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GIGA-TRONICS

Giga-tronics ASCOR Series 8000 Switch

Getting Started Guide

Terukuni Okuyama

2013-08-14

This guide describes the installation, controlling, and programming of the Series 8000 Switch Module.

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Record of Changes			
Revision	**Description of Change**	**Chg Order #**	**Approved By**
A	Initial Release	03579	TO
B	Added Installation Without IO Section Added Commands Section	03587	TO
C	Fixed Sec. 3.2.2 SPDT/Transfer description Fixed Typo “Ith” to”If” Added Switch Configure Commands and Switch Enabling Commands sections Added sections for USB-based chassis	03593	TO

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1. Overview

This Getting Started Guide makes you familiarized with the controlling and programming aspects of the Series 8000 Switch. It guides you through the GUI and I/O installation process. Modification of the IP address for the LAN-based Series 8000 Switch and the GPIB address for the GPIB-based Series 8000 Switch is described. A complete sample program for Microsoft Visual C++ is provided at the end.

This guide can be used for different families of the Series 8000 Switch, such as Series 8000 Switch for LAN, GPIB, or USB, or 8901 and 8902 for LAN, GPIB, or USB.

The LAN-based Series 8000 Switch is a VXI-11.3 compliant instrument. VXI-11 is a communication standard which utilizes RPC (Remote Procedure Call) and allows communication between a controller and an instrument over LAN.

The GPIB-based Series 8000 Switch is an IEEE-488.2 compatible instrument.

The USB-based Series 8000 Switch is controlled via the USB bus using Microsoft's Virtual COM Port Driver.

All versions of the Series 8000 Switch are controlled with the VISA I/O. It is used for making calls to communicate with the Series 8000 Switch. VISA I/O libraries are available from National Instruments and Agilent Technologies.

Our installation program for the Series 8000 GUI program comes in two different packages. The GUI program package installs the graphic runtime engine and the GUI program. The GUI program plus I/O drivers package installs all the necessary I/O drivers to gain access to the Series 8000 Switch. The latter package installs National Instruments VISA Runtime Engine for the support of the LAN-based Series 8000 Switch, and National Instruments IEEE-488.2 driver for the support of the GPIB-based Series 8000 Switch.

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2. Installing Series 8000 GUI Program, I/O and USB Driver

The following steps will guide you to install the GUI program for the Series 8000 Switch. There are two different installation packages, one with only the GUI program and one with the GUI program and the I/O driver. If you already have Agilent-VISA or NI-VISA installed in your system you may choose the installation package with only the GUI program. If you are installing on a fresh computer, choose the installation package with the I/O driver.

Locate the appropriate Series 8000 SVP folder on the Installation CD or unzip the appropriate Series 8000 SVP zip file to any temporary folder and run the setup.exe program.

2.1 Installing Series 8000 GUI Program and I/O Driver

2.1.1 Setup Opening Panel

One of the two Opening Panels for the Installation program will appear. Click Next to continue.

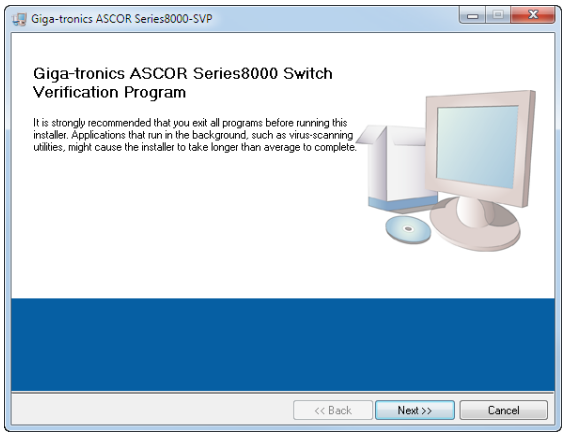


Figure 1 - Setup Opening Panel

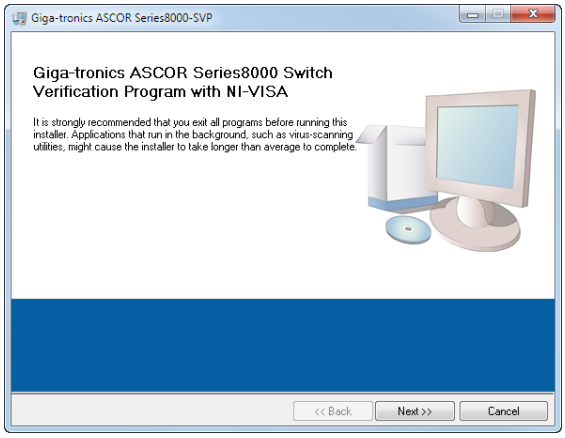


Figure 2 – Setup with I/O Opening Panel

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2.1.2 Destination Directory Panel

Set the destination folder if you desire to install the Series8000 GUI or the I/O driver into a different folder. In normal conditions, there is no need to change these folders. Click Next to continue.

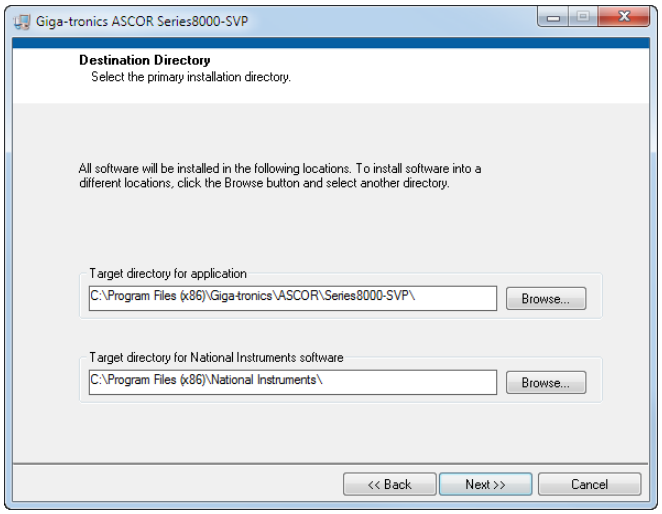


Figure 3 - Destination Directory Panel

2.1.3 License Agreement Panel

Please read the License Agreement and click on the "I accept the License Agreement" radio button. Click Next to continue.

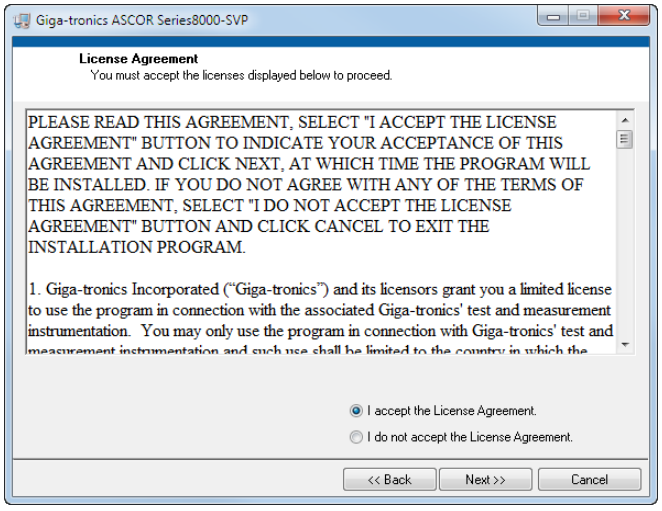


Figure 4 - License Agreement Panel

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2.1.4 Start Installation Panel

Verify the programs to be installed. Some sections may have already been installed in prior installations. Click Next to continue.

