Master Control

Reference Manual

Master Control — Reference Manual

- **Revision**: 2.10

- **Software Version**: 7.2.0.0

- **Part Number**: UG0065-00

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Note	Return Material Authorization (RMA) required for all returns.

Change History

The table below lists the changes to the Master Control Reference Manual.

- Part # UG0065-00

- Software version: 7.2.0.0

Rev	Date	ECO	Description	Approved By
2.10	29 Nov 11	17941	Conforms to software release 7.2.0. This manual started as a copy of UG0013.	D.Cox

Important Safeguards and Notices

This section provides important safety guidelines for operators and service personnel. Specific warnings and cautions appear throughout the manual where they apply. Please read and follow this important information, especially those instructions related to the risk of electric shock or injury to persons.

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

Symbols and Their Meanings

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

The exclamation point within an equilateral triangle alerts the user to the presence of important operating and maintenance/service instructions.

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

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

The presence of this symbol in or on Miranda equipment means that it has been designed, tested and certified as complying with applicable Underwriter's Laboratory (USA) regulations and recommendations.

The presence of this symbol in or on Miranda equipment means that it has been designed, tested and certified as essentially complying with all applicable European Union (CE) regulations and recommendations.

General Warnings

A warning indicates a possible hazard to personnel which may cause injury or death. Observe the following general warnings when using or working on this equipment:

• Heed all warnings on the unit and in the operating instructions.

• Do not use this equipment in or near water.

• This equipment is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting the equipment inputs or outputs.

• Route power cords and other cables so they are not likely to be damaged.

• Disconnect power before cleaning the equipment. Do not use liquid or aerosol cleaners; use only a damp cloth.

• Dangerous voltages may exist at several points in this equipment. To avoid injury, do not touch exposed connections and components while power is on.

• Do not wear rings or wristwatches when troubleshooting high current circuits such as the power supplies.

• To avoid fire hazard, use only the specified fuse(s) with the correct type number, voltage and current ratings as referenced in the appropriate locations in the service instructions or on the equipment. Always refer fuse replacements to qualified service personnel.

• To avoid explosion, do not operate this equipment in an explosive atmosphere.

• Have qualified service personnel perform safety checks after any service.

General Cautions

A caution indicates a possible hazard to equipment that could result in equipment damage. Observe the following cautions when operating or working on this equipment:

• When installing this equipment, do not attach the power cord to building surfaces.

• To prevent damage to equipment when replacing fuses, locate and correct the problem that caused the fuse to blow before re-applying power.

• Use only the specified replacement parts.

• Follow static precautions at all times when handling this equipment.

• This product should only be powered as described in the manual. To prevent equipment damage, select the proper line voltage on the power supply(ies) as described in the installation documentation.

• To prevent damage to the equipment, read the instructions in the equipment manual for proper input voltage range selection.

• Some master control products include a backup battery. There is a risk of explosion if the battery is replaced by a battery of an incorrect type. Dispose of batteries according to instructions.

• Products that have (1) no on/off switch and (2) use an external power supply must be installed in proximity to a main power output that is easily accessible.

Table of Contents

Table of Contents

Table of Contents

Table of Contents

Table of Contents

1. Preface

Chapter 1 is an introduction to the *Master Control Reference Manual*. It presents the following topics:

- Chapter Structure
- The PDF Document
- Terms, Conventions and Abbreviations
- Document Usage

Chapter Structure

This manual provides an architectural and functional description of the combined Imagestore 750/NV5100MC master control system. It includes the following chapters:

- Chapter 1, Preface (this chapter) outlines effective ways to use this manual, and presents a "roadmap" to using the other manuals included with the master control system.

- Chapter 2, Introduction, presents an architectural and functional overview of the master control system.

- Chapter 3, Frames, describes master control frames, their cards, and their connectors.

- Chapter 4, MCPMs, describes master control processors (MCPMs). The detail in this chapter is necessary to understand MCPM configuration.

- Chapter 5, MCEs, describes master control engines. The information in this chapter is necessary to understand MCE configuration. (MCEs are a newer class of MCPMs.)

- Chapter 6, Imagestore 750, describes the Imagestore 750, as it relates to the master control system. The information in this chapter is necessary to understand the configuration of panels that control Imagestore 750s.

- Chapter 7, Control Panels, describes master control control panels (hardware and software).

- Chapter 8, Other Master Control Products, describes other master control products such as the emergency bypass control panel.

- Appendix B, Specifications, lists electrical, mechanical, video, audio, and environmental specifications for the system and for its components. It also provides connector details.

- Appendix C, Misc. Information, provides a glossary, a parts list (ordering information), information about optional hardware, such as the TLA, and a few brief application notes.

- An index is also provided.

The PDF Document

This guide is provided in PDF format, allowing you to use Acrobat's "bookmarks" to navigate to any desired location. You can also easily print a hardcopy. Please note:

- Use the Table of Contents bookmarks to jump to any desired section.

- Many hyperlinks are provided within the chapters.

- Use the Index to jump to specific topics within a chapter. Each page number in the index is a hyperlink.

- Use Acrobat's 'Go to Previous View' and 'Return to Next View' buttons to retrace your complete navigational path.

- Use the 'First Page', 'Previous Page', 'Next Page', and 'Last Page' buttons to go to the first, previous, next, or last page within a PDF file.

Note	To display the Acrobat navigation buttons, right-click the Tool Bar area, and check 'Navigation'.

- Use Acrobat's extensive search capabilities, such as the 'Find' tool and 'Search' tool to perform comprehensive searches as required.

Terms, Conventions and Abbreviations

The following conventions are used throughout this guide:

- The symbol ▲ denotes an example or a special message.

- Entries written in a sans-serif font, in Capital Letters, or enclosed in single quotation marks (' ') denote the names of GUI menus and buttons, and on occasion, physical control panel buttons and knobs:

  ▲ Click 'Apply' to . . .

  ▲ Press Transition to . . .

- Double quotation marks (" ") denote colloquial or informal language. Single and double quotes do ***not*** have the same meaning.

- Entries written in a monospaced font denote pathnames, parts of your file system, or items that you must select or enter, within the scope of Windows XP:

  `C:\Program Files\Miranda\Master Control\...`

- The term "MC" is an abbreviation for "master control."

- The terms "panel" and "control panel" refer to NV5100MC control panels, either hardware or software. The term "GUI" represents the iMC-Panel-GUI (a software control panel).

- The terms "low-tally" and "high-tally" mean low illumination and high illumination for buttons and indicators.

- The term "MFR" is an abbreviation for "multi-format router."

Other terms, used occasionally, include the following:

- Intuition XG is a single- or dual-channel graphics processor. The term "Intuition XG" can encompass all the hardware and software involved in the Intuition XG component of master control.

- XMedia is a term that includes different software applications that create and manage images, clips, logos, etc. used by Intuition XG.

- Xplay and the XG Dashboard are software applications under XMedia. Both of these are used to configure the Intuition XG processor.

- Xbuilder and Xstudio are creative software applications under XMedia.

- Oxtel is a division of Miranda. Its name is used to identify certain parts of the Intuition XG hardware. A reason for this is probably unobtainable.

- The Imagestore 750 is a 1RU "channel branding processor." It provides one master control channel, as do MCPMs and MCEs.

- The term "DC21" identifies the Master Control device controller used for machine control. "DC21" is trademark of DNF Controls.

Document Usage

There are several manuals and user's guides in the master control documentation set:

Table 1-1. Configuration Guides and Information

UG0061	MasterConfig User's Guide	How to configure MCPMs and MCEs.
UG0062	MasterDiag User's Guide	How to initialize and update MCPMs and MCEs.
UG0063	MasterLogo User's Guide	How to convert graphic files to the format required by MCPM logos and send logos to the MCPMs.
UG0064	MC Installation Guide	How to install, connect, and configure MC equipment.
UG0065	Master Control Reference Manual	Architectural and functional detail regarding the Miranda master control system.
UG0066	MCS Panel Configuration Editor User's Guide	How to use *MCS Panel Configuration Editor* software to configure control panels.
UG0067	Device Controller User's Guide	How to use and configure the master control device controller.
UG0068	Tally Processor User's Guide	How to use and configure the master control tally processor.

Table 1-2. Panel Operator's Guides

UG0069	iMC-Panel-100 Operator's Guide for Imagestore 750	3RU control panel
UG0053	iMC-Panel-GUI Operator's Guide for Imagestore 750	Software control panel
UG0054	iMC-Panel-200 Operator's Guide for Imagestore 750	Compact panel
UG0055	iMC-Panel-300 Operator's Guide for Imagestore 750	Full-size panel
UG0070	iMC-Panel-100 Operator's Guide for MCEs and MCPMs	3RU control panel
UG0057	iMC-Panel-GUI Operator's Guide for MCEs and MCPMs	Software control panel
UG0058	iMC-Panel-200 Operator's Guide for MCEs and MCPMs	Compact panel
UG0059	iMC-Panel-300 Operator's Guide for MCEs and MCPMs	Full-size panel

Note the following:

- Control panel operators should read the operator's guide (for instructions) and this reference manual (to understand system features).

  A person who operates a GUI (iMC-Panel-GUI) need not read the iMC-Panel-300 manual.

  Persons who control Imagestore 750s should read the *Imagestore 750 Reference Manual*.

- Administrators should read the documentation for all installed equipment. Although it is a large amount of reading, it is essential.

- The documents do ***not*** address the installation or configuration of an NV9000 router control system or the installation or configuration of an automation system.

- If your master control system is to include machine control, configurers should read the DC21 Device Controller User's Guide.

- If your master control system is to support Intuition XG functions, administrators should obtain and distribute all Intuition XG documentation and related documents from Miranda.

The terms used here (MCPM, iMC-Panel-GUI, etc.) will become clearer if you read the introduction to this reference manual (or the Glossary).

2. Introduction

Chapter 2 is an introduction to the combined Imagestore 750/NV5100MC master control system. It presents the following topics:

- Overview
- Aspects of the System

Overview

Miranda's *master control* system has many modular parts and provides many options. You can order a master control system that is optimal for your facility. It can change with your needs.

The master control system can be structured in 3 basic ways:

1 Imagestore 750s transition processors (a.k.a. "channel branding processors"), an NV9000 router control system, and control panels that support Imagestore 750s.

2 MCEs and MCPMs (transition processors) residing in NV5100MC frames, control panels, and optionally an NV9000 router control system.

3 A combination of 1 and 2.

At the heart of a master control system are transition processors: MCEs, MCPMs, and Imagestore 750s. MCEs and MCPMs reside in NV5100MC frames; the Imagestore 750 is a stand-alone 1RU processor.

The *primary* purpose of a master control system is to place one of many video and audio sources "on air" or, alternatively, to switch video and audio sources to selected output(s). When it switches, the master control system can do so with a set of transition effects that include speed, fade, video effects, and audio mixing.

Secondary purposes include:

- Placing keys, logos, video clips, animations, etc., on air and controlling their attributes.
- Performing DVEs (digital video effects) and squeezeback and controlling those effects.
- Selecting and mixing up to 16 audio channels, controlling audio levels, and mixing audio "overs" with program audio.
- Performing video and audio breakaways.
- Machine control and pre-roll.
- Previewing and monitoring various video and audio sources.

2. Introduction

Overview

These are the components of a combined master control system:
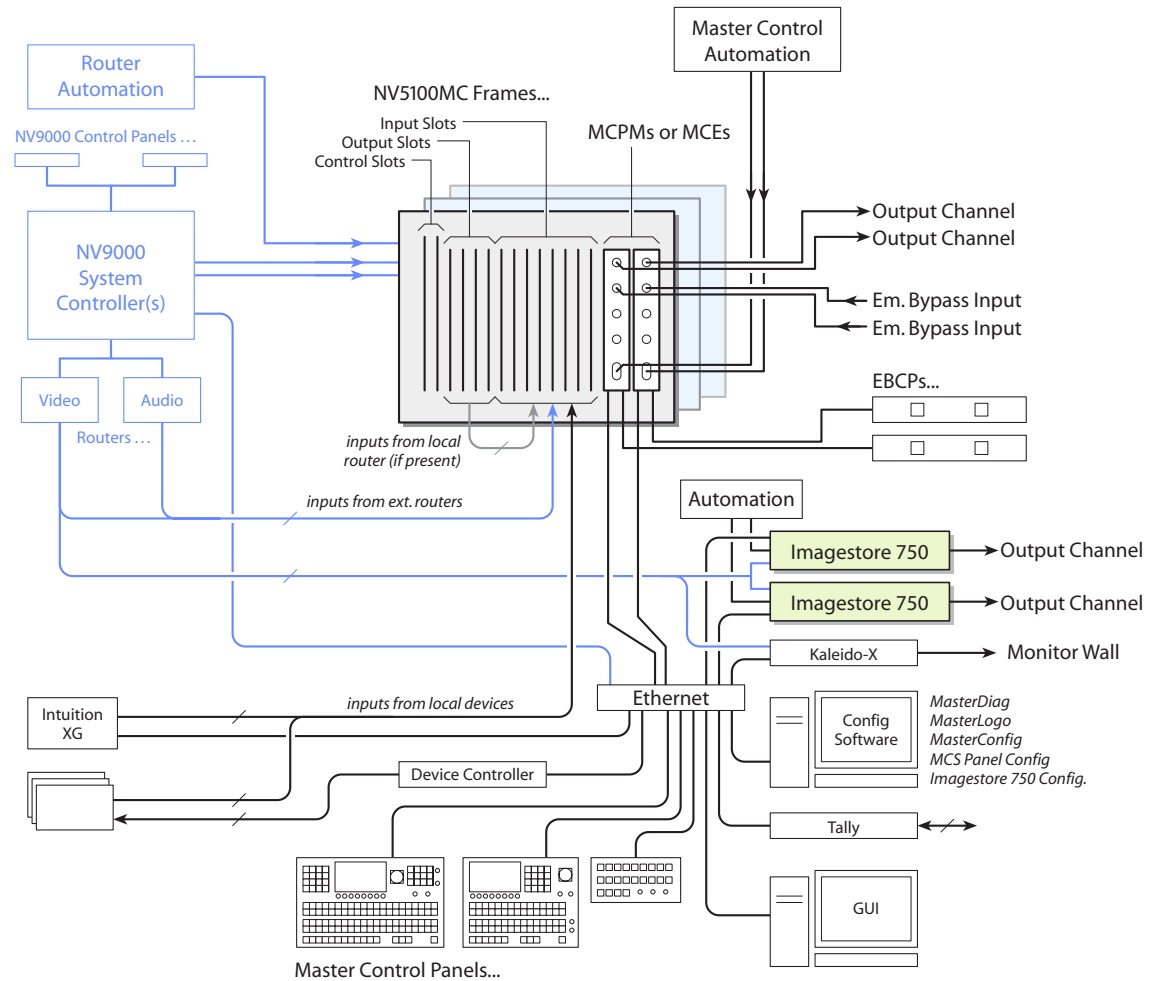
These are the components of a master control system *without* MCEs or MCPMs:
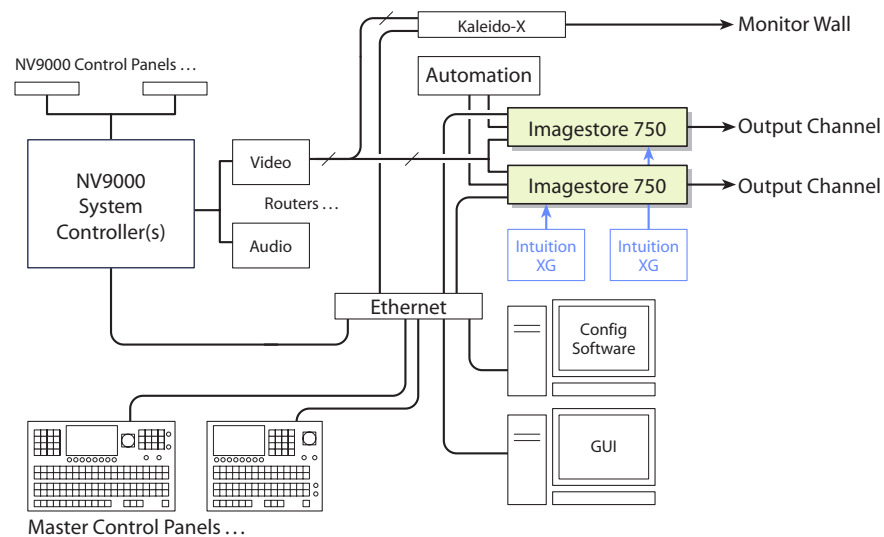
Here, the NV9000 router control system is a requirement.

A master control system includes:

- Transition processors.

  These include MCPMs, MCEs, and Imagestore 750s.

  A transition processor does the work of switching and mixing and produces the master control output. It also produces monitoring (and metering) output. It can receive instructions from an automation system. One MCPM, MCE, or Imagestore 750 is equivalent to one program *channel*.

  MCEs and MCPMs reside in NV5100MC frames; Imagestore 750s are separate 1RU devices.

- Control panels.

  Control panels (hardware or software) are the means by which a human operator effects changes in the master control output.

  Control panels have no particular "intelligence" in themselves. They are to the master control system as a keyboard, monitor, and mouse are to ordinary computers.

  The control panels can control Imagestore 750s,[1] MCEs, and MCPMs.

- Video and audio inputs.

  Miranda's master control frames have slots for input cards of different formats: AES audio, analog audio, analog video, SD video, and HD video. The formats can be used together. These are the inputs that an MCPM or MCE switches and mixes. An MCPM or MCE can also obtain inputs from routers connecting in an NV9000 router control system. The MCPM-MK-HD is unique: it obtains inputs from its own backplane module.

  The NV5100MC frame can contain a "multi-format" router. With suitable output cards, MCPMs and MCEs can receive input from the router's output cards.

  The MCPMs and MCEs can get receive feeds from Intuition XG processors.

  An Imagestore 750 obtains video input directly from a router controlled by an NV9000 system. It can also obtain some video from discrete devices and from Intuition XG processors.

- Other equipment.

  EBCP—emergency bypass control panel.

  Tally Processor—32 GPIs and 32 GPOs, plus communication with, and control of, MCPMs and MCEs.

  Device Controller—machine control for 4 devices under serial protocol (Sony, Odetics, or VDCP) and 16 devices under start/stop control.

  Intuition XG subsystem—one- or two-channel HD/SD graphics processor with storage. Intuition XG processors can be used with MCEs or Imagestore 750s.

Master control panels and transition processors communicate over an Ethernet LAN. Master control automation communicates directly with MCPMs and MCEs, serially. Master control automation also communicates directly with Imagestore 750s, serially. The protocol for MCPMs and MCEs is different from the protocol for Imagestore 750s.

The master control system can be part of an NV9000 router control system. It must be part of an NV9000 system if it includes Imagestore 750 processors. The routers typically provide the video and audio inputs to master control. A master control frame can contain a multi-format router which

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1. Legacy control panels do not control Imagestore 750s.

can provide inputs to the MCPMs and MCEs (and even to Imagestore 750s) and perform other functions related to master control.

Aspects of the System

Master control can be considered from many different perspectives.

Multi-Format Router Frames

The master control system originally derived from the design of the NV5128 Multi-Format Router (MFR). A master control system (using MCEs and MCPMs) and an MFR use the same frame and, in fact, both can coexist in the same frame. The NV5128-MC master control architecture took advantage of that fact. The newer NV5100MC architecture does also.

The newer NV5100MC frame is the same size as the NV5128-MC frame, accepts the same control cards and power supplies, and accepts most of the same I/O cards as the NV5128-MC frame. It has a different motherboard that allows multiple SWB output cards and provides the throughput for up to 8 HD MCEs. The older NV5128-MC frame supports the "classic" HD cards and machine control I/O cards. The NV5100MC frame does not supports these devices.

Either frame has 8 input card slots, 8 output card slots, and 2 control card slots. Each input slot services 16 inputs. Each output slot services 16 outputs.

In a master control frame, MCPMs and MCEs occupy one or more of the output slots and the MCPMs and MCEs function as outputs. In an MC/MFR frame, some of the output slots contain output cards.

An MC/MFR frame requires at least one router control card (EM0374). A master control frame without an MFR requires only a clock generator card (EM0414) but accepts the EM0374.

The input cards allowed in an MC system include AES audio (synchronous), analog audio, analog video, SD video, and HD video.

An MFR supports input cards of those formats and also supports time-code and machine control formats. The MFR typically requires one or more output cards.

The design of your system must take into consideration how the master control and MFR components (if present) fit together mechanically and architecturally.

NV9000 Router Control System

A master control system can be viewed as a part of an NV9000 system. Alternatively, the NV9000 can be regarded as a provider of inputs to the MC system.

In either case, the MC system accepts router outputs as master control inputs and allows an operator (or automation) to take any router source to a MC output.

Frames

An NV5100MC frame used in conjunction with an NV9000 system must be connected to the NV9000 (in the control section of the frame). At least one EM0374 router control card is required for such a connection. (See)

Router Sources for MCEs and MCPMs

The NV9000 can provide video and audio signals to the MCEs and MCPMs in the master control system. Video and audio sources defined in the NV9000 can be accessed in 3 ways:

- As *indirect* sources.

  These are router sources that have a fixed connection, through a router destination, to the MC system.

- As *router pre-select* sources.

  A master control panel operator may browse router sources and choose a source.

- As *external router sources*.

  Certain router sources are chosen, for each MCE or MCPM, during configuration. Operators may choose such sources without ever knowing whether they are *external* (in the NV9000 system) or *local* (connected at the frame's backplane). The phrase "external router sources" encompasses (1) the sources and (2) the mechanism that allows MCEs and MCPMs to access router sources transparently.

Router Sources for Imagestore 750s

The NV9000 can (and must) provide video and audio signals to the Imagestore 750s in the master control system. (The panel operator can select different groups of sources from among those available in the NV9000 system.)

The Imagestore 750 can operate stand-alone or in conjunction with automation and certain other master control devices. In the context of the combined master control system, however, the Imagestore 750 requires source input from an NV9000 system.

In addition, the Imagestore 750 can control a number of NV9000 sources and destinations that do not directly feed the Imagestore 750. The Imagestore 750 can switch the sources to an auxiliary device such as a waveform monitor and it can switch the sources to a monitor wall according to the source selections made by a panel operator.

Control Panels

Currently, there are 2 hardware control panels and 1 software control panel:

iMC-Panel-GUI	A software control panel, often called the "GUI," that runs on a PC. This GUI is a software emulation of the *iMC-Panel-200*. This GUI is also designed to operate with or without a touch-sensitive screen.
iMC-Panel-100	A 3RU rack-mounted panel (just over 3″ in depth) with a separate rack-mountable display. This display can be a touchscreen or an ordinary VGA monitor.
iMC-Panel-200	A compact hardware control panel that has a large touchscreen, many function buttons, and a joystick. The panel mounts on a desktop or work surface. All buttons have LCD legends and color-coding.
iMC-Panel-300	A "full-size" control panel that has a large touchscreen, many function buttons, and a joystick. The panel mounts on a desktop or work surface. All but 2 buttons have LCD legends and color-coding.

There are other legacy panels. It is possible that they are, or could be, installed in your system. These are described in the *MCS Panel Editor User's Guide.*

In most cases, a panel's function buttons have dynamic legends and change color and brightness as required to indicate the function state. For example, a source selection button turns red if the source is disconnected or LOS. A source button turns bright (high-tally) when its source is selected.

For more information, refer to Chapter 7, Control Panels, on page 103.

SNMP

Under control of the NV9000 system, MCPMs and MCEs can be monitored through SNMP. Master control's SNMP function is available through the NV5100MC SNMP license (EC9610). It requires a NV9000 system with an EC9600 option. The NV9000 provides the SNMP agent.

The Imagestore 750 supports SNMP using its own methods. It does not report to the NV9000.

Operational Features

The panels support the control of Imagestore 750s, MCEs, and MCPMs. The architecture of the Imagestore 750 is different from the architecture of MCEs and MCPMs. Panels have, among other features, rows of buttons called the *preset, program, preview/user*, and *aux/user* button rows.

The *program* and *preset* rows include a set of source selection buttons and a set of "effects" buttons. The program row corresponds to what is on the "program" output of the transition processor under control. The preset row contains identical buttons, but these buttons are used to preset the image (and effects) that will appear on the program output after a transition takes place.

The preview/user button row is dual-purpose. When panels are controlling Imagestore 750s, the preview/user row is a set of customer-configurable buttons. When panels are controlling MCEs, the buttons of the preview/user row are identical to those of the program and preset rows. The preview/user row applies to the preview bus of the MCE. (Panels that control MCPMs do not use the preview/user buttons.)

The aux/user button row is also dual-purpose. When panels are controlling Imagestore 750s, the aux/user row includes aux buttons and customer-configurable buttons. The left-most aux/user buttons are main source buttons matching those of the preset and program rows. When a main source is selected on the aux row, the source is routed to a configured auxiliary device such as a monitor. The right-most aux/user buttons are customer-configurable buttons.

When panels are controlling MCEs, the left-most aux/user buttons are main source buttons that match the preset, program, and preview rows. The right-most aux/user buttons are "aux delegates" that control how the aux bus is to be used. Typically, the main source buttons of the aux/user buttons are applied to the *aux* bus of the MCE. (Panels that control MCPMs do not use the aux/user buttons.)

Transitions

A transition takes place when an operator presses a transition button or when a command is issued by automation. The transition at a selected transition rate and with a selected transition type.

For MCEs and MCPMs, the transition rate can be fast, medium, or slow. The exact duration of "fast," "medium," and "slow" is configurable. It is important to note that transitions occur in the MCE or MPCM, not in the control panel.

For Imagestore 750s, the transition rate can be fast, medium, slow, or the automation rate. The exact duration of "fast," "medium," and "slow" is configurable. Here too, the transition occurs in

the Imagestore 750, not in the control panel. The duration of DVEs, keys, and voice-overs involved in a transition can differ.

Basic transition types include cut, V-fade (or fade-fade), cut-fade, cross-fade, and fade-cut. (Other types exist.) Audio transitions occur at the same rate as the video transitions. For Imagestore 750s, the shape of a transition type can be configured. Refer to the *Imagestore 750 Reference Manual* for more information.

Video Effects

For MCEs and MCPMs, video effect processors include

> keyer 1, logo A, squeezeback, keyer 2, keyer 3, and logo B.

The effects are performed in that order (although some MCPMs do not support all effects and some control panels can be configured without certain effects). Selected effects are cumulatively applied (in the MCPM or MCE) to the selected source.

For Imagestore 750s, video effect processors include

> DVE, DSK 1, DSK 2, DSK 3, and DSK 4

Panels controlling Imagestore 750s can have up to 4 DVE buttons and up to 4 DSK buttons (and up to 8 XG layer buttons). The DSKs (downstream keyers) are layered in their numeric order. The DVE processor inserts its DVE in one of 3 places: before DSK 1, before DSK 2, or before DSK 3. Selected effects are cumulatively applied to the selected main source.

The DVE processor is an Imagestore 750 option. When the option is activated, the DVE processor can optionally provide a single DVE or a dual DVE.

A *key* is a video overlay. A *keyer* mixes the key with program (or preset) video using two video sources: key (i.e., a mask) and fill. Some keyers have only one source—fill—and the mask is derived from the luminance of the fill.

The Imagestore 750 processes up to 4 keys. It has storage for internal keys and can accept up to 3 external keys. The term DSK applies to the Imagestore 750's key processors.

One of the Imagestore 750's external keys can be input from an Intuition XG processor.

We use the term *logo* primarily for MCEs and MCPMs. Other terms apply to Imagestore 750s: clips, images, animations, stills. A *logo* is a graphic overlay. Logos are stored in the MCPM or MCE and are selectable at the control panel or by automation. Logos overlays require no video input. Logos can be single-frame images or animations. Animations can either loop or play once. The number of logos and animations is limited by MCPM or MCE memory.

We use the term *squeezeback* primarily for MCEs and MCPMs. *Squeezeback* means that program output is reduced to a set portion of the video image gradually over the transition period while a video source (the squeeze "background") is displayed under the squeezed image. There are 3 forms of squeezeback—basic, enhanced (single), and enhanced (dual). Dual squeezeback involves two images (main sources); single squeezeback involves just one image. Enhanced squeezeback allows the squeeze regions to have borders of variable width and color.

Video effects are included identically on the preset and program buttons. If a panel has preview buttons (and it controls an MCE) the preview row also has the same video effects.

Audio Overs

The program and preset rows can include two audio over buttons. (Some control panels can be configured without audio over buttons.) If a panel has preview buttons (and it controls an MCE) the preview row also has the same audio over buttons.

For MCEs and MCPMs, an "audio over" is an audio overlay. For Imagestore 750s, we use the term *voice-over*, but it is the same thing. However, MCEs and MCPMs process audio overs differently from Imagestore 750s and the terms that describe the controls for audio overs and voice-overs are different.

An MCE or MCPM mixes the audio over and program audio at some ratio that can be preconfigured and also adjusted with a knob on the control panel.

The Imagestore 750 mixes a voice-over with program audio. It reduces the level of main source audio and plays the over at another level. The two levels can be preconfigured and also adjusted with a knob on the control panel.

An audio over requires an audio source. For MCEs and MCPMs, the typical over source is a physical AES input. For Imagestore 750s, the typical over source is an internally stored "EasyPlay" audio clip.

Options

Not all MCPMs support all effects. Some control panels can be configured with a reduced set of effects. Only the MCPM-SDHD and MCE support enhanced squeezeback. (See Transitions Involving Squeeze on page 66.)

Some Imagestore 750s are configured with DVEs and some are not. (There are many Imagestore 750 options.)

Other Features

Control panels have a fairly large number of customer-definable buttons. Such buttons can, for example, select a channel or activate GPI circuits.

All control panels have a menu with which to choose sources or to select options. The iMC-Panel-200 and iMC-Panel-300 have an LCD touchscreen that displays the menus. The iMC-Panel-GUI has a menu area that is like the LCD touchscreen of the hardware panels.

The iMC-Panel-200 and iMC-Panel-300 have a metering input (BNC) and a "live levels" display that functions in conjunction with a dedicated metering input (often originating at an MCE's audio metering output). This input is not used (or needed) for panels controlling Imagestore 750s.

▲ The metering input does not necessarily take input from the currently selected MCE. Obtaining input from multiple MCEs requires a router or a multiplexer.

Intuition XG

Miranda's Intuition XG graphics processor and its associated Xmedia software can be integrated with the master control system. The Intuition XG subsystem includes a graphics processor that stores, and plays out, video clips (with audio). It can access "live" data including feeds from wire services and databases. The Intuition XG processor can deliver one or two clips simultaneously to one MCE. Additional Intuition XG subsystems might be required for multiple MCEs. Intuition XG is not supported by MCPMs.

▲ For MCEs, Intuition XG requires at least one SWB input card in the frame of the MCE with which it communicates.

An Imagestore 750 can also receive input from Intuition XG processors. XG clips are handled by one of the Imagestore 750's DSKs.

See

Kaleido-X

Master control can be integrated with a Kaleido-X multi-viewer (or monitor wall) in such a way that master control can trigger a Kaleido-X *re-layout*. The Kaleido system defines *rooms* (in which a multi-viewer exists) and *layouts* (the organization of views on the multi-viewer) for each room.

Panel operators can have available 'Kaleido-X Layout' buttons that trigger multi-viewer re-layout. A channel change can also trigger a multi-viewer re-layout.

Control panels, when they are controlling Imagestore 750s, can cause the *source content* of a monitor wall to change when the operator changes the current source group. In contrast, a multi-viewer re-layout changes the *organization* of the sources on the display.

Machine Control

MCEs can perform machine control and pre-roll operations. Control panels correspondingly might have several machine control and pre-roll buttons. Machine control and pre-roll functions are carried out by a DC21 Device Controller on the master control network. The device controller can control up to 4 VTRs (or similar devices) with a serial protocol (Sony, Odetics, or VDCP) and has the capability of controlling up to 16 other devices with start and stop pulses.

See

The Imagestore 750 does not perform machine control or pre-roll.

Automation

All MCPMs and MCEs have an RS-422 port for automation. Automation connections are serial and point-to-point. (Miranda does not offer an automation system.)

MCEs and MCPMs can accept either of two similar serial protocols:

• Miranda's Serial Protocol for Master Control (document NP0024-00, revision F, presently).
• Thomson M-2100 protocol.

Imagestore 750s have 4 COM ports that can be used for automation. The Imagestore 750 accepts the Oxtel automation protocol.

Ethernet

The MCPM, MCEs, Imagestore 750s, control panels, and PCs in a master control system communicate over Ethernet.

A master control system requires a connected PC for configuration purposes, but does not require a PC after configuration. Of course, the PC used for a software control panel must be connected.

Transition Processors

Imagestore 750s

There is one model of the Imagestore 750 (although it has many configuration options). It is a 1RU channel branding processor, that provides A/B mixing, a DVE, 4 DSKs, and 2 voice-overs. See the *Imagestore 750 Reference Manual* for complete detail.

One of the Imagestore 750's options is the master control option, which makes it possible for the Imagestore 750 to operate in conjunction with the NV9000 system and iMC panels.

MCPMs

MCPMs (master control processing module) are the devices that perform master control switching and mixing. There are several types of MCPMs:

MCPM-SD	2-slot modules that process standard definition (SD) video. Provides 3 keyers, 2 logos, 1 squeezeback layer, 4 AES outputs, and 8 analog audio outputs in addition to program output. Inputs are from the frame's motherboard.
MCPM-HD, MCPM-HD2	4-slot modules that process high definition (HD) video. Provides 3 keyers, 2 logos, 1 squeezeback layer, 4 AES outputs, and 8 analog audio outputs in addition to program output. Inputs are from the frame's motherboard. Two slots can be filled with router output cards.
MCPM-SDHD	4-slot modules that process either HD or SD video, as a field-programmable option. Provides 3 keyers, 2 logos, 1 enhanced squeezeback layer, 4 AES outputs, and 8 analog audio outputs in addition to program output. Inputs are from the frame's motherboard. One of the slots can be occupied by a router output card.
MCPM-MK-SD	1-slot modules that process standard definition (SD) video. Provides 3 keyers, 1 logo, but no squeezeback. Inputs are from the frame's motherboard. These modules are also named "mixer/keyers" or "branding engines."
MCPM-MK-HD	2-slot modules that process high definition (HD) video. Provides 3 keyers, 1 logo, and no squeezeback. Inputs (up to 16) are from the module's backplane, *not* the frame's motherboard. These modules are also named "mixer/keyers" or "branding engines."
MCE	A 1- to 3-slot transition processor. MCEs are considered "next generation" processors and have new expandable architecture. See Chapter 5, MCEs on page 75.

Other than the distinctions made here, all MCPMs and MCEs have common characteristics, such as audio meter/monitor outputs, GPIO, and emergency bypass capability.

Configuration Applications

There are 4 configuration applications for MCEs and MCPMs:

MasterConfig	Creates, modifies, and uploads MCPM configurations (complete with logos). Supports all MCPM types, including MCEs.
MasterDiag	Diagnostic software for MCPMs. Allows administrators to assign network addresses to MCPMs and to upload software revisions, among other things.
MasterLogo	Logo conversion software (for MCPMs). The software converts an existing graphic file or files into the format required by an MCPM. Logos are typically uploaded to an MCPM with a configuration upload from MasterConfig. However, it is MasterLogo that does the upload.

There is 1 configuration application for panels:

MCS Panel Configuration Editor	Creates, modifies, and uploads panel configurations and GUI configurations.

There are several configuration applications for Imagestore 750s, among which are the following:

Imagestore 750 Configurator	Batch Converter
Audio Builder	Animation Builder
Clip Builder	DVE Editor
Clock Builder	

The Imagestore 750 Configurator creates, modifies, and uploads Imagestore 750 configurations. It is essential for integrating the Imagestore 750, the control panels, and the NV9000 system.

Miranda's *Vertigo Xplorer* can also be used for the transfer and management of still images and animations.

The Imagestore 750 also has a built-in "browser application" that you can access from a browser on your PC. It can be used to change parameters, view the status of the Imagestore 750, or to stop or restart the Imagestore 750.

Other

Two additional configuration tools are available. Both are browser applications resident in hardware from DNF controls:

- The Master Control Tally Processor.
- The Master Control Device Controller.

Intuition XG configuration tools and creative tools are available. Among these are Xplay, Xbuilder, Xstudio, and XG dashboard.

Ancillary Hardware

These products are briefly described here. Refer to Chapter 8, Other Master Control Products, on page 141, for more detail.

EBCP

All MCPMs and MCEs have emergency bypass capability. Under certain conditions (e.g., malfunction, power-up, external switch) an MCPM or MCE enters bypass mode with this effect: emergency

bypass inputs are switched to program output. When the MCPM or MCE leaves bypass mode, normal output resumes.

The emergency bypass control panel (EBCP) is a simple one: it is a 1RU panel that has two large button switches. One says "Main" and the other says "Bypass." Pressing the red "Bypass" button places an MCPM or MCE in bypass mode. Pressing the green "Main" button enables normal mode. (The panel controls only the MCPM or MCE to which it is connected.)

The green button lights when the MCPM or MCE is in normal mode. The red button lights when the MCPM is in bypass mode. Because the buttons are large, the MCPM or MCE state is obvious from a distance. The bypass button functions as a "kill switch." Because it is large, it is easy to find and press quickly.

(A bypass switch and bypass LED are situated at the front of each MCPM or MCE, but they are enclosed in the frame and might not be readily accessible.)

▲ The EBCP does not apply to Imagestore 750s.

Tally Processor

Miranda offers a third-party "tally processor"—a 1RU device that provides 32 optically isolated inputs and 32 relay outputs, also optically isolated. Through Miranda's NVISION Ethernet protocol (NVEP), the tally processor can sense master control events such as main source selections and transitions and trigger master control events.

Multiple tally processors can be added to a master control network.

The manufacturer (DNF Controls) provides a configuration utility program that operates as a browser application.

▲ The tally processor is treated as if it were a control panel and the presence of one or more tally processors limits the number of actual control that can control a single MCPM or MCE. (An MCPM or MCE can communicate with a maximum of 4 panels.)

▲ The tally processor does not apply to Imagestore 750s.

Device Controller

Miranda offers a third-party "device controller"—a 1RU device that can control 4 VTRs or other devices using a serial protocol (Sony, Odetics, or VDCP) and up to 16 devices using start and stop pulses. Like the tally processor from the same company, the device controller also provides 32 optically isolated inputs which are not used by master control, but can be used for any purpose. The device controller receives commands from MCEs under Miranda's Ethernet protocol (NVEP).

Multiple device controllers can be added to a master control network. The product includes a self-contained configuration utility program that operates as a browser application.

The manufacturer (DNF Controls) provides a configuration utility program that operates as a browser application.

▲ The device controller does not apply to Imagestore 750s.

3. Frames

Chapter 3 describes NV5100MC frames, their I/O cards, and their connectors. It presents the following topics:

- Overview
- Connectors
- Input (and Output) Cards
- Other Modules

▲ If your master control system does not include MCEs or MCPMs, it does not require master control frames and you need not read this chapter.

Overview

The NV5128-MC frame was an adaptation of the design of the NV5128 Multi-Format Router (MFR). Master control and the MFR, in fact, coexist in the same frame. The master control architecture both supports and uses the MFR if it is present.

The NV5100MC frame is a newer version of the NV5128-MC frame. It is the same size as the NV5128-MC frame, accepts the same control cards and power supplies, and accepts the same I/O cards[1] as the NV5128-MC frame. The NV5100MC frame has an enhanced motherboard that allows multiple SWB and provides additional throughput for up to 8 HD MCEs.

▲ Except for the legends on the door, the NV5100MC frame is visually indistinguishable from an NV5128-MC frame.

▲ The two frames are nearly identical in function. However, the constraints on the way you can populate the card slots differ slightly for each frame.

Each of the frames is 8RU (19″ w × 13.97″ h × 18.75″ d).

Frames ship pre-assembled (with I/O cards, backplanes, etc.) according to the equipment you ordered with the frame.

If the frame contains a multi-format router (MFR), you will have to use UniConfig and the NV9000 configuration tools to set up the MFR. Please refer to the *NV5128 MFR User's Guide* for more information.

UniConfig takes only a short time if you know what to do. Deciding how your router(s) will work with master control is a bigger task. Contact Miranda (or visit www.miranda.com) if you wish to receive an application note (AN0004) that presents a case study.

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1. It does not accept the classic HD cards or machine control cards which apply only in a NV5128 router.

Control Cards

The NV5100MC frame has 2 control card slots. A control card can be an EM0374 (router control card) or an EM0414 (clock generator card). The EM0374 is required if (1) an MFR is present in the frame or (2) an NV9000 router control system is connected.

The frame requires only one control card. A second control card is for redundancy. When a secondary control card is present, the master control system will automatically switch to the secondary card if the first one fails.

The EM0374 control card can process control information from an external router control system such as the NV9000. The EM0374 also manages various reference signals. The EM0374 supplies appropriate timing and control signals to the I/O cards and the MCPMs in the frame. So does the clock generator card (EM0414), although it does not support any routers.

The control card(s) also handle alarm signaling.

Power Supplies

The frame has two power supply bays (one for redundancy) and a fan tray at the top of the frame. The power supplies are PS6100s.[2]

Frame Cooling

A pull-out fan tray at the top of the frame provides a quiet flow of ambient air through the frame to ensure cool and reliable operation. Periodic maintenance of the air filter will help maintain system reliability. Refer to NV5100MC Maintenance on page 206 for more information.

▲ For proper air flow, keep the door closed during operation and place cover plates over unused slots at the rear of the frame.

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2. Older frames in the field might still use PS6000 power supplies.

Inputs and Outputs

The frame has 8 input card slots and 8 output card slots. The 8 input slots are in the middle, with 4 output slots on either side. All I/O cards provide 16 connections. The frame allows up to 128 input connections and up to 128 output connections. Figure 3-1 shows a front view of an NV5128-MC frame with a sampling of I/O cards and MCPMs:
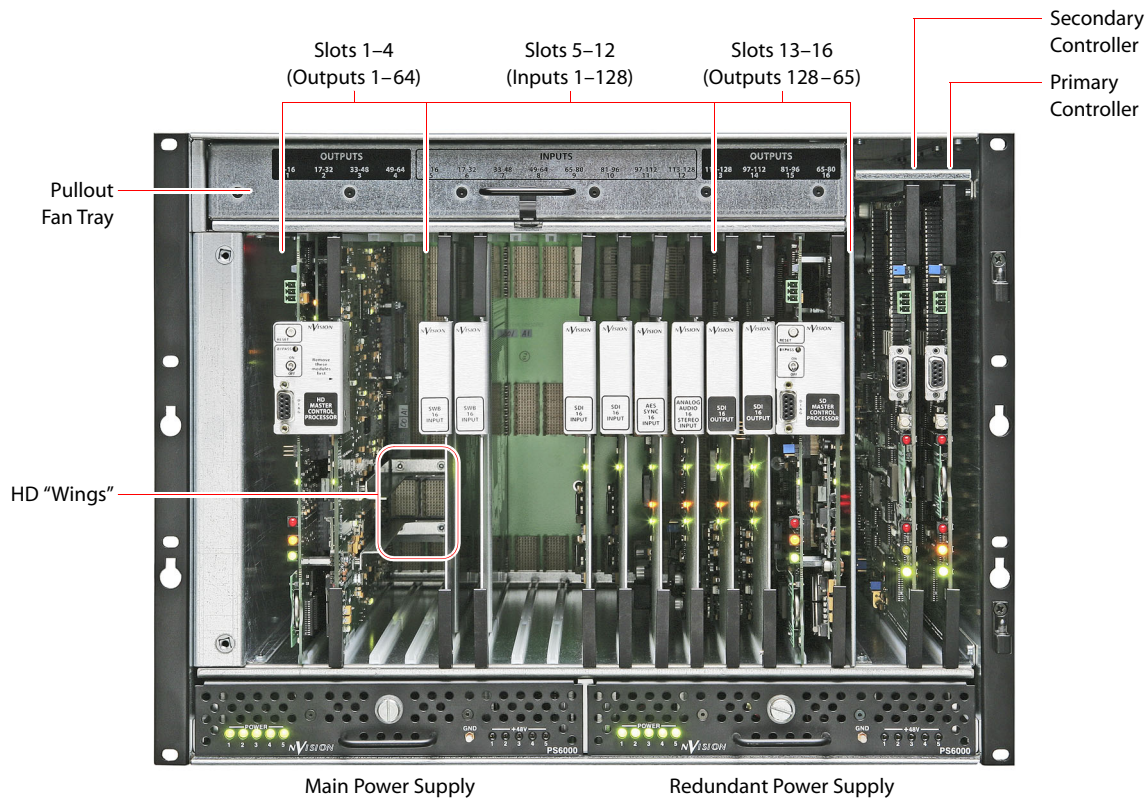
Figure 3-1. NV5100MC Frame, Front View, Showing MCPMs, I/O Cards, and Control Cards

The frame in Figure 3-1—one of many possible configurations—holds the following items:

- An MCPM (HD) in slots 1 and 2.
- An MCPM (SD) in slots 15 and 16.
- Two SWB input cards in slots 5 and 6.
- Two SD input cards in slots 9 and 10.
- Two audio cards in slots 11 and 12.
- Two router output cards (SD) in slots 13 and 14.
- Two (EM0374) router control cards.

▲ Note the two "wing" slots of the MCPM-HD. The wing slots accept optional SWB router output cards.

▲ NV5100MC frames allow the use of multiple independent SWB input and output cards.

3. Frames

Overview

Figure 3-2 shows a rear view of the NV5100MC frame. The organization of I/Os and MCPMs matches the organization of the frame shown in Figure 3-1.
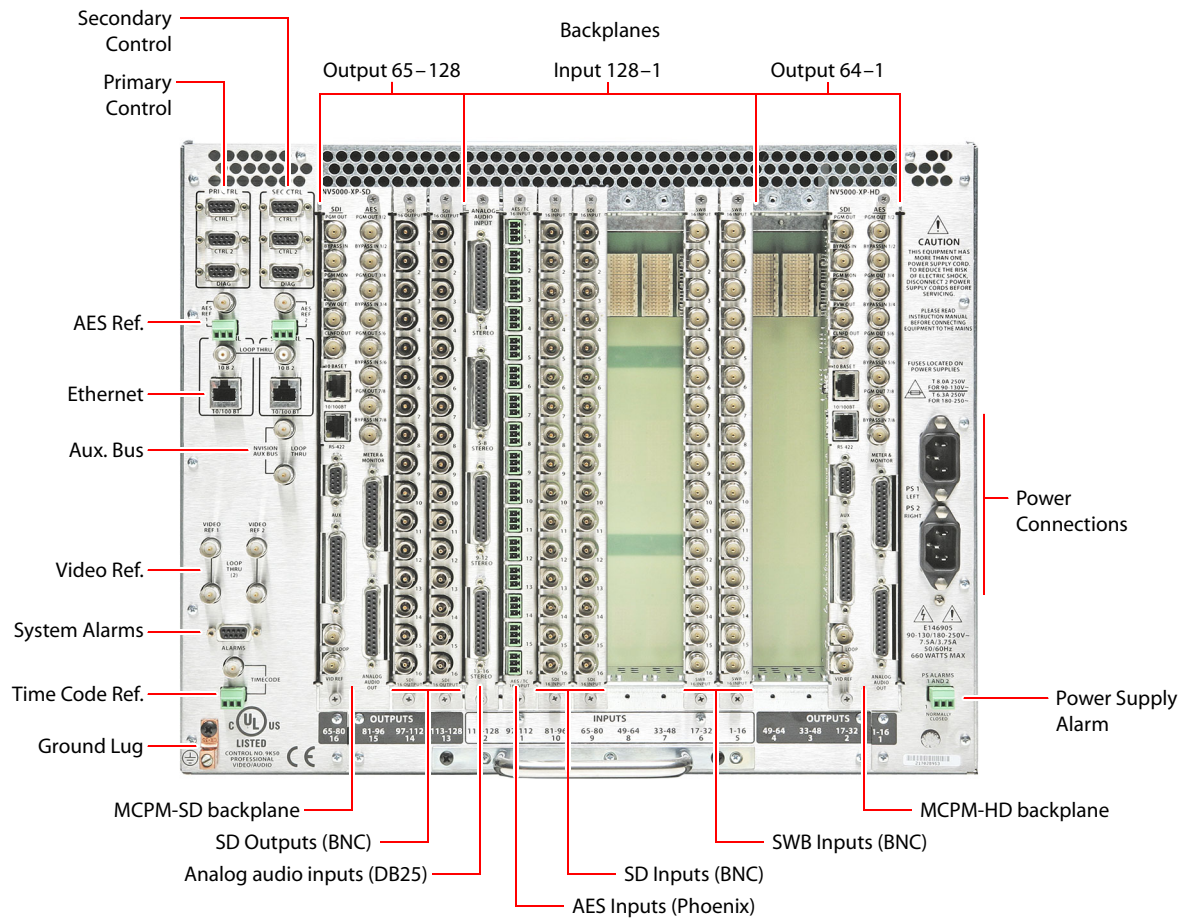
Figure 3-2. NV5100MC Frame Rear View

Figure 3-3 is a schematic view of the frame, from the top, showing the relative position of the I/O cards, control cards, and backplanes, and their relationship to the motherboard.
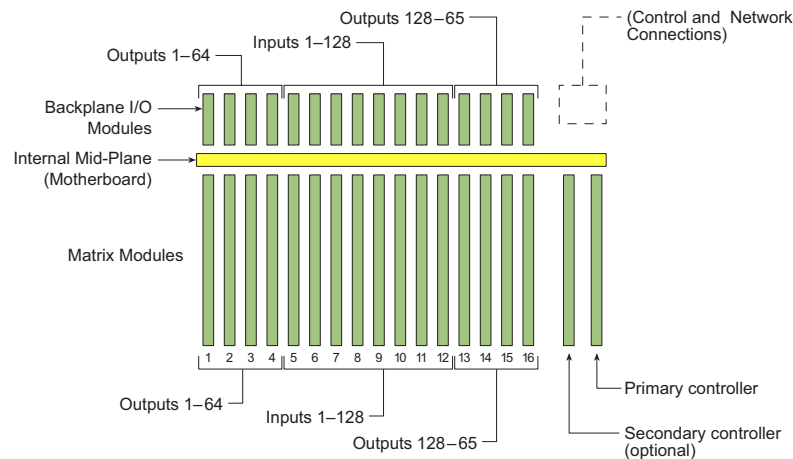
Figure 3-3. NV5100MC Frame, Top View, Showing Module Locations

Each slot is divided by the motherboard with "backplanes" to the rear and I/O cards (a.k.a. matrix modules) to the front. The backplane modules provide I/O connectors and allow a choice of connector types for certain I/O cards.

Matrix modules slide into the frame from the front. Each module, whether input or output, has a companion backplane module that fits into the frame from the rear. Signals enter and exit the crosspoint through the backplane connectors. The motherboard spans the frame and distributes input and control signals, timing, and power. Backplanes and I/O modules plug into the motherboard.

Numbering

The numbering of the slots is sequential, from 1 to 16, but the connector numbers in slots 13–16 are in reverse order. These are the connectors, as seen from the rear:

Slots															
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Output				Input								Output			
65	81	97	113	113	97	81	65	49	33	17	1	49	33	17	1
66	82	98	114	114	98	82	66	50	34	18	2	50	34	18	2
67	83	99	115	115	99	83	67	51	35	19	3	51	35	19	3
68	84	100	116	116	100	84	68	52	36	20	4	52	36	20	4
69	85	101	117	117	101	85	69	53	37	21	5	53	37	21	5
70	86	102	118	118	102	86	70	54	38	22	6	54	38	22	6
71	87	103	119	119	103	87	71	55	39	23	7	55	39	23	7
72	88	104	120	120	104	88	72	56	40	24	8	56	40	24	8
73	89	105	121	121	105	89	73	57	41	25	9	57	41	25	9
74	90	106	122	122	106	90	74	58	42	26	10	58	42	26	10
75	91	107	123	123	107	91	75	59	43	27	11	59	43	27	11
76	92	108	124	124	108	92	76	60	44	28	12	60	44	28	12
77	93	109	125	125	109	93	77	61	45	29	13	61	45	29	13
78	94	110	126	126	110	94	78	62	46	30	14	62	46	30	14
79	95	111	127	127	111	95	79	63	47	31	15	63	47	31	15
80	96	112	128	128	112	96	80	64	48	32	16	64	48	32	16

All backplane connectors are numbered 1 at the top and 16 at the bottom. This is true regardless of the type of connectors.

Input Numbering

The "global" number G (1–128) assigned to any input connector C is

$G = (slot - 5) \times 16 + C$ where $slot$ = 5–12.

Output Numbering

The "global" number G (1–128) assigned to any output connector C is

$G = (slot - 1) \times 16 + C$ where $slot$ = 1–4

or

$G = (16 - slot) \times 16 + 64 + C$ where $slot$ = 13–16

Inverse Numbering

Given G (1–128), **any** connector C (1–16) is

$C = [(G - 1) \bmod 16] + 1$

Signal Formats

Master control signal formats can be a mix of AES audio, analog audio, analog video, SD video, and HD video. The MFR can route time-code signals and machine-control signals. The master control (MC) system does not accept signals of these types at the motherboard.

I/O cards can be mixed in many combinations. Generally, each I/O card handles 16 signals.

Audio and video cards and MCPMs share — and compete for — the output slots. A 16-input SD video card consumes one slot, leaving fewer slots for other cards. An MCPM-HD requires 4 output slots (an entire output bay), leaving 4 output slots for router cards or other MCPMs. Trade-offs must be made during the allocation of slots.

▲ Although the MCPM-HD occupies 4 slots, it has "wing" slots that accommodate two SWB router output cards.

▲ The maximum number of video inputs depends on the MCPM. It is either 128, 64, or 16.

All modules and backplanes are "hot-swappable."

Figure 3-4 is a simplified block diagram of a typical system. In this example, the MCPMs occupy two output slots each, leaving room for 4 router output cards.
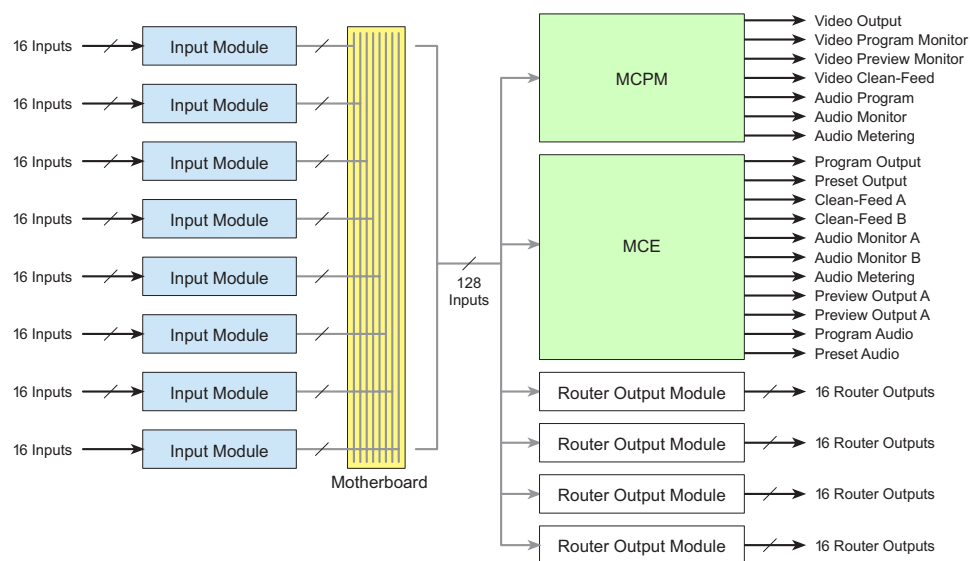
Figure 3-4. Typical Master Control System

The MFR crosspoint matrix, if present, is distributed among 128×16 crosspoints in the output cards.

Please note:

▲ The MCPM-MK-HD does not receive inputs from the motherboard, but from its own backplane.

▲ The MCPM-HD and -HD2 each have an additional crosspoint that, in conjunction with an MFR, can route SWB[3] inputs to 32 SWB outputs. SWB output cards fit in the two "wings" of the MCPM-HD (or -HD2).

---

3. SWB (super wide band) includes both SD and HD formats.

▲ The MCPM-SDHD has an additional crosspoint that, in conjunction with an MFR, can route SWB inputs to 16 SWB outputs. SWB output cards fit in the single "wing" of the MCPM-SDHD.

Refer to MCPM Types on page 44 for more information.

Local vs. Router Input

There are several ways to connect video and audio devices to the frame's inputs:

- Static, direct or *local* connection. The video and audio outputs of a device (such as a camera or VTR) are cabled to connectors on the frame's backplane.

- Static, indirect connection. Video and audio outputs of a device have a dedicated connection, through one or more router(s), to the frame's backplane.

- Dynamic, *router pre-select* connection. A large number of router sources are available for *explicit* selection. The connection requires that a router destination (one or more router outputs) be cabled to the frame.

  The master control operator must actively browse router sources to choose a source. The operator must also "take" the source to the destination connected to the frame.

- Dynamic, *external router source* connection. Specific router sources are available for *transparent* selection. An MCPM configuration designates some video or audio sources as *external* (i.e., from the NV9000) and others as *local* (i.e., connected at the frame's backplane). All external sources reach the MCPM through a specifically configured set of the frame's ports.

  A master control operator need not know which sources are external and which are not. The mechanism for accessing the route source is automatic and hidden from the operator.

  See External Router Sources on page 70 for more information.

Connectors

At the rear of the frame are a variety of connectors:

Serial Control	Video Reference	Power Supply Alarms
Diagnostic Ports	Aux Bus	Power
Ethernet Control	Time Code Ref	Ground Lug
AES Reference	System Alarm Outputs	

Many of the connectors are used when a router is present in the frame and are not necessarily useful for master control.
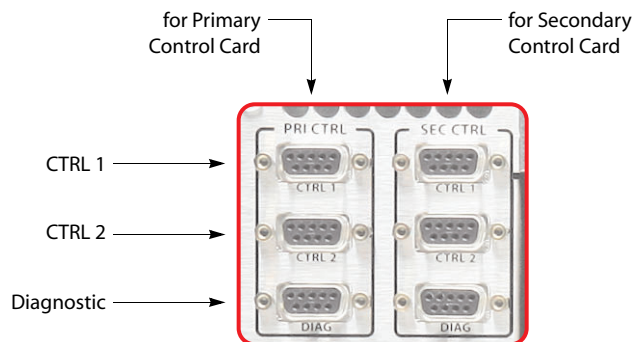
Control Ports

At the top left portion of the rear of the frame are 6 serial connectors, and further below that are 2 Ethernet connectors:

Serial Control

The CTRL1 and CTRL2 ports are DE9, RS-422.

You can use these connectors for control using a serial protocol from (1) a primary or secondary NV9000 router control system, (2) a primary or secondary third-party router control system, or (3) a router automation system.

▲ The CTRL connectors are needed only when a router is present in the frame and a serial control protocol is in use.

Cases:

1 If you are using an NV9000 control system with a serial protocol or if you are using a third-party control system, connect the primary CTRL1 port to a COM port on the system controller. Similarly connect the secondary CTRL1 port if your frame has a secondary control card.

2 If you have a redundant control system, connect the primary CTRL2 port to a COM port on the redundant controller. Similarly connect the secondary CTRL2 port if your frame has a secondary control card.

3 If you do not have a redundant control system, but have an automation system, connect the primary CTRL2 port to a COM port of the automation system. Similarly connect the secondary CTRL2 port if your frame has a secondary control card.

The control system's COM ports must be compatible with the frame's serial ports — the same Baud rate, parity settings and so on.

An automation system's COM ports must also be compatible with the frame's serial ports.

Diagnostic Ports

The DIAG ports are DE9, RS-232 or RS-422.

These ports are for configuration, firmware uploads, and testing. The ports are typically used with UniConfig to initialize the primary and secondary control cards for routing.

The DIAG ports are not used during normal operation.

Ethernet Control

The Ethernet connectors are used when you have an NV9000 router control system connected over Ethernet.

for Primary
Control Card

for Secondary
Control Card
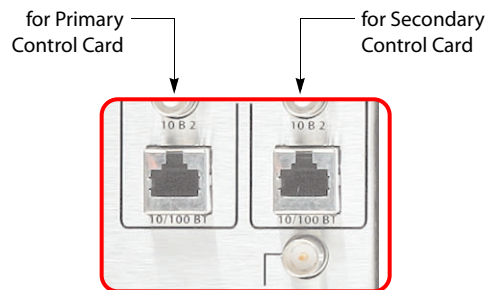
▲ The Ethernet connectors are needed only when a router is present in the frame and a Ethernet control protocol is in use

OR

when the master control system uses router sources as inputs.

Cases:

1 If you are using an NV9000 control system with an Ethernet protocol, connect the primary Ethernet port to the "Router/Panel" network switch connected to the NV9000 system controller. Similarly connect the secondary Ethernet port of your frame if it has a secondary control card.

2 If you have a redundant control system, then no router connections are required, but the redundant controller should be connected to the "Router/Panel" network switch.

3 If you have an automation system, connect a COM port of the automation system to *either* primary serial port, CTRL1 or CTRL2. Similarly connect a COM port to either secondary serial port if your frame has a secondary control card.

AES Reference

AES reference connectors allow you to sync the master control frame with your house reference. If you do not supply an external AES reference, the control card itself will generate its own 48 kHz reference. An external reference is not strictly necessary for master control.

for Primary
Control Card

for Secondary
Control Card

AES Ref,
BNC
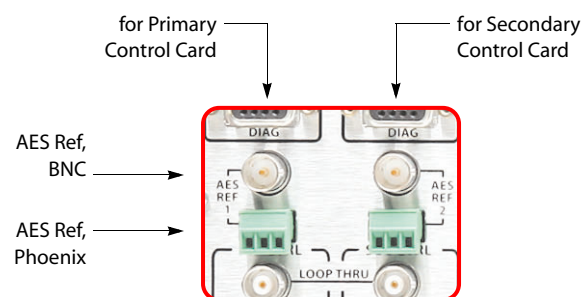
AES Ref,
Phoenix

There are two pairs of connectors for AES reference—one for the primary control card and one for the secondary control card. Each control card can use either:

• BNC (75-ohm).

• A 3-pin Phoenix connector for STP connections.

Both accept AES3-id signals at a 48 kHz sample rate (3.072 MHz bit rate). The AES reference signal does not loop-through. Each input supports both balanced and unbalanced formats. Only one connector can be used at a time for a given input.

The use of redundant references from independent reference generators increases reliability and is the recommended method of operation. If one reference is lost, the system will automatically select the backup reference. Supply only 48 kHz reference signals to the frame.

The NV5100MC supports "near-sync" operation. That is, an unlocked 48 kHz AES source can be routed by a synchronous AES input/output module pair. To accomplish this, audio samples are discarded or repeated as required to bring the source into exact synchronization at the output.

An AES reference is required only when there is a router in the frame and the router has AES or analog I/O cards. The reference makes inter-mixing analog and AES audio formats easier.

▲ The EM0374 generates its own AES reference if no external reference is present. The external reference is needed only to sync the frame with your house reference.

An acceptable reference includes any AES3 formatted signal with a sample rate of 48 kHz. Typically digital silence is used as a house AES reference. Miranda manufactures several AES sync generators suitable for this task.

▲ At software release 6.1.0 and later, MCEs derive AES reference from their video reference. (The current release is version 7.1.0.0.)

Aux Bus

At the middle left portion of the rear of the frame are 2 'Miranda Aux Bus' (BNC) connectors:.

Aux Connectors
(BNC, 50Ω)
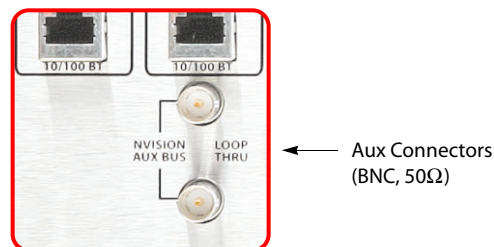
If you are using an SMS7000 router control system with the master control system, connect the SMS7000 to the Miranda aux bus connector.

