Application Note

NV8500 Monitor Configuration and Operation

Introduction

The NV8500 family of routers support the monitoring of output and input signals. Third-party control systems or software drivers can be used to monitor NV8500 family router capabilities. Controlling which inputs and outputs are switched to the different monitor outputs is accomplished by partitioning the router's inputs and outputs and then assigning the partition a unique level named 'Monitor'. "Level" is the term used to describe an organizational partition in the router. A monitor level solely manages monitor signals.This partition is then addressed using a standard "take" command as defined in the protocol being used.

Whether both outputs and inputs are monitored depends upon the control card currently installed in the router frame. Older control cards run an application that supports only output monitor signals. More recent control cards run an application that supports both output and input signal monitoring.

Control cards running the following application versions support the listed monitor signals:

- APP, Versions 13.0.3.xx and older — The control card supports output monitor signals only (matching FPGA versions: CPLD, SV0900-06, SV0901-05 and older).
- APP, Versions 14.0.0.xx and newer — The control card supports both input and output monitor signals (matching FPGA versions: CPLD, SV0900-07, SV0901-06 and newer).

To properly access and control monitor cards and signals, a monitor level must be configured using version 8.9.0.42 of UniConfig, or later.

UniConfig is a configuration application, run on a computer in the network, used to configure routers. This Application Note briefly outlines how to connect to the monitor cards and monitoring equipment, and how to create "monitor levels" in UniConfig. For more detailed information on the routers, see the *NV8500 Family Digital Router User's Guide*. For detailed information on UniConfig, see the *UniConfig User's Guide*.

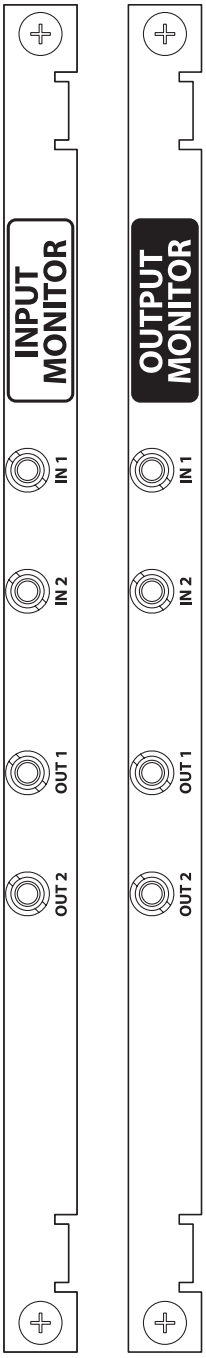
Overview

The NV8500 family is composed of several routers that are either standalone routers or routers that can be connected together to create larger switching matrices called "expandable" router frames. Expandable router frames are denoted by the word "Plus."

The following is a list of routers within the NV8500 family.

Router	Switching Matrix	Expandable	Expanded Switching Matrix	Configurations based on
NV8144	144 × 144	No	—	9 inputs and 18 outputs
NV8280	288 × 576	No	—	9 inputs and 18 outputs
NV8280-Plus	288 × 288	Yes	576 × 576	9 inputs and 9 outputs
NV8576	576 × 1152	No	—	9 inputs and 18 outputs
NV8576-Plus	576 × 576	Yes	1152 × 1152	9 inputs and 9 outputs

Depending on the router frame, up to 4 monitor cards can be installed. Each monitor card produces 2 signals that can be sent to monitoring equipment for the purpose of assessing signal presence and quality. The monitor card must have a corresponding monitor backplane installed. (See Figure 1.)



The backplane contains connectors through which signals are sent from the "mated" monitor card to monitoring equipment. The backplane connectors are labeled 'IN 1', 'IN 2', 'OUT 1' and 'OUT 2'. Two of the connectors connect cables to the monitoring equipment. The other two connectors are used for "chaining together" multiple monitor cards or multiple routers.

The connectors labeled 'IN' on the backplane:

- Cross-connect monitor cards to other monitor cards, such as when two expandable frames (NV8280-Plus or NV8576-Plus) are connected together, which enables the monitoring equipment access to all inputs or outputs, or
- Connect to an 'OUT' connector when cross-connecting multiple monitor cards in the same frame to each other. This only applies to NV8576 or NV8576-Plus.

