

GXSW

Switching Instruments

GX7016

GENASYS Switching Subsystem

User's Guide

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Chapter 1 - Introduction

Manual Scope and Organization

Manual Scope

This manual provides all the information necessary for installation, operation, and maintenance of the **GX7016** chassis, and the switching boards: **GX6256**, **GX6192**, **GX6864**, **GX6009**, and **GX6032**. These components are part of the GX7016 digital subsystem that is part of the TS-323/GENASYS test system. The manual also covers the **GXSW** software package that includes the GX6256, GX6864 and GX6192 driver. In addition to the GXSW software components, this manual also described the **SwitchEasy** software that is based on the GXSW driver and provides a rule-based, pin mapping and higher level access to the switching subsystem. SwitchEasy software is described later in this manual. This manual assumes the reader has a general knowledge of PC based computers, Windows operating systems, and a general knowledge of modular test equipment.

Manual Organization

This manual is organized in the following manner:

Chapter	Content
Chapter 1 – Introduction	Introduces the GX7016 switching subsystem manual and shows warning conventions used in the manual.
Chapter 2 – Overview	Provides the GX7016 switching subsystem list of features, description of the board, architecture, specifications and the virtual panel description and operation.
Chapter 3 –Installation and Connections	Provides instructions about how to install the switching modules and the GXSW software.
Chapter 4 –SwitchEasy Software	Provides an overview of the SwitchEasy software driver and panel
Chapter 5 – Functions Reference	Provides a list of the GXSW driver functions for the GX6256, GX6192, GX6864, GX6009, and GX6032. Each function description provides syntax, parameters, and any special programming comments.

Conventions Used in this Manual

Symbol Convention	Meaning
	Static Sensitive Electronic Devices. Handle Carefully.
	Warnings that may pose a personal danger to your health. For example, shock hazard.
	Cautions where computer components may be damaged if not handled carefully.
	Tips that aid you in your work.

Formatting Convention	Meaning
Monospaced Text	Examples of field syntax and programming samples.
Bold type	Words or characters you type as the manual instructs. For example: function or panel names.
Italic type	Specialized terms. Titles of other references and information sources. Placeholders for items you must supply, such as function parameters

Chapter 2 - Overview

Introduction

The Marvin Test Solutions GX7016 GENASYS switching subsystem provides the following features:

- 6U PXI chassis with integrated MAC Panel SCOUT receiver
- 20 slot 6U PXI chassis supports GENASYS switching subsystem modules
- Supports over 4000 multiplexed, hybrid pin connections
- Supports up to 288 digital channels when integrated with a digital subsystem

Description

A component of the GENASYS platform, the GX7016 switching subsystem offers a new level of high performance, high density switching for board and system level functional test. Based on the 6U PXI architecture, the GX7016 incorporates a modular switch matrix and multiplexer architecture which supports up to 4608 multiplexed, hybrid I/O pins. Up to 128 external resources can be connected to any of the test system's receiver I/O pins via a high performance, internal 16 wire matrix bus. For digital test capability, the GX7016's switching subsystem can be connected to a digital subsystem such as Marvin Test Solutions' GX5960 digital subsystem, providing hybrid pin capability for each multiplexed I/O pin. Up to 288 digital channels are supported by the switching subsystem.

GX7016 chassis incorporates the MAC Panel 6U SCOUT receiver. The SCOUT receiver offers a reliable and high performance method to connect the switch modules to a mass interconnect receiver, minimizing the need for cable assemblies. The SCOUT receiver is a "pull-through" design, with each switch card providing a "cable-less" connection to the receiver connectors, – eliminating the need for cable harnesses and the associated reliability issues that come with cabled solutions. The result is a system interconnect design that is cost effective, reliable, and maintainable. The modular design of the SCOUT also allows for the use of a broad range of receiver connectors including high density, high current, and coaxial types. The 6U SCOUT receiver can accommodate up to 21 connector slots and over 8000 connections when fully populated.

Features

The GX7016 is a 20-slot 6U PXI chassis that can accommodate up to 19 switching or instrument cards as well as a remote PXI bus interface such as the MXI-4. In addition to supporting all of the PXI-1 resources, the GX7016's PXI backplane provides an internal, high performance, 16 wire, and analog bus via the backplane's P5 connectors. Each of the GENASYS switching cards connects to this internal 16 wire bus, providing the ability to route signals from an external instrument to any of the receiver's interface connections.

System power for the GX7016 is provided by a 755-watt power supply. Forced-air cooling for the chassis is provided by a four (4) 79 CFM fans mounted under the card cage—providing positive airflow per the PXI specification. This configuration provides the optimum cooling for the chassis regardless of the type or number of instruments or switch cards used. Additional cooling is provided for the system power supply. This cooling configuration, in conjunction with air plenums within the chassis, provides airflow for all module slots per the PXI specification and requires no additional rack space for inlet or outlet air.

The GX7016 chassis supports the monitoring of slot temperatures and system power supply voltages as well providing the ability to program or map each PXI trigger line from one PCI segment to another. In addition, the user can program the temperature monitoring function for specific warning and shutdown limits. All user specific setups can be stored in non-volatile memory as a user configuration and can be used as the default setup for normal chassis operation.

Configuration

The GX7016's Slot 1 is dedicated for the remote system controller. A PXI Star Trigger controller, any PXI or cPCI instrument or a GENASYS switching module can be used in slot 2. Slots 3-15 support the PXI Star Trigger, any PXI or cPCI instrument or a GENASYS switching module. Slots 16-20 accommodate a PXI or cPCI instruments without the Star Trigger or a GENASYS switching module.

Switching Subsystem Components

The modular architecture of the GX7016 allows the switching subsystem to support a wide range of configurations and capabilities. Input analog signal routing is supported by the GX6032, a matrix switch module which is located on the rear of the chassis. This module is configured as 32 x 16 matrix and supports up to 32 inputs which can be connected to the GX7016's internal 16 wire bus. Up to (4) of these modules can be supported by the system. The base system is supplied with (1) GX6032.

Signal routing from the internal backplane to the receiver interface is supported by the GX6256 MultiMatrix™ switch card which is an extended 6U PXI module with direct connection to the receiver interface. The module combines a 16x16 matrix with (16) 2:16 multiplexers. The result is a switch card that can support up to 256 multiplexed signals from the 16-wire bus. Additionally, a secondary bus is included, providing the ability to route (2) resources to each group of 16 I/O pins within a mux group. The GX6256 also supports the ability to select an analog or digital resource (GX5960 digital subsystem) for each of the 16 inputs/ outputs.

For higher performance, analog switching applications, the GX7016 can be configured with the GX6192 HF MultiMatrix™ switch cards which combines a 16x16 matrix with (16) 1x12 multiplexers, providing a total of 192 high performance I/O pins at the receiver interface. HF resources are connected directly to the GX6192 via an external connector. In addition, signals can be routed to / from the HF switch card to other switch cards in the system via the system's internal 16 wire bus.

The GX7016 switching subsystem includes the following components:

- GX7016 – 6U PXI chassis with a special backplane used for plugging in the SR, RTM in addition to the PXI boards LF and HF
- GX6009 - Switching Routers modules (SR)
- GX6032 - Rear Transition modules (RTM)
- GX6192 - High Frequency multiplexer PXI boards (HF)
- GX6256 - Low Frequency multiplexer PXI boards (LF)
- GX6864 – Video multiplexer PXI boards (VF)
- In addition to the GX6256 and GX6192 switching function, they are also used control an RTM and an SR that are mounted to backplane since these cards do not sit on the PXI bus.

GX7016 – PXI Chassis

The GX7016 switching sub system includes a PXI chassis with a special backplane that includes Switching Routers (SR GX6009), Rear Transition Modules (RTM GX6032), GX6192 (HF) and GX6256s (LF). The GX6256 and GX6192 can control an RTM and an SR that are mounted to backplane.



Figure 2-1: GX7016 Genasys Switching Chassis

GX6256 - Low Frequency Multiplexer PXI (LF)

The GX6256 Low Frequency multiplexer 6U PXI card has sixteen 2x16 switching groups connected to 256 channels tied to selectors. Each channel has a primary path and a secondary path. The primary path is designed for optimum performance while the secondary path is intended to be used for DC signal.

The board consists of a multiplexer, matrix and selectors. The GX6256 connects to 16 analog signals through the backplane and to 16 digital signals through a connector in the bottom. Input selectors select the analog or digital input for each multiplex group. Each group routes this signal to one of sixteen channels that are connected to the front connectors.

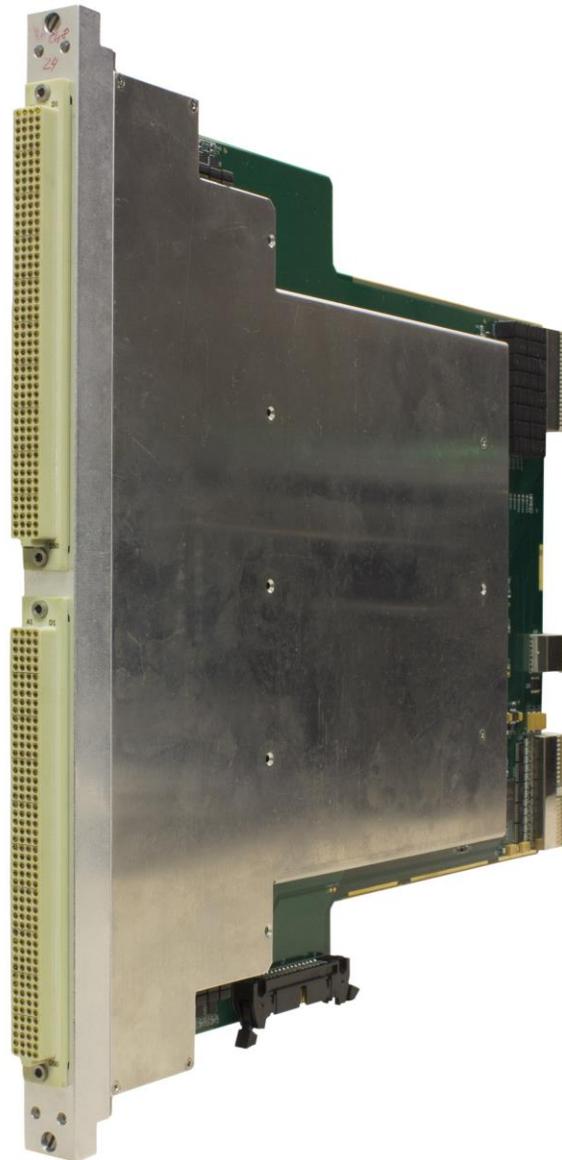


Figure 2-2: GX6256 Low Frequency Mux and Matrix board

GX6192 - High Frequency Multiplexer PXI Board (HF)

The GX6192 is a High Frequency 6U PXI card derivative of the GX6256 with several changes in architecture. The GX6192 provides the user with the ability to connect and interface 16 resources to 192 UUT connections. The board consists of sixteen 1x12 multiplexer groups, eight 4x8 matrices, sixteen 2:2 selectors, and sixteen 1:4 input selectors. The GX6192 connects to 16 analog signals bus through a connector in the back. Each multiplexer group routes its signals to one of sixteen channels that are connected to the front connectors.

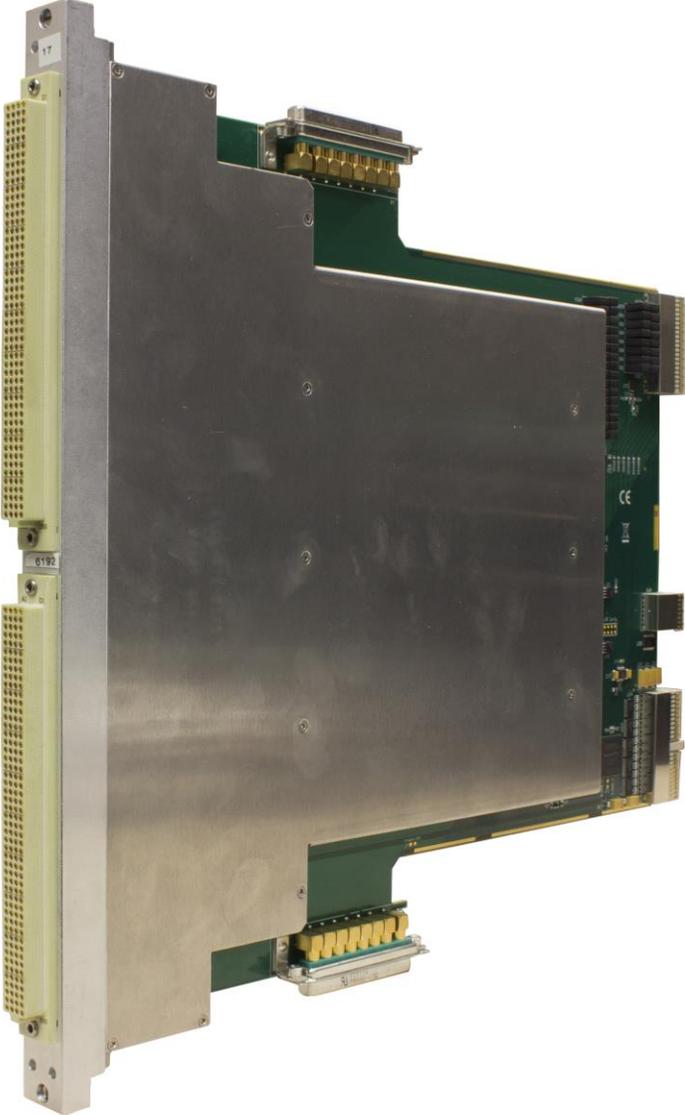


Figure 2-3: GX6192 High Frequency Mux and Matrix board

GX6864 - Video Multiplexer PXI Board (VF)

The GX6864 is a multiplexer designed to switch high bandwidth, 75-ohm impedance video signals. The GX6864 provides the user with the ability to connect and interface 8 resources to 64 UUT connections. The board consists of four 2x16 multiplexer groups, four 4x8 matrices, four 4:2 input selectors, and sixteen BIT and backplane (BP) connections. The GX6864 connects to 16 analog signals bussed through a connector in the back. Each mux group routes its signals to one of sixteen channels that are connected to the front connectors.



Figure 2-4: GX6864 Video Multiplexer board

GX6032 - Rear Transition Module (RTM)

The GX6032 Rear Transition Module (RTM) connects to the back side of the GX7016 backplane. The RTM is designed to connect up to 32 external instrument inputs to the backplane's 16 global bus lines via a 32x16 matrix. The RTM is controlled by an accompanying GX6256 or GX6192 board which is connected to the PXI slot adjacent to the RTM.



Figure 2-5: GX6032 Rear Transition Module (RTM)

GX6009 – Switching Router Module (SR)

The GX6009 Switching Router module (SR) connects up to 9 switching cards (GX6256 or GX6192) together across the backplane via the global us lines. The GX7016 switching subsystem contains two GX6009 switching routers which can be connected together in order to connect the global bus across up to 18 slots.

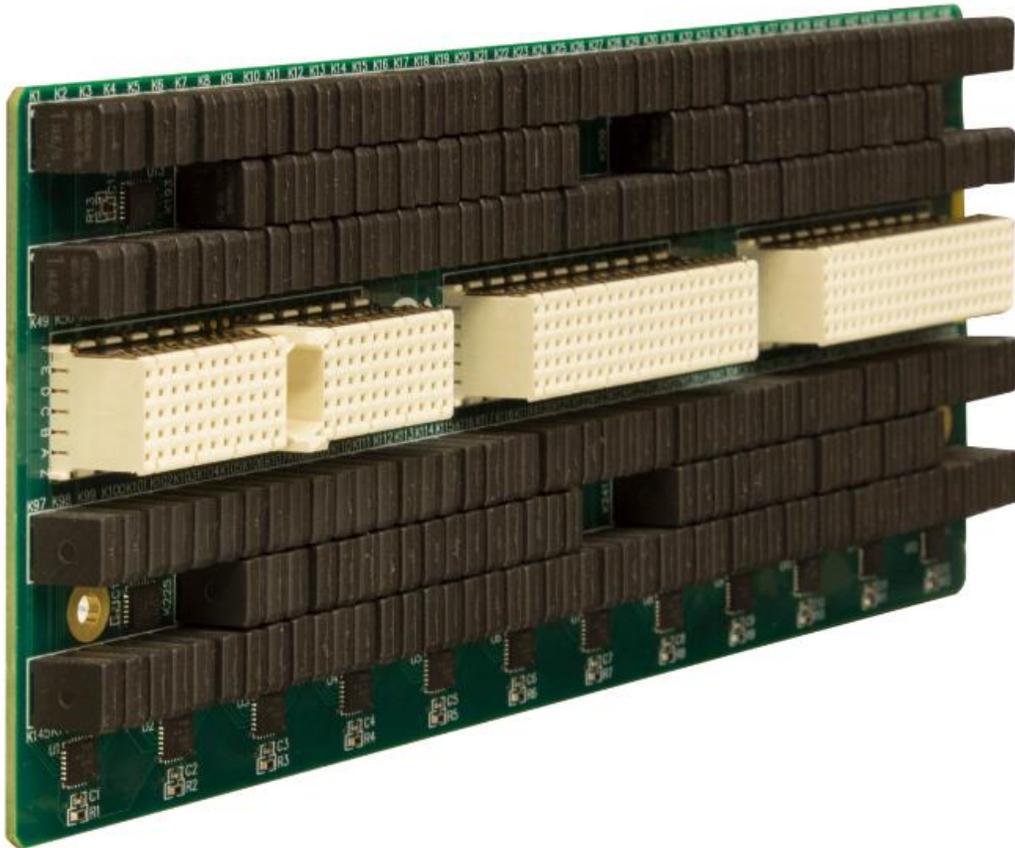


Figure 2-6: GX6009 Switch Router (SR)

GX6256 (LF)

The GX6256 comprises of sixteen 1:4 input selectors, eight 4x8 matrices, sixteen 3:2 selectors, and sixteen 2x16 multiplexer groups connected to 256 channels. The switch matrix is essentially a 16x16 matrix implemented as eight 4x8 matrices to reduce stubs length. The row selector and input selector help in facilitating this architecture.

In order to reduce stubs length, the actual implementation divides the group to two sets of eight channels each. Channels 1-8 are the 'Lo' channels and 9-16 are the 'Hi' channels. Another feature implemented in the design is a Build-In Test circuit (BIT). By connecting a pull-up and a level sensor to one input of a pair, and a pull down to the other input, the activation of all the groups' relays can be verified.

Figure 2-8 describes the switching sections of the GX6256. Each section is shown in a different color.

- There are eight 4x8 switch matrices. The matrices columns are routed to the input channels and the rows are routed to multiplexer groups via the selectors.
- The input selector switches an Input channel from the global switching bus in the backplane to one of four groups of rows: A-D, E-H, I-L, M-P. Figure 2-9 includes a logic schematic of an input selector.
- The row selector switches a pair of multiplexer groups to one of two sets of columns: 1-8 or 9-16 or to a digital input. Figure 2-9 includes a logic schematic of a row selector. The row selector can also connect the row to the BIT circuit.
- The multiplexer has 16 switching groups, A-P. Each group has 16 output channels. In order to reduce stubs length, the actual implementation divides the group to two sets of eight channels each. Channels 1-8 are the 'Lo' channels and 9-16 are the 'Hi' channels.

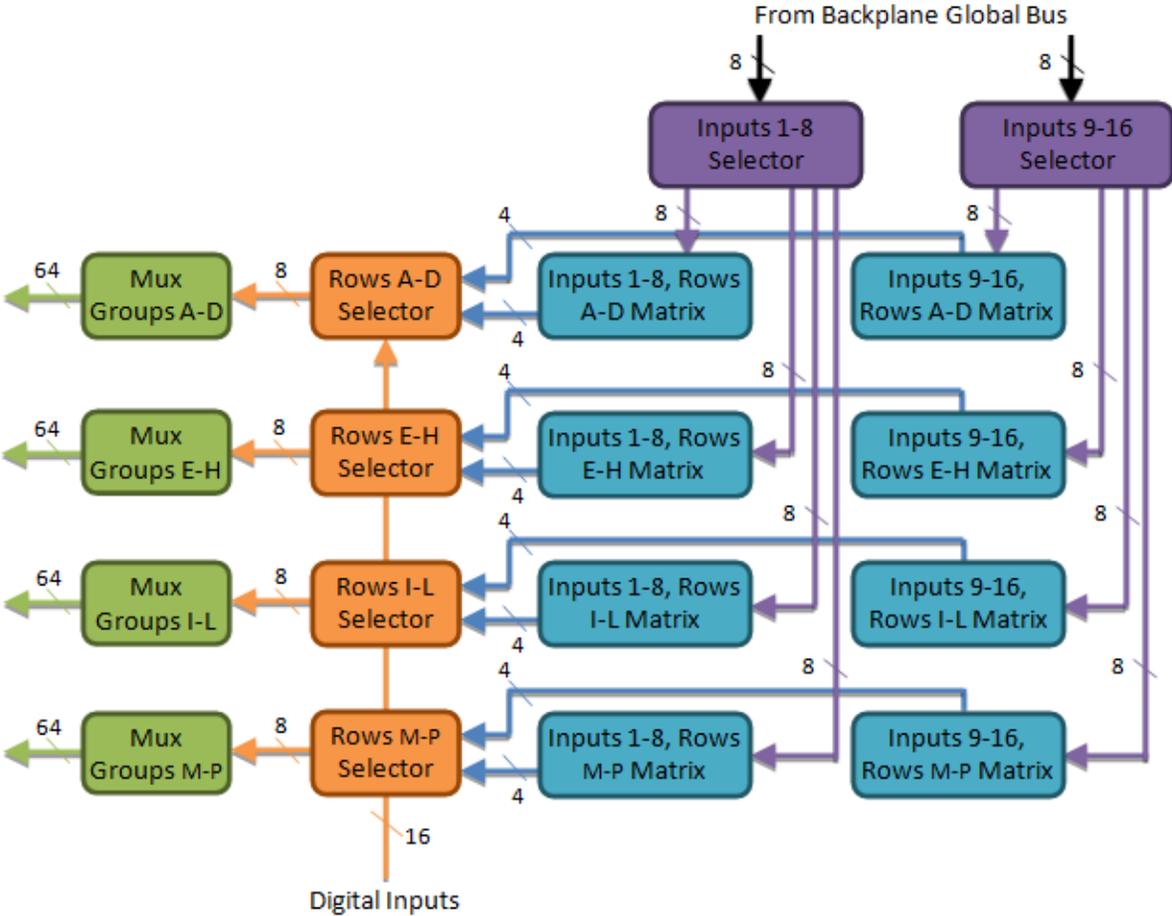


Figure 2-8: Block Diagram of the Switching Sections of the GX6256

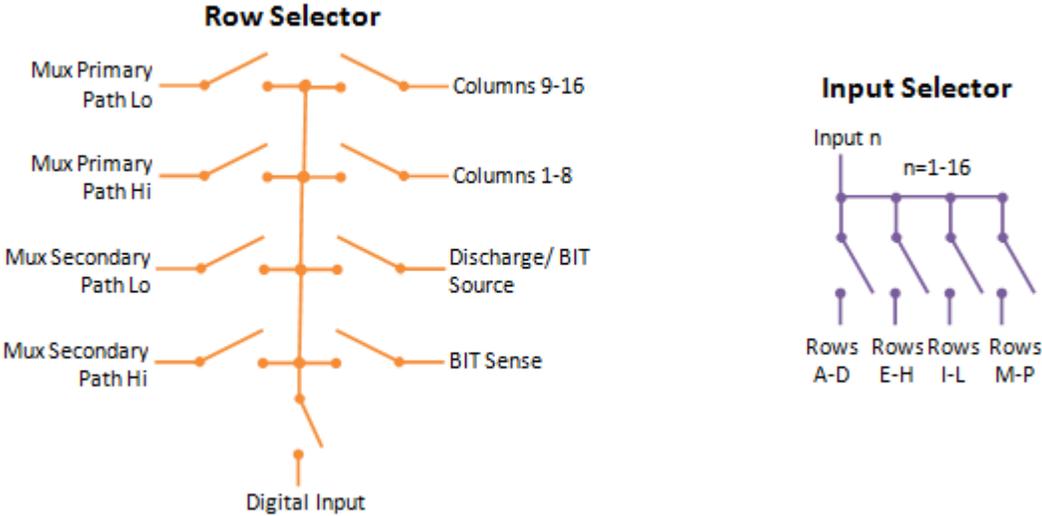


Figure 2-9: Schematic Diagram for Selectors

GX6192 (HF)

The GX6192 comprises of sixteen 1:4 input selectors, eight 4x8 matrices, sixteen 2:2 selectors, and sixteen 1x12 multiplexer groups connected to 192 channels. The switch matrix is essentially a 16x16 matrix implemented as eight 4x8 matrices to reduce stubs length. The selector and input selector help in facilitating this architecture.

Figure 2-10 describes the switching sections of the GX6192. Each section is shown in a different color.

- There are eight 4x8 switch matrices. The matrices columns are routed to the input channels and the rows are routed to multiplexer groups via the selectors.
- The input selector switches an Input channel to one of four groups of rows: A-D, E-H, I-L, M-P. Figure 2-10 includes a logic schematic of an input selector.
- The row selector switches a multiplexer group to one of two sets of columns: 1-8 or 9-16. Figure 2-11 includes a logic schematic of a row selector. The row selector can also connect the row to the corresponding global bus line in the backplane.
- The multiplexer has 16 switching groups, A-P. Each group has 12 output channels. In order to reduce stubs length, the actual implementation divides the group to two sets of six channels each. Channels 1-6 are the 'Lo' channels and 7-12 are the 'Hi' channels.