The frame has two aux bus connections. The connection is loop-through: you can pass the SMS7000 "node bus" control signals on to another device if it is required. You can connect a redundant control system on the "node bus."

If you are using an SMS7000 control system, terminate the "node bus" with a 50Ω terminator.

▲ Using an SMS7000 requires an SMS7000 mezzanine card installed on each router control card. Jumpers J4 and J6 must be set. See Jumpers on page 176 for detail.

▲ There is no relation between this aux bus and the aux bus of an MCE or the aux buttons of certain control panels.

Video Reference

At the lower left portion of the rear of the frame are 4 video reference (BNC) connectors:

Video Reference Connectors
(BNC, 75Ω)
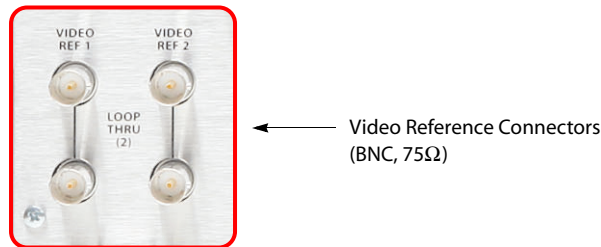
These references affect only the router, if present, **not** the MCPMs or MCEs in the frame. Each MCPM or MCE should have a video reference too. However, it is possible to "daisy chain" the video reference from the frame's reference connectors to the MCPMs' reference connector.

If there is no video reference, the control card's front red LED remains lit and takes will not occur at defined switch points.

Two connections (Video Ref 1 and Video Ref 2) are provided for video reference. Each connection is "loop-through." One connector receives the reference signal; the other feeds it to another device.

Acceptable reference signals include NTSC analog, PAL analog, or HD tri-level analog signals. External 75-ohm termination is required on the frame if you do not feed the reference to another device. You can feed the MCPM references from these connectors.

▲ Many MCPMs (include MCEs) support Dolby E audio, embedded or discrete. Dolby E requires an interlaced video reference format. Dolby E works with 720p video sources when the reference is 525i, 625i, or 1080i.

▲ At software release 6.1.0, MCEs derive AES reference from their video reference.

In the case of composite reference signals, only the sync portion is used. Reference signals may be *single*, *redundant* (same video standard and rate) or different (*dual-standard* mode, different rates).

Single Reference Signals

There is one reference input, possibly "daisy chained" to reference inputs on other devices.

Redundant Reference Signals

In this mode, both reference inputs are driven with identical but separate reference signals. At startup, the control card checks both inputs for valid signals. If both inputs are good, reference input 1 will be used. If this input fails, the controller automatically selects reference input 2. If input 1 is subsequently restored, the router will continue to use input 2 until the control card is reset. If both references fail, an internally generated reference signal will be used. In this case, switches will be asynchronous. This mode improves system reliability.

Dual-Standard Reference Signals

In this mode, the reference inputs are driven with different signals. An example might be NTSC analog black on reference input 1 and HD tri-level sync on reference input 2.

If either reference fails, it will be replaced with the internally generated signal and any outputs using the failed reference will switch asynchronously.

Each of these modes requires that configuration settings be made using UniConfig software.
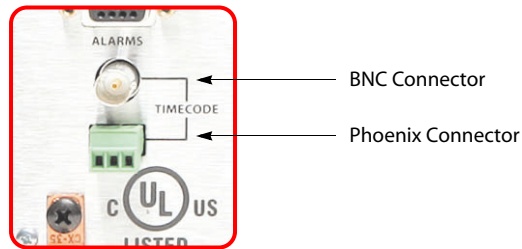
This mode allows the use of SD and HD video with video reference.

Time Code Ref

At the lower left portion of the rear of the frame are 2 connectors for time-code reference.
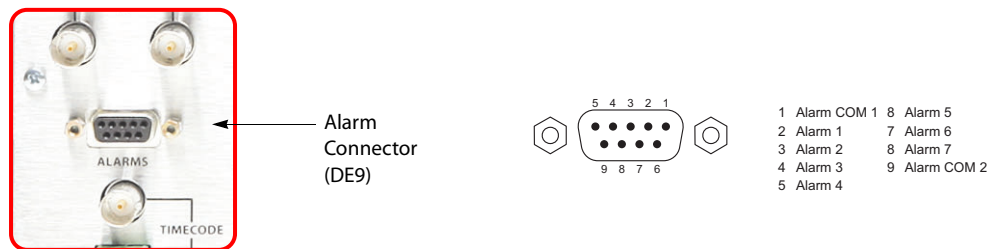

BNC Connector

Phoenix Connector

Master control does not use time-code reference. You can ignore these connectors unless there is a router in the frame that includes time-code I/O.

Alarms

System Alarm Outputs

At the lower left portion of the rear of the frame is a DE9 connector for system alarms:

Alarm Connector (DE9)

| 5 4 3 2 1 |
| 9 8 7 6 |

1 Alarm COM 1	8 Alarm 5
2 Alarm 1	7 Alarm 6
3 Alarm 2	8 Alarm 7
4 Alarm 3	9 Alarm COM 2
5 Alarm 4	

This connector allows you to create alarm circuits of your own.

The internal alarm signalling is provided by solid-state relays that turn on in the event of an alarm condition. Table 3-1 describes the individual alarm connections:

Table 3-1. Alarm Signals

Pin	Signal	Description	Possible Alarm Condition(s)
1, 9	Alarm Com	Common	Common connection for all alarm signalling pins. This is a "return" for an external circuit.
2	Alarm 1	Major alarm	Missing reference inputs, possible failure of fans or over-temperature conditions on one or more modules.
3	Alarm 2	Minor alarm	Any of alarms conditions 3, 4, 5 or 6.
4	Alarm 3	Power supply	Main power supply module is missing.
5	Alarm 4	Video reference	Missing video reference signal 1 or 2 (if applicable).
6	Alarm 5	AES or time code reference	Missing AES reference signals or loss of system clock.
7	Alarm 6	Fans or internal Temperature	Failure of any one of three fans. Over-temperature conditions on one or more modules.
8	Alarm 7	Controller health	Control card(s) are not "healthy."

▲ Pins 2 through 8 signal alarm conditions that are signalled on either the primary or secondary control cards. The connector offers no way to distinguish which control card has an alarm.

Figures 3-5 and 3-6 show sample system-level alarm circuits. (You can use alarm signalling devices other than LEDs, or in addition to LEDs.)
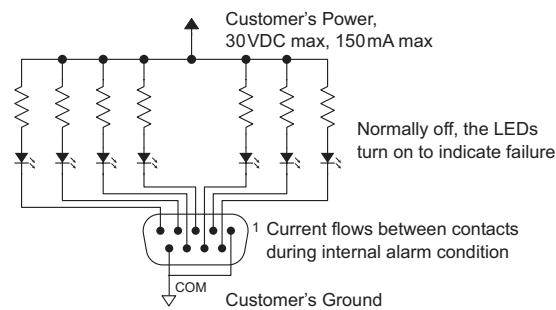

Figure 3-5. Simple Alarm Circuit

Here, LEDs are all *off* unless a failure occurs. The LED for the failed circuit turns *on*.

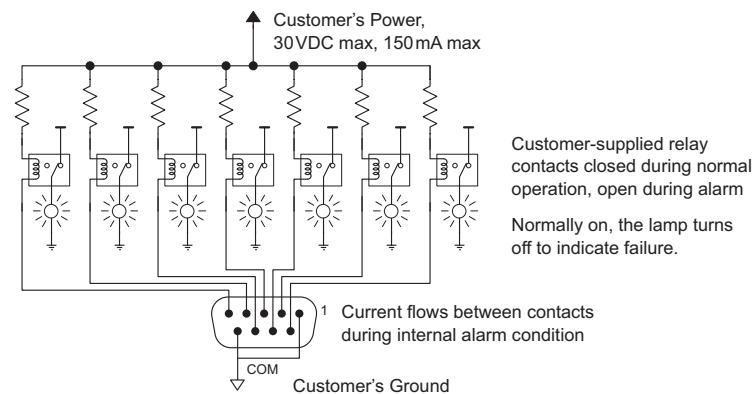This is an alarm circuit that can drive heavier loads, not just LEDs.

Figure 3-6. Alarm Circuit to Drive Loads

In this example, the LEDs are normally *on* and turn *off* when a failure occurs.

CAUTION: If the alarm load is inductive, protect the internal alarm relay contacts with a reversed-biased diode. The external supply voltage should not exceed ±30 VDC and the load resistors should be sized to limit contact current to less than 150 mA.

Power Supply Alarms

At the lower right portion of the rear of the frame is a Phoenix 3-pin connector for power supply alarms:

The frame has alarm outputs for each power supply installed in the frame. An internal solid-state relay is provided for each supply. The relay turns on when there is an alarm condition.

Figure 3-7 shows suggested alarm circuit implementations. You can use signalling devices other than LEDs or in addition to LEDs. For example, you can operate a buzzer or other audible alarm to warn operators of a potential problem.
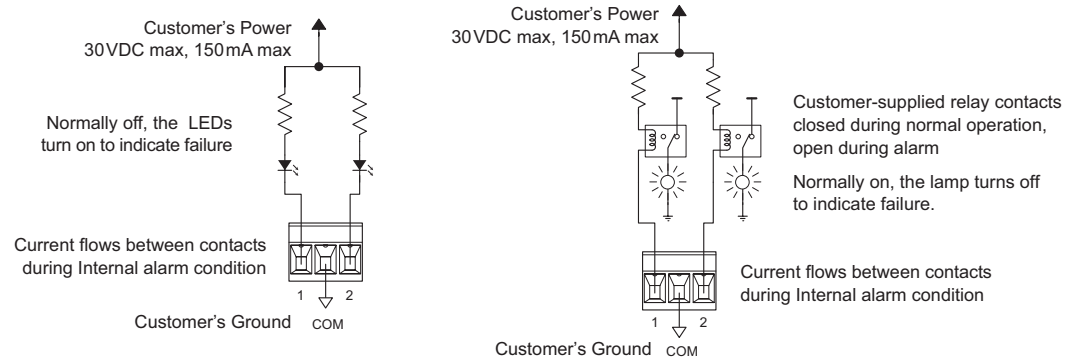

Figure 3-7. Power Supply Alarms

CAUTION: The voltage of the external power supply for alarm signalling should not exceed ±30 VDC. Resistors should be sized to limit the current through each internal alarm contact to less than 150 mA.

If the load is inductive, the alarm contacts should be protected with a parallel, reverse-biased diode.

Power

The frame has two power supply bays (and two power connectors) to support redundancy. Only one power supply is actually required.

Connectors

At the middle right portion of the rear of the frame are 2 AC connectors:

The frame has one (IEC) 3-conductor power connection for each of its 2 power supplies. These should be connected to a 90–130 VAC or 180–250 VAC 15A grounded circuit wired in accordance with local electrical codes.

Fuses for both AC power inputs are located on their respective power supplies. Ensure that the fuse ratings comply with specific requirements in your area. A 7.5 A fuse is required for 110/120 VAC applications. For 220/240 VAC operation, a 3.75 A fuse is required.

For increased protection against loss of power, we suggest that each power supply be connected to a separate branch circuit. A removable wire bail grips the power cable and hold it in place to reduce the possibility of accidental loss of power.

The power cords represent the only means of disconnecting main power from the frame. Make sure to clearly mark the line side power connection with its function so that in the event of an emergency, power can be disconnected quickly. Disconnect both power cords before servicing any internal frame components.

Power Supply

The PS6100[4] power supply accepts a wide range of AC input voltages and produces five +48 VDC outputs. Each of the five circuits producing the +48 volt outputs is identical. The power supply automatically senses the AC input voltage (90–130 VAC or 180–250 VAC) and adjusts itself to maintain a relatively constant DC output. You do not have to select the voltage. The five regulated outputs are directed to the various regulators that produce the DC voltages required by the local circuits.

Each +48 VDC output powers one of the five green LEDs and output test points on the front of the power supply. Under normal operation, all five LEDs should be on. If any is not, it is likely that the corresponding branch circuit has failed. When the power supply output voltages are measured at the test points, the voltage should be approximately +48 VDC under a full load. If modules have been removed from the frame or options are not installed, some or all of the test point voltages could be somewhat higher than +48 VDC.

There are four low-speed fans located at the front edge of the power supply. They pull a small quantity of air across the internal heat sinks.

The top power connector on the rear panel corresponds to the power supply on the left and the bottom connector corresponds to the power supply on the right (as you face the front of the frame).

Ground Lug

At the lower left portion of the rear of the frame is a ground lug:
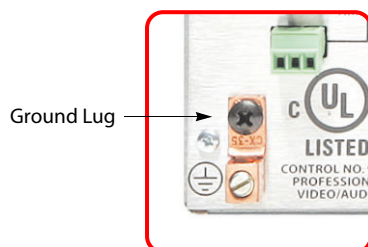
Connect this "lug" to earth ground using 8–14 AWG wire.

---

4. Older master control frames in the field might still use PS6000 power supplies.

Input (and Output) Cards

Each input (and output) module employs one or more DC-DC converters to convert the +48VDC on the backplane into the appropriate regulated supply voltage(s).The combination of pre-regulators and DC-DC converters and supply voltages varies from module type to module type, depending on the requirements of the associated circuitry. There is a non-serviceable, self-resetting 1A fuse located on each module.

The master control system uses input cards. Its MCPMs are its output modules. The multi-format router (MFR) does of course use output cards. Refer to the *NV5128 Multi-Format Router User's Guide* for information on the output cards and information about the router.

This table lists the I/O cards and backplanes related specifically to master control.

Card	Part No	Backplanes
Analog Audio	NV5000-AA-IN	IO5000-AA-IN (DB25)
Synchronous AES	NV5000-SA-IN	IO5000-AES-IN-TP / IO5000-AES-IN-BNC
Analog Video Conversion	NV5000-AVC-IN	IO5000-AVC-IN
SD Video	NV5000-SD-IN	IO5000-SD-IN
SWB Video (input)	NV5000-HD-IN	IO5000-HD-IN
SWB Video (output) [a]	NV5000-HD-OUT	IO5000-HD-OUT
SWB Video (input)	NV5100MC-SWB-IN	IO5100MC-3GIG-IN [b]
SWB Video (output) [c]	NV5100MC-SWB-OUT	IO5100MC-3GIG-OUT

a. This SWB output card fits in the wing slots of an MCPM-HD or -HD2 or MCPM-SDHD.
b. The 3Gig backplanes are used for SWB I/O cards.
c. Any output cards belong to the MFR, if it is present in the frame.

SWB cards support both HD and SD video.

The input cards in group A work in all input slots of NV5128-MC frame. They do *not* work in slots 5–8 of the NV5100MC frame. (Keep in mind that frame slots 5–12 are *input* slots 1–8.)

Input cards in group B work in all input slots of the NV5100MC frame and *must* be used in slots 5–8. These cards consume more power (25W) than the SD video cards (17W), so it would be prudent to use the SD video cards in slots 9–12 if you require additional SD video.

The MCPM-HD, -HD2, MCPM-SDHD, and MCE require video in slots 5–8 and audio in slots 9–16. These processors are consistent with the division of the input slots. It is only when you are using an MCPM-SD or MCPM-MK-SD that any complication occurs. That is because the SD processors allow audio in all slots and video in all slots.

▲ The MCPM-MK-HD does not receive input from the motherboard and so does not use any input cards. Its 16 BNCs support HD (and not SD) video for its exclusive use.

The NV5100MC frame allows multiple (single-slot) SWB output cards. The NV5128-MC frame allows only one.

The NV5100MC frame provides throughput for up to 8 HD MCEs. The throughput of the NV5128-MC is less.

Summary for NV5100MC

Use only SWB cards in slots 5–8.
Use any card in slots 9–12.
The frame supports up to 8 HD MCEs.

Summary for NV5128-MC

The NV5128-MC have at most 1 SWB card.
SD input cards and audio cards for SD can go in any slot.
HD input cards go in slots 5–8. Audio cards for HD and for MCEs must go in input slots 9–12.

MFRs can use other types of cards (in NV5128-MC frames only), including those that would interfere with master control. Avoid using such cards. See the *MFR User's Guide* for information.

Cases

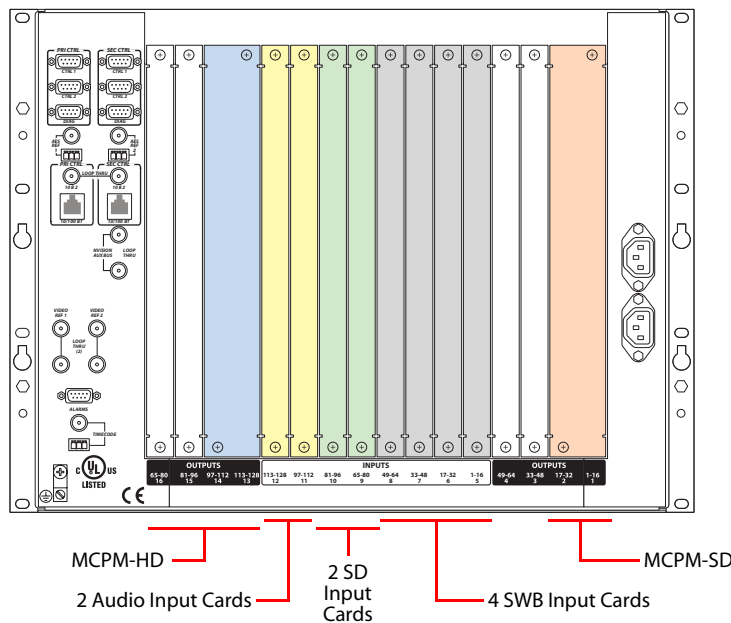Case 1: An MCPM-SD with 128 SD inputs all having embedded audio.
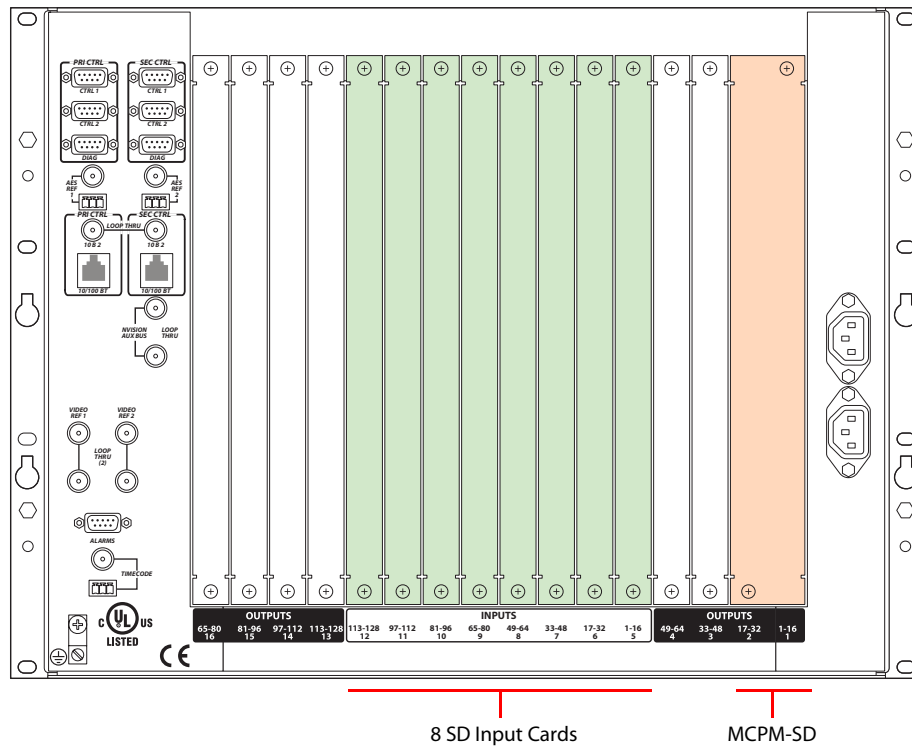
8 SD Input Cards   MCPM-SD

The frame must be an NV5128-MC.

Case 2: An MCPM-HD with 64 HD inputs, an MCPM-SD with 32 inputs, and 32 audio inputs. The frame may be an NV5128-MC or an NV5100MC.

Note that the MCPM-HD is a 4-slot module but its backplane module occupies only two slots. The other two backplane slots would be used for SWB output backplanes if the MCPM-HD were to include wing output cards.

MCPM-HD
2 Audio Input Cards
2 SD Input Cards
4 SWB Input Cards
MCPM-SD

Case 3: An MCE with 64 HD or SD inputs, and 64 audio inputs. The frame must be an NV5100MC. Audio may be embedded or discrete as required.

4 Audio Input Cards
4 SWB Input Cards
MCE
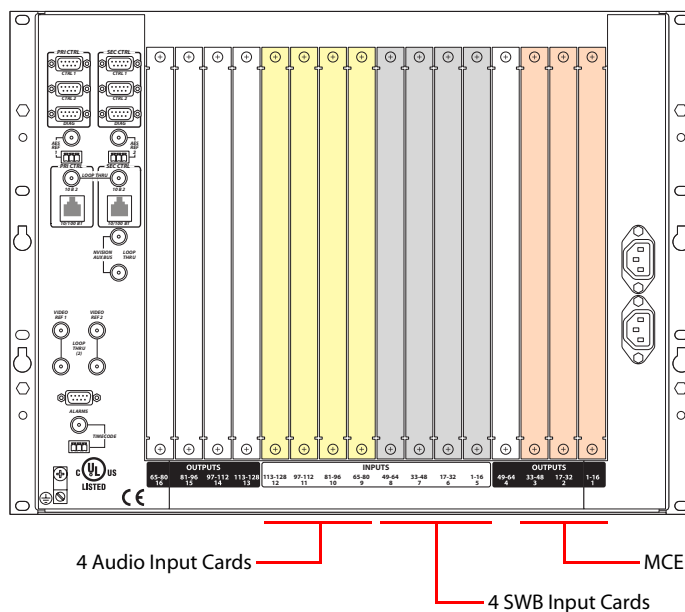
Other arrangements are possible.

Analog Audio

Master control and the MFR route only AES format audio, at 48 kHz with 24-bit sample values. Each analog audio card (and its backplane) converts analog audio to AES format and processes 16 stereo (or 32 mono) signals.

Analog Audio Input Module

The NV5000-AA-IN is designed for balanced analog audio signals. Differential receivers buffer incoming signals. Precision components in the input stages provide very high common mode rejection and gain stability. Additional stages provide low-pass filtering. Signal levels are scaled to accommodate the desired +24 dBu maximum input level. On-board DIP switches allow the gain of each channel to be raised +6dB to accommodate low-level or single-ended input channels.

Each analog-to-digital converter accepts two analog signals — either left and right channels of a stereo pair or two independent mono channels — and output the sampled data in multiplexed bit streams. System clocks are supplied by the frame's control card. The conversion rate is nominally 48 kHz, locked to an external reference. FPGAs format the audio data and re-time it to a common sample point. The resulting synchronous AES bit stream(s) feed the frame's motherboard where they are delivered either to the MCPMs (or to MFR output modules).

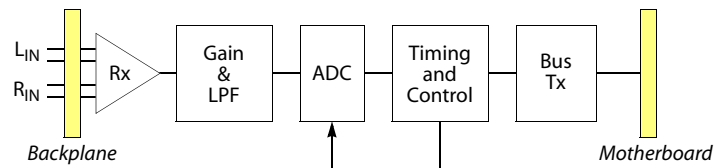Figure 3-8 shows the signal flow for a single stereo channel:

Figure 3-8. Analog Audio Signal Flow

Analog Audio Input Backplane

The EM0381 is the backplane module for analog audio input. It has 4 DB25 connectors. Each connector handles 4 stereo pairs or 8 mono signals.

Each connector requires a DB25 breakout cable (NV5000-CABLE1, or your own).

Synchronous AES

AES input cards provide 16 AES channels of input.

AES backplanes are available in two types: BNC, for unbalanced signals on coaxial cable, and Phoenix 3-pin pluggable screw terminal connectors for balanced, twisted-pair signals.

Synchronous AES Input Module

AES signals, balanced or unbalanced, arrive at the input module from the appropriate backplane module. These signals are transformer-coupled to balanced input receivers. The module extracts timing information from the signals on the input receivers. The module uses the timing information to format the data and to correct timing errors. The module can accommodate nearly synchronous input signals by either deleting or repeating samples to bring the signal into synchronization. Balanced drivers feed the signal to the internal motherboard.

Figure 3-9 shows the synchronous AES signal path:

Sync AES In — Rx — Retime & Format Data — Bus Tx

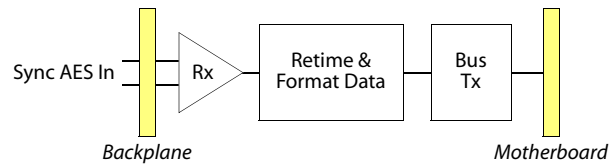*Backplane*   *Motherboard*

Figure 3-9. Synchronous AES Signal Flow

Synchronous AES Input Backplanes

The IO5000-AES-IN-TP backplane module has 16 Phoenix connectors for balanced signals. The IO5000-AES-IN-BNC backplane module has 16 BNC (75Ω) connectors for unbalanced signals.

(Asynchronous AES input cards exist but are not used under master control.)

Analog Video Conversion

The EM0432 Analog Video Conversion (AVC) input module converts incoming composite analog video signals (NTSC or PAL) to SD video.

Analog Video Conversion Input Module

Each of the 16 composite video inputs from the passive backplane module is received by a differential input amplifier. The single-ended outputs of these amplifiers are passed to anti-aliasing filters before being processed by a video converter. The outputs of the converters are then passed to an FPGA which serves as an SMPTE 259M formatter and bus driver. A PLL locked to the video converter reduces jitter in the data formatting process. The outputs of the drivers feed the differential traces on the motherboard.

▲ The SD output of the AVC input module is line-locked to the incoming composite signal.

▲ The input processing delays the signal by approximately 1.25 lines. Frame sync and subcarrier phase alignment are not maintained with respect to reference. AVC modules are intended to provide an economical way to convert signals to feed to monitors with SD or NTSC/PAL inputs and for use in similar applications where signal timing is not critical.

Figure 3-10 shows a simplified view of the signal flow through the AVC input card.

EM0432

Analog Video In — Rx — Anti-Alias Filter — Video Decoder — SMPTE 259M-C Data Formatter and LVDS Bus Driver (×16) — SD Video (at motherboard)
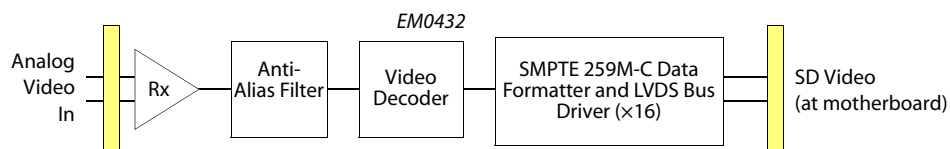
Figure 3-10. AVC Signal Flow

Analog Video Input Backplane

The AVC card uses the IO5000-AVC-IN backplane. It has 16 BNC connectors.

SD Video

SD Video Backplane and Input Module (EM0383)

The backplane applies SD video signals to a cable equalization circuit through a return loss compensation network. The equalizer automatically compensates for up to 300m of Belden 1694A or equivalent cable. The equalizer also has a muting function that prevents digital noise in the output

in the absence of a valid signal. Inputs are self-terminating. After equalization, the SD video is buffered to compensate for any loss accumulated in the path to the crosspoint/output cards via the motherboard.

Figure 3-11 shows a simplified view of the SD signal flow:
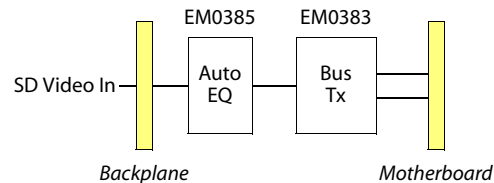

Figure 3-11. SD Video Signal Flow

SD Video Input Backplane

The SD input card uses the backplane. It has 16 BNC connectors. The SD input backplane is an active module.

SWB Video

The NV5128-MC and NV5100MC frames differ in their support for SWB video.

The NV5100MC frame is newer and provides more throughput for HD channels. It supports any number of SWB output cards. The limit is the number of output slots which is 8.

The NV5128-MC frame supports up to 4 of the older SWB output cards that mount in the wings of MCPM-HDs, -HD2s, and -SDHDs (and SWB output modules). The NV5128-MC frame also allows 1 (only) new SWB output card.

(Without the MFR, there is no reason to have any output cards of any kind.)

Old SWB 16-Input Backplane and Input Modules

The SWB input card accepts a wide range of data rates, both HD and SD.

The SWB backplanes contain active circuitry that performs cable equalization.

SWB input cards support 16 inputs. An SWB input card buffers the automatically equalized inputs from the backplane and feeds the 16 input signals to the motherboard.

New SWB 16-Input Backplane and Input Modules

The SWB input card accepts a wide range of data rates, both HD and SD.

The SWB backplanes contain active circuitry that performs cable equalization.

SWB input cards support 16 inputs. An SWB input card buffers the automatically equalized inputs from the backplane and feeds the 16 input signals to the motherboard.

The new input cards can feed more than one MCE.

▲ At least one SWB input card (and backplane) is required if the frame is to support an Intuition XG subsystem.

Old SWB Output Module

The NV5000-HD-OUT is a special card that plugs into a wing slot of an MCPM-HD, -HD2, or -SDHD. The NV5000-HD-OUT also fits in the wing slots of an NV5000-HD-XPT/OUT output module (when an MFR is present).

In either case — master control or MFR — the output card is part of the MFR crosspoint matrix.

▲ When an MFR is present, it can use the SWB output card for routing HD, SD, and asynchronous AES signals.

The MCPM-HD and -HD2 provide 2 wing slots; the MCPM-SDHD provides 1 wing slot.

The SWB output cards use IO5000-HD-OUT backplanes. Each has 16 BNC connectors. Even though the NV5000-HD-OUT output cards plug into the wing slots of another module, they require backplanes.

New SWB Output Module

The NV5100MC-SWB-OUT is a newer output card designed to work especially well in the NV5100MC frame. Any number of these output cards can be used in an NV5100MC frame. Only one of these cards can be used in an NV5128-MC frame. The card does not plug into an MCPM wing slot.

The output card is, as previously stated, part of the MFR crosspoint matrix.

▲ When an MFR is present, it can use the SWB output card for routing HD, SD, and asynchronous AES signals.

These SWB output cards use IO5100MC-3GIG-OUT backplanes. Each has 16 BNC connectors.

Other Modules

Control Cards

There are two types: the EM0374 (universal) router control card and the EM0414 clock generator card. The EM0374 is required only if you have a router in the frame. The frame has two control card slots. One of the slots for a redundant (or secondary) control card.

In all case, the control cards provide clocks and AES reference signals to the MCPMs.

The router (if present) receives instructions from a router control system.

MCPMs receive instructions from control panels or automation. (The MCPMs are independent modules and, although they receive clocking from the control card and video and audio from the motherboard, they are controlled independently.)

EM0374

A memory backup battery located along the front edge of the module maintains data in RAM for several months or longer if power is turned off or the module is removed. This ensures that the router can return to its previous state after a power outage. The battery may be replaced with the control card powered on without affecting the operation of the system.

Flash memory stores FPGA code and application program(s), including protocols for communicating with the external control system(s). The flash memory can be reprogrammed using UniConfig. Updating or changing the control system protocol is a quick and relatively easy process.

A pair of EEPROMs are located on the *motherboard* — one for each control card. The EEPROMs store UniConfig settings and other system parameters. Thus, any control card can be installed in the frame without reconfiguration. The configuration stays with the frame.

Also included on the controller card is the processing circuitry for the video and AES reference inputs. With respect to video, a timing chip receives the reference input(s) and uses them to create a vertical interval strobe and other clocks. These clocks are used to enable crosspoint switching during the video vertical blanking interval and to control other system functions. AES reference signals are processed similarly. An AES receiver chip extracts clock and formatting information from the supplied AES reference(s). These signals are applied to an FPGA that in turn derives all required signals for AES operation.

Interface circuitry on the control module connects to the various serial data ports on the backplane and interfaces those data ports to the microprocessor. The Ethernet NIC is auto-negotiating. All ports may be used simultaneously.

On-board power regulators accept +48 VDC from the power supply module(s) and produce ±12 VDC, +5 VDC, and +3.3 VDC for on-board circuits. Power and signal presence LEDs on the front of the card indicate when power and reference input signals are present.

See EM0374 Jumpers on page 176 for more information.

EM0414

The EM0414 is an AES clock generator card. It does not support any router control functions.

See EM0414 Jumpers on page 177 for more information.

Power Supply

The PS6100[5] power supply module accepts a wide range of AC input voltages and produces five outputs, each +48 VDC. Each of the five circuits producing the 48 V outputs is identical. The power supply automatically senses the AC input voltage (90–130 or 180–250 VAC) and adjusts itself to maintain a relatively constant DC output; no voltage selection is required of the customer.

The five regulated outputs are directed to the various modules in the frame where on-board regulators produce the DC voltages required by the local circuits. Each 48 V output powers one of the five green LEDs and output test points on the front of the power supply.
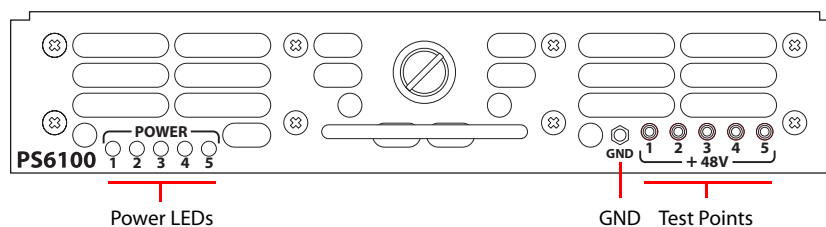
Under normal operation, all five LEDs should be on. If any is not, the corresponding branch circuit has probably failed. When the power supply output voltages are measured at the test points, the voltage should be approximately +48 VDC under a full load. If power supply modules have been removed from the frame or options are not installed, some or all of the test point voltages could be somewhat higher than +48 VDC.

There are four low-speed fans located along the front edge of the power supply. They are intended to pull a small quantity of air across the internal heat sinks.

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5. The PS6100 is a replacement for the former PS6000.

Fuse

A replaceable AC fuse cartridge is used on the PS6100 power supply modules. The correct fuse is 15A (1.25″ × 0.25″ fast-blow).

The correct fuse for the older PS6000 power supply is given in this table:

90–130 VAC	8.0 A, 5×20 mm, slow-blow fuse
180–250 VAC	6.3 A, 5×20 mm, slow-blow fuse

Figure 3-12 shows the location of the fuse on either power supply module.

Figure 3-12. Fuse Location, PS6000 or PS6100 Power Supply

▲ Replacing the fuse without determining what caused it to fail could cause equipment damage or fire by restoring power to an already damaged unit.

4. MCPMs

Chapter 4 describes the MCPMs and *presents a foundation for understanding MCEs*. It presents the following topics:

- Overview
- MCPM Types
- MCPM Architecture
- Transitions
- Other General Features

Please refer to Chapter 5, MCEs, on page 75, for details regarding MCE architecture.

If your system does not include MCPMs or MCEs, you may skip this chapter.

Overview

An MCPM is a "master control processing module." An MCPM is also called a *transition processor*. It performs the bulk of what occurs in master control. A master control system has one or more MCPMs.

The most basic function of the MCPM is to switch its output from one program source to another and to maintain a smooth transition as it does so. A transition involves both video and audio. A secondary MCPM function is to apply video effects and audio "overs" to program output. A program source is called a *main* source in contrast to other sources, such as those for video keyers.
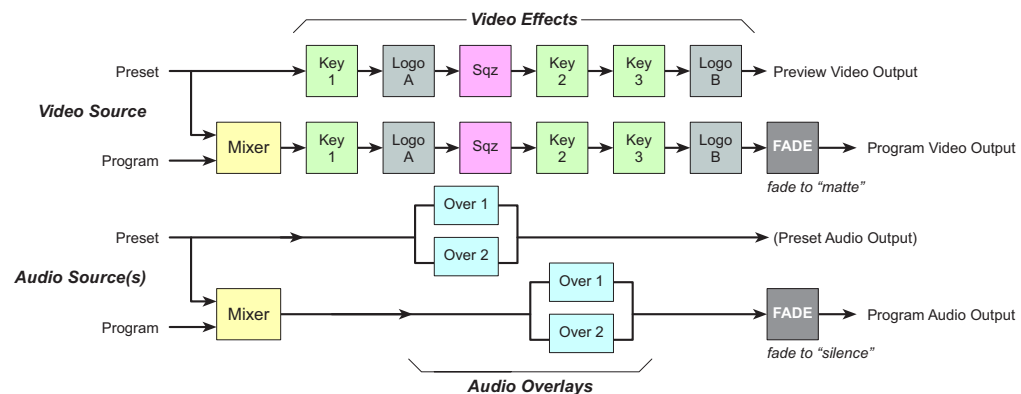
Figure 4-1. Simple view of the Program and Preset Paths

What the MCPM produces as output is called *program* and what is to be next on the program output is called *preset*. (The preset monitor output is also called *preview* monitor output on an MCPM backplane.) An operator at a control panel or an automation system presets a *main* source (video and audio) and one or more video effects or audio overs. When the operator or the automation system initiates a transition, the MCPM mixes the preset and program video and the preset and program audio. The video effects and audio overs fade in or out as required by the transition rate and

transition type. (Not all transitions involve mixing.) At the end of the transition, what was on preset is now on program. The MCPM also has options to swap the preset and program settings and to clear effects from preset after the transition.

The MCPM applies video effects and audio overs in the left-to-right sequence shown in Figure 4-1. What is on the right is considered *downstream* and what is on the left is considered *upstream*. Downstream effects modify any upstream effects. For instance, a squeeze effect affects logo A, because logo A is upstream of the squeeze function, but does not affect logo B, which is downstream. Downstream effects appear on top of upstream effects.

The MCPM adheres to the "audio follows video" paradigm: a main source in the MCPM is considered a video input with attached audio inputs. There are two ways the MCPM can obtain an audio input:

• From a discrete audio connector: analog, AES, or Dolby E.

• From audio embedded in the video signal: AES or Dolby E, but not analog.

The MCPM can process Dolby-E encoded audio input if the MCPM has Dolby module(s) installed.

The MCPM provides 8 channels of audio processing. Each main source (on both program and preset) can have 8 channels of audio. Each channel is independent and can be individually configured.
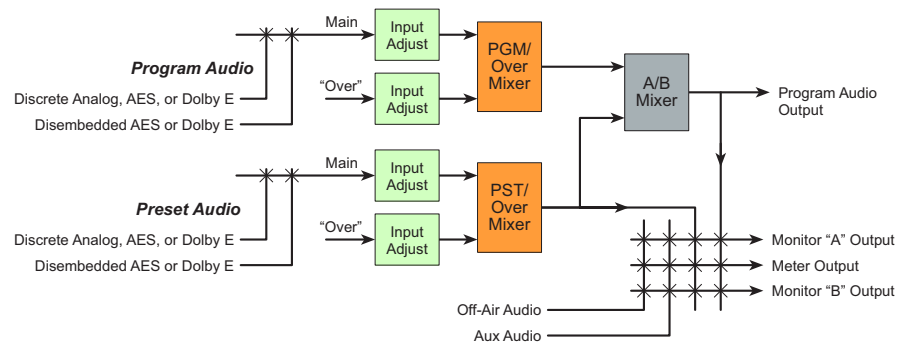

Figure 4-2. Simple View of MCPM Audio

A third function (provided by some MCPMs) is to "host" one or more router output cards. These MCPMs have one or two "wing" connectors into which you can plug SWB router cards. These MCPMs contain one or more crosspoints that provide the outputs, 16 for each router output card. (The router output cards are optional.)

A fourth function is to switch from normal program output to emergency program output during periods of "emergency" or malfunction. MCPMs have an *emergency bypass* control that performs the switch.

All MCPMs provide audio metering outputs and audio monitoring outputs. Some MCPMs provide analog audio outputs. All MCPMs have auxiliary functions (such as GPIs). The set of auxiliary functions varies among the MCPM models.

Video Effects and Audio Overs

Applicable effects and audio overs include

keyer 1, logo A, squeezeback, keyer 2, keyer 3, logo B, over 1, over 2.

The MCPM applies these effects, layered cumulatively, to the selected main source (preset or program) in the order listed here. Some MCPMs do not support all effects.

A *keyer* is a video overlay. A keyer can have two video sources: key (or mask) and fill. Some keyers have only one source — fill — and the mask is derived from the luminance of the fill. A keyer is selectable at the control panel or by automation.

A *logo* is a graphic overlay. Logos are stored in the MCPM and are selectable at the control panel or by automation. Logos overlays require no video input. Logos can be single-frame images or animations. Animations can either loop or play once. The number of logos and animations is limited by available MCPM memory.

Squeezeback means that program output is reduced to a set portion of the video image gradually over the transition period while a video source (the squeeze "background") is displayed under the squeezed image. There are 3 forms of squeezeback — basic, enhanced (single), and enhanced (dual). Dual squeezeback involves two images (main sources); single squeezeback involves just one image. Enhanced squeezeback allows the squeeze regions to have borders of variable width and color.

An *over* is an audio overlay. An audio over requires an audio source. The MCPM mixes audio over and program audio at some ratio that can be preconfigured and also adjusted at the control panel. Audio overs for MCPMs have up to 8 audio channels. (Audio overs for MCEs have up to 16 channels.)

Not all MCPMs support all effects. Some control panels can be configured with a reduced set of effects. Only the MCPM-SDHD supports enhanced squeezeback. (See page 66.)

▲ The MCPM can apply 3 keyers at a time. Each of the keyers can access any of 8 distinct keyer source pairs. Similarly, any logo applied can be selected from 64 stored logos. Any squeeze effect can access any of 32 squeeze background sources. Each of 32 squeeze settings may use a distinct background source. (Note that MCEs support more than 64 logos.)

▲ The MCPM can apply 1 audio over at any time. The audio over can access any of 4 distinct over sources.

▲ Keyer connections and squeezeback connections consume up to 7 (or 8) inputs.

See [Transitions](#), on page 58, for detail.

Transition Types

The transition rate can be fast, medium, slow, or controlled by a transition lever arm (TLA). The exact duration of "fast," "medium," and "slow" is configurable. A transition controlled by a TLA is also called a "manual" transition.

Basic transition types include cut, V-fade (or fade-fade), cut-fade, cross-fade (or X-fade), and fade-cut. (Other types exist. See page 58.) The MCPM performs audio transitions that match the rate and period of the video transitions. Audio transition types are analogous to the video transition types, but are not exactly the same.

The MCPM can also perform a "fade-to-black" or FTB transition. An FTB transitions the program video to a pre-defined matte (and program audio to silence) — after all effects and overs — in the transition period defined for the FTB. The matte can be any color, not just black.

The master control system allows "hot cuts" although they are not recommended. A "hot cut" is where the operator switches a main source immediately (on program output) or turns an effect on or off *without benefit of transition processing*. A hot cut should be considered an emergency measure — to correct an error quickly — because it can have noticeable artifacts that would be absent in a normal transition.

MCPM Types

There are 7 MCPM types:

- MCPM-SD
- MCPM-HD, MCPM-HD2
- MCPM-SDHD
- MCPM-MK-SD ("Mixer/Keyer")
- MCPM-MK-HD ("Mixer/Keyer")
- MCE

All MCPMs have common characteristics, such as audio meter outputs, GPIO, clean-feed outputs, and emergency bypass capability, but also have many differences. Refer to Table B-19 in Appendix B for a comparison.

MCEs ("next generation" processors) are different enough from other MCPMs that they warrant their own chapter. See Chapter 5, MCEs, on page 75.

Common Features

All MCPM models have a diagnostic/configuration port, a reset button, and an emergency bypass switch (and bypass indicator) at the front. All MCPMs also have a set of LED status indicators. See Figure 4-3 for an example. Refer also to LED Status Indicators on page 208.

The large red "alarm" LED indicates that there is an alarm condition.

The large yellow "active" LED indicates that the MCPM has successfully initialized.

The large green "health" LED indicates that the MCPM is functioning properly. (The red and green LEDs are opposites: when the green light is on, the red light is off and vice versa.)

The diagnostic port is a DE9 connector through which you can upload software and firmware upgrades, specify the MCPM's network address, and perform other tasks using MasterDiag software.

A PS alarm LED indicates that one or both power supplies (in the MCPM) show an alarm condition. The power LED indicates that the MCPM is receiving power from the PS6100(s).

MCPMs have a program output, preview[1] monitor output, and clean-feed output connector. Each of these provides video output with embedded audio. Some models provide additional AES outputs.

MCPMs have an emergency bypass video input (that supports embedded audio). Some models have additional (AES) emergency bypass inputs.

MCPMs have 2 video reference connectors and meter/monitor connectors.

MCPMs have control connectors and auxiliary connectors, although the number of pins of auxiliary connectors differ. The aux connectors provide GPI inputs and outputs and emergency bypass relay connections, at a minimum.

---

1. The preview monitor output displays the source and effects of the *preset* bus. This should not be confused with the preview bus outputs of the MCEs.

MCPM-SD

The MCPM-SD is a 2-slot module. Each of these processes standard definition (SD) video.

▲ The MCPM-SD now has an internal black/silence generator for use as a program or preset main source, or as a squeeze background.
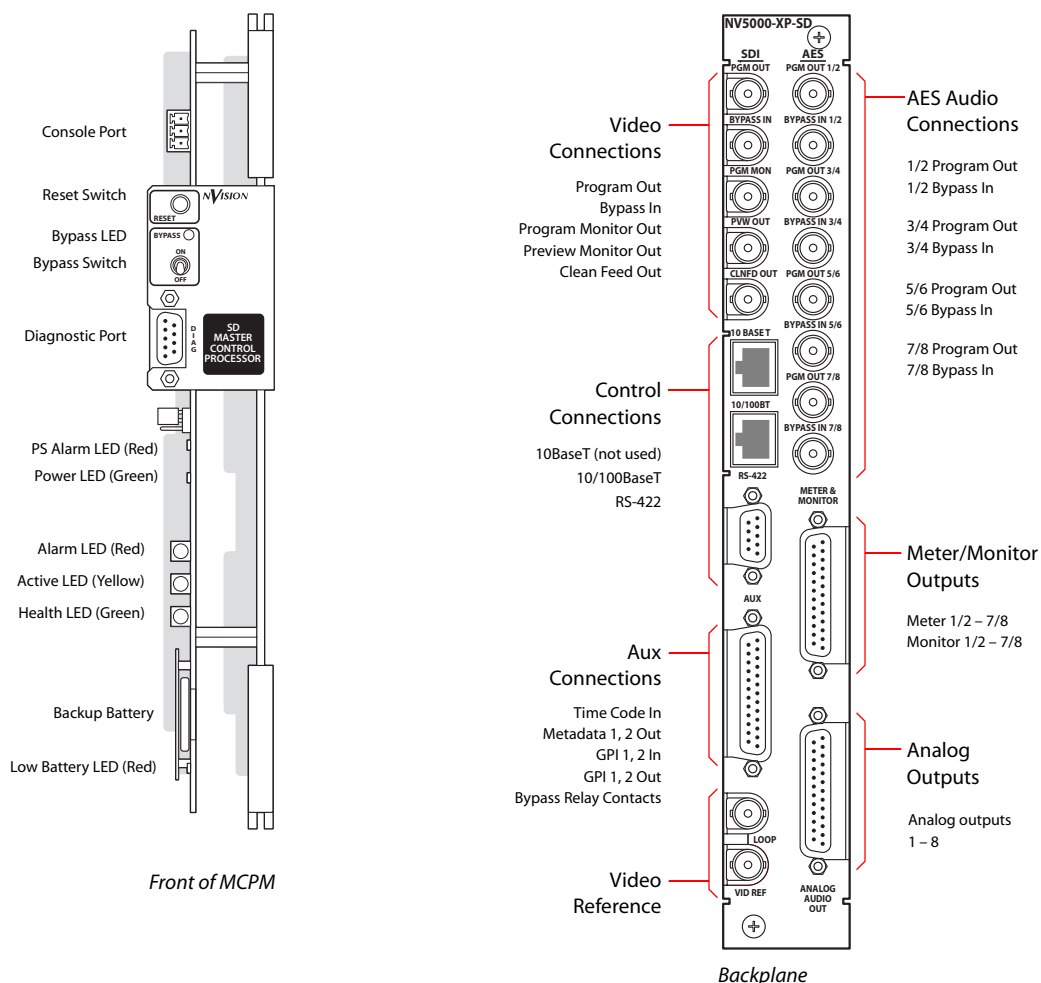

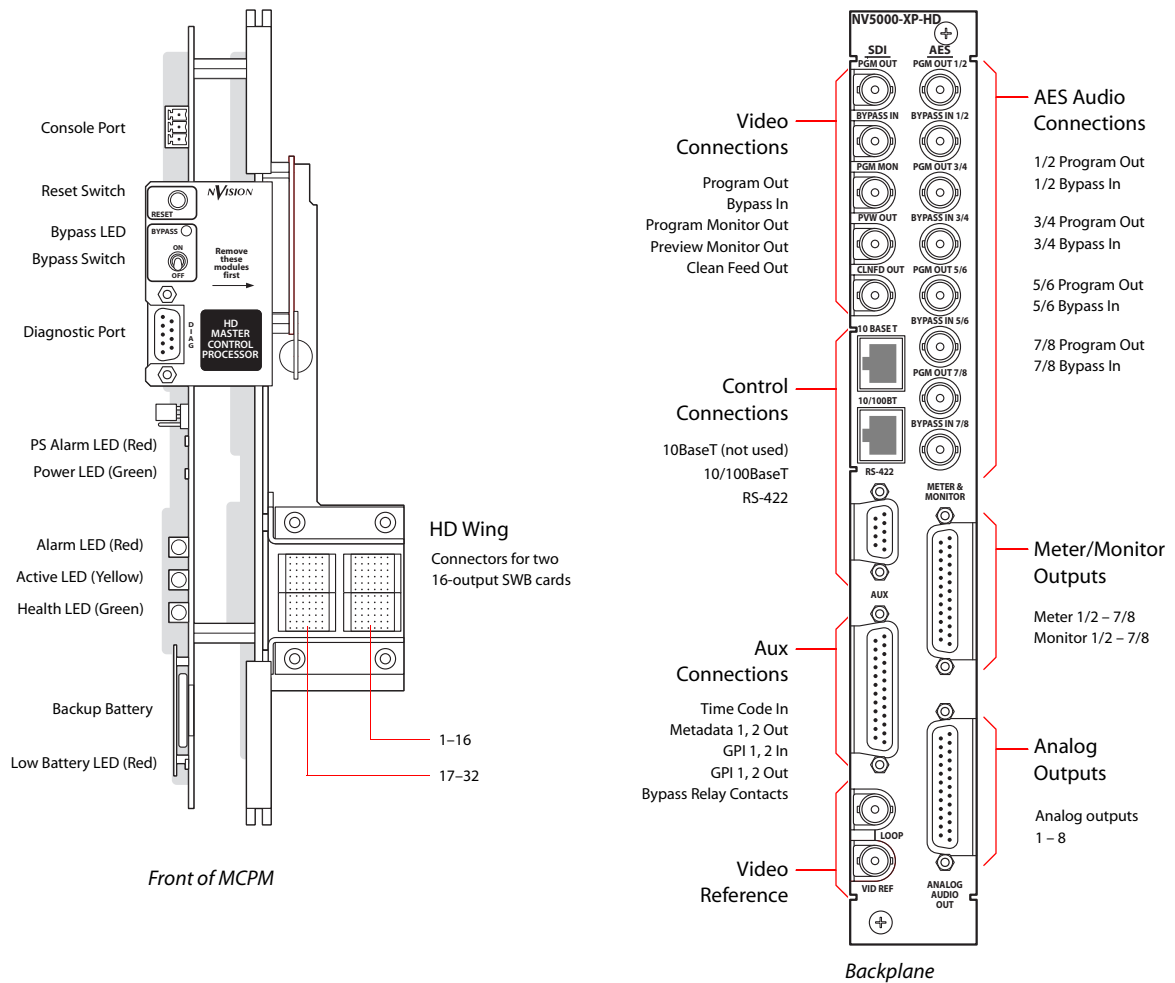*Figure 4-3. MCPM-SD (Front, Backplane)*

The MCPM-SD receives video and audio input from the frame's motherboard — up to 128 video sources or 128 stereo (256 mono) sources, or a combination thereof, in multiples of 16 sources. Video sources may contain embedded audio. The MCPM-SD provides 3 video keyers, 2 logo key-ers, 1 squeezeback layer, and 2 audio overs. These MCPMs accept optional Dolby E decoders.

The MCPM-SD has a backup battery and a "low battery" indicator.

At the backplane, the MCPM-SD also has 4 discrete AES program outputs. The backplanes also have 5 emergency bypass inputs, one video (with or without embedded audio) and 4 AES inputs.

The MCPM-SD has 8 analog audio outputs in addition to audio meter and monitor outputs.

The MCPM-SD has Ethernet (control) and RS-422 (automation) connections. (An additional 10BaseT port is unused.) The aux connector has time-code inputs and Dolby metadata outputs in addition to GPI and relay contacts.

MCPM-HD, -HD2

The MCPM-HD and -HD2 are 4-slot modules. Each of these processes high definition (HD) video. The MCPM-HD2 is an improved version of the -HD.

Front of MCPM
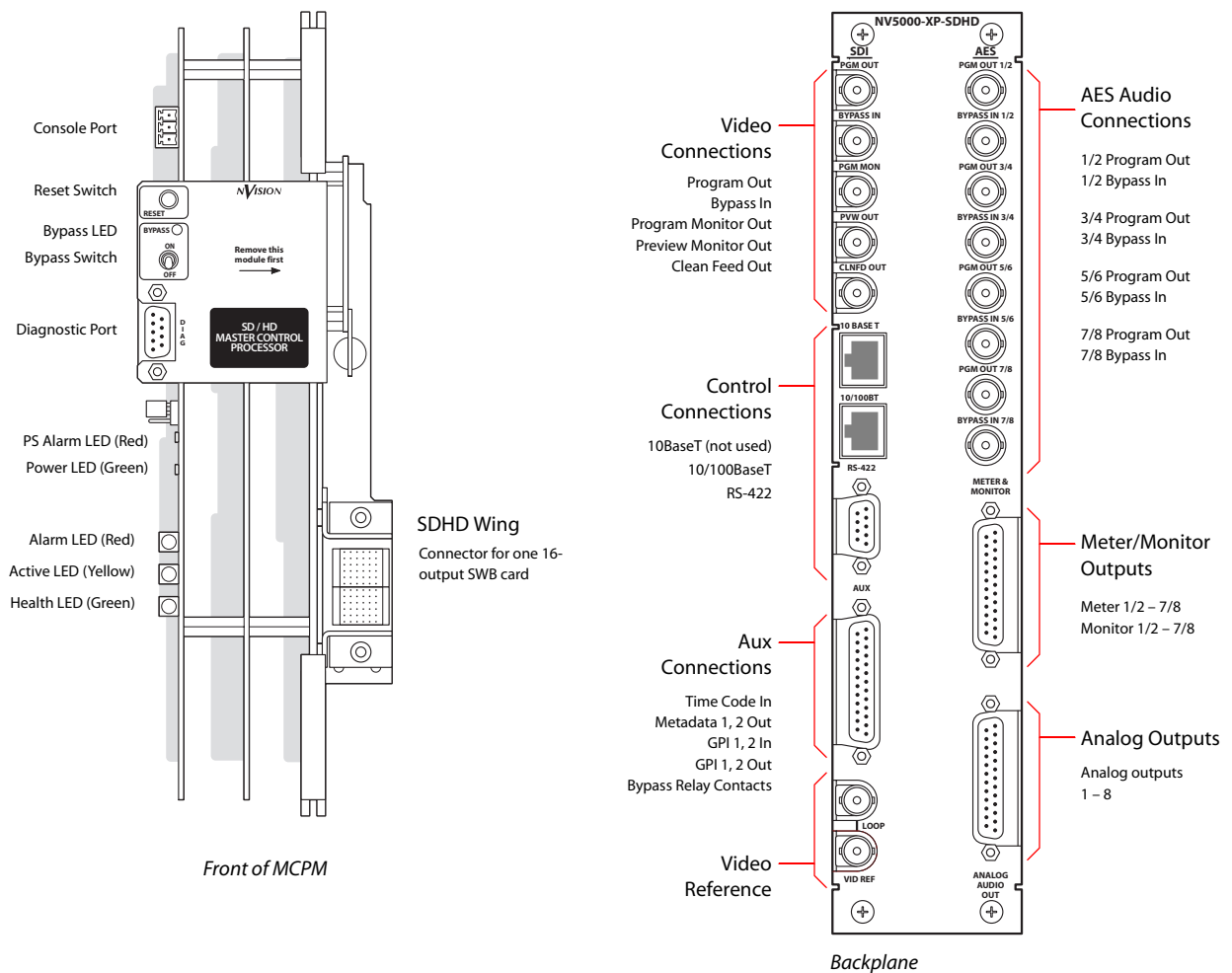
Backplane

Figure 4-4. MCPM-HD (Front, Backplane)

The MCPM-HD (and -HD2) receives video and audio input from the frame's motherboard — up to 64 video sources on inputs 1–64 and 64 stereo (128 mono) sources on inputs 65–128, or a combination thereof, in multiples of 16 sources. Video sources may contain embedded audio. The MCPM-HD and -HD2 provide 3 video keyers, 2 logo keyers, 1 squeezeback layer, and 2 audio overs. These MCPMs accept optional Dolby E decoders.

The MCPM-HD has a backup battery and a "low battery" indicator. The MCPM-HD2 does not.

At the backplane, the MCPM-HD and -HD2 also have 4 discrete AES program outputs. The backplanes also have 5 emergency bypass inputs, one video (with or without embedded audio) and 4 AES inputs. The MCPM-HD and -HD2 both have 8 analog audio outputs in addition to audio meter and monitor outputs.

The MCPM-HD and -HD2 both Ethernet (control) and RS-422 (automation) connections. (An additional 10BaseT port is unused.) The aux connector has time-code inputs and Dolby metadata outputs in addition to GPI and relay contacts.

The MCPM-HD and -HD2 both have a 2-slot wing that accepts one or two SWB router output cards. The output cards have little or nothing to do with master control. These MCPMs provide two 16-output crosspoints for the multi-format router that might optionally occupy the frame. The output cards connect to the wing and not to the motherboard.

The MCPM-HD does not have control over its wing output cards. The MCPM-HD2 has *some* control over its wing output cards. In the MCPM-HD2, wing outputs 1–16 (in wing slot 1) can be individually configured:

- To be controlled only by the router control card. (This is the default setting.)
- To follow (i.e, emit) program main video.[2]
- To follow (i.e, emit) preset main video.[2]

Wing outputs 17–32 (in wing slot 2) cannot be configured. They are controlled only by the router output card.

▲ If you have an SWB output card (NV5000-HD-OUT) in a wing slot, you must also have an SWB output backplane (IO5000-HD-OUT) in the corresponding backplane slot.

▲ The newer SWB output cards (NV5100MC-SWB-OUT) do ***not*** go in the wing slots. Do not use the newer SWB backplanes (IO5100MC-SWB-OUT) with the wing slots either.

▲ MasterConfig's 'Wing Output' page erroneously includes two aux bus options for wing outputs. The MCPM-HD2 has no aux bus. These options do nothing.

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2. The main video output is unprocessed original video. It does not contain video effects applied by the MCPM.

MCPM-SDHD

The MCPM-SDHD is a 3-slot module. It processes either HD or SD video, as a field-programmable option. It provides all the features of an SD or HD process and these two extensions:

- It has an internal black/silence generator for use as a program or preset main source, or as a squeeze background.

- It provides enhanced squeezeback. Enhanced squeezeback can manipulate 2 squeezeback video sources and an audio source for the second video image.

  (The second video source is a main source. The squeezeback audio is from that main source and is accessible when the panel operator selects the squeeze audio as an audio over.)

Figure 4-5 shows the MCPM-SDHD:

Front of MCPM

Backplane

Figure 4-5. MCPM-SDHD (Front, Backplane)

The MCPM-SDHD receives video and audio input from the frame's motherboard—up to 64 video sources on inputs 1–64 and 64 stereo (128 mono) sources on inputs 65–128, or a combination thereof, in multiples of 16 sources. Video sources may contain embedded audio. The MCPM-SDHD provide 3 video keyers, 2 logo keyers, 1 *enhanced* squeezeback layer, and 2 audio overs. It accepts optional Dolby E decoders.

At the backplane, the MCPM-SDHD has 4 discrete AES program outputs. The backplanes also have 5 emergency bypass inputs, one video (with or without embedded audio) and 4 AES inputs. The MCPM-SDHD has 8 analog audio outputs in addition to audio meter and monitor outputs.

The MCPM-SDHD has Ethernet (control) and RS-422 (automation) connections. (An additional 10BaseT port is unused.) The aux connector has time-code inputs and Dolby metadata outputs in addition to GPI and relay contacts.

The MCPM-SDHD has a 1-slot wing that accepts an SWB router output card. This card has relatively little to do with master control. The MCPM-SDHD provides a 16-output crosspoint for the multi-format router that might optionally occupy the frame. The output card connects to the wing and not to the motherboard.

The MCPM-SDHD has some control over its wing output card. Each of the 16 wing outputs can be individually configured:

- To be controlled only by the router control card. (This is the default setting).
- To follow (i.e., emit) program main video.[3]
- To follow preset main video.[3]
- To follow program main audio (if embedded).[4]
- To follow preset main audio (if embedded).

▲ If you have an SWB output card (NV5000-HD-OUT) in a wing slot, you must also have an SWB output backplane (IO5000-HD-OUT) in the corresponding backplane slot.

▲ The newer SWB output card (NV5100MC-SWB-OUT) does **not** go in the wing slot. Do not use the newer SWB backplane (IO5100MC-SWB-OUT) with the wing slot either.

▲ MasterConfig's 'Wing Output' page erroneously includes two aux bus options for wing outputs. The MCPM-SDHD has no aux bus. These options do nothing.

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3. The main video output is unprocessed original video. It does not contain video effects applied by the MCPM.
4. Similarly, the main audio output is unprocessed original audio. It does not contain audio changes applied by the MCPM.

MCPM-MK-SD

The MCPM-MK-SD is a 1-slot module. MCPM-MK-SDs are also named "mixer/keyers" or "branding engines." The MCPM-MK-SD processes standard definition (SD) video. The MCPM-MK-SD is a lower-cost and smaller alternative to the MCPM-SD, but has a reduced feature set:

- One logo generator, not two.
- No squeezeback generator.
- No analog outputs.
- No Dolby E decoders (and no Dolby metadata output).
- No "program monitor" output. (The clean-feed output can be used as a program monitor.)
- No AES outputs (except for monitor/meter output).

Although it has no 10BaseT connector, those connectors on other MCPMs are not used for anything. Otherwise, it has all the many features found in the MCPM-SD.

