9970-QS-MC

3G/HD/SD-SDI/CVBS Expandable Master Control Multiviewer with Advanced On-Screen Graphics

Product Manual

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9970-QS-MC-OM (V1.3)

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Congratulations on choosing the Cobalt® 9970-QS-MC 3G/HD/SD-SDI/CVBS Expandable Master Control Multiviewer with Advanced On-Screen Graphics. The 9970-QS-MC is part of a full line of modular processing and conversion gear for broadcast TV environments. The Cobalt Digital Inc. line includes video decoders and encoders, audio embedders and de-embedders, distribution amplifiers, format converters, remote control systems and much more. Should you have questions pertaining to the installation or operation of your 9970-QS-MC, please contact us at the contact information on the front cover.

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Chapter 1

Introduction

Overview

This manual provides installation and setup instructions for the 9970-QS-MC 3G/HD/SD-SDI/CVBS Expandable Master Control Multiviewer with Advanced On-Screen Graphics card (also referred to herein as the 9970-QS-MC).

This manual consists of the following chapters:

- **Chapter 1, "Introduction"** – Provides information about this manual and what is covered. Also provides general information regarding the 9970-QS-MC.
- **Chapter 2, "Installation"** – Provides instructions for installing the 9970-QS-MC in a frame, and connecting signal and control cabling to the 9970-QS-MC.
- **Chapter 3, "Setup Instructions"** – Provides overviews of setup operating controls and instructions for setting up the 9970-QS-MC to integrate within its signal flow environment.

This chapter contains the following information:

- **9970-QS-MC Card Software Versions and this Manual (p. 1-2)**
- **Manual Conventions (p. 1-3)**
- **Safety and Regulatory Summary (p. 1-5)**
- **9970-QS-MC Functional Description (p. 1-6)**
- **Technical Specifications (p. 1-17)**
- **Warranty and Service Information (p. 1-19)**
- **Contact Cobalt Digital Inc. (p. 1-20)**

9970-QS-MC Card Software Versions and this Manual

When applicable, Cobalt Digital Inc. provides for continual product enhancements through software updates. As such, functions described in this manual may pertain specifically to cards loaded with a particular software build.

The Software Version of your card can be checked by viewing the **Card Info** menu in DashBoard™. See Checking 9970-QS-MC Card Information (p. 3-6) in Chapter 3, “Operating Instructions” for more information. You can then check our website for the latest software version currently released for the card as described below.

Note: Not all functionality described in this manual may appear on cards with initial software versions.

Check our website and proceed as follows if your card’s software does not match the latest version:

Card Software **earlier** than latest version	Card is not loaded with the latest software. Not all functions and/or specified performance described in this manual may be available. You can update your card with new Update software by going to the **Support>Firmware Downloads** link at www.cobaltdigital.com. Download “Firmware Update Guide”, which provides simple instructions for downloading the latest firmware for your card onto your computer, and then uploading it to your card through DashBoard™. **Software updates are field-installed without any need to remove the card from its frame.**
Card Software **newer** than version in manual	A new manual is expediently released whenever a card’s software is updated **and specifications and/or functionality have changed** as compared to an earlier version (a new manual is not necessarily released if specifications and/or functionality have not changed). A manual earlier than a card’s software version may not completely or accurately describe all functions available for your card. If your card shows features not described in this manual, you can check for the latest manual (if applicable) and download it by going to the card’s web page on www.cobaltdigital.com.

Cobalt Reference Guides

From the Cobalt® web home page, go to **Support>Reference Documents** for easy to use guides covering network remote control, card firmware updates, example card processing UI setups and other topics.

Manual Conventions

In this manual, display messages and connectors are shown using the exact name shown on the 9970-QS-MC itself. Examples are provided below.

- Card-edge display messages are shown like this:

  Ch01

- Connector names are shown like this: **SDI IN A**

In this manual, the terms below are applicable as follows:

- **9970-QS-MC** refers to the 9970-QS-MC 3G/HD/SD-SDI/CVBS Expandable Master Control Multiviewer with Advanced On-Screen Graphics card.
- **Frame** refers to the HPF-9000, OG3-FR, 8321, or similar 20-slot frame that houses Cobalt® or other cards.
- **Device** and/or **Card** refers to a Cobalt® or other card.
- **System** and/or **Video System** refers to the mix of interconnected production and terminal equipment in which the 9970-QS-MC and other cards operate.
- Functions and/or features that are available only as an option are denoted in this manual like this:

  Option

Warnings, Cautions, and Notes

Certain items in this manual are highlighted by special messages. The definitions are provided below.

Warnings

Warning messages indicate a possible hazard which, if not avoided, could result in personal injury or death.

Cautions

Caution messages indicate a problem or incorrect practice which, if not avoided, could result in improper operation or damage to the product.

Notes

Notes provide supplemental information to the accompanying text. Notes typically precede the text to which they apply.

Labeling Symbol Definitions

	Important note regarding product usage. Failure to observe may result in unexpected or incorrect operation.
	Electronic device or assembly is susceptible to damage from an ESD event. Handle only using appropriate ESD prevention practices. If ESD wrist strap is not available, handle card only by edges and avoid contact with any connectors or components.
	Symbol (WEEE 2002/96/EC) For product disposal, ensure the following: • Do not dispose of this product as unsorted municipal waste. • Collect this product separately. • Use collection and return systems available to you.

Safety and Regulatory Summary

Warnings

! WARNING ! **To reduce risk of electric shock do not remove line voltage service barrier cover on frame equipment containing an AC power supply. NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.**

Cautions

CAUTION **This device is intended for environmentally controlled use only in appropriate video terminal equipment operating environments.**

CAUTION **This product is intended to be a component product of an openGear® frame. Refer to the openGear® frame Owner's Manual for important safety instructions regarding the proper installation and safe operation of the frame as well as its component products.**

CAUTION **Heat and power distribution requirements within a frame may dictate specific slot placement of cards. Cards with many heat-producing components should be arranged to avoid areas of excess heat build-up, particularly in frames using only convection cooling. The 9970-QS-MC has a moderate power dissipation (<18 W). As such, avoiding placing the card adjacent to other cards with similar dissipation values if possible.**

CAUTION **If required, make certain Rear I/O Module(s) is installed before installing the 9970-QS-MC into the frame slot. Damage to card and/or Rear I/O Module can occur if module installation is attempted with card already installed in slot.**

CAUTION **If card resists fully engaging in rear I/O module mating connector, check for alignment and proper insertion in slot tracks. Damage to card and/or rear I/O module may occur if improper card insertion is attempted.**

CAUTION **The 9970-QS-MC FPGA is designed for a normal-range operating temperature around 85° C core temperature. Operation in severe conditions exceeding this limit for non-sustained usage are within device operating safe parameters, and can be allowed by setting this control to Disable. However, the disable (override) setting should be avoided under normal conditions to ensure maximum card protection.**

EMC Compliance Per Market

Market	Regulatory Standard or Code
United States of America	FCC "Code of Federal Regulations" Title 47 Part15, Subpart B, Class A
Canada	ICES-003
International	CISPR 24:2010 IEC 61000-4-2:2008 IEC 61000-4-3:2006 with A1:2007 and A2:2010 IEC 61000-4-4:2004 IEC 61000-4-6:2008 IEC 61000-6-3:2006 with A1:2010 CISPR 22:2008

9970-QS-MC Functional Description

Figure 1-1 shows a functional block diagram of the 9970-QS-MC. The 9970-QS-MC includes input processing functions to accommodate SDI and CVBS analog inputs, a validity check function to provide indication of input defects, timecode and audio data handling and routing control, multi-split ARC/scaling functions, a timing alignment function to synchronize the inputs to house reference, up to 5:1 Picture-in-Picture (PiP) video combining, and burn-in attributes and control of borders, UMD display text, audio meters, and other accessory displays. The output is available as a 2x DA 3G/HD/SD-SDI output or HDMI/DVI. The output raster format and aspect ratio is user-configurable.

9970-QS-MC Program Video Input/Output Formats

The 9970-QS-MC provides the following inputs and outputs:

- **Inputs:**
  - **SDI/CVBS IN A** thru **SDI/CVBS IN E** – five coaxial video inputs (auto-detecting 3G/HD/SD-SDI or CVBS analog video)
- **Outputs:**
  - **3G/HD/SD-SDI OUT** – 2x DA 3G/HD/SD-SDI multi-image video outputs
  - **HDMI/DVI OUT** – Multi-image HDMI/DVI out with selectable audio embedding (suitable for direct connection to monitor panels)

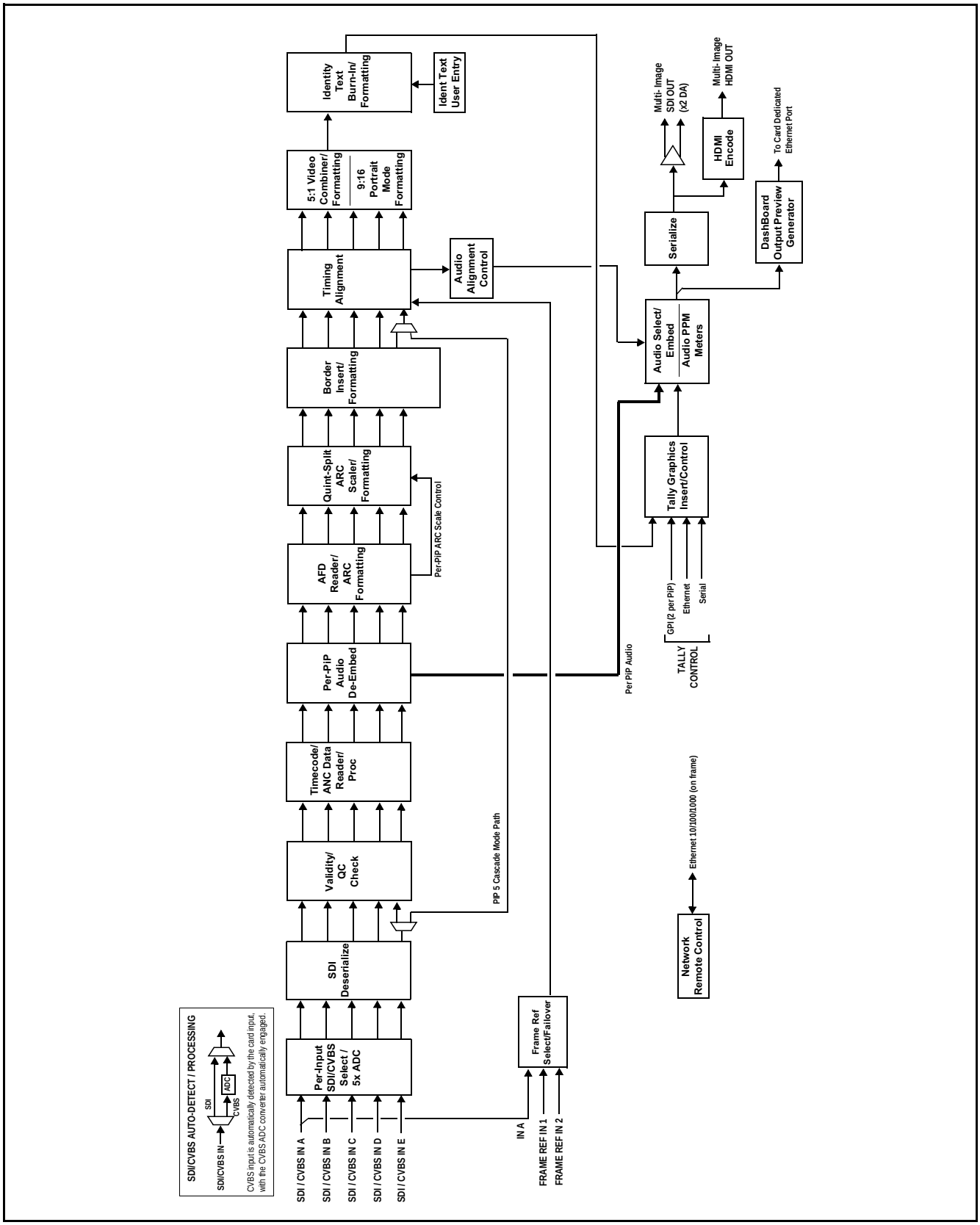


Figure 1-1 9970-QS-MC Functional Block Diagram

Video Processing Description

The 9970-QS-MC features input select and validity check functions, timing alignment, and PiP ARC/scaling functions as described below.

Input Video Select Function

Auto-detect per PiP inputs independently set each of the card video inputs as 3G/HD/SD-SDI or CVBS SD analog video. Either mode preserves waveform and packet-based ancillary data for extraction and usage later in the card processing chain. A CVBS input is automatically detected by the card input, with the CVBS ADC converter automatically engaged in these cases.

Video Quality Events Detect Function

A video quality check function provides a **Video Quality Events** user interface and an **Event Triggers** user interface for setting an area of concern across the program raster which can be monitored for frozen or black video events. Threshold controls allow setting the sensitivity of the function, while engage and disengage threshold timing controls allow setting how fast the event detection engages and releases when triggered. The **Event Triggers** user interface allows instructing the card as to the action to take upon an event (such as invoke a PiP border color change indicating a quality error).

Timecode Processor

This function provides for extraction of timecode data from any of the five per-PiP input video sources, and in turn allows timecode strings to be burned into the respective PiP images. The function can monitor any of the video inputs of the card for supported timecode formats such as HD ATC_LTC or ATC_VITC, and ATC_VITC or VITC waveform for SD SDI or CVBS inputs. LTC timecode can be received by the card serial port.

ARC Processor

This function provides separate ARC controls for each PiP input. The separate controls can re-aspect SD to match the aspecting used for HD inputs, and vice versa. Custom aspecting is also available for both HD and SD formats.

Quint-Split ARC Scaler/Formatting Function

This function provides conversion of each PiP input to match a common user-selected format, resulting in images that are format-matched and suitable for combining into a single PiP image. When the PiP images are sized by this function, the borders and other accessory attributes are now integrated into each PiP image. In addition to full user control of PiP image H/V sizing, accessory attributes such as border size, weight, and color can be user configured.

Quint Timing Alignment Function

This function provides for frame alignment control of the five PiP inputs using either one of two external **FRAME REF IN (1,2)** reference signals distributed with the card frame, or a selected input video as a frame reference. As such, the card can accommodate asynchronous program video inputs.

This function also allows frame offset delay to be added between the output video and the frame sync reference. Frame sync can select from either of two card frame reference sources, input video, or free-run (internal) timing. Selectable failover allows alternate reference selection should the initial reference source become unavailable or invalid.

5:1 Video Combiner/Formatting Function

This function combines the five video images into the user-configured positions within the overall image. At this point, all PiP images are of the same raster format and fully synchronous. User positioning controls provide the H and V offsets that position the images as desired by the operator using the DashBoard controls.

The 9970-QS-MC provides the ability to orient and arrange PIPs in columns arranged for a 9x16 “portrait” layout. This allows consumer or professional monitors to be oriented “on-end”, thereby saving wall-width in any area (especially in space-conscious mobile environments).

Identity Text Burn-In/Formatting Function

This function provides user controls for entering UMD and user ident text that is burned into each PiP image. Controls allow full control of positioning, sizing, and color/background/opacity attributes. Burn-in text can be user entry text, video format of the corresponding PiP, wall-time clock, or external text sourced via IP from an automation system.

Tally Graphics Insert/Control

This function accommodates tally inputs (received as GPI, serial, or network commands) and allows configuring the commands to provide tally indications for each PiP image. All visual attributed are configurable, including “lamp” color, size, and positioning. Tally activation can also be controlled via IP from an automation system/router. UMD text can be inserted using local user text entry or integrated with router automation to receive text from the automation system.

GPI/Event-Based Control

Up to five GPI inputs are available to control display attributes such as tally and border activation and color. GPI inputs can also be used to control insertion and attributes of user text insertion. Any combination of the GPI inputs can be set up to provide binary words of up to 16 combinations to define unique conditions tied to a specific word value (using “virtual” GPIs comprised of bit states for any of the discrete GPI inputs). Coding settings allow true conditions upon level or edge-triggered conditions.

Display attributes (such as border colors, ident text, and tally control) can also be controlled using internal intelligent event triggers, which provides attribute control based off of detected signal conditions.

Output Preview via Network Connection

A DashBoard Output Preview function provides the display of regularly-sampled screen captures in the card DashBoard remote control page. This provides remote-access program video content/presence and multiviewer layout confidence monitoring via the card’s DashBoard display without needing collocation with the card or its input or output video signals.

When the card is acquiring frame captures (either 5-second periodic-updated continuous images or single frame (user selectable)), the area on the bottom of the DashBoard page displays the multiviewer image of the input video PiPs. DashBoard acquires program video frame captures using an external network connection from a card rear module Ethernet port to the network/computer hosting the card’s DashBoard connection. (DashBoard “learns” the card’s IP address. When preview is requested, DashBoard queries the card address for the image, with the image transferred via the card rear module Ethernet connection.)

Note: This function operates only if the card is set to provide a **progressive** video output (e.g., 720p, 1080p, etc.).

User Graphic Insertion

(See Figure 1-2.) A User Graphic insertion function provides for graphic insertion onto the SDI processed output raster of the host card/device. The allows for uploading your .png image graphic file to the card/device memory. to the host card/device. (png files are converted to a special format using a web tool before uploading; this is described in the setup/operating instructions “User Graphic Overlay (Logo) Insertion Controls” in Chapter 3 – Setup Instructions.)

When the image file(s) is uploaded to the card/device, its insertion can be enabled via DashBoard Event Setup controls that enable the graphic insertion only under certain conditions as desired. DashBoard controls allow for positioning the image within the active video.

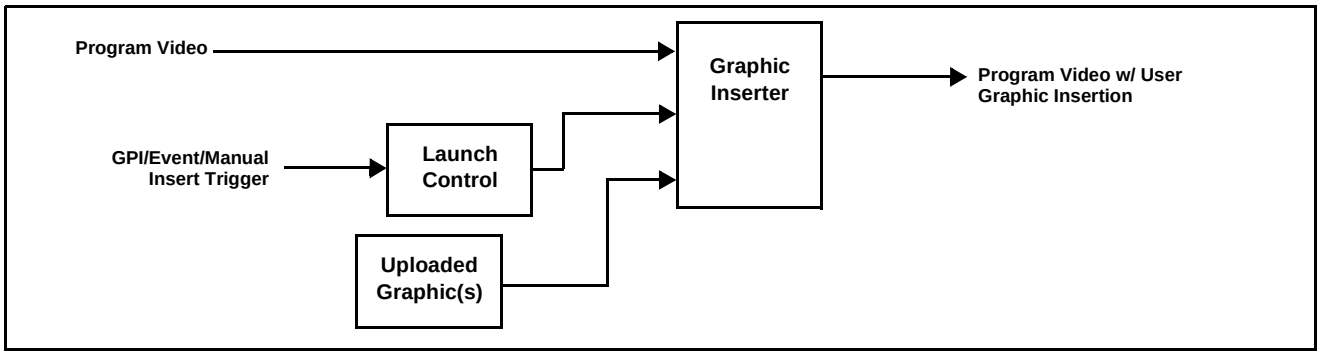


Figure 1-2 Graphic Insertion Simplified Functional Diagram

Audio Processor Description

Audio Select/Embed

The audio processor operates as an internal audio router for selecting PiP-input embedded channels 1-16 as channels (as a four-group package) to be embedded into the combined PiP SDI and HDMI video outputs. The audio processor function operates with the timing alignment function to align audio with the selected reference.

Note:
- Output audio always corresponds to a single particular selectable PiP input. Various output embedded channels cannot be sourced from a mix of various PiP input embedded channels.
- To maintain conformance with CEA-861D HDMI audio channel line-up specifications and industry standard SDI convention, the HDMI output swaps between the C and LFE channels for the HDMI output.

Audio Events Detect Function

An audio quality check function provides a **Audio Detect Events** user interface and an **Event Triggers** user interface for checking user-selected channels to detect audio silence conditions. The **Event Triggers** user interface in turn allows instructing the card as to the action to take upon an event (such as activate a GPO or send an automated email).

Per-PiP Audio PPM Meters

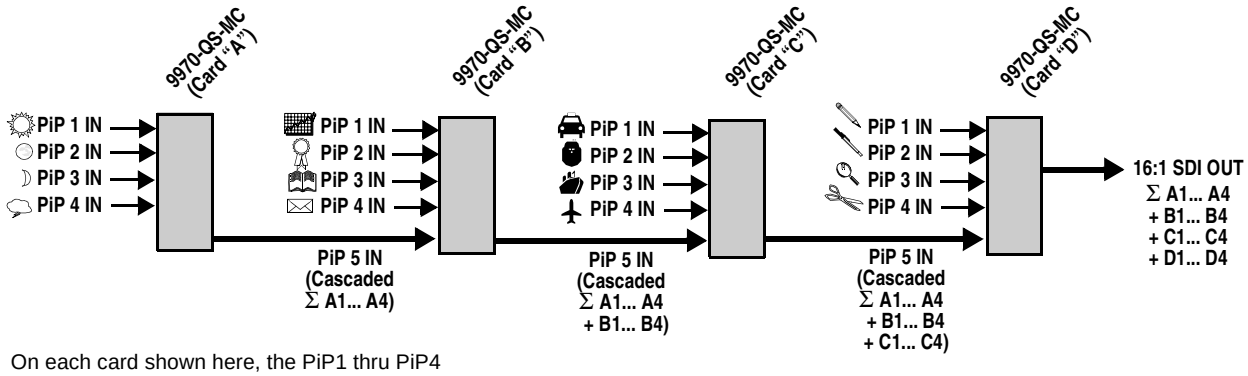
Each PiP image area has setup controls to provide audio meters in several formats (channel count) as desired. Each PiP image has an audio meter display that can display from 2-bar stereo up to all four embedded audio groups for the audio associated with the PiP input. User controls allow setting meter complement, position, size, and other graphic attributes.

Cascading (Multi-Card) 9970-QS-MC Operation and Setup Overview

(See Figure 1-3.) The 9970-QS-MC **PIP 5** input is ideally suited to allow multiple 9970-QS-MC cards to operate in a **cascading** arrangement, where four of the card inputs serve as program video inputs local to the card, and the fifth input receives the cascading combined layout of a preceding 9970-QS-MC card in a daisy-chain arrangement. In this mode, the **PIP 5** input is configured to serve as a full-size underlay with **PIP 1** thru **PIP 4** being overlays. In this manner, added PiPs can be positioned within the imported underlay resulting in a combined image of the imported underlay PiPs and the locally added PiPs.

Cascading Low-Latency Operation

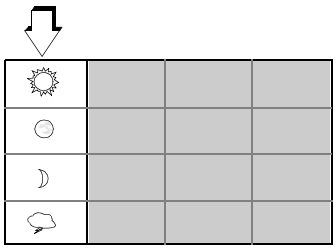
Low-latency modes provide for reducing card I/O latency by bypassing the cascade input framesync. Low-latency modes apply framesyncing when needed (applying framesync and bypassing low-latency during these intervals). When alignment is again detected by the local card, framesyncing is correspondingly disabled and low-latency operation is again applied.



On each card shown here, the PiP1 thru PiP4 inputs on the repective card can be considered **local** inputs, and the PiP5 input on cards B thru D considered **cascade** inputs.

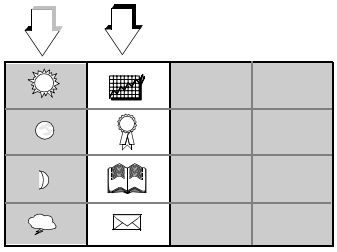
Card "A" has its controls set to position PiP1 thru PiP4 in the **1st** (left-most) column of a 4-column grid.

The card "A" output is fed to card "B" as the PiP5 full-sized **cascading** input, which serves as an underlay that rests underneath any added PiPs.



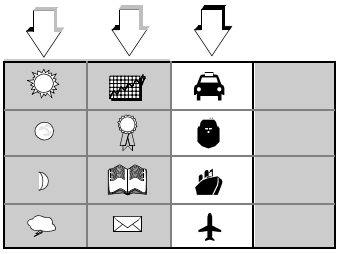
Card "B" has its controls set to position its PiP1 thru PiP4 inputs in the **2nd** column of a 4-column grid.

Along with the full-sized cascading underlay of preceding card "A", eight PiPs are now positioned in the two resulting columns.



Card "C" has its controls set to position its PiP1 thru PiP4 inputs in the **3rd** column of a 4-column grid.

Along with the full-sized cascading underlay of preceding cards "A" and "B", 12 PiPs are now positioned in the three resulting columns.



Card "D" has its controls set to position its PiP1 thru PiP4 inputs in the **4th** column of a 4-column grid.

Along with the full-sized cascading underlay of preceding cards "A" thru "C", all 16 PiPs are now positioned in the four resulting columns. This provides the 16:1 multiviewer layout using four cards ("A" thru "D") in a cascaded form.

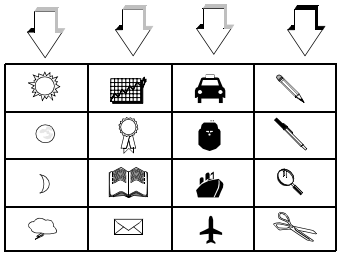


Figure 1-3 Cascaded 9970-QS-MC Example 16:1 Setup and Overview

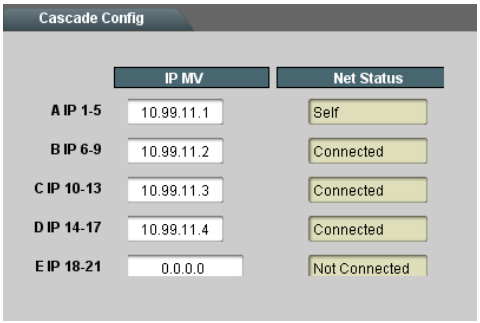
Cascade Config (Configurator) DashBoard Control Consolidation

(See Figure 1-4.) The **Cascade Config** DashBoard tabs and multi-card network connection allows cascade chain network-connected 9970-QS-MC cards to communicate with each other and expose settings and attributes from all of the cards within the chain. In this setup, each card will “see” the other cards in the network chain connection, with access to PiP controls for all PiPs from any card within the chain. Cascade Config consolidated control can span card chains within a frame or across multiple frames.

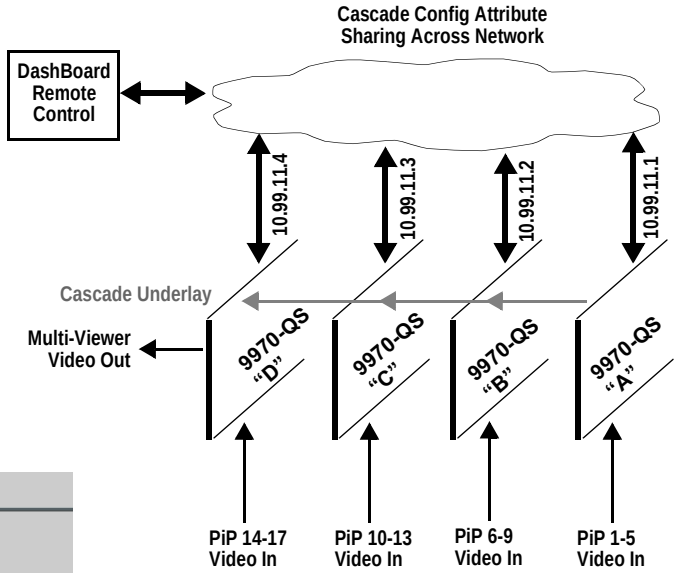
This global consolidation allows setup control of any of the PiPs from one card. Settings can be performed on one PiP, and then be cloned across as many PiPs in the chain as desired. This removes the need to set up each card individually, with settings manually repeated for several cards. It also allows presets that can “look at” and set up all the cards in the chain from a single preset.

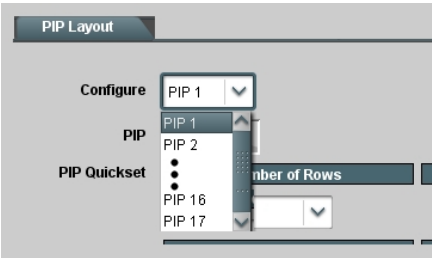
Cascade Config DashBoard tabs and multi-card card network connection allows cascade chain network-connected 9970-QS cards (9970-QS cards “A” thru “D” in this example) to communicate with each other and centrally expose setup attributes of all of the cards within the chain.

Cascade Config is designed to use the first card as a full quint-split processor, with subsequent cards in the chain taking in the cascade underlay as **In E** and additional PiP inputs as **In A** thru **In D**. In this example, a 17-input multiviewer is attained (four cards providing 5+4+4+4 = 17 input channels).



9970-QS cards within the chain (equipped with Ethernet-port rear modules) are connected to a shared network. This allows the cards to “see” each other, with each card exposing control attributes for **all** the cards.





For each per-PiP control, the result is **all** PiPs within the chain being exposed, allowing settings to be performed from **any** of the cards and cloned to any card as desired. User presets can encompass all cards in the chain and be invoked in a single action done at one card.

SCPD2014-24

Figure 1-4 Example Cascade Config Connection and Functionality

User Control Interface

Figure 1-5 shows the user control interface options for the 9970-QS-MC. These options are individually described below.

Note: All user control interfaces described here are cross-compatible and can operate together as desired. Where applicable, any control setting change made using a particular user interface is reflected on any other connected interface.

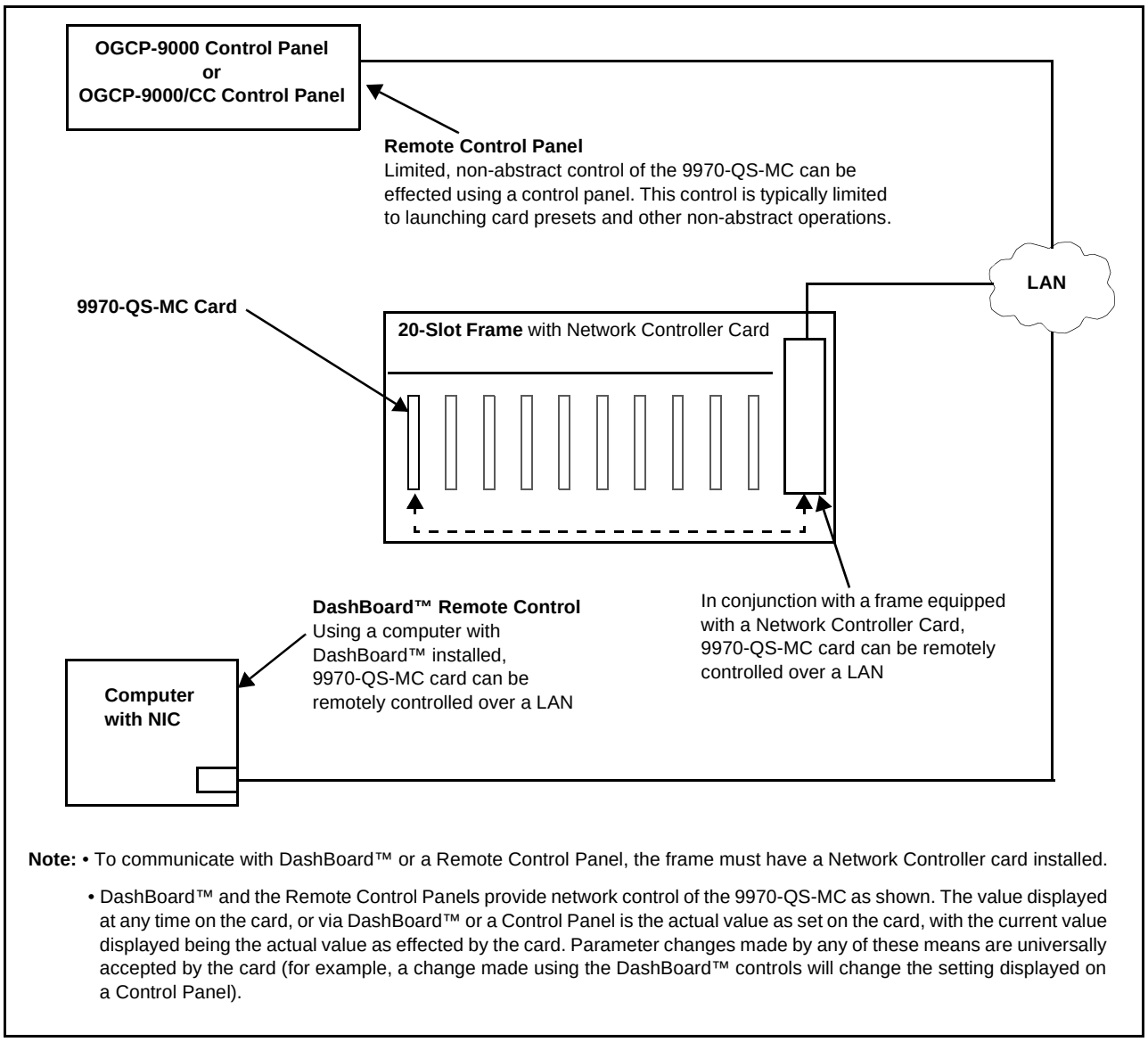
- **DashBoard™ User Interface** – Using DashBoard™, the 9970-QS-MC and other cards installed in openGear®[1] frames can be controlled from a computer and monitor.

