Installation and Service

Tektronix

Grass Valley Model 4000
Digital Production Switcher
Software Release 5.3

071-0163-00

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Customer Support

Tektronix Grass Valley Products is committed to providing the most responsive and professional product support available. We have a fully staffed, highly trained support team ready to respond to anything from a simple question to an emergency repair. Support is available via telephone or email. For new and updated customer support documents, as well as new product information, check the Tektronix web site and Grass Valley's web page.

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Tektronix
Grass Valley Products

EC Declaration of Conformity

We

Tektronix Holland N.V.
Marktweg 73 A
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THE NETHERLANDS

declare under sole responsibility that the

Model 4000-2A Video Production Switcher
Model 4000-2B Video Production Switcher

manufactured by the Grass Valley Group, a Tektronix Company meets the intent of Directive 89/336/EEC for Electromagnetic Compatibility and the Low Voltage Directive 73/23/EEC.

89/336/EEC EMC Directive
EN 50081-1
EN55022 Class A Radiated and Conducted Emissions

EN 50082-1 Immunity

IEC 801-2	Electrostatic Discharge Immunity
IEC 801-3	RF Electromagnetic Field Immunity
IEC 801-4	Electrical Fast Transient/Burst Immunity

73/23/EEC Low Voltage Directive
EN 60950 "Safety of Information Technology Equipment"

Tom Myers, (Acting) Product Line Manager — 22/MAR/95
Date

Tom Myers, Quality Manager — 22/MAR/95
Date

Jaap Meijer, EC Representative — 6 April 95
Date

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Sophia K Meyer — 11/2/95
Sophia Meyer, (Acting) Product Line Manager — Date

Sophia K Meyer — 11/2/95
Sophia Meyer, Quality Manager — Date

11 10 95
Jaap Meijer, EC Representative — Date

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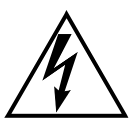
Important Safeguards and Regulatory Notices

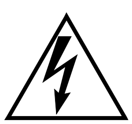
Specific warnings and cautions will be found throughout the manual where they apply, but may not appear here. Please read and follow the important safety information, noting especially those instructions related to risk of fire, electric shock or injury to persons.



WARNING

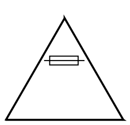
Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

Symbols and Their Meaning in This Manual

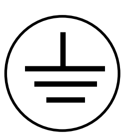


The lightning flash with arrowhead symbol, within an equilateral triangle, alerts the user to the presence of "dangerous voltage" within the equipment's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

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 equipment.

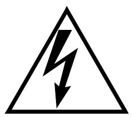


The fuse symbol indicates that the fuse referenced in text must be replaced with one having the ratings indicated.



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

Danger



- Electrical potential is still applied to some internal components even when the power switch / breaker is in the off position. To prevent electrical shock when working on this equipment, disconnect the AC line cord from the AC source before working on any internal components.
- A residual voltage may be present immediately after unplugging the system due to slow discharge of large power supply capacitors. Wait 30 seconds to allow capacitors to discharge before working on the system.

Warnings

- To reduce the risk of electrical shock, plug each power supply cord into separate branch circuits employing separate service grounds.
- Turn the power switches off on both the main and redundant power supplies before attempting repair to the Control Panel.
- Heed all warnings on the unit and in the operating instructions.
- Do not use this equipment in or near water.
- Verify that all power supply lights are off before removing power supply or servicing equipment.
- Disconnect ac power before installing any options.
- The attachment plug receptacles in the vicinity of the equipment are all to be of a grounding type, and the equipment grounding conductors serving these are to be connected to earth ground at the service equipment.
- This equipment 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 equipment 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 equipment. To avoid personal injury, do not touch exposed connections and components while power is on.
- Do not wear hand jewelry or watches when troubleshooting high current circuits, such as the power supplies.
- To prevent damage to equipment when replacing fuses, locate and correct the trouble that caused the fuse to blow before applying power.
- 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 components of the the specified type, voltage, and current rating as referenced in the appropriate parts list for this equipment. Always refer fuse replacement to qualified service personnel.
- To avoid explosion, do not operate this equipment in an explosive atmosphere unless it has been specifically certified for such operation.
- Have qualified personnel perform safety checks after any completed service.

Cautions

- 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 the fire enclosure and should be kept closed during normal operation.
- This equipment should be powered only as described in the manual. To prevent equipment damage select the proper line voltage at the ac input connector as described in the Installation documentation.

Power Cord Notices

North American Power Supply Cords

The Control Panel is supplied with a molded grounding plug (NEMA 5-15P) at one end and a molded grounding receptacle (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

This equipment is supplied with a molded grounding receptacle (IEC 320-C13) at one end and stripped conductors (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

FCC NOTICE

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

1 System Overview

Introduction

This section presents a general description of the Grass Valley Group Model 4000 Series Switching Systems, their basic architecture, and a list of video specifications.

System Description

The Model 4000 Series of digital production switchers includes the Model 4000-2A, the Model 4000-2B and the Model 4000-3. All switcher models manipulate CCIR 601 4:2:2 serial component digital and component analog video and key signals. The input format may be a mix of component analog and component serial digital. Outputs from the switcher are provided in serial digital and analog component.

The Model 4000-2A switcher shown in Figure 1-1 provides 2 mix / effects systems with a Program / Preset mixer that is functionally similar to a mix / effects. Up to 48 video / key sources can be mapped to crosspoint buttons and accessed directly from the control panel.

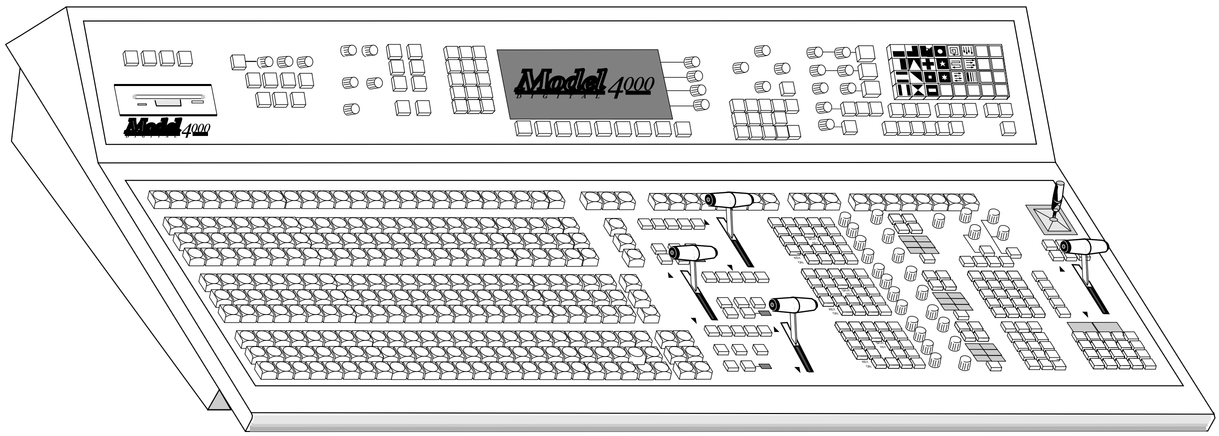


Figure 1-1. Model 4000-2A Control Panel

The Model 4000-2B switcher shown in Figure 1-2 provides 2 mix / effects systems with a Program / Preset mixer with Dual Downstream Keyer which can access up to 32 direct video / key sources at a time.

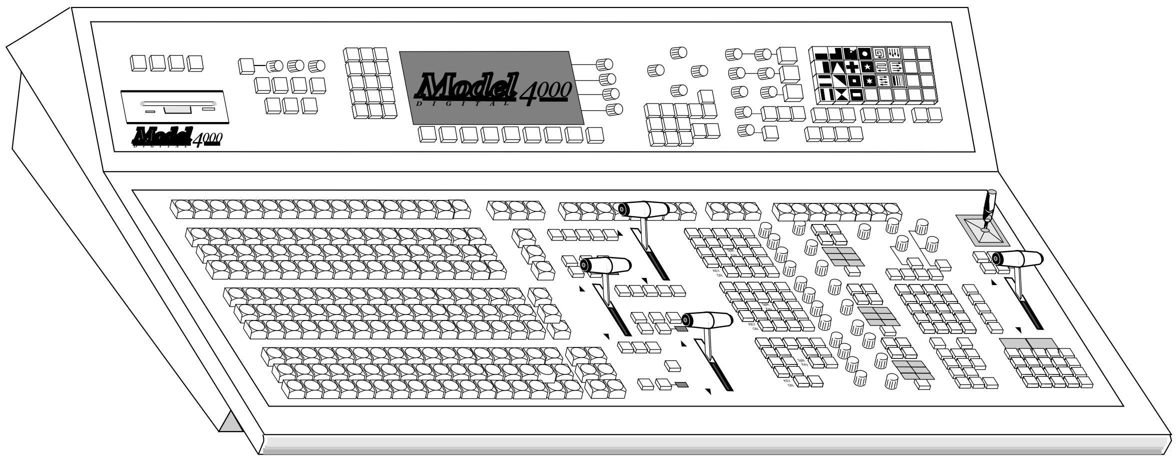


Figure 1-2. Model 4000-2B Control Panel

The Model 4000-3 switcher shown in Figure 1-3 provides 3 mix / effects systems with a Program / Preset mixer with Dual Downstream Keyer which can access up to 48 direct video / key sources at a time.

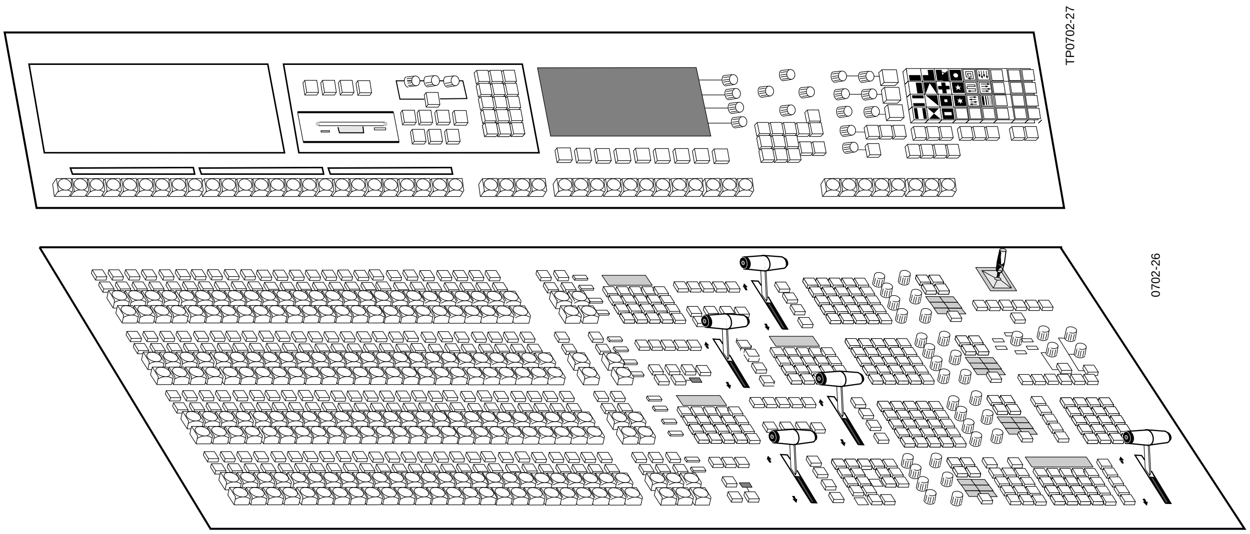


Figure 1-3. Model 4000-3 Control Panel

Modularity extends throughout the switching system, providing simple configuration and expansion to meet your present and future needs. The basic system consists of a Signal Processor Frame, Signal Processor Frame Power Supply, and a Control Panel, as shown in Figure 1-4.

The Signal Processor Frame houses the serial and analog I/O modules, the signal processing modules and the system controller.

Power supplies for both the Control Panel and Signal Processor Frame can be made fault tolerant by the purchase of optional redundant supplies. See Section 2, Installation, for further information.

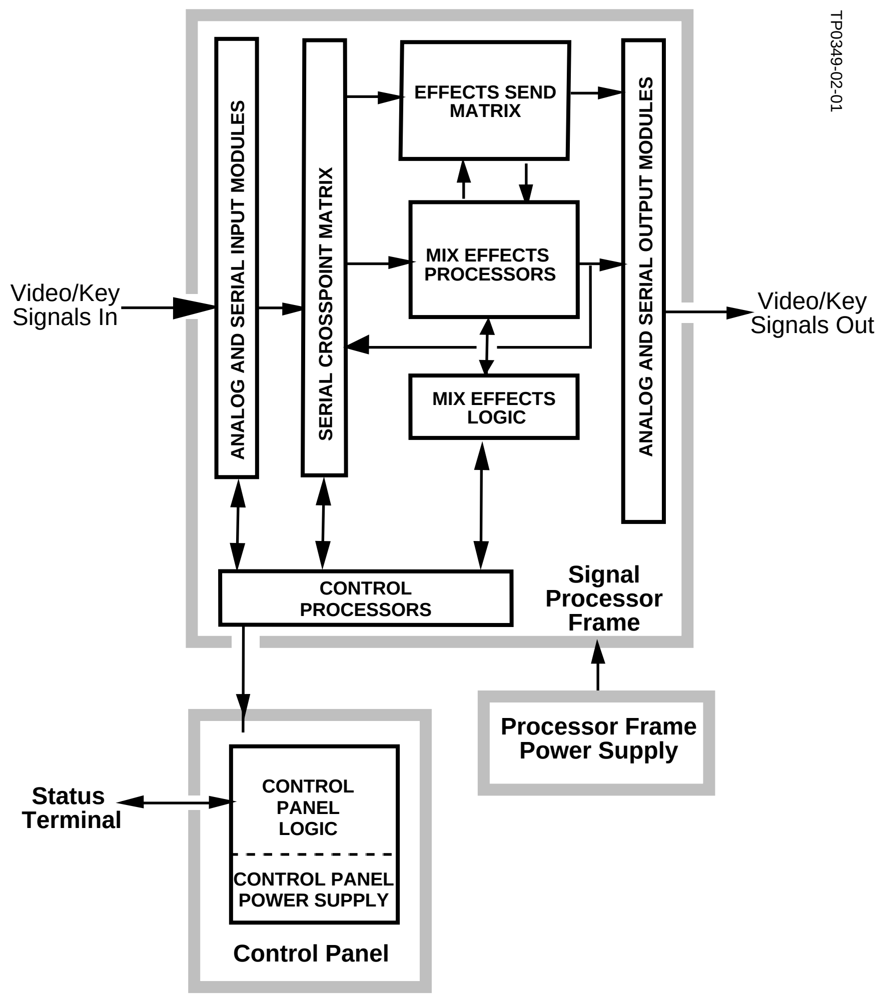


Figure 1-4. Model 4000 Simplified Block Diagram

Available Options

This section provides brief descriptions of available options for the Model 4000 Series switchers.

Input Modules

The input formats may be a mix of component analog and component serial digital. A total of 64 inputs may be installed. A total of 12 optional input modules, 8 Component Analog Input Modules and 4 Component Serial Digital Input Modules can be installed. These modules are installed in the upper and lower rear bays of the Signal Processor Frame. The following module types are available:

- Serial Input Modules (8 modules total, 8 looping inputs on each module)
- Analog Input Modules (8 modules total, each adds 2 CAV–RGB, YUV, Beta, or MII and 2 Key inputs)
- Chroma Key Input Modules (3 modules total–each provides 2 inputs–RGB, YUV, Beta or MII)

Output Modules

The Model 4000 has one standard Analog Output Module and can have up to 4 optional Serial Output Modules. Each Serial Output Module option has eight different output signals (2BNCs per output for a total of 16 BNCs on each module).

Analog Outputs

The standard Analog Output Module includes the following outputs:

- DSK Program Video
- Switched Preview Video

Serial Outputs

Serial Output Modules include the following outputs:

Serial Output 1 (Slot D6) (All Models)

- Mask
- Switched Preview
- DSK Program Video
- DSK Program Key
- M / E 1 Program Video
- M / E 1 Program Key / Clean Feed Video (switchable)
- M / E 2 Program Video
- M / E 2 Program Key / Clean Feed Video (switchable)

Serial Output 2 (Slot D5) (Model 4000-2A / B shipped before 1 / 96)

- M / E 1 Preview Video / Look Ahead
- M / E 2 Preview Video / Look Ahead
- DSK Preview Video
- Spare (unused)
- DSK Preview Video
- Clean Feed Video
- Aux Bus 9a Video / Key
- Aux Bus 9b Video / Key

Serial Output 2 (Slot D5) (All Models shipped after 1 / 96) (M / E 3 available only for Model 4000-3)

- M / E 3 Program Video
- M / E 3 Program Key
- M / E 1 Look Ahead Preview Video
- M / E 2 Look Ahead Preview Video
- M / E 3 Look Ahead Preview Video
- DSK Look Ahead Preview Video
- Program Clean Feed
- DSK Preview

Serial Output 3 (Slot D4) (All Models)

- Aux / Effects Send Bus 1a Video
- Aux / Effects Send Bus 1b Key
- Aux / Effects Send Bus 2a Video
- Aux / Effects Send Bus 2b Key
- Aux / Effects Send Bus 3a Video
- Aux / Effects Send Bus 3b Key
- Aux / Effects Send Bus 4a Video
- Aux / Effects Send Bus 4b Key

Serial Output 4 (SlotD3) (All Models)

- Aux Bus 5a Video / Key
- Aux Bus 5b Video / Key
- Aux Bus 6a Video / Key
- Aux Bus 6b Video / Key
- Aux Bus 7a Video / Key
- Aux Bus 7b Video / Key
- Aux Bus 8a Video / Key
- Aux Bus 8b Video / Key

Serial Output 5 (Slot D2) (All Models shipped after 1 / 96)

- Frame Store Video
- Frame Store Key
- Aux 9a Video / Key
- Aux 9b Video / Key
- All other outputs unused

Timed Aux Outputs

The Timed Aux Output Module provides four independent output pairs (video / video or video / key)from aux buses 5A through 8B for use with Kaleidoscope and DPM systems.

Effects Send Matrix

The Effects Send Matrix option provides a method of integrating digital effects devices into the Switcher mix / effects system. Up to four send channels can be used to route the video and key from an M / E to and from an external digital effects system.

This option comes in the form of two Effects Send Matrix Modules installed in the lower front Signal Processor Frame bay and a Serial Output Module which installs in the upper rear bay.

Secondary Wipe Generators

An optional Secondary Wipe Generator for each Mix / Effects provides a second wipe pattern for each of the M / E systems. With this option installed, two independent wipe patterns are allowed within each M / E. The output from the Secondary Wipe Generator can be mixed or non-additively mixed with the output from the primary wipe generator to create novel wipe patterns.

This option also allows the Preset wipe pattern to differ from the transition wipe pattern. It can also be used as an additional mask source and a matte generator modulator within each M / E.

The Secondary Wipe Generator Modules are sub-modules which mount onto the Mix / Wipe Modules in each M / E.

An identical Secondary Wipe Generator Module option is also available for the Program / Preset Mixer in the Model 4000-2A switcher only.

Dual Chromatte Advanced Chroma Keyer

Optional Chromatte™ Advanced Chroma Keyer Modules are available for component chroma keying. Each module provides chroma keying for both foreground keyers in each M / E. Dual Chromatte™ Chroma Keyer Modules are installed in the lower front bay of the Signal Processor Frame. Any internal 4:2:2 component signal may be used to chroma key.

To use external analog component inputs for chroma keying, the optional Dual Analog Component Chroma Key Input Modules must be installed. Each input module provides two analog component inputs for use by any chroma keyer. Up to three input modules may be installed for a total of six analog component inputs. The input modules are installed in the lower rear bay of the Signal Processor Frame.

The following analog component formats are supported:

- RGB Betacam® [1]
- YUV
- MII
- SMPTE

1. Betacam is the registered trademark of Sony Corporation.

BORDERLINE Key Edge Generation

BORDERLINE® Key Edge Generators are optional for each keyer in the switcher. The BORDERLINE option is added by plugging a small sub-module onto the Keyer module of an M/E or the DSK. One sub-module can be installed for each of the two keyers in each M/E and one in each of the two keyers of the Down Stream Keyer (DSK) module. The Switcher could have up to six sub-modules installed, two for the keyers in each M/E and two for the DownStream Keyer.

Each BORDERLINE Key Edge Generator supports 1, 2, or 3 line wide borders or outlines. Video fill is provided within the borders. Shadow and extrude modes create 1 to 6 line wide edges, positioned either below left or below right. Separate mattes are provided by the generators for edge and fill. Key Edge opacity is adjustable.

Tally Output

The Tally Relay Module Option provides 64 tally relay closures for on-air source indicators. This option is a single module which slides into the rear bays.

An Extended Tally Option is also available to allow expanded tally relay outputs. Three additional Tally Modules provide 64 tally relay outputs per module. The additional Tally Modules are housed in a separate two rack-unit frame which connects to the main frame via a standard SMPTE interconnect cable not to exceed 1000 feet (305 meters).

Look-Ahead Preview

The Look-Ahead Preview option provides look-ahead preview processing for both M/Es, the Program/Preset and the DSK. This option provides a Clean Feed output in place of the M/E Program Key and allows you to preview the next event on the preview bus output. Each Look-Ahead Preview Module is a plug-in mezzanine module that installs below the Primary Wipe Generator Module mezzanine on each Mix/Wipe Module in the system.

Extender Modules

Two module extenders are supplied for use in troubleshooting Signal Processor Frame modules to the module level only. The longer extender is for the modules in front bays A (top) and B (bottom). The shorter one is for the input and output modules in rear bays C (top) and D (bottom). These extenders allow you to extend a circuit module beyond the depth of the signal frame, so that components are readily accessible for testing and maintenance.

Frame Store Option

The Frame Store option allows storage and retrieval of images at a resolution of 10 bits. Frame Store is source oriented in that its inputs are fed with an AUX/effects send bus (Aux 4) and the outputs are available as primary inputs to the crosspoint matrix. Frame Store can be connected in the effects send loops. Frame Store features are listed below:

- Video hue functions include rotate or blur (mutually exclusive).
- Frame Store functions can be controlled by E-MEM.
- Real-time video bit map effects include Mosaic, Posterize, Solarize, Color modulate, Contrast stretching or Hue modulate and subpixel repositioning. Effects can be applied to frozen or live video.
- Write after read capability allowing layering of stills in a recursive manner. (i.e., frame store could receive output from an M/E that is using the frame store as one of its inputs).
- Ability to provide a real-time drop shadow on a key that can be positioned anywhere in the raster. Shadow can be blurred and opacity adjusted independently of Video and Key framestores.
- Frame Store Video and Key may be keyed on top of a background source.
- Four pages of two-field images may be captured at 525 line rate (3 pages at 625 line).
- If Field 1 or Field 2 are frozen, interpolation modes can be applied.
- Independently adjustable crop on video and/or key.

Power Supplies

The Model 4000 is powered by two power supply assemblies. One assembly supplies the Control Panel. It is located inside the Control Panel tub. The Signal Processor Frame is powered by a single 19" standard rack mounted power supply assembly.

Optional redundant power supply assemblies are available for both the Control Panel and the Signal Processing Frame.

Control Panel Power Supplies

Power is provided to the Control Panel by an assembly containing two individual power supplies which is mounted inside the main Control Panel tub. A redundant power supply option provides a second, backup power supply assembly. The optional assembly also mounts inside the panel.

Frame Power Supplies

Power for the Signal Processor Frame is provided by a single 19” rack mounted assembly containing two individual power supplies. The assembly is rack mounted directly below and wired directly to the Signal Processor Frame. When the optional redundant supply is installed, it is rack mounted below the standard supply and interconnected by a wiring harness. The frame power supply assembly is air cooled by integral fans.

Physical Description

Model 4000 Series electronic circuitry is contained on circuit modules in the Signal Processor Frame and Control Panel.

Control circuitry is located in the Control Panel and in the top bay of the Signal Processor Frame. There are four card cages referred to as ”bays” in the Signal Processor Frame. For reference, the bays are referred to as “A” and “B,” corresponding to the top and bottom front bays and “C” and “D,” corresponding to the top and bottom rear bays.

In this manual and in other related documents, the circuit modules will be referred to by the specific names and assembly numbers printed on them.

Control Panel

The Control Panel is the operator interface for the Model 4000 systems and provides all operator controls for the two Mix/Effects and DSK systems.

Through the Control Panel, the operator performs all actions via mechanical buttons and controls, or through software controlled menus and soft button adjustments. The Control panel provides the data link to the Signal Processor Frame.

Signal Processor Frame

The Signal Processor Frame is a large rack-mounted unit, (see Figure 1-5), that houses all of the signal processing modules along with some control processor modules.

The Head-of-State (HOS) processor and all M/E processors reside on two Control Processor modules in Bay A (top bay) of the frame. Control Processor 1 contains the HOS processor which supervises the state of the switcher, handles communication with the Control Panel and controls the video hardware. The M/E 1 processor also resides on this module.

The Control Processor 2 contains the circuitry for communication with the editor, tally expansion and other remote control. The M/E 2 and M/E 3 processors are on this module.

Since each M/E has its own processor, failure of the HOS processor does not shut down the entire switcher. Individual M/Es can continue to operate independently, although in a degraded capacity (cuts, mixes and fade- to-black continue to operate).

The Control Panel communicates with the Signal Processor Frame over RS-422 data links, one per M/E plus a flip/flop mix data link. Each of the links is contained within a single cable that may be up to 1000 feet long.

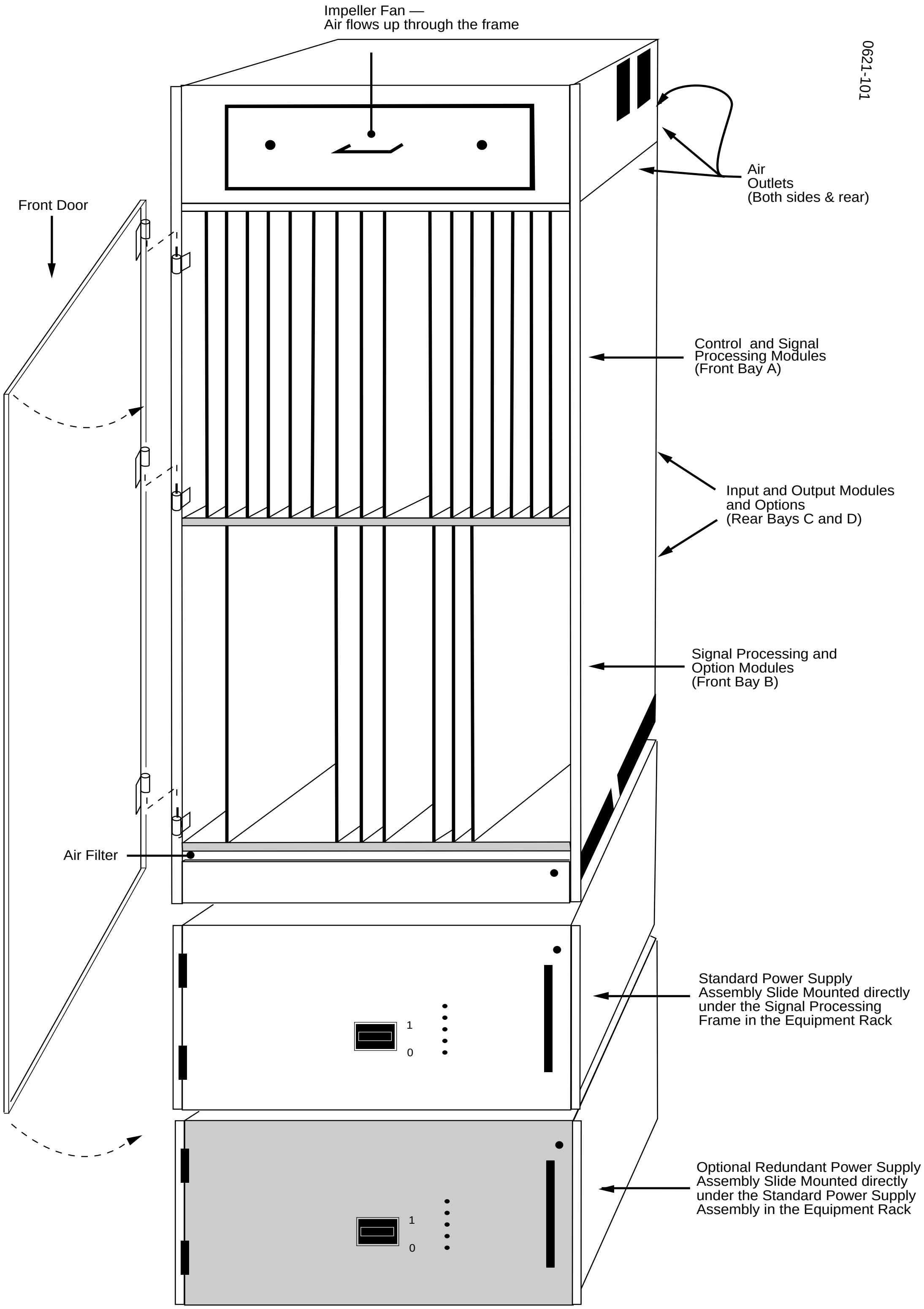


Figure 1-5. Signal Frame and Power Supply.

System Specifications

Specifications for the Model 4000 Systems are listed on the following pages. Refer to Section 2, Installation and Configuration, for information on the mechanical characteristics of the system.

Specifications[1] are provided for the following:

- Table 1-1—Power Specifications
- Table 1-2—Analog Input Video Characteristics
- Table 1-3—Serial Digital Input Video Characteristics
- Table 1-4—Analog Output Characteristics
- Table 1-5—Serial Digital Output Characteristics
- Table 1-6—Video System Characteristics (Analog In To Analog Out)
- Table 1-7—Video System Characteristics (Analog and Digital)
- Table 1-8—Environmental Characteristics

Table 1-1. Model 4000 Power Specifications

Component	Power	Voltage	Frequency
Control Panel	300 Watts Max	110/220 VAC (Nominal)[1]	50-60 Hz (Nominal)
Frame Power Supply	1300 Watts (no options) 1800 Watts (Typical) 2500 Watts (Max)	176-264 VAC (100-264 VAC - auto-ranging for Model 4000-2A/B only with P/S 098901-03)	50-60 Hz (Nominal)

1. The Control Panel Power supply must be internally physically reconfigured for a different input voltage.

1. All specifications subject to change without notice.

Table 1-2. Analog Input Video Requirements

Characteristic	Requirement
Video Amplitude (Luminance channel) for Primary Inputs	0.714 mV with/without setup or 0.700 mV without setup (with or without sync)
Maximum luminance Excursion Relative To Black level (before clipping)	+108 IRE peak positive - 6 IRE peak negative
Video Amplitude For Color Difference Chroma Key and Analog Inputs (100% saturated bars)	Betacam ± 467 mV MII 60 Hz ±324 mV MII 50 Hz ±350 mV SMPTE ±350 mV EBU ±350 mV (Format for each input is individually selectable)
Video Amplitude For RGB Chroma Key and Analog Inputs	0.714mV with or without setup or 700mV without setup (with or without sync) (Format for each input is individually selectable)
Linear Key Amplitude	0.714 mV with or without setup or 0.700 mV without setup
DC Offset Of Blanking Level[1]	± 1Volt DC
Common Mode Hum[2]	1.0 V p-p Max
Random Noise	< -54 dB RMS relative to 1 V p-p
Analog Reference Input	Black (Burst is not required)
Impedance (Chroma key and analog inputs)	75 Ω Terminating (Chroma Key/Analog Inputs) 75 Ω loop-through (Reference input)
Return Loss	> 40 dB to 5 MHz
Manual Timing steps	18 nS
Manual Timing range	±1 µS (Chroma Key inputs) ±37 nS (Analog inputs)
Common Mode Hum Attenuation	>34 dB

1. Exclusive of Common Mode Hum
2. With DC Offset at 0.0 volts

Table 1-3. Serial Digital Input Video Requirements

Characteristic	Requirement
Channel Coding	Conforms to SMPTE RP-259M
Aux Data	Auxiliary data is blanked
Connector	BNC
Input Impedance	75 Ω
Return Loss	> 15dB 5 MHz to 270 MHz
Autotiming Range	±18 µS
Maximum Cable Length Equalized (Belden 8281 type cable)	225 meters (738 feet)
Number of Bits	10

Table 1-4. Analog Output Specifications

Characteristic	Specifications
Output Amplitude	1.0 Volt p-p nominal
DC On Output Blanking Level	< 50 mV
Output Return Loss	> 34 dB to 5 MHz
Output Isolation	> 54 dB to 5 MHz
Output Y/C Timing error	<10 nS
Number Of Outputs	2 (RGB, SMPTE/EBU, MII or Betacam)

Table 1-5. Serial Digital Output Specifications

Characteristic	Specifications
Rise and Fall Times (Between 20% and 80% amplitude points)	Between 400 pSec and 1.5 nSec across 75 Ω termination
Jitter	Timing of rising edges of data signal shall be within ±0.25 nSec of average timing of rising edges over a period of 1 line
Channel Coding	Conforms to SMPTE RP-259M
Aux Data	None
Connector	BNC
Output Impedance	75 Ω
Return Loss	> 15 dB 5MHz to 270 MHz
Output Amplitude	800 mV p-p across 75 Ω ±10%
DC Offset on Output	< 50 mV across 75 Ω termination
Number Of Bits	10 bits
Number Of Outputs	2 (Timed Aux Output has 1)

Table 1-6. Video System Specifications (Analog In to Analog Out)

Characteristic	Specifications
Frequency Response	≤ ± 0.2 dB to 5MHz, -18 at 6.75 MHz
Group Delay error	≤ ± 8 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%
S/N Ratio (unweighted, 5 Mhz Bandwidth)	< 54 dB
Line Time Non Linearity	< 0.5%
Gain Deviation	< 1%
Crosstalk	> 50 dB to 5 MHz

Table 1-7. Video System Specifications (Analog or Digital)

Characteristic	Specifications
Blanking Width	10.222 µS (525 line) 10.666 µS (625 line)
Number Of Quantization Bits	10 Minimum
Mix Tracking Error	0
Linearity During Mix	Linearity Is Not Affected By Mix
Frequency Response During Mix	Response Is Not Affected By Mix
Path Length	80 µs (4000-2A/B) 90 µS (4000-3)
Rounding Method (digital only)	Adaptive Bit Reduction™ (Patent Pending)

Table 1-8. Environmental Specifications

Characteristic	Specifications
Operating Ambient Temperature Range	0 - 40° C (32 - 104° F)
Ambient Temperature for Specifications	20 - 30° C (68 - 86° F)
Relative Humidity (Operating)	95% Maximum (Non-Condensing)

2 *Installation*

Introduction

This section describes the installation and setup of the Model 4000 Digital Switchers. The process of installing the Model 4000 is discussed in the following major areas:

- Unpacking
- Installing the Control Panel
- Installing the Signal Processor Frame in the rack
- Option Installation
- Cabling the equipment
- Power Connections
- Checking, and timing the installed system

NOTE: *Software configuration of the system is described in the Startup section of the Model 4000 User's Guide.*

Unpacking

The Model 4000 is packaged in several boxes, one each for the following:

- Signal Processor Frame
- Control Panel, panel cable, power cord, spare fuse kit, and diagnostic probe (ribbon cable)
- Signal Processor Frame Power Supply and Instruction Manuals
- Optional Redundant Power Supply for the Signal Processor frame if ordered

Carefully check the contents of each box against the packing slip to ensure that everything shipped to you was received. If any items are missing or damaged, contact the shipping company or your supplier or sales representative immediately.

Pre-installation Procedures

Before you physically install the Model 4000, there are certain considerations such as tools required, physical specifications, safety and power requirements you should be aware of. These considerations are covered in the following headings.

Items Required but not Supplied

The following is a list of items required for installation:

- Medium flat bladed screwdriver
- Medium Phillips head screwdriver
- #10, #15, & #20 Torx screwdrivers
- 3/8” Deep Well Socket (to fit the Torque Wrench)
- Torque Wrench (100 inch/pound range)

Physical Specifications and Installation Requirements

Physical dimensions for the Model 4000, shown in Figure 2-1, are provided to assist you in the installation. Power requirements are listed in Figure 2-2 and environmental characteristics are listed in Figure 2-3.

Table 2-1. Model 4000 Component Size Summary

Component	Depth	Width	Height	Weight
4000-2A Control Panel	25.41 inches (64.54 cm)	49.0 inches (124.5 cm)	8 inches (20.3 cm)	130 lbs (59 kgs)
4000-2B Control Panel	25.41 inches (64.54 cm)	42.80 inches (108.7 cm)	8 inches (20.3 cm)	114 lbs (51.8 kgs)
4000-3 Control Panel (Upper)	10.2 inches (25.9 cm)	54.0 inches (137.0 cm)	6.50 inches (16.5 cm)	63 lbs (28.58 kgs)
4000-3 Control Panel (Lower)	21.5 inches (54.5 cm)	54.0 inches (137.0 cm)	8.63 inches (21.9 cm)	137 lbs (62.14 kgs)
Signal Processor Frame	22.5 inches (57.15 cm)	Std (19 inches) (48.26 cm)	43.75 inches (111.13 cm)	300 lbs (136.4 kgs)
Power Supply	22.5 inches (57.15 cm)	Std (19 inches) (48.3 cm)	12.25 inches (31.12 cm)	143 lbs (65 kgs)
Redundant Power Supply	22.5 inches (57.15 cm)	Std (19 inches) (48.3 cm)	12.25 inches (31.11 cm)	143 lbs (65 kgs)

* Allow 14 rack units total under Signal Processor Frame if installing redundant Power Supply.

Power Requirements

Power requirements for the Model 4000 Control Panel and Signal Processing Frames are listed in Figure 2-2. The Frame is shipped from the factory configured for 220 VAC operation.

Table 2-2. Power Requirements

Component	Power	Voltage	Frequency
Control Panel	300 Watts (max)	110/220 VAC (nominal)	50-60 Hz
Signal Processor Power Supply	1800 Watts (Typical) 2500 Watts (Fully Optioned) 1300 Watts (No Options)	176-264 VAC or 100-264 VAC[1]	50-60 Hz

1. Model 4000-2A/B only with auto-ranging power supply P/N 098901-03

Environmental Characteristics

The Model 4000 has been designed to operate efficiently in environments outlined below in Figure 2-3.

Table 2-3. Environmental Characteristics

Characteristic	Requirement
Operating ambient temperature	0 - 40 ° C (32 - 104 ° F)
Ambient temperature for specifications	20 -30 ° C (68 - 86 ° F)
Relative humidity	95% max (non-condensing)

Safety Requirements

The following precautions are provided to ensure that safety considerations for both equipment and personnel are presented before any installation procedures are begun. To prevent injury or equipment damage, read, understand, and follow all installation safety precautions.

WARNING

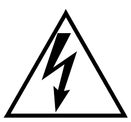
The Model 4000 Digital Signal Processor Frame weighs approximately 300 lbs (136 Kg) when fully configured. Provide appropriate equipment to support the Frame during installation.

Do not lift the Control Panel, by the lid. The lid could open causing the unit to fall creating a hazard to personnel and/or damage to the equipment.

WARNING

The Signal Processing Frame power supply assembly exhibits high leakage (fault) currents due to the EMI suppression filter system. This power supply chassis <u>must</u> be connected to earth ground via the ground wire provided in the AC input cord. An additional ground lug is provided on the rear of the power supply chassis for supplementary grounding purposes.

WARNING



Electrical potential is still applied to some internal components even when the power switch/breaker is in the off position. To prevent electrical shock when working on this equipment, disconnect the AC line cord from the AC source before working on any internal components. A residual voltage may be present immediately after unplugging the system due to large power supply capacitors discharging. Wait thirty seconds to allow capacitors to discharge before working on the system.

CAUTION

To avoid static damage to sensitive electronic devices, protect the Model 4000 Digital Switcher from static discharge. Avoid handling switcher modules in a high static environment. Touch the Signal Processor 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 and grounded equipment.

Installation

The following procedures contain the instructions necessary to install the Control Panel, Signal Processor Frame, and Frame power supply. Procedures are also included for optional modules and cable installation. Before proceeding, read and understand all precautions and notes.

Model 4000-2A/B Control Panel Installation

This installation does not require countersunk or beveled edges. The tub slips into the cutout from the top and is held in place by an overhanging lip secured by six screws. To install the Control Panel in the console, proceed with the following steps.

NOTE: *The control panel should be installed on as flat a surface as possible. It is not recommended to have more than a 10 degree tilt, as this would add excessive weight on the gas shocks supporting the Control Panel top.*

Be sure to leave a minimum of 6.0" (15.3 cm) of clear space inside the console behind the Control Panel for control, signal, and power cables and connectors.

Also, be sure to leave a minimum of 5.3" (13.5 cm) of clear space behind the Control Panel so the lid can be fully opened, as shown in Figure 2-1.

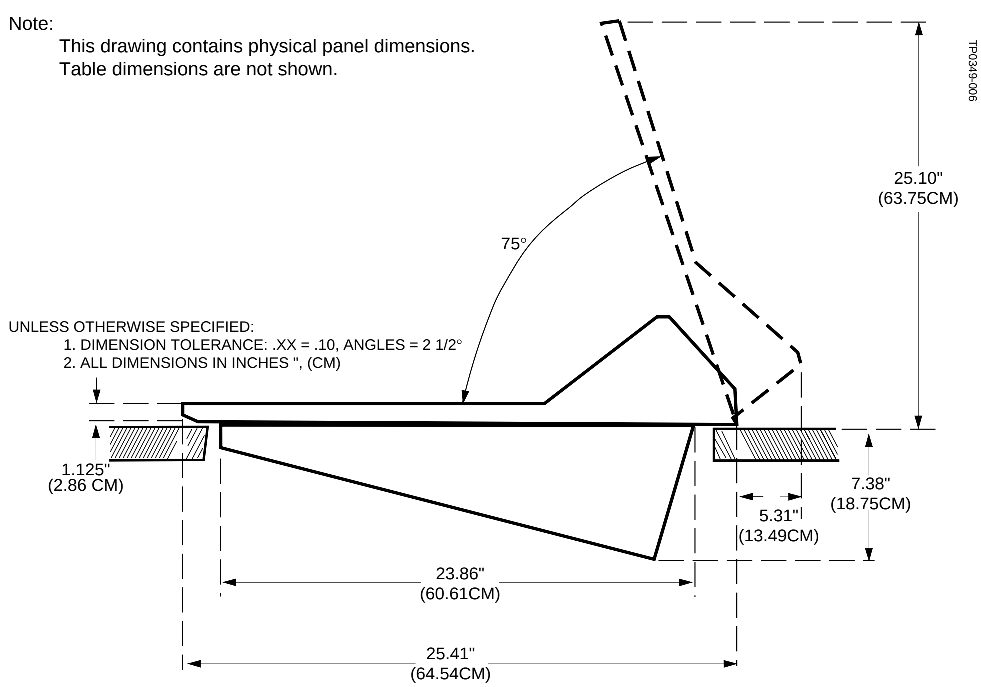


Figure 2-1. Model 4000 -2A/B Control Panel Profile

Model 4000-2A Cutout Dimensions

1. Using the dimensions shown in Figure 2-2, make cutouts in the console to accommodate the Model 4000-2A Control Panel.

2. Carefully place the Control Panel into the cutout and mark the pilot hole locations for the six anchor screws. Note that the ends of the panel tub have been designed to grasp for removal.

3. Remove the Control Panel and use a 1/8" (3 mm) bit to drill six pilot holes to secure the Control Panel to the console.

WARNING

Do not lift the Control Panel by the lid or the transition lever arms. Be careful when opening or closing the panel lid. The gas shock supports may cause the lid to open or close abruptly, causing possible injury or damage to the equipment. Always lift the Control Panel by holding onto the tub.

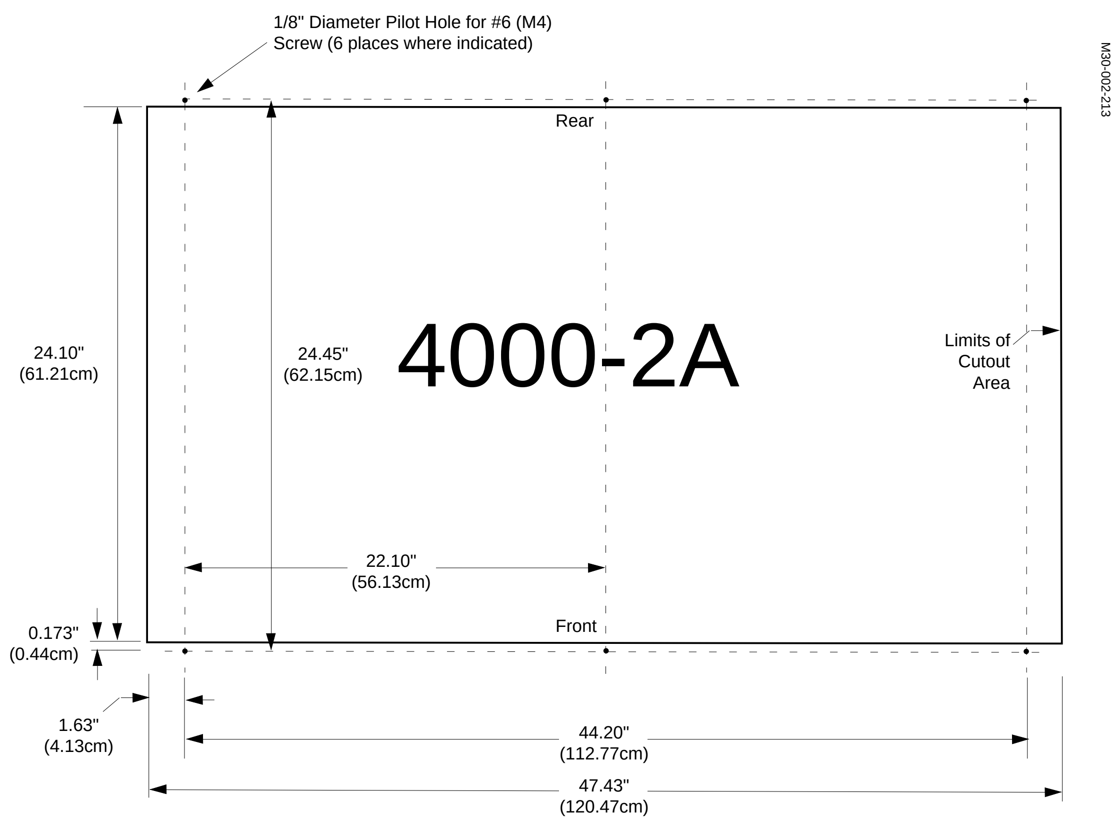


Figure 2-2. Model 4000-2 A Control Panel Console Cutout Dimensions

Model 4000-2B Cutout Dimensions

1. Using the dimensions shown in Figure 2-3, make cutouts in the console to accommodate the Model 4000-2B Control Panel.

2. Carefully place the Control Panel into the cutout and mark the pilot hole locations for the six anchor screws. Note that the ends of the panel tub have been designed to grasp for removal.

3. Remove the Control Panel and use a 1/8” (3 mm) bit to drill six pilot holes to secure the Control Panel to the console.

WARNING

Do not lift the Control Panel by the lid or the transition lever arms. Be careful when opening or closing the panel lid. The gas shock supports may cause the lid to open or close abruptly, causing possible injury or damage to the equipment. Always lift the Control Panel by holding onto the tub.

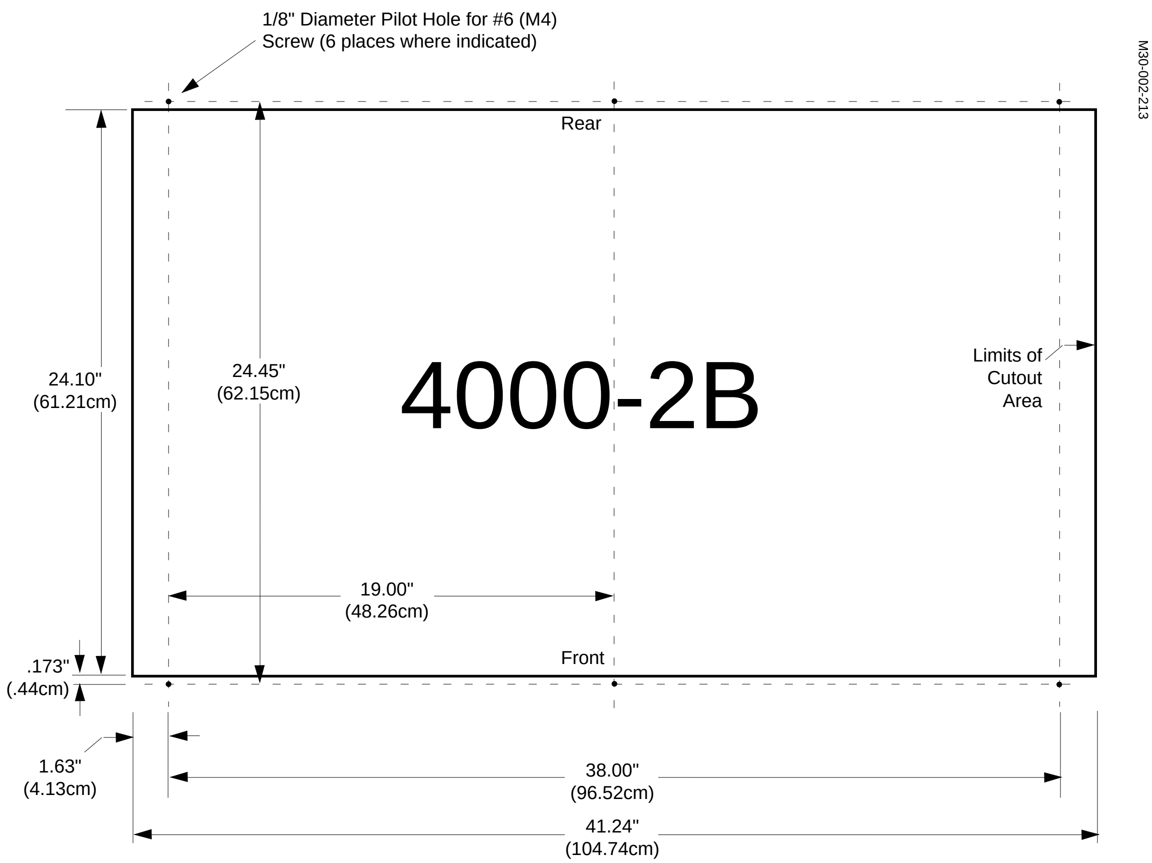


Figure 2-3. Model 4000-2 B Control Panel Console Cutout Dimensions

Model 4000-2 Rear Cable Clearance

1. Using the dimensions shown in Figure 2-4, make cutouts in the rear of the console platform appropriate for your switcher model.

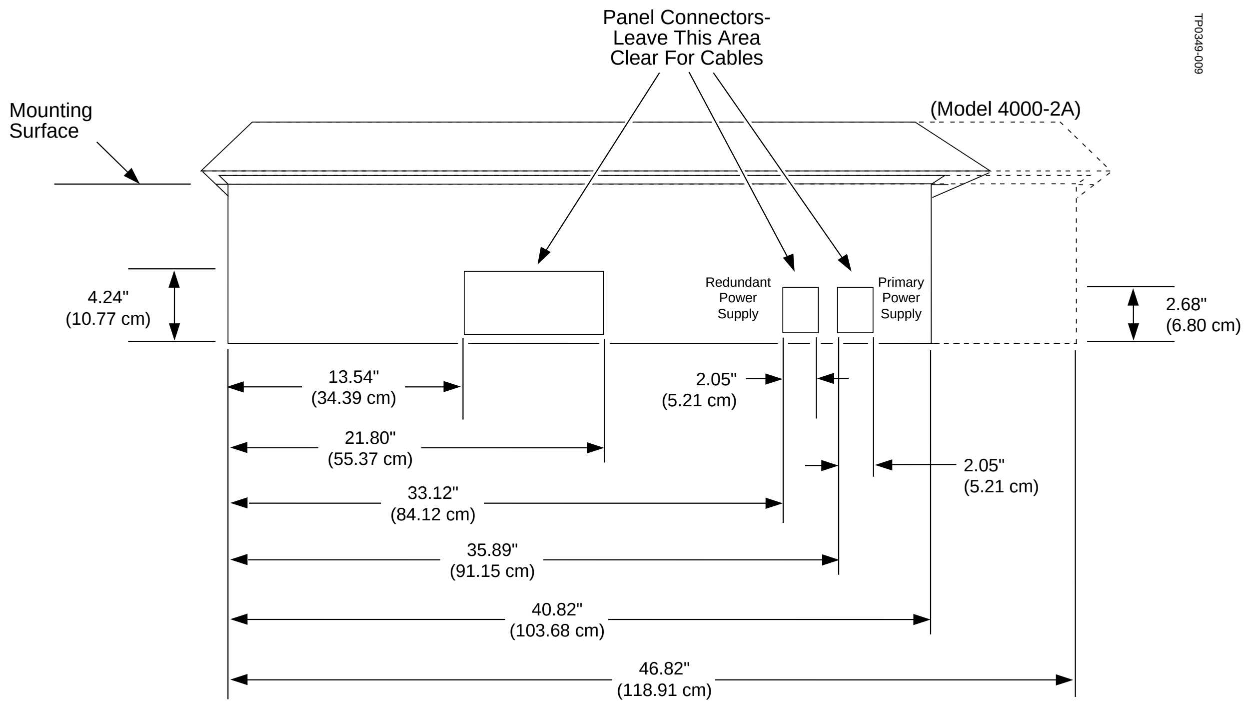


Figure 2-4. Required Cable Clearance

Inserting the 4000-2 Panel

1. Carefully place the Control Panel into the cutout in the console.

2. Secure the Control Panel to the console with six #6 (M4) screws (not included) into the pilot holes drilled in the console.

3. Do not connect power to the Control Panel until all cable connections have been completed and verified.

Model 4000-3 Control Panel Installation

A full flush-mount installation requires countersunk edges. The Panel enclosures (upper and lower tubs) slip into the cutout from the top, are fitted into the routed openings, and secured by 27 screws inserted through overhanging flanges at the front, rear, and sides of the tubs.

NOTE: *The lower Control Panel tub should be installed on as flat a surface as possible. It is not recommended to have more than a 10° tilt, as this would add excessive weight on the gas shocks supporting the lower panel lid.*

To guarantee adequate cable clearances leave a minimum of 11.5" (29.0 cm) of clear space inside the console behind the upper Control Panel, and 3.25" (8.3 cm) of clear space inside the console behind the lower Control Panel for control, signal, and power cables and connectors. See Figure 2-5 and Figure 2-6 If you elect to reduce these minimums, we suggest the Control Panels be on site before you prepare the console.

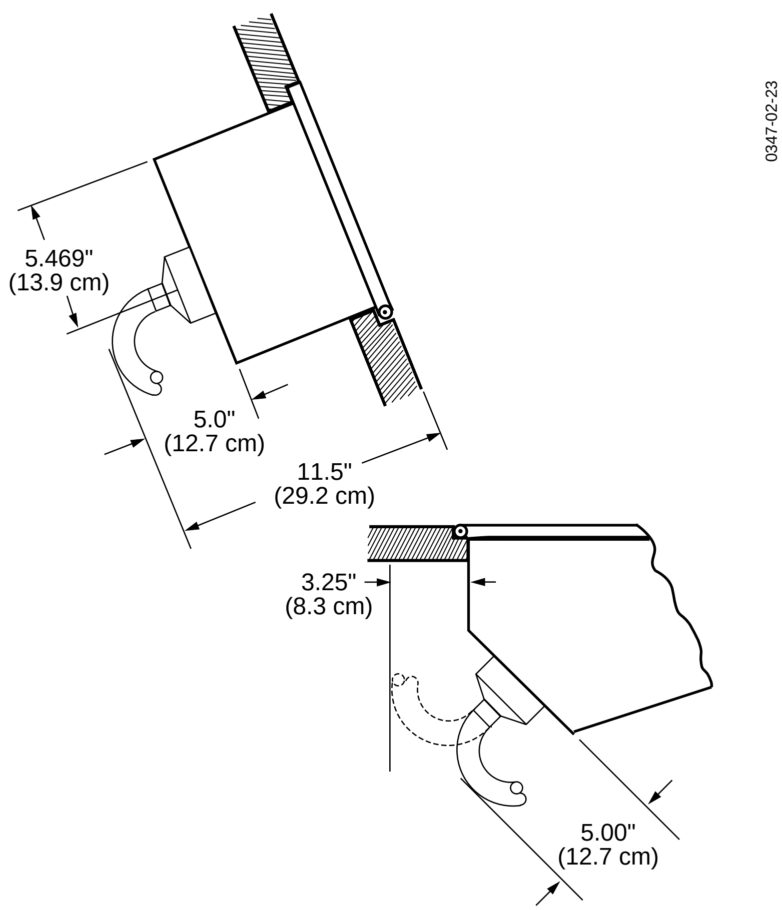


Figure 2-5. Model 4000-3 Control Panel Cable Clearance

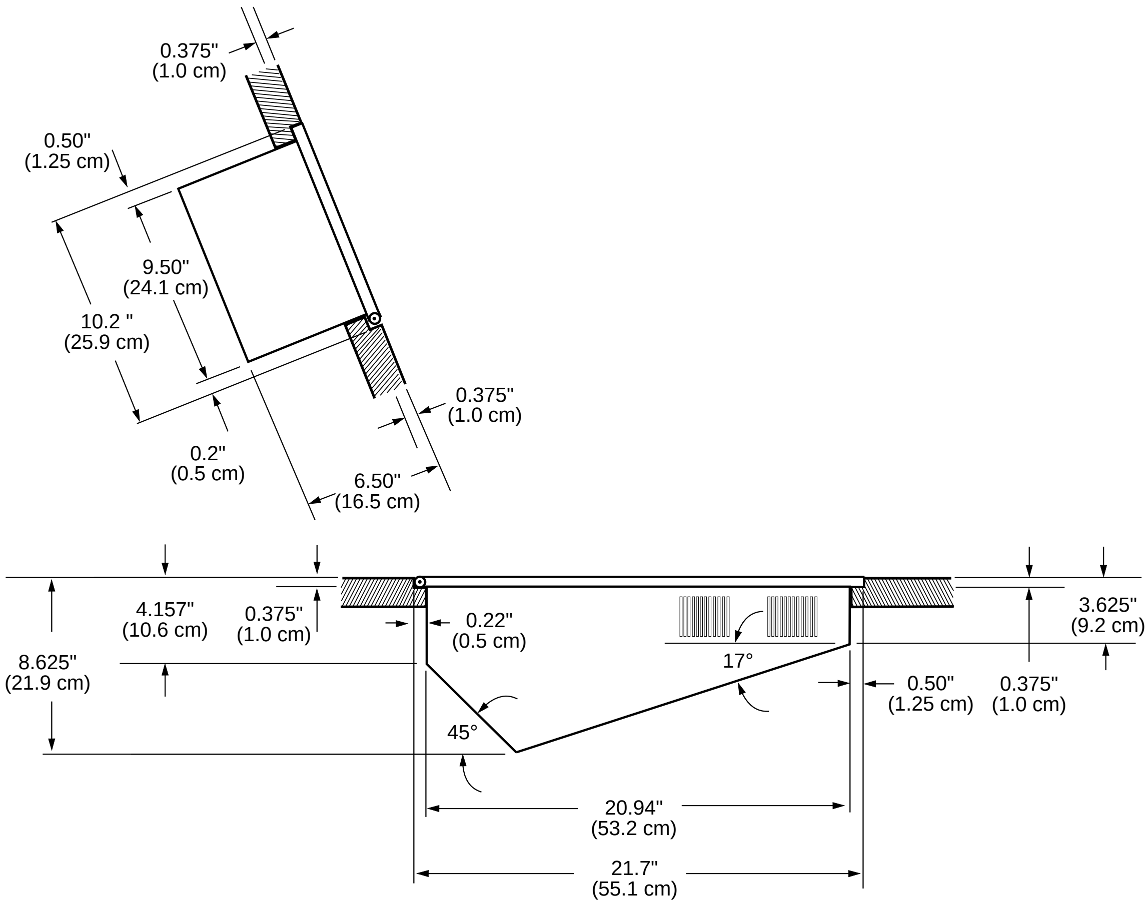


Figure 2-6. Model 4000-3 Control Panel Side Dimensions (Flush Mount)

Model 4000-3 Control Panel Console Dimensions

These instructions allow you to install your Control Panel in a full flush-mount installation. For a semi flush-mount installation, simply cut the console to the dimensions indicated in Figure 2-7, set both Control Panel tubs in the console, and complete Steps 1, 4, 9, and 10 on both tubs. For a full flush mount installation, it is recommended that the Control Panel be on site before cutting the holes and fabricating the routed flanges.

1. Using the dimensions shown in Figure 2-7, make a cutout in the console to accommodate the Model 4000-3 upper Control Panel unit.

2. Route a 1/2” (12 mm) by 3/8” (9 mm) lip around the right, left, and top edge of the cutout. For clarification the routed edges of the cutout are illustrated in Figure 2-8.

Note that in all four corners, clearance must be provided for round screw heads located on the front and rear of the Control Panel tubs. See notches illustrated in Figure 2-7.

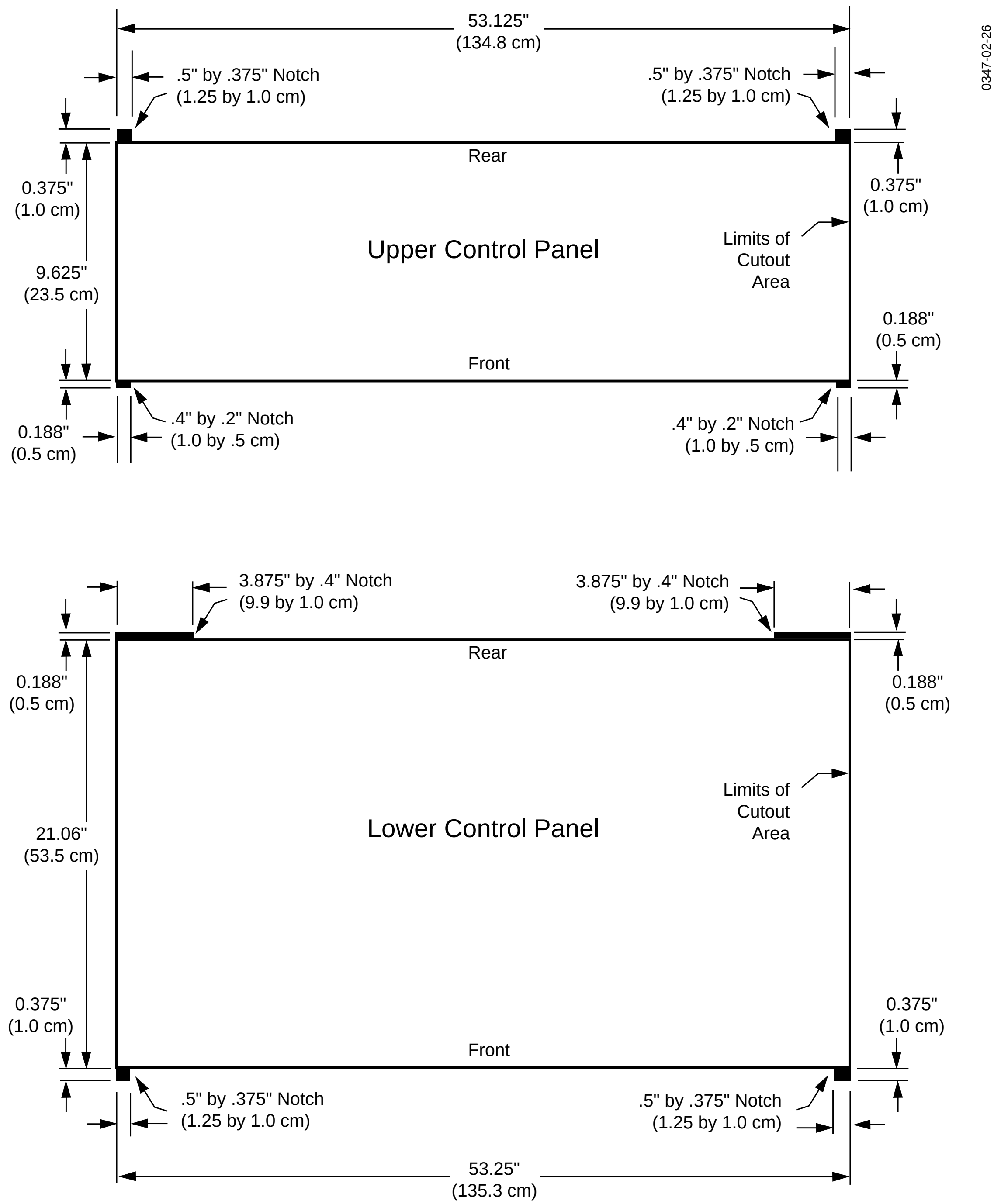


Figure 2-7. Model 4000-3 Control Panel Console Cutout Dimensions

3. Route a 3/8” (9 mm) by 3/16” (4.5 mm) lip on the lower edge of the cutout as illustrated in Figure 2-8.

4. Carefully place the Upper Control Panel into the cutout *(do not lift the control panel by the lever or transition arms*) and mark pilot hole locations for the 12 anchor screws.

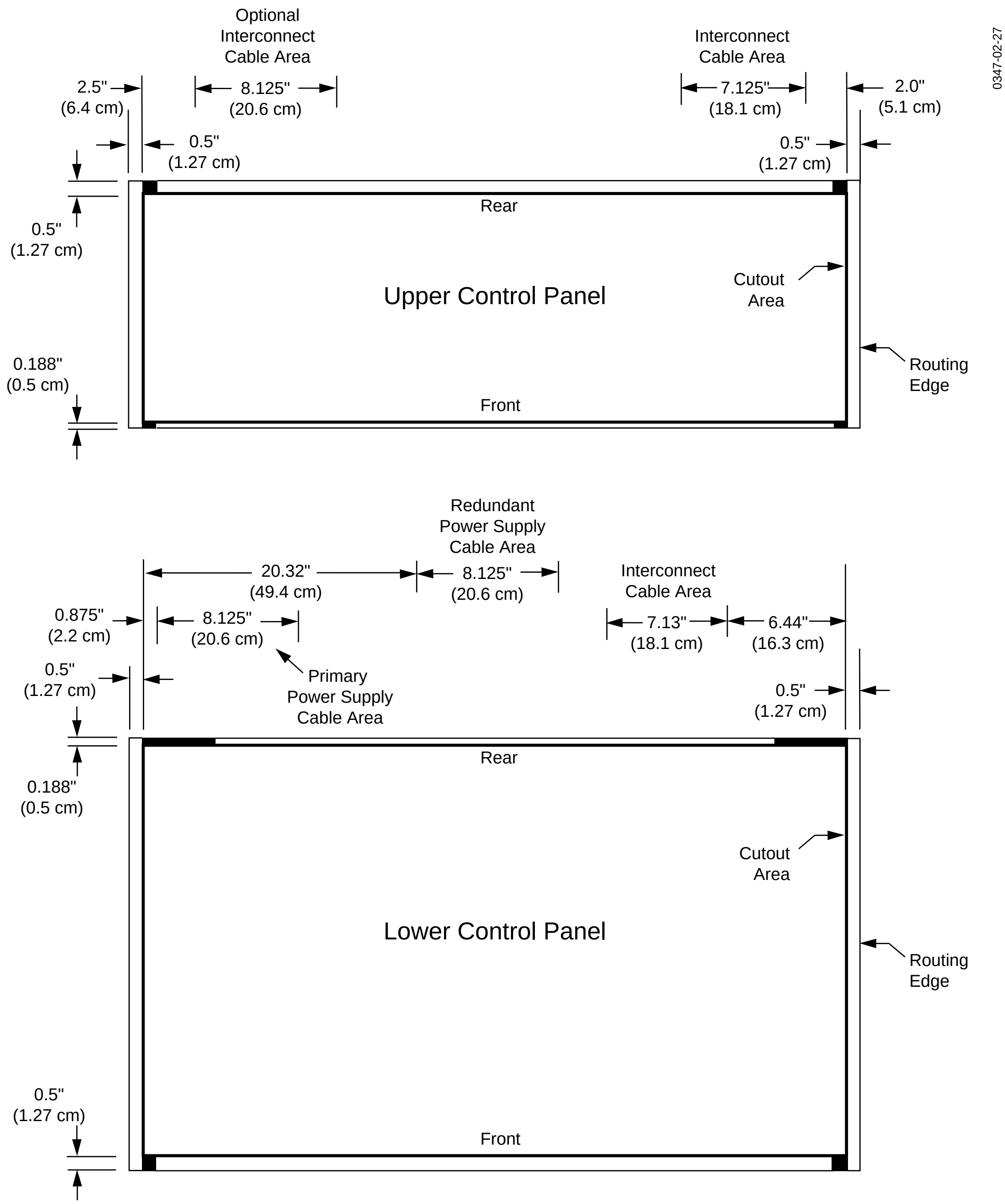


Figure 2-8. Model 4000-3 Routing and Cable Clearance

WARNING

Clearance required between the hinge edge of both Control Panel tubs and the finished edge of the console increases as the panel lid is opened (full flush installation). Before marking the pilot holes, carefully open the lid on both panels and observe that sufficient clearance is allowed.

WARNING

Do not lift the Control Panel by the handles or the transition lever arms. Take care when opening or closing the lower panel lid. The gas shock supports may cause the lid to open or close abruptly, causing possible injury or damage to the equipment. Always lift the Control Panels by holding onto the tub.

5. Remove the upper Control Panel and use a 1/8” (3 mm) bit to drill 12 pilot holes for the screws that will secure the upper Control Panel to the console.

6. Using the dimensions shown in Figure 2-7, make a cutout in the console to accommodate the Model 4000-3 lower Control Panel unit.

7. Route a 1/2” (12 mm) by 3/8” (9 mm) lip around the right, left, and lower edges of the cutout.

8. Route a 3/16” (4.5 mm) by 7/16” (10.5 mm) lip on the upper edge of the cutout.

9. Carefully place the lower Control Panel into the cutout and mark pilot hole locations for the 15 anchor screws.

10. Remove the lower Control Panel and use a 1/8” (3 mm) bit to drill 15 pilot holes for the screws that will secure the lower Control Panel to the console.

Inserting the Model 4000-3 Panel

1. Carefully place the upper and lower Control Panels into the cutouts in the console.

2. Secure the Control Panels to the console with 27 #6 (M4) screws (not included) into the pilot holes drilled in the console.

3. Do not connect power to the Control Panels until all cable connections have been completed and verified.

Pushbutton Lens Chip Installation

The primary crosspoint pushbuttons on the control panel are designed so lens chips can be inserted to label the inputs assigned to each crosspoint. An envelope containing a set of printed lens chips is shipped with the control panel. Make sure not to throw away the lens chips inadvertently.

To install a lens chip, grasp the lens firmly with your fingers and pull it straight out. The pushbutton may come off with the lens. You can then pull apart the pushbutton, lens, and lens chip (refer to Figure 2-9). When re-inserting the pushbutton and lens into the panel, make sure to align the keys on the legs of the pushbutton base with the larger key slots on the base of the switch (not the smaller slots at the top of the switch, near the lamp). When properly installed, the pushbutton should lock in place and not rotate around the lamp and switch. Two lens designation strips are typically installed in crosspoint buttons using both shifted and unshifted selection.

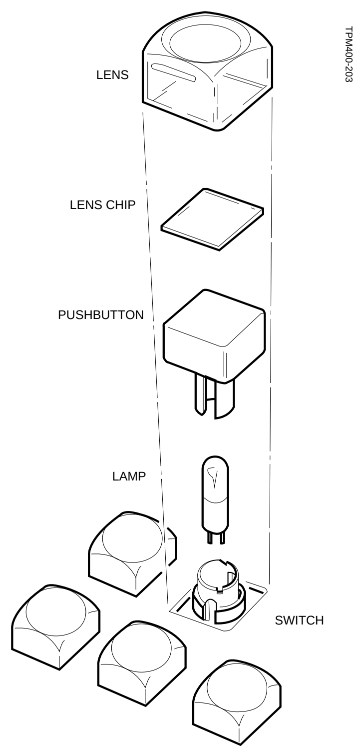


Figure 2-9. Lens Chip Installation

Control Panel Option Installation

These instructions are provided for installing the Redundant Control Panel Power Supply and the Model 4000-3 Input Readout Display if these options have been ordered after your original switcher installation. If you ordered either option with your original switcher, the options have already been installed and you may skip these steps.

Model 4000-2 Redundant Control Panel Power Supply

To install the optional Control Panel Redundant Power Supply proceed as follows:

1. Open the Model 4000-2 Control Panel and turn the AC power switch on the left front of the enclosure to the OFF position. See Figure 2-10.

CAUTION

At the rear of the Control Panel, disconnect the primary power supply power cord from the ac source.

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2. Remove the three ribbon cables from the Control panel CPU Board in front of the enclosure.

3. Remove the enclosure covering the power supplies by removing the six screws securing it to bottom of the Control Panel tub.

4. Remove the ten screws securing the flat mounting plate supporting the supply on the tub bottom. (This step is necessary in order to access the screws to be installed in Step 6.)

5. Attach the redundant power supply to the flat power supply mounting plate with the screws provided so that the wiring assembly is on the right side closest to the standard supply (the wiring assembly will plug into J8 on the Control Panel I / O board right above it.)

6. Reattach the flat mounting plate to the bottom of the tub with the ten screws you removed earlier.

7. Connect the power supply wiring from the new redundant supply to the vacant connector, J8, on the Control Panel I / O Board.

8. Install the redundant ac connector / Power ON / OFF switch and fuse unit into the vacant opening to the left of the standard AC unit, removing the blank plate if present.

9. Replace the power supply enclosure. Make sure the fuse in installed in the redundant ac unit inside the panel. Install the ac cord into the redundant connector at the rear of the panel and connect the power to an ac source.

10. The Control Panel Power Supplies are auto-ranging; that is, they will automatically adjust to operate on either 110 or 220 Vac nominal.

NOTE: *You may choose to install the redundant supply power into a different ac source than the primary power supply; however, doing this is not required.*

11. Reinstall the ac power cord for the primary supply into its ac source.

12. If you have installed this option into an existing system, turn on both power supply switches for operation. No power supply adjustments are required at this time.

