



Master Control for the Contemporary Market

Introduction

As revenue models have changed for broadcasters, it is critical that systems designed for program delivery be as scalable and flexible as possible. Today's master control systems must deliver richly featured branding while ensuring the most cost-effective use of new investments and existing assets of the owner.

This document discusses the market requirements for master control systems and how Miranda¹ master control systems meet contemporary market needs.

Market Requirements for Master Control Systems

Today's broadcasters are facing several trends when it comes to master control system design. These include:

- 1 Preparation for "Analog Fade-to-Black" in 2009.
- 2 Migration from a single-building, single-channel model to single-building, multi-channel facilities that are automated.
- 3 Transition from HD pass-through to locally branded HD programming.

Systems for the Smaller Market

With the advent of the required DTV transition (and preservation of their analog licenses), smaller market stations faced, and still face today, a severe impact on net revenue. The average investment in DTV infrastructure such as transmitters, towers, encoders etc., can range anywhere from \$2M to \$5M. All of this investment has been made with no corresponding increase in revenue because of a lack of additional DTV viewership in the local market.

Of course, the most common way for a station faced with a fixed market revenue potential to increase net income is to reduce costs. As a result, consolidation of multiple master control (MC) operations (typically under automation control) into one facility has rapidly emerged in this market as a cost-saving tool. Two of the most common business models used are single-owner duopolies or multiple owners delivering multiple channels under a joint operation agreement (JOA).

Miranda at the Forefront

The NV5128-MC Master Control System is the industry leader in system performance and cost when meeting these system requirements. Some significant benefits are:

- The NV5128-MC is based on the NV5128 Multi-Format Router platform that supports up to 128 discrete inputs that can include audio and video analog-to-digital conversion. As a result, legacy sources and routers can be interfaced to the NV5128-MC without external conversion equipment.
- Many other vendors are limited to A and B local inputs. Their systems require embedded audio and external embedders. These tend to require the purchase of additional routing for source selection.
- The NV5128 performs disembedding and embedding of local inputs internally—as standard—eliminating the need for additional routing and embedding investment.

1. This document describes portions of the former NVISION's NV5128-MC master control product series.

Master Control for the Contemporary Market

Market Requirements

- The NV5128-MC is the first master control system integrated with a multi-format router platform. Both routing and master control are located in the same 8RU frame.

Figure 1 shows some of the architecture of a NV5128-MC system that combines routing and master control. In this case, 128 multi-format inputs (8 blocks of 16) are shared by a full-featured SD *Master Control Processing Module* (MCPM) and two “Mixer/Keyers” branding engines. There are 32 SDI router outputs and 32 AES router outputs. This just one of many configuration possibilities that can range from 100% router through a mix of router and MC to 100% MC.

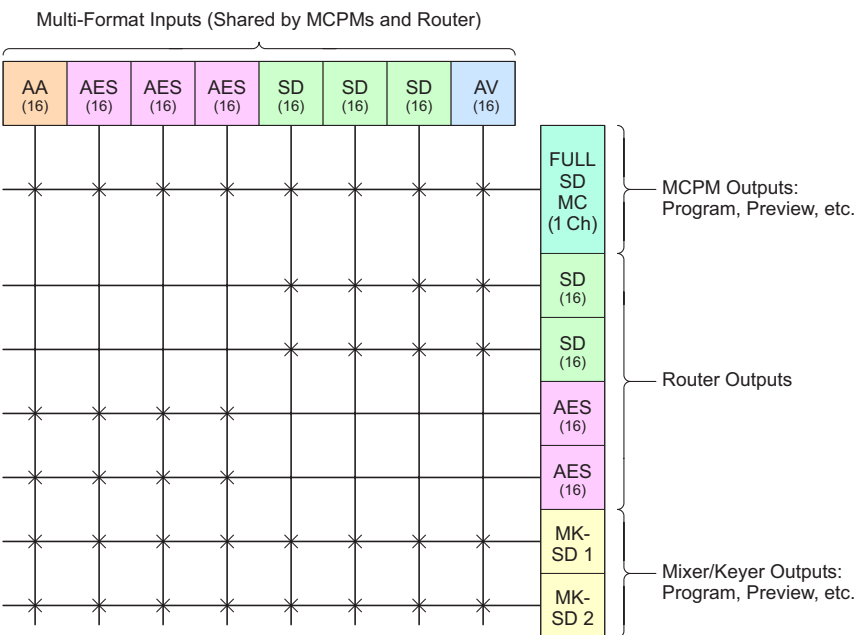


Figure 1. Typical Master Control/Router Layout

HD Migration in Smaller Markets

There are two common ways to migrate to HD master control in smaller market applications.