  DashBoard™ allows users to view all frames on a network with control and monitoring for all populated slots inside a frame. This simplifies the setup and use of numerous modules in a large installation and offers the ability to centralize monitoring. Cards define their controllable parameters to DashBoard™, so the control interface is always up to date.

  The DashBoard™ software can be downloaded from the Cobalt Digital Inc. website: www.cobaltdigital.com (enter “DashBoard” in the search window). The DashBoard™ user interface is described in Chapter 3,“Setup Instructions”.

- **Cobalt® OGCP-9000 and OGCP-9000/CC Remote Control Panels** – The OGCP-9000 and OGCP-9000/CC Remote Control Panels are not intended to be used for PiP sizing and other visual abstract configuration aspects. However, the control panel can be used as a convenient “one-button” control surface for launching non-abstract functions such as a user preset that invokes setups such as PiP splits and other presets.

1. openGear® is a registered trademark of Ross Video Limited. DashBoard™ is a trademark of Ross Video Limited.



Note: • To communicate with DashBoard™ or a Remote Control Panel, the frame must have a Network Controller card installed.

• DashBoard™ and the Remote Control Panels provide network control of the 9970-QS-MC as shown. The value displayed at any time on the card, or via DashBoard™ or a Control Panel is the actual value as set on the card, with the current value displayed being the actual value as effected by the card. Parameter changes made by any of these means are universally accepted by the card (for example, a change made using the DashBoard™ controls will change the setting displayed on a Control Panel).

Figure 1-5 9970-QS-MC User Control Interface

Note: If network remote control is to be used for the frame and the frame has not yet been set up for remote control, Cobalt® reference guide **Remote Control User Guide (PN 9000RCS-RM)** provides thorough information and step-by-step instructions for setting up network remote control of Cobalt® cards using DashBoard™. (Cobalt® OGCP-9000 and OGCP-9000/CC Remote Control Panel product manuals have complete instructions for setting up remote control using a Remote Control Panel.)

Download a copy of this guide by clicking on the **Support>Reference Documents** link at www.cobaltdigital.com and then select DashBoard Remote Control Setup Guide as a download, or contact Cobalt® as listed in Contact Cobalt Digital Inc. (p. 1-20).

9970-QS-MC Rear I/O Modules

The 9970-QS-MC physically interfaces to system video connections at the rear of its frame using a Rear I/O Module. All inputs and outputs shown in the 9970-QS-MC Functional Block Diagram (Figure 1-1) enter and exit the card via the card edge backplane connector. The Rear I/O Module breaks out the 9970-QS-MC card edge connections to BNC and other connectors that interface with other components and systems in the signal chain.

The full assortment of 9970-QS-MC Rear I/O Modules is shown and described in 9970-QS-MC Rear I/O Modules (p. 2-4) in Chapter 2, “Installation and Setup”.

Technical Specifications

Table 1-1 lists the technical specifications for the 9970-QS-MC 3G/HD/SD-SDI/CVBS Expandable Master Control Multiviewer with Advanced On-Screen Graphics card.

Table 1-1 Technical Specifications

Item	Characteristic
Part number, nomenclature	9970-QS-MC 3G/HD/SD-SDI/CVBS Expandable Master Control Multiviewer with Advanced On-Screen Graphics
Installation/usage environment	Intended for installation and usage in frame meeting openGear™ modular system definition
Power consumption	< 18 Watts maximum
Installation Density	Up to 10 cards per 20-slot frame
Environmental: Operating temperature: Relative humidity (operating or storage):	 32° – 104° F (0° – 40° C) < 95%, non-condensing
Frame communication	10/100/1000 Mbps Ethernet with Auto-MDIX
Indicators	Card edge display and indicators as follows: • 4-character alphanumeric display • Status/Error LED indicator • Input Format LED indicator
Program Video Input	Five video inputs, auto-detecting CVBS or 3G/HD/SD-SDI Data Rates Supported: SMPTE 424M, 292M, SMPTE 259M-C (Inputs C thru E also support SMPTE 425 Level B)

Table 1-1 Technical Specifications — continued

Item	Characteristic
Program Video Input (cont.)	Impedance: 75 Ω terminating Receive Cable Length: 3G/HD/SD-SDI: 120/180/320 m (Belden 1694A) Return Loss (SDI): > 15 dB up to 1.485 GHz > 10 dB up to 2.970 GHz
Serial Digital PiP Video Output	Number of Outputs: Two 3G/HD/SD-SDI BNC Impedance: 75 Ω Return Loss: > 15 dB at 5 MHz – 270 MHz Signal Level: 800 mV ± 10% DC Offset: 0 V ± 50 mV Jitter (3G/HD/SD): < 0.3/0.2/0.2 UI
SDI Input-Output Latency (720p5994)	Basic I/O latency < 1.5 frames (max) PiP channel derived from cascaded preceding-card output consists of source card basic delay with < 2 line added delay.
HDMI PiP Video Output	HDMI CEA-861D
GPIO	GPI and GPO; opto-isolated GPO Specifications: Max I: 120 mA Max V: 30 V Max P: 120 mW GPI Specifications: GPI LO @ Vin < 1.5 V GPI HI @ Vin > 2.3 V Max Vin: 9 V
Frame Reference Input	Number of Inputs: Two non-terminating (looping) Frame Reference inputs with selectable failover Standards Supported: SMPTE 170M/318M (“black burst”) SMPTE 274M/296M (“tri-level”) Return Loss: > 35 dB up to 5.75 MHz

Warranty and Service Information

Cobalt Digital Inc. Limited Warranty

This product is warranted to be free from defects in material and workmanship for a period of five (5) years from the date of shipment to the original purchaser, except that 4000, 5000, 6000, 8000 series power supplies, and Dolby® modules (where applicable) are warranted to be free from defects in material and workmanship for a period of one (1) year.

Cobalt Digital Inc.'s ("Cobalt") sole obligation under this warranty shall be limited to, at its option, (i) the repair or (ii) replacement of the product, and the determination of whether a defect is covered under this limited warranty shall be made at the sole discretion of Cobalt.

This limited warranty applies only to the original end-purchaser of the product, and is not assignable or transferrable therefrom. This warranty is limited to defects in material and workmanship, and shall not apply to acts of God, accidents, or negligence on behalf of the purchaser, and shall be voided upon the misuse, abuse, alteration, or modification of the product. Only Cobalt authorized factory representatives are authorized to make repairs to the product, and any unauthorized attempt to repair this product shall immediately void the warranty. Please contact Cobalt Technical Support for more information.

To facilitate the resolution of warranty related issues, Cobalt recommends registering the product by completing and returning a product registration form. In the event of a warrantable defect, the purchaser shall notify Cobalt with a description of the problem, and Cobalt shall provide the purchaser with a Return Material Authorization ("RMA"). For return, defective products should be double boxed, and sufficiently protected, in the original packaging, or equivalent, and shipped to the Cobalt Factory Service Center, postage prepaid and insured for the purchase price. The purchaser should include the RMA number, description of the problem encountered, date purchased, name of dealer purchased from, and serial number with the shipment.

Cobalt Digital Inc. Factory Service Center

2506 Galen Drive	Office: (217) 344-1243
Champaign, IL 61821 USA	Fax: (217) 344-1245
www.cobaltdigital.com	Email: info@cobaltdigital.com

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Contact Cobalt Digital Inc.

Feel free to contact our thorough and professional support representatives for any of the following:

- Name and address of your local dealer
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Phone:	(217) 344-1243
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Technical Support:	support@cobaltdigital.com

Chapter 2

Installation

Overview

This chapter contains the following information:

- Installing the 9970-QS-MC Into a Frame Slot (p. 2-1)
- Installing a Rear I/O Module (p. 2-3)
- Setting Up 9970-QS-MC Network Remote Control (p. 2-6)

Installing the 9970-QS-MC Into a Frame Slot

CAUTION

Heat and power distribution requirements within a frame may dictate specific slot placement of cards. Cards with many heat-producing components should be arranged to avoid areas of excess heat build-up, particularly in frames using only convection cooling. The 9970-QS-MC has a moderate power dissipation (<18 W). As such, avoiding placing the card adjacent to other cards with similar dissipation values if possible.

CAUTION

	This device contains semiconductor devices which are susceptible to serious damage from Electrostatic Discharge (ESD). ESD damage may not be immediately apparent and can affect the long-term reliability of the device. **Avoid handling circuit boards in high static environments such as carpeted areas, and when wearing synthetic fiber clothing. Always use proper ESD handling precautions and equipment when working on circuit boards and related equipment.**

Note: **If installing the 9970-QS-MC in a slot with no rear I/O module, a Rear I/O Module is required** before cabling can be connected. Refer to Installing a Rear I/O Module (p. 2-3) for rear I/O module installation procedure.

CAUTION

If required, make certain Rear I/O Module(s) is installed before installing the 9970-QS-MC into the frame slot. Damage to card and/or Rear I/O Module can occur if module installation is attempted with card already installed in slot.

Note: Check the packaging in which the 9970-QS-MC was shipped for any extra items such as a Rear I/O Module connection label. In some cases, this label is shipped with the card and to be installed on the Rear I/O connector bank corresponding to the slot location of the card.

Install the 9970-QS-MC into a frame slot as follows:

1. Determine the slot in which the 9970-QS-MC is to be installed.
2. Open the frame front access panel.
3. While holding the card by the card edges, align the card such that the plastic ejector tab is on the bottom.
4. Align the card with the top and bottom guides of the slot in which the card is being installed.
5. Gradually slide the card into the slot. When resistance is noticed, gently continue pushing the card until its rear printed circuit edge terminals engage fully into the rear I/O module mating connector.

CAUTION

If card resists fully engaging in rear I/O module mating connector, check for alignment and proper insertion in slot tracks. Damage to card and/or rear I/O module may occur if improper card insertion is attempted.

6. Verify that the card is fully engaged in rear I/O module mating connector.
7. Close the frame front access panel.
8. Connect the input and output cables as shown in 9970-QS-MC Rear I/O Modules (p. 2-4).
9. Repeat steps 1 through 8 for other 9970-QS-MC cards.

Note: The 9970-QS-MC BNC inputs are internally 75-ohm terminated. It is not necessary to terminate unused BNC inputs or outputs.

Note: To remove a card, press down on the ejector tab to unseat the card from the rear I/O module mating connector. Evenly draw the card from its slot.

10. If network remote control is to be used for the frame and the frame has not yet been set up for remote control, perform setup in accordance with Setting Up 9970-QS-MC Network Remote Control (p. 2-6).

Note: If installing a card in a frame already equipped for, and connected to DashBoard™, no network setup is required for the card. The card will be discovered by DashBoard™ and be ready for use.

Installing a Rear I/O Module

Note: This procedure is applicable **only if a Rear I/O Module is not currently installed** in the slot where the 9970-QS-MC is to be installed.

If installing the 9970-QS-MC in a slot already equipped with a suitable I/O module, omit this procedure.

Install a Rear I/O Module as follows:

1. On the frame, determine the slot in which the 9970-QS-MC is to be installed.
2. In the mounting area corresponding to the slot location, install Rear I/O Module as shown in Figure 2-1.

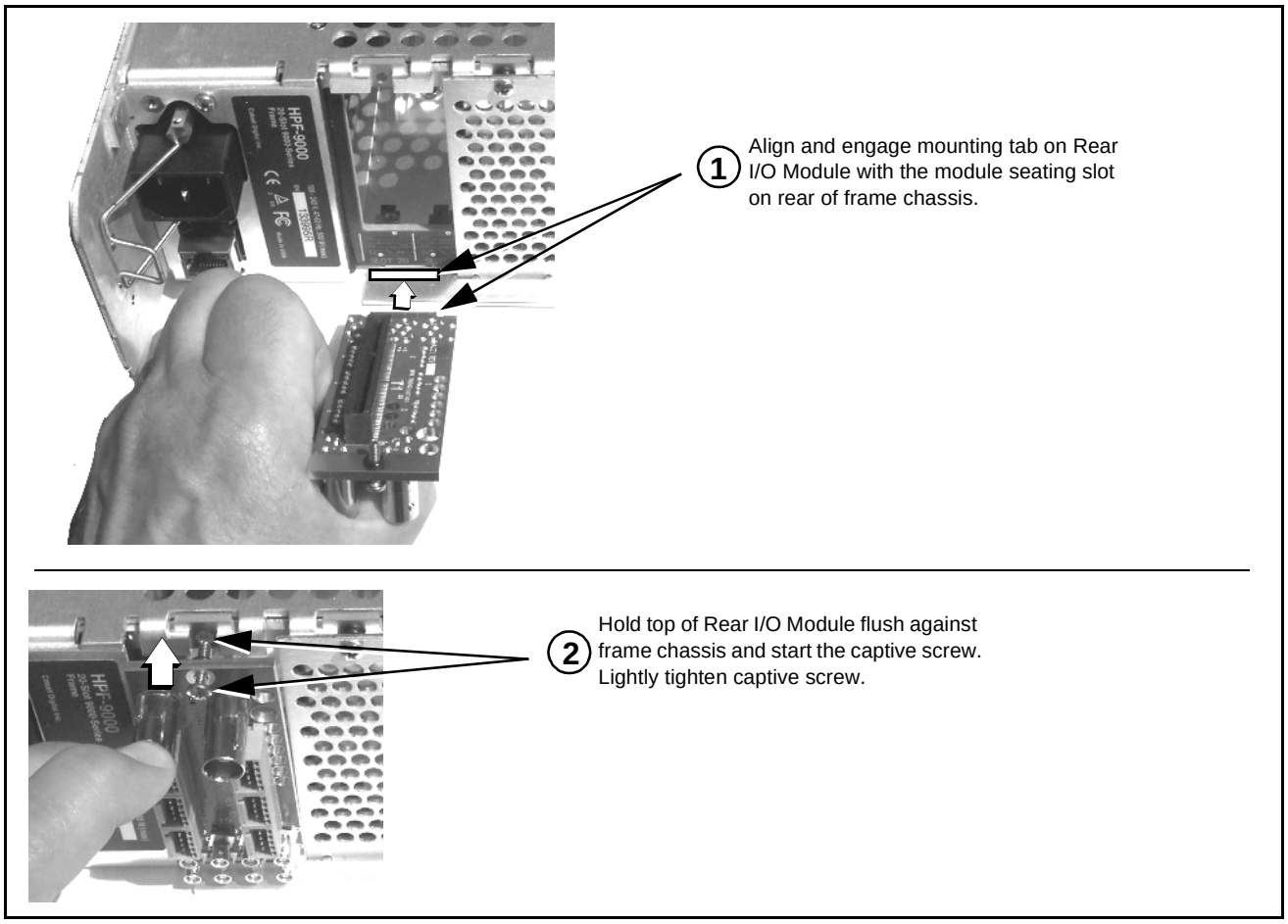


Figure 2-1 Rear I/O Module Installation

9970-QS-MC Rear I/O Modules

Table 2-1 shows and describes the full assortment of Rear I/O Modules specifically for use with the 9970-QS-MC.

Table 2-1 9970-QS-MC Rear I/O Modules

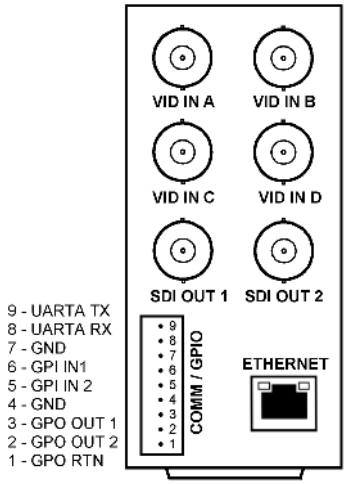
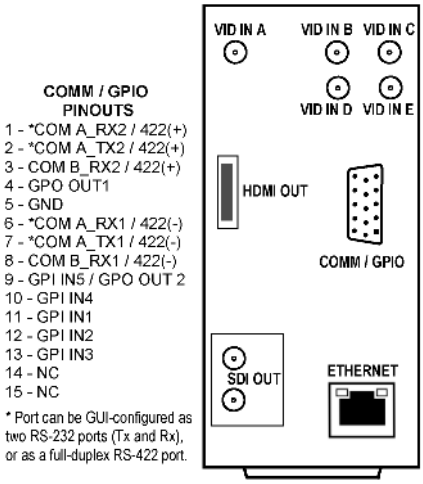
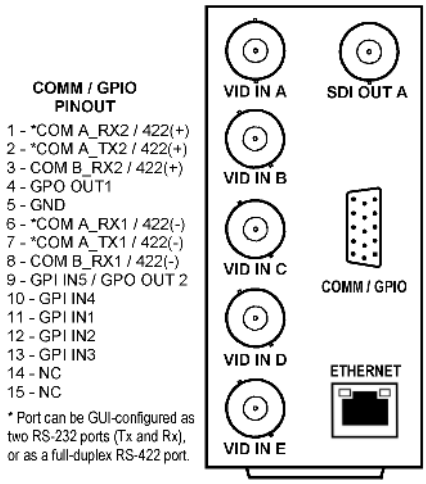
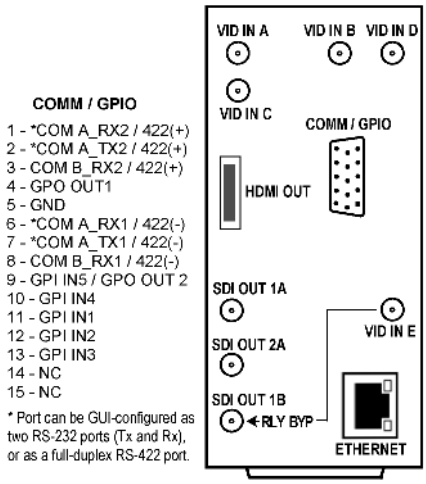
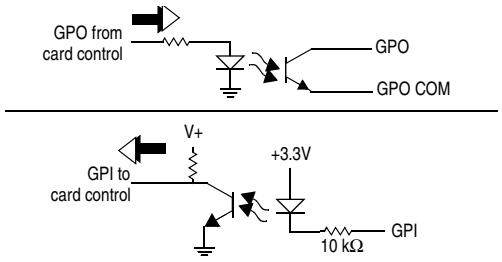
9970-QS-MC Rear I/O Module	Description
RM20-9970-B  	Provides the following connections: • Four PiP Video In BNCS (**VID IN A** thru **VID IN D**); auto-detecting as 3G/HD/SD-SDI or CVBS • Two 3G/HD/SD-SDI PiP Combined Video Out BNCs (**SDI OUT 1** and **SDI OUT 2**) • **COMM/GPI** multi-conductor connector • **ETHERNET** 10/100 connector (reserved) **Note:** Ethernet connector is reserved for tally, UMD control, DashBoard Output Preview, and other functions. This port is independent of card/frame network remote control.
RM20-9970-C  	• Five PiP Video In (**VID IN A** thru **VID IN E**); auto-detecting as 3G/HD/SD-SDI or CVBS • Two 3G/HD/SD-SDI PiP Combined Video Out (**SDI OUT 1** and **SDI OUT 2**) • **COMM/GPIO** multi-conductor connector • **ETHERNET** 10/100 connector (reserved) • **HDMI OUT** connector **Note:** • Ethernet connector is reserved for tally, UMD control, DashBoard Output Preview, and other functions. This port is independent of card/frame network remote control. • Available equipped with High-Density BNC (HDBNC) or DIN1.0/2.3 connectors as: RM20-9970-C-HDBNC or RM20-9970-C-DIN, respectively.

Table 2-1 9970-QS-MC Rear I/O Modules — continued

9970-QS-MC Rear I/O Module	Description
RM20-9970-D  	• Five PiP Video In (**VID IN A** thru **VID IN E**) BNCs; auto-detecting as 3G/HD/SD-SDI or CVBS • One 3G/HD/SD-SDI PiP Combined Video Out BNC (**SDI OUT A**) • **COMM/GPIO** multi-conductor connector • **ETHERNET** 10/100 connector (reserved) **Note:** Ethernet connector is reserved for tally, UMD control, DashBoard Output Preview, and other functions. This port is independent of card/frame network remote control.
RM20-9970-E  	• Four PiP Video In (**VID IN A** thru **VID IN D**); auto-detecting as 3G/HD/SD-SDI or CVBS • Cascade PiP SDI In (PiP E) (Relay bypass protected cascade path) (**VID IN E**) • Two 3G/HD/SD-SDI PiP Combined Video Out (**SDI OUT 1A** and **SDI OUT 2A**) • Cascade relay bypass protected cascade path out **SDI OUT 1B**) (Relay bypass provides passive VID IN E cascade input to SDI output upon card removal or loss of power.) • **COMM/GPIO** multi-conductor connector • **ETHERNET** 10/100 connector (reserved) • **HDMI OUT** connector **Note:** • Ethernet connector is reserved for tally, UMD control, DashBoard Output Preview, and other functions. This port is independent of card/frame network remote control. • Available equipped with High-Density BNC (HDBNC) or DIN1.0/2.3 connectors as: RM20-9970-E-HDBNC or RM20-9970-E-DIN, respectively.
 	GPIO uses equivalent opto-isolated circuits shown below. **GPO Specifications:** Max I: 120 mA Max V: 30 V Max P: 120 mW Pullup R >500Ω resistor is recommended when using 5V control. **GPI Specifications:** GPI LO @ Vin < 1.5 V GPI HI @ Vin > 2.3 V Max Vin: 9 V

Setting Up 9970-QS-MC Network Remote Control

Perform remote control setup in accordance with Cobalt® reference guide "Remote Control User Guide" (PN 9000RCS-RM).

Note:

- If network remote control is to be used for the frame and the frame has not yet been set up for remote control, Cobalt® reference guide **Remote Control User Guide (PN 9000RCS-RM)** provides thorough information and step-by-step instructions for setting up network remote control of Cobalt® cards using DashBoard™. (Cobalt® OGCP-9000 and/or OGCP-9000/CC Remote Control Panels are not recommended for use with this product.)

  Download a copy of this guide by clicking on the **Support > Reference Documents** link at www.cobaltdigital.com and then select DashBoard Remote Control Setup Guide as a download, or contact Cobalt® as listed in Contact Cobalt Digital Inc. (p. 1-20).

- If installing a card in a frame already equipped for, and connected to DashBoard™, no network setup is required for the card. The card will be discovered by DashBoard™ and be ready for use.

- Cards using firmware versions 1.62.000 or greater (which includes current and recent firmware versions) require DashBoard™ version 6.0 or greater. This is due to the added user interface controls which can only be accommodated with DashBoard version 6.0 or greater. While cards with the firmware version 1.62.000 (or later) will appear in the frame Basic Tree View in earlier DashBoard versions, the card controls will not be accessible. For a free download of the latest DashBoard version, please go to **www.cobaltdigital.com**, and select **Products > Software Control > DashBoard™**, and then select the version applicable to your computer.

Chapter 3

Setup Instructions

Overview

If you are already familiar with using DashBoard to control Cobalt cards, please skip to Overview of Operator User Controls Outline and Setup Overview (p. 3-7).

This chapter contains the following information:

- Control and Display Descriptions (p. 3-1)
- Accessing the 9970-QS-MC Card via Remote Control (p. 3-4)
- Checking 9970-QS-MC Card Information (p. 3-6)
- 9970-QS-MC Function Menu List and Descriptions (p. 3-9)
- Troubleshooting (p. 3-64)

Control and Display Descriptions

This section describes the user interface controls, indicators, and displays for using the 9970-QS-MC card.

Access to the 9970-QS-MC functions (and the controls, indicators, and displays related to a particular function) follows a general arrangement of Function Menus under which related controls can be accessed (as described in Function Menu/Parameter Menu Overview below).

Note: When a setting is changed, settings displayed on DashBoard™ are the settings as effected by the card itself and reported back to the remote control; the value displayed at any time is the actual value as set on the card.

Function Menu/Parameter Menu Overview

The functions and related parameters available on the 9970-QS-MC card are organized into function **menus**, which consist of parameter groups as shown below.

Figure 3-1 shows how the 9970-QS-MC card and its menus are organized, and also provides an overview of how navigation is performed between cards, function menus, and parameters.

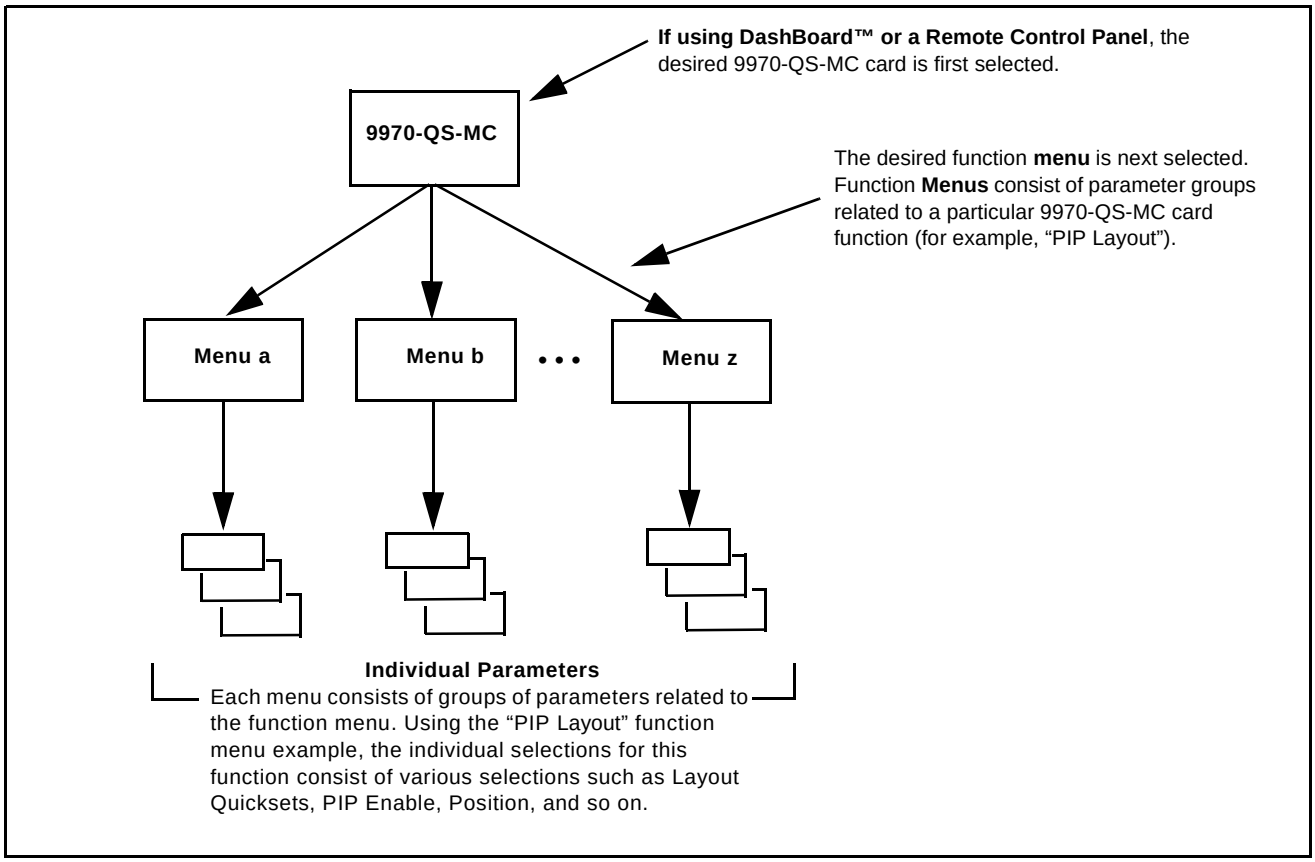


Figure 3-1 Function Menu/Parameter Menu Overview

DashBoard™ User Interface

(See Figure 3-2.) The card function menus are organized in DashBoard™ using tabs. When a tab is selected, each parametric control or selection list item associated with the function is displayed. Scalar (numeric) parametric values can then be adjusted as desired using the GUI slider controls. Items in a list can then be selected using GUI drop-down lists.

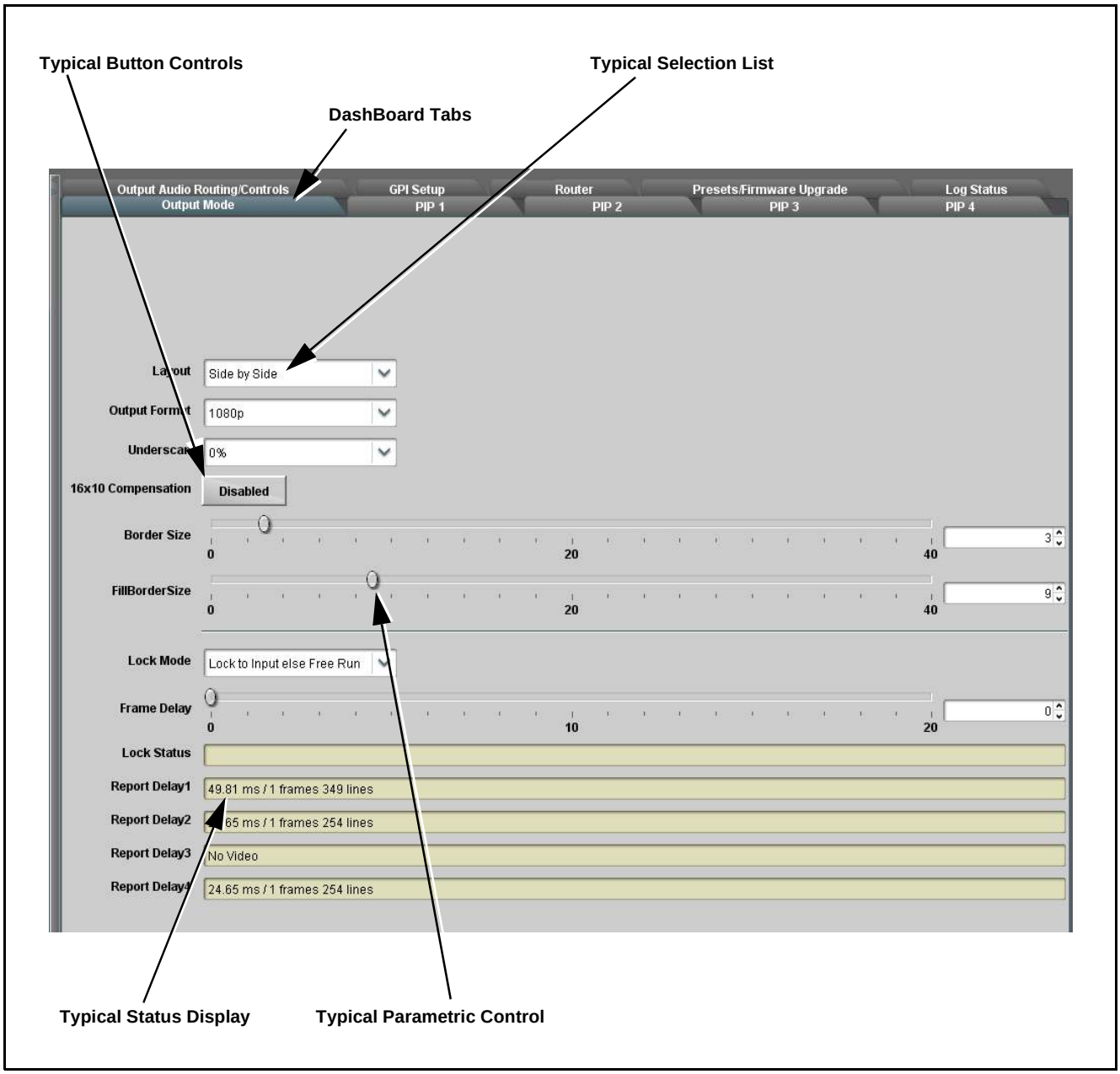


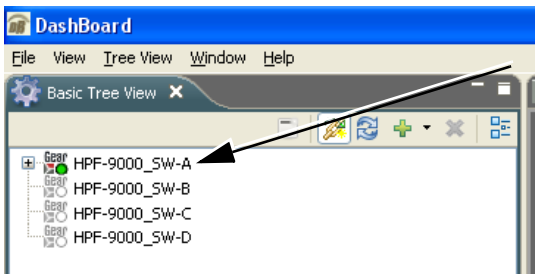
Figure 3-2 Typical DashBoard Tabs and Controls

Accessing the 9970-QS-MC Card via Remote Control

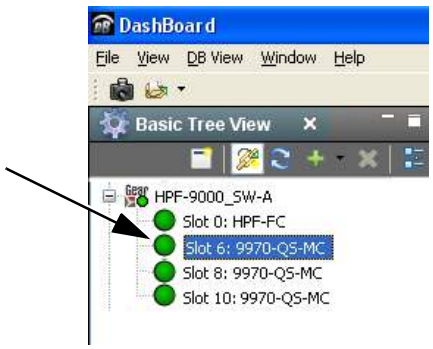
Access the 9970-QS-MC card using DashBoard™ or Cobalt® Remote Control Panel as described below.

