



grass valley

A **BELDEN** BRAND

# CRSC

COMPACT ROUTER SYSTEM CONFIGURATOR

## User's Guide

VERSION 3.3

UG0032-08

2015-07-07

[www.grassvalley.com](http://www.grassvalley.com)

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## Electrostatic Discharge (ESD) Protection



Electrostatic discharge occurs when electronic components are improperly handled and can result in intermittent failure or complete damage adversely affecting an electrical circuit. When you remove and replace any card from a frame always follow ESD-prevention procedures:

- Ensure that the frame is electrically connected to earth ground through the power cord or any other means if available.
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- For safety, periodically check the resistance value of the antistatic strap, which should be between 1 and 10 megohms.
- When temporarily storing a card make sure it is placed in an ESD bag.
- Cards in an earth grounded metal frame or casing do not require any special ESD protection.

## Protection contre les décharges électrostatiques (DES)



Une décharge électrostatique peut se produire lorsque des composants électroniques ne sont pas manipulés de manière adéquate, ce qui peut entraîner des défaillances intermittentes ou endommager irrémédiablement un circuit électrique. Au moment de remplacer une carte dans un châssis, prenez toujours les mesures de protection antistatique appropriées :

- Assurez-vous que le châssis est relié électriquement à la terre par le cordon d'alimentation ou tout autre moyen disponible.
- Portez un bracelet antistatique et assurez-vous qu'il est bien en contact avec la peau. Connectez la pince de masse à une *surface non peinte* du châssis pour détourner à la terre toute tension électrostatique indésirable. En l'absence de bracelet antistatique, déchargez l'électricité statique de votre corps en touchant une surface métallique *non peinte* du châssis.
- Pour plus de sécurité, vérifiez périodiquement la valeur de résistance du bracelet antistatique. Elle doit se situer entre 1 et 10 mégohms.
- Si vous devez mettre une carte de côté, assurez-vous de la ranger dans un sac protecteur antistatique.
- Les cartes qui sont reliées à un châssis ou boîtier métallique mis à la terre ne nécessitent pas de protection antistatique spéciale.

## Précautions pour les écrans LCD et TFT



Regarder l'écran pendant une trop longue période de temps peut nuire à votre vision. Prenez une pause de 10 minutes, après 30 minutes d'utilisation.

Si l'écran LCD ou TFT est brisé, manipulez les fragments de verre avec précaution au moment de vous en débarrasser. veillez à ce que le cristal liquide n'entre pas en contact avec la peau ou la bouche. En cas de contact avec la peau ou les vêtements, laver

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immédiatement à l'eau savonneuse. Ne jamais ingérer le liquide. La toxicité est extrêmement faible, mais la prudence demeure de mise en tout temps.

## Recycling

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## Certification and Compliance

### Safety Compliance



c

This equipment complies with the requirements of CSA/UL/IEC/EN 60950-1, 2<sup>nd</sup> Ed. + AM1, Safety of information technology equipment.

The power cords supplied with this equipment meet the appropriate national standards for the country of destination.

### Electromagnetic Compatibility



This equipment has been tested for verification of compliance with FCC Part 15, Subpart B requirements for class A digital devices.

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Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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This equipment has been tested and found to comply with the requirements of the EMC directive 2004/108/EC:

- EN 55022 Class A Radiated and conducted emissions
- EN 61000-3-2 Limits for harmonic current emissions
- EN 61000-3-3 Limitation of voltage fluctuations and flicker
- EN 61000-4-2 Electrostatic discharge immunity
- EN 61000-4-3 Radiated, radio-frequency, electromagnetic field immunity
- EN 61000-4-4 Electrical fast transient immunity
- EN 61000-4-5 Surge transient immunity
- EN 61000-4-6 Conducted disturbances immunity
- EN 61000-4-8 Power frequency magnetic field immunity
- EN 61000-4-11 Voltage dips, short interruptions and voltage variations immunity

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# 1 Introduction

Chapter 1 provides concepts and definitions that are needed to understand CRSC—the Compact Router System Configurator.

Please refer to the *CR Series Compact Router User's Guide* and to the *CR6400 Family User's Guide* for complete detail about CR Series routers and panels.

## Summary

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## Hardware Summary

The CR Series products include compact routers, (compact) control panels, and (compact) remote panel modules.

CR Series products include 1RU and 2RU video and audio routers in several formats, and machine control routers.

There are 3Gig, HD, and SD versions of the video routers. The HD routers also support SD. The 3Gig routers also support HD and SD. The CR Series also includes analog video routers, AES and analog audio routers, and machine control routers.

The CR Series routers and panels can be deployed in several different ways and in different kinds of networks. For information, see [Usage](#), following.

The matrices in the 1RU routers range from 16×2 to 16×16. The matrices in the 2RU routers range from 32×4 to 32×32. The newer CR6400 routers (also 2RU) provide 64×64 switching matrices. Video, audio, and machine control routers can be combined in a system to represent multiple signal levels.

Control panels in the CR Series are designed to mount on the front of either compact routers or remote panel modules. Remote panel modules are used in CRSC networks. They transmit commands from the panels mounted on them to the routers in the network and receive status messages from the routers in the network.

Control panels that mount directly on compact routers are termed “captive panels.”

Control panels that mount on remote panel modules are termed “remote panels.”

The CR Series includes CQX (“clean and quiet”) routers that support several smooth transition types (including cross-fades) and rates.

## Routers

With the exception of the machine control routers, all the compact routers are X/Y routers having  $n \times m$  crosspoint matrices. An input can be routed to any or all of the outputs.

The machine control routers (also called *port routers*) are point-to-point routers. An input can be connected to at most one output. (The connections are RS485 or RS-422 and bidirectional, typically with control commands in one direction and responses in the other direction.)

Each of the 3 “clean and quiet” (CQX) router models routes 16 inputs to 2 “clean and quiet” outputs or to 6 auxiliary (normal) outputs. For the clean and quiet outputs, the router performs smooth transitions. The transitions are governed by transition type and transition rate, selectable on the CP1602-CQX control panel. The CQX routers also provide 2 bypass inputs. The 2 clean and quiet outputs switch to the bypass inputs if the router loses power.

The CR6400 routers (2RU) are newer in design, have removable I/O modules, and are deeper (about 10” or 25 cm) than other CR Series routers. Otherwise, they operate much like other CR Series routers.

## Control Panels

A CR Series control panel mounts on the front of a router or on the front of a remote panel module. The panel provides direct visual and tactile control of the router (or of the routers in a network). (You can install or uninstall one easily in a few seconds.) However, any of the routers can also operate without a control panel, under network control or through automation.

The CP3201 is special case: it is a 1RU panel that controls 32 sources and 1 destination. It does not mount on the front of a router and is used only in a CRSC Network.

The CP1602-CQX is also a special case: it is a 1RU control panel used in conjunction with any of the CQX routers. This panel has 16 source buttons, 2 “clean and quiet” destination buttons, 6 auxiliary destination buttons, 4 transition type buttons, 3 transition rate buttons, and 7 function buttons (5 undefined).

The newer CP6464—a 2RU panel—has an array of 64 buttons that typically switch any of 64 sources to 64 destinations. (These buttons can also be used in other ways.) A specially configured CP6464—called the CP6401 in CRSC—operates as a single-destination panel having 64 inputs and 1 destination.

## Remote Panel Modules

A “remote panel module” is a device that sends control messages to a network of routers (and receives status messages from the routers in the network). A remote panel module receives take and lock commands from an attached control panel and must have a control panel attached to be useful. We say the module is “remote” because it and its control panel can be located apart from the routers (from a few inches to several hundred meters, subject to cable limitations).

*A remote panel* is defined as a control panel mounted on a remote panel module.

A remote panel module can be configured to operate (with its mounted control panel) as either (1) a CRSC remote panel or (2) an NV9000 panel in an NV9000 router control system.

When it is set up for use as a panel in a CRSC network, it is configured in CRSC. When it is set up for use as an NV9000 panel, it must be configured in NV9000-SE Utilities.

## Usage

There are several ways to use CRSC (Compact Router System Configurator):

- A single stand-alone router with a “captive” control panel or with automation.
- A single stand-alone CR6400 router with a “captive” control panel or with automation.
- A network of stand-alone routers (other than CR6400 routers), possibly with remote panels, possibly with captive panels, and with or without automation.
- A network of stand-alone CR6400 routers, possibly with captive panels, and with or without automation.
- A CRSC network of routers and remote panels with or without automation. *Here, the panels and routers are configured using CRSC.*
- A network of routers under an NV9000 family router control system.
- A single stand-alone CQX router with a “captive” CQX control panel or with automation.
- A CQX router with a remote CQX control panel.
- ▲ CR6400 stand-alone routers and networks are distinguished from other types of stand-alone routers and networks because the user interfaces are different.
- ▲ Automation is possible and is left to the customer. We do not discuss it in any detail. Please contact Grass Valley customer support if you need assistance with automation.

Routers and remote panel modules come from the factory ready for stand-alone operation. In stand-alone mode, they work simply and reliably. However, if you want to exploit their more elegant features, they must be configured for use either in a CRSC network or in an NV9000 network. Once configured, they will not function in stand-alone mode unless they are reset to their factory defaults.

A remote panel module must be configured to work either in a CRSC network or in an NV9000 network. (These two configuration modes are mutually exclusive.)

Figure 1-1 compares a stand-alone router with a captive panel to a router network with remote panel modules:

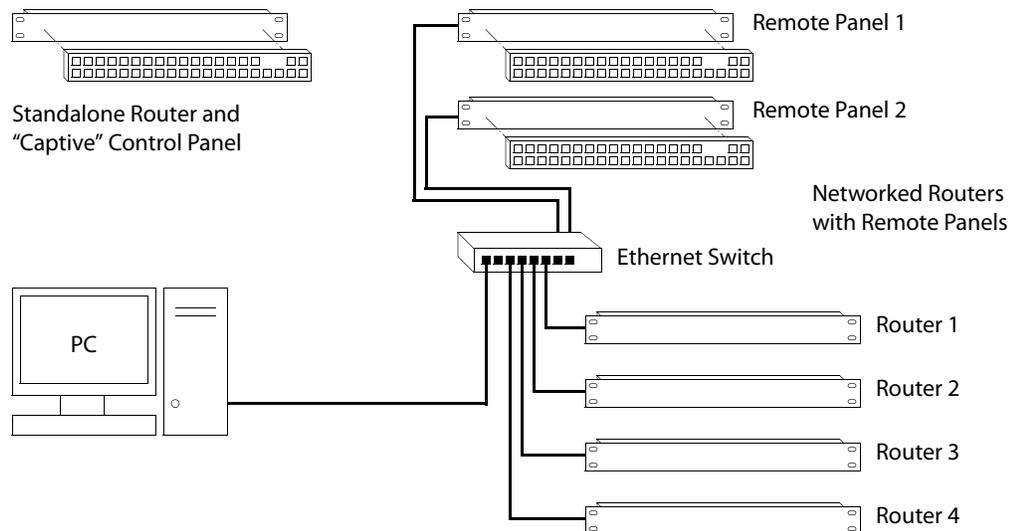


Fig. 1-1: Standalone Router vs. a Network of Routers

A CRSC network has the same topology as a stand-alone network (shown in Figure 1-1), except (1) the routers and remote panel modules have been configured under CRSC which provides a more elegant solution to system design than does a stand-alone network.

### NV9000 Networks

Figure 1-2 shows a sample NV9000 network, one of several possible topologies:

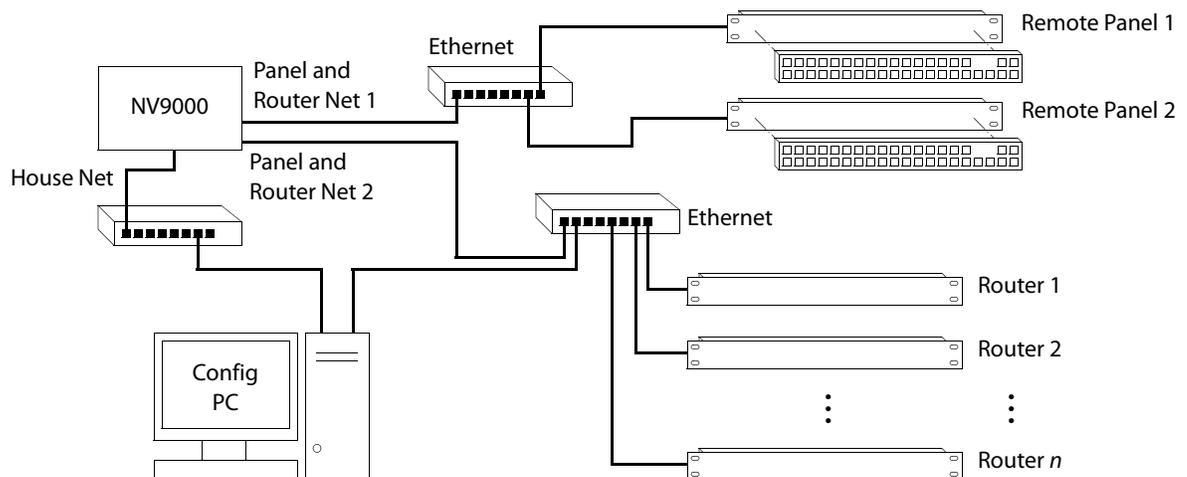


Fig. 1-2: NV9000 Network of Routers

An NV9000 network supports a larger number of routers. Commands issue from the remote panels to the NV9000 which then dispatches the instructions to the routers. The routers return status to the NV9000 which in turn relays the status to the remote panels.

CR Series routers can be used with a NV9000 family router control system. These router control systems extend the capabilities of the compact routers.

An NV9000 network is constructed and operated according to the requirements of the NV9000 router control system. Configuration and control of the routers is entirely within the scope of NV9000-SE Utilities, although you can use CRSC to designate IP addresses.

### CQX Networks

Figure 1-3 shows the ways a “clean and quiet” router can be connected:

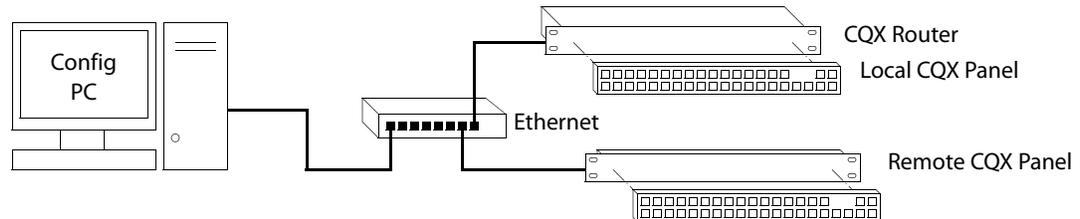


Fig. 1-3: CQX Network

At present, the CQX connections are limited. One CQX router with a local (or captive) CQX panel or a remote CQX panel (or both) can exist on any subnet. (You can have more than one subnet, however.)

At present there is little to configure other than the IP address of the router (and possibly the remote panel module).

## CRSC Summary

CRSC (the Compact Router System Configurator) is configuration software that runs on your PC.

- ▲ If you have very old compact routers and remote panel modules, they should be updated with new firmware that is compatible with CRSC.

## CRSC Features

Compared to using a stand-alone system, CRSC offers the following benefits:

- Configurable panels
  - A stand-alone system is not configurable.
  - In a CRSC system, you can create and configure router levels, and exercise control over network device addresses. You can also save and restore panel configuration files.
  - CRSC supports 3 panel operating modes.
- Partitioning
  - A stand-alone system does not allow router partitioning.
  - A CRSC network allows partitioning. A “level” is equivalent to a partition.
- Configurable networks
  - A stand-alone network comprises up to 4 routers and up to 16 remote panels. IP addresses depend on the devices’ rotary switches and router levels are limited to the range 1–4.
  - A CRSC network supports up to 4 routers, up to 8 levels, and up to 16 remote panels. IP addresses are configurable.

You can create many CRSC networks. If you do, CRSC can manage them all at once as long as your configuration PC has the network connections to do so. CRSC accesses multiple CRSC networks on different subnets.

- Efficient multi-level ‘takes’ and breakaway

In a stand-alone system, panel buttons have a fixed, predefined, and limited association with router inputs and outputs.

In a CRSC network, remote panel buttons have a configurable association with router inputs and outputs. In fact, remote panels control *sources* and *destinations*, not merely inputs and outputs. Consequently, CRSC systems can use available equipment more effectively.

Remote panels configured in “enhanced” mode provide automatic level selection. Remote panels in a CRSC system provide a form of breakaway status. (See [Remote Panel Modes](#), on page 49.)

- CRSC systems can perform salvos. (Salvos are stored take sequences.)
- CRSC itself can perform system monitoring. You can examine and set crosspoints and view and clear locks from your PC.
- CRSC simplifies firmware updates with a single file for all CR Series devices. All of your CR Series devices can (and should) be updated at the same time.

You can also use CRSC to initialize your remote panel module(s) for use with a NV9000 network and to restore those remote panel module(s) to use under CRSC.

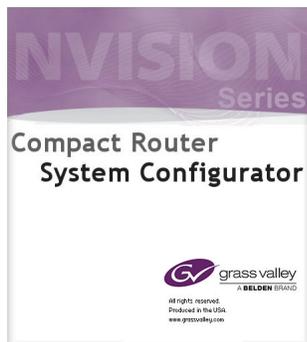
Using CRSC, configuration changes can be made easily and quickly.

## CRSC User Interface

After CRSC is installed, you will probably have its icon on your PC desktop:



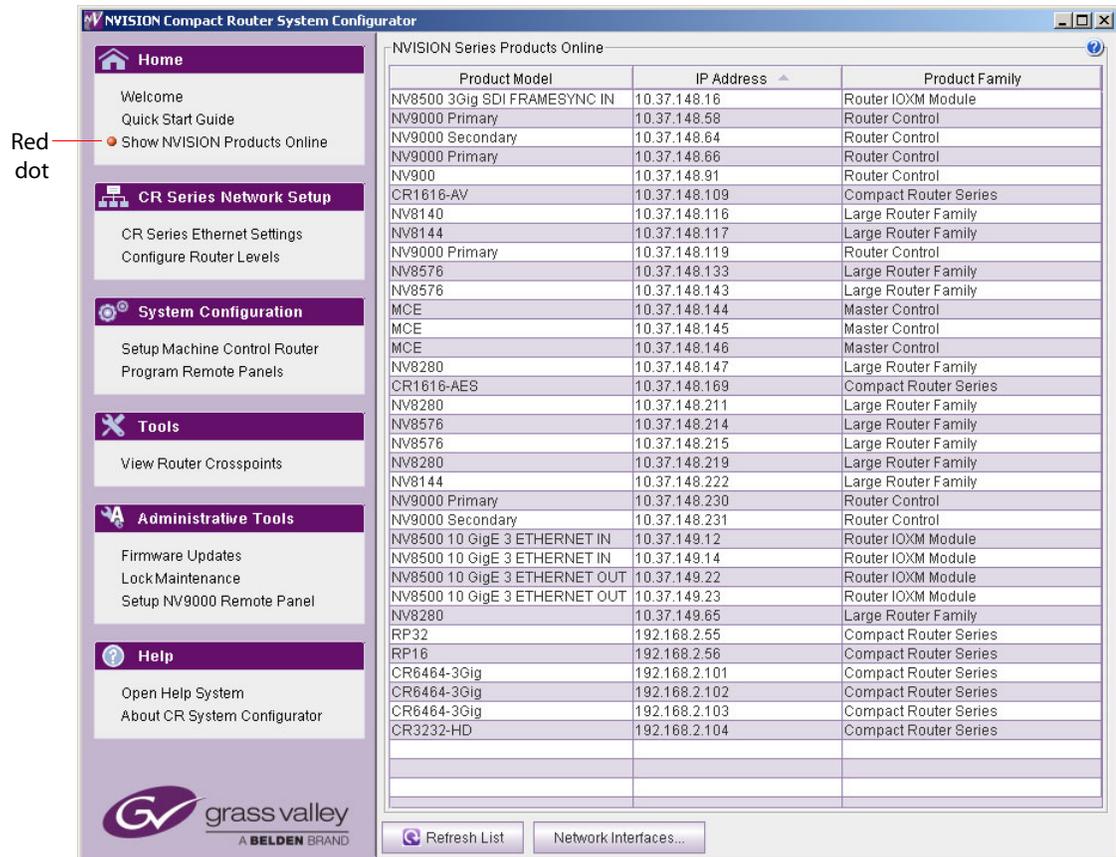
Double-click the icon to launch CRSC. When you launch CRSC, you will momentarily see its “splash” screen:



Then the CRSC window appears with its "welcome" page displayed:



The CRSC window is divided into two main parts, a navigation pane at the left, and a work area at the right:



Navigation Pane

Work Area

By clicking the different entries in the navigation pane, you can select different pages in the work area. When you click a navigation entry, a red dot appears to the left of that entry. The red dot serves as a visual aid to remind you which page you are viewing.

Following is a summary of the different pages:

- **Welcome**  
The welcome page gives you a brief introduction to CRSC and provides links to tutorial material.
- **Quick Start Guide**  
The quickstart guide gives you a short lesson on using CRSC—enough to get you started.
- **NVISION Series Products Online**  
The 'NVISION Series Products Online' page lists all the NVISION series products detectable on the networks to which your configuration PC is connected. These include large routers, NV9000 control systems, and master control products, as well as compact routers and remote panel modules.  
(See [NVISION Series Products Page](#), on page 23.)

- **CR Series Ethernet Settings**

The 'CR Series Ethernet Settings' page lists all the CR Series products detectable on the networks to which your configuration PC is connected. These include only compact routers and remote panel modules.

It is in this page that you assign the devices IP addresses on a CRSC network.  
(See [Ethernet Settings Page](#), on page 25.)
- **Configure Router Levels**

Use this page to define the levels associated with the routers. A router corresponds to at least one level. A level is the same thing as router partition and essentially defines the size and type of a switching matrix.

  - ▲ Assigning a level to a router (and clicking the page's 'Apply Updates' button) places the router in what CRSC calls "config" mode and the router will no longer function in stand-alone mode. If you accidentally do this, you can easily restore the router to its factory default state. See the *Compact Router User's Guide* for instructions.
- (See [Router Levels Page](#), on page 31.)
- **Set Up Machine Control Router**

Use this page to designate the port types for machine control routers.  
(See [Machine Control Routers Page](#), on page 39.)
- **Program Remote Panels**

Use this page to configure the buttons of remote panels.  
(A *remote panel* is a CR Series control panel mounted on a remote panel module.)  
(See [Remote Panels Page](#), on page 45.)
- **View Router Crosspoints**

Use this page to view the native crosspoint matrices of various compact routers and to perform primitive takes in those routers.  
(See [Router Crosspoints Page](#), on page 73.)
- **Firmware Updates**

It is in this page that you can update the firmware of selected compact router and remote panel modules.  
(See [Firmware Updates Page](#), on page 93.)
- **Lock Maintenance**

Use this page to examine and clear locks and protects made by various users. You cannot set locks in this page.  
(See [Locks Page](#), on page 101.)
- **Set Up NV9000 Remote Panel**

Use this page to change a panel from one that operates in CRSC mode to one that operates in NV9000 mode or vice versa. Those two modes are mutually exclusive.  
(See [NV9000 Remote Panel Settings Page](#), on page 105.)
- **Open Help System**

This entry in the navigation pane does not select a page in the work area, but launches CRSC's interactive help system. (The interactive help is an on-line version of this document.)

- About CRSC

This page provides the CRSC version number and Grass Valley contact information.

## Creating a CRSC Network

CR Series products (and CRSC) communicate on an Ethernet LAN. There are three main reasons to create a network:

- To perform multi-level operations, such as 'takes' and locks.
- To operate routers or a network of routers remotely (e.g., from a separate room).
- To make use of CRSC features, such as configurable remote panels. (But remember that it is actually the remote panel *module* that is configurable.)

CRSC can access multiple subnets. Each subnet can include the following items:

- From 1 to 16 remote panel modules (with attached control panels).
- From 1 to 4 compact routers. You can mix CR Series routers of any size and type according to your requirements.

▲ If you are also using any CQX routers and control panels, a second, separate subnet must be created for the CQX products.

The control panels and routers communicate by sending messages across the network. If any routers or control panels on the network have duplicate IP addresses, the devices are not distinguishable and the network will not function properly. CRSC will notify you of any duplicate IP addresses and tell you which frames are inaccessible on a specific subnet.

You can create multiple CRSC subnets. CRSC can detect and manage all subnets as long as your configuration PC can connect to the different subnets.

### IP Addresses

An IP address is a 32-bit number usually expressed by four 8-bit values (octets) in decimal notation separated by periods: 192.168.2.87 (for example). The 32-bit number has two parts: a subnet identifier and a device address with the subnet.

For example, if a router's full IP address is 192.168.2.87, and the subnet *mask* is 24 bits, the router's address is 87 and the subnet is 192.168.2.xxx.

### Subnets

A subnet allows a single large network to be organized into smaller sub-networks. Typically, a subnet may represent all the machines at one geographic location or on the same local area network (LAN).

A CQX router and control panel must be on its own subnet.

A router can receive commands only from a control panel on the same subnet.

### Subnet Masks

A subnet mask is a set of bits that Ethernet uses to divide an IP address into a subnet field and a field for a device address that exists in that subnet. For compact routers, the typical subnet mask is 24 bits (out of 32):

11111111 11111111 11111111 00000000

and this is typically represented by 255.255.255.0. For such a subnet, there are 256 possible device addresses. The addresses 0 and 255 are reserved. Device addresses can therefore range from 1 to 254.

The subnet masks need not be 24 bits. If it differs, the device address range will be something other than 1–254.

## Rotary Switches

The 16-position 'Frame ID' rotary switches (located at the front of a router or remote panel module) are used in the following circumstances:

- When a router is stand-alone or in a stand-alone network.
- In a CRSC network, when the router or remote panel module is still in its default state (e.g., when you are in the process of adding a router or remote panel module to the CRSC network).

Otherwise, in a CRSC network, the rotary switch settings have no importance.

## Adding Devices to a CRSC Network

When you are adding a router or remote panel module to a CRSC network, the 16-position rotary switch determines its *initial* IP address. Routers and remote panel modules usually come from the factory with the rotary switch set to position 1.

The 16 positions are numbered (in hex) from 0 to F. In hex notation, letters represent digits greater than 9:

A = 10, B = 11, C = 12, D = 13, E = 14, F = 15

The value of the switch is then added to a fixed number to create the initial IP address for the router or remote panel module. Letting the subnet be represented by xxx.yyy.zzz,

For CQX routers, the IP address = xxx.yyy.zzz.sss where sss = switch value + 200. Use only a switch setting in the range 1–4 (resulting in an address range of 201 to 204).

For other compact router routers, the IP address = xxx.yyy.zzz.sss where sss = switch value + 100 (resulting in an address range of 101 to 104).

For remote panel modules, IP address = xxx.yyy.zzz.sss where sss = switch value + 50. Use only a switch setting in the range 1–15 (resulting in an address range of 51 to 65).

Note carefully that if a rotary switch is set to zero, the router or panel reverts to the factory default state (when it powers up) and not to a previously set state. Do not use a switch setting of 0 when you are adding a router or remote panel module to a CRSC network!

A router and a remote panel module can have the same switch setting because each is being added to a different base number. However, two routers or two control panels cannot have the same switch setting because the resulting number would be the same, creating identical IP addresses.

After the devices are added to your network, you can use CRSC to assign them specific IP addresses. (The new addresses must be written to the devices from CRSC.) After that, the devices are no longer in their default state, but belong to the CRSC network and the rotary switches are irrelevant (except that they must not be set to 0).

Remember that each device must have a unique IP address.

## CQX Networks

A CQX router must be operated with a CQX control panel (or automation). Do not place a CQX router on a subnet with other routers. However, you can have more than one subnet dedicated to supporting CQX routers.

Figure 3-3 shows the ways a “clean and quiet” router can be connected:

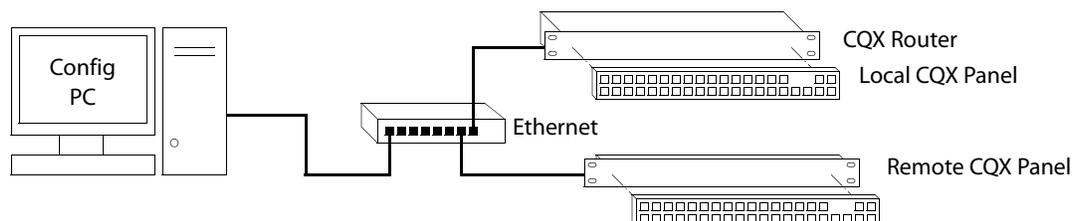


Fig. 1-4: Figure 3-3. CQX Network

The CQX panel can be local (mounted on a CQX router) or it can be remote (mounted on a remote panel module). The remote CQX panel then must be connected to the CQX router by an Ethernet switch. It is possible to use both a captive panel and a remote panel.

Unlike other compact routers, the CQX routers have two rotary switches. You must set both switches to an appropriate value.

### Mode Rotary Switch for CQX Routers

The 16-position ‘Mode’ rotary switch configures the router’s video format. Set the rotary switch to a position in the range 0–9, A, B, C, or D, according to this table:

Setting	Format	Setting	Format	
0	1080i, 59.94 or 60 1080p, 29.97 or 30 1080psf, 29.97 or 30	6	1080p, 59.94 or 60	Switch positions 6 and 7 correspond to video according to SMPTE 425 level A.
1	1080i, 50 1080p, 25 1080psf, 25	7	1080p, 50	
2	525i, 59.94	8	2 × 1080i, 59.94 or 60	
3	625i, 50	9	2 × 1080i, 50	Switch positions 8 and 9 correspond to video according to SMPTE 425 level B.
4	720p, 59.94 or 60	A	720p, 29.97 or 30	
5	720p, 50	B	720p, 25	
		C	720p, 23.98 or 24	
		D	1080p, 23.98 or 24, 1080psf, 23.98 or 24	
		E	reserved	
		F	reserved	

The default is 1080i, 59.94 Hz (switch setting 0). Positions E and F are not valid positions.

Where a switch setting supports multiple formats, the format is governed by the video reference applied to the router and must be compatible with that reference format.

- ▲ When a control panel is mounted on a router or remote panel module, it conceals the rotary switch. You must remove the control panel when you are setting the rotary switch.
- ▲ Every time you make a switch change, power-cycle the router or remote panel module.

## Usage Tips

### Network Speed

Compact router networks are Ethernet LANs (100 Mb/s, UDP). That means they are reasonably fast, and have potentially many network configuration options. However, no matter how fast the network is, the amount of network traffic increases exponentially with the number of devices on the network. At some point, the traffic exceeds the capacity of the network. The practical limit is 4 compact routers and about 16 remote panel modules.

#### Network Considerations

Compact routers (and remote panel modules) were designed to use 10/100BaseT networks, occasionally auto-negotiating to 10BaseT.

Modern 100/1000BaseT switches (such as those offered by Cisco) will stop sending router traffic when a compact router goes to 10BaseT.

Such auto-negotiating tends to occur where CAT 5 cable lengths exceed 25 meters.

Our recommendation for network equipment is this: use a 10/100BaseT unmanaged switch for your compact router network. These switches should reliably support CAT 5 to 100 meters or better.

The CR6400 routers are immune to this problem, having parts of more recent design.

### Cabling

Compact routers generally use 75Ω BNC cable for signal connections. However, machine control connectors are RJ-45 and analog audio connectors are DB25. Each DB25 connector supports 8 audio channels (4 stereo pairs). You will need to acquire breakout cables to connect individual analog audio devices, such as Grass Valley's WC0053 breakout cable.

CR6400 routers use DIN 1.0/2.3 connectors for signal connections. We call these connectors "coax" connectors.

The CR Series devices use RJ-45 connectors for Ethernet.

### Power-Up Re-initialization

A router or remote panel module re-initializes to its factory default settings if you power it up with the rotary switch set to zero (0). If you reset the frame by accident, and the frame is in your network, you will have to add the frame again and reconfigure it.

### Uploading Firmware

You will receive a firmware file when you receive CRSC. You can receive firmware updates periodically or upon request.

We recommend that when you receive a firmware file, you upload the firmware to *all* your compact routers and remote panel modules before proceeding. See [How to Update Firmware](#), on page 97.

## Panels Locked at Reset

After a reset, a panel is locked. Before you can use a panel, you must unlock the panel by pressing the red 'Panel Lock' button.

## System Design

By the time you are ready to use CRSC, most of the compact router system design decisions have likely already been made. However, it may be helpful to review the following points to ensure that all issues have been captured in your system design.

### Design Issues

What signals does your system manage? How many signals are there?

What are the signal types? Do you need or have machine control routers?

Are you using CQX ("clean and quiet") routers? If so, CQX routers only operate by themselves with CQX control panels and must be on a separate subnet from other routers.

The CR6400 routers have an architecture that differs slightly from the architecture of the other CR Series routers. Be aware of those differences. Please refer to the *CR6400 Family User's Guide*.

A compact router has a maximum of 16, 32, or 64 inputs or outputs. (An AES router in mono mode has a 64×64 matrix although it is still considered a 32×32 router.) How you partition a router depends in part on the organization of buttons on your control panels and similarly the organization of buttons depends in part on router partitions.

Router partitions are *contiguous* sets of connectors in the ordering of connectors on the router. A partition cannot consist of a disjoint set of connectors.

Router partitions may overlap if it suits your system design.

Router partitions, especially for AES or machine control routers, depend on many factors:

- AES partitions— number of AES channels. Number of embedded audio channels.

- Machine control partitions— what kind of devices you have that require machine control.

HD routers can switch SD signals. You do not need a separate SD router. If you have a 3Gig router, it can switch HD and SD signals as well as 3Gig signals.

You can switch analog signals using analog video (AV) and analog audio (AA) routers. You can also use analog-to-digital (A/D) and digital-to-analog (D/A) converters in conjunction with HD, SD, and AES routers when you have analog signals. Whether this is an effective solution depends on factors that include your budget, whether you need or already have A/D and D/A converters, and how much delay you can tolerate in your video or audio.

Whether your video signals contain embedded audio is another issue. Do you actually need any audio routers?

CR Series routers and panels do not start, stop, rewind, cue, or otherwise control any media. You might need to purchase equipment that performs those tasks. You must consider how that equipment works in conjunction with CR Series products.

For additional information, review the [Sample Configuration](#), on page 118. It illustrates design issues that you might encounter.

## Setting Up Your Configuration PC

Your configuration PC must be assigned an IP address on one or more of the subnets you intend to use for the CRSC network.

If you have multiple subnets in your compact router system, you will probably have to add those subnets to your PC's network configuration. Doing this is especially important for CQX routers.

### How to Configure your PC's IP Address(es)

- 1 From the PC's Start menu, choose 'Settings > Network Connections' or 'All Programs > Accessories > Communications > Network Connections', whichever is available. The 'Network Connections' dialog box appears:

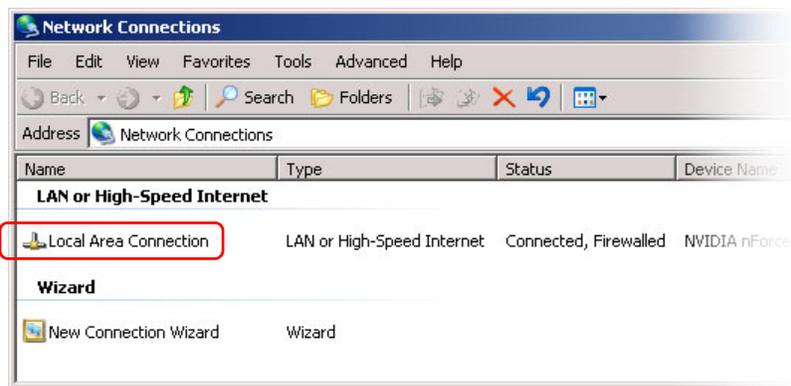


Fig. 1-5: Network Connections Window

- 2 Double-click 'Local Area Connection'. The 'Local Area Connection Status' dialog box appears:

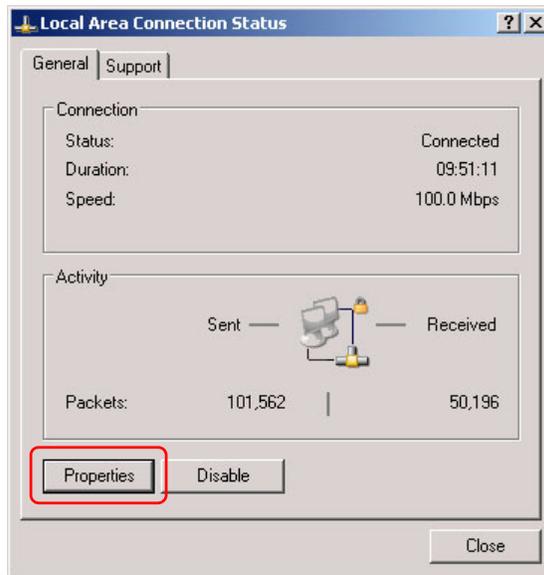


Fig. 1-6: Local Area Connection Status Dialog Box

- 3 Choose the 'General' tab and click **Properties**. The 'Local Area Connection Properties' dialog box appears.

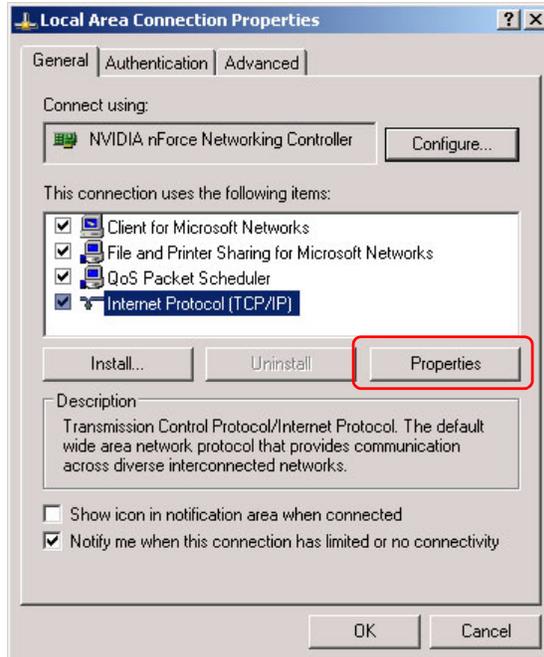


Fig. 1-7: Local Area Connection Properties Dialog Box

- 4 Select 'Internet Protocol (TCP/IP)' and click **Properties**. The 'Internet Protocol (TCP/IP) Properties' dialog box appears.