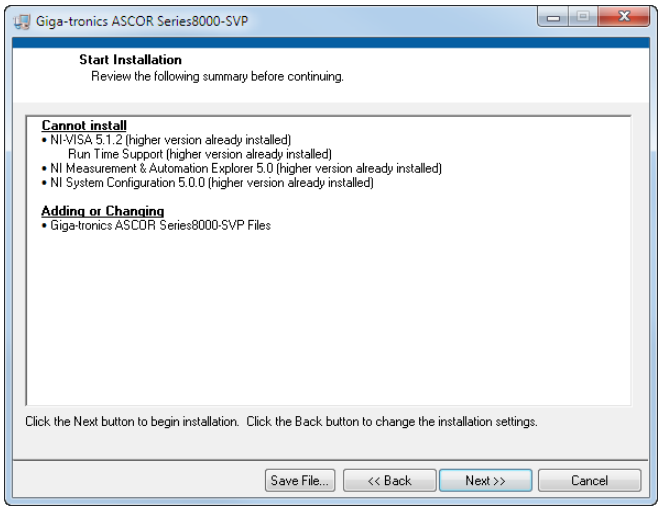


Figure 5 - Start Installation Panel

2.1.5 Installation Complete Panel

Installation is completed. Click Finish to exit the installation program.

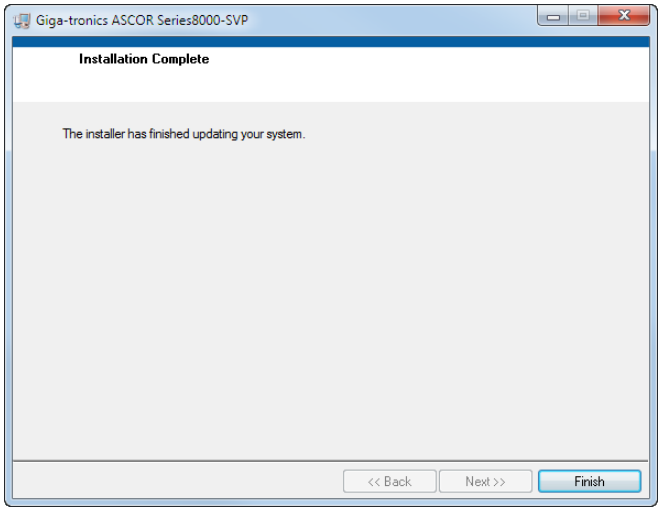


Figure 6 - Installation Complete Panel

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2.2 Installing the USB Device Driver

This section is for installing the USB Device Driver for Windows for USB-based Series 8000 Switch. If your Series 8000 Switch is not a USB-based version then you may skip this section.

Before plugging in the USB-based Series 8000 Switch to your PC, a device driver for the USB device must be installed for Windows to recognize the Switch chassis. The following Windows versions are supported: Windows XP Service Pack 3 or later, Windows 7 x86, and Windows 7 x64.

There are two versions of the installation program, one for the 32-bit Windows and the other for the 64-bit Windows. x86 folder holds the installation program for the 32-bit Windows and x64 folder holds the installation program for the 64-bit Windows. The two folders are located under MCP2200 Driver Installation Tool folder in the installation package.

Run the installation program MCP2200DriverInstallationTool.exe from the appropriate folder and follow the instruction.

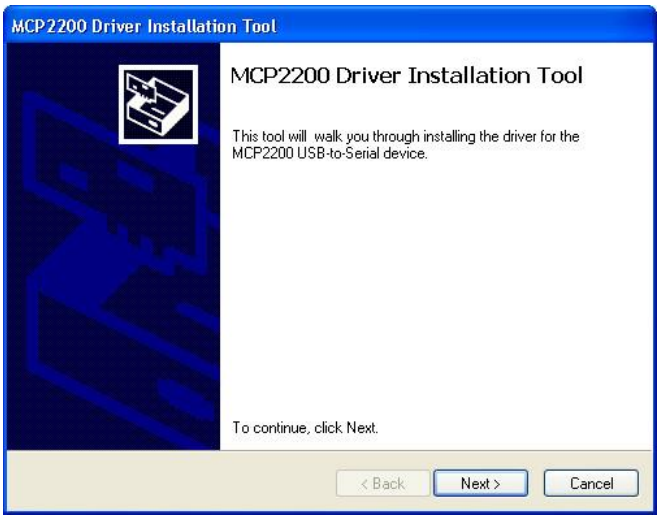


Figure 7 - USB Device Driver Initial Panel

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Please read the End User License Agreement and click on the “I accept” radio button. Click Next to continue.

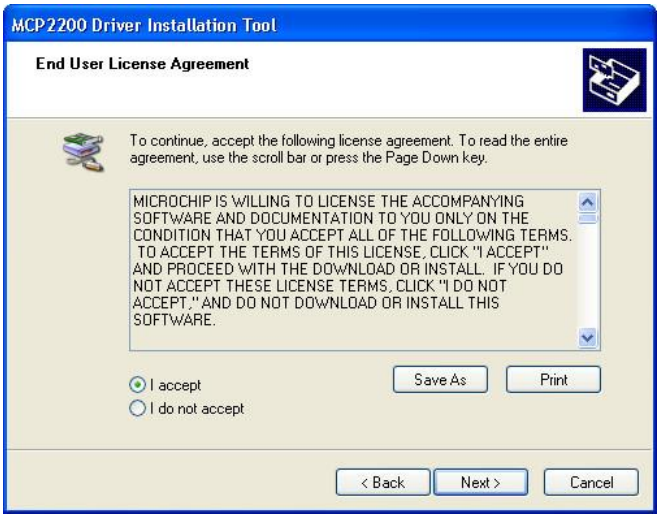


Figure 8 - USB Device Driver EULA Panel

Installation is completed. Click Finish to exit the installation program.

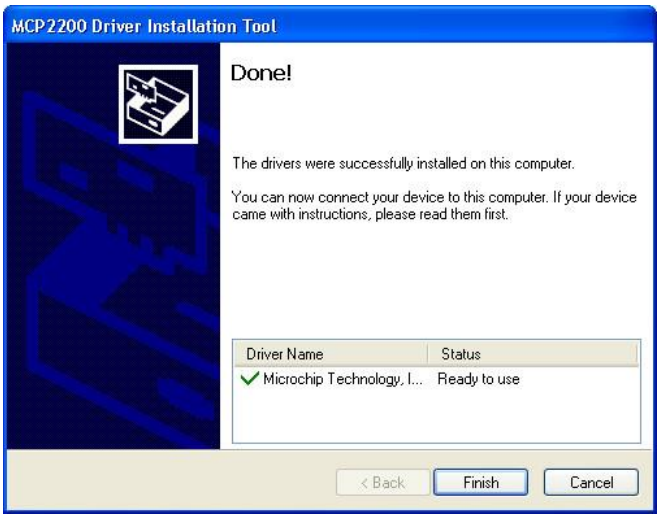


Figure 9 - USB Device Driver Done Panel

If the Series 8000 Switch was plugged in your PC before the driver was installed, Windows may assign a wrong driver for the Series 8000 Switch. In such a case, unplug the USB cable of Series 8000 Switch to the PC, uninstall the incorrect driver, restart Windows, and install the USB Device Driver.

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3. Starting the Series 8000 GUI Program

After the successful installation of the Series 8000 GUI program, it can be started from the Start Menu. Please follow one of the link below:

Start >> Series8000-SVP
Or
Start >> All Programs >> Giga-tronics >> ASCOR >> Series8000-SVP >> Series8000-SVP

3.1 Main Panel - Initialization Tab

The Series 8000 GUI program starts up in the Initialization Tab of the Main Panel. From this tab you can connect to the Series 8000 Switch in live mode. Or you can run this program in simulation mode.