The connectors labeled 'OUT' on the backplane:

- Connect to an 'IN' connector when cross-connecting monitor cards (as noted above), or
- Send signals for monitoring purposes to monitoring equipment.

There is a single type of monitor card; not different monitor cards for monitoring inputs or outputs. Whether the card monitors inputs, outputs, or both depends on the type of router frame, the slot into which it is installed on the frame, and the backplane associated with the card.

The NV8144 has one monitor card slot and uses one monitor card and a single output monitor backplane. The single monitor card receives one signal from each input card and each output card: 'OUT 1' is used to monitor all outputs and 'OUT 2' is used to monitor all inputs. This function is unique to the NV8144.

The NV8280/NV8280-Plus and NV8576/NV8576-Plus router frames have separate monitor card slots for monitoring inputs and outputs. The NV8280/NV8280-Plus router frame uses two cards: one for inputs; one for outputs. The NV8576/NV8576-Plus router frame uses four cards: two for inputs; two for outputs. The card slot determines the signals monitored: a monitor card in the input monitor card slot monitors inputs; a monitor card in the output monitor card slot monitors outputs.

In the NV8280/NV8280-Plus, the input monitor card receives one signal from each input card. Similarly, an output monitor card receives one signal from each output card. The NV8576/NV8576-Plus monitor cards work exactly the same way except that the monitor cards in the upper portion of the router frame receive signals only from the output cards and input cards located in the upper region. Likewise, the monitor cards in the lower region of the frame receive signals only from the input and output cards installed in the lower region of the frame.

Figure 1. Backplanes

To maximize efficiency, only one signal is sent from each input or output card to the monitor card for forwarding to monitoring equipment. This means that only one signal from each input card or output card is monitored at any give time.

Whether input and/or output monitor signals can be accessed and managed depends on the application version currently loaded on the router's control cards and if a monitor level has been created using UniConfig. (See UniConfig Settings on page 7.)

Making Monitor Connections

Each monitor backplane has 4 DIN 1.0/2.3 connectors. Using an 1855A Belden cable, or an equivalent (provided with the product), monitor backplanes can be connected to monitoring equipment. Follow the instructions for your router frame and whether the router is being used in stand-alone or expanded mode. For instructions on installing the monitor card(s) that mate with the backplane(s) in the router frame, see the *NV8500 Digital Router User's Guide*.

Note Unused 'In' connectors on the router are not to be terminated.

How to Make Output Monitor Connections

1 Locate the monitor backplanes. Figure 2 shows the NV8576/NV8576-Plus router:

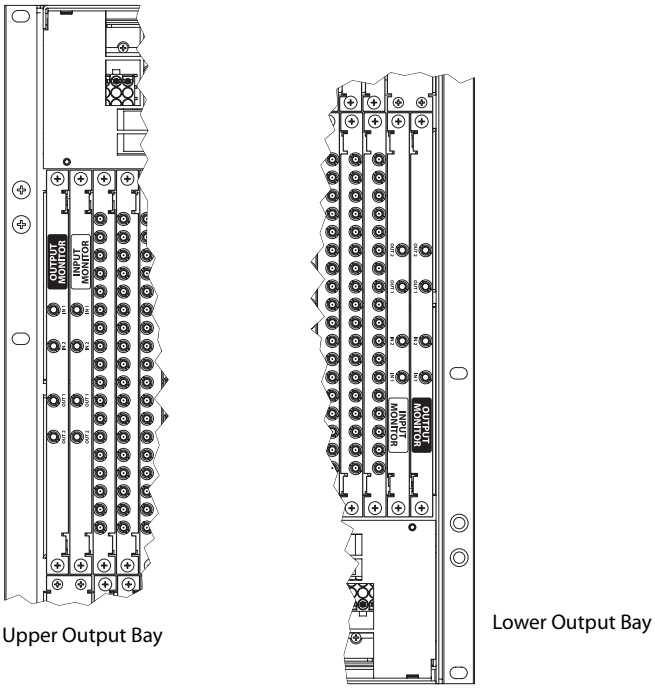


Figure 2. NV8576 Monitor Connections (Rear View)

Depending on the router frame, facing the rear of the router, the monitor backplanes are located as follows:

- NV8144 — a single monitor backplane is located directly to the right of the output backplanes.
- NV8280/NV8280-Plus — there are two monitor backplanes located in the upper left-hand corner next to the output backplanes.
- NV8576/NV8576-Plus — there are four monitor backplanes: two are located in the upper left-hand corner and two in the lower right-hand corner next to the output cards, as shown in Figure 2.