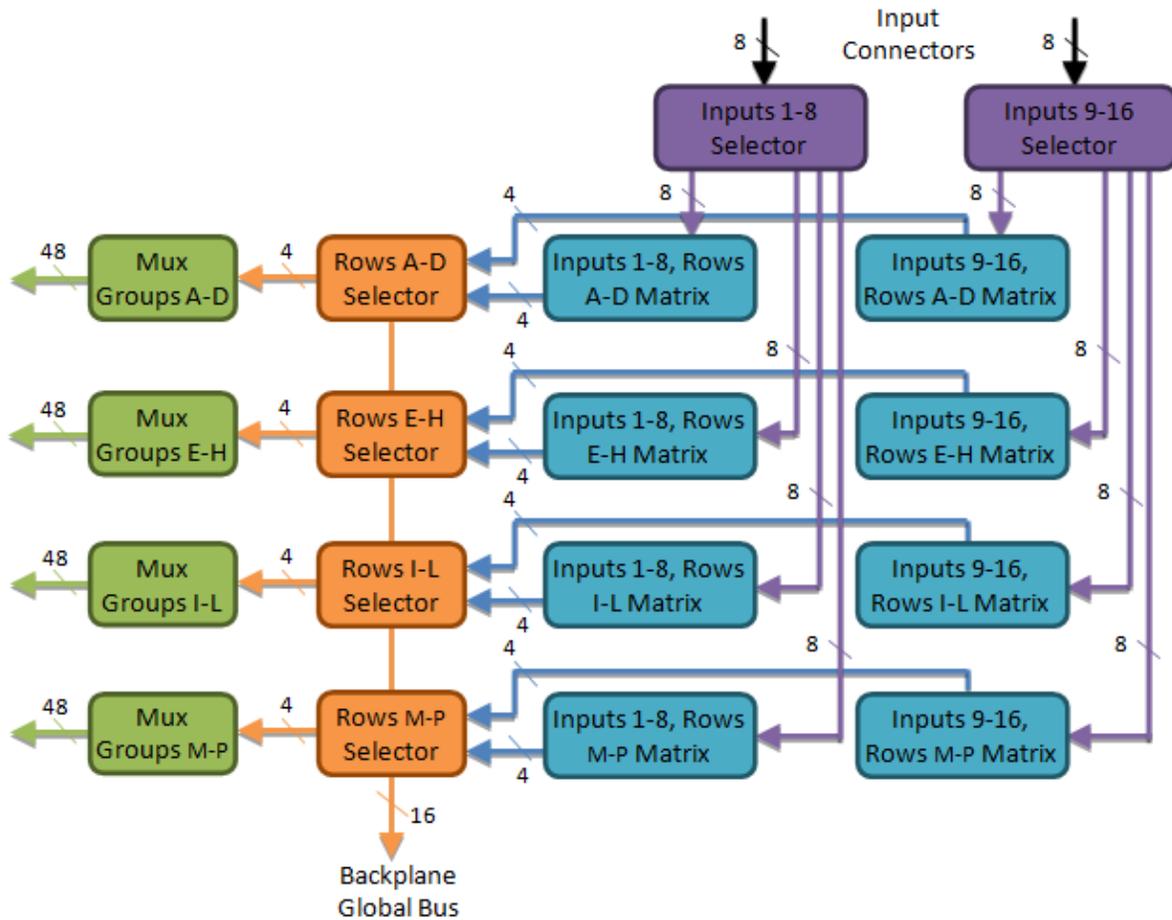


Figure 2-10: Diagram of the Switching Sections of the GX6192

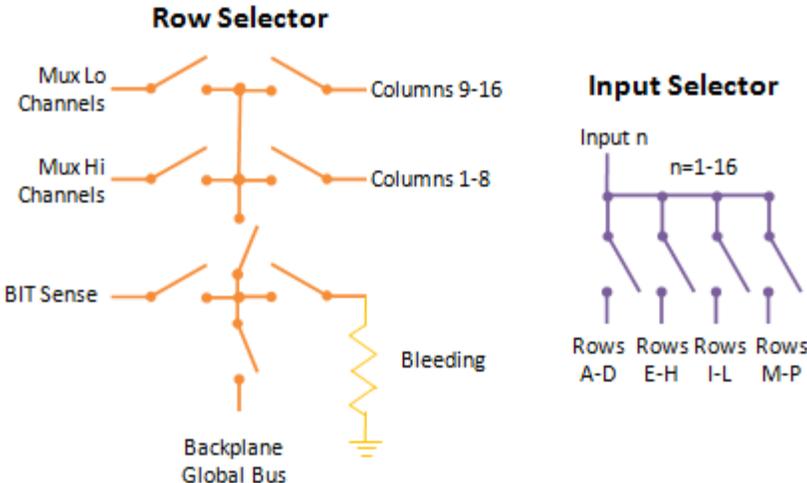


Figure 2-11: Schematic Diagram for Selectors

GX6864 (VF)

The GX6864 comprises of BIT and BP connection, four 4x8 matrices, four 4:2 input selectors, and four 2x16 multiplexer groups connected to 64 channels. The switch matrix is essentially a 16x8 matrix implemented as four 4x8 matrices to reduce stubs length. The selector helps in facilitating this architecture.

- The multiplexer has four switching groups, A-D. Each group has 16 output channels. In order to reduce stubs length, the implementation is done using 1:2 multiplexers as building blocks. A total of 15 such multiplexers are used for each input. Figure 2-12: Diagram of the Switching Sections of the GX6864 includes a schematic of a multiplexer group. Each of the inputs has its switching path shown in a different color.

- The input selector is integrated in the mux group and it selects for each group the source of each input – input connector or global bus. Figure 2-13 includes a logic schematic of an input selector.

- There are four 4x8 switch matrices. The matrices columns are routed to the global bus channels and the rows are routed to multiplexer groups via the input selectors.

- The BIT and BP connection connects the global bus signals from the backplane to the matrix. By selecting the global bus as input to the mux group BIT can be performed on the mux relays' contacts. Figure 2-13 includes a logic schematic of one signal in the BIT and BP connection.

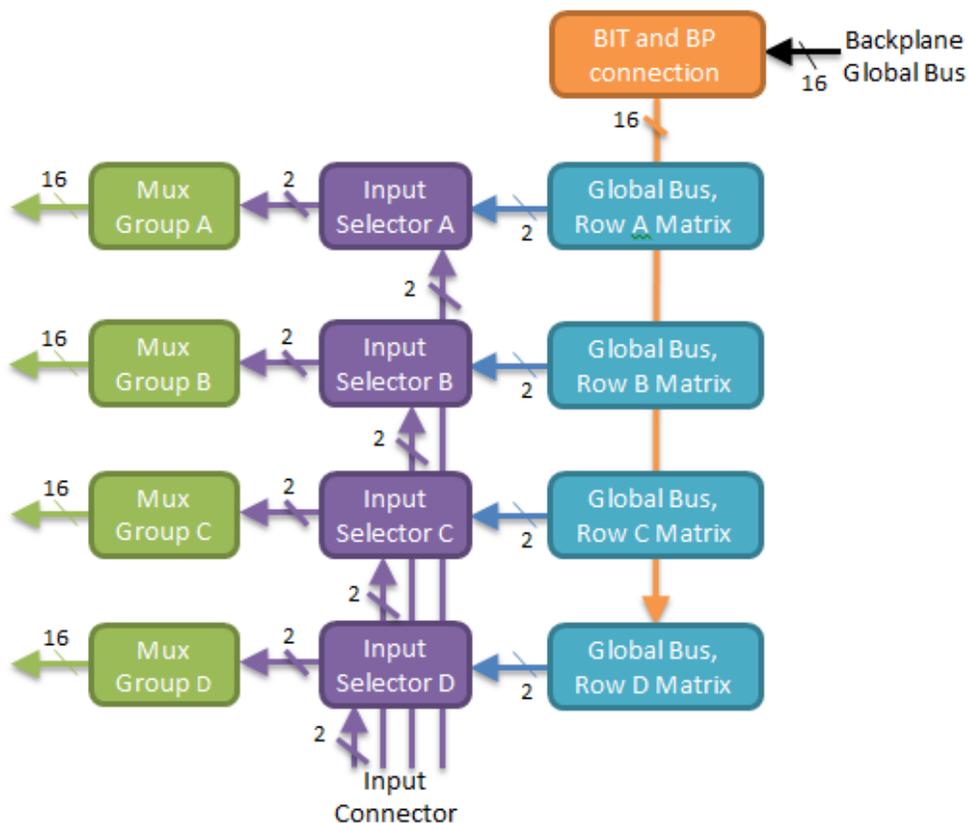


Figure 2-12: Diagram of the Switching Sections of the GX6864

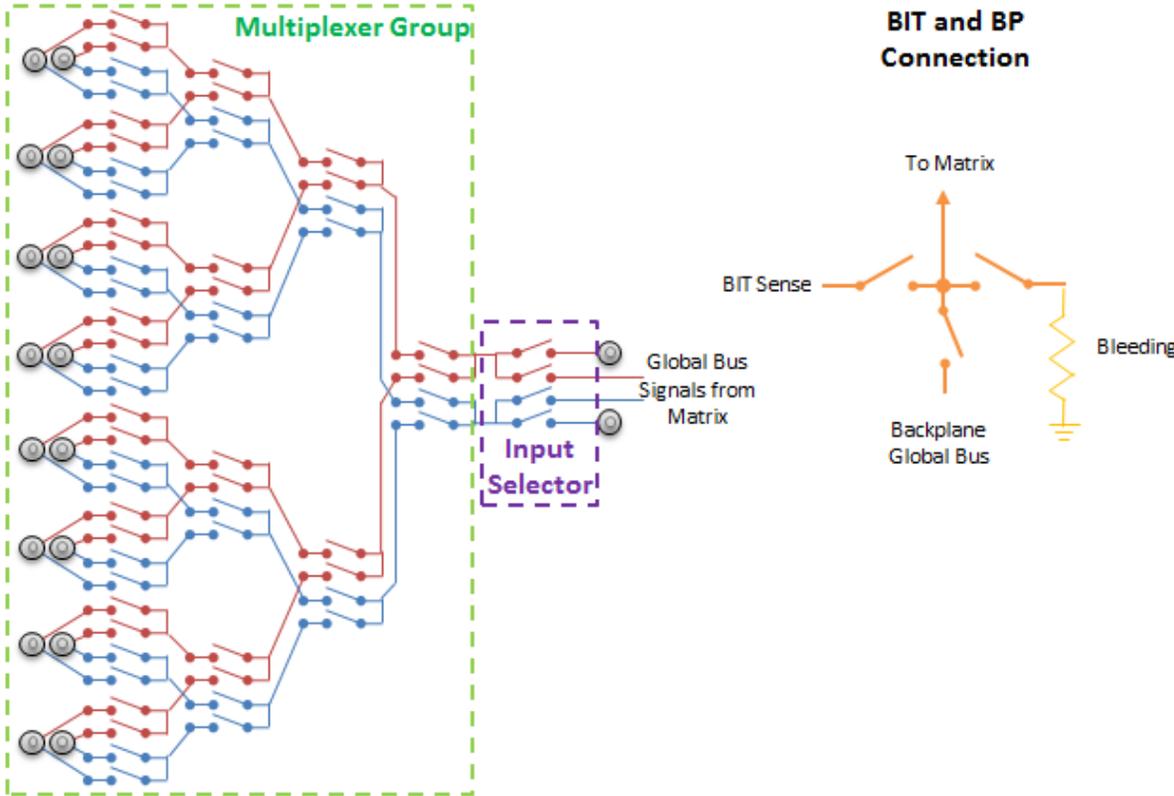


Figure 2-13: Schematic Diagram for Switching Blocks

GX6032 (RTM)

The RTM comprises of 32 1:2 input selectors, 16 4x8 matrices, and 16 1:8 selectors. The switch matrix is essentially a 32x16 matrix implemented as 16 4x8 matrices to reduce stubs length. The row selector and input selector help in facilitating this architecture. Figure 2-14 describes the switching sections of the GX6032. Each section is shown in a different color.

- There are 16 4x8 switch matrices. The matrices columns are routed to the input channels and the rows are routed to the global bus via the selectors.
- The input selector switches an Input channel from a BNC connector to one of two groups of columns: 1-8, 9-16. These numbers are related to the global bus signals. Figure 2-15 includes a logic schematic of an input selector.
- The column selector switches a global bus signal to one of eight sets of rows: 1-4, 5-8, 9-12, 13-16, 17-20, 21-24, 25-28 or 29-32. These numbers are related to the input channels. Figure 2-15 includes a logic schematic of a row selector.

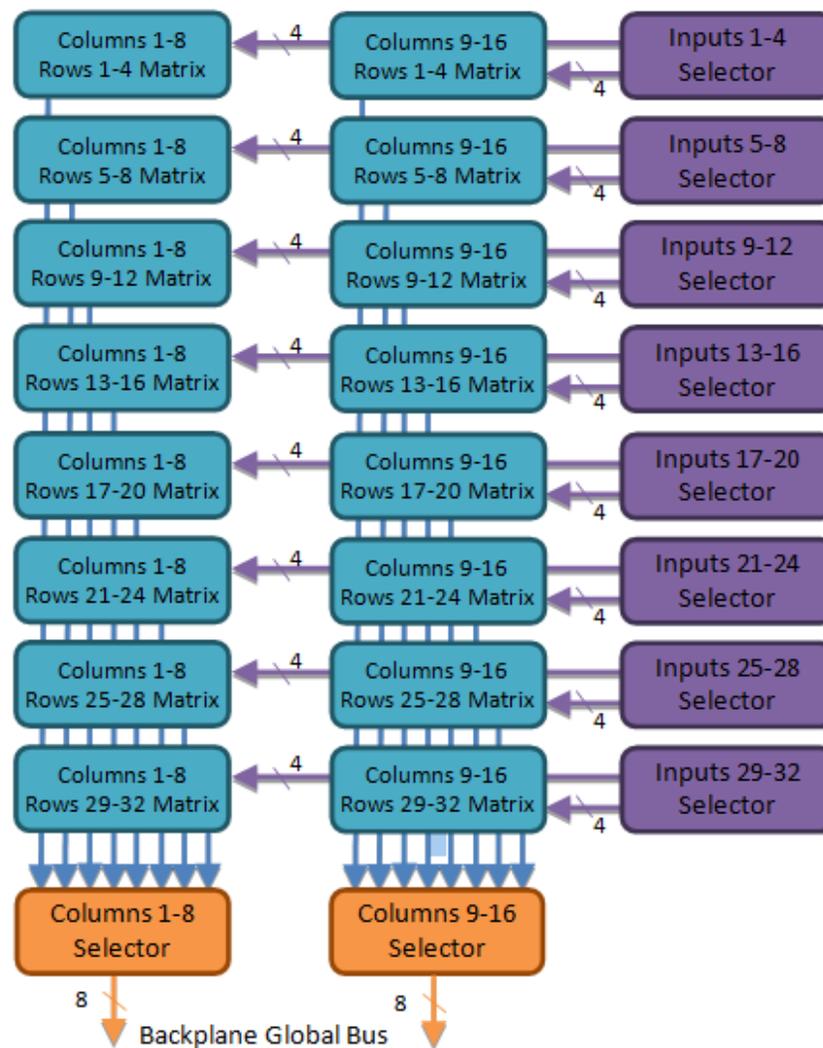


Figure 2-14: Block Diagram of the Switching Sections of the RTM

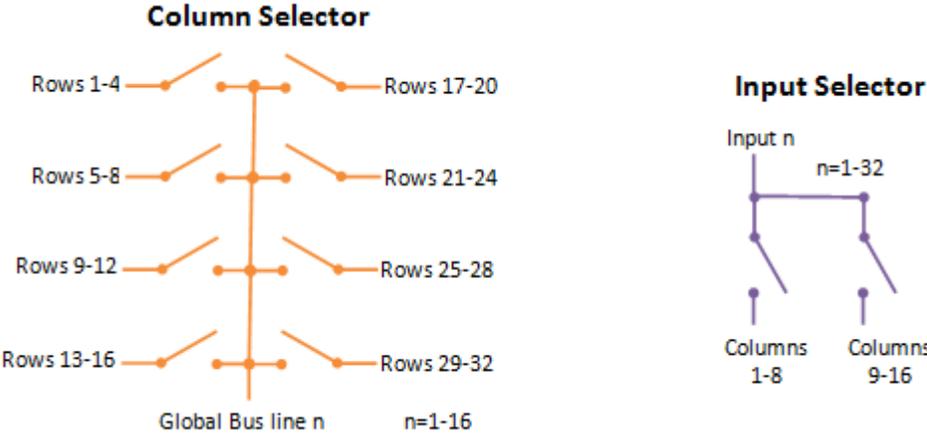


Figure 2-15: Schematic Diagram for RTM Selectors

GX6009 (SR)

The Switching router routes the 16 lines of the global bus between the slots. Each one of the bus lines routing consists of four switching groups, with four relays each. Three groups are slot switching groups and one is the common switching group. Figure 2-16 shows a schematic of one bus line implementation in the SR. Three of the relays in a slot group are connected to slots and the fourth is connected to the common group. Three of the relays in the common group are connected to slot groups and the fourth is connected to the other SR board.

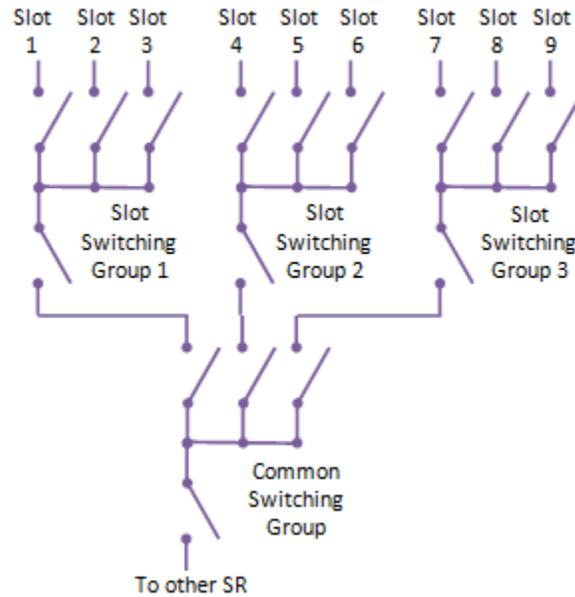


Figure 2-16: Schematic Diagram for One Bus Signal of the Switching Router

Specifications

The following table outlines the specifications of the GX6256/GX6192/GX6864/GX6032/GX6009 switching cards:

Switching Specifications	
GX6032 Switch Card	Configuration: 32 x16 Inputs: 32 to 128 (4 switch cards)
GX6256 LF Switch Card	Configuration: 16 x16 matrix with 2 to 1 selector, (16) 2:16 multiplexers Inputs: 16 internal analog bus and 16 digital Outputs: 256
GX6192 HF Switch Card	Configuration: 16 x 16 matrix with (16) 1:12 multiplexers Inputs: 16 external analog inputs or 16 internal analog bus Outputs: 192
GX6864 VF Switch Card	Configuration: 16 x 8 matrix Inputs: 8 external analog inputs or 16 internal analog bus Outputs: 64
Relay Specifications	Max AC pk or DC voltage 170 V Max DC or AC pk carry current: 1A Max DC or AC pk switching current: 0.5A Max. contact rating:: 10 W
Signal Bandwidth	
Input to Output (input switch card to LF switch card output)	> 20 MHz
HF Switch Card (external input to output)	> 100 MHz
I/O Connections	
GX6032 Switch Card	32 coaxial connections (Positronics BD8W8F85R70T0/AA)
GX6256 Switch Card	Receiver: Dual 200 pin connector Digital I/O: 34 pin, dual row latched header
GX6192 Switch Card	Receiver: Dual 200 pin connector Digital I/O: 34 pin, dual row latched header External I/O: 16 coaxial connections (Positronics BD8W8F85R70T0/AA)
GX6864 Switch Card	Receiver: 2 - 32 pin coaxial connectors (Positronics BD8W8F85R70T0/AA) External: I/O: 8 coaxial connections (Positronics BD8W8F85R70T0/AA)

The following table outlines the specifications of the GX7016 Chassis:

Chassis Specifications	
Input AC Power	90 to 264 VAC, 12 A max (PFC) 47 to 63 Hz
Total Available DC Power	755 W
+5 V	60 A (max)
+3.3 V	60 A (max)
+12 V	30 A (max)

-12 V Note: Total output power cannot exceed 755 W.	5 A (max)
Power Supply Monitoring	Monitored voltages: 3.3, 5, +12, -12, VIO value Accuracy: $\pm 2\%$ of reading
Temperature Monitoring	Per slot monitoring, 1 reading/sec/slot 4 second moving average value User selectable alarm criteria: Maximum slot temperature Average slot temperature Accuracy: $\pm 2\text{ }^{\circ}\text{C}$ Default warning and shutdown limits: $+50\text{ }^{\circ}\text{C}$ & $+70\text{ }^{\circ}\text{C}$ Warning and shutdown limits programmable via software driver Status: Query via software driver and audible alarm for a warning limit condition
PXI Triggers	Slots: 2 – 20 Number: 8 per segment Software controlled segment mapping supports: Isolate a trigger line within a segment Map a trigger line left to right Map a trigger line right to left
PXI Clock	Integrated 10 MHz PXI clock with auto-detect function. Presence of an external 10 MHz PXI clock will disable the internal clock. PXI clock is distributed to all peripheral slots. 10 MHz PXI clock accuracy: $\pm 100\text{ ppm}$ External input: Rear panel (TTL compatible) or via timing slot Output: Rear panel, (TTL compatible)
Slots	20 PXI or cPCI Slots (19 instruments max)
Weight (core system)	61 lbs.
Overall Dimensions	10U (17.5") H x 19" W x 24" D
Cooling	Four 79 CFM fans for system cooling. Integrated temperature monitoring via an on-board microcontroller with audible and software notification when preset temperature limits are exceeded. Fan speed control and monitoring is automatic and can be controlled / monitored via the GxChassis software.

The following table outlines the environmental specifications of the switching subsystem:

Environmental Specifications	
Operating	0 °C to +50 °C
Storage	-20 °C to +60 °C
Relative Humidity (operating)	5% to 80% RH, non-condensing
Relative Humidity (non-operating)	5% to 95% RH, non-condensing
Altitude (operating)	Up to 2000 M
CE Compliance	EN61010-1 (pending) EN61326 (pending)

Virtual Panel

The **GXSW** software includes a virtual panel program, which provides full access to the various configuration settings and operating modes. To fully understand the front panel operation, it is best to become familiar with the functionality of the board.

To open the virtual panel application, select **GX7016 Panel** from the **Marvin Test Solutions, GXSW** menu under the **Start** menu. The GX7016 virtual panel will you're your system and will show all the GX6256/GX6192/GX6864/GX6032/GX6009 installed in your system, each card will show in its own page as shown here:

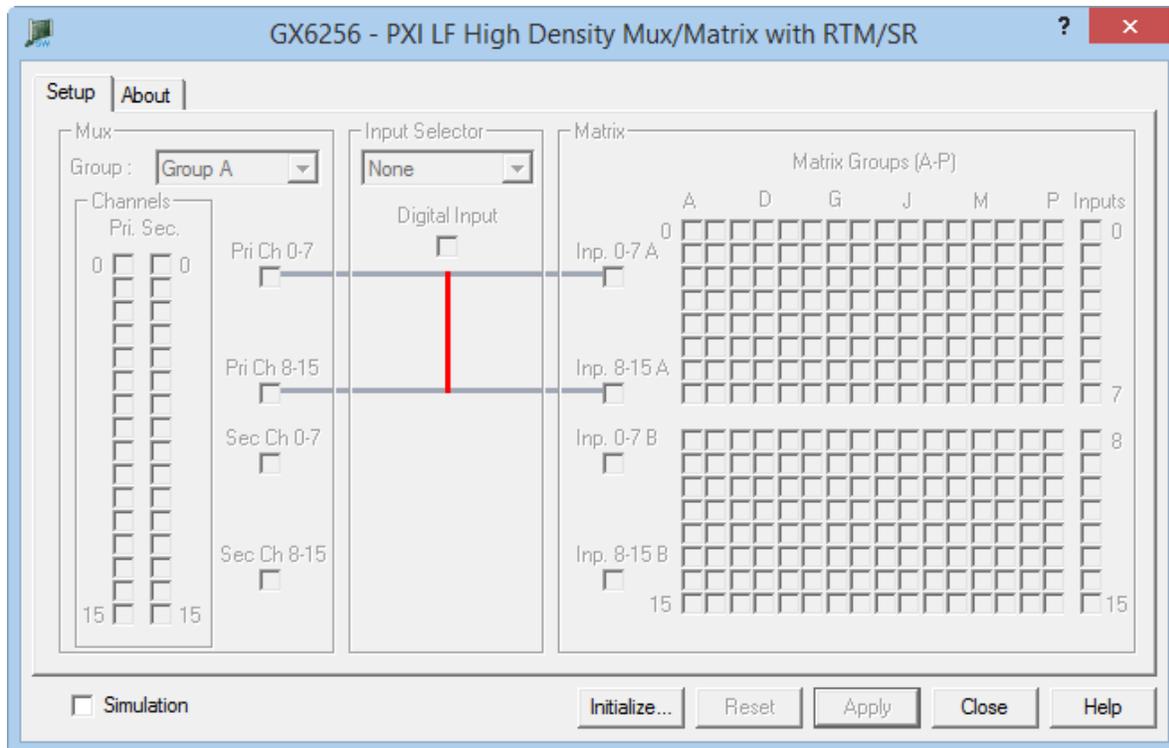


Figure 2-17: Virtual Panel - Uninitialized

Simulation – Selects simulation mode. When the check box is checked when the **Initialize** button is clicked, the panel will operate in simulation mode. If the check box is not checked when the **Initialize** button is clicked, the panel will control actual hardware.

Initialize – Scans the current system for any components of the GX7016 switching sub system (GX6256, GX6192, GX6864, GX6009, and GX6032) and initializes each one. The current settings of each device will not change after calling initialize. The panel will reflect the current settings of each device.

Reset – Resets the device settings of the device that corresponds to the currently active page, to their default state.

Apply – Applies changed settings to the board.

Close – Closes the panel. Closing the panel **does not affect** the board settings.

Help – Opens the on-line help window. In addition to the help menu, the caption shows a **What's This Help** (?) button. This button can be used to obtain help on any control that is displayed in the panel window. To display the What's This Help information click on the (?) button and then click on the control – a small window will display the information regarding this control.

Virtual Panel - LF Slot Page

After the board is initialized the panel is enabled and will display the current setting of the board. The following picture shows the **LF Slot Page, 2-LF** (LF PXI card that is installed on PXI Slot #2) settings:

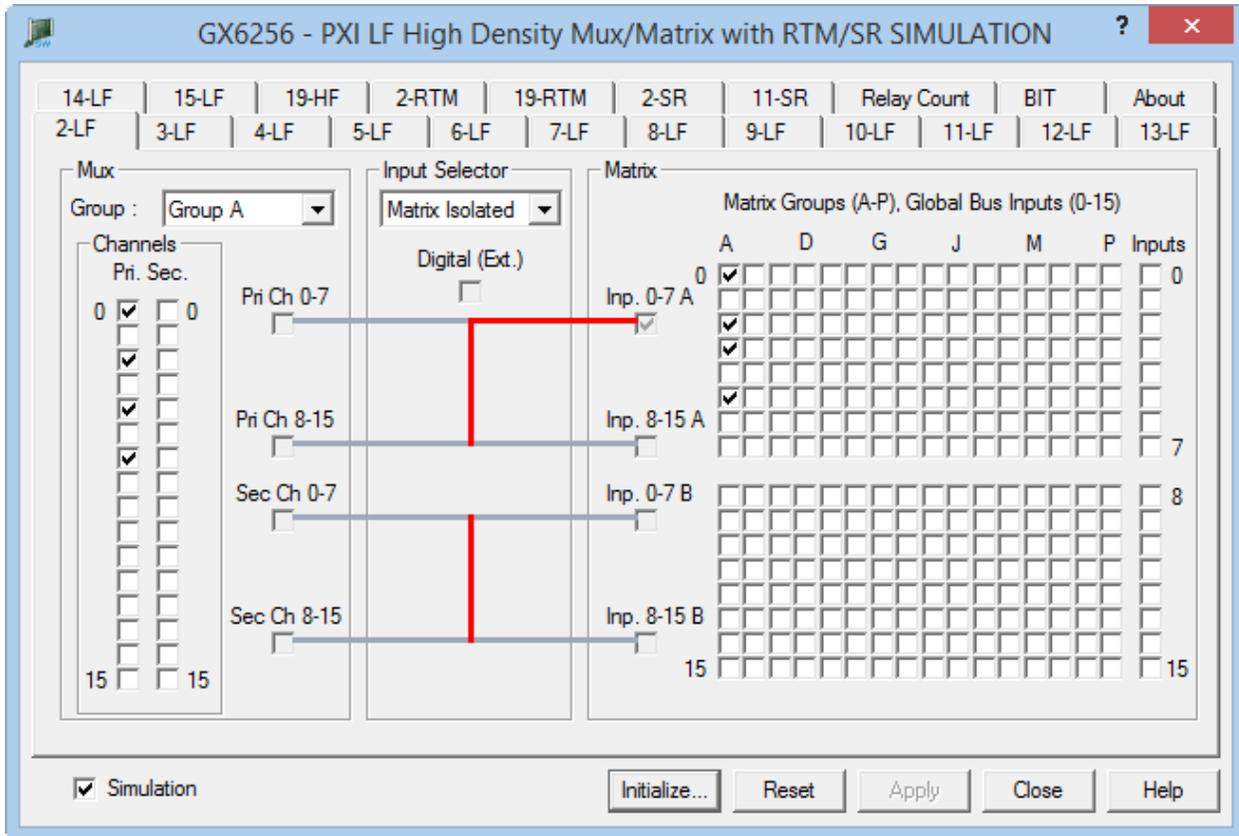


Figure 2-18: Virtual Panel – LF (GX6256) Page

The following controls are shown:

Mux Group Selection (combo box): Set/Displays the currently selected Mux Group

Channels (checkboxes): Displays the current relay setting (closed or open). When a box in the matrix is checked, the relay in that row/column is closed. Similarly, unchecked boxes mean relays are open.

