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GLX4000 Crossbar Switch
User Reference Manual

F-T-MR-L5XL144#-A-0-A1

CURTISS WRIGHT Controls, Inc.
Embedded Computing

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Chapter 1
FORMALITIES

FOREWORD

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Revised: June 21, 2004

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EMI Statement

FCC

This product is intended for use in industrial, laboratory or military environments. This product uses and emits electromagnetic radiation, which may interfere with other radio and communication devices. The user may be in violation of FCC regulations if this device is used in other than the intended market environments.

CE

As a component part of another system, this information technology product has no direct function and is therefore not subject to applicable European Union directives for Information Technology equipment.

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Chapter 2
INTRODUCTION

How to Use This Manual

Purpose

This manual introduces the LinkXchange GLX4000 144x144 Switch, referred to in this manual as the GLX4000, and describes how to unpack, setup, and operate the product.

Scope

The information in this manual is intended for information systems personnel, systems coordinators, or highly skilled network users.

Style Conventions

- Callouts within figures when referenced in text are enclosed in parentheses. For example (C) = ©.
- Called functions are italicized. For example, *OpenConnect()*.
- Data types are italicized. For example, *int*.
- Function parameters are bolded. For example, **Action**.
- Path names are italicized. For example, *utility/sw/cfg*.
- File names are bolded. For example, **config.c**.
- Path file names are italicized and bolded. For example, ***utility/sw/cfg/config.c***.
- Hexadecimal values are written with a "0x" prefix. For example, 0x7e.
- For signals on hardware products, an 'Active Low' is represented by prefixing the signal name with a slash (/). For example, /SYNC.
- Code and monitor screen displays of input and output are boxed and indented on a separate line. Text that represents user input is bolded. Text that the computer displays on the screen is not bolded. For example:

```
ls
file1           file2           file3
```

- Large samples of code are Courier font, at least one size less than context, and are usually on a separate page or in an appendix.

Related Information

- *Fibre Channel, A Technical Overview* – available from the Systran division of Curtiss-Wright Controls.
- *Fibre Channel Physical and Signaling Interface* (FC-PH), Revision 4.3, June 1, 1994; Produced by the ANSI X3T9.3 standards group.
- *Fibre Channel Physical and Signaling Interface-2* (FC-PH-2), Revision 7.3, January 5, 1996; Produced by the ANS X3T11 standards group.
- *Fibre Channel Physical and Signaling Interface-3* (FC-PH-3), Revision 8.6, April, 1996; Produced by the ANSI X3T11 standards group.
- *Serial Front Panel Data Port (FPDP) ANSI/VITA 17.1–2003 Specification*, Produced by the VITA Standards Organization.
- *ANSI Z136.2-1988 American National Standard for the Safe Use of Optical Fiber Communication Systems Using Laser Diode and LED Sources.*

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- *Interface Between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange* – EIA Standard RS-232C.
- *IEC 825-1984 Radiation Safety of Laser Products, Equipment Classification, Requirements, and User's Guide*, 2 parts, 1993.
- *Small Form-factor Pluggable (SFP) MultiSource Agreement (MSA)*, September 14, 2000, FO Transceiver Industry
- Fibre Channel Europe – http://www.fibrechannel-europe.com/
- INCITS Technical Committee T11 – http://www.t11.org/index.htm
- Curtiss-Wright Controls Embedded Computing – www.cwcembedded.com

Quality Assurance

Curtiss-Wright Controls Corporate policy is to provide our customers with the highest quality products and services. In addition to the physical product, the company provides documentation, sales and marketing support, hardware and software technical support, and timely product delivery. Our quality commitment begins with product concept, and continues after receipt of the purchased product.

Curtiss-Wright Controls Quality System conforms to the ISO 9001 international standard for quality systems. ISO 9001 is the model for quality assurance in design, development, production, installation and servicing. The ISO 9001 standard addresses all 20 clauses of the ISO quality system, and is the most comprehensive of the conformance standards.
Our Quality System addresses the following basic objectives:

- Achieve, maintain and continually improve the quality of our products through established design, test, and production procedures.
- Improve the quality of our operations to meet the needs of our customers, suppliers, and other stakeholders.
- Provide our employees with the tools and overall work environment to fulfill, maintain, and improve product and service quality.
- Ensure our customer and other stakeholders that only the highest quality product or service will be delivered.

The British Standards Institution (BSI), the world's largest and most respected standardization authority, assessed Curtiss-Wright Controls Quality System. BSI's Quality Assurance division certified we meet or exceed all applicable international standards, and issued Certificate of Registration, number FM 31468, on May 16, 1995. The scope of Curtiss-Wright Controls registration is: "Design, manufacture and service of high technology hardware and software computer communications products." The registration is maintained under BSI QA's bi-annual quality audit program.
Customer feedback is integral to our quality and reliability program. We encourage customers to contact us with questions, suggestions, or comments regarding any of our products or services. We guarantee professional and quick responses to your questions, comments, or problems.

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Chapter 3
TECHNICAL SUPPORT

Technical documentation is provided with all of our products. This documentation describes the technology, its performance characteristics, and includes some typical applications. It also includes comprehensive support information, designed to answer any technical questions that might arise concerning the use of this product. We also publish and distribute technical briefs and application notes that cover a wide assortment of topics. Although we try to tailor the applications to real scenarios, not all possible circumstances are covered.

While we have attempted to make this document comprehensive, you may have specific problems or issues this document does not satisfactorily cover. Our goal is to offer a combination of products and services that provide complete, easy-to-use solutions for your application.

If you have any technical or non-technical questions or comments, contact us. Hours of operation are from 8:00 a.m. to 5:00 p.m. Eastern Standard/Daylight Time.

- Phone: (937) 252-5601 or (800) 252-5601
- E-mail: support@systran.com
- Fax: (937) 252-1465
- World Wide Web address: www.cwcembedded.com

Ordering Process

To learn more about Curtiss-Wright Controls Embedded Computing products or to place an order, please use the contact information above or E-mail: info@systran.com. Hours of operation are from 8:00 a.m. to 5:00 p.m. Eastern Standard/Daylight Time.

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Chapter 4
PRODUCT OVERVIEW

Functional Overview

The Curtiss-Wright Controls GLX4000 Crossbar Switch, Figure 4-1, is a managed, non-blocking, multipurpose 144 port crosspoint switch for digital signals at speeds up to 4.25 gigabits per second (Gbps). Any of its 144 outputs can be connected to any one of its 144 inputs. The protocol or structure of data routed through the switch is ignored by the GLX4000 and is unaltered by its passage through the switch. As a result, the GLX4000 can be used with many different types of networks and signals. The GLX4000 holds up to three port cards. Each port card holds up to 48 Small Form Factor, Pluggable (SFP) transceiver modules. The crosspoint switch can operate from zero to 4.25 Gbps; however, different types of SFP transceiver modules impose different limitations on the range of data rates or the format they will pass.