2 Using a DIN 1.0/2.3 connector and 1855A Belden cable, or an equivalent (provided with product package) for each connector, make connections as follows:

- NV8144 — connect 'OUT 1' and 'OUT 2' on the monitor backplane to your monitoring equipment.
- NV8280/NV8280-Plus — connect 'OUT 1' and 'OUT 2' on the output monitor backplane to your monitoring equipment.

- For NV8576/NV8576-Plus:

a Connect ‘OUT 1’ of the output monitor backplane in the lower bay, to ‘IN 1’ of the output monitor backplane in the upper bay, as shown in Figure 3

b Similarly connect ‘OUT 2’ of the output monitor backplane in the lower bay, to ‘IN 2’ of the output monitor backplane in the upper bay, as shown in Figure 3.

c Connect ‘OUT 1’ and ‘OUT 2’ of the output monitor backplane in the upper bay to your monitoring equipment, as shown in Figure 3:

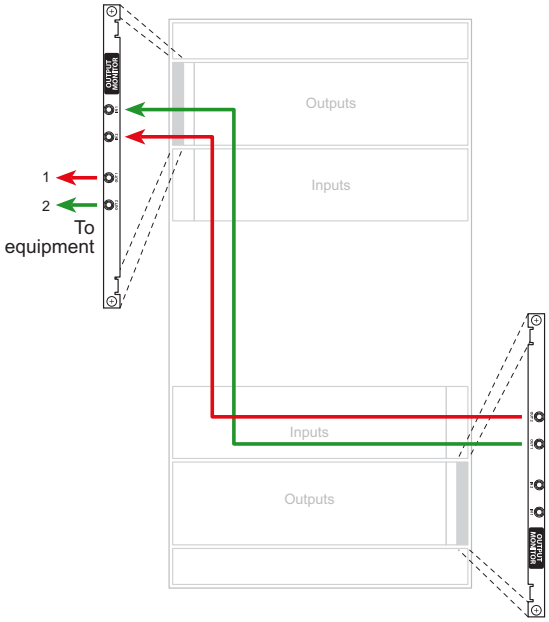


Figure 3. Monitor Connections for NV8576 (Rear View)

How to Make Input Monitor Connections

Because NV8144 only uses one monitor card and one monitor backplane, this procedure does not apply to that router. This procedure applies only to the NV8280/NV8280-Plus and NV8576/NV8576-Plus routers.

1 Locate the input monitor backplanes as shown in Figure 2.

2 Using a DIN 1.0/2.3 connector and 1855A Belden cable, or an equivalent (provided with product package) for each connector, make connections as follows:

- NV8280/NV8280-Plus—connect ‘OUT 1’ and ‘OUT 2’ on the input monitor backplane to your monitoring equipment.
- For NV8576/NV8576-Plus:

a Connect ‘OUT 1’ of the input monitor backplane in the lower bay, to ‘IN 1’ of the input monitor backplane in the upper bay, as shown in Figure 4

b Similarly connect ‘OUT 2’ of the input monitor backplane in the lower bay, to ‘IN 2’ of the input monitor backplane in the upper bay, as shown in Figure 4.

c Connect ‘OUT 1’ and ‘OUT 2’ of the input monitor backplane in the upper bay to your monitoring equipment, as shown in Figure 4.

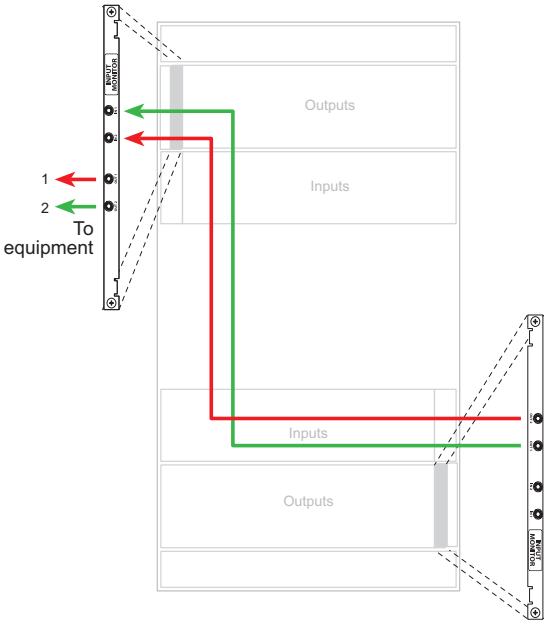


Figure 4. Monitor Connections for NV8576 (Rear View)