Input Selector (combo box): Sets/Displays the currently selected input selector mode

- None: The Mux, Matrix, and external lines are not connected to each other.
- Matrix Only: The Mux and Matrix are allowed to connect but the external lines are disconnected.
- Ext. Only: The Mux and the external lines are allowed to connect to each other.
- Matrix and Ext.: The Mux is allowed to connect to the Matrix and external lines.
- Matrix Isolated: The Mux is not allowed to connect to the selector, effectively making it isolated from the rest of the board.

Digital (Ext.) (checkbox): Displays the state of the connection between the digital external input and the input selector

Pri Ch 0-7 (checkbox): Displays the state of the connection between the primary mux low channels to the input selector

Pri Ch 8-15 (check box): Displays the state of the connection between the primary mux high channels to the input selector

Sec Ch 0-7 (check box): Displays the state of the connection between the secondary mux low channels to the input selector

Sec Ch 8-15 (check box): Displays the state of the connection between the secondary mux high channels to the input selector

Inp. Ch 0-7 (check box): Displays the state of the connection between the matrix low channels to the input selector

Inp. Ch 8-15 (check box): Displays the state of the connection between the matrix high channels to the input selector

Matrix (check boxes): Sets/Displays the states of each of the GX6256 Matrix relays. If the check box is checked, the associated relay is closed. If the check box is not checked, the associated relay is open.

Inputs (check boxes): Sets/Displays the states of each of the global bus input relays. If the check box is checked, the associated relay is open. If the check box is not checked, the associated relay is closed.

Virtual Panel - HF Slot Page

The following picture shows the **HF Slot Page, 19-HF** (HF PXI card that is installed on PXI Slot #19) settings:

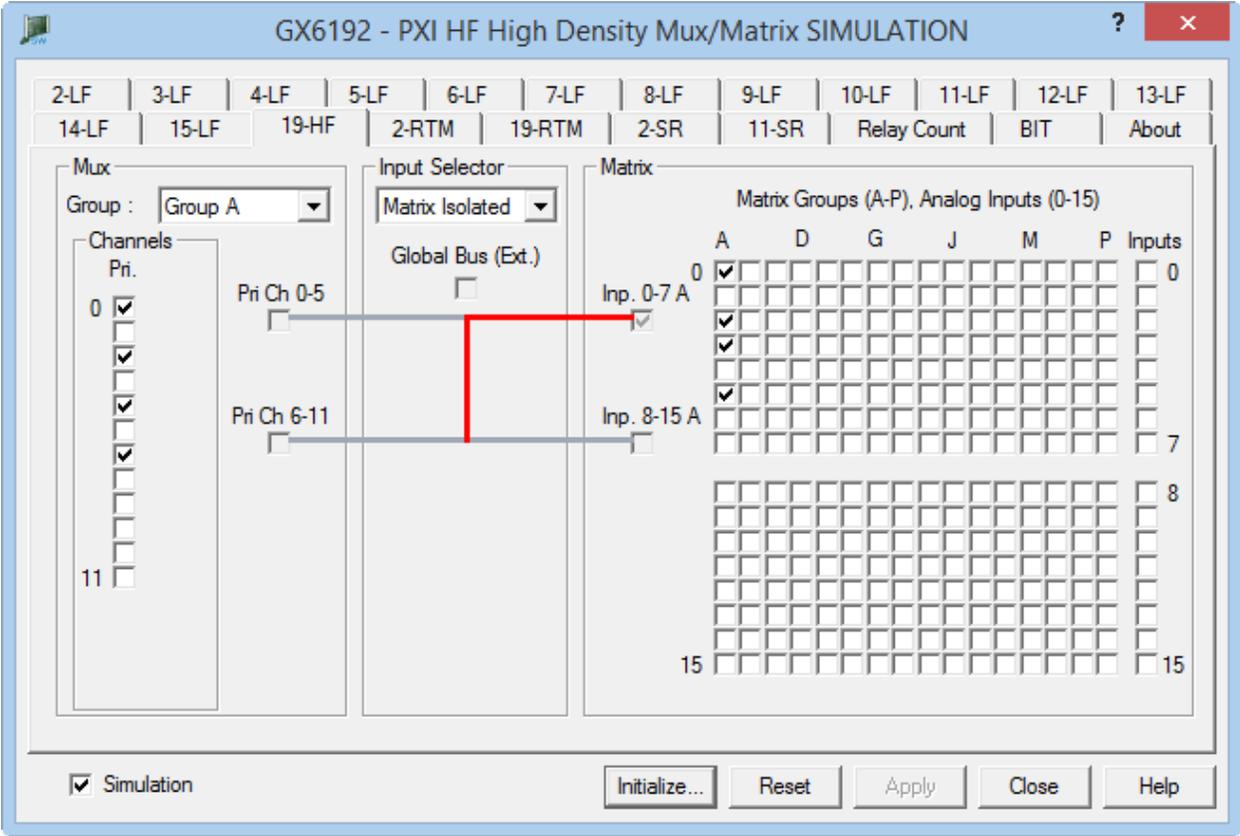


Figure 2-19: Virtual Panel – HF (GX6192) Page

The following controls are shown:

Mux Group Selection (combo box): Set/Displays the currently selected Mux Group

Channels (check boxes): Displays the current relay setting (closed or open). When a box in the matrix is checked, the relay in that row/column is closed. Similarly, unchecked boxes mean relays are open.

Input Selector (combo box): Sets/Displays the currently selected input selector mode

- **None:** The Mux, Matrix, and external lines are not connected to each other.
- **Matrix Only:** The Mux and Matrix are allowed to connect but the external lines are disconnected.
- **Ext. Only:** The Mux and the external lines are allowed to connect to each other.
- **Matrix and Ext.:** The Mux is allowed to connect to the Matrix and external lines.
- **Matrix Isolated:** The Mux is not allowed to connect to the selector, effectively making it isolated from the rest of the board.

Global Bus (Ext.) (check box): Displays the state of the connection between the global bus external input and the input selector

Pri Ch 0-7 (check box): Displays the state of the connection between the primary mux low channels to the input selector

Pri Ch 8-15 (check box): Displays the state of the connection between the primary mux high channels to the input selector

Sec Ch 0-7 (check box): Displays the state of the connection between the secondary mux low channels to the input selector

Sec Ch 8-15 (check box): Displays the state of the connection between the secondary mux high channels to the input selector

Inp. Ch 0-7 (check box): Displays the state of the connection between the matrix low channels to the input selector

Inp. Ch 8-15 (check box): Displays the state of the connection between the matrix high channels to the input selector

Matrix (check boxes): Sets/Displays the states of each of the GX6192 Matrix relays. If the check box is checked, the associated relay is closed. If the check box is not checked, the associated relay is open.

Inputs (check boxes): Sets/Displays the states of each of the instrument input relays. If the check box is checked, the associated relay is closed. If the check box is not checked, the associated relay is open.

Virtual Panel - VF Slot Page

The following picture shows the **VF Slot Page, 19-HF** (VF PXI card that is installed on PXI Slot #5) settings:

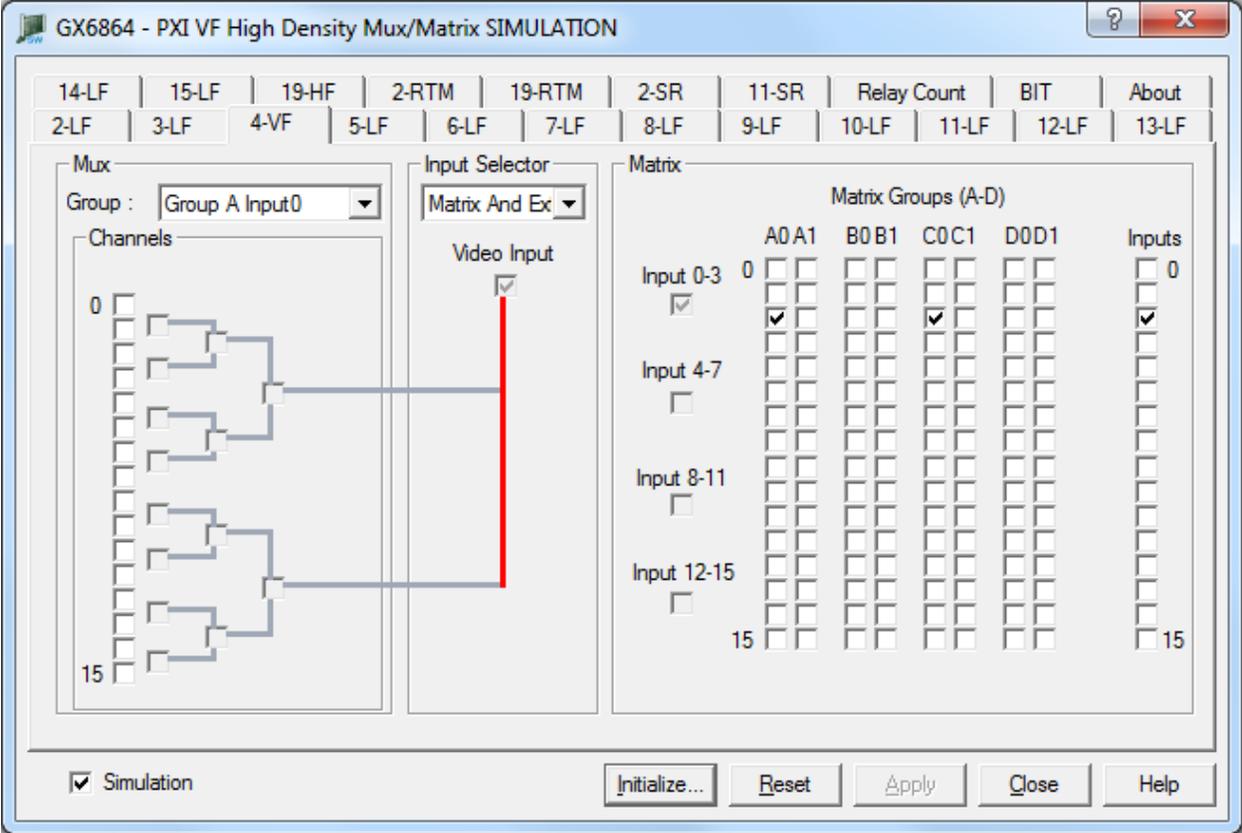


Figure 2-20: Virtual Panel – VF (GX6864) Page

The following controls are shown:

Mux Group Selection (combo box): Set/Displays the currently selected Mux Group

Channels (check boxes): Displays the current relay setting (closed or open). When a box in the matrix is checked, the relay in that row/column is closed. Similarly, unchecked boxes mean relays are open.

Input Selector (combo box): Sets/Displays the currently selected input selector mode

- **None:** The Mux, Matrix, and external lines are not connected to each other.
- **Matrix Only:** The Mux and Matrix are allowed to connect but the external lines are disconnected.
- **Ext. Only:** The Mux and the external lines are allowed to connect to each other.
- **Matrix and Ext.:** The Mux is allowed to connect to the Matrix and external lines.
- **Matrix Isolated:** The Mux is not allowed to connect to the selector, effectively making it isolated from the rest of the board.

Video input (check box): Displays the state of the connection between the external video inputs and the input selector

Input 0-3 (check box): Displays the state of the connection between the matrix channels 0-3 to the input selector

Input 4-7 (check box): Displays the state of the connection between the matrix channels 4-7 to the input selector

Input 8-11 (check box): Displays the state of the connection between the matrix channels 8-11 to the input selector

Input 12-15 (check box): Displays the state of the connection between the matrix channels 12-15 to the input selector

Matrix (check boxes): Sets/Displays the states of each of the GX6864 Matrix relays. If the check box is checked, the associated relay is closed. If the check box is not checked, the associated relay is open.

Inputs (check boxes): Sets/Displays the states of each of the instrument input relays. If the check box is checked, the associated relay is closed. If the check box is not checked, the associated relay is open.

Virtual Panel - Rear Transition Module (RTM) Page

The following picture shows the **RTM page, 2-RTM** (RTM module that is installed on PXI backplane on slot #2, controlled using 2-LF) settings:

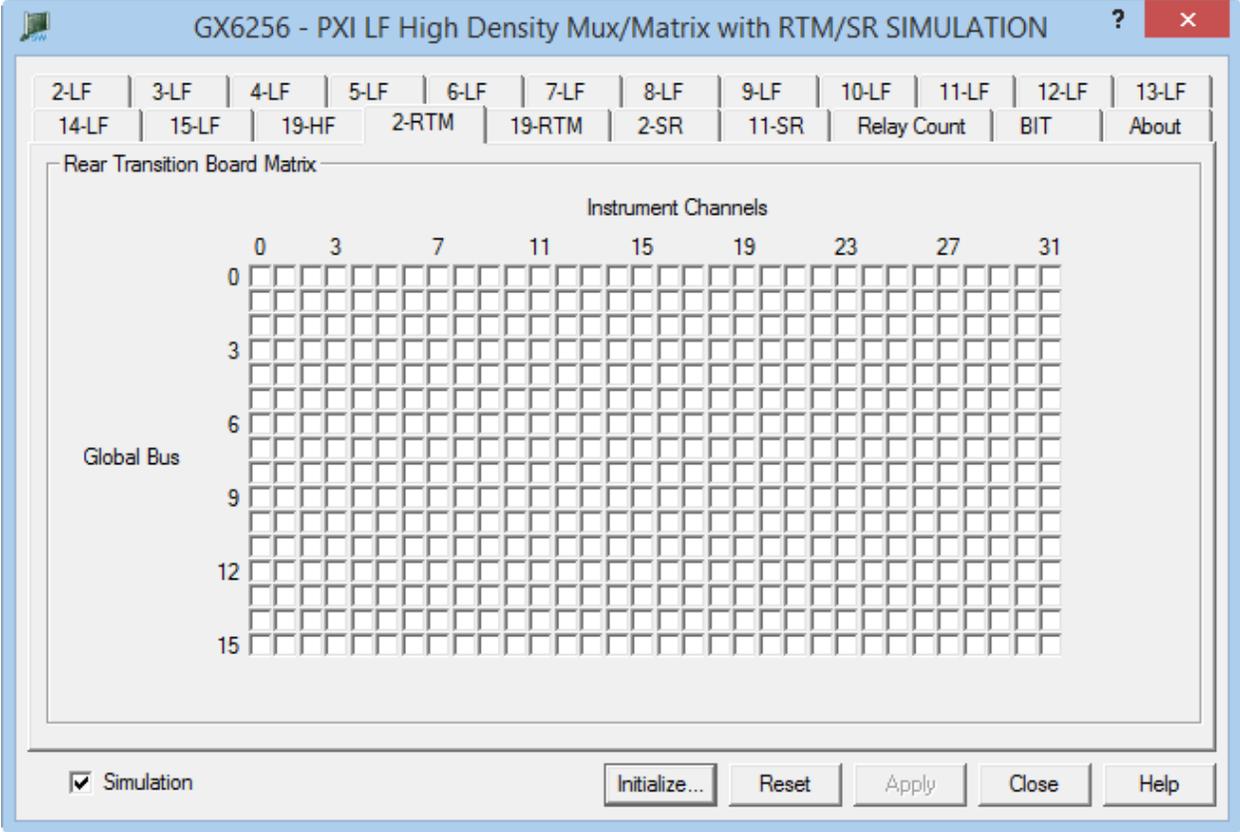


Figure 2-21: Virtual Panel - Rear Transition Module (GX6032) Page

The following controls are shown:

Rear Transition Board Matrix (check boxes): Sets/Displays the states of each of the rear transition module relays. If the check box is checked, the associated relay is closed. If the check box is not checked, the associated relay is open.

Virtual Panel - Switch Router (SR) Page

The following picture shows the **SR page, 2-SR** (SR module that is installed on PXI backplane on slot #2, controlled using 2-LF) settings:

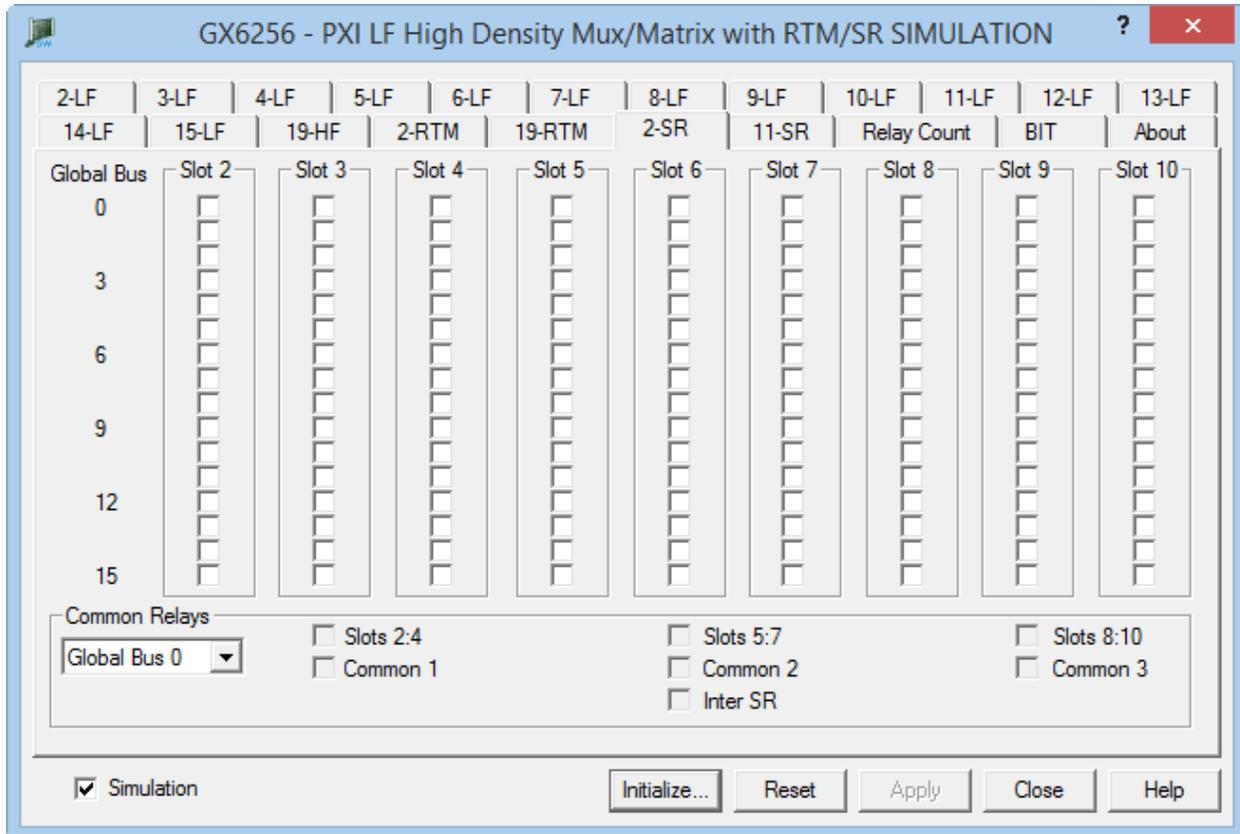


Figure 2-22: Virtual Panel - Switching Router Module (GX6009) Page

The following controls are shown:

Slot Global Bus (check boxes): Sets/Displays the states of each of the switch router relays. If the check box is checked, the associated relay is closed. If the check box is not checked, the associated relay is open. Each relay corresponds to a particular global bus line (0-15).

Common Relays Global Bus Selection (combo box): Set/Displays the currently selected global bus line

Slots 2:4 and Common 1 (check boxes): Displays the status of the relay that connects slots 2, 3, and 4 to the other slots

Slots 5:7 and Common 2 (check boxes): Displays the status of the relay that connects slots 5, 6, and 7 to the other slots

Slots 8:10 and Common 3 (check boxes): Displays the status of the relay that connects slots 8, 9, and 10 to the other slots

Inter SR (check box): Displays the status of the relay that connects this switch router to the other switch router

Virtual Panel - Relay Count Page

Clicking on the **Relay Count** tab will show the **Relay Count Page** as shown in Figure 2-23:

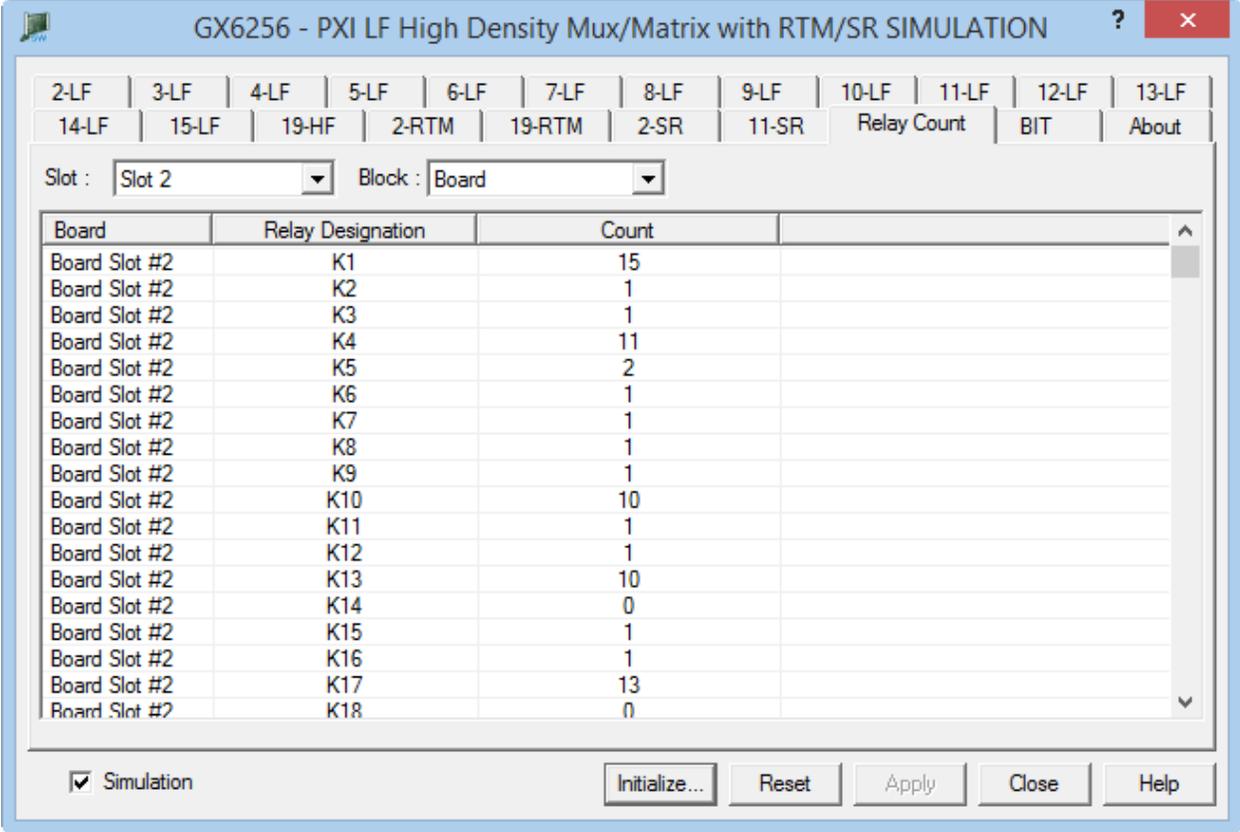


Figure 2-23: Virtual Panel – Relay Count Page

The following controls are shown in the Relay Count page:

Slot Selection (combo box): Set/Displays the currently selected board's slot

Block Selection (combo box): Sets/Displays the currently selected block (board, RTM, or SR) of the currently selected board

- **Board:** Show relays that are located only on the board (GX6256/GX6192/GX6864) that resides in the selected slot.
- **RTM:** Show relays that are located only on the Rear Transition Module (GX6032) that resides in the selected slot.
- **Switch Router:** Show relays that are located only on the Switch Router (GX6009) that resides in the selected slot.

Relay Count List (list control): Displays the number of openings and closures of each relay within the currently selected block of the currently selected board (slot).

