

# NV9648

NV9000 Control Panel

## User's Guide

UG0075-01

20 Nov 2014



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## Change History

Rev.	Date	ECO	Description	Approved
1.0	24 Apr 13	18826	Initial release	D.Cox
1.1	20 Nov 14	19357	New format. Added Korean compliance statement. Client assignments (in server mode) preserved over power cycles.	D.Cox

## Safety Compliance

### Korean Compliance (KCC) Statement



KCC-REM-XEI-NV8500

A 급 기기

( 업무용 방송통신 기자재 )

Class A Equipment

(Commercial Broadcasting & Communication Equipment)

이 기기는 업무용 (A 급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

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All of the equipment described in this manual has been designed to conform with the required safety and emissions standards of the European Community. Products tested and verified to meet these standards are marked as required by law with the CE mark.

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## Important Safeguards and Notices

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

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### WARNING

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

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### Restriction on Hazardous Substances (RoHs)

Grass Valley is in compliance with EU Directive RoHS 2002/95/EC governing the restricted use of certain hazardous substances and materials in products and in our manufacturing processes.

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It is our objective at Miranda GVD to maintain compliance with all relevant environmental and product regulatory requirements. Detailed information on specific products or on the RoHS program at Grass Valley is available from Grass Valley Customer Support at 1-800-719-1900 (toll-free) or 1-530-265-1000 (outside the U.S.).

## Symbols and Their Meanings



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



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



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



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



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



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

## General Warnings

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

- Heed all warnings on the unit and in the operating instructions.
- Do not use this equipment in or near water.
- This equipment is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting the equipment inputs or outputs.
- Route power cords and other cables so they are not likely to be damaged.
- Disconnect power before cleaning the equipment. Do not use liquid or aerosol cleaners; use only a damp cloth.
- Dangerous voltages may exist at several points in this equipment. To avoid injury, do not touch exposed connections and components while power is on.
- Do not wear rings or wristwatches when troubleshooting high current circuits such as the power supplies.

- 
- To avoid fire hazard, use only the specified fuse(s) with the correct type number, voltage and current ratings as referenced in the appropriate locations in the service instructions or on the equipment. Always refer fuse replacements to qualified service personnel.
  - To avoid explosion, do not operate this equipment in an explosive atmosphere.
  - Have qualified service personnel perform safety checks after any service.

## General Cautions

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

- When installing this equipment, do not attach the power cord to building surfaces.
- To prevent damage to equipment when replacing fuses, locate and correct the problem that caused the fuse to blow before re-applying power.
- Use only the specified replacement parts.
- Follow static precautions at all times when handling this equipment.
- This product should only be powered as described in the manual. To prevent equipment damage, select the proper line voltage on the power supply(ies) as described in the installation documentation.
- To prevent damage to the equipment, read the instructions in the equipment manual for proper input voltage range selection.
- Some products include a backup battery. There is a risk of explosion if the battery is replaced by a battery of an incorrect type. Dispose of batteries according to instructions.
- Products that have (1) no on/off switch and (2) use an external power supply must be installed in proximity to a main power outlet that is easily accessible.
- To reduce the risk of electrical shock, plug each power supply cord into a separate branch circuit having a separate service ground.

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# 1

## Preface

Chapter 1 is an introduction to the NV9648 User's Guide.

### Topics

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<a href="#">The PDF Document</a> .....	1
<a href="#">Terms, Conventions and Abbreviations</a> .....	2
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## Chapter Structure

The following chapters provide detailed information regarding the NV9648 Control Panel:

- Chapter 1, [Preface](#), (this chapter) outlines ways to use this guide.
- Chapter 2, [Introduction](#), provides a functional description of the NV9648.
- Chapter 3, [Installation](#), provides installation, connection, and initialization instructions.
- Chapter 4, [Configuration](#), provides configuration instructions.  
This chapter is for configurers, primarily.
- Chapter 5, [Operation](#), provides operating instructions.  
This chapter is for operators, primarily.
- Chapter 6, [GPIO](#), describes the tally (a.k.a. GPIO) interface and tells you how to configure it.
- Chapter 7, [Technical Details](#), provides electrical, mechanical, and environmental specifications, product drawings, and default settings.
- Chapter 8, [Misc. Topics](#), presents a glossary and miscellaneous instructions and information.
- An [Index](#) is also provided for your reference.

## The PDF Document

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

- Use the Table of Contents or the bookmarks page to jump to any desired section.
- Many hyperlinks are provided within the chapters.
- Use the Index to jump to specific topics within a chapter. Each page number in the index is a hyperlink.
- Use Acrobat's 'Go to Previous View' and 'Go to Next View' buttons to retrace your complete navigational path.

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

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#### Note

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

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

## Terms, Conventions and Abbreviations

The following conventions are used throughout this guide:

- The symbol **p** denotes either an example or a special message.
- Entries enclosed in single quotation marks or Capital Letters denote physical control panel buttons, configuration buttons, or menu items.
  - Click 'Apply' to ...
  - Press the SRC 12 button ...

The following terms and abbreviations are used throughout this guide:

- The term "control panel" refers to the NV9648 control panel and to NV96xx control panels, in general.
- "High tally" means that a button is brightly illuminated. High-tally usually means that the button function is selected or active.
- "Low tally" means that a button is illuminated at low intensity. Most buttons assume a low tally state until selected.
- "SE" is an abbreviation used in this document for NV9000-SE Utilities.

## Other Documentation and Software

You should read and be familiar with the material presented in the following documents:

- NV9000 Quickstart Guide.
- NV9000-SE Utilities User's Guide (or NV9000-SE Utilities help files).
- The router manuals for whatever routers you have in your system.

You should also be familiar with the NV9000-SE Utilities software and NV9000 router control systems.

# 2 Introduction

Chapter 2 provides a functional description of the NV9648.

## Topics

- [Summary](#) ..... 3
- [Function Buttons and Displays](#) ..... 4
- [Tally Interface](#) ..... 5
- [Modes of Operation](#) ..... 5
- [Other NV9648 Functions](#) ..... 7

## Summary

The NV9648 is a 2RU half-width panel, approximately 3" deep. Two NV9648s can be mounted in a rack side-by-side with a rack mounting kit (part number NV9649-48-RMK).

The panel is organized as shown in figures 2-1 and 2-2:



Fig. 2-1: NV9648 Front

At the rear, the panel has power, serial, and network connectors, and a 25-pin GPIO (tally) connector that supports 4 optically isolated relay outputs and 8 optically isolated inputs:

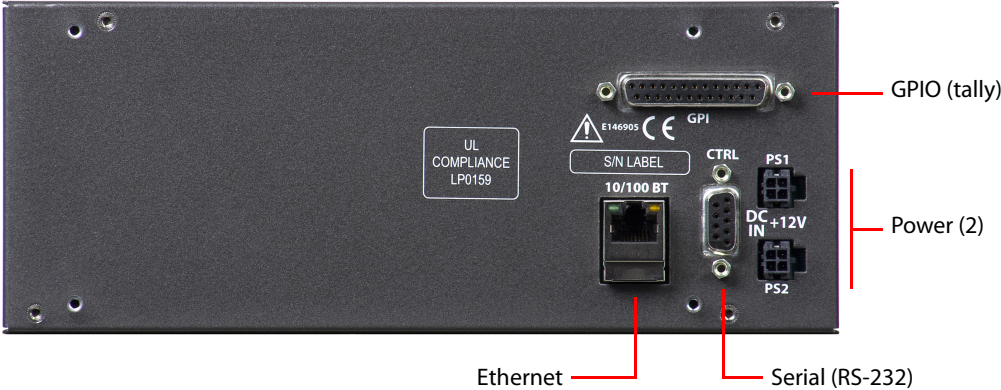


Fig. 2-2: NV9648 Rear

The NV9648 has 3 very different operating modes (or behavioral models):

- ‘Panel Client’ mode. For brevity, we can call this “client” mode.

When the panel is in “client” mode, it operates in conjunction with an NV9649 and other NV9648s. The NV9649 is the “server” and the NV9648s are the “clients.” The NV9649 and the NV9648s combine to form, in essence, a larger panel — actually a cluster of many small panels. The NV9649, being the server, can control which sources and destinations the NV9648s can select. See [‘Panel Client’ Mode](#) on page 5.

- ‘Panel Standalone’ mode. For brevity, we can call this “standalone” mode.

When the panel is in “standalone” mode, it functions much the way it does in “client” mode, but with a few added button functions. See [‘Panel Standalone’ Mode](#) on page 6.

- ‘LCD Min XY/MD’ mode. For brevity, we can call this LCD XY/MD mode.

In this mode, the panel also operates standalone, but has a richer function set. The panel’s buttons are used in a hierarchical fashion: pressing a ‘navigation’ button causes the panel to display a new set of button functions or a “button page.” There can be many such pages, organized in a configurable tree structure.

The operator can switch the panel between “X-Y mode” and multi-destination (MD) mode. In X-Y mode, the operator can perform takes (and locks) on individually selected levels. In MD mode, takes occur on all levels, but the operator can perform takes to multiple destinations simultaneously. See [‘LCD Min XY/MD’ Mode](#) on page 7.

The panel’s 27 buttons and 3 displays are used in very different ways in the 3 modes.

## Function Buttons and Displays

At the front, the panel is divided into 3 sections. Each section has 1 display and 9 buttons. Refer to Figure 2-1.

Each display is an 8-character alphanumeric LED display.

Each function button incorporates a 64x32 LCD. The buttons’ LCDs can be illuminated in 7 colors: red, green, yellow, blue, purple, amber, and grey. Each LCD can be off, bright (high-tally) or dim (low-tally) depending on what the operator is doing and what functions are selected.

A button’s LCD (when it is not off) presents the button legend. Some button legends are fixed. Source and destination buttons, for example, show the source or destination mnemonic. Some button legends vary. Selection buttons have 3 lines of text, the top line displaying the current source, the middle line displaying the preset source, and the bottom line displaying the level (in X-Y mode) or MD device in MD mode.

The buttons and displays are used differently in the 3 operating modes.

In client mode and in standalone mode, each section functions as a complete and separate panel, unrelated to the other two sections. Each display shows the source or destination chosen for its section. (When the panel is in client mode, the NV9649 server panel can reassign the destination and sources to each section of each NV9648.)

In LCD XY/MD mode, all 3 sections are integrated. The displays show, in MD mode, respectively, from left to right, (1) the current source, (2) the preset source, and (3) the selected destination. All 27 function buttons form a “button page” in a hierarchical structure of button pages.

## Tally Interface

At the rear of the panel is a DB25 connector that provides 8 tally inputs and 4 tally outputs. (The outputs are solid state relay outputs.) Both inputs and outputs are optically isolated.

During configuration, you can construct Boolean logic that switches the outputs on or off. The terms of the logic expressions are states of the source and destination devices, etc., controlled by the NV9000 control system.

During configuration, you can prescribe NV9648 behavior that depends on the tally inputs.

What you connect to the tally interface is, of course, up to you. Grass Valley provides a breakout cable (WC0053) for the tally connector as a purchase option.

The NV9000-SE Utilities on-line help documentation calls the tally interface a GPIO interface. On the rear of the panel, it is labeled a "GPI interface."

See chapter 6, [GPIO](#), on page 75, for complete detail.

## Modes of Operation

The NV9648 has 3 operating modes (or behavioral models). The panel's 27 buttons and 3 displays are used in very different ways in the 3 modes.

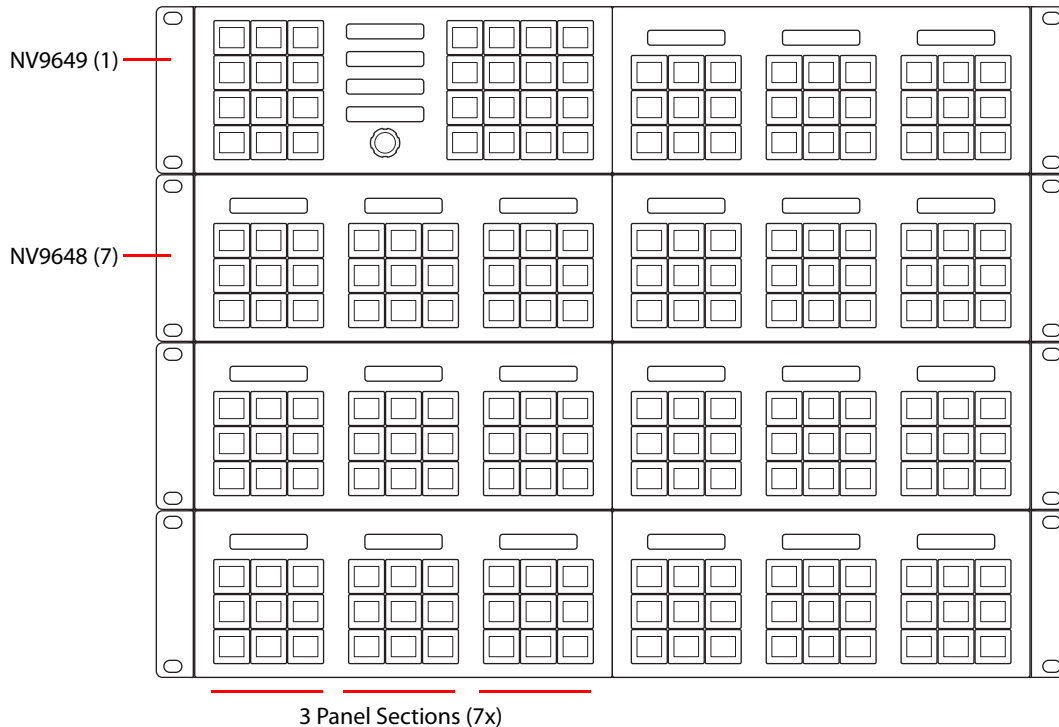
### 'Panel Client' Mode

When the panel is in "client" mode, it operates in conjunction with an NV9649 and other NV9648s. The NV9649 is the "server" and the NV9648s are the "clients." The NV9649 and the NV9648s combine to form, in essence, a larger panel — actually a cluster of many small control units. The NV9649, being the server, can control which sources and destinations the NV9648s can select.

Each NV9648 has 3 identical sections and, in client mode, each section functions as a complete and separate control unit, unrelated to the other two sections. Each display shows a destination chosen by the operator of the NV9649.

In client mode, the control unit shows the current source in its display when the NV9649 server is in source mode and the destination when NV9649 is in destination mode.

Here is an example of a system with an NV9649 and 7 NV9648 clients:



In this example, there are 21 control sections in addition to the controls of the NV9649. At any moment, the operator can route to 21 destinations. The operator can, of course, assign different destinations to the control units at any time. The function buttons in each unit apply only to the destination assigned to the unit.

### Saved Client Assignments

Every time an operator assigns a destination to an NV9648 client or assigns a source to a source button of a client, those assignments are recorded within the NV9000 system controller. Therefore, if and when the system controller undergoes a power cycle, the source and destination assignments of all the NV9648 clients are preserved.

The NV9649 (server) can be configured so that up to 12 different sets of client assignments (or "set-ups" as they are called in the NV9649's menu) can be defined, selected, redefined, and otherwise managed as different operators choose.

A NV9649 always has a default setup and may have eleven other named setups.

### 'Panel Standalone' Mode

When the panel is in "standalone" mode, it functions much the way it does in "client" mode, but it does not require the presence of an NV9649 and has a few added button function types, in particular a destination section button.

In standalone mode, each of the panel's 3 control sections functions as a complete and separate control unit, unrelated to the other two sections. Each unit's display shows the destination chosen for its section. If the unit has no destination selected, the display reads "NO DEST."

Each of the 3 units can be configured with a default destination.



## 'LCD Min XY/MD' Mode

When the panel is in LCD XY/MD mode, the panel also operates standalone, not requiring the presence of an NV9649, and has a moderately richer function set. The panel's buttons can be used in a hierarchical fashion: pressing a 'navigation' button causes the panel to display a new set of configured button functions, called a "button page." There can be many such pages, organized in a configurable tree structure.

The operator can switch the panel between "X-Y mode" and multi-destination (MD) mode. In X-Y mode, the operator can perform takes (and locks) on individually selected levels for a single destination at a time. In MD mode, takes occur on all levels, but the operator can perform takes to multiple destinations simultaneously.

Under the LCD XY/MD model, the 3 sections of the panel are integrated. The displays show, respectively, from left to right, (1) the current source, (2) the preset source, and (3) the selected destination. All 27 function buttons form a "button page" in a hierarchical structure of button pages.

The panel supports the use of multiple 'selection' buttons. When the panel is in X-Y mode, the selection buttons select levels. When the panel is in MD mode, the selection buttons select MD devices (which are destinations). If there are more levels (or more MD devices) than there are selection buttons, the operator can press a 'Page Up' or 'Page Down' button to scroll through the list of levels (or, in MD mode, the list of MD devices).

## Additional Modes

Additional but secondary modes of panel operation are:

- Setup mode— where the NV9648 is freshly powered up, but disconnected from the network. In this mode, you can preset the NV9648's panel ID and perform a few diagnostic tasks. See [Setup Mode](#) on page 71.
- Menu mode— pressing a menu button places the NV9648 in "menu" mode. In menu mode, the buttons lose their normal functions and become part of a menu that changes as needed during menu operation. See [Menu Mode](#) on page 68.

Other modes of operation are:

- Hold mode— when you press the 'Hold' button, hold mode becomes active and when you press it again, hold mode becomes inactive. See [Hold](#) on page 61.  
Hold mode is available when the panel is operating under the LCD XY/MD model.

## Other NV9648 Functions

The NV9648 can be configured to perform the following additional functions:

- Previous source and free source.
- System salvos.
- Lock/protect/release for destinations.
- Device selection using categories and indexes or suffixes.
- Multiple- and single-level breakaways.

Most of these capabilities are available only under the 'LCD Min XY/MD' behavioral model.

# 3 Installation

Chapter 3 provides a functional description of the NV9648.

## Topics

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<a href="#">Initialization</a> .....	11
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## Package Contents

If you have ordered one or more NV9648 control panels from Grass Valley, inspect the shipping container for damage. If you find any container damage, unpack and inspect the contents. If the contents are damaged, notify the carrier immediately.

As you unpack the shipping container, look for the packing slip and compare it against the contents to verify that you received everything as ordered. If anything is missing (or if you find equipment damage unrelated to shipping), please contact technical support. Refer to [Grass Valley Technical Support on page 101](#).

Depending on your order, the NV9648 items that can ship include:

- One or more NV9648 control panels.
- One or two power supplies for each NV9648, with straps that secure the AC power cords to the power supplies.
- One or more rack-mounting kits (NV9649-48-RMK).
- Optional WC0053 breakout cable.

The package does not contain network cables, serial cables, or mounting screws. (The rack-mounting kit, if present, does contain screws.)

You do not need to take any special precautions regarding ESD.

This document **does** address the relationship of the NV9648 to the NV9649. Otherwise, this document does **not** address the shipment or installation of any other equipment or software that can be used in conjunction with the NV9648 (including the NV9000 system controller, NV915 system controller, other NV96xx control panels, EC9700 GUI, EC9710 GUI, and configuration programs such as UniConfig or NV9000-SE Utilities).

This document **does** briefly address the use of NV9000-SE Utilities and the Panel IP Configuration Utility as they pertain to panel configuration.

## Installation

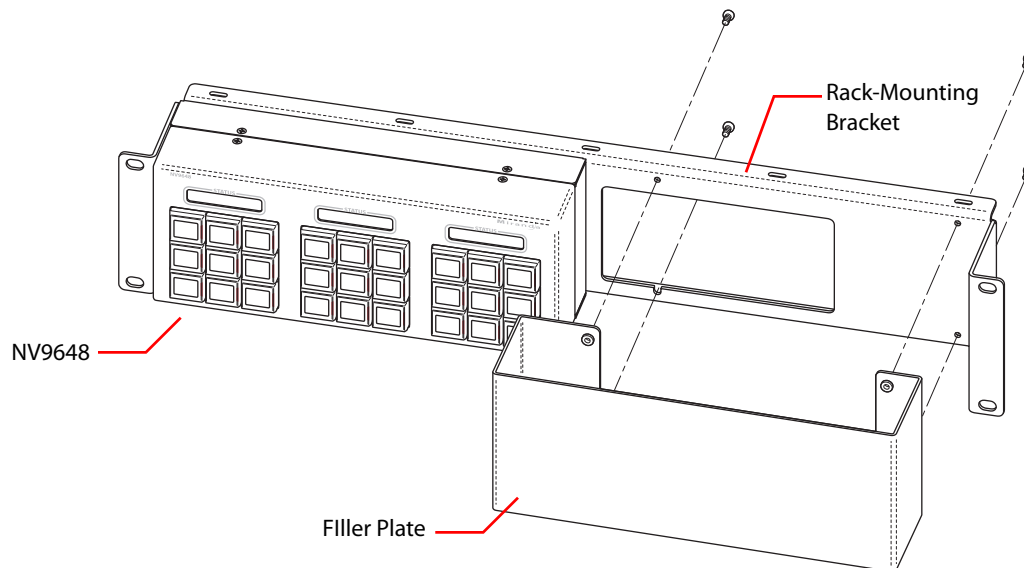
Follow these steps to install a NV9648 control panel:

- 1 Mount, and secure, the panel(s) in the rack.

The NV9648 is designed to mount in a 19" rack. Rack-mounting is not a requirement.

The NV9648 is a 2RU half-width panel: you can install two of them side by side in a rack. Rack mounting (either one or two NV9648s) requires a rack mounting bracket such as the one in Grass Valley's NV9649-48-RMK (rack-mounting kit). The kit contains two parts, (1) the bracket itself and (2) a filler plate for brackets that will hold only one panel. The kit provides 8 mounting screws for attaching the panels to the bracket.

The NV9648 mounts on the kit's bracket using 4 screws. The bracket has two apertures in which the connectors at the rear of the panel are exposed:



The filler plate and the NV9648 attach to the bracket in the same way. Each may be placed on either side of the bracket.

See [Drawings](#) on page 83 for bracket dimensions.

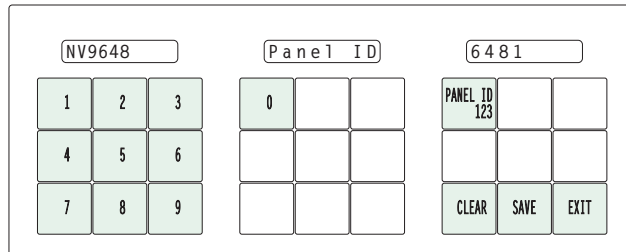
Once the panel(s) are attached to the bracket, you can place the bracket in position in your rack. Attach the bracket to the rack frame, using screws appropriate for your rack. The bracket's mounting slots are spaced 3.00" (76.2 mm) vertically and allow approximately 1/8" (3 mm) of movement horizontally.

- 2 We assume that you have an Ethernet switch connected to the "Panel and Router Network" port of your system controller. Connect an Ethernet cable from that switch to the RJ-45 port at the rear of the NV9648.
- 3 Connect one or both power supplies. First connect the 4-pin connector to PS1 or PS2 on the rear of the router. The connectors are keyed and snap into place. There is only one way they fit. Do not force them. Then connect the power supply to AC power.





