GXSW

Switching Instruments

GX6338

User's Guide

Last updated: December 13, 2016

MARVIN TEST SOLUTIONS

Safety and Handling

Each product shipped by Marvin Test Solutions is carefully inspected and tested prior to shipping. The shipping box provides protection during shipment, and can be used for storage of both the hardware and the software when they are not in use.

The circuit boards are extremely delicate and require care in handling and installation. Do not remove the boards from their protective plastic coverings or from the shipping box until you are ready to install the boards into your computer.

If a board is removed from the computer for any reason, be sure to store it in its original shipping box. Do not store boards on top of workbenches or other areas where they might be susceptible to damage or exposure to a strong electromagnetic or electrostatic fields. Store circuit boards in protective anti-electrostatic wrapping and away from electromagnetic fields.

Be sure to make a single copy of the software CD for installation. Store the original CD in a safe place away from electromagnetic or electrostatic fields. Return compact disks (CD) to their protective case or sleeve and store in the original shipping box or other suitable location.

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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 **GX6338** PXI Switch Matrix Board. The manual also covers the **GXSW** software package that includes the GX6338 driver. 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

The GX6338 manual is organized in the following manner:

Chapter	Content
Chapter 1 – Introduction	Introduces the GX6338 manual and shows warning conventions used in the manual.
Chapter 2 – Overview	Provides the GX6338 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 a GX6338 board and the GXSW software.
Chapter 4 – Functions Reference	Provides a list of the GXSW driver functions for the GX6338. 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

Users of the Marvin Test Solutions GX6338 Switching instruments must be familiar with the GXSW User's Guide for a more thorough understanding of the following topics:

- Theory of Operation of Switching Systems

- Control GXSW Switching instruments using various programming languages

- Setup and Installation of GXSW Switching instruments

Caution - Do not attempt to insert or remove a switching instrument until you are familiar with **GXSW User's Guide Chapter 3 "Setup and Installation"**.

Features

The GX6338 is a 6U PXI high-density relay switching instrument supporting the following features:

- 114 individual relays

- 0.5A contact rating per channel

- Occupies one PXI bus slot

Board Description

The GX6338 is a 6U PXI board featuring 114 channels of single pole single throw switches with three connectors J6, J7 and J8 and one chassis ground jumper - JP1.
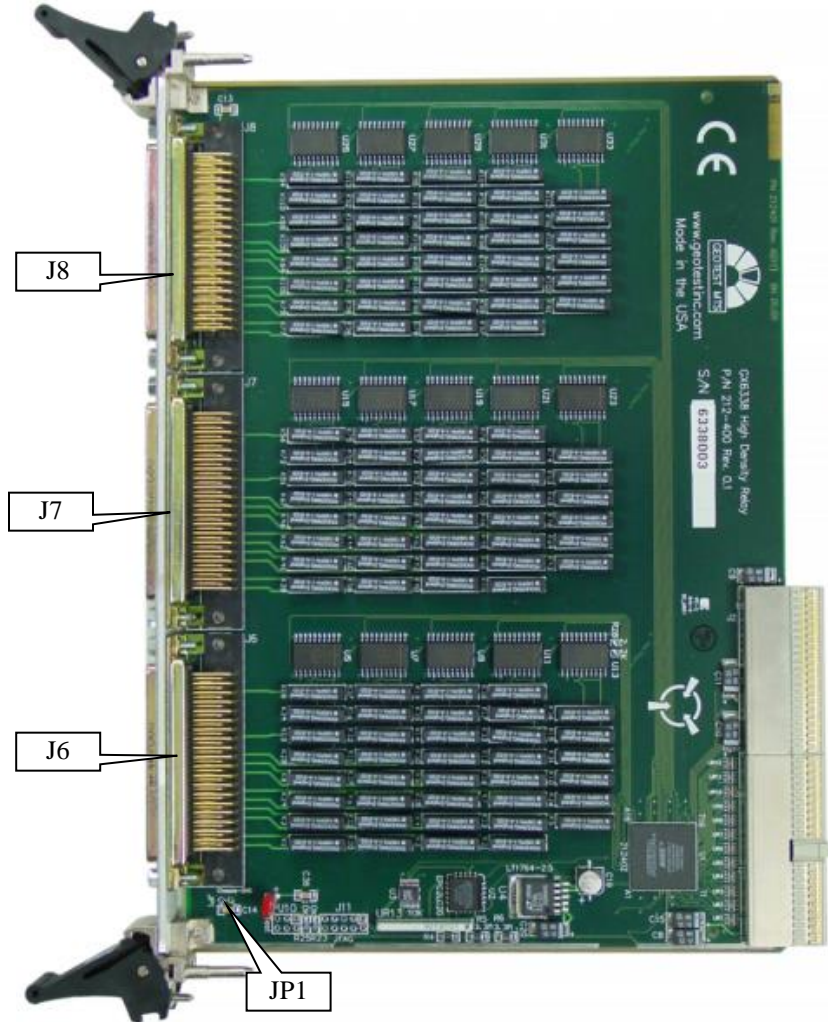
Figure 2-1: GX6338 High Density Relay Board

Architecture

The GX6338 consists of three switching groups: A, B and C. Each group has 38 individual relays. The group relays A, B and C are connected to J6, J7 and J8 connectors as shown in Figure 2-2.
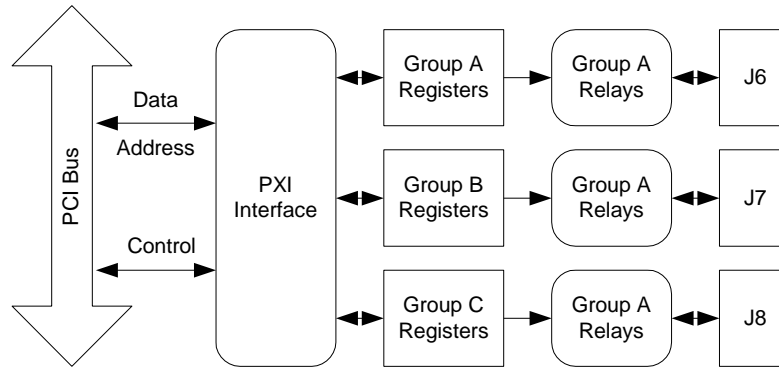
Figure 2-2: GX6338 Architecture

Relays

The GX6338 has 114 Form A (SPST) relays (see Figure 2-3).