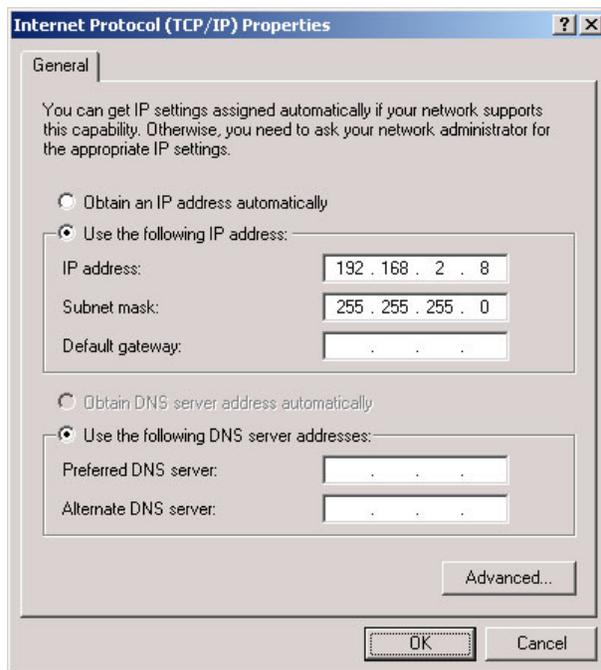


Fig. 1-8: Internet Protocol (TCP/IP) Properties Dialog Box

- 5 Select 'Use the following IP address' and enter the IP address for your PC. It is recommended that you use the default subnet 192.168.2.xxx and the subnet mask 255.255.255.0.

Any unique IP address will work as long as it is on one of the subnets of your CRSC network. The PC's address on the subnet must not be the same as any of the frames (routers or remote panels) on the subnet. It is recommended that you use Avoid addresses in the 50, 100 and 200 range. CRSC uses those as defaults. For details, see [IP Addresses](#), on page 10.

- 6 Click **OK** to save your changes.

### How to Create Multiple Subnets

- 1 Starting from step 4 in the preceding procedure, click **Advanced**.
- 2 In the 'Advanced' window, click **Add** and enter an IP address for your PC on each of the subnets. Repeat this step for additional subnets.
- 3 After adding IP addresses for your subnets, click **OK**.

## Installing CRSC

CRSC is available on the software and documentation CD (SB0033-xx) that ships with the equipment. CRSC is a Java application and the installer installs a Java runtime support package.

You can also obtain the installer from Grass Valley customer service.

The installer creates a desktop shortcut for CRSC and makes an entry in Windows' Start menu for CRSC. The software installation process takes about one minute.

Follow these steps to install CRSC:

- 1 Insert the CD in your CD drive.

Wait for the initial screen:



Click the 'CR Series Routing Products' button.

- 2 The 'CR Series Routing Products' page appears:



Click 'Install CRSC'.

- 3 The installation script will begin to run:



Click 'Next'.

- 4 A window appears in which you can designate the location on your PC in which to install MRC:



The window presents the default location. If you prefer another location, click 'Browse' to navigate to a different folder.

Uncheck 'Create a desktop icon' if you do not want a CRSC shortcut to appear on your PC desktop.

The window tells you the disk space needed for the installation. If you do not have that much space, the installation will fail.

When you are satisfied with the pathname and options, click 'Next'.

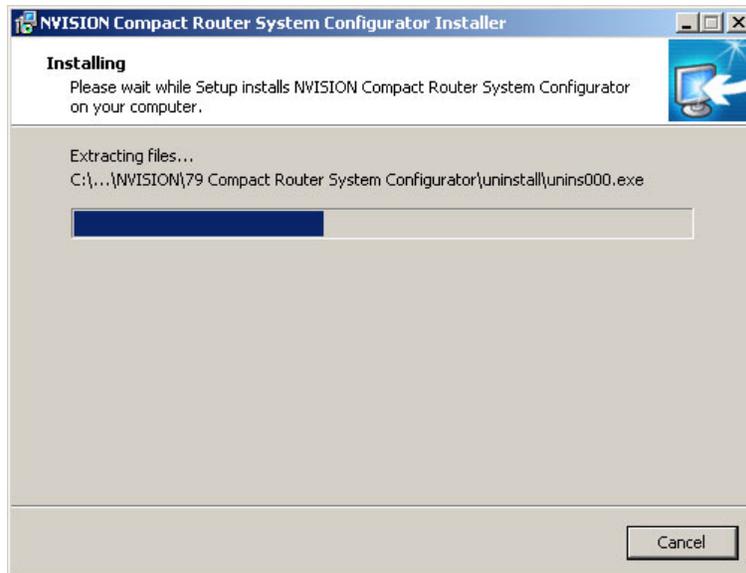
5 A confirmation window appears:



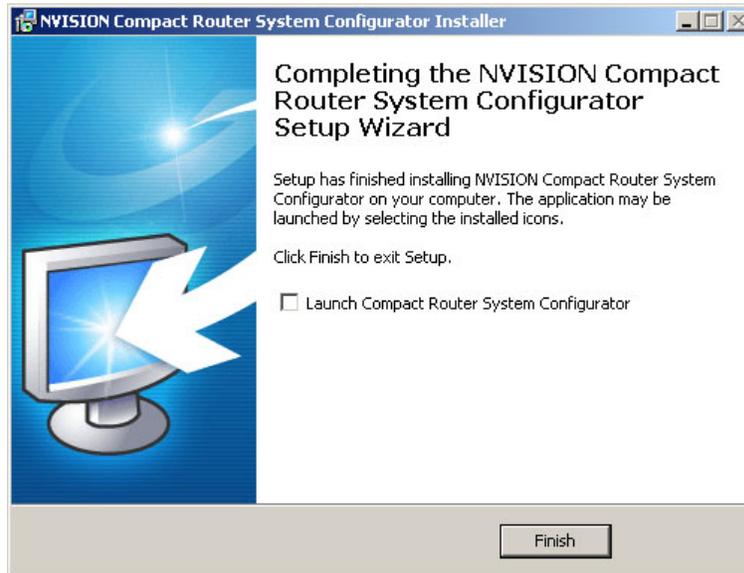
If the options presented are not correct, click 'Back' to go back to the previous window and re-enter a pathname or change options.

Otherwise, click 'Next' to start the installation or click 'Cancel' to stop the installer.

When you start the installation, a progress window appears:



6 After several seconds, the installation will complete. The completion window appears:



Uncheck 'Launch Compact Router System Configurator' if you do not want to run CRSC immediately.

7 Click 'Finish'.

## Installation Testing

After installing CRSC, launch CRSC by clicking its desktop icon or selecting 'NVISION > Compact Router System Configurator' from the Windows 'Start' menu. Go to the 'CR Series Ethernet Settings' page. Click 'Refresh List'.

Examine the list of devices and note whether any of the following conditions exist:

- No entries in the list.  
You have no network (or no devices on your network) or the network is not properly connected to your PC. Ensure that your PC has an Ethernet connection to the Ethernet switch for the network.  
Click the 'Network Interfaces' button in CRSC's 'NVISION Series Products Online' page to determine to which subnets your configuration PC is connected.
- Entries read "IP Conflict." To correct this, find and change IP address so that all IP addresses are distinct.
- If you determine that IP addresses are not a problem, one or more of the frames might be disconnected, have no power, or might be defective. Again, check Ethernet connections, power connections, and power supplies. A power supply light and the power indicators on all routers, remote panel modules, and control panels should be on.
- Entries read "Different Subnet." These are frames that are detectable by CRSC, but are not on a currently available subnet. To view available subnets, hover your mouse over the text "Different Subnet." A popup list of available subnets appears.

There are several options for such entries:

Change the IP address of the frame to the current subnet.

Change the IP address or subnet of the configuration PC.

Change the IP address in some other way, but leaving the device on some other subnet.

Physically remove the frame from the network by disconnecting the connecting cables.

Fix any problems and click **Refresh List** on the 'CR Series Ethernet Settings' page to view an updated list of devices. When the network is functioning properly, you are ready to use CRSC to perform other tasks.

## Getting Started

Before you can use all the features of CRSC effectively, you should complete the following tasks:

- 1 Optionally, upload new compact router firmware using CRSC. See [Uploading Firmware](#), on page 13.
- 2 Be sure that any control panels are unlocked. See [Panels Locked at Reset](#), on page 14.
- 3 Using CRSC assumes that your compact router network is designed and connected. See [System Design](#), on page 14 and [Creating a CRSC Network](#), on page 10.
- 4 Set up your configuration PC and install CRSC. See [Setting Up Your Configuration PC](#), on page 15.
- 5 Test the CRSC installation to verify that everything is working properly. See [Installation Testing](#), on page 21.

If you are unfamiliar with routing, networking concepts, or CR series products, we recommend that you read the [Tutorials](#), on page 109.

Please refer to the *CR Series User's Guide* and the *CR6400 Family User's Guide* for details about the many compact routers and (compact) control panels.

# NVISION Series Products Page

The 'NVISION Series Products' page lists *all* NVISION series products—compact routers, remote panels, large routers, router control systems—detectable on the networks to which the configuration PC is connected.

Click 'Show NVISION Products' in the navigation pane to open the 'NVISION Series Products' page:

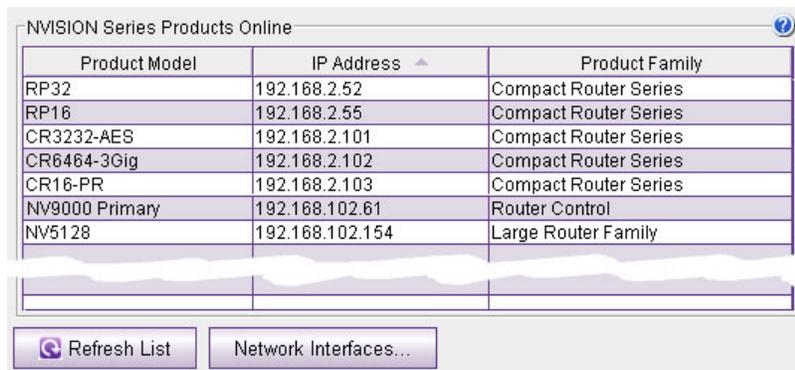
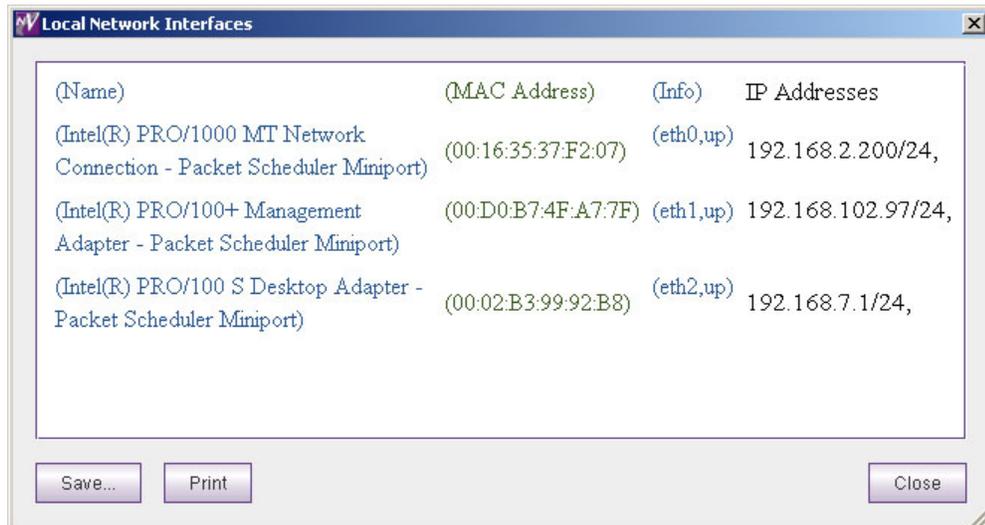


Fig. 2-1: NVISION Series Products Page

The page shows, for each product, the product name and model, its IP address, and the device family. Use this page for reference when determining which products can be configured. The page is for information only.

Click **Network Interfaces** to get a report about the NIC or NICs (network interface cards) in your configuration PC:



You can, at any time, click **Refresh List** to view the most recent state of detectable products.



# Ethernet Settings Page

# 3

## Summary

The 'CR Series Ethernet settings' page lists compact routers and remote panel modules available on the CRSC network. Click 'CR Series Ethernet Settings' in the navigation pane to view the 'CR Series Ethernet Settings' page:

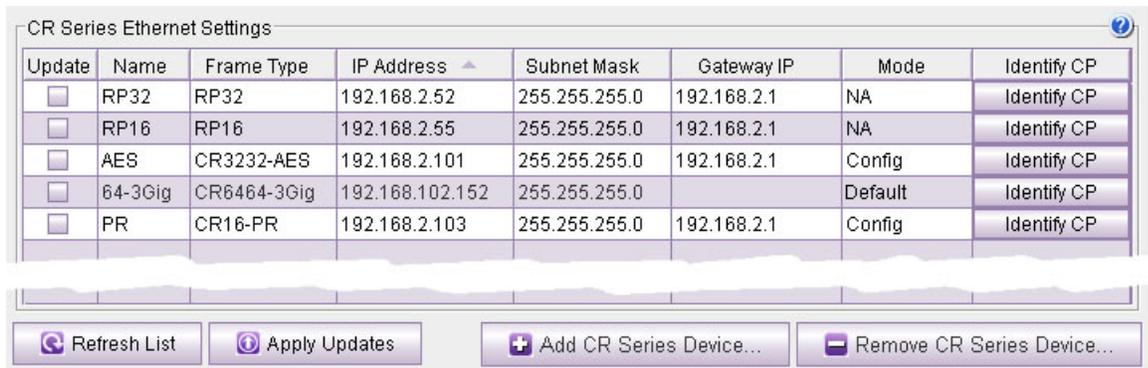


Fig. 3-1: CR Series Ethernet Settings Page

The table columns presents the following option or information:

Column	Description
Update	Check the check box to select the device listed on that row for updating.
Name	Name assigned to the compact router or remote panel.
Frame type	Type (or model number) of compact router or remote panel.
IP address	IP address currently assigned to the device.
Subnet mask	Subnet mask currently assigned to the device. It is recommended that you leave the subnet mask at 255.255.255.0.
Gateway IP	Gateways are not used except by third-party systems or occasionally by an NV9000 system. Developers may use the gateway and subnet mask fields in any way they find useful. A gateway setting is not needed for a normal compact router setup.

Column	Description
Mode	The 'Mode' column is status-only and displays how the particular router or remote panel module is configured. These are the 3 possible "modes": NA — The device is either a remote panel module or a router with old software. Config — The device is a router configured by CRSC. Default — No settings have been changed and the device is a router in the factory default mode. Default+IP — For CR6400 routers only, this means that no settings have been changed except the IP address, and the device is a router in the factory default mode.
Identify CP	When you click 'Identify CP', the control panel listed mounted on the device listed on that row identifies itself, physically, by displaying a moving pattern of button lights. This feature is helpful if you forget which panel of possibly many panels is represented by the particular IP address. The moving button lights continue indefinitely. To turn off the pattern, either press any button on the panel or click 'Identify CP' again.

## Buttons

There are 4 buttons at the bottom of the page.

Click **Refresh List** at any time to cause the page to display the current state of the devices on the network.

The **Apply Updates** button remains dimmed until you have made a change to a setting in the page. When you have made changes, the software automatically checks the check box in the rows you have change and the **Apply Updates** button becomes enabled. Click **Apply Updates** to cause those changes to be applied.

You can also check or uncheck the check boxes manually.

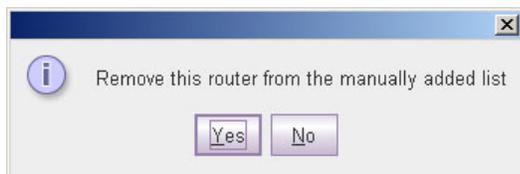
Use the **Add CR Series Device . . .** button to add a device is not discovered through normal methods, for instance, when the router is detectable on through a network gateway. Such devices might be those on a different network. When you click the button, a dialog appears in which you may specify the IP address of the device:



Click OK to add the device or 'Cancel' if you do not want to add the device. Devices added this way are said to be "manually" added.

Use the **Remove CR Series Device . . .** button to remove a manually added device (one that has been added with the 'Add CR Series Device . . .' command).

First place a check mark in the table row of the device you want to remove. Then click the button. A confirmation dialog appears:



Click OK to remove the device or 'Cancel' if you do not want to remove the device.

## Usage

The 'CR Series Ethernet Settings' page lets you can change the name, IP address, subnet mask, or gateway IP address of any compact router or remote panel module.

Use the page to add routers and remote panel modules to your CRSC network. The process of adding these devices involves making physical Ethernet connections and then, in CRSC, changing the devices' IP addresses and other data from their defaults to what you want.

(If you have previously configured a router or remote panel module, and you are adding it to your CRSC network, it might already be configured the way you want.)

### Note:

A CQX router must be operated using a CQX control panel, either mounted on the CQX router itself or on a remote panel module.

It is important to assign each CQX router and CQX panel a subnet separate from other compact routers or control panels. You can, of course, have more than one subnet.

## How to Add Routers to a Network

**Note:** the limitation of 4 routers on a subnet is a physical limit imposed by the amount of network traffic that the routers can handle. CRSC, however, will allow you to have any number of routers on a subnet. Although you can exploit this capability for ease of configuration, you must ensure that your compact router system observes the network limits when it is running.

Routers from the factory are usually all set to the same subnet: 192.168.2.xxx. Routers that are freshly reset to default also use that subnet.

Adding a router to the CR system creates a *new level*. Routers are assigned to a subnet and no more than 8 levels *in any single subnet* are allowed. CRSC will not let you delete a router you just added because each router must correspond to at least one level. Either disconnect the router physically, delete one or more levels (other than those just added), or move the router to another subnet. Levels are managed using the 'Router Levels' page. See [Router Levels Page](#), on page 31.

Follow these steps to add routers to your network:

- 1 Connect up to 4 routers to your network with unique rotary switch settings in the range 1 to F (hex).

---

Remember to cycle power after you change a rotary switch.

However, if a rotary switch is set to zero (0), and you then power-cycle the router or remote panel module, the device reverts to the factory default state, and loses its previously configured state.

---

- 2 Go to the 'CR Series Ethernet Settings' page.
- 3 Verify that all routers appear in the list. Click 'Refresh List' if necessary.
- 4 For each router, click on the cell in the 'IP Address' column to edit the field. Enter a unique IP address.
- 5 Repeat steps 1 through 4 for additional router. Remember that no more than 4 routers can operate to a single subnet.
- 6 Click **Apply Updates** to send the changes to the selected frames. Only those frames with 'Update' checked in the table rows are updated. The data are stored in the frames internally.

## How to Add Remote Panel Modules to a Network

Follow these steps to add remote panel modules to your network:

- 1 Connect up to 15 remote panel modules to the network with unique rotary switch settings in the range 1 to F.

---

Remember to cycle power after you change a rotary switch.

However, if a rotary switch is set to zero (0), and you then power-cycle the router or remote panel module, the device reverts to the factory default state, and loses its previously configured state.

---

- 2 Go to the 'CR Series Ethernet Settings' page.
- 3 Verify that all added remote panel modules appear in the list.
- 4 For each remote panel module, click on the cell in the 'IP Address' column to edit the field. Enter a unique IP address according to the following formulas:
- 5 Repeat steps 1 through 4 for additional remote panel modules.
- 6 Click **Apply Updates** to send the changes to the selected frames. Only those frames with 'Update' checked in the table rows are updated. The data are stored in the frames internally.

## How to Change Ethernet Settings

- 1 Go to the 'CR Series Ethernet Settings' page.
- 2 Locate the router or remote panel module you want to update.
- 3 In that row, click the cell you want to change: the IP address, subnet mask or gateway IP address. The field opens for editing.
- 4 Type in the new value.  
We recommend that you leave the subnet masks at 255.255.255.0.

- 5 To record your change, press <enter> or <tab>, or click in another field. Press <Esc> to cancel your change.
- 6 Repeat steps 2–5 for additional changes. The 'Update' check box automatically displays a check mark if you update any of the information.
- 7 Click **Apply Updates** to send the changes to the selected frames. Only those frames with 'Update' checked in the table rows are updated. The data are stored in the frames internally.



# 4 Router Levels Page

## Summary

The 'Router Levels' page lets you view and change router levels:

**Setup Crosspoint Ranges for Levels**

Level Number	Level Name	Router Name	Signal Type	Physical Input Start	Physical Input End	Controller Source Start	Physical Output Start	Physical Output End	Controller Destination Start
1	HD	D_32HD	HD or SD Digital Video	1	32	1	1	32	1
2	AES	D_32AES	Synchronous AES Mono	1	64	1	1	64	1
3	MC	D_PR	Machine Control Reverse	1	32	1	1	32	1

Update Router Levels      Active Subnet: 192.168.97.0 (255.255.255.0)      Add Level...      Delete Level...

---

**Network Frame Summary**

Routers      All CR Frames

Name	Frame Type	Level(s)	IP Address	Subnet Mask
D_32HD	CR3232-HD	1	192.168.97.22	255.255.255.0
D_PR	CR32-PR	3	192.168.97.23	255.255.255.0
D_32AES	CR3232-AES	2	192.168.97.24	255.255.255.0

Refresh Summary

Fig. 4-1: Configure Router Levels Page

The page is divided into two parts: above is the table of "crosspoint ranges" (or partitions) and at the bottom is a network frame summary.

The upper table lets you view the levels defined for the subnet you select in the 'Active Subnet' drop-down list:

Active Subnet: 192.168.97.0 (255.255.255.0) ▼

The lower table lets you review the routers on all networks detectable by your PC.

Click 'Refresh Summary' to be sure that you are viewing the most current information.

## Background Information

You may define up to 4 levels in any single router. A *level* is a router partition defined by (1) its size (or bounds) and (2) its signal type. A level is created either when you create a router partition or when you add a router to the network. When you add a router to a CRSC network, the level that is added for that router is a *default* level for that router type.

You may define up to 8 levels for any single subnet.

Levels within a router may overlap or they may be distinct. A level may be the entire router or may be limited to specific inputs and outputs.

---

### IMPORTANT

CQX routers are designed *not* to use levels. For proper functioning, do *not* configure levels in a CQX router.

---

Adding a router to a CRSC network creates a new level. Routers are assigned to a subnet and no more than 8 levels *in any single subnet* is allowed.

**Note:** CRSC will not let you delete a level for a router you just added because each router must correspond to at least one level. If, by adding a router, you created a level problem, you can either disconnect the router physically, delete one or more levels (other than the one just added), or move the router to another subnet.

**Note:** Grass Valley does not guarantee system performance beyond 4 routers in a subnet.

## Levels and Partitions

Partitions define boundaries within the router used to organize switching. Partitions also define what signal format is in use.

Signals are switched within a partition. It is not possible to switch an input from one partition to the output of another partition. Every router must include at least one partition. One partition for an entire router might be desirable.

In CRSC, partitions are called levels. CRSC allows you to define up to 8 levels for each subnet and up to 4 levels for each router.

### Modes in the Levels Table

If a router is to be used stand-alone or in a stand-alone network, do *not* update the levels of family routers in this page. (If you do not change its level, the router will not be updated.)

If you do change the level of a router, it will enter “config” mode and be suitable only for operating in a CRSC network or an NV9000 network.

If you change only the IP address of a router, it will enter “default + IP” mode and remain suitable for stand-alone operation.

“Config mode” is meant only for CRSC networks or NV9000 networks and not for stand-alone routers or stand-alone networks.

## Using the Router Levels Page

At the top of the page, the 'Setup Crosspoint Ranges for Levels' table displays all levels currently added to the selected subnet and lets you add, delete, and change levels as needed.

In the lower section of the page the 'Network Frame Summary' has two tabs—'Routers' and 'All CR Frames'—that list the devices detectable by your PC. The 'Routers' tab lists only CR Series routers. The 'All CR Frames' lists all CR Series devices.

The 'Setup Crosspoint Ranges for Levels' table display the following information for each level:

Column	Description
Level Number	A number assigned to the level. The number must be unique and from 1 to 250. The numbers are automatically generated.
Level Name	A name you assign to the level. The name is limited to 16 characters.
Router Name	The name of the router that contains the level. The router names are not editable.
Signal Type	The type of signal switched on that level. See <a href="#">Signal Types</a> , on page 34.
Physical Input Start	Use these fields to define the <i>physical</i> start and endpoints of the level within the router.
Physical Input End	
Physical Output Start	
Physical Output End	
Controller Source Start	I/O numbering in a remote panel might not match the physical I/O numbers of the router. Use these fields to map the router's numbering to the NV9000's numbering. (The remote panel's source <i>end</i> and destination <i>end</i> values are derived from the physical start and end and the source start and destination start values.) If there is no remote panel in your system, you can ignore these fields.
Controller Destination Start	

The 'Network Frame Summary' presents the following information:

Tab	Column	Description
Routers	Name	The name of the compact router.
	Frame Type	The type of router.
	Level(s)	Level numbers associated with the router. Each level is assigned a unique number.
	IP Address	IP address currently assigned to the device.
	Subnet Mask	Subnet mask currently assigned to the device.

Tab	Column	Description
All CR Frames	Frame Type	The type of router or remote panel.
	Level(s)	Level numbers associated with routers.
	Subnet Mask	Subnet mask currently assigned to the device.

None of this information is editable.

## Active Subnet

CRSC detects all subnets for which there are connections in your configuration PC. You can place different frames on different subnets and use any available subnet you want. Choose the subnet from the 'Active Subnet' drop-down list.:

Active Subnet:  ▼

The page refreshes its lists of levels after you choose a different subnet.

The designation "active" applies only in CRSC itself: it is the subnet you are configuring. In the actual network, all subnets operate independently and concurrently.

## Signal Types

In general, the CR Series routers can switch these signal types.

AV	Analog Video or Timecode
AA	Analog Audio or Timecode
AES	Synchronous AES Mono
SD	SD Digital Video
HD	HD or SD Digital Video
3Gig	3Gig, HD, or SD Digital Video
PR	Machine Control Reverse

The signal types for CR6400 routers are similar, but not quite the same as for other routers:

AES	Asynchronous AES
3Gig	3Gig, HD, or SD Digital Video

(Any single CR Series router switches exactly one signal type.)

Among routers other than CR6400 routers, AES (audio) signals and machine control signals are handled differently from video signals. If you are unfamiliar with the various signal types, please review [Signals](#), on page 112.

## How to Update a Level

- 1 Go to the 'Router Levels' page.
- 2 Optionally, select the subnet on which you want to change routers levels.
- 3 In the 'Setup Crosspoint Ranges for Levels' table, locate the row listing the level you want to change.

- 4 Optionally, in that row, click in the 'Level Number' or 'Level Name' cell to activate the field and enter new values. Level numbers must be unique in the range 1 to 250. Level names are limited to 16 characters.
- 5 Define the physical start and end numbers for the level. These numbers identify physical connections on the router. The numbers you enter will of course depend on what you want to do with the router.  
The default level for the router covers the entire span of inputs and outputs. For example, the default values for a 32x32 video router are  
input start = 1, input end = 32,  
output start = 1, output end = 32.
- 6 If you have a remote panel in your system, you might need to specify 'Controller Input Start' and 'Controller Destination Start' values for the level.  
Click the field to enter a value in the field.  
(The controller end values are derived from the controller start fields and the physical start and end fields.)
- 7 When you have finished changing level data, click **Update Router Levels** to send the level configuration data to the routers. You should see a confirmation message:



Note that the 'Update Router Levels' button updates only the levels that were changed. Other levels remain unaffected. This is particularly important for the levels of CR6400 routers.

## How to Add a Level

- 1 Go to the 'Configure Router Levels' page.
- 2 Optionally, select the subnet on which you want to add routers levels.
- 3 Click the **Add Level . . .** button.

If your subnet has more than one router, a dialog appears:



Choose a router from the drop-down list and click OK. (The routers you choose are those that exist in the selected subnet.)

If your subnet has no routers, you will receive a message stating that CRSC cannot create levels where there are no routers.

If your subnet has more than 8 levels, you will receive a message stating that a subnet cannot have more than 8 levels.

- 4 If there were no failures in step 3, CRSC creates a new level, with a new (unique) level number for the router you chose.  
If your subnet has only a single router, CRSC simply adds a level identical to the existing level.  
If your subnet has more than one router, CRSC adds a default level for the router you chose in the dialog of step 3.  
You can now edit the parameters for this level. (See [How to Update a Level](#), on page 34.)
- 5 Repeat steps 2–4 for additional levels.  
When you have finished adding levels, click **Update Router Levels** to send the level configuration data to the routers. You should see a confirmation message:



Note that adding a level creates an additional level for one of the routers that already exists on the subnet. You cannot create levels that do not correspond to a router.

This is especially useful when you are planning to use an AES router to switch multiple AES levels, as illustrated in this example:

Level Number ▲	Level Name	Router Name	Signal Type	Physical Input Start	Physical Input End	Controller Source Start	Physical Output Start	Physical Output End	Controller Destination Start
1	HD	D_32HD	HD or SD Digital Video	1	32	1	1	32	1
2	AES12	D_32AES	Synchronous AES Mono	1	32	1	1	32	1
3	AES34	D_32AES	Synchronous AES Mono	33	64	1	33	64	1
4	MC	D_PR	Machine Control Reverse	1	32	1	1	32	1

Here the AES router switches two levels, AES1/2 and AES3/4. Each of these levels includes 16 AES pairs (32 mono channels). These levels can be switched nearly simultaneously under a multi-level take performed at a remote panel. Note that the controller start values for both of these levels is 1 (and the controller end values, derived and not shown, are 32.)

There is a shortcut. Right-click a row to cause the context menu to appear:



Choose 'Add Level . . .' The "Select a Router" dialog appears with the router identified in the row you clicked selected. You can use that router or choose a different router. In that dialog, click **OK** to choose the router or click **Cancel** if you change your mind.

## How to Delete a Level

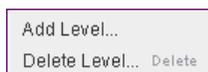
- 1 Go to the 'Configure Router Levels' page.
- 2 Optionally, select the subnet on which you want to delete routers levels.
- 3 Click on row in the crosspoint ranges table to select that level.

4 Click the **Delete Level . . .** button. A dialog appears:



Click **Yes** to delete the level. Click **No** to cancel.

There is a shortcut. Right-click a row to cause the context menu to appear:



Choose **Delete Level . . .** and respond **Yes** or **No** to the dialog (shown above) that appears.

When you have finished deleting levels, click **Update Router Levels** to send the level configuration data to the routers. You should see a confirmation message:





# Machine Control Routers Page



## Summary

Click the 'Setup Machine Control Router' entry in the navigation pane to access the machine control routers page:

The screenshot displays the 'Machine Control Port Settings' interface. It features a table with 17 rows, each representing a port. The first column is 'Port Number' (1-17) and the second is 'Port Type' (SMPTE 207M Controlling for port 1, and SMPTE 207M Dynamic for ports 2-17). Below the table is an 'Update Router' button.

Below the port settings is the 'Network Frame Summary' section. It has three tabs: 'Machine Control Routers' (selected), 'Levels', and 'All CR Frames'. The table below has columns for 'Edit', 'Name', 'Frame Type', and 'IP Address'. The first row is selected and shows 'D\_PR' as the name, 'CR32-PR' as the frame type, and '192.168.97.23' as the IP address. A 'Refresh Summary' button is located at the bottom of this section.

Port Number	Port Type
1	SMPTE 207M Controlling
2	SMPTE 207M Dynamic
3	SMPTE 207M Dynamic
4	SMPTE 207M Dynamic
5	SMPTE 207M Dynamic
6	SMPTE 207M Dynamic
7	SMPTE 207M Dynamic
8	SMPTE 207M Dynamic
9	SMPTE 207M Dynamic
10	SMPTE 207M Dynamic
11	SMPTE 207M Dynamic
12	SMPTE 207M Dynamic
13	SMPTE 207M Dynamic
14	SMPTE 207M Dynamic
15	SMPTE 207M Dynamic
16	SMPTE 207M Dynamic
17	SMPTE 207M Dynamic

Edit	Name	Frame Type	IP Address
<input checked="" type="radio"/>	D_PR	CR32-PR	192.168.97.23
<input type="radio"/>			

The page has two regions. Above is a table in which you can configure each port of a machine control router.

Below is a 'Network Frame Summary'. You can select a machine control router in its 'Machine Control Routers' tab by clicking the radio button in the row for that machine control router. If your system has no machine control routers, this table will be empty.

Click 'Refresh Summary' at any time to be sure that you are viewing the most current information.

## Background Information

CR Series machine control routers are different from other compact routers:

- Machine control routes are bidirectional. Unlike video or audio routers, information flows both ways.
- Machine control routes are point-to-point— one input connects to one output at most. (Some ports might be tristated in which case they connect to nothing.)
- The ports of machine control routers are RS-422 using RJ-45 connectors. Each port can be configured as a receiver or as a transmitter, either during configuration or dynamically as needed.

For more information about machine control signals, see [Signals](#), on page 112.

---

**Note:**

Some external devices must be placed in “remote” mode to work with a machine control router.

---

## Machine Control Port Types

Machine control routers do not have X/Y crosspoints *per se*, but allow point-to-point connections. One input may connect to (at most) one output.

The 1RU machine control router has 16 bidirectional serial ports (RJ-45). It supports up to 8 routes.

The 2RU machine control router has 32 bidirectional serial ports (RJ-45). It supports up to 16 routes.

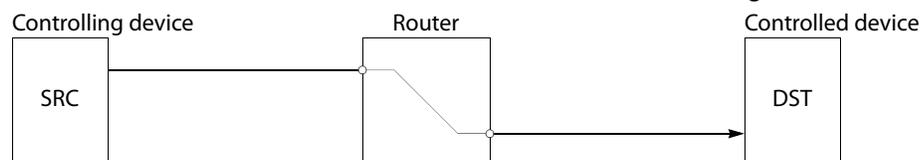
Machine control routers convey serial data, typically commands in one direction and responses in the other direction. Because the connections are bidirectional, a port is both an input and an output.

Machine control routers are defined as “data reverse” routers. Each port can be configured as dynamic, master, slave, controlling, or controlled.

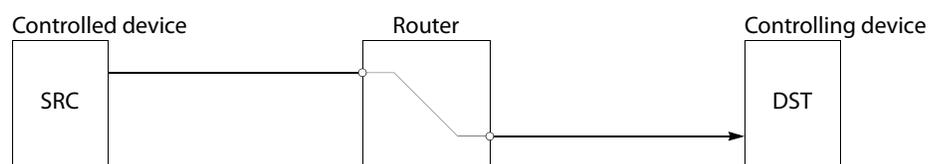
The machine control routers support serial communication up to 1 Mb/s.

### Terms

A device can be considered a “controlled” device or a “controlling” device.



Above, the source device is a controlling device. A destination can also be the controlling device:



A controlling device sends commands to a controlled device. The controlled device passes responses (such as status) back to the controlling device. A source device can be a controlling device or a controlled device. A destination device can be a controlling device or a controlled device.

▲ Some external devices must be placed in “remote” mode to work with a port router.

A *controlling* port is one connected to a *controlling* device.

A *controlled* port is one connected to a *controlled* device.

The compact machine control routers operate in “data reverse” mode. This means that in any connection, the destination device is the controlling device by default. The default can be overridden by port type.

The 5 port types are variations of “controlled” or “controlling”:

Controlling	Master	Dynamic
Controlled	Slave	

It is in CRSC’s machine control routers page that you can specify the individual port types for a machine control router. See [How to Change a Port Type](#), on page 44.

### Controlling or Controlled

These port settings fix the direction of the router port to “controlling” or “controlled.” The port’s connection for Tx and Rx—made during configuration—is static and does not change during operation.

### Dynamic

A dynamic port in the router can be a controlling or controlled port depending on whether it is connected to a master port or slave port in the router. The port’s configuration is dynamic and can change during operation.

Dynamic ports are typically assigned to VTRs.

### Master or Slave

Any dynamic port of the router connected to a “master” port of the router will be changed to a *controlled* port. A “slave” port is the opposite of a “master” port: any dynamic port connected to a slave port will be changed to a *controlling* port.

The compact router applies logic to the port direction setting when a master port is connected to a dynamic port. In this case, the machine at the dynamic port is always controlled and the machine at the master port is always *controlling*.

## Machine Control Router Crosspoints

The display of machine control “crosspoint matrices” is different from that of other matrices.

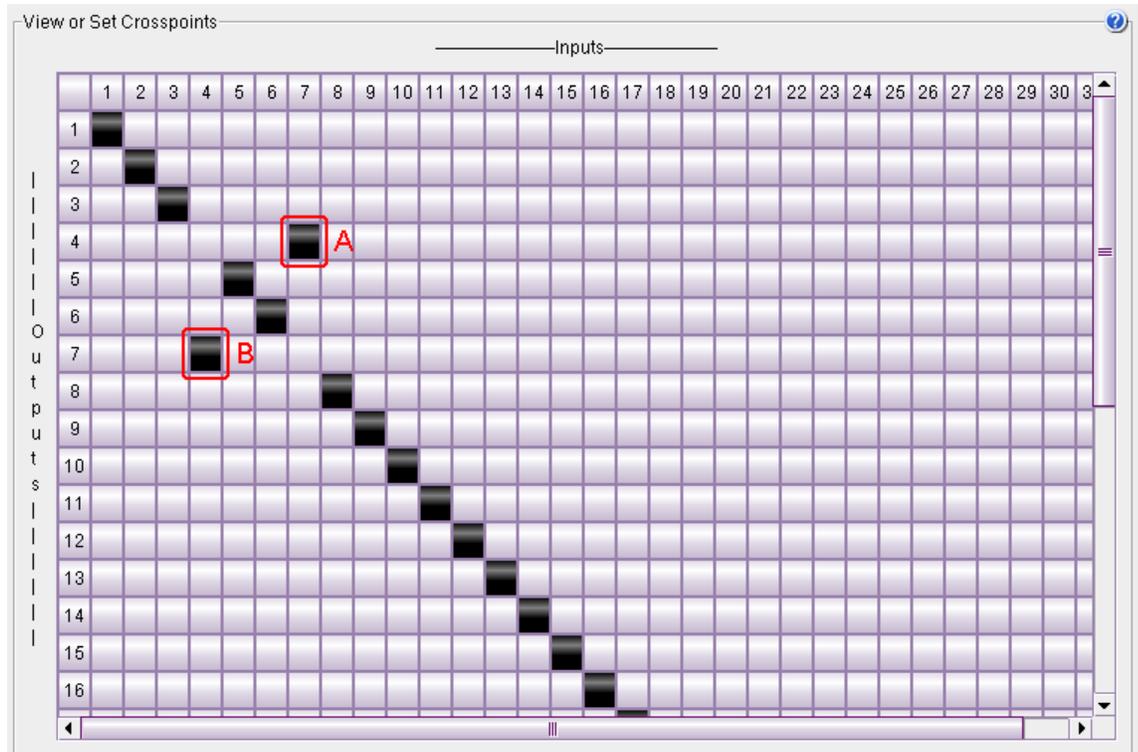


Fig. 5-1: Machine Control Crosspoints

See [Router Crosspoints Page](#), on page 73.

In the matrix of Figure 5-1, ports 4 and 7 are connected. The square (A) at row 4 and column 7 is highlighted. The square (B) at row 7 and column 4 is also highlighted.

For machine control crosspoints only, when you click on a square in column C and row R, the squares at positions (C,R) and (R,C) become highlighted.