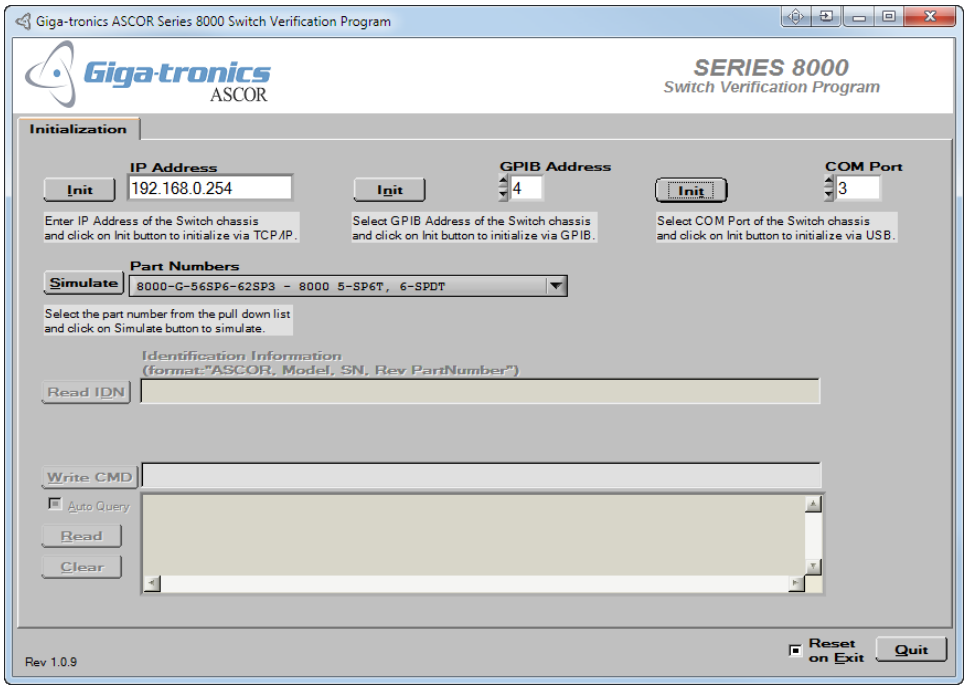


Figure 10 - Series 8000 SVP Initialization Tab

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3.1.1 Live Mode

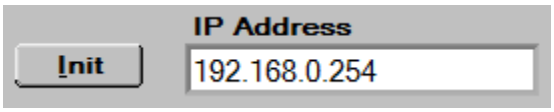
3.1.1.1 Connecting to the Series 8000 Switch

Series 8000 GUI supports LAN-based and GPIB-based Series 8000 Switch. Follow the appropriate section below.

3.1.1.1.1 For LAN-based Series 8000 Switch

If this is the first time connecting to the LAN-based Series 8000 Switch, see Section 4 Connecting to LAN-based Series 8000 Switch for the First Time for more information.

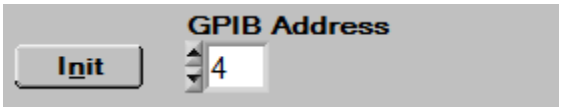
Enter the IP Address of the Series 8000 Switch and click on Init button.



3.1.1.1.2 For GPIB-based Series 8000 Switch

If this is the first time connecting to the GPIB-based Series 8000 Switch, see Section 7 Connecting to GPIB-based Series 8000 Switch for the First Time for more information.

Select the GPIB address of the Series 8000 Switch and click on Init button.



3.1.1.1.3 For USB-based Series 8000 Switch

If this is the first time connecting to the USB-based Series 8000 Switch, see Section 9 Connecting to USB-based Series 8000 Switch for the First Time for more information.

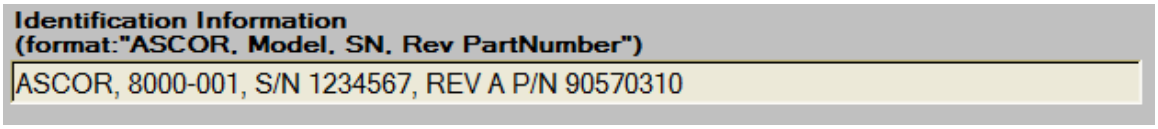
Select the COM port of the PC that is used for the Series 8000 Switch and click on Init button.



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3.1.1.2 Identification Information

After successful initialization, identification information is queried from the Series 8000 Switch and displayed on the display.



The format of the Identification Information is as follows:

<Manufacturer Name>, <Model>, <SN>, <Rev> <PartNumber>

Manufacturer Name is "ASCOR".

Model is the model number and it is either "8000" for the unit that does not support switch access counting capability. Or "8000-001" for the unit that supports switch access counting capability. These two model numbers are used for all different variations of the Series 8000 Switch including 8900 family.

SN is the serial number field of "S/N" header and a seven digit serial number of the unit separated by a space.

Rev is the revision number field of "REV" header and a revision number of the chassis assembly separated by a space.

PartNumber is the part number field of "P/N" header and a part number of the chassis separated by a space.

The Identification Information can be queried again by simply clicking the Read IDN 

button.

3.1.1.3 Manual Command Entry

Commands to the Series 8000 Switch can be manually from the Manual Command Entry block.



Enter the command in the entry section on the right and click the Enter key of the keyboard or click on the Write CMD button to send the command.

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3.1.1.4 Response Display

After a query command a response from the Series 8000 Switch is displayed in the Response Display.

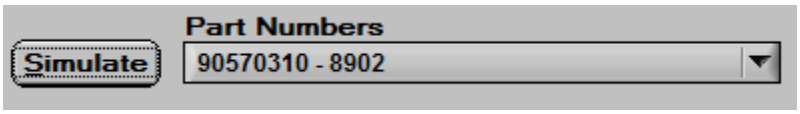


Enabling the Auto Query function will make the Series 8000 GUI program automatically read the response after query command. If the Auto Query function is disabled, the response to the query command can be read back by clicking on the Read button.

Clicking the Clear button clears the content of the Response Display.

3.1.2 Simulation Mode

If you do not have the Series 8000 Switch to connect or if you simply want to run the Series 8000 GUI program in simulation mode, select the desired part number of the unit to simulate from the Part Number pull down menu and click the Simulate button.



The controls and displays for the functionalities that are not supported in simulation mode are dimmed out and cannot be used. Any responses to the query commands are not simulated and default values are used instead.

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3.2 Main Panel - Switch Control Tab

The Switch Control Tab gives the capability to toggle the switch by simply clicking on the desired pin. This tab represents the front panel of the connected Series 8000 Switch that was automatically identified by the GUI program. In simulation mode this tab represents the front panel of the Series 8000 Switch selected by Part Number pull down menu in the Initialization tab.

The Series 8000 GUI supports various types of Series 8000 Switch. The panel below shows the virtual panel for the Model 8902 which can be identified by the part number 90570310 displayed on the sub tab.

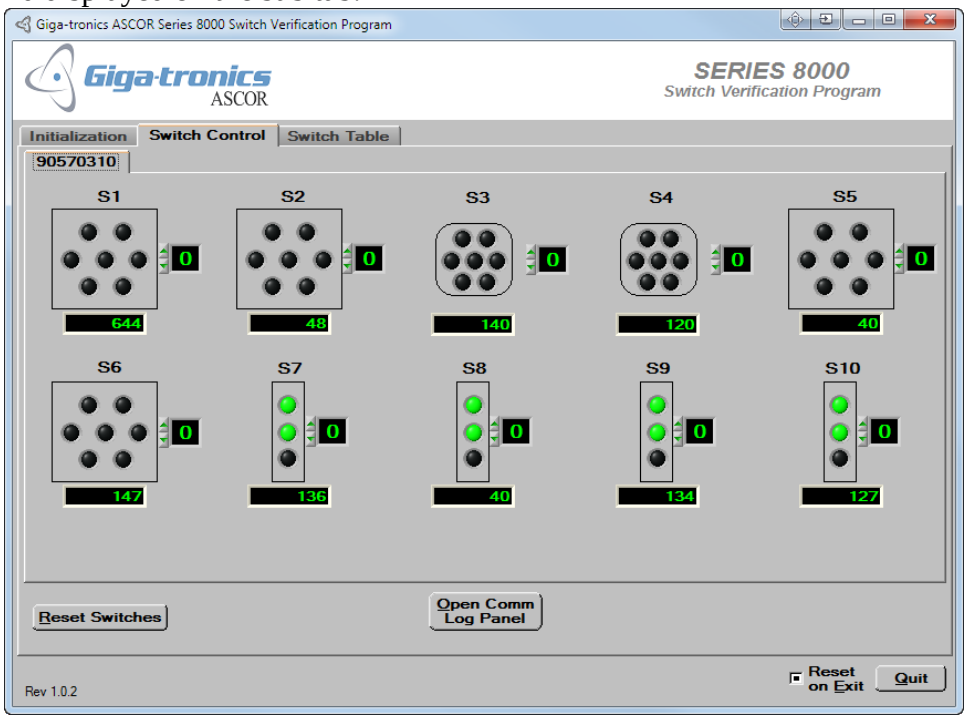


Figure 11 - Series 8000 SVP Switch Control Tab

The green or yellow color on the virtual LED signifies the associated pins are connected together. The black pins signify that there are no connections between the pins.