Figure 2-3: A typical GX6338 relay

When the relay is activated, the Change Over (CO) terminal is connected to the Normally Open (NO) terminal. When the relay is deactivated, the CO terminal is disconnected from to the Normally Closed (NO) terminal. After the board is reset, all relays are deactivated. Both sides of the relay are connected to the connector, one side is CHnA and the other is CHnB, where n is 1 to 144 (see Table 3-1, Table 3-2 and Table 3-3 for J6, J7 and J8 connectors' pins).

Specifications

The following table outlines the specifications of the GX6338:

Contact Specifications

Relay Format	114 SPST (1 Form A)	
Channel Resistance	0.3 Ω	Maximum
	0.1Ω	Typical
Relay Contact Resistance	0.2 Ω	Maximum
	0.03Ω	Initial
Contact Life Rating At 28 VDC @ 0.5A	10×10^6 Typical	Rated Load
Switching Voltage	200 VDC	Maximum
Switching Current	0.5 A	Maximum
Contact Carry Current	1.2 A	Maximum
Operate Time	500 µSec	Maximum, excluding bounce
Release Time	250 µSec	Maximum, excluding bounce

Power Requirements

3.3V Power	100mA Max / 300mA Max
5V Power	1.2A Max

Environmental

Temperature: Operating: Storage:	0 to+50°C -20 to+70°C
Vibration	9g at 10-55Hz
Shock ½ Sine	10g for 11mS

Physical

Size	6U PXI
Weight	420g

Virtual Panel Description

The GX6338 includes a virtual panel program, which enables full utilization of the various configurations and controlling 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 **GX6338 Panel** from the **Marvin Test Solutions**, **GXSW** menu under the **Start** menu. The GX6338 virtual panel opens as shown here:
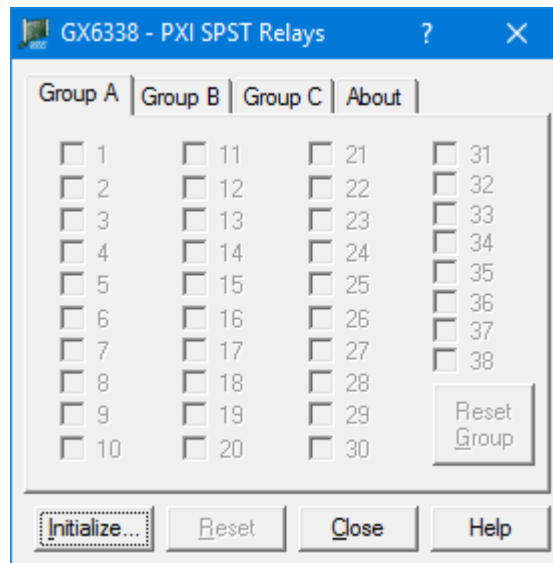
Figure 2-4: GX6338 Virtual Panel

The following controls are shown:

Initialize: Opens the Initialize Dialog (see Initialize Dialog paragraph) in order to initialize the board driver. The current settings of the selected counter **will not change after calling initialize**. The panel will reflect the current settings of the counter after the Initialize dialog closes.

Reset: Resets all relays to an open state and sets panel parameters to the default state.

Close: Closes (exits) the GX6338 panel.

Help: Opens the GX6338 on-line help window.

Virtual Panel Initialize Dialog

The Initialize dialog initializes the driver for the selected counter board. The counter settings **will not change** after initialize is called. Once initialize, the panel will reflect the current settings of the counter.

The Initialize dialog supports two different device drivers that can be used to access and control the board:

1. **Use Marvin Test Solutions' HW** – this is the device driver installed by the setup program and is the default driver. When selected, the **Slot Number** list displays the available counter boards installed in the system and their slots. The chassis, slots, devices and their resources are also displayed by the HW resource manager, **PXI/PCI Explorer** applet that can be opened from the Windows Control Panel. The PXI/PCI Explorer can be used to configure the system chassis, controllers, slots and devices. The configuration is saved to PXISYS.INI and PXIeSYS.INI located in the Windows folder. These configuration files are also used by VISA. The following figure shows the slot number 0x103 (chassis 1 Slot 3). This is the slot number argument (*nSlot*) passed by the panel when calling the driver **Gx6338Initialize** function used to initialize driver with the specified board.
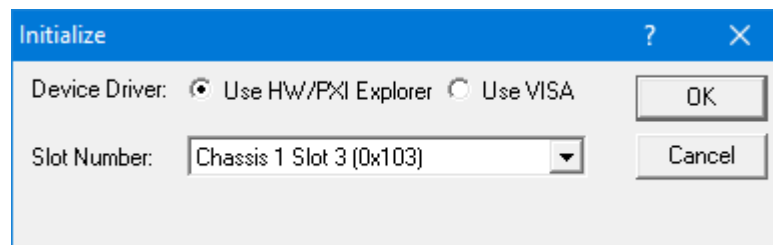
Figure 2-5: Initialize Dialog Box using Marvin Test Solutions' HW driver