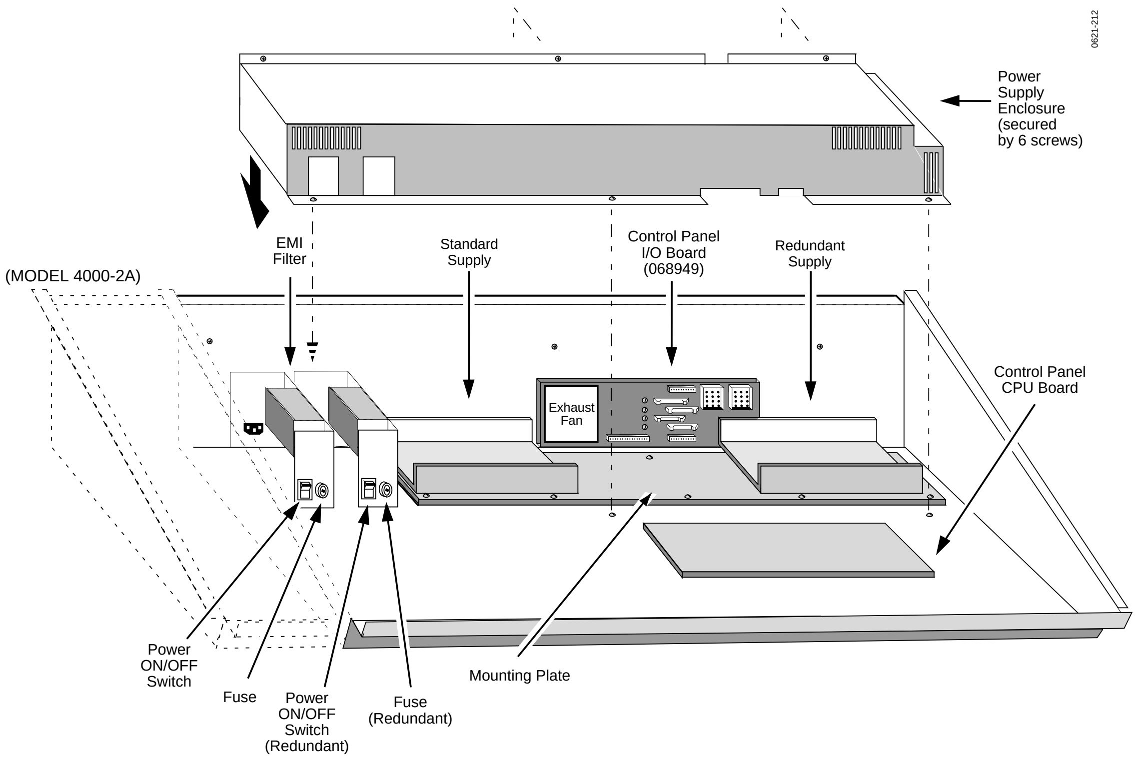

Figure 2-10. Model 4000-2A/B Panel Redundant Power Supply Installation

Model 4000-3 Redundant Control Panel Power Supply

To install the redundant Control Panel power supply in a Model 4000-3 control panel proceed as follows:

1. Open the lower Control Panel tub and turn the AC power switch on the front of the primary supply to the OFF (**Ø**) position.

CAUTION

At the rear of the lower Control Panel, disconnect the power cord from the primary supply ac source.

2. Remove the blank plate in the redundant power supply positions illustrated in Figure 2-11.

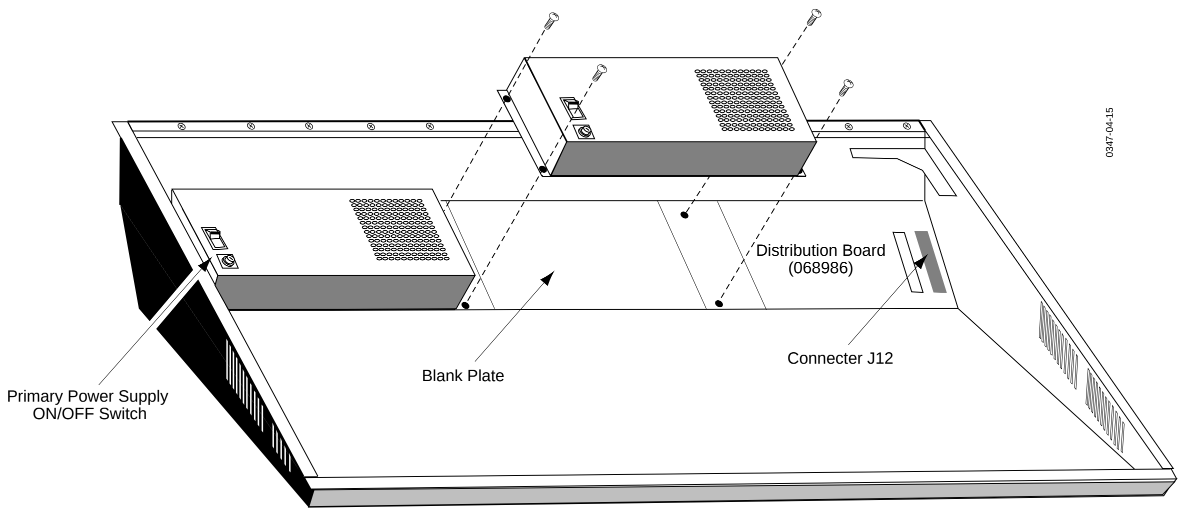

Figure 2-11. Model 4000-3 Redundant Control Panel Power Supply Installation

3. Line up the holes in the redundant supply case with the holes in the back of the panel and install the supply with the screws provided.

4. Attach the control cable from the redundant supply to the vacant connector (J12) on the Distribution Board (068986) mounted to the right of the supply.

5. Make sure the power switch on the front of the redundant supply is set to OFF. Attach the ac line cord to the redundant connector on the back of the control panel and connect it to an ac source.

6. The Control Panel Power Supplies are auto-ranging; that is, they will automatically adjust to operate on either 110 or 220 Vac nominal.

NOTE: *You may choose to install the redundant supply power into a different ac source than the primary power supply; however, doing this is not required.*

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7. Reinstall the ac power cord for the primary supply into its ac source.

8. If you have installed this option into an existing system, turn on both power supply switches for operation. No power supply adjustments are required at this time.

Model 4000-3 Input Readout Display Panel

The Input Readout Display option consists of three Readout Display circuit boards attached to three bracket assemblies; each providing eight 4-character readouts. The bracket assemblies attach to the inside of the accessory panel above the readout windows at the lower left of the Model 4000-3 upper accessory panel. Refer to Figure 2-12. The readouts will identify the primary inputs by the first four characters of the input name as defined in the Configuration menu discussed later in the installation process.

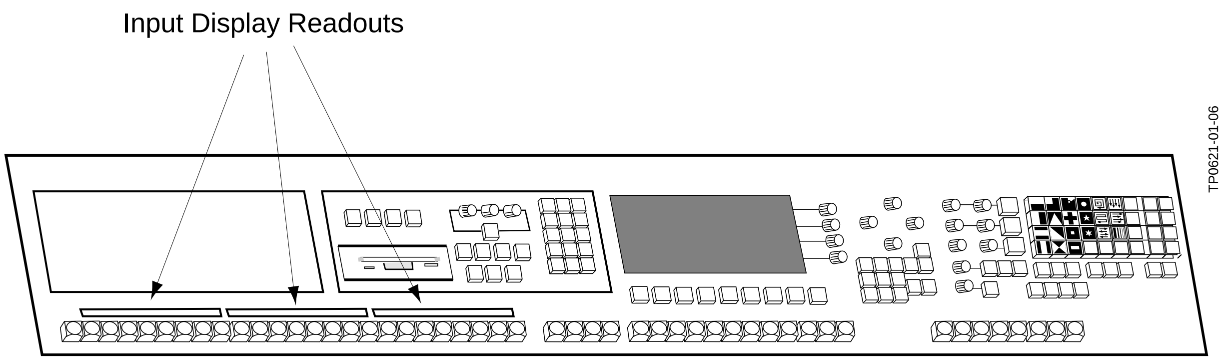


Figure 2-12. Input Display Readouts in Model 4000-3 Upper Accessory Panel

To install each bracket assembly, follow the instructions below:

1. If you are putting this option into an already installed control panel, power down the control panel by switching the primary and redundant (if present) power switches inside the lower tub to OFF.

2. Open the upper accessory panel and locate the two holes in the panel metal above each display window.

3. There are eight holes in the Readout Display bracket metal. Line up the second and sixth holes from the left in each bracket assembly with the two holes above the display window so the display shows properly through the window. Refer to Figure 2-13. Attach each bracket assembly to the accessory panel with two of the six loose screws provided.

4. Three different length ribbon cables are provided for connecting the readout display circuit boards to the Control Panel CPU Board (Assembly Number 068985) mounted on the inside of the upper accessory panel. Install the following cables from the Readout Display circuit boards to the indicated connectors on the CPU board as shown in Figure 2-13 and described below. (Note pin1 on each ribbon cable is indicated with a red line.)
   - Attach the ribbon cable labeled 156020-00 from Board 0 (far right) to J4 (labeled Aux Bus Readout Display Board 0).
   - Attach the ribbon cable labeled 156020-01 from Board 1 (middle) to J3 (labeled Aux Bus Readout Display Board 1).
   - Attach the ribbon cable labeled 156020-02 from Board 3 (far left) to J2 (labeled Aux Bus Readout Display Board 2).

5. If you are only installing this option to an existing control panel at this time, reapply power to the control panel.

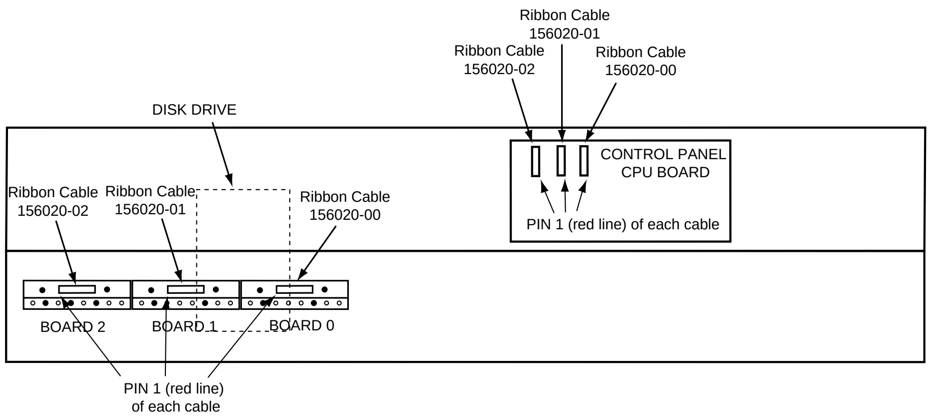


Figure 2-13. Model 4000-3 Readout Display Installation

6. The displays should indicate the first four characters of the 24 primary crosspoint names as defined in the NAME XPT BUTTON menu.

7. If you wish to change or assign the crosspoint names, select the Config button in the main menu display. Select Inputs / Map Inputs / Name Xpt Button to bring up the menu.

8. If you need help in naming the crosspoint buttons, Refer to the Model 4000 User's Guide (TP0790) and Operation Reference (TP0764) Manuals for detailed information.

Signal Processor Frame Installation

NOTE: *The Signal Processor Frame must be installed before either of the power supplies. When planning your installation, ensure that the Frame will be installed high enough in the equipment rack to allow 7 rack units for the installation of the Frame Primary Power Supply (and another 7 rack units for the optional redundant Power Supply, if purchased) below it.*

To allow the use of extender modules and access for other maintenance, sufficient room should be allowed in front of the equipment rack (≥41 inches, 105 cm). Sufficient room should also be allowed in the rear of the rack for access to cables and the exhausting of cooling air.

The Signal Processor Frame mounts in a standard 19-inch (48.3 cm) wide equipment rack. It is installed in the rack from the front and secured at the front edges of the Frame with screws (not provided by GVP). Its Power Supply mounts below it in the rack on slide rails. The procedure for installing the Power Supply follows the Frame installation procedure.

To install the Frame in the equipment rack, read the following precautions, then refer to Figure 2-14 and complete the following steps:

WARNING

The Model 4000 Signal Processor Frame weighs approximately 300 lbs (136 Kg) when fully configured. Provide appropriate equipment to support the Frame during installation.

When the Signal Processor Frame and Power Supply are installed, the equipment rack is top heavy and could topple. Ensure that the equipment rack is attached solidly to the floor/building to prevent tipping when the Frame and Power Supply are installed.

When lifting the Frame into place in the equipment rack, it is recommended that a mechanical lifting device, such as a hydraulic forklift truck, be used.

Ensure that the bottom plate of the Frame is protected from damage while the Frame is being lifted into the equipment rack.

NOTE: *The Frame is shipped with a protective metal plate on the bottom. Leave the plate in place to protect the power cables until the Frame is mounted in the rack.*

1. Ensure that all packing foam, strapping, and tape is removed from the Frame before installing the Frame in the rack.
2. Carefully, with the aid of a mechanical lifting device, lift the Frame and place it in position in the equipment rack.
3. Align the Frame so that its screw holes match up with those in the rack and secure the 16 rack screws and washers (not supplied) required by the rack manufacturer.
4. Install all screws and tighten to the rack manufacturer's specifications.
5. Remove the protective plate from the bottom of the Signal Processor Frame.

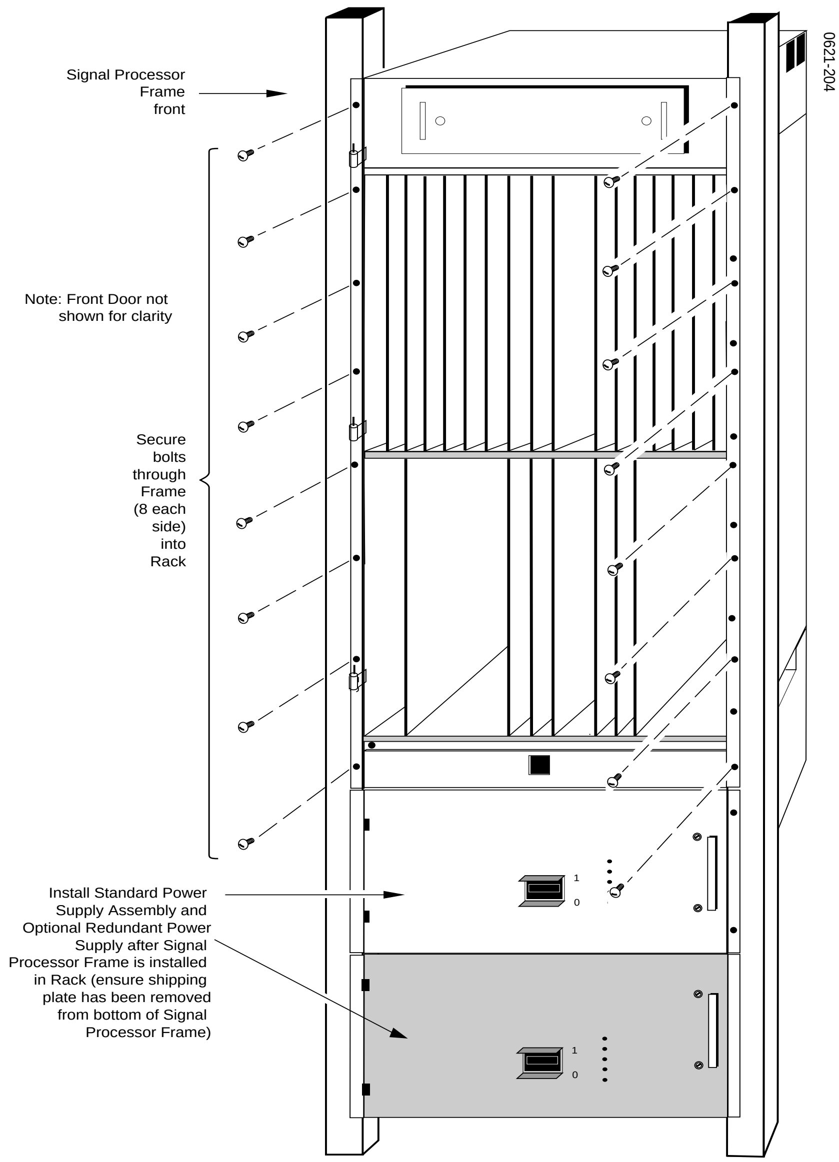


Figure 2-14. Frame Installation

Signal Processor Frame Power Supply Installation

The Primary Power Supply must be mounted immediately below the Signal Processor Frame in the rack. If you are installing an optional Redundant Power Supply, it must be located immediately below the Primary Power Supply. Verify that you have allowed enough rack space (7 rack units for each supply) before proceeding.

WARNING

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.

NOTE: *Information about the Jetta Power Suplies (found only in the Model 4000-3) is found in Addendem A in this manual.*

Frame Power Supply Assemblies

Each Signal Processor Power Supply assembly for a Model 4000 Switcher consists of a rack-mounted frame (assembly number 098901-XX) containing a Multi-Output Power Supply unit and a high-current +5 Volt Power Supply unit. The assembly number of the power supply frame is noted on the back of the frame. Grass Valley assembles and tests the power supplies; however, the individual power units in the power supplies are manufactured by other suppliers.

There are two suppliers of the individual power supply units—Pioneer Magnetics and Todd Products Corporation. Differences between the units and important notes about them will be presented here for ease of installation.

It is important to know what type of power units you have for the reasons listed below:

1. Because of differences in the electronic design, it is not possible to operate Pioneer and Todd power units of the same type in a redundant power supply configuration. In other words, you may not connect a Pioneer Multi-Output unit in parallel with a Todd Multi-Output unit, and you may not connect a Pioneer +5 Volt unit in parallel with a Todd +5 Volt unit. This will be explained in more detail in the section describing installation of redundant supplies.

2. A Model 4000-2A / B switcher with Todd power supply units may operate on 110VAC. Pioneer supply units must always operate on 220VAC.

3. Todd +5V power supply units are internally wired for power surge protection, Pioneer +5V power supply units are not. There is a jumper in the Model 4000 fan assembly at the top of the Signal Processor Frame which must be set to either bypass or enable a surge protection circuit depending on the type of unit present. Refer to the “Fan Jumper Settings” heading later in this section.

Before installing your power supply, you will need to determine the type of supply units you have. To do this:

1. Locate the assembly number sticker on the back of the power supply frame. Systems with Pioneer power units will have power supply frames numbered 098901-00 or -01. Systems with Todd power units will have frames labeled 098901-03.

2. Remove the back covers on the left and right sides of the primary and / or redundant power supply frames. Leave the covers off for installation purposes later.

   You may distinguish between a Todd supply and a Pioneer supply as follows:

   Viewed from the front, both +5 V and Multi-Output Pioneer units are each about 5 inches wide, and each has a 4 1 / 2 inch diameter fan.

   The Todd +5 V unit (on the left) is about 3 1 / 2 inches wide. The Multi-Output supply is slightly narrower. Each supply has two cooling fans.

   From the rear, the Todd and Pioneer +5 Volt units can also be identified by the arrangement of the large power lugs on the rear of the supplies. They are arranged horizontally on the Pioneer supplies, and diagonally on the Todd supplies. For clarity however, both types of supplies will be illustrated in this manual in most cases.

Model 4000-2A/B Only–Determining 110V or 220V AC Operation

If you have Pioneer power supply units, you must operate at 220Vac.

If you have a Model 4000-2A / B with Todd power supply units that are capable of operating at 110Vac, there will be a label on the rear plate of the power supply frame to indicate this. The recommended operating voltage is 220Vac.

If it is desired to operate on a 100 to 120 Vac circuit, first check the rear plate on the Frame Power Supply to see that it indicates this capability.

For 110 Vac nominal operation, the supplied 10 AWG power cord must be replaced with 6 AWG wiring. It is recommended that this 6 AWG wiring be connected into the power supply frame directly from a junction box. This should be a dedicated circuit fused for 40A overload protection.

To rewire the Frame Power Supply for nominal 110 Vac operation, proceed as follows:

1. Make sure that all power is disconnected (from both supplies in a redundant system).

2. Remove the left and right rear covers from the primary and redundant (if installing) power supply frames if you have not already done so, and then remove the center rear cover plate from the power supply.

3. In the center section, disconnect the incoming AC power wires from the left and right sides of the terminal block (see Figure 2-15).

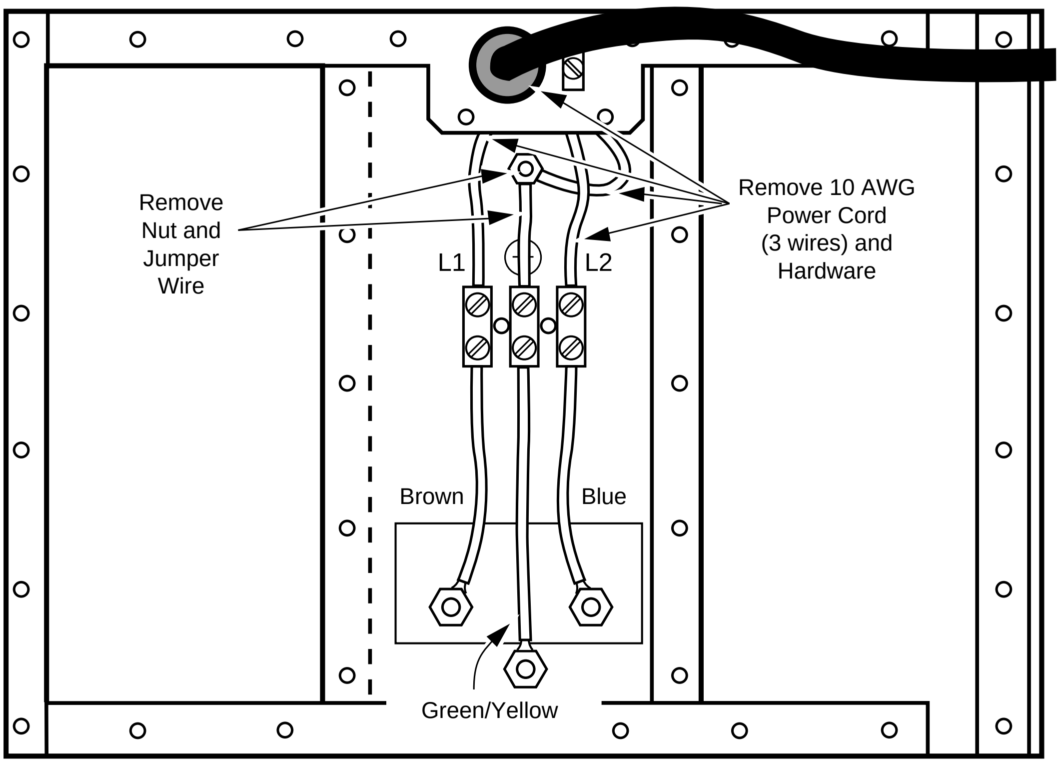


Figure 2-15. For 110 Vac Operation – Remove 220 Vac Wiring

4. Remove the hardware fastening the incoming AC power cable ground wire to the chassis ground stud and disconnect that wire. Also remove the jumper wire which ties the stud to the terminal block.

5. Unscrew the knurled cord retainer and remove the 10 AWG power cord.

6. Remove the power cord retention block from the supply chassis.

7. The 6 AWG wiring may now be installed (see Figure 2-16). It is suggested that a 3/4-inch (19 cm) electrical conduit fitting be installed in the hole from which the power cord retention block was removed and the wiring be routed in through flexible conduit from a junction box. In the United States, field wiring

must be in compliance with the National Electrical Code and any applicable local codes.

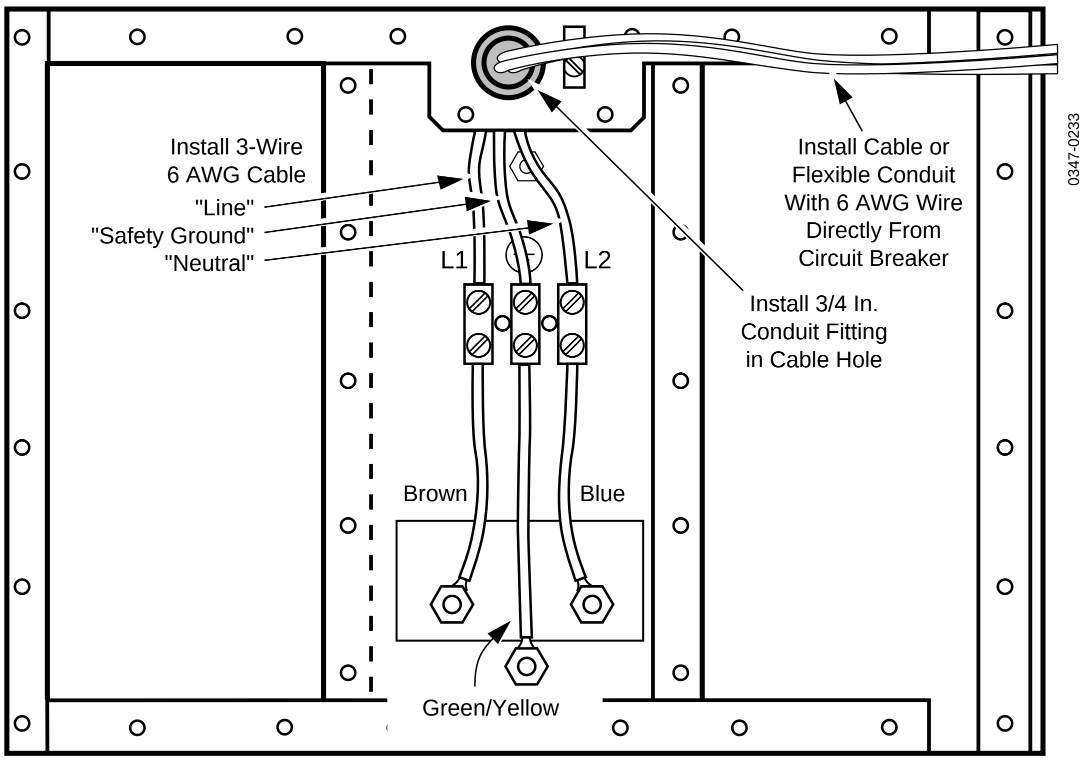


Figure 2-16. For 110 Vac Operation – Install 110 Vac Wiring

8. Connect the incoming “safety ground” wire to the center terminal of the terminal block.

9. Connect the “neutral” side of the incoming AC power to the side of the terminal block associated with the blue wire

10. Connect the “line” side of the incoming AC power to the side of the terminal block associated with the brown wire.

11. Inspect your work to make sure that all connections are correct, tight, and safe.

12. Reinstall the center cover plate, putting in the four screws at the top and the three screws at the bottom.

Frame Fan Jumper Settings

There is a jumper on a small circuit board (064851) in the fan assembly at the top of the Signal Processor Frame in each Model 4000 Switcher. This jumper must be in the correct position for proper operation of these power supplies.

If your switcher has been shipped directly from the factory, this jumper setting will be correct. If you are changing *types* of power supplies, make sure this jumper is set correctly.

To check the jumper setting, do the following:

CAUTION

Make sure power to the frame is OFF.

---

1. Loosen the retaining screws of the fan assembly and pull the assembly out of the rack.

2. Check the position of the BYPASS / PROTECT jumper.
   a. For the *Todd* +5 Volt power supplies, set the jumper to the BYPASS position. The Todd supplies have internal protection. They *will not* operate with the jumper in PROTECT mode.
   b. For the *Pioneer* +5 Volt power supplies, set the jumper to the PROTECT position. The jumper, in PROTECT position, is intended to prevent a harmful surge should the Pioneer +5 V supply be accidentally shorted.

Primary Frame Power Supply Installation

To install the Signal Processor Primary Frame Power Supply in the equipment rack, refer to Figure 2-17 and proceed as follows:

1. Ensure that the Primary Power Supply is disconnected from any power source.

2. Locate the installation kit containing the power supply assembly slide mounts and hardware. The installation kit consists of the following:
   a. Slide Mounts
   b. Mounting Hardware

3. Measure the location of the slide sections mounted on the power supply chassis to determine the height at which the stationary sections of the slides are to be mounted in the rack.

NOTE: *The Primary Power Supply will be attached to the bottom of the Signal Processor Frame by eight captive screws. It must be installed so that it is touching the bottom of the Frame.*

---

4. Verify that the screws holding the chassis sections of the slides to the power supply chassis are securely tightened.

5. Mount the rack sections of the slides to the front and back of the rack and secure them in place with the appropriate screws as illustrated in Figure 2-17. The mounting ears at the front of the slides should mount to the *inside* surface of the rack rail. On **threaded rails**, run short pan head screws from inside. On **unthreaded rails**, run flat head screws (with nuts) from the outside. This results in the power supply being flush with the frame; plus allowing for the proper mating of the electrical connectors in the back. It may be necessary to adjust the length of the rear brackets, depending upon the depth of the rack assembly.

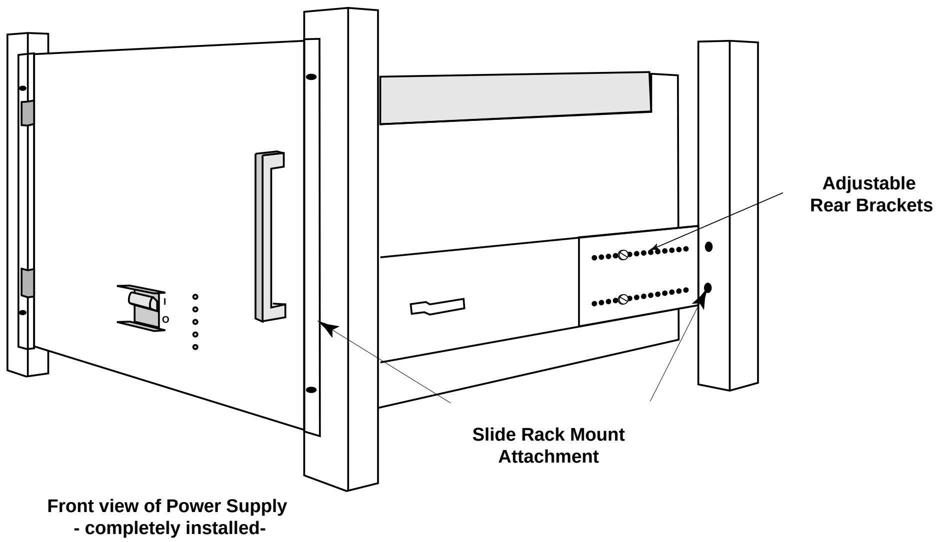


Figure 2-17. Frame Power Supply Installation (frame not shown)

CAUTION

The Frame Power Supply is very heavy and should be supported in the rack by both the front and rear rack slide mounting.

NOTE: *In the following descriptions, the terms "right" and "left" refer to the locations of components as viewed from the rear of the power supply.*

6. Remove the right and left covers from the rear of the Power Supply assembly to expose the wiring connections if you have not already done so.

7. Extend the intermediate sections of the slides and while fully supporting the weight of the power supply, insert the chassis sections (mounted on the power supply chassis) into the intermediate sections.

8. Still supporting the full weight of the power supply, slide the power supply assembly into the rack, making sure that the power cables from the Signal Processor Frame pass through the slot in the top rear of the Power Supply.

9. Secure the front of the Power Supply assembly to the rails by installing the appropriate 1/4" (6.4 mm) length rack screws. *(Use optional [not supplied] flat nylon washers with the rack screws to protect the equipment finish.)* The finished power supply installation will appear as illustrated in Figure 2-14.

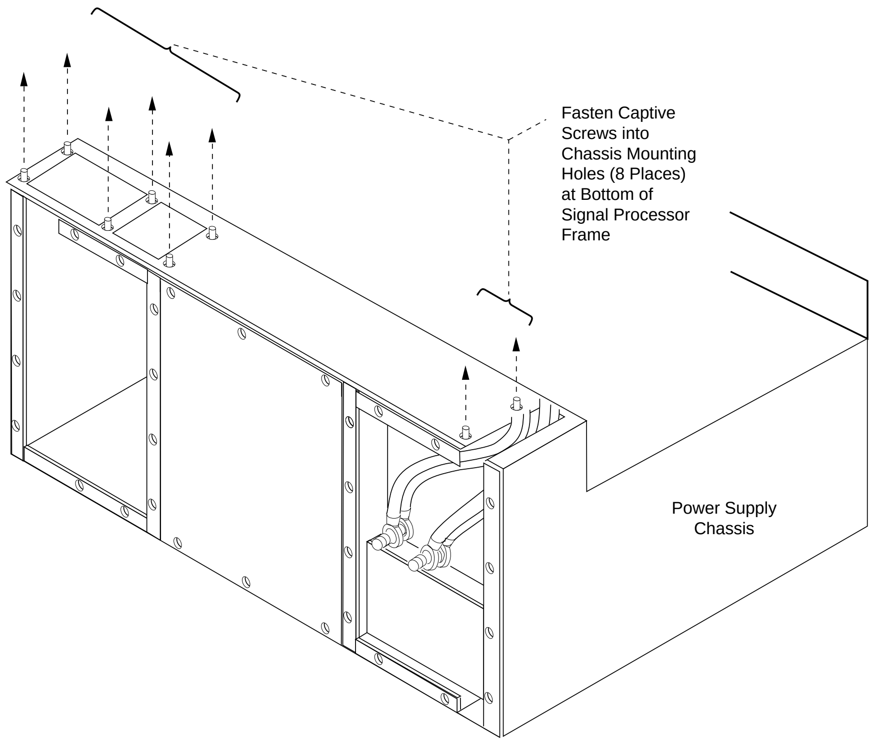


Figure 2-18. Captive Screw Locations, Frame Power Supply (Pioneer)

10. At the rear of the unit, install the 8 "captive" screws (see Figure 2-18) through the top of the power supply chassis into the bottom of the Signal Processor Frame. Tighten the 8 screws securely.

11. Remove the nuts and lockwashers from the two large electrical posts in the right compartment of the power supply. Do not discard.

NOTE: *If you will be installing a Redundant Frame Power Supply, position the cables in steps 12 and 13 over the studs but do not attach the nuts and lockwashers to the studs at this time.*

NOTE: *Steps 12 and 13 below require the following installation order: 1) cable, 2) lockwasher, 3) nut. Also be sure and torque the nuts to* 80 ***inch***/pounds *(6.67* ***foot****/ pounds) +/- 5%. These measures will prevent an inferior connection that could overheat. Do not over tighten; this may strip or break the studs and the power supply then must be shipped back to the factory for repairs.*

---

12. Refer to Figure 2-19. Connect the two large black cables running down from the right rear of the Signal Processor Frame to the right (Pioneer) or bottom (Todd) stud. If you are only installing a primary supply, secure with the nut and lock-washer removed previously. Torque the nut to 80 *inch* / pounds *(6.67* ***foot****/pounds) +/- 5%*.

13. Connect the two large red cables running down from the right rear of the Frame to the left (Pioneer) or top (Todd) stud. If your are only installing a primary supply, secure with the nut and lockwasher removed previously. Torque the nut to 80 *inch* / pounds *(6.67* ***foot****/pounds) +/- 5%*.

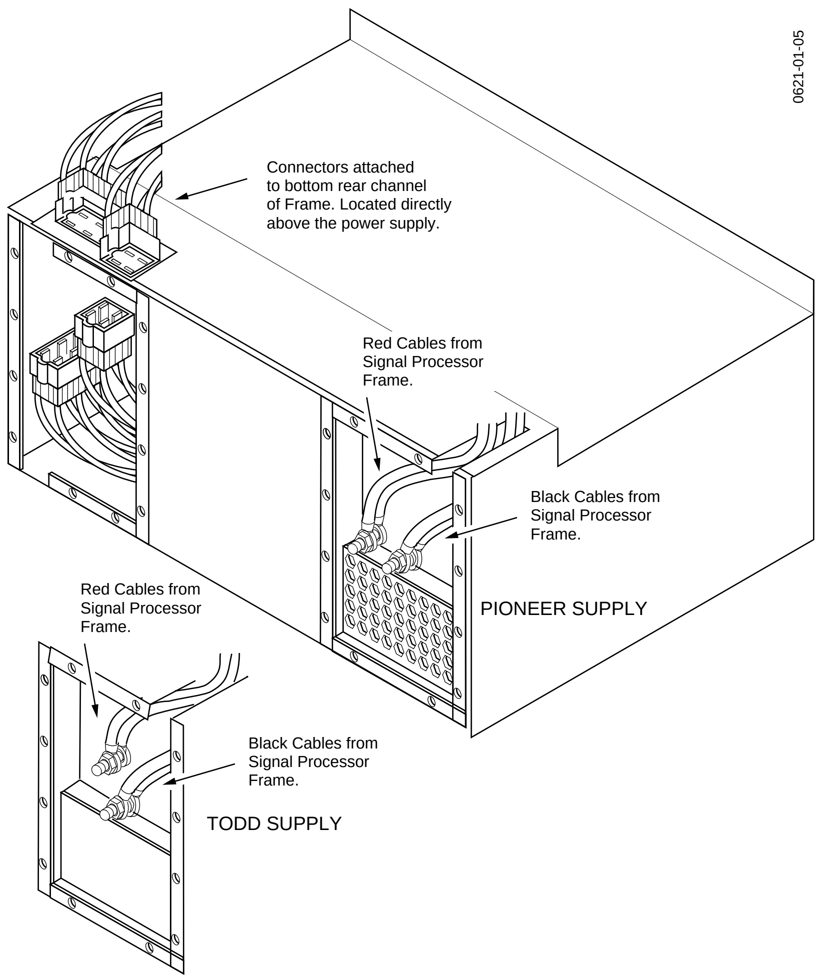


Figure 2-19. Frame Power Supply Connections.

14. Ensure that the power cables are properly positioned in the slot cut out of the Power Supply.

15. At the left rear of the Power Supply, thread the two connectors through the rectangular cutouts in the power supply and connect them to the jacks that are installed in the bottom rear channel of the frame. The connectors are keyed for proper alignment.

CAUTION

Do not power up until you reach the "Power Up" section later in this procedure.

16. If you are only installing a primary power supply at this time, skip the Redundant Frame Power Supply Installation section below.

Redundant Frame Power SupplyInstallation

The following procedure is provided for installing a redundant power supply during an initial switcher installation and also for adding a redundant power supply ordered later after the switcher has already been installed.

The Redundant Frame Power Supply Option consists of the following components:

- Power Supply Chassis (identical to the Frame Power Supply)
- Pair of Red cables
- Pair of Black cables
- 2 threaded stand-offs
- 4 lock washers
- 2 nuts

WARNING

It is not possible to operate Pioneer and Todd power supply units of the same type in a redundant power supply configuration. In other words, you may not connect a Pioneer Multi-Output unit in parallel with a Todd Multi-Output unit, and you may not connect a Pioneer +5 Volt unit in parallel with a Todd +5 Volt unit.

Before installing a redundant supply, determine what type of power supply units you have, if you have not already done so, by reading "Frame Power Supply Assemblies" earlier in this section. (See** page 2-24**.)

WARNING

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.

Perform the following procedure to install the Redundant Power Supply.

1. Ensure that the Primary and Redundant Power Supplies are disconnected from all power sources.

2. If you are installing a redundant supply into an already existing system, remove the rear panel access covers (right and left sides) of the Redundant and (if necessary) the Primary Power Supply.

3. Make sure you have read the warning on the previous page about power supply unit types.

4. Remove (do not discard) the hex nuts and lock washers that secure the red and black power cables on the Primary power supply. (Leave the cables positioned over their respective studs.)

5. Install the new lock washers and stand-offs provided with the redundant supply kit over the threaded ends of the existing studs. Using the “deep well” 3/8” socket, and the torque wrench, torque the stand-offs to 80 *inch* pounds *(6.67* ***foot****/pounds) +/- 5%*.

6. Remove the connector and cable slot covers from the bottom of the Primary Power Supply (see Figure 2-20 for Pioneer Supply Units and Figure 2-21 for Todd Power Supply Units).

7. Mount the Redundant Power Supply chassis underneath the Primary Power supply in the same manner as the Primary Power Supply was installed (see preceding pages).

8. Tighten the 8 captive screws that secure the Redundant chassis to the Primary chassis

9. Place the pair of new black cables over the appropriate studs in the Primary and Redundant Power Supplies, routing the cables through the slot in the bottom of the Primary supply and the top of the Redundant supply. (The colors must match those of the existing cables.)

NOTE: *The black cables must go in the slot before the red cables; the black cables are shorter than the red.*

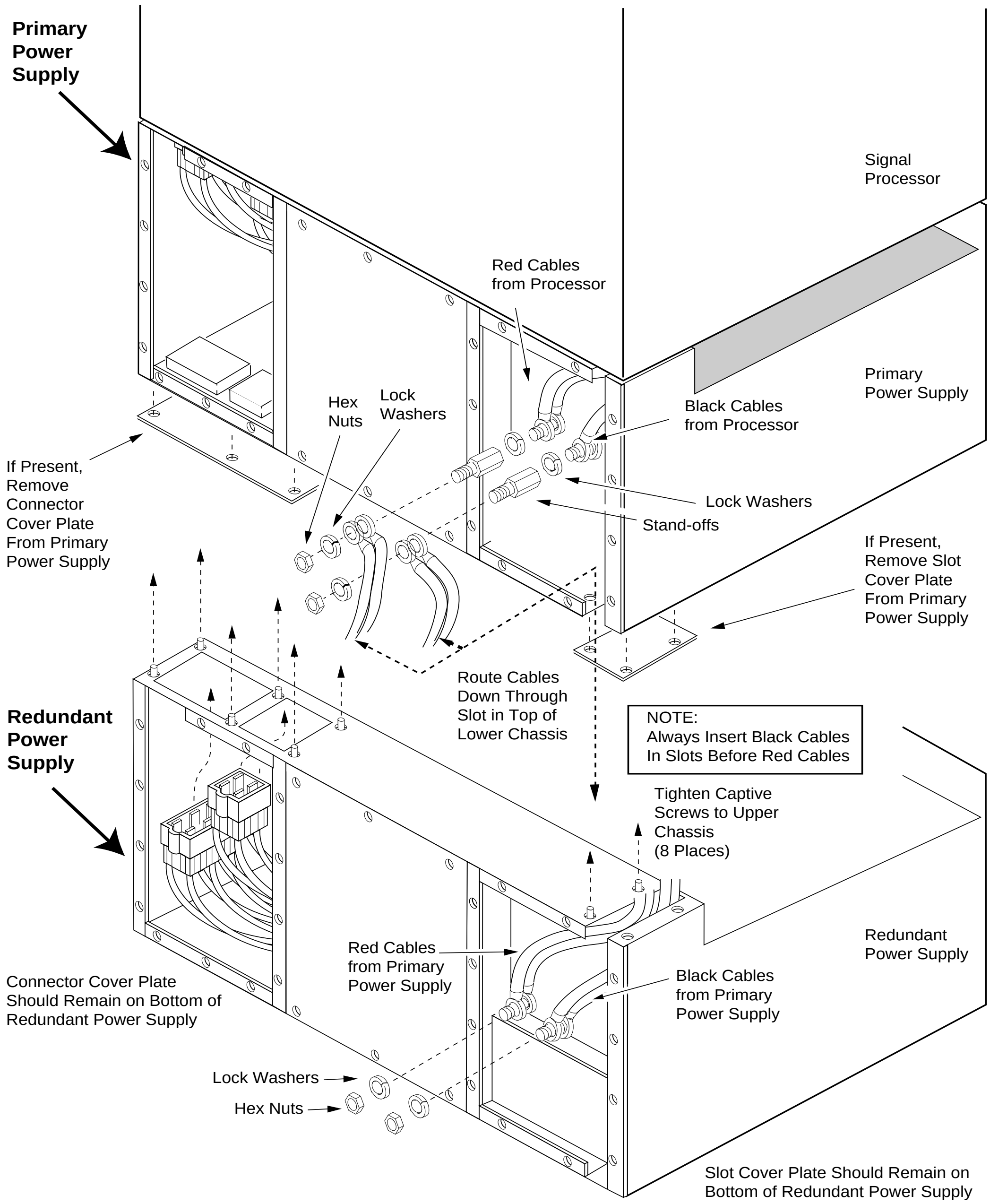


Figure 2-20. Redundant Power Supply Installation (Pioneer Power Supply Units)

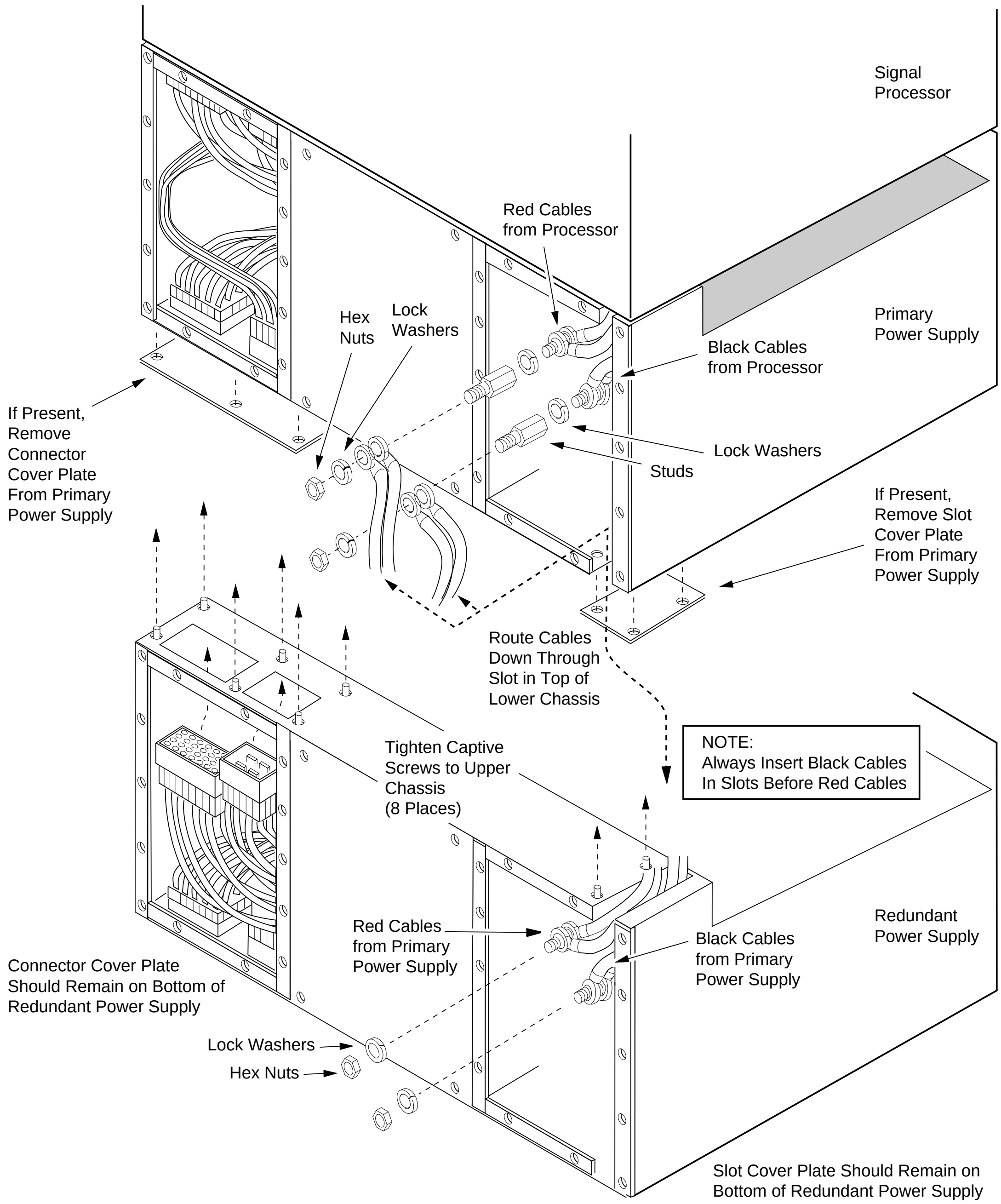


Figure 2-21. Redundant Power Supply Installation (Todd Power Supply Units)

10. Secure the cables by placing a lock-washer and hex nut (removed earlier) over each end of the cables.

11. Similarly, place the pair of new red cables over the right studs in the Primary and Redundant Power Supplies and secure the cables with lockwashers and hex nuts.

12. Torque all four hex nuts to 80 *inch* pounds *(6.67* ***foot****/pounds) +/- 5%*. Route the loose cable harness connectors on the left side of the chassis up through the two holes at the top, and securely insert them into the connector sockets in the bottom of the primary power supply chassis. (The connectors are keyed for proper alignment.)

13. Check your work to ensure all connections are secure and safe.

CAUTION

Do not power up until you reach the “Power Up” section later in this procedure.

---

14. After power up you will need to access the voltage test points at the back of the power supply frames. Replace the rear panel access covers (left and right) on both the Primary and Redundant Power Supplies with two of the screws to hold the covers in place as you will need to remove them again later.

15. If you have installed a redundant supply into an already existing system, proceed to the “Power Up” heading on page 2-93.

Frame Module Installation

The Model 4000 switcher is shipped fully configured with all the standard and ordered optional modules already installed in the Signal Processor Frame.

The Frame is divided into four “bays”, labeled Bay A (top front), Bay B (bottom front), Bay C (top rear) and Bay D (bottom rear). The modules slide into the frame bays, plugging into connectors attached to the main motherboard in the frame. The correct location of each module is indicated on a designation strip above the top bays A and C.

Module Installation and Removal

To insert a module, slide it slowly into the correct location, avoiding contact with the modules on either side. Be sure to match the rear connectors before applying pressure to seat the module.

To remove a module from the front A and B Bays, pull up on the upper and lower plastic ejector tabs and pull the module out slowly avoiding contact with the modules on either side. See Figure 2-22.

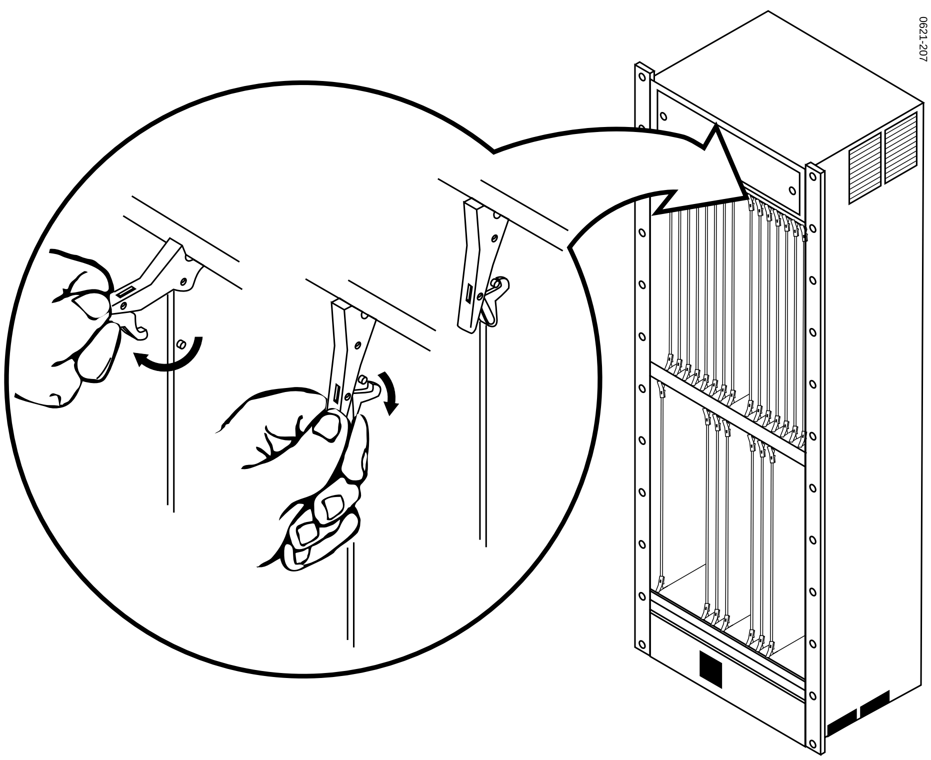


Figure 2-22. Removing a Module From the A or B Bays

The modules in the rear C and D Bays are removed by first removing the two screws at the top and bottom of each module, then pulling up on the upper and lower metal ejectors to release the module. Pull the module out slowly. Refer to Figure 2-23.

CAUTION

The EMI fingers may interfere with components located on adjoining boards. Caution must be used when replacing the boards in the Signal Processing Frame to prevent damage to the EMI shield and modules.

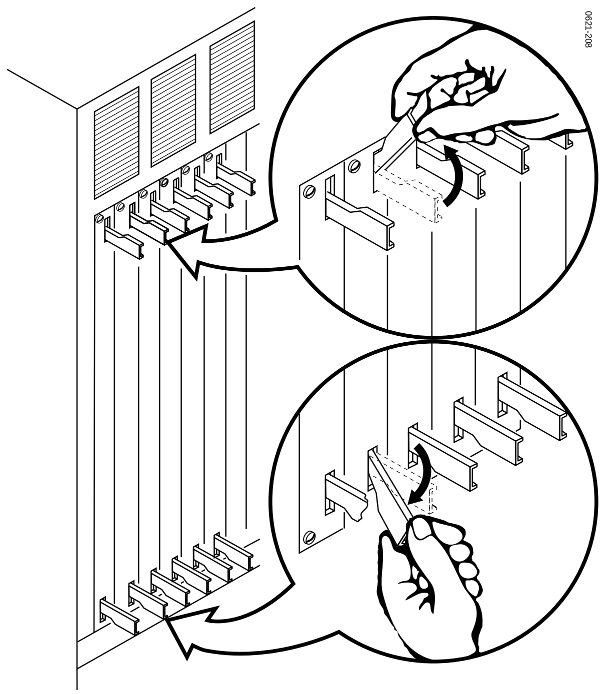


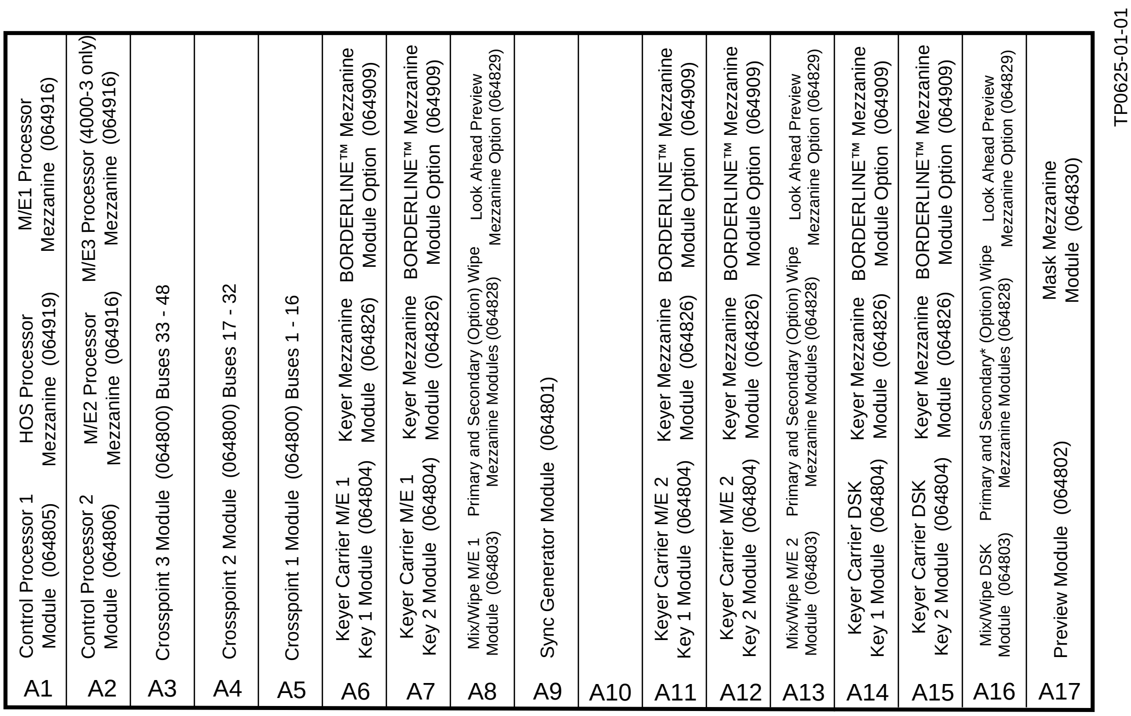
Figure 2-23. Removing a Module From the C and D Bays

Frame Module Locations

On the following pages refer to the figures listed below for the module locations in each bay.

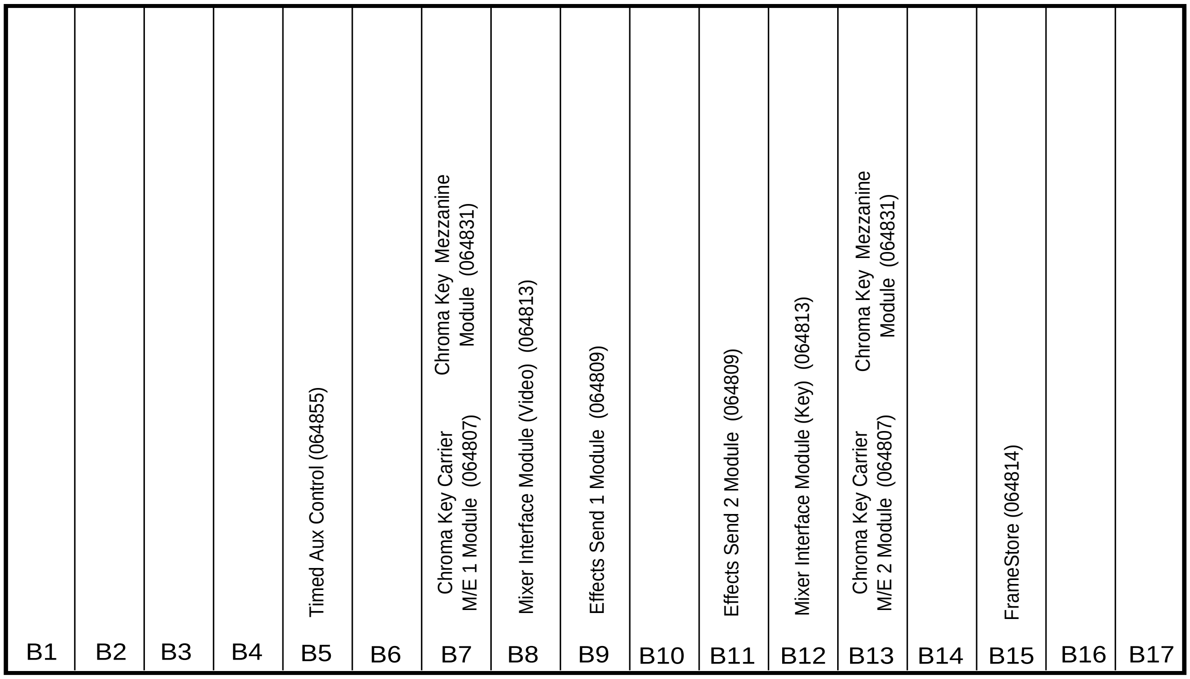
NOTE: *There are two versions of Model 4000 Signal Processor Frames covered in this manual; frames shipped before January, 1996 for all model switchers (Matrix 094800-00) and those modified for the Model 4000-3 (Matrix 094803-00). The matrix number is labeled on the top left rear of each frame. Any differences between the frames will be explained in the text for clarity.*

- Figure 2-24 - Upper Front Bay A Module Locations (All Models)
- Figure 2-25 - Lower Front Bay B Modules - Model 4000-2A / B (shipped from the factory before January, 1996)
- Figure 2-26 - Lower Front Bay B Modules - All models shipped after January, 1996
- Figure 2-27 - Upper Rear Bay C Module Locations (All Models)
- Figure 2-28 - Lower Rear Bay D Module Locations (All Models)



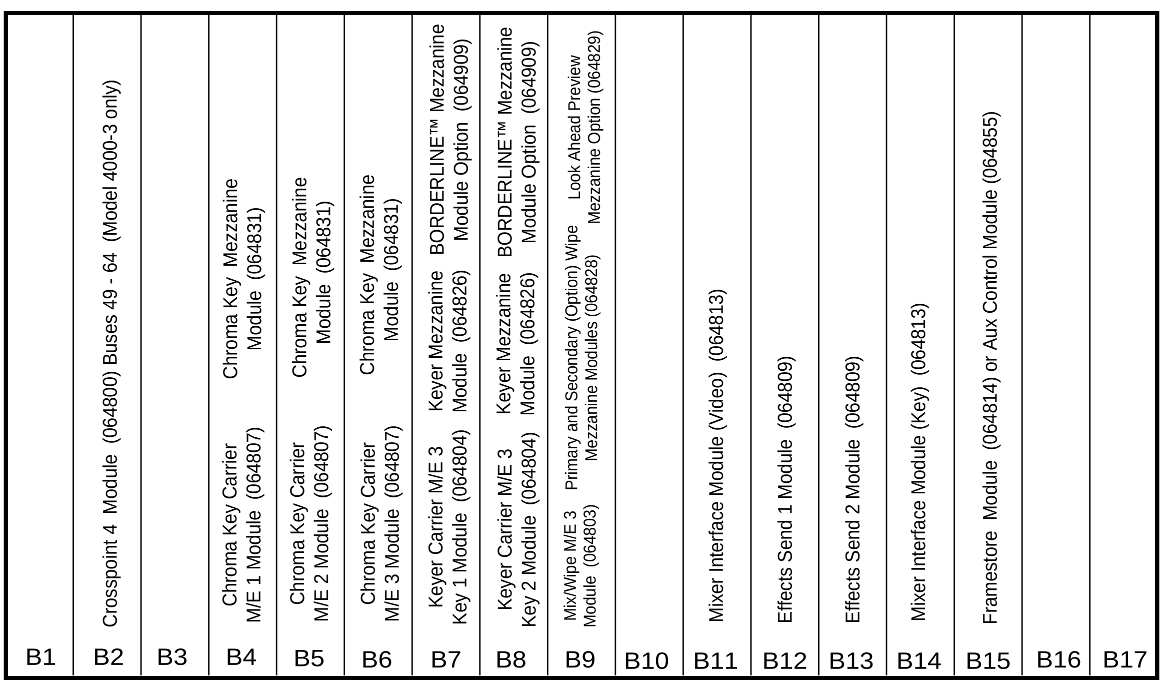
Top Card-Cage Bay A

Figure 2-24. Upper Front Bay A Module Locations (All Models)



4000-2A/B — Bottom Card-Cage Bay B

Figure 2-25. Lower Front Bay B Modules —4000-2A/B Before January, 1996



Model 4000-3 — Bottom Card-Cage Bay B

Figure 2-26. Lower Front Bay B Modules - All Models After January, 1996

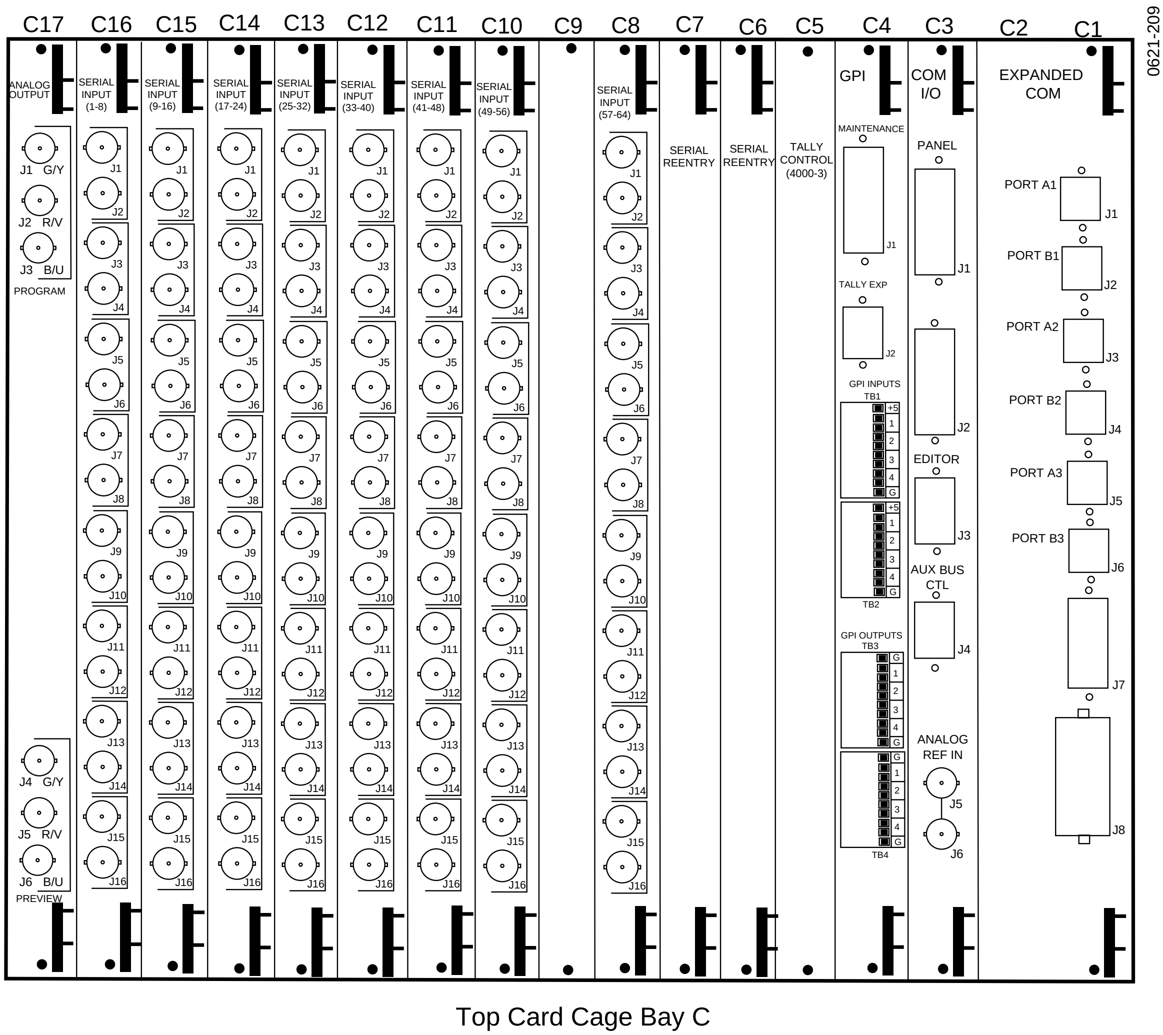
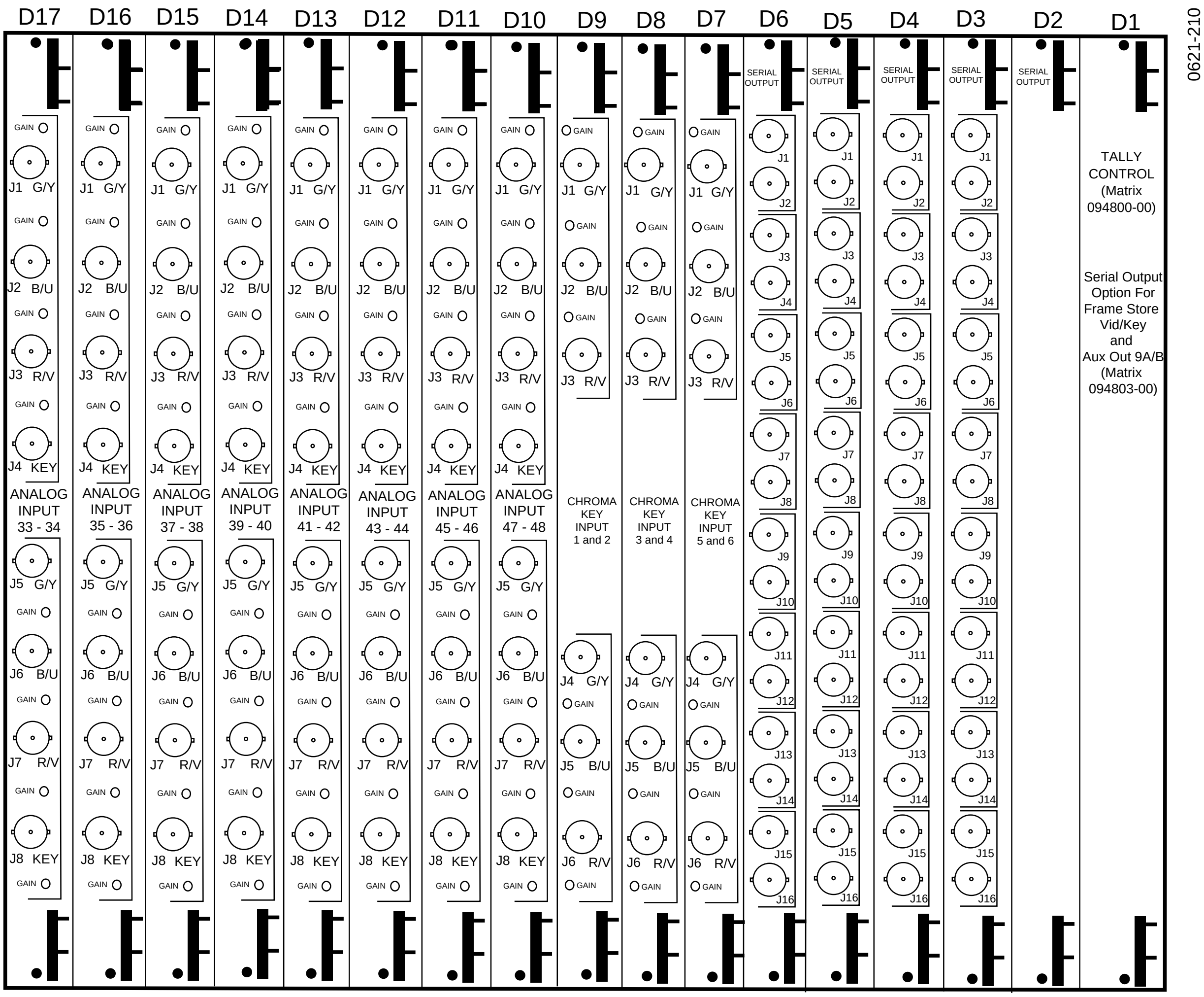


Figure 2-27. Upper Rear Bay C Module Locations (All Models)



Bottom Card Cage Bay D

Figure 2-28. Lower Rear Bay D Module Locations (All Models)

NOTE: *The Timed Aux Output Option Module is a double-width module which is installed in Slot D3 and extends to Slot D2. There are eight single BNC output connectors on the module; no looping BNC's are available.*

Optional Frame Module Installation

These instructions are provided for installing the Model 4000 Signal Frame options if they have been ordered after your original switcher installation. If you ordered any options with your original switcher, the options have already been installed and you may skip these steps.

There are two types of optional circuit boards used in the switcher. A full sized circuit board that slides into a frame bay is called a “module.” A second circuit board type is a smaller “mezzanine” board which uses pin connectors and attaching screws to mount on a module.

Empty module cells in the C and D Bays have blank metal strips screwed in place to maintain proper air flow inside the switcher and to preserve the EMI status. These must be removed before the options purchased after your initial installation can be installed.

Many options require operating and configuration parameters to be set in the main menu panel. Refer to the Model 4000 User’s Guide (TP0790) and Operation Reference (TP0764) Manuals for detailed information.

CAUTION

Special EMI fingers are installed on each module connector and blank strip in bays C and D. Use extreme care when removing or installing the modules and blank strips so that the EMI fingers do not break off.

Input Modules

Primary inputs to the Model 4000 switchers are chosen from a list of input options. The inputs can be analog component and / or component serial digital. A total of 64 inputs may be installed in any combination of video and key. Up to 8 Component Analog Input Module options can be installed providing 32 analog inputs (16 CAV and 16 analog key inputs). The system can accept up to 8 Serial Input Module options providing eight serial inputs per module.

Up to three optional Chroma Key Input Modules can be installed. Each Chroma Key Input Module provides two full bandwidth manually timed external analog component inputs which can be routed to any M / E with the optional chroma keyer installed.

Serial Digital Input Module Options—Each optional Serial Digital Input Module can accommodate 8 serial digital component inputs. Up to 8 modules can be installed in the Model 4000 for a total of 64 serial digital video / key inputs.

The Serial Input Modules (064820) reside in the upper rear C Bay of the Signal Processor Frame as illustrated in Figure 2-27.

NOTE: *If you are installing Analog Input Modules in addition to Serial Input Modules, the use of Serial Reentry Modules is required. The Serial Reentry Modules install in the slots designated for the optional Serial Digital Input Modules at locations C8, C10, C11 and C12. Refer to* Table 2-5.

Table 2-4. Physical Serial Input Module Locations

J #	C16	C15	C14	C13	C12	C11	C10	C8
J1	1	9	17	25	33	41	49	57
J2	2	10	18	26	34	42	50	58
J3	3	11	19	27	35	43	51	59
J4	4	12	20	28	36	44	52	60
J5	5	13	21	29	37	45	53	61
J6	6	14	22	30	38	46	54	62
J7	7	15	23	31	39	47	55	63
J8	8	16	24	32	40	48	56	64

Analog Input Module Options—Up to 32 analog component inputs, 16 component video and 16 analog key, can be installed in the Model 4000. Each Analog Input Module provides 2 component video and 2 analog key inputs. Up to 8 modules can be installed.

Two Analog Input Module options are available:

The first is the Analog Input Module Set. It includes one Analog Input Module (064818) with two mezzanine boards (064837 and 064839), providing 2 component video and 2 key inputs, and a Serial Reentry Module (064822). The Serial Reentry Module processes the converted analog component signals and routes them to the switcher crosspoints. Each Serial Reentry Module processes the signals from 2 Analog Input Modules.

The second Analog Input Module option is the Analog Input Expansion Module. This is a single Analog Input Module which may be added to the Analog Input Module Set in order to provide another 2 component video and 2 key inputs, for a total of 4 component video and 4 keys per set. This option must be ordered in addition to the Analog Input Module Set, as it requires the use of a Serial Reentry Module to operate.

Refer to Table 2-5 below and Figure 2-28. for the correct module installation locations. The Analog Input Modules are installed into Slots D-10 through D-17 of the D Bay. The Serial Reentry Modules are installed into cells C8, and C10–C12 of the C Bay where the optional Serial Input Modules would normally be installed.

Table 2-5. Analog Input Module and Serial Reentry Module Locations

Analog Input Module Locations	Serial Reentry Module Locations
Analog Input 1–Slot D-17 Analog Input 2–Slot D-16	Serial Reentry Module–Slot C12 (Serial Input Module 5 location)
Analog Input 3–Slot D-15 Analog Input 4–Slot D-14	Serial Reentry Module–Slot C11 (Serial Input Module 6 location)
Analog Input 5–Slot D-13 Analog Input 6–Slot D-12	Serial Reentry Module–Slot C10 (Serial Input Module 7 location)
Analog Input 7–Slot D-11 Analog Input 8–Slot D-10	Serial Reentry Module–Slot C8 (Serial Input Module 8 location)

The following component analog video formats can be connected to the Analog Input Modules.

- RGB (50 or 60 Hz, SU or NSU)
- Betacam
- MII (50 or 60 Hz)
- SMPTE
- EBU

(The component analog video specifications are located at the end of Section 1, System Overview)

The parameters for Analog Video Inputs, Analog Key Inputs and Analog Input Timing must be defined for each input in the configuration menus. These menus appear in Confg / Inputs / Anlg Video Inputs / Anlg Key Inputs / Anlg Input Timing. Refer to the Model 4000 User’s Guide (TP0790) and Operation Reference (TP0764) Manuals for detailed information.