Accessing the 9970-QS-MC Card Using DashBoard™

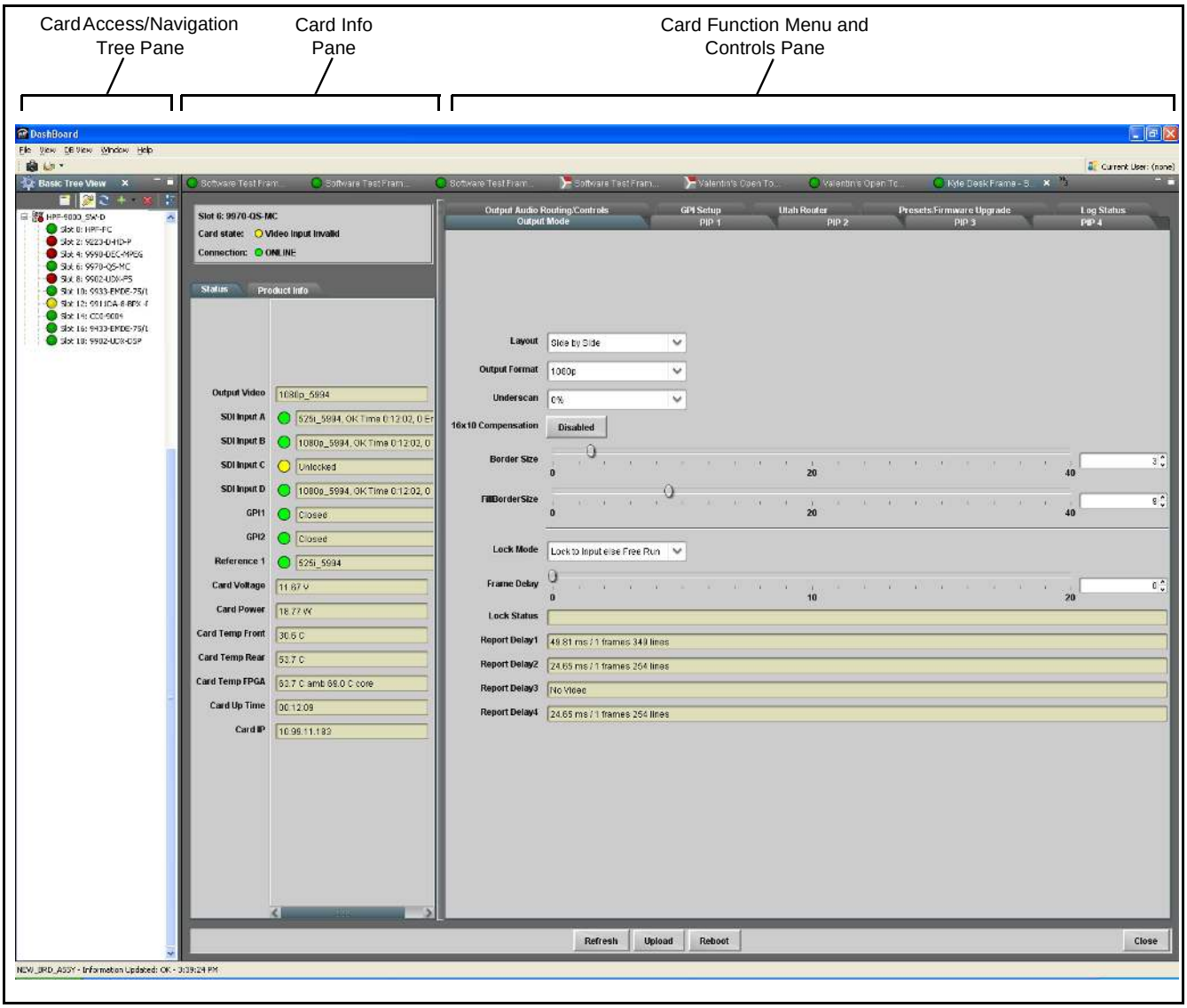
1. On the computer connected to the frame LAN, open DashBoard™.
2. As shown below, in the left side Basic View Tree locate the Network Controller Card associated with the frame containing the 9970-QS-MC card to be accessed (in this example, “HPF-9000_SW-A”).



3. As shown below, expand the tree to access the cards within the frame. Click on the card to be accessed (in this example, “Slot 6: 9970-QS-MC”).



As shown on the next page, when the card is accessed in DashBoard™ its function menu screen showing tabs for each function is displayed. (The particular menu screen displayed is the previously displayed screen from the last time the card was accessed by DashBoard™).


Card Access/Navigation Tree Pane
Card Info Pane
Card Function Menu and Controls Pane
DashBoard
Basic Tree View
Slot 6: 9970-QS-MC
Card state: Video Input Invalid
Connection: ONLINE
Status
Product Info
Output Video
SDI Input A
SDI Input B
SDI Input C
SDI Input D
GPI1
GPI2
Reference 1
Card Voltage
Card Power
Card Temp Front
Card Temp Rear
Card Temp FPGA
Card Up Time
Card IP
Output Audio Routing/Controls
GPI Setup
Utah Router
Presets/Firmware Upgrade
Log Status
Output Mode
PIP 1
PIP 2
PIP 3
PIP 4
Layout
Output Format
Underscan
16x10 Compensation
Disabled
Border Size
FillBorderSize
Lock Mode
Frame Delay
Lock Status
Report Delay1
Report Delay2
Report Delay3
Report Delay4
Refresh
Upload
Reboot
Close

Checking 9970-QS-MC Card Information

The operating status and software version the 9970-QS-MC card can be checked using DashBoard™. Figure 3-3 shows and describes the 9970-QS-MC card information screen using DashBoard™.

Note: Proper operating status in DashBoard™ is denoted by green icons for the status indicators shown in Figure 3-3. Yellow or red icons respectively indicate an alert or failure condition. Refer to Troubleshooting (p. 3-64) for corrective action.

The **Tree View** shows the cards seen by DashBoard™. In this example, Network Controller Card is hosting a 9970-QS-MC card in slot 4.

Status Display
This displays shows the status and format of the signals being received by the 9970-QS-MC, as well as card status.

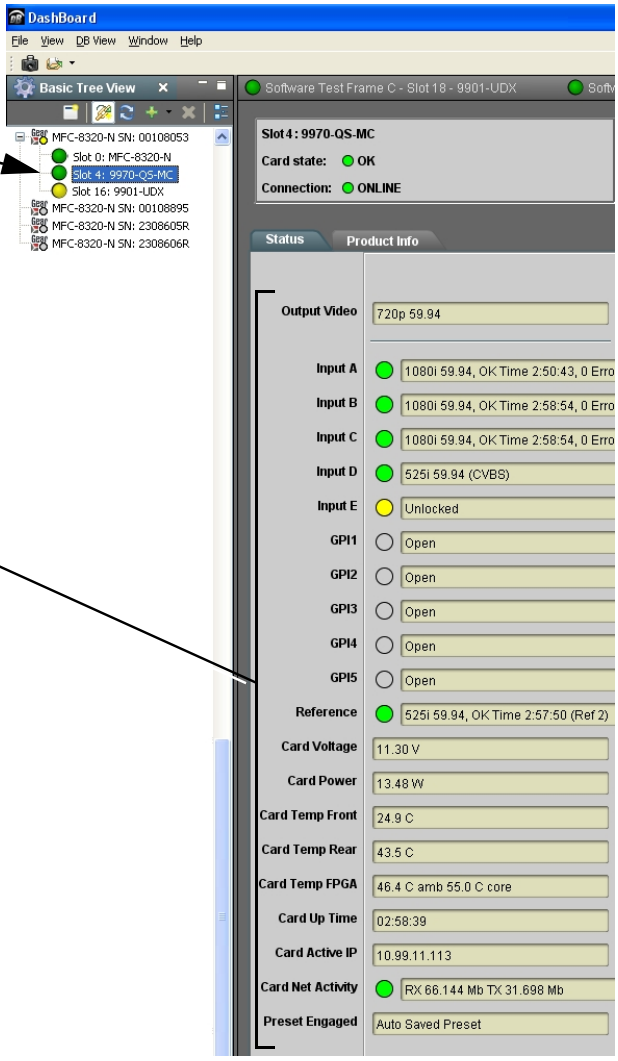


Figure 3-3 9970-QS-MC Card Info/Status Utility

Overview of Operator User Controls Outline and Setup Overview

Figure 3-4 shows an example quint-split output image along with the 9970-QS-MC menus and functions that control the attributes shown. Figure 3-5 outlines the basic flow of setting up the 9970-QS-MC, along with the DashBoard tabs where these tasks are performed.

Note: Although Figure 3-5 can be used as a guide to the basic tasks required in setting up the 9970-QS-MC, the detailed descriptions and examples in 9970-QS-MC Function Menu List and Descriptions (p. 3-9) should **always** be read and understood before committing to a setup. Some DashBoard tabs/ functions not directly related to basic setup are not shown in this overview.

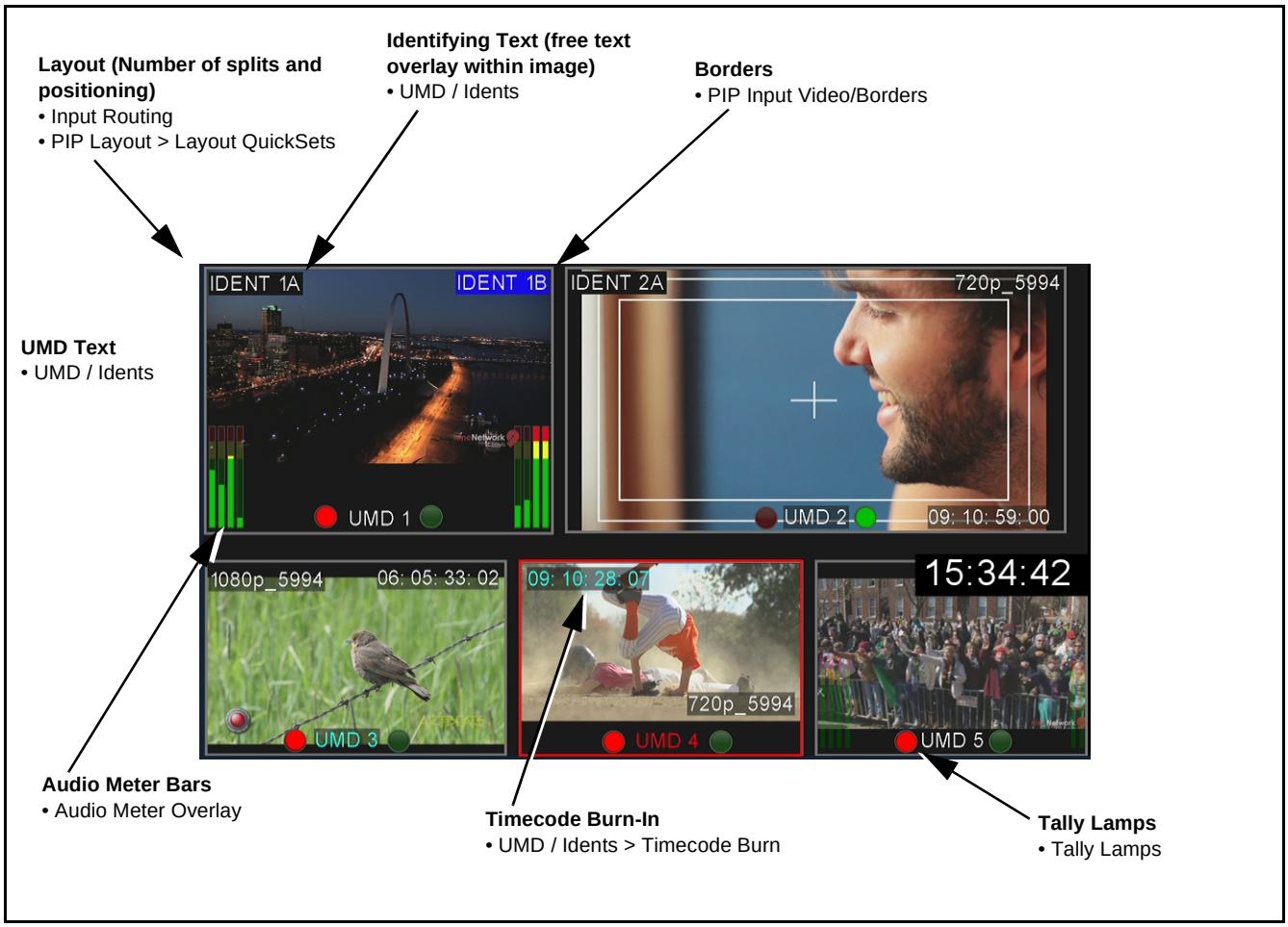


Figure 3-4 Example Quint-Split Image and Configurable Functions

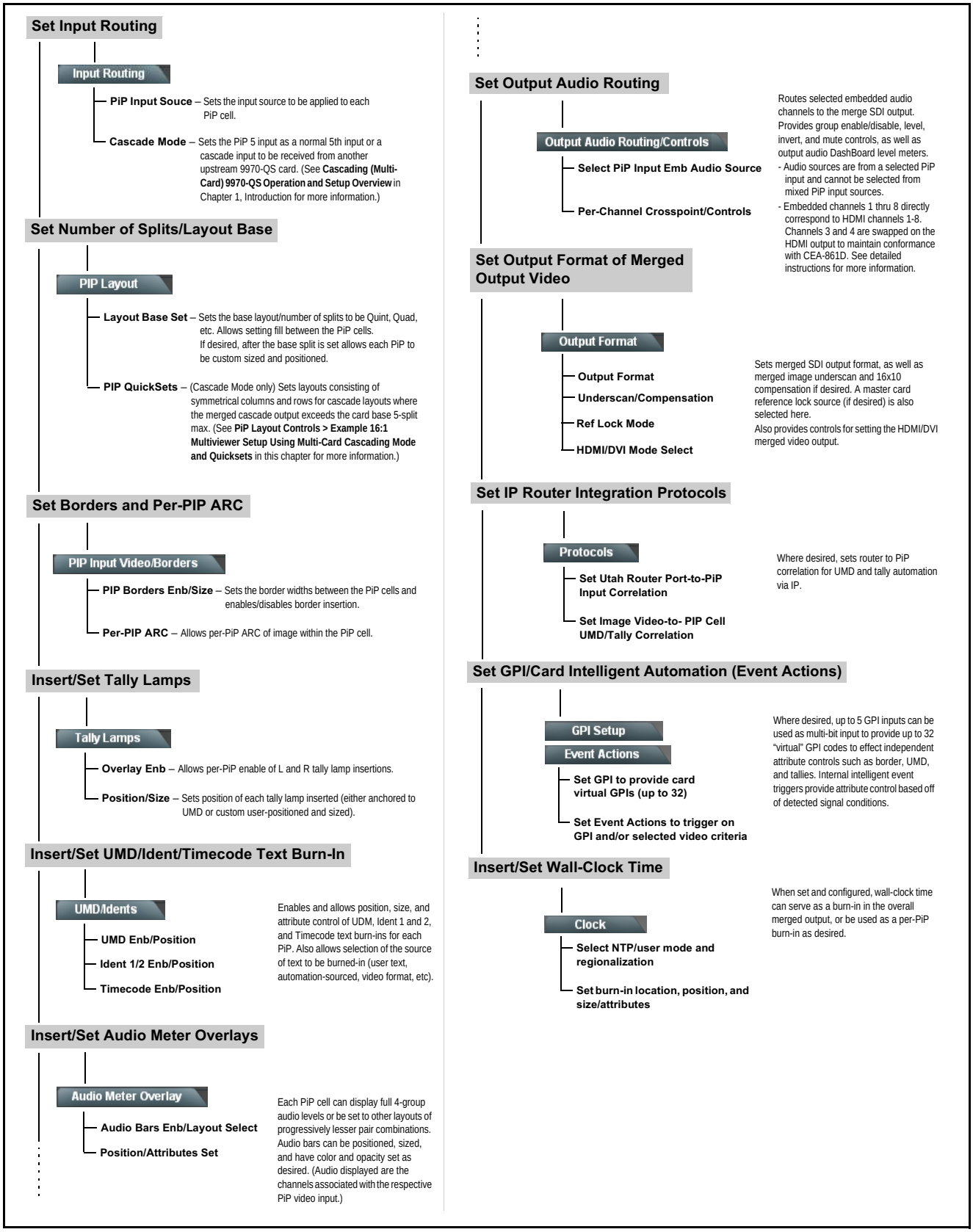


Figure 3-5 Overview and Flow of Setting-Up 9970-QS-MC

9970-QS-MC Function Menu List and Descriptions

Table 3-1 individually lists and describes each 9970-QS-MC function menu and its related list selections, controls, and parameters. Where helpful, examples showing usage of a function are also provided. Table 3-1 is primarily based upon using DashBoard™ to access each function and its corresponding menus and parameters.

Note: All numeric (scalar) parameters displayed on DashBoard™ can be changed using the slider controls, ⇕ arrows, or by numeric keypad entry in the corresponding numeric field. (When using numeric keypad entry, add a return after the entry to commit the entry.)

On DashBoard™ itself and in Table 3-1, the function menu items are organized using tabs as shown below.

Some functions use **sub-tabs** to help maintain clarity and organization. In these instances, Table 3-1 shows the ordinate tab along with its sub-tabs. Highlighted sub-tabs indicate that controls described are found by selecting this sub-tab (in this example, the **UMD** sub-tab on the **UMD/Idents** page).

The table below provides a quick-reference to the page numbers where each function menu item can be found.

Function Menu Item	Page	Function Menu Item	Page
Input Routing	3-10	GPI Setup Controls	3-47
PIP Clone Global Controls	3-13	Event Actions/Setup Controls	3-48
PIP Layout Controls	3-14	Output Preview	3-53
PIP ARC/Borders Controls	3-20	Video Quality Events Setup Controls	3-54
Tally Lamp Insertion Controls	3-22	Audio Detect Events Setup Controls	3-55
UMD/Identification Text Insertion Controls	3-24	User Graphic Overlay (Logo) Insertion Controls	3-56
Audio Meter Overlay Controls	3-32	Clock (Wall-Clock Time/LTC) Controls	3-57
Output Format Controls	3-36	Presets	3-58
Output Audio Routing/Controls	3-39	Admin	3-61
Cascade Config Setup Controls	3-40	User Log	3-64
Protocols (Router Integration) Controls	3-45		

Table 3-1 9970-QS-MC Function Menu List

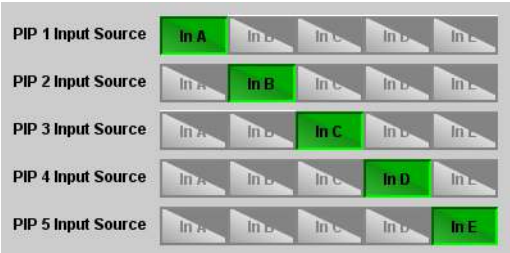
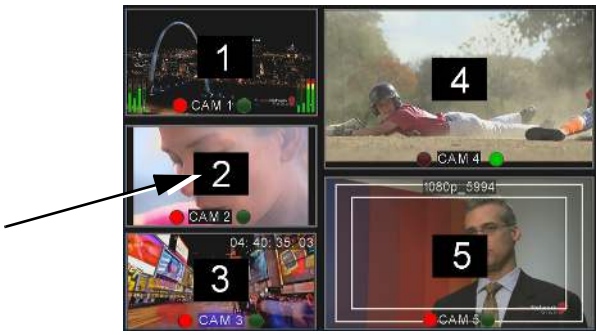
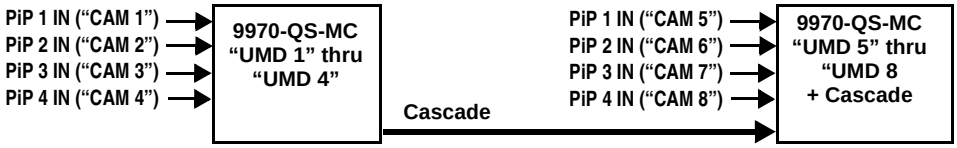
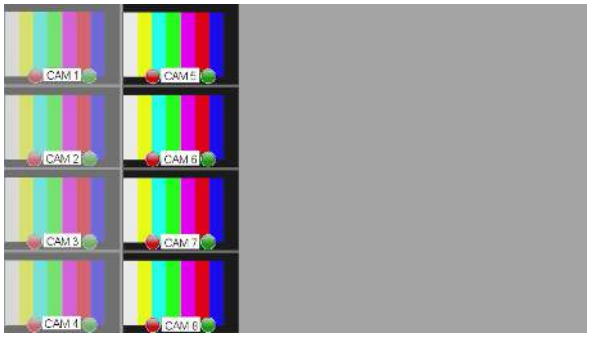
Input Routing	Select inputs to be applied to each PiP. Also provides controls for using Cascade Mode (where required).
• **PiP Input Source Select**  	Routes the card SDI inputs (VID IN A thru VID IN E as **In A** thru **In E**, respectively) to the respective card PiP input. (In this example, VID IN A thru VID IN E are respectively routed as PIP 1 thru PIP 5 input sources.) **Note:** A CVBS input is automatically detected by the card input, with the CVBS ADC converter automatically engaged.
• **Identify PIPs Button** 	Pressing this button momentarily displays an overlay on each PiP image that correlates the PiP to its card PiP identity. This control is useful if you “lose track” of which displayed PiP correlates to which card PiP input channel.  Pressing Identify PIPs shows the PIP assignment in the merged output (display ceases after about 3 seconds)

Table 3-1 9970-QS-MC Function Menu List — continued

Input Routing	(continued)
• **Cascade Mode Select** Cascade Mode [Enabled]	**Note:** • See Cascading (Multi-Card) 9970-QS-MC Operation and Setup Overview (p. 1-12) in Chapter 1, Introduction for an overview of multi-card cascading that provides multiviewer images exceeding that of a single quint-split card. • See Cascade Mode Using PiP Layout QuickSet Template Presets (p. 3-16) for examples control settings using Cascade Mode along with other per-PiP settings to provide a cascaded multiviewer image setup. **Cascade Mode Select** sets PiP 5 as a input to be used to receive a cascade output from another 9970-QS-MC card or to be set as a regular fifth PiP input as follows: • **Enabled:** Sets PiP 5 input to receive a cascade output from another 9970-QS-MC card. Because this cascaded underlay will have any burn-in insertions already in place from the upstream source card, all PiP 5 burn-in insertions are automatically disabled in this mode. Also, since this PiP will serve as an underlay for any added PiPs, in this mode PiP 5 is inserted full-size, with all sizing and positioning controls locked out for this PiP insertion. • **Disabled:** Sets PiP 5 input to be used as regular input, with full aspect and sizing/positioning control and burn-ins as PiPs 1 thru 4. Use this mode when only a single, non-cascaded 9970-QS-MC is to used for multi-image processing.



First 9970-QS-MC card receives “CAM 1” thru “CAM 4”, as PiP 1 thru PiP 4 inputs. This output is fed to a second, daisy-chained 9970-QS-MC as a **cascading** input.



The second 9970-QS-MC card receives “CAM 5” thru “CAM 8”, as PiP 1 thru PiP 4 inputs and is set to position these images in a 2nd column. The imported PiP 5 cascade input (carrying “CAM 1” thru “CAM 4”) serves as an underlay.

The resulting output (consisting of eight PiPs) now consists of the imported cascading “CAM 1” thru “CAM 4” images, as well as the local input “CAM 5” thru CAM 8” images.

Note: When using cascade mode, the symmetrical alignments shown here are available as “QuickSet” presets using the card per-PiP controls as described in PIP Layout Controls (p. 3-14) and in the example shown in Cascade Mode Using PiP Layout QuickSet Template Presets (p. 3-16).

Table 3-1 9970-QS-MC Function Menu List — continued

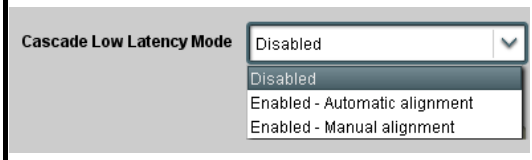
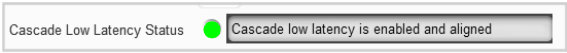
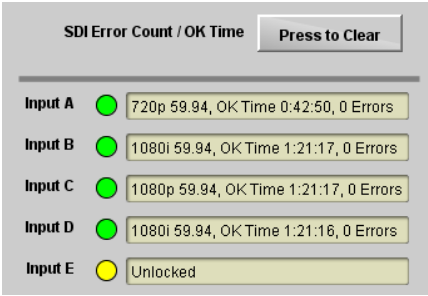
Input Routing	**(continued)**
Card **Local** inputs are inputs received by the card to serve as an individual PiP image. A **Cascade** input is an image imported into the card from an upstream 9970-QS-MC used in a multi-card cascading multiviewer arrangement. An input used as a cascade input has controls related to local setup locked out (for example, burn-ins and sizing) since a cascading input serves as an underlay with all its burn-ins and other attributes already provided by the upstream card. Note that on a downstream card receiving a cascade input, this input should be considered independent of the local input positioning and attribute control provided by the downstream card.	
• Cascade Mode Low-Latency Mode Select  	Provides modes where card I/O latency can be reduced (by bypassing cascade input framesync) using the choices shown and described below. • **Disabled:** Normal default mode where an upstream cascaded input is **always** aligned to the local card's selected reference. This results in the normal, expected one-frame delay due to the framesyncing action. Where low-latency is not required, it is recommended to use this mode. • **Enabled – Automatic alignment:** This mode applies framesyncing when needed (**applying** framesync and **bypassing** low-latency during these intervals). When alignment is again detected by the local card, framesyncing is correspondingly disabled and low-latency operation is again applied. Because this mode can automatically enable and disable framesyncing, an occasional video "hit" should be expected when using this mode. • **Enabled – Manual alignment:** Similar to the AUtomatic alignment mode, this mode will disable low-latency framesync bypass when needed. However, it will not apply alignment until the **Cascade Alignment Apply** button is pressed, thereby circumventing an unexpected auto-align video "hit". **Note:** Where a multi-card cascaded arrangement is being used, locking **all** inputs and **all** 9970-QS-MC cards to the same house reference will optimize alignment and help allow unimpeded low-latency operation (with Latency Mode being set to Enabled - Automatic alignment).
• Cascade Mode Low-Latency Status	Displays the low-latency framesync bypass status as shown below.
 	• Green indicator and "disabled" message indicates low-latency framesync bypass is disabled by Low Latency control being set to Disabled.
 	• Yellow indicator and "drifting" message indicates low-latency framesync bypass is disabled by event requiring framesync with low-latency correspondingly disabled. This message typically appears when auto mode is selected and cascaded input is experiencing timing drift versus local card timing.
 	• Yellow indicator and "requires alignment" message indicates cascading input is now detected as being locked, but local card requires **Align** button to be pressed to remove any buffer excess and re-establish sync.
 	• Green indicator and "enabled and aligned" message indicates cascading input is now detected as being locked, with full bypass of framesyncing and low-latency now is effect.
• SDI Error Counter/Clear  	In conjunction with the card **Status** page and its Input status indicators (where an SDI input(s) is being used) allows running error totals to be cleared. **Status** page shows input status and **OK Time / Errors** for inputs receiving SDI.

Table 3-1 9970-QS-MC Function Menu List — continued

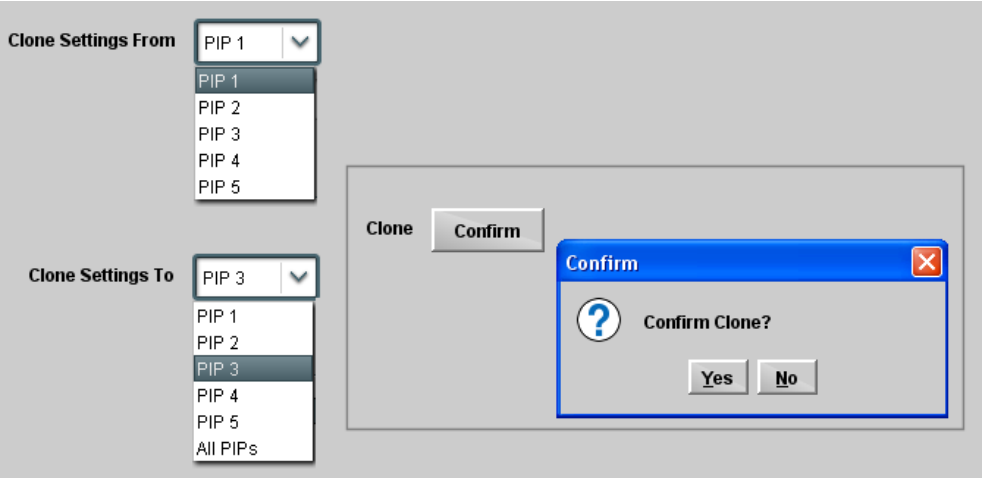
PIP Clone	Provides controls to set global “cloning” of card graphics attributes settings from one PiP to another. This helps in providing a consistent and easily set layout across selected PiPs.

Cloned settings can significantly affect layouts. Make certain all aspects of layouts/attributes are understood (as described in this Chapter) before applying clones to other PiPs. Make certain only desired attributes are cloned as intended (using the controls described below). Individual tabs also have clone controls which can be used to clone only certain layout attributes to other PiPs as desired.

Note: • When cloned settings are applied, they can be left as is, or changed as desired on the PiP receiving the cloned settings. The cloning can serve as a baseline or as the final intended setup as desired.