If the two ports (in this example, ports 4 and 7) are dynamic ports, then clicking box A and clicking box B give different results. Either way connects ports 4 and 7, but clicking box B makes port 7 “controlled” whereas clicking box A makes port 7 “controlling.”

Clicking box A has the same effect as pressing destination (DST) 7 then source (SRC) 4 on a control panel.

Clicking box B has the same effect as pressing DST 4 then SRC 7 on a control panel.

*Reminder:* A controlling port is defined as one that is connected to a controlling device. A controlled port is one connected to a controlled device.

*Reminder:* A dynamic port is one that can change direction during operation. If a port is not dynamic, it cannot change from its configured state.

Thus, in general, clicking column C, row R has the same effect as pressing DST C then SRC R: columns are destinations and rows are sources.

Be aware that when a port appears on the diagonal of the matrix, it is tri-stated or disabled. It neither transmits nor receives. (Clicking a column head for a machine control router is a no-op.)

You can click the upper left corner of the crosspoint matrix (above and to the left of column 1, row 1) to force a "diagonal" take for the router. This places all the ports into tristate and they all appear on the diagonal of the displayed matrix.

## Using the Machine Control Router Page

The 'Machine Control Port Settings' table displays all port types for the machine control router you select in the 'Machine Control Routers' table at the bottom of the page.

To change the port type, click an entry in the 'Port Type' column and select type from the drop-down list:

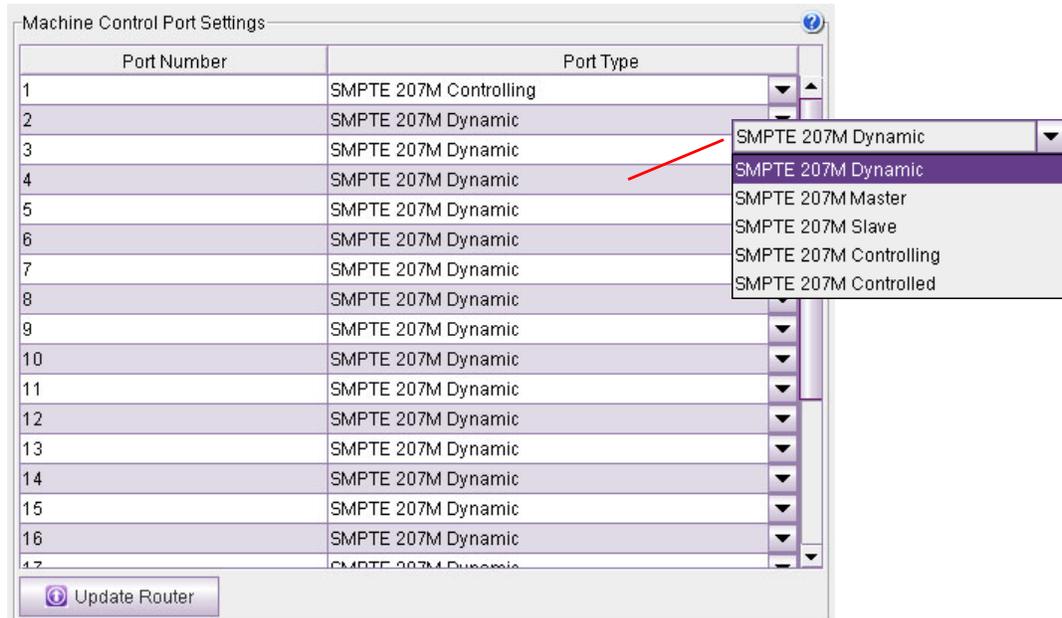


Fig. 5-2: Machine Control Port Specification

The 'Machine Control Port Settings' section displays the following:

Column	Description
Port Number	Port number of a port on the machine control router. Because machine control ports are bidirectional, these numbers represent both inputs and outputs.
Port Type	Port type assigned to the port. There are five port types. (See <a href="#">Machine Control Port Types</a> , on page 40.) Port types are selected from the drop-down list.

The 'Network Frame Summary' presents the following option and information:

Tab	Column	Description
Machine Control Routers	Edit	Select the radio button on the row listing the router you want to view or edit in the 'Machine Control Port Settings' table.
	Name	Name of the router.
	Frame Type	Type (model number) of router.
	Level(s)	Level numbers associated with the router.
	IP Address	IP address currently assigned to the device.
	Subnet Mask	Subnet mask currently assigned to the device.
Levels	Level	The level names (with level numbers).
	Signal Type	Type of signal(s) assigned to the level.
	Router	Router to which the level is assigned.
	Physical Inputs	The physical input and output ranges of the routers.
	Physical Outputs	
	Controller Sources	The "logical" input and output ranges of the router — as they might be identified on a remote panel.
	Controller Dest	
All CR Frames (lists all frames in the system)	Name	Name assigned to the router.
	Frame Type	Type (model number) of router.
	IP Address	IP address currently assigned to the router.
	Subnet Mask	Subnet mask currently assigned to the device.

## How to Select a Machine Control Router

To select a specific router, locate the router in the 'Machine Control Routers' table of the 'Network Frame Summary' section and click on that row.

Details of the port settings for that router appear in the 'Machine Control Port Settings' table.

## How to Change a Port Type

- 1 Select a machine control router. In the 'Machine Control Port Settings' table, locate the row listing the port number you want to change.
- 2 Click the field in the 'Port Type' column. In the drop-down menu that appears, choose a port type. There are five types of ports:  
 Controlled    Controlling    Dynamic    Master    Slave
- 3 Repeat step 2 for other ports you want to change.
- 4 Click **Update Router**. CRSC uploads the port configurations to the router.

# 6 Remote Panels Page

## Summary

Click the 'Program Remote Panels' entry in the navigation pane to access the remote panels page:

The screenshot shows the 'Remote Panel CP3232' configuration page. It is divided into several sections:

- Panel Image:** A grid of 32 source buttons (SRC 1-32) and 4 destination buttons (DST LOCK, PNL LOCK). Below the grid are four level buttons (Level 1-4) and two salvo buttons (Salvo 1-2).
- Button Configuration Area:**
  - Select Button Functions:** Includes fields for Button Type (Source), Device Name / Button Label (SRC 1), and Panel Mode (Standard).
  - Configure Button's Inputs:** A table with columns 'Level' and 'Input'.
 

Level	Input
1) Level 1	1
2) Level 2	1
3) Level 3	1
4) Level 4	1

 Action buttons: Set In All, Sort Table, Clear Table, Delete Row.
- Network Frame Summary:** A table showing a list of remote panels.
 

Edit/Update	Name	Frame Type	Panel Type	IP Address	Identify CP
<input checked="" type="radio"/>	CP3232	RP32 / CP3232	CP3232	192.168.2.55	Identify CP
<input type="radio"/>	CP1616	RP16 / CP1616	CP1616	192.168.2.56	Identify CP
- Buttons:** Includes 'Refresh Summary' and 'Remote Panel Configuration Options' (New, Read Panel, Update Panel, Read from File..., Save to File...).

A remote panel is a control panel mounted on a remote panel module. Using this page, you perform two major functions:

- 1 Assign a control panel type to a remote panel module. (When you place the panel in service, It is important to mount a control panel of that particular type on the remote panel module. Otherwise, the remote panel will function incorrectly, if at all.)
- 2 Configure the remote panel module to support control panel functions for the panel type you selected. (This is usually very simple, but design issues can be complex.)

## Page Layout

There are 4 sections in the page:

- Near the bottom of the page, a [Network Frame Summary](#).  
This section has 3 tabbed tables. Use the 'Remote Panels' tab to select a remote panel module for editing or to change the panel type associated with the remote panel module.  
The other two tables in this section are for information primarily. However, using the 'Levels' table, you can drag-and-drop levels into a panel's source, destination, and level buttons and to the entries in a salvo definition. See [Fast Level Assignment](#), on page 65.
- At the top of the page, a control panel image. This section is empty (i.e., all black) if you have not selected a remote panel module in the 'Remote panels' tab.  
If you have selected a remote panel module, this image shows the buttons of the panel possibly with mnemonic labels. Click on any button in the image to view the button's present configuration and to edit the button's configuration.  
Panel images differ according to the type of control panel you have assigned to the remote panel module.
  - ▲ The mnemonics you see in this page do not appear on the panel's buttons (unless you create clear plastic button legends that resemble these mnemonics).
- In the middle of the page, an area in which you can configure the buttons you select in the panel image.
- At the very bottom of the page are 6 buttons:

Refresh Summary    [New](#)                      [Read Panel](#)  
[Update Panel](#)        [Read from File ...](#)      [Save to File ...](#)

Click 'Refresh Summary' at any time to be sure that you are viewing the most current information in the network frame summary. The other 5 buttons are [configuration options](#).

### Network Frame Summary

There are 3 tabbed tables in the network frame summary:

- [Remote Panels](#)
- [Levels](#)
- [All CR Frames](#)

### Remote Panels

These are the fields of the 'Remote Panels' table in the 'Network Frame Summary':

Column	Description
Edit/Update	Click the radio button in the row displaying the remote panel module you want to view or edit.
Name	Name of the remote panel.
Frame Type	Type of remote panel module by model number.

Column	Description
Panel Type	Click this field if you wish to change the panel type assigned to the remote panel module.
IP Address	IP address currently assigned to the device.
Identify CP	When you click <b>Identify CP</b> , the remote panel listed on that row identifies itself by displaying a moving pattern of button lights. This feature is helpful if you forget which panel of possibly many is represented by the particular IP address. The moving button lights continue indefinitely. To turn off the pattern, click any button on the panel or click <b>Identify CP</b> again.

### Levels

These are the fields of the 'Levels' table in the 'Network Frame Summary':

Column	Description
Level	The level name and number.
Router	The router to which the level is assigned.
Frame Type	The type (model number) of router.
Router IP	The IP address assigned to the router.
Physical Inputs	The physical input and output ranges of the routers.
Physical Outputs	
Controller Sources	The "logical" input and output ranges of the router —as they might be identified on a remote panel.
Controller Dest	

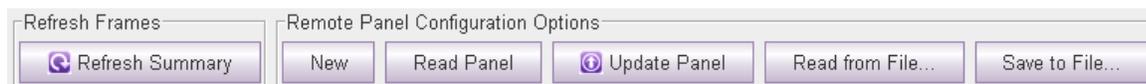
### All CR Frames

These are the fields of the 'All CR Frames' table in the 'Network Frame Summary':

Column	Description
Name	Name assigned to the CR Series device.
Frame Type	Type (model number) of CR Series device.
Panel Type	Type (model number) of control panel associated with a remote panel module. The field is blank if the device is not a remote panel module.
Subnet Mask	Subnet mask currently assigned to the device.

### Configuration Options

Five of the six buttons at the bottom of the page are configuration options:



- **New**  
Click this button to create a new configuration for the selected remote panel module.

This is an effective way (and the only way) to change the panel type assigned to a remote panel module.

- **Read Panel**

Click this button to upload the configuration from the selected remote panel module.

- **Update Panel**

Click this button to download the present configuration to the selected remote panel module. Clicking this button is required to complete the remote panel configuration.

- **Read from File . . .**

Click this button to get the configuration from a saved configuration file.

- **Save to File . . .**

Click this button to save the present configuration to a file.

You can use the saved file to configure additional remote panel modules and to preserve your configuration in case of hardware failure.

For general information on operating a panel, see [Operation](#), on page 145. For additional information see the *CR Series Compact Router User's Guide* or the *CR6400 Family User's Guide*.

## Essential Information

A *remote panel* is a control panel mounted on a remote panel module.

A remote panel sends control messages to a network of routers and receive status information from the network.

These panels are called "remote" because they need not be attached to a router and can be used at a distance, as far as cable restrictions allow.

## Terms

Please review the following definitions:

- An **input** or an **output** is a single port at the rear of a compact router. Different routers have different kinds of connectors (e.g., BNC, DB25, RJ-45, "coax").
- A **source** is a set of inputs on one or more routers, on one or more levels. The inputs might, or might not, belong to a single physical device.
- A **destination** is a set of outputs on one or more routers, on one or more levels. The outputs might, or might not, belong to a single physical device.
- A **salvo** is a sequence of primitive takes. The takes execute, in order, when a panel operator presses a salvo button. A primitive take in a salvo comprises 3 values: level, input, and output. A primitive take routes a single input to a single output on a single level.
  - ▲ Salvos in remote panel configurations should not be confused with the salvos that save and restore crosspoint states under the 'View Router Crosspoints' page.
- The **primary level** is the first level defined for a particular destination.
- The **precedence** of level buttons depends on the location of the level buttons on the panel. In general terms, level buttons have higher precedence if they are to the left of, or are above, other level buttons.
- A **normal take** is a non-breakaway take.

Operators control a CRSC system using remote panels. An operator is presented with a large and potentially bewildering array of buttons. It is the configurator's task to produce a panel that is easy to understand and to use:

- When your system has multiple panels, exercise caution so that you do not create panel configurations that conflict with each other.
- Avoid configuring source buttons and destination buttons that do not match the actual router connections and the numbering given by the router partitions.
- Create meaningful button legends that accurately describe what the buttons do. There are button templates available on the installation CD (SB0033-xx).

### **"Captive" Panels**

*Captive* panels are control panels that are mounted on a compact router and not on a remote panel module. CRSC cannot detect or configure captive panels.

When a router is in CRSC mode, the captive panel controls only that router and does so as if the router were a stand-alone router.

A captive panel displays status according to the inputs and outputs of the compact router on which it is mounted.

In a CRSC network, changes to a router's state made at a captive panel are detected through the network and the network's remote panels do reflect that status.

### **Remote Panel Modes**

Remote panels operate in one of three modes: (1) standard mode, (2) enhanced mode with hold, and (3) enhanced mode without hold.

#### **Standard Mode**

*In standard mode, takes are performed on (manually) selected levels only.*

Level selection is persistent and at the discretion of the panel operator. Once the operator makes a level selection, it remains until the operator changes the selection. The current level selection enables some sources and destinations and disables others. The sources and destinations that are enabled depend on which level button has *precedence*. See [Button Order](#), on page 148 for information about precedence.

If no levels are selected, no sources or destinations are enabled. A take cannot occur.

If the panel has no level buttons, all of a destinations' levels are always selected and all destinations are enabled.

Which level button has precedence depends on the order of level buttons on the panel and the order in which the operator presses the level buttons. See [Button Order](#), on page 148.

Standard mode allows breakaway. A breakaway is when you route to some, not all, of a destination's levels. By default, all valid levels are automatically selected when you set up a take. By creating a breakaway, you route only to the levels you have individually selected.

#### **Enhanced Mode (Hold and No-hold)**

*'Takes' are performed on all the levels specified by the destination.*

In enhanced mode, level selection is applicable only to breakaway. Level selection governs the selection of sources for the breakaway. All sources and destinations are always enabled.

Enhanced mode has 2 submodes:

- Hold mode— the level selection persists after the destination button is pressed (initiating a take) and continues indefinitely until the operator changes it. This allows an operator to try different sources. To clear a breakaway, the operator starts a new normal take (non-breakaway) to that destination. See [Normal Takes](#), on page 152.
- No-hold mode— a level selection reverts to the levels defined by the destination after the operator presses a source button (completing a take). To clear a breakaway, either start a new normal take to that destination or press a source without a level selection. See [Normal Takes](#), on page 152.

The choice between hold mode and no-hold mode is meant to accommodate operator or administrator preferences.

## Salvos

A “salvo” is a sequence of primitive (or simple) takes. Salvos are usually defined because their operations are commonly repeated often. By assigning a salvo to a button, an operator need only press the one button to execute the entire take sequence. When an operator presses a salvo button, the ‘takes’ execute very rapidly and in sequence, but not quite simultaneously. The salvo button lights turns bright during the salvo execution and returns to dim at completion.

Salvos do not:

- Execute source selections, destination selections, or level selection functions.
- Execute other salvos. (That is, salvos cannot be nested.)
- Contain loops or branches.

A simple take is expressed in CRSC as 3 values: level, input and output. These three values uniquely define a crosspoint in the set of routers and router partitions.

For control panels other than the CP32-6464, CP6401, or CP6464, a salvo can include up to 32 primitive takes. A panel configuration can have up to 32 individual salvo buttons. (In practice, a panel would rarely have that many salvo buttons.) Each panel can have a different set of salvos.

For the CP32-6464, CP6401, or CP6464, which control the 64×64 matrices of CR6400 routers, a salvo can include up to 64 primitive takes and a panel configuration can have up to 64 individual salvo buttons, subject to a total of 1024 primitive takes. (For example, a panel could have 16 salvos of 64 takes or 64 salvos of 16 takes or some other combination.) Each panel can have a different set of salvos.

If multiple salvos execute simultaneously, it is likely that their effects will be in conflict. There is an exception: if two or more salvos have no outputs in common, they can safely run at the same time. It is not possible to execute multiple salvos simultaneously from a single panel.

If a salvo attempts an impossible take (e.g., one on a non-existent level), it will try the take and wait for a response 5 times before proceeding. This means that salvos that have errors take noticeably longer to execute than salvos without errors. A salvo without errors should take only a fraction of a second to execute.

## Paging

Certain CR Series control panels can have buttons that control the presence or absence of sets of sources and destinations that can be controlled by the panel. We call these sets of sources or destinations “pages.”

The panels that have “paging” buttons are the CP6464 and CP32-6464. These are the panels that can control networks that include CR6400 family routers. (The CP6401 also controls CR6400 family routers but does not have paging buttons.)

## Panel Types

These are the panel types available in CRSC:

CP0808	CP1602	CP1604	CP1616
CP1602-CQX	CP3201	CP3204	CP3232
CP32-6464	CP6401	CP6464	

Briefly, the name of the panel indicates the number of sources and destinations that it supports (in stand-alone mode). For example, the CP3204 has 32 source buttons and 4 destination buttons. In stand-alone mode, this panel can switch (up to) 32 sources to 4 destinations. (In CRSC mode, the buttons can be configured arbitrarily.)

In general, the panels whose names begin CP16 are 1RU panels, having space for a  $2 \times 16$  matrix of function buttons at the left and 6 function buttons at the right. Some panels have fewer buttons than the space allows.

In general, the panels whose names begin CP32 are 2RU panels, having space for a  $4 \times 16$  matrix of function buttons at the left and 12 function buttons at the right.

These are the exceptions:

- The CP0808 is a 1RU panel having a  $2 \times 8$  matrix at the left.
- The CP1602-CQX is a 1RU panel that works with the “clean and quiet” routers. The CP1602-CQX is not configurable in CRSC.
- The CP3201 is a 1RU single-destination panel. It cannot be configured with destination buttons. It has a  $2 \times 16$  button matrix at the left.
- The CP6464 is a 2RU panel capable of switch 64 sources to 64 destinations.
- The CP6401 is a 2RU single-destination panel. It cannot be configured with destination buttons. It has a  $4 \times 16$  button matrix at the left.

The CP6401 is an artificial panel type. There is no physical CP6401. The CP6401 is a fiction that allows CRSC to configure a (real) CP6464 as a single-destination panel.

- The CP32-6464 is another artificial panel type. The CP32-6464 is a fiction that allows CRSC to configure a (real) CP3232 in such a way that it can control the 64 sources and 64 destinations of CR6400 routers in a network.

## Bulk Configuration

There are three conveniences that help you make panel configurations quickly:

- You can select multiple buttons in the panel image and perform button configuration operations on them all at the same time.  
Your selection of panel buttons can be non-contiguous.

- ▲ If the buttons you select are of mixed type, the button definition section becomes blank and requires you to select a button type for the multiple buttons.
- You can “auto-increment” the buttons you have selected. The factory-defined order of the panel’s buttons affects the numbering that results from automatic incrementing.
- You can transfer levels from the ‘Levels’ table (in the Network Frame Summary) into the button definition table when you are defining destination buttons, source buttons, or salvo buttons. (This operation affects all the panel buttons you have selected.)

See [Shortcuts](#), on page 65 for details.

## Using the Remote Panels Page

### Selecting a Remote Panel Module

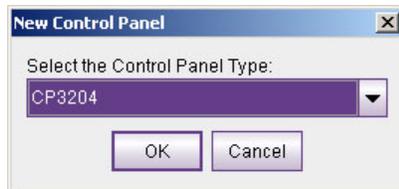
At the bottom of the page, in the ‘Network Frame Summary’ is a ‘Remote Panels’ tab:

Edit/Update	Name	Frame Type	Panel Type	IP Address	Identify CP
<input checked="" type="radio"/>	D_RP32	RP32	CP3232	192.168.97.21	Identify CP
<input type="radio"/>	D_RP16	RP16	CP1616	192.168.97.20	Identify CP

Fig. 6-1: Remote Panels Tab

Click the radio button in the row of the remote panel module that you want to view or edit.

If the panel shown is an unknown type, you can specify the panel type that is assigned to this remote panel module by clicking in the ‘Panel Type’ field of the selected row. A drop-down list of panel types appears. Choose a panel type from that list.



These are the panel types available in CRSC:

CP0808	CP1602	CP1604	CP1616
CP1602-CQX	CP3201	CP3204	CP3232
CP32-6464	CP6401	CP6464	

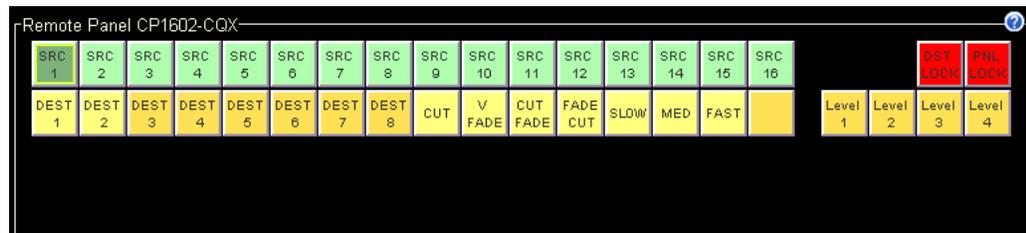
Only the panel types appropriate for the remote panel module you have selected appear in the drop-down list.

See [Panel Types](#), on page 51.

## CQX Panels

The 'Remote Panels' page supports remote panel modules to which a CP1602-CQX is attached. Because the CP1602-CQX is unique, the support for it is unique (but limited).

If you have a CP1602-CQX mounted on an RP16, you can select "CP1602-CQX" in the 'Panel Type' drop-down list. The page will display an image of the CP1602-CQX as the panel graphic:



However, the configuration of the CP1602-CQX is *fixed*. You cannot edit the configuration, except that you can change the button mnemonics in the configuration page. Nor can you change the panel mode.

Nevertheless, you must click 'Update Panel' if you want to assign an CP1602-CQX configuration to the remote panel module. (Or click 'Save to File . . .' to save the configuration for later use.)

Assigning the CP1602-CQX configuration to the remote panel module allows operators to use the CP1602-CQX (which controls transition rate and transition types) remotely.

## Defining Button Functions

After you have selected a remote panel module and assigned it a panel type, the remaining task is to configure the panel. This takes a certain amount of planning — away from CRSC — to know what you want your panel to do.

There are two steps:

- Select a panel mode: (1) standard, (2) enhanced with hold, or (3) enhanced without hold. The button functions differ subtly depending on the mode. See [Remote Panel Modes](#), on page 49.
- Define one or more button functions.

Any button on any remote panel can be configured to perform one of several functions. Most panel types support these 4 functions:

- [Destination Selection Buttons](#)
- [Level Buttons](#)
- [Salvo Buttons](#)
- [Source Selection Buttons](#)

Some panels also provide one or more "paging" button types such as a 'Toggle Pages' button. These are the panels that are designed to control networks that include CR6400 routers, namely the CP32-6464 and CP6464. See [Paging Buttons](#), on page 59.

Buttons that you do not define are called "unused" in the drop-down list for button types and remain unlit (dark) when the panel is in use.

The buttons in the graphic image of the configuration page correspond in number and position to the buttons of the actual control panel. (The single-destination panels — the CP3201 and the CP6401 — are exceptions. For these panels, the graphic has a button for the configured destination, but the panels have no such button.)

▲ As a reminder, the buttons of a CP1602-CQX are *not* configurable.

The 'Destination Lock' and 'Panel Lock' buttons (both red in the panel graphic) are not configurable for any panel.

### Selecting a Panel Mode

In the 'Panel Mode' field, select a mode of operation from the drop-down list:

- 'Standard',
- 'Enhanced—Hold',
- 'Enhanced—No Hold'.

For a description of each mode, see [Remote Panel Modes](#), on page 49.

▲ The differences between the modes are difficult to understand until you see the panels in operation in the different modes. We recommend that you spend some time experimenting.

### Destination Selection Buttons

To configure a button as a destination button:

- 1 Click on the image of the particular button you want to configure.
- 2 Choose 'Destination' from the 'Button Function' drop-down list. The 'Configure Button's Outputs' table appears. It has 8 rows. Each row can represent a level/output pair. (Refer to [Partitions and Levels](#), on page 113 and [Using the Router Levels Page](#), on page 33.)

Level	Output
1) Level 1	1
2) Level 2	1
3) Level 3	1
4) Level 4	1

Fig. 6-2: Destination Button Fields

At the right are 4 buttons that serve as shortcuts:

- 'Set in All'. If you have selected a single row of the table, this button applies the output of that row to all the other rows.
- 'Sort Table'. This button reorders the entire table in ascending order of level numbers (and not necessarily level name).
- 'Clear Table' erases the entire table.

- 'Delete Row' removes selected rows (levels) from the table. (The button is disabled until you have selected one or more rows.)
- 3 Enter (level, output) pairs on rows of the table. Click on 'Level' field to select a level from drop-down list. Click in the 'Output' field to enter an output number manually.  
You can use the context menu to edit the destination table. See [Context menus](#), on page 67 for information.  
Use drag-and-drop to transfer levels from the 'Levels' table to the destination table. See [Fast Level Assignment](#), on page 65 for information.
  - 4 Optionally enter a mnemonic in the 'Device Name / Button Label' field. (Button mnemonics are used only in the 'Remote Panels' page, but they can be helpful.)

The purpose of the table is to identify the output ports that compose the destination.

The outputs you specify are *in the range you specified as the "Controller Outputs"* in the 'Router Levels' page. See [Partitions and Levels](#), on page 113 and [Using the Router Levels Page](#), on page 33.

For example, suppose a 32×32 AES router is divided into 4 equal partitions:

Level A = outputs 1–8,

Level B = outputs 9–16,

Level C = outputs 17–24,

Level D = outputs 25–32 where each level's *controller outputs* start counting at 1.

When entering an output on level C, you specify an output in the range 1–8, not 17–24. Output 3 of level C is router output 19 (in this example). You would specify (level C, output 3) in the table and run cable to the router's output BNC numbered 19.

Entries in the 'Level' column are drop-down lists. The drop-down list shows available levels. The number of choices in the list diminishes as you add levels to the destination button's level list. CRSC does not allow you to represent the same level more than once.

How you organize levels is up to you. It is recommended that you place, as the first entry in the list, the level you want to be considered the primary level. Typically this would be a video level.

---

#### Special Cases:

The CP3201 and the CP6401 do not have destination buttons because they are single-destination control panels. Such panels have an implicit destination that is not operator-selectable. (A default destination button does, however, appear in the configuration page for a CP3201 or CP6401, just to the left of the **Destination Lock** button.)

To configure the implicit destination of a CP3201 or CP6401, select the button labeled 'DEF DEST' and specify its levels and outputs as you would any ordinary destination.

The default destination does not correspond to any physical button an operator can press.

---

## Level Buttons

A level is a partition within a router. A group of levels the router partitions that can be switched simultaneously by a take performed at a control panel.

(See [Partitions and Levels](#), on page 113 and [Using the Router Levels Page](#), on page 33.)

To configure a button as a level button:

- 1 Click on the image of the particular button you want to configure.
- 2 Choose 'Level' from the 'Button Function' drop-down list. The 'Level Button Setup' table appears. It has one field: a drop-down list of defined levels. Select a level from the drop-down list.

The screenshot shows a configuration window titled "Select Button Functions". It contains three main sections: "Button Type", "Device Name / Button Label", and "Panel Mode". The "Button Type" dropdown is set to "Level", indicated by a red arrow. The "Device Name / Button Label" field contains "Level 1". The "Panel Mode" dropdown is set to "Standard". Below these fields is a section titled "Level Button Setup" which contains a single dropdown menu labeled "Select a Level:" with "1) Level 1" selected.

Fig. 6-3: Level Button Fields

- 3 Optionally enter a mnemonic in the 'Device Name / Button Label' field. (Button mnemonics are used only in the 'Remote Panels' page, but they can be helpful.)

A panel requires one level button for every level that is to be controlled at the panel. 'Takes' do not occur on unselected levels. A level cannot be selected unless it is on a button, with one exception: if a panel has **no** level buttons defined, 'takes' and locks occur on **all** levels defined for the destination selected.

(There is no context menu for level button configuration.)

### Salvo Buttons

A salvo is a stored sequence of primitive takes. A primitive take routes one router input to one router output, on a designated level (or partition). For most panels, you can define up to 32 different salvos for a panel and each salvo can execute up to 32 primitive takes.

For the CP32-6464, CP6401, and the CP6464, you can define up to 64 salvos and any salvo you define may have up to 64 primitive takes, subject to a total of 1024 primitive takes.

- ▲ Salvos in remote panel configurations should not be confused with the salvos that save and restore crosspoint states under the 'View Router Crosspoints' page.

To configure a button as a salvo button:

- 1 Click on the image of the particular button you want to configure.
- 2 Choose 'Salvo' from the 'Button Function' drop-down list. The 'Configure Salvo Buttons' table appears. It shows the sequence of takes. The salvo (one of either 32 or 64) is identified by number at the left.

Salvo	Level	Input	Output
3	1) HD	1	1
	2) AES12	1	1
	3) AES34	1	1
	4) MC	1	1

At the right are two buttons:

- 'Clear Table' erases the entire list of takes.  
You can also right-click anywhere in the salvo table and choose 'Clear Table' from the context menu that appears.
- 'Delete Row' removes selected rows (levels) from the table. (The button is disabled until you have selected one or more rows.)

See [Salvos](#), on page 50.

- 3 Choose the salvo you want to assign to the salvo button in the 'Salvo' drop-down list at the left. (Salvos are numbered either from 1 to 32 or from 1 to 64.)
- 4 Enter simple take data in each row of the table until you have completed the salvo.

A primitive take entry consists of a level specification in the 'Level' column, a router input in the 'Input' column and a router output in the 'Output' column.

Use drag-and-drop to transfer levels from the 'Levels' table to the destination table. See [Fast Level Assignment](#), on page 65 for information.

You can right-click the salvo table to get a context menu to build a salvo more quickly. The context menu applies to the column in which you have selected a field. Be careful to select one or more fields before you right-click a column. See [Context Menu for Salvos](#), on page 69 for information.

The input and output numbers are "controller" numbers, not physical I/O numbers. Controller numbers are relative to the partition (level) chosen for the take.

A zero value in any of the fields renders the take a no-op.

- 5 Optionally enter a mnemonic in the 'Device Name / Button Label' field. (Button mnemonics are used only in the 'Remote Panels' page, but they can be helpful.)

Salvos execute in the remote panel module. Salvos cannot contain loops. It is indeterminate what happens when salvos from more than one remote panel execute simultaneously.

## Source Selection Buttons

To configure a button as a source button:

- 1 Click on the image of the particular button you want to configure.
- 2 Choose 'Source' from the 'Button Function' drop-down list. The 'Configure Button's Inputs' table appears. It has 8 rows. Each row can represent a level/input pair. (Refer to [Partitions and Levels](#), on page 113 and [Using the Router Levels Page](#), on page 33.)

Select Button Functions		
Button Type	Device Name / Button Label	Panel Mode
Source	SRC 1	Standard

Configure Button's Inputs		
Level	Input	
1) Level 1	1	Set In All Sort Table Clear Table Delete Row
2) Level 2	1	
3) Level 3	1	
4) Level 4	1	

Fig. 6-4: Source Button Fields

At the right are 4 buttons that serve as shortcuts:

- 'Set in All'. If you have select a single row of the table, this button applies the input of that row to all the other rows.
- 'Sort Table'. This button reorders the entire table in ascending order of level numbers (and not necessarily level name).
- 'Clear Table' erases the entire table.
- 'Delete Row' removes a single row (i.e., a single level) from the table.

- 3 Enter (level, input) pairs on rows of the table. Click on 'Level' field to select a level from drop-down list. Click in the 'Input' field to enter an input number manually.

You can use the context menu to edit the destination table. See [Context menus](#), on page 67 for information.

Use drag-and-drop to transfer levels from the 'Levels' table to the destination table. See [Fast Level Assignment](#), on page 65 for information.

- 4 Optionally enter a mnemonic in the 'Device Name / Button Label' field. (Button mnemonics are used only in the 'Remote Panels' page, but they can be helpful.)

The purpose of the table is to identify the input ports that compose the source.

The inputs you specify are *in the range you specified as the "Controller Inputs"* in the 'Router Levels' page. See [Using the Router Levels Page](#), on page 33.

For example, suppose a 32x32 AES router is divided into 4 equal partitions:

Level A = inputs 1–8,

Level B = inputs 9–16,

Level C = inputs 17–24,

Level D = inputs 25–32 where each level starts counting at output 1.

When entering an input on level C, you specify an input in the range 1–8, not 17–24. Input 3 of level C is router input 19 (in this example). You would specify (level C, input 3) in the table and run cable to the router's input BNC numbered 19.

Entries in the 'Level' column are drop-down lists and list available levels. The number of choices diminishes as you add levels to the source button's level list. CRSC does not allow you to represent the same level more than once.

How you organize levels is up to you. It is recommended that you place, as the first entry in the list, the level you want to be considered the primary level. Typically this would be a video level.

### Unused Button Type

A fifth entry appears in the 'Button Type' drop-down list — *unused*. Buttons that you designate "unused" perform no function (and remain unlit on the panel).

## Paging Buttons

Certain control panels have paging buttons (that support the 64×64 matrices of CR6400 routers). These are the panels:

**CP32-6464** An artificial panel type (one that does not physically exist) that represents a CP3232 (a real panel) that can access the 64 sources and destinations of a CR6400 router in 2 pages.

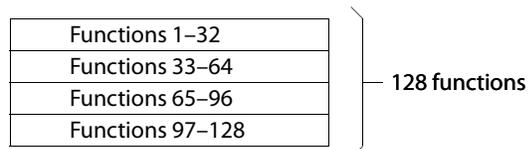
**CP6464** The CP6464 (a real panel) offers several paging button types.

Each of these panels provides, in addition to the 4 basic button types, another class of buttons. This class comprises several "paging" buttons:

CP32-6464	CP6464
Display Page 1	Display Page 1
Display Page 2	Display Page 2
Toggle Page 1 and Page 2	Toggle Page 1 and Page 2
	Display Sources
	Display Destinations
	Toggle Sources/Destinations

### What Paging Is

Either panel — the CP32-6464 or CP6464 — has an array of 64 function buttons at the left and 12 function buttons at the right. This array of 64 buttons represents 128 functions, which are divided into 4 segments:



Paging occurs on the array of 64 buttons; the 12 function buttons at the right are not affected.

The 'Display Page 1' button causes the panel to present

Segments 1 and 3	Functions 1–32	On the top 32 buttons
	Functions 65–96	On the bottom 32 buttons

and the 'Display Page 2' button causes the panel to present

Segments 2 and 4	Functions 33–64	On the top 32 buttons
	Functions 97–128	On the bottom 32 buttons

The 'Display Sources' button causes the panel to present

Segments 1 and 2	Functions 1–64	On the 64 buttons
------------------	----------------	-------------------

and the 'Display Destinations' button causes the panel to present

Segments 3 and 4	Functions 65–128	On the 64 buttons
------------------	------------------	-------------------

The default button mnemonics for the 'Display Sources' and 'Display Destinations' buttons are 'SHOW SRC' and 'SHOW DST'.

When you click on any paging button in the configuration page, CRSC changes the graphic to display the button page represented by the paging button you clicked.

The terms 'Display Sources' and 'Display Destinations' denote that destination buttons are not permitted on the page of source buttons and source buttons are not permitted on the page of destination buttons. (The 'Display Page 1' and 'Display Page 2' buttons do not have this restriction.)

If, while you are editing a CP6464, you click 'Show SRC' and the source page is visible and attempt to change a source button to a destination button, CRSC gives an error message:



Level buttons and salvo buttons are permitted anywhere.

(The mnemonics apply only in the 'Remote Panels' page. Actual panels require you to fabricate appropriate clear plastic button legends if their buttons are to have legends.)

## Paging Button Types

CRSC's 'Remote Panels' page calls these "panel type" buttons. These are the button types:

- Display Page 1

This button causes functions 1–32 and 65–96 to appear on the 64-button array.

For the CP32-6464, this is a typical result (as far as the configuration page goes):



For the CP6464, this is a typical result:



- Display Page 2

This button causes functions 1–32 and 65–96 to appear on the 64-button array.

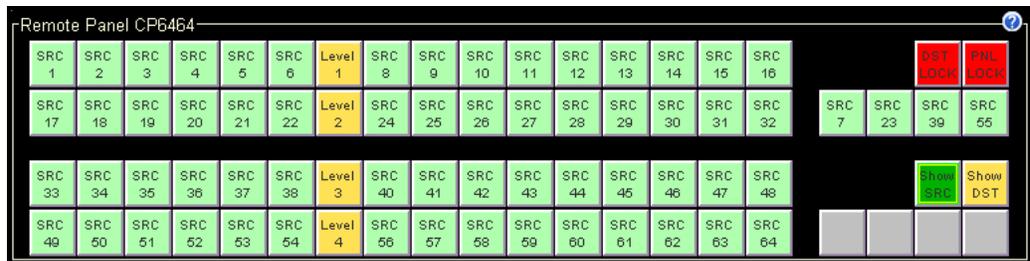
For the CP32-6464, this is a typical result (as far as the configuration page goes):



For the CP6464, this is a typical result:



- **Toggle Page 1 and Page 2**  
 This toggle button switches the panel between the effects of the 'Display Page 1' and 'Display Page 2' buttons.
- **Display Sources**  
 This button applies only to the CP6464. It causes functions 1–64 to appear on the 64-button array. In typical configurations, most of these are source buttons (green).  
 This is a possible result:



- **Display Destinations**  
 This button applies only to the CP6464. It causes functions 65–128 to appear on the 64-button array. In typical configurations, most of these are destination buttons (amber).  
 This is a possible result:



- **Toggle Sources and Destinations**  
 This toggle button switches the panel between the effects of the 'Display Sources' and 'Display Destinations' buttons.

## How to Upload an Existing Panel Configuration

You can upload, view, and modify a panel configuration from a remote panel module.

- 1 Go to the 'Program Remote Panels' page.
- 2 In the 'Remote Panels' tab at the bottom of the page, click the radio button in the 'Edit/Update' field of the remote panel module you want to upload.

The CRSC software usually reads the configuration from the remote panel module automatically and displays its details in the panel image. If there is no configuration, a default configuration is automatically created.