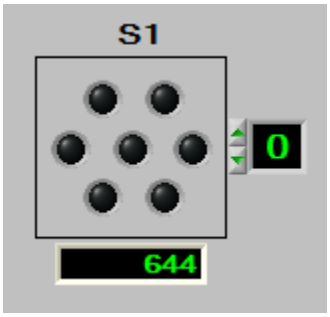


Figure 12 - SP6T Switch Block

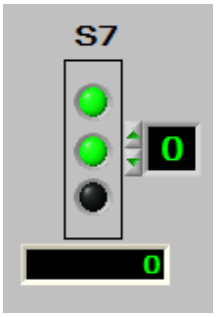


Figure 13 - SPDT Switch Block

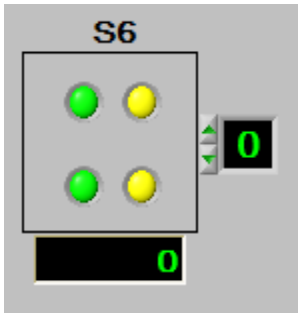


Figure 14 - Transfer Switch Block

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3.2.1 Closing and Opening Switches using Virtual LEDs

The switch can be controlled by clicking on the virtual LEDs.

For SP3T, SP4T, SP5T, SP6T, and SP8T switches, click on the unlit (black) virtual LED corresponding to the physical switch pin to connect a path from the corresponding pin to the common pin. Two virtual LEDs will light up indicating the corresponding path is closed. Click on either of the lit (green) virtual LEDs to open the connected path.

For SPDT switches, click on the virtual LED for the Normally Open (NO) to connect the path from Common to Normally Open. This is an energized or on state. Click on the virtual LED for the Normally Closed (NC) to connect from Common to Normally Closed. This is a de-energized or off state. Alternatively, click on the virtual LED for Common (C) to toggle between Normally Open and Normally Closed states.

For Transfer switches, click on the top right virtual LED to connect the path from Common to Normally Open. This is an energized or on state. In this state the paths along the horizontal pins are connected. Click on the bottom left virtual LED to connect the path from Common to Normally Closed. This is a de-energized or off state. In this state the paths along the vertical pins are connected. Alternatively, click on the top left or bottom right virtual LEDs to toggle between Normally Open and Normally Closed states.

3.2.2 Closing and Opening Switches using Numerical Controls

The switch can be controlled by selecting the desired position using the numerical control 

associated to the switch.

For SP3T, SP4T, SP5T, SP6T, and SP8T switches, the numerical control can be used for setting the switch to the desired position. Set to 0 to open the switch. Set to non-zero to close the switch to the desired position. The maximum position varies depending on the available poles of the switch.

For SPDT and Transfer switches, the numerical control can be used for selecting on and off states. Set to 0 for the off state. In this state the Common pin will connect to the Normally Closed pin. Set to 1 for the on state. In this state the Common pin will connect to the Normally Open pin.

3.2.3 Switch Access Count Indicators

For the Series 8000 Switch where counting capability is available, the counting indicator 

displays the running access count of the associated switch.

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3.3 Main Panel - Switch Table Tab

The Switch Table Tab lists all the possible switches for the selected chassis. The table has six columns – Label, Conn, Available, SW, Count, and Serial Number. The "Label" column shows the label of the switches on the Series 8000 Switch front panel. The "Conn" column shows the J-numbers of the socket on the driver board where the plugs of the switch cables connect. The "Available" column shows the availability of the switch. The "SW" column shows the switch number used in switch commands. The "Count" column shows the running access count of the switch. This count can be modified to any desired value. The "Serial Number" column shows the serial number of the switch.

In simulation mode, Counts and Serial Numbers can be changed in the Switch Table but cannot be saved and gets reverted to their respective default values.

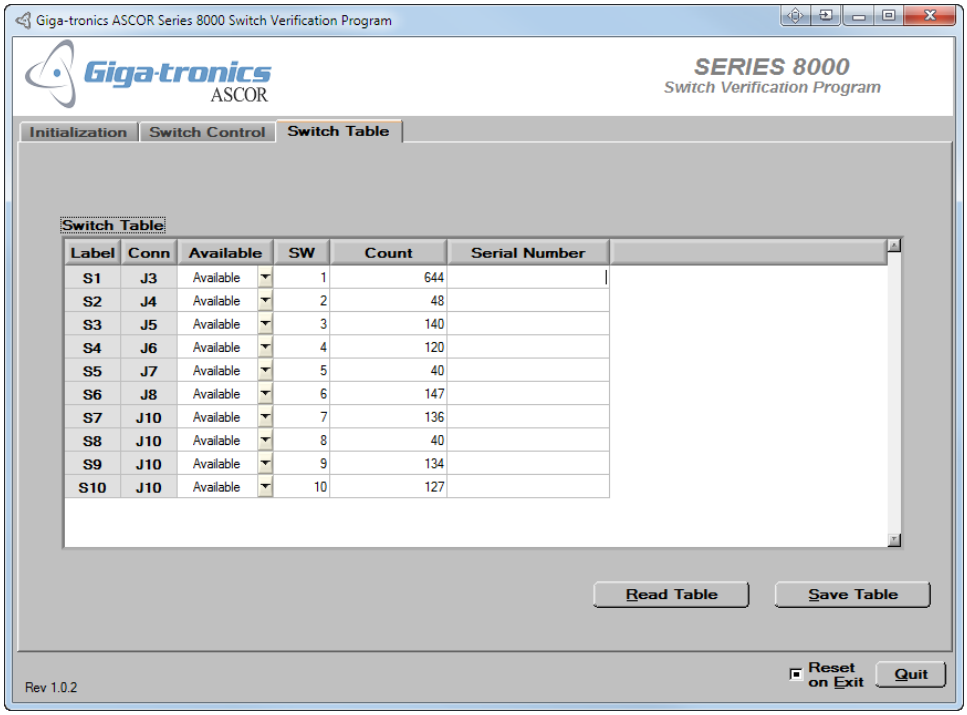


Figure 15 - Series 8000 SVP Switch Table Tab

Click on the Read Table button 

to restore the Switch Table with the information stored in the Series 8000 Switch flash memory.

Click on the Save Table button 

to update the Series 8000 Switch flash memory with the information in the Switch Table.

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3.4 Communication Panel

The Communication Panel displays the commands sent from the Series 8000 GUI and responses returned from the Series 8000 Switch.

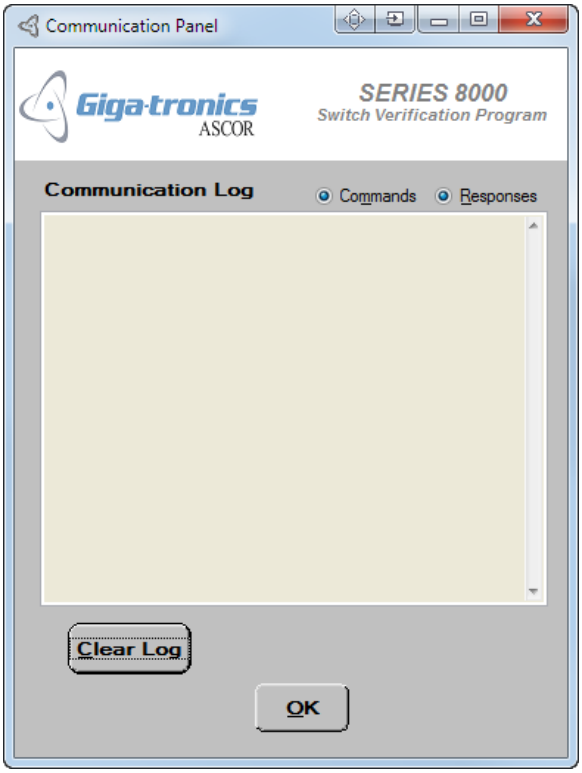
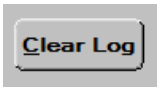


Figure 16 - Communication Panel

You can select what gets displayed by toggling the radio button corresponding to the type of communication. 