Expansion Frame Monitor Connections

If you have connected two expandable router frames (NV8280-Plus or NV8576-Plus), only one router is connected directly to the monitoring equipment. This is called the *primary* router. Monitor expansion connections are then made between the primary router and the other, or *secondary*, router. This enables the monitoring equipment to sample all signals on both routers through the monitor connections on the primary router.

Note Unused ‘IN’ connectors are not to be terminated.

How to Make Expansion Monitor Connections for NV8280-Plus

1 Connect ‘OUT 1’ of the output monitor backplane in the *secondary* frame to ‘IN 1’ of the output monitor backplane of the *primary* frame, as shown in Figure 5.

2 Connect ‘OUT 2’ of the output monitor backplane in the *secondary* frame to ‘IN 2’ of the output monitor backplane of the *primary* frame, as shown in Figure 5.

3 Connect ‘OUT 1’ and ‘OUT 2’ of the output monitor backplane of the *primary* frame to your monitoring equipment, as shown in Figure 5.

Figure 5. NV8576-Plus Connections (Rear View)

4 Repeat steps 1 through 3 for the input monitor backplanes.

How to Make Expansion Monitor Connections for NV8576-Plus

1 For each router frame, connect ‘OUT 1’ of the lower output monitor backplane to ‘IN 1’ of the upper output monitor backplane and ‘OUT 2’ of the lower output monitor backplane to ‘IN 2’ of the upper output monitor backplane, as shown in Figure 6.

2 Connect ‘OUT 1’ of the upper output monitor backplane in the *secondary* frame to ‘IN 1’ of the lower output monitor backplane of the *primary* frame, as shown in Figure 6.

3 Connect ‘OUT 2’ of the upper output monitor backplane in the *secondary* frame to ‘IN 2’ of the lower output monitor backplane of the *primary* frame, as shown in Figure 6.

4 Connect ‘OUT 1’ and ‘OUT 2’ of the upper output monitor backplane of the *primary* frame to your monitoring equipment, as shown in Figure 6.

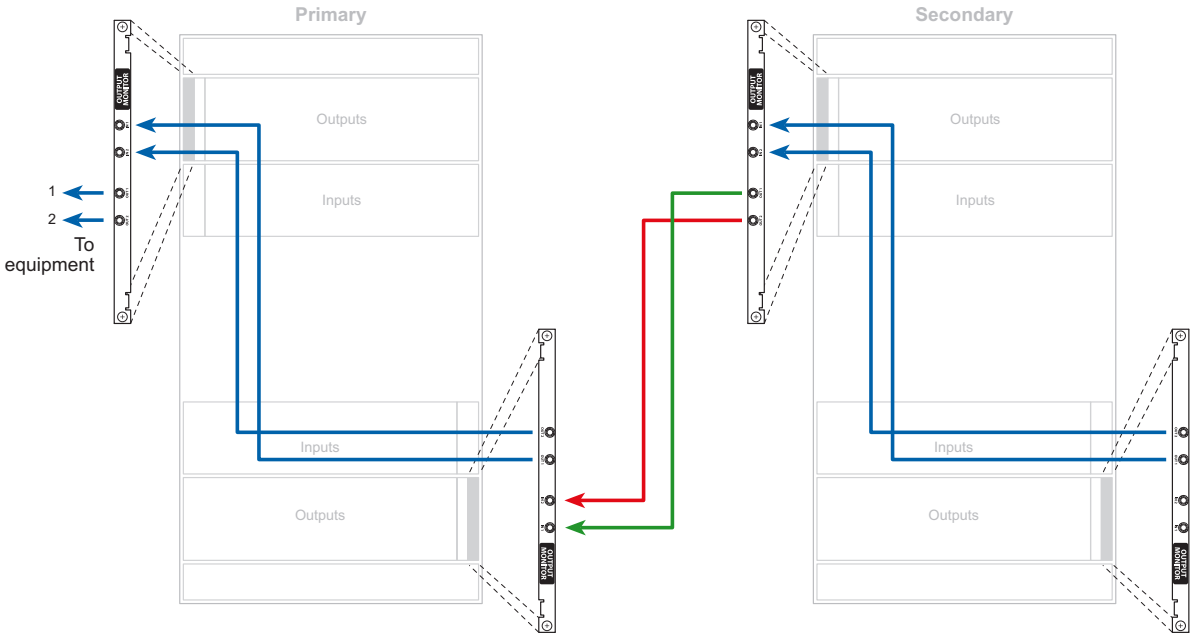


Figure 6. NV8576-Plus Connections (Rear View)