One way is to configure a NV5128-MC with Super Wide-Band (SWB) input modules and one or more SD master control processors. Because SWB inputs pass both SD and HD signals, the system can initially be configured for SD operation. One can either add HD MCPMs or replace the SD MCPMs to support HD operation, sharing the HD inputs of the SWB input modules.

Another way is to take the output(s) of a SD master control system such as the one shown in Figure 1 and feed them to one or more up-converters. Synapse modular product line offers high-quality up-converters (based on Teranex technology) at a very affordable price.

Systems for Mid-sized to Larger Markets

Originally, most stations complied with DTV guidelines by simply passing the network HD feed combined with an up-converted version of their SD product. An increasing number of stations are producing their local news in HD. Syndicated shows such as *Wheel of Fortune* and *Jeopardy* are produced in HD. As a result, several stations have seen the need to transition the local branding of their HD product to duplicate (or come close to) the local branding of their local SD product.

Although configurations such as the one described previously can be found in mid-sized facilities, the configuration in Figure 2 is more typical. In this case, the NV5128-MC is primarily configured as one or more standalone MC switchers fed by critical local sources and pre-select sources from an upstream router.

Figure 2 shows such a system that can release fully-branded HD and SD programs with a small utility router that can be used for applications such as driving a monitor wall.

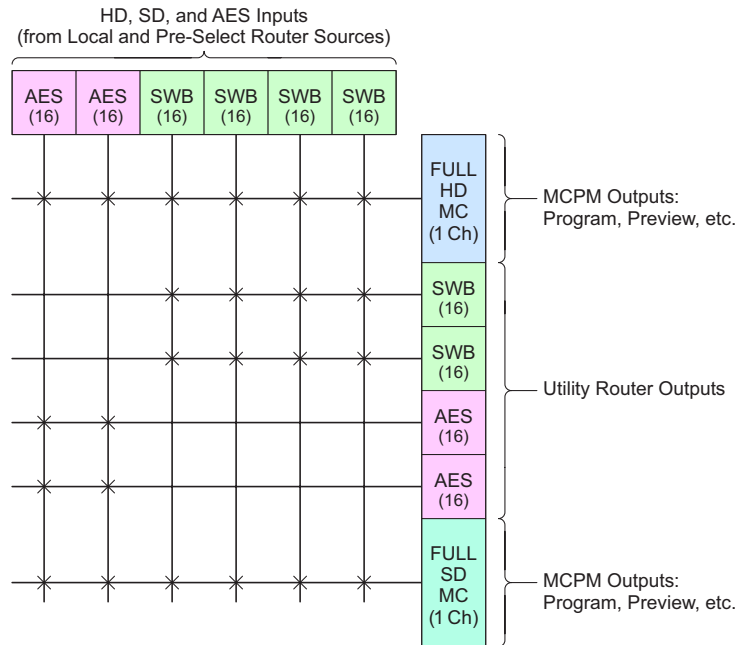


Figure 2. Another Master Control/Router Layout

Large Network and Content Providers

Originally, large broadcast centers were built for commercial television networks and state broadcasters. Since then, satellite and cable have realized enormous growth and have taken over the bulk of delivery to the home services.

In some cases, branding is required at the main aggregation and distribution facilities that feed cable and satellite distribution. Typically these systems consist of large router cores whose buses feed branding channels before distribution.

Figure 3 shows an NV5128-MC frame configured with 4 HD “Mixer/Keyer” channels, each with its own local group of 16 inputs. Each Mixer/Keyer combines an A/B mixer, 3 video keyers, and a logo keyer.