Select the Commands radio button to display the commands sent to the Series 8000 Switch. Select the Responses radio button to display the responses returned from the Series 8000 Switch.



Click the Clear Log button to clear the items displayed in the Communication Log display.

In simulation mode, only the outgoing commands are displayed. Not responses are simulated.

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4. Connecting to LAN-base Series 8000 Switch for the First Time

4.1 Equipment needed

First your computer must be equipped with the network capability. Second you will need an RJ-45 network cable. If you are connecting the Series 8000 Switch directly to the computer, you may need to use a special crossover cable, especially if your computer does not have an auto-sensing functionality.

4.2 Connecting to the Series 8000 Switch

When you are connecting to the Series 8000 Switch for the first time, care has to be taken to have the IP address of the computer and the Series 8000 Switch in the same subnet. The Series 8000 Switch comes with a factory default IP address of 192.168.0.254. Verify this address with the IP address labeled next the LAN cable plug on the back of the Series 8000 Switch.

Make sure your computer's IP address belongs to the same subnet and do not have any IP address conflict with the Series 8000 Switch or any other devices that are connected in the network. If you need to change the computer's IP address go to the Section 4.3 Matching Your Computer's IP Address to the Series 8000 Switch.

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4.3 Matching Your Computer's IP Address to the Series 8000 Switch

In order to communicate to the Series 8000 Switch via LAN or to change the IP address of the Series 8000 Switch, your computer's IP address must be in the same subnet with the Series 8000 Switch. You can modify your computer's IP address from the Internet Protocol Version Properties dialog box in Windows.

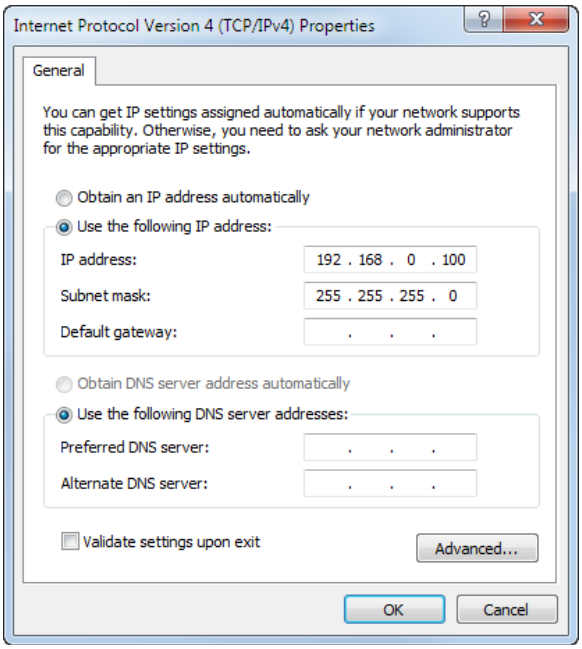


Figure 17 - Internet Protocol Version Properties

Click on the "Use the following IP address" radio button and enter the new IP address of the computer. Your new IP address should match the first three octets of the IP address Series 8000 Switch, 192.168.0 in this case. The last octet should be something unique, 100, in this case. Enter "255.255.255.0" for the Subnet mask. Click OK until you exit all the dialog boxes.

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5. Changing the IP Address of the Series 8000 Switch

The IP address of the LAN-based Series 8000 Switch can be changed from the configuration web page of the Series 8000 Switch using a web browser. This means that before you can change the IP address of the Series 8000 Switch, you have to first have your computer's IP address set to the same subnet of the Series 8000 Switch. If you need to match your computer's IP address to the Series 8000 Switch follow the instruction in the Section 4.3 Matching Your Computer's IP Address to the Series 8000 Switch.

Using a web browser go to the Welcome Page of the Series 8000 Switch. You can reach the Welcome Page by typing the IP address of the Series 8000 Switch, such as "192.168.0.254" in your browser's address bar and hit return.

5.1 Welcome Web Page

The Welcome Page gives you information about the Series 8000 Switch that is connected. The information such as Model number, serial number, revision, MAC address, and IP address are displayed. A link to the Configuration Page is on the bottom center of the screen.

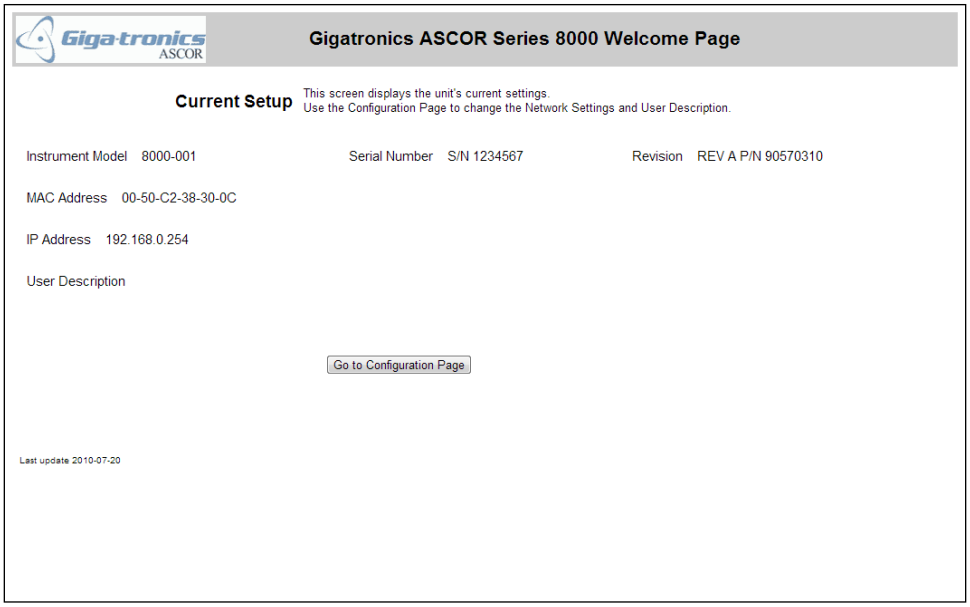
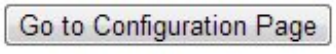


Figure 18 - Welcome Web Page

Click on the "Go to Configuration Page" button  to go to the Configuration Page.

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5.2 Configuration Web Page

Configuration Page allows you to change the IP Address and the Net Mask to the desired values.