- 3 The panel ID menu has a numeric “keypad” with which you can enter a new panel ID:



The panel shows the current panel ID in the right-most display. It shows the panel ID you are entering in the first button under that display.

If you make a mistake, press ‘Clear’ to erase your entry and start over.

When you have entered a panel ID correctly, press ‘Save’.

Press ‘Exit’ at any time to leave the panel ID menu. You might have to press ‘Exit’ more than once to leave the menu entirely.

- 4 After you enter the panel ID, reconnect the Ethernet cable. The NV9000 system controller can detect your panel in a few seconds. (**All** panel IDs must be unique.) But it will do so only when the NV9000 has a panel configuration defined for this panel ID.

You can now prepare an NV9648 configuration in NV9000-SE Utilities and upload the configuration to the NV9000. You need the panel ID to create a NV9648 configuration. When you upload the configuration, the panel ID you entered in NV9000-SE Utilities designates the actual panel to which the upload will occur. If no actual panel has that ID, the upload cannot occur.

When you restart the NV9000 system controller with the appropriate panel configuration, the NV9648 you have configured should become active. Its buttons and displays will turn on, showing meaningful data.

## Testing

A panel test function is available when the NV9648 is disconnected from the system controller. Run the test to determine the health of your NV9648. See [Setup Mode](#) on page 71 for detail. You can also view the software version numbers under setup mode.

These are points to consider after you install your NV9648 control panel(s):

- 1 Do the buttons illuminate? When an NV9648 powers up, one or more of its buttons are supposed to turn green or amber. Does it pass the panel test mentioned above?
- 2 When the NV9648 powers up and it is connected to the system controller, it should initialize completely. (That takes a few seconds.) The NV9000 system should load whatever configuration exists for that panel and the buttons appropriate for its configuration should light.

If you continue to see “No Server,” “Acquire IP Address,” or “Locating Network,” you have a problem. Reboot everything and try again.

- ▲ The NV9648, by default, acquires its IP address through DHCP on the NV9000’s panel/router network. You can use the Panel IP Configuration Utility to force the panel to have a static IP address.

If (in setup mode) you do not see your designated panel ID in the top left button, you have either not initialized the panel or no configuration has been created for your panel in NV9000-SE Utilities.

- 3 Is the NV9000 system controller actually running? With the typical noise levels in a facility, it can sometimes be difficult to tell. Use the 'System' pages of NV9000-SE Utilities to make the determination.
- 4 Is NV9000-SE Utilities installed and operating? If so, can you upload a configuration to the specified panel?
- 5 Does the configuration actually work? Is it useful? Can the operator perform takes and perform other operations?

You might want to consider how well your operator interface works in addition to the basic question of whether it works.





# 4 Configuration

Chapter 4 provides configuration instructions for the NV9648.

## Topics

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This chapter addresses configurers. Operators and other persons not interested in NV9648 configuration need not read this chapter.

## Summary

The NV9648 is a relatively simple panel. It has 27 function buttons, 3 small displays, and a GPIO (tally) interface. The displays and function buttons are organized into 3 groups, each group having 1 display and 9 function buttons.

Each display shows 8 characters.

Each function button has a color LCD, 64×32, that provides up to 3 lines of text, 8 characters per line, in several colors and at two levels, bright (high-tally) and dim (low-tally). When a button is undefined, unassigned, or momentarily disabled, its LCD is off and we say the button is “dark.”

The NV9648 panel can be configured to operate under 3 behavioral models (or operating modes):

- ‘Panel Client’ mode.

When the panel is in “client” mode, it operates in conjunction with an NV9649 and other NV9648s. The NV9649 is the “server” and the NV9648s are the “clients.” The NV9649, being the server, can control which sources and destinations the NV9648s can select. To some extent, it can control the functioning of the clients.

- ‘Panel Standalone’ mode.

When the panel is in “standalone” mode, it functions much the way it does in “client” mode, but with a slightly different function set. In standalone mode, an NV9649 is not required.

- ‘LCD Min XY/MD’ mode.

In this mode, the panel also operates standalone, but has a richer function set. The panel’s buttons are used in a hierarchical fashion: pressing a ‘navigation’ button causes the panel to display a new set of button functions or a “button page.” There can be many such pages, organized in a configurable tree structure.

## Configuration

### Adding a Panel to an NV9000 Configuration

The operator can switch the panel between “X-Y mode” and multi-destination (MD) mode. In X-Y mode, the operator can perform takes (and locks) on individually selected levels. In MD mode, takes occur on all levels, but the operator can perform takes to multiple destinations simultaneously.

The panel’s 27 buttons and 3 displays are used in very different ways in the 3 modes.

At the rear of the panel, a DB25 connector supports 8 tally inputs and 4 tally outputs. See Chapter 6, [GPIO](#), on page 75.

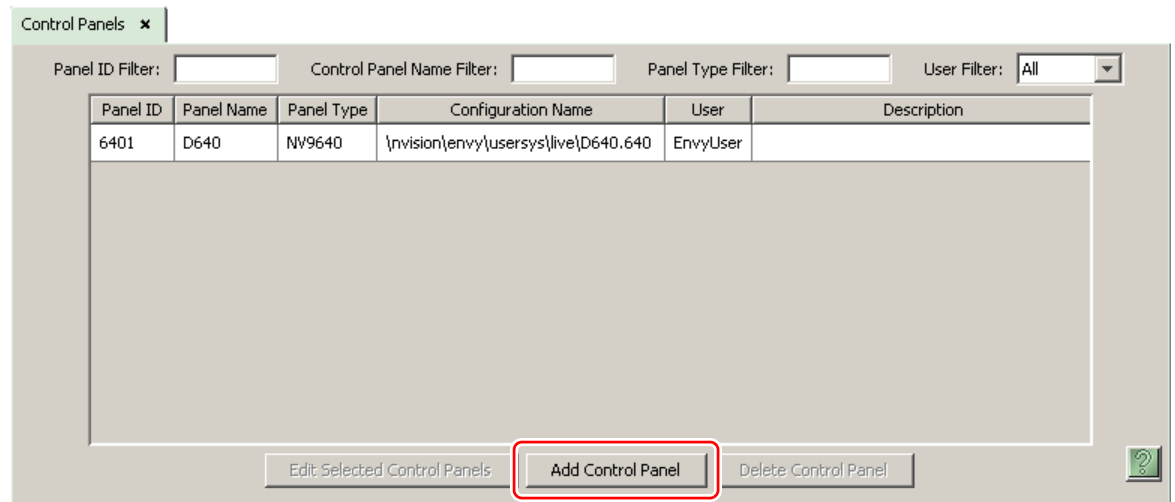
NV9000-SE Utilities is the software with which to configure the NV9648. Figures 4-1, 4-2, and 4-3, following, show typical NV9648 panel configurations (in NV9000-SE Utilities) for each of the behavioral models.

## Adding a Panel to an NV9000 Configuration

You must create configurations for the NV9648 using NV9000-SE Utilities. We assume that you are familiar enough with NV9000-SE Utilities that you can understand the following material. It is not difficult material, but some of the concepts might not be familiar to everyone.

It takes only a few seconds to add a new panel configuration.

After launching NV9000-SE Utilities, choose ‘Control Panels’ from the Configuration pane in the navigation area. The ‘Control Panels’ configuration page appears:



Click ‘Add Control Panel’ at the bottom of the configuration page.

The 'Add Control Panel' page appears:

The screenshot shows a dialog box titled "Add Control Panel". It contains the following fields and options:

- Type: NV9648 (dropdown menu)
- ID: 6483 (text box)
- Name: N648 (text box)
- User: EnvyUser (dropdown menu)
- Configuration Options:
  - New, named: [ ] copied from: [ ]
  - Existing: [ ]
  - New (default), named: N648 (text box)

At the bottom of the dialog are buttons for "Previous", "Next", "Finish", "Cancel", "Suffix", "Navigate", and a help icon.

Choose "NV9648" from the 'Type' field. In the ID field, enter the panel ID you assigned to the panel while it was in setup mode. Give a name to the panel in the name field and select a user. When you are creating a panel configuration you have 3 options. These options are presented in the 'Configuration Options' area:

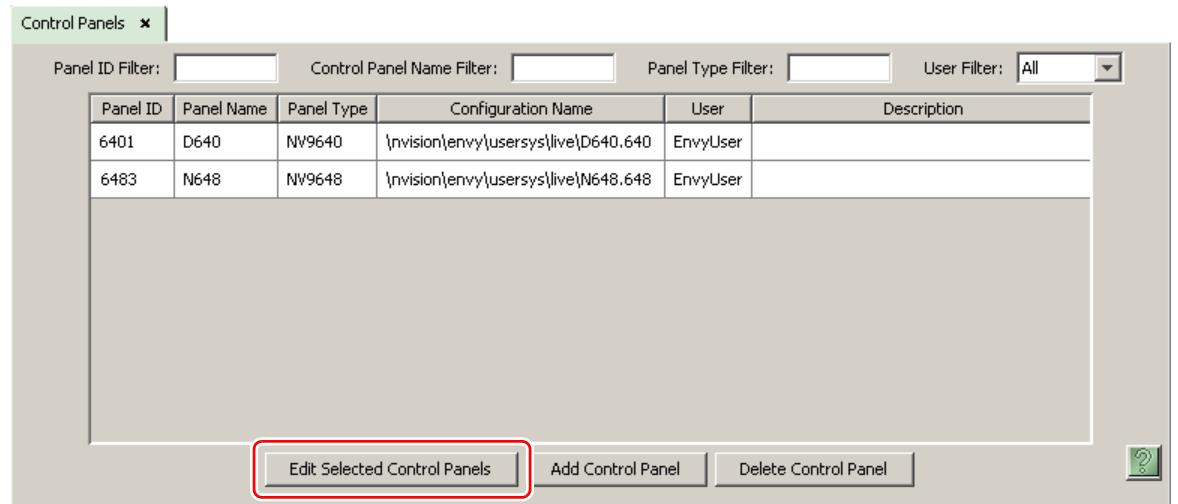
- 1 Make a copy of an existing configuration file, giving it a new file name.
- 2 Use an existing configuration file. (This allows several panels to share a single configuration.)
- 3 Create an entirely new configuration file.

In the first and third cases, you will create a new configuration file whose name you designate. The file extension for an NV9648 configuration file is .648. Click 'Next' or 'Finish' to proceed.

## Configuration

### NV9648 Panel Configuration Page(s)

Return to the 'Control Panels' page to view your new entry. To edit an NV9648 configuration, either double-click its list entry or select the entry and then click 'Edit Selected Control Panels':



You will then see the panel configuration page for the selected NV9648.

The following section of this guide discusses using the panel configuration page in which you configure an NV9648.

## NV9648 Panel Configuration Page(s)

The NV9648 panel can be configured to operate under 3 behavioral models:

- 'Panel Client' mode.
- 'Panel Standalone' mode.
- 'LCD Min XY/MD' mode.

(The behavioral model is selected in the first entry—a drop-down list—among the panel options.)

The panel configuration pages for the 3 models differ greatly. The set of button functions differ and the panel options also differ.

However, the configuration pages do have some common features.

### Common Page Features

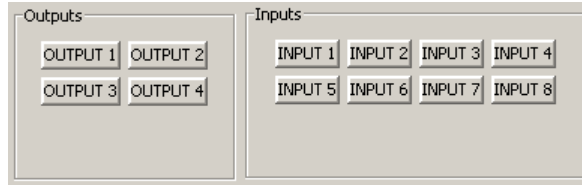
#### Panel Graphic

At the top of the page is a graphic representation of the NV9648 panel. Above the graphic is the pathname of the panel's configuration file. (This file corresponds to what you are editing, which will eventually be sent to the NV9000.)

Configurers must click a button "proxy" in the graphic to select the button for configuration.

## GPIO Section

In this section, configurers may define GPIO logic. The control panel has a rear connector that provides 4 relay outputs and 8 optically isolated inputs. The section has two parts: inputs and outputs.



By clicking on one of the input or output buttons, you can configure the input or output. (The NV9648 has no actual tally buttons. These buttons represent the DB25 connector at the rear. The buttons are present in the configuration page to allow you to configure the tally interface.)

If you are interested in configuring the tally interface, read chapter 6, [GPIO](#), on page 75.

## Commitment Buttons

Two buttons at the bottom of the configuration page are self-explanatory and present on most configuration pages:

- Revert to Saved. Press this button if you want to discard any recent changes you have made.
- Save. Press this button to commit all your recent changes.

Neither of these actions is reversible.

The 'Save and Close' button, also at the bottom, dismisses the configuration page in addition to saving the configuration changes.

## Clear Configuration Button

The 'Clear Configuration' button, located in the 'Panel Options' section, completely empties the configuration, reverting to default values. The button does not, however, change the selected behavioral model.

## Common Configuration Tasks

The person configuring an NV9648 panel will want to consider how best to use the buttons to support the devices and routers in the router control system at hand. The task is non-trivial. In support of that effort, the configurer will do the following:

- Select panel options.
- Assign functions to buttons.
- Define logic for some or all of the tally inputs and outputs.

## Configuration Page for Client Mode

This is a sample NV9648 panel configuration page for client mode:

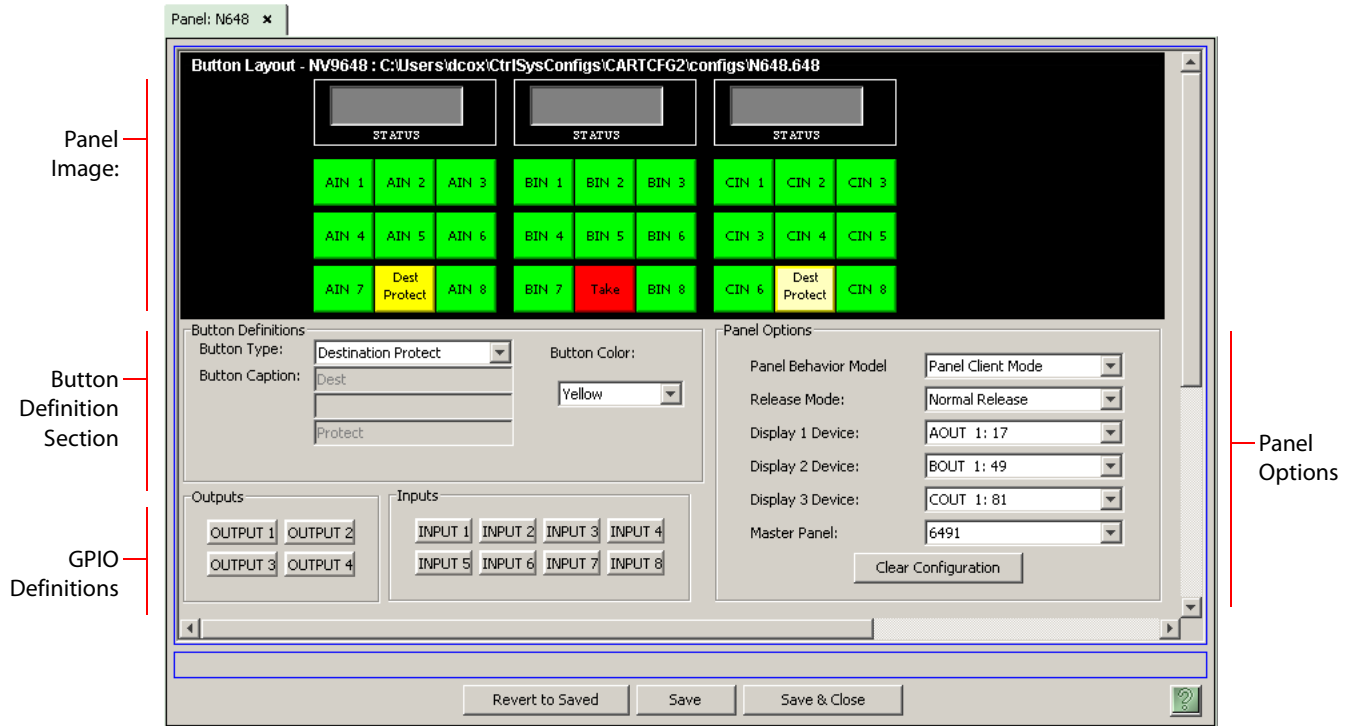


Fig. 4-1: NV9648 Configuration Page (in Client Mode)

There are 5 button function types for a panel in client mode:

- Destination Lock      Destination Protect      Quick Source
- Source                      Take

These are described in [Button Functions for Client Mode](#) on page 34.

### Characteristics of Client Mode

The panel has 3 sections that are independent control units. Each unit—having one display and 9 buttons—corresponds to a destination.

One or more NV9648s (clients) operate with an NV9649 (server). The NV9649 can assign a destination to any of an NV9648's sections and also assign sources to the source buttons of any of an NV9648's sections.

In client mode, clients show current sources in their displays when the NV9649 is in source mode and show the sections' destinations when the NV9649 is in destination mode.

(Refer to the NV9649 Users' Guide.)

- ▲ Before you can complete an NV9648 "client" configuration, you must have defined an NV9649 server configuration. The NV9648 references the NV9649 by its panel ID.

## Client Mode Panel Options

In a client mode configuration, the panel options section, at the right of the configuration page, has 6 drop-down menus (and no checkbox options). These are the drop-down menus:

- ▲ By making a selection in the behavioral model field, you change the content of the entire configuration page, including the set of panel options. In changing the model, you effectively clear the entire configuration.

These are the drop-down menu options for the panel in client mode:

Panel Behavioral Model	Panel Client Mode	In client mode, the panel interoperates with an NV9649 and other NV9648s, the NV9649 being configured as the “server” to the client panels. It is in the ‘Master Panel’ drop-down list that you specify which NV9649 is the “server” for this panel. The panel’s 3 control sections are independent of each other.
	Panel Standalone Mode	In standalone mode, the panel behaves as if it were in client mode, but it does not require an NV9649 server and can stand alone. The panel’s 3 control sections are independent of each other.
	LCD Min XY/MD Mode	In LCD XY/MD mode, the panel has a rich function set. The operator can choose either X-Y mode or multi-destination mode. The panel’s 3 control sections are not independent, but integrated. The terms “LCD” and “Min” have no particular meaning.
Release Mode	Normal Release	This panel can release “locks” and “protects” set by the designated user (at this panel or any other panel).
	Force Release	This panel can release locks and protects set by any user.
Display 1 device	None	After a reset, the panel displays no destination device. in display 1 (the left-most display). This is not recommended.
	<device>	The panel uses the specified device as the destination after a reset.
Display 2 device	None	After a reset, the panel displays no destination device. in display 2 (the middle display). This is not recommended.
	<device>	The panel uses the specified device as the destination after a reset.
Display 3 device	None	After a reset, the panel displays no destination device. in display 3 (the right-most display). This is not recommended.
	<device>	The panel uses the specified device as the destination after a reset.

## Configuration

### NV9648 Panel Configuration Page(s)

Master Panel      <panel ID>

The NV9648 in client mode must be associated with the NV9649 server identified by <panel ID>.

Selecting a panel ID in this field presupposes that you have previously defined an NV9649 configuration (even if it is incomplete at the time you are configuring the NV9648).

**Do not let this field remain blank.**

## Configuration Page for Standalone Mode

This is a sample NV9648 panel configuration page for standalone mode:

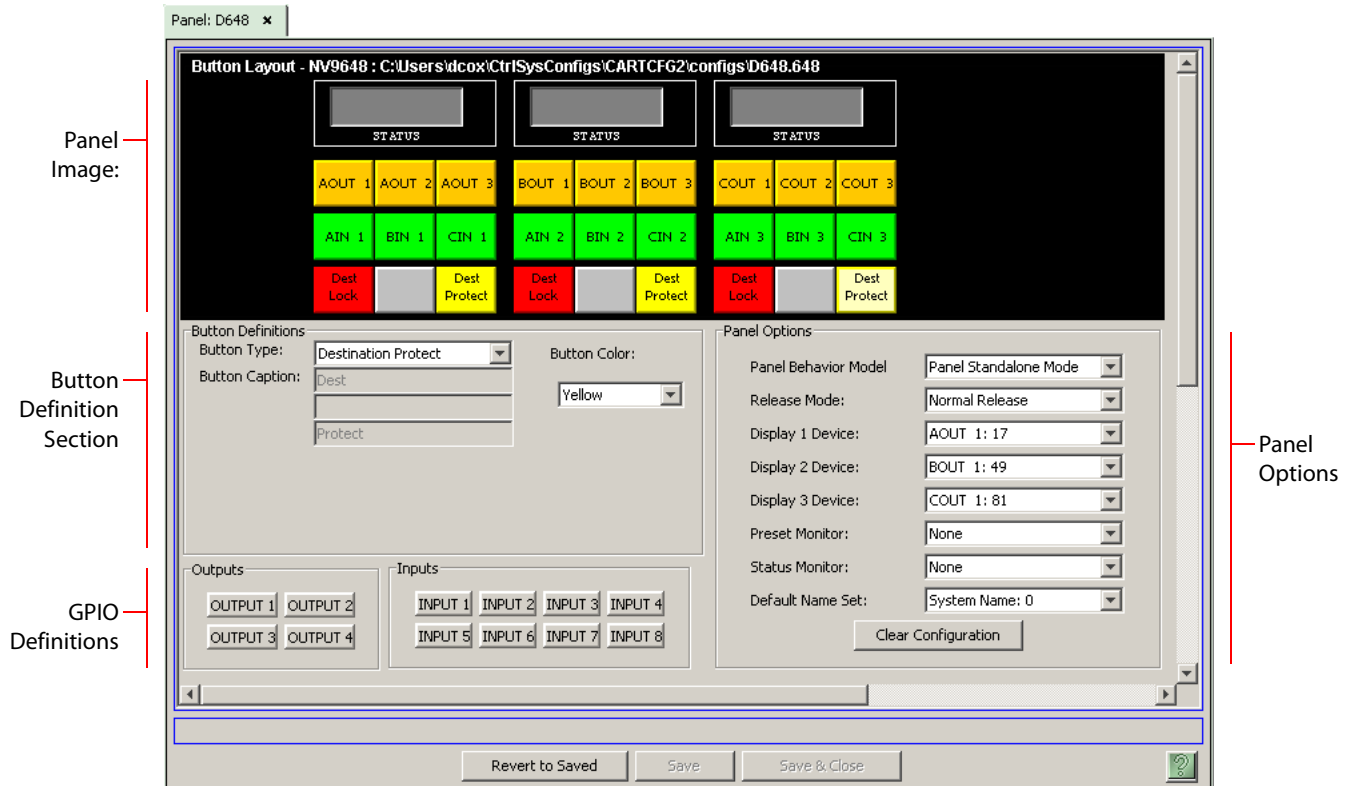


Fig. 4-2: NV9648 Configuration Page (in Standalone Mode)

There are 7 button function types for a panel in standalone mode:

Destination	Destination Lock	Destination Protect
Quick Source	Salvo	Source
Take		

These are described in [Button Functions for Standalone Mode](#) on page 34.