Figure 4-6 shows the MCPM-MK-SD (Mixer/Keyer):

Front of MCPM
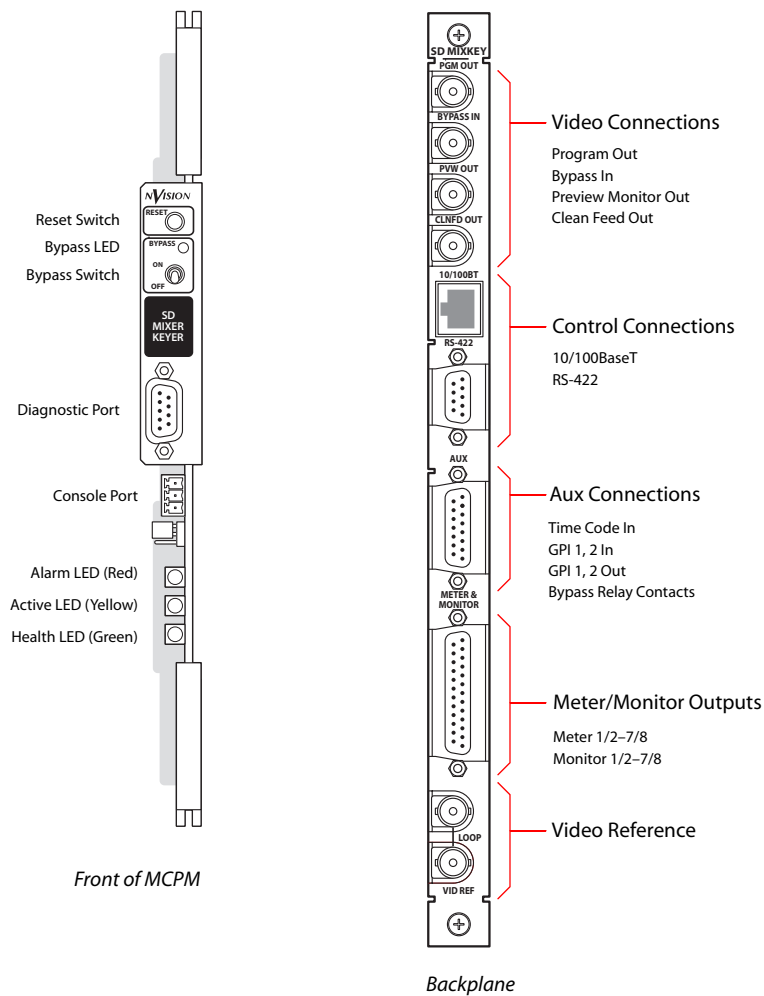
Backplane

Figure 4-6. MCPM-MK-SD (Front, Backplane)

The MCPM-MK-SD receives video and audio input from the frame's motherboard—up to 128 video sources or 128 stereo (256 mono) sources, or a combination thereof, in multiples of 16

sources. Video sources may contain embedded audio. The MCPM-MK-SD provides 3 video keyers, 1 logo keyers, and 2 audio overs.

At the backplane, the MCPM-MK-SD has no AES output connectors (except for meter/monitor outputs). Emergency bypass audio input must be embedded in the emergency bypass video input.

The MCPM-MK-SD has no backup battery and no "low battery" indicator.

The MCPM-MK-SD has no analog audio outputs, but does have audio meter and monitor outputs.

The MCPM-MK-SD has Ethernet (control) and RS-422 (automation) connections. The aux connector has time-code inputs in addition to GPI and relay contacts. Because the MCPM-MK-SD does not have a Dolby E decoder, the aux connector does not have Dolby metadata outputs.

MCPM-MK-HD

The MCPM-MK-HD is a 2-slot module. MCPM-MK-HDs are also named "mixer/keyers" or "branding engines." The MCPM-MK-HD processes high-definition (HD) video. The MCPM-MK-HD is a lower-cost and smaller alternative to the MCPM-HD, but has a reduced feature set:

- One logo generator, not two.
- No squeezeback generator.
- No analog audio outputs.
- No Dolby E decoders (and no Dolby metadata output).
- No "program monitor" output. (The clean-feed output can be used as a program monitor.)
- No AES outputs (except for monitor/meter output).

Although it has no 10BaseT connector, those connectors on other MCPMs are not used for anything. Otherwise, it has all the many features found in the MCPM-HD.
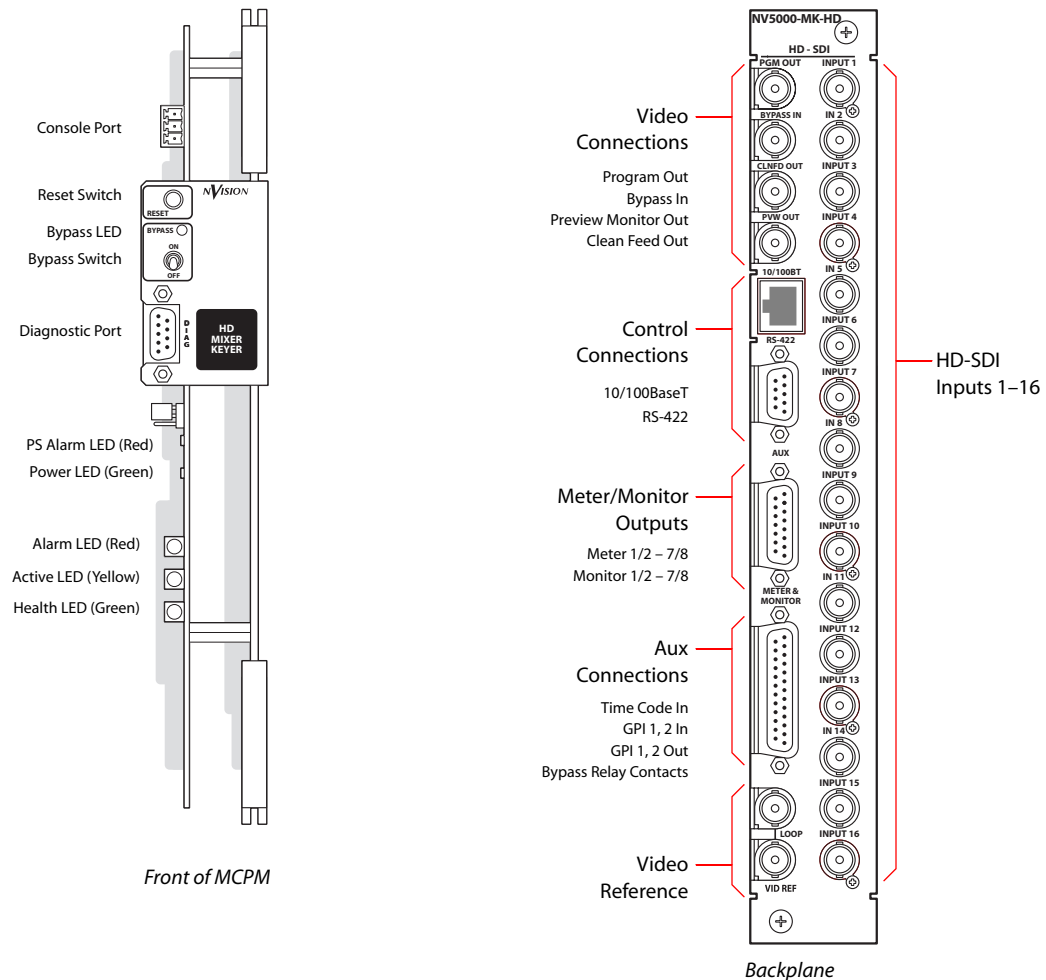
Figure 4-7. MCPM-MK-HD (Front, Backplane)

Unlike other master control processors, the MCPM-MK-HD obtains video inputs (16) from its own backplane, *not* from the frame's motherboard. These inputs can contain embedded audio. However, they are HD inputs, *not* SWB inputs and do not accept SD signals. These inputs are not available to other MCPMs or MCEs.

The MCPM-MK-HD does, however, receive audio input from the motherboard—up to 64 stereo (128 mono) sources on inputs in the range 65–128, in multiples of 16 sources. The MCPM-MK-HD provides 3 video keyers, 1 logo keyer, and 2 audio overs.

At the backplane, the MCPM-MK-HD has no AES connectors. Emergency bypass audio input must be embedded in the emergency bypass video input.

The MCPM-MK-HD has no backup battery and no "low battery" indicator.

The MCPM-MK-HD has no analog audio outputs, but does have audio meter and monitor outputs.

The MCPM-MK-HD has Ethernet (control) and RS-422 (automation) connections. The aux connector has time-code inputs in addition to GPI and relay contacts. Because the MCPM-MK-HD does not have a Dolby E decoder, the aux connector does not have Dolby metadata outputs.

MCPM Architecture

The MCPM-SD was the first MCPM released. Its description follows and is used as a basis for comparison with other MCPMs. Differences in other MCPM models exist. For example:

• The HD MCPMs have an input space of 64 connectors (input connectors 1–64]), not 128 as for the SD MCPMs. The -MK-HD has 16 inputs.

• Some MCPMs have no Dolby and no squeeze; the -SDHD has extra Dolby and enhanced squeeze.

• Some MCPMs have two logo generators; others have one.

• MCEs have new architecture. They are discussed in Chapter 5, MCEs, on page 75.

In the master control frame, all video input connectors are BNCs—ether analog, SD, or HD. All audio inputs have either DB25 (analog), BNC (AES) or Phoenix twisted pair (AES) connectors. In any case, audio inputs are considered "stereo" pairs. AES input cards accept 16 stereo pairs and analog audio input cards do also. The MCPM can be configured to treat any or all stereo inputs as 2 distinct "mono" inputs. So for the MCPM-SD, 128 connectors can potentially provide 256 "mono" channels. (We use the term "mono," but we really mean "independent.")

▲ This discussion does not consider the SWB router output card options.

Frame inputs can be connected to local devices (sources) or to routers. When an input is connected to a router, the input can support "router pre-select" sources or "external router sources." See External Router Sources on page 70.

An MCPM has a *video processing section* and an *audio processing section*. The video and audio functions overlap in places. For example, the video section has audio disembedders and embedders.

Video Processing Section

The video crosspoint admits up to 128 (-SD, -MK-SD), 64 (-HD, -SDHD, in the range 1–64), or 16 (-MK-HD) inputs. The crosspoint has 9 (or 10) internal outputs, as shown in Figure 4-8. Preset, program, keyer, and squeezeback sources are chosen dynamically (at a control panel or by automation). Any of the 3 keyers can accept input from one of 8 keyer sources.

Logos are stored in memory. Any logo effect can use any of 64 logo images.

The squeezeback layer can accept input from any of 32 background sources. (Basic and enhanced squeezeback differ slightly.)
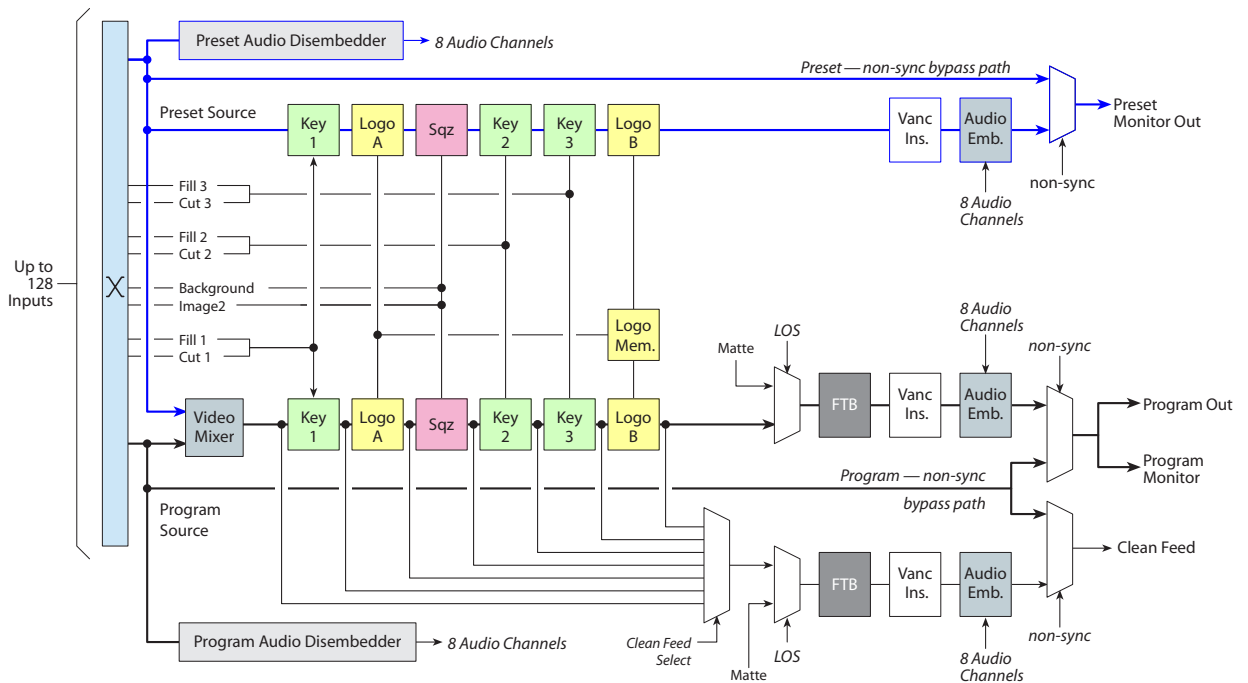

Figure 4-8. Video Processing Section

It is possible for the program or preset video sources to have embedded audio. If so, the audio is disembedded and sent to the audio section. In all cases, the MCPM re-embeds program audio—from whatever sources—in the program video output (in groups 1 and 2).

Preset and program video are *mixed* in the first stage of the processing path. While a transition is *not* in progress, the mix is 0% preset and 100% program and keyers, logos, and squeezeback effects that have been already applied remain in effect. These effects apply cumulatively, in left-to-right order. Downstream effects can modify upstream effects.

To perform a transition, an operator (or automation) selects a preset main source (video and/or audio), some set of effects and executes the transition. During the transition, program and preset video and program and preset audio are mixed in varying proportions and effects fade in or out as required.

▲ Note that the MCPM does not allow effect settings to *differ* on preset and program, except when an effect may be *absent* from program or preset. For instance, if a squeezeback effect presently exists on the program output, you cannot select a different squeezeback effect. When you turn squeezeback off on program, directly or by means of a transition, then you can select a different squeezeback effect. This is true for keyers and logos as well.

Under normal operation, the program video, with effects applied, reaches program output (with audio embedded) and preset video with effects applied reaches preset output (a.k.a. preview output) with audio embedded. In addition, the MCPM can be configured with one of 7 clean-feed taps along the program output chain. A clean-feed tap includes upstream effects and *excludes* down-stream effects. Refer to Figure 4-8 to see the tap positions.

Several non-normal conditions can exist:

- The emergency bypass relay trips. What happens can vary. The MCPM will typically send emergency bypass video (with its original embedded audio, if any) onto program output.

  If the MCPM has BNC connectors for AES, the relay will switch the bypass audio inputs to program audio output.

  (The relay will also trip when the MCPM loses power.)

- The preset video is non-synchronous (has lost reference) and the MCPM bypasses normal video processing, presenting the original video (with its original embedded audio if it exists) at the preview output.

- The program video is non-synchronous (has lost reference) and the MCPM bypasses normal video processing, presenting the original video (with its original embedded audio if it exists) at the program output. When this happens, the clean-feed output is the same original video as the program output.

- LOS (loss of signal) on program source. The program output and clean-feed output display a pre-defined matte value.

- FTB. An operator or automation system fades program output to FTB matte (which need not be black). The clean-feed output will also fade. (Audio fades to silence in the same period.)

Video Summary

Main video sources may contain audio and the MCPM can disembed the audio. As a transition occurs, the preset main source and the program main source are mixed, video effects are applied in layers, and the results appears at program output, preset output, and clean-feed output. Audio is re-embedded (with overs mixed) prior to output.

When the video is non-synchronous, it does not undergo any processing, but feeds the output directly, whether program or preset. If the MCPM detects LOS for the program source, it outputs a predefined matte.

An operator (or automation) can apply a fade-to-black (FTB) to program output unless the program main source is non-synchronous, in which case program output *cuts* to matte.

Audio Processing Section

When an operator or automation chooses a video source for preset or for program, the MCPM selects its associated audio inputs also.

Audio can either be disembedded from the video source or it can be discrete (present on a connector). Discrete audio can be analog or AES. Any audio input can be Dolby E encoded if the MCPM has a Dolby E decoder.

▲ Dolby E requires a non-interlaced video reference format. Dolby E works with 720p video sources when the reference is 525i, 625i, or 1080i.

The audio crosspoint accepts discrete audio inputs directly and accepts embedded audio after it passes through a disembedder. Each disembedder produces 8 channels: 4 AES pairs, as shown in Figure 4-9.

Discrete audio inputs are "stereo" inputs. The MCPM treats the separate stereo channels as distinct. During MCPM configuration, you can select any of up to 256 single, a.k.a. "mono," channels at any time.

An MCPM has 8 *internal* audio channels for program and 8 *internal* audio channels for preset. Any or all of these can be associated with the main video source. You can combine different audio types on these channels as you wish.

The MCPM accepts 8 discrete audio over inputs for preset and 8 discrete audio over inputs for program. See Figure 4-9.

In addition, the MCPM accepts 8 discrete "aux" inputs and 8 discrete "off air" inputs. Although these names perhaps suggest a use for the inputs, the aux and off-air inputs are simply two extra sets of inputs. However, the aux and off-air inputs are not processed or mixed with program audio, but feed directly to the audio meter and monitor outputs. The MCPM offers some choices regarding what appears on the meter and monitor outputs.

The result of channel processing is, of course, "program audio output." Program output is (up to) 4 AES pairs that appear on program audio connectors, if the particular MCPM model has them. In any case, program audio output is embedded in the program video (in groups 1 and 2).
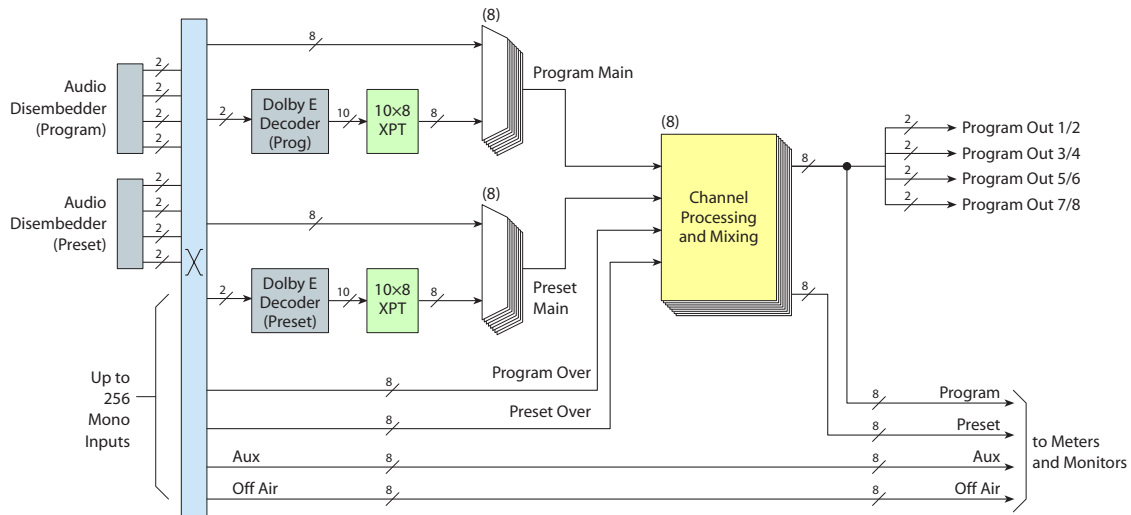
Figure 4-9. Audio Processing Section (but not Meters and Monitors

The channel processing function is the same for all 8 internal audio channels: Program main and program over are mixed. Preset main and preset over are mixed. The two results are then mixed according to the current transition. If a transition is *not* in progress, the mix is 0% preset and 100% program. Otherwise, the mix varies according to the progress of the transition.
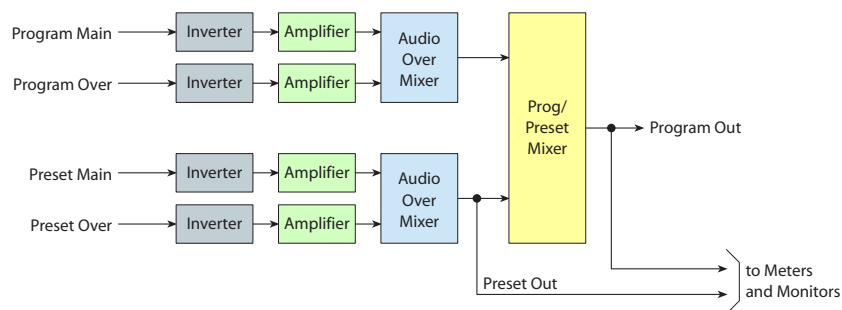
Figure 4-10. Audio Channel Processing (One of 8 Channels)

In any case, program audio output and preset audio output are sent to the audio meter and monitor section where they can be chosen (or not) for output.

Gain controls—independent for all 8 channels—range from +12 dB to –108 dB. Gain can be specified during configuration and changed during operation. Whether to invert a signal is a simple configuration option.

The over/main mixing ratio

The over/main ratio is a *perceptual mix* and differs from the normal mixing method:
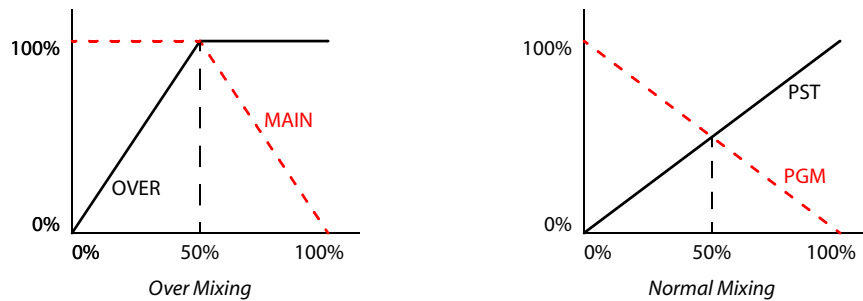
Over Mixing

Normal Mixing

(The program/preset audio mixer behaves according to the "normal" model.)

Meters and Monitors Section

The audio meter and monitor section presents signals on DB25 connectors. Figure 4-11 shows the organization of the audio metering and monitoring section. (Note that not all MCPMs provide analog audio output.)
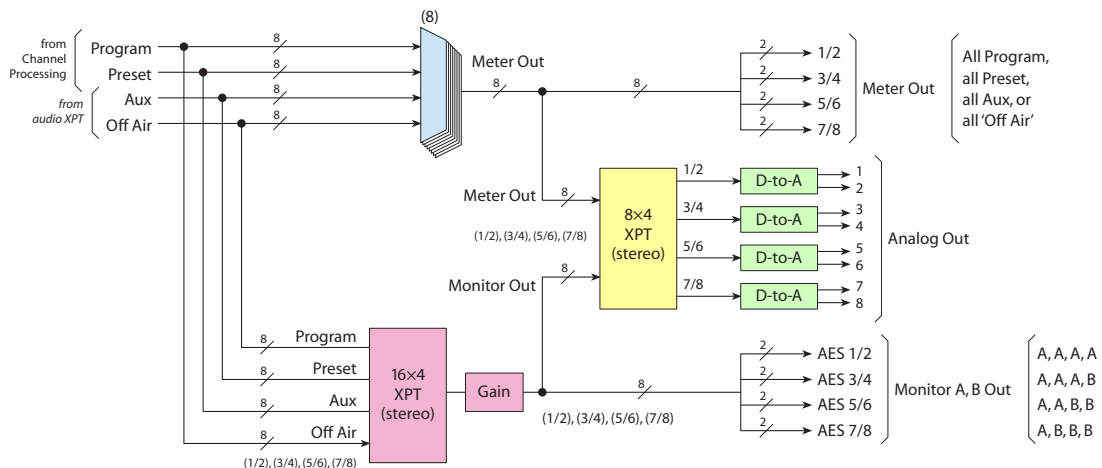
Figure 4-11. Audio Meters and Monitors

The meter and monitor section receives program and preset inputs from each of the 8 channel processors. It also receives 8 aux and 8 off-air inputs from the audio crosspoint.

The metering multiplexer delivers either program, preset, aux, or "off air," to the metering output connectors. It does not recombine program, preset, aux, or "off air" in any way.

The 16×4 monitor crosspoint allows you to recombine program, preset, aux, and off-air—in AES pairs—on the monitor outputs. There are two monitor "buses" named A and B (both evident on control panels). During configuration you can distribute buses A and B on the monitor outputs in 4 ways. (If you reverse A and B, you get an additional 4 ways.) Monitor A might, for example, play program audio and monitor B might play preset audio.

Monitor and meter outputs can be configured as fixed or dynamic. (When a monitor or meter output is configured as "user can modify," the operator may choose "Program," "Preset," "Aux," or "Off Air" buttons on the control panel. In any event, the distribution of audio across monitors A and B on the monitor outputs does not change during operation.

Each monitor — A and B — has independent gain and a "dim" function. When an operator presses the monitor's "dim" button at a control panel, the monitor level decreases (by as much as 108 dB).

The analog audio output section (if the MCPM model has one) receives AES signals in pairs from the meter and monitor outputs. Internal DACs convert the AES signals in pairs. Any analog audio output pair can reproduce any meter or monitoring pair.

Audio Summary

The audio section receives either discrete or embedded audio from the audio crosspoint. Dolby audio is decoded if a decoder is present. Discrete analog audio is converted to AES format internally. The MCPM also accepts two other forms of audio input: aux and off air, which are simply extra sets of inputs.

The MCPM has 8 internal audio channel processors that mix the incoming main audio and audio "over" for both program and preset, and then mixes program and preset according to the transition in effect.

Program and preset output appear at the MCPM backplane connectors. Program audio is embedded in program video output.

Program, preset, aux, and off-air signals are sent also to the meter and monitor section where the signals are distributed on the various meter and monitor output connectors.

Transitions

An MCPM is called a *transition processor*. Much of the time, an MCPM actually does not perform transitions, but presents program output to air or to a recording device. Once in a while, a program change requires a transition and the MCPM carries out the transition, switching what is on preset to program.

The transition period can be configured as a certain number of video frames (from 3 to 300). The transition mix ratio — T — varies from 0 to 1 over the transition period. The inverse ratio is $(1-T)$.

Several transition types are formed from two basic transition methods: fade and cut. During a fade transition,

$$\text{output} = \text{preset} \times T + \text{program} \times (1-T) \text{ as } T \text{ progresses from 0 to 1.}$$

A video cut transition is instantaneous. T goes from 0 to 1 at the next video frame. An audio cut is not instantaneous, but a very quick fade down, then up.

Transition Modes

There are 3 modes in which a transition can occur:

- Flip-flop mode.

  Whatever was on the program bus — main source, effects, and overs — appears the preset bus immediately after a transition. The program and preset buses are effectively swapped.

  Flip-flop mode is applicable to the main sources and all effects. Control panels automatically specify flip-flop mode or normal mode at each transition. (Automation software cannot request flip-flop transitions.)

- Normal mode.

  Whatever was on the preset bus remains on the preset bus after a transition.

- "Clear preset" mode.

  A preset effect in "clear preset" mode is removed from the preset bus immediately after a transition (unless it was on program before the transition). The preset main source remains on preset. Other effects that are not in "clear preset" mode also remain on preset.

  "Clear preset" mode is applied individually to the keyer, logo, and squeeze effects during MCPM configuration. If the effect is configured as "normal," it always remains on the preset bus after the transition.

Table 4-1 compares the behavior of effects in the different modes:

Table 4-1. Transition Modes—Behavior of Video and Audio Effects

States Before Trans.		After 'Clear Preset' Trans.		After Normal Trans.		After Flip-Flop Trans.	
PST	PGM	PST	PGM	PST	PGM	PST	PGM
Off	Off	Off	Off	Off	Off	Off	Off
On	Off	Off	On	On	On	Off	On
Off	On	Off	Off	Off	Off	On	Off
On	On	On	On	On	On	On	On

Each entry indicates whether the effect is **on** or **off** the preset or program bus, before or after a transition. Note that row 1 shows that if the effect is off for both buses, there is no change. Likewise, row 4 shows that if the effect is on for both buses, there is also no change.

▲ Flip-flop mode applies to all transitions and is determined at a control panel. "Clear preset" mode applies individually to effects and is determined during MCPM configuration.

Transition Behavior

During a transition

1 The preset *main source* (1) mixes with, and finally replaces, the program main source on the program bus or (2) immediately replaces the program main source on the program bus. The mix behaves according to the transition type (cut, cross-fade, etc.) and transition rate.

2 A preset *effect* (1) fades on or off or (2) cuts on or off, as required, on the program bus. The effect behaves according to the transition type (cut, cross-fade, etc.) and transition rate.

After a transition

1 In flip-flop mode, whatever was on the program bus — main source, effects, and overs — appears the preset bus immediately after the transition.

2 In normal mode, whatever was on the preset bus remains on the preset bus.

3 An effect in "clear preset" mode is removed from the preset bus immediately after a transition (unless it was on program before the transition).

While the MCPM is performing a transition, it does not allow changes to:

1 The preset bus.

2 The video effects on the program bus.

3 The audio overs on the program bus.

4 Transition type or rate.

Changes

It is not possible to change the source of an effect until the effect is off the program bus.

Hot Cuts

A "hot cut" occurs when an operator switches a main source, video effect, or audio over directly on the program bus, without executing a transition.

If the MCPM is in transition and a "hot cut" is requested, the MCPM cancels the transition and the following will occur immediately:

1 Any video effects that were "on" prior to the transition on both the program and preset buses will be left "on." All other video effect will be "off" on the program bus.

2 If the same audio over was "on" prior to the transition on both the program and preset buses, it will be left "on." Otherwise all audio overs will be "off" on the program bus.

3 The program output will switch to the selected source.

TLA (Transition Lever Arm)

If the operator presses the 'Enable' button of a TLA while an MCPM is performing a transition, the MCPM will reject or ignore the 'Enable' request.

Transition Types

MCPM transitions are combinations of *cuts* and *fades*. A fade is a smooth transition over the transition period. A video "cut" is an instantaneous transition: from off to on, or on to off, at the next frame. An audio cut is not instantaneous, but always fades down to silence in 3 frames and up from silence to the new audio in 3 frames.

▲ All audio transitions are smoothed (or S-shaped) to prevent induced artifacts, although the illustrations in this document do not show the smoothing.

During a fade, preset and program video sources mix and preset and program audio sources mix. During a fade, video effects and audio overs fade on or off, although they overlay (mix with) the upstream content.

During a cut, the video mixer is not involved, but preset and program audio sources mix. During a cut, video effects turn on or off instantly, and audio effects turn on or off quickly (6 frames).

Before and after transitions, a mix is always 0% preset and 100% program.

The MCPM supports the following transition types:

1 Cut

The video mixer is not (directly) involved. The video switch is instant. The audio switch is quick (6 frames).
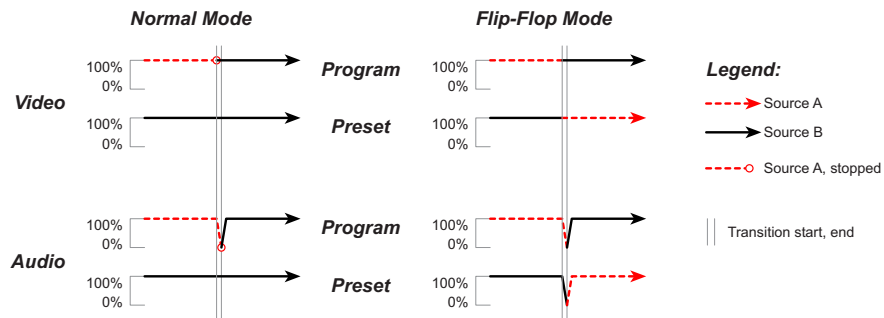
Video effects turn on or off instantly. Audio overs switch quickly (6 frames).

▲ The small circle(s) indicates where the MCPM stops using source A.

2 V-Fade (or fade-fade)

Program video mixes to matte (in the first half of the transition period) and then mixes from matte to the new source. Audio fades to silence (in the first half of the transition period) and then fades from silence to the new source.
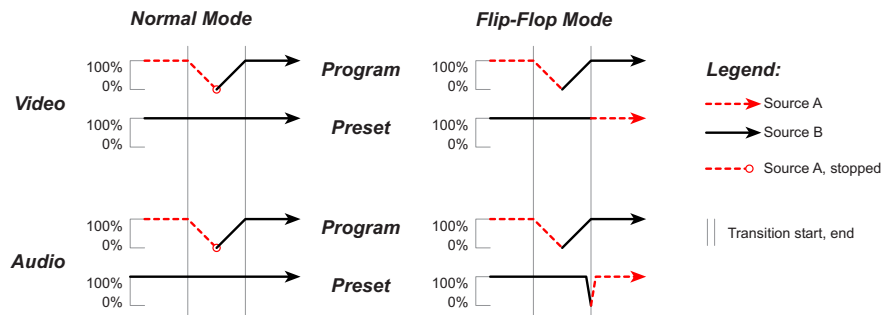
Video effects fade on and off as required. Audio overs fade on and off as required.

3 Cross Fade (or X-fade)

Program and preset video mix, with the program component decreasing and the preset component increasing. Program and preset audio mix, with the program component decreasing and the preset component increasing.
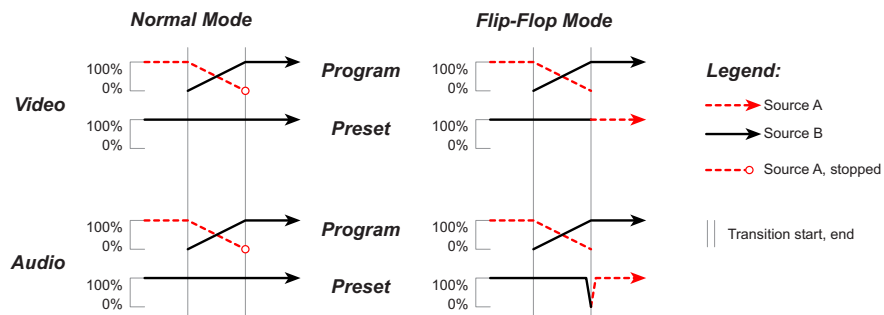
Video effects fade on or off as required. Audio overs fade on or off as required.

4 Fade/Cut

Video fades to matte (over the entire transition period) and switches instantly at the end to the new source. Audio fades to silence (over the entire transition period) and "quick fades" at the end to the new source. (The audio quick-fade starts 3 frames before the end.)
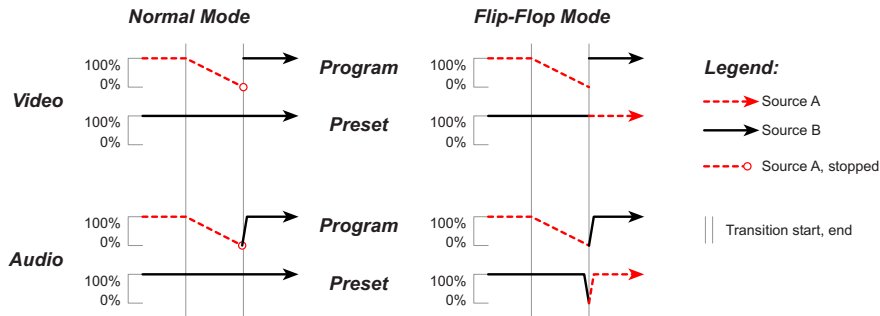
Video effects fade on or off as required and then cut on or off as required. Audio overs fade on or off as required and then quick-fade on or off as required.

5 Cut/Fade

Video cuts to matte instantly and the matte then mixes to the new source over the transition period. Audio quick-fades to silence and then fades to new source over the transition period.
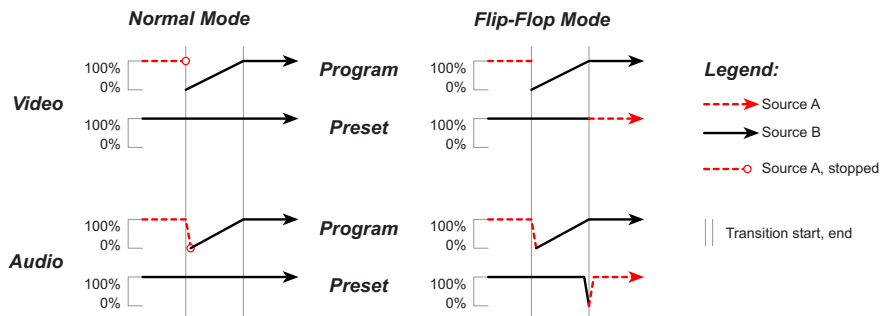
Video effects cut on or off as required and then fade on or off as required. Audio overs quick-fade on or off as required and then cut on or off as required.

The panels also allow "preset black" transitions. Preset black (PB) transitions can actually be performed using legacy panels that have a TLA (transition lever arm) option. The iMC-Panel-200, iMC-Panel-300, and iMC-Panel-GUI do not have a TLA option. These panels substitute a normal transition for a PB transition when an operator happens to select a PB transition.

Transitions Involving the Video Mixer

The video mixer combines program input with either preset input or a matte.

Program Out = Program In × T + Preset In × (1 – T)   ... as T varies, in steps, from 0 to 1.

Transitions Involving Keyers

During a transition, a video keyer can transition either on or off the program bus.

A keyer can be configured to go off preset after the transition. (That way, the operator does not have to do it.)

The keyer module(s) can accept either self-keyed signals (the key is derived from the fill) or signals with separate keys. In either case, it is luminance data that is used to create the key. This is true for logos and for video keyers.

The MCPM processes video keyers and logo keyers much the same way. The source differs: a video keyer (key and fill) comes from discrete video sources and a logo is graphic, static or animated, stored in memory.

The MCPM configuration software provides a few keyer parameters that apply to both logos and video keyers:

- Opacity.
- Video clip.
- Video gain.

These parameters apply only to video keyers:

- Self-key enable.
- S-Shape enable.
- Luma filter bypass.
- Chroma filter bypass.
- Additive key mix.

Video Clip and Video Gain

Key clip and key gain are parameters of a transform applied to the incoming key signal. The configurer may set the key clip parameter from 0 to 100%. The configurer may set the key gain parameter from 0 to 1023, where 1 is unity gain.

▲ Warning: the term "clip" is misleading. "Offset" is more accurate.

▲ Video gain in MCEs is different: for MCEs, the gain range is 0 to 63.9375 in fractional steps of 1/16. For other MCPMs, the range is 0 to 1023, in integral steps.

Before it applies clip and gain, the MCPM or MCE normalizes the key luminance to the range [–0.5 to +0.5]. The "clip" value given during configuration is a *percentage*:

$$\text{Offset} = -0.5 + percentage \times 1.0$$

Thus, the clip and gain transform is:

$$K_{OUT} = (K_{IN} - \text{offset}) \times \text{gain}$$

Because the gain ranges from 0 to 1023, K_{OUT} can be very large. The normalization process clips K_{OUT} to the range [–0.5 to +0.5].

The following graphs illustrate some of the effects of offset, gain, and clipping.

Gain = 0, Any Clip	Gain = 1, Clip = 50%	Gain = 4, Clip = 50%	Gain = 1023, Clip = 50%
A	**B**	**C**	**D**

Range Limit
[–0.5 to +0.5]

Gain = 2, Clip = 0%	Gain = 2, Clip = 25%	Gain = 2, Clip = 75%	Gain = 2, Clip = 100%
E	**F**	**G**	**H**

Range Limit
[–0.5 to +0.5]

Input Range	Input Range	Input Range	Input Range
[–0.5 to +0.5]	[–0.5 to +0.5]	[–0.5 to +0.5]	[–0.5 to +0.5]
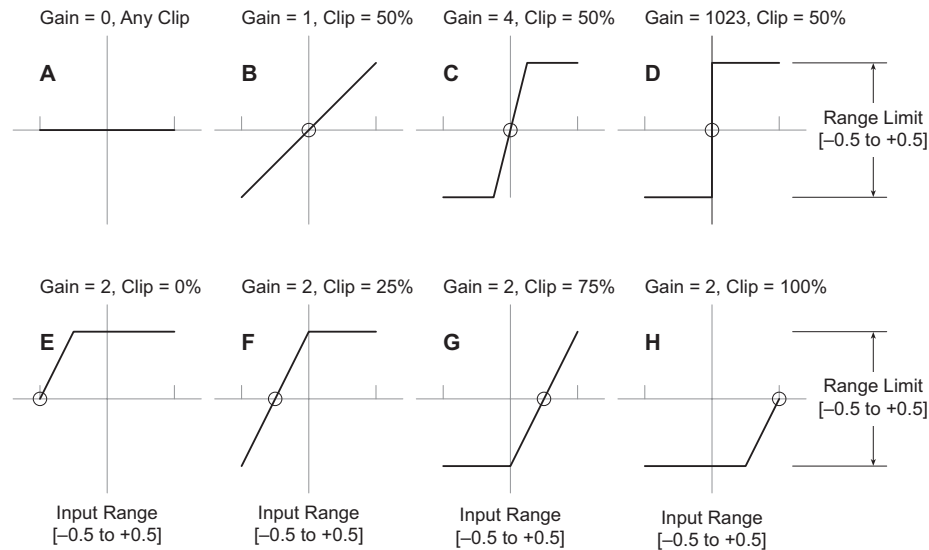
Luminance (the key) is a black-to-white value. When the keyer is mixed with upstream video, black admits 0% of the keyer's fill. White admits 100% of a keyer's fill. Thus, white means that the fill is opaque; black means that the fill is transparent, and the shades in between represent variations in keyer opacity.

This list shows the meaning of various clip and gain values above:

A When gain is 0, luminance output is a flat 50% "gray."

B When gain is 1 and the clip point is at 50%, luminance output is equal to the input.

C When gain is 4 (or more) and the clip point is at 50%, luminance output is mostly black or white with a limited or very limited midrange.

D When gain is 1023 and the clip point is at 50%, luminance output is all black or white with virtually no midrange. Displayed keyer pixels are either transparent or opaque with no intermediate values.

E When the clip point is at 0%, the output is mostly white.

F When the clip point is at 25%, the dark tones ramp quickly to white and most tones are light or white.

G When the clip point is at 75%, most tones are dark or black and light tones ramp quickly from black to white.

H When the clip point is at 100%, the output is mostly black.

You might prefer to think in terms of high/low or foreground/background, rather than clip/gain. To convert from high/low or foreground/background use these formulas:

Clip = (high+low) / 2 = (foreground+background) / 2

Gain = 1 / (high–low) = 1 / (foreground–background)

A key limiter keeps the key signal between –0.5 and +0.5.

S Shaping

An optional S-shaper smooths the key signal at the transitions between the linear portion of the signal and the limited portions. It does this by applying the cubic transform shown below to the key signal.

$$K_{OUT} = -2\,K_{IN}^{3} + 3\,K_{IN}^{2}$$

(1,1)

(0,0)

Without S Shaping

With S Shaping

Gain = 2, Clip = 50%
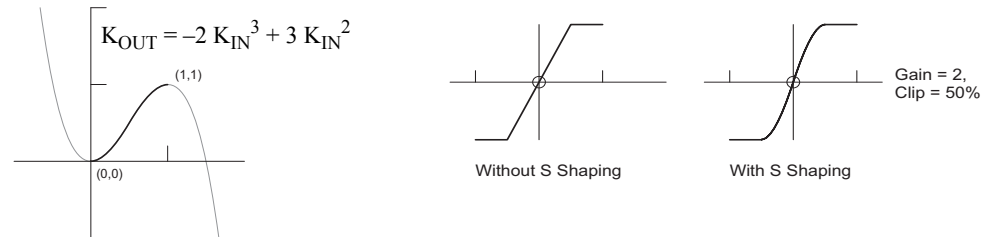
▲ If the key signal is shaped externally (ahead of the keyer module), then do not select the S-shaping option (in MasterConfig).

The final output of the clip/gain/limiter (with or without S-shaping) is translated by the following equation:

$$K_{OUT} = K_{IN} + 0.5$$

At this point, the key signal varies from 0.0 to 1.0. A key value of 0 means the corresponding point in the key fill is transparent. A key value of 1.0 means that the corresponding point is fully opaque. Any value in between 0 and 1 means that the corresponding fill point is partially opaque (when it mixes with upstream video).

▲ For MCEs, gain ranges from 0 to 63 15/16, in discrete multiples of 1/16. In MasterConfig, keyer gain is expressed as an integer in the range [0,1023]. Unity gain is given as a value of 16; a value of 32 represents a gain of 2.0.

▲ For other (and older) MCPMs, gain is *not* scaled by 16: a value of 1 means unity gain and the maximum gain is 1023. In these MCPMs, there are no fractional gain values.

Opacity

Key opacity (specified as a percentage during configuration) is the *maximum* opacity of the key image. During fade transitions, the keyer's opacity will be less than or equal to its maximum:

$$Opacity_T = T \times Opacity_{MAX} \qquad \textit{keyer turning ON}$$

or

$$Opacity_T = (1-T) \times Opacity_{MAX} \qquad \textit{keyer turning OFF}$$

as T goes from 0 to 1.

Furthermore, the computed key value applies at each pixel in the keyer:

$$Key' = K_{OUT} \times Opacity_T \qquad K_{OUT} \text{ in the range } [0 \text{ to } 1.0]$$

▲ Operators and configurers may not reduce overall keyer (or logo) opacity ($Opacity_{MAX}$) below 1.0%.

Luma and Chroma Filters

Two two low-pass filters can be applied to the keyer or they can be bypassed. The effect of the low-pass filtering is to reduce noise.

There is one filter for the luma component and one filter for the chroma components.

Additive Mix

There are two ways to mixer a keyer and upstream video: normal and additive.

This is normal (or multiplicative) mixing:

$$\text{Pixel}' = \text{Fill} \times \text{Key}' + \text{Pixel} (1 - \text{Key}')$$

This is additive:

$$\text{Pixel}' = \text{Fill} + \text{Pixel} (1 - \text{Key}')$$

Transitions Involving Squeeze

During a transition, a squeeze effect can fade on or off the program bus or cut on or off the program bus.

▲ Squeezeback is not available in the MCPM-MK-SD or MCPM-MK-HD.

▲ The MCPM-SDHD supports "enhanced" squeezeback.

A squeeze effect either (1) *reduces* the upstream video image to a portion of the video frame or (2) *crops* the upstream video image to some portion of the video frame. At the same time, a background image (a discrete video input) is displayed "behind" the squeezed main image.

The squeeze region of the video frame is determined by 4 values: left, top, width and height, as a percentage of the video frame. The minimum size is 30%. The squeeze region may not extend beyond the video frame.

The squeezeback generator overlays the scaled (or cropped) video on the background image. The squeezeback generator scales the squeeze region approximately linearly—from full screen to final size or vice versa—in the transition period. The scaling rate is not constant, however, but "S-shaped." The scaling starts slow, gets faster, and slows down at the end of the period.

Enhanced Squeezeback

Enhanced squeezeback is basic squeezeback with an additional video input and its audio (selected from the *main sources*) that can be scaled and placed on program output.

The additional squeeze image can be placed in the program output 3 ways:

• Under the first squeeze background. (It will be invisible although its audio might be audible.)

• Under the primary squeeze image (partially obscured by the primary squeeze image).

• Over the primary squeeze image (partially obscuring the primary squeeze image).

Enhanced squeezeback also allows the main source's audio (possibly Dolby E encoded) to be associated with the squeeze function. The operator (or automation) may select the audio as a special audio over on one of the audio over buttons. The MCPM configuration software supports these enhanced squeeze parameters:

• Squeezeback audio level (as a percentage).

• Which over button(s) can be used for enhanced squeezeback.

• Opacity, position, and size of the secondary image. The minimum size is 30%.

▲ The secondary image follows the squeeze or crop behavior of the primary image.

▲ The secondary image cuts on or cuts off. It does not shrink or grow as does the primary image.

▲ The secondary image can also have borders as does the primary image.

Squeeze Borders

Squeeze effects allow borders. Although squeezed images cannot be clipped to the video frame, borders are clipped.

Border thickness can be adjusted from 0.0% to 5.0% of the screen size, relative to the *height* of the screen. The border thickness is always the same on all four sides of the squeezed image.

A border thickness of 2% uses 9.6 (i.e., 10) pixels on a 480-line image. Horizontally, the border would also be 10 pixels).

Border color is a configurable parameter.

Squeeze Transitions

There are 4 squeezeback transition types, similar to, but not quite the same as, the basic transition types for effects:

1 Cut On — scales the image to final (reduced) size in 2 frames.

2 Cut Off — scales the image back to full size in 2 frames.

3 Mix On — scales the image to final (reduced) size over the full transition period.

4 Mix Off — scales the image back to full size over the full transition period.

(Squeeze changes occur at the switch point of vertical blanking.) Opacity is not involved.

FTB Transitions

FTB stands for "fade to black/silence." The fade actually transitions to the defined matte color, which is not necessarily black. Audio also fades to silence. The FTB transition rate is independent of the preset/program transition rate.

There are 4 FTB transition types. These are similar to, but not quite the same as, the basic transition types for effects:

1 Fade from synchronous source — the program output mixes with matte:

Output = matte $\times T + $ program $\times (1-T)$ as T progresses from 0 to 1.

2 Fade from matte to synchronous source — the program output mixes with matte:

Output = program $\times T + $ matte $\times (1-T)$ as T progresses from 0 to 1.

3 Cut to matte from non-synchronous source.

Fades are not possible with non-sync sources. Program output cuts from the non-sync bypass to matte.

4 Cut to non-synchronous source from matte.

Fades are not possible with non-sync sources. Program output cuts from matte to non-sync bypass.

(Fade changes occur at switch point of vertical blanking.)

Ancillary Data and Switch Point

The MCPM passes Vertical Ancillary Data (VANC) without modification. It (1) extracts the VANC data from the video stream, (2) bypasses the video processing path, and (3) reinserts it in the outgoing video at the right moment relative to the switch point. The VANC passed is always associated with the source on the program bus. The MCPM switches VANC data from the prior source to the new source at the *end* of the transition.

Embedded audio data output from the MCPM originates in the MCPM. If a source has embedded audio and the system is configured to process embedded audio, then the embedded audio is processed and inserted downstream of the video processing section. If the source does not contain embedded audio, then the MCPM embeds discrete AES audio in the video output.

The MCPM complies with the SMPTE RP168-2002 definition of switch point with an exception. The MCPM is not field-based, so switching occurs on the first field of the frame only.

The program, preset, and clean-feed outputs each receive the source's VANC and embedded audio.

Transitions Involving Pre-Roll

Only MCEs support machine control or pre-roll. See [Machine Control and Pre-Roll](#) on page 160.

Transitions Involving Intuition XG

Only MCEs perform Intuition XG functions. See [Intuition XG](#) on page 147.

Other General Features

These features apply to MCEs and MCPMs, but not to Imagestore 750s.

Emergency Bypass

MCPMs and MCEs provide emergency bypass inputs for program video and audio. The MCPMs and MCEs use relays on their backplanes that switch between the program signal path and the emergency bypass inputs. A relay control signal from the internal "system controller" of the MCPM or MCE controls the relays. The relay control signal is driven by a one-shot (watchdog) timer that, if not reset periodically, will cause the relays to change to the bypass position. This ensures that if the system controller is not operating correctly, that the emergency bypass inputs are routed to the program video and audio outputs.

The emergency bypass LED on the front of the card indicates the state of the bypass relay. The emergency bypass relay will switch to 'bypass' if any of the following conditions are true:

- There is a physical problem with the MCPM or MCE (e.g., power failure or component failure).
- The MCPM determines that it is not capable of passing video and audio (e.g., bad configuration or FPGAs not loaded).
- If the bypass toggle switch located on the front of the MCPM or MCE forces the emergency bypass relays into the bypass mode.
- A GPI input, configured to control the emergency bypass relay, forces the MCPM or MCE into bypass mode.

Note that the emergency bypass relay will be set to non-bypass or "normal" mode (i.e., passing program video) only if all of these conditions are false.

Bypass at System Startup

When the MCPM or MCE restarts, the program outputs are fed by the bypass inputs. When the MCPM or MCE has initialized and is stable, the system controller switches the program outputs to the master control outputs.

To avoid pops, the audio begins in silence and fades up.

Emergency Bypass Relay Behavior

When error conditions exist, the MCPM or MCE ignores any external control of the emergency bypass relay. An external control will not be able to set the emergency bypass relay to "normal." If the bypass switch on the front of the MCPM or MCE is set to bypass, the MCPM or MCE will also ignore any external control of the emergency bypass relay.

The aux connector of the MCPM or MCE provides an external connection to the emergency bypass relay. The MPCM-SD, -HD, and -SDHD provide all 3 relay terminals, NC, COM, and NO. The MCPM-MK-SD and -HD provide only 2 terminals, COM and NO.

There are 3 ways in which the emergency bypass relay can be controlled externally:

* From the GPI inputs of the MCPM or MCE.
* From the control panel's GPI outputs.
* By automation.

The MCPM or MCE has two configurable GPI inputs. The MCPM or MCE configuration software lets you select a GPI input and specify one of 5 behaviors for the input:

* Toggle control of the emergency bypass relay.

  When the GPI input has transitioned from off to on, the MCPM toggles the state of the emergency bypass relay. Otherwise the MCPM does nothing.

* Level control of the emergency bypass relay.

  While the GPI input is on, the MCPM or MCE sets the EBR to "bypass." While the GPI input is off, the MCPM or MCE sets the EBR to "normal."

* Set the EBR to "bypass."

  This behavior is used in conjunction with the emergency bypass control panel (EBCP).

* Set the EBR to "normal."

  This behavior is used in conjunction with the emergency bypass control panel (EBCP).

* Disabled. The MCPM ignores the GPI input.

Typically, router outputs connect to the bypass input connectors. This allows, for example, the same program to continue to broadcast during the emergency or break, albeit without the transitions and effects provided by the MCPM or MCE.

Another use of the bypass BNCs would be to provide a "technical difficulties" message.

Router Pre-Select

Router pre-select means that the panel operator chooses a router source manually prior to executing a master control transition.

A router destination (one or more outputs) is connected to one or more frame inputs. Without any further controls, an NV9000 operator can take a router source to the router destination as long as at least one of an MCPM's main sources or over sources is configured to allow it.

(The configuration for router pre-select is partly in the MCPM or MCE and partly in a panel.) A main or over source is configured in MasterConfig to be a router pre-select source. The panel is configured with router source categories (up to 10).

The operator may choose a main or over source configured for router pre-select, then select a router source through the 'Router Preselect' menu of the panel. The operator chooses the source based on a category/index identifier and presses a button to execute the take. The router source is now connected to the router destination which is connected at the frame input. If the MC system has a preview monitor, the source appears on the monitor (unless of course it is LOS).

External Router Sources

"External router sources" is a feature that can be enabled or disabled in an MCPM during configuration. Control panel operators need not be aware of it. Persons installing master control systems and configuring MCPMs (and MCEs) must take it into consideration. When enabled, external router sources impose some cabling constraints on the frame and might impose some design constraints on the NV9000 router control system. (An NV9000 control system is a requirement if your system will support external router sources.)

"External router sources" involves these concepts:

- External router sources include main sources, audio over sources, key sources, and squeeze image sources (background and image 2).

   ▲ Router pre-select involves mains and overs only.

   External router sources are added to whichever source list applies during configuration. For instance, when an external main source is defined, it is added to the main source list. Subsequently, the external source is simply one of many main sources.

   The number of external sources is limited to the number of list entries allowed in the MCPM configuration. Currently, the limits are:

   Main sources—128, 64, or 16 depending on the MCPM or MCE.
   Keyer sources—8 fill, 8 key
   Over sources—4
   Squeeze (background) sources—32
   Squeeze (image 2) sources—32

   The limits include all sources—local and external.

   ▲ Router pre-select has no such limits.

- External router sources consume a number of frame ports.

   These are the numbers for the source types:

Main sources	Minimum 2 video ports, optionally up to 8 audio ports, optionally 2 additional video ports. Those extra two video inputs exist to allow breakaway for external main sources with embedded audio.
Key sources	Minimum 3 "fill" video ports. optionally 3 "key" video ports.
Squeeze background	No minimum; optionally 1 video port.
Squeeze image 2	No minimum; optionally 1 video port.
Over sources	Two video ports for embedded audio and up to 8 audio ports.

   These ports are connected to router outputs. Those router outputs correspond to router destinations defined in the configuration of the NV9000 system.

   ▲ Each router pre-select main source consumes at least one video port and up to four[5] audio ports. Each router pre-select over source consumes up to four2 audio ports.]

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5. It is possible, but unlikely, for any local main or over source to consume 8 local audio ports.

• External router sources are managed by the MCPM under control, assuming it has been configured for external router sources. Under normal conditions, this management is *transparent* (internal and not detectable).

The MCPM has 2 port groups (A and B) for main sources and for over sources. It has 3 key source port groups. The key port groups are labeled 1, 2, and 3.

A port group is always available for a source.

• It is possible to configure each MCPM in a frame with different external router source ports. If you do so, you will quickly run out of ports. We recommend that you use the same external router source ports for all MCPMs in a single frame.

Compared to Router Preselect

Compared with router pre-select, "external router sources" saves a few keystrokes (and time and thought) while the operator selects external main and over sources, but also allows the selection of external key sources and squeeze sources, which router pre-select does not allow.

The drawback is this: external source selection is limited to the small number of sources the MCPM allows, not the entire space of the router system. The external router sources defined at configuration do not necessarily reflect the sources present in the NV9000 at any given moment. With router pre-select, the entire set of router sources—determined dynamically—can be available to the master control operator.

Main Source Connections

External main sources (that are not chosen during operation as squeeze sources) reach the frame through two ports, designated A and B. The designations are not important and serve only to distinguish one port from the other. There are 2 ports because there are 2 buses, preset and program.

Each port comprises 6 input connectors and two router destinations. A connector is a BNC, a Phoenix 3-pin STP, or a 3-pin STP cluster on a DB25. The *second* router destination is required only when at least one external source's audio is embedded and breakaway is possible for that source.

The *first* router destination (defined in the NV9000 configuration) provides video and audio on one or more virtual[6] levels. There are potentially 5 levels.

This example shows hypothetical connections for one main source port:
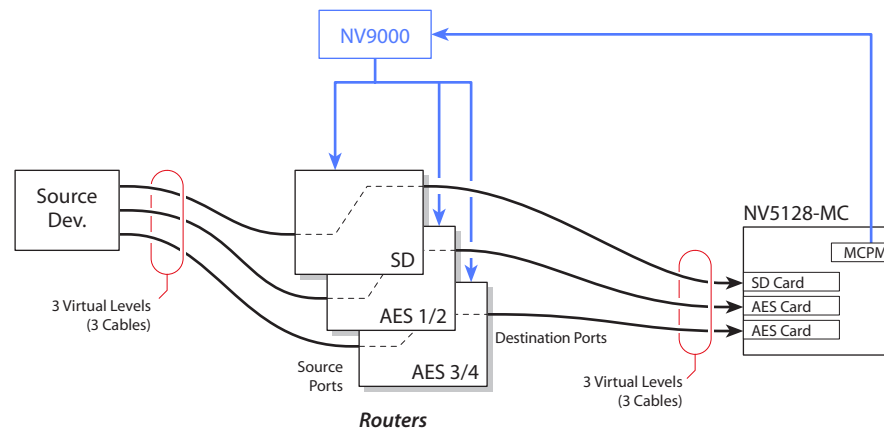
6. Refer to the NV9000 documentation for the definition of a "virtual" level.

If (1) any external main source's audio is embedded and (2) the master control system will require audio breakaway from any of those sources, you will need to connect a second router destination and a second frame video input (in addition to the first).

Key Source Connections

External key sources reach the frame through 3 ports, designated 1, 2, and 3. The designations are not important and serve only to distinguish one port from the other. There are 3 ports because there are 3 keyers in the MCPM.

Each port comprises 2 video input connectors (BNC). One input is for video fill; the other is for the key. If *all* your external keys are self-keys, you do not need to use the key input.

The router destinations (defined in the NV9000 configuration for the purpose of supplying a master control system) provides the video on 1 or 2 virtual levels.

This example shows hypothetical connections for one key source port:
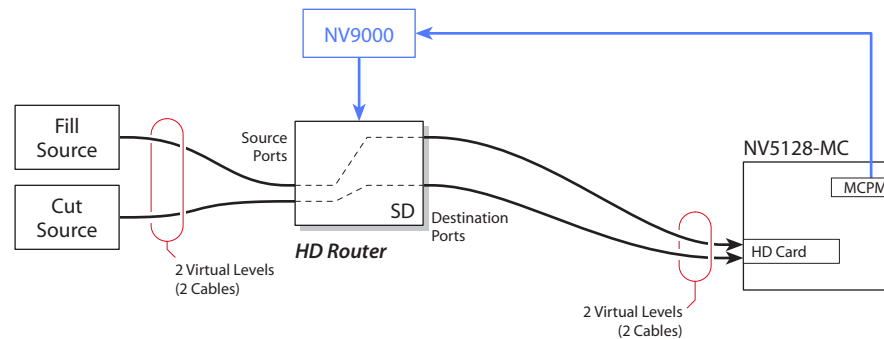
Squeezeback Source Connections

External squeeze sources reach the frame through 2 ports. One port is for background images; the other is for "image 2" sources under enhanced squeezeback.

▲ Enhanced squeezeback is available only in the MCPM-SDHD and MCE.

▲ External squeeze sources always go through the ports assigned to external squeeze sources, even when the squeeze sources are configured as main sources. This applies to squeeze back-grounds and to squeeze image 2.

Audio Over Source Connections

Like external main sources, external over sources reach the frame through two ports, designated A and B. The designations are not important and serve only to distinguish one port from the other. There are 2 ports because there are 2 buses, preset and program.

Each port comprises 5 input connectors and a router destination. A connector is a BNC, a Phoenix 3-pin STP, or a 3-pin STP cluster on a DB25. The first 4 connectors are for discrete audio; the fifth connector supports embedded audio (and it is actually a video connector).

The router destination (defined in the NV9000 configuration for the purpose of supplying a master control system) provides audio on one or more virtual levels.

GPI Outputs

The MCPM's two GPI output are SPDT relays (24VDC, 100mA). Connections to the relay terminals are present on the MCPM's aux connector. The Mixer/Keyers (MCPM-MK-SD and -MK-HD) provide COM and NO connections; other MCPMs provide COM, NO, and NC connections.

The MCPM can be configured so that when certain conditions are met, the MCPM activates the output relay — triggering the device that you have connected to the outputs (e.g., a cart machine).

(Activation means that the NO-COM circuit closes and the NC-COM circuit opens.)

There are 7 ways a GPI output can be configured:

1 Disabled. The GPI output is "off." (COM and NO are disconnected.)

2 Controlled from UI. Enables manual control from a control panel.

Use MasterUIConfig to assign a GPI output to a configurable panel button. (The button is a toggle. Pressing the button once activates the MPCM's GPI relay. Pressing it again relaxes the relay.)

3 Video Effect Status.

The GPI relay is active while a specified video effect is present on the preset bus or on the program bus.

4 Transition Status.

The GPI relay is active for the duration of any transition.

5 Main Source.

The GPI relay is active while a specific main source is selected on either the preset or the program bus.

6 Over Source.

The GPI relay is active while a specific audio over source is selected on either the preset or the program bus.

7 Dolby Decoder.

The GPI relay is active when the Dolby decoder is in use by any main source on the preset or program bus.

Breakaway

Breakaway — in the master control system — allows an operator to preset audio and video from separate sources. Breakaway is requested at a control panel (or by automation) and performed in the MCPM.

If it is possible for a control panel operator to perform breakaway on *any* external main source having embedded audio, the external main source connections must be cabled with an extra port for the audio. See

Auxiliary Connectors

The auxiliary connectors differ among the MCPM models.

The MCPM-SD, -HD, and -SDHD provide time-code inputs, Dolby metadata outputs, GPI inputs and GPI outputs, and connections to all 3 emergency bypass relay terminals, COM, NC, and NO.

The MCPM-MK-SD and -HD provide time-code inputs, GPI inputs and GPI outputs, and connections to only 2 of the emergency bypass relay terminals, COM and NO.

▲ MCEs have aux bus connectors (1.0/2.3 coax). Those are not auxiliary connectors.

Ethernet

The MCPM's 10/100BaseT port allows you to connect your MCPM on the master control network. Master control panels and configuration PCs communicate on this network with the MCPMs on this network.

You will use MasterDiag software to set the IP addresses of the MCPMs in your network.

RS-422 Automation

Contact Miranda for the master control serial protocol and how to use an automation system with master control.

Router Output Cards

The MCPM-HD, MCPM-HD2, and MCPM-SDHD all have "wings" that accept SWB router output cards. The MCPM-SDHD accepts one SWB card; the MCPM-HD and -HD2 accept two.