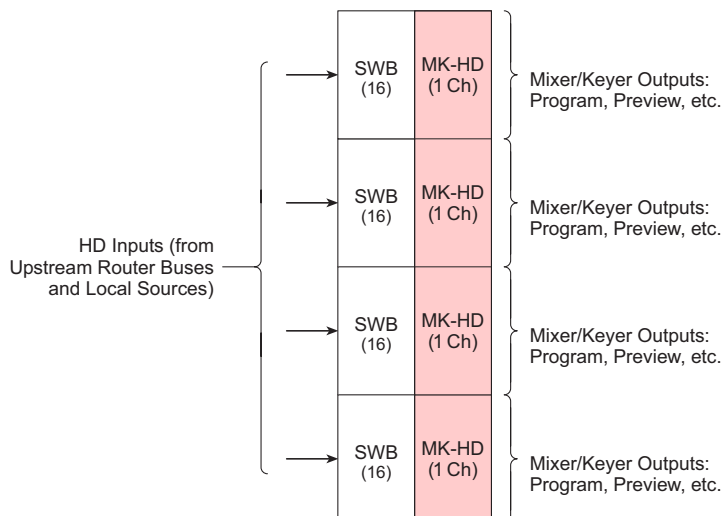


Figure 3. HD Branding Layout

Master Control for the Contemporary Market

NVISION Master Control Panels

Miranda Master Control Panels

Miranda has the most extensive line of control panels in the industry.

Miranda provides the most scalable and flexible MC signal management system (covering a broad range of market applications). Miranda also offer the largest selection of master control panels in the industry.

The control panel system architecture, as with the signal management system, is very flexible. For example systems can be configured as one panel to one channel, one panel to several channels, several panels to one channel or several panels to several channels.

All control panels support the same rich feature set that allows operators to switch between different control panels without confusion.

FFCP

The NV5128-MC-FFCP offers the most dedicated buttons with an touchscreen menu system. This panel is widely used and can be found in every market application. This panel is very well suited for applications where a significant amount of manual operation is required.



The FFCP can be recessed in a table top.

CFCP

The NV5128-MC-CFCP is a compact version of the FFCP. This panel fits well in applications that need manual intervention in automated environments and where console space is limited.



The CFCP can be rack mounted or recessed in a table top.

SCP

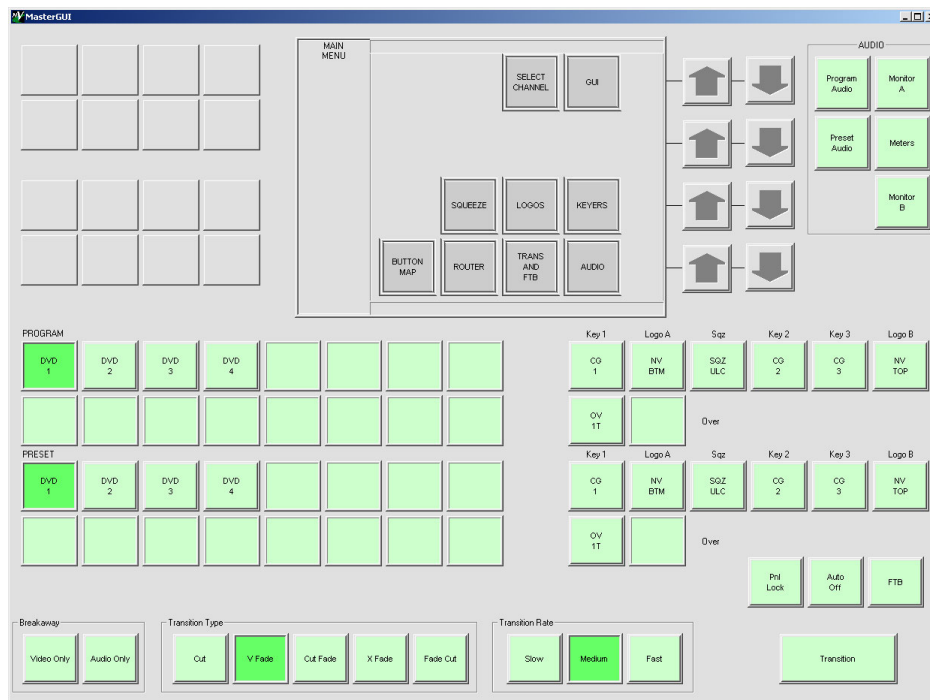
The NV5128-MC-SCP (simple control panel) is best suited for large multi-channel systems that are primarily under automation control. This panel features color-coded buttons with LCD readout that show critical channel status at a glance.



The SCP is a 3RU rack mounted unit and has a reduced feature set. It is as easy to operate as the other panels, if not easier.