Figure 4-1 GLX4000 144x144 Switch

Features

The GLX4000 Crossbar Switch has the following features:

- Up to 144 non-blocking SFP transceiver ports.
- Up to 4.25 Gbps/port baud rate.
- Supports Loop, Point-to-Point, One-to-Many communication links.
- Supports multiple physical media options including short wavelength (850 nm), long wavelength (1300 nm), and HSSDC2
- Automatic port fault isolation.
- Front panel indicators.
  - "Signal Detect" for each port
  - "Transmitter On" for each port
  - "Heartbeat"

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  - "Flash WR"
  - "Alarm"
  - "Watchdog"
- Out-of-band control through an Ethernet port.
- Can be controlled from a remote location.
- Watchdog timer.
- Dual-redundant hot-swappable power supplies.
- Hot-swappable fans.
- Hot-pluggable Small Form-factor transceiver modules.
- Hot-pluggable port cards.
- Multiple temperature monitoring points within enclosure.
- Configuration data stored on a removable CompactFlash card.
- Automatic fan speed control based on enclosure temperature.
- Fan tachometer monitor.

GLX4000 Description

The GLX4000 is packaged in a 4U (7 inches high) 19-inch rack-mountable enclosure as shown in Figure 4-1. Each enclosure holds up to three port cards, which must be purchased separately. Each port card contains two rows of 24 ports, as shown in Figure 4-2. A display panel above the port cards indicates system and port status.

Two hot-swappable power supplies and four hot-swappable fans plug into the rear of the enclosure as shown in Figure 4-3. A controller card, which is not hot-swappable, also plugs into the rear of the enclosure.

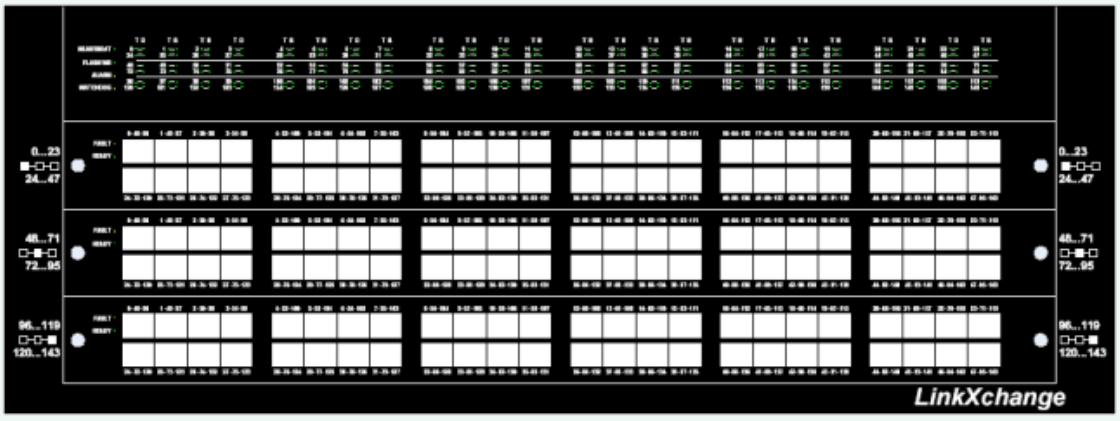


Figure 4-2 GLX4000 Front View

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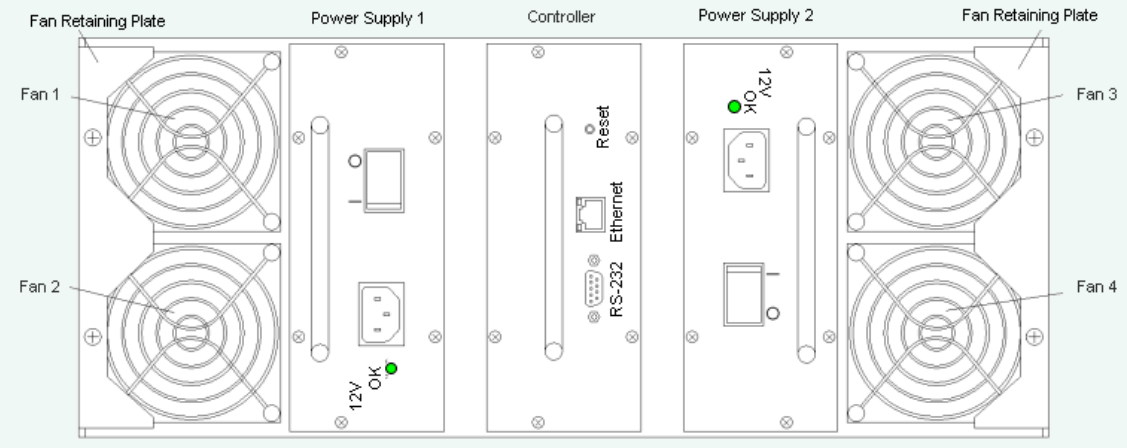


Figure 4-3 GLX4000 Rear View

SFP Transceiver Modules

The GLX4000 SFP Port Card accepts Small Form-Factor Pluggable transceivers that comply with the Small Form-Factor Pluggable transceiver Multisource Agreement (SFP MSA). The SFP MSA ensures compatibility between the various transceiver vendors.



Figure 4-4 SFP Transceiver Module

SFP transceivers are hot-pluggable and are available in optical laser or HSSDC2 copper formats. SFP modules may be purchased from Curtiss-Wright Controls, Data Communication Center (see the Technical Support chapter) or elsewhere. Transceivers are available that are compatible with these Curtiss-Wright Controls products:

- FibreXtreme Serial FPDP SL240 (2.5 Gbps)
- FibreXtreme Serial FPDP SL100 (1.0625 Gbps)
- FibreXpress FX200 (2.125 Gbps Fibre Channel)
- FibreXpress FX100 (1.0625 Gbps Fibre Channel)

Many transceivers can operate at multiple data rates. The GLX4000 is compatible with Fibre Channel and many other digital data formats. Contact Curtiss-Wright Controls, Data Communication Center for information concerning currently supported products.

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User Control Interface

The GLX4000 may be operated through a network (10/100Base-T Ethernet) connection or directly through an RS-232 serial connection. The recommended approach is to use the network, as the serial port is available primarily for initial system setup. The switch supports TELNET and Secure Shell (SSH, v1 and v2) connections over its Ethernet interface. Both connection methods provide access to the same user interface.

The user interface includes the following:

- Comprehensive online help for each command.
- Route configuration commands.
- Switch routing displays.
- Switch status and health information.
- Command history, editing, and tab-completion.
- Advanced features such as command auto-repeat, named port lists, and scripts.

Most of the GLX4000's front face is occupied by three port cards, on which reside the switch's data ports. Above the port cards is a display panel that shows the status of each port and a few general system status indicators.

The GLX4000's rear panel houses the Ethernet port, RS-232 port, reset pushbutton, power switches, and power connectors.

See the "OPERATION" chapter for more information on the user interface.