Virtual Panel - Built In Test (BIT) Page

Clicking on the **BIT** tab will show the **BIT Page** as shown here:

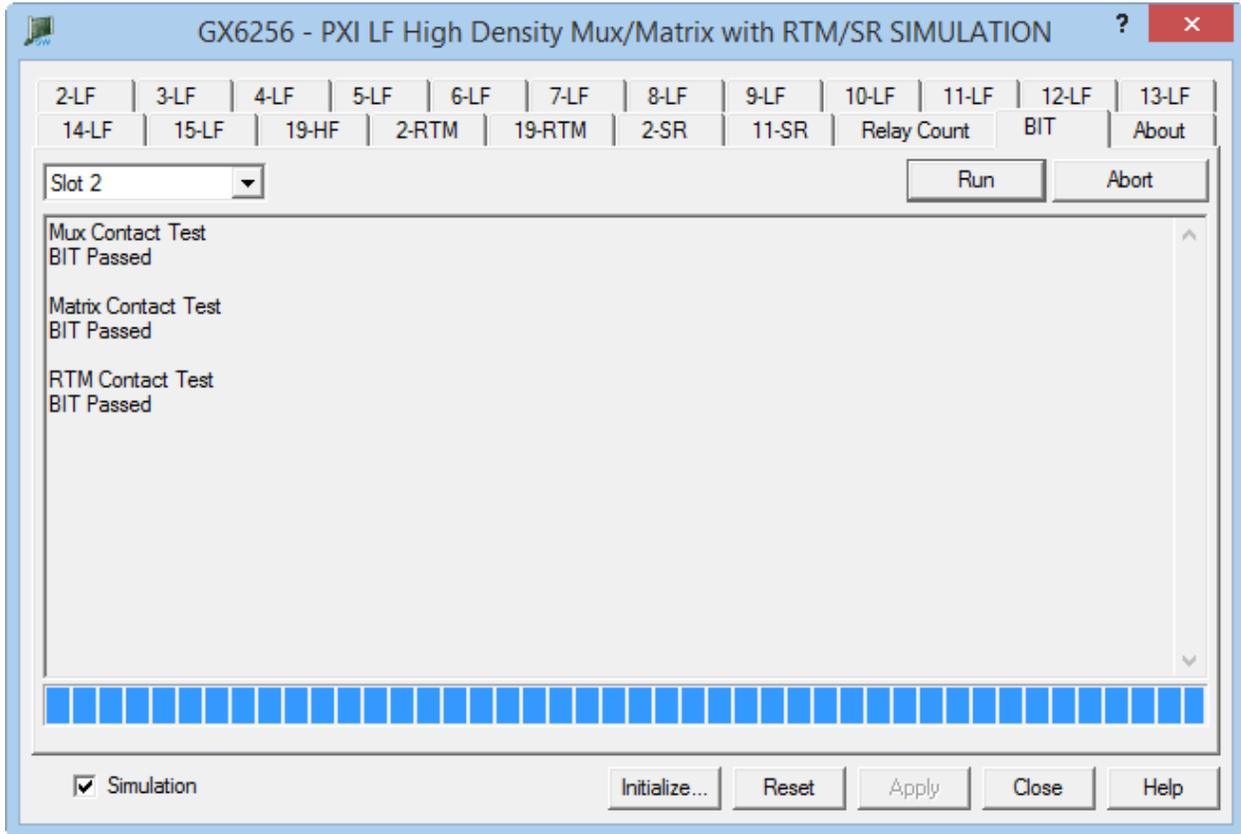


Figure 2-24: Virtual Panel - Built In Test (BIT) Page

The following controls are shown in the Built In Test (BIT) page:

Slot Selection (combo box): Set/Displays the currently selected board's slot

Run Button (button): Starts running the Built In Test (BIT)

Abort Button (button): Aborts a currently running Built In Test (BIT)

Built In Test Results (text box): Displays the results of the last completed Built In Test (BIT)

Virtual Panel About Page

Clicking on the **About** tab will show the **About Page** as shown in Figure 2-25:

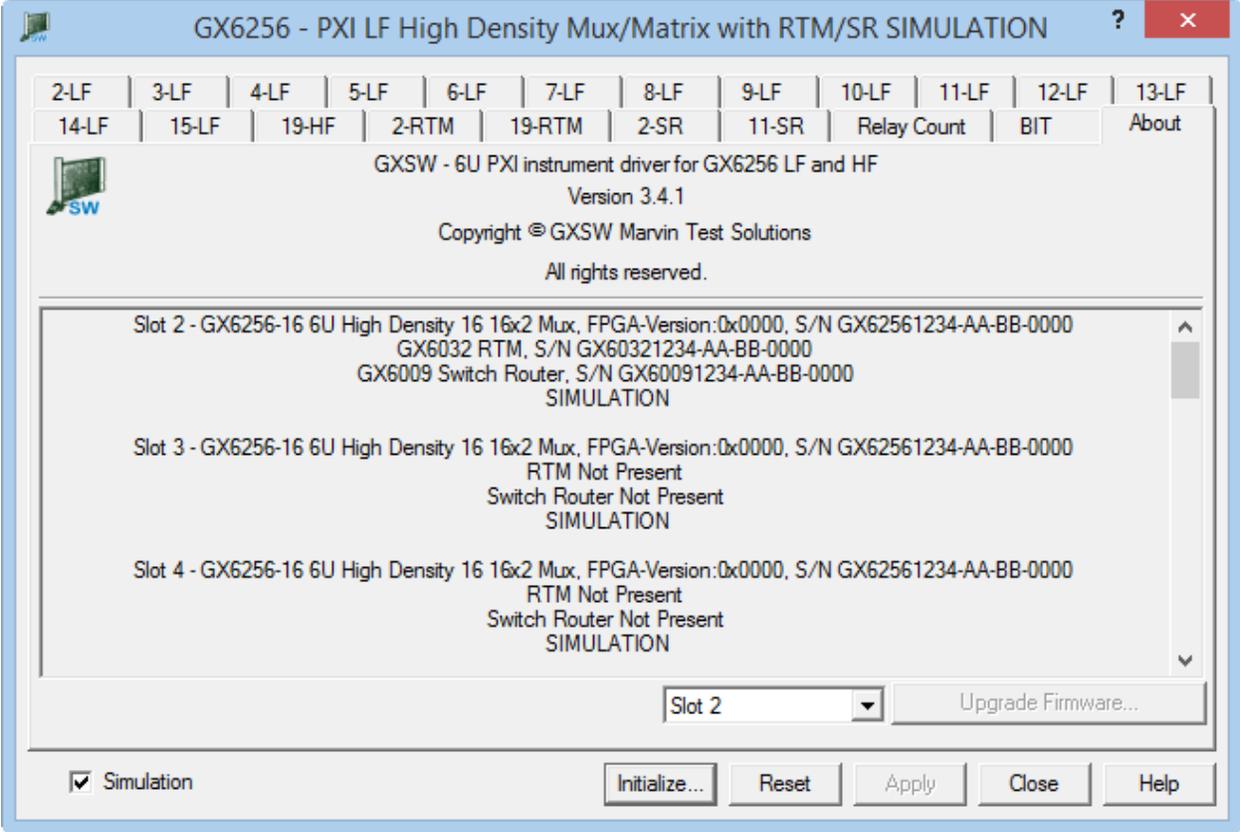


Figure 2-25: Virtual Panel – About Page

The following controls are shown in the About page:

The top part of the **About** page displays version and copyright of the GXSW driver. The bottom part displays the board summary.

The **About** page also contains a button **Upgrade Firmware...** which is used to upgrade the board’s FPGA firmware. This button maybe used only when the board requires upgrade as directed by Marvin Test Solutions support. The upgrade requires a firmware file (.jam) that is written to the board FPGA. After the upgrade is complete, you must shut down the computer to recycle power to the board.

Slot Selection (combo box): Set/Displays the currently selected board's slot for upgrading firmware.

Chapter 3 - Installation and Connections

Getting Started

This section includes general hardware installation procedures for the GX6256/GX6192/GX6864 board and installation instructions for the GX6256/GX6192/GX6864/GX6032/GX6009 (GXSW) software. Before proceeding, please refer to the appropriate chapter to become familiar with the board being installed.

To Find Information on...	Refer to...
Hardware Installation	This Chapter
Driver Installation	This Chapter
Function Reference	Chapter 5

Packing List

All GX6256/GX6192/GX6864 boards have the same basic packing list, which includes:

1. GX6256/GX6192/GX6864 Board
2. CD that includes the GXSW software

Unpacking and Inspection

After removing the board from the shipping carton:



Caution - Static sensitive devices are present. Ground yourself to discharge static.

1. Remove the board from the static bag by handling only the metal portions.
2. Be sure to check the contents of the shipping carton to verify that all of the items found in it match the packing list.
3. Inspect the board for possible damage. If there is any sign of damage, return the board immediately. Please refer to the warranty information at the beginning of the manual.

System Requirements

The switching instrument boards are designed for use with a 6U cPCI or PXI compatible chassis. The software is compatible with any computer system running Windows

Installation of the GXSW Software

Before installing the board, it is recommended that you install the GXSW software as described in this section. To install the GXSW software, follow the instruction described below:

1. Insert the Marvin Test Solutions CD-ROM and locate the **GXSW.EXE** setup program. If your computer's Auto Run is configured, when inserting the CD, a browser will show several options. Select the Marvin Test Solutions Files option, then locate the setup file. If Auto Run is not configured, you can open the Windows explorer and locate the setup files (usually located under \Files\Setup folder). You can also download the file from Marvin Test Solutions' web site (www.marvintest.com).
2. Run the GXSW setup and follow the instruction on the Setup screen to install the GXSW driver.

Note: When installing under Windows, you may be required to restart the setup after logging-in as a user with Administrator privileges. This is required in-order to upgrade your system with newer Windows components and to install kernel-mode device drivers (HW driver) which are required by the GXSW driver to access resources on your board.

3. The first setup screen to appear is the Welcome screen. Click **Next** to continue.
4. Enter the folder where GXSW is to be installed. Either click Browse to set up a new folder, or click Next to accept the default entry. The default entry for 32 bit machines is **C:\Program Files\Marvin Test Solutions\GXSW**, and for 64 bit Windows **C:\Program Files (x86)\Marvin Test Solutions\GXSW**.
5. Select the type of Setup you wish and click **Next**. You can choose between **Typical**, **Run-Time** and **Custom** setups types. The **Typical** setup type installs all files. **Run-Time** setup type will install only the files required for controlling the board either from its driver or from its virtual panel. The **Custom** setup type lets you select from the available components.

The program will now start its installation. During the installation, Setup may upgrade some of the Windows shared components and files. The Setup may ask you to reboot after completion if some of the components it replaced were used by another application during the installation – do so before attempting to use the software.

You can now continue with the installation to install the board. After the board installation is complete you can test your installation by starting a panel program that lets you control the board interactively. The panel program can be started by selecting it from the Start, Programs, GXSW menu located in the Windows Taskbar.

Setup Maintenance Program

You can run the Setup again after GXSW has been installed from the original disk or from the Windows Control Panel – Add Remove Programs applet. Setup will be in the Maintenance mode when running for the second time. The Maintenance window show below allows you to modify the current GXSW installation. The following options are available in Maintenance mode:

- **Modify.** When you want to add, or remove GXSW components.
- **Repair.** When you have corrupted files and need to reinstall.
- **Remove.** When you want to completely remove GXSW.

Select one of the options and click **Next** and follow the instruction on the screen until Setup is complete.

Overview of the GXSW Software

Once the software is installed, the following tools and software components are available:

- **GXSW Panel** – Configures and controls the GX7016 Switching Subsystem's various features via an interactive user interface.
- **GXSW driver** - A DLL based function library (GXSW.DLL (32 bit) or GXSW64.DLL (64 bit), located in the Windows System folder) used to program and control the board.
- **Programming files and examples** – Interface files and libraries for support of various programming tools such as C#, C++, VB, VB6, LabVIEW. A complete list of files and development tools supported by the driver is included in subsequent sections of this manual.
- **Documentation** – On-Line help and User's Guide for the Switching Subsystem, GXSW driver and panel.
- **HW driver and PXI/PCI Explorer applet** – HW driver allows the GXSW driver to access and program the supported boards. The explorer applet configures the PXI chassis, controllers and devices. This is required for accurate identification of your PXI instruments later on when installed in your system. The applet configuration is saved to PXISYS.ini and PXIE SYS.ini and is used by Marvin Test Solutions instruments HW driver and VISA. The applet can be used to assign chassis numbers, Legacy Slot numbers and instrument alias names. The HW driver is installed and shared with all Marvin Test Solutions products to support accessing the PC resources. Similar to HW driver, VISA provides a standard way for instrument manufacturers and users to write and use instruments drivers. VISA is a standard maintained by the VXI Plug & Play System Alliance and the PXI Systems Alliance organizations (<http://www.ivifoundation.org>, <http://www.pxisa.org/>). The VISA resource manager such as National Instruments **Measurement & Automation** (NI-MAX) displays and configures instruments and their address (similar to Marvin Test Solutions' PXI/PCI Explorer). The GXSW driver can work with either HW or VISA to control an access the supported boards.

In addition to the GXSW software components, this manual also described the **SwitchEasy** software that is based on the GXSW driver and provides a rule-based, pin mapping and higher level access to the switching subsystem. SwitchEasy software is described later in this manual.

Installation Folders

The GX6256/GX6192/GX6864 driver files are installed in the default folder **C:\Program Files\Marvin Test Solutions\GXSW**, or on 64 bit machines they are installed in the default folder **C:\Program Files (x86)\Marvin Test Solutions\GXSW**. You can change the default GXSW folder to one of your choosing at the time of installation.

During the installation, GXSW Setup creates and copies files to the following folders:

Name	Purpose / Contents
...\Marvin Test Solutions\GXSW	The GXSW folder. Contains panel programs, programming libraries, interface files and examples, on-line help files and other documentation.
...\Marvin Test Solutions\HW	HW device driver. Provide access to your board hardware resources such as memory, IO ports and PCI board configuration. See the README.TXT located in this directory for more information.
...\ATEasy\Drivers	ATEasy drivers folder. GXSW Driver and example are copied to this directory only if ATEasy is installed to your machine.
...\Windows\System32, or ...\Windows\SysWOW64 when running 64 bit Windows	Windows System directory. Contains the GXSW DLL driver, HW driver shared files and some upgraded system components, such as the HTML help viewer, etc.

Configuring Your PXI System using the PXI/PCI Explorer

To configure your PXI/PCI system using the **PXI/PCI Explorer** applet follow these steps:

1. **Start the PXI/PCI Explorer applet.** The applet can be start from the Windows Control Panel or from the Windows Start Menu, **Marvin Test Solutions, HW, PXI/PCI Explorer**.
2. **Identify Chassis and Controllers.** After the PXI/PCI Explorer is started, it will scan your system for changes and will display the current configuration. The PXI/PCI Explorer automatically detects systems that have Marvin Test Solutions controllers and chassis. In addition, the applet detects PXI-MXI-3/4 extenders in your system (manufactured by National Instruments). If your chassis is not shown in the explorer main window, use the Identify Chassis/Controller commands to identify your system. Chassis and Controller manufacturers should provide INI and driver files for their chassis and controllers which are used by these commands.
3. **Change chassis numbers, PXI devices Legacy Slot numbering and PXI devices Alias names.** These are optional steps and can be performed if you would like your chassis to have different numbers. Legacy slots numbers are used by older Marvin Test Solutions or VISA drivers. Alias names can provide a way to address a PXI device using a logical name (e.g. "DMM1"). For more information regarding slot numbers and alias names, see the **Gx6256Initialize** and **Gx6256InitializeVisa** functions.
4. **Save your work.** PXI Explorer saves the configuration to the following files located in the Windows folder: PXISYS.ini, PXIeSYS.ini and GxPxiSys.ini. Click on the **Save** button to save your changes. The PXI/Explorer will prompt you to save the changes if changes were made or detected (an asterisk sign ' * ' in the caption indicated changes).

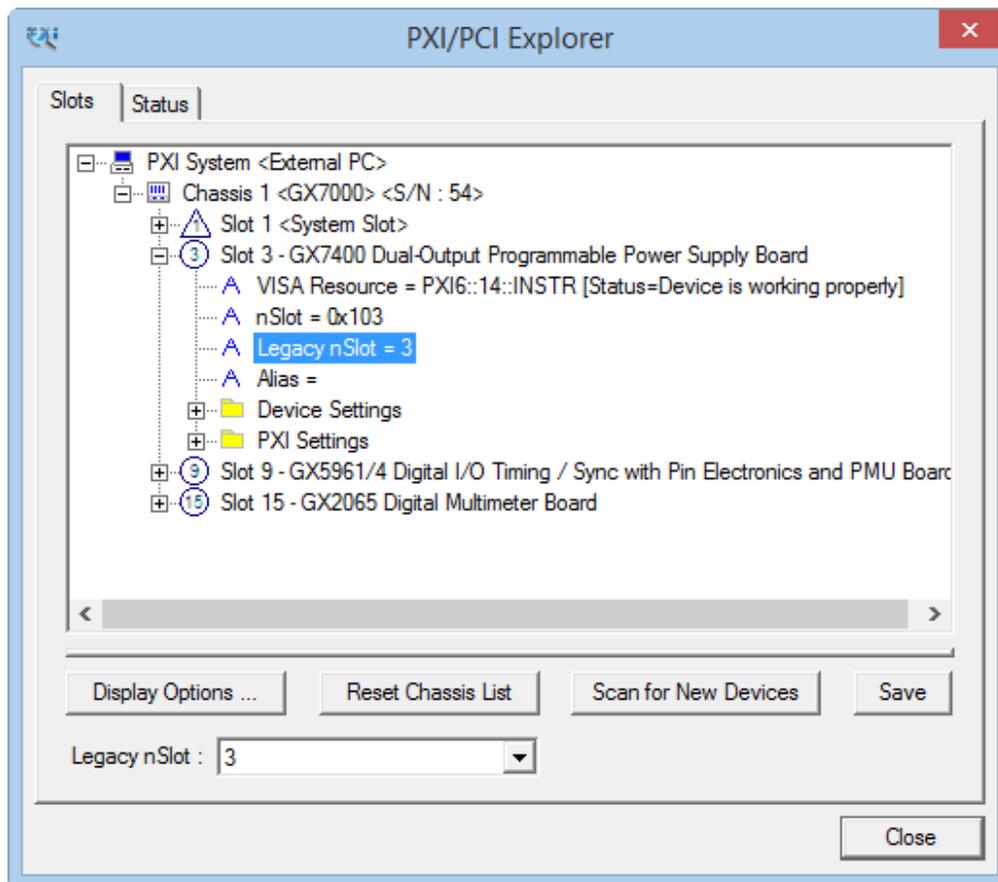


Figure 3-1: PXI/PCI Explorer

Board Installation

Before you Begin

- Install the GXSW driver as described in the prior section.
- Configure your PXI/PC system using **PXI/PCI Explorer** as described in the prior section.
- Verify that all the components listed in the packing list (see previous section in this chapter) are present.

Electric Static Discharge (ESD) Precautions

To reduce the risk of damage to the GX6256 board, the following precautions should be observed:

- Leave the board in the anti-static bags until installation requires removal. The anti-static bag protects the board from harmful static electricity.
- Save the anti-static bag in case the board is removed from the computer in the future.
- Carefully unpack and install the board. Do not drop or handle the board roughly.
- Handle the board by the edges. Avoid contact with any components on the circuit board.



Caution – Do not insert or remove any board while the computer is on. Turn off the power from the PXI chassis before installation.

Installing a PXI Board

Install the board as follows:

1. Install first the GXSW Driver as described in the next section.
2. Turn off the PXI chassis and unplug the power cord.
3. Locate a PXI empty slot on the PXI chassis.
4. Place the module edges into the PXI chassis rails (top and bottom).
5. Carefully slide the PXI board to the rear of the chassis, make sure that the ejector handles are pushed **out** (as shown in Figure 3-2).

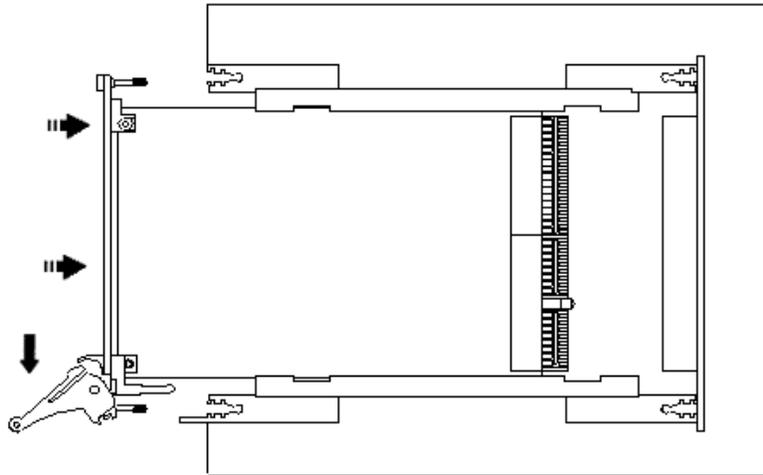


Figure 3-2: Ejector handles position during module insertion

6. After you feel resistance, push in the ejector handles as shown in Figure 3-3 to secure the module into the frame.

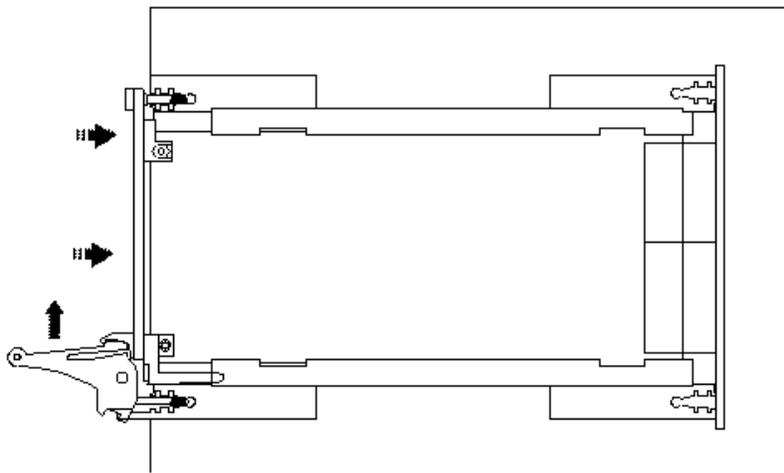


Figure 3-3: Ejector handles position after module insertion

7. Tighten the module's front panel to the chassis to secure the module in.
8. Connect any necessary cables to the board.
9. Plug the power cord in and turn on the PXI chassis.

Plug & Play Driver Installation

Plug & Play operating systems such as Windows notifies the user that a new board was found using the **New Hardware Found** wizard after restarting the system with the new board.

If another Marvin Test Solutions board software package was already installed, Windows will suggest using the driver information file: HW.INF. The file is located in your Program Files\Marvin Test Solutions\HW folder. Click **Next** to confirm and follow the instructions on the screen to complete the driver installation.

If the operating system was unable to find the driver (since the GXSW driver was not installed prior to the board installation), you may install the GXSW driver as described in the prior section, then click on the **Have Disk** button and browse to select the HW.INF file located in **C:\Program File\Marvin Test Solutions\HW**. On 64 bit systems the HW.INF file is located in **C:\Program File (x86)\Marvin Test Solutions\HW**.

If you are unable to locate the driver click **Cancel** to the found New Hardware wizard and exit the New Hardware Found Wizard, install the GXSW driver, reboot your computer and repeat this procedure.

The Windows Device Manager (open from the System applet from the Windows Control Panel) must display the proper board name before continuing to use the board software (no Yellow warning icon shown next to device). If the device is displayed with an error, you can select it and press delete and then press F5 to rescan the system again and to start the New Hardware Found wizard.

Removing a Board

Remove the board as follows:

1. Turn off the PXI chassis and unplug the power cord.
2. Locate a PXI slot on the PXI chassis.
3. Disconnect and remove any cables/connectors connected to the board.
4. Un-tighten the module's front panel screws to the chassis.
5. Push out the ejector handles and slide the PXI board away from the chassis.
6. Optionally – uninstall the GXSW driver.

Connectors and Jumpers

GX6256

Figure 3-4 shows the GX6256 board connectors and jumpers followed by their description:



Figure 3-4: GX6256 Connectors and Jumpers

J2 – Front Connector: Mac-Panel DAK connector (200 pin).

J3 – Front Connector: Mac-Panel DAK connector (200 pin).

J7 – Instrument Connector: Shrouded right angle IDC header (34 pin).

JP1 – Chassis Ground Jumper: Connects chassis to power ground

GX6192

Figure 3-5 shows the GX6192 board connectors and jumpers followed by their description:

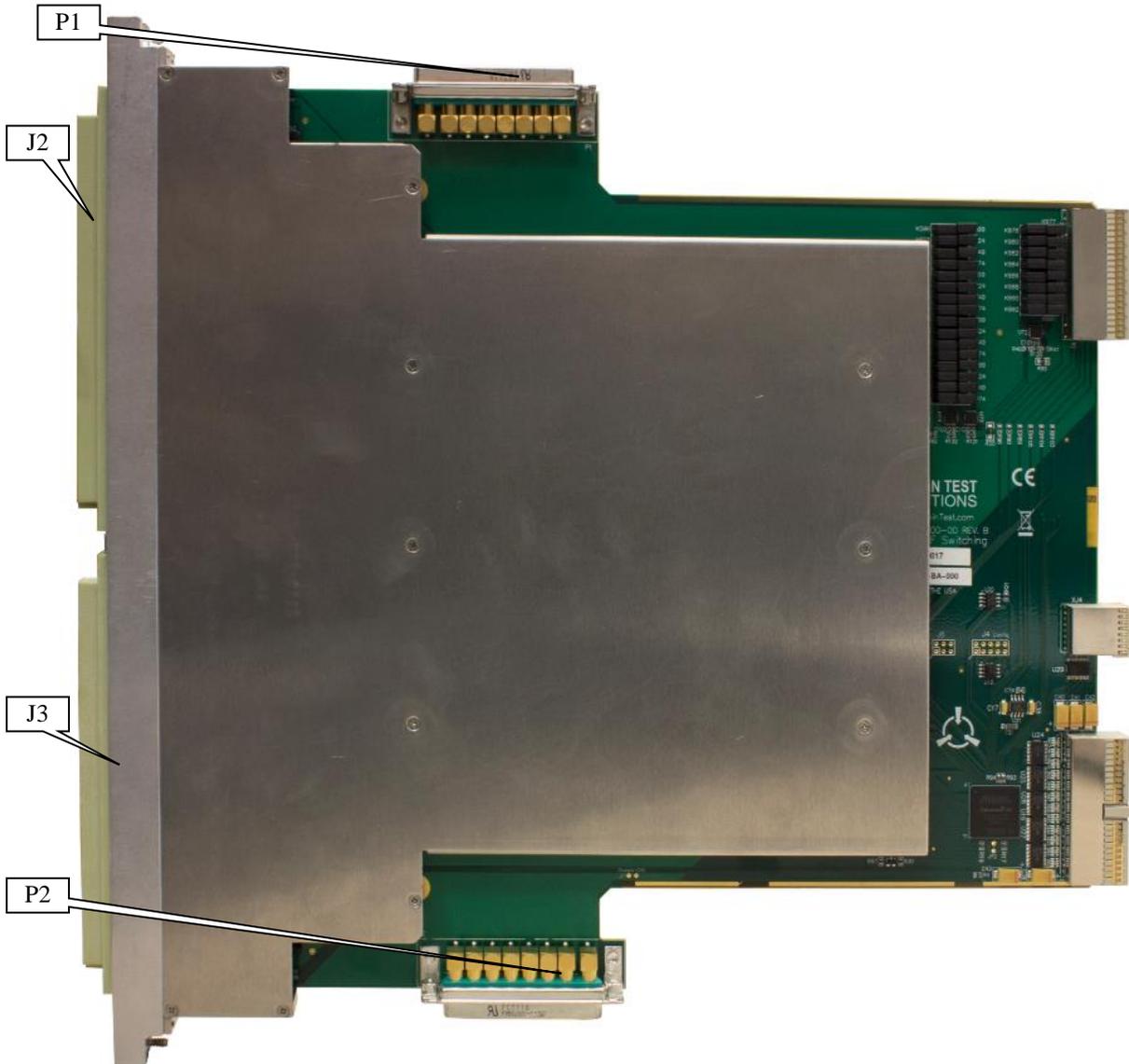


Figure 3-5: GX6192 Connectors and Jumpers

J2 – Front Connector: Mac-Panel DAK connector (200 pin).