• For multi-card setup using Cascade Config mode/setup, Clone Settings **from any** of the cards in the chain can be cloned **to any** card in the chain (i.e., **all** cards in the chain appear in the **Clone Settings From** and **Clone Settings To** drop-downs). See Cascade Config Setup Controls (p. 3-40) for more information.

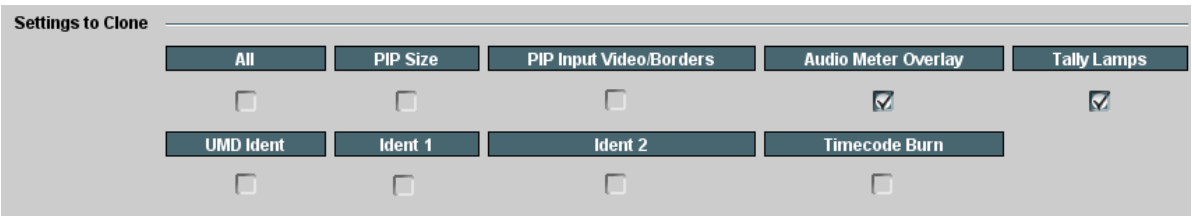
• **Clone Settings From/To PiP Selector**	**Clone Settings From** and **Clone Settings To** drop-downs select the PiP to serve as the cloned source, and the PiP(s) to receive the cloned settings.



In the example here, **PIP 1** is the settings source to be cloned for **PIP 3**. The **Confirm** pop-up allows applying or backing out of the clone operation.

Note: This dialog is also present on several layout tabs (for example, “Tally Lamps”) described later in this Chapter. As such, cloning can be performed on this page/tab, or on tabs specific to a particular function.

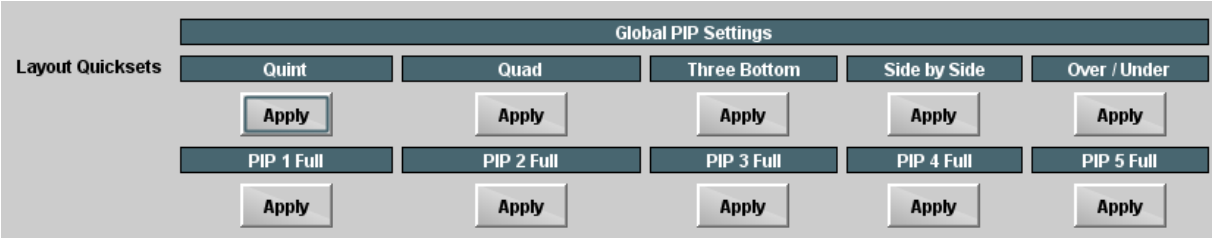
• **Clone Settings Attribute Select (Settings to Clone)**	Check boxes allow all (global), or only certain attributes to be cloned to a receiving PiP(s) as desired.



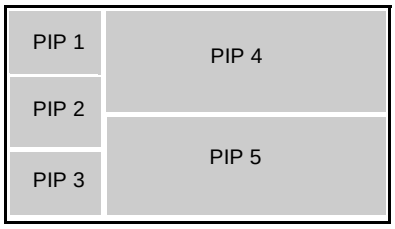
In the example here, specifically the **Audio Meter Overlays** and **Tally Lamps** settings will be applied to the cloned PiPs (while other attributes will be left as is). Any combination of checks can be applied as desired.

Table 3-1 9970-QS-MC Function Menu List — continued

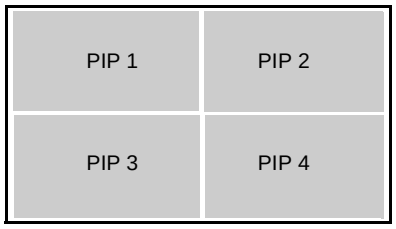
PIP Layout	Provides PiP layout presets templates and other controls related to the number of splits and layout for the overall merged-image output.
• **Layout Preset Template Select**	For **local** (**non-cascading) inputs**, selects from several preset global (base) layout templates from the choices shown and depicted below. **Note:** • The Preset templates described below are intended for non-cascading layouts. For symmetrical cascaded layouts (layouts exceeding five PiPs), see Cascade Mode Using PiP Layout QuickSet Template Presets (p. 3-16). • As shown and described here, the orientations here apply to the normal “landscape” layout.



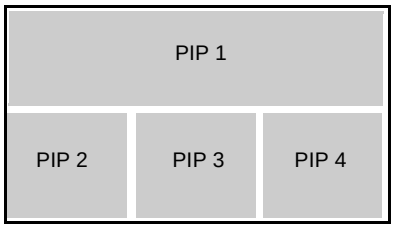
Quint



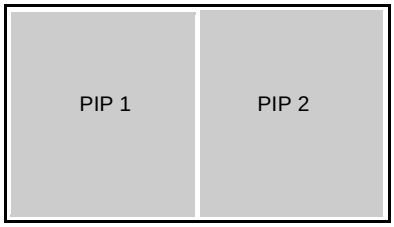
Quad (symmetrical)



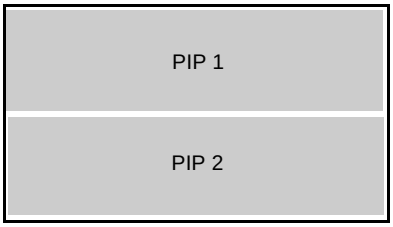
Three Bottom



Side-by-Side



Over / Under



PiP 1, 2...thru PiP 5 Full

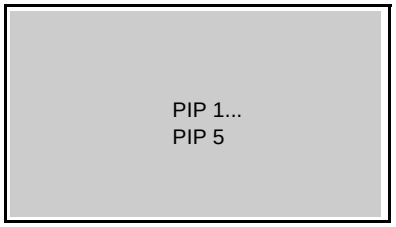


Table 3-1 9970-QS-MC Function Menu List — continued

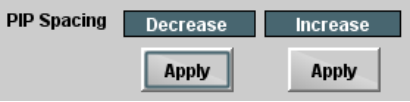
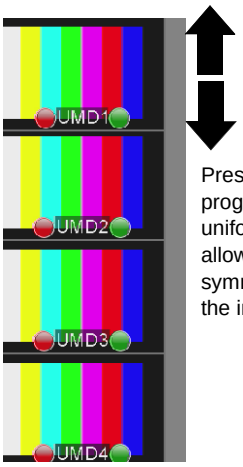
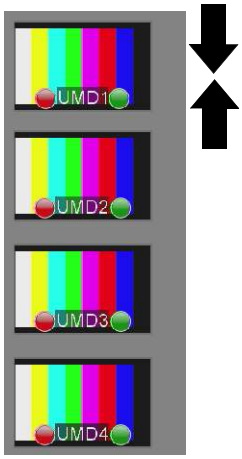
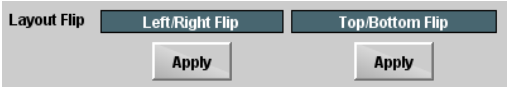
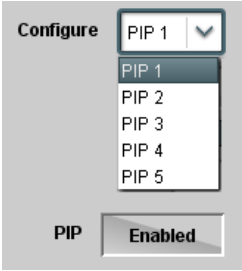
PIP Layout	**(continued)**
• **Decrease/Increase Spacing Controls**  	Provides tailoring of the PiP image sizes relative to background fill.
 Pressing **Decrease** progressively expands all PiPs uniformly over the fill areas, allowing each PiP to symmetrically occupy more of the image area	Pressing **Increase** progressively reduces all PiPs, allowing fill to symmetrically occupy more of the PiP image area 
• **Layout Flip Controls**  	For local inputs to the card, allows PiP layout to flip top/bottom or L/R.
Note: • The following controls are used for **individual PiP (per-PiP)** layout and positioning control. • Any sizing/positioning performed using cloning controls can be overwritten using these controls.	
• **PiP Custom Size/Position Controls**  	Individually selects any of the five PiP inputs to be selected for sizing/ positioning edits, and enables PiP insertion into the merged output. (In this example, PiP 1 is selected for editing.) **Note:** • These controls are intended only for card local inputs and not a cascade underlay imported from an upstream 9970-QS-MC card. • For multi-card setup using Cascade Config mode/setup, Clone Settings **from any** of the cards in the chain can be cloned **to any** card in the chain (i.e., **all** cards in the chain appear in the **Clone Settings From** and **Clone Settings To** drop-downs). See Cascade Config Setup Controls (p. 3-40) for more information.

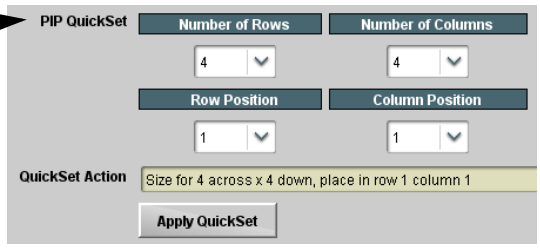
Table 3-1 9970-QS-MC Function Menu List — continued

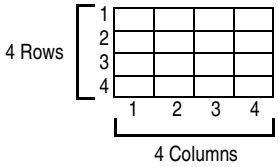
PIP Layout	(continued)
• **PiP Layout QuickSet Template Presets (Cascade Mode)**	Layout QuickSets provide for layouts consisting of symmetrical **columns** and **rows** that are intended for cascade layouts where, for example, an upstream 9970-QS-MC card provides a first column of PiP images, and then a second 9970-QS-MC provides the second column of PiP images. The descriptions here describe using the controls and also provide examples using the controls and the resulting multi-card cascade setups.

The **Number of Rows** and **Number of Columns** drop-downs set the grid format to be used for a multi-card, multiviewer setup. Once the number of rows/columns is set, this is propagated to other PiP controls on the card, since this will be a card global setting that allows other PiP insertions to conform with the desired grid layout.

The **QuickSet Action** field shows a summary of the configured layout. Click **Apply QuickSet** to enact the layout setup.

In this example, a 4-row x 4-column grid is being set up (which can provide a 16:1 multiviewer layout using four 9970-QS-MC cards, each handling four PiP images).





The **Row Position** and **Column Position** drop-downs set where in the grid the PiP image will be inserted (in this example, position row 1 / column 1).

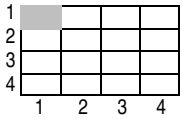


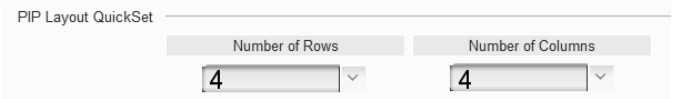
Table 3-1 9970-QS-MC Function Menu List — continued

PIP Layout	(continued)

Example 16:1 Multiviewer Setup Using Multi-Card Cascading Mode and Quicksets

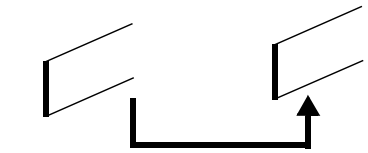
This example shows a layout setup that provides a 16:1 multiviewer output. It uses four 9970-QS-MC cards, each handling four PiP inputs, and with each card set to work with a 16-PiP (4x4) grid.

1. First, on the **PIP 1 > PIP Position** tab a 4x4 grid is set up. This setup will propagate to the PiP 2 thru PIP 4 same controls on the card. (This must also be done for any other 9970-QS-MC cards in the chain.)



2. On the **first** 9970-QS-MC card, PiP 1 thru PiP 4 images ("CAM 1 thru "CAM 4") are routed and positioned as Row Positions 1 thru 4, all in Column 1. This results in the first column of four images for the 16:1 multiviewer setup.

The SDI output of this card is routed to the next 9970-QS-MC card as the PIP 5 input, with this card set up with **Cascade Mode > Enabled**. This places the first card output as an underlay with its merged PiP output positioned in the first column.



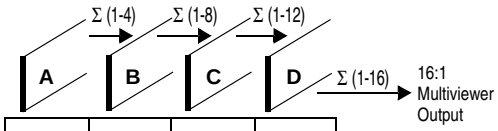
Card A:
"CAM 1" – "CAM 4" in 1st column

Card B:
"CAM 1" – "CAM 4" in 1st column imported as underlay.
"CAM 5" – "CAM 8" (card 2 local inputs 1-4) positioned in 2nd column.

3. On the **second** 9970-QS-MC card, PiP 1 thru PiP 4 images ("CAM 5" thru "CAM 8") are routed and positioned as Row Positions 1 thru 4, all now set in Column 2.

Along with the underlay imported from card 1 as column 1, this now results in the first column of four underlay imported images and the second column of four more locally inputed PiP images ("CAM 1" thru "CAM 8").

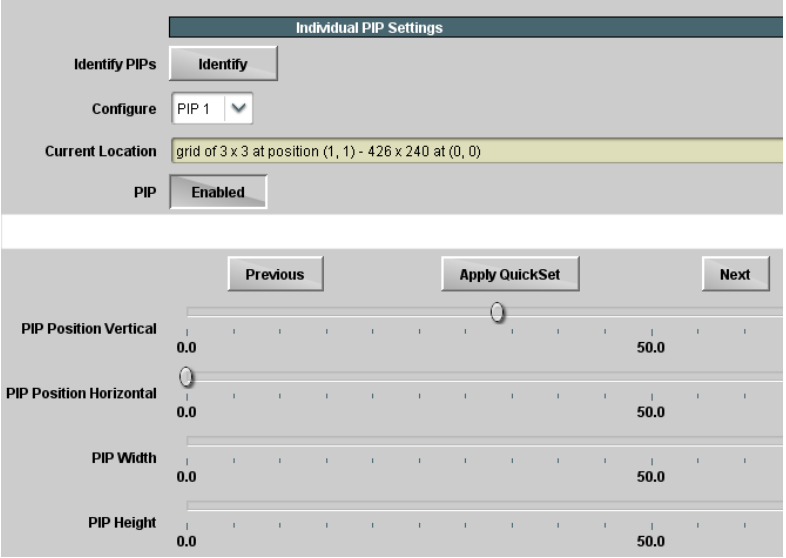
4. Using a total of four 9970-QS-MC cards (**Card A** thru **Card D**) similarly configured in a daisy-chain arrangement, the SDI output of an upstream 9970-QS-MC card provides the cumulative built-up underlay, and allows positioning local PiP images in successive columns. In this example, four cards each are set to progressively position local PiP inputs in columns 1 thru 4, respectively. This results in four multiviewer columns consisting here of:
"CAM 1" – "CAM 4"
"CAM 5" – "CAM 8"
"CAM 9" – "CAM 12"
"CAM 13" – "CAM 16"



1	5	9	13
2	6	10	14
3	7	11	15
4	8	12	16

Table 3-1 9970-QS-MC Function Menu List — continued

PIP Layout	(continued)
• **PiP Custom Positioning Controls**	Controls allow the positioning and sizing of the PiP within the overall merged output image. • **Position Vertical** and **Position Horizontal** sets the PiP origin location (Vertical in lines; horizontal in pixels) • **Width** and **Height** sets the PiP size (Vertical in lines; horizontal in pixels) The **PIP Size** display shows the PiP size and H/V origin point position. **Note:** Even if a PiP layout QuickSet was applied, these controls allow manipulating PiP position and size as desired.



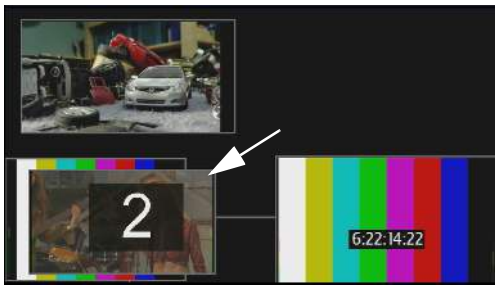
Configure drop-down selects the PiP to be set. **Current Location** shows the PiP size and X:Y location.

The **Next** and **Previous** buttons advance or decrement the PiP selection in the Configure drop-down (for example, if PiP 1 is showing, pressing Next will set Configure to PiP 2).

Table 3-1 9970-QS-MC Function Menu List — continued

PIP Layout	**(continued)**

PiP 2 with custom positioning/sizing placed in normal upper-right corner of merged quint-split output



PiP 2 with new custom positioning/sizing now places PiP 2 in lower-left corner (over PiP 3) of merged quint-split output

When using custom positioning, it is helpful to first size all the PiP small (as thumbnail sized). This helps avoid a PiP “hiding” underneath another PiP. Pressing the **Identify PIPs** button as shown here will help make sure each PiP input correlation is known, and all PiP are present as expected.

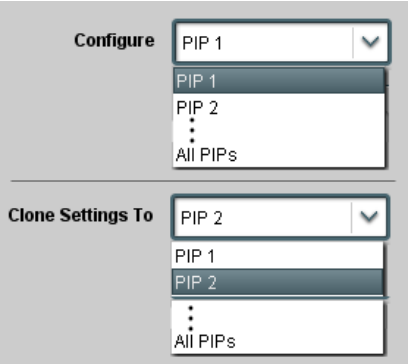
With the PiP identities now known, one-by-one each PiP can be sized and positioned to its desired size/position as shown in the example here.

Table 3-1 9970-QS-MC Function Menu List — continued

PIP ARC/Borders

Provides controls to individually set border, ARC, and custom sizing for each local PiP input.

• PiP Configure Select/Clone

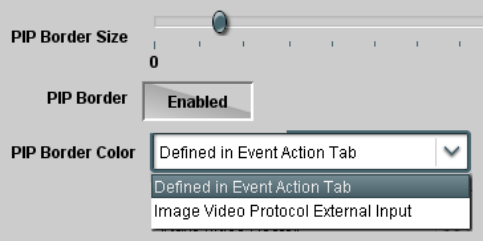


Individually selects any of the five PiP inputs to be selected for sizing/ positioning edits (as described below). Allows cloning settings to other PiPs.

Note: • These controls are intended only for base program video inputs and not a cascade underlay imported from an upstream 9970-QS-MC card.

• For multi-card setup using Cascade Config mode/setup, Clone Settings **from any** of the cards in the chain can be cloned **to any** card in the chain (i.e., **all** cards in the chain appear in the **Clone Settings From** and **Clone Settings To** drop-downs). See Cascade Config Setup Controls (p. 3-40) for more information.

• PiP Border Size/Enable Control



• **PIP Border Size** sets the border thickness for **all** PiP borders.

• **PIP Border** enables/disables border insertion.

• **PIP Border Color** allows setting border colors as directed by Event Action settings or by direction of Image Video™ Protocol external input.

Note: The Enable control inserts or removes borders for **only** the PiP(s) selected using the Configure Select drop-down above.

Border set for 0
(all images touch with no border)

Border set for 10
(a 10-pixel border is added)

Note: PiP border colors are typically controlled in an automated manner using GPI coding or IP automation. However, the border colors of each PiP can be set for static manual user control using forced settings, as described in Event Actions/ Setup Controls (p. 3-48).

Table 3-1 9970-QS-MC Function Menu List — continued

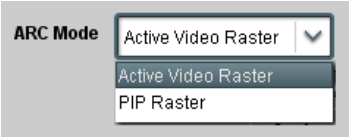
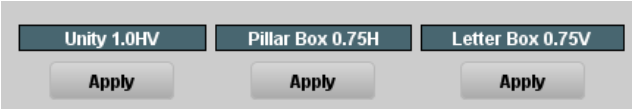
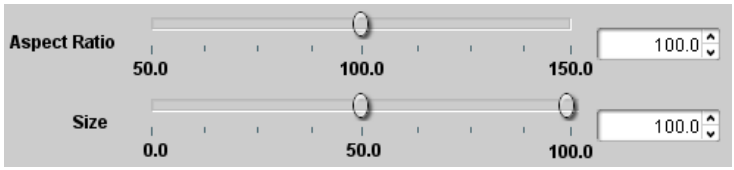
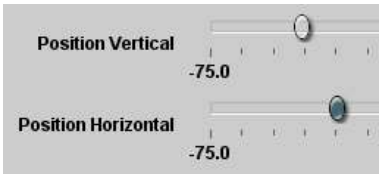
PIP ARC/Borders	(continued)
• **PiP ARC Mode Select**  	ARC Mode select allows the ARC controls to either use the aspect ratio defined by the incoming PiP video to serve as the referenced aspect ratio for other ARC controls, or to use a custom-sized aspect ratio PiP raster as the referenced aspect ratio. • **Active Video Raster** selection sets ARC action to use the incoming PiP video as the referenced aspecting (e.g., with a 16:9 input, setting ARC to Unity 1.0 HV results in a PiP with a 16:9 aspect ratio). • **PiP Raster** selection ARC action to use a custom-configured aspect ratio to serve as the referenced aspecting. PiP Raster selection can accommodate use cases where non-standard aspect ratios are desired even with image stretching or collapsing.
• **Standard Preset Template Aspect Ratio Conversion Selectors**	Selects between the standard preset Aspect Ratio Conversions (ARC) shown below.
 	
• **User-defined Aspect Ratio Controls**	**Aspect Ratio Horizontal** and **Aspect Ratio Vertical** controls adjust horizontal and vertical zoom percentage. Settings less than 100% provide zoom-out; settings greater than 100% provide zoom-in. (50% to 150% range in 0.1% steps; null = 100.0)
 	**Aspect Ratio** control applies a custom ARC with scaling reflecting the division of the aspect ratio (e.g., "50%" setting is equivalent to 2H:4V, or 2 divided by 4). **Size** control provides a proportional scaling of the PiP Image within the PiP area, maintaining whatever aspect ratio is in effect.
• **Within-PiP Positioning Controls**  	Where ARC settings result in an image smaller than the PiP active area, allows the image to be vertically and horizontally positioned within the PiP area boundaries. (-75% to 75% range in 0.1% steps) **Note:** This control affects only image positioning within the PiP image area cell. It will not move an image to an area outside the currently-defined PiP area cell.

Table 3-1 9970-QS-MC Function Menu List — continued

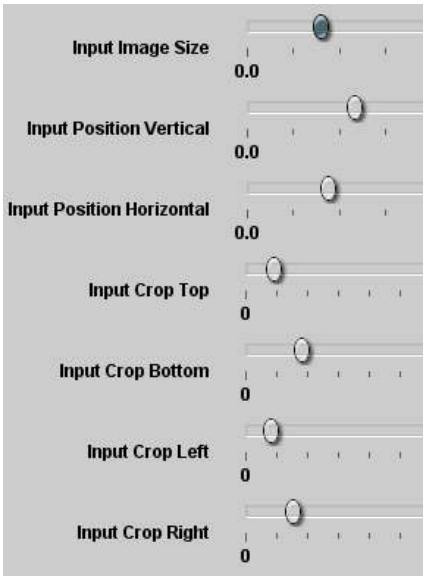
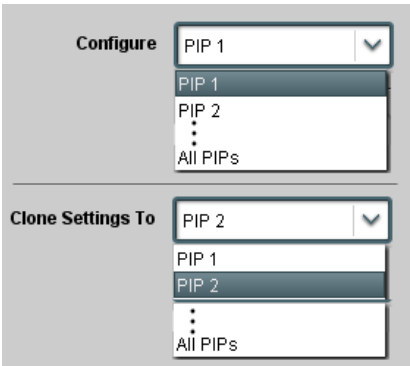
PIP ARC/Borders	(continued)
• Input PiP Video Size/Position Controls  	The controls shown here allow manipulating the input scaling and positioning of the selected PiP image before it is processed by the image area ARC. **Note:** This control affects only image positioning within the PiP image area cell. It will not move an image to an area outside the currently-defined PiP area cell.
Tally Lamps	Provides controls for each PiP to insert tally indicator “lamps” as overlays into the output video.
Note: • Tally lamp activation (ON/OFF and color control) is set using IP automation, or other external actions such as GPI (see Event Actions/Setup Controls (p. 3-48) for setting up tally lamp control). The controls here enable lamp overlay insertion, and set size and position attributes. These controls do not control tally activation. • Identical independent controls are provided for a **Tally Lamp 1** and **Tally Lamp 2** tally lamps. Therefore, only the **Tally Lamp 1** controls are shown here.	
• PiP Configure Select/Clone  	Individually selects any of the five PiP inputs to be selected for tally insertion edits (as described below). Allows cloning settings to other PiPs. **Note:** For multi-card setup using Cascade Config mode/setup, Clone Settings **from any** of the cards in the chain can be cloned **to any** card in the chain (i.e., **all** cards in the chain appear in the **Clone Settings From** and **Clone Settings To** drop-downs). See Cascade Config Setup Controls (p. 3-40) for more information.

Table 3-1 9970-QS-MC Function Menu List — continued

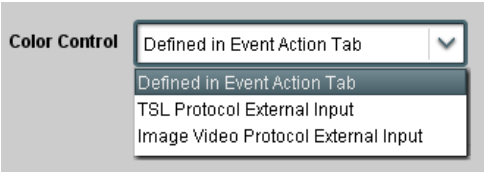
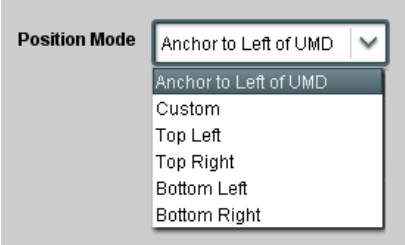
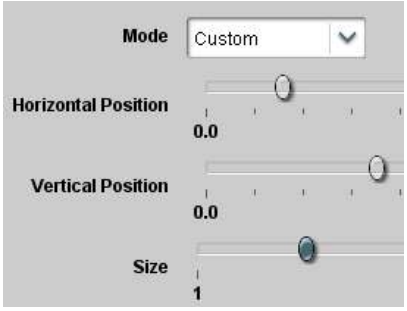
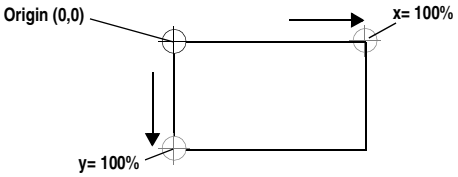
Tally Lamps	(continued)
• **Tally Insertion Select** 	Enables or disables lamp insertion overlay for selected PiP(s).
• **Lamp Color Control** 	Provides control for setting selected tally lamp “illuminated” color as directed by the control inputs shown.
• **Tally Position Select** 	Sets the location of the tally lamp as anchored to UMD, custom, or one of the positions shown here. (When Custom is selected, tally lamp position and size is configured using the controls described below.) **Note:** Tally Lamp 1 has anchored position Left of UMD (and is intended for left placement). Tally Lamp 2 has anchored position Right of UMD (and is intended for right placement).
• **Tally Custom Sizing/Position Controls** 	Where Custom is selected, allows tally lamp to be positioned anywhere in the image area of the respective PiP. **Horizontal** and **Vertical Position** controls set the origin point for the tally lamp overlay. 

Table 3-1 9970-QS-MC Function Menu List — continued

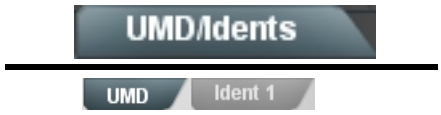
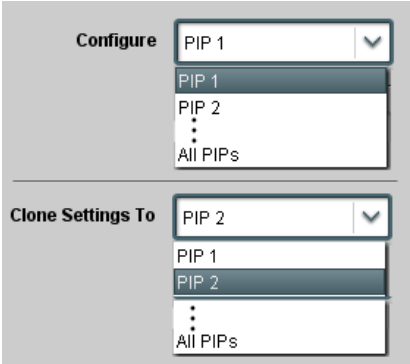
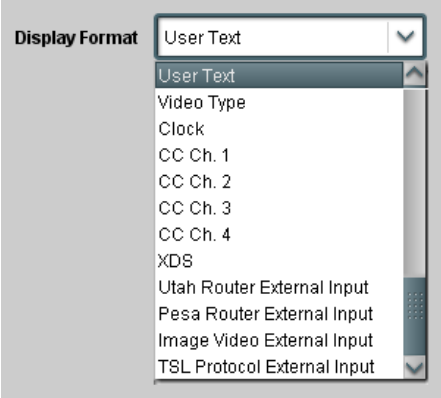
	Provides controls for each PiP to insert UMD text, user identification text, and timecode burn-in. Also allows setting insertion rules and text attributes such as size and color.
• **PiP Configure Select/Clone** 	Individually selects any of the five PiP inputs to be selected for UMD text insertion edits (as described below). Allows cloning settings to other PiPs. **Note:** For multi-card setup using Cascade Config mode/setup, Clone Settings **from any** of the cards in the chain can be cloned **to any** card in the chain (i.e., **all** cards in the chain appear in the **Clone Settings From** and **Clone Settings To** drop-downs). See Cascade Config Setup Controls (p. 3-40) for more information.
• **UMD Insertion Select** 	Selects the rules for UMD overlay insertion into the PiP area.
• **UMD Text Type (Format) Select** 	Selects the type of data to be displayed as UMD text from choices shown. • **User text** allows user text to be entered using field described below. • **Video type** inserts an overlay showing the video format of the respective PiP input. • **Clock** inserts a wall-clock time overlay (see Clock (Wall-Clock Time/ LTC) Controls (p. 3-57) for setting the wall-clock time clock feature). • **CC Ch 1** thru **XDS** insert the selected closed-captioning related text from the video associated with the corresponding PiP input video. • **Utah Router External Input** thru **TSL Protocol External Input** insert text from the external router source. **Note:** UMD Text Character/Background Attributes controls and Text/ Background Positioning controls described below are locked out when closed captioning is selected for burn-in text. Text positioning, size, and other attributes are dictated within the closed captioning message; text displayed here follows the externally dictated attributes.

Table 3-1 9970-QS-MC Function Menu List — continued

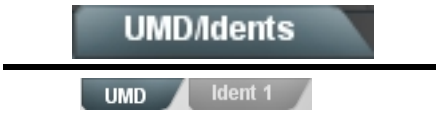
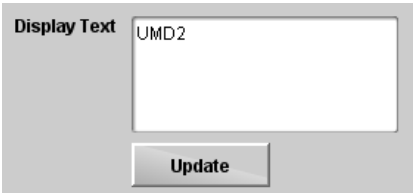
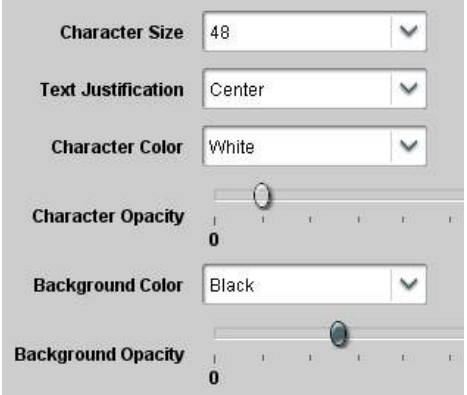
	**(continued)**
• **UMD Text Entry Field** 	Dialog entry box that allows entry of desired ident text string. Enter desired text as click **Update** when done to input the text string. **Note:** • All normal keyboard alphanumeric characters are supported. Not all ASCII special characters (Windows ALT+*nnnn*) are supported. • Up to 126 characters can be entered. • User custom text cannot be cloned and must be entered manually for each PiP UMD and/or Ident field.
Note: The sizing/positioning controls below for text and background have an interrelation where a background shading box can automatically track with text size/position and vice-versa as described below.	
• **UMD Text Character/Background Attributes Controls** 	Provides independent controls for setting the color and opacity of the UMD text and its background. • **Character Size** drop-downs set text size (in pixels). • **Text Justification** selects from left, center, or right-aligned text. • **Character** and **Background Color** drop-downs select text and background colors from various independent choices. • **Opacity** controls set text or background opacity from 0% (least opacity) to 100% (full opacity).

