grass valley

Encore

Control System

Installation and Service Manual

SOFTWARE VERSION 1.6.5

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the most watched worldwide

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Grass Valley Web Site

The www.thomsongrassvalley.com web site offers the following:

Online User Documentation — Current versions of product catalogs, brochures, data sheets, ordering guides, planning guides, manuals, and release notes in .pdf format can be downloaded.

FAQ Database — Solutions to problems and troubleshooting efforts can be found by searching our Frequently Asked Questions (FAQ) database.

Software Downloads — Software updates, drivers, and patches can be downloaded.

Contents

Preface

About This Manual

This Installation and Service Manual provides information for the Grass Valley Group Encore Control System. This manual is designed for facility engineers and operators of Encore systems.

Documentation Set

The standard Encore documentation set consists of a:

- User Manual,
- Installation and Service Manual, and
- Release Notes.

The *User Manual* contains background information about the Encore Control System, and describes operating procedures. This manual can be used while learning about Encore, and for enhancing your basic knowledge of the system.

The *Installation and Service Manual* contains information about installing, configuring, and maintaining the system.

The *Release Notes* contain information about new features and system enhancements for a specific software version, and will typically include software installation procedures. Always check the release notes for your current system software before you begin operating your system.

Safety Summary

Read and follow the important safety information below, noting especially those instructions related to risk of fire, electric shock or injury to persons. Additional specific warnings not listed here may be found throughout the manual.

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.**

Safety Terms and Symbols

Terms in This Manual

Safety-related statements may appear in this manual in the following form:

WARNING **Warning statements identify conditions or practices that may result in personal injury or loss of life.**

CAUTION Caution statements identify conditions or practices that may result in damage to equipment or other property, or which may cause equipment crucial to your business environment to become temporarily non-operational.

Terms on the Product

The following terms may appear on the product:

DANGER — A personal injury hazard is immediately accessible as you read the marking.

WARNING — A personal injury hazard exists but is not immediately accessible as you read the marking.

CAUTION — A hazard to property, product, and other equipment is present.

Symbols on the Product

The following symbols may appear on the product:

Indicates that dangerous high voltage is present within the equipment enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

Indicates that user, operator or service technician should refer to product manual(s) for important operating, maintenance, or service instructions.

This is a prompt to note fuse rating when replacing fuse(s). The fuse referenced in the text must be replaced with one having the ratings indicated.

Identifies a protective grounding terminal which must be connected to earth ground prior to making any other equipment connections.

Identifies an external protective grounding terminal which may be connected to earth ground as a supplement to an internal grounding terminal.

Indicates that static sensitive components are present which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.

Warnings

The following warning statements identify conditions or practices that can result in personal injury or loss of life.

Dangerous voltage or current may be present — Disconnect power and remove battery (if applicable) before removing protective panels, soldering, or replacing components.

Do not service alone — Do not internally service this product unless another person capable of rendering first aid and resuscitation is present.

Remove jewelry — Prior to servicing, remove jewelry such as rings, watches, and other metallic objects.

Avoid exposed circuitry — Do not touch exposed connections, components or circuitry when power is present.

Use proper power cord — Use only the power cord supplied or specified for this product.

Ground product — Connect the grounding conductor of the power cord to earth ground.

Operate only with covers and enclosure panels in place — Do not operate this product when covers or enclosure panels are removed.

Use correct fuse — Use only the fuse type and rating specified for this product.

Use only in dry environment — Do not operate in wet or damp conditions.

Use only in non-explosive environment — Do not operate this product in an explosive atmosphere.

High leakage current may be present — Earth connection of product is essential before connecting power.

Dual power supplies may be present — Be certain to plug each power supply cord into a separate branch circuit employing a separate service ground. Disconnect both power supply cords prior to servicing.

Double pole neutral fusing — Disconnect mains power prior to servicing.

Use proper lift points — Do not use door latches to lift or move equipment.

Avoid mechanical hazards — Allow all rotating devices to come to a stop before servicing.

Cautions

The following caution statements identify conditions or practices that can result in damage to equipment or other property

Use correct power source — Do not operate this product from a power source that applies more than the voltage specified for the product.

Use correct voltage setting — If this product lacks auto-ranging power supplies, before applying power ensure that the each power supply is set to match the power source.

Provide proper ventilation — To prevent product overheating, provide equipment ventilation in accordance with installation instructions.

Use anti-static procedures — Static sensitive components are present which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.

Do not operate with suspected equipment failure — If you suspect product damage or equipment failure, have the equipment inspected by qualified service personnel.

Ensure mains disconnect — If mains switch is not provided, the power cord(s) of this equipment provide the means of disconnection. The socket outlet must be installed near the equipment and must be easily accessible. Verify that all mains power is disconnected before installing or removing power supplies and/or options.

Route cable properly — Route power cords and other cables so that they ar not likely to be damaged. Properly support heavy cable bundles to avoid connector damage.

Use correct power supply cords — Power cords for this equipment, if provided, meet all North American electrical codes. Operation of this equipment at voltages exceeding 130 VAC requires power supply cords which comply with NEMA configurations. International power cords, if provided, have the approval of the country of use.

Use correct replacement battery — This product may contain batteries. To reduce the risk of explosion, check polarity and replace only with the same or equivalent type recommended by manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Troubleshoot only to board level — Circuit boards in this product are densely populated with surface mount technology (SMT) components and application specific integrated circuits (ASICS). As a result, circuit board repair at the component level is very difficult in the field, if not impossible. For warranty compliance, do not troubleshoot systems beyond the board level.

Regulatory Notices

Certifications and Compliances

FCC Emission Control

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, 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. Changes or modifications not expressly approved by Grass Valley Group can affect emission compliance and could void the user's authority to operate this equipment.

Canadian EMC Notice of Compliance

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'emet pas de bruits radioélectriques dépassant les limites applicables aux appareils numeriques de la classe A préscrites dans le Règlement sur le brouillage radioélectrique édicte par le ministère des Communications du Canada.

EN55022 Class A Warning

For products that comply with Class A. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Canadian Certified Power Cords

Canadian approval includes the products and power cords appropriate for use in the North America power network. All other power cords supplied are approved for the country of use.

Canadian Certified AC Adapter

Canadian approval includes the AC adapters appropriate for use in the North America power network. All other AC adapters supplied are approved for the country of use.

Laser Compliance

Laser Safety Requirements

The device used in this product is a Class 1 certified laser product. Operating this product outside specifications or altering from its original design may result in hazardous radiation exposure, and may be considered an act of modifying or new manufacturing of a laser product under U.S. regulations contained in 21CFR Chapter1, subchapter J or CENELEC regulations in HD 482 S1. People performing such an act are required by law to recertify and reidentify this product in accordance with provisions of 21CFR subchapter J for distribution within the U.S.A., and in accordance with CENELEC HD 482 S1 for distribution within countries using the IEC 825 standard.

Laser Safety

Laser safety in the United States is regulated by the Center for Devices and Radiological Health (CDRH). The laser safety regulations are published in the "Laser Product Performance Standard," Code of Federal Regulation (CFR), Title 21, Subchapter J.

The international Electrotechnical Commission (IEC) Standard 825, "Radiation of Laser Products, Equipment Classification, Requirements and User's Guide," governs laser products outside the United States. Europe and member nations of the European Free trade Association fall under the jurisdiction of the Comite European de Normalization Electrotechnique (CENELEC).

For the CDRH: The radiant power is detected trough a 7 mm aperture at a distance of 200 mm from the source focused through a lens with a focal length of 100 mm.

For IEC compliance: The radiant power is detected trough a 7 mm aperture at a distance of 100 mm from the source focused through a lens with a focal length of 100 mm.

FCC Emission Limits

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesirable operation. This device has been tested and found to comply with FCC Part 15 Class B limits for a digital device when tested with a representative laser-based fiber optical system that complies with ANSI X3T11 Fiber Channel Standard.

Certification

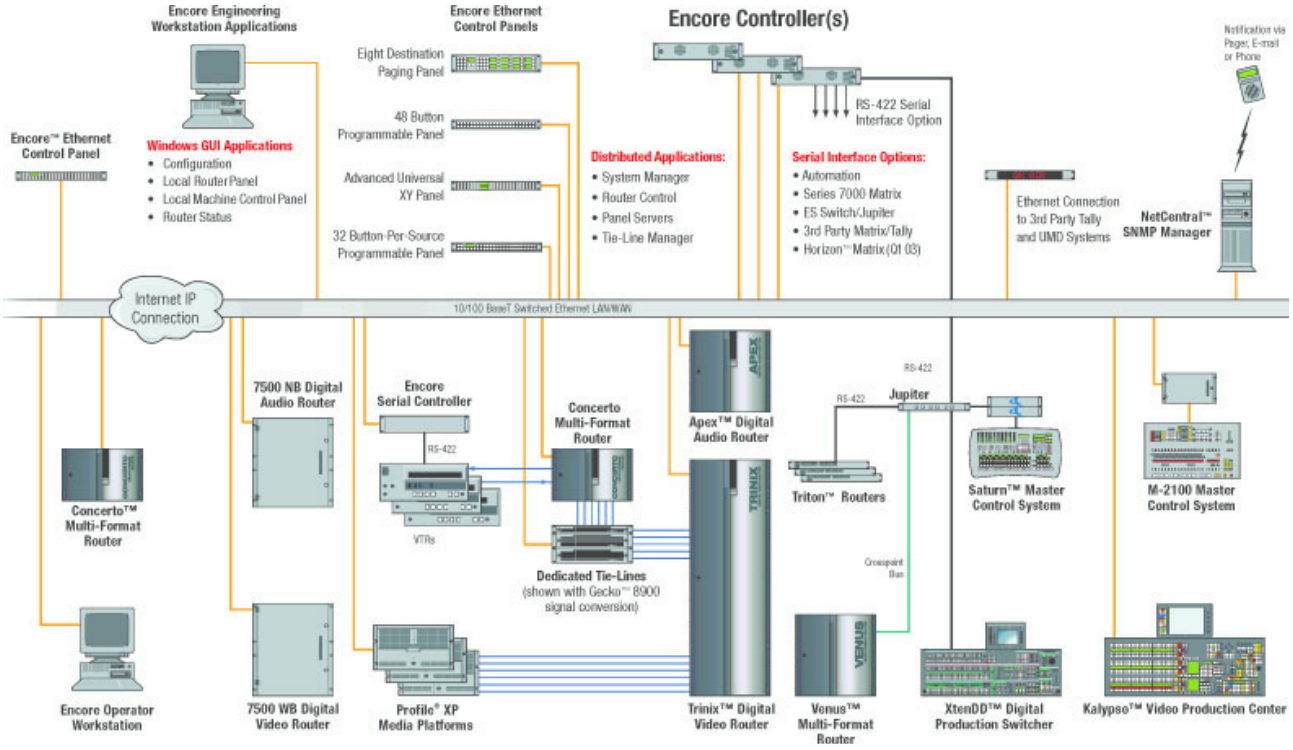
Category	Standard	Designed/tested for compliance with:
Safety	UL1950	Safety of Information Technology Equipment, including Electrical Business Equipment (Second edition, 1993).
	IEC 950	Safety of Information Technology Equipment, including Electrical Business Equipment (Second edition, 1991).
	CAN/CSA C22.2, No. 950-93	Safety of Information Technology Equipment, including Electrical Business Equipment.
	EN60950	Safety of Information Technology Equipment, including Electrical Business Equipment.

Section 1

Overview

The Encore system architecture takes advantage of Ethernet IP networking while addressing interface and control requirements from a simple audio/video routing system to extensive control integration with Grass Valley Group products and many other manufacturer's products.

Figure 1. Encore Facility Control System



The Encore system supports multiple levels of redundancy. Hardware redundancy is supported in the Encore System Controller Frame by a dual wire connection to the System Controllers. Control panel redundancy is supported on Serial and Ethernet interfaces. Additionally, the software applications, Encore controller hardware, signal paths, AC power, DC power, and Ethernet LAN connections can be made fully redundant.

The Encore Controller Frame based system is recommended for play-to-air applications including broadcast, satellite, and live production.

Features

Redundancies

There are two controller module slots. Each controller module slot is independent to support isolation of system components. The controller modules can be configured identically as a mirrored pair for redundancy, or configured with independent applications.

There are two power supply module slots. One power supply is required to power the frame. The second power supply provides redundancy.

Connections

The back of the frame has two identical sets of connectors, one set for each controller module slot. The controller module is the interface for the four RJ-45 connectors labelled **EN1** (Ethernet), **EN2** (Ethernet), **Com1** (Console), and **Com2** (RS422/RS-485). The controller module also provides the interface for the three BNC connectors labelled **Sync 1**, **Sync 2**, **Ref Out**, the 9-pin D connector labelled **GPI In**, the 15-pin D connector labelled **GPI Out**, and the USB B series connector labelled **USB**.

The optional SIO ISA mezzanine is the interface for the eight RJ-45 serial connectors. The four sets of BNC connectors labelled **GSC 1** to **GSC 4** will be the interface for the future optional GSC ISA mezzanine.

Each power supply module slot has an IEC AC connector. There is a single 48 V DC connector for the frame, with a floating ground for either +/- 48 VDC operation.

Characteristics

The Encore System Controller frame is 2 RU. Cooling is built into the frame so no external cooling units are required. All modules are front removable and hot pluggable.

Section 2

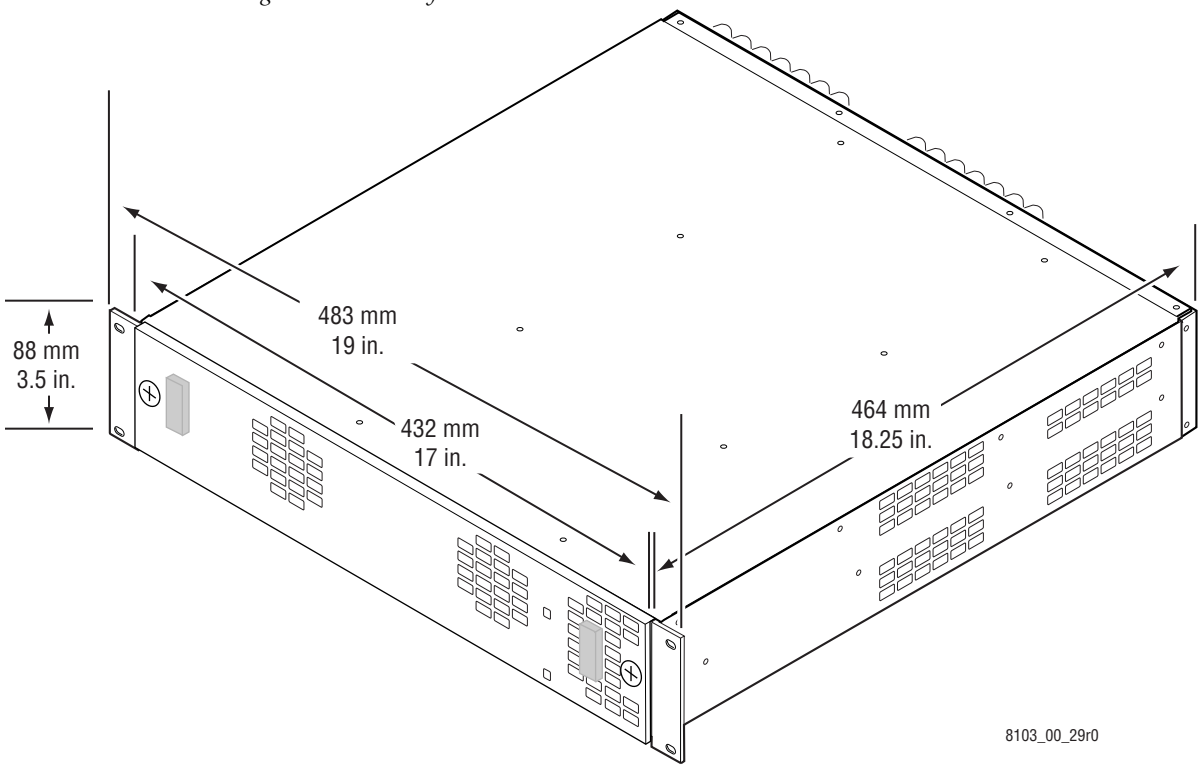
Installation

Rack Layout

Encore System Controller Frame

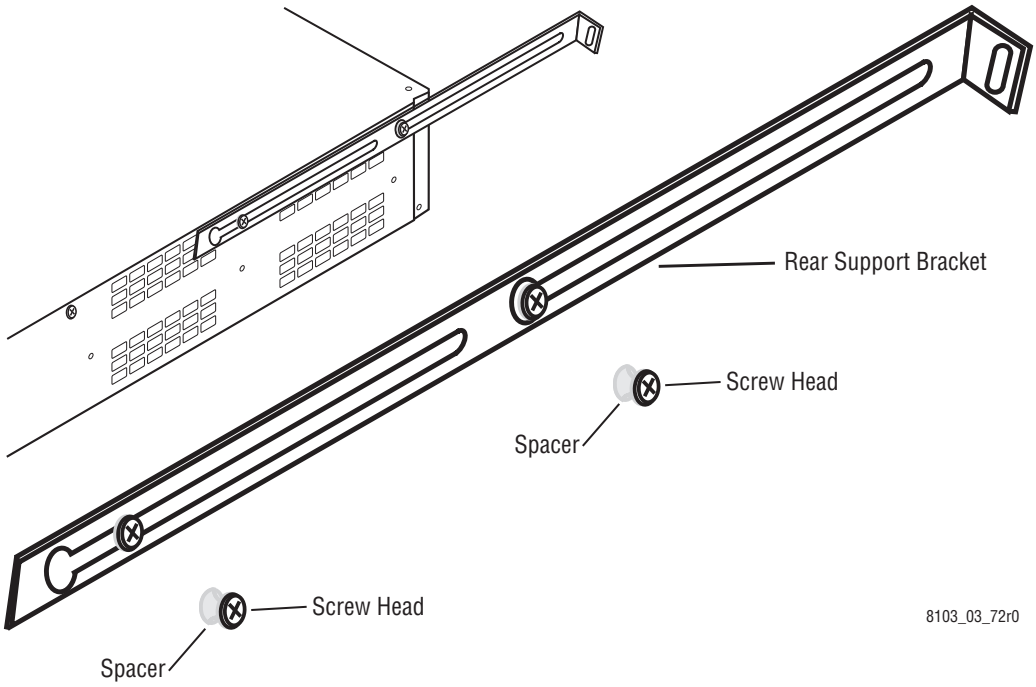
The Encore System Controller frame is installed in a standard 483 mm (19-inch) rack. Rear frame support brackets are included; their use is highly recommended but not required. The frame occupies two rack units. See Figure 2. Cooling is by internal fans mounted on the Controller and Power Supply modules.

Figure 2. Encore System Controller Frame



On each side of the Encore Controller frame are two screws with spacers. See Figure 3. The openings on the rear support bracket will fit over the screw heads. The spacers allow enough room to slide the bracket along the frame. Adjust the bracket to fit the rack and secure with user supplied screws, washers, and nuts.

Figure 3. Encore Rear Support Bracket

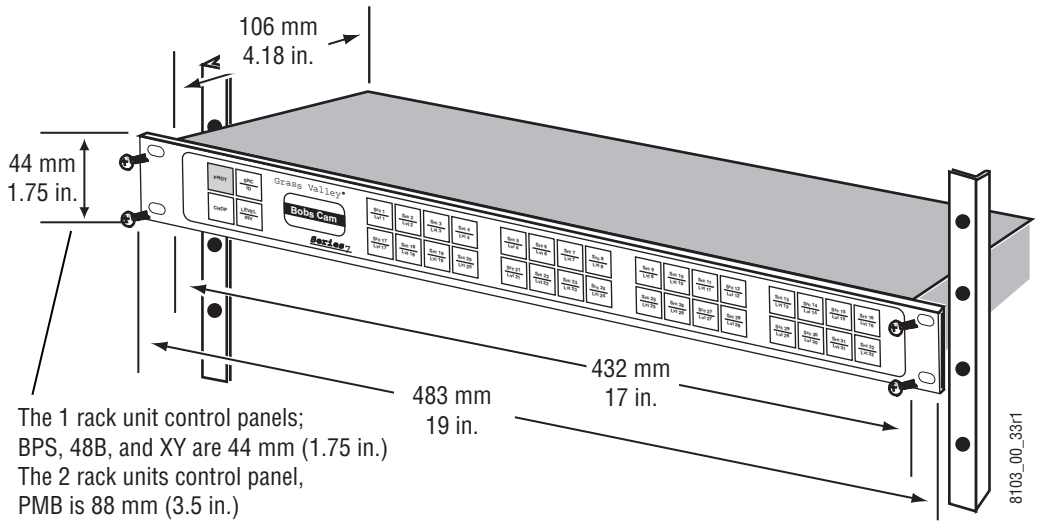


Control Panels

Control panel rack mounting is straightforward and requires no special tools or adaptors. Simply position the control panel in the rack and secure the panel in place using rack screws or bolts and nuts (depending upon your equipment racks). Refer to Figure 4.

CAUTION Do not position rack-mount control panels between matrix frames and their fan and exhaust units. This will break the chimney air flow and create open areas for EMI emissions.

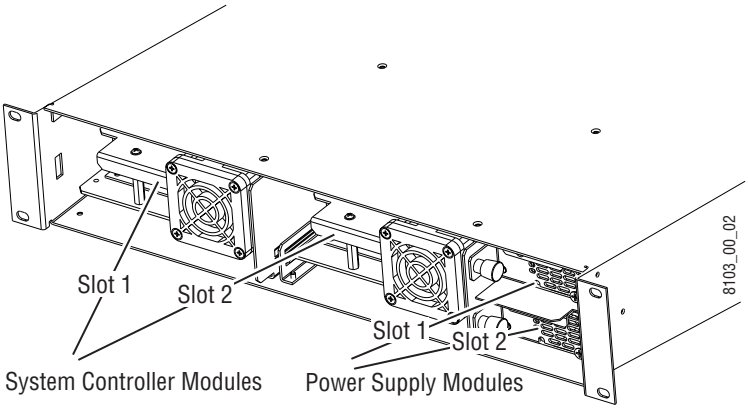
Figure 4. Rack Mount Control Panel Installation



Modules

There are two slots for System Controller modules and two slots for Power Supply modules. See Figure 5.

Figure 5. System Controller and Power Supply Modules



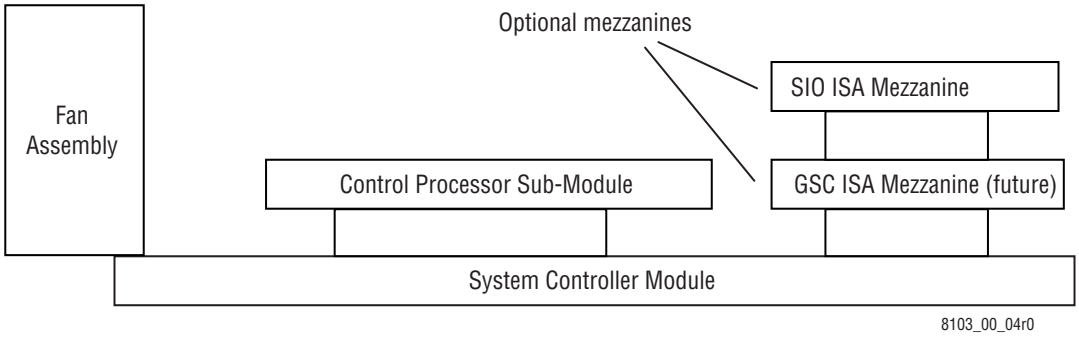
Note It is very important that the module be completely seated to operate properly. The fan and LEDs will come on before the Controller module is fully seated. See the Maintenance Section (*To Insert System Controller Modules* on page 67) for instructions on removing and inserting the Controller module.

System Controller

The **SYSTEM CONTROLLER** module provides the interface between the Control Processor module, the optional mezzanines, and the System Controller frame. There are no user adjustments on the module.

The module has two main components, the System Controller module and a Control Processor sub-module. The Serial Interface (SIO) mezzanine is optional. If purchased with the System Controller the mezzanine will come installed. If the mezzanine is purchased separately then installation consists of plugging the mezzanine into the Controller module. An optional Global Serial Channel (GSC) mezzanine is planned for the future. Once the GSC mezzanine is available, the mezzanine will be installed as shown in Figure 6. Operation is not affected by mezzanine location, however, the SIO ISA mezzanine has jumper and dip switch settings for each of its eight serial ports. Therefore it is suggested that the SIO ISA mezzanine be placed on top, as shown in Figure 6.

Figure 6. System Controller Components



Control Processor

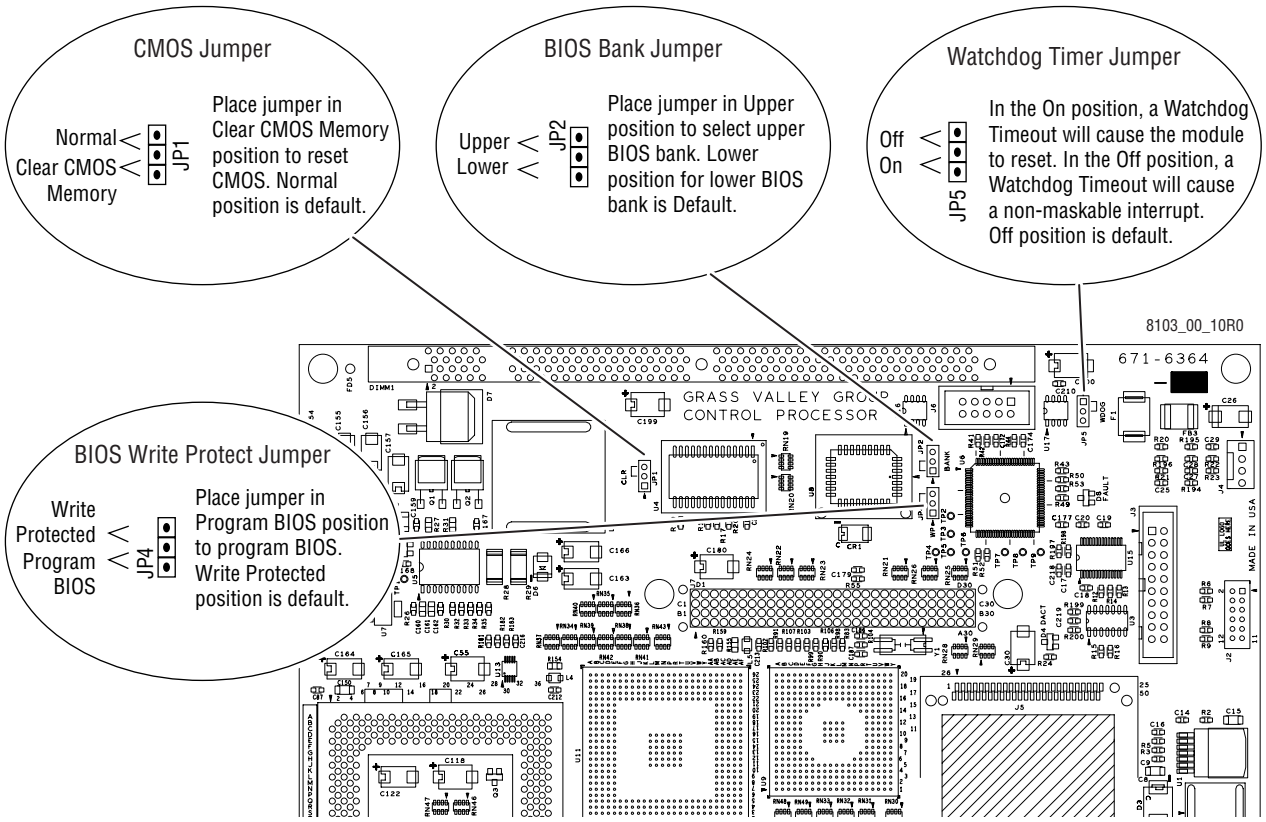
The **CONTROL PROCESSOR** module provides the processing capacity required for the Router Control and/or the Control Panel Server applications. There are several user adjustments on the module.

Control Processor Jumper Settings

There are four sets of Jumpers on the Control Processor module (see Figure 7):

- Placing the CMOS Jumper in the Clear position and resetting the System Controller module will erase the CMOS memory. After clearing the memory, the jumper must be returned to the Normal position and the System Controller module reset to resume operation. Only operate the System Controller with the jumper in the Normal position,
- Placing the BIOS Bank Jumper in the Upper position will select the upper BIOS Bank. The Lower position selecting the lower BIOS Bank is default,
- Placing the Watchdog Timer Jumper in the On position will cause the module to reset whenever a Watchdog Timeout occurs. The Off position will cause a non-maskable interrupt whenever a Watchdog Timeout occurs. Off is the default position, and
- Placing the BIOS Write Protect Jumper in the Program position will allow the BIOS to be programmed. Write Protected is the default position. Only operate the System Controller with the jumper in the Write Protected position.