2. **Use VISA** – this is a third-party device driver usually provided by National Instrument (NI-VISA). When selected, the **Resource** list displays the available boards installed in the system and their VISA resource address. The chassis, slots, devices and their resources are also displayed by the VISA resource manager, **Measurement & Automation** (NI-MAX) and in Marvin Test Solutions **PXI/PCI Explorer**. The following figure shows PXI9::14::INSTR as the VISA resource (PCI bus 9 and Device 14). This is VISA resource string argument (*szVisaResource*) passed by the panel when calling the driver **Gx6338InitializeVisa** function to initialize the driver with the specified board.
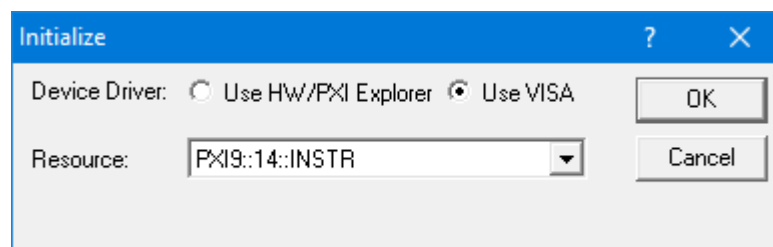
Figure 2-6: Initialize Dialog Box using VISA resources

Virtual Panel Group Page

After the board is initialized the panel is enabled and will display the current setting of the board. The following picture shows the **Group page** settings:
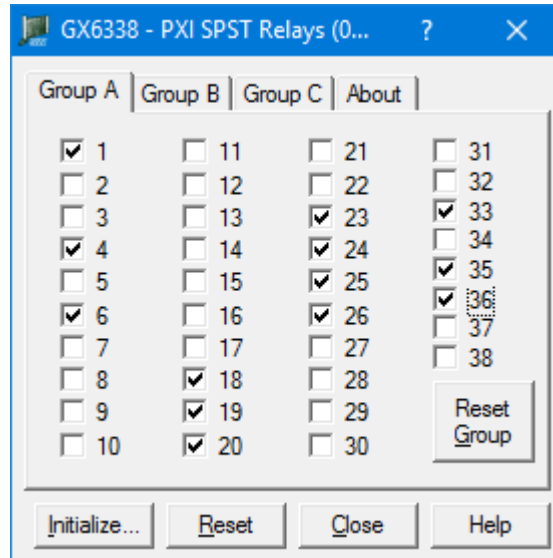
Figure 2-7: GX6338 Virtual Panel (Initialized)

The following controls are shown in the Group page:

Groups A, B and C Tabs: The **Group** tab changes the view of the Matrix Display Area. Choices are A, B or C.

Matrix Display Area (Relays K1 – K114): Displays the current relay setting (closed or open). When a box is checked, the relay is closed. Similarly, unchecked boxes mean relays are open.

Reset Group: Open all relays that show for the selected group.

Virtual Panel About Page

Clicking on the **About** tab will show the **About page** as shown in Figure 2-8:
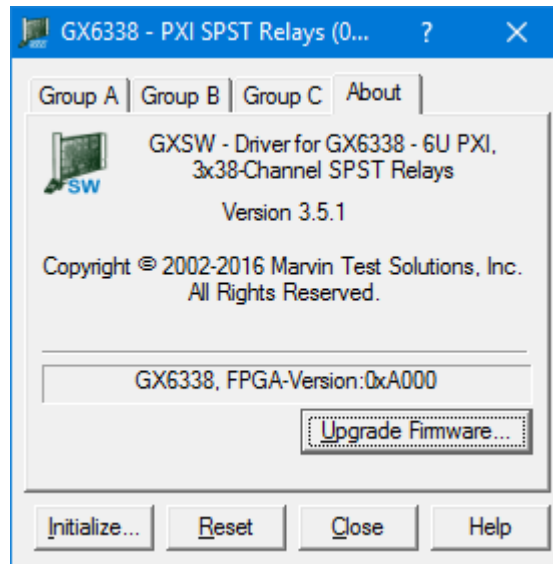
Figure 2-8:GX6338 Virtual Panel – About Page

The top part of the **About** page displays version and copyright of the GX6338 driver. The bottom part displays the board summary and the FPGA version. The **About** page also contains a button **Upgrade Firmware…** used to upgrade the board FPGA. 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.

Chapter 3 - Installation and Connections

Getting Started

This section includes general hardware installation procedures for the GX6338 board and installation instructions for the GX6338 (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
GX6338 Driver Installation	This Chapter
GX6338 Function Reference	Chapter 4

Packing List

All GX6338 boards have the same basic packing list, which includes:

1. GX6338 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 GX6338 instrument board is designed for use with a 3U or 6U cPCI or PXI compatible chassis. The software is compatible with any computer system running Windows XP SP3, VISTA, 7, 8, and 10 (32/64 bit) operating systems.

Each board requires one unoccupied 3U PXI bus slot.

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 the Marvin Test Solutions' HW 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 GX6338 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 GX6338 board, 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 PXIeSYS.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.vxipnp.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.