J3 – Front Connector: Mac-Panel DAK connector (200 pin).

P1 – Analog Input Connector: BNC (8 pin).

P2 – Analog Input Connector: BNC (8 pin).

GX6864

Figure 3-5 shows the GX6864 board connectors and jumpers followed by their description:



Figure 3-6: GX6864 Connectors and Jumpers

J2 – Front Connector: Mac-Panel DAK connector (32 pin).

J3 – Front Connector: Mac-Panel DAK connector (32 pin).

P1 – Input Connector: BNC (8 pin).

Connectors and Accessories

GX6256



Figure 3-7: GX6256 front Connectors

GX6192

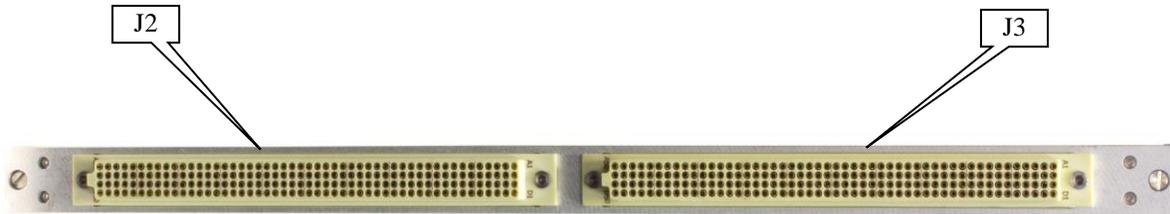


Figure 3-8: GX6192 front Connectors

GX6864



Figure 3-9: GX6864 front Connectors

GX6256 J2 Connector

The following table describes the J2 (200 pin) connector's pin out:

Pin	Column A	Column B	Column C	Column D
1	UUT GND	UUT GND	UUT GND	UUT GND
2	Group A Channel 1	Group B Channel 1	Group C Channel 1	Group D Channel 1
3	Group A Channel 2	Group B Channel 2	Group C Channel 2	Group D Channel 2
4	Group A Channel 3	Group B Channel 3	Group C Channel 3	Group D Channel 3
5	Group A Channel 4	Group B Channel 4	Group C Channel 4	Group D Channel 4
6	UUT GND	UUT GND	UUT GND	UUT GND
7	UUT GND	UUT GND	UUT GND	UUT GND
8	Group A Channel 5	Group B Channel 5	Group C Channel 5	Group D Channel 5
9	Group A Channel 6	Group B Channel 6	Group C Channel 6	Group D Channel 6
10	Group A Channel 7	Group B Channel 7	Group C Channel 7	Group D Channel 7
11	Group A Channel 8	Group B Channel 8	Group C Channel 8	Group D Channel 8
12	UUT GND	UUT GND	UUT GND	UUT GND
13	UUT GND	UUT GND	UUT GND	UUT GND
14	Group A Channel 9	Group B Channel 9	Group C Channel 9	Group D Channel 9
15	Group A Channel 10	Group B Channel 10	Group C Channel 10	Group D Channel 10
16	Group A Channel 11	Group B Channel 11	Group C Channel 11	Group D Channel 11
17	Group A Channel 12	Group B Channel 12	Group C Channel 12	Group D Channel 12
18	UUT GND	UUT GND	UUT GND	UUT GND
19	UUT GND	UUT GND	UUT GND	UUT GND
20	Group A Channel 13	Group B Channel 13	Group C Channel 13	Group D Channel 13
21	Group A Channel 14	Group B Channel 14	Group C Channel 14	Group D Channel 14
22	Group A Channel 15	Group B Channel 15	Group C Channel 15	Group D Channel 15
23	Group A Channel 16	Group B Channel 16	Group C Channel 16	Group D Channel 16
24	UUT GND	UUT GND	UUT GND	UUT GND
25	I/O0	I/O0	I/O0	I/O0
26	CHASSIS	CHASSIS	CHASSIS	CHASSIS
27	UUT GND	UUT GND	UUT GND	UUT GND
28	Group E Channel 1	Group F Channel 1	Group G Channel 1	Group H Channel 1
29	Group E Channel 2	Group F Channel 2	Group G Channel 2	Group H Channel 2
30	Group E Channel 3	Group F Channel 3	Group G Channel 3	Group H Channel 3
31	Group E Channel 4	Group F Channel 4	Group G Channel 4	Group H Channel 4
32	UUT GND	UUT GND	UUT GND	UUT GND
33	UUT GND	UUT GND	UUT GND	UUT GND

34	Group E Channel 5	Group F Channel 5	Group G Channel 5	Group H Channel 5
35	Group E Channel 6	Group F Channel 6	Group G Channel 6	Group H Channel 6
36	Group E Channel 7	Group F Channel 7	Group G Channel 7	Group H Channel 7
37	Group E Channel 8	Group F Channel 8	Group G Channel 8	Group H Channel 8
38	UUT GND	UUT GND	UUT GND	UUT GND
39	UUT GND	UUT GND	UUT GND	UUT GND
40	Group E Channel 9	Group F Channel 9	Group G Channel 9	Group H Channel 9
41	Group E Channel 10	Group F Channel 10	Group G Channel 10	Group H Channel 10
42	Group E Channel 11	Group F Channel 11	Group G Channel 11	Group H Channel 11
43	Group E Channel 12	Group F Channel 12	Group G Channel 12	Group H Channel 12
44	UUT GND	UUT GND	UUT GND	UUT GND
45	UUT GND	UUT GND	UUT GND	UUT GND
46	Group E Channel 13	Group F Channel 13	Group G Channel 13	Group H Channel 13
47	Group E Channel 14	Group F Channel 14	Group G Channel 14	Group H Channel 14
48	Group E Channel 15	Group F Channel 15	Group G Channel 15	Group H Channel 15
49	Group E Channel 16	Group F Channel 16	Group G Channel 16	Group H Channel 16
50	UUT GND	UUT GND	UUT GND	UUT GND

Table 3-1: GX6256 Connector J2

The following table describes the signals mentioned in Table 3-1:

Signal name	Comments
Group X Channel Y	Mux Group channels for group A through H
UUT GND	Unit Under Test ground. This ground is isolated from power ground and chassis.
I/O X	PIO (Static general purpose I/O) pins 0 to 3

GX6256 J3 Connector

The following table describes the J3 (200 pin) connector's pin out:

Pin	Column A	Column B	Column C	Column D
1	UUT GND	UUT GND	UUT GND	UUT GND
2	Group I Channel 1	Group J Channel 1	Group K Channel 1	Group L Channel 1
3	Group I Channel 2	Group J Channel 2	Group K Channel 2	Group L Channel 2
4	Group I Channel 3	Group J Channel 3	Group K Channel 3	Group L Channel 3
5	Group I Channel 4	Group J Channel 4	Group K Channel 4	Group L Channel 4
6	UUT GND	UUT GND	UUT GND	UUT GND
7	UUT GND	UUT GND	UUT GND	UUT GND
8	Group I Channel 5	Group J Channel 5	Group K Channel 5	Group L Channel 5
9	Group I Channel 6	Group J Channel 6	Group K Channel 6	Group L Channel 6
10	Group I Channel 7	Group J Channel 7	Group K Channel 7	Group L Channel 7
11	Group I Channel 8	Group J Channel 8	Group K Channel 8	Group L Channel 8
12	UUT GND	UUT GND	UUT GND	UUT GND
13	UUT GND	UUT GND	UUT GND	UUT GND
14	Group I Channel 9	Group J Channel 9	Group K Channel 9	Group L Channel 9
15	Group I Channel 10	Group J Channel 10	Group K Channel 10	Group L Channel 10
16	Group I Channel 11	Group J Channel 11	Group K Channel 11	Group L Channel 11
17	Group I Channel 12	Group J Channel 12	Group K Channel 12	Group L Channel 12
18	UUT GND	UUT GND	UUT GND	UUT GND
19	UUT GND	UUT GND	UUT GND	UUT GND
20	Group I Channel 13	Group J Channel 13	Group K Channel 13	Group L Channel 13
21	Group I Channel 14	Group J Channel 14	Group K Channel 14	Group L Channel 14
22	Group I Channel 15	Group J Channel 15	Group K Channel 15	Group L Channel 15
23	Group I Channel 16	Group J Channel 16	Group K Channel 16	Group L Channel 16
24	UUT GND	UUT GND	UUT GND	UUT GND
25	I/O0	I/O0	I/O0	I/O0
26	CHASSIS	CHASSIS	CHASSIS	CHASSIS
27	UUT GND	UUT GND	UUT GND	UUT GND
28	Group M Channel 1	Group N Channel 1	Group O Channel 1	Group P Channel 1
29	Group M Channel 2	Group N Channel 2	Group O Channel 2	Group P Channel 2
30	Group M Channel 3	Group N Channel 3	Group O Channel 3	Group P Channel 3
31	Group M Channel 4	Group N Channel 4	Group O Channel 4	Group P Channel 4
32	UUT GND	UUT GND	UUT GND	UUT GND
33	UUT GND	UUT GND	UUT GND	UUT GND

34	Group M Channel 5	Group N Channel 5	Group O Channel 5	Group P Channel 5
35	Group M Channel 6	Group N Channel 6	Group O Channel 6	Group P Channel 6
36	Group M Channel 7	Group N Channel 7	Group O Channel 7	Group P Channel 7
37	Group M Channel 8	Group N Channel 8	Group O Channel 8	Group P Channel 8
38	UUT GND	UUT GND	UUT GND	UUT GND
39	UUT GND	UUT GND	UUT GND	UUT GND
40	Group M Channel 9	Group N Channel 9	Group O Channel 9	Group P Channel 9
41	Group M Channel 10	Group N Channel 10	Group O Channel 10	Group P Channel 10
42	Group M Channel 11	Group N Channel 11	Group O Channel 11	Group P Channel 11
43	Group M Channel 12	Group N Channel 12	Group O Channel 12	Group P Channel 12
44	UUT GND	UUT GND	UUT GND	UUT GND
45	UUT GND	UUT GND	UUT GND	UUT GND
46	Group M Channel 13	Group N Channel 13	Group O Channel 13	Group P Channel 13
47	Group M Channel 14	Group N Channel 14	Group O Channel 14	Group P Channel 14
48	Group M Channel 15	Group N Channel 15	Group O Channel 15	Group P Channel 15
49	Group M Channel 16	Group N Channel 16	Group O Channel 16	Group P Channel 16
50	UUT GND	UUT GND	UUT GND	UUT GND

Table 3-2: GX6256 Connector J3

The following table describes the signals mentioned in Table 3-2:

Signal name	Comments
Group X Channel Y	Mux Group channels for group I through P
UUT GND	Unit Under Test ground. This ground is isolated from power ground and chassis.
I/O X	PIO (Static general purpose I/O) pins 4 to 7

GX6256 J7 Connector

Pin	Function	Pin	Function
1	Din1	2	UUT GND
3	Din2	4	UUT GND
5	Din3	6	UUT GND
7	Din4	8	UUT GND
9	Din5	10	UUT GND
11	Din6	12	UUT GND
13	Din7	14	UUT GND
15	Din8	16	UUT GND
17	Din9	18	UUT GND
19	Din10	20	UUT GND
21	Din11	22	UUT GND
23	Din12	24	UUT GND
25	Din13	26	UUT GND
27	Din14	28	UUT GND
29	Din15	30	UUT GND
31	Din16	32	UUT GND
33	NC	34	DUTGND

Table 3-3: GX6256 Connector J7

GX6192 J2 Connector

The following table describes the J2 (200 pin) connector's pin out:

Pin	Column A	Column B	Column C	Column D
1	Group A Channel 1	UUT GND	Group C Channel 1	UUT GND
2	UUT GND	Group B Channel 1	UUT GND	Group D Channel 1
3	Group A Channel 2	UUT GND	Group C Channel 2	UUT GND
4	UUT GND	Group B Channel 2	UUT GND	Group D Channel 2
5	Group A Channel 3	UUT GND	Group C Channel 3	UUT GND
6	UUT GND	Group B Channel 3	UUT GND	Group D Channel 3
7	Group A Channel 4	UUT GND	Group C Channel 4	UUT GND
8	UUT GND	Group B Channel 4	UUT GND	Group D Channel 4
9	Group A Channel 5	UUT GND	Group C Channel 5	UUT GND
10	UUT GND	Group B Channel 5	UUT GND	Group D Channel 5
11	Group A Channel 6	UUT GND	Group C Channel 6	UUT GND
12	UUT GND	Group B Channel 6	UUT GND	Group D Channel 6
13	Group A Channel 7	UUT GND	Group C Channel 7	UUT GND
14	UUT GND	Group B Channel 7	UUT GND	Group D Channel 7
15	Group A Channel 8	UUT GND	Group C Channel 8	UUT GND
16	UUT GND	Group B Channel 8	UUT GND	Group D Channel 8
17	Group A Channel 9	UUT GND	Group C Channel 9	UUT GND
18	UUT GND	Group B Channel 9	UUT GND	Group D Channel 9
19	Group A Channel 10	UUT GND	Group C Channel 10	UUT GND
20	UUT GND	Group B Channel 10	UUT GND	Group D Channel 10
21	Group A Channel 11	UUT GND	Group C Channel 11	UUT GND
22	UUT GND	Group B Channel 11	UUT GND	Group D Channel 11
23	Group A Channel 12	UUT GND	Group C Channel 12	UUT GND
24	UUT GND	Group B Channel 12	UUT GND	Group D Channel 12
25	I/O0	I/O1	I/O2	I/O3
26	CHASSIS	CHASSIS	CHASSIS	CHASSIS
27	Group E Channel 1	UUT GND	Group G Channel 1	UUT GND
28	UUT GND	Group F Channel 1	UUT GND	Group H Channel 1
29	Group E Channel 2	UUT GND	Group G Channel 2	UUT GND
30	UUT GND	Group F Channel 2	UUT GND	Group H Channel 2
31	Group E Channel 3	UUT GND	Group G Channel 3	UUT GND
32	UUT GND	Group F Channel 3	UUT GND	Group H Channel 3
33	Group E Channel 4	UUT GND	Group G Channel 4	UUT GND

34	UUT GND	Group F Channel 4	UUT GND	Group H Channel 4
35	Group E Channel 5	UUT GND	Group G Channel 5	UUT GND
36	UUT GND	Group F Channel 5	UUT GND	Group H Channel 5
37	Group E Channel 6	UUT GND	Group G Channel 6	UUT GND
38	UUT GND	Group F Channel 6	UUT GND	Group H Channel 6
39	Group E Channel 7	UUT GND	Group G Channel 7	UUT GND
40	UUT GND	Group F Channel 7	UUT GND	Group H Channel 7
41	Group E Channel 8	UUT GND	Group G Channel 8	UUT GND
42	UUT GND	Group F Channel 8	UUT GND	Group H Channel 8
43	Group E Channel 9	UUT GND	Group G Channel 9	UUT GND
44	UUT GND	Group F Channel 9	UUT GND	Group H Channel 9
45	Group E Channel 10	UUT GND	Group G Channel 10	UUT GND
46	UUT GND	Group F Channel 10	UUT GND	Group H Channel 10
47	Group E Channel 11	UUT GND	Group G Channel 11	UUT GND
48	UUT GND	Group F Channel 11	UUT GND	Group H Channel 11
49	Group E Channel 12	UUT GND	Group G Channel 12	UUT GND
50	UUT GND	Group F Channel 12	UUT GND	Group H Channel 12

Table 3-4: GX6192 Connector J2

The following table describes the signals mentioned in Table 3-4:

Signal name	Comments
Group X Channel Y	Mux Group channels for group A through H
UUT GND	Unit Under Test ground. This ground is isolated from power ground and chassis.
I/O X	PIO (Static general purpose I/O) pins 0 to 3

GX6192 J3 Connector

The following table describes the J3 (200 pin) connector's pin out:

Pin	Column A	Column B	Column C	Column D
1	Group I Channel 1	UUT GND	Group K Channel 1	UUT GND
2	UUT GND	Group J Channel 1	UUT GND	Group L Channel 1
3	Group I Channel 2	UUT GND	Group K Channel 2	UUT GND
4	UUT GND	Group J Channel 2	UUT GND	Group L Channel 2
5	Group I Channel 3	UUT GND	Group K Channel 3	UUT GND
6	UUT GND	Group J Channel 3	UUT GND	Group L Channel 3
7	Group I Channel 4	UUT GND	Group K Channel 4	UUT GND
8	UUT GND	Group J Channel 4	UUT GND	Group L Channel 4
9	Group I Channel 5	UUT GND	Group K Channel 5	UUT GND
10	UUT GND	Group J Channel 5	UUT GND	Group L Channel 5
11	Group I Channel 6	UUT GND	Group K Channel 6	UUT GND
12	UUT GND	Group J Channel 6	UUT GND	Group L Channel 6
13	Group I Channel 7	UUT GND	Group K Channel 7	UUT GND
14	UUT GND	Group J Channel 7	UUT GND	Group L Channel 7
15	Group I Channel 8	UUT GND	Group K Channel 8	UUT GND
16	UUT GND	Group J Channel 8	UUT GND	Group L Channel 8
17	Group I Channel 9	UUT GND	Group K Channel 9	UUT GND
18	UUT GND	Group J Channel 9	UUT GND	Group L Channel 9
19	Group I Channel 10	UUT GND	Group K Channel 10	UUT GND
20	UUT GND	Group J Channel 10	UUT GND	Group L Channel 10
21	Group I Channel 11	UUT GND	Group K Channel 11	UUT GND
22	UUT GND	Group J Channel 11	UUT GND	Group L Channel 11
23	Group I Channel 12	UUT GND	Group K Channel 12	UUT GND
24	UUT GND	Group J Channel 12	UUT GND	Group L Channel 12
25	I/O0	I/O0	I/O0	I/O0
26	CHASSIS	CHASSIS	CHASSIS	CHASSIS
27	Group M Channel 1	UUT GND	Group O Channel 1	UUT GND
28	UUT GND	Group N Channel 1	UUT GND	Group P Channel 1
29	Group M Channel 2	UUT GND	Group O Channel 2	UUT GND
30	UUT GND	Group N Channel 2	UUT GND	Group P Channel 2
31	Group M Channel 3	UUT GND	Group O Channel 3	UUT GND
32	UUT GND	Group N Channel 3	UUT GND	Group P Channel 3

33	Group M Channel 4	UUT GND	Group O Channel 4	UUT GND
34	UUT GND	Group N Channel 4	UUT GND	Group P Channel 4
35	Group M Channel 5	UUT GND	Group O Channel 5	UUT GND
36	UUT GND	Group N Channel 5	UUT GND	Group P Channel 5
37	Group M Channel 6	UUT GND	Group O Channel 6	UUT GND
38	UUT GND	Group N Channel 6	UUT GND	Group P Channel 6
39	Group M Channel 7	UUT GND	Group O Channel 7	UUT GND
40	UUT GND	Group N Channel 7	UUT GND	Group P Channel 7
41	Group M Channel 8	UUT GND	Group O Channel 8	UUT GND
42	UUT GND	Group N Channel 8	UUT GND	Group P Channel 8
43	Group M Channel 9	UUT GND	Group O Channel 9	UUT GND
44	UUT GND	Group N Channel 9	UUT GND	Group P Channel 9
45	Group M Channel 10	UUT GND	Group O Channel 10	UUT GND
46	UUT GND	Group N Channel 10	UUT GND	Group P Channel 10
47	Group M Channel 11	UUT GND	Group O Channel 11	UUT GND
48	UUT GND	Group N Channel 11	UUT GND	Group P Channel 11
49	Group M Channel 12	UUT GND	Group O Channel 12	UUT GND
50	UUT GND	Group N Channel 12	UUT GND	Group P Channel 12

Table 3-5: GX6192 Connector J3

The following table describes the signals mentioned in Table 3-5:

Signal name	Comments
Group X Channel Y	Mux Group channels for group I through P
UUT GND	Unit Under Test ground. This ground is isolated from power ground and chassis.
I/O X	PIO (Static general purpose I/O) pins 4 to 7

GX6192 P1 Connector

The following table describes the P1 Analog Input (8 pin) connector's pin out:

Pin	Function	Pin	Function
1	Analog Input 15	2	Analog Input 13
3	Analog Input 11	4	Analog Input 9
5	Analog Input 7	6	Analog Input 5
7	Analog Input 3	8	Analog Input 1

Table 3-6: GX6192 Connector P1

GX6192 P2 Connector

The following table describes the P2 Analog Input (8 pin) connector's pin out:

Pin	Function	Pin	Function
1	Analog Input 2	2	Analog Input 4
3	Analog Input 6	4	Analog Input 8
5	Analog Input 10	6	Analog Input 12
7	Analog Input 14	8	Analog Input 16

Table 3-7: GX6192 Connector P2

GX6864 J2 Connector

The following table describes the J2 (32 pin) connector's pin out:

Pin	Signal	Pin	Signal
1	Group A Channel 1	17	Group B Channel 1
2	Group A Channel 2	18	Group B Channel 2
3	Group A Channel 3	19	Group B Channel 3
4	Group A Channel 4	20	Group B Channel 4
5	Group A Channel 5	21	Group B Channel 5
6	Group A Channel 6	22	Group B Channel 6
7	Group A Channel 7	23	Group B Channel 7
8	Group A Channel 8	24	Group B Channel 8
9	Group A Channel 9	25	Group B Channel 9
10	Group A Channel 10	26	Group B Channel 10
11	Group A Channel 11	27	Group B Channel 11
12	Group A Channel 12	28	Group B Channel 12
13	Group A Channel 13	29	Group B Channel 13
14	Group A Channel 14	30	Group B Channel 14
15	Group A Channel 15	31	Group B Channel 15
16	Group A Channel 16	32	Group B Channel 16

Table 3-8: GX6864 Connector J2

The following table describes the signals mentioned in Table 3-8:

Signal name	Comments
Group X Channel Y	Mux Group channels for group A through B

GX6864 J3 Connector

The following table describes the J3 (32 pin) connector's pin out:

Pin	Signal	Pin	Signal
1	Group C Channel 1	17	Group D Channel 1
2	Group C Channel 2	18	Group D Channel 2
3	Group C Channel 3	19	Group D Channel 3
4	Group C Channel 4	20	Group D Channel 4
5	Group C Channel 5	21	Group D Channel 5
6	Group C Channel 6	22	Group D Channel 6
7	Group C Channel 7	23	Group D Channel 7
8	Group C Channel 8	24	Group D Channel 8
9	Group C Channel 9	25	Group D Channel 9
10	Group C Channel 10	26	Group D Channel 10
11	Group C Channel 11	27	Group D Channel 11
12	Group C Channel 12	28	Group D Channel 12
13	Group C Channel 13	29	Group D Channel 13
14	Group C Channel 14	30	Group D Channel 14
15	Group C Channel 15	31	Group D Channel 15
16	Group C Channel 16	32	Group D Channel 16

Table 3-9: GX6864 Connector J3

The following table describes the signals mentioned in Table 3-9:

Signal name	Comments
Group X Channel Y	Mux Group channels for group C through D

GX6864 P1 Connector

The following table describes the P1 Analog Input (8 pin) connector's pin out:

Pin	Function	Pin	Function
1	Mux Group D, Input 1	2	Mux Group D, Input 0
3	Mux Group C, Input 1	4	Mux Group C, Input 0
5	Mux Group B, Input 1	6	Mux Group B, Input 0
7	Mux Group A, Input 1	8	Mux Group A, Input 0

Table 3-10: GX6864 Connector P1

Chapter 4 - SwitchEasy Software

SwitchEasy is a software platform based on ATEasy that allows users to control and configure the GX7016 Switching Subsystem through an ATEasy driver commands providing pin-mapping, rule based switching and higher level operation of the GX7016 switching subsystem.

SwitchEasy Overview

SwitchEasy is an ATEasy software driver provided with the TS-323 test system (GENASYS) that controls the connections and disconnections of the UUT signals to and from the Test Station equipment. Signal path connections, can be automatically chosen by the program or routed per user preference, must comply with a predefined set of rules, and provides repeatable paths configurations. The program supports UUT pin (name or user supplied ID) to MacPanel pin mapping and includes panels to provide the user with additional switching path information.

SwitchEasy is unique to TS-323 and only supports TS-323 switching architecture and topologies. Support for other switching architectures is not planned at this time (although it may be added in the future).

The SwitchEasy software is not part of the GXSW software and is installed as part of the TS-323/GENASYS test system software.

SwitchEasy Panel

The SwitchEasy Panel is designed to work as a standalone application that displays the switching subsystem's current status. The panel lists the instrument pins, UUT pins, triggers, and busses that are currently in use by the subsystem.

Status Page

The Status page displays the current state of connections between instrument resources and pins (UUT/Mac panel). This page also shows the global bus resources that are being used to facilitate connections.