Figure 7. Control Processor



SIO ISA Board

The **SIO ISA BOARD** mezzanine provides serial interfaces for eight ports at RS-422/485. Four of the eight ports will also support RS-232. There are user adjustments for each port.

SIO ISA Mezzanine Settings

Table 1. SIO ISA Ports

Port Number		RS-232	RS-422 /485
Mezz.	Frame		
0	1	Yes	Yes
1	2	Yes	Yes
2	3	Yes	Yes
3	4	Yes	Yes
4	5	No	Yes
5	6	No	Yes
6	7	No	Yes
7	8	No	Yes

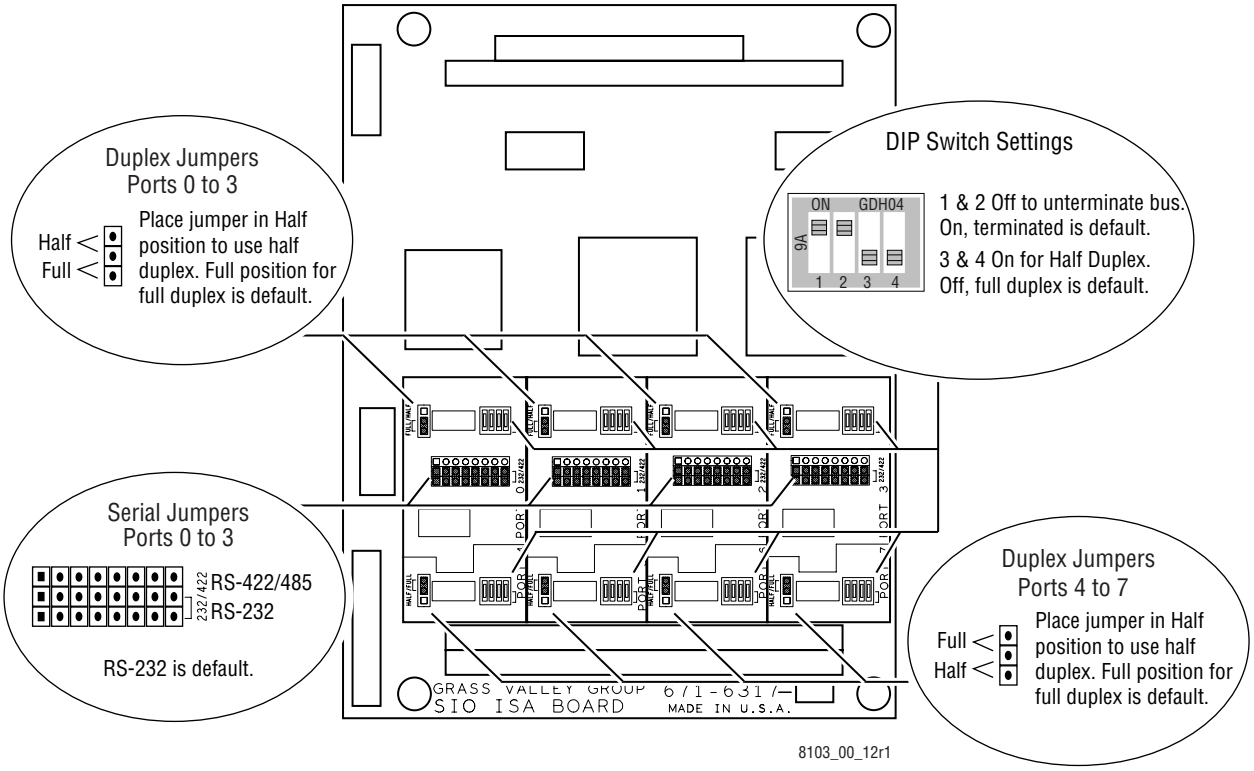
There are eight RJ-45 ports controlled by the SIO ISA mezzanine. On the mezzanine the ports are labelled 0 to 7. See Table 1 for port assignments and signal types. Each port has a Duplex Jumper, which allows you to choose Half or Full Duplex. The default setting is **Full**; if you want to use the **Half** setting you must also change the DIP switch setting.

The DIP switch bank has four switches. DIP switches 1 and 2 must be in the **On** (default) position to terminate the bus. DIP switches 3 and 4 (**Off** Full Duplex is default position) are set to the **On** position if the **Half** position is selected for the Duplex Jumper.

CAUTION On all mezzanine ports (whether used or unused), DIP switches 1 and 2 must be in the **On** position.

The default for the first four ports is RS-232; to set these ports to RS-422/485 set all eight jumpers on each port to the 422 position. See Figure 8 for jumper and DIP switch locations.

Figure 8. SIO ISA Port Jumpers and DIP Switches



System Cabling

Figure 9 shows the backplane cabling for the Encore System Controller Frame.

Figure 9. Encore System Controller Frame Rear View

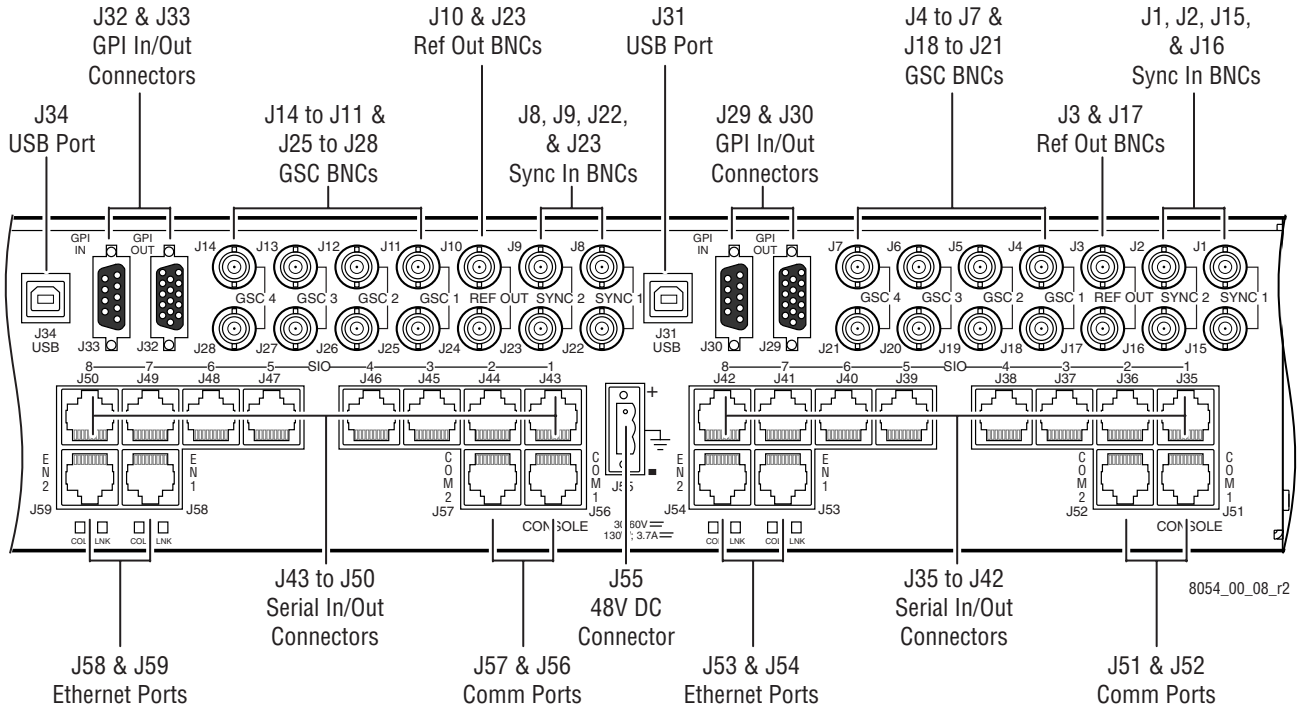


Table 2 contains a compilation of the connectors found on the Encore System Controller Frame. The Gender column indicates the gender of the connector found on the frame. The Details column contains information to assist in using the connector.

Table 2. Connectors Found on Encore System Controller Frame

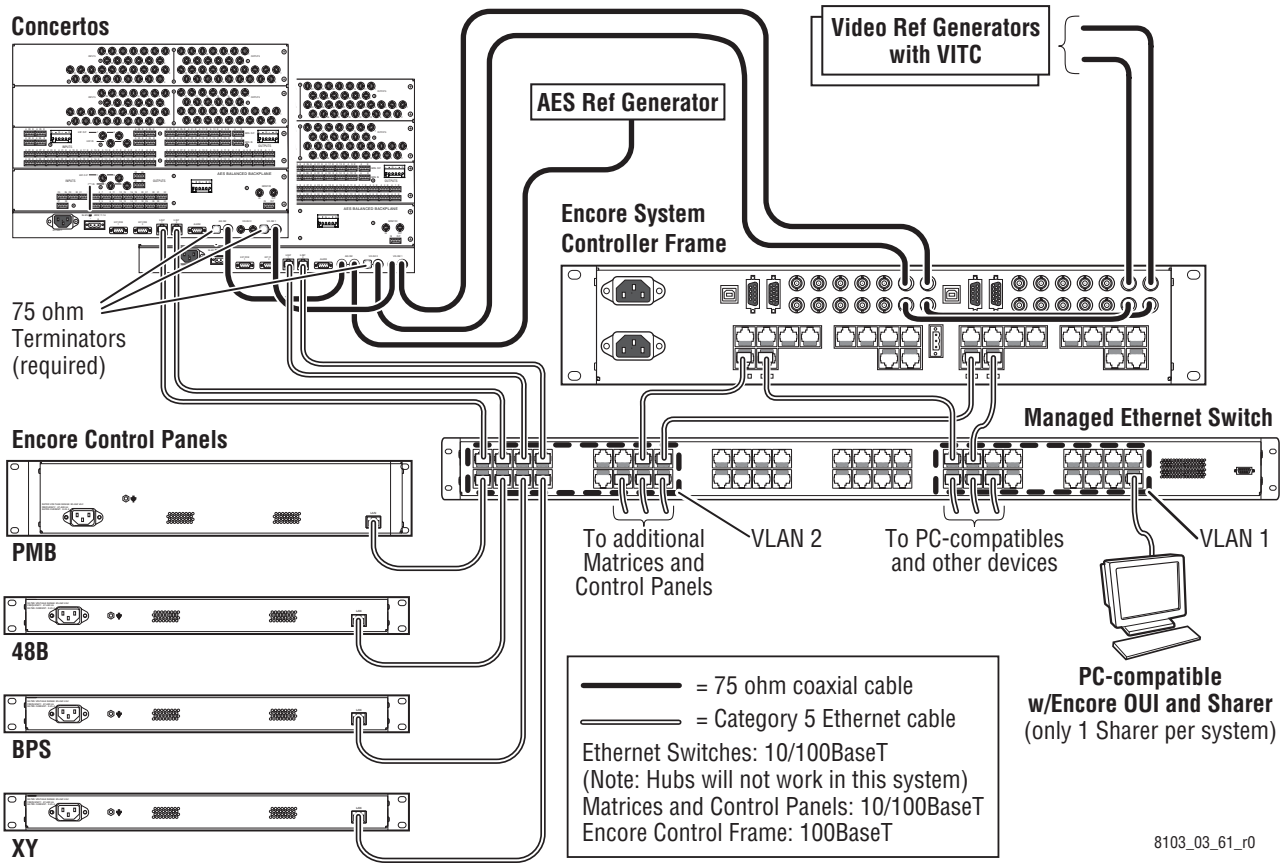
Label	Connector		Details
	Type	Gender	
+ ⏚ -	Terminal Block	Male	Use 12 AWG (3.31 mm^2) wire and a 3-pin terminal block connector to establish a DC power connection.
COM 1 CONSOLE	RJ-45	Female	RS-232 connector, use Category 5e cable, 8 conductor twisted pair.
COM 2	RJ-45	Female	RS-422, RS-485 connectors, use Category 5e cable, 8 conductor twisted pair.
EN 1 and 2	RJ-45	Female	Ethernet network communication interface is 10Base-T and 100Base-T compatible, use Category 5e cable, 8 conductor twisted pair.
GPI IN	9 Pin D	Male	Future use. Cable specifications and pinouts determined by type of serial device.
GPI OUT	15 Pin D	Male	Future use. Cable specifications and pinouts determined by type of serial device.
GSC 1, 2, 3, and 4	BNC	Female	Use 75 ohm connectors, terminators, and coaxial cable. Loop-thru cabling supported.

Table 2. Connectors Found on Encore System Controller Frame - (continued)

Label	Connector		Details
	Type	Gender	
REF OUT	BNC	Female	Synchronous video references use 75 ohm connectors, terminators, and coaxial cable. Loop-thru cabling supported.
SIO 1, 2, 3, and 4	RJ-45	Female	RS-232, RS-422, RS-485 connectors, use Category 5e cable, 8 conductor twisted pair.
SIO 5, 6, 7, and 8	RJ-45	Female	RS-422, RS-485 connectors, use Category 5e cable, 8 conductor twisted pair.
SYNC 1 and 2	BNC	Female	Synchronous video references use 75 ohm connectors, terminators, and coaxial cable. Loop-thru cabling supported.
USB	USB	Female	Future use B series receptacle, use A to B high/full-speed standard detachable cable.

Figure 10 shows the cabling for a redundant Encore Control System using a managed switch configured with two VLANs. This example uses two 128x128 Concerto matrices, four Encore control panels, a single PC-compatible, a single managed switch, and a single Encore frame with dual System Controllers.

Figure 10. Redundant System Controllers Configured Using VLANs



The two System Controllers are both configured as Panel Servers and Router Engines. Panels may be placed anywhere on the network as long as the panel has an Ethernet path to a Encore System Controller frame config-

ured as a Control Panel Server. A Control Panel server can control up to a maximum of 128 Encore control panels. To add more panels, use another Encore System Controller configured as a Control Panel Server.

Serial and Ethernet connections cannot be routed internally from one side of the System Control frame to the other, so a separate connection is shown from each System Controller to the device or switch.

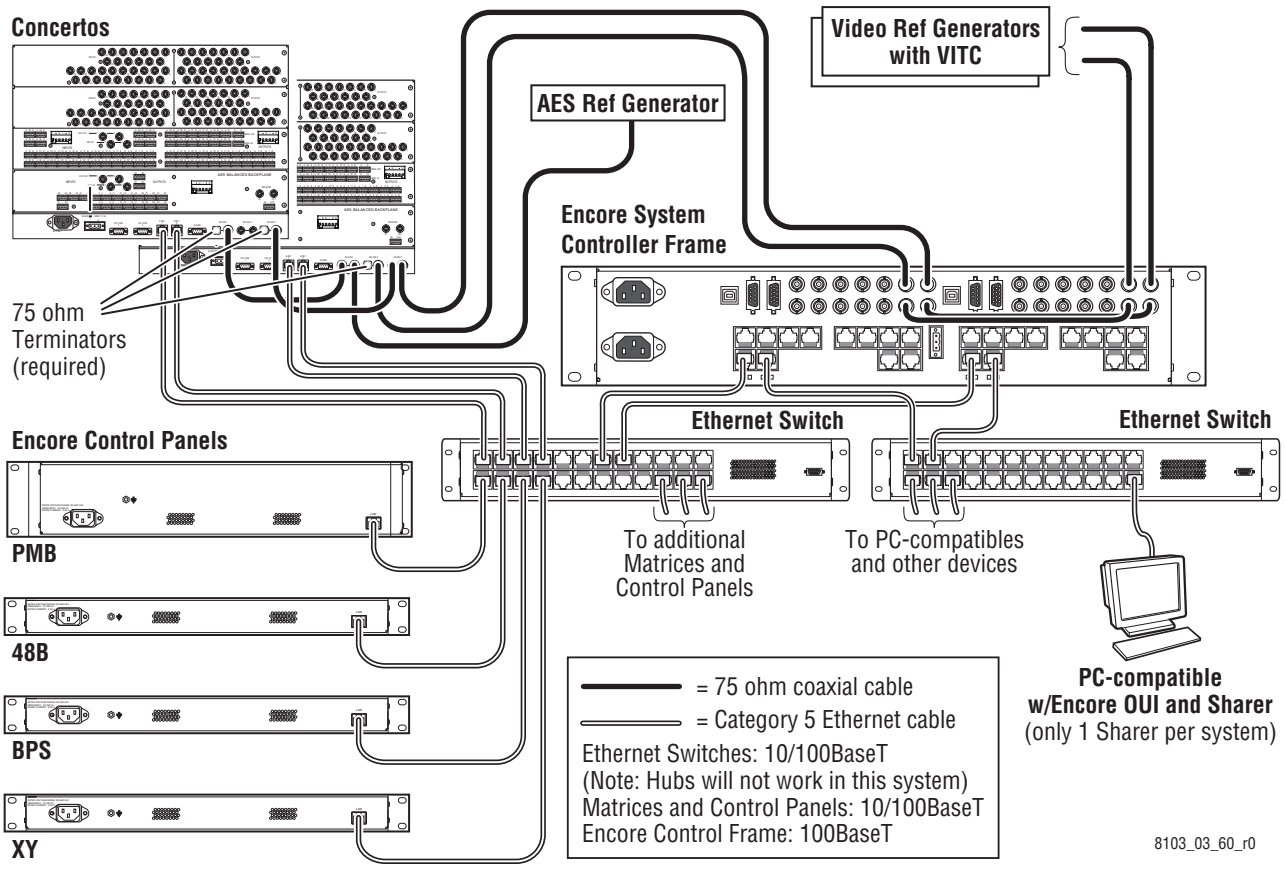
Video Reference signals can be routed via loop-thru daisy-chain. Two video references are routed through one System Controller to the other and on to the Concerto frames. Video Reference 2 is terminated at the first Concerto frame. Video Reference 1 continues from the first Concerto to the second Concerto before being terminated. An AES reference is added at the first Concerto frame and routed to the second Concerto where it is terminated.

All BNC cabling shown is 75 ohm coaxial and must be terminated at the end of the bus. All RJ-45 connected cabling is Category 5e.

Managed 10/100BaseT switches are recommended for all Encore Systems. Unmanaged 10/100BaseT switches can be used as secondary switches connecting several devices to a managed Ethernet switch, or in isolated areas.

Figure 11 shows the same system configuration using two switches.

Figure 11. Redundant System Controllers Configured Using Two Switches



Ethernet Cabling

Encore communicates with devices using Ethernet networks. Examples of the different device types include:

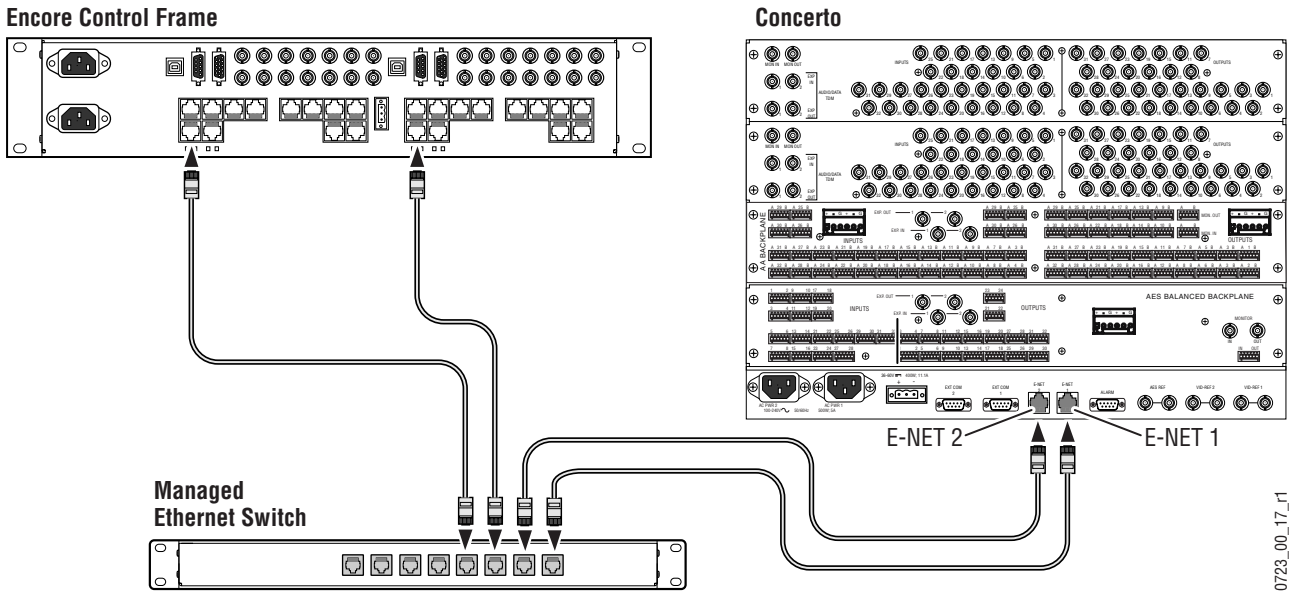
- Router matrices (Apex, Concerto, Trinix, 7500 Series, etc.),
- Control systems (Jupiter, Series 7000, etc.),
- PC-compatibles (Desktops, Laptops, NetCentral Monitoring Station, etc.),
- Master control systems (M-2100, MMCP, Maestro, etc.),
- Control panels (Encore control panels, Soft panels, etc.),
- Switchers (Kalypso, Zodiak, KayakDD, etc.), and
- Media storage (Profile XP, Profile PDR. etc.).

The Encore Control frame has four RJ-45 Ethernet connectors, two for each System Controller. The two RJ-45 connectors communicate with the system controller exactly the same, therefore, the usage is user defined. Use standard pin-to-pin (patch) cables to connect via switches. Use standard peer-to-peer (crossover) cables to connect a device directly to the Encore Control frame.

Router Matrices

Adding router matrices to the Encore Control system requires a network connection between the matrices and the Encore Control System. See Figure 12. Refer to the documentation for the particular router matrix for matrix installation and cabling instructions. Refer to the *Encore Control System User Manual* for matrix configuration instructions.

Figure 12. Network Connection between Encore and Router Matrix



Reference Cabling

Analog Color Black (NTSC/PAL) is used as the primary system Video Reference, and is required for both the controller and the matrices. To allow time stamped deterministic switching, the Video Reference must contain an embedded Vertical Interval Time Code (VITC) signal.

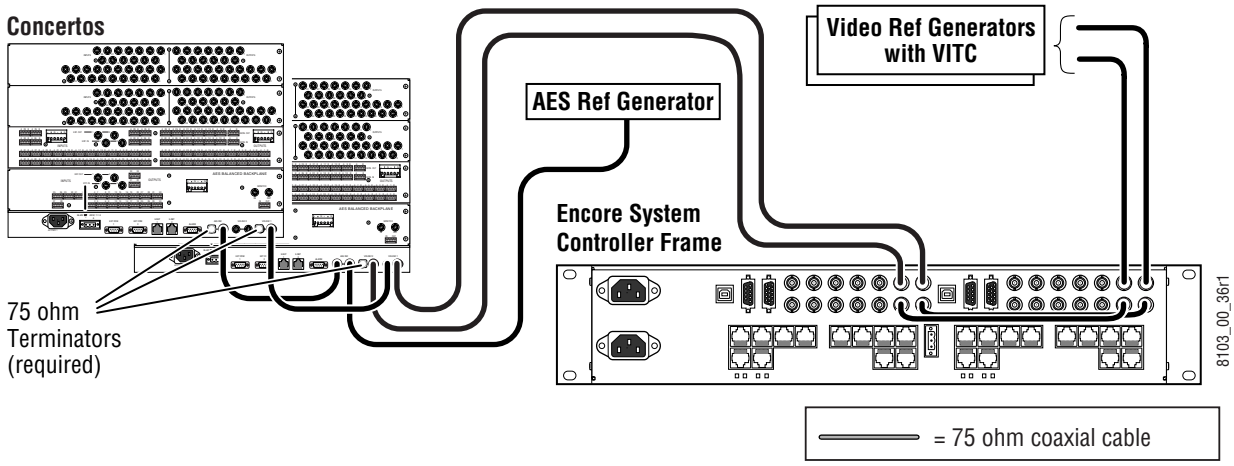
The Encore control system switches the matrices at Frame boundaries, not at Field boundaries (as in the Series 7000 control system). Frame based switching is required to ensure Dolby E compliance.

The Encore System Controller frame, the DV Series matrices, the 7500 Series matrices, and the Concerto matrix support multiple independent switch point reference signals. Multiple reference signals support synchronously switching groups of sources with different repetition rates (PAL/NTSC) or offset timing (delay from studios vs. direct feeds).

Reference signals can be routed via loop-thru daisy-chains. In Figure 13 two Video References are routed through the System Controller and on to the Concerto frame. Video Reference 2 is terminated at the first Concerto frame. Video Reference 1 continues from the first Concerto to the second Concerto before being terminated at the end of the bus. An AES Audio Reference is added at the first Concerto frame and routed to the second Concerto frame where it is terminated.

Note If Concerto is configured with an Audio Module, an AES Audio Reference must be present.

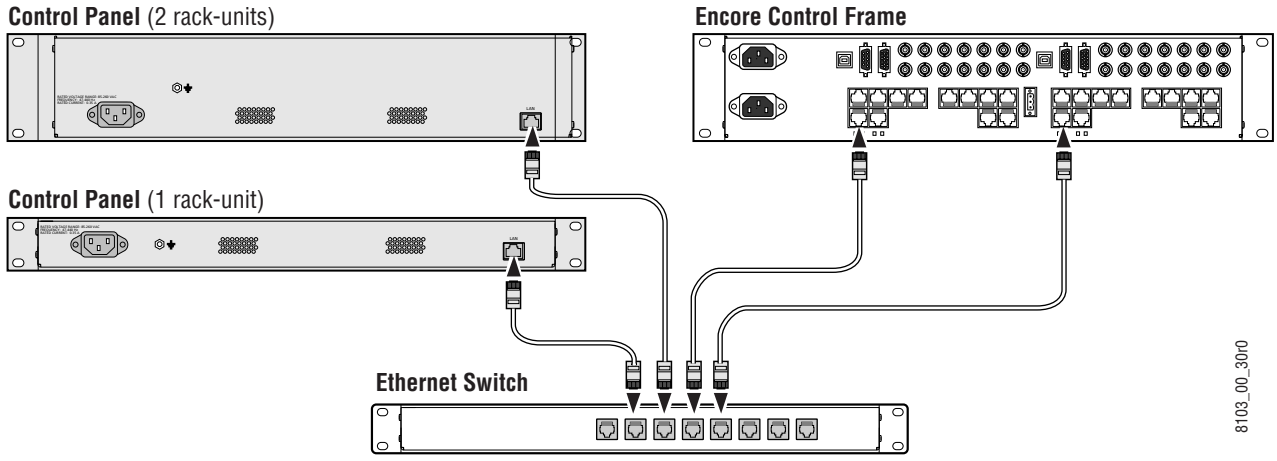
Figure 13. Video and AES References



Control Panels Cabling

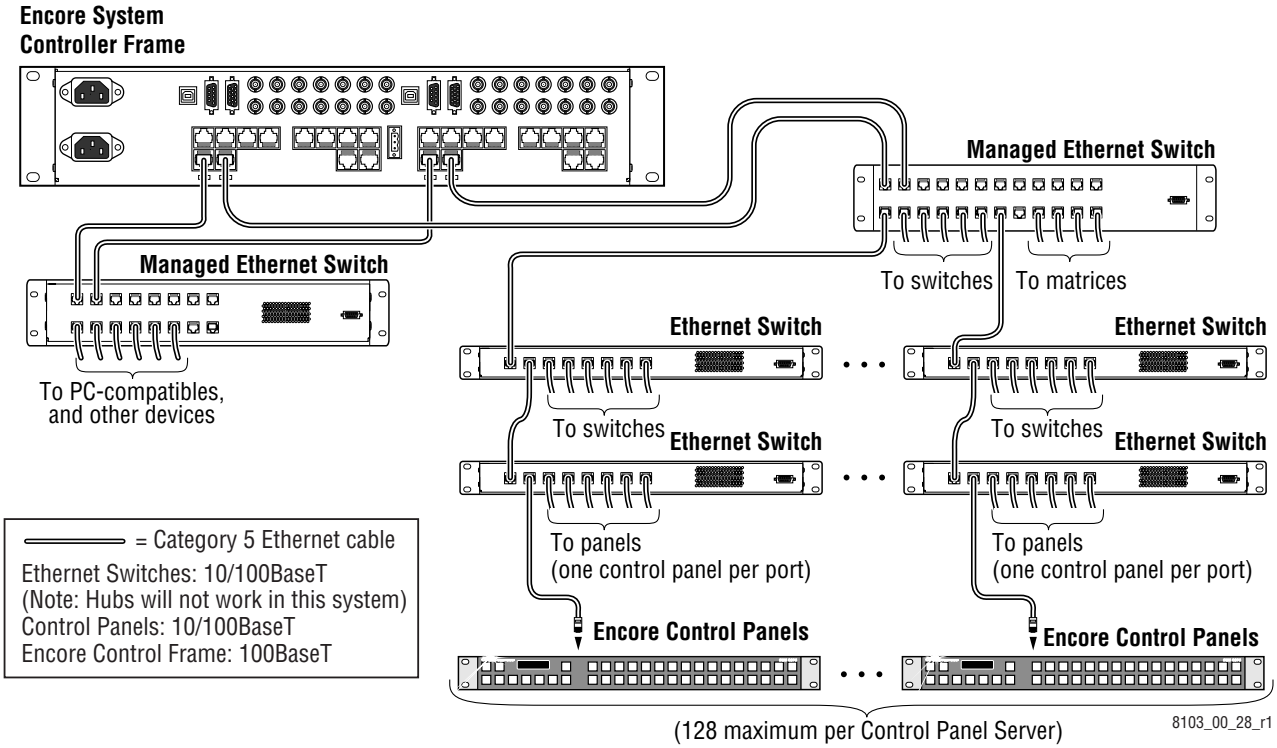
The recommended cabling configuration is to connect control panels via 10/100BaseT switches using Category 5e Ethernet patch cables. Each control panel requires a separate port. See Figure 14.

