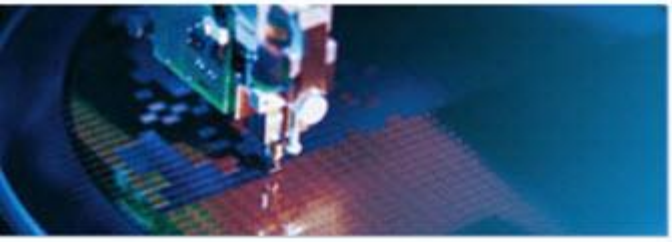
USER MANUAL



Parvus® SWI-22-10

PCI/104-Express 8-/20-Port Gigabit Ethernet Switch

MNL-0641-01 Rev A3 ECO-4823 Effective: 04 Oct 16

CURTISS-WRIGHT

Disclaimer

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CHAPTER 1 INTRODUCTION

The SWI-22-10 is a rugged PCI/104-Express Gigabit Ethernet Switch card equipped with up to twenty triple-speed 10/100/1000Mbps ports for connecting IPv4- and IPv6-compatible computing devices in demanding embedded systems LAN applications.

ABOUT THIS DOCUMENT

This manual provides functional and technical descriptions of the SWI-22-10 hardware, instructions on connecting the card to test equipment, operational information on using the SWI-22-10 management consoles and commands, connector descriptions and pinouts, and specifications.

DEFINITIONS

Please refer to the Glossary at the end of this document for an explanation of networking terms used in this manual.

DESCRIPTION OF SAFETY SYMBOLS

The following symbols are used in this manual to indicate important information and potentially dangerous situations.

Warning! Danger, electrical shock hazard!
Personal injury or death could occur. Also damage to the system, connected peripheral devices, or software could occur if the warnings are not followed carefully.

Caution! Hazard to individuals, environment, devices, or data!
If you do not adhere to the safety advice next to this symbol, there is obvious hazard to individuals, to environment, to materials, or to data.

Note: This symbol highlights important information or instructions that should be observed.

FUNCTIONAL DESCRIPTION

The SWI-22-10 is a rugged Commercial Off the Shelf (COTS) Gigabit Ethernet switch card optimized for Size, Weight and Power (SwaP)-sensitive embedded military and civilian computer network systems applications. Featuring advanced Layer 2 networking features with up to 20 ports with 10/100/1000Mbps connectivity, an integrated management processor, low power consumption, and robust carrier Ethernet software features, the SWI-22-10 enables reliable local area network (LAN) switching across extended operating temperature ranges (-40° to +85°C) and extreme shock/vibration for technology refresh and new system designs. With a compact PCI/104-Express form factor (approx. 3.6" x 3.8") featuring either twenty or eight 1000BaseT Ethernet ports, the SWI-22-10 is one of the smallest rugged Gigabit Ethernet switches available, and is an ideal solution for connecting a large number of IP-enabled embedded devices, including computers, cameras, sensors, and command-and-control equipment deployed in manned and unmanned system platforms at the network edge.

This fully managed Layer 2 switch card supports IPv4- and IPv6-multicast traffic, Virtual Local Area Networks (VLANs), port control (speed/mode/statistics, flow control), Quality of Service (QoS) traffic prioritization, Link Aggregation (802.3AD), SNMP/v1/v2/v3 management, secure authentication (802.1X, ACLs, Web/CLI), redundancy (RSTP/MSTP), precision timing (IEEE-1588v2), port monitoring, IGMP Snooping, Low-power, Energy-Efficient, Ethernet compliance, and data zeroization. The unit also supports Layer 3 IPv4 / IPv6 unicast static routing for IP routing to attached WAN / radio ports. The SWI-22-10 is designed to integrate with open-architecture PCI-104, PCIe104, PC/104-Plus, PCI/104-Express, EPIC, or EBX systems, as well as non-PC/104 embedded systems, while flexibly supporting either CAT5e cabling or cableless (card-to-card) termination of the Ethernet signals.

The SWI-22-10 is available with an optional integrated thermal plate, and can be ordered as a standalone card or pre-integrated into the Parvus DuraNET 20-10 switch subsystem. The card can also be integrated by Curtiss-Wright into other rugged enclosures and/or combined with PC/104-based DuraMAR mobile routers or DuraCOR mission computers subsystems.

CONFIGURATIONS

The SWI-22-10 is available in four standard configurations: 20 GigE ports and 8 GigE ports, with or without an integrated thermal plate.

Product Number	Description
SWI-22-10-10	PCI/104-Express GigE Switch, 20x 1000BaseT, Harwin Connectors
SWI-22-10-10T	PCI/104-Express GigE Switch, 20x 1000BaseT, Harwin Connectors, Thermal Plate
SWI-22-10-01	PCI/104-Express GigE Switch, 8x 1000BaseT, Molex Connectors
SWI-22-10-01T	PCI/104-Express GigE Switch, 8x 1000BaseT, Molex Connectors, Thermal Plate

SPECIAL ORDER OPTIONS

- Conformal coating
- No PCI/104 connectors (minimum order applies)

FEATURES

High Port Density

- Up to 20 Gigabit Ethernet Switch ports in single-slot PCI/104-Express form factor (3.6”x3.8”) card; 8-port option also available.

Rugged Design

- -40/+85C° extended-temperature operation, vibration-tolerant connectors for cableless/cabled network connections, staked and underfilled components.

Carrier Grade

- Carrier Ethernet (CE) Switch Engine with embedded 32-Bit Management Processor.
- CE Services Software delivers Rich Layer-2 Switch Features, Layer 3-Aware Packet Processing, Service Classification and Traffic Policing; IEEE-1588 Precision Timing Protocol and Hardware Accurate Timestamping.

Layer 2 Switching

- 10/100/1000 Mbps Gigabit Ethernet connectivity, IPv4/IPv6 Multicast, VLAN, QoS/CoS Traffic Prioritization, Multiple/Rapid Spanning Tree, Link Aggregation, IEEE-1588 Sync.

Layer 3 Routing:

- Layer 3 IPv4 / IPv6 Unicast Static Routing Support for IP Routing to Attached WAN / Radio Ports.

Management

- SNMPv3, HTTP Server, Web GUI, RS-232 Console CLI, Port Monitoring, RMON, Syslog, Network Access Server (NAS), 802.1X Authentication, IGMP Snooping, Access Control Lists (ACLs), Zeroization, Built in Test (BIT) Diagnostics.

Declassification

- Data Zeroization support for secure data (initiated by off-board signal trigger).

Low Power

- Energy-efficient Ethernet (IEEE-802.3AZ) support with low-power PHYs and smart cable reach technology for extremely low power consumption.

Bus or External Powering

- Can be powered via PCI-104 (PCI) bus, PCIe104 (PCI Express) bus, or auxiliary power connector for standalone operation.

Integration Flexibility

- Two connector options (Harwin, Molex) to support either hand-crimping CAT5e cabling or card-to-card (cableless) interface for Ethernet ports.

MANAGEMENT INTERFACE OVERVIEW

The SWI-22-10 provides two types of console interfaces for switch configuration and management: a serial command line interface (CLI) via RS-232 serial port, and a Web GUI via Ethernet. Each management interface on the card connects to a host PC which acts as the console.

- Serial CLI: Connect to the host PC via a serial connector.
- Web GUI: Connect to the host PC via any one of the Ethernet ports.

Figure 1 and Figure 2 illustrate the SWI-22-10-10 and -01 interfaces, respectively. Chapter 4 explains how to use each interface.

Figure 1. Management Interface Block Diagram SWI-22-10-10

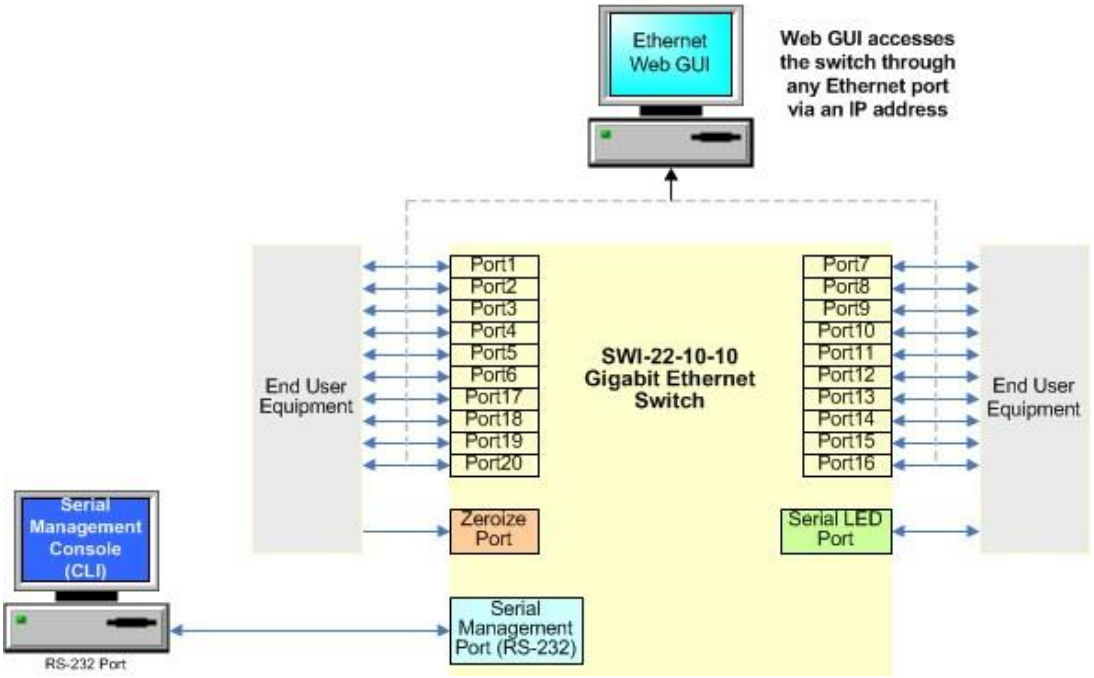
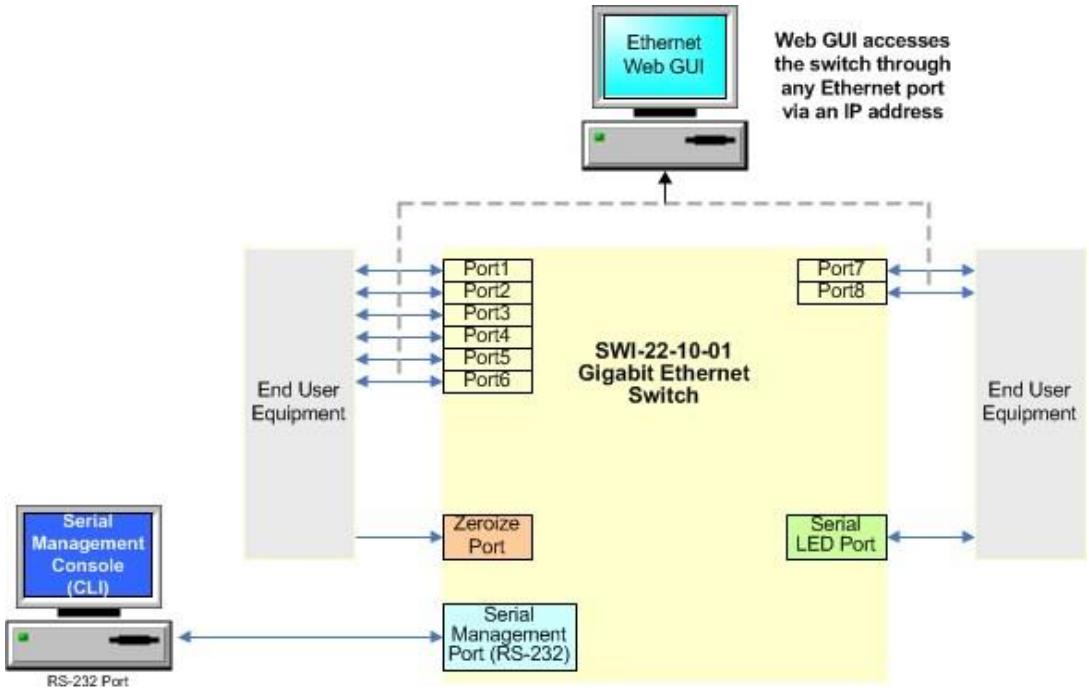


Figure 2. Management Interface Block Diagram SWI-22-10-01



CHAPTER 2 HARDWARE DESCRIPTION

This chapter describes the SWI-22-10-XX cards. The major differences in the cards are the number of ports (20 or 8) and whether the thermal plate is factory-installed.

- SWI-22-10-10, 20 ports
- SWI-22-10-10T, 20 ports, with thermal plate
- SWI-22-10-01, 8 ports
- SWI-22-10-01T, 8 ports, with thermal plate

CARD LAYOUT

SWI-22-10-10 CARD

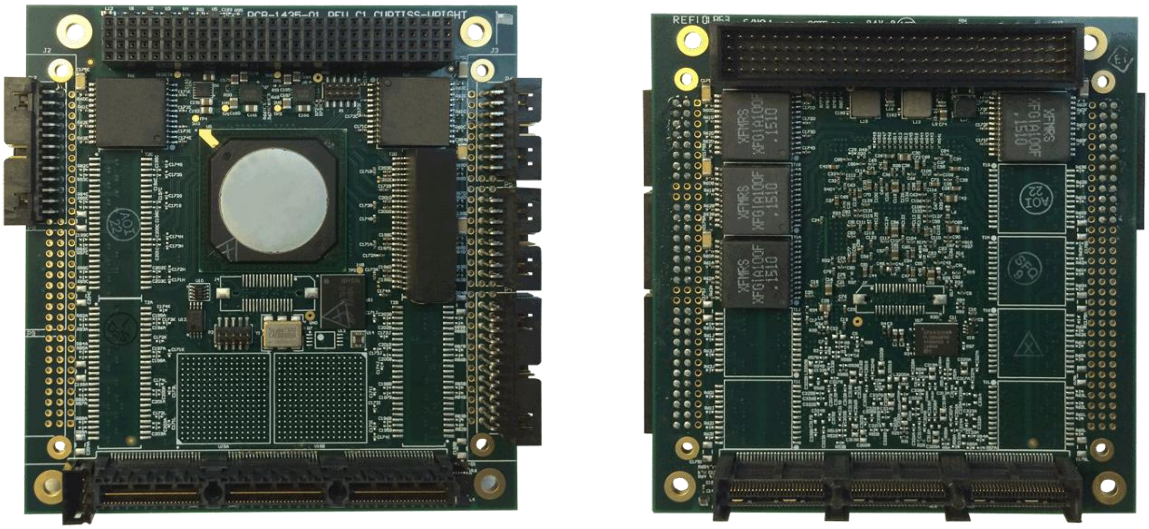
Figure 3 shows top and bottom views of the SWI-22-10-10 card.

Figure 3. SWI-22-10-10 Card

SWI-22-10-01 CARD

Figure 4 shows top and bottom views of the SWI-22-10-01 card.

Figure 4. SWI-22-10-01 Card



SWI-22-10 THERMAL PLATE

The SWI-22-10-01T and -10T include a factory-installed thermal plate for conduction cooling in a no-moving-parts system. Figure 5 shows the SWI-22-10-10T with the factory-installed thermal plate.

Figure 5. SWI-22-10 Card with Thermal Plate

Figure 6 shows the mounting holes in the sides of the thermal plate that are used to mount the thermal plate in a chassis for heat dissipation.

Figure 6. Thermal Plate Mounting Hole Locations

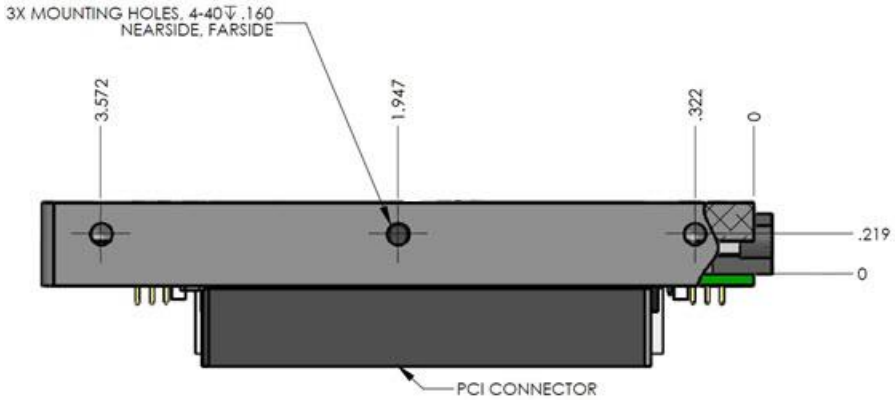


Figure 7 and Figure 8 show where the thermal plate is located relative to the PCB.

Figure 7. Thermal Plate Vertical Dimensions

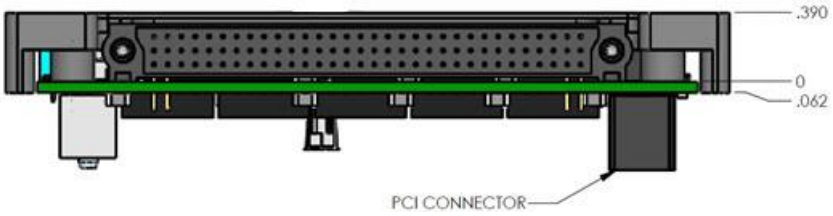
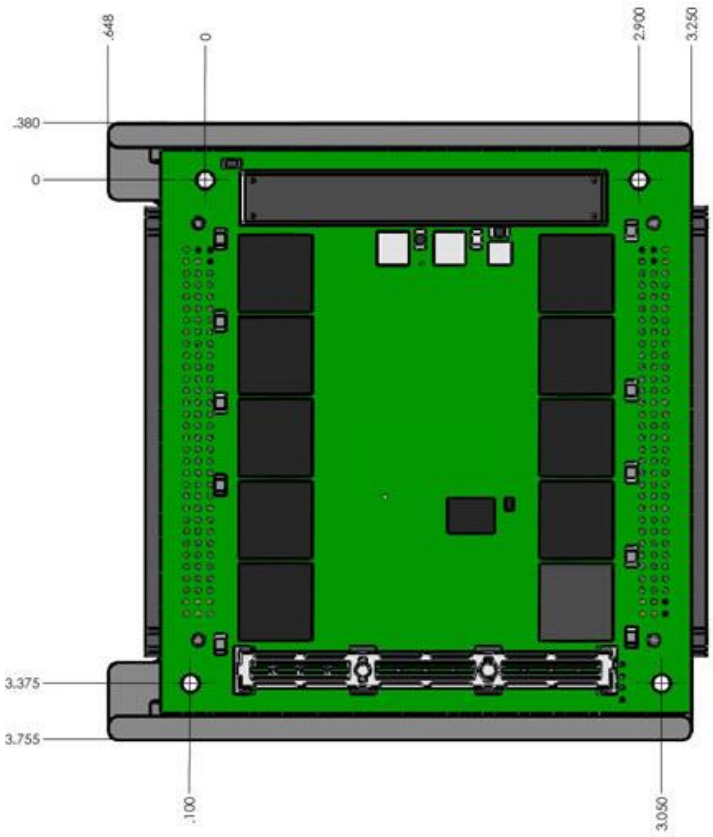


Figure 8. Thermal Plate Horizontal Dimensions



The 2D drawings and 3D model for the thermal plate are available to customers that wish to design their own thermal solution.

Note: If you do not use the thermal plate available from Curtiss-Wright, then your system design must provide adequate heat dissipation.

CHAPTER 3. HARDWARE INSTALLATION

EQUIPMENT INSTALLATION

To use the SWI-22-10-xx in a lab environment, you must have:

- Appropriate cables, such as the CBL-SWI-22-10-10 Breakout Cable Set
- A power source, either:
  - A PCI/104 stack or a PCI/104-Express stack
  - +5VDC@3A supplied to the SWI-22-10 board (connected at P3). A power cable is included with the Breakout Cable Set.
- Thermal cooling, either:
  - SWI-22-10 Thermal Plate factory-installed on the SWI-22-10-10T or the SWI-22-10-01T
  - A custom cooling solution (a small fan blowing across the top of the board will do).
- A host PC with a free RS-232 port and/or an Ethernet port. See “Serial CLI Setup” and “Using the Web GUI” in chapter four to setup the serial and Ethernet ports on the host PC.

INSTALLATION PRECAUTIONS

ESD Warning!
This product uses components that can be damaged by electrostatic discharge (ESD). Observe precautions for handling electrostatic-discharge sensitive devices.

Exercise extreme caution when installing or removing the board. The interface pins are very easily bent.

- Ensure proper line-up with receptacles before applying force.
- Apply force as evenly as possible to prevent the interface pins from inserting at an angle.
- If the stack requires disassembly, apply even force while disassembling components.

BREAKOUT CABLE SET

You should test the SWI-22-10 interfaces and cabling prior to installation in the target system to ensure full operational capability. Full bench-top testing can be performed by using the appropriate cable set for the card. You can also use a custom set of cables made specifically for the intended target system, vehicle, or craft; refer to Chapter 5 for connector pinouts and descriptions.

The breakout cable set (CBL-SWI-22-10-10 or CBL-SWI-22-10-01) is available for purchase through Curtiss-Wright and is intended for lab or bench testing purposes only.

The SWI-22-10-10 cable set (CBL-SWI-22-10-10, shown in Figure 9) includes the following cables:

Cable	Qty.	Description	Function
CBL-2444-01	1	SWI-22-10, ten Ethernet, console, zeroize	Breaks out to Ports 1-6 and Ports 17-20 RJ-45 cables, DB-9 console port cable, and zeroize port cable.
CBL-2444-02	1	SWI-22-10, ten Ethernet, LEDs	Breaks out to Ports 7-16 RJ-45 cables and LED port cable
CBL-2551-01	1	SWI-22-10, external power	Connects auxiliary power connector and chassis ground ring lugs to banana plugs for a bench-top power supply.
CBL-1536-01	1	6’ DB9 M/F serial extension	Extends console port connection length if breakout cable is not long enough to reach host computer.

Figure 9. Breakout Cableset (CBL-SWI-22-10-10)

The SWI-22-10-01 cable set (CBL-SWI-22-10-01, shown in Figure 10) includes the following cables:

Cable	Qty.	Description	Function
CBL-2562-01	1	SWI-22-10-0x, Ethernet ports 1-2, console, zeroize	Breaks out to Ethernet Ports 1 and 2 RJ-45 cables, DB-9 console port cable, and zeroize port cable.
CBL-2562-02	1	SWI-22-10-0x, Ethernet ports 3-4	Breaks out to Ports 3 and 4 RJ-45 cables.
CBL-2562-03	1	SWI-22-10-0x, Ethernet ports 5-6	Breaks out to Ports 5 and 6 RJ-45 cables.
CBL-2562-04	1	SWI-22-10-0x, Ethernet ports 7-8, LEDs	Breaks out to Ports 7 and 8 RJ-45 cables and LED port cable.

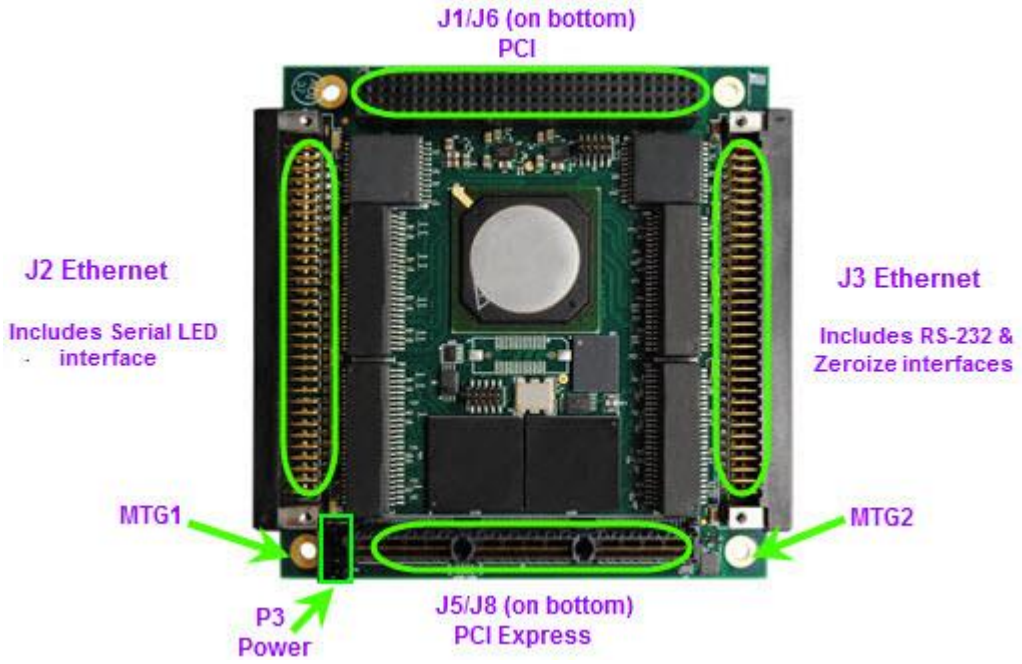
Cable	Qty.	Description	Function
CBL-2551-01	1	SWI-22-10, external power	Connects auxiliary power connector and chassis ground ring lugs to banana plugs for a bench-top power supply.
CBL-1536-01	1	6' DB9 M/F serial extension	Extends console port connection length if breakout cable is not long enough to reach host computer.

Figure 10. Breakout Cableset (CBL-SWI-22-10-01)

TEST SETUP SWI-22-10-10

Figure 11 shows the location of the connectors on the SWI-22-10-10.