Chroma Key Input Modules—The Dual Analog Component Chroma Key Input option includes up to three Chroma Key Input Modules (064817) with mezzanine boards (064837), each with two full bandwidth component analog inputs that can be routed to any Chroma Keyer in the system.

The Chroma Key Input Modules reside in the lower rear D Bay in slots D7, D8, and D9. Refer to Table 2-6 and Figure 2-28. for module locations. Input signals to the modules can be in the same formats as the Analog Input Module listed above.

Table 2-6. Chroma Key Input Module Locations

Chroma Key Input	Bay D Module Location
1 and 2	Slot D9
3 and 4	Slot D8
5 and 6	Slot D7

The input parameters for Chroma Key Inputs must be defined in the configurations menus. These menus appear in Confg / Inputs / Chr Key Inputs. Refer to the Model 4000 User's Guide (TP0790) and Operation Reference (TP0764) Manuals for detailed information.

Important timing considerations for Chroma Key Inputs are also discussed later in this procedure in the "System Timing" section (see page 2-96).

Serial Output Module Options

Each Serial Output Module (064821) option has eight different output signals (2 BNCs per output for a total of 16 BNCs on each module). The cell locations and the output signals available for each optional module are given below and shown in Figure 2-28.

Serial Output 1 (Slot D6) (All Models)

- Mask
- Switched Preview
- DSK Program Video
- DSK Program Key
- M/E 1 Program Video
- M/E 1 Program Key/Clean Feed Video (switchable)
- M/E 2 Program Video
- M/E 2 Program Key/Clean Feed Video (switchable)

Serial Output 2 (Slot D5) (Model 4000-2A/B shipped before 1/96)

- M/E 1 Preview Video/Look Ahead
- M/E 2 Preview Video/Look Ahead
- DSK Preview Video
- Spare (unused)
- DSK Preview Video
- Clean Feed Video
- Aux Bus 9a Video/Key
- Aux Bus 9b Video/Key

Serial Output 2 (Slot D5) (All Models shipped after 1/96)
(M/E 3 available only for Model 4000-3)

- M/E 3 Program Video
- M/E 3 Program Key
- M/E 1 Look Ahead Preview Video
- M/E 2 Look Ahead Preview Video
- M/E 3 Look Ahead Preview Video
- DSK Look Ahead Preview Video
- Program Clean Feed
- DSK Preview

Serial Output 3 (Slot D4) (All Models)

- Aux/Effects Send Bus 1a Video
- Aux/Effects Send Bus 1b Key
- Aux/Effects Send Bus 2a Video
- Aux/Effects Send Bus 2b Key
- Aux/Effects Send Bus 3a Video
- Aux/Effects Send Bus 3b Key
- Aux/Effects Send Bus 4a Video
- Aux/Effects Send Bus 4b Key

Serial Output 4 (SlotD3) (All Models)

- Aux Bus 5a Video / Key
- Aux Bus 5b Video / Key
- Aux Bus 6a Video / Key
- Aux Bus 6b Video / Key
- Aux Bus 7a Video / Key
- Aux Bus 7b Video / Key
- Aux Bus 8a Video / Key
- Aux Bus 8b Video / Key

Serial Output 5 (Slot D2) (All Models shipped after 1 / 96)

- Frame Store Video
- Frame Store Key
- Aux 9a Video / Key
- Aux 9b Video / Key
- All other outputs unused

Effects Send Option

The Effects Send option allows video / key signals in an M / E to be routed outside of the switcher for processing by external devices and then brought back into the switcher primaries for mixing and output.

The Effects Send option consists of Effects Send Modules 1 and 2 and a Serial Output Module. Effects Send 1 resides in slot B9 and Effects Send 2 in slot B11 (see Figure 2-25 or Figure 2-26). The Serial Output Module (slot D4) has four Aux Bus video / key pair outputs (Aux Buses 1a / 1b, 2a / 2b, 3a / 3b, and 4a / 4b).

The parameters for Effects Send must be set in the main menu panel. Refer to the Model 4000 User's Guide (TP0790) and Operation Reference (TP0764) Manuals for detailed information.

Chromatte Advanced Chroma Keyer

You may install one Chromatte™ Chroma Keyer in each M / E to add internal 4:2:2 chroma keying functions to Keyer 1 and Keyer 2. Any serial digital input may be used for 4:2:2 chroma keying from the key bus. External analog component video may be used for 4:4:4 chroma keying with the Chroma Keyer Input Modules option. Each option includes a Chroma Key Carrier Module (064807) with a mezzanine board (064831).

The Chroma Keyer for M / E 1 slides into slot B7 and the M / E 2 Chroma Keyer slides into slot B13 in systems shipped before 1 / 96 (Matrix 094800-00). In systems shipped after 1 / 96 (Matrix 094803-00), the M / E 1 module goes into Slot B4, the M / E 2 module goes into Slot B6 and the M / E 3 module (4000-3 only) goes into Slot B6.

The parameters for various Chroma Keying functions must be defined in the main menu panel. These menus appear under the Chr Key button. Refer to the Model 4000 User's Guide (TP0790) and Operation Reference (TP0764) Manuals for detailed information.

BORDERLINE Key Edge Generator Option

The BORDERLINE option consists of one mezzanine module (064909) for each keyer. This option module mounts on the Keyer Carrier where the Borderline is desired. Up to eight BORDERLINE options may be installed on the Keyer Carriers; one for M/E 1 Keyer 1 (Slot C6), M/E 1 Keyer 2 (Slot C7), M/E 2 Keyer 1 (Slot C11), M/E 2 Keyer 2 (Slot C12), M/E 3 (4000-3 only) Keyer 1 (Slot B7), M/E 3 (4000-3 only) Keyer 2 (Slot B8), DSK Keyer 1 (Slot C14) and DSK Keyer 2 (Slot C15).

To install a Borderline mezzanine, remove the designated Keyer Carrier carefully, and place it on a static free surface. The Borderline Mezzanine installs in the top location of the module above the Keyer Mezzanines as illustrated in Figure 2-29.

1. Line up the four 50-pin connectors on the Borderline mezzanine with the matching connectors on the Keyer Carrier. Be sure the pins are lined up properly before seating the mezzanine (look between the mezzanine and the Carrier). Push down firmly to seat the mezzanine to the Carrier. Check that no pins are bent or outside of the connectors.

2. From the solder side of the Carrier, attach the mezzanine to the module; install the four screws into the metal spacers on the mezzanine, and carefully reinstall the Keyer Carrier into the frame in its proper slot location.

NOTE: *For best mechanical fit, Mezzanine modules should always be removed by unscrewing from the solder side of the Carrier, not from the component side of the Mezzanine.*

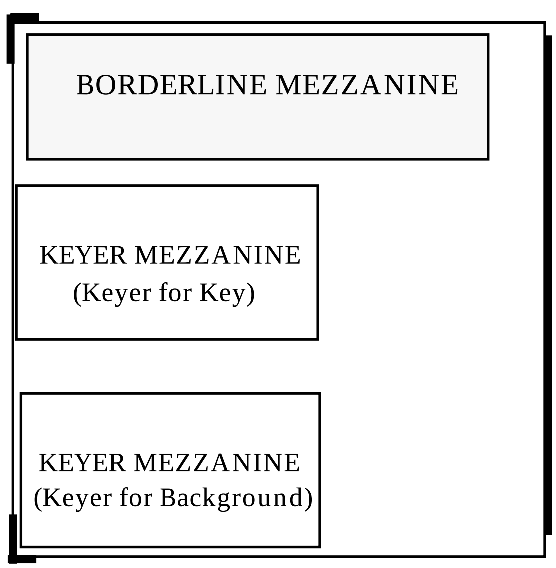


Figure 2-29. Borderline Option Mezzanine Installation

Secondary Wipe Pattern Generator Options

There are two Secondary Wipe Pattern Generator options for the Model 4000 series:

1. The Secondary Wipe Pattern Generator for the Mix / Effects systems

2. Secondary Wipe Pattern Generator for the Program / Preset Mixer and the DSK (Model 4000-2A only).

The first option provides a second wipe pattern for each Mix / Effects subsystem in the switcher. It consists of a mezzanine module which mounts on the Mix / Wipe Modules for M / E 1 (Slot A8), M / E 2 (Slot A13), and M / E 3 (4000-3 only) (Slot B9). Refer to Figure 2-25 or Figure 2-26 for the Mix / Wipe module locations.

The second option provides a Secondary Wipe Pattern Generator for the Program / Preset Mixer and DSK with wipe capabilities in the Model 4000-2A switcher only (see NOTE below). This mezzanine module mounts on the Mix / Wipe DSK Module (Slot A16).

NOTE: *The Program/Preset Secondary Wipe Pattern mezzanine is standard on the Model 4000-2B. It is required to provide the circuitry for creating the secondary wipe wash for the backgrounds and the user defined wash angle for the DSK.*

The Secondary Wipe Pattern Generator Mezzanines (064828) mount next to the Primary Wipe Generator Mezzanines already present on each Mix / Wipe Module. The Look Ahead Preview Option Mezzanines described later also mount on each Mix / Wipe Module. Refer to Figure 2-29.

To install the Secondary Wipe Pattern Generator Mezzanine modules, carefully remove the correct Mix / Wipe Modules from the frame. Place them on a static free surface.

1. Line up the Mezzanine Module so that Connector J1 on the Mezzanine aligns with J10 of the Mix / Wipe Module. Note that the keying plug on J1 will mate with the missing pin on J10. Line up the two 50-pin connectors on the Secondary Wipe Pattern Generator mezzanine with the matching connectors on the Mix / Wipe Module. Be sure the pins are lined up properly before seating the mezzanine (look between the mezzanine and the main module). Check that no pins are bent or outside of the connectors. Push down firmly to seat the mezzanine to the module.

NOTE: *Be sure the mezzanine modules are oriented the same on each Mix/Wipe Module.*

---

2. From the solder side of the Mix / Wipe Module, attach the mezzanine to the module, and install the screws into the metal spacers on the mezzanine.

NOTE: *For best mechanical fit, Mezzanine modules should always be removed by unscrewing from the solder side of the Carrier, not from the component side of the Mezzanine.*

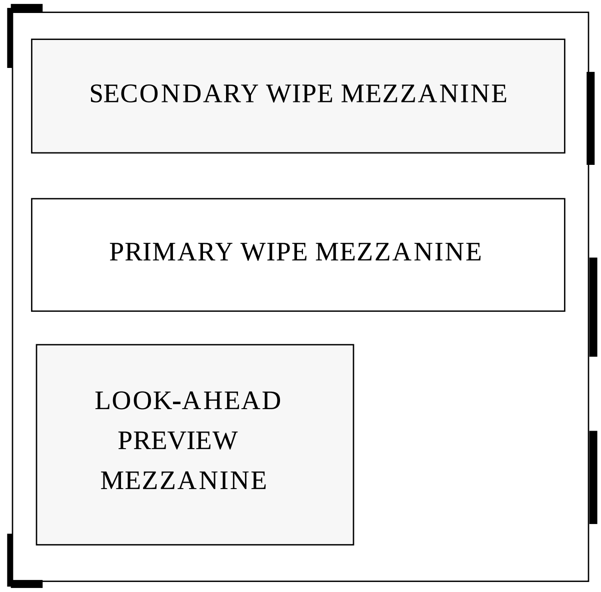


Figure 2-30. Secondary Wipe and Look Ahead Preview Option Installation

The parameters for Secondary Wipes must be set in the main menu panel. These menus appear under the main Wipe pushbutton. Refer to the Model 4000 User's Guide (TP0790) and Operation Reference (TP0764) Manuals for detailed information.

Look Ahead Preview Option

The Look Ahead Preview Option consists of identical mezzanine modules (064829) which mount on the Mix / Wipe Modules in each M / E: M / E 1 (Slot A8), M / E 2 (Slot A13), M / E 3 (4000-3 only) (Slot B9) and Program / Preset (Slot A16) next to the Primary Wipe Mezzanines as shown in Figure 2-30. This option mezzanine module not only provides Look-ahead preview, but also DSK Preview and the Clean Feed video. An optional Serial Output Module must be present in Slot D5 to view these outputs.

To install the modules, carefully remove the Mix / Wipe Modules from the frame. Place them on a static free surface.

1. Line up the six 50-pin connectors on the Look-ahead Preview mezzanine with the matching connectors on the Mix / Wipe Module. Be sure the pins are lined up properly before seating the mezzanine (look between the mezzanine and the main module). Check that no pins are bent or outside of the connectors. Push down firmly to seat the mezzanine to the module.

2. From the solder side of the Mix / Wipe Module, attach the mezzanine to the module, and install the screws into the metal spacers on the mezzanine.

3. Carefully reinstall the Mix / Wipe Module in its proper location.

For operation refer to the Model 4000 User's Guide (TP0790) and Operation Reference (TP0764) Manuals for detailed information.

Tally Control Module Option

The Tally Control Module Option provides relay closures for on-air outputs for each of the mix / effects buses in the Model 4000 (64 tally relay outputs). There are also tally outputs for the M / E 1, M / E 2, and M / E 3 (4000-3 only) reentries.

The option consists of a Tally Control Module (064808) with 7 DIP switches that must be set before installing the module to determine the tally status. See Figure 2-31.

NOTE: *This information applies to Tally Modules using U31 PROM version 156001-03 or later.*

The first bank of 8 switches, labeled on the module as MODE (S1), selects one of several specialized tally functions.

ON AIR Tally (Mode 0) is the normal, most commonly-used tally system (all DIP switches OFF). When Mode 0 is selected, any input whose signal reaches the DSK Program Video or DSK Program Key output is tallied.

Table 2-7. Tally MODE Switch (S1) Settings

DIP Switch Segment	ON AIR Tally Mode 0	M/E 1 Iso Tally Mode 1	M/E 2 Iso Tally Mode 2	M/E 3 Iso Tally[1] Mode 3	Individual Bus Iso Tally[2] Mode 4	Preset (Look-Ahead) Tally Mode 5
1	OFF	**ON**	OFF	**ON**	OFF	**ON**
2	OFF	OFF	**ON**	**ON**	OFF	OFF
3	OFF	OFF	OFF	OFF	**ON**	**ON**
4	OFF	OFF	OFF	OFF	OFF	OFF
5	OFF	OFF	OFF	OFF	OFF	OFF
6	OFF	OFF	OFF	OFF	OFF	OFF
7	OFF	OFF	OFF	OFF	OFF	OFF
8	OFF	OFF	OFF	OFF	OFF	OFF

1. 3 M/E switchers only.
2. Iso tally for every bus having its associated DIP switch closed. Select the individual buses as listed in Table 2-6.

When Mode 1, 2, or 3 (Iso Tally) is selected, the switcher tallies (only) the inputs that contribute to the output of the corresponding M / E.

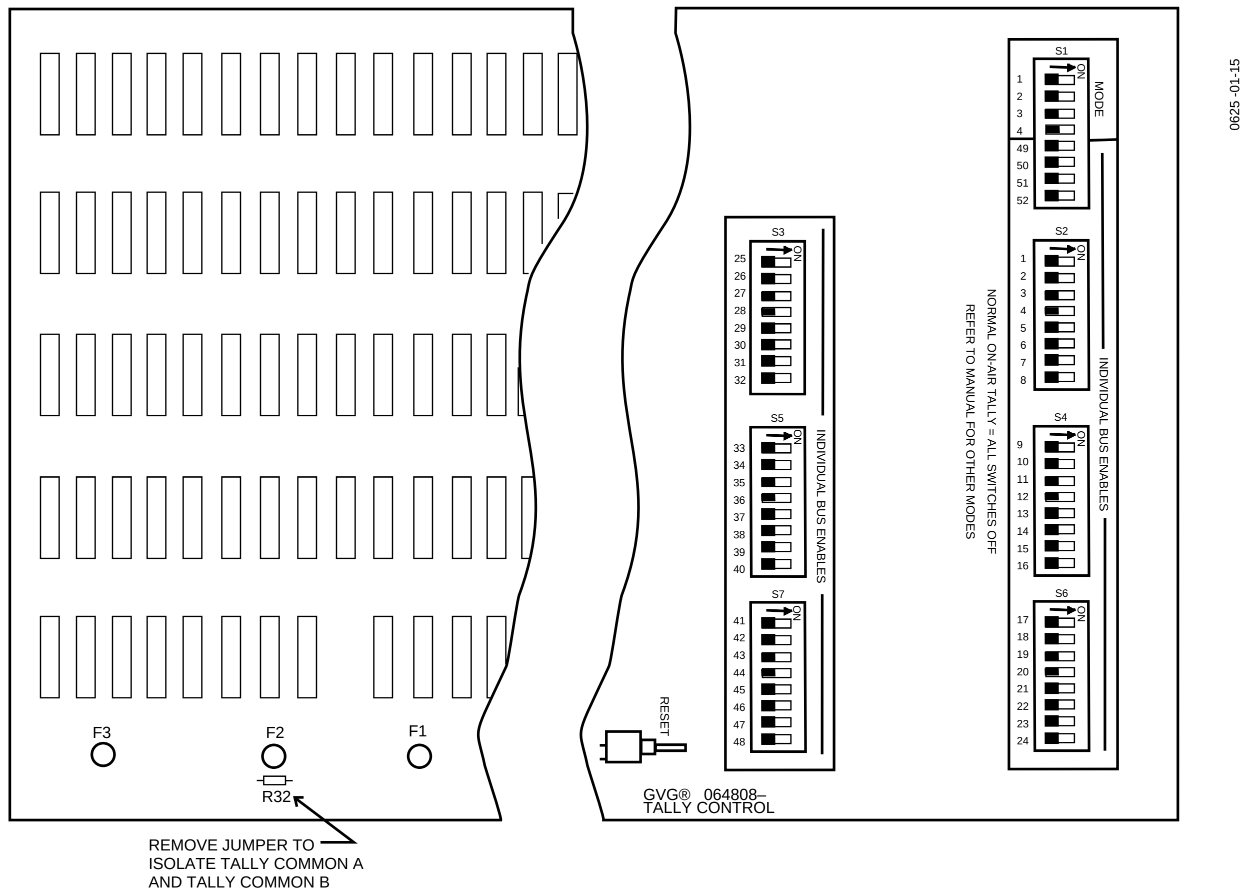


Figure 2-31. Tally Output Module Switch and Jumper Location

When Mode 4 (Individual Bus Iso Tally) is selected, the remaining six banks of switches on the board (Switches S2–S7) select the switcher's internal buses to be used as tally sources (see Table 2-8). For example, with the Bus Enable switches set for buses 35 and 36 ON, if an input were selected on bus 35 or 36, its corresponding relay would close. The same input chosen on other buses would cause no relay closures. It is possible to tally as many buses as desired simultaneously.

When Mode 5 (Look-Ahead Tally) is selected, the switcher tallies the source(s) that will be on air after one of the following transitions:

- Flip-Flop Mix / DSK Cut
- Flip-Flop Mix / DSK Auto Transition
- Flip-Flop Mix / DSK Lever Arm Transition

Table 2-8. Individual Bus Enable Switch Settings

Switch #	DIP Switch ON	Function	Switch #	DIP Switch ON	Function
S2	1	PGM Video Bus	**S3**	25	M/E 3 Key 1 Video Bus[1]
	2	PGM Key Bus		26	M/E 3 Key 1 Key Bus*
	3	PST Video Bus		27	M/E 3 Key 2 Video Bus*
	4	PST Key Bus		28	M/E 3 Key 2 Key Bus*
	5	DSK 1 Video Bus		29	M/E 3 BKGD A Video Bus*
	6	DSK 1 Key Bus		30	M/E 3 BKGD A Key Bus*
	7	DSK 2 Video Bus		31	M/E 3 BKGD B Video Bus*
	8	DSK 2 Key Bus		32	M/E 3 BKGD B Key Bus*
S4	9	M/E 1 Key 1 Video Bus	**S5**	33	PVW Video Bus
	10	M/E 1 Key 1 Key Bus		34	Mask Bus
	11	M/E 1 Key 2 Video Bus		35	Aux 1 Video Bus
	12	M/E 1 Key 2 Key Bus		36	Aux 1 Key Bus
	13	M/E 1 BKGD A Video Bus		37	Aux 2 Video Bus
	14	M/E 1 BKGD A Key Bus		38	Aux 2 Key Bus
	15	M/E 1 BKGD B Video Bus		39	Aux 3 Video Bus
	16	M/E 1 BKGD B Key Bus		40	Aux 3 Key Bus
S6	17	M/E 2 Key 1 Video Bus	**S7**	41	Aux 4 Video Bus
	18	M/E 2 Key 1 Key Bus		42	Aux 4 Key Bus
	19	M/E 2 Key 2 Video Bus		43	Aux 5 Video Bus
	20	M/E 2 Key 2 Key Bus		44	Aux 5 Key Bus
	21	M/E 2 BKGD A Video Bus		45	Aux 6 Video Bus
	22	M/E 2 BKGD A Key Bus		46	Aux 6 Key Bus
	23	M/E 2 BKGD B Video Bus		47	Aux 7 Video Bus
	24	M/E 2 BKGD B Key Bus		48	Aux 7 Key Bus
			S1	49	Aux 8 Video Bus
				50	Aux 8 Key Bus
				51	Aux 9 Video Bus
				52	Aux 9 Key Bus

1. 3 M/E Switcher Only

After setting the Tally Control Module switches, install the module by following the steps listed below:

1. Remove the blank plate, if installed, and slide the Tally Control Module into Slot D1 of the lower rear D Bay for switchers shipped before January, 1996 (Matrix 094800-00) or Slot C5 of the upper rear C Bay for switchers shipped after January, 1996 (Matrix 094803-00). Pull the metal ejectors towards each other to seat the module. Screw in the two screws at either end of the front metal plate with a screwdriver

2. Refer to the Cable Connections portion next in this section for tally connection instructions.

The TALLY RESET button and the TALLY RUN light are located on the Sync Generator Module in Slot A9. The Tally Run light can be viewed from the front of the Model 4000 Signal Frame, and the Reset button can be accessed without opening the Signal Frame door.

Timed Aux Output Option

The Timed Aux Output Option provides four timed aux output pairs (video / video or video / key) from aux buses 5A through 8B. The outputs are autotimed on the module to match the Program output. The option consists of the Timed Aux Output Module (064852) with the Timed Aux Mezzanine (064854) mounted on it and the Timed Aux Control Module (064855).

To install the Timed Aux Output option modules follow the steps below:

1. Remove the blank plates or Serial Output Module, if installed, in location D3 and D2. Install the Aux Output Module into Slot D3. Pull the metal ejectors towards each other to seat the module. Screw in the two screws at either end of the front metal plate with a screwdriver.

2. Install the Timed Aux Control Module into Slot B5 for systems shipped before 1 / 96 (Matrix 094800-00) or Slot B15 in systems shipped after 1 / 96 (Matrix 094803-00).

3. Refer to the Cable Connections portion next in this section for Aux bus connection instructions.

The parameters for various Aux Bus functions must be defined in the main menu panel. Refer to the Model 4000 User’s Guide (TP0790) and Operation Reference (TP0764) Manuals for detailed information.

Remote Aux Panel Option

The Remote Aux Control Panel Option allows you to control the Model 4000's aux buses from a remote location. As many as 32 Remote Aux Panels can be daisy-chained to the switcher (see Cabling Information later in this section). There are three Remote Aux Panel configurations available, identified by the number of rack units (RUs) each occupies in the equipment rack. See Figure 2-32 below. Refer to the Remote Aux Control Panel Options stand-alone documentation (TP0699) for operating, testing, and troubleshooting information.

The panels are designed to control 48 external inputs (24 unshifted and 24 shifted). On the Model 4000-2B, panel input buttons 17 through 24 are disabled (inputs 1 thru 16, and shift 1 thru shift 16 are the active crosspoints).

Each crosspoint lamp on the Remote Aux panel will high tally when that input is on the air. There is an ON AIR lamp on the one Remote Aux panel (088901) which will illuminate to indicate that the selected input is on the air. The on-air tally can be permanently enabled on all three Remote Aux Panels.

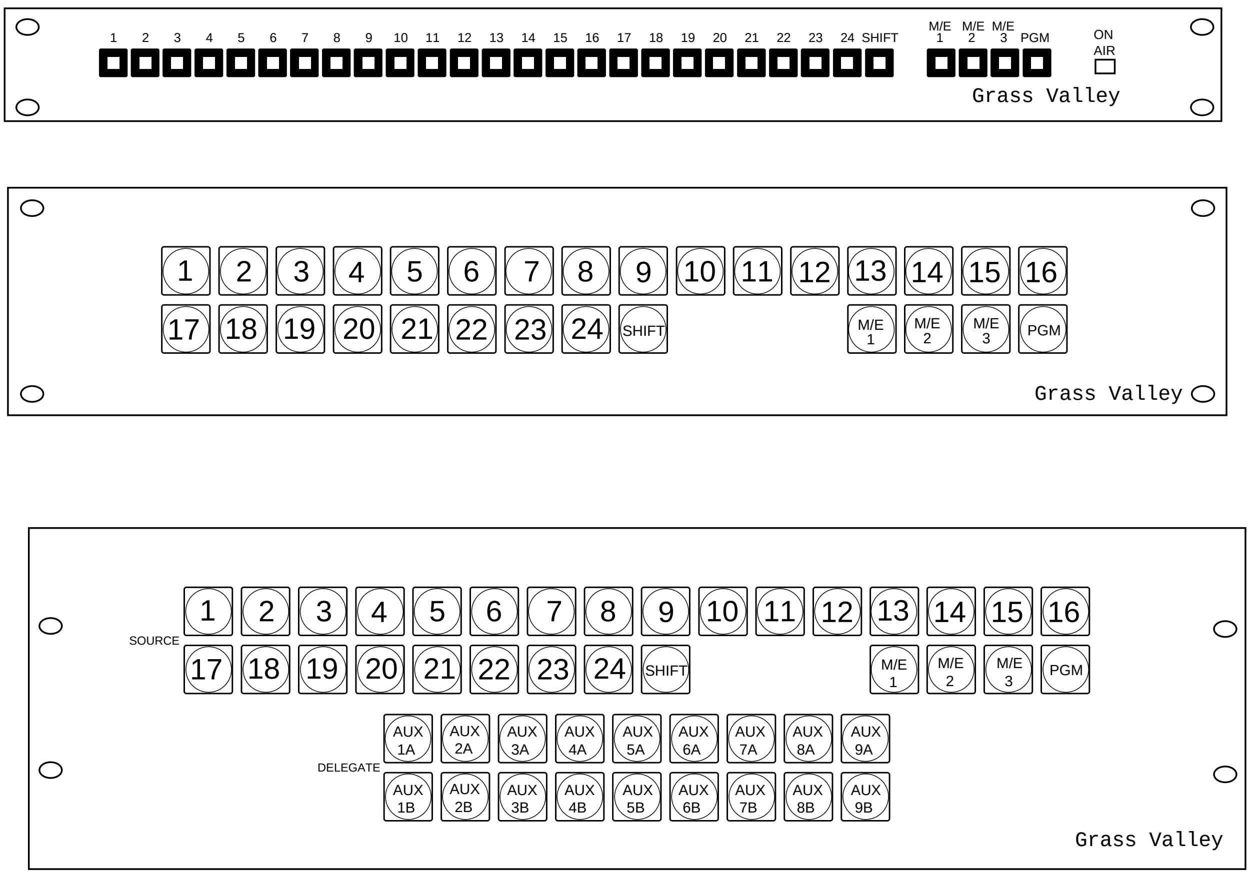


Figure 2-32. Remote Aux Panels

Setting Rear Panel Switches —The Remote Aux rear panel includes a number of switches that control operating modes, such as address, bus enable, delegate enable, and test mode. Settings of these switches are explained below (Figure 2-33).

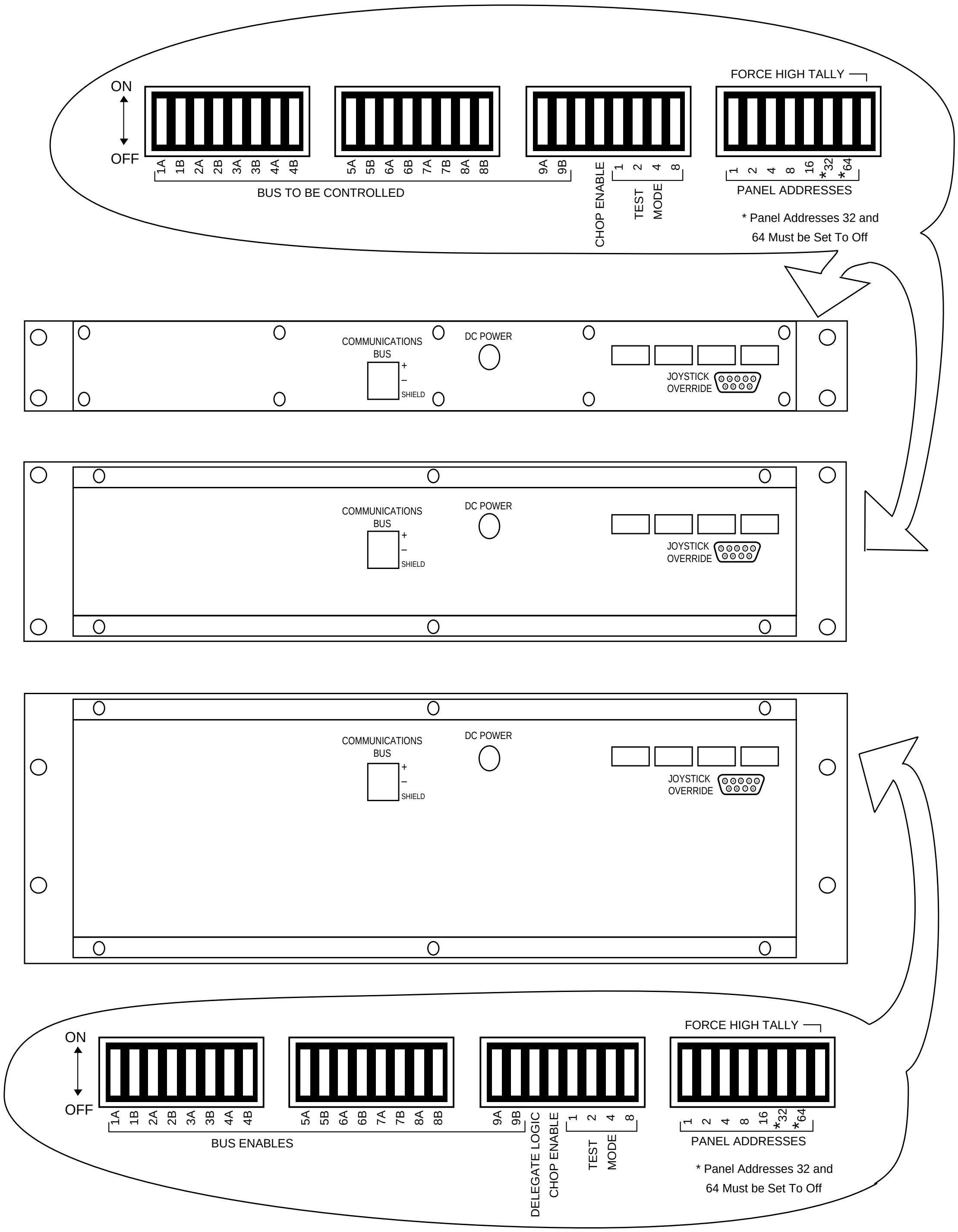


Figure 2-33. Rear View of Remote Aux Panels Showing DIP Switches

Address Switches—Set the address of the Remote Aux Panel (0 through 31) using the switches marked PANEL ADDRESS on the right rear of the panel (see Figure 2-33). The seven switches have 128 possible combinations; however, only five of the switches may be used (1-16). Switches 32 and 64 must be in the OFF position. If there is more than one panel, it may be useful to maintain a record of each Remote Aux panel address.

CAUTION

Each panel must have a unique address. Setting the same address for two or more panels will cause the entire Remote Aux system to malfunction.

Chop Enable Switch—the following Chop Enable modes can be set on the 3-RU panel:

- Chop Enable Switch On– Allows Chop mode to be activated using the front panel buttons
- Chop Enable Switch Off– Disables Chop mode

Bus to be Controlled (Bus Enable) Switches—The 1-RU and 2-RU panels have eighteen switches labeled BUS TO BE CONTROLLED. These set which aux bus is controlled by the panel. Only one of these switches may be ON.

The 3-RU panel has eighteen switches labeled BUS ENABLE. These set which aux buses can be controlled by the panel. Turn the switch ON for each aux bus to be controlled. Any combination of the eighteen switches can be turned ON. The functioning of the buses that have the switches turned OFF depends on the position of the DEL LOGIC switch (see below).

If your switcher has only fourteen aux buses, the last four switches (8A through 9B) must be set to OFF.

NOTE: *Two or more panels can control the same aux bus; however, if the same bus is selected on more than one panel and selections are made on both panels at the same time, the panel with the highest address will control the bus.*

Delegate Logic Switch—On the 3-RU panel, the DEL LOGIC switch controls the functioning of the aux buses that are *not* selected:

DEL LOGIC Switch OFF: If a BUS ENABLE switch is OFF, the associated Delegate button on the panel can be selected and the source button selected for that bus will light but cannot be changed.

DEL LOGIC Switch ON: The Delegate button on the panel cannot be selected if its BUS ENABLE switch is OFF.

NOTE: *The DEL LOGIC switch is not used on the 1-RU and 2-RU panels.*

Force High Tally Switch—On the 1-RU panel, the FORCE HIGH TALLY switch forces the ON AIR lamp on at all times.

On the 2-RU and 3-RU panels, the FORCE HIGH TALLY switch disables the low tally condition. The lamps will be on bright whether the bus is on air or not.

Test Mode Switches—For normal operation set all four TEST MODE switches to OFF.

Remote Aux Panel Lens Chip Installation—The primary crosspoint pushbuttons on the 2-RU and 3-RU control panels can be labeled as desired. An envelope containing a set of printed lens chips is shipped with the control panel. Make sure not to throw away the lens chips inadvertently.

To change a lens chip, follow the instructions given earlier in the control panel installation portion called “Pushbutton Lens Chip Installation” (see page 2-14).

Frame Store

The Frame Store option allows storage and retrieval of images at a 10-bit resolution. Up to four 2-field pages can be stored in both the video store and the key store. Video and Key inputs may be frozen together or independently. The images can later be read with either one- or two-field mode. Either replication or interpolation may be used if one field readout is selected.

The Frame Store option consists of a single circuit board (064813) with a mezzanine board (064823) mounted on it. To install the Frame Store option, follow the instructions below.

1. Install the Frame Store Module in either Slot B2 (for Model 4000-2) or slot B15 (for Model 4000-3) of the front B Bay (refer to Figure 2-25 or Figure 2-26). Be sure the module is oriented correctly. Carefully slide the module in, avoiding contact with the modules on either side. Be sure to match the rear connections before applying pressure to seat the module.

To view the direct switcher output for Frame Store video and key images, you must install an optional Serial Output Module in Slot D1 (for all models shipped after 1/96) (see Figure 2-28).

Mask Draw Tablet Option

The following WACOM graphics tablet models are supported (Grass Valley does not supply the tablet):

- KT-0405-R “ART PAD” (PC compatible version)
- UD—XXXX—R (Any PC-compatible UD-series tablet)
- UD-608-R “ART Z” (PC compatible version)
- SD series (these tablets are now obsolete; however, they may be used if a pressure sensitive pen is used with the tablet)

Installing UD and KT Series Tablets

The following connector pin-out information applies to the UD and KT series tablets.

The KT and UD tablets include a 9-pin male to 25-pin female adapter. You will need a 25-pin male-to-male gender adapter to connect the tablet to the **POINTING DEVICE** input port on the back of the switcher Control Panel.

The 9-pin male to 25-pin female adapter must be wired as follows: (All other pin wiring is unchanged.)

25-Pin	9-Pin
Pin 2	Pin 3
Pin 3	Pin 2

1. Connect the graphics tablet to the **POINTING DEVICE** input port on the back of the switcher Control Panel.

2. The Control Panel CPU Board RS-232 jumper blocks must be set to the “DCE” position. Refer to the following text for Model-specific jumper locations.

Model 4000-2:

- Open the Control Panel lid and locate the Control Panel CPU Board. Locate the two RS232 jumper blocks (2 pins each) labeled J3 at the top, middle, of the board. Set the blocks to the “DCE” setting (horizontal as you view the board from the front of the panel).

Model 4000-3:

- Open the Upper Control Panel lid and locate the Control Panel CPU Board. Locate the two RS232 jumper blocks (2 pins each) labeled J11 in the center of the board. Set the blocks to the “DCE” setting (horizontal as you view the board from the front of the panel).

NOTE: *Refer to the Model 4000 User Guide for Drawing Tablet operational information.*

Installing SD Series Tablet

1. Connect the graphics tablet to the **POINTING DEVICE** input port on the back of the switcher Control Panel.

2. The Control Panel CPU Board RS-232 jumper blocks must be set to the “DTE” position.

Model 4000-2:

- Open the Control Panel lid and locate the Control Panel CPU Board. Locate the two RS232 jumper blocks (2 pins each) labeled J3 at the top, middle, of the board. Set the blocks to the “DTE” setting (vertical as you view the board from the front of the panel).

Model 4000-3:

- Open the Upper Control Panel lid and locate the Control Panel CPU Board. Locate the two RS232 jumper blocks (2 pins each) labeled J11 in the center of the board. Set the blocks to the “DTE” setting (vertical as you view the board from the front of the panel).

NOTE: *Refer to the Model 4000 User Guide for Drawing Tablet operational information.*

Cable Connections

This section describes the cabling of the Model 4000 system components. You need not follow the specific sequence of steps presented here; however the procedures do provide a reference for ensuring that all connections are properly made.

Cabling is described in the following sequence:

Control Panel Connections

- Connection of the control cables from the Control Panel to the Frame
- Connection of a Status Terminal to the Control Panel

Frame Signal Connections

- Connection of Video and Key signals to the inputs
- Connection of analog and serial output signals

Frame Communications Connections

- Editor
- GVP Digital Effects Systems - Krystal, KALEIDOSCOPE, DPM-700
- GPI inputs and outputs
- Remote Aux Panels
- Tally Control Module Connections
- Maintenance Terminal

Power Connections to Control Panel and Frame

Control Panel Connections

The control panel communicates with the Signal Processor Frame over RS-422 data lines–one per M/E plus a flip/flop mix data link. All of the links are contained in a single RP125 parallel digital cable that may be up to 300 meters (985 feet) long. Standard jacketed (PVC) and plenum rated (Teflon®) cables are available.

The pinout for the parallel digital cables is illustrated in Figure 2-34.

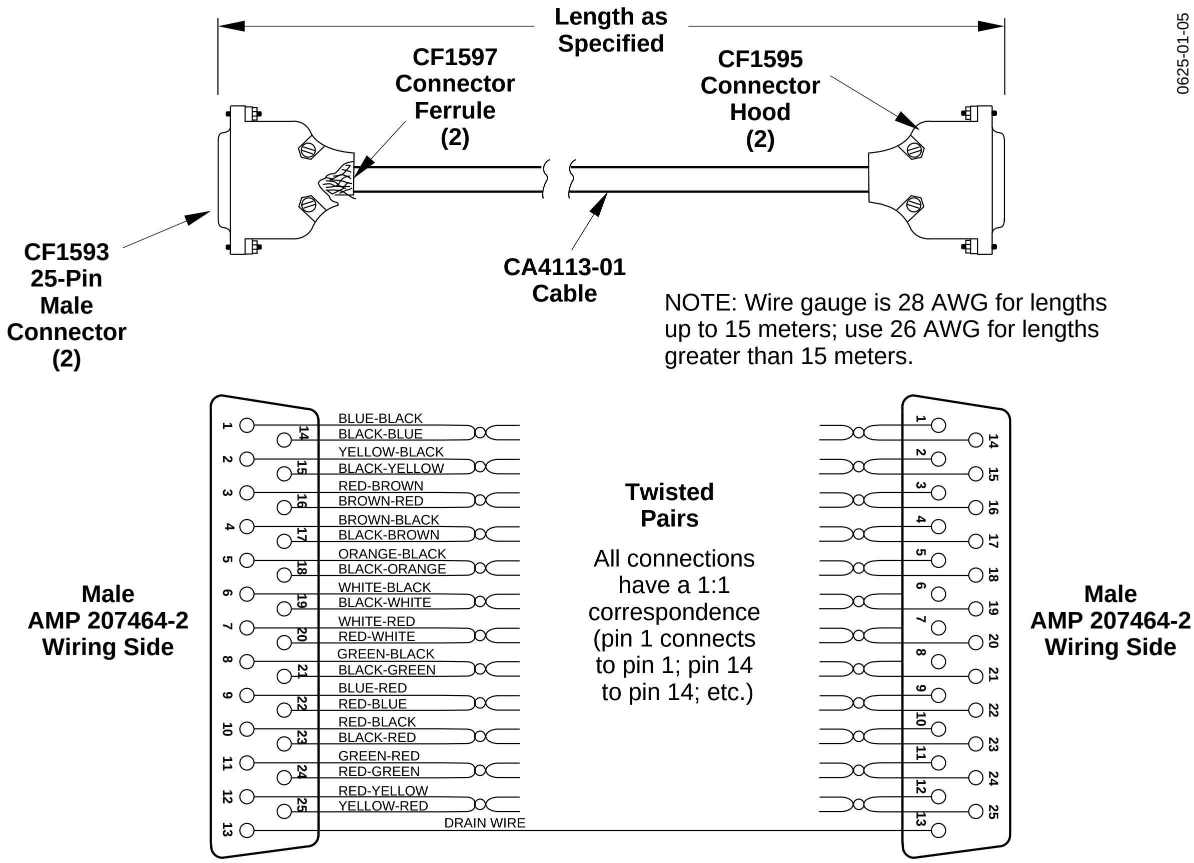


Figure 2-34. Control Panel to Frame RP125 Digital Cable

Model 4000-2A/B Control Cable

1. Connect the interconnect control cable to the connector marked J1 on the rear of the Control Panel as shown in Figure 2-35.

2. Connect the other end of the interconnect control cable to J1 (PANEL) on the COM I/O Module in the top rear bay (Slot C3) of the Signal Processor Frame illustrated in Figure 2-35.

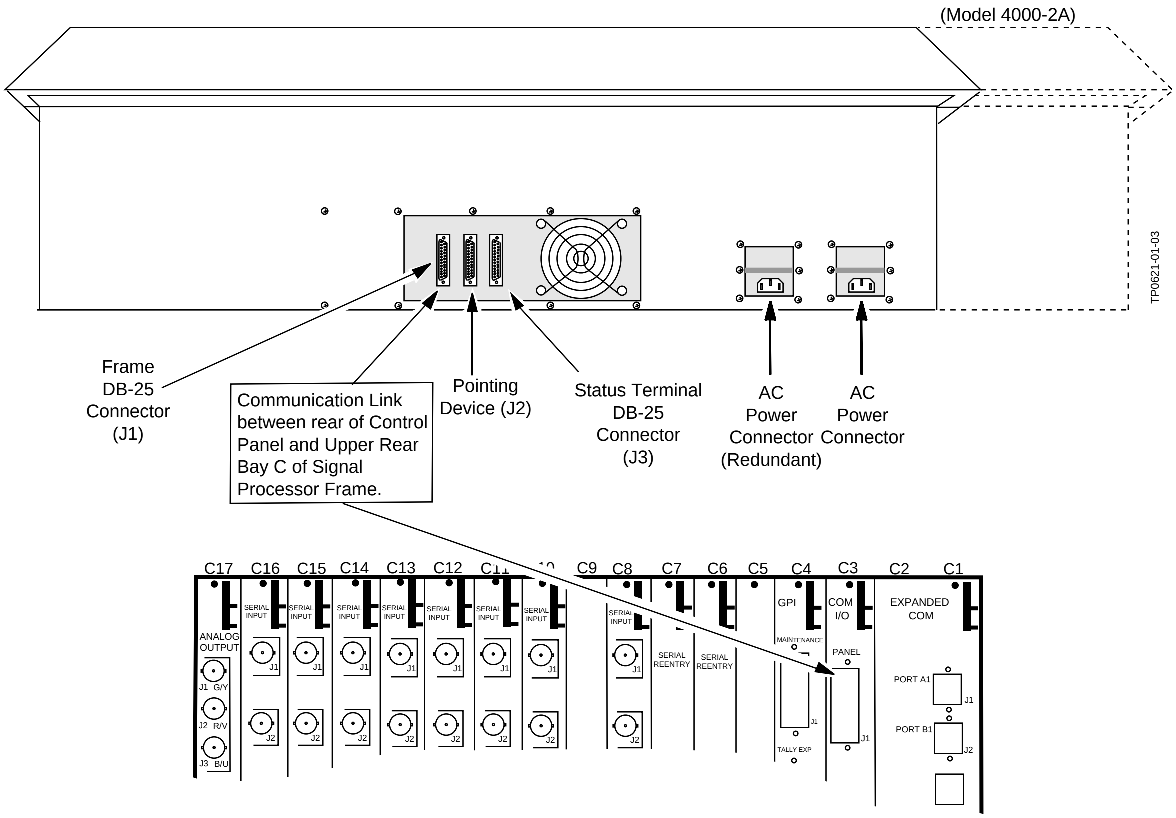


Figure 2-35. Control Panel Connections

Model 4000-3 Control Cable

1. Connect the interconnect control cable (Frame Communication) to the connector marked J105 on the rear of the upper Control Panel as shown in Figure 2-36.

2. Connect the other end of the Frame Communication cable to J1 (PANEL) on the COM I/O Module in the top rear bay (Slot C3) of the Signal Processor Frame illustrated in Figure 2-36. This cable length may be extended to a maximum of 300 meters.

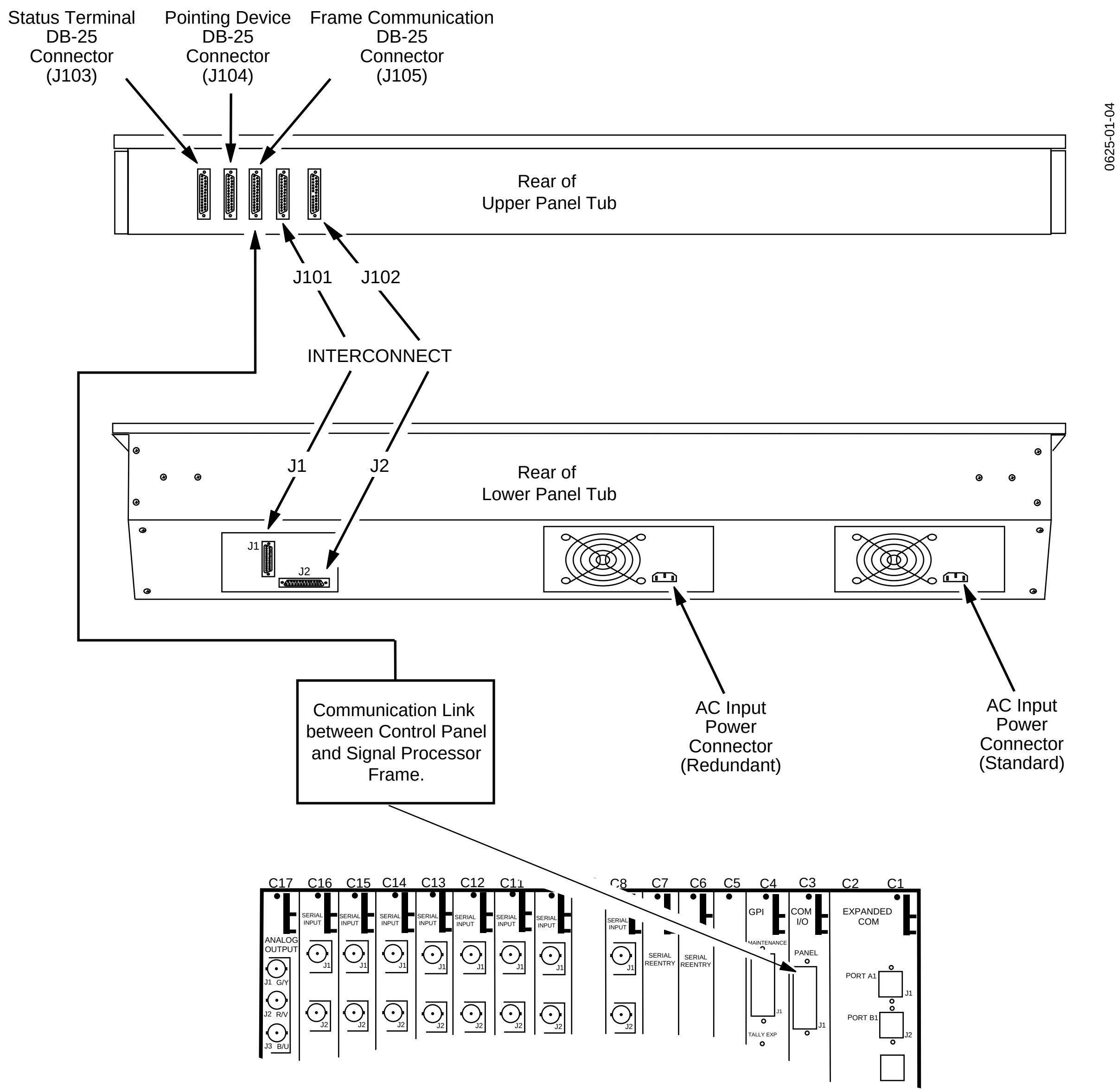


Figure 2-36. Model 4000-3 Control Panel Connections

3. Connect the first Communication Cable from the rear of the upper Control Panel (J101) to the rear of the lower Control Panel marked TO ACCESSORY PANEL (J1).

4. Connect the second Communication Cable from the rear of the upper Control Panel (J102) to the rear of the lower Control Panel marked TO ACCESSORY PANEL (J2).

Status Terminal Connections

The Status Terminal connector (labeled "MAINTENANCE") on the rear of the Control Panel allows the connection of a VT-100 (type) terminal to be connected to the Model 4000. The terminal is used to monitor system status and for maintenance purposes.

1. Connect a cable between the input of a VT-100 (type) terminal and J3 (Status Terminal connector) on the rear of the Control Panel. The connector (J3) on the rear of the Control Panel is a standard RS-232 configuration via a DB-25 connector with the following pin-outs:
   - **Pin 1** — Protective Ground
   - **Pin 2** — TxD (From the Terminal)
   - **Pin 3** — RxD (To the Terminal)
   - **Pin 7** — Signal Ground
2. Ensure that the baud rate and other parameters of the Model 4000 given below match the baud rate of the terminal. See the Owner's Manual of the terminal in use to determine or set the baud rate of the terminal. Also be sure the terminal is set to "Newline Off" or "No Newline".
   - 9600 baud
   - 8 data bits
   - 1 stop bit
   - No parity

Frame Signal Connections

Analog Reference Connection

Connect an analog signal such as color black or any other stable analog signal to either J5 or J6, ANALOG REF IN, on the Com I/O Module in Slot C3. Terminate any unused BNC connectors.

Input Signal Connections (Video and Key)

The Model 4000 allows up to 64 video/key inputs to be connected. These inputs are connected to either a Serial Digital or an Analog Input Module at the rear of the frame. Inputs are configured in the soft menus.

Component analog inputs can also be connected to each of three optional Chroma Key Input Modules.

NOTE: *Grass Valley Products does not supply analog (BNC) signal cables or 75Ω terminators for the loop-through BNC connections. These must be obtained from other suppliers.*

Serial Digital Video Connections—The serial digital inputs require the use of 75Ω coaxial cables. The use of 75Ω BNC connectors is recommended but not required. Facilities with existing cables with 50Ω connectors on 75Ω cables need not change their connectors. However, with the use of 50Ω connectors there is the possibility of some errors occurring in the serial data stream.

The maximum length of serial digital cables should not exceed 225 meters (984.25 feet). Fiber optic distribution and transmission is recommended for runs longer than 300 meters.

Connect serial digital video sources to the Serial Input Modules in Slots C8, C10-C16 as required for your facility. Be sure to terminate each looping input with a 75Ω termination.

Analog Input Connections—There are two types of optional analog inputs: component analog inputs (video and key) and external chroma key inputs. Formats accepted by the system for the analog inputs include the following:

- RGB (50 or 60 Hz, Setup or No Setup)
- Beta
- MII (50 or 60 Hz)
- EBU / SMPTE

Connect your analog sources to the input options you have installed according to the module locations in Figure 2-28 (lower rear D Bay).

After power up, you must manually time the input signals to the external analog reference signal. Refer to the System Timing section (page 2-96) for the timing procedure.

There are gain adjustments for each external analog input. These adjustments have been set at the factory and should not normally need any adjustment. Adjustments to these are necessary when an external analog source may have a noticeable variation. In this case it is advisable to insert a known test signal (such as 100% color bars) as an input and adjust the gain as desired while observing a waveform monitor.

Output Signal Connections

Analog Output Module—The Model 4000 has one standard Analog Output Module located in Bay C, Slot 17 of the Signal Processor Frame. Analog Program Video (J1-3) and Switched Preview video (J4-6) output signals from the Analog Output Module may be connected directly to external analog devices. There are two DAC Mezzanine boards on the Analog Output Module; one providing the Program analog output and the other, the Preview analog output. There are ten Color Difference or RGB formats to choose from as the analog output. Output format is determined by the customer by setting jumpers on the Analog Output Module and the mezzanine boards. Gain adjustments must also be made for accurate output levels.

Analog Output Modules leave the factory set at RGB .700V, No Setup, and narrow RP125 blanking. To change to a different standard, perform the following steps:

1. Remove the Analog Output Module from the rear Signal Processor Frame, and place it on a flat, static-free surface.

2. Locate jumper J17, on the right hand side of the Analog Output Module immediately below TP7. Set the jumper setting to the desired blanking width of the converted video output. When set to RS-170 (wide blanking), blanking edges are placed as in the RS-170 specifications for 60 Hz systems or for the CCIR 470-2 recommendation for 50 Hz systems. When it is set to RP-125, blanking is active from end of active video (EAV) to start of active video (SAV) data words, inclusive, as described in SMPTE recommended practice RP-125.

3. Locate jumper J16 on the Analog Output Module, and select the appropriate Setup (54 mV) or No Setup setting for your system’s desired analog outputs. Note that this setting is common to both program and preview outputs. Whatever is chosen for one applies to both.

Table 2-9. Analog Output Module Setting

Format Selection	J16 Analog Module	J5, J6, J9, J11 DAC Mezz. Color Diff.	J4 (Y) DAC Mezz.	J8 (R-Y) DAC Mezz.	J10 (B-Y) DAC Mezz.
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

4. Remove the Program DAC Mezzanine board from the Analog Output Module, and turn the module to the component side. Locate jumpers J5, J6, J9, and J11; set all four jumpers to either “a” for Color Difference format, or “b” for RGB format.

5. Locate jumpers J4, J8, and J10 on the Program DAC Mezzanine. Referring to Table 2-9, set each jumper to the desired format selection for your 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, a suitable substitute can be made of a short piece of 24 gauge solid tinned copper wire.

6. Carefully replace the Program DAC Mezzanine on the Analog Output Module, making sure all connector pins are in the sockets correctly.

7. Remove the Preview DAC Mezzanine board from the Analog Output Module, and repeat Steps 4 and 5.

8. Carefully replace the Preview DAC Mezzanine on the Analog Output Module, making sure all connector pins are in the sockets correctly.

Coarse adjustment of the format voltage levels are set by jumper selection; however, you may need to fine tune these levels using the gain adjustments on the DAC Mezzanines.

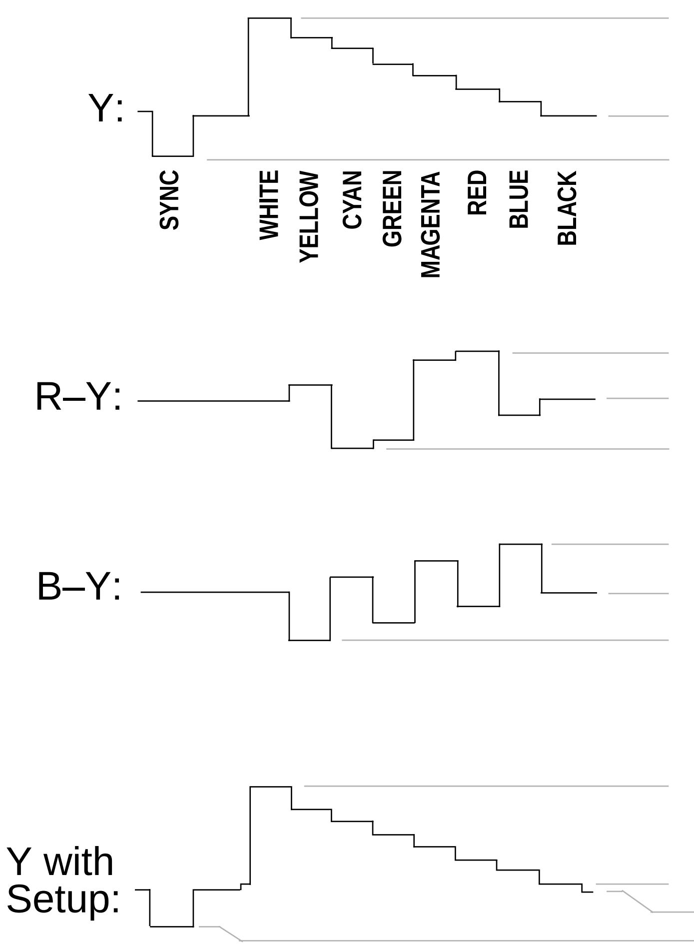
1. Place the Analog Output Module on the I/O Module Extender (064834), and select 100% Color Bars as the Program and Preview switcher output. (You may use the internal signal for this adjustment which is accessible through the Configuration ***[INPUTS]*** menu.)

2. The gain adjustment trimpots are accessible with the DAC mezzanines installed on the Analog Output Module. Connect a waveform monitor or oscilloscope to the Analog Output(s). Terminate the scope or monitor's inputs in 75 Ohms. A component waveform monitor is convenient in that all three output channels can be observed simultaneously, but it is only necessary to observe one at a time.

3. Adjust the gain controls to match the waveform for the desired format shown in Figure 2-37 for color difference or Figure 2-38 for RGB.

NOTE: *In RGB formats, the gain controls are somewhat interactive. For best results, adjust Y gain while observing green output such that the white color bar is at specified level. Then observe 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



	RP-125	EBU/ SMPTE	BETA 50	BETA 60	BETA 60 NO SETUP	MII 50	MII 60	MII 60 NO SETUP
Y:	$3AC_H$	700	700	—	714	700	—	700
	040_H	0	0	—	0	0	—	0
		-300	-300	—	-286	-300	—	-300
R–Y:	$3C0_H$	350	467	467	467	350	324	324
	200_H	0	0	0	0	0	0	0
	040_H	-350	-467	-467	-467	-350	-324	-324
B–Y:	$3C0_H$	350	467	467	467	350	324	324
	200_H	0	0	0	0	0	0	0
	040_H	-350	-467	-467	-467	-350	-324	-324
Y with Setup:	$3AC_H$	—	—	714	—	—	70	—
	040_H	—	—	54	—	—	52.5	—
		—	—	0	—	—	0	—
		—	—	-286	—	—	-300	—

NOTE: All voltage levels are in millivolts.

Figure 2-37. Color Difference Format Chart

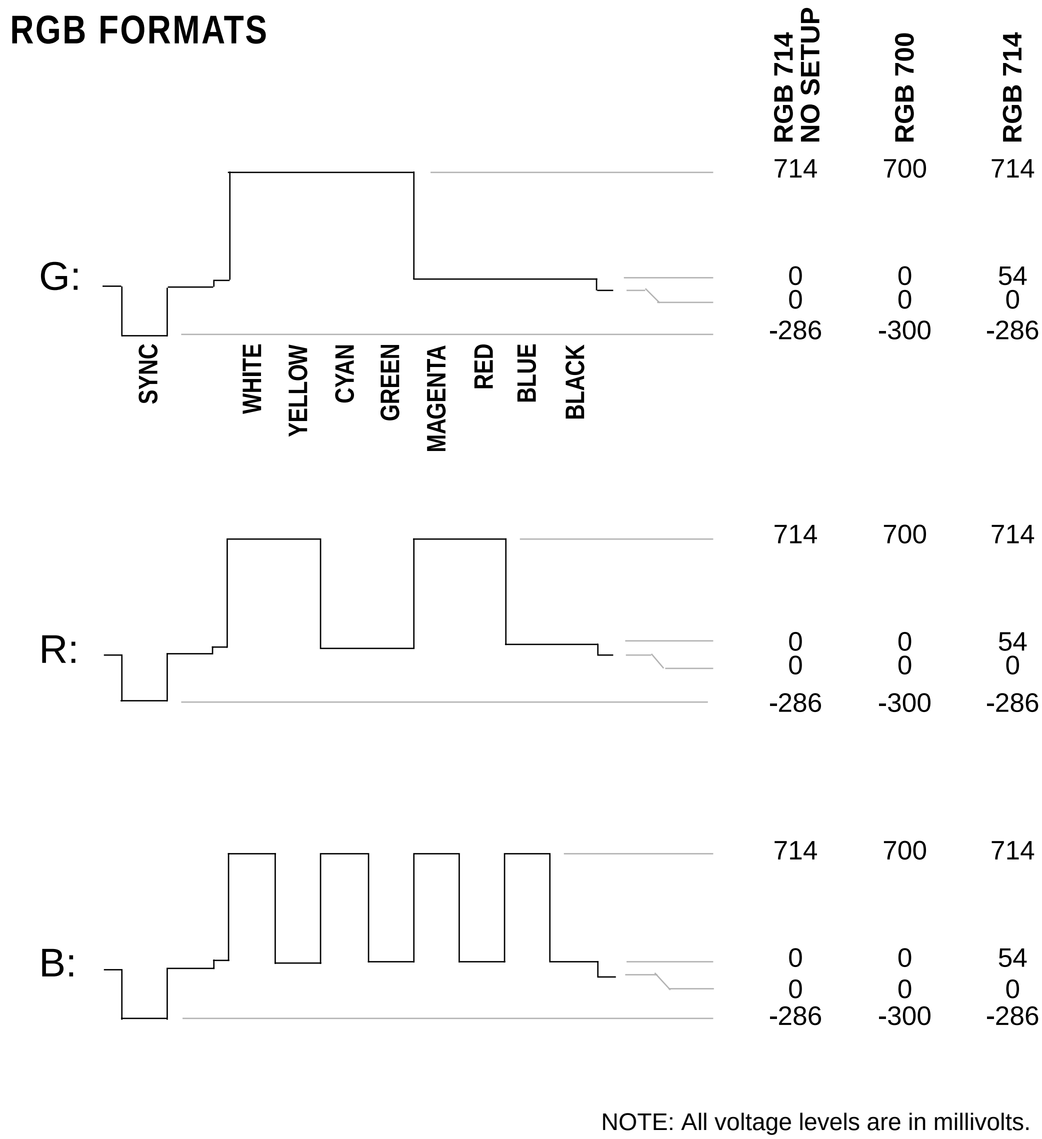


Figure 2-38. RGB Format Chart

Timed Aux Output Connections—The Timed Aux Output module allows eight connections from the Model 4000 to your Krystal or other digital effects device BNC input connectors. These inputs may be independent video or video/key pairs. Connectors J1, J5, J9, and J13 are video outputs. Connectors J3, J7, J11, and J15 may be used as video or key outputs. (See Figure 2-39 below.)

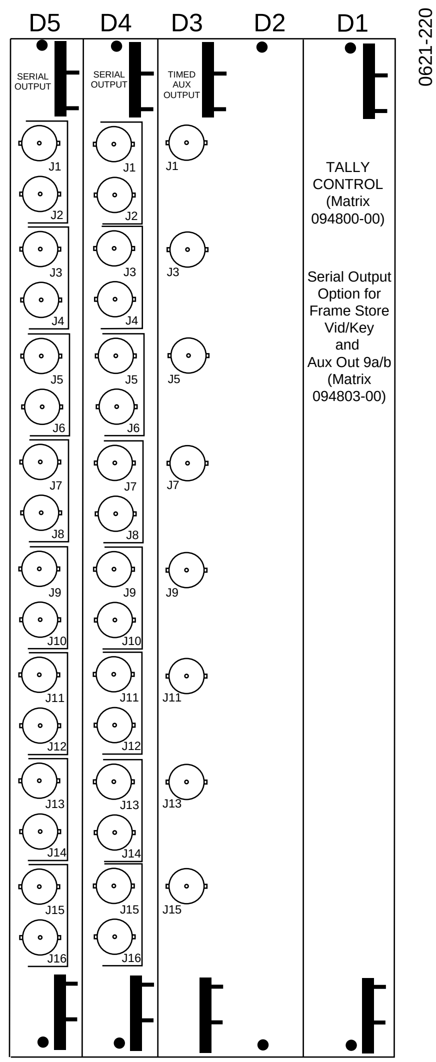


Figure 2-39. Timed Aux Output Connections

Serial Digital Output Connections—Serial Digital Output Modules allow connection to the serial digital output signals from the Model 4000. The signal type of each output is hardwired according to the slot ID and is listed on the designation strip on the back of the Signal Frame (above the C Bay). The outputs are illustrated in Figure 2-40 for switchers shipped before January, 1995 and Figure 2-41 for systems shipped after January, 1995.

NOTE: *Untimed aux bus outputs are shown in these figures.*

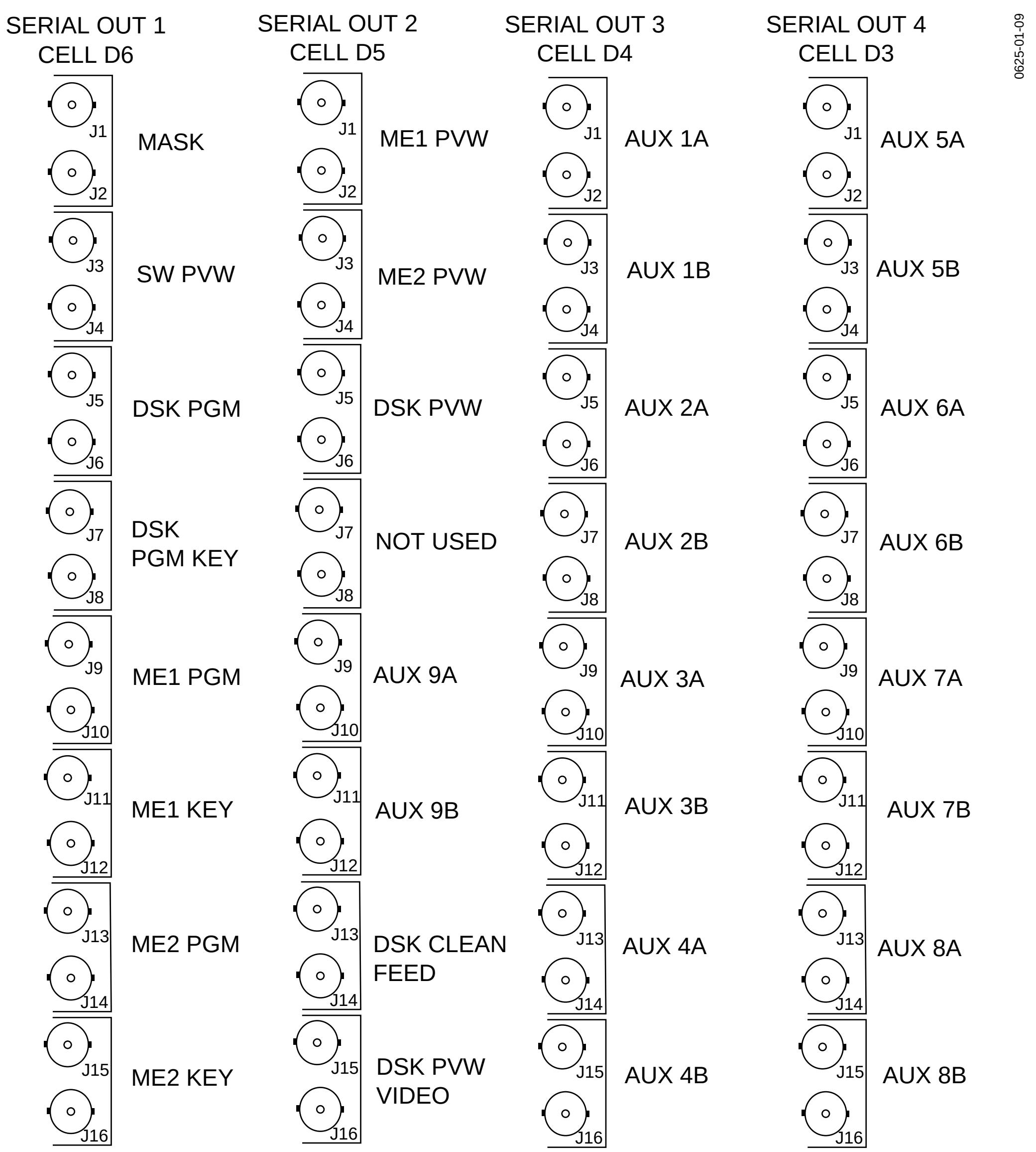


Figure 2-40. Serial Digital Output Connections (Before January, 1996)

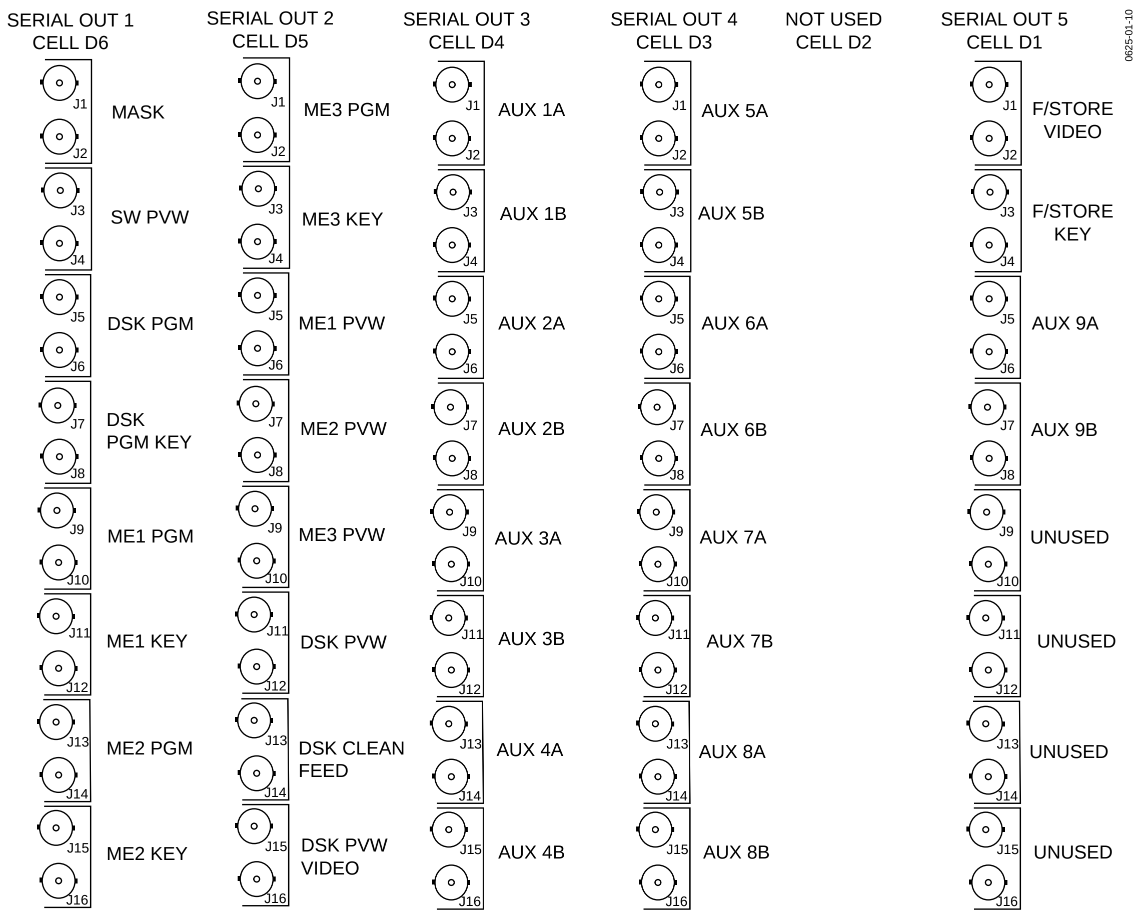


Figure 2-41. Serial Digital Output Connections (Models Shipped after 1/96)

Frame Communications Panel Connections

You can connect external devices such as Video Production Editors, Digital Effects Systems such as GVP's Krystal, Kaleidoscope, and DPM-700, GPI connections, Tally Expansion, and a maintenance terminal to the Model 4000 switcher. These are connected to the switcher via the Communications I/O Module, GPI Module, and the Expanded Communications Module, located at the C Bay of the Frame as shown in Figure 2-42. (The Tally Module pinouts are shown in Figure 2-52.)

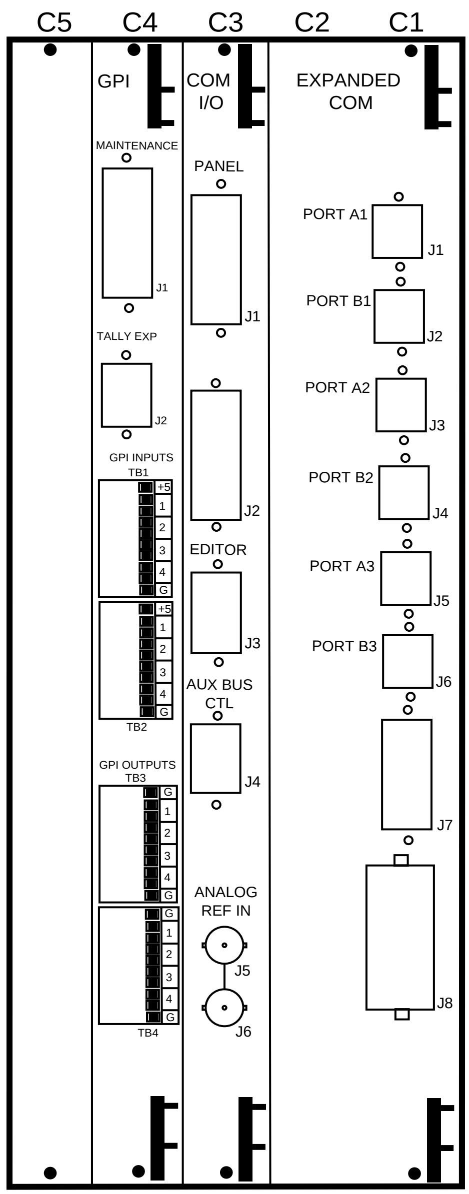


Figure 2-42. Signal Processor Frame Rear Connections (Control Section)

Video Production Editor Connections

The Model 4000 may be connected to video editors such as GVP's VPE or Sabre series of editors.