## Characteristics of Standalone Mode

The panel in standalone mode functions much the same way it does in client mode, but (1) does not require the presence of an NV9649 and (2) provides 2 additional button functions.

As under client mode, the panel has 3 sections that are independent control units. Each unit corresponds to a destination that is selectable.



Each section's display shows its own destination. (The display reads "NO DEST" if no destination has been selected.)

### Standalone Panel Options

In a standalone configuration, the panel options section, at the right of the configuration page, has 6 drop-down menus (and no checkbox options):

Panel Behavior Model	Panel Standalone Mode
Release Mode:	Normal Release
Display 1 Device:	AOUT 1: 17
Display 2 Device:	BOUT 1: 49
Display 3 Device:	COOUT 1: 81
Preset Monitor:	None
Status Monitor:	None
Default Name Set:	System Name: 0

By making a selection in the behavioral model field, you change the content of the entire configuration, including the set of panel options.

These are the drop-down menu options for the panel in standalone mode:

Panel Behavioral Model	Panel Client Mode	In client mode, the panel interoperates with an NV9649 and other NV9648s, the NV9649 being configured as the "server" to the client panels. The panel's 3 control sections are independent of each other.
	Panel Standalone Mode	In standalone mode, the panel behaves as if it were in client mode, but it does not require an NV9649 server and can stand alone. The panel's 3 control sections are independent of each other.
	LCD Min XY/MD Mode	In LCD XY/MD mode, the panel has a rich function set. The operator can choose either X-Y mode or multi-destination mode. The panel's 3 control sections are not independent, but integrated. The terms "LCD" and "Min" have no particular meaning.
Release Mode	Normal Release	This panel can release "locks" and "protects" set by the designated user (at this panel or any other panel).
	Force Release	This panel can release locks and protects set by any user.
Display 1 device	None	After a reset, the panel displays no destination device. in display 1 (the left-most display). This is not recommended.
	<device>	The panel uses the specified device as the destination after a reset.
Display 2 device	None	After a reset, the panel displays no destination device. in display 2 (the middle display). This is not recommended.
	<device>	The panel uses the specified device as the destination after a reset.
Display 3 device	None	After a reset, the panel displays no destination device. in display 3 (the right-most display). This is not recommended.
	<device>	The panel uses the specified device as the destination after a reset.

## Configuration

NV9648 Panel Configuration Page(s)

---

Preset Monitor	None <device>	The preset source video is not sent to a monitor. The preset source video for the selected destination appears on the specified monitor (device).
Status Monitor	None <device>	The current source video is not sent to a monitor. The current source video for the selected destination appears on the specified monitor (device).
Default Name Set	System Name	A list of "name sets" appears in the drop-down menu. The name sets can be defined under the System Management pane of NV9000-SE Utilities. Choose 'System Name' in this list if you do not want, or do not care about, alternate device names. Do <b>not</b> choose 'System Name' if you are configuring any 'Name Set Toggle' buttons.

## Configuration Page for LCD XY/MD Mode

This is a sample NV9648 panel configuration page for XY/MD mode:

Panel: L648

**Button Layout - NV9648 : C:\Users\lcox\CtrlSysConfigs\CARTCFG2\configs\L648.648**

Panel Image:

Button Definition Section:

Page Table:

Page Number	Page Name	Linked From Page
1	Default	
2	A SRCs	1
3	B SRCs	1
4	C SRCs	1
7	A DSTs	1
8	B DSTs	1
9	C DSTs	1

GPIO Definitions:

Panel Options:

Panel Behavior Model: LCD Min XY/MD Mode

Default Mode: Multi-Destination Mode

Release Mode: Normal Release

Default Destination: MON 1: 116

Preset Monitor: MON 1: 116

Status Monitor: MON 8: 123

XY Data Routing Mode: Automatic

MD Data Routing Mode: Automatic

Default Name Set: System Name: 0

Multidest Device Limit: 64

User Programmable ID  Save Preset Default

Hold Preset Default  Enable Destination Lock

Enable Destination Protect  Source Master Default

Hide Sources not configured on this panel

Jump to Multidest Selection When Switching to XY

Flip-Flop Source & Preset After Take  Enable Force Release

Jump Back After Source Selection  Jump Back After Take

Jump Back After Destination Selection  Src/Dst Immediate Take

Clear Configuration

Revert to Saved Save Save & Close

Panel Options

Fig. 4-3: NV9648 Configuration Page (in XY/MD Mode)

There are 21 button function types for a panel in XY/MD mode:

Back	Category	Clear Preset
Destination	Destination Lock	Destination Protect
Hold	Level Map	Menu
Navigate	Page Down	Page Up
Panel Lock	Previous Source	Quick Source
Salvo	Selection	Source
Take	X-Y Display	XY/MD Mode

These are described in [Button Functions for LCD XY/MD Mode](#) on page 35.

### Characteristics of LCD XY/MD Mode

The panel in LCD XY/MD mode has a more extensive function set than panels in client mode or standalone mode. In LCD XY/MD mode too, the panel does not require the presence of an NV9649.

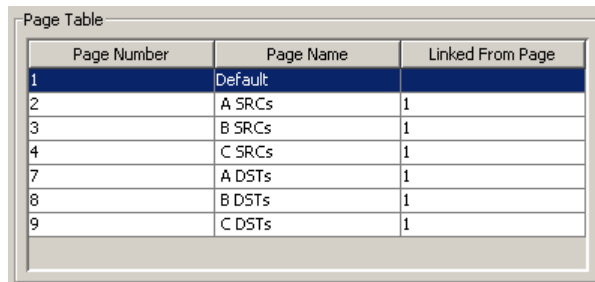
The panel's 3 sections are *not* independent control units, but integrated into a single larger control unit. The 3 displays together show the current source, the preset source, and the current destination. All 27 function buttons form a "button page" in a hierarchical structure of button pages.

The panel's buttons can be used in a hierarchical fashion: pressing a 'navigation' button causes the panel to display a new set of configured button functions, called a "button page." There can be many such pages, organized in a configurable tree structure.

The panel supports the use of multiple 'selection' buttons. When the panel is in X-Y mode, the selection buttons select levels. When the panel is in MD mode, the selection buttons select MD devices (which are destinations). If there are more levels (or more MD devices) than there are selection buttons, the operator can press a 'Page Up' or 'Page Down' button to scroll through the list of levels (or, in MD mode, the list of MD devices).

### The Button Page Table

In LCD XY/MD mode, the configuration page has an additional section, the button page table, just below the button definition section. This is an example:



Page Number	Page Name	Linked From Page
1	Default	
2	A SRCs	1
3	B SRCs	1
4	C SRCs	1
7	A DSTs	1
8	B DSTs	1
9	C DSTs	1

This section displays a list of the individual pages of the tree structure. The button page at the top of the list (or root of the tree) is called "Default."

During operation, category buttons can display device subpages when pressed. Those subpages are not explicitly definable in NV9000-SE Utilities. The button page list does not display the device subpages accessed through category buttons. Category buttons can also display suffix pages when pressed. Suffix pages are included in the button page table.

See [Button Page List](#) on page 31.

## Panel Options

The panel options section, at the right of the configuration page, has two parts: drop-down menus and checkbox options. These are the drop-down menus:

The screenshot shows the following configuration options:

- Panel Behavior Model: LCD Min XY/MD Mode
- Default Mode: Multi-Destination Mode
- Release Mode: Normal Release
- Default Destination: VTR 1: 108
- Preset Monitor: MON 1: 116
- Status Monitor: MON 8: 123
- XY Data Routing Mode: Automatic
- MD Data Routing Mode: Automatic
- Default Name Set: System Name: 0
- Multidest Device Limit: 64

These are its drop-down menu options:

Panel Behavioral Model	Panel Client Mode	In client mode, the panel interoperates with an NV9649 and other NV9648s, the NV9649 being configured as the "server" the client panels. The panel's 3 control sections are independent of each other.
	Panel Standalone Mode	In standalone mode, the panel behaves as if it were in client mode, but it does not require an NV9649 server and can stand alone. The panel's 3 control sections are independent of each other.
	LCD Min XY/MD Mode	In LCD XY/MD mode, the panel has a rich function set. The operator can choose either X-Y mode or multi-destination mode. The panel's 3 control sections are not independent, but integrated. The terms "LCD" and "Min" have no particular meaning.
Default Mode	X-Y Mode	Starts the panel in XY mode after a reset. See <a href="#">Defaults</a> on page 89.
	Multi-Dest Mode	Starts the panel in multi-destination mode after a reset.
Release Mode	Normal Release	This panel can release "locks" and "protects" set by the designated user (at this panel or any other panel).
	Force Release	This panel can release locks and protects set by any user.
Default Destination	None	After a reset, the panel displays no destination device. (This is not recommended.)
	<device>	The Panel uses the specified device as the destination after a reset. (The 'Default State' button also returns the panel to this destination.)
Preset Monitor	None	The preset source video is not sent to a monitor.
	<device>	The preset source video for the selected destination appears on the specified monitor (device).
Status Monitor	None	The current source video is not sent to a monitor.
	<device>	The current source video for the selected destination appears on the specified monitor (device).

## Configuration

NV9648 Panel Configuration Page(s)

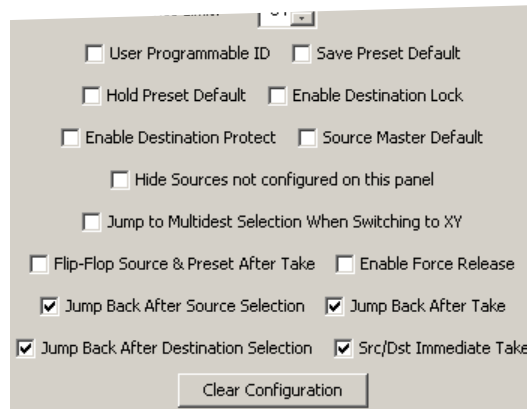
---

XY Data Routing Mode	Automatic	<p>If a machine control (i.e., data) level is involved in a route, the system makes the route on the control level even if the control port is in use on the source or destination device. It breaks the previous control connection and then makes a new control connection for the route in progress.</p>
	Semi-automatic (recommended)	<p>If the control port is in use for the source or destination device, the system takes all (selected) levels except control and allows the operator to perform the control level route by pressing 'Take' a second time. The operator may cancel the control-level take by pressing a button other than 'Take.'</p> <p>If the control port is not in use, the control level take occurs normally.</p>
	Manual	<p>If the control port is in use for the source or destination device, the system takes all (selected) levels except control. It <b>does not</b> perform the control level route.</p> <p>If the control port is not in use, the control level take occurs normally.</p> <p>To carry out a take on a machine control port that is in use, the operator must first free the port by performing a "tristate" take on the port, that is, taking the device (as a source) to itself (as a destination) on the control level.</p> <p>A take can occur on the machine control level if, in the status column of the display, the source entry is "FREE."</p>
MD Data Routing Mode	Automatic	<p>If a machine control (i.e., data) level is involved in a route, the system makes the route on the control level even if the control port is in use on the source or destination device. It breaks the previous control connection and then makes a new control connection for the route in progress.</p>
	Manual	<p>If the control port is in use for the source or destination device, the system takes all (selected) levels except control. It <b>does not</b> perform the control level route.</p> <p>If the control port is not in use, the control level take occurs normally.</p> <p>To carry out a take on a machine control port that is in use, the operator must first free the port by performing a "tristate" take on the port, that is, taking the device (as a source) to itself (as a destination) on the control level.</p> <p>An operator can determine whether the control level is free by switching momentarily to X-Y mode and examining the destination's levels.</p>

Default Name Set	System Name	A list of "name sets" appears in the drop-down menu. The name sets can be defined under the System Management pane of NV9000-SE Utilities. Choose 'System Name' in this list if you do not want, or do not care about, device name aliases. Do <b>not</b> choose 'System Name' if you are configuring any 'Name Set Toggle' buttons.
Multidest Device Limit	(Selectable in multiples of 8)	The number of multi-destination entries you are allowing. Make this value equal to or greater than the number of MD devices you need. The default, and lowest value, is 8. The maximum is 512. (Elsewhere in the configuration, you will create a list of MD devices. You can leave some MD destinations unassigned.)

### Checkbox Options

The checkbox options section is just below the panel options section, enclosed in the same region:



A check in the box enables the option. Clearing the checkbox disables the option.

By default, all the check box options are unchecked except 'Src/Dst Immediate Take'. That particular option is enabled by default.

The following items are the checkbox options:

- User-Programmable ID.  
Allows the Panel ID to be changed locally at the control panel (in menu mode).
- Save Preset Default.  
Makes 'Save Preset' mode active when the panel reverts to its default state (after a Default State button is pressed, or when the panel is restarted).
  - ▲ A 'Save Preset' button is needed only when you want the operator to be able to view or change the mode.
- Hold Preset Default.  
Makes "hold" mode active when the panel reverts to its default state (after a Default State button is pressed, or when the panel is restarted).
  - ▲ **Note:** a 'Hold' button is needed only when you want the operator to be able to view or change the mode.

- Enable Destination Lock.  
Check 'Enable Destination Lock' so that any 'Destination Lock' button on the panel will function.
- Enable Destination Protect.  
Check 'Enable Destination Protect' so that any 'Destination Protect' button on the panel will function.
- Source Master Default.  
Makes a machine control source the *controlling* device (or master device) by default. Otherwise, the destination is the master by default. (The option is specifically for use with NV9000 series machine control routers.)  
"Source is master" is used for duplication, or broadcast routing, on a machine control level.  
"Destination is master" is for machine-to-machine editing.
- Hide sources not configured on this panel.  
Causes the names of source devices that are not presently configured for this particular panel to be effectively hidden. When another panel changes the source to one not configured for this panel, this panel displays asterisks instead.
- Jump to multi-dest selection when switching to XY.  
Makes the currently selected multi-destination device the current destination when you switch from MD mode to X-Y mode.
  - ▲ The X-Y destination shown will be the default destination when the panel is in MD "hold" mode and multiple destinations are selected — if a default destination is specified in the configuration. Otherwise, no destination will be selected.
- Flip-flop source and preset after take.  
Swaps the preset source and the currently routed source for this destination after a take.
- Enable force release.  
Allows operators to execute a force release.
- Jump back after source selection.  
After you make a source selection, the panel reactivates the *default* button page.
- Jump back after take.  
After you press a 'Take' button, the panel reactivates the *default* button page.
- Jump back after destination selection.  
After you make a destination selection, the panel reactivates the *default* button page.
  - ▲ Jumping back to the default page is usually helpful, but in some configuration designs, might not be. You can design your panel configuration to take advantage of the jump-back behavior.
- Src/dst immediate take.  
A 'Src/Dst' button connects a source to a destination. When this box is checked (as it is in the default NV9648 configuration) the button performs an immediate take. When the box is clear, the button sets up the take and the operator must press a 'Take' button to complete the take.



## Button Page List

This section is the region below the button definition section. It lists the pages of the button tree. It has 3 columns: Page Number, Page Name, and "Link to Page Num(s)."

The button page at the top (or root) of the tree is called "Default." Initially, the tree has just the default page, until you add other pages.

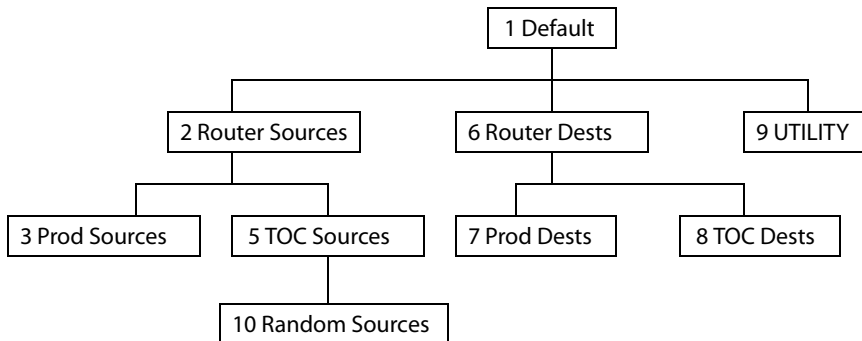
To delete a page or pages from the tree, select the pages in the button page list, right-click the list, and choose one of the deletion commands from the context menu that appears.

- ▲ Be aware when deleting pages from the tree that the deletion does **not** remove any navigation buttons from any button page.

This is a sample of a button page list:

Page Number	Page Name	Links to Page Num(s)
1	Default	
2	Router Sources	1
3	Prod Sources	2
5	TOC Sources	2
6	Router Dests	1
7	PROD Dests	6
8	TOC Dests	6
9	UTILITY	1
10	Random Sources	5

It represents this tree structure:



You can change the name of a page by double-clicking the page's name field and editing its text. Changing the name of a page does not cause a change to the caption of the navigation button and vice versa.

During configuration, you will use 'Navigate' buttons to create new pages. During configuration, you can double-click a 'Navigate' button to jump to its page.

During operation, panel operators will press navigation buttons or category buttons to jump to other pages.

When you double-click the page number field of a page you want to edit, the image of that page appears in the panel graphic area.

The "Links to Page Num(s)" column lists, for any page, the other pages that refer to it. Using the links column you can mentally examine the tree structure or create a sketch of the tree structure. You might note that if the link field of a page is empty, the page is inaccessible during operation. (The exception is the default page which is always available after reset. It might become unavailable in a configuration that has subpages with no 'back' buttons.)

## Button Definitions

The NV9648 panel can be configured to operate under 3 behavioral models:

- 'Panel Client' mode.
- 'Panel Standalone' mode.
- 'LCD Min XY/MD' mode.

The set of button functions for the 3 behavioral models differ greatly.

There are four classes of button functions:

- Dedicated functions, such as 'Default State' or 'Chop'.
- Variable functions, such as 'Category' or 'Source'. With this type of button, additional selections are needed to complete the button configuration.
- Special functions, such as 'Navigate' and 'Back'. These functions allow the panel operator to move from one button page to another. (The Navigate button is unique: it initiates a dialog in which you create a subtree.)
- System-generated button functions. These are buttons that are generated dynamically (by the router control system) during operation. An example of system-generated buttons is a device list generated when the user presses a category button. The set of devices in a category can change over time (as the configuration database changes); the NV9648 device list changes also.

The number and names of categories can also change over time and the NV9648 will track those changes too.

---

### Note

Certain button fields contain a colon (:) and number after the data in the field. The number is the record ID of the object in the NV9000 configuration database. The record IDs can be ignored but might be of some use when the configurer is searching for items in the configuration database.

---

## Button Specification

The button definitions section has several controls:

The screenshot shows a configuration window titled "Button Definitions". It contains the following controls:

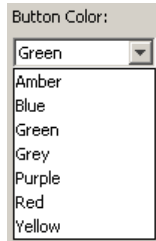
- Button Type:** A pull-down menu with "Selection" selected.
- Button Caption:** Three stacked text input fields. The first field contains "Sel".
- Display Index:** A pull-down menu with "1" selected.
- Button Color:** A pull-down menu with "Yellow" selected.
- Place this button on all subsequent child pages:** An unchecked checkbox.
- Edit Multi-Dest Devices:** A button located at the bottom center.

The controls vary according to the button type.

- |                |   |
|----------------|---|
| Button Type    | A pull-down menu where you may select a button type.  |
| Button Caption | Three text boxes in which you can enter three lines of button text up to 8 characters each. SE provides a default for the button caption. |

Some buttons do not allow you to enter button text. Category buttons, for example, use the category name as the button text.

Button Color A pull-down menu where you can select a button color: amber, blue, green, grey, purple, red, or yellow:



On the panel, each of the 7 defined colors has two brightness levels: “high-tally” and “low-tally.” Buttons are dark if their functions are disabled. Buttons are low tally if they are available and unselected. Buttons are high tally when they are selected. (An exception to this is the LCD brightness submenu when the panel is in menu mode.) Some button types are never high-tally.

Check box “Place this button on all child pages.” When the operator presses a navigation button, its target page appears on the buttons. Any page can have multiple navigation buttons and therefore multiple target pages. If you check this option, the button you are defining will occur, *in the same position*, on all pages in the subtree available through the navigation button. A “back” button is a good candidate for such a button. The back button returns the operator to the previous page. (Back buttons are automatically placed on list pages and most navigation target pages.)

Check box “Use custom button text.” This checkbox is not present for all button types. The option allows you to define specific button text for certain buttons such as the ‘Src/Dst’ button. By default, the button gets the source name and destination name as text. The option, when checked, overrides the default.

Be careful: unchecking this box alters the text you entered.

When you choose a button type, additional drop-down menus can appear, depending on the button type, allowing you to further specify the button’s behavior. Available options and selections vary from button type to button type.

The Navigate button is a special case. It invoking an “Edit Navigate Button” dialog during configuration. See [‘Edit Navigation Button’ Dialog](#), on page 39.

## Button Functions for Client Mode

These are the button types available for NV9648 configurations under the client model:

Type	Description
Destination Lock	Sets or removes a “lock” on the current destination device. The lock can be removed only by the user that originally set the lock, or by a panel that has “Force Release” enabled.
Destination Protect	Sets or removes a “protect” on the current destination device. The protect can be removed only by the user that originally set the protect, or by a panel that has “Force Release” enabled.  <b>Note:</b> a protect prevents <i>others</i> from routing to a destination; a lock prevents <i>anyone</i> — even the user who issued the lock— from routing to the destination.
Quick Source	A quick source button selects a source and performs an immediate take.  When you assign a quick source button, a drop-down menu appears in which you choose a source device. (The ‘None’ entry is merely a placeholder. Do not choose ‘None.’)
Source	A source button selects a source. (Note that a quick source button selects a source and also performs an immediate take.)  When you assign a source button, a drop-down menu appears: ‘Source Device.’ Choose a device from the list. (The ‘None’ entry is merely a placeholder. Do not choose ‘None.’)
Take	A ‘Take’ button performs the route set up by a destination selection and a source selection.
Undefined	Makes the button undefined and inactive. On the actual panel, it will remain unlit (dark).

## Button Functions for Standalone Mode

These are the button types available for NV9648 configurations under the standalone model:

Type	Description
Destination	Selects a destination.  When you assign a destination button, a drop-down menu appears: ‘Destination Device.’ Choose a device from the list.  The ‘None’ entry is merely a placeholder. Do not choose ‘None.’
Destination Lock	Sets or removes a “lock” on the current destination device. The lock can be removed only by the user that originally set the lock, or by a panel that has “Force Release” enabled.
Destination Protect	Sets or removes a “protect” on the current destination device. The protect can be removed only by the user that originally set the protect, or by a panel that has “Force Release” enabled.  <b>Note:</b> a protect prevents <i>others</i> from routing to a destination; a lock prevents <i>anyone</i> — even the user who issued the lock— from routing to the destination.