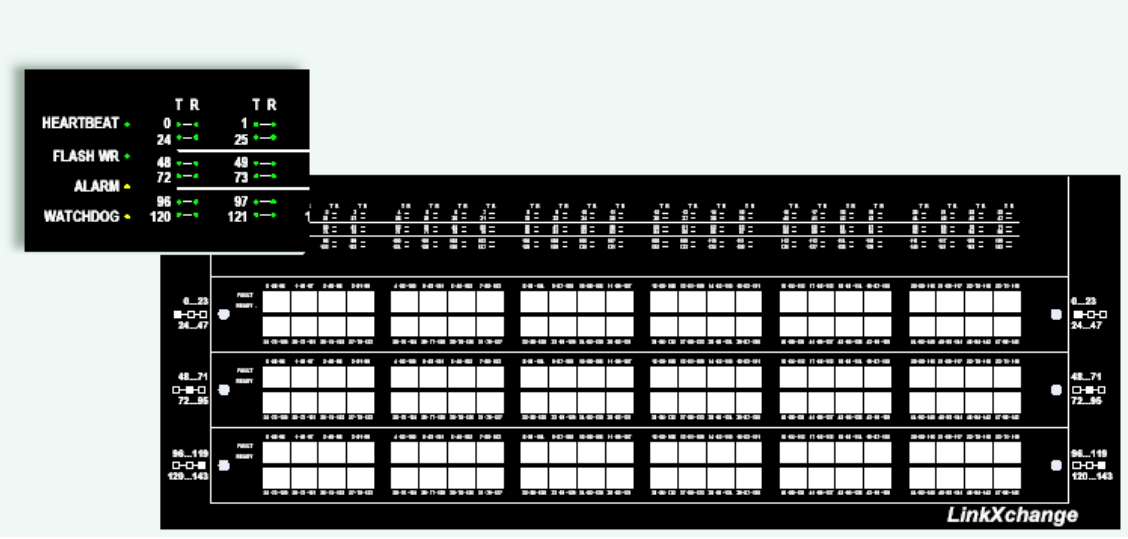


Figure 4-5 Front Panel Detail

Example Applications

Crossbar Switch

The GLX4000 can be used to connect multiple nodes into one or more loops as shown in Figure 4-6. Nodes 1 and 2 are in one loop while 3 and 4 are in another separate loop. Using the GLX4000 this way provides a network with more stability and improves the ability to troubleshoot problems and make topological changes. Once the initial cabling is in place, the

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GLX4000 makes managing the network much easier. Physical cable reconfiguration is eliminated. The wear and tear on the cable connectors is greatly reduced. Other advantages include:

- Automatic fault isolation allows the loop to continue functioning after a node fails.
- A node can be added or dropped, without interrupting the loop operation, by issuing one out-of-band command.
- Copper and fiber optic interface media can be mixed.

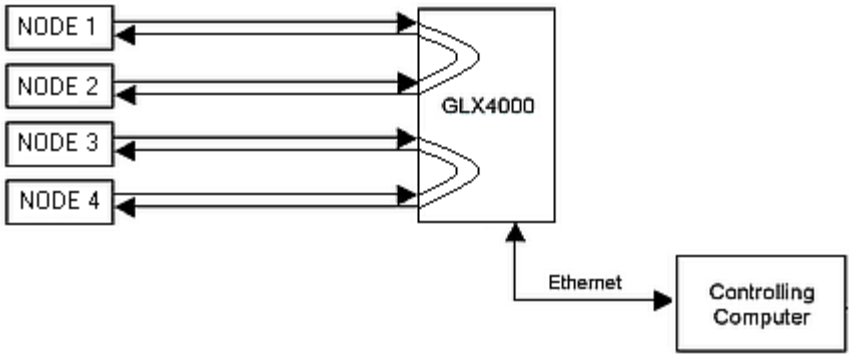


Figure 4-6 GLX4000 Connected to Multiple Nodes

Data Multicast

The GLX4000 can replicate the output stream from a data source to multiple data sinks for redundancy or parallel processing. See Figure 4-7. The data arrives at the multiple destinations concurrently rather than sequentially. This in effect reduces latency from one node to the next and allows for better data alignment for parallel processing. This topology may not be valid for protocols that require acknowledgement handshaking such as Fibre Channel.

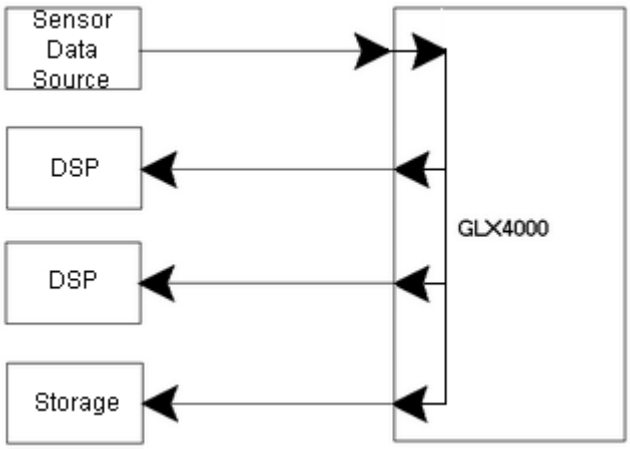


Figure 4-7 GLX4000 Used for Data Multicast

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Patch Panel

The GLX4000 can act as an electronic patch panel to facilitate system debug or to allow scarce resources to be used in multiple configurations. Saved command sequences can be recalled to instantly connect components in a pre-defined configuration. See Figure 4-8.

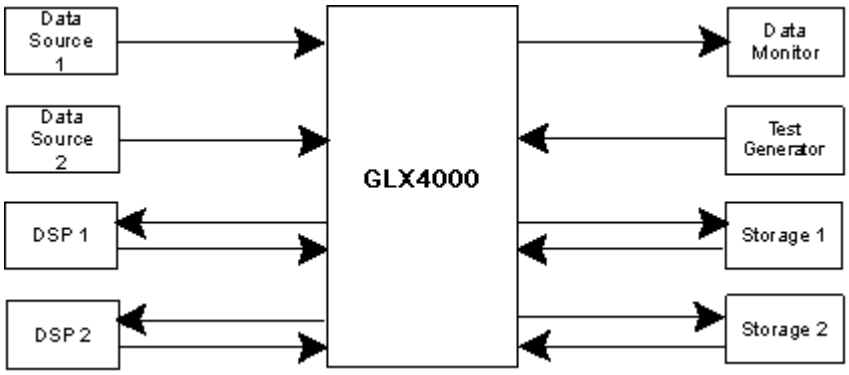


Figure 4-8 GLX4000 Used as Patch Panel

Fibre Channel Arbitrated Loop Hub

Using the GLX4000 as a Fibre Channel arbitrated loop hub provides a system with more stability and improves your ability to troubleshoot problems and make topological changes. Once the initial cabling is in place, the GLX4000 makes managing the network much easier. With 8 nodes, one possible configuration could be three separate loops.
Loop 1: Nodes 1, 2, 5, and 6.
Loop 2: Nodes 3 and 7.
Loop 3: Nodes 4 and 8.
This arrangement is shown in Figure 4-9.

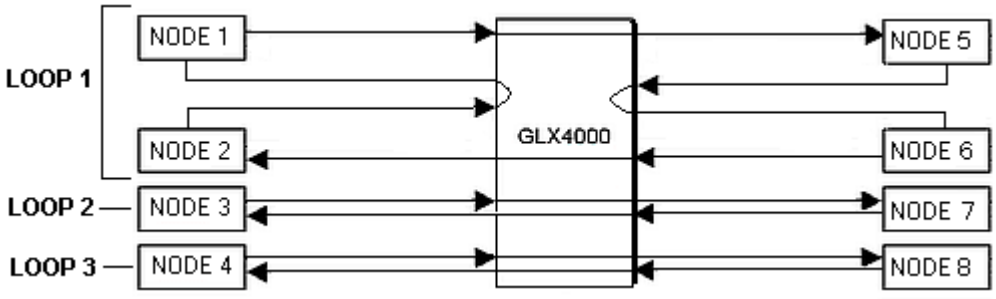


Figure 4-9 GLX4000 Arbitrated Loop Hub

Some additional advantages are as follows:

- Automatic fault isolation allows the loop to continue functioning after a node fails.
- A new node can be added, without interrupting the loop operation, by issuing one out-of-band command.
- Copper and fiber optic interface media can be mixed.