1. Attach the signal cable from the editor to the EDITOR port (J3) located on the Communications I/O Module in Slot C3 as shown in Figure 2-42.

2. The EDITOR INTERFACE menu for assigning baud rate and parity is found under the EXTERNAL I/F section of the CONFIG menus.

3. The Communications standard (RS-422 or RS-232) is set with jumpers on the Control Processor II module. (See Editor Port Jumper Settings on the next page.)

Electrical and mechanical specifications for Port J3 are shown in Table 2-10.

Table 2-10. Editor Port Specifications

Item	Description
Baud Rate	38,400
Word Size	8 bits, 1 start bit, 1 stop bit only
Parity	ODD only [1]
Communications	RS-422 or RS-232, depending upon the Editor
Connector	9-pin D-subminiature

1. The switcher may initialize with a default Parity setting of NONE. If so, this parameter must be set to ODD in the Config/External IF/Editor IF menu.

The pinout for the EDITOR port is shown in Table 2-11.

Table 2-11. Editor Port Pinout

Pin	Signal	Pin	Signal
1	Common	6	Common
2	TX	7	TX+
3	RX+	8	RX-
4	Common	9	Common
5	NC		

Editor Port Jumper Settings—There are two sets of EDITOR port jumpers which are located on the Control Processor II module (064806) as shown in Figure 2-43. Jumper J15 sets the communication standard (RS-232 or RS-422); Jumpers J16, J17, and J18 set the EDITOR port termination (terminated or not terminated).

NOTE: *If you are using either the Sabre Edit or Super Edit GVP editors, the factory default settings are correct and you may skip this section.*

Communication Standard—For RS-422, set the two jumpers of J15 to the upper (RS422) position as shown in Figure 2-43. This connects pins 1 and 3 together and pins 2 and 4 together.

For **RS-232** set the two jumpers of J15 to the lower (RS232) position. This connects pins 3 and 5 together and pins 4 and 6 together.

Termination —Set jumpers J16, J17, and J18 to either the upper (terminated) or lower (not terminated) position, depending upon the requirements of your system. All three of these jumpers should be set to the same position (all up or all down). There is only one jumper for each of these jumper blocks.

If J15 is set for RS-232, Jumpers J16 through J18 have no effect.

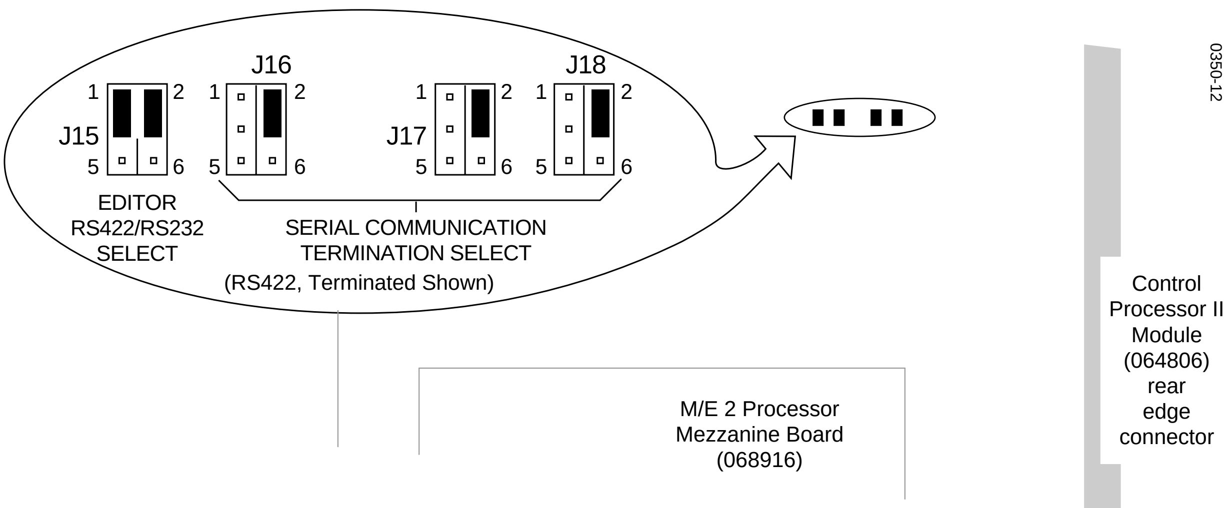


Figure 2-43. EDITOR Port Jumper Settings on Model 4000

Connecting to A Krystal Digital Effects System

A typical Model 4000 and Krystal Digital Effects System connection is illustrated in Figure 2-44. The Model 4000's Timed Aux Bus video and key outputs are connected to the Krystal's video and key inputs. (There is also an optional mask connection available with a Krystal option.) The Krystal's modified outputs can then be connected to any of the Model 4000 physical inputs (1 to 64).

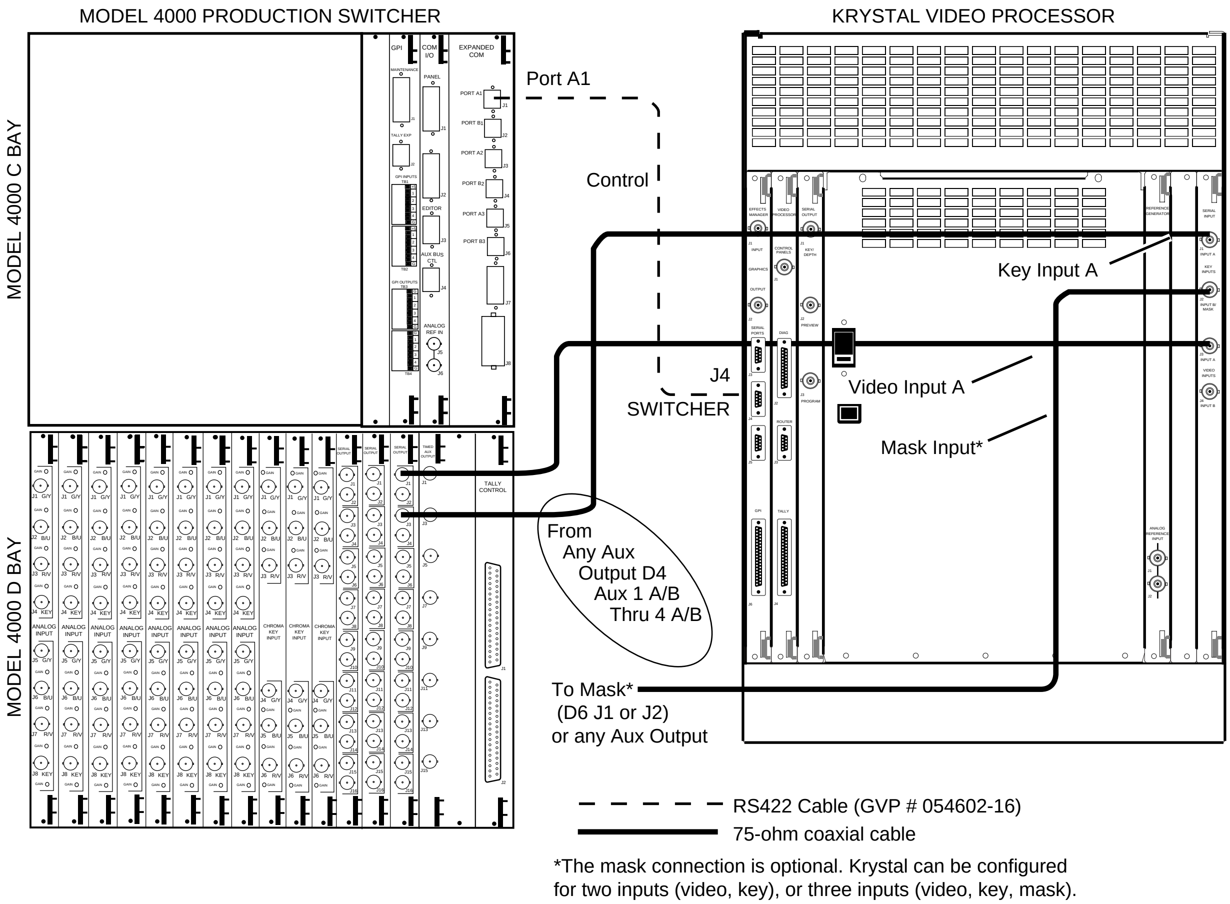


Figure 2-44. Example of the Model 4000 to Krystal Cabling

The Krystal connects to the Model 4000 through an RS-422 control cable (054602-16) available from GVP. The control cable connects from Port A1 of the switcher to connector J4 on the Krystal frame.

Available cable length is 16 meters (054602-16). Alternatively, you may make your own cable, as illustrated in Figure 2-47. Maximum length of the control cable is 300 meters. See Figure 2-47 for the pinout diagram.

The parameters for connecting a Krystal to a Model 4000, must be defined in the main menu panel. Refer to the Model 4000 User's Guide (TP0790) and Operation Reference (TP0764) Manuals for detailed information.

Connecting to Kaleidoscope

The Kaleidoscope Controller connects to the Model 4000 through an adapter cable (151022-00) and the Model 4000 RS-422 control cable (054602-16). See Figure 2-45.

The Model 4000's Aux Bus video and key outputs (numbered 1 thru 5) are connected to the Kaleidoscope Channel video and key inputs. Note that the Model 4000's physical Aux Bus 1 output must be cabled to Kaleidoscope's physical Channel A, the Model 4000's physical Aux Bus 2 to Kaleidoscope's physical Channel B, and so on up to the desired number of channels.

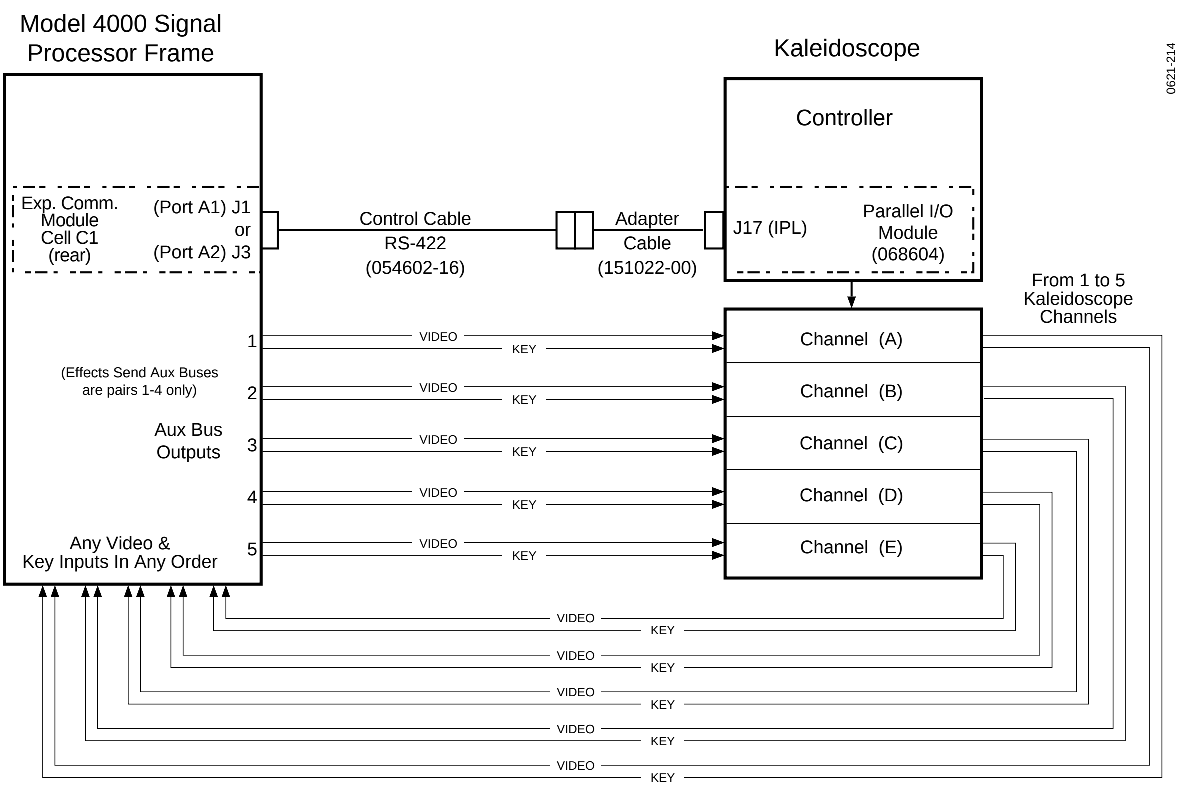


Figure 2-45. Model 4000 to Kaleidoscope Cabling

The Kaleidoscope Channel outputs can be connected to any of the Model 4000 physical inputs (1 to 64), in any order. It is important to note which physical inputs are connected from which Kaleidoscope Channel outputs, for both video and key. This information must be entered later into a setup menu in the Model 4000 (DPM Map Inputs Menu under the External Interfaces Menu).

When the Kaleidoscope's outputs are sent to an Output Router, the Primary Video and Key, and Secondary Video and Key outputs may be connected to any four analog inputs on the Model 4000. The Model 4000's inputs are assigned via menus to any crosspoints (Map Inputs Menu under the Inputs Menu). This assignment is described later in this section.

NOTE: *Standard length of the RS-422 cable is 16 meters (The cable length is indicated by the dash number on the end of the part number.) The maximum combined length of the adapter and RS-422 cables should not exceed 300 meters.*

The adapter cable connects between J17 at the rear of the Kaleidoscope Controller chassis, and the 9-pin D-type connector on the end of the RS-422 control cable. The control cable connects to J1 (Port A1) or J3 (Port A2) on the Communications Panel at the rear of the Model 4000 Signal Processor Frame.

NOTE: *This interface requires that the Serial Communications mezzanine board (068918) be installed on the Model 4000 Expanded Communications Carrier Module (064824). The Expanded Communications Carrier Module is located in slot C1 in the Model 4000 Signal Processor Frame.*

Additional Kaleidoscope requirements are as follows: The Parallel I/O module in the Kaleidoscope Controller must be a 068604 module (not a 068537), and the software version installed in Kaleidoscope must be 6.0 or later.

Connecting to a DPM–700

The Model 4000 can initiate E-MEM Effects Memory Learn and Recall operations in a DPM-700 using Peripheral Bus II protocol. In addition, the Model 4000 can trigger specific functions in the DPM.

Communication is controlled from the Model 4000 to the DPM; the DPM will not control or communicate with the Model 4000. (Direct DPM control of the Model 4000 Aux buses is not provided.)

NOTE: *This interface requires that the Serial Communications mezzanine board (068918) be installed on the Model 4000 Expanded Communication Module (068824). The Expanded Communications Module is located in slot C1 in the C Bay of the Model 4000 Signal Processor Frame.*

Control and video / key connections between the Model 4000 and the DPM are illustrated in Figure 2-46. The Model 4000’s Aux Bus video and key outputs are connected to the DPM’s Channel 1 and Channel 2 inputs, as shown (2nd. channel DPM optional). The DPM’s outputs can be connected to any of the Model 4000’s physical inputs. The inputs are then assigned via menus to any crosspoints, as described later in this section (Map Inputs Menu under Inputs Menu).

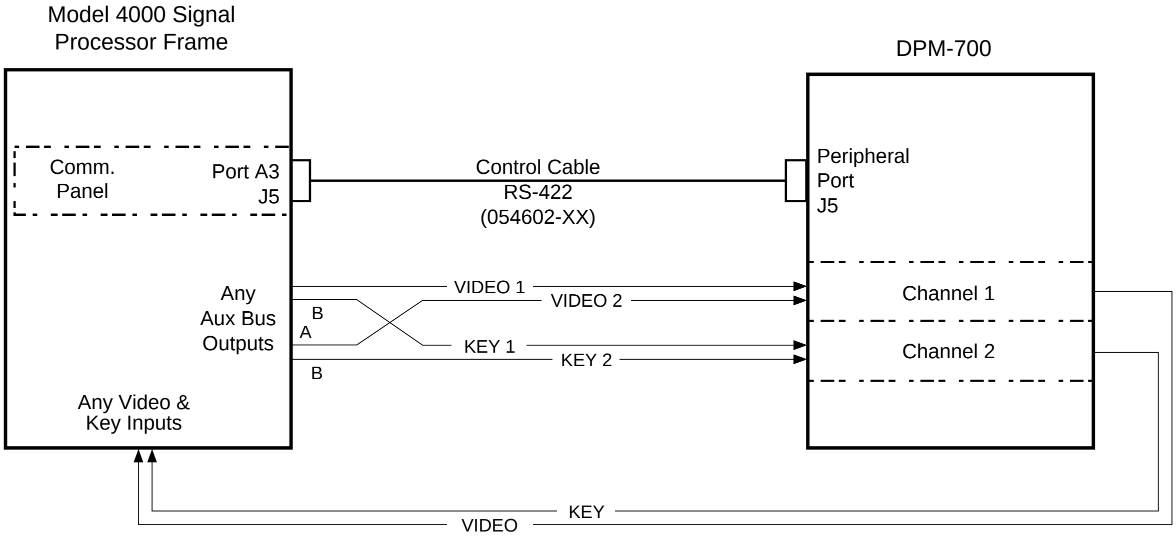


Figure 2-46. Model 4000 to DPM-700 Cabling

The Control cable is connected between the Peripheral Port (J5) at the rear of the DPM frame, and Port A3 (J5) on the Expanded Communications Panel at the rear of the Model 4000 Signal Processor Frame.

The DPM-700 connects to the Model 4000 through an RS-422 control cable available from GVP. Available cable length is 16 meters (054602-16). Alternatively, you may make your own cable, as illustrated in Figure 2-47. Maximum length of the control cable is 300 meters.

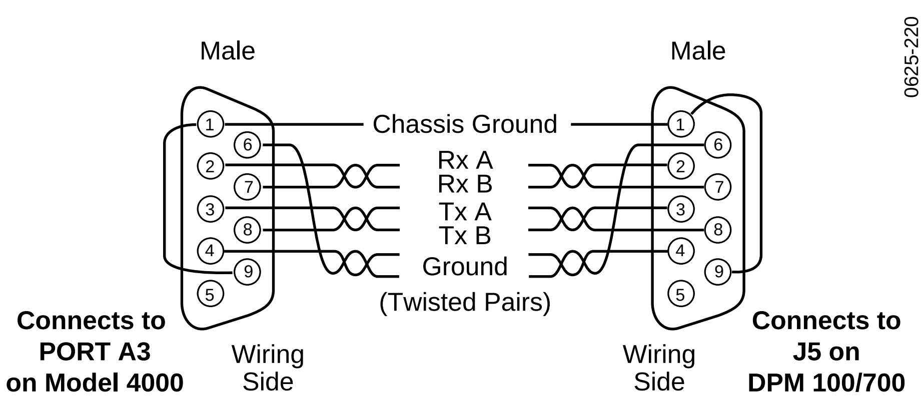


Figure 2-47. RS-422 Cable Design

GPI Connections

The four GPI connectors on the rear panel of the Signal Processor Frame provide eight input and eight output GPI connections. See Figure 2-42. These connections provide a variety of user-assignable GPI applications such as remote control of Auto Transitions, DSK mix, Fade-to-Black Transitions and other selected functions. Refer to “External Interface Setup” later in this section for defining GPI inputs.

GPI Inputs—GPI inputs are opto-isolators. These pairs of input connectors are numbered 1 through 8 with a chassis ground connection on the bottom and +5V connection on the top end of each connector module. To trigger the GPI input, a DC voltage must be applied across the pair of terminals for that input. Voltage must be between 4V and 24V, either polarity. When the device used to trigger this input has a pair of relay contacts available, the following wiring connection is recommended (Input 6 shown in the following example).

Connect the appropriate GPI DC input signals to the GPI INPUTS connectors TB1 and TB2. See Figure 2-48.

GPI Outputs—Each GPI output consists of pairs of connections on the rear of the Frame, which are connected to an isolated pair of relay contacts (SPST; normally open). These pairs of output connectors TB 3 and TB 4 are numbered 1 through 8 with a chassis ground connection on both ends of each connector module. These relay connections are rated at 500mA (peak) for voltages not to exceed 30 volts peak (AC or DC) with respect to chassis ground.

Connect the appropriate GPI output connections to GPI OUTPUTS connectors TB3 and TB4. Record these output connections for use by the operator when attaching the triggers to E-MEM recalls.

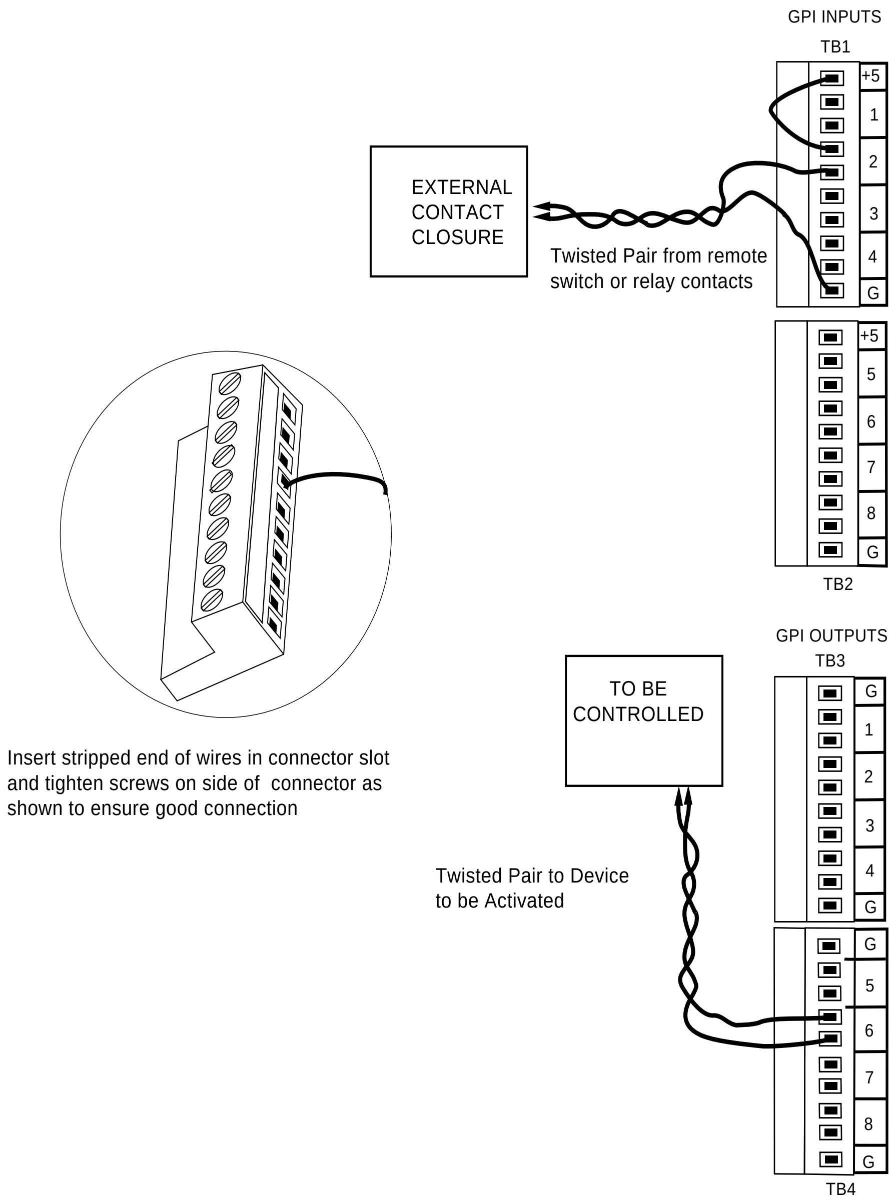


Figure 2-48. GPI Connections

Remote Aux Connections

The Remote Aux Control Panel consists of three parts:

- Remote Aux Panel Assembly
- Power supply with power cord
- Communications bus cable connector

NOTE: *Due to limited access at the rear of the Remote Aux Panel after it is installed in the rack, it is recommended that the communications cable and power supply cord be connected and the DIP switches on the rear of the panel be set before the panel assembly is installed in the rack.*

Cable Installation—A Remote Aux cable connector is provided with each panel. See Figure 2-49 for connector illustration. This connector must be applied to a shielded twisted-pair control cable with a D connector on the opposite end. The D connector of the cable will later be plugged into the rear of the switcher frame.

CAUTION

Do not plug the D connector in at this time. If power is applied to the switcher, the cable line drivers in the switcher may be damaged.

The other end of the cable will be plugged into the Communications Bus connector on the rear of the Remote Aux Panel using the supplied connector. Any additional panel(s) will be connected to the previous panel. Keep in mind that the total length of the cable must not exceed 1000 ft (320 m).

For a Model 4000 Switcher, place the D-connector end of the cable so that it will reach J4 (AUX BUS CTL) on the Communication I/O Module Slot C3.

Lay the cable from the switcher frame to where the first Remote Aux Panel will be. Allow enough cable to reach the control panel connector, and about 3 feet (1 meter) extra, then cut the cable and strip the wires.

Connector Installation—The connector that plugs into the Remote Aux Panel has screw clamps to hold the wires. Paying attention to polarity (see Table 2-12), insert the wires into the appropriate holes and screw down the clamps. If there is another control panel, the cable to the next panel must also be inserted into this connector. The D connector on that cable must be cut off, and the wires for the next panel must be stripped and inserted into the same holes before the screws are tightened. Make sure the polarity is correct.

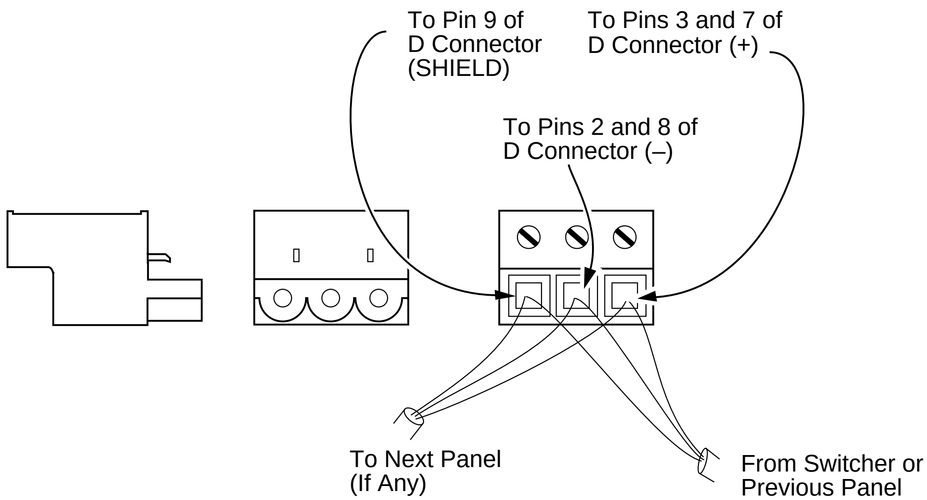


Figure 2-49. Remote Aux Panels Connection

If you are building your own cable, use a shielded twisted pair such as Belden 8451 and refer to Table 2-12.

Table 2-12. Cable Polarity

Panel Connector	D-Connector	Factory Supplied Cable
+ (Plus)	3 and 7	Red
–(Minus)	2 and 8	Black
Shield	9	Shield

Joystick Override Cable Installation—A user fabricated cable, external switches, and a 9-pin subminiature D connector with 4-40 jackscrews are required to implement the joystick override. The cable needs to be shielded, with the shield connected to the metal connector shell (see Figure 2-50).

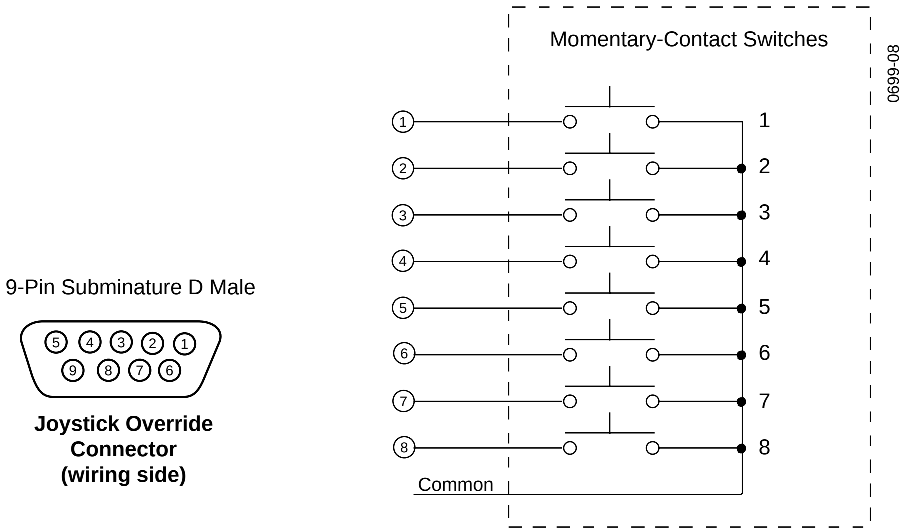


Figure 2-50. Joystick Override Connector Cable Wiring Diagram

Power Supply Installation—The Remote Aux Panel Power Supply (Figure 2-51) should be securely fastened either on a horizontal surface where it will not be disturbed, or attached to a support inside the equipment rack. Verify that the power supply cord will reach the Remote Aux Control Panel and the AC source. The power supply requires 100–120 VAC or 200–240 VAC and automatically switches to select one of these two line voltages.

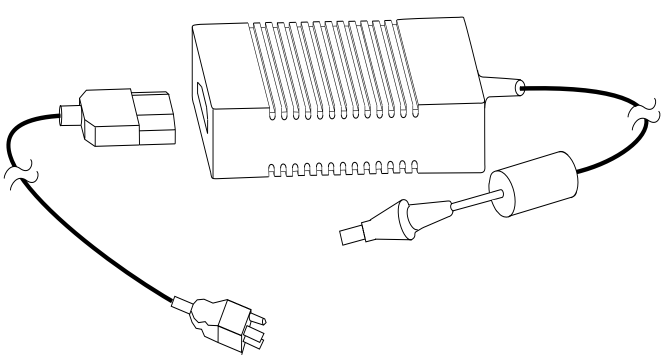


Figure 2-51. Remote Aux Panel Power Supply

Remote Aux Panel Installation

1. Turn OFF the power to the Model 4000.

2. Attach the Communications Bus Cable(s) and the Power Supply cable to the connectors on the rear of the Remote Aux Panel.

3. Using standard rack-mounting screws and washers (not supplied), install the Remote Aux Panel in the equipment rack.

4. Plug the Remote Aux Panel power supply into the AC power source (100–120 VAC or 200–240 VAC).

5. After all panels have been connected, plug the D connector on the Communications Cable into connector J4 on the Communications I/O module at the rear of the Model 4000 switcher.

6. Turn the Model 4000 Switcher's power on.

Tally Control Module Connections

The pinouts for each Tally connector are shown in Figure 2-52 (shown side-by-side for clarity). You will need to supply two 37-pin D type connectors. Each tally relay is rated at 1 A, 30V. Each connector is fused separately with a 5A fuse.

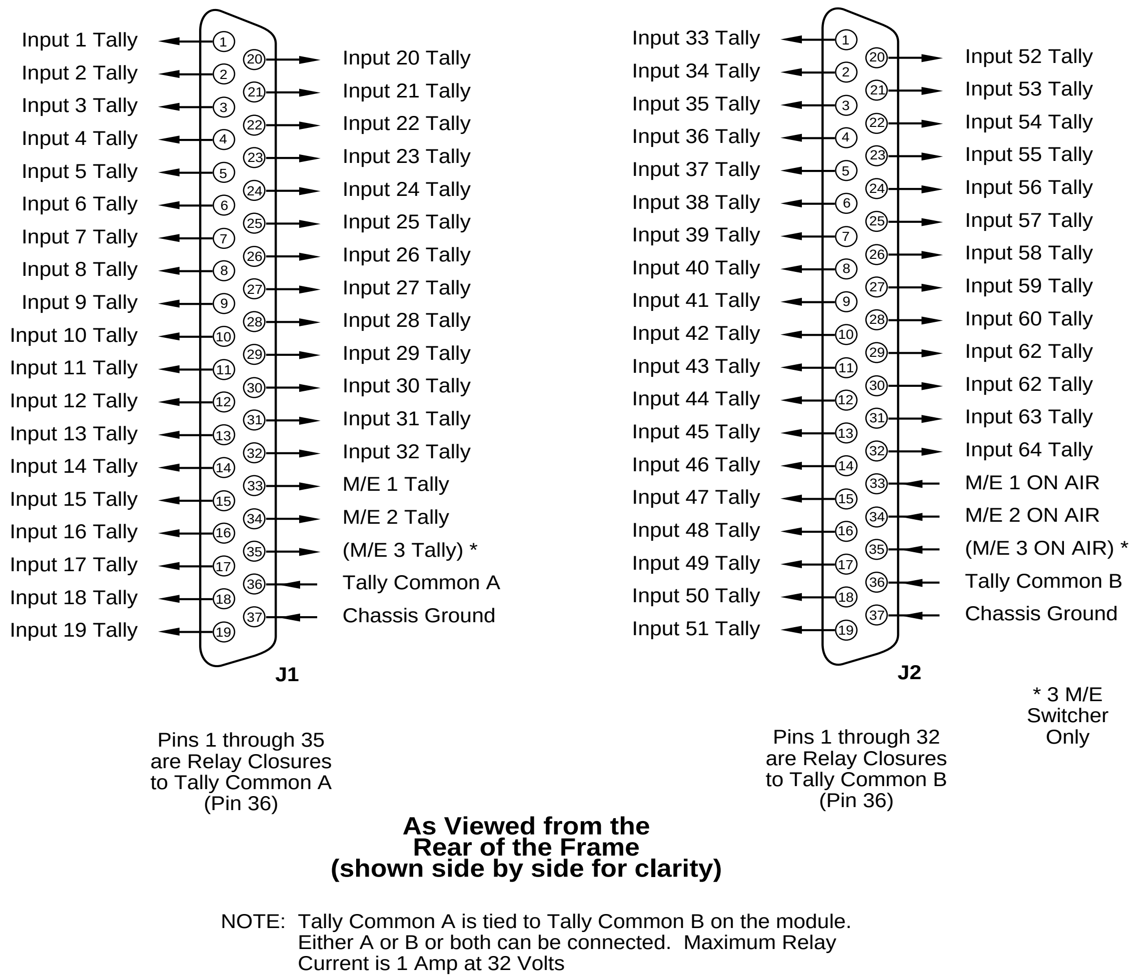


Figure 2-52. Tally Module Connector Pinouts

Maintenance Terminal Connections

The Maintenance port allows a text-only monitor to be connected to the Model 4000. The monitor is normally used for maintenance purposes only.

1. Connect a cable from the input port of a RS-232 terminal to J1 (MAINTENANCE port) on the GPI Module in Slot C4. See Figure 2-42.

The Data cable must be wired in a standard RS-232 configuration with pin assignments as follows:

- **Pin 1** — Protective Ground
- **Pin 2** — TxD (From the Terminal)
- **Pin 3** — RxD (To the Terminal)
- **Pin 7** — Signal Ground

2. Ensure that the baud rate of the terminal matches the parameters of the Model 4000 given below.
   - 9600 baud
   - 8 data bits
   - 1 stop bit
   - No parity

See the monitor's manual for its settings.

Power Connections to Control Panel and Frame

Control Panel Power Supply Connections

1. Open the Control Panel lid and check to see that the power switch (located on the left side of the tub) is in the OFF position.

2. Connect the power cable from the back of the Control Panel to source power. Do *NOT* turn Control Panel power on at this time.

3. Verify you have received the correct power cable. For use in Europe, the power cables must be TUV approved. The Control Panel power cable should be a molded grounding connector (IEC 320-C13) on one end with pigtails on the other.

4. For use in the United States, Canada, South America and Southeast Asia, a standard 110VAC power cable is supplied for the Control Panel. It has a molded grounding plug (NEMA 5-15P) at one end and a molded grounding connector (IEC 320-C13) at the other end.

Frame Power Supply Connections

1. Ensure that the power switch located on the front of the Frame power supply is in the OFF position.

2. Connect the power cable from the rear of the Frame Power Supply to an appropriate source of 220VAC power. Refer to Table 2-2 for power requirements.

3. Make sure you have the correct power cable. For use in Europe you should have received a power cable with pigtails on the free end. For use in the U.S., Canada, South America and Southeast Asia the power cable should have a 20 Amp Twist-Lock 240 VAC NEMA Type l6-20P plug attached as illustrated in Figure 2-53.

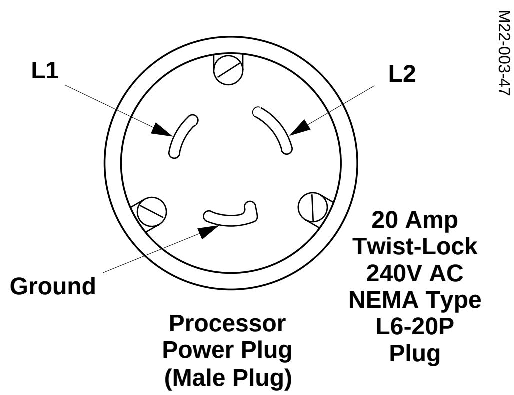


Figure 2-53. AC Power Connector

4. If a redundant Frame Power Supply is installed, connect it to a *separate* power source (branch circuit).

System Startup

This section describes how to turn on and perform the initial startup of the Model 4000 Switcher. It is designed to assist you in verifying proper operation of the system, as well as allowing you to reconfigure the preset (default) definitions of video sources and other system parameters.

System setup is divided into the following areas:

- Preliminary Steps— Describes the basic requirements for bringing the system to the power-on stage. Initial checks, test / monitoring equipment needs, and verification of proper operation are included.
- Power Up—Describes powering up the frame and control panel and any necessary adjustments to be made at initial installation.
- System Configuration—This section summarizes what system parameters must be set up using the main soft panel menus to configure the switcher.
- System Timing—Controls on the Sync Generator allow you to move the timing of the whole switcher—and the input timing window—relative to the analog reference.

Preliminary Steps

Before bringing the system on-line, there are several preliminary checks and preparations to be made.

WARNING

You should observe normal precautions when working around high current, low voltage power supplies. Always remove rings, wrist watches, etc. before working inside any of the systems components.

1. 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.

2. Check that all modules are seated firmly in the frame.

3. Verify that the Control Panel and Signal Processor Frame AC power cables are properly connected.

Power Up

Raise the Control Panel and set the power supply switch to ON. Verify the green RUN LED on the CPU Board (located in the middle of the tub) is lit. Set the power switches on the Signal Processor Frame Power Supply to the ON position. Verify that the power supply voltage LEDs on the front of the Frame Power Supply are lighted and the fan is on. If any of these conditions are not present, turn the system off and refer to Section 5, Diagnostics and Troubleshooting.

NOTE: *Refer to the illustrations at the beginning of this section (Installation) for the component locations described here.*

A successful power-on is indicated by:

- All green LEDs on the Frame power supply are on.
- The green **RUN LED** on the Control Panel CPU Board is on.
- The Control Panel Menu Display is on and displaying the Model 4000 sign-on message.

Check the following indications inside the front door of the A and B Frames:

- The +**5V RUN** lights at the top of each module in the A & B Bays of the Signal Processor Frame are lit.
- The rear module power indicators on the Sync Generator Module in Slot A9 are lit for each module present in the rear C and D Frames.

Set the **FIELD RATE** and **LOCK FREQ** switches on the Sync Generator Module (064801) in Slot A9 to the correct settings for your facility:

- **S1 - FIELD RATE** to either 60 or 50 Hz
- **S2 - LOCK FREQ** to 13.5 Mhz

CAUTION

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

NOTE: *Maintenance Personnel should be familiar with the Control panel and its usage. For information and reference, see the Model 4000 operation Reference Manual (TP0764).*

When the system is turned on, the switcher will initialize into a defined default state. This default state may be either a user-defined default or a GVP factory default of switcher enabled levels, as selected in the Define Defaults Menu (see the User’s Guide [TP0790]).

Primary and Redundant Power Supply Voltage Adjustments

If you ordered a redundant Frame Power Supply *with* the Model 4000, it was tested and adjusted with the system before leaving the factory. In this case, it is *not* necessary to perform the following procedure.

If a redundant Frame Power Supply is ordered *after* the Model 4000, the following procedure should be performed to ensure that the Primary and Redundant supplies are working properly together.

WARNING

Dangerous voltages are present inside the Signal Processor Frame Power Supply. Do not perform any servicing of this equipment unless you are qualified to do so. Remove all rings, wrist watches, etc., before working inside the equipment.

---

1. Remove the rear access panels of both power supplies if they have not already been removed.

2. With the Redundant Power Supply power off, turn on the Power switch on the front of the Primary Power supply.

3. Measure the supply output voltages (-5.2, +13, -13, and +48 Vdc) at the test points inside the left rear compartment of the power supply (referenced to the GND test point) and the +5Vdc supply between the power lugs in the right rear compartment (see Figure 2-54 for Pioneer supplies or Figure 2-55 for Todd supplies). Record your measurements on paper.

4. Turn the primary power supply off, then turn the redundant supply on and measure its voltages. Compare the values measured to those recorded earlier.

5. With an insulated screwdriver-type adjustment tool, adjust the redundant supply voltages to within 20mV of the recorded values. Adjustment locations for Pioneer power supplies are shown in Figure 2-54. Adjustment locations for Todd power supplies are shown in Figure 2-55.

6. Turn off both power supplies and install the access panels on the rear of the supplies.

7. Turn on both supplies for redundant operation.

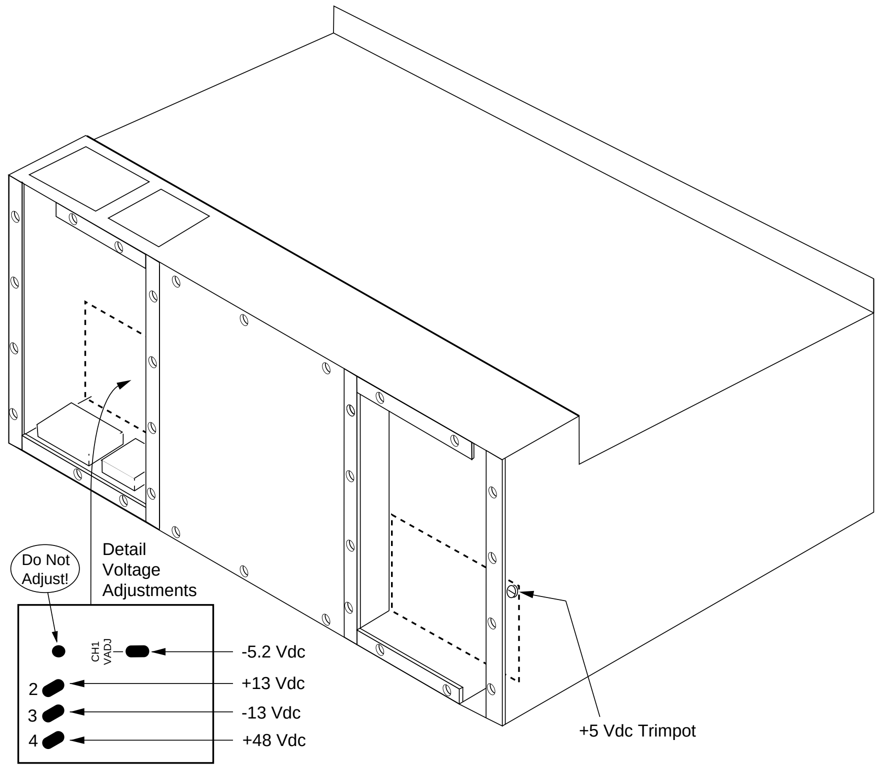


Figure 2-54. Voltage Adjustments for Pioneer Power Supply Units

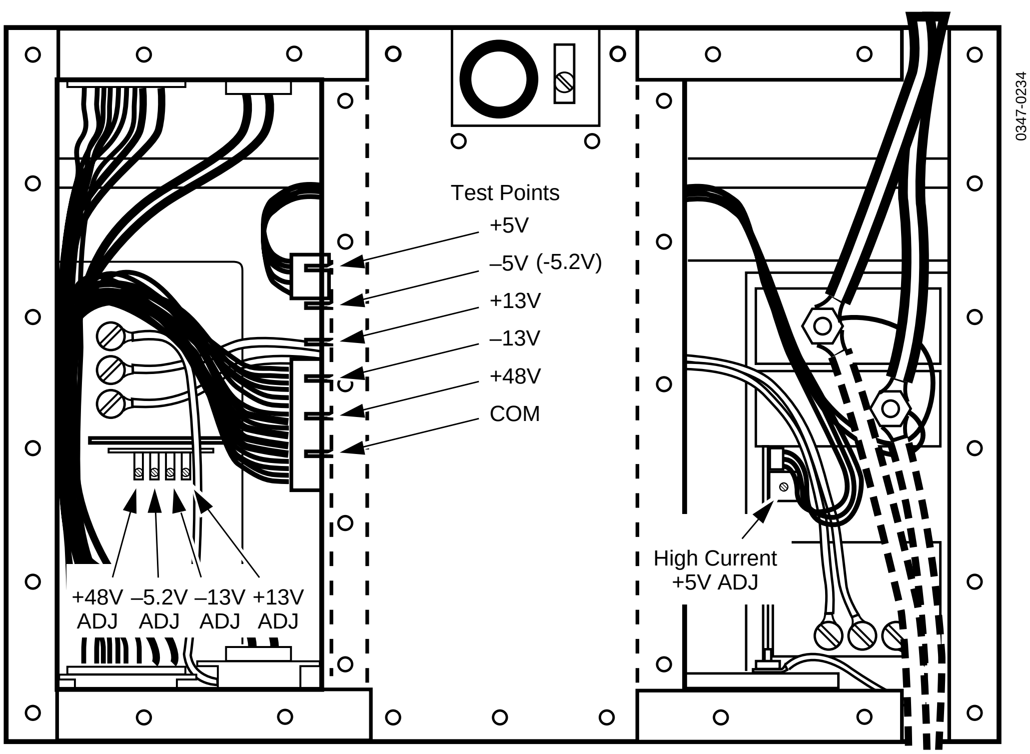


Figure 2-55. Voltage Adjustments for Todd Power Supply Units

System Configuration

Follow the Software Setup procedures described in the Startup section of your User's Guide (TP0790) to configure the 4000 system to your installation. In addition to assigning sources, the process includes setting configuring inputs, output levels, external interfaces, and system parameters. These menu items are accessed through the Configuration menu on the Control Panel Main Menu Subpanel.

System Timing

The Model 4000 switcher has timing compensation to allow the autotiming range, or "window", of the switcher digital inputs to be positioned in relation to an analog reference signal. This reference is a "house" analog timing signal such as color black (refer to The Analog Reference Connection heading on page 2-67). Analog inputs should be timed to the reference signal using external timing equipment.

Autotiming

The Model 4000 Series uses autotiming, a system of synchronization which automatically times all digital inputs. The signal processing in the system is a stream of digital data which includes horizontal and vertical blanking intervals to properly synchronize and format the picture when viewed, transmitted, or recorded. Within the blanking intervals are data words that identify the start of active video (SAV) and the end of active video (EAV). The Model 4000 circuitry uses these data words as feedback to automatically time all digital inputs together.

Detailed timing diagrams have been included to help you see the possible positions of the timing windows in relation to the analog reference. As shown in the timing diagrams, the range for error correction is approximately 44 µS for the Model 4000-2 and 26 µS for the
Model 4000-3. Refer to the following figures during this procedure:

- Figure 2-56 illustrates the timing for the Model 4000-2A / B switcher
- Figure 2-57 illustrates the timing for the Model 4000-3 switcher

The timing window is positioned by setting of controls on the Sync Pulse Generator. You are given control over the offset between the incoming reference and the position of the autotiming window by adjustment of three rotary switches on the front of the 064801 Sync Generator Module located in Slot A9 in the top of the front A Bay of the switcher frame.

The range of each control on the Sync Generator is as follows for a total range of 75.8 µS:

- COARSE: 4.74 µS (64 pixels) per step
- MEDIUM: 296 nS (4 pixels) per step
- FINE: 18.5 nS per step (1/4 pixel) per step

The rotary switches should be set to 6ED to place the autotiming window approximately centered around the incoming house reference signal.

Most installations do not require any adjustment of these rotary switches because most digital source equipment provides timed outputs that fall within the autotiming window. If a particular source falls outside the window, it is preferable to make adjustments at the source or through a delaying digital distribution amplifier. However, if adjustment at the source is not possible, then the autotiming window can be shifted until it encompasses the optimum number of available digital inputs.

The autotiming windows shown on the timing diagrams represent the worst case of the paths through the switcher. The actual autotiming window of most paths is larger than shown. If an input is suspected of marginal timing, it should be checked through one of the worst case paths. The worst case paths are outlined below:

- a primary source on the switched preview bus
- a primary source on the mask bus

Symptoms of an input signal falling outside of the autotiming window are horizontal displacement and/or odd colors, or a jittery picture that will not lock horizontally. If you suspect an input is mistimed, and if you are certain that you have configured the inputs correctly through the main menu panel, you can determine roughly where its timing lies by viewing the signal at the switcher output and temporarily changing the position of the COARSE switch until the picture improves. This tells you which way to adjust the source equipment's timing: Higher numbers on the rotary switch imply the source is arriving late, and lower imply early.

Procedure for Checking Input Timing

For this procedure, you will need a Serial Digital to Analog Converter (DAC) with known fixed delay and an oscilloscope triggered on the switcher analog reference. The output of the converter should have sync on the green (or Y) output. Make a note of the settings of the rotary switches on your switcher.

NOTE: *When measuring the timing, don't forget to subtract the delay of the DAC used in this test as some DACs have significant delay. Refer to the specifications for the DAC you are using. (The GVP SMS8103 has a 6 µS minimum delay, for example.)*

---

1. Connect the switcher analog reference to one channel of the oscilloscope and the green or Y output of the DAC to the other channel.

2. Connect the serial digital input under test to the input of the DAC.

3. On the oscilloscope, verify that the serial digital input timing is within the autotiming window corresponding to the Sync Generator rotary switch settings. Use the timing diagrams (see Figure 2-56 or Figure 2-57), to determine the center of the autotiming window relative to the switcher analog reference.

   For example, a Model 4000-3 switcher with a Sync Generator setting of 800 must have inputs arrive within -8 µS to +18 µS of the switcher reference. Setting the rotary switches to 6ED centers the autotiming window around the reference (0 offset).

4. Do this for each serial digital input to determine if you need to adjust the rotary switches.

NOTE: *If the switcher has analog video inputs in addition to serial digital inputs, changing the setting of the Sync generator rotary switches will affect the timing of the analog inputs.*

Analog Input Timing

Analog Primary Sources—Optional analog and chroma key external inputs are not autotimed. Therefore it is necessary to time them to the switcher analog reference.

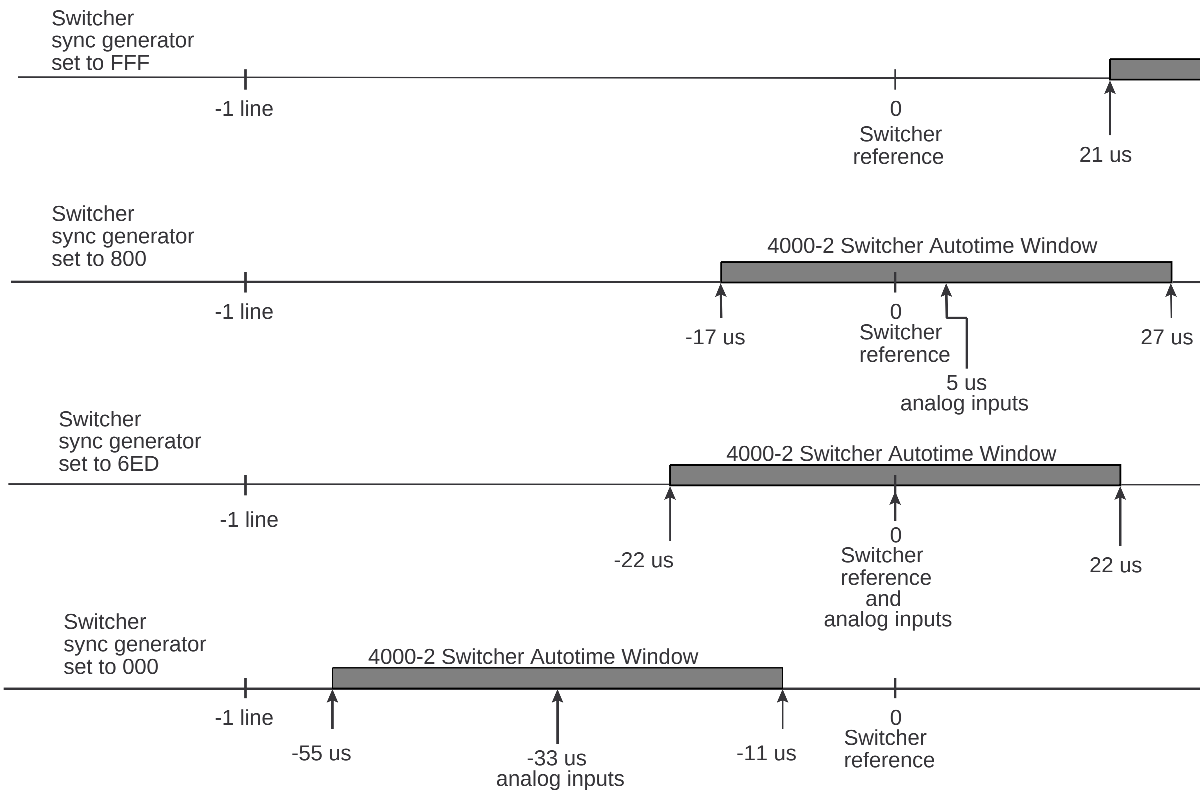
The timing diagrams show that the required arrival time of these inputs is dependent upon the setting of the Sync Generator rotary switches. For a setting of 6ED, the analog input s must arrive in time (0 offset) with the switcher reference. For a setting of 800, the inputs must arrive 5 µS after the reference. Analog inputs can be timed using the oscilloscope method of comparison with the switcher reference.

Chroma Key Input Sources—Analog chroma key inputs are not visible on the output of the switcher as primary sources, therefore, initial timing should be checked using an oscilloscope. For proper chroma keys to be achieved, the external chroma key inputs must arrive at the switcher in time with the analog reference. The chroma key input is clamped using a local clamp pulse generated on the Sync Generator which is derived from the switcher analog reference, not the external input. Incorrect clamping time results in poor or unusable chroma keys.

Final timing compensation can be performed with a fine adjustment setting in the main menu system under Config / Inputs / Chr key inputs. Although this timing adjustment in the menu has a large timing range (more than 20 µS) it is intended for artistic use and will not correctly compensate for a mistimed input.

In this Chroma Key menu, the value of the timing number should be in the vicinity of +80. If it is more tan a few clocks from that, recheck the input timing of the source.

With the Sync Generator switches set to 800, the external chroma key inputs should arrive at +5 µS relative to the switcher reference. For a setting of 6ED on the Sync Generator, the external chroma key inputs should arrive in time (0 offset) with the swticher reference.



Notes: 1 -The absolute dimensions of the digital input autotiming window is dependent upon the output and the path selected through the switcher.

The autotiming windows shown represent the composite worst case of all outputs and paths. Various outputs and paths may have larger autotiming windows than shown.

2 - Switcher digital output timings represent all outputs including *timed* aux bus outputs 5A - 8B.

The only exceptions are untimed aux bus outputs 5A - 9B. These outputs occur less than 1 µS after the video enters the primary input.

3 - There are two types of optional analog inputs. Up to 16 analog primary inputs are applied to the main switch matrix and can be used on any bus similar to the serial digital inputs. Up to 6 optional external analog chroma key inputs are applied to the chroma keyers for external chroma keys. Neither of these inputs are auto timed. Both types must be timed externally to arrive at the switcher at the time labeled "analog inputs" on the above timelines. The analog inputs must be in time with the switcher reference when the sync generator is set to 6ED.

There is an external chroma key timing adjustment in the menu system. This is intended for artistic use or to compensate for minor external timing errors. This control can position the chroma key hole cutter approximately +- 20 us. However, the external analog chroma key inputs must arrive within -0.5 us to +2.0 us of the time labeled "analog inputs" for correct operation of the analog input clamps.

4 - All numbers are valid for both 525 and 625 standards. The line number marks on the horizontal scale represent 525 system lines (63.5 us).

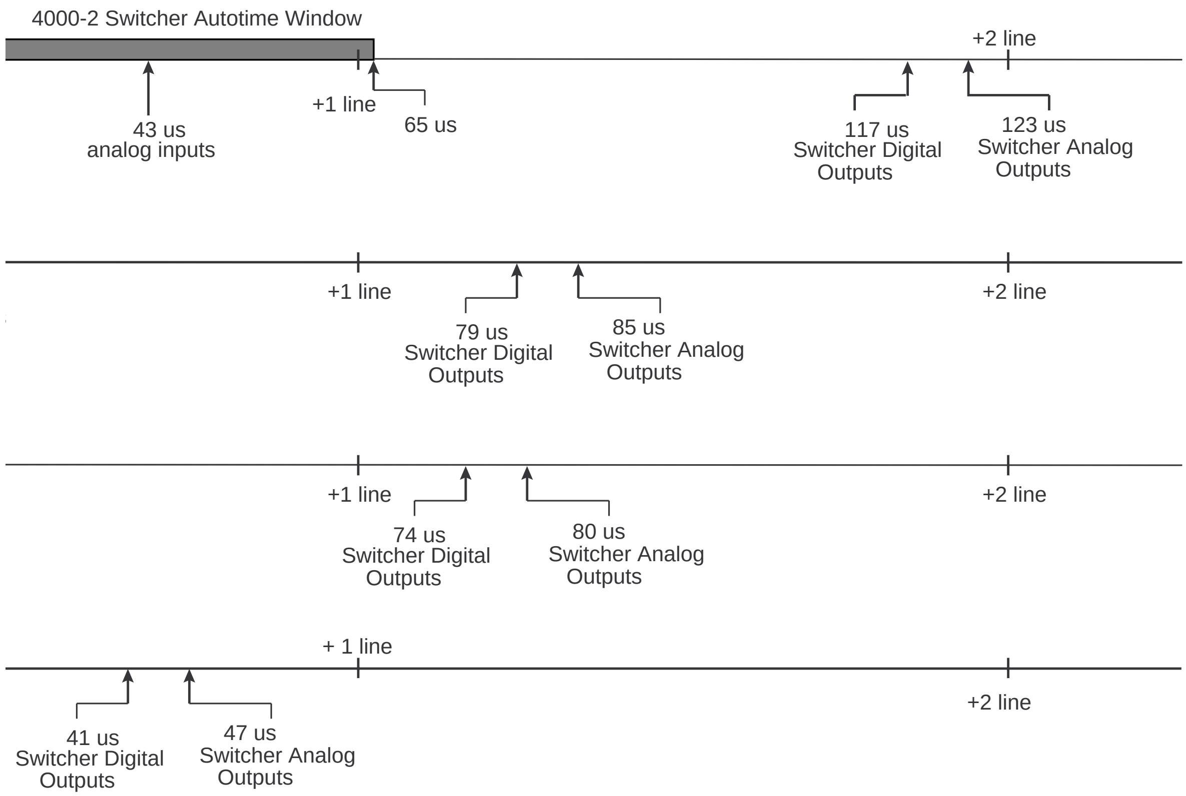
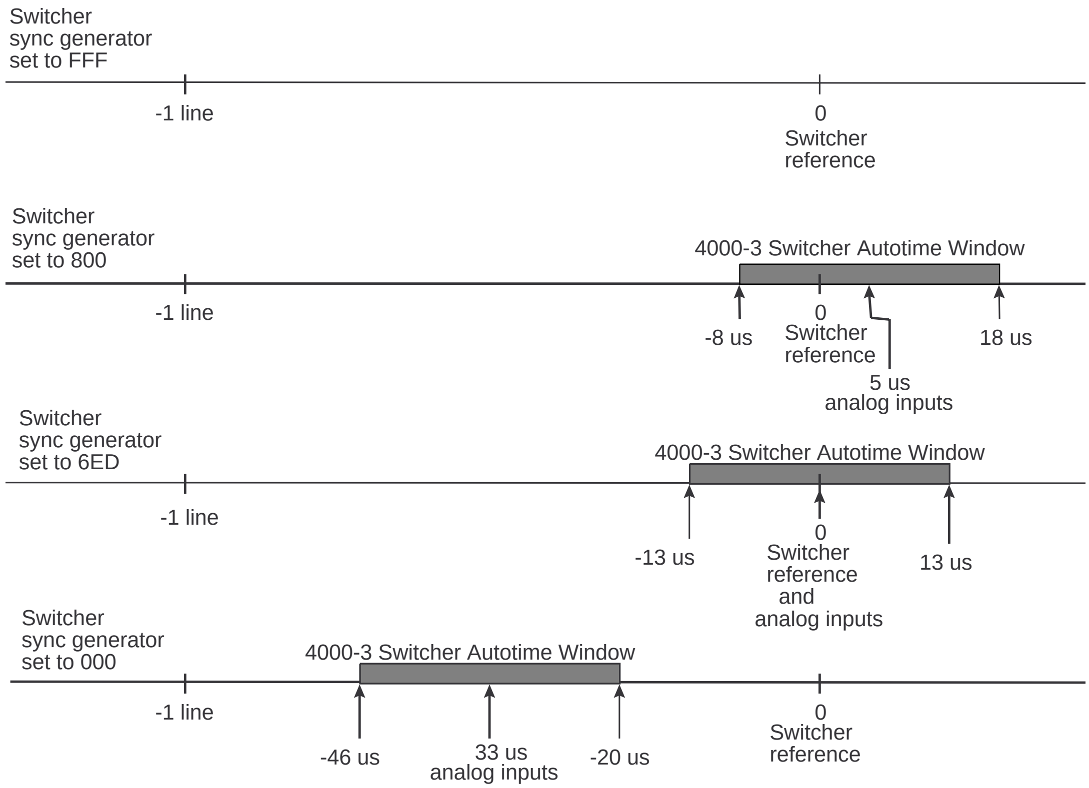


Figure 2-56. Model 4000-2A/B Timing Diagram



Notes: 1 -The absolute dimensions of the digital input autotiming window is dependent upon the output and the path selected through the switcher.

The autotiming windows shown represent the composite worst case of all outputs and paths. Various outputs and paths may have larger autotiming windows than shown.

2 - Switcher digital output timings represent all outputs including *timed* aux bus outputs 5A - 8B.

The only exceptions are: Untimed aux bus outputs 5A - 9B These output less than 1 us. after the video enters the primary input.

Framestore video & key - these output 10 us before program output.

3 - There are two types of optional analog inputs. Up to 16 analog primary inputs are applied to the main switch matrix and can be used on any bus similar to the serial digital inputs. Up to 6 external analog chroma key inputs are applied to the chroma keyers for external chroma keys. Neither of these inputs are auto timed. Both types must be timed externally to arrive at the switcher at the time labeled "analog inputs" on the above timelines. The analog inputs must be in time with the switcher reference when the sync generator is set to 6ED.

There is an external chroma key timing adjustment in the menu system. This is intended for artistic use or to compensate for *minor* external timing errors. This control can position the chroma key hole cutter approximately +- 20 us. However, the external analog chroma key inputs must arrive within -0.5 us to +2.0 us of the time labeled "analog inputs" for correct operation of the analog input clamps.

4 - All numbers are valid for both 525 and 625 standards. The line number marks on the horizontal scale represent 525 system lines (63.5 us).

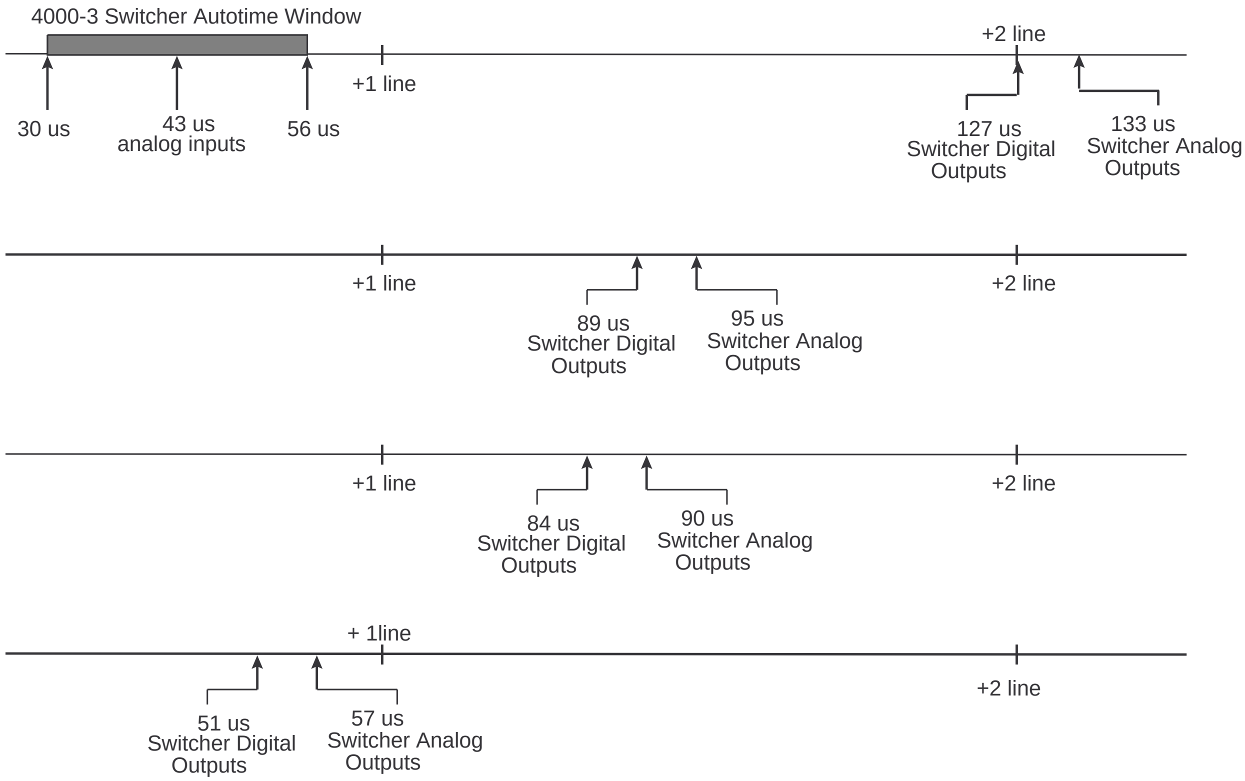


Figure 2-57. Model 4000-3 Timing Diagram

3 *Functional Description*

Introduction

This section introduces the various hardware modules and their functions and interactions within the Model 4000 system. This section and Section 5 (Diagnostics and Troubleshooting) can be used to isolate module problems in the switcher. To do this there is a description of each module in the system with all of the associated inputs, outputs and control signals.

The Model 4000 Switcher consists of three main areas:

- Signal Processor Frame
- Control Panel
- Frame Power Supply Chassis

See Figure 3-1 on page 3-5 or Figure 3-2 on page 3-7 while reading the overview (depending on what version Signal Processor Matrix you have.

System Overview

The Standard Model 4000 system consists of a Signal Processor Frame, a Frame Power Supply, a Control Panel and interconnecting cables.

Signal Processor Frame

The Signal Processor frame houses the video and control circuitry for the Model 4000. Frame modules mount in four upper and lower “bays” in the front and back of the frame.

NOTE: *There are two versions of Model 4000 Signal Processor Frames covered in this manual; frames shipped before January, 1996 for all model switchers (Matrix 094800-00) and those modified for the Model 4000-3 (Matrix 094803-00). The matrix number is labeled on the top left rear of each frame. Any differences between the frames will be explained in the text for clarity.*

Power Distribution

The Model 4000 Signal Processor Frame has a separate power supply (2 supplies if the optional Redundant Power Supply is installed) which mounts directly below the Signal Processor frame. Installation and setup of the power supplies is described in detail in Section 2 - Installation. Replacement and maintenance of the power supplies is described in Section 4 - Maintenance.

- Input Voltage - 240 volts nominal 50 to 60 Hz
  (Note: Model 4000-2 switchers with Power Supply assembly 098901-03 with Todd power supplies may operate at 110 to 240VAC)
- Operating Voltages - +5.0V, -5.2V, +13.0V, -13.0, and +48V

Control Panel

The control panels for the Model 4000 systems contain circuit boards for controlling the panel functions.

- Input Voltages: 120 to 240 volts nominal (auto-ranging)
- Operating voltages: +5V and +14V

Signal Paths

The video takes one of the following paths (See Figure 3-1):

The normal path is:

- Input Module
- Crosspoint Module
- Keyer Module
- Mixer Interface Module
- Mix / Wipe Module
- Output Module

For reentry signals, the path is the same as the normal path except that instead of going to the output module, the signal is routed to a reentry module then back into the crosspoint module.

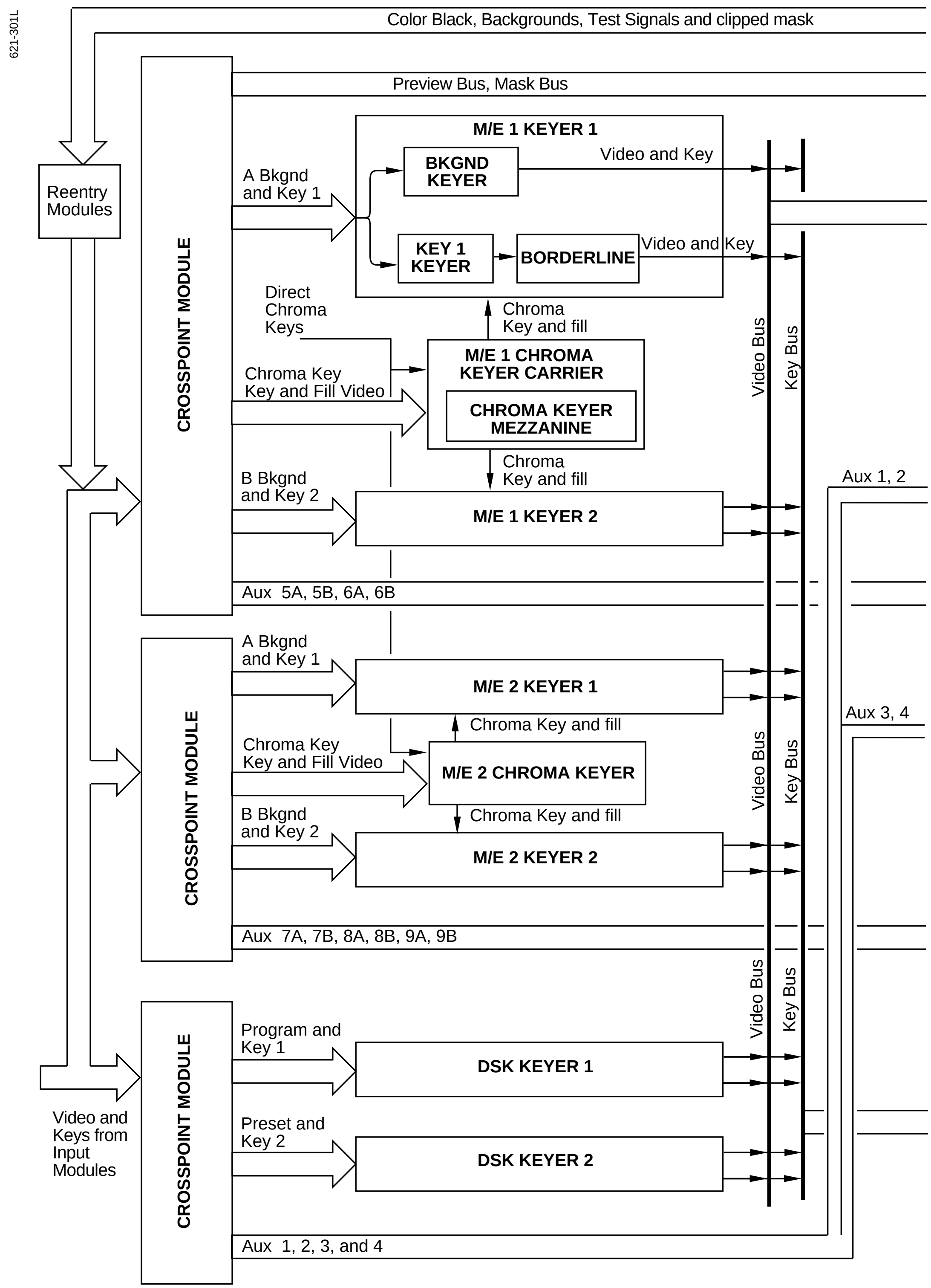
For effects send, the signals use the following path:

- Input Module
- Crosspoint Module
- Keyer Module
- Mixer Interface Module
- Effects Send Module
- Output Module

This will send the video and key out on an aux bus to a DVE.