5 Repeat steps 1 through 4 for the input monitor backplanes.

UniConfig Settings

To access and control monitor signals, a monitor level needs to be created using the Uniconfig configuration tool. Every router has at least one control card. The version of the control application currently loaded on the control card determines what monitor signals are accessed and how to configure a monitor level in UniConfig. The level must be created separately for each control card in the router.

Each output monitor backplane has two outputs. These outputs in the NV8280/NV8280-Plus and the NV8576/NV8576-Plus can function independently, but only when routed to separate output cards (each card has 18 outputs), otherwise the monitor take is executed on both monitor outputs. For example, when the monitor level is selected, performing a take of 2 to 1 followed by take 5 to 2 results in both monitors routed to output 5. In contrast, take 3 to 1 followed by 19 to 2 result in monitors connected to different outputs (3 and 19 correspondingly).

Similarly, each input monitor backplane has two outputs. Specific to application version 14.0.0.xx, in the NV8280/NV8280-Plus and the NV8576/NV8576-Plus these outputs only function independently when they are routed to separate input cards. Each card has 9 inputs, so performing a take of 2 to 3 followed by take 5 to 4 results in both input monitors routed to output 5. However, take 3 to 3 followed by take 10 to 4 result in monitors connected to different outputs (3 and 10 correspondingly).

The NV8144 has two monitor outputs, one for monitoring router outputs and one for monitoring router inputs. These two outputs are independent because they have connections to different sets of cards: input and output respectively.

Mapping to the Monitor Level

In UniConfig, when creating the monitor level you enter the total number of monitor signals. Only ‘OUT’ connectors on the monitor backplanes are used to send signals to monitoring equipment. Therefore, only these connectors are managed in UniConfig and configured as ‘Physical Outputs’ and ‘Controller Outputs’. How each ‘OUT’ connector maps to a monitor level output changes depending on the router and number of connectors.

The NV8144 uses only one monitor card. This means that the ‘OUT 1’ is used to monitor all outputs and ‘OUT 2’ is used to monitor all inputs. ‘IN 1’ and ‘IN 2’ are unused because the NV8144 is a standalone router. However, when configuring the monitor level in UniConfig, four connections are configured. This is due to the design of the monitor card, which maps ‘OUT 1’ to output 1 and maps ‘OUT 2’ to output 3.

NV8280/NV8280-Plus and NV8576/NV8576-Plus each have a minimum of two monitor cards: one for inputs and one for outputs. Therefore, the ‘OUT’ connectors map directly to the same level in UniConfig.

The following lists how for each router, the associated monitor backplane connectors, map to Uniconfig monitors on the ‘Monitor’ page, and to the ports on monitor level. (See tables 1-1 and 1-2.)

Router Monitor	Backplane Connector	UniConfig Monitors	Controller Outputs
NV8144 (*Output Monitor*)	OUT 1	Monitor 3	3
NV8144 (*Input Monitor*)	OUT 2	Monitor 1	1
NV8280/NV8280-Plus NV8576/NV8576-Plus (*Output Monitor*)	OUT 1	Monitor 1	1
	OUT 2	Monitor 2	2
NV8280/NV8280-Plus NV8576/NV8576-Plus (*Input Monitor*)	OUT 1	Monitor 3	3
	OUT 2	Monitor 4	4

Version 13.0.3.xx

Control cards running control application versions APP, 13.0.3.xx and older support output monitors only (matching FPGA versions: CPLD, SV0900-06, SV0901-05 and older).

Version 14.0.0.xx

Control cards running control application versions APP, 14.0.0.xx and newer support input and output monitors (matching FPGA versions: CPLD, SV0900-07, SV0901-06 and newer).