Each of these MCPMs includes a 16-output crosspoint for each SWB card. An NV5128 multi-format router (in the same frame) can route any of up to 64 SWB inputs to outputs on these cards.

The MCPMs have little or nothing to do with the router output except to supply the crosspoints and connectors. However, the -HD2 and -SDHD both allow limited control over the outputs. See for more information.

5. MCEs

Chapter 5 describes the MCEs. It presents the following topics:

- Statement of Function
- Structure
- Assembly
- Summary

Statement of Function

"MCE" stands for "master control engine." An MCE is a specific and newer type of MCPM.

MCEs are the "next generation" of master control transition processors. MCEs are different enough from previous MCPMs to warrant their own chapter. MCEs are configurable through MasterConfig, as are all MCPMs.

MCEs perform all the functions of the earlier MCPMs and provide additional capabilities. Functions discussed in the preceding chapter, MCPMs, are available in the MCEs. MCEs add the *preview bus*, the *aux bus*, 16-channel audio, and more storage for logos and animations. MCEs are also *modular*, comprising from 1 to 3 circuit boards and a number of optional daughter cards.

MCEs can be tested in conjunction with the video and audio timing page of MasterDiag.

The MCE offers:

- Hot-swaps. No electrical hazard when backplanes and board are mismatched.
- Field configuration for SD or HD at these rates:
  525i/59.94 and 625i/50.
  1080i/50, 1080i/59.94,
  720p/50, and 720p/59.94.
- Video reference type—NTSC, PAL, and tri-level sync.
- Up to 64 discrete video inputs (1–64) and 64 discrete audio inputs (65–128) from the frame's backplane.
- Video and audio input from a nearly unlimited number of router sources.
- Execution of router salvos.
- LOS matte generator.
- Internal black/silence generator, configurable as a main source.
- Program, preset, preview, and aux processing paths (i.e., buses).
- All transition types, normal and preset black.
- Three keyer effects, 2 logo effects, squeezeback and enhanced squeezeback. (The effects occur in fixed order.)
- Four Intuition XG keyer layers, with support for Xstudio programming.

- 16 independent audio channels (the maximum). 24-bit audio processing internally, with values reduced to 20-bit at output.
- Program/preset mixer and main/over mixer. Gain control and inversion.
- GPIO (optically isolated, 2 relay outputs, 2 inputs).
- Automation.
- Emergency bypass functions.
- Program, preset, preview (A and B) video outputs with embedded audio.
- Two aux outputs (A and B).
- Two video source inputs—*for future expansion*.
- Two 16-channel audio monitor outputs, A and B, with optional video output.
- One 16-channel audio metering output, with optional video output.
- Two clean feed outputs, A and B.
- Two audio monitor and meter outputs, clean feed outputs.
- 24 configurable AES outputs from the AXM card—arbitrarily selected from the MCE.
- 8 configurable Dolby metadata outputs from the AXM card.
- Dolby pass-through.
- Machine control and pre-roll.
- Enhanced squeeze effects (borders with width and color parameters, dual-image squeezeback).
- Storage of, and use of, up to 400 logos.
- Audio macros.

Structure

The MCE is an extendable product, occupying up to 3 card slots. The idea is that customers can buy just what they need with the possibility of later expansion.

There are 5 modules in the MCE card set:

- MCE-CORE. The minimum MCE comprises this single (full-size) card that performs *core* master control functions.
- MCE-PVW. The *preview* module supports the "next generation" preview bus.
- MCE-AXM. The *audio expansion module* provides Dolby E decoders for the program and preset buses and presents Dolby E metadata and AES output at its backplane.
- MCE-DVE. The *digital video effect* cards are small mezzanine cards that can be added to the core and to the preview boards for additional video effects.
- Dolby E. These are third-party Dolby E processors. Up to 8 Dolby cards mount on the MCE-AXM board, depending on your needs.

MCEs have inputs and outputs similar to those of most other MCPMs, such as audio meter outputs, GPIO, clean-feed outputs, and emergency bypass inputs. All MCEs have a reset switch, a bypass toggle (for the emergency bypass relay) and an diagnostic port at their front. Like the MCPM-SDHD, the MCE can process either HD or SD signals as a field-programmable option.

Differences

Notable differences between the MCEs and older MCPMs include:

- MCE audio output is embedded (except for the optional AXM outputs).
- MCE audio and video connectors are coax (1.0/2.3 DIN) connectors; MCPM audio and video connectors are BNCs.
  - ▲ Breakout panels are available. These 1RU panels provide 16 DIN-to-BNC conversion channels. Each BNC connector on the panel is coupled to a 2 m cable with a DIN connector.
- MCEs have 2 clean feed outputs; MCPMs have 1.
- MCEs have 2 aux outputs and 2 (extra) source inputs; other MCPMs do not have these.
- All MCE audio outputs carry 16 embedded audio channels; MCPM audio output varies. Certain MCPMs offer analog audio output.
- MCEs have preview and aux buses. MCPMs do not.
- MCEs have 16 audio channels. MCPMs have 8.
- MCEs support machine control and pre-roll.
- MCEs support Intuition XG subsystems (i.e., stored video keys).

There are other minor differences.

Program and Preset Buses

The MCE's program and preset buses are functionally the same as the program and preset buses of other MCPMs, except that each supports 16 audio channels.

The MCE's audio path differs from the other MCPMs' audio paths. Audio monitoring and metering is *very* different.

Audio Processing Section

When an operator or automation chooses a video source for preset or for program, the MCE selects its associated audio inputs also.

Audio can either be disembedded from the video source or it can be discrete (present on a connector). Discrete audio for MCEs is always AES. Any audio input can be Dolby E encoded if the MCE has Dolby E decoders.

MCEs can be configured with 2, 4, 6, or 8 Dolby decoders (on the AXM card). There are 3 ways the decoders can be allocated. (See Audio Expansion Module on page 90 for the locations of the decoders.)

- The default. (Refer to Figure 5-1.)

  Decoders A and B support program and preset main audio.

  Decoders C and D support program and preset over audio and, in particular, audio for enhanced squeezeback's image 2.

  Decoders E supports preview main audio.

  Decoders F supports preview over audio, including audio for enhanced squeezeback's image 2.

  Decoders G and H are not needed.

- Dual Dolby decoders supporting overs on the program and preset buses. (Refer to Figure 5-2.)

  Decoders A, B, C, and D support program and preset main audio.

  Decoders E, F, G, and H support *program and preset over* audio.

- Dual Dolby decoders supporting main sources on the preview bus. (Refer to Figure 5-3.)

  Decoders A, B, C, and D support program and preset main audio.

  Decoders E and F support *preview main* audio. (Decoders G and H are not needed.)

▲ Dolby metadata outputs are available on the AXM backplane. The 8 metadata ports are configurable.

▲ Dolby E requires a non-interlaced video reference format. Dolby E works with 720p video sources when the reference is 525i, 625i, or 1080i.

The audio crosspoint accepts discrete audio inputs directly and accepts embedded audio after it passes through a disembedder. Each disembedder produces 16 channels (8 AES pairs) as shown in Figure 5-1.

Discrete audio inputs are "stereo" inputs. The MCE treats the separate stereo channels as distinct. During MCE configuration, you can select any of up to 128 single, a.k.a. "mono," channels at any time. (AES input pairs are numbered in the range 65–128.)

An MCE has 16 internal audio processing channels (per bus). Any or all of these can be associated with a main video source. You can combine different audio types on these channels as you wish.

The MCE also accepts up to 16 discrete or embedded audio over inputs for program, preset, and preview. Figure 5-1 shows the schema for MCEs without dual Dolby decoders:
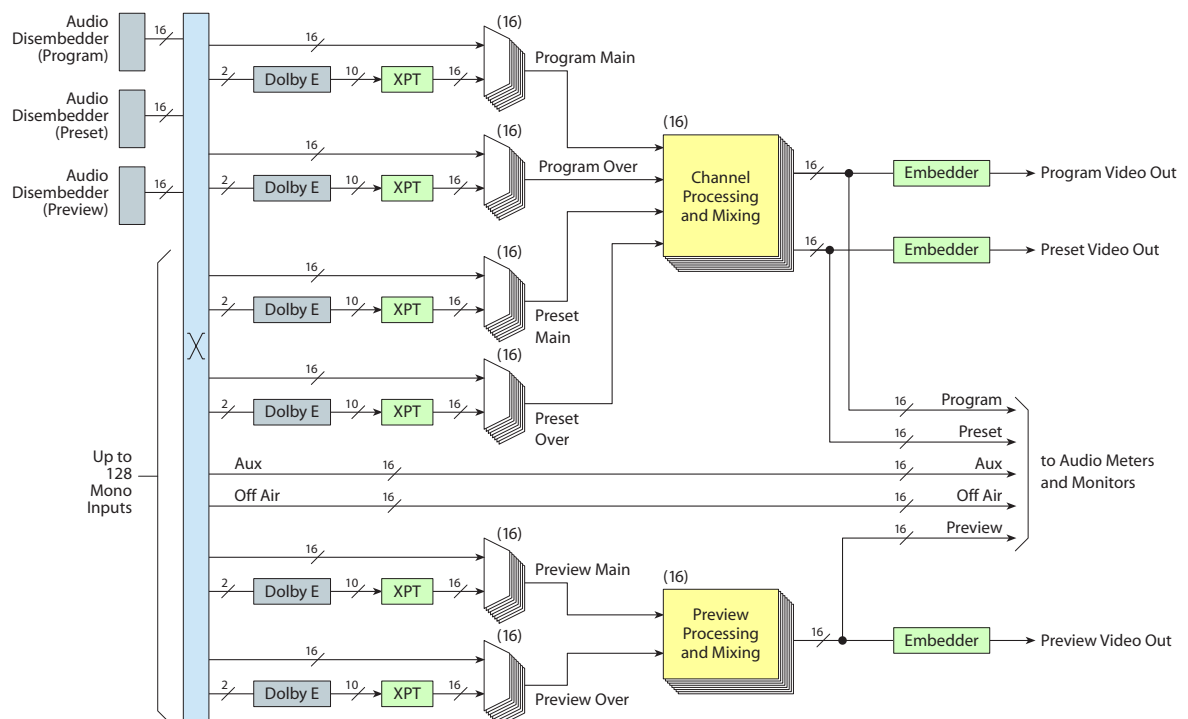
Figure 5-1. Audio Processing Section (without Dual Dolby)

Figure 5-2 shows the schema for MCEs with dual Dolby decoders supporting program and preset main sources and program and preset overs:
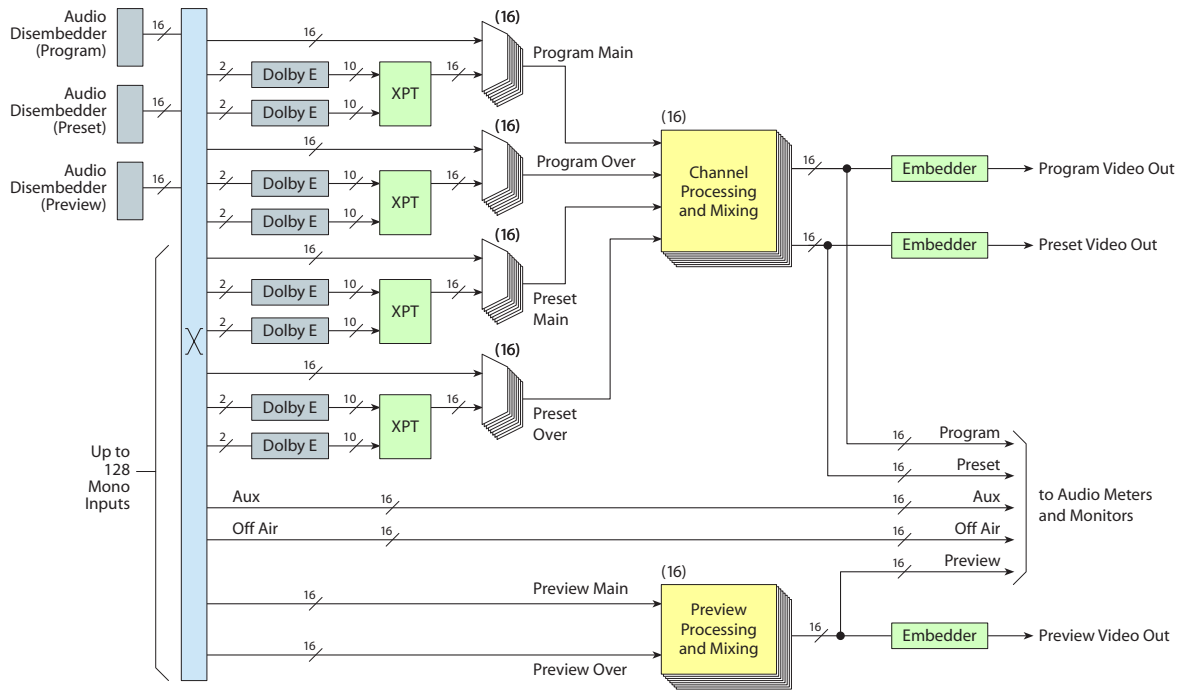
Figure 5-2. Audio Processing Section (Dual Dolby for Program and Preset, Main Sources and Overs)

Figure 5-3 shows the schema for MCEs with dual Dolby decoders supporting program, preset, and preview main sources:
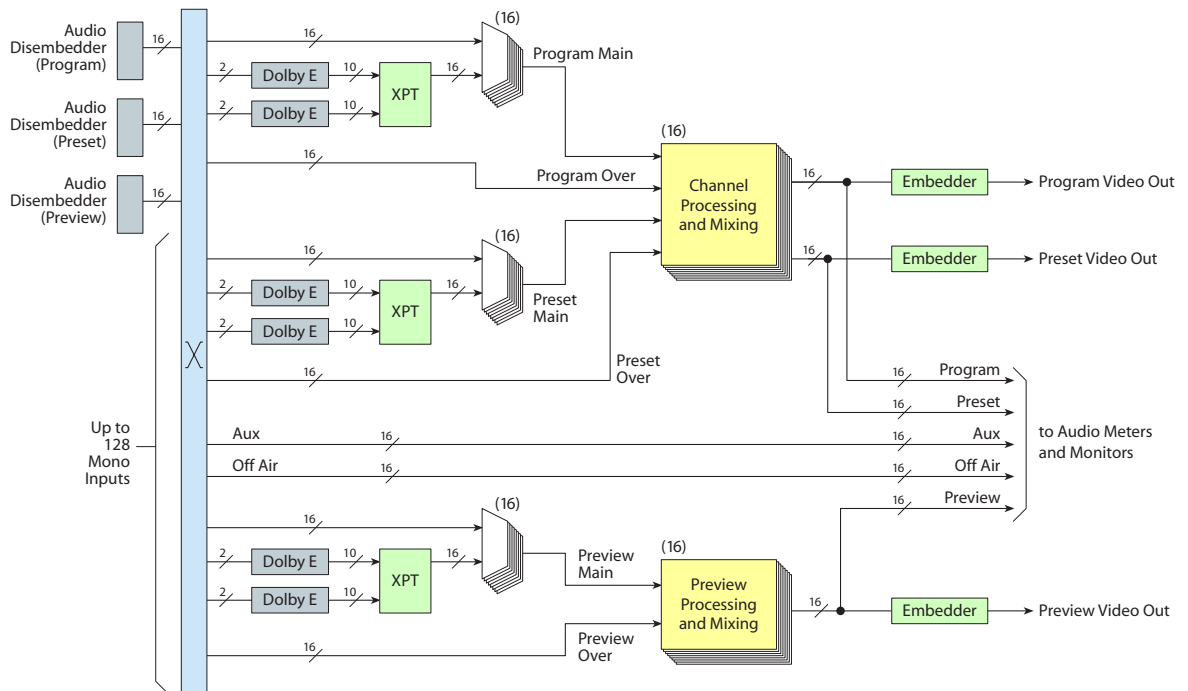
Figure 5-3. Audio Processing Section (Program, Preset, and Preview Main Sources)

In addition, the MCE accepts up to 16 "auxiliary" inputs and 16 "off air" inputs. These are discrete inputs only. Although these names perhaps suggest a use for the inputs, the aux and off-air inputs are simply two extra sets of inputs. However, the aux and off-air inputs are not processed or mixed with program audio, but feed directly to the audio meter and monitor outputs. The MCE offers some choices regarding what appears on the meter and monitor outputs.

The result of channel processing is 16 channels of program audio and 16 channels of preset audio. These channels are embedded in the program output and preset output that appear at the MCE-CORE backplane.

The same is true for preview audio. Preview audio is, however, separated from program and preset audio processing. Preview audio appears, embedded, in the Preview A output of the MCE-PVW backplane. (The Preview B output is a copy of Preview A.)

Channel Processing

The channel processing function is the same for all 16 internal audio channels: Program main and program over are mixed. Preset main and preset over are mixed. The two results are then mixed according to the current transition. If a transition is not in progress, the mix is 0% preset and 100% program. Otherwise, the mix varies according to the progress of the transition.
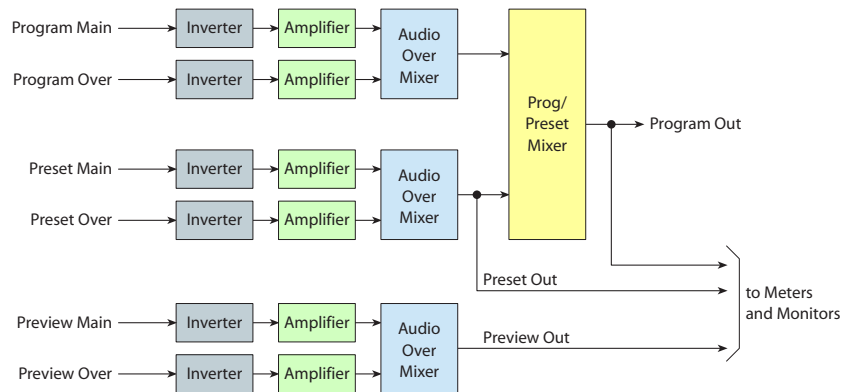
Figure 5-4. Audio Channel Processing (One of 16 Channels)

Preview main and preview over are mixed separately.

In any case, program audio output, preset audio output, and preview audio output are sent to the audio meter and monitor section where they can be selected (or not) for output.

Gain controls—independent for all 16 channels—range from +12 dB to –108 dB. Gain can be specified during configuration and changed during operation. Whether to invert a signal is a simple configuration option.

▲   Signals are inverted by multiplying the digital values by –1.

The over/main mixing ratio

As for MCPMs, the over/main ratio for MCE audio is a perceptual mix and non-linear:
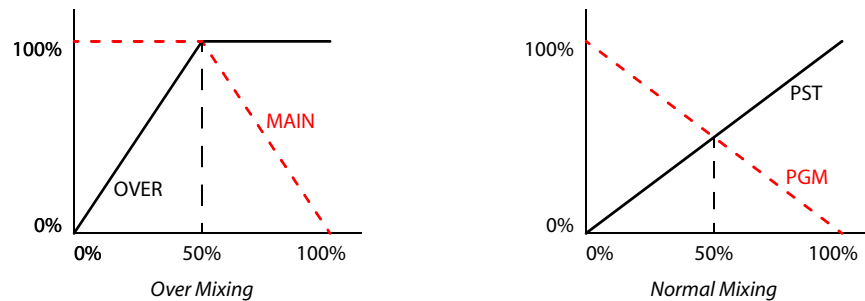
(The program/preset audio mixer behaves according to the "normal" model.)

Meters and Monitors Section

The audio meter and monitor section of an MCE is different from that of the MCPM.

It presents monitor and meter signals on coax (1.0/2.3 DIN) connectors. Figure 5-5 shows the organization of the audio metering and monitoring section.
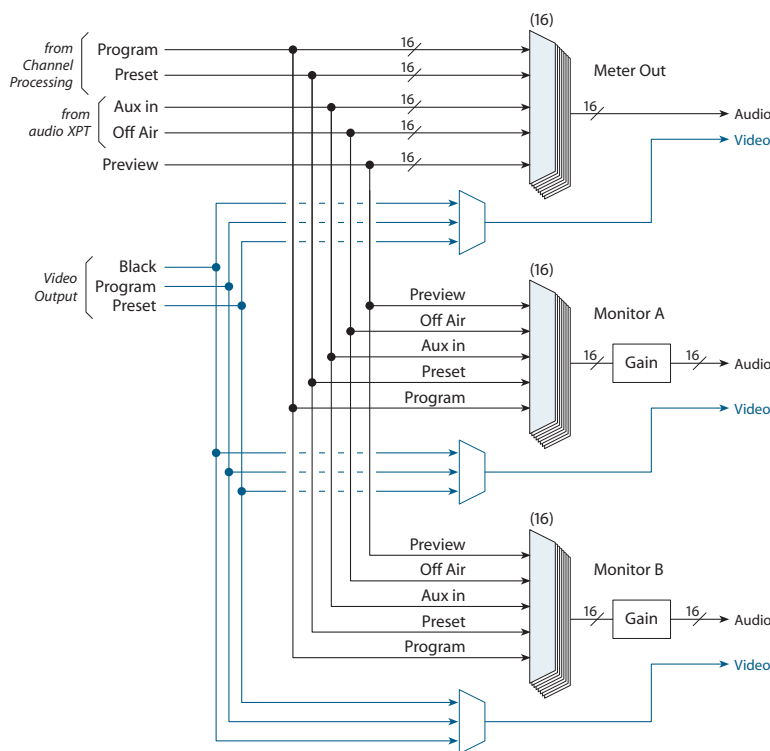
Figure 5-5. Audio Meters and Monitors

The meter and monitor section receives program and preset audio from each of the 16 channel processors. It receives preview audio from the 16 preview mixers. It also receives 16 auxiliary and 16 off-air inputs from the audio crosspoint.

Monitor and meter outputs can be configured as fixed or dynamic. When a monitor or meter output is configured as "user can modify," the operator may press "Program," "Preset," "Aux," "Off Air," or "Preview" buttons on the control panel. The selected audio appears on that output.

Each monitor—A and B—has independent gain and a "dim" function. When an operator presses the monitor's "dim" button at a control panel, the monitor level decreases (by as much as 108 dB). The default attenuation is 20 dB.

It is possible to include program or preview output instead as 'black' on the video channel of each of the monitor and meter outputs. That is a MasterConfig option.

▲ You should note that the included video—black, program, or preset—does not switch when the operator presses audio metering or monitoring buttons. The buttons switch only audio.

Audio Summary

The audio section receives either discrete or embedded audio from the audio crosspoint. Dolby audio is decoded if decoders are present. The MCE also accepts two other forms of audio input: aux in and off air, which are simply extra sets of inputs.

The MCE has 16 internal audio channel processors that mix the incoming main audio and audio "over" for both program and preset, and then mixes program and preset according to the transition in effect. The MCE also mixes preview main and preview over audio.

Program and preset output appear on MCE-CORE backplane connectors. Audio is embedded in video output.

Preview output appears on the MCE-PVW backplane.

Audio monitoring and metering outputs (embedded in a video signal) appear on MCE-CORE backplane connectors. Monitor and meter outputs present program, preset, aux, off-air, or preview audio.

Preview Bus

The MCE's preview bus, not present in other MCPMs, allows master control operators to preview sources and video effects without interrupting program output or automation (which controls preset and program output).
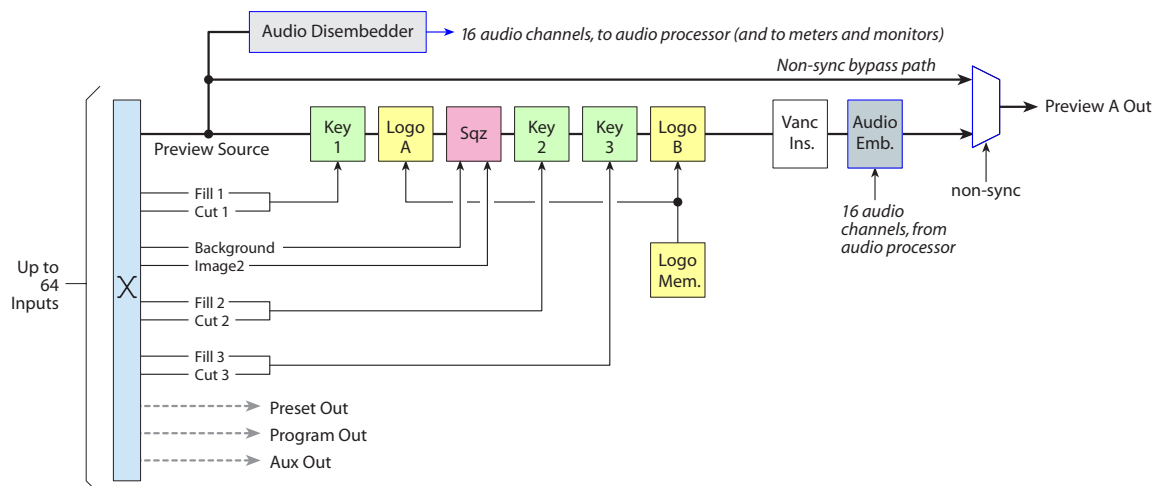
If your system does not involve automation, you can safely use the preset bus as a preview mechanism. The preview bus is entirely independent of "on air" programming.

▲ It is possible for the operator to copy a video effect setting from the preview bus to the preset bus, or from the preset bus to the preview bus.

The preview card is required for a preview bus and its preview functions. Presently there is only one preview output and that is preview output A. Preview output B is not operational and the B output connector simply presents a copy of preview output A.

The preview bus, unlike the program and preset buses, does not perform non-sync bypass path.

The preview/user button row of the control panels corresponds to the preview bus of the MCE.

▲ A panel's preview button row is disabled unless the panel is controlling an MCE.

Aux Bus

The MCE's aux bus (not referring to the aux button row on a panel) is really a multiplexer that is set at configuration time. The MCE has two aux outputs, A and B, both identical. They can be set independently.
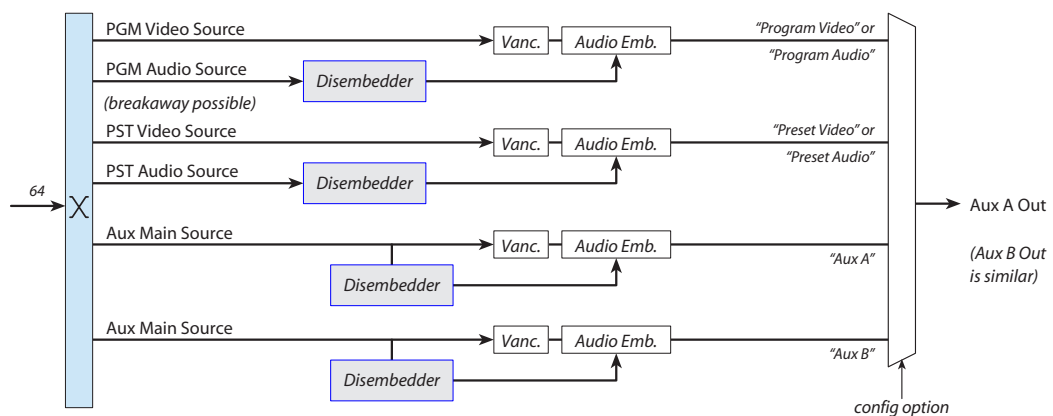
These are the aux bus options. Each aux bus can be configured with one of these settings:

- Aux Bus A (Panel Control)

  The aux output (A or B, whichever you choose) carries the main source chosen on the control panel's aux button row when the panel operator presses the "Aux A" delegate button.

- Aux Bus B (Panel Control)

  The aux output (A or B, whichever one you choose) carries the main source chosen on the control panel's aux button row when the panel operator presses the "Aux B" delegate button.

- Program Video

  The aux output (A or B, whichever one you choose) carries the video and audio of the main source(s) chosen on the control panel's program bus.

  Under breakaway, the aux audio output still comes from the *video* source.

- Preset Video

  The aux output (A or B, whichever one you choose) carries the video and audio of the main source(s) chosen on the control panel's preset bus.

  Under breakaway, the aux audio output still comes from the *video* source.

- Program Audio

  The aux output (A or B, whichever one you choose) carries the video and audio of the main source(s) chosen on the control panel's program bus.

  Under breakaway, the aux audio output comes from the **audio** source.

▲ This option does not appear unless you have checked 'Enable Main Disembedders' in the general settings of MasterConfig.

• Preset Audio

The aux output (A or B, whichever one you choose) carries the video and audio of the main source(s) chosen on the control panel's preset bus.

Under breakaway, the aux audio output comes from the *audio* source.

▲ This option does not appear unless you have checked 'Enable Main Disembedders' in the general settings of MasterConfig.

The aux outputs cannot replicate program audio or preset audio unless it is embedded. The aux outputs pass whatever audio is embedded—all 16 channels, Dolby-encoded or not.

Aux/User Button Row

The panels provide an *aux/user button row*. (This button row is inoperative for MCPMs.)

When a panel is controlling an Imagestore 750, the 6 "user" buttons at the right of the button row are simply customer-configurable buttons.

When a panel is controlling an MCE, the aux/user buttons include a set of main source buttons and a number of "aux delegate" buttons. The delegate buttons select different functions for the aux bus. These are the delegate functions:

Aux A Bus	Preset Squeeze Background	Preview Squeeze Background
Aux B Bus	Preset Squeeze Image 2	Preview Squeeze Image 2

When a panel operator presses "Aux A Bus," the main source selected on the aux bus is sent to whichever of the aux outputs in the MCE corresponds to the aux A bus. If neither aux output was configured for aux bus A, the aux output is unaffected.

The same is true for the "Aux B Bus" panel button.

The other 4 delegate types—conveniences for the panel operator, and not relevant to the MCE—allow panel operators to select main sources as squeeze images, either background or image 2. These functions are discussed in the *iMC-Panel-200 Operator's Guide*, the *iMC-Panel-300 Operator's Guide*, the *iMC-Panel-GUI Operator's Guide*, and in the *MCS Panel Configuration Editor User's Guide*.

▲ Depending on configurations, the aux button row *might or might not* correspond to the aux bus of the MCE.

Machine Control and Pre-Roll

MCEs can perform machine control and pre-roll operations. Control panels correspondingly might have several machine control and pre-roll buttons. Machine control and pre-roll functions are carried out by a DC21 Device Controller on the master control network. The device controller can control up to 4 VTRs (or similar devices) with a serial protocol (Sony, Odetics, or VDCP) and has the capability of controlling up to 16 other devices with start and stop pulses.

See

Intuition XG

Miranda's Intuition XG graphics processor and its associated Xmedia software can be integrated with the master control system. The Intuition XG subsystem includes a graphics processor that stores, and plays out, video keys. It can access "live" data including feeds from wire services and databases. The Intuition XG processor can deliver one or two keys simultaneously to one MCE. Additional Intuition XG subsystems might be required for multiple MCEs. (Intuition XG is supported only by MCEs and not MCPMs.)

▲ Intuition XG requires at least one SWB input card in the frame of the MCE with which it communicates.

See Intuition XG on page 147.

Core Card

The core card contains the microprocessor, the video processor, audio processor, crosspoints, logo store, application code, and other components that make up most of the processing power of the MCE:
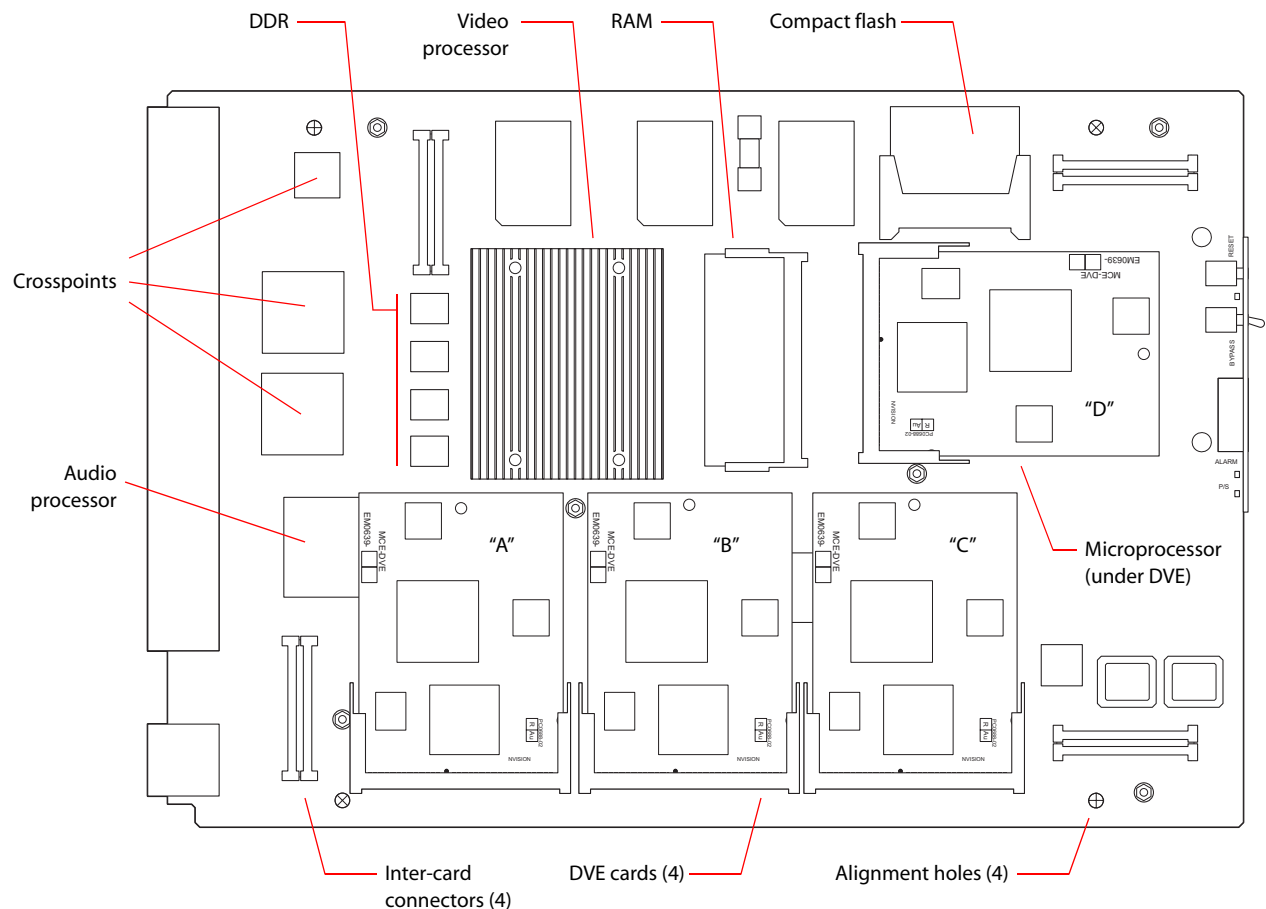
The compact flash card provides non-volatile logo storage and application storage.

The memory card labeled 'RAM' provides the logo store when MCE is running.

Inter-card connectors and alignment holes are used when the core is coupled to a preview card or an AXM.

DVEs are optional. The two labeled "C" and "D" are required for squeezeback. A third ("B") is required for dual (enhanced) squeezeback. The fourth ("A") is for future expansion.

The audio processor (not shown above) operates at 48 kHz (48,000 samples per second). It receives audio from backplane inputs 65–128. The audio processor sends and receives audio data to and from the AXM if it is present.

When development is complete, the audio processor will handle audio signals associated with logos.

The core's backplane provides the main connections to, and from, the MCE. Many of these signals use 1.0/2.3 DIN connectors:

Label	Description
PGM OUT	Program output
BYP IN	Emergency Bypass Input
PST OUT	Preset Output
CLN A OUT / CLN B OUT	Clean-Feed Outputs, A and B
MON A OUT / MON B OUT	Audio Monitor Outputs, A and B
AUX A OUT / AUX B OUT	Aux Outputs, A and B
MTR OUT	Audio Meter Output
SRC A IN / SRC B IN	Source Inputs, A and B (*Unused*)
10/100BT	Ethernet (RJ-45)
RS-422	Automation (DE9, RS-422)
AUX	GPIO, Bypass Relay (DB25)
VID REF IN	Video Reference (Analog)

(Each output connector presents video with 16 embedded audio channels. Audio monitor and meter subsystems must disembed the audio and route the audio signals to the appropriate devices. For the audio meter and monitor outputs, the video signal can be 'black' or video from the MCE's program or preset bus.)

The audio meter output can connect to a metering input of a iMC-Panel-200 or iMC-Panel-300 control panel. You may connect the meter output to any metering system. Again, the metering system must disembed the audio.

▲ "Live level" metering is still undergoing development. A metering input does not necessarily have to connect to an MCE. If you have multiple MCEs, you might need a multiplexer or router (but not a disembedder) to connect to the panel.

The Ethernet, automation, and DB25 connectors are similar to those of the MCPM-SDHD. See Core Connectors on page 185.

The 1.0/2.3 connectors are spaced to allow 1694A cable.

The video reference is always internally terminated (75Ω).

Monitor, meter, and aux outputs are audio (embedded). Each connector supplies 16 embedded audio channels.

Program, preset, and emergency bypass connectors function as for other MCPMs, but embed 16 audio channels.

Preview Card

The preview board is optional. The board implements the preview bus, to which a panel's preview buttons correspond.

The preview bus allows operators to examine video sources independently, applying video effects and audio overs at will, without affecting program content or interfering with automation.

The preview board contains a 1-channel video processor and up to 4 DVEs. It receives all its sig-nals from the core.

DDR   Video   Inter-card

processor   connectors (4)

"D"

"A"   "B"   "C"

Alignment holes (2)   DVE cards (4)   Alignment blocks (underside, 2)
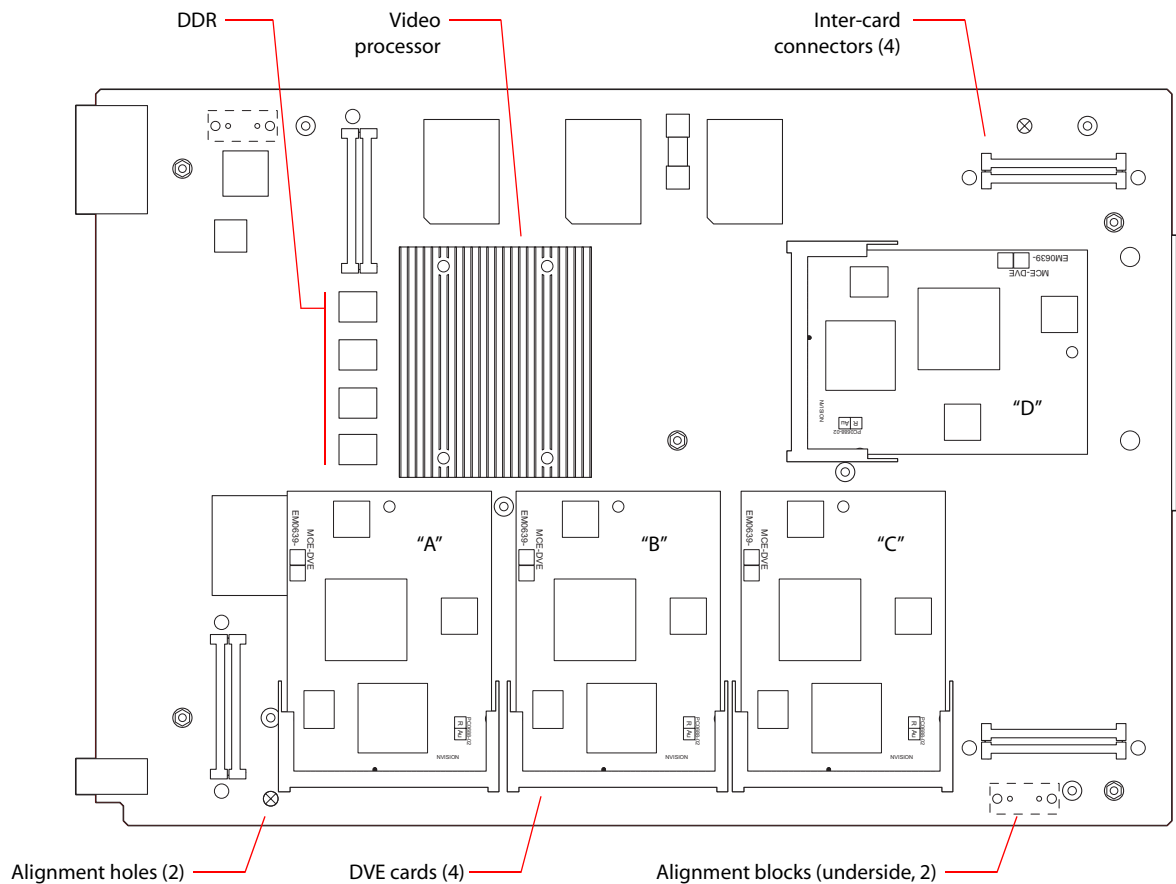
DVEs are optional. The DVE labeled "D" is required for the squeeze background image (on the preview bus). A DVE labeled "B" is required for squeeze image 2 (on the preview bus). The DVEs labeled "A" and "C" are for future expansion.

The preview board is required only for preview bus functions. Its backplane module has two 1.0/2.3 DIN connectors:

MCE PVW

PVW
A
OUT
————————————————— Preview output, A

PVW
B
OUT
————————————————— Preview output, B
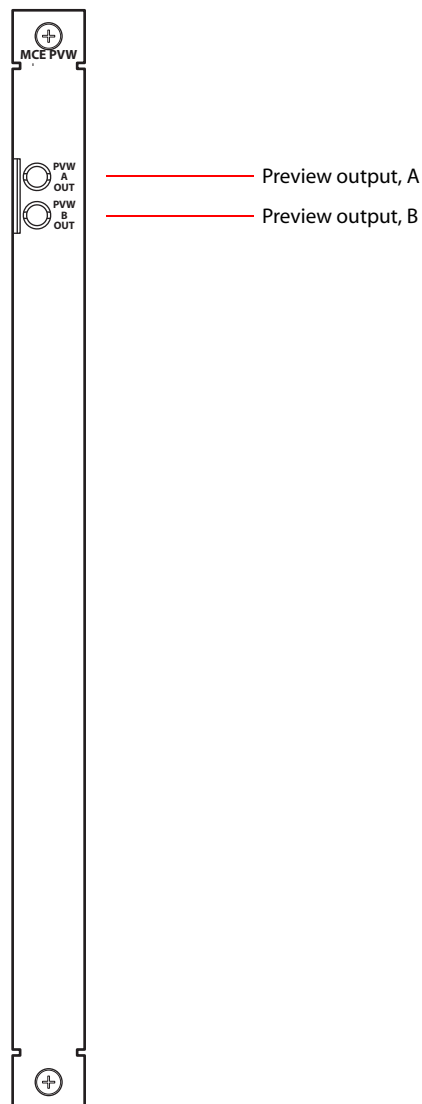
Preview bus A outputs whatever combination of main sources, video effects an operator selects at a control panel. The output is video only. Although an operator can apply audio overs, they would have no effect.

Preview bus B is not yet operational. Presently, preview output B simply replicates output A.

Audio Expansion Module

The audio expansion module is optional.

This illustration shows the AXM board and the location of the Dolby E cards on the board:

Dolby E module (1 of 8) ——————   Alignment blocks (underside, 2) ——————

Inter-card connectors (3) ——————
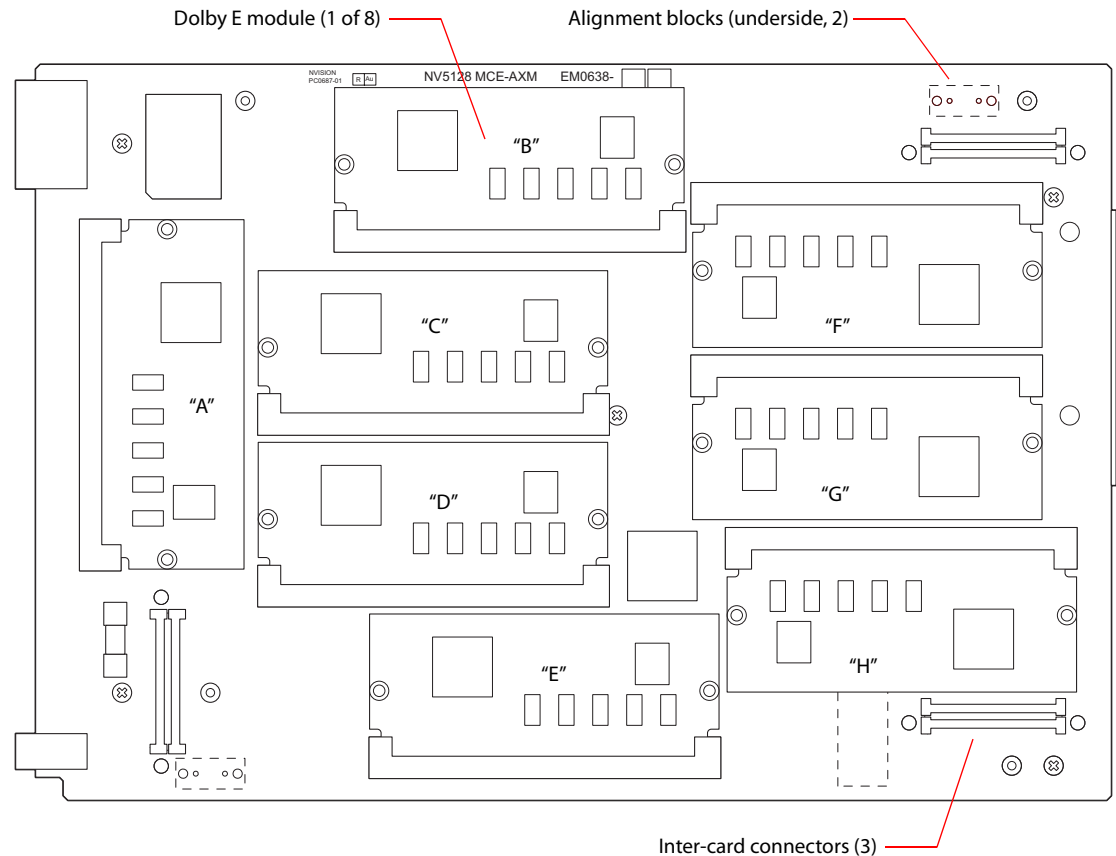
The AXM receives 8 AES pairs from the audio processor on the core board. Each of the 8 pairs goes to one of the 8 Dolby E modules on the AXM.

Each Dolby E module decodes its AES input and outputs 5 AES pairs: channels 1/2 (L, R), 3/4 (C, LFE), 5/6 (Ls, Rs), 7/8 (Lt, Rt), and Aux (also Lt/Rt). Each Dolby module also produces metadata output. The AXM sends the 5 pairs from each Dolby module back to the audio processor on the core—40 pairs in all.

The AXM sends the metadata output to the first of its backplane connectors. The first connector presents 8 metadata signals, one for each Dolby module. The 8 metadata ports are configurable. Each output can carry:

Program main audio	Program over audio
Preset main audio	Preset over audio
Preview main audio	Preview over audio
Monitor A main audio	Monitor A over audio
Monitor B main audio	Monitor B over audio
Meter main audio	Meter over audio

The AXM presents 24 AES channels for on the other 3 backplane connectors. The AES ports are configurable (in MasterConfig) in 6 groups of 4 AES pairs (8 channels). Each group may represent one of the following sets:

Program channels 1–8	Program channels 9–16
Preset channels 1–8	Preset channels 9–16
Preview channels 1–8	Preview channels 9–16
Monitor A channels 1–8	Monitor A channels 9–16
Monitor B channels 1–8	Monitor B channels 9–16
Meter channels 1–8	Meter channels 9–16

You might wish to note that the pinouts of the DB25 connectors for AES output do not follow a completely predictable pattern. See AXM Connectors on page 186 for pinout information.

▲ Dolby E requires a non-interlaced video reference format. Dolby E works with 720p video sources when the reference is 525i, 625i, or 1080i.

The AXM backplane presents Dolby metadata and AES outputs:
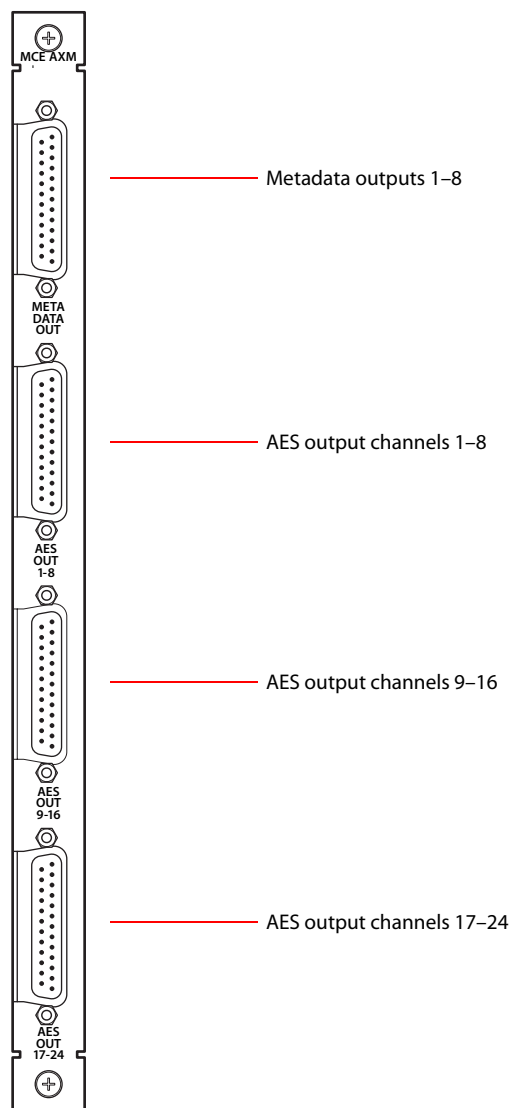
See AXM Connectors on page 186.

DVE

DVE boards perform squeezeback. DVEs are labelled (A through D) on the core board. DVE C supports squeezeback on the program bus. DVE D supports squeezeback on the preset bus. DVE B supports "image 2" for enhanced squeezeback.

DVEs are labelled the same way (A through D) on the preview board. DVE D on the preview board supports squeezeback on the preview bus and DVE B supports "image 2" for enhanced squeezeback on the preview bus.

Dolby E

Each Dolby unit (on the AXM board) receives on AES pair from the core board's audio processor and returns 5 decoded AES pairs to the core.

The 8 units are labelled A through H. Units A and B presently support main sources on the program and preset buses. Units C and D support over audio (including audio for "image 2" under enhanced squeezeback) for the program and preset buses.

Unit E supports preview main audio. Unit F supports preview over audio, including audio for squeezeback image 2.

Units G and H are not in use yet.

Assembly

There are 4 ways MCEs can be assembled:

- Core only.
- Core + AXM.
- Core + PVW.
- Core + PVW + AXM.

See the figure on the next page.

You might wish to note these points. However, they are not essential:

1 Assembly requires the use of alignment blocks, standoffs, and inter-board connectors.
2 Attaching a DVE to a core or PVW board requires teflon spacers and 4-40 nuts with teflon inserts.
3 Attaching a Dolby E module to an AXM board requires a different type of teflon spacer.
4 Dolby E modules and DVE cards snap into their respective slots.
5 The AXM board is thinner (0.062) than the core or PVW boards (0.093). For correct board spacing, use 0.738″ standoffs (6 required) to mount an AXM board. PVW boards require (5) 0.707″ standoffs. A core board by itself requires no standoffs or inter-board connectors.
6 A 2-board assembly requires four 2-board (T-shaped) connectors. A 3-board assembly requires three 3-board connectors and one 2-board connector.

There are detailed assembly instructions that customers may obtain from Miranda customer service. Customers should not ordinarily assemble MCEs.

▲ The preview (PVW) card is required for a preview bus and preview functions.
▲ The audio expansion card (AXM) is required for Dolby E audio.

These are the front views of the 4 possible board configurations:

Standoffs (0.738″)

Standoffs (0.738″)

Standoffs (0.707″)

Diagnostic port (same in all views)

Standoffs (0.707″)

2-slot connectors

3-slot connectors

Core (only)   *Core + AXM*   *Core + PVW*   *Core + PVW + AXM*
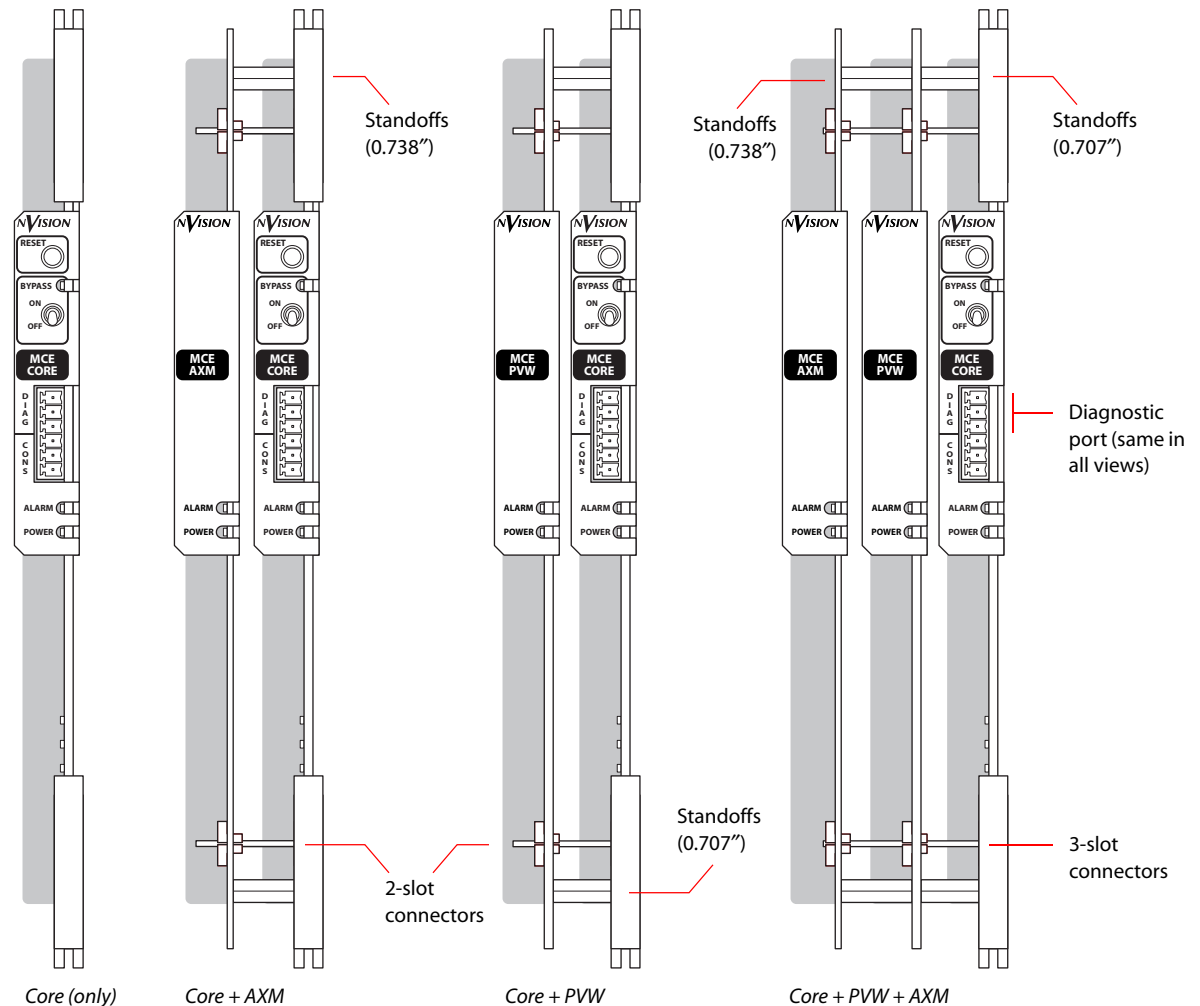
Summary

An MCE provides all the functions of older MCPMs, and adds preview and aux buses. Development of MCEs is virtually complete.

▲ MCEs do not accept analog video input or analog audio input.

The MCE is modular and can be assembled with only the cards necessary for you facility. The minimal MCE is a core board with no DVEs. The maximal MCE has 3 cards, 8 DVEs, and 8 Dolby E cards.

Its backplane connectors are 1.0/2.3 coax connectors, each supporting 16 channels of embedded audio. There are no AES connectors except on the AXM board and those are DB25s.

Its diagnostic port (at the front of the core module) includes the top 3 pins of a Phoenix 6-pin connector.

5. MCEs
Summary

6. Imagestore 750

Chapter 6 describes the Imagestore 750. It presents the following topics:

- Statement of Function
- Use in the Combined Master Control System

Refer to the *Imagestore 750 Reference Manual* for a complete description.

Refer to the *Master Control Installation Guide* for information about installing an Imagestore 750 in the master control system.

Statement of Function

The Imagestore 750 is an independent transition processor (also called a "channel branding processor") that can operate as a stand-alone unit with or without automation, or as part of Miranda's iMC (combined Imagestore 750/NV5100MC) master control system. In the context of the combined master control system, it operates in conjunction with an NV9000 router control system, that provides video and audio sources, and one or more master control panels, such as the iMC-Panel-200, that provide commands. The Imagestore 750 issues switching instructions to the NV9000 when it receives commands from a master control panel.

The Imagestore 750 is essentially an A/B transition processor that inserts video effects (DVEs and DSKs) and voice-overs into its output. It has many configuration options. The principal software used is the "Imagestore 750 Configurator." Note that a particular version of this software is required for operation in the context of an iMC master control system: at present, it is v1.5. Other configuration tools exist, notably the DVE Editor.

Version 4.2 of the Imagestore 750 software and firmware is required for use in the master control system. The Imagestore 750 must be equipped with the master control option.

This is a "black box" diagram of the Imagestore 750:
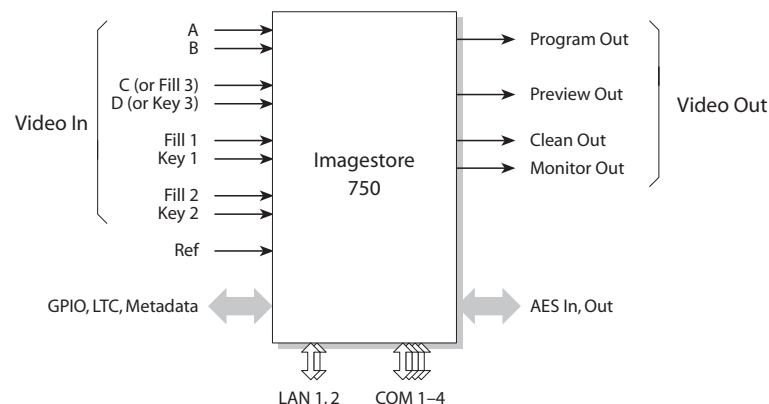
Inputs and outputs of the Imagestore 750 include:

- Four SDI inputs, A–D. These accept HD and SD input.
- Two external keyer pairs (fill and key). Inputs C and D can be used for a third keyer pair.
- A GPIO connector that supports 16 GPIO ports (each configurable as an input or an output), LTC, and Dolby metadata.
- 16 AES inputs and 16 AES outputs.
- Four SDI outputs (program, preview, clean-feed, and monitor).

There are also 4 COM ports and 2 Ethernet ports.

This drawing shows the general location of the connectors:
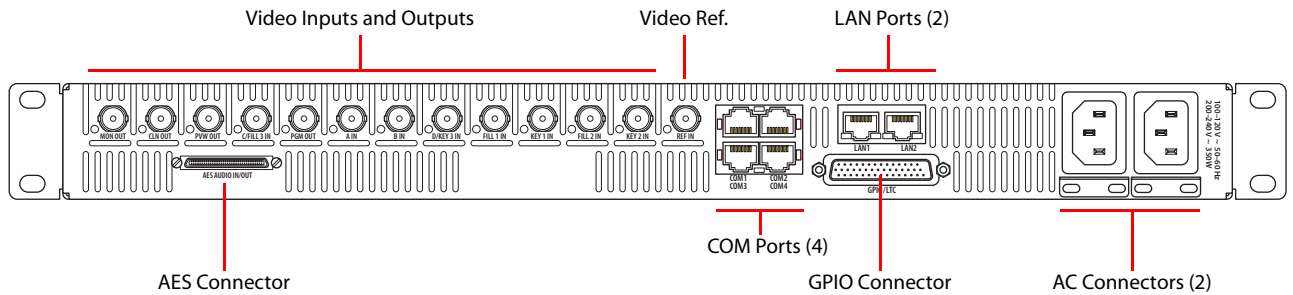
Conceptual Model

Figure 6-1 shows the Imagestore 750's conceptual model in the iMC master control system:
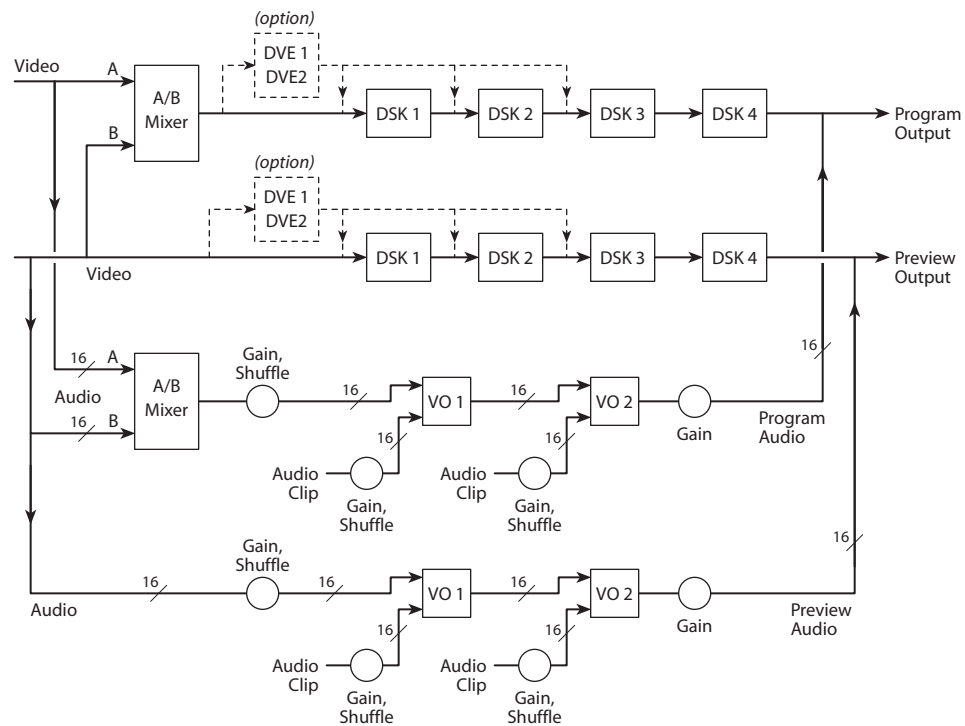
Figure 6-1. Conceptual Model of the Imagestore 750

There are two video processing paths, program and preview. Each includes 4 downstream keyers (DSKs) and an optional DVE processor. The *preview output and inputs,* as they are called in Imag-

estore 750 terminology, are called the *preset output and inputs* at the control panels. An A/B mixer combines preset video and program video according to the selected transition type and rate, and according to configured transition modes.

The configuration tool allows you a nearly infinite number of ways to connect audio components. Only a few of those ways (similar to what is shown in Figure 6-1) are useful in the master control system.

After audio is disembedded, the audio processing path includes an A/B mixer and two voice-over processors. Audio is re-embedded in program and preview audio after processing. (See the detailed model, next page.) Voice-overs are either stored EasyPlay clips or from external AES input.

The model also includes a clean-feed (video) output and a (video) monitor output. There are many selectable tap locations, video and audio, for these outputs.

