

GXSW

Switching Instruments

GX6138

Form A Relay Board

User's Guide

Last update: December 13, 2016

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 strong electromagnetic or electrostatic fields. Store circuit boards in protective anti-electrostatic wrapping and away from electromagnetic fields.

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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 **GX6138** PXI Switch Matrix Board. The manual also covers the **GXSW** software package that includes the GX6138 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 GX6138 manual is organized in the following manner:

Chapter	Content
Chapter 1 – Introduction	Introduces the GX6138 manual and shows warning conventions used in the manual.
Chapter 2 – Overview	Provides the GX6138 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 GX6138 board and the GXSW software.
Chapter 4 – Functions Reference	Provides a list of the GXSW driver functions for the GX6138. 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.
<i>Italic type</i>	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 GX6138 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 GX6138 is a 6U PXI high-density relay switching instrument supporting the following features:

- 38 individual relays
- 0.5A contact rating per channel
- Occupies one PXI bus slot

Board Description

The GX6138 is a 6U PXI board featuring 38 channels of single pole single throw switches with one connector J6 and one chassis ground jumper - JP1.



Figure 2-1: GX6138 High Density Relay Board

Architecture

The GX6138 consists of three switching groups: A, B and C. Each group has 38 individual relays connected to J6 as shown in Figure 2-2.

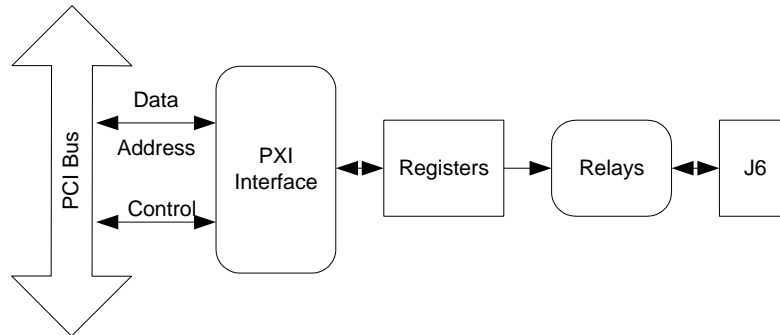


Figure 2-2: GX6138 Architecture

Relays

The GX6138 has 38 Form A (SPST) relays (see Figure 2-3).



Figure 2-3: A typical GX6138 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 CH n A and the other is CH n B, where n is 1 to 38 (see Table 3-1 for J6 connectors' pins).

Specifications

The following table outlines the specifications of the GX6138:

Contact Specifications

Relay Format	38 SPST (1 Form A)	
Channel Resistance	0.3 Ω 0.1 Ω	Maximum Typical
Relay Contact Resistance	0.2 Ω 0.03 Ω	Maximum Initial
Contact Life Rating At 28 VDC @ 0.5A	10x10 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 μ Sec	Maximum, excluding bounce
Release Time	250 μ Sec	Maximum, excluding bounce

Power Requirements

3.3V Power	160mA Max
5V Power	600mA Typical, 1.1A 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	3U PXI
Weight	200g

Virtual Panel Description

The GX6138 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 **GX6138 Panel** from the **Marvin Test Solutions, GXSW** menu under the **Start** menu. The GX6138 virtual panel opens as shown here:

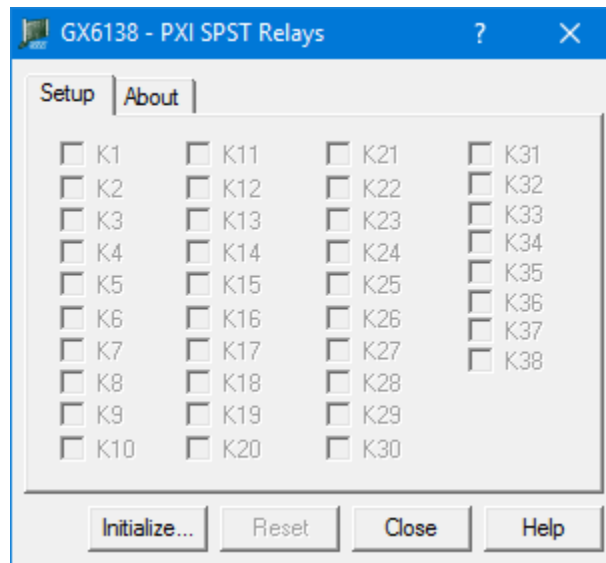


Figure 2-4: GX6138 Virtual Panel

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 GX6138 panel.