GUI

The NV5128-MC-GUI is a software control panel. It is a Windows application that can be operated with either a mouse or touch-screen interface. The GUI can be used as a channel status and control panel locally or remotely over WANs via TCP/IP.



NV5128-MC Master Control Systems Architecture

Miranda supports MC systems ranging anywhere from stand-alone, manually-operated master control switchers to large automated systems that can access sources from local inputs and an upstream router core at the same time.

We discuss 4 basic master control configurations:

- Stand-alone.
- Stand-alone with router pre-select.
- Master control engine controlling A and B bus feeds from an upstream router.
- Master control engine controlling A and B bus feeds from an upstream router plus local inputs.

Stand-Alone Master Control

Figure 4 shows a basic master control switcher:

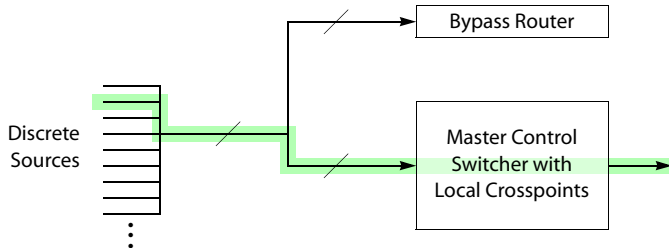


Figure 4. Conventional Stand-Alone MC Switcher

The basic switcher is stand-alone and has 12–16 local inputs. A master control switcher is usually configured with some sort of bypass router or patch for critical source devices such as tape machines, video servers or network feeds. Bypass sources come from either source DAs or passive loop-through connectors on the MC switcher.

NV5128-MC master control switchers can be configured, for example, to behave according to the stand-alone model:

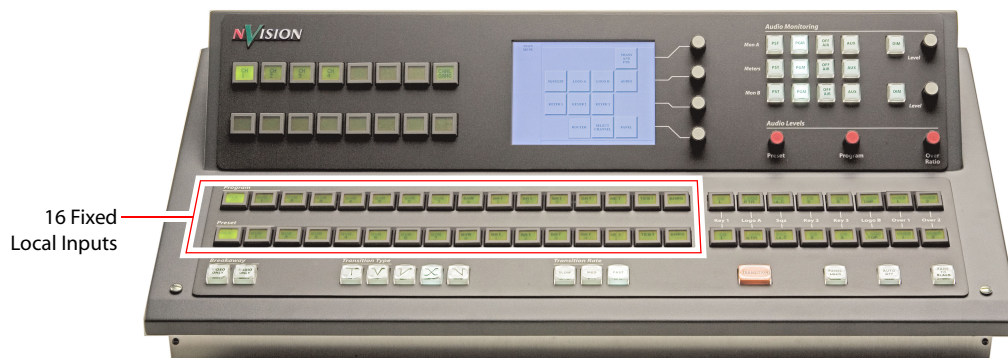


Figure 5. NV5128-MC as a Stand-Alone MC Switcher (Control Panel)

Master Control with Router Pre-Select

The router pre-select model supports additional master control input by connecting one or more outputs from an upstream router to the MC switcher as pre-select sources.

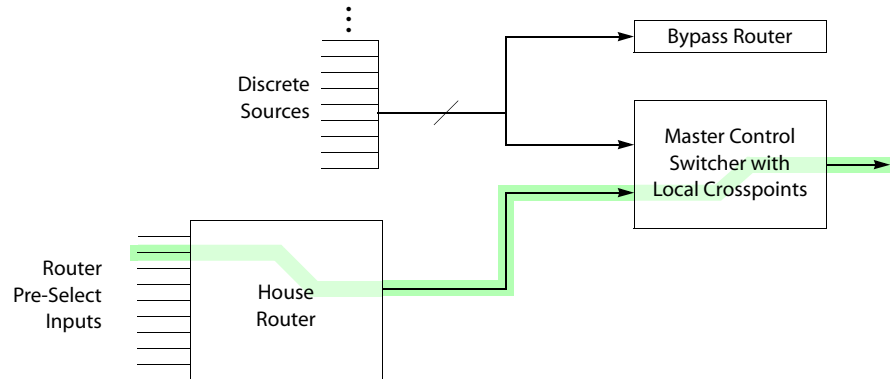


Figure 6. Conventional MC Switcher with Router Pre-Select

Early pre-select systems were very simple: a router control panel was installed next to, or above, the MC switcher control panel. Sources for one or more router outputs are pre-selected on the router panel and are fed to the input(s) of the MC switcher. The pre-selected sources are brought to air by selecting a “router pre-select” input on the MC switcher. For example, if there are two router preselect inputs, the buttons of a control panel could be labeled “RTR1” and “RTR 2.” In this situation, the operator uses the router control panel’s status or button tally to confirm the source’s device name.