Figure 11. Connector Locations (SWI-22-10-10)



1. Place the card on an anti-static surface, such as the bag that the card was packaged in, or install it into a PCI/104 or PCI/104-Express stack.
2. Connect the two Ethernet cables (CBL-2444-01 and -02) to the card, matching up the J2 and J3 labels on the cables with ports J2 and J3 on the card.

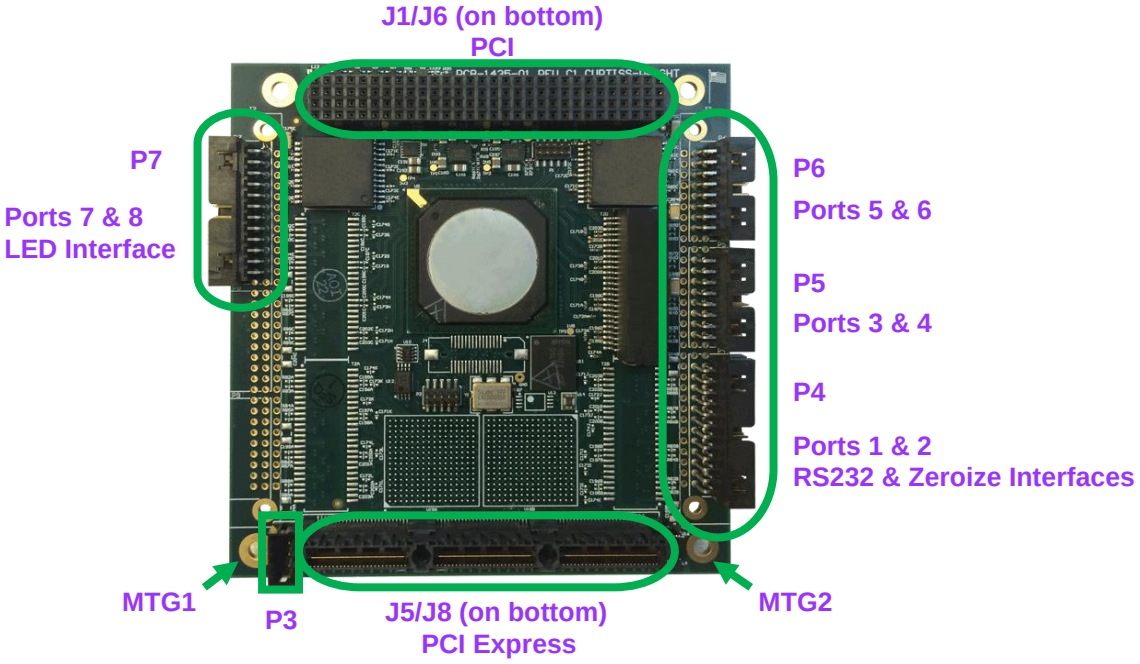
   The Harwin connectors can't be mated by just plugging them together. Match up the faces of the mating connectors and use a small bladed screwdriver to screw in one of the captive screws part way, then the other screw part way, then proceed to screw both screws in fully.
3. If the card is installed in a PCI/104 or PCI/104-Express stack, it will be powered by the stack. Skip to step 4. Otherwise, connect power:
   - Connect the power cable CBL-2551-01 to the auxiliary power connector P3.
   - Attach the two ring lugs on the power cable to the two mounting holes on the board: one to MTG1 (chassis ground 1) and the other one to MTG2 (chassis ground 2), using the supplied screws, star washers, and nuts.
   - Connect chassis ground 1 and chassis ground 2 either to the chassis ground of the bench-top power supply or to the chassis ground of the PCI/104 stack. Failure to do so could affect data transmission over long cables.
   - Connect the power cable banana plugs to a bench-top power supply that can supply 5V/3A.
4. Connect the DB-9 connector on CBL-2444-01 to an open serial port on your host computer for access to the console (CLI). Use the supplied extension cable (CBL-1536-01) if a longer reach is needed.
5. Connect one Ethernet port to your host computer or to a network shared by your host computer for access to the Web GUI management interface (GUI).
6. Connect other Ethernet ports to desired equipment for testing.

7. Turn on the power supply.
8. After about 18 seconds, a green LED should start flashing on the edge of the board next to the PCI-Express connector. The flashing LED indicates that the card is ready for operation. During this boot process the serial CLI port will output information about the progress of the booting process.

TEST SETUP SWI-22-10-01

Figure 12 shows the location of the connectors on the SWI-22-10-01.

Figure 12. Connector Locations (SWI-22-10-01)



1. Place the card on an anti-static surface, such as the bag that the card was packaged in, or install it into a PCI/104 or PCI/104-Express stack.
2. Connect the four Ethernet cables (CBL-2562-01, -02, -03, and -04) to the card, matching cables labeled P10, P13, P14, and P15 to the corresponding ports on the card.
3. If the card is installed in a PCI/104 or PCI/104-Express stack, it will be powered by the stack. Skip to step 4. Otherwise, connect power:
   - Connect the power cable CBL-2551-01 to the auxiliary power connector.
   - Attach the two ring lugs on the power cable to two mounting holes on the board: one to MTG1 (chassis ground 1) and the other one to MTG2 (chassis ground 2), using the supplied screws, star washers, and nuts.
   - Connect chassis ground 1 and chassis ground 2 either to the chassis ground of the bench-top power supply or to the chassis ground of the PCI/104 stack. Failure to do so could affect data transmission over long cables.
   - Connect the power cable banana plugs to a bench-top power supply that can supply 5V/3A.
4. Connect the DB-9 connector on CBL-2562-01 to an open serial port on your host computer for access to the console (CLI). Use the supplied extension cable (CBL-1536-01) if a longer reach is needed.

5. Connect one Ethernet port to your host computer or to a network shared by your host computer for access to the Web GUI management interface (GUI).
6. Connect other Ethernet ports to desired equipment for testing.
7. Turn on the power supply.
8. After about 18 seconds, a green LED should start flashing on the edge of the board next to the PCI-Express connector. The flashing LED indicates that the card is ready for operation. During this boot process the CLI port will output information about the progress of the booting process.

ZEROIZATION

For data security, the SWI-22-10 provides a zeroization capability to erase the configuration data stored on the card. In normal operation, zeroization is used only if the user loses or forgets the SWI-22-10 password. The SWI-22-10 has no way to recover the password. The only way to resolve the issue and regain access to the SWI-22-10 management interface is to zeroize the configuration back to the default configuration. The user can then reload the user configuration.

INITIATING ZEROIZATION

During lab testing, the breakout cable set provides zeroization capability. The breakout cables (CBL-2444-01 for the SWI-22-10-10 and CBL-2562-01 for the SWI-22-10-01) have a pair of wires protruding from the rear of the DB-9 shell, for use as the zeroization interface.

Before you can test zeroization, you must enable zeroization using the CLI command **optzenable**, described in Appendix B. The default time to zeroize is 2 seconds, but the time is adjustable through the CLI command **optzdelay.**

The hardware setup must generate the off-board Zeroize trigger, a nominal +12VDC signal pulse. For testing purposes, a fresh 9V battery can be used for the Zeroize trigger.

1. Attach the zeroize ground return (orange wire) to the negative terminal of the 9V battery.
2. Attach the zeroize input (green wire) to the positive terminal for more than the **optzdelay** delay time to initiate the zeroize operation.

Caution! Do not apply +9VDC or +12VDC to any other pin.

For information on user-made cabling, refer to the pinouts in Chapter 5: “J3 Pinout” for the SWI-22-10-10 or “P7 Pinout” for the SWI-22-10-01.

ZEROIZATION RECOVERY

Zeroization erases the configuration data stored in startup-config. When the switch is restarted after power down, the switch will start up with the factory-default configuration. You can then reload the user configuration if you have a backup config file, otherwise, you have to reconfigure the switch.

On units that have firmware version 1.0.0, to ensure the system operates properly, logon with the user name admin and no password. Issue the following commands to the console:

1. configure terminal
2. Thermal-protect prio 0 temperature 255
3. Thermal-protect prio 1 temperature 255
4. Thermal-protect prio 2 temperature 255
5. Thermal-protect prio 3 temperature 255
6. hostname SWI-xxxx (xxxx is the unit serial number).

7. end
8. copy running-config startup-config

CHAPTER 4 MANAGEMENT INTERFACE DESCRIPTION

The SWI-22-10 management interfaces provide the network administrator with a set of comprehensive management functions. The network administrator has a choice of two easy-to-use management interfaces:

- Serial CLI (command line interface)
  - Manages all switch features.
  - Must be used to change the switch IP address from the factory default.
  - Can be used even if there is no network connectivity.
  - Provides brief help on syntax for each command.
- Web GUI (graphical user interface).
  - Manages all switch features except the switch IP address.
  - Requires network connectivity.
  - Provides extensive help on functions and parameters.

For centrally managed networks, the switch also supports SNMP Management (not described in this manual).

This chapter explains the switch configuration files that store switch parameters, and then provides step-by-step instructions on how to use each of these interfaces to configure and manage the switch. The CLI is described in detail in Appendix A.

UNDERSTANDING THE SWITCH CONFIGURATION FILES

The switch supports an Industry Standard configuration (ICFG) and stores the configuration in text files in CLI format. The files are either virtual (RAM-based) or stored in flash on the switch. All configuration files except 'running-config' are stored in the flash: file system.

There are four kinds of configuration files:

- 'running-config', a virtual file containing the currently running system configuration. running-config is created each time the system boots, by reading default-config and then startup-config. When you make configuration changes, they affect running-config.
- 'startup-config', containing the saved configuration that is read at boot time. If you make configuration changes, you must copy running-config to startup-config in order to save them and apply them at the next boot.
- 'default-config', a read-only file that contains the factory defaults for the switch. It is used to reset a feature to its default, or if 'startup-config' is missing, to set the entire configuration to factory defaults.
- User-defined configuration files. These are typically used for backups or variants of startup-config. The maximum number of files in flash is limited to a compressed size which does not exceed roughly 1MB.
  - The CLI supports the maximum number of files.
  - The GUI file management capabilities are limited; refer to "Managing Configuration Files".

The configuration files can be edited and can be populated on multiple other switches using any standard text editor offline.

It is possible to reset the total system configuration to defaults in two ways:

- Deleting 'startup-config' and rebooting.
- Instructing the software to discard the current configuration and reset to defaults without rebooting.

Deleting 'startup-config' doesn't change the current 'running-config'; however, when the system is rebooted, only the defaults will be loaded. Conversely, discarding the current configuration affects 'running-config' but does not touch 'startup-config'.

The sections on "Using the CLI" and "Using the Web GUI" provide instructions on working with the configuration files.

Note: You must use the CLI to change the VLAN 1 IP address from the factory default; refer to the "CLI Quick Start" section. For all other management activities, you can use either the CLI or the Web GUI.

USING THE CLI

This document describes basic usage and configuration of the command line interface (CLI) for the Parvus SWI-22-10.

The CLI interface is an industry-standard CLI and consists of configuration commands which provide the ability to configure and view the configuration using the serial console, or Telnet or SSH access. Even if there is no network connectivity, you can still manage the switch using a serial connection.

SERIAL CLI SETUP

1. Connect the SWI-22-10 to a serial port on the host computer.
2. Power-on the SWI-22-10.
3. Set the serial port on the host to 115200 baud, no parity, 8 data bits, 1 stop bit, no parity, no flow control.
4. Start a terminal emulator on the host, such as TeraTerm or PuTTY on Windows, or Minicom on Linux.

CLI QUICK START

The instructions in this section provide step-by-step instructions on how to use the most critical CLI commands. This section describes how to:

- Log in.
- Set the VLAN 1 IP address.
- Verify connectivity using 'ping.'
- Set the admin user password (optional).
- Display the current configuration and save it to flash storage.
- Make a backup copy of the configuration.

Once the system is set to the correct VLAN 1 IP address, you can use either the CLI or the web GUI to perform system configuration.

Remember that **bold** identifies what you should type exactly as shown; ***bold italic*** marks a parameter you should provide, such as ***my-device***.

Log In

When the card powers on, the switch boots through RedBoot to the switch CLI and the following messages are displayed on the console:

```
RedBoot> go
Parvus version 1.0.0
Press ENTER to get started
```

1. Press Enter one or more times until the 'Username:' prompt appears.

```
Username:
```

2. Type **admin** and press Enter.

```
Username: admin
Password:
```

3. At the Password prompt, press Enter. (There is no default password.) This completes the login sequence. The prompt changes to SWI2210-XXXX#, where XXXX is the serial number of your SWI-22-10.

```
Username: admin
Password:
SWI2210-XXXX#
```

At this point the admin user is operating at the highest privilege level, level 15. This means the admin has full control over the switch and its configuration.

Set VLAN 1 IP Address

If the system is on a different network, you need to change the default VLAN 1 address. The default address is 192.168.1.13 and the default subnet mask is 255.255.255.0.

1. Change to configuration mode. The prompt changes to include the mode name in parentheses.

```
SWI2210-XXXX# configure terminal
SWI2210-XXXX(config)#
```

2. Enter the 'interface vlan 1' command to change to a configuration sub-mode that allows, among other things, configuration of the IP address. The prompt now includes the sub-mode.

```
SWI2210-XXXX(config)# interface vlan 1
SWI2210-XXXX(config-if-vlan)#
```

3. Enter the ip address command. This example uses 172.16.1.2 255.255.0.0 for the address and subnet mask. The command syntax depends on whether your addressing scheme is DHCP.

   For non-DHCP systems, use:

```
SWI2210-XXXX(config-if-vlan)# ip address <address> <subnet mask>
SWI2210-XXXX(config-if-vlan)#
```

   For DHCP systems, use:

```
SWI2210-XXXX(config-if-vlan)# ip address dhcp fallback <address> <subnet mask>
SWI2210-XXXX(config-if-vlan)#
```

4. Exit configuration mode. The exit command returns to the next higher mode, and the prompt changes to show the current mode.

```
SWI2210-XXXX(config-if-vlan)# exit
SWI2210-XXXX(config)# exit
SWI2210-XXXX#
```

5. After configuration is complete, you can use the show command to inspect the resulting IP address. In the example below the DHCP negotiation succeeded and the device obtained an address:

```
SWI2210-XXXX# show ip interface brief
Vlan Address              Method   Status
---- -------------------- -------- ------
   1 172.16.1.17/16       DHCP     UP
SWI2210-XXXX#
```

Check Connectivity

You can verify management connectivity by issuing a 'ping' command to a known external IP address:

```
SWI2210-XXXX# ping ip 172.16.1.1
PING server 172.16.1.1, 56 bytes of data.
64 bytes from 172.16.1.1: icmp_seq=0, time=0ms
64 bytes from 172.16.1.1: icmp_seq=1, time=0ms
64 bytes from 172.16.1.1: icmp_seq=2, time=0ms
64 bytes from 172.16.1.1: icmp_seq=3, time=0ms
64 bytes from 172.16.1.1: icmp_seq=4, time=0ms
Sent 5 packets, received 5 OK, 0 bad
SWI2210-XXXX#
```

If the ping is successful, network logins can now be performed via telnet or ssh to the address on VLAN 1, 172.16.1.17 (or 172.16.1.2).

Save the Configuration

These steps describe how to perform a basic save operation and view the new configuration file.

1. Copy running-config to startup-config:

```
SWI2210-XXXX# copy running-config startup-config
Building configuration...
% Saving 1326 bytes to flash:startup-config
```

2. Use the dir command to display the contents of the flash file system.

```
SWI2210-XXXX# dir
Directory of flash:
    r- 1970-01-01 00:00:00         648 default-config
    rw 1970-01-03 18:21:28        1326 startup-config
2 files, 1974 bytes total.
```

3. Enter the more command to output the contents of the startup-config file.

```
SWI2210-XXXX# more flash:startup-config
hostname SWI2210-XXXX
username admin privilege 15 password encrypted dmVyeS1zZWNyZXQ=
!
vlan 1
name default
[...]
```

Create a Backup Copy of the Configuration

These steps describe how to make a backup copy of startup-config in the flash file system on the switch and then make another copy on the host computer.

1. Copy startup-config to a new file. In this example, backup is the name of the new file.

```
SWI2210-XXXX# copy startup-config flash:backup
Building configuration...
% Saving 1326 bytes to flash:backup
```

2. Use the dir command to display the contents of the flash file system.

```
SWI2210-XXXX# dir
Directory of flash:
    r- 1970-01-01 00:00:00         648 default-config
    rw 1970-01-03 18:21:28        1326 startup-config
    rw 1970-01-03 18:21:28        1326 backup
3 files, 3300 bytes total.
```

3. Enter the more command to output the contents of the backup file.

```
SWI2210-XXXX# more flash:backup
hostname SWI2210-XXXX
username admin privilege 15 password encrypted dmVyeS1zZWNyZXQ=
!
vlan 1
name default
[...]
```

4. To store the backup file on the host computer, use the copy command with this syntax:

```
SWI2210-XXXX# copy backup tftp://<server>[:<port>]/<path-to-file>
```

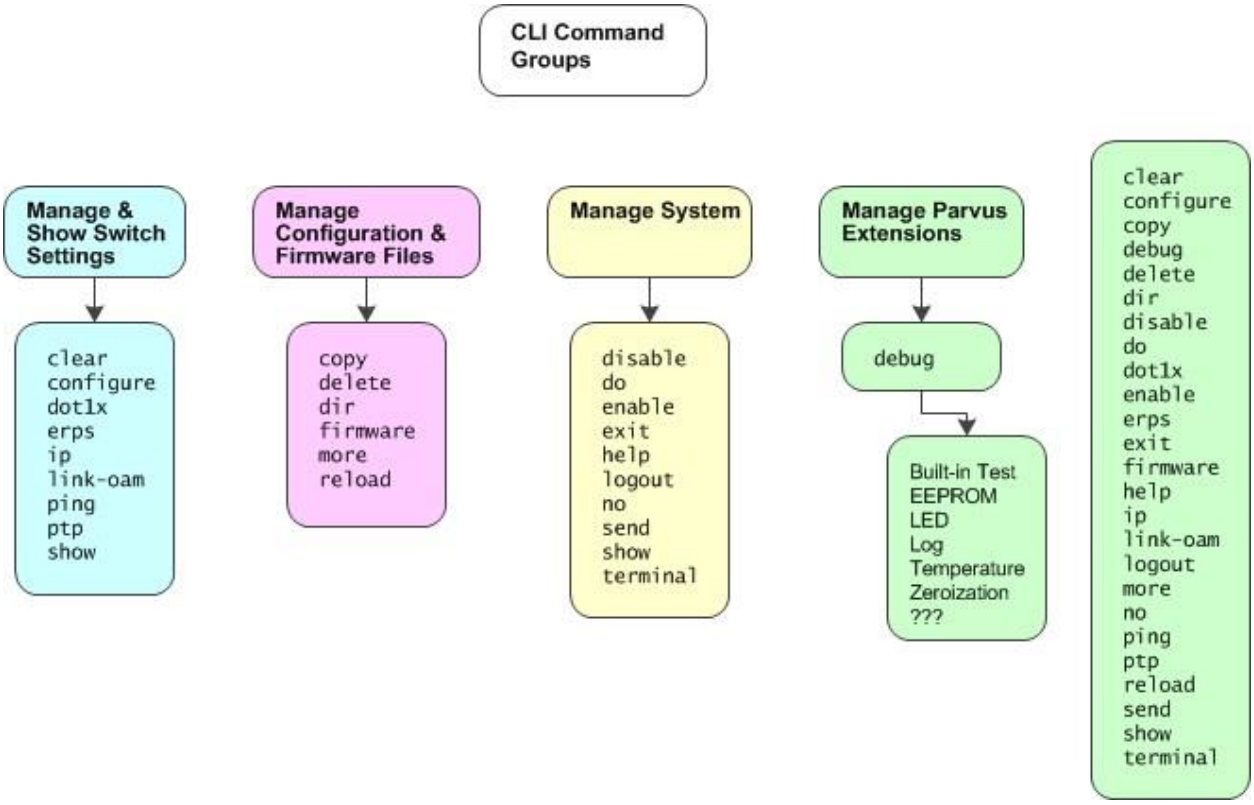
CLI COMMAND GROUPS

CLI commands can be grouped into the following functional categories:

- Manage and show switch settings.
- Manage configuration and firmware files.
- Manage system.
- Manage Parvus extensions.

Figure 13 shows the list of Exec commands and the commands available in each group. Appendix A provides more information on the first three command groups, with multiple examples of their use. Appendix B describes the Parvus extensions, which are specialized commands for viewing board status and enabling optional board features like zeroization.

Figure 13. CLI Functional Groups



WORKING WITH CONFIGURATION FILES

Configuration file names are case-sensitive.

Saving and Deleting Configuration Files

The available operations are copy, dir, more, and delete.

copy <*source*> <*destination*>

Copies *source* to *destination*. The *source* and *destination* can be one of:

- running-config
- startup-config (or flash:startup-config)
- flash:<*filename*>
- tftp://<*server*>[:<*port*>]/<*path-to-file*>

dir

Lists the contents of the flash: file system.

more flash: <*filename*>

Outputs the contents of the specified file <*filename*>to the terminal.

delete flash: <*filename*>

Deletes the specified file <*filename*>.

Example: Working With Configuration Files

The following example assumes a file system which contains a user-defined configuration file called 'backup', previously created with a 'copy' command.

```
! List files in flash:
SWI2210-XXXX# dir
Directory of flash:
    r- 1970-01-01 00:00:00      648 default-config
    rw 1970-01-06 03:57:33     1313 startup-config
    rw 1970-01-01 19:54:01     1237 backup
3 files, 3198 bytes total.

! Display the contents of the file 'backup' (output is abbreviated):
SWI2210-XXXX# more flash:backup
hostname SWI2210-XXXX
...
end

! Use file 'backup' for the next boot by overwriting startup-config:
SWI2210-XXXX# copy flash:backup startup-config
% Saving 1237 bytes to flash:startup-config

! Verify that the sizes are identical:
SWI2210-XXXX# dir
Directory of flash:
    r- 1970-01-01 00:00:00      648 default-config
    rw 1970-01-06 05:30:41     1237 startup-config
    rw 1970-01-01 19:54:01     1237 backup
3 files, 3122 bytes total.

! Delete startup-config. Note how 'flash:' is required:
SWI2210-XXXX# delete flash:startup-config
SWI2210-XXXX# dir
Directory of flash:
    r- 1970-01-01 00:00:00      648 default-config
```

```
    rw 1970-01-01 19:54:01     1237 backup
2 files, 1885 bytes total.

! Use the current running-config for next boot:
SWI2210-XXXX# copy running-config startup-config
Building configuration...
% Saving 1271 bytes to flash:startup-config
```

Reverting to the Default Configuration

An explicit 'copy running-config startup-config' is necessary to make the change persistent.

Rebooting and resetting configuration to defaults is accomplished with the 'reload' command:

reload cold [sid <*switch_id*>]
reload defaults [keep-ip]

The first form reboots the system. The second form loads configuration defaults. If the 'keep-ip' keyword is specified, the system attempts to keep the most relevant parts of the VLAN 1 IP setup--the IP address setup and the active default route--in order to maintain management connectivity.

> *Note: There is no guarantee that the above is sufficient. It depends on the actual network properties and the system's total IP configuration. In some cases it may be preferable to explicitly un-configure the system using 'no' commands, or prepare a suitable configuration and download it to the system's 'startup-config' and reboot.*

Example: Using Reload Commands

```
! Reload defaults, but try to keep VLAN 1 configuration. First list current IP
! settings:
SWI2210-XXXX# show ip interface brief
Vlan Address              Method   Status
---- -------------------- -------- ------
   1 172.16.1.17/24       DHCP     UP

SWI2210-XXXX# reload defaults keep-ip
% Reloading defaults, attempting to keep VLAN 1 IP address. Please stand by.
# show ip interface brief
Vlan Address              Method   Status
---- -------------------- -------- ------
   1 172.16.1.17/24       DHCP     UP

! Contents of flash: are unchanged:
SWI2210-XXXX# dir
Directory of flash:
    r- 1970-01-01 00:00:00 648 default-config
    rw 1970-01-06 05:33:18 1237 startup-config
    rw 1970-01-01 19:54:01 1237 backup
3 files, 3122 bytes total.

! Reload again, but don't try to keep VLAN 1 settings:
# reload defaults
% Reloading defaults. Please stand by.

! Verify that the default IP settings have been restored:
# show ip interface brief
Vlan Address              Method   Status
---- -------------------- -------- ------
   1 192.0.2.1/24         Manual   UP

! Reboot the system
# reload cold
% Cold reload in progress, please stand by.
! ... bootup output omitted ...
```

LOADING A NEW FIRMWARE IMAGE

The system can store up to two software images in flash. The image selected for bootup is termed the ***active*** image, while the other is termed the ***alternate*** image.

It is possible to swap the active and alternative images, and it is possible to upgrade to a new active image.

- A **swap** simply switches the active/alternate designation on each image and reboots the system.
- A firmware **upgrade** performs these steps:
  - Downloads new firmware using TFTP and verifies suitability for the system.
  - Overwrites the current alternate image with the newly downloaded image.
  - Swaps active/alternate and reboots.

The result is that the old active build becomes the alternate and the newly downloaded image is active.

The relevant commands are:

```
! Use show version to list details about the system, including the images in flash.
SWI2210-XXXX# show version
SWI2210-XXXX# firmware swap
SWI2210-XXXX# firmware upgrade tftp://<server>[:<port>]/<path_to_file>
```

'show version' lists various details about the system, including the images in flash.

USING THE WEB GUI

The web-based software management method allows the network administrator to configure, manage, view, and control the switches remotely. The Web based Management method also provides help pages for assisting the switch administrator in understanding the usage. SNMP management is standards-based, with configuration parameters specified in the supported MIBs.