Installation Folders

The GX6338 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 **GX6338Initialize** and **GX6338InitializeVisa** 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).
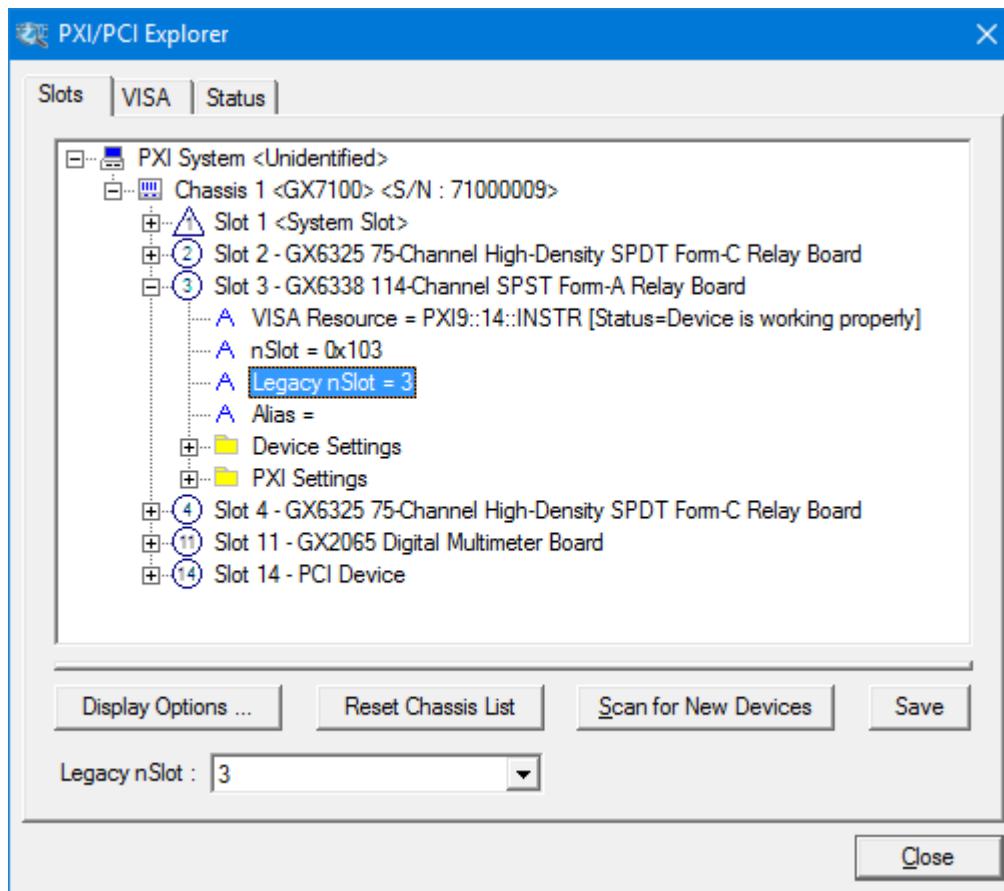
Figure 3-1: PXI/PCI Explorer

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 GX6338 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 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 372HFigure 3-2).

Figure 3-2: Ejector handles position during module insertion

6. After you feel resistance, push in the ejector handles as shown in 373HFigure 3-3 to secure the module into the frame.

Figure 3-3: Ejector handles position after module insertion

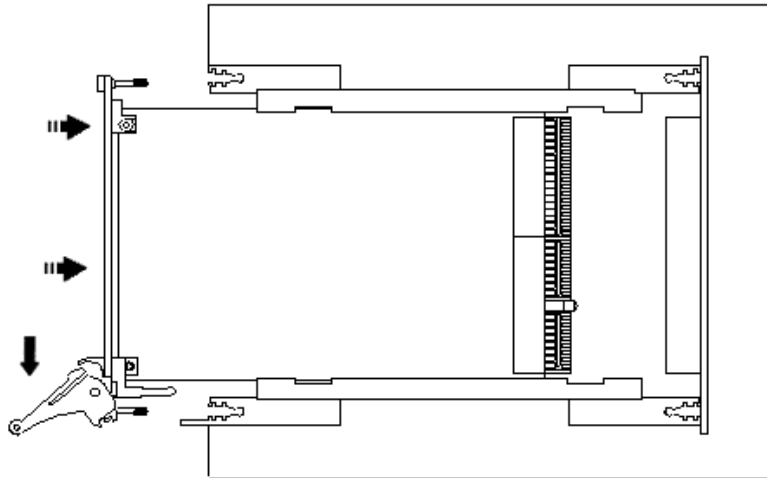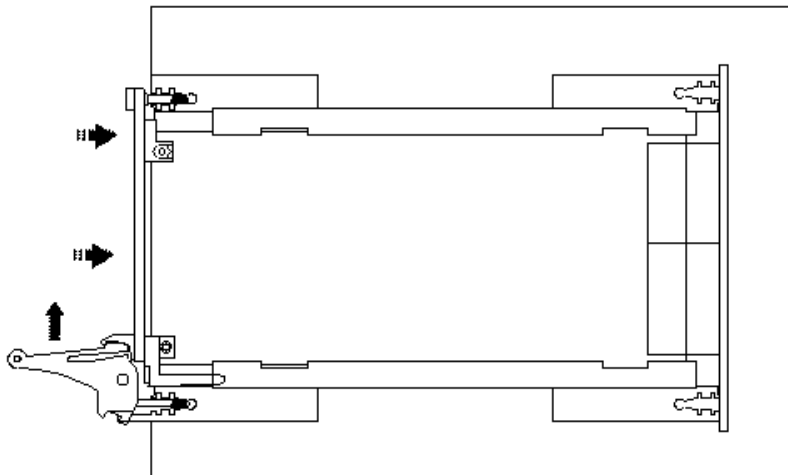7. Tighten the module's front panel to the chassis to secure the module in.