Current MC switcher control panels can communicate with router control systems over Ethernet or a serial link. Source mnemonics (and potentially, any source information) for selected devices are delivered from the router control system to the MC switcher panel where they are dynamically displayed on either LED or LCD readout buttons or GUI displays.

The router pre-select model for master control has been very popular and is being used in hundreds of facilities worldwide. This is a perfect solution for those who want an autonomous MC switcher that is not completely dependent on a house or upstream router for source selection while still providing input expansion on a pre-select basis.

NV5128-MC master control switchers can be configured (in many ways) to support the router pre-select model also. Figure 4 shows a NV5128-MC control panel configured with two router pre-select buttons.

The source for any router button can be “pre-selected” from a display on the panel’s GUI:

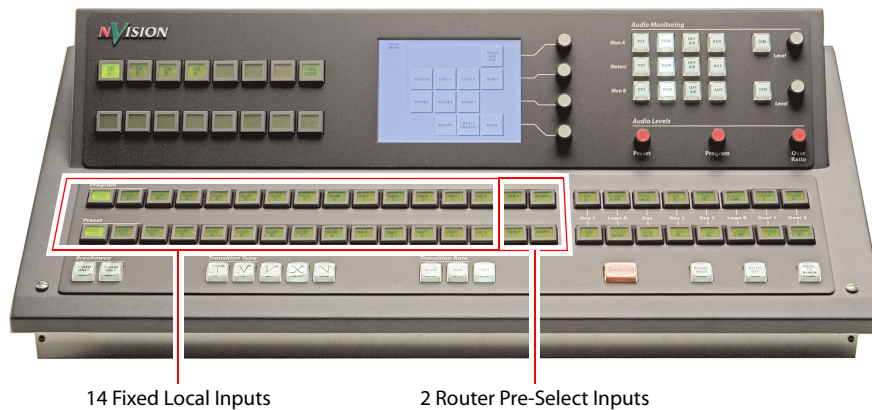


Figure 7. NV5128-MC Switcher Configured with Two Router Pre-Select Inputs

Master Control for the Contemporary Market

Master Control Architecture

Branding Engine Controlling A,B Feeds from Upstream Router

Other contemporary master control systems are based on a processing engine that has A and B inputs fed by two upstream router outputs under direct “take” control.

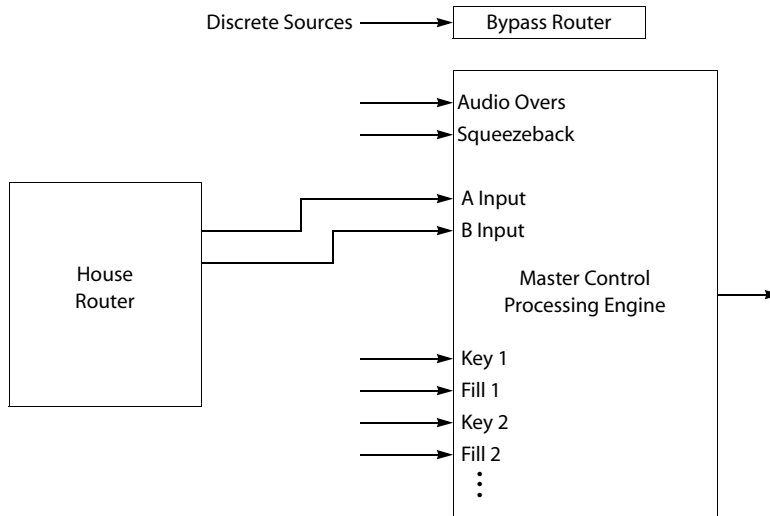


Figure 8. Typical Upstream System

In addition to the upstream A and B inputs, these processing engines have dedicated local inputs for keys, fills, squeezeback, and audio overs.

This design evolved from two basic sources:

- Router vendors who added master control as a special form of control panel with an external processing Engine
- Logo insertion vendors who added additional features and a control panel to the logo inserter for master control. These systems typically rely on third-party routers for source selection.