The supported web browsers are:

- Internet Explorer 7.0 and above
- Firefox 3.6 and above
- Google Chrome 8.0 and above
- Safari S5 and above
- Opera 11 and above

Connect to the host PC via any Ethernet port. The factory-default IP address is: 192.168.1.13 and the default subnet mask is 255.255.255.0.

Note: You must use the CLI to change the VLAN 1 IP address from the factory default; refer to the "CLI Quick Start" section. For all other management activities, you can use either the CLI or the Web GUI.

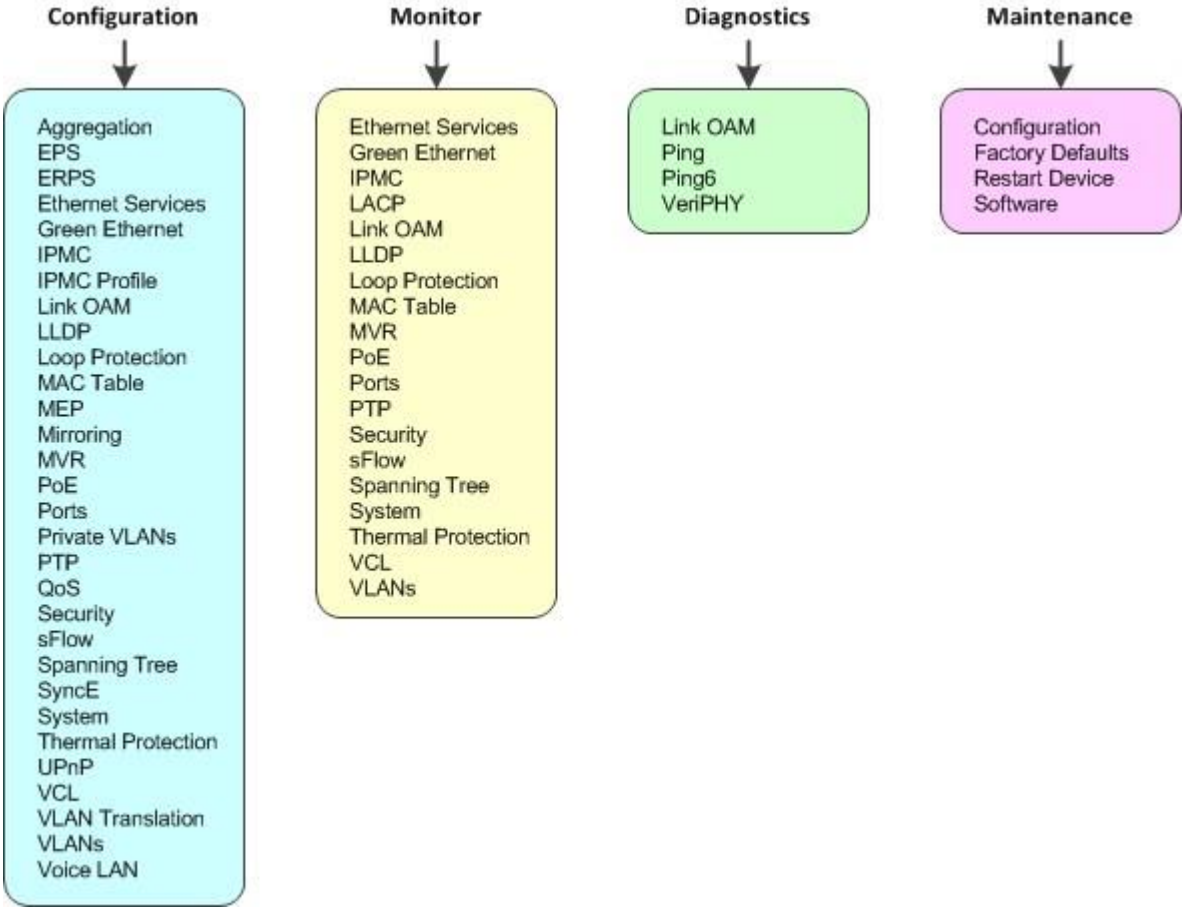
ETHERNET GUI FEATURES

The Web GUI is divided into four different trees:

- Configuration of features
- Monitoring of the configured features, with 'Auto-Refresh' option
- Diagnostics
- Maintenance-related features

Figure 14 is an alphabetized list of the top-level features in each group.

Figure 14. Web GUI Top Level Features (Alphabetized)



WEB GUI INTRODUCTION

This section explains how to access the web GUI, describes page navigation, and explains how to access help.

Accessing the Web Interface

Once the IP address of the switch is set up, you can use the Web GUI to manage the switch.

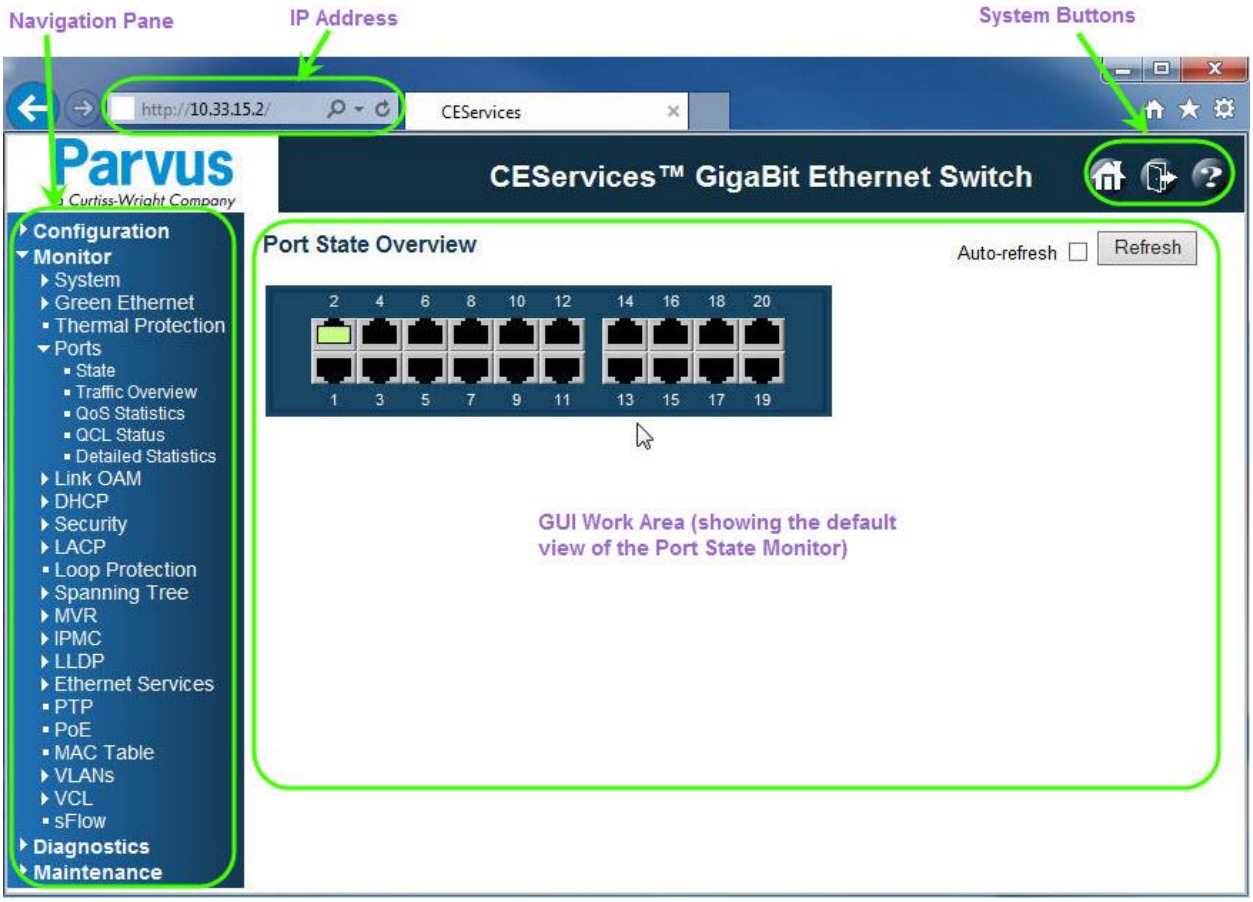
where the IP address of the switch is .

1. Connect the switch to a host computer via an Ethernet port. The computer must exist on the same subnet as the switch IP address.
2. Type the switch URL (IP address) into the address bar of a web browser on the host computer; for example: http://**10.33.15.2**
3. The Password popup is displayed. Type **admin** in the User name box.

4. If you've already set an admin password, type it in the password box. Otherwise leave the box empty—there is no default password--and click OK.

5. The GUI home page is displayed.

The standard parts of the GUI are the navigation pane on the left, the large work area, and system buttons in the upper right corner of the window. The default view for the GUI is the monitor for Port States.



Navigation Pane

The navigation pane selects what is displayed in the work area. The pane is organized into categories (such as Configuration, Monitor, and Diagnostics) and subcategories (such as System, Green Ethernet, and Ports under Monitor). The categories and subcategories are just navigation tools—they aren't displayed in the work area. Only the work pages, represented by the square bullet, are displayed.

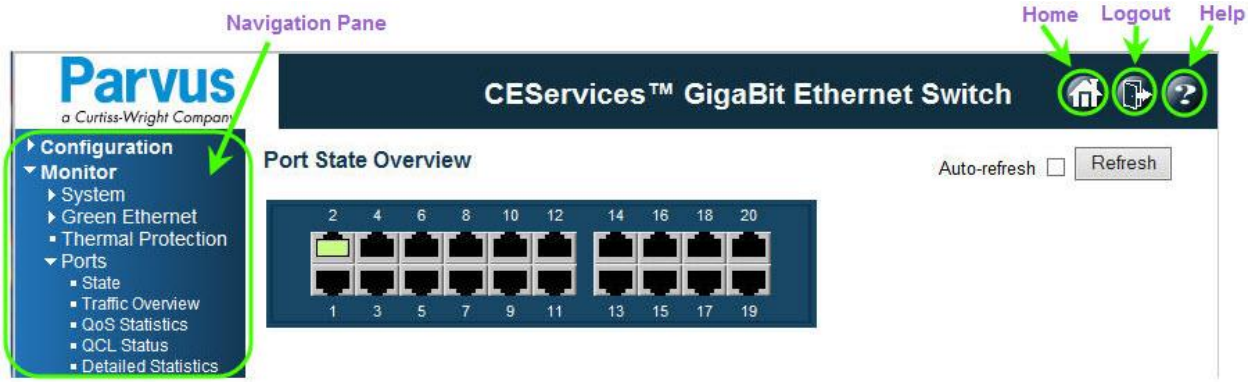
To expand or collapse a category, click the name, not the symbol. Expanding does not affect what's displayed in the work area.

- ▸ indicates a collapsed topic.
- ▾ indicates an expanded topic. Topics remain expanded until you collapse them.
- ■ indicates a work page.

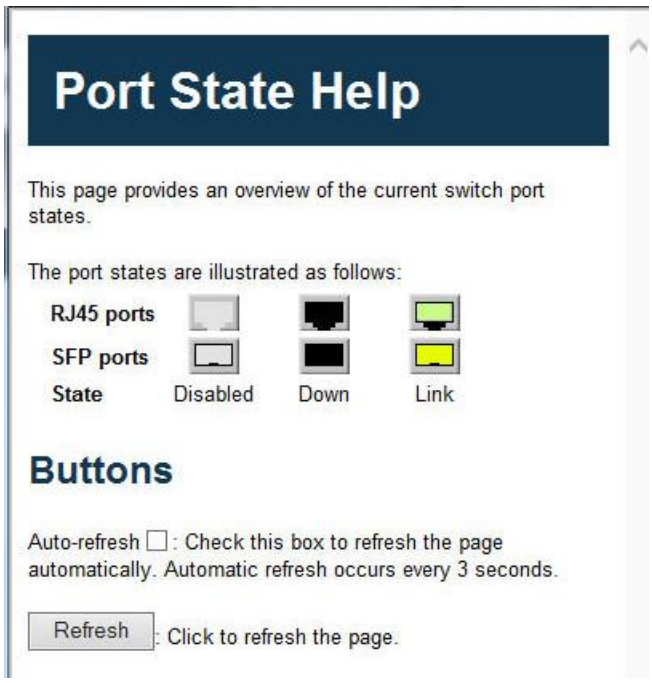
The page displayed in the work area doesn't change until you select a different command page. Only pages have help.

System Buttons

The system buttons are circled in this example page.



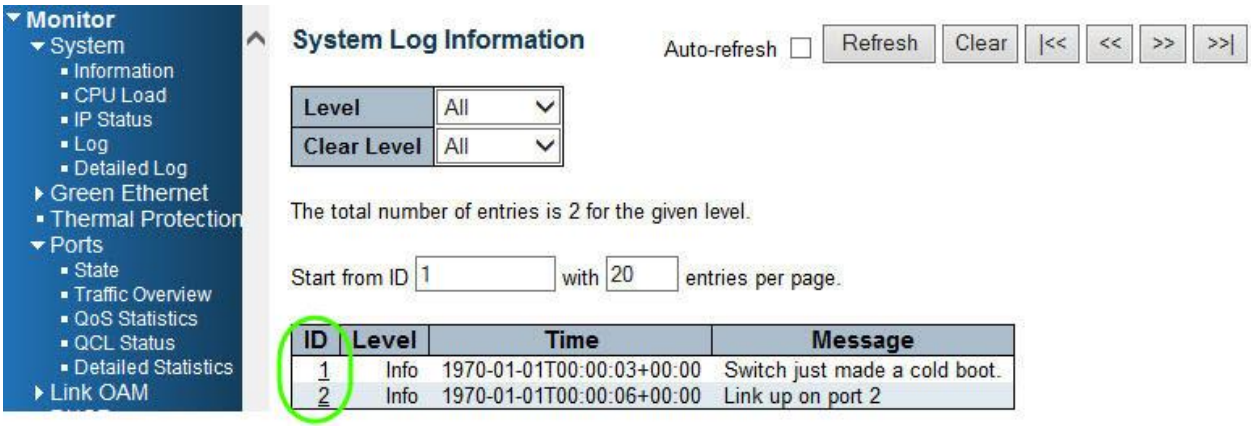
- Home: A shortcut to quickly display the home page without using the navigation pane. Any unsaved changes are lost.
- Logout: Closes the GUI.
- Help: Opens a separate help window for the current work page. It describes each field and button on the page, like this example for the Port State Overview page. If you leave the help window, navigate to a new page, and click Help, the help window updates with help for the new page.



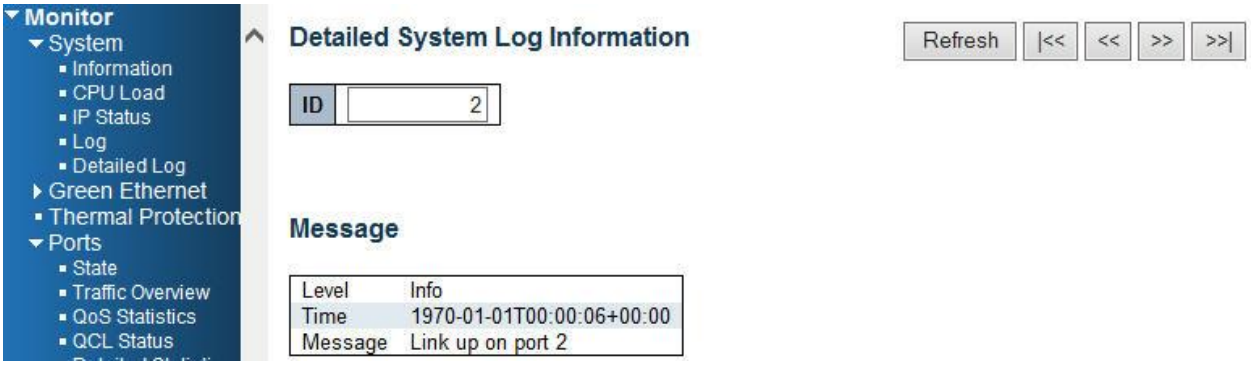
Note: If you minimize the help window and then try to display help for a new page, the help window may not automatically maximize.

Links to Detail Popups

Many of the GUI pages display a table of results, like this example of the system log. Underlined entries in the table (ID 1 and 2) indicate that a detail page is available for the entry.



If you click on the underlined item, the display changes to show more information, like this example of detailed system log information for ID 2.



CHANGING AND SAVING CONFIGURATION SETTINGS

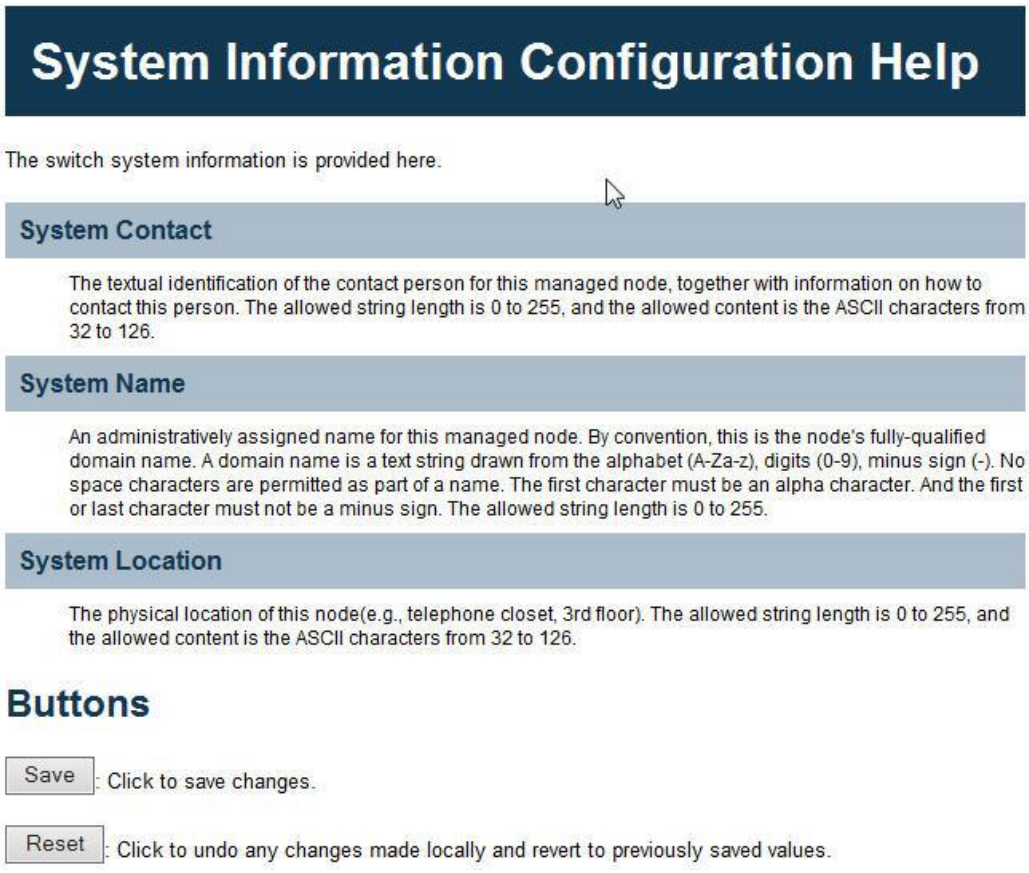
These instructions walk you through the processes for changing the switch hostname and the admin password, providing tips that are relevant to any configuration change. The instructions then explain how to save the configuration.

Changing the Switch Hostname (Example)

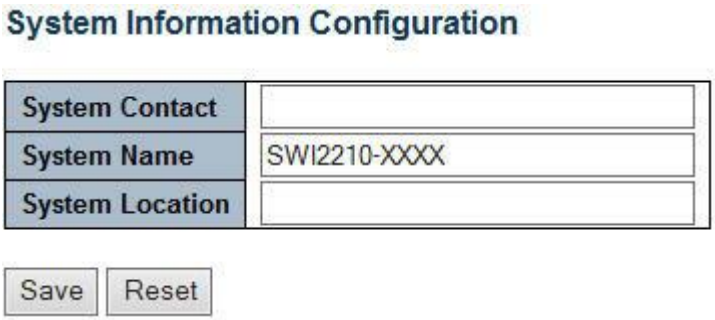
The basic process for changing any configuration setting is illustrated here, using changing the switch host name from my-device to SW2210-XX as an example.

1. Use the navigation pane to find and display the appropriate page.

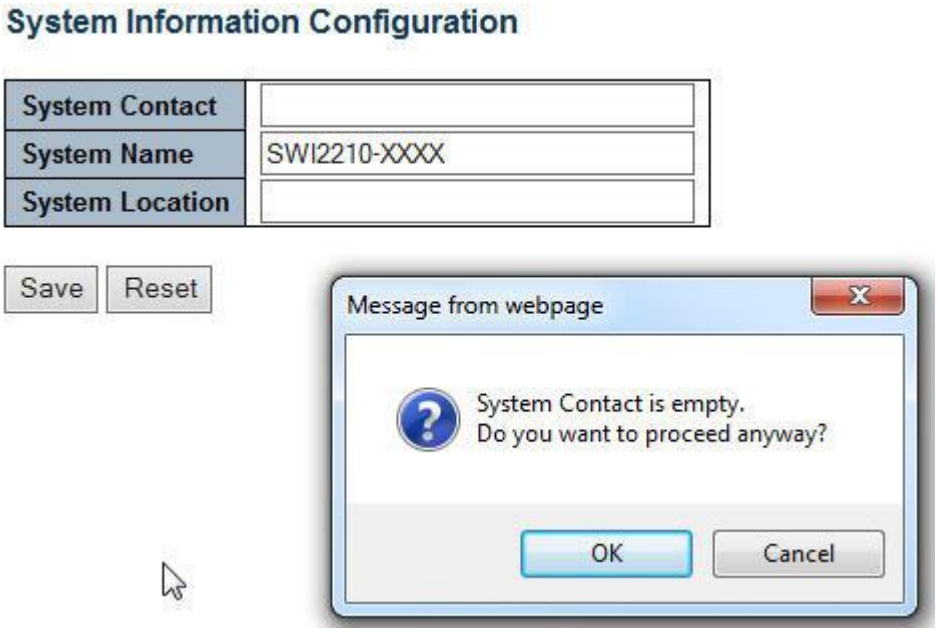
2. Display help if you're unsure what a field means.



3. Complete all required fields on the page.



4. Click the Save button.
   - If you left any optional fields blank, a reminder that the field is empty is displayed. Click OK or return to the page and supply a value.
   - Once all fields have been checked, the change goes into effect immediately.



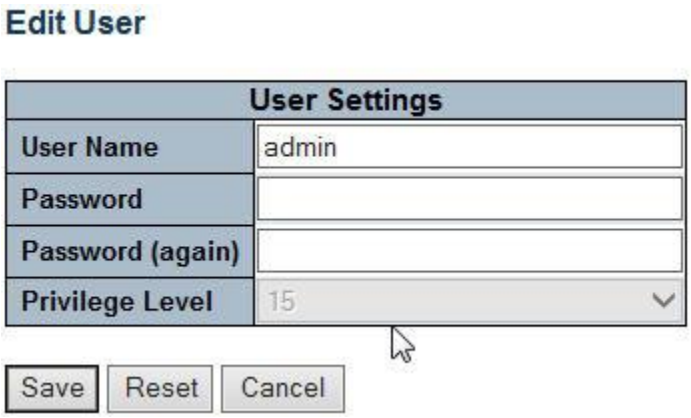
5. Repeat steps 1-4 to make any other configuration changes you need.
6. When you're finished making changes, save the changes to startup-config, following the instructions in the next section. If you do not copy the changes to startup-config, they will be lost when power is turned off.

Changing the Admin Password (Example)

By default, there is no admin password. To set a password:

1. Use the navigation pane to find and display the appropriate page.
   - The Users Configuration page lists the configured users. You can also use this page to add users.
   - Each user name is underlined, indicating it is a link to a detail page.

2. Display help if you're unsure what a field means.
3. Click the admin user name. The Edit User popup is displayed



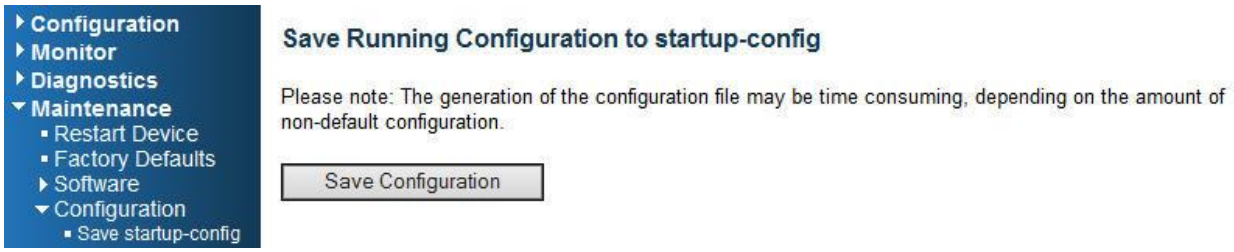
4. Type the new password twice.
5. Click the Save button. The change goes into effect immediately.
6. When you're finished making all changes, save the changes to startup-config, following the instructions in the next section. If you do not copy the changes to startup-config, they will be lost when power is turned off.

