grass valley
A BELDEN BRAND

K-FRAME

VIDEO PRODUCTION CENTER

Installation Planning Guide

www.grassvalley.com

071887504
NOVEMBER 2014

CERTIFICATE

Certificate Number: 510040.001

The Quality System of:

Grass Valley USA, LLC and its Grass Valley Affiliates

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Including its implementation, meets the requirements of the standard:

ISO 9001:2008

Scope:
The design, manufacture and support of video and audio hardware and software products and related systems.

This Certificate is valid until: June 14, 2015
This Certificate is valid as of: June 14, 2012
Certified for the first time: June 14, 2000

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Contents

Section 1

Introduction

Overview

The Grass Valley K-Frame family of multi-format digital production switchers provides powerful, ground-breaking features designed to meet the widest range of requirements for live studio, mobile, and post-production applications.

The K-Frame Video Processor is the heart of the system, providing extensive video switching and signal processing capabilities. This functionality is controlled using:

- a Kayenne control surface,
- a Karrera control surface,
- the Soft Panel (KSP option), and/or
- the Menu application running on a PC.

In addition, a K-Frame system supports direct control of external devices (DDRs, Servers) and bi-directional control to and from routing and automation systems.

Features

General

- Fully digital 10-bit 4:2:2 video switcher including Future-Ready 4K and 1080p (level A or B) support.
- Optional smart I/O modules provide up/down/cross-conversion when licensed with SetDef and MatchDef.
- Integrated Macro Builder/Editor allows users to edit macros online or offline on a PC running the menu application.
- Optional DoubleTake™ (split M/E mode) effectively increases the number of M/Es and adds flexibility to Suites operation while FlexiKey™ programmable clean feed mode supports separately programmable configurations of keyers from four M/E outputs.
- Aux bus transitions for dissolves and wipes on aux bus outputs.
- Interfaces with Grass Valley routers and Kaleido Multiviewers and their control systems.
- Optional Integrated Image Store capable of delivering up to 32 GB storage of Stills (3,000 images) or "Movies" (a total of 50 seconds) of 1080p video.
- LDK Series and LDX Series camera control with Ethernet tally via Connect Gateway.
- Optional integrated external ClipStore provides multiple channels of video/key pairs for up to 10+ hours of nonvolatile video/key/audio clip content.
- 999 macros with many new ways to recall macros from the Control Panel.
- 1,000 E-MEM registers with Define E-MEM for fine control in creation and editing of effects.
- Optional M/E Previewer provides a method to check and monitor any input to an M/E.
- VDCP Ethernet connection for stadium applications.
- Ethernet tally connection for integration with external tally systems.
- Optional RGB color correction on M/E buses and aux bus outputs.

- Source Rules:
  - Links keyers to sources.
  - Settings for On/Off/Left Alone on every M/E.
  - Full look-ahead preview of rules.
- Hot-swappable, front/rear removable modules and power supplies.
- Optional multiple Multiviewer capability with 5 pre-configured layouts (maximum 14 panes per layout) with On-Air and Preview tally.

K-Frame Standard Frame

- Up to 192 inputs and 96 outputs.
- Up to 9 M/Es, accessible across two suites—by using DoubleTake this may be increased to 18 virtual M/Es.
- Every M/E has six keyers with standard keying modes including Chroma Key, a pool of floating 3D iDPMs, and two frame stores per keyer—the Controller M/E cannot use floating 3D iDPMs.
- 2D-DPMs (resizers) on every keyer, with 6 pairs per M/E so iDPMs can be utilized for more complex effects.
- The Controller M/E has a complement of 6 full keyers with Chroma Key and 2D-DPMs.
- Up to 16 iDPMs (Integrated Digital Picture Manipulators), assigned as either floating iDPMs or within an eDPM at user's discretion.

K-Frame Compact Frame

- Up to 80 inputs and 48 outputs.
- Up to 5 M/Es, accessible across two suites, increased to 10 virtual M/Es by using DoubleTake.
- Every M/E has six keyers with standard keying modes including Chroma Key, two frame stores per keyer—every keyer except for Controller M/E can use the pool of floating 3D iDPMs.
- 2D-DPMs (resizers) on every keyer.
- The Controller M/E has a complement of 6 full keyers with Chroma Key and 2D-DPMs.
- Up to 8 iDPMs (Integrated Digital Picture Manipulators), assigned as either floating iDPMs or within an eDPM at user's discretion.

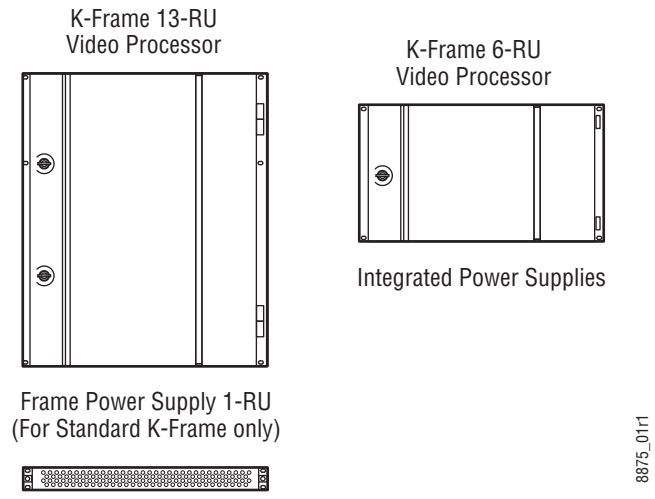
K-Frame Compact S-series Frame (Differences)

- Up to 6 M/Es, accessible across two suites, increased to 12 virtual M/Es by using DoubleTake.
- Every M/E has four keyers with standard keying modes including Chroma Key and every keyer can use the pool of floating 3D iDPMs (Key Stores are not available).
- 2D-DPMs (resizers) on every keyer.
- Controller M/E replaced by a pair of Multiviewers with pre-configured layouts and On-Air/Preview tally.

K-Frame Video Processor

The K-Frame Video Processor is available in two sizes, the 13RU Standard and the 6RU Compact. The number of licensed boards present in the frame determines the number of MEs available, as well as the number of video inputs, outputs, GPIOs and Relay Tallies.

Figure 1. K-Frame Video Processors



K-Frame Control Surfaces

Kayenne

A Kayenne control surface typically consists of a Control Panel, a Menu Panel with an included articulated support arm, a Panel Control Unit (PCU) frame, and optional Satellite Panels. This control surface has an

innovative modular design. Representative Kayenne control surfaces are shown in the following illustrations.

Figure 2. Kayenne 4-ME 35 Control Surface

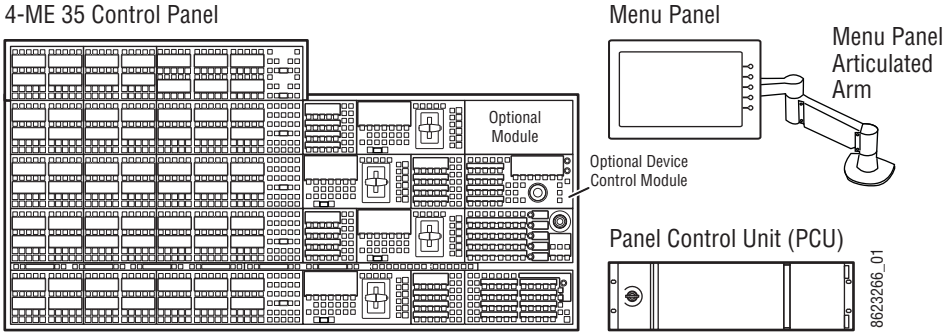


Figure 3. Kayenne 3-ME 35 Control Surface

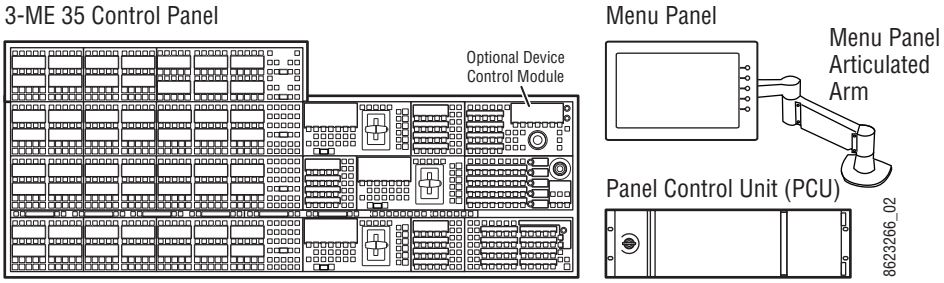


Figure 4. Kayenne 2-ME 25 Control Surface

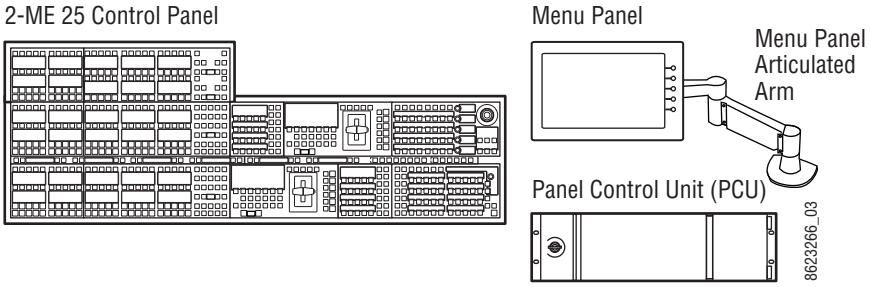
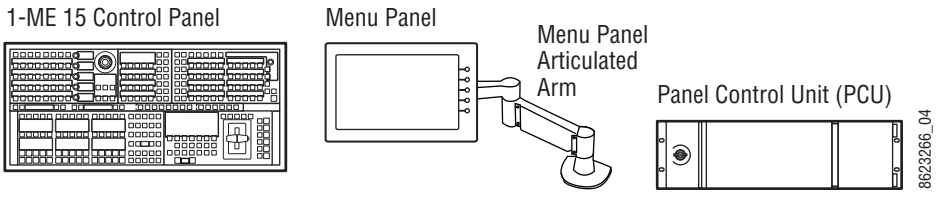


Figure 5. Kayenne 1-ME 15 Control Surface



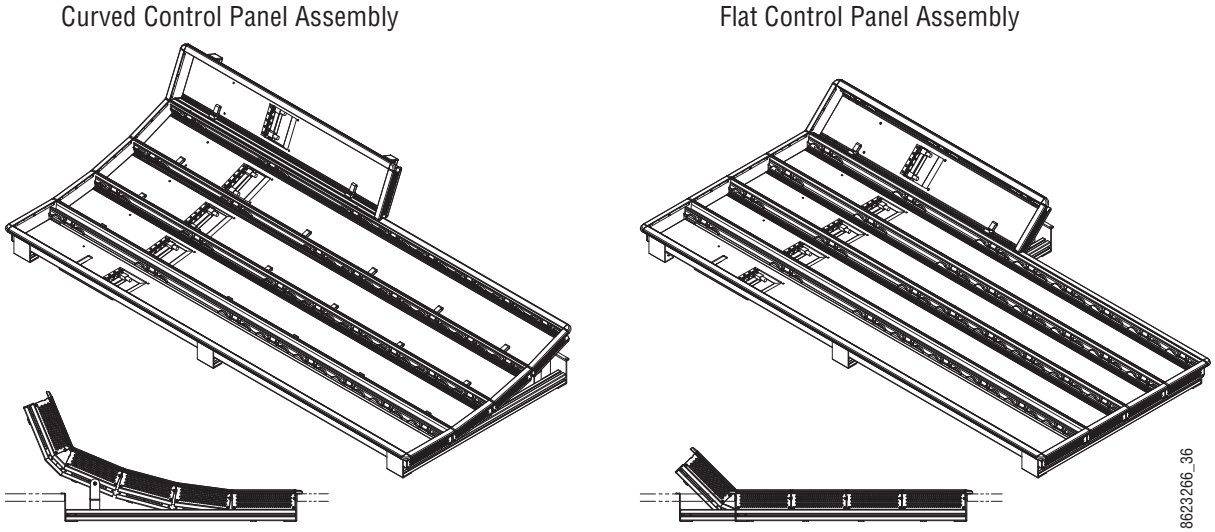
The modular design and use of a separate PCU supports the hot-replacement of individual Control Panel components, if necessary, while the rest of the system remains operational.

CAUTION Do not connect or disconnect the PCU to Control Panel cables while the system is powered on.

Flat or Curved Control Panel Orientation

The main Kayenne Control Panel supports different physical orientations. Besides a conventional flat surface, a special support design permits a curved working surface, where the MEs progressively tilt for improved ergonomics.

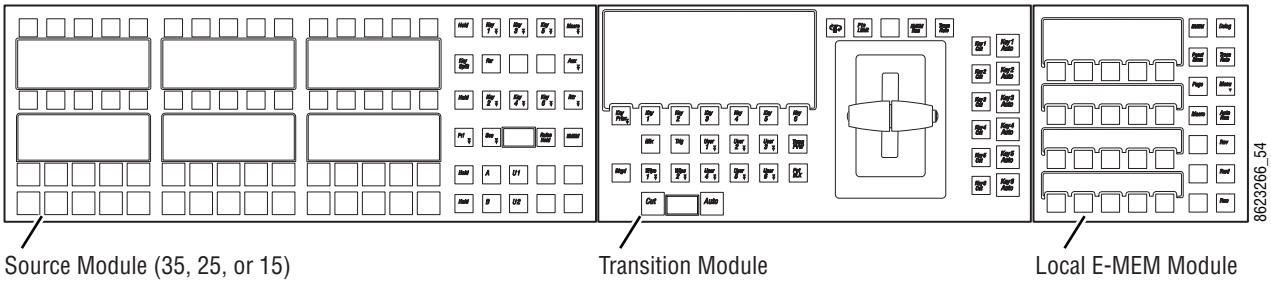
Figure 6. Curved and Flat Control Surface Installations



Control Panel Stripes

The main Kayenne Control Panel is organized into from one to five Stripes. Each Stripe consists of a tray and its complement of drop-in modules. An ME Stripe has a module for Source Selection, Transition, and individual E-MEM control. Additional Master E-MEM, Machine Control, Multi-Function, and Local Aux modules are populated to complete the control surface functionality.

Figure 7. Portion of Control Panel ME Stripe

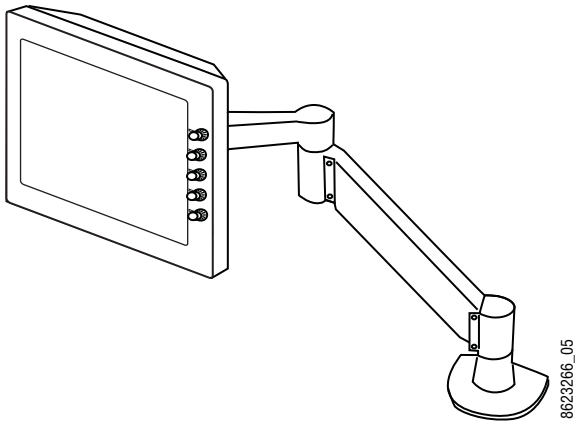


Touch Screen Menu Panel

Each Kayenne control surface includes a Menu Panel that features a wide format 15 in. touch screen display. An articulated arm is also included, offering a wide variety of installation options. The Menu Panel has a standard VESA-75 hole pattern and M4 threads, compatible with this and many other mounting devices.

The Menu Panel has four USB ports, two on the right side edge of the panel and two on the back for keyboard and mouse (wired or wireless are supported).

Figure 8. Menu Panel with Articulated Arm



Karrera

A Karrera control surface typically consists of a Control Panel and a Menu application. Representative Karrera control surfaces are shown in the following illustrations.