Detailed Model

This diagram shows a more detailed view of the Imagestore 750's video processing:
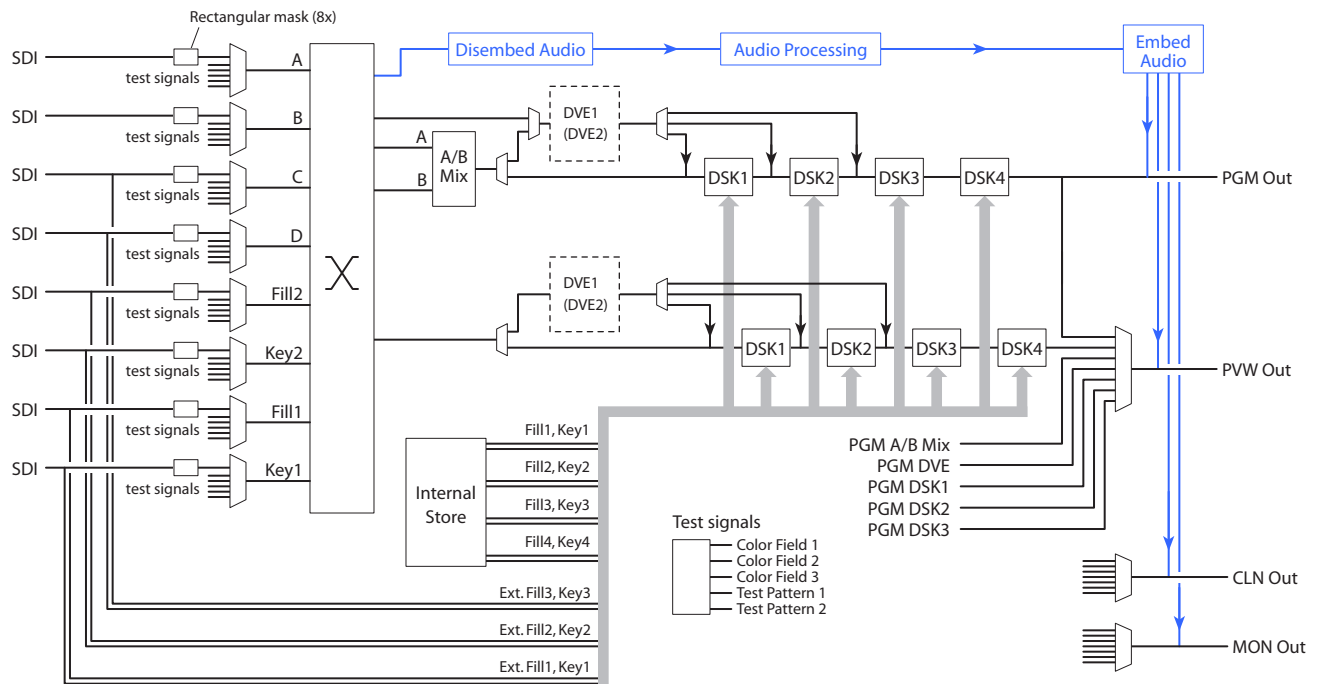
Each input (A, B, C, D, Fill1, Key1, Fill2, and Key2) can be individually selected as an SDI input or one of 5 test signals. (Each SDI input can be subject to a rectangular clipping mask.)

Both the A and B side of the A/B mixers can connect to any of the inputs (A, B, C, D, Fill1, Key1, Fill2, and Key2). Similarly, any of the DVEs can connect to any of those inputs.

The DVEs can also accept the output of the A/B mixer. The DVE output (either DVE1 or DVE2) can be inserted in the processing path in one of 3 places: before DSK1, before DSK2, or before DSK3.

The DVE processing section is a purchase option. The DVE processor can be bypassed if it is installed.

The Imagestore 750 has storage (up to 2 GB) supporting internal keyers. In addition to the two external (fill, key) inputs, inputs C and D can be used as external key (fill3, key3). Any of the 3 external (fill, key) inputs can be used to receive Intuition XG clips.

The preview output can present video from one of several different tap points. Similarly, the clean-feed (CLN) output and the monitor (MON) outputs can present video from several different tap points.

Audio is disembedded from SDI sources, sent to the audio processing pipeline, and re-embedded on output. The audio is re-embedded in the PGM, PVW, CLN, and MON outputs.

Use in the Combined Master Control System

The master control system adds certain features to the Imagestore 750's software architecture. The Imagestore 750 has a licensed "master control" option that makes this possible. Version 4.2 of the Imagestore 750 is required.

These features relate to the NV9000 router control system.

- NV9000's IP address.
- PGM destination.
- PST destination.
- Aux destination.
- (Optionally) monitor wall destinations.

A certain version of the Imagestore 750 Configurator is required to support these features. That version is v1.4 at present.

▲ These options in the Imagestore 750 Configurator refer to the PGM, PST, and aux **button rows** of iMC panels.

This simplified diagram illustrates the connections represented by the features:
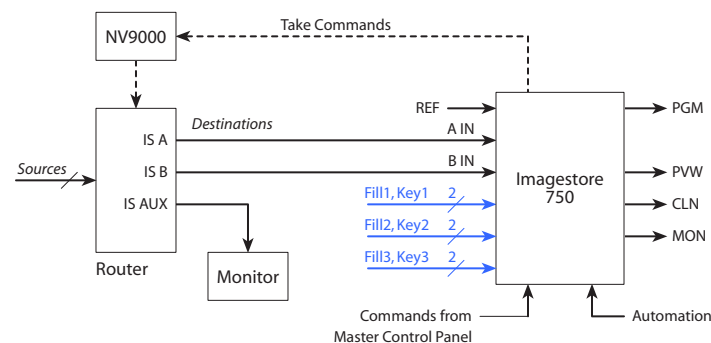
This section presents only a brief description. The *Master Control Installation Guide* has complete installation and connection details.

NV9000's IP Address

The IP address of the NV9000 router control system is an essential part of the Imagestore 750 configuration. Without it, the software cannot configure video and audio sources and the Imagestore 750 cannot function in the iMC system.

PGM and PST Destination

The PGM destination is an NV9000 destination that corresponds to the Imagestore 750's A input. It is this destination's video signal that is connected to the Imagestore 750's A IN connector.

Similarly, the PST destination is an NV9000 destination that corresponds to the Imagestore 750's B input. It is this destination's video signal that is connected to the Imagestore 750's B IN connector.

Each of the video inputs may have up to 16 embedded audio channels.

Aux Destination

The aux destination is an NV9000 destination that can be connected to a separate device (such as a waveform monitor). The aux destination does **not** connect to the Imagestore 750.

However, the Imagestore 750 can issue commands to the NV9000 to perform takes for main source buttons on the aux/user button row of a master control panel. When the operator presses a main source button in the aux/user button row, that source is switched to the designated "aux" destination.

In that way, the panel operator who is controlling an Imagestore 750 has an "extra" set of controls (i.e., the aux buttons) with which to view sources on a monitor or to route sources to some other device for some other purpose.

In systems that have multiple panels and multiple Imagestore 750s (and perhaps a Kaleido-X monitor wall) the aux destinations assigned to the Imagestore 750s can be overridden by an aux destination specified in a panel configuration. Thus, multiple Imagestore 750s can share a single aux destination (and a single auxiliary device connected at that destination).

Fill and Key

The Imagestore 750 has 4 downstream keyers (DSKs). Each DSK can apply stored keys or any of 3 external keys to the video signal upstream. Each key comprises a fill and key signal. They keys are governed by "CGT" (clip, gain, transparency) parameters. (The Fill3 and Key3 inputs are on the same connectors as the C and D inputs.)

It is possible to connect an external keyer input to an Intuition XG processor.

DVEs

The Imagestore 750 has a DVE option. You can order the Imagestore 750 with a "single" DVE option or a "dual" DVE option. With the dual option, the Imagestore 750's DVE processor performs operations with two windows instead of one.

You can store up to 97 DVE sequences (or "moves") in the Imagestore 750. The DVE processor can execute one of those sequences at any given time. DVE sequences are typically composed in the DVE Editor (which is part of the MCS software package that comes with the Imagestore 750).

Master control panels can be configured with up to 4 DVE buttons. Each can activation a specific DVE sequence. The DVE buttons are mutually exclusive. Only one DVE sequence can be processed in any given transition.

Source Groups

The Imagestore 750 configurator allows the definition of *source groups*. A source group is a named set of sources. Master control operators can select different sets of sources using 'Group Select' buttons.

Each group maps NV9000 sources to consecutive integers starting at 1. The group can have "holes" — you need not assign a source to an integer.

When the master control operator selects a source group, the sources in the group are mapped to the preset, program, and aux buttons of the panel one-to-one. The button at the left (i.e., button 1) corresponds to source 1, button 2 to source 2, and so on. The mapping is limited either by the minimum of the number of main source buttons or by the number of sources in the group. Where the group has holes, the main source buttons are disabled.

The source groups themselves are named and listed in the Imagestore 750 configurator. The source groups have an implicit numbering and ordering ***starting at 0***. When the panel configurer defines a 'Group Select' button, the group selected by the button is identified by its number in the ordering within the Imagestore 750 configurator: 0, 1, 2, 3 and so on.

Monitor Wall

See [Monitor Wall](#) on page 164 for detailed information.

When panel operators select different source groups, it is convenient to have the system's monitor wall (if it has one) switch to the same sources. The operator's panel must be configured with the NV9000 destinations that correspond to individual monitors in the monitor wall. That configuration option is part of the MCS Panel Configuration Editor.

When an operator selects a source group, the Imagestore 750 issues a set of take commands routing the sources in the source group to the corresponding destinations driving the monitors.

Because the iMC-Panel-200 and iMC-Panel-GUI have potentially 16 source buttons and the iMC-Panel-300 has potentially 24 source buttons, up to 24 NV9000 destinations may be reserved for the monitor wall (or the master control portion of a monitor wall). The monitor wall of course can have hundreds of monitors. Master control can identify up to 24 of them and cause the sources displayed on those to change when the operator presses a 'Group Select' button.

Kaleido-X

Master control can be integrated with a Kaleido-X multi-viewer (or monitor wall) in such a way that master control can trigger a Kaleido-X *re-layout*. The Kaleido system defines *rooms* (in which a multi-viewer exists) and *layouts* (the organization of views on the multi-viewer) for each room.

Panel operators can have available 'Kaleido-X Layout' buttons that trigger multi-viewer re-layout. A channel change can also trigger a multi-viewer re-layout.

Control panels, when they are controlling Imagestore 750s, can cause the *source content* of a monitor wall to change when the operator changes the current source group. In contrast, a multi-viewer re-layout changes the *organization* of the sources on the display.

Preset Tally

Panel configurations have an option that applies to panels when they are controlling Imagestore 750s. This option governs the way a panel's preset button row tallies before, during, and after tran-

sitions. Some operators like the "PresStation" method of arming DVEs, DSKs, and voice-overs on the preset bus. Other operators like the traditional method (which is used for MCEs and MCPMs).

The option is specified in the 'Advanced' configuration page of the MCS Panel Configuration Editor. If the option is enabled, it is imperative that the 'Active Preview Keyers' parameter of the Imagestore 750 configuration be set to true.

6. Imagestore 750

Use in the Combined Master Control System

7. Control Panels

Chapter 7 describes the master control panels. It presents the following topics:

- Overview
- iMC-Panel-300
- iMC-Panel-200
- iMC-Panel-100
- iMC-Panel-GUI

Overview

Presently, the Miranda master control system include these panel types:[1]

- iMC-Panel-300 — Full-size control panel.
- iMC-Panel-200 — Compact control panel.
- iMC-Panel-100 — 3RU control panel with separate display.
- iMC-Panel-GUI — Software control panel.

None of the control panels do any significant amount of processing; it is the transition processor (Imagestore 750, MCPM, or MCE) that performs almost all master control processing. A control panel bears the same relationship to a transition processor that a keyboard and monitor have to a PC. A panel sends commands to a transition processor (over Ethernet) and receives and displays status from the transition processor.

Each panel has two kinds of features:

- Features for transition processors.
- Features for the panel itself.

Features for the Transition Processor

Many of the buttons and knobs in the surface of a control panel were developed to match the functions of an MCPM or an MCE. For instance, the program and preset button rows match the program and preset buses of the MCPM or MCE.

These features were then adapted for use with the Imagestore 750. For instance, the aux row supports the auxiliary device capability of the Imagestore 750.

Buttons for MCEs and MCPMs

The program button row matches the program bus of the MCPM or MCE.

The preset button row matches the preset bus of the MCPM or MCE.

---

1. There are other *legacy* panels. It is possible that your system might include a legacy panel.

The preview/user button row matches the MCE's preview bus A. (Preview bus B follows bus A.)

The aux/user button row matches the MCE's aux bus (usually) and includes "aux delegate" buttons that control the behavior of the main sources of the aux/user buttons. (When the aux delegate selected is not "aux bus A" "aux bus B," the aux buttons do not correspond to the aux bus, but represent main sources that can be used as squeeze images for preset or preview.)

The audio sections of a control panel match the audio features of an MCPM or MCE.

Buttons for Imagestore 750s

The program button row matches the program path of the Imagestore 750.

The preset button row matches the preview path of the Imagestore 750.

The preview/user button row is a set of customer-configurable buttons.

The aux/user button includes (1) a set of main sources that can be directed to an auxiliary device such as a waveform monitor and (2) a set of customer-configurable buttons. (Aux buttons can be configured to follow the program or preset bus.)

The audio sections of a control panel match the audio features of an Imagestore 750.

Features for Any Transition Processor

All panels can have transition rate and transition type buttons. Transition rates are defined in the Imagestore 750, MCPM, or MCE and the transition types are those supported by the Imagestore 750, MCPM, or MCE. The behavior of video effects and audio overs are defined in the Imagestore 750, MCPM, or MCE configuration.

Refer to Chapter 4, MCPMs, on page 41, for information about MCPMs, to Chapter 5, MCEs, on page 75, for information about the MCEs, and to Chapter 6, Imagestore 750, on page 95, for information about the Imagestore 750s. (In many cases, MCPM features apply also to MCEs.)

All control panels have GPI input and output functions. Hardware control panels have 2 hardware inputs and 2 hardware outputs; software control panels (GUIs) of course do not. All control panels, including the GUIs, can read the two GPI inputs from the MCPM or MCE and control the two GPI outputs in the MCPM or MCE.

The Imagestore 750s have GPI inputs and outputs, but these cannot be controlled from a control panel explicitly. Note that operators can execute GPI macros from a control panel.

All control panels can obtain the emergency bypass status from an MCPM or MCE and control the emergency bypass relay of an MCPM or MCE.

The Imagestore 750 has a bypass capability, different from that of the MCPM or MCE. Its status is not accessible from the control panel.

The panels support *audio macros* for MCEs. Audio macros are button functions that create routes in the internal 16×16 audio switching matrix of MCEs. Audio macros are disabled when the control panel is not controlling an MCE.

The panels also support Imagestore 750 macros.

Features for the Panel

The buttons and knobs not devoted to functions of the transition processor under control are for the panel itself. For instance, a panel-lock button applies to the panel.

Panel-specific GPIO, Channel, Gang Channel, and Flip-Flop buttons control other panel-only functions.

Kaleido-X

Master control can be integrated with a Kaleido-X multi-viewer (or monitor wall) in such a way that master control can trigger a Kaleido-X *re-layout*. The Kaleido system defines *rooms* (in which a multi-viewer exists) and *layouts* (the organization of views on the multi-viewer) for each room.

Panel operators can have available 'Kaleido-X Layout' buttons that trigger multi-viewer re-layout. A channel change can also trigger a multi-viewer re-layout.

Control panels, when they are controlling Imagestore 750s, can cause the *source content* of a monitor wall to change when the operator changes the current source group. In contrast, a multi-viewer re-layout changes the *organization* of the sources on the display.

Preset Tally

Panel configurations have an option that applies to panels when they are controlling Imagestore 750s. This option governs the way a panel's preset button row tallies before, during, and after transitions. Some operators like "PresStation" method of arming DVEs, DSKs, and voice-overs on the preset bus. Other operators like the traditional method (which is used for MCEs and MCPMs).

The option is specified in the 'Advanced' configuration page of the MCS Panel Configuration Editor.

Menus

All control panels have a menu. The menu area (an LCD on hardware panels) presents a number of different graphical displays that include buttons, scroll bars, and thumbnails. Associated with the menu(s) are 8 knobs on the hardware panels (and 8 knob images or "proxies" in the GUI) for the adjustment of parameter values.

Operators use the menu for several purposes:

- To select a main source.
- To select or change a video effect setting.
- To select an audio source.
- To perform diagnostics, updates, and status queries.
- To change the audio levels and mix.
- To select audio sources for monitoring.
- To select a channel.

All panels allow "preset black" (PB) transition types.[2] However, none of the panels support the use of the TLA (transition lever arm) which actually performs PB transitions and other manual transitions. If the panel is configured with a PB transition type, it substitutes a normal transition for the PB transition. This policy affects on MCEs and MCPMs.

---

2. The panels accept PB transition types because the panels can be installed in systems that do use TLAs and PB transitions. Other (legacy) panels in such systems can initiate a PB transition. The transition type belongs to the MCE or MCPM, not the panel. If a panel shares that MCE or MCPM, it will attempt to use the transition type currently selected in the MCE or MCPM.

Features for MCEs Only

The panels support (1) machine control with pre-roll and (2) Intuition XG functions.

▲ Machine control and pre-roll are not available with the Imagestore 750.

▲ The Imagestore 750 can be connected to Intuition XG processors and use the video clips generated in the processors. However that capability is not directly controllable from control panels. However, panel operators can select clips from the Intuition XG.

Machine Control

Panels can be configured with machine control buttons. There are 10 machine control button types. Main sources (presumably VTR sources or similar) can be configured with a pre-roll constant. MasterConfig allows a choice for the method of machine control.

▲ Machine control buttons are disabled in panels that are not controlling MCEs.

Transitions being set up are called pre-roll transitions if they include at least one pre-roll source. For pre-roll transitions, the transition button turns red and blinks during the pre-roll period of a transition. The pre-roll period can be up to several seconds.

Intuition XG

▲ This feature applies only to MCEs. Imagestore 750s can use Intuition XG clips in other ways.

The control panels can be configured with (up to 4) XG keyer layer buttons on the program bus, with matching XG keyer layer buttons on the either the preset bus or the preview bus, depending on MCE configuration. (The XG layer buttons act like other video effect buttons. However, for XG layer buttons, the MCE "steals" one or two of its keyers to support input from the Intuition XG processor. The buttons for the "stolen" keyers are disabled on the panel.

▲ XG layers are available only for MCEs that have Intuition XG enabled and that are connected to Intuition XG equipment.

See <u>Intuition XG</u> on page 147 for more detail.

Features for Imagestore 750s Only

The panels, when controlling Imagestore 750s, use the aux button row to direct main sources to any auxiliary device such as a waveform monitor.

In addition, the Imagestore 750 allows a number of main source groups. Panel operators may select different groups using 'Group Select' buttons. If the panel configuration allows it, the sources in the group can appear on a monitor wall and change when the operator selects a different group.

Imagestore 750s provide 4 DSKs (downstream keyers). The keyers can process external key sources or internally stored key sources (clips, stills, animations, etc.).

Imagestore 750s can include DVEs (as an option). Control panels can have up to 4 DVE buttons (which can be enabled or disabled). Each DVE button is coupled with a DVE stored in the Imagestore 750. Operators cannot change the DVE assignments. DVEs are created and managed with the DVE Editor that ships with the Imagestore 750.

When a panel is controlling an Imagestore 750, it provides a number of menu activation buttons. When an operator presses a menu activation button, the associated menu appears on the touchscreen (or the menu area, in the case of the GUI.

Panel Summary

iMC-Panel-200

The iMC-Panel-200 has 4 rows of 16 buttons at the front. Some of those buttons can be configured as main source buttons, video effect buttons, or audio over buttons, as needed. All buttons have color-coded LCD legends.

The iMC-Panel-200's touchscreen is large and has 8 menu knobs. The iMC-Panel-200 has a joystick for fine visual control over certain video effects and for scrolling.

MCEs and MCPMs

When the panel is controlling an MCE, it supports the MCE's preview and aux buses with preview and aux button rows and provides control over enhanced squeezeback parameters such as border width and color, and dual-image squeezeback.

The panel has a metering input that feeds a "Live Levels" display.

Imagestore 750s

When the panel is controlling an Imagestore 750, it supports the Imagestore 750's auxiliary device control feature and provides selectable source groups. If the panel is so configured, it can cause the sources in a selected group to appear on a monitor wall.

The panel has control over the Imagestore 750's DSKs and DVE and can select among many DSK sources.

iMC-Panel-300

The iMC-Panel-300 has 4 rows of 24 buttons at the front. Some of those buttons can be configured as main source buttons, video effect buttons, or audio over buttons, as needed. All buttons have color-coded LCD legends.

The iMC-Panel-300's touchscreen is large and has 8 menu knobs. The iMC-Panel-300 has a joystick for fine visual control over certain video effects and for scrolling.

The panel has a metering input that feeds "live audio levels" display.

MCEs and MCPMs

When the panel is controlling an MCE, it supports the MCE's preview and aux buses with preview and aux button rows and provides control over enhanced squeezeback parameters such as border width and color, and dual-image squeezeback.

The panel has a metering input that feeds a "Live Levels" display.

The panel has an audio monitoring/metering control section that has 12 buttons that select the audio monitoring source. The audio monitors (A and B) each have a gain control and a "dim" button.

Imagestore 750s

When the panel is controlling an Imagestore 750, it supports the Imagestore 750's auxiliary device control feature and provides selectable source groups. If the panel is so configured, it can cause the sources in a selected group to appear on a monitor wall.

The panel has control over the Imagestore 750's DSKs and DVE and can select among many DSK sources.

The 12 buttons in the panel's audio monitoring/metering section are customer-configurable buttons and have nothing in particular to do with audio. The audio monitors (CLN and MON respectively) each have a gain control. The "dim" buttons do not apply to Imagestore 750 audio.

iMC-Panel-GUI

The iMC-Panel-GUI is designed so that it can run on a PC with a touchscreen.

Controlling an Imagestore 750

Controlling an MCE or MCPM

The GUI's menu area is large and has 8 buttons that function as menu "knobs."

When it is controlling an Imagestore 750, the appearance of the GUI differs from when it is controlling an MCE or MCPM, as shown above.

MCEs and MCPMs

The GUI supports the MCE's preview and aux buses, and provides control over enhanced squeeze-back parameters such as border width and color, and dual-image squeezeback.

It has dedicated audio controls (at the right).

Imagestore 750s

The GUI's aux buttons supports the Imagestore 750's auxiliary device. The GUI provides control over enhanced the Imagestore 750's DSKs and DVE.

The GUI, when it controls an Imagestore 750, can cause the currently selected sources to appear on a monitor wall.

Control Panel Features

Master control panels offer many standard features. (In most cases, the features are those of the transition processor under control.)

- Channel selection, including 'no channel' mode.

  A channel selection button assigns the control panel to a specific channel. A channel is equivalent to one transition processor (Imagestore 750, MCE, or MCPM). When you press a channel selection button, certain parameters of the transition processor are downloaded to the panel. (It takes about one second.) Source names appear on the button legends and in the menus.

  A channel can communicate with up to 4 control panels concurrently. Any combination of up to 4 control panels (hardware or software) may acquire the same channel at the same time. If a fifth control panel attempts to connect to a channel that already has 4 control panels connected to it, the channel ignores the fifth control surface's request for connection.

  ▲ Each tally processor[3] in a master control network counts as one of the control panels.

The channel broadcasts it status to all panels connected to it. An operator will see status changes initiated by another panel connected to the same channel.

- Ganged channels.

A "gang" button lets the operator couple two or more channels for "ganged" channel operation.

When channels are ganged, any action performed on a "main" channel is also performed on all selected "follower" channels. (Follower channel buttons tally amber; the main channel button tallies green.)

A control panel can control individual channels or "gang" channels together. For further flexibility, channels can be preset individually, and *then* ganged, letting you simultaneously transition *different* inputs to each channel.

Because each channel has its own configuration, source assignments for each channel can be different. Thus, the "main" channel and "follower" channels can perform similar or different operations — even if preset while in gang mode.

A panel can be configured with a default channel. The default channel can be configured so that, whenever it is selected, regardless of the method, it is automatically ganged with up to 3 other channels. This feature is called "automatic gang mode."

▲ Automatic gang mode is not available for certain legacy panels (CFCP, FFCP, and PC GUI).

- No channels.

A "no-channel" button completely disconnects a control panel from the master control network. No MCPMs remain connected to the panel. A "no channel" button is typically used for diagnostic purposes, so that the on-air signal is not affected.

- Sharing channels.

Panels can be configured to share — or not to share — Imagestore 750s. Panels that do not share can preempt another panel, of lower priority, if it wants to a acquire that channel. Panels that do share can be denied access to channels "owned" by non-sharing panels.

Up to 4 panels may share a single channel.

- Salvos.

Control panels can trigger a router salvo each time a channel change occurs. A salvo is a stored set of commands that execute in sequence. Refer to the *NV9000-SE Utilties User's Guide* for instructions on programming system salvos.

You can also execute salvos that are assigned to buttons.

- Panel Lock. A "panel lock" button locks the Control Panel, preventing inadvertent switching. Pressing the button again unlocks the panel. The panel continues to reflect the status of the select MCPM.

- Automation Off. An "automation off" button is a toggle that turns automation off or on.

- GPIO.

A panel can have GPI inputs or outputs buttons as a customer-defined option.

A "GPI-panel" output button triggers one of 2 relay outputs in the panel. Panel-specific outputs are useful for controlling a resource such as a cart machine. Panel-specific outputs can operate across all channels.

A "GPI-panel" input button provides the status of one of two panel inputs.

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3. A third-party device, servicing 32 optically isolated inputs and 32 (optically isolated) solid-state relay outputs.

A "GPI-MCPM" output button triggers one of 2 relay outputs in the current MCPM or MCE. We say these are "channel-specific" outputs. (The MCPM or MCE must be configured for this.)

A "GPI-MCPM" input button provides the status of one of the two inputs of the current MCPM or MCE.

- Audio functions.

The control panels have knobs (or functions) that allow an operator to adjust audio levels or audio monitoring levels.

Most control panels also allow an operator to perform "channel swaps" and to change the gain (and inversion) of any of the internal audio channels.

(The audio section of an MCPM can be considered a crosspoint matrix of 8 input channels and 8 output channels: any input can be switched to any output or combination of outputs. MCEs and Imagestore 750s have 16×16 audio crosspoint matrices.)

  ▲ Audio functions for Imagestore 750s are different from audio functions for MCEs and MCPMs.

- Router pre-select.

  ▲ Router pre-select applies only to MCEs and MCPMs.

One of the most important features of Miranda master control is its ability to perform takes in a upstream router, redirecting any of hundreds (or even thousands) of router source to a master control input where it can be switched to program output.

- Breakaway.

  ▲ Breakaway applies only to MCEs and MCPMs.

Operators can perform transitions involving a combination of video and audio from different sources, as well as normal transitions (video and audio from a single source).

- Configuration and setup.

A control panel provides a way for operators to view its status and software revision numbers, to redefine its IP address, to start, stop, or restart the panel, to test the panel, and to view panel log files.

The methods differ from panel to panel.

- Preview/user and aux/user buttons. For MCEs, the panels have a preview button row that control main sources, video effects, and audio overs on the MCE's preview bus. (The preview bus does not affect program content.) The aux button row typically direct main sources to the MCE's aux bus, but can be used for other purposes.

For panels that control Imagestore 750s, the button rows are labeled 'Preview/User' and 'Aux/ User'. The function of the button rows when the panel is controlling an Imagestore 750 is different from the function of the button rows when the panel is controlling an MCE or MCPM.

- Machine control and pre-roll functions and buttons. MCEs can be configured with machine control enabled and pre-roll enable, or both. Imagestore 750s and MCPMs cannot.

Each individual main source defined for the MCE can be associated with a machine control type, machine control options, and pre-roll value.

All new panels have machine control buttons and perform machine control operations when pre-roll sources transition to the program bus.

The transition button changes color and legend when a pre-roll transition is pending (i.e, when the preset bus has at least one pre-roll source.

- Intuition XG layer buttons and functions. MCEs can be connected to Intuition XG equipment and configured for Intuition XG functions. MCPMs cannot. The Intuition XG hardware and software provide storage and execution of video keys (with fill and key signals).

  Although Imagestore 750s can be connected to, and use, Intuition XG equipment, control panels have no way to control such connections although XG clips can be selected as DSK sources.

- Live level display (integrated visual audio monitor). The audio metering input(s) take 16-channel embedded audio from *any source* and display the levels — in real time — on the panel's LCD. Although the iMC-Panel-GUI cannot not support this, the iMC-Panel-200, and iMC-Panel-300 have a 16-channel audio monitor input.

  If the audio source for the live levels display is an audio monitor or meter output of the MCE under control at the panel, the live level display shows that output and, as. you switch the source to the monitor/meter from program to preset or preview, the live levels display will also switch. If the audio for the live levels display is any other source, of course, you cannot do that.

  ▲ When a panel is controlling an Imagestore 750, the audio metering input is disabled. The panel displays audio levels for the Imagestore 750 by other means.

- 16-channel audio support.

  All panels can manipulate the 16 channels of MCEs and Imagestore 750s as well as the 8 channels of other MCPMs). Operators may adjust the gain and inversion of audio data, make changes to the internal audio crosspoint.

  The panels also support a small set of audio macros. (Audio macros are predefined audio channel swap configurations.)

- Audio macro buttons. In MCEs only, up to 16 audio "macros" — functions — execute predefined crosspoint mappings and can change channel gain. Macros are defined in the MCS Panel Configuration Editor. Refer to the *MCS Panel Configuration Editor User's Guide* for information.

iMC-Panel-200

The iMC-Panel-200 is a configurable master control panel, 19.7″ wide × 6.96″ high × 20.21″ deep. It has only one mounting option: it sits on a console or desk top.

The panel can control Imagestore 750s as well as MCEs and MCPMs. It has silkscreen markings that are appropriate for both Imagestore 750s and MCEs and MCPMs.

Arrayed on the front of the panel are 92 color-coded LCD buttons, a touchscreen with 8 associated control knobs, 4 audio knobs, and a joystick. Each LCD button shows 3 lines of text, 8 characters per line. The LCD buttons are green, amber, red, blue, white, violet, or aqua—off, low-tally, or high-tally. Red is generally used to indicate an error condition.

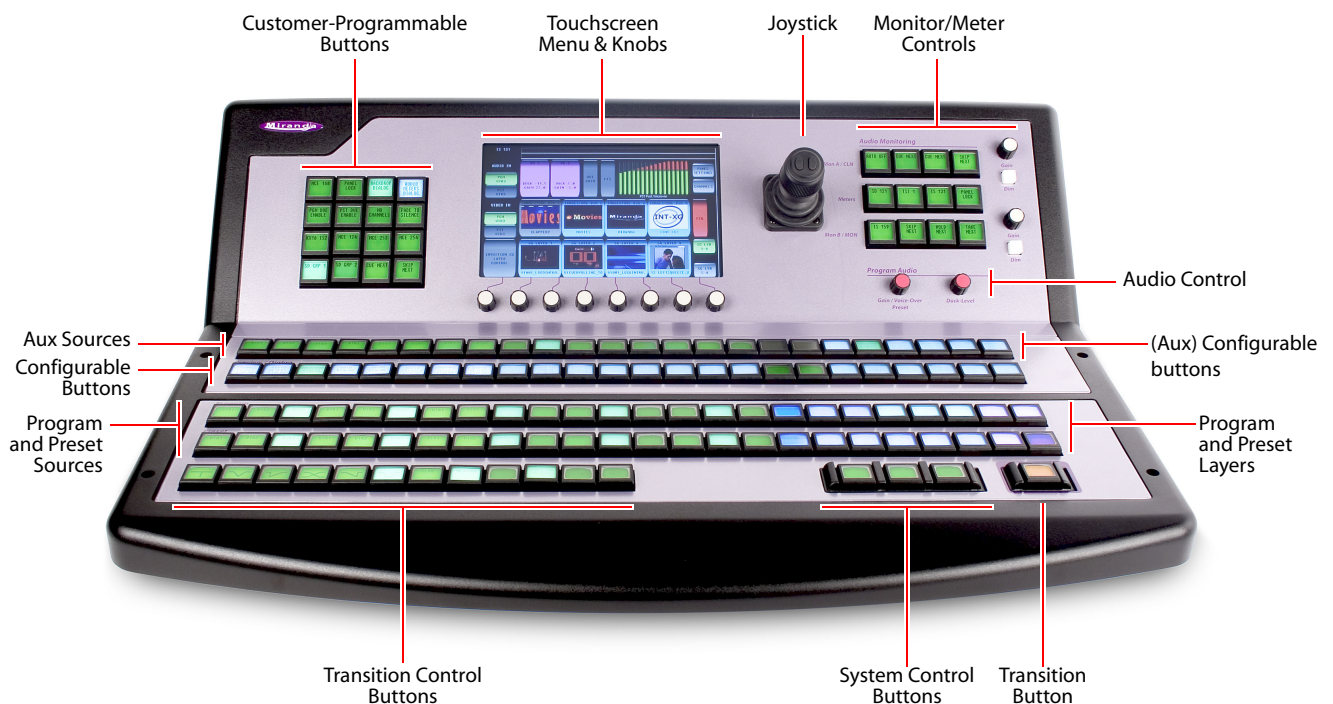Figure 7-1. iMC-Panel-200 (front view)

The iMC-Panel-200 has 4 rows of 16 buttons. These rows are labeled 'Preset', 'Program', 'Preview/User', and 'Aux/User'.

When the panel is controlling an MCE, the 'Preview/User' buttons and 'Aux/User' buttons are active (enabled) and perform functions that control the preview bus and aux bus of the MCE.

For MCPMs, the 'Preview/User' buttons and 'Aux/User' buttons are inactive.

For Imagestore 750s, the 'Preview/User' buttons are all customer-definable and the 'Aux/User' buttons comprise *aux* buttons and customer-definable buttons. The aux buttons can direct main sources to an auxiliary device such as a waveform monitor.

All 4 button rows are configurable to one degree or another.

The panel has 2 monitor level knobs. (The monitoring functions for Imagestore 750s are different from those for MCEs and MCPMs.)

The panel has 2 program audio knobs. (The audio functions for Imagestore 750s are different from those for MCEs and MCPMs.)

The panel has 3 system control buttons and 8 transition control buttons in the very front row. These buttons are all configurable. (They are called the "bottom row" buttons in the MCS Panel Configuration Editor.)

The panel has 16 customer-programmable buttons to the right of the touchscreen.

The surface of the panel is light gray-purple and very dark gray.

iMC-Panel-200 for MCEs and MCPMs

When the panel is controlling an MCE or an MCPM, the preset and program rows have identical buttons. On these 2 buses, the leftmost buttons are main source buttons and the rightmost buttons can be configured as video effects and audio overs. All 16 buttons could be main sources. Up to 8 buttons can be video effects (including 2 XG keyer layers). Up to 2 buttons can be audio overs. The video effect and audio over buttons match on both of these buses.

When the panel is controlling an MCE, the 'Preview/User' buttons are active. They are identical to the buttons of the preset and program rows and control the MCE's preview bus. When the panel is controlling an MCPM, the 'Preview/User' buttons are disabled.

The 'Aux/User' buttons are different. The leftmost buttons are main source buttons and these correspond to the main source buttons on the preset, program, and preview/user buses. The rightmost 'Aux/User' buttons not committed to main sources can be "aux delegates"—buttons that select the function of the aux button row. By default, the 'Aux/User' buttons control the aux output of the MCE. When the panel is controlling an MCPM, the 'Aux/User' buttons are disabled.

With a "bank select" button, the operator can switch between two banks of main sources. The button mnemonics change when the sources are switched. The bank selection button itself turns green or amber depending on which bank is selected.

iMC-Panel-200 for Imagestore 750s

When the panel is controlling an Imagestore 750, the preset and program rows have identical buttons. On these 2 button rows, the leftmost buttons are main source buttons and the rightmost buttons can be configured as video effects and voice-overs. All 16 buttons could be main sources. Up to 8 buttons can be video effects. Up to 2 buttons can be audio overs. The video effect and audio over buttons match on both of these button rows.

The 'Preview/User' buttons are all customer-definable buttons.

The leftmost buttons of the 'Aux/User' row are main source buttons and these correspond to the main source buttons on the preset and program button rows. The rightmost buttons of the 'Aux/ User' row are all customer-definable. The aux row can direct the selected main source to an auxiliary device such as a waveform monitor.

When the panel is controlling an Imagestore 750, "group select" buttons allow the operator to select different groups of sources. The mnemonics of the sources (taken from the NV9000 control system) appear on the main source buttons. Depending on an Imagestore 750 option, the sources themselves are displayed on a monitor wall and change when different source groups are selected.

iMC-Panel-200 Buttons

Panel buttons are large and appear in several colors (green, amber, red, blue, white, violet, or aqua) and 3 brightness levels: off, low-tally, and high-tally. They are dynamically re-legendable, displaying 3 lines of text, 8 characters per line. (The text might be blank.)

The buttons allow you to select channels, choose sources, options, video effects, and audio overs, and perform other functions. Some buttons can serve as status buttons.

Pressing a deselected toggle button will cause it to become selected. Pressing a selected toggle button will make it deselected.

Some groups of buttons operate as a mutually exclusive set. Pressing a deselected button will cause it to become selected and all other buttons in the set to become deselected. There are two types of mutually exclusive buttons:

1 Pressing a selected button makes it deselected. (All other buttons in the set remain deselected.)

2 Pressing a selected button leaves the button selected.

The iMC-Panel-200 has a menu system built into its LCD touchscreen. It is through the menu that you can adjust operating parameters such as audio levels and video effect settings. If an Imagestore 750, MCE, or MCPM configuration permits, the operator may also modify video effect settings.

The iMC-Panel-200's "Transition" button (orange) is large, obvious, and protected against accidental presses.

iMC-Panel-200 Knobs

Turning a knob clockwise increases the associated value until the maximum value is reached. Turning the knob counter-clockwise decreases the associated value until the minimum value is reached. After you reach either extremity, turning the knob has no effect.

Functional Sections of the iMC-Panel-200

Following are brief descriptions of each section. Refer to Figure 7-1 on page 113.

1 Customer-programmable buttons.

The customer-programmable section includes 16 function buttons. Each may be programmed to perform functions such as channel selection or audio control.

The customer-programmable buttons support one set of functions for MCEs and MCPMs and another set of functions for Imagestore 750s.

2 Touchscreen menu.

Using the color LCD touchscreen, you can access all secondary system functions such as key setup and audio settings. Associated with the touchscreen are 8 rotary knobs for selection and adjustment of parameters.

When the panel is controlling an MCE or MCPM, the touchscreen displays a set of menus appropriate for MCEs and MCPMs. When the panel is controlling an Imagestore 750, the touchscreen displays a set of menus appropriate for Imagestore 750s.

3 Joystick.

In some instances, the joystick allows (1) visual adjustment of video effect parameters and (2) scrolling. The joystick has 2 buttons and a knurled cylinder that the operator turns to control a third axis. (The third axis of the joystick is not used for Imagestore 750s.

4 Audio monitor controls.

When the panel is controlling an MCE or MCPM, the monitor knobs control the gain of monitor channels A and B of the MCE or MCPM. When the panel is controlling an Imagestore 750, the monitor knobs control the gain of the Imagestore 750's CLN and MON outputs.

5 Program audio control.

The program audio section includes 2 knobs for adjusting main and over audio of program output.

The knob's functions for MCEs and MCPMs are different from the functions for Imagestore 750s.

6 Program and preset button rows.

The program buttons correspond to what is currently on program output. The preset buttons allow you to premix a source with video effects and audio overs in preparation for a transition to the program bus.

The program and preset buttons rows are used for main source selections, video effects, and audio overs.

The leftmost buttons are main source buttons. The rightmost buttons can be configured as video effects or audio overs. (Video effects and audio overs cannot be duplicated but might be absent.)

7 'Preview/User' button row.

For Imagestore 750s

The button row is a set of customer-definable buttons when the iMC-Panel-200 is controlling an Imagestore 750.

For MCEs

The preview bus (in the MCE) and the 'Preview/User' button row (of the iMC-Panel-200) allow an operator to view video sources in combination with video effects and audio overs without affecting program or preset output and therefore, without interfering with automation.

The preview button row is just like the preset and program button rows. Operating the preview bus is the same as operating the preset bus. The preview bus output appears at 'Preview Output A' of the PVW backplane. (Preview Output B is presently a copy of preview output A.)

▲ The preview button row is disabled when the iMC-Panel-200 is controlling an MCPM.

8 'Aux/User' button row.

For Imagestore 750s

The Aux/User button row comprises main source buttons on the left and (optionally) customer-definable buttons on the right. The main source buttons direct sources to an auxiliary device such as a waveform monitor. (The auxiliary device is not a requirement.)

For MCEs

There are 2 aux buses in the MCE, bus A and bus B. Each has an output on the CORE backplane. Either one or both of these can be configured to output what is selected on the aux button row of a control panel. These buses can be also configured for other functions ***not*** related to the panel's aux button row.

If the aux button row is not completely populated with main source buttons, some number of "aux delegate" buttons can be configured at the rightmost end of the aux button row. (If you do

not have at least one aux delegate button, what happens when you press a main source on the aux button row is difficult to determine.)

▲ The aux button row is disabled when the iMC-Panel-200 is controlling an MCPM.

The aux delegate buttons control what the aux button row does. There are 6 aux delegate types:

• Aux A bus.

The operator can direct any of the main sources available to the MCE's Aux A bus. (actually whichever aux bus was configured to receive a source when the operator presses the Aux A delegate).

• Aux B bus.

The operator can direct any of the main sources available to the MCE's Aux B bus. (actually whichever aux bus was configured to receive a source when the operator presses the Aux B delegate).

• Preset Squeeze Background.

The operator can select any of the main sources available as the preset squeeze background image.

• Preset Squeeze Image 2

The operator can select any of the main sources available as the preset squeeze image 2.

• Preview Squeeze Background.

The operator can select any of the main sources available as the preview squeeze background image.

• Preview Squeeze Image 2.

The operator can select any of the main sources available as the preview squeeze image 2.

In all of these cases, the operator selects the source on the aux button row.

▲ If a squeeze image is configured with an "internal black" background or an internal black image 2, the background or image 2 is fixed (constant) and cannot be a main source.

9 Transition control buttons.

By convention, the 8 transition control buttons include 5 transition types and 3 transition rates. These buttons are configurable, however.

10 System control buttons.

These 3 buttons are system control buttons, by convention, but they are configurable.

11 Transition button.

Pressing the transition button initiates a transition in the transition processor currently controlled by the iMC-Panel-200. Operators can change the transition rate and type.

MCEs and MCPMs

The transition button displays the transition type (as a graphic) and the transition rate (in text). 'Cut' transitions involve no rate and therefore display no rate text.

The button is bright orange for non-pre-roll transitions. It is low-tally red and the word "Preroll" appears on the button when a pre-roll transition is pending (for MCEs only).

Imagestore 750s

The transition button displays the word "Take." The button is orange. During a transition, it is high-tally.

(See Transitions on page 58.)

iMC-Panel-200 Connectors

At the rear of the panel are 2 power connections, an Ethernet port, an aux port (DB15), a USB port, a GPI/alarm connector (DB25), and an audio metering input.
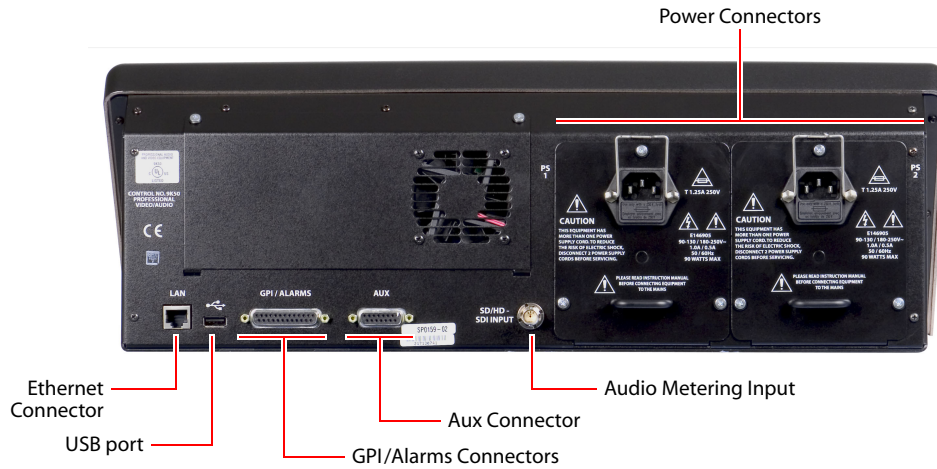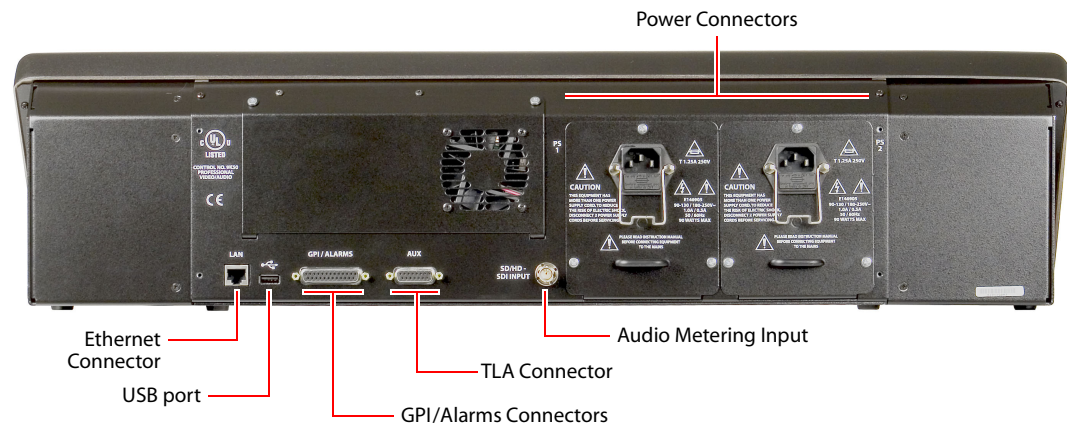

Figure 7-2. iMC-Panel-200 (rear)

Power

There are 2 AC connectors, PS1 and PS2, for redundancy. You need not use both if you are not concerned with redundancy.

Ethernet

The panel has one RJ-45 Ethernet port. The panel connects to the Ethernet switch of the master control network.

It is on this network that the iMC-Panel-200 communicates with transition processors and with the configuration software. You (or your system administrator) must provide a unique IP address for the panel. Use the Panel ID menu under the Panel Menu to set the IP address and IP subnet mask. The default IP address is 192.168.7.100 and the subnet mask must always be 255.255.255.0.

GPI/Alarm

The panel has a DB25 connector that supports GPI inputs, GPI outputs, and alarms:
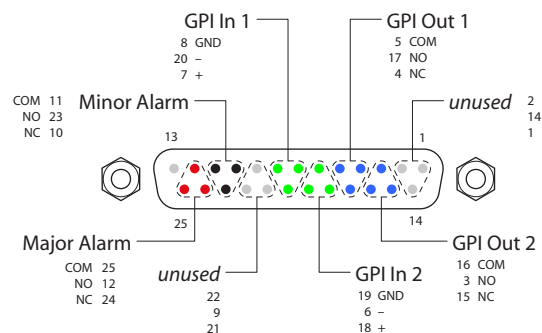
Refer to the GPI section in either of the *iMC-Panel-200 Operator's Guides* for connection information. Also see GPI/Alarms on page 192.

Aux Connector

The aux port is *reserved for future development*.

USB Port

The USB port is *reserved for future development*.

Audio Metering Input

The iMC-Panel-200 has a BNC connector to which you connect audio metering input (audio embedded in an SD or HD video signal).

When the panel is controlling an MCE or an MCPM, the metering input feeds the 'Live Levels' display under the panel's audio menu. The metering output of an MCE is a suitable audio source for the 'Live Levels' display. The audio metering input is ***not*** generally related to the iMC-Panel-200's audio metering outputs. However, if inputs come from an MCE under control of the panel, then there is a relationship.

When the panel is controlling an Imagestore 750, the metering input is unused.

iMC-Panel-300

The iMC-Panel-300 is a configurable master control panel, 28.25″ wide × 6.96″ high × 20.14″ deep. It has only one mounting option: it sits on a console or desk top.

The panel can control Imagestore 750s as well as MCEs and MCPMs. It has silkscreen markings that are appropriate for both Imagestore 750s and MCEs and MCPMs.

Arrayed on the panel are 140 color-coded LCD buttons, a touchscreen menu (LCD) with 8 associated control knobs, 2 white toggle buttons, 4 audio knobs (a.k.a. rotary encoders), and a joystick. Each LCD button shows 3 lines of text, 8 characters per line. The LCD buttons are either green, amber, red, blue, white, violet, or aqua — off, low-tally, or high-tally. Red is generally used to indicate an error condition.

Figure 7-3. iMC-Panel-300 (front view)

The panel has 4 rows of 24 buttons. These rows are labeled 'Preset', 'Program', 'Preview/User', and 'Aux/User'.

When the panel is controlling an MCE, the 'Preview/User' buttons and 'Aux/User' buttons are active (enabled) and perform functions that control the preview bus and aux bus of the MCE.

For MCPMs, the 'Preview/User' buttons and 'Aux/User' buttons are inactive.

For Imagestore 750s, these 'Preview/User' buttons are all customer-definable and the 'Aux/User' buttons comprise *aux* buttons and customer-definable buttons. The aux buttons can direct main sources to an auxiliary device such as a monitor.

All 4 button rows are configurable to one degree or another.

The panel has 2 program audio knobs. (The audio functions for Imagestore 750s are different from those for MCEs and MCPMs.)

The panel has 3 system control buttons and 12 transition control buttons in the very front row. These buttons are all configurable. (They are called the "bottom row" buttons in the MCS Panel Configuration Editor.)

The panel has 16 customer-programmable buttons to the left of the touchscreen.

The panel has an audio monitor/meter section to the right of the touchscreen. This section has 12 buttons. For panels controlling MCEs and MCPMs, the buttons select the sources for the monitor and meter outputs. For panels controlling Imagestore 750s, these are simply customer-configurable buttons.

The surface of the panel is light gray-purple and very dark gray.

iMC-Panel-300 for MCEs and MCPMs

When the panel is controlling an MCE or an MCPM, the preset and program rows have identical buttons. On these 2 buses, the leftmost buttons are main source buttons and the rightmost buttons can be configured as video effects and audio overs. All 24 buttons could be main sources. Up to 8 buttons can be video effects (including 2 XG keyer layers). Up to 2 buttons can be audio overs. The video effect and audio over buttons match on both of these buses.

When the panel is controlling an MCE, the 'Preview/User' buttons are active. They are identical to the buttons of the preset and program rows and control the MCE's preview bus.

When the panel is controlling an MCPM, the 'Preview/User' buttons are disabled.

The 'Aux/User' buttons are different. The leftmost buttons are main source buttons and these correspond to the main source buttons on the preset, program, and preview/user buses. The rightmost 'Aux/User' buttons not committed to main sources can be "aux delegates"—buttons that select the function of the aux button row. By default, the 'Aux/User' buttons control the aux output of the MCE.

When the panel is controlling an MCPM, the 'Aux/User' buttons are disabled.

With a "bank select" button, the operator can switch between two banks of main sources. The button mnemonics change when the sources are switched. The bank selection button itself turns green or amber depending on which bank is selected.

The panel has a large audio monitoring section. It includes 12 buttons, two gain control knobs and two "dim" buttons. The buttons are configurable and allow the operator to select the source for each of two monitors, A and B, and for the metering output.

iMC-Panel-300 for Imagestore 750s

When the panel is controlling an Imagestore 750, the preset and program rows have identical buttons. On these 2 button rows, the leftmost buttons are main source buttons and the rightmost buttons can be configured as video effects and audio overs (a.k.a. voice-overs). All 24 buttons could be main sources. Up to 5 buttons can be video effects. Up to 2 buttons can be audio overs. The video effect and audio over buttons match on both of these button rows.

The 'Preview/User' buttons are all customer-definable.

The leftmost buttons of the 'Aux/User' row are main source buttons and these correspond to the main source buttons on the preset and program button rows. The rightmost buttons of the 'Aux/User' row are all customer-definable.

When the panel is controlling an Imagestore 750, "group select" buttons allow the operator to select different groups of sources. The mnemonics of the sources (taken from the NV9000 control system) appear on the main source buttons. Depending on an Imagestore 750 option, the sources themselves are displayed on a monitor wall and change when different source groups are selected.

The 12 buttons of the "audio monitoring section" are customer-definable buttons and have little or nothing to do with audio. The two gain control knobs affect the level of the CLN and MON outputs of the Imagestore 750. The two "dim" buttons are disabled when the panel is controlling an Imagestore 750.

iMC-Panel-300 Buttons

Panel buttons are large and appear in several colors (green, amber, red, blue, white, violet, or aqua) and 3 brightness levels: off, low-tally, and high-tally. They are dynamically re-legendable, displaying 3 lines of text, 8 characters per line. (The text might be blank.)

The buttons allow you to select channels, choose sources, options, video effects, and audio overs, and perform other functions. Some buttons can serve as status buttons.

Pressing a deselected toggle button will cause it to become selected. Pressing a selected toggle button will make it deselected.

Some groups of buttons operate as a mutually exclusive set. Pressing a deselected button will cause it to become selected and all other buttons in the set to become deselected. There are two types of mutually exclusive buttons:

1 Pressing a selected button makes it deselected. (All other buttons in the set remain deselected.)

2 Pressing a selected button leaves the button selected.

The iMC-Panel-300 has a menu system built into its LCD touchscreen. It is through the menu that you can adjust operating parameters such as audio levels and video effect settings. If an Imagestore 750, MCE, or MCPM configuration permits, the operator may also modify video effect settings.

The iMC-Panel-300's "Transition" button (orange) is large, obvious, and protected against accidental presses.

iMC-Panel-300 Knobs

Turning a knob clockwise increases the associated value until the maximum value is reached. Turning the knob counter-clockwise decreases the associated value until the minimum value is reached. After you reach either extremity, turning the knob has no effect.

Functional Sections of the iMC-Panel-300

Following are brief descriptions of each section. Refer to Figure 7-3 on page 120.

1 Customer-programmable buttons.

The customer-programmable section includes 16 function buttons. Each may be programmed to perform functions such as channel selection or audio control.

The customer-programmable buttons support one set of functions for MCEs and MCPMs and another set of functions for Imagestore 750s.

2 Touchscreen menu

Using the color LCD touchscreen, you can access all secondary system functions such as key setup and audio settings. Associated with the touchscreen are 8 rotary knobs for selection and adjustment of parameters.

When the panel is controlling an MCE or MCPM, the touchscreen displays a set of menus appropriate for MCEs and MCPMs. When the panel is controlling an Imagestore 750, the touchscreen displays a set of menus appropriate for Imagestore 750s.

3 Joystick.

In some instances, the joystick allows (1) visual adjustment of video effect parameters and (2) scrolling. The joystick has 2 buttons and a knurled cylinder that the operator turns to control a third axis.

4 Audio monitor/meter control

For Imagestore 750s

When the panel is controlling an Imagestore 750, the monitor knobs control the gain of the Imagestore 750's CLN and MON outputs and the 12 buttons are customer-definable buttons, having little or nothing to do with audio. The "dim" buttons are disabled.

For MCEs and MCPMs

The audio monitoring section (of an MCPM or MCE) provides 2 independent audio monitoring buses and a bus for audio metering. The 12 configurable buttons in this section include a choice of 5 sources—program audio, preset audio, preview audio, aux audio, or "off-air" audio—and a dedicated "dim" button for each monitor, and independent monitor level controls knobs. (There are no controls for the metering bus levels.)

5 Program audio control

The program audio section includes 2 knobs for adjusting main and over audio of program output.

The knob's functions for MCEs and MCPMs are different from the functions for Imagestore 750s.

6 Program and preset button rows

The program buttons correspond to what is currently on program output. The preset buttons allow you to premix a source with video effects and audio overs in preparation for a transition to the program bus.

The program and preset buttons rows are used for main source selections, video effects, and audio overs.

The leftmost buttons are main source buttons. The rightmost buttons can be configured as video effects or audio overs. (Video effects and audio overs cannot be duplicated but might be absent.)

7 'Preview/User' button row.

For Imagestore 750s

The button row is a set of customer-definable buttons when the iMC-Panel-300 is controlling an Imagestore 750.

For MCEs

The preview bus (in the MCE) and the 'Preview/User' button row (of the iMC-Panel-300) allow an operator to view video sources in combination with video effects and audio overs without affecting program or preset output and therefore without interfering with automation.

The preview button row is just like the preset and program button rows. Operating the preview bus is the same as operating the preset bus. The preview bus output appears at 'Preview Output A' of the PVW backplane. (Preview Output B is presently a copy of preview output A.)

▲ The preview button row is disabled when the iMC-Panel-300 is controlling an MCPM.

8 'Aux/User' button row.

For Imagestore 750s

The Aux/User button row comprises main source buttons on the left and (optionally) customer-definable buttons on the right. The main source buttons direct sources to an auxiliary device such as a waveform monitor. (The auxiliary device is not a requirement.)

For MCEs

There are 2 aux buses in the MCE, bus A and bus B. Each has an output on the CORE backplane. Either one or both of these can be configured to output what is selected on the aux button row of a control panel. These buses can be also configured for other functions ***not*** related to the panel's aux button row.

If the aux button row is not completely populated with main source buttons, some number of "aux delegate" buttons can be configured at the rightmost end of the aux button row. (If you do not have at least one aux delegate button, what happens when you press a main source on the aux button row is difficult to determine.)

▲ The aux button row is disabled when the panel is controlling an MCPM.

The aux delegate buttons control what the aux button row does. There are 6 aux delegate types:

• Aux A bus.

  The operator can direct any of the main sources available to the MCE's Aux A bus. (actually whichever aux bus was configured to receive a source when the operator presses the Aux A delegate).

• Aux B bus.

  The operator can direct any of the main sources available to the MCE's Aux B bus. (actually whichever aux bus was configured to receive a source when the operator presses the Aux B delegate).

• Preset Squeeze Background.

  The operator can select any of the main sources available as the preset squeeze background image.

• Preset Squeeze Image 2

  The operator can select any of the main sources available as the preset squeeze image 2.

• Preview Squeeze Background.

  The operator can select any of the main sources available as the preview squeeze background image.

• Preview Squeeze Image 2.

  The operator can select any of the main sources available as the preview squeeze image 2.

In all of these cases, the operator selects the source on the aux button row.

▲ If a squeeze image is configured with an "internal black" background or an internal black image 2, the background or image 2 is fixed (constant) and cannot be a main source.

9 Transition control buttons

By convention, the 12 transition control buttons include 5 transition types and 3 transition rates. These buttons are configurable, however.

10 System control buttons

These 3 buttons are system control buttons, by convention, but they are configurable.

11 Transition button.

Pressing the transition button initiates a transition in the transition processor currently controlled by the iMC-Panel-300. Operators can change the transition rate and type.

MCEs and MCPMs

The transition button displays the transition type (as a graphic) and the transition rate (in text). 'Cut' transitions involve no rate and therefore display no rate text.

The button is bright orange for non-pre-roll transitions. It is low-tally red and the word "Pre-roll" appears on the button when a pre-roll transition is pending (for MCEs only).

Imagestore 750s

The transition button displays the word "Take." The button is orange. During a transition, it is high-tally.

(See)

iMC-Panel-300 Connectors

At the rear of the panel are 2 power connections, an Ethernet port, a USB port, an aux port (DB15), and a GPI/alarm connector (DB25), and an audio metering input.

Figure 7-4. iMC-Panel-300 (rear)

Power

There are 2 AC connectors, PS1 and PS2, for redundancy. You need not use both if you are not concerned with redundancy.

Ethernet

The iMC-Panel-300 has one RJ-45 Ethernet port. The iMC-Panel-300 connects to the Ethernet switch of the master control network.

It is on this network that the iMC-Panel-300 communicates with MCPMs and with the configuration software. You (or your system administrator) must provide a unique IP address for the iMC-

Panel-300. Use the 'Panel ID' menu under the 'Panel Menu' to set the IP address and IP subnet mask. The default IP address is 192.168.7.100 and the subnet mask must always be 255.255.255.0.

GPI/Alarm

The iMC-Panel-300 has a DB25 connector that supports GPI inputs, GPI outputs, and alarms:
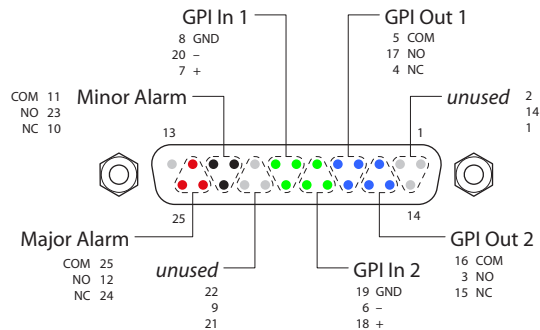
Refer to the GPI section in either of the *iMC-Panel-300 Operator's Guides* for connection information. Also see GPI/Alarms on page 192.

Aux Connector

The aux port is *reserved for future development*.

USB Port

The USB port is *reserved for future development*.

Audio Metering Input

The iMC-Panel-300 has a BNC connector to which you connect audio metering input (audio embedded in an SD or HD video signal).

When the panel is controlling an MCE or an MCPM, the metering input feeds the 'Live Levels' display under the panel's audio menu. The metering output of an MCE is a suitable audio source for the 'Live Levels' display. The audio metering input is *not* generally related to the iMC-Panel-300's audio metering outputs. However, if inputs come from an MCE under control of the panel, then there is a relationship.

When the panel is controlling an Imagestore 750, the metering input is unused.

iMC-Panel-100

The iMC-Panel-100 is a configurable master control panel. It consists of two parts:

- A 3RU button panel, 19.0″ wide × 5.22″ high × 3.70″ deep. At the rear of this panel are various I/O connectors.

- A customer-supplied monitor.

The panel can control Imagestore 750s as well as MCEs and MCPMs. It has silkscreen markings that are appropriate for both Imagestore 750s and MCEs and MCPMs. This is a front view of the button panel:
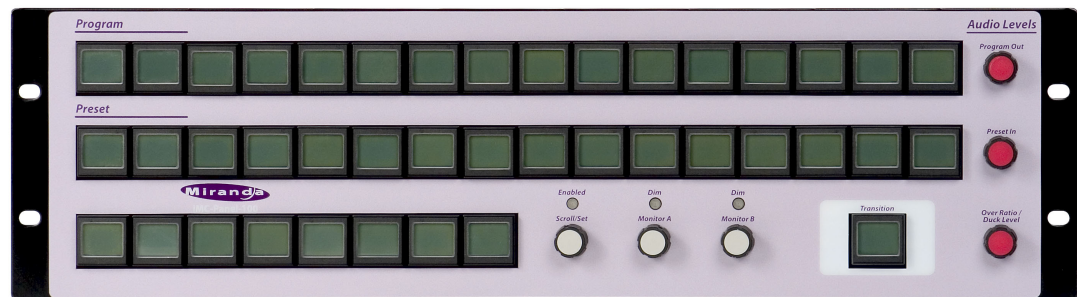
The button panel requires at least 2–3″ clearance at the rear for cables. The button panel can be rack-mounted or it can sit on a console or desktop.

Miranda provides support for the Planar series of touchscreens. This is the Planar PT1945R:

It has a removable stand and can be wall-mounted. Other VGA monitors can be used. If your choice of a monitor is not a touchscreen, an operator can use a mouse to select items on the screen.