How to Set Up a Monitor Level

1 Launch UniConfig and establish communication:

   a Click on the short-cut on your desktop or from the operating system ‘Start’ menu, select ‘Programs > UniConfig’. Refer to your operating system’s Help system for details.

   b Establish communication using an Ethernet or serial connection:

   For an Ethernet connection, connect the PC running UniConfig to the RJ45 Ethernet port of the router and from the menu bar, select ‘Communications > Ethernet’.

   Or

   For a serial connection, connect the PC running UniConfig to one of the router diagnostic serial ports and from the menu bar, select ‘Communications > Serial’.

2 Select a control card:

   If using an Ethernet connection, from the menu bar, select ‘Communications > Ethernet’. The ‘Control Card’ pane appears. On the ‘Control Cards’ pane, click on the name of a control card to select it.

   Or

   If using a serial connection:

   a From the menu bar, select ‘Communications > Serial’.

   b Again, from the menu bar, select ‘Communications > Setup’. The ‘Serial Communications Setup’ pane appears.

   c From the ‘Comm port’ drop-down list, select the port associated with the control card you want to select.

   d From the ‘Baud rate’ drop-down list, select 38400.

   e Click ‘OK’.

3 From the menu bar, select ‘Windows > Configuration’. The ‘Configuration’ window appears, as shown in Figure 7.

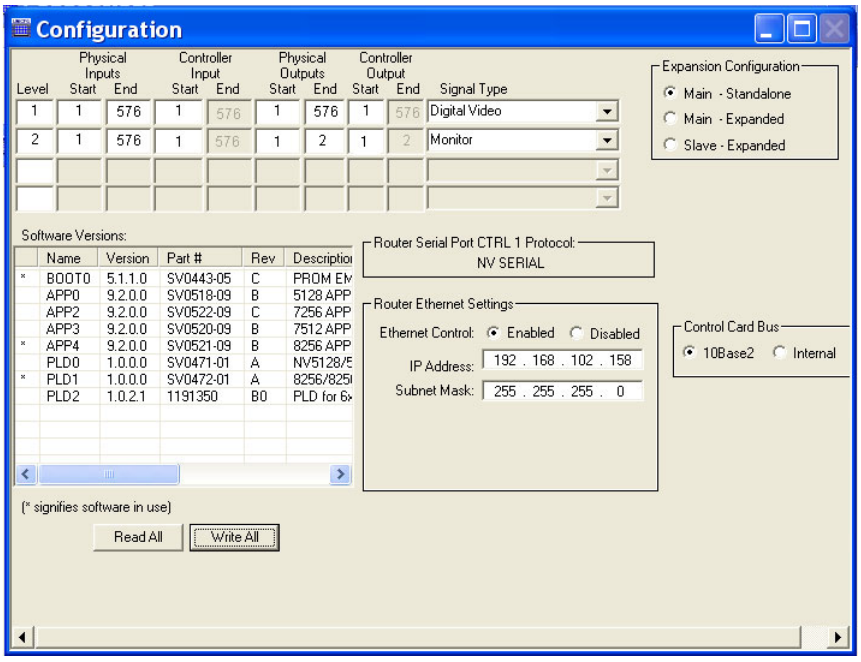


Figure 7. Example of a Configuration Window for NV8576-Plus

4 Click ‘Read All’. The ‘Configuration’ window populates with the current router configuration and Ethernet settings. If no prior configuration is stored, many of the fields are blank

5 In the ‘Level’ column enter a unique number between 1 and 240. This value identifies a particular partition in the router and should match what has been configured in the controller being used. This number must be unique to enable the controller to differentiate sets of crosspoints.

6 Enter values for inputs and outputs for the level in the following fields. :

Table 1-1. For version 13.0.3.xx, enter the following values

	Physical Inputs		Controller Inputs		Physical Outputs		Controller Outputs	
Router	Start	End	Start	End	Start	End	Start	End
NV8144	1	144	1	144	1	2	1	2
NV8280/ NV8280-Plus	1	576	1	576	1	2	1	2
NV8576/ NV8576-Plus	1	1152	1	1152	1	2	1	2

Table 1-2. For version 14.0.0.xx, enter the following values

	Physical Inputs		Controller Inputs		Physical Outputs		Controller Outputs	
Router	Start	End	Start	End	Start	End	Start	End
NV8144	1	144	1	144	1	4	1	4
NV8280/ NV8280-Plus	1	576	1	576	1	4	1	4
NV8576/ NV8576-Plus	1	1152	1	1152	1	4	1	4