Figure 14. Control Panels



The switches can be layered up to a maximum of five deep. Always use the fewest layers practical for the installation. Figure 15 shows a possible connection configuration using three layers of switches. It is also recommended that control panels that are on shared networks be routed through managed switches at the point where the control panels can come into contact with signals from other devices.

Figure 15. Control Panels on Three Layers of Switches

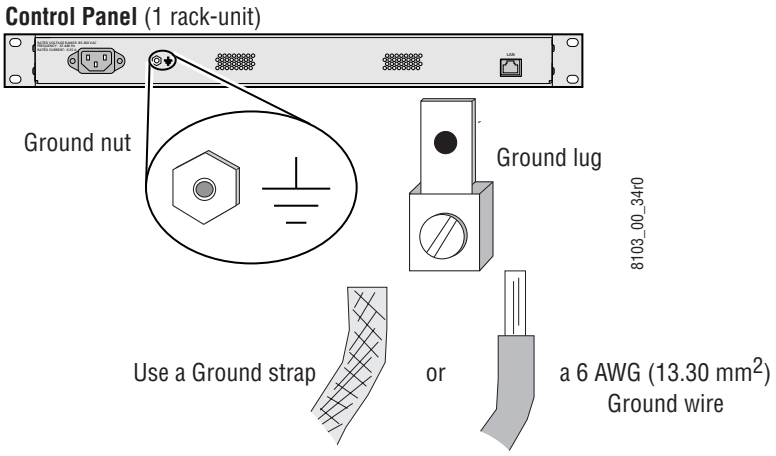


Note While it is possible to directly connect a control panel to an Encore Control frame; a direct connection would limit the number of control panels to two per System Controller. To connect a control panel directly to the Encore Control frame use a Category 5e Ethernet crossover cable between the **LAN** connector on the back of the control panel and the Ethernet connector on the back of the Encore System Controller frame.

Control panels must be properly grounded before connecting AC power. Use the ground nut located on the rear of each control panel. See Figure 16.

1. Attach either a 6 AWG (13.30 mm^2) wire or a ground strap to lug.
2. Attach lug to ground post.
3. Secure with nut.

Figure 16. Control Panel Ground

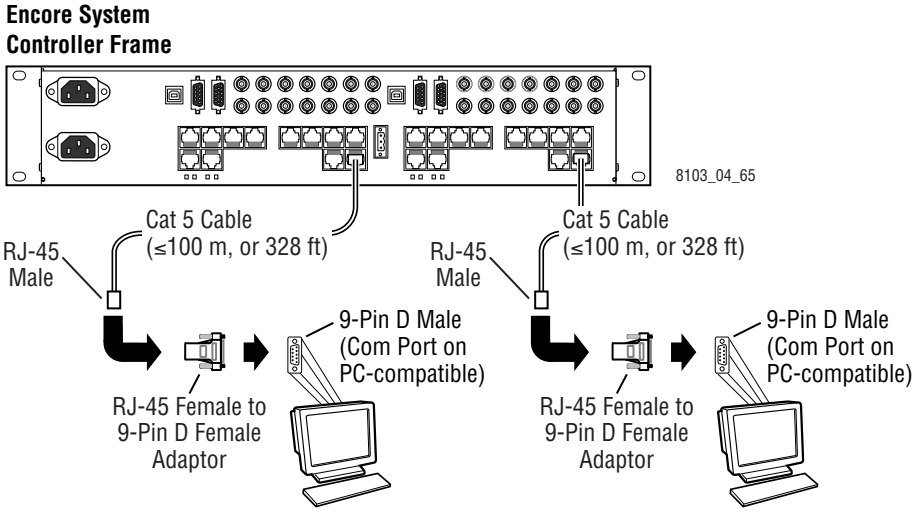


Serial Cabling RS-232

COM 1 (CONSOLE) and Ports 1 to 4 RS-232

COM 1 (CONSOLE) is a RS-232 serial connection used for connecting to a console. The pinouts and cabling for the port is the same on all the Encore frames. This is a non-redundant port; for redundant RS-232 connections use ports 1, 2, 3, or 4 on the optional SIO ISA mezzanine. See Figure 17 for a cabling example using PC-compatibles.

Figure 17. COM 1 RS-232 Cabling



Ports 1 to 4 come from the factory with RS-232 as the default. See *SIO ISA Board* on page 24 for information on port settings. Use the pinouts in Table 6 on page 46.

Serial Cabling RS-422/485

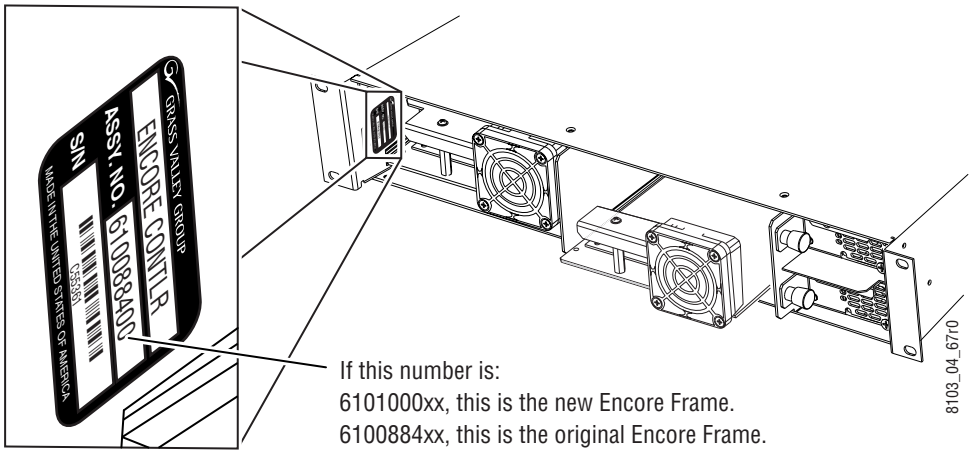
There are two different sets of pinouts used on the serial RJ-45 connectors on the Encore Control frame backplane. The original Encore Control frame part number 6100884xx is non-conforming and the newer Encore Control frame part number 6101000xx is conforming.

Note The Serial Interface Y Cable Option contains 8 cables that can be used with the original frame part number 6100884xx. These cables part number 174821600 are custom crossover cables. See *Contacting Grass Valley* on page 2 for more information on ordering these cables.

Encore Control Frame Identification

It is very important to use the correct cabling for the Encore Control frame. There is a label inside the front of the frame, as shown in Figure 18, to identify the part number of the frame.

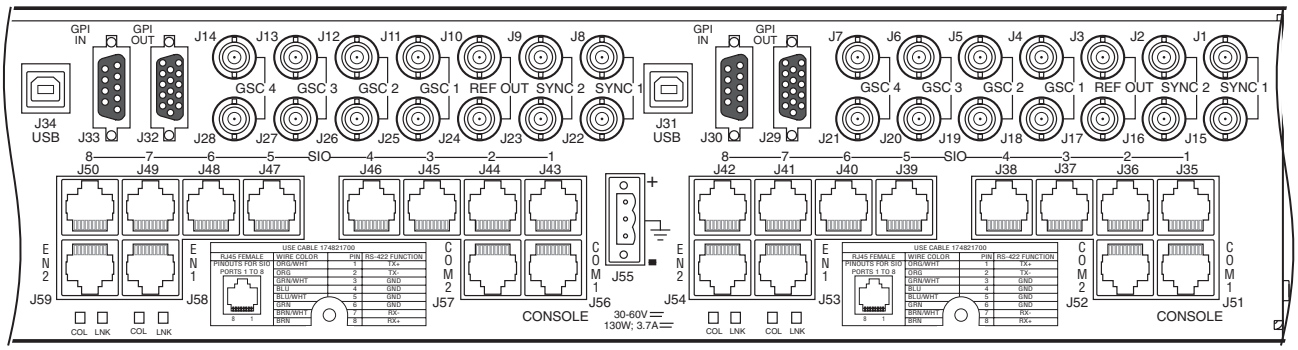
Figure 18. Frame Part Number



Frame 6101000xx Backplane

Encore Control frame with part number 6101000xx has pinouts for a RS-422 serial port either on a label or silk screened on the backplane as shown in Figure 19.

Figure 19. Backplane for Frame 6101000xx

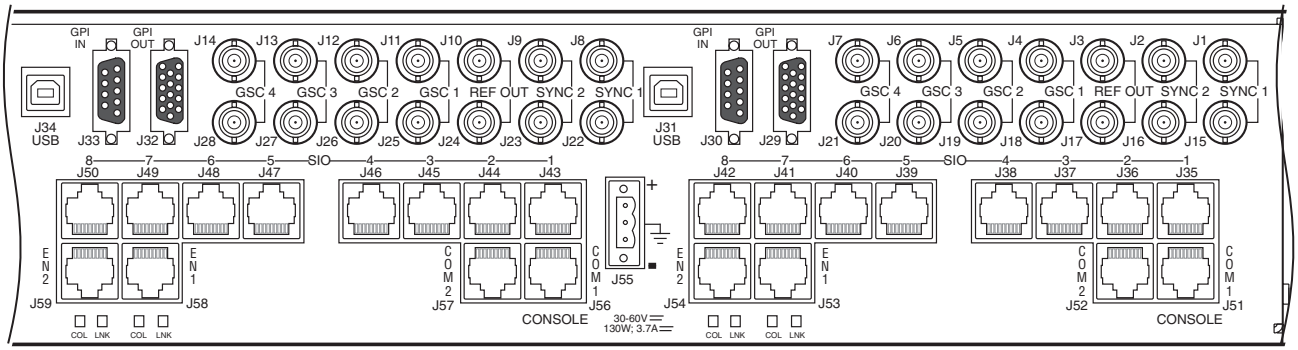


8103_04_68

Frame 6100884xx Backplane

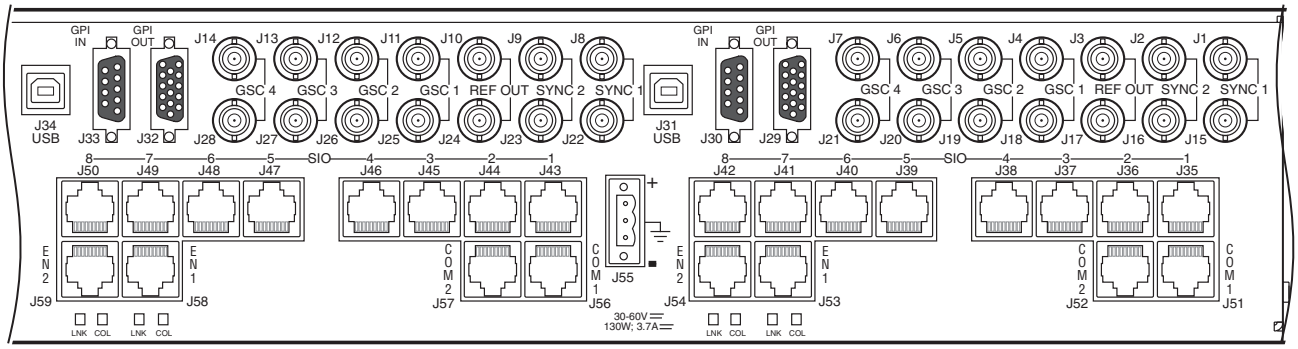
Encore Control frames with part numbers in the 6100884xx range will appear as one of the two types shown in Figure 20.

Figure 20. Encore Control Frames 6100884xx



Encore Control Frame with part number 610088401

8279_00_05



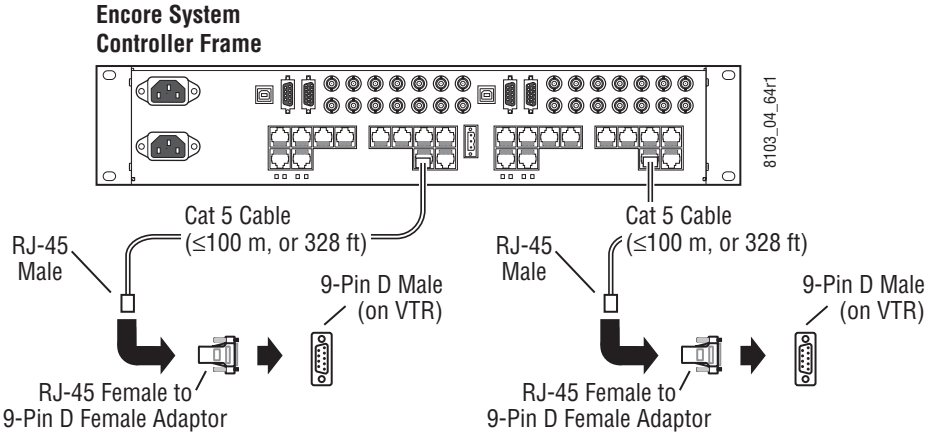
Encore Control Frame with part number 610088400

8279_00_06

COM 2

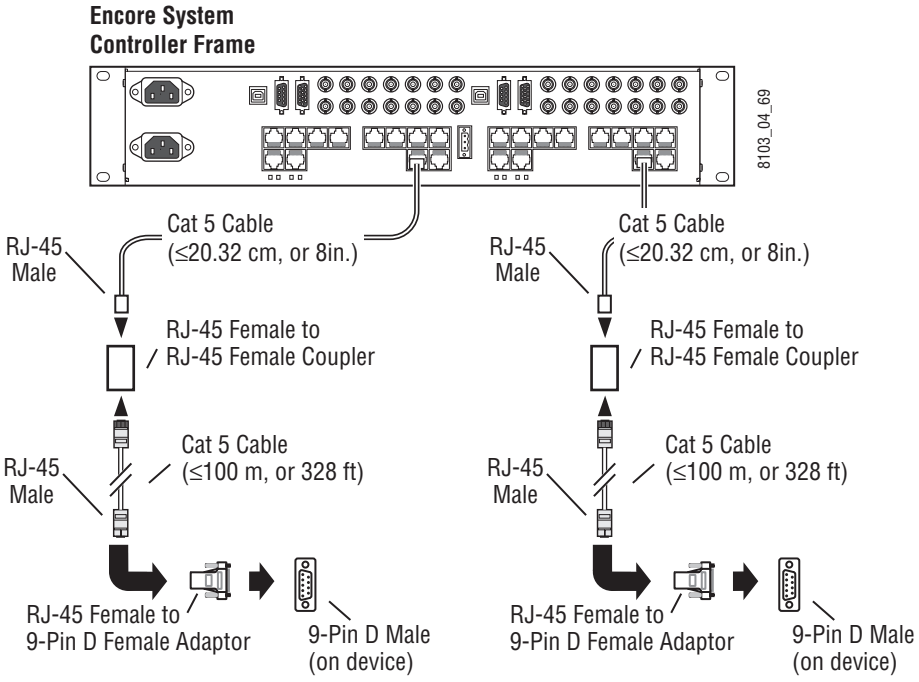
COM 2 is an RS-422/485 serial connection that can be used for connecting to serial devices such as a VTR or an automation system. The pinouts and cabling for the port is determined by which Encore Control Frame is being cabled. This is a non-redundant port; for redundant RS-422/485 connections use ports 1, 2, 3, 4, 5, 6, 7, or 8 on the optional SIO ISA mezzanine. See Figure 21 for a cabling example using Encore Control Frame 6101000xx and two VTRs.

Figure 21. COM 2 RS-422/485 Cabling New Encore Frame 6101000xx



See Figure 22 for a cabling example using Encore Control Frame 6100884xx and two VTRs.

Figure 22. COM 2 RS-422/485 Cabling Original Encore Frame 6100884xx



Ports 1 to 8 RS-422/485

Sixteen of the RJ-45 Connectors on the back of the Encore frame are labeled **SIO**. Ports labeled **1** (**J35**) to **8** (**J42**) are controlled by the SIO ISA Mezzanine on the System Controller in slot 1. Ports labeled **1** (**J43**) to **8** (**50**) are controlled by the SIO ISA Mezzanine on the System Controller in slot 2.

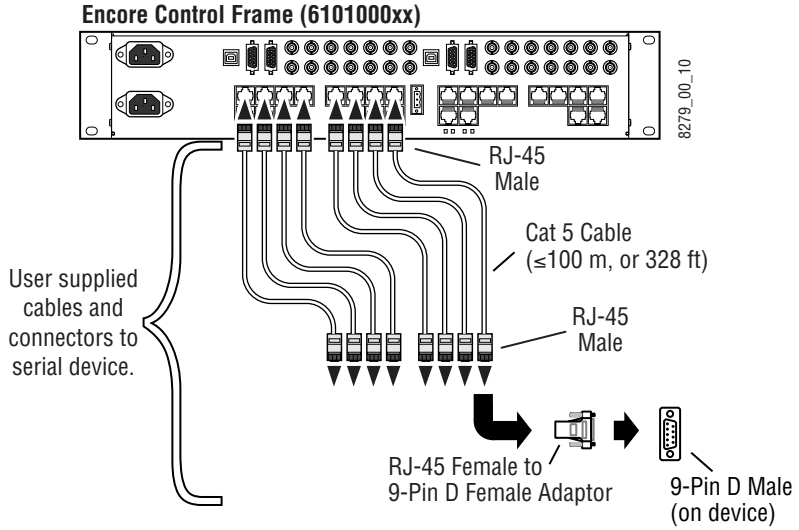
Nonredundant Frame 6101000xx

The RJ-45 serial connectors on this frame use pinouts that conform to an off-the-shelf Cat 5e Ethernet patch (pin-to-pin) cable pinouts. Do not use the patch (pin-to-pin) cables 174821700 for non-redundant cabling. Use customer supplied cabling.

The customer supplied cabling from the Encore Control frame to the device is not specified but here are a few guidelines:

- Use the shortest cabling practical for the installation,
- When using RJ-45 to D type serial adaptors, put the adaptor as close to the device as possible, ideally connect the adaptor to the device, and
- Use Cat 5e Ethernet patch (pin-to-pin) type cabling with RJ-45 connectors from the Encore Control frame to either the device or the adaptor on the device.

Figure 23. Non-Redundant Cabling for Encore Control Frame 6101000xx



Nonredundant Frame 6100884xx

The RJ-45 serial connectors on this frame use pinouts that do not conform to off the shelf Cat 5e Ethernet cable pinouts. The crossover cables 174821600 are custom designed to change the pinouts from the noncon-

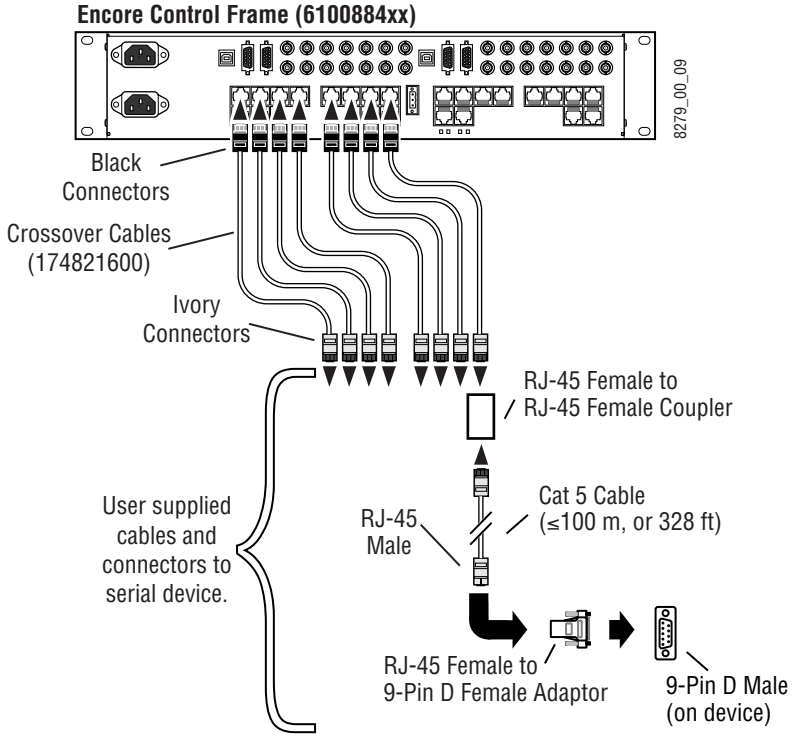
forming (black connector end of the cable) pinouts at the Encore Control frame to conforming pinouts (ivory connector end of the cable. See Figure 24.

The length of the cables (20.32 cm, 8 in.)provided is the maximum length supported for cabling from the Encore Control frame to a conforming RJ-45 coupler (female-to-female pass-though) connector.

The customer supplied cabling from the ivory RJ-45 connector to the device is not specified but here are a few guidelines:

- Use the shortest cabling practical for the installation,
- When using RJ-45 to D type serial adaptors, put the adaptor as close to the device as possible, ideally connect the adaptor to the device, and
- Use Cat 5e Ethernet patch (pin-to-pin) type cabling with RJ-45 connectors to either the device or the adaptor on the device.

Figure 24. Non-Redundant Cabling for Encore Control Frame 6100884xx



Redundant Cabling for Encore Control of Device

Redundant Encore control of serial devices is similar to non-redundant cabling.The redundant Encore controllers have to be the same type either frame 6101000xx or frame 6100884xx. One serial connection from each of the two Encore controllers needs to be connected to two separate serial ports on the controlled device.

Figure 25 shows redundant cabling using an Encore frame 6101000xx. There is a connection from **SIO Port 5** on the Encore frame from the Controller in Slot 1 to a serial port on the controlled device. There is another connection from **SIO Port 5** on the Encore frame from the Controller in Slot 2 to a separate serial port on the controlled device. These connections can use standard patch cables (pin-to-pin).

The customer supplied cabling from the Encore Control frame to the device is not specified but here are a few guidelines:

- Use the shortest cabling practical for the installation,
- When using RJ-45 to D type serial adaptors, put the adaptor as close to the device as possible, ideally connect the adaptor to the device, and
- Use Cat 5e Ethernet patch (pin-to-pin) type cabling with RJ-45 connectors from the Encore Control frame to either the device or the adaptor on the device.

Figure 25. Redundant Cabling Encore Frame 6101000xx

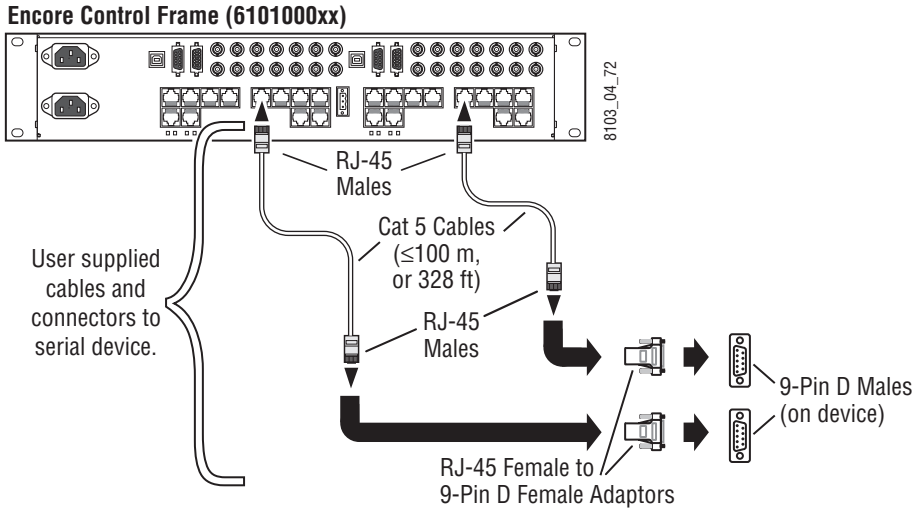


Figure 26 shows redundant cabling using an Encore frame 6100884xx. There is a connection from **SIO Port 5** on the Encore frame from the Controller in Slot 1 to a serial port on the controlled device. There is another connection from **SIO Port 5** on the Encore frame from the Controller in Slot 2 to a separate serial port on the controlled device.

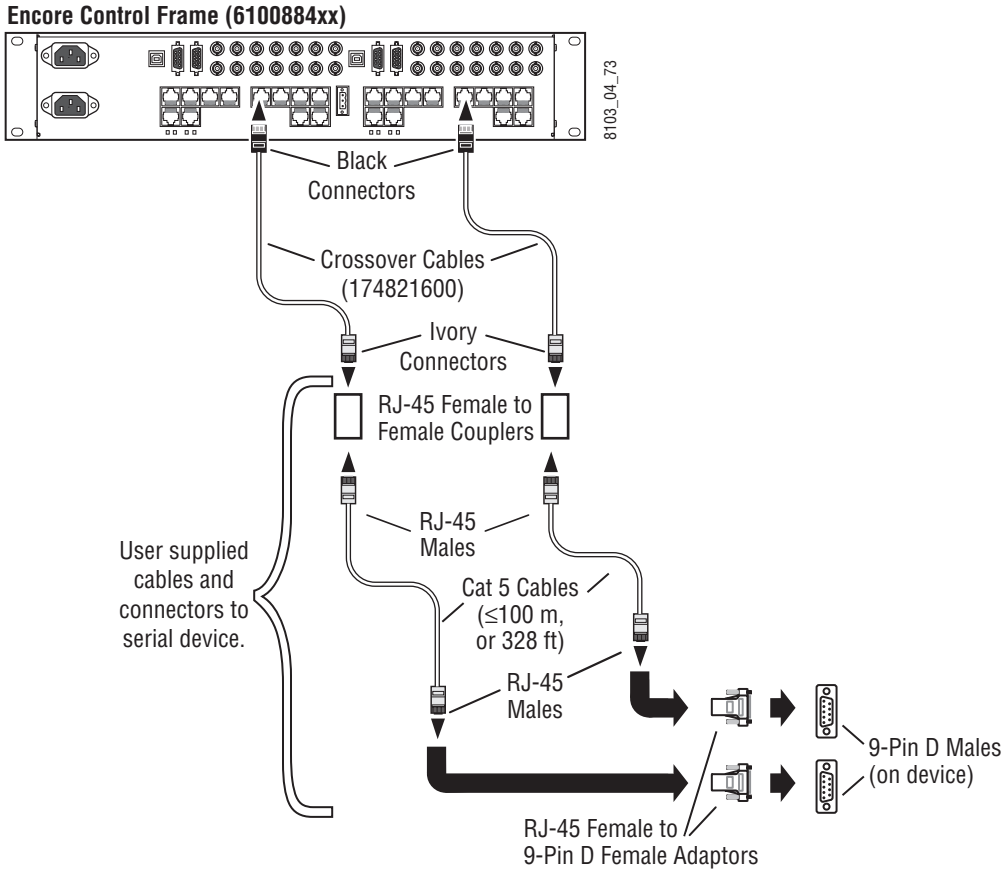
The RJ-45 serial connectors on this frame use pinouts that do not conform to off the shelf Cat 5e Ethernet cable pinouts. The crossover cables 174821600 available in Kit # are custom designed to change the pinouts from the nonconforming (black connector end of the cable) pinouts at the Encore Control frame to conforming pinouts (ivory connector end of the cable.

The length of the cables (20.32 cm, 8 in.)provided is the maximum length supported for cabling from the Encore Control frame to a conforming RJ-45 coupler (female-to-female pass-though) connector.