Type	Description
Quick Source	<p>A quick source button selects a source and performs an immediate take.</p> <p>When you assign a quick source button, a drop-down menu appears in which you choose a source device. (The 'None' entry is merely a placeholder. Do not choose 'None'.)</p>
Salvo	<p>Executes a salvo.</p> <p>When you assign a Salvo button, a drop-down list appears in which you select a system salvo (previously defined in NV9000-SE Utilities).</p> <p>The 'None' entry is merely a placeholder. Do not choose 'None'.</p> <p>(You can cause the panel to generate salvo buttons automatically using the options of the 'Edit Navigation Button' dialog when you create a navigation button.) See <a href="#">'Edit Navigation Button' Dialog</a> on page 39.</p>
Source	<p>A source button selects a source. (Note that a quick source button selects a source and also performs an immediate take.)</p> <p>When you assign a source button, a drop-down menu appears: 'Source Device'. Choose a device from the list. (The 'None' entry is merely a placeholder. Do not choose 'None'.)</p>
Take	<p>A 'Take' button performs the route set up by a destination selection and a source selection.</p>
Undefined	<p>Makes the button undefined and inactive. On the actual panel, it will remain unlit (dark).</p>

## Button Functions for LCD XY/MD Mode

These are the button types available for NV9648 configurations under the LCD XY/MD model:

Type	Description
Back	<p>The 'Back' function places the predecessor of the current button page on the panel.</p> <p>The panel software can introduce a "back" button if an automatically generated list has more entries than can fit on a page.</p>
Category	<p>Displays a category's device list.</p> <p>When you assign a category button, two additional drop-down menus appear: 'Src Category' and 'Dst Category'. Choose a category from one of the category lists. When you choose a source category, the destination categories become inaccessible and vice versa: a category button must be either a source category or a destination category. You must choose 'None' in either category list to switch to the other category list.</p> <p>When the operator clicks the category button, a list of devices in the category appears.</p> <p>The default button text will be the category name. You can override the default text.</p>

Type	Description
Clear Preset	<p>Erases preset entries, while leaving the panel in the same mode. We recommend you use this button because it is a “safety” feature.</p> <p>The clear preset button has the side effect of switching off ‘Save Preset’ mode.</p>
Destination	<p>Selects a destination.</p> <p>When you assign a destination button, a drop-down menu appears: ‘Destination Device’. Choose a device from the list.</p> <p>The ‘None’ entry is merely a placeholder. Do not choose ‘None’.</p>
Destination Lock	<p>Sets or removes a “lock” on the current destination device. The lock can be removed only by the user that originally set the lock, or by a panel that has “Force Release” enabled.</p>
Destination Protect	<p>Sets or removes a “protect” on the current destination device. The protect can be removed only by the user that originally set the protect, or by a panel that has “Force Release” enabled.</p> <p><b>Note:</b> a protect prevents <i>others</i> from routing to a destination; a lock prevents <i>anyone</i>— even the user who issued the lock— from routing to the destination.</p>
[Forward]	<p>The panel software can introduce a “forward” button if an automatically generated list has more entries than can fit on a page.</p> <p>A ‘Forward’ button displays and activates the next button page in an automatically generated sequence.</p> <p>There is no explicit ‘Forward’ button type; configurers cannot create forward buttons explicitly.</p>
Hold	<p>Toggles the panel in and out of “hold” mode. In multi-destination mode, hold mode retains destination selections after a take. In X-Y mode, hold mode retains breakaway levels after a take. (There are other effects. See <a href="#">Selection Buttons</a> on page 42.)</p>
Level Map	<p>Cross-connects levels (in the same physical router). The function is typically used to shuffle audio channels, for example, to connect AES1/2 to AES3/4.</p> <p>The Level Map mode is cancelled when the next normal take is performed involving the selected destination.</p>
Menu	<p>This button puts the NV9648 panel in menu mode and displays a menu on the LCD buttons that provides access to a variety of panel options. Place the button on the panel only if you want the user to have access to the menu.</p> <p>By pressing certain buttons, the user makes menu selections and may enter data (such as panel ID) or change LCD brightness values. See <a href="#">Menu Mode</a> on page 68.</p>

Type	Description
Navigate	<p>During operation, a navigate button selects and displays a “target” button page. During configuration, a navigate button presents a dialog in which you can enter details of the target page. After you do so, SE displays the target page’s buttons on the panel image and adds the subtree to the tree window in the lower left corner if it is not there.</p> <p>(You’ll use the navigate function to create new button pages.)</p> <p>The default text for a Navigate button depends on what you assign it. Sometimes it is “Navigate.” You will probably want to change it to something meaningful to operators.</p> <p>See <a href="#">‘Edit Navigation Button’ Dialog</a> on page 39 for detail.</p>
Page Down	<p>Scrolls a list <i>down</i>. Lists include categories, source devices, and destination devices. Scrolling is necessary when the list exceeds the number of buttons available for the list.</p> <p>‘Page Down’ also scrolls through multi-destination devices in multi-destination mode and through levels in X-Y mode.</p>
Page Up	<p>Scrolls a list <i>up</i>. Lists include categories, source devices, and destination devices. Scrolling is necessary when the list exceeds the number of buttons available for the the list.</p> <p>‘Page Up’ also scrolls through multi-destination devices in multi-destination mode and through levels in X-Y mode.</p> <p>When the operator is displaying a list of devices from a category, the ‘Page Up, button (which appears on the page automatically) returns the operator to the page containing the category button.</p>
Panel Lock	<p>Prevents accidental changes to the panel settings, especially router crosspoints. When the panel is locked, the button array becomes blank except for the Panel Lock button which becomes high tally red. Pressing the Panel Lock button again reverts the panel to its previous mode.</p>
Previous Source	<p>Presets the previously routed source to the currently selected destination. The operator must next press ‘Take’ to restore the previous source. This function is useful when a user makes a route in error.</p> <p>The button does <b>not</b> restore the previous destination. If the user changed the destination and presses ‘Previous Source’, the take will not restore the previous route.</p>
Quick Source	<p>A quick source button selects a source and performs an immediate take.</p> <p>When you assign a quick source button, a drop-down menu appears in which you choose a source device. (The ‘None’ entry is merely a placeholder. Do not choose ‘None.’)</p>

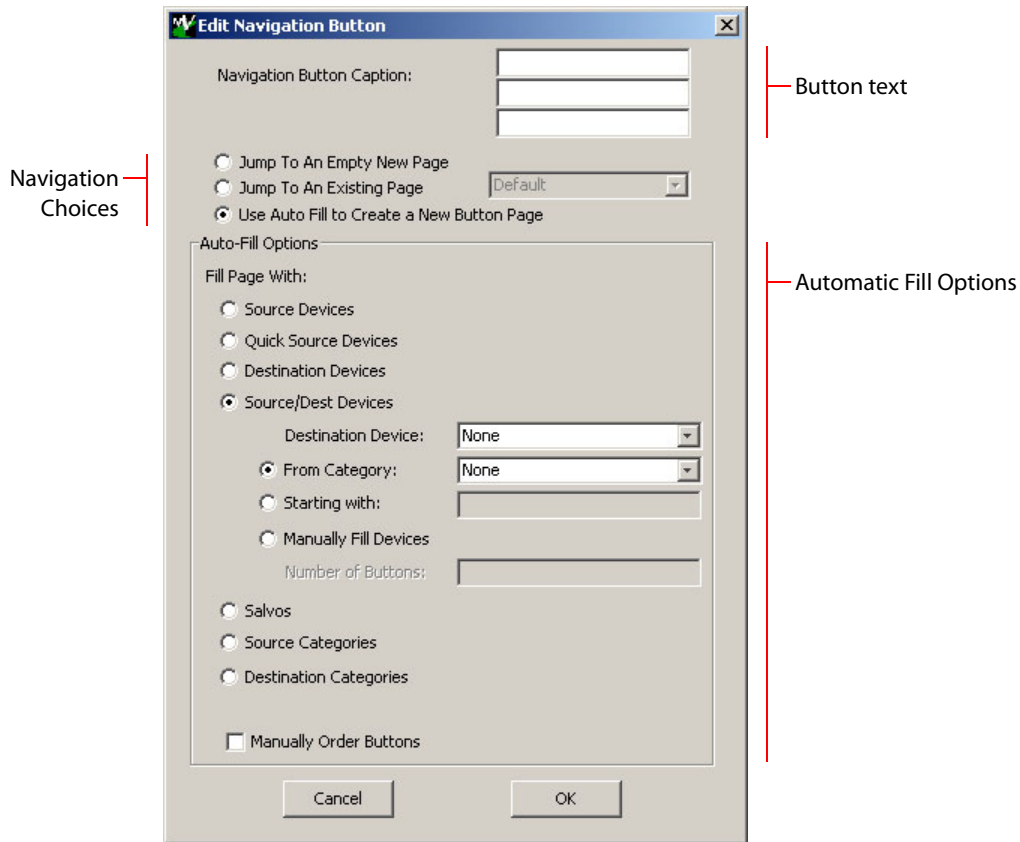
Type	Description
Salvo	<p>Executes a salvo.</p> <p>When you assign a Salvo button, a drop-down list appears in which you select a system salvo (previously defined in NV9000-SE Utilities).</p> <p>The 'None' entry is merely a placeholder. Do not choose 'None.'</p> <p>(You can cause the panel to generate salvo buttons automatically using the options of the 'Edit Navigation Button' dialog when you create a navigation button.) See <a href="#">'Edit Navigation Button' Dialog</a> on page 39.</p>
Selection	<p>Typically, at least one button page should provide a set of selection buttons. Operators press selection buttons to select levels (when the panel is in XY mode) or to select MD devices (in MD mode). Each selection button represents one level or one MD device.</p> <p>You may configure any number of selection buttons (on any button page). The selection buttons can be arranged anywhere on the button page.</p> <p>When there are more levels, or more MD devices, than buttons on a page, the panel enables scrolling. The operator presses 'Page Up' or 'Page Down' to scroll through the levels or MD devices to make selections.</p> <p>See <a href="#">Selection Buttons</a> on page 42 for further detail.</p> <p>During configuration, when you assign a selection button, an additional drop-down menu appears in the button definition area: 'Display Index'. An 'Edit Multi-Dest Devices' button also appears.</p> <p>The drop-down menu for the button's <i>display index</i> has as many entries as the the number of selection buttons you have defined. Choose consecutive display indexes from 1 to the number of selection buttons on the page.</p> <p>Use the 'Edit Multi-Dest Devices' button to define MD devices. They are assigned to selection buttons in the order in which you define them. See <a href="#">Multi-Destination Configuration</a> on page 44.</p>
Source	<p>A source button selects a source. (Note that a quick source button selects a source and also performs an immediate take.)</p> <p>When you assign a source button, a drop-down menu appears: 'Source Device'. Choose a device from the list. (The 'None' entry is merely a placeholder. Do not choose 'None'.)</p>
Take	<p>In X-Y mode, a take button switches the preset source device to the selected destination device on selected levels.</p> <p>In MD mode, a take button switches the preset source device(s) to the selected destination device(s) on all levels.</p> <p>In most cases, configurers should provide the operator a 'Take' button on one or more pages.</p>
Undefined	<p>Makes the button undefined and inactive. On the actual panel, it will remain unlit (dark).</p>



Type	Description
X-Y Display	This button displays the current source and current destination. It is usable in both X/Y mode and MD mode.
XY/MD Mode	Switches the panel between X-Y mode and multi-destination mode (when the panel is operating under the LCD XY/MD behavioral model).  The configuration page lets you specify a color for this button, but the color you specify is ignored. The button is always green for XY mode and amber for multi-destination mode.

### 'Edit Navigation Button' Dialog

During configuration, when you choose 'Navigate' for a selected button, NV9000-SE Utilities displays an 'Edit Navigate Button' dialog in which you specify the navigation button's details:



At the top, this dialog presents 3 lines on which you can enter text for the button caption. In this dialog, The 3 lines you enter here are concatenated to form the name of the page in the button page table and *might be* the button caption, depending on context.

- ▲ The button caption is independent of the page name. You can change either without affecting the other.

The dialog has 3 navigation choices:

- Jump to an empty new page.

This option creates a new page in the button tree. During operation, the navigation button you are creating will cause the NV9648 to display, or jump to, that page. The name of the page and the button caption are what you type in the three lines for the button caption. You can change the name of the page in the button page list. At the time you create it, the page is empty. After the page is created, you can select it at any time and edit its buttons.

- Jump to an existing page.

This option does **not** create a new page in the button tree. The navigation button you are creating will cause the NV9648 to display the page you select in the associated drop down menu. The button caption is what you type in the three lines for the button caption.

- Use “auto fill” to create a new button page.

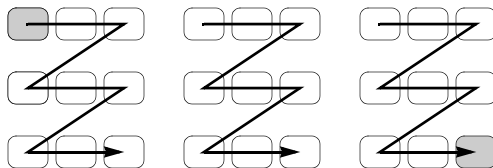
NV9000-SE Utilities (SE) creates at least one new button page, filling the page(s) with button functions according to the fill options you specify. Automatic fill has several sub-options:

Source buttons	Salvo buttons
Destination buttons	Source category buttons
Source/destination buttons	Destination category buttons
Quick source buttons	

Automatic fill has a “manually order buttons” option where you can reorder the list items as you wish. See [Automatic Fill Options](#), following.

Automatic fill creates as many new pages in the button tree as required to support the number of fill items. If the number of items is greater than 29, SE places 28 items on a page where the bottom left button is a back button and the bottom right button is a “forward” button. The last page of the automatic fill will not have a forward button and might not be completely filled.

The fill occurs in left-to-right, top-down, order:



During operation, the navigation button will cause the NV9648 to display the first of the auto-fill pages. The operator uses the back and forward buttons to scroll through the list.

The button caption is what you type in the three lines for the button caption. You can change the names of the automatic fill pages in the button page list. After the pages are created, you can select any of them at any time and edit its buttons.

During configuration, you can double-click a navigation button to view and edit its target page. Any page can have navigation buttons. You can also select pages by double-clicking on the page’s page number field in the button page list.

### Automatic Fill Options

- Source Devices

SE assigns sources to buttons in new button subpage(s). If it has too many sources to fit on the subpage, it creates further subpages as needed. The software adds ‘Back’ and ‘Forward’ buttons when more than one subpage is required.

There are 3 sub-options under 'Source Devices':

- 'From Category'. Specify a category other than 'None'. The fill list will include all the devices in the category.
  - 'Starting with'. Specify an initial substring. For example, if you specify "V," all sources whose names start with "V" are included in the list.
    - ▲ If you leave the 'Starting with' field blank, the page will list all devices.
  - 'Manually Fill Devices'. Specify the number of buttons you want to be assigned. The software creates as many subpages as are required to hold the buttons. The buttons are source buttons, but remain blank so that you can assign sources to them manually.
- Quick Source Devices  
Automatic fill using quick source buttons for source devices is the same as for source devices, except that quick source buttons are used. In the case of manual fill, blank quick source buttons are created.
  - Destination Devices  
Automatic fill using destination devices is the same as for source devices, except that destination devices are chosen. In the case of manual fill, blank destination buttons are created.
  - Source/Dst Devices  
This option creates subpages of 'Source/Destination' buttons. All use the same destination, which you specify in the 'Destination Device' field that becomes enabled for this option. The sources can vary according to the sub-option:
    - 'From Category'. The fill list will include all the source devices in the category you choose.
    - 'Starting with'. Specify an initial substring. For example, if you specify "CA," all sources whose names start with "CA" are included in the list.
      - ▲ If you leave the 'Starting with' field blank, the page(s) will create 'Src/Dst' buttons for all source devices.
    - 'Manually Fill Devices'. Specify the number of buttons you want to be assigned. The software creates as many subpages as are required to hold the buttons. The buttons are 'Src/Dst' buttons, but remain blank so that you can assign sources and destinations to them manually.
  - Salvos  
SE assigns salvos to buttons in new button subpage(s). If it has too many salvos to fit on the subpage, it creates further subpages as needed. The software adds 'Back' and 'Forward' buttons when more than one subpage is required.
  - Source Categories  
SE assigns source categories to buttons in new button subpage(s). If there are too many source categories to fit on the subpage, it creates further subpages as needed. The buttons are labeled with the category names. You can edit the button captions. The software adds 'Back' and 'Forward' buttons when more than one subpage is required.  
Categories that are both source and destination categories are included.
  - Destination Categories  
Automatic fill using destination categories is the same as for source categories, except that destination categories are chosen.
  - Manually Order Buttons

If you check the 'Manually order buttons' box, SE presents a dialog that lists the sources, destinations, categories, or salvos you selected. You may reorder the items. To do so, **double-click** on a row in the ordered list and drag it up or down to the position that you want. The new position will be indicated by a slightly heavier black line. The row you selected is repositioned where the black line is when you release your mouse button.

## Selection Buttons

- ▲ Selection buttons are available only when the panel is configured under the LCD XY/MD model.

Operators use selection buttons to select *levels* when the panel is in X-Y mode and *MD devices* when the panel is in MD (multi-destination) mode. Selection buttons also provide feedback (e.g., source and destination mnemonics on the face of the buttons) when the operator is performing takes.

A set of selection buttons supports (1) level selection in XY mode and (2) device selection in multi-destination mode.

You should configure at least one selection button (for feedback). You may configure as many selection buttons as are suitable for your system. For instance, if your system has a maximum of 12 levels for any device, it might make sense to have 12 selection buttons.

Operators can scroll through multiple pages of levels in X-Y mode and through multiple pages of devices in MD mode.

Selection (of levels or MD devices) is affected by 'Hold' mode. The user may toggle hold mode at any time. Using the selection buttons follows hold mode or normal mode, whichever is in effect at the moment.

## Selection Button Behavior

### X-Y Mode

When the panel is in X-Y mode, a set of selection buttons presents a set of virtual levels. The levels displayed on the buttons correspond to the levels in the level set of a selected destination device. If a selection button is dark and blank, the level does not exist in the level set. If a selection button is dark, but has text, the level exists, but is not defined for the selected device.

If a selection button is high-tally, the level is selected. If a selection button is low-tally, the level is not selected.

If there are more levels than selection buttons, the 'Page Up' and 'Page Down' buttons activate and the operator can scroll through the levels.

### MD Mode

When the panel is in MD mode, a set of selection buttons presents a set of MD devices.

If a selection button is blank, an MD device was not assigned to it. If a selection button is high-tally, the MD device is selected. If a selection button is low-tally, the MD device is not selected.

If there are more destinations than selection buttons, the operator can scroll through the destinations using 'Page Up' and 'Page Down' buttons. Including those buttons on the button page that has the selection is strongly recommended.

- ▲ Note that the maximum number of MD destinations is configured in multiples of 8, from 8 to 512.

### Populating the MD Device List

The 'Edit Multi-Destination Device' button appears when you are configuring a selection button. Click this button to get the 'Multi-Destination Entry' window. The window presents a list of all destinations on the left and a set of MD devices at the right. The MD device set is initially empty and becomes populated as you add destination devices from the left. You can add devices in any order. The order is preserved and is the order in which the MD devices appear on the selection buttons under scrolling.

See [Multi-Destination Configuration](#) on page 44.

## Selection

### XY Mode — Normal

When the operator selects a destination, all selection buttons that have levels defined for the destination turn on (high-tally). The operator may select or deselect any levels as required, by pressing selection buttons and perhaps scrolling the display.

- ▲ Note that if the operator selects a level when all levels are on, all the *other* levels become unselected (low-tally).

Selecting a new destination again turns on all selection buttons that have levels defined.

- ▲ Source/Destination buttons are "all level"—not subject to level selection.

### XY Mode — Hold Mode

- ▲ In hold mode, when the operator selects a destination, previously deselected levels (defined for the destination) remain selected for additional takes and previously unselected levels remain deselected. (Individual levels turn on or off as the user selects them.)

### MD Mode — Normal

- ▲ When the user selects an MD device, all selection buttons are mutually exclusive: when the operator presses one button, any others that were selected turn off. To perform MD takes, the operator alternately selects an MD device and then a source until all intended devices have been preset. Then the operator presses 'Take'.

(In normal mode, any selected MD devices become unselected after the take.)

### MD Mode — Hold Mode

In hold mode, selection buttons are **not** mutually exclusive. To perform MD takes, the operator selects one or more MD devices. All of them turn on (high-tally). The operator then selects a source (which becomes preset for all the selected devices).

The operator can preset another source to another set of destinations by deselecting selected destinations, selecting other destinations, and selecting another source.

When all intended destinations are preset, the operator then presses 'Take'.

(In hold mode, the MD devices remain selected after the take.)

## Display Indexes

You can configure selection buttons on any of your button pages. During configuration, when you assign a selection button, an additional drop-down menu appears: 'Display Index'.

The drop-down menu for the button's *display index* has as many entries as there are selection buttons. Creating a new selection button creates a new display index.

It is possible but probably wasteful for two or more selection buttons to have the same display index.

## Single-Destination Mode

The panel, when it is in client mode, is — by definition — a single-destination panel. More precisely, each of the 3 independent control units of the panel are single-destination control units. (The destination can be changed at the NV9649 server panel.)

When it is in standalone mode, the 3 sections of the panel can be configured as single-destination units. The units would have default destinations defined and no destination buttons.

It is also possible to configure a panel in LCD XY/MD mode as a single-destination panel. Again, the panel would have a default destination defined and no destination buttons.

For panels in LCD XY/MD mode, other more complex forms of "single-destination" mode are conceivable.

## Multi-Destination Configuration

Multi-destination (MD) devices are a subset of all destination devices. You can configure a panel to have from 8 to 512 MD destinations in increments of 8 destinations. Not all of those need be used. Those that are not used are considered "undefined."

- ▲ It is possible to have duplicate entries in the MD destination set. For example, it might be useful to have one or two MD destinations visible at all times.
- ▲ You should make sure your configuration includes a 'Page Up' and a 'Page Down' button if the operator will be required to scroll through MD devices.

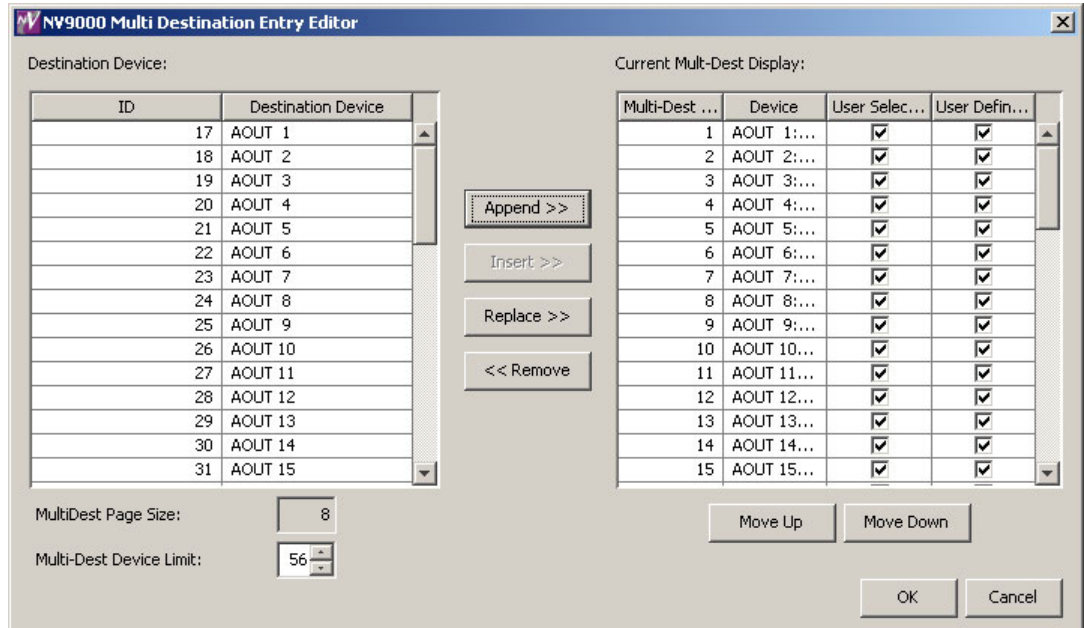
The limit to the number of MD devices is a panel option. If the limit is 64, for example, the display can scroll through 8 pages of 8 rows, regardless of whether these rows have been assigned a destination. Similarly, the operator could scroll through 4 pages of 16 selection buttons.