Figure 9. Karrera 3-ME 35 Control Surface

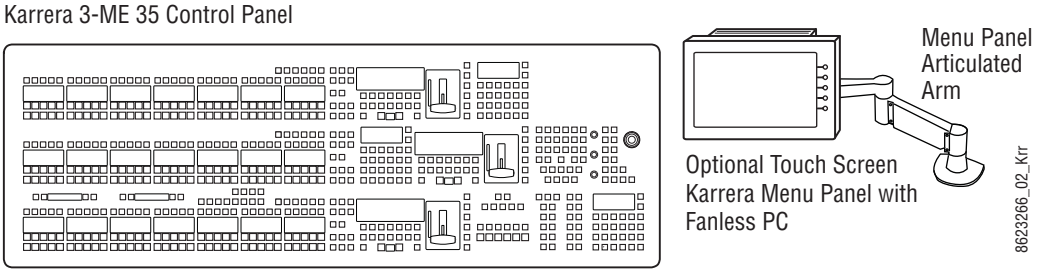
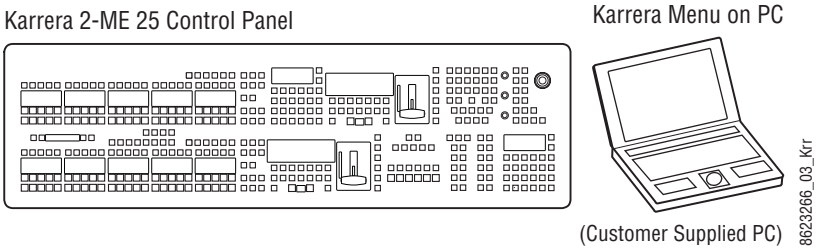


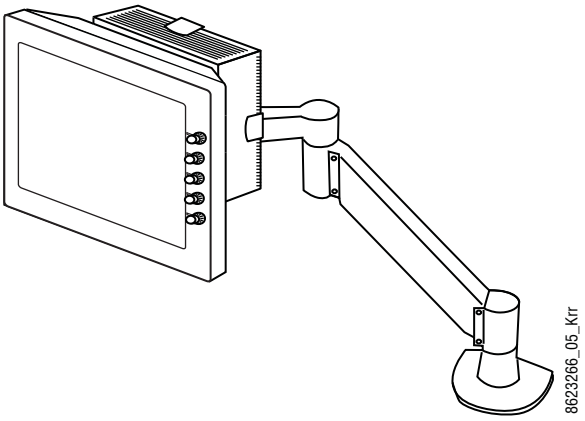
Figure 10. Karrera 2-ME 25 Control Surface



Touch Screen Menu Panel Option

A hardware Karrera Menu Panel is available as an option, which features a wide format 15 in. touch screen display. An articulated arm is also included, offering a wide variety of installation options.

Figure 11. Menu Panel with Articulated Arm



The Menu Panel has a standard VESA-75 hole pattern and M4 threads, compatible with this and many other mounting devices. The Menu Panel also has four USB ports, two on the right side edge of the panel and two on the back for keyboard and mouse (wired or wireless are supported).

A fanless PC, running Windows OS, is available which mounts behind the Menu Panel.

Soft Panel (KSP) Option

Figure 12. Soft Panel Application

The KSP is an optional 1-ME Soft Panel GUI which provides direct control of switching crosspoints, recalling effects and macros together with an integrated version of the Menu application. A customized PC keyboard is included with the option for users who like quick cut and mix action from a hard-button interface. The KSP can be used as an adjunct to a main panel, providing a second seat (second control surface) in a Suite, or as the only control surface for a second Suite.

The KSP GUI application is designed to run on a PC platform. The screen must be 1920x1080 resolution or better (which is common in professional video environments). A touchscreen is not required, but can be very useful.

The KSP software is included with the switcher application software. Purchasing the option provides a software license that enables the interface for the selected switcher, and includes a customized PC keyboard. The license activates an unlimited number of KSP applications associated with the licensed video processor frame. Additional customized PC keyboards are also available for purchase.

Menu Application

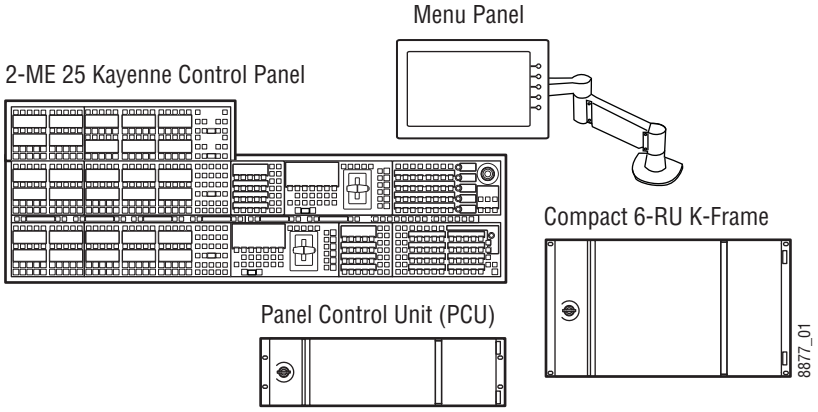
The Menu application software provided with every K-Frame system can be run on a standard PC. This software accesses all the system's functionality, permitting mouse and keyboard control from a laptop, or remote control from any location on the network.

Kayenne K-Frame System Examples

Basic Single Suite Kayenne Panel System

A basic K-Frame system consists of a Control Panel, a Menu application running on a touch screen Menu Panel, and a Video Processor Frame. The Control Panel and Menu application make up a control surface associated with that frame. The Kayenne Control Panel and Menu Panel have associated active electronics housed in the Panel Control Unit (PCU).

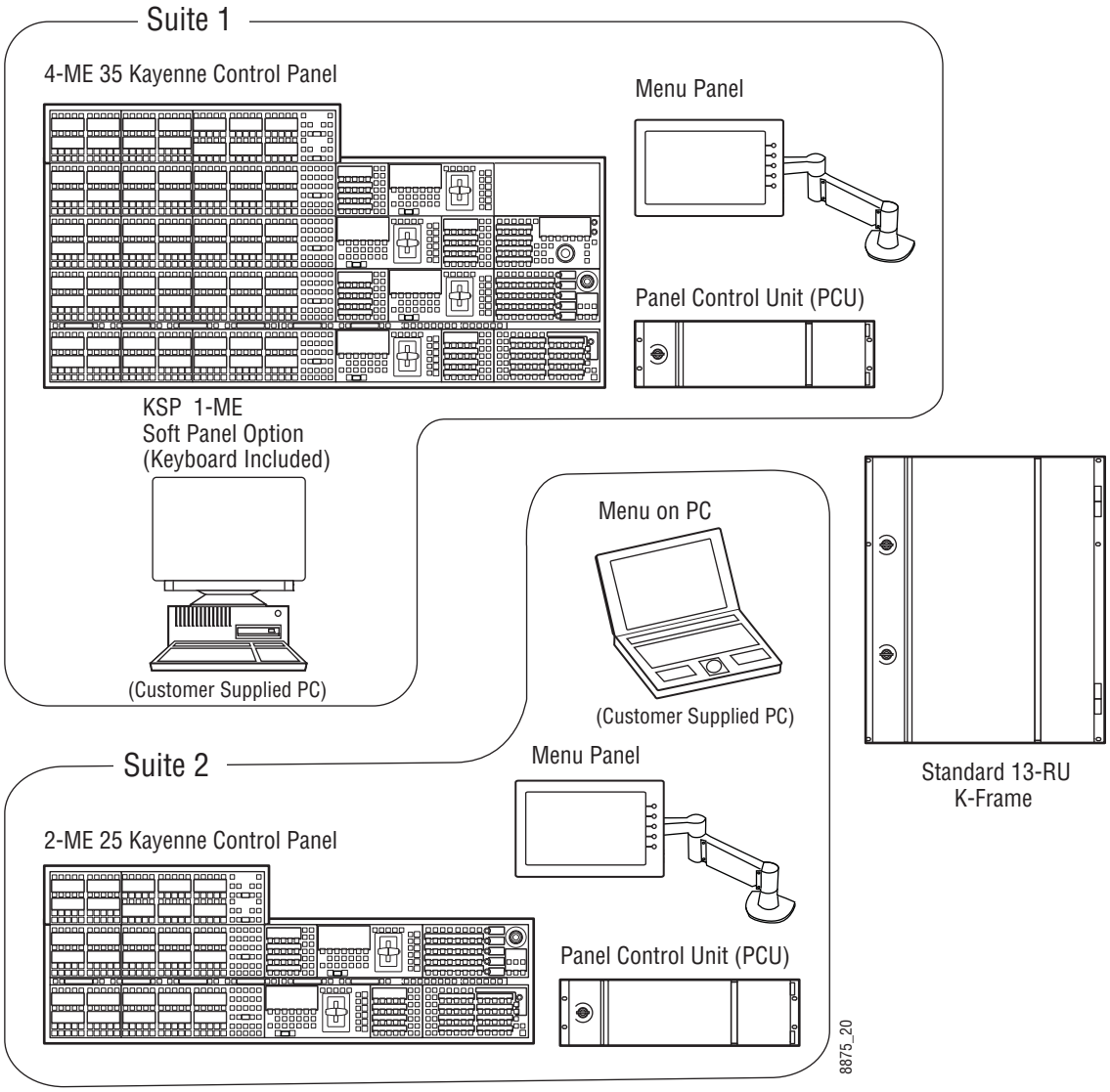
Figure 13. Kayenne Single Suite Compact Frame Example



Multiple Suite Kayenne Panel System

A K-Frame system can be subdivided into two suites, if desired, each of which can have two control surfaces (Surface A and Surface B). Each surface has it's own set of Panel Preferences for configuration of the control panel behavior and independent macro systems to allow for independent building and running of macros by each operator at the control surface. Hardware resources in the Video Processor Frame can be assigned to an individual suite during configuration, essentially creating two separate switchers sharing one frame.

Figure 14. Kayenne Multi-Suite Standard Frame Example

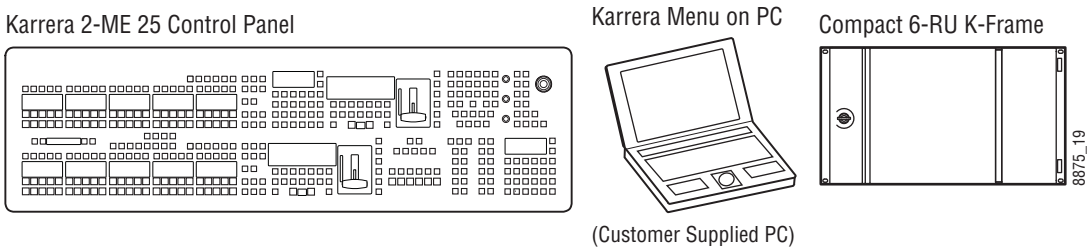


Karrera K-Frame System Examples

Basic Single Suite Karrera Panel System

A basic K-Frame system consists of a Control Panel, a Menu application running on a PC, and a Video Processor Frame. The Control Panel and Menu application make up a control surface associated with that frame.

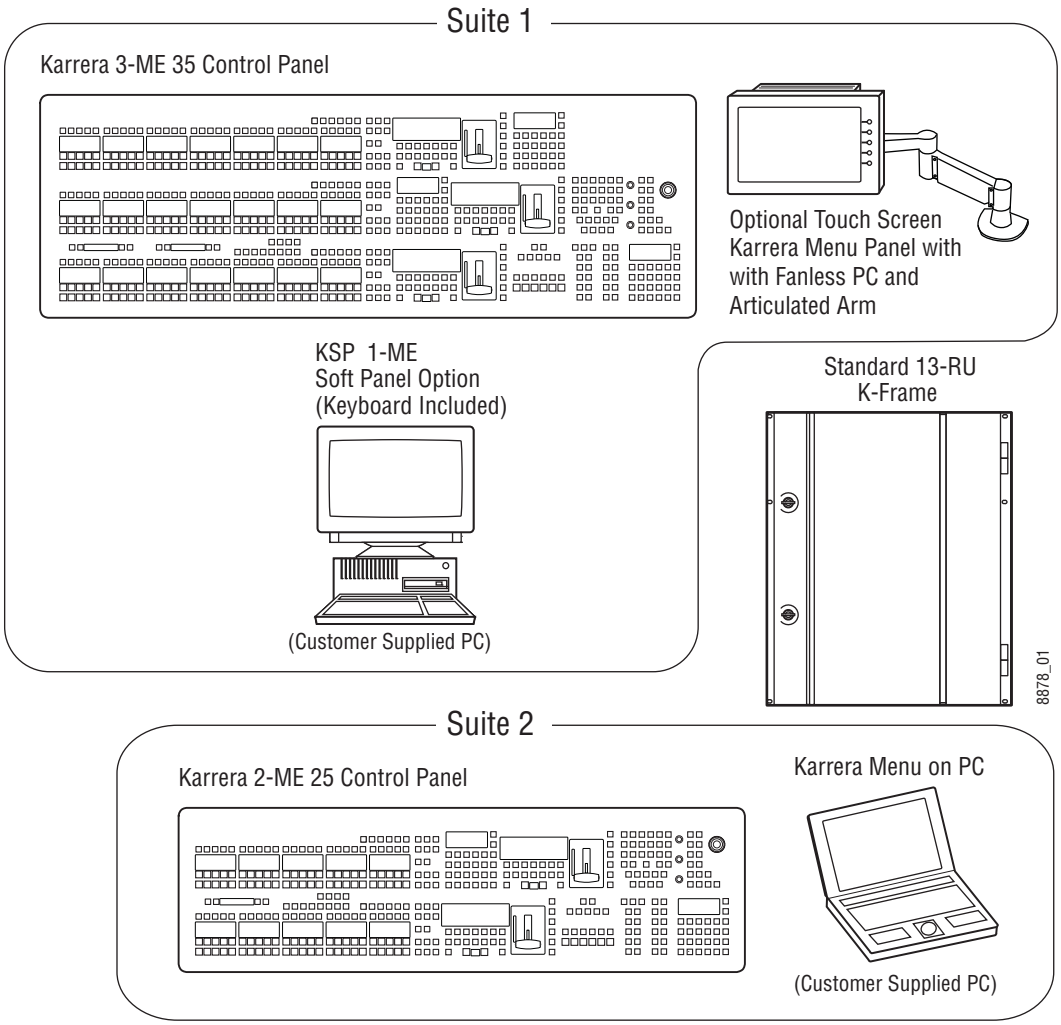
Figure 15. Karrera Single Suite Compact Frame Example



Multiple Suites and Control Surfaces

A K-Frame system can be subdivided into two suites, if desired, each of which can have two control surfaces. Hardware resources in the Video Processor Frame can be assigned to an individual suite during configuration, essentially creating two separate switchers sharing one K-Frame.