Figure 4-10 shows an example of the various Fibre Channel devices that can be connected to the GLX4000.

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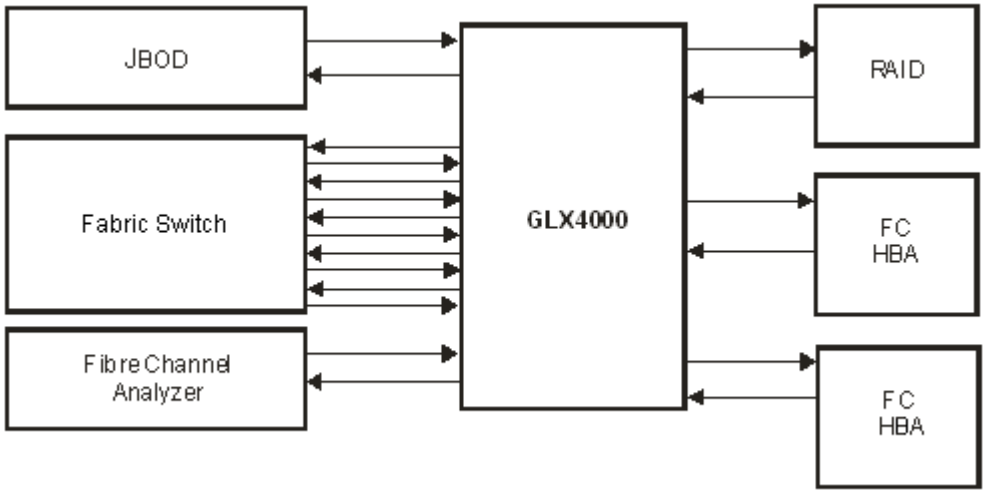


Figure 4-10 GLX4000 Fibre Channel Devices

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Chapter 5
INSTALLATION

Overview

This chapter covers the following:

- Unpacking the GLX4000
- Mounting or situating the GLX4000
- Installing port cards in the GLX4000
- Making connections
- Power-on and initial configuration

Unpacking



CAUTION: Exercise care regarding the static environment. Use an anti-static mat connected to a wristband when handling or installing the GLX4000.

When you unpack the GLX4000, verify the following items are present:

- Enclosure with two port card filler plates installed
- Two power supplies
- Four fans
- One controller card
- Two AC power cords
- A user reference manual

Save the packing materials in case you need to return the unit. If the GLX4000 was damaged in shipping, notify Curtiss-Wright Controls or your supplier immediately.

Mounting

The GLX4000 is designed to be mounted in a standard 19-inch (482.6mm) equipment rack. It is 7 inches (177.8mm, 4U) high and 17 inches (481.8mm) deep. Side rails (not provided) may be used if desired.

Cooling Requirements

Cooling air enters the enclosure at the right rear (as viewed from the front) and exits at the left rear. Make sure that sufficient airflow is available to the GLX4000. Air must be able to flow past the rear of the enclosure so the GLX4000 does not just re-circulate the same air. The air temperature at the inlet must not exceed 60° C.

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Power Requirements

The GLX4000 has two redundant power supplies, each with its own power cord and power switch. Power requirements for each supply are:

- A properly wired, earth-grounded outlet
- Input voltage: 90-132 or 180-264 VAC
- Line frequency: 47-63 Hz
- Power: 370 watts for both power supplies

The GLX4000 power supplies automatically switch to accept power in either of the two voltage ranges. Note that two power outlets are required. Either supply can power the GLX4000 by itself. When both power supplies are working, they share the load.

Installing Port Cards

Port cards are purchased separately from the GLX4000 base unit. The base unit comes with two filler plates for use in empty port card slots. To install your port cards, follow these instructions:



CAUTION: Exercise care regarding the static environment. Use an anti-static mat connected to a wristband when handling or installing port card. Failure to do this may cause permanent damage to components on the card.

1. Put on the wristband attached to an anti-static mat.
2. Remove the card and anti-static bag from the carton.
3. Place the bag on the anti-static mat.
4. Open the anti-static bag and remove the card.
5. Visually inspect the board. If the card was damaged in shipping, notify Curtiss-Wright Controls or your supplier immediately.
6. Save the shipping materials in case you need to return your port card.
7. Remove the GLX4000 filler plate from the desired slot.
8. Follow the instructions under "Port Cards" in the "OPERATION" chapter.

Installing Pluggable Modules

Port cards that accept Small Form-factor Pluggable (SFP) transceiver modules may be shipped without modules. SFP modules may be installed or removed at any time. See "SFP Transceiver Modules" in the "PRODUCT OVERVIEW" chapter for more details.

User Interface Connections

RS-232 Port Connection

An RS-232C connection is required for initial configuration of the GLX4000. To control the GLX4000 through its RS-232 port, connect a serial cable between the port on the rear panel and a serial terminal (or a computer that can emulate a serial terminal). The terminal's port should be set to 38400 bps, 8 bits, no parity, one stop bit.

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The GLX4000's RS-232 port is a nine-pin male connector with the same pinout as a standard PC serial port. If you connect it to a PC port, you'll need to use a null modem adapter or cable. For more details, see Appendix C.

Ethernet Connection

A 10/100 Base-T Ethernet connection is required for operational control of the GLX4000. Connect a cable from the rear panel RJ-45 connector to a 10 or 100 Base-T Ethernet hub or wall jack.

If the network to which the GLX4000 is attached has a DHCP server, the GLX4000 can get its IP address from the server. Otherwise, the IP address must be configured as described in Power-up and Initial Configuration, below.

Signal Connections

The data signals switched by the GLX4000 enter and exit the network through the port cards. The type of connectors and cables are application-specific. See Appendix B for details on available port cards.

Power-up And Initial Configuration

Power-Up

Connect both of the GLX4000's power supplies to a power outlet using the provided power cords and turn on each supply's power switch. The green power indicator light on each supply will light and the fans will start up at full speed. A moment later, the green Ready indicator on each port card will light. After about 40 seconds some indicator lights on the display panel may illuminate and the Heartbeat indicator will begin to flash steadily. At this point a banner message and login prompt will be sent across the serial connection. The switch is now ready for operation through the network or serial connection. About 10 seconds after this stage the fans will reduce to a more nominal speed if the switch temperature is suitable.

Initiating Communications

To initially configure the date, time, and network settings, the serial port may be required for access. If network connectivity is initially unavailable, see "RS232 Port Connection" above. To connect a working serial terminal or PC with terminal emulator software, then skip to the Authentication section.

If the GLX4000 is reachable through the network determine its IP address and connect to it using a standard Telnet or SSH client. Information on determining the IP address can be found in "Initial Configuration" in this section.

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Connecting Via Telnet

Telnet clients vary somewhat in the setup of connections, but most options are acceptable as defaults. The most important options are the host name or IP address (use the IP address provided by the GLX4000) and the port number (use 23, which should be the default). To telnet from Windows for example, first click the Start button, then click Run... and type the following command:

```
telnet #.#.#.#
```

Replace each # with the corresponding portion of the IP address. To connect using a Unix-like system, enter the above command from a regular command shell. Proceed to the Authentication section.

Connecting Via Secure Shell

SSH clients are available for most platforms. As with telnet, most options should be suitable at their defaults. The switch accepts secure shell connections on the standard port 22. If connecting from a Unix-like system with commonly available SSH utilities installed, typically all that is needed is the following command:

```
ssh user@#.#.#.#
```

Replace "user" with an appropriate username (see below) and replace each # with the corresponding portion of the switch IP address.