In an case, you can click the 'Read Panel' button at the bottom of the page to cause CRSC to read the configuration from the remote panel module. Reading the configuration from the remote panel module might overwrite any configuration you have made and have not saved. CRSC will warn you if that is about to happen.

## How to Create a New Panel Configuration

- ▲ This is also the procedure to change a panel type for a particular remote panel module.

- 1 Go to the 'Program Remote Panels' page.
- 2 In the 'Remote Panels' tab at the bottom of the page, click the radio button in the 'Edit/Update' field of the remote panel module for which you want to create a new configuration.
- 3 Click **New**. A 'New Control Panel' dialog box appear:



- 4 Select a control panel type from the drop-down list.  
Only the panel types appropriate for the physical control panel mounted on the remote panel module will appear in the drop-down list. For example, if you have mounted a CP6464 on a remote panel module, the only choices for a new panel type are CP6401 and CP6464. If you wanted to configure a CP3232 for that particular remote panel module, you would first have to mount a CP3232 on the remote panel module.
- 5 If your panel type is CP1602-CQX, skip to step 8.  
Note that if you are creating a configuration for a CP1602-CQX, the treatment of the configuration is unique among panel types. See [CQX Panels](#), on page 53.
- 6 Choose a panel mode: 'Standard', 'Enhanced – Hold', or 'Enhanced – No Hold'.  
See [Remote Panel Modes](#), on page 49.
- 7 Define button functions:
  - a Click on the image of a button in the panel graphic at the top of the page.
  - b From the 'Button Function' drop-down list, select a button function (or do nothing and accept the present button definition).
  - c Fill each field as needed for the type of button. The fields vary with the button function:
    - [Destination Selection Buttons](#)
    - [Level Buttons](#)
    - [Salvo Buttons](#)
    - [Source Selection Buttons](#)
    - [Paging Buttons](#)
    - [Unused Button Type](#)
  - d In the 'Device Name / Button Label' field, enter a mnemonic for the button and press <enter> or <tab> on your keyboard. The mnemonic you enter appears in the panel graphic at the top of the page (only).
- 8 Save the panel configuration.  
Either click **Update Panel** to write the button configuration to the remote panel module . . .

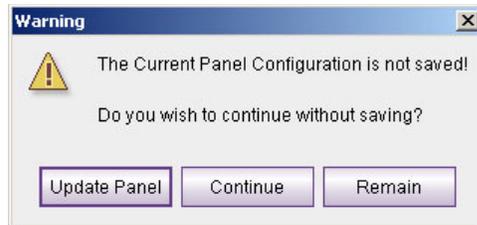
... Or, click **Save to File** to save the configuration in your PC's file system. The extension for panel configuration files is .pfg. You can later open this file or other saved files to download to remote panel modules.

---

The configuration is stored in the remote panel module. If you later change the panel type assigned to the remote panel module, it might not work properly with this configuration.

---

- 9 If you leave the remote panels page before you have saved your remote panel configuration, CRSC will give you a warning:



## How to Change a Button Function

- 1 Go to the 'Program Remote Panels' page.
- 2 In the 'Remote Panels' tab at the bottom of the page, click the radio button in the 'Edit/Update' field of the remote panel module for which you want to create a new configuration.
- 3 In the panel graphic at the top of the page, click on the button you want to change.
  - a From the 'Button Function' drop-down list, select a function — if you want to change the function type.
  - b Fill each field as needed for the type of button. The fields vary with the button function:
    - [Destination Selection Buttons](#)
    - [Level Buttons](#)
    - [Salvo Buttons](#)
    - [Source Selection Buttons](#)
    - [Paging Buttons](#)
    - [Unused Button Type](#)
  - c In the 'Device Name/Button Label' field, enter a mnemonic for the button and press <enter> on your keyboard. The mnemonic you enter appears in the panel graphic at the top of the page (only).
- 4 When you have finished defining button functions, click **Update Panel** to write the button configuration to the remote panel.
- 5 *Important!* Click **Save to File** to save the configuration in your PC's file system. The extension for panel configuration files is .pfg.

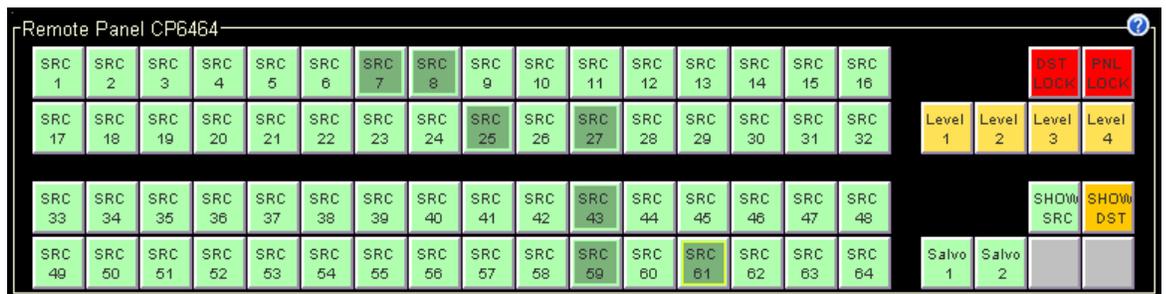
## How to Change the Panel Mode

- 1 Go to the 'Program Remote Panels' page.
- 2 In the 'Remote Panels' tab at the bottom of the page, click the radio button in the 'Edit/Update' field of the remote panel module for which you want to create a new configuration.
- 3 In the 'Panel Mode' field, select a mode of operation from the drop-down list:
  - 'Standard',
  - 'Enhanced — Hold',
  - 'Enhanced — No Hold'.
 For a description of each mode, see [Remote Panel Modes](#), on page 49.

## Shortcuts

### Multiple Button Selection

You can select multiple buttons in the panel image using standard click, shift-click, and ctrl-click techniques. Operations you perform in the 'Remote Panels' page then apply to each button of the multiple selection. Here is an example of a multiple selection:



Example 1: in a new CP6464 configuration, if you select the entire 64-button array at the left side of the panel and then choose 'Source' as the button type, CRSC not only makes all the buttons source buttons but also numbers them consecutively.

Example 2: if you select any set of buttons, make them destinations, and drag-and-drop levels onto the outputs table for those destinations, the levels will apply to all the destinations you have selected. CRSC will also assign default output numbers for those levels if none have been assigned. (See [Fast Level Assignment](#), following.)

If your selection of multiple buttons has buttons of mixed type, CRSC blanks the button configuration section and you must then either assign a button type to your selection or make a different selection. No operation can be performed until you choose a button type.

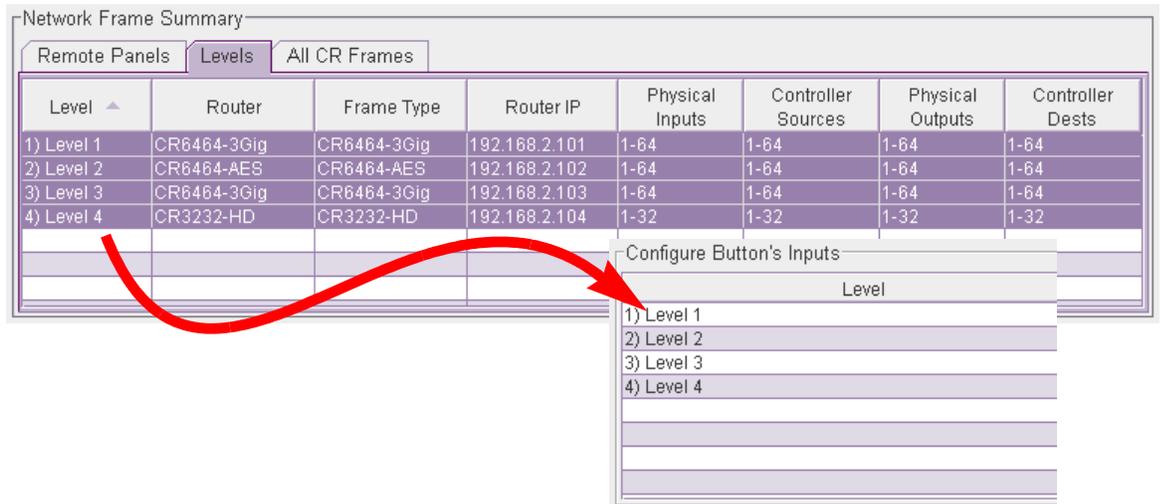
### Fast Level Assignment

The shortcut to level assignment is in two parts: (1) select all buttons for which the level assignment is to apply, and (2) drag-and-drop levels from the 'Levels' table in the network frame summary to the levels column of the button table in which you are working.

Fast level assignment applies to source buttons, destination buttons, or salvos. (The buttons you select must all be of one type.)

To drag and drop levels, first select levels in the 'Levels' table. Once you have selected those levels, they remain selected for additional operations. You can select only the levels you want to use.

Then drag the selection to the levels column:



You must drag the levels to the first row at which you want to apply the selection.

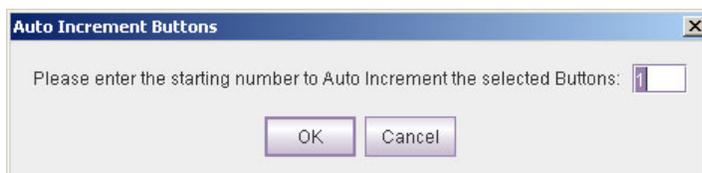
If you have multiple buttons selected, the level assignment applies to all the buttons selected.

## Auto-increment

If you right-click the panel image, a context menu appears. The context menu has one command, 'Auto Increment . . .':



When you click 'Auto Increment . . .', a dialog appears in which you may select the starting number for the increment:



When you specify the starting number and click OK, CRSC numbers the buttons you have selected, starting at the starting number. The numbering sequence follows the factory-defined ordering of the panel's buttons.

It usually makes sense for your button selection to be contiguous, but that is not a requirement.

'Auto Increment . . .' applies to source buttons, destination buttons, salvo buttons, and level buttons. The buttons you select must all be of the same type. CRSC presents an error message if they are not:



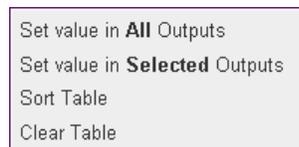
## Context menus

- The 'Remote Panels' page offers four context menus:
- For destination button configuration
- For source button configuration
- For salvo configuration
- For the 'Remote Panels' table in the network frame summary

(There is no context menu for level configuration.)

### Context Menu for Destinations

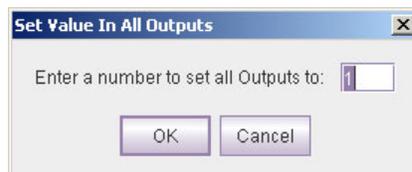
If you right-click in the destination table when you are configuration destinations, the destination context menu appears:



The context menu has 4 commands:

- Set value in all outputs

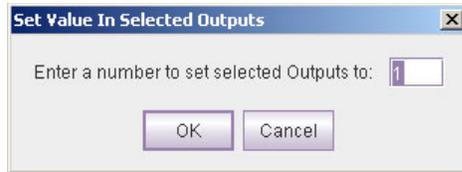
When you click this command, a dialog appears in which you can specify an output number:



CRSC applies the specified value to all the outputs in the output column. The value applied extends to all destination buttons you have selected at the time.

- Set value in selected outputs

When you click this command, a dialog appears in which you can specify an output number:



CRSC applies the specified value to all the *rows* you have selected in the output column. The value applied extends to all destination buttons you have selected at the time.

- Sort table

CRSC sorts the destination table in ascending order of level number (not level mnemonic).

The ordering extends to all destination buttons you have selected at the time.

This command has the same function as the 'Sort Table' button that appears directly on the page.

- Clear table

CRSC erases the entire destination table.

The erasure extends to all destination buttons you have selected at the time.

This command has the same function as the 'Clear Table' button that appears directly on the page.

### Context Menu for Sources

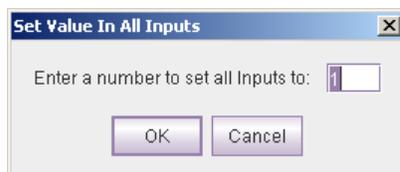
If you right-click in the source table when you are configuration sources, the source context menu appears:



The context menu has 4 commands:

- Set value in all inputs

When you click this command, a dialog appears in which you can specify an input number:



CRSC applies the specified value to all the inputs in the input column. The value applied extends to all source buttons you have selected at the time.

- Set value in selected inputs

When you click this command, a dialog appears in which you can specify an input number:



CRSC applies the specified value to all the *rows* you have selected in the input column. The value applied extends to all source buttons you have selected at the time.

- Sort table

CRSC sorts the source table in ascending order of level number (not level mnemonic).

The ordering extends to all source buttons you have selected at the time.

This command has the same function as the 'Sort Table' button that appears directly on the page.

- Clear table

When you click this command, CRSC erases the entire source table. The erasure extends to all source buttons you have selected at the time.

This command has the same function as the 'Clear Table' button that appears directly on the page.

## Context Menu for Salvos

### For Panels Other than CP32-6464, CP6401, or CP6464

If you right-click in the salvo table when you are configuration salvos, the salvo context menu appears:

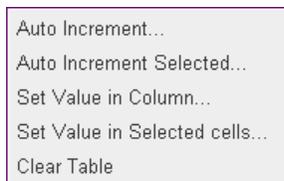


The context menu has 1 command: 'Clear Table'. When you click this command, CRSC erases the entire salvo table.

The erasure extends to all salvo buttons you have selected at the time.

### For the CP32-6464, CP6401, or CP6464

If you right-click in the salvo table when you are configuration salvos, the salvo context menu appears:



The context menu has 5 commands:

- 'Auto Increment . . .'

If you click this command for the input column or the output column, a confirmation dialog appears. Click 'OK' to fill the column with integers from 1 to 64.

If you click this command for the level column, a dialog appears in which you can specify a starting number for the fill. CRSC populates the entire level column with consecutive integers starting from the number you supply. If your starting number would cause the "auto-increment" to create a value out of range, CRSC will display an error message. (Level numbers must be in the range 1–250.)

If you populate the levels column using this command, you will have 64 levels in a system where only 8 levels are permitted. You will then have to clear the fields that do not contain actual levels.

CRSC will show the level name in fields for which you have actually defined levels.

- 'Auto Increment Selected . . .'

When you click this command, a dialog, such as this one for the input column, appears in which you can specify a starting number for the operation:



CRSC populates the range of fields you have selected, starting with the starting number you selected.

- 'Set Value in Column . . .'

When you click this command, a dialog, such as this one for the input column, appears in which you can specify an integer value for the operation:



CRSC populates the entire column, starting with the value you specified.

- 'Set Value in Selected Cells . . .'

When you click this command, a dialog, such as this one for the input column, appears in which you can specify an integer value for the operation:



CRSC populates the range of fields you have selected with the value you specified.

- 'Clear Table':

When you click this command, CRSC erases the entire salvo table.

When you execute any of these commands, the operation extends to all salvo buttons you have selected at the time.

The context menu commands apply locally to column in which you have selected on or more fields. You should be careful not to right-click a column in which you have not selected fields. If you do, the command you execute applies to the column in which fields are selected.

### Context Menu for Remote Panels Table

If you right-click a remote panel module in the 'Remote Panels' table, a remote panel context menu appears:



This context menu has one option (Identify CP) and one command (Reset Frame).

#### Identify CP

Place a check in the check box next to the 'Identify CP' option if you want to locate the physical panel in your facility. The physical panel will start blinking in a readily identifiable pattern.

Clear the check box to turn the blinking off.

The blinking does not affect the state of any router.

This option is similar to the function of the 'Identify CP' field in the 'Ethernet Settings' page.

#### Reset Frame

Click 'Reset Frame' to cause the remote panel module you right-clicked to reset, pending an alert message and your confirmation:





# 7

## Router Crosspoints Page

### Summary

Click 'View Router Crosspoints' in the navigation pane to access the crosspoints page.

The screenshot displays the 'View or Set Crosspoints' interface. It features a 'Graphic View' tab and a 'Table View' tab. The main area is a 14x30 grid representing the router matrix. The columns are labeled 'Inputs' (1-30) and the rows are labeled 'Outputs' (1-14). Black squares indicate active crosspoint connections, and a red square indicates a locked connection. Below the grid is a 'Network Frame Summary' section with tabs for 'Routers', 'Levels', and 'All CR Frames'. The 'Routers' tab is active, showing a table with columns for 'Select', 'Name', 'Frame Type', 'IP Address', and 'Reference'.

Select	Name	Frame Type	IP Address	Reference
<input checked="" type="radio"/>	D_32HD	CR3232-HD	192.168.97.22	NONE
<input type="radio"/>	D_PR	CR32-PR	192.168.97.23	NONE
<input type="radio"/>	D_32AES	CR3232-AES	192.168.97.24	NONE
<input type="radio"/>	D_6464	CR6464-3Gig	192.168.97.25	NONE

Buttons at the bottom: Refresh Summary, Undo Last Take, Diagonal Take..., Range Take...

In this page, you can view router crosspoints and perform 'takes' (i.e., make crosspoint connections). The upper portion of the page provides either a graphic or a tabular representation of the router matrix.

Each black (or red) square is a crosspoint connection. Empty squares represent the absence of a connection. (A red square indicates that a crosspoint connection is locked.)

The grid that appears in the graphics view crosspoints page represents a router's *entire* crosspoint matrix, without regard to partitioning. The table view also represents the router's entire crosspoint matrix without regard to partitioning.

This is a sample of the tabular view of the crosspoints page that represents the same crosspoint state as the graphic view shown previously:

View or Set Crosspoints

Graphic View Table View

Output	Input	Locked	Lock Id	Locked By Panel	Status
1	5				
2	3				
3	6				
4	7				
5	11				
6	9				
7	4				
8	4				
9	15				
10	16				
11	16				
12	16				
13	16				
14	16				
15	9				
16	16				
17	17				
18	14				
19	17		0000	Self	
20	17				
21	15				
22	5				
23	1				
24	1				
25	17				
26	5				

Network Frame Summary

Routers Levels All CR Frames

Select	Name	Frame Type	IP Address ^	Reference
<input checked="" type="radio"/>	D_32HD	CR3232-HD	192.168.97.22	NONE
<input type="radio"/>	D_PR	CR32-PR	192.168.97.23	NONE
<input type="radio"/>	D_32AES	CR3232-AES	192.168.97.24	NONE
<input type="radio"/>				
<input type="radio"/>				

Refresh Summary Undo Last Take Diagonal Take... Range Take...

Near the bottom of the page is a 'Network Frame Summary'. This section has 3 tabbed tables. Use the 'Routers' tab to select a router for which you can view or change the crosspoints. The other two tables are for information only.

## Buttons

At the very bottom of the page are 4 buttons:

- Refresh Summary.  
Click **Refresh Summary** at any time to be sure that you are viewing the most current information.

- **Undo Last Take.**  
Click **Undo Last Take** if you make a mistake and perhaps forget what you did.  
The 'Undo Last Take' can undo multiple takes — one at a time, the most recent one first.
- **Diagonal Take.**  
Click **Diagonal Take** to perform a diagonal take. See [Diagonal Takes](#), on page 81 for information.
- **Range Take.**  
Click **Range Take** to perform a diagonal take. See [Range Takes](#), on page 84 for information.

## The Table View

You can use the table view to perform takes and to see lock status and take status for each of the router's outputs. The columns of the table are as follows:

Column	Description
Output	Each row in the table is a router output. The number in the output column identifies the output.
Input	The input that has been routed to the output
Locked	A lock icon in this column means the output is locked. If a field of the column is clear, the output is unlocked.
Lock ID	An identification number for the user that applied a lock.
Status	When a take is performed, the column indicates the success of the take. You can hover your mouse over an entry in the column to show the time the take occurred and a summary of the take. Typical status results are "Success" or "Destination Locked."

In the table view, you can select a range of outputs (multiple contiguous rows) for the purpose of a copy or a range take. See [Copying and Pasting Crosspoint Data](#), on page 78. It is not possible to make a disjoint selection.

## The Graphic View

Columns in the graphic view (or grid) are inputs; rows are outputs. There are as many rows and columns as supported by the router. For example, a 16×4 router will have 16 columns and 4 rows.

There are exceptions:

- 1 Except for the CR6464-AES, the grid for AES routers shows twice as many rows and columns because there are two channels for a single input or output. For example, a 32×32 AES router has a 64×64 matrix. AES routers have additional behavioral aspects. (See [About AES Crosspoints](#), following.)  
The CR6464-AES has a 64×64 matrix of stereo pairs. For the CR6464, the crosspoint view displays a 64×64 grid.
- 2 The display for CQX routers is a special case. The first two rows represent the 2 CQX outputs. The remaining 6 rows represent the router's "auxiliary" outputs.

- 3 The grid for machine control routers shows rows and columns as if there were a crosspoint matrix in the router. But, as you might recall, machine control routers are point-to-point routers and their connectors are bidirectional. Consequently, two black squares represent a machine control route. For instance, if you route port 5 to port 9, the square at (row, column) = (5,9) and the square at (9,5) are both black. That is because each port is both an input and an output.

If a black square appears on the diagonal of a machine control matrix, it means the port is tristated (i.e, disconnected).

In the graphic view, you cannot select any outputs as you can in the table view.

## Page Basics

You can use the 'View Router Crosspoints' page to view or set crosspoints (i.e., perform "takes"), to view output status, and to save and load crosspoint matrix data.

You can perform the same operations using the graphic view or the table view.

- ▲ Crosspoint changes you make in this page are immediately made in the crosspoint matrix of the router.

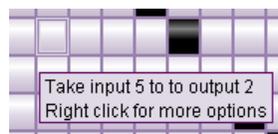
The crosspoints page can change because of external events. That is, panel operators can perform takes and locks at any time, changing the router crosspoints. Any crosspoint change made by a panel operator is reflected (almost) immediately in the 'View Router Crosspoints' page.

## Graphic View

You can perform simple takes in the graphic view of the crosspoints page by clicking a cell where an input (column) intersects an output (row). For example, to take input 7 to output 11, click the cell at column 7 and row 11. The cell turns black indicating that it is a crosspoint connection.

(There are some exceptions to this and variations of this. When an output is locked, a take does to that output not occur. The display and router behavior is different when the router is AES stereo (except for the CR6464-AES). The display and router behavior is different when the router is a machine control router.)

If you hover your mouse over a square, a help message appears:



This message tells you the connection you will make if you click the square.

(The message also tells you that you can right-click the crosspoint matrix to obtain a context menu that has 7 additional commands. See [Context Menu](#), following.

Note: to undo the most recent take, click **Undo Last Take** at the bottom of the page.

## Table View

You can perform simple takes in the table view of the crosspoints by entering a new port number in the input field of a row that corresponds to the desired output. The status field of that row indicates whether the take succeeded.

(There are some exceptions to this and variations of this. When an output is locked, a take does to that output not occur. The display and router behavior is different when the router is AES stereo (except for the CR6464-AES). The display and router behavior is different when the router is a machine control router.)

(You can right-click the crosspoint table to obtain a context menu that has 7 additional commands. See [Context Menu](#), next.

## Context Menu

The context menu (obtained by right-clicking within the graphic view or table view has a set of 7 commands:

 Copy	Ctrl-C
 Paste...	Ctrl-V
 Load Salvo...	Ctrl-L
 Save As Salvo...	Ctrl-S
 Jump to...	Ctrl-J
 Diagonal Take...	Ctrl-D
 Range Take...	Ctrl-R

The following describes the context menu commands:

Menu Option	Icon	Description
Copy		Copies either selected rows or the entire crosspoint matrix to the Windows clipboard. See <a href="#">Copying and Pasting Crosspoint Data</a> , following.
Paste		Initiates a dialog in which you can paste the clipboard contents (which must be a valid set of outputs and inputs) into the current crosspoint view. Doing this affects the router as well as the 'View Router Crosspoints' page. See <a href="#">Copying and Pasting Crosspoint Data</a> , following.
Load Salvo		Opens a salvo file and executes it. A salvo is a "snapshot" of the entire crosspoint matrix that has been saved earlier. See <Hyperlink Cell>Salvos on page 80.
Save As Salvo		Saves the entire crosspoint matrix as a salvo file (a "snapshot") for later use. See <Hyperlink Cell>Salvos on page 80.
Jump to ...		Opens the 'Jump to ...' dialog. This command causes CRSC to display the specified input and output in the crosspoint view. See <a href="#">&lt;Hyperlink Cell&gt;Jumping to Outputs</a> on page 80.

Menu Option	Icon	Description
Diagonal Take		Opens the 'Diagonal Take' dialog. In this dialog, you can connect a contiguous range of inputs to a contiguous range of physical outputs. For example, input 1 to output 1, input 2 to output 2, and so on. You can click <b>Reverse</b> in the dialog to obtain a reverse diagonal take. See <Hyperlink Cell>Diagonal Takes on page 81.
Range Take		Opens the 'Range Take' dialog. Using this dialog, you can connect one input to a contiguous range of outputs. See <Hyperlink Cell>Range Takes on page 84.

## Copying and Pasting Crosspoint Data

Using the **Copy** and **Paste** commands (available in the context menu) you can transfer crosspoint data to and from any file in your file system that will accept the data (which is plain text). Microsoft Excel, Word, and Notepad are suitable file formats.

You can copy or paste a selected part of a crosspoint as small as a single row, or you can copy or paste entire matrix. Any set of selected rows will always be contiguous.

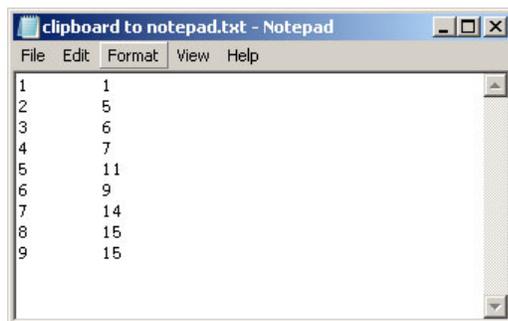
### Copy

To copy a portion of a crosspoint matrix (to the clipboard), select a set of rows in the displayed crosspoint matrix. Then type Ctrl-C or select **Copy** from the context menu.

To copy an entire crosspoint matrix (to the clipboard), deselect all rows in the displayed crosspoint matrix. Then type Ctrl-C or select **Copy** from the context menu.

A copy places the data on the Windows "clipboard." As long as the data remain on the clipboard, you can paste it any document that will accept the data.

This is an example of a range of crosspoint data copied to NotePad:



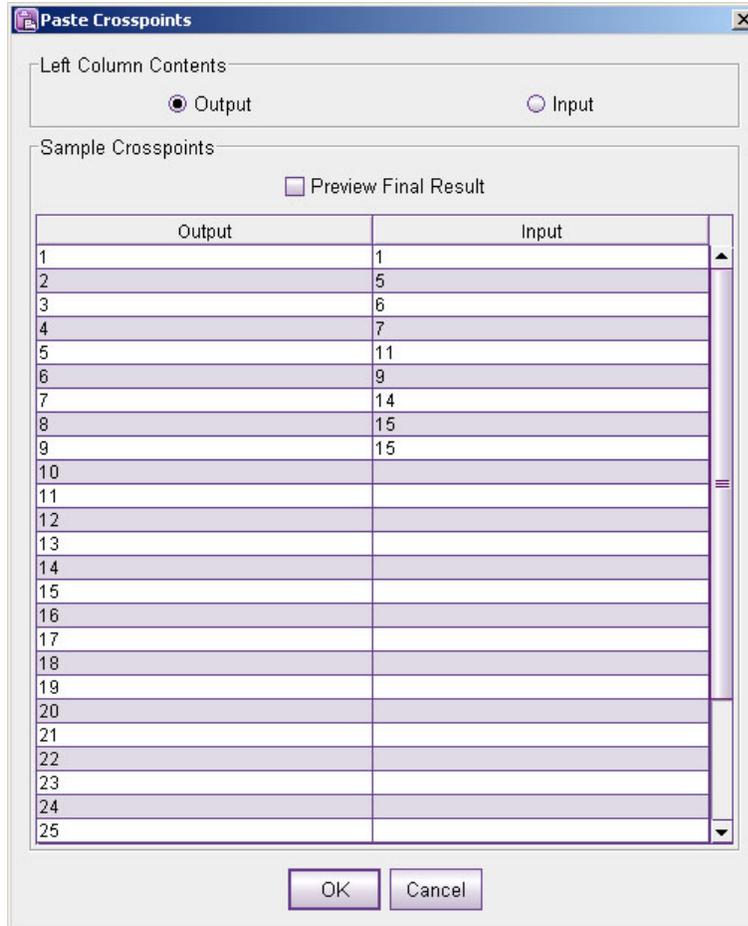
### Paste

The 'Paste' command updates the currently displayed crosspoint matrix with the contents of the Windows clipboard.

If the clipboard represents a range of outputs smaller than the crosspoint matrix, only those outputs are changed. If the clipboard represents the entire matrix, then of course, the entire matrix is changed.

Pasting *replaces* the crosspoint data with the data on the clipboard. Outputs that are not specified in the clipboard data are not affected.

To issue the paste command, type Ctrl-V or select **Paste** from the context menu. The 'Paste Crosspoints' dialog opens, displaying the clipboard contents:



(The clipboard contents must be a valid list of crosspoints.)

Using this dialog, you can preview the data to be pasted. (You cannot edit the data to be pasted.)

There are 3 options in the dialog:

- Output  
Treat the first column of the clipboard data as *outputs*. The second column then holds inputs.
- Input  
Treat the first column of the clipboard data as *inputs*. The second column then holds outputs.

- Preview Final Result  
If you check this check box. *all* the inputs of the crosspoint matrix are shown in the paste dialog as they will appear after the paste.  
If you do not check this check box, the input fields for outputs not listed in the clipboard contents are left blank.

## Salvos

A salvo is a “snapshot” of the crosspoint state that you save in a file.

- ▲ Salvos, with respect to crosspoints, should not be confused with the salvos (and salvo buttons) of remote panel configurations.

### Save as Salvo . . .

The ‘Save as Salvo . . .’ command saves the current crosspoint state in a salvo file. Salvo files have the extension .salvo or .svo.

- ▲ Be careful with salvo file names. Other software can create salvo files having .svo (or .salvo) extensions. If you store CRSC salvos in a folder used by other software, you might not remember which files are CRSC salvos.

When you click this command, CRSC presents a dialog in which you browse your file system to name the file and place it in a folder of your choice.

Subsequently, you can use the salvo file to restore the crosspoint matrix to a previous state.

### Load Salvo . . .

The ‘Load Salvo . . .’ command executes a salvo. When you click this command, CRSC presents a dialog in which you browse your file system to locate the salvo file you want. When you click OK in that dialog, CRSC executes the salvo. That is, it replaces the current crosspoint state with the crosspoint state saved in the salvo file.

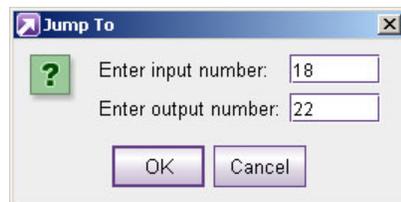
## Jumping to Outputs

The crosspoints page has a ‘Jump to . . .’ command. The command causes the crosspoint view to scroll so that the output (and input) you want to view is displayed in the top row, and as close horizontally to the center of the window as possible.

To jump, right-click the crosspoint view. Then click the ‘Jump to . . .’ command.

The dialog in the graphic view is slightly different from the dialog in the table view.

This is the dialog under the graphic view:



It has 2 field in which to enter an output and an input. Simply enter numbers in those fields and click OK.

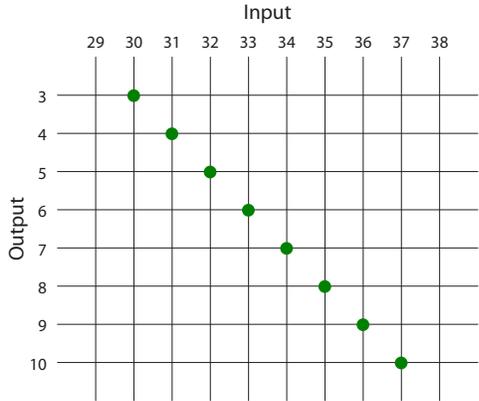
This is the dialog under the table view:



It has only an output field. Simply enter an output number in that field and click OK.

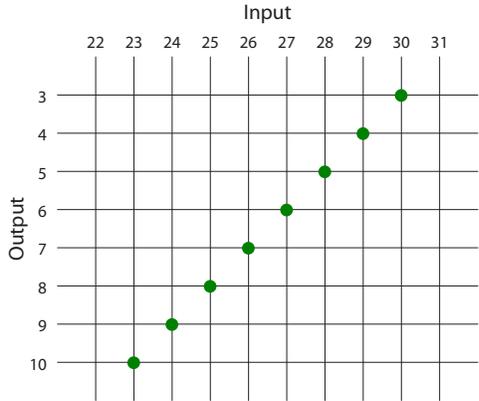
### Diagonal Takes

A diagonal take connects inputs  $M$  to outputs  $N$ , in *ascending* order, given an input starting point that you specify:



Input starting point  $P = 30$ ;  
Output starting point  $Q = 3$ ;  
As output  $N$  varies from 3–10,  
input  $M = P + (N - Q)$

A reverse diagonal take connects inputs  $M$  to outputs  $N$ , in *descending* order, given an input starting point that you specify:



Input starting point  $P = 30$ ;  
Output starting point  $Q = 3$ ;  
As output  $N$  varies from 3–10,  
input  $M = P - (N - Q)$

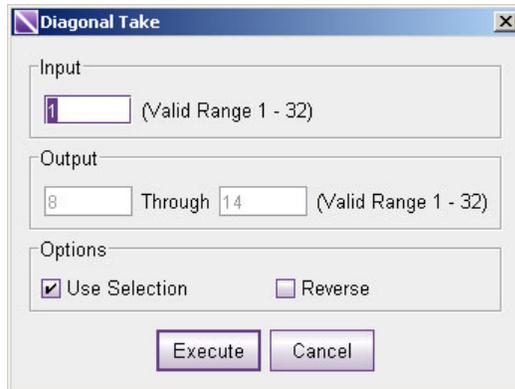
If the resulting input would fall out of the absolute range of the crosspoint matrix, an individual take is not performed. CRSC will perform as many takes, in the range you specify, as it can.

You can perform diagonal and reverse diagonal takes.

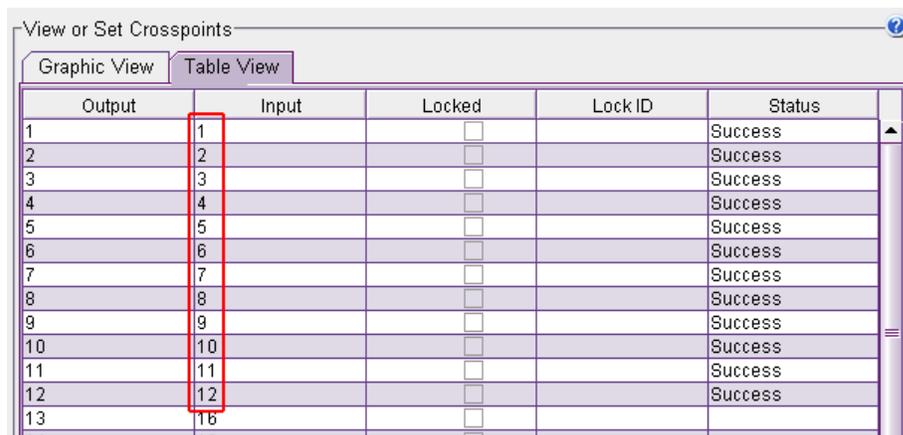
Under the table view, you can select a range of outputs and perform a diagonal take for those outputs.

### How to Perform a Diagonal Take in the Table View

- 1 Optionally perform a selection of outputs. Use standard click, shift-click, and ctrl-click methods to make the selection.
- 2 Either click the 'Diagonal Take' button at the bottom of the page or right-click the crosspoint view and choose the 'Diagonal Take . . .' command from the context menu that appears.
- 3 The 'Diagonal Take' dialog appears.



- 4 If you made a selection of outputs in step 1, the 'Use Selection' check box will be checked and the diagonal take will apply to those outputs. You can, of course, uncheck that option and specify any output range you prefer, in the 'Output' section.
- 5 The range of valid destinations appears at the right.
- 6 (Optional) Check the **Reverse** check box to perform a *reverse* diagonal take.
- 7 Enter a starting input number in the 'Input' section. If you checked 'Reverse', the number you enter must be the highest input number of the range that will be generated. Otherwise, the number you enter must be the lowest input in the range. A diagonal take counts inputs *upward* from the starting point.



Output	Input	Locked	Lock ID	Status
1	1	<input type="checkbox"/>		Success
2	2	<input type="checkbox"/>		Success
3	3	<input type="checkbox"/>		Success
4	4	<input type="checkbox"/>		Success
5	5	<input type="checkbox"/>		Success
6	6	<input type="checkbox"/>		Success
7	7	<input type="checkbox"/>		Success
8	8	<input type="checkbox"/>		Success
9	9	<input type="checkbox"/>		Success
10	10	<input type="checkbox"/>		Success
11	11	<input type="checkbox"/>		Success
12	12	<input type="checkbox"/>		Success
13	13	<input type="checkbox"/>		
14	14	<input type="checkbox"/>		

A reverse diagonal take counts inputs *downward* from the starting point.

Output	Input	Locked	Lock ID	Status
1	12	<input type="checkbox"/>		Success
2	11	<input type="checkbox"/>		Success
3	10	<input type="checkbox"/>		Success
4	9	<input type="checkbox"/>		Success
5	8	<input type="checkbox"/>		Success
6	7	<input type="checkbox"/>		Success
7	6	<input type="checkbox"/>		Success
8	5	<input type="checkbox"/>		Success
9	4	<input type="checkbox"/>		Success
10	3	<input type="checkbox"/>		Success
11	2	<input type="checkbox"/>		Success
12	1	<input type="checkbox"/>		Success
13	16	<input type="checkbox"/>		
14	16	<input type="checkbox"/>		

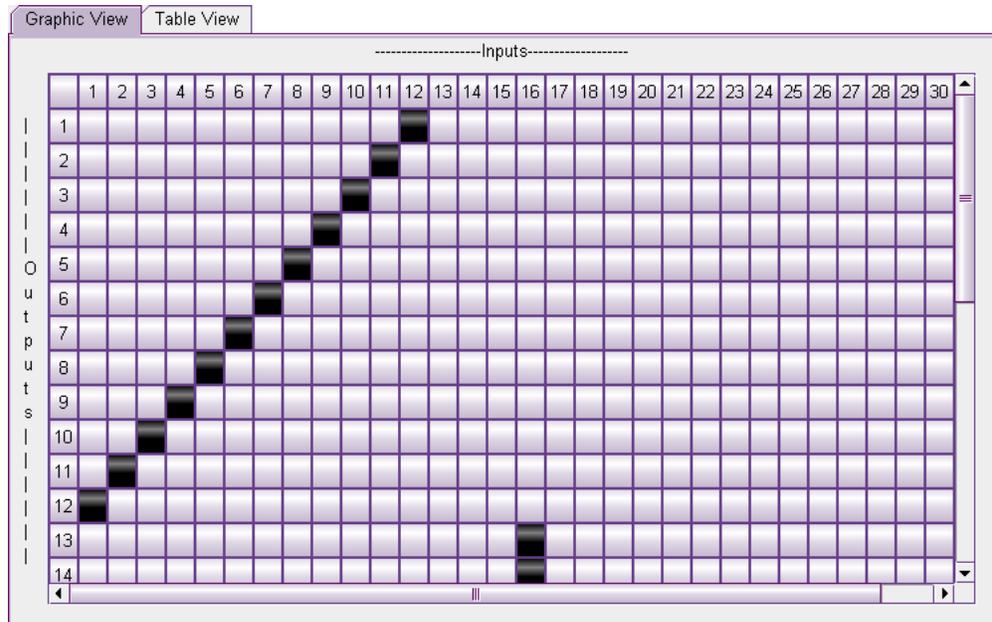
- 8 Click **Execute**. The take is performed. Click **Cancel** to leave the dialog without performing any takes.
- 9 CRSC shows the status of the affected entries in the 'Status' column. (If an output is locked, the status will be "Destination Locked" and the take to that output will not occur.)