The customer supplied cabling from the ivory RJ-45 connector to the device is not specified but here are a few guidelines:

- Use the shortest cabling practical for the installation,
- When using RJ-45 to D type serial adaptors, put the adaptor as close to the device as possible, ideally connect the adaptor to the device, and
- Use Cat 5e Ethernet patch (pin-to-pin) type cabling with RJ-45 connectors to either the device or the adaptor on the device.

Figure 26. Redundant Cabling Encore Frame 6100884xx



Redundant Cabling for Device Control of Encore

Redundant serial port cabling where a device controls Encore requires the Serial Interface Y Cable Option (Y cable). The Y cable is needed when a device such as an automation system on a PC-compatible, or a router is using a single serial port to control Encore. The Y cable option contains enough cables and connectors to create four Y cables.

The crossover cables (174821600) in the Serial Interface Y Cable Option can also be used for non-redundant cabling to the original Encore Control frame (6100884xx).

The original Encore Control frame part number 6100884xx is nonconforming and requires the crossover cable (174821600). The newer Encore Control frame part number 6101000xx is conforming and uses a standard Patch (pin-to-pin) cable (174821700).

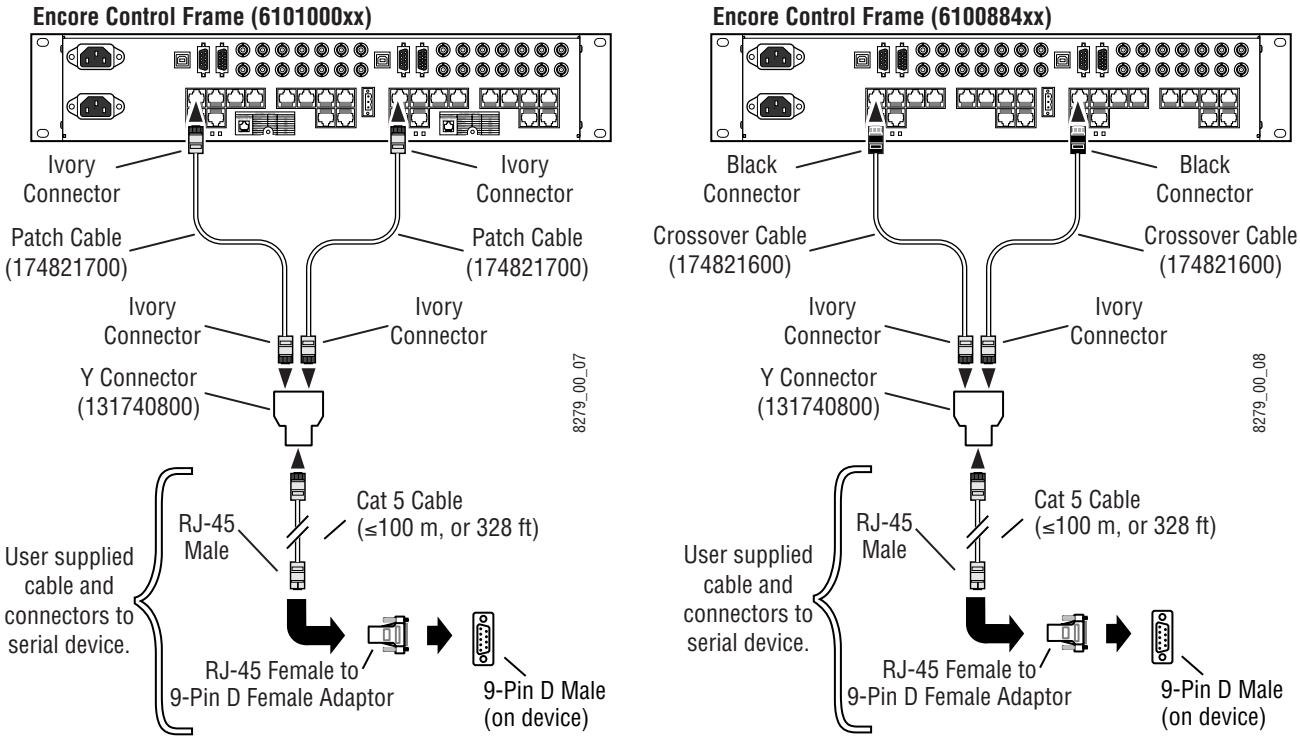
The length of the cables (20.32 cm, 8 in.)provided is the maximum length supported for cabling from the Encore Control frame to the Y connector. Each of the cables connecting an Encore System Controller to the Y connector must be the same length. Redundant connections need to be made within an area ≤ to the length of the two cables. See Figure 27.

The two Encore System Controllers must have identical hardware and software configurations. The most common placement of redundant System controllers are side-by-side in one Encore Control frame. However, the redundant System Controllers can be in different Encore Control frames as long as they meet the cable length and configuration requirements.

The customer supplied cabling from the Y connector to the device is not specified but here are a few guidelines;

- Use the shortest cabling practical for the installation,
- When using RJ-45 to D type serial adaptors, put the adaptor as close to the device as possible, ideally connect the adaptor to the device, and
- Use Cat 5e Ethernet patch (pin-to-pin) type cabling with RJ-45 connectors from the Y connector to either the device or the adaptor on the device.

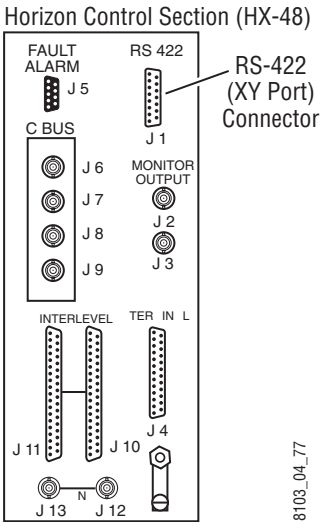
Figure 27. Redundant Cabling



Horizon Interface RS-422/485

Encore provides support for serial control of a Horizon matrix as follows:

- Matrix sizes up to 128 x 128,
- Maximum of 4 levels,
- Serial matrix (XY port) communication baud rate of 19200, and
- The Encore RS-422 SIO port baud rate is user adjustable. Supported rates are 19200, 9600, 4800, and 2400.



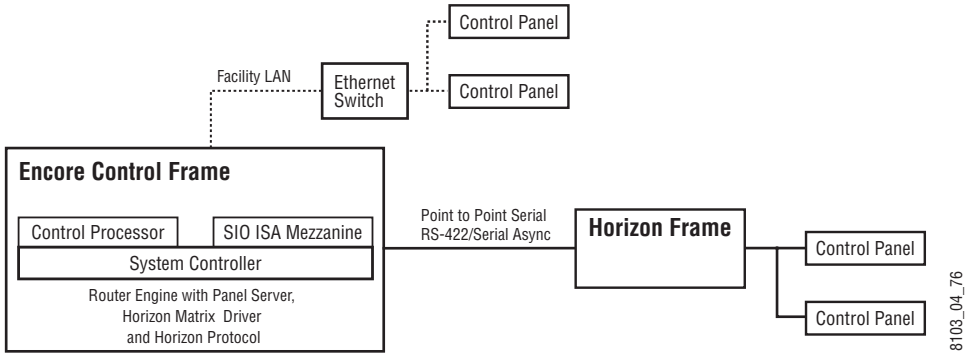
The Horizon interface to the Encore control system allows users to perform Takes from any connected point of control (including, but not limited to, an Encore panel, a Horizon panel, and the OUI). Execution of such Takes will result in corresponding tally on any connected point of control that is observing an affected destination.

On the back of the Horizon Control frame is a 15-pin D female connector labeled **RS-422**; this is the connector to use for the interface. A 15 pin D male to RJ-45 female adapter is required. The adapter's 15 pin D connector end can be plugged directly into the Horizon frame or an RS-422 male to female cable can be used. See Table 9 on page 49 for adaptor pinouts.

The **RS-422** connector is also know as the Horizon XY port. This port was designed as a maintenance port. Many customers have used this port to connect XY control panels or other serial devices. In some cases, customers have used Y cables or other splitters to connect multiple devices to the Horizon XY port at the same time. The Encore-Horizon interface requires Encore to be the only device connected to the Horizon using the **RS-422** (XY) port.

Refer to Figure 28 for a sample configuration diagram.

Figure 28. Sample Configuration Diagram



Encore to Horizon Protects and Unprotects

Encore control of Horizon only supports All Level Protects and Unprotects. It does not support soft Locks, hard Locks, force Unlocks, or Lock/Protect Override.

An Encore issued Protect to a Horizon router is removable using the force Unprotect feature.

Horizon enforces a time-to-live on all destination protects. Horizon uses an 8-bit protocol and does not utilize text strings for identifying a protecting device. Also, Horizon cannot query for which device has protected a given destination (however the Encore Router Control Engine (RCE) does have this knowledge base).The Horizon system associates a device ID for a protect that cannot be externally accessed.

The Horizon recognizes the RS-422 (XY) port connection as a single device. Therefore, a protect issued from the Encore RCE interface will always be identified as a single issuing device from within the Horizon system; however, the RCE has knowledge of which device has protected a Horizon Destination.

An Encore issued protect cannot be unlocked or overridden by any Horizon device. An Encore issued protect must be removed by the Encore issuing device or Encore control system.

Horizon to Encore Protects and Unprotects

A Horizon issued protect cannot be unlocked or overridden by any Encore device. A Horizon issued protect must be removed by the Horizon issuing device. If the Horizon router is rebooted or loses connection with the Encore control system then all protects are lost.

The Horizon does not broadcast Tally status. It must be queried Destination by Destination in order to receive Tally status information (polling).

Jupiter Interface RS-422/485

Use the same connectors, adaptors, and cables as shown in *Ports 1 to 8 RS-422/485* on page 36. To create a RJ-45 to 9 pin D adaptor use Table 8 on page 48, this adaptor is for use with the cables in the Serial Interface Y Cable Option. The adaptor in Table 7 on page 47 is for use with a ≤4 inch patch cable.

The pinouts in Figure 29 and Figure 30 on page 50 are used for creating serial cables to connect an Encore Control frame to either the Jupiter VM 3000 or the Jupiter CM4000.

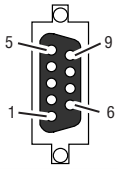
Pinouts

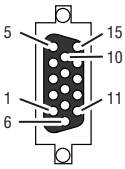
Control Frame Pinouts

GPI Pinouts

General Purpose Interface (GPI) pinouts are in Table 3. The **GPI IN** is a 9-pin D male connector and the **GPI OUT** is a 15-pin D male connector.

Table 3. GPI Pinouts

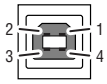
GPI In	Pin	Function	Pin	Function
9 Pin D Male 	1	GPI_IN1-	6	GPI_IN1+
	2	GPI_IN2-	7	GPI_IN2+
	3	GPI_IN3-	8	GPI_IN3+
	4	GPI_IN4-	9	GPI_IN4+
	5	GPI_Power	-	-

GPI Out	Pin	Function	Pin	Function	Pin	Function
15 Pin D Male 	5	No connect	10	No connect	15	No connect
	4	GPI_REL4_NC	9	GPI_REL4_COM	14	GPI_REL4_NO
	3	GPI_REL3_NC	8	GPI_REL3_COM	13	GPI_REL3_NO
	2	GPI_REL2_NC	7	GPI_REL2_COM	12	GPI_REL2_NO
	1	GPI_REL1_NC	6	GPI_REL1_COM	11	GPI_REL1_NO

USB Pinouts

The **USB** pinouts are in Table 4.

Table 4. USB Pinouts

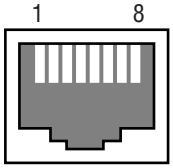
USB	Pin	Function
USB Female 	1	USB_+5
	2	USB_TX-
	3	USB_TX+
	4	USB_GND

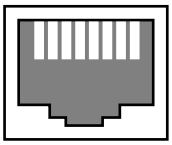
RJ-45 Pinouts

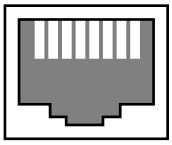
There are twelve RJ-45 connectors per slot on the Encore Control Frame:

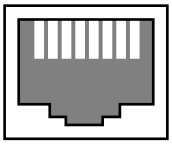
- **EN 1** and **EN 2** are used for Ethernet connections. They require a patch cable if connecting to a switch, or a crossover cable if connecting directly to a PC-compatible.
- **COM 2** and the eight connectors labelled **SIO 1** to **8** are RS-422/485 serial connections. There are different pinouts for RS-422/485 depending on which Encore Control frame is used. See *Encore Control Frame Identification* on page 33 for help.
- Ports labelled **SIO 1** to **4** can be used for RS-232 connections by changing jumpers on the SIO ISA mezzanine. See *SIO ISA Mezzanine Settings* on page 24.
- **COM1 CONSOLE** connector is a RS-232 serial connection used by either a terminal or a terminal emulator on a PC-compatible.

Table 5. RJ-45 Pinouts

RJ-45 Ethernet	Wire Color	Pin	Function
RJ-45 Female 1 8 	Orange White	1	TX+
	Orange	2	TX-
	Green White	3	RX+
	Blue	4	No connect
	Blue White	5	No connect
	Green	6	RX-
	Brown White	7	No connect
	Brown	8	No connect

RS-232 COM 1 (CONSOLE) and Ports 1 to 4	Wire Color	Pin	Function
RJ-45 Female 1 8 	Orange White	1	RTS
	Orange	2	DTR
	Green White	3	TD
	Blue	4	Ground
	Blue White	5	Ground
	Green	6	RD
	Brown White	7	DSR
	Brown	8	CTS

RS-422/485 COM 2, Ports 1 to 8 on Encore Frame 6100884xx	Wire Color	Pin	Function
RJ-45 Female 1 8 	Orange White	1	RX+
	Orange	2	No connect
	Green White	3	TX+
	Blue	4	Ground
	Blue White	5	Ground
	Green	6	RX-
	Brown White	7	No connect
	Brown	8	TX-

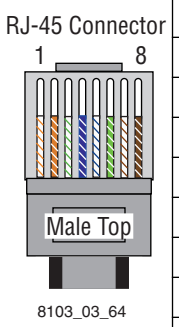
RS-422/485 COM 2, Ports 1 to 8 on Encore Frame 6101000xx	Wire Color	Pin	Function
RJ-45 Female 1 8 	Orange White	1	TX+
	Orange	2	TX-
	Green White	3	Ground
	Blue	4	Ground
	Blue White	5	Ground
	Green	6	Ground
	Brown White	7	RX-
	Brown	8	RX+

RJ-45 to 9-Pin D Adaptor Pinouts

Table 6 shows the adaptor pin assignments for RS-232 serial connection to a terminal or a terminal emulator on a PC-compatible.

Table 6. RS-232 Pinouts for RJ-45 to 9-Pin D Adaptor

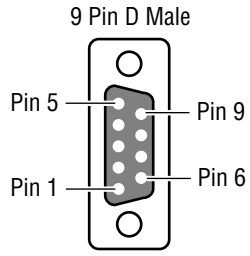
RJ-45 Cable with Male Connector

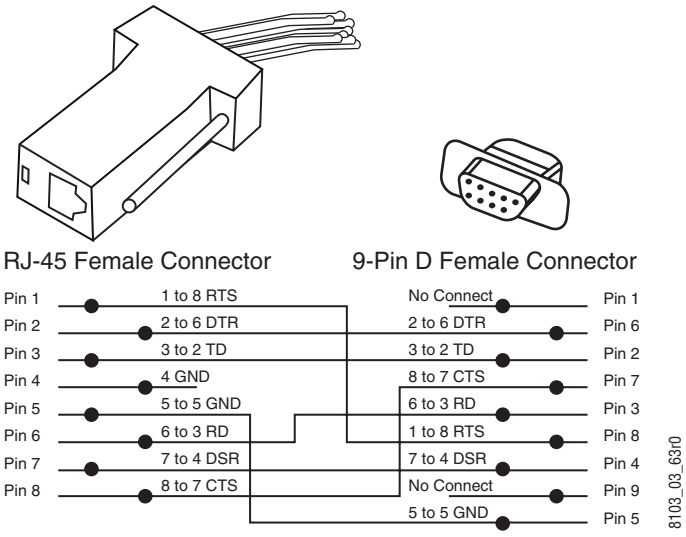


Wire Color	Pin	Function
Orange White	1	RTS
Orange	2	DTR
Green White	3	TD
Blue	4	Ground
Blue White	5	Ground
Green	6	RD
Brown White	7	DSR
Brown	8	CTS

RS-232 Cable with 9-Pin D Male Connector

Pin	Function
1	No connect
2	TD
3	RD
4	DSR
5	Ground
6	DTR
7	CTS
8	RTS
9	No connect





RJ-45 to 9-Pin D Adaptor

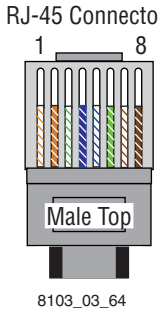
RJ-45 Female Connector Pin	9-Pin D Female Connector Pin	Function
1	8	RTS
2	6	DTR
3	2	TD
4	-	Ground
5	5	Ground
6	3	RD
7	4	DSR
8	7	CTS
-	1	No connect
-	9	No connect

The RJ-45 side of an adaptor will have the pinouts as shown when using RS-232. The D side may change depending on the device.

Table 7 shows the adaptor pin assignments for a RS-422/485 connection on an Encore frame with part number 6100884xx that is not using the cross-over cable 174821600. This adaptor must be used with a ≤ 4 inch pin-to-pin Cat 5e cable connected to the Encore Control frame.

Table 7. RS-422/485 Pinouts on Encore Frame 6101000xx RJ-45 to 9-Pin D Adaptor

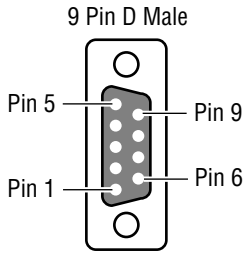
RJ-45 Cable with Male Connector

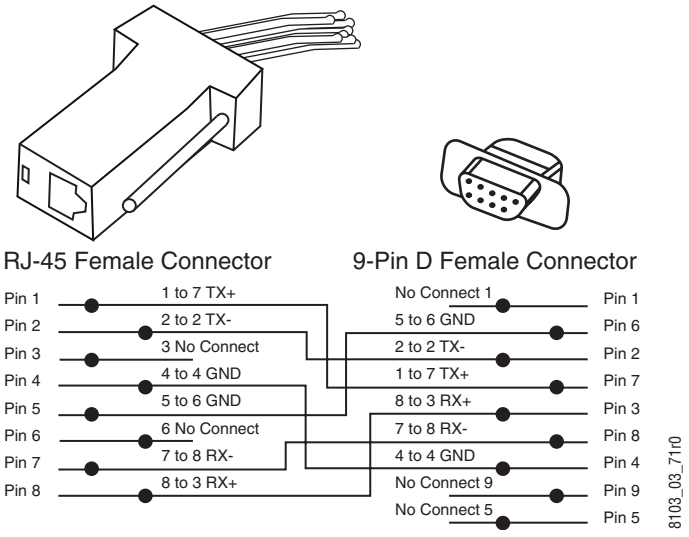


Wire Color	Pin	Function
Orange White	1	TX+
Orange	2	TX-
Green White	3	Ground
Blue	4	Ground
Blue White	5	Ground
Green	6	Ground
Brown White	7	RX-
Brown	8	RX+

RS-422/485 Cable with 9-Pin D Male Connector

Pin	Function
1	No connect
2	TX-
3	RX+
4	Ground
5	No connect
6	Ground
7	TX+
8	RX-
9	No connect





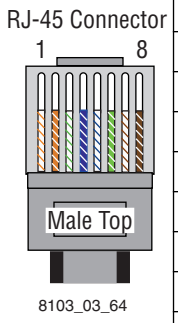
RJ-45 to 9-Pin D Adaptor

RJ-45 Female Connector Pin	9-Pin D Female Connector Pin	Function
1	7	TX+
2	2	TX-
3	-	No connect
4	4	Ground
5	6	Ground
6	-	No connect
7	8	RX-
8	3	RX+
-	1	No connect
-	5	No connect
-	9	No connect

Table 8 shows the adaptor pin assignments for a RS-422/485 connection on an Encore frame with part number 6101000xx or an Encore frame with part number 6100884xx. The Encore frame with part number 6100884xx must use the crossover cable 174821600 which is part of the Serial Interface Y Cable Option.

Table 8. RS-422/485 Pinouts on Encore Frame 6101000xx RJ-45 to 9-Pin D Adaptor

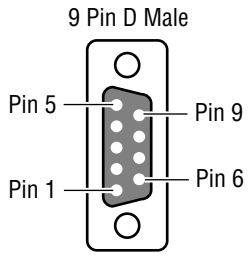
RJ-45 Cable with Male Connector

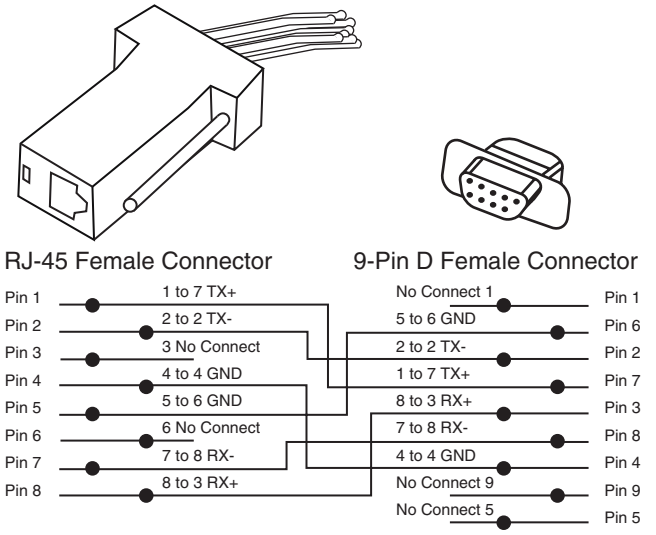


Wire Color	Pin	Function
Orange White	1	TX+
Orange	2	TX-
Green White	3	Ground
Blue	4	Ground
Blue White	5	Ground
Green	6	Ground
Brown White	7	RX-
Brown	8	RX+

RS-422/485 Cable with 9-Pin D Male Connector

Pin	Function
1	No connect
2	TX-
3	RX+
4	Ground
5	No connect
6	Ground
7	TX+
8	RX-
9	No connect





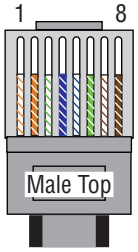
RJ-45 to 9-Pin D Adaptor

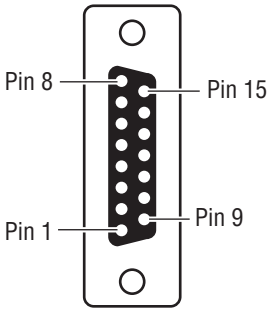
RJ-45 Female Connector Pin	9-Pin D Female Connector Pin	Function
1	7	TX+
2	2	TX-
3	-	No connect
4	4	Ground
5	6	Ground
6	-	No connect
7	8	RX-
8	3	RX+
-	1	No connect
-	5	No connect
-	9	No connect

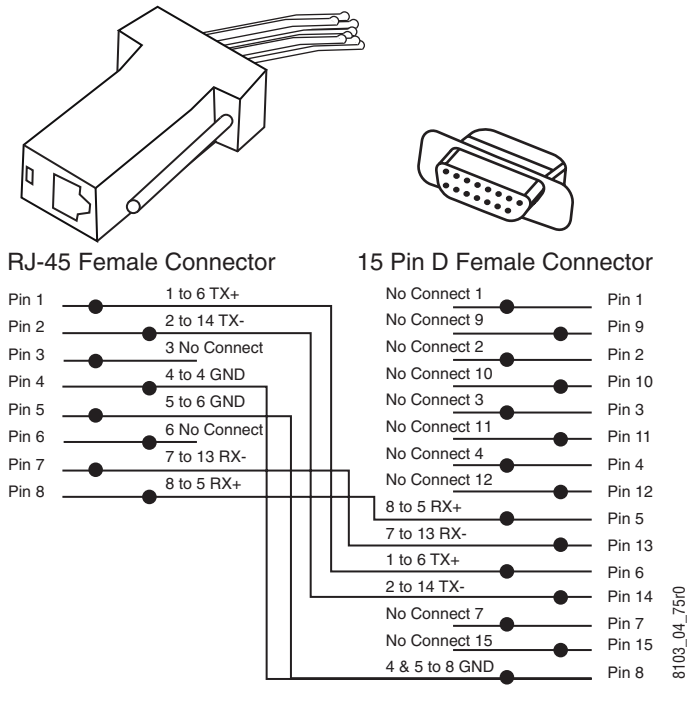
The RJ-45 side of an adaptor will have the pinouts as shown when using RS-422/485. The D side may change depending on the device.

Table 9 shows the adaptor pin assignments for a RS-422/485 connection from an Encore frame to a Horizon frame

Table 9. RS-422/485 Pinouts for Encore RJ-45 to 15 Pin D Horizon Adaptor

RJ-45 Cable with Male Connector			
RJ-45 Connector 1 8  8103_03_64	**Wire Color**	**Pin**	**Function**
	Orange White	1	TX+
	Orange	2	TX-
	Green White	3	No connect
	Blue	4	Ground
	Blue White	5	Ground
	Green	6	No connect
	Brown White	7	RX-
	Brown	8	RX+

RS-422/485 Cable with 9-Pin D Male Connector		
Pin	**Function**	15 Pin D Male 
1	No connect	
2	No connect	
3	No connect	
4	No connect	
5	RX+	
6	TX+	
7	No connect	
8	Ground	
9	No connect	
10	No connect	
11	No connect	
12	No connect	
13	RX-	
14	TX-	
15	No connect	



RJ-45 to 9-Pin D Adaptor		
RJ-45 Female Connector Pin	**9-Pin D Female Connector Pin**	**Function**
1	6	TX+
2	14	TX-
3	-	No connect
4	8	Ground
5		Ground
6	-	No connect
7	13	RX-
8	5	RX+
-	1	No connect
-	2	No connect
-	3	No connect
-	4	No connect
-	7	No connect
-	8	No connect
-	10	No connect
-	11	No connect
-	12	No connect
-	15	No connect

Serial RS-422/485 Cables

Figure 30 shows the pin assignments for a RS-422/485 cable from an Encore frame with part number 6100884xx to either the Jupiter VM 3000 or the Jupiter CM4000.

Figure 29. Serial RS-422/485 Cable for Encore Frame 6100884xx

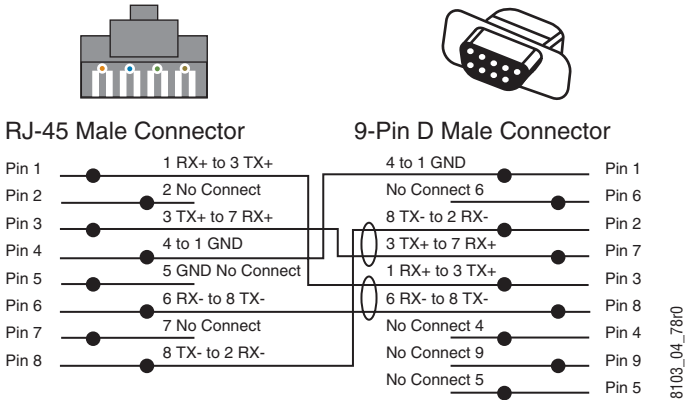
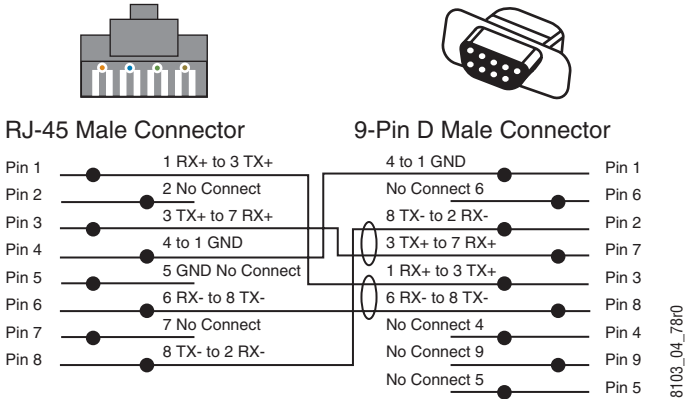


Figure 30 shows the pin assignments for a RS-422/485 cable from an Encore frame with part number 6101000xx to either the Jupiter VM 3000 or the Jupiter CM4000.

Figure 30. Serial RS-422/485 Cable for Encore Frame 6100884xx



Power

Frames may be powered using either an AC power source, or a 48V DC power source. It is also possible to cable a matrix using an AC power source and a 48V DC power source at the same time. If a matrix has both AC and DC power sources available it will use whichever power source can meet its power level demand. So if the AC power source fails then the DC power source would feed the matrix, and if the DC power starts to fall the AC power would feed the matrix. AC and DC power sources are kept separate with no feedback, so the AC power source will not charge batteries used in a connected DC power source.