Authentication

The GLX4000 provides access through user accounts. The default accounts on the switch are `guest, user,` and `admin`. The `guest` account has read-only access, meaning the account can view the switch routing and status, but cannot make any changes to the routing or any other configuration. By default, `guest` has no password, though you may assign one. The `user` account has read-write access, meaning the account is able to issue routing commands to set up connections within the switch. The default password for `user` is "password" (all lowercase). The `admin` account allows full access to the switch, including configuration of the underlying system. The default password for `admin` is "glx4000" (all lowercase).

To authenticate, connect via one of the three methods described above (serial, Telnet, or SSH). A brief identification message should appear followed by a login prompt. If connecting through the serial port, you may need to press the Enter key once or twice to see the login prompt. At the prompt, enter the appropriate username and press Enter. If the account has a password, the switch will then present another prompt. Type the password (nothing will be shown as you type) and press Enter. At this point some brief information will be presented followed by a command prompt.

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Initial Configuration

Initial configuration must be performed through the admin account. After authenticating as admin, perform the steps below from the ">" prompt. Note, each command must begin with an exclamation mark (!).

Time
The time and date appear in some status displays and messages. To display the current date and time, enter the command:

```
!sysdate
```

If the date or time needs corrected, use the command:

```
!sysdate -S
```

Follow the prompts to adjust the settings accordingly.

Passwords
To change account passwords, use the password command in one of the following instances:

```
!password guest
!password user
!password admin
```

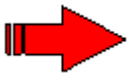
The switch will prompt for the new password. Enter a new password, or leave the input blank and just press Enter to set the account to not require a password. The admin account must have a password, however.

IP Configuration

The IP configuration of the switch can be modified through the serial console or Ethernet connection. The out-of-box configuration of the switch uses DHCP to obtain an IP address and other network information. However, this configuration can be modified to use a static IP address, netmask, and gateway.

Before you modify the IP settings on the GLX4000, obtain valid settings from your network administrator. You will need to get a valid IP address, netmask, and gateway/router address. Alternatively, you will need to confirm that your network runs a DHCP server.

In addition to the modifiable IP configuration, the GLX4000 also has one fixed IP address. The fixed IP address is 192.168.2.2 (subject to change) with netmask 255.255.255.0. It may be used to connect to the GLX4000 through Telnet or SSH. Establishing a connection to this IP address may require adjustments to the IP settings on your computer. Please contact your network administrator for assistance.



NOTE: Please do not use the fixed IP address for normal operation unless the GLX4000 will be connected point-to-point to one computer only. This is just a backup IP address intended to simplify the configuration of the GLX4000 on networks that do not support DHCP. If multiple switches are connected to the same network, the fixed IP addresses will create a conflict.

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In order to modify the IP configuration, a login session must be established with the switch. If the current IP address of the switch is unknown, then the simplest way to connect is through the serial console. The fixed IP address previously described may also be used. Also, the current IP address of the switch can be retrieved from the GLX4000 front LED panel. About one minute after power-on or reset, the switch displays the current IP address on the LED panel. The display will repeat 4 times, once each minute.

Once a Telnet, SSH, or serial console connection has been established, authenticate as user admin and run the command:

```
!ipconfig -S
```

for interactive setup. For help with the !ipconfig command, run:

```
!ipconfig -h
```



CAUTION: Improper configuration may result in significant problems on your local network.

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Chapter 6
OPERATION

Structure of the GLX4000

A fully loaded GLX4000 contains three port cards, each port card containing 48 data ports, for a total of 144 ports. The port cards each have two rows of 24 ports, numbered 0 to 23 for the top row, and continuing 24 to 47 in the second row and so on adding 24 for each successive row. Ports are referred to by their panel number (e.g., 0 through 143). Figure 6-1 shows the GLX4000 front panel with its lettering.

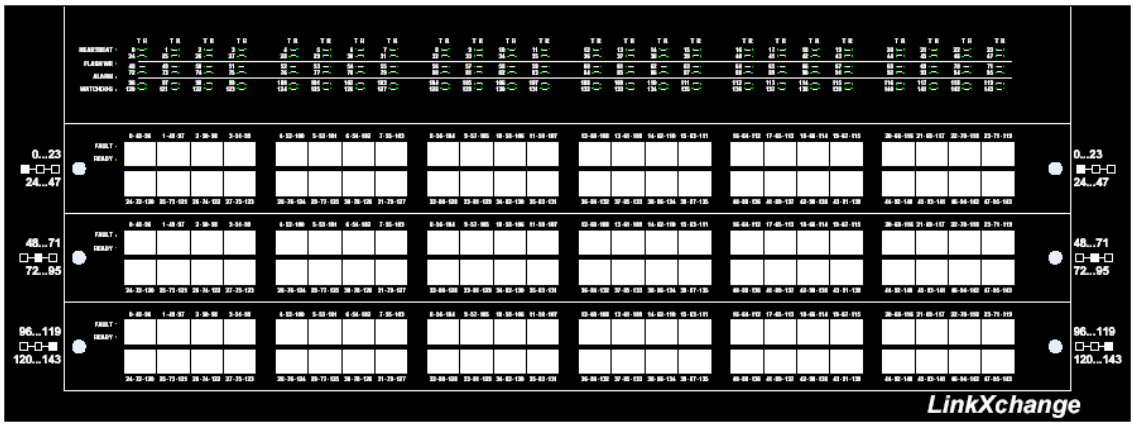


Figure 6-1 GLX4000 Front Panel

A GLX4000 also contains two power supplies, a controller card, and four fans, all of which are accessible from the rear of the enclosure.

Reliability and Serviceability Features

The GLX4000 contains a number of self monitoring features to avoid failure during operation. In most cases, if the system finds a problem it sets the Alarm condition, which lights the Alarm indicator on the front panel, sounds the audible alarm, and flags the problem to the user interface.

Fans. The GLX4000 monitors the speed of its fans and sets the Alarm condition if a fan is running slower than expected. The fans are hot-swappable, so a replacement can be installed while the system continues to run.

Temperature Sensors. Sensors monitor the GLX4000's internal temperature. The Alarm condition is set if a temperature goes above 70° C.

Power Supplies. The GLX4000 uses two redundant hot-swappable power supplies. Each supply produces a "power good" signal when it is operating within specifications, and the GLX4000 monitors these signals. The combined supply voltage is also monitored by a window comparator. The GLX4000 sets the Alarm condition if any of these signals depart from their normal states.

Either supply can furnish the GLX4000's entire power load by itself. In normal operation, the two supplies share the load between themselves. If a supply fails, it can be swapped out while the remaining supply supports the system.

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Power Fuses. Separate fuses on the backplane protect power to the backplane, controller card, and port cards. If a port card fuse blows, the GLX4000 sets the Alarm condition. The rest of the system continues to operate. (If the backplane or controller fuse blows, the GLX4000 has no way to report it.)

Power Regulators. The main power supplies produce 12 volts, which is distributed throughout the system and converted down to lower voltages by local regulators. The regulated voltages on the backplane and port cards are monitored by window comparators and the Alarm condition is set if they go out of spec. A failing port card can be swapped out while the rest of the system continues to operate.