Figure 16. Karrera Multi-Suite Standard Frame Example



Supported Control Protocols

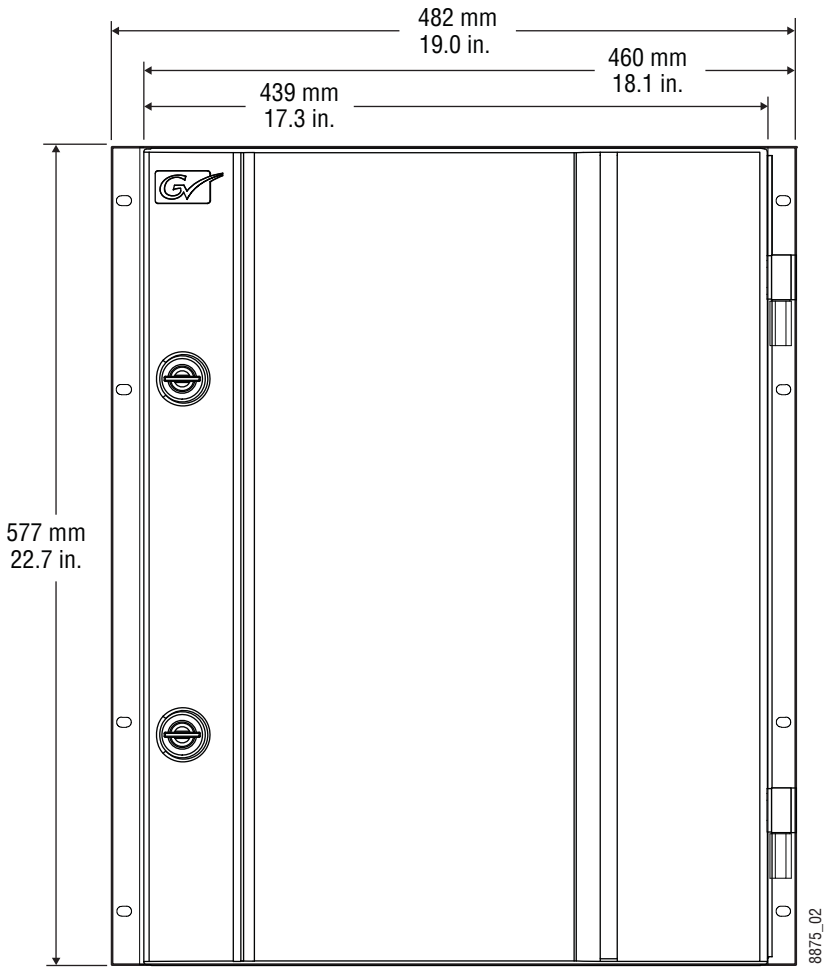
- PBus II
- GPI Inputs and Outputs
- Serial BVW-75 for VTR control
- Odetics protocol for VTR control
- AMP (advanced media protocol) for Profile PVS, Profile XP Media Platform, K2, M-Series, Turbo iDDR, and T2 iDDR systems over Ethernet
- Grass Valley Native Protocol for routers/routing control systems (Trinix/Trinix NXT, Venus™, Triton™, and third-party routers; Jupiter and Encore router control systems)
- Tally (contact closure)
- K-Frame Ethernet Tally protocol
- Ethernet CPL to control Grass Valley external remote AUX Panels
- Grass Valley Editor protocol
- SNMP system monitoring
- Serial and Ethernet VDCP
- LDK Series & LDX Series™ camera control with Ethernet tally via Connect Gateway

Section 2

K-Frame Installation

13-RU Video Processor

Figure 1. K-Frame 13-RU Dimensions (Front View)



Note Mounting a K-Frame in a rack immediately below equipment that extends forward from the rack may not provide enough clearance to completely remove the K-Frame door. See *K-Frame Video Processor Door Removal Clearance* on page 38.

Figure 2. K-Frame 13-RU Dimensions (Top View)

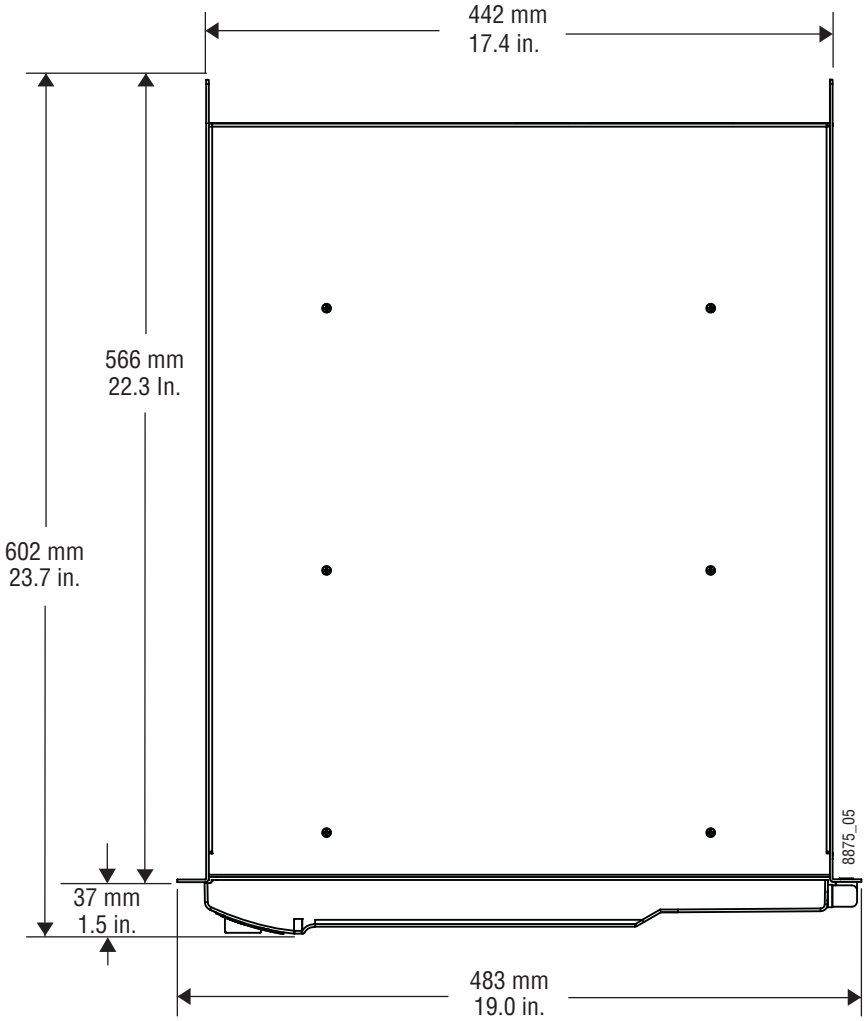
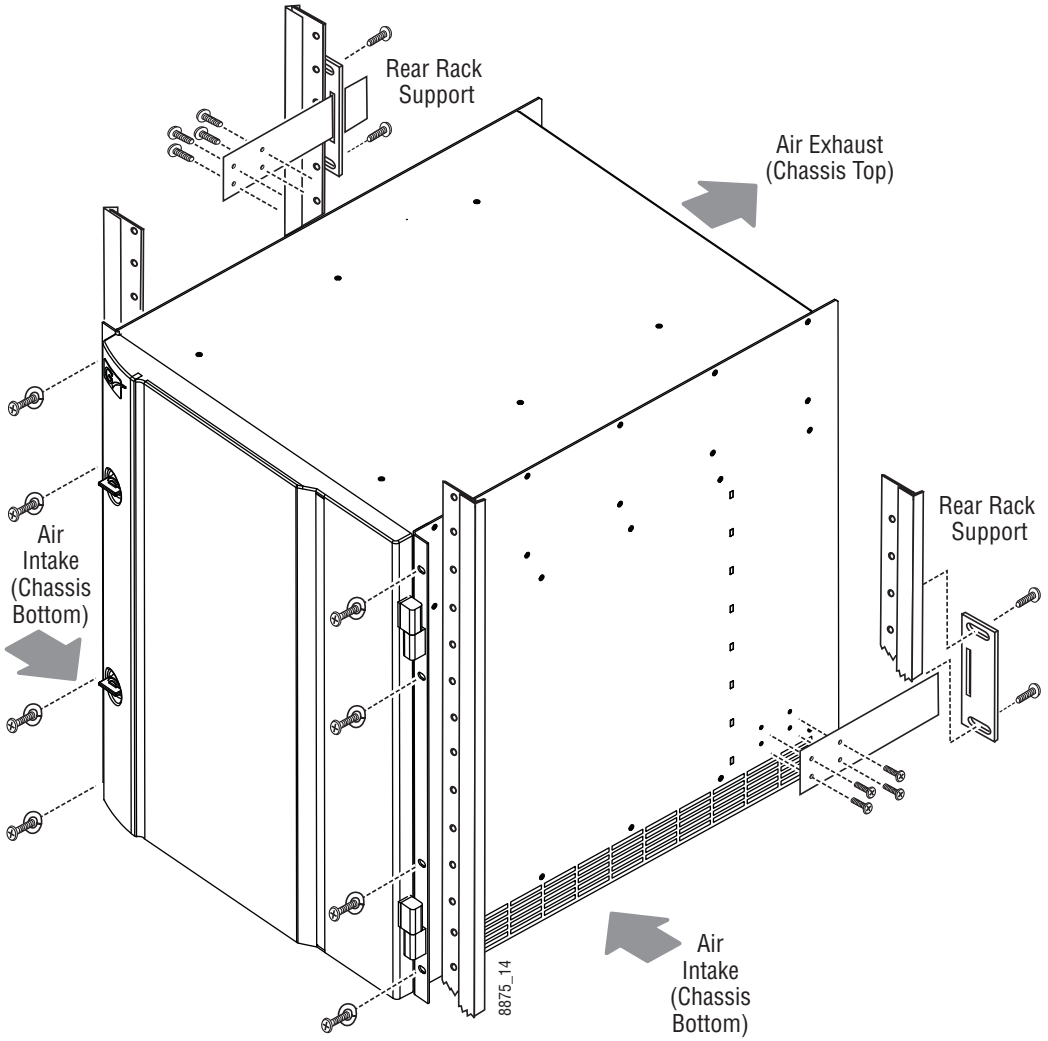
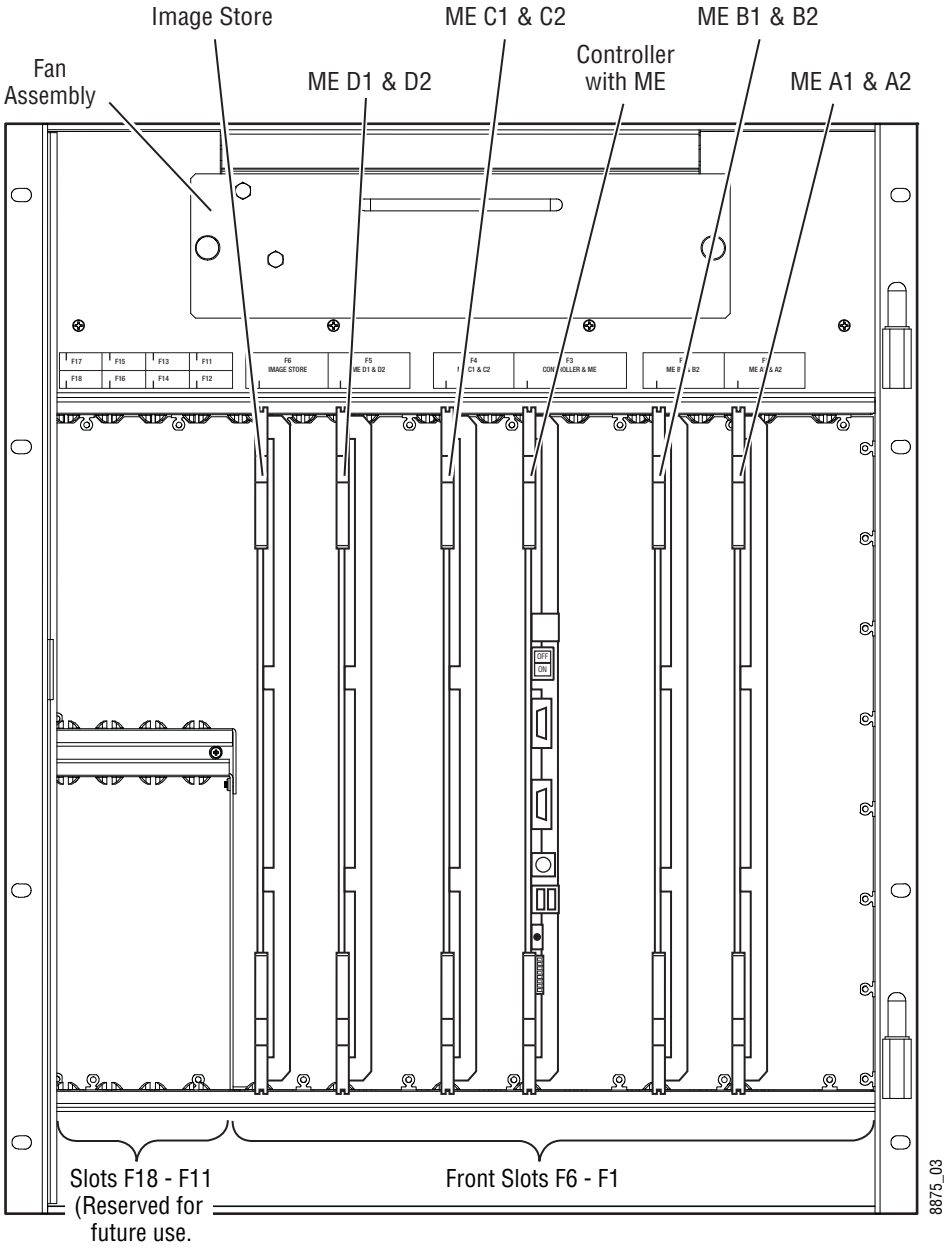


Figure 3. K-Frame 13-RU Rack Mounting and Cooling Airflow



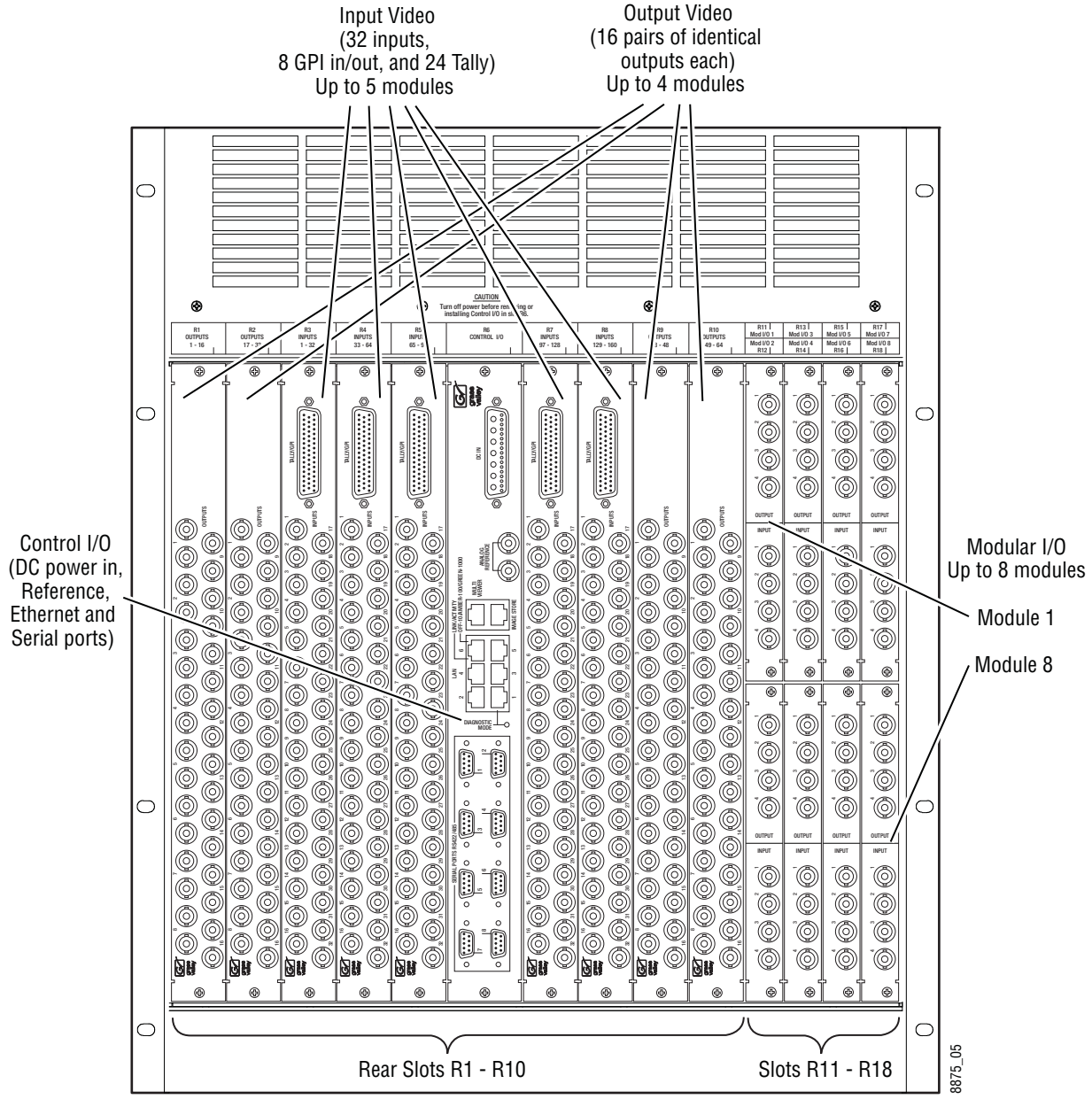
CAUTION K-Frame installations require the use of the provided rear rack supports.