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

Figure 3-4 shows the GX6338 board connectors and jumper followed by their description:
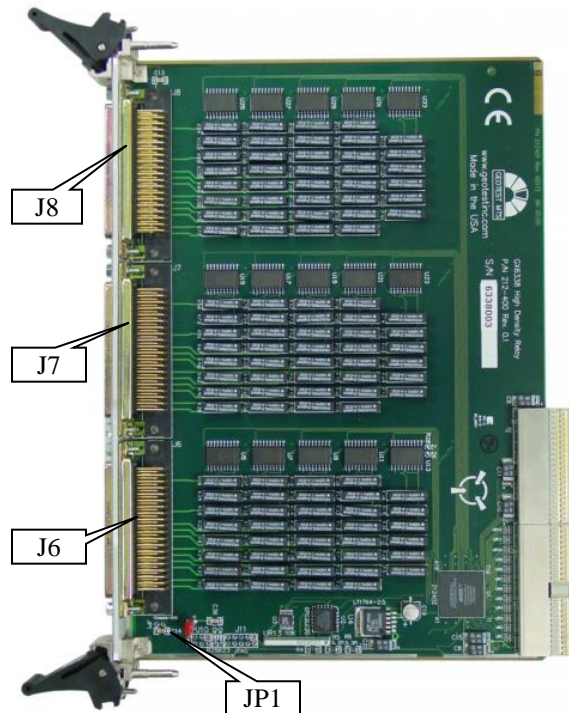
Figure 3-4: GX6338 Connectors and Jumpers

JP1-Chassis Ground Jumper

JP1 jumper connects the chassis ground to the logic ground. When jumper is not installed (default), chassis and logic ground are separate. This does not preclude them being connected elsewhere, such as in the power supplies. When the jumper is installed, chassis and logic ground are connected on the board.

Cable Connections

When building the UUT adapter, refer to the Pin Connector Listing table later in this chapter. Connect the necessary cables to the GX6338 using standard 78 pins, D-Type Male connectors. Each GX6338 uses three mating DB78 connectors. Extra connectors are available separately.

Connectors and Accessories

The following accessories are available from Marvin Test Solutions for GX6338 switching instruments.

Part / Model Number	Description
GX96001	Extra switching products user manual
GX96501	Extra user manual for GX6338
GT96002	Connector, D-Type 78 pin male with solder pins
GT96078	78 pin connector to screw terminal interface
GT96107	3' harness, 78 pin male connector on both ends
GT97102	3' harness, 78 pin male connector on one end, loose wires (numbered) other end
GT97103	1' harness, 78 pin male connector on one end, loose wires (numbered) other end
GT97104	1' harness, 78 pin male connectors on both ends

J6 – Group A Relays Connector

The following table describes the J6 (78 D Type) connector's pins:

Pin	Name	Pin	Name	Pin	Name	Pin	Name
1	CH1A	21	CH1B	40	CH20A	60	CH20B
2	CH2A	22	CH2B	41	CH21A	61	CH21B
3	CH3A	23	CH3B	42	CH22A	62	CH22B
4	CH4A	24	CH4B	43	CH23A	63	CH23B
5	CH5A	25	CH5B	44	CH24A	64	CH24B
6	CH6A	26	CH6B	45	CH25A	65	CH25B
7	CH7A	27	CH7B	46	CH26A	66	CH26B
8	CH8A	28	CH8B	47	CH27A	67	CH27B
9	CH9A	29	CH9B	48	CH28A	68	CH28B
10	CH10A	30	CH10B	49	CH29A	69	CH29B
11	CH11A	31	CH11B	50	CH30A	70	CH30B
12	CH12A	32	CH12B	51	CH31A	71	CH31B
13	CH13A	33	CH13B	52	CH32A	72	CH32B
14	CH14A	34	CH14B	53	CH33A	73	CH33B
15	CH15A	35	CH15B	54	CH34A	74	CH34B
16	CH16A	36	CH16B	55	CH35A	75	CH35B
17	CH17A	37	CH17B	56	CH36A	76	CH36B
18	CH18A	38	CH18B	57	CH37A	77	CH37B
19	CH19A	39	CH19B	58	CH38A	78	CH38B
20	CHASSIS			59	GND		

Table 3-1: J6 Connector (Group A)

J7 - Group B Relays Connector

The following table describes the J7 (78 D Type) connector's pins:

Pin	Name	Pin	Name	Pin	Name	Pin	Name
1	CH39A	21	CH39B	40	CH58A	60	CH58B
2	CH40A	22	CH40B	41	CH59A	61	CH59B
3	CH41A	23	CH41B	42	CH60A	62	CH60B
4	CH42A	24	CH42B	43	CH61A	63	CH61B
5	CH43A	25	CH43B	44	CH62A	64	CH62B
6	CH44A	26	CH44B	45	CH63A	65	CH63B
7	CH45A	27	CH45B	46	CH64A	66	CH64B
8	CH46A	28	CH46B	47	CH65A	67	CH65B
9	CH47A	29	CH47B	48	CH66A	68	CH66B
10	CH48A	30	CH48B	49	CH67A	69	CH67B
11	CH49A	31	CH49B	50	CH68A	70	CH68B
12	CH50A	32	CH50B	51	CH69A	71	CH69B
13	CH51A	33	CH51B	52	CH70A	72	CH70B
14	CH52A	34	CH52B	53	CH71A	73	CH71B
15	CH53A	35	CH53B	54	CH72A	74	CH72B
16	CH54A	36	CH54B	55	CH73A	75	CH73B
17	CH55A	37	CH55B	56	CH74A	76	CH74B
18	CH56A	38	CH56B	57	CH75A	77	CH75B
19	CH57A	39	CH57B	58	CH76A	78	CH76B
20	CHASSIS			59	GND		