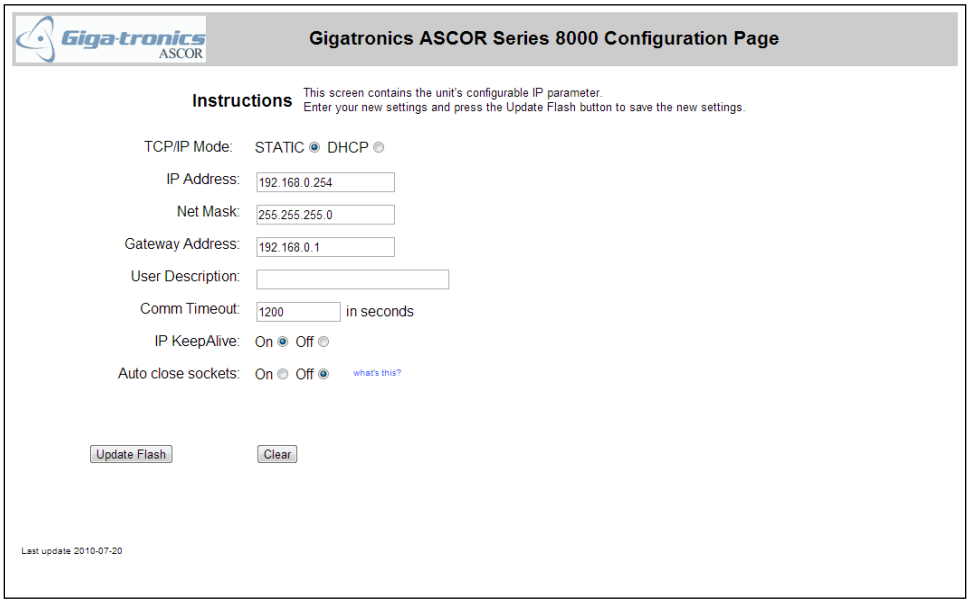
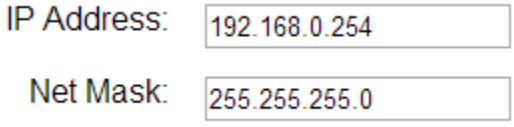


Figure 19 - Configuration Web Page

Enter the new IP address and set the Net Mask to 255.255.255.0:



Click on Update Flash button. 

Wait for the web page to switch to the Confirmation page.

5.3 Other Configuration Web Page Settings:

Following are some other setting available under the Configuration page. These setting do not have to be changed for changing the IP address but are presented here for completeness.

Comm Timeout (in seconds): If the Series 8000 Switch senses no client communication for more than the Comm Timeout setting, then the Series 8000 Switch will close the socket, release any locks, and reclaim all associated instrument resources. Use of a short setting of 3-5 minutes is recommended during the debugging stages to recover broken

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links faster. Use a longer setting of 10 minutes or longer for debugged applications. A value of 0 disables the Comm Timeout. The Comm Timeout range is between 0 and 4294967295 seconds.
IP KeepAlive: Enables the socket layer of the Series 8000 Switch to send the client side socket layer a short test message once every 120 minutes if no messages have been sent. If the other socket fails to reply, the Series 8000 Switch will close the socket, release any locks, and reclaim all associated instrument links. Do not enable Keep Alive if the target socket does not support Keep Alive messages. The recommended setting is On.

Auto Close Sockets: Enabling this feature causes the Series 8000 Switch to close the socket and release all resources when the available link count goes to zero. It is not recommended when there are other operations running since it can cause communication loss. The default is Off.

5.4 Confirmation Web Page

The new IP address is saved in the Series 8000 Switch flash memory and the unit has to be rebooted or power cycled. You can click on the "Return to the Configuration Page" button if you wish to modify further.

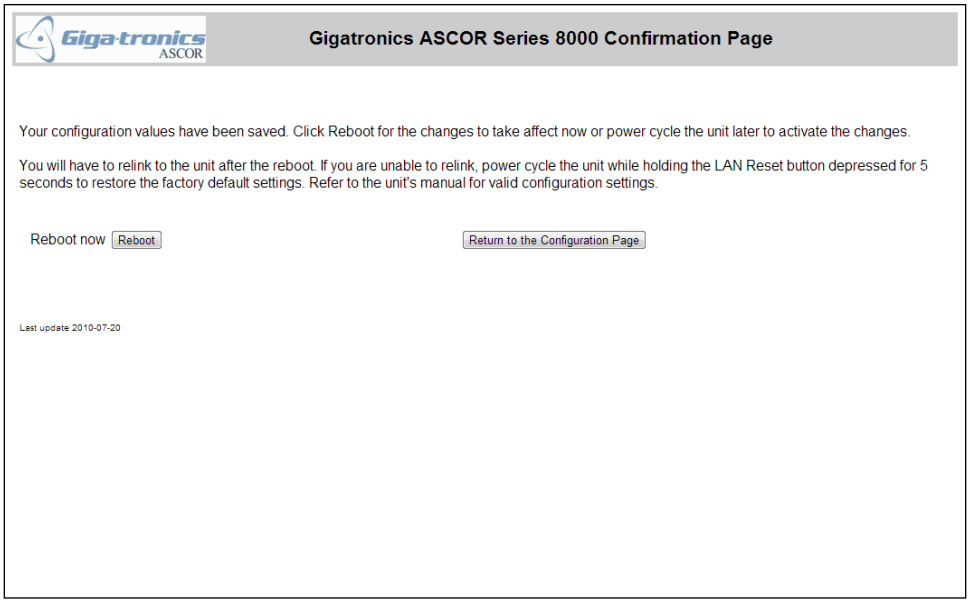
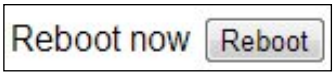


Figure 20 - Confirmation Web Page

Click on Reboot button. 

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5.5 Rebooting Web Page

Wait for the Series 8000 Switch to reboot.

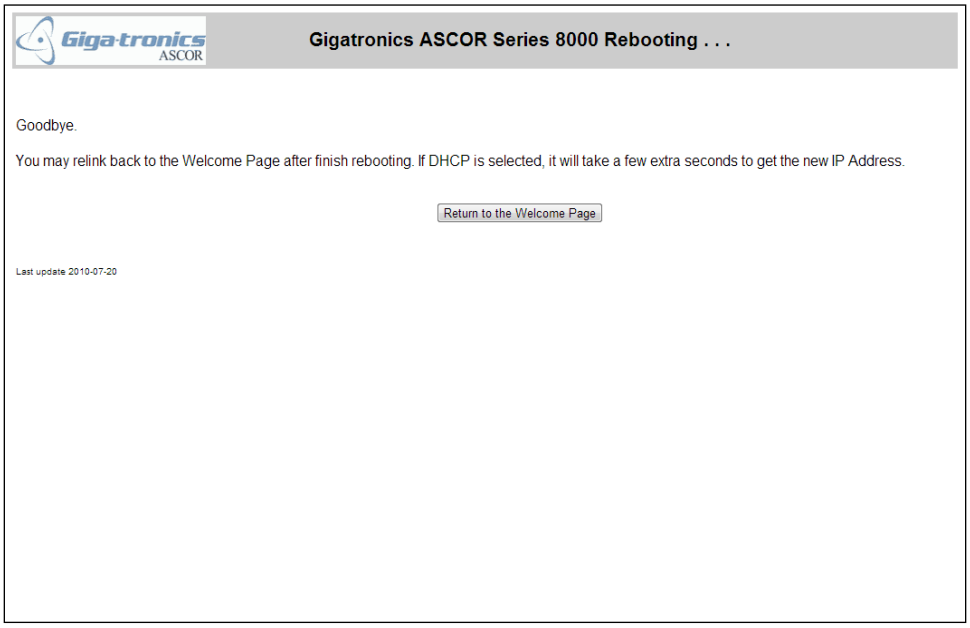
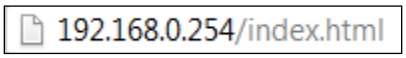


Figure 21 - Rebooting Web Page

Click on the "Return to the Welcome Page" button only if the new IP address is the same as the old IP address.

Otherwise, enter the new IP address into your browser's address bar and hit return to verify the change. If the new IP address is in a different subnet as your computer, follow the instructions in the Section 4.3 Matching Your Computer's IP Address to the Series 8000 Switch.

Type in the new IP address in your browser.



Verify the new IP address.

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6. Restoring Factory Default IP Address

The IP address of the LAN-based Series 8000 Switch can be restored to the factory default by pressing the reset button while powering up the device. The default IP address is 192.168.0.254. Make sure there are no other devices on the network with the same address. Follow the detailed instructions:

A. Turn off the power to the Series 8000 Switch.
B. Open the cover of the Series 8000 Switch.
C. Locate the relay driver board.
D. Locate the controller board underneath the relay driver board.
E. Locate the white IP Address Reset push button.
F. Press and hold the IP Address Reset button while powering up the Series 8000 Switch.
G. Keep holding the IP Address Reset button for 5 seconds after the power is on.
H. Release the IP Address Reset button.
I. Turn off the power and place the cover back.
J. Make sure the network cable is hooked up.
K. Turn on the power to the Series 8000 Switch.
L. Verify the Series 8000 Switch at the factory default IP address.
M. It may take a while for the address to propagate through the network

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7. Connecting to GPIB-base Series 8000 Switch for the First Time

7.1 Equipment needed

First your computer must be equipped with the GPIB capability. Second you will need a GPIB cable.