Figure 4. K-Frame 13-RU, Front View with Door Removed



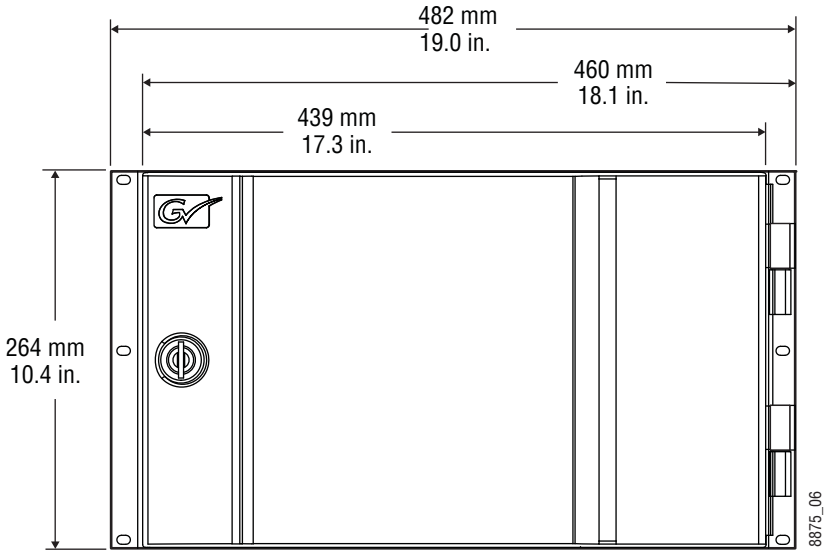
CAUTION The Video Processor front door must remain in place and closed during normal system operation to maintain maximum cooling efficiency.

Figure 5. K-Frame 13-RU, Rear View



6-RU Video Processors

Figure 6. K-Frame 6-RU Dimensions (Front View)



Note Mounting a K-Frame in a rack immediately below equipment that extends forward from the rack may not provide enough clearance to completely remove the K-Frame door. See *K-Frame Video Processor Door Removal Clearance* on page 38.

Figure 7. K-Frame 6-RU Dimensions (Top View

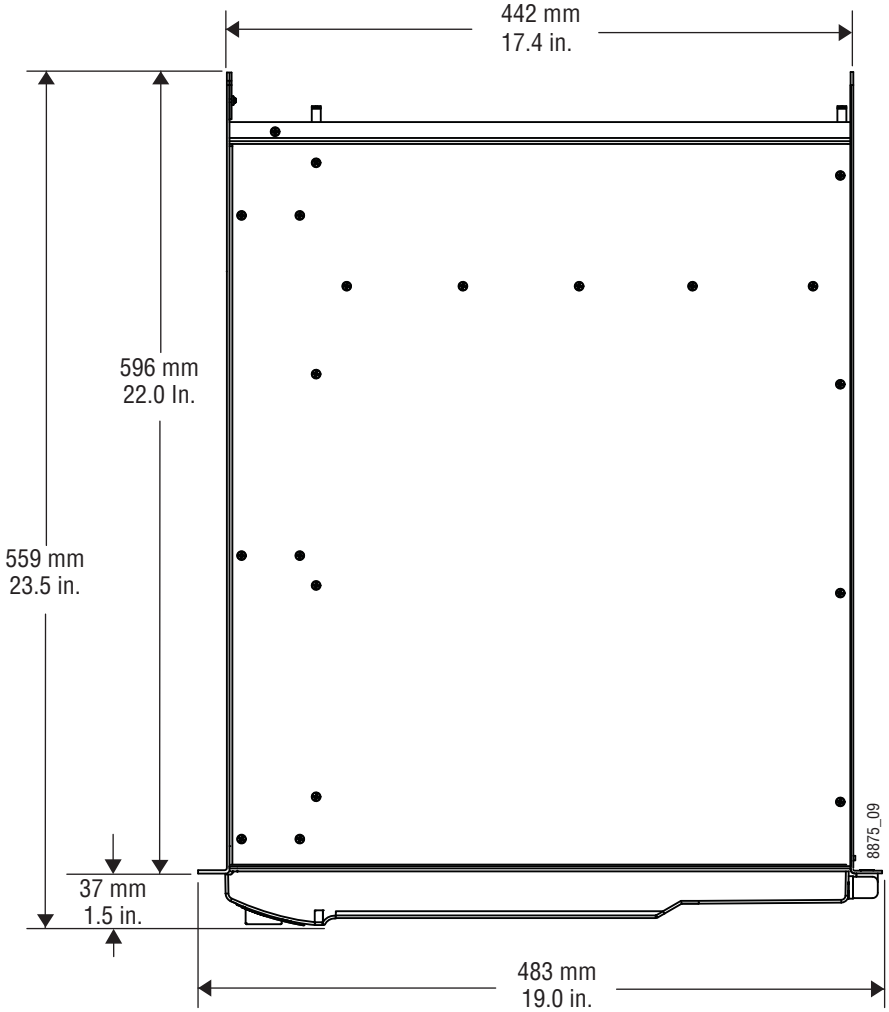
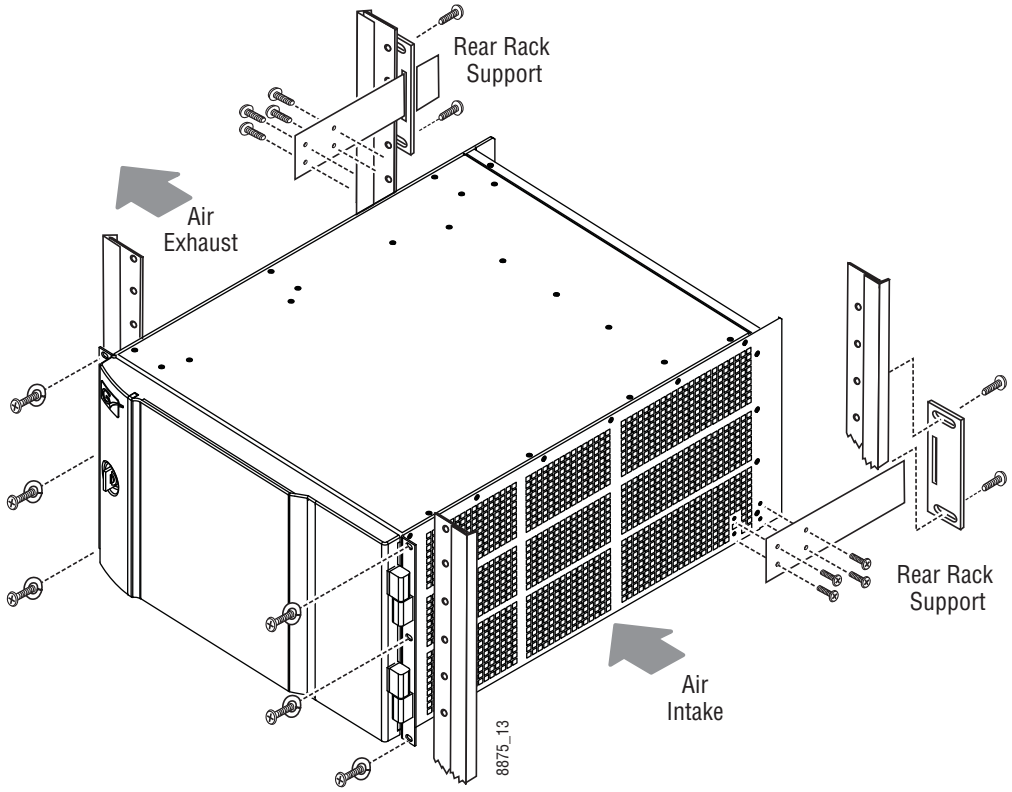


Figure 8. K-Frame 6-RU Rack Installation and Cooling Airflow

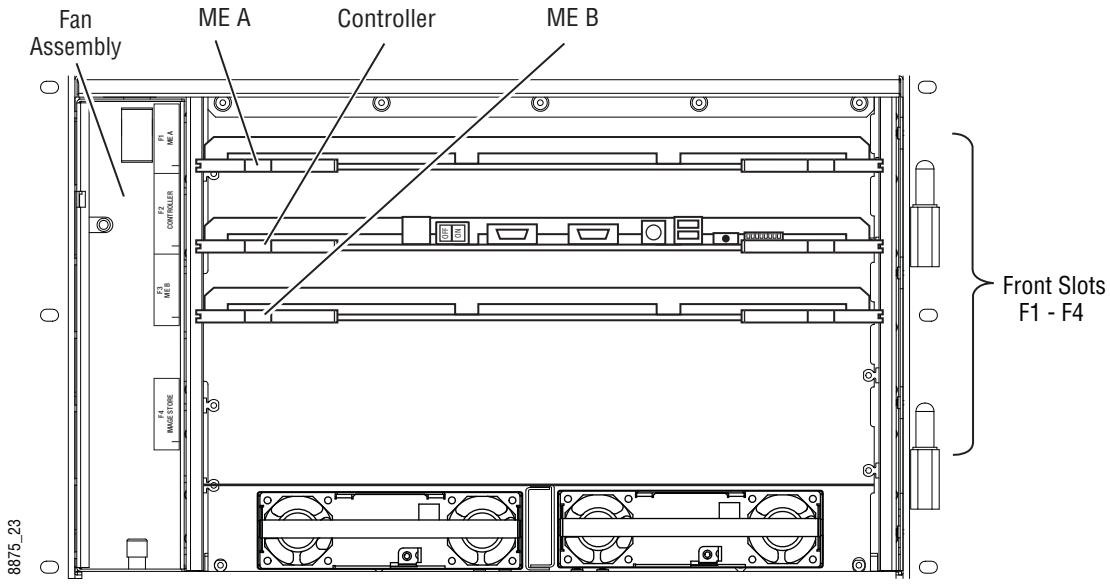


CAUTION K-Frame installations require the use of the provided rear rack supports.

6RU Compact S-series Front Views with Doors Removed

The Compact S-series Frame includes four keyers per ME and two Multiviewers on the Controller board.

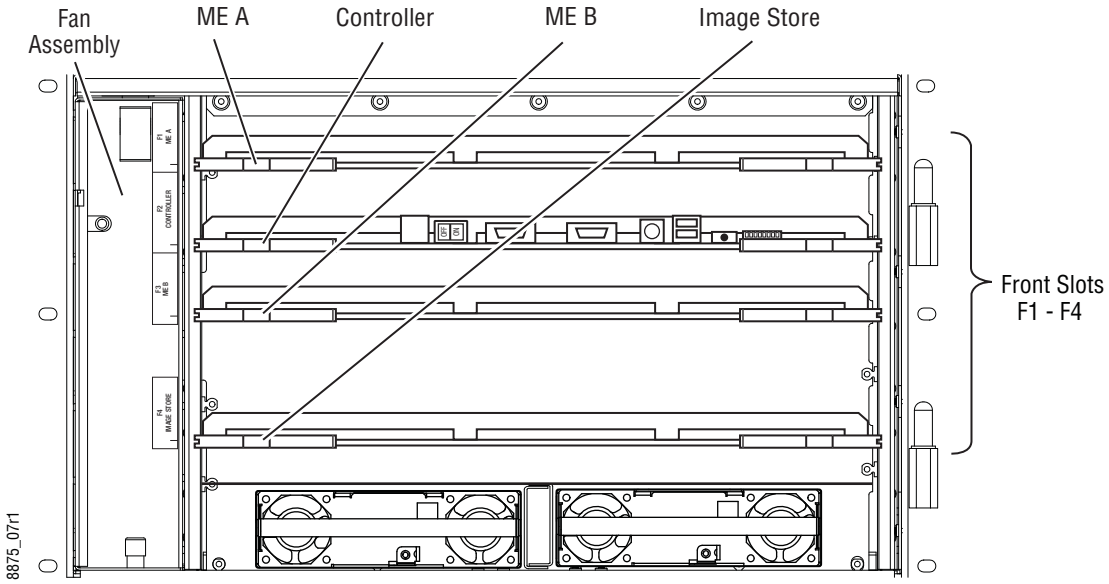
Figure 9. K-Frame Compact S-series 6-RU, Front View with Door Removed



6RU Compact Front Views with Doors Removed

The Compact Frame includes optionally, an Image Store board and six keyers per ME.

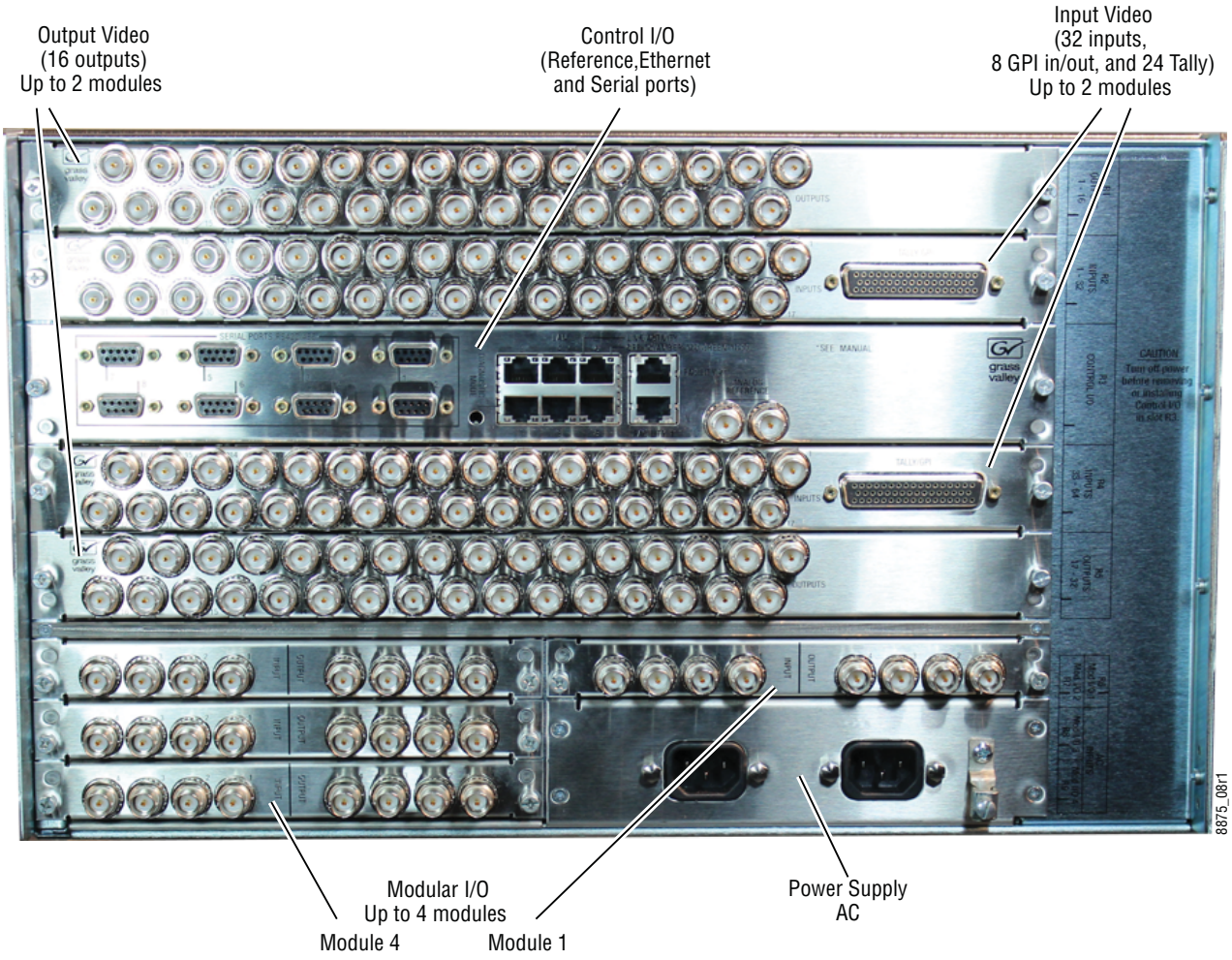
Figure 10. K-Frame Compact Performance Frame 6-RU, Front View with Door Removed



CAUTION The Video Processor front door must remain in place and closed during normal system operation to maintain maximum cooling efficiency.