Table 3-2: J7 Connector (Group B)

J8 - Group C Relays Connector

The following table describes the J8 (78 D Type) connector's pins:

Pin	Name	Pin	Name	Pin	Name	Pin	Name
1	CH77A	21	CH77B	40	CH96A	60	CH96B
2	CH78A	22	CH78B	41	CH97A	61	CH97B
3	CH79A	23	CH79B	42	CH98A	62	CH98B
4	CH80A	24	CH80B	43	CH99A	63	CH99B
5	CH81A	25	CH81B	44	CH100A	64	CH100B
6	CH82A	26	CH82B	45	CH101A	65	CH101B
7	CH83A	27	CH83B	46	CH102A	66	CH102B
8	CH84A	28	CH84B	47	CH103A	67	CH103B
9	CH85A	29	CH85B	48	CH104A	68	CH104B
10	CH86A	30	CH86B	49	CH105A	69	CH105B
11	CH87A	31	CH87B	50	CH106A	70	CH106B
12	CH88A	32	CH88B	51	CH107A	71	CH107B
13	CH89A	33	CH89B	52	CH108A	72	CH108B
14	CH90A	34	CH90B	53	CH109A	73	CH109B
15	CH91A	35	CH91B	54	CH110A	74	CH110B
16	CH92A	36	CH92B	55	CH111A	75	CH111B
17	CH93A	37	CH93B	56	CH112A	76	CH112B
18	CH94A	38	CH94B	57	CH113A	77	CH113B
19	CH95A	39	CH95B	58	CH114A	78	CH114B
20	CHASSIS			59	GND		

Table 3-3: J8 Connector (Group C)

Chapter 4 - Functions Reference

Introduction

The GX6338 driver functions 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).

- The first parameter of most functions is *nHandle* (16-bit integer). This parameter is required for operating the board and is returned by the **Gx6338Initialize** or the **Gx6338InitializeVisa** 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 GX6338.DRV.

- Parameter name are prefixed as follows:

Prefix	Type	Example
a	Array, prefix this before the simple type.	*anArray* (Array of Short)
n	Short (signed 16-bit)	*nMode*
d	Double - 8 bytes floating point	*dReading*
dw	Double word (unsigned 32-bit)	*dwTimeout*
hwnd	Window handle (32-bit integer).	*hwndPanel*
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*

Table 4-1: Parameter Name Prefixes

Gx6338 Functions

The following list is a summary of functions available for the GX6338:

Driver Functions	Description
Gx6338Close	Closes the specified relay.
Gx6338GetBoardSummary	Returns the board summary.
Gx6338GetChannel	Returns the state of the specified relay.
Gx6338GetGroupChannels	Returns the status of all relays in the specified group.
Gx6338GroupReset	Opens all relays of the specified group.
Gx6338Initialize	Initializes the driver for the GX6338 board at the specified PXI slot.
Gx6338InitializaVisa	Initializes the driver for the specified slot using VISA. The function returns a handle that can be used with other GX6338 functions to program the board.
Gx6338Open	Opens the specified relay.
Gx6338Panel	Opens the GX6338 virtual panel used to interactively control the GX6638 board.
Gx6338Reset	Opens all the board relays.
Gx6338SetGroupChannels	Sets all relays of the specified group to a specified state.
GxSWGetErrorString	Returns the error string associated with the specified error number.

Gx6338Close

Purpose

Closes the specified relay.

Syntax

Gx6338Close (*nHandle, nChannel, pnStatus*)

Parameters

Name	Type	Comments
nHandle	SHORT	Handle to a GX6338 board.
nChannel	SHORT	Specifies the relay number. Can be 1 to 114.
pnStatus	LPSHORT	Returned status: 0 on success, negative number on failure.

Comments

The **Gx6338GetChannel** function can be used to retrieve the current channel state.

Caution - When closing a relay, verify that all other relays on the same circuit that may cause a short are disconnected (a delay may be required between switching commands). Low Impedance sources such as power supplies may cause irreversible damage to this product when shorted to other signals.

Example

The following example closes relay 1 and relay 22:

```
Gx6338Close (nHandle, 1, &nStatus);
Gx6338Close (nHandle, 22, &nStatus);
```

See Also

Gx6338Initialize, **Gx6338Open**, **Gx6338SetGroupChannels**, **Gx6338GetChannel**

Gx6338GetBoardSummary

Purpose

Returns the board summary.

Syntax

Gx6338GetBoardSummary (*nHandle, szSummary, nSumMaxLen, pnStatus*)

Parameters

Name	Type	Comments
nHandle	SHORT	Handle to a GX6338 board.
szSummary	PSTR	Buffer to contain the returned board info (null terminated) string.
nSumMaxLen	SHORT	Size of the buffer to contain the board info string.
pnStatus	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The GX6338 summary string provides the following data from in the order shown:

- Instrument Name (e.g., GX6338)

- FPGA version (e.g. 0xA003)

For example, the returned string looks like the following:

```
"GX6338, FPGA-Version:0xB201"
```

See Also

GxSWGetDriverSummary, GxSWGetErrorString

Gx6338GetChannel

Purpose

Returns the state of the specified relay.

Syntax

Gx6338GetChannel (*nHandle, nChannel, pnState, pnStatus*)

Parameters

Name	Type	Comments
nhandle	SHORT	Handle to a GX6338 board.
nChannel	SHORT	Specifies the relay number. Can be 1 to 114.
pnState	LPSHORT	Returned relay state. Closed = 1 and Open = 0.
pnStatus	LPSHORT	Returned status: 0 on success, negative number on failure.