The return signal path for the modified video and key is:

- Input module
- Crosspoint Module
- Effects Send Module
- Mixer Interface Module
- Mix / Wipe Module


621-301L
Color Black, Backgrounds, Test Signals and clipped mask
Preview Bus, Mask Bus
Reentry Modules
CROSSPOINT MODULE
A Bkgnd and Key 1
M/E 1 KEYER 1
BKGND KEYER
Video and Key
KEY 1 KEYER
BORDERLINE
Video and Key
Direct Chroma Keys
Chroma Key and fill
M/E 1 CHROMA KEYER CARRIER
Chroma Key Key and Fill Video
CHROMA KEYER MEZZANINE
Chroma Key and fill
Video Bus
Key Bus
Aux 1, 2
B Bkgnd and Key 2
M/E 1 KEYER 2
Aux 5A, 5B, 6A, 6B
A Bkgnd and Key 1
M/E 2 KEYER 1
Aux 3, 4
Chroma Key and fill
Chroma Key Key and Fill Video
M/E 2 CHROMA KEYER
Chroma Key and fill
B Bkgnd and Key 2
M/E 2 KEYER 2
CROSSPOINT MODULE
Aux 7A, 7B, 8A, 8B, 9A, 9B
Video Bus
Key Bus
Program and Key 1
DSK KEYER 1
Video and Keys from Input Modules
CROSSPOINT MODULE
Preset and Key 2
DSK KEYER 2
Aux 1, 2, 3, and 4

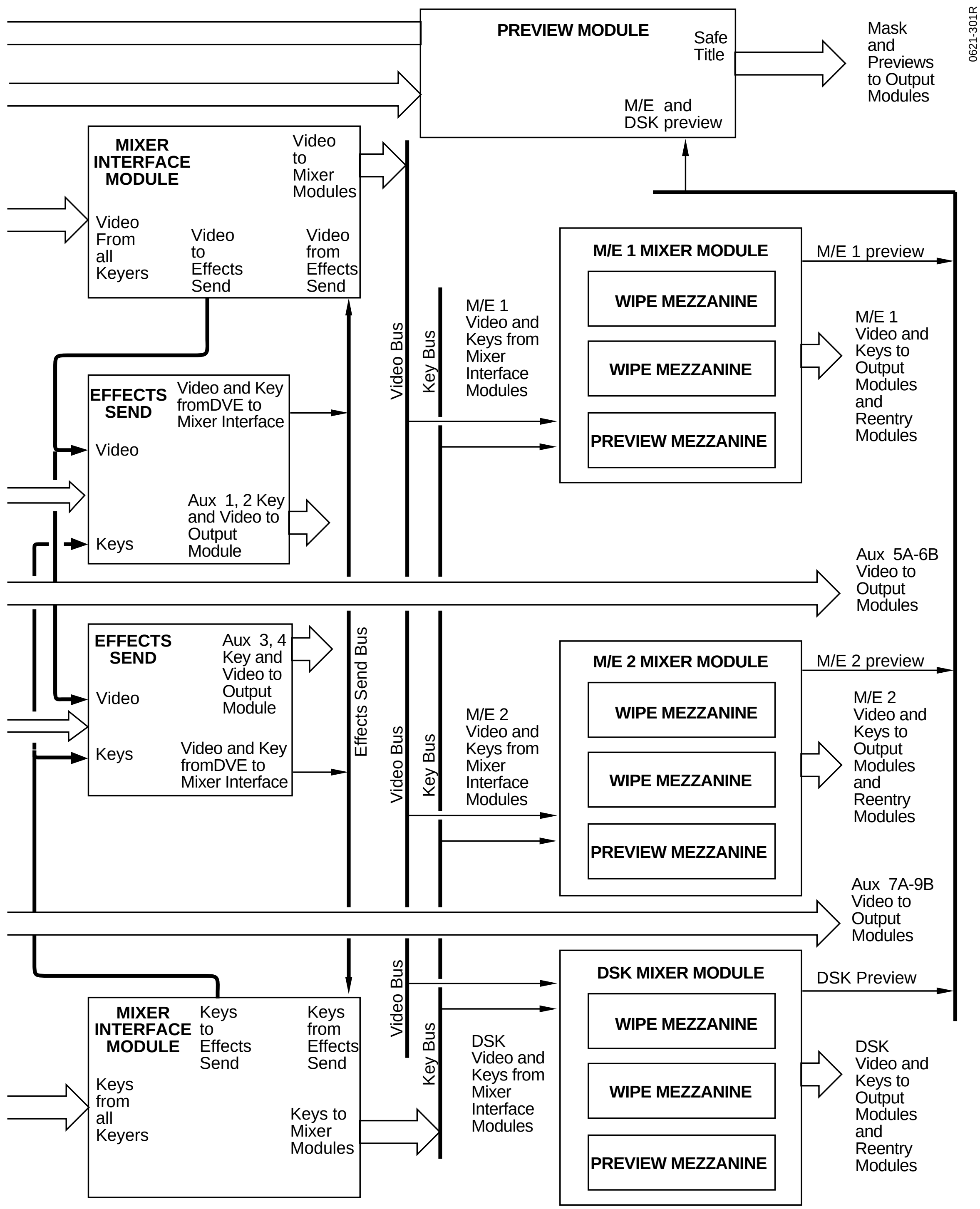
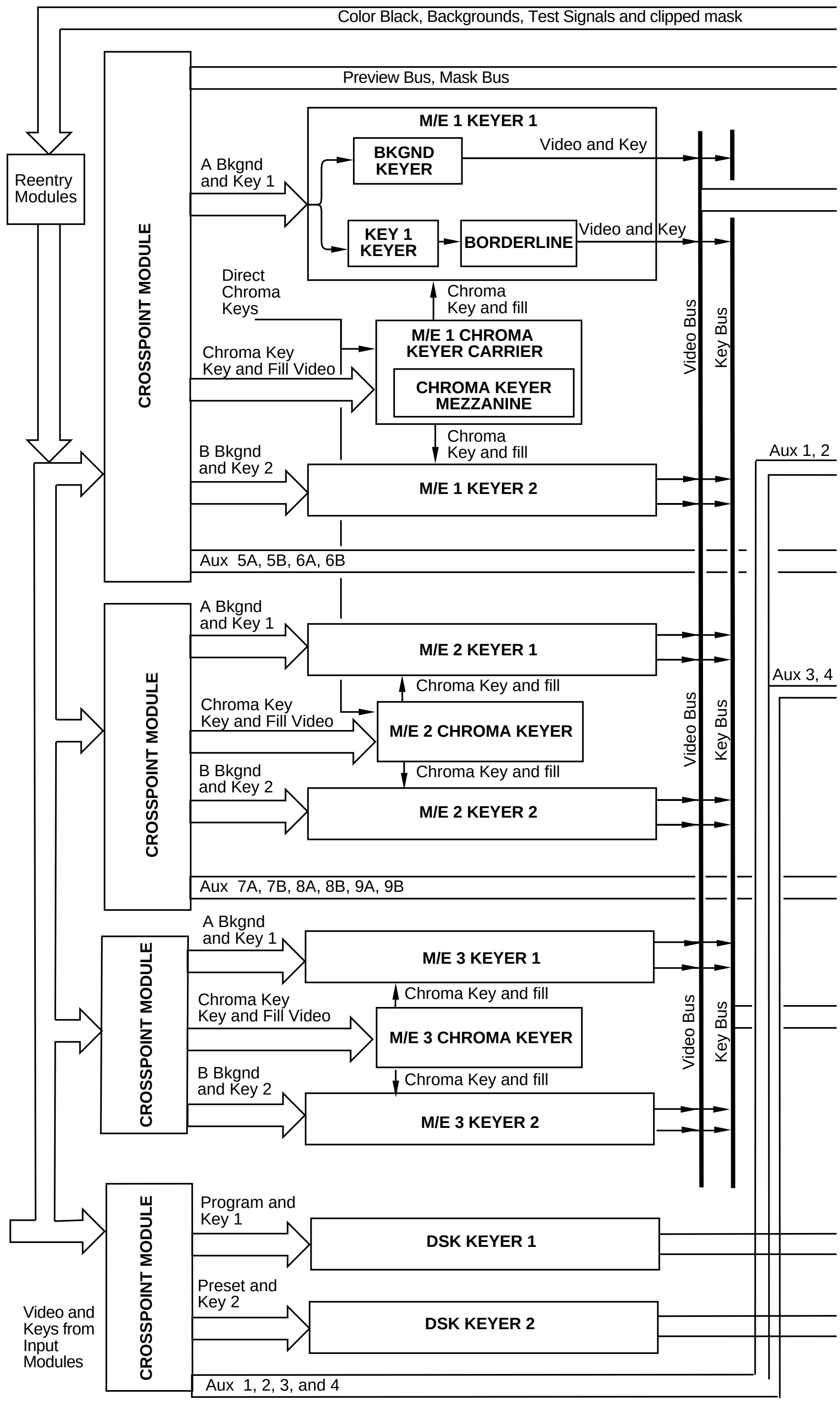


Figure 3-1. System Block Diagram (Matrix 094800-00)


Color Black, Backgrounds, Test Signals and clipped mask
Preview Bus, Mask Bus
Reentry Modules
CROSSPOINT MODULE
M/E 1 KEYER 1
BKGND KEYER
Video and Key
A Bkgnd and Key 1
KEY 1 KEYER
BORDERLINE
Video and Key
Direct Chroma Keys
Chroma Key and fill
M/E 1 CHROMA KEYER CARRIER
CHROMA KEYER MEZZANINE
Chroma Key Key and Fill Video
Chroma Key and fill
Video Bus
Key Bus
B Bkgnd and Key 2
M/E 1 KEYER 2
Aux 1, 2
Aux 5A, 5B, 6A, 6B
A Bkgnd and Key 1
M/E 2 KEYER 1
Aux 3, 4
Chroma Key and fill
Chroma Key Key and Fill Video
M/E 2 CHROMA KEYER
Chroma Key and fill
B Bkgnd and Key 2
M/E 2 KEYER 2
Aux 7A, 7B, 8A, 8B, 9A, 9B
A Bkgnd and Key 1
M/E 3 KEYER 1
Chroma Key and fill
Chroma Key Key and Fill Video
M/E 3 CHROMA KEYER
Chroma Key and fill
B Bkgnd and Key 2
M/E 3 KEYER 2
Program and Key 1
DSK KEYER 1
Preset and Key 2
DSK KEYER 2
Video and Keys from Input Modules
Aux 1, 2, 3, and 4

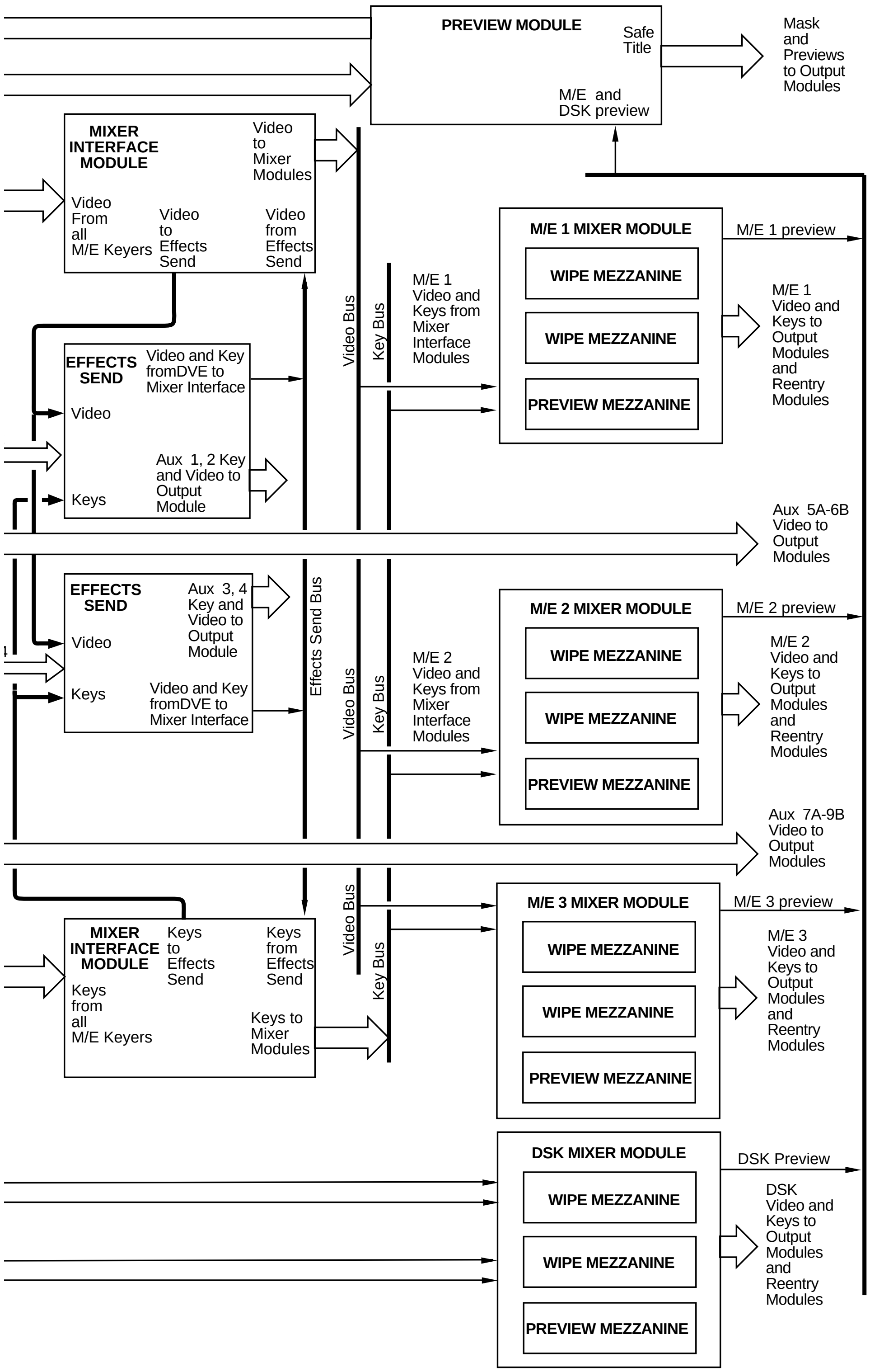


Figure 3-2. System Block Diagram (Matrix 094800-00

Signal Processor Frame

This section begins with a general description of each frame module and board type. The section to follow continues with full functional descriptions of each module or board.

In general, "module" refers to a circuit board that plugs into a slot in the frame into the main motherboard. A "board" refers to a mezzanine that mounts on top of another circuit board. Included in the descriptions are the input and output signals and the microprocessor(s) that control that specific module. Unless otherwise indicated in the description, all modules and mezzanine boards with the same part number are interchangeable.

For the video modules the descriptions answer the following questions:

- What does the module do?
- What are the input signals?
- What are the output signals?
- Which microprocessors are used in each area of the module?

For the processor modules, the control panel and other non-video modules:

- A description of what the module does.

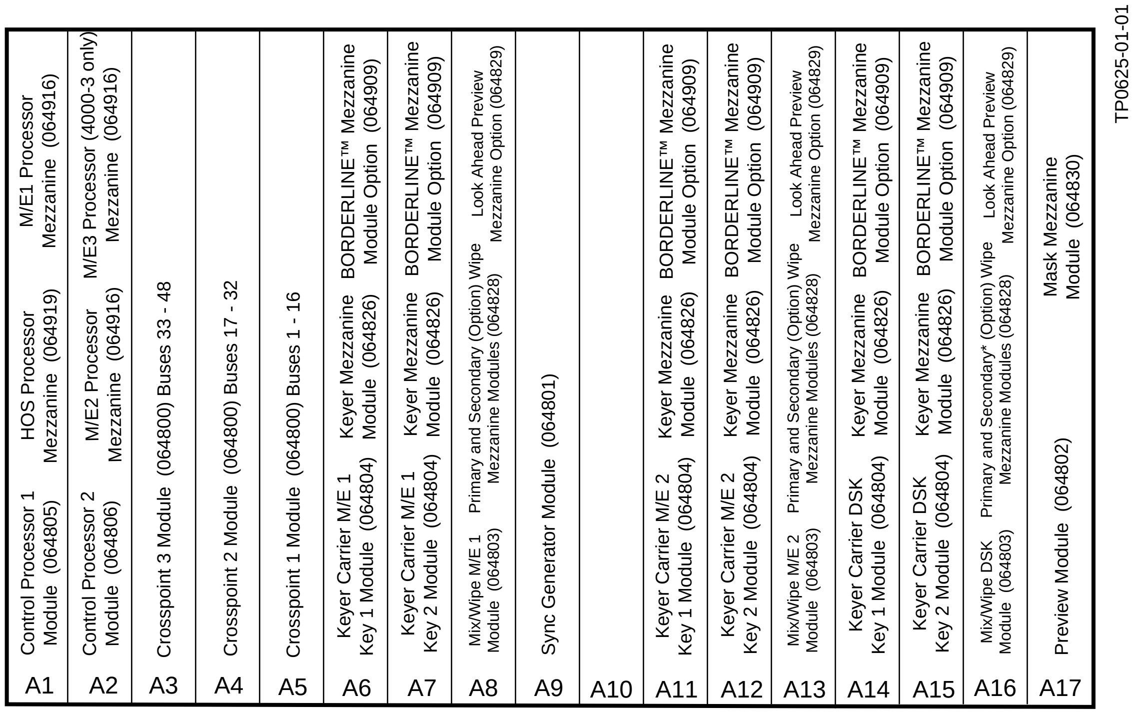
Frame Module Locations

The modules are located in four "bays" referred to as A,B C and D.

Each module has a six-digit assembly number followed by a two-digit version number and letter to identify it. For example the Sync Generator Module is numbered 064801-XX with a letter following the dash number. It may also be referred to as the 801 Module. This number can be found on the silk screen in different locations on each module circuit board.

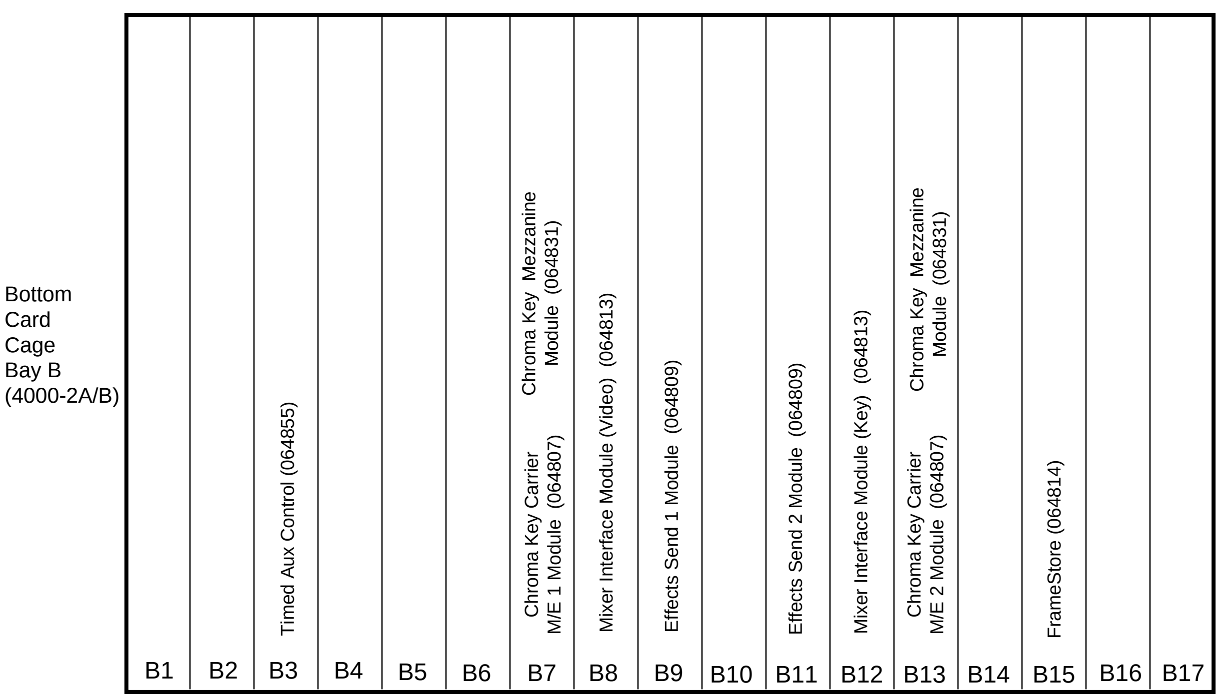
On the following pages refer to the figures listed below for the module locations in each bay.

- Figure 3-3 - Upper Front Bay A Module Locations (All Models)
- Figure 3-4 - Lower Front Bay B Modules - Model 4000-2A / B (factory shipped before January, 1996)
- Figure 3-5 - Lower Front Bay B Modules - All models (factory shipped after January, 1996)
- Figure 3-6 - Upper Rear Bay C Module Locations (All Models)
- Figure 3-7 - Lower Rear Bay D Module Locations (All Models)



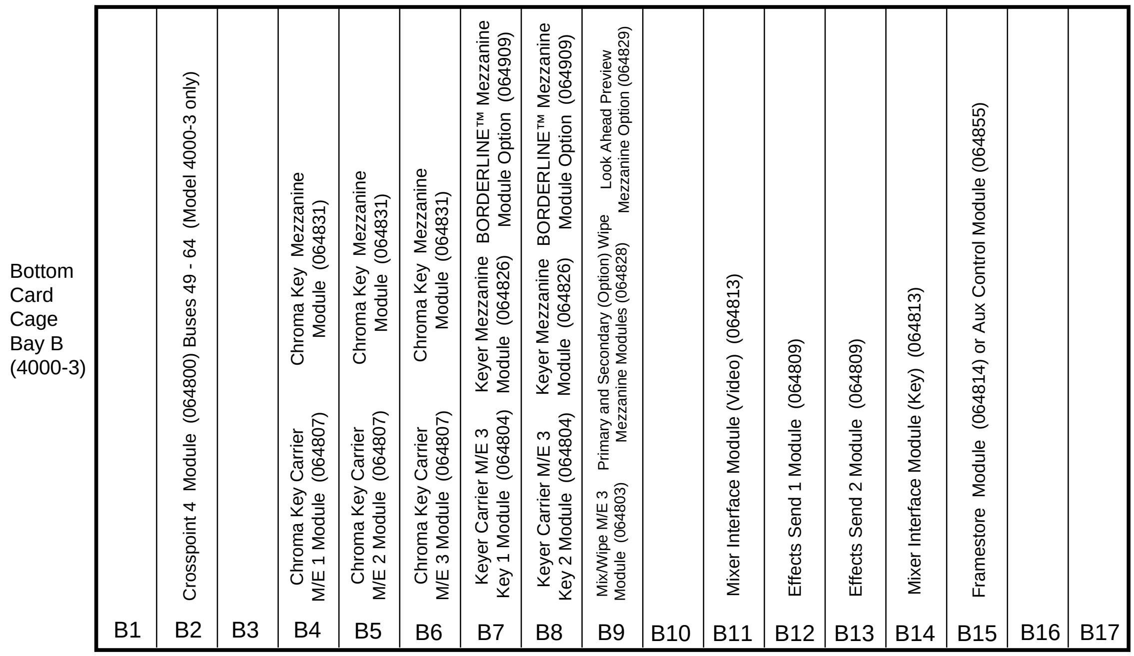
Top Card-Cage Bay A

Figure 3-3. Upper Front Bay A Module Locations (All Models)



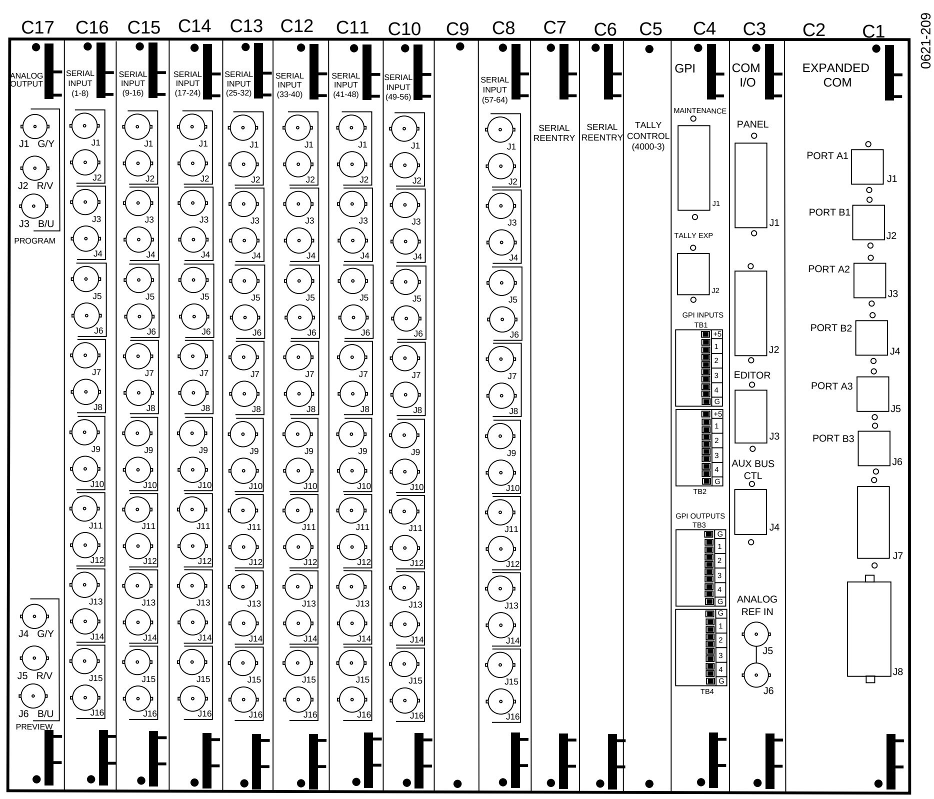
FRONT VIEW

Figure 3-4. Lower Front Bay B Modules—4000-2A/B Before January, 1996



FRONT VIEW

Figure 3-5. Lower Front Bay B Modules—All Models After January, 1996



Top Card Cage Bay C

Figure 3-6. Upper Rear Bay C Module Locations (All Models)

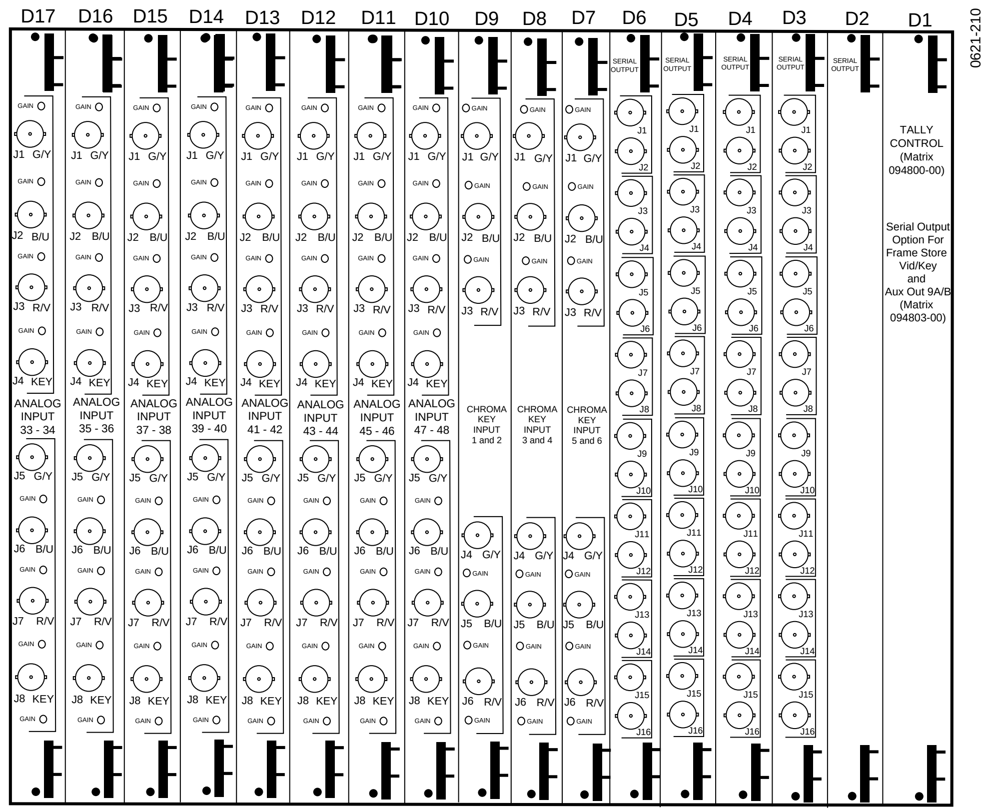


Figure 3-7. Lower Rear Bay D Module Locations (All Models)

NOTE: *The Timed Aux Output Option Module is a double-width module which is installed in Slot D3 and extends to Slot D2. There are eight single BNC output connectors on the module; no looping BNCs are available.*

Frame Module Descriptions

Input Modules

There are four types of input modules available: Serial Digital Input, Component Analog Input, Serial Reentry Input, and Chroma Key Input modules. Any combination of inputs can be chosen to mix Serial and Analog sources for up to 64 video or key inputs. All inputs can be Serial Digital video or key. Up to 32 inputs can be configured as Analog inputs, 16 component video and 16 analog key.

Serial Digital Input Module (064820)

- Converts from unbalanced (coax) to balanced (differential) mode
- Does cable equalization
- Reclocks the data
- Provides Lock / Unlock indicator

Component Analog Input Module (064818)

The Analog Input Module has three BNC Connectors for each video channel, and 1 BNC connector for each key channel. The output signals go directly to the Serial Crosspoint Matrix.

Inputs:

A wide variety of analog video standards are supported, including:

- RGB, MII, YUV, BETA, SMPTE, EBU

Output:

- Serial digital component video

Serial Re-entry Input Module (064822)

The Serial Re-entry Input Modules are used in conjunction with the Component Analog Input Modules. Refer to Section 2, Option Module Installation, Analog Input Module Options, for more information.

- Processes converted analog component signals
- Routes analog component signals to switcher crosspoints

Chroma Key Input Module (064817-Matrix 094800-00, 064f856-Matrix 094803-00)

This module converts from analog component video to digital component video. The Chroma Key Input Module has three BNC Connectors for each video channel. The output signals go directly to the Chroma Keyer.

Inputs:

A wide variety of analog video standards are supported, including:

- RGB, MII, YUV, BETA, SMPTE, EBU

Output:

- Full bandwidth multiplexed color difference signals

Output Modules

The output modules available are described below:

Serial (Digital) Output Modules (064821)

The Serial Output Modules convert the output signals from balanced (differential) to unbalanced (coax) mode.

Table 3-1 (Matrix 094800-00) and Table 3-2 (Matrix 094803-00) summarize the outputs of each of the Serial Output Modules.

Table 3-1. Serial Output Modules (Matrix 094800-00)

OUTPUT	SER. OUT 1 (D6)	SER. OUT 2 (D5)	SER. OUT 3 (D4)	SER. OUT 4 (D3)	SER. OUT 5 (D2)
J1/J2	Mask	M/E 1 PVW	Aux 1 Video	Aux 5A	N.C.
J3/J4	SW PVW	M/E 2 PVW	Aux 1 Key	Aux 5B	N.C.
J5/J6	DSK PGM	DSK PVW	Aux 2 Video	Aux 6A	N.C.
J7/J8	DSK PGM Key	N.C.	Aux 2 Key	Aux 6B	N.C.
J9/J10	M/E 1 PGM	Aux 9A	Aux 3 Video	Aux 7A	N.C.
J11/J12	M/E 1 Key	Aux 9B	Aux 3 Key	Aux 7B	N.C.
J13/J14	M/E 2 PGM	DSK Clean Feed	Aux 4 Video	Aux 8A	N.C.
J15/J16	M/E 2 Key	DSK PVW Video	Aux 4 Key	Aux 8B	N.C.

Table 3-2. Serial Output Modules (Matrix 094803-00)

OUTPUT	SER. OUT 1 (D6)	SER. OUT 2 (D5)	SER. OUT 3 (D4)	SER. OUT 4 (D3)	SER. OUT 5 (D2)
J1/J2	Mask	M/E 3 PGM	Aux 1 Video	Aux 5A	Frame Store
J3/J4	SW PVW	M/E 3 PGM Key	Aux 1 Key	Aux 5B	Frame Store Key
J5/J6	DSK PGM	M/E 1 PVW	Aux 2 Video	Aux 6A	Aux 9A
J7/J8	DSK PGM Key	M/E 2 PVW	Aux 2 Key	Aux 6B	Aux 9B
J9/J10	M/E 1 PGM	M/E 3 PVW	Aux 3 Video	Aux 7A	N.C.
J11/J12	M/E 1 Key	DSK PVW	Aux 3 Key	Aux 7B	N.C.
J13/J14	M/E 2 PGM	PGM Clean Feed	Aux 4 Video	Aux 8A	N.C.
J15/J16	M/E 2 Key	DSK PVW Out	Aux 4 Key	Aux 8B	N.C.

Analog Output Module (AOT) (064819)

The Analog Output Module provides analog programmed preview output signals for external monitoring of the outputs.

Timed Aux Output Module (TAO) (064852)

The Timed Aux Output Module provides four sets of aux video / key outputs in time with the program output to feed an external DVE. These signals can then be manipulated in the DVE and sent back to the switcher.

Serial Reentry Module (064822)

There are two Serial Reentry Modules (SRE). The SRE Modules are used to reenter M/E and DSK switcher outputs back into the switcher. Reentered signals are then sent to the crosspoint module. The reentered signals are treated the same as any other video or key. Table 3-3 summarizes the uses of both the Reentry Modules.

Table 3-3. Reentry Module Signals

CROSSPOINT INPUT	SIGNALS FOR SRE 1	CROSSPOINT INPUT	SIGNALS FOR SRE 2
65	M/E 3 Program Video	73	Background 1
66	M/E 3 Program Key	74	Background 2
67	Frame Store Video	75	Clipped Mask
68	Frame Store Key	76	Reserved
69	DSK Program Key	77	M/E 2 Program Video
70	DSK Program Video	78	ME 2 Program Key
71	Black	79	M/E 1 Program Video
72	Test	80	M/E 1 Program Key

Crosspoint Module (064800)

The Crosspoint Modules distribute the video input signals in serial digital mode to all the buses in the system.

After going through the Input Modules, the video is sent to all Crosspoint Modules, M/E 1, M/E 2, M/E 3 and DSK. The Crosspoint Modules have a series of 16 input X 8 output crosspoint ICs which create an 80 X 16 output matrix form each module. The outputs from the Crosspoint Matrix ten provide the different buses for the system.

All of the Crosspoint Modules make use of the HOS processor to control the aux buses. The M/E processors control their respective M/E and key buses. The Program, Preset and DSK key buses are controlled by the Head of State (HOS) processor.

The HOS processor is wired to the same connector location in all Crosspoint Module slots. The M/E 1 processor is wired to the same connector location in slot A5 as the M/E 2 and M/E 23 processors are wired to in slot A4 and B2 respectively. In slot A3 that connector location is empty and there is a jumper on the connector that tells the module in that slot to use the HOS processor for everything.

The function, inputs, outputs, and processor used for each Crosspoint Module are outlined below:

DSK Crosspoint Module (Slot A3) (Buses 33–48)

Function of the module:

This module takes all of the video inputs to the switcher including the ones generated by the switcher and distributes them as video and keys to the DSK Program and Preset buses and Aux Buses 1 through 4.

Inputs:

- Primary inputs 1 through 64 from the Input Modules
- Reentries and internally generated signals from the Serial Reentry Modules

Outputs:

- DSK Program video and key
- DSK Preset video and key
- DSK key 1 and key 2
- Aux 1 through Aux 4 video and key

Processors Used:

- Uses the Head of State (HOS) processor

M/E 3 Crosspoint Module (Slot B2) (Buses 49–64)

Function of the module:

This module takes all of the video inputs to the switcher including the ones generated by the switcher and distributes them as video and keys to the M/E 3 Program and Preset buses.

Inputs:

- Primary inputs 1 through 64 from the Input Modules
- Reentries and internally generated signals from the Serial Reentry Modules

Outputs:

- M/E 3 Program video and key
- M/E 3 Preset video and key
- M/E 3 key 1 and key 2

Processors Used:

- Uses M/E 3 Processor for M/E 3 control

M/E 2 Crosspoint Module (Slot A4) (Buses 17–32)

Function of the module:

This module takes all of the video inputs to the switcher including the ones generated by the switcher and distributes them as video and keys to the M/E 2 Program and Preset buses and Aux Buses 7A through 9B.

Inputs:

- Primary inputs 1 through 64 from the Input Modules
- Reentries and internally generated signals from the Serial Reentry Modules

Outputs:

- M/E 2 Program video and key
- M/E 2 Preset video and key
- M/E 2 key 1 and key 2
- Aux 7A through Aux 9B video and key

Processors Used:

- Uses the Head of State (HOS) processor for aux bus control
- Uses M/E 2 Processor for M/E 2 control

M/E 1 Crosspoint Module (Slot A5) (Buses 1–16)

Function of the module:

This module takes all of the video inputs to the switcher including the ones generated by the switcher and distributes them as video and keys to the M/E1 Program and Preset buses and Aux Buses 5A through 6B.

Inputs:

- Primary inputs 1 through 64 from the Input Modules
- Reentries and internally generated signals from the Serial Reentry Modules

Outputs:

- M/E 1 Program video and key
- M/E 1 Preset video and key
- M/E 1 key 1 and key 2
- Aux 5A through Aux 6B video and key

Processors Used:

- Uses the Head of State (HOS) processor for aux bus control
- Uses M/E 1 Processor for M/E 1 control

Keyer Carrier Module (064804)

There are two Keyer Carrier Modules for each M/E and two for the DSK. The Keyer Carrier Module accepts serial video signals and keys from the Crosspoint Module and parallel keys and shaped video from the Chroma Keyer Module for that M/E. The outputs are shaped video and clipped and gained keys. Outputs are sent to the Mixer Interface Modules.

The Keyer Carrier Module does the following:

- Converts video from serial to parallel (not used with chroma key)
- Interfaces to the optional BORDERLINE Mezzanines (key layer only)
- Bypasses BORDERLINE submodule if not installed
- Interfaces to the Key Processor Mezzanines
- Can do a non additive mix with the other Keyer Module in that M/E
- Routes wipe and wash information from the Mix/Wipe Module to the Key Processor Mezzanine Board
- Generates Box Mask for the Keyer Mezzanine Boards
- Transfers key and video fill information from Chroma Keyer Module to Keyer Mezzanine Board

Each Keyer Carrier Module has connectors and circuitry to support two Keyer Mezzanine Boards and one BORDERLINE Mezzanine. The input signals for each Keyer Carrier Module are the following:

Serial video from the Crosspoint Modules:

- One background video and its key source
- One key and its video fill

Parallel video from the Keyer Mezzanine Board:

- A clipped, gained and masked key and a shaped video for the background
- A clipped, gained and masked key and a shaped video for the key

The incoming video and keys from the Crosspoint Module are first converted from serial to parallel. Next, there are selectors that select between the Chroma Keyer and the Crosspoint Module. The selected video and key are then sent to the Keyer Mezzanine Boards. The parallel video outputs of the Keyer Carrier Module are sent to the Mixer Interface Module.

On the Keyer Mezzanine Board the video is separated into luminance and chroma. All videos are timed together and all keys are timed together. The video then goes through processing for gain and offset and coring for noise reduction. The key is clipped and gain adjusted, and the video is shaped by its key. Masks are added, then the signal goes off the Keyer Mezzanine Board and sent back to the Keyer Carrier Module.

Each Key Carrier Module is identical and thereby interchangeable for troubleshooting purposes. The functions, inputs, outputs and processor used for the Key Carrier Modules in the M/Es are outlined below in general terms.

M/E Key 1 Keyer Carrier Module

Function of the module:

This module (along with its submodules) generates key signals for the individual M/E A Background and Key 1

Inputs:

- M/E Background A Video and Background A Key source
- M/E Key 1 Video and Key 1 source
- Chroma key video and key

Outputs:

- Shaped M/E Background A Video Fill
- M/E Background A Key
- Shaped M/E Key 1 Video Fill
- M/E Key 1

Processors Used:

- M/E Processor

M/E Key 2 Keyer Carrier Module

Function of the module:

This module (along with its submodules) generates key signals for M/E B Background and Key 2.

Inputs:

- M/E Background B Video and Background B Key source
- M/E Key 2 Video and Key 2 source
- Chroma key video and key

Outputs:

- Shaped M/E Background B Video Fill
- M/E Background B Key
- Shaped M/E Key 2 Video Fill
- M/E Key 2

Processors Used:

- M/E Processor

The functions, inputs, outputs and processor used for the Key Carrier Modules in the DSK are outlined below

DSK Key 1 Keyer Carrier Module

Function of the module:

This module (along with its submodules) generates key signals for the DSK Program and Key 1

Inputs:

- DSK Program Background Video and Program Background Key source
- DSK Key 1 Video and Key 1 source
- Chroma key video and key

Outputs:

- Shaped DSK Program Background Video Fill
- DSK Program Background Key
- Shaped DSK Key 1 Video Fill
- DSK Key 1

Processors Used:

- Head of State (HOS) Processor

DSK Key 2 Keyer Carrier Module (Slot A15)

Function of the module:

This module (along with its submodules) generates key signals for the DSK Preset and Key 2.

Inputs:

- DSK Program Preview Video and Preview Background Key source
- DSK Key 2 Video and Key 2 source
- Chroma key video and key

Outputs:

- Shaped DSK Preview Background Video Fill
- DSK Preview Background Key
- Shaped DSK Key 2 Video Fill
- DSK Key 2

Processors Used:

- Head of State (HOS) Processor

Keyer Mezzanine Board (064826)

The standard system has two Keyer Mezzanine Boards on each of the Key Carrier Modules. One Keyer Mezzanine is for a background layer and the second Keyer Mezzanine is for the key layer. Backgrounds can be used as keys in the “Layered Mode.”

The Keyer Mezzanine:

- Demultiplexes parallel inputs from Keyer Carrier Module
- Uses the key source and the key fill video to create a clipped and gained key and a shaped video fill
- Can move the key horizontally in subpixel increments over a six pixel range
- Modifies offset and gain on the input video fill
- Generates two key fill mattes which can be substituted for the video
- Uses signals from the wipe generator to generate a wash between the two mattes
- Masks the key with both force and inhibit masks
- Times the inputs
- Provides a washed matte border for preset patterns

Input signals for each Keyer Mezzanine Board are:

- Video fill source
- Video key source

Each of the Key Mezzanine Boards creates:

- A shaped video fill or washed matte
- A clipped, gained and masked key

The Keyer Mezzanine Board accepts parallel data from the Keyer Carrier Module making the outputs parallel.

On the Keyer Mezzanine Board, video is separated into luminance and chroma.

The Keyer Mezzanine Board has circuitry to time the video and key signals. The timing is set so that the signals are aligned at the output of the Keyer Carrier Module even though the keyer path is longer (because of the BORDERLINE and key NAM) than the background path.

Video then goes through processing for gain, offset, and coring for noise reduction. The key is clipped and gain adjusted, and the video is shaped by its key. Both the video and key masks are added at this point. The signals are then sent off the mezzanine onto the carrier module.

The Keyer Mezzanine Board uses the box mask from the Keyer Carrier Module, or the wipe masks from the Mix/Wipe Module, to mask the keys and key fill. The keys can be filled with matte. The matte is generated by a dual matte generator on the Key Mezzanine Board. The matte can be modulated by the wipe signal from the Mix/Wipe Module.

The functions, inputs, outputs, and processor used for each of the Key Mezzanines on the M/E Key Carrier Modules are given below.

M/E A Background Mezzanine Board

Function of the board:

This Mezzanine Board shapes the key fill signal for M/E 1 A Background.

Inputs:

- M/E Background A Video and Background A Key source

Outputs:

- Shaped M/E Background A Video Fill
- Clipped and gained M/E Background A Key

Processors Used:

- M/E Processor

M/E Key 1 Mezzanine Board

Function of the board:

This Mezzanine Board shapes the key fill signal for M/E 1 Key 1.

Inputs:

- M/E Key 1 Video and M/E 1 Key 1 source

Outputs:

- Shaped M/E Key 1 Video Fill
- Clipped and gained M/E Key 1

Processors Used:

- M/E Processor

M/E B Background Mezzanine Board

Function of the board:

This Mezzanine Board shapes the key fill signal for M/E B Background.

Inputs:

- M/E Background B Video and Background B Key source

Outputs:

- Shaped M/E Background B Video Fill
- Clipped and gained M/E Background B Key

Processors Used:

- M/E Processor

M/E Key 2 Mezzanine Board

Function of the board:

This Mezzanine Board shapes the key fill signal for M/E 1 Key 2.

Inputs:

- M/E Key 2 Video and M/E1 Key 2 source

Outputs:

- Shaped M/E Key 2 Video Fill
- Clipped and gained M/E Key 2

Processors Used:

- M/E Processor

DSK Program Background Mezzanine Board

Function of the board:

This Mezzanine Board shapes the key fill signal for the DSK Program Background.

Inputs:

- DSK Program Background Video and Program Background Key Source

Outputs:

- Shaped DSK Program Background Video Fill
- Clipped and gained DSK Program Background Key

Processors Used:

- HOS Processor

DSK Key 1 Mezzanine Board

Function of the board:

This Mezzanine Board shapes the key fill signal for DSK Key 1.

Inputs:

- DSK Key 1 Video and DSK Key 1 source

Outputs:

- Shaped DSK Key 1 Video Fill
- Clipped and gained DSK Key 1

Processors Used:

- HOS Processor

DSK B Background Mezzanine Board

Function of the board:

This Mezzanine Board shapes the key fill signal for DSK Preset Background.

Inputs:

- DSK Preset Background Video and Preset Background Key source

Outputs:

- Shaped DSK Preset Background Video Fill
- Clipped and gained DSK Preset Background Key

Processors Used:

- HOS Processor

DSK Key 2 Mezzanine Board

Function of the board:

This Mezzanine Board shapes the key fill signal for DSK Key 2.

Inputs:

- DSK Key 2 Video and DSK Key 2 source

Outputs:

- Shaped DSK Key 2 Video Fill
- Clipped and gained DSK Key 2

Processors Used:

- HOS Processor

BORDERLINE Mezzanine (067909)

A BORDERLINE option can be mounted on each of the Keyer Carrier Modules.

The BORDERLINE Mezzanine Board is next in the key path. If it is installed, the BORDERLINE Mezzanine Board can shift the timing of the key and insert a border around the key. If the BORDERLINE is not installed, the key signal goes directly to the non additive mixer.

Next, there is a a Non-Additive Mixer (NAM) in the key path. The NAM can do a mix between the two keys of that M/E. The key NAM compares the luminance level of Key 1 and Key 2 fills and puts the key that has the highest instantaneous luminance level of its fill on the air.

Before being sent off the module, the video signals first have the chrominance and luminance recombined.

The Keyer Carrier Module generates Box Masks (one for each Keyer Mezzanine board). The Keyer Carrier Module also gets wipe information from the Mix/Wipe Module and sends that to the Key Mezzanine Board for use as a mask.

Processors Used:

- Uses the Head of State (HOS) processor for aux bus control
- Uses M/E 1 Processor for M/E control

See Figure 3-8 for Mezzanine Board location.

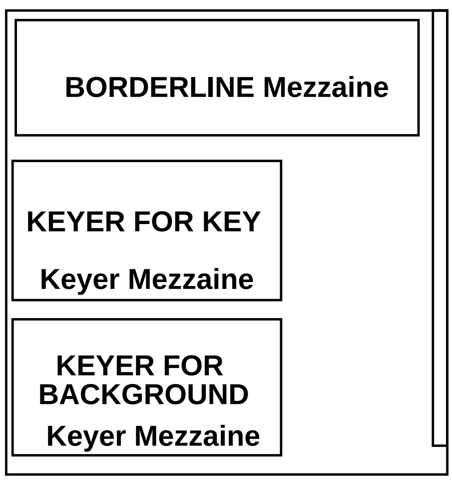


Figure 3-8. BORDERLINE Mezzanine Location

Mixer Interface Module (064813)

The Mixer Interface Module:

- Interfaces the Keyer Modules to the Mix / Wipe Modules and the optional Effects Send Modules
- The module in slot B 8 or B11 routes the video signals (key fill).
- The module in slot B 12 or B14 routes the key signals.

There are two Mixer Interface Modules in the system. One for the video signals and another for the key signals. If the Effects Send is not installed, this module simply passes the video and key signals from the Keyer Modules to the Mix / Wipe Modules. See Figure 3-9.

When Effects Send is installed, these modules act as a switch. If the switcher is in normal mode, the Mixer Interface Modules switch the video and keys from the keyer to the appropriate Mix / Wipe Module. If the switcher is in the Effects Send mode, the Mixer Interface Module switches the appropriate video and key signals from the Keyer Module to the Effects Send Module which sends the signals to the DVE on optional timed aux bus outputs. Signals from the DVE are reentered into the switcher on aux buses. These signals are routed back to the Effects Send Modules where they are sent to the Mixer Interface Modules and on to the Mix / Wipe Modules.

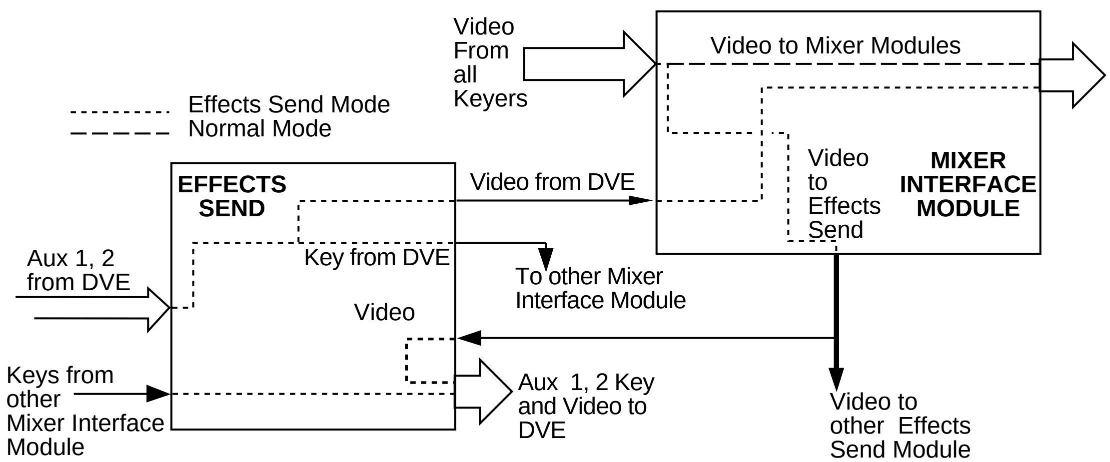


Figure 3-9. Mixer Interface and Effects Send

Inputs:

The inputs to the Mixer Interface Module can be separated into two groups:

- The first group is all 24 primary video and key buses from the Key Carrier Modules. If the system is in the normal (not effects send) mode these signals are passed along to the Mix / Wipe Modules. When the Model 4000 is in the effects send mode, one or more (up to four) of the keys and their associated video (key fill) are rerouted to the Effects send Module. The rest of the signals are still sent directly to the Mix / Wipe Modules.
- The second group of inputs are the modified key(s) and video(s) being returned from the Effects Send Modules. These are then sent to the Mix / Wipe Module. From there the signals are sent to the Output Modules over the same key or video path they were on before they were sent to the Effects Send Module.

The input signals are given in Table 3-4 (Matrix 094800-00) and Table 3-5 (Matrix 094803-00) below.

Table 3-4. Mixer Interface Module Inputs (Matrix 094800-00)

Video Path (Slot B 8)	Key Path (Slot B 12)
Aux 1 video return from Effects Send Module	Aux 1 key return from Effects Send Module
Aux 2 video return from Effects Send Module	Aux 2 key return from Effects Send Module
Aux 3 video return from Effects Send Module	Aux 3 key return from Effects Send Module
Aux 4 video return from Effects Send Module	Aux 4 key return from Effects Send Module
M/E 1 Background A video from Keyer Module	M/E 1 Background A key from Keyer Module
M/E 1 Background B video from Keyer Module	M/E 1 Background B key from Keyer Module
M/E 1 Key 1 video from Keyer Module	M/E 1 Key 1 key from Keyer Module
M/E 1 Key 2 video from Keyer Module	M/E 1 Key 2 key from Keyer Module
M/E 2 Background A video from Keyer Module	M/E 2 Background A key from Keyer Module
M/E 2 Background B video from Keyer Module	M/E 2 Background B key from Keyer Module
M/E 2 Key 1 video from Keyer Module	M/E 2 Key 1 key from Keyer Module
M/E 2 Key 2 video from Keyer Module	M/E 2 Key 2 key from Keyer Module
Program Background video from Keyer Module	Program Background key from Keyer Module
Preset Background video from Keyer Module	Preset Background key from Keyer Module
DSK 1 video from Keyer Module	DSK 1 key from Keyer Module
DSK 2 video from Keyer Module	DSK 2 key from Keyer Module

Table 3-5. Mixer Interface Module Inputs (Matrix 094803-00)

Video Path (Slot B 11)	Key Path (Slot B 14)
Aux 1 video return from Effects Send Module	Aux 1 key return from Effects Send Module
Aux 2 video return from Effects Send Module	Aux 2 key return from Effects Send Module
Aux 3 video return from Effects Send Module	Aux 3 key return from Effects Send Module
Aux 4 video return from Effects Send Module	Aux 4 key return from Effects Send Module
M/E 1 Background A video from Keyer Module	M/E 1 Background A key from Keyer Module
M/E 1 Background B video from Keyer Module	M/E 1 Background B key from Keyer Module
M/E 1 Key 1 video from Keyer Module	M/E 1 Key 1 key from Keyer Module
M/E 1 Key 2 video from Keyer Module	M/E 1 Key 2 key from Keyer Module
M/E 2 Background A video from Keyer Module	M/E 2 Background A key from Keyer Module
M/E 2 Background B video from Keyer Module	M/E 2 Background B key from Keyer Module
M/E 2 Key 1 video from Keyer Module	M/E 2 Key 1 key from Keyer Module
M/E 2 Key 2 video from Keyer Module	M/E 2 Key 2 key from Keyer Module
M/E 3 Background A video from Keyer Module	M/E 3 Background A key from Keyer Module
M/E 3 Background B video from Keyer Module	M/E 3 Background B key from Keyer Module
M/E 3 Key 1 video from Keyer Module	M/E 3 Key 1 key from Keyer Module
M/E 3 Key 2 video from Keyer Module	M/E 3 Key 2 key from Keyer Module

Outputs:

The output signals going to the Effects Send Module come from the Keyer Carrier Module. The Output signals going to the Mix / Wipe Module can come from either the Keyer Carrier Module or the Effects Send Module.

The output signals are given below in Table 3-6:

Table 3-6. Mixer Interface Module Outputs (Matrix 094800-00)

Video Path (Slot B 8)	Key Path (Slot B 12)
Aux 1 video to Effects Send Module	Aux 1 key to Effects Send Module
Aux 2 video to Effects Send Module	Aux 2 key to Effects Send Module
Aux 3 video to Effects Send Module	Aux 3 key to Effects Send Module
Aux 4 video to Effects Send Module	Aux 4 key to Effects Send Module
M/E 1 Background A video to Mix/Wipe Module	M/E 1 Background A key to Mix/Wipe Module
M/E 1 Background B video to Mix/Wipe Module	M/E 1 Background B key to Mix/Wipe Module
M/E 1 Key 1 video to Mix/Wipe Module	M/E 1 Key 1 key to Mix/Wipe Module
M/E 1 Key 2 video to Mix/Wipe Module	M/E 1 Key key to Mix/Wipe Module
M/E 2 Background A video to Mix/Wipe Module	M/E 2 Background A key to Mix/Wipe Module
M/E 2 Background B video to Mix/Wipe Module	M/E 2 Background B key to Mix/Wipe Module
M/E 2 Key 1 video to Mix/Wipe Module	M/E 2 Key 1 key to Mix/Wipe Module
M/E 2 Key 2 video to Mix/Wipe Module	M/E 2 Key 2 key to Mix/Wipe Module
Program Background video To Mix/Wipe Module	Program Background key To Mix/Wipe Module
Preset Background video To Mix/Wipe Module	Preset Background key To Mix/Wipe Module
DSK 1 video To Mix/Wipe Module	DSK 1 key To Mix/Wipe Module
DSK 2 video To Mix/Wipe Module	DSK 2 key To Mix/Wipe Module

Processors Used:

- Both modules use the HOS processor

Table 3-7. Mixer Interface Module Outputs (Matrix 094803-00)

Video Path (Slot B 11)	Key Path (Slot B 14)
Aux 1 video to Effects Send Module	Aux 1 key to Effects Send Module
Aux 2 video to Effects Send Module	Aux 2 key to Effects Send Module
Aux 3 video to Effects Send Module	Aux 3 key to Effects Send Module
Aux 4 video to Effects Send Module	Aux 4 key to Effects Send Module
M/E 1 Background A video to Mix/Wipe Module	M/E 1 Background A key to Mix/Wipe Module
M/E 1 Background B video to Mix/Wipe Module	M/E 1 Background B key to Mix/Wipe Module
M/E 1 Key 1 video to Mix/Wipe Module	M/E 1 Key 1 key to Mix/Wipe Module
M/E 1 Key 2 video to Mix/Wipe Module	M/E 1 Key key to Mix/Wipe Module
M/E 2 Background A video to Mix/Wipe Module	M/E 2 Background A key to Mix/Wipe Module
M/E 2 Background B video to Mix/Wipe Module	M/E 2 Background B key to Mix/Wipe Module
M/E 2 Key 1 video to Mix/Wipe Module	M/E 2 Key 1 key to Mix/Wipe Module
M/E 2 Key 2 video to Mix/Wipe Module	M/E 2 Key 2 key to Mix/Wipe Module
M/E 3 Background A video to Mix/Wipe Module	M/E 3 Background A key to Mix/Wipe Module
M/E 3 Background B video to Mix/Wipe Module	M/E 3 Background B key to Mix/Wipe Module
M/E 3 Key 1 video to Mix/Wipe Module	M/E 3 Key 1 key to Mix/Wipe Module
M/E 3 Key 2 video to Mix/Wipe Module	M/E 3 Key 2 key to Mix/Wipe Module

Effects Send Modules (064809)

There are two Effects Send Modules in the Model 4000. Both of which receive video and key signals from the Mixer Interface Modules.

Each Effects Send Module can send two keys and two video signals (key fill) onto aux buses. The aux buses can then send the video and key to a DVE. The DVE will then return the modified signals back through the Crosspoint Module to the same aux bus. The aux bus will route the video and key signals back to the Effects Send Module which will send the signals back to the Mixer Interface Module.

The Effects Send Modules will encode, decode, shape, and unshape the video as necessary.

Effects Send Module 1 in slot B 9 (Matrix 094800-00) or B12 (Matrix 094803-00) r routes the video and key signals out Aux 1 and 2. Effects Send Module 2 in slot B 11 (or B13) routes the video and key signals out Aux 3 and 4.

Inputs:

There are two sets of input signals to the Effects Send Module:

- The keys and their associated video that are to be "sent." These signals come from the Mixer Interface Modules. The input signals from the Mixer Interface Modules are sent to the Effects Send Modules. These inputs are sent out on the aux bus(es) to a DVE
- The other inputs are the same signals after they have been modified by the DVE and returned via the aux bus

Outputs:

There are two groups of outputs for the Effects Send Module:

- The output signals to the Mixer Interface Module. These signals come from the DVE via the aux buses
- The aux bus signals to the DVE. These signals come from the Mixer Interface Module

Processors Used:

- Both modules use the HOS processor

Chroma Keyer Carrier Module (064807)

Each M/E can have a Chroma Keyer option. Each module can create two chroma keys and key fills (one for each keyer in the M/E) from any primary inputs or optional external chroma key inputs. The chroma key and key fill are sent to the Keyer Module where they are selected and handled the same as a luminance key.

The Chroma Keyer:

- Creates a chroma key and shaped fill for Key 1 of the M/E from any primary or chroma key video input
- Does all of the timing and control for the Chroma Keyer Mezzanine

The input signals are serial digital. Signals are converted to parallel on the carrier module and sent either to the chroma key circuit (Key 1) or the mezzanine board (Key 2).

The input signals for each Key Carrier Module are:

- Any of the primary inputs (one key and one fill)
- Or any of the six chroma key inputs (one key and one fill)

Each of the Chroma Keyer Modules creates:

- Chroma key
- Video shaped by the chroma key

The Chroma Keyer outputs are sent to the Keyer Carrier Module and the Keyer Mezzanine Board. The chroma key uses the linear key on the keyer modules.

The function, inputs, outputs and processor used for each M/E are given below:

M/E Chroma Keyer Module Set

Function of the modules:

Create a chroma key and fill for each M/E.

Inputs:

- Any of the primary inputs (one key and one fill)
- Any of the six external chroma key inputs (one key and one fill)

Outputs:

- Chroma key
- Video shaped by the chroma key

Processors Used:

- M/E processor

Chroma Key Mezzanine Board (064831)

The Chroma Key Mezzanine:

- Creates the chroma key and shaped fill for Key 2 of the M/E

Mix/Wipe Module (064803)

A Mix / Wipe Module is provided for each of the M / Es, and one for the DSK (program / preset) bus. The Mix / Wipe Module uses the resultant video signals, key signals and the wipe control signals to create a video output with all the requested elements. The Mix / Wipe Module accomplishes the following:

- Combines video signals, key signals, and the wipe solid signal to create the program video
- Interfaces to the Wipe Generators (one standard and one optional)
- Does preview processing for that M / E
- Converts output video from parallel to serial

The Mix / Wipe circuit board has connectors for two Wipe Mezzanine Boards and one Preview Module.

The Mix / Wipe Module has its own microprocessor, program memory (flash PROM), and dual port memory. The system processor sends information to the dual port memory indicating what is to be done during the next field. The Mix / Wipe processor reads this information and does the calculations necessary to accomplish the operations and sends the information to the rest of the module and the mezzanine boards.

The Mix / Wipe Module routes the output of each Wipe Mezzanine into the other Wipe Mezzanine. This allows the mezzanine boards to do a mix or a NAM (Non Additive Mix) between the outputs of the two mezzanine boards. See Figure 3-10 for mezzanine board locations.

Wipe Mezzanine Board (064828)

The Wipe Mezzanines:

- Create the wipe and preset pattern key control signals

The Wipe Mezzanine generates the wipe solid for all wipes including the matrix wipe. The primary Wipe Mezzanine generates the wipe solid for the wipe. The secondary wipe generator generates the wipe solid for the preset pattern. Each Wipe Mezzanine Board can take in the wipe solid from the other Wipe Mezzanine and do a mix or a NAM (Non Additive Mix) between its output and the other Wipe Mezzanine's output.

There is space on the Mix / Wipe Module for two Wipe Generator mezzanines. The first Wipe Generator Mezzanine for each M / E is standard and can generate the wipe and preset pattern key control signal. If only this mezzanine is installed, these two signals are identical. If the second Wipe Generator Mezzanine is installed, that mezzanine generates the preset pattern key signal which then may be different than the wipe pattern.

Preview Mezzanine Board (064829)

The Preview Mezzanine generates:

- Look ahead preview for that M/E
- Key Preview for that M/E
- Clean feed for that M/E

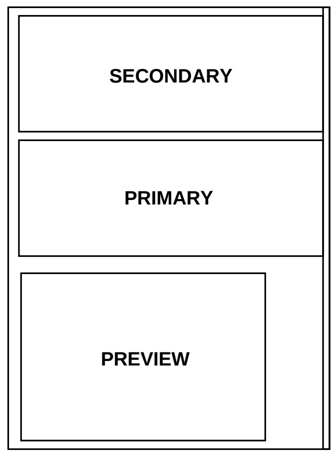


Figure 3-10. Mix/Wipe Mezzanine Locations

The function, inputs, outputs and processor used on each Mix/Wipe Module are given below.

M/E Mix/Wipe Module Set

Generates the Wipes, Mix, Program Output, and Previews for M/E 1.

Inputs:

- M/E A Video and Key
- M/E B Video and Key
- M/E K1 Video and Key
- M/E K2 Video and Key

Outputs:

- M/E Program Video and Key
- M/E Clean Feed or program key
- M/E Preview

Processors Used:

M/E Processor

DSK Mix/Wipe Module Set (Slot A16)

Generates the Wipes, Mix, Program Output and preview for the DSK.

Inputs:

- DSK Program Video and Key
- DSK Preset Video and Key
- DSK K1 Video and Key
- DSK K2 Video and Key

Outputs:

- DSK Program Video and Key
- DSK Clean Feed or program key
- DSK Preview

Processors Used:

- HOS

Sync Generator Module (064801) (Slot A9)

The basic functions of the Sync Generator Module are:

- Use the input reference video to lock the switcher
- Generate sync pulses for the other modules in the system
- Generate clocks for the other modules in the system
- Generate "Sync Edge" pulse for analog input alignment

The input is the analog reference video signal. This signal is brought in as a differential video signal from the Communications I/O Module at the rear of the frame. The video is filtered, then sync is stripped off. The sync is used to lock a 13.5 MHz phase-locked loop. The 13.5 MHz signal is used to lock a four times 13.5 clock from which all sync pulses are derived. The oscillator can be switched between 13.5 MHz for normal operation and 18.0 MHz for extended definition 16 X 9 aspect ratio.

The two clocks generated on this module are "system clock" and "multiplex clock" which is twice the frequency of "system clock." These clocks have a separate driver for each module. The clock outputs are differential positive ECL level. The multiplex clock is used on the modules to multiplex and demultiplex the video signals. The system clock is used to clock the video through the system.

The system sync pulses are a TTL level and are generated from the four times 13.5MHz phase lock loop. There are two separate generators, one for the vertical rate signals and one for the horizontal rate signals. The sync pulses have drivers that feed four or five modules.

The "dither" mode line is controlled on the Sync Generator Module through the VID interface.

Switches:

- Clock Frequency (13.5 MHz or 18 MHz select)
- Field Rate 50 Hz or 60 Hz select
- Tally Control Module reset
- Horizontal timing (three switches)

LEDs:

- +5V present
- Video present (reference video)
- Lock (this indicates only that the first phase lock loop is locked; it does not indicate that the entire system is locked
- Rear module power LEDs
- Tally Control Module CPU running
- ±10V present

Inputs:

- Analog reference video

Outputs:

- Two clocks
- Sync pulses

Processors Used:

- HOS processor

Frame Store Module (064814)

The Frame Store function allows storage and retrieval of images at a 10-bit resolution. Two 10-bit channels, video and key, enter the module from the Mixer Interface Module. The signals are processed on the module according to the controls on the Frame Store subpanel, delayed and sent to the Frame Store output on the optional Serial Output Module and to the reentry crosspoints. The Frame Store Mezzanine Board mounts on the Frame Store Module.

Microprocessor control of the module is from a resident microprocessor on the module and the HOS processor.

Timed Aux Output Module (064852) (Slot D3)

The basic function of the Timed Aux Output Module (TAO) is to provide four sets of aux video / key outputs in time with the program output to feed an external DVE. These signal can then be manipulated in the DVE and sent back to the switcher.

There are eight identical channels on the module. In one typical channel, the aux bus signal arrives from the Crosspoint Module. The signal is de-serialized, descrambled, and presented to a RP-125 decoder ASIC.

The ASIC is used in a standard fashion to re-synchronize and demux the signal. The timing signal is also used to provide delay information to a pair of HSP-9501 delay lines. The delayed Y and C components of the signal are muxed together by RP-125 encoder. Finally, the signal is scrambled and serialized.

The Timed Aux Control Module(064855) (latches the VID Data and control data, and sends it on the backplane to the Timed Aux Output module. The Timed Aux Mezzanine (064854) is mounted on the double-wide Timed Aux Output module located in cell D2 and D3.

NOTE: *Note that the TAO module will not work on the Extender Module.*

Control Module Description

In the Signal Processing Frame there are two Control Processor Modules (Control Processor 1 and Control Processor 2).

The multiple microprocessors are designed to prevent total loss of system control if one of the processors fails. To accomplish this some of the modules have address and data buses for more than one processor. If one of the processors fails, the rest of the system continues to function but with some reduced capability.

The control signals begin in microprocessors present in the control panel. The pushbuttons and shaft encoders of the control panel are scanned and any change in the status of the controls is noted by the appropriate controller and sent to the Control Processor Modules in the signal processor frame.

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

M / E 1 control is handled by the M / E Mezzanine Board (068916) installed on Control Processor 1 (064805).

M / E 2 control is accomplished by the M / E Mezzanine Board (068916) installed on Control Processor 2 (064806).

M / E 3 control is accomplished by the M / E Mezzanine Board (068916) installed on Control Processor 2 (064806).

DSK control is handled by the Head of State (HOS) Mezzanine Board (068919) installed on Control Processor 1 (064805). The HOS processor has overall control of the system.

Strobe: There is a strobe from the processor modules to each of the other modules to select that module.

Batteries: Each of the processor modules has a lithium battery installed. They are the power source for the battery backed up RAM when power is removed from the module.

CAUTION

Be careful not to short out the battery. This can cause permanent damage to the battery and loss of the data in battery backed up RAM.

Control Processor 1 Module (064805) (Slot A1)

The Control Processor 1 Module has three processors, one on the processor module and one on each of two mezzanine boards.

The three processors do the following tasks:

Communications Processor 1:

- Sends status information to panel
- Controls modem port
- Controls diagnostic terminal port

The Head of State (HOS) Mezzanine Board

- Tracks switcher state information
- Controls Program, Preset, DSK operation
- Controls analog I/O configuration
- Communicates with panel
- Overall control of the system

M/E 1 Processor Mezzanine Board

- Controls M/E 1 operations
- Communicates with panel

The function, inputs, outputs and processor used on the Control Processor 1 Module are given below.

Input signals:

- Vertical sync from the Sync Generator Module
- Clock from the Sync Generator Module
- 4X3/16X9 signal from the Sync Generator Module
- 50Hz/60Hz from the Sync Generator Module
- Power supply voltages

Output signals:

- Address and data buses to all modules
- Reset signal to all the modules
- Module Select to all modules
- Two address and data buses between Control Module 1, Control Module 2, and the communications Carrier Module

LEDs: There is an LED for each microprocessor in the Model 4000. These LEDs light to indicate correct operation of the microprocessor. The LED labeled COMP lights to indicate that all of the installed processors are operating correctly. All processors may not be installed. There are LEDs for the +5.0V and -5.2V.

Reset Switch: Resets all of the processors in the Model 4000.

Programming switch: This switch enables the +12V necessary to program flash memory. A yellow LED indicates this switch is in the program position; a red LED indicates the flash memory is being programed.

Diagnostic Port connectors: two connectors for connecting a terminal to the switcher for diagnostics.

Control Processor 2 Module (064806) (Slot A2)

The Control Processor 2 Module has up to three processors, one on the processor module and the others on the mezzanine boards. This module contains the global RAM that all the processors use. This is the primary method used for the various processors to communicate with each other.

LEDs: There are two LEDs on this module. One LED for +5.0 V and the other for -5.2V.

The Control Processor 2 Module has up to three processors that have the following tasks:

Communications Processor 2:

- Controls GPI communications
- Controls remote aux communications
- Controls tally communications
- Controls editor communications

M/E 2 Processor Mezzanine

- Controls M/E 2 operations
- Communicates with panel

M/E 3 Processor Mezzanine (4000-3 only)

- Controls M/E 3 operations
- Communicates with panel

Communications I/O Module (064823) (Slot C3)

This module has several connectors which transfer signals between the external circuits and the Model 4000.

- Connectors for the tally relays on Control Processor 2 Module
- Connector for the Control Panel
- Connector for editor
- Connector for remote aux control
- Connector for modem

There is one active circuit on the module:

- Input circuit for the analog reference video

Expanded Communications Carrier Module (064824) (Slot C1)

The Communications Carrier Module has one processor that does the following:

Communications Processor 3

- Controls Ethernet communications
- Controls other serial communications

Processors Used:

HOS

GPI Module (064825) (Slot C4)

The GPI Module provides connectors for the GPI relays which are located on Control Processor 2.

The GPI Module has a device which will open the +5 Volt supply if the +5 Volt supply is shorted. This condition will last until the short is removed.

Tally Control Module (064808)

The tally data from Communications Processor 2 on Control Module 2 is sent via an RS-422 connector. This data is translated by the on board microprocessor and sent to the appropriate relays. There are DIP switches on the module which tell the processor how to interpret the data.

Control Panel Description

The Model 4000 has three Control Panels available. The smaller size of the Model 4000-2A (24 inputs) and 4000-2B (16 inputs) panel is achieved through greater use of shared subpanels that are delegated to the M / Es. The Model 4000-3 is more appropriate for live operation by having independent panel functions, separate Key buses, and more inputs available.

Control Panel Components

The following figures show the major Control Panel components and rear panel connections for the Control Panel.

The Control Panels consist of metal tubs with hinged top plates that contain knobs and switch assemblies. Gas shock absorbers on the lower tubs limit the speed of opening and closing the tubs; preventing the lid from closing too fast and slamming against the tub rim. Circuit modules and other components are located in the Control Panel tubs.

Rear panel connections contain power connections for either 110 / 220 VAC (auto-ranging).

NOTE: *Power supplies are discussed later in this section.*

Model 4000-2A/B Control Panels

Control Panel components include the following:

- Control panel CPU module: handles communications with the frame, floppy disk and flat display, and responds to PuP communications.
- One power supply: provides +5Vdc and +14Vdc power to the Control Panel tub and top plate assemblies. A redundant Power Supply option is available for the Control Panel. Power supplies are hidden under a cover inside the tub, which protects the operator from hazardous voltage. Power ON / OFF and fuse access are accessible via a cutout in the power supply cover.
- Standard system has AC source power input with EMI filter, replaceable fuse and power switch: provides power to the internal power supplies. Optional redundant power supply has duplicate AC source power input, filter, fuse, and switch.
- Rear Panel I / O Connector Assembly: contains the external connectors for the frame, status terminal and pointing device, and also an internal ribbon cable interconnect for the CPU module. Two LEDs show power status (+5Vdc and +14Vdc).
- Gas Shock: provides lift mechanism for the Control Panel lid.

Top plate components include the following:

- Upper Control Panel PuP (peripheral utility processor) circuit module: monitors and controls actions on the Upper Right Switch module, Soft Button Switch module, and Upper Left Switch module. It also controls the display of all lamps on the upper panel.
- Lower Control Panel PuP circuit module: monitors and controls actions on the Lower Right Switch module, Lower Center Switch module, and Lower Left Switch module. It also controls the display of all indicator LEDs and lamps on the lower panel.
- Lower Left Switch Assembly: contains the crosspoint and preview / Aux Bus pushbutton switches.
- Lower Right Switch Assembly: contains the pushbutton switches, shaft encoders and knobs, indicators and lever arm for the Mattes sub-panel, Chroma Keyers sub-panel, Bus Delegate switches and Master Effects Memory sub-panel.
- Lower Center Switch Assembly: contains pushbutton switches, shaft encoders and knobs, indicators and lever arms for the DSK sub-panel, Keyers sub-panels, Transition sub-panels, Preview-only switches and Aux 1-4 Effects Send-only switches.
- Upper Left Switch Assembly: contains pushbutton switches, shaft encoders and knobs for the External Interfaces sub-panel, Frame Store sub-panel and Menu buttons area.
- Soft Button Switch Assembly: contains pushbutton switches for the nine menu selection buttons located under the flat panel display.
- Upper Right Switch Assembly: contains pushbutton switches, shaft encoders and knobs, and indicators for the Masks and Wipe sub-panels. Also present are four shaft encoders and knobs for the soft knobs located next to the flat panel display.
- Positioner Assembly: contains the positioner joystick.
- 3.5" Floppy Disk Drive: contains a 3.5" floppy disk drive mounted in a metal support bracket. The drive is connected directly to the Control Panel CPU module.
- Flat Panel Display: 512 by 256 pixel electroluminescent display connected directly to the Control Panel CPU module.