AC Connections

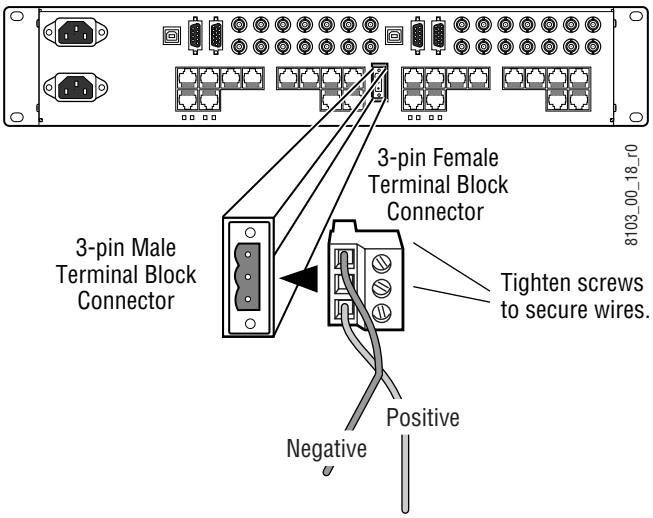
The Encore System Controller frame comes with one power supply. Redundancy is provided by adding an additional power supply.

48V DC Connections

WARNING **Do not apply a 48V DC power source until all 48V DC connections on the matrices are complete and secure.**

The 48V DC connection requires 12 AWG (3.31 mm2) wire and a 3-pin female terminal block connector. See Figure 31.

Figure 31. 48V DC Connection



SNMP Monitoring

Encore supports the Simple Network Management Protocol (SNMP) for monitoring the Encore System Controller.

Note Customers using the Thomson Grass Valley NetCentral application receive the required Management Information Bases (MIBs) with the NetCentral software. Customers using a Third Party SNMP Manager refer to *Contacting Grass Valley* on page 2 to contact Customer Service for instructions on obtaining MIBs.

SNMP messages originating from Thomson Grass Valley equipment conform to the SNMPv1 protocol (IETF RFC 1157) and SNMPv2c. These messages can also be trapped by other SNMP management stations.

Encore System Controller – SNMP Agent

The Encore SNMP agent allows SNMP Manager applications to monitor the subsystems shown in Table 10.

Table 10. SNMP Subsystems

Subsystem	Description
General	General Information about the system controller board like System Controller Name, IP Address, Model Number, Product Name and Serial Number.
Modules	Information about Module/Board presence and their status (SIO board / GSC board /CPU Mezzanine board)
LEDs	Current status of LEDs on the system controller (Error, Busy, Power, Done, Sync TC, Sync RF1, Sync RF2, Sync Error LEDs)
Power	Current status of Power supply 1 and 2 present, AC and DC
Fan	Current status of Frame fan, CPU fan, Power supply1 fan and Power supply2 fan
Thermal	Currents CPU temperature in Fahrenheit and centigrade
Network	Details about Name, Status, IP Address, Subnet mask and Gateway Address for Network Interface 1 and 2
Software	Details about Boot software version, Application software version, Name, Software versions and status of various applications running on SCB - Panel Server, Router Controller, Tie-line Manager
Ports	Details about Port Number, Port Name and Port Status of SIO and COMM ports
General Purpose Interface	Details about GPI Number, GPI Name, GPI Type and GPI Status for all the GPI's
File System	Details about File system Status, File System Type, Use Space, Free Space and File System Capacity

In addition to reporting the status of the subsystems, the Encore System Controller SNMP Agent generates alarm messages, called Traps. The Traps are sent to all registered SNMP Managers when there is a failure detected in any of the subsystems. Similarly, Traps are generated by the System Controller for the corresponding subsystem when the subsystems returns to a normal state.

The Thomson Grass Valley NetCentral SNMP Manager automatically registers itself with the Encore System Controller to receive the Traps. Third Party SNMP Managers need to manually register with the Encore System Controller. Please see *Third Party SNMP Managers* on page 56 for detailed information.

SNMP Agent Licensing

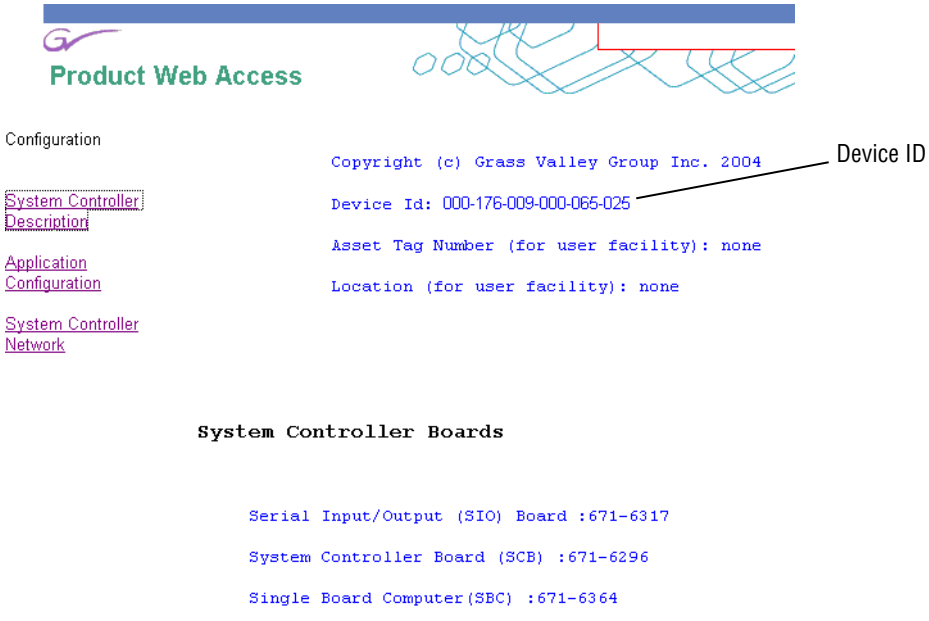
The SNMP Agent is an optional component, and is licensed separately. The default for the SNMP Agent is Disabled. The License Key is needed to activate the SNMP Agent, and is obtained from Customer Support. You will be asked to send the Device ID. In systems with redundant System Controllers a unique License Key must be obtained for each controller.

SNMP License Key

To obtain the Device ID and enter the License Key you will need to open the Product Web Access windows for the System Controller you want to enable. If you know the IP Address of the System Controller you can enter it in a Web browser. If you do not know the IP Address or you want to see more than one System Controller use the Thomson Grass Valley utility application, NetConfig.

1. Open the Product Web Access window for a System Controller.

Figure 32. System Controller Description Window

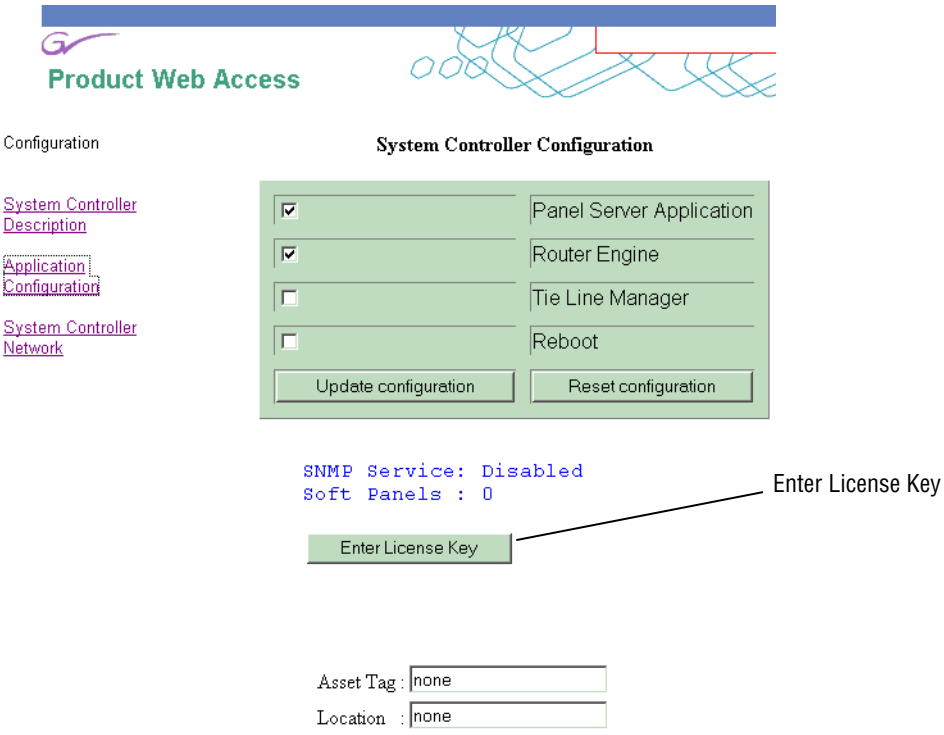


2. Locate the Device ID in the System Controller Description window.

3. Obtain License Key from Thomson Grass Valley Customer Service. See *Contacting Grass Valley* on page 2.

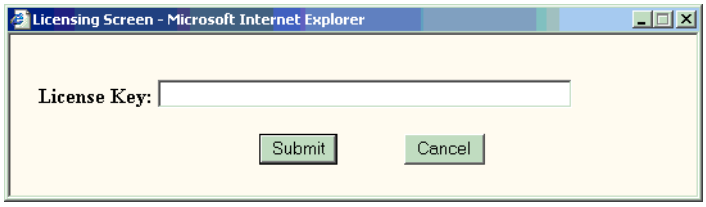
4. Select the Application Configuration window for the System Controller.

Figure 33. System Controller Application Configuration Window



5. Click on **Enter License Key** button.

Figure 34. Enter License Key Window



6. Enter License Key in text box and click **Submit**.

7. Verify that the System Controller Application Configuration window now shows **SNMP Service: Enabled**.

Figure 35. SNMP Service Enabled

Repeat the procedure for each System Controller that needs a License Key.

NetCentral SNMP Manager

The Thomson Grass Valley NetCentral system is a suite of software modules, residing on one or more centrally located PC-compatible computers. These modules work together to monitor and report the operational status of devices such as an Encore System Controller, using Simple Network Management Protocol (SNMP).

The Encore SNMP Agents interface with NetCentral. The NetCentral product is sold separately. Once the Encore SNMP Agent is registered, it can be monitored by NetCentral.

NetCentral Capabilities

The Encore SNMP Agent is registered on an Encore System Controller. The Encore System Controller will automatically send Trap messages to the NetCentral Monitoring Station, reporting the device status. The NetCentral Monitoring Station is configured to listen to and respond to the Trap messages. The Trap message is assigned a severity status and a response. The responses can range from; sound an alarm, or send E-mail, or call someone on a phone, or call a pager, or log the status. Refer to the *NetCentral TV Facility Monitoring System User Guide Software Version 4.0* for more information.

Third Party SNMP Managers

Other industry standard Third Party SNMP Managers can monitor Encore System Controllers. For their installation & configuration, please contact your SNMP Manager Software vendor. The Third Party SNMP Manager needs to be manually registered in the Encore SNMP agent database so the Encore System Controller will send Traps to the corresponding SNMP Manager.

Note Customers using a Third Party SNMP Manager refer to *Contacting Grass Valley* on page 2 to contact Customer Service for instructions on obtaining MIBs.

The Third Party SNMP Manager requires the following MIBs:

- GVG-ELEMENT-MIB
- GVG-REG-MIB, and
- THOMSON-MATRIX-MIB

Add all the MIB files to the MIB repository of the SNMP Manager you use.

Register a New SNMP Manager

In the GVG-ELEMENT-MIB, a Trap target table is defined to store the IP Addresses and community names of the SNMP Managers intended to receive Traps from the Encore System Controller SNMP agent.

Add a New SNMP Manager

From the Third Party SNMP Manager perform the following steps:

1. Send a `GET` request for `gvgTtCfgTableNextIndex` variable defined in `GVG-ELEMENT-MIB`. For an example we will use 2 as the response for the `GET` request.
2. Create a new Row in the Trap target table by sending a `SET` request for the gvgTtCfgEntryStatus(1.3.6.1.4.1.4947.2.1.3.3.1.4).index,
   - Where index is the value returned in Step 1.

     In this case generate a SET request for `1.3.6.1.4.1.4947.2.1.3.3.1.4.2` wherein 2 is the next available index, syntax is INTEGER32 and set the value as 5 (create and wait), if the SET request is successful proceed to Step 3.
   - SET request could be unsuccessful:

   a. If the row for the above index already exists, or

b. If the no. of registered Managers count in SNMP Agent database has reached the maximum allowed number. A maximum of 5 managers can be registered at any point of time. All the subsequent attempts to register additional managers will fail unless existing managers are deleted from it's database.

3. Send a SET request for gvgTtCfgIpAddress (1.3.6.1.4.1.4947.2.1.3.3.1.2).index, where index is the value returned in the step 1 above.
   - In this case generate a SET request for 1.3.6.1.4.1.4947.2.1.3.3.1.2.2 wherein 2 is the next available index, syntax is IPADDRES and enter the IP Address of the SNMP Manager to be registered, if the SET request is successful proceed to next step.
   - SET request could be unsuccessful, if the above IP Address is already present in the Trap target table.

4. Send a SET request for gvgTtCfgCommunity(1.3.6.1.4.1.4947.2.1.3.3.1.3).index, where index is the value returned in the Step 1 above. In this case generate a SET request for 1.3.6.1.4.1.4947.2.1.3.3.1.3.2 wherein 2 is the next available index, syntax is OCTET STRING and enter the community string that would be used for the communication between the Encore System Controller and the SNMP Manager.

If the SET request is successful you are all set to receive the Traps.

Remove a SNMP Manager

Some possible reasons for wanting to delete an SNMP Manager include:

- The SNMP manager IP Address is changed,
- You no longer wish to monitor the Encore system controller using the SNMP manager,
- You want to add a new SNMP manager but the Encore System Controller SNMP agent has the maximum number of SNMP Managers already registered, or
- You want to delete the SNMP managers you no longer use.

Delete an SNMP Manager

From the Third Party SNMP Manager perform the following steps:

1. Scan through the gvgTtCfgIpAddress and write down the index of the row, you want to delete.

2. Delete the above selected Row from the Trap target table by sending a SET request for the gvgTtCfgEntryStatus (1.3.6.1.4.1.4947.2.1.3.3.1.4).index, where index is the value returned in Step 1 *Add a New SNMP Manager* on page 56, syntax is INTEGER32 and set the value as 6 (destroy). If the SET request is successful then you may add new SNMP Managers as described above.

   SET request could be unsuccessful, if the above row is already deleted from the Trap target table.

Section 3

Control Panels

Encore Control Panels

Key Features

- Web browser based setup,
- 10Base-T Ethernet RJ-45 control interface, includes active and collision indication,
- Internal auto-ranging AC mains power supply,
- Easy-on-the-eyes green displays,
- Back-lit buttons for use in low-light conditions with display intensity adjustments, and
- Simple name-based identification.

Control Panel Defaults

Control panels are shipped with default button assignments. This allows a control panel to be taken out of its box and used immediately. Some control panel defaults are based upon the default Area (Area 1) configuration. Areas create hierarchies within the Encore Control System and this makes it easier to group sources and destinations in a large system. Once an Area is defined, an Area prefix is automatically assigned to each source and destination in the Area by the router engine. This allows, for example, VTR_1 in the master control Area to be named the same as a VTR_1 in the production Area. The Area prefix is part of the system name and can be displayed on certain panels. A user can configure up to 64 Areas in a Encore system. Typically, in most installations, a single Area is used.

The default Area, also known as Area 1, is the place where control panels look to find defaults. If Area 1 has been configured with Sources, Destinations, and Levels, then the control panels will operate using the Area 1

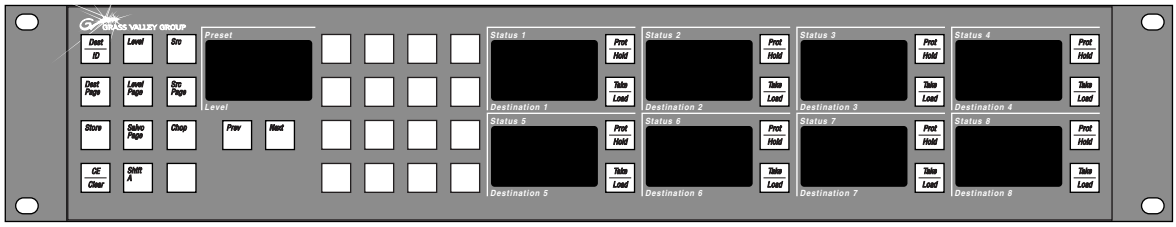
defaults. If the Control Panel Server that is in charge of the control panel is cut off from Area 1, then the control panels will need to be configured before they can be used.

The individual defaults for each panel are found under the panel's heading.

PMB Panel

The PMB (Paging Multi-Bus) panel, has two displays for **Preset** and **Level**, eight displays for **Status** and **Destination**, twenty-seven pre-programmed buttons, a sixteen button keypad, and three user-programmable buttons. Any of the three user-programmable buttons can be configured as a Salvo, a **Panel Lock**, an **Area Mode**, a **Store**, or a **Shift A**. See Figure 36.

Figure 36. PMB Control Panel



8054_00_01_r0

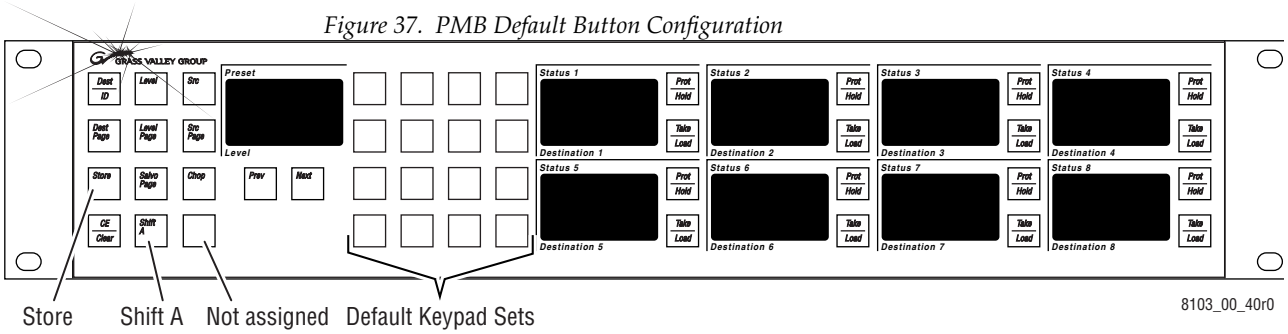
PMB Panel Features

- 2RU Rack mount,
- Multi bus display of both Source and Destination,
- Individual protects per Destination,
- Paging mode offers the ability to scroll through pages of Sources, Destinations, and Salvos,
- Previous / Next scrolling within prefix group,
- Three user-defined buttons, and
- 16 button user-defined prefix /suffix keypad.

PMB Panel Default Button Assignments

There are 3 user programmable buttons; Store, Shift A, and a blank. The factory defaults are as shown in Figure 37.

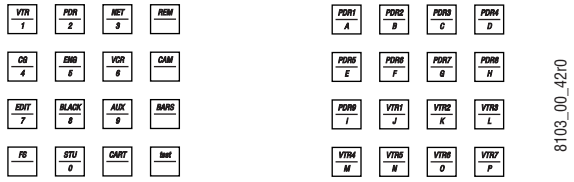
Figure 37. PMB Default Button Configuration



Note Some panels were shipped with the blank button erroneously labelled as **Shift B**.

The Keypad is assigned the Default Keypad Sets. See Figure 38. The primary keypad set is the active set. To access the secondary keypad set, hold down the **Shift A** button.

Figure 38. PMB Default Keypad Configurations

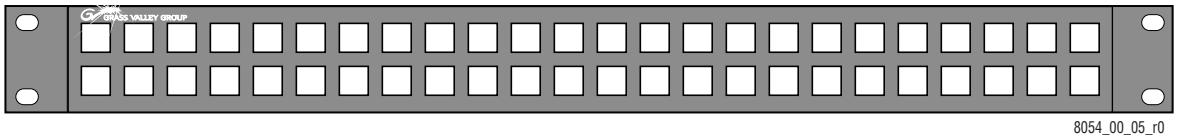


Primary Keypad Set Secondary Keypad Set

48B Panel

The 48B (Forty-Eight Button) panel has forty-eight user-programmable buttons. Any of the forty-eight buttons can be configured as a Source, a Level, a Destination, a Salvo, or a Protect. See Figure 39.

Figure 39. 48B Control Panel



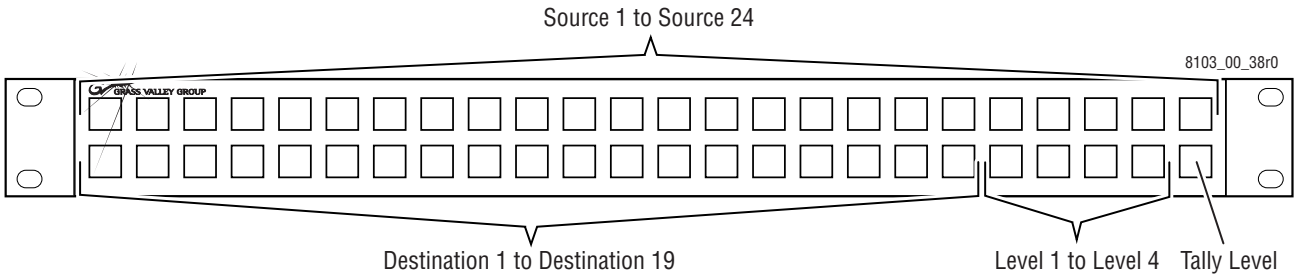
48B Panel Features

- 1RU Rack mount,
- 48 user defined buttons for Sources, Destinations, and Salvos,
- Enables simple X-Y functionality, program row of Sources and row of Destinations,
- Allows Destination ganging (ideal for tape duplication), and
- Grouping with other panels to expand functionality.

48B Panel Default Button Assignments

The 48 buttons are assigned as shown in Figure 40 using the configuration in the default Area (see *Control Panel Defaults* on page 59 for an explanation of the default Area).

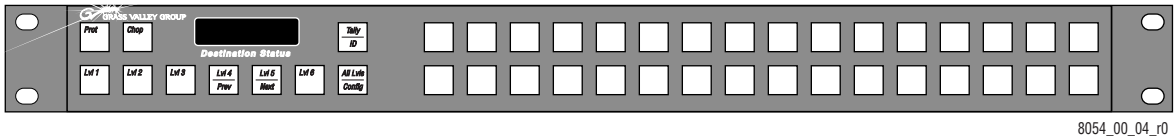
Figure 40. 48B Default Button Configuration



BPS Panel

The BPS (Button Per Source) panel has a **Destination Status** display, ten pre-programmed buttons, and thirty-two user-programmable buttons. Any of the thirty-eight user-programmable buttons can be configured as a Source, a Level, a Salvo, or a Protect. See Figure 41.

Figure 41. BPS Control Panel



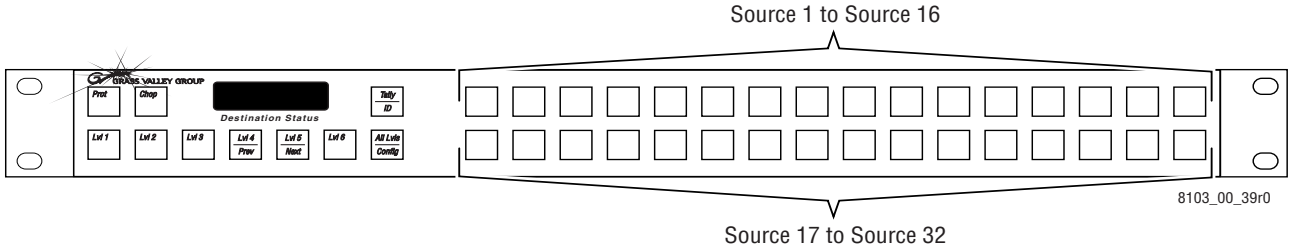
BPS Panel Features

- 1RU Rack mount,
- User-defined button functionality. Configuration application enables selection of button type for the right side 32 buttons as Source, Salvo or Audio attribute,
- Local configuration mode of Source selection buttons,
- Quick, single button level break-away operation using six dedicated buttons, plus an all-level button,
- Dedicated Destination protection button, and
- Eight character source name display.

BPS Panel Default Button Assignments

The 32 buttons are assigned as shown in Figure 42 using the configuration in the default Area (see *Control Panel Defaults* on page 59 for an explanation of the default Area).

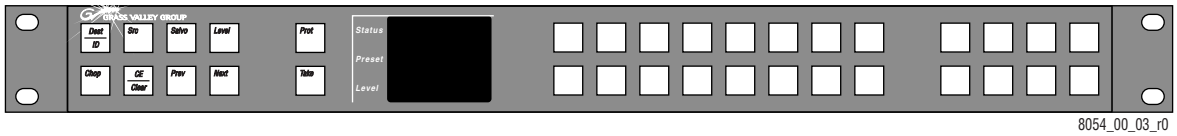
Figure 42. BPS Default Button Configuration



XY Panel

The XY panel has three displays for **Status**, **Preset**, and **Level**, ten pre-programmed buttons, a sixteen button keypad, and eight user-programmable buttons. The XY represents the concept that all inputs (X) that are mapped to this panel are available to all outputs (Y) that are mapped to this panel. Any of the eight user-programmable buttons can be configured as a Source, a Level, a Destination, or a Salvo. See Figure 43

Figure 43. XY Control Panel



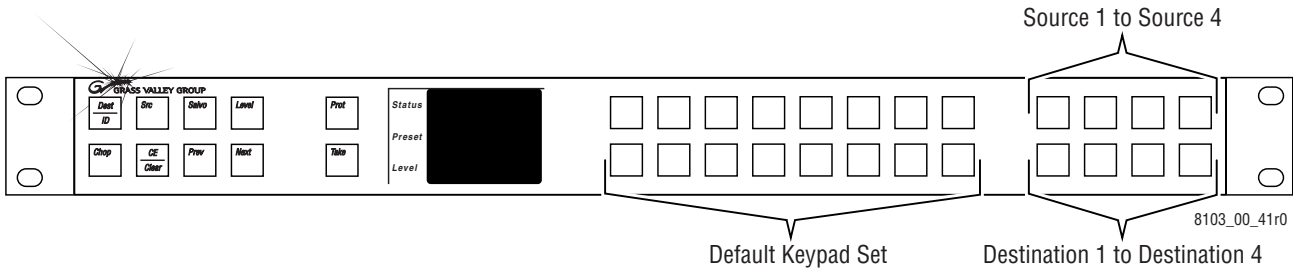
XY Panel Features

- 1RU Rack mount
- 16 user defined prefix/suffix keypad, 2 rows of eight
- 10 dedicated mode buttons
- 8 user-defined buttons, Source (direct take mode), Destination, Salvo, and
- 3 Eight character source name displays.

XY Panel Default Button Assignments

The buttons are assigned as shown in Figure 44 using the configuration in the default Area (see *Control Panel Defaults* on page 59 for an explanation of the default Area).

Figure 44. XY Default Button Configuration



The Keypad is assigned the Default Keypad Set as shown in Figure 45.

Figure 45. XY Default Keypad Configuration

Section 4

Maintenance and Troubleshooting

Maintenance

Field Replaceable Units

Modules and Power Supplies are not serviced in the field. Replace faulty modules and Power Supplies with spares. Return faulty units to a designated repair depot. Contact Customer Service. (See *Contacting Grass Valley* on page 2.)

Modules

Modules can be inserted or removed from the frame without powering down the system.

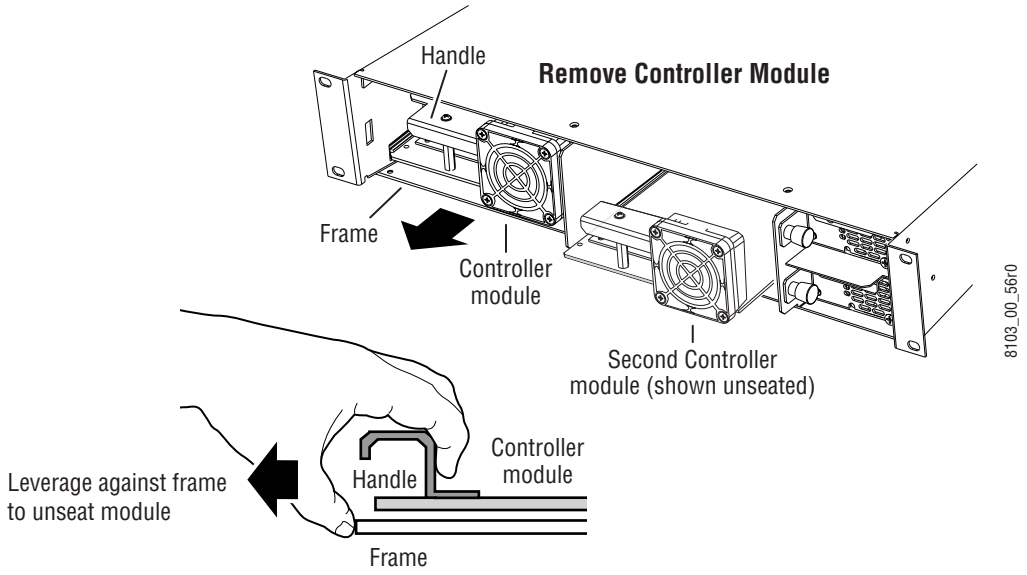
CAUTION Static sensitive components are present which may be damaged by electrostatic discharge. Use anti-static procedures, equipment and surfaces during servicing.