### How to Perform a Diagonal Take in the Graphic View

- 1 Either click the 'Diagonal Take' button at the bottom of the page or right-click the crosspoint view and choose the 'Diagonal Take ...' command from the context menu that appears.
- 2 The 'Diagonal Take' dialog appears.

- 3 Enter a range of outputs in the 'Output' section. The range of valid destinations appears at the right. Enter a starting number in the left-hand field and an ending number in the right-hand field. All outputs in that range are selected.
- 4 (Optional) Check the **Reverse** check box to perform a *reverse* diagonal take.
- 5 Enter a starting input number in the 'Input' section. If you checked 'Reverse', the number you enter must be the highest input number of the range that will be generated. Otherwise, the number you enter must be the lowest input in the range.

A diagonal take counts inputs *upward* from the starting point. A reverse diagonal take counts inputs *downward* from the starting point.



This illustration show a reverse diagonal take of inputs 1–12 to outputs 1–12.

- 6 Click **Execute**. The take is performed. Click **Cancel** to leave the dialog without performing any takes. (If any output is locked, the take to that output will not occur.)
- ▲ See also [The Diagonal Take Shortcut](#), on page 90.

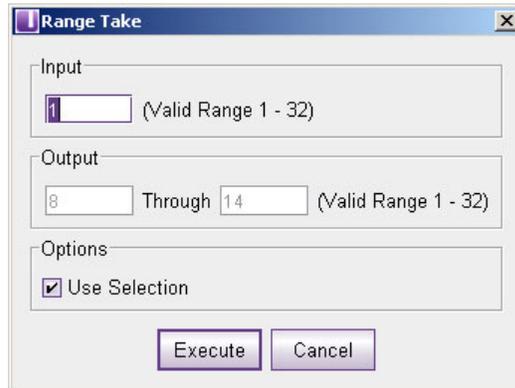
## Range Takes

A range take switches a single input to multiple outputs. Input 1 could be switched to outputs 1 through 12, for example. The outputs can be contiguous or non-contiguous.

### How to Perform a Range Take in the Table View

- 1 Optionally perform a selection of outputs. Use standard click, shift-click, and ctrl-click methods to make the selection.
- 2 Either click the 'Range Take' button at the bottom of the page or right-click the crosspoint view and choose the 'Range Take . . .' command from the context menu that appears.

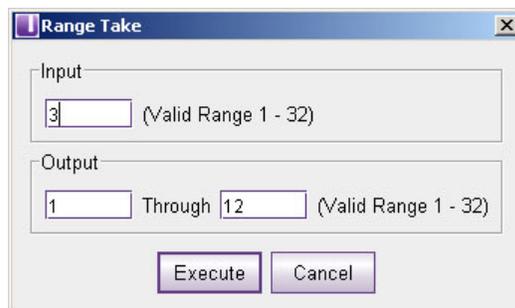
- 3 The 'Range Take' dialog appears.



- 4 Enter a range of outputs In the 'Output' section. The range of valid destinations appears at the right. Enter a starting number in the left-hand field and an ending number in the right-hand field. All outputs in that range are selected.
- 5 In the 'Input' field, enter the input to be switched to the destinations.
- 6 Click **Execute**. The take is performed. Click **Cancel** to leave the dialog without performing a range take.
- 7 CRSC shows the status of the affected entries in the 'Status' column. (If an output is locked, the status will be "Destination Locked" and the take to that output will not occur.)

### How to Perform a Range Take in the Graphic View

- 1 Either click the 'Range Take' button at the bottom of the page or right-click the crosspoint view and choose the 'Range Take . . .' command from the context menu that appears.
- 2 The 'Range Take' dialog appears.



- 3 If you made a selection of outputs in step 1, the 'Use Selection' check box will be checked and the range take will apply to those outputs. You can, of course, uncheck that option and specify any output range you prefer, in the 'Output' section.
- 4 The range of valid destinations appears at the right.
- 5 In the 'Input' field, enter the input to be switched to the destinations.
- 6 Click **Execute**. The take is performed. Click **Cancel** to leave the dialog without performing any takes. (If any output is locked, the take to that output will not occur.)

- ▲ See also [The Shortcut Vertical Take](#), on page 91.

## About AES Crosspoints

- ▲ The crosspoint of the CR6464-AES is a 64×64 matrix of stereo pairs. There are no options. The following material applies to AES routers *other than* the CR6464-AES.

AES routers have paired signals for each input and output. Usually the signals are stereo pairs, but this is not a requirement. Because of this pairing, an AES crosspoint has 2 inputs for every input connector and 2 outputs for every output connector. As an example, a 32×4 AES crosspoint matrix has 64 inputs and 8 outputs. Therefore the crosspoint view for that router has 64 columns and 8 rows.

If a video reference signal is present (at the AES router), the AES router operates in *synchronous* mode. Otherwise, the router operates in *asynchronous* mode.

Compact routers cannot resolve mono signals without a video reference signal.

When the router is in synchronous mode, the router's level type is 'Synchronous AES Mono'. When the router is in asynchronous mode, the router's level type is *undefined*, but it *appears* as though it were 'Synchronous AES Mono'.

Audio router 'takes' differ depending on the mode:

- Synchronous mode— Takes performed in the crosspoint page are "mono" meaning that any individual channel can be taken to any individual output channel.
- Asynchronous mode— Takes performed in the crosspoint page are "stereo" meaning that you can take only paired input channels to paired output channels. A pair of channels is always an (odd/even) pair, where the even number = the odd number + 1. Thus (1,2) is a valid "stereo" pair, but (2,3) is not and (1,5) is not.

## Using the Crosspoints Page

The page is divided into two sections. At the top is the crosspoint graphic. At the bottom of the page, the 'Network Frame Summary' has three tabs that display a list of 'Routers', 'Levels', or 'All CR Frames' (compact routers) defined in the network. Use the 'Routers' tab to select a router crosspoint.

The 'Network Frame Summary' presents the following information:

Tab	Column	Description
Routers	Select	Click the radio button to select the router listed on that row.
	Name	Name of the compact router.
	Frame Type	Type of router.
	IP Address	IP address currently assigned to the router.
	Reference	Lists the reference signal for the router, if any, and whether it is an audio or video reference.

Tab	Column	Description
Levels	Level	Level name and level number. For CQX routers, only one level appears.
	Signal Type	Type of signal(s) associated with that level.
	Router	Router to which the level is assigned.
	Physical Inputs	These fields show the physical start and endpoints of the level within the router.
	Physical Outputs	
	Controller Sources	The "logical" input and output ranges of the router —as they might be identified on a remote panel.
	Controller Dest	
All CR Frames	Name	Name assigned to the compact router or remote panel module.
	Frame Type	Type (model number) of the router or remote panel module.
	IP Address	IP address assigned to the router or remote panel module.
	Subnet Mask	The subnet mask currently assigned to the router or remote panel module.

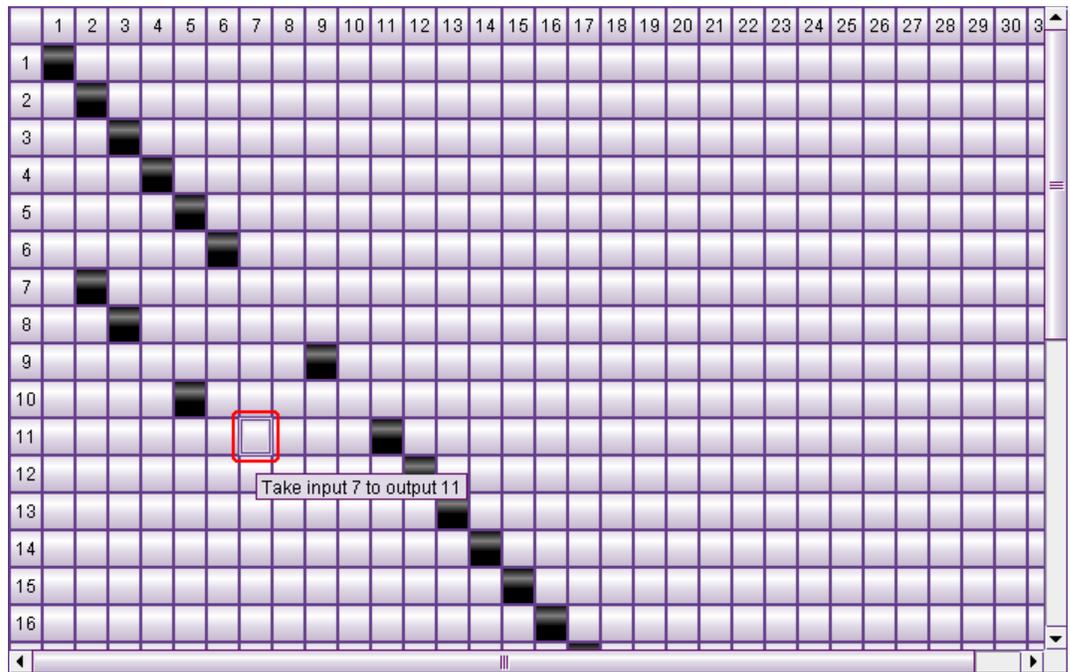
## How to View a Crosspoint Configuration

- 1 Go to the crosspoints page.
- 2 In the 'Routers' tab at the bottom of the page, click the radio button on the row listing the router whose crosspoint matrix you want to view. Details of the crosspoints appear in the graphic view or the table view of the crosspoint matrix, which you have selected.

## How to Perform a Simple Take in the Graphic View

- For video routers, synchronous AES routers, and other audio routers, including the CR6464-AES.

To perform a take — i.e., connect an input to an output — click any cell at the intersection of the input (a column) the output (a row). For example, to take input 7 to output 11, click the square at the intersection of column 7 and row 11:

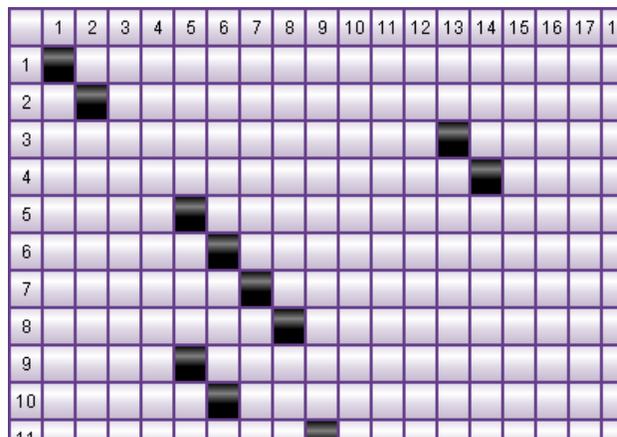


The square turns black indicating that it is a crosspoint connection.

(A red square indicates that crosspoint connections that are locked. You cannot perform a take to a destination that is locked.)

- For asynchronous AES routers (which do *not* include the CR6464-AES)

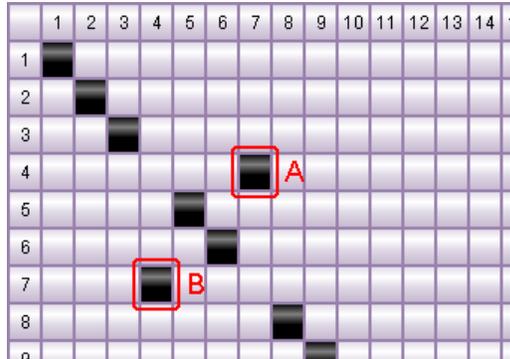
You must click the intersection of odd rows and columns:



Asynchronous AES takes occur in adjacent pairs. This diagram illustrates, for example, that inputs (13,14) are taken to outputs (3,4).

- Machine control routers

Machine control takes also occur in pairs (in the display):



However, how you choose the row and column affects the outcome.

If the two ports (in this example, ports 4 and 7) are dynamic ports, then clicking box A and clicking box B give different results. Either way connects ports 4 and 7, but clicking box B makes port 7 “controlled” whereas clicking box A makes port 7 “controlling.”

## How to Perform a Simple Take in the Table View

- For video routers, synchronous AES routers, and other audio routers, including the CR6464-AES.

To perform a simple take, enter a port number in the input field of any output (row) of the table. The status of the take appears in the ‘Status’ field of that row.

- For asynchronous AES routers (which do *not* include the CR6464-AES)

To perform a simple take, enter an *odd* numbered port in the input field of any *odd* numbered output (row) of the table. The take status appears in the ‘Status’ field of that row:

View or Set Crosspoints					
Graphic View		Table View			
Output	Input	Locked	Lock Id	Locked By Panel	Status
1	7		0234	192.168.2.52	Desination Locked
2	8		0234	192.168.2.52	
3	5				Success
4	6				
5	5				
6	6				
7	7				
8	8				

The illustration above shows that input 5 was taken to output 3 (successfully). Because AES signals are switched as stereo pairs, input 6 was switched also to output 4. Thus the pair (5,6) was switched to pair (3,4).

If you attempt to switch an even input or an even output, you will see a message similar to the following:



Note also that locks apply to stereo pairs. The illustration preceding shows that the 'Status' field displays 'Destination Locked' only for the odd-numbered row of the pair.

- Machine control routers

To perform a simple take, enter a port number in the input field of any output (row) of the table. The status of the take appears in the 'Status' field of that row:

Output	Input	Locked	Lock Id	Locked By Panel	Status
1	1				
2	4	🔒	0233	192.168.2.51	
3	3				
4	2	🔒	0233	192.168.2.51	
5	8				
6	6				
7	7				
8	5				
9	9				
10	10				
11	11				
12	12				
13	22				Success
14	14				
15	15				
16	16				
17	17				
18	18				
19	19				
20	20				
21	21				
22	13				
23	23				
24	24				
25	25				
26	26				

Because machine control routes are bidirectional, two rows show modification, in the same way that two squares are affected in the graphic view of the crosspoint.

In the illustration above, input 22 was taken to output 13. Thus, input 13 also appears as the input to output 22.

Note that locks also appear in pairs. The illustration above shows that ports 2 and 4 form a route and the route is locked.

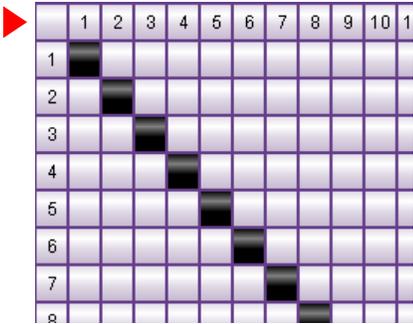
## The Diagonal Take Shortcut

This shortcut is something you can do in the graphic view only.

A diagonal take is where input  $n$  is connected to output  $n$  for all  $n$ . (The black squares are arranged diagonally.)

The shortcut creates a diagonal take across the entire crosspoint matrix. That is, input  $n$  is connected to output  $n$  for all  $n$ .

To perform a diagonal take, click the top left corner of the grid, scrolling if necessary:



CRSC displays a warning message:



Click **Yes** to perform the take or click **No** to cancel the take.

For machine control routers, the meaning of a diagonal take is different from diagonal takes for other routers. Entries on the “diagonal” of a machine control matrix graphic are tristated (or disconnected).

Remember that machine control routers are point-to-point routers and do not have a matrix *per se*. The matrix in the crosspoints page, for machine control routers, is a convenient fiction.

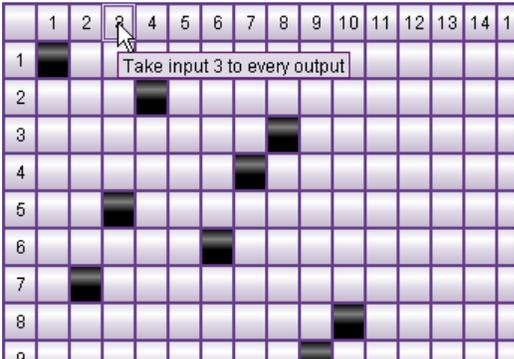
### The Shortcut Vertical Take

This shortcut is something you can do in the graphic view only.

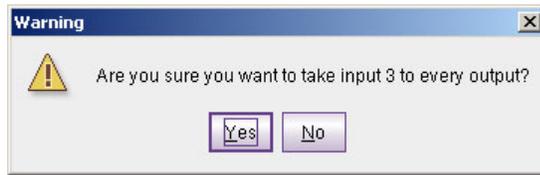
A vertical take is where input  $n$  is connected to *all* outputs. (The black squares are arranged vertically.)

The shortcut is a special range take connects input  $m$  is connected to output  $n$  for all  $n$ .

To perform a vertical take, click the input number at the top of a column:



CRSC displays a warning message:



Click **Yes** to perform the take or click **No** to cancel the take.

The result is that all outputs are taken to the input you clicked:

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

For asynchronous AES routers, stereo input pair  $n$  is connected to all stereo output pairs. The pattern is vertical, but occupies two columns in alternation. For synchronous AES routers, the result is a single column for any input you choose:

Asynchronous AES

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

Synchronous AES

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

(Note that AES takes performed at a control panel are always paired.)

For machine control routers, vertical takes are not possible.



## Page Features

### Device Table

The columns in the table of devices present the following options and information:

Column	Description
Select	Check the check box to select the device listed on that row for updating.
Name	Name of the compact router or remote panel module.
Frame Type	Type of compact router or remote panel module, such as CR3232-HD.
IP Address	IP address currently assigned to the device.
CRF Version	The version of the CRF file last used to update the firmware.
Boot Version	Boot code for the device.
Application Version	Application code for the device.
FPGA Version	Firmware for the device.

### Selection Options

To perform an update, you must select one or more devices in the table. You can do this manually using the check boxes in the 'Select' column of the table.

However, there are two shortcut buttons that you can click: 'Select All' and 'Select None'.

Firmware updates take time. To shorten the time it takes to perform multiple updates, you can check the 'Only update if versions are different' check box. When this box is checked, CRSC will not perform an update for those devices that are already updated, i.e., those that have the same version of firmware that are present in the firmware file you are using for the update.

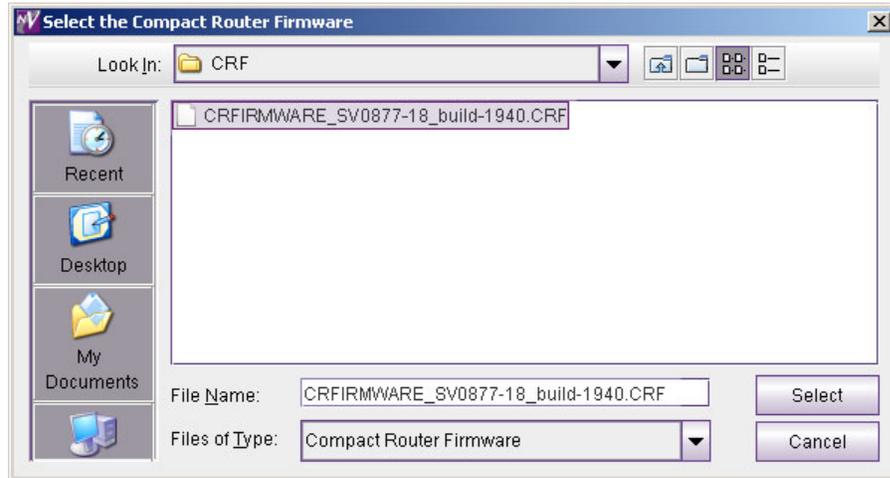
### Function Buttons

Among the function buttons is 'Refresh List'. Click this button at any time to be sure that you are viewing the most current information.

Two buttons execute the primary functions of the page:

- Update Firmware

Click this button to start a firmware update for all selected devices. When you click this button, CRSC presents an open dialog in which you can navigate to select a firmware file:



Choose a .crf file. Then click 'Select'.

After you make a selection, the update begins and the 'Stop Update' button becomes enabled. You can click the 'Stop Update' button at any time during the update and CRSC will stop the firmware update.

If the 'Only update if versions are different' check box is checked, CRSC will not perform an update for devices that are already up-to-date.

- Reset Frames

Click this button to reset all selected devices. Usually there is no need to reset any frame in operation.

A third button, 'View Past Update Logs . . .' displays CRSC's update log. You can view the log, save the log to a file, or print the log.

## Stopping an Update

At the bottom right corner of the 'Firmware Updates' page is a 'Stop Update' button. Much of the time this button is disabled, but when an update is in progress, it becomes active:



Disabled



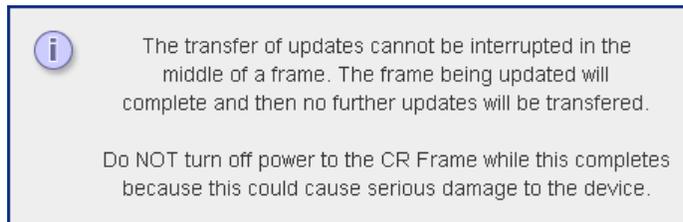
Active

If you click the 'Stop Update' button while an update is running, CRSC presents a confirmation message:



Click **Yes** if you wish to stop the update and **No** if you wish to continue.

When the update terminates, CRSC notifies you that it will complete the current process and then perform no more updates:



Occasionally, stopping an update will cause the update to fail with this error message:



The device for which the failure occurred will report 'Update Failed' in one of its fields:

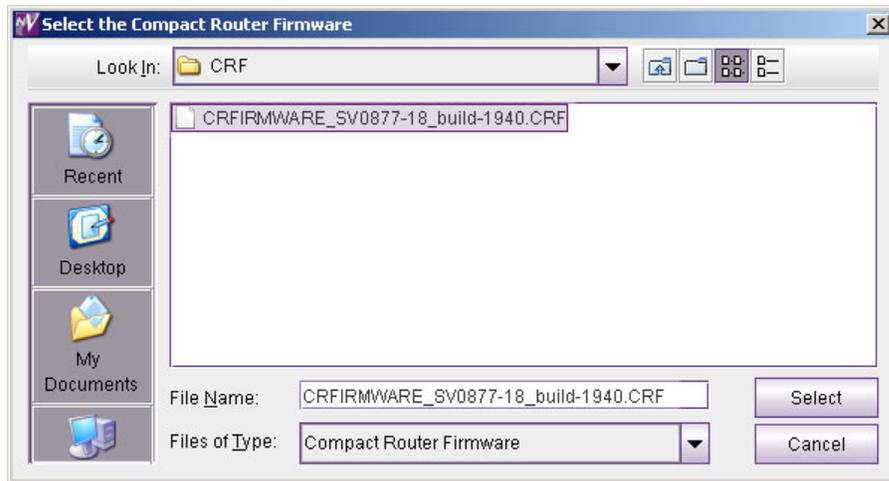
Boot (uC) Version
Update failed
SV0770-01A0 Version 1.2.0.0
SV0770-01A0 Version 1.2.0.0

The best course of action in the case of an update failure is to try the update again for the failed device.

## Using the Page

### How to Update Firmware

- 1 Go to the 'Firmware Updates' page.
- 2 Select individual compact routers or remote panel modules by checking the check box in 'Select' column on the row listing the device.  
Or, click **Select All** to select all devices.  
You can unselect devices by clearing their individual check boxes or by clicking **Select None**.  
To execute a firmware update, you must have selected at least one device in the device list.
- 3 (Optional) Clear the 'Only update if versions are different' check box if you want to force every selected device to be updated. Otherwise, a device is updated only when the new firmware is different from the firmware in the device. CRSC automatically checks the firmware version.
- 4 Click **Update Firmware**. The 'Select the Compact Router Firmware' dialog box appears.



*Fig. 8-1: Select the Compact Router Firmware Dialog*

- 5 Browse to select a firmware file. (The file extension of a firmware file is .crf.) and click **Select**. The updates begins.  
CRSC displays a progress bar in one of the fields of the device it is currently updating—either the 'Boot (uC) Version' field, 'Application (uC) Version' field, or the 'Firmware (FPGA) Version' field—depending on where it is in the process.  
The firmware applies to all the devices you have selected. Firmware updates take between 2 and 3 minutes for each device.  
While CRSC is performing the update, you can click 'Stop Update' to terminate the update at any time. See [Stopping an Update](#), on page 95.

6 When the firmware update completes, it displays a status report:

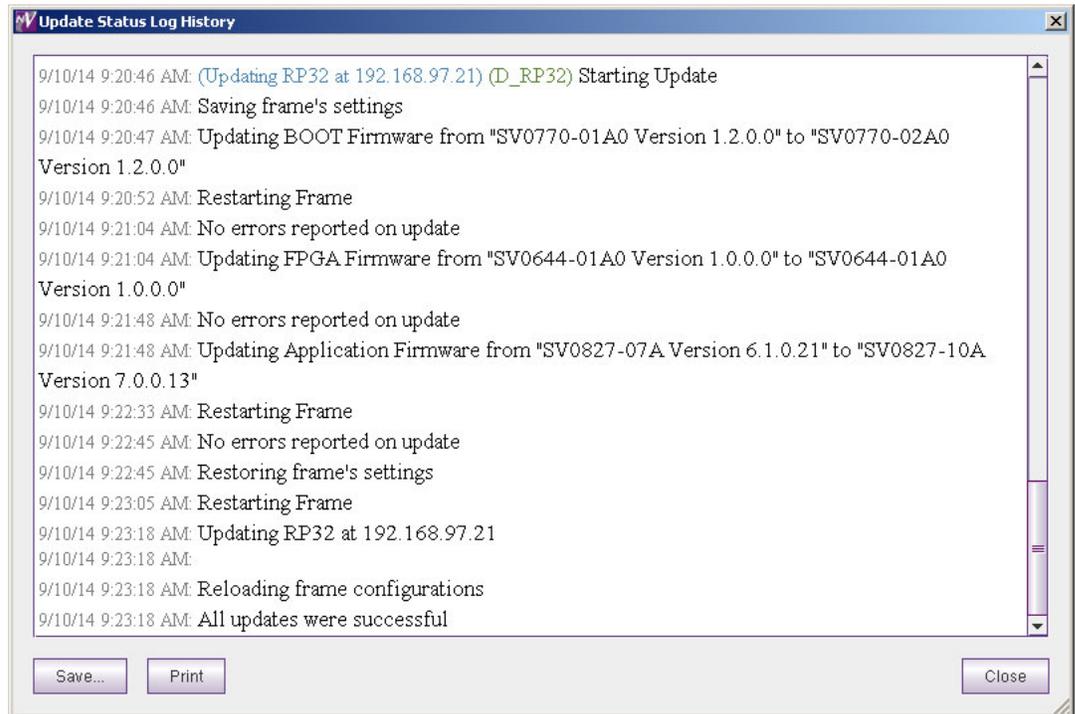


Fig. 8-2: Sample Firmware Status Report

Click **Save . . .** to save this report as a .txt file to archive, to print, or to review later.

Click **Print** to print this report on your local printer.

---

**Note:** If CRSC fails to update any frame, try the update again. If the frame fails repeatedly, cycle power, restart, and try the update again. If the frame fails again, contact Grass Valley Technical Support.

---

## How to Reset Frames

It is usually not necessary to reset any frames in your system. But if you are in doubt about whether any devices are operating correctly, you can reset the devices.

- 1 Go to the 'Firmware Updates' page.
- 2 Select individual compact routers or remote panel modules by checking the check box in 'Select' column on the row listing the device.

Or, click **Select All** to select all devices.

You can unselect devices by clearing their individual check boxes or by clicking **Select None**.

To reset a device, you must have selected at least one device in the device list.

- 3 Click **Reset Frames**. All selected compact routers and remote panel modules are reset. A reset takes a few seconds, but it can take up to a minute for remote panel modules to determine the state of the network.

## How to View Past Update Reports

To display all update status messages, click 'View Past Update Logs'. The button is initially disabled (grayed out) and remains grayed out until you have performed an update that can be logged.

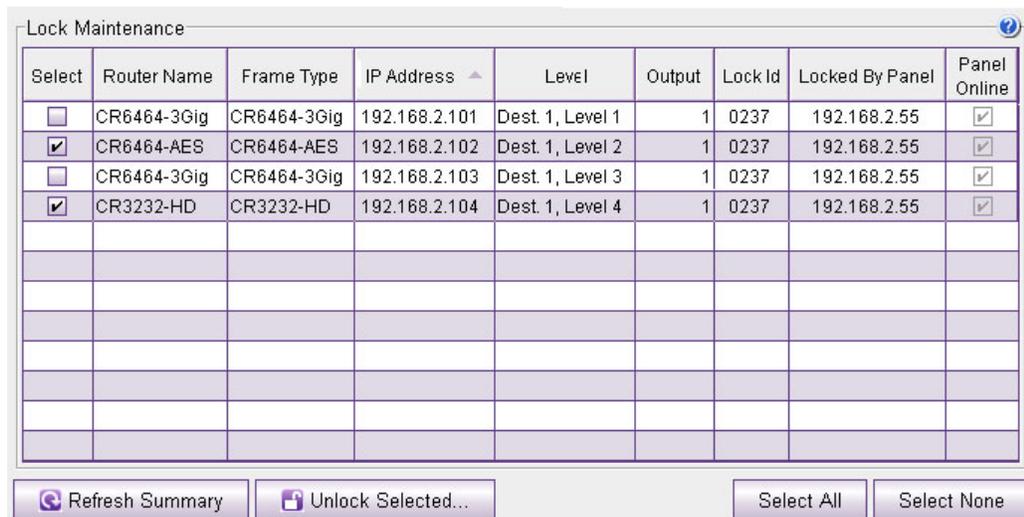
The log shows all messages since CRSC was installed on your PC.



# 9 Locks Page

## Summary

The 'Lock Maintenance' page let you view all locks, and to clear selected locks:



The screenshot shows a web interface titled "Lock Maintenance". It contains a table with the following columns: Select, Router Name, Frame Type, IP Address, Level, Output, Lock Id, Locked By Panel, and Panel Online. There are four rows of data, with the second and fourth rows selected. Below the table are four buttons: "Refresh Summary", "Unlock Selected...", "Select All", and "Select None".

Select	Router Name	Frame Type	IP Address	Level	Output	Lock Id	Locked By Panel	Panel Online
<input type="checkbox"/>	CR6464-3Gig	CR6464-3Gig	192.168.2.101	Dest. 1, Level 1	1	0237	192.168.2.55	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	CR6464-AES	CR6464-AES	192.168.2.102	Dest. 1, Level 2	1	0237	192.168.2.55	<input checked="" type="checkbox"/>
<input type="checkbox"/>	CR6464-3Gig	CR6464-3Gig	192.168.2.103	Dest. 1, Level 3	1	0237	192.168.2.55	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	CR3232-HD	CR3232-HD	192.168.2.104	Dest. 1, Level 4	1	0237	192.168.2.55	<input checked="" type="checkbox"/>

You can use this page to clear locks that cannot be cleared at a control panel.

You **cannot** use this page to set locks.

The page might be empty. If it is, no locks have been set. Click 'Refresh Summary' at any time to be sure that you are viewing the most current information.

There are two types of locks:

- Panel Lock—Locks the entire panel, preventing accidental changes. Panel locks are neither displayed nor reset in this page.
- Destination Lock—A locked destination is one to which a source may not be routed. This prevents the content delivered at the destination from being changed. When the lock is released, the destination's source can be changed.

## Using the Lock Maintenance Page

Locks are listed for each **output** that is locked, not for each *level* nor for each *destination*. A single destination lock usually includes locks on several levels (i.e, several outputs).

Select	Router Name	Frame Type	IP Address	Level	Output	Lock Id	Locked By Panel	Panel Online
<input checked="" type="checkbox"/>	CR3204-AES	CR3204-AES	192.168.2.101	Dest. 2, Level 3 (...)	3	0238	192.168.2.56	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	CR3204-AES	CR3204-AES	192.168.2.101	Dest. 2, Level 3 (...)	4	0238	192.168.2.56	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	CR3204-AES	CR3204-AES	192.168.2.101	Dest. 3, Level 3 (...)	5	0233	192.168.2.51	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	CR3204-AES	CR3204-AES	192.168.2.101	Dest. 3, Level 3 (...)	6	0233	192.168.2.51	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	CR1616-SD	CR1616-SD	192.168.2.102	Dest. 1, Level 1 (...)	1	0000	Self	<input type="checkbox"/>
<input checked="" type="checkbox"/>	CR1616-SD	CR1616-SD	192.168.2.102	Dest. 2, Level 1 (...)	2	0238	192.168.2.56	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	CR1616-SD	CR1616-SD	192.168.2.102	Dest. 3, Level 1 (...)	3	0233	192.168.2.51	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	CR1616-SD	CR1616-SD	192.168.2.102	Dest. 5, Level 1 (...)	5	0238	192.168.2.56	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>								
<input checked="" type="checkbox"/>								
<input checked="" type="checkbox"/>								
<input checked="" type="checkbox"/>								

Fig. 9-1: Lock Maintenance Page

The levels are “flattened” in the lock list displayed on the lock maintenance page. For example, if a 32x32 HD router had two partitions each numbered 1–16 and 1–16, the range reported for the HD router is 1–32 and the output number given is for the *router*, not the *partition (or level)*.

The case of AES routers is distinct: an AES router output is a stereo pair unless the router is in synchronous mode. Therefore, a single stereo output appears twice in the list.

The case of machine control routers is also distinct: a machine control route is bidirectional. Therefore both ports of the route appear in the lock list.

The page presents the following information:

Column	Description
Select	Select the check box on the row listing the panel you want to unlock.
Router Name	Name of the router.
Frame Type	Type (model) of compact router.
IP Address	IP address currently assigned to the device.
Level	Destination, level number, and level name for each router output that is currently locked.
Output	The output that is locked.
Lock ID	Entries in the ‘Lock ID’ column are hexadecimal values used by automation systems that follow a serial protocol. The automation system uses lock IDs as “passwords” to lock and unlock router outputs. You may safely ignore lock IDs.

Column	Description
Locked By Panel	Lists one of three values: 1) the IP address of the panel that locked the output. 2) 'Self' if the output was locked using a control panel attached to the router. 3) 'Serial' if the output was locked by a control system operating over a serial connection.
Panel Online	Indicates, by a check mark, whether the panel that locked an output is connected on the CRSC network.

To change the ordering of the table, click any column header once for ascending order; click the column header again for descending order. The entire table will re-display ordered according to the data in the column you select.

## How to Release Selected Locks

- 1 Go to the 'Lock Maintenance' page.
- 2 Click the 'Select' check box on the rows listing that locks you want to release.  
Or, to release all locks, click **Select All**.  
To deselect locks, clear the 'Select' check box for the lock or click **Select None**.
- 3 Click the **Unlock Selected . . .** button.

After they are unlocked, locks cannot be reapplied through CRSC. Locks are applied at a control panel only.





## Page Features

In the middle of the page is 'Network Frame Summary' in which there are 3 tabbed pages. Use the 'Remote Panels' tab to select a remote panel module (by clicking a radio button). The other two tabs are for information only.

At the top of the page is a check box with which you enable or disable NV9000 mode for the selected remote panel module. Associated with the check box is a field in which you can specify the unit's panel ID (required in NV9000 systems) and another check box in which you can specify whether the panel will have a fixed IP address or whether the NV9000 system will use DHCP<sup>1</sup> to determine its IP address.

At the bottom of the page is a 'Refresh Summary' button. Click this button at any time to be sure that you are viewing the most current information.

The 'Network Frame Summary' presents the following option and information:

Tab	Column	Description
Remote Panels	Edit/Update	Click the radio button on the row displaying the remote panel module you want to convert.
	Name	Name of the remote panel module.
	Frame Type	Type of remote panel module by model number.
	Panel Type	Type of control panel by model number. If the type is unknown, the entry will read "unknown."
	Panel Mode	Either standard, enhanced with hold, or enhanced without hold
	IP Address	IP address currently assigned to the device.
	Identify CP	When you click <b>Identify CP</b> , the control panel mounted on the remote panel module listed on that row identifies itself by displaying a moving pattern of button lights. This feature is helpful if you forget which panel of possibly many is represented by the particular IP address. The moving button lights continue indefinitely. To turn off the pattern, click any button on the panel or click <b>Identify CP</b> again.
Levels	Level	The name and number assigned to the level.

---

1. Dynamic Host Configuration Protocol

Tab	Column	Description
	Signal Type	The signal type of the router to which the level is assigned.
	Router	Router to which the level is assigned.
	Frame Type	Type (model number) of the router to which the level is assigned.
	Router IP	IP address assigned to the router.
	Physical Inputs	The physical start and end points of the level within the router.
	Physical Outputs	
	Controller Sources	I/O numbering in a remote panel might not match the physical I/O numbers of the router. Use these fields to map the router's numbering to the NV9000's numbering.
	Controller Dests	
All CR Frames	Name	Name assigned to the frame.
	Frame Type	Type (model number) of frame.
	IP Address	IP address currently assigned to the frame.
	Subnet Mask	Subnet mask currently assigned to the device.

## Using the Page

### How to Convert a Remote Panel Module

- 1 Go to the 'NV9000 Remote Panel Settings' page.
- 2 In the 'Remote Panel' tab, click the radio button on the row listing the remote panel module to be converted.
- 3 *Check* the 'Enable NV9000 Mode' check box to convert the remote panel module to use with an NV9000 control system.  
*Uncheck* the 'Enable NV9000 Mode' check box to revert the remote panel module to use in a CRSC network.
- 4 If you have enabled NV9000 mode, enter a panel ID in the 'NV9000 Panel ID' field.  
The panel ID must be a number unique within the NV9000 system. It must contain no special characters, spaces, or punctuation marks.  
By default, the panel ID is composed of the last two octets of the module's current IP address. For example, if its IP address is 192.168.97.21, then the default panel ID is 97021.
- 5 If you have enabled NV9000 mode, check the 'Use DHCP to acquire IP Address' check box if you want the NV9000 system to use DHCP to determine the remote panel module's IP address. Otherwise, the panel's IP address will be fixed in the NV9000 system and will retain its present IP address.
- 6 Click **Update Remote Panel** to complete the conversion.