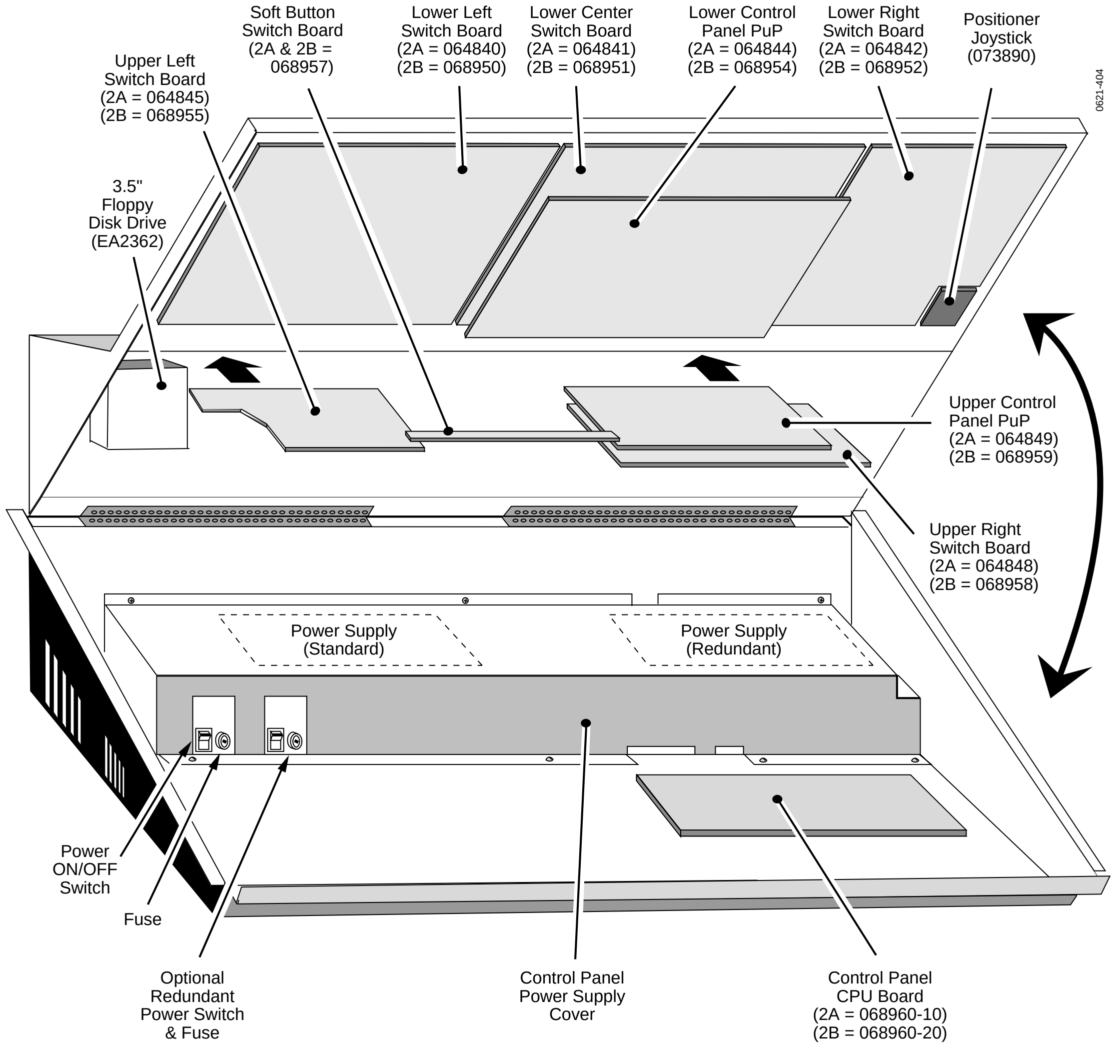


Figure 3-11. Model 4000-2 Control Panel Components.

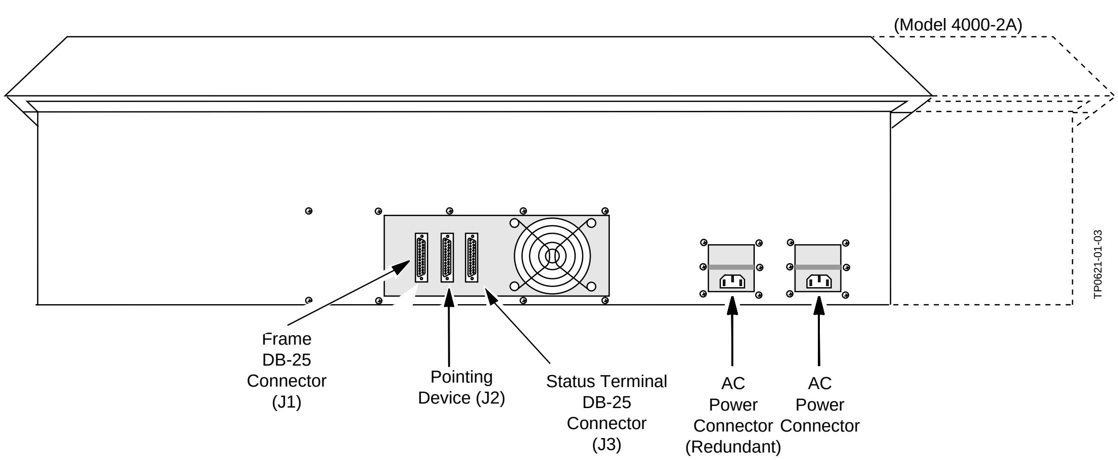


Figure 3-12. Model 4000-2 Control Panel, Rear View.

Model 4000-3 Control Panel

The Upper Control Panel components include the following items:

- Control panel CPU module: handles communications with the frame, floppy disk drive and flat display, responds to Upper and Lower PuP communications, and coordinates diagnostic activity and software loading.
- Upper Left Switch Assembly: contains pushbutton switches, shaft encoders and knobs for the External Interfaces sub-panel, Frame Store sub-panel and Menu buttons area.
- Upper Right Switch Assembly: contains pushbutton switches, shaft encoders and knobs, and indicators for the Masks and Wipe sub-panels. Also present are four shaft encoders and knobs for the soft knobs located next to the flat panel display.
- 3.5" Floppy Disk Drive: contains a 3.5" floppy disk drive mounted in a metal support bracket. The drive is connected directly to the Control Panel CPU module.
- Flat Panel Display: 512 by 256 pixel electroluminescent display connected directly to the Control Panel CPU module.
- Soft Button Switch Assembly: contains pushbutton switches for the nine menu selection buttons located under the flat panel display.
- Upper Control Panel PuP (peripheral utility processor) circuit module: monitors and controls actions on the Upper Right Switch module, Soft Button Switch module, Upper Left Switch module, and Aux Bus Switch module. It also controls the display of all lamps on the upper panel.
- Aux Bus Switch Modules: a total of three (3) modules that contain pushbuttons associated with the Aux buses.
- Upper Distribution Module: routes signals from external devices to various modules in the Upper Panel; also, provides power distribution and fusing for the Upper Panel.

The Lower Control Panel components include the following items:

- One Power Supply: provides +5V dc and +14V dc power to the Control Panel tubs. A redundant Power supply option is available for the Control Panel. Power ON / OFF and fuse access are accessible on the front of the power supply cover. Power Supplies (Standard and Redundant) are identical and physically interchangeable.
- Mix Effects Modules: each of the three (3) Mix Effects groups operate independently from each other. Within each group is found the following:
- Mix Effect Processor Module: coordinates all pushbutton, lamp, lever arm, and knob activity with its group, and communicates directly with the Signal Processor Frame.
- Eight and Sixteen Input Switch Modules.
- Either Left or Right Lever Arm modules.
- Program Preset Modules consist of the following modules:
- Flip Flop Mix PuP Module: coordinates all pushbutton, lamp, lever arm, and knob activity with its group, and communicates with the CPU module located in the Upper Control Panel tub.
- Eight and Sixteen Input Switch Modules.
- Either Left or Right Lever Arm modules.
- E-MEM Switch Module
- FF Mix / DSK Switch Module
- Lower Control Panel Distribution Module: Provides power distribution and fusing to modules in the Lower Control Panel, routes communications between upper and lower Control Panel, and provides load sharing between the standard and redundant Power Supplies.
- Gas Shock: provides lift mechanism for the lower Control Panel lid.

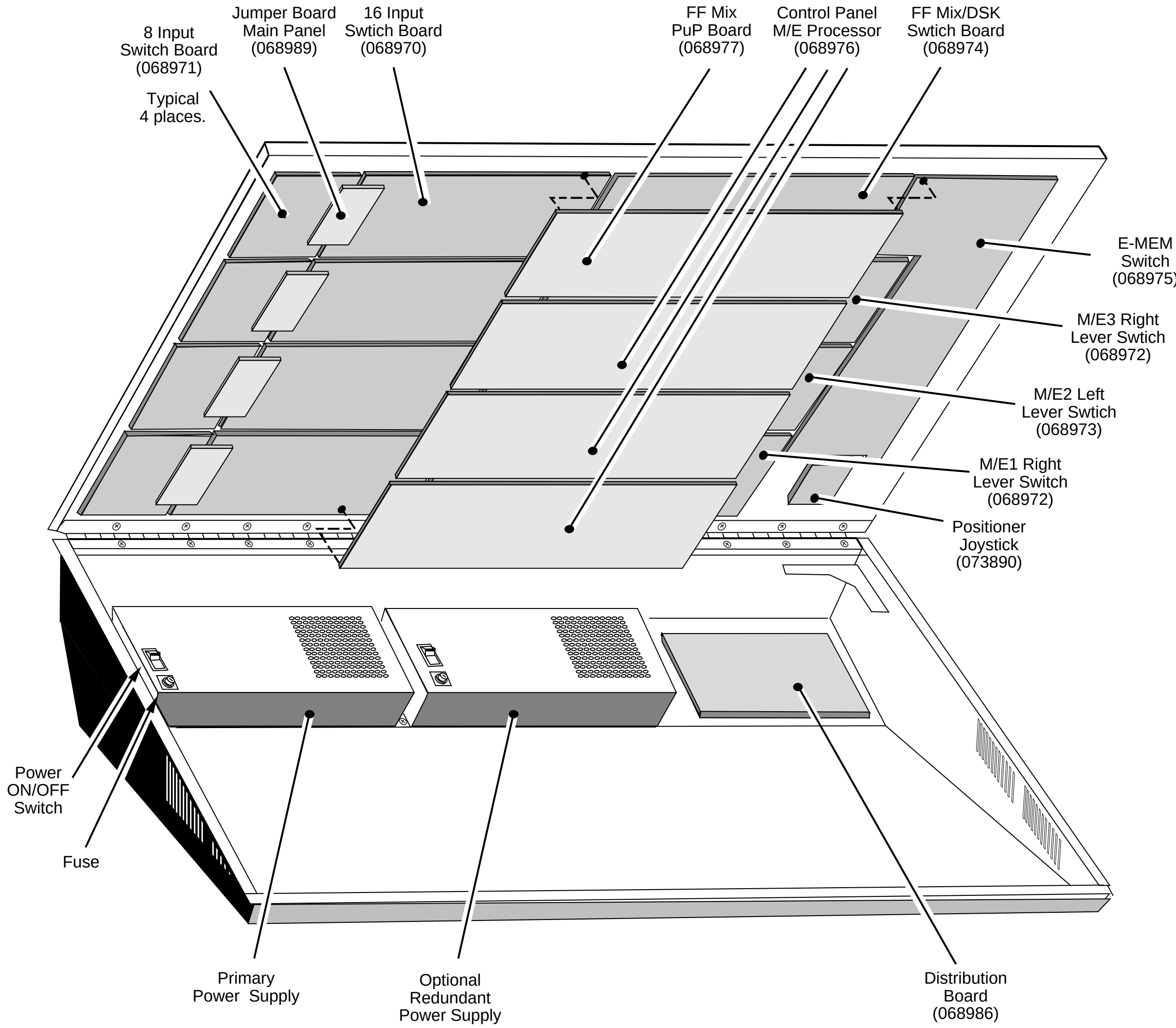


Figure 3-13. Model 4000-3 Lower Control Panel Components.

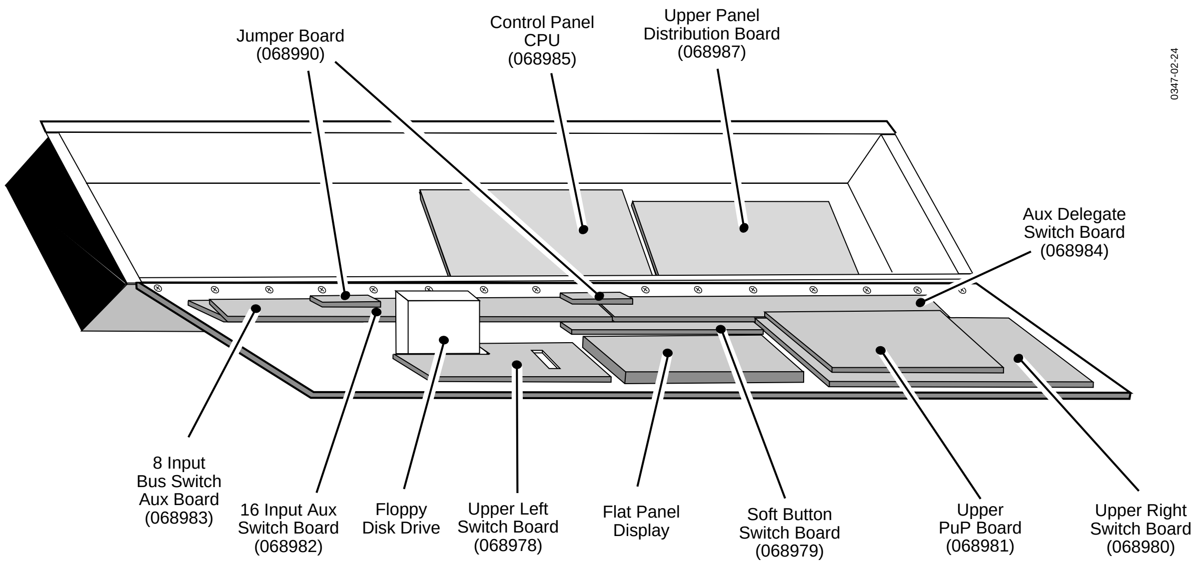


Figure 3-14. Model 4000-3 Upper Control Panel Components.

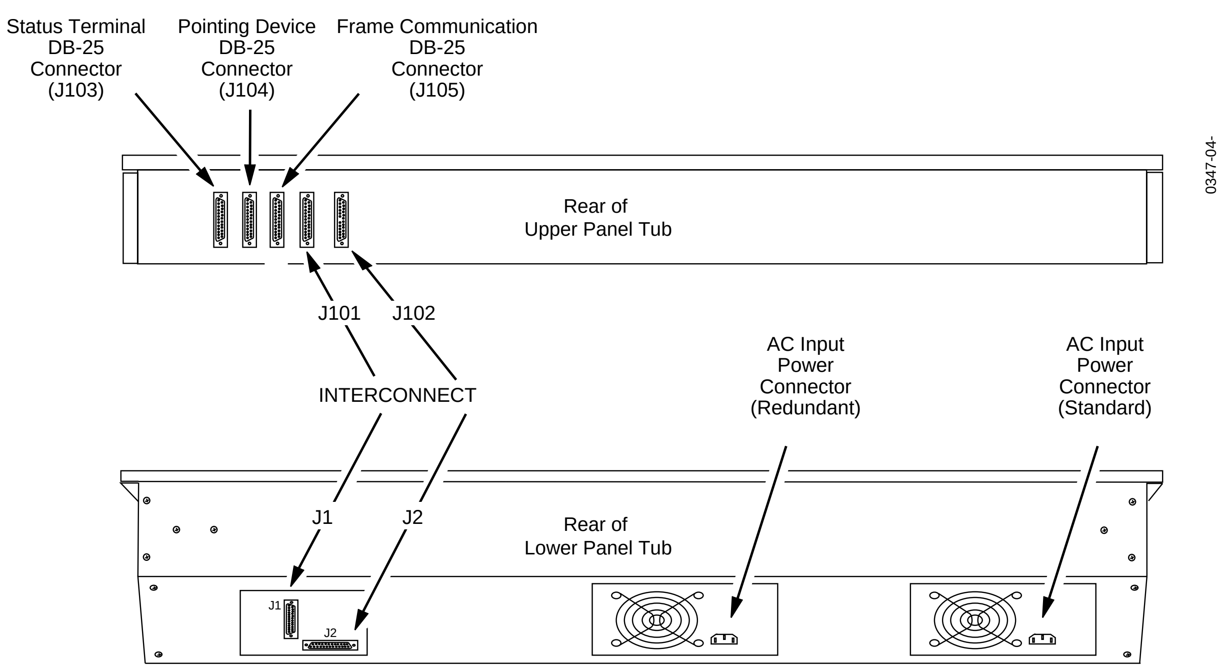


Figure 3-15. Model 4000-3 Control Panel, Rear View.

Control Panel Functional Operation

The following pages discuss the functions of the circuits in the Model 4000 Control Panels.

Model 4000-2A/B

Communication between the frame and the Control Panel is over a single cable containing five sets of serial lines as follows:

- M / E 1 data link (serial port) transfers data to and from M / E 1 communications processor in the signal frame. The Control Panel CPU module reads and writes data to the 38K baud asynchronous RS-422 port. The Control Panel CPU communicates the status of all PuPs, switches, knobs and lever arms to the M / E 1 processor on the Controller module.
- M / E 2 data link performs exactly the same functions as M / E 1 but for M / E 2.
- F / F Mix data link is a serial port that transfers Flip / Flop Mix / DSK data to and from the frame via a peripheral processor on the Controller module. The Control Panel CPU module reads and writes data to this synchronous 1.2M baud RS-422 port. The Control Panel CPU reads the status of the upper and lower PuP modules to transfer switch, knob, lever arm status, flat panel display and 3.5" disk data to a peripheral processor.
- Status Terminal port is a serial RS-422 port that transfers data between the frame and a VT-100-compatible status terminal. The terminal data lines are looped through an internal switch in the tub and on to the Signal Processor frame.

Processing of operator controls on the Control Panel is handled by two Peripheral Utility Processors (PuPs). One PuP monitors the upper Control Panel area and another monitors the lower panel.

The flat panel display is driven by a graphics controller / driver circuit on the Control Panel CPU module. Both text and bitmap graphic data are directed by the CPU to the controller for the actual work of pixel addressing, refresh and manipulation. A PuP is not used with the flat panel, the controller communicates directly with the CPU.

Another device that communicates directly with the CPU, is the 3.5" floppy disk controller circuit. Parallel data words are sent to and from the drive controller, which formats the data and handles all read / write drive control operations (head stepping, track / sector seek, etcetera).

The 68000 (series) MPU on the Control Panel Central Processor module has its own EPROM, RAM and support logic. Firmware contained in EPROM supplies the instruction for event scheduling, real-time operation, file management (3.5" disk) and device control.

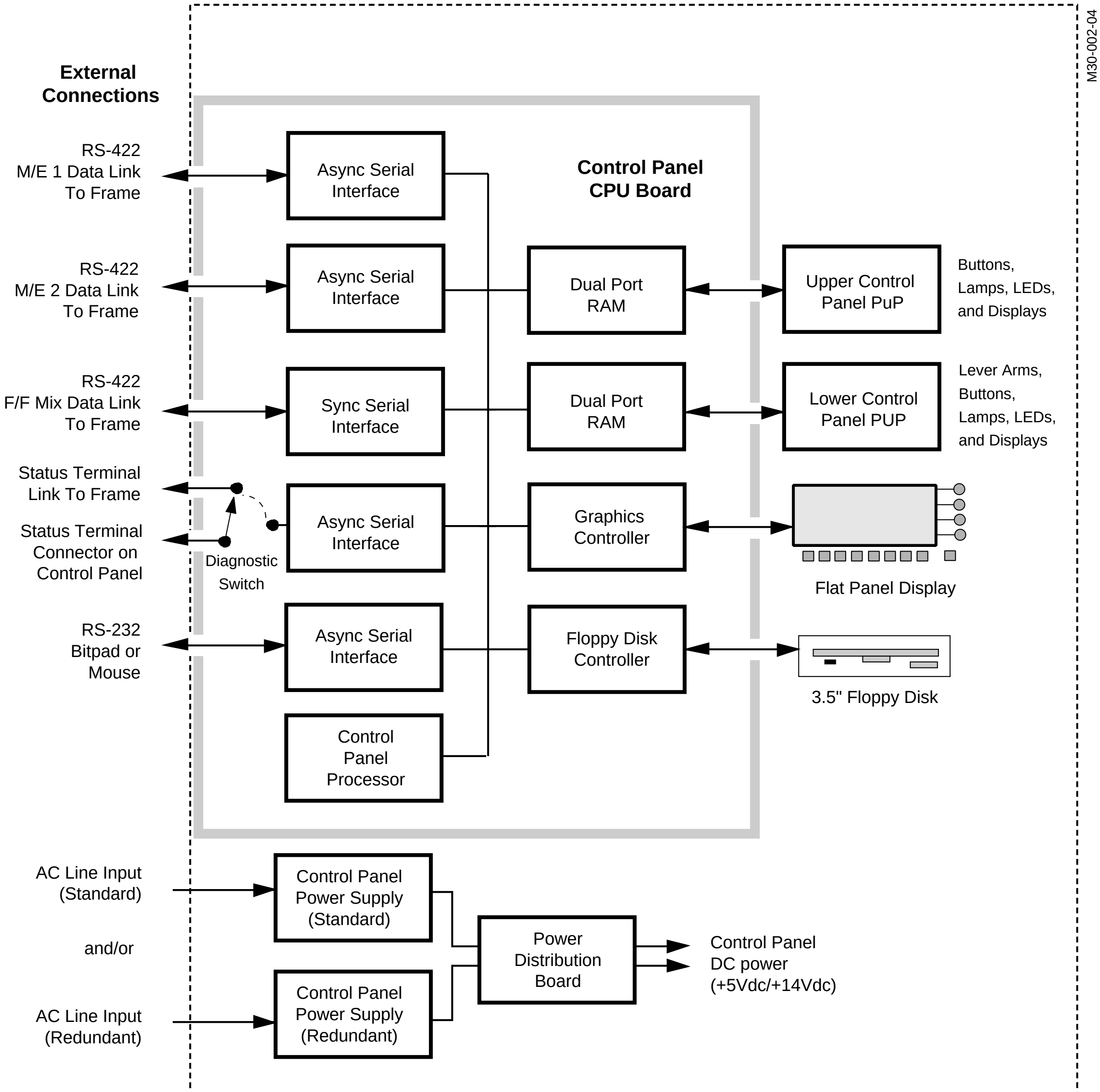


Figure 3-16. Model 4000-2 A/B Control Panel Functional Block Diagram

Model 4000-3

Communication between the frame and the Control Panel is over a single cable containing five sets of serial lines as follows:

- M / E 1 data link (serial port) transfers data to and from M / E 1 communications processor in the signal frame. The Control Panel Mix Effect processor module reads and writes data to the 38K baud asynchronous RS-422 port. The Control Panel M / E processor communicates the status of all switches, knobs and lever arms within its M / E group to the Mix Effect Processor in the Signal Processor Frame.
- M / E 2 data link performs exactly the same functions as M / E 1 but for M / E 2.
- M / E 3 data link performs exactly the same functions as M / E 1 but for M / E 3.
- F / F Mix data link is a serial port that transfers Flip / Flop mix / DSK data to and from the frame via a peripheral processor on the Controller module. The Control Panel CPU module reads and writes data to this synchronous 1.2M baud RS-422 port. The Control Panel CPU reads the status of the upper and lower PuP modules to transfer switch, knob, lever arm status, flat panel display and 3.5" disk data to a peripheral processor.
- Status Terminal port is a serial RS-422 port that transfers data between the frame and a VT-100-compatible status terminal. The terminal data lines are looped through an internal switch on the CPU module located in the Upper Panel tub, and on to the Signal Processor frame.

Processing of operator controls, other than the Mix Effects group, on the Control Panel is handled by two Peripheral Utility Processors (PuPs). One PuP monitors the upper Control Panel area and another monitors the lower panel.

The flat panel display is driven by a graphics controller / driver circuit on the Control Panel CPU module. Both text and bitmap graphic data are directed by the CPU to the controller for the actual work of pixel addressing, refresh and manipulation. A PuP is not used with the flat panel, the controller communicates directly with the CPU.

Another device that communicates directly with the CPU, is the 3.5" floppy disk controller circuit. Parallel data words are sent to and from the drive controller, which formats the data and handles all read / write drive control operations (head stepping, track / sector seek, etcetera).

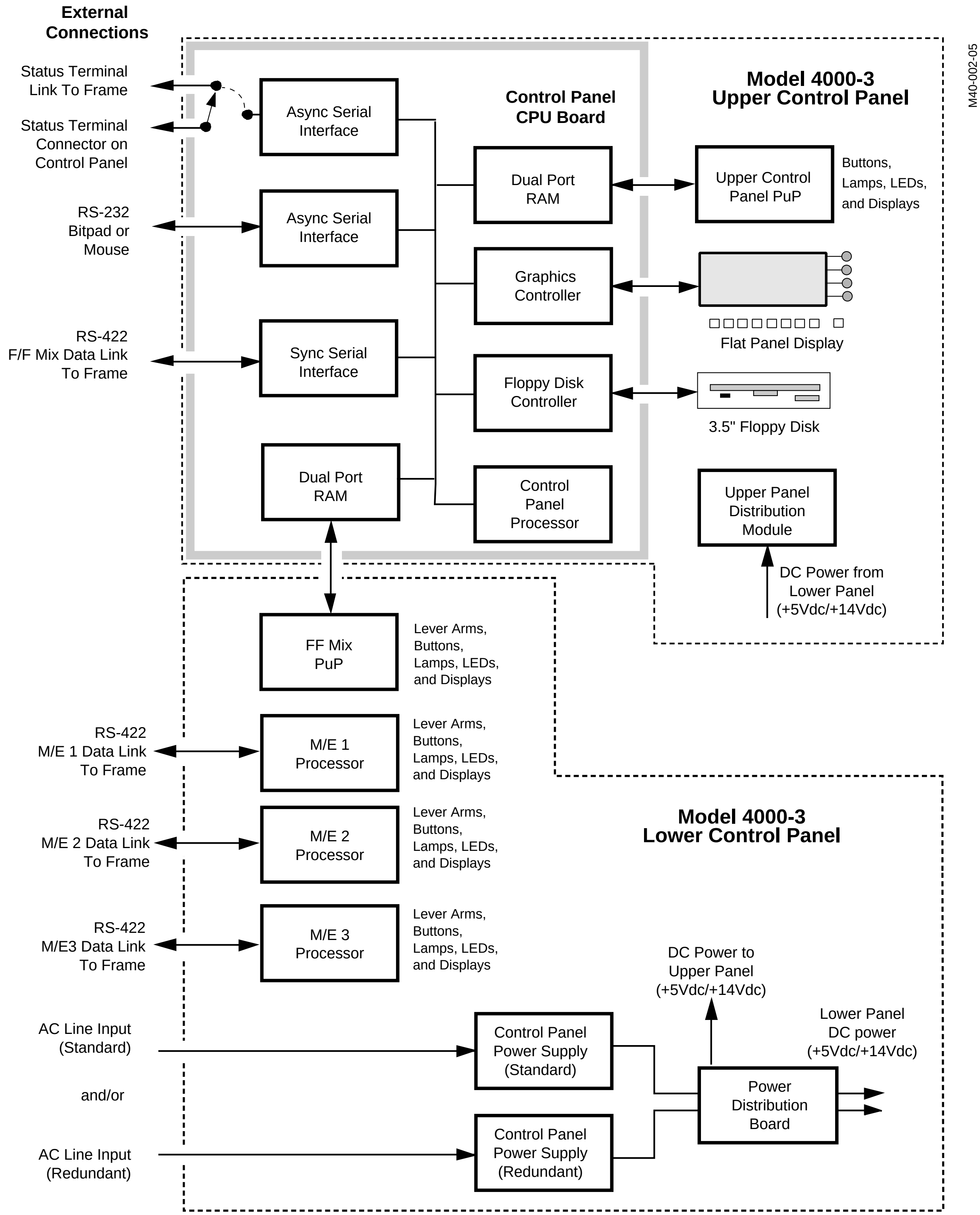


Figure 3-17. Model 4000-3 Control Panel Functional Operation, Block Diagram

Peripheral Utility Processor (PuP) Functional Operation

The PuPs are used to handle low-level scanning of operator pushbutton switches, shaft encoders (rotation sensing devices), and lever arms. PuPs also drive the lamps inside the pushbutton switches and control segmented LED displays and status indicator LEDs.

Each PuP has a microprocessor/controller (68HC11) supported by DRAM, and EPROM memory. Buttons, knobs and lamps/LEDs are controlled using memory mapped I/O. Lever arm status is monitored by the lower PuP via serial peripheral registers that are read by its processor.

The PuP communicates data to the Control Panel CPU (68000 series) via dual-port RAM over buffered data and address buses.

Diagnostics for troubleshooting the PuP are built into the firmware. A diagnostics terminal can be connected to the PuP by a making a switch selection via a Control Panel tub switch that reroutes the external status terminal port to an RS-232 asynchronous serial port on the PuP.

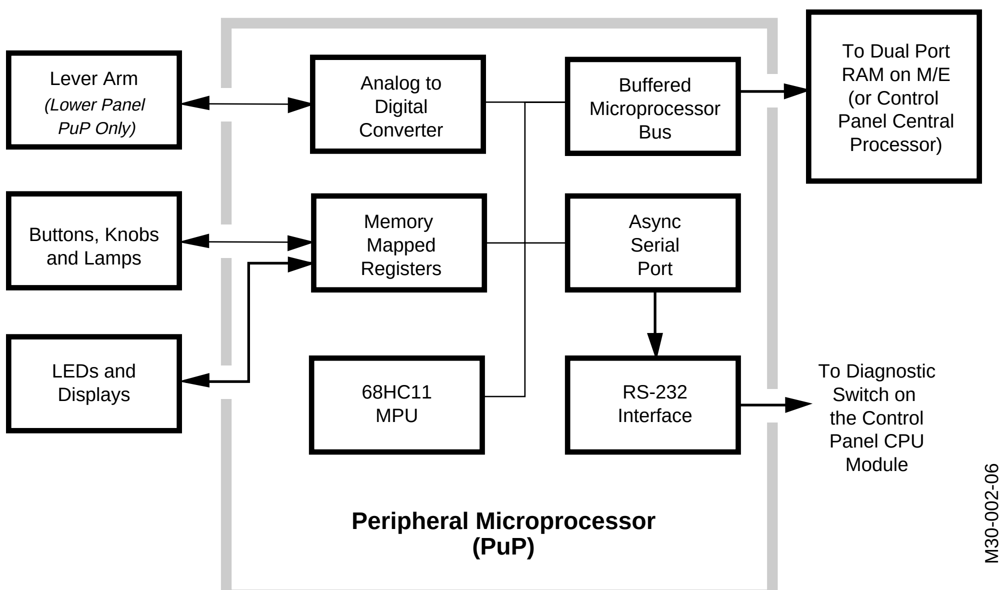


Figure 3-18. Peripheral Utility Processor (PuP), Block Diagram.

Power Supply Description

Power to the Control Panel and Signal Processing Frame is supplied by separate power supplies.

Control Panel

In a non-redundant configuration, the Control Panel contains one power supply that converts 110 VAC or 220 VAC (auto-ranging) to the internal DC voltages required.

In the optional redundant configuration, an additional power supply is housed in the Control Panel tub that converts 110 VAC or 220 VAC (auto-ranging) to the internal DC voltages required.

Signal Processing Frame

The standard Frame power supply is contained in a single 19-inch rack- mounted chassis installed below the Signal Processor Frame. It is configured for 220 VAC.

An optional redundant Frame power supply is also available to supply backup power in case the primary frame supply should fail. In the redundant configuration, the two supplies are current-sharing, so no switch over is required in the event that one should fail.

The standard and optional redundant power supplies are both 19 inch rack mounted chassis that are 12.5 inches high and 20 inches deep. Each chassis is slide mounted for ease of installation. Internal fans in the power supply chassis provide cooling.

Frame power supply status can be checked by viewing LED indicators on the front of the chassis (a secondary set of LEDs is mounted in the rear of the chassis behind the left hand perforated cover). Power Supply status is monitored by a readback latch on the Controller module and can be read by the operator from a status screen on the flat panel display.

Frame power supply connections are located on the rear of the frame.

To summarize a fully redundant configuration, the switcher has two 19-inch power supply chassis instead of one. Additionally, the Control Panel has two sets of power supplies internally in the tub, instead of one.

Remote Aux Panel

Each of the Remote Aux Control Panels contains two printed circuit modules. The Switch Module, which is different for each Remote Aux system, and the CPU Module, which is identical in each system.

- 068965 a one rack unit Remote Aux Switch Module
- 068963 a two rack unit Remote Aux Switch Module
- 068964 a three rack unit Remote Aux Switch Module
- 068966 a Remote Aux CPU Module

The CPU module contains the back panel setup switches, switch decoders, the communications interface, and the lamp and switch interface. The CPU Module contains the power supply for both modules in the system. The input +12 Volts uses a 2 Amp fuse, and a 5 Volt regulator. The +5 Volts powers the processor module, and the +5 and +12 Volts power the Switch Module.

The Switch Module contains the switch and lamp decoding circuitry.

4 Maintenance

Introduction

This section provides maintenance and safety information for servicing the Model 4000 Signal Processor Frame, Control Panel, and Frame Power Supplies.

Refer to the Diagnostics and Troubleshooting section (Section 5 of this manual) for procedures to be used to isolate and resolve specific problems.

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 improper air flow and cause overheating of components.

Draining the Control Processor RAM

If, after installing a software update, your floppy disk drive does not respond, you need to drain the Control Processor RAM. The Model 4000 has two Control Processor modules. Follow the procedure listed below:

1. Remove the Control Processor I module located in Slot A1 in the Model 4000 Switcher Processor Frame.
2. Remove the jumper located near the Lithium battery.
3. Rremove the Control Processor II module located in slot A2 in the Switcher Processor Frame.
4. Remove the jumper across J9. Jumper J9 is located near the Lithium battery.
5. Wait 15 minutes for the dielectric-capacitors to discharge. Or, to expedite the discharge process, connect the right jumper-pin to the nearest ground. This action drains the capacitor’s charge immediately.
6. Replace the Control Processor I and II module into the Processor Frame.
7. Repower the Signal Processor Frame.

Powering Down

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.

CAUTION

When power to the Signal Processor Frame is turned off, current switcher state data (e.g., selected video/key sources, key memory, etc.), 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 boards from the Control Processor Modules will result in complete data loss from the battery-backed SRAM on the mezzanine boards removed. This occurs because the batteries supplying power to these boards are located on the main Control Processor Modules.

Servicing Circuit Boards and 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.

CAUTION

When removing circuit modules place them on a flat non-conductive surface. Failure to follow this precaution can result in loss of SRAM data due to battery discharge or component damage due to electro-static discharge.

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 4000 circuit modules are not designed to be repaired in the field unless a repair is authorized by Customer Service, usually in the form of a Field Modification Note. Failed modules should be replaced.

Surface mount technology and multi-layer printed circuit 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 unless directed to do so. Use of improper tools or equipment to repair surface mount components and multi-layer circuit modules could result in potentially expensive damage to your system.

WARNING

When installing or removing control cables for installation or troubleshooting purposes, follow recommended anti-static procedures at all times. All connectors are subject to static discharge damage. Use the same precautions as when handling static sensitive circuit boards.

Signal Processor Frame Servicing

The following section covers maintenance of the Signal Processor frame in the areas listed below.

- Signal Processor Frame Module Precautions
- Removing Modules From the Frame
- Servicing Frame Power Supplies
- Frame Air Filter Cleaning

Signal Processor Frame Module Precautions

WARNING

When Signal Processor Frame power is turned off, current switcher state data will be lost. When power is restored, the switcher will reset to either a user-defined default state, or a GVG factory default state (setup in the Define Defaults Menu). If you wish to save the current switcher state, "learn" the state to an empty E-MEM register. When the switcher is turned back on, you can recall that E-MEM register to return to the previous state.

WARNING

High current capability is present in the Signal Processor Frame. Remove all rings and other jewelry when working on extended circuit modules, and use caution when using metal tools in the vicinity of power buses.

CAUTION

Many of the circuit modules in the Signal Processor Frame are sensitive to static discharge. Failure to use proper static-control procedures while working on circuit modules may cause data loss and/or electrical destruction of static-sensitive devices.

Removing Modules From the Frame

There are two types of modules or circuit boards in the Signal Processor Frame. The frame modules are slide-in units that can be removed for servicing or replacement. Smaller submodules called mezzanines mount on the frame modules. The locations of the Signal Processor Frame bays, circuit modules and mezzanines are illustrated in figures in Section 2 or Section 3 of this manual.

Two circuit module extenders are provided with the system. One is for use with the main video processing and control modules located in the front bays of the switcher. The second is for use with the I/O and communications Modules in the rear bays. 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.

To remove a circuit module from the front A or B Bay of the Signal Processor Frame, proceed as follows:

1. Release the captive screws on the front door of the Signal Processor Frame by turning them counterclockwise. open the door.

2. Remove the modules by unlocking the top and bottom levers as shown in Figure 4-1. Pull the circuit module straight out and away from the frame.

3. Set the module on a static free surface and be aware there are fragile components on either side of the circuit board.

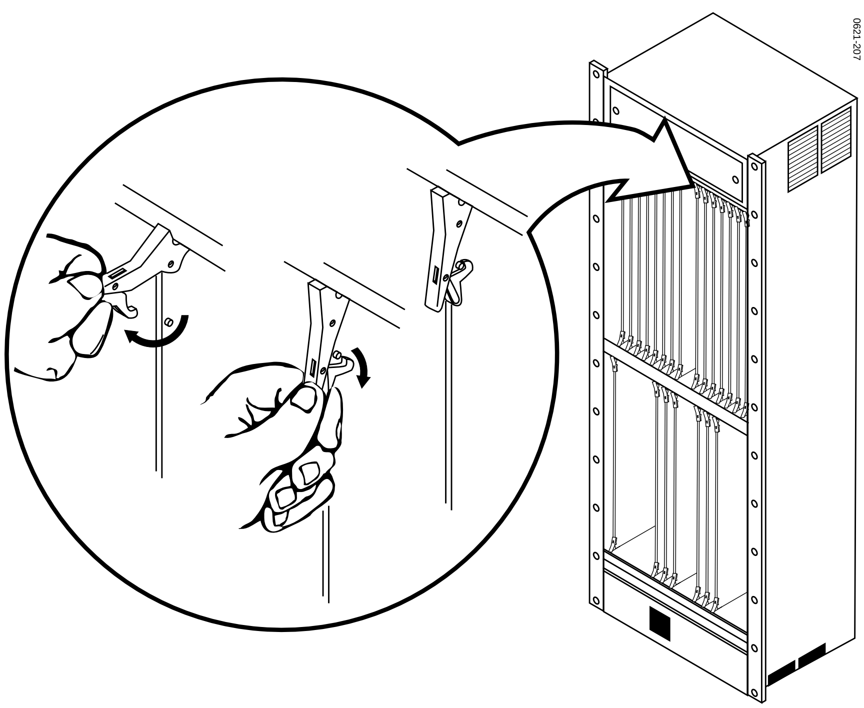


Figure 4-1. A and B Bay Module Removal

To reinstall modules in the A and B Bays of the Signal Processor Frame, do the following:

1. Place the module in the correct slot. Align the module in the guides and gently slide it in as far as it will easily travel.

2. Secure the module by moving the locking levers into the locked position, thereby seating the edge connector. See Figure 4-1.

To remove a circuit module from the rear C or D Bays of the Signal Processor Frame, proceed as follows:

1. If necessary uncable the cables attached to the modules. Make sure the cables are labeled for proper reconnnection. Remove the modules by first unscrewing the screws at the top and bottom of each module.

2. Unlock the top and bottom ejectors as illustrated in Figure 4-2 by pushing them away from each other. Pull the circuit module straight out and away from the frame.

3. Set the module on a static free surface and be aware there are fragile components on either side of the circuit board.

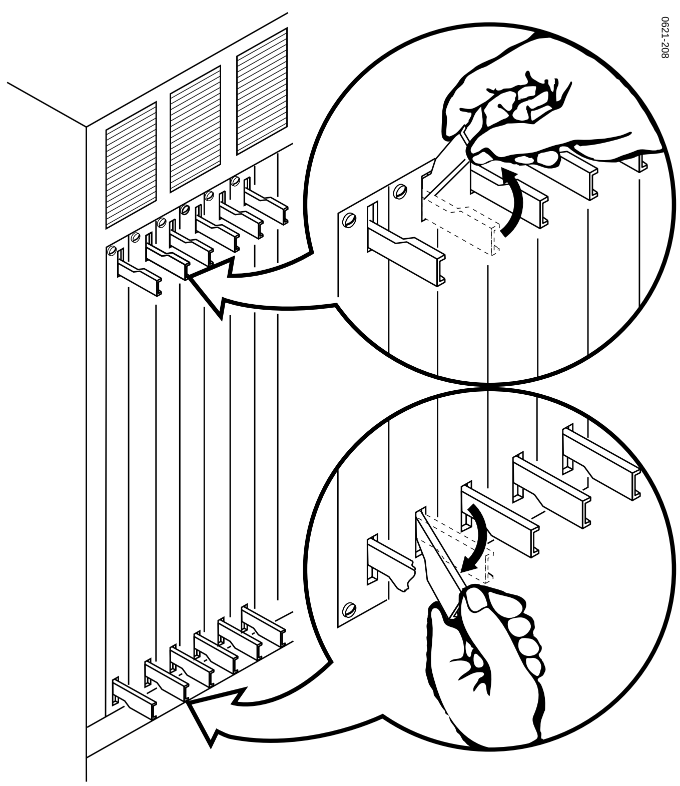


Figure 4-2. C and D Bay Module Removal

To reinstall modules in the rear C and D Bays of the Signal Processor Frame, do the following:

CAUTION

The EMI fingers may interfere with components located on adjoining boards. Caution must be used when replacing the boards in the Signal Processing Frame to prevent damage to the EMI shield.

4. Place the module back in its original slot. Align the module in the guides and gently slide it in as far as it will easily travel.

5. Secure the module by moving the locking levers into the locked position, thereby seating the edge connector. Reinstall the two screws at the top and bottom of the modules.

6. Recable the cables to the proper connectors.

Servicing Frame Power Supplies

Field repair of Model 4000 power supply internal power units is not supported or recommended. Failed power supply units 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.

Model 4000 Power Supply Configurations

The standard power supply configuration for the Model 4000 is a single supply chassis for the Signal Processor Frame and single supply for the Control Panel. These power supplies are separately connected to AC source power.

The Control Panel and Signal Processing Frame can each, optionally, be configured with a second (redundant) power supply.

The redundant supply for the Signal Processing Frame is identical to the standard supply. It is installed, in the rack below, and in tandem with the first. They are configured to share the current load, and the failure of a single supply should not cause a switcher failure.

When the Control Panel is configured with redundant power supplies, both supplies are installed inside the main control panel tub.

Frame Power Supply Assemblies

Each Signal Processor Power Supply assembly for a Model 4000 Switcher consists of a rack-mounted frame (assembly number 098901-XX) containing a Multi-Output Power Supply unit and a high-current +5 Volt Power Supply unit. The assembly number of the power supply frame is noted on the back of the frame. Grass Valley assembles and tests the power supplies; however, the individual power units in the power supplies are manufactured by other suppliers.

There are two suppliers of the individual power supply units—Pioneer Magnetics and Todd Products Corporation. Differences between the units and important notes about them will be presented here for ease of installation.

It is important to know what type of power units you have for the reasons listed below:

1. Because of differences in the electronic design, it is not possible to operate Pioneer and Todd power units of the same type in a *redundant power supply configuration*. In other words, you may not connect a Pioneer Multi-Output unit in parallel with a Todd Multi-Output unit, and you may not connect a Pioneer +5 Volt unit in parallel with a Todd +5 Volt unit.

2. A Model 4000-2A/B switcher with Todd power supply units may operate on 110VAC. Pioneer supply units must always operate on 220VAC.

3. Todd +5V power supply units are internally wired for power surge protection, Pioneer +5V power supply units are not. There is a jumper in the Model 4000 fan assembly at the top of the Signal Processor Frame which must be set to either bypass or enable a surge protection circuit depending on the type of unit present. Refer to the "Fan Jumper Settings" heading in Section 2 in this manual.

Before replacing your power supply, you will need to determine the type of supply units you have. To do this:

1. Locate the assembly number sticker on the back of the power supply frame. Systems with Pioneer power units will have power supply frames numbered 098901-00 or -01. Systems with Todd power units will have frames labeled 098901-03.

2. Remove the back covers on the left and right sides of the primary and/or redundant power supply frames. Leave the covers off for installation purposes later.

   You may distinguish between a Todd supply and a Pioneer supply as follows:

   Viewed from the front, both +5 V and Multi-Output Pioneer units are each about 5 inches wide, and each has a 4 1/2 inch diameter fan.

   The Todd +5 V unit (on the left) is about 3 1/2 inches wide. The Multi-Output supply is slightly narrower. Each supply has two cooling fans.

   From the rear, the Todd and Pioneer +5 Volt units can also be identified by the positions of the large power lugs on the rear of the supplies. They are arranged horizontally on the Pioneer supplies, and diagonally on the Todd supplies. For clarity however, both types of supplies will be illustrated in this manual in most cases.

Frame Power Supply Replacement

To replace the entire Frame power supply chassis proceed as follows:

1. Turn the main power switch on the front of the supply to the OFF position. The five green DC output LEDs on the front panel will extinguish. See Figure 4-3.

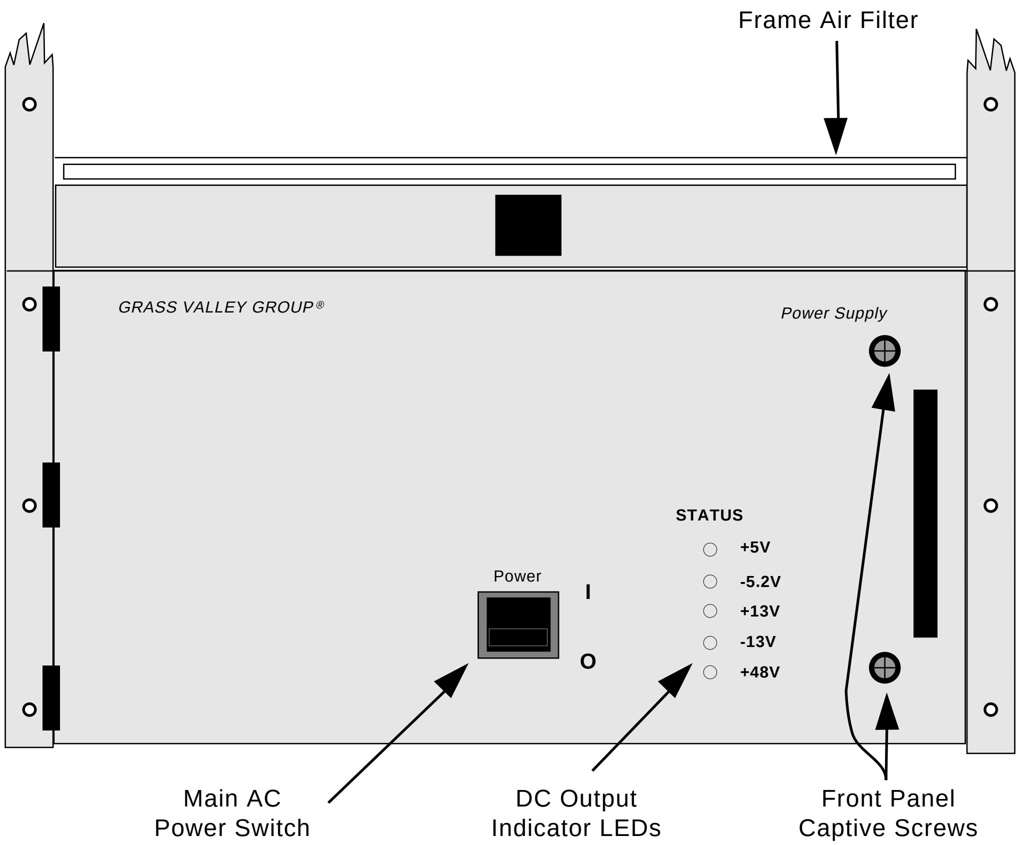


Figure 4-3. Frame Power Supply (Front) AC Switch Location

2. At the rear of the equipment rack, disconnect the AC power to the supply by unplugging the cable from the AC source.

3. Remove the left and right rear covers of the power supply chassis to expose the wiring connections, see Figure 4-4.

4. At the rear of the power supply chassis, disconnect the following:
   a. Disconnect the two plugs connected to the jacks at the top of the left rear opening in the chassis. See Figure 4-4.
   b. Remove the two nuts securing the large cables on the right rear opening in the chassis and disconnect the cables. See Figure 4-4.

NOTE: *Pioneer power supply units are shown in Figure 4-4. In the Todd power supply units, the lugs are diagonal.*

c. Locate and release the four captive slotted screws behind the top lip of the right and left hand openings in the chassis (Two screws on each side).

Figure 4-4. Frame Power Supply Connector Removal

WARNING

The chassis weighs approximately 125 lbs. It should be moved only by two persons or with the aid of some type of mechanical lifting device. Failure to follow this precaution could result in injury or damage to the equipment.

5. Place a wheeled cart or some appropriate support in the front of the power supply chassis to support it as it is removed.

6. Release the chassis from the rack by removing the screws at the front of the chassis at the left and right hand lip. See Figure 4-3.

WARNING

If the equipment rack is not securely bolted down to the floor, do not extend it on its mounting rails. The weight of the power supply chassis, when extended on the mounting rails, is enough to topple the equipment rack if it is not bolted down or otherwise supported. Failure to follow this precaution could result in injury or damage to the equipment.

7. While guiding the heavy cables at the right rear through the cut-out in the chassis, pull the chassis out on its mounting rails until they are fully extended.

8. Release the chassis from the rails by locating and pressing the two release buttons (one on each rail).

9. Using two persons or an appropriate lifting device, remove the chassis from the mounting rails.

WARNING

If you are replacing a power supply in a system using a primary and a redundant power supply, make sure the power supply units in the replacement supply are of the same type (Pioneer or Todd) as the existing supply. See page 4-9 ***of this section for more information.***

10. To reinstall the power supply or install a replacement supply reverse the previous steps.

Replacement of Individual Power Supply Assemblies

If it is necessary to replace an individual power supply in the Signal Processor Frame Power Supply, it is important for you to be aware of the following information:

- Two types of power supplies are used in the Signal Processor Frame Power Supply for the 4000 Switchers—a Multi-Output supply and a high-current +5 Volt supply.
- Power supply units from two different manufacturers—Pioneer Magnetics and Todd Products Corporation—have been used in the Signal Processor Frame Power Supplies.

The units from the two manufacturers are very different in appearance, but are electrically compatible, with the following exception:

> In a redundant power system, the two +5 Volt supplies must be of the same “make” and the two Multi-Output supplies must be of the same make. (The +5 Volt and Multi-Output supplies, however, may be of different makes.)
>
> This means that if you need to replace *one* power supply assembly in a redundant power system, you must either replace that supply with one of the same make, or replace *both* supplies that operate in parallel.

Check to see that your replacement is compatible in a redundant system, and, if necessary, contact Grass Valley Customer Service.

NOTE: *In a non-redundant power system, if both power supply units (one Multi-Output and one +5V) in the single power supply frame are Todd supplies, the frame can be wired to operate on 110 volts, as described in the Installation Section of this manual.*

Configurations

Each power supply comes as a complete assembly (“sled”) that must be replaced as a unit. As viewed from the rear of the frame, the +5 Volt supply assembly is located in the compartment at the right side of the chassis and the Multi-Output (+13V / –13V / –5.2V / +48V) supply is located in the compartment at the left.

Procedures

The following procedures (one for the Multi-Output supply and one for the +5 Volt supply) describe replacing Pioneer power supply assemblies with Todd power supply assemblies.

For any of the other three possible replacements—replacing a Pioneer unit with a Pioneer, replacing a Todd unit with a Todd, or replacing a Todd unit with a Pioneer—use the following procedures as guides and perform the appropriate steps.

Replacement of Multi-Output Power Supply Assembly

NOTE: *In order to replace a Pioneer Multi-Output supply with a Todd Multi-Output supply, you will need to have the installation kit that is part of Field Modification Note FM2025.*

To replace a Pioneer Multi-Output assembly with a Todd Multi-Output assembly, proceed as follows:

1. On the front panel of the main Signal Processor Frame Power Supply, turn off the main power switch. The indicator LEDs on the front panel will go out.

   If there is a Redundant Signal Processor Frame Power Supply, also turn off its main power switch.

2. Inside the switcher Control Panel, turn off the main Control Panel Power Supply switch and (if present) the redundant Control Panel Power Supply switch.

3. At the rear of the equipment rack, disconnect AC power from the Signal Processor Frame Power Supply by unplugging the cable from the AC power source.

   If there is a redundant Signal Processor Frame Power Supply, also disconnect it from the AC power source.

WARNING

If a redundant power supply is installed, power to both supplies must be disconnected, due to the interconnecting wiring.

Removal of Pioneer Multi-Output Supply

1. Remove the left rear cover of the power supply frame, as viewed from the rear, to expose the wiring connections at the rear of the Multi-Output power unit. See Figure 4-5.

   If this is the upper power supply in a redundant power system, also remove the left rear cover of the lower power supply.

2. Disconnect the two connectors that plug into the jacks at the top of the left rear compartment. (Hint: To release the connectors, squeeze the near and far side tabs on the large connector, and the left and right side tabs on the four-wire connector.

   If this is the upper power supply in a redundant power system, also disconnect the corresponding two plugs in the lower power supply frame.

3. Unplug the small multiwire connector that connects to the top of the circuit board containing the power supply indicator LEDs.

4. At the upper right of the compartment, on the rear of the power supply unit, remove the terminal block cover (if present) and disconnect the blue and brown wires from the terminal block. The green / yellow wire may be left in place.

5. Push the two wires back through the hole into the frame cavity, so they will not interfere when the sled is removed.

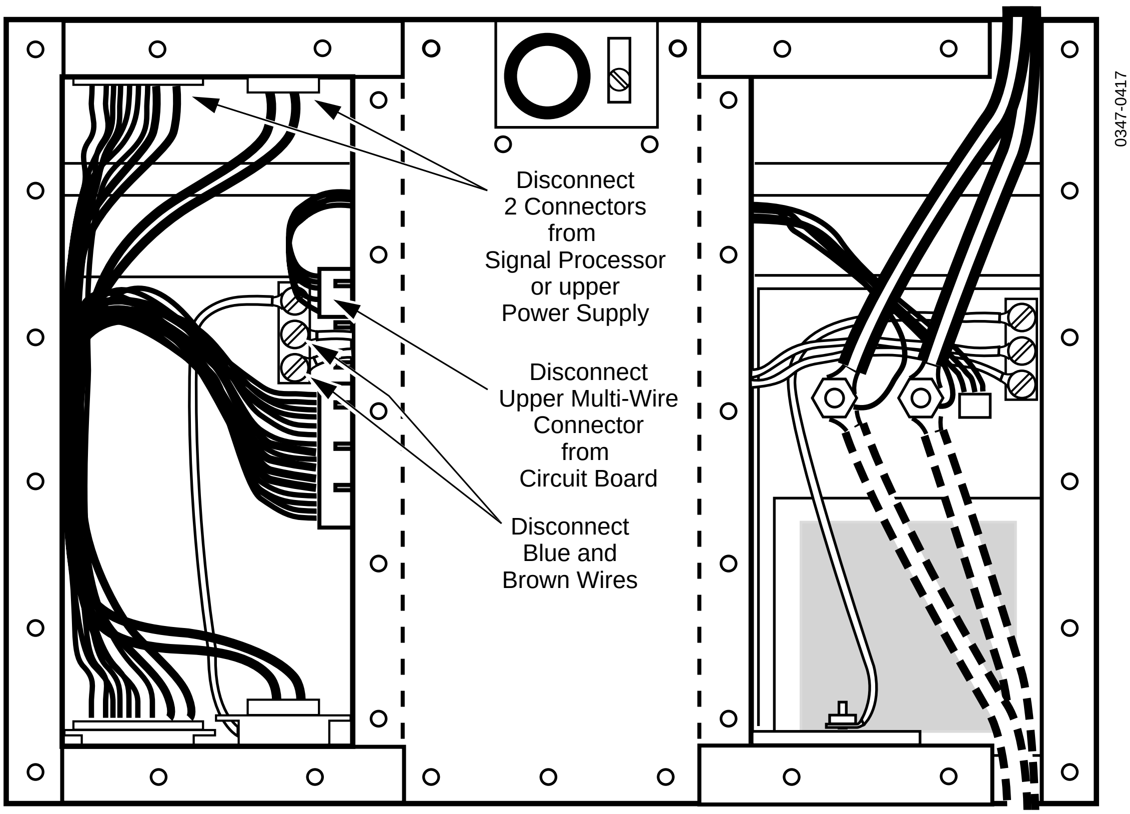


Figure 4-5. Removal of Pioneer Multi-Output Power Supply Assembly

6. Open the door at the front of the power supply frame.

7. Remove the two screws at the bottom that secure the Multi-Output supply to the power supply frame.

8. Carefully slide the supply assembly forward, out of the frame, taking care that the wiring follows freely.

Installation of Todd Multi-Output Supply

Installation of the replacement supply is *not* a simple reversal of the removal procedure. The reason for this is that the AC power connection on the Todd supply is at the upper left corner of the unit, whereas the connection on the Pioneer supply is at the upper right.

Mount Terminal Block

1. Before installing the new power supply unit in the frame, mount the terminal block (provided in the Field Modification kit) on the rear of the Todd Multi-Output power assembly, as shown in Figure 4-6. The terminal block has four terminals, but only two will be used. Remove and discard the four tab connectors from the terminal block, but keep two of the screws for the next step.

2. Install the blue and brown jumper wires from the kit as shown in Figure 4-6. Connect only the power supply ends for now. (You will have to disconnect the wires from the terminal block again when connecting the frame wiring later in this procedure.

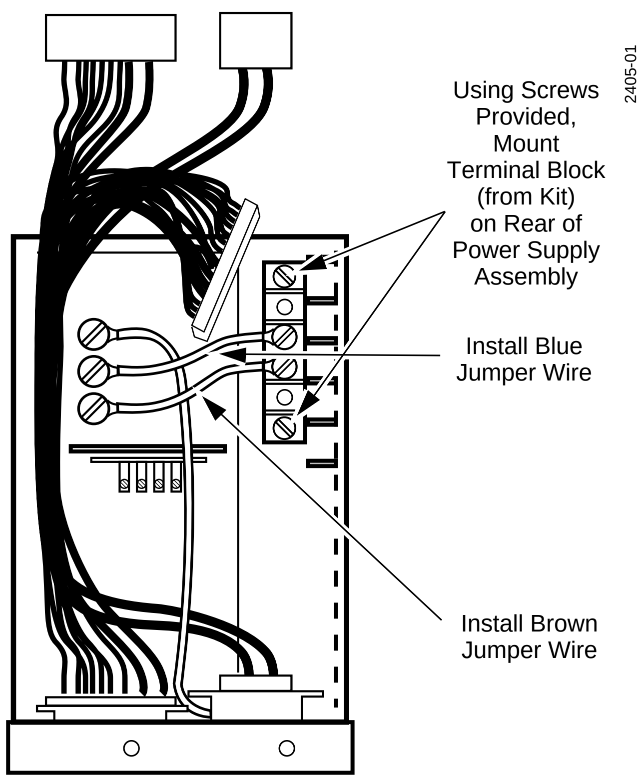


Figure 4-6. Installation of Terminal Block and Jumpers

Install Assembly in Frame

1. To install the replacement supply in the frame, slide it into place from the front of the frame, secure it with the two screws previously removed, and close the front door.

2. Disconnect the wide connector from the circuit board. (It's still connected in the Todd frame, even though you removed it in the Pioneer frame.)

3. At the terminal block you just installed on the Todd power unit, connect the blue and brown AC power wires you previously disconnected from the Pioneer supply, as shown in Figure 4-6. (These may be reached and pushed back into the power supply area from the front of the frame if necessary.)

4. Connect the blue wire coming out of the frame to the terminal with the blue jumper wire; connect the brown wire coming out of the frame to the terminal with the brown jumper wire.

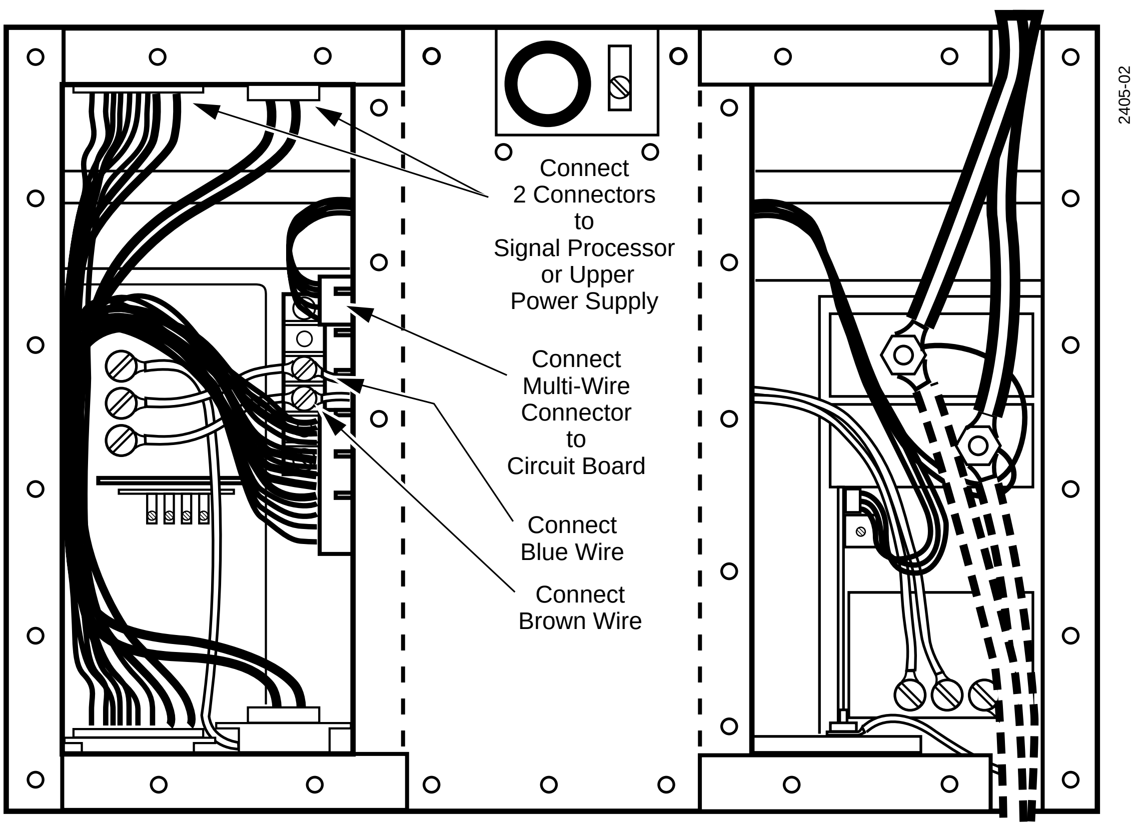


Figure 4-7. Installation of Todd Multi-Output Power Supply Assembly

5. At the top of the circuit board containing the indicator LEDs, reconnect the multiwire connector that you previously disconnected.

6. Reconnect the two plugs to the jacks at the top of the compartment.

   If this is the upper power supply in a redundant system, connect the corresponding plugs in the lower supply to their mates in the bottom of this supply.

7. Turn on the power supply.

8. Adjust the voltages, as in the Primary and Redundant Power Supply Voltage Adjustments procedure in Section 2 of this manual.

9. Reinstall the left and right rear access panels of the power supply.

10. If this is a *redundant* power system:

    a. You must first replace the Multi-Output power assembly in the *second* Power Supply frame (if it is not a Todd supply) by repeating the procedure given above.

    b. When you have completed the installation (of both Multi-Output supplies, if required), reconnect the power source and apply power to both units.

    c. Before you install the rear plates on the Power Supply frames, you must adjust the output voltages for load-sharing. Refer to the Primary and Redundant Power Supply Voltage Adjustments procedure in Section 2 of this manual.

Replacement of +5 Volt Power Supply Assembly

The following procedure describes replacing a Pioneer +5 Volt power supply assembly with a Todd power supply assembly.

For any of the other three possible replacements—replacing a Pioneer unit with a Pioneer, replacing a Todd unit with a Todd, or replacing a Todd unit with a Pioneer—use the following procedure as a guide and perform the appropriate steps.

Removal of Pioneer +5 Volt Supply

To replace a Pioneer +5 Volt assembly with a Todd Multi-Output assembly, proceed as follows:

1. On the front panel of the main Signal Processor Frame Power Supply, turn off the main power switch. The indicator LEDs on the front panel will go out.

   If there is a Redundant Signal Processor Frame Power Supply, also turn off its main power switch.

2. Inside the switcher Control Panel, turn off the main Control Panel Power Supply switch and (if present) the redundant Control Panel Power Supply switch.

3. At the rear of the equipment rack, disconnect AC power from the Signal Processor Frame Power Supply by unplugging the cable from the AC power source. If there is a redundant Signal Processor Frame Power Supply, also disconnect it from the AC power source.

WARNING

If a redundant power supply is installed, power to both supplies must be disconnected, due to the interconnecting wiring.

4. Remove both the right and left rear covers of the power supply frame, as viewed from the rear, to access the wiring connections. See Figure 4-8.

5. Remove the nuts and lockwashers and disconnect the heavy red and black cables from the studs. If this is the upper supply in a redundant system, remove the extension studs and the second set of heavy cables from this supply as well.

6. Disconnect the small multi-wire connector from the top of the circuit board in the left compartment of the power supply frame and feed it back through the holes into the +5 Volt supply compartment.

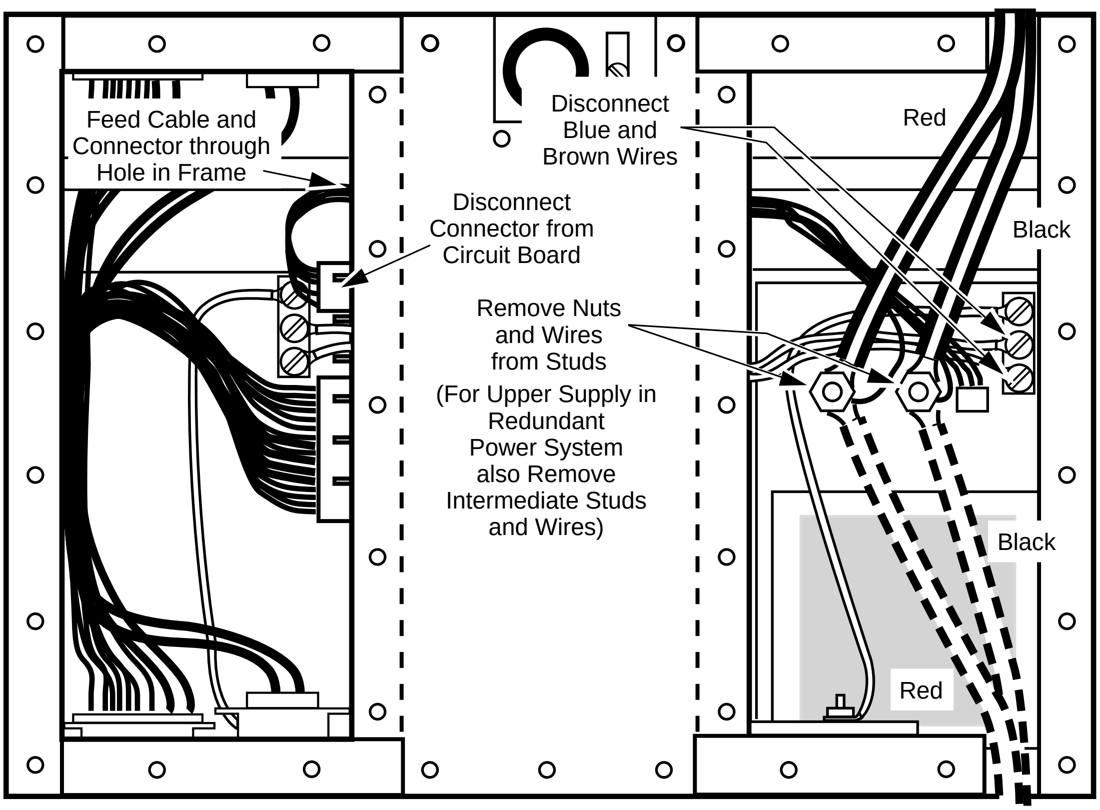


Figure 4-8. Removal of Pioneer +5 Volt Power Supply Assembly

7. At the right side of the compartment, on the rear of the +5 Volt supply, remove the terminal block cover (if present) and disconnect the blue and brown AC power wires from the terminal block. The green / yellow wire may be left in place.

8. Open the door at the front of the power supply frame.

9. Remove the two screws at the bottom that secure the +5 Volt supply assembly to the power supply frame.

10. Slide the supply assembly forward out of the frame, taking care that the wiring follows freely.

Installation of Todd +5 Volt Supply

1. To install the replacement supply, slide it into place and install the front mounting screws.

2. Feed the small multi-wire cable from the new power supply through the hole at the top left of the +5V supply compartment (see Figure 4-9), and on through the frame to the hole into the Multi-Output supply compartment. If necessary, gain access from the front of the frame.

3. In the Multi-Output supply compartment, connect the connector on the end of the multiwire cable to the mating connector at the top of the circuit board.

4. In the +5 Volt supply compartment, ensure that the connector on the other end of the multiwire cable is securely attached to the mating connector on the circuit board.

5. Connect the blue AC power wire to the left screw on the AC power terminal block.

6. Connect the brown AC power wire to the center screw on the AC power terminal block.

7. If this is the +5 volt supply in a *non-redundant* power system or the *lower* +5 volt supply in a *redundant* power system, perform Step 8 through Step 10.

8. Connect the heavy red wire to the left stud.

9. Connect the heavy black wire to the right stud.

10. Replace the lockwashers and nuts and torque to 80 inch pounds.

WARNING

***Insufficient* torquing of the nuts may cause overheating of the terminals which could result in fire. However, *excessive* torquing of the nuts may break the studs.**

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11. If this is a *non-redundant* power system:
    a. Before applying power you **must** set the BYPASS / PROTECT jumper in the rack fan assembly as described in Section 2 of this manual.
    b. Adjust the power supply voltages as described in the Primary and Redundant Power Supply Voltage Adjustments procedure in Section 2 of this manual.
    c. You may now reinstall the cover on the rear of the frame, reconnect the power source, and apply power.

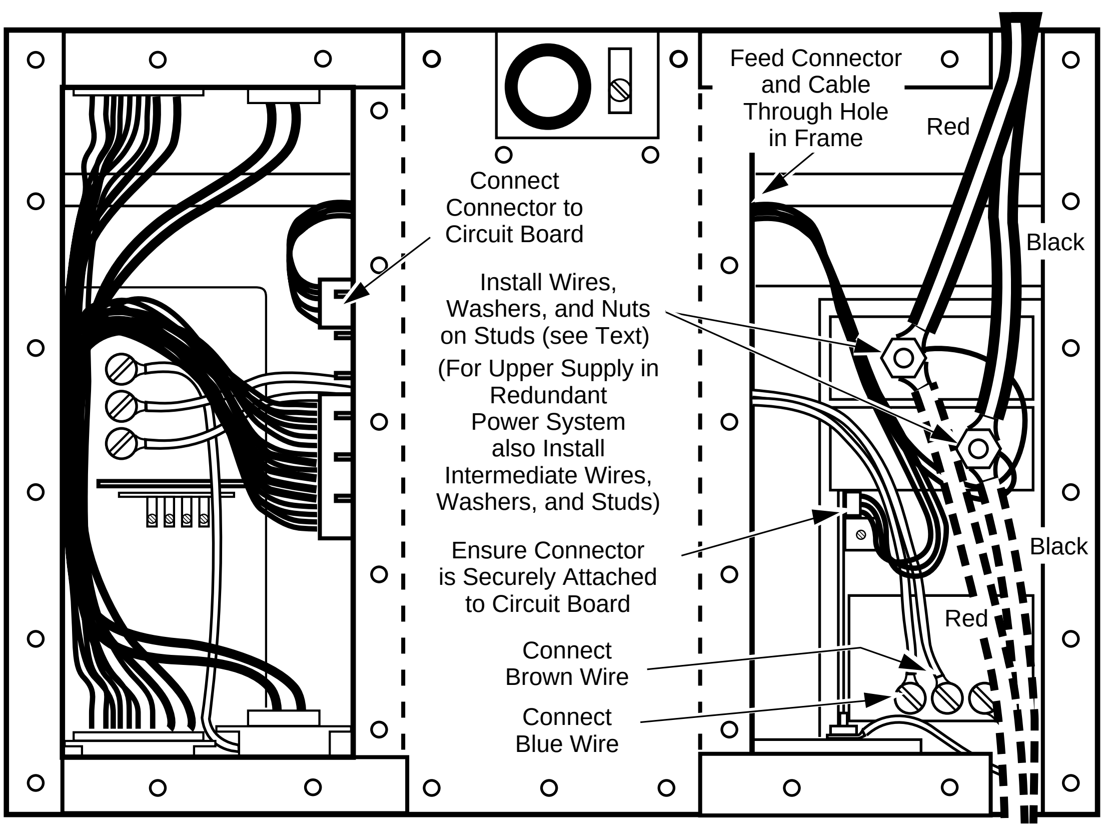

Figure 4-9. Installation of Todd +5 Volt Power Supply Assembly

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NOTE: *Refer to* Figure 4-10 *when performing the following step.*

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12. If this is the *upper* +5 volt supply in a *redundant* system:
    a. Place the wiring from the signal processor frame over the power supply studs (red to the left; black to the right), install the lockwashers and second set of studs, and torque these studs to 80 inch pounds. See WARNING above.
    a. Place the wiring to the lower supply over the second set of studs, install the lockwashers and nuts, and torque the nuts to 80 inch pounds.

13. If this is a *redundant* power system:
    a. You must replace the +5 Volt power assembly in the *second* Power Supply frame (**if it is not a Todd supply**) by repeating the procedures listed above.
    b. Before applying power you **must** set the BYPASS / PROTECT jumper in the rack fan assembly as described in the Installation information in Section 2 of this manual.
    c. When you have completed the installation (of both +5 Volt supplies, if required), reconnect the power source and apply power to both units.
    d. Before you install the rear plates on the Power Supply frames, you must check the output voltages for load-sharing, as described in the Installation information in Section 2 of this manual.