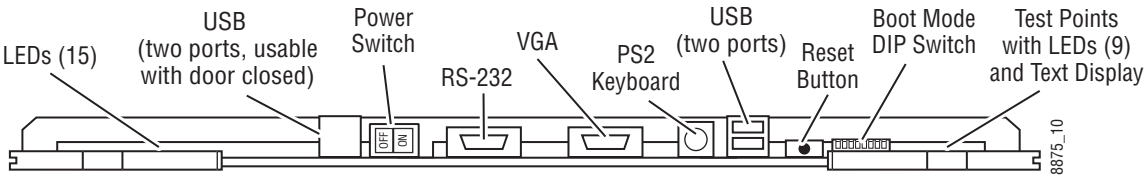
6RU Rear View

Figure 11. K-Frame 6-RU, Rear View



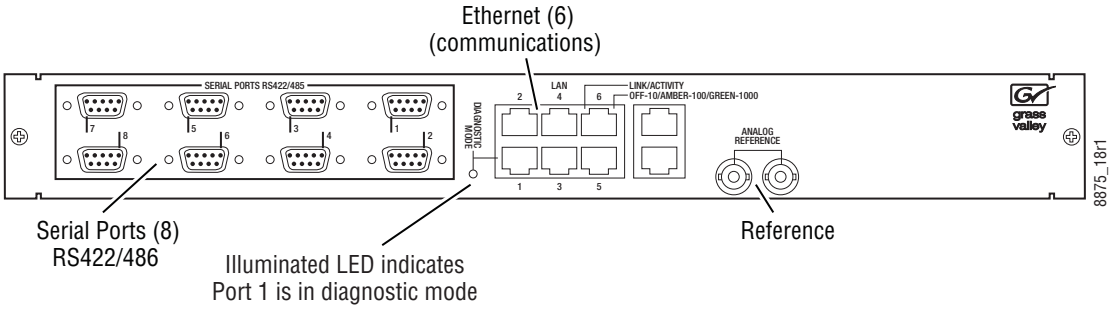
K-Frame Controller Connections

Figure 12. K-Frame Controller Board, Inside Chassis



NOTE: Ports and indicators here are intended only for diagnostic and service procedures.

Figure 13. Controller I/O Connections, Rear of Chassis



K-Frame Standard Power Supply Frame Installation

A 1-RU Power Supply Frame provides DC power for the Standard, 13RU K-Frame Video Processor.

Figure 14. K-Frame 13RU Power Supply Frame Dimensions (Front and Rear Views)

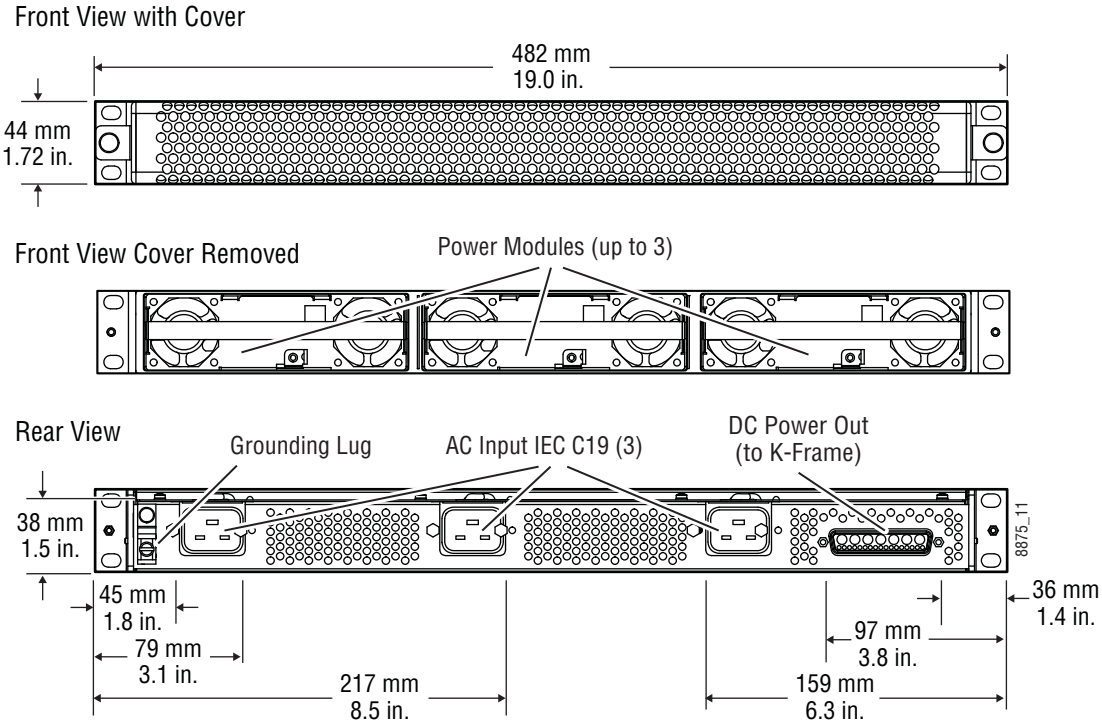
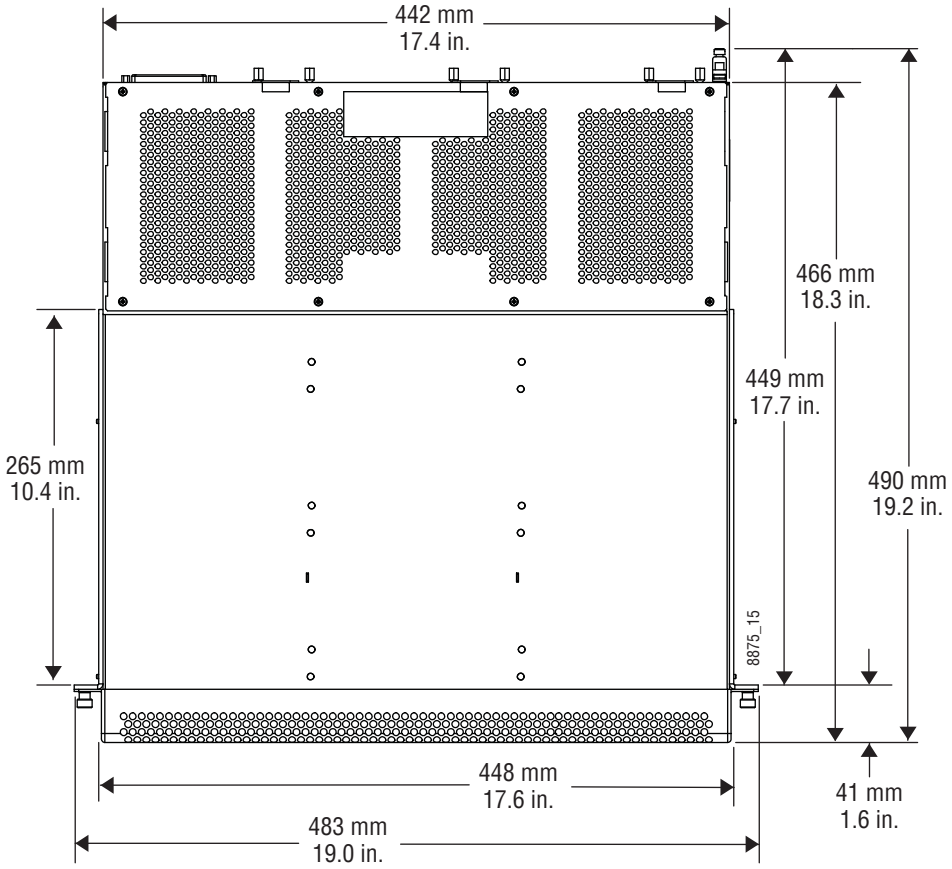


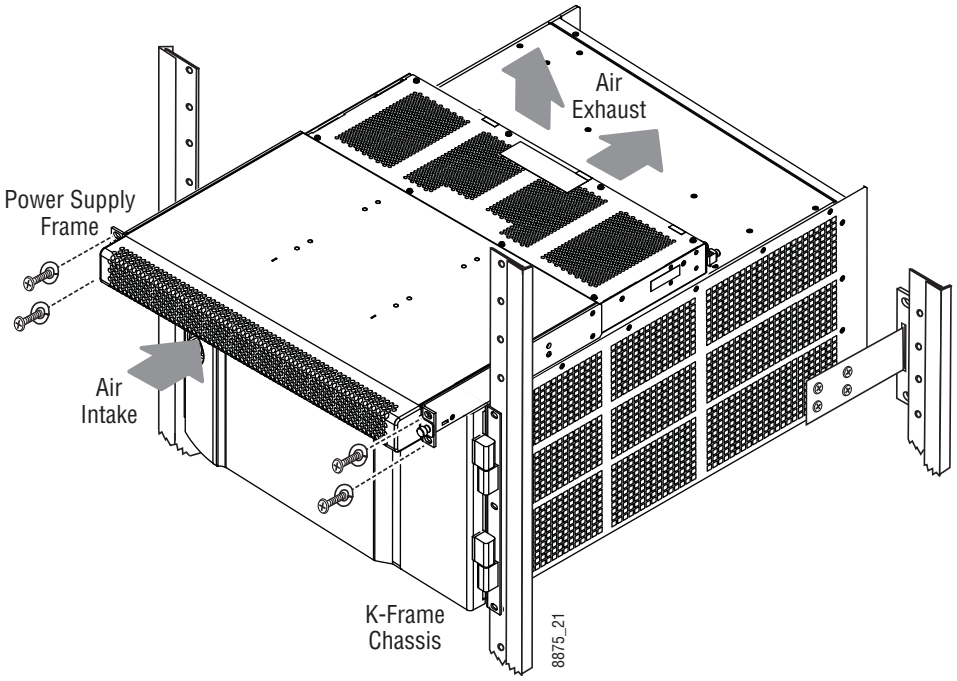
Figure 15. K-Frame 13RU Power Supply Frame Dimensions (Top View)



K-Frame Standard Power Supply Frame Rack Placement

The K-Frame power supply frame is ideally rack mounted immediately above the Standard Video Processor chassis. The power supply frame is then supported by the lower chassis and eliminates the need for power supply rear rack supports.

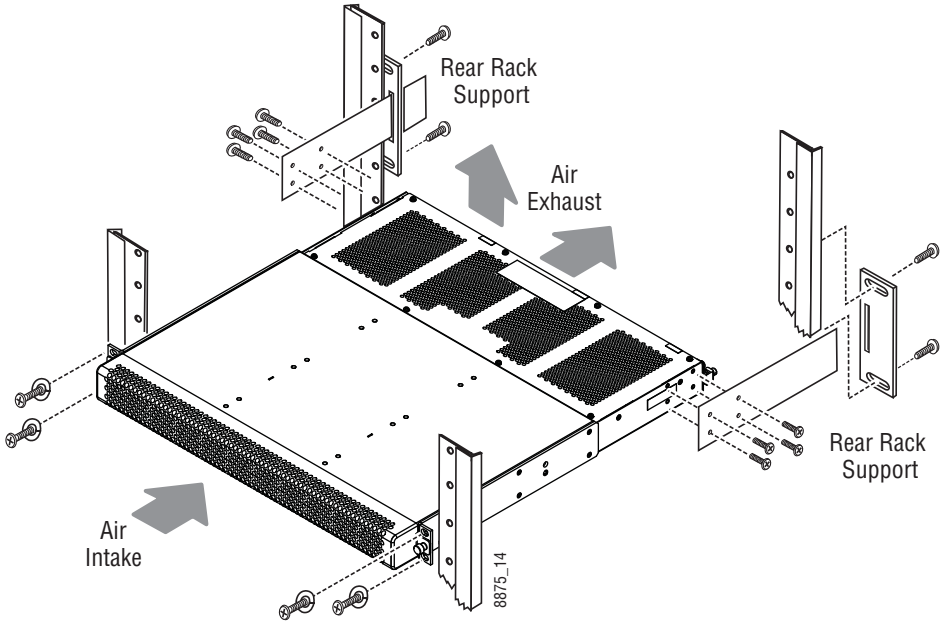
Figure 16. Standard K-Frame Power Supply Rack Installation and Cooling Airflow



In addition, this placement allows removal of the front door of the K-Frame (see *K-Frame Video Processor Door Removal Clearance* on page 38).

If the power supply frame is not mounted above the K-Frame chassis, rear rack supports are required. If mounting in an alternative location, allow for the 34″ DC interconnect cable length.

Figure 17. Isolated K-Frame Standard Power Supply Rack Installation



K-Frame Standard Power Supply Cooling

The top surface of the rear of the K-Frame Power Supply Frame has air holes and is slightly recessed, which permits air flow even if equipment is mounted in the rack directly above. These top recessed air holes must remain open for proper cooling. Ensure paper or other obstructions do not block these air holes.

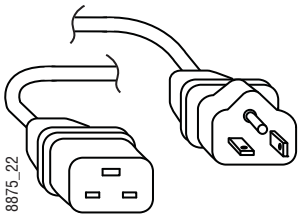
K-Frame Standard Power Supply AC Requirements

The K-Frame Power Supply Frame has provision to support up to three hot swappable power modules. These convert the AC line input to 48V DC for the Video Processor Frame. The cells for the three modules (referred to as left, center, right) are identical and any or all cells can have a module installed. Each cell has its own AC line cord. The supplies are power factor corrected and automatically accommodate low line (120V nominal) or high line (240V nominal). The power supply frame has a rating of 100 – 240 volts, although it is designed and tested for a range of 90 to 264 volts to accommodate under and over voltage conditions. A Compact K-Frame is supplied with one power module. A second power module can be fitted as a redundant power supply option. A Standard K-Frame is supplied with two power modules. A third power module can be fitted as a redundant (n+1) power supply option.

Supplied Power Cables for Standard K-Frame

The K-Frame Power Supply Frame has IEC C19 sockets, instead of the more common C13 style, to accommodate potentially higher currents. Cables provided with K-Frame systems are matched to the destination country's standard. For example, in the USA C19 to NEMA 5-20P cables are provided.

Figure 18. USA Power Cable Example



About Low Line (120V) Operational Considerations

If low line (120V) operation is used (mostly in North America) three characteristics of the switcher should be kept in mind when provisioning AC power for the system, which will result in the most reliable system possible:

- Consider brown-out—Modern switching power supplies are constant power devices and as such, unlike resistive loads, the input current increases as the input voltage decreases.
- Consider power supply failure—If two or three power modules are present, they will load share. For instance, if two modules are fitted and the total AC line current is 10 amps, each of the two line cords will draw about 5 amps. If one supply fails, the other supply takes up the entire load. At this point, one line cord will draw 0 amps and the other cord will draw 10 amps.
- Consider future options—The total AC power consumption is significantly influenced by the number and type of hardware options installed. This includes the number of MEs, Inputs, Outputs, and Modular I/Os.

About High Line (208V-240V) Verses Low Line (120V) Operations

North American users usually have a choice to use low line (120 volts) or high line (208-240 volts) as the AC source. If Lo line is used, a Standard (13RU) K-Frame with all options installed and running at 120 volts will draw a total of approximately 12 amps from the line cords. At 100 volts, this increases to approximately 14 amps. This load will be evenly distributed among the line cords. However, if one or more power supplies go offline, it is possible for the entire 12 – 14 amps to be drawn by one line cord. For this reason, it is recommended that each line cord be serviced by a dedicated 20 amp circuit. If this circuit is shared by other loads, consider what will happen if the switcher line cord suddenly doubles (or triples) its current consumption.