# A Tutorials

Appendix A provides a conceptual background regarding CR Series products and CRSC.

## Summary

<i>Routing Overview</i> .....	109
<i>Remote Panel Operating Modes</i> .....	114
<i>Salvos</i> .....	115
<i>Cabling</i> .....	116
<i>Products</i> .....	124

The following topics are designed for users who are unfamiliar with routing and other aspects of CRSC operation. Each topic covers a specific area of information:

- Networks—CRSC and related devices communicate over a network. To learn more about networks, IP addresses, subnets and related topics, see [Creating a CRSC Network](#), on page 10.
- Routing—An overview of how signals are moved from device to device. This section discusses routers, crosspoints, control panels, signal types, partitions and levels, and router controls. See [Routing Overview](#), on page 109.
- Control Panel Modes—Control panels operate in standard or enhanced mode. To learn about how this affects level selection by operators using the panel, see [Remote Panel Operating Modes](#), on page 114.
- Salvos—Salvos let you pre-program a sequence of takes so that one button press on a control panel performs the entire sequence. See [Salvos](#), on page 115.
- Cabling—Devices, such as routers and control panels, are connected using cables. This section discusses in detail the different cables and connectors used. See [Cabling](#), on page 116.
- Products—See [Products](#), on page 124 for a list of Grass Valley products related to CRSC.

## Routing Overview

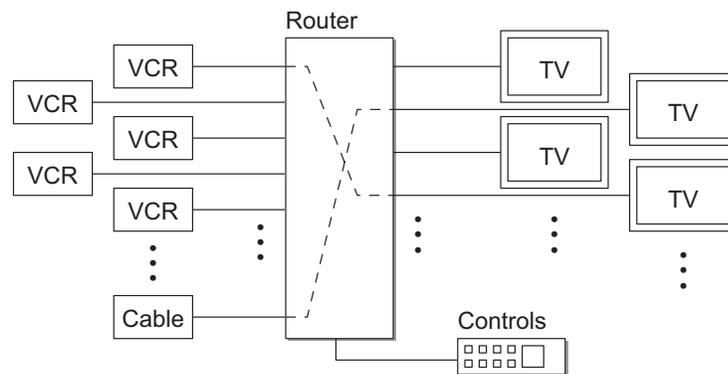
Routing is the movement of signals from one device to another. In general, there are devices that create signals, such as video recorders. These devices send the signals to a router. The router switches the signal from the input to a designated output. Usually routers manage hundreds of incoming and outgoing signals. The output is then sent to another device for distribution, manipulation, and so on. To manage the incoming and outgoing signals, and how they are switched in the router, operators use pre-programmed control panels. Commands from the control panels are sent to the routers telling the routers how to switch the signals.

## What is a Router?

Suppose you have two VCRs and one TV. You want to be able to view a movie from either VCR. So you plug the cable from one VCR into the TV. When you want to use the other VCR, you switch cables. After a while, that gets a little tiresome. Wouldn't it be easier if you had a switch you could flip?

Now suppose you have a dozen TVs and a dozen VCRs plus cable service. You want to be able to direct any program from any VCR or from the cable company to any of the TVs. But how? That is what routers do: direct the content from a number of inputs to selected outputs.

A router is a box (containing electronics) that has a number of input connectors and a number of output connectors. Inside the box are switches that "listen" to a control panel. Pressing buttons on the control panel causes one of the switches to connect one of the inputs to one of the outputs, for example, input 3 to output 12.



You can connect your VCRs to the box's inputs, and your TVs to its outputs, punch a few buttons on its control panel, and everyone can view their programs.

If you have DVD players, it is slightly more complicated: there are several signals for each DVD and you will need a router for each of the different signal types. Further, you might need converters if your TVs are older models that cannot receive DVD input.

CR Series routers and control panels allow you to control and route signals to and from your professional-grade equipment.

CR Series routers and control panels do **not** start, stop, rewind, cue, or fast-forward any device. CR Series routers do **not** perform signal conversion.

## Inside the Router

In concept, at least, a router contains an array of wires. (Physically, it might be different.)

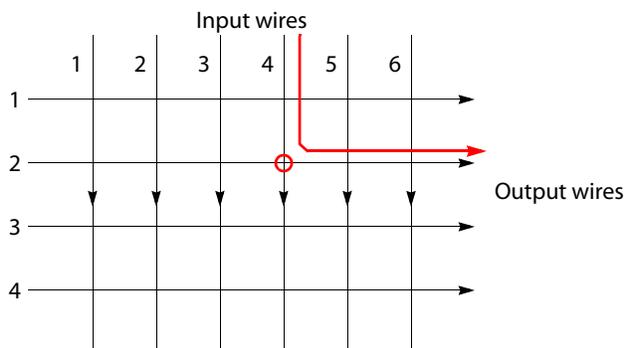


Fig. A-1: A rudimentary switching matrix

If you had the patience and some materials, you could build a simple router. It would be nothing more than a number of wires arranged so they cross over each other. If you pressed two wires together where they cross, a signal could flow (given proper electrical connections) from the input to the output. In Figure A-1, input wire 4 and output wire 2 are connected.

The point where they cross is called a *crosspoint*. The pattern formed by all the points is called a *crosspoint matrix*.

If a matrix has  $N$  inputs and  $M$  outputs, it has  $N \times M$  crosspoints. The  $6 \times 4$  matrix depicted above has 24 crosspoints. By convention, the number on the left represents inputs; the number on the right, outputs.

In a real router, the matrix is an integrated circuit, and the connection between an input and an output is performed electronically (by a transistor or similar circuit).

Some routers also perform signal conditioning at the output of the matrix.

## Sources and Destinations

The signals that routers process come from, and go to, *devices*. "Device" is a generic name for VCRs, DVDs, cameras, video monitors, audio monitors, mixers, video editing workstations, and so on.

A *source* device is one that feeds a signal into a router. The *source* is where the signal originates.

A *destination* device is one that receives a signal from a router. The *destination* is where the signal is going.

## What is a Control Panel?

A control panel is the set of buttons, knobs, switches, etc. that operators use to control a router.

Grass Valley's compact routers and control panels are separate units and more than one router can be controlled from a single panel. This lets you place multiple panels in different rooms. Grass Valley's CR Series control panels were designed for very simple operation.

Control panels, under CRSC, operate in one of 3 modes. For details on panel operation modes, see [Remote Panel Operating Modes](#), on page 114.

## Signals

Many signal sources (and receivers) have several signal types. In the CR Series, routers can switch one or more signal types.

AV	Analog Video or Timecode
AA	Analog Audio or Timecode
AES	Synchronous AES Mono
CR6464-AES	Asynchronous AES <sup>a</sup>
SD	SD Digital Video
HD	HD or SD Digital Video
3Gig	3Gig, HD, or SD Digital Video
PR	Machine Control Reverse

a. Asynchronous AES applies only to the CR6464-AES.

Video signals are classified as digital (i.e., 3Gig, HD, SD) or analog. Audio signals are classified as digital or analog and also stereo or mono. For compact routers, digital audio is AES3id (AES for short). There are several different digital video formats and two analog video formats. Video signals might or might not also carry audio signals. Audio carried in a video signal is called *embedded* audio. Digital video can embed (carry) up to 16 individual AES audio channels.

Analog signals are not directly compatible with digital signals, but devices that convert one to the other are available.

The different digital formats are also not compatible, but an HD router will also route SD signals and a 3Gig router will also route HD and SD signals. Most video monitors recognize several different formats and adjust themselves to display the format they receive. See [Digital Video Routers](#), on page 132 and [Digital Audio Routers](#), on page 136 for more information.

### A Note About AES Signal Types

AES matrices are different from other matrices. AES signals are numbered as stereo pairs. A 16×16 AES router has a 32×32 matrix. A 32×32 AES router has a 64×64 matrix.

If the AES router detects a video reference signal, the router operates in *synchronous* mode. Otherwise, it operates in *asynchronous* mode.

- Asynchronous Mode

In asynchronous mode, AES ‘takes’ occur in “stereo” pairs only. AES channels 1 and 2 are a pair, 3 and 4 are a pair, and so on. For example, you can take input pair (1,2) to output pair (5,6).

You cannot choose (even, odd) pairs. For instance, you cannot take (2,3) to any output. You cannot take any input to an (even, odd) output.

- Synchronous Mode

When an AES router is in synchronous mode (i.e., it has a valid video reference signal), the router’s level type is ‘Synchronous AES Mono’.

AES 'takes' in a "mono" partition are not paired. Each AES channel is independent. The 16×16 router has 32 independent inputs and 32 independent outputs. The 32×32 router has 64 independent inputs and 64 independent outputs.

---

**Note:**

The same level type (Synchronous AES Mono) appears whether the router is in asynchronous mode or synchronous mode.

---

When an AES router is in synchronous mode, the video reference type appears in the 'Reference' column of the 'Routers' tab of the 'View Router Crosspoints' page (See [Router Crosspoints Page](#), on page 73). If the router is in asynchronous mode, the word 'None' appears in that **column**.

### A Note About Machine Control Signals

Machine control routers operate in "machine control reverse" mode. "Machine control reverse" means that the destination device is the controlling device (as opposed to the controlled device).

Machine control signals operate according to a serial communications protocol called RS-422 (or EIA-422). Typically, control signals originate in an editing machine which sends commands to playback devices. Commands include "rewind," "skip to a certain frame," "stop," and so on.

A machine control signal is *bidirectional*, unlike video or audio. There is a command in one direction and a response in the reverse direction. Each end of the connection is therefore both an input and an output. Machine control routers are *point-to-point*. When a machine control signal connection is made, any prior connections of its input or output are first broken.)

Video, audio, and data signals flow continuously in a stream. Control signals occur asynchronously and intermittently. See [Machine Control Routers Page](#), on page 39

## Partitions and Levels

A router may be considered a switching matrix and that matrix can be partitioned into smaller regions. The regions for doing so are many and varied. Partitions are boundaries that organize switching.

A level is the name given to a signal type. Because each CR Series router offers a single signal type, the term level is often equivalent to the term router. If a router has more than one partition, the term level is equivalent to a router partition. And even if the router has only one partition, we say that the level is equivalent to that single partition.

---

**Note:** Partitions and levels do not apply to CQX routers.

---

Signals are switched within a partition, not between partitions. Inputs can be switched only to outputs contained in the same partition. Every router must contain at least one partition.

Router partitions can overlap.

In CRSC, a level is defined (1) when you create a router partition or (2) when you add a router to your network. CRSC allows you to define up to 8 levels in a single subnet or up to 4 levels per router, with up to 4 routers in a subnet.

## Router Control

Large routers usually require large router control systems (such as Grass Valley's NV9000).

A CRSC network can function efficiently with no external control system. The "intelligence" of a CRSC network resides in the remote panel module(s) in the network. Thus, a CRSC network, by definition, includes at least one remote panel.

A CRSC network provides operators 3 capabilities:

- Performing multi-level 'takes' with or without breakaway.
- Locking or unlocking one or more destinations (or locking and unlocking panels).
- Executing salvos.

The operator performs all operations by pressing buttons on a remote panel. The panel's buttons reflect the state of the routers using different colors and levels of brightness.

Routers are passive; they switch when commanded. Control panels are also passive—they are no more complex than are keyboards and displays. It is the remote panel module that performs the network's control functions.

## Remote Panel Operating Modes

Remote panels operate in different modes. There are 3 panel modes:

- Standard.
- Enhanced, with hold.
- Enhanced, without hold.

They differ chiefly in the use of level selection buttons.

---

Note: Panel modes do not apply to CQX panels.

---

## Standard Mode

Level selection is persistent and at the discretion of the panel operator. Once the operator makes a level selection (manually), it remains until the operator next changes the selection.

The current level selection enables some sources and destinations and disables others. The sources and destinations that are enabled depend on which level button has precedence.

If no levels are selected, no sources or destinations are enabled. A take cannot occur.

However, if the panel has no level buttons, all destinations' levels are always selected and all destinations are enabled.

Which level button has precedence depends on the order of level buttons on the panel and the order in which the operator presses the level buttons.

Standard mode allows breakaway. To determine what sources are routed to a destination might require a few button presses. Clearing a breakaway is relatively simple. For general information on panel operation, see [Operation](#), on page 145.

For detailed information, see the *CR Series User's Guide*.

## Enhanced Mode

Level selection is applicable to breakaway and only to breakaway. Level selection governs the selection of sources for the breakaway.

All sources and destinations are always enabled.

Enhanced mode has 2 submodes: hold and no-hold.

- Hold mode: the level selection persists (after the destination button press) until you change it. This allows you to try different sources.  
(Clear a breakaway by starting a new normal take to that destination.)
- No-hold mode: a level selection reverts to the levels defined by the destination after you press a source button.  
(Clear a breakaway by either starting a new normal take to that destination or just pressing a source without a level selection.)

The choice between hold mode and no-hold mode is meant to accommodate operator preferences. There is no functional difference between these two submodes. For general information on panel operation, see [Operation](#), on page 145.

For detailed information, see the *CR Series Compact Router User's Guide*.

## Salvos

A “salvo” is a stored list of simple takes that execute, at a button press, in rapid sequence. Salvos are usually created to carry out commonly repeated tasks.

When an operator presses a salvo button on a panel, the salvo button lights turn bright during the salvo execution and returns to dim at completion.

A simple take is defined by a level, an input, and an output. The input is taken to the output in the specified level. The (level, input, output) triple uniquely defines a crosspoint in the set of routers and router levels you have.

---

Salvos do not apply to CQX panels.

---

For control panels other than the CP32-6464, CP6401, or CP6464, a salvo can include up to 32 simple ‘takes’ and a panel configuration can have up to 32 individual salvo buttons.

For the CP32-6464, CP6401, or CP6464, which can control the 64×64 matrices of CR6400 routers, a salvo can include up to 64 simple ‘takes’ and a panel configuration can have up to 64 individual salvo buttons, subject to a total of 1024 simple takes.

Each panel can have a different set of salvos.

Salvos do **not** execute source selections, destination selections, or level selection functions.

Salvos do **not** execute other salvos. (That is, salvos cannot be nested.)

Salvos do **not** contain loops or branches.

If multiple salvos execute simultaneously (on different panels), it is likely that their effects will be in conflict. There is an exception: if two or more salvos have no outputs in common, they can safely run at the same time — from different panels. (Their inputs can overlap

without ill effect.) It is not possible to execute multiple salvos simultaneously from a single panel.

If a salvo attempts an impossible take (one on a non-existent level, or one that uses non-existent ports) it will try the take and wait for a response 5 times before proceeding. Thus, salvos that have errors will take noticeably longer to execute than salvos without errors. A salvo without errors should take only a small fraction of a second to execute. Under normal conditions, a typical salvo executes in a few milliseconds.

Salvos are not affected by the state of level buttons.

## Cabling

Compact routers and control panels are professional- or industrial-grade products. Although they are small and relatively inexpensive, they are actually designed to be used in broadcast systems and professional video editing. They can also be used in conference rooms, digital cinemas, and other facilities.

Routers and control panels are just one part of a system that may include DVDs, VTRs, Monitors, A/D converters, D/A converters, and so on. To connect all these devices you will need cables and connectors. Whatever your application, it requires high-quality cables of various kinds and certain tools to prepare cables of the right length.

### Cable Types

There are many cable types. In a compact router system, cables differ primarily by connector type. Most of Grass Valley's compact routers have BNC connectors.

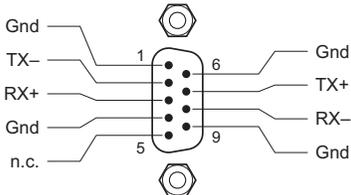
Length limits are as follows:

- SD—Belden 1694A, BNC, up to 350 m at 270 MB/s (1312 feet)
- HD—Belden 1694A, BNC, up to 150 m at 1.485 GB/s (492 feet)
- 3Gig—Belden 1694A, BNC, up to 100 m at 2.97 GB/s (328 feet)
- AV—Belden 8281, BNC connectors, up to 1000 feet.
- AA—Belden 8451, DB25 connectors (each supports 8 shielded twisted pairs), to 1000 feet. See [DB25 Connectors](#), on page 117. Grass Valley's WC0053 breakout cable can be useful with DB25 connectors.
- Machine control—RJ-45 connectors, cable length to 100 m with high-quality cable. machine control routers often connect to machines (VTRs, for example) that have DE9 serial connectors. If that is your case, you will have to fabricate a DE9-to-RJ45 cable. (Grass Valley's BP-PORT-64 breakout panel can be of some use here.) See [RJ-45 Connectors](#), on page 118.
- Ethernet—RJ-45 connectors, cable length to 100 m with CAT5 or CAT6 cable. Beyond 100 m, you will probably experience some packet loss or degradation in speed.

# Connectors

## Serial Connector

The automation connector for all CR Series routers and remote panel modules has this pinout:

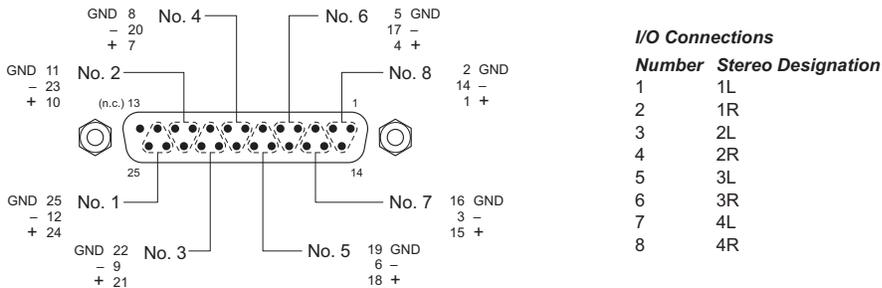


The connector is RS-485, but can be used as RS-422.

Customers who want to operate the router through an automation system may contact Grass Valley technical support for information.

## DB25 Connectors

The analog audio routers use DB25 connectors. Each connector supports 8 inputs (or outputs):



For 16x16 routers, the connectors provide inputs (or outputs) 1–8, 9–16, 17–24, and 25–32, respectively, and are labelled that way on the rear of the router. Inputs (and outputs) are treated as 16 stereo pairs.

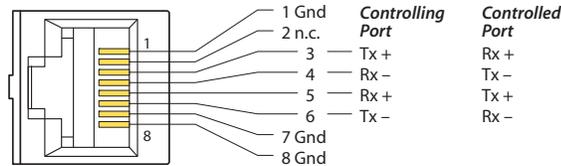
For 32x32 routers, the connectors provide inputs (or outputs) 1–8, 9–16, 17–24, 25–32, 33–40, 41–48, 49–56, and 57–64, respectively, and are labelled that way on the rear of the router. Inputs (and outputs) are treated as 32 stereo pairs.

For 32x4 routers, the connectors provide inputs 1–8, 9–16, 17–24, 25–32, 33–40, 41–48, 49–56, and 57–64, respectively. The inputs and outputs are labelled accordingly. The inputs are treated as 32 stereo pairs. The single output connector provides outputs 1–8 (4 stereo pairs). The inputs and outputs are labelled accordingly.

You can use Grass Valley's WC0053 breakout cable with DB25 connectors.

## RJ-45 Connectors

All machine control ports are serial, RS-422, operating at up to 1 MB/s. The interface is RJ-45. Each port has the following pinout:



A port can be configured as “controlling” or “controlled” or variants (dynamic, master, slave). That is, the definition of the port can be reversed (Tx becomes Rx and vice versa) either during configuration or during operation.

## Making Connections

When making connections, you will (1) decide which router inputs and outputs to use for each of your devices and (2) need to remember what you decided. It is strongly recommended that you create and maintain lists of all connections.

Your decisions will be based in part on the button layouts of the control panels you have in your system. Keep in mind that salvos (and salvo buttons) can effect rapid changes that otherwise might require too much thought or activity from a human operator.

If you have only a few destination devices or just one, you can use a control panels with fewer buttons (such as the CP1602, CP3204, CP3201, or CP6401).

## Sample Configuration

Here is a sample cabling configuration. It illustrates some of the issues often encountered during system configuration. This example is for illustration only and is not in any way endorsed by Grass Valley. The equipment described is theoretical and fictitious.

### Equipment

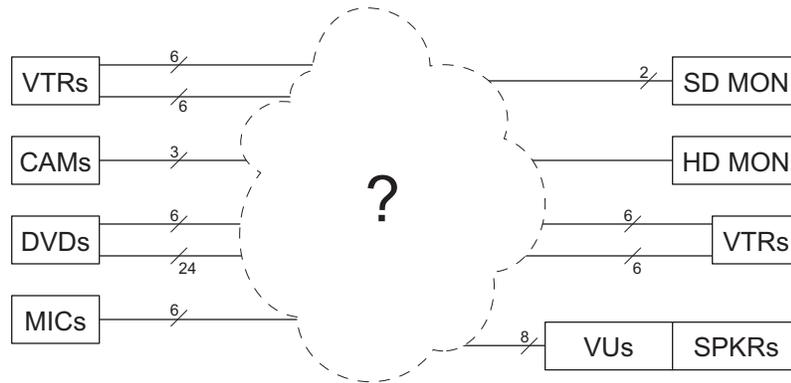
You have 6 VTRs that play, and record, SD and AES 1/2.

You have 2 SD cameras and 1 HD camera and with the cameras are (pairs of) microphones that produce analog audio (stereo).

You have 6 DVD players that produce HD and AES 1/2, 3/4, and 5/6 as Dolby 5.1 output, and produce AES 7/8 as a stereo mix-down of the Dolby. (The DVDs do not record.)

You have 2 SD monitors and 1 HD monitor. You have analog audio speakers (6 set up for Dolby, and 2 as stereo) and perhaps a set of VU meters.

You want to direct any video/audio source to any monitor or to any VTR.



How can it be done?

### Analysis

Sources	Destinations
8 SD	8 SD
4 AA (3 mic pairs + silence)	2 HD
8 HD	11 AES
14 AES 1/2	1 AA (mic out)
6 AES 3/4	
6 AES 5/6	
6 AES 7/8	

Totals:

video in = 16, video out = 10

AES in = 32, AES out = 11 (6 AES 1/2 to the VTRs, 3 Dolby + 1 stereo to the D/A, 1 "DDD")

AA in = 3 mic + 1 silence), AA out = 1 (mic out to AES mic in)

The system needs these routers:

CR1616-HD (handling both HD and SD)

CR3232-AES

CR1604-AA

Additional equipment to be purchased:

1 HD-to-SD down-converter (DVD to VTR)

1 analog-to-AES audio converter for mics

4 AES-to-analog converters (4 AES in, 4 analog pairs out) for speakers/VU

As far as panels are concerned, there are 16 sources and 10 destinations. The DVD output uses the 6 Dolby speakers/VUs. The VTR outputs use the 2 stereo speakers/VUs. The VUs and speakers are on the same circuit. The operator can adjust the speaker levels.

Therefore, a CP1616 is sufficient.

The speakers are all analog (and so are the VUs) so the AES outputs will require D/A conversion. The mics require AA to AES conversion. To record the HD of the DVD to a VTR requires (at least) one down-conversion channel.

## Partitioning

### HD router:

8 SD, 8 HD in, 8 SD out, 2 HD out

Put the 8 SD in & out on the left and the remaining (HD) devices on the right. Could partition the router into 2 levels but that creates an extra level for nothing.

Result one combined SD/HD level. (SD gets routed as SD, HD gets routed as HD.)  
Level name = 'SD/HD'

### AES router:

12 AES 1/2 in, 6 each AES 3/4, 5/6, 7/8 in, Mic in, DDS (32 in all)  
14 out (6 AES 1/2, 4 for speakers, 1 DDD)

The HD with Dolby requires 4 levels: AES12, AES34, AES56, AESLR. Let the SD with just AES 1/2 use the level named AESLR.

Partitions: AES12 = in 1–6, out 1; AES34 = in 7–12, out 2; AES56 = in 13–18, out 3;  
AESLR = in 19–32, out 4-32

Total now 5 levels.

### AA router:

In 4 pairs (3 mics + silence)

Out (1 pair to A/D to AES mic in)

---

#### Note:

Note the clusters of I/O on the DB25s. 1-8, 9-16, 17-24, 25-32. They are labeled as if mono, but in fact are switched in stereo pairs.

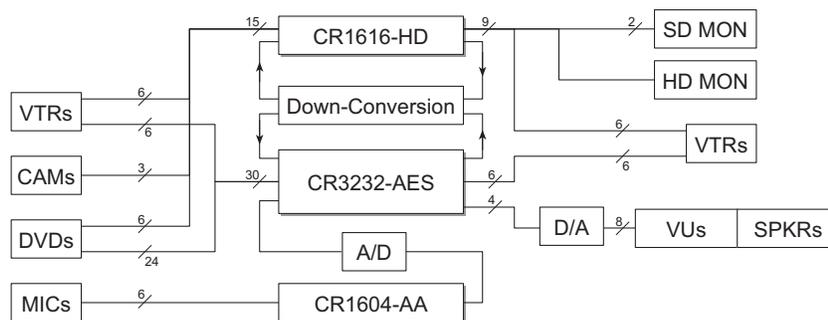
---

Put the 3 mic pairs on the first DB25 input. The mic out goes on the first DB25 output.

Levels: one additional level ('AA'). The total is now 6 levels.

(So we could have that additional HD/SD level split if it desired. Could also add another AES level if desired.)

Here's the resulting block diagram:



Here is the breakdown for the panel:

Device	Src	Dst	Panel Buttons	Connectors
VTR1	1	1	1, 17	HD in1, out1; AES in25, out25
VTR2	2	2	2, 18	HD in2, out2; AES in26, out26
VTR3	3	3	3, 19	HD in3, out3; AES in27, out27
VTR4	4	4	4, 20	HD in4, out4; AES in28, out28
VTR5	5	5	5, 21	HD in5, out5; AES in29, out29
VTR6	6	6	6, 22	HD in6, out6; AES in30, out30
CAM1	7	—	7	HD in7, AES in31 (mic in)
CAM2	8	—	8	HD in8, AES in31 (mic in)
CAM3	9	—	9	HD in9, AES in31 (mic in)
DVD1	10	—	10	HD in10; AES in 1, 7, 13, 19
DVD2	11	—	11	HD in11; AES in 2, 8, 14, 20
DVD3	12	—	12	HD in12; AES in 3, 9, 15, 21
DVD4	13	—	13	HD in13; AES in 4, 10, 16, 22
DVD5	14	—	14	HD in14; AES in 5, 11, 17, 23
DVD6	15	—	15	HD in15; AES in 6, 12, 18, 24
SDMON1	—	7	23	HD out7, AES out 4
SDMON2	—	8	24	HD out8, AES out 4
HDMON	—	9	25	HD out9, AES out 1–3
MIC1	—	—	(salvo1)	AA in 1,2
MIC2	—	—	(salvo2)	AA in 3,4
MIC3	—	—	(salvo3)	AA in 5,6
MUTE	—	—	(salvo4)	AA in 7,8 (silence)
MICout	—	—	—	AA out 1,2
MICin	—	—	—	AES in 31
DDS	16	—	—	HD in 16, AES in 32
DDD	—	—	32	HD out 16, AES out 32
Level buttons				
SD/HD			26	
AES12			27	
AES34			27	
AES56			28	
AESLR			30	
AA			31 (not essential)	

AES 1/2 is considered (L,R) stereo and so is Dolby 7/8. Therefore the level AESLR represents both.

Please refer to the [Cabling Diagram](#), on page 122.

## Operational Considerations

You can view HD sources on the HD monitor and SD sources on the SD monitors.

You can take SD CAM or VTR to any VTR.

The DVDs do not record. Take DVD to VTR in two 'takes': DVD to DDD; DDS to VTR. Between DDD and DDS is a down-converter. There might be a video frame delay (with loss of sync with audio). To perform a take:

- 1 Press DDD. 2 Press a DVD. 3 Press a VTR (dest). 4 Press DDS.

The HD CAM would have to go through DDD/DDS as well to reach a VTR.

There are 3 salvos that select microphone (pairs). Pressing a Camera source gets whichever microphone pair you've selected. Mic input is converted to AES.

Each salvo contains one take: (level = AA, input = 1, 2, or 3 as required, output = 1).

You can record to VTR but to view/hear the source on the monitors requires an additional take.

A take (or a double take) does not start, stop, rewind, or cue any media. That you have to do on your own.

Cameras and microphones are assumed to be on at all times. They are not playback devices and there is no stop, start, rewind, etc. for these devices.

The level buttons are not really necessary—except for those times an operator wants a breakaway. AA is for the microphones only so its level button could be omitted from the buttons.

The AA router is under-utilized. It is needed because (1) there is only one ADC channel and (2) there is only one AES input left because of all the DVDs in the system. Take one DVD out and you've got 4 additional AES inputs that could put the mics (through ADCs) directly into the AES router. Then you wouldn't need the AA router.

There is only one (expensive) down-converter channel. So any DVD input routed to a VTR (HD-to-SD down conversion) must go through it. Thus there is one destination (DDD) and one source port (DDS) for the purpose.

The "mute" salvo works by routing silence to the AES MIC input. The mute does not silence other AES inputs. A breakaway to silence could do that. The silence is actually low-level noise and not complete silence. If you ground the mute inputs, you'll get complete silence.

### **Cabling Diagram**

The diagram is on the next page. It shows the I/O connections of all routers in the cabling example and the button assignments for the CP1616 panel used.



## Products

The CR Series includes a wide variety of routers and panels. This section provides an overview of all CR Series products. For more details about any product, refer to the device's documentation or contact Grass Valley.

### Summary

CRSC products include 1RU and 2RU routers, control panels, and "remote panel modules." The CRSC includes video and audio routers in several formats, and machine control routers. These are the 1RU compact routers and matching control panels:

1RU Routers		Corresponding 1RU Control Panel	
CR0808-3Gig CR0808-HD CR0808-SD CR0808-AES	8x8, "3Gig" digital video 8x8, HD digital video 8x8, SD digital video 8x8, AES3id digital audio	CP0808	8x8, with 6 function buttons
CR0808-HD-NR CR0808-SD-NR	8x8, HD video, non-reclocking 8x8, SD video, non-reclocking		
CR0808-AA CR0808-AV	8x8, analog audio 8x8, analog video		
CR1616-3Gig CR1616-HD CR1616-SD CR1616-AES	16x16, "3Gig" digital video 16x16, HD digital video 16x16, SD digital video 16x16, AES3id digital audio	CP1616	16x16, with 6 function buttons
CR16-PR	16-port machine control		
CR1616-HD-NR CR1616-SD-NR	16x16, HD video, non-reclocking 16x16, SD video, non-reclocking		
CR1616-AA CR1616-AV	16x16, analog audio 16x16, analog video		
CR1604-3Gig CR1604-HD CR1604-SD CR1604-AES	16x4, "3Gig" digital video 16x4, HD digital video 16x4, SD digital video 16x4, AES3id digital audio	CP1604 CP1602	16x4, with 6 function buttons 16x2, with 6 function buttons
CR1604-HD-NR CR1604-SD-NR	16x4, HD video, non-reclocking 16x4, SD video, non-reclocking		
CR1604-AA CR1604-AV	16x4, analog audio 16x4, analog video		
CR1602-3Gig-CQX CR1602-HD-CQX CR1602-SD-CQX	16x2, HD digital video 16x2, SD digital video	CP1602-CQX	16x8, with 4 transition type buttons, 3 transition rate buttons, and 7 function buttons

These are the 2RU compact routers and matching control panels:

2RU Routers		Corresponding 2RU Control Panel	
CR3232-3Gig CR3232-HD CR3232-SD CR3232-AES	32x32, "3Gig" digital video 32x32, HD digital video 32x32, SD digital video 32x32, AES3id digital audio	CP3232	32x32, with 12 function buttons
CR32-PR	32-port machine control		
CR3232-HD-NR CR3232-SD-NR	32x32, HD video, non-reclocking 32x32, SD video, non-reclocking		
CR3232-AA CR3232-AV	32x32, analog audio 32x32, analog video		
CR3204-3Gig CR3204-HD CR3204-SD CR3204-AES	32x4, "3Gig" digital video 32x4, HD digital video 32x4, SD digital video 32x4, AES3id digital audio		
CR3204-HD-NR CR3204-SD-NR	32x4, HD video, non-reclocking 32x4, SD video, non-reclocking	CP3204	32x4, with 12 function buttons
CR3204-AA CR3204-AV	32x4, analog audio 32x4, analog video		
CR6464-3Gig CR6464-AES	64x64 video router 64x64 AES3id router		

The CP3201 (a 1 RU panel) is special case not listed in the tables above: it controls 32 sources and 1 destination. It does not "correspond" to any router and is used only in a CRSC network. (See [Ethernet Settings Page](#), on page 25.)

Remote Panel Modules		Corresponding Control Panel	
RP16	1RU	CP1616, CP1604, CP1602, CP1602-CQX, CP3201	16x16, 16x4, 16x2, with 6 function buttons. (The CP3201 is a 1RU panel.)
RP32	2RU	CP3232, CP3204, CP6464	32x32, 32x4, 64x64 with 12 function buttons.

## Routers

The 16x16 routers can switch any of 16 inputs to any of 16 outputs and the 32x32 routers can switch any of 32 inputs to any of 32 outputs. The 8x8 routers switch 8 inputs to 8 outputs. The 16x4 routers switch 16 inputs to 4 outputs. The 32x4 routers switch 32 inputs to 4 outputs.

The 64x64 routers can switch any of 64 inputs to any of 64 outputs.

With the exception of the machine control routers (CR16-PR and CR32-PR), all the compact routers are X/Y routers having  $n \times m$  crosspoint matrices. An input can be routed to any or all of the outputs.

The machine control routers (also called *port routers*) are point-to-point routers. An input can be connected to at most one output. (The connections are RS-422 and bidirectional, typically with commands in one direction and responses in the other direction.)

### CQX Routers

Each of the 3 CQX (“clean and quiet”) routers routes any of 16 inputs to 2 “clean and quiet” outputs or to 6 auxiliary (normal) outputs. For the clean and quiet outputs, the router performs smooth transitions. The transitions are governed by transition type and transition rate, selectable on the CP1602-CQX control panel. The CQX routers also provide 2 bypass inputs. The 2 clean and quiet outputs switch to the bypass inputs if the router loses power. There are no 2RU clean and quiet routers at present. The CQX routers also provide a GPIO connector, supporting 16 inputs and 4 outputs. The inputs each select one of the video inputs for CQ output 1 and the outputs signal alarms and status.

### CR6400 Family

The CR6400 routers are 2RU routers of modular construction. They have removable control cards, crosspoint cards, and a removable fan tray. Because they are removable, they are field-replaceable. Each router has 4 removable I/O cards. If a router is populated with one or more AES cards, it is considered a CR6464-AES. If a router is populated with one or more 3Gig cards, it is considered a CR6464-3Gig. If a router has no I/O cards, it is considered “undefined.”

The CR6400 routers switch a 64×64 matrix.

## Control Panels

A control panel mounts on the front of a router or on the front of a remote panel module and provides direct visual and tactile control of the router or routers connected to the remote panel module. (You can install or uninstall one easily in a few seconds.) However, any of the routers can also operate without a control panel, under network control or through automation.

The CP3201 is special case: it is a 1 RU panel that controls 32 sources and 1 destination. It does not mount on the front of a router and is used only in a CRSC network.

The CP1602-CQX is also a special case: it is a 1RU control panel used in conjunction with any of the 3 CQX routers. This panel has 16 source buttons, 2 “clean and quiet” destination buttons, 6 auxiliary destination buttons, 4 transition type buttons, 3 transition rate buttons, and 7 function buttons.

The CP6464 is the control panel that is generally used with the CR6400 routers.

## Remote Panel Modules

A “remote panel module” is a device that sends control messages to a network of routers (and receives status messages from the routers in the network). A remote panel module receives take and lock commands from an attached control panel and must have a control panel attached to be useful. We say the panel module is “remote” because it and its control panel can be located apart from the routers (from a few inches to several hundred meters, subject to cable limitations).

A remote panel module can be configured to operate (with its mounted control panel) as either (1) a CRSC panel or (2) an NV9000 panel in a system controlled by an NV9000 family router control system. When it is set up for use as a control panel, it is configured in CRSC. When it is set up for use as an NV9000 panel, it must be configured in NV9000-SE Utilities.

## Usage

There are several different ways to use compact routers:

- A single stand-alone router with a “captive” control panel or with automation.
- A network of stand-alone routers, possibly with remote panels, possibly with captive panels, and with or without automation.
- A single stand-alone CR6400 router with a “captive” control panel or with automation.
- A network of stand-alone CR6400 routers, possibly with remote panels, possibly with captive panels, and with or without automation.
- A CRSC network of routers and remote panels with or without automation. Here, the panels and routers are configured using CRSC.
- A network of routers under an NV9000 family router control system.
- A single stand-alone CQX router with a “captive” CQX control panel or with automation.
- A CQX router with a remote CQX control panel.

A captive panel is one attached directly to a router. A remote panel is one mounted on a remote panel module.

Automation is a topic left to the customer.

Routers and remote panel modules come from the factory ready for stand-alone operation. They must be configured for use either in a CRSC network or in an NV9000 network. Once configured, they must be reset to work in stand-alone mode.

A remote panel module must be configured to work either in a CRSC network or in an NV9000 network. The two configuration modes are not compatible.

### Stand-Alone Operation

Figure A-3 compares a stand-alone router with a captive panel to a stand-alone router network with remote panel modules:

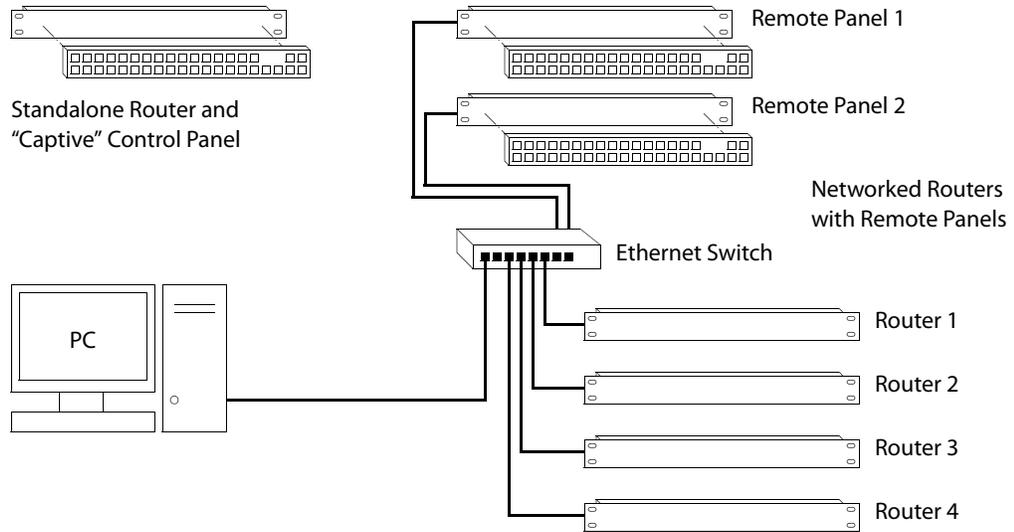


Fig. A-3: Standalone Router vs. a Network of Routers

### CRSC Operation

A CRSC network has the same topology as a stand-alone network, except (1) the routers and remote panel modules have been configured under CRSC which provides a more elegant solution to system design.