7.2 Connecting to the Series 8000 Switch

The Series 8000 Switch comes with a factory default GPIB address of 4. Identify the GPIB address from the DIP switch located to the GPIB connector on the back of the Series 8000 Switch.

Refer to the Section 8 Changing the GPIB Address of the Series 8000 Switch if you wish to set the GPIB address of the Series 8000 Switch to another address.

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8. Changing the GPIB Address of the Series 8000 Switch

The GPIB address of the Series 8000 Switch can be changed by setting the GPIB Address DIP switch. The GPIB Address DIP switch is located next to the GPIB connector on the back of the Series 8000 Switch. There are eight rocker switches in the GPIB Address DIP switch module. The left most five switches are used for the GPIB addressing. Do not modify the right most three switches. GPIB address range from 0 to 31. Address 0 is reserved for the controller. Set the DIP switch according to the GPIB address you wish to set using the table below.

Address	1	2	3	4	5
0	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	ON
2	OFF	OFF	OFF	ON	OFF
3	OFF	OFF	OFF	ON	ON
4	OFF	OFF	ON	OFF	OFF
5	OFF	OFF	ON	OFF	ON
6	OFF	OFF	ON	ON	OFF
7	OFF	OFF	ON	ON	ON
8	OFF	ON	OFF	OFF	OFF
9	OFF	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON	OFF
11	OFF	ON	OFF	ON	ON
12	OFF	ON	ON	OFF	OFF
13	OFF	ON	ON	OFF	ON
14	OFF	ON	ON	ON	OFF
15	OFF	ON	ON	ON	ON

Address	1	2	3	4	5
16	ON	OFF	OFF	OFF	OFF
17	ON	OFF	OFF	OFF	ON
18	ON	OFF	OFF	ON	OFF
19	ON	OFF	OFF	ON	ON
20	ON	OFF	ON	OFF	OFF
21	ON	OFF	ON	OFF	ON
22	ON	OFF	ON	ON	OFF
23	ON	OFF	ON	ON	ON
24	ON	ON	OFF	OFF	OFF
25	ON	ON	OFF	OFF	ON
26	ON	ON	OFF	ON	OFF
27	ON	ON	OFF	ON	ON
28	ON	ON	ON	OFF	OFF
29	ON	ON	ON	OFF	ON
30	ON	ON	ON	ON	OFF
31	ON	ON	ON	ON	ON

Figure 22 - GPIB Address to DIP Switch

The factory default GPIB address is 4.

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9. Connecting to USB-base Series 8000 Switch for the First Time

9.1 Equipment needed

First your computer must be equipped with a USB port that is compatible with USB 1.1 or USB 2.0. Second you are running Windows XP Service Pack 3 or later, Windows 7 x86, or Windows 7 x64. Third you will need a USB adapter cable with Type A to Type B plugs.

9.2 USB Device Driver Installation

If you have not already installed the USB Device Driver for Windows, please follow the instruction on Section 2.2 Installing the USB Device Driver to install the driver.

9.3 Identifying the COM Port

After the USB Device Driver is installed and the Series 8000 Switch plugged in and powered on, go to Windows Device Manager and look for USB Serial Port (COMx) where x is the port number, under Ports (COM & LPT). Windows assigns an unused COM Port to the newly plugged in USB-based Series 8000 Switch.

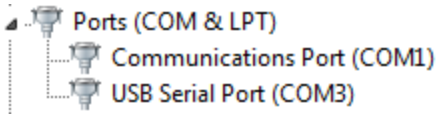


Figure 23 - Device Manager Device Tree

9.4 Setting the COM Port parameters

The Series 8000 Switch is set to 115.2 K baud, 8 data bit, and no parity. The USB Driver for the newly plugged in Series 8000 Switch must be set to match these settings.

Right click on the USB Serial Port (COMx) identified in the previous section. Then select Properties to bring up the USB Serial Port (COMx) Properties dialog box. Click on the Port Settings tab. Then match the port settings to the settings described in Section 10.1 Communication Settings found in the next section. Click OK and then close the Device Manager dialog box.

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10. USB Interface Operation

10.1 Communication Settings

USB-based Series 8000 Switch has the following serial port binding:

Baud rate:	115200
Data bits:	8
Parity:	None
Stop bits:	1
Flow control:	None

10.2 Command Termination

Each command that is sent to the USB-based Series 8000 Switch must be terminated with a line feed character (0Ah). The line feed terminating character is optional for GPIB and LAN-based Series 8000 Switch.

10.3 Communication Prompt

The USB-based Series 8000 Switch sends back a communication prompt after completion of each operation to signal that it is ready for the next command. This prompt must be read before the next command can be sent to the USB-based Series 8000 Switch. The prompt consists of two characters, a greater than character ">" and a line feed character.

For an output command the sequence of operation is

a) send command and
b) read prompt.

For a query command the sequence is

a) send query command,
b) read input message, and
c) read prompt.

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11. Command Set

The following sections list some of the main commands to control and query the switch.

11.1 Switch Control Commands

The SCPI commands required to set switch positions, query the switch info, and to save counters are listed below:

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>ROUTe:SWITch Sw, P</td><td>Sets a switch to a desired position. Sw is the switch identification number, 1-nn. P is the desired position as a decimal value. The sub-table below lists available positions for different types of switches.

For SP3T, SP4T, SP5T, SP6T, and SP8T switches, setting the position to 0, disconnects a path between common pin and any connected pin. Setting the position to a non-zero number connects a path between common pin and the pin of the selected position.
<table>
<tr><th>Sw Type</th><th>Positions</th></tr>
<tr><td>SP3T</td><td>0=All Open, 1, 2, 3</td></tr>
<tr><td>SP4T</td><td>0=All Open, 1, 2, 3, 4</td></tr>
<tr><td>SP5T</td><td>0=All Open, 1, 2, 3, 4, 5</td></tr>
<tr><td>SP6T</td><td>0=All Open, 1, 2, 3, 4, 5, 6</td></tr>
<tr><td>SP8T</td><td>0=All Open, 1, 2, 3, 4, 5, 6, 7, 8</td></tr>
</table>
For SPDT switches, setting the position to 0, connects a path between common pin and Normally Closed pin. Setting the position to 1 connects a path between common pin and Normally Open pin.
<table>
<tr><th>Sw Type</th><th>Positions</th></tr>
<tr><td>SPDT</td><td>0=Normally Closed, 1=Normally Open</td></tr>
</table>
For Transfer switches, setting the position to 0, connects a path along the vertical pins. Setting the position to 1 connects a path along the horizontal pins.
<table>
<tr><th>Sw Type</th><th>Positions</th></tr>
<tr><td>TRAN</td><td>0=Normally Closed, Vertical Pins
1=Normally Open, Horizontal Pins</td></tr>
</table>
</td></tr>
</table>

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Command	Description
ROUTe:SWITch? Sw	Returns the switch number, switch position, current switch count, and switch identifier string. Sw is a number from 1-nn to identify the switch. The response is: Sw, position, count, ID. ID consists of the following fields: switch part number, switch serial number, S or T for Non-terminated or Terminated switch. Example: ROUTe:SWITch? 1 Returns: 1, 5, 1002123, 52200310, 2006001, T
ROUTe:SWITch:SAVe	Saves all switch counter values to flash memory. The command only saves the current counter values.
ROUTe:SWITch:SAVe?	Queries the number of flash saves done via the ROUTe:SWITch:SAVe command, and auto save intervals.