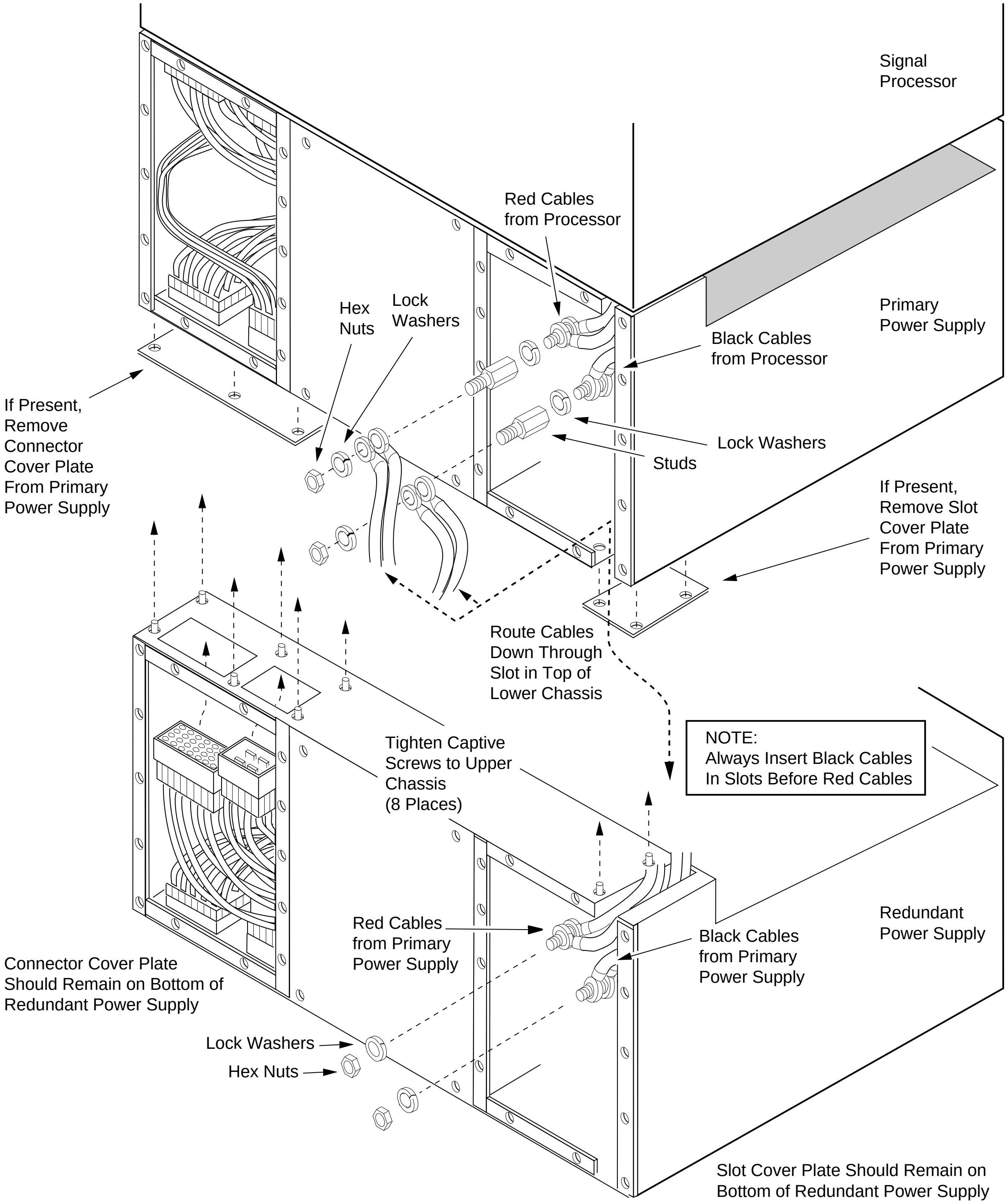

Figure 4-10. Todd Redundant Power Supply Installation Diagram

Frame Air Filter Cleaning

The air filter at the bottom of the Signal Processor Frame reduces the accumulation of dust in the electronic circuitry. The filter should be checked and cleaned regularly. See Figure 4-11 for filter removal.

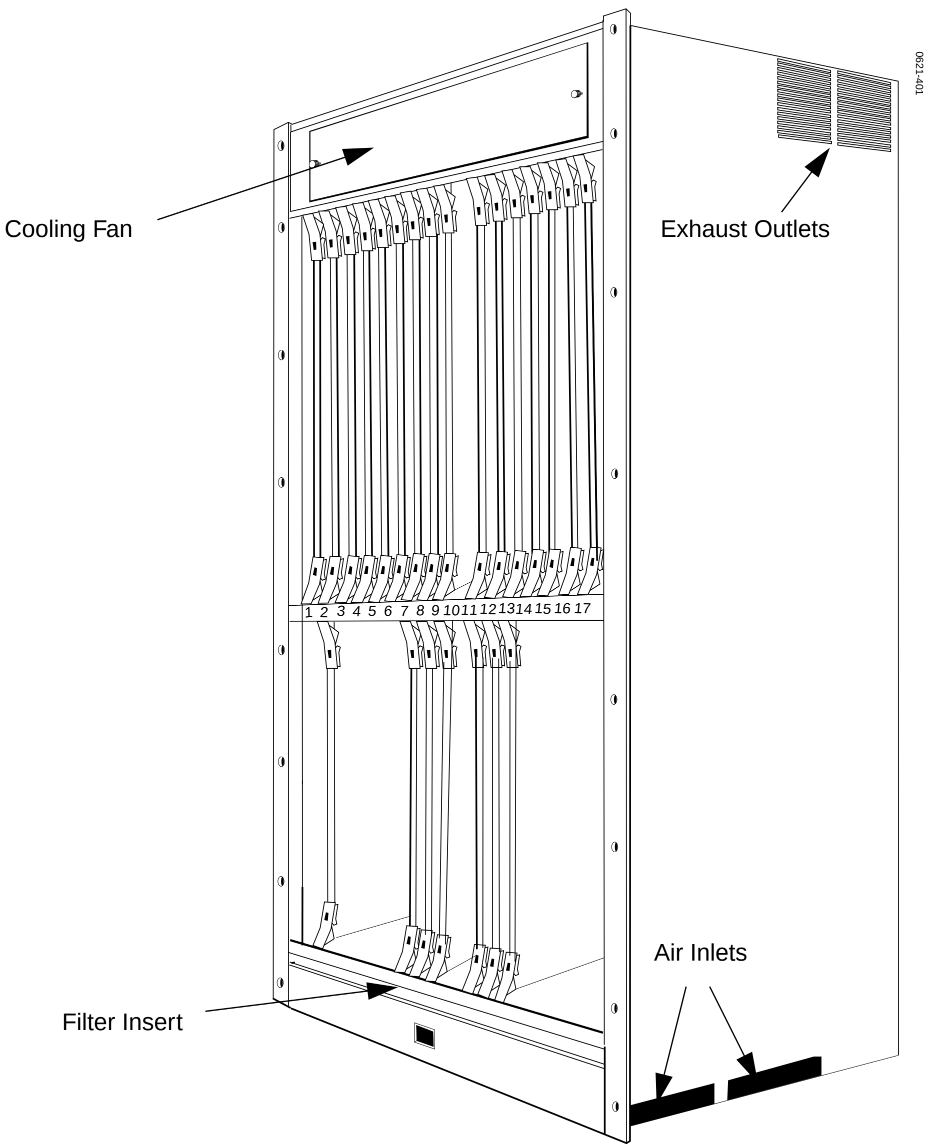

Figure 4-11. Frame Cooling System Vent and Filter Locations

A fan at the top of the frame draws air up through the circuit cards from inlets at the bottom. Cooling air entering the frame passes through the slide-in air filter then out the vents at the top of the frame.

To clean or replace the air filter in the Signal Processor Frame, refer to Figure 4-12 and proceed as follows:

1. Release the quarter turn captive screws on the front door of the Signal Processor Frame and open the door.

2. At the bottom of the frame card bay assembly locate the square air filter access hole.

3. Slide the filter out of the frame to the front by inserting a finger into the access hole and moving the air filter far enough out to be grasped and pulled the rest of the way out.

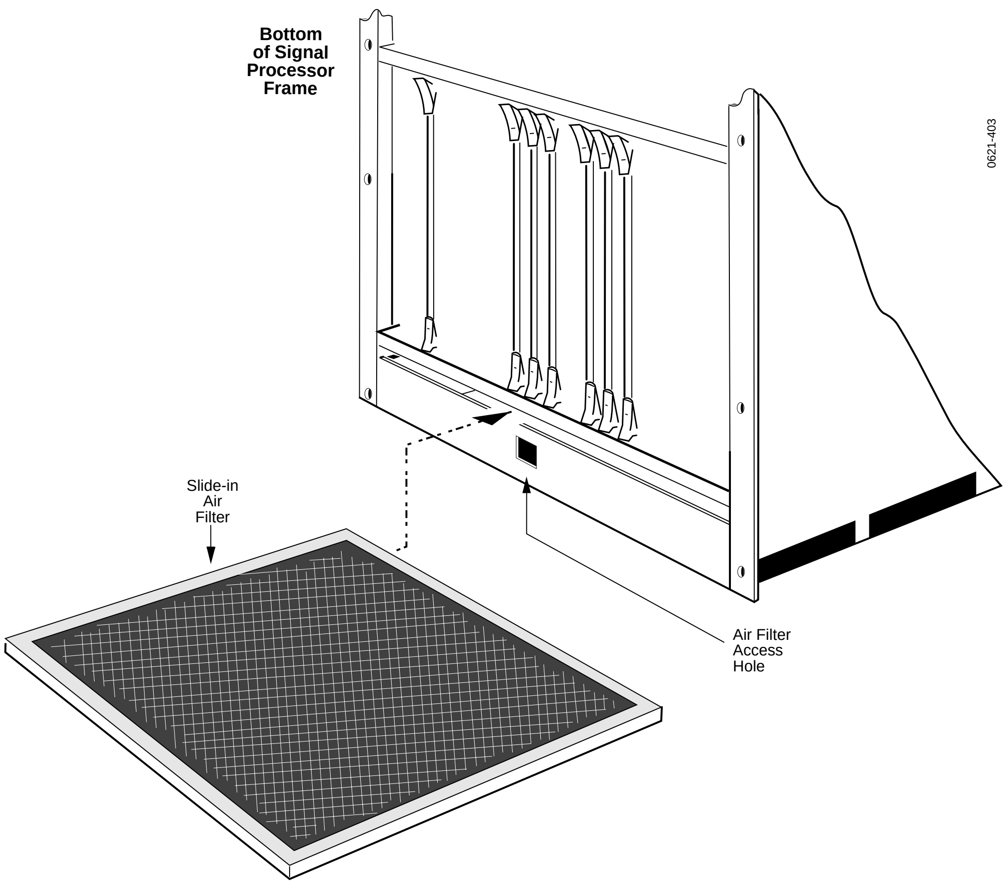

Figure 4-12. Signal Processor, Air Filter Removal

CAUTION

If the system is under power, do not reinstall the filter until it is thoroughly dry. Failure to follow this precaution could result in damage to the equipment due to shorting raised by residual moisture.

4. Clean the filter with a vacuum cleaner and / or wash it in a warm water and detergent solution. Rinse the filter thoroughly with fresh water, and air dry completely.

Frame Power Supply Air Filter Cleaning

The frame power supply has three small air filters located in the top of the chassis. See Figure 4-13. These filters should be inspected regularly and cleaned as necessary. Clogged filters can cause overheating and failure of the power supplies. To replace the frame power supply air filters proceed as follows:

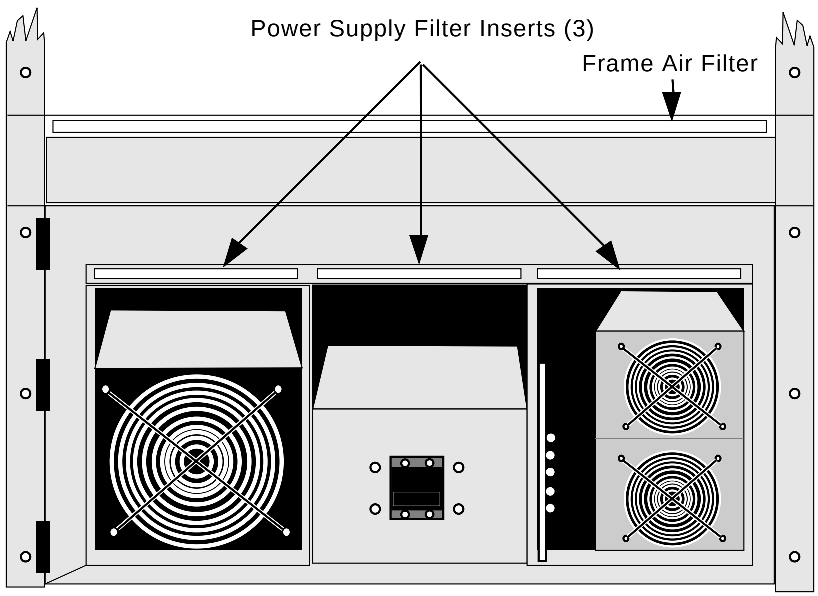

Figure 4-13. Frame Power Supply Panel Release Screws

1. Release the two quarter turn screws on the front panel and open the panel. See Figure 4-13.

2. Grasp the filters and pull out to the front.

3. Clean the filter with a vacuum cleaner or wash it in a warm water and detergent solution, rinsing thoroughly with fresh water. Thoroughly air dry before reinstalling it.

Control Panel Servicing

The following section covers maintenance of the Control Panel in the areas listed below.

- Control Panel Servicing Precautions
- Control Panel Circuit Board Locations
- Replacing Control Panel Power Supplies

Control Panel Servicing Precautions

The following servicing procedures provide general precautions and procedures for removal and replacement of typical types of components and assemblies in either the Model 4000-2 or Model 4000-3 control panels. Detailed procedures are provided only where a component or module is unique or requires special handling, tools or test equipment.

CAUTION

Many of the circuit modules in the Control Panel are sensitive to static discharge. Failure to use proper static-control procedures while working on circuit modules may cause data loss and/or electrical destruction of static-sensitive devices.

CAUTION

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

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 control panel.

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

Model 4000-3 Control Panel Board Locations

The Model 4000-3 Control Panel is housed in two tubs referred to as the Upper Control Panel and Lower Control Panel. The location of the components in these two tubs are illustrated in Figure 4-14 and Figure 4-15.

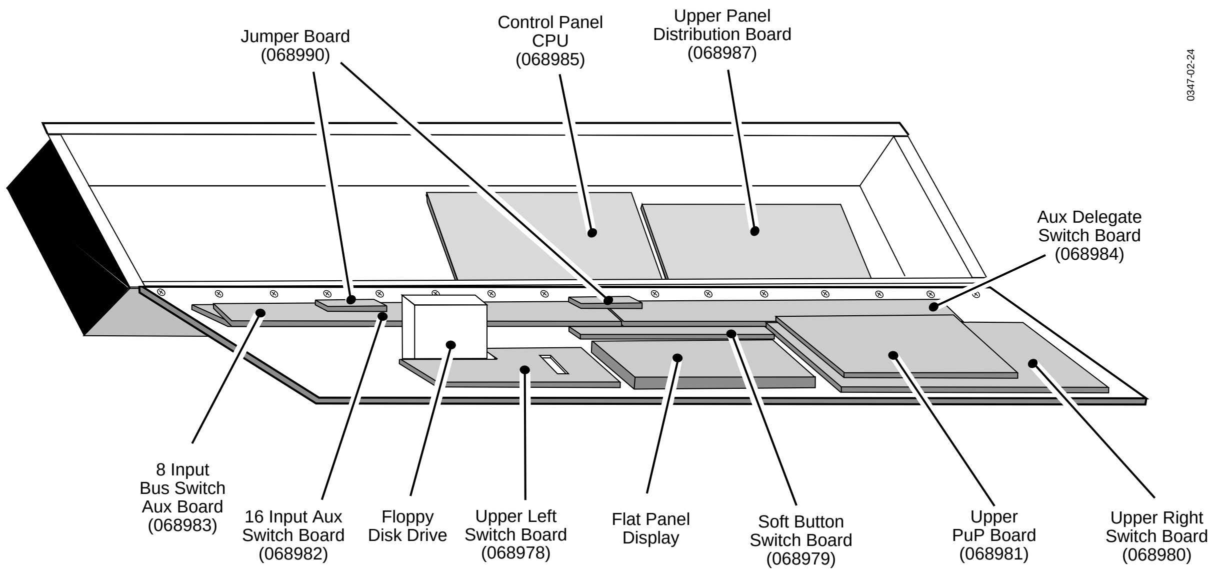

Figure 4-14. Model 4000-3 Upper Control Panel Circuit Board Locations

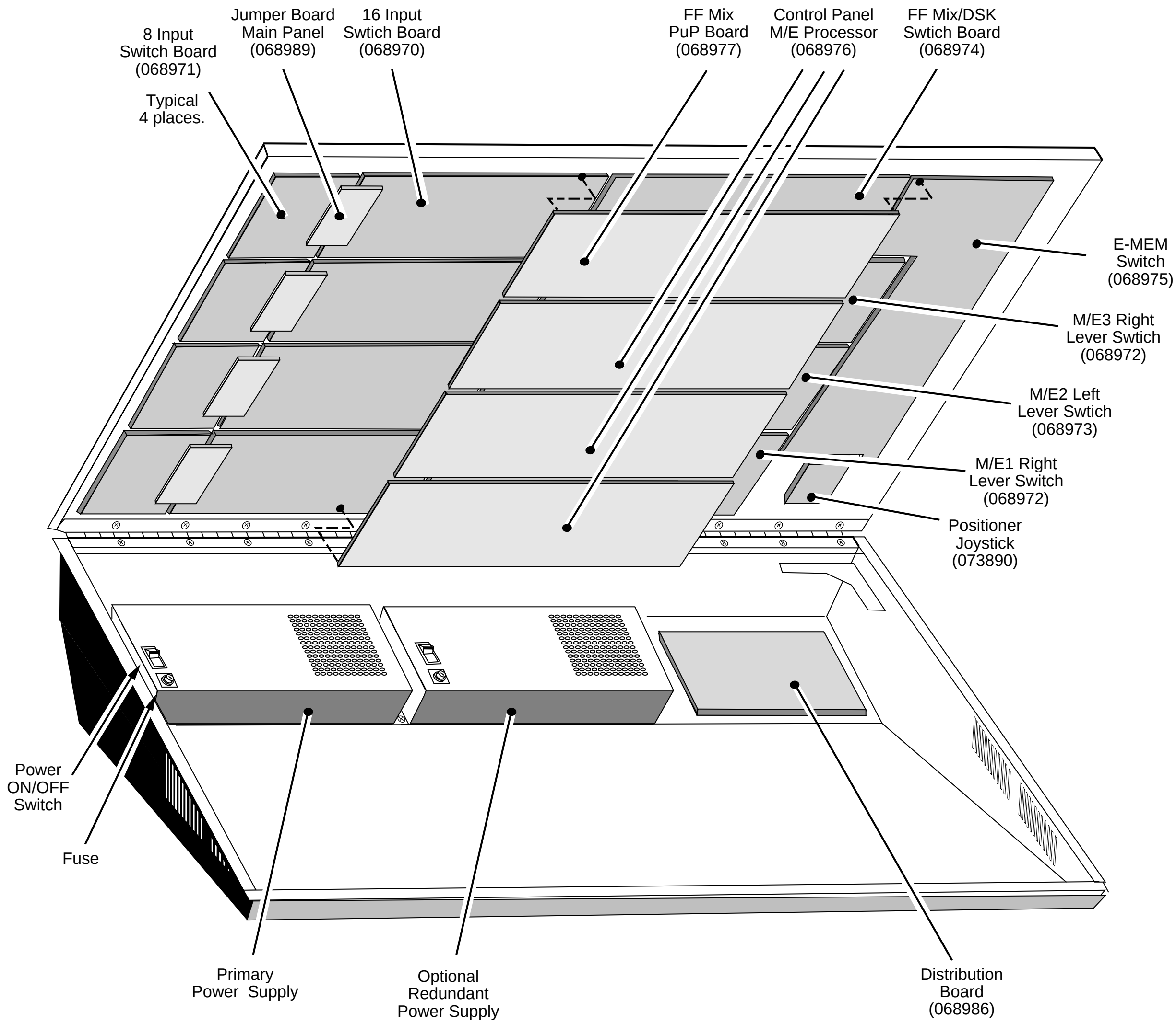

Figure 4-15. Model 4000-3 Lower Control Panel Circuit Board Locations

Model 4000-2A/B Control Panel Board Locations

The Model 4000-2A / B Control Panel is divided into two main areas, referred to as the Upper Panel and the Lower Panel. The location of the components in these two areas are illustrated in Figure 4-16.

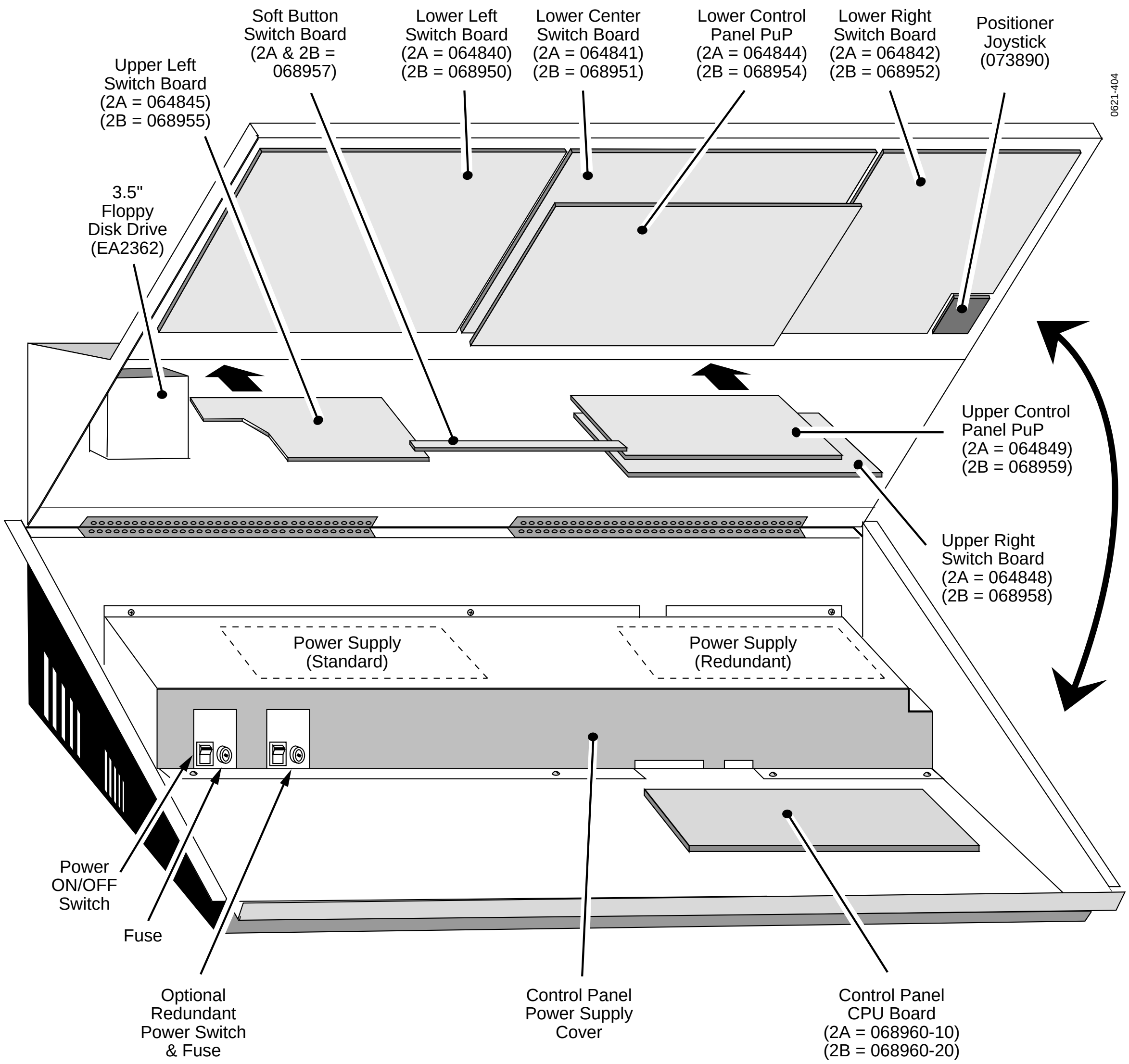

Figure 4-16. Standard Control Panel Parts Locations

Removing Control Panel Circuit Boards

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 left end of the power supply enclosure inside the Control Panel.

2. Unplug the AC line cord from the AC source. The AC line cord is located at the rear of the Control Panel.

3. On the top of the Control Panel, remove any control knobs, lever arm T-handles, etc. that would interfere with removal of the assembly.

NOTE: *If the lower right switch board is to be removed, the plug from the joystick/ positioner must be unplugged from the side of the board (under the top of the Control Panel at the rear of the positioner) before lowering the board out of the Control Panel. It is not necessary to remove the positioner to remove the switch board.*

4. Open the Control Panel and locate the circuit board to be replaced.

5. Disconnect any cables or wiring that are 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 boards.

6. If the board to be removed has a “piggy-back” mezzanine sub-module mounted on it as inFigure 4-17, perform the following sub-steps. If not, proceed to the next step.
   a. Disconnect interconnecting wiring, if any, between the main and mezzanine board.
   b. While supporting the mezzanine, carefully press in the tab on each standoff to release it.
   c. Lift the mezzanine off and place it on a flat non-static surface.

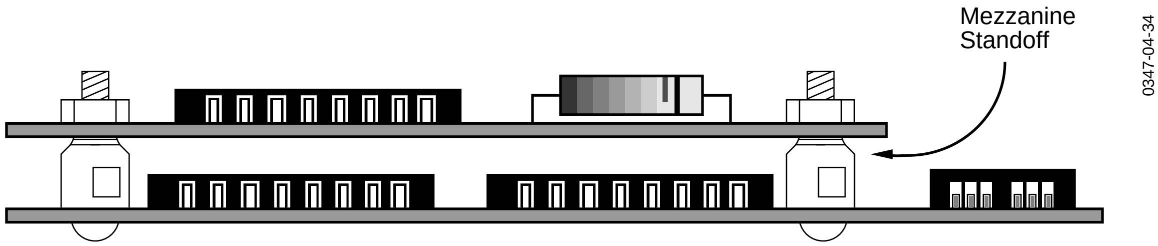

Figure 4-17. Sub-Module Mounting Showing Standoffs

CAUTION

Use caution when handling or removing circuit boards. Due to their size and weight and because of their surface-mount components and multilayer 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.

7. While supporting the mezzanine, remove all retaining screws and carefully lift the module out of the Control Panel.

8. To replace or reinstall a circuit board, reverse the steps of the previous procedure.

Replacement of Control Panel Power Supplies

Model 4000-2 Control Panel Power Supplies

To replace the primary or redundant Control Panel power supply proceed as follows:

1. Open the Control Panel and turn the AC power switch(s) on the left front of the enclosure to the OFF (Ø) position. See Figure 4-18.

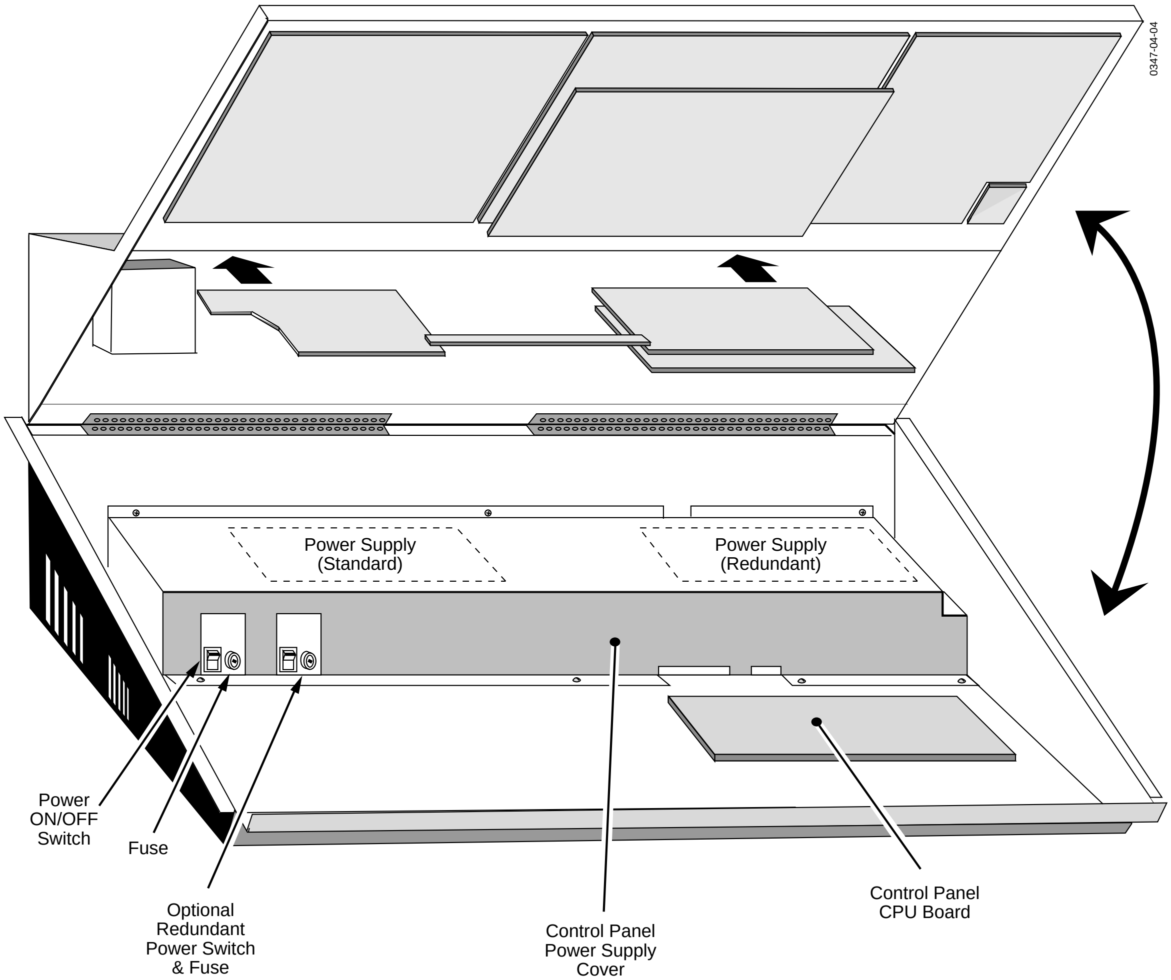

Figure 4-18. Model 4000-2 Control Panel AC Power Switch Location.

2. At the rear of the Control Panel, disconnect the power cord from the AC source.

3. Remove the enclosure covering the power supplies by removing the screws securing it to the Control Panel tub.

NOTE: Removal of some Control Panel internal ribbon cables may ease the removal of the power supply enclosure.

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4. Disconnect the AC input and DC output wiring from the supply to be removed. See Figure 4-19.

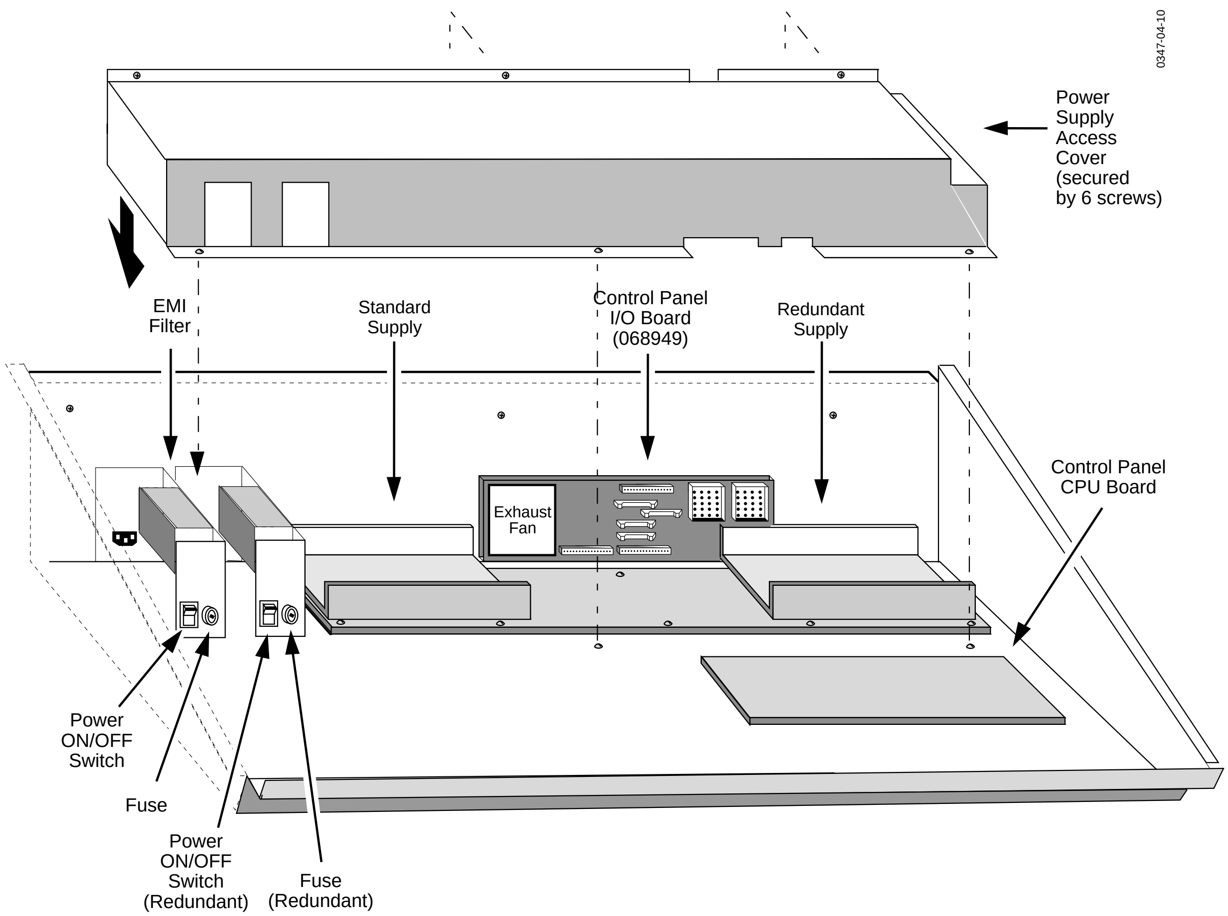


Figure 4-19. Model 4000-2 Control Panel Power Standard Supply Removal

5. Remove the ten screws securing the flat mounting plate supporting the supply(s).

6. Remove the screws securing the power supply to the flat power supply mounting plate.

7. To reinstall or replace either of the standard power supplies, reverse the previous steps.

Replacement of Model 4000-3 Control Panel Power Supplies

To replace the primary or redundant Control Panel power supply proceed as follows:

1. Open the lower Control Panel tub and turn the AC power switch on the front of each supply to the OFF (**Ø**) position. See Figure 4-20.

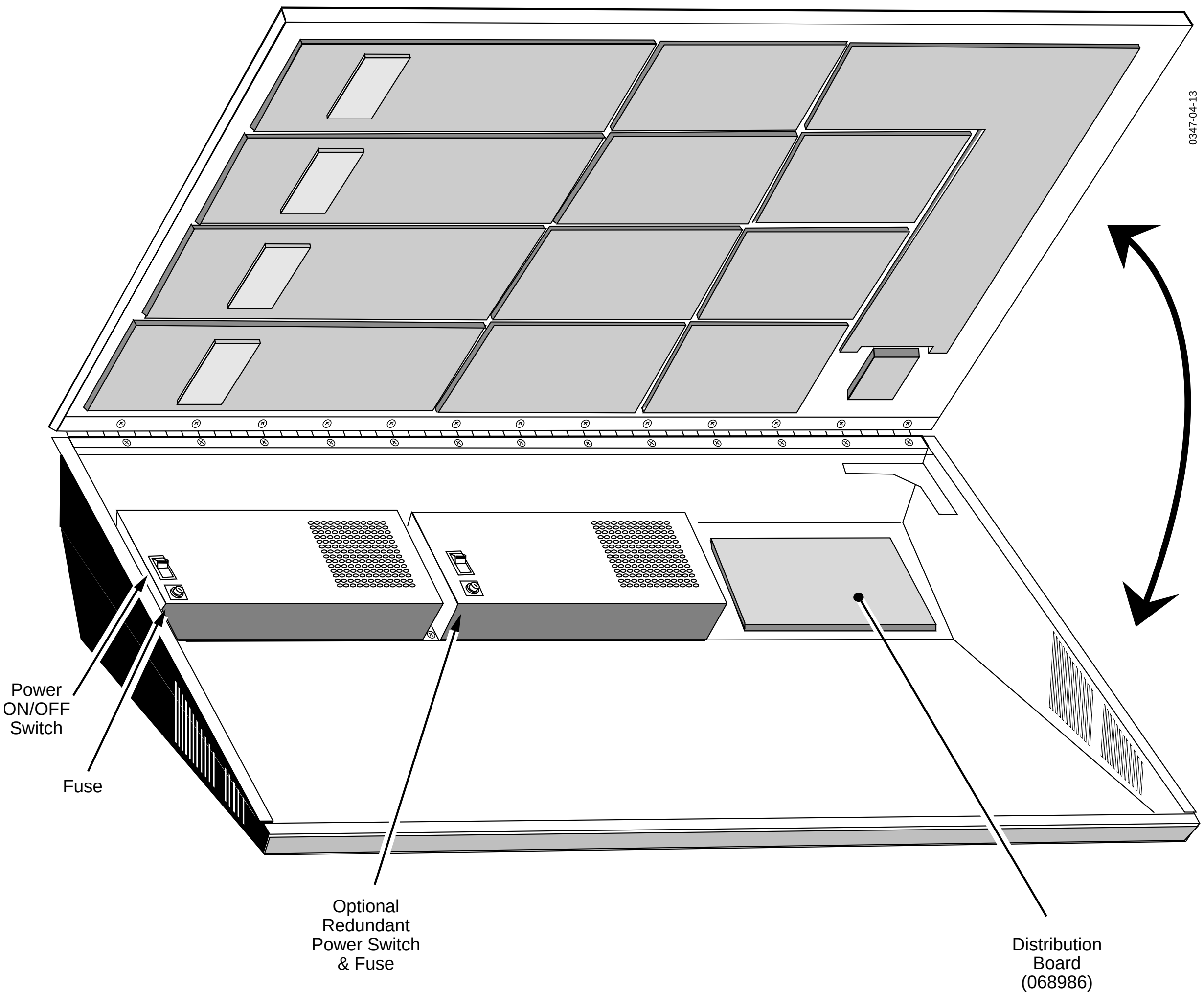


Figure 4-20. Model 4000-3 Control Panel AC Power Switch Location

2. At the rear of the lower Control Panel, disconnect the power cord(s) from the AC source.

3. Inside the Control Panel tub, disconnect the AC input and DC output wiring from the supply(s) to be removed.

4. Remove the screws securing the power supply to the Control Panel tub. See Figure 4-21.

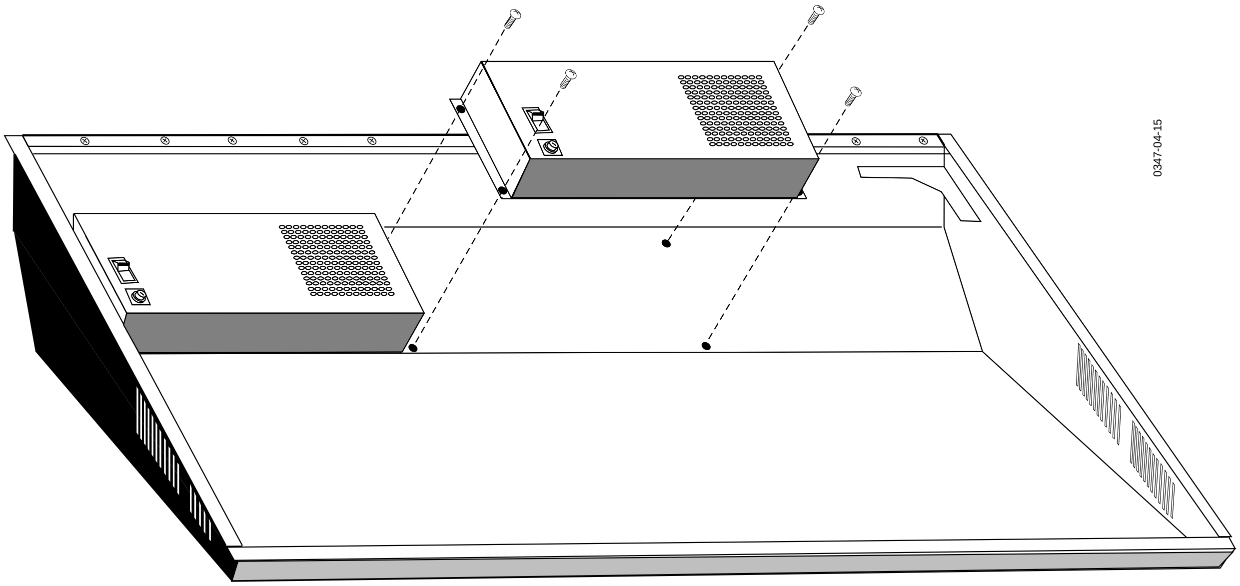


Figure 4-21. Model 4000-3 Control Panel Power Supply Removal

5. To reinstall or replace either of the standard power supplies, reverse the previous steps.

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 button cap. See Figure 4-22.

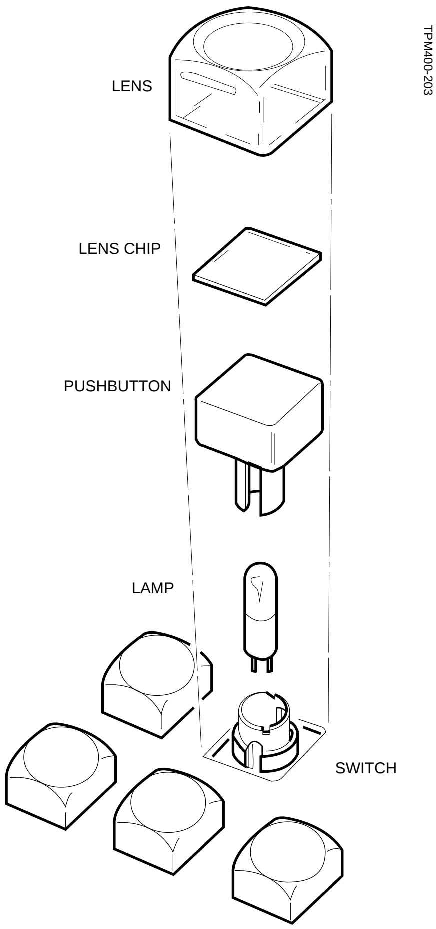


Figure 4-22. Control Panel Lamp Replacement

5 Troubleshooting and Diagnostics

Introduction

This section of the manual provides information to assist you in isolating faults that may occur in the Control Panel and Signal Processing Frame. For safety, service should only be performed by qualified personnel.

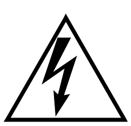
The information is organized to allow for quick diagnosis and isolation of system faults to a circuit module level only. When the suspected circuit module is located it should be replaced with a spare or sent to your nearest GVP Customer Service facility for module swap.

CAUTION

Multi-layer printed circuit manufacturing and surface mount technology (SMT) 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.

Later versions of the system software will include software diagnostic routines to further assist you in quickly locating and correcting faults.

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 4000 system with the Signal Processing Frame doors or covers open or removed for an extended period, as overheating may occur.

System 4000 Service Philosophy

The service philosophy presented throughout this manual is aimed at rapidly isolating system problems to the circuit board or " black-box" level only. This approach is necessitated by circuit complexity, the use of multi-layer boards, surface mount technology (SMT), ASICs, and hybrid circuits. The fault is traced to the module or assembly level, then the module or assembly is replaced using a spare or an exchange module from GVP Customer Service.

Isolating problems in the Model 4000 system involves a systematic and logical troubleshooting process explained later in this section under the Troubleshooting heading. A basic understanding of the system architecture as described in Section 3 - Functional Description will aid you in this process.

Static Precautions

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.

Module Extenders

There are two module extenders provided with the system, one for the I/O Modules in the rear C and D Bays and one for the Video and Control modules in the front A and B Bays. Use care when handling any module on the extender and also when probing on the module itself.

Drawing and Parts Lists Manuals

A Drawings Manual and a Parts Lists Manual are included in the main manual set for each switcher. Many schematics include well-documented block diagrams within them that can be of help pinpointing problems.

These manuals are tools for troubleshooting purposes only. Individual components should not be changed due to the nature of the circuit board technology as mentioned earlier. Attempting to repair circuit modules can damage fragile circuits and void your GVP warranty.

Recommended Test Equipment

- Wide-band oscilloscope with a delayed sweep
- Non-timing Serial Digital-to-Analog converter (used in System Timing)

Required Reference Signals

In addition to the test equipment listed previously, the following signals should be supplied or available at the Signal Processor Frame:

- Reference Black
- Pulse and Bar (or any signal at goes from full black to white during active video)
- Ramp (to indicate all bits)

Troubleshooting

The Model 4000 troubleshooting section is divided into four basic sections:

- Overall System Troubleshooting
- Individual Module Troubleshooting
- Control Panel Troubleshooting
- Power Supply Troubleshooting

Overall System Troubleshooting

After power-up or reset check for the following indicators throughout the switcher:

The following indicators should be on to show the switcher Control Panel is functioning properly:

- The Model 4000 message is on in the soft menu display.
- The green (RUN) light is lit on the Control Panel CPU inside the panel.
- Crosspoints can be changed and video will follow change.

For Control Panel problems refer to the Control Panel Troubleshooting heading later in this section.

Inside the front door of the Signal Processor Frame check for the following:

- +5 RUN lights at the top of each module in the A and B Bays should be lit. If not, the +5V fuse on the module is blown.
- The rear power indicators on the Sync Generator Module in Slot A9 should be lit for each module present. These indicators show that the module is plugged in and the +5V is running.
- The LOCK and REF indicators on the Sync Generator in Slot A9 should be lit.
- All green LED indicators (except CP 4) are lit on the Control Processor 1 Module in Slot A1.
- Check the RUN indicators on each Mix / Wipe Module.

Troubleshooting for each individual module can be found under the Individual Module Troubleshooting heading later in this section.

Check that the Power Supply (Supplies) are running properly:

- Power On indicators on the front of the power supply and optional redundant power supply are lit.

Refer to the Power Supply Troubleshooting heading later in this section for Control Panel problems.

Individual Module Troubleshooting

As mentioned earlier, the service philosophy for the Model 4000 is to troubleshoot switcher problems down to the module or assembly level and replace that module or assembly with a spare or a board exchange from the nearest GVP Customer Service facility. Given below is a procedure for determining the defective module or assembly. The switcher problem is isolated according to an operational function, identified as a subpanel name on the main control panel or a menu in the softpanel. The problem is then traced to a module or assembly using a troubleshooting tree which describes a board swap method.

Follow the steps below to determine which module or assembly may be at fault:

1. First, consult the cross reference tables of Subpanels (Table 5-1), and Menus (Table 5-2) given on the following pages to isolate the problem to a specific subpanel or to define a function on the main control panel. For example, you might be having a problem setting the CLIP and GAIN in the Keyer subpanel of M/E 1 Key 1. Refer to the Keyers Subpanel heading in Table 5-1.

2. For each subpanel or function a list of modules is then given which are most likely associated with that switcher function. The first module in the list is the most likely to be at fault, then in descending order, the other modules are given which might be suspect.

   Figure 5-1 and Figure 5-2 show the module locations in the A, B, C and D bays of the Signal Processor Frame. The slot number of each module is also given in the tables.

   In the example above, the first module to try swapping will be the 064804 Keyer Carrier Module in Slot A6 (ME1K1).

3. Now, go to the 064804 Keyer Carrier Troubleshooting Tree in Figure 5-7. Follow the instructions given in the tree for swapping the modules.

4. If swapping the 064804 Keyer Carrier and associated mezzanines did not fix the problem, you would move to the next module in the list, the 064813 Mixer Module. Go to the troubleshooting tree for this module and follow the instructions.

5. Continue on through the module list under the Keyers Subpanel attempting to find the faulty module. If a faulty module is found you will need to have it replaced by GVP Customer Service.

6. If you cannot locate a faulty module using this method, more detailed troubleshooting involving GVP Customer Service may be needed to solve the problem.

Table 5-1 and Table 5-2 give the subpanel or menu name and/or function where the problem may exist. Follow the recommended order of each module when using the procedure. Refer to each individual module procedure for swapping instructions. Figure 5-3 gives some common video and timing problems you may encounter with the system.

Table 5-1. Subpanel References

SUBPANEL and/or FUNCTION	MODULE NUMBER and NAME	CELL #	FIGURE #
Aux Bus Crosspoint Inputs			
Is the problem common to the M/E bus input selection also? If so, go to Serial Crosspoint Inputs section first.			
Does the problem involve the **Aux Buses**?	064800 Serial Crosspoint Module Also check Aux Format in Configutration menu.	A3, A4, A5	Figure 5-3
Is the problem unique to one or more **Aux Buses** 1-4 or **Effects Send**?	064809 Effects Send Module 1 & 2 064813 Mixer Interface Module Also check: 064821 Serial Output Module	B9- 1 B11- 2 B8- Video B12- Key D2 - D6	 Figure 5-12 Figure 5-18
Does the problem involve the **Switched Preview Bus**?	064802 Preview Module	A17	Figure 5-5
Is a primary involved?	064800 Serial Crosspoint Module Also check Input Mapping in Configuration me nu.	A3, A4, A5	Figure 5-3
Is **M/E Preview** involved?	064803 Mix/Wipe Module Also check: 064819 Analog Output Module 064821 Serial Output Module	A8- M/E1 A13- M/E2 A16- DSK C17 D2 - D6	Figure 5-6 Figure 5-5 Figure 5-18
Does the problem involve the **Mask Bus**?	064802 Preview Module 064800 Serial Crosspoint Module 064821 Serial Output Module Check also: 064805 Control Processor 1 Module 064801 Sync Generator Module	A17 A3, A4, A5 D2 - D6 A1 A9	Figure 5-5 Figure 5-3 Figure 5-18 Figure 5-5 Figure 5-4
Chroma Key Subpanel	064807 Chroma Key Carrier Module 064804 Keyer Carrier Module 064800 Serial Crosspoint Module 064806 Control Processor 2 064801 Sync Generator Module	B7- ME1 B13- ME2 A6- ME1 K1 A7- ME1 K2 A11- ME2 K1 A12- ME2 K2 A14- DSK K1 A15- DSK K2 A3, A4, A5 A2 A9	Figure 5-9 Figure 5-7 Figure 5-3 Figure 5-5 Figure 5-4
E-MEM™ Effects Memory Subpanel	064805 Control Processor 1 064806 Control Processor 2 **064801 Sync Generator Module**	A1 A2 A9	Figure 5-5 Figure 5-5 Figure 5-4

Table 5-1. Subpanel References - (continued)

SUBPANEL and/or FUNCTION	MODULE NUMBER and NAME	CELL #	FIGURE #
External Interface Subpanel			
Does the problem involve the disk?	See the **Disk Operation** in Table .		
Does the problem involve the edit interface?	064823 Communications I/O Module 064824 Expanded Communication Module	C3 C1	Figure 5-5 Figure 5-5
Does the problem involve the **GPI** Interface?	064825 GPI Interface Module	C4	Figure 5-5
Does the problem involve the peripheral interface?	064824 Expanded Com. Module Also check: 064805 Control Processor 1 064806 Control Processor 2 **064801 Sync Generator Module**	C1 A1 A2 A9	Figure 5-5 Figure 5-5 Figure 5-5 Figure 5-4
Input (M/E and PGM/PST) Crosspoint Buses			
Are many buses involved?	064800 Serial Crosspoint Module 064805 Control Processor 1 Module 064806 Control Processor 2 Module 064801 Sync Generator Module	C8, C10 - C16 A1 A2 A9	Figure 5-3 Figure 5-5 Figure 5-5 Figure 5-4
Is a whole bus involved? See **Serial Outputs** and **Analog Outputs** in Table .	064800 Serial Crosspoint Module	C8, C10 - C16	Figure 5-3
Are the same inputs involved on more than one bus? Are the inputs serial primaries?	064616 M/E Processor Mezzanine on 064805 Control Processor 1 064820 Serial Input Module Also check: Integrity of incoming serial signal. Check Map Inputs in Configuration menu. See Video Table 5-3 later in this section.	 A1 C8, C10 - C16	 Figure 5-5 Figure 5-17
Are the inputs analog?	064617 Chroma Key Input Module 064822 Serial Re-entry Module Also check: Integrity of incoming analog signals.	D7 - D9 C6, C7	Figure 5-13 Figure 5-19
Are the inputs re-entry, black, background, or test?	064822 Serial Re-entry Module 064803 Mix/Wipe Module 064802 Preview Module	C6, C7 A8- ME1, A13- ME2 A16- DSK A17	Figure 5-19 Figure 5-6 Figure 5-5
Is a single input on one bus involved?	064800 Serial Crosspoint Module	C8, C10 - C16	Figure 5-3
Positioner Subpanel	064803 Mix/Wipe Module 064805 Control Processor 1 064806 Control Processor 2 064801 Sync Generator Module	A8- ME1 A13- ME2 A16- DSK A1 A2 A9	Figure 5-6 Figure 5-5 Figure 5-5 Figure 5-4

Table 5-1. Subpanel References - (continued)

SUBPANEL and/or FUNCTION	MODULE NUMBER and NAME	CELL #	FIGURE #
Keyer Subpanel	064804 Keyer Carrier Module	A6- ME1K1 A7- ME1K2 A11- ME2K1 A12- ME2K2 A14- DSK K1 A15- DSK K2	Figure 5-7
	064813 Mixer Interface Module	B8- Video B12- Key	Figure 5-12
	064803 Mix/Wipe Module	A8- ME1 A13- ME2 A16- DSK	Figure 5-6
	064805 Control Processor 1	A1	Figure 5-5
	064806 Control Processor 2	A2	Figure 5-5
	064801 Sync Generator Module	A9	Figure 5-4
Mask Subpanels	064803 Mix/Wipe Module	A8- ME1 A13- ME2 A16- DSK	Figure 5-6
	064804 Keyer Carrier Module	A6- ME1K1 A7- ME1K2 A11- ME2K1 A12- ME2K2 A14- DSK K1 A15- DSK K2	Figure 5-7
	064805 Control Processor 1	A1	Figure 5-5
	064806 Control Processor 2	A2	Figure 5-5
	064801 Sync Generator Module	A9	Figure 5-4
Matte Subpanels	064803 Mix/Wipe Module	A8- ME1 A13- ME2 A16- DSK	Figure 5-6
	064804 Keyer Carrier Module	A6- ME1K1 A7- ME1K2 A11- ME2K1 A12- ME2K2 A14- DSK K1 A15- DSK K2	Figure 5-7
	064805 Control Processor 1	A1	Figure 5-5
	064806 Control Processor 2	A2	Figure 5-5
	064801 Sync Generator Module	A9	Figure 5-4
Transition Subpanels	064803 Mix/Wipe Module	A8- ME1 A13- ME2 A16- DSK	Figure 5-6
	064805 Control Processor 1	A1	Figure 5-5
	064806 Control Processor 2	A2	Figure 5-5
	064801 Sync Generator Module	A9	Figure 5-4
Wipe Subpanels	064803 Mix/Wipe Module	A8- ME1 A13- ME2 A16- DSK	Figure 5-6
	064805 Control Processor 1	A1	Figure 5-5
	064806 Control Processor 2	A2	Figure 5-5
	064801 Sync Generator Module	A9	Figure 5-4

Table 5-2. Menu References

MENU NAME and /or PROBLEM	MODULE NUMBER and NAME	CELL NUMBER	FIGURE NO.
Analog Outputs			
	068919 HOS Processor Mezzanine on 064805 Control Processor 1	A1	Figure 5-5
Is the problem at the **PGM** output?	064803 Mix/Wipe M/E 1 Module	A8- ME1 A13- ME2 A16- DSK	Figure 5-6
Is the problem at the **PVW** output?	064802 Preview Module Also check: 064801 Sync Generator Module	A17 A9	Figure 5-5 Figure 5-4
Aux Bus	064809 Effects Send Module 064813 Mixer Interface Module Also check: 064805 Control Processor 1 064806 Control Processor 2	B9- 1 B11- 2 B8- Video B12- Key A1 A2	 Figure 5-12 Figure 5-5 Figure 5-5
Configuration			
Is the problem in the User Prefs menu?			
Does it involve **Keyer Prefs**?	064804 Keyer Carrier Module	A6- ME1K1 A7- ME1K2 A11- ME2K1 A12- ME2K2 A14- DSK K1 A15- DSK K2	Figure 5-7
Does it involve **Preview Prefs**?	064802 Preview Module 064803 Mix/Wipe Module	A17 A8- ME1 A13- ME2 A16- DSK	Figure 5-5 Figure 5-6
Is the problem in the System Parameters menu?			
Does it involve **Aspect**?	064801 Sync Generator Module	A9	Figure 5-4
Does it involve **Matte Gen Limiting**?	064803 Mix/Wipe Module 064804 Keyer Carrier Module	A8- ME1 A13- ME2 A16- DSK A6- ME1K1 A7- ME1K2 A11- ME2K1 A12- ME2K2 A14- DSK K1 A15- DSK K2	Figure 5-6 Figure 5-7
Does it involve the **Clock**?	064805 Control Processor 1 Module	A1	Figure 5-5

Table 5-2. Menu References - (continued)

MENU NAME and /or PROBLEM	MODULE NUMBER and NAME	CELL NUMBER	FIGURE NO.
Is the problem in the Inputs menu? (Configuration continued)			
Does it involve selecting **test signal patterns**?	064802 Preview Module 064822 Serial Reentry Module	A17 C6, C7	Figure 5-5 Figure 5-19
Does it involve configuring **Analog Inputs**?	064817 Chroma Key Input Module 064822 Serial Reentry Module	D7 - D9 C6, C7	Figure 5-13 Figure 5-19
Does it involve timing **Analog Inputs**?	064817 Chroma Key Input Module 064801 Sync Generator Module	D7 - D9 A9	Figure 5-13 Figure 5-4
Is the problem in the **Maps Inputs** submenu?	064800 Serial Crosspoint Module	D2 - D6	Figure 5-3
Does it involve shaping the **Video**?	064804 Keyer Carrier Module	A6- ME1K1 A7- ME1K2 A11- ME2K1 A12- ME2K2 A14- DSK K1	Figure 5-7
Is the problem in the Inputs menu?			
Does it involve selecting the **Chroma Key** input?	064807 Chroma Key Carrier Module 064818 Analog Input Module	B7- ME1 B13- ME2 D10 - D17	Figure 5-9 Figure 5-14
Is the problem in the **Chroma Key Inputs** submenu?	064807 Chroma Key Carrier Module 064818 Analog Input Module	B7- ME1 B13- ME2 D10 - D17	Figure 5-9 Figure 5-14
Is the problem in the **Effects Return** submenu?	064803 Mix/Wipe M/E 1 Module 064805 Control Processor 1 064806 Control Processor 2	A8- ME1 A13- ME2 A16- DSK A1 A2	Figure 5-6 Figure 5-5 Figure 5-5
Is the problem in the **GPI** submenu?	064825 GPI Interface Module Also check: 064805 Control Processor 1 064806 Control Processor 2	C4 A1 A2	Figure 5-5 Figure 5-5 Figure 5-5
Chroma Keyer	064807 Chroma Key Carrier Module 064804 Keyer Carrier Module 064818 Analog Input Module 064800 Serial Crosspoint Module Also check: 064805 Control Processor 1 064806 Control Processor 2	B7- ME1 B13- ME2 A6- ME1K1 A7- ME1K2 A11- ME2K1 A12- ME2K2 A14- DSK K1 D10 - D17 D2 - D6 A1 A2	Figure 5-9 Figure 5-7 Figure 5-14 Figure 5-3 Figure 5-5 Figure 5-5
Communications I/O	064823 Communications I/O Module 064824 Expanded Communications Module	C3 C1	Figure 5-5 Figure 5-5

Table 5-2. Menu References - (continued)

MENU NAME and /or PROBLEM	MODULE NUMBER and NAME	CELL NUMBER	FIGURE NO.
Control Panel	See the Control Panel troubleshooting procedure.		
Disk	064805 Control Processor 1 Also troubleshoot the Control Panel.	A1	Figure 5-5
Disk Operation	064805 Control Processor 1 Also troubleshoot the Control Panel.	A1	Figure 5-5
E-MEM & Key Framing	064805 Control Processor 1 064806 Control Processor 2	A1 A2	Figure 5-5 Figure 5-5
GPI	064825 GPI Interface Module	C4	Figure 5-5
Keyer	064804 Keyer Carrier Module Also check: 064805 Control Processor 1 064806 Control Processor 2	A6- ME1K1 A7- ME1K2 A11- ME2K1 A12- ME2K2 A14- DSK K1 A1 A2	Figure 5-7 Figure 5-5 Figure 5-5
M/E Mode	064803 Mix/Wipe M/E 1 Module Also check: 064805 Control Processor 1 064806 Control Processor 2	A8- ME1 A13- ME2 A16- DSK A1 A2	Figure 5-6 Figure 5-5 Figure 5-5
Mask	064803 Mix/Wipe M/E 1 Module Also check: 064805 Control Processor 1 064806 Control Processor 2	A8- ME1 A13- ME2 A16- DSK A1 A2	Figure 5-6 Figure 5-5 Figure 5-5
Matte	064803 Mix/Wipe M/E 1 Module 064804 Keyer Carrier Module 064809 Effects Send Module Also check: 064805 Control Processor 1 064806 Control Processor 2	A8- ME1 A13- ME2 A16- DSK A6- ME1K1 A7- ME1K2 A11- ME2K1 A12- ME2K2 A14- DSK K1 B9- 1 B11- 2 A1 A2	Figure 5-6 Figure 5-7 Figure 5-5 Figure 5-5

Table 5-2. Menu References - (continued)

MENU NAME and /or PROBLEM	MODULE NUMBER and NAME	CELL NUMBER	FIGURE NO.
Serial Outputs	064821 Serial Output Module Also troubleshoot the most appropriate one: 064802 Preview Module 064804 Keyer Carrier Module 064809 Effects Send Module 064801 Sync Generator Module Also check Outputs menu under Configuration	D2 - D6 A17 A6- ME1K1 A7- ME1K2 A11- ME2K1 A12- ME2K2 A14- DSK K1 B9- 1 B11- 2 A9	Figure 5-18 Figure 5-5 Figure 5-7 Figure 5-4
Tally	064808 Tally Control Module 064806 Control Processor 2 Also check: 064801 Sync Generator Module	D1 A2 A9	Figure 5-5 Figure 5-5 Figure 5-4
Wipe	064803 Mix/Wipe M/E 1 Module Also check: 064805 Control Processor 1 064806 Control Processor 2	A8- ME1 A13- ME2 A16- DSK A1 A2	Figure 5-6 Figure 5-5 Figure 5-5
Miscellaneous			
Does the problem involve **Safetitle**?	064802 Preview Module	A17	Figure 5-5
Does the problem involve **Dither** selection? (Troubleshoot the appropriate module.)	064802 Preview Module 064803 Mix/Wipe M/E 1 Module 064804 Keyer Carrier Module 064807 Chroma Key Carrier Module 064809 Effects Send Module Also check: 064805 Control Processor 1 064806 Control Processor 2 Check the Signal Process menu in the MISC menu	A17 A8- ME1 A13- ME2 A16- DSK A6- ME1K1 A7- ME1K2 A11- ME2K1 A12- ME2K2 A14- DSK K1 B7- ME1 B13- ME2 B9- 1 B11- 2 A1 A2	Figure 5-5 Figure 5-6 Figure 5-7 Figure 5-9 Figure 5-5 Figure 5-5

Table 5-3. Common Video and Timing Problems

VIDEO OR TIMING PROBLEM	CAUSE and MODULE NUMBER/NAME	CELL#
Snow (no video)	Improper deserializing on Serial Input Module (064820) No input connected - check Map Inputs in Config menu	
Magenta video	Open Video lines Video lines are high Check for unplugged module	
Dark green video	Video lines are grounded	
Video horizontally displaced	Sync Generator Module	A9
Vertical bars on screen	Sync Generator Module Video source outside of autotiming range	
Streaks or sparkles in video	Noise in Serial Input	
Banding on soft edges		
Ringing on key edges		
Large color errors (color bars totally off)	Cositing error in video Timing error	
Video breaks up with multiple horizontal lines on externally referenced monitor	Sync Generator Module (064801) Check external analog reference is present at J	A9

TP0625-01-01

Slot	Module	Mezzanine	Mezzanine
A1	Control Processor 1 Module (064805)	HOS Processor Mezzanine (064919)	M/E1 Processor Mezzanine (064916)
A2	Control Processor 2 Module (064806)	M/E2 Processor Mezzanine (064916)	M/E3 Processor (4000-3 only) Mezzanine (064916)
A3	Crosspoint 3 Module (064800) Buses 33 - 48		
A4	Crosspoint 2 Module (064800) Buses 17 - 32		
A5	Crosspoint 1 Module (064800) Buses 1 - 16		
A6	Keyer Carrier M/E 1 Key 1 Module (064804)	Keyer Mezzanine Module (064826)	BORDERLINE™ Mezzanine Module Option (064909)
A7	Keyer Carrier M/E 1 Key 2 Module (064804)	Keyer Mezzanine Module (064826)	BORDERLINE™ Mezzanine Module Option (064909)
A8	Mix/Wipe M/E 1 Module (064803)	Primary and Secondary (Option) Wipe Mezzanine Modules (064828)	Look Ahead Preview Mezzanine Option (064829)
A9	Sync Generator Module (064801)		
A10			
A11	Keyer Carrier M/E 2 Key 1 Module (064804)	Keyer Mezzanine Module (064826)	BORDERLINE™ Mezzanine Module Option (064909)
A12	Keyer Carrier M/E 2 Key 2 Module (064804)	Keyer Mezzanine Module (064826)	BORDERLINE™ Mezzanine Module Option (064909)
A13	Mix/Wipe M/E 2 Module (064803)	Primary and Secondary (Option) Wipe Mezzanine Modules (064828)	Look Ahead Preview Mezzanine Option (064829)
A14	Keyer Carrier DSK Key 1 Module (064804)	Keyer Mezzanine Module (064826)	BORDERLINE™ Mezzanine Module Option (064909)
A15	Keyer Carrier DSK Key 2 Module (064804)	Keyer Mezzanine Module (064826)	BORDERLINE™ Mezzanine Module Option (064909)
A16	Mix/Wipe DSK Module (064803)	Primary and Secondary* (Option) Wipe Mezzanine Modules (064828)	Look Ahead Preview Mezzanine Option (064829)
A17	Preview Module (064802)	Mask Mezzanine Module (064830)	

Top Card-Cage Bay A

Slot	Module	Mezzanine	Mezzanine
B1			
B2	Crosspoint 4 Module (064800) Buses 49 - 64 (Model 4000-3 only)		
B3			
B4	Chroma Key Carrier M/E 1 Module (064807)	Chroma Key Mezzanine Module (064831)	
B5	Chroma Key Carrier M/E 2 Module (064807)	Chroma Key Mezzanine Module (064831)	
B6	Chroma Key Carrier M/E 3 Module (064807)	Chroma Key Mezzanine Module (064831)	
B7	Keyer Carrier M/E 3 Key 1 Module (064804)	Keyer Mezzanine Module (064826)	BORDERLINE™ Mezzanine Module Option (064909)
B8	Keyer Carrier M/E 3 Key 2 Module (064804)	Keyer Mezzanine Module (064826)	BORDERLINE™ Mezzanine Module Option (064909)
B9	Mix/Wipe M/E 3 Module (064803)	Primary and Secondary (Option) Wipe Mezzanine Modules (064828)	Look Ahead Preview Mezzanine Option (064829)
B10			
B11	Mixer Interface Module (Video) (064813)		
B12	Effects Send 1 Module (064809)		
B13	Effects Send 2 Module (064809)		
B14	Mixer Interface Module (Key) (064813)		
B15	Framestore Module (064814) or Aux Control Module (064855)		
B16			
B17			

Model 4000-3 — Bottom Card-Cage Bay B

Figure 5-1. A and B Bay Module Locations

0621-01-06

Slot	Module
C17	Analog Output
C16	Serial Input 1through 8
C15	Serieal Input 9 through 16
C14	Serial Input 17 through 24
C13	Serial Input 25 through 32
C12	Serial Input 33 through 40
C11	Serial Input 41 through 48
C10	Serial Input 49 through 56
C9	
C8	Serial Input 57 through 64
C7	Serial Re-Entry
C6	Serial Re-Entry
C5	Telly Control (4000-3)
C4	Mantenance
C3	Communication Input/Output
C2 C1	Expanded Communication

Top Card-Cage Bay C

0621-01-07

Slot	Module
D17	Analog Input 33 and 34
D16	Analog Input 35 and 36
D15	Analog Input 37 and 38
D14	Analog Input 39 and 40
D13	Analog Input 41 and 42
D12	Analog Input 43 and 44
D11	Analog Input 45 and 46
D10	Analog Input 47 and 48
D9	Chroma Key Input 1 and 2
D8	Chroma Key Input 3 and 4
D7	Chroma Key Input 5 and 6
D6	Serial Output
D5	Serial Output
D4	Serial Output
D3	Serial Output
D2	Serial Output
D1	Tally Control

Bottom Card-Cage Bay D

Figure 5-2. C and D Bay Module Locations

Module Troubleshooting Trees

064800 - Serial Crosspoint Module

1. Check the Operator's Guide for any operation, configuration or menu setups to verify correct usage of the function that appears broken.
2. Verify the function in question is supported by the current software release.
3. Identify which Serial Input Crosspoint module is responsible for the bus in question.

   Crosspoint 1 (Slot A3)—All DSK Program and Preset Buses - Aux Buses 1 thru 4

   Crosspoint 2 (Slot A4)—All M/E 2 Buses - Aux Buses 7A thru 9B

   Crosspoint 3 (Slot A5)—All M/E 1 Buses - Aux Buses 5A thru 6B - Preview - Mask

4. Is the LED at the front edge of the Crosspoint module lit? If no, check fuse.

Replace the suspected module (as identified above) with another Serial Crosspoint module in the frame.

The problem went away.

Problem is probably the module in question.

The problem remains unchanged.

Problem is not on Serial Crosspoint Module 064800

A. Visually inspect the module for obvious problems such as bent connector pins or broken solder connections.

B. If unable to find a problem, contact customer service for instructions.

Figure 5-3. 064800—Serial Input Crosspoint Module

064801 - Sync Generator Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken.
2. Verify the function in question is supported by the current software release.
3. Is +5V LED at front edge of module lit? If not, check fuse.
4. Is the "REFERENCE" LED at the front edge of the Sync Generator module lit? If no, verify the reference signal is present in the cable, and the cable is connected at the rear of the frame.
5. Is the "LOCK" LED at the front edge of the Sync Generator module lit? If no, verify that the correct Field rate and Clock frequency are selected.

Replace the suspected module (as identified above) with a spare Sync Generator module.

The problem went away?

The problem remains unchanged?

Problem is not on Sync Generator Module 064801

A. Visually inspect the module for obvious problems such as bent connector pins or broken solder connections

B. If unable to find a problem, contact customer service for instructions.

Figure 5-4. 064801—Sync Generator Module

064802 - Preview Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken.
2. Verify the function in question is supported by the current software release.
3. Is the +5 LED at front edge of module lit? If not, check fuse
4. Visually inspect module for obvious problem: bent connector pins, improperly socketed parts, or broken solder connections.

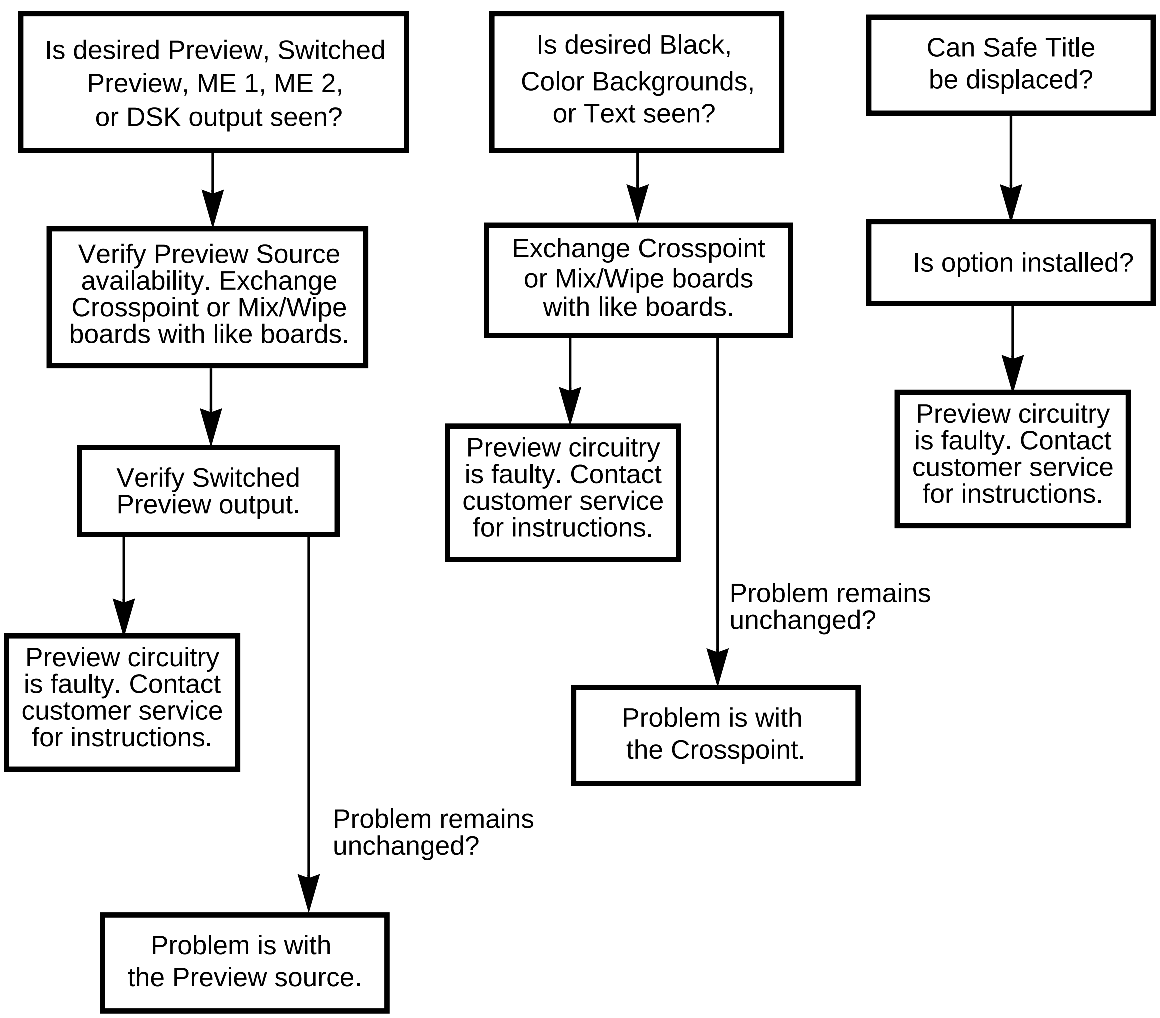


Figure 5-5. 064802—Preview Module

064803 - Mix/Wipe Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken.
2. Verify the function in question is supported by the current software release.
3. Is +5V LED at front edge of module lit? If not, check fuse.
4. Is the "RUN" LED at the front edge of the Mix/Wipe module lit? If no, check to be sure that Prom's, micro-processor, and other socketed parts are properly installed.