One 20 amp circuit is adequate to service the two or three K-Frame line cords since the total current never exceeds 14 amps. The only disadvantage is the reduced redundancy using one branch circuit instead of multiple circuits. In a three phase WYE distribution system, additional protection can be achieved by using different phases for each of these circuits.

The possibility of drawing as much as 14 amps from a line cord explains the 20 amp (NEMA 5-20P) plug on the line cords supplied. The NEC in the US specifies that the ubiquitous 15 amp outlet be de-rated to 12 amps for continuous loads. A 20 amp outlet is needed for the rare case of a 14 amp load experienced during a fault condition.

Most of the above is not an issue if high line (240V) operation is used. Since AC line currents are approximately half of those at low line, exceeding the current rating of a circuit should not be a problem. In areas where there is

a choice between high line or low line operation, the user should consider the advantages and disadvantages of each power sourcing scheme.

K-Frame Compact Power Supply AC Requirements

The K-Frame chassis has provision to support up to two hot swappable power modules. These convert the AC line input to 48V DC for the Video Processor Frame. The cells for the two modules (referred to as left and right) are identical and either or both cells can have a module installed. Each cell has its own AC line cord. The supplies are power factor corrected and automatically accommodate low line (120V nominal) or high line (240V nominal). The power supplies have a rating of 100 – 240 volts, although it is designed and tested for a range of 90 to 264 volts to accommodate under and over voltage conditions. A Compact K-Frame is supplied with one power module. A second power module can be fitted as a redundant power supply option.

About Low Line (120V) Operational Considerations

If low line (120V) operation is used (mostly in North America) three characteristics of the switcher should be kept in mind when provisioning AC power for the system, which will result in the most reliable system possible:

- Consider brown-out—Modern switching power supplies are constant power devices and as such, unlike resistive loads, the input current increases as the input voltage decreases.
- Consider power supply failure—If two or three power modules are present, they will load share. For instance, if two modules are fitted and the total AC line current is 10 amps, each of the two line cords will draw about 5 amps. If one supply fails, the other supply takes up the entire load. At this point, one line cord will draw 0 amps and the other cord will draw 10 amps.
- Consider future options—The total AC power consumption is significantly influenced by the number and type of hardware options installed. This includes the number of MEs, Inputs, Outputs, and Modular I/Os.

About High Line (208V-240V) Verses Low Line (120V) Operations

North American users usually have a choice to use low line (120 volts) or high line (208-240 volts) as the AC source. If Lo line is used, a Compact K-Frame with all options installed and running at 120 volts will draw a total of approximately 9 amps from the line cords. At 100 volts, this increases to approximately 10 amps. This load will be evenly distributed

among the line cords. However, if one or more power supplies go offline, it is possible for the entire 10 amps to be drawn by one line cord. For this reason, it is recommended that each line cord be serviced by a dedicated 20 amp circuit. If this circuit is shared by other loads, consider what will happen if the switcher line cord suddenly doubles its current consumption.

One 20 amp circuit is adequate to service the two K-Frame line cords since the total current never exceeds 10 amps. The only disadvantage is the reduced redundancy using one branch circuit instead of multiple circuits.

Most of the above is not an issue if high line (240V) operation is used. Since AC line currents are approximately half of those at low line, exceeding the current rating of a circuit should not be a problem. In areas where there is a choice between high line or low line operation, the user should consider the advantages and disadvantages of each power sourcing scheme.

Replacing Compact Power Supplies

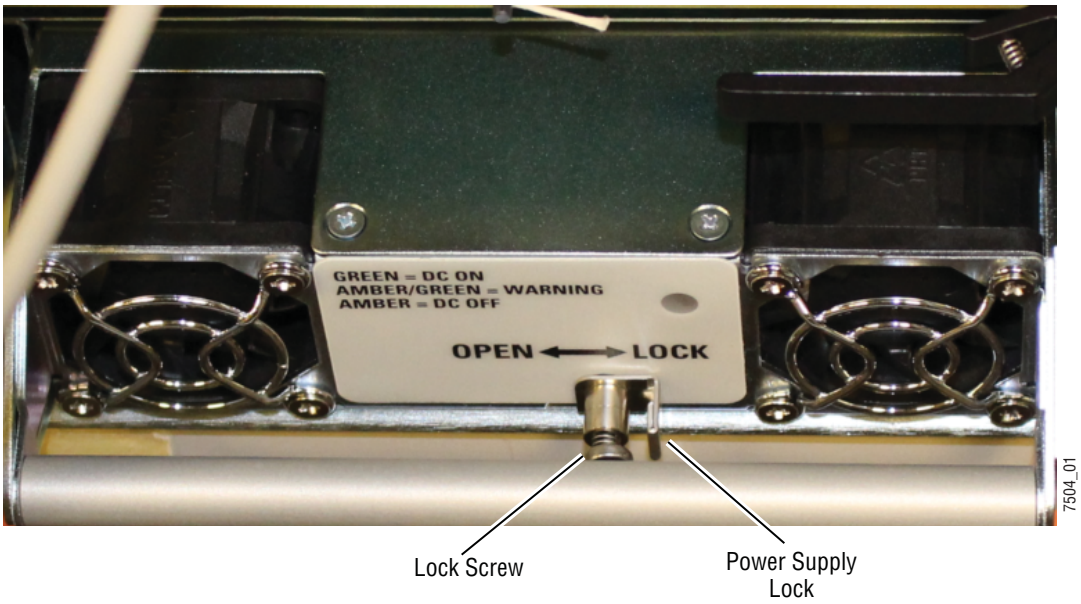
Compact K-Frame Video Processors come with one power supply with the option of a second, located in the front of the chassis. Power supplies are hot swappable in systems containing two power supplies.

CAUTION ESD equipment and procedures should be used when servicing electronic components.

Remove the power supply.

1. Open the front door of the Compact K-Frame.
2. Locate the lock and lock screw, located in the front, lower middle of the power supply labeled OPEN and LOCKED.

Figure 19. Compact Frame Power Supply Lock Screw



3. Loosen the lock screw a few turns to the left, using a Phillips head screwdriver.
4. Slide the lock toward the OPEN label (left) and pull the power supply straight out of the chassis.

Replace the power supply.

1. Slide the replacement power supply straight in and make sure the lock is in the LOCKED position.
2. Tighten the lock screw to the right, just until tight.
3. Close the Compact K-Frame door, making sure that it latches in the closed position.

K-Frame Video Processor Door Removal Clearance

CAUTION The Video Processor front door must remain in place and closed during normal system operation to maintain maximum cooling efficiency.

The K-Frame Video Processor door on all K-Frames can be completely removed when installed in a rack immediately below conventional flush mounted rack-ear only equipment. If the Standard K-Frame power supply Frame is mounted directly above the Standard K-Frame chassis, the chassis door can be completely removed after removing the power supply's front screen. However, mounting any K-Frame (including Compact Performance and Compact S-series) in a rack immediately below other equipment that

extends forward from the rack (for example, under another K-Frame chassis) may not provide enough clearance to remove the K-Frame door.

If mounted below equipment that extends forward from the rack, allow at least 24 mm (0.94 in.) of vertical clearance above the K-Frame to permit door removal. A flush design 1 RU blank filler panel can be used for clearance, if required.

Section 3

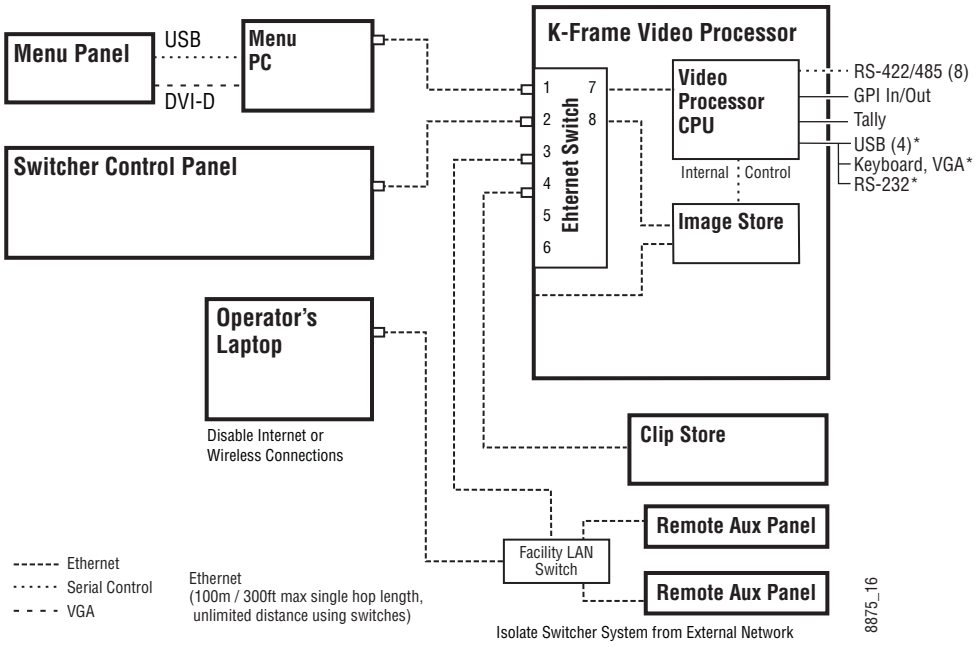
K-Frame Cabling

Overview

A K-Frame Video Processor uses Ethernet for basic system communications, can operate with Kayenne or Karrera control surfaces, supports several video inputs and output standards, and has other available interfaces (RS-232, Tally, GPI).

Note Specific Kayenne and Karrera control surface cabling information is provided in each product's separate documentation sets. One important difference is Kayenne systems incorporate the Menu PC and Control Panel electronics into a Panel Control Unit (PCU) chassis,

Figure 1. K-Frame System Communications Overview



CAUTION The facility network used for your K-Frame system (and other video production equipment) should be kept separate from any external network, to prevent network traffic from adversely affecting K-Frame system operation.

Network Cabling

Network connections are required between the K-Frame Video Processor, Control Panels, and Menu Panel PC.

K-Frame Ethernet Tally Verses Serial Tally

Our K-Frame tally system provides significantly more information than the bandwidth of the serial connection. Therefore, we support Ethernet tally only. However, many tally vendors do support our Ethernet tally system so contact your tally vendor for K-Frame Ethernet tally support information.

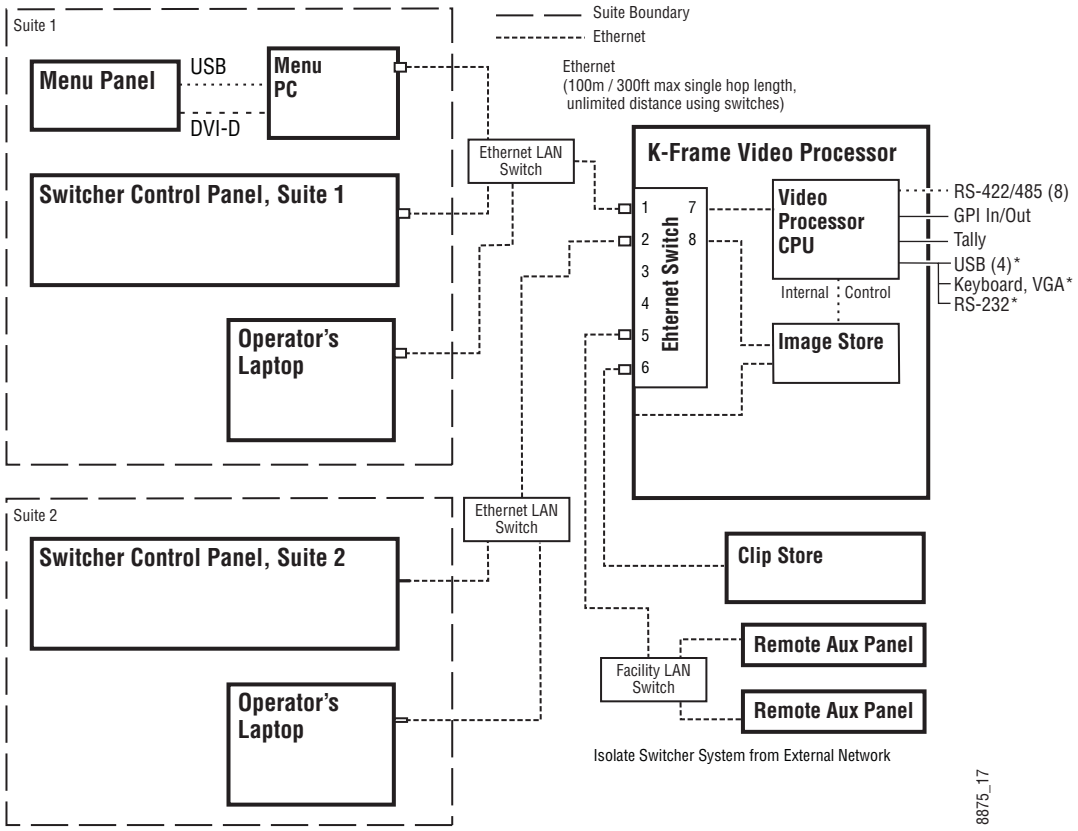
K-Frame Ethernet Switch

The Ethernet switch built into the K-Frame auto-detects speed and polarity, and is 10/100/1000 Mbps capable. Either straight-through or crossover Ethernet cabling can be used. Available Ethernet connectors may be connected to the Facility LAN or other devices, as needed. However, should the K-Frame power down, the internal Ethernet switch will also power down, interrupting communication to devices connected to that Frame's internal Ethernet switch. Only connect devices that are K-Frame system related.

Suites and Control Surfaces

A K-Frame system can be divided into two suites. K-Frame system resources (MEs, eDPMs, external devices, etc.) can be assigned to each suite, creating two switchers with one K-Frame system. Each suite can be subdivided into two control surfaces. These control surfaces can be located anywhere on the network, permitting system control from different rooms, floors, or even different buildings. Two dedicated, customer supplied Ethernet switches may be required when multiple suites are being used.

Figure 2. Two Suite K-Frame System



Customer Supplied Ethernet Routers and Switches

Existing facility Ethernet switches can be used in conjunction with a K-Frame system. If connecting to a network area outside that used by the K-Frame system, use of an appropriately configured Ethernet Router is strongly advised. This reduces network traffic on the K-Frame network and keeps it isolated. Any Ethernet switches added specifically for use with the K-Frame system should be 1000 Mbps capable for the most efficient operation.

Table 1. Customer Provided Equipment Ethernet Specifications

Cables	**Type**	10BaseT, 100BaseT, 1000BaseT compatible. Category 5 cable, 8 conductor twisted pair. The system will work at lower ratings with reduced performance. 1000BaseT components are highly recommended.
	Connectors	RJ-45 male connector at each end of cable.
	Length	10BaseT, 100BaseT, 1000BaseT: 328 ft. (100 m) maximum. Use additional switches to exceed maximum cable runs.
Switch	**Speed**	10/100/1000 Mbps
	Ports	RJ-45 auto-negotiating 10/100/1000 Mbps; number of ports required is dependent upon system size. Frame ports are capable of 1000 Mbps. Using a 1000 Mbps Ethernet switch enhances Image Store transfer speeds.
	Unmanaged	Recommended. Configuration not required, but does not provide remote monitoring capability.
	Managed	May be used. Requires configuration, but offers remote monitoring capability.