Help: Opens the GX6138 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 0x10D (chassis 1 Slot 13). This is the slot number argument (*nSlot*) passed by the panel when calling the driver **Gx6138Initialize** function used to initialize driver with the specified board.

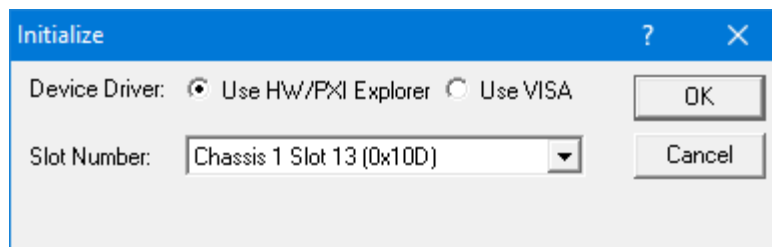


Figure 2-5: Initialize Dialog Box using Marvin Test Solutions' HW driver

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 PXI10::10::INSTR as the VISA resource (PCI bus 10 and Device 10). This is VISA resource string argument (*szVisaResource*) passed by the panel when calling the driver **Gx6138InitializeVisa** function to initialize the driver with the specified board.

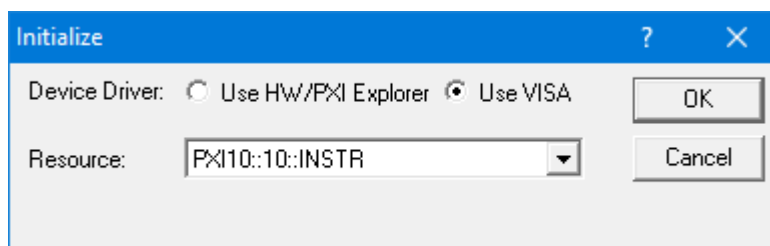


Figure 2-6: Initialize Dialog Box using VISA resources

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:

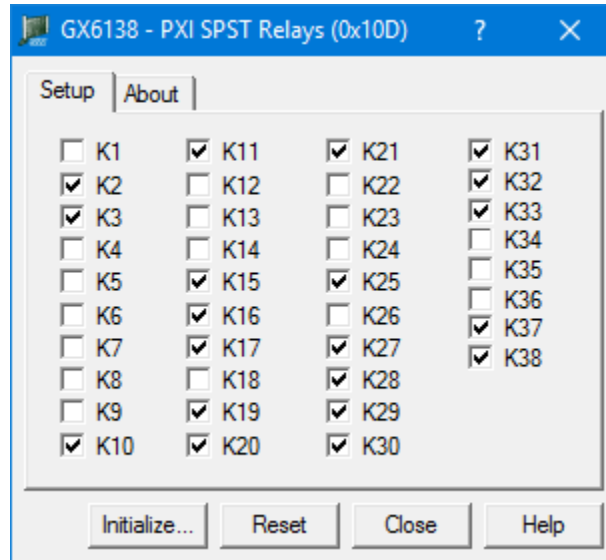


Figure 2-7: GX6138 Virtual Panel (Initialized)

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 – K38): 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:

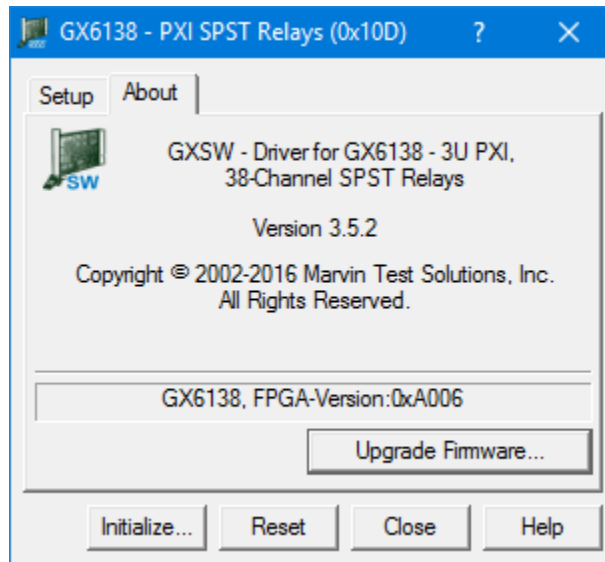


Figure 2-8: GX6138 Virtual Panel – About Page

The top part of the **About** page displays version and copyright of the GX6138 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 GX6138 board and installation instructions for the GX6138 (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
GX6138 Driver Installation	This Chapter
GX6138 Function Reference	Chapter 4

Packing List

All GX6138 boards have the same basic packing list, which includes:

1. GX6138 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 GX6138 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. In addition, Microsoft Windows Explorer version 4.0 or above is required to view the online help.

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 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 GX6138 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 GX6138 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 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.

Installation Folders

The GX6138 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. GXPIO 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 **GX6138Initialize** and **GX6138InitializeVisa** 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).

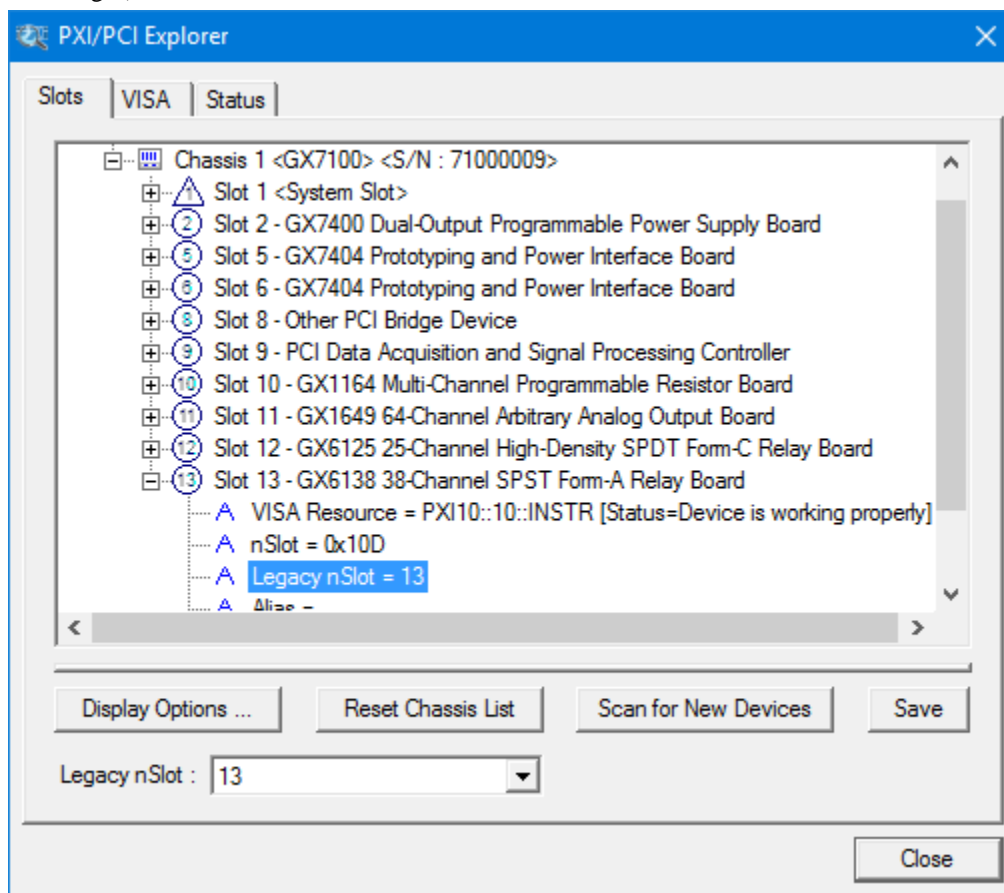


Figure 3-1: PXI/PCI Explorer

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 GX6138 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 Figure 3-2).