Watchdog Timer. A timer on the backplane monitors operation of the controller. If the controller locks up for some reason, the watchdog resets the controller in an attempt to restore it to normal operation. The Watchdog indicator on the front panel lights when this occurs. The backplane and port cards continue to pass data while the controller resets, although they cannot respond to any changes in transceiver signal detects.

Watchdog resets should not occur in normal operation. A watchdog reset is an indication of a failure in the controller hardware or software. If you see watchdog resets in your GLX4000, contact Curtiss-Wright Controls, Data Communications Center support so the problem can be resolved.

GLX4000 Front Panel

Figures 6-2 and 6-3 show enlarged views of parts of the GLX4000 front panel including the indicators and ports. Ports are numbered from 0 at the top left to 143 at the bottom right of the front panel. At the far edges of the panel are legends that indicate the port numbers (A) in each row (e.g. **0…23**). The three small boxes (B) indicate the port number position (C). For example, ■–□–□ indicates the first of the three number marking the port is its number.

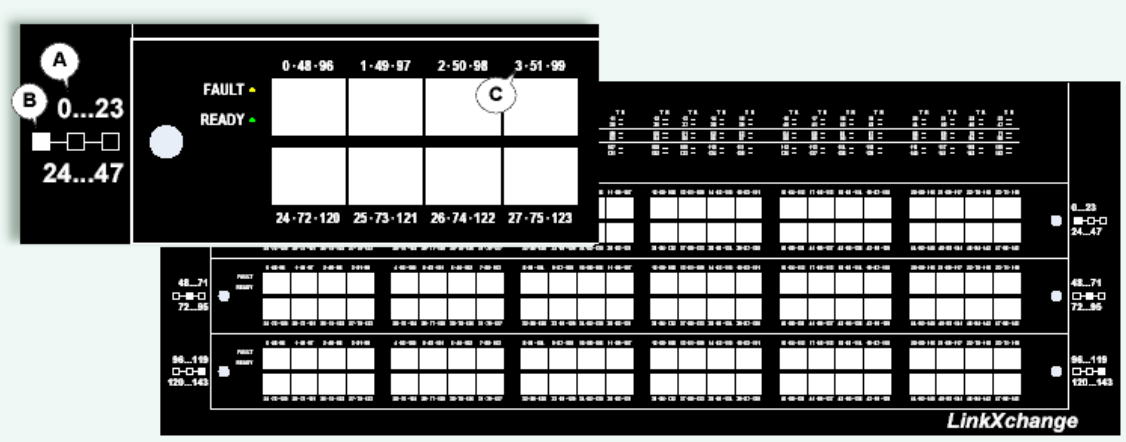


Figure 6-2 Detail of GLX4000 Front Panel

At the top of the panel above the port cards are system and port status indicators; the following list explains their meaning.

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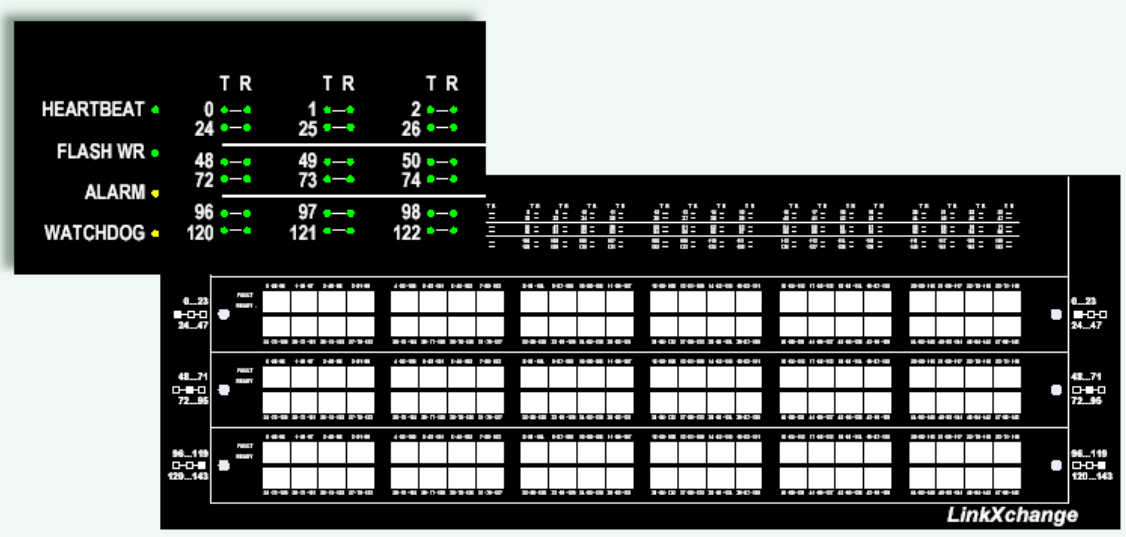


Figure 6-3 Detail of GLX4000 Front Panel

"Heartbeat" Indicator — Blinks at a 0.5 Hz rate (one second on, one second off) to indicate that the controller program is running.

"Flash WR" Indicator — Lights when the controller writes data to its CompactFlash module.

"Alarm" Indicator — Lights when an alarm condition exists, e.g. high temperature in the box or a fan running slow.

"Watchdog" Indicator — Lights to indicate that the Watchdog timer has tripped and reset the controller.

"T" Indicators — For each port, lights to indicate that the port's transmitter is enabled. For laser transceivers, this indicates that the laser is turned on.

"R" Indicators — For each port, lights to indicate a signal is detected at that port's receiver.

"Fault" Indicators — For each port card, lights to indicate that the port card has detected some sort of fault in its operation.

"Ready" Indicators — For each port card, lights to indicate that the port card has initialized and is ready for operation.

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GLX Rear Panel

Figure 6-4 shows the rear panel of the GLX4000.

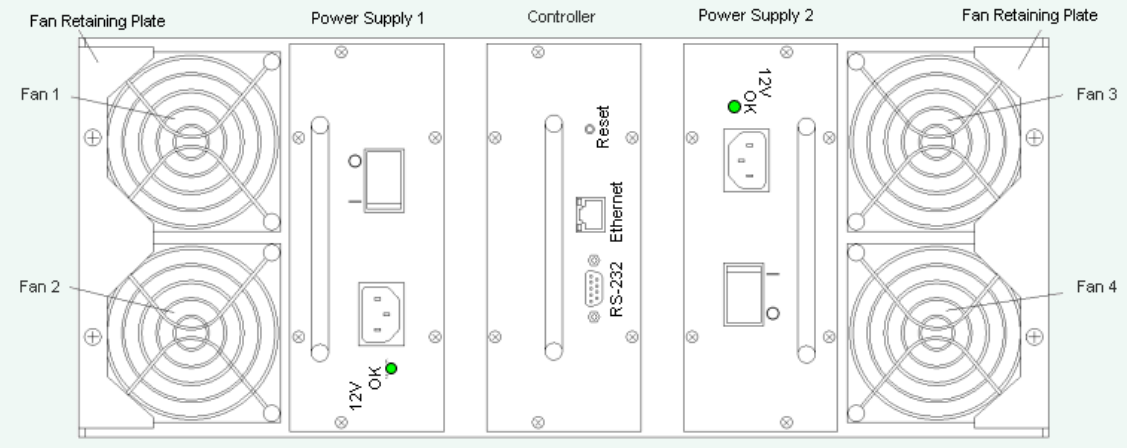


Figure 6-4 GLX4000 Rear Panel

Fans	Four separate fans are individually hot-swappable. Fans 1 and 2 draw air into the box; Fans 3 and 4 blow air out.
Power Supplies	Each power supply has its own line cord connector and power switch.
"12V OK" Indicators	On each power supply, lights when that power supply's 12V output is good.
Reset Pushbutton	Press to reset the controller.
Ethernet Port	Connection for 100Base-T or 10Base-T Ethernet cable.
Ethernet Speed Indicator	The upper LED on the Ethernet port lights when the Ethernet speed is 100 Mbps.
Ethernet Present / Activity Indicator	The lower LED on the Ethernet port lights when an Ethernet connection of either speed is detected, and blinks when the Ethernet is active.
RS-232 Port	The RS-232 port can be used for initial configuration of the GLX4000. The data rate is 38400 bps.