Saving the Configuration via the Web GUI

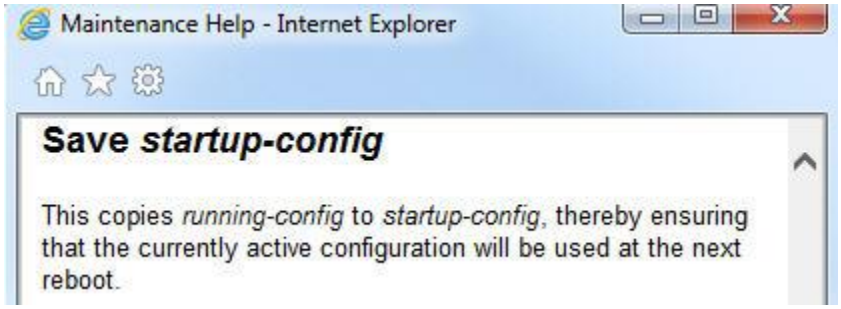
This section explains how to copy running-config to startup-config, thereby ensuring that the currently active configuration will be available at the next reboot.

1. Use the navigation pane to find the appropriate page. Save startup-config is under Maintenance > Configuration.

2. Click Save start-up config.



3. Display help if you're unsure what this command does.



4. Click the Save Configuration button. A confirmation message is displayed, indicating that startup-config has been updated.
5. To make a backup copy of startup-config, refer to "Managing Configuration Files". You must **download** the file from the switch to the browser. If you want to store the backup file in the switch flash, you can then **upload** the file from the browser to the switch.

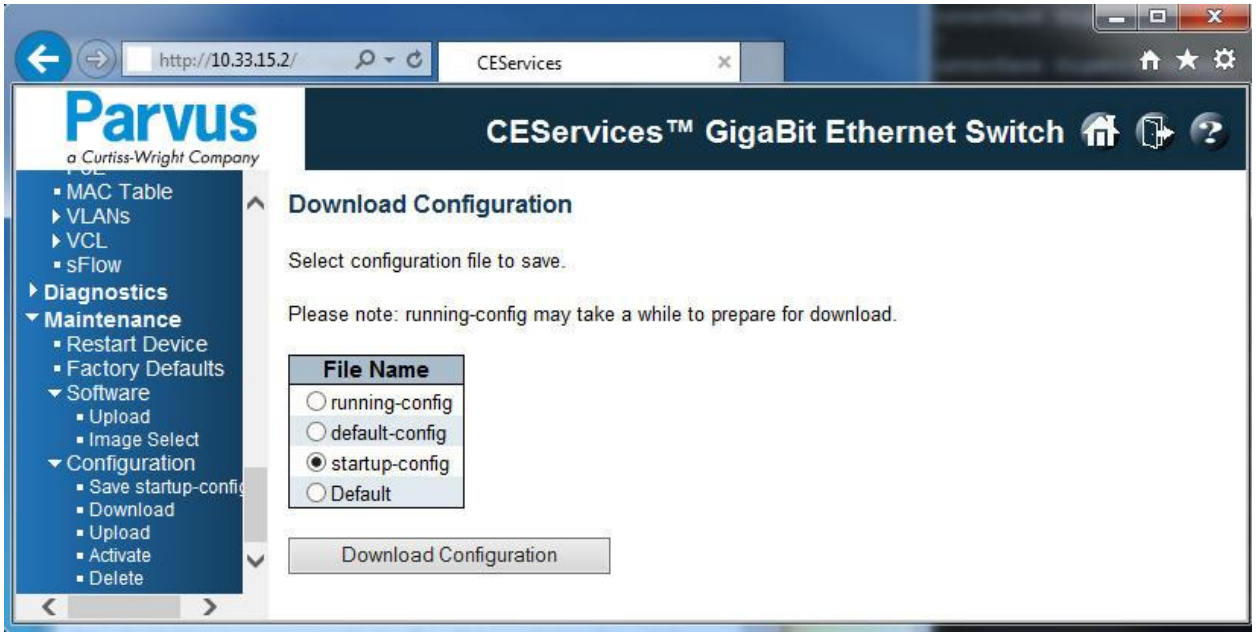
MANAGING CONFIGURATION FILES

Configuration parameters are represented as attribute values. When saving the configuration from the switch, the entire configuration including syntax descriptions is included in the file. The file may then be modified using an editor and loaded to a switch.

Downloading a Configuration File

Downloading a configuration file creates a backup file by downloading the configuration file from the switch to the web browser. The default files include running-config, default-config and the startup-config. Other files on the flash are also listed.

1. Use the navigation pane to find the appropriate page. Download is under Maintenance > Configuration. Click Download.



2. Select the file to be downloaded, then click Download Configuration.
3. The actual save operation is browser-specific. The browser performs the save operation, and usually provides options to save-as new name and select the save location. Status and completion messages are controlled by the browser; the GUI work area doesn't change.

Uploading a Configuration File

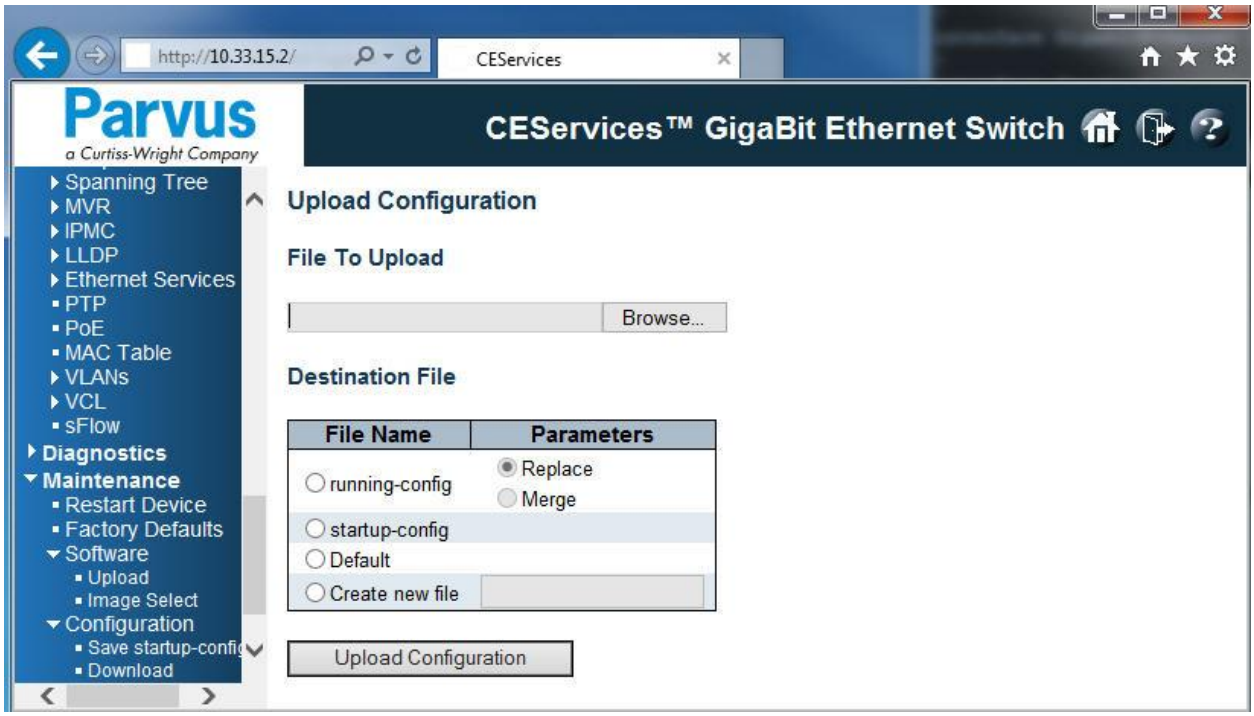
You can upload a file from the web browser to any of the files on the switch, except default-config, which is read-only. The upload can replace the current file or create a new file in flash.

If the destination is running-config, the file will be applied to the switch configuration. This can be done in two ways:

- Replace mode: The current configuration is fully replaced with the configuration in the uploaded file.
- Merge mode: The uploaded file is merged into running-config.

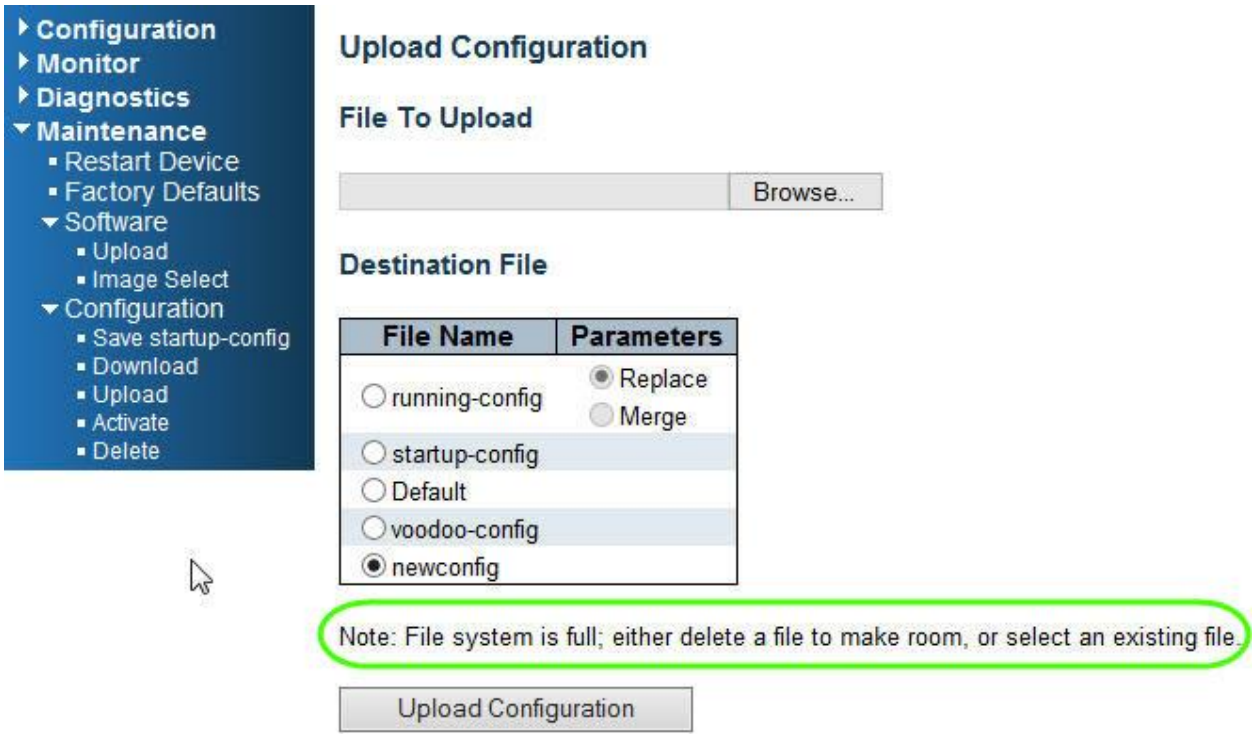
If the file system is full (i.e., contains three system files plus user-defined files), you can't create new files. In that case, you must either first delete an existing file or allow the upload to overwrite an existing file.

1. Use the navigation pane to find the appropriate page. Upload is under Maintenance > Configuration. Click Upload.

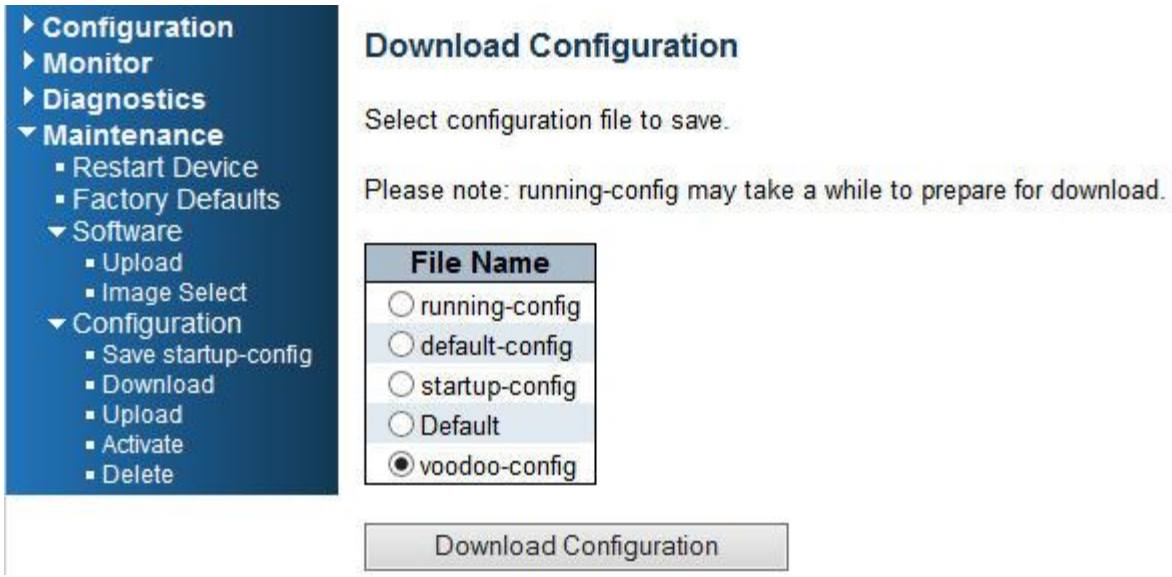


2. Click the Browse button and find the file to upload.

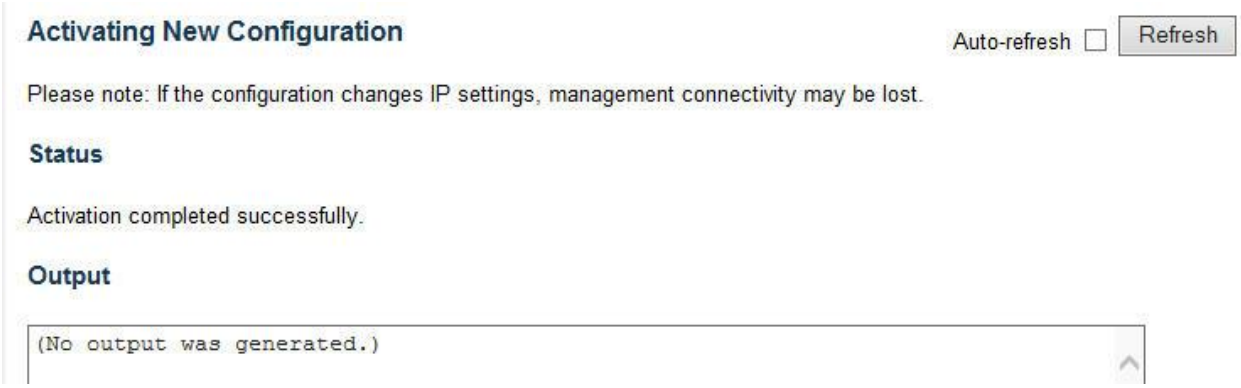
3. Select the destination. The available destination files show the first four files in flash. If the GUI file system is full, the Create a new file option is not available and a message is displayed.



4. If you decide to delete an existing file, click Delete in the navigation pane. Then select the file to delete. A confirmation message is displayed. Return to step 1.



5. Click Upload Configuration. A completion message is displayed.



Activating a Configuration File

Activating a file means initiating the process of completely replacing the existing configuration with that of the selected file. You can activate any of the configuration files present on the switch, except for running-config which represents the currently active configuration.

Deleting a Configuration File

You can delete any of the writable files stored in flash, including startup-config. If this is done and the switch is rebooted without a prior Save operation, this effectively resets the switch to the default configuration.

LOADING A NEW FIRMWARE IMAGE

TBD

CHAPTER 5 CONNECTOR DESCRIPTIONS

This chapter identifies connector part numbers, locations, and pinouts to facilitate fabrication of cables that can connect to the SWI-22-10. The chapter describes the card-specific connectors for the SWI-22-10-10 and SWI-22-10-01 and then describes the connectors common to both cards. Finally, implementation information for the console, zeroize, and LED ports is provided.

SWI-22-10-10 CARD-SPECIFIC CONNECTORS

PART NUMBERS

The following table shows the manufacturer part numbers for the SWI-22-10-10 connectors (identified in Figure 15), together with the suggested mating connectors.

Connector	Part Number	Mating Connector
J2 & J3	Harwin M83-LML3M1N96-0000-000	Harwin M83-LFC1F1N96-0000-000 for 24- gauge CAT-5E wiring Harwin M83-LFT1F2N96-0000-000 for flex cable or PCB mounting

Figure 15. SWI-22-10-10 Ethernet Connectors

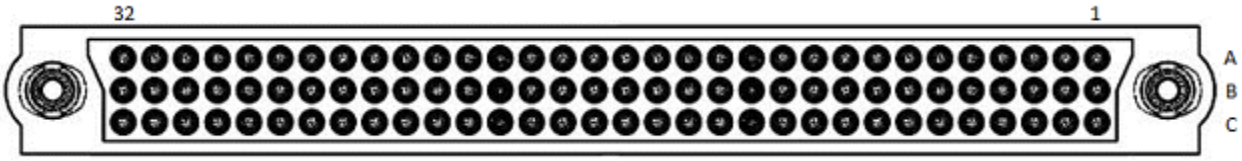
DESCRIPTION AND PINOUTS

Connectors J2 and J3 form the Ethernet Switch Interface for the SWI-22-10-10.

- 20 Gigabit Ethernet Ports - The ports are numbered 1 through 20. Each port has four differential matched pairs: A, B, C, and D (e.g., GBE20_A_P and GBE20_A_N).
- RS-232 Port - Serial console interface
- Zeroize - an external configuration erase function which returns the board to a default configuration state.
- Serial LED Interface

Figure 16 shows the physical orientation for J2 and J3.

Figure 16. SWI-22-10-10 Ethernet Connector Detail



J2 Pinout

J2 PIN	SIGNAL	J2 PIN	SIGNAL	J2 PIN	SIGNAL
A1	GBE16_A_P	**B1**	GBE12_A_P	**C1**	GBE12_B_P
A2	GBE16_A_N	**B2**	GBE12_A_N	**C2**	GBE12_B_N
A3	GBE16_B_P	**B3**	GBE12_C_P	**C3**	GBE12_D_P
A4	GBE16_B_N	**B4**	GBE12_C_N	**C4**	GBE12_D_N
A5	CHASSIS	**B5**	GBE11_A_P	**C5**	GBE11_B_P
A6	GBE16_C_P	**B6**	GBE11_A_N	**C6**	GBE11_B_N
A7	GBE16_C_N	**B7**	GBE11_C_P	**C7**	GBE11_D_P
A8	GBE16_D_P	**B8**	GBE11_C_N	**C8**	GBE11_D_N
A9	GBE16_D_N	**B9**	GBE15_A_P	**C9**	GBE15_B_P
A10	GBE15_C_P	**B10**	GBE15_A_N	**C10**	GBE15_B_N
A11	GBE15_C_N	**B11**	GBE10_A_P	**C11**	GBE10_B_P
A12	CHASSIS	**B12**	GBE10_A_N	**C12**	GBE10_B_N
A13	GBE15_D_P	**B13**	GBE10_C_P	**C13**	GBE10_D_P
A14	GBE15_D_N	**B14**	GBE10_C_N	**C14**	GBE10_D_N
A15	GBE14_A_P	**B15**	GBE9_A_P	**C15**	GBE9_B_P
A16	GBE14_A_N	**B16**	GBE9_A_N	**C16**	GBE9_B_N
A17	GBE14_B_P	**B17**	GBE9_C_P	**C17**	GBE9_D_P
A18	GBE14_B_N	**B18**	GBE9_C_N	**C18**	GBE9_D_N
A19	NC	**B19**	GBE14_C_P	**C19**	GBE14_D_P
A20	CHASSIS	**B20**	GBE14_C_N	**C20**	GBE14_D_N
A21	GBE13_A_P	**B21**	GBE8_A_P	**C21**	GBE8_B_P
A22	GBE13_A_N	**B22**	GBE8_A_N	**C22**	GBE8_B_N
A23	GBE13_B_P	**B23**	GBE8_C_P	**C23**	GBE8_D_P
A24	GBE13_B_N	**B24**	GBE8_C_N	**C24**	GBE8_D_N
A25	GBE13_C_P	**B25**	GBE7_A_P	**C25**	GBE7_B_P
A26	GBE13_C_N	**B26**	GBE7_A_N	**C26**	GBE7_B_N
A27	GBE13_D_P	**B27**	GBE7_C_P	**C27**	GBE7_D_P
A28	GBE13_D_N	**B28**	GBE7_C_N	**C28**	GBE7_D_N
A29	NC	**B29**	NC	**C29**	NC
A30	NC	**B30**	LED_LOAD	**C30**	LED_nRESET
A31	NC	**B31**	LED_CLOCK	**C31**	LED_PWR
A32	NC	**B32**	LED_DO	**C32**	GND

J3 Pinout

J3 PIN	SIGNAL	J3 PIN	SIGNAL	J3 PIN	SIGNAL
A1	GBE20_A_P	**B1**	GBE6_A_P	**C1**	GBE6_B_P
A2	GBE20_A_N	**B2**	GBE6_A_N	**C2**	GBE6_B_N
A3	GBE20_B_P	**B3**	GBE6_C_P	**C3**	GBE6_D_P
A4	GBE20_B_N	**B4**	GBE6_C_N	**C4**	GBE6_D_N
A5	CHASSIS	**B5**	GBE5_A_P	**C5**	GBE5_B_P
A6	GBE20_C_P	**B6**	GBE5_A_N	**C6**	GBE5_B_N
A7	GBE20_C_N	**B7**	GBE5_C_P	**C7**	GBE5_D_P
A8	GBE20_D_P	**B8**	GBE5_C_N	**C8**	GBE5_D_N
A9	GBE20_D_N	**B9**	GBE19_A_P	**C9**	GBE19_B_P
A10	GBE19_C_P	**B10**	GBE19_A_N	**C10**	GBE19_B_N
A11	GBE19_C_N	**B11**	GBE4_A_P	**C11**	GBE4_B_P
A12	CHASSIS	**B12**	GBE4_A_N	**C12**	GBE4_B_N
A13	GBE19_D_P	**B13**	GBE4_C_P	**C13**	GBE4_D_P
A14	GBE19_D_N	**B14**	GBE4_C_N	**C14**	GBE4_D_N
A15	GBE18_A_P	**B15**	GBE3_A_P	**C15**	GBE3_B_P
A16	GBE18_A_N	**B16**	GBE3_A_N	**C16**	GBE3_B_N
A17	GBE18_B_P	**B17**	GBE3_C_P	**C17**	GBE3_D_P
A18	GBE18_B_N	**B18**	GBE3_C_N	**C18**	GBE3_D_N
A19	NC	**B19**	GBE18_C_P	**C19**	GBE18_D_P
A20	CHASSIS	**B20**	GBE18_C_N	**C20**	GBE18_D_N
A21	GBE17_A_P	**B21**	GBE2_A_P	**C21**	GBE2_B_P
A22	GBE17_A_N	**B22**	GBE2_A_N	**C22**	GBE2_B_N
A23	GBE17_B_P	**B23**	GBE2_C_P	**C23**	GBE2_D_P
A24	GBE17_B_N	**B24**	GBE2_C_N	**C24**	GBE2_D_N
A25	GBE17_C_P	**B25**	GBE1_A_P	**C25**	GBE1_B_P
A26	GBE17_C_N	**B26**	GBE1_A_N	**C26**	GBE1_B_N
A27	GBE17_D_P	**B27**	GBE1_C_P	**C27**	GBE1_D_P
A28	GBE17_D_N	**B28**	GBE1_C_N	**C28**	GBE1_D_N
A29	NC	**B29**	NC	**C29**	NC
A30	NC	**B30**	NC	**C30**	ZEROIZE
A31	NC	**B31**	RS232_RXD	**C31**	ZEROIZE GND
A32	NC	**B32**	RS232_TXD	**C32**	GND

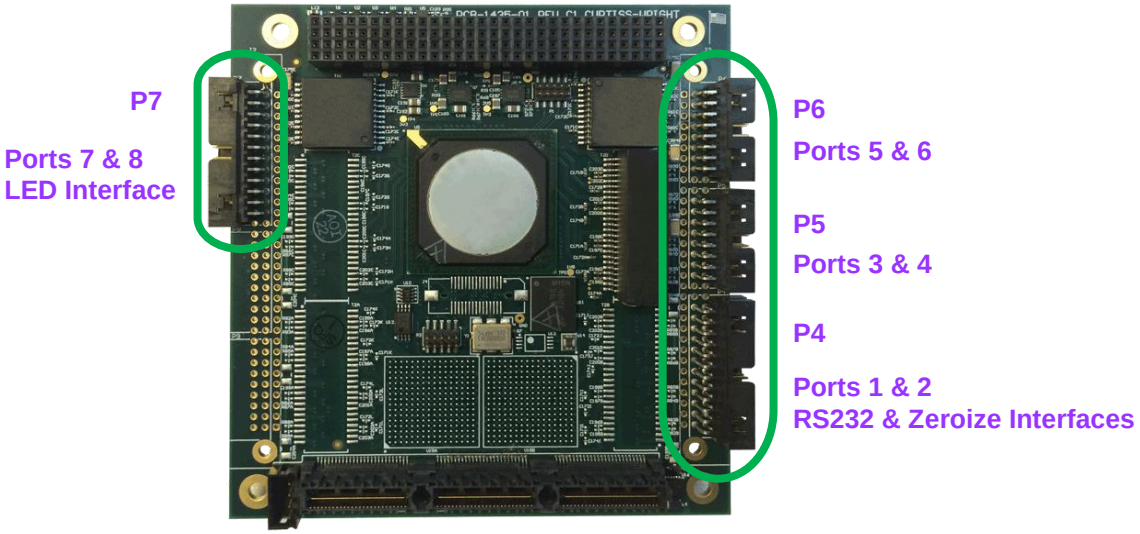
SWI-22-10-01 CARD-SPECIFIC CONNECTORS

PART NUMBERS

The following table shows the manufacturer part numbers for the SWI-22-10-01 connectors (identified in Figure 17), together with the suggested mating connectors.