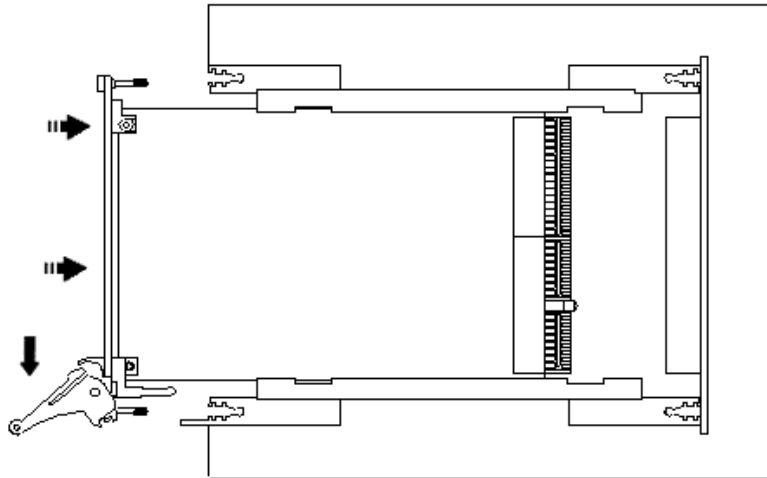


Figure 3-2: Ejector handles position during module insertion

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

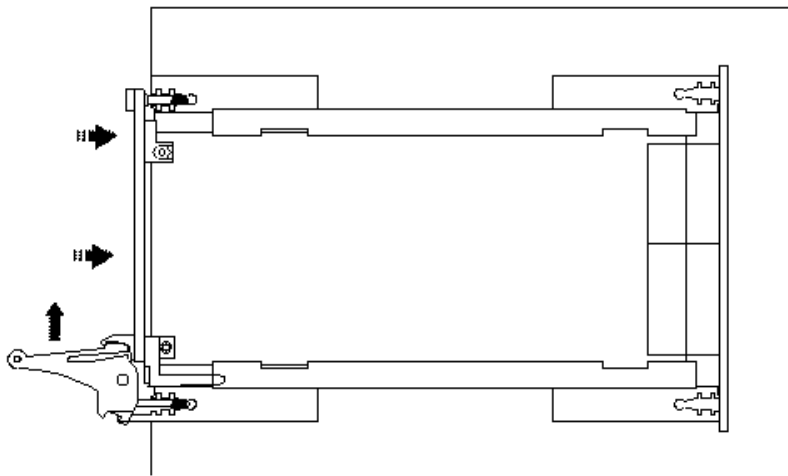


Figure 3-3: Ejector handles position after module insertion

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

Figure 3-4 shows the GX6138 board connectors and jumper followed by their description:

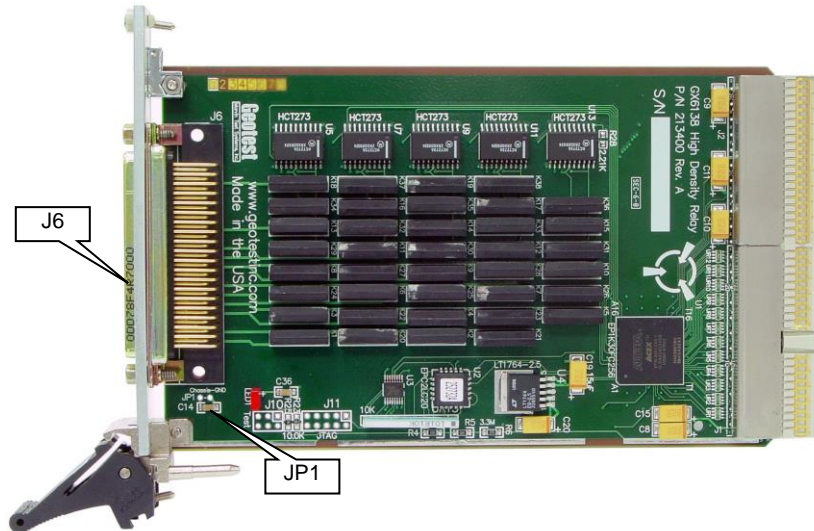


Figure 3-4: GX6138 Connectors and Jumpers

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 GX6138 using standard 78 pins, D-Type Male connectors. Each GX6138 uses three mating DB78 connectors. Extra connectors are available separately.

Connectors and Accessories

The following accessories are available from Marvin Test Solutions for GX6138 switching instruments.

Part / Model Number	Description
GX96001	Extra switching products user manual
GX96501	Extra user manual for GX6138
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 – 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

Chapter 4 - Functions Reference

Introduction

The GX6138 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 **Gx6138Initialize** or the `Gx6138InitializeVisa` 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 `GX6138.DRV`.
- 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)	<i>nMode</i>
d	Double - 8 bytes floating point	<i>dReading</i>
dw	Double word (unsigned 32-bit)	<i>dwTimeout</i>
hwnd	Window handle (32-bit integer).	<i>hwndPanel</i>
l	Long (signed 32-bit)	<i>lBits</i>
p	Pointer. Usually used to return a value. Prefix this before the simple type.	<i>pnStatus</i>
sz	Null (zero value character) terminated string	<i>szMsg</i>
w	Unsigned short (unsigned 16-bit)	<i>wParam</i>

Table 4-1: Parameter Name Prefixes

Gx6138 Functions

The following list is a summary of functions available for the GX6138:

Driver Functions	Description
Gx6138Close	Closes the specified relay.
Gx6138GetBoardSummary	Returns the board summary.
Gx6138GetChannel	Returns the state of the specified relay.
Gx6138GetGroupChannels	Returns the status of all relays in the specified group.
Gx6138GroupReset	Opens all relays of the specified group.
Gx6138Initialize	Initializes the driver for the GX6138 board at the specified PXI slot.
Gx6138InitalizeVisa	Initializes the driver for the specified slot using VISA. The function returns a handle that can be used with other GX6138 functions to program the board.
Gx6138Open	Opens the specified relay.
Gx6138Panel	Opens the GX6138 virtual panel used to interactively control the GX6638 board.
Gx6138Reset	Opens all the board relays.
Gx6138SetGroupChannels	Sets all relays of the specified group to a specified state.
GxSWGetErrorString	Returns the error string associated with the specified error number.

Gx6138Close

Purpose

Closes the specified relay.

Syntax

Gx6138Close (*nHandle*, *nChannel*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6138 board.
<i>nChannel</i>	SHORT	Specifies the relay number. Can be 1 to 38
<i>pnStatus</i>	LPSHORT	Returned status: 0 on success, negative number on failure.

Comments

The **Gx6138GetChannel** 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:

```
Gx6138Close (nHandle, 1, &nStatus);
Gx6138Close (nHandle, 22, &nStatus);
```

See Also

Gx6138Initialize, **Gx6138Open**, **Gx6138SetGroupChannels**, **Gx6138GetChannel**

Gx6138GetBoardSummary

Purpose

Returns the board summary.

Syntax

Gx6138GetBoardSummary (nHandle, szSummary, nSumMaxLen, pnStatus)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6138 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 error string.
<i>pnStatus</i>	PSHORT	Returned status: 0 on success, negative number on failure.