Table 3-1 9970-QS-MC Function Menu List — continued

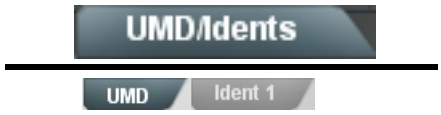
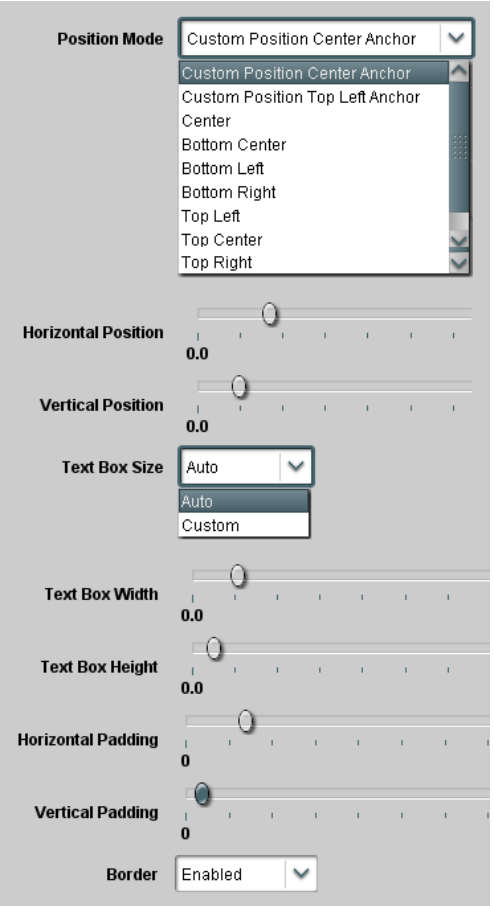
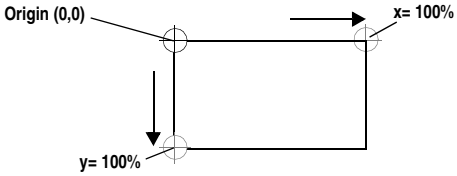
	**(continued)**
• **Text/Background Positioning Controls** 	• Using the **Position Mode** drop-down, UMD text and its background can be positioned using template choices (as shown) or can use the Custom choices which provide basic positioning which can then be further manipulated as described below. • When Custom is selected, the **Horizontal** and **Vertical Position** controls allow fine adjustment of the text/background positioning.  • **Text Box Size** selects from **Auto** (in which the box size tracks with the configured text size) and **Custom** (in which the box size is then set using the **Text Box Width** and **Height** controls. • **Horizontal** and **Vertical Padding** add padding (“white space”) within the box and its text. • **Border** enables/disables a border around whatever box size is present. (The border color tracks with whatever the text color is set to.)

Table 3-1 9970-QS-MC Function Menu List — continued

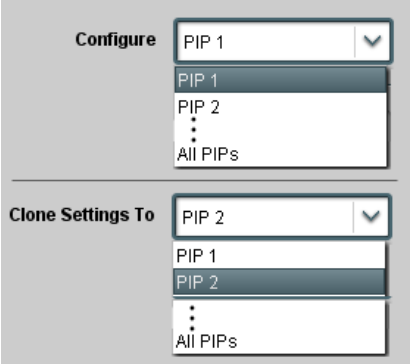
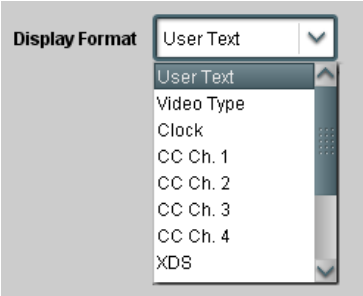
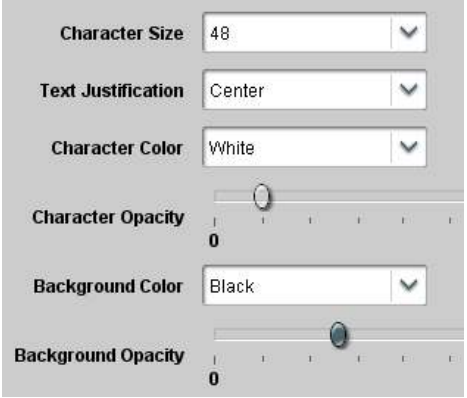
	Provides controls for each PiP to insert identifying active-video area burn-in text, and set insertion rules and text attributes such as size and color.
Note: Identical independent controls are provided for additional ident text insertion **Ident 2**. Therefore, only the **Ident 1** controls are shown here.	
• **Ident Insertion Select** 	Selects the rules for ident text overlay insertion into the PiP area.
• **PiP Configure Select/Clone** 	Individually selects any of the five PiP inputs to be selected for Ident text insertion edits (as described below). Allows cloning settings to other PiPs.
• **Text Entry Field** 	Dialog entry box that allows entry of desired ident text string. Enter desired text as click **Update** when done to input the text string. **Note:** • All normal keyboard alphanumeric characters are supported. Not all ASCII special characters (Windows ALT+*nnnn*) are supported. • Up to 126 characters can be entered. • User custom text cannot be cloned and must be entered manually for each PiP UMD and/or Ident field.
• **Text Type (Format) Select** 	Selects the type of data to be displayed as UMD text from choices shown. • **User text** allows user text to be entered using field described below. • **Video type** inserts an overlay showing the video format of the respective PiP input. • **Clock** inserts a wall-clock time overlay (see Clock (Wall-Clock Time/ LTC) Controls (p. 3-57) for setting the wall-clock time clock feature). • **CC Ch 1** thru **XDS** insert the selected closed-captioning related text from the video associated with the corresponding PiP input video. **Note:** Text Character/Background Attributes controls and Text/ Background Positioning controls described below are locked out when closed captioning is selected for burn-in text. Text positioning, size, and other attributes are dictated within the closed captioning message; text displayed here follows the externally dictated attributes.

Table 3-1 9970-QS-MC Function Menu List — continued

(continued)

Note: The sizing/positioning controls below for text and background have an interrelation where a background shading box can automatically track with text size/position and vice-versa as described below.

- **Text Character/Background Attributes Controls**



Provides independent controls for setting the color and opacity of the ident text and its background.

- **Character Size** drop-downs set text size (in pixels).
- **Text Justification** selects from left, center, or right-aligned text.
- **Character** and **Background Color** drop-downs select text and background colors from various independent choices.
- **Opacity** controls set text or background opacity from 0% (least opacity) to 100% (full opacity).

Using both **Ident 1** and **Ident 2** provides enhanced flexibility in burn-in identification.

In this example, **Ident 1** is being used to display user text, and **Ident 2** is being used to display PiP input video format

Ident 1 set to display user text (in this example, “USER 1”)

Ident 2 set to display video format (in this example, PiP input with 1080i_5994)

Table 3-1 9970-QS-MC Function Menu List — continued

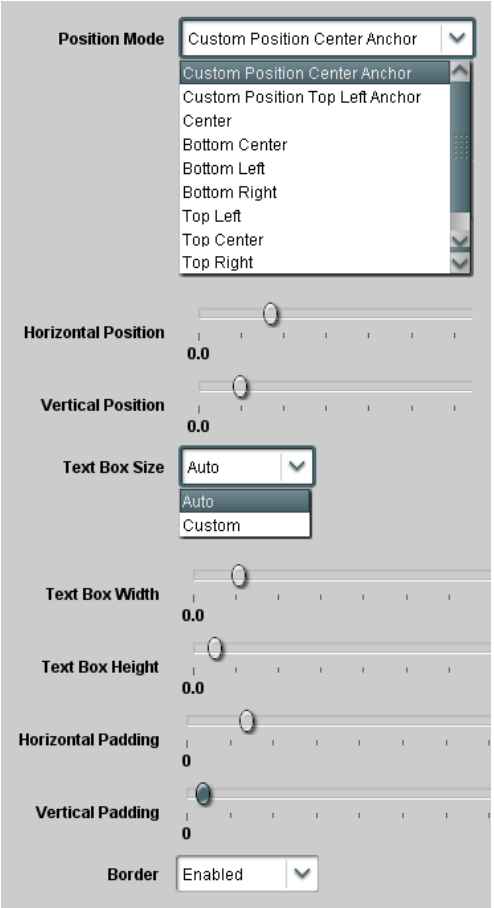
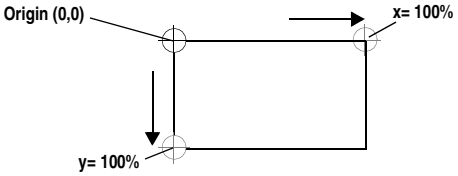
	(continued)
• **Text/Background Positioning Controls** 	• Using the **Position Mode** drop-down, ident text and its background can be positioned using template choices (as shown) or can use the Custom choices which provide basic positioning which can then be further manipulated as described below. • When Custom is selected, the **Horizontal** and **Vertical Position** controls allow fine adjustment of the text/background positioning.  • **Text Box Size** selects from **Auto** (in which the box size tracks with the configured text size) and **Custom** (in which the box size is then set using the **Text Box Width** and **Height** controls. • **Horizontal** and **Vertical Padding** add padding (“white space”) within the box and its text. • **Border** enables/disables a border around whatever box size is present. (The border color tracks with whatever the text color is set to.)

Table 3-1 9970-QS-MC Function Menu List — continued

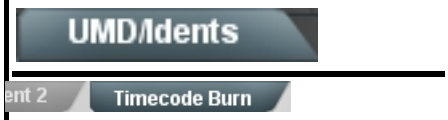
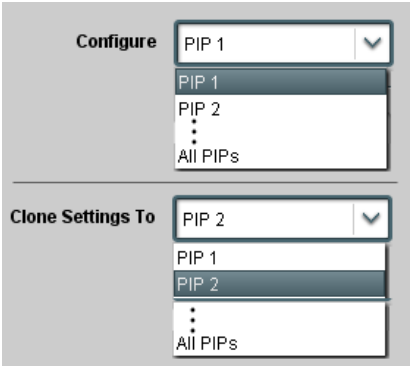
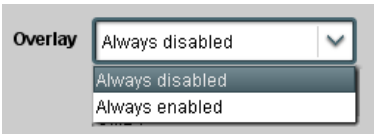
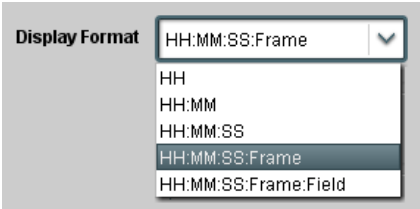
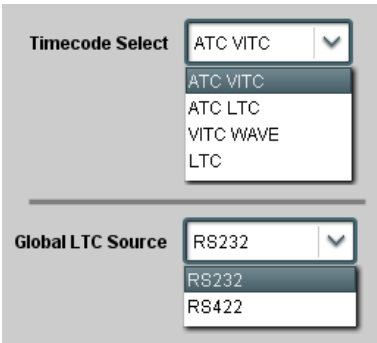
	Provides controls for each PiP to insert active-video area timecode burn-in, and set insertion rules and attributes such as size and color.
Note: Timecode character burn-in is always the embedded timecode associated with the PiP (i.e., PiP 1 Timecode Burn uses only the timecode value embedded on PiP 1 input video).	
• **PiP Configure Select/Clone** 	Individually selects any of the five PiP inputs to be selected for Timecode insertion edits (as described below). Allows cloning settings to other PiPs. **Note:** For multi-card setup using Cascade Config mode/setup, Clone Settings **from any** of the cards in the chain can be cloned **to any** card in the chain (i.e., **all** cards in the chain appear in the **Clone Settings From** and **Clone Settings To** drop-downs). See Cascade Config Setup Controls (p. 3-40) for more information.
• **Timecode Insertion Select** 	Selects the rules for timecode overlay insertion into the PiP area.
• **Timecode Format Display Select** 	Selects the format of timecode string burn-in overlay insertion from choices shown.
• **Timecode Input Select** 	• For the selected PiP and its input video, **Timecode Select** filters the timecode format choice to be used and burned in from the following choices: • **ATC_VITC** – SD or HD packet-based ATC_VITC timecode • **ATC_LTC** – HD packet-based ATC_LTC timecode • **VITC WAVE**– SD “waveform-based” VITC timecode (SD-SDI or CVBS) • **LTC** – externally-sourced LTC timecode not integrated within SDI or CVBS video • **Global LTC Source** selects from RS232 or RS422 external timecode source when **LTC** is selected above.

Table 3-1 9970-QS-MC Function Menu List — continued

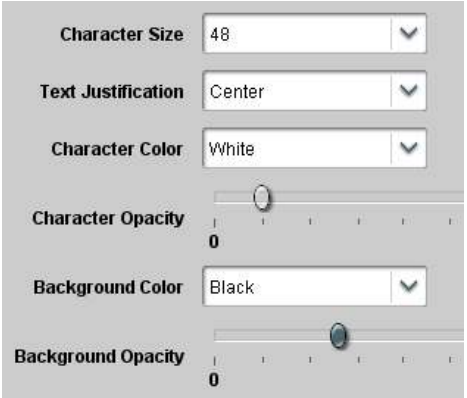
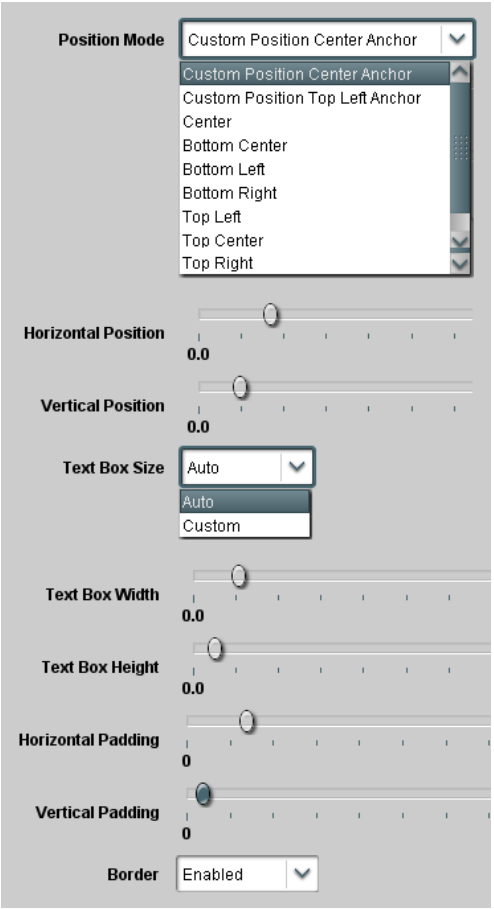
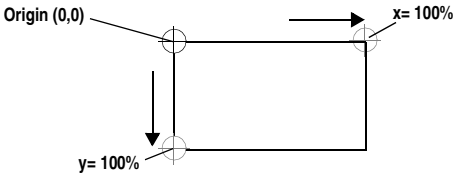
	(continued)
• **Text Character/Background Attributes Controls** 	Provides independent controls for setting the color and opacity of the ident text and its background. • **Character Size** drop-downs set text size (in pixels). • **Text Justification** selects from left, center, or right-aligned text. • **Character** and **Background Color** drop-downs select text and background colors from various independent choices. • **Opacity** controls set text or background opacity from 0% (least opacity) to 100% (full opacity).
• **Text/Background Positioning Controls** 	• Using the **Position Mode** drop-down, ident text and its background can be positioned using template choices (as shown) or can use the Custom choices which provide basic positioning which can then be further manipulated as described below. • When Custom is selected, the **Horizontal** and **Vertical Position** controls allow fine adjustment of the text/background positioning.  • **Text Box Size** selects from **Auto** (in which the box size tracks with the configured text size) and **Custom** (in which the box size is then set using the **Text Box Width** and **Height** controls. • **Horizontal** and **Vertical Padding** add padding (“white space”) within the box and its text. • **Border** enables/disables a border around whatever box size is present. (The border color tracks with whatever the text color is set to.)

Table 3-1 9970-QS-MC Function Menu List — continued

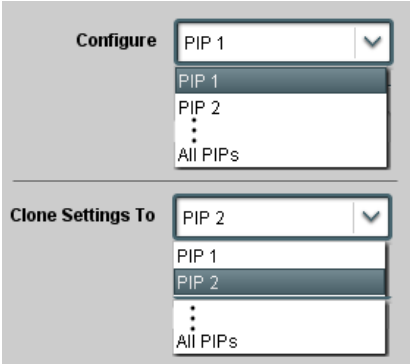
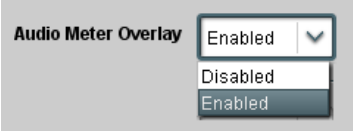
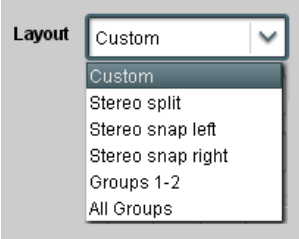
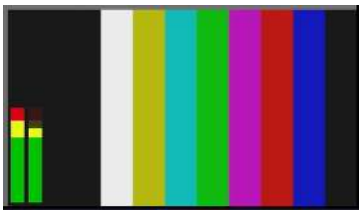
Audio Meter Overlay	Provides controls for each PiP to insert active-video area audio meters (bars), and set insertion rules and attributes such as layout, size and position.
Note: Audio meters are correlated with the embedded audio associated with the PiP input video. Each PiP can be set to display audio meters as desired.	
• PiP Configure Select/Clone  	Individually selects any of the five PiP inputs to be selected for Audio Meter insertion edits (as described below). Allows cloning settings to other PiPs. **Note:** For multi-card setup using Cascade Config mode/setup, Clone Settings **from any** of the cards in the chain can be cloned **to any** card in the chain (i.e., **all** cards in the chain appear in the **Clone Settings From** and **Clone Settings To** drop-downs). See Cascade Config Setup Controls (p. 3-40) for more information.
• Meter Insertion Enable/Disable  	Selects the rules for audio meters overlay insertion into the selected PiP area(s).
• Layout Select  	Selects from several preset layout templates and custom from the choices shown and depicted below. **Note:** Stereo selections are always correlated to embedded channels 1 and 2.

Table 3-1 9970-QS-MC Function Menu List — continued

Example Meter Layouts

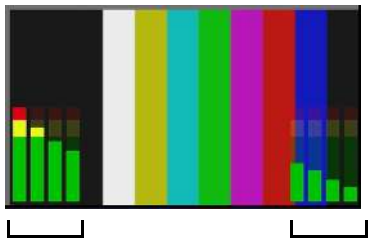
Stereo snap left



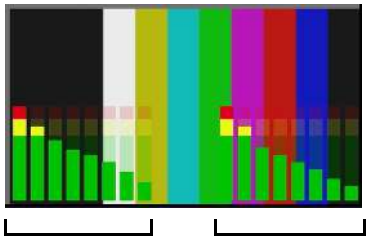
Stereo snap right

Stereo split

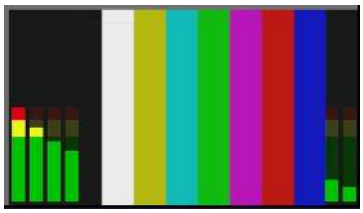
Groups 1-2



All Groups

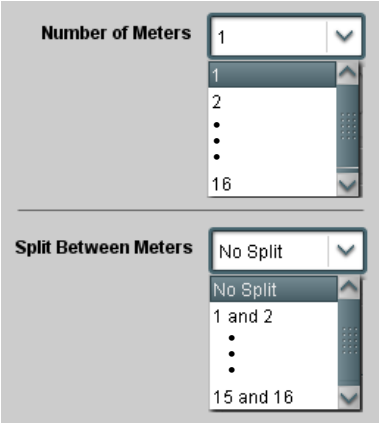


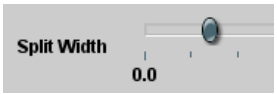
Custom



In this example, ch 1-4 on left, and ch 5-6 on right; 6 meters total

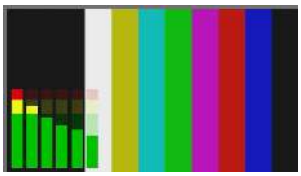
- **Number of Meters / Split Between Meters / Position (Custom Mode only)**





Where **Custom** mode is selected, allows for custom number of meter channels displayed, as well as a split between meters (if desired) which can be set between any pair.

Split Width controls sets the space between the space between the division set using the **Split Between Meters** control.



Split Width set at minimum (no split)

Split Width set at maximum (split pushes 2nd pair flush right)

Position controls raise the meter base when the control setting is increased, and move the display as a unit left or right.

Note: Where custom channel number complement is configured, channel correlation is always contiguous assignments starting at embedded channel 1.

Table 3-1 9970-QS-MC Function Menu List — continued

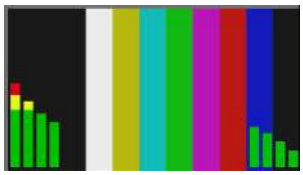
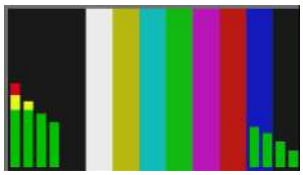
Audio Meter Overlay	(continued)
• **Meter Width Control** 	Sets the relative height of the audio bars.  **Width** set at middle **Width** set at less
• **Meter Height Control** 	Sets the relative height of the audio bars.  **Height** set at middle **Height** set at less
• **Meter Opacity Control** 	Sets the relative opacity of the audio bars. **Opacity** set at middle **Opacity** set at less

Table 3-1 9970-QS-MC Function Menu List — continued

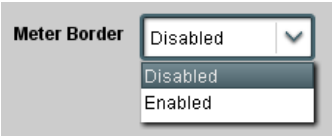
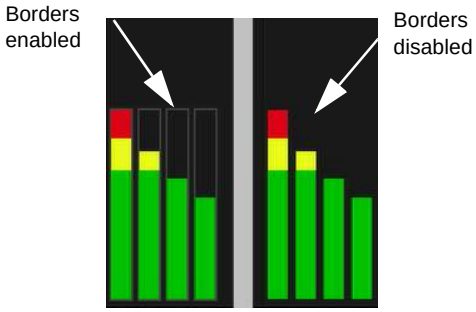
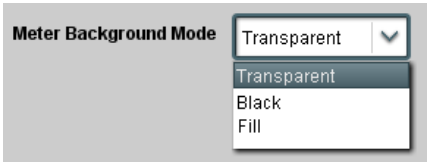
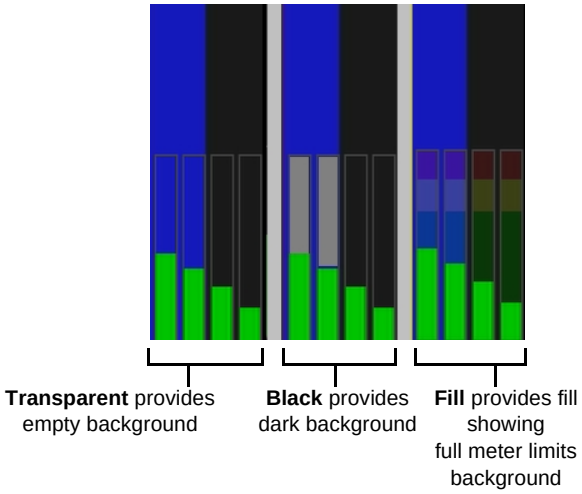
Audio Meter Overlay	**(continued)**
• **Meter Borders Select**  	Enables or disables limit borders surrounding each audio bar. 
• **Meter Brightness Control** 	Adjusts relative brightness of audio meter bars display.
• **Meter Background Select**  	Provides choice of three background themes for each meter bar. 

Table 3-1 9970-QS-MC Function Menu List — continued

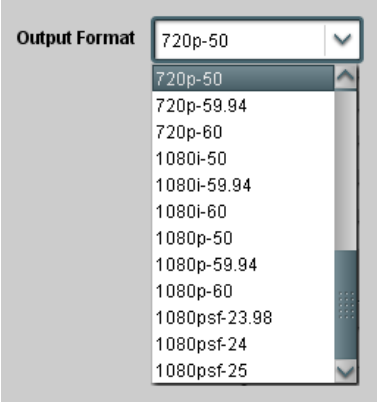
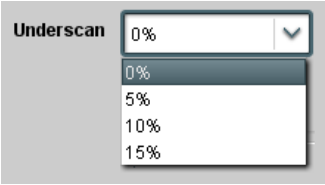
Output Format	Provides controls to set merged split output format and landscape or portrait orientation. Also provides settings to force an HDMI or DVI output suitable for direct connection to monitors using a DVI input in case the connection is not detected by the monitor. Also provides color mode controls to match HDMI/DVI output to the color space of the monitor.
• Output Format Selector  	Provides conversions to formats as shown. **Note:** Although drop-down and card will allow output video raster/rate choices unrelated to the input rates (for example, PAL 50Hz rate for NTSC 59.94Hz input rates), cross-rate conversion choices should not be used for critical applications (frames will be dropped when performing such conversions).
• Underscan Select  	Provides underscanning to reduce the merged output raster size by choices shown.
• 16x10 Compensation Select 	Provides compensating rescaling to fully fit a native 16x10 aspect ratio image into the 16x9 aspect ratios used for various layouts.

Table 3-1 9970-QS-MC Function Menu List — continued

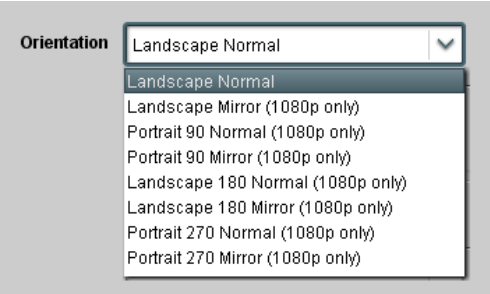
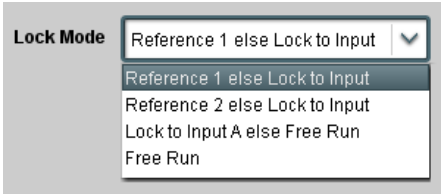
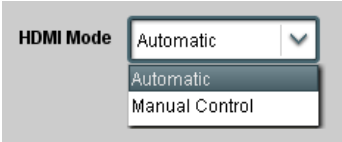
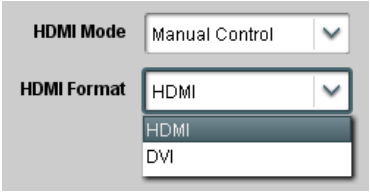
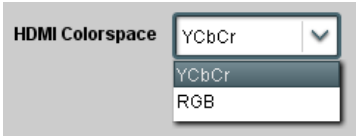
Output Format	**(continued)**
• **Orientation Select**  	Provides image rotation of the merged output image. Among the setting choices are Portrait modes which allow monitors to be rotated “on end”, and then have the 9970-QS-MC portrait mode provide a large PiP capacity view while keeping display wall width to a minimum. **Note:** • Except for the default Landscape Normal mode, all rotated modes require **Output Format** to be set at a 1080p choice. • Mirror modes will mirror-rotate any text in the image (such as text appearing in content, as well as UMD/tally text). (UMD/tally text burn-in is done upstream of the re-orientate described here.) • The number value in the selection names refers to degrees of rotation relative to the default (Landscape Normal) orientation.
  Landscape Normal orientation is the default orientation, basically suited for normal landscape monitor positioning. In the example here, **Portrait 90 Normal** is selected. The layout grid is rotated 90° clockwise. (When Portrait modes are selected, it may be desirable to resize the PiPs to better fit the new portrait aspecting.) 	
• **Video Lock Mode Select**  	Selects lock to reference functions from the choices shown and described below. • **Free Run:** PiP inputs and output video is locked to the card’s internal clock. Output video is **not** locked to external reference. • **Lock to Reference:** PiP inputs and output video is locked to selected external reference (Ref 1 or Ref 2) received on the frame reference bus, else input. • **Lock to Input A:** Uses Input A program video input video signal as the reference standard, else free-run. **Note:** Lock to reference provides the most stable operation, and is preferred where available. In this case, source video should also be locked to the same reference.

Table 3-1 9970-QS-MC Function Menu List — continued

Output Format	**(continued)**
• **Frame Delay Control** 	When Framesync is enabled, specifies the smallest amount of latency delay (frames held in buffer) allowed by the frame sync. The frame sync will not output a frame unless the specified number of frames are captured in the buffer.
• **HDMI Mode Control**  	Sets HDMI/DVI output to use the connected monitor to inform 9970-QS-MC to automatically detect the monitor format, or to use manual (forced) control. Where the monitor may not be able to provide this handshake signal, it is recommended to use **Manual** mode and force the desired mode as described below.
• **HDMI/DVI Format Manual (Forced) Mode Control**  	When set to Manual Control, sets HDMI card output as forced HDMI or DVI mode.
• **HDMI Colorspace Control**  	When set to Manual Control, forces output colorspace as either YCbCr or RGB.

Note: The HDMI output on this card conforms with CEA-861D HDMI audio channel line-up specifications. As such, a swap between the C and LFE channels for the HDMI output is automatically performed.

If connecting to a device that does not meet CEA-861D HDMI, a Ch3 / Ch4 swap using the Output Audio Routing/Controls may be required to effect desired C - LFE line-up.

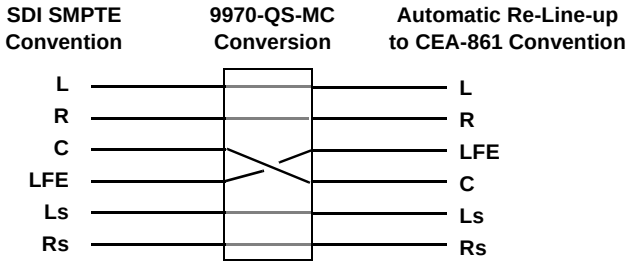


Table 3-1 9970-QS-MC Function Menu List — continued

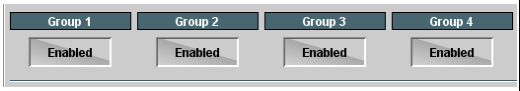
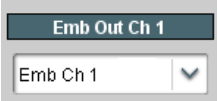
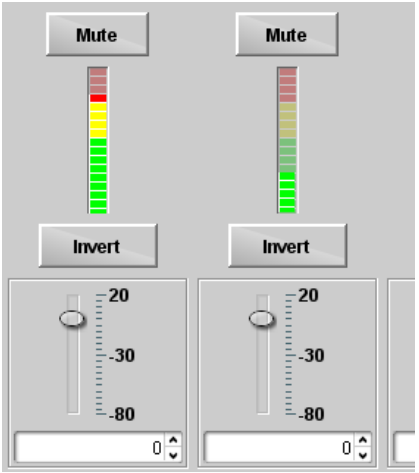
Output Audio Routing/Controls	Provides an audio crosspoint allowing the audio source selection for each embedded audio output channel. Also provides Gain, Phase Invert, and Muting controls and peak level meters for each output channel.
Note: • **Embedded Ch 2** thru **Embedded Ch 16** have controls identical to the **Source**, **Gain**, **Mute**, and **Invert** controls described here for **Embedded Ch 1**. Therefore, only the **Embedded Ch 1** controls are shown here. • For each channel, its source and destination should be considered and appropriately set. Unused destination channels should be set to the **Silence** selection.	
• **Embedded Audio Output Input Source** 	• **Audio Output Source** selects the four-group embedded audio to be embedded in the output embedded SDI audio (and HDMI Ch1 - Ch8 embedded audio). (In this example, PIP1 input audio is selected as the output four-group audio.) • **Audio Follow Full Screen** (when checked) automatically forwards audio associated with a full-screen video input whenever full screen is selected.
• **Group Enable/Disable Controls**  	Allows enable/disable of embedded audio groups 1 thru 4 on card program video output to accommodate some legacy downstream systems that may not support all four embedded audio groups. **Note:** Changing the setting of this control will result in a noise burst in all groups. This control should not be manipulated when carrying on-air content.
• **Embedded Output Channel Source**  	Using the drop-down list, selects the audio input source to be embedded in the corresponding embedded output channel from the following choices: • Card **Audio Bus (Emb) Ch 1** thru **Ch 16** • Built-in Tone generators **Tone 1** thru **Tone 16** (all are -20 dBFS level; freq (Hz) in ascending order are 100, 200, 300, 400, 500, 600, 700, 800, 900, 1k, 2k, 4k, 6k, 8k, 12k, and 16k) • Option Audio **LTC**
• **Channel Mute/Phase Invert/Gain Controls and Peak Level Display**  	Provides **Mute** and phase **Invert** channel controls, as well as peak level meter for each output channel. (Meter shows level as affected by Level control.) **Gain** controls allow relative gain (in dB) control for the corresponding destination Embedded Audio Group channel. (-80 to +20 dB range in 1.0 dB steps; unity = 0 dB) **Note:** Although this card can pass non-PCM data such as Dolby® E or AC-3, setting the gain control to any setting other than default 0 will corrupt Dolby data.