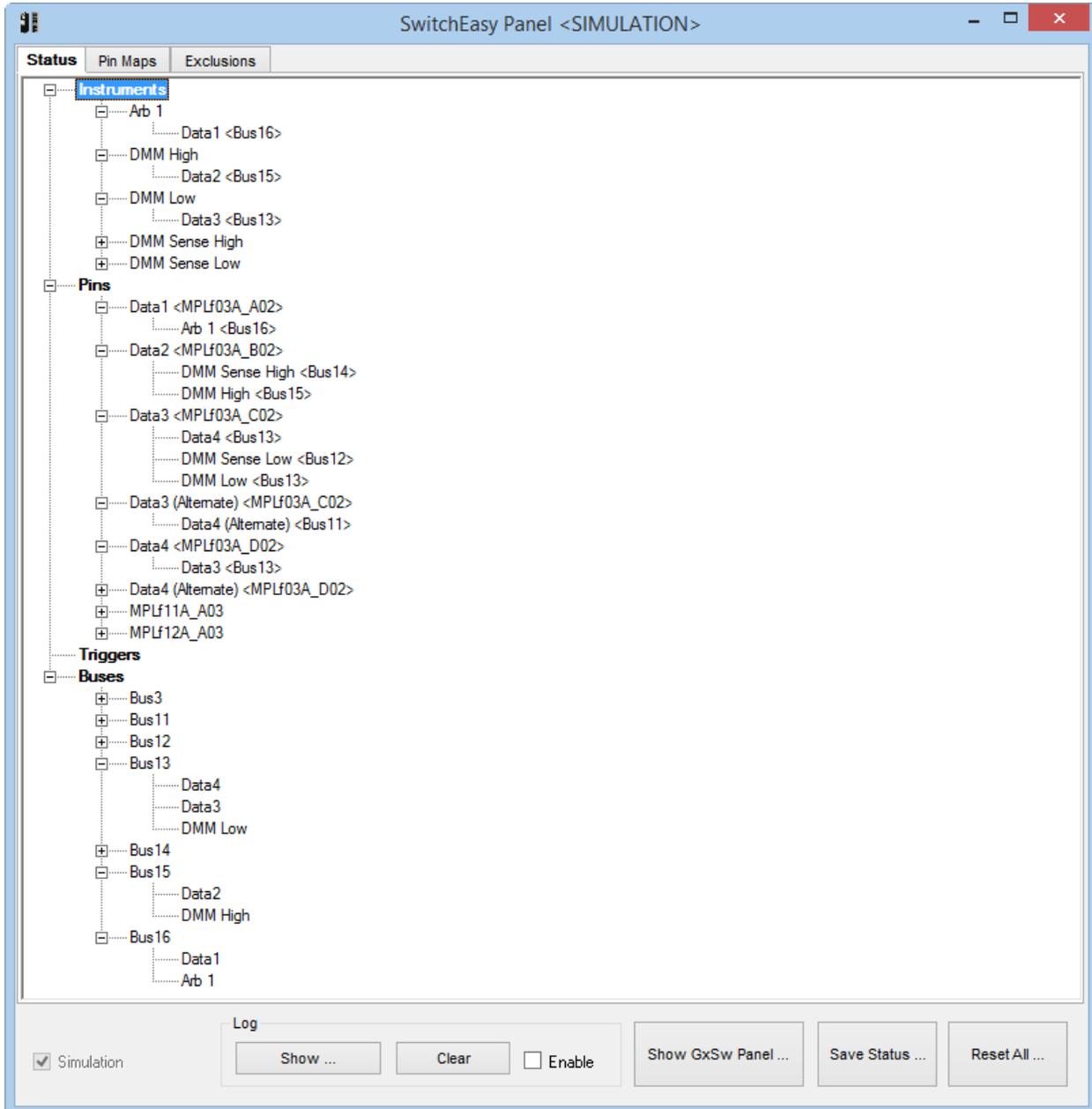


Figure 4-1: Switch Easy Panel Status Page

Status (Tree): The tree view shows currently made connections from the perspective of Instruments, Pins, Triggers, and Buses. The Instruments node expands to show what UUT/MacPanel pin are connected to each instrument resource. The Pins node expands to show what each UUT/MacPanel pin is connected to. For example, in Figure 4-1, under the Pins node, the Data1 pin is shown being connected to the Arb 1 instrument resource. The same information is mirrored under the Instruments node, where the Arb 1 instrument resource is shown connected to the Data 1 pin.

Log Group Box

Show... (Button): This button will launch the Windows event log which will show a log of Switch Easy events that have occurred.

Clear (Button): This button will clear Switch Easy events from the Windows event log.

Enable (Checkbox): This checkbox will enable or disable logging of Switch Easy events to the Windows event log.

Show GxSw Panel... (Button): This button will launch the GxSw low level panel.

Save Status... (Button): This button will save the connection state of Switch Easy to a file

Reset All... (Button): This button will reset all connections (disconnect everything).

Pin Maps Page

The Pins Maps page displays all pin mappings. The physical location of the pin (slot, tier, column, and row) are shown along with the mapped name.

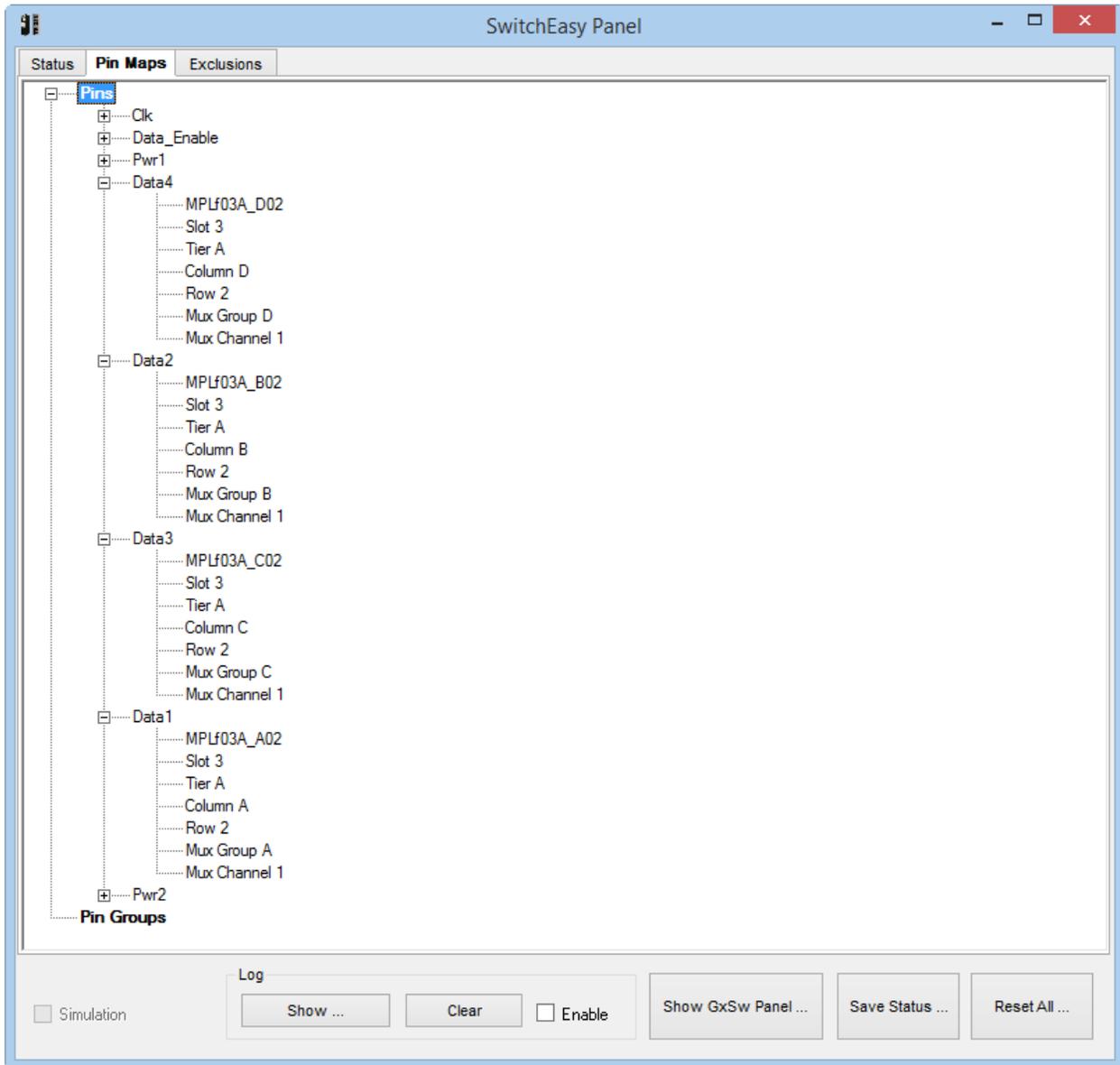


Figure 4-2: Switch Easy Panel Pin Maps Page

Pin Maps (Tree): The tree view shows currently mapped pins. Each mapped name node expands to show the physical location and description of the pin. For example, in Figure 4-2, the **Data 4** node is expanded to show its location at Slot 3, Tier A, Column D, and Row 2. Mux group (D) and Mux Channel (1) are also displayed to provide the user more information about the physical pin.

Exclusions Page

The Exclusions page allows the user to select which instrument resources, pins, or global bus resources will be excluded from making connections. Any attempt to connect with an excluded instrument, pin or global bus will result in a run-time error.

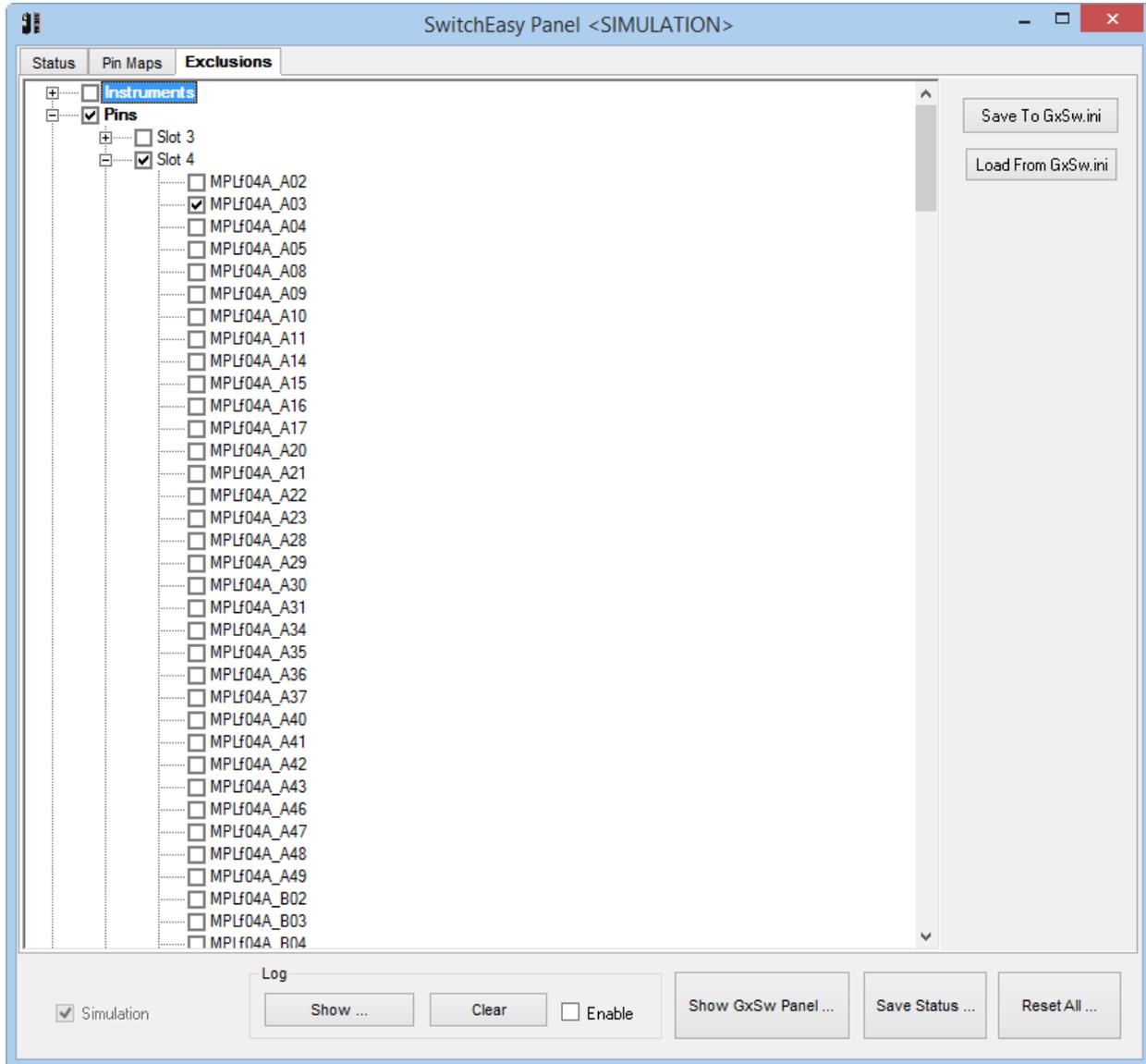


Figure 4-3: Switch Easy Panel Exclusions Page

Exclusions (Tree): The tree view shows all instruments, pins, triggers, and buses that are part of the switching subsystem. A marked checkbox indicates that the corresponding resource cannot be connected. For example, in Figure 4-3, the **MPLf04A_A02** pin has been checked. This indicates that this particular pin will not be allowed to make a connection to any instrument resource, pin, trigger, or bus.

Save To GxSw.ini (Button): This button allows the user to save the exclusion rules to the GxSw.ini file.

Load From GxSw.ini (Button): This button loads the previously saved exclusions rules from the GxSw.ini file to Switch Easy.

SwitchEasy Base Commands

The following is a list of the SwitchEasy base commands:

- Connect - These commands establish a connection between an instrument and a MacPanel pin
- Disconnect - These commands break a connection between an instrument and a MacPanel pin
- Reset - Force all relays to an open state
- Setup - Configures SwitchEasy (Instrument/Pin mapping, windows logging, trigger)
- Panel - Starts the SwitchEasy panel
- Utility - Configure and use the built-in test, interrupts, and the PIO

SwitchEasy Command Reference

Command	Description
<u>Connect/Disconnect</u>	
Connect Instrument Differential	Connects Differential Instrument to two Pins using optional bus and rules
Connect Instrument Instrument	Connects an Instrument to an Instrument
Connect Instrument MpPin	Connect Instrument Pin to MacPanel Pin
Connect Instrument Pin	Connect Instrument Pin to UUT Pin
Connect Pin Pin	Connect UUT Pin to UUT Pin
Connect Pin MpPin	Connect UUT Pin to MacPanel Pin
Connect MpPin MpPin	Connect MacPanel Pin to MacPanel Pin
Connect Trigger Instrument	Connect Trigger to Instrument
Connect Trigger MpPin	Connect Trigger to MacPanel pin
Connect Trigger Pin	Connect Trigger to UUT Pin
Connect Trigger Trigger	Connect Trigger to Trigger
Connect Digital Pin	Connect UUT Pin to digital line
Connect Digital MpPin	Connect MacPanel Pin to digital line
Disconnect Bus	Disconnect Bus from All, Instrument or Pin
Disconnect Digital Pin	Disconnect UUT Pin from digital line
Disconnect Digital MpPin	Disconnect MacPanel Pin from digital line
Disconnect Instrument Instrument	Disconnect Instrument from another instrument
Disconnect Instrument MpPin	Disconnect Instrument from MacPanel pin
Disconnect Instrument Pin	Disconnect Instrument from UUT pin
Disconnect MpPin MpPin	Disconnect MacPanel pin from another MacPanel pin
Disconnect Pin Pin	Disconnect UUT pin from another UUT pin
Disconnect Pin MpPin	Disconnect UUT Pin from MacPanel pin
Disconnect Trigger Instrument	Disconnect trigger from instrument

Command	Description
Disconnect Trigger MpPin	Disconnect Trigger from MacPanel pin
Disconnect Trigger Pin	Disconnect Trigger pin from UUT pin
Disconnect Trigger Trigger	Disconnect Trigger from Trigger
Reset All	Reset all boards (LF and HF) along with any RTMs and SRs.
<u>Setup</u>	
Setup Instrument Name	Set instrument name
Setup Instrument PreferredBus	Sets a preferred bus to be used in connecting to a particular instrument
Setup Instrument Map	Maps instrument to a specific input channel (located on the RTM for an LF board, or on the HF board itself) The instrument name is also set in this command.
Setup Log Clear	Clears the SwitchEasy Windows event log
Setup Log On	Turns the SwitchEasy Windows event logging on
Setup Log Off	Turns the SwitchEasy Windows event logging off
Setup Pin Group	Maps UUT pins to a UUT pin group
Setup Pin Map	Maps UUT pin to a specific MacPanel pin
Setup Pin Remove	Remove UUT or MacPanel pin from mapping
Setup State MpPin Analog	Sets the pin state of a MacPanel pin to analog
Setup State MpPin Digital	Sets the pin state of a MacPanel pin to digital
Setup State MpPin Hybrid	Sets the pin state of a MacPanel pin to hybrid (analog and digital)
Setup State MpPin Null	Sets the pin state of a MacPanel pin to none
Setup State Pin Analog	Sets the pin state of a UUT pin or pin group to analog
Setup State Pin Digital	Sets the pin state of a UUT pin or pin group to digital
Setup State Pin Hybrid	Sets the pin state of a UUT pin or pin group to hybrid
Setup State Pin Null	Sets the pin state of a UUT pin or pin group to none
Setup Trigger Name	Set trigger name
Setup Trigger Map	Maps trigger to a specific input channel (located on the RTM) The trigger name is also set in this command.
Setup Dio Connection	Maps a group of 16 DIO channels to a specific LF board
<u>Get</u>	
Get Instrument Name	Get instrument's name
Get Instrument PreferredBus	Get instrument's preferred bus
Get MpPin Count Lf	Return number of LF channels
Get MpPin Count Hf	Return number of HF channels
Get MpPin Column	Returns the MacPanel column (A, B, C, or D) that is associated with a specified MacPanel pin
Get MpPin Tier	Returns the MacPanel Tier (A or B) that is associated with a specified MacPanel pin

Command	Description
Get MpPin DioChannel	Returns the DIO channel number (0-based) that is mapped to a MacPanel pin
Get MpPin From Name	Returns MacPanel pin from a given pin name
Get MpPin From Position	Returns MacPanel pin from physical location specified by MacPanel Slot, Tier, Column, and Row
Get MpPin From MuxPosition	Returns MacPanel pin from mux location specified by slot, mux group (A-P), and mux channel (1-16)
Get MpPin Name	Returns the MacPanel Pin Name
Get MpPin Row	Returns the MacPanel Row location for a given MacPanel pin
Get MpPin Type	Returns a MacPanel's slot type (LF or HF)
Get MpPin MuxGroup	Return Mux Group for specified MacPanel pin
Get MpPin MuxChannel	Return Mux Channel for specified MacPanel pin
Get Pin Count	Returns number of UUT pins.
Get Pin DioChannel	Returns the DIO channel mapped to a specified UUT pin
Get Pin IsGroup	Returns True if the specified pin is a UUT pin group.
Get Pin MpPin	Returns the MacPanel pin mapped to the specified UUT pin
Get Pin MpSlot	Returns the MacPanel slot mapped to the specified UUT pin
Get Pin Name	Returns name associated with UUT pin or group
Get Pin Type	Returns a UUT pin slot type (LF or HF)
Get Pin Group Count	Returns number of UUT pin groups.
Get Pin Group Pins	Returns the array of children UUT pins.
Get Pin Group PinsCount	Returns number of children UUT pins.
Get Pin Group NextPin	Return next UUT pin is available, otherwise returns empty string.
Get Pin Group Pin	Returns name or id of the specified child UUT pin given the pin index
Get Relay Count	Returns the total number of relay openings/closures that have occurred for a specified block (board, RTM or SR) The count for each relay is accumulated throughout the life of a board
Get Relay States	Returns the state of each relay of a specified block (board, RTM or SR) The index of an array element specifies its relay designation minus 1. For example, index 0 corresponds with relay K1, index 256 corresponds with relay K257.
Get Trigger Name	Returns trigger pin name
Get Connections State	Returns the current connection status of the switching system All types or a type (instrument, trigger, or pin) of connection can be specified
Get Slot Information	Return True if SW card is installed at the specified slot, also return slot type LF/HF, and whether RTM and SR are present.
Panel	Shows the Switch Easy Panel

Command	Description
Utility	
Utility BIT Abort	Aborts the Built In Test
Utility BIT GetStatus	Returns Built in Test Status
Utility BIT Run	Starts a Built In Test
Utility Interrupt Disable	Disable PCI interrupt.
Utility Interrupt Resume	Resume PCI interrupt.
Utility Interrupt Reset	Reset interrupt source.
Utility Interrupt Setup	Configures the behavior of the interrupts.
Utility PIO Set Output Data	Set the PIO Output Data
Utility PIO Set Output Enable	Set the PIO Output Enable
Utility PIO Get Input Data	Reads the PIO Input
Utility PIO Get Output Data	Returns the PIO Output Data
Utility PIO Get Output Enable	Returns the PIO Output Enable

Table 4-1: Switch Easy driver commands

SwitchEasy Connect/Disconnect Commands

From the Connect/Disconnect commands the following connections types can be made:

Instrument	Test Station Instruments, includes Digital Multimeter (DMM), Source Measurement Unit (SMU), Digital Storage Oscilloscope (Scope), Arbitrary Waveform Generator (Arb), Supported Test Station Instruments connections are enumerated under enumSeInstruments.
Pin	Pin is the equivalent of a named MpPin/Slot, users must define Pin characteristics before using (see Setup/Pin/Map)
MpPin	MacPanel Pin of the Gx6256 (LF), Gx6864 (VF), and Gx6192 (HF). Switchable MpPin are enumerated under enumSeMpPin.
Trigger	Some of the Test Station Instruments have connections for indicating an event or starting a process. Supported Trigger interfaces are enumerated under enumSeTrig.
Digital	Digital connections are from the Gx5964 (DIO).

Table 4-2: Connect / Disconnect Commands, Connections Types

Once the “to/from” connections types are defined, specific connections details can be added.

Next, the choice of internal bus(es) can be defined (Bus 0 to Bus 15 or default). Note “default” allows Switch Easy to choose the Bus.

Finally, the choice of routing rules can be defined (note switching rules can be ORed). The choices are:

- aSeRuleDefaultDefault: No multiple connections, no hybrid connections, no auto-disconnect, bleed on disconnect, no bleed on disconnect, use main channel
- aSeRuleAllowMuxMultiConnect: Allow multiple channels within the same mux group
- aSeRuleAllowMultiConnect: Allow multiple items (Pin, Instrument, Trigger) connections
- aSeRuleHybrid: Allow digital and analog connections together

- `aSeRuleAlternate`: Connection to Alternate channel (LF pins only)
- `aSeRuleAlternate2`: For commands with two pins, Applied to second pin, connection to Alternate channel (LF pins only)
- `aSeRuleConnectBleedInhibit`: Disable bleeding during connection
- `aSeRuleDisconnectBleedEnable`: Enable bleeding on disconnection
- `aSeRuleAutoDisconnectMpPin`: Auto disconnect connected MacPanel pin before connect to a new MacPanel pin
- `aSeRuleAllowConnectMatrixInput`: Allow connect matrix input when connecting HF pins from different tiers within the same board.

SwitchEasy – Reset

The command **SwitchExec Reset All()** will force all relays to an open state, thereby disconnecting all signal paths.

SwitchEasy Commands Conventions

- Use Enum for MacPanel (Slot, Pin), buses, instruments, etc
- Use UUT Pin name (string) or ID (user supplied enum constant) mapped to MacPanel Pin for commands
- Use of optional Parameters with default values to avoid entering all parameters

Programming Examples

Mapping pins and pin groups

Switch Easy allows users to assign names to physical pins. These names can later be used in place of the physical pin designation when calling commands that make or break connections. Switch Easy also allows users to define pin groups, which are collections of assigned pin names.

The following is an example of assigning the name **Data1**, **Data2**, **Data3**, and **Data4** to the physical Mac Panel pins located at Slot 3, Tier A, Row2, Column A, B, C, and D respectively:

```
SwitchExec Setup Pin Map("Data1", 0, aSeMpSlot3, aSeLfa_A02) ! Slot3 Tier A, Column A, Row 2
SwitchExec Setup Pin Map("Data2", 1, aSeMpSlot3, aSeLfa_B02) ! Slot3 Tier A, Column B, Row 2
SwitchExec Setup Pin Map("Data3", 2, aSeMpSlot3, aSeLfa_C02) ! Slot3 Tier A, Column C, Row 2
SwitchExec Setup Pin Map("Data4", 3, aSeMpSlot3, aSeLfa_D02) ! Slot3 Tier A, Column D, Row 2
```

Note that the second (optional) parameter is the unique numerical ID that is associated with the particular mapping.

The following is an example of creating a pin group called **Data Pins** that contains **Data1**, **Data2**, **Data3**, and **Data4**.

```
SwitchExec Setup Pin Group("Data Pins", {"Data1", "Data2", "Data3", "Data4"})
```

The name **Data Pins** can now be used in other commands to reference the group of four pins.

Making a connection

Switch Easy provides the user with the ability make connections between pins and instruments. The connection commands use a mapped name or a physical location (slot, tier, column and row) to specify a pin. The pin is referred to as a UUT pin when using a mapped name, and a Mac Panel pin when using a physical location.

Switch Easy can make the following types of connections:

Instrument to UUT pin

A predefined instrument resource is connected to a pin which has been previously mapped to a name.

The following is an example of making a connection between the instrument named **Arb1** and a mapped pin named **Data1**:

```
SwitchExec Connect Instrument Pin(aSeInstrumentArb1, "Data1")
```

Instrument to Mac Panel pin

A predefined instrument resource is connected to a pin using its physical location (slot, tier, column, and row).

The following is an example of making a connection between the instrument named **Arb1** and the pin physically located in slot 3, on Tier A, Column A, Row 2:

```
SwitchExec Connect Instrument MpPin(aSeInstrumentArb1, aSeMpSlot3, aSeLfA_A02, ,
aSeRuleAllowMultiConnect)
```

Note that this particular example specifies a rule (allow multiple connections) when making the connection.

Multiple Instruments to UUT pin

Multiple instrument resources can be connected to the same pin concurrently. This can be accomplished when using the Allow Multiple Connections rule.

The following is an example of creating connections required for a 4-wire measurement resistance measurement:

```
SwitchExec Connect Instrument Pin(aSeInstrumentDmmHi, "Data2")
SwitchExec Connect Instrument Pin(aSeInstrumentDmmSenseHi, "Data2",, aSeRuleAllowMultiConnect)
SwitchExec Connect Instrument Pin(aSeInstrumentDmmLo, "Data3")
SwitchExec Connect Instrument Pin(aSeInstrumentDmmSenseLo, "Data3",, aSeRuleAllowMultiConnect)
```

The instrument resources **DmmHi**, and **DmmSensesHi** are both connected to the **Data2** pin. The instrument resources **DmmLo** and **DmmSenseLo** are both connected to the **Data2** pin.

Differential Instrument to Mac Panel pin

Instruments that use differential channels (such as a DMM) can be connected to two pins using only one command.

The following is an example of connecting the DMM's differential inputs (DmmHi and DmmLo) to the pin located at Slot 10, Tier A, ColumnA, Row 2, and Slot 10, Tier A, Column B, Row 2:

```
SwitchExec Connect Instrument Differential(aSeInstrumentDmm, aSeMPSlot10, aSeLfA_A02,
aSeMPSlot10, aSeLfA_B02)
```

UUT pin to UUT pin

One pin can be connected to another pin, without having to connect to an instrument resource.

The following is an example of connecting the **Data4** pin to the **Data3** pin:

```
SwitchExec Connect Pin Pin("Data4", "Data3", , aSeRuleAllowMultiConnect)
```

Note that the Allow Multiple Connections rule must be specified when connecting one pin to another.

Mac Panel pin to Mac Panel pin

One pin can be connected to another pin, without having to connect to an instrument resource.

The following is an example of connecting the pin located at Slot 11, Tier A, Column A, Row 3 to the pin located at Slot 12, Tier A, Column A, Row 3:

```
SwitchExec Connect MpPin MpPin(aSeMPSlot11, aSeLfA_A03, aSeMpSlot12, aSeLfA_A03, aSeBus3)
```

Disconnecting

Switch Easy allows the user to disconnect pins from instruments, and instruments from all connections.