7. Control Panels

Figure 7-5 shows the location of the iMC-Panel-100's touchscreen, function buttons, and controls.
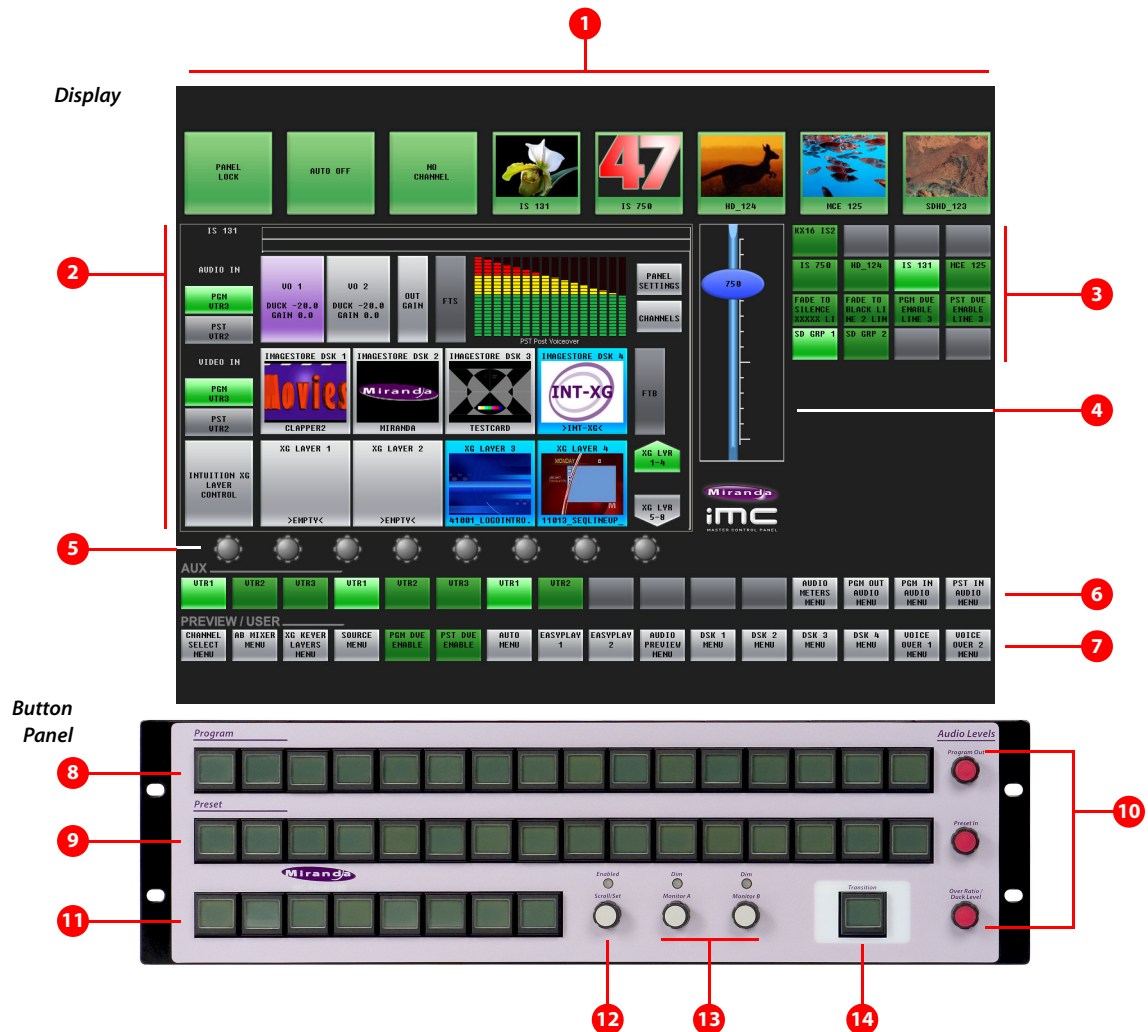
Figure 7-5. Sections of the iMC-Panel-100 (Shown Controlling an Imagestore 750)

1	Top row buttons	6	Aux/user buttons	11	Bottom row buttons
2	Menu area	7	Preview/user buttons	12	'Scroll/Set' knob
3	Configurable buttons	8	Program buttons	13	Audio monitoring knobs
4	Slider	9	Preset buttons	14	Transition button
5	Knob "Proxies"	10	Audio level knobs		

Following are brief descriptions of each section:

1 Top row buttons

The 8 large buttons in this row are all customer-configurable buttons. However, the row is designed to accommodate channel selection buttons that have thumbnail images representing the channels.

2 Menu area

Using the menus of the display, you can adjust parameters and control system functions. Associated with the menu are 8 knob "proxies" for adjustment of parameters.

3 Configurable buttons

The configurable button section includes 16 buttons, each of which may be programmed to per-form functions such as channel selection, menu selection, or source group selection. Some of these buttons can function as status indicators.

Buttons in other sections of the panel are also configurable.

4 Slider

The slider helps you make certain parameter adjustments such as changes to the size or position of DSKs.

5 Knob "Proxies"

The 8 knob "proxies" under the menu area allow you to adjust menu parameters. Not all of these "knobs" are active all the time. When a knob is active, the menu shows a colored indicator near the knob.

6 Aux/user buttons

When the panel is controlling an Imagestore 750, this button row contains source buttons and customer-definable buttons.

The sources are the same sources as on the preset and program button rows. These buttons allow you to direct a main source to an auxiliary device such as a waveform monitor.

▲ If the Imagestore 750 is not configured for controlling an auxiliary device, the aux button row's source buttons are disabled (dark).

7 Preview/user buttons

This row of buttons is a set of "preview" buttons when the panel is controlling an MCE or MCPM and it is a set of customer-definable buttons when the panel is controlling an Imagestore 750. (Among the customer-definable buttons can be "menu" buttons.)

8 Program buttons

The 16 program buttons include main source buttons and "layer" buttons. The layer buttons can be configured as video effects or voice-overs. The number of main sources, video effects, and voice-overs varies according to the panel configuration.

Whatever main source, video effects, and voice-overs are selected on the program buttons form the *program* output of the Imagestore 750 that is currently controlled by the panel.

9 Preset buttons

The preset buttons allows you to set up the state of the program output that will exist after the next transition.

The preset buttons include main source buttons and "layer" buttons. In fact, the preset bus and program bus have the same button functions. The function assigned to a program button is also assigned to the preset button directly beneath it.

Whatever main source, video effects, and voice-overs are selected on the preset bus form the *preview* output of the Imagestore 750 that is currently controlled by the panel.

10 Audio level knobs

The panel has 3 rotary knobs in this section, labeled:

- Program Out

    This knob controls either the program output level as a whole or (when a voice-over is active on the program bus) the voice-over level.

- Preset In

    This knob controls the preset input level (as a whole).

- Over Ratio / Duck Level

    When the panel is controlling an Imagestore 750, this knob controls the audio level of the main source when a voice-over is mixed with program output. (That is called the "duck level." The term "over ratio" applies only to MCEs and MCPMs.)

11 Bottom row buttons

The buttons in this section are all configurable.

12 'Scroll/Set' knob

When you touch (or click) the knob proxy (under the menu) associated with some parameter (such as voice-over level), the slider appears on the display and the 'Scroll/Set' knob of the button panel becomes enabled. You can use either the 'Scroll/Set' knob or the slider to adjust the parameter.

13 Audio monitoring knobs

The panel has two rotary knobs in this section, labeled:

- Monitor A

- Monitor B

The knobs apply when the panel is controlling an MCE or an MCPM. The knobs do not apply to Imagestore 750s.

14 Transition button

The transition button displays the transition type (as a graphic) and the transition rate (in text).

'Cut' transitions involve no rate and for cut transitions, the button displays no rate text.

The button is bright orange.

Pressing the transition button initiates a transition in the Imagestore 750 according to the panel's setup.

iMC-Panel-100 Buttons

Buttons allow the operator to choose sources and video effects and to make menu selections. Some buttons display status. Pressing a button usually selects something. However, nothing happens when the operator pushes a button that is disabled or off and nothing happens when the operator pushes a button that merely displays status.

Panel buttons are large and appear in several colors (green, amber, red, blue, white, violet, and aqua) and 3 brightness levels: off, low-tally, and high-tally. They are dynamically re-legendable, displaying 3 lines of text, 8 characters per line. (The text might be blank.)

In addition to these colors, a button can be dark (that is, off, or having no color). High-tally red and high-tally amber usually indicate warnings.

The following color scheme usually applies. Exceptions will be noted.

• Non-selected state: low tally — green, blue, violet, or orange.

• Selected state: high tally — green, blue, violet, orange, or red.

• Status: green, white, amber, red. (Status buttons do nothing when pressed.)

• When the panel is controlling an Imagestore 750, menu buttons are aqua when selected.

Some buttons are *toggles*. Pressing a deselected toggle button will cause it to become selected. Pressing a selected toggle button will make it deselected.

Some groups of buttons operate as a mutually exclusive set. Pressing a deselected button will cause it to become selected and all other buttons in the set to become deselected. There are two types of mutually exclusive buttons:

1 Pressing a selected button makes it deselected. (All other buttons in the set remain deselected.)

2 Pressing a selected button has no effect: the button remains selected.

iMC-Panel-100 Knobs

Turning a knob on the button panel clockwise increases the associated value until the maximum value is reached. Turning the knob counter-clockwise decreases the associated value until the minimum value is reached. Turning the knob beyond its value limits has no effect.

The monitor has knob "proxies" below the menu area and when the panel is controlling an MCE or MCPM, additional audio monitor knob proxies at the right. Indicators on the menu illuminate just above the menu knobs when the knobs are enabled. When an operator touches a knob proxy, a slider appears on the screen, and the 'Scroll/Set' knob of the button panel is enabled. The operator can then use the slider or the 'Scroll/Set' knob to adjust the applicable parameter.

iMC-Panel-100 Monitor

The monitor provides a menu system, the aux/user and preview/user button rows, the "top row" of configurable buttons, and a 4×4 array of configurable buttons. When the panel is controlling an MCE or MCPM, it also provides a set of audio monitor buttons and knob proxies.

The use of the touchscreen differs when the panel is controlling an MCE or MCPM or an Imagestore 750.

MCE and MCPM

For MCEs and MCPMs, the monitor lets operators do the following:

• Select a main source or an over source.

• Choose a router source.

• Select a video effect and alter its settings.

• View "live levels" (MCEs only).

The touchscreen provides scroll bars for list selection.

Imagestore 750

For Imagestore 750s, the touchscreen lets operators do the following:

• Select a main source.

• Select a downstream keyer (DSK) and alter its settings.

• Select a DVE and alter its settings.

• Arm or "fire" macros.

• Load media into DSKs and XG keyer layers.

The touchscreen provide scroll bars for list selection.

For Either

• Select a channel (i.e., an MCPM, MCE, or an Imagestore 750).

• Manipulate audio.

• View status and error messages.

• Change transition rates.

• Perform panel maintenance and updates.

iMC-Panel-100 Connectors

At the rear of the iMC-Panel-100 are 2 power connectors, one Ethernet connector, two USB ports, a fan, an aux port, a GPI/alarm connector, and a VGA connector:
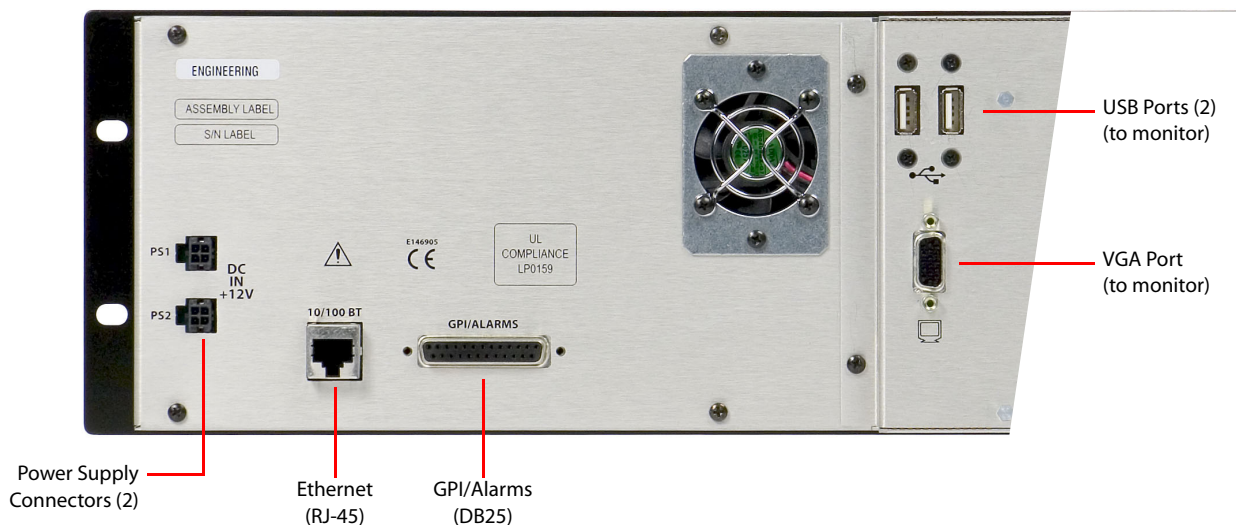
Figure 7-6. iMC-Panel-100 (rear view)

USB Ports

The USB ports are for connecting the button panel to the monitor. One USB port is for receiving touchscreen selections. The other port can be used to support a mouse.

VGA Port

The VGA port connects to and provides the video signals for the monitor.

Power

There are 2 DC connectors, PS1 and PS2, for redundancy. You need not use both if you are not concerned with redundancy. These connect to a PS0001 external power supply. See the *iMC-Panel-100 User's Guide* for details.

Ethernet

The iMC-Panel-100 has one RJ-45 Ethernet port. The panel connects to the Ethernet switch of the master control network.

It is on this network that the iMC-Panel-100 communicates with MCPMs, MCEs, Imagestore 750s and with the configuration software. You (or your system administrator) must provide a unique IP address for the iMC-Panel-100. Use the IP settings submenu under the 'Panel' menu to set the IP address, IP subnet mask, and gateway IP address. The default IP address is 192.168.7.100 and the subnet mask must always be 255.255.255.0.

GPI/Alarm

The iMC-Panel-100 has a DB25 connector that supports GPI inputs, GPI outputs, and alarms:
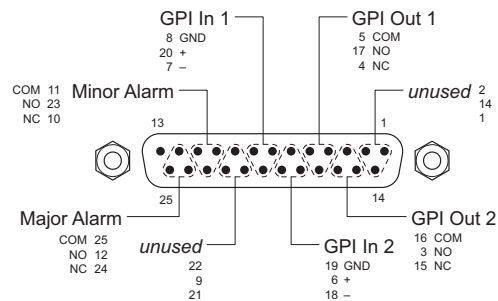
Refer to the GPI section in one of the two iMC-Panel-100 operator's guides for connection information.

iMC-Panel-GUI

The iMC-Panel-GUI is a software control panel that runs on a PC connected to the master control network. It emulates the functions of the iMC-Panel-200. Its menu section emulates the touchscreen of the iMC-Panel-200. The GUI can be operated either with a mouse on any PC or by finger pressure on a touchscreen PC.

▲ The PC on which the GUI runs must be set up to operate on the master control network.

▲ The GUI window is 1280 × 966 pixels and requires a monitor at least that size to function. (Although the window can be resized, doing so obscures important parts of the GUI.)

Arrayed on the GUI are 92 (or 95) color-coded buttons and a menu area with 8 associated knob "proxies." Clicking or touching a knob proxy causes a slider to be displayed which the operator can use to adjust parameters. The knob proxies emulate the 8 menu knobs of the iMC-Panel-200.

Each button has 3 lines of text, 8 characters per line. Buttons are green, amber, red, blue, white, or violet and off, low-tally, or high-tally. Buttons that are unused are just gray. Red generally indicates an error condition. Buttons that are defined, but disabled momentarily, show dimmed text.

Figure 7-7 identifies the sections of the GUI, as it appears when controlling an Imagestore 750:
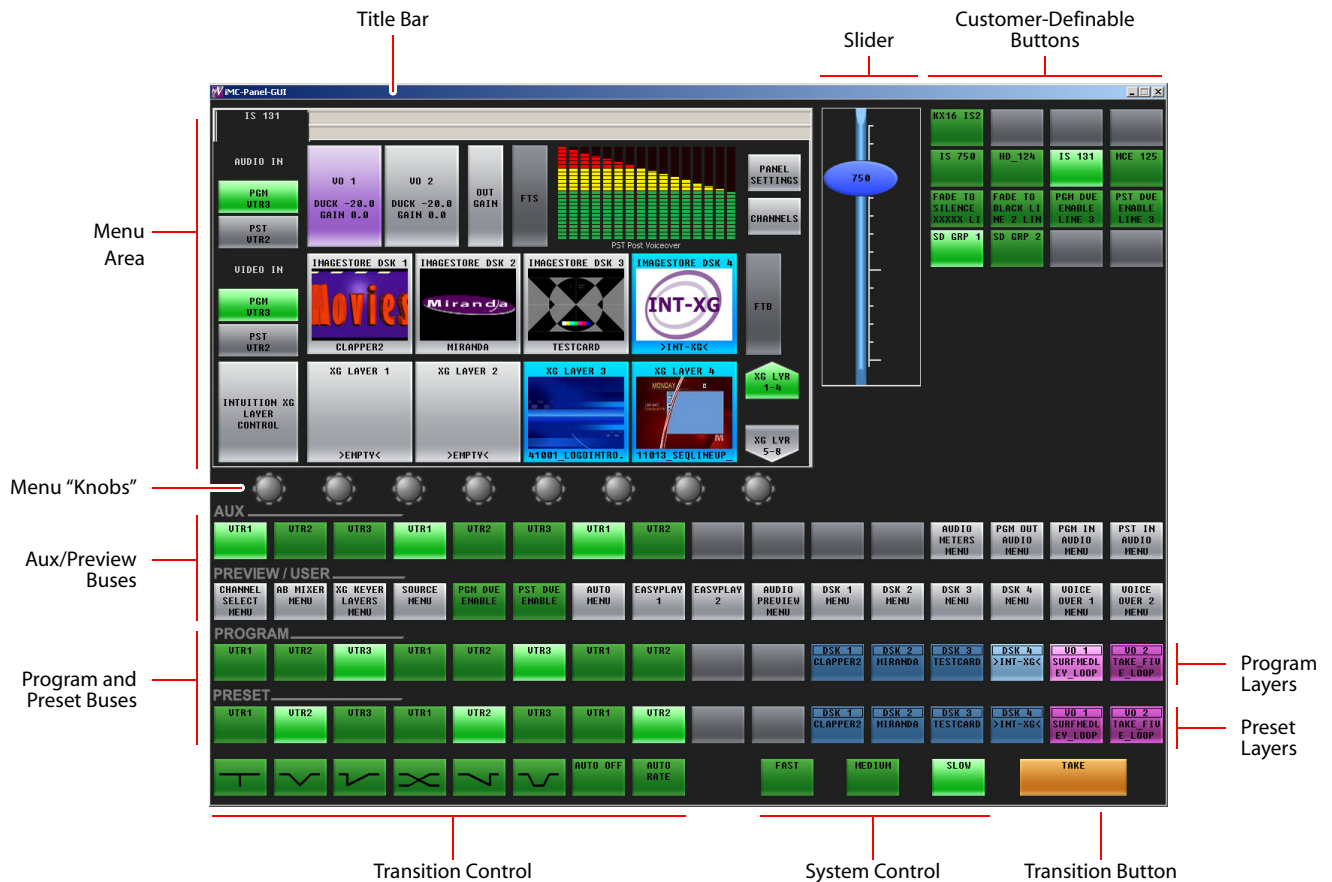
Figure 7-7. iMC-Panel-GUI (for Imagestore 750)

Like the iMC-Panel-200, the GUI has 4 rows of 16 buttons. These rows are labeled 'Preset', 'Program', 'Preview/User', and 'Aux'.

When the GUI is controlling an MCE, the 'Preview/User' buttons and 'Aux' buttons are active (enabled) and perform functions that control the preview bus and aux bus of the MCE.

For MCPMs, the 'Preview/User' buttons and 'Aux' buttons are inactive.

For Imagestore 750s, these 'Preview/User' buttons are all customer-definable and the 'Aux' buttons comprise *aux* buttons and customer-definable buttons. The aux buttons can direct main sources to an auxiliary device such as a waveform monitor.

All 4 button rows are configurable to one degree or another.

The GUI has 3 system control buttons and 8 transition control buttons. These buttons are configurable. (They are called the "bottom row" buttons in the MCS Panel Configuration Editor.)

When the GUI is controlling an MCE or MCPM, it has a different appearance:
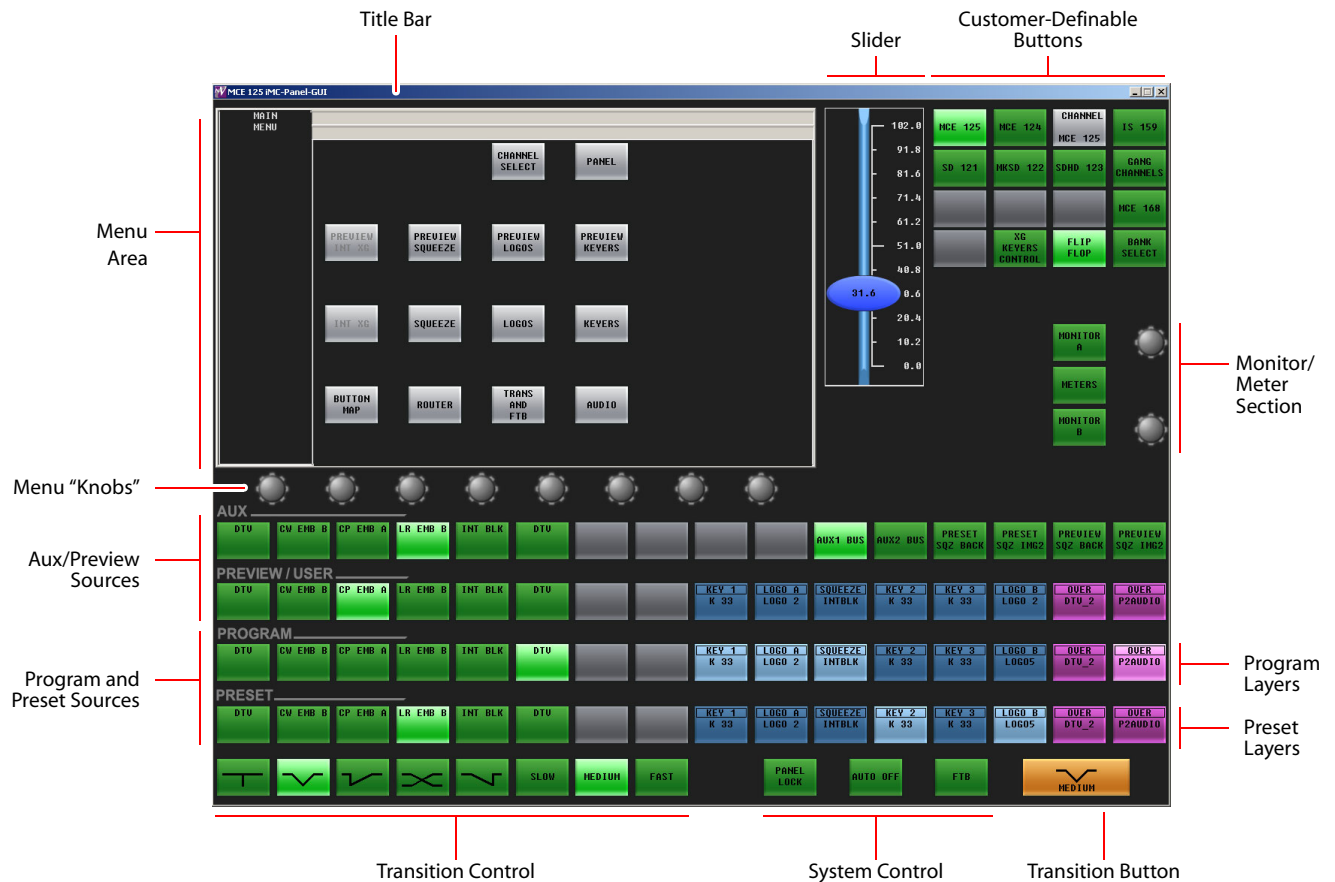
Figure 7-8. iMC-Panel-GUI (for MCEs and MCPMs)

GUI for MCEs and MCPMs

When the GUI is controlling an MCE or an MCPM, the preset and program buttons are identical. On these 2 buses, the leftmost buttons are main source buttons and the rightmost buttons can be configured as video effects and audio overs. All 16 buttons could be main sources. Up to 8 buttons can be video effects (including 2 XG keyer layers). Up to 2 buttons can be audio overs. The video effect and audio over buttons match on both of these buses.

When the panel is controlling an MCE, the 'Preview/User' buttons are active. They are identical to the buttons of the preset and program rows and control the MCE's preview bus.

When the panel is controlling an MCPM, the 'Preview/User' buttons are disabled.

The 'Aux' buttons are different. The leftmost buttons are main source buttons and these correspond to the main source buttons on the preset, program, and preview/user buses. The rightmost 'Aux/User' buttons not committed to main sources can be "aux delegates"—buttons that select the function of the aux button row. By default, the 'Aux' buttons control the aux output of the MCE.

When the panel is controlling an MCPM, the 'Aux' buttons are disabled.

With a "bank select" button in the customer-programmable button section, the operator can switch between two banks of main sources. The button mnemonics change when the sources are switched. The bank selection button itself turns green or amber depending on which bank is selected.

GUI for Imagestore 750s

When the panel is controlling an Imagestore 750, the preset and program buttons are identical. On these 2 button rows, the leftmost buttons are main source buttons and the rightmost buttons can be configured as video effects and audio overs (a.k.a. voice-overs). All 16 buttons could be main sources. Up to 5 buttons can be video effects. Up to 2 buttons can be audio overs. The video effect and audio over buttons match on both of these button rows.

The 'Preview/User' buttons are all customer-definable.

The leftmost buttons of the 'Aux' row are main source buttons and these correspond to the main source buttons on the preset and program button rows. The rightmost buttons of the 'Aux' row are all customer-definable.

When the panel is controlling an Imagestore 750, "group select" buttons allow the operator to select different groups of sources. The mnemonics of the sources (taken from the NV9000 control system) appear on the main source buttons. Depending on an Imagestore 750 option, the sources themselves are displayed on a monitor wall and change when different source groups are selected.

GUI Buttons

The buttons are large and appear in several colors (grey, green, amber, red, blue, white, violet, and aqua) and 3 brightness levels: off, low-tally, and high-tally. They are dynamically re-legendable, displaying 3 lines of text, 8 characters each. (The text might be blank.)

The buttons allow you to select channels, choose sources, options, video effects, and audio functions, and perform other functions.

Some buttons are *toggles*. Pressing a deselected toggle button will cause it to become selected. Pressing a selected toggle button will make it deselected.

Some groups of buttons operate as a mutually exclusive set. Pressing a deselected button will cause it to become selected and all other buttons in the set to become deselected. There are two types of mutually exclusive buttons:

  1 Pressing a selected button makes it deselected. (All other buttons in the set remain deselected.)

  2 Pressing a selected button leaves the button selected.

The GUI has a menu system. It is through the menu that you can adjust operating parameters such as audio levels and keyer settings. If an Imagestore 750, MCE, or MCPM configuration permits, the operator may also modify video effect settings.

The GUI's "Transition" button is orange and at the lower right.

"Knobs"

The GUI has knob "proxies." When the operator clicks or touches a proxy, the proxy turns bright green and the GUI's slider appears. The operator can adjust parameter values using the slider.
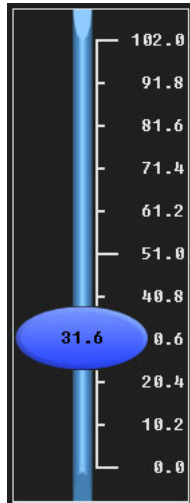
Monitor/Meter Section

When the GUI is controlling an MCE or an MCPM, it has a monitor control section:
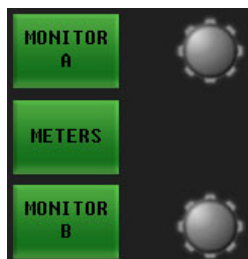
This section is not present when the GUI is controlling an Imagestore 750.

Pressing one of the buttons in the monitor/metering section causes an audio menu to be displayed. Audio monitor and metering functions are available in the menu.

Clicking or touching one of the monitor knob proxies causes the slider to appear with which the operator may adjust audio monitor levels.

Functional Sections of the GUI

Following are brief descriptions of each section. Refer to Figure 7-7 on page 134.

1 Customer-programmable buttons.

The customer-programmable section includes 16 function buttons. Each may be programmed to perform functions such as channel selection or audio con.trol.

The customer-programmable buttons support one set of functions for MCEs and MCPMs and another set of functions for Imagestore 750s.

2 Menu area.

Using the menus, an operator can access all secondary system functions such as keyer settings, squeezeback presets and audio settings. Associated with the menu are 8 "knobs" for selection and adjustment of parameters.

When the panel is controlling an MCE or MCPM, the touchscreen displays a set of menus appropriate for MCEs and MCPMs. When the panel is controlling an Imagestore 750, the touchscreen displays a set of menus appropriate for Imagestore 750s.

3 Monitor/metering section.

When the panel is controlling an MCE or MCPM, the monitor and meter buttons (and knobs) are present in the GUI. The buttons do nothing more than access audio menus. Audio monitor and metering functions are available in the menu. The knobs in this section control the gain of monitor channels A and B of the MCE or MCPM.

When the panel is controlling an Imagestore 750, the monitor and meter buttons (and knobs) are not present in the GUI.

4 Program and preset button rows.

The program buttons correspond to what is currently on program output. The preset buttons allow you to premix a source with video effects and audio overs in preparation for a transition to the program bus.

The program and preset buttons rows are used for main source selections, video effects, and audio overs.

The leftmost buttons are main source buttons. The rightmost buttons can be configured as video effects or audio overs. (Video effects and audio overs cannot be duplicated but might be absent.)

5 'Preview/User' button row.

For Imagestore 750s

The button row is a set of customer-definable buttons when the GUI is controlling an Imagestore 750.

For MCEs

The preview bus (in the MCE) and the 'Preview/User' button row (of the GUI) allow an operator to view video sources in combination with video effects and audio overs without affecting program or preset output and therefore without interfering with automation.

The preview button row is just like the preset and program button rows. Operating the preview bus is the same as operating the preset bus. The preview bus output appears at 'Preview Output A' of the PVW backplane. (Preview Output B is presently a copy of preview output A.)

▲ The preview button row is disabled when the GUI is controlling an MCPM.

6 'Aux' button row.

For Imagestore 750s

The aux button row comprises main source buttons on the left and (optionally) customer-definable buttons on the right. The main source buttons direct sources to an auxiliary device such as a monitor. (The auxiliary device is not a requirement.)

For MCEs

There are 2 aux buses in the MCE, bus A and bus B. Each has an output on the CORE backplane. Either one or both of these can be configured to output what is selected on the aux button

row of a control panel. These buses can be also configured for other functions *not* related to the panel's aux button row.

If the aux button row is not completely populated with main source buttons, some number of "aux delegate" buttons can be configured at the rightmost end of the aux button row. (If you do not have at least one aux delegate button, what happens when you press a main source on the aux button row is difficult to determine.)

▲ The aux button row is disabled when the GUI is controlling an MCPM.

The aux delegate buttons control what the aux button row does. There are 6 aux delegate types:

• Aux A bus.

 The operator can direct any of the main sources available to the MCE's Aux A bus. (actually whichever aux bus was configured to receive a source when the operator presses the Aux A delegate).

• Aux B bus.

 The operator can direct any of the main sources available to the MCE's Aux B bus. (actually whichever aux bus was configured to receive a source when the operator presses the Aux B delegate).

• Preset Squeeze Background.

 The operator can select any of the main sources available as the preset squeeze background image.

• Preset Squeeze Image 2

 The operator can select any of the main sources available as the preset squeeze image 2.

• Preview Squeeze Background.

 The operator can select any of the main sources available as the preview squeeze background image.

• Preview Squeeze Image 2.

 The operator can select any of the main sources available as the preview squeeze image 2.

In all of these cases, the operator selects the source on the aux button row.

▲ If a squeeze image is configured with an "internal black" background or an internal black image 2, the background or image 2 is fixed (constant) and cannot be a main source.

7 Transition control buttons.

 By convention, the 8 transition control buttons include 5 transition types and 3 transition rates. These buttons are configurable, however.

8 System control buttons.

 These 3 buttons are system control buttons, by convention, but they are configurable.

9 Transition button.

Pressing the (large) transition button initiates a transition in the transition processor currently controlled by the GUI. Operators can change the transition rate and type.

MCEs and MCPMs

The transition button displays the transition type (as a graphic) and the transition rate (in text). 'Cut' transitions involve no rate and therefore display no rate text.

The button is bright orange for non-pre-roll transitions. It is low-tally red and the word "Pre-roll" appears on the button when a pre-roll transition is pending (for MCEs only).

Imagestore 750s

The transition button displays the word "Take." The button is orange. During a transition, it is high-tally.

(See)

8. Other Master Control Products

Chapter 8 describes ancillary master control products. It presents the following topics:

- Emergency Bypass Control Panel
- Tally Processor
- Device Controller

Emergency Bypass Control Panel

The Emergency Bypass Control Panel (EBCP) is a simple 1RU device that connects to an MCPM or an MCE. It allows an operator (or anyone) to switch the MCPM or MCE from normal mode to bypass mode or vice versa.

The EBCP features two very large buttons—one red for bypass mode and one green for normal mode. The advantage of the EBCP is that it can be installed where it can be reached easily and instantly. Other methods exist for switching between bypass and normal modes, but those methods require access to the MCPM or MCE inside the master control frame (which might be remote).

Figure shows the features of the EBCP:
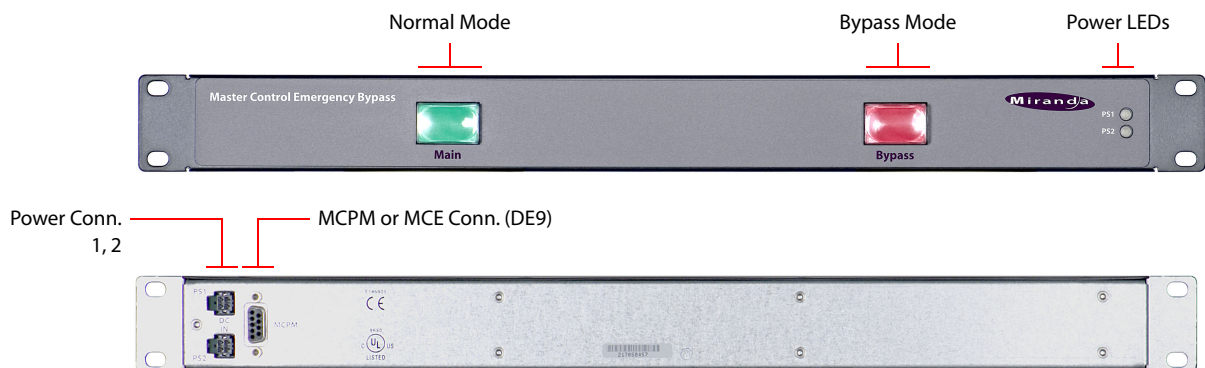
Figure 8-1. EBCP, Front and Rear Views

One EBCPM connects to one MCPM or one MCE.

Status and Control

The EBCP indicates the status of the emergency bypass relay. The green button illuminates when the MCPM is in normal mode. The red button illuminates when the MCPM or MCE is in bypass mode.

Pressing the green button switches the MCPM or MCE to normal mode, barring other conditions that put the MCPM in bypass mode. Pressing the red button places the MCPM or MCE in bypass mode, overriding the bypass switch at the front of the MCPM or MCE.

States

The EBCP and the MCPM (or MCE) cycle between normal mode and bypass mode based on several different inputs:
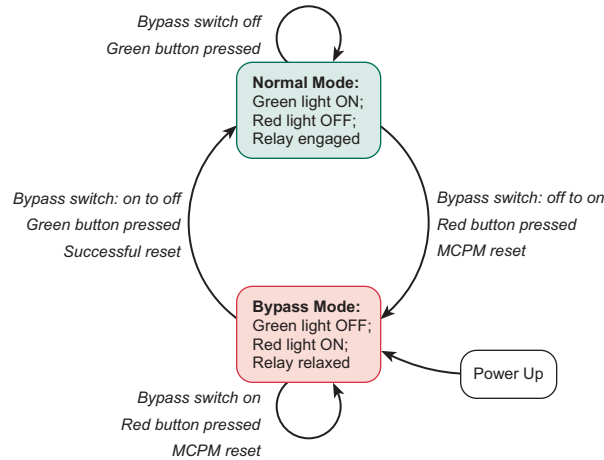
These are the inputs:

- Bypass switch on the front of the MCPM or MCE.
- Red button press
- Green button press
- MCPM (or MCE) reset button pressed or power to the MCPM (or MCE) cycled.

(Refer to Emergency Bypass on page 68 for more information.)

Connections

The EBCP connects to the auxiliary port of the MCPM or MCE and uses both of the GPI inputs to control the emergency bypass relay.

Pressing a button activates either GPI1 or GPI2. Those, in turn, under a certain software configuration, cause the bypass relay to switch. When the relay switches, it draws current through one or the other of the LEDs.

The bypass relay can switch under other (e.g., emergency) conditions also.

The bypass relay is in the MCPM backplane and connected through the MCPM's Aux port. The GPIs are in the MCPM. The switches are on the EBCP.

To make the connection between the MCPM aux port and the EBCP connector requires a DE9 to DB25 (or DB15) cable. Keep in mind that other aux functions, if used, will use the same cable connector.

▲ When the GPI inputs are used for emergency bypass, they cannot be used for another purpose.

Figure 8-2 shows the connection between the EBCP and the auxiliary port of the MCE, MPCM-SD, -HD, -HD2, -SDHD:

EBCP		MCPM	
Pin	Function	Function	Pin
1	n.c.	n/a	—
2	Bypass COM	Common relay contact	2
3	GND	GPI2–	6
4	Red Switch Out	GPI1+	7
5	n.c.	n/a	—
6	Bypass NO	Normally open relay contact	14
7	Green Switch Out	GPI2+	18
8	n.c.	n/a	—
9	GND	GPI1–	20
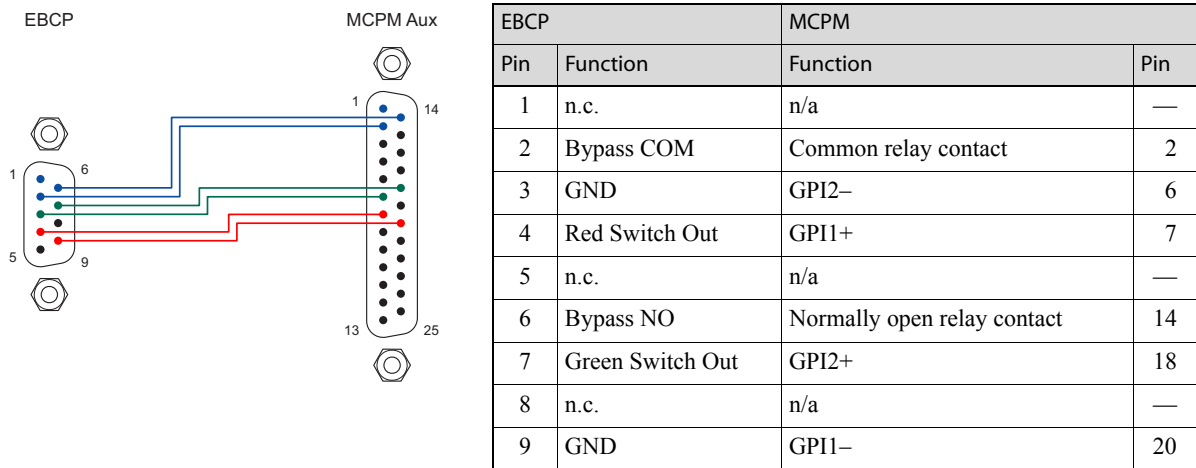
Figure 8-2. EBCP Connections to DB25 of MCPM-SD, -HD, -HD2, and -SDHD

Figure 8-3 shows the connection between the EBCP and MPCM-MK-SD or -MK-HD aux ports:

EBCP		MCPM	
Pin	Function	Function	Pin
1	n.c.	n/a	—
2	Bypass COM	Common relay contact	13
3	GND	GPI2–	10
4	Red Switch Out	GPI1+	1
5	n.c.	n/a	—
6	Bypass NO	Normally open relay contact	5
7	Green Switch Out	GPI2+	2
8	n.c.	n/a	—
9	GND	GPI1–	9
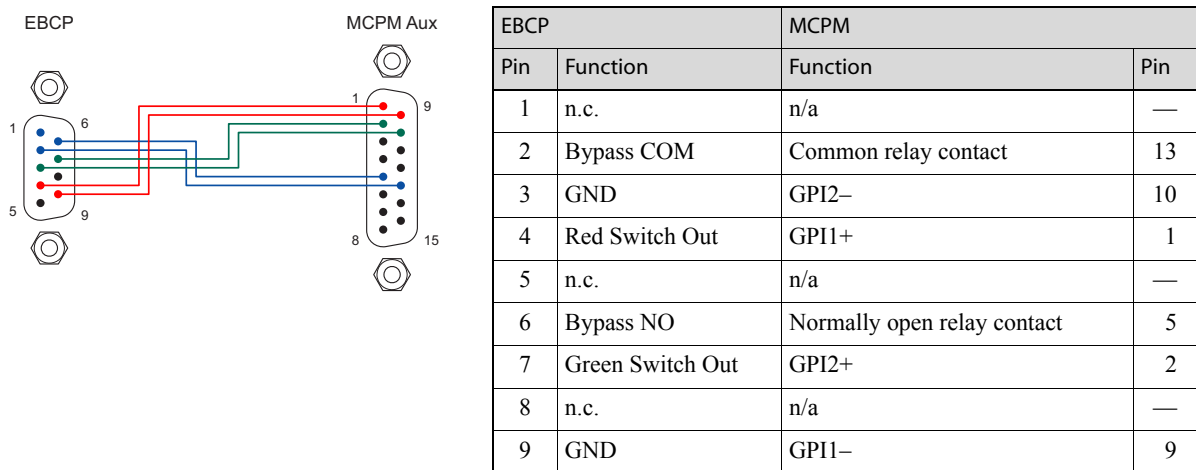
Figure 8-3. EBCP Connections to DB15 of MCPM-MK-SD and MCPM-MK-HD

Configuration

The MCPM must be configured to allow its GPI inputs to control the emergency bypass relay for use with the EBCP. The MCPM configuration software lets you specify one of 5 behaviors for each GPI input. In conjunction with the cabling of figures 8-2 or 8-3, make the following settings:

For GPI2, choose 'Set Emergency Bypass Relay to Normal'.

For GPI1, choose 'Set Emergency Bypass Relay to Bypass'.

Refer to the *MasterConfig User's Guide* for details regarding configuration.

Tally Processor

The "tally processor" is a third-party IRU device, 8.5″ deep, that has 32 optically isolated inputs and 32 relay outputs (also optically isolated).
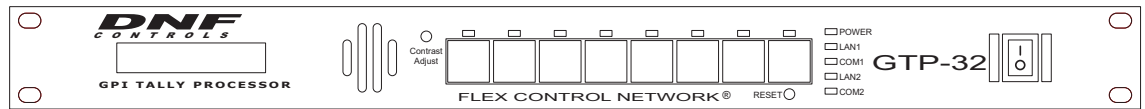
Figure 8-4. Tally Processor, Front View
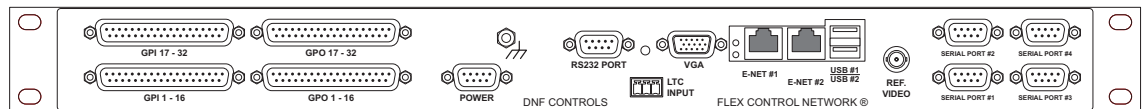
Figure 8-5. Tally Processor, Rear View

Multiple tally processors can be connected together over the master control network.

According to the manufacturer, the tally processor is a GPI/tally router, a GPI/tally distributor and a GPI/tally combiner:

- As a GPI/tally router, any tally input may be routed to any output.
- As a GPI/tally distributor, one input can be routed to many outputs.
- As a GPI/tally combiner, many inputs can be routed to one output.

The tally processor can receive signals from, and send signals to, an MCPM or MCE using Miranda Ethernet protocol (NVEP).

A combinational logic option allows a tally output to be controlled by multiple tally inputs based upon a customer-designed formula.

The unit includes, at the front, a 2×16 character display and an 8-key button pad. The unit comes with a separate switching power supply.

The tally processor has a built-in configuration tool (a browser application) that lets you specify the input and output logic.

Refer to the *Tally Processor User's Guide* for more information.

Refer to Appendix B, Specifications, for connector details.

Device Controller

The DC21 "Device Controller" is a third-party IRU device, 8.5″ deep, that has 32 optically isolated inputs and 32 relay outputs (also optically isolated) and 4 serial ports.
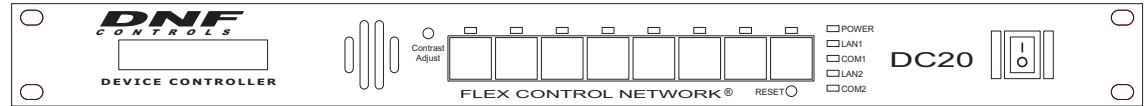
Figure 8-6. Device Controller, Front View
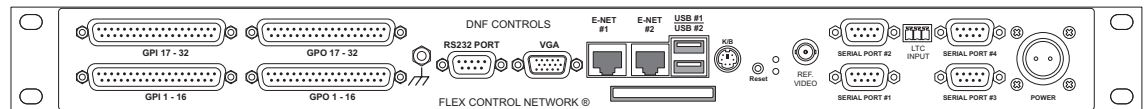
Figure 8-7. Device Controller, Rear View

The relay outputs and serial ports are used by MCEs in a master control system to issue machine control and pre-roll commands to VTRs and other devices that require control.

The DC21 is a requirement if your master control system is to include machine control.

The relay outputs are committed (in pairs) to "start" and "stop" functions. The start and stop functions are 100 ms positive-going pulses at TTL levels. *We make no recommendation for how the outputs are to be used.*

The DC21 communicates through its serial ports using a protocol appropriate to the device under control. The DC21 provides a choice of 3 protocols: Sony, Odetics, and VDCP.

The device controller communicates with MCEs using Miranda's NVISION Ethernet protocol (NVEP).

The unit includes, at the front, a 2×16 character display and an 8-key button pad. The unit comes with its own switching power supply.

The device controller has a built-in configuration tool (a browser application) that lets you specify the input and output logic.

Refer to the *Device Controller User's Guide* for more information.

Refer to Appendix B, Specifications, for connector details.

8. Other Master Control Products

Device Controller

A. Special Features

Appendix A describes important options of the master control system. It presents these topics:

- Intuition XG
- Machine Control and Pre-Roll
- Monitor Wall

These features are distinct enough to warrant their own sections.

Intuition XG

The Intuition XG system is an "advanced HD/SD graphics processor" coupled with Xmedia software.

Intuition XG is a master control *option*. Intuition XG systems can stand on their own independently. Master control is enhanced by it but does not require it.

When it is integrated with an NV5100MC master control system, the Intuition XG processor feeds HD or SD keys (fill and key video inputs with up to 16 audio channels) to MCEs. It is a single- or dual-channel graphics processor that provides multi-level character generation, and animation, still, and clip playout with multi-channel audio. The Intuition XG processor can also control an MCE's squeezeback functions, audio overs, and main sources. With these features, Intuition XG adds what can be called "rich branding" to the MCE.

Intuition XG is associated with a set of configuration tools and graphics generation applications. These tools generally belong to Miranda's 'Xmedia' product series.

One of the most significant aspects of the Intuition XG processor is that it can process "live" data:

- Multiple databases files, XML, RSS feeds, and web data.
- Proprietary data feeds, including Reuters, AP, SportsTicker, and Bloomberg.

Intrinsic Features

- HD and SD character generator.
- Text and graphics on multiple layers.
- Large capacity storage (1.8 TB).
- Simultaneous playout of multiple clips.
- One or two outputs. SD output as NTSC or PAL. HD output as 1080i, 720p or 480p.
- Full integration with the Xmedia suite for graphics automation.
- 16-channel audio.
- Automation.

Integration with MCE

The XG processor delivers two channels of HD or SD video (each with fill and key and up to 16 audio channels) to the MCE. (See Connections, following.) Audio reaches the MCE through the keyer fill input dedicated to the XG channel. The audio from the keyer input is handled internally (and can be selected by panel operators) as a special audio over named "XG over."

The MCE configuration can specify that the XG over turns on (or off) when the keyer assigned to the XG channel turns on (or off)—unless the XG over was selected independently.

The MCE can control up to 4 XG keyer layers. Each layer corresponds to an XG media clip (identified by a recall ID). The video and the audio of the clips are combined and sent to the MCE through keyer inputs at the rear of the master control frame.

The clips in the XG processor can also send control messages to the MCE that do the following:

- Select a main source.
- Select and control the position, size (and opacity) of squeeze images.
- Select audio overs and control their over-to-main ratios.

▲ Note that the MCE has one squeezeback and one audio over (per bus). Only the program bus really matters. The preview bus is not involved in transitions at all. The preset bus is involved in flip-flop transitions, but only superficially involved in flip-only transitions.

The control messages are entered in the timeline of a media clip developed in Xstudio. There is a set of 18 control messages from which to choose. See Xstudio Functions, following.

It should be noted that the squeeze images and controlled audio overs *do not* come from the XG processor and *are not* mixed with the XG video or audio output in the XG processor. Any squeezeback controlled by an XG clip is handled entirely by the MCE in its normal video effects ordering. Only a single audio over can be in use: it either carries the XG audio or carries audio from another over source, but not both.

The XG clip can select any main source (of the 128 main sources known to the MCE). The MCE processes only one main source at any time: one chosen by the panel operator, by automation, or by the XG clip. (The XG clip does not perform router preselection, although the operator or automation can do so prior to playing the clip.)

Automation

MCE external keyers that have been assigned to the Intuition XG integration are repurposed as keyer layers, for automation to control. If additional keyer layers beyond this number are to be controlled by automation, there is a mechanism by which an automation system can control additional XG layers—by repurposing (sacrificing) other video effects layers.

In brief, the MCE will substitute an XG layer for, say, a logo, under automation. The choices are MasterConfig options, made in the RS-422 configuration page. Thus, the choices cannot be overridden by the automation system. You can make changes only by reconfiguring the MCE.

See the *MasterConfig User's Guide* for details.

Xstudio Functions

There are 18 add-on functions that allow Xstudio clips to manipulate an MCE's squeezeback, audio overs, and main sources.

▲ The add-on functions are built into non-standard XML files that must be obtained either from the installation CD (SB0221) or from Miranda technical support.

The special XML files are for customers who want to make use of the MCE embedded commands. The default XML files are intended for use with Imagestore.

While you are editing a time-line, the tracks are named at the left and displayed on the right:
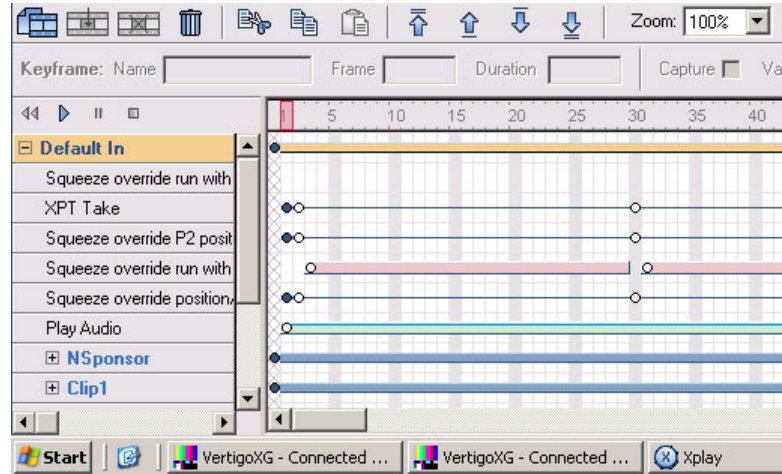
Right-click a track name. You will see a context menu:
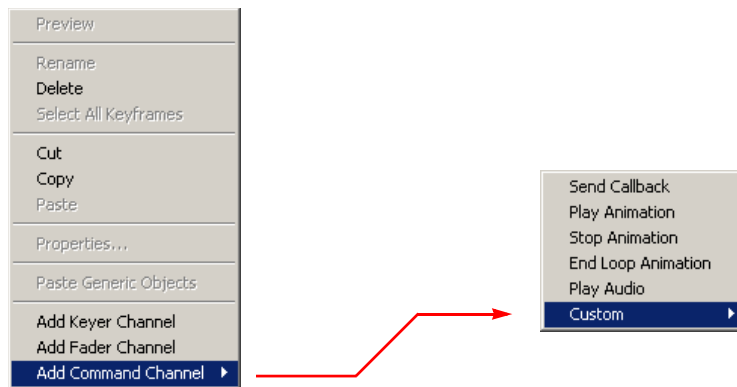
At the bottom of the context menu is an 'Add Command Channel' entry. Clicking that entry presents another menu. Click 'Custom' to get the MCE add-ons list:

```
Custom command
Squeeze move
Squeeze move Cut
Squeeze move default tranrate
Squeeze move reverse
Squeeze move reverse Cut
Squeeze move reverse default tranrate
Squeeze override P2 position/size
Squeeze override position/size
Squeeze override run
Squeeze override run Cut
Squeeze override run with P2
Squeeze override run with P2 Cut
Voice-over Fade off
Voice-over Fade on
Voice-over Fade on XG Over
Voice-over Fade rate
Voice-over Ratio
XPT Take
```

You may disregard the first entry which is 'Custom command'. Choose any of the other commands.

Choosing a command creates a track. You can add commands at key frames in the time line. Certain commands take parameters. These are viewable in a drop-down menu at the right of the timeline:
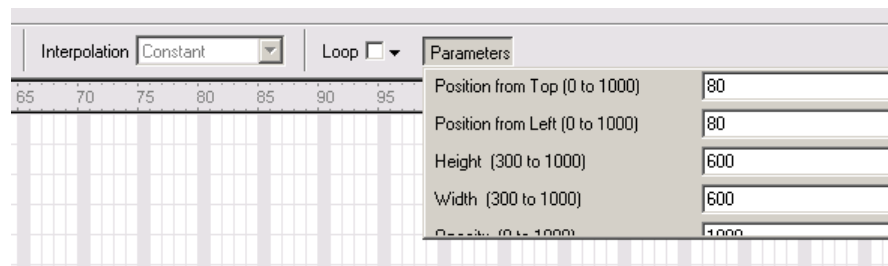
Figure A-1. Xstudio Parameters

You might see some entries clipped off. Although it is not easy, it is possible to enter values in one of the clipped text boxes.

If a track has multiple key frames, the MCE interpolates parameters between the points. Thus, for example, you can vary the position, size, and opacity of a squeeze image over time.

The interpolation is not performed, or controlled, by Xstudio. Although it has interpolation options, those options are not used for the add-on functions.

▲ Important: Add-on effects placed in the first frame of the clip play out when the operator cues the clip (on the program, or preset or preview bus).

Control Messages

The following items are the 18 control messages. The first 12 affect squeezeback, the next 5 affect audio overs, and the last affects the main source.

The control messages are presented here as if they were functions in a programming language, that is with parameters in parentheses separated by commas. In Xstudio, of course, the parameters

shown here — such as *number* or *duration* — are displayed by Xstudio in a drop-down menu as shown in Figure A-1:

1 Squeeze move (number, duration)

Executes the squeeze effect identified by *number* (in the range 1–32) for a specified *duration* expressed in frames.

▲ Squeeze effects are created and ordered by numbers assigned in MasterConfig.

2 Squeeze move cut (number)

Executes the squeeze effect identified by *number* (in the range 1–32). Being a *cut*, there is no duration.

3 Squeeze move default transrate (number)

Executes the squeeze effect identified by *number* (in the range 1–32) using the default transition rate.

4 Squeeze move reverse (duration)

Reverse-executes the squeeze effect previously selected over the previously specified *duration* (expressed in frames).

5 Squeeze move reverse cut ( )

Reverse-executes the squeeze effect previously selected. Being a *cut*, there is no duration.

6 Squeeze move reverse default transrate ( )

Reverse-executes the squeeze effect previously selected at the default transition rate.

7 Squeeze override P2 position/size (top, left, height, width, opacity)

The commands sets up the *image 2* parameters for the two "run with P2" commands following. The parameters *top* and *left* specify the position of the image. The *height* and *width* parameters specify the size. Squeeze image 2 further has an opacity value specified by *opacity.*

▲ "P2" is Miranda's internal code (jargon) for squeeze image 2.

Units are 0.1 percent and range from 0–1000. The size parameters must be at least 300 (30%).

8 Squeeze override position/size (top, left, height, width)

The commands sets up the *background image* parameters for the "run" and "run with P2" commands following. The parameters *top* and *left* specify the position of the image. The *height* and *width* parameters specify its size.

Units are 0.1 percent and range from 0–1000. The size parameters must be at least 300 (30%).

9 Squeeze override run (number, duration)

Executes the squeeze effect identified by *number* (in the range 1–32) for a specified *duration* (expressed in frames). This squeeze uses the overrides of item 8.

10 Squeeze override run cut (number)

Executes the squeeze effect identified by *number* (in the range 1–32). Being a *cut*, there is no duration. This squeeze uses the overrides of item 8.

11 Squeeze override run with P2 (number, duration)

Executes the squeeze effect identified by *number* (in the range 1–32) for a specified *duration* (expressed in frames). This squeeze uses **both** squeeze images, background and image 2, and thus uses the overrides of item 8 and item 7.

12 Squeeze override run with P2 cut (number)

Executes the squeeze effect identified by *number* (in the range 1–32). Being a cut, there is no duration. This squeeze uses **both** squeeze images, background and image 2, and thus uses the overrides of item 8 and item 7.

13 Voice over fade on (number)

Ramps *up* the audio over specified by number, using the rate and ratio specified in items 16 and 17.

The over number may be in the range 1–4 (normal overs), and may be 17 (squeeze image 2 over) or 18 (XG over). The fade on will use the default rate and ratio if none are specified.

14 Voice over fade off ()

Ramps *down* the audio over specified by number, using the rate and ratio specified in items 16 and 17.

The over number may be in the range 1–4 (normal overs), and may be 17 (squeeze image 2 over) or 18 (XG over). The fade off will use the default rate and ratio if none are specified.

15 Voice over fade on XG over ( )

This command message is the same as item 13 with a parameter value of 18 (XG over).

16 Voice over fade rate (duration)

Sets up an audio over. The *duration* parameter is expressed as a number of frames.

17 Voice over ratio (ratio)

Sets up an audio over. The *ratio* is expressed in units of 0.1 percent, in the range 0–1000.

▲ MCE over ratios are non-linear. The default is a 50% ratio, meaning 100% main source and 100% over source.

18 XPT take (source)

Selects a main source specified by *source*, in the range 1–128. The command message overrides the previously selected main source, no matter how it was selected.

The command does not perform router pre-selection. A panel operator may do that prior to executing the XG clip.

Connections

This diagram shows the required Intuition XG connections:
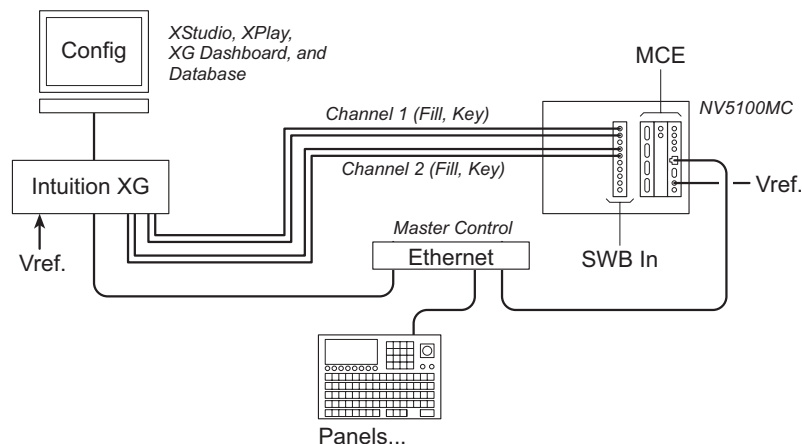
The Intuition XG processor and the MCE communicate on the master control network. The Intuition XG processor delivers one or two (fill, key) pairs to the master control system through an SWB card (a requirement). The MCE configuration identifies the ports through which the signals enter the master control system.

The Intuition XG processor provides the XG configuration, video storage, and access to a network of graphics tools, information databases, and so on.

Operators at master control panels use (and choose) the XG "layers" created or stored within the Intuition XG processor as they would choose any other video effect.

Video cables connect to the Intuition XG processor with an 8-BNC breakout connector. One of those cables is video reference (Analog Ref In). Note that the required reference is tri-level (1080i/59.94) or NTSC.

The MCE can use tri-level, NTSC, or PAL reference. If the references supplied to the Intuition XG and MCE are different (one is using NTSC and the other is using tri-level) the two references must be properly timed.

The 4 video cables on the breakout connector are labeled:

(Program)	(Preset)	
SDI out A	SDI out B	"fill"
SDI out C/key	SDI out D/key	"key"

On panels that are configured for Intuition XG, there is an 'Int XG' button and a 'Preview Int XG' button in the main menu where the operator can choose XG layers to place on air. Those panels have up to 4 'XG layer' buttons in the program button row and matching 'XG layer' buttons in either the preset button row or the preview button row. The 'XG layer' buttons place the selected XG layers on the preset (or preview) bus and the program bus.

A panel can have an optional 'XG Keyer Control' button. That button turns the keyers that support XG layers on and off when the panel operator presses it. It is intended as an emergency kill switch.

The 'XG Keyer Control' button will also turn on and off the XG over if the XG over was selected automatically when the XG layers were selected. (If the XG over was selected independently, the 'XG keyer control' button leaves it unchanged.)

When panel operator chooses a channel (an MCE) that is configured for Intuition XG, the channel selection causes the panel to download thumbnail images of all the keyers the XG has available. Xplay must be running in the Intuition XG processor for that to happen.

Panel operators that are controlling MCPMs or MCEs not configured for Intuition XG will find all Intuition XG features disabled. Regular keyers assigned to the Intuition XG system become available when a panel is not controlling an MCE configured for Intuition XG.

Intuition XG Configuration

Some of these items are "givens"—features that are created during commissioning. This document assumes that any and all "commissioning" has taken place.

1 The Intuition XG graphics processor runs Windows XP. Use the built-in Windows tools to give it an IP address on the master control network.

2 Verify the software versions. At revision 6.3.1, MCEs are compatible with:

XMedia Suite version 4.3 build 249 (or later)
Vertigo XG version 1.11.35.0 (or later)

In earlier software revisions, MCEs are compatible with XMedia Suite version 4.2, but not version 4.3.

3 There are 3 `.ini` files in `C:\Program Files\VertigoXmedia\Apps\`

> `XPlay.ini`
> `Channel_A\VCG2.ini`   (These names are arbitrary)
> `Channel_B\VCG2.ini`

4 Verify the configuration of XG channels A and B.

Start the Dashboard. Be sure that each entry in the table has a green dot, not red. This is the Dashboard table with channel A selected:

Output resolution must be 1080i30M (29.97 Hz), not 1080i30 (30 Hz) for both channels or 720p60M (59.94 Hz), not 720p60 (60 Hz) for both channels.

Genlock status to be "locked," not "locking" or "free running" for both channels.

▲ Channels A and B must be running. If they are not, click the channel icons on the desktop.

▲ A single-channel processor would have only channel A. Please disregard any mention of channel B if that is your case.