Comments

Use the **Gx6338GetGroupChannels** to retrieve the status of all channels of the specified group.

Example

The following example return the status of relay 1:

```
Gx6338GetChannel(nHandle, 1, &nStateClose, &nStatus);
if (nState==1)
    printf("Relay 1 is Closed");
else
    printf("Relay 1 is Open");
```

See Also

Gx6338Initialize, **GxSWGetErrorString**, **Gx6338Close**, **Gx6338Open**, **Gx6338GetGroupChannels**

Gx6338GetGroupChannels

Purpose

Returns the status of all relays in the specified group.

Syntax

Gx6338GetGroupChannels (*nHandle, nGroup,* plHighChStates, plLowChState,*pnStatus*)

Parameters

Name	Type	Comments
nHandle	SHORT	Handle to a GX6338 board.
nGroup	SHORT	Group on the GX6338 board. 0-2: 0 for group A, 1 for group B and 2 for group C.
plHighChStates	LPLONG	Returned state of relays 33-38 of the given group.
plLowChStates	LPLONG	Returned state of relays 1-32 of the given group.
pnStatus	LPSHORT	Returned status: 0 on success, negative number on failure.

Comments

The function returns the state of all the channels (relays) of a specified group in two 32-bit long variables, plHighChStates and plLowChStates. Every bit in plxxxStates represents a channel. The bits 0-31 of *lLowChStates* are for relays 1-32 and bits 0-5 of *lHighChStates* are for relays 33-38 respectively. For each bit, a value of 0 indicates that the channel is open while a value of 1 indicates that the channel is closed.

Use **Gx6338GetChannel** function to retrieve the status of a single channel.

Example

The following example checks whether relays 1 and 3 of group A are closed:

```
Gx6338GetGroupChannels(nHandle, 0, &lHighChStates,
    &lLowChStates, &nStatus);
if ((plLowChStates & 0x5) == 0x5)    // binary ..0000101
    printf("Relay 1 and 3 are closed");
```

See Also

Gx6338Initialize, **GxSWGetErrorString**, **Gx6338GetChannel**, **Gx6338SetGroupChannels**

Gx6338GroupReset

Purpose

Opens all relays of the specified group.

Syntax

Gx6338GroupReset (*nHandle, nGroup, pnStatus*)

Parameters

Name	Type	Comments
nHandle	SHORT	Handle to a GX6338 board.
nGroup	SHORT	Group number: 0-2, represents group A-C
pnStatus	LPSHORT	Returned status: 0 on success, negative number on failure.

Example

The following example initializes the driver and then resets 38 relays of group A.

```
Gx6338Initilize (1, &nHandle, &nStatus);
if (nStatus < 0)
    return nStatus;    // return error
Gx6338GroupReset (nHandle, 0, &nStatus);
```

See Also

Gx6338Initialize, **GxSWGetErrorString**, **Gx6338SetGroupChannels**

Gx6338Initialize

Purpose

Initializes the driver for the GX6338 board at the specified PXI slot. The function returns a handle that can be used with other GX6338 functions to program the board.

Syntax

Gx6338Initialize (*nSlot, pnHandle, pnStatus*)

Parameters

Name	Type	Comments
nSlot	Short	GX6338 board slot number on the PCI bus.
pnHandle	LPSHORT	Returned handle for the board. The handle is set to zero on error and non zero on success.
pnStatus	LPSHORT	Returned status: 0 on success, negative number on failure.

Comments

The **Gx6338Initialize** function verifies whether or not the GX6338 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 # x 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 GX6338 functions.

Example

The following example initializes two GX6338 boards at slot 1 and 2.

```
SHORT   nHandle1, nHandle2, nStatus;

Gx6338Initilize (1, &nHandle1, &nStatus);
Gx6338Initilize (2, &nHandle2, &nStatus);
if (nHandle1==0 || nHandle2==0)
{   printf("Unable to Initialize the board")
    return;
}
```

See Also

Gx6338Reset, **GxSWGetErrorString**

Gx6338InitializeVisa

Purpose

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

Syntax

Gx6338InitializeVisa (szVisaResource, *pnHandle, pnStatus*)

Parameters

Name	Type	Comments
szVisaResource	LPCTSTR	String identifying the location of the specified board in order to establish a session.
pnHandle	PSHORT	Returned Handle (session identifier) that can be used to call any other operations of that resource
pnStatus	PSHORT	Returned status: 0 on success, 1 on failure.

Comments

The **Gx6338InitializeVisa** 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 GX6338 boards at PXI bus 5 and device 11.

```
SHORT nHandle, nStatus;
GX6338InitializeVisa ("PXI5::11::INSTR", &nHandle, &nStatus);
if (nHandle==0)
{
    printf("Unable to Initialize the board")
    return;
}
```

See Also

Gx6338Initialize, Gx6338Reset, **GxSWGetErrorString**

Gx6338Open

Purpose

Opens the specified relay.

Syntax

Gx6338Open (*nHandle, nChannel, pnStatus*)

Parameters

Name	Type	Comments
nHandle	SHORT	Handle to a GX6338 board.
nChannel	SHORT	Specifies the relay number. Can be 1 to 114.
pnStatus	LPSHORT	Returned status: 0 on success, negative number on failure.

Comments

The **Gx6338GetChannel** function can be used to retrieve the current channel state.

Example

The following example opens relay 1 and relay 22:

```
Gx6338Open (nHandle, 1, &nStatus);
Gx6338Open (nHandle, 22, &nStatus);
```

See Also

Gx6338Initialize, **GxSWGetErrorString**, **Gx6338Reset**, **Gx6338Close**, **Gx6338SetGroupChannels**,**Gx6338GetChannel**

Gx6338Panel

Purpose

Opens a virtual panel used to interactively control the GX6338 board.