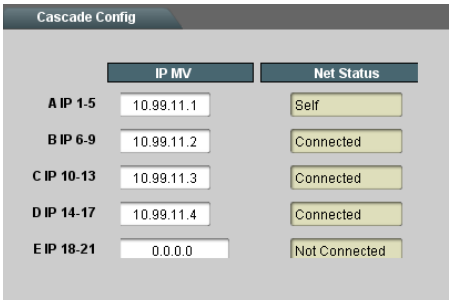
Table 3-1 9970-QS-MC Function Menu List — continued

Cascade Config	Cascade Config (in conjunction with multi-card network connection) provides cascade chain network-connected 9970-QS-MC cards to communicate with each other and expose settings and attributes from all of the cards within the chain. Each card “sees” the other -QS-MC cards in the network chain connection, with access to PiP controls for all PiPs from any card within the chain. The Cascade Config tab allows setting up the cards in the cascade chain to communicate with each other.

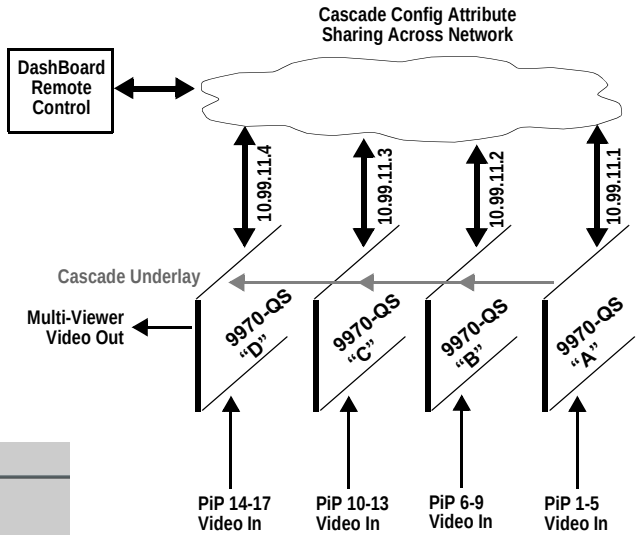
Note:
- Cards within a cascade chain communicate via Ethernet using each card’s dedicated rear module Ethernet port (DashBoard CAN bus is not used for this function). Cards must be fitted with a rear modules equipped with an Ethernet port (or use a smart frame that provides per-card dedicated Ethernet communication).
- In Cascade Config mode, any control setting changes are saved for all cards in the chain. However, to load a saved configuration from a Presets files to new of different cards for a Cascade Config chain, a special procedure must be used to make certain all cards in the chain receive the intended settings. See Loading Saved Presets to New or Different Cards (Cascade Config Usage) (p. 3-60) in Presets for instructions.
- If a global preset is to apply in some manner to all cards in the chain, it is recommended to have all cards in the chain set up as desired, and then save the preset on the **last** card in the chain. This helps ensure that **all** saved states in each card will be saved in an “umbrella” preset encompassing **all** cards in the chain.

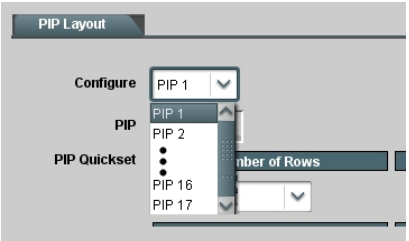
Cascade Config DashBoard tabs and multi-card card network connection allows cascade chain network-connected 9970-QS cards (9970-QS cards “A” thru “D” in this example) to communicate with each other and centrally expose setup attributes of all of the cards within the chain.

Cascade Config is designed to use the first card as a full quint-split processor, with subsequent cards in the chain taking in the cascade underlay as **In E** and additional PiP inputs as **In A** thru **In D**. In this example, a 17-input multiviewer is attained (four cards providing 5+4+4+4 = 17 input channels).



9970-QS cards within the chain (equipped with Ethernet-port rear modules) are connected to a shared network. This allows the cards to “see” each other, with each card exposing control attributes for **all** the cards.





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For each per-PiP control, the result is **all** PiPs within the chain being exposed, allowing settings to be performed from **any** of the cards and cloned to any card as desired. User presets can encompass all cards in the chain and be invoked in a single action done at one card.

Table 3-1 9970-QS-MC Function Menu List — continued

Cascade Config	**(continued)**

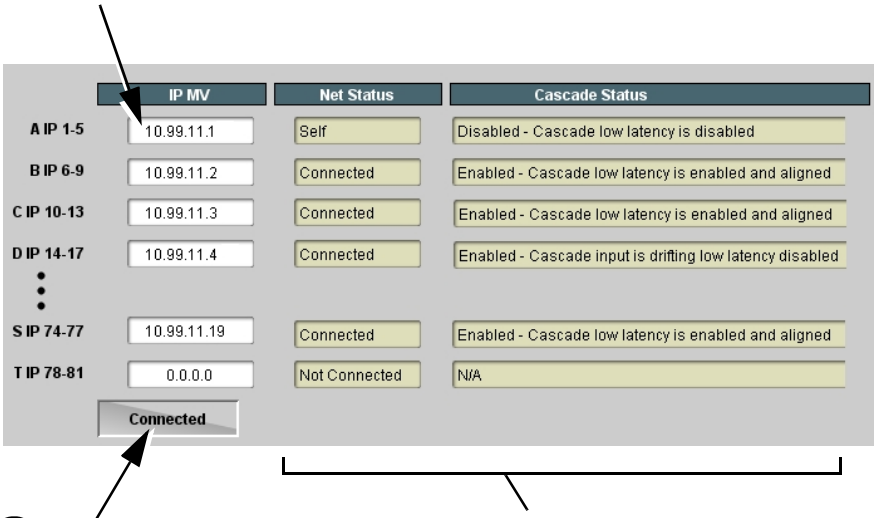
Cascade Configurator Network Setup

The configurator definer tool defines the 9970-QS-MC cards within a particular cascade chain by card IP address, and each card's position within the multiviewer setup. The setup is based on 9970-QS-MC cards being used with the first card receiving 5 program video inputs, and subsequent cascade 9970-QS-MC cards each receiving an upstream cascade underlay (on **PiP 5 In**) with 4 program video inputs being received on **PiP In 1** thru **PiP In 4** (in other words, as a **5 + 4*n*** matrix, with ***n*** being the number of downstream cascade cards).

This allows multiviewer setups using up to 20 cards (**A** thru **T** in the definer shown below) to provide an up to 81-split combined multiviewer image.

1. Assign each card in the cascade chain a card dedicated IP address (if not done so already). Working from the starting card to each downstream cascade card, enter the card IP address in each **IP MV** field.

   Refer to Admin (p. 3-61) for details on setting card IP address.



2. When done, click the **Connect** button. When all cards enter are connected, button shows Connected.

Net Status fields show connection status of each entered card.

- **Self** indicates card that is currently being viewed in setup dialog.
- **Connected** indicates other card that is defined in dialog .
- **Not Connected** indicates that card IP hasn't been entered in **IP MV** row, or simply a blank MV definer row that isn't being used.
- **Connection Failed** indicates a card that has IP entered is no longer connected (due to cabling issue or other network issue).

Cascade Status fields show cascade mode settings (Enabled or Dsiabled) and status for each defined card in the chain (as shown in the example here, first card in chain is not set for cascade since it uses all inputs as program video PiPs).

Note: When all cards are connected, this pane is available in **all** defined cards in the chain.

All 9970-QS-MC cards (except for card in first-card row **A** position) **must** be set for **Cascade Mode**. This allows subsequent cards to receive the PiP images from preceding cards.

See Cascade Mode Select (p. 3-11) for details on using the cascade mode.

3. Set up PiP positioning, sizing, and attributes (UMD, Idents, tallies, audio bars etc.) as described in respective sections of this chapter. Once the definer described above is connected, these attributes for all cards can be configured from any card in the chain. See the example on the next page for an overview and tips on using Cascade Config.

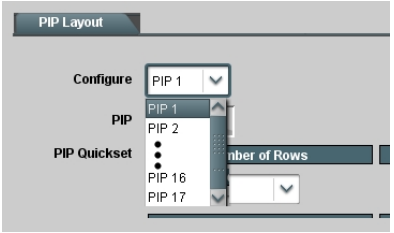
Table 3-1 9970-QS-MC Function Menu List — continued

Cascade Config	**(continued)**

Cascade Configurator Example and Setup Tips

The following shows an example where a 17:1 multiviewer is furnished using Cascade Config with four 9970-QS-MC cards forming a 4-card chain (5+4+4+4 PiP inputs which provides a 17-PiP multiviewer).

A very important and clarifying aspect of using Cascade Config is when the cards are cascade network defined (as described on the previous page) **the DashBoard UI simply combines all the discrete cards as a single device**. A primary function of Cascade Config is to provide a global, centralized setup point for all cards in the chain, thereby creating (from the UI perspective) a virtual single-device multiviewer.



As shown to the left, all DashBoard layout and attribute controls appear and function just like using the single-card 9970-QS-MC. The only difference is now **all the PiPs can be accessed from a single point** (rather than going from card-to-card). In our example, the **PIP Layout** drop-down now has **Configure** definers for PiPs 1 thru 17 instead of just PiPs 1 thru 5 for a single, non-networked card.

With Cascade Config, the only setup aspects that remain local to each card in the chain are:

- **Input Routing** (each card still needs its per-card input sources defined)
- **Output Audio** (each card needs to know whether to pass audio from an upstream card, or use audio sourced from a local PiP input
- **Output Format** (Output format will likely be set consistent across all cards in the chain. If a format change is needed for the final output, this is best accomplished by doing this on the last card in the chain.)

Shown below is the example multiviewer setup described in this example. For this example, Idents are set as **PIP1** thru **PIP 17** for the 17 PiPs in the merged MV output. Also for example purposes, the parenthetical designations correlate to the card **A** thru **D** per-card PiP inputs that provide the 5+4+4+4 that result in the 17-PiP aggregate.

— Example continued on next page —

Table 3-1 9970-QS-MC Function Menu List — continued

Cascade Config	(continued)

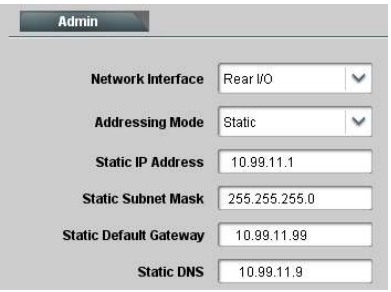
Cascade Configurator Example and Setup Tips (cont.)

1 First, all 9970-QS-MC cards in the cascade chain need to be assigned dedicated IP addresses to be used in conjunction with the per-card dedicated rear I/O module Ethernet RJ-45 port. (See Admin (p. 3-61) for details on setting card IP address.)

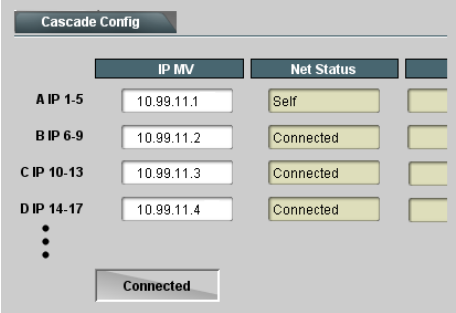
In the example here, four cards (**A** thru **D** in the cascade chain) are using dedicated IP addresses **10.99.11.1** thru **10.99.11.4**, respectively. This provides for a 17-PiP multiviewer setup

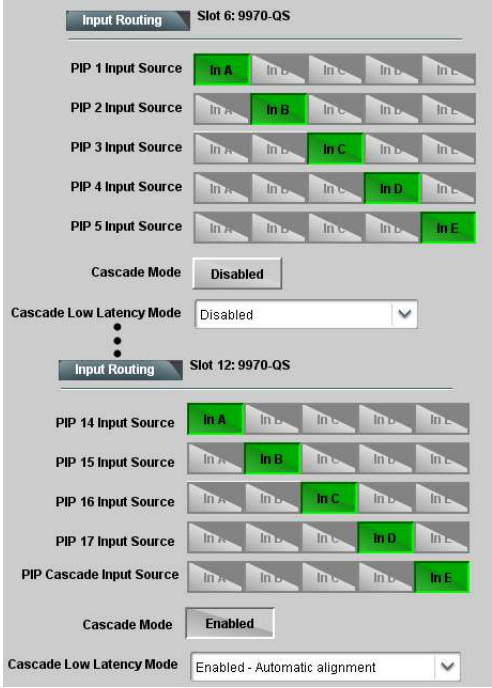
Card A (10.99.11.1) PiP 1 thru 5
Card B (10.99.11.2) PiP 6 thru 9
Card C (10.99.11.3) PiP 11 thru 13
Card D (10.99.11.4) PiP 14 thru 17

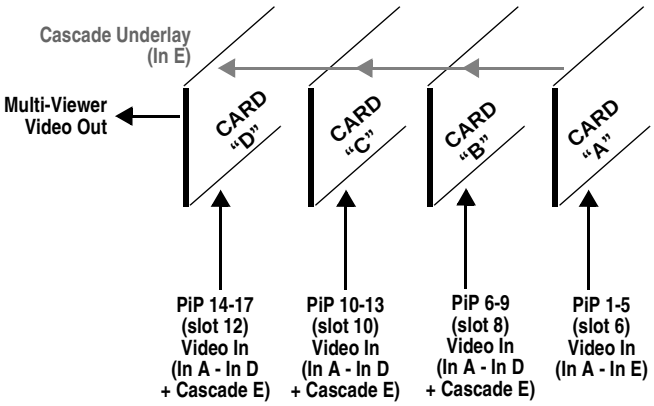
Total: PiPs 1 thru 17 on combined MV output



2 With the four cards (A thru D comprising the chain) assigned dedicated IP addresses, the IP addresses of the four cards are entered in the **A** thru **D** definer slots in Cascade Config page. When all card IP's are entered, click **Connect**. The cards are now connected in the Cascade mode.







3 On a per-card basis, the physical routing of PiP sources to each card's Source-to-PiP routing needs to be set up.

Shown here is the routing setup that applies the 17 PiP inputs to the respective inputs in the four-card Cascade chain.

- The **first** card in the chain (**Slot 6 Card A** in the example) is set as a regular quint-split, with five discrete program inputs and Cascade Mode disabled (since this card is not receiving a cascade underlay).
- **Subsequent downstream** cards in the chain (**Slot 8 Card B** thru **Slot 12 Card D** in the example) are set as cascade, with four discrete program inputs per card and Cascade Mode enabled (since these cards receive a cascade underlay).

— Example continued on next page —

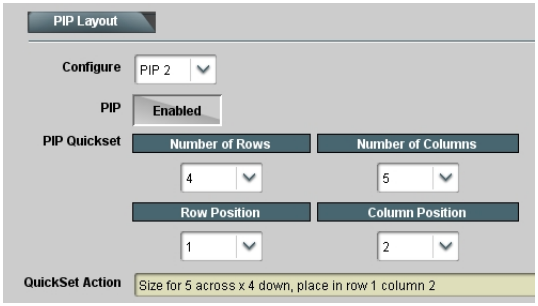
Table 3-1 9970-QS-MC Function Menu List — continued

Cascade Config	**(continued)**

4 All of the PiP Layout, ARC/Borders, Tally, UMD/Idents, and other graphical attributes are under the cloning “umbrella” (i.e., attributes can be set up for a given PiP and then cloned across others as desired). Knowing the desired general layout, set up any PiP meeting your desired layout, and then clone and modify the settings to achieve the overall desired layout. The example below shows some examples of setting up a given PiP, and then cloning and “tweaking” the settings for another PiP.

Note: Refer to setup control sections (e.g., PIP ARC/Borders Controls, UMD/Identification Text Insertion Controls, etc.) for specific instructions on using the particular graphic tool.

In the example layout shown, knowing a layout with 4 rows and 5 columns is desired, the PiP Layout settings for any PiP can be set for 4x5 rows/columns as shown. In this example starting with PiP 2, the row 1 position and column 2 position is set and applied, and the PiP is sized accordingly (20x25 in this example).



Once this is done, this PiP is cloned across **all** PiPs to establish the baseline consistency across all PiPs. Then after this, the row/column positions for the other PiPs can be tweaked to place them as desired. Other attributes such as UMD/Idents and Tally settings are then group cloned and then tweaked as desired.

Using the global 4x5 rows/columns layout, **PiP 2** is accordingly sized and set up to be positioned in Row Position 1 and Column Position 2. This baseline setting is cloned across all PiPs.

Using the global cloned settings from PiP 2, **PiP 9** is set up by using all cloned settings and simply tweaking the Row/Column positions to place it as desired.

Note that **any** PiP settings can be accessed from **any** card in the cascade chain.

Note: User custom text entered in UMD or Ident cells **must** be manually entered for each UMD and/or Ident cell. User custom text cannot be cloned from one PiP to another.

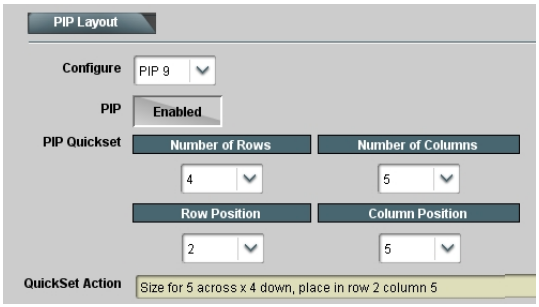


Table 3-1 9970-QS-MC Function Menu List — continued

Provides controls for integrating Utah Scientific™ router (such as SC-4) IP communication with 9970-QS-MC to provide automated UMD and Ident text burn-in, independently for PiP IN A thru IN E input channels.

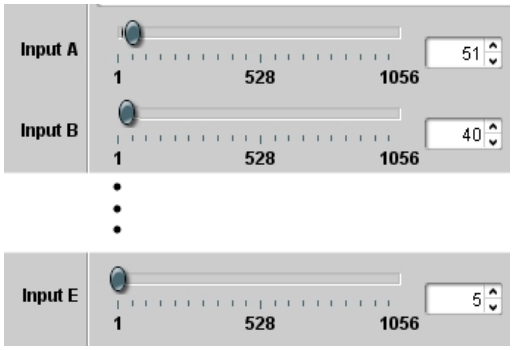
Note:
- Router address must be accessible to network used for 9970-QS-MC rear module Ethernet port (as set using the card Admin > Networking function (see pg. 3-61).
- When router access (fetch) is enabled, control of certain burn-in aspects is asserted by router control, with user manual control locked out.
- Utah routers (such as SC-4) are limited to UMD text assert only. This router cannot assert tally lamp activation states.
- The **PESA Router** sub-tab has controls and functions similar to those described below.

• Router Fetch Enable / Address Controls

Enables or disables Utah router command fetch and provides entry for Utah router address.

Note: When router access (fetch) is enabled, UMD text is asserted by Utah router commands. The **UMD > Display Format** control is locked to **External Input**, with user text entry or other UMD type selections locked out.

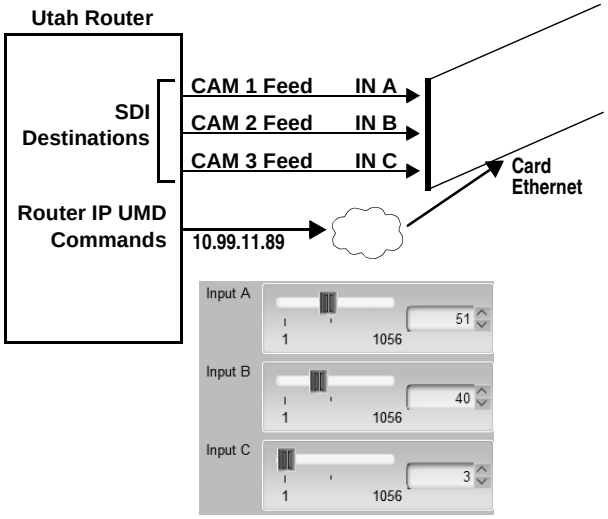
• Router Fetch Enable / Address Controls



Sets the router logical port-to-card input correlation for up to 5 card inputs (**IN A** thru **IN E**).

In the example below:

- Router logical port 51 is correlated to card input A
- Router logical port 40 is correlated to card input B
- Router logical port 5 is correlated to card input E



With the router destination commands for Input A thru Input C as shown here, router-enabled settings allow router to assert UMD text correlated to router destination outputs, and in turn, 9970-QS-MC inputs (in this example, router IP ports 51, 40, and 3 used for packet streams for IN A thru IN C, respectively).

As shown in the example, this asserts the “CAM 1” thru CAM 3” UMD text insertions for these three card inputs.

Table 3-1 9970-QS-MC Function Menu List — continued

Protocols uter Image Video	Provides controls for integrating Image Video™ router IP communication with 9970-QS-MC to provide automated UMD and Tally burn-ins, independently for PiP 1 thru PiP 5.
• **Router Enable Controls** Connection Status PIP 1 Update From Display 1 Update From Line 1 Enable Updates Enabled PIP 2 Update From Display 1 Update From Line 1 Enable Updates Enabled • • • PIP 5 Update From Display 1 Update From Line 1 Enable Updates Enabled	Enables or disables Image Video router updates for each of the five card PiPs. • **Update from Display** asserts PiP tally lamp activation. • **Update from Line** asserts UMD text. **Note:** • The Image Video integration works on a PiP-by-PiP basic (rather than commands being tied to card input channels). • Image Video router/server holds 9970-QS-MC IP address to establish connection. Therefore, the Image Video address is not required here.
Protocols age Video TSL Protocol	Provides controls for integrating TSL™ router IP communication with 9970-QS-MC to provide automated UMD and Tally burn-ins, independently for PiP 1 thru PiP 5.
• **Router Enable/Correlate to PiP Controls** Enable TSL Protocol Enabled TSL Port Number 5005 PIP 1 Update From Display 0 PIP 2 Update From Display 1 PIP 3 Update From Display 2 PIP 4 Update From Display 3 PIP 5 Update From Display 4 Tally 1 Color Green Tally 2 Color Red	TSL router messages typically provide automated UMD text correlating to names used on the TSL control surface (for example, “CAM 1” for PiP1). • **Enable TSL Protocol** enables and sets card to look for TSL messages. • **TSL Port Number** is the logical port assigned for the TSL router. • **PIP *n* Update From Display** correlates the TSL display number to the 9970-QS-MC PiP channel. • **Tally 1 Color / Tally 2 Color** selects the “illumination” colors to be used when either Tally Lamp 1 or Tally Lamp 2 is activated. **Note:** • The TSL integration works on a PiP-by-PiP basic (rather than commands being tied to card input channels). • TSL router/server holds 9970-QS-MC IP address to establish connection. Therefore, the Image Video address is not required here.

Table 3-1 9970-QS-MC Function Menu List — continued

GPI Setup	Provides controls for setting up to 16 “virtual GPIs” using the up to five discrete GPI inputs. The virtual GPIs can in turn be used for attribute control such as tally lamp activation, borders, and ident text (in conjunction with the **Event Action** tab controls).

Up to five GPI inputs are available which can be used as direct or logic statement control inputs. Additionally, up to 256 VGPIs (virtual GPIs) can be received via certain automation system via the card network connection.

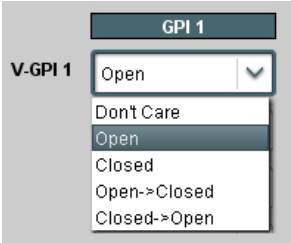
In examples here, **GPI Condition 2** goes active when triggers defined as other than Don’t Care become true (in this case, the GPI 1 and GPI 2 2 conditions shown).

In the **GPI Condition 15** example shown here, the card GPI inputs are not used (set to Don’t Care), while when **VGPI# 15** goes true, GPI Condition 15 becomes active.

GPI Condition 1 thru **GPI Condition 16** defined here are in turn used with the **Event Actions** page to provide tally, border, and other attributes control based off of GPI inputs received. (See Event Actions/Setup Controls (p. 3-48) for instructions on setting up action triggering controls.)

GPI 1 thru **GPI 4** definers have drop-down which allow setting the logic associated with the input:

Open = pullup HI
Closed = pulldown LO
Open->Closed = falling-edge trigger
Closed->Open = rising-edge trigger



• Unused GPI inputs should be set to “Don’t Care”

Make certain GPI inputs are in accordance with GPI Inputs in Technical Specifications, Chapter 1. Introduction.

Table 3-1 9970-QS-MC Function Menu List — continued

Provides controls for setting up attribute control such as tally lamp activation, borders, and ident text using GPI, video format, or other action triggers. Internal intelligent event triggers provide attribute control based off of detected signal conditions.

The Event Actions page allows defining up to 32 discrete events that can be used to control attributes (color, on/off states, and other visual cues) of tally, border, or other graphics in response to GPI, data, or video status conditions. This provides easily incorporated and flexible attributes control using internally assessed conditions or via integration with external IP assets.

Event Trigger Select

Sets conditions or inputs that control attributes actions:

- **Engage Mode** tells row settings to be engaged upon defined rules being true, or by forcing the event. **Force Event** setting is useful for testing how the Action appears, or for manually setting an attribute without external triggers.
- **GPI Condition #** allows virtual GPI control to be used to trigger an Action (see GPI Setup Controls (p. 3-47) for info on GPI setup).
- **Data** allows camera metadata to be used to trigger an Action.
- **Video Format** allows received video format of the selected PiP to be used to trigger an Action.
- **Video Condition** allows triggering on true video format conditions, or triggering on false (inverse) video format conditions. This is useful in defining a trigger that invokes an action to indicate contrary formats.

Event Correlator Rows

Allows up to 32 discrete events to be defined and used in any combination for PiPs 1 thru 5

	PIP #	Engage Mode	GPI Condition #	Data	Video Format	Video Condition
Event 1	PIP 1	Use Event Rules	GPI Condition 4	RED Record	Don't Care	Enable if True
Event 2	PIP 1	Use Event Rules	Don't Care	RED Stop	Don't Care	Enable if True
⋮						
Event 32	PIP 4	Use Event Rules	Don't Care	Don't Care	1080i 59.94	Enable if False

Event Action Select

Sets the action to take place when a corresponding trigger is received:

- **Tally Select** allows selecting tally lamp 1 and/or 2 attribute actions to be applied when a trigger is true.
- **Tally Color** assigns a color to be applied to the selected lamp when a trigger is true.
- **Border Action** allows border color to be changed when a trigger is true.
- **Ident Select** selects fromUMD, Ident1, Ident2, Timecode, or No Action to be invoked when a trigger is true.
- **Ident FG (foreground) Color** and **BG (background) Color** allow text and/or background color changes to either Ident1 and/or Ident2 text insertions to be applied when a trigger is true.
- **Ident Text** allows alternative Ident text to be optionally asserted when a trigger is true.

Tally Select	Tally Color	Border Action	Ident Select	Ident FG Color	Ident BG Color	Ident Text:	Status
Tally Lamp 1	Green	Green	Ident 1	Green	Red		Active
Tally Lamp 2	Red	Red	Ident 1	Magenta	Yellow		Inactive
⋮							
No Action	Red	Red	No Action	No Action	No Action		Inactive

Note:
- Event Action conditions, when used in a combination and not set as “Don’t Care” comprise an **AND** function. Make certain any conditions not to be considered are set to Don’t Care. Similarly, if an attribute is not to be “touched” by the invoking of an event, make certain these actions are set to “No Action”.
- Loss of true conditions does not disengage an event-based triggering. A new set of true conditions (or a separate row defined as the false of the condition) must be defined and then occur to transition from one event-based trigger to another.
- Any attribute can be manually set by defining an event, and then setting Engage Mode to **Force Event**.
- The **Event Actions** Event 1 thru 32 here are nested and confined to actions set on this subtab page. Events 1 thru 32 here are **not** related to, controlled, or activated by Event 1 thru 32 on the **Event Triggers** subtab page.

Table 3-1 9970-QS-MC Function Menu List — continued

(continued)

Event Action Examples

	PIP #	Engage Mode	GPI Condition #	Data	Video Format	Video Condition
Event 1	PIP 1	Use Event Rules	GPI Condition 1	Don't Care	Don't Care	Enable if True
Event 2	PIP 1	Use Event Rules	GPI Condition 2	Don't Care	Don't Care	Enable if True

Tally Select	Tally Color	Border Action	Ident Select	Ident FG Color	Ident BG Color	Ident Text:	Status
Tally Lamp 1	Green	No Action	No Action	No Action	No Action		Active
Tally Lamp 2	Red	No Action	No Action	No Action	No Action		Inactive

In this example, **GPI Condition 1** and **GPI Condition 2** are used to control the color and activation of the PiP 1 tally lamps.
- When **GPI Condition 1** is active as a trigger (Event 1) , the event action sets the tally lamp 1 to **green**.
- When **GPI Condition 2** is active (Event 2), the event action sets the tally lamp 1 to **red**.

	PIP #	Engage Mode	GPI Condition #	Data	Video Format	Video Condition
Event 1	PIP 5	Use Event Rules	Don't Care	Don't Care	1080i 59.94	Enable if True
Event 2	PIP 5	Use Event Rules	Don't Care	Don't Care	1080i 59.94	Enable if False

Tally Select	Tally Color	Border Action	Ident Select	Ident FG Color	Ident BG Color	Ident Text:	Status
No Action	No Action	Green	No Action	No Action	No Action		Active
No Action	No Action	Red	No Action	No Action	No Action		Inactive

In this example, **Video Format** is used as a trigger to put up a special border for PiP 5 if the PiP format is anything other than 1080i 5994.
- If 1080i 5994 is being received (Event 1), the border displays as **green**.
- If a format other than 1080i 5994 is received (comprising a false condition as set in Event 2), the previous action is overwritten with a new action to turn the border to **red**.

Table 3-1 9970-QS-MC Function Menu List — continued

Provides event-based loading allowing a defined action to be automatically engaged upon various received signal status.

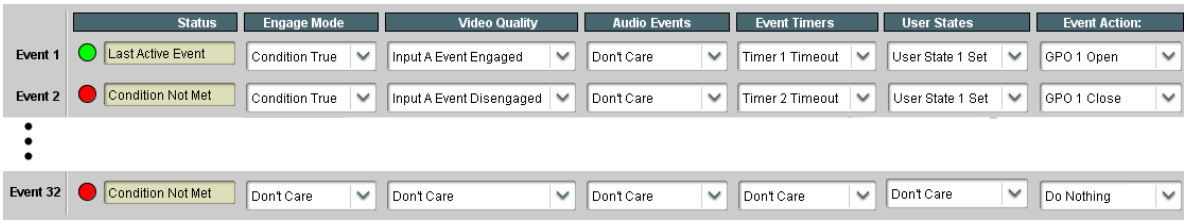
Event based actions are not passive and can result in very significant and unexpected card control and signal processing changes if not properly used. If event based actions are not to be used, make certain the **Event Based Loading** button is set to **Disabled**.

Note: The **Event Triggers** Event 1 thru 32 here are nested and confined to events set on this subtab page. Events 1 thru 32 here are indepedent of, and **not** related to Event 1 thru 32 on the **Event Actions** subtab page (e.g., Event 1 becoming true here has no effect on Event 1 on the Event Actions subtab page).

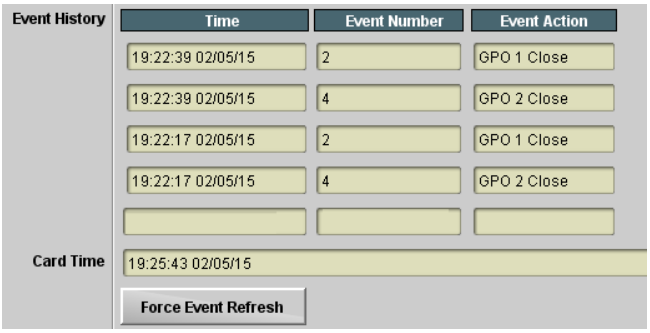
Event triggers allow a variety of event screening criteria, and in turn provide an Event Action "go to" in response to the detected event(s). For each screened criteria, categories can be set as "Don't Care" or set to specific criteria to broaden or concentrate on various areas of concern.