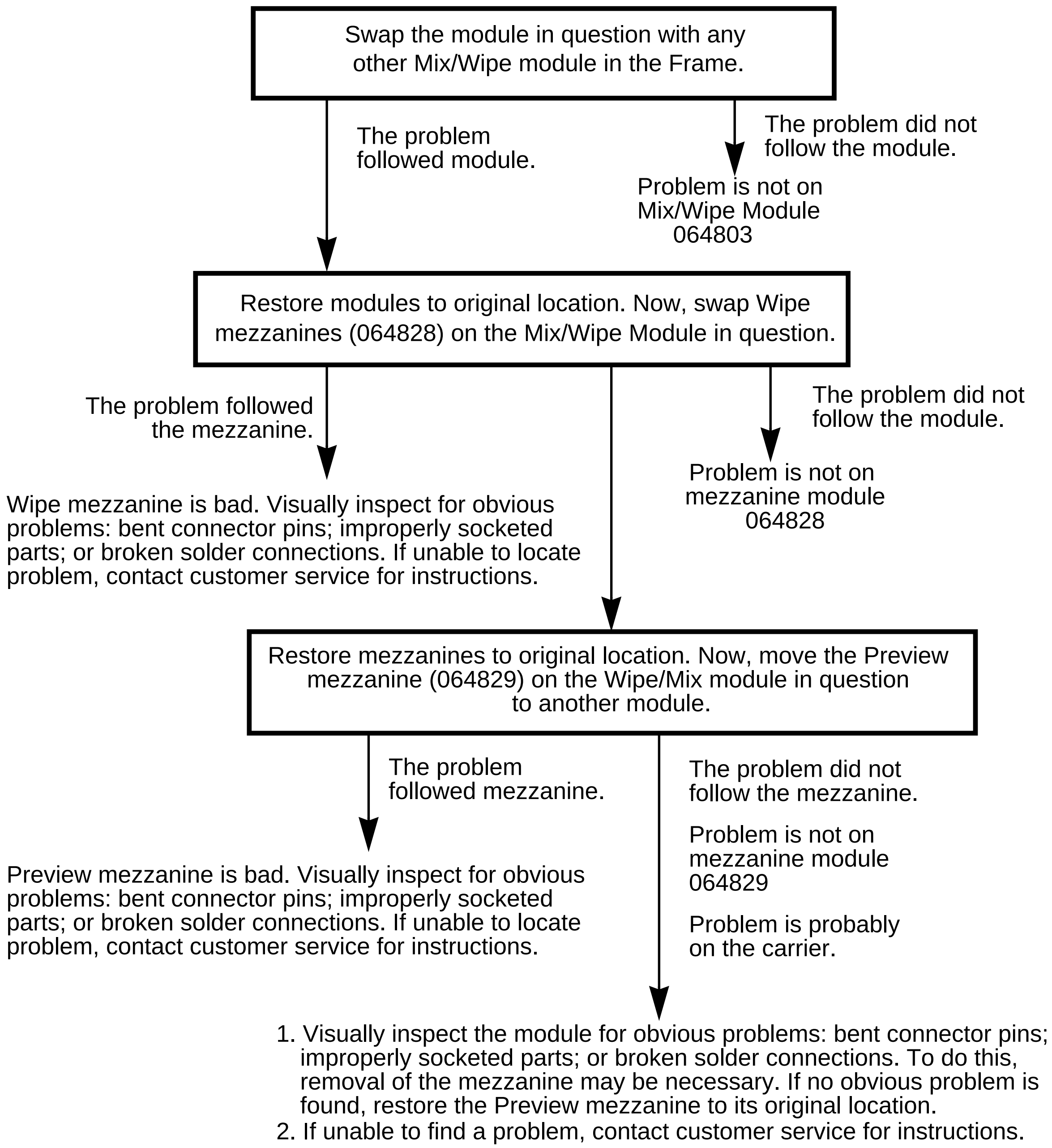


Figure 5-6. 064803—Mix/Wipe Module

064804 - Keyer Carrier Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken.
2. Verify the function in question is supported by the current software release.
3. Are the +5V and -5V LEDs at front edge of module lit? If not, check fuse.

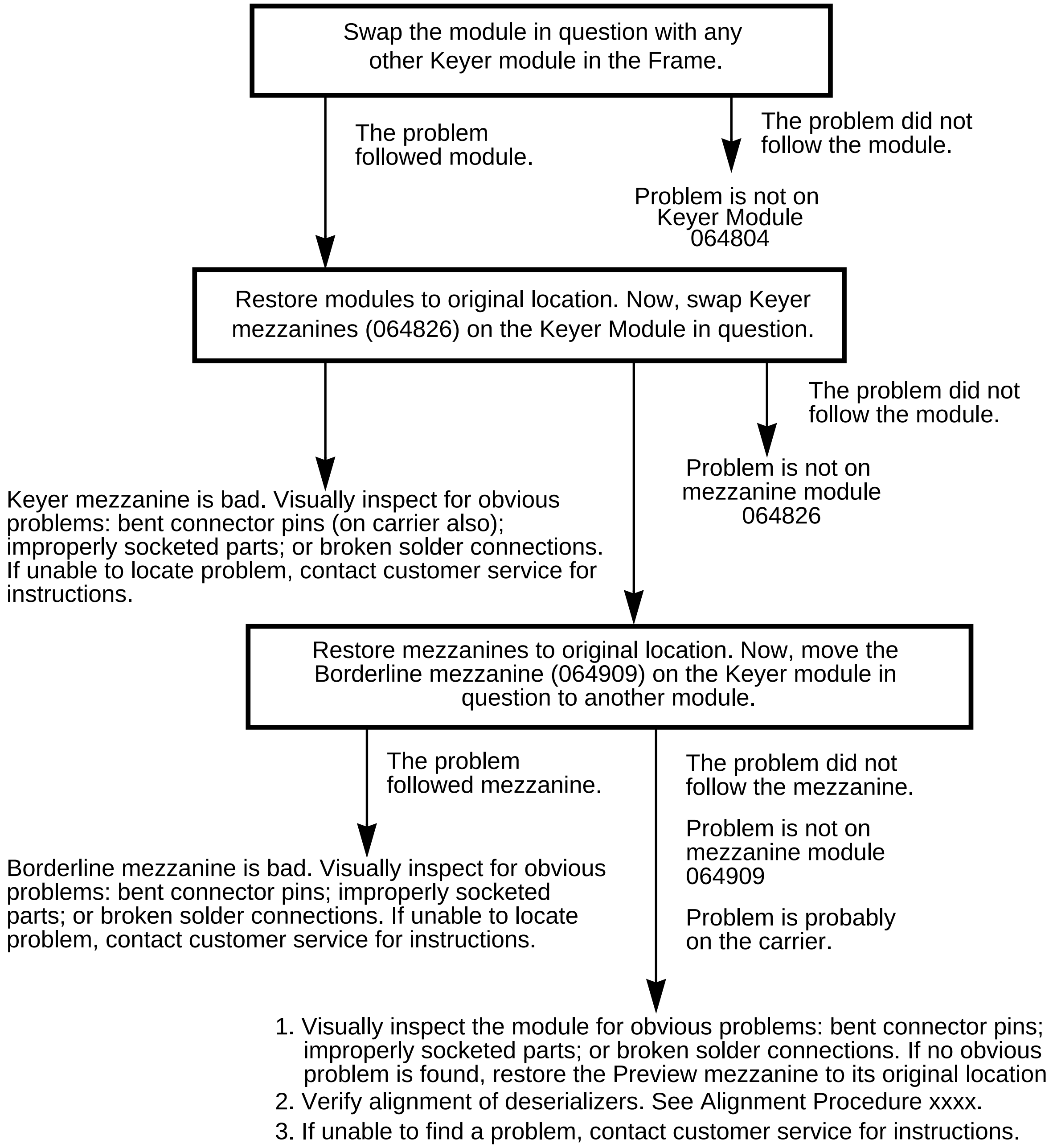


Figure 5-7. 064804—Keyer Carrier Module

064805/064806 - Control Processors I & II Modules

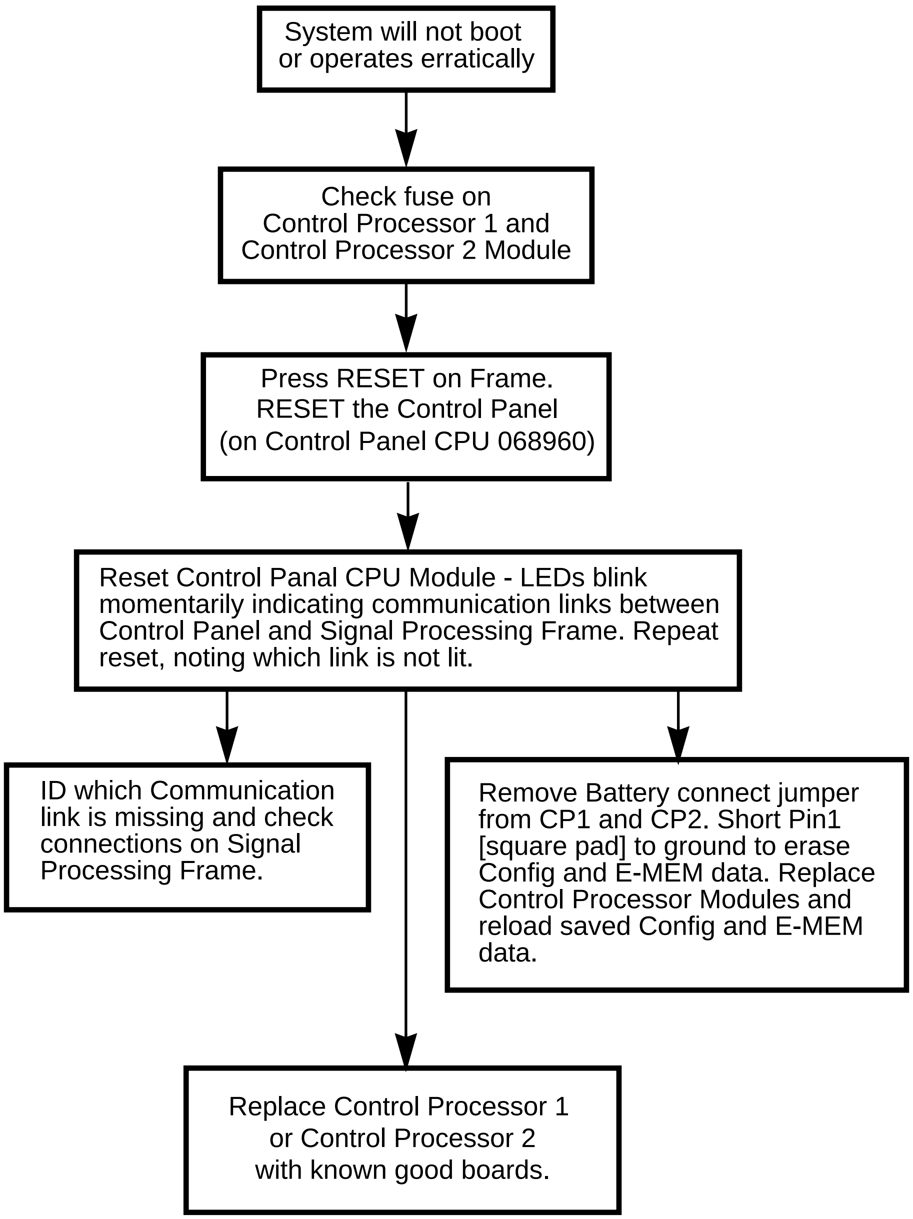


Figure 5-8. 064805/064806 —Control Processor I and II Modules

064807 - Chroma Key Input Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken.
2. Verify the function in question is supported by the current software release.
3. Are the +5V and -5V LEDs at front edge of module lit? If not, check fuse.

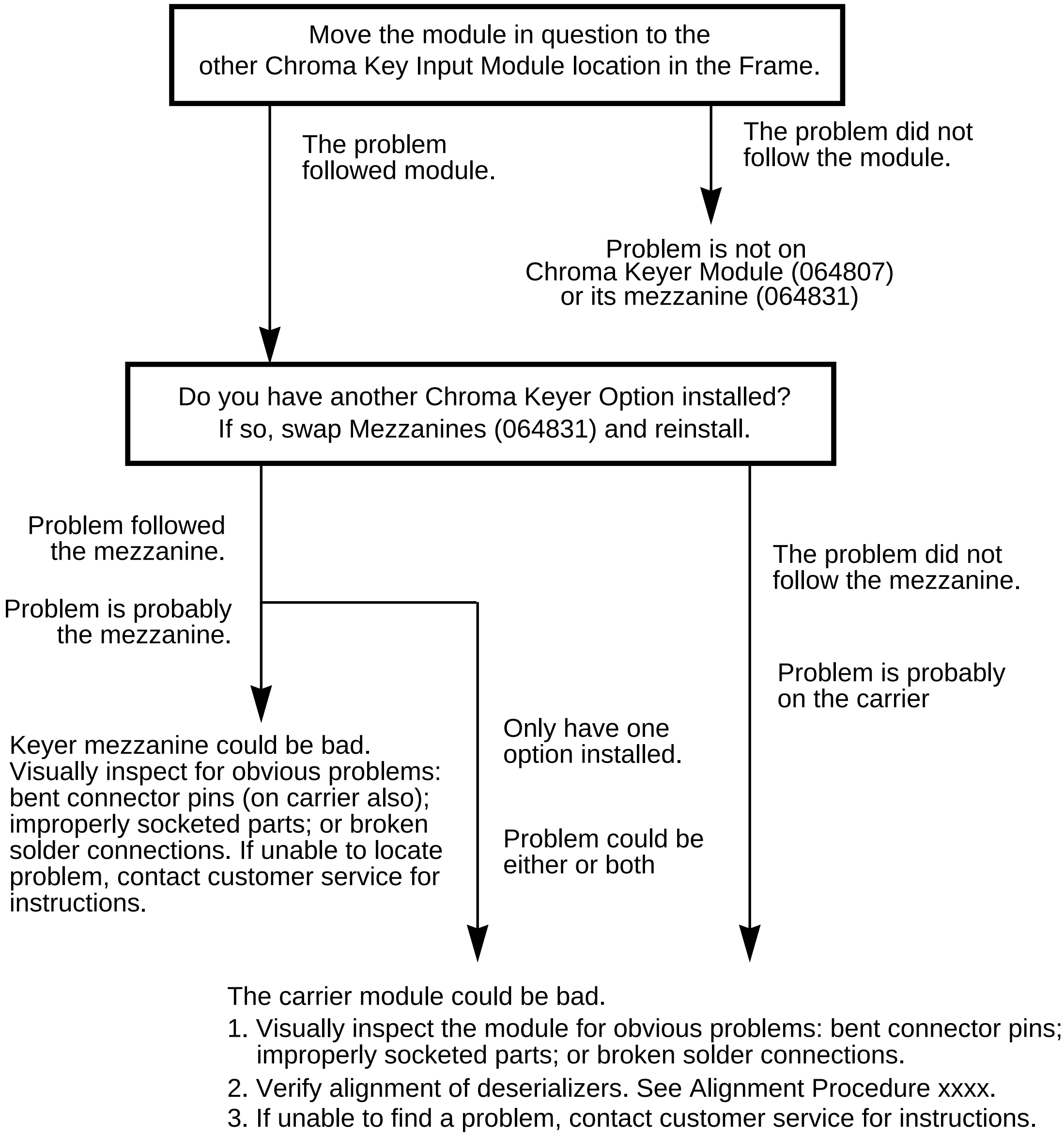
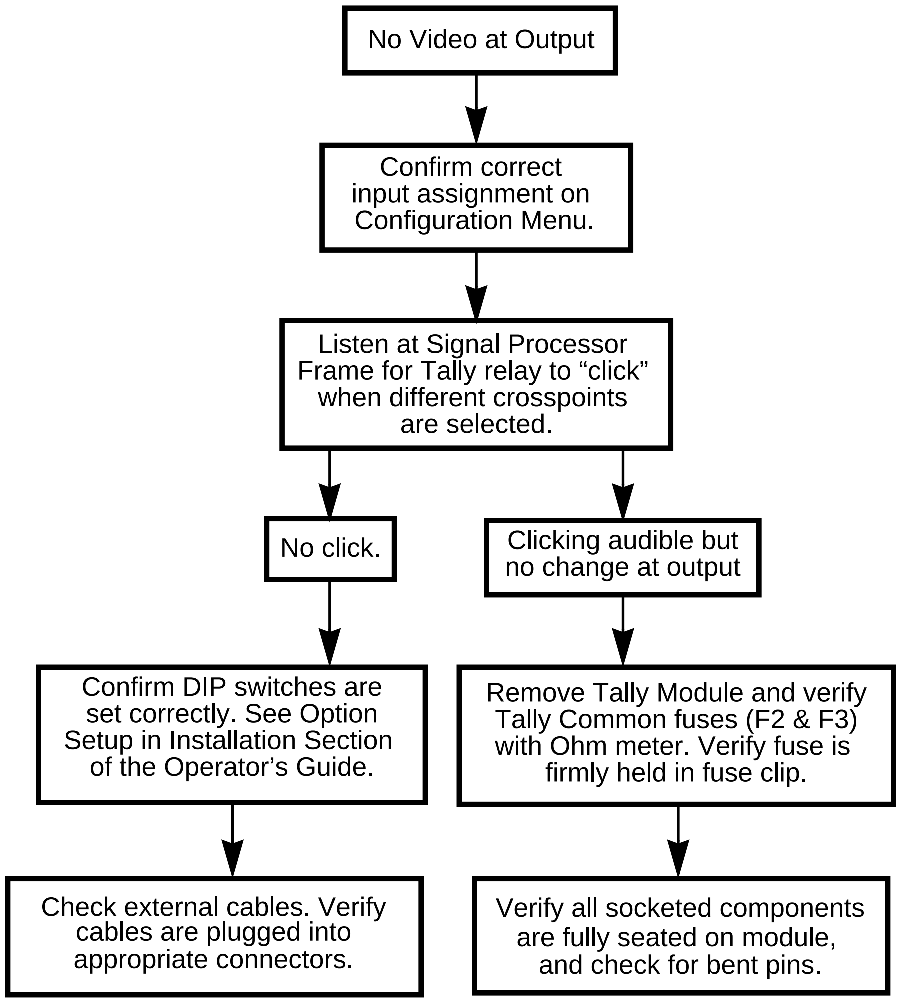


Figure 5-9. 064807—Chroma Key Input Module

064808 -Tally Control Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken.
2. Verify the function in question is supported by the current software release.
3. Is the +5V LEDs at front edge of module lit? If not, check fuse.



See following page for diagnostics.

Figure 5-10. 064808—Tally Control Module

The µprocessor software contains some self-diagnostic routines. If the µprocessor is not totally broken, the diagnostics can identify a faulty part. To use the “DIAG” test point, connect oscilloscope to TP1, “DIAG”, and view repeated 5V logic pulses.
The meaning of the error codes are given in the following table:

# Of Pulses	Error Code	Comment
Ø	No Error	No errors found
1	CPU	CPU’s internal RAM has failed
2	ROM Checksum	ROM Checksum did not verify correctly
3	Timer	Internal timer is not functioning
4	Interrupt	External interrupt is not functioning
5	External RAM	Address or Data error has occurred in RAM
6	RX Buffer Full*	Communications Receiver’s circular buffer overflowed
7	RX Overrun*	Communications Receiver received byte faster than it could process
8	RX Framing*	Communications Receiver framing error
9	RX Checksum	Incoming message packet with invalid checksum, corrupt data
10	Crosspoint	Illegal Crosspoint number received, exceeds boundary (Software Error)
11	Illegal Mode	Illegal mode selected on DIP switches; check settings
12	Illegal Relay Number	Relay number outside memory mapping (Software Error)
13	Illegal Relay Mode	Software Error
14	Frame Store	Frame Store Variable out of range (Software Error)
15	RX No Data	Lack of data from host processor causing reset error
16	Infinite Loop	Infinite loop detected (Software Error)
17	Watchdog	Watchdog Timer has timed out
18	RX Noise*	Communications port noise error
19	RX Frame*	Communications port framing error

* Check the RS-422 Data lines and the Input Buffer U32.

Figure 5-11. 064808—Tally Control Module (Continued)

064813 - Mixer Interface Module

1. Check the Operator’s Guide to verify correct usage of the function that appears broken.
2. Verify the function in question is supported by the current software release.
3. Is the +5V LEDs at front edge of module lit? If not, check fuse.

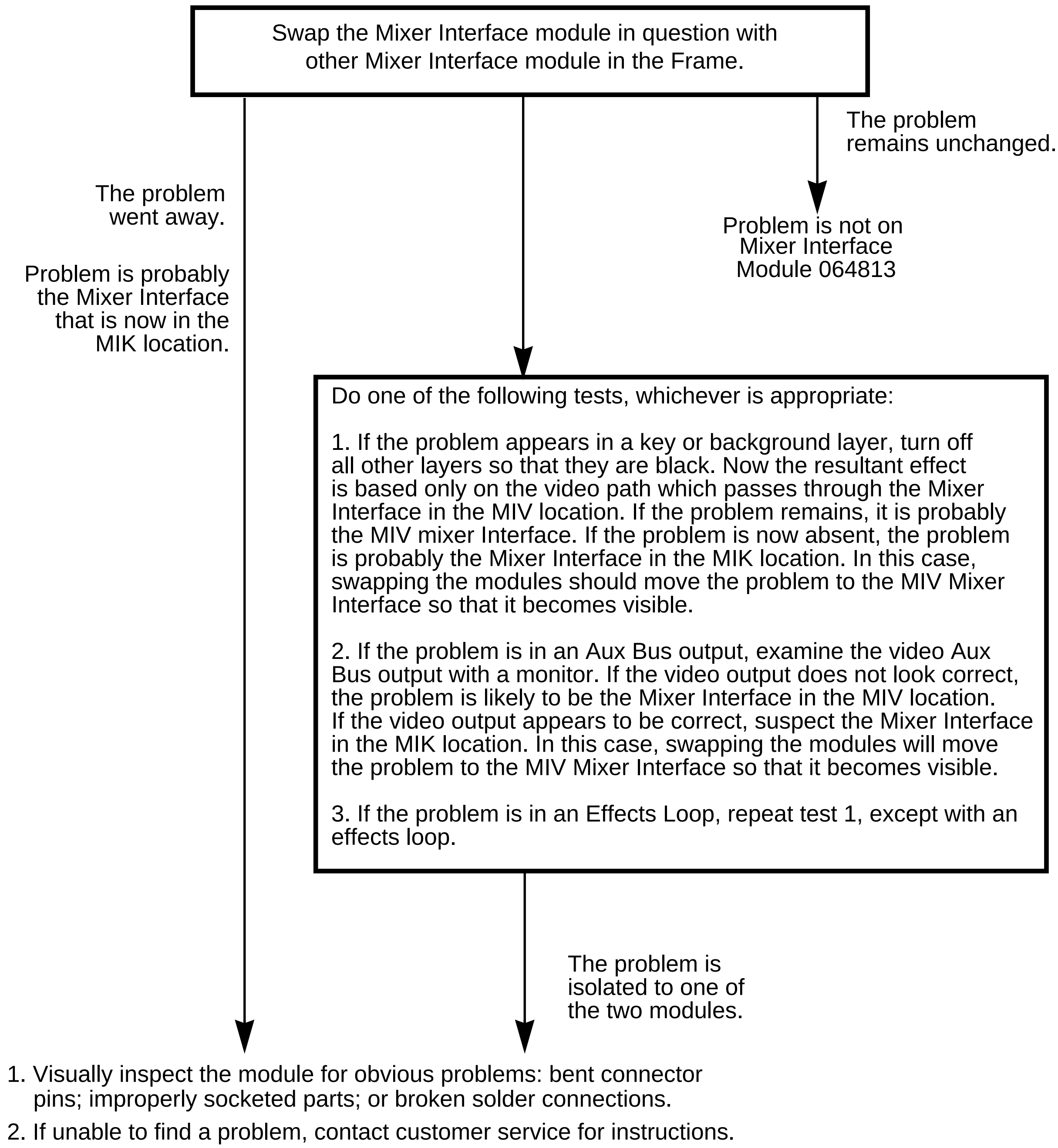
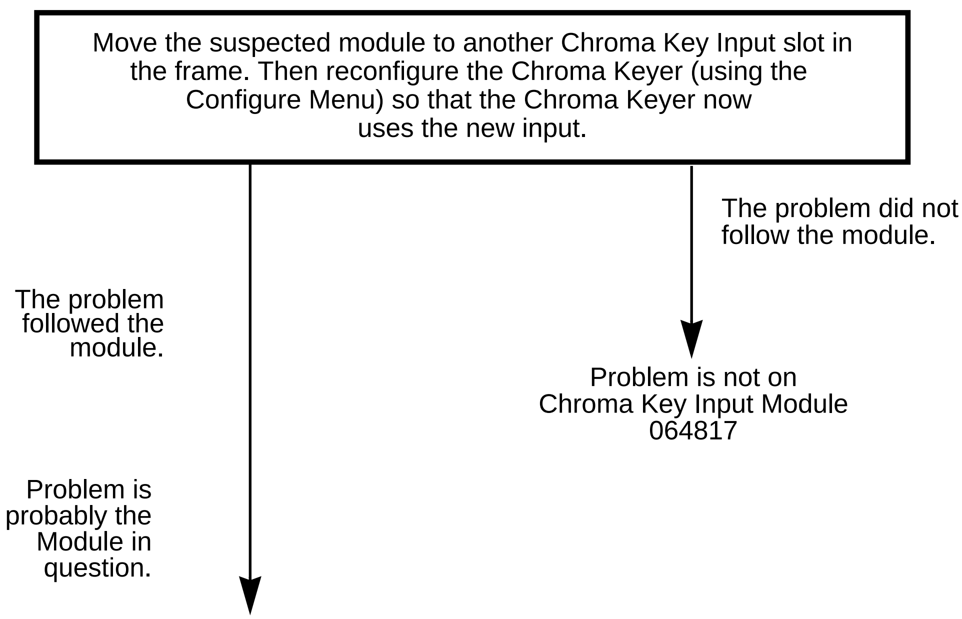


Figure 5-12. 064813—Mixer Interface Module

064817 - Chroma Key Input Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken. This especially applies to selection of input format for analog inputs, and setting switcher input timing (this determines clamp timing of analog inputs).
2. Verify the function in question is supported by the current software release.
3. Is the LED at front edge of the Sync Generator module lit? If not, check fuse on the Chroma Key Input Module.
4. Identify which Serial Input Module is responsible for the input in question from the following list:

Chroma Key Input 1 (Slot D9): Inputs 1 and 2
Chroma Key Input 2 (Slot D8): Inputs 3 and 4
Chroma Key Input 3 (Slot D7): Inputs 5 and 6



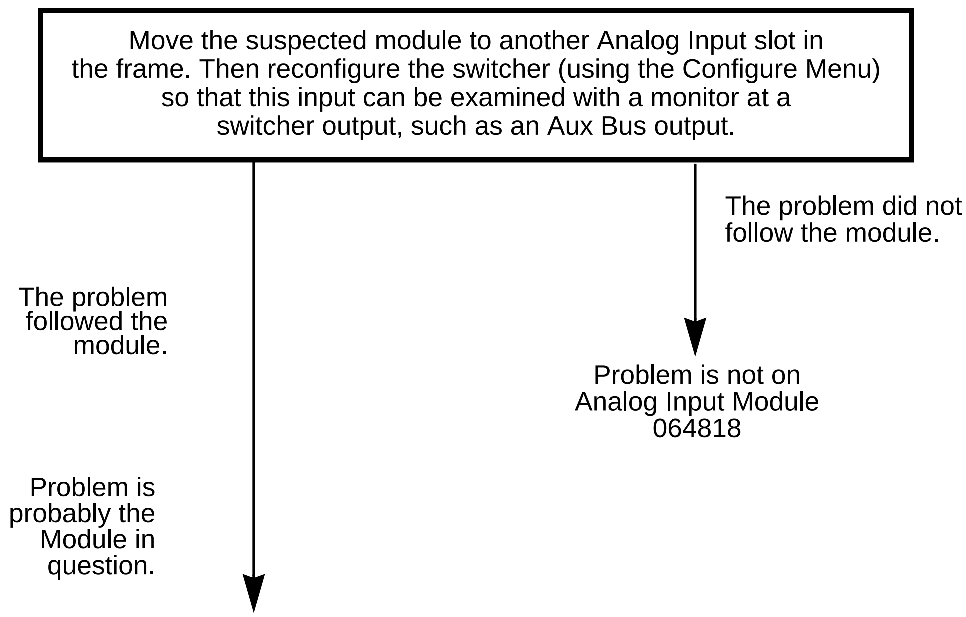
1. Visually inspect the module for obvious problems: bent connector pins; improperly socketed parts; or broken solder connections.
2. Verify alignment of module. See Alignment Procedure xxxxx.
3. If unable to locate problem, contact customer service for instructions.

Figure 5-13. 064817—Chroma Key Input Module

064818 - Analog Input Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken. This especially applies to selection of input format for analog inputs, and setting switcher input timing (this determines clamp timing of analog inputs).
2. Verify the function in question is supported by the current software release.
3. Is the LED at front edge of the Sync Generator module lit? If not, check fuse on the Analog Input Module.
4. Identify which Serial Input Module is responsible for the input in question from the following list:

Analog Input 1 (Slot D17): Inputs 1 and 2
Analog Input 2 (Slot D16): Inputs 3 and 4
Analog Input 3 (Slot D15): Inputs 5 and 6
Analog Input 4 (Slot D14): Inputs 7 and 8
Analog Input 5 (Slot D13): Inputs 9 and 10
Analog Input 6 (Slot D12): Inputs 11 and 12
Analog Input 7 (Slot D11): Inputs 13 and 14
Analog Input 8 (Slot D10): Inputs 15 and 16



1. Visually inspect the module for obvious problems: bent connector pins; improperly socketed parts; or broken solder connections.
2. Verify alignment of module. See Alignment Procedure xxxxx.
3. If unable to locate problem, contact customer service for instructions.

Figure 5-14. 064818—Analog Input Module

064819 - Analog Output Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken.

2. Verify the function in question is supported by the current software release.

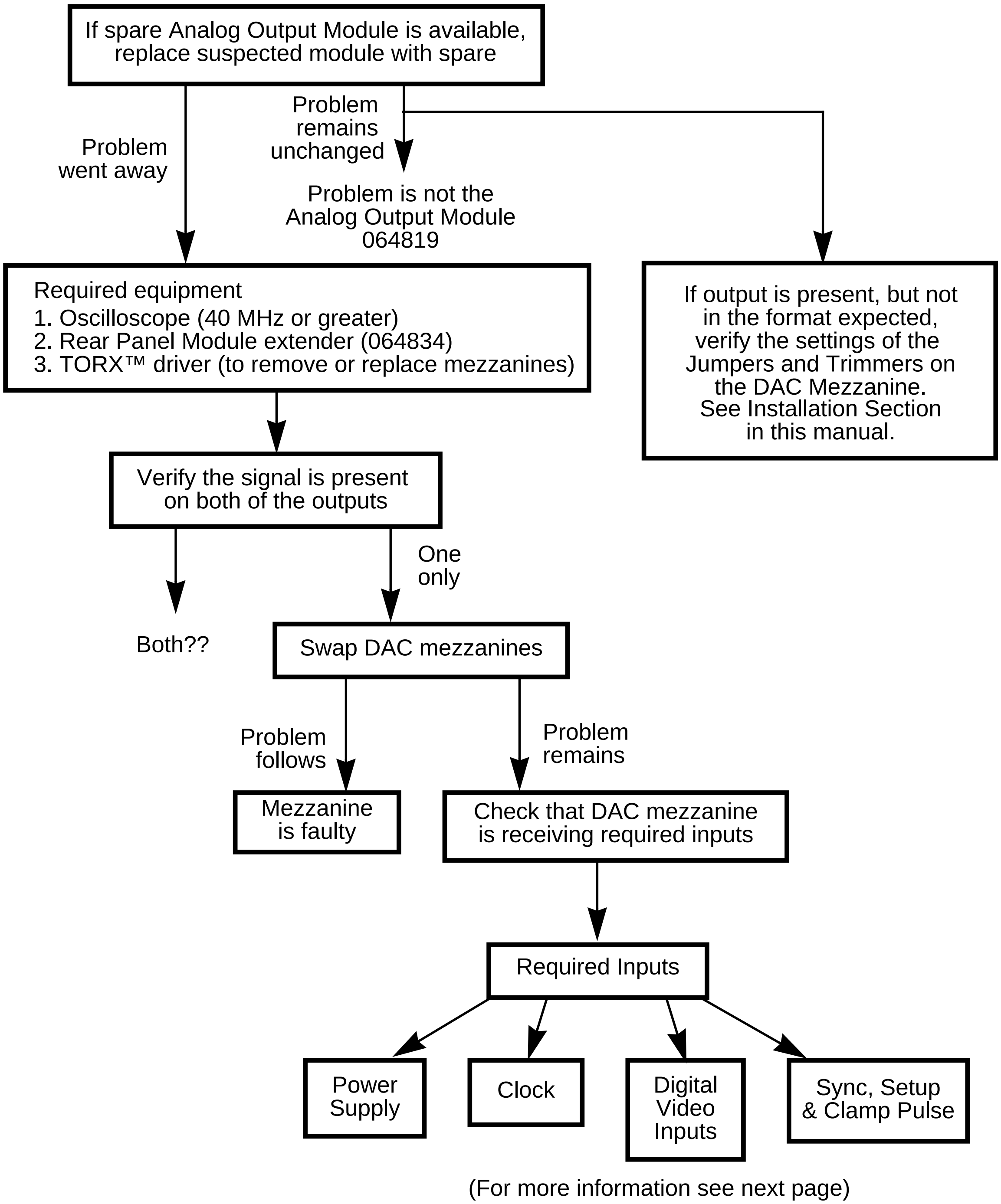


Figure 5-15. 064819—Analog Output Module

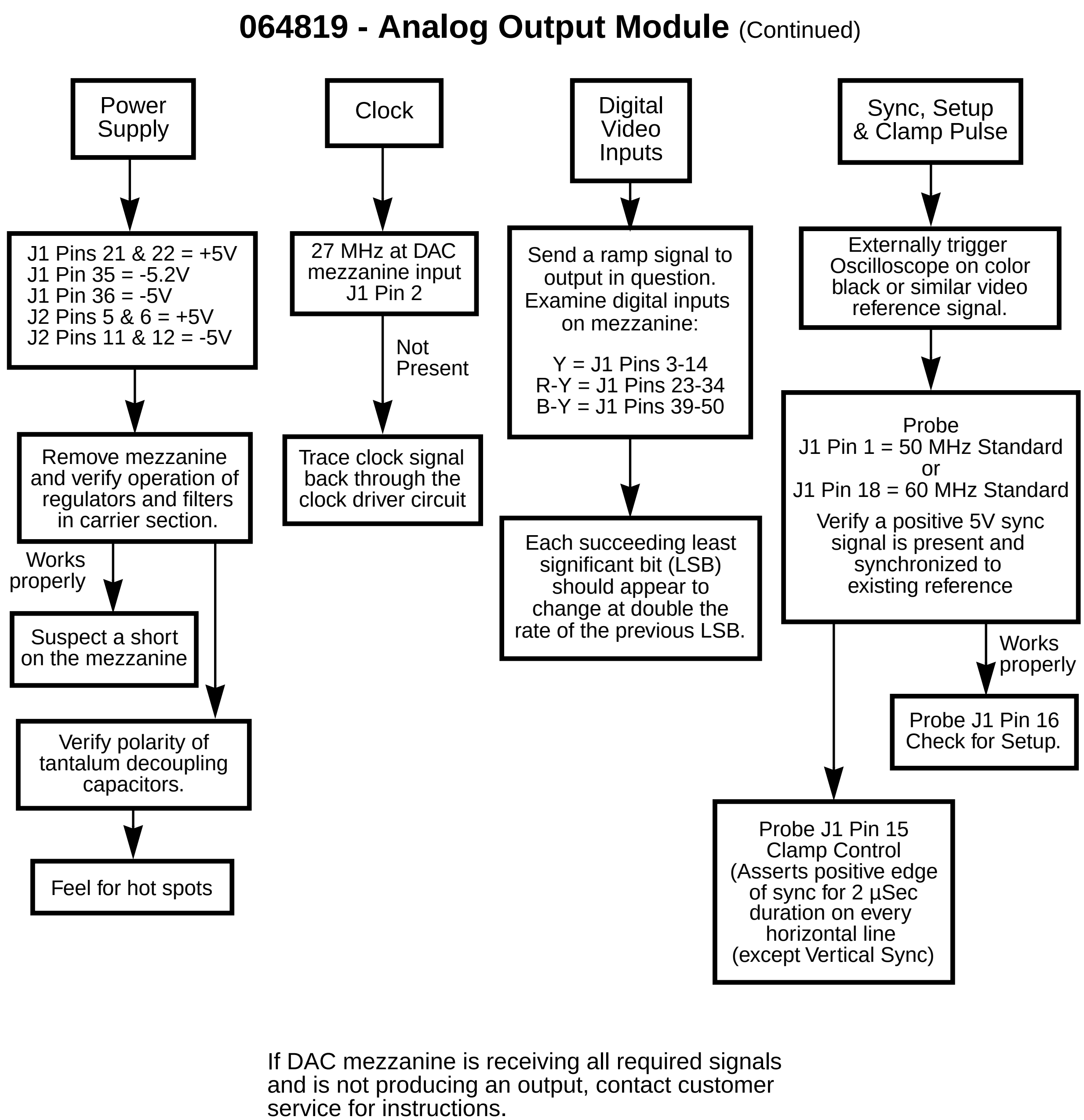
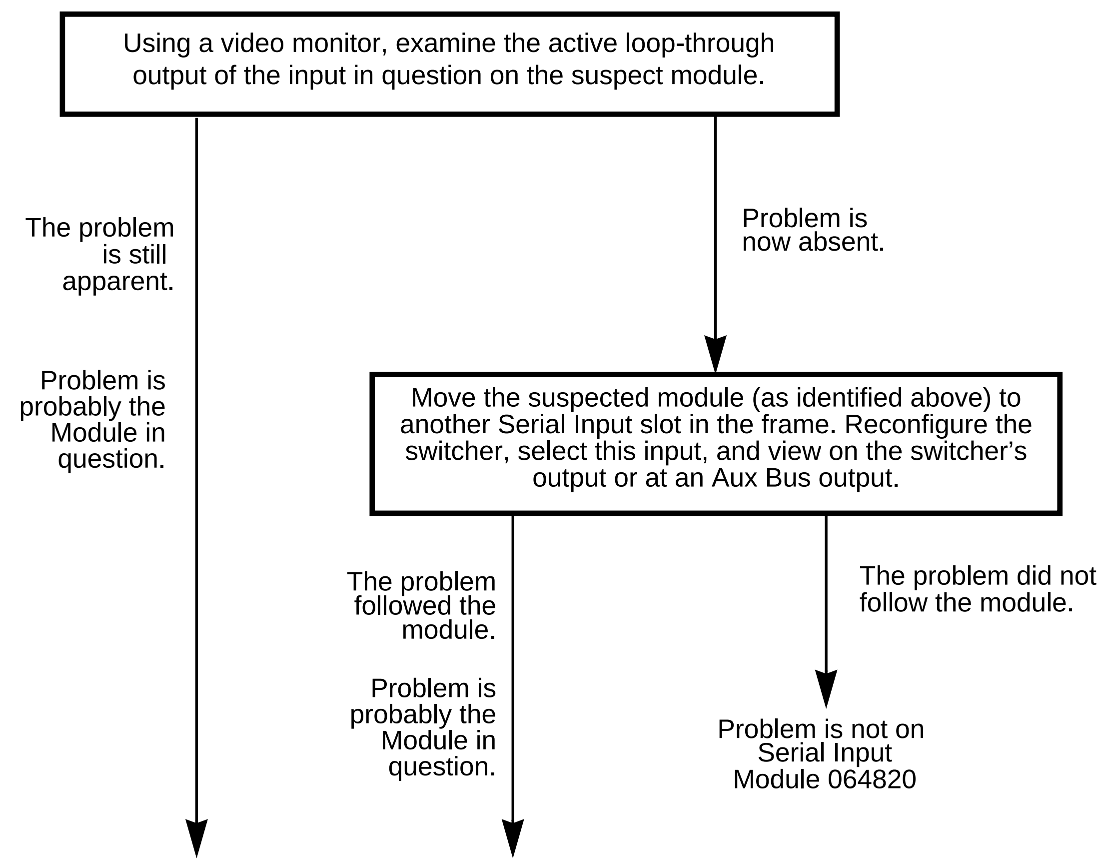


Figure 5-16. 064819—Analog Output Module (Continued)

064820 - Serial Input Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken.
2. Verify the function in question is supported by the current software release.
3. Is the LED at front edge of the Sync Generator module lit? If not, check fuse on the Serial Input Module.
4. Identify which Serial Input Module is responsible for the input in question from the following list:

Serial Input 1 (Slot C16): Inputs 1 thru 8
Serial Input 2 (Slot C15): Inputs 9 thru 16
Serial Input 3 (Slot C14): Inputs 17 thru 24
Serial Input 4 (Slot C13): Inputs 25 thru 32
Serial Input 5 (Slot C12): Inputs 33 thru 40
Serial Input 6 (Slot C11): Inputs 41 thru 48
Serial Input 7 (Slot C10): Inputs 49 thru 56
Serial Input 8 (Slot C8): Inputs 57 thru 64



1. Visually inspect the module for obvious problems: bent connector pins; improperly socketed parts; or broken solder connections.
2. If unable to locate problem, contact customer service for instructions.

Figure 5-17. 064820—Serial Input Module

064821 - Serial Output Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken.
2. Verify the function in question is supported by the current software release.
3. Is the LED at front edge of the Sync Generator module lit? If not, check fuse on the Serial Reentry Module.
4. Identify which Serial Input Module is responsible for the input in question from the following list:

Serial Output 1 (Slot D6)	Serial Output 2 (Slot D5)	Serial Output 3 (Slot D4)	Serial Output 4 (Slot D3)	Serial Output 5 (Slot D2)
Mask	M/E 1 Pvw	Aux 1 Video	Aux 5A	—
Sw Pvw	M/E 2 Pvw	Aux 1 Key	Aux 5B	—
DSK Pgm	DSK Pvw	Aux 2 Video	Aux 6A	—
DSK Pgm Key	—	Aux 2 Key	Aux 6B	—
M/E 1 Pgm	Aux 9A	Aux 3 Video	Aux 7A	—
M/E 1 Key	Aux 9B	Aux 3 Key	Aux 7B	—
M/E 2 Video	DSK Clean Feed	Aux 4 Video	Aux 8A	—
M/E 2 Key	DSK Key/Dirty Feed	Aux 4 Key	Aux 8B	—

Note that the outputs are in pairs.

<u>If the suspected module is the only Serial Output Module available,</u> troubleshoot the Mix/Wipe modules first. Then move the Serial Output module to the S/O 4 (Slot D4) Serial Output slot in the Frame. Examine the Aux Buses 5A, 5B, 6A, and 6B with a monitor by selecting an input such as internal color bars in the Aux Bus selection subpanel.

The problem followed the module.

Problem is probably the Module in question.

1. Visually inspect the module for obvious problems: bent connector pins; improperly socketed parts; or broken solder connections.
2. If unable to locate problem, contact customer service for instructions.

The problem did not follow the module.

Problem is not on Serial Output Module 064821

<u>If another Serial Output Module is available,</u> replace the module in question with it.

The problem went away.

Problem is probably the Module in question.

1. Visually inspect the module for obvious problems: bent connector pins; improperly socketed parts; or broken solder connections.
2. If unable to locate problem, contact customer service for instructions.

The problem remains

Problem is not on Serial Output Module 064821

Figure 5-18. 064821—Serial Output Module

064822 - Serial Reentry Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken.
2. Verify the function in question is supported by the current software release.
3. Is the LED at front edge of the Sync Generator module lit? If not, check fuse on the Serial Reentry Module.
4. Identify which Serial Reentry Module is responsible for the reentry input in question from the following list:

Serial Reentry 5 (Slot C12): Inputs 1 and 2

Serial Reentry 6 (Slot C11): Inputs 3 and 4

Serial Reentry 7 (Slot C10): Inputs 5 and 6

Serial Reentry 8 (Slot C8): Inputs 7 and 8

Serial Reentry 9 (Slot C7)	Serial Reentry 10 (Slot D6)
DSK Pgm Video	Bkgd 1
DSK Pgm Key	Bkgd 2
Black	Chipped Mask
Test Signal	Maskstore
	M/E 2 Video
	M/E 2 Key
	M/E 1 Video
	M/E 1 Key

If an Analog Input is suspected, replace the suspected module (as identified above) with the Serial Reentry module from Slot C6 in the frame.

The problem went away.

Problem is probably the Module in question.

The problem remains unchanged.

Problem is not on Serial Reentry Module 064822

1. Visually inspect the module for obvious problems: bent connector pins; improperly socketed parts; or broken solder connections.
2. If unable to locate problem, contact customer service for instructions.

If either Serial Reentry 9 or 10 (as identified above) is suspected, replace the suspected module with the other Serial Reentry Module. Do not use an analog input for this test.

The problem went away

Problem is probably the Module in question.

The problem remains unchanged.

Problem is not on Serial Reentry Module 064822

1. Visually inspect the module for obvious problems: bent connector pins; improperly socketed parts; or broken solder connections.
2. If unable to locate problem, contact customer service for instructions.

Figure 5-19. 064822—Serial Reentry Module

064823 - Communications I/O Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken.
2. Verify the function in question is supported by the current software release.

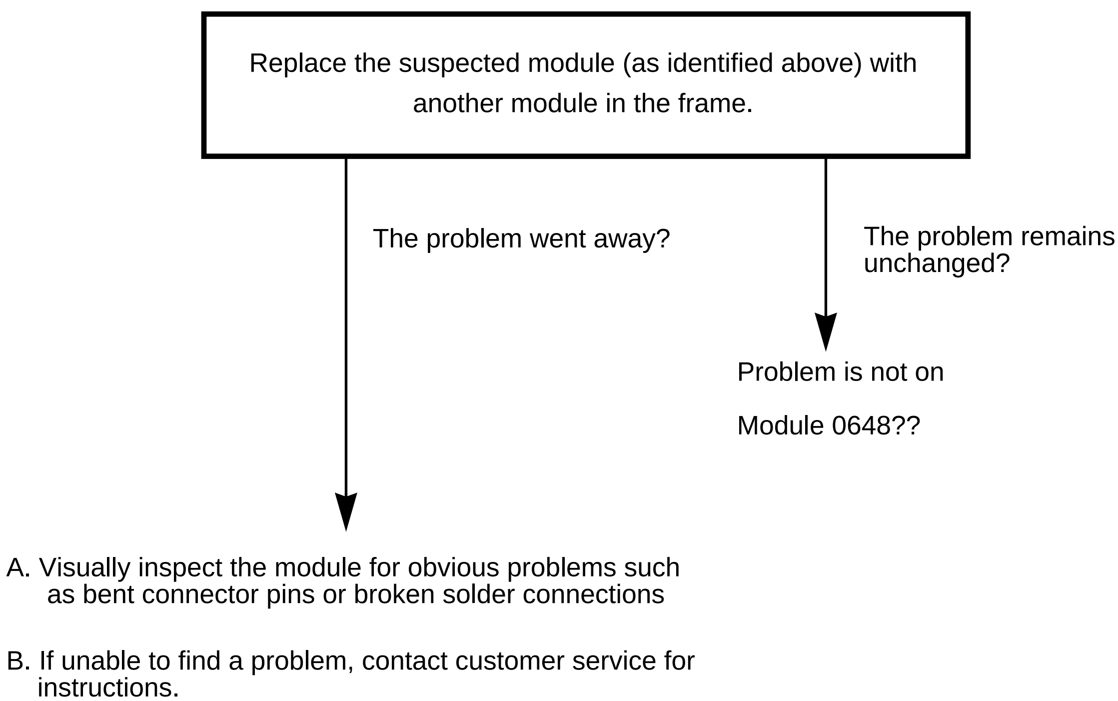


Figure 5-20. 064823—Communications I/O Module

064824 - Expanded Communications Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken.

2. Verify the function in question is supported by the current software release.

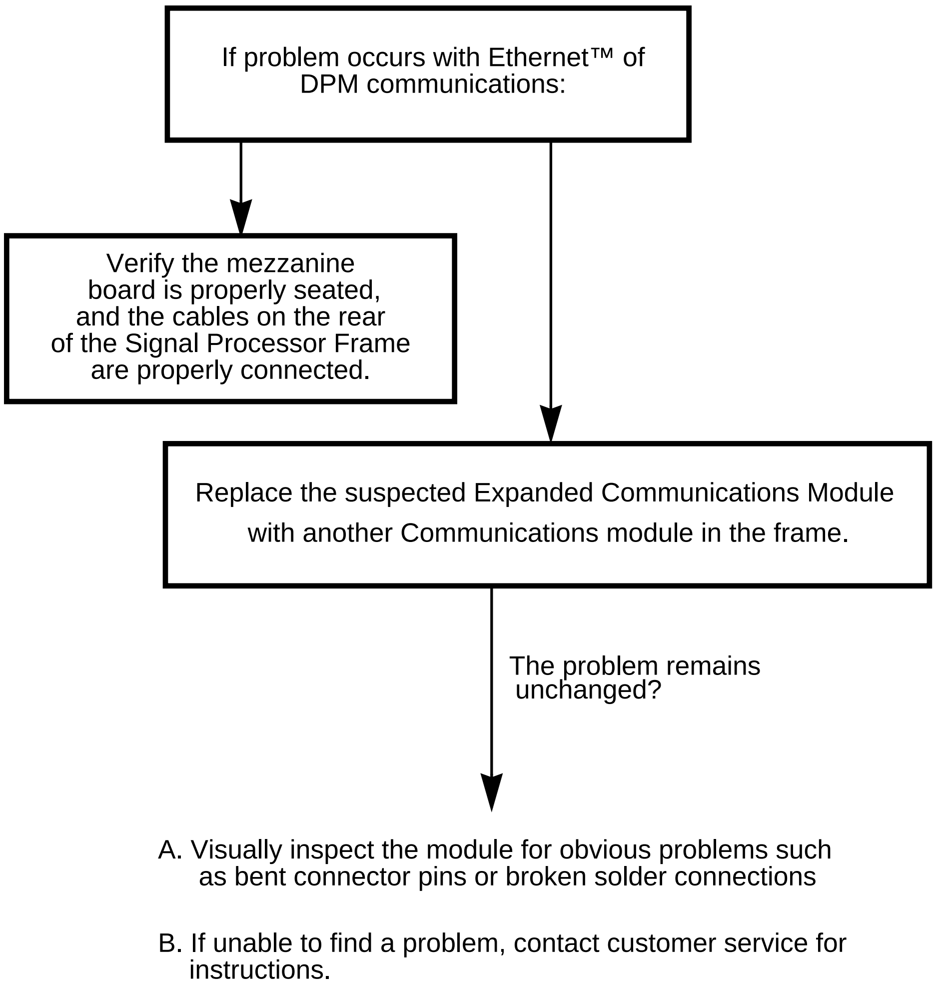


Figure 5-21. 064824—Expanded Communications Module

064825 - GPI Interface Module

1. Check the Operator's Guide to verify correct usage of the function that appears broken.
2. Verify the function in question is supported by the current software release.
3. Is the +5V LEDs at front edge of module lit? If not, check fuse. A 30 Amp fuse on the +5V line prevents catastrophic failure.
4. A silicon polyswitch (self-setting fuse) protects the module inputs from a dead short (+5V to Ground). It will automatically reset after shorted condition is corrected.

Figure 5-22. 064825—GPI Interface Module

Control Panel Troubleshooting

Control Panel

1. Verify the A / C fuse (at the On / Off switch) is operational on the main power supply and the optional redundant power supply.
2. Verify the fuse located on the individual power supplies is operational.

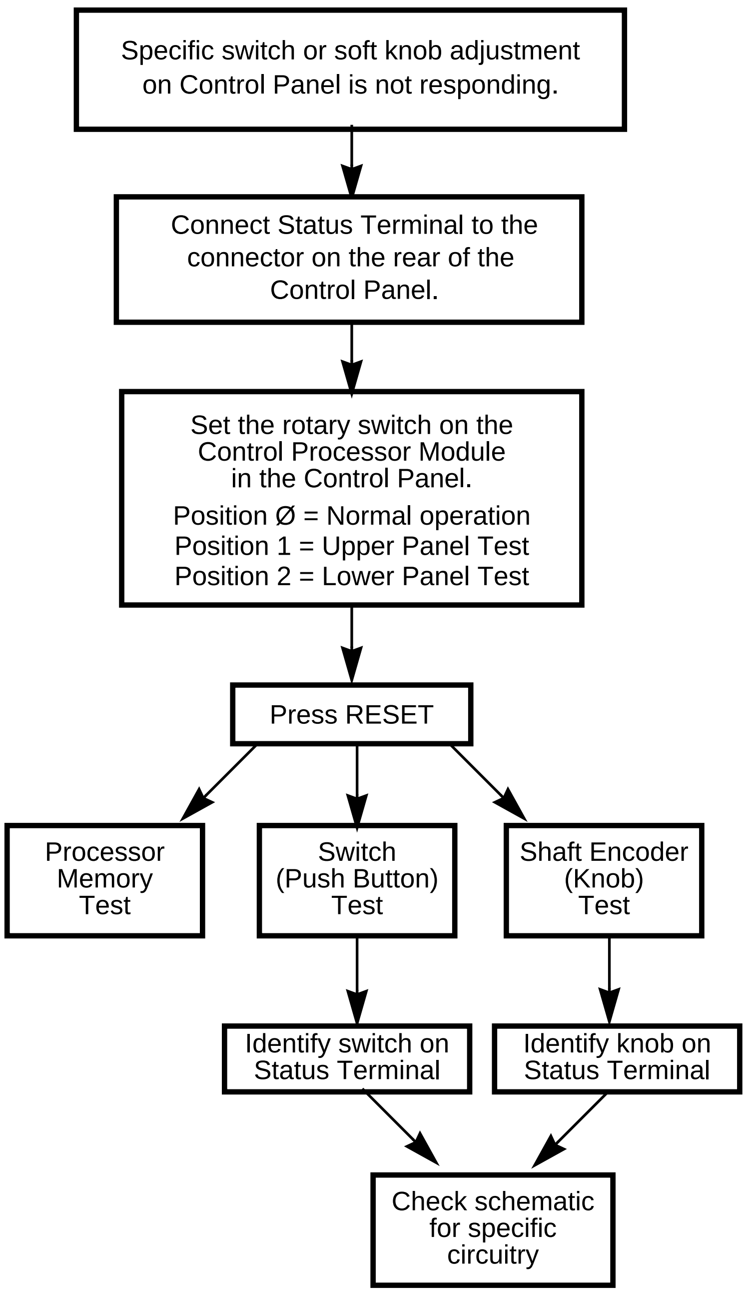


Figure 5-23. Control Panel

A

Appendix A — Jetta Power Supply Information

NOTE: *This Addendum applies ONLY to the Model 4000-3 Switcher, which uses a different frame power supply than all other Model 4000 Switchers.*

Introduction

The purpose of this Addendum is twofold:

- To describe replacement of Todd +5 Volt power supply units with Jeta +5 Volt power supply units in Model 4000-3 Switchers
- To provide maintenance information for Model 4000-3 Switchers that have Jeta +5 Volt power supply units

Power Supply Configurations

Each Signal Processor Frame Power Supply assembly for a Model 4000-3 Switcher consists of a rack-mounted frame containing a Multi-Output Power Supply unit and a high-current +5 Volt Power Supply unit.

These power supply assemblies can be mounted in either a non-redundant configuration (1 frame with the two power supply units) or a redundant configuration (2 frames; each with two power supply units).

Grass Valley assembles and tests the power supplies; however, the individual power units in the power supplies are manufactured by other suppliers.

An earlier version of the Signal Processor Frame Power Supply assembly for the Model 4000-3 contained both a Multi-Output Power Supply unit and a high-current +5 Volt Power Supply unit manufactured by Todd Products Corporation. That is the version described in Section 2 of this manual.

The present version of the Signal Processor Frame Power Supply assembly for the Model 4000-3 also contains a Todd Multi-Output Power Supply unit, but the high-current +5 Volt Power Supply unit is now a Jeta. This version of the Signal Processor Frame Power Supply is described here.

The reason for the change in power supplies is that, when fully optioned, the Model 4000-3 draws enough current from the +5 Volt supply that it comes close to exceeding the specifications of the Todd +5 Volt Supply.

Installation Information

Changes to the Installation section of the Model 4000 Installation & Service manual are as follows:

Initial Installation of the Model 4000-3

Refer to the Section 2 of this manual for initial installation of the Model 4000-3, with the following exceptions:

- Ignore the references to connecting the power supply for 110-volt operation. The Jeta +5 Volt power supply will not run on 110 volts; therefore, the power supply frame cannot be connected to a 110-volt source.
- Ignore references to Pioneer power supply units. No Pioneer units have been shipped with Model 4000-3 Switchers. Beware of swapping power supply assemblies between switchers. The Model 4000-3 will not operate properly with Pioneer or Todd +5 Volt supplies from other Model 4000, 3000, or 2200 Switchers.

NOTE: *For the Jeta +5 Volt power supply, the BYPASS/PROTECT jumper in the Model 4000-3 fan assembly should be set to the BYPASS position as described in the Section 2, Installation, in this manual.*

Replacement of Jeta +5 Volt Supply

1. To install the replacement supply, slide it into place and install the front mounting screws.

2. Feed the small multi-wire cable from the new power supply through the hole at the top left of the +5 Volt supply compartment (see Figure A-1), and on through the frame to the hole into the Multi-Output supply compartment. If necessary, gain access from the front of the frame.

3. In the Multi-Output supply compartment, connect the multiwire cable connector to the mating connector at the top of the circuit board.

4. In the +5 Volt supply compartment, ensure that the connector on that end of the multiwire cable is securely attached to its mating connector.

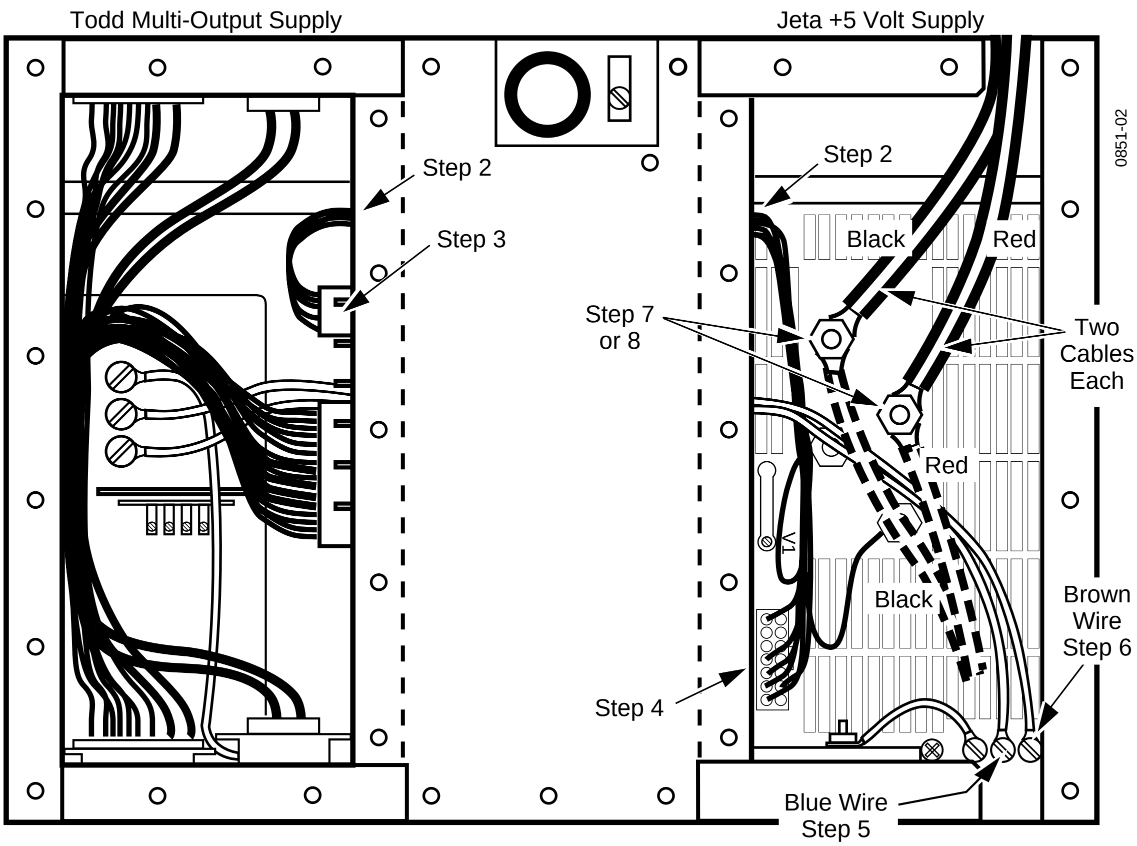


Figure A-1. Installation of Jeta +5 Volt Power Supply Assembly

5. Connect the blue AC power wire to the center screw on the AC power terminal block.

6. Connect the brown AC power wire to the right screw on the AC power terminal block.

7. If this is the +5 volt supply in a *non-redundant* power system or the *lower* +5 volt supply in a *redundant* power system, perform the following steps:
    a. Place the two heavy black cables from the Signal Processor frame or the upper power supply on the LEFT stud.
    b. Place the two heavy red cables from the Signal Processor frame or the upper power supply on the RIGHT stud.

WARNING

Note that the connections on the Jeta +5 Volt supply, referenced in Step 7, are just the opposite of the connections that you removed from the Todd +5 Volt supply. Note also that the studs, nuts, and cable ends for the positive (red) cables are larger than those for the negative (black) cables, to prevent them from being incorrectly connected. Connecting the cables incorrectly could destroy portions of your power supply and/or switcher.

---

    c. Install the lockwashers and nuts and torque to 80 inch pounds.

WARNING

Use caution when tightening the nuts. Insufficient torquing of the nuts may cause overheating of the terminals which could result in fire. However, excessive torquing of the nuts may break the studs.

NOTE: *Refer to* Figure A-2 *when performing the following step.*

---

8. If this is the *upper* +5 volt supply in a *redundant* system:
   a. Place the two heavy black cables from the signal processor frame over the LEFT power supply stud.
   b. Place the two heavy red cables from the signal processor frame over the RIGHT power supply stud.

WARNING

Note that the connections on the Jeta +5 Volt supply, referenced in Step 8, are just the opposite of the connections that you removed from the Todd +5 Volt supply. Note also that the studs, nuts, and cable ends for the positive (red) cables are larger than those for the negative (black) cables, to prevent them from being incorrectly connected. Connecting the cables incorrectly could destroy portions of your power supply and/or switcher.

---

   c. Install the lockwashers and standoff studs that you removed from the supply being replaced. Torque these studs to 80 inch pounds.

WARNING

Use caution when tightening the nuts. Insufficient torquing of the nuts may cause overheating of the terminals which could result in fire. However, excessive torquing of the nuts may break the studs.

NOTE: *New 14-1/4-inch black cables (P/N 051900-02) are required for the following substep.*

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   d. Place the two new black cables to the lower supply (dashed lines) over the LEFT stand-off stud. See first WARNING above.
   e. Place the two heavy red cables to the lower supply (dashed lines) over the RIGHT stand-off stud.

9. Install the lockwashers and nuts, and torque the nuts to 80 inch pounds. See second WARNING above.If this is a *non-redundant* power system:
   a. Adjust the power supply voltages as described in the Maintenance Information in this Addendum.
   b. You may now reinstall the covers on the rear of the frame, reconnect the power source, and apply power.

10. If this is a *redundant* power system:
   a. You must replace the +5 Volt power assembly in the *second* Power Supply frame by repeating the procedures described above.
   b. When you have completed the installation (of both +5 Volt supplies), reconnect the power source and apply power to both units.
   c. Before you install the rear plates on the Power Supply frames, you must check the output voltages for load-sharing, as described in the Maintenance Information in this Addendum.

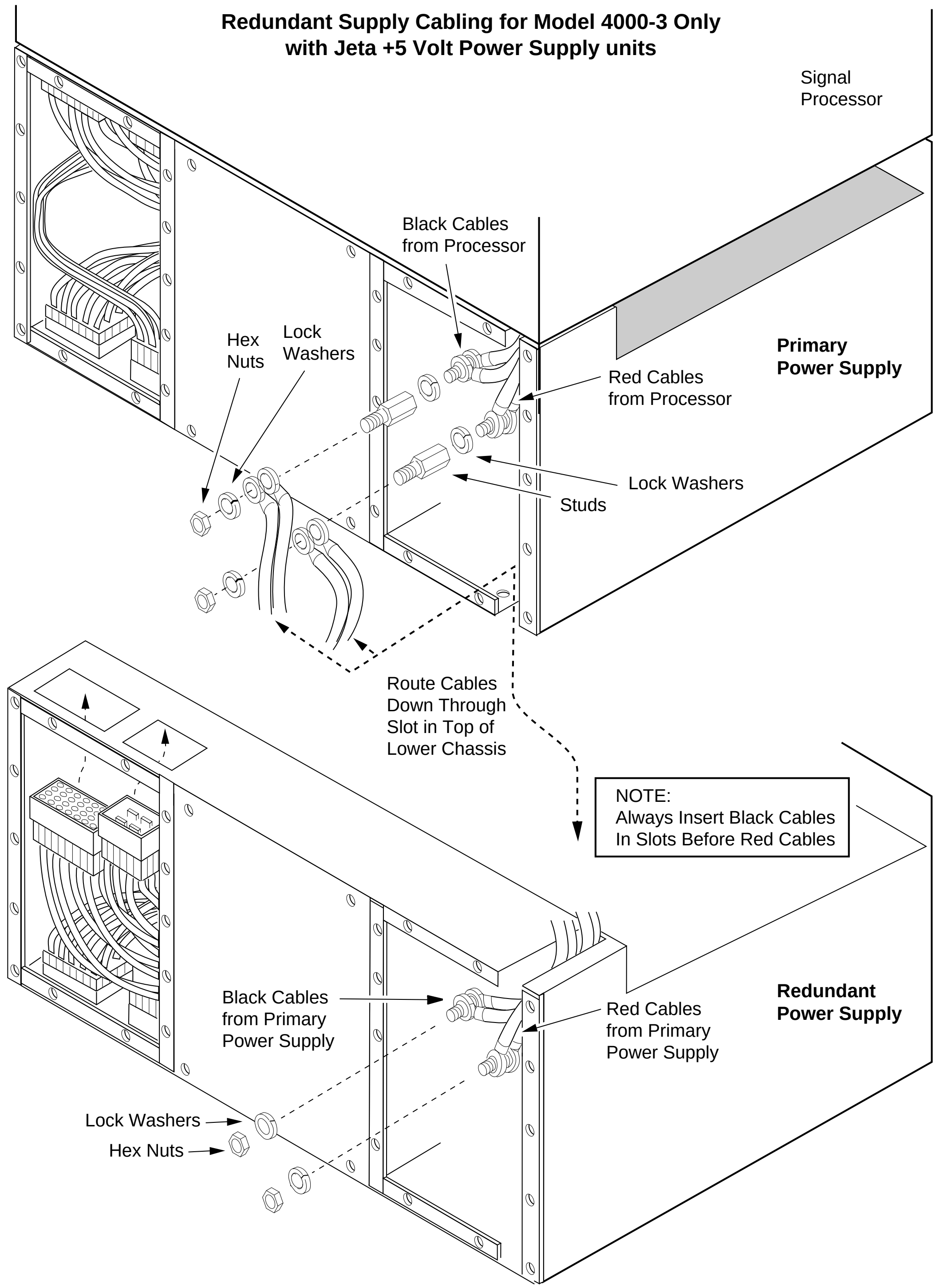

Figure A-2. Redundant Power Supply Cable Installation

Maintenance Information

Changes to the Maintenance section of the Model 4000 Installation & Service manual are as follows:

Replacement of Individual Power Supply Units

Replacement of a Jeta +5 Volt Power Supply

The removal of Pioneer and Todd +5 Volt supplies described in the Model 4000 Installation & Service manual does not apply to the Model 4000-3.

To remove a Jeta +5 Volt power supply unit from the Power Supply frame, reverse the procedure described in the Upgrade Instructions ("Installation of Jeta +5 Volt Supply") in this Addendum.

NOTE: *Wiring diagrams of the Todd Multi-Output and Jeta + 5V Power Supplies are provided at the end of this Addendum.*

Power Supply Voltage Adjustments

Whenever a power supply is replaced or a redundant power supply is added, power supply adjustments are required.

The Power Supply Adjustment Procedure given in the Model 4000 Installation & Service manual is correct for both the Todd and Jeta power supplies, except for the location of the +5 Volt adjustment. The location of the high-current +5 Volt adjustment (V1) on the Jeta supply is shown in Figure A-3.

For your convenience, the adjustment procedure is repeated here.

WARNING

Dangerous voltages are present inside the Signal Processor Frame Power Supply. Do not perform any servicing of this equipment unless you are qualified to do so. Remove all rings, wrist watches, etc., before working inside the equipment.

Adjusting Single Power Supply System

1. Remove the left and right rear access panels of the power supply if they have not previously been removed.

NOTE: *The –5.2V supply is labeled –5V.*

2. Measure each of the supply voltages (+5, –5.2, +13, –13, and +48 Vdc), between the COM test point and the respective power supply test point. ***Important****: Do not measure from chassis ground to the test points.*

CAUTION

DO NOT USE the large power supply terminals when adjusting the +5 Volt power supply. You must USE THE TEST POINTS, or your adjustment will be incorrect and the voltage set too low at the Signal Processor Frame.

3. Refer to Figure A-3 for adjustment locations. Using a trimpot adjustment tool, adjust the supplies to within 20mV of their labeled voltages. Remember to set the supply labeled –5V to –5.2V.

4. Turn off the power supply and replace the rear covers.

5. The system may now be turned on for normal operation.

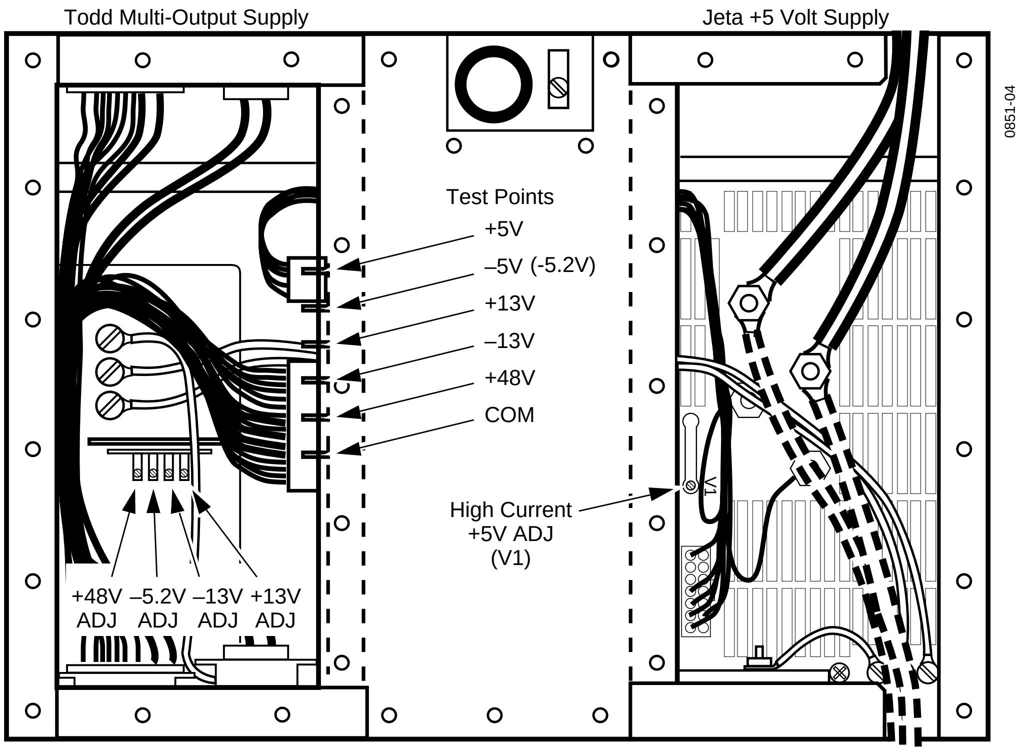

Figure A-3. Voltage Test Points and Adjustments on the Todd Multi-Output and Jeta +5 Volt Power Supplies

Adjusting Redundant Power Supply System

1. Remove the left and right rear access panels of both power supply frames if they have not previously been removed.

NOTE: *The –5.2V supply is labeled –5V.*

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2. With the primary (upper) supply ON, and the redundant (lower) supply OFF, measure each supply voltage (+5, –5.2, –13, +13, +48 Vdc) between the COM test point and the respective power supply test point on the primary supply. ***Important***: *Do not measure from chassis ground to the test points.*

3. Refer to Figure A-3 for adjustment locations. Using a trimpot adjustment tool, adjust the supplies to within 20mV of their labeled voltages. Remember to set the supply labeled –5V to –5.2V.

4. Recheck the supply voltages at the test points and record them on paper.

5. Turn OFF the upper supply and turn ON the lower one.

6. Measure the lower supply voltages and adjust them to match those of the upper supply within 20mV. Adjustment locations are shown in Figure A-3.

7. Turn off both power supplies and install the access panels on the rear of the supplies.

8. Turn on both supplies for redundant operation.

Wiring Diagrams

Wiring diagrams for the Jeta +5 Volt Power Supply, the Todd Multi-Output Power Supply, and the Signal Processor Frame A / C Power Supply assemblies are shown on the *Model 2200/4000 Drawings* manual.

- Jeta +5V Power Supply – B11-078959-01 / 11
- Todd Multi-Output Power Supply – D11-078960-00 / 10
- Signal Processor Frame A / C Power Supply – D11-098901-03 / 04

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