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11.2 Switch Configure Commands

The SCPI commands required to set and query switch counts and switch identification are listed below:

Command	Description
ROUTe:CONFigure: COUNTer Sw, count	Presets the Switch Counter value. Use this command to set the switch counter when installing a switch in a chassis. Sw is a number from 1-50 to identify the switch. Count is the switch count value for presetting the switch counter to a new value. Count value ranges from 0 to 100,000,000. Example: ROUT:CONF:COUNT 7,15340 Sets switch SW7 to 15,340 counts.
ROUTe:CONFigure: COUNTer? Sw	Queries the Switch Counter value. Use this command to read the switch counter. Sw is a number from 1-50 to identify the switch. Example: ROUT:CONF:COUNT? 7 Returns: 15340
ROUTe:CONFigure: ID Sw, string	Writes the user's Switch ID string to Switch Sw. Sw is a number from 1-50 to identify the switch. String is limited to 23 characters plus a linefeed character.
ROUTe:CONFigure: ID? Sw	Reads the current Switch ID string for Switch Sw. Sw is a number from 1-50 to identify the switch. ID consists of the following fields: switch part number, switch serial number, S or T for Non-terminated or Terminated switch. Example: ROUTe:CONF:ID? 7 Returns: 52200310, 2006001, T

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11.3 Switch Enabling Commands

The SCPI commands required to set and query switch enable and to query switch configuration are listed below:

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>ROUTe:CONFigure:
ENABle <switch list></td><td>Enables or disables a list of factory preconfigured switches. The switch list is a list of numbers of the poles in the switch, in the order of the configured switches. A non-zero (1-255) value enables the switch; a 0 disables the switch. Switches are configured at the factory.

Disabling the switch removes the switch control command for the selected switch.

<table>
<tr><th>Sw Type</th><th>Enable/Disable number</th></tr>
<tr><td>Disable</td><td>0</td></tr>
<tr><td>TRAN</td><td>22</td></tr>
<tr><td>SPDT</td><td>2</td></tr>
<tr><td>SP3T</td><td>3</td></tr>
<tr><td>SP4T</td><td>4</td></tr>
<tr><td>SP5T</td><td>5</td></tr>
<tr><td>SP6T</td><td>6</td></tr>
<tr><td>SP8T</td><td>8</td></tr>
</table>

Example:
The following example is for a switch chassis configured with four switches: SW1, SW2, SW6, and SW7.

ROUT:CONF:ENAB (@ 6,6,0,6)
Enables all the switches except SW6

ROUT:CONF:ENAB (@ 6,6,6,6)
Enables all 4 switches</td></tr>
</table>

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Command	Description
ROUTe:CONFigure: ENABle?	Returns a list of currently enabled switches in the chassis as a comma separated list. The response is '-1' if there are no configured switches to report. Example: For a chassis with four 6-pole switches, all enabled except the third configured switch: ROUT:CONF:ENA? Returns: 6,6,0,6
ROUTe:CONFigure: SWITch?	Returns a list of the configured switches in the chassis. The list is comma separated. If no switches are configured, the response is 0. Example: For a chassis with switch SW1 and SW6 ROUT:CONF:SWIT? Returns: 1,6 For a chassis with switch SW1, SW2, SW3, SW4 ROUT:CONF:SWIT? Returns: 1,2,3,4

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11.4 IEEE-488.2 Commands

This unit responds to the following IEEE-488.2 commands.

Command	Description		
*ESR?	Returns the <value> of the "Event Status Register" and then clears it. This will clear the ERR LED. <value> is an integer whose binary equivalent corresponds to the state (1 or 0) of bits in the register. The bit weights are:		
	Bit	**Weight**	**Error**
	7	128	Power On
	6	64	Ext Data Ready F/F
	5	32	Command Error
	4	16	Execution Error
	3	8	Flash Data Corrupted
	2	4	Query Error
	1	2	EDR F/F#2 Set
	0	1	Operation Complete

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Command	Description
*IDN?	Identification Query. Returns the device identification code as four fields separated by commas. These fields are: Manufacturer, Model, Serial Number, and Hardware revision and part number in the following formats ASCOR, 8000, S/N XXXXXXX, REV X P/N XXXXXXXX or ASCOR, 8000-001, S/N XXXXXXX, REV X P/N XXXXXXXX Manufacturer field is "ASCOR". Model Field is either "8000" to denote switch chassis without switch access counting capability. Or "8000-001" to denote switch chassis with switch access counting capability. These two model numbers are used for all different variations of the Series 8000 and Series 8900 switch family. Serial Number field consists of "S/N" header followed by a seven digit serial number. Hardware revision sub field consists of "REV" header followed by a chassis revision number. Part Number sub field consists of "P/N" header followed by a part number of the switch chassis. <u>Example:</u> For 90570320 chassis: *IDN? Returns: ASCOR, 8000-001, S/N 1234567, REV A P/N 90570320 For 90570310 chassis: *IDN? Returns: ASCOR, 8000-001, S/N 1234567, REV A P/N 90570310

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12. Sample Program

The following code is a complete C++ program written using Microsoft Visual Studio 2005. It is a simple program but covers the necessary steps to control the Series 8000 Switch.

This program performs the following:

1. Establishes connection to the default resource manager.
2. Creates a session handle for the Series 8000 Switch.
3. Sends commands to toggle switch 1.
4. Sends commands to query switch 1.
5. Reads response to the query.
6. Closes the session handle.
7. Closes the connection to the default resource manager.

This program uses VISA for the I/O driver. VISA Runtime Library is included with the installation of the Series 8000 GUI program.

In order to dynamically link with the VISA.dll, Microsoft Visual Studio project property for the program must be modified to include **visa32.lib** under Additional Dependencies.

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```
// series8000.cpp : Sample console program for controlling Series 8000 Switch.
//

#include "stdafx.h"
#include "string.h"
#include "visa.h"

int _tmain(int argc, _TCHAR* argv[])
{
ViChar          resourceName[255], cmdBuf[255], rspBuf[255];
ViSession       rmSession, instrSession;
ViStatus        status;
ViUInt32        retCnt;

    //  Open Resource Manager Session
    status = viOpenDefaultRM (&rmSession);
    if (status < VI_SUCCESS) {
        return status;
    }

    //  Open Instrument Session for Series 8000 Switch at IP address 192.168.0.254
    strcpy_s (resourceName, "TCPIP0::192.168.0.254::inst0::INSTR");
    status = viOpen (rmSession, resourceName, VI_NULL, VI_NULL, &instrSession);
    if (status != VI_SUCCESS) {
        instrSession = 0;
        return status;
    }

    //  Send the command to open switch 1
    strcpy_s (cmdBuf, "ROUTe:SWITch 1, 0");
    status = viWrite (instrSession, (ViBuf)cmdBuf, (ViUInt32) strlen (cmdBuf), &retCnt);
    if (status != VI_SUCCESS) {
        return status;
    }

    //  Send the command to close switch 1 position 1
    strcpy_s (cmdBuf, "ROUTe:SWITch 1, 1");
    status = viWrite (instrSession, (ViBuf)cmdBuf, (ViUInt32) strlen (cmdBuf), &retCnt);
    if (status != VI_SUCCESS) {
        return status;
    }

    //  Send the command to query switch 1 position
    strcpy_s (cmdBuf, "ROUTe:SWITch? 1");
    status = viWrite (instrSession, (ViBuf)cmdBuf, (ViUInt32) strlen (cmdBuf), &retCnt);
    if (status != VI_SUCCESS) {
        return status;
    }

    //  Read the response to the query
    status = viRead (instrSession, (ViBuf)rspBuf, 100, &retCnt);
    if (status != VI_SUCCESS) {
        return status;
    }

    //  Close the Instrument Session for the Series 8000 Switch
    status = viClose (instrSession);
    if (status != VI_SUCCESS) {
        return status;
    }

    //  Close the Resource Manager Session
    status = viClose (rmSession);
    if (status != VI_SUCCESS) {
        return status;
    }

    return 0;
}
```

Figure 24: C++ Sample Program

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