- The **Event based loading** button serves as a master enable/disable for the function.
- Go-to **Event Actions** can be "canned" (hard-coded) selections (such as GPIO triggers, timer controls (see Event Timer Setup (p. 3-52)), or automated E-mail alert to a respondent (see Email Alerts (p. 3-52) for setting up e-mail alerts).
- Each Event (**Event 1** thru **Event 32**) can be set to screen for any or several Definer criteria as shown in the example below. Up to 32 separate events can be defined.
- Event 1 thru Event 32 are arranged with Event 1 having the highest priority, descending down to Event 32. Where multiple event screening is enabled, lower-priority events are serviced first, with the highest-priority event being the final event serviced and last action taken as well as last item logged in the Event History (see below). This helps ensure that a lower-priority event does not mask detection of higher-priority event(s).
- The **Status** indicator and message shows the activation status of each Event. Green indicator means event is currently engaged.

Event Definers
Each event can be uniquely set up for any of the condition types in these columns. Unless set to Don't Care, all defined conditions will need to be true in order for the Event to be considered active



Note: Event criteria settings in any row comprise an AND function. Where multiple criteria are selected, a true (trigger) condition is not propagated unless **all** specified criteria are true. To independently screen for multiple criteria, rows should be set up where each criteria is screened in its own Event row. Examples of this are shown on the following pages.



The **Event History** log shows any triggered events in groups of five most recent events (newest at the top).

In the example here, log shows Event 2 as the most recent event, and its user-selected action of GPO 1 Close.

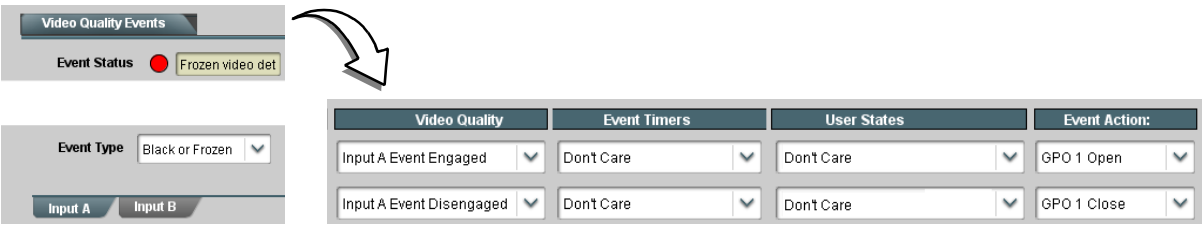
Pressing the **Force Event Refresh** button updates the list.

Table 3-1 9970-QS-MC Function Menu List — continued

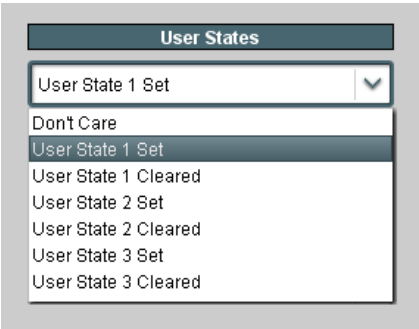
(continued)

In the example here for Event 1, the **Video Quality Events** tab is set to screen for frozen video on Input A. When detected, this status can be used here (Video Quality set to "Input A Event Engaged" indicating black or frozen video detected). Using the Event Action selector, go-to action of **GPO 1 Open** can be invoked.

Conversely, to change the GPO state to the original state, an event could be set up with Video Quality here looking for "Input A Event Disengaged" and in turn invoke an event action of **GPO 1 Close**).



Note:
- Screened conditions are triggered upon start of event. Any event-based setup must be done in advance of the triggering event in order for event to be detected.
- Loss of true conditions does not disengage an event-based triggering. A new set of true conditions must be defined and then occur to transition from one event-based trigger to another.
- Time required to engage an event-based trigger depends upon complexity of the called action. (For example, an action that invokes a video change will take longer to engage than an action involving only an audio routing change.)
- Make certain all definable event conditions that the card might be expected to "see" are defined in any of the Event 1 thru Event 32 rows. This makes certain that the card will always have a defined "go-to" action if a particular event occurs. For example, if the card is expected to "see" a 720p5994 stream or as an alternate, a 525i5994 stream, make certain both of these conditions are defined (with your desired go-to actions) in any two of the Event 1 thru Event 32 condition definition rows.
- Where multiple event screening is set up, the event you consider to be the highest priority should be set as higher priority than lesser events. Also, this prioritization helps ensure that all desired events are screened for before a significant change (such as input video source change) is effected.

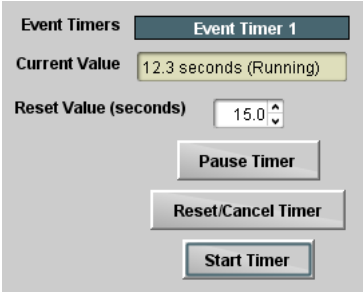


User States is a special column which allows a logic state to be set (similar to a register or latch) whenever a defined condition is first triggered. A user state (which is latched until cleared by some other definable action) can be sucessively used with other user states, thereby allowing a final action to be invoked only when subordinate user states have been sequentially satisfied as true.

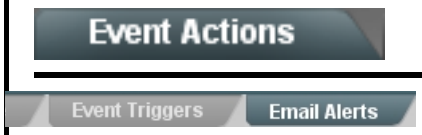
Three discrete user state latches are available in each row.

Table 3-1 9970-QS-MC Function Menu List — continued

Provides three general-purpose timers that can be triggered to start, pause, reset, or stop upon event actions. The state of each timer, in turn, can also be used to invoke other actions.



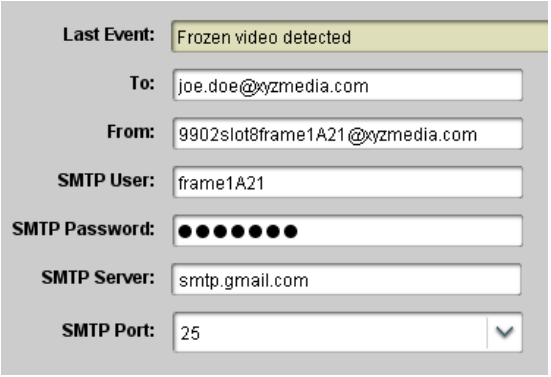
Event Timers 1 thru **3** (Timer 1 shown) can be set with count-down values. The Pause/Reset/Start control here are manual controls. The timers are available to be started, paused, or reset/cancelled using events in the **Event Triggers** sub-tab.



Provides setup for automated Email alerts when an event has occurred.

As an Event Action choice on the Events Triggers sub-tab, an Email alert can be sent as a response. Set up email fields as shown in the example below.

Note: Frame hosting the card must be accessible to email recipient's network. It is recommended to set up and generate a test event to test the email send.

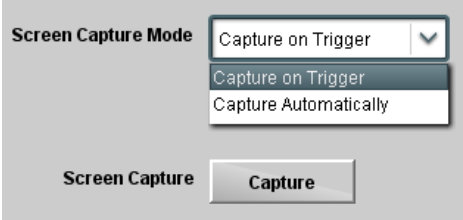


When fields are filled-in to specify recipient and sender, and email alert is selected for Event Action on Event Triggers sub-tab page, recipeient receives an email alert upon event, with the triggering event shown (in this example, "frozen video detected").

Table 3-1 9970-QS-MC Function Menu List — continued

Output Preview displays regularly-sampled screen captures in the card DashBoard page. The transfer of screen image frame captures (via the card through the DashBoard network connection) allows over-the-network confidence assessment of input video program content and presence over DashBoard remote control without physical collocation with the card or its input or output streams.

• **Screen Capture Mode Controls**



Screen Capture Mode sets the capture/display action as follows:

- **Capture on Trigger** allows manually initiated screen captures which are executed **only** when the **Screen Capture** button is pressed.
- **Capture Automatically** provides periodic samplings consisting of a new capture about every 5 seconds.

Note: This function operates only if the card is set to provide a **progressive** video output (e.g., 720p, 1080p, etc.).

It is recommended to set the Screen Capture Mode control to Capture On Trigger (or entirely disable Output Preview) when the preview function is no longer needed. DashBoard control motion may lack smoothness or act "jerky" if Capture Automatically is left enabled.

- When the card is acquiring frame captures (either 5-second periodic-updated continuous images or single frame when Capture on Trigger > Capture is invoked), the area on the bottom of the DashBoard page displays the multiviewer image of the input video PiPs.
- The preview frame(s) will remain displayed in DashBoard.
- To exit from the capture display, click on any other DashBoard tab. DashBoard will then resume with the normal DashBoard control surface display.
- (See below). DashBoard acquires program video frame captures using an external network connection from a card rear module **Ethernet** port to the network/computer hosting the card's DashBoard connection.
  - DashBoard "learns" the card's IP address.
  - When preview is requested, DashBoard queries the card address for the image (with the image transferred via the card rear module Ethernet connection).

Note: This feature requires that card be fitted with a rear module with an Ethernet connection to the network hosting DashBoard, or card is fitted to a "smart" frame with dedicated per-slot Ethernet connections. This connection is used to transfer the image from the card to the computer hosting DashBoard (the image is **not** transferred via the regular frame CAN bus/frame connection). Connection can be DHCP or static IP. See Admin (p. 3-61) for card network setup.

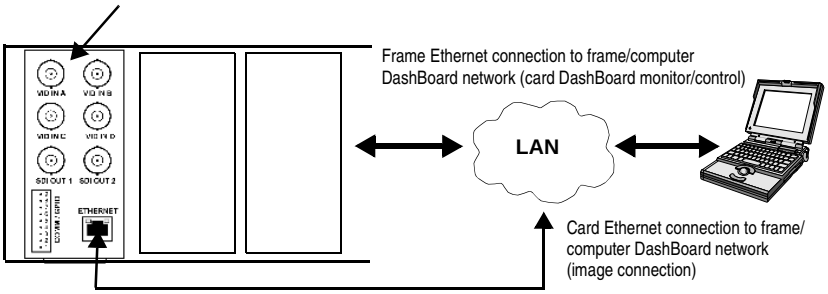


Table 3-1 9970-QS-MC Function Menu List — continued

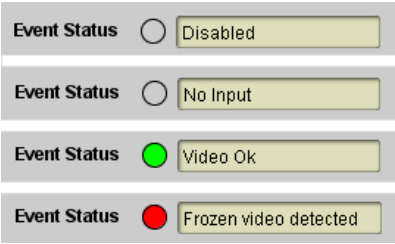
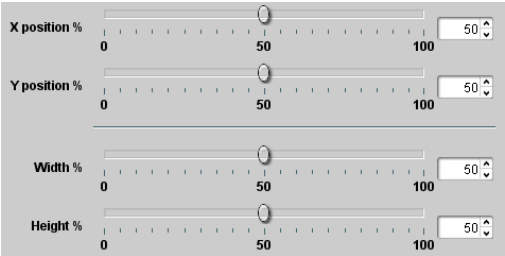
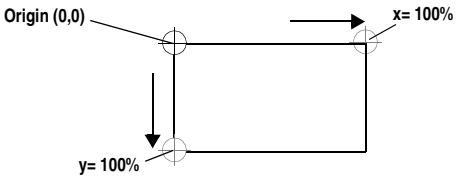
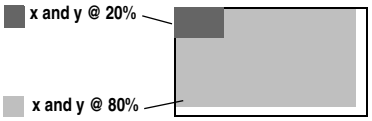
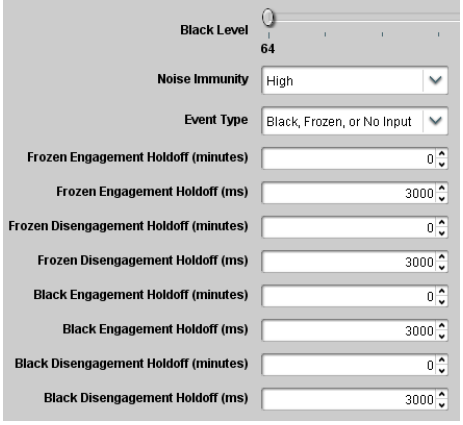
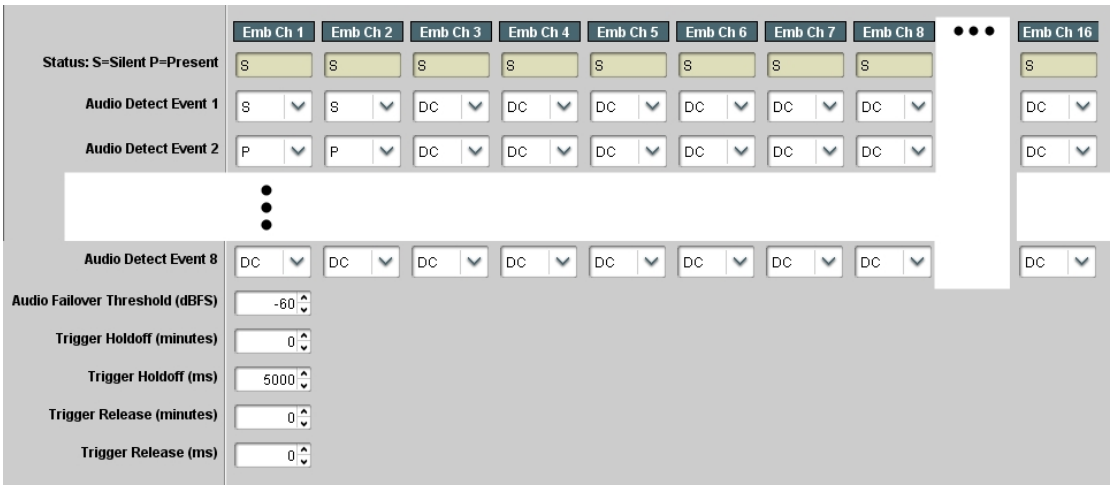
Video Quality Events	Sets quality check screening and thresholds for video quality event alerts. When a quality events occur, the event(s) can be used by the Event Actions function to invoke alerts or other actions.
Note: Only **Input A** can be screened for video quality events.	
• **Event Status Indicator**  	Displays event status (based on criteria set below) for signal condition to be considered OK (green), or signal condition considered to be a quality alert event (red) due the condition exceeding the criteria threshold(s) set below.
• **Position and Width Controls**  	Position and Width controls set the area of concern to be screened by the Quality Event function. **X and Y Position** controls set the origin point for the area of concern  **X and Y Width** controls set the size for the area of concern 
• **Threshold and Event Type Controls**  	Sets the thresholds for black frame and event type to be considered. Also provides holdoff controls for event trigger engagement and disengagement. • **Noise Immunity** sets the relative noise levels that are rejected in the course of black event assessment (Low, Medium, or High). • **Engagement Holdoff** sets the time (in msec) where, when time is exceeded, an event is to be considered a valid alert event. • **Disengagement Holdoff** sets the time (in msec) where, when event time is has ceased, an alert event is cleared. • **Event Type** sets the type of event(s) to be considered by the event screening (Disabled, Frozen frame, Black frame, or either No Input, Black or Frozen frame).

Table 3-1 9970-QS-MC Function Menu List — continued

Audio Detect Events	Sets audio level screening and thresholds for audio silence/presence/"DC" event alerts on embedded audio in. When an audio events occur, the event(s) can be used by the Event Actions function to invoke alerts or other actions.

Any combination of embedded input channels can be selected to be screened for presence (**P**), silence (**S**), or don't care (**DC**). In the example here, **Audio Detect Event 1** is set to trigger if audio on channels Emb Ch 1 and Ch 2 fall below the selected threshold for an interval exceeding the selected threshold. Status indicators for each channel show silence (S) / presence (P) status based on the configured thresholds.

Up to eight independent audio silence/presence events can be set to be screened (with descending priority of consideration from Event 1 down to Event 8). This status here can be propagated to the **Event Actions** tab controls to issue a GPO or other command when audio silence events are detected.



- **Audio Failover Threshold** sets the dBFS level at which channel content is considered to be silent, and correspondingly also a transition back to an untriggered condition with resumption of audio for the selected embedded channels. If the selected channels maintain levels above the selected **Audio Failover Threshold**, no triggering is invoked.
- **Trigger Holdoff** sets the period of time in which selected channel silence must occur before an Audio Silence Event trigger goes true.
- **Release Holdoff** control sets the time in which the trigger is revoked upon an event false condition.

Note:
- Default threshold and holdoff settings shown here are recommended for typical use.
- "Don't Care" setting may be labeled as **Don't Care**, **DC**, or **DSBL** (disabled). All notations mean ignoring the channel from event triggering.
- Selections other than Don't Care work as an AND function. Where multiple selections are set, a true (trigger) condition is not propagated unless **all** selected channels experience the configured criteria.
  (In the example shown above, **both** channels Emb Ch 1 and Emb Ch 2 need to experience a Silence event for a trigger to be propagated.)

Table 3-1 9970-QS-MC Function Menu List — continued

Logo Insertion	Provides for insertion of loaded user graphic file which can be used as a branding “bug” or a personalized background “skin”.

Note: For a background skin, the file must have layer settings that allow transparency or PiP “windows” such that the graphic does not obscure the PiP image. Consult Product Support with any questions, or for questions regarding file formats and sizing.

Uploading Your Logo Graphic Image to 9970-QS-MC Card

A user memory area for images is reserved in the card. A standard .png file is converted to a .bin file which is uploaded to the card, where the .bin then provides the logo graphic used by the card. The conversion consists of an online tool that takes in a .png and outputs the image .bin file which is then uploaded to the card as described in the steps below.

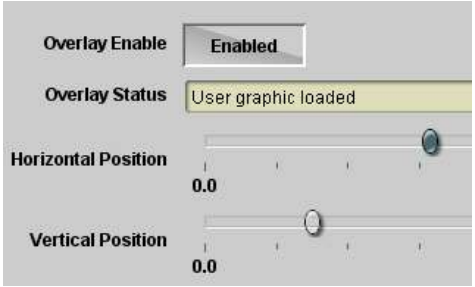
Note: • Your file **must** be a **.png** file with a .png extension. The filename should not contain spaces.

- No scaling is applied or available using the generator tool. (For example, if a 100 x 100 pixel image is uploaded to the tool, the image overlay will also be 100 x 100 pixel regardless of program video format or raster dimensions.)
- Transparency aspects in your native file are preserved in the generator conversion.

Use the conversion tool as described below.

1. With your .png sized as desired for insertion, go to **http://a.cdi-eng.com:55080/cgi-bin/image_upload.py**
2. Browse to your file. A prompt will appear to save the generated .bin file. Select Save (or Save As) to store the generated file in your desired folder. Close the tool when done.
3. In DashBoard on the card page, click **Upload** to upload the image file to the card/device. Follow the prompts to browse to and upload the file. The image is now ready to be used by the card/device.

• User Graphic Overlay Insert/Size Controls



Provides basic controls for enabling insertion and positioning the insertion within the overall merged PiP output video raster.

In the example here, the user graphic is inserted over the lower right PiP image area.

Note that the graphic insertion layer is behind burn-ins (such as UMD) but on top of the PiP video image. Sizing and transparency must be considered depending on the purpose of the graphic.

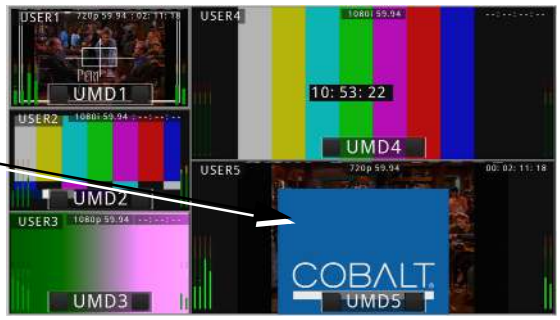


Table 3-1 9970-QS-MC Function Menu List — continued

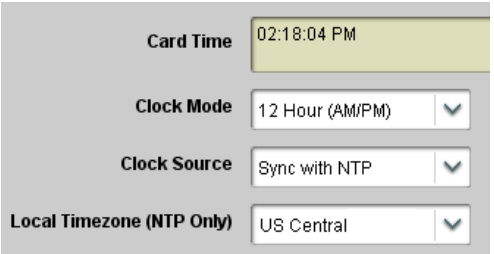
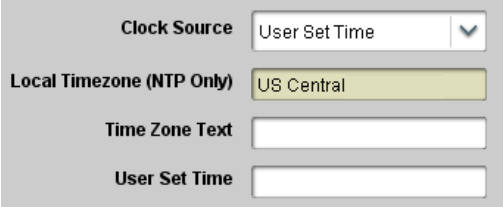
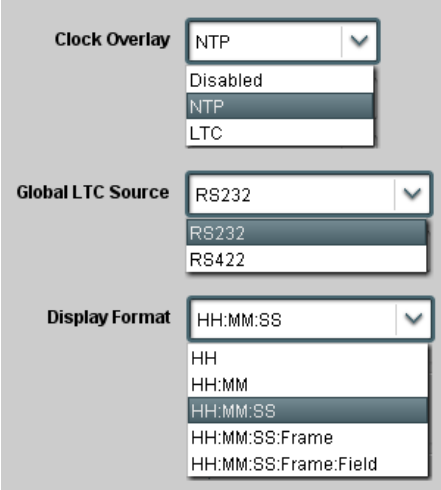
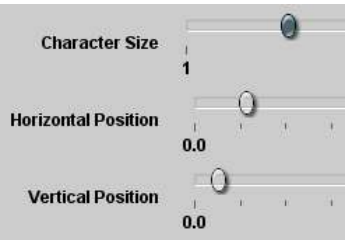
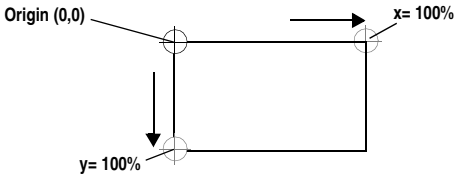
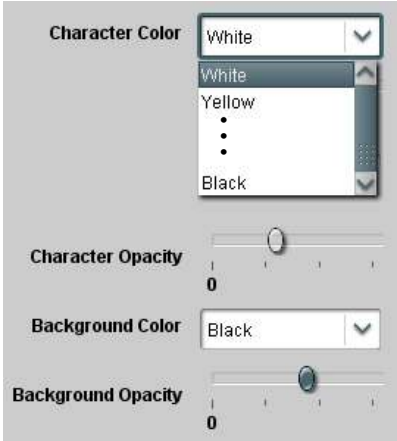
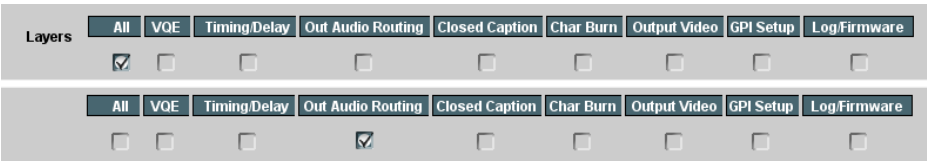
Clock	Provides controls for setting and inserting wall-clock time into merged output or as a per-PiP insertion selection.
• **Clock Mode / Set Controls**  	Allows clock time and display mode to be set as follows: • **Clock Mode** selects between 24-hour ("military") time, or time using AM and PM designations. • **Clock Source** selects user-entered arbitrary time or NTP-synced time. • **Local Timezone** provides timezone offsets for localization when using NTP time. • **Card Time** display shows the currently configured running wall-clock time (whether set as user-entered arbitrary time or NTP-synced time). **Note:** NTP syncing is only done at various intervals. To invoke resyncing, power-cycle to card to immediately sync with NTP.
• **User Set Mode Controls**  	When **Clock Source** is set to **User Set Time**, allows entry of user time, and also allows entry of user text identifying the time zone or other text (this time zone text is displayed when entered for either user time or NTP time) Click **Set Time** to invoke user set time.
Note: Clock can be burned in as an overlay over the merged split output (using the controls below) and/or as a per-PiP insertion using the individual PiP 1 thru PiP 5 **UMD/Idents** insertion controls. Where insertion as a per-PiP Ident burn-in is desired, the enable control below does not have to be set to Enabled.	
• **Clock Overlay Select/Enable**  	• **Clock Overlay** allows wall-clock time to be burned into the **overall merged** video output. Also allows selecting source as NTP/User or external LTC. • **Global LTC Source** selects from RS232 or RS422 external timecode source when **LTC** is selected above. • Display Format (when LTC is selected above) selects the format of timecode string burn-in overlay insertion from choices shown. . **Clock Overlay** set to Enabled inserts a clock burn-in into the merged video output and not directly bound to any PiP area

Table 3-1 9970-QS-MC Function Menu List — continued

Clock	**(continued)**
• **Clock Character Size and Custom Position Controls**  	**Horizontal** and **Vertical Position** controls set the origin point for the clock overlay. 
• **Clock Text Character/Background Attributes Controls**  	Provides independent controls for setting the color and opacity of the clock text and its background. • **Color** drop-downs set text or background color from multiple choices. • **Opacity** controls set text or background opacity from 0% (least opacity) to 100% (full opacity).
Presets	Allows user control settings to be saved in a one-button Preset and then loaded (recalled) as desired, and provides a one-button restore of factory default settings.

• **Preset Layer Select**

Allows selecting a functional layer (or “area of concern”) that the preset is concerned with. Limiting presets to a layer or area of concern allows for highly specific presets, and masks changing card settings in areas outside of the layer or area of concern.



Default **All** setting will “look” at all device settings, and save and invoke **all** settings when the preset is invoked (loaded).

Selecting a layer (in this example, “Out Audio Routing”) will set the preset to **only** “look at” and “touch” output audio routing settings and save these settings under the preset. When the preset is invoked (loaded), **only** the output audio routing layer is “touched”.

Example: Since audio routing can be considered independent of PiP layout settings, if normal audio routing was set up with a particular PiP setting in effect, and at a later time audio routing is desired to be saved as a preset, selecting **Out Audio Routing** here limits preset-invoked changes to **only** the audio routing layer, “telling” the preset save/load to not concern itself with other aspects such as PiP settings. In this manner, when the preset is invoked any PiP settings in effect will remain untouched, with only the audio routing changes invoked.

Table 3-1 9970-QS-MC Function Menu List — continued

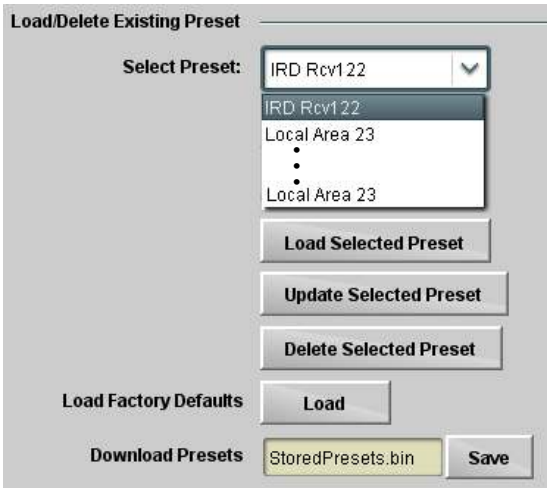
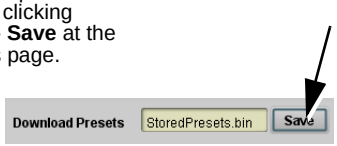
Presets	**(continued)**
• **Preset Enter/Save/Delete** **Protected** state – changes locked out **Ready** (open) state – changes can be applied	Locks and unlocks editing of presets to prevent accidental overwrite as follows: • **Protect (ready):** This state awaits Protected and allows preset Save/Delete button to save or delete current card settings to the selected preset. **Use this setting when writing or editing a preset.** • **Protected:** Toggle to this setting to lock down all presets from being inadvertently re-saved or deleted. **Use this setting when all presets are as intended.** • **Create New Preset:** Field for entering user-defined name for the preset being saved (in this example, "IRD Rcv122"). • **Save:** Saves the current card settings under the preset name defined above.
• **Preset Save/Load Controls**  	• **Select Preset:** drop-down allows a preset saved above to be selected to be loaded or deleted (in this example, custom preset "IRD Rcv122"). • **Load Selected Preset** button allows loading (recalling) the selected preset. When this button is pressed, the changes called out in the preset are immediately applied. • **Update Selected Preset** button allows saving any card settings changes to the selected preset. When this button is pressed, the changes in effect are rolled into the selected preset. • **Delete Selected Preset** button deletes the currently selected preset. • **Load Factory Defaults** button allows loading (recalling) the factory default preset. When this button is pressed, the changes called out in the preset are immediately applied. **Note:** Load Factory Defaults functions with no masking. The Preset Layer Select controls have no effect on this control and will reset **all** layers to factory default. • **Download Presets** saving the preset files to a folder on the connected computer.
Note: If using **Cascade Config** mode where a global preset is to apply in some manner to all cards in the chain, it is recommended to have all cards in the chain set up as desired, and then save the preset on the **last** card in the chain. This helps ensure that **all** saved states in each card will be saved in an "umbrella" preset encompassing **all** cards in the chain.	

Table 3-1 9970-QS-MC Function Menu List — continued

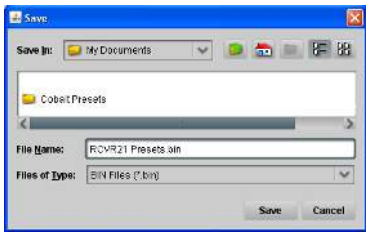
(continued)

Download (save) card presets to a network computer by clicking **Download Presets – Save** at the bottom of the Presets page.



Browse to a desired save location (in this example, *My Documents\Cobalt Presets*).

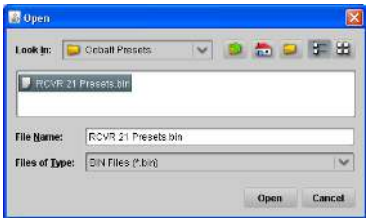
The file can then be renamed if desired (*RCVR21 Presets* in this example) before committing the save.



Upload (open) card presets from a network computer by clicking **Upload** at the bottom of DashBoard.

Browse to the location where the file was saved on the computer or drive (in this example, *My Documents\Cobalt Presets*).

Select the desired file and click **Open** to load the file to the card.



Note: • Preset transfer between card download and file upload is on a **group** basis (i.e., individual presets cannot be downloaded or uploaded separately).

• After uploading a presets file, engagement of a desired preset is only assured by selecting and loading a desired preset as described on the previous page.

Uploading Saved Presets to New or Different Cards (Cascade Config Usage)

When uploading presets .bin files to 9970-QS-MC cards in a Cascade Config chain, the steps below must be used to make certain each card receives cascade setup info which is stored individually on each card.

1. Upload the desired presets .bin file to all cards in the chain.

2. On the **Cascade Config** tab in any card in the chain, re-link the IP settings for the cards within the cascade chain.

3. Select one of the presets you want to configure; all the connected cards will then have the matching preset automatically selected. On **Presets** page of any card in the chain, click **Load Selected Preset**. All cards will now be loaded with that preset.

4. On **Preset** page of any card in the chain, now click **Upload Selected Preset**. This step now re-saves the cascade IP settings to each card's memory.