NV5128-MC Master Control System was designed as an extension of the NV5128 Multi-Format Router platform. The NV5128-MC can be configured as a branding engine with A/B upstream router feeds but without the restriction of dedicated inputs for keys and fills, etc., because of its unique architecture. Figures 9 and 10 illustrate the difference between conventional branding engines and the NV5128-MC’s Master Control Processing Module (MCPM).

NV5128-MC MCPM—Much More than a Branding Engine

Figure 9 shows the internal architecture of a typical upstream-router-based processing engine that has dedicated program and preset inputs:

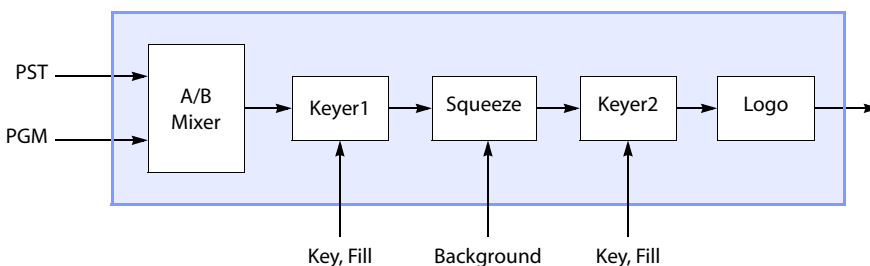


Figure 9. Conventional Processing Engine

Figure 10 illustrates the unique design of the MCPM:

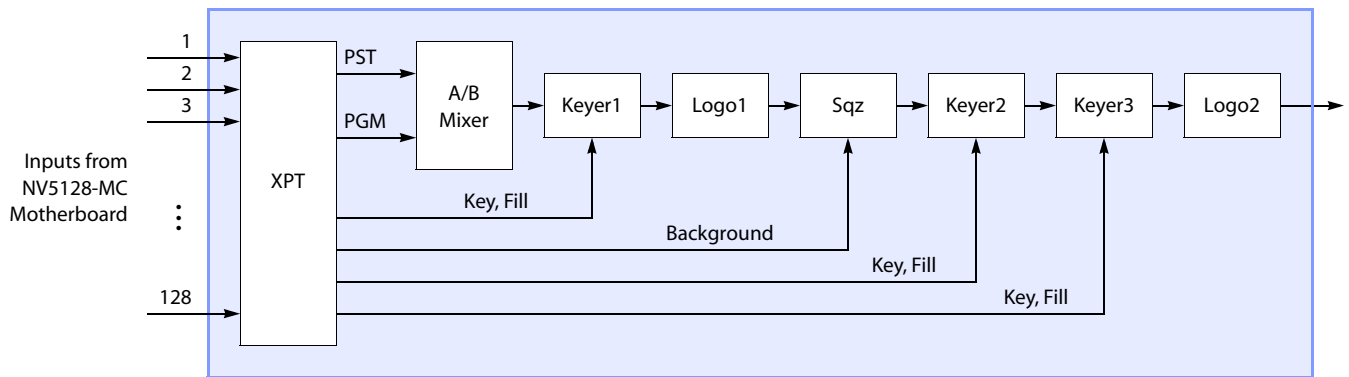


Figure 10. NV5128-MC Master Control Processing Module (MCPM)

The NV5128-MC Master Control Processing Module takes a new approach: integrated local crosspoints.

Here, the keyer inputs and squeeze background are not fixed, but can be selected from any of the 128 NV5128-MC inputs. Because one or more of those 128 inputs can be connected to an upstream router, the keyer inputs (and squeeze background) can be taken from any router source. Unlike earlier conventional MC switchers that were limited to few inputs, each NV5128-MC frame supports up to 128 multi-format inputs. Each input can feed multiple MCPMs or (optionally) router output modules in the same frame. This dynamic shared input capability is unique to the NV5128-MC and can be very useful for several applications. For example, an EAS decoder or CG output can be distributed to several output channels. Compare this to the single EAS (or internal CG) per channel offered by other upstream systems.

Some upstream systems offer a local input option as well. However, such options are local only and the systems cannot share inputs among multiple channels. As a result, these systems are more similar to the stand-alone model shown in Figure 8.