Connector	Part Number	Mating Connector
P4, P7	Molex 87833-2420	Molex 51110-2451, use with Molex crimp pins 50394-8052 or -8200
P5, P6	Molex 87833-1620	Molex 51110-1651, use with Molex crimp pins 50394-8052 or -8200

Figure 17. SWI-22-10-01 Ethernet Connectors



DESCRIPTION AND PINOUTS

Connectors P4, P5, P6, and P7 form the Ethernet Switch Interface for the SWI-22-10-01.

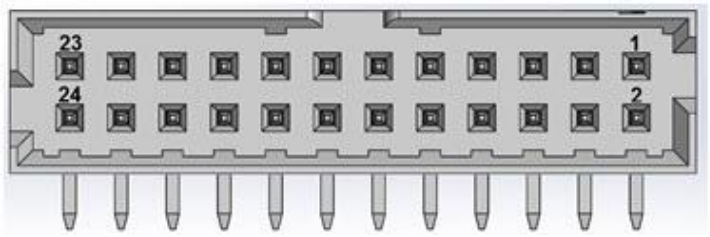
- 8 Gigabit Ethernet Ports.
- The ports are numbered 1 through 8.
- Each port has four differential matched pairs: A, B, C, and D (e.g., GBE8_A_P and GBE8_A_N).

These connectors also provide the signals for the console port, the zeroize port, and the LED port.

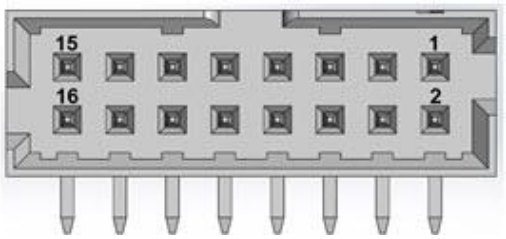
Figure 18 shows the physical orientation for P4, P5, P6, and P7.

Figure 18. SWI-22-10-01 Ethernet Connector Detail

Connectors P4 and P7 pin arrangement



Connectors P5 and P6 pin arrangement



P4 Pinout

P10 PIN	SIGNAL	P10 PIN	SIGNAL
1	GBE8_A_P	2	GBE8_B_P
3	GBE8_A_N	4	GBE8_B_N
5	GBE8_C_P	6	GBE8_D_P
7	GBE8_C_N	8	GBE8_D_N
9	GBE7_A_P	10	GBE7_B_P
11	GBE7_A_N	12	GBE7_B_N
13	GBE7_C_P	14	GBE7_D_P
15	GBE7_C_N	16	GBE7_D_N
17	NC	18	NC
19	LED_LOAD	20	LED_nRESET
21	LED_CLOCK	22	LED_PWR
23	LED_DO	24	GND

P7 Pinout

P13 PIN	SIGNAL	P13 PIN	SIGNAL
1	GBE2_A_P	2	GBE2_B_P
3	GBE2_A_N	4	GBE2_B_N
5	GBE2_C_P	6	GBE2_D_P
7	GBE2_C_N	8	GBE2_D_N
9	GBE1_A_P	10	GBE1_B_P
11	GBE1_A_N	12	GBE1_B_N
13	GBE1_C_P	14	GBE1_D_P
15	GBE1_C_N	16	GBE1_D_N
17	NC	18	NC
19	NC	20	ZEROIZE
21	RS232_RXD	22	ZEROIZE GND
23	RS232_TXD	24	GND

P5 Pinout

P14 PIN	SIGNAL	P14 PIN	SIGNAL
1	GBE4_A_P	2	GBE4_B_P
3	GBE4_A_N	4	GBE4_B_N
5	GBE4_C_P	6	GBE4_D_P
7	GBE4_C_N	8	GBE4_D_N
9	GBE3_A_P	10	GBE3_B_P
11	GBE3_A_N	12	GBE3_B_N
13	GBE3_C_P	14	GBE3_D_P
15	GBE3_C_N	16	GBE3_D_N

P6 Pinout

P15 PIN	SIGNAL	P15 PIN	SIGNAL
1	GBE6_A_P	2	GBE6_B_P
3	GBE6_A_N	4	GBE6_B_N
5	GBE6_C_P	6	GBE6_D_P
7	GBE6_C_N	8	GBE6_D_N
9	GBE5_A_P	10	GBE5_B_P
11	GBE5_A_N	12	GBE5_B_N
13	GBE5_C_P	14	GBE5_D_P
15	GBE5_C_N	16	GBE5_D_N

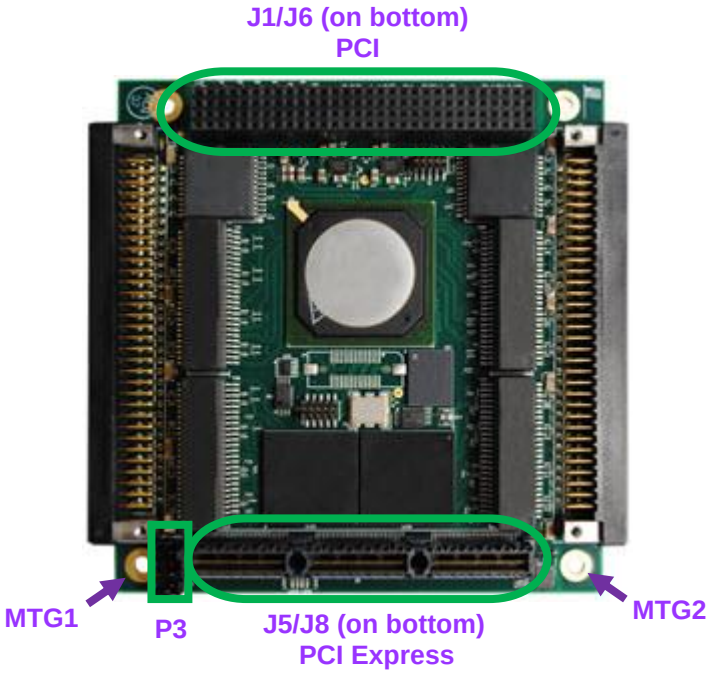
CONNECTORS COMMON TO ALL SWI-22-10 MODELS

COMMON CONNECTOR LOCATIONS

Figure 19 shows the location of the common connectors for all versions of the SWI-22-10. These connectors are:

- Auxiliary power connector (P3)
- Mounting holes (MTG1, MTG2)
- PCI Connectors (J1 & J6)
- PCI-Express Connectors (J5 & J8)

Figure 19. SWI-22-10 Common Connectors



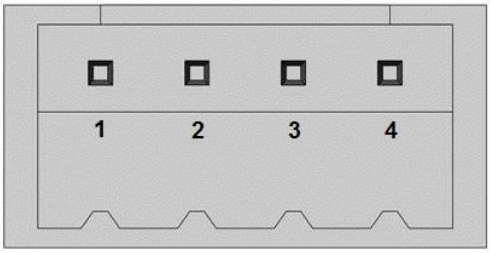
AUXILIARY POWER CONNECTOR (P3)

The following table shows the manufacturer part number for the SWI-22-10-XX auxiliary power connector (identified in Figure 20), together with the suggested mating connector.

Connector	Part Number	Mating Connector
P3	Hirose DF3-4P-2DSA(01)	Hirose DF3-4S-2C, use with Hirose crimp pins DF3-2428SCC or DF3-22SCC.

P3 is an alternative way to provide power to the board during lab testing and configuration. Figure 20 shows the pin orientation for P3.

Figure 20. Auxiliary Power Connector Pin Orientation (P3)



P3 Pin	Signal	Description
1	+V	+3.0-5.5VDC Input (measured at P3)
2	+V	+3.0-5.5VDC Input (measured at P3)
3	GND	+V Return
4	GND	+V Return

Mounting Holes (MTG1, MTG2)

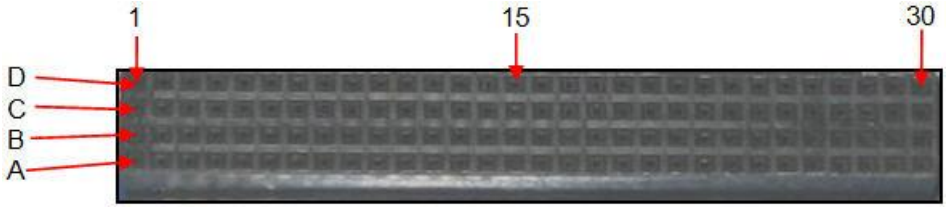
Figure 19 shows the location of the card mounting holes. MTG1 and MTG2 must be connected to system chassis ground via a 4-40 screw and star washer. Refer to "Test Setup SWI-22-10-10" or "Test Setup SWI-22-10-01" for instructions.

PCI Connectors (J1 & J6)

See www.pc104.org for standardization details.

Figure 21 shows the pin orientation for the PCI connectors.

Figure 21. PCI Connectors (J1 & J6)



J1 & J6 Signal	Pin List
GND	A1, A5, A10, A14, A20, A24, A28, B3, B9, B13, B18, B23, C4, C7, C12, C16, C22, C26, D5, D11, D15, D20, D25, D27, D30
+5V	A22, A26, B21, B27, C1, C24, C28, D2

PCI-EXPRESS CONNECTORS (J5 & J8)

See www.pc104.org for standardization details.

PCIe Bus Pin Matrix (PCI/104 Express Standard) (J5 & J8)

1	USB_OC#	+5 Volts	PE_RST#	2	Bank 1
3	3.3V		3.3V	4	
5	USB_1p		USB_0p	6	
7	USB_1n		USB_0n	8	
9	GND		GND	10	
11	PEx1_1Tp		PEx1_0Tp	12	
13	PEx1_1Tn		PEx1_0Tn	14	
15	GND		GND	16	
17	PEx1_2Tp		PEx1_3Tp	18	
19	PEx1_2Tn		PEx1_3Tn	20	
21	GND		GND	22	
23	PEx1_1Rp		PEx1_0Rp	24	
25	PEx1_1Rn		PEx1_0Rn	26	
27	GND		GND	28	
29	PEx1_2Rp		PEx1_3Rp	30	
31	PEx1_2Rn		PEx1_3Rn	32	
33	GND		GND	34	
35	PEx1_1Clkp		PEx1_0Clkp	36	
37	PEx1_1Clkn		PEx1_0Clkn	38	
39	+5V_SB		+5V_SB	40	
41	PEx1_2Clkp		PEx1_3Clkp	42	
43	PEx1_2Clkn		PEx1_3Clkn	44	
45	DIR		PWRGOOD	46	
47	SMB_DAT		PEx_x4_Clkp	48	
49	SMB_CLK		PEx_x4_Clkn	50	
51	SMB_ALERT		PSON#	52	

105	STK2 / SDVO_DAT	+12 Volts	LPC_CLK	106	Bank 3
107	GND		GND	108	
109	PEx4_1R(0)p		PEx4_0R(0)p	110	
111	PEx4_1R(0)n		PEx4_0R(0)n	112	
113	GND		GND	114	
115	PEx4_1R(1)p		PEx4_0R(1)p	116	
117	PEx4_1R(1)n		PEx4_0R(1)n	118	
119	GND		GND	120	
121	PEx4_1R(2)p		PEx4_0R(2)p	122	
123	PEx4_1R(2)n		PEx4_0R(2)n	124	
125	GND		GND	126	
127	PEx4_1R(3)p		PEx4_0R(3)p	128	
129	PEx4_1R(3)n		PEx4_0R(3)n	130	
131	GND		GND	132	
133	SATA_R1p		SATA_R0p	134	
135	SATA_R1n		SATA_R0n	136	
137	GND		GND	138	
139	SSRX1p		SSRX0p	140	
141	SSRX1n		SSRX0n	142	
143	GND		GND	144	
145	LPC_AD0		LPC_DRQ#	146	
147	LPC_AD1		LPC_SERIRQ#	148	
149	GND		GND	150	
151	LPC_AD2		LPC_FRAME#	152	
153	LPC_AD3		RTC_Battery	154	
155	GND		GND	156	

53	STK0 / WAKE#	+5 Volts	STK1 / PEG_ENA#	54	Bank 2
55	GND		GND	56	
57	PEx4_1T(0)p		PEx4_0T(0)p	58	
59	PEx4_1T(0)n		PEx4_0T(0)n	60	
61	GND		GND	62	
63	PEx4_1T(1)p		PEx4_0T(1)p	64	
65	PEx4_1T(1)n		PEx4_0T(1)n	66	
67	GND		GND	68	
69	PEx4_1T(2)p		PEx4_0T(2)p	70	
71	PEx4_1T(2)n		PEx4_0T(2)n	72	
73	GND		GND	74	
75	PEx4_1T(3)p		PEx4_0T(3)p	76	
77	PEx4_1T(3)n		PEx4_0T(3)n	78	
79	GND		GND	80	
81	SATA_T1p		SATA_T0p	82	
83	SATA_T1n		SATA_T0n	84	
85	GND		GND	86	
87	SSTX1p		SSTX0p	88	
89	SSTX1n		SSTX0n	90	
91	GND		GND	92	
93	*Reserved*		*Reserved*	94	
95	*Reserved*		*Reserved*	96	
97	GND		GND	98	
99	*SATA_DET#1*		*SATA_DET#0*	100	
101	*SATA_PWREN#1*		*SATA_PWREN#0*	102	
103	GND		GND	104	

Toward center of board

CONSOLE PORT

On the SWI-22-10-10-10, the console port is located on a set of pins on J3.

J3	Signal	Function
B31	CONSOLE_RXD	Receive signal to the switch
B32	CONSOLE_TXD	Transmit signal from the switch
C32	CONSOLE_GND	Console signal ground

On the SWI-22-10-10-01, the console port is located on a set of pins on P4.

P4	Signal	Function
21	CONSOLE_RXD	Receive signal to the switch
23	CONSOLE_TXD	Transmit signal from the switch
24	CONSOLE_GND	Console signal ground

ZEROIZE PORT

On the SWI-22-10-10-10, the zeroize port is located on a set of pins on J3.

J3	Signal	Function
C30	ZEROIZE	Zeroize signal to the switch
C31	ZEROIZE_GND	Zeroize signal ground

On the SWI-22-10-10-01, the console port is located on a set of pins on P4.

P4	Signal	Function
20	ZEROIZE	Zeroize signal to the switch
22	ZEROIZE_GND	Zeroize signal ground

LED PORT

On the SWI-22-10-10-10, the LED port is located on a set of pins on J2.

J2	Signal
B30	LED_ LOAD
C30	LED_ nRESET
B31	LED_CLOCK
C31	LED_PWR
B32	LED_DO
C32	LED_GND

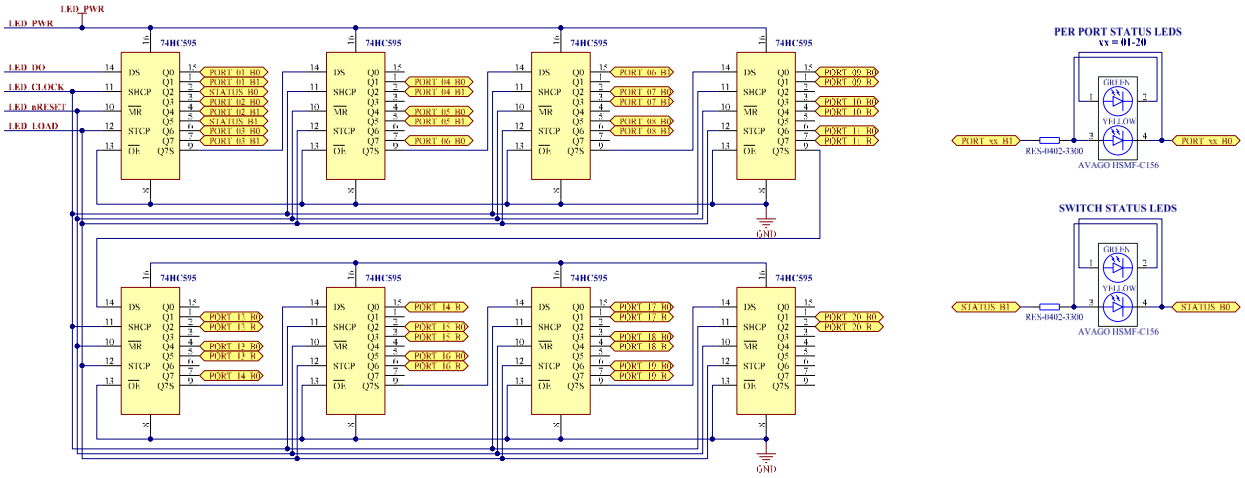
On the SWI-22-10-10-01, the LED port is located on a set of pins on P7.

P7	Signal
19	LED_ LOAD

20	LED_ nRESET
21	LED_CLOCK
22	LED_PWR
23	LED_DO
24	LED_GND

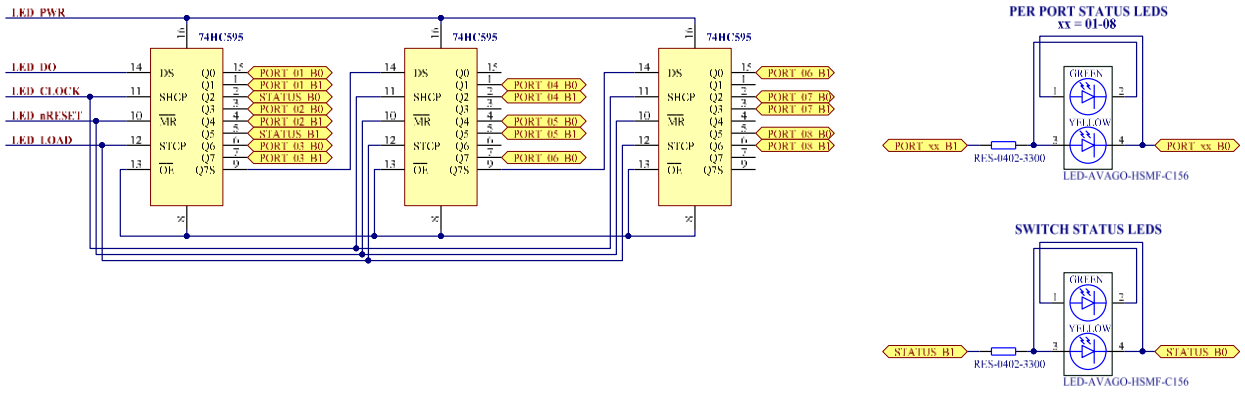
These pins implement a serial interface that outputs a string of LED on/off bits that indicate the status of the Ethernet ports and the overall status of the switch. The schematic in Figure 22 shows the recommended circuit that the standard firmware can drive to support two LEDs for each of the 20 copper Ethernet ports on the SWI-22-10-10.

Figure 22. Recommended SWI-22-10-10 LED Port Interface Circuit



The schematic in Figure 23 shows the recommended circuit that the standard firmware can drive to support two LEDs for each of the 8 copper Ethernet ports on the SWI-22-10-01.

Figure 23. Recommended SWI-22-10-01 LED Port Interface Circuit



If the LED Port Interface Circuit is to be located more than a few inches from the SWI-22-10, it is recommended that all four of the LED interface signals be driven by Schmitt-trigger input non-inverting buffers to reduce loading and improve signal quality on those signals.

LED Behavior

- A port LED, when there is no link on its associated port, will not be illuminated.
- A port LED, when there is a 1000Mb link on its associated port, will be illuminated steady green.
- A port LED, when there is a 100Mb or 10Mb link on its associated port, will alternate slowly between green and yellow
- A port LED, when illuminated, will flash when there is receive or transmit activity. The rate at which it flashes is related to the port activity.

CHAPTER 6 SPECIFICATIONS

GENERAL SPECIFICATIONS

APPLICATIONS

- Small form factor embedded systems, including standalone or stacking architectures (i.e., PC/104-Plus, PCI-104, PCIe/104, PCI/104-Express, EBX, EPIC)
- High-speed Gigabit Ethernet Local Area Network (LAN) switching for IP-enabled equipment, such as onboard computers, cameras, sensors, monitoring devices, and command-and-control gear in harsh temperature and vibration environments
- Size, Weight & Power (SWaP) sensitive mobile, tactical, airborne, and vehicle applications for situational awareness and network centric operations

BREAKOUT CABLE SET

- Optional breakout cable set mates with onboard Ethernet and power connectors and transitions to RJ-45, RS-232, and power supply connectors (for lab/testing purposes)

TECHNICAL SPECIFICATIONS

This section describes the technical specifications of the SWI-22-10.

POWER

- Power Input: 5VDC (via PCI bus / PCI Express Bus); 3.0-5.5VDC (via Auxiliary Power Connector, measured at the connector)
- Power Consumption: < 14W maximum (all 20 ports actively driving 100-meter cables with full-bandwidth traffic)
- Support for Energy Efficient Ethernet (IEEE 802.3az) in Switch Core and PHYs

SWITCHING ARCHITECTURE

- Packet Processor: Highly Integrated Vitesse Carrier Grade Ethernet Switch Engine
- Switching: Non-Blocking Layer 2, IPv4 / IPv6 Multicast, Low-Latency, Auto-MDI/MDIX, Auto-Negotiation, Auto-Detect; Speed Auto-Sensing, Auto-Crossover, Full/Half Duplex Modes
- Management Processor: Embedded 32-Bit MIPS CPU @ 416MHz with DDR-2 Memory
- Networking Software: Vitesse CEServices Carrier Ethernet application running on eCos operating system for optimal performance and Redboot bootloader for reliability

PORT FEATURES

- 20-Port: 20x Copper Gigabit Ethernet 1000BaseT, RS-232 Console, Harwin connectors
- 8-Port: 8x Copper Gigabit Ethernet 1000BaseT, RS-232 Console, Molex connectors

LAYER 2 SWITCHING

- Port Control: port-speed, duplex mode, flow control, port frame size (jumbo frames), port state, port status (link monitoring), port statistics (MIB counters)
- Quality of Service (QoS) Traffic Prioritization and Queuing: 8 priorities,8 CoS queues per port, strict or deficit-weighted RR Scheduling, shaping/policing per queue and per port, Storm Control
- VLAN: 8K MAC addresses, 4K VLANs, 802.11Q Static VLAN, Protocol-Based VLAN, MRP, MVRP, MVR, IEEE-80210ad Provider Bridge, Link Aggregation (IEEE-802.3ad)
- IEEE-802.1 D/w/s (Spanning Tree, Rapid Spanning Tree, Multiple Spanning Tree Protocol)
- L2 IEEE-1588v2 Precision Timing Protocol (PTP)

MANAGEMENT

- In-band Ethernet management using Web GUI or Simple Network Management Protocol (SNMP), or command line interface (CLI) over RS-232 console for Telnet / SSH / Terminal
- HTTP/HTTPS Web Server, SNMP v1/v2/v3 Client, DHCP Client, IEEE 802.1X Authentication, System Syslog, SSHv2, IPv6 Management, IGMP/MLD/DHCP Snooping , Access Control Lists, Port Mirroring, BPDU Guard, RMON, Cisco Discovery Filtering, IEEE-802.10AB LLDP

SECURITY

- Network Access Server (NAS) IEEE-802.1X, RADIUS Accounting, MAC address limit, TACACS, Web and CLI authentication, ACLs, IP Source Guard
- Declassification: Data Zeroization support for secure data (initiated by offboard signal trigger)

STATUS INDICATION

- Serial LED interface provides off-board support for two status LEDs per port

RELIABILITY

- MTBF: 979,192 hours (ground benign, 25°C)-Calculated per MIL-HDBK-217F. See qualification test report for further details.
- Workmanship: Assembled to IPC-A-610 Class III Workmanship
- No moving parts. No active cooling required. Staked components and underfilled BGAs.

Mechanical Specifications

- Form Factor: PCI/104-Express form factor compliant (PCIe, PCI buses)
- Card only: 3.6” x 3.8” (90 x 96 mm) L x W (excluding Ethernet connector extensions)
- Card with Thermal Plate: 3.86” x 4.11” x 0.63” (98 x 104.5 x 16mm) L x W x H (excluding Ethernet and bottom-side bus connector extensions)
- Weight: card only =. 0.24 lbs (0.11 kg); card with thermal plate = 0.47 lbs (0.21 kg)
- Passive thermal management: optional integrated thermal plate for conductive cooling to optimize/ease system integration
- Conformal coating for additional humidity protection (optional)
- No moving parts
- Assembled to IPC-A-610 Class III Workmanship
- Industrial temperature grade components

Connector Specifications

Refer to "Chapter 5 Connector Descriptions" for connector details.

- Ethernet connectors:
  - Right-Angle Molex (8-port configuration)
  - Right-Angle Harwin Datamate (20-port configuration)
- Recommended mating connectors support hand crimping of CAT5e wiring and include latching mechanisms for vibration mitigation.
- Harwin connector can also support card-to-card cableless interface.
- These card (de)population options are available:
  - No PCI/104-Express or PCI/104 buses

Environmental Specifications

Designed to meet MIL-STD-810G:

- Operating/Storage Temperature: -40° to +85°C / -40° to +185°F (MIL-STD-810G, Methods 501,502) with proper thermal management.
- Operating Shock: 40g, 11ms, 3 pos/neg per axis (MIL-STD-810G, Method 516)
- Random Vibration: Jet-Helo-Tracked Vehicle Profile, 3 Axes (MIL-STD-810G, Method 514)
- Humidity: Up to 95% RH @ 40°C, non-condensing (special order: conformal coating).