5 Verify that Xplay is properly configured.

You should see 4 panes, i.e., 2 keyer sources for channels A and B. The names are arbitrary. Here they are CGA-0, CGA-1, CGB-0, and CGB-1:
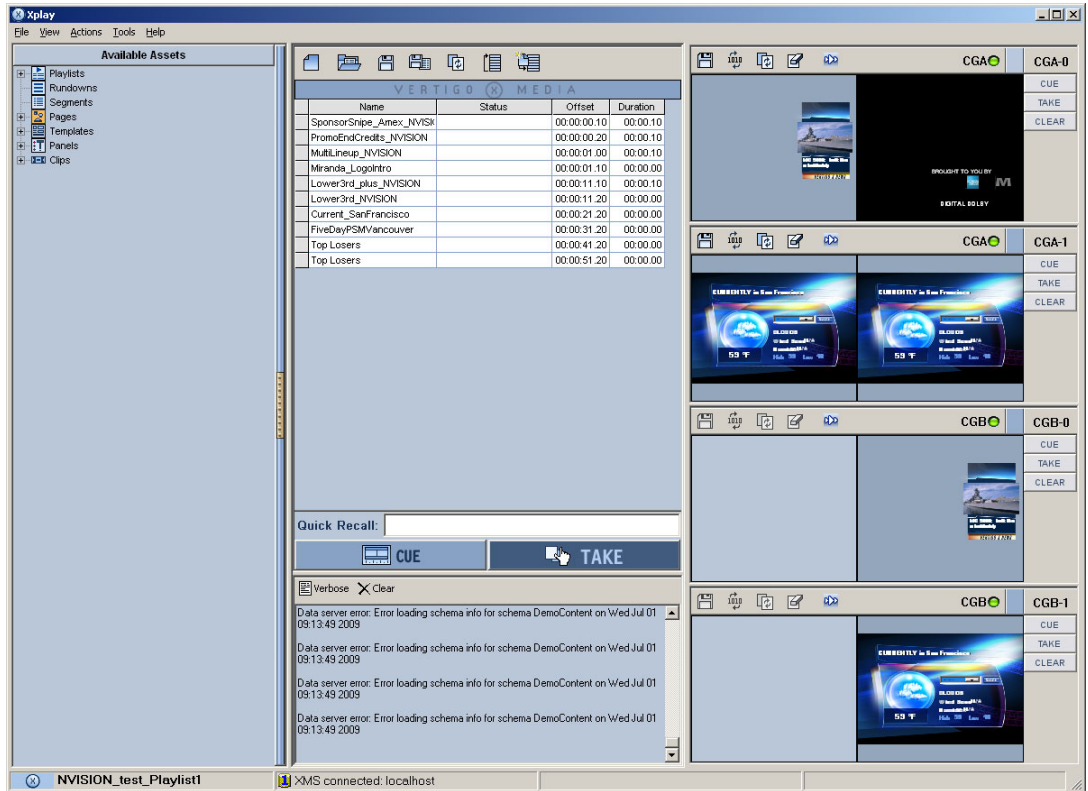
Choose Xplay > Tools > Settings > General.

Ensure that the layout is 'Multidevice'. Ensure that the number of devices is 4.

Choose Xplay > tools > Device manager:
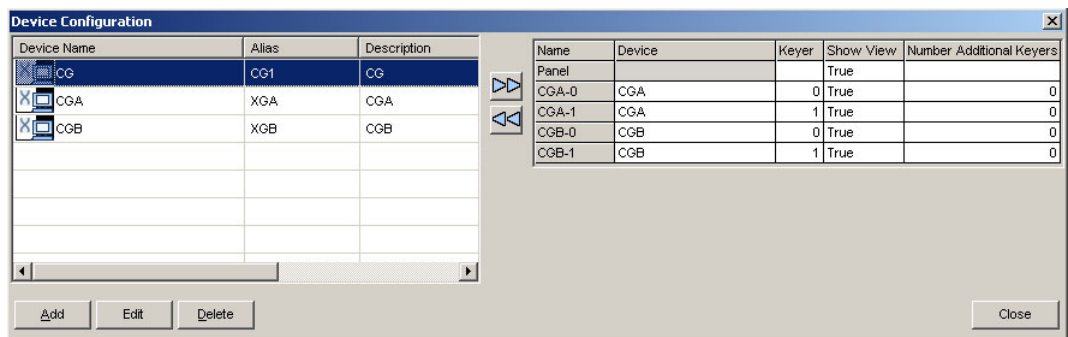
Verify that your channels (named CGA and CGB here) are present.

Choose Xplay > Tools > Configure Automation.

For channel A ("program" in MasterConfig) the TCP port must be 5006.
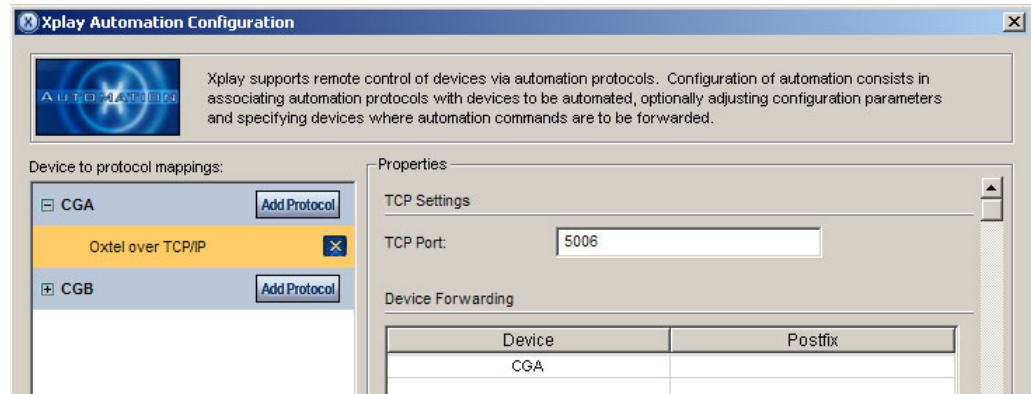
If it exists, channel B (which corresponds to "preset" in MasterConfig) must be 5007.

6 Recall IDs

Customers define XG keys (clips, animations, etc.) using Xmedia creative software such as Xbuilder or Xstudio. Although they keys have names, master control identifies the different keys by their *recall IDs* which are assigned in the Xmedia software. A master control panel (configured for Intuition XG and controlling an MCE configured for Intuition XG) will load thumbnail images for use in the 'Int XG' menu according to Xplay's asset list. (The 'XG Select' menu displays the key names and also the key categories.)

The master control panel recognizes only recall IDs that are numerical and in the range 1 to 65535. In Xbuilder or Xstudio, you can use alphanumeric recall IDs, but master control does not recognize these. The panel will load the thumbnails of all Xplay assets, but the panel operator cannot choose an Int XG "key layer" that has an unrecognizable ID. The panel beeps when the operator makes such an attempt.

▲ Panel operators should be aware that a beep means an unavailable Intuition XG keyer layer. (This is the only instance of audible feedback in the panels.)

▲ Legacy M2100 automation protocols must restrict recall IDs to the range 1–255 (a single byte).

Recall IDs must not be blank or zero.

Recall IDs must not have leading zeroes.

Recall IDs must not contain characters other than 0–9. Hexadecimal digits, alphabetic characters, punctuation, and underbars are not allowed.

Any XG clip that has a recall ID that violates these conditions is inaccessible to master control. A control panel produces a notification beep if an operator attempts to access such a clip.

NV5100MC Configuration

Configuration of the Master Control system for Intuition XG occurs in two parts: one is in Master-Config and the other is in the MCS Panel Configuration Editor.

Please refer to the manuals for those applications for more detail.

MasterConfig

1 Enable pre-roll in the general settings. Intuition XG requires it to function properly.

2 In the 'Intuition XG' page, check the 'Program' box and, if your XG box has 2 channels, also check either the 'Preset' box or the 'Preview box'.

3 Assign IP addresses to 'program' and 'preset' or 'preview'. If they use a single XG processor, use the same IP address. If you have not checked the 'Program' box, the checkboxes for preview and preset are dim (disabled). If you do not check the 'Preset' (or 'Preview') box, no options appear for preset (or preview).

4 Assign "Oxtel" ports. Use 5006 for program and 5007 for preset. These are predetermined by the Intuition XG processor.

5 Choose a keyer for the 'program' channel and choose a (different) keyer for the preset (or preview) channel.

If you have a two-channel XG processor, the program keyer must be keyer 3 and the preset keyer must be keyer 2. (Note that these are both post-squeeze in the effects ordering.)

If you have a single-channel XG processor, you may use any of the 3 keyers. (Keyer 1 is pre-squeeze.)

▲ Master control supports up to 4 XG layers. Each layer can be assigned an XG media clip identifiable by a "recall ID." The clips mix with the MCE's program video through the keyers assigned to the XG channels. In an MCE configured for Intuition XG, those keyers are not available as independent keyers.

6 Specify the SWB input ports for each channel. (These belong to an SWB input backplane. The SWB input card and backplane are required for Intuition XG.)

These inputs receive the fill and key video signals from the Intuition XG processor.

7 Specify the XMS port as 14050 (predetermined by the Intuition XG processor) for the processor(s) you have identified by their IP addresses. Specify the keyer behavior (disabled, normal or clear after preset). It is not likely that you would want 'disabled' but it is one of the choices.

8 Specify the pre-roll value as 6 (frames). This is actually not a pre-roll, but a latency. The latency might vary and might have to be determined through experimentation.

Use a value of 12 frames if your MCE's video standard is progressive.

9 Specify the audio parameters.

The Intuition XG video signals can include embedded audio (up to 16 channels). The MCE processes this audio as an audio over. These are the audio options:

• The number of audio channels (from 2 to 16).

• The default over-to-main ratio of the XG layers. This is simply labeled 'Ratio'. Panel operators can adjust the over level and the over-to-main ratio.

• Whether to turn on the audio over automatically when a panel operator presses an 'XG layer' button. This is a checkbox option. (With this option, the over actually turns on when the keyer that supports the XG channel is on and turns off when the keyer is off.)

▲ As with other audio over sources, the XG key's audio might be non-existent or inaudible. If that is the case, the over will switch on automatically (when enabled) but present no detectable audio.

10 Specify the maximum number of layers.

The lower this value, the better your system performance will be.

11 Specify the keyer behavior.

The choices are 'Normal' and 'Clear Preset after Program Transitions to On'. See the *NV5100MC MasterConfig User's Guide* for details.

MCS Panel Configuration Editor

Place one or two XG layer buttons on the preset and program buses. The place to do this is the 'Button Assignment' page. Use one XG layer button for a single-channel Intuition XG processor. Use two XG layer buttons for a two-channel processor.

▲ You might have to sacrifice a main source button or two to do so. Or, you can sacrifice the keyer buttons for the keyers assigned to the Intuition XG layers.

▲ \When XG layer buttons are active, the keyers assigned to the XG layers become inaccessible for normal use.

Optionally configure one of the customer-definable buttons as an "XG Keyer Control" button. The button turns off all keyers assigned to XG layers on both program and preset (and can turn off the XG over). The button acts as an emergency override.

Notes

The Intuition XG's video reference must be NTSC or tri-level 1080i/59.94, connected to 'Analog Ref In'. The reference for the MCE and Intuition XG references must be closely timed (within ± 1/2 line). Otherwise, you'll get non-sync errors.

The Intuition XG processor receives information regarding what to play and when to play it from the MCE over its Ethernet connection.

Operation

During operation, Xplay must be running, channel A must be running, and channel B (if it exists) must be running. Master control cannot process Intuition keys unless these conditions are met.

Follow these guidelines:

1 Boot the Intuition XG and login. You'll see the desktop with its Miranda report.

2 Double-click the channel A and B icons to launch the channels. It takes approximately 15 seconds for their displays to appear. They appear in the same place on the screen. Move one aside so you can see the other.

3 Double-click the Xplay icon to launch Xplay. It starts immediately.

If a master control panel is waiting for Intuition XG data, it can now obtain the data.

Behavior

XG Layers

Master control can process up to 4 XG layers. An XG layer corresponds to an XG media clip. XG media clips are identified by "recall IDs." XG media clips deliver video (with fill and key signals), 16 audio channels, and can control MCE squeeze effects, audio overs, and main sources.

Control panels have up to 4 selectable "XG keyer layer" buttons. Each one may be assigned any available XG clip.

Channels A and B

Channel A in the Intuition XG processor always mixes with program. Channel B (if it exists in the Intuition XG processor) always mixes with preset or preview (as configured in the MCE).

When the operator places an XG clip on preset (or preview), it is cued up in channel B and placed in the output buffer on channel B, where it plays out on a preset (or preview) monitor. If channel B is not present, you cannot view the XG key on the preset (or preview) monitor.

A moment after it loaded on channel B, the key is cued up on channel A also, but not played out. Playout on channel A occurs during a transition.

When an operator presses the transition button, channel A starts playing at the appropriate moment during the transition, mixing with the rest of program content.

Channel B will display any or all XG layers as an operator chooses them. After they play out, only the persistent portion of the clip remains on preset (or preview).

Channel A will display all XG layers involved in a transition with their timing as designed.

▲ It is possible to use Xplay to watch the channel A and B cue and output buffers load and switch during transitions. Note that manual control of clips under Xplay is not recommended because it would interfere with the MCE.

▲ XG layers with higher numbers have visual priority over layers with lower numbers.

Machine Control and Pre-Roll

Machine control and pre-roll are two independently configurable master control *options*. Machine control applies to VTRs, video disk players, video servers, and similar devices that need to be started, stopped, paused, rewound, and so on. Pre-roll generally applies to tape media (VTRs, etc.) that need to be tensioned and brought up to speed before playing.

The term "pre-roll" in master control applies *also* to Intuition XG subsystems (which are not tape players) and to other media where a certain amount of delay must be applied to transitions to account for playout latency. "Pre-roll" is therefore *also* a generic term applying to a combination of various pre-roll and delayed playback conditions.

MCEs and the control panels support pre-roll and machine control. MCPMs and older panels do not support these functions.

MCEs enable these options independently. You can have one without the other. Intuition XG, for example, requires a pre-roll value, but is not subject to machine control.

Each of the MCE's main sources can be assigned its own machine control parameters and its own pre-roll values. Each MCE can be assigned a *system pre-roll* value.

▲ Pre-roll values for progressive video should be double those of interlaced video.

Any main source in an MCE for which machine control is enabled can specify the following machine control parameters:

- Type (GPO vs. serial)
- Port
- Default time code mode
- Default transition type and rate

Any main source in an MCE for which pre-roll is enabled can have a pre-roll value (expressed as a number of frames, from 0 to 300). The MCE also has a system pre-roll value that is applied as described under Theory, following.

Squeeze images taken from among the main sources "inherit" the pre-roll and machine control values of the main sources. That applies to the squeeze background and to squeeze image 2.

An audio over taken from among the main sources also inherit the pre-roll and machine control values of the main source.

A master control system that performs machine control must include a DC21 device controller. The DC21 functions as an intermediary between the MCE and the devices under control (typically VTRs and video disks). The MCE calculates the timing required to start the various devices used in a transition, and sends appropriate commands to the DC21, which then sends the appropriate protocol commands to the VTRs and other devices.

The DC21 controls up to 4 devices using a serial protocol. The serial protocols supported are Sony, Odetics, and VDCP. Odetics is much like Sony and master control does not use any Odetics features that are not found in the Sony protocol. VDCP means video disc control protocol and applies to video disk players.

The DC21 can also control up to 16 other devices using 100 ms start and stop pulses (via GPO relay signals). *We do not know whether any device that can be controlled by such pulses exists.*

MCE Parameters

An MCE can be configured with a *system pre-roll* value.

▲ The pre-roll value for an MCE with progressive video should be double that of an MCE with interlaced video.

We recommend that the system pre-roll value be set to the longest pre-roll value in your system. See Theory, following, for an explanation.

Main Source Parameters

Main sources (whether they are used as main sources, squeeze images, or audio overs) have 4 machine control parameters.

• Type

The choice for type is GPO or serial. Serial control uses one of 3 standard protocols. GPO control uses a pair of GPO pulse outputs either to start or to stop a device.

• Port

The port specifies which DC21 port to use. If the machine control type is GPO, the port is one of 16 GPO pairs. If the machine control type is serial, the port is one of the 4 serial ports.

• Default Time Code Mode

The default time code should usually be LTC, but there are four choices: 'Ctl Track', LTC, VITC, and 'VDCP Elapsed Time'. The last applies only to VDCP.

• Default Transition Type and Rate

The default transition type and rate allow a main source (1) to have its own transition type and rate independent of the MCE's current transition type and rate or (2) to use the MCE's current transition type and rate.

Default time code, transition type, and transition rate are not strictly machine control concepts, but they are not available unless machine control is enabled.

Panels

Master control panel configurations can include up to 10 different machine control buttons. Panel operators will usually see only a subset of those because the 16 configurable buttons must be committed to a variety of functions. These are the machine control button functions:

| Play | Fast Forward | Cue | Preroll | Ready |
| Stop | Rewind | Pause | Abort | Mark |

The 'Preroll' and 'Abort' buttons are considered the "pre-roll" group; the other 8 buttons and are considered the "machine control" group. That is because pre-roll can be enabled independently of machine control (in the MCE configuration).

The buttons are disabled (dark) if the device corresponding to the main source selected on the preset bus is not powered up, not connected, not in remote control mode, or has its cassette ejected, or is otherwise unavailable.

A panel's transition button turns red when a pre-roll transition is pending, that is when one or more sources chosen on the preset bus has a non-zero pre-roll value. The transition button blinks during the period of pre-roll and reverts to its normal color (orange).

▲ A transition is always a pre-roll transition when the MCE's system pre-roll value is non-zero.

The *pre-roll period* is essentially the longest pre-roll value of the pending sources.

Theory

The pre-roll period is calculated in relation to the point at which new video appears on the program bus. In a V-fade, for example, that is in the middle of the transition. (See Figure A-2, following.)

MasterConfig refers to the *cue point.* The cue point can be configured to be the *mark point* or at the *pre-roll point*:

- Pre-roll point.

  The panel operator will position a tape and press the mark button. The tape is then at the MCE's "mark" point. If the operator then presses the cue button, the VTR will reposition the tape in advance of the mark point by the number of frames specified as the pre-roll value.

- Mark point.

  The panel operator will position a tape and press the mark button. The tape is then at the MCE's "mark" point. The cue button also positions the tape at this point. (Pre-roll positioning must be performed using some other means.)

Most cases use the pre-roll point, where:

For each sources, cue = mark – pre-roll.

The actual timing of the transition is further adjusted by a device latency value:

Effective pre-roll = max [all (pre-roll + latency)]

Transition pre-roll = max [*effective* pre-roll, *system* pre-roll]

▲ The VTR gets "parked" at the pre-roll point. It is only when transition timing is calculated or when the transition executes that latency matters.

It is in the DC21 configuration that the "device latency" is specified. That latency is essentially a "fudge factor" that you must determine experimentally.

▲ Device latency depends in part on the time it takes for commands to get from the MCE through the DC21 to the device. Good pre-roll values must also be determined by experimentation.

About Preroll and Latency

A source configured with pre-roll will always have the defined preroll when it participates in a transition. However, if a source is configured for serial machine control, then that source's *effective pre-roll* may be longer. The device controller has a "Device Internal Latency" field in its device configuration table (accessed through the 'Protocol Assignment' page). The "device internal latency is intended to account for all delays in the serially controlled device (such as mechanical ballistics and serial command pipeline delay) that effectively lengthen the pre-roll.

For example, a serially controlled VTR configured for a 3-second pre-roll might typically have a device internal latency setting of between 5 and 8 frames, to time the first frame of video with the point at which new video must appear as part of the master control transition.

If this single source were the only machine-controlled source involved in the transition then the "effective pre-roll" for this transition would be 3:08 (3 seconds and 8 frames).

When several sources having machine control are involved in a transition, the transition's effective preroll is the longest of any of the sources' effective preroll.

▲ Please note that a source can be configured to have pre-roll without having machine control. Such a source's contribution to a transition's effective pre-roll still holds, but without the contribution of any device internal latency. That is because pre-roll sources that are not also machine control sources are not controlled by the DC21 which is the only place latency values are used.

A transition's pre-roll time might be further modified by the system pre-roll value specified in the general settings of MasterConfig. For any transition, the maximum of system preroll or effective preroll will be used as that transition's pre-roll.

We recommend that configurers set a value for system preroll at the maximum of all pre-roll values so that all transitions will exhibit the same (maximum) preroll period.

This diagram shows a sample pre-roll transition:
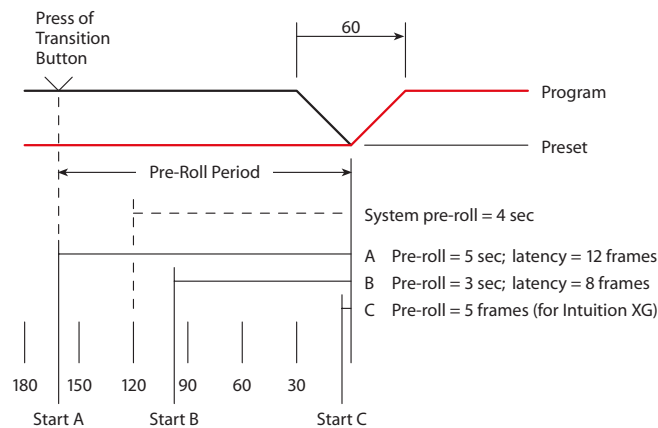
Figure A-2. Pre-Roll Timing

It shows 3 pre-roll sources, A, B, and C with different pre-roll values. The pre-roll value for C—an Intuition XG key—is small in comparison to the transition period which is 60 frames. The transition is a V-fade, so the point at which all new video must begin is 30 frames into the transition (the middle).

The longest effective pre-roll is 162 frames. The pre-rolls and the transition are timed so that the transition starts 30 frames before all three pre-rolls finish (simultaneously). There is therefore a 132-frame delay before the transition itself actually begins.

▲ The operator is obligated to press the transition button about 4.5 seconds (132 frames) before the program video starts to fade. Automation must also start pre-roll transitions ahead of time. To do so, the automation system must either be able to calculate the effective pre-roll for a transition or assume a fixed (maximum) pre-roll time. A fixed system-wide preroll value can eliminate the need for these calculations.

The system pre-roll value (120 frames) is not greater than the longest source pre-roll, so it is dismissed in this case. Had it been greater, it would have been used as the transition's pre-roll value.

Notes

1 A source's effective pre-roll period *elapses* at the first appearance of that sources video for that transition, and typically ***not*** at the start of the transition. See Figure A-2.

2 Hot cuts can pre-roll too.

3 Master control's machine control and pre-roll functions do little to ensure that a tape, or any other medium, is properly cued. Correct playout is always the operator's responsibility.

4 There is an 'Abort' button to cancel pre-roll transitions before a transition completes the pre-roll period.

5 Pre-roll values (expressed as a number of frames) must account for the 50, 60, or 59.94 frames per second of progressive video and the 25, 30, or 29.97 frames of interlaced video.

Monitor Wall

If your master control system is part of a system that has a monitor wall, the monitor wall can display master control sources. The sources can change as the master control operator makes changes.

A monitor wall in a Miranda system is typically one or more Kaleido-X multi-viewers. Although that is not a requirement, some monitor wall features do require a Kaleido-X.

The different Kaleido-X models provide scalability from 16 video inputs and 2 multi-viewer outputs up to 1152 inputs (with an NVISION series router) and 96 multi-viewer outputs. (Each multi-viewer output supports multiple images.)

A single Kaleido-X can control monitor walls in multiple rooms with several layouts defined for each room. Multiple Kaleido-Xs can control different portions of a single monitor wall.

Monitor wall usage differs for panels controlling Imagestore 750s and panels controlling MCEs.

The full use of a monitor wall in master control requires the presence of an NVISION series router and an NV9000 router control system.

Panels Controlling Imagestore 750s

Master control can control up to 24 sources of the potentially hundreds of sources displayed on the monitor wall. The monitor wall can also display the *outputs* of an Imagestore 750.

The panels that control Imagestore 750s are the iMC-Panel-200, iMC-Panel-300, and the iMC-Panel-GUI.

There are several ways master control interacts with the monitor wall:

1 The operator can change the Kaleido-X *room* and *layout* either with a button press or through a channel change.

   It is not likely that a panel operator would want to change the room, but the option is available. It is also not likely that a panel operator would want to change the layout radically, but might want to "zoom in" on a particular image:
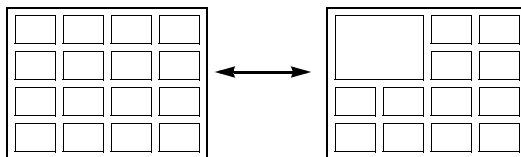
   Different layouts can show different subsets of the Imagestore 750's sources.

2 The monitor wall can display the sources of the Imagestore 750's currently selected source group. The operator (or automation) can change to a different source group and the monitor wall will update accordingly. The operator (or automation) can change sources within a source group and that change will appear on the monitor wall.

3 The monitor wall can display the program, preset, clean-feed, and monitor outputs of the panel's currently selected Imagestore 750. That is, all of the Imagestore 750's outputs can be routed anywhere, including to the Kaleido-X.

   When a panel attaches an Imagestore 750, the monitor wall can automatically switch to show that Imagestore 750's program, preset, clean-feed, monitor, and aux outputs.

   It can also display the aux output associated with the currently selected Imagestore 750.

The Imagestore 750's aux output is a special case. First, it is not actually part of the Imagestore 750, but a router destination that is controlled by the Imagestore 750. (The Imagestore 750 causes the NV9000 to "take" a source, selected on the aux buttons of the control panel, to the aux destination.)

Second, the router's aux output can be defined (1) for each Imagestore 750 or (2) for each control panel (which can control multiple Imagestore 750s.) The latter case allows multiple Imagestore 750s to share a single aux destination.

When an aux destination is defined for the monitor wall (in the panel configuration), all the Imagestore 750s use that aux destination instead of their own aux destination. When the panel configuration does not define an aux destination, each Imagestore 750 uses its own aux destination.

For a panel that is to control an Imagestore 750, you can define up to 24 router destinations that feed sources to the monitor wall. These router destinations apply to all Imagestore 750s controllable at the panel.

Panels Controlling MCEs

For MCEs, control of the monitor wall is limited to Kaleido-X room/layout changes.

None of an MCE's sources has a direct relationship to the monitor wall.

It is possible to write NV9000 salvos that a master control operator (or automation) can execute to switch sources to the monitor wall. It is also possible to write NV9000 salvos that a master control operator (or automation) can execute to switch MCE outputs (e.g., program output) to the monitor wall.

The panels that allow Kaleido-X changes for MCEs are the iMC-Panel-200, iMC-Panel-300, the iMC-Panel-GUI, FECP, CECP, and CECP GUI.

There are a few ways a panel controlling an MCE interacts with the monitor wall:

1 The operator can change the Kaleido-X *room* and *layout* either with a button press or through a channel change. Different layouts might show different sources.

The panel has no *direct* control over the sources, except through NV9000 salvos.

2 The monitor wall can display the program, preset, clean-feed, aux, and preview outputs of the panel's currently selected MCE. That is, all of the MCE's outputs can be routed anywhere, including to the Kaleido-X.

When a panel attaches an MCE, it must execute a salvo to switch the MCE's outputs to the monitor wall. The switch will not occur without the salvo.

For panels that can control both Imagestore 750s and MCEs, it possible and perhaps advisable to share some or all of the 24 router destinations that feed Imagestore 750 sources to the monitor wall with the MCEs. The router destinations for PGM, PST, AUX, etc., can also be shared.

Assumptions:

• 1:1 relationship between panels and Kaleido-X multi-viewers.

A panel cannot address more than one Kaleido-X.

• 1:N relationship between Kaleido-X and monitor walls.

• N:1 relationship between Imagestore 750s and Kaleido-X.

• M:N relationship between panels and Imagestore 750s.

These are the relationships for Imagestore 750s:
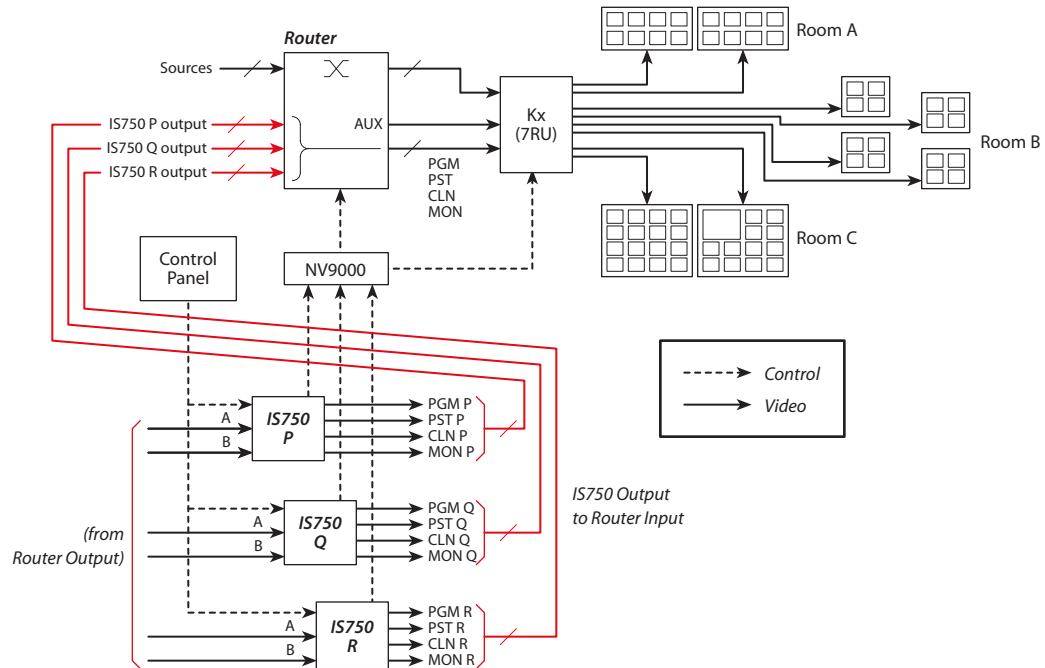
Figure A-3. Kaleido-X Usage for Imagestore 750s

The Kaleido-X drives one or more monitor walls (the number depending on the Kaleido-X model and your system requirements).

Multiple control panels can share control of a single Imagestore 750 (when sharing is enabled). Multiple Imagestore 750s send control messages to the NV9000, which in turn sends crosspoint changes to the router (or routers, perhaps) and "update" commands to the Kaleido-X.

The Aux Output

The aux output associated with an Imagestore 750 is a special case. (Remember that it is not part of the Imagestore 750.)

You can configure the aux output (a router destination) for each Imagestore 750 and for each control panel. There are two cases:

- Case 1: If you do configure the aux output for the panel, multiple aux outputs can feed the Kaleido-X (and auxiliary equipment). It requires router connections as shown in Figure A-4:
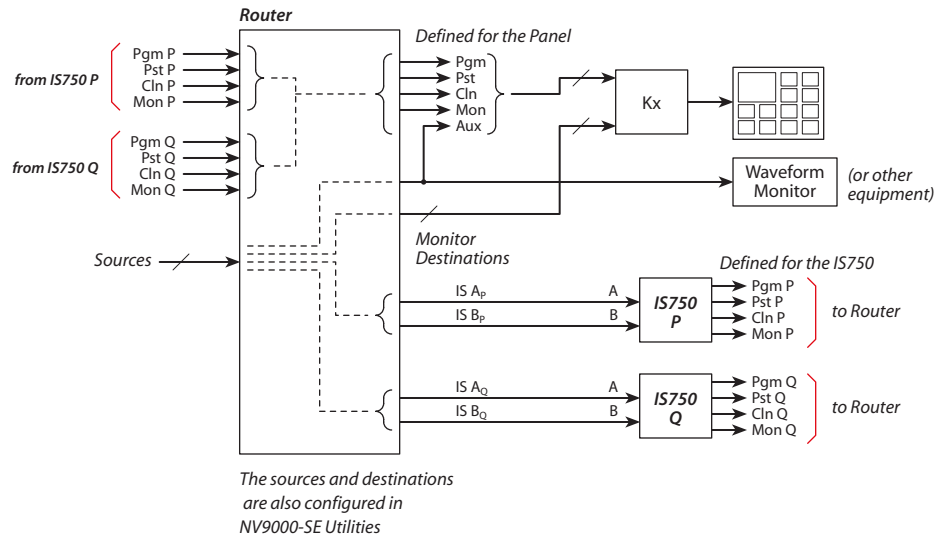
Figure A-4. Router Connections with Aux Output for the Panel

A channel change switches the AUX input as well as the PGM, PST, CLN, and MON inputs.

- Case 2: If you leave the aux output for the panel *undefined,* no aux output can feed the Kaleido-X and auxiliary equipment must be connected directly to the Imagestore 750:
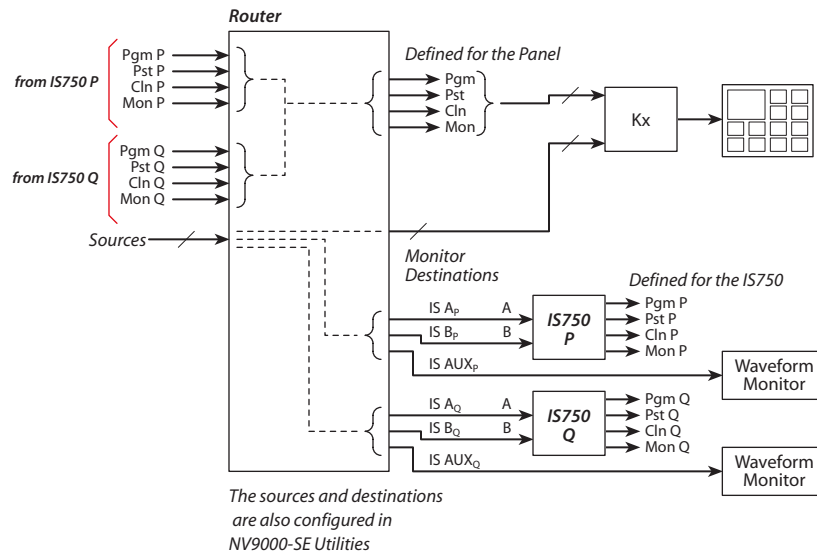
Figure A-5. Router Connections with No Aux Output for the Panel

In this case, a channel change does not switch the aux output.

These are the relationships for MCEs:
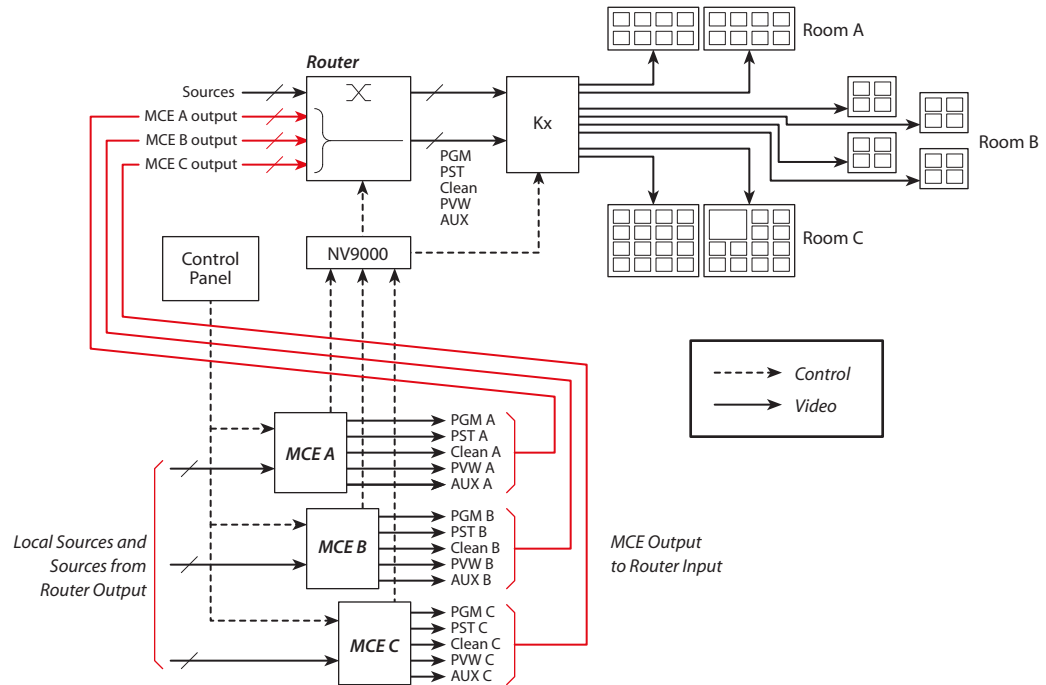
Figure A-6. Kaleido-X Usage for MCEs

The Kaleido-X drives one or more monitor walls (the number depending on the Kaleido-X model and your system requirements).

Multiple control panels can share control of a single MCE.

In the illustration, sources and outputs of multiple MCEs can be viewed on the monitor wall if channel changes are associated with salvos that route the appropriate sources to the router destinations supporting the Kaleido-X.

Sources local to the NV5100MC frames in which the MCEs reside cannot reach the monitor wall unless they are either connected directly or connected through a router.

Monitor Wall Configuration

The Master Control Installation Guide discusses monitor wall configuration for master control.

Following is a summary of the concepts.

1 Enable a Kaleido-X connection in the 'Advanced' page of the MCS Panel Configuration Editor. This applies both to panels controlling Imagestore 750s and panels controlling MCEs.

2 You can configure Kaleido-X room/layout changes in the 'Channel Selection List' page of the MCS Panel Configuration Editor and in any of its user-configurable button pages. This also applies both to panels controlling Imagestore 750s and panels controlling MCEs.

   When a Kaleido-X connection is enabled, the 'Channel Selection List' page shows columns for the room and layout. Each room entry has drop-down list whose elements are defined in the Kaleido configuration. (Refer to the separate X-Edit documentation for information about Kaleido-X configurations.)

3 Router destinations for the monitor wall are configured in the 'Monitor Wall' page of MCS panel editor. The 'Monitor Wall' page applies only to panels controlling Imagestore 750s.

The iMC-Panel-200 and iMC-Panel-GUI support 16 router destinations corresponding to Imagestore 750 *sources*. The iMC-Panel-300 supports 24 router destinations corresponding to Imagestore 750 *sources*.

The 'Monitor Wall' page also defines 5 router destinations that correspond to Imagestore 750 outputs (program, preset, clean-feed, monitor, and aux). When a panel operator attaches an Imagestore 750, that Imagestore 750's outputs are routed to the 5 router destinations defined in this page.

As mentioned already, the aux output associated with the Imagestore 750 is just a router destination. It is not actually part of the Imagestore 750.

4 Use the Imagestore 750 Configurator to configure router sources for the monitor wall. Navigate to the 'Master Control' section under 'Configuration Mode' and choose 'Router Sources' in that section. Assign sources to the appropriate fields.

5 Source groups are also configured in Imagestore 750 Configurator.

See the *Master Control Installation Guide* for full detail.

A. Special Features
Monitor Wall

B. Specifications

Appendix B provides specifications for the devices in the combined imagestore 750 / NV5100MC master control system. It presents these topics:

MCEs are distinct enough from other MCPMs to warrant their own section.

Frames

Specifications

Table B-1. Electrical Power Requirements

Parameter	Specification
AC power	90–130 or 180–250 VAC, 50/60 Hz, auto-ranging. 660 W maximum, power factor corrected.
Receptacles	Two (2) standard IEC 60320 C13/C14, filtered. One receptacle for each of two power supplies. The second power supply is optional.
Agency approvals	UL listed, CE compliant

Table B-2. Mechanical Specifications

Parameter	Specification
Input card slots	8 (16 inputs each)
Output card slots	8 (16 outputs each)
Control card slots	2, primary and secondary (optional). Accepts EM0414 clock generator or EM0374 router control card
Power supply slots	2, primary and secondary (optional). Uses PS6100s.
Dimensions	8 RU (14″) × 19″ W × 19″ D.
Weight	100 lb (45 kg) maximum, with all components installed.

Table B-3. Environmental Operating Conditions

Parameter	Specification
Operating temperature	0–40°C (32–104°F)
Humidity	0–90%, non-condensing

B. Specifications

Frames

Table B-4. Analog Video Specifications

Parameter	Specification
Input level	1.0 V p-p, nominal.
Input impedance	75Ω, internally terminated.
Output level	1.0 V p-p, nominal into 75Ω
Output impedance	75Ω, source terminated internally.
DC on output	±50 mV
Insertion gain	0 dB ± 0.15 dB (±1.75 IRE in active video)
Frequency response	±0.1 dB to 8 MHz, −3 dB at 50 MHz
Signal-to-noise ratio	65 dB to 5.5 MHz, unweighted
Differential gain	±0.15 dB
Differential phase	±0.1°
Delay variation	≤ 1.75° from any input to any output.
System gain match	±0.15 dB
Tilt	< 0.5%
Crosstalk	−57 dB worst case (4.43 MHz, 100% color bars)
Common mode range	±2 V p-p
CMRR	>60 dB to 10 kHz
Hum and noise	−60 dB maximum
Return loss	>38 dB to 8 MHz
Output isolation	>40 dB

Table B-5. Analog Audio Specifications

Parameter	Specification
Max. input level	+24 dBu.
Input impedance	>20 kΩ
Max. output level	+24 dBu, selectable +6 dB via gain switch.
Output impedance	50Ω
I/O connectors	4 DB25, female. Each connector supports 4 stereo pairs.
I/O conversion	24-bit at 48 kHz, either locked to external AES reference or free-run.
Frequency response	20 Hz to 20 kHz ± 0.2 dB.
THD	< 0.02% at +4 dBu at 1 kHz
IMD	< 0.5% per SMPTE method, using a 60 Hz, +12 dBu sine wave and a 7 kHz, 0 dBu sine wave.
Noise	95 dB below +24 dBu
Inter-route delay	< 1 μs
Input-to-output delay	< 1.2 ms
Crosstalk	−80 dB worst case
Insertion gain/loss	±0.1 dB
CMRR	> 75 dB from 60 Hz to 20 kHz

Table B-6. SD Video Specifications (SMPTE 259M)

Parameter	Specification
Input equalization	Automatic equalization for up to 300 m Belden 1694 or equivalent cable.
Input impedance	75 Ω, internally terminated.
Input jitter	≤ 0.2 UI p-p maximum jitter on input signal applied to router.
Input return loss	≥ 15 dB, 5–270 MHz.
Output level	800 mV p-p ± 10% into 75 Ω
Output impedance	75 Ω, 5–270 MHz, internally source terminated.
Supported rates	SMPTE 259M A, B and C (143, 177, 270 Mb/s serial rates.)
Output return loss	≥ 15 dB, 5–270 MHz.
Output DC offset	0.0 VDC, ± 0.5 V
Output rise/fall time	Varies, nominally in the range of 0.4 to 1.5 ms
Output jitter	≤ 0.2 UI p-p
Output overshoot	≤ 10% of amplitude.

Table B-7. HD Video Specifications (SMPTE 292M)

Parameter	Specification
Input equalization	Automatic equalization for up to 100 m Belden 1694 or equivalent cable
Input impedance	75 Ω, internally terminated
Input jitter	≤ 0.2 UI p-p maximum jitter on input signal applied to router.
Input Return Loss	≥ 15 dB, 5 MHz to 1.5 GHz
Output level	800 mV p-p ± 10% into 75 Ω
Output impedance	75 Ω, 5 MHz to 1.5 GHz
Supported Rates	SMPTE 292M, automatic re-clocking for HD-SDI data rates
Output return loss	≥ 15 dB, 5 MHz to 1.5 GHz
Output DC offset	0.0 VDC, ± 0.5 V
Output rise/fall time	≥ 270 ps
Output jitter	≥ 0.2 UI p-p
Output overshoot	≥ 10% of amplitude

B. Specifications

Frames

Table B-8. AVC Video Specifications

Parameter	Specification
Input signal type	NTSC or PAL analog composite video.
Output signal type	SD-SDI (internal, delivered to system motherboard) Note: output signal is line-locked to composite input signal.
Input level	1.0 V p-p, nominal
Input impedance	75 Ω, internally terminated.
Common mode range	±2 V p-p
Frequency response	±0.5 dB to 5.5 MHz (luminance)
S/N (pedestal test signal)	> 75 dB unweighted (BW = 6.5 MHz)
S/N (ramp test signal)	> 50 dB unweighted (BW = 6.5 MHz)
Chroma/luma delay	< 12 ns
Chroma/luma gain inequality	< 0.5 dB

Table B-9. AES Audio Specifications

Parameter	Specification
Signal format	AES3-id
I/O connectors	BNC, unbalanced 75 Ω connectors, or Phoenix screw-type connectors for balanced 110 Ω twisted pair, shielded cables
Sample rates	Synchronous modules, 48 kHz. Asynchronous modules, 28 kHz through 96 kHz.
Inputs and outputs	Meets or exceeds AES3 digital audio specifications
Input levels	Balanced inputs, 110 ohms, 200mV to 10Vp-p. Unbalanced inputs, 75 ohms, 100mV to 1.2Vp-p ±10%
Output levels	Balanced outputs, 110 Ω, 3 V to 7 V p-p Unbalanced outputs, 75 Ω, 1 V p-p ± 10%
Path delay	4 AES samples at 48 kHz.

Table B-10. Communication Port Specifications

Parameter	Specification
Serial communication ports	One primary DE9 female (CRTL1) and one secondary DE9 female (CTRL2) RS-422 receptacles for each control card (4 in total). Ports comply with the SMPTE 207M standard. Signalling protocol and communication parameters are software-dependant.
Ethernet ports	One RJ-45 connector (10/100baseT) for each control card (2 in total). Connection speed is auto-negotiated. Port employs NVEP (NVISION Ethernet protocol). One BNC connector adhering to 10base2 specification for each control card (2 in total). Connection shared between controllers.
Diagnostic ports	One DE9 female diagnostic connector for each control card (2 in total).
Rear panel	Software configured for RS-232 (default) or RS-422 interface specification.
Front edge of control card	DE9, RS-232 (9600, 8, N, 1)
Alarm ports	One DE9 female receptacle (system-level alarms). One 3-pin Phoenix receptacle (power supply alarm).

Table B-11. Reference Port Specifications

Parameter	Specification
Video reference ports	2 looping BNC input pairs, one for each installed control module. External terminators are required. Ports accept NTSC, PAL or HD tri-level analog reference signals. Inputs may be of differing rates. Redundant and dual modes are supported. Return Loss > 30 dB to 5 MHz.
AES reference ports	2 BNC input receptacles, one for each installed control module. Ports accept AES3id format signals at 48 kHz sample rate OR 2 Phoenix twisted pair screw terminal blocks, one for each installed control module. Phoenix ports accept AES3 format signals at 48 kHz sample rate. Note: only one connector type may be used on each AES reference input.
Time-code reference port	This port is not supported.

Jumpers

EM0374 Jumpers

The EM0374 router control card has several jumper sets:
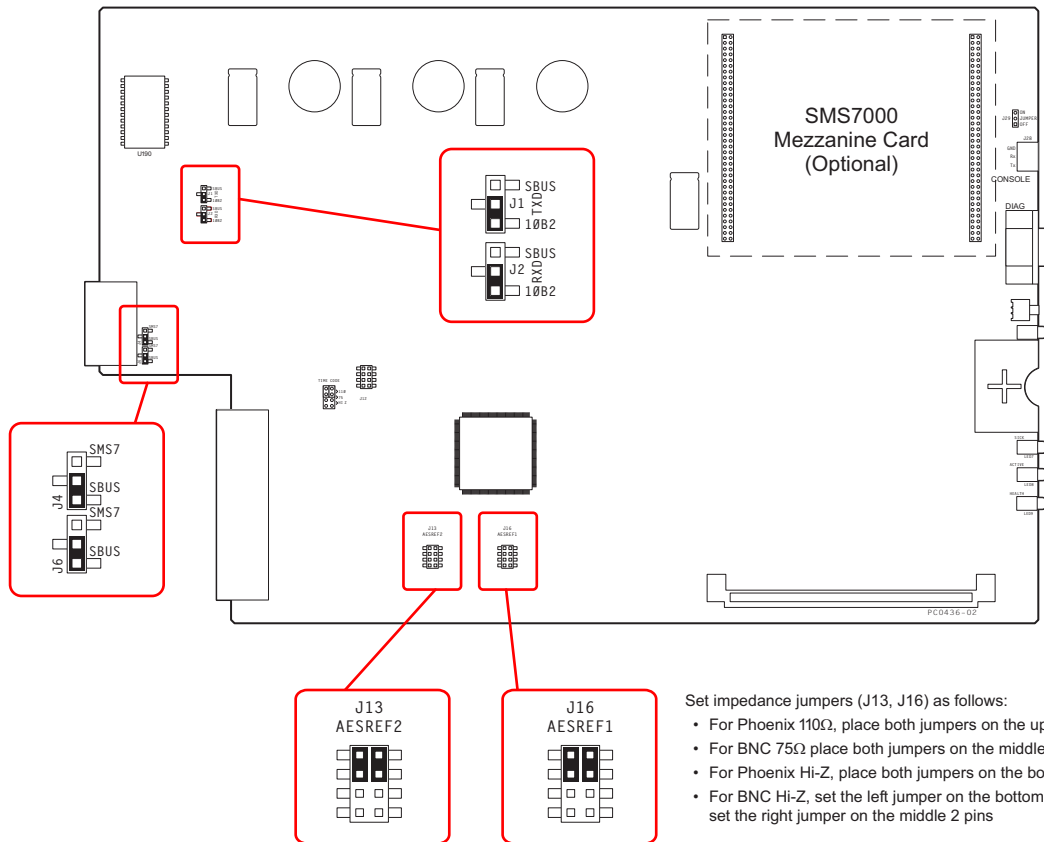
Figure B-1. EM0374 Router Control Card Jumpers

Set impedance jumpers (J13, J16) as follows:

- For Phoenix 110Ω, place both jumpers on the upper 4 pins.
- For BNC 75Ω place both jumpers on the middle 4 pins.
- For Phoenix Hi-Z, place both jumpers on the bottom 4 pins.
- For BNC Hi-Z, set the left jumper on the bottom 2 pins and set the right jumper on the middle 2 pins

Table B-12 describes the jumpers. Jumpers not listed should be left in the factory position:

Table B-12. EM0374 Jumpers

Jumper	Settings
J1, J2	Leave these jumpers in the 10B2 position. The control card (and therefore the frame) does not support SBus yet.
J4, J6	SMS7000 option. Place the jumpers in the SMS7 position to use a SMS7000 control system and the Node Bus connectors. Otherwise, leave the jumpers in the SBus position. (SBus is not supported.) *Note:* Using an SMS7000 requires an SMS7000 mezzanine card to be installed.
J13, J16	AES reference termination options. See Figure B-1 for jumper settings.

EM0414 Jumpers

The EM0414 clock generator card also has several jumper sets:
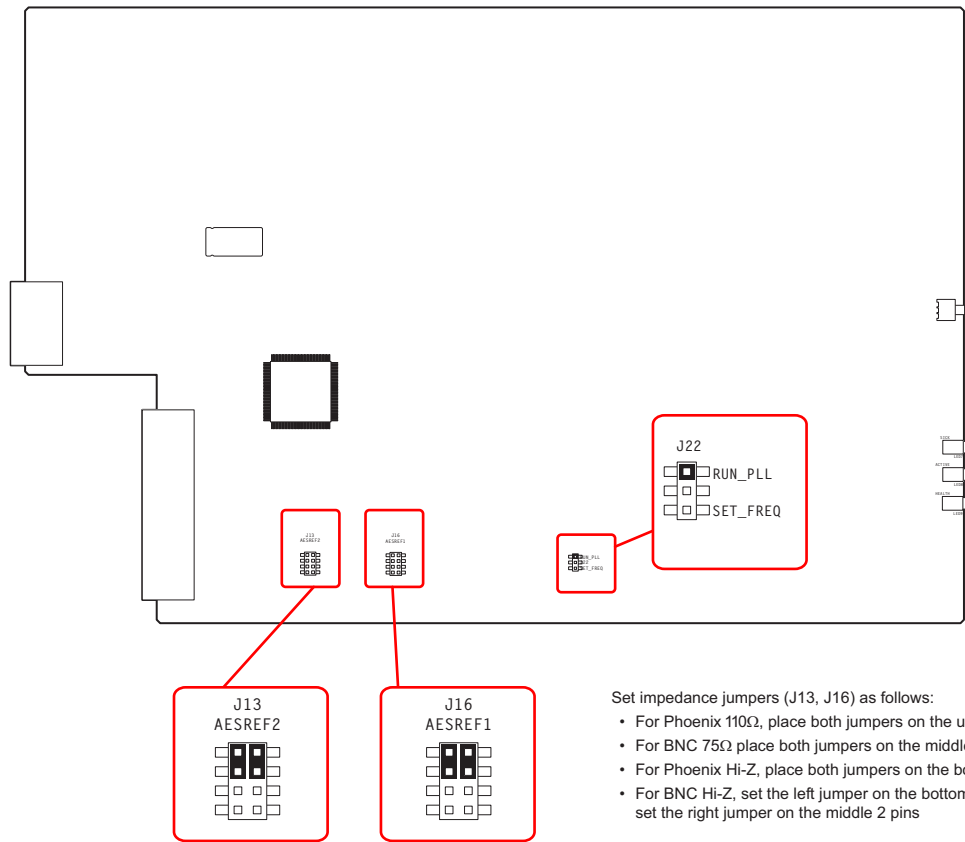
Figure B-2. EM0414 Clock Generator Card Jumpers

Set impedance jumpers (J13, J16) as follows:
- For Phoenix 110Ω, place both jumpers on the upper 4 pins.
- For BNC 75Ω place both jumpers on the middle 4 pins.
- For Phoenix Hi-Z, place both jumpers on the bottom 4 pins.
- For BNC Hi-Z, set the left jumper on the bottom 2 pins and set the right jumper on the middle 2 pins

Table B-13 describes the jumpers. Jumpers not listed should be left in the factory position:

Table B-13. EM0414 Jumpers

Jumper	Settings
J13, J16	AES reference termination options. See Figure B-2 for jumper settings. (The settings are the same for the EM0374 and EM0414.)
J22	Leave this jumper in the RUN_PLL position.

Connectors

Control Port Connectors

The master control frame has two sets of these connectors — one for the primary control card and one for the redundant control card.
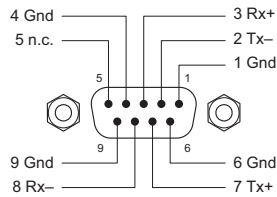
CTRL1, CTRL2   DIAG
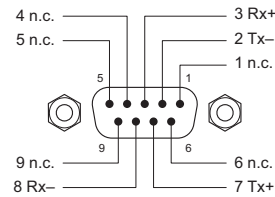
Router Control Card

At the front of the EM0374 router control card is a DE9 diagnostic port:
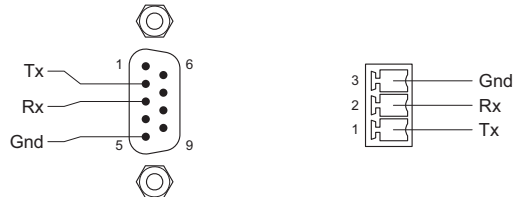
An alternative to the 9-pin diagnostic port is the Phoenix 3-pin "console" port immediately above it. Note that GND is at the top and Tx is at the bottom of the Phoenix connector. (The pins are labelled on the PCB.)

On the DE9, pins 1, 4, and 6 are tied together and pin 9 is not connected.

Analog Audio Cards — DB25

The analog audio input backplane has 4 DB25 connectors. Each supports 4 of 16 stereo channels (or 8 of 32 mono channels):
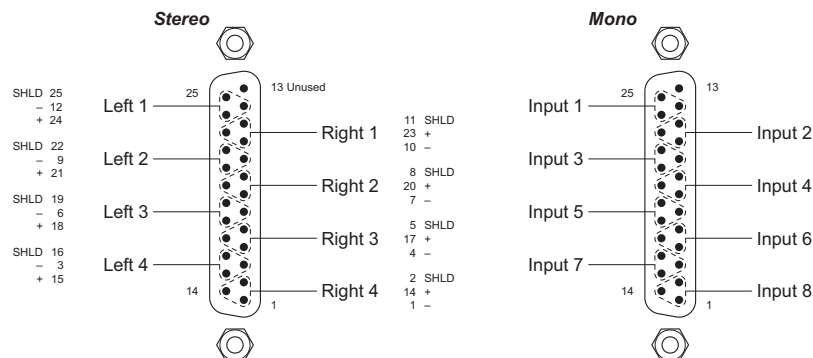
Phoenix Audio Cards — 3-Pin

The EM0391 AES audio input backplane has 16 Phoenix connectors. Each connector supports 1 AES stereo channel:
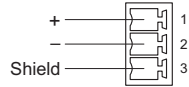
The stereo pairs can be split into independent channels internally.

(The EM0381 backplane has 16 BNC connectors.)

MCPMs

Specifications

Table B-14. MCPM Environmental and Compliance Specifications

Parameter	Specification
Safety	UL1419, EN60950
Emissions (EMC)	FCC CFR 47 Part 15 Class A; EN55103-1
Immunity (EMI)	EN55103-2
Operating temperature	0–40°C (32–104°F)
Humidity	0–90%, non-condensing

Table B-15. MCPM Analog Audio Specifications

Parameter	Specification
Max. output level	+24 dBu, selectable +6 dB via gain switch.
Output impedance	50Ω
Frequency response	20 Hz to 20 kHz ± 0.2 dB.
THD	< 0.02% at +4 dBu at 1 kHz
IMD	< 0.5% per SMPTE method, using a 60 Hz, +12 dBu sine wave and a 7 kHz, 0 dBu sine wave.
Noise	95 dB below +24 dBu
Crosstalk	−80 dB worst case
Insertion gain/loss	± 0.1 dB
CMRR	> 75 dB from 60 Hz to 20 kHz

B. Specifications

MCPMs

Table B-16. MCPM AES Audio Specifications

Parameter	Specification
Signal format	AES3-id
I/O connectors	BNC, unbalanced 75Ω connectors, or DB25 connectors for balanced 110Ω twisted pairs.
Sample rates	Synchronous modules, 48kHz.
Inputs and outputs	Meets or exceeds AES3 digital audio specifications.
Input levels	Balanced inputs, 110 ohms, 200mV to 10Vp-p. Unbalanced inputs, 75 ohms, 100mV to 1.2Vp-p ±10%
Output levels	Balanced outputs, 110Ω, 3V to 7V p-p Unbalanced outputs, 75Ω, 1V p-p ± 10%

Table B-17. MCPM SD Video Specifications (SMPTE 259M)

Parameter	Specification
Input equalization	Automatic equalization for up to 300m Belden 1694 or equivalent cable.
Input impedance	75Ω, internally terminated.
Input jitter	≤ 0.2UI p-p maximum jitter on input signal applied to router.
Input return loss	≥ 15dB, 5–270MHz.
Output level	800mV p-p ± 10% into 75Ω
Output impedance	75Ω, 5–270MHz, internally source terminated.
Supported rates	SMPTE 259M A, B and C (143, 177, 270Mb/s serial rates.)
Output return loss	≥ 15dB, 5–270MHz.
Output DC offset	0.0VDC, ± 0.5V
Output rise/fall time	Varies, nominally in the range of 0.4 to 1.5ms
Output jitter	≤ 0.2UI p-p
Output overshoot	≤ 10% of amplitude.

Table B-18. MCPM SWB Video Specifications (SMPTE 259M, 344M, and 292M)

Parameter	Specification
Input equalization	Automatic equalization for up to 100m Belden 1694 or equivalent cable
Input impedance	75Ω, internally terminated
Input jitter	≤ 0.2UI p-p maximum jitter on input signal applied to router.
Input return loss	≥ 15dB, 5MHz to 1.5GHz
Output level	800mV p-p ± 10% into 75Ω
Output impedance	75Ω, 5MHz to 1.5GHz
Supported rates	SMPTE 292M, automatic re-clocking for HD-SDI data rates
Output return loss	≥ 15dB, 5MHz to 1.5GHz
Output DC offset	0.0VDC, ± 0.5V
Output rise/fall time	≤ 270ps
Output jitter	≤ 0.2UI p-p
Output overshoot	≤ 10% of amplitude

▲ SWB means "super wide band" and includes SD and HD rates.

Table B-19. MCPM Video Reference Specifications

Parameter	MCPM				
	-SD	-MK-SD	-MK-HD	-HD, -HD2	-SDHD
Operation with no termination	YES				
Operation with one 75Ω terminator	YES				
Operation with two 75Ω terminators	YES			NO	
Blanking level range	0.0 V ± 0.5 VDC			0 mV ± 50 mVDC	
Input level	0.5 V–2.0 V p-p			1.0 V–2.0 V p-p	
Accept NTSC or PAL	YES				
Accept tri-level	NO		YES		
More than one other device on loop	YES			NO	

Connectors

Aux Connectors

There are two forms of the aux connector: DB15 for the MCPM-MK-SD and -HD, and a DB25 for the MCPM-SD, -HD, -HD2, and -SDHD.
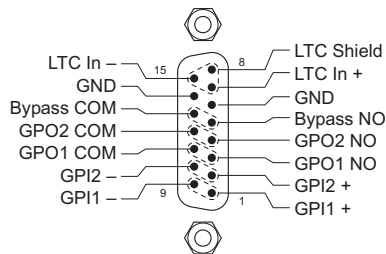
DB15   DB25
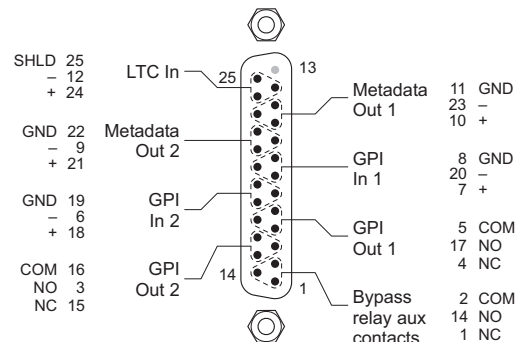
GPI and GPO here stand for general purpose input and output, respectively. The bypass terminals are connected to the MCPM's emergency bypass relay. The LTC (linear time code) inputs are unused.

Metadata 1 carries decoded Dolby E metadata from the program bus. Metadata 2 carries decoded Dolby E metadata from the preset bus.

▲ The MCPM-MK-SD and -HD have no Dolby E audio and therefore no metadata outputs.

Meter and Monitor Connectors

All MCPMs have an digital output port for metering and monitoring:

```
SHLD  25      Meter 1/2   25      13
 −    12                                      11   SHLD
 +    24                          Meter 3/4   23    −
                                              10    +
SHLD  22      Meter 5/6
 −     9                                       8   SHLD
 +    21                          Meter 7/8   20    −
                                               7    +
SHLD  19      Mon. 1/2
 −     6                                        5   SHLD
 +    18                           Mon. 3/4    17    −
                                                4    +
SHLD  16      Mon. 5/6   14       1
 −     3                                        2   SHLD
 +    15                           Mon. 7/8    14    −
                                                1    +
```
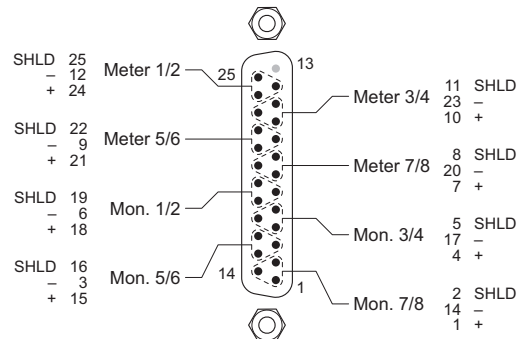
The MCPM-SD, -HD, -HD2, and -SDHD also have an analog output connector for metering and monitoring:

```
SHLD  25      Output 1   25      13
 −    12                                      11   SHLD
 +    24                          Output 2    23    −
                                              10    +
SHLD  22      Output 3
 −     9                                        8   SHLD
 +    21                          Output 4    20    −
                                                7    +
SHLD  19      Output 5
 −     6                                        5   SHLD
 +    18                          Output 6    17    −
                                                4    +
SHLD  16      Output 7   14       1
 −     3                                        2   SHLD
 +    15                          Output 8    14    −
                                                1    +
```
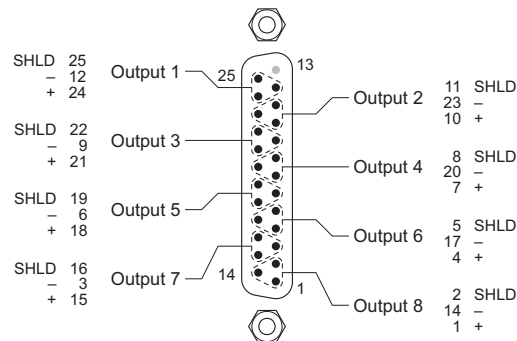
The MCPM-MK-SD and -HD do not.