Using The Command Line Interface

To begin using the GLX4000 command line interface, first connect to the switch and authenticate as explained in "Authentication" in the "INSTALLATION" chapter. After logging in, the command line prompt (>) will appear at which commands may be entered. For online help, use the "h" command. Help for a specific command is displayed with "h command" where "command" is replaced appropriately.

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Some basic command groupings are as follows:

`h`	Online help
`st`	Display the routing status of some or all ports
`al`	Set up or view Auto Loops
`cc`	Set up any type of static port connections
`oe`	Control or view the output (Tx) enable for each port

The command line interface supports command history within any given session. This allows all previous commands from the same login session to be recalled by using the Up arrow and Down arrow keys. Command line editing allows the current command line to be modified in place by moving the cursor with the left and right arrow keys. Finally, the interface supports tab-completion of commands and PLists, whereby the Tab key is pressed after any number of initial letters have been entered, displaying all possible completions or automatically completing if only one is possible. For information on PLists, refer to the online help. The arrow key support is only available on capable terminals such as VT100, VT220, or ANSI.

Making Connections With The Switch

Available Routing Topologies

The GLX4000 can be used to establish complex data routing among communications devices. Available routing topologies include:

- Fixed loop
- Point-to-point
- Auto loop
- Chain
- Multicast
- Mixtures of routing topologies

Fixed loop routing provides simplex connections among devices, such that there is a complete route from the data source of device A back to the data sink of device A. For example, data may pass from device A to device B, from B to C, and from C back to A. From the GLX4000 command shell, such connections may be established using complex connect "cc" type commands. The shell's built-in help provides command details.

Point-to-point routing provides duplex connections between two devices. A point-to-point connection is effectively a fixed loop with two devices. From the GLX4000 command shell, such connections may be established using complex connect "cc" type commands.

Auto loops are similar to fixed loops. However, they are actively managed by the GLX4000 software. When the switch no longer detects a signal from a device, that device is removed from the auto loop, and a route bypassing the device is established. This way the remaining devices on the loop can continue to pass data. When the signal is restored the device is re-entered in the loop. From the GLX4000 command shell, such connections may be established using auto loop "`al`" type commands. The shell's built-in help provides command details.

Chain routing provides simplex connections among devices, such that there is no complete route from the data source of device A back to the data sink of device A. For example, data may pass from device A to device B, from B to C, and from C to D. From the GLX4000

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command shell, such connections may be established using complex connect "cc" type commands.

Multicast routing provides one-to-many connections among devices, such that data from one source device can be sent to the data sinks of many devices. For example, data may pass from device A to device B, from A to C, and from A to D. From the GLX4000 command shell, such connection may be established using multicast "m" type commands.

It is also possible to combine the routing topologies listed above, creating more complex configurations. For example, data from a device in an auto loop may also be routed to devices not in the auto loop to create a multicast.

Monitoring Temperature And Fans

High-speed electronic circuits dissipate significant power, and adequate ventilation is necessary to keep them from overheating. The GLX4000 has four fans to circulate air through its enclosure. Viewing the GLX4000 from the front, air is drawn into the enclosure by the two fans at the right rear. It flows through the enclosure and is exhausted by the two fans at the left rear. The GLX4000 controller automatically controls the speed of the fans to maximize their life and minimize noise.

A tachometer monitors each fan's speed. The tachometers can be used to detect a failing fan and replace it while the other fans carry the cooling load.

Three temperature sensors are associated with the backplane. One (BT1) is located near the crosspoint IC, and a second (BT2) at the left edge of the backplane. The third (BT3) is actually on the controller card.

Each port card has two temperature sensors. PxT1 (where "x" is the port card number) is at the card's front left corner, where air has been heated to a maximum by flowing across the port card electronics. PxT2 is at the right rear edge of the card, where air has only been heated by flowing across one of the power supplies. The air here will be only a few degrees warmer than the inlet air.

Use the "bc env" command to display fan speeds and temperature readings:

```
>bc env
_HDR=Fan1 Fan2 Fan3 Fan4 BT1 BT2 BT3 P1T1 P1T2 P2T1 P2T2 P3T1 P3T2
_BCE=3747 3786 3881 3767 28  29  30   32   27   36   27   34   26
```

If a fan speed is too low or a temperature is too high, an alarm sounds and a message is displayed. The alarm is silenced with the command "bc alarm"; this turns off the alarm until the next fault occurs.

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Chapter 7
HARDWARE CONFIGURATION

Configuring Switches and Jumpers

Backplane Configuration Switches

"S1" is a block of four switches near the upper-left corner of the backplane. They are labeled "A, B, C, D" on the printed circuit board and "1, 2, 3, 4" on the switch body. Rocking a switch up closes it; rocking it down opens it.

The functions of the backplane switches are as follows:

Table 7-1 Backplane Configuration Switches

Switch	Default Position	Function
A / 1	closed	Closed: Controller expects Power Supply 1 to be populated. Open: The presence of Power Supply 1 is ignored.
B / 2	closed	Closed: Controller expects Power Supply 2 to be populated. Open: The presence of Power Supply 2 is ignored.
C / 3	open	Spare; ignored by current software.
D / 4	open	Closed: At boot time initialize configuration to factory defaults. Open: Standard boot.

Controller "Clear CMOS" Jumper

The CMOS memory and time-of-day clock on the controller is supported by a 1-Farad capacitor. This capacitor charges whenever the system is powered up and should support the CMOS for about two weeks without power. To clear the CMOS, this capacitor must be discharged. To discharge the capacitor, remove the controller from the system and short together the two pins of J9. Keep the short in place for at least 10 minutes to make sure the capacitor is discharged.

User Replaceable Parts

The GLX4000 is a modular design in which many of its parts can be easily replaced. Most parts can be hot-swapped: They can be inserted into and removed from the system while the system is powered up and running, without interfering with the operation of the remainder of the system.

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CAUTION: Exercise care regarding the static environment. Use an anti-static mat connected to a wristband when handling or installing GLX4000 parts.

Port Cards

GLX4000 port cards are hot pluggable and may be inserted into or removed from the system at any time.

To remove a port card from the GLX4000:

1. Unscrew the two retaining screws at the sides of the card's faceplate. The screws are captive and should remain in the faceplate.
2. Grip the retaining screws and pull the card away from its connectors.
3. *Carefully* slide the card out of its slot. Remember that any port cards still in the switch are under power. Be careful not to cause shorts.