PROTOCOL STANDARDS

- IEEE 802.3 10Mbps 10BASE-T (Ethernet)
- IEEE 802.3u 100BASE-TX 100Mbps (Fast Ethernet)
- IEEE 802.3ab 1000BASE-T 1000Mbps (Gigabit Ethernet)
- IEEE 802.3ad Link Aggregation
- IEEE 802.3af PoE Support
- IEEE 802.3az Energy Efficient Ethernet
- IEEE 802.3x Full-Duplex Flow Control
- IEEE 802.1ad Provider Bridges
- IEEE 802.1ag Connectivity Fault Management
- IEEE 802.1AS Timing and Synchronization for Time-Sensitive Applications in Bridged Local Area Networks
- IEEE 802.1D Spanning Tree Protocol (Bridging)
- IEEE 802.1P LAN Layer 2 QoS/CoS Protocol for Traffic Prioritization
- IEEE 802.1Q Virtual LANs (VLAN) and Trunking
- IEEE 802.1Qav Forwarding and Queuing Enhancements for Time-Sensitive Streams
- IEEE 802.1S Multiple Spanning Trees
- IEEE 802.1W Rapid Spanning Tree Reconfiguration
- IEEE 802.1X Port-Based Network Access Control
- RFC 2236 Internet Group Management Protocol, Version 2
- RFC 2710 Multicast Listener Discovery for IPv6
- RFC 2819 Remote Network Monitoring (RMON)
- RFC 2863 The Interfaces Group MIB
- RFC 3376 Internet Group Management Protocol, Version 3
- RFC 3635 Definitions of Managed Objects for Ethernet-like Interface Types

CHAPTER 7 TROUBLESHOOTING

PRODUCT IDENTIFICATION

The product is labeled with the Curtiss-Wright P/N and serial number. Please refer to this information when communicating with Technical Support.

TECHNICAL ASSISTANCE

If you have a technical question or if you cannot isolate a problem with your product, please call or e-mail the Curtiss-Wright Technical Support team:

Email	slp_tsupport@curtisswright.com
Phone	1 (801) 433-6322
Fax	1 (801) 483-1523

RETURNING FOR SERVICE

Before returning any Curtiss-Wright product, please fill out a Return Material Authorization (RMA) request form, available for download from the following website under the support section:

www.cwcdefense.com/support/rma-salt-lake-city.html

Email this form to the Technical Support email address (slp_tsupport@curtisswright.com) to receive authorization for shipment. An RMA number will be emailed back to you as soon as possible.

Note: You must have the RMA number in order to return any product for any reason.

Warning!

Any product returned to Curtiss-Wright improperly packed will immediately void the warranty for that particular product.

CHAPTER 8 CONTACT INFO

Company contact info:

Defense Solutions Division
Curtiss-Wright
3222 S. Washington St.
Salt Lake City, Utah, USA 84115

(801) 483-1533
FAX (801) 483-1523

Web-site: www.cwcdefense.com

Sales:

+1(800) 483-3152 or (801) 483-1533
slp_sales@curtisswright.com

Product Technical Support:

+1 (801) 433-6322
slp_tsupport@curtisswright.com

Customer Feedback:

slp_feedback@curtisswright.com

APPENDIX A CLI REFERENCE

This appendix describes basic usage and configuration of the command line interface (CLI) for the Parvus SWI-22-10.

The CLI interface is an industry-standard CLI and consists of configuration commands which provide the ability to configure and view the configuration using the serial console, or Telnet or SSH access. Even if there is no network connectivity, you can still manage the switch using a serial connection.

For CLI startup information, refer to "Serial CLI Setup" in Chapter 4.

INDUSTRY STANDARD CLI FORMAT

The switch software provides an industry-standard CLI which includes features such as the following also implemented on the other industry popular Switches/Routers:

- Command history - Use of the Up arrow presents the history of commands
- Command-line editing
- Shortcut key options
- Context-sensitive help - User has an option to press the '?' key for a list of valid possible parameters, with descriptions.
- Auto completion - Press the Tab key after partially typing the keyword. The rest of the keyword will be entered automatically.
- Modes - Each command can belong to one or more modes. The commands in a particular mode can be made invisible in any other mode.
- Privilege - A set of privilege attributes may be assigned to each command based on the level configured. A command cannot be accessed or executed if the logged in user does not have sufficient privilege
- Keyword abbreviations - Any keyword can be accepted just by typing an unambiguous prefix (e.g., "sh" for "show").
- Error checking - Before executing a command, the CLI checks that the current mode is still valid, user has sufficient privilege, and valid range of parameter(s) among others. The user is alerted to the error by displaying a caret under the offending word along with an error message.

CLI BASICS

This section explains what you need to know in order to enter CLI commands successfully.

In the manual, terminal input/output is indicated by a special font and color. User input is shown in **bold** (commands and keywords) or ***bold italic*** (parameters you supply).

```
# show version

MEMORY           : Total=86382 KBytes, Free=70497 KBytes, Max=70496 KBytes
FLASH            : 0x40000000-0x40ffffff, 64 x 0x40000 blocks
MAC Address      : 00-01-c1-00-ad-80
Previous Restart : Cold
...
```

HOW THE CLI WORKS

- The CLI has several different modes, and some commands are restricted to a specific mode. The top-level mode is called **exec mode**. It allows the user to perform operations related to configuration files, reloading defaults, displaying system information, etc., but it does not allow the user to change detailed configuration. Such operations are performed while in **configuration mode**. In turn, configuration mode has **sub-modes** for configuration of specific items, such as VLANs or Ethernet interfaces (ports).
- The CLI is line-based, i.e., no screen-editing features, and executes commands instantly upon end-of-line (i.e., pressing Enter).
- The CLI is designed to minimize the time required to type commands. Keywords and certain parameters can be abbreviated (truncated) as long as they are unambiguous. (See "Command Structure" for details.) For example, these commands are identical:

```
SWI2210# configure terminal
SWI2210# config term
SWI2210# conf t
```

- The command line may be partially completed by the system, if the system can "guess" what you need to enter. For example, if you request help on a particular command, the prompt displayed after the list begins with that command, ready for you to enter the arguments. (GET NEW EXAMPLE)

```
SWI2210-XXXX# clear ?
    access           Access management
    access-list      Access list
       .
       .
       .
    spanning-tree    STP Bridge
    statistics       Clear statistics for one or more given interfaces
SWI2210-XXXX# clear
```

- The system will tell notify you if there's a problem with the command you entered.

```
SWI2210-XXXX# config
% Incomplete command.
```

- Frequently a caret is displayed under the incorrect entry along with the error message. If the caret is below the prompt, the problem may be that you aren't in the correct mode to use that command.

```
SWI2210-XXXX# show config
              ^
% Invalid word detected at '^' marker
```

- Multiple sessions can co-exist at the same time, each providing separate environments with differences in logged-in user ID, privilege level, command history, mode, and session settings. It is therefore possible for the same user to control several concurrent sessions; for example, one serial console session and one ssh session.
- The user database is either local or provided by a RADIUS or TACACS+ server. In case of a local user database, passwords and privilege levels are maintained on the device.

ACCESSING THE CLI HELP MENU

To view the top-level help, type **help** or **?** at the system prompt. If you use the ?, the help is displayed as soon as you type the ?—you don't need to press Enter.

```
SWI2210-XXXX# help
Help may be requested at any point in a command by entering
a question mark '?'.  If nothing matches, the help list will
be empty and you must backup until entering a '?' shows the
available options.
Two styles of help are provided:
1. Full help is available when you are ready to enter a
   command argument (e.g. 'show ?') and describes each possible
   argument.
2. Partial help is provided when an abbreviated argument is entered
   and you want to know what arguments match the input
   (e.g. 'show pr?'.)
```

To view a list of commands available in a particular mode, change to the mode and then type **?**. A list of commands is displayed. (This example shows only the beginning of the list.)

```
SWI2210# conf t
SWI2210(config)# ?
    aaa                 Authentication, Authorization and Accounting
    access              Access management
    access-list         Access list
...
```

If a help list or any other output to the screen is long (more than one screen), the display pauses and shows a "more" message at the bottom of the screen. Press Space to view the next page, g to continue the list, or Ctrl+C to quit.

```
...
    logging             Syslog
    loop-protect        Loop protection configuration
    mac                 Mac Address Table information
-- more --, next page: Space, continue: g, quit: ^C
```

For help with an individual command, enter the command and press one of the keys in the table.

Key	Operation
?	Show next possible input and description
? ? / Ctrl+Q	Show syntax of possible command(s)
TAB	Show next possible input without description or expand current word fully if it is unambiguous

This example 1 shows the results for each help key. Comment lines have been added to the example to clarify what is shown; the comments are in italics and begin with an exclamation point (!).

Example: Using Context-sensitive Help

```
! Show possible next input for a command that begins with 'show a':
SWI2210-XXXX# show a?
    aaa             Login methods
    access          Access management
    access-list     Access list
    aggregation     Aggregation port configuration

! The same, but without descriptions:
SWI2210-XXXX# show a<TAB>
aaa          access       access-list        aggregation

! If the user enters a 'g', the word 'aggregation' is the only possibility:
SWI2210-XXXX# show ag?
    aggregation      Aggregation port configuration
    <cr>

! Pressing <TAB> now expands the word fully:
SWI2210-XXXX# show aggregation

! Possible next input is displayed with a press of '?':
SWI2210-XXXX# show aggregation ?
    |         Output modifiers
    mode      Traffic distribution mode
    <cr>

! The syntax is displayed with another press of '?':
SWI2210-XXXX# show aggregation ?
    show aggregation [ mode ]

! This shows that there is an optional 'mode' word (square brackets indicate an option).

! Repeated presses of '?' toggles display between next possible input and syntax:
SWI2210-XXXX# show aggregation ?
    |         Output modifiers
    mode      Traffic distribution mode
    <cr>

SWI2210-XXXX# show aggregation ?
show aggregation [ mode ]

! Finally, the syntax display is also directly available with Ctrl+Q:
SWI2210-XXXX# show aggregation ^Q
show aggregation [ mode ]
```

USING THE KEYBOARD

The CLI provides a rich set of keys to assist the user while working with the command line. The functionality is divided into:

- Basic line editing
- Command history
- Context-sensitive help
- Long lines and pagination

The table summarizes the keys supported by the CLI.

Key	Operation
Line Editing	**Allows you to input characters to form a command, while also allowing cursor movement and insertion/deletion of characters and words.**
Left or Right	Move one character left/right
Home / Ctrl+A	Move to start of line
End / Ctrl+E	Move to end of line
Del / Ctrl+D	Delete character at cursor
Backspace / Ctrl+H	Delete character to the left of cursor
Ctrl+N	Delete the entire current line
Ctrl+U / Ctrl+X	Delete all characters to the left of the cursor
Ctrl+K	Delete all characters under the cursor and right
Ctrl+W	Delete from cursor to start of word on the left
TAB	Complete word at end-of-line (see also "XXXX")
Command History	**Allows you to view previous or next commands (see Command History).**
Up / Ctrl+P	Previous line in command history
Down	Next line in command history
Context-Sensitive Help	**Allows you to display context-sensitive help (see XXXXX).**
?	Show next possible input and description
? ? / Ctrl+Q	Show syntax of possible command(s)
TAB	Show next possible input without description or expand current word fully if it is unambiguous
Pagination Control	**Allows you to view output that is longer or wider than the terminal screen.**
Enter	Display next line of output
Space	Display next page of output
G	Display remainder of output without more pagination
Q / Ctrl+C	Discard remainder of output
Any other key	Display next page of output. Note that certain terminal keys (arrows, Home, End, etc.) may appear as multiple characters to the CLI, leading to multiple pages being output in quick succession.
Exec Mode	**Allows you to instantly return to Exec mode.**
Ctrl+Z	Return directly to Exec mode (see XXX for information on Exec mode).

Note: Your terminal emulator may not support all of these keys. For example, you may have to press Ctrl+H to backspace.

COMMAND HISTORY

A session maintains a non-persistent command history of previously entered command lines. The history can be up to 32 lines long. Once full, a new line will push the oldest entry out.

Use 'show history' to list the history:

```
SWI2210-XXXX# show history
    show running-config
    copy running-config startup-config
    dir
    show history
SWI2210-XXXX#
```

The list begins with the oldest entry at top (‘show running-config’). To see additional lines, use the Up and Down keys.

The number of lines to keep in the history for the current session is configurable. The current value is displayed as part of the output from ‘show terminal’:

```
SWI2210-XXXX# show terminal
Line is con 0.
    * You are at this line now.
    Alive from Console.
    Default privileged level is 2.
    Command line editing is enabled
    Display EXEC banner is enabled.
    Display Day banner is enabled.
    Terminal width is 80.
             length is 24.
             history size is 32.
             exec-timeout is 10 min 0 second.

    Current session privilege is 15.
    Elapsed time is 0 day 0 hour 6 min 20 sec.
    Idle time is 0 day 0 hour 0 min 0 sec.
```

Use 'terminal history' to change the number of lines stored. The size is a value between 0 and 32. 0 disables the history entirely.

```
SWI2210-XXXX# terminal history size 32
```

CONTROLLING THE DISPLAY

The session configuration controls the width of the terminal in characters and the height in lines. It uses these parameters to control handling of long input lines and to control pagination of multi-line output. For details about changing these parameters, please refer to section XX.

Long Lines

Long lines come into play when a line is longer than the terminal width minus the prompt. In that case the prompt is always displayed and part of the line will be hidden from display, as indicated by '$' at the beginning and/or end of the visible part of the line. You can use the right and left arrows to see the rest of the line.

For example:

```
SWI2210-XXXX# $there is text to the left of what is visible here
SWI2210-XXXX# there is text to the right of what is visible here$
SWI2210-XXXX# $there is text at both ends of what is visible here$
```

The first line has scrolled left; the second line has scrolled right; the third line has been scrolled to the middle of a quite long line.

Pagination

Pagination appears each time execution of a command causes output of more lines than what has been configured as terminal length. A typical example is the output from 'show running-config'. After the first several lines have been output, the pagination prompt is presented:

```
! [lines of text]
-- more --, next page: Space, continue: g, quit: ^C
```

The following keys control pagination:

Key	Operation
Enter	Display next line of output.
Space	Display next page of output.
G	Display remainder of output without more pagination.
Q / Ctrl+C	Discard remainder of output.
Any other key	Display next page of output. Note that certain terminal keys (arrows, Home, End, etc.) may appear as multiple characters to the CLI, leading to multiple pages being output in quick succession.

The terminal length (also sometimes called height) can be configured for the current session using the 'terminal length lines' command. If lines = 0 is input, pagination is disabled.

```
SWI2210-XXXX# terminal length 0
SWI2210-XXXX# terminal length 25
```

UNDERSTANDING COMMANDS

Command Structure

A command is a single line of text consisting of keywords and parameters, for example:

```
SWI2210-XXXX# show vlan id 10
...
SWI2210-XXXX# show vlan id 20
...
```

The keywords are show, vlan, and id. 10 and 20 are parameters that could contain a different value in another command invocation.

Keywords are case-insensitive, i.e., show, SHOW and Show are identical. Conversely, parameters may either be case-sensitive or case-insensitive depending on the command and parameter in question. For example, file names are usually case-sensitive.

Keywords and certain parameters can be truncated to save typing time, as long as they are unambiguous (unique within that mode or sub-mode) and known to the system (a standard parameter). For example, these commands are identical:

```
SWI2210-XXXX# show interface GigabitEthernet 1/5 capabilities
...
SWI2210-XXXX# sh in g 1/5 c
...
```

This works because:

- Many keywords begin with ‘s’ but only one begins with ‘sh’.
- Several commands begin with ‘show i’ but only one begins with ‘show in’.
- The ‘show interface’ command takes a port type as parameter. Depending on the hardware capabilities, the options are: FastEthernet, GigabitEthernet, 2.5GigabitEthernet, 5GigabitEthernet and 10GigabitEthernet. Thus, ‘g’ is a unique abbreviation for ‘GigabitEthernet’.
- 1/5 identifies the interface as belonging to switch 1, port 5. This parameter cannot be abbreviated.
- The ‘show interface’ command can output different kinds of information--capabilities, statistics, status, and several others. The ‘c’ is a unique abbreviation for ‘capabilities’.

With a bit of practice this allows for highly efficient keyboard entry, in particular when coupled with the context-sensitive help features of the CLI (see XXXX).

Command Syntax

A command is described by its syntax, for example:

show interface *<list>* { status | statistics | capabilities | switchport | veriphy }

The conventions are:

- **Keywords** are shown in bold.
- ***<Parameters>*** are enclosed by angle brackets and shown in bold italics. In the CLI online help, parameters are marked with angle brackets. Parameters often require a list of values. List items must be separated by commas with no spaces, and can include ranges such as 3-9.
- [...] indicates an optional construct. You can omit it.
- { ... } indicates a grouping; the constructs within belong together somehow.
- ‘**|**’ indicates a choice between two or more alternatives, e.g., **a | b | c** reads as “a or b or c”.

In the show interface example, the syntax is simple. You must enter a list of interfaces and then choose one of ‘status’, ‘statistics’, ‘capabilities’, ‘switchport’ or ‘veriphy’.

show erps [<*groups*>] [detail | statistics]

The show erps command is a bit more complex: ‘show’ and ‘erps’ are mandatory, but the remaining parameters and keywords are optional. You can enter group IDs and optionally specify either ‘statistics’ or ‘detail’. This example shows how the command is used.

```
! Show short-form ERPS (Ethernet Ring Protection Switching) information for all
! instances:
SWI2210-XXXX# show erps
...

! Show statistics for all instances:
SWI2210-XXXX# show erps statistics
...

! Show details for all instances:
SWI2210-XXXX# show erps detail
...

! You cannot show details and statistics at the same time.  If you try, an error message:
! is displayed.
SWI2210-XXXX# show erps detail statistics
                           ^
% Invalid word detected at '^' marker.

! Show details for specific set of instances:
SWI2210-XXXX# show erps 1-6 detail
...
```

Additional Syntax Elements

The syntax is more complex if the command allows sequences of multiple optionals, such as **[a] [b] [c]**.

- Each of a, b, c can be included or omitted, e.g., “a c” is valid, as is no input at all.
- Order is not important, e.g., “a c” and “c a” are equivalent.
- Each optional can be used only once, not repeated.

There are variations:

- Group of optionals of which at least one must be present: **{ [a] [b] [c] }*1**
- Group of optionals where one or more has a fixed position: **[a] {[b]} [c]**

  {[b]} says that ‘b’ is optional, but if it is present then it must follow after ‘a’ (if ‘a’ is present) and it must come before ‘c’ (if ‘c’ is present).

For example, assume a command with this syntax:

a [b] [c] { d | e } {[f] [g]}*1

Valid input examples are:

- ‘a d f’, because ‘b’ and ‘c’ are optional, ‘d’ is picked instead of ‘e’, and ‘f’ is chosen as the mandatory optional.
- ‘a d f g’, because ‘b’ and ‘c’ are optional, ‘d’ is picked instead of ‘e’, and both ‘f’ and ‘g’ are chosen in the final group of optional.
- ‘a c b e g’, because the ‘b’ and 'c' can be in any order, ‘e’ is picked instead of ‘d’, and ‘g’ is chosen for the mandatory optional.

ETHERNET INTERFACE NAMING

An Ethernet interface (“port”) is identified by three pieces of information:

- Its type: FastEthernet, GigabitEthernet, 2.5GigabitEthernet, 5GigabitEthernet, 10GigabitEthernet.
- The switch it belongs to. For non-stacking systems this value is always 1.
- The port number within the type and switch. The switch and port numbers are separated by a slash, such as 1/1. The numbering starts with 1 for each type, so a switch may have both GigabitEthernet 1/1 and 2.5GigabitEthernet 1/1, for example.

Many CLI commands accept a list of interfaces. In a list, the switch ID and port numbers can be listed as single numbers, as a range like 1-3, or as a comma-separated list (no spaces) like 2,4,6.

Examples:

`GigabitEthernet 1/5`	for the single gigabit port number 5 on switch 1
`GigabitEthernet 1/2,4,10-12`	for gigabit ports 2, 4, 10, 11, 12 on switch 1
`GigabitEthernet 1-3/2`	for gigabit port 2 on switches 1, 2 and 3

You can use a wildcard (*) for the type and/or switch ID and/or ports to mean “all types”, “all switch IDs” and “all ports”, respectively.

- **‘*’** means “all ports of all types on all switches”
- **type ‘*’** means “all ports of the specified type on all switches”

Examples:

This example assumes a stack with two switches, switch ID 1 and 3. Each switch has 9 gigabit ports and two 2.5 gigabit ports.

`interface * (or: interface * * *)`
All ports of all types on all switches: GigabitEthernet 1,3/1-9 2.5GigabitEthernet 1,3/1-2

`interface * 1/2`
Switch 1, port number 2 of all types: GigabitEthernet 1/2 2.5GigabitEthernet 1/2

`interface * */2`
All switches, all types, port number 2: GigabitEthernet 1,3/2 2.5GigabitEthernet 1,3/2

`interface * */4`
All switches, all types, port number 4: GigabitEthernet 1,3/4. Note that there are no 2.5 gigabit ports in the result.

`interface GigabitEthernet 3/*`
Switch 3, all gigabit ports: GigabitEthernet 3/1-9

`interface 2.5GigabitEthernet * (or: interface 2.5GigabitEthernet */*)`
All 2.5 gigabit ports on all switches: 2.5GigabitEthernet 1,3/1-2

Wildcards will include the largest possible set of ports, but may output an error message if a specific switch ID or port number doesn’t exist. For example, these sets are invalid:

`interface * 2/*`
All ports of all types on switch 2 – which isn’t a member of the stack

`interface * */100`
There is no port 100 of any type on any switch.

`interface GigabitEthernet */* 2.5GigabitEthernet 2/*`
Again, switch 2 doesn’t exist so the entire set is considered invalid.

Validity is determined per set of (type, switch ID/port) containing wildcards. The result for that set is valid if there is at least one port that matches the set. A list of sets is valid if all sets match at least one port each.

FILTERING OUTPUT

The output from commands can in most cases be filtered to limit the output to only those lines that match/trigger a specific string. The available filtering is:

- **Begin** – display the first line that begins with the matching string and all subsequent lines
- **Include** – display only those lines that match
- **Exclude** – display only those lines that do not match

The filter is added at the end of the command and its parameters; the | character marks the beginning of the filter. The <***string***> parameter is case-sensitive and can specify any item in the output line. The syntax is:

<*command*> | { begin | include | exclude } <*string*>

```
! Execute a command that generates some output; no filtering initially:
SWI2210-XXXX# show users
Line is con 0.
    * You are at this line now.
    Connection is from Console.
    User name is admin.
    Privilege is 15.
    Elapsed time is 0 day 21 hour 52 min 50 sec.
    Idle time is 0 day 0 hour 0 min 0 sec.

! Filter to include specific word:
SWI2210-XXXX# show users | include User
    User name is admin.

! Exclude all lines that contain '0' (zero)
SWI2210-XXXX# show users | exclude 0
    * You are at this line now.
    Connection is from Console.
    User name is admin.
    Privilege is 15.

! Begin output when specific word is matched:
SWI2210-XXXX# show users | begin Elapsed
    Elapsed time is 0 day 21 hour 53 min 29 sec.
    Idle time is 0 day 0 hour 0 min 0 sec.
```

USING 'NO' FORMS TO RESET OR REMOVE CONFIGURATION VALUES

Almost all configuration commands have a "no" form to negate or set its default. In general, the no form is used to reverse the action of a command or reset a value back to the default. For example, the 'no ip routing' configuration command reverses the 'ip routing' of an interface.

The 'no' form is syntactically similar (but not necessarily identical) to the configuration command, but either resets the parameters to defaults for the configurable item being addressed, or removes the item altogether.

In many cases 'no' can be read as "no(t) different from default settings".

Example: Using 'no' Forms

The following example:

- Configures the VLAN 1 interface IP address to use DHCP.
- Configures the DNS name server to be taken from DHCP.
- Inspects the configuration.
- Removes the DNS name server.
- Removes the IP address on the VLAN 1 interface.
- Inspects the configuration again.

Both 'no' operations can be viewed as reset-to-default, with the defaults being: No DNS name server and IP address.

```
SWI2210-XXXX# configure terminal
SWI2210-XXXX(config)# interface vlan 1
SWI2210-XXXX(config-if-vlan)# ip address dhcp
SWI2210-XXXX(config-if-vlan)# exit
SWI2210-XXXX(config)# ip name-server dhcp
SWI2210-XXXX(config)# end

SWI2210-XXXX# show ip interface brief
Vlan Address              Method   Status
---- -------------------- -------- ------
   1 172.16.1.15/24       DHCP     UP

SWI2210-XXXX# show ip name-server
Current DNS server is 172.16.1.1 set by DHCP.

SWI2210-XXXX# configure terminal
SWI2210-XXXX(config)# no ip name-server
SWI2210-XXXX(config)# interface vlan 1
SWI2210-XXXX(config-if-vlan)# no ip address
SWI2210-XXXX(config-if-vlan)# end
SWI2210-XXXX# show ip name-server

Current DNS server is not set.
SWI2210-XXXX# show ip interface brief
Vlan Address              Method   Status
---- -------------------- -------- ------
SWI2210-XXXX#
```

Note how the syntax of the configuration commands and their 'no' forms are different. The 'no' forms usually do not take as many parameters.

CLI COMMAND GROUPS

The CLI implements a number of modes that control the available command set (refer to XXX for more information on modes). The commands are divided into command groups as shown below. Help texts are available on groups and specific commands.