Automation Connectors

All MCPMs have an automation connector:

```
n.c. ──────         9      5      ────── n.c.
Rx − ──────                       ────── Rx Com
Tx + ──────                       ────── Rx +
Tx Com ────         6      1      ────── Tx −
                                  ────── Gnd
```
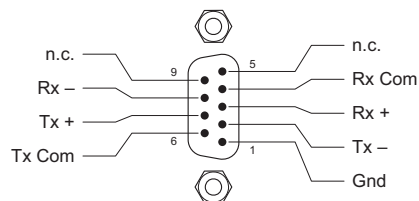
(The protocol is RS-422.)

Diagnostic/Configuration Connector

At the front of each MCPM is a DE9 diagnostic and configuration port:

```
Tx ───        1      6              3 ──── Gnd
Rx ───                              2 ──── Rx
Gnd ───       5      9              1 ──── Tx
```
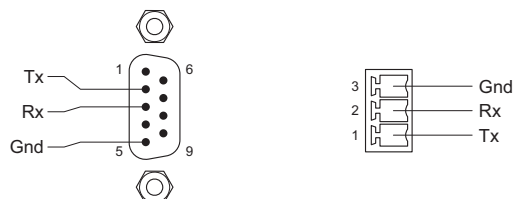
The protocol is RS-232.

An alternative to the 9-pin diagnostic port is the Phoenix 3-pin "console" port, either above or below the DE9 connector. Note that GND is at the top and Tx is at the bottom of the Phoenix connector. (The pins are not labelled on the PCB.)

On the DE9, pins 1, 4, and 6 are tied together and pin 9 is not connected.

MCEs

Specifications

Table B-20. MCE Environmental and Compliance Specifications

Parameter	Specification
Safety	UL1419, EN60950
Emissions (EMC)	FCC CFR 47 Part 15 Class A; EN55103-1
Immunity (EMI)	EN55103-2
Operating temperature	0–40°C (32–104°F)
Humidity	0–90%, non-condensing

Table B-21. MCE AES Audio Specifications

Parameter	Specification
Signal format	AES3-id
I/O connectors	1.0/2.3 Coax
Sample rates	Synchronous modules, 48 kHz.
Inputs and outputs	Meets or exceeds AES3 digital audio specifications.
Input levels	Balanced inputs, 110 ohms, 200mV to 10Vp-p. Unbalanced inputs, 75 ohms, 100mV to 1.2Vp-p ±10%
Output levels	Balanced outputs, 110Ω, 3V to 7V p-p Unbalanced outputs, 75Ω, 1V p-p ± 10%

Table B-22. MCE SD Video Specifications (SMPTE 259M)

Parameter	Specification
Input equalization	Automatic equalization for up to 300m Belden 1694 or equivalent cable.
Input impedance	75Ω, internally terminated.
Input jitter	≤ 0.2 UI p-p maximum jitter on input signal applied to router.
Input return loss	≥ 15 dB, 5–270 MHz.
Output level	800mV p-p ± 10% into 75Ω
Output impedance	75Ω, 5–270 MHz, internally source terminated.
Supported rates	SMPTE 259M A, B and C (143, 177, 270 Mb/s serial rates.)
Output return loss	≥ 15 dB, 5–270 MHz.
Output DC offset	0.0 VDC, ± 0.5V

Parameter	Specification
Output rise/fall time	Varies, nominally in the range of 0.4 to 1.5 ms
Output jitter	≤ 0.2 UI p-p
Output overshoot	≤ 10% of amplitude.

Table B-23. MCE SWB Video Specifications (SMPTE 259M, 344M, and 292M)

Parameter	Specification
Input equalization	Automatic equalization for up to 100 m Belden 1694 or equivalent cable
Input impedance	75 Ω, internally terminated
Input jitter	≤ 0.2 UI p-p maximum jitter on input signal applied to router.
Input return loss	≥ 15 dB, 5 MHz to 1.5 GHz
Output level	800 mV p-p ± 10% into 75 Ω
Output impedance	75 Ω, 5 MHz to 1.5 GHz
Supported rates	SMPTE 292M, automatic re-clocking for HD-SDI data rates
Output return loss	≥ 15 dB, 5 MHz to 1.5 GHz
Output DC offset	0.0 VDC, ± 0.5 V
Output rise/fall time	≤ 270 ps
Output jitter	≤ 0.2 UI p-p
Output overshoot	≤ 10% of amplitude

▲ SWB means "super wide band" and includes SD and HD rates.

Table B-24. MCE Video Reference Specifications

Parameter	Value
Termination	75 Ω, internal
Blanking level range	0.0 V ± 0.5 VDC
Input level	0.5 V–2.0 V p-p
Accept NTSC or PAL	YES
Accept tri-level	YES
More than one other device on loop	NO

Core Connectors

Aux Connectors

The MCE has a DB25 auxiliary connector:
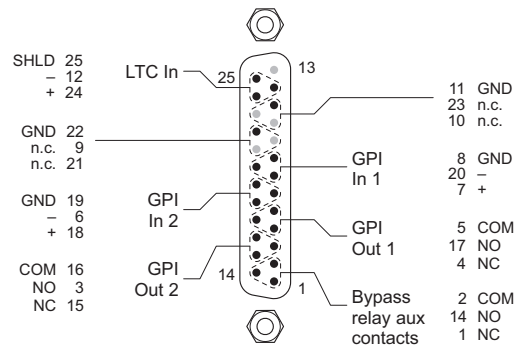
The LTC input is not presently in use.

GPI and GPO here stand for general purpose input and output, respectively. The bypass terminals are connected to the MCPM's emergency bypass relay. The LTC (linear time code) inputs are unused.

Automation Connectors

All MCPMs have an automation connector:
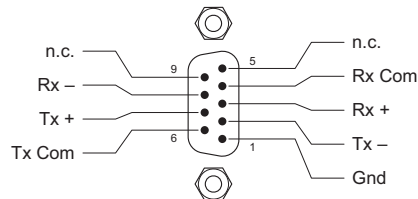
(The protocol is RS-422.)

Diagnostic/Configuration Connector

At the front of each MCE (-CORE card) is a 6-pin Phoenix connector that supports both the diagnostic and configuration ports:
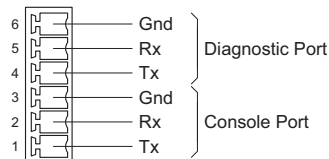
The diagnostic protocol is RS-232. So is the console protocol, but the console is not used with MasterDiag. It is the diagnostic part of this port to which you connect when using MasterDiag.

AXM Connectors

The MCE-AXM has unusual connectors. The signals on these 4 DB25 connectors will change at a later revision. The connectors are called J1–J4, J1 being at the top of the AXM backplane module:

SHLD 25
– 12
+ 24
SHLD 22
– 9
+ 21
SHLD 19
– 6
+ 18
SHLD 16
– 3
+ 15

1 25 13 Unused
2 11 SHLD
   23 –
3 10 +
4 8 SHLD
   20 –
5 7 +
6 5 SHLD
   17 –
7 4 +
8 2 SHLD
14 14 –
1 1 +

J1 — Metadata Output

SHLD 25
– 12
+ 24
SHLD 22
– 9
+ 21
SHLD 19
– 6
+ 18
SHLD 16
– 3
+ 15

Ch. 1/2 25 13 Unused
Ch. 3/4 11 SHLD
         23 –
Ch. 5/6 10 +
Ch. 7/8 8 SHLD
         20 –
Ch. 9/10 7 +
Ch. 11/12 5 SHLD
           17 –
Ch. 13/14 4 +
Ch. 15/16 2 SHLD
14 14 –
1 1 +

J2 — AES Outputs (1–8)

SHLD 25
– 12
+ 24
SHLD 22
– 9
+ 21
SHLD 19
– 6
+ 18
SHLD 16
– 3
+ 15

Ch. 1/2 25 13 Unused
         11 SHLD
Ch. 5/6 Ch. 15/16
         23 –
         10 +
Ch. 9/10 Ch. 11/12
         8 SHLD
         20 –
         7 +
         Ch. 7/8
         5 SHLD
Ch. 13/14 17 –
         4 +
         Ch. 3/4
         2 SHLD
14 14 –
1 1 +

J3 — AES Output (9–16)

SHLD 25
– 12
+ 24
SHLD 22
– 9
+ 21
SHLD 19
– 6
+ 18
SHLD 16
– 3
+ 15

Ch. 1/2 25 13 Unused
         11 SHLD
Ch. 5/6 Ch. 15/16
         23 –
         10 +
Ch. 9/10 Ch. 11/12
         8 SHLD
         20 –
         7 +
         Ch. 7/8
         5 SHLD
Ch. 13/14 17 –
         4 +
         Ch. 3/4
         2 SHLD
14 14 –
1 1 +

J4 — AES Outputs (17–24)

The metadata connector J1 provides 8 metadata signals. The metadata pairs are compatible with RS-422 or RS-485 electrical characteristics. Each of the 8 metadata ports is configurable.

The other 3 connectors provide 8 AES pairs each. The 24 outputs are configurable.

Imagestore 750s

Mechanical

19.0″ × 1.72″ × 26.0″.
9.0 kg (19.8 lb).
Cooling by forced air, internal fan.

Power

Automatically senses input 90–132VAC or 180–264 VAC, 50 or 60 Hz.
Draw is about 150 W, depending somewhat on options. Max draw is 350 W.
2 power supply units, with 3 fuses in each. (There are also DC supply fuses, internally.)

Environment

Operating temperature range is 5–40 C, relative humidity 20–80%.
Storage temperature –10 to +70 C.

Video

HD — 1080i50, 720p50, 1080i59.94, 720p59.94
SD 625i50, 525i59.94
Reference — analog reference, HD tri-level sync. SD bi-level sync.
Cable equalization: lengths up to 110 m (Belden 8281 or 1694A).
Output levels: 800 MV ± 10%
Return loss better than –15 dB, up to 1.5 GHz.

GPIO

This a drawing of the GPIO connector:
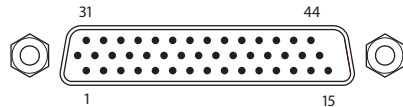
There is a GPIO adapter for this connector. The part number is GPIO-44TBA.

There are 16 GPIO pins. Any of these can be an input or an output. There are two GPIO grounds and a +5V and +12V input for GPIO.

Each GPIO terminal can be configured in one of 4 ways:

- GPI Input On — a positive voltage level triggers the GPI input, relative to the GPI ground pin(s).
- GPI Input Off — a (nominally) zero voltage level triggers the GPI input, relative to the GPI ground pin(s).
- GPI Output On — a zero voltage level, relative to the GPI ground pin(s), drives an output circuit.
- GPI Output Off — a positive voltage level, relative to the GPI ground pin(s), drives an output circuit.

GPI inputs can be configured to execute "macros." (A macro is a sequence of commands, up to 2048 bytes, about 200 commands, such as 'DSK 1 Fade Up'. A macro can also include GPI output commands.)

A GPI output can be associated with one (of several) internal conditions, such as 'EAS Running'. The outputs can be configured to turn on or off when its associated condition arises.

GPIO Pinout

Pin	Signal	Pin	Signal	Pin	Signal
1	LTC–	16	RS485/1+	31	LTC+
2	LTC_GND	17	RS485/1–	32	GP_GND
3	TOTAL_DC_FAIL	18	RS485/2+	33	GPIO_16
4	GPIO_15	19	RS485/2–	34	GPIO_14
5	GPIO_13	20	RS485/3+	35	GPIO_12
6	GPIO_11	21	RS485/3–	36	GPIO_10
7	GP_+5V	22	RS485/4+	37	TOTAL_DC_FAIL
8	GP_+12V	23	RS485/4–	38	GPIO_9
9	GPIO_8	24	GND	39	GPIO_7
10	GPIO_6	25	GND	40	GPIO_5
11	GPIO_4	26	GND	41	GPIO_3
12	GPIO_2	27	RS232A_TX [a]	42	GPIO_1
13	GP_GND	28	RS232A_CTS	43	RS232A_RX
14	RS232B_TX	29	RS232A_RTS	44	RS232B_RX
15	RS232B_RTS	30	RS232B_CTS		

a. The RS-2332 pins are *reserved for future development*.

AES I/O

This is a drawing of the AES connector:

Pinout:
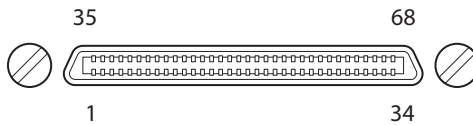
Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
1	AES_IN_1 (+)	35	AES_IN_1 (–)	18	AES_OUT_1 (+)	52	AES_OUT_1 (–)
2	AES_IN_2 (+)	36	AES_IN_2 (–)	19	AES_OUT_2 (+)	53	AES_OUT_2 (–)
3	AES_IN_3 (+)	37	AES_IN_3 (–)	20	AES_OUT_3 (+)	54	AES_OUT_3 (–)
4	AES_IN_4 (+)	38	AES_IN_4 (–)	21	AES_OUT_4 (+)	55	AES_OUT_4 (–)
5	AES_IN_5 (+)	39	AES_IN_5 (–)	22	AES_OUT_5 (+)	56	AES_OUT_5 (–)
6	GND	40	GND	23	AES_OUT_6 (+)	57	AES_OUT_6 (–)
7	AES_IN_6 (+)	41	AES_IN_6 (–)	24	AES_OUT_7 (+)	58	AES_OUT_7 (–)
8	AES_IN_7 (+)	42	AES_IN_7 (–)	25	AES_OUT_8 (+)	59	AES_OUT_8 (–)
9	AES_IN_8 (+)	43	AES_IN_8 (–)	26	AES_OUT_9 (+)	60	AES_OUT_9 (–)
10	AES_IN_9 (+)	44	AES_IN_9 (–)	27	AES_OUT_10 (+)	61	AES_OUT_10 (–)
11	AES_IN_10 (+)	45	AES_IN_10 (–)	28	AES_OUT_11 (+)	62	AES_OUT_11 (–)
12	AES_IN_11 (+)	46	AES_IN_11 (–)	29	AES_OUT_12 (+)	63	AES_OUT_12 (–)
13	AES_IN_12 (+)	47	AES_IN_12 (–)	30	GND	64	GND
14	AES_IN_13 (+)	48	AES_IN_13 (–)	31	AES_OUT_13 (+)	65	AES_OUT_13 (–)
15	AES_IN_14 (+)	49	AES_IN_14 (–)	32	AES_OUT_14 (+)	66	AES_OUT_14 (–)
16	AES_IN_15 (+)	50	AES_IN_15 (–)	33	AES_OUT_15 (+)	67	AES_OUT_15 (–)
17	AES_IN_16 (+)	51	AES_IN_16 (–)	34	AES_OUT_16 (+)	68	AES_OUT_16 (–)

These are balanced differential pairs. Cabling is up to customer. However, breakout boxes are available for 110 Ω and 75 Ω BNCs. The part numbers are ABT-32-32-D110 and ABT-32-32-D75 respectively. Connect the breakout box to the AES port using a SCSI VHDCI-68 male-to-male cable. The cable must have connectors with 0.8 mm pin spacing.

COM Ports

COM ports: There are 4 all like this:

	RS-422	RS-232
1	Tx+	RTS
2	Tx−	Tx
3	Rx+	CTS
4	n.c.	n.c.
5	n.c.	n.c.
6	Rx −	Rx
7	n.c.	n.c.
8	Gnd	Gnd

The ports support RS-232 or RS-422. The pinout is odd-ball.

Rates 9600, 19,200, 38,400, 57,600, and 115,200. The factory default is 57,600.

There are 5 protocols: (Oxtel) automation, Presmaster, Intuition, and 2 EAS.

BNCs

The BNCs are all 75 Ω connectors. The reference BNC is also 75 Ω and is terminated internally.

For the LAN ports you don't need detail.

Other Signals (on the GPIO Connector)

'Total DC Fail' is a pair of terminals. You can connect a lamp (or similar circuit) to this pair. There is a contact closure when DC fails within the Imagestore 750. Otherwise, the contacts are open. The limits are 400 mA and 25 VDC.

The connector supports 4 RS-485 ports (differential pairs). The ports operate at 115.2 kBaud with 1 start bit, 8 data bits, 1 stop bit, and no parity. The ports can be configured as inputs or outputs.

The RS-485 ports are for Dolby metadata.

There are pins for two RS-232 ports, but the ports are disabled at present. They are for future use.

There are 3 LTC connectors (+, −, and GND) but I do not know whether this is differential or what.

B. Specifications

Imagestore 750s

Drawing
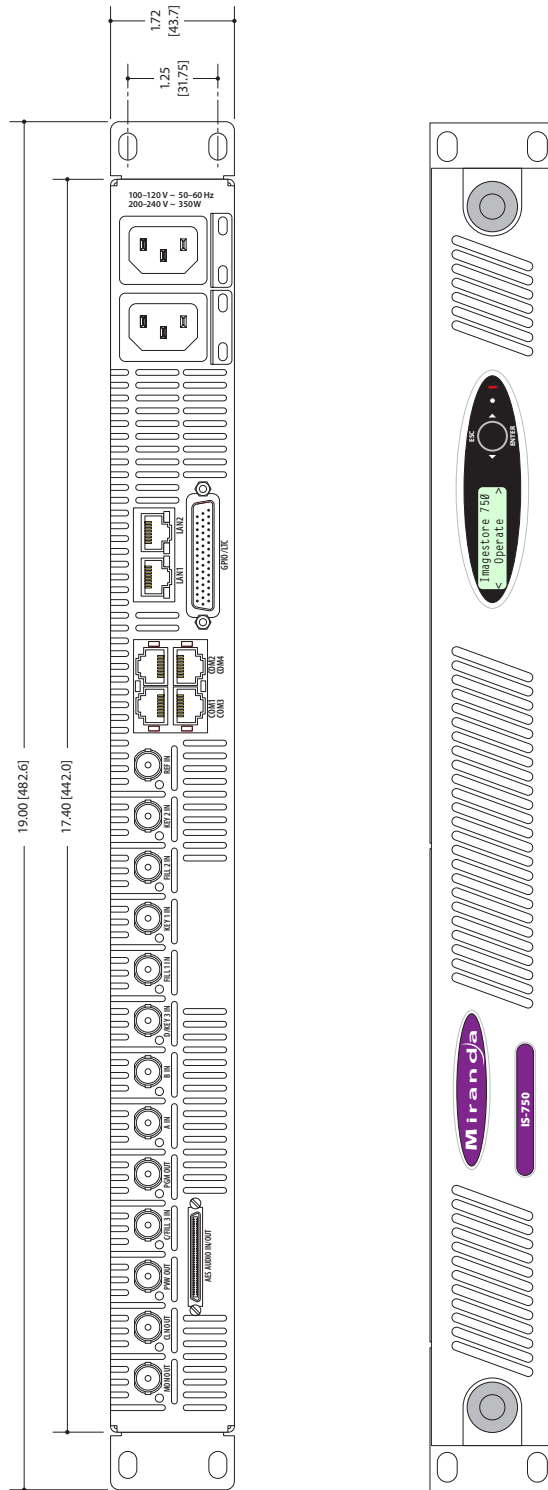
Figure B-3. Imagestore 750, Rear View and Front View

Control Panels

Specifications

Table B-25. iMC-Panel-300 Specifications

Parameter	Specification
AC power	90–130 or 180–250 VAC, 50/60 Hz, auto-ranging. 90 W maximum, power factor corrected.
Receptacles	Two standard IEC 60320 C13/C14, filtered. One receptacle for each of two power supplies. The second power supply is optional.
Agency approvals	UL listed, CE compliant
Dimensions	28.25″ w × 6.96″ h × 20.14″ d. (718 mm × 177 mm × 512 mm)
Weight	30.8 lb (13.97 kg)
Operating temperature	0–40°C (32–104°F)
Humidity	0–90%, non-condensing

Table B-26. iMC-Panel-200 Specifications

Parameter	Specification
AC power	90–130 or 180–250 VAC, 50/60 Hz, auto-ranging. 90 W maximum, power factor corrected.
Receptacles	Two standard IEC 60320 C13/C14, filtered. One receptacle for each of two power supplies. The second power supply is optional.
Agency approvals	UL listed, CE compliant
Dimensions	19.7″ w × 6.96″ h × 20.21″ d. (500 mm × 177 mm × 513 mm)
Weight	23.4 lb (10.6 kg)
Operating temperature	0–40°C (32–104°F)
Humidity	0–90%, non-condensing

Table B-27. iMC-Panel-100 Specifications

Parameter	Specification
AC power	90–130 or 180–250 VAC, 50/60 Hz, auto-ranging. 90 W maximum, power factor corrected.
Receptacles	Two Molex 4-pin connectors (to PS0001-00 power supplies).
Agency approvals	UL listed, CE compliant
Dimensions	19.0″ w × 5.22″ h × 3.70″ d. (482.6 mm × 132.6 mm × 94.0 mm)
Weight	5.4 lb (2.45 kg) button panel only, not considering monitor weight.
Operating temperature	0–40°C (32–104°F)
Humidity	0–90%, non-condensing

Connectors

AUX

The AUX connector (DB15) is present, but unused, on the iMC-Panel-200 and iMC-Panel-300.

GPI/Alarms

The GPI/Alarm connector (DB25) is the same for all hardware control panels:
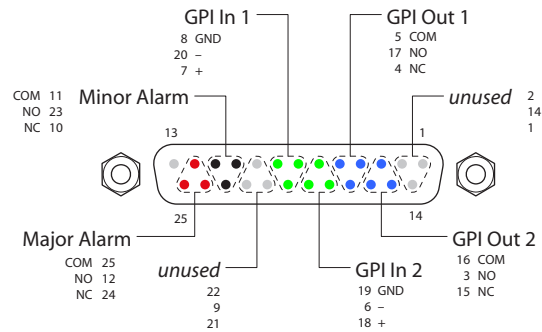
A panel produces two levels of alarm output:

- Major alarm:

  A failure of any circuit board.
  Failure of both power supplies.
  The internal panel temperature is greater than 60°C.
  (FFCP, CFCP) A detected failure of an attached transition lever arm.
  (SCP) The panel has been in one of the following states for greater than 5 minutes:

    a Panel restarting or panel startup.

    b Panel shutdown.

    c Panel restarting.

    d Internal panel communication problem.

- Minor alarm:

  Failure of one power supply.
  Fan failure or over temperature (> 50°C).

The alarm outputs are SPDT relay terminals (NC, NO, COM) as are the GPI output terminals. External GPI and alarm circuits are determined by the customer.

▲ An alarm will clear when all of the triggering conditions are off for 5–10 seconds continuously.

Power applied to the GPI inputs can be from 5 to 24 VDC, and less than 30 mA. Typically, 5 V at 1 mA. Loads for the GPI and alarm outputs can be larger:

Max current: 1 A
Max voltage: 125 VAC, 110 VDC.
Max capacity: 62.5 VA, 33 W.
Rated loads: 1 A at 30 VDC; 0.3 A at 110 VDC; 0.5 A at 125 VAC.

Other Products

Tally Processor

Table B-28. Tally Processor Specifications

Parameter	Specification
AC power	90–240 VAC, 1.35 A, 47–63 Hz.
DC power	APX switching power supply, SP45970DR.
Dimensions	19.0″ w × 1.75″ h × 8.5″ d. (483 mm × 45 mm × 216 mm)
Weight	7.2 lb (3.3 kg).
Supplier	DNF Controllers, www.dnfcontrollers.com
Software, firmware	DC30, version 5.5

Connectors

The tally processor has 32 inputs and 32 outputs on 4 DC37 (a.k.a. DB37) connectors. Shown here are the connectors for inputs 1–16 and outputs 1–16.
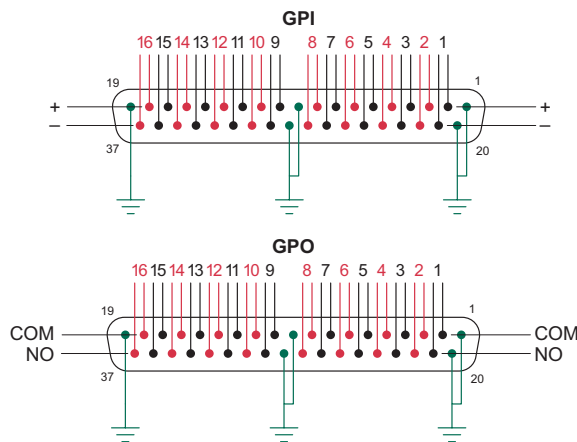
Inputs: The upper pins are the "+" connections for each GPI signal. The lower pins are the "−" signals.

Outputs: The upper pins are the COM (common) connections for each relay output. The lower pins are the NO (normally open) connections.

Inputs 17–32 and outputs 17–32 have the same ordering.

Device Controller

Table B-29. Device Controller Specifications

Parameter	Specification
AC power	100–240 VAC, 1.6 A, 50–60 Hz.
DC power	APX4108 switching power supply, 24V, 2.5A
Dimensions	19.0″ w × 1.75″ h × 8.5″ d. (483 mm × 45 mm × 216 mm)
Weight	7 lb (3.2 kg).
Supplier	DNF Controls, www.dnfcontrols.com
Software, firmware	DC21, version 5.31

GPIO Connectors

The device controller has 32 inputs and 32 outputs on 4 DC37 connectors. Shown here are the connectors for inputs 1–16 and outputs 1–16.
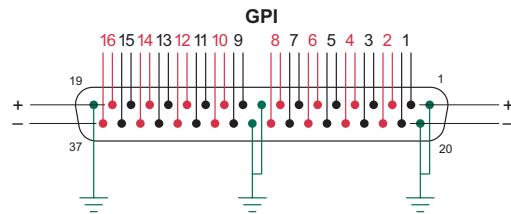
Inputs: The upper pins are the "+" connections for each GPI signal. The lower pins are the "−" signals.
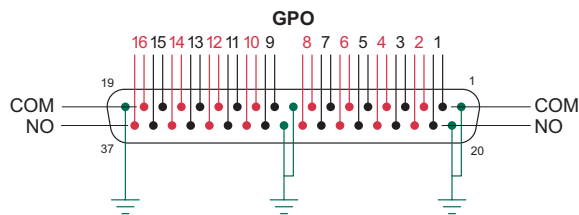
Outputs: The upper pins are the COM (common) connections for each relay output. The lower pins are the NO (normally open) connections.

Inputs 17–32 and outputs 17–32 have the same ordering. These are the ratings:

Inputs	Outputs
5–12 VDC	0.5 A at 125 VAC
24 VDC with ext. resistor 680–820Ω	1.0 A at 24 VDC
20 mA max	1.0 A max

The inputs are not used by master control, but may be used for other purposes.

Serial Connectors

The DC21 device controller has 4 serial ports. Each of the 4 serial ports has this pinout:

4 Gnd — 3 Tx+
5 n.c. — 2 Rx–
1 Gnd
9 Gnd — 6 Gnd
8 Tx– — 7 Rx+
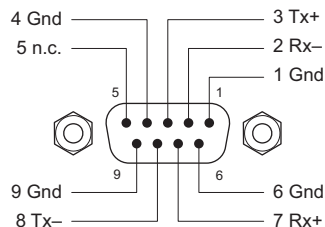
The DC21 supports RS-422 or RS-232 communication.

EBCP

Table B-30. EBCP Specifications

Parameter	Specification
AC power	See PS0001 Power Supply on page 195.
Receptacles	Two 4-pin receptacles. One receptacle for each of two power supplies. The second power supply is optional.
Agency approvals	UL listed, CE compliant
Dimensions	19.0″ w × 1.72″ h × 1.64″ d. (482.6 mm × 43.7 mm × 41.7 mm)
Weight	1.62 lb (0.734 kg)
Operating temperature	0–40°C (32–104°F)
Humidity	0–90%, non-condensing

PS0001 Power Supply

The PS0001-00 is a small power supply used for the EBCP.

Table B-31. Power Supply Specifications

Specification	Detail
AC power	90–264 VAC (127–300 VDC), 47–447 Hz. Inrush current < 50 A at 230 VAC, cold start, at 25°C, Input current < 2.0 A rms at 115 VAC; < 1.0 A at 230 VAC.
DC power	≤ 60 W, 12 VDC, 5 A (5.4 A peak), Regulation ± 2%. Ripple ≤ 120 mV.
Efficiency	Efficiency > 80% at full load typical, 115 VAC.
Weight	1.06 lb (0.48 kg).
Regulatory	UL listed and CE compliant.
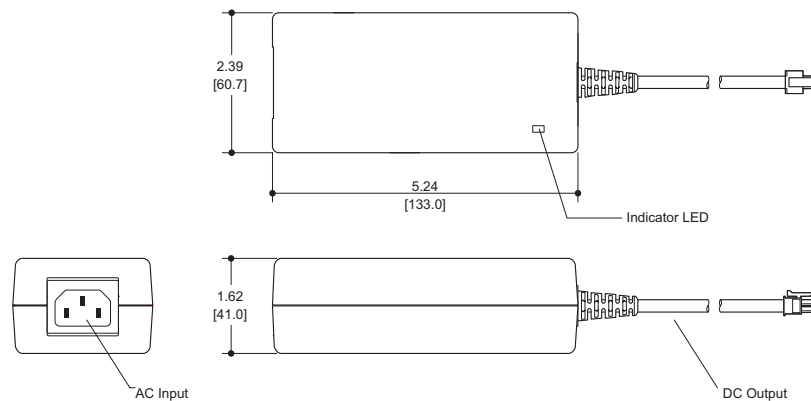
The power output has a Molex 4-pin plug.

C. Misc. Information

Appendix C provides several useful reference sections. The following topics are discussed:

- Glossary
- Components
- NV9000 Integration
- Application Notes
- NV5100MC Maintenance
- North American and International Power Cords

Glossary

Async AES, Sync AES	Synchronous AES occurs when all AES inputs are tied to a common 48 kHz reference signal. Asynchronous AES input is valid at almost any data rate. Synchronous AES implies 48.000 kHz.
	(A 48 kHz rate—48,000 samples per second—is 3.072 Mb/s.)
	Master control does not use asynchronous AES input.
AVC	Analog Video Conversion. A simple conversion that creates an SD digital output signal from a composite analog video input.
	The term also means the conversion of an SD signal to an analog composite video output signal.
	AVC coding provides a cost-effective method to provide feeds to video monitors without requiring an external conversion device. AVC modules are not a substitute for professional-grade format converters. Path delay and subcarrier phase might not be precisely maintained in an AVC conversion path within a frame.
Backplanes	Modular, rear-mounted assemblies providing input and output connectors.
Clean Feed	An output that contains program content minus some or all of the program layering. The clean feed signal is directed to a clean feed output at the rear of the MCPM. There are 7 clean-feed choices.
	The Imagestore 750 has a 'CLN' output and several clean-feed taps.
Control surface	An inclusive term meaning hardware or software control panel.
DARS	Digital Audio Reference Signal.
DB25	A common 25-pin subminiature D connector.
DC21	A third-party device (1RU) used by master control systems to execute device control functions.
DE9, DB9	A common 9-pin subminiature D connector.
EIA	Electronic Industries Alliance, Arlington, VA (www.eia.org). See also TIA.
EIA-422	See RS-422.
GUI	Literally "graphical user interface." Also an abbreviation for the iMC-Panel-GUI.

C. Misc. Information

HD, HD-SDI	HD and HD-SDI are equivalent terms in master control documents. An HD-SDI signal is a high-definition, serial digital video format that conforms to the SMPTE 292M standard.
iMC-Panel-200	A compact master control panel.
iMC-Panel-300	A large master control panel.
iMC-Panel-GUI	A software master control panel (or GUI).
Imagestore 750	A 1RU master control transition processor.
IP address	A 32-bit number that identifies a device on a network. The address is usually expressed as 4 octets, in decimal notation, joined by periods (e.g., 192.168.7.20). (Although IP means "internet protocol," here we just mean network address.)
Intuition XG	Intuition XG is a combination of a video, audio, and graphics processor and Xmedia software.
Key	A video image (called the fill) generally coupled with another video image (the "key") to be over-laid, possibly with transparency, on the program output. The "key" is a mask that hides or reveals pixels in the fill according to the brightness of the pixel in the cutter. Some keys do not have separate key images. These "self-key," that is, the image is masked according to the luminance values in the fill image itself. Keys are subject to transition type and transition rate.
	A *keyer* is the master control function that processes keys.
Layer	For the MCE, one of the video output components (main source, 2 logos, 3 keyers, and squeeze-back). The are called layers because of their visual priority. Functions to the right, on the control surface, have priority.
	For the Imagestore 750, a DVE, DSK, or voice-over.
Logo	A graphics file (static or animated) that can be overlaid on program output. The logo either contains a distinct key layer or can "self-key" from its luminance data. Logo files acceptable to an MCPM or MCE are converted from files in common graphic formats (TIF, GIF, JPEG, TGA, BMP, PNG). Animation source files must be Targa (TGA) files.
	The term applies to MCEs and MCPMs only.
MCE	*Master Control Engine*, an advanced MCPM model. The MCE is modular, occupying from 1 to 3 card slots.
MCPM	*Master Control Processing Module*. A master control switcher. There are several models: MCPM-SD, MCPM-HD, MCPM-HD2, MCPM-SDHD, MCPM-MK-SD, and MCPM-MK-HD, and MCE.
Module	Modules are interchangeable — or modular — parts. Master control modules include input cards, output cards, control cards, power supplies, fans, backplanes, MCPMs, and MCEs.
Reference Signal	A timing signal used to synchronize events such as the switching of video signals during a specific portion of the vertical interval. Reference signals are externally applied. In their absence, signals generated internally (by a control card) are used to sustain operation.
RJ45, RJ-45	Registered jack, type 45. A common 8-pin modular plug and/or jack used in the telecommunications and broadcast industry to transport Ethernet or machine control signals.

RS-422   Recommended standard 422. Also called TIA/EIA-422-B. A bidirectional serial communications standard. Miranda documents refer to the latest standard in effect at the time the product was developed.

SD, SD-SDI   SD and SD-SDI are equivalent terms in master control documents. An SD-SDI signal is a standard definition, serial digital video format that conforms to the SMPTE 259M standard.

SDI   Serial digital interface.

Squeezeback   A process in which the program video is either (1) reduced in size or (2) cropped and possibly repositioned so that an additional video image (the background) can be displayed in the program output. Squeezeback is subject to transition type and transition rate.

                Enhanced squeezeback (available with the MCPM-SDHD) involves a second image with or without audio.

                The term applies to MCEs and MCPMs. The Imagestore 750 has DVEs (roughly equivalent to squeezeback).

Sync AES   See Async AES.

SWB   (Super Wide Band). A term originated by Miranda that means a wide range of digital bit rates and formats. Miranda's SWB supports data rates from 10 Mbps to about 1.5 Gbps. The SWB input cards reclock at 143, 177, 270, 360, and 540 MB/s and 1.483 and 1.485 Gb/s. The SWB input cards bypass re-clocking for non-video rates. See the SWB specification (Table B-18 on page 180).

TIA   Telecommunications Industry Association, Arlington, VA (www.tiaonline.org). See EIA.

Transition   The process by which the MCPM or MCE moves the content of the preset bus (source and layers) to the program bus. Transitions are governed by transition type and transition rate.

Vertigo XG   A single- or dual-channel HD/SD graphics processor.

XG Dashboard   Configuration tool for Intuition XG.

XMedia   A collection of configuration and creative software used with Intuition XG.

Xbuilder   "Template population" and "promo timeline control" software for Intuition XG.

XPlay   A "media event sequencer" used to configure the Intuition XG and to manage clips. Xplay must be running on the Intuition XG processor for correct operation under master control.

Xstudio   "Template creation" software for Intuition XG.

Components

The following tables list the components that a customer may purchase for use in a master control system. Input cards have 16 inputs and output cards have 16 outputs, unless otherwise specified. The list does not include parts used for a multi-format router (MFR).

Table C-1. I/O Cards and Backplanes

Part	Description	Order Code
EM0374	Router control card	*Please contact Miranda*
EM0414	Clock generator card	CLK-GEN
EM0377	AVC input backplane (BNC)	IO5000-AVC-IN
EM0585	Analog audio input card [a]	NV5000-AA-IN
EM0381	Analog audio input backplane (DB25) [a]	IO5000-AA-IN
EM0383	SD input card	NV5000-SD-IN
EM0385	SD input backplane	IO5000-SD-IN
EM0389	AES sync input card [a]	NV5000-SA-IN
EM0391	AES input backplane, balanced (STP)	IO5000-AES-IN-TP
EM0393	AES input backplane, unbalanced (BNC)	IO5000-AES-IN-BNC
EM0396	SWB input backplane. *See EM0466.*	IO5000-HD-IN
EM0424	SWB output backplane. *See EM0465.*	IO5000-HD-OUT
EM0432	AVC input card. *Use backplane EM0377.*	NV5000-AVC-IN
EM0465	SWB output card. *Use backplane EM0424.*	NV5000-HD-OUT
EM0466	SWB input card. *Use backplane EM0396.*	NV5000-HD-IN
EM0724	SWB input card. *Use backplane EM0725.*	NV5100MC-SWB-IN
EM0735	SWB output card. *Use backplane EM0736.*	NV5100MC-SWB-OUT
EM0725	SWB input backplane.	IO5100MC-3GIG-IN
EM0736	SWB output backplane.	IO5100MC-3GIG-OUT

a. 16 stereo inputs or 32 independent (mono) inputs.

Table C-2. MCPMs and Backplanes

Part	Description	Order Code
EM0430	MCPM-SD transition processor	NV5000-XP-SD
EM0461	MCPM-HD transition processor	NV5000-XP-HD
EM0583	MCPM-HD2 transition processor	NV5000-XP-HD2
EM0518	MCPM-MK-SD transition processor	NV5000-MK-SD
EM0560	MCPM-MK-HD transition processor	NV5000-MK-HD
EM0524	MCPM-SDHD transition processor	NV5000-XP-SDHD/H, /S, /U
EM0462	MCPM-HD backplane	IO5000-XP-HD
EM0431	MCPM-SD backplane	IO5000-XP-SD
EM0539	MCPM-SDHD backplane	IO5000-XP-SDHD
EM0519	MCPM-MK-SD backplane	IO5000-MK-SD
EM0561	MCPM-MK-HD backplane	IO5000-MK-HD

Table C-3. MCEs and Backplanes

Part	Description	Order Code
EM0638	AXM audio expansion module	NV5100MC-AXM
EM0636	CORE processing module	NV5100MC-CORE
EM0637	PVW preview module	NV5100MC-PVW
EM0639	DVE digital video effects module (2D)	NV5100MC-DVE
EM0643	AXM backplane	IO5100MC-AXM
EM0641	CORE backplane	IO5100MC-CORE
EM0642	PVW preview backplane	IO5100MC-PVW

Table C-4. Control Panels

Part	Description	Order Code
SV0404	Software control panel	iMC-Panel-GUI, SB0072
FR0038	Compact control panel	iMC-Panel-200
FR0063	Large control panel	iMC-Panel-300

Table C-5. Additional Products or Components

Part	Description	Order Code
FR0008	RJ45-to-DE9 breakout panel	BP-PORT-64
FR0013	Emergency bypass control panel	EBCP
LP0060	CFCP insert for video effects and audio overs	*For replacement, contact Miranda*
NV5500	Universal sync generator	NV5500
NV9000	NV9000 router control system	*Please contact Miranda*
PS6100	Power supply module	PS6100
SB0160	Software upgrade, SD to HD, for MCPM-SDHD	NV5000-XP-SDHD/U
SD4150	AES embedder, 4-channel	SD4150
SD4161	AES disembedder, 4-channel	SD4161
SG4410	AES sync generator	SG4410
SG4424	HD-SDI slave sync generator	SG4424
SM0434	Dolby-E decoder for MCPM	NV5000-XP-DOLBY
SV0403	Master Control Configuration Software	SB0075
WC0053	DB25 breakout cable (for analog audio)	NV5000-CABLE1
HB0392	Master Control Tally Interface	NV5100MC-TALLY
HB0404	1.0/2.3 DIN to BNC breakout panel (16 channels)	NV5100MC-BOP

NV9000 Integration

If the master control system is used with an NV9000 Router Control System, connected routers may be used as sources for master control inputs.

The benefits of integrating the master control system and a NV9000 system include:

• More than 128 inputs (depending on the external router size).

- Router source names appear on buttons (because of integration).
- A control panel can control the upstream router in certain ways. Router information is displayed on the control panel.
- The ability to execute router salvos (either automatically with a channel change or explicitly) from the control panel.

The NV9000 router control system's device names are formatted for display on control panel buttons according to NV9000 rules. Some editing of the NV9000 mnemonics within the NV9000 configuration software might be needed to correct display problems on master control panels.

SNMP

Under control of the NV9000 system, MCPMs and MCEs can be monitored through SNMP. Master control's SNMP function is available through the NV5100MC SNMP license (EC9610). It requires a NV9000 system with an EC9600 option. The NV9000 provides the SNMP agent. Refer to the *NV9000-SE Utilties User's Guide* for more information.

The Imagestore 750 supports SNMP using its own methods. It does not report to the NV9000.

Application Notes

Multi-Channel Monitoring for MCEs and MCPMs

With many stations running multiple channels of master control, video and audio monitoring can be difficult. One of the unique attributes of Miranda master control can help. You can allocate space in the frame for a small (multi-format) router in addition to the master control channels. The program and monitor outputs of the MCPMs can be switched through the router. Router output cards drive video and audio monitoring equipment. If you are using the NV9000 Router Control System, monitor switching can be integrated in the master control panel (or GUI).

An NV9000 Router Control System, with an appropriately configured NV96*xx* control panel, allows operators to select individual channels for monitoring with the push of a button. Two or three channels of master control and the required routing hardware will easily fit into a single NV5100MC or NV5128-MC frame. (Router control card(s) are required, instead of clock generator

cards.) The router control cards support a wide range of control protocols allowing operation with either Miranda's NV9000 Router Control System or those of several other manufacturers.
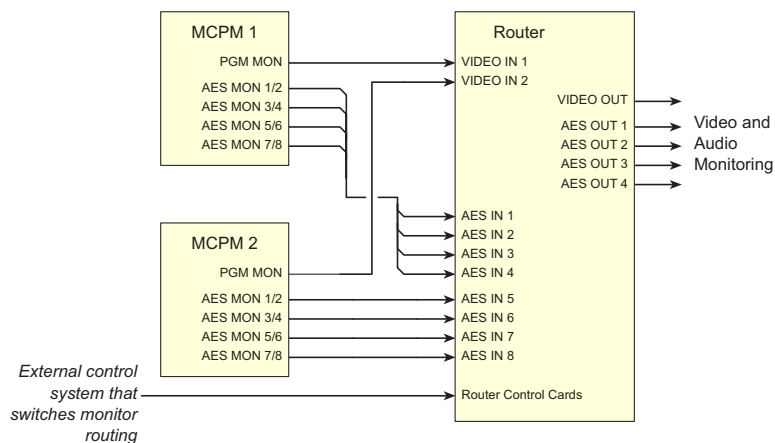
Figure C-1. Multi-Channel Monitoring

You can also switch MCPM outputs with external routers, but it is a matter of considerable convenience and economy to use the in-frame router that can switch multiple formats: audio, SD video, HD video, and other formats as well.

Using Router Pre-Select for Master Control

Any one of hundreds (or even thousands) of router sources can feed any master control input:
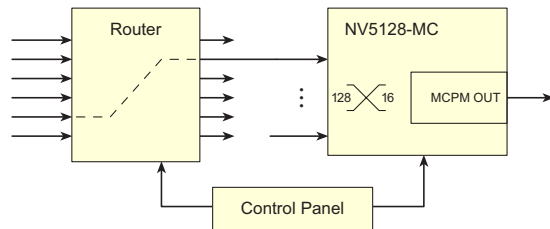
The master control operator chooses which router source to map to an MCPM main source. Control panel buttons will display the source mnemonics used in the NV9000 system.

Such source mapping is an intrinsic feature of the master control system.

You can also apply source mapping to keyers, squeeze backgrounds, and audio over sources, although this kind of source mapping is not automatic. A master control operator can execute router salvos at the control panel that switch keyer sources, background sources, audio over sources, and in fact, any sources.

The master control operator can also use any NV9000 control panel to perform router operations.

Using External Router Sources

External router sources (ERS) are a topic for MCPM configurers and system designers. The master control panel operator need not and probably will not know which sources are *external* (from routers) and which sources are *local* (connected at the frame's backplane), although the operator might have to load and control media in local devices.

Much of ERS is customer-dependent. At best, this document can present some general guidelines.

An NV5100MC or NV5128-MC frame has 128 potential input ports in 8 input card slots. ERS can consume up to 30 ports — video or audio. The master control system must balance cabling between local sources and external sources.

▲ If all audio is embedded, the cabling job is easier.

ERS configurations apply to MCPMs. Two MCPM configurations that use completely different ERS inputs could consume 60 inputs. It is to your advantage to configure ERS inputs for all MCPMs in one frame in exactly the same way. (Doing so makes the NV9000 configuration simpler too.)

You must have a number of video input cards and audio input cards that support your application. Inputs come in multiples of 16. (An audio input is stereo pair, but it can be split.)

MCPMs occupy 1, 2, 3, or 4 *output* slots. MCEs occupy from 1 to 3 slots. You could conceivably have 8 MCPM-MK-SDs in one frame. MCPM backplane modules occupy 1, 2, or 3 backplane slots. MCPMs (including MCEs) can coexist in a frame if you have the slots for them.

Note that MCPM-MK-HDs have 16 inputs on their own (2-slot) backplanes and those inputs are not shared. All main, squeeze, and key sources, external and local, must come through the those 16 inputs, and not from the motherboard.

An MFR (multi-format router) can coexist in the frame with the MC system. The combination can offer great benefits[1] but imposes constraints on the MC system (i.e., fewer slots for MCPMs, dedicated slot assignments for the MFR with port cards and time-code cards, HD output cards in MCPM wings, etc.) The MFR can manipulate/manage some of the signals of the MC system.

Configuring ERS

ERS configuration is performed entirely in MasterConfig. Any MCPM, including MCEs, can perform external router source selection. ERS must be enabled in MasterConfig's general settings.

External router sources can be main sources, over sources, key sources, and squeeze images. Each type must be enabled individually. The configurer should enable only what is needed because ERS consumes inputs ports:

Main sources require up to 12 ports (in pairs).

Key sources require (usually) 6 connectors, but you can get by with 3 if all you have are self-keys.

Over sources require up to 8 connectors, but if all overs are embedded, 2 will suffice.

Squeeze backgrounds requires 1 connector.

Squeeze image 2 requires 1 connector.

Router sources and destinations are typically multi-level (one video level, multiple audio levels) and unless all your video has embedded audio, you must connect a cable for each level. This applies primarily to main sources, but also to key sources, and over sources.

Caveats

An external main source must be added to the main source list as an 'External Router Input'.

An external key source must be added to the keyer source list as an 'External Router Input'.

---

1. See the Miranda application note *Routing and Master Control Integration* (AN0004-xx).

An external over source must be added to the over source list as an 'External Router Input'.

An external squeeze source must be added to the *main* source list as an 'External Router Input'. Further, the main source must be chosen in either the squeeze1 or squeeze2 settings. (A panel operator has some discretion in choosing squeeze sources.)

The MCPM configuration limits the number of sources:

Main sources ≤ 128, 64, or 16, depending on the MCPM
Key sources ≤ 8
Over sources ≤ 4
Squeeze2 sources ≤ 32
Squeeze background sources ≤ 32

(Local squeeze 2 images are also defined as main sources.)

Linking Two MCPMs as Primary and Backup

You can use the external video and audio bypass inputs to provide a form of redundancy for the master control system, by cross-connect two MCPMs, as shown in Figure C-2.

The bypass relay within the MCPM will switch to the bypass input when a fault occurs. You can switch to bypass manually using (1) the toggle switch on the front of the MCPM, (2) an emergency bypass control panel, or (3) by pressing a button on a master control panel.

Control functions for the two MCPMs can be configured so that the two track each other as the operator performs transitions to air. If automation is used, a separate connection from the automation system to each MCPM is needed.

This approach does not prevent using the backup processor as a second channel occasionally. Its program outputs can be used to provide a second program feed when backup operation is not needed. Although this is not shown here, routing functions could be used to allow a single MCPM to act as a backup for several others. A salvo within the control system could then route the appropriate video and audio signals in a manner similar to that shown in Figure C-2.
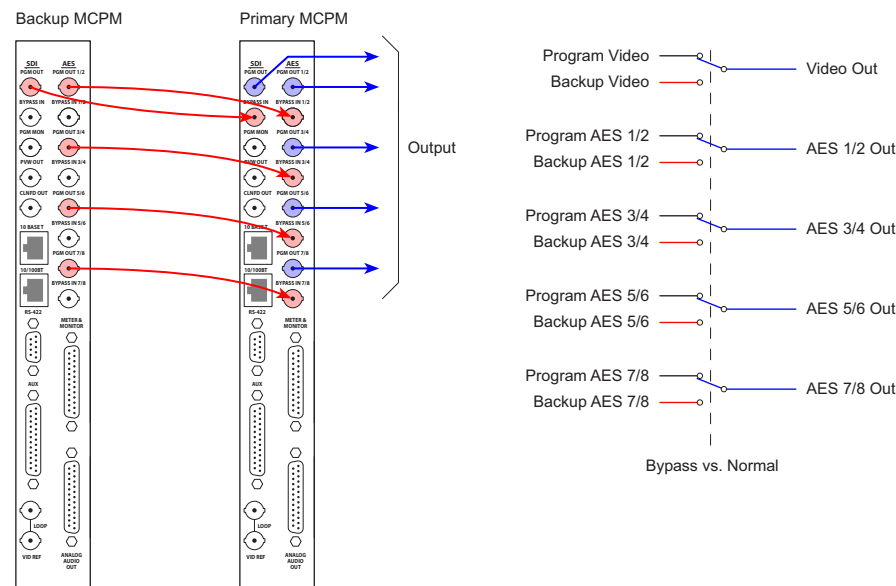
Figure C-2. Connecting Two MCPM-SDs (or -HDs) as Primary and Backup

NV5100MC Maintenance

The frame requires very little in the way of routine or preventative maintenance. Other than cleaning the fan air intake filter, all that is required is periodic inspection of the system to make sure no failures have occurred.

Miranda master control panels require no maintenance.

Periodic Inspection

Periodically inspecting the frame for signs of trouble is the best way to prevent unplanned outages. The following items will be helpful when performing this inspection. Begin the inspection at the front of the frame. Open the door to the frame and make these observations.

1 Check the +48 VDC LEDs on the front of the PS6100 power supplies. An LED that is off or very dim indicates a failed or failing supply.

2 Place your hand lightly across the air intakes on the front of the power supplies. You should feel slight air movement, indicating that the internal cooling fans are running. These fans run at very low speed, so you will notice only slight air movement. You can use a flashlight to verify that the fan blades are rotating at the proper speed.

3 Look at each input/output module and verify that none of the red alarm LEDs are illuminated. Normally, the green and/or amber LEDs are illuminated. Refer to Table C-8 on page 209 to interpret the LED status indicators.

4 Look at each MCPM and verify that none of the red alarm LEDs are illuminated. Normally, the green and amber LEDs are illuminated. Refer to Table C-7 on page 208 to interpret the LED status indicators.

5 Look at the control card(s) and verify that the green and amber LEDs are illuminated on the active control card, and that the green LED is on for the standby controller (if present). Verify that the low battery LED is off on one or both control cards. Table C-6 on page 208 describes the various LEDs and their meaning.

6 Inspect the air intake filter located inside the door. If the filter is dirty or clogged, refer to Intake Filter Screen Cleaning for information on how to clean it.

Next, inspect the rear of the matrix frame.

1 Verify that there are no missing backplane cover plates. Cover plates are required to ensure proper cooling in the frame.

2 Place your hand near the air exhausts. You should feel strong air pressure evenly across the entire opening.

3 Check all cable connectors for any sign of unseating.

4 Verify that one or both AC cords are firmly seated at both ends. Make sure that the spring bail power cord retainers on the rear of the frame are in place.

Intake Filter Screen Cleaning

The intake filter is located on the front door assembly of the frame. To access the filter, simply open the door by releasing the two thumbscrew locks. Slide the filter up and to the right to remove it. This process might be easier if you remove the entire door. To remove it, simply open the door and lift it straight up. The system can be operated safely with the door removed for short periods of time.

▲ NOTE: Be sure to replace the door when done. This ensures that air entering the frame is properly filtered.

If the filter is only lightly contaminated with debris, clean it with a vacuum cleaner or dry compressed air. Remove loose debris and dirt with a vacuum cleaner or by blowing air from the clean side to the dirty side. For filters that are badly clogged, a rinse with cold water may prove effective. You can also wash the filter with warm water and mild detergent. In any case, make sure the filter is completely dry before reinstalling it.

Battery Replacement

A CR2330 lithium coin cell is located on the front edge of a router control module and at the front edge of an MCPM-SD or -HD. These batteries provides power to maintain the RAM contents when power is lost.

▲ Some MCPMs have a battery and some do not. MCPMs do not need a battery. There is no need to replace a battery in the MCPM.

Under continual power, the battery should last several years or more. If the module is frequently powered down, you should replace the battery every 6 months. A red LED, located directly above the battery holder in the control card illuminates if the battery is low. The MCPM-SD and -HD have no obvious battery LED.

The batteries can be replaced while the frame is powered up and operating. Simply pull the battery from its holder to remove the spent cell. Insert the replacement in the holder while carefully observing the polarity of the battery.

Reinstall the battery with positive (+) terminal facing *left* as you insert the battery (or facing *up* if you have taken the module out of the frame).
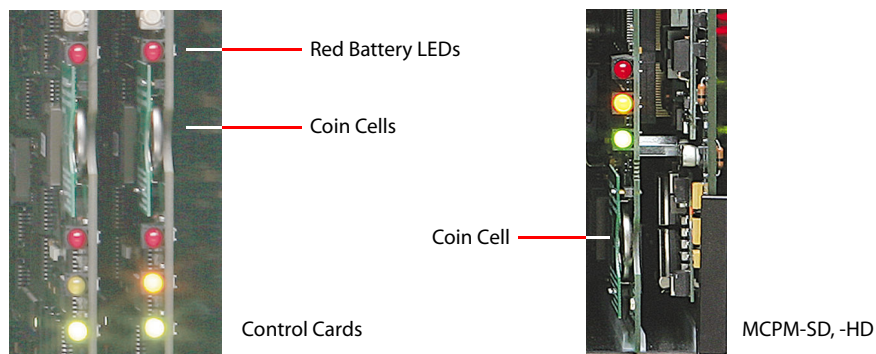
Figure C-3. Battery Replacement

▲ WARNING: Inserting the battery backwards may result in an explosion.

Fuse Replacement

All input and output modules, except for the SD output module, all HD modules and the control cards, include 1 A non-serviceable, self-resetting thermal fuses. These fuses open in the event of a serious overload, preventing major damage. They will self-reset if allowed to cool.

A replaceable AC fuse cartridge is used on the PS6100 power supply modules. The correct fuse is 15 A (1.25″ × 0.25″ fast-blow).

The correct fuse for the older PS6000 power supply is given in this table:

90–130 VAC	8.0 A, 5×20 mm, slow-blow fuse
180–250 VAC	6.3 A, 5×20 mm, slow-blow fuse

▲ NOTE: If a fuse fails, locate the cause of the trouble rather than simply replacing the fuse blindly. While fuses that have been in service for years may fail due to cumulative stress, a fuse normally fails for a reason. Contact technical support for assistance if a fault problem cannot be isolated. Replacing the fuse without determining what caused it to open could cause equipment damage or fire by restoring power to a damaged unit.

Trouble-Shooting

LED Status Indicators

Every module has LEDs at its front that indicate the status of the module. The LEDs provide visual clues about the cause of a failure. Tables C-6 through C-8 give the function of the most important LEDs:

Table C-6. Control Card Status LEDs

LED	Function	Description
Red (above battery holder)	Battery status	If the red LED is on, replace the battery.
Green	Healthy	Normal operation, successful boot, module power supplies OK. Either active or ready to go active.
Amber	Active	The control card is active (the other control card is inactive).
Red	Alarm	Fault State: • Bad or missing video or AES reference. • Bad on-module power supply. • Microprocessor failure. Try rebooting.

Table C-7. MCPM Status LEDs

LED	Function	Description
Red (bypass)	Bypass	Indicates that the MCPM is in bypass mode.
Green	Healthy	Normal operation. (The green LED is the opposite of the red LED.)
Amber	Active	Module is running.
Red	Alarm	Fault State: • Bad or missing video or AES reference. • Bad on-module power supply. • Microprocessor failure. Try rebooting.

Table C-8. I/O Card Status LEDs

LED	Function	Description
Red (upper)	Alarm	Indicates a fault condition. For example, an on-module power supply could be faulty.
Green (upper)	Power	All power supplies are OK.
Amber	FPGA loaded	Indicates that FPGA code is properly loaded. This LED must be on for normal operation.
Green (lower)	Comm. good	Communication with the controller is healthy,
Red (lower)	Comm. failure	Communication with the controller has failed.

Other LED indicators may be present on some modules. For example, the control card and the MCPMs also have a "heartbeat" LED that blinks at an approximate 1 Hz. Some cards have LEDs that indicate the presence of data on the many communication ports. These indicators are located on the module PCB and are intended for more advanced troubleshooting.

Miranda customer support representatives might ask for the status of these indicators and will provide instruction on locating them on the specific module if necessary.

Module Replacement

Front-Mounted Modules

The power supplies and all front-loaded I//O modules may be removed or installed with the power applied or "hot swapped." These include the MCPMs and MCEs.

A replacement MCPM must be configured with the appropriate configuration file—including any logo images—before placing the MCPM or MCE back in service.

If a module appears to be defective, first try re-seating it in the frame.

Rear-Mounted Modules

All but the SWB input and output backplanes and the SD input backplanes are completely passive and may be removed at any time. Use the same cautions as exercised with front-loaded modules. Be sure to match rear modules to the corresponding front modules. Those using BNC connectors are especially easy to install in the wrong location because, under casual observation, they look very similar. No damage normally results from an unintentional mismatch.

SWB input and output backplanes and SD input backplanes contain active circuitry. Power to these modules is supplied by their associated front-mounted module. To remove one of these rear interface modules, first remove the front module. It is sufficient just to disconnect the module from the motherboard. Pull that module out a short distance if you wish to leave it in the frame slot.

North American and International Power Cords

Power cords differ depending on your location. Note that the power cords supplied with this equipment provide the only means of AC power disconnection. The socket (outlet) must be near the equipment and must be easily accessible.

The North American power cords supplied with this equipment have a molded grounding plug (NEMA 5-15P) at one end and molded grounding receptacle (IEC 320-C13) at the other end. Conductors are CEE color-coded:

Line, Brown
Neutral, Blue
Ground (Earth), Green, or Green with Yellow Stripe
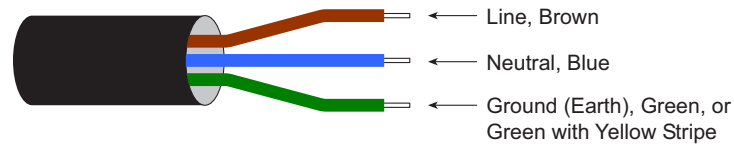
Operation of this equipment at voltages exceeding 130 VAC will require power supply cords which comply with NEMA configurations.

The International power cords supplied with this equipment have a molded grounding receptacle (IEC 320-C13) at one end and stripped conductors (50/5 mm) at the other end. Conductors are CEE color-coded:

Line, Brown
Neutral, Blue
Ground (Earth), Green with Yellow Stripe
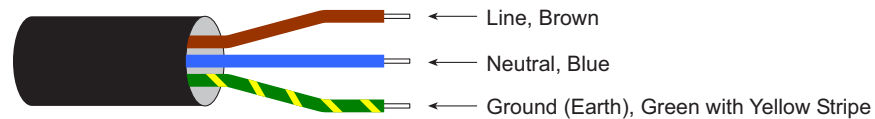
Other IEC 320-C13 type power supply cords can be used if they comply with the safety regulations of the country in which they are installed.

Index

Index

Index

Index

G

Gain
audio 57–58, 80, 82, 111
key 63–65
unity 63
video 63–65
Gang channels (button) 105
Ganged channels 110
General purpose interface
see GPI
Generator, black/silence 45, 48
GIF 198
GPI
inputs 133
outputs 133
GPI (general-purpose interface)
circuits 192
inputs 12, 44–46, 49, 51, 53, 68–69, 73–74,
. . . . 104, 110–111, 118, 126, 142–143
output 73
output, and main source 73
output, and transition status 73
output, and video effect type 73
output, controlled from UI 73
output, disabled 73
outputs 12, 44–46, 49, 51, 53, 73–74, 104,
. . . . 110–111, 118, 126, 192
GPI/alarm connectors . . . 118, 125–126, 132–133, 192
GPIO (general-purpose I/O) 14, 44, 76, 110, 144,
. . . . 193–194
buttons 105
channel-specific 111
MCPM 111
panel-specific 110
GPIO connector, Imagestore 750 187
GPO (general-purpose output) 193–194
Ground lug 31
Group select buttons 100, 114
GTP-32 . . . . 144, 193
GUI (software control panel) . 2, 13, 104, 109, 133, 197
buttons 2
window 133

H

HD 198
input 7–8, 22, 27, 46, 48, 53, 200
output 19, 200
router cards (SWB) 42
video 181, 184
video specifications, frame 173
HD-SDI 198
slave sync generator 201
Heartbeat LED 209

High tally 2, 115, 122, 133, 136
High-tally 130
Hot cuts 43, 60
Hot-swapping 22, 75
How to use this guide 2
Hyperlinks, Acrobat 2

I

Imagestore 750 . . . . . 3, 5, 7–14, 16, 95, 99, 103–104,
. . . . 106, 111–112, 114, 164, 198
Imagestore 750 configurator 15, 169
Imagestore 750 parameters
active preview keyers 101
iMC-Panel-100
USB ports 132
VGA port 132
iMC-Panel-100 monitor 131
iMC-Panel-200 12, 100, 107, 112–113, 127, 164, 169
iMC-Panel-200 (compact control panel) 3, 9, 12,
. . . . 113–115, 118, 133, 198
dimensions 113, 127, 191
general specifications 191
sections 128
weight 191
iMC-Panel-300 . . . . 12, 108, 112, 164, 169
iMC-Panel-300 (3RU control panel) 3
iMC-Panel-300 (full-size control panel) . . . 3, 9, 12, 103,
. . . . 120–122, 125
dimensions 120, 191
general specifications 191
weight 191
iMC-Panel-GUI 3, 9, 12, 100, 103, 109, 112,
. . . . 133–134, 164, 169
Individual channels 110
Inductive loads, alarm circuits 29–30
Input
audio 7, 75
GPI 69
HD 7–8, 22, 27, 46, 48, 53, 200
SD 7–8, 22, 27, 36–37, 45, 48, 53, 200
SWB 13, 22–23, 37, 85, 157
video 7, 75
Input card slots 19
Input cards 21, 32, 35–37
AES, async 36
AES, sync 35
analog audio 35
video, AVC 36
video, SD 36
video, SWB 37
Input numbering 21
Inputs
AES . . . 7–8, 22, 35, 42, 45–46, 49, 53, 179, 200
analog audio . . . 7–8, 22, 35, 42, 53, 58, 178, 200
analog video 7–8, 22, 36, 53, 200

Index

Index

P

R

Index

Index

W

X-Y-Z