To insert a port card into the GLX4000:

1. Carefully align the card with its card guides. It is important to take care here in order to keep the card from brushing against its neighbors and causing shorts.
2. Slide the card into its slot until it is fully seated. If you feel any unusual resistance as the card seats, remove it and examine its connectors and their mates on the backplane. It is possible for the connector pins to become slightly misaligned. It is much easier to fix them before they have been crushed by a mis-mating connector.
3. If power is on when the card seats, the GLX4000 will detect its presence. The card's Ready indicator will light and some "T" and "R" lights in the card's rows on the display panel may light. The "Alarm" indicator may flash briefly as the card seats; this is normal and may be ignored.
4. If the lights don't behave as described, there may be a problem with the card. Remove it and try again. If that doesn't work, try a different card.
5. Tighten the retaining screws at the sides of the card's face plate.

Small Form-factor Pluggable (SFP) Transceiver Modules

EYE SAFETY

The optoelectronic transceiver modules used in this product are class 1 laser products compliant with FDA Radiation Performance Standards, 21 CFR Subchapter J. These components are also class 1 laser compliant according to International Safety Standard IEC-825-1. Class 1 lasers are considered incapable of producing damaging radiation under reasonably foreseeable conditions of operation.

The SFP transceiver modules used on some port cards are hot pluggable and may be inserted into or removed from the card at any time.

To insert an SFP module:

1. Hold the module with its labeled surface up for a receptacle on the top side of the port card, or down for a receptacle on the bottom side of the port card.
2. Slide the module into the receptacle. There will be a small click as the module latches into place.

To remove an SFP module:

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1. Activate the latch release on the module. This may be a bail that rotates out or a button or tab on the bottom side of the module. The module will pop out slightly as the latch releases.
2. Pull the module out of the receptacle.
3. Unpopulated SFP port cards are shipped with a Dust/EMI plug for each transceiver receptacle. Install these in empty receptacles to prevent contamination of internal components and to optimize EMI performance.

Power Supplies

The GLX4000's power supplies are hot pluggable. Either supply may be removed and replaced while the other supply continues to power the system. The "12V OK" indicator on each supply lights to indicate that the supply is providing power to the GLX4000. (When both supplies are working, they share the load.)

Avoid operating the GLX4000 for long periods of time with an open Power Supply slot. The large opening in the rear panel impairs the flow of cooling air through the box.

To remove a power supply from the GLX4000:

1. Turn off the power supply. If the supply was operating normally, this will cause the GLX4000 to indicate an alarm because the supply has "failed." This is normal.
2. Unplug AC cord from the power supply.
3. Unscrew the six retaining screws around the perimeter of the supply's faceplate. The screws are captive and should remain in the faceplate.
4. Use the handle to pull the card away from its connectors and slide it out of its slot.

To insert a power supply into the GLX4000:

1. Carefully align the power supply with its card guides and slide the card into its slot until it is fully seated. If you feel any unusual resistance as the card seats, remove it and examine its connectors and their mates on the backplane.
2. Tighten the six retaining screws around the perimeter of the supply's faceplate.
3. Attach the supply's AC power source.
4. Turn the supply's power switch on. The "12V OK" indicator on the supply should light to indicate that the supply is providing power to the system.

Fans

The four fans on the GLX4000's rear panel are hot pluggable. Any fan may be swapped out while the others continue to cool the system. There are two types of fan subassemblies: Fans 1 and 2 (see Figure 6-4) are *inlet* fans, which blow air into the box. Fans 3 and 4 are *outlet* fans, which blow air out of the box. Arrows molded into the fan bodies indicate the direction of air flow and fan rotation. Do not install an inlet fan on the outlet side of the box, or vice versa.

To remove a fan from the GLX4000:

1. Unscrew the two screws holding the fan retaining plate and set the plate and screws aside.
2. Use fingernails or a small tool to grip the finger guard and pull the fan out of its niche. (Be careful; an inlet fan's blades are about 5mm behind the finger guard.) If the fan was running normally, this will cause the GLX4000 to indicate an alarm because the fan has "failed." This is normal.

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To insert a fan into the GLX4000:

1. Double-check the airflow direction arrow on the fan. It should point into the box for an inlet fan (fan 1 or 2) and out of the box for an outlet fan (fan 3 or 4).
2. Orient the fan assembly so its connector is toward the side of the box, to align it with its mate inside the box.
3. Slide the fan into its niche until it is fully seated. If power is on, the fan will start up as its connector mates. If it does not start up, remove the fan and look for the problem. Perhaps the assembly is rotated so the connectors don't mate. Correct and try again.
4. Replace the fan retaining plate and fasten it in place with its two screws.

Controller

The GLX4000 controller is not hot-pluggable, However, it can be hot-plugged without damaging the hardware, but not without disrupting operation.

To remove the controller from the GLX4000:

1. Turn off the power switches on both power supplies.
2. Unscrew the six retaining screws around the perimeter of the controller's faceplate. The screws are captive and should remain in the faceplate.
3. Use the handle to pull the card away from its connectors and slide it out of its slot.

To insert the controller into the GLX4000:

1. Carefully align the controller with its card guides and slide the card into its slot until it is fully seated. If you feel any unusual resistance as the card seats, remove it and examine its connectors and their mates on the backplane. It is possible for the connector pins to become slightly misaligned. It is much easier to fix them before they have been crushed by a mis-mating connector.
2. Tighten the six retaining screws around the perimeter of the controller's faceplate.

CompactFlash Module

The CompactFlash module resides in a socket on the GLX4000 controller and acts as a disk drive for the controller's CPU. The GLX4000's controlling software and configuration data reside on the module.

To remove the CompactFlash module from the GLX4000:

1. Remove the controller from the GLX4000 as described above.
2. The ejector button on the CompactFlash socket folds over the end of the module to latch it into place. Unfold the ejector button and press it toward the rear of the socket to eject the module.

To install the CompactFlash module:

1. Place the module in front of the socket label-side up, holding the ejector button out of the way, and slide the module into the socket.
2. As the module seats into the connector, the ejector button folds over the end of the module. Make sure the module is fully seated.
3. Replace the controller assembly in the GLX4000 as described above.

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Fuses

Five fuses on the front side of the GLX4000 backplane protect the system from short circuits. The fuse holders are labeled Controller, Backplane, PC1 (Port Card 1), PC2 (Port Card 2), and PC3 (Port Card 3). The fuses are 5 x 20 mm fast-acting miniature cartridge fuses, designed to meet IEC standard 60127-2/2. The following table shows fuse ratings and suggested replacement part numbers.

Table 7-2 User Replaceable Fuses

Fuse Location	Current Rating	Littelfuse P/N	Schurter P/N
Backplane PC1 PC2 PC3	10A	217-010	0034.1526
Controller	5A	217-010	0034.1523

To replace a fuse, first turn off both power supplies and unplug both supplies from the AC power source. Remove all three port cards to gain access to the fuse holders on the backplane.

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Chapter 8
APPENDICES

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Appendix A

Base Unit Specifications

Physical Dimension:	with handles, mounting ears: 19.05" wide by 7.0" tall by 17.75"deep (484 mm by 178 mm by 450 mm)
Box only:	17.13" wide by 7.0" tall by 15.75"deep (435 mm by 178 mm by 400 mm)
Weight:	43 pounds (19.5 Kg)
Power Requirements:	Input voltage: 90-132 or 180-264 VAC, 47-63 Hz Input power 370 watts total
Storage Temperature Range:	-40° to +85° C
Operating Temperature Range:	-10° to +60° C
Storage Humidity Range:	5% to 95% (noncondensing)
Operating Humidity Range:	10% to 90% (noncondensing)
Data Rates:	Up to 4.25 Gbps (port card dependent)
Total Bandwidth:	612 Gbps