Unique Configuration Capability

Not only does the NV5128-MC hardware offer a very dynamic local input design but the NV5128-MC configuration software provides a unique capability for input configurations. Parameters such as embedded audio, Dolby E, audio levels, and audio channel swaps can all be configured on an input by input basis using the NV5128-MC configuration software for either local inputs or upstream router sources.

For example, this configuration capability enhances the unsurpassed audio processing performance of the MCPM. Miranda is the only vendor that can perform seamless audio transitions between any combination of Analog, PCM or Dolby E while maintaining lip sync.

Another benefit of this application is that, when used properly, the need for external processing equipment in the system can be eliminated thereby reducing system design and equipment costs.

Figure 11 shows configuration settings for an SD input (SDI) with embedded Dolby E:

The screenshot shows the 'Audio Channels' configuration window for an NV5128-MC. The window has an 'Apply' button and a 'Cancel' button at the top left. On the left side, there are several input fields: 'Selection Number' set to 21, 'Mnemonic' set to VTR06, 'Video Input' section with 'Router Input (BNC) 1-128' set to 20 and an unchecked 'Is Analog' checkbox, 'Embedded Audio In Source' set to 'InGrps1and2', and a section for 'Source has DolbyE Audio' with 'Embedded' checked and 'Channel pair feeding Dolby E decoder' set to 'Ch1/2'. The main area is titled 'Audio Channels' and contains a table with 8 rows. Each row has columns for 'Use', 'from Dolby', 'Dolby Xpt', 'to Audio Channel', 'Gain -108.0 to 12.0 dB', and 'Invert Phase'. The 'Use' column has checkboxes, 'from Dolby' has checkboxes, 'Dolby Xpt' has dropdown menus (Ch1/2, Ch3/4, Ch5/6, Ch7/8), 'to Audio Channel' has numbers 1-8, 'Gain' has text boxes with '0.0', and 'Invert Phase' has checkboxes.

Use	from Dolby	Dolby Xpt	to Audio Channel	Gain -108.0 to 12.0 dB	Invert Phase
☒	☒	Ch1/2	1	0.0	☐
☒	☒		2	0.0	☐
☒	☒	Ch3/4	3	0.0	☐
☒	☒		4	0.0	☐
☒	☒	Ch5/6	5	0.0	☐
☒	☒		6	0.0	☐
☒	☒	Ch7/8	7	0.0	☐
☒	☒		8	0.0	☐

Figure 11. Example of an NV5128-MC input configuration

Branding Engine Controlling AB Feeds from Upstream Router and Local Inputs

Miranda recognizes that upstream router control for master control source selection has its benefits as well. Where the local input model works very well in typical television station applications, the upstream control model can be a better fit for large distribution facilities that have a large common router core with a high number of release channels.

The NV5128-MC offers a unique and comprehensive “best of both worlds” solution. In this case, the NV5128-MC not only provides control of upstream router buses to A and B inputs but also controls any number of upstream key, fill, squeeze, and audio over sources that can be fed to any of the 128 inputs on the NV5128-MC frame. The NV5128-MC is unsurpassed in providing the most flexible, scalable, and efficient solution available.

One benefit of the NV5128-MC design is that upstream character generators can be dynamically assigned to one or more MCPMs, eliminating the need for a dedicated CG or EAS system for each master control channel.

The same input configuration for local inputs to the NV5128-MC can be applied to upstream router sources as well. This unique capability provides maximum utilization of the MCPM’s processing power regardless of whether the source is local or upstream.

Because the system supports both upstream and local inputs, sources can be mirrored between the local inputs and upstream router adding redundancy to the system.