Comments

The GX6138 summary string provides the following data:

- Instrument name (e.g., GX6138)
- FPGA version of main board (e.g. 0xA003)

For example, the returned string could look like the following:

```
GX6138, FPGA Version:0xA000
```

Gx6138GetChannel

Purpose

Returns the state of the specified relay.

Syntax

Gx6138GetChannel (*nHandle*, *nChannel*, *pnState*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nhandle</i>	SHORT	Handle to a GX6138 board.
<i>nChannel</i>	SHORT	Specifies the relay number. Can be 1 to 38.
<i>pnState</i>	LPSHORT	Returned relay state. Closed = 1 and Open = 0.
<i>pnStatus</i>	LPSHORT	Returned status: 0 on success, negative number on failure.

Comments

Use the **Gx6138GetGroupChannels** to retrieve the status of all channels of the specified group.

Example

The following example return the status of relay 1:

```
Gx6138GetChannel(nHandle, 1, &nStateClose, &nStatus);
if (nState==1)
    printf("Relay 1 is Closed");
else
    printf("Relay 1 is Open");
```

See Also

Gx6138Initialize, **GxSWGetErrorString**, **Gx6138Close**, **Gx6138Open**, **Gx6138GetGroupChannels**

Gx6138GetGroupChannels

Purpose

Returns the status of all relays in the specified group.

Syntax

Gx6138GetGroupChannels (*nHandle*, *nGroup*, *plHighChStates*, *plLowChState*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6138 board.
<i>nGroup</i>	SHORT	Group on the GX6138 board. 0-2: 0 for group A, 1 for group B and 2 for group C.
<i>plHighChStates</i>	LPLONG	Returned state of relays 33-38 of the given group.
<i>plLowChStates</i>	LPLONG	Returned state of relays 1-32 of the given group.
<i>pnStatus</i>	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 **Gx6138GetChannel** function to retrieve the status of a single channel.

Example

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

```
Gx6138GetGroupChannels(nHandle, 0, &lHighChStates,
    &lLowChStates, &nStatus);
if ((plLowChStates & 0x5) == 0x5)    // binary ..0000101
    printf("Relay 1 and 3 are closed");
```

See Also

Gx6138Initialize, **GxSWGetErrorString**, **Gx6138GetChannel**, **Gx6138SetGroupChannels**

Gx6138GroupReset

Purpose

Opens all relays of the specified group.

Syntax

Gx6138GroupReset (*nHandle*, *nGroup*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6138 board.
<i>nGroup</i>	SHORT	Group number: 0-2, represents group A-C
<i>pnStatus</i>	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.

```
Gx6138Initilize (1, &nHandle, &nStatus);
if (nStatus < 0)
    return nStatus;    // return error
Gx6138GroupReset (nHandle, 0, &nStatus);
```

See Also

Gx6138Initialize, **GxSWGetErrorString**, **Gx6138SetGroupChannels**

Gx6138Initialize

Purpose

Initializes the driver for the GX6138 board at the specified PXI slot. The function returns a handle that can be used with other GX6138 functions to program the board.

Syntax

Gx6138Initialize (*nSlot*, *pnHandle*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nSlot</i>	SHORT	GX6138 board slot number on the PCI bus.
<i>pnHandle</i>	LPSHORT	Returned handle for the board. The handle is set to zero on error and non-zero on success.
<i>pnStatus</i>	LPSHORT	Returned status: 0 on success, negative number on failure.

Comments

The **Gx6138Initialize** function verifies whether or not the GX6138 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 GX6384 functions.