5. Repeat steps 3 and 4 for **each** preset in the **Select Preset** drop-down list. (Note that even presets that may not apply to other cards in the chain need to updated as described here. For subsequent presets, remove all IPs from the Cascade Config tab and click **Disconnect**. Then load the presets and then update the preset.) **Contact Support for assistance if necessary.**

Table 3-1 9970-QS-MC Function Menu List — continued

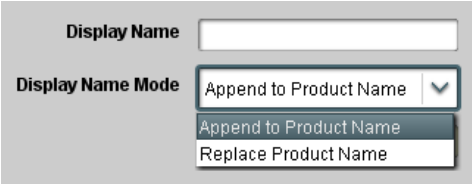
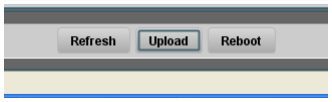
	Provides a global card operating status and allows a log download for factory engineering support. Also provides controls for selecting and loading card firmware upgrade files. Networking controls provide dedicated card networking setup in conjunction with rear module Ethernet port.
• **Log Status and Download Controls** 	• **Log Status** indicates overall card internal operating status. • **Download Log File** allows a card operational log file to be saved to a host computer. This log file can be useful in case of a card error or in the case of an operational error or condition. The file can be submitted to Cobalt engineering for further analysis. • **Thermal Shutdown** enable/disable allows the built-in thermal failover to be defeated. (Thermal shutdown is enabled by default). **CAUTION** **The 9970-QS-MC FPGA is designed for a normal-range operating temperature around 85° C core temperature. Operation in severe conditions exceeding this limit for non-sustained usage are within device operating safe parameters, and can be allowed by setting this control to Disable. However, the disable (override) setting should be avoided under normal conditions to ensure maximum card protection.**
• **Card DashBoard Name Control** 	Allows card name In DashBoard to be changed as desired. Click return to engage change. • **Append to Product Name** appends (or adds to) existing OEM name (for example, "9970-QS-MC *Processing 1A*"). • **Replace Product Name** completely replaces the OEM name OEM name (for example, "*Processing 1A*"). **Note:** DashBoard instance(s) may have to be refreshed before name change appears.

Table 3-1 9970-QS-MC Function Menu List — continued

	(continued)
• **Firmware Upgrade Controls**	Firmware upgrade controls allow a selected firmware version (where multiple versions can be uploaded to the card's internal memory) to invoke an upgrade to a selected version either instantly, or set to install on the next card reboot (thereby allowing card upgrade downtime to be controlled at a scheduled point in time).

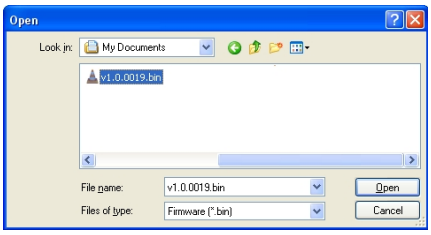
Note: The page/tab here allows managing multiple firmware versions saved on the card. New upgrade firmware from our web site can always be directly uploaded to the card without using this page. Instructions for firmware downloading to your computer and uploading to the card can be found at the **Support>Firmware Downloads** link at www.cobaltdigital.com.

1. Access a firmware upgrade file from a network computer by clicking **Upload** at the bottom of DashBoard.



2. Browse to the location of the firmware upgrade file (in this example, *My Documents\v1.0.0019.bin*).

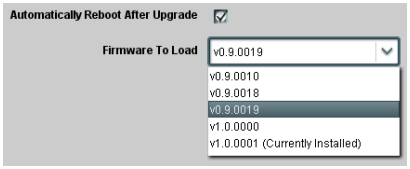
3. Select the desired file and click **Open** to upload the file to the card.



• **Immediate firmware upload.** The card default setting of **Automatically Reboot After Upgrade** checked allow a selected firmware version to be immediately uploaded as follows:

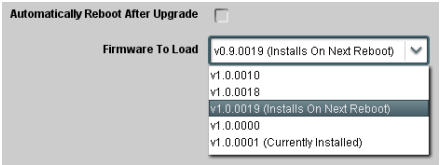
1. Click **Firmware To Load** and select the desired upgrade file to be loaded (in this example, "v1.0.0019").

2. Click **Load Selected Firmware**. The card now reboots and the selected firmware is loaded.



• **Deferred firmware upload.** With **Automatically Reboot After Upgrade** unchecked, firmware upgrade loading is held off until the card is manually rebooted. This allows scheduling a firmware upgrade downtime event until when it is convenient to experience to downtime (uploads typically take about 60 seconds).

1. Click **Firmware To Load** and select the desired upgrade file to be loaded (in this example, "v1.0.0019"). Note now how the display shows "Installs on Next Reboot".



2. Click **Load Selected Firmware**. The card holds directions to proceed with the upload, and performs the upload only when the card is manually rebooted (by pressing the **Reboot** button).

3. To cancel a deferred upload, press **Cancel Pending Upgrade**. The card reverts to the default settings that allow an immediate upload/upgrade.

Table 3-1 9970-QS-MC Function Menu List — continued

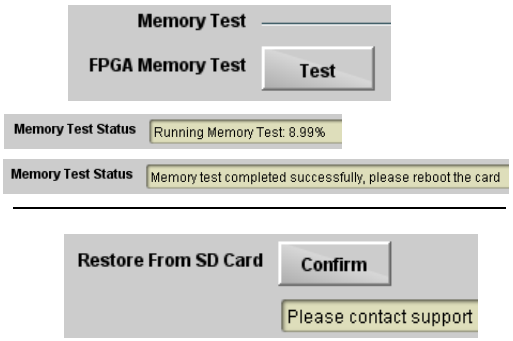
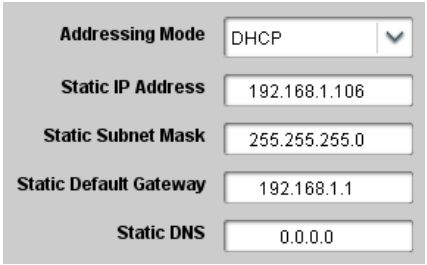
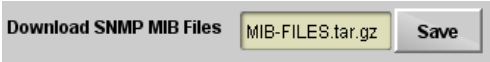
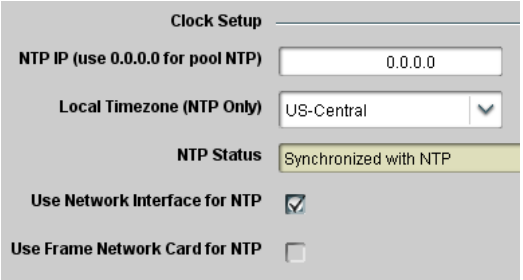
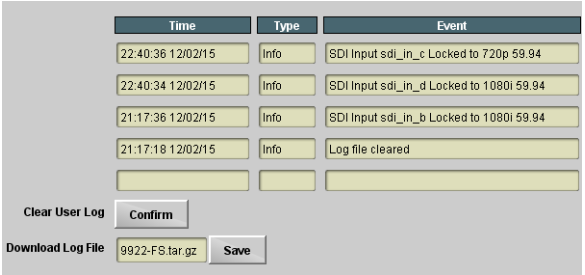
	(continued)
• **Card Check and Restore Utilities** 	**Memory Test** allows all cells of the card FPGA memory to be tested. ⚠ This control should **only** be activated under direction of product support. Exercising the memory test is **not** part of normal card maintenance. **Restore from SD Card** allows card rendered inoperable to be restored using an SD memory card fitted to the card internal SD slot. ⚠ Product support must be contacted prior to performing this operation. Use of any SD card not supplied by support can corrupt the card.
	The **Networking** sub-tab provides a dedicated Ethernet connection to card control and monitoring via a rear module Ethernet port. (This IP interface is entirely independent and separate from the card's DashBoard frame-based remote control/monitoring interface.) (Dedicated card control using IP has not been fully implemented at this release. Some functions may be reserved.)
• **Card IP Physical Port Select Control** 	Allows card dedicated IP interface (as set below) to use frame communications or dedicated rear I/O module Ethernet RJ-45 port. **Note:** • Frame net connection allows cards with per-card Ethernet connection to connect with network via a shared frame Ethernet port instead of per-card dedicated Ethernet connectors on the card's rear module. Frame net connection is available only on certain frame models. • Card slot must be fitted with a rear I/O module equipped with an Ethernet connector in order to use **Rear I/O** selection.
• **Card IP Setup Controls** 	Provides controls for setting up card dedicated IP interface. • **Addressing Mode** selsects either DHCP or static. Where Static is selected, standard IP fields allow entry of Address, Subnet Mask, and Default Gateway.
• **Card SNMP MIB Download** 	Where supported, allows card SNMP MIB files to be downloaded and saved using user-configured name.

Table 3-1 9970-QS-MC Function Menu List — continued

	(continued)
• **NTP Clock Setup** 	Allows device NTP clock IP source and localization. This is the clock/time device will use for logs and other recorded actions. • **NTP IP** sets the IP address where NTP is to be obtained. • **Local Timezone** sets the recorded time to the localized time. • **NTP Status** shows if time is synced with NTP or if an error exists. • **Use Network Interface** and **User Frame Network Card** checkboxes allows selecting the network source that will provide NTP time.
	Automatically maintains a log of user actions and input lock status.
User Log shows input lock and other user conditions (with most recent event at top of list). **Clear User Log** clears all entries. **Download Log File** opens a browser allowing the log file to be saved on the host machine.	

Troubleshooting

This section provides general troubleshooting information and specific symptom/corrective action for the 9970-QS-MC card and its remote control interface. The 9970-QS-MC card requires no periodic maintenance in its normal operation; if any error indication (as described in this section) occurs, use this section to correct the condition.

Error and Failure Indicator Overview

The 9970-QS-MC card itself and its remote control systems all (to varying degrees) provide error and failure indications.

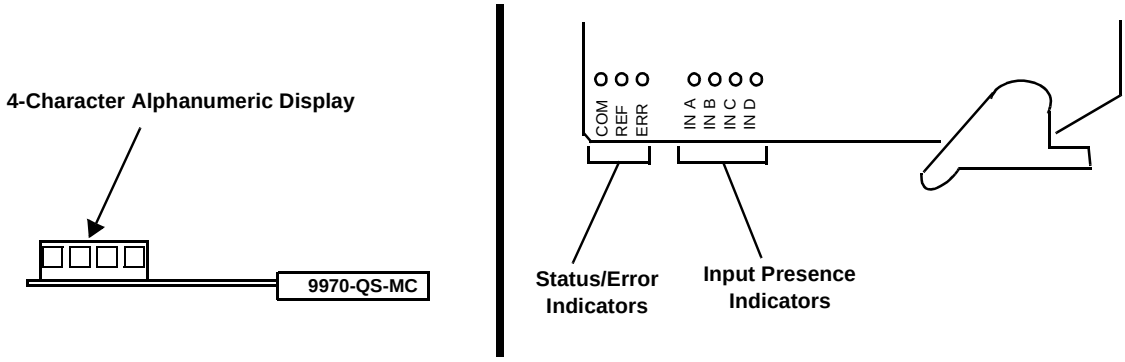
The various 9970-QS-MC card and remote control error and failure indicators are individually described below.

Note: The descriptions below provide general information for the various status and error indicators. For specific failures, also use the appropriate subsection listed below.

- Basic Troubleshooting Checks (p. 3-68)
- 9970-QS-MC Processing Error Troubleshooting (p. 3-68)
- Troubleshooting Network/Remote Control Errors (p. 3-70)

9970-QS-MC Card Edge Status/Error Indicators and Display

Figure 3-6 shows and describes the 9970-QS-MC card edge status indicators and display. These indicators and the display show status and error conditions relating to the card itself and remote (network) communications (where applicable). Because these indicators are part of the card itself and require no external interface, the indicators are particularly useful in the event of communications problems with external devices such as network remote control devices.



Item	Function
Alphanumeric Display	Reserved
COM LED	Blue LED flashes when 9970-QS-MC is receiving control message from remote network control (e.g., DashBoard™ or Cobalt® Remote Control Panel)
REF LED	Blue LED illuminates indicating 9970-QS-MC is receiving valid reference when set up for framesync operation.
ERR LED	Red LED illuminates when 9970-QS-MC unable to lock to framesync.
Input Presence LEDs	LEDs for SDI inputs A thru D indicate the input signal presence.

Figure 3-6 9970-QS-MC Card Edge Status Indicators and Display

DashBoard™ Status/Error Indicators and Displays

Figure 3-7 shows and describes the DashBoard™ status indicators and displays. These indicator icons and displays show status and error conditions relating to the 9970-QS-MC card itself and remote (network) communications.

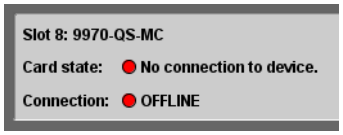
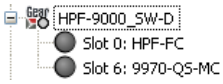
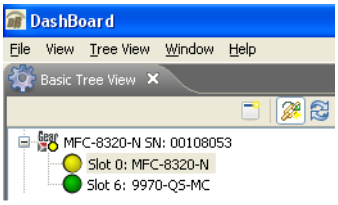
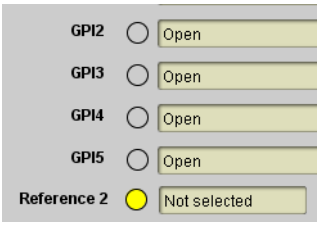
Indicator Icon or Display	Error Description
	Red indicator icon in Card Access/Navigation Tree pane shows card with Error condition (in this example, the Card Access/Navigation Tree pane shows a general error issued by the 9970-QS-MC card in slot 6).
	Specific errors are displayed in the Card Info pane (in this example “No connection to device” indicating 9970-QS-MC card is not connecting to frame/LAN).
	If the 9970-QS-MC card is not connecting to the frame or LAN, all controls are grayed-out (as shown in the example here).
	Gray indicator icon in Card Access/Navigation Tree pane shows card(s) are not being seen by DashBoard™ due to lack of connection to frame LAN (in this example, both a 9970-QS-MC card in slot 6 and the HPF-FC Network Controller Card for its frame in slot 0 are not being seen).
	Yellow indicator icon in Card Access/Navigation Tree pane shows card with Alert condition (in this example, the Card Access/Navigation Tree pane shows a general alert issued by the MFC-8320-N Network Controller Card).
	Clicking the card slot position in the Card Access/Navigation Tree (in this example Network Controller Card “Slot 0: MFC-8320-N”) opens the Card Info pane for the selected card. In this example, a “Fan Door Open” specific error is displayed.
	Yellow indicator icon in 9970-QS-MC Card Info pane shows error alert, along with cause for alert (in this example, the 9970-QS-MC is not receiving an enabled framesync source).

Figure 3-7 DashBoard™ Status Indicator Icons and Displays

Access Card Info panes for specific cards by clicking the card slot position in the Card Access/Navigation Tree pane (as shown in the example in Figure 3-8).

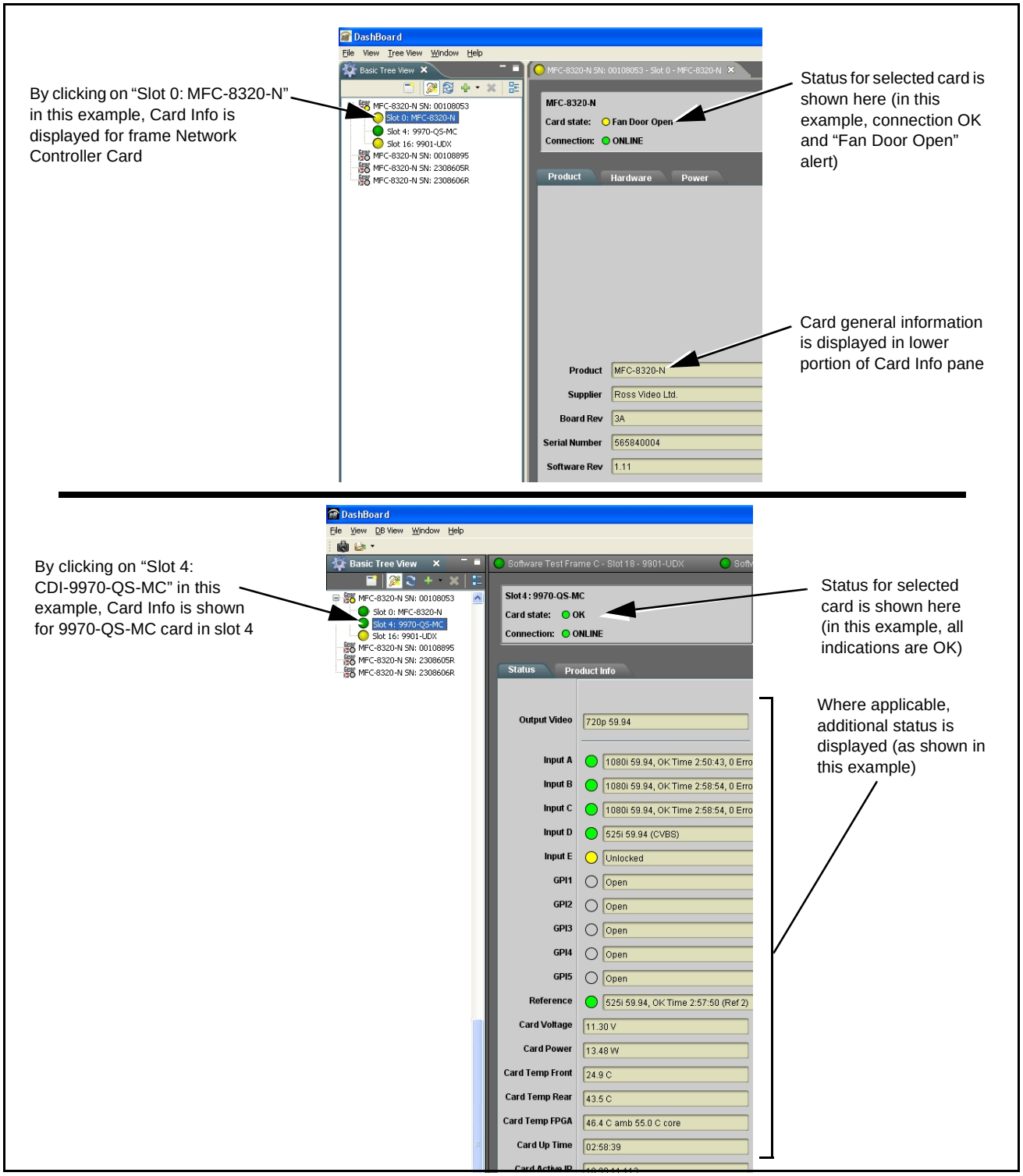


Figure 3-8 Selecting Specific Cards for Card Info Status Display

Basic Troubleshooting Checks

Failures of a general nature (affecting many cards and/or functions simultaneously), or gross inoperability errors are best addressed first by performing basic checks before proceeding further. Table 3-2 provides basic system checks that typically locate the source of most general problems. If required and applicable, perform further troubleshooting in accordance with the other troubleshooting tables in this section.

Table 3-2 Basic Troubleshooting Checks

Item	Checks

Verify power presence and characteristics	• On both the frame Network Controller Card and the 9970-QS-MC, in all cases when power is being properly supplied there is always at least one indicator illuminated. Any card showing no illuminated indicators should be cause for concern.
	• Check the Power Consumed indication for the 9970-QS-MC card. This can be observed using the DashBoard™ Card Info pane.
	  • If display shows **no** power being consumed, either the frame power supply, connections, or the 9970-QS-MC card itself is defective.
	  • If display shows **excessive** power being consumed (see Technical Specifications (p. 1-15) in Chapter 1, “Introduction”), the 9970-QS-MC card may be defective.

Check Cable connection secureness and connecting points	Make certain all cable connections are fully secure (including coaxial cable attachment to cable ferrules on BNC connectors). Also, make certain all connecting points are as intended. Make certain the selected connecting points correlate to the intended card inputs and/or outputs. Cabling mistakes are especially easy to make when working with large I/O modules.
Card seating within slots	Make certain all cards are properly seated within its frame slot. (It is best to assure proper seating by ejecting the card and reseating it again.)
Check status indicators and displays	On both DashBoard™ and the 9970-QS-MC card edge indicators, red indications signify an error condition. If a status indicator signifies an error, proceed to the following tables in this section for further action.
Troubleshoot by substitution	All cards within the frame can be hot-swapped, replacing a suspect card or module with a known-good item.

9970-QS-MC Processing Error Troubleshooting

Table 3-3 provides 9970-QS-MC processing troubleshooting information. If the 9970-QS-MC card exhibits any of the symptoms listed in Table 3-3, follow the troubleshooting instructions provided.

In the majority of cases, most errors are caused by simple errors where the 9970-QS-MC is not appropriately set for the type of signal being received by the card.

Note:
- The error indications shown below are typical for the corresponding error conditions listed. Other error indications not specified here may also be displayed on DashBoard™ and/or the 9970-QS-MC card edge status indicators.
- Where errors are displayed on both the 9970-QS-MC card and network remote controls, the respective indicators and displays are individually described in this section.

Table 3-3 Troubleshooting Processing Errors by Symptom

Symptom	Error/Condition	Corrective Action
• **DashBoard™** shows **Unlocked** message in 9970-QS-MC Card Info pane. • Card edge **Input Presence** LED(s) not illuminated.	No video input present	Make certain intended video source is connected to appropriate 9970-QS-MC card video input. Make certain BNC cable connections between frame Rear I/O Module for the card and signal source are OK.
Cannot see one of five PiPs on output	PiP obscured by another PiP	When custom layouts are being used, it is easy for a PiP to “hide” underneath another PiP. When using this mode, size all PiPs small enough such that a PiP cannot be obscured. See Input Routing (p. 3-10) for more information.
Cascade mode upstream card image not as expected	• Cards in cascade chain not set for same grid layout	• All cards used in a cascading chain must be set for the same number of columns and rows. See Cascade Mode Using PiP Layout QuickSet Template Presets (p. 3-16) for more information.
	• Downstream card importing a cascade input not set for cascading mode	• Downstream 9970-QS-MC which are receiving a cascade output from an upstream 9970-QS-MC card must use the PiP 5 input and have the card set with **Cascade Mode > Enabled**. This ensures the imported upstream image is inserted as full-screen and with no burn-ins caused by the receiving card. See Input Routing (p. 3-10) controls for more information.
Cascade grid layout has been inadvertently lost	Non-cascade mode using the Layout Presets (Quint, Quad, Three Bottom, etc.) was possibly applied	The non-cascade Layout Presets will clear or change row/column settings previously set for a custom cascading grid that was set up using the cascading QuickSet setup controls. The basic non-cascade Layout Presets should not be re-applied once a cascade layout is set up.
Cannot set UMD text Display Format to choice other than External Input	Protocols tab inadvertently set to use router for UMD assert/ burn-in	If the **Protocols** tab > **Enable Utah Router Fetch** control is set to Enabled, UMD text is asserted by Utah router commands. The UMD > Display Format control is locked to External Input, with user text entry or other UMD type selections locked out.

Table 3-3 Troubleshooting Processing Errors by Symptom — continued

Symptom	Error/Condition	Corrective Action
Audio not processed or passed through card	Enable control not turned on	On **Output Audio Routing/Controls** tab, **Audio Group Enable** control for group 1 thru 4 must be turned on for sources to be embedded into respective embedded channel groups.
Output Preview function does not provide preview pane display.	• Card is not using external card rear module Ethernet connection to network/ computer hosting DashBoard, or card is not installed in a “smart” frame (e.g., oGx frame model) that hosts per-slot dedicated Ethernet connections.	• DashBoard acquires program video frame captures using an external network connection from the card rear module (or via per-slot Ethernet) to the network/computer hosting the card’s DashBoard connection. This feature requires that card be fitted with a rear module with an Ethernet connection or fitted to a smart frame for this function. See Output Preview (p. 3-53) and Admin (p. 3-61) for more information.
	• Card is not set to provide a progressive raster video output	• This function operates only if the card is set to provide a progressive video output (e.g., 720p, 1080p, etc.)
DashBoard card slider controls lack fluidity, have “jerky” motion.	DashBoard experiencing high traffic volume due to **Output Preview** mode set to Capture Automatically	Automatically updated captures are useful for assessing incoming content on a dynamic basis. However, due to the traffic demands imposed by this mode, it is recommended to set the **Screen Capture Mode** control to Capture On Trigger (or entirely disable Output Preview) when the preview function is no longer needed. When the mode is set to capture on trigger or this function is disabled, normal fluid control motion will be restored. See Output Preview (p. 3-53) for more information.
(Cascade Config mode) User text (UMD, Idents) does not appear in cloned PiPs	Manually entered user text cannot be cloned	Only pre-defined DashBoard selections (from drop-downs or other selections) can be cloned from one PiP to another. User custom text cannot be cloned and **must** be entered manually for each PiP UMD and/or Ident field.
(Cascade Config mode) Presets cannot be uploaded from computer to cards	Special upload steps required	Saved preset .bin files from a computer to target cards must be uploaded as described in Loading Saved Presets to New or Different Cards (Cascade Config Usage) (p. 3-60).
Selected upgrade firmware will not upload	Automatic reboot after upgrade turned off	Card **Presets** > **Automatically Reboot After Upgrade** box unchecked. Either reboot the card manually, or leave this box checked to allow automatic reboot to engage an upgrade upon selecting the upgrade.

Troubleshooting Network/Remote Control Errors

Refer to Cobalt® reference guide “Remote Control User Guide” (PN 9000RCS-RM) for network/remote control troubleshooting information.

In Case of Problems

Recovering Card From SD Memory Card

New production cards come equipped with an SD card installed in a slot receptacle on the underside of the card. The data on this SD card can be used to restore a card should the card become unresponsive (can't communicate with DashBoard or other remote control). Recovering a card using the procedure here will restore the card to any installed option licenses and the most recent firmware installed.

1. (See Figure 3-9.) Make certain the card has the proper SD card installed in the under-card slot. If SD card is **not** installed, contact Product Support to obtain an SD card.

Note: If unit is a BBG-1000 Series device, remove the top cover before proceeding.

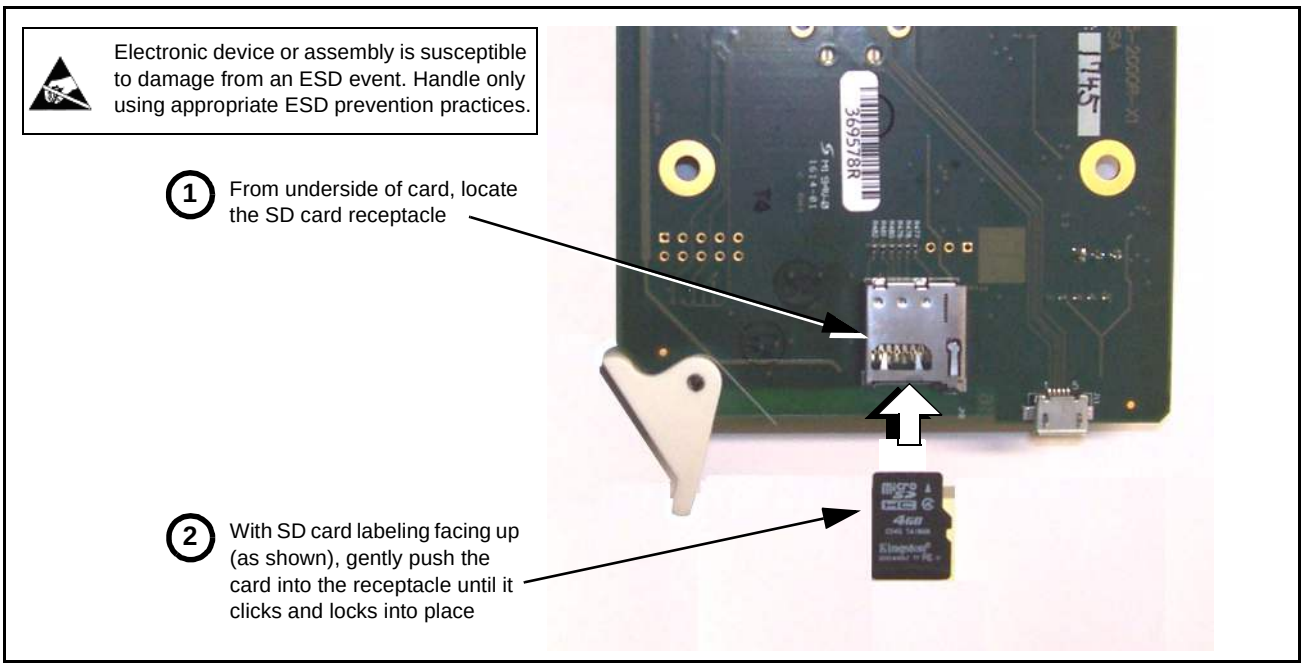


Figure 3-9 SD Card Installation

2. (See Figure 3-10.) With card powered-down, locate the **MMC BOOT** button on the card. Proceed as shown in picture.

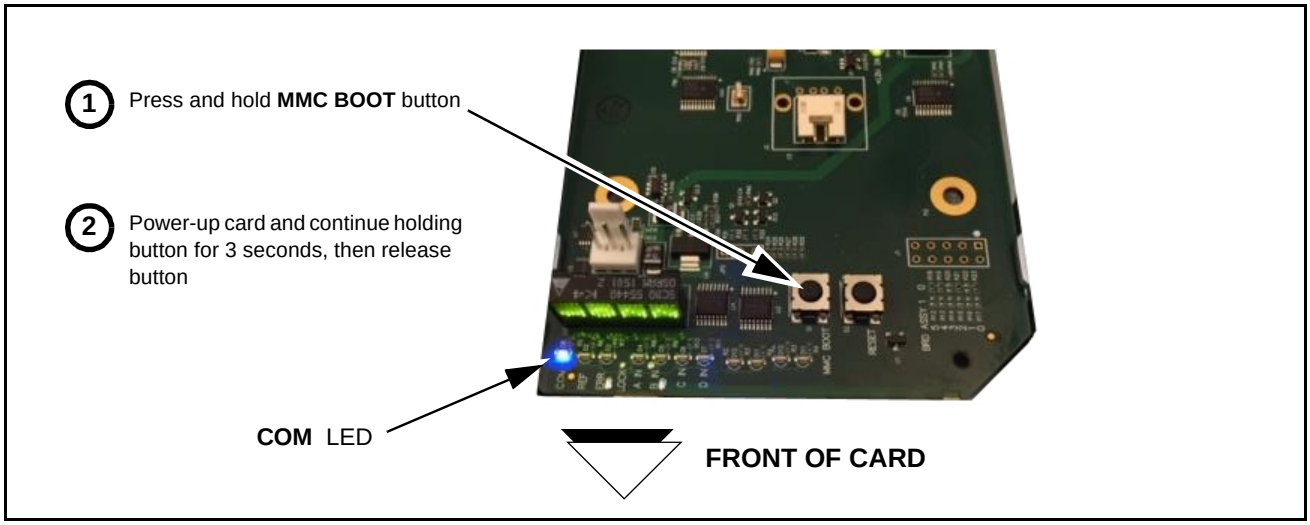


Figure 3-10 MMC Boot Button

3. With button now released, the card will begin reprogramming:
   - **COM** LED illuminates and remains illuminated.
   - When reprogram is complete, **COM** LED turns off, on, and then off again (entire process takes about 1-1/2 minute).
4. Remove power from the card (remove card from slot or power-down BBG-1000 Series unit).
5. Re-apply power to the card. The card/device will display as "***UNLICENSED***" in DashBoard/remote control.
6. In Dashboard or web remote control, go to **Admin** tab and click **Restore from SD Card**. After about 1/2-minute, the card license(s) will be restored and card will be using its most recently installed firmware.
7. Card/device can now be used as normal. On BBG-1000 Series unit, re-install top cover.

Contact and Return Authorization

Should any problem arise with this product that was not solved by the information in this section, please contact the Cobalt Digital Inc. Technical Support Department.

If required, a Return Material Authorization number (RMA) will be issued to you, as well as specific shipping instructions. If required, a temporary replacement item will be made available at a nominal charge. Any shipping costs incurred are the customer's responsibility. All products shipped to you from Cobalt Digital Inc. will be shipped collect.

The Cobalt Digital Inc. Technical Support Department will continue to provide advice on any product manufactured by Cobalt Digital Inc., beyond the warranty period without charge, for the life of the product.

See Contact Cobalt Digital Inc. (p. 1-20) in Chapter 1, "Introduction" for contact information.

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