System Controller Modules

To Remove System Controller Modules

1. Position the hands with the index and third fingers of both hands curled around the module handle. Place both thumbs on the frame. See Figure 46.

Figure 46. Removing the Controller Module



2. Push against the frame with the thumbs while gently pulling with the fingers to disengage the module from the backplane.
3. Slide the module out of the frame.
4. Use anti-static precautions to protect the module.

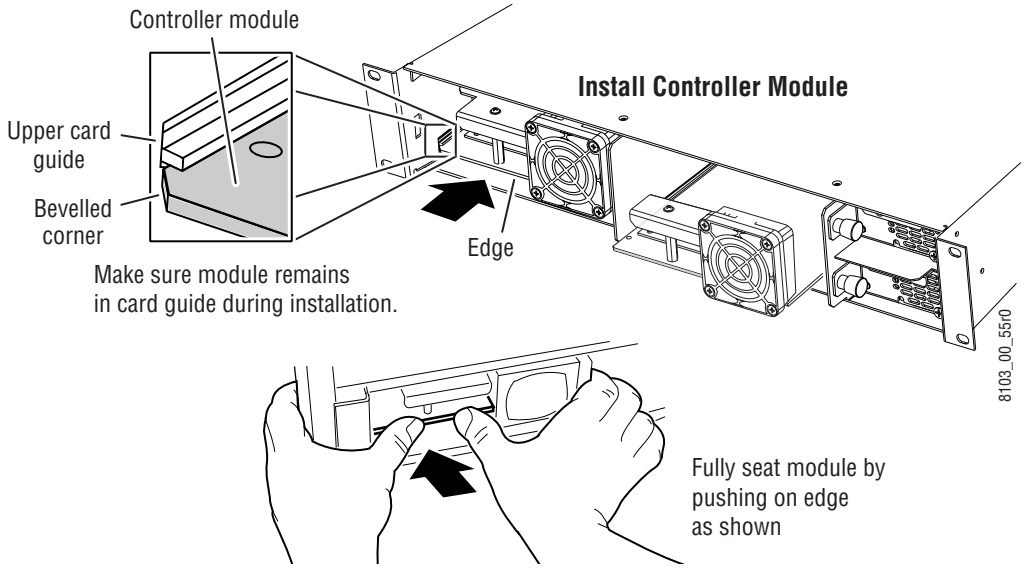
To Insert System Controller Modules

1. Align the module in the appropriate frame slot.
2. Slide the module into the frame.

   The fan and the LEDs will come on as soon as the pins make contact with the backplane before the module is fully seated.
3. Seat the module by firmly pressing against the bottom edge of the module using index fingers and thumbs.

   When the module is fully seated the bevelled edge of the module will line up with the upper card guide as shown in Figure 47.

Figure 47. Installing the Controller Module

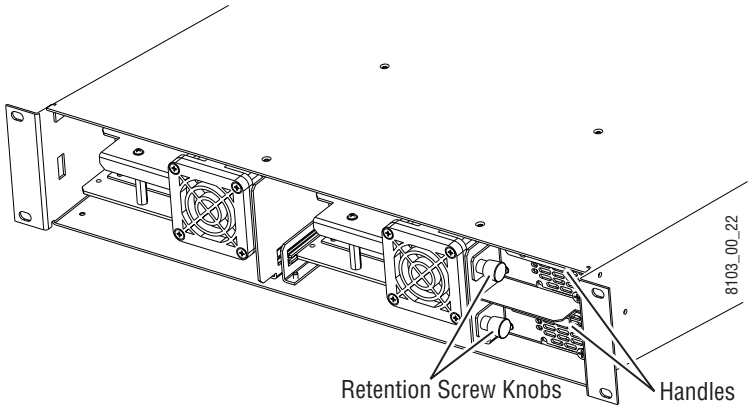


CAUTION Multi-pin module connectors can become misaligned and cause damage to the backplane and interconnect. Use caution when inserting modules.

Power Supply Modules

Refer to Figure 48 for the following procedure.

Figure 48. Power Supply Modules



To Remove Power Supply Modules

1. Unscrew the retention screw knob to disconnect the module from the frame.
2. Pull the module gently to disengage it from the backplane.
3. Slide the module out of the frame.
4. Use anti-static precautions to protect the module.

To Insert Power Supply Modules

1. Align the module in the appropriate frame slot.
2. Slide the module into the frame.
3. Gently push the module to engage the backplane.
4. Tighten the retention screw knob to secure the module to the frame.

CAUTION Multi-pin module connectors can become misaligned and cause damage to the backplane and interconnect. Use caution when inserting modules. Do not force modules into slots.

Fan Assemblies

The fan unit and/or the fan filter on the Encore System Controller module can be replaced. The Fan Filter is made of soft, moderately dense material. It can be cleaned and re-used or replaced with a new filter. Contact Customer Service to order replacements. (See *Contacting Grass Valley Group* *on page 2*.)

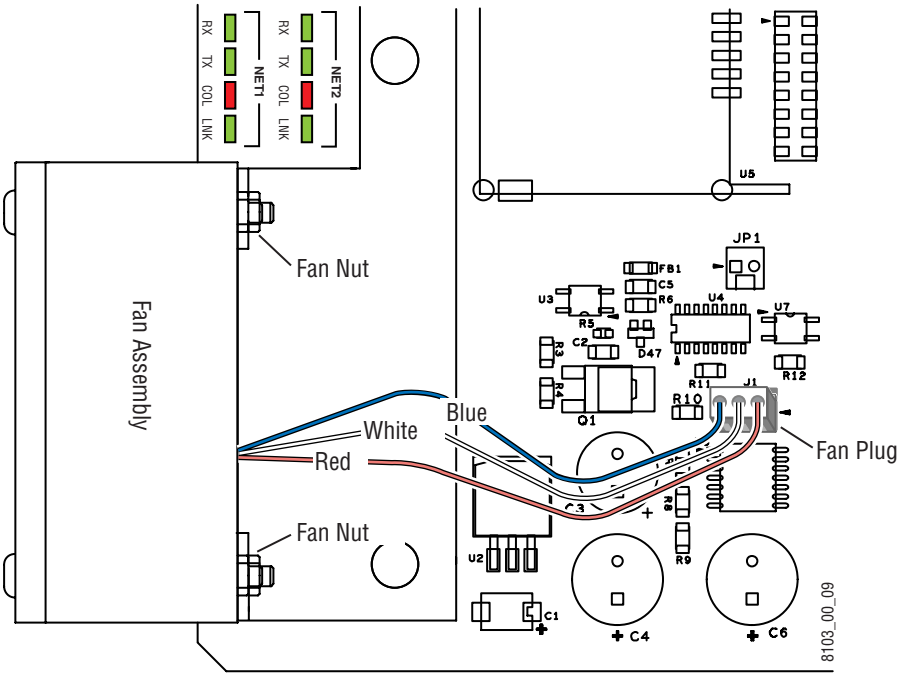
To Replace the Fan Unit

See Figure 49 for the location of the fan unit and plug.

1. Remove the System Controller module from the Encore Control Frame.
2. Disconnect the fan plug located at J1 on the System Controller module.
3. Remove the fan nuts holding the fan unit in place.
4. Remove the old fan unit and position the new fan unit on the module.
5. Replace the fan nuts to secure the fan unit.
6. Connect the new fan unit's plug in the connector at J1.

   The new fan unit must be aligned as shown in Figure 49 with the Blue, White, and Red wires in the proper position.
7. Insert the System Controller into the Encore control Frame.

Figure 49. System Controller Module Fan Unit



To Replace the Fan Filter

Before starting this procedure, ensure that the fan is not operating and will not start by disconnecting the System Controller module. You can disconnect power to the System Controller module by unseating the module, pulling it an inch or so away from the connectors on the Encore Control frame.

See Figure 50 for the location of the fan filter.

1. Remove the Fan Filter Cover.

   The cover is a snap-on, snap-off plastic grid, very little pressure is required to remove it.

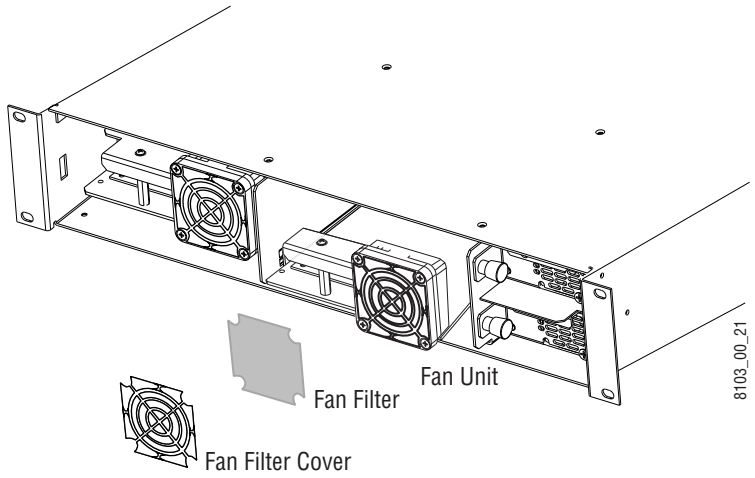
2. Remove the Fan Filter.

   Either clean the Fan Filter or discard it, then use a new Fan Filter.

3. Insert the Fan Filter.

4. Replace the Fan Filter Cover.

Figure 50. System Controller Module Fan Filter



Service and Replacement Parts

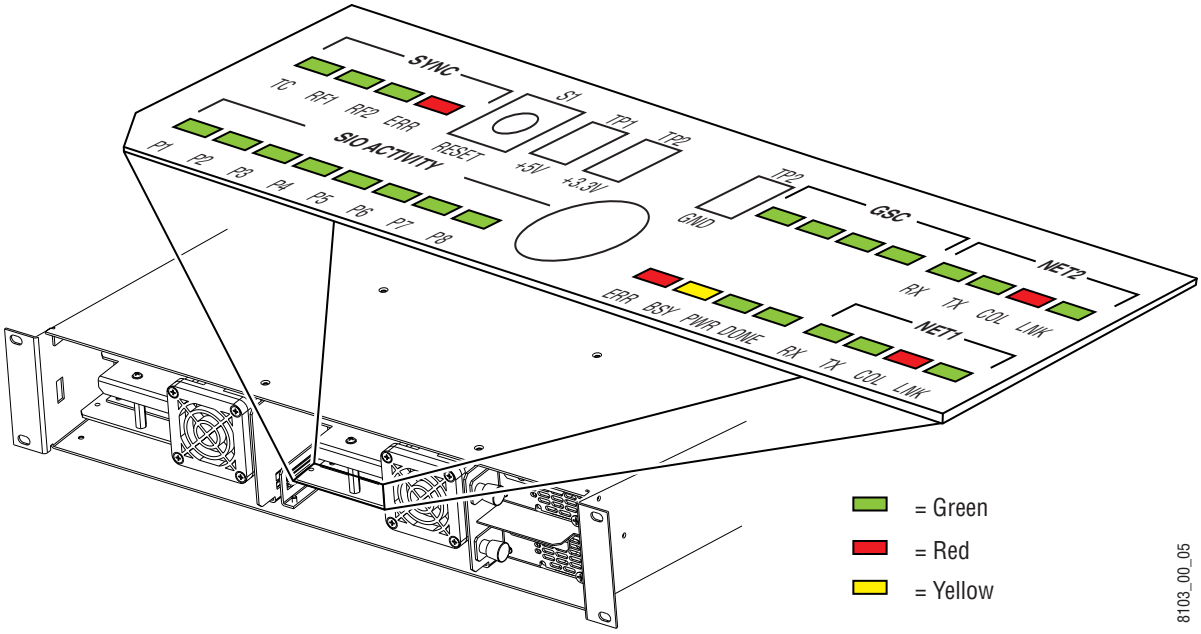
Replacement parts can be ordered. Contact Customer Service. (See *Contacting Grass Valley* on page 2.) They will provide the current part numbers, part availability, and ordering directions.

Troubleshooting

System Controller LEDs

The System Controller module has LEDs, testpoints, and switches along its front edge which is visible when the frame door is open. The LEDs indicate the operating condition of the module and any mezzanines on that module. Testpoints are used to check voltages and ground. Switches are used to reset the module. Testpoint and switch markings are self-explanatory.

Figure 51. System Controller LEDs



The LEDs found on the System Controller module are shown in Table 11.

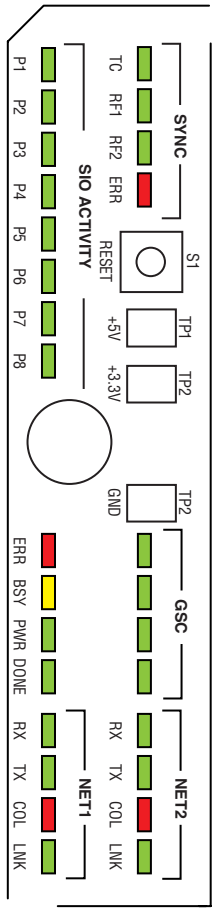


Table 11. System Controller LEDs

Component	Group Label		Color	Indication	Condition
System Controller Module	None	ERR	Red	On	Circuit failure or reset
				Off	Normal
		BSY	Yellow	On	Active controller indication
				Off	Inactive
		PWR	Green	On	Power on - normal
				Off	Power off - unseated or bad module
		DONE	Green	On	Firmware loaded okay
				Off	Firmware load problem
	SYNC	TC	Green	On	Time code present
				Off	Time code not present
		RF1	Green	On	Reference 1 present
				Off	Reference 1 not present
		RF2	Green	On	Reference 2 present
				Off	Reference 2 not present
		ERR	Red	On	Reference Error
				Off	Normal
	NET1	RX	Green	On	Ethernet receiving
				Off	Ethernet not receiving
		TX	Green	On	Ethernet transmitting
				Off	Ethernet not transmitting
		COL	Red	On	Ethernet collision
				Off	Ethernet normal
		LNK	Green	On	Ethernet linked
				Off	Ethernet not linked
	NET2	RX	Green	On	Ethernet receiving
				Off	Ethernet not receiving
		TX	Green	On	Ethernet transmitting
				Off	Ethernet not transmitting
		COL	Red	On	Ethernet collision
				Off	Ethernet normal
		LNK	Green	On	Ethernet linked
				Off	Ethernet not linked

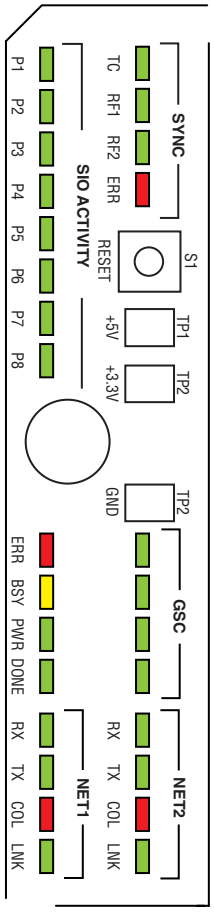


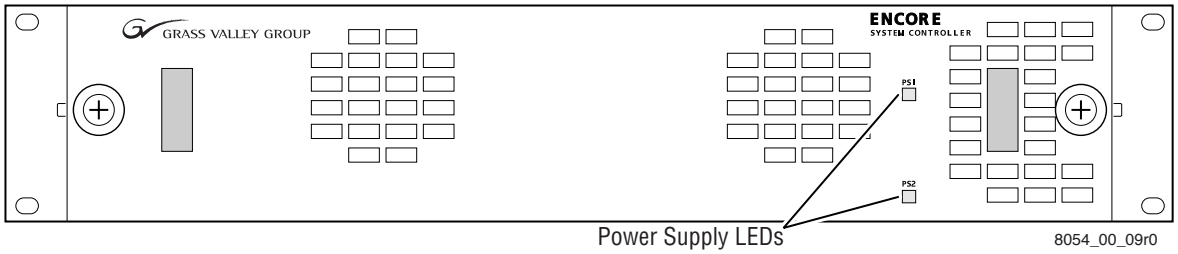
Table 11. System Controller LEDs - (continued)

Component	Group Label		Color	Indication	Condition
Global Serial Channel Mezzanine	GSC	None	Green	On	Software debug
				Off	Normal
		None	Green	On	Mezzanine Failure
				Off	Normal
		None	Green	On	Application dependent can be on or off
				Off	
		None	Green	On	Normal is flashing 1/sec
				Off	No mezzanine or if mezzanine is present then it is unseated or bad
Serial Input Output Mezzanine	SIO ACTIVITY	P1	Green	On	Serial port active
				Off	Serial port inactive
		P2	Green	On	Serial port active
				Off	Serial port inactive
		P3	Green	On	Serial port active
				Off	Serial port inactive
		P4	Green	On	Serial port active
				Off	Serial port inactive
		P5	Green	On	Serial port active
				Off	Serial port inactive
		P6	Green	On	Serial port active
				Off	Serial port inactive
		P7	Green	On	Serial port active
				Off	Serial port inactive
		P8	Green	On	Serial port active
				Off	Serial port inactive

Power Supply LEDs

Each Power Supply module has a single LED that can be seen when the Encore Control Frame cover is in place. When the Power Supply module is in use the LED will be Green. If there is no power to the frame, or there is no module in the slot, or the module is defective the LED is dark.

Figure 52. Power Supply LEDs



Appendix A

Specifications

Power Requirements and Mechanical Specifications

Table 12. Encore Mechanical and Power Specifications

Model	Depth	Width	Height	Weight	Rack Units	Voltage Input	Power Consumption (Maximum)
Encore System Controller Frame	464 mm 18.25 in.	483 mm 19 in	88 mm 3.5 in.	13.15 kg. 29 lbs.	2	100-240 VAC or 30-60 VDC	≤ 150 W
BPS Control Panel	106 mm 4.18 in.	483 mm 19 in	44 mm 1.75 in.	1 kg. 2.2 lbs	1	100-240 VAC or 50-60 VDC	≤ 25 W
48B Control Panel	106 mm 4.18 in.	483 mm 19 in	44 mm 1.75 in.	1.04 kg. 2.3 lbs.	1	100-240 VAC or 50-60 VDC	≤ 25 W
XY Control Panel	106 mm 4.18 in.	483 mm 19 in	44 mm 1.75 in.	1 kg. 2.2 lbs.	1	100-240 VAC or 50-60 VDC	≤ 25 W
PMB Control Panel	106 mm 4.18 in.	483 mm 19 in	88 mm 3.5 in.	1.36 kg. 3 lbs.	2	100-240 VAC or 50-60 VDC	≤ 25 W

Performance and Environmental Specifications

Table 13. Encore System Controller Frame

Com 1 (Console)	
Type	RS-232
Connector	RJ-45
Cable	Cat 5e Ethernet
Com 2	
Type	RS-422/485
Connector	RJ-45
Cable	Cat 5e Ethernet
SIO Ports 1, 2, 3 & 4	
Type	RS-232 or RS-422/485
Connector	RJ-45
Cable	Cat 5e Ethernet

Table 13. Encore System Controller Frame - (continued)

SIO Ports 5, 6, 7, & 8		
Type		RS-422/485
Connector		RJ-45
Cable		Cat 5e Ethernet
Ref Out and Sync Input		
Type		NTSC or PAL color black
Impedance / Connector		High looping BNC
Return Loss		> 25 dB @ 1 MHz, when terminated into 75 Ohms
GSC Inputs		
Type		SMS7000 Node Bus proprietary Global Serial Channel
Impedance / Connector		High, looping BNC
Return Loss		> 10 dB @ 1 MHz, when terminated into 75 ohms
Ethernet Ports		
Type		10BaseT/100BaseTx full duplex
Connector		RJ-45
Cable		Cat 5e Ethernet
Power Supply		
Mains AC Voltage		100-240 V 50/60 Hz
AC Current	100-120 V	3.3 amps maximum
	200-240 V	1.7 amps maximum
DC Voltage		48 V DC nominal (36-60 V DC)
DC Current		4 amps DC nominal @ 48 V in
Environmental		
Power Consumption		≤ 150 W
Operating Temperature		0-45 degrees C (32-113 degrees F)
Storage Temperature		-40-95 degrees C (-104-203 degrees F)
Operating Humidity		5-95% non-condensing
Storage Humidity		5-95% non-condensing

Appendix B

Encore Networking

The purpose of this section is to give the reader a basic understanding of the network topologies, protocols and hardware required to support the Encore Control System.

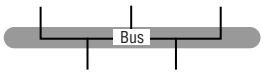
Major Topologies

Topology describes the physical layout of a network

The choice of network topology is dependent upon:

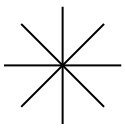
- The type and number of computers connected,
- Data transfer rates and bandwidth requirements for planned applications,
- Acceptable message latency,
- Acceptable window of indeterminacy,
- Reliability, and
- Cost.

The four major competing topologies are:

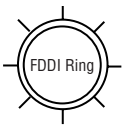


- Bus – a network architecture using thin coaxial cable as a single cable trunk that connects one workstation to the next in a daisy chain configuration

- Ring – a network topology in which each node is connected to two adjacent nodes, forming a ring.



- Star – a network architecture using twisted pair cabling to provide workstations individual connections back to a hub, switch, or router. The star topology's physical implementation uses more cable than other topologies, however it uses low cost cable and connectors. Commonly used with Encore systems.

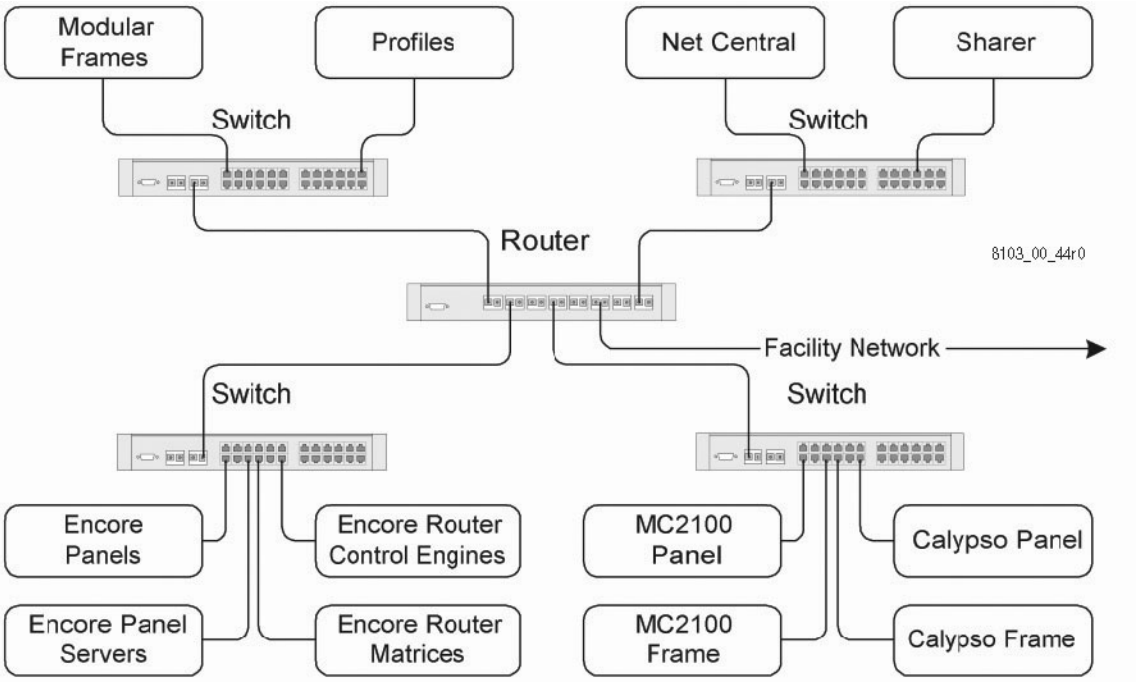


- FDDI – Fiber Distributed Data Interface is a token passing ring architecture in which all devices are connect by fiber, and operate under a set of protocols unique to FDDI.

Encore Topologies

The star topology is the basis for all Encore networking. This topology may range from a simple, flat network in which all devices operate within the same sub network to more complex systems which use multiple VLANs and sub networks, and may have other facility equipment on the network that communicate via Ethernet. Cabling is generally Unshielded Twisted Pair, UTP. Some segments of the network may be connected using fiber. Leading edge switch and routing equipment often use Fibre Channel for the switch to router trunk lines.

Figure 53. Encore Topologies Block Diagram



Advantages:

- Ease of expansion. Additional switches and workstations can be added without disruption to network service.
- Centralized Control and Management.
- Centralized Network Monitoring.

Disadvantages

- Failure of a switch or router cripples all workstations connected to that device. Fault tolerance can be built into the network by mirroring devices so as to provide alternate routing of mission critical data.

Encore System Examples

The following system examples show Encore interconnections as well as interfaces to Grass Valley and other manufacturer's devices.

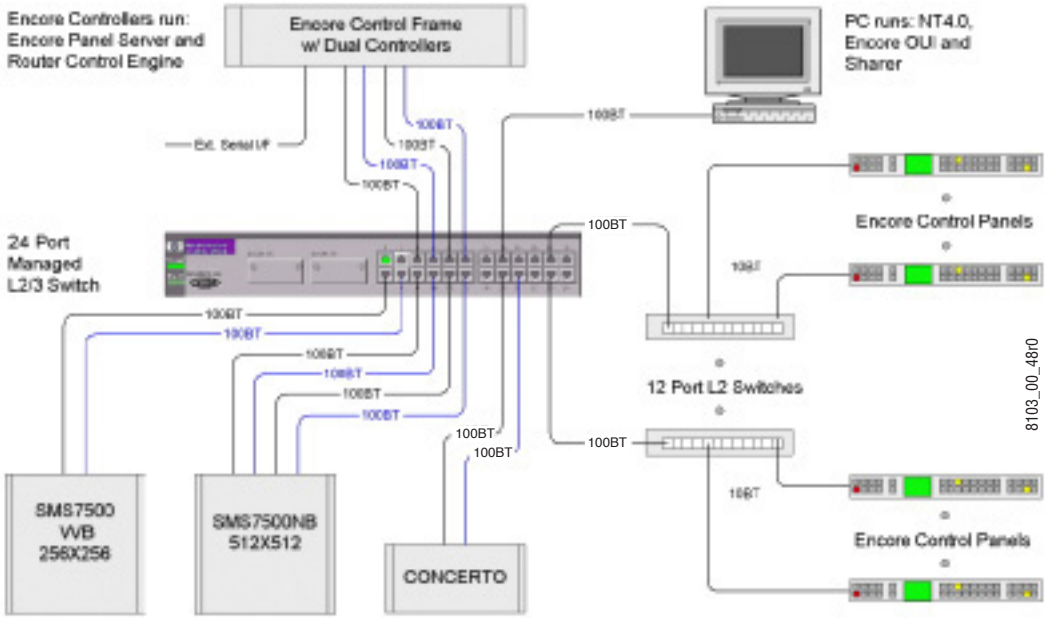
The Single Frame Encore System

This Encore system is constructed with a purpose-built hardware controller running a real-time operating system that offers both hardware and software redundancy. This single frame dedicated controller system is ideal for the traditional broadcast customer, which require redundancy and real-time deterministic switching for play-to-air applications.

Additional workstations can be added to the Encore system as required. It is important to note that at least one PC, running the Sharer application, is required to make system-level configuration changes. If desired, the PC can be removed from the system after all the configuration of the system is completed.

Serial interfaces to automation systems or other vendor's routing systems are supported by the ENC-SIO module.