Factory Default Network Settings

Table 2. K-Frame System Default IP Addresses

Device	IP Address
K-Frame Video Processor CPU	192.168.0.170
Image Store CPU	192.168.0.171
Control Panel Surface 1A	192.168.0.173
Touch Screen Menu Panel 1	192.168.0.175
Touch Screen Menu Panel 2	192.168.0.176
Control Panel Surface 1B	192.168.0.177
Control Panel Surface 2A	192.168.0.178
Control Panel Surface 2B	192.168.0.179
32-Crosspoint Remote Aux Panels V1.6.5 and higher software: (hard reset with the front panel buttons)	IP Address: 192.168.1.2 Frame IP: 192.168.1.1 Gateway IP: 192.168.1.1 Subnet Mask 255.255.255.0 **Note** 32-Crosspoint Remote Aux Panel default settings must be changed to operate with other system components that are configured with their default IP addresses.
All Subnet Masks)	255.255.255.0
All Gateways (except V1.6.5 software Remote Aux panel)	192.168.0.1
Reserved For Future Use	**CAUTION** Do not connect any devices configured with the following IP addresses to a K-Frame network.
Video Processor Frame Gigabit Ethernet	**192.168.0.172**
Reserved LAN Port	**192.168.0.174**

Note Customer orders with multiple Control Panels will be pre-configured to the listed IP addresses. However, if one of these additional Control Panels is reset to factory defaults, it will be given the standard 1A default 192.168.0.173 address.

To integrate K-Frame system devices into an existing network, ask the local network administrator for that network's subnet mask. Before changing IP addresses always set the subnet masks of the devices to the mask of the local network.

Video Cabling

All K-Frame system video inputs and outputs are configurable. For cabling configuration flexibility, each external primary input can be mapped to any control panel source select button, as can each internal video system source. Any K-Frame system video signal, such as ME program, preview, clean feed, or PGM/PST, can be mapped to any output bus to be sent to any output connector, or an output bus can act as an auxiliary bus.

Inputs

Non-looping video inputs on the back of the Video Processor Frame are numbered 1 through 32 on each input module. Each accepts a 270 MHz, 1.485 GB, or 3 GB serial digital video signal.

Outputs

Paired outputs on the back of the Video Processor Frame are numbered 1 through 16 on each output module. Identical signals are present on each of the paired output connectors. All of the outputs carry the same video format, as determined by the selected video standard.

MatchDef and SetDef Format Conversion

K-Frame Video Processor modular IO is available for MatchDef and SetDef signal conversion, or to increase the number of standard video inputs and outputs. This functionality is configurable in software. The 13-RU Standard K-Frame can hold up to eight modules, and the 8-RU can hold up to four.

Each modular I/O module has four pairs of connectors, labeled IN 1-4 and OUT 1-4. The connectors with the same number on that module constitutes a configurable pair. Three different software settings are available for each pair of modular I/O connectors:

Table 3.

Setting	Connector Function
Bypass	Input connector receives normal video.
	Output connector is a normal Aux bus.
MatchDef	Input connector has a configurable MatchDef scaler
	Output connector is a normal Aux bus.
SetDef	Input connector receives normal video.
	Output connector has a configurable SetDef scaler

Reference Input

The K-Frame Video Processor has one analog looping reference input, which can be used with any SD/HD/3G standard. This reference input signal must have the same frame rate as the native operating standard of the K-Frame.

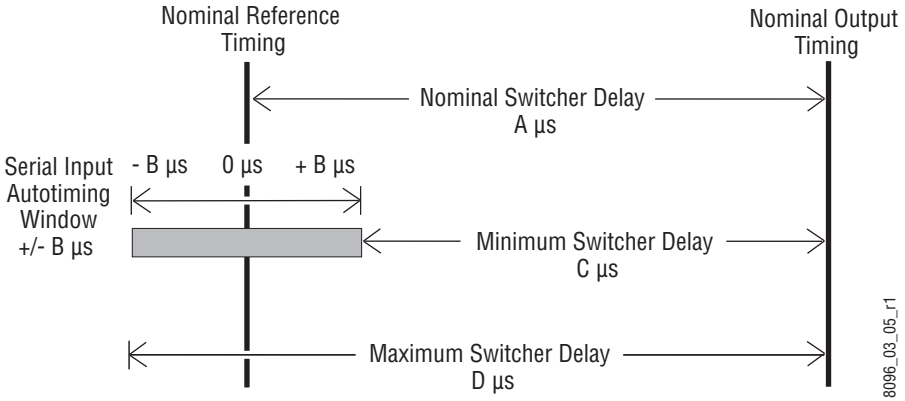
75-ohm termination of the looping input is required, either directly on the adjacent connector or at the end of a daisy chain looping to other equipment.

Alternatively, any one of the K-Frame video inputs can also be used as reference in the respective standard.

K-Frame System Video Timing and Delay

The total delay of a video input to the switcher output can vary according to the relationship of the input to the switcher reference. The switcher will automatically autotime inputs that fall within an autotiming window. Inputs must be within this range to be properly timed at the output. The calculation of the actual video delay of a specific input is the Nominal Switcher Delay minus the input time location within the autotiming window (the time location value can be zero, positive, or negative).

Figure 3. Switcher Timing Diagram



- For inputs entering the switcher in zero time with the reference, the total delay through the switcher is the Nominal Switcher Delay (A µs).
- Inputs that reach the switcher at the latest point in the autotiming window (+B µs) will have a total delay that equals the time required for switcher processing. This value is the Minimum Switcher Delay (C µs).
- Inputs that reach the switcher at the earliest point in the autotiming window (-B µs) will have a total delay equal to the Nominal Switcher Delay (A µs) plus the autotiming window range. This value is the Maximum Switcher Delay value (D µs).

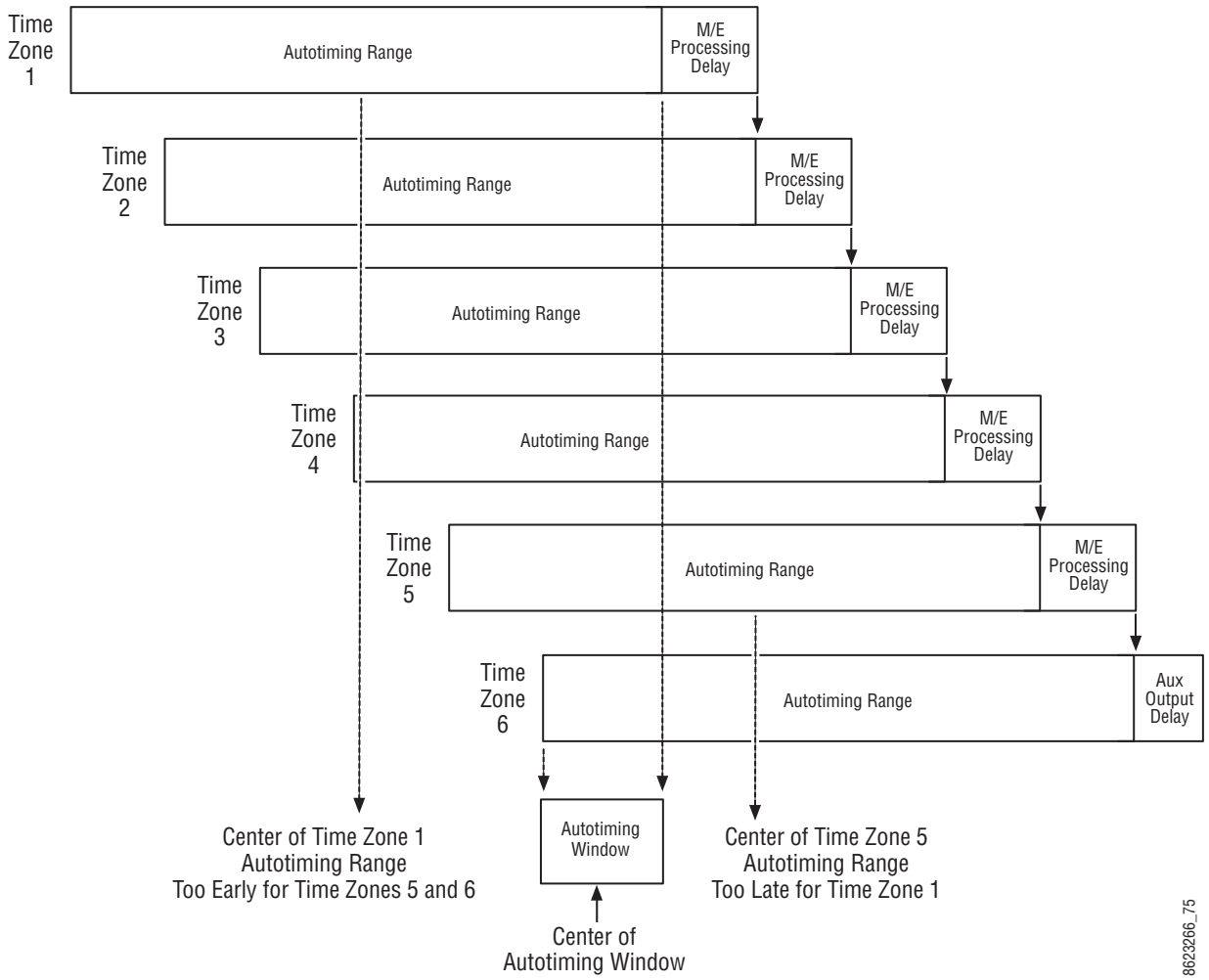
On K-Frame systems the autotiming window varies depending on the operating mode. The Timing Analyzer in the Video Settings Menu displays this autotiming information.

Note The maximum switcher delay is approximately one line of video.

Time Zones and the Autotiming Window

Each ME has a fixed amount of delay from its input to output. To allow reentries to remain in time, ME timings are staggered such that the up stream ME outputs are in time (or earlier) than down stream ME inputs. A 5 ME production switcher has six time zones to accommodate reentry through all the MEs to any output. When all MEs are cascaded into each other, the most up stream ME is in the earliest time zone. Aux buses and other outputs are always in the latest time zone. The overlapping range of all the autotimers is the published autotiming window for the switcher.

Figure 4. Production Switcher Time Zones



Any source fed to the switcher must be within the autotiming range of all six time zones. If not, the source will be in time on some MEs but not on others. As illustrated in the figure, a source centered in one time zone's autotiming range can be too early or late for other switcher time zones.

If a signal falls just outside the autotiming window, that image will be shifted one line up or down. On SD systems a shift of one line could be

easily seen, but on higher resolution systems the lines are so narrow that a single line shift may be difficult to observe. See the *Kayenne/Karrera K-Frame Installation & Service Manuals* for K-Frame system video timing and delay information.

Video Processor Frame GPI/Tally Interface

The GPI (General Purpose Interface) and tally interface provides a means to transfer commands to and from the switcher to external customer provided equipment. A one wire per function parallel hardware relay mechanism is used. The nominal contact rating specification for each relay is 1A, 60 V.

Note A tally interface that communicates with third party devices over Ethernet is also available. Refer to the separate *Switcher Products Protocols Manual* for specific information.

GPI and Tally Connections

Each K-Frame Video Input module has a 50 pin female subminiature D connectors on the rear of the chassis, available for GPI and tally. Each connector has 8 GPI Inputs, 24 Tally Outputs, and 8 GPI Outputs. These connectors do not share any signals in common, other than ground reference and chassis ground. Because of this, some GPI/Tally interconnects may require external common connections between connectors, as explained below.

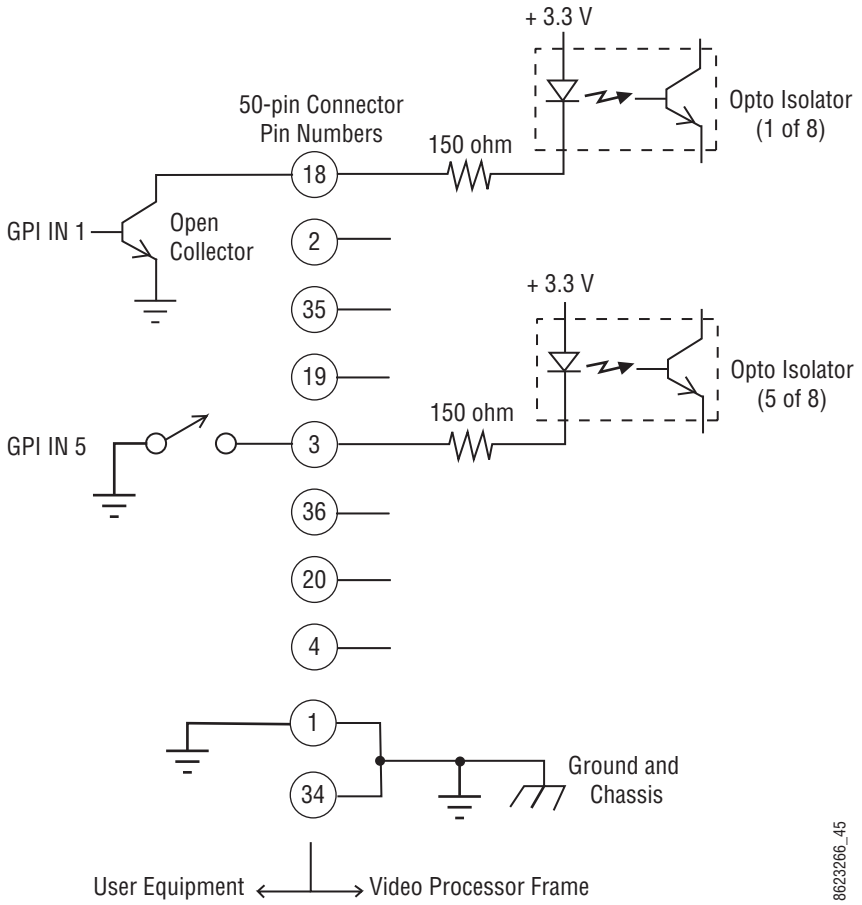
GPI Inputs

The purpose of the GPI In pins is to provide a stimulus from the customer's equipment to the switcher. A simple connection of two pins activates the corresponding input. An external relay contact or an open-collector output can be employed.

CAUTION When connecting to an open-collector output, there is no ground potential isolation between the Video Processor Frame and controlling devices.

Since the circuit ground is led out of the device, cabling should be shielded for this kind of control. Non-shielded cables may cause EMC and/or ESD problems. To activate a GPI In you must provide switch closure between a particular GPI In pin and one of the two GPI In Com pins (1 and 34). Pins 1 and 34 of each connector is connected to ground. For applications that span across more than one connector, only one ground (common) connection is required.

Figure 5. GPI Input Connections (Typical 2 of 8 Connections)

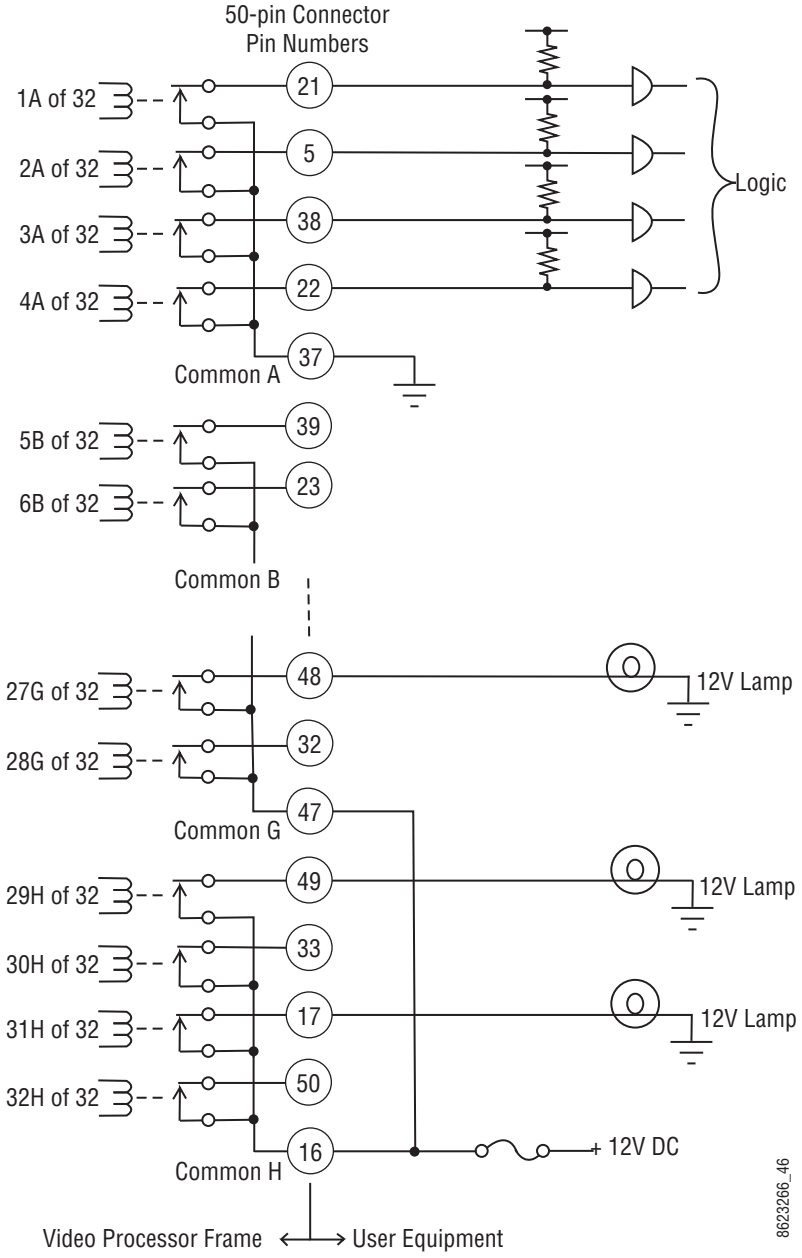


The function of each GPI input is user assignable. A function can be programmed to occur on the leading edge or the trailing edge of the closure, or both edges. The switch must be closed for at least one field.