The following is an example of disconnecting the **Data1** pin from the instrument resource **Arb1**:

```
SwitchExec Disconnect Instrument Pin(aSeInstrumentArb1, "Data1")
```

The following is an example of disconnecting the **Arb1** instrument resource from all pins:

```
SwitchExec Disconnect Instrument(aSeInstrumentArb1)
```

All connections can be removed while still maintaining the current pin mapping by using the following command:

```
SwitchExec Reset All()
```

Chapter 5 - Function Reference

Introduction

The GX7016 switching subsystem function reference includes low level GX6192/GX6256/GX6864/RTM/SR functions used to program the digital subsystem components. User should use the SwitchEasy ATEasy command reference to use the digital subsystem. The functions are prefixed with the card type they are addressing (Gx6256, Gx6864, or Gx6192) followed by the main components that they are addressing (SR for switch router, etc.). The reference chapter is organized in alphabetical order. Each function is presented starting with the syntax of the function, a short description of the function parameters description and type followed by a Comments, an Example (written in C), and a See Also sections.

All function parameters follow the same rules:

- Strings are ASCIIZ (null or zero character terminated).
- Most function's first parameter is nHandle (16-bit integer). This parameter is required for operating the board and is returned by the GxxxxInitialize or the GxxxxInitializeVisa functions. The nHandle is used to identify the board when calling a function for programming and controlling the operation of that board.
- All functions return a status with the last parameter named pnStatus. The pnStatus is zero if the function was successful, or less than a zero on error. The description of the error is available using the GxSWGetErrorString function or by using a predefined constant, defined in the driver interface files: GXSW.H, GXSW.BAS, GXSW.PAS or the ATEasy SwitchEasy driver.
- Parameter name are prefixed as follows:

Prefix	Type	Example
a	Array, prefix this before the simple type.	<i>anArray</i> (Array of Short)
n	Short (signed 16-bit)	nMode
d	Double - 8 bytes floating point	dReading
dw	Double word (unsigned 32-bit)	dwTimeout
l	Long (signed 32-bit)	lBits
p	Pointer. Usually used to return a value. Prefix this before the simple type.	pnStatus
sz	Null (zero value character) terminated string	szMsg
w	Unsigned short (unsigned 16-bit)	wParam
hwnd	Window handle (32-bit integer).	hwndPanel

Table 5-1: Parameter Prefixes

GX6256/GX6192/GX6864/GX6009/GX6032 Functions

The following list is a summary of functions available for the GX6256/GX6192/GX6864/GX6009/GX6032:

Driver Functions	Description
Gx6192/Gx6256/Gx6864BITAbort	Abort currently running BIT test
Gx6192/Gx6256/Gx6864BITGetStatus	Returns BIT status
Gx6192/Gx6256/Gx6864BITRun	Starts BIT test
Gx6192/Gx6256/Gx6864BleedRelayClose	Closes a mux group's bleed relay
Gx6192/Gx6256/Gx6864BleedRelayGetState	Returns the state of a mux group's bleed relay
Gx6192/Gx6256/Gx6864BleedRelayOpen	Opens a mux group's bleed relay
Gx6192/Gx6256/Gx6864GetBoardSummary	Returns the board summary.
Gx6192/Gx6256/Gx6864GetBoardType	Returns the board type.
Gx6192/Gx6256/Gx6864GetRelayCount	Returns the number of relays on a device (board, RTM, or SR)
Gx6192/Gx6256/Gx6864GetRelayStates	Returns the close/open states of all relays on a device (board, RTM, or SR)
Gx6192/Gx6256/Gx6864Initialize	Initializes the driver for the board at the specified slot number. The function returns a handle that can be used with other functions to program the board
Gx6192/Gx6256/Gx6864InitializeVisa	Initializes the driver for the specified slot using VISA. The function returns a handle that can be used with other functions to program the board.
Gx6192/Gx6256/Gx6864MatrixClose	Closes a matrix relay
Gx6192/Gx6256/Gx6864MatrixGetChannel	Returns a matrix relay's state
Gx6192/Gx6256/Gx6864MatrixOpen	Opens a matrix relay
Gx6192/Gx6256/Gx6864MatrixReset	Resets (opens) all relays in the matrix
Gx6192/Gx6256/Gx6864MatrixInputSelectorClose	Closes a matrix selector relay
Gx6192/Gx6256/Gx6864MatrixInputSelectorGetChannel	Returns a matrix selector relay's state
Gx6192/Gx6256/Gx6864MatrixInputSelectorOpen	Opens a matrix selector relay
Gx6192/Gx6256/Gx6864MuxClose	Close a mux relay
Gx6192/Gx6256/Gx6864MuxGetChannel	Returns a mux relay's state
Gx6192/Gx6256/Gx6864MuxOpen	Open a mux relay
Gx6192/Gx6256/Gx6864MuxReset	Resets (opens) all relays in a mux groups
Gx6192/Gx6256/Gx6864MuxGetSelectorMode	Returns the mux selector mode for a mux group
Gx6192/Gx6256/Gx6864MuxSetSelectorMode	Sets the mux selector mode for a mux group
Gx6192/Gx6256/Gx6864Panel	Opens a virtual panel used to interactively control the GX7016 boards switching boards.
Gx6192/Gx6256/Gx6864PioGetOutputData	Returns PIO output data
Gx6192/Gx6256/Gx6864PioGetOutputEnable	Returns PIO output enable (tristate) data

Driver Functions	Description
Gx6192/Gx6256/Gx6864PioReadInput	Returns PIO input data
Gx6192/Gx6256/Gx6864PioSetOutputData	Set PIO output data
Gx6192/Gx6256/Gx6864PioSetOutputEnable	Set PIO output enable (tristate) data
Gx6192/Gx6256/Gx6864Reset	Opens all the board relays.
Gx6192/Gx6256/Gx6864RtmMatrixClose	Closes a RTM matrix relay
Gx6192/Gx6256/Gx6864RtmMatrixGetChannel	Returns a RTM matrix relay's state
Gx6192/Gx6256/Gx6864RtmMatrixOpen	Opens a RTM matrix relay
Gx6192/Gx6256/Gx6864SrBusClose	Closes a SR bus relay
Gx6192/Gx6256/Gx6864SrBusGetChannel	Returns a SR bus relay's state
Gx6192/Gx6256/Gx6864SrBusOpen	Opens a SR bus relay
GxSWGetErrorString	Returns the error string associated with the specified error number.

Gx6192/Gx6256/Gx6864BITAbort

Purpose

Abort currently running BIT test

Syntax

Gx6256BITAbort (*nHandle*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The built-in test checks each relay in a specified device for continuity. This function aborts a test that is currently running.

Example

The following example runs the built-in test, waits one second, and then aborts the test:

```
Gx6256Initilize (10, FALSE, &nHandle, &nStatus);
Gx6256BITRun (nHandle, GX6256_BIT_MODE_ALL, &nStatus);
sleep(1000);
Gx6256BITAbort (nHandle, &nStatus);
```

See Also

Gx6256BITGetStatus, Gx6256BITRun, GxSWGetErrorString

Gx6192/Gx6256/Gx6864BITGetStatus

Purpose

Returns BIT status

Syntax

Gx6256BITGetStatus (*nHandle*, *pbPass*, *pszBITResult*, *nResultMaxLen*, *pdPercentCompleted*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>pbPass</i>	PBOOL	Returns with the pass/fail status of the built-in test. TRUE is pass and FALSE is fail.
<i>pszBITResult</i>	PSTR	Returned string containing the built-in test result.
<i>nResultMaxLen</i>	SHORT	Size of the buffer to contain the BIT result.
<i>pdPercentCompleted</i>	PDOUBLE	Return the percentage completed
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The built-in test checks each relay in a specified device for continuity. This function returns the percent completed while the test is running. When the test has completed, this function returns the result of the test in the form of a string (**pszBITResult**) and a flag (**pbPass**) that indicates pass or fail.

Example

The following example runs the built-in test and then polls the built-in test status until it has completed:

```

BOOL bPass;
CHAR szBITResult[1024];
DOUBLE dPercentCompleted;

Gx6256BITRun (nHandle, GX6256_BIT_MODE_ALL, &nStatus);
Gx6256BITGetStatus (nHandle, &bPass, szBITResult, 1024, &dPercentCompleted, &nStatus);
while (dPercentCompleted<100)
{
    printf("BIT Percent Completed = %f %", dPercentCompleted);
    Gx6256BITGetStatus (nHandle, &bPass, szBITResult, 1024, &dPercentCompleted, &nStatus);
}

```

See Also

Gx6256BITGetStatus, **Gx6256BITRun**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864BITRun

Purpose

Starts BIT test

Syntax

Gx6256BITRun (*nHandle*, *nMode*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>nMode</i>	SHORT	Selects which BIT test <ol style="list-style-type: none"> 0. GX6256_BIT_MODE_MUX: Test Mux relays only 1. GX6256_BIT_MODE_MATRIX: Test Matrix relays only 2. GX6256_BIT_MODE_RTM: Test Rear Transition Module relays only (if one is connected) 3. GX6256_BIT_MODE_ALL: Test all relays
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The built-in test checks each relay in a specified device for continuity. When this function is called, the BIT runs asynchronously in the background. The status and progress of the BIT can be checked by calling **Gx6256BITGetStatus**.

Example

The following example runs the built-in test and checks the status until the test has completed:

```

BOOL    bPass;
CHAR    szBITResult[1024];
DOUBLE  dPercentCompleted;

Gx6256BITRun (nHandle, GX6256_BIT_MODE_ALL, &nStatus);
Gx6256BITGetStatus (nHandle, &bPass, szBITResult, 1024, &dPercentCompleted, &nStatus);
while (dPercentCompleted<100)
{
    printf("BIT Percent Completed = %f %", dPercentCompleted);
    Gx6256BITGetStatus (nHandle, &bPass, szBITResult, 1024, &dPercentCompleted, &nStatus);
}

```

See Also

Gx6256BITGetStatus, **Gx6256BITRun**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864BleedRelayClose

Purpose

Closes the bleed relay for a specified mux group

Syntax

Gx6256BleedRelayClose (*nHandle*, *nMuxGroup*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>nMuxGroup</i>	SHORT	Mux Group numbers are: <ol style="list-style-type: none"> 0. GX6256_GROUP_A 1. GX6256_GROUP_B 2. GX6256_GROUP_C 3. GX6256_GROUP_D 4. GX6256_GROUP_E 5. GX6256_GROUP_F 6. GX6256_GROUP_G 7. GX6256_GROUP_H 8. GX6256_GROUP_I 9. GX6256_GROUP_J 10. GX6256_GROUP_K 11. GX6256_GROUP_L 12. GX6256_GROUP_M 13. GX6256_GROUP_N 14. GX6256_GROUP_O 15. GX6256_GROUP_P
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

Each mux group has a bleed relay that can be used to bleed the path when making a new connection.

Example

The following example closes the mux group A bleed relay:

```
Gx6256BleedRelayClose (nHandle, GX6256_GROUP_A, &nStatus);
```

See Also

Gx6256BleedRelayGetState, **Gx6256BleedRelayOpen**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864BleedRelayGetState

Purpose

Returns a bleed relay's state

Syntax

Gx6256BleedRelayGetState (*nHandle*, *nMuxGroup*, *pnState*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>nMuxGroup</i>	SHORT	Mux Group numbers are: <ol style="list-style-type: none"> 0. GX6256_GROUP_A 1. GX6256_GROUP_B 2. GX6256_GROUP_C 3. GX6256_GROUP_D 4. GX6256_GROUP_E 5. GX6256_GROUP_F 6. GX6256_GROUP_G 7. GX6256_GROUP_H 8. GX6256_GROUP_I 9. GX6256_GROUP_J 10. GX6256_GROUP_K 11. GX6256_GROUP_L 12. GX6256_GROUP_M 13. GX6256_GROUP_N 14. GX6256_GROUP_O 15. GX6256_GROUP_P
<i>pnState</i>	SHORT	Returns the state of a bleed relay
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The Gx6256/Gx6192 switching boards contain a matrix.

The Gx6256 matrix connects the mux groups to the global bus lines.

The Gx6192 matrix connects the mux groups to the analog inputs.

Example

The following returns the state of Mux Group A bleed relay state:

```
Gx6256BleedRelayGetState(nHandle, GX6256_GROUP_A, &nState, &nStatus);
```

See Also

Gx6256MatrixClose, Gx6256MatrixOpen, GxSWGetErrorString

Gx6192/Gx6256/Gx6864BleedRelayOpen

Purpose

Opens the bleed relay for a specified mux group

Syntax

Gx6256BleedRelayOpen (*nHandle*, *nMuxGroup*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>nMuxGroup</i>	SHORT	Mux Group numbers are: 0. GX6256_GROUP_A 1. GX6256_GROUP_B 2. GX6256_GROUP_C 3. GX6256_GROUP_D 4. GX6256_GROUP_E 5. GX6256_GROUP_F 6. GX6256_GROUP_G 7. GX6256_GROUP_H 8. GX6256_GROUP_I 9. GX6256_GROUP_J 10. GX6256_GROUP_K 11. GX6256_GROUP_L 12. GX6256_GROUP_M 13. GX6256_GROUP_N 14. GX6256_GROUP_O 15. GX6256_GROUP_P
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

Each mux group has a bleed relay that can be used to bleed the path when making a new connection.

Example

The following example opens the mux group A bleed relay:

```
Gx6256BleedRelayOpen (nHandle, GX6256_GROUP_A, &nStatus);
```

See Also

Gx6256BleedRelayGetState, **Gx6256BleedRelayClose**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864GetBoardSummary

Purpose

Returns the board summary.

Syntax

Gx6256GetBoardSummary (*nHandle*, *szSummary*, *nSumMaxLen*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>szSummary</i>	PSTR	Buffer to contain the returned board info (null terminated) string.
<i>nSumMaxLen</i>	SHORT	Size of the buffer to contain the board info string.
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The GX6256 summary string provides the following data from in the order shown:

- Instrument Name (e.g., GX6256)
- FPGA version (e.g. 0xA002)
- Serial Number (e.g. 62560210)

Example

For example, the returned string looks like the following:

```
"GX6256 6U High Density 16 16x2 Mux, FPGA-Version:0xA003, S/N 62561234"
```

See Also

GxSWGetDriverSummary, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864GetBoardType

Purpose

Closes a Mux path

Syntax

Gx6256GetBoardType (*nHandle*, *pwBoardType*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>pwBoardType</i>	PWORD	Returns the board's type (0x6256, 0x6864, or 0x6192)
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The GX6256 has two paths, primary and secondary, from mux channels to mux selector.

Example

The following example closes returns the board type:

```
Gx6256GetBoardType(nHandle, &wBoardType , &nStatus);
```

See Also

Gx6256GetBoardSummary, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864GetRelayCount

Purpose

Returns the relay count associated with all the relays on the specified device

Syntax

Gx6256GetRelayCount (*nHandle*, *nBlock*, *padwRelayCount*, *pnMaxLen*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nBlock</i>	SHORT	The device to read the relay count from <ol style="list-style-type: none"> 0. GX6256_BLOCK_BOARD: Read relay count for all relays on the switching board 1. GX6256_BLOCK_RTM: Read relay count for all relays on the connected Rear Transition Module if it exists 2. GX6256_BLOCK_SR: Read relay count for all relays on the connected Switching Router if it exists
<i>padwRelayCount</i>	PDWORD	Returns an array containing each relay's cumulative open/close count
<i>pnMaxLen</i>	PSHORT	Size of the array passed into the <i>padwRelayCount</i> parameter The function returns the actual number of elements written to the array in this variable as well.
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

Each board, Rear Transition Module, and Switching Router contain many relays. Whenever each relay is opened or closed, the count for the specific relays is incremented and then stored on an onboard EEPROM.

Each element in the relay count array, *padwRelayCount*, represents the total number of open/close events for the lifetime of a relay. The element index corresponds with the relay designation number minus one. For example, element 0 in the array contains the relay count for the relay designated "K1", element 1 in the array contains the relay count for the relay designated "K2", and so on.

Example

The following example returns the relay count for relay K200 on a rear transition board that is connected to slot 5:

```
SHORT nHandle, nStatus;
DWORD adwRelayCount[256];

Gx6256Initialize(5, &nHandle, &nStatus);
Gx6256GetRelayCount(nHandle, GX6256_BLOCK_RTM, adwRelayCount, 256, &nStatus);
printf("Relay K200 has been opened/closed %d times.", adwRelayCount[199]);
```

See Also

Gx6256GetRelayStates, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864GetRelayStates

Purpose

Returns the state (open or closed) of each relay on the device specified

Syntax

Gx6256GetRelayStates (*nHandle*, *nBlock*, *padwRelayStates*, *pnMaxLen*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nBlock</i>	SHORT	The device to read the relay count from <ol style="list-style-type: none"> 0. GX6256_BLOCK_BOARD: Read relay count for all relays on the switching board 1. GX6256_BLOCK_RTM: Read relay count for all relays on the connected Rear Transition Module if it exists 2. GX6256_BLOCK_SR: Read relay count for all relays on the connected Switching Router if it exists
<i>padwRelayStates</i>	PDWORD	Returns an array containing each relay's state (open or closed)
<i>pnMaxLen</i>	PSHORT	Size of the array passed into the <i>padwRelayStates</i> parameter The function returns the actual number of elements written to the array in this variable as well.
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

Each board, Rear Transition Module, and Switching Router contain many relays.

Each element in the relay count array, *padwRelayCount*, represents the current state a relay. The element index corresponds with the relay designation number minus one. For example, element 0 in the array contains the relay state for the relay designated "K1", element 1 in the array contains the relay state for the relay designated "K2", and so on.

Example

The following example returns the relay state for relay K200 on a rear transition board that is connected to slot 5:

```
SHORT nHandle, nStatus;
DWORD adwRelayStates[256];

Gx6256Initialize(5, &nHandle, &nStatus);
Gx6256GetRelayStates(nHandle, GX6256_BLOCK_RTM, adwRelayStates, 256, &nStatus);
if (adwRelayStates[199]==0)
    printf("Relay K200 is open");
else
    printf("Relay K200 is closed");
```

See Also

Gx6256GetRelayCount, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864Initialize

Purpose

Initializes the driver for the board at the specified slot number. The function returns a handle that can be used with other GX6256 functions to program the board.

Syntax

Gx6256Initialize (*nSlot*, *bSimulation*, *pnHandle*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nSlot</i>	SHORT	GX6256/GX6864/GX6192 board slot number on the PXI bus.
<i>bSimulation</i>	BOOL	Simulation mode flag. Set to TRUE to enable simulation mode.
<i>pnHandle</i>	PSHORT	Returned handle for the board. The handle is set to zero on error and $\neq 0$ on success.
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The **Gx6256Initialize** function verifies whether or not the GX6256 board exists in the specified PXI slot. The function does not change any of the board settings. The function uses the HW driver to access and program the board.

The Marvin Test Solutions HW device driver is installed with the driver and is the default device driver. The function returns a handle that for use with other Counter functions to program the board. The function does not change any of the board settings.

The specified PXI slot number is displayed by the **PXI/PCI Explorer** applet that can be opened from the Windows **Control Panel**. You may also use the label on the chassis below the PXI slot where the board is installed. The function accepts two types of slot numbers:

- A combination of chassis number (chassis # + 256) with the chassis slot number. For example, 0x105 (chassis 1 slot 5).
- Legacy *nSlot* as used by earlier versions of HW/VISA. The slot number contains no chassis number and can be changed using the PXI/PCI Explorer applet (1-255).

The returned handle *pnHandle* is used to identify the specified board with other GX6256 functions.

Example

The following example initializes two GX6256 boards at slot 10 and 12 with simulation mode disabled.

```
SHORT nHandle1, nHandle2, nStatus;
Gx6256Initilize (10, FALSE, &nHandle1, &nStatus);
Gx6256Initilize (12, FALSE, &nHandle2, &nStatus);
if (nHandle1==0 || nHandle2==0)
    {printf("Unable to Initialize the board")
    return;
}
```

See Also

Gx6256Reset, GxSWGetErrorString

Gx6192/Gx6256/Gx6864InitializeVisa

Purpose

Initializes the driver for the specified PXI slot using the default VISA provider.

Syntax

Gx6256InitializeVisa (*szVisaResource*, *bSimulation*, *pnHandle*, *pnStatus*)

Parameters

Name	Type	Comments
<i>szVisaResource</i>	LPCTSTR	String identifying the location of the specified board in order to establish a session.
<i>bSimulation</i>	BOOL	Simulation mode flag. Set to TRUE to enable simulation mode.
<i>pnHandle</i>	PSHORT	Returned Handle (session identifier) that can be used to call any other operations of that resource
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, 1 on failure.

Comments

The **Gx6256InitializeVisa** opens a VISA session to the specified resource. The function uses the default VISA provider configured in your system to access the board. You must ensure that the default VISA provider support PXI/PCI devices and that the board is visible in the VISA resource manager before calling this function.

The first argument *szVisaResource* is a string that is displayed by the VISA resource manager such as NI Measurement and Automation (NI_MAX). It is also displayed by Marvin Test Solutions PXI/PCI Explorer as shown in the prior figure. The VISA resource string can be specified in several ways as follows:

- Using chassis, slot, for example: "PXI0::CHASSIS1::SLOT5"
- Using the PCI Bus/Device combination, for example: "PXI9::13::INSTR" (bus 9, device 9).
- Using alias, for example: "COUNTER1". Use the PXI/PCI Explorer to set the device alias.

The function returns a board handle (session identifier) that can be used to call any other operations of that resource. The session is opened with VI_TMO_IMMEDIATE and VI_NO_LOCK VISA attributes. On terminating the application the driver automatically invokes **viClose()** terminating the session.

Example

The following example initializes a GX6256 boards at PXI bus 5 and device 11 with simulation disabled.

```
SHORT nHandle, nStatus;
Gx6256InitializeVisa ("PXI5::11::INSTR", FALSE, &nHandle, &nStatus);
if (nHandle==0)
{
    printf("Unable to Initialize the board")
    return;
}
```

See Also

Gx6256Initialize, **Gx6256Reset**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864MatrixClose

Purpose

Closes a Matrix relay

Syntax

Gx6256MatrixClose (*nHandle*, *nMuxGroup*, *nInput*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nMuxGroup</i>	SHORT	Mux Group numbers are: <ol style="list-style-type: none"> 0. GX6256_GROUP_A 1. GX6256_GROUP_B 2. GX6256_GROUP_C 3. GX6256_GROUP_D 4. GX6256_GROUP_E 5. GX6256_GROUP_F 6. GX6256_GROUP_G 7. GX6256_GROUP_H 8. GX6256_GROUP_I 9. GX6256_GROUP_J 10. GX6256_GROUP_K 11. GX6256_GROUP_L 12. GX6256_GROUP_M 13. GX6256_GROUP_N 14. GX6256_GROUP_O 15. GX6256_GROUP_P
<i>nInput</i>	SHORT	Inputs numbers are 0-15
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The Gx6256/Gx6192 switching boards contain a matrix.

The Gx6256 matrix connects the mux groups to the global bus lines.

The Gx6192 matrix connects the mux groups to the analog inputs.

Example

The following example closes input 5 in Mux Group B:

```
Gx6256MatrixClose(nHandle, GX6256_GROUP_B, 5, &nStatus);
```

See Also

Gx6256MatrixGetChannel, Gx6256MatrixOpen, GxSWGetErrorString

Gx6192/Gx6256/Gx6864MatrixGetChannel

Purpose

Returns a Matrix relay's state

Syntax

Gx6256MatrixGetChannel (*nHandle*, *nMuxGroup*, *nInput*, *pnState*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nMuxGroup</i>	SHORT	Mux Group numbers are: 0. GX6256_GROUP_A 1. GX6256_GROUP_B 2. GX6256_GROUP_C 3. GX6256_GROUP_D 4. GX6256_GROUP_E 5. GX6256_GROUP_F 6. GX6256_GROUP_G 7. GX6256_GROUP_H 8. GX6256_GROUP_I 9. GX6256_GROUP_J 10. GX6256_GROUP_K 11. GX6256_GROUP_L 12. GX6256_GROUP_M 13. GX6256_GROUP_N 14. GX6256_GROUP_O 15. GX6256_GROUP_P
<i>nInput</i>	SHORT	Inputs numbers are 0-15
<i>pnState</i>	SHORT	Returns the state of a matrix relay
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The Gx6256/6192 switching boards contain a matrix.

The Gx6256 matrix connects the mux groups to the global bus lines.

The Gx6192 matrix connects the mux groups to the analog inputs.

Example

The following returns the state of Mux Group A, input 5 connection state:

```
Gx6256MatrixGetChannel(nHandle, GX6256_GROUP_A, 5, &nState , &nStatus);
```

See Also

Gx6256MatrixClose, Gx6256MatrixOpen, GxSWGetErrorString

Gx6192/Gx6256/Gx6864MatrixOpen

Purpose

Opens a Matrix relay

Syntax

Gx6256MatrixOpen (*nHandle*, *nMuxGroup*, *nInput*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nMuxGroup</i>	SHORT	Mux Group numbers are: <ol style="list-style-type: none"> 0. GX6256_GROUP_A 1. GX6256_GROUP_B 2. GX6256_GROUP_C 3. GX6256_GROUP_D 4. GX6256_GROUP_E 5. GX6256_GROUP_F 6. GX6256_GROUP_G 7. GX6256_GROUP_H 8. GX6256_GROUP_I 9. GX6256_GROUP_J 10. GX6256_GROUP_K 11. GX6256_GROUP_L 12. GX6256_GROUP_M 13. GX6256_GROUP_N 14. GX6256_GROUP_O 15. GX6256_GROUP_P
<i>nInput</i>	SHORT	Inputs numbers are 0-15
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The Gx6256/6192 switching boards contain a matrix.

The Gx6256 matrix connects the mux groups to the global bus lines.

The Gx6192 matrix connects the mux groups to the analog inputs.

Example

The following example opens input 5 in Mux Group B:

```
Gx6256MatrixOpen(nHandle, GX6256_GROUP_B, 5, &nStatus);
```

See Also

Gx6256MatrixGetChannel, Gx6256MatrixClose, GxSWGetErrorString

Gx6192/Gx6256/Gx6864MatrixInputSelectorClose

Purpose

Connects inputs to the board matrix

Syntax

Gx6256MatrixInputSelectorClose (*nHandle*, *nInput*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nInput</i>	SHORT	Inputs numbers are 0-15
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The Gx6256/Gx6192 switching boards contain a matrix.

The Gx6256 matrix connects the mux groups to the global bus lines.

The Gx6192 matrix connects the mux groups to the analog inputs.

This function makes the connection between the board matrix and the "inputs" which can be either global bus lines or analog inputs depending on the type of switching card as described above.

Example

The following example connects input 5 to the board matrix:

```
Gx6256MatrixInputSelectorClose(nHandle, 5, &nStatus);
```

See Also

Gx6256MatrixInputSelectorGetChannel, **Gx6256MatrixInputSelectorOpen**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864MatrixInputSelectorGetChannel

Purpose

Returns an matrix input connection state

Syntax

Gx6256MatrixInputSelectorGetChannel (*nHandle*, *nMuxGroup*, *pnState*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nInput</i>	SHORT	Inputs numbers are 0-15
<i>pnState</i>	SHORT	Returns the state of a matrix input connection
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The Gx6256/Gx6192 switching boards contain a matrix.

The Gx6256 matrix connects the mux groups to the global bus lines.

The Gx6192 matrix connects the mux groups to the analog inputs.