CRSC networks also support a mix of CR6400 routers and other CR Series routers.

### NV9000 Operation

Figure A-4 shows a sample NV9000 network, one of several possible topologies:

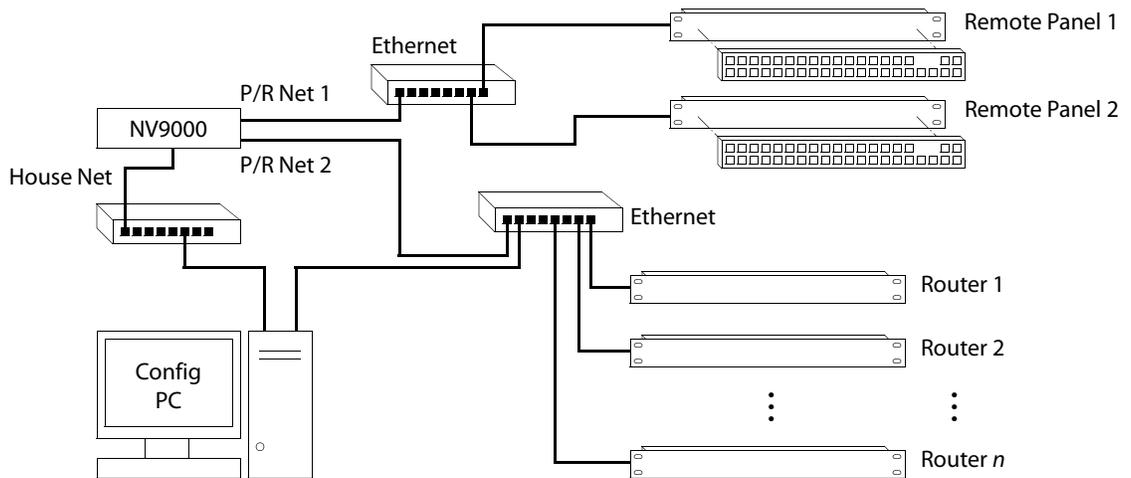


Fig. A-4: NV9000 Network of Routers

An NV9000 network supports a larger number of routers. Commands issue from the remote panels to the NV9000 which then dispatches the instructions to the routers. The routers return status to the NV9000 which in turn relays the status to the remote panels.

CR Series routers can be used with a NV9000 family router control system. These router control systems extend the capabilities of the compact routers.

An NV9000 network is constructed and operated according to the requirements of the NV9000 router control system. Configuration and control of the routers is entirely within the scope of NV9000-SE Utilities, although you can use CRSC to designate IP addresses. See [Ethernet Settings Page](#), on page 25.

### CQX Usage

Figure A-5 shows the ways a “clean and quiet” router can be connected:

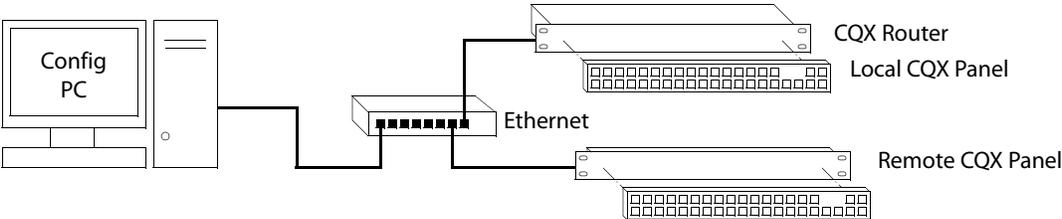


Fig. A-5: CQX Network

At present, the CQX connections are limited. One CQX router with a local (or captive) CQX panel or a remote CQX panel can exist on any subnet. (You can have more than one subnet, however.)

At present there is little to configure other than the IP address of the router or the remote panel module. (You must also specify that the remote panel module supports a CP1602-CQX. See [Using the Remote Panels Page](#), on page 52.)

### Standalone CR6400 Usage

A stand-alone network of CR6400 routers functions well with CP6464 panels. Up to 4 CR6400 routers may be controlled with a single CP6464.

Although you can mix other types of routers and panels with the CR6400 routers, they will probably not function well. Therefore we do not recommend mixing router types.

Figure A-3 compares a stand-alone router with a captive panel to a stand-alone router network with remote panel modules:

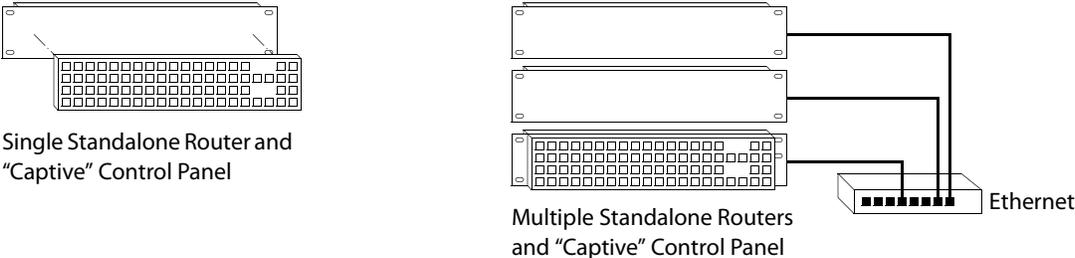


Fig. A-6: CR6400 Usage

It is in a CRSC network that you can mix CR6400 routers and other router types without problems.

## The Routers

The routers are slim (35–57 mm or 1.38”–2.25”) and mechanically similar, differing principally in the number and type of connectors. The fronts of all the 1RU routers are the same except for their legends and the fronts of all the 2RU routers are the same except for their legends.

The 3Gig, HD, SD, AES, and analog video routers have BNC connectors. The analog audio routers have DB25 connectors (and fans). The machine control routers have RJ-45 connectors.

Figures A-7 through A-19 show front and rear views of the routers.



Fig. A-7: Front View of the CR1616-SD Digital Video Router



Fig. A-8: Rear View of the 16x16 3Gig, HD, SD, or AES Routers

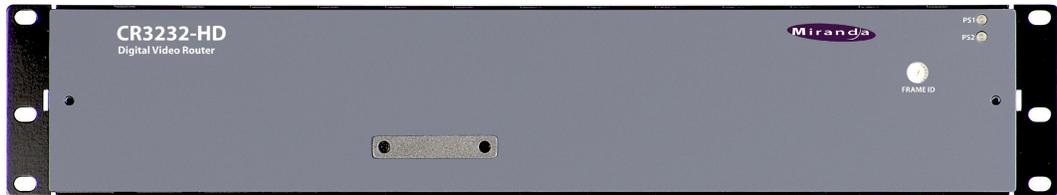


Fig. A-9: Front View of the CR3232-HD Digital Video Router



Fig. A-10: Front View of the CR6400 Digital Router



Fig. A-11: Rear View of the 32x32 3Gig, HD, SD, or AES Routers



Fig. A-12: Rear View of the CR1616-AV Analog Video Router

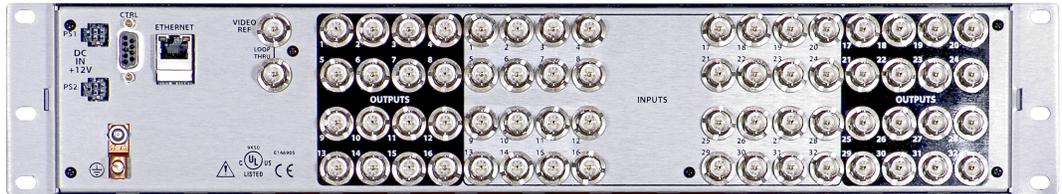


Fig. A-13: Rear View of the CR3232-AV Analog Video Router



Fig. A-14: Rear View of the CR1616-AA Analog Audio Router



Fig. A-15: Rear View of the CR3232-AA Analog Audio Router



Fig. A-16: Rear View of the CR16-PR Machine Control Router



Fig. A-17: Rear View of the CR32-PR Machine Control Router



Fig. A-18: Rear View of the 16x2 COX Routers (3Gig, HD, or SD)



Fig. A-19: Rear View of a CR6400 Router (CR6464-3Gig)

Some routers (e.g., the CR3204-AA or the CR0808-3Gig) have fewer input or output connectors than shown here.

All compact routers save their state in non-volatile memory. Thus, if a power loss occurs, a router can recover almost instantly. All compact routers require a few seconds to initialize.

All compact routers have an automation port (DE9, RS-422 or RS-485).

All routers except machine control routers accept these video reference rates:

Composite	HD Tri-level		
525i / 59.94 (NTSC)	720p / 23.98	1080i / 47.95	1080p / 23.98
	720p / 24	1080i / 48	1080p / 24
625i / 50 (PAL)	720p / 25	1080i / 50	1080p / 25
	720p / 29.97	1080i / 59.94	1080p / 29.97
	720p / 30	1080i / 60	1080p / 30
	720p / 50		1080p / 50
	720p / 59.94		1080p / 59.94
	720p / 60		1080p / 60

The machine control routers do not receive video reference signals.

The CQX routers accept the same video reference rates.

The video format received must be compatible with the video reference applied.

### Digital Video Routers

(See [CQX Video Routers](#), following, for a discussion of the CQX routers.)

The 1RU digital video routers have 16x16, 16x4, or 8x8 crosspoint matrices, depending on the model. The 2RU digital video routers have either 32x32 or 32x4 crosspoint matrices.

Figure A-20 shows a simplified view of the digital video router:

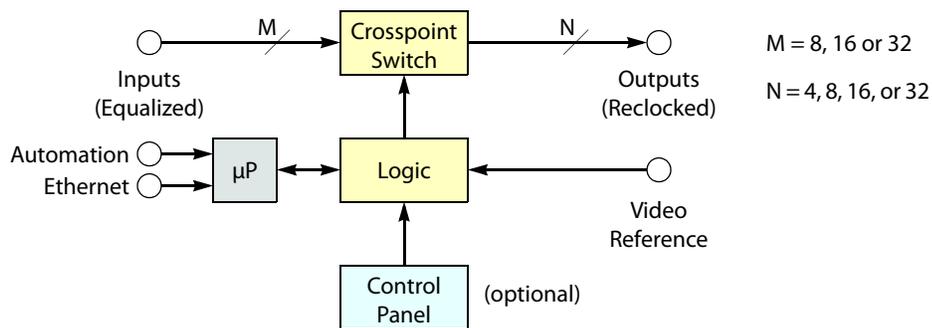


Fig. A-20: Block Diagram of the Digital Video Router

The video routers perform input equalization and, except for the -NR models, perform reclocking of outputs. The -NR models do not perform reclocking. Router outputs are switched in sync with an external video reference if it is present.

All digital video routers accept bi-level or tri-level video references (sync) and switch according to SMPTE RP168-2002.

### 3Gig Video Routers

All of the "3Gig" routers support 2.966 Gb/s, and 2.97 Gb/s video rates as well as a number of HD bit rates and formats. The 3Gig routers reclock at 270 Mb/s, 1.483 Gb/s, 1.485 Gb/s, 2.966 Gb/s, and 2.97 Gb/s. The 3Gig routers bypass re-clocking for other rates. Video references must be nominally 800 mV p-p and bi-level or tri-level in nature.

### HD Video Routers

All of the "HD" routers are SWB (super wide band) routers: they support a wide range of SD and HD bit rates and formats, from 10 Mbps to 1.5 Gbps. With the exception of the -NR routers, the HD routers reclock at 143, 177, 270, 360, and 540 Mb/s and 1.483 and 1.485 Gb/s and bypass re-clocking for other rates. Video references must be nominally 800 mV p-p and bi-level or tri-level in nature. The HD routers support DVB-ASI signals.

### SD Video Routers

All of the "SD" routers support a wide range of SD serial data rates from 10 Mb/s to 540 MB/s. With the exception of the -NR routers, the SD routers reclock at 143, 177, 270, 360, and 540 Mb/s. The SD routers support DVB-ASI signals.

### NR Video Routers

The HD and SD routers are available in non-reclocking models, such as the CR1616-HD-NR and CR3204-SD-NR. These models are less expensive than the models that have reclocking circuitry and work well with relatively noise-free signals. The reclocking models give better performance in noisy environments.

### CQX Video Routers

These 1RU "clean and quiet" video routers switch 16 inputs to 2 "clean and quiet" outputs and 6 auxiliary outputs.

The CQX routers have two crosspoint matrices. The first crosspoint routes 16 normal inputs either to an internal mixer or to the second crosspoint matrix.

The mixer has 2 channels. Each channel mixes two inputs and produces an internal "clean" output. One of the inputs is the signal previously routed to that channel and the other input is the signal that *will be* routed to that channel. The mixer produces the transition between the previous input and the next input according to the transition type and transition rate currently selected (at a control panel) for the router.

For the SD and HD CQX routers, each input supports video plus 16 embedded audio channels. The mixer transitions both the video and the audio without artifacts.

The 3Gig router supports both level A and level B of the SMPTE 425M standard. The mixer transitions signals of level A, at 1080p, video and audio without artifacts. It handles level B

—two 1080i signals in one stream— somewhat differently. It mixes the 16 audio channels of “link A” (from the two inputs) but passes the 16 audio channels of link B (from the two inputs) through to the output unmixed. “Link B” will undergo a cut transition with possible audio artifacts. Although audio for Link B is not processed and undergoes a cut transition, video for Link B is mixed according to the transition type and rate selected on the CQX control panel.

▲ The 3Gig routers do not accept level B's 2x720p signals at present.

The second crosspoint matrix receives internal signals and produces the CQX outputs 1 and 2 and the 6 auxiliary outputs (which are normal outputs). A multiplexer selects either the clean output or the emergency bypass input. The emergency bypass input is selected only when power fails. (The multiplexer is controlled by a relay that switches to its relaxed position when power fails.)

The router has 16 normal input BNCs, 2 bypass input BNCs, 2 CQX output BNCs, and 6 aux output BNCs.

Figure A-20 shows a simplified view of the CQX digital video router:

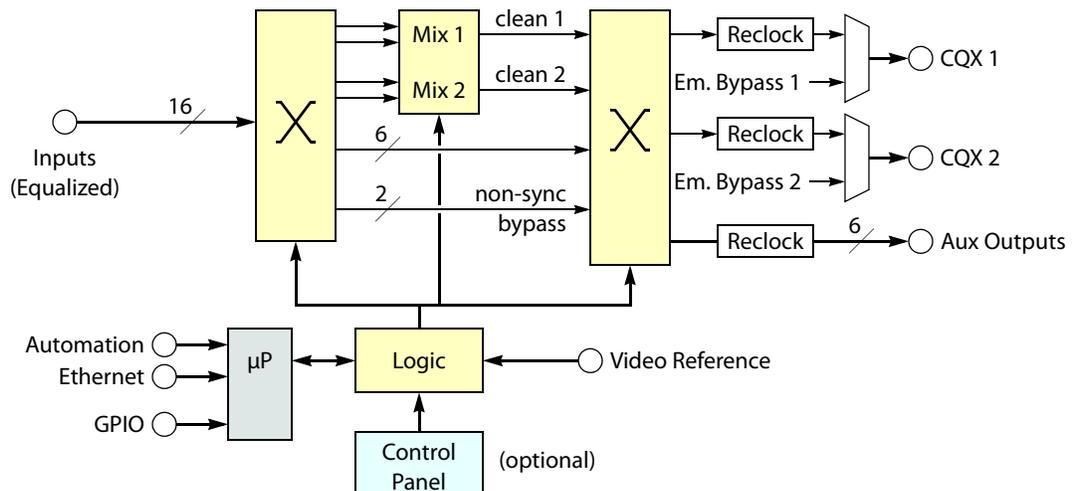


Fig. A-21: Block Diagram of the CQX Digital Video Router

The video routers perform input equalization and perform reclocking of outputs. Router outputs are switched in sync with an external video reference if it is present. The video reference also provides sync for embedded audio.

All CQX video routers accept bi-level or tri-level video references (sync) and switch according to SMPTE RP168-2002.

The CQX video routers also provide a bypass path for non-synchronous input signals. If the two sources chosen for a clean and quiet switch are not of the same format, are off-rate, are not at the same frame rate as the video reference, or do not meet the timing window ( $\pm 3$  lines), the video processor enters non-sync bypass mode where the source signal bypasses the video processor and goes straight to the outputs. Thus, the clean and quiet output behaves like an aux output in which there is no video or audio processing— with no transition processing. Switches still occur at the specified switchpoint for the video reference, but they will not be “clean and quiet.”

However, if there is no video reference present, the CQX does the cut to the new source as soon as it receives the command from the control panel and does not wait for the switchpoint.

Where one or both of the sources is off-rate or at a frame rate different from that of the video reference, the output will bypass the video processor.

If a clean and quiet output is in a non-sync state but conditions change so that a clean switch is possible, the processor waits for one frame of video before switching to processed video to ensure that the processed video has enough time to pass through the video processing path.

The CQX video routers have a removable fan unit. The fan unit is not visible when a CQX panel is mounted on the router.

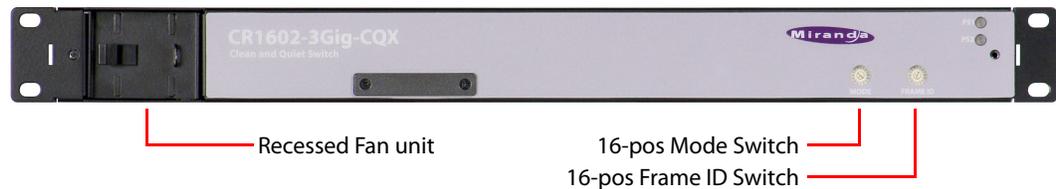


Fig. A-22: Front View of the CQX Video Router

Customers should have no reason to remove the fan unit.

The CQX video routers have a “mode” switch in addition to the 16-position frame ID switch. Both are 16-position rotary switches that turn with a small screwdriver. The “mode” switch configures the video format of the router.

Set the rotary switch to a position in the range 0–9, A, B, C, or D, according to this table:

Setting	Format	Setting	Format	
0	1080i, 59.94 or 60 1080p, 29.97 or 30 1080psf, 29.97 or 30	6	1080p, 59.94 or 60	Switch positions 6 and 7 correspond to video according to SMPTE 425 level A.
1	1080i, 50 1080p, 25 1080psf, 25	7	1080p, 50	
2	525i, 59.94	8	2 × 1080i, 59.94 or 60	Switch positions 8 and 9 correspond to video according to SMPTE 425 level B.
3	625i, 50	9	2 × 1080i, 50	
4	720p, 59.94 or 60	A	720p, 29.97 or 30	
5	720p, 50	B	720p, 25	
		C	720p, 23.98 or 24	
		D	1080p, 23.98 or 24, 1080psf, 23.98 or 24	
		E	reserved	
		F	reserved	

The default is 1080i, 59.94 Hz (switch setting 0). Positions E and F are not valid positions.

Where a switch setting supports multiple formats, the format is governed by the video reference applied to the router and must be compatible with that reference format.

The CQX routers enter non-sync bypass mode for signals at all other rates.

- ▲ Every time you make a switch change, power-cycle the router.
- ▲ Settings 6 and 7 are for SMPTE 425 level A. Settings 8 and 9 are for SMPTE 425 level B.

### Analog Video Routers

The 1RU analog video routers have 16×16, 16×4, or 8×8 crosspoints. The 2RU analog video routers have either 32×32 or 32×4 crosspoints.

Figure A-23 shows a simplified view of an analog video router:

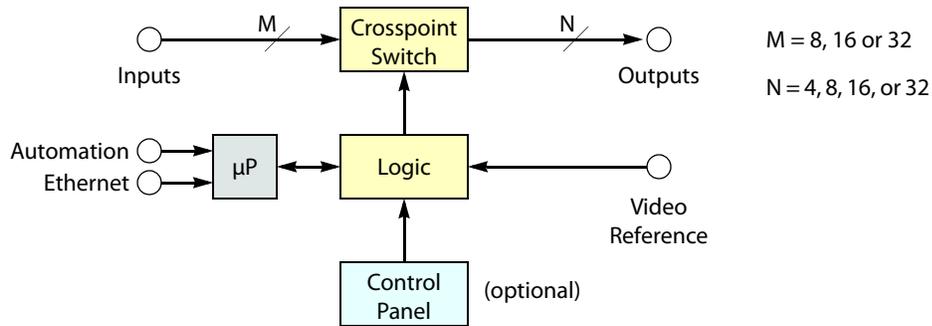


Fig. A-23: Block Diagram of the Analog Video Router

The analog video routers switch NTSC (525i) or PAL (625i) video signals. The router outputs are switched in sync with an external video reference if it is present.

### Digital Audio Routers

- ▲ This information does not apply to the CR6464-AES. Please refer to the CR6400 Family User's Guide for details of the CR6464-AES.

The 1RU AES routers have 16×16, 16×4, or 8×8 crosspoints. The 2RU AES routers have either 32×32 or 32×4 (stereo) crosspoints.

Figure A-24 is a simplified view of an AES router:

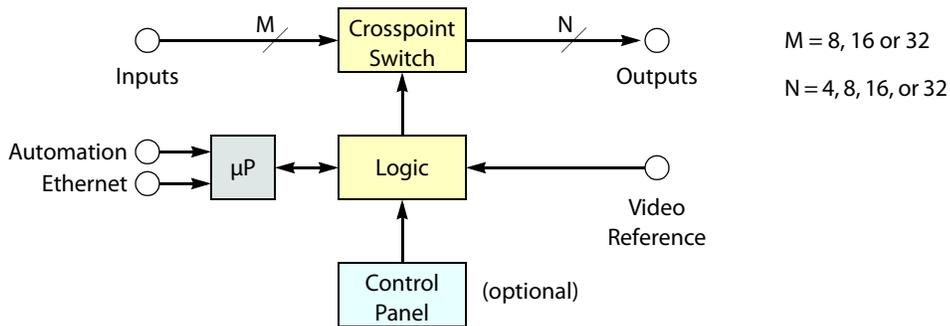


Fig. A-24: Block Diagram of the AES Router

If a video reference is present, the router is considered “synchronous” and regenerates output at 48kHz (nominally). The routers also perform a certain amount of signal processing if the input is synchronous. If a video reference is not present, the router is asynchronous and passes input signals straight through without any processing.

In synchronous mode, the router can perform mono routing, in which case, the maximum number of signals is  $2N$ , that is 8, 16, 32, or 64. In asynchronous mode, the router processes AES stereo pairs.

The "AES" routers switch AES3id audio. The AES routers switch in sync with a video reference if one is present.

The two AES modes have different functional characteristics:

- Synchronous mode.

This mode is intended for 48 kHz input. However, the router accepts input from 32 kHz to 192 kHz. The router produces AES3id output at 48 kHz using *adds* and *drops*,<sup>1</sup> as required. If the input itself is locked to the video reference, no adds or drops occur.

The 16×16 router supports either 16×16 stereo switching or 32×32 mono channel switching (when controlled by an external control system). The 32×32 router supports either 32×32 stereo switching or 64×64 mono channel switching (when controlled by an external control system).

A control panel **cannot** and **does not** perform mono switching. It is only in external software (CRSC, NV9000, or third-party software) that you can do that and then only when the router is in synchronous mode (i.e., has a video reference).

- Asynchronous mode.

The router passes the input stream (32 kHz–192 kHz) transparently to the output with no audio processing. The output is the same as the input and the output rate is the same as the input rate.

Because the router does no audio processing, it performs *stereo* switching only.

AES routers power up in asynchronous mode. If a video reference is present, the router immediately switches to synchronous mode. If no video reference is present, the router stays in asynchronous mode.

If a video reference is applied at any time after power-up, the router immediately switches from asynchronous to synchronous mode.

---

**Note:**

When the router is in synchronous mode, and video reference is lost, the router waits 15 minutes (a "grace" period) before reverting to asynchronous mode. If you need to switch from synchronous mode to asynchronous mode in less than 15 minutes, you can cycle power to the router with the video reference disconnected.

---

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1. When the source and output AES streams are not in sync, AES samples arrive at a rate different from the rate at which they leave the router. **Add:** when the source is slower than the output, router software occasionally inserts an extra copy of the most recent sample in the output stream until the source and output are back in sync. **Drop:** when the source is faster than the output, software occasionally does not send the sample(s) to the output until the source and output are back in sync again. Adds and drops are performed on a minute scale, never in large blocks, keeping perceptible distortions to a minimum.

### Analog Audio Routers

The 1RU analog audio routers have 16×16, 16×4, or 8×8 crosspoints. The 2RU analog audio routers have either 32×32 or 32×4 (stereo) crosspoints. Figure A-25 shows a simplified view of the analog video router:

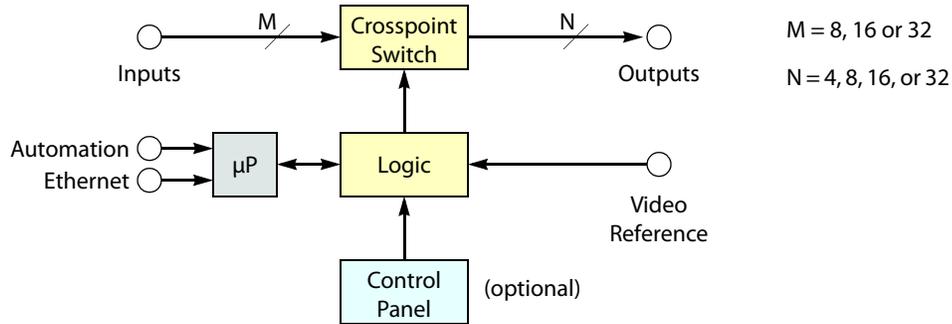


Fig. A-25: Block Diagram of the Analog Audio Router

The analog audio routers switch analog audio signals. Router outputs are switched in sync with an external video reference if the reference is present and are switched asynchronously if no reference is present.

The analog audio router passes input signals transparently to the output with no audio processing or adjustments.

Although the analog audio routers signals are stereo, the connectors are labeled as if the signals were mono. A 16×16 router shows inputs and outputs numbered 1–32. A 32×32 router shows inputs and outputs numbered 1–64. An 8×8 router shows inputs and outputs numbered 1–16.

### Machine Control Routers

The machine control routers do not have X/Y crosspoints *per se*, but allow point-to-point connections. One input may connect to (at most) one output.

The 1RU machine control router has 16 bidirectional serial ports (RJ-45). The 2RU machine control router has 32. Figure A-26 shows a simplified view of the machine control router:

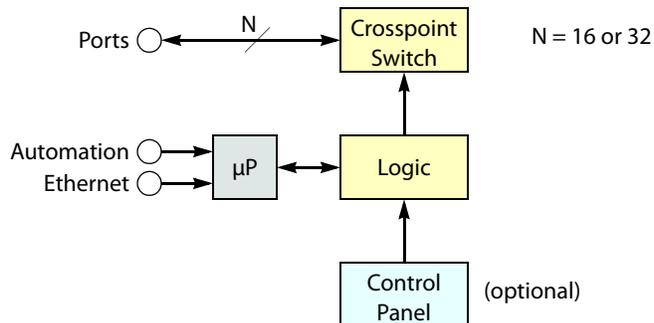


Fig. A-26: Block Diagram of the Machine Control Router

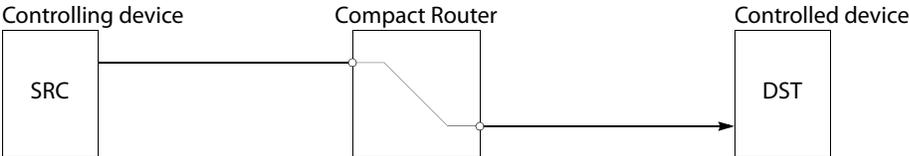
Machine routers channel serial data, typically commands in one direction and responses in the other direction. Because the connections are bidirectional, a port is both an input and an output.

The machine control routers are defined as “data reverse” routers. Each port can be configured as dynamic, master, slave, controlling, or controlled. CRSC is a requirement for configuring the ports.

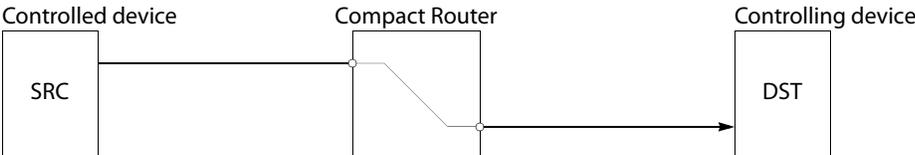
The machine control routers support serial communication up to 1 Mb/s.

**Background Information**

A device can be considered a “controlled” device or a “controlling” device.



Above, the source device is a controlling device. A destination can also be the controlling device:



A controlling device sends commands to a controlled device. The controlled device passes responses (such as status) back to the controlling device. A source device can be a controlling device or a controlled device. A destination device can be a controlling device or a controlled device.

Some external devices must be placed in “remote” mode to work with a port router.

A *controlling* port is one connected to a *controlling* device.

A *controlled* port is one connected to a *controlled* device.

The compact machine control routers operate in “data reverse” mode. This means that in any connection, the destination device is the controlling device by default. The default can be overridden by port type.

The 5 port types are variations of “controlled” or “controlling”:

- Controlling    Master    Dynamic
- Controlled    Slave

**Controlling or Controlled**

These port settings fix the direction of the router port to “controlling” or “controlled.” The port’s connection for Tx and Rx—made during configuration—is static and does not change during operation.

**Dynamic**

A dynamic port can be a controlling or controlled port depending on whether it is connected to a master port or slave port. The port’s configuration is dynamic and can change during operation.

Dynamic ports are typically assigned to VTRs.

## Master or Slave

Any dynamic port connected to a “master” port will be changed to a **controlled** port. A “slave” port is the opposite of a “master” port: any dynamic port connected to a slave port will be changed to a **controlling** port.

The compact router applies logic to the port direction setting when a master port is connected to a dynamic port. In this case, the machine at the dynamic port is always controlled and the machine at the master port is always **controlling**.

## Configuration

Configuring the ports of a machine control router requires CRSC.

## The Control Panels

Control panels are optional if you have an automation system.

### 1RU Panels

The CP1616 control panel has 38 buttons:



Fig. A-27: Front view of the CP1616 Control Panel

The CP1604 control panel resembles the CP1616, but it has 4 buttons in the lower row on the left, instead of 16. The CP1602 has 2 buttons in the lower row on the left.

The CP0808 has 2 rows of 8 buttons at the far left.

In stand-alone systems, a CP1616 has 16 source selection buttons, 16 destination selection buttons, the 2 lock buttons shown, and 4 level selection buttons (as shown).

In a CRSC network, all buttons except the lock buttons (shown) are configurable. In an NV9000 system, all buttons are configurable, including the lock buttons.

You can mount a 1RU panel on any 1RU router or remote panel module.

The CP3201 is a 1RU panel that resembles the CP1616, but it has 32 source buttons (in 2 rows of 16) and no destination buttons. The CP3201 cannot be used as a captive panel. Its design requires a CRSC or NV9000 network.

### CQX Panel

The CP1602-CQX is also a 1RU control panel that has 38 buttons:

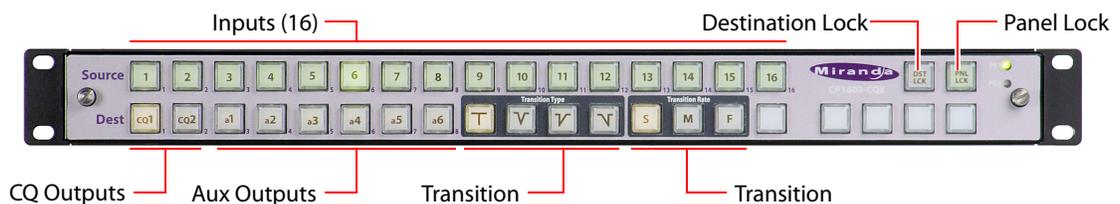


Fig. A-28: Front view of the CP1602-CQX Control Panel

The CP1602-CQX control panel has 16 source buttons, 2 CQX destination buttons, 6 auxiliary destination buttons, 4 transition type buttons, 3 transition rate buttons, and 7 function buttons.

Of the function buttons, 5 are presently disabled, reserved for future use, and two are active. The active buttons are 'Destination Lock' and 'Panel Lock'.

## 2RU Panels

The CP3232 control panel has 76 buttons:



Fig. A-29: Front view of the CP3232 Control Panel

The CP6464 control panel also has 76 buttons, but the panel is slightly different and used exclusively with CR6400 family routers:

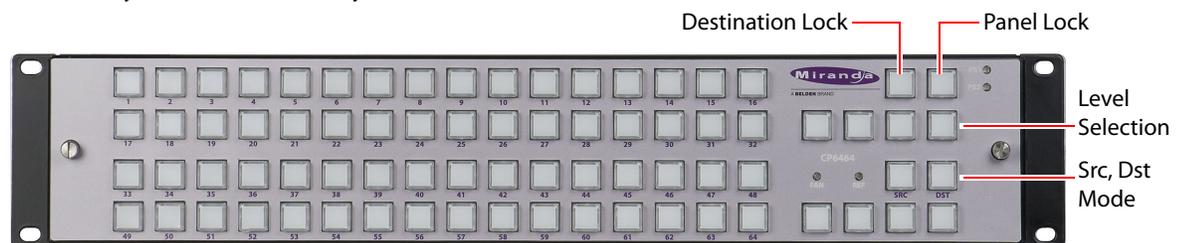


Fig. A-30: Front view of the CP6464 Control Panel

The CP3204 control panel resembles the CP3232, but it has 4 buttons in the lower section on the left, instead of 32.

In stand-alone systems, a CP3232 has 32 source selection buttons, 32 destination selection buttons, the 2 lock buttons shown, and 4 level selection buttons (as shown).

In a CRSC network, all buttons except the lock buttons (shown) are configurable. In an NV9000 system, all buttons are configurable, including the lock buttons.

You can mount a 2RU panel on any 2RU router or remote panel module.

Except under NV9000 control, all control panels have two lock buttons (at the top right):

- Panel Lock. Protects the state of the entire panel.
- Destination Lock. Protects one or more destinations.

Buttons are not labeled at the factory. If you want button legends, you must create your own.

A panel's buttons have color: green, amber, red. In a network, the colors green and amber have no particular meaning. In a CRSC network, the labels 'Source' and 'Dest' that you see on the panel front also have no particular meaning. Any button, regardless of color or position — except for the lock buttons — can be a source, a destination, or have any assignable function.

In stand-alone systems, green means source and amber means destination and the labels 'Source' and 'Dest' do have meaning. The group of buttons labeled 'Source' are (green) source buttons and the group of buttons labeled 'Dest' are (amber) destination buttons.

In CRSC or NV9000 systems, the color of the button means little.

Buttons go high-tally (bright) when selected (pressed) and remain low-tally (dim) when they are not selected.

For all but machine control routers, source buttons represent inputs and destination buttons represent outputs. For machine control routers, a port is both an input and an output. Source button  $n$  and destination button  $n$  both represent port  $n$ .

The function buttons vary in color.

- Unused function buttons are not illuminated.
- The panel lock button, normally low-tally green, goes high tally red when the panel is locked.
- The destination lock button, normally amber, goes high tally red when the currently selected destination is locked. When a destination is locked, the destination button goes high tally red as a warning if you press it. The button color of locked destinations varies with the type of system.

Operating a control panel is usually very simple. See [Operation](#), on page 145.

## The Remote Panel Modules

Like the routers, the remote panel modules are slim (35 mm or 1.38"). Except that they have no input or output connectors and no video reference connectors, remote panel modules are virtually the same size and shape as the routers.

Figures A-31 through A-34 show front and rear views of the remote panel modules:



Fig. A-31: Front View of the RP16 Remote Panel Module



Fig. A-32: Rear View of the RP16 Remote Panel Module



Fig. A-33: Front View of the RP32 Remote Panel Module



*Fig. A-34: Rear View of the RP32 Remote Panel Module*

A remote panel module must have a CR Series control panel attached to be usable. The remote panel module can be set up for operation under CRSC or NV9000.

Under CRSC, when you execute operations on the attached control panel, the remote panel module sends commands to the network of routers and receives status messages from the routers. The attached control panel shows router status on its buttons.

Under NV9000, when you execute operations on the attached control panel, the remote panel module sends commands to the NV9000 and receives status messages from the NV9000 which communicates with the routers. The attached control panel shows router status on its buttons.

A stand-alone network allows up to 16 remote panel modules, up to 4 routers, and up to 4 levels.

A CRSC network allows up to 16 remote panel modules, up to 4 routers, up to 8 levels, and enhanced capabilities.

An NV9000 network allows an indefinite number of remote panels, routers, and levels. The limitations are the number of IP addresses in your network and of course the throughput of the network.

A network requires one or more customer-supplied Ethernet switches.



# B Operation

Appendix B provides a summary of panel operating principles.

## Summary

<i>Control Panel Buttons</i> .....	145
<i>Power Up and Reset</i> .....	151
<i>Performing Takes</i> .....	151
<i>Performing Locks</i> .....	160
<i>Executing Salvos</i> .....	162
<i>Performing Level Selection</i> .....	162

Operating a control panel is usually quite simple. The basic operations are the same for all panels except the CP3201 and CP6401. The CP3201 and CP6401 are slightly different because they are single-destination panels having “default” destinations. Additionally, the CQX (“clean and quiet”) panel features unique buttons for smooth transitions.

Two of the three panels that can control the 64×64 matrices of CR6400 routers (the CP32-6464 and CP6464) are different from others because they can have “paging” buttons.

The CP6401 and CP32-6464 are names given to configuration variants of the CP6464 and CP3232, respectively. There are no physical panels having those names.

For detailed information on operating CR Series panels, refer to the *CR Series Compact Router User’s Guide* and the *CR6400 Family Users’ Guide*.

For a complete list of panels supported by the Compact Router System Configurator (CRSC), see [Products](#), on page 124.

This section briefly describes how to use the control panel to perform the following tasks:

- Perform ‘takes’ (normal and breakaway). See [Performing Takes](#), on page 151.
- Lock or unlock destination or control panels. See [Performing Locks](#), on page 160.
- Execute salvos. See [Executing Salvos](#), on page 162.
- Select levels. See [Performing Level Selection](#), on page 162.

Although operations are usually straightforward, the meaning of the operations differ according to panel mode. See [Remote Panel Operating Modes](#), on page 114.

Before configuring or using a panel, it is recommended that you become familiar with how control panel buttons are grouped and what different button illuminations denote, as described in [Control Panel Buttons](#), on page 145.

## Control Panel Buttons

All CR Series control panels have common button features. The CQX panels are somewhat different and operate on their own network. See [CQX Panel Buttons](#), on page 150.

Most CR Series control panels were designed before the existence of the Compact Router System Configurator (CRSC). Their button layouts (and button colors) are appropriate to what has been called “default” mode (and what this document calls “stand-alone” mode) where green buttons are grouped together and labeled “Source” and amber buttons are grouped together and labeled “Dest.” For these earlier panels, this coloring has little meaning in a CRSC network.