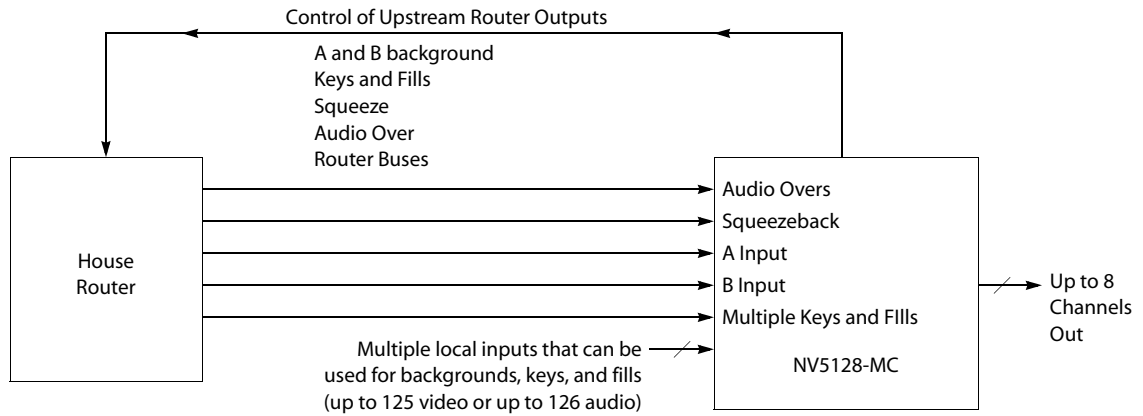


Figure 12. Miranda Upstream Router Control and Local Input

Summary

Modern market conditions indicate the following trends:

- 1 Preparation for “Analog Fade to Black” in 2009.
- 2 Migration from a single-building, single-channel model to single-building, multi-channel facilities that are automated.
- 3 Transition from HD pass-through to locally branded HD programming.

Optimized for multi-channel applications, the NV5128-MC Master Control System addresses these trends by offering the most advanced, scalable master control signal management and control system available in the industry.

Appendix

These are the 5 MCPM models, in brief:

- 1 MCPM-MK-SD.
SD “Mixer/Keyer”
1 slot, A/B mix, 3 keyers, 1 logo, 2 audio overs;
128 inputs from motherboard.
- 2 MCPM-MK-HD.
HD “Mixer/Keyer”
2 slots, A/B mix, 3 keyers, 1 logo, 2 audio overs;
16 HD inputs from backplane, 64 audio inputs from motherboard.
- 3 MCPM-SD.
SD “MC processor”
2 slots, A/B mix, 3 keyers, 2 logo, 1 squeezeback, 2 audio overs;
128 inputs from motherboard.

Master Control for the Contemporary Market

Summary

4 MCPM-HD.

SD “MC processor”

4 slots, A/B mix, 3 keyers, 2 logo, 1 squeezeback, 2 audio overs;

64 inputs from motherboard. Supports up to 32 SWB router outputs.

5 MCPM-SDHD.

An MC processor, field-programmable as SD or HD, with an enhanced squeezeback function

4 slots, A/B mix, 3 keyers, 2 logo, 1 squeezeback, 2 audio overs;

64 inputs from motherboard. Supports up to 16 SWB router outputs.

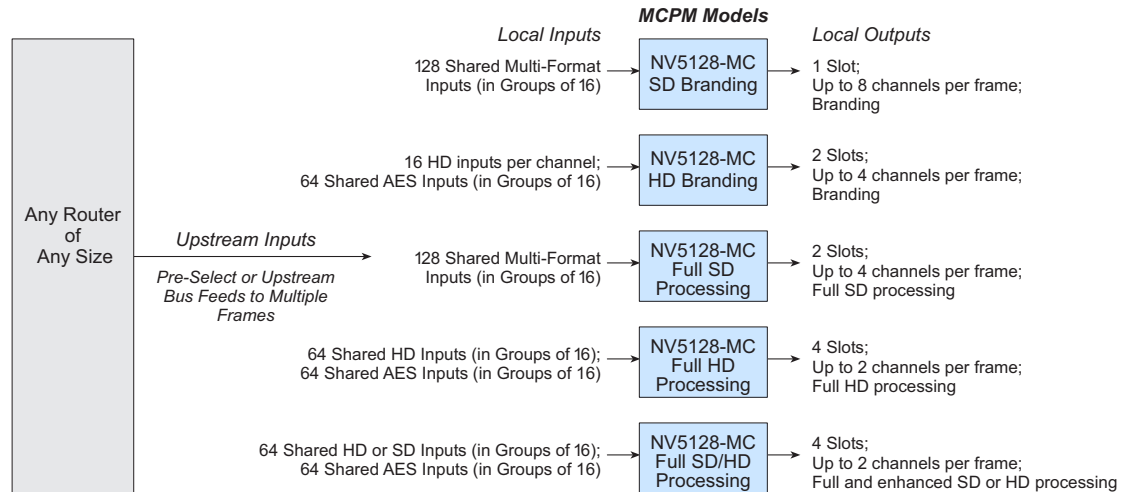


Figure 13. Master Control Processing Modules