Example

The following returns the board's matrix input 5 connection state:

```
Gx6256MatrixGetChannel(nHandle, 5, &nState , &nStatus);
```

See Also

Gx6256MatrixInputSelectorClose, **Gx6256MatrixInputSelectorOpen**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864MatrixInputSelectorOpen

Purpose

Disconnects inputs to the board matrix

Syntax

Gx6256MatrixInputSelectorOpen (*nHandle*, *nInput*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nInput</i>	SHORT	Inputs numbers are 0-15
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The Gx6256/Gx6192 switching boards contain a matrix.

The Gx6256 matrix connects the mux groups to the global bus lines.

The Gx6192 matrix connects the mux groups to the analog inputs.

This function breaks the connection between the board matrix and the "inputs" which can be either global bus lines or analog inputs depending on the type of switching card as described above.

Example

The following example disconnects input 5 to the board matrix:

```
Gx6256MatrixInputSelectorOpen(nHandle, 5, &nStatus);
```

See Also

Gx6256MatrixInputSelectorGetChannel, **Gx6256MatrixInputSelectorClose**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864MatrixReset

Purpose

Opens all the Mux relays that are connected to a specified mux group.

Syntax

Gx6256MatrixReset (*nHandle*, *nMuxGroup*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nMuxGroup</i>	SHORT	Mux Group numbers are: 0. GX6256_GROUP_A 1. GX6256_GROUP_B 2. GX6256_GROUP_C 3. GX6256_GROUP_D 4. GX6256_GROUP_E 5. GX6256_GROUP_F 6. GX6256_GROUP_G 7. GX6256_GROUP_H 8. GX6256_GROUP_I 9. GX6256_GROUP_J 10. GX6256_GROUP_K 11. GX6256_GROUP_L 12. GX6256_GROUP_M 13. GX6256_GROUP_N 14. GX6256_GROUP_O 15. GX6256_GROUP_P
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

This function opens all Matrix relays within a column that represents a specified mux group.

Example

The following resets Mux group B column in the matrix.

```
Gx6256MatrixReset (nHandle, GX6256_GROUP_B, &nStatus);
```

See Also

Gx6256Initialize, **Gx6256MuxReset**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864MuxClose

Purpose

Closes a Mux path

Syntax

Gx6256MuxClose (*nHandle*, *nMuxGroup*, *nChannel*, *nPath*, *nMuxMode*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nMuxGroup</i>	SHORT	Mux Group numbers are: <ol style="list-style-type: none"> 0. GX6256_GROUP_A 1. GX6256_GROUP_B 2. GX6256_GROUP_C 3. GX6256_GROUP_D 4. GX6256_GROUP_E 5. GX6256_GROUP_F 6. GX6256_GROUP_G 7. GX6256_GROUP_H 8. GX6256_GROUP_I 9. GX6256_GROUP_J 10. GX6256_GROUP_K 11. GX6256_GROUP_L 12. GX6256_GROUP_M 13. GX6256_GROUP_N 14. GX6256_GROUP_O 15. GX6256_GROUP_P
<i>nChannel</i>	SHORT	Channel numbers are 0-15 for GX6256 and 0-11 for GX6192
<i>nPath</i>	SHORT	Mux Paths are (Only applicable to GX6256): <ol style="list-style-type: none"> 0. GX6256_PATH_PRIMARY: The primary path is used to make the connection 1. GX6256_PATH_SECONDARY: The secondary path is used to make the connection
<i>nMuxMode</i>	SHORT	Mux connection modes are: <ol style="list-style-type: none"> 0. GX6256_MUX_MODE_SINGLE_CONNECTION: Only one mux channel can be closed at a time 1. GX6256_MUX_MODE_MULTI_CONNECTION: Multiple mux channels can be closed at the same time
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The GX6256 has two paths, primary and secondary, from mux channels to mux selector.

Example

The following example closes the channel 5 in Mux Group B using the primary path and multiple connection mode:

```
Gx6256MuxClose(nHandle, GX6256_GROUP_A, 5, GX6256_PATH_PRIMARY, GX6256_MUX_MODE_MULTI_CONNECTION,  
&nStatus);
```

See Also

Gx6256MuxGetChannel, Gx6256MuxOpen, GxSWGetErrorString

Gx6192/Gx6256/Gx6864MuxGetChannel

Purpose

Closes a Mux path

Syntax

Gx6256MuxGetChannel (*nHandle*, *nMuxGroup*, *nChannel*, *nPath*, *pnState*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nMuxGroup</i>	SHORT	Mux Group numbers are: <ol style="list-style-type: none"> 0. GX6256_GROUP_A 1. GX6256_GROUP_B 2. GX6256_GROUP_C 3. GX6256_GROUP_D 4. GX6256_GROUP_E 5. GX6256_GROUP_F 6. GX6256_GROUP_G 7. GX6256_GROUP_H 8. GX6256_GROUP_I 9. GX6256_GROUP_J 10. GX6256_GROUP_K 11. GX6256_GROUP_L 12. GX6256_GROUP_M 13. GX6256_GROUP_N 14. GX6256_GROUP_O 15. GX6256_GROUP_P
<i>nChannel</i>	SHORT	Channel numbers are 0-15 for GX6256 and 0-11 for GX6192
<i>nPath</i>	SHORT	Mux Paths are (Only applicable to GX6256): <ol style="list-style-type: none"> 0. GX6256_PATH_PRIMARY: The primary path is used to make the connection 1. GX6256_PATH_SECONDARY: The secondary path is used to make the connection
<i>pnState</i>	SHORT	Returns the state of a Mux connection
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The GX6256 has two paths, primary and secondary, from mux channels to mux selector.

Example

The following returns the state of Mux Group A, channel 5 connection state:

```
Gx6256MuxGetChannel(nHandle, GX6256_GROUP_A, 5, &nState , &nStatus);
```

See Also

Gx6256MuxClose, Gx6256MuxOpen, GxSWGetErrorString

Gx6192/Gx6256/Gx6864MuxOpen

Purpose

Opens a Mux path

Syntax

Gx6256MuxOpen (*nHandle*, *nMuxGroup*, *nChannel*, *nPath*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nMuxGroup</i>	SHORT	Mux Group numbers are: <ol style="list-style-type: none"> 0. GX6256_GROUP_A 1. GX6256_GROUP_B 2. GX6256_GROUP_C 3. GX6256_GROUP_D 4. GX6256_GROUP_E 5. GX6256_GROUP_F 6. GX6256_GROUP_G 7. GX6256_GROUP_H 8. GX6256_GROUP_I 9. GX6256_GROUP_J 10. GX6256_GROUP_K 11. GX6256_GROUP_L 12. GX6256_GROUP_M 13. GX6256_GROUP_N 14. GX6256_GROUP_O 15. GX6256_GROUP_P
<i>nChannel</i>	SHORT	Channel numbers are 0-15 for GX6256 and 0-11 for GX6192
<i>nPath</i>	SHORT	Mux Paths are (Only applicable to GX6256): <ol style="list-style-type: none"> 0. GX6256_PATH_PRIMARY: The primary path is used to make the connection 1. GX6256_PATH_SECONDARY: The secondary path is used to make the connection
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The GX6256 has two paths, primary and secondary, from mux channels to mux selector.

Example

The following example opens the primary path for channel 5 in Mux Group B:

```
Gx6256MuxOpen(nHandle, GX6256_GROUP_A, 5, GX6256_PATH_PRIMARY, &nStatus);
```

See Also

Gx6256MuxGetChannel, Gx6256MuxClose, GxSWGetErrorString

Gx6192/Gx6256/Gx6864MuxReset

Purpose

Opens all the Mux relays.

Syntax

Gx6256MuxReset (*nHandle*, *nMuxGroup*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nMuxGroup</i>	SHORT	Mux Group numbers are: <ol style="list-style-type: none"> 0. GX6256_GROUP_A 1. GX6256_GROUP_B 2. GX6256_GROUP_C 3. GX6256_GROUP_D 4. GX6256_GROUP_E 5. GX6256_GROUP_F 6. GX6256_GROUP_G 7. GX6256_GROUP_H 8. GX6256_GROUP_I 9. GX6256_GROUP_J 10. GX6256_GROUP_K 11. GX6256_GROUP_L 12. GX6256_GROUP_M 13. GX6256_GROUP_N 14. GX6256_GROUP_O 15. GX6256_GROUP_P
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

This function opens all Mux and Matrix relays. If an RTM or SR is connected to the board, then the relays on those devices are also opened.

Example

The following resets Mux group B.

```
Gx6256MuxReset (nHandle, GX6256_GROUP_B, &nStatus);
```

See Also

Gx6256Initialize, **Gx6256MuxReset**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864MuxGetSelectorMode

Purpose

Returns a mux group's selector mode.

Syntax

Gx6256MuxGetSelectorMode (*nHandle*, *nMuxGroup*, *pnSelectorMode*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nMuxGroup</i>	SHORT	Mux Group numbers are: <ol style="list-style-type: none"> 0. GX6256_GROUP_A 1. GX6256_GROUP_B 2. GX6256_GROUP_C 3. GX6256_GROUP_D 4. GX6256_GROUP_E 5. GX6256_GROUP_F 6. GX6256_GROUP_G 7. GX6256_GROUP_H 8. GX6256_GROUP_I 9. GX6256_GROUP_J 10. GX6256_GROUP_K 11. GX6256_GROUP_L 12. GX6256_GROUP_M 13. GX6256_GROUP_N 14. GX6256_GROUP_O 15. GX6256_GROUP_P
<i>pnSelectorMode</i>	PSHORT	Mux selector modes are: <ol style="list-style-type: none"> 0. GX6256_SELECTOR_MODE_NONE: The Mux, Matrix, and external lines are not connected to each other. 1. GX6256_SELECTOR_MODE_MATRIX_ONLY: The Mux and Matrix are allowed to connect but the external lines are disconnected. 2. GX6256_SELECTOR_MODE_EXTERNAL_ONLY: The Mux and the external lines are allowed to connect to each other. 3. GX6256_SELECTOR_MODE_MATRIX_AND_EXTERNAL: The Mux is allowed to connect to the Matrix and external lines. 4. GX6256_SELECTOR_MODE_MATRIX_ISOLATED: The Mux is not allowed to connect to the selector, effectively making it isolated from the rest of the board.

pnStatus PSHORT Returned status: 0 on success, negative number on failure.

Example

The following returns Mux group B selector mode:

```
SHORT nSelectorMode;  
Gx6256MuxGetSelectorMode(nHandle, GX6256_GROUP_B, &nSelectorMode, &nStatus);
```

See Also

Gx6256MuxSetSelectorMode, GxSWGetErrorString

Gx6192/Gx6256/Gx6864MuxSetSelectorMode

Purpose

Sets a mux group's selector mode.

Syntax

Gx6256MuxSetSelectorMode (*nHandle*, *nMuxGroup*, *nSelectorMode*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>nMuxGroup</i>	SHORT	Mux Group numbers are: <ol style="list-style-type: none"> 0. GX6256_GROUP_A 1. GX6256_GROUP_B 2. GX6256_GROUP_C 3. GX6256_GROUP_D 4. GX6256_GROUP_E 5. GX6256_GROUP_F 6. GX6256_GROUP_G 7. GX6256_GROUP_H 8. GX6256_GROUP_I 9. GX6256_GROUP_J 10. GX6256_GROUP_K 11. GX6256_GROUP_L 12. GX6256_GROUP_M 13. GX6256_GROUP_N 14. GX6256_GROUP_O 15. GX6256_GROUP_P
<i>nSelectorMode</i>	SHORT	Mux selector modes are: <ol style="list-style-type: none"> 0. GX6256_SELECTOR_MODE_NONE: The Mux, Matrix, and external lines are not connected to each other. 1. GX6256_SELECTOR_MODE_MATRIX_ONLY: The Mux and Matrix are allowed to connect but the external lines are disconnected. 2. GX6256_SELECTOR_MODE_EXTERNAL_ONLY: The Mux and the external lines are allowed to connect to each other. 3. GX6256_SELECTOR_MODE_MATRIX_AND_EXTERNAL: The Mux is allowed to connect to the Matrix and external lines. 4. GX6256_SELECTOR_MODE_MATRIX_ISOLATED: The Mux is not allowed to connect to the selector, effectively making it isolated from the rest of the board.

pnStatus PSHORT Returned status: 0 on success, negative number on failure.

Example

The following sets Mux group B selector mode to matrix only:

```
Gx6256MuxSetSelectorMode(nHandle, GX6256_GROUP_B, GX6256_SELECTOR_MODE_MATRIX_ONLY, &nStatus);
```

See Also

Gx6256MuxGetSelectorMode, GxSWGetErrorString

Gx6192/Gx6256/Gx6864Panel

Purpose

Opens a virtual panel used to interactively control the GX7016 switching boards.

Syntax

Gx6256Panel (*pnHandle*, *hwndParent*, *nMode*, *phwndPanel*, *pnStatus*)

Parameters

Name	Type	Comments
<i>panhandle</i>	PSHORT	Handle to a GX6192/GX6256/GX6864 board. This number may be zero if the board is to be initialized by the panel window.
<i>hwndParent</i>	DWORD	Sets the panel parent window handle. A value of 0 sets the desktop as the parent window.
<i>nMode</i>	SHORT	The mode in which the panel main window is created. 0 for modeless and 1 for modal window.
<i>phwndPanel</i>	PDWORD	Returned window handle for the panel (for modeless panel only).
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The function is used to create the panel window. The panel window may be open as a modal or a modeless window, depending on the *nMode* parameters.

If the mode is set to modal dialog (*nMode*=1), the panel will disable the parent window (*hwndParent*) and the function will return only after the user closed the window. In that case the *pnHandle* may return the handle created by the user using the panel Initialize dialog. This handle may be used when calling other GX6256 functions.

If a modeless dialog was created (*nMode*=0), the function returns immediately after creating the panel window, returning the window handle to the panel - *phwndPanel*. It is the responsibility of the calling program to dispatch window messages to this window, so that the window can respond to messages.

Example

The following example opens the panel in modal mode:

```
DWORD dwPanel;
SHORT nHandle=0, nStatus;
...
Gx6256Panel (&nHandle, 0, 1, &dwPanel, &nStatus);
```

See Also

Gx6256Initialize, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864PioGetOutputData

Purpose

Returns the PIO output value from the output register

Syntax

Gx6256PioGetOutputData (*nHandle*, *pucOutputData*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6192/GX6256/GX6864 board.
<i>pucOutputData</i>	PBYTE	Bit field that represents the 8 output lines of the PIO
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

This function controls the output (driving) data of the 8 line PIO device.

Example

The following example returns the output data register value:

```
BYTE ucOutputData;  
Gx6256PioGetOutputData (nHandle, &ucOutputData, &nStatus);
```

See Also

Gx6256PioGetOutputData, **Gx6256PioSetOutputEnable**, **Gx6256PioGetOutputEnable**,
GxSWGetErrorString

Gx6192/Gx6256/Gx6864PioGetOutputEnable

Purpose

Returns the PIO output enable (tri-state) value of the output register

Syntax

Gx6256PioGetOutputEnable (*nHandle*, *pucOutputEnable*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>pucOutputEnable</i>	PBYTE	Bit field that represents the 8 enable (tri-state) control lines of the PIO
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

This function controls the tri-state data of the 8 line PIO device.

Example

The following example returns the output enable (tri-state) control data:

```
BYTE ucOutputEnable
Gx6256PioGetOutputEnable (nHandle, &ucOutputEnable, &nStatus);
```

See Also

Gx6256PioSetOutputEnable, Gx6256PioSetOutputData, Gx6256PioGetOutputData, GxSWGetErrorString

Gx6192/Gx6256/Gx6864PioReadInput

Purpose

Reads PIO sampled value from input register

Syntax

Gx6256PioReadInput (*nHandle*, *pucInputData*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>pucInputData</i>	PBYTE	Bit field that represents the 8 input lines of the PIO
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

This function reads the last sampled value from the input register.

Example

The following example reads all 8 input lines from the PIO:

```
BYTE ucInputData;  
Gx6256PioReadINput (nHandle, &ucInputData &nStatus);
```

See Also

Gx6256PioSetOutputData, Gx6256PioGetOutputData, Gx6256PioSetOutputEnable, Gx6256PioGetOutputEnable, GxSWGetErrorString

Gx6192/Gx6256/Gx6864PioSetOutputData

Purpose

Writes PIO output value to output register

Syntax

Gx6256PioGetOutputData (*nHandle, ucOutputData, pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.Handle to a GX6256/GX6192 board.
<i>ucOutputData</i>	BYTE	Bit field that represents the 8 output lines of the PIO
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

This function controls the output (driving) data of the 8 line PIO device.

Example

The following example sets all 8 IO lines to generate a logic HI:

```
Gx6256PioSetOutputEnable (nHandle, 0xFF &nStatus);
Gx6256PioSetOutputData (nHandle, 0xFF &nStatus);
```

See Also

Gx6256PioGetOutputData, Gx6256PioSetOutputEnable, Gx6256PioGetOutputEnable, GxSWGetErrorString

Gx6192/Gx6256/Gx6864PioSetOutputEnable

Purpose

Writes PIO output enable (tristate) value to the output register

Syntax

Gx6256PioSetOutputEnable (*nHandle*, *ucOutputEnable*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>ucOutputEnable</i>	BYTE	Bit field that represents the 8 enable (tristate) control lines of the PIO
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

This function controls the tri-state data of the 8 line PIO device.

Example

The following example sets all 8 lines to output enabled:

```
Gx6256PioSetOutputEnable (nHandle, 0xFF, &nStatus);
```

See Also

Gx6256PioGetOutputEnable, Gx6256PioSetOutputData, Gx6256PioGetOutputData, GxSWGetErrorString

Gx6192/Gx6256/Gx6864Reset

Purpose

Opens all the board relays.

Syntax

Gx6256Reset (*nHandle*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

This function opens all Mux and Matrix relays. If an RTM or SR is connected to the board, then the relays on those devices are also opened.

Example

The following example initializes the driver and then resets the board.

```
Gx6256Initialize (10, FALSE, &nHandle, &nStatus);
if (nStatus < 0)
    return nStatus; // return error
Gx6256Reset (nHandle, &nStatus);
```

See Also

Gx6256Initialize, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864RtmMatrixClose

Purpose

Closes a Matrix relay on the rear transition module

Syntax

Gx6256RtmMatrixClose (*nHandle*, *nChannel*, *nGlobalBusLine*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>nChannel</i>	SHORT	Instrument channels (0-31)
<i>nGlobalBusLine</i>	SHORT	Global Bus line (0-15)
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The rear transition module contains a matrix that connects instrument inputs to global bus lines (on the backplane).

Example

The following example closes the channel 5 and global bus line 15:

```
Gx6256RtmMatrixClose(nHandle, 5, 15, &nStatus);
```

See Also

Gx6256RtmMatrixGetChannel, **Gx6256RtmMatrixOpen**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864RtmMatrixGetChannel

Purpose

Returns a rear transition board Matrix relay's state

Syntax

Gx6256RtmMatrixGetChannel (*nHandle*, *nChannel*, *nGlobalBusLine*, *pnState*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>nChannel</i>	SHORT	Instrument channels (0-31)
<i>nGlobalBusLine</i>	SHORT	Global Bus line (0-15)
<i>pnState</i>	SHORT	Returns the state of a rear transition module matrix relay
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The rear transition module contains a matrix that connects instrument inputs to global bus lines (on the backplane).

Example

The following returns the state of channel 5, global bus line 15 connection state:

```
Gx6256RtmMatrixGetChannel(nHandle, 5, 15, &nState , &nStatus);
```

See Also

Gx6256RtmMatrixClose, **Gx6256RtmMatrixOpen**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864RtmMatrixOpen

Purpose

Opens a Matrix relay on the rear transition module

Syntax

Gx6256RtmMatrixOpen (*nHandle*, *nChannel*, *nGlobalBusLine*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>nChannel</i>	SHORT	Instrument channels (0-31)
<i>nGlobalBusLine</i>	SHORT	Global Bus line (0-15)
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The rear transition module contains a matrix that connects instrument inputs to global bus lines (on the backplane).

Example

The following example opens the channel 5 and global bus line 15:

```
Gx6256RtmMatrixOpen (nHandle, 5, 15, &nStatus);
```

See Also

Gx6256RtmMatrixGetChannel, **Gx6256RtmMatrixClose**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864SaveRelayCountToEeprom

Purpose

Saves the cache relay counts to the board EEPROM for permanent storage.

Syntax

Gx6256SaveRelayCountToEeprom (*nHandle*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

As relays are activated, this action is recorded in a local cache. Since this process locks access to the EEPROM for a few seconds, it is best to manually save the relay count during periods where no switching will occur. It is the application responsibility to save the relay count to the board occasionally. Not calling this function will cause the relay count not to match with the actual relay activations. Relay activations are displayed in the SwitchEasy Panel.

Example

The following example save the relay count changes to the board:

```
Gx6256SaveRelayCountToEeprom (nHandle, &nStatus);
```

See Also

GxSWGgetErrorString

Gx6192/Gx6256/Gx6864SrBusClose

Purpose

Makes a switch router connection between switching boards

Syntax

Gx6256SrBusClose (*nHandle*, *nGlobalBusLine*, *nSlot*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>nGlobalBusLine</i>	SHORT	Global Bus line (0-15)
<i>nSlot</i>	SHORT	Slot number (1-9)
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The Switching router routes the 16 lines of the global bus between the slots.

Example

The following example connects the switch boards from slot 2 and slot 3 via global bus line 5:

```
Gx6256Initialize(2, FALSE, &nHandle1, &nStatus);
Gx6256Initialize(3, FALSE, &nHandle2, &nStatus);
Gx6256SrBusClose(nHandle1, 5, 1, &nStatus);
Gx6256SrBusClose(nHandle2, 5, 2, &nStatus);
```

See Also

Gx6256SrBusGetChannel, **Gx6256SrBusOpen**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864SrBusGetChannel

Purpose

Returns a switch router connection state between switching boards

Syntax

Gx6256SrBusGetChannel (*nHandle*, *nGlobalBusLine*, *nSlot*, *pnState*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>nGlobalBusLine</i>	SHORT	Global Bus line (0-15)
<i>nSlot</i>	SHORT	Slot number (1-9)
<i>pnState</i>	PSHORT	Returns the state of a rear transition module matrix relay
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The Switching router routes the 16 lines of the global bus between the slots.

Example

The following returns the state of slot 5, global bus line 15 connection state:

```
Gx6256SrBusGetChannel(nHandle, 15, 5, &nState, &nStatus);
```

See Also

Gx6256SrBusClose, **Gx6256SrBusOpen**, **GxSWGetErrorString**

Gx6192/Gx6256/Gx6864SrBusOpen

Purpose

Breaks a switch router connection between switching boards

Syntax

Gx6256SrBusOpen (*nHandle*, *nGlobalBusLine*, *nSlot*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6256/GX6864/GX6192 board.
<i>nGlobalBusLine</i>	SHORT	Global Bus line (0-15)
<i>nSlot</i>	SHORT	Slot number (1-9)
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The Switching router routes the 16 lines of the global bus between the slots.

Example

The following example disconnects the switch boards from slot 2 and slot 3 via global bus line 5:

```
Gx6256Initialize(2, FALSE, &nHandle1, &nStatus);
Gx6256Initialize(3, FALSE, &nHandle2, &nStatus);
Gx6256SrBusOpen(nHandle1, 5, 1, &nStatus);
Gx6256SrBusOpen(nHandle2, 5, 2, &nStatus);
```

See Also

Gx6256SrBusGetChannel, **Gx6256SrBusClose**, **GxSWGetErrorString**

GxSWGetErrorString

Purpose

Returns the error string associated with the specified error number.

Syntax

GxSWGetErrorString (*nError*, *pszMsg*, *nErrorMaxLen*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nError</i>	SHORT	Error number as returned by the <i>pnStatus</i> of any GXSW function. See table below for possible error numbers values. The error number should be a negative number, otherwise the function returns the “No error has occurred” string.
<i>pszMsg</i>	LPSTR	Buffer containing the returned error string (null terminated string).
<i>nErrorMaxLen</i>	SHORT	Size of the buffer <i>pszMsg</i> .
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The function returns the error string associated with the *nError* as returned from other driver functions.

This function returns error value or 0 on success.

The following table displays the possible error values; not all errors apply to this board type:

Resource Errors

-1	Can't open HW
-2	Board not exist
-3	Wrong board
-4	Slot not configuration
-5	Unable register device
-6	Unable allocate device resource
-7	Unable allocate memory
-8	Unable create panel
-9	Unable to get timer
-10	Board invalid Eeprom
-11	Not in calibration mode
-12	Not calibrated
-13	Err function not supported
-14	Not MTS board
-15	Unable to open file
-16	Error file not exist

- 17 Error mode not supported by slot
- 18 Not PXI board
- 19 Not PCI board

Parameter Errors

- 20 Invalid error
- 21 Invalid parameter
- 22 Invalid slot
- 23 Invalid handle
- 24 Invalid string length
- 25 Invalid mode
- 26 Parameter out of range
- 27 File extension not supported
- 28 Invalid chassis number
- 29 Invalid calibration time stamp

VISA error

- 30 Load DLL error
- 31 Open default resource manager error
- 32 Open error
- 33 Get attribute error
- 34 VI-In error
- 35 Memory map error

Misc error

- 37 Sync create
- 38 Sync timeout
- 39 Lvrt unsupported
- 40 License error
- 41 Event enable failed
- 42 Event disable failed
- 43 Event wait timeout
- 44 Event wait error
- 45 DMA mem alloc failed
- 46 Error DMA mem un map
- 47 Error DMA mem free
- 48 Error checksum

Bult In Test error

- 50 BIT adaptor not connected

- 51 BIT comparator
- 52 BIT close open
- 53 BIT close column
- 54 BIT switch other
- 55 BIT partial

Board Errors/Warnings

- 60 Error closed loop
- 61 Invalid relay number
- 62 Invalid number of relays
- 63 Invalid relays cycles limit
- 64 Invalid relay cycles array size
- 65 Error over limit relay replacement
- 66 Eeprom busy timeout
- 67 Error closed relays over limit
- 68 Error set relays timeout

Board specific parameter error

- 80 Invalid configuration
- 81 Invalid channel
- 82 Invalid bus
- 83 Invalid group
- 84 Invalid row
- 85 Invalid column
- 86 Invalid relay
- 87 Invalid daisy chain mode
- 88 Invalid relay type
- 89 Invalid group mode
- 90 Invalid section
- 91 Invalid path
- 92 Invalid signal type
- 93 Invalid input
- 94 Simulation INI file read error
- 95 Invalid block
- 96 Error bit still running
- 97 Eeprom checksum invalid

Example

The following example initializes the board at slot 3. If the initialization failed the following error string is printed:

```
CHARsz[256];  
SHORT nStatus, nHandle;  
  
GX6256Initialize(3, FALSE, &Handle, &Status);  
if (nStatus<0)  
{ GxSWGetErrorString(nStatus, sz, sizeof sz, &nStatus);  
  printf(sz);// print the error string return;  
}
```

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