On these early panels, the labels “Source” and “Dest” at the left have no meaning in a CRSC network. Operators must ignore these colors and these labels.

The newer CP6464, a 64x64 panel, does not suffer from the fixed coloring of the earlier panels. Any button can be green or amber, depending on its function.

Figures B-1, B-2, and B-3 show the CP1616, CP3232, and CP6464 respectively. Other panel types are variations of these. The CP1604 for instance has only 4 buttons in the lower row. The CP6401 (a configuration variant of the CP6464) does not have any destination buttons.

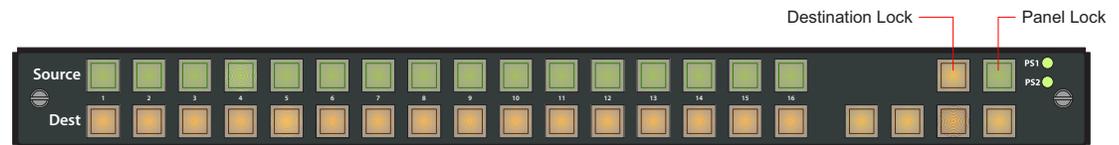


Fig. B-1: CP1616



Fig. B-2: CP3232



Fig. B-3: CP6464

The color red indicates one of several conditions. See [Red Buttons](#), following. A button that is unlit is either (1) undefined or (2) momentarily turned off.

There are two fixed-function buttons on all control panels (CQX included) at the top right, as shown in Figures B-1, B-2, and B-3.

The two fixed-function buttons are locks:

- Panel Lock (the rightmost button). Prevents accidental changes on the entire panel.
- Destination Lock. A locked destination is one to which a source may not be routed. This prevents the content delivered at the destination from being changed. When the lock is released, the destination's content can be changed.

## Button Types

These button types are applicable to all panels. For most panels, all buttons *except* the lock buttons are configurable as:

- Level selection buttons.
- Source buttons.
- Destination buttons.
- Salvo buttons.

Two of the three panels that can control the 64×64 matrices of CR6400 routers (CP32-6464 and CP6464) also have what are called *paging buttons*— buttons that control (1) whether sources or destinations are presented on the panel or (2) which set of sources and destinations is presented.

Because the panel's buttons are configurable, the operator will be confronted with a button layout that is different from those of other panel configurations.

The CQX panel (CP1602-CQX) is an exception: its buttons are not configurable.

The CP3201 and CP6401 do not have destination buttons. They are single-destination panels.

## Panel Modes

Panel modes are applicable to all panel *except* the CQX panel. Panels can be configured in one of 3 modes:

- Standard
- Enhanced, with hold
- Enhanced, without hold

These modes control level selection in quite different ways. Operators will need to know how levels are managed in the panels they use. See [Remote Panel Operating Modes](#), on page 114 for definitions.

## Red Buttons

Depending on context, red means:

- Lock. (The panel is locked or a destination is locked.)
- Breakaway. (Applicable to all panels *except* the CQX panel.)
- Occasionally, red can also indicate an unintentional breakaway that occurs as result of an improper configuration. (Applicable to all panels *except* the CQX panel.)

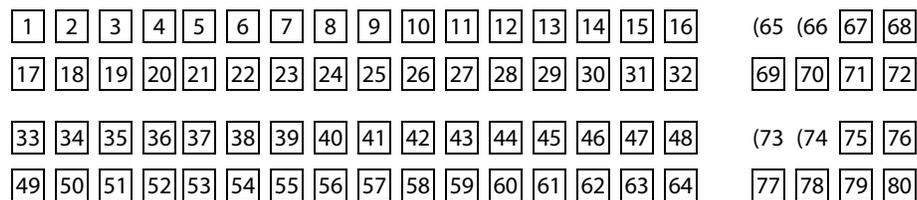
## Button Order

The order in which buttons appear on a control panel affects the meaning of level buttons. All panels *except* the CQX panel are affected by button ordering because CQX panels do not have configurable buttons or levels.

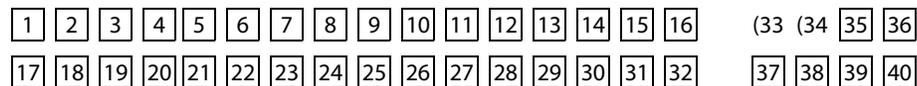
### Spatial Ordering

(This means the organization of the buttons on the panel.)

Buttons on a control panel are numbered from left to right, and then from top to bottom. This is the ordering for the 2RU panels:



Buttons on a control panel are numbered from left to right, and then from top to bottom. This is the ordering for the 1RU panels:



(Some button numbers do not correspond to an actual button.)

The button order affects the meaning of level buttons in standard mode. Briefly stated, on any button row, level buttons to the left have higher precedence than buttons to the right. All buttons on an upper row have higher precedence than any button on rows below that row.

- ▲ *Precedence* determines—for a panel in standard mode—which source and destination buttons are enabled for selection. See [Performing Level Selection](#), on page 162.

### Temporal Ordering

(This means the order in which you press buttons.)

In standard mode, the order in which you press level buttons affects the outcome of your operation. After a level selection, the order in which the buttons were pressed is no longer apparent. Any set of selected levels can therefore represent a number of different sets of sources and destinations. See [Performing Level Selection](#), on page 162.

## Button Illumination

Button illumination is applicable to all panels. To discuss button lighting, there are some terms that are helpful when discussing button states:

Current destination	The destination that is currently selected.
Routed source	A source that matches or partially matches what is routed to the current destination.
Primary level	The first configured level for the destination button.

Primary source                      The routed source on the primary level.

Figure B-4 illustrates the terms:

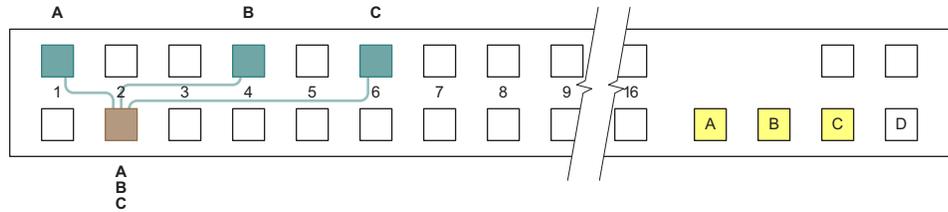


Fig. B-4: Buttons on a Panel

In this illustration, blue buttons are **routed sources**. The brown button is the **current destination**. Yellow buttons are selected levels. Buttons without any specific color are unselected.

In this example, the destination uses levels A, B, and C. Level A is the **primary level** because it is the first. Source 1 is the **primary source** because it routes level A (indicated by the letter A over the source button).

(The example uses blue, brown, and yellow buttons for the purpose of discussion. Real CRSC control panels have green, amber, and red buttons.)

### Source Button Illumination

In a normal non-breakaway take, the (single) source button selected is always high-tally (green or amber).

In a breakaway in enhanced mode, the primary source is high-tally green or amber. Non-primary sources taken are high-tally red.

In a breakaway in standard mode, all taken sources are high-tally green or amber.

### Destination Button Illumination

The current destination is high-tally (generally green or amber). All other destinations are unselected and low-tally.

However, if the destination on a button is locked, the button is red, high-tally if selected, and low-tally if not.

### Level Button Illumination

#### Enhanced Mode

- A level button is high-tally (green or amber) if it is selected and represents the primary level.
- A level button is low-tally (green or amber) if it is not selected and represents the primary level.
- A level button will be red (in a breakaway only) if it does **not** represent the primary level. If the level button is selected, it is high-tally. Otherwise it is low-tally.
- A level button is off if the current destination does not include this level.

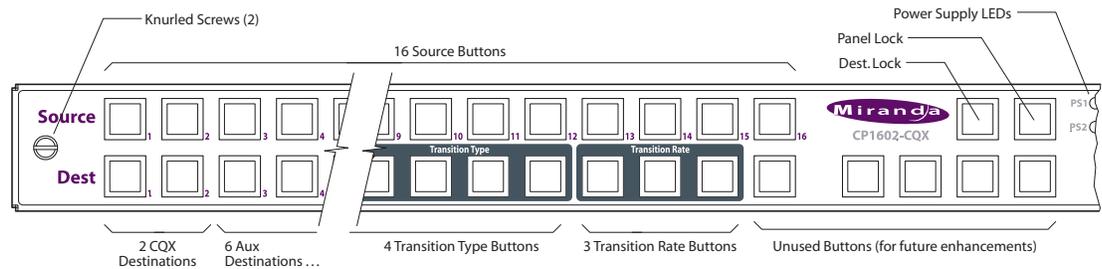
### Standard Mode

- A level button is high-tally (green or amber) if it is selected.
- A level button is low-tally (green or amber) if it is not selected.

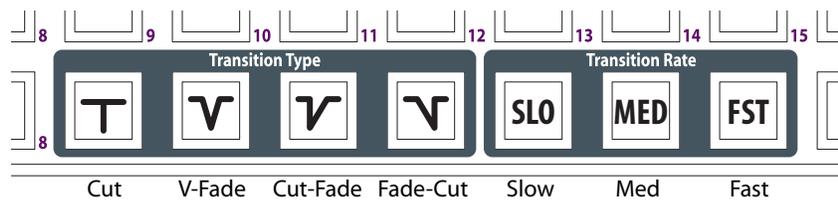
## CQX Panel Buttons

CQX (“clean and quiet”) panels feature a unique set of buttons for executing smooth transitions. There are 16 source buttons, 2 “clean and quiet” destination buttons and 6 auxiliary destination buttons: ‘Panel Lock’ and ‘Destination Lock’. See [Control Panel Buttons](#), on page 145. The remaining panel buttons are not configurable at this time.

A CQX router is one that performs smooth transitions in 3Gig, HD, or SD video, and audio. There are 3 models, the CR1602-3Gig-CQX, CR1602-HD-CQX, and CR1602-SD-CQX. The CQX control panel (CP1602-CQX) is used with the CQX router or a remote panel. Unlike other CR Series panels, the CQX panel has 4 dedicated transition type buttons (cut, v-fade, cut-fade, and fade-cut) and 3 dedicated transition rate buttons (slow, medium, and fast).



The transition buttons appear in this ordering:



The transition rate buttons are not configurable at this time. The rates are fixed at the following transition rates:

- 1080i59.94, NTSC:    slow = 90,    medium = 60,    fast = 30.
- 1080i50, PAL:        slow = 75,    medium = 50,    fast = 25.
- 720p50:                slow = 150,    medium = 100,    fast = 50.
- 720p60:                slow = 180,    medium = 120,    fast = 60.

The result is that slow is 3 seconds, medium is 2 seconds, and fast is 1 second for all CQX routers.

A cut transition is instantaneous for video; its audio ramps down over 3 frames and ramps back up over 3 frames.

(Transition type and rate are selectable on both captive panels and remote panels.)

## Power Up and Reset

Operators generally do not need to bother about startup—unless there is a power outage.

At power-up, and at every *reset*, a control panel's 'Panel Lock' button is on and red. An operator must turn the panel lock off before the panel can be used. At power-up, a remote panel (module) "discovers" the state of the routers in the network and illuminates its buttons to reflect the routes and levels that were selected prior to power-up (reset). It can take up to 60 seconds to finish the discovery. The operator can actually start using the panel before the discovery completes.

### Routers at Power-Up

At power-up, a router loads stored program code into its internal FPGA and restores its previous operational state. (Its "state" includes the name, crosspoint map, levels, and which of the outputs are locked.)

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If a router's rotary switch is set to the 0 position, the router reverts to the *factory default state*, not its previous state. Its entire state and all configuration data are lost and will need to be reconfigured.

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At power-up, the router detects the presence or absence of a video reference signal.

(The AES routers switch immediately to synchronous mode if a *video* reference is present. Otherwise they remain in asynchronous mode.)

### Remote Panel Modules at Power-Up

At power-up, a remote panel module also loads stored program code into its internal FPGA and restores its previous operational state. (Its "state" includes all the button definitions and its own panel mode.)

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If a remote panel module's rotary switch is set to the 0 position, the remote panel module reverts to the *factory default state*, not its previous state. Its entire state and all configuration data are lost and will need to be reconfigured.

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## Performing Takes

A take is the connection of a signal from a source to a destination. 'Takes' are performed using the control panel; pressing buttons that have been configured to represent specific sources or destinations. Sources may only be taken to destinations on the same level.

There are five types of 'takes':

- Normal 'takes' have no breakaway; the source and destination are on the same level. See [Normal Takes](#), on page 152.
- A *breakaway* take has multiple sources on different levels to a destination. See [Breakaway Takes](#), on page 153.
- *Single-destination* 'takes' differ slightly and apply to the CP3201 and CP6401 which have only a default destination that can neither be selected nor deselected. See [Single-Destination Takes](#), on page 156.

- Machine control ‘takes’ are the same as other compact routers, but the intrinsic nature of the take is different. See [Machine Control Takes](#), on page 159.
- CQX router “clean and quiet” ‘takes’ employ transition type and rate (for outputs 1 and 2). See [CQX Takes](#), on page 159. CQX routers also perform normal ‘takes’ similar to other routers on its auxiliary outputs (3 through 8).

## Normal Takes

By “normal take” we mean a non-breakaway take.

First press a destination button and then a source button. The take occurs immediately. The previous route (for the destination) is lost.

Please note:

- Takes on CP3201s and CP6401s are different. See [Single-Destination Takes](#), on page 156.
- If a destination is locked, the destination button is usually red, high-tally when selected. You cannot perform a take for a destination that is locked. See [Performing Locks](#), on page 160.
- The *meaning* of a take for a machine control router is different from ‘takes’ on other routers. See [Machine Control Takes](#), on page 159.

### Example — Normal Take in Standard Mode

You want to route source *S* to destination *D*.

- 1 Optionally, select the levels on which you want the take to occur. Potentially, this changes the sources and destinations enabled for the take. See [Level Selection in Standard Mode](#), on page 163. (Selecting levels prior to the destination does not result in breakaway.)
- 2 Press destination *D*.



- 3 Press source *S*.



Pressing another destination button (always) starts a new take.

In standard mode, a normal take occurs on all selected levels.

### Example—Normal Take in Enhanced Mode

You want to route source *S* to destination *D*.

- 1 Do **not** press any level buttons. Doing so initiates a breakaway for the previously chosen destination.
- 2 Press destination *D*.



- 3 Press source *S*.



Pressing another destination button (always) starts a new take.

In enhanced mode, a normal take occurs on all the levels defined for the destination.

## Breakaway Takes

A *breakaway* takes multiple sources, on different levels, to a destination. Breakaway takes can be performed on all control panels *except* CQX panels.

To perform a breakaway, first press a destination button. Then alternately press level buttons (one or more) and then a source button and then repeat for other levels. The multiple takes occurs immediately when you press the source buttons. The previous route (for that destination) is lost.

Please note:

- Takes on CP3201s and CP6401s are different. See [Single-Destination Takes](#), on page 156.
- If a destination is locked, the destination button is usually red, high-tally when selected. You cannot perform a take for a destination that is locked. See [Performing Locks](#), on page 160.
- The *meaning* of a take for a machine control router is different from takes on other routers. See [Machine Control Takes](#), on page 159.

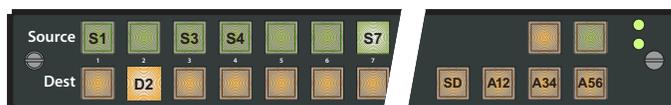
### Example—Breakaway in Standard Mode

You want to take SD video from source 1 to destination 2. But you also want to take AES12 from source 3 and both AES34 and AES56 from source 4.

(Assume that these sources and destinations are enabled and remain enabled.)

The level buttons are SD, A12, A34, and A56.

- 1 Press destination 2. The previous source was source 7 so it is high-tally.



- 2 Select level SD (only). Press source 1.



- 3 Select level A12 only. Press source 3.



- 4 Select levels A34 and A56 only. Press source 4.



Double-press any of the level buttons to highlight the source that contributes that level.

You can continue to break sources away, ad infinitum, and you can come back to the destination later and it will still show the breakaway. You could add or remove breakaway sources at that time.

### Example — Breakaway in Enhanced Mode without Hold — Variant 1

You want to take SD video from source 1 to destination 2. But you also want to take AES12 from source 3 and both AES34 and AES56 from source 4.

The levels defined for the destination are SD, A12, A34, and A56. SD was defined first in the destination description. Therefore it is considered the **primary level**.

- 1 Press destination 2. The previous source was source 7 so it is high-tally.



- 2 Select just level SD. Press source 1.



Source 1 is high-tally because you have taken SD—the primary level—from this source. Source 7 is red because the other levels still come from source 7. (The SD level button is amber because SD is the primary level. The other level buttons are red because they are not primary. All level buttons go high-tally once again, red or amber.)

- 3 Select just level A12. Press source 3.



Source 3 goes high-tally red because it is not the primary source. All level buttons go high-tally once again.

- 4 Select both A34 and A56. Press source 4.



Source 4 goes high-tally red because, like source 3, it is not the primary source. All level buttons go high-tally once again. Source 7 goes dim because no other levels come from source 7.

Pressing another source button without selecting a level would revert the take to a normal take, undoing the breakaway you started.

Pressing another destination button (always) starts a new take.

### Example — Breakaway in Enhanced Mode without Hold — Variant 2

You want to take all levels from source 1 to destination 3 *except* CTRL, which is to come from source 4. Destination 3 is presently connected to source 6.

The levels defined for the destination are HD, A12, A34 and CTL. HD was defined first in the destination description. Therefore it is considered the **primary level**.

- 1 Press destination 3. The previous source was 6 so it is high-tally.



- 2 Do not press a level button. Press source 1.



Source 1 goes high tally because it provides all levels including the primary level. (All level buttons are amber because all levels belong to the primary source.)

- 3 Press level CTL. Press source 4.



Source 4 goes high-tally red because it is not the primary source. All level buttons go high-tally. The CTL level button turns red because now CTL is not from the primary source. The HD, A12, and A34 buttons remain amber because they are from the primary source.

Pressing another source button without selecting a level would revert the take to a normal take, undoing the breakaway you started.

Pressing another destination button (always) starts a new take.

### Example — Breakaway in Enhanced Mode with Hold

You want to take SD video from source 1 to destination 2. But you also want to take AES12 from source 3 and both AES34 and AES56 from source 4. The previous source was source 7.

The levels defined for the destination are SD, A12, A34, and A56. SD was defined first in the destination description. Therefore it is considered the **primary level**.

- 1 Press destination 2. The previous source was source 7 so it is high-tally.



- 2 Select just level SD. Press source 1.



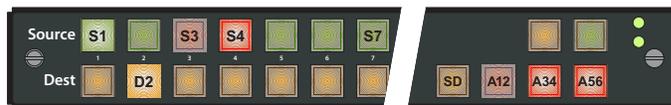
Source 1 goes high tally because you have taken SD—the primary level—from this source. Source 7 is red, indicating that the other levels still come from source 7. (The SD level button is amber because SD is the primary level. The other level buttons are red because they are not primary. They are low-tally because this is hold mode and SD remains the only level selection.)

- 3 Select just A12. Press source 3.



Source 3 goes high-tally red because it is not the primary source. The level buttons remain unchanged. You could choose another source at this point.

- 4 Select just A34 and A56. Press source 4.



Source 4 goes high-tally red because, like source 3, it is not the primary source. The level buttons remain unchanged. Again, you could choose another source. Pressing another source button without selecting another level simply changes the source for that selected level (or levels).

Pressing another destination button (always) starts a new take. If you wish to clear the breakaway for destination 2, press destination 2, then press a source without selecting any levels.

## Single-Destination Takes

Single-destination takes are slightly different. A CP3201 or CP6401 has only a default destination that can neither be selected nor deselected.

### Example—Normal Take for CP3201 or CP6401

You want to route source S to the default destination. Just press source S. It's a single button press.

A normal take occurs on all the levels defined for the default destination.

### Example—Breakaway for CP3201 or CP6401 in Standard Mode

You want to take SD from source 1 to the default destination. But you also want to take AES12 from source 3 and both AES34 and AES56 from source 4.

(Assume that these sources and destinations are enabled and remain enabled.)

The following example shows a CP6401. The level buttons are SD, A12, A34, and A56.

- 1 Select just level SD. Press source 1.



- 2 Select just level A12. Press source 3.



- 3 Select just levels A34 and A56. Press source 4.



If these levels are selected, you can double-press any of the level buttons to make visible the source that contributes that level.

You can continue to break sources away, ad infinitum.

To clear the breakaway, select all levels and then press a source.

### Example—Breakaway for CP3201 or CP6401 in Enhanced Mode with Hold

You want to take SD from source 1 to the default destination. But you also want to take AES12 from source 3 and both AES34 and AES56 from source 4. The previous source was source 7.

The levels defined for the destination are SD, A12, A34, and A56. SD was defined first in the destination description. Therefore it is considered the *primary level*.

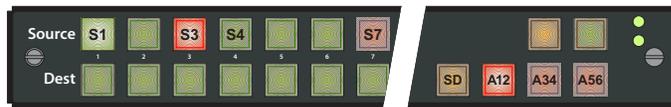
This example shows a CP3201:

- 1 Select just level SD. Press source 1.



Source 1 goes high tally because you have taken SD—the primary level—from this source. Source 7 is red indicates that the other levels still come from source 7. (The SD level button is amber because SD is the primary level. The other level buttons are red because they are not primary. They are low-tally because this is hold mode and SD remains the selection.)

- 2 Select just A12. Press source 3.



Source 3 goes high-tally red because it is not the primary source. The level buttons remain unchanged. You could choose another source at this point.

- 3 Select just A34 and A56. Press source 4.



Source 4 goes high-tally red because, like source 3, it is not the primary source. The level buttons remain unchanged. Again, you could choose another source at this point. Pressing another source button without selecting another level simply changes the source for that selected level (or levels).

To clear the breakaway, select all levels for the default destination and then press a source.

### Example—Breakaway Take for CP3201 in Enhanced Mode without Hold

You want to take SD from source 1 to the default destination. But you also want to take AES12 from source 3 and both AES34 and AES56 from source 4. The previous source was source 7.

The levels defined for the destination are SD, A12, A34, and A56. SD was defined first in the destination description. Therefore it is considered the **primary level**.

- 1 Select just level SD. Press source 1.



Source 1 is high-tally because you have taken SD—the primary level—from this source. Source 7 is red because the other levels still come from source 7. (The SD level button is amber because SD is the primary level. The other levels are red because they are not primary.)

- 2 Select just A12. Press source 3.



Source 3 goes high-tally red because it is not the primary source. All level buttons go high-tally once again.

- 3 Select both A34 and A56. Press source 4.



Source 4 goes high-tally red because, like source 3, it is not the primary source. All level buttons go high-tally once again.

Pressing another source button without selecting a level reverts the take to a normal take, clearing the breakaway you performed.

## Machine Control Takes

The method for performing a machine control take is the same as for any other compact router: first press a DST button and then a SRC button. However, for machine control routers, the intrinsic nature of the take is different:

- A machine control router is a point-to-point router; the other compact routers are X/Y routers. In an X/Y router, a source can be routed to multiple destinations. In a machine control router, a new route breaks all previous connections to the source and all previous connections to the destination prior to making the new connection.
- Port router connections are bidirectional. A port is both an input and an output. Thus, if you take SRC1 to DST6, SRC6 is also connected to DST1.
- For dynamic ports (only), there is a difference between taking DST6/SRC 1 and taking DST1/SRC6.

DST1/SRC6            Port 1 is "controlling." Port 6 is "controlled."

DST6/SRC 1           Port 6 is "controlling." Port 1 is "controlled."

Thus, it is the destination that is "controlling." That is because compact machine control routers are "data reverse."

See [Machine Control Routers](#) or [Port Configuration](#) for definitions of terms and more information.

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### Note:

Machine control 'takes' do not start or stop machines, nor do they pre-roll or position any media.

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## CQX Takes

Takes on a CQX panel involve transition type and rate when the destination selected is one of the two CQX destinations. Takes do not involve transition type and rate when the destination is one of the 6 auxiliary outputs.

To perform a CQX take, first choose a CQX destination, then select a transition type and rate. You do not need to do this if the currently selected transition type and rate are what you want. The take occurs immediately when a source is selected.

To perform an auxiliary take, press an AUX output (aux DST) button and then a SRC button. The take occurs immediately (without a transition effect).

When you press the DST button, it tallies high (amber). The button for the source that corresponds to the selected DST also tallies high (green). When you press a SRC button, the old connection is lost (after the transition), the old SRC button goes low tally, and the new SRC button goes high tally.

If a destination is locked, it will be low-tally red. If you select a locked destination, it will go high-tally red. You cannot perform a take for a destination that is locked.

## Performing Locks

### Panel Lock

Pressing a 'Panel Lock' button disables the control panel. Panel locks apply to all control panels, including CQX panels. Only the 'Panel Lock' button remains enabled. Pressing it again re-enables the control panel. Panel locks are available on all panels, including the CQX panel.



When the control panel is locked, the lock button is high tally red and the state of the entire control panel is protected. Changes from the control panel are disabled.

### Destination Locks

When the operator presses a 'Destination Lock' button, the current destination is locked to its source(s). No operator may choose another source for that destination at any panel. Destination locks are available on all panels, including the CQX panel.

A destination lock occurs on all the levels defined for the destination *except those levels that have been deselected*.

A **simple lock** protects a destination on *all levels defined for the destination*.

A **complex lock** protects a destination only on the *levels defined for the destination that are selected*. Sources may still be taken to that destination on other levels.

Unlocking a locked destination can be simple or moderately complex.

You *can* route the source that feeds a locked destination to any number of other destinations:

- A destination lock on a CP3201 or CP6401 is slightly different because such a panel has only a "default destination." See [Single-Destination Locks and Unlocks](#), on page 161.
- You cannot unlock, at a panel, a destination locked by someone else. It is possible to release those locks using CRSC. See [Locks Page](#), on page 101.

- A destination might be locked (at another panel) on levels that you cannot see or control on your panel. If that is the case, you cannot route any source to it.

### Simple Locks

Press a destination, then press 'Destination Lock'.

Under a simple lock, the destination button is:

- High-tally red when it is selected and at least one of the levels on which it is locked is selected.
- High-tally amber when it is selected and none of the levels on which it is locked is selected.
- Dark (in standard mode) when none of its levels are selected. (The destination cannot be selected.)
- Low-tally red when it is not selected.

The 'Destination Lock' button is:

- High-tally red when the destination is selected and at least one of the levels on which it is locked is selected.
- Low-tally amber otherwise.

To undo a simple lock, press the destination and then press 'Destination Lock'.

### Complex Locks

Press the button for a destination, then alternately select a level (or levels) and press 'Destination Lock'.

Under a complex lock, the destination button is the same as for a simple lock:

- High-tally red when it is selected and at least one of the levels on which it is locked is selected.
- High-tally amber when it is selected and none of the levels on which it is locked is selected.
- Low-tally red when it is not selected.

The 'Destination Lock' button is the same as for a simple lock.

- High-tally red when the destination is selected and at least one of the levels on which it is locked is selected.
- Low-tally amber otherwise.

To undo a complex lock, select all levels, press the destination and then press 'Destination Lock'. You might have to press the lock button twice. That is because the first press might actually lock a level you did not know was unlocked.

### Single-Destination Locks and Unlocks

Because a CP3201 or CP6401 has only a default destination, locks are different.

Simple Lock — CP3201 or CP6401

Select all levels and press the destination lock button. The panel's destination is locked on all levels defined for the destination: its current source(s) cannot be changed on any level.

The destination lock button remains red until you press it again to unlock the default destination.

To undo a simple lock, select all levels and then press 'Destination Lock'. You might have to press the lock button twice. That is because the first press might accidentally lock a level you did not know was unlocked.

#### Complex Lock — CP3201 or CP6401

Select one or more levels and press the destination lock button. The panel's destination is locked on all selected levels: its current source(s) cannot be changed on any of those levels.

The destination lock button is high-tally red if you have selected any levels and low-tally amber otherwise.

To undo a complex lock, select all levels and then press 'Destination Lock'. You might have to press the lock button twice. That is because the first press might actually lock a level you did not know was unlocked.

To unlock a single locked level, select that level only and then press 'Destination Lock'.

## Executing Salvos

A salvo is a pre-defined list of up to 32 (or 64) basic 'takes'. A salvo is assigned to a control panel button. When the operator presses a salvo button, the 'takes' defined in the salvo execute in order. Salvos do not loop and must not execute simultaneously. An attempt to run two or more salvos at once will have unpredictable results.

Salvos are available on all panels, *except* the CQX panel.

No instructions are required for pressing a salvo button. However, the configurer should let the operator know at least what the general effect of the salvo is. Meaningful button labels help.

If a level specified in the salvo is not enabled, or if the input or output does not exist, the take(s) on that level do not occur. Salvos with errors take longer to execute because of multiple attempts to perform 'takes' and the resulting time-outs. There is no error reporting or warning if a salvo fails at any point.

A salvo button goes high-tally when it is executing and returns to low-tally when the salvo completes. As a rule of thumb, no salvo should require more than a few hundred milliseconds.

## Performing Level Selection

Level buttons enable or disable levels. When a level button is high-tally, the level is enabled. The levels enabled at any particular time are called the *selected levels*. A panel must have a level button for each level it controls. The panel will not switch a source on a level for which there is no level button. The exception to this is that when a panel has no level buttons, all levels defined for the destination are selected. Level selection has no effect on routed signals until you perform a take.

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By default, CQX routers are assigned a single level that encompasses the entire router. For this reason CRSC does not allow level configuration for a CQX router. Therefore, no level selection is performed on CQX panels. See [CQX Takes](#), on page 159.

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The result of level selection depends on panel mode: standard, enhanced with hold, or enhanced without hold.

## Level Selection in Standard Mode

A level selection affects all 'takes' made after the level selection. The levels you select persist until you change them. This is true for normal 'takes' and for breakaway.

In most cases, the level buttons are toggles: press the level button to select the level if it is unselected or deselect the level if it is selected. However, there are 2 exceptions:

- When you have selected *all* the levels on the panel, pressing any level button deselects the *other* levels and leaves the one you pressed selected.
- When you have only one level on your panel, pressing the level selection button has no effect. The single level is always selected.

Level selection in standard mode is affected by button order.

### Button Order

The ordering of buttons on a panel affects the meaning of level selection under standard mode. We call this *spatial ordering*.

The order in which the operator presses level buttons affects the meaning of level selection under standard mode. We call this *temporal ordering*.

To illustrate, the following examples use a set of 6 sources and 6 destinations. Three of the sources and three of the destinations have AV, AES, and TC levels. The remaining sources and destinations have SD, AES, and TC levels. The four level buttons are AV, AES, TC, and SD.

Button order is important only in standard mode. The examples are for panels in standard mode.

In standard mode, pressing level buttons enables certain sources and destinations and disables other sources and destinations. The button for a disabled source or destination is off. The operator may perform 'takes' only for enabled destinations and sources.

### Spatial Ordering

**Rule 1:** when *all* levels are selected, the sources and destinations that are enabled for selection are those that include the level that is controlled by the level button with the lowest button number. If no levels are selected, no sources and destinations are enabled.

The level on the level button with the lowest button number has *precedence* or priority over other levels.

These examples show the difference between two orderings of level buttons. Figure B-5 shows level buttons in the order AV, AES, TC, SD:



Fig. B-5: Spatial Ordering AV, AES, TC, SD

Level AV is on the left and has the lowest button number. Because all levels are selected, sources and destinations that include level AV are enabled (low-tally) and other sources and destinations are disabled (buttons turned off).

Figure B-6 shows level buttons in the reverse order (SD, TC, AES, AV):



Fig. B-6: Spatial Ordering SD, TC, AES, AV

Here, level SD is on the left and has the lowest button number. Again, all levels are selected. Sources and destinations that include level SD are now enabled and other sources and destinations are disabled (buttons turned off).

Thus, with one particular level button ordering, AV sources are enabled. With the other ordering, SD sources are enabled.

If a panel's level buttons are distributed across the panel, one should remember the ordering method: (1) buttons in any row have higher precedence than buttons in lower rows and (2) within a row, buttons to the left have higher precedence than any to the right.

Precedence determines—for a panel in standard mode—which source and destination buttons are enabled for selection.

### Temporal Ordering

**Rule 2:** when not all levels are selected, the sources and destinations that are enabled are those that include the level that you select *last*. If no levels are selected, no sources and destinations are enabled.

Figure B-7 shows level buttons again in the order AV, A12, TC, SD, but this time with level AV unselected:



Fig. B-7: Temporal Ordering AES, TC, SD

Although it is not visually apparent, when the A12 button is pressed last, the sources and destinations that include A12 are enabled.

Figure B-8 shows the same selected level buttons, but this time level SD was pressed last:



Fig. B-8: Temporal Ordering AES, TC, SD

The same level buttons were pressed here as in Figure B-7, but in different order with a very different result. Sources and destinations that include level SD are enabled.

### The Double-Press

To reselect a level, first deselect the level, then select the level. That is, press the level button twice. You can consider this action a “double-press.”

A double-press gives the level **precedence** over other selected levels.

In the example of Figure B-8, if you double-pressed A12, the result would again be like Figure B-7.

#### Standard Mode Summary

**Rule 1:** when *all* levels are selected, the sources and destinations that are enabled are those that include the level that is controlled by the level button with the lowest button number.

**Rule 2:** when not all levels are selected, the sources and destinations that are enabled are those that include the level that you select **last**.

'Takes' occur on all selected levels. Destinations (and sources) are enabled by the level with precedence:

- (Rule 1) precedence given by the lowest level button number.
- (Rule 2) precedence given by the most recently pressed level button.

'Takes' can occur only for enabled destinations and sources.

## Level Selection in Enhanced Mode

In enhanced mode, level buttons do not *enable* or *disable* levels, but *select* levels. What enables and disables the levels is the destination: whatever levels the destination includes are enabled *when you press the destination button* to begin a take. These levels remain enabled during the take. Other levels are disabled and remain disabled during the take.

Enhanced mode has two submodes: hold and no-hold. The submodes affect breakaway. In fact, level selection applies only in breakaway:

- In **no-hold mode**, the selected levels persist only until you press a breakaway source. Then they revert to the levels of the destination.  
Not pressing a level button before pressing a source results in a normal take from that source. It clears the breakaway condition during the take.
- In **hold mode**, the selected levels persist until you change the level selection or you press another destination. (This allows the operator to try different sources.)  
Clearing a breakaway condition during the take requires more effort in hold mode than in no-hold mode.

Clearing a breakaway *after a take* (perhaps after many intervening 'takes' to other destinations) is as simple as performing a normal take to a destination that has breakaway.

For normal 'takes' in enhanced mode, the levels selected are always exactly those included in the destination's level list.

In enhanced mode, all defined sources and destinations remain enabled without regard to level selection. Button ordering (spatial or temporal) is not a factor in enhanced mode.



<b>3Gig</b>	Video at 2.97 or 2.967 Gbps. In Grass Valley routers, 3Gig cards support HD and SD signals as well. Video at 3Gig conforms to SMPTE standard 424M.
<b>Asynchronous mode</b>	As it applies to the compact AES routers, “asynchronous” means switched without a video reference signal. In asynchronous mode, the AES router passes the input to the output unmodified.  In asynchronous mode, AES ‘takes’ occur in “stereo” pairs only.
<b>Breakaway</b>	A <i>breakaway</i> takes multiple sources, on different levels, to a destination.
<b>CE</b>	Conformité Européenne. European health and safety product label.
<b>Captive Panel</b>	A “captive” panel is one that is mounted on a router and not on a remote panel module.  CRSC can detect, but not configure, captive panels.
<b>CR</b>	Compact Router.
<b>CR6400</b>	A family of 2RU routers with the CR Series that have a 64×64 switching matrix and modular construction. The family includes a 2RU control panel.
<b>CQX</b>	CQX represents the “clean and quiet” compact routers and panels.
<b>DC</b>	Direct Current.
<b>DHCP</b>	DHCP (Dynamic Host Configuration Protocol) is an IP standard for simplifying the management of host IP configuration. A DHCP server assigns a device an IP address using an IP address database on a local network. Such assignments are made dynamically and the devices do not have fixed IP addresses.
<b>EIA</b>	Electronic Industries Alliance. A trade organization for electronics manufacturers in the United States. The organization helps develop standards on electronic components, consumer electronics, electronic information, telecommunications, and Internet security.
<b>HD</b>	High definition (HD-SDI). In Grass Valley routers, HD cards support SD signals as well. HD video conforms to SMPTE standard 292M.
<b>IEC</b>	International Electrotechnical Commission. An international standards organization dealing with electrical, electronic and related technologies.
<b>IEEE</b>	Institute of Electrical & Electronics Engineers. An international non-profit, professional organization for the advancement of technology related to electricity.
<b>I/O</b>	Input/Output.
<b>LAN</b>	Local Area Network.
<b>Remote Panel</b>	A remote panel is a control panel that is mounted on a remote panel module. Remote panels are different from “captive” panels.
<b>Remote Panel Module</b>	A remote panel module is a a CR Series device, resembling a router without I/O connectors, that issues commands to routers when a control panel is mounted on it. The remote panel module also returns router status to the control panel mounted on it.
<b>RU</b>	Rack Unit. A standard measure or size for frames (1.75 inches).
<b>Salvo</b>	(1) A salvo is a stored sequence of simple takes that can be executed at a control panel.

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	(2) A salvo can also mean a “snapshot” of a router crosspoint matrix in the context of the ‘View Router Crosspoints’ page of CRSC.
<b>SD</b>	Standard definition (SD-SDI). SD video conforms to SMPTE standard 259M at 143, 177, 270 and 360Mb/s and SMPTE 344M at 540 Mb/s.
<b>SMPTE</b>	Society of Motion Picture and Television Engineers. <a href="http://www.smpte.org">www.smpte.org</a> . An international professional association, based in the United States of America, of engineers working in the motion imaging industries.
<b>Synchronous</b>	As it applies to the AES routers, “synchronous” means switched in relation to the sync obtained from a video reference signal. The AES routers perform certain functions when in “synchronous” mode, namely (1) outputting an AES stream at 48kHz, and (2) switching mono channels.
<b>Subnet Mask</b>	A subnet is an identifiably distinct portion of an organization's network. A subnet allows a single large network to be broken down into smaller ones. A subnet mask is a bit pattern used by the IP protocol to identify a subnet and a device within the subnet.
<b>UL</b>	In CRSC networks, all routers and panels that communicate must be on the same subnet. Underwriters Laboratory Incorporated. Develops standards and test procedures for materials, components, assemblies, tools, equipment and procedures, chiefly dealing with product safety and utility.

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## **Grass Valley Technical Support**

For technical assistance, contact our international support center, at 1-800-547-8949 (US and Canada) or +1 530 478 4148.

To obtain a local phone number for the support center nearest you, please consult the Contact Us section of Grass Valley's website ([www.grassvalley.com](http://www.grassvalley.com)).

An online form for e-mail contact is also available from the website.

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