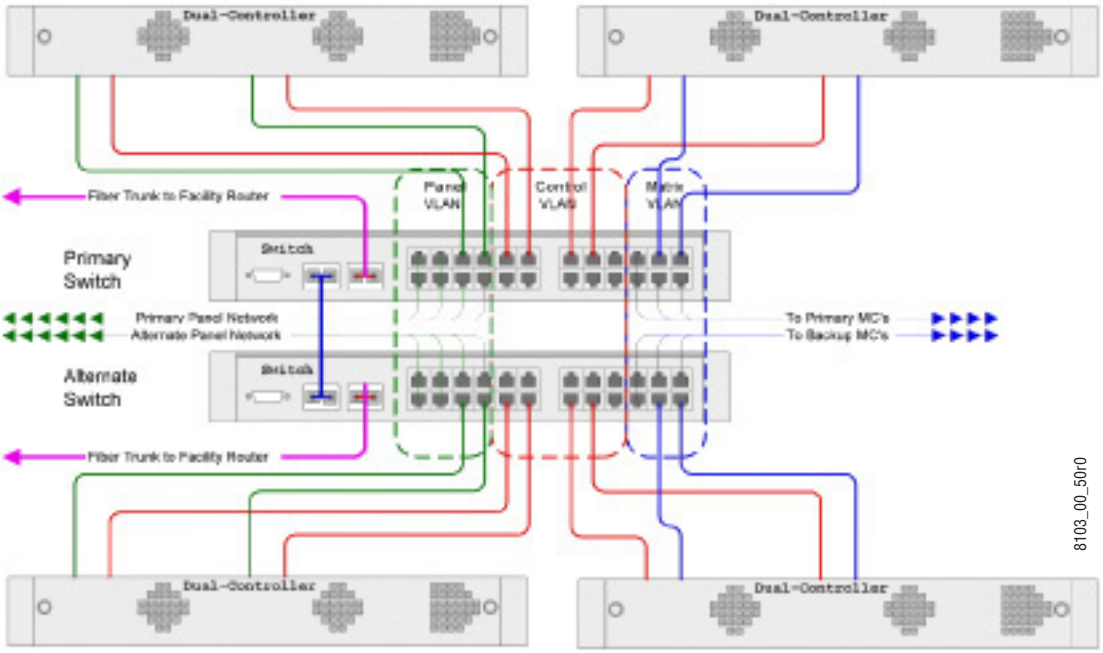
Figure 54. Encore Controller Based System



The Multiple Frame Encore System

Multiple Encore control frames each with dual controllers can be connected to the network for complete redundancy and greater throughput processing. It's strongly suggested that the factory be contacted for assistance when designing a system with this degree of complexity.

Figure 55. Multiple Frame Encore Controller Based System



Encore Network Hardware

Hubs, switches and routers are the building blocks for 10, 100, 1000Base-T networks. Switches are beginning to replace hubs in networks to increase available bandwidth and efficiency, particularly as the cost of switches begins to approach the cost of hubs. A switched network is required for the Encore control system. A switched Ethernet network provides point-to-point buffered connections and, except under extreme load conditions, a collision-free network. It is important to note that not all manufacturers switches are the same. Switch backplane bandwidth may determine the point at which a switch will block or drop messages.

Switches may be stacked to provide additional ports (such as stacking three, 24 port switches to get 72 ports) or may be partitioned into multiple VLANs to provide isolated domains within a system. Note that once a switch is partitioned into multiple VLANs, an Ethernet router is required for communication between those VLANs. Switch ports may be assigned to more than one VLAN when a device connected to the port requires communications with devices in different VLANs.

Hubs

A hub is a device that serves as the center of a star topology network. Hubs are commonly used to connect segments of a LAN. A hub contains multiple ports. When a packet arrives at one port, it is copied to the other ports so that all segments of the LAN can see all packets. Hubs can be active (where they repeat signals sent through them) or passive (where they do not repeat, but merely split, signals sent through them). Intelligent (manageable) hubs include additional features that enable a network administrator to monitor the traffic passing through the hub and to configure each port in the hub.

A hub connected network, unlike a switched network, functions as a logical bus where all devices share the same bus and only one device can talk during a specific period of time. When two devices attempt to talk at the same time, a collision occurs, both devices back off, and attempt to gain access to the network at different times.

The Encore system does not support the use of Hubs.

Switches

A switch is a device that filters and forwards packets between LAN segments. Switches primarily operate at the data link layer (layer 2) of the OSI reference model and therefore support any packet protocol. In the past two years, switch manufacturers have begun providing hardware-based support for layer 3 VLAN support. LANs that use switches to join segments are called switched LANs. Managed switches include additional features that enable an administrator to configure port-based VLANs, configure trunk ports, enable spanning tree support, and multicast IGMP support. Switch administration may be through a serial console port or via Ethernet connection using either telnet or HTTP. The administration application has traditionally been a command line interface, however recently introduced switch products also provide menu and browser-based graphical user interfaces.

Layer 2 Switching

Layer 2 switching is a form of hardware based bridging. In a switch, frame forwarding is handled by specialized hardware ASICs. Because of the ASIC technology employed, switches provide scalability to Gigabit speeds with low latency at costs significantly lower than conventional Ethernet bridges. Layer 2 switches operate at the data link layer of the OSI model.

Layer 2 switches give network managers the ability to increase bandwidth without adding unnecessary complexity to the network. Layer 2 data frames consist of both infrastructure content, such as MAC addresses, and end-user content. At Layer 2, no modification is required to the structure or contents of fields within the packet when going between Layer 1 interfaces

such as Ethernet to Fast Ethernet. Changes to structure and content may occur when bridging between unlike media types such as FDDI and Ethernet or Token Ring and Ethernet.

Workgroup connectivity and network segmentation are primary uses for Layer 2 switches. The high performance of a Layer 2 switch can produce network designs that decrease the number of hosts per physical segment. This leads to a flatter network design. Layer 2 Switching and Bridging are logically equivalent.

Layer 3 Switching

Layer 3 switching is hardware-based routing. In particular, packet forwarding is handled by specialized hardware ASICs. Layer 3 switches operate at the network layer of the OSI reference model and handle packets the same as traditional Ethernet routers.

Layer 3 Switch Features:

- Determines the forwarding path based on layer 3 information,
- Validates the integrity of the Layer 3 header via checksum,
- Verifies packet expiration and updates accordingly,
- Processes and responds to any option information,
- Updates forwarding statistics in the Management Information Base (MIB), and
- Applies security controls if required.

The primary difference between the packet-switching operation of an Ethernet router and a layer 3 switch is the physical implementation. In general-purpose Ethernet routers, microprocessor-based engines typically perform packet switching. A layer 3 switch performs packet switching with hardware.

Layer 3 switching and routing are functionally equivalent.

Layer 4 Switching

Layer 4 switching refers to a layer 3 hardware-based Ethernet router that makes decisions for bandwidth allocation based on the administrator-defined configuration. Layer 4 switching provides the ability to make forwarding decisions based on the physical address, source/destination IP address, Layer 3 protocol type, TTL and packet application information. In TCP or UDP flows, the application is encoded as a port number in the segment header.

When performing Layer 4 functions, a switch reads the TCP and UDP fields to determine what type of information the packet is carrying. Information in packet headers typically includes Layer 2 and Layer 3 addressing

and the Layer 3 protocol type, plus more fields relevant to Layer 3 devices, such as TTL and checksum. The packet also contains information relevant to the higher layers within the communicating hosts, such as the protocol type and port number. The switch can also be programmed to prioritize traffic by application, which allows definition for the quality of service so that, for example, audio/video router matrix control messages may be granted higher priority than SNMP messages. Layer 4 switching is vendor-neutral and is beneficial even when added to preexisting network environments.

Routers

A router is a device that connects any number of LANs or VLANs. Routers operate at the network and transport layers (layer 3 and layer 4) of the OSI model. Routers use headers and forwarding tables to determine where packets go, and they use ICMP and OSPF to communicate with each other and configure the best route between any two hosts. Very little filtering is done through routers.

Encore Network Protocols

A protocol is defined as a set of formal rules describing how to transmit data, especially across a network. Low-level protocols define the electrical and physical standards to be observed, bit and byte ordering, and the transmission, error detection and correction of the bit stream. High-level protocols deal with the data formatting which includes the syntax of messages, terminal to computer dialogue, character sets, and the sequencing of messages.

Protocols present in a given LAN will be determined by network complexity and services required by deployed hardware such as Ethernet routers and switches. Small systems will require only a small subset of the network protocols summarized below.

Application Data Transport Protocols

FTP File Transport Protocol

A protocol used to send files across the Internet or LAN. FTP runs on top of TCP/IP.

IP Internet Protocol

The network layer for the TCP/IP protocol suite widely used on Ethernet networks. IP is a connectionless, best-effort packet switching protocol. It provides packet routing, fragmentation and re-assembly through the data link layer. IP is the workhorse of the network.

Multicast

To multicast is to transmit a message to a select group of recipients. Multicasting refers to sending a message to a select group, whereas broadcasting refers to sending a message to everyone connected to a network. Multicast messages are addressed to a multicast group defined by a range of addresses between 224.0.0.0 and 239.255.255.255. Multicast is used by Encore to distribute information that is required by a subset of hosts connected to the network.

SMB Server Message Block

Server Message Block is a protocol for sharing files, printers, serial ports, and communications abstractions such as named pipes and mail slots between computers. SMB can run over multiple protocols, including TCP/IP and UDP/IP. The Encore file sharer application, to exchange configuration data, uses SMB with control panel servers, router control engines, and other configurable devices residing on the Encore control LAN.

TCP Transmission Control Protocol

This is the most common transport layer protocol used on Ethernet and on the Internet. TCP is built on top of Internet Protocol (IP) and is nearly always seen in the combination TCP/IP (TCP over IP). It adds reliable communication, flow control, multiplexing, and connection-oriented communication. It provides full-duplexing and process-to-process connections.

UDP User Datagram Protocol

UDP is a connectionless layer that, like TCP, runs on top of IP protocol at the transport layer. UDP adds a checksum and additional process-to-process addressing information. UDP is the primary data transport protocol for the Encore Router Control System. Broadcast, Multicast, SMB and SNMP protocols run on top of UDP.

Network Protocols

ARP Address Resolution Protocol

A protocol used to convert an IP address into a physical ("MAC") address. A host wishing to obtain a physical address broadcasts an ARP request to the IP network. The host on the network that has the requested IP address replies with its physical hardware address.

DHCP Dynamic Host Configuration Protocol

DHCP is a protocol for assigning IP addresses dynamically to devices on a network. With dynamic addressing, a device can have a different IP address every time it connects to the network. DHCP also supports a mixture of static and dynamic IP addresses. DHCP is used within the Encore system to simplify network configuration and administration.

ICMP Internet Control Message Protocol

ICMP is an extension of the Internet Protocol (IP). ICMP supports packets containing error, control, and informational messages. The "ping" command uses ICMP to test a LAN or Internet connection.

IGMP Internet Group Management Protocol

IGMP is the standard for IP multicasting to the Internet. It is used to establish host memberships, and in particular, multicast groups on a single network. The mechanisms of the protocol allow a host to inform its local Ethernet switch or router, using host membership reports, that it wants to receive messages addressed to a specific multicast group.

OSPF Open Shortest Path First

OSPF is a routing protocol developed for IP networks based on the shortest path first or link-state algorithm. Routers use linkstate algorithms to send routing information to all nodes in a network by calculating the shortest path to each node based on the topography of the network constructed by each node.

RARP Reverse Address Resolution Protocol

A protocol in the TCP/IP stack that provides a method for finding IP addresses based on physical ("MAC") addresses.

STP Spanning Tree Protocol

STP is a link management protocol for media access control bridges. This protocol provides path redundancy while preventing undesirable loops in a network that are created by multiple active paths between stations. Loops

occur when there are alternate routes between hosts. STP allows only one active path at a time between any two networked devices (preventing loops) but establishes the redundant links as a backup, should the initial link fail. If one network segment becomes unreachable, the spanning tree algorithm reconfigures the spanning tree topology and reestablishes the link by activating the standby path. Without spanning tree in place, it is possible that both connections may be simultaneously live, which could result in an endless loop of traffic on the LAN.

Network Maintenance Protocols

HTTP Hyper-Text Transfer Protocol

HTTP is the underlying protocol used by the World Wide Web (WWW). HTTP defines how messages are formatted and transmitted, and what actions Web servers and browsers should take in response to various commands. HTTP is a stateless protocol where each command is executed independently, without knowledge of previous commands.

RMON Remote Monitoring

A network management protocol that allows network information to be gathered at a single workstation. Whereas SNMP gathers network data from a single type of Management Information Base (MIB), RMON defines nine additional MIBs that provide a much richer set of data about network usage. The newest version of RMON, provides data about traffic at the network layer in addition to the physical layer. This allows administrators to analyze traffic by protocol. For RMON to work, network devices, such as hubs and switches, must be designed to support it.

SNMP Simple Network Management Protocol

SNMP is a set of protocols for managing complex networks. SNMP works by sending messages, called protocol data units (PDUs), to different parts of a network. SNMP-compliant devices, called agents, store data about themselves in Management Information Bases (MIBS) and return this data to the SNMP requester. The Grass Valley Net Central II remote monitoring application uses SNMP to acquire status information from network devices such as modular products, routing matrices, production switchers, and Profile XP Media Platforms.

Utility Applications

PING Packet Internet Gopher

Ping is a utility used to determine whether a specific IP address is accessible. It works by sending an ICMP packet to the specified address and then waits for a reply. Ping is used primarily to troubleshoot LAN and Internet connections.

Network Addresses

The following paragraphs provide information that will be helpful in understanding Address Classes, Subnetting and Addresses that are safe to use within private networks. If you need public addresses, i.e. registered addresses that will be visible to the internet, you should talk to your system administrator, or lacking that resource, contact your Internet Service Provider (ISP). It is unlikely that you will want your routing system accessible by the general public through the Internet, so the use of private address space is preferred. The use of private addresses does not preclude control of the system across the Internet, a leased T1, or dialup connection as you can choose to set up a Virtual Private Network (VPN) with segments of the network located in different cities. Addresses within the VPN are hidden from the public.

IP Address Fundamentals

Address Classes

An IP address consists of four octets (1 octet = 8 bits), 4 groups of 8 bits for a total of 32 bits. The value in each octet ranges from 0 to 255 decimal, or 00000000 - 11111111 binary.

These octets are broken down to provide an addressing scheme that can accommodate large and small networks. There are five different classes of networks, A to E. To determine the class of an address, look at the first octet of the dotted-decimal address.

- Class A 1 - 126 (ex. 10.0.24.5)
- Class B 128 - 191 (ex. 158.16.10.5)
- Class C 192 - 223 (ex. 192.168.49.1)

In a class A address, the first octet is the network portion, so the class A example above has a major network address of 10. Octets 2, 3, and 4 (the next 24 bits) are for the network manager to divide into subnets and hosts as needed. Class A addresses are used for networks that have more than 65,536 hosts, up to 16,581,375 hosts.

In a class B address, the first two octets are the network portion, so the class B example above has a major network address of 158.16. Octets 3 and 4 (16 bits) are for local subnets and hosts. Class B addresses are used for networks that have between 256 and 65,536 hosts.

In a class C address, the first three octets are the network portion. The class C example above has a major network address of 192.168.49. Octet 4 (8 bits) is for local subnets and hosts - perfect for networks with less than 256 hosts.

Subnetting

Subnetting allows you to make efficient use of your addresses by creating multiple logical networks that exist within a single Class A, B, or C network. If you don't subnet, you will only be able to use one network from your Class A, B, or C network. Unless you have been assigned a major network, you will probably need to subnet. Each data link on a network must be a unique subnet, with every node on that link being a member of the same subnet.

A subnet mask is defined for each IP address. The subnet mask identifies which portion of the 4 octets is used to identify the data link, with the remaining bits identifying the node. If you want no subnetting, use these default masks (255 - strictly follow number, 0 - wildcard): Class A: 255.0.0.0, Class B: 255.255.0.0, Class C: 255.255.255.0.

Networking Rules

Cable & Fiber Lengths

Category 5 UTP cable segments for both 10 and 100Base-T are limited to 100 meters between switches, hubs or repeaters. This limitation is an EIA/TIA specification. When planning cable runs, it is necessary to include patch cables and a drop box to host cable runs within the 100-meter limit.

How Many Hops are allowed?

Several factors determine the maximum number of hops over which a message frame may propagate.

When propagated through switches or switched repeaters, there is no limit to the number of hops since the message is received, stored and recreated at each switch point. This process may continue indefinitely.

Networking Terms and Acronyms

Bandwidth

Difference between the highest and lowest frequencies available for network signals. The term is also used to describe the rated throughput capacity of a given network medium or protocol.

Bridge

A device that connects two or more network segments. The bridge passes packets between segments, based on node-address information and/or any filtering criteria established by the network manager

Bridging

Bridging is a method of path selection (contrast routing). In a bridged network, no correspondence is required between addresses and paths. Put another way, addresses imply nothing about where hosts are physically attached to the network. Any address can appear at any location. In contrast, routing requires more thoughtful address assignment, corresponding to physical placement. Two types of bridging exist. Transparent bridging is used in Ethernet environments and relies on switching nodes. Token Ring networks use source-route bridging (SRB), in which end systems actively participate by finding paths to destinations, then including this path in data packets.

Broadcast

A transmission to multiple, unspecified recipients. On Ethernet, a broadcast packet is a special type of multicast packet, which all nodes on the network are always willing to receive.

A data packet that will be sent to all nodes on a network. Broadcasts are identified by a broadcast address. Compare with multicast and unicast. See also broadcast address.

Broadcast Address

Special address reserved for sending a message to all stations. Generally, a broadcast address is a MAC destination address of all ones. Compare with multicast address and unicast address. See also broadcast.

CIDR Classless Inter-Domain Routing

CIDR defines address assignment and aggregation strategies designed to minimize the size of top-level Internet routing tables. The subnetting mask, previously a number set in a computer's boot sequence, becomes an integral part of routing tables and protocols. A route is no longer an IP address broken down into network and host bits according to its class. A route is

now a combination of address and mask. Not only can networks be broken into subnets, but they can also be combined into supernets, so long as they have a common network prefix.

Collision

When two hosts transmit on a network at once, it causes their packets to collide and corrupt each other.

Collision Detection

A class of methods for sharing a data transmission medium in which hosts transmit as soon as they have data to send and then check to see whether their transmission has suffered a collision with another host's transmission. If a collision is detected then the data must be resent. The re-sending algorithm should try to minimize the chance that two host's data will repeatedly collide. For example, the CSMA/CD protocol used on Ethernet specifies that they should then wait for a random time before retransmitting

CSMA/CD Carrier Sense Multiple Access / Collision Detect

CSMA/CD is the low-level network arbitration protocol used on Ethernet. Nodes wait for quiet on the net before starting to transmit and listen while they are transmitting. If two nodes transmit at once the data gets corrupted. The nodes detect this and continue to transmit for a certain length of time to ensure that all nodes detect the collision. The transmitting nodes then wait for a random time before attempting to transmit again, minimizing the chance of another collision. The ability to detect collisions during transmission reduces the amount of bandwidth wasted on collisions compared with simple Aloha broadcasting.

Datagrams and Streams

In modern data networking, it is important to distinguish between datagrams and streams.

A stream is typically thought of as a communication channel. Remote logins, file transfers, and mail deliveries all use streams. A stream functions like a pipeline and has two endpoints. Data is put in one end and comes out the other. None of the data is duplicated, discarded, or reorganized in any way. Two streams can be paired together to form a full-duplex connection.

A datagram, often called a packet, is much more atomic in nature. It is a small piece of data, often required to be less than a maximum length (typically in the 256 to 2000 byte range). Datagrams are completely self-contained. They have a source and a destination, but nothing that could be called a connection. Datagrams have no relationship to any others that came before or after them.

Although most networking communication uses streams, all Internet transfers are in the form of datagrams. Internet streams are actually emulated using datagrams by the TCP Protocol. To diagnose Internet operation, a packet decoder such as TCP Dump is used to view individual packets. This, along with knowledge of TCP operation, enables the Internet engineer to diagnose network operation.

Data link layer

The OSI layer that is responsible for data transfer across a single physical connection, or series of bridged connections, between two network entities.

Deterministic

Describes a system with a fixed amount of latency. Used in routing systems to ensure exact, frame accurate switching.

Domain

Most commonly used to refer to a group of computers on the Internet whose host names share a common suffix, the domain name. The last component of this is the top-level domain.

Ethernet

Networking system originally developed by DEC, Intel and Xerox. Ethernet has l0Mbps throughput and uses a carrier sensing access method in which workstations share a network cable, but only one can use the cable at a time.

Fast Ethernet

Any of a number of 100-Mbps Ethernet specifications. Fast Ethernet offers a minimum speed increase ten times that of the 10Base-T Ethernet specification, while preserving such qualities as frame format and MAC address resolution mechanisms. Such similarities allow the use of existing 10Base-T applications and network management tools on Fast Ethernet networks. Fast Ethernet is based on an extension to the IEEE 802.3 specification.

Flooding

Traffic passing technique used by switches and bridges in which traffic received on an interface is sent out on the interface onto which the information was originally received. Flooding by a switch means that it sends messages to every other port on the switch except the port from which the packet arrived. This happens when a switch receives a packet with a MAC destination address unknown to the switch.

LAN Local Area Network

High-speed, low-error data network covering a relatively small geographic area (up to a few thousand meters). LANs connect workstations, peripherals, terminals, and other devices in a single building or other geographically limited area. LAN standards specify cabling and signaling at the physical and data link layers of the OSI model. Ethernet, FDDI, and Token Ring are widely used LAN technologies.

LAN Switch

High-speed switch that forwards packets between data-link segments. Most LAN switches forward traffic based on MAC addresses. This variety of LAN switch is sometimes called a frame switch. LAN switches are often categorized according to the method they use to forward traffic: cut-through packet switching or store-and-forward packet switching. Multilayer switches are an intelligent subset of LAN switches. Compare with multilayer switch.

Latency

A delay or wait time. Specific contributors to latency include mismatches in data speed between the microprocessor and input/output devices and inadequate data buffering. In networks and within a computer, each juncture in routing or temporary holding of data introduces a new possibility for latency.

Jabber

A blanket term for a device that is behaving improperly in terms of electrical signaling on a network. In Ethernet networks, jabbering can be very destructive since Ethernet uses electrical signal levels to determine whether the network is available for transmission. A jabbering device can cause the entire network to halt because all other devices think it is busy.

MIB Management Information Base

A database of network management information that is used and maintained, or can be changed or retrieved by a network management protocol such as SNMP or CMIP. The value of a MIB object can be changed or retrieved using SNMP or CMIP commands, usually through a GUI network management system. MIB objects are organized in a tree structure that includes public (standard) and private (proprietary) branches.

Multicast Addressing

Ethernet addressing scheme used to send packets to devices of a certain type or for broadcasting to all nodes.

Multicast Group

A dynamically determined group of IP hosts identified by a single IP multicast address.

Multilayer Switch

A switch that filters and forwards packets based on MAC addresses and network addresses. A subset of LAN switches.

NAT Network Address Translator

An Internet standard that enables a local area network (LAN) to use one set of IP addresses for internal traffic and a second set of addresses for external traffic. A NAT box located where the LAN meets the Internet makes all necessary IP address translations.

A NAT provides a type of firewall by hiding internal IP addresses and provides a method for using more internal IP addresses. Since the addresses on the inside of the firewall are used internally only, there is no possibility of conflict with IP addresses used by other organizations.

NIC Network Interface Card

A specific type of adapter that allows for hardware connection to LAN media.

Network Layer

The third lowest layer in the OSI seven layer model. The network layer determines routing of packets of data from sender to receiver via the data link layer and is used by the transport layer. The most common network layer protocol is IP.

Network

A group of computers and shared peripherals connected in a continuous cabling system. This applies to networks with a Bus topology, however, it is more correct to say that a network is a series of nodes interconnected by communication paths. Encore uses the Star topology; SMS7000 uses Bus topology for its GSC Control Panel Network.

Node

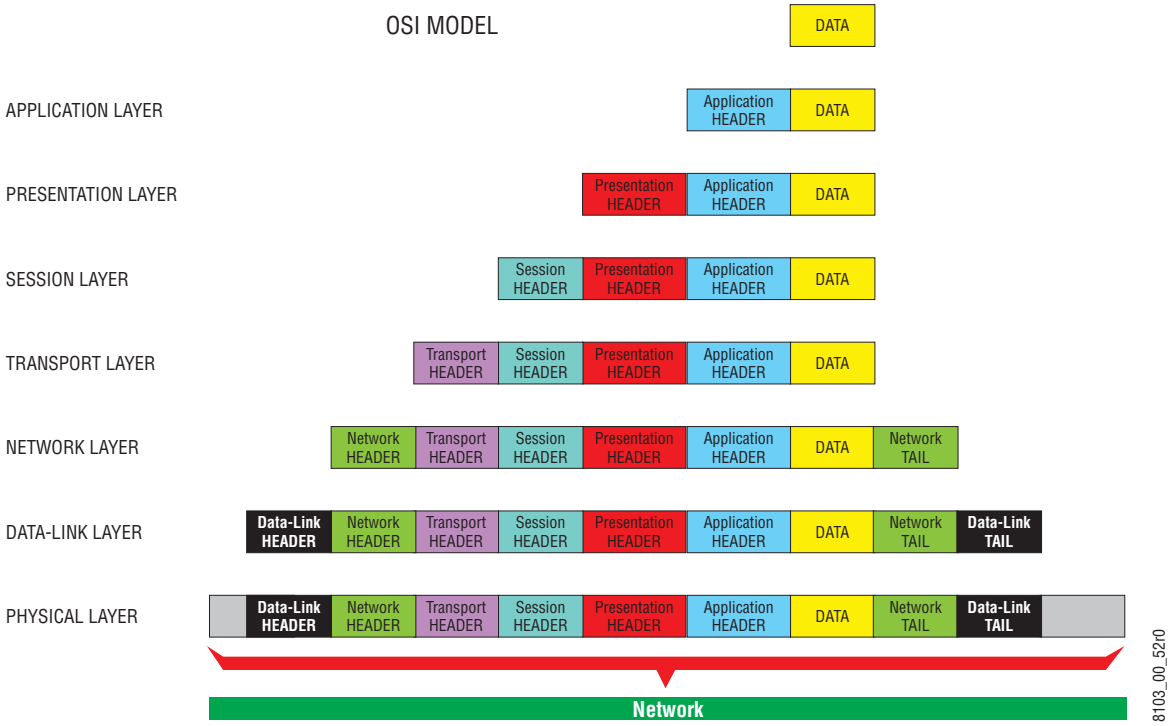
Any device on a network that can independently send or receive information and has a network address.

OSI Reference Model

Open System Interconnection reference model. Network architectural model developed by ISO and ITU-T. The model consists of seven layers, each of which specifies particular network functions such as addressing, flow control, error control encapsulation, and reliable message transfer.

The first layer (physical layer) is closest to the media technology. The lower three layers are implemented in hardware and software, while the upper five layers are implemented only in software. The highest layer (the application layer) is closest to the user. The OSI reference model is used universally as a method for teaching and understanding network functionality.

Figure 56. OSI Model



PHY Physical Layer Device

A PHY can be a fiber optic device or a copper device. It can operate at any speed: 1Mb/s, 10Mb/s, 100Mb/s, 1000Mb/s, etc.

Protocol

A protocol is a set of formal rules describing how to transmit data from point to point or across a network. Low-level protocols define the electrical and physical standards to be observed, bit and byte ordering, and the transmission, error detection and correction of the bit stream. High-level protocols deal with the data formatting, including the syntax of messages, the terminal to computer dialogue, character sets, and sequencing of messages.

Repeater

A device that extends the maximum physical length of a network by amplifying, regenerating, or retransmitting signals between network segments. Repeaters usually have no bridging or routing capability, and have a maximum delay between network segments of a few bits.

Router

A device that forwards packets between networks. The forwarding decision is based on network layer information and routing tables, often constructed by routing protocols.

Routing

Routing is a method of path selection. Routing is the main process used by Internet hosts to deliver packets. The Internet uses a hop-by-hop routing model. Each host or router that handles a packet examines the destination address in the IP header, computes the next hop that will bring the packet one step closer to its destination, and delivers the packet to the next hop, where the process is repeated. To make this work, two things are needed. First, routing tables that match destination addresses with next hops. Second, routing protocols that determine the contents of these tables.

Routing assumes that addresses have been assigned to facilitate data delivery. In particular, routing assumes that addresses convey at least partial information about where a host is located. This permits routers to forward packets without having to rely on either broadcasting or a complete listing of all possible destinations. At the IP level, routing is used almost exclusively, primarily because the Internet was designed to construct large networks in which heavy broadcasting or huge routing tables are unfeasible.