EXEC Commands

The EXEC commands include the following:

```
SWI2210-XXXX# ?
    clear        Reset functions
    configure    Enter configuration mode
    copy         Copy from source to destination
    debug        Debugging functions
    delete       Delete one file in flash: file system
    dir          Directory of all files in flash: file system
    disable      Turn off privileged commands
    do           To run exec commands in config mode
    dot1x        IEEE Standard for port-based Network Access Control
    enable       Turn on privileged commands
    erps         Ethernet Ring Protection Switching
    exit         Exit from EXEC mode
    firmware     Firmware upgrade/swap
    help         Description of the interactive help system
    ip           IPv4 commands
    link-oam     Link OAM configuration
    logout       Exit from EXEC mode
    more         Display file
    no           Negate a command or set its defaults
    ping         Send ICMP echo messages
    ptp          Enable wireless mode for an interface.
    reload       Reload system.
    send         Send a message to other tty lines
    show         Show running system information
    terminal     Set terminal line parameters
SWI2210-XXXX#
```

Show Commands

Show commands display switch configuration, statistics, and other information.

```
SWI2210-XXXX# show ?
    aaa                 Login methods
    access              Access management
    access-list         Access list
    aggregation         Aggregation port configuration
    clock               Configure time-of-day clock
    dot1x               IEEE Standard for port-based Network Access Control
    eps                 Ethernet Protection Switching
    erps                Ethernet Ring Protection Switching
    evc                 Ethernet Virtual Connections
    green-ethernet      Green ethernet (Power reduction)
    history             Display the session command history
    interface           Interface status and configuration
    ip                  Internet Protocol
    ipmc                IPv4/IPv6 multicast configuration
    ipv6                IPv6 configuration commands
    lacp                LACP configuration/status
    line                TTY line information
    link-oam            Link OAM configuration
    lldp                Display LLDP neighbors information.
    logging             Syslog
    loop-protect        Loop protection configuration
    mac                 Mac Address Table information
    mep                 Maintenance Entity Point
    mvr                 Multicast VLAN Registration configuration
    network-clock       Show selector state.
    ntp                 Configure NTP
    platform            Platform specific information
    poe                 Power Over Ethernet.
    port-security
    privilege           Display command privilege
    ptp                 Precision time Protocol (1588)
    pvlan               PVLAN configuration
    qos                 Quality of Service
    radius-server       RADIUS configuration
    rmon                RMON statistics
    running-config      Show running system information
    sflow               Statistics flow.
    snmp                Display SNMP configurations
    spanning-tree       STP Bridge
    switchport          Display switching mode characteristics
    tacacs-server       TACACS+ configuration
    terminal            Display terminal configuration parameters
```

```
    thermal-protect    Display thermal protection status.
    upnp               Display UPnP configurations
    users              Display information about terminal lines
    version            System hardware and software status
    vlan               VLAN status
    voice              Voice appliance attributes
    web                Web
SWI2210-XXXX#
```

Configuration Commands

Configuration commands allow you to configure features and available options of the device. This is the list for Global Configuration Mode.

```
SWI2210-XXXX(config)# ?
    aaa                Authentication, Authorization and Accounting
    access             Access management
    access-list        Access list
    aggregation        Aggregation mode
    banner             Define a login banner
    clock              Configure time-of-day clock
    default            Set a command to its defaults
    do                 To run exec commands in config mode
    dot1x              IEEE Standard for port-based Network Access Control
    enable             Modify enable password parameters
    end                Go back to EXEC mode
    eps                Ethernet Protection Switching.
    erps               Ethernet Ring Protection Switching
    evc                Ethernet Virtual Connections
    exit               Exit from current mode
    green-ethernet     Green ethernet (Power reduction).
    gvrp               Enable GVRP feature
    help               Description of the interactive help system
    hostname           Set system's network name
    interface          Select an interface to configure
    ip                 Internet Protocol
    ipmc               IPv4/IPv6 multicast configuration
    ipv6               IPv6 configuration commands
    lacp               LACP settings
    line               Configure a terminal line
    lldp               LLDP configurations.
    logging            Syslog
    loop-protect       Loop protection configuration
    mac                MAC table entries/configuration
    mep                Maintenance Entity Point
    monitor            Set monitor configuration.
    mvr                Multicast VLAN Registration configuration
    network-clock      network-clock
    no                 Negate a command or set its defaults
    ntp                Configure NTP
    poe                Power Over Ethernet.
    port-security      Enable/disable port security globally.
    privilege          Command privilege parameters
    ptp
    qos                Quality of Service
    radius-server      Configure RADIUS
    rmon               Remote Monitoring
    sflow              Statistics flow.
    snmp-server        Set SNMP server's configurations
    spanning-tree      Spanning Tree protocol
    switchport         Set switching mode characteristics
    tacacs-server      Configure TACACS+
    thermal-protect    Thermal protection configuirations.
    upnp               Set UPnP's configurations
    username           Establish User Name Authentication
    vlan               VLAN commands
    voice              Voice appliance attributes
    web                Web
SWI2210-XXXX(config)#
```

Copy Commands

Copy commands allow transferring or saving the configuration files to and from the switch.

```
SWI2210-XXXX# copy ?
    flash:filename | tftp://server/path-and-filename    File in FLASH or on
                                                        TFTP server
    running-config                                      Currently running
                                                        configuration
```

```
    startup-config                                  Startup configuration
SWI2210-XXXX# copy
```

Clear Commands

Clear commands clear (reset) specified settings to factory defaults.

```
SWI2210-XXXX# clear ?
    access           Access management
    access-list      Access list
    dot1x            IEEE Standard for port-based Network Access Control
    eps              Ethernet Protection Switching.
    erps             Ethernet Ring Protection Switching
    evc              Ethernet Virtual Connections
    ip               Interface Internet Protocol config commands
    ipv6             IPv6 configuration commands
    lacp             Clear LACP statistics
    link-oam         Clear Link OAM statistics
    lldp             Clears LLDP statistics.
    logging          Syslog
    mac              MAC Address Table
    mep              Maintenance Entity Point
    mvr              Multicast VLAN Registration configuration
    network-clock    Clear active WTR timer.
    sflow            Statistics flow.
    spanning-tree    STP Bridge
    statistics       Clear statistics for one or more given interfaces
SWI2210-XXXX# clear
```

Modes

Example: VLAN Configuration Mode Commands

```
SWI2210-XXXX(config)# vlan 100
SWI2210-XXXX(config-vlan)# ?
    do      To run exec commands in config mode
    end     Go back to EXEC mode
    exit    Exit from current mode
    help    Description of the interactive help system
    name    ASCII name of the VLAN
    no
SWI2210-XXXX(config-vlan)#
```

Example: Interface Configuration Mode Commands

```
SWI2210-XXXX(config)# interface GigabitEthernet 1/10
SWI2210-XXXX(config-if)# ?
    access-list          Access list
    aggregation          Create an aggregation
    do                   To run exec commands in config mode
    dot1x                IEEE Standard for port-based Network Access Control
    duplex               Interface duplex
    end                  Go back to EXEC mode
    evc                  Ethernet Virtual Connections
    excessive-restart    Restart backoff algorithm after 16 collisions (No
                         excessive-restart means discard frame after 16
                         collisions)
    exit                 Exit from current mode
    flowcontrol          Traffic flow control.
    green-ethernet       Green ethernet (Power reduction)
    gvrp                 Enable GVRP on port(s)
    help                 Description of the interactive help system
    ip                   Internet Protocol
    ipv6                 IPv6 configuration commands
    lacp                 Enable LACP on this interface
    link-oam             Enable or Disable(when the no keyword is entered) Link
                         OAM on the interface
    lldp                 LLDP configurations.
    loop-protect         Loop protection configuration on port
    mac                  MAC keyword
    media-type           Media type.
    mtu                  Maximum transmission unit
    mvr                  Multicast VLAN Registration configuration
    network-clock        network-clock
    no                   Negate a command or set its defaults
    poe                  Power Over Ethernet.
    port-security        Enable/disable port security per interface.
```

```
    ptp
    pvlan                Private VLAN
    qos                  Quality of Service
    rmon                 Configure Remote Monitoring on an interface
    sflow                Statistics flow.
    shutdown             Shutdown of the interface.
    snmp-server          Set SNMP server's configurations
    spanning-tree        Spanning Tree protocol
    speed                Configures interface speed. If you use 10, 100, or
                         1000 keywords with the auto keyword the port will only
                         advertise the specified speeds.
    switchport           Switching mode characteristics
    thermal-protect      Thermal priority for the interface.
SWI2210-XXXX(config-if)#
```

FREQUENTLY USED CLI COMMANDS

This section demonstrates how to use common CLI commands together to perform these tasks:

- Reset the configuration to factory defaults.
- Set the device hostname.
- View the current IP configuration.
- Set the switch IP address.
- Ping a network device.
- Use the Show command.

Reset Configuration to Defaults

You can reset the configuration to factory defaults.

```
# reload defaults
% Reloading defaults. Please stand by.
#
```

When the prompt returns, the system has reverted to factory defaults.

Set the Device Hostname

To set the device hostname, type the **bold** commands exactly as shown; ***bold italic*** marks a parameter you provide, such as ***my-device*** as the new hostname.

1. Change to configuration mode, using one of the commands shown here. As these examples show, you can abbreviate commands to short versions that are unique.

```
SWI2210# configure terminal
SWI2210# config term
SWI2210# conf t
```

2. The prompt changes to include the mode name in parentheses.

```
SWI2210(config)#
```

3. Enter the 'hostname' command and the new name. The command is executed immediately, and the prompt changes to show the new name of the switch.

```
SWI2210(config)# hostname my-device
my-device(config)#
```

4. Exit configuration mode. The **exit** command returns to the next higher mode, and the prompt changes to show the new mode.

```
my-device(config)# exit
my-device#
```

5. Save the configuration (see XXX).

View the Current IP Configuration

To view the IP configuration, enter:

```
IP configuration
```

Set the Switch IP Address

To display the current IP address settings, enter the following commands:

```
# show ip interface brief
Vlan Address              Method   Status
---- -------------------- -------- ------
1    192.0.2.1/22         Manual   UP
#
```

To set up the switch with a static IP address, enter the following commands. This example sets the switch IP address to 192.0.2.1 with a subnet mask of 255.255.252.0:

```
# config term
(config)# interface vlan 1
(config-vlan)# ip address 192.0.2.1 255.255.252.0
(config-vlan)# exit
(config)# exit
```

To set up the switch to acquire an IP address using DHCP with a fallback address, enter the following commands. This example sets the switch to acquire an IP address using DHCP, and if unsuccessful, will set the IP address to 192.0.2.1 with a subnet mask of 255.255.252.0:

```
# config term
(config)# interface vlan 1
(config-vlan)# ip address dhcp fallback 192.0.2.1 255.255.252.0
(config-vlan)# exit
(config)# exit
```

To save these settings, enter the following command:

```
# copy running-config startup-config
```

Ping a Network Device

```
IP Ping <ip_target>
```

where <ip_target> is the IP address or quoted host name (Like 'google.com')

USING 'SHOW' COMMANDS

The family of 'show' commands is the cornerstone of CLI-based system monitoring. Most features implement one or more 'show' commands that will display a relevant mix of status and configuration.

Please note: The exact set of available commands, parameters and output format depends on the system configuration and software version, so some of the following commands and examples may not be applicable to all systems.

'show' commands exist only in the two Exec modes and are subject to session privilege level enforcement. Therefore, listing the largest possible set of 'show' commands requires the session to be at level 15.

Showing Available Commands

Example: Listing All 'show' Commands

The following example raises the session privilege level to 15. In this example an 'enable secret' has been specified, so password entry is required to proceed.

Then the user inputs 'show' and uses the context-sensitive help feature to list the possible show commands, in this case for a Carrier Ethernet system.

```
SWI2210-XXXX> enable
Password: ***
SWI2210-XXXX# show ?
    aaa                 Login methods
    access              Access management
    access-list         Access list
    aggregation         Aggregation port configuration
    clock               Configure time-of-day clock
    dot1x               IEEE Standard for port-based Network Access Control
    eps                 Ethernet Protection Switching
    erps                Ethernet Ring Protection Switching
    evc                 Ethernet Virtual Connections
    green-ethernet      Green ethernet (Power reduction)
    history             Display the session command history
    interface           Interface status and configuration
    ip                  Internet Protocol
    ipmc                IPv4/IPv6 multicast configuration
    ipv6                IPv6 configuration commands
    lacp                LACP configuration/status
    line                TTY line information
    link-oam            Link OAM configuration
    lldp                Display LLDP neighbors information.
    logging             Syslog
    loop-protect        Loop protection configuration
    mac                 Mac Address Table information
    mep                 Maintenance Entity Point
    mvr                 Multicast VLAN Registration configuration
    network-clock       Show selector state.
    ntp                 Configure NTP
    perf-mon            Performance Monitor
    platform            Platform specific information
    port-security       Port security
    privilege           Display command privilege
    ptp                 Precision time Protocol (1588)
    pvlan               PVLAN configuration
    qos                 Quality of Service
    radius-server       RADIUS configuration
    rfc2544             RFC2544 perfomance tests
    rmon                RMON statistics
    running-config      Show running system information
    sflow               Statistics flow.
    snmp                Display SNMP configurations
    spanning-tree       STP Bridge
    switchport          Display switching mode characteristics
    tacacs-server       TACACS+ configuration
    terminal            Display terminal configuration parameters
    thermal-protect     Display thermal protection status.
    upnp                Display UPnP configurations
    users               Display information about terminal lines
    version             System hardware and software status
    vlan                VLAN status
```

```
    voice               Voice appliance attributes
    web                 Web
```

Showing Command Help

Example: Using Context-sensitive Help for Discovery

The context-sensitive help feature for syntax display is useful as well while drilling down on the exact command to execute. In the following example the user discovers the proper command 'show ip statistics system' through exploration:

```
SWI2210-XXXX# show ip ?
    arp Address Resolution Protocol
    dhcp Dynamic Host Configuration Protocol
    http Hypertext Transfer Protocol
    igmp Internet Group Management Protocol
    interface IP interface status and configuration
    name-server Domain Name System
    route Display the current ip routing table
    source source command
    ssh Secure Shell
    statistics Traffic statistics
    verify verify command

SWI2210-XXXX# show ip statistics ?
    | Output modifiers
    icmp IPv4 ICMP traffic
    icmp-msg IPv4 ICMP traffic for designated message type
    interface Select an interface to configure
    system IPv4 system traffic
    <cr>

! A repeated press of '?' displays the syntax:
SWI2210-XXXX# show ip statistics ?
show ip statistics [ system ] [ interface vlan <v_vlan_list> ] [ icmp ]
[ icmp-msg <type> ]

SWI2210-XXXX# show ip statistics system

IPv4 statistics:
  Rcvd:   2768 total in 181458 bytes
          1727 local destination, 0 forwarding
          0 header error, 0 address error, 0 unknown protocol
          0 no route, 0 truncated, 0 discarded
  Sent:   2553 total in 180047 bytes
          1512 generated, 0 forwarded
          0 no route, 0 discarded
  Frags:  0 reassemble (0 reassembled, 0 couldn't reassemble)
          0 fragment (0 fragmented, 0 couldn't fragment)
          0 fragment created
  Mcast:  0 received in 0 byte
          0 sent in 0 byte
  Bcast:  0 received, 0 sent
```

Show Running-Config

'running-config' consists of a list of commands that, taken together, result in the currently running system configuration. This list of commands is usually not 100% identical to the list of commands a user has input to configure the device. That is because 'running-config' is a textual representation of the system configuration which is stored in binary form in the RAM memory of the device.

Since the effective device configuration is huge, 'running-config' in the majority of cases only lists the delta between default settings and current settings. This significantly reduces the amount of output and greatly improves readability of the configuration, but it does require that you know what the default settings are. You can specify that defaults be included by appending the keyword 'all-defaults' to the 'show running-config' command.

Example: Default vs. Non-default vs. All Defaults

In this example if the speed and duplex settings of an Ethernet interface are at default values (auto-negotiation). then nothing will be output. If the user then changes the speed to be fixed at 1Gbps then that value is now non-default and will be output. Duplex is also output, since it is forced to 'full' when the speed is fixed at 1Gbps.

```
! Display current configuration for an interface. All settings are at default:
SWI2210-XXXX# show running-config interface GigabitEthernet 1/4
Building configuration...
interface GigabitEthernet 1/4
!
end

! Now set the speed to 1Gbps and display the configuration again:
SWI2210-XXXX# configure terminal
SWI2210-XXXX(config)# interface GigabitEthernet 1/4
SWI2210-XXXX(config-if)# speed 1000
SWI2210-XXXX(config-if)# end

SWI2210-XXXX# show running-config interface GigabitEthernet 1/4
Building configuration...
interface GigabitEthernet 1/4
 speed 1000
 duplex full
!
end

! Include all default settings for that interface:
SWI2210-XXXX# show running-config interface GigabitEthernet 1/4 all-defaults
Building configuration...
interface GigabitEthernet 1/4
 switchport voice vlan mode disable
 no switchport voice vlan security
 switchport voice vlan discovery-protocol oui
 loop-protect
 no loop-protect action
 loop-protect tx-mode
 switchport access vlan 1
 switchport trunk native vlan 1
 switchport hybrid native vlan 1
! ... much output omitted for brevity ...
```

Note how the output of 'show running-config' can be restricted to a specific interface. There are several other such filters, described below.

show running-config [all-defaults]

This displays the entire currently running system configuration.

show running-config feature <*feature_name*> [all-defaults]

Only output the commands relevant to a particular feature. The feature list depends on system configuration and software version. For example:

```
SWI2210-XXXX# show running-config feature ?
    CWORD    Valid words are 'GVRP' 'access' 'access-list' 'aggregation'
             'arp-inspection' 'auth' 'clock' 'dhcp' 'dhcp-snooping'
             'dhcp_server' 'dns' 'dot1x' 'eps' 'erps' 'evc' 'green-ethernet'
             'http' 'icli' 'ip-igmp-snooping' 'ip-igmp-snooping-port'
             'ip-igmp-snooping-vlan' 'ipmc-profile' 'ipmc-profile-range' 'ipv4'
             'ipv6' 'ipv6-mld-snooping' 'ipv6-mld-snooping-port'
             'ipv6-mld-snooping-vlan' 'lacp' 'link-oam' 'lldp' 'logging'
             'loop-protect' 'mac' 'mep' 'monitor' 'mstp' 'mvr' 'mvr-port'
             'network-clock' 'ntp' 'perf-mon' 'phy' 'port' 'port-security'
             'ptp' 'pvlan' 'qos' 'rfc2544' 'rmon' 'snmp' 'source-guard' 'ssh'
             'thermal-protect' 'upnp' 'user' 'vlan' 'voice-vlan'
             'web-privilege-group-level'

SWI2210-XXXX# show running-config feature dns
Building configuration...
!
vlan 1
!
!
!
ip dns proxy
!
interface GigabitEthernet 1/1
...
```

The structure of running-config is maintained in the output, i.e., sub-modes such as VLANs and Ethernet interfaces are listed but may be empty if the requested feature is irrelevant for the particular sub-mode.

show running-config interface <*list*> [all-defaults]

Show running-config for the specific list of Ethernet interfaces. This may contain wildcards, for example:

```
SWI2210-XXXX# show running-config interface 2.5GigabitEthernet *
Building configuration...
interface 2.5GigabitEthernet 1/1
 speed 1000
 duplex full
!
interface 2.5GigabitEthernet 1/2
!
end
```

show running-config vlan <*list*> [all-defaults]

Show running-config for the specific list of VLANs, for example:

```
SWI2210-XXXX# show running-config vlan 1-10
Building configuration...
vlan 1
 name default
!
end
```

In this example there is only one VLAN on the system.

show running-config interface vlan <*list*> [all-defaults]

Show running-config for the specific list of VLAN interfaces, for example:

```
SWI2210-XXXX# show running-config interface vlan 1-10
Building configuration...
interface vlan 1
 ip address dhcp fallback 172.16.1.2 255.255.0.0
!
end
```

In this example there is only one VLAN interface on the system.

show running-config line { console | vty } <*list*> [all-defaults]

Show running-config for the console or list of virtual terminal devices (vty). On current designs there is a single console device, 0. Example:

```
SWI2210-XXXX# show running-config line console 0
Building configuration...
line console 0
 exec-timeout 0 0
!
end
```

CONFIGURING THE SYSTEM

Changes to system configuration can only be done from the Global Configuration mode and its sub-modes (the exception is that working with configuration files or reloading defaults must be done in Privileged Exec mode). The process is:

1. Raise privilege level to 15.
2. Enter Global Configuration mode.
3. Input appropriate configuration commands.
4. Optionally enter sub-modes and input appropriate commands there.
5. Exit Global Configuration mode.
6. Verify configuration.
7. Save configuration to flash.

Example: Configuration

In this example the hostname and VLAN 1 IP address are configured, verified and saved.

```
!  This example assumes the session is initially unprivileged.

!  Step 1: Raise privilege level:
> enable
Password: ***

!  Step 2: Enter Global Configuration mode:
# configure terminal

!  Step 3: Input configuration commands. The IP address is set from within the
!  VLAN interface submode:
(config)# hostname SWI2210-XXXX
SWI2210-XXXX(config)# interface vlan 1
SWI2210-XXXX(config-if-vlan)# ip address dhcp fallback 172.16.1.2 255.255.0.0
SWI2210-XXXX(config-if-vlan)# exit

!  Step 4: Leave Global Configuration mode and go back to Privileged Exec:
SWI2210-XXXX(config)# end
```

```
! Step 5: Inspect and verify the configuration (some output omitted for brevity):
SWI2210-XXXX# show running-config
Building configuration...
hostname SWI2210-XXXX
username admin privilege 15 password encrypted Zm9v
!
vlan 1
 name default
!
interface GigabitEthernet 1/1
!
interface GigabitEthernet 1/2
!
...
interface vlan 1
ip address dhcp fallback 172.16.1.2 255.255.0.0
!
...
end

! More verification: Display IP interfaces and assigned IP address and status:
SWI2210-XXXX# show ip interface brief
Vlan Address              Method   Status
---- -------------------- -------- ------
   1 172.16.1.15/24       DHCP     UP

! An address was obtained from DHCP, so the fallback wasn't used

! Try to inspect hostname:
SWI2210-XXXX# show hostname
              ^
% Invalid word detected at '^' marker.

! No such command exists, but it is possible to extract a single line from
! running-config by using a filter:
SWI2210-XXXX# show running-config | include hostname
hostname SWI2210-XXXX

! Step 6: Save configuration to flash:
SWI2210-XXXX# copy running-config startup-config
Building configuration...
% Saving 1272 bytes to flash:startup-config
```

ADVANCED CONCEPTS

UNDERSTANDING MODES AND SUB-MODES

The CLI implements a number of modes that control the available command set. The modes are further influenced by the privilege level of the user; some modes or commands are only accessible to administrators while others require no privileges beyond log in.

There are three major modes, Exec, Privileged Exec and Config. Under Config are a number of sub-modes. The sub-modes allow configuration of specific VLANs, Ethernet interfaces, etc.

Mode	Parent Mode	Description
Exec	-	Lowest-privileged mode; used for basic system monitoring. Generally does not allow modifications to the system. Command: **disable** Prompt: hostname>
Privileged Exec	Exec	Privileged mode; allows configuration and other modifications to the system. Command: **enable** Prompt: hostname#
Config	Privileged Exec	Global configuration mode Command: **configure terminal** Prompt: hostname(config)#
VLAN config	Config	Sub-mode for configuring active VLANs Command: **vlan** *vlan_id_list* Prompt: hostname(config-vlan)#
VLAN interface config	Config	Sub-mode for configuring VLAN interfaces Command: **interface vlan** *vlan_id_list* Prompt: hostname(config-if-vlan)#
Interface config	Config	Sub-mode for configuring Ethernet interfaces Command: **interface** *type switch_num/port_num* Prompt: hostname(config-if)#
Line	Config	Sub-mode for configuring terminal lines Command: **line { con | vty }** *line_num* Prompt: hostname(config-line)#
IPMC Profile Config	Config	Sub-mode for configuring IP Multicast profiles Command: **ipmc profile** *profile_name* Prompt: hostname(config-ipmc-profile)#
SNMP Server Host Config	Config	Sub-mode for configuring SNMP server host entries Command: **snmp-server host** *host_name* Prompt: hostname(config-snmps-host)#
STP Aggregation Config	Config	Sub-mode for configuring Spanning Tree Protocol aggregation Command: **spanning-tree aggregation** Prompt: hostname(config-stp-aggr)#
DHCP Pool Config	Config	Sub-mode for configuring DHCP client pools Command: **ip dhcp pool** *pool_name* Prompt: hostname(config-dhcp-pool)#
RFC2544 Profile Config	Config	Sub-mode for configuring RFC2544 profiles Command: **rfc2544 profile** *profile_name* Prompt: hostname(config-rfc2544-profile)#

It is possible for a user to transition between these modes using certain commands, subject to the user's privilege level and the current session privilege level (see section XXX).

The initial mode is determined by the privilege level of the user logging in. If the privilege level is 0 or 1, the user is unprivileged and begins in the (Unprivileged) Exec mode. If the privilege level is higher, the session begins in Privileged Exec mode. The User EXEC mode contains a limited set of commands. The command prompt shown at this level is:

```
SWI2210-XXXX>
```

The user can raise the Exec mode privilege level to a higher value if an enable password has been configured for that level. This elevation is done with the 'enable level' command, where level is a value between 1 and 15. Level 15 is required to have access to the full suite of commands. The reverse operation, lowering the privilege level, is achieved with the 'disable' command. The command prompt shown at this level is:

```
SWI2210-XXXX#
```

Once in Privileged Exec mode it is possible to enter into the Global Configuration mode by entering the command 'configure terminal'. Exit from Global Configuration is achieved with one of 'end', 'exit' or Ctrl+Z.

Access to a configuration sub-mode (e.g., for Ethernet interfaces) goes through Global Configuration or another sub-mode, i.e., it is possible to change directly from, say, VLAN sub-mode to Ethernet interface sub-mode.