Example

The following example initializes two GX6138 boards at slot 1 and 2.

```
SHORT  nHandle1, nHandle2, nStatus;

Gx6138Initilize (1, &nHandle1, &nStatus);
Gx6138Initilize (2, &nHandle2, &nStatus);
if (nHandle1==0 || nHandle2==0)
{ printf("Unable to Initialize the board")
  return;
}
}
```

See Also

Gx6138Reset, **GxSWGetErrorString**

Gx6138InitializeVisa

Purpose

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

Syntax

Gx6138InitializeVisa (*szVisaResource*, *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>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 **Gx6138InitializeVisa** 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 GX6138 boards at PXI bus 5 and device 11.

```
SHORT nHandle, nStatus;
Gx6138InitializeVisa ("PXI5::11::INSTR", &nHandle, &nStatus);
if (nHandle==0)
{
    printf("Unable to Initialize the board")
    return;
}
```

See Also

Gx6138Initialize, **Gx6138Reset**, **GxSWGetErrorString**

Gx6138Open

Purpose

Opens the specified relay.

Syntax

Gx6138Open (*nHandle*, *nChannel*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6138 board.
<i>nChannel</i>	SHORT	Specifies the relay number. Can be 1 to 38.
<i>pnStatus</i>	LPSHORT	Returned status: 0 on success, negative number on failure.

Comments

The **Gx6138GetChannel** function can be used to retrieve the current channel state.

Example

The following example opens relay 1 and relay 22:

```
Gx6138Open (nHandle, 1, &nStatus);  
Gx6138Open (nHandle, 22, &nStatus);
```

See Also

Gx6138Initialize, **GxSWGetErrorString**, **Gx6138Reset**, **Gx6138Close**, **Gx6138SetGroupChannels**, **Gx6138GetChannel**

Gx6138Panel

Purpose

Opens a virtual panel used to interactively control the GX6138 board.

Syntax

Gx6138Panel (*pnHandle*, *hwndParent*, *nMode*, *phwndPanel*, *pnStatus*)

Parameters

Name	Type	Comments
<i>pnHandle</i>	LPSHORT	Handle to a GX6138 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>	LPDWORD	Returned window handle for the panel (for modeless panel only).
<i>pnStatus</i>	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 GX6138 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;
...
Gx6138Panel (&nHandle, 0, 1, &dwPanel, &nStatus);
```

See Also

Gx6138Initialize, **GxSWGetErrorString**

Gx6138Reset

Purpose

Opens all the board relays.

Syntax

Gx6138Reset (*nHandle*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6138 board.
<i>pnStatus</i>	LPSHORT	Returned status: 0 on success, negative number on failure.

Comments

The function is normally called after calling the **Gx6138Initialize** function, since the initialize function will not reset the board.

Example

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

```
Gx6138Initilize (1, &nHandle, &nStatus);  
if (nStatus < 0)  
    return nStatus;    // return error  
Gx6138Reset (nHandle, &nStatus);
```

See Also

Gx6138Initialize, **GxSWGetErrorString**, **Gx6138SetGroupChannels**

Gx6138SetGroupChannels

Purpose

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

Syntax

Gx6138SetGroupChannels (*nHandle*, *nGroup*, *lHighChStates*, *lLowChState*, *pnStatus*)

Parameters

Name	Type	Comments
<i>nHandle</i>	SHORT	Handle to a GX6138 board.
<i>nGroup</i>	SHORT	Group on the GX6138 board. 0-2: 0 for group A, 1 for group B and 2 for group C.
<i>lHighChStates</i>	LONG	State of relays 33-38 of the given group.
<i>lLowChStates</i>	LONG	State of relays 1-32 of the relays group.
<i>pnStatus</i>	LPSHORT	Returned status: 0 on success, negative number on failure.

Comments

The *lxxxStates* parameters 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 **Gx6138GetChannel** 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;
Gx6138SetGroupChannels(nHandle, 0, lHighChOpenClose, lLowChOpenClose, &nStatus);
```

See Also

Gx6138Initialize, **Gx6138GetChannel**, **GxSWGetErrorString**, **GX6138GetGroupChannels**, **GX6138Close**, **GX6138Open**

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>	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;

GX6138Initialize(3, &Handle, &Status);
if (nStatus<0)
{
    GxSWGetErrorString(nStatus, sz, sizeof sz, &nStatus);
    printf(sz);          // print the error string return;
}
```


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