7 From the ‘Signal Type’ drop-down list, select the signal type ‘Monitor’.

8 Click ‘Write All’ to writes changes to the control card.

9 Repeat Steps 2 through 8 for each control card being updated.

Using Partitioning Addressing

Third-party control systems or software drivers may be used to control the monitoring of router inputs and outputs. This section assumes that the control card in the router is running application version 14.0.0.xx and newer (matching FPGA versions: CPLD, SV0900-07, SV0901-06 and newer), which supports the monitoring of both input and output signals.

Controlling which inputs and outputs are switched to the different monitor outputs is accomplished using the same switching methods for controlling crosspoints. To do this, the following steps must occur:

1. The router's inputs and outputs are partitioned and assigned a unique level. A level is simply a way of defining an organizational partition within a router.
2. The level is assigned the unique signal type value 'Monitor'.
3. Save the new partition configuration to the router.
4. Issue a standard 'take' command from the control system to the router's monitor partition, as defined in the protocol being used. In most cases this will be the NVISON Ethernet or Serial protocol. (See the *UniConfig User's Guide* for more information on partitioning and signal types.)

Each router in the NV8500 Family—NV8144, NV8280/NV8280-Plus and NV8576/NV8576-Plus—has subtle differences when setting up and controlling monitors. Developers writing control software, or system engineers using one of the router's supported third-party protocols, must be aware of the differences when performing monitor 'takes'. In addition, to maximize efficiency, only one signal is sent from each input or output card to the monitor card for forwarding to monitoring equipment. This means that only one signal from each input card or output card is monitored at any given time. Programmers should be aware of these limitations when writing control software. For more information, see Overview on page 1.

The format of a 'take' command may vary depending on the protocol used, but the command always sends the router the level value of the partition, the output value, and the input value. The 'take' commands causes the input value to be switched to the output value, and because it is in the monitor partition (i.e., the level with the signal type 'Monitor' assigned), the router knows to send the input or output to the monitor card in the router.

For specific 'take' command formats, refer to the following Miranda protocol documents:

NP0016—NVISION Ethernet Protocol Router Control Messages

NP0010—NVISION Serial Protocol Router Control Messages

Figure 8 shows how partition values as displayed in UniConfig. These values are valid for any NV8500 Family router. In this example, 'Physical Inputs' and 'Physical Outputs' map one-to-one to the 'Controller Inputs' and 'Controller Outputs'. Level 1 controls switching of the router's inputs or outputs through the monitor card. Level 2 controls standard crosspoint switching.