Three general prerequisites must be met to perform routing:

- Design – a plan must exist by which addresses are assigned. Typically, addresses are broken into fields corresponding to levels in a physical hierarchy. At each level of the hierarchy, only the corresponding field in the address is used, permitting addresses to be handled in blocks. In IP, the most common designs are IP Address Classes, Subnetting, and CIDR.
- Implementation – the design plan must be implemented in switching nodes, which must be able to extract path information from the addresses. Since router programming is generally not under a designer's control, designs must be limited by the features provided by manufacturers. The great appeal of subnetting lies in its great flexibility, while using a fairly simple implementation model.
- Enforcement – the plan must be enforced in host addressing. A design is useless unless addresses are assigned in accordance with it. Addressing authority must be centralized. This is possible with subsets of the available addressing space delegated to subordinates.

In the Internet environment, routing is almost always used at the IP level, and bridging almost always used at the Data Link Layer. For new network installations, the best advice is to plan for routing, even if it's not used at first. This requires some advanced planning to design an addressing scheme that will work. However, the management of this addressing is all manual - hardware won't know the difference between organized and hap-

hazard addressing schemes. Plan for the ability to put routers in strategic locations, even if those locations will initially use bridges or just signal boosters (such as Ethernet hubs and repeaters). In this manner, routers can be easily added later. Nothing is more frustrating that knowing exactly where a router should be added, and knowing that a hundred addresses must be changed before it can be.

Routing Tables

Routing tables can take many forms, but there is a simple model that can explain most Internet routing. Each entry in a routing table has at least two fields - IP Address Prefix and Next Hop. The Next Hop is the IP address of another host or router that is directly reachable via an Ethernet, serial link, or some other physical connection. The IP Address Prefix specifies a set of destinations for which the routing entry is valid. In order to be in this set, the beginning of the destination IP address must match the IP Address Prefix, which can have from 0 to 32 significant bits.

Bridged networks are regarded as single connections. If no routing table entries match a packet's Destination Address, the packet is discarded as undeliverable (possibly with an ICMP notification to the sender). If multiple routing table entries match, the longest match is preferred. The longest match is the entry with the most "1" bits in its Routing Mask.

To avoid needing routing entries for every possible Internet destination, most hosts and routers use a default route (some routing tables contain nothing but a single default route). A default route has a Routing Address/Mask pair of 0.0.0.0/0.0.0.0. In other words, it matches every IP address, but since there are no "1" bits in its Routing Mask, any other match would be selected by the longest match rule. The default route will only be used if there are no others matches in the routing table, thus its name. Default routes are quite common, and are put to best use on networks with only a single link connecting to the global Internet. On such a network, routing tables will have entries for local nets and subnets, as well as a single default route leading to the outbound link. However, remember that all Next Hops must be directly reachable, so the default routes won't necessarily point to the same IP address. Also, some networks (large Internet service providers, mostly) use defaultless routing tables that must be able to match every IP address in the global net.

STP Shielded Twisted Pair

A type of LAN cabling containing eight wires, which are all shielded by an insulating cover. STP is commonly used in Token Ring LANs

Switch

A network device that filters, forwards, and floods frames based on the destination address of each frame. The switch operates at the data link layer of the OSI model.

Switching

An electrical switch directs current to one of several wires. Once the connection is made, the switch appears as part of the wire - it (ideally) introduces no resistance, no attenuation, and no delay. A networking switch is designed to behave in much the same way. Its primary feature is speed - like an electrical switch, it is designed to appear much like a wire when relaying data signals.

Switches implement a normal path selection algorithm; they just do it faster. Layer 2 switches bridge; layer 3 switches route. Normal bridges and routers will receive an entire packet, analyze its headers, make a forwarding decision, and then transmit the packet. The packet is stored in RAM while being processed. These RAM buffers can become bottlenecks in a busy network. Switches use specialty silicon chips than can forward packets directly from source to destination without passing through RAM buffers.

A typical Ethernet switch acts much like a standard IEEE 802.1d bridge. The difference is that as soon as an incoming packet's header has been received, a forwarding decision is immediately made, even before the packet is completely received. If the destination Ethernet segment is idle, the packet begins transmission to the destination immediately. As bits are received they are shunted through the switch fabric to the destination interface. On 10 Mb/s Ethernet, the net delay is perhaps one or two microseconds, as opposed to several milliseconds for a typical bridge. This is also called cut-through switching.

Unicast

A message sent to a single network destination.

Unicast Address

An address specifying a single network device.

UTP Unshielded Twisted Pair

UTP is a type of LAN cabling containing eight wires that are all covered with a thin insulating cover. Often referred to as telephone wire. Commonly used in Ethernet l0Base-T and Token Ring LANs.

VLAN Virtual Local Area Network

A group of devices on one or more LANs that are configured (using management software) so that they can communicate as if they were attached to the same wire, when in fact they are located on a number of different LAN segments. Because VLANs are based on logical instead of physical connections, they are extremely flexible.

WAN Wide Area Network

A data communications network that serves users across a broad geographic area and often uses transmission devices provided by common carriers. Frame Relay, SMDS, and X.25 are examples of WANs.

10Base-2

10 Mb/s baseband Ethernet specification using 50-ohm thin coaxial cable. 10Base-2, which is part of the IEEE 802.3 specification, has a distance limit of 606.8 feet (185 meters) per segment.

10Base-5

10 Mb/s baseband Ethernet specification using standard thick 50-ohm baseband coaxial cable. 10Base-5, which is part of the IEEE 802.3 baseband physical layer specification, has a distance limit of 1640 feet (500 meters) per segment.

10Base-T

10 Mb/s baseband Ethernet specification using two pairs of twisted-pair cabling (Category 3, 4, or 5), one pair for transmitting data and the other for receiving data. 10Base-T, which is part of the IEEE 802.3 specification, has a distance limit of approximately 328 feet (100 meters) per segment.

100Base-T

100 Mb/s baseband fast Ethernet specification, using UTP wiring. Like the 10Base-T technology on which it is based, 100Base-T sends link pulses over the network segment when no traffic is present. However, these link pulses contain more information than those used in 10Base-T. Based on the IEEE 802.3 standard, 100Base-T has a distance limit of 328 feet (100 meters) per segment.

100Base-TX

100 Mb/s baseband fast Ethernet specification using two pairs of either UTP or STP wiring. The first pair of wires is used to receive data; the second is used to transmit. To guarantee proper signal timing, a 100Base-TX segment cannot exceed 328 feet (100 meters) in length. Based on the IEEE 802.3 standard.

100Base-T4

100 Mb/s baseband fast Ethernet specification using four pairs of Category 3, 4, or 5 UTP wiring. To guarantee proper signal timing, a 100Base-T4 segment cannot exceed 328 feet (100 meters) in length. Based on the IEEE 802.3 standard.

l00Base-FX

100 Mb/s baseband fast Ethernet specification using two strands of multi-mode fiber-optic cable per link. To guarantee proper signal timing, a 100Base-FX link cannot exceed 1312 feet (400 meters) in length. Based on the IEEE 802.3 standard.

1000Base-T

A specification for Gigabit Ethernet over copper wire (IEEE Std. 802.3ab). The standard defines 1 Gb/s data transfers over distances of up to 100 meters using four pairs of CAT-5 balanced copper cabling and a 5 level coding scheme.

1000Base-LX

Gigabit Ethernet operating with a 1300nm laser over single and multi-mode fiber optic cable.

1000Base-SX

Gigabit Ethernet operating with 850nm laser over multi-mode fiber optic cable.

802.1Q – VLAN

Defines a method of establishing VLANs, Establishes new frame type: Tagged Frame, Provides a way to maintain priority information across LANs

802.3

IEEE specification for l0/100 Mbps Ethernet

Glossary

AES

Audio Engineering Society. AES represents any of the digital audio standards established by the Audio Engineering Society.

AES/EBU

Name for a digital audio standards established jointly by the Audio Engineering Society and European Broadcasting Union. The sampling frequencies for this standard vary depending on the format being used.

Alarm

A signal indicating major or minor alarm conditions.

Alien Matrices

Any matrix which is not a part of the Series 7000 router product line.

All-level Takes

Switch the same input number on all Levels, to the controlled Destination.

Amezi

Asynchronous Mezzanine board. An RS-422/RS-232 communications board which mounts on the 7000 MCPU or a 7000 Communications Interface (CIF) module and provides RS-422 and RS-232 ports. The Asynchronous Mezzanine board is one of several mezzanine boards of differing functionality.

ANC

Active Node Controller. An ANC is communicating with the MCPU and will appear in a list of Active Node Controllers when polled by the GUI. The Enhanced Node Controller and the Matrix Controller modules also appear in the list. ANCs include both the primary and backup Controller modules.

ANSI

American National Standards Institute.

Assignment

Assignment is an action that grants permission for exclusive control of a resource. Multiple devices may be assigned permission for exclusive control of a single device, however only one may exercise control at a specific point in time.

Control of particular sources and TieLines can be Assigned to destinations on a case-by-case basis. The Assignment system is enabled (Machine and TieLine Assignment) through the GUI Enables menu. Active Assignments are controlled through the GUI (on-line, OnLine menu, Assignments submenu) or may be handled by an external automation or scheduling system.

Backplane (Rear connector channel, Motherboard)

The circuit board at the back of an electronics frame where modules (from the front) and cables (from the rear) are plugged-in.

BNC

Bayonet Neill-Concelman (BNC) connector. (Named for its inventors). A type of coaxial cable connector.

BPI

Backplane Interface. This is required for a Communications Interface module to communicate with a MCPU module.

BPS

Button Per Source. Name given to a panel feature that performs a source take with the single push of a button.

Breakaway

A Take operation which is performed by accessing the control Levels of a Destination individually and selecting a different Source on at least one Level than that selected on the others. Breakaways allow a Destination to selectively utilize video and audio from different Sources.

BSY

Busy. This is commonly found on the modules to identify the yellow busy LED.

Bus

A signal path to which a number of inputs may be connected to feed one or more outputs. Also, a signal path used to communicate between devices such as the node bus or the Control Panel bus. the node bus is used to communicate between the MCPU and the Controller modules. The Control Panel bus is used to communicate between the MCPU and Control Panels.

Chop

A variation of a Take command that alternately connects each of two different Sources to a single Destination (flip-flopping) at a designated switching rate (the chop rate).

CIF

Communication Interface. A Series 7000 optional CIF module is a general purpose communications interface module used to augment the capability of the Series 7000 MCPU when the MCPU is housed in a standalone Control Frame. Each CIF module will support four mezzanine submodules; mezzanine submodules in turn provide a particular communications capability.

CLN

Client Control Panel. A companion panel used with the Server panel to expand Source and Destination selection. Each Client controls three Destinations.

Coaxial Cable (coax)

A cable which has a metallic noise shield surrounding a signal-carrying conductor. In video, the cable impedance is typically 75 ohms. Ethernet coax is typically 50Ω impedance.

Cold Start

A boot from power off.

Component Video

The un-encoded output of a camera, videotape recorder, etc., consisting of 3 primary color signals: Red, Green, and Blue (RGB) that together convey all necessary picture information. In some component video formats, these three components have been translated into a luminance signal and two color difference signals, e.g. Y, R-Y, B-Y.

Composite Video

An encoded video signal, such as NTSC or PAL video, that includes horizontal and vertical synchronizing information.

Control Device

Panel, computer, or other device that controls router crosspoint selections.

Control Panel Bus (CP bus)

Communications path between control panels or devices and the MCPU which controls the routing matrices.

Controllers

Part of the control system, Controllers are circuit modules which interface between the MCPU and signal processing modules.

COS

Cubicle or Studio. A custom configuration set.

CPO

Clear Protected Output.

Crosspoint (XPT)

An electronic switch that allows a signal to pass from an input to an output when the switch is closed.

DA

Distribution Amplifier. The Series 7000 uses DAs to expand outputs.

Data Matrix

A signal processing matrix containing modules that route RS-422 or RS-485 data.

Default

The setup condition existing when a device is first powered-up or after a system restart.

Destination (DEST or DST)

The point to which Source signals are routed. In Series 7000, a Destination may include one or more outputs, across multiple Levels, with any connector number offset (user-defined in system configuration). (See Multilevel Switching in Section 1.)

Destination Exclusion Set (DXS)

User-determined set of Destinations excluded from control by a particular panel. If used, Destination Exclusion Sets are included in a Panel Template before the template is downloaded to a particular control panel. A specific Destination Exclusion Set may be shared by more than one panel template.

DGND

Digital Ground.

DST

See *Destination (DEST or DST)*.

DSVOM

Dual Sync Video Output Monitor. Part of the DV Series.

Dumb Terminal

A conversational slave to a host computer.

EC I/F

External Control Interface.

EDP

Eight Destination Paging control panel.

EMI

Electromagnetic interference.

ENC

Enhanced Node Controller. Designed to replace the Node Controller it can be used in all Classic and DV Series matrices. The ENC is required for Dual Control of a matrix by the Series 7000 Control System and an external device such as a PC. The ENC does not support the Kscope Interface Mezzanine.

EPROM

Erasable Programmable Read Only Memory. EPROMs are non-volatile memory chips. They are commonly called Flash memory chips.

ERR

Error. This is commonly found on the modules to identify the red error LED.

Ethernet

A local area network (LAN) technology capable of transmitting information between computers at speeds of 10 and 100 Mbps.

Exclusion

User-determined Sources excluded from routing to a particular Destination.

FC

Frame Controller.

FET

Field Effect Transistor.

First Come First Served (FCFS)

Tieline status where it is not necessary to create a reservation to use the specified Tieline.

Flag

A parameter that can be set in a control panel template to control how the panel operates.

Flash Memory

See: *EPROM*.

Flip-Flopping

Alternately connecting each of two different Sources to a single Destination (at a designated switching rate (See: *Chop*).

GBR (Green, Blue & Red)

The three primary colors used in video processing, often referring to the three un-encoded outputs of a color camera. The sequence of GBR indicates the mechanical sequence of the connectors in the SMPTE standard. *Also see: RGB.*

GPI

General Purpose Interface. Refers to the HX-GPI or Horizon General Purpose Interface used to connect a Horizon Routing Switcher to a Series 7000 System.

GSC

Global Serial Channel. Refers to the GSC Mezzanine which provides additional BNC, serial communications ports for the Series 7000 MCPU. The four additional BNCs provided per mezzanine can be used as additional control panel bus or Tally System ports. The GSC can also be used to provide Node Control Bus expansion. In this capacity, only one of the four BNCs can be used because traffic density is too great for all four BNCs to be serviced by a single communications controller.

GUI

Graphical User Interface. Refers to the Configuration Editor software program used to configure the Series 7000 System.

Hardware

1. Electrical devices connected through physical wiring. 2. Electronic programming technique using physical connections and therefore essentially unalterable.

HDTV

Television with a resolution approximately four times that of Conventional Definition Television and a 16:9 (H x V) picture aspect ratio.

Heartbeat

A health status message provided by networked frames that are polled by MCPUs.

Horizon

A Grass Valley line of routing switchers.

HX

Grass Valley Horizon Series Crosspoint Routing System.

IBOP

Interconnect /Break Out Panel. An option panel used to add BNC connectors to an audio matrix using 50-pin D connectors.

ID or IDENT

A software routine that identifies a device (e.g. a control panel). Includes such information as:

- controlled Destination
- active tally level
- panel name
- software version
- system name

I/O

Abbreviation for input/output. Typically refers to sending information or data signals to and from devices.

Input

A single physical, numerically designated connection point of an in-coming signal to a matrix. One or more Series 7000 inputs can be assigned to a Source name during System Configuration.

Input Offset

Unlike traditional multi-level systems, Series 7000 Sources do not have to use the same input connector number on each matrix Level (i.e. RGB inputs for one Source can use input #1 in one matrix for R, input #4 in another matrix for G, etc.) The offset of the input numbers used is logged in the System Configuration.

J Number

Jack Number.

Jumper

A short conductor used to manually bridge two contact points. Used in Series 7000 Alarm system. Also called a strap.

Kadenza

A Grass Valley Group digital video effects system that can be used in an integrated environment with the Series 7000.

Kaleidoscope

A Grass Valley Group digital video effects system that can be used in an integrated environment with the Series 7000.

KISS

Key Input Source Select. Used in configuring the Kscope Key Sources.

KScope

The collective name for Kadenza and Kaleidoscope.

Krystal

A Grass Valley Group digital video effects system.

LED

Light emitting Diode. In Grass Valley products, LEDs illuminate to indicate a specific state (such as normal, error, on-line, and so on).

Level

Level is a name given to a group of signals that have something in common such as video, audio right, audio left, R, G, or B. This grouping becomes an independently controllable stratum of signals or crosspoints within a Physical Matrix or routing system. A Level may include more than one Virtual matrix as a slaved set. All elements in a Level respond to commands addressed to that Level.

Local

Local is used during configuration to identify local Sources and Destinations. Local Sources and Destinations are inputs and outputs physically connected to the Series 7000 System using the related configuration file.

Master

A module that controls a subordinate (slave) module.

Matrices

Plural of matrix.

Matrix

A configuration of potentially intersecting inputs and outputs. In routing switchers, signal switching hardware configured such that any input may be switched to any output.

MB4

Programmable Multibus 4 Control Panel.

MB8

Programmable Multibus 8 Control Panel.

MC

Matrix Controller. Controller module used in 7500 Series matrices.

MCO

Machine Control Only Control Panel.

MCPU

Master Control Processing Unit. This module provides:

- Overall system control
- Node manager interface to Series 7000 matrices
- Direct control panel support for up to 64 control panels
- Programmable real-time clock, date and time stamping for logged events
- Redundant controller interface (allows primary and backup MCPU pairs)
- Static RAM sizes (ranging from 128k bytes to 4M bytes) are supported
- Flash ROM sizes (ranging from 128k bytes to 4M bytes) are supported

MEC

Matrix Element Control. The MEC bus connects the control circuits of the various matrix modules in a frame section to the Node Controller. In some cases, when the MCPU and Node Controller reside in the same frame, these connections are all internal to the frame. More often, there are multiple Node Controllers in a system and a coaxial cable is run between Node Bus ports of each frame in the system. Only secondary systems and a particular compact configuration run external MEC buses.

MEDIC

Matrix Element Decode Integrated Circuit. Used as a communications bus between the MCPU and Controllers.

Mezzanine

A secondary printed circuit module consisting of a flat circuit board of insulating material with conductive circuits etched on and/or components mounted on its surface. These submodules generally plug into a primary module. Sometimes referred to as a submodule or daughter board.

Module

A single circuit board or assembly of circuit boards that can be readily removed from an electronics frame without first having to remove screws or other mounting hardware.

Multiformat

Ability to pass multiple signal types, such as serial digital, analog component, and analog composite.

Name(s)

Sources, Destinations, Levels, Salvos, Control Panels, Node Controllers, MCPUs, Mezzanine Boards, Tally Modules, and other components of the Series 7000 system all have names. When system software sets out to perform a function, a Take for instance, it looks for the source name, determines the inputs involved, and Takes the Source to the Destination specified (by name). Naming conventions are discussed in Section 1 of the *Configuration* manual. Names are important to operation and equally so to configuration.

NB (Node Bus)

Node Bus. A name for the communications bus between the MCPU and Controllers.

NB (Narrow Band)

Identifies the 7500 Series AES Audio Matrices.

NC

Node Controller. Controller used by Classic and DV Series matrices. The controller collects information from the modules in a matrix, sends the information to the system MCPU, and receives instructions from the MCPU.

Node Controller

See *NC*.

NTSC

Standard for scanning television signals. Used in the U.S., Canada, and Japan.

Output

A single physical, numerically designated connection point of an out-going signal from a matrix. One or more Series 7000 outputs can be assigned to a Destination name during System Configuration.

P32

32 Button-per-source Control Panel.

P48

48 Button-per-source Control Panel.

PAL

Standard for scanning television signals. Used in most European countries.

Panel Prefixes

A set of 1-to-8 printable ASCII character strings assigned to the 16-button or 24-button keypads on control panels. Used with suffixes to comprise a complete Source or Destination name. (Prefixes and 1-character suffixes are assigned to panel Keypad sets.)

Panel Suffix Set

A set of single printable ASCII characters usually the numbers 0-9 assigned to 10 buttons of a control panel 16-button or 24-button keypad. Pre-configured defaults exist for Telephone and Calculator style suffix sets.

Panel Template

Configuration data specifying control panel configuration; which includes items such as Tally Level, Destination, button assignments, and Flags restricting or allowing certain actions. Completed templates are downloaded to specific control panels.

Physical Matrix

Defines the total Input/Output size of a like signal type matrix. A Physical Matrix may be sized from 16x16 to 1,024x1,024 in increments of 16. Physical Matrices may be used to unite discrete frames in a large matrix or to fragment a single frame into smaller matrices. Every system must have at least one Physical Matrix and one Controller slice.

PLD

Programmable Logic Device.

Port

A connector, usually bidirectional, through which one device communicates with others.

Preset

Selecting a Source in preparation to taking it to air; a tentative change to one or more crosspoints which has not yet been executed.

Protect (PROT)

A control function which prevents control panels or devices from changing the current Source selection for the specified Destination.

PROTOVRD

Protect Override.

PWR

Power. This is commonly found on the modules to identify the green power LED.

PXD

X-Y Destination Control Panel.

PXS

Programmable X-Y Source Control Panel.

PXY

Programmable X-Y. Used to identify a group of control panels consisting of a PXS, and one or more PXYE and PXD panels.

PXYE

Programmable X-Y Expansion Control Panel.

Rack

An equipment rack. A standard EIA equipment rack is 19 inches (48.26 am) wide.

Rack Unit (RU)

Unit of measure of vertical space in an equipment rack. One rack unit is equal to 1.75 inches (445 mm). The height of a GVG electronics frame is typically specified in rack units.

RAM

Random access memory.

RAS

Remote Access Service.

Rear Connector Channel

See *Backplane (Rear connector channel, Motherboard)*.

Reboot (Reset)

To restart a computer, reloading the software.

Redundant Power Supply

Backup power supply which takes over immediately if the primary power supply fails.

Remote

Remote is used during configuration to identify remote Sources and Destinations. Remote Sources and Destinations are inputs and outputs not physically connected to the Series 7000 System using the related configuration file. These remote Sources and Destinations are controlled over a network.

Reserved

Tieline status where a reservation is required to use a specified Tieline. See *First Come First Served (FCFS)*.

Reset

See reboot.

Resource Group

A resource group is an association of machine control devices all within a single work area.

RGB (Red, Green & Blue)

The three primary colors used in video processing, often referring to the three un-encoded outputs of a color camera. *See GBR (Green, Blue & Red)*.

ROM

Read Only Memory.

Room

A group of Destinations (usually a physical studio or control room within a facility) to which machine control and tally assignments can be made by an automated facility control system or the GUI Assignments menu. An assignment made to one Destination in a room allows control by any of the Destinations in that room.

RP

Rear Panel. RPs are special connector channels that support the various mezzanine boards. They are attached to the back of the stand-alone Control Frame according to which mezzanines are on the associated CIF module.

RS-232 or RS-232C

A serial data communications standard. RS-232C is a low-speed serial interface which uses a single-ended (unbalanced) interconnection scheme. Commonly used in telecommunications to connect computers and terminals to modems and other devices. The C suffix refers to the version of the RS-232 standard.

RS-485

A high-speed serial interface connection between data communications equipment. RS-485 specifies the characteristics of a balanced (differential) multipoint transceiver/receiver interface.

RU

Rack Unit. See *Rack Unit (RU)*.

Salvo (SVO)

A named, system-wide Preset which, when executed, may change crosspoints on one or more Destinations at the same time.

Salvo Elements

The individual take commands (Source to Destination connections) which comprise a Salvo.

Salvo Permission Set

User-determined set of Salvos permitted to be controlled by a specific panel. If used, Salvo Permission Sets are included in a Panel Template before the template is downloaded to a particular control panel. A single Salvo Permission Set may be used by more than one panel template.

SCP

Simple Control Panel.

SDP

Single Destination Paging control panel.

SDV

Serial Digital Video.

SERIM

Serial Interface Module.

SID

Source Identification panel.

Slave

Component in a system that does not act independently, but only under the control of another component.

Slice

A group of inputs and outputs assigned to a Controller.

SLIP

Serial Line Internet Protocol. Used only in SMS-V64x64 Systems to communicate with the GUI.

SMS

Signal Management System.

Source

Software defined, can be made up of one or more inputs on one or more Levels (i.e., a Source may consist of one input on the video Level and two inputs [left and right] on the audio Level). Two different Sources may share one or more inputs on one or more Levels. For example, if the Source **BARSTONE** (Bars, Tone) consists of a video and an audio input connected to a Color bar generator, BarsSil (Bars, Silent) can use the same video input.

Source Exclusion

This provides a means for limiting system access to specified sources on a Destination by Destination basis. Also, it prevents the inadvertent transmission of material that might be inappropriate for a specified Destination. Source Exclusion is applicable to all Levels on which a specified Source appears. Multiple Sources shall be excluded for single or multiple Destinations.

SMPTE

Society of Motion Picture and Television Engineers.

SRC

Source. See *Source*.

SS

Secondary Switch. The Series 7000 uses SSs to expand inputs.

Status

The current Source connected to a given Destination on a specific Level (usually the Tally level); sometimes referred to as the on air signal.

STB

Strobe.

Strap

A short conductor used to manually bridge two contact points. Used in Series 7000 Alarm system. Also called a jumper.

STROPCHS

Store Operator Changes.

Submodule

A small circuit board designed to mount on a larger module. Also known as a mezzanine board.

SVO

See *Salvo (SVO)*.

SVR

Server.

System Controller

Another term for the MCPU.

Take

Direct, immediate switching from one Source to another, occurring during the vertical interval for clean transition. The control operation which switches a Source or Sources to a Destination.

Tally

An acknowledgment returned to a control panel or terminal that an operation has been executed.

Tally Level, Active

Initially set to the default tally level, the active tally level will tally if the default tally level is not defined for the Destination assigned to a bus. In the UCP,MB8, and Client panels, the name(s) of this/these Level(s) appear(s) in the status display(s) at the start of the IDENT function.

Tally Level, Default

Set during Configuration, this level is the default Level that will tally in panel displays if no other Level tally is activated by control panel operation. In the UCP, MB8, and Server panels, the name of this Level appears in the Preset display at the start of the IDENT function.

Tally Modules

Circuit modules, housed in Grass Valley MAX Series frames, which use opto-isolated inputs and relay closure outputs to facilitate visual or aural tally indicators within a facility. For example, when a Source machine is selected on a Destination, the returned tally could light a lamp to let the machine operator know that a machine was in use.

TCI

Terminal Computer Interface.

Terminate, Termination

To complete a circuit by connecting a resistive load to it. A video termination is typically a male BNC connector which contains a 75-ohm resistive load.

TieLine

A physical connection used to give a Destination connected to the output of one matrix access to Source equipment connected to the input of another matrix. A signal which passes through 2 or more matrices; more specifically the path (consisting of 1 or more Tie Wires) which links a Destination of one matrix to a Source of another matrix. Tielines are established during system configuration.

TieLine Type

Is the Level created to be assigned to one end of a TieLine. Each TieLine must have two TieLine Types, one for each end.

Tie Wire

A physical cable which links the output of one matrix to the input of another matrix. One or more tie wires comprise a tie line.

Time Code

Timing code laid down on video tape to give each frame a unique number to ensure exact transitions during editing.

Timing Scatter

The temporal range of the different electrical lengths of router paths.

TLYLVL

Tally Level.

TM

Tally Module.

Toggle

To switch back and forth between two settings.

Twisted Pair

A cable composed of two small insulated conductors twisted together without a common covering.

UART

Universal Asynchronous Receiver Transmitter.

UCP

Universal Control Panel.

UMD

Under Monitor Display.

VI

Vertical Interval.

Virtual Matrix

Virtual Matrices can be used to fragment a Physical Matrix. Inputs and Outputs within a Virtual Matrix need not be contiguous. Only Destinations with Outputs in a given Virtual Matrix will be able to directly, without using a TieLine, access the Sources within that Virtual Matrix. As an example of their functionality, Virtual Matrices, working with control Levels, allow you set up selected Inputs and Outputs to handle R, G, B video signals by assigning each component to its own Virtual Matrix. Extending this example, if you assign the R, G, and B Virtual Matrices to the same control Level, they will always switch together as a married block; if you assign the R component Virtual Matrix to one Level, and the G and B Virtual Matrices to a second Level, you would then be able to break the R component away from the other two by selecting to control only the R Virtual Matrix associated Level at the control panel.

VISS

Video Input Source Select.

VITC

Vertical Interval Time Code.

VOM

Video Output Monitor

VSD

Visual Status Display.

VT100

A standard protocol for dumb terminals. VT100 terminals may be used for router diagnostics.

Warm Start

A boot from power on, where the CPU and peripherals are already powered up (warm).

A warm boot might be performed after a software crash or a hardware reset.‘

WO

Which block of Outputs.

XPT

See Crosspoint.

YUV

A type of video which employs luminance (Y) and two color components (U [B-Y] and V [R-Y]).

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