Tally/GPI Outputs

Tally and GPI Outputs are arranged in groups of four. Each group has its own common connection. These commons can all be tied together, forming one common bus for all the outputs. Alternatively, multiple smaller commons can be constructed to interface with systems that need isolated common connections. This common or isolated bus scheme can extend across multiple connectors. For example, a situation may require two isolated common busses, half of the commons form the first common bus and the other half form the second common bus.

Figure 6. Tally and GPI Output Connection Example



The first four outputs (COMMON A) have the common bus tied to ground. This drives a logic system. The last outputs (COMMON G and COMMON H) have the common bus tied to +12 volts. This drives a tally lamp system.

Although diagram shows mechanical relays, the actual outputs are implemented with solid state relays. The solid state relays are bidirectional; either polarity voltage can be applied. If the switcher GPI/Tally outputs are used to drive downstream DC relays, be sure to install diodes across the

relay coils to clamp inductive spikes. Shielded cable is recommended for the connection from the switcher to the user tally system.

Table 4. Tally and GPI Output Specifications

Maximum current for any one output	1 amp AC/DC
Maximum current for any one common	2 amp AC/DC
Maximum off (open circuit) voltage between output and common	60 Volts peak
Maximum voltage between any point and ground (chassis)	60 Volts peak

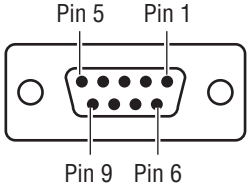
Pin Assignments

RS-422/485 Ports

Eight RS-422/485 ports are available on the rear of the K-Frame Video Processor, and can be used to control various devices, or for switcher control by an external controller.

Note The Frame serial port pinout is automatically configured based on assignment. The Frame is the bus controller when controlling external devices and PBus. The Frame is a tributary when controlled by an editor.

Table 5. RS-422/485 Pinouts

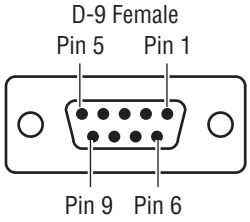
Socket	Pin	Bus Controller	Tributary
	1	Chassis Ground	Chassis Ground
	2	RxA (-)	TxA (-)
	3	TxB (+)	RxB (+)
	4	Signal Ground	Signal Ground
	5	Not used	Not used
	6	Signal Ground	Signal Ground
	7	RxB (+)	TxB (+)
	8	TxA (-)	RxA (-)
	9	Chassis Ground	Chassis Ground

RS-232 Ports

RS-232 serial ports are located on each processor board (Video Processor, Panel Processor, Menu PC), available for maintenance and diagnostics.

Standard VGA and keyboard ports, present on all processor boards, are also available for maintenance.

Table 6. RS-232 Pinouts

Socket	Pin	Signal
	1	Chassis Ground
	2	Transmit Data
	3	Receive Data
	4	Not used
	5	Signal Ground
	6	Not used
	7	Clear to Send
	8	Request to Send
	9	Not used

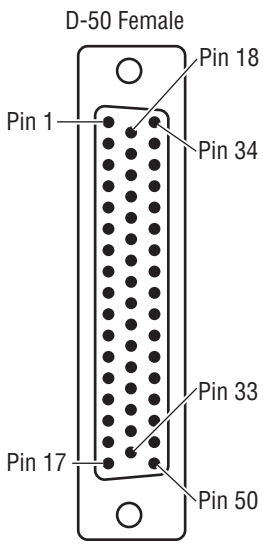
GPI In, Tally, GPI Out

Each Input Module has a 50 pin connector for GPI and Tally. The connectors are arranged in left to right order on the rear of the Standard (13-RU) K-Frame, and in top to bottom order on the Compact (6RU) K-Frame.

Table 7. Input Module Connectors

Module Number	Signals	6RU Frame	13 RU Frame
1	GPI In 1-8 Tally 1-24 GPI Out 1-8	Yes	Yes
2	GPI In 9-16 Tally 25-48 GPI Out 9-16	Yes	Yes
3	GPI In 17-24 Tally 49-72 GPI Out 17-24	No	Yes
4	GPI In 25-32 Tally 73-96 GPI Out 25 - 32	No	Yes
5	GPI In 33-40 Tally 97-120 GPI Out 33-40	No	Yes

Table 8. GPI In, Tally, GPI Out Signals

Socket	Ribbon Cable	50-Pin D-Sub			1	2	3	4	5
	1			1	GPIInCom	GPIInCom	GPIInCom	GPIInCom	GPIInCom
	2	34			GPIInCom	GPIInCom	GPIInCom	GPIInCom	GPIInCom
	3		18		GPIIn1	GPIIn9	GPIIn17	GPIIn25	GPIIn33
	4			2	GPIIn2	GPIIn10	GPIIn18	GPIIn26	GPIIn34
	5	35			GPIIn3	GPIIn11	GPIIn19	GPIIn27	GPIIn35
	6		19		GPIIn4	GPIIn12	GPIIn20	GPIIn28	GPIIn36
	7			3	GPIIn5	GPIIn13	GPIIn21	GPIIn29	GPIIn37
	8	36			GPIIn6	GPIIn14	GPIIn22	GPIIn30	GPIIn38
	9		20		GPIIn7	GPIIn15	GPIIn23	GPIIn31	GPIIn39
	10			4	GPIIn8	GPIIn16	GPIIn24	GPIIn32	GPIIn40
	11	37			TallyComA	TallyComJ	TallyComS	TallyComAA	TallyComAG
	12		21		Tally1A	Tally25J	Tally49S	Tally73AA	Tally97AG
	13			5	Tally2A	Tally26J	Tally50S	Tally74AA	Tally98AG
	14	38			Tally3A	Tally27J	Tally51S	Tally75AA	Tally99AG
	15		22		Tally4A	Tally28J	Tally52S	Tally76AA	Tally100AG
	16			6	TallyComB	TallyComK	TallyComT	TallyComAB	TallyComAH
	17	39			Tally5B	Tally29K	Tally53T	Tally77AB	Tally101AH
	18		23		Tally6B	Tally30K	Tally54T	Tally78AB	Tally102AH
	19			7	Tally7B	Tally31K	Tally55T	Tally79AB	Tally103AH
	20	40			Tally8B	Tally32K	Tally56T	Tally80AB	Tally104AH
	21		24		TallyComC	TallyComL	TallyComU	TallyComAC	TallyComAJ
	22			8	Tally9C	Tally33L	Tally57U	Tally81AC	Tally105AJ
	23	41			Tally10C	Tally34L	Tally58U	Tally82AC	Tally106AJ
	24		25		Tally11C	Tally35L	Tally59U	Tally83AC	Tally107AJ
	25			9	Tally12C	Tally36L	Tally60U	Tally84AC	Tally108AJ
	26	42			TallyComD	TallyComM	TallyComV	TallyComAD	TallyComAK
	27		26		Tally13D	Tally37M	Tally61V	Tally85AD	Tally109AK
	28			10	Tally14D	Tally38M	Tally62V	Tally86AD	Tally110AK
	29	43			Tally15D	Tally39M	Tally63V	Tally87AD	Tally111AK
	30		27		Tally16D	Tally40M	Tally64V	Tally88AD	Tally112AK
	31			11	TallyComE	TallyComN	TallyComW	TallyComAE	TallyComAL
	32	44			Tally17E	Tally41N	Tally65W	Tally89AE	Tally113AL
	33		28		Tally18E	Tally42N	Tally66W	Tally90AE	Tally114AL
	34			12	Tally19E	Tally43N	Tally67W	Tally91AE	Tally115AL
	35	45			Tally20E	Tally44N	Tally68W	Tally92AE	Tally116AL
	36		29		TallyComF	TallyComP	TallyComX	TallyComAF	TallyComAM
	37			13	Tally21F	Tally45P	Tally69X	Tally93AF	Tally117AM
	38	46			Tally22F	Tally46P	Tally70X	Tally94AF	Tally118AM
	39		30		Tally23F	Tally47P	Tally71X	Tally95AF	Tally119AM
	40			14	Tally24F	Tally48P	Tally72X	Tally96AF	Tally120AM
	41	47			GPIOutComG	GPIOutComQ	GPIOutComY	GPIOutComAG	GPIOutComAJ
	42		31		GPIOut1G	GPIOut9Q	GPIOut17Y	GPIOut25AG	GPIOut33AJ
	43			15	GPIOut2G	GPIOut10Q	GPIOut18Y	GPIOut26AG	GPIOut34AJ
	44	48			GPIOut3G	GPIOut11Q	GPIOut19Y	GPIOut27AG	GPIOut35AJ
	45		32		GPIOut4G	GPIOut12Q	GPIOut20Y	GPIOut28AG	GPIOut36AJ
	46			16	GPIOutComH	GPIOutComR	GPIOutComZ	GPIOutComAH	GPIOutComAK
	47	49			GPIOut5H	GPIOut13R	GPIOut21Z	GPIOut29AH	GPIOut37AK
	48		33		GPIOut6H	GPIOut14R	GPIOut22Z	GPIOut30AH	GPIOut38AK
	49			17	GPIOut7H	GPIOut15R	GPIOut23Z	GPIOut31AH	GPIOut39AK
	50	50			GPIOut8H	GPIOut16R	GPIOut24Z	GPIOut32AH	GPIOut40AK

Appendix A

Specifications

Table 1. K-Frame Video Standards

3G Modes	
1080p50/59.94/60, Level A and Level B	SMPTE 424M-2006
HD Modes	
1080i 29.97/30	SMPTE 274M Table 4, 5
1080i 25	SMPTE 274M Table 6
1080psf 23.976/24/25/29.97/30	SMPTE RP211 Table 12-16
720p 50/59.94/60	SMPTE 296 Table 1-3
SD Modes	
525i 29.97	SMPTE 259M
625i 25	SMPTE 259M

Table 2. K-Frame Mechanical Specifications

Component	Depth	Width	Height	Weight [a]	Rack Units
Compact 6-RU K-Frame	558.8 mm (22.0 in.)	482.8 mm (19 in.)	266 mm (10.47 in.)	31 kg (68 lbs.)	6
Standard 13-RU K-Frame	566.2 mm (22.29 in.)	482.8 mm (19 in.)	577.1 mm (22.72 in.)	55 kg (121 lbs.)	13
Power Supply Frame	492 mm (19.37 in.)	483.1 mm (19 in.)	44.0 mm (1.75 in.)	11 kg (24 lbs.) Above for two PS modules. A single module weighs 2.5 kg (5.4 lbs.). Up to three modules supported.	1

[a] All weights approximate.

Table 3. Environmental

Storage temperature	-20 to 70 deg C (-4 to 158 deg F)
Operating temperature	0 to 40 deg C (32 to 104 deg F)
Relative humidity	0-95% (non-condensing)
Electromagnetic environment	E2 (according to EN55103-1, -2)

Table 4. Network Connections

Type of connection	10/100/1000 Base T
Protocol	TCP(UDP)/IP, Auto speed detection. Auto crossover cable configuration.
Cable and connectors	CAT5 UTP, RJ45 connectors;
Max. Cable Length	100m / 300ft
Note	The K-Frame Video Processor has an internal Ethernet switch with six available external ports. One connection is required for each Control Panel and one is required for each Menu PC. An external Ethernet switch is required to connect more than six devices.

Table 5. Power

K-Frame Video Processor Power Supply	
Line voltage	100V-240V AC +/-10% autorange, power factor corrected. Automatic line-voltage sensing for 120V and 240V sources.
Line frequency	50/60Hz +/- 5%
Power consumption	6-RU (Internal Power Supplies) K-Frame, max. 750W
	13-RU K-Frame, max. 1400W
Leakage current	< 2.5 mA
Interconnect DC cable length	864 mm 34 in.

Table 6. Numbers of MEs, Inputs, and Outputs

Frame	**M/Es**	**Inputs**	**Outputs**	**GPI Inputs**	**GPI/Tally Outputs**	**Smart I/O Modules (MatchDef/SetDef)**
Compact 6-RU	1 to 5	32 to 64 plus up to 16 MatchDef	16 to 32 dual plus 4 to 16 SetDef	8 per input board	32 per input board	Each Smart I/O module provides 4 inputs and 4 outputs with up/down/cross conversion capability
Standard 13-RU	1 to 9	32 to 160 plus up to 32 MatchDef	16 to 64 dual plus up to 32 SetDef			
Board Count						
Compact 6 RU	Up to 2 M/E boards	Up to 2 input boards (32 inputs per input board)	Up to 2 output boards (16 dual outputs per output board)			Up to 4 modules
Standard 13 RU	Up to 4 M/E boards	Up to 5 input boards (32 inputs per input board)	Up to 4 output boards (16 dual outputs per output board)			Up to 8 modules

Table 7. Serial Digital Video Inputs

Format	ITU-R656, SMPTE 259M, 270 Mbit/s. SMPTE 292M, 1.485 Gbit/s SMPTE 424M-2006, 3 Gbit/s
Return loss	>10 dB, 1.5GHz to 3GHz
Type of Connector	75 ohm BNC (SMPTE 259M)
Nominal Amplitude	800mV peak-to-peak terminated
Channel Coding	conforms to SMPTE 259M, SMPTE 292M
Ancillary Data	Blanked or passed (user selectable)
Embedded audio	Blanked or passed (user selectable)
EDH	Blanked
Input Impedance	75 ohm
Max cable length	HD Video 100 meters (328 ft.) using Belden 1694A type cable
	SD Video 300 meters (984 ft.) using Belden 1694A type cable

Table 8. Serial Digital Video Outputs

Format	ITU-R656, SMPTE 259M, 270 Mbit/s. SMPTE 292M, 1.485 Gbit/s SMPTE 424M-2006, 3 Gbit/s
Return loss	>10 dB, 1.5GHz to 3GHz
Type of Connector	75 ohm BNC (SMPTE 259M)
Nominal Amplitude	800 mv peak-to-peak across 75 ohm +/- 10%
Rise & Fall Times	400 to 1400 picoseconds 75 ohm termination between 20% and 80% amplitude
Timing Jitter	≤ I UI R 601/656
Alignment jitter	≤ 2 UI (SD), ≤ 1 UI (HD)
Output Impedance	75 ohm
DC Offset	< 50mV with 75 ohm termination

Table 9. Analog Reference Input

Video Standard	Tri-level Sync or Color Black, analog equivalent to the standard being used.
Return loss	> 40dB, up to 5 MHz
Connectors	2 BNC loop-through
Impedance	75 ohm external

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