## How to Configure MD Devices

Follow these guidelines.

- 1 Go to the NV9648 configuration page of NV9000-SE Utilities.
- 2 Click any button in the panel image. In the button definition section, choose 'Selection' from the drop-down list.  
A 'Display Index' field and an 'Edit Multi-Dest Devices' button appear in the button definition section.

3 Click 'Edit Multi-Dest Devices'. The multi-destination entry editor appears:



On the left is a list of *all* destinations defined in the NV9000 system. On the right is a table of the MD destinations you are defining. The number of rows in this table is equal to the maximum number of MD destinations your configuration allows. The MD device list is initially empty.

To define an MD destination, select a destination on the left and copy it, using either the 'Append' button, the 'Insert' button, or the 'Replace' button, to the right.

The 'Append' button *appends* the selected destination(s) to the end of your set of MD destinations.

The 'Insert' button places the selected destination(s) immediately *above* whatever MD destination you have highlighted on the right.

The 'Replace' button *replaces* whatever MD destination(s) you have highlighted on the right with the selected destination from the left.

The 'Remove' button *removes* highlighted MD destinations from the right.

At the bottom left, there is a scroll box in which you can adjust the maximum number of MD destinations. (The page size field is grayed out and irrelevant.)

At the bottom right, are 'Move Up' and 'Move Down' buttons. You can use these to adjust the position in the list of any MD destination.

After you have finished configuring MD destinations, click OK (or cancel, if you want to discard your entries). The MD destinations you have configured will appear on the selection buttons or the display of a running panel having this configuration (when it is operating in MD mode).

You can edit the set of MD devices later, adding or removing entries as you wish. (To edit the MD devices, again choose a selection button in the panel graphic and click the 'Edit Multi-Dest Devices' button.)

## MD Destination Options

On the right side of the multi-destination entry editor, each MD destination has two checkboxes. One is in the 'User Definable' column and the other is in the 'User Selectable' column.

### User-Definable

When the MD destination is "user definable," the operator may choose a different destination using the panel buttons. "User definable" is the default for all MD destinations. Uncheck the 'User Definable' box if you want to prevent the operator from changing this MD destination.

### User-Selectable

When the MD destination is "user selectable," the operator may select it and assign a different source to it using the panel buttons. That is also the default for all MD destinations. Uncheck the 'User Selectable' box if you want to prevent the operator from taking a source to this destination.



# 5 Operation

Chapter 5 provides instructions for the NV9648 control panel.

## Topics

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This chapter is intended specifically for the NV9648 panel **operator**.

## Summary

As an NV9648 operator, you will be confronted initially with a relatively small and simple panel—27 function buttons and three 8-character displays, arranged in three groups.

The panel can operate according to 3 behavioral models (or operating modes):

- Client mode.
- Standalone mode.
- LCD XY/MD mode.

If you communicate with your system administrator (or whoever designed the control system and configured its control panels) you will readily understand the model in which the panel was configured and how it operates.

- ▲ If your panel operates under the client model, it will operate in conjunction with an NV9649 in “server” mode and other NV9648s in client mode. You will need to understand how to operate the NV9649 as well.

## Buttons and Button Legends

Each of the NV9648’s 27 LCD buttons has 3 lines of text (up to 8 characters per line). The buttons can display one of seven colors dynamically: nominally red, green, blue, purple, amber, yellow, or grey. We say a button is “dark” when its LCD is turned off.

During configuration, you can assign any of the 7 colors to a button.

Each LCD button has *four* levels of brightness: off, low, medium, and high, and supports *three* operational levels: high tally, low tally, and off. High tally can be either medium or high brightness and low tally can be either low or medium brightness. High tally is always constrained to be brighter than low tally. See [LCD Buttons](#), page 87, for a color chart.

The panel's LCD XY/MD behavioral model supports a hierarchical (or tree-structured) set of button pages. Although one can see a list of the pages in the tree during configuration, the structure of the tree is not evident on the panel itself. The panel operator must commit some or all of the tree structure to memory to be able to use the panel. It is up to the person configuring the panel to design a usable tree structure.

Under the LCD XY/MD model, some buttons functions are assigned by the system depending on the context. For example, if a button page is to represent all sources in a category, and that list changes, the button subtree adjusts in size dynamically. The panel software adds a "Page Down" button and a "Page Up" button if there are more sources than buttons. Pressing the 'Page Down' button takes you to the next page of sources. Pressing the 'Page Up' button takes you to the previous page of sources.

Some button states depend on context. Many buttons remain unlit when their functions are disabled. For example, 'Page Up' and 'Page Down' buttons remain unlit until there is an opportunity to scroll up or down, respectively. By default, an XY/MD button turns green for X-Y mode and amber for multi-destination mode.

Under the XY/MD model, the LCD buttons display a menu if the operator presses a menu button. When the operator make a menu selection, the panel displays viewable data on the LCD buttons. In some cases, the operator can enter data (such as panel ID or LCD brightness) using buttons that allow data entry.

Under the LCD XY/MD model, configurers can define 'Selection' buttons that select a level during a breakaway setup. (They *must* do so if the operator is to make such selections.)

In X-Y mode, selection buttons report the preset source, current source, and the levels for the current destination.

In multi-destination (MD) mode, selection buttons report the preset source, current source, and destination device.

A reverse field (light letters on a dark background) on the top line of a button indicates that a breakaway exists on a source. A reverse field (light letters on a dark background) on the bottom line of a button indicates that level mapping has been performed.

The user interface of an NV9648 in one installation can be radically different from the user interface of an NV9648 in another installation.

Because some of the panel's buttons can have arbitrary legends, a button's legend might or might not indicate its function. Operators and configurers will have to communicate about the meaning of the buttons in the button tree.

## Behavioral Models

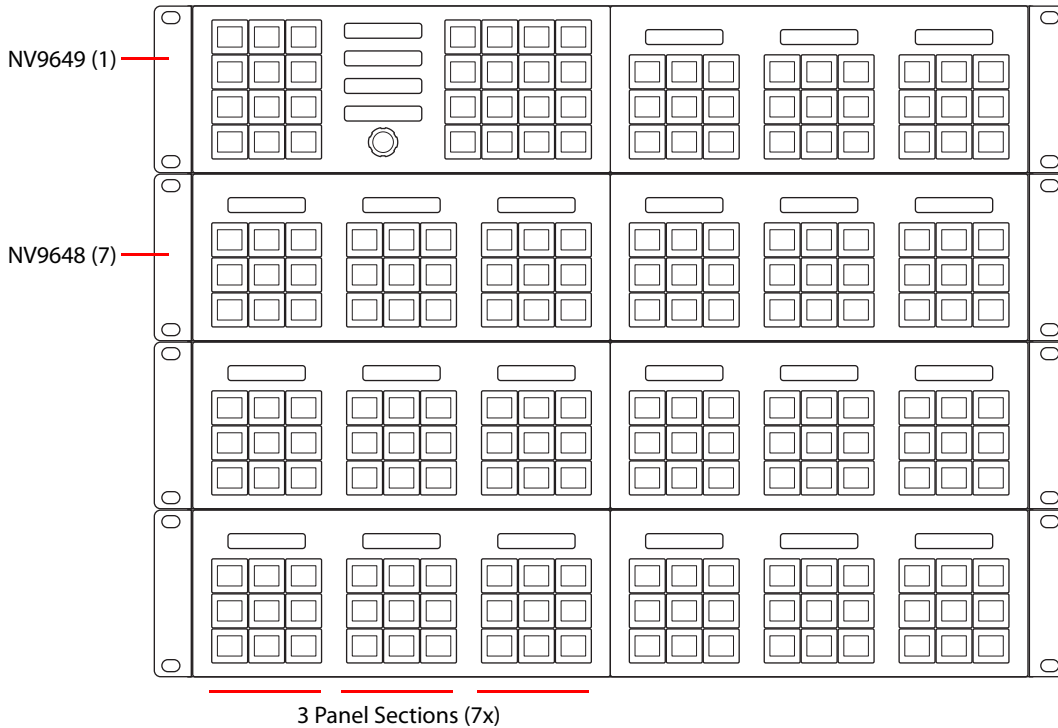
The panel can operate according to 3 behavioral models (or operating modes):

- Client mode.
- Standalone mode.
- LCD XY/MD mode.

Your panel will operate in one of these modes. It is not likely that your panel will change mode often, if it changes at all. It is not possible to change modes except by reconfiguration.

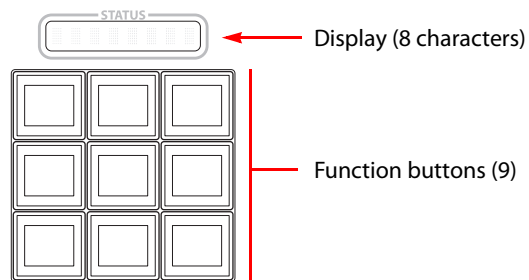
## Client Mode

When the panel is in “client” mode, it operates in conjunction with an NV9649 and other NV9648s. The NV9649 is the “server” and the NV9648s are the “clients.” The NV9649 and the NV9648s combine to form, in essence, a larger panel — actually a cluster of many small control units. This is an example of a system with an NV9649 and 7 NV9648 clients:



The NV9649, being the server, can control which sources and destinations the NV9648s can select. It can also perform takes, locks, and other functions.

Under the client model, each NV9648 has 3 identical sections:



Each section functions as a complete and separate control unit. Each control unit corresponds to a single destination either assigned during configuration or chosen at the NV9649 and its display typically shows that destination (when the NV9649 is in destination mode). The function buttons allow simple all-level takes to, and locks on, that destination.

*Each control unit is completely unrelated to, and unaffected by, the other control units.*

When the NV9649 is in source mode, the control unit's display shows the current source. When the NV9649 is in destination mode, the display shows the destination controlled by the control unit.

## Saved NV9648 Assignments

Every time an operator, at the NV9649 server, assigns a destination to an NV9648 client or assigns a source to a source button of a client, those assignments are recorded within the NV9000 system controller. Therefore, if and when the system controller undergoes a power cycle, the source and destination assignments of all the NV9648 clients are preserved.

The NV9649 (server) can be configured so that up to 12 different sets of client assignments (or “set-ups” as they are called in the NV9649’s menu) can be defined, selected, redefined, and otherwise managed as different operators choose.

A NV9649 always has a default setup and may have eleven other named setups.

## Button Functions

There are 5 button function types for a panel in client mode:

[Destination Lock](#)    [Destination Protect](#)    [Quick Source](#)  
[Source](#)                      [Take](#)

These are described in [Buttons for the Client Model](#) on page 57.

Each control unit can switch up to 9 sources — on ‘Quick Source’ buttons — to its destination. Each unit can switch at least 6 sources. At the NV9649, you can change any or all of the sources of the control unit and you can change its destination.

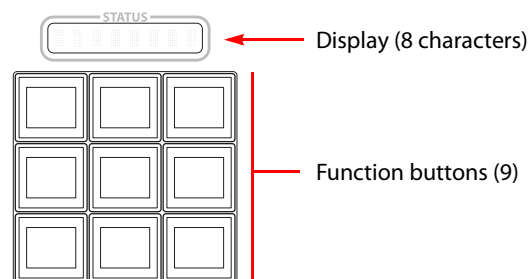
See [Operating Methods](#) on page 66 for how to change sources and destinations.

Please refer to the *NV9649 Users Guide* for information regarding the use of the NV9649.

## Standalone Model

When the panel is in “standalone” mode, it functions much the way it does in “client” mode, but it does *not* require the presence of an NV9649. It has a few added button function types, in particular a destination selection button.

Under the standalone model, each NV9648 has 3 identical sections:



Each section functions as a complete and separate control unit. Each control unit corresponds to a single destination and its display shows that destination. If the unit has no destination selected, the display reads “NO DEST.” The function buttons allow simple all-level takes to, and locks on, that destination. The unit can also execute system salvos.<sup>1</sup>

*Each control unit is completely unrelated to, and unaffected by, the other control units.*

---

1. Please refer to the *NV9000-SE Utilities Users Guide* for information regarding the construction of salvos.

Although each control unit's destination can be selected, the control unit can also be configured having a default destination. If the unit has a default destination, it can function without destination selection buttons.

There are 7 button function types for a panel operating under the standalone model:

[Destination](#)                      [Destination Lock](#)                      [Destination Protect](#)  
[Quick Source](#)                      [Salvo](#)                      [Source](#)  
[Take](#)

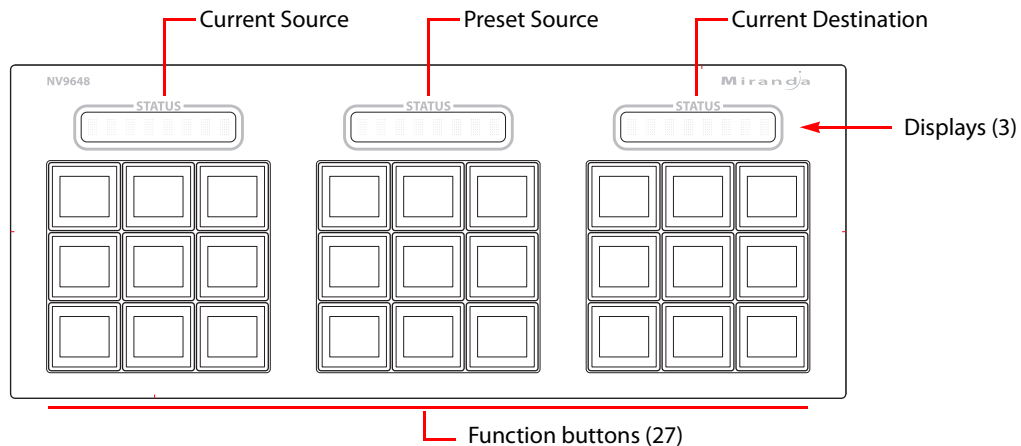
These are described in [Buttons for the Standalone Model](#) on page 58.

Each control unit can switch up to 9 sources — on 'Quick Source' buttons — to its destination. If the unit has no destination buttons, you cannot change its destination.

In general, the control unit should have more than one 'Source' or 'Quick Source' button.

## LCD XY/MD Model

Under the LCD XY/MD model, the panel also operates standalone, not requiring the presence of an NV9649, and has a moderately richer function set. The 3 sections of the NV9648 are *not* independent, but form an integral unit:



The displays are used together to show the preset source, the currently selected destination, and the source currently routed to that destination.

- ▲ In XY mode, level information is typically displayed on selection buttons. The displays show the source and destination on the primary level.

The panel's buttons can be used in a hierarchical fashion: pressing a 'navigation' button causes the panel to display a new set of configured button functions, called a "button page." There can be many such pages, organized in a configurable "tree" structure.

The configured tree structure is not readily apparent to operators. (You should discuss your panel's tree structure with your system's administrator.) However, you might notice that certain buttons cause the panel's button legends, and colors, to change. The buttons that cause a new button page to be displayed are navigate buttons and category buttons. (See [Category Selection](#) on page 54.)

- ▲ Pressing a menu button will also cause the set of buttons to change, but the menu that results is not a "button page" *per se*, and is not part of normal operations.

This behavioral model is called the LCD XY/MD model because you can switch the panel between “X-Y mode” and multi-destination (MD) mode. In X-Y mode, you can perform takes (and locks) on individually selected levels for a single destination, one destination at a time. In MD mode, takes occur on *all levels*, but you can perform takes to multiple destinations simultaneously, as required.

The panel supports the use of multiple ‘selection’ buttons. When the panel is in X-Y mode, the selection buttons select levels. When the panel is in MD mode, the selection buttons select MD devices (which are destinations). If there are more levels (or more MD devices) than there are selection buttons, you can press a ‘Page Up’ or ‘Page Down’ button to scroll through the list of levels (in X-Y mode) or the list of MD devices (in MD mode).

Under the LCD XY/MD model, the panel can also be configured having a default destination. If the panel has a default destination, it can function without destination selection buttons.

There are 21 button function types for a panel in LCD XY/MD mode:

<a href="#">Back</a>	<a href="#">Category</a>	<a href="#">Clear Preset</a>
<a href="#">Destination</a>	<a href="#">Destination Lock</a>	<a href="#">Destination Protect</a>
<a href="#">Hold</a>	<a href="#">Level Map</a>	<a href="#">Menu</a>
<a href="#">Navigate</a>	<a href="#">Page Down</a>	<a href="#">Page Up</a>
<a href="#">Panel Lock</a>	<a href="#">Previous Source</a>	<a href="#">Quick Source</a>
<a href="#">Salvo</a>	<a href="#">Selection</a>	<a href="#">Source</a>
<a href="#">Take</a>	<a href="#">X-Y Display</a>	<a href="#">XY/MD Mode</a>

These are described in [Buttons for the LCD XY/MD Model](#) on page 59.

## Additional Modes

Additional but secondary modes of panel operation are:

- Setup mode— where the NV9648 is freshly powered up, but disconnected from the panel/router network. In setup mode, you can preset the NV9648’s panel ID and perform a few diagnostic tasks.

Usually, only configurers need be concerned with setup mode.

See [Setup Mode](#) on page 71.

- Menu mode— pressing a menu button places the NV9648 in “menu” mode. In menu mode, the buttons lose their normal functions and become part of a menu that changes as needed during menu operation. Menu mode is similar to setup mode in many ways, except you can enter setup mode only when the panel is disconnected from its network.

There is nothing in the menu that concerns operators except button brightness. An operator may use the menu to set button brightness. Administrators and configurers may use the menu to view or change the panel ID, or to review the software and firmware revisions.

See [Menu Mode](#) on page 68.

One other minor mode of operation exists. That is Hold mode— when you press the ‘Hold’ button, hold mode becomes active and when you press it again, hold mode becomes inactive. See [Hold](#) on page 61.

## Operating Concepts

### Levels

In NV9000-SE Utilities and in the NV9000 router control system, routes occur on *levels*. A level is typically SD, HD, analog video, AES, analog audio, or machine control. Various devices are defined as sending and receiving signals on certain levels. The set of levels handled by a device belong to what is called a *level set*.

A source can be routed to a destination if it has the same set of levels, i.e., it belongs to the same named level set. A source can be routed to a destination in a different level set if the NV9000 configuration has the appropriate mapping.

Levels are usually called “virtual levels” in NV9000-SE Utilities.

The effect of this is that when you, the operator, choose a destination, the NV9000 recognizes which source devices are allowed to be routed to the destination and limits your selection to those sources.

### Breakaway

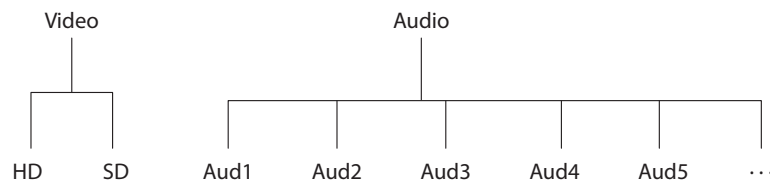
Routes can be “all-level” in which case they are taken on all levels defined for the destination. The acceptable sources for a route have the same levels as, or some configured mapping to, the levels of the destination.

A breakaway is where you take different sources to the same destination — on different levels.

It is not possible to take different sources to the destination on the same level. For instance, you cannot take SD from two different sources. The outcome would be noise even if you could do it. (Routers are not mixers.)

### Level Grouping

Virtual levels can be grouped. This diagram illustrates grouping:



There are two types of virtual levels: basic and abstract. Basic virtual levels are those that correspond to actual physical levels. Abstract virtual levels do not correspond to physical levels. In the illustration, the 5 “Audx” levels are grouped under ‘Audio’. The two video levels are grouped under ‘Video’.

The levels ‘Video’ and ‘Audio’ are abstract levels; the other levels are basic levels.

▲ If you have chosen a destination whose basic levels are grouped, the panel’s selection buttons show only the basic level names. (Other panels can show level group names.)

*We discuss level groups — a feature of the router control system — only to state that the NV9648 does **not** have support for level groups.*

## Hold

Hold mode (and hold buttons) apply in both X-Y mode and multi-destination mode.

## Breakaway

In X-Y mode, a hold button retains breakaway levels after a take.

Simply press the hold button at any time before the take.

A hold button is a toggle. Press it once to put the panel in hold mode; press it again to remove hold mode.

## Multi-Destination Mode

In multi-destination mode, hold mode allows you to select more than one MD destination at a time.

## Category Selection

In the NV9000 system, devices are assigned to categories, where the devices within the categories are either numbered or identified by alphanumeric suffixes. For instance, a category representing cameras might be CAM and the cameras in the category might be named CAM1, CAM2, and so on.

NV9648 category buttons can represent either a source category or a destination category (but not both). When you pressing category buttons to begin device selection, the panel displays a list of all devices in that category. If the list has more entries than will fit on the available buttons, you can scroll through multiple pages of devices using 'Page Up' and 'Page Down' buttons to find the device you want.

## Lock, Protect, and Release

In a multi-user system, routes made by one user can be made safe from being accidentally or maliciously change by another user.

Definitions

Owner                      The user ID of a panel where a lock or protect was issued.

Source lock                No one can use the source.

Source protect            No one but the owner can use the source.

Destination lock        No one can route to the destination.

Destination protect    No one but the owner can route to the destination.

Release                    To remove a lock or protect.

Some control panels can lock or protect both sources and destinations. However, *The NV9648 provides locks and protects for destinations only.*

A forced release is when the lock or protect is removed by someone other than the owner. A forced release can be performed:

- At any panel configured with release mode set to "forced release".
- At any other panel with "force release" enabled.

The 'Destination Lock' and 'Destination Protect' buttons are toggles. Press the lock (or protect) button to lock (or protect) a destination. Press the button again to release the lock (or protect).



## Takes

A "take" is a route as it is being performed.

In X-Y mode, a take can be a route from one source, on all levels, to a destination or it can be a router from multiple sources, on different levels, to a destination.

In MD mode, a take is (1) a route of a source to a destination on all levels or (2) several such routes executed simultaneously.

A take can occur in 4 ways:

- You have selected a destination and then a source. A 'Take' button lights and you press the 'Take' button.
- You have selected a destination and press a 'Quick Source' button (or a 'Src/Dst' button). The take occurs immediately.
- There is a default destination (or a destination assigned by an NV9649) and you select a source. A 'Take' button lights and you press the 'Take' button.
- There is a default destination (or a destination assigned by an NV9649) and you press a 'Quick Source' button (or a 'Src/Dst' button). The take occurs immediately.

▲ Immediate takes on 'Src/Dst buttons' is a panel option that can be enabled or disabled.

## Name Sets

NV9000-SE Utilities allows configurers to define multiple *name sets*. Each name set contains aliases (alternate names) for any and all devices in the NV9000 system. The aliases can appear in the displays of your panel. Whichever name set you are currently using is the *active* name set.

There is always a 'System Name' set. That name set includes the device names defined within the NV9000 configuration. Any other name sets are optional.

Device selection using categories and suffixes requires that you enter device names using the *system name set*. However, the display shows the device name as it is represented in the *active name set*.

For example, suppose the system name for a destination is "VTR\_42" and its alias is "Prod\_A." Follow these steps to select the device using category selection:

- 1 Switch to destination mode if necessary.
- 2 Press a VTR category button. (Suffix buttons become enabled.)
- 3 Press 4, then 2. The device is selected, but the name appearing in the destination display is "PROD\_A."

Note that when the panel is displaying aliases, and a device does not have an alias, the panel displays the system name.

## Data Routing

There are 3 data routing options that affect sources and destinations that have a machine control level (i.e., a data level). These options govern what happens when a source or destination device is to be used.

### Automatic Data Routing

A take involving a machine control level occurs naturally on all selected levels, including the machine control level, regardless of whether an affected machine control port is in use. The system breaks any existing control connections involved with the source and destination and makes a new control connection for the source and destination.

This data routing option applies in both operating modes.

### Manual Data Routing

If a control port for the source or destination is “in use,” a take involving a machine control level occurs on all levels *except* the machine control level. You must break either the source’s control connection, the destination’s control connection, or both of those existing connections before you can take the source to the destination on the machine control level. To break a connection, route a device (as a source) to itself (as a destination) on the machine control level. When the connection is broken, the status column of the display reads “FREE” for the machine control level (in X-Y mode). If your panel is in multi-destination mode, you might switch to X-Y mode momentarily to see this.

When a take involving a machine control level is blocked on the control level, the display displays the message “Control In Use.”

If neither of the control ports for the source or destination are in use, the take occurs naturally without any further action required. Note that the ports will become “in use” after the take you are performing.

This data routing option applies in both operating modes.

### Semi-Automatic Data Routing

This data routing option applies only in X-Y mode.

If a control port for the source or destination is “in use,” a take involving a machine control level occurs on all levels *except* the machine control level. Nevertheless, you are given the opportunity to complete the take on the machine control level by pressing the ‘Take’ button a second time.

If neither of the control ports for the source or destination are in use, the take occurs naturally without any further action required. Note that the ports will become “in use” after the take you are performing.

Follow these steps to take the data level as a breakaway:

- 1 Select a destination.
- 2 Select a source.
- 3 Examine the display and the take button.
- 4 If the display shows “Control in Use” and the Take button is still high-tally, press the ‘Take’ button again to complete the take.

You can cancel the control-level take by pressing a button other than ‘Take’.

## Button Functions

The NV9648 has 3 behavioral models. The sets of button functions differ in the 3 models.

## Buttons for the Client Model

Under the client model, the panel has 3 independent control units, and therefore each panel can control 3 destinations. The NV9649 (the server) can change the destinations assigned to the NV9648's 3 control units.

Under the client model, there are 5 button types, not including "undefined" which is not a true button type:

<a href="#">Destination Lock</a>	<a href="#">Quick Source</a>	<a href="#">Take</a>
<a href="#">Destination Protect</a>	<a href="#">Source</a>	<a href="#">Undefined</a>

### Destination Lock

This button is a toggle that sets or clears a *lock* on the destination assigned to the control unit in which the destination lock button is located. The lock can be removed at the panel that originally set the lock, at a panel that has the same user ID, or by a forced release at any panel.

- ▲ The NV9648 provides no explicit indication, during operation, whether a destination is locked or unlocked.

### Destination Protect

This button is a toggle that sets or clears a *protect* on the destination assigned to the control unit in which the destination protect button is located. The protect can be removed at the panel that originally set the protect, at any panel that has the same user ID, or by a forced release at any panel.

- ▲ **Note:** a protect prevents *others* from routing to a destination; a lock prevents *anyone*—even the user who issued the lock—from routing to the destination.
- ▲ You can lock a protected destination, but you cannot change a locked destination to a protected destination directly. You must first unlock it.
- ▲ The NV9648 provides no explicit indication, during operation, whether a destination is protected or unprotected.

### Quick Source

A quick source button selects a source and performs an immediate take (to the destination of the control unit in which the quick source button is located).

Quick source and source buttons are similar, except that the quick source performs a take. Be aware of which buttons are quick sources so you do not perform an accidental take.

Normally, the button text is the source's mnemonic, but the configurer can assign any text to the button.

### Source

A source button selects a source. (Note that a quick source button selects a source and also performs an immediate take.)

Quick source and source buttons are similar, except that the quick source performs a take. Be aware of which buttons are quick sources so you do not perform an accidental take.

Normally, the button text is the source device's mnemonic, but the configurer can assign any text to the button.

## Take

A take button routes the chosen source to the destination device for the control unit in which the take button is located. (The source must have been selected in the same control unit.)

The default button text is “Take” but the button can have any legend.

## Undefined

An undefined button cannot be used and appears dark (unlit) on the panel. The term “undefined button” has meaning primarily to the configurer and not the operator.

## Buttons for the Standalone Model

Under the standalone model, the panel has 3 independent control units, and therefore each panel can control 3 destinations. Because the panel is standalone, an NV9649 is not required.

Under the standalone model, there are 7 button types, not including “undefined” which is not a true button type:

<a href="#">Destination</a>	<a href="#">Quick Source</a>	<a href="#">Take</a>
<a href="#">Destination Lock</a>	<a href="#">Source</a>	<a href="#">Undefined</a>
<a href="#">Destination Protect</a>	<a href="#">Salvo</a>	

## Destination

The button selects a destination. The destination name appears in the display of the control unit in which the destination button is located. The destination is the target of an upcoming take, which will route a source to that destination.

Pressing a destination button has a side effect: it turns off the ‘Take’ button if it is on.

## Destination Lock

This button is a toggle that sets or clears a *lock* on the destination assigned to the control unit in which the destination lock button is located. The lock can be removed at the panel that originally set the lock, at a panel that has the same user ID, or by a forced release at any panel.

The button for a protected destination is high-tally yellow; the button for a locked destination is high-tally red.

## Destination Protect

This button is a toggle that sets or clears a *protect* on the destination assigned to the control unit in which the destination protect button is located. The protect can be removed at the panel that originally set the protect, at any panel that has the same user ID, or by a forced release at any panel.

- ▲ **Note:** a protect prevents *others* from routing to a destination; a lock prevents *anyone*—even the user who issued the lock—from routing to the destination.
- ▲ You can lock a protected destination, but you cannot change a locked destination to a protected destination directly. You must first unlock it.
- ▲ The NV9648 provides no explicit indication, during operation, whether a destination is protected or unprotected.

## Quick Source

A quick source button selects a source and performs an immediate take (to the destination of the control unit in which the quick source button is located).

Quick source and source buttons are similar, except that the quick source performs a take. Be aware of which buttons are quick sources so you do not perform an accidental take.

Normally, the button text is the source's mnemonic, but the configurer can assign any text to the button.

## Salvo

A salvo button presets an NV9000 system salvo. A subsequent press of a 'Take' button is required to execute the salvo. (If you press any other button, the pending salvo is canceled.)

The button legend is typically the salvo name.

## Source

A source button selects a source. (Note that a quick source button selects a source and also performs an immediate take.)

Quick source and source buttons are similar, except that the quick source performs a take. Be aware of which buttons are quick sources so you do not perform an accidental take.

Normally, the button text is the source device's mnemonic, but the configurer can assign any text to the button.

## Take

A take button routes the chosen source to the destination device for the control unit in which the take button is located. (The source must have been selected in the same control unit.)

The default button text is "Take" but the button can have any legend.

## Undefined

An undefined button cannot be used and appears dark (unlit) on the panel. The term "undefined button" has meaning primarily to the configurer and not the operator.

## Buttons for the LCD XY/MD Model

Under the LCD XY/MD model, the 27 buttons and 3 displays of the panel form an integrated unit. The 3 displays work together. The left-most display shows the preset source; the middle display shows the current source and the right-most display shows the current destination.

Under the LCD XY/MD model, there are about 21 button types, not including "undefined" which is not a true button type:

<a href="#">Back</a>	<a href="#">Level Map</a>	<a href="#">Quick Source</a>
<a href="#">Category</a>	<a href="#">Menu</a>	<a href="#">Salvo</a>
<a href="#">Clear Preset</a>	<a href="#">Navigate</a>	<a href="#">Selection</a>
<a href="#">Destination</a>	<a href="#">Page Down</a>	<a href="#">Source</a>
<a href="#">Destination Lock</a>	<a href="#">Page Up</a>	<a href="#">Take</a>
<a href="#">Destination Protect</a>	<a href="#">Panel Lock</a>	<a href="#">X-Y Display</a>

[Hold](#)  
[Undefined](#)

[Previous Source](#)

[XY/MD Mode](#)

## Back

Redisplay the previous button page. (The previous button page becomes active.)

A back button may have any legend and be any color, but typically its legend is just “BACK” and typically, its color is blue, as it is for back buttons generated automatically for lists. A back button is never high-tally.

See also [\[Forward\]](#).

## Category

A category button corresponds to either a source category or a destination category. When you press a category button, a new button page appears in which the devices of the category are listed. The new button page also shows a ‘Page Up’ button.

The button page also has a ‘Page Down’ button if the category has more than 25 devices. You can scroll through as many button pages as are necessary to browse through all the devices in the category.

To exit from the device list, it is necessary to press the ‘Page Up’ button. Pressing ‘Page Up’ from the first page of the device list returns you to the button page in which you pressed the category button.

If the panel is so configured, pressing a source button in a page of source buttons will cause the panel to return to the page in which you pressed the category button. If the panel does not have this feature, you must press the ‘Page Up’ button to return to the previous page.

## Clear Preset

The ‘Clear Preset’ button removes any preset entries.

The default button text is “Clear Preset” but the button can have any legend.

## Destination

The button selects a destination. The destination name appears in the ‘Destination’ display (the right-most display). The destination is the target of an upcoming take, which will route a source to that destination.

Pressing a destination button has two side effects: it clears — or partially clears — the ‘Preset’ display (the left-most display), and (2) it turns off the ‘Take’ button if it is on.

## Destination Lock

This button is a toggle that sets or clears a *lock* on the current destination. The lock can be removed at the panel that originally set the lock, at a panel that has the same user ID, or by a forced release at any panel.

- ▲ The NV9648 provides no explicit indication, during operation, whether a destination is locked or unlocked.

## Destination Protect

This button is a toggle that sets or clears a *protect* on the current destination device. The protect can be removed at the panel that originally set the protect, at any panel that has the same user ID, or by a forced release at any panel.

- ▲ **Note:** a protect prevents *others* from routing to a destination; a lock prevents *anyone*—even the user who issued the lock—from routing to the destination.
- ▲ You may lock a protected destination, but you cannot change a locked destination to a protected destination directly. You must first unlock it.
- ▲ The NV9648 provides no explicit indication, during operation, whether a destination is locked or unlocked.

## [Forward]

This button displays and activates the next button page of an automatically generated list. A forward button is never high-tally. A forward button is generated by the system when the current page of a list has more than 25 or 26 elements. Forward buttons are always accompanied by “back” buttons.

See also [Back](#).

## Hold

The ‘Hold’ button is a toggle. Press it once to activate “hold” mode, press it again to deactivate “hold.” The button is high-tally when hold mode is active and low-tally when it is not.

You can activate or deactivate hold mode at any time during an MD selection or a breakaway selection in X-Y mode. Your selection remains intact and the panel subsequently operates in hold mode or non-hold mode according to the hold button state.

The default button text is “Hold Preset” but the button can have any legend.

## MD Mode

In MD mode, turning hold mode on allows you to select more than one destination button at a time. When you select a source, the source applies to all selected (high-tally) destinations. If hold is still on when you press ‘Take’, the selected destinations remain selected and the display reflects the selected destinations. The buttons for the selected destinations remain high-tally.

Without hold enabled, the panel has no destinations selected after an MD take and the buttons for the selected destinations go low-tally.

When hold is active, all selected MD destinations get the source you selected most recently (in case you change your mind and selected another source).

## X-Y Mode

In X-Y mode, the hold button causes breakaway levels to be retained after a take. The levels you selected (and deselected) remain lit (or unlit) as they were before the take.

## Level Map

The ‘Level Map’ button cross-connects levels (typically in the same physical router). The function is typically used to shuffle audio channels, for example, to connect AES1/2 to AES3/4.

The default button text is “Level Map” but the button can have any legend.

## Menu

This button puts the panel in menu mode and produces a menu on the buttons and in the displays that provides access to a variety of panel functions.

Without the button, the operator has no access to the menu functions.

By pressing certain buttons, you makes menu selections and enter data (such as panel ID) or change brightness values. When the panel is in menu mode, you must press the 'Menu' button to cycle through the functions of the menu. See [Menu Mode](#) on page 68.

## Navigate

▲ It is not likely that you will see any button labeled "navigate" on your panel. The configurer will have labeled such buttons according to their actual purpose.

A "navigate" button displays and activates one of the button pages defined in the panel configuration. We call that page the "target" of the button.

The target page can be an ordinary button page (defined during configuration) or it can be the first page of a list. Lists are characterized by "back" and "forward" buttons on the panel. Such lists can be categories, sources, destinations, or salvos.

Navigate buttons have no specific default text and it is the configurer's job to provide text that is meaningful. The text should help identify the contents of the target page.

Just press the navigate button to access the target page.

Category buttons can also cause the display of a target page. In practice, navigate buttons and category buttons are nearly indistinguishable, although the pages they display can be quite different.

See the [Category](#) button type.

## Page Down

The button scrolls *down*. The meaning of scrolling varies with context:

- Scrolling devices within a category: 'Page Down' moves forward in the list of devices. (Forward means toward the end of the list of devices.)
  - Scrolling levels in X-Y mode: Scrolling can occur when (1) selection buttons are visible on the current button page, and the currently selected destination has more levels than the number of selection buttons.  
'Page Down' moves forward in the list of levels. (Forward means toward the end of the list of levels.)
  - Scrolling MD devices in MD mode: Scrolling can occur when (1) selection buttons are visible on the current button page, and there are more MD devices than the number of selection buttons.  
'Page Down' moves forward in the list of MD devices. (Forward means toward the end of the list of MD devices.)
- ▲ The number of MD devices is the value of the 'MultiDest Device Limit' field in the configuration. This value might be greater than the number of actual MD devices. The MD device list might have blank entries.



## Page Up

The button scrolls *up*. The meaning of scrolling varies with context:

- Scrolling devices within a category: 'Page Up' moves back in the list of devices. (Back means toward the beginning of the list of devices.)

When the list of devices is at the beginning already, the 'Page Up' button returns you to the page in which you pressed the category button.

- Scrolling levels in X-Y mode: Scrolling can occur when (1) selection buttons are visible on the current button page, and the currently selected destination has more levels than the number of selection buttons.

'Page Up' moves back in the list of levels. (Back means toward the beginning of the list of levels.)

- Scrolling MD devices in MD mode: Scrolling can occur when (1) selection buttons are visible on the current button page, and there are more MD devices than the number of selection buttons.

'Page Up' moves back in the list of MD devices. (Back means toward the beginning of the list of MD devices.)

- ▲ The number of MD devices is the value of the 'MultiDest Device Limit' field in the configuration. This value might be greater than the number of actual MD devices. The MD device list might have blank entries.

## Panel Lock

The button prevents accidental changes to the panel settings, especially router crosspoints. When the panel is locked, the button array becomes blank except for the Panel Lock button which becomes high tally amber.

The button is a toggle: press the panel lock button again to revert the panel to its previous state.

## Previous Source

This button presets the previously selected source for the current destination. This function is useful when you make a route in error.

To recover the previous source, press 'Previous Source'. When you do, the 'Take' button goes high-tally. Then press 'Take' to finish recovering the source.

The default button text is "Previous Source" but the button can have any legend.

## Quick Source

A quick source button selects a source and performs an immediate take.

Quick source and source buttons are similar, except that the quick source performs a take. Be aware of which buttons are quick sources so you do not perform an accidental take.

Normally, the button text is the source's mnemonic, but the configurer can assign any text to the button.

## Salvo

A salvo button presets an NV9000 system salvo. A subsequent press of a 'Take' button is required to execute the salvo. (If you press any other button, the pending salvo is canceled.)

The button legend is typically the salvo name.

### Selection

Any button page available at the panel might have one or more selection buttons. The buttons are typically arranged in a row or matrix that would make sense when you scroll entries displayed on the selection buttons.

In X-Y mode, a selection button selects or deselects a level (on which a take can occur). In MD mode, a selection button selects or deselects an MD device to which a take will occur. A selection button is high-tally when its associated level or MD device is selected and low-tally otherwise.

If the panel has more levels (in X-Y mode) than selection buttons or more MD devices (in MD mode) than buttons, scrolling is enabled. If your panel has 'Page Up' and 'Page Down' buttons on that button page, you can scroll through the list of levels or MD devices.

When you scroll the selection buttons using the 'Page Up' or 'Page Down' buttons, the legends on the selection buttons change to newly displayed selection entries.

- ▲ When all levels are selected, pressing a level button turns them all off except the one pressed.

### In X-Y Mode

Deselecting levels in X-Y mode prepares a breakaway take.

Hold mode preserves the level selection after a take. See [Hold](#).

### In MD Mode

When your panel is in hold mode (i.e., you have pressed a 'Hold' button), you can select more than one destination at once. If your panel is not in hold mode, MD destinations are mutually exclusive: you can select only one at a time.

If you have enabled 'Hold' mode,

- 1 Select one or more MD devices. Scroll the MD device display as needed to locate the devices.
- 2 Select a source.
- 3 Repeat steps 1 and 2 until your presets are complete.
- 4 Press 'Take'. The selected MD devices remain selected.

If you have **not** enabled 'Hold' mode,

- 1 Select an MD device. Scroll the MD device display as needed that device.
- 2 Select a source.
- 3 Repeat steps 1 and 2 until your presets are complete.
- 4 Press 'Take'. The selected MD devices become unselected.

The panel configuration might allow you to redefine certain MD destinations. To do so is simple: (1) select an MD destination on a selection button, (2) choose a destination that is not on a selection button. You might have to navigate or scroll through a destination list to choose one.

### Source

A source button selects a source. (Note that a quick source button selects a source and also performs an immediate take.)

Quick source and source buttons are similar, except that the quick source performs a take. Be aware of which buttons are quick sources so you do not perform an accidental take.

Normally, the button text is the source device's mnemonic, but the configurer can assign any text to the button.

### Take

In X-Y mode, a take button routes the preset source device(s) on selected levels to the selected destination device.

In MD mode, a take button switches the preset source device(s) to the selected destination device(s) on all levels.

The default button text is "Take" but the button can have any legend.

### Undefined

An undefined button cannot be used and appears dark (unlit) on the panel. The term "undefined button" has meaning primarily to the configurer and not the operator.

### X-Y Display

The 'X-Y Display' button displays status in either X-Y mode or MD mode. It also displays other messages in other circumstances, as required. Pressing this button has no effect.

Prior to a take, the status includes the selected destination and *current* source. After a take, the status includes current source and current destination. The 'X-Y Display' button turns low-tally red if that destination is locked (by anyone) or protected (by another user).

If there is no destination selected, this button says so.

The button appears in whatever color the system assigns it—typically amber or dark red.

- ▲ Prior to a take, the *preset* source name is displayed on any selection buttons present on the panel. After a take, the selection buttons continue to display the source name, which is now the *current* source name.

In MD mode, the X-Y Display button shows (1) current source, (2) preset source, and (3) destination for one of the selected MD devices—the first one if more than one are selected.

### XY/MD Mode

This button switches the panel between X-Y and multi-destination modes.

The button is green for X-Y mode and amber for multi-destination mode.

The button text changes to read "XY-MD In XY Mode" or "XY-MD In MD Mode" according to the mode you have selected. The alphanumeric display also reflects the current mode.

## Operating Methods

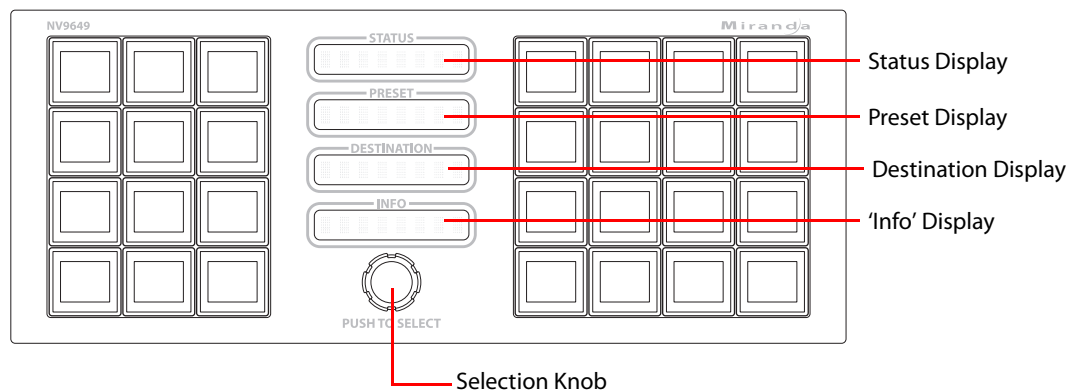
Operating the NV9648 in either standalone mode or LCD XY/MD mode is straightforward. The standalone model is simple; the LCD XY/MD model is complex.

The client model is also simple but not at all obvious because of the interaction between the NV9649 and the NV9648s.

To summarize that interaction, the NV9649 can assign destinations to each of the individual control units (9 buttons, 1 display) of the associated NV9648s. The NV9649 can also assign sources to source buttons (or to quick source buttons) of the individual control units of the associated NV9648s.

(The NV9649 button that applies in this interaction is the 'Assign' button. The NV9649's knob can be used to perform device selection by category. The NV9649 will have been configured in "server" mode.)

This is a view of the NV9649 panel, identifying the different features that apply to client mode:



### Client Model Procedures

Preset procedures, A and B, are used by the "Assign" procedures, C and D, following, next page.

#### Procedure A — Preset a Source Using the Knob

To preset a source in the preset display of the NV9649 (server):

- 1 Ensure that the NV9649 is in *source* mode. Press a 'Source Mode' button or press a 'SRC/DST Mode' button when the panel is in destination mode.
- 2 Turn the knob on the NV9649, clockwise or counter-clockwise, to scroll through the categories that were configured for the panel.
- 3 When you reach the desired category, identified in the NV9649's preset display, push the knob. (You can feel it click.) The NV9649's preset display will show the mnemonic of the selected category.
- 4 Use the knob now to scroll through the devices in the category until you see the desired device in the preset display. (Device names consist of the category mnemonic followed by a (usually) numeric suffix.)
- 5 At any time, you can press a 'Clear' button to erase the preset entry you have selected. You might have to press 'Clear' more than once.

### Procedure B — Preset a Source Using a Keypad

To preset a source in the preset display of the NV9649 (server):

- 1 Ensure that the NV9649 is in *source* mode. Press a 'Source Mode' button or press a 'SRC/DST Mode' button when the panel is in destination mode.
- 2 Use a category button to select the desired category. The selected category will be displayed in the preset display. (The panel must have been configured with one or more category buttons.)
- 3 After choosing a category, use the panel's keypad to "type in" the index of the desired device contained in the category. For example, if the category is VTR and the device is VTR\_12, type in 1, then 2. (The panel must have been configured with one or more suffix buttons, which are category buttons that provide suffixes.)

As you press keys of the keypad, a device that currently matches the string of indexes will be displayed in the 'Preset' display.

Note also that you can use the knob to scroll forward or back from any point in the device selection (starting at that whatever index you have entered so far).

- ▲ During device selection by keypad, certain keys in the keypad become disabled if it is not possible to use the keys to perform further selection. For instance, if you have devices numbered 1–16 in a category and you press 2 (e.g., VTR2), all keys in the keypad become disabled because another digit would create an index of 20, 21, or similar, which is beyond the range of 1–16.

- 4 At any time, you can press a 'Clear' button to go back **one key press at a time** as you require.

### Procedure C — Assign a New Source to a NV9648 Source Button

To assign a new source to a source button of an NV9648's control unit:

- 1 Ensure that the NV9649 is in *source* mode. Press the 'Source Mode' button or press a 'SRC/DST Mode' button if the panel is in destination mode.
- 2 Use procedure A or procedure B described above to select (i.e., preset) the desired source.
- 3 Press an 'Assign' button on the NV9649.
- 4 Press the intended source button — in the intended control unit of the intended NV9648. The software assigns the source selected at the NV9649 to that button. The source text appears on the button's LCD.

### Procedure D — Assign a New Destination to a NV9648 Control Unit

To assign a new destination to a control unit of an NV9648:

- 1 Ensure that the NV9649 is in *destination* mode. Press the 'Destination Mode' button or press a 'SRC/DST Mode' button if the panel is in source mode.
- 2 Select a destination device by (1) turning the knob or (1) selecting the category and device index using a "keypad." Use the method described under procedures A or B. But because you have placed the NV9649 in destination mode, the method selects a destination.
- 3 Press an 'Assign' button on the NV9649.
- 4 Press any *source* button in the intended control unit of the intended NV9648. (To help you do this, the source buttons of NV9648s — and only the source buttons — will be lighted.)

Note: because the NV9649 is in destination mode, the new destination mnemonic will immediately appear in the display of the intended control unit.

### Procedure E — Takes Using Source Buttons

To perform a take to a single destination using a NV9648 control unit having standard source buttons:

- 1 Press a source button in the control unit that corresponds to your intended destination.  
The source becomes selected and the source button goes high-tally. The take button in the same control unit goes high-tally red.
- 2 Press the take button. The take is completed.

### Procedure F — Takes Using Quick Source Buttons

To perform a take to a single destination using a NV9648 control unit having quick source buttons:

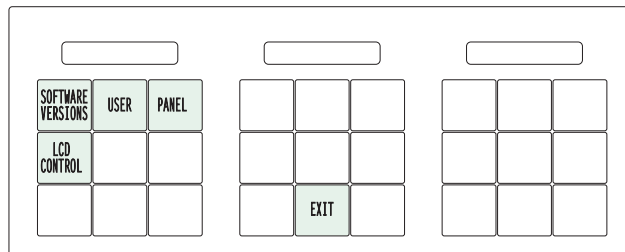
- 1 Press a quick source button in the control unit that corresponds to your intended destination.
- 2) That source is immediately taken to the destination of that control unit.

## Menu Mode

The NV9648 enters menu mode if it has a menu button and you press the menu button.

- ▲ The menu is available only when the panel is operating under the LCD XY/MD model.
- ▲ The menu uses some of the buttons on your panel. The legends and functions of these buttons in normal operating mode do not apply while the panel is in menu mode.

While the panel is in menu mode, you will use the menu button to cycle through the various parts of the menu. This is the menu that appears when you press a menu button:



There are 4 parts:

- Software Versions
- User
- Panel Information
- LCD button illumination levels

Configurers should ensure that the menu button is not part of the numeric keypad that becomes available in the panel submenu. See [Panel Information](#), following.

## Software Versions

Press the 'Software Versions' button to view the software and firmware versions:

[ ]			[ ]			[ ]		
BOOT SV1133- 000000	APP SV0000- 000000	SERVER SV0921- 06	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
[ ]	[ ]	[ ]	[ ]	EXIT	[ ]	[ ]	[ ]	[ ]

The 3 buttons at the left tell you the current versions of the software in the NV9648. Generally, this is of no relevance unless you are in a diagnostic situation.

Press 'Exit' in the middle section to return to the menu.

## User

Press the 'User' button to view user data:

[ ]			[ ]			[ ]		
USER	USER_ID 01	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
[ ]	[ ]	[ ]	[ ]	EXIT	[ ]	[ ]	[ ]	[ ]

The 2 buttons at the left tell you the user name and user ID as determined by the router control system. These are **not** the Windows user name or the panel ID.

- ▲ User names are important in lock, protect, and release situations. The user who "owns" a lock or protect is identified by a user name.

Press 'Exit' on the right to return to the menu.

## Panel Information

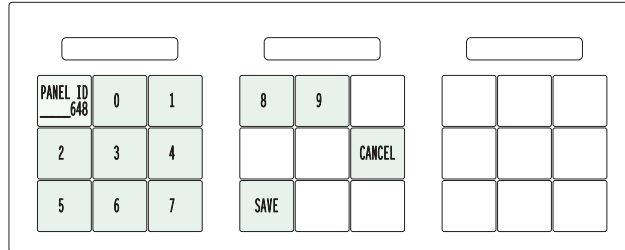
Press the 'Panel' button to view panel data:

[ ]			[ ]			[ ]		
PANEL_ID 6482	PANEL_NAME L648	IP_ADDR 192.168. 104.214	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
SVR_NAME L648	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]	[ ]
[ ]	[ ]	[ ]	[ ]	EXIT	[ ]	[ ]	[ ]	[ ]

The 5 buttons at the left tell you the panel ID, and other useful information about the panel, in particular, the panel's IP address. These are useful in a diagnostic situation. This information helps configurers ensure that they are sending correct configuration file to the correct panel.

- ▲ The panel acquires its IP address through DHCP on the NV9000's panel/router network.

If the 'Panel ID' button is high-tally, you may change the panel ID. Normally, only your system administrator would do that. To change the panel ID, press the panel ID button. A panel ID entry menu appears containing a keypad:



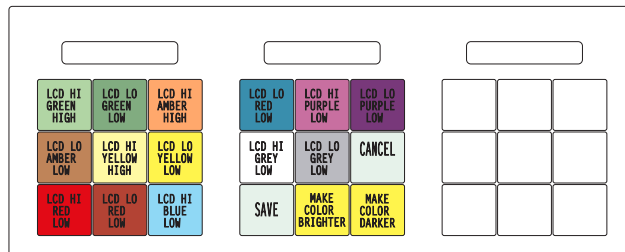
Press the keys of the keypad to enter a number. The number you enter is displayed on the panel ID button.

Press Cancel to leave the submenu without changing the panel ID.

Press Save to accept your change to the panel ID and leave the submenu.

## Button Illumination

Press the 'LCD Control' button to view and change LCD brightness. When you do, the current LCD button state appears on the 14 top left buttons:



There are 14 buttons for the 7 button colors. They occur in pairs. The pair shows the high tally and low tally values for the particular color.

You can change high-tally from high to medium brightness and change low tally to medium or low brightness, as long as high tally is brighter than low tally. (They cannot both be medium brightness.)

To change a color's brightness, select the button for the color you want to change. Press either the 'Make Color Brighter' button or the 'Make Color Darker' button, whichever is available.

If you make a change, press 'Save' to commit the change or press 'Cancel' to discard the change. Pressing either button returns you to the panel menu.

The actual colors cannot be represented accurately in print or in a PDF file displayed on your screen. There is a small amount of variation in color from button to button. See [LCD Buttons](#) on page 93 for a better color chart.



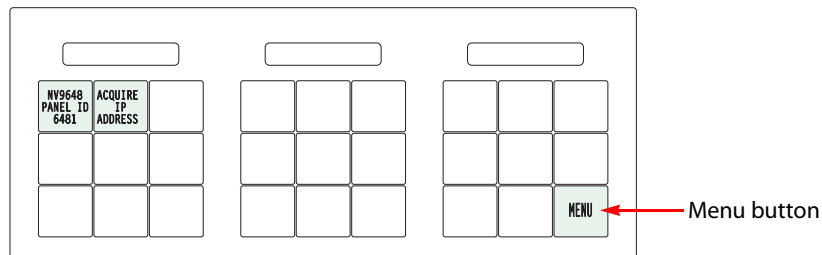
## Setup Mode

Setup mode occurs when the NV9648 is disconnected from its network and is freshly powered up. In setup mode, you can set or change the panel ID, identify the software version, and perform a test of the panel's buttons. It is in setup mode that you must initially set the panel ID.

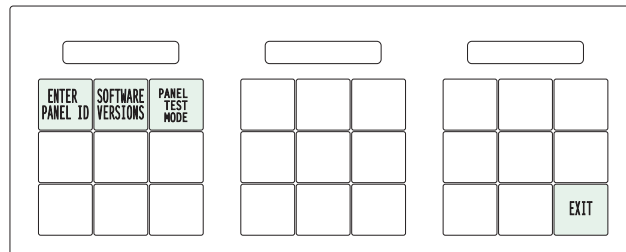
▲ It can take several seconds for the buttons to appear.

### Panel ID

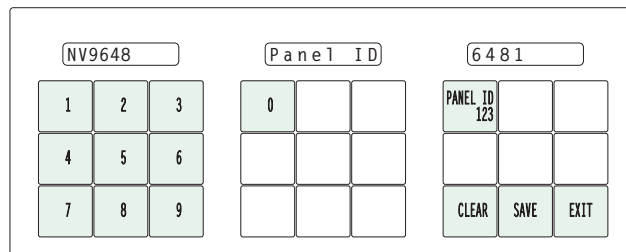
The panel powers up with a "menu" button illuminated in green and a display of the current panel ID. The panel ID is usually set to 0 at the factory:



Press the menu button to proceed to the first part of setup which is to set the panel ID:



The buttons on the left side of the panel light up and form a numeric keypad. Enter a panel ID (up to 8 digits) by pressing the appropriate numerical buttons:



Press 'Clear' at the lower right if you make a mistake. Then enter the panel ID again.

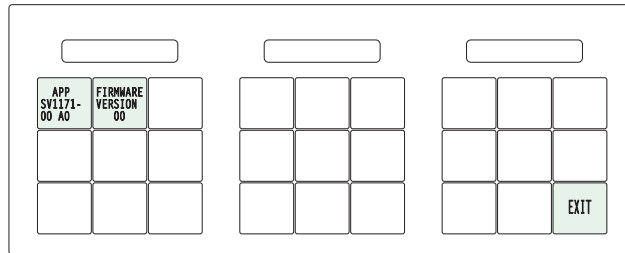
Press 'Save' to accept the new panel ID and to exit the panel ID entry submenu.

Press the 'Exit' button to leave the submenu without making a change.

### Software Versions

Press the 'Software Versions' button to display the panel's software and firmware versions. The software part number and its revision number wrap around the first two lines of the display. In

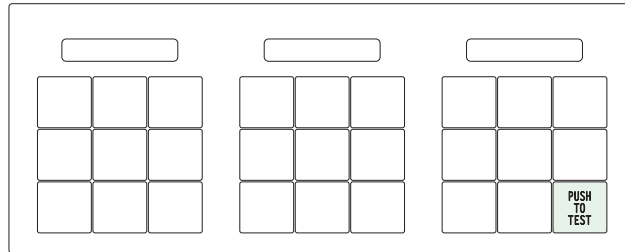
the illustration above, the part number is SV1171-00 and the revision is A0. The CPLD version number is 00:



## Panel Test

Press the 'Panel Test Mode' button to perform a panel test. The test reveals the color and viability of the 3 displays and the function buttons.

The submenu shows a 'Push to Test' button at the lower right:

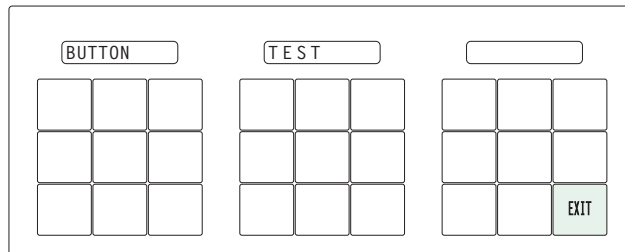


Press that button to proceed to the display test.

The display test should show that the pixels of the character elements of the displays are brightly lit.

Press the 'Push to Test' button again to start the color test. The first segment of this test shows all the buttons illuminated in high-tally green. Press the 'Push to Test' button again. The next segment shows low-tally green.

Keep pressing that button until all the colors have been displayed — green, amber, yellow, red, blue, purple, grey, and white and high and low-tally for each. At this point, the displays now read button test. Pause for a moment. Do not press 'Exit':



Press any button to test it. The button will flash a few times rapidly and the number of the button will appear on the display.

Pressing the exit button will terminate the button test and return you to the initial display of setup mode. At this point — if you have assigned your NV9648 a suitable panel ID — you may connect your NV9648 to the panel network of your NV9000 system.





# 6 GPIO

Chapter 6 provides information about the tally (GPIO) interface.

## Topics

<i>The Interface</i> .....	75
<i>GPIO Configuration Concepts</i> .....	76
<i>Configuring Outputs</i> .....	77
<i>Configuring Inputs</i> .....	79

## The Interface

The tally interface includes 8 optically isolated inputs and 4 solid-state relay outputs (also optically isolated). Tally devices you connect to inputs can trigger events—through the NV9648—in the router control system. The router control system can trigger events that—through the relays in the NV9648—switch your tally devices.

The DB25 connector, labeled “GPI Interface” at the rear of the NV9648 presents the tally signals. There are 8 input signals and 4 pairs of output signals.

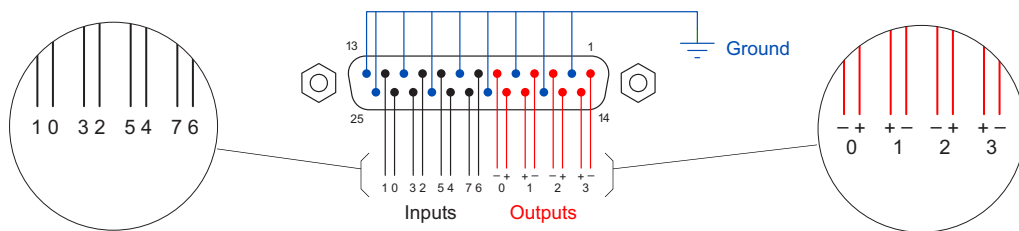


Fig. 6-1: GPI Interface

## Input

The tally inputs expect contact closure to ground, through the ground pins on the connector, to trigger a GPI input event.

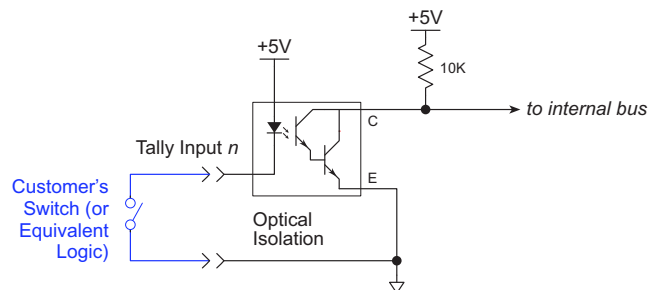


Fig. 6-2: GPI Input

When the input transitions off or transitions on, the NV9648 notifies the router control system, which carries out the task defined for the input (if a task has been configured).

During contact closure, a current of 1.2mA flows. A maximum of 48VDC can be applied to the tally input for less than 5 seconds without failure. No voltage above 5VDC should be continuously applied.

## Output

A tally output is a solid state relay (no audible click) with a maximum resistance of 10W and current capability of 150mA. It can withstand 200VAC.

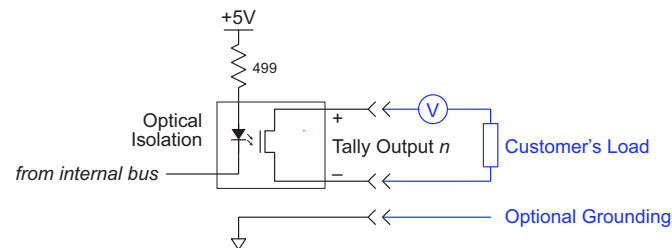


Fig. 6-3: GPI Output

When a condition (defined for the relay) occurs, the router control system notifies the NV9648 which then opens or closes the relay. The relay switches the customer's circuit on or off. (It does not power the circuit. Customers must provide their own power.)

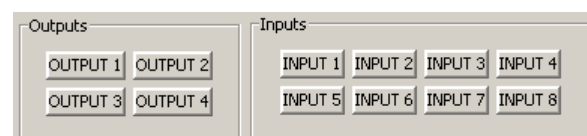
## GPIO Configuration Concepts

These are the I/O characteristics of the NV9648's tally interface:

- Eight optically isolated inputs (sometimes called GPIs) that can be configured to trigger an event when the input transitions from off to on and to trigger another event on a transition from on to off. Events include:
  - Execute a salvo.
  - Route the "previous source" switched by *any* panel to a destination.
  - Route the "previous source" switched by *this* panel to a destination.
  - Route a source to a destination.
- Four relays that can be configured to switch on a number of conditions:
  - One or more routes occurring on specific levels.
  - Conditions involving output ports (destination, level).
  - A transition on one or more of the panel's tally inputs.

## The GPIO Section of the NV9648 Page

SE's NV9648 configuration page provides a GPIO section, below the tree window:



Click on a button under 'Outputs' to configure one of the 4 tally outputs.  
Click on a button under 'Inputs' to configure one of the 8 tally inputs.

▲ There are no actual GPIO *buttons* on the NV9648 control panel.

## Configuring Outputs

Clicking an output button (one of 4) displays a "Relay Rule" dialog for the output:

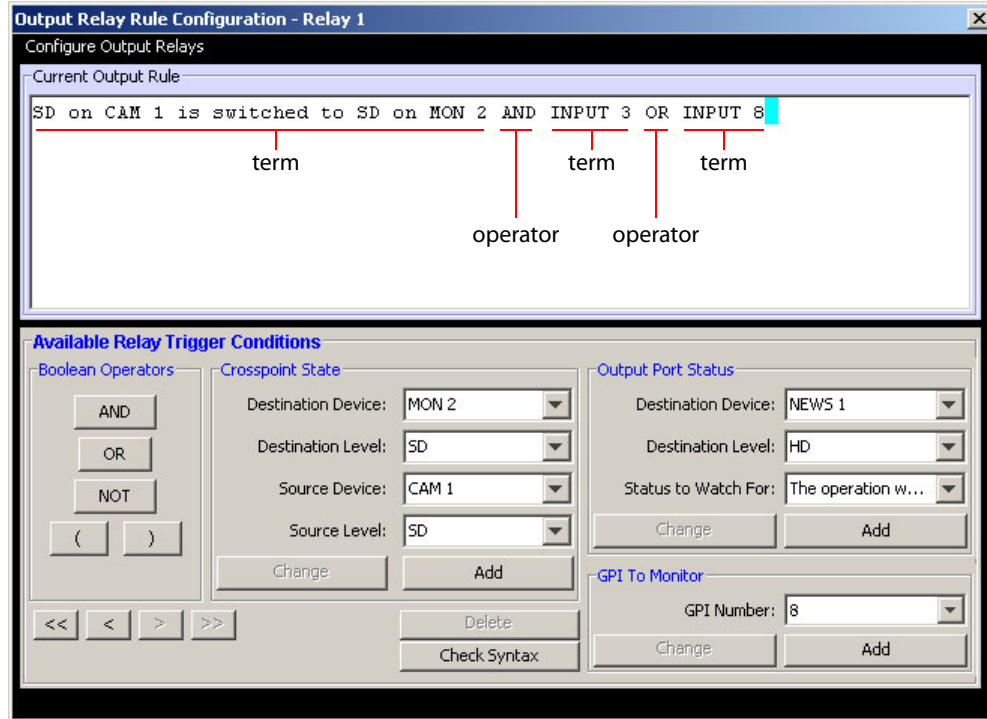


Fig. 6-4: Relay Rule Dialog

In this dialog, you create a Boolean expression involving sources destinations, port status, and GPI (input) status. When the conditions of the Boolean expression are met (i.e., the expression is "true") the relay closes. When the conditions are not met, the relay opens. Figure 6-4 shows one such Boolean expression.

Boolean expressions comprise *terms* and *operators*. The operators include those indicated on the left: AND, OR, and NOT. Expressions can be parenthesized to control the order of evaluation. Operator precedence is normally NOT > AND > OR. All parenthesized expressions are evaluated first; expressions in nested parentheses are evaluated before those in outer parentheses.

Terms (i.e., operands) are generated by choosing entries in the other fields in this dialog and clicking 'ADD'. The example shows the following:

Dest. Device:MON2Dest. Level:SD  
Source Device:CAM1Source Level:SD

Choosing these items (and clicking ADD) produces the Boolean sub-expression:

SD on CAM1 is switched to SD on MON2

In Figure 6-4, that sub-expression is ANDed with another sub-expression

INPUT 3 OR INPUT 8

The relay will turn on when the *entire* expression is true. That is, when the switch occurs and either of the inputs (3 or 8) transitions from off to on.

(To allow a relay to switch when an input transitions from on to off, precede the input term by "NOT." For example, the expression

```
INPUT 3 OR NOT INPUT 8
```

will evaluate TRUE when either input 3 goes on or input 8 goes off.)

You can also include one or more sub-expressions regarding the state of output ports. You must choose a entry in the drop-down menu. These are the choices:

- The operation was successful
- Destination port locked
- Destination port protected
- Router offline / unavailable
- No tieline available
- Used as master point to point
- Used as master without responses
- Used as broadcast master
- Used as slave point to point
- Used as slave without responses
- Used as broadcast slave

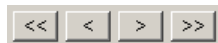
As an example, choosing 'Used as broadcast slave', device VTR3, and level CTRL for output port status produces the sub-expression:

```
CTRL on VTR3 has status of 'Used as broadcast slave.'
```

which you can combine with other sub-expressions as you require.

The actual logic takes place in the router control system, based on the state of the NV9648 inputs and other system-wide events. The router control system sends signals to the NV9648 instructing it to open or close its relays.

Four arrow buttons at the lower left corner of the relay dialog allow you to traverse the expression you are building:



The left double arrows highlights the first term or operator in the expression. The right double arrow positions you at the very end of the expression where you may add more items.

The single arrows select and highlight the previous or next terms, operators, or spaces between terms and operators. If you wish to change a term, you may highlight it, reconstruct the term in the appropriate entry fields, and click the 'Change' button to effect the change.

Using the arrows is the only way to position between two items or at the end of the expression. You can double-click a term or an operator to select it directly.

You can click 'Check Syntax' to evaluate the syntax of your complete expression. Generally, a syntax error will have occurred because you forgot an operator between terms or you have an extra operator at the end. You can click 'Delete' to delete a selected term.

This is a summary of Boolean operations:

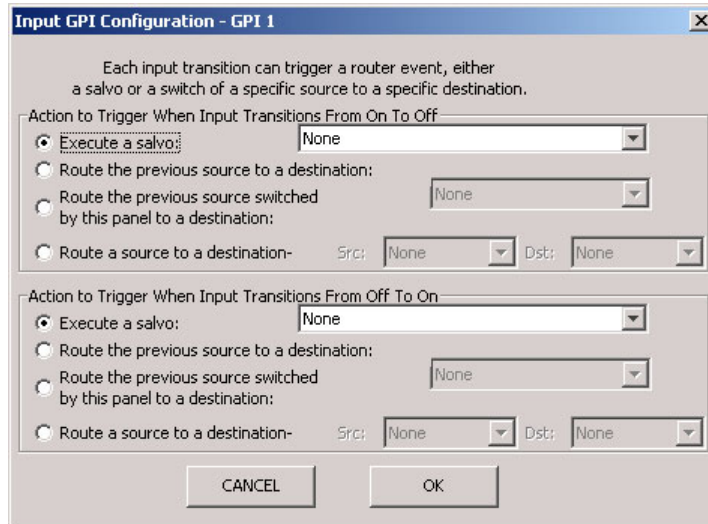
- All operands evaluate either TRUE or FALSE.
- AND = true if ALL terms are true; false if ANY term is false.
- OR = false if ALL terms are false; true if ANY term is true.
- NOT = true if term is false; false if term is true (i.e., negation).

▲ Relay output expressions can be as rich (or complex) as you require.



## Configuring Inputs

Clicking an input button (one of 8) displays the GPI input dialog:



An event is signalled when a transition occurs on the input from on to off or from off to on. You can configure the NV9648 to recognize either occurrence on any of the 8 inputs, and specify one of 4 behaviors for each event or both:

1 Execute a salvo.

If you choose this behavior, select a salvo ID in the salvo drop-down list.

**Note:** Although it is not evident in the GPIO input dialog (or anywhere else), a 'Previous Source' command in a salvo chooses the most recent source that is *different* from the current source (for a designated destination).

2 Route the "previous source" (that was switched by **any** control panel) to a destination, even if it is the same as the current source.

If you choose this behavior, select a destination in the destination drop-down list.

3 Route the "previous source" switched by **this** panel to a destination, even if it is the same as the current source.

If you choose this behavior, select a destination in the destination drop-down list.

4 Route a source to a destination.

If you choose this behavior, select a source and a destination in the two drop-down lists.

### GPIO Summary

The NV9648 has 4 relays that can switch on or off your external devices, based on (1) NV9648 input transitions and (2) events in the router control system.

Its 8 inputs can be switched on or off by your external devices. When an input transitions on or off, the NV9648 can respond with one of 4 actions, such as executing a salvo. (It is the system that actually executes the salvo.)



# 7 Technical Details

Chapter 7 provides the following:

## Topics

<i>Power Specifications</i> .....	81
<i>NV9648 Specifications</i> .....	82
<i>Environmental Specifications</i> .....	83
<i>Defaults</i> .....	83
<i>Drawings</i> .....	83

## Power Specifications

Table provides power specifications for the NV9648 control panels.

### NV9648 Power Specifications

Specification	Detail
DC power	External power supply: 12VDC $\pm$ 10%, 5 A.
Power consumption	9.15 W
Regulatory	UL listed and CE compliant.

Table provides specifications for the PS0001 power supply.

### Power Supply Specifications

Specification	Detail
AC power	90–264 VAC (127–300 VDC), 47–447 Hz. Inrush current < 50 A at 230 VAC, cold start, at 25°C, Input current < 2.0 A rms at 115 VAC; < 1.0 A at 230 VAC.
DC power	$\leq$ 60W, 12 VDC, 5 A (5.4 A peak), Regulation $\pm$ 2%. Ripple $\leq$ 120 mV.
Efficiency	Efficiency > 80% at full load typical, 115 VAC.
Weight	1.06 lb (0.48 kg).
Regulatory	UL Listed and CE Compliant.

The power supply is an Grass Valley PS0001-00:

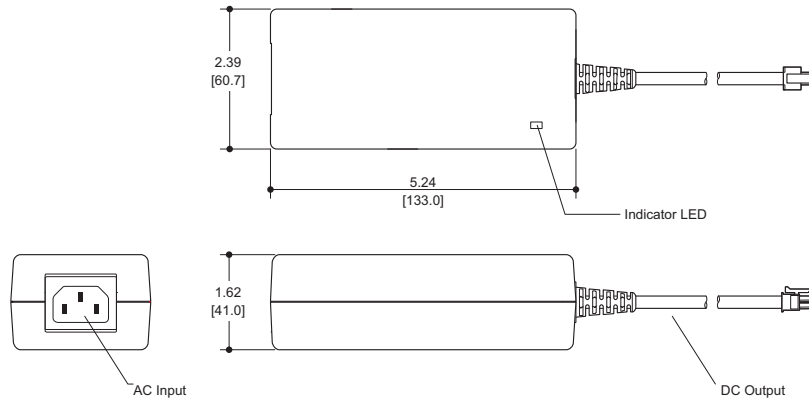


Fig. 7-1: The power output has Molex 4-pin plug. See [Power Cord Retention](#) on page 87.

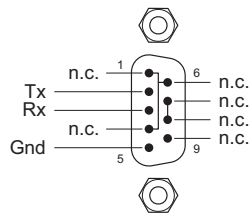
## NV9648 Specifications

Table provides specifications for the NV9648.

### NV9648 Physical Specifications

Specification	Detail
Dimensions	Height: 3.47" (88.1 mm), fits EIA 2 RU (3.5" or 88.9 mm), Width: 8.7" (221.0 mm). The panel mounts in one of the two apertures of the main bracket of the NV9649-48-RMK (rack-mounting kit) which is 19" wide and 3.47" high (2RU).
Depth	2.46 ± 0.01" (62.5 mm), enclosure. 2.99" (75.9 mm) overall.
Power	9.15 W
Weight	0.994 kg (2.19 lb).
Connectors	Power: 2 connectors, Molex 4-pin, keyed. Ethernet: 1 connector, 10/100baseT, RJ-45 jack. RS-232: 1 connector, 9-pin D type, for diagnostics and upgrades. GPIO: DB25.
Tally Interface (GPIO)	Input: ≤ 5VDC continuous; ≤ 48VDC for less than 5 seconds; 1.2 mA when on. Output: ≤ 150 mA; ≤ 200 VAC.
Grounding terminal	None.

The RS-232 connector has this pinout:



Pins 1, 4, and 6 are tied together and pins 7 and 8 are tied together. None of those pins are connected to any circuitry.

## Environmental Specifications

Table provides environmental specifications for the NV9648.

### NV9648 Environmental Specifications

Specification	Detail
Operating temperature	0–40°C, ambient.
Relative humidity	0 to 90%, non-condensing.
Cooling	No fan required.

## Defaults

### Initial Panel State

Destination: the configured default.

Buttons: low-tally is 40% brightness by default and stays at its most recent setting.

### Configuration Page

The initial NV9648 configuration has no buttons defined. The default panel options are:

Behavioral model: 'Panel Client' mode.

Release mode: Normal.

Display 1 device: None.

Display 2 device: None.

Display 3 device: None.

Display 3 device: None.

Master panel: None

Panel options for the other behavioral models are not in effect.

The tally inputs and outputs are all initially undefined.

### DHCP

The panel is set up to respond to DHCP from the factory. It is possible to assign the panel a fixed IP address using the Panel IP Configuration Utility.

## Drawings

The following drawings identify panel features and provide overall and critical dimensions.

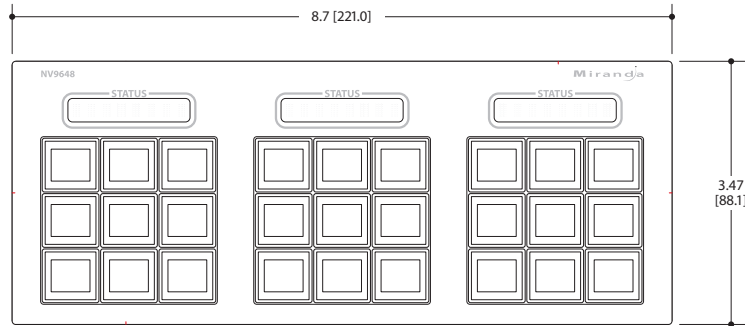


Fig. 7-2: Front View of the NV9648

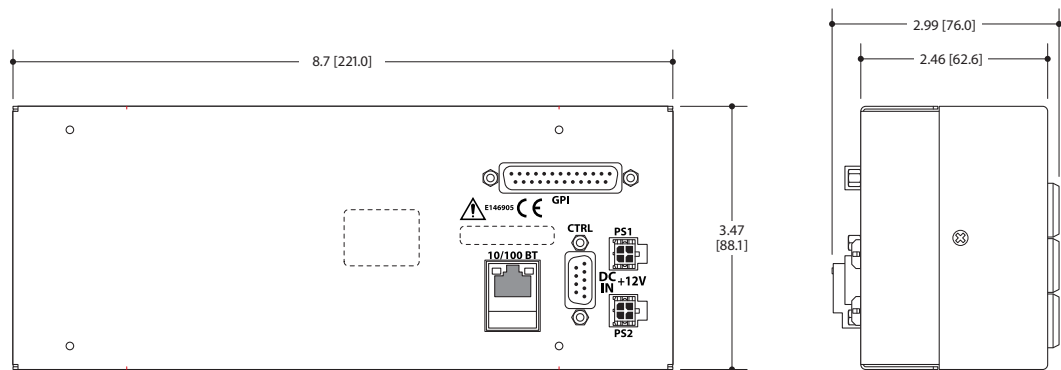


Fig. 7-3: Rear and Side View of the NV9648

This is the NV9648's rack mounting filler plate:

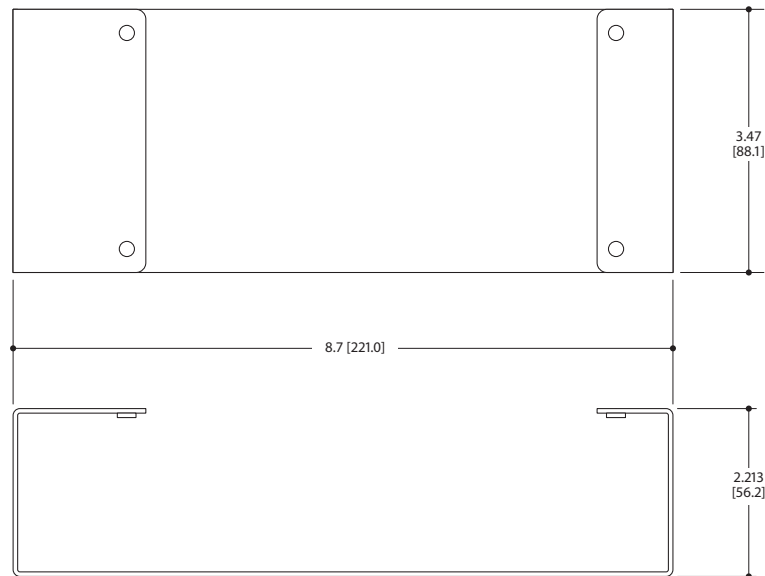


Fig. 7-4: NV9648 Rack Mounting Filler Plate

This drawing provides overall dimensions of the NV9648's rack mounting bracket:

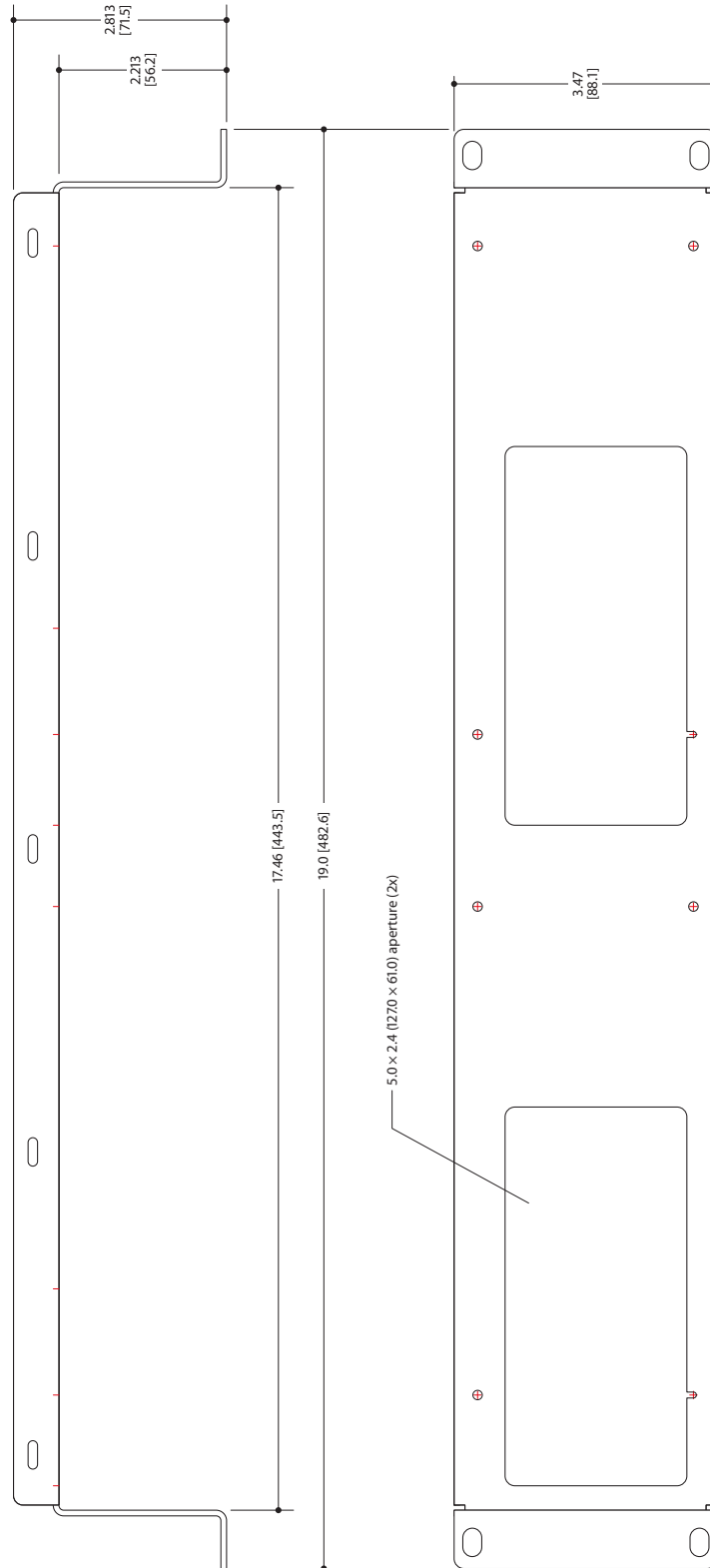
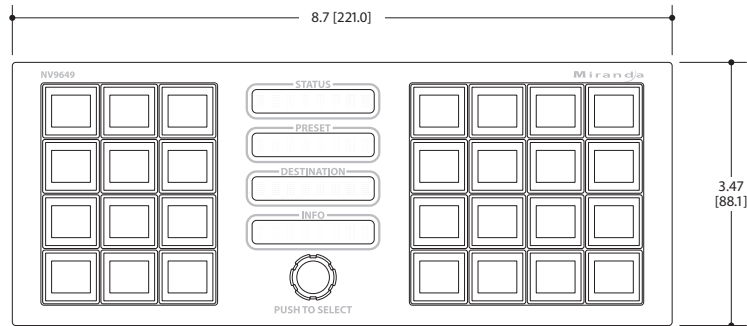


Fig. 7-5: NV9649-48-RMK Rack Mounting Bracket

For reference, this is a view of the NV9649:



*Fig. 7-6: Front View of the NV9649*



# 8

## Misc. Topics

Chapter 8 provides the following:

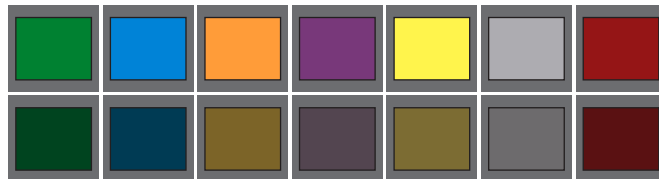
### Topics

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<i>Power Cord Retention</i> .....	87
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## LCD Buttons

The 16 LCD buttons have 3 lines of text, 8 characters each. The text can be blank. The buttons can be of 7 colors in 4 brightness levels: high, medium, low, and off. “Off” is not quite black—you can read black text on the “off” background.

The following is an approximate representation of the 14 button colors:



*Fig. 8-1: Button Colors*

The best way to view this illustration is on a computer monitor. A color printer cannot represent these colors nor can a black and white printer.

Each color is represented in Figure 8-1 as a (high-tally, low-tally) pair.

The colors of the up and down buttons are fixed. When they are off, they are white. When they are on, they are said to be “amber.” This amber is not the same as for the LCD buttons: it is pale and almost yellow.

The buttons are 24.5 mm × 23.5 mm with the LCD portion about 20 mm × 16.5 mm. The button legend appears in a 64×32 pixel matrix.

## Power Cord Retention

Use the supplied retention strap to keep the AC power cord firmly connected to the power supply. Follow these steps to use the strap:

- 1 Firmly insert the AC power cord into the power supply. Examine the last figure in this section to see how the strap should be applied.
- 2 Placed the Velcro retention strap, fuzzy side up, on top of the power supply with the buckle loop approximately 1 inch from the AC input side and the remaining strap around the cord end and down:



- 3 Holding the buckle in place, lift the strap up and around the cord end so the strap overlaps itself:



- 4 Holding the buckle loop in place, route the strap around the back of the supply diagonally across so that it sticks out on the left below the output cord:



- 5 Continue the strap around toward the buckle loop and through the loop. Cinch the strap tightly. While keeping tension, place the 2 inch strap end (with Velcro loops) down on the fuzzy part to complete the process:



- 6 Examine the strap though its path around the cord and power supply. Be sure that no slack exists and that it is tight the full length of the strap. If necessary, adjust and cinch it more tightly.

## Ordering Information

These are the NV9648 components:

PS0001	12V power supply, 4-pin Molex connector, with cord, and cord retention strap.
NV9648	NV9000 control panel. 27 button, 3 displays, 2RU half-rack unit
WC0053	Optional breakout cable for the tally interface



# G

## Glossary

<b>AES/EBU</b>	(Audio Engineering Society/European Broadcasting Union). AES and EBU are standards organizations.
<b>Breakaway</b>	A condition where a destination has multiple sources on different levels.
<b>Category</b>	A category represents a set of devices. (The concept of categories exists to make it easier to select devices at a control panel.) A category can contain sources, destinations, or devices that are both sources and destinations. Each device in the category has a unique selection index within that category. Each category has a mnemonic ID associated with it.
<b>Data Routing</b>	Data routing (a.k.a., machine control routing) is a bidirectional form of routing. Routes are characterized by a controlling device and controlled device(s). The NV9648 provides certain data routing options including a 'Broadcast' button.
<b>Device</b>	A "device" is a grouping of input and output ports that define a logical entity. (The logical entity often represents a real device, but it does not have to be a real entity.) For example, a system might have 3 levels: video, AES, and time code. A hypothetical device in this system is Camera 1, which consists of video on input port 1 of the video router, AES on input port 5 of the AES router, and time code on input port 8 of the time code router.
<b>GPIO</b>	General Purpose Input and Output. A generic term for the NV9648's tally interface. The tally interface is called the "GPI Interface" at the rear of the NV9648.
<b>Level set</b>	A level set is a group of virtual levels that are commonly used together when switching devices. A level set also defines the mapping of each virtual level within the level set to a single physical level. All levels in a level set have a unique display index within that level set.
<b>Multi-Destination (Mode)</b>	A mode on an NV9000 control panel that presents many destinations at once, in contrast to X-Y mode. An operator may route sources to multiple destinations in a single take. Multi-destination mode does not permit the selection of breakaway levels.
<b>Operator</b>	The term operator (a.k.a. user) usually refers to users other than the system administrator or configurator. An operator is responsible for making the routes.
<b>Physical Level</b>	Multiple routers provide different "physical levels" on which to switch the signals of devices. Any particular device might send or receive HD, SD, AES, time-code, or machine-code signals.
<b>PIN</b>	The system administrator may create a single "super user" personal identification number (PIN) that functions as a passcode. A PIN is 4–6 digits in length. The PIN allows certain operators to perform functions such as (1) forced release on a control panel that is configured for normal release or (2) changing the ID of a control panel.
<b>Port</b>	A port is the physical connection on a router. A port can only be an input port or an output port.
<b>Salvo</b>	A salvo is a stored group of commands that can be recalled and executed at a NV9000 control panel.
<b>Source/ Destination</b>	The term "source device" is used interchangeably with "source" and the term "destination device" is used interchangeably with "destination." A source is a device that is connected to one or more input ports. A destination is a device that is connected to one or more output ports. An example of such a device would be a monitor.

## Glossary

---

	A device can be both a source and destination. An example of such a device is a VTR.
<b>System administrator</b>	The system administrator is the person responsible for installing, configuring, and maintaining a router control system.
<b>Tally</b>	(1) High or low button illumination. (2) Tally interface <i>to be defined</i> .
<b>Virtual level</b>	Virtual levels allow the system administrator to define a single physical router level as multiple levels. Within a physical level, any port can be mapped to any virtual level. For example, an AES matrix could be divided into AES 1/2 and AES 3/4 <i>virtual</i> levels.
<b>X-Y (mode)</b>	A mode on a control NV9000 control panel that switches one destination at a time, in contrast to multi-destination mode. In X-Y mode, some panels can display the virtual levels for the selected destination. Operators using those panels can perform breakaway level selection and level mapping.

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