Each mode and sub-mode thus implements a scope for commands: Inside each mode a particular subset of commands is available; to get to other commands one must generally change mode/sub-mode. This is necessary because there are commands with identical prefixes in different modes; for example there are commands that begin with 'ip' in Privileged Exec, Global Configuration and VLAN Interface Configuration modes.

There are two exceptions to this:

- While in a configuration sub-mode, access to Global Configuration mode commands is possible as long as there is no ambiguity. Execution of a Global Configuration command exits the sub-mode.
- Exec mode commands, be that privileged or unprivileged, are accessible from within Global Configuration or one of the sub-modes by using the 'do' command.

The 'do' command takes the specified command line from Exec and executes it. In the following example, the user wants to change the IP address on the VLAN 1 interface, but wants to verify the current address while in the sub-mode.

Example: Using 'do' While In a Sub-mode

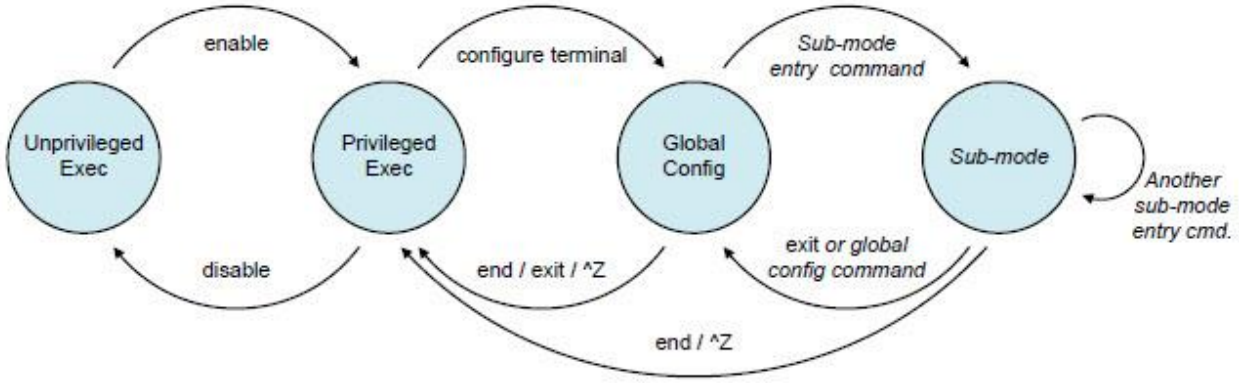
```
SWI2210-XXXX# configure terminal
SWI2210-XXXX(config)# interface vlan 1
SWI2210-XXXX(config-if-vlan)# do show ip interface brief
Vlan Address               Method   Status
---- --------------------- -------- ------
   1 172.16.1.15/24        DHCP     UP
SWI2210-XXXX(config-if-vlan)# end

! When in Exec, no 'do' prefix is needed:
SWI2210-XXXX# show ip interface brief
Vlan Address               Method   Status
---- --------------------- -------- ------
   1 172.16.1.15/24        DHCP     UP
```

CLI Mode Transitions

Figure 24 illustrates the possible transitions between major modes and sub-modes, and some of the relevant commands.

Figure 24. CLI Mode Transition Commands



Example: Changing Between CLI Modes

```
! Initial mode for this example is Unprivileged Exec. Raise level
! (and change mode):
SWI2210-XXXX> enable
Password: ***
SWI2210-XXXX#

! Note how the prompt changed from '>' to '#' to indicate the privileged exec mode
! Enter Global Configuration mode:
SWI2210-XXXX# configure terminal

! Now create VLAN 100 and give it a name. This enters the VLAN sub-mode, as
! indicated by a new prompt:
SWI2210-XXXX(config)# vlan 100
SWI2210-XXXX(config-vlan)# name MyVlan

! Change directly from VLAN sub-mode into Ethernet interface sub-mode for
! interface instance 4 on switch 1, and set link speed to 'auto'
SWI2210-XXXX(config-vlan)# interface GigabitEthernet 1/4
SWI2210-XXXX(config-if)# speed auto

! Then enter a command from the global configuration mode; this leaves Ethernet
! interface sub-mode
SWI2210-XXXX(config-if)# hostname SWI2210-XXXX

! Exit Global Configuration mode and go back to Privileged Exec
SWI2210-XXXX(config)# end

! And use 'disable' to go back to Unprivileged Exec:
SWI2210-XXXX# disable
SWI2210-XXXX>
```

UNDERSTANDING PRIVILEGE LEVELS

A privilege level is a number in the range 0 to 15, inclusive, with 0 being the lowest. It is assigned to a user session and used to determine access to CLI commands: Only commands at the same or lower privilege level can be accessed.

Each user on the device has a default privilege level which is copied to the session's privilege level at log in. It is, however, possible for the user to change the session privilege level by executing the 'enable' or 'disable' commands. This can be used, for example, as follows:

- The user account is configured with privilege level 0.
- Whenever the user needs to perform higher-privileged commands, the user changes session priority level, executes the necessary commands, and then reverts back to the default priority level.

Access to higher priority levels must be password-protected by using the 'enable password' or 'enable secret' global configuration commands. The main difference between the two is whether passwords are displayed in clear text or encrypted form in running-config (and, consequently, startup-config).

Password input can also be in encrypted or clear text form. The latter is used when an operator inputs a new password, as the operator will usually not know the encrypted form of the password.

The admin user is by default at level 15, i.e., at the highest possible privilege level.

Example: Configuring Privilege Level Passwords

The following example configures a level 15 password using 'enable secret', inspects the resulting configuration, then removes it again.

```
SWI2210-XXXX# configure terminal

! A secret can either be input in clear text or encrypted form; a digit indicates
! which kind follows on the command line:
SWI2210-XXXX(config)# enable secret ?
    0 Specifies an UNENCRYPTED password will follow
    5 Specifies an ENCRYPTED secret will follow

! In this case: Unencrypted. Then follows either the level for which a password
! is being configured, or, if no level is given, the password for level 15:
SWI2210-XXXX(config)# enable secret 0 ?
    <word32> Password
    level Set exec level password

! The following two commands are equivalent:
SWI2210-XXXX(config)# enable secret 0 my-secret
SWI2210-XXXX(config)# enable secret 0 level 15 my-secret

! The running configuration can be inspected to see the encrypted form:
SWI2210-XXXX(config)# do show running-config | include enable
enable secret 5 level 15 D29441BF847EA2DD5442EA9B1E40D4ED

! To remove the password, use the 'no' form (the two first two commands are
! equivalent for level 15):
SWI2210-XXXX(config)# no enable secret
SWI2210-XXXX(config)# no enable secret level 15
SWI2210-XXXX(config)# do show running-config | include enable
SWI2210-XXXX(config)#
```

MANAGING USERS

This section describes local user management on the device. RADIUS and TACACS+ user management is beyond the scope of this document.

It is possible to create several user accounts on a system. Each user account has a set of configurable attributes:

- User name
- Password
- Privilege level

All attributes are configured with the same command, 'username'.

username <*username*> privilege <*level*> password { unencrypted | encrypted } <*password*>
username <*username*> privilege <*level*> password none
no username <*username*>

'password none' is used when no password is desired; the security implications of using this should be considered carefully.

'no username' deletes the given user account.

Example: Adding, Modifying and Deleting Users

The following example adds two user accounts at different privilege levels, inspects the configuration, and deletes one account using 'no username'.

```
! Display current set of local user accounts:
SWI2210-XXXX# show running-config | include username
username admin privilege 15 password encrypted dmVyeS1zZWNyZXQ=

! Add two accounts, 'operator' and 'monitor'. The passwords are supplied in
! unencrypted form:
SWI2210-XXXX# configure terminal
SWI2210-XXXX(config)# username operator privilege 10 password unencrypted a-secret
SWI2210-XXXX(config)# username monitor privilege 1 password unencrypted new-secret

! Verify that the configuration is correct (shows 3 usernames) . Note that passwords
! are displayed in encrypted form:
SWI2210-XXXX(config)# do show running-config | include username
username admin privilege 15 password encrypted dmVyeS1zZWNyZXQ=
username operator privilege 10 password encrypted YS1zZWNyZXQ=
username monitor privilege 1 password encrypted YW5vdGhlci1zZWNyZXQ=

! Delete the 'operator' user and verify it is removed from the configuration:
SWI2210-XXXX(config)# no username operator
SWI2210-XXXX(config)# do show running-config | include username
username admin privilege 15 password encrypted dmVyeS1zZWNyZXQ=
username monitor privilege 1 password encrypted YW5vdGhlci1zZWNyZXQ=
```

UNDERSTANDING TERMINAL PARAMETERS

Each login to the system--whether via the serial console or telnet or ssh-- creates a session. The session is initialized with settings that are configurable from the 'line' configuration sub-mode, but most of them can also be changed from exec mode while the session is active. Such changes are not persistent, however, and are lost when the session is terminated.

The table lists the available settings and the modes where each can be configured.

Setting	Modes	Description
editing	Exec, Line	Enable/disable command line scrolling.
exec-banner	Line	Enable/disable display of the Exec banner (configured with 'banner exec ...').
exec-timeout	Exec, Line	Inactivity timer; automatically log out after a period of inactivity. A value of zero disables automatic logout.
history	Exec, Line	Length of command history buffer.
length	Exec, Line	Terminal length in lines, used for pagination. Zero disables pagination.
location	Line	A line of text that describes the terminal location, e.g., "Server room".
motd-banner	Line	Enable/disable display of Message-Of-The-Day banner (configured with 'banner motd ...').
privilege	Line	Assign default privilege level.
width	Exec, Line	Terminal width in characters, used for pagination.

The system allows one serial console session and up to 16 network sessions. The console session is called "console 0" whereas each network session is called "vty X", where X is a value between 0 and 15 (vty is an abbreviation for virtual TTY).

The configuration appears near the bottom of the 'running-config' output and looks like this:

```
line console 0
exec-timeout 0
!
line vty 0
!
line vty 1
!
line vty 2
! [...]
```

It is possible to specify different settings for each vty, but this is generally not recommended since there is no way to associate an incoming ssh or telnet connection with a specific vty.

Example: Changing Terminal Parameters

This example shows how to change some values for the current session and for all future console sessions.

```
! First inspect current settings for this session:
SWI2210-XXXX# show terminal
Line is con 0.
* You are at this line now.
Alive from Console.
Default privileged level is 2.
Command line editing is enabled
Display EXEC banner is enabled.
Display Day banner is enabled.
Terminal width is 80.
         length is 24.
         history size is 32.
         exec-timeout is 10 min 0 second.

Current session privilege is 15.
Elapsed time is 0 day 0 hour 15 min 42 sec.
Idle time is 0 day 0 hour 0 min 0 sec.

! Then set terminal length to zero to disable pagination, and exec-timeout to
! zero to disable automatic logout:
SWI2210-XXXX# terminal length 0
SWI2210-XXXX# terminal exec-timeout 0
SWI2210-XXXX# show terminal
Line is con 0.
        .
        .
    Terminal width is 80.
             length is 0.
             history size is 32.
             exec-timeout is 0 min 0 second.

! Then we do the same, but for all future console sessions. Note how the commands
! have no 'terminal' prefix ('length' vs. 'terminal length'):
SWI2210-XXXX# configure terminal
SWI2210-XXXX(config)# line console 0
SWI2210-XXXX(config-line)# exec-timeout 0
SWI2210-XXXX(config-line)# length 0
SWI2210-XXXX(config-line)# end

! Finally save the configuration to startup-config to make it persistent:
SWI2210-XXXX# copy running-config startup-config
Building configuration...
% Saving 1287 bytes to flash:startup-config
SWI2210-XXXX#
```

USING BANNERS

The system provides three different banners--text that is output as messages to the user:

- The Message Of The Day banner (MOTD), displayed upon connection to the system, or when a console login attempt has timed out
- The Login banner, displayed before the first “Username:” login prompt
- The Exec banner, displayed upon successful login

All banners are configured in a similar manner, using the ‘banner’ command:

banner [motd] <*banner*>
banner exec <*banner*>
banner login <*banner*>

The <*banner*> text can be either a single line or multiple lines. The first character of the text defines a delimiter character; the actual text of the banner then follows and ends at the first appearance of the delimiter character. Neither of the delimiters are included in the actual text. The delimiter can be any printable character that is not used in the message.

Example: Configuring Banners

```
! First configure the MOTD banner, which in this case is multi-line. '*' is
! used as delimiter character, but any printable character that isn't used in
! the message is usable:
SWI2210-XXXX# configure terminal
SWI2210-XXXX(config)# banner motd *This is the Message Of The Day Banner.
Enter TEXT message. End with the character '*'.
It spans multiple lines.
And one more. But now it ends.*

! Then the Login and Exec banners. Both are single-line. Note how different
! delimiters are used in each banner:
SWI2210-XXXX(config)# banner login XThis is SWI2210-XXXX.X
SWI2210-XXXX(config)# banner exec "WARNING: Production system. Be careful."
SWI2210-XXXX(config)# end

! Inspect configuration:
SWI2210-XXXX# show running-config
Building configuration...
banner motd "This is the Message Of The Day Banner.
It spans multiple lines.
And one more. But now it ends."
banner exec "WARNING: Production system. Be careful."
banner login "This is SWI2210-XXXX."
hostname SWI2210-XXXX
! [...]
end

! Test it: Log out, then log in again:
SWI2210-XXXX# exit

This is the Message Of The Day Banner.
It spans multiple lines.
And one more. But now it ends.

Press ENTER to get started<ENTER>

This is SWI2210-XXXX.

Username: admin
Password:

WARNING: Production system. Be careful.
SWI2210-XXXX#

! Finally save the configuration to startup-config to make it persistent:
SWI2210-XXXX# copy running-config startup-config
Building configuration...
% Saving 1461 bytes to flash:startup-config
SWI2210-XXXX#
```

APPENDIX B PARVUS CLI ENHANCEMENTS

This appendix describes the Parvus enhancements to the SWI-22-10 CLI software. The enhancements provide additional commands for viewing system data, running manufacturing tests, and setting options for advanced functions such as data zeroization. These functions are available only through the CLI; they do not have GUI equivalents.

Caution! Incorrect use of some commands can cause loss of configuration files.
Follow the instructions in this appendix and do not use commands identified as "For manufacturing use only."

ACCESSING THE PARVUS CLI COMMANDS

The Parvus commands are available only from a special debug mode. You must type the full strings shown here—no abbreviations allowed.

ENTERING PARVUS DEBUG MODE

1. At the system prompt, enter the following string, including the underscores. The prompt does not change.

```
SWI2210-XXXX# _debug_privilege_
SWI2210-XXXX#
```

2. Type the following string. The system prompt changes to :/>

```
SWI2210-XXXX# debug vcli debug cli toggle
SWI2210-XXXX:/>
```

3. Enter the debug command. A message is displayed and the prompt changes to :/Debug>

```
SWI2210-XXXX:/> debug
Type 'up' to move up one level or '?' to go to root level
SWI2210-XXXX:/Debug>
```

4. Enter the following string. A message is displayed and the prompt changes to :/Debug/Parvus>

```
SWI2210-XXXX:/Debug> parvus
Type 'up' to move up one level or '?' to go to root level
SWI2210-XXXX:/Debug/Parvus>
```

5. You can now enter Parvus debug commands.

EXITING PARVUS DEBUG MODE

To exit debug mode, you need to return to the root level and then reboot the switch. You can use either the up command or a /.

1. Type 'up' to move up one level or '/' to go to root level.

```
SWI2210-XXXX:/Debug/Parvus>up
SWI2210-XXXX:/Debug>/
SWI2210-XXXX:/>
```

2. Type 'system' to access the system level.

```
SWI2210-XXXX:/>system
```

3. Type 'reboot'. The system reboots.

```
SWI2210-XXXX:/>reboot
```

COMMANDS OVERVIEW

- Commands are persistent, meaning values are changed immediately and written to permanent storage.
- Commands are not case-sensitive. They are displayed with capitals for readability.
- Commands cannot be abbreviated.
- As shown in the summary table, some commands are for manufacturing use only (e.g., Built-in Test); others should not be changed. Using these commands may wipe out all configuration data, requiring a complete reload of firmware and configuration.

Type	Command	Description
Built-In Test	`BitClear`	TEST--Manufacturing Use Only
	`BitInterval <integer>`	TEST--Manufacturing Use Only
	`BitStatus`	TEST--Manufacturing Use Only
EEPROM	`EeDump <addr> <item_cnt>`	Displays fault logging
	`EeFill <addr> <item_cnt> <fill_val>`	TEST--Manufacturing Use Only
LED	`LED`	TEST--Manufacturing Use Only
Log	`LogAddEntry`	TEST--Manufacturing Use Only
	`LogErase`	Erases the fault log
	`LogShow`	Displays the fault log
	`OptDefaults`	
	`OptShow`	
	`OptWrapFaultLog <integer>`	
Temperature	`OptTCritical <integer> <integer>`	
	`OptTDisplay <integer>`	
	`OptTWarning <integer> <integer>`	
Zeroization	`OptZDelay <integer>`	Zeroization delay parameter
	`OptZEnable <integer>`	Zeroization enable parameter
	`OptZPolarity <integer>`	DO NOT CHANGE
	`OptZStyle <integer>`	DO NOT CHANGE
Switch Data	`Status`	Debug status
	`Temp`	TEST--Manufacturing Use Only
	`Uptime`	Lifetime counter
	`Version`	Displays the Parvus version number
	`WatchdogEnable <integer>`	DO NOT CHANGE
	`XoShow`	TEST--Manufacturing Use Only
	`XoUp`	TEST--Manufacturing Use Only

OptShow

Displays the current values of all Parvus persistent options.

Syntax

Debug Parvus OptShow

Example

```
SWI2210-XXXX:/Debug/Parvus>optshow
Parvus options:
        Fault log wrapping:    enabled
        Watchdog enabled:      enabled
        Zeroize enabled:       disabled
        Zeroize polarity:      +12 VDC
        Zeroize style:         0 - Clear configuration.
        Zeroize debounce time: 20 (2.0 S)
        CBIT test interval:    600 (60.0 S)
        Temp monitor display:  disabled
        Temperature thresholds:
                Sensor warn critical
                ------ ---- --------
                local   100   115
                switch  100   115
                phy1    100   115
                phy2    100   115
SWI2210-XXXX:/Debug/Parvus>
```

OptDefaults

Resets all Parvus persistent options to default values.

Syntax

Debug Parvus OptDefaults

Example

```
SWI2210-XXXX:/Debug/Parvus>optdefaults
```

EEdump

Display contents of eeprom.

Syntax

Debug Parvus EeDump <addr> <item_cnt>

<addr> is the starting address
<item_cnt> is the number of locations to display. Default: 1

Example

```
SWI2210-XXXX:/Debug/Parvus>eedump 0 348

Dumping EEPROM.  348 bytes @ 0x0000...
 00000   00 04 39 4E 00 04 3A 4D-00 04 37 40 00 04 38 4F   ..9N..:M..7@..8O
 00010   01 10 00 14 58 02 64 64-64 64 73 73 73 73 CA 00   ....X.ddddssss..
 00020   FF FF FF FF FF FF FF FF-FF FF FF FF FF FF FF FF   ................
 00030   07 04 00 00 00 00 01 00-19 06 00 00 00 00 00 00   ................
 00040   CC 07 04 F0 2C 01 00 01-00 C2 06 00 F0 2C 01 00   ....,........,..
 00050   00 88 07 04 F0 2C 01 00-01 00 C2 06 00 F0 2C 01   .....,........,.
 00060   00 00 88 07 04 C0 2F 01-00 01 00 C1 06 00 C0 2F   ....../......../
 00070   01 00 00 E4 07 04 30 38-01 00 01 00 E5 06 00 30   ......08.......0
 00080   38 01 00 00 E8 07 04 98-39 01 00 01 00 1F 06 00   8.......9.......
 00090   98 39 01 00 00 14 07 04-70 43 01 00 01 00 B2 06   .9......pC......
 000A0   00 70 43 01 00 00 98 07-04 D8 44 01 00 01 00 03   .pC.......D.....
 000B0   06 00 D8 44 01 00 00 10-07 04 A8 47 01 00 01 00   ...D.......G....
 000C0   76 06 00 A8 47 01 00 00-B4 07 04 08 6F 01 00 01   v...G.......o...
 000D0   00 DC 06 00 08 6F 01 00-00 39 07 04 08 6F 01 00   .....o...9...o..
 000E0   01 00 DC 06 00 08 6F 01-00 00 39 07 04 D8 71 01   ......o...9...q.
 000F0   00 01 00 B8 06 00 D8 71-01 00 00 F7 07 04 B0 7B   .......q.......{
 00100   01 00 01 00 67 06 00 B0-7B 01 00 00 DE 07 04 80   ....g...{.......
 00110   7E 01 00 01 00 2F 06 00-80 7E 01 00 00 C6 07 04   ~..../...~......
 00120   80 7E 01 00 01 00 2F 06-00 80 7E 01 00 00 C6 07   .~..../...~.....
 00130   04 68 96 01 00 01 00 E3-06 00 68 96 01 00 00 30   .h........h....0
 00140   07 04 38 C6 01 00 01 00-F1 06 00 38 C6 01 00 00   ..8........8....
 00150   36 07 04 18 D7 01 00 01-00 9A 06 00               6...........
SWI2210-XXXX:/Debug/Parvus>
```

Logshow

Displays the contents of the fault log.

Syntax

logshow

Example

```
SWI2210-XXXX:/Debug/Parvus>logshow

Dumping fault log...
 ix  len time-hex days:hh:mm:ss op info/description
---- --- -------- ------------ -- ----------------------------------------
0000   7 0005F730    4:12:36:00  4 BIT error detected. Flag(s):WATCHDOG_RESET_DETECTED
0009   6 0005F730    4:12:36:00  0 Power on reset detected. Cause:1.
2 fault log entries found!
SWI2210-XXXX:/Debug/Parvus>
```

optwrapfaultlog

Enables or disables fault log wrapping. If wrapping is enabled and the fault log is full, the fault log wraps and overwrites older entries. Otherwise it stops accepting new entries.

Syntax

Debug Parvus OptWrapFaultLog <*integer*>

<integer> is 1 (enable) or 0 (disable) fault log wrapping

Example

```
SWI2210-XXXX:/Debug/Parvus>optwrapfaultlog
```

LogErase

Erases the entire fault log. Depending on the number of entries, this may require several minutes to complete.

Syntax

logerase

Example

```
SWI2210-XXXX:/Debug/Parvus>logerase
Erasing fault log. Remaining locations...XXXXXXX
```

A counter decrements as the locations are erased. When the erasure is complete, the system reboots.

Status

Shows the status of Parvus extensions.

Syntax

status

Example

```
SWI2210-XXXX:/Debug/Parvus>status

Parvus thread has run 54442 times.
Zeroize input is not asserted.
```

Temp

Displays temperature readings.

Syntax

temp

Example

```
SWI2210-XXXX:/Debug/Parvus>temp

Temp readings...
        LOCAL  = 51.0 deg C.
        SWITCH = 68.0 deg C.
        PHY1   = 54.4 deg C.
        PHY2   = 55.0 deg C.
SWI2210-XXXX:/Debug/Parvus>
```

Uptime

Displays up-time and service life (operational hours).

Syntax

uptime

Example

```
SWI2210-XXXX:/Debug/Parvus>uptime
Up time     0:01:38:42 (days:hh:mm:ss)
Lifetime    4:12:32:42
SWI2210-XXXX:/Debug/Parvus>
```

version

Show Parvus version number.

Syntax

version

Example

```
SWI2210-XXXX:/Debug/Parvus>version
Parvus version 1.0.0.
SWI2210-XXXX:/Debug/Parvus>
```

xoshow

Show registers from Silicon Labs Si570 Programmable XO.

Syntax

Debug Parvus XoShow

Example

```
SWI2210-XXXX:/Debug/Parvus>xoshow
Si570 HS_DIV = 1, N1 = 7, RFREQ = 0x2BC0CA731 (11744880433).
SWI2210-XXXX:/Debug/Parvus>
```

xoup

Increases frequency of Silicon Labs Si570 Programmable XO.

Syntax

Debug Parvus XoUp

Example

ZEROIZE

For security, the board provides a digitial zeroize input. This section describes the available zeroization parameters. For more information on the signal, refer to "Zeroization" in Chapter 3.

optzdelay

Sets the debounce time (the minimum amount of time the zeroize input must be asserted before the zeroize feature is invoked).

Syntax

Debug Parvus OptZDelay <integer>
<integer> is 2-255, where 2=200 mS, 255=25.5 seconds. The default is 20 (2.0 seconds).

Example

```
SWI2210-XXXX:/Debug/Parvus>optzdelay 50
```

optzenable

Enable/disable zeroize feature. Zeroize must be enabled before it can be invoked.

Syntax

Debug Parvus OptZEnable <integer>
<integer> is 0 (disable) or 1 (enable). Default is 0.

Example

```
SWI2210-XXXX:/Debug/Parvus>optzenable 0
```

optzpolarity (do not use)

Sets the polarity of the zeroize input.

Syntax

optzpolarity <integer>
<integer> is 0 (12 VDC) or 1 (grounded). Default is 0.

Example

```
SWI2210-XXXX:/Debug/Parvus>optzpolarity 0
```

optzstyle (do not use)

Sets the zeroize style (what is erased by the zeroize input). The 3 levels are:

- Erase only configuration options and data; reboot the board.
- Erase the application firmware and configuration options and data.
- Erase the bootloader, application firmware, and configuration options and data.

Syntax

Debug Parvus OptZStyle <integer>
<integer> is
0 (configuration only),
1 (configuration and -Config/app,
2-Config/app/bootloader.

Example

```
SWI2210-XXXX:/Debug/Parvus>optzstyle 0
```