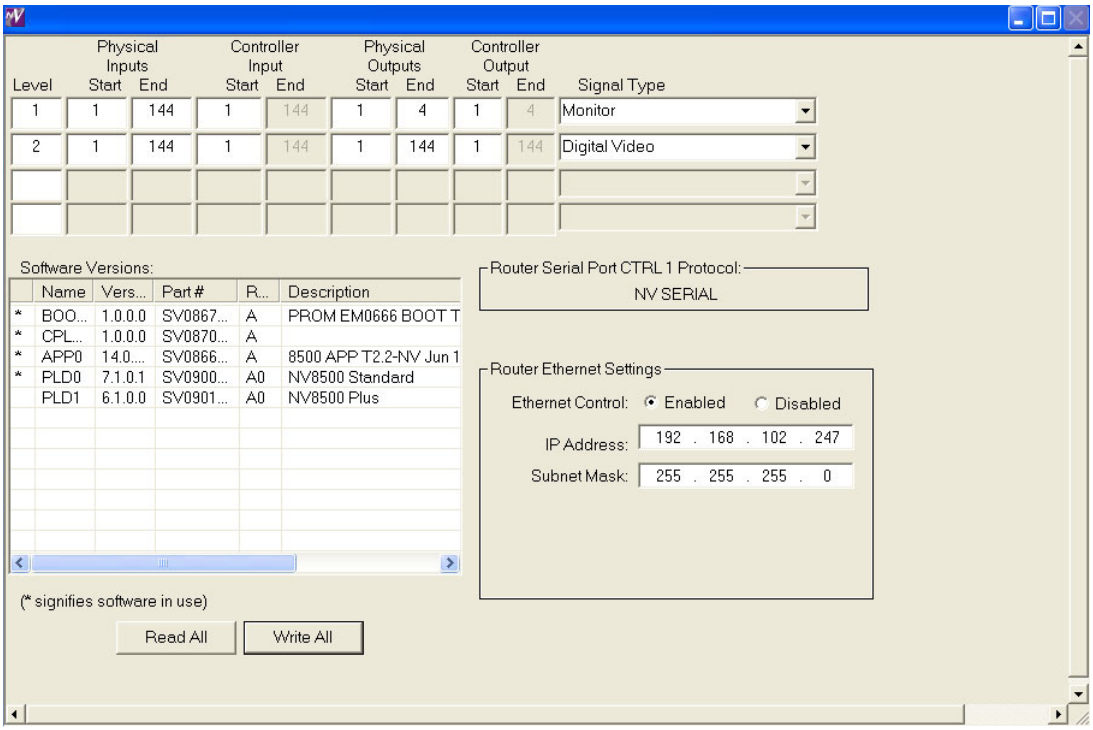


Figure 8. Example of UniConfig with Partition Values

For a monitor level, ‘Controller Inputs’ and ‘Controller Outputs’ map to the following:

- ‘Controller Inputs’ can be any of the router’s inputs or outputs to be monitored.
- ‘Controller Outputs’ map directly to the monitor card ‘OUT’ connectors as shown in Table 1-3

Table 1-3. Monitor Card Output Connectors

Router Monitor	Controller Inputs	Controller Output to Monitor Card Connector Map	
		Controller Outputs	Backplane Connector
NV8144 (*Output Monitor*)	Outputs	3	OUT 1
NV8144 (*Input Monitor*)	Inputs	1	OUT 2
NV8280/NV8280-Plus NV8576/NV8576-Plus (*Output Monitor*)	Outputs	1	OUT 1
	Outputs	2	OUT 2
NV8280/NV8280-Plus NV8576/NV8576-Plus (*Input Monitor*)	Inputs	3	OUT 1
	Inputs	4	OUT 2

How to Monitor NV8144 Switching

Note The NV8144 differs from the NV8280 and NV8576 because it uses only one monitor card. See Overview on page 1.

- To monitor one of the router's inputs, switch any of the 'Controller Inputs' to the 'Controller Output 1'.

  The router knows that a router's input is to be monitored because the input is being switched to 'Controller Output 1', which is associated with the router's monitor card 'OUT 1' connector.

  Example: Using the example partition in Figure 8, a 'take' command is sent to the router using level 1, source 5 and destination 1. This switches the router's physical output 5 to the router's monitor card 'OUT 2' connector.

- To monitor one of the router's outputs, switch any of the 'Controller Inputs' to the 'Controller Output 3'.

  The router knows that a router's output is to be monitored because the output is being switched to 'Controller Output 3', which is associated with the router's monitor card 'OUT 2' connector.

  Example: Using the example partition table in Figure 8, a 'take' command is sent to the router using level 1, source 5 and destination 3. This switches the router's physical output 5 to the router's monitor card 'OUT 1' connector.

How to Monitor NV8280 or NV8576 Switching

Unlike the NV8144, the NV8280 and NV8576 router frames have separate monitor cards for inputs and outputs. For details, see Overview on page 1.

- To monitor one of the router's inputs, switch any of the controller inputs to 'Controller Output 3' or 'Controller Output 4'.

  The router knows that a router's input is to be monitored because the input is being switched to 'Controller Output 3' or 'Controller Output 4' which is associated with the router's input monitor card 'OUT 1' or 'OUT 2' connector, respectively.

  Example: Using the example partition table in Figure 8, a 'take' command is sent to the router using level 1, source 5 and destination 3. This switches the router's physical input 5 to the router's input monitor card 'OUT 1' connector.

- To monitor one of the router's outputs, switch any of the controller inputs to the 'Controller Output 1' or 'Controller Output 2'.

  The router knows that a router's output is to be monitored because the output is being switched to 'Controller Output 1' or 'Controller Output 2', which is associated with the router's output monitor card 'OUT 1' or 'OUT 2' connector, respectively.

  Example: Using the example partition table in Figure 8, a 'take' command is sent to the router using level 1, source 5 and destination 1. This switches the router's physical output 5 to the router's output monitor card 'OUT 1' connector.