Syntax

Gx6338Panel (*pnHandle, hwndParent, nMode, phwndPanel, pnStatus*)

Parameters

Name	Type	Comments
pnHandle	LPSHORT	Handle to a GX6338 board. This number may be zero if the board is to be initialized by the panel window.
hwndParent	DWORD	Sets the panel parent window handle. A value of 0 sets the desktop as the parent window.
nMode	SHORT	The mode in which the panel main window is created. 0 for modeless and 1 for modal window.
phwndPanel	LPDWORD	Returned window handle for the panel (for modeless panel only).
pnStatus	LPSHORT	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 GX6338 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;
...
Gx6338Panel (&nHandle, 0, 1, &dwPanel, &nStatus);
```

See Also

Gx6338Initialize, **GxSWGetErrorString**

Gx6338Reset

Purpose

Opens all the board relays.

Syntax

Gx6338Reset (*nHandle, pnStatus*)

Parameters

Name	Type	Comments
nHandle	SHORT	Handle to a GX6338 board.
pnStatus	LPSHORT	Returned status: 0 on success, negative number on failure.

Comments

The function is normally called after calling the **Gx6338Initialize** function, since the initialize function will not reset the board.

Example

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

```
Gx6338Initilize (1, &nHandle, &nStatus);
if (nStatus < 0)
    return nStatus;   // return error
Gx6338Reset (nHandle, &nStatus);
```

See Also

Gx6338Initialize, **GxSWGetErrorString**, **Gx6338SetGroupChannels**

Gx6338SetGroupChannels

Purpose

Sets all relays of the specified group to a specified state.

Syntax

Gx6338SetGroupChannels (*nHandle*, *nGroup*, *lHighChStates, lLowChState*, *pnStatus*)

Parameters

Name	Type	Comments
nHandle	SHORT	Handle to a GX6338 board.
nGroup	SHORT	Group on the GX6338 board. 0-2: 0 for group A, 1 for group B and 2 for group C.
lHighChStates	LONG	State of relays 33-38 of the given group.
lLowChStates	LONG	State of relays 1-32 of the relays group.
pnStatus	LPSHORT	Returned status: 0 on success, negative number on failure.

Comments

The lxxxStates parameter holds the state of group relays. Every bit represents a channel. A value of 0 indicates that the channel is open while a value of 1 indicates that the channel is closed. Bit 0 (low order bit) of *lLowChStates* is used for channel 1 and bit 31 (hi order) for channel 32, e.g. a value of 3 means channel 1 and 2 are closed and the rest of the channels (1 to 32) of the group are open. Bit 0 (low order bit) of *lHighChStates* is used for channel 33 and bit 5 for channel 38, e.g. value of 5 means channel 33 and 35 are closed and the rest of channels (33 to 38) of the group are open.

Note: Channels that changes state from close to open are first being opened and only then closes any channel that needs to be closed.

Use **Gx6338GetChannel** function instead to retrieve the status of a single channel.

Caution - When closing a relay, verify that all other relays on the same circuit that may cause a short are disconnected (a delay may be required between switching commands). Low Impedance sources such as power supplies may cause irreversible damage to this product when shorted to other signals.

Example

The following example sets relays 1 and 3 of group A to a closed state:

```
lLowChOpenClose=0x5; lHighChOpenClose=0;
Gx6338SetGroupChannels(nHandle, 0, lHighChOpenClose, lLowChOpenClose, &nStatus);
```

See Also

Gx6338Initialize, **Gx6338GetChannel**, **GxSWGetErrorString, GX6338GetGroupChannels, GX6338Close, GX6338Open**

GxSWGetErrorString

Purpose

Returns the error string associated with the specified error number.

Syntax

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

Parameters

Name	Type	Comments
nError	SHORT	Error number as returned by the *pnStatus* 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.
pszMsg	LPSTR	Buffer containing the returned error string (null terminated string).
nErrorMaxLen	SHORT	Size of the buffer *pszMsg*.
pnStatus	LPSHORT	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 values, or 0 on success.

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

Resource Errors

-1   Board does not exist in this slot

-2   Unable to open the HW device/Service

-3   Different board exist in the specified PCI slot

-4   PCI slot not configured properly. You may configure it by using the **PCIExplorer** from the Control Panel

-5   Unable to register the PCI device

-6   Unable to allocate system resource or memory for the PCI device

-7   Too many boards

-8   Unable to create panel

-9   Unable to create a Windows timer

Parameter Errors

-20   Invalid parameter

-21   Invalid PCI slot number

-22   Invalid board handle

-23   Invalid channel number

-24   Invalid bus number

-25   Invalid mode

-26   Invalid group number

-27   Invalid string length

-28　　　Invalid row number

-29　　　Invalid column number

Board Errors/Warnings

-50　　　BIT error: Adapter not connected

-51　　　BIT error: Comparator Error

-52　　　BIT error: Unable to open/close a relay in Group *x*, Row *y* Column *z*

-53　　　BIT error: Error occurred while switching a relay in Group *x* (Row y Column *z*) in Row *a*, Column *b*

-54　　　The board successfully passed the BIT. Only one BIT adapter was found and tested.

Miscellaneous Errors

-99　　　Invalid or unknown error number

Example

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

```
CHAR    sz[256];
SHORT   nStatus, nHandle;

GX6338Initialize(3, &Handle, &Status);
if (nStatus<0)
{   GxSWGetErrorString(nStatus, sz, sizeof sz, &nStatus);
    printf(sz);          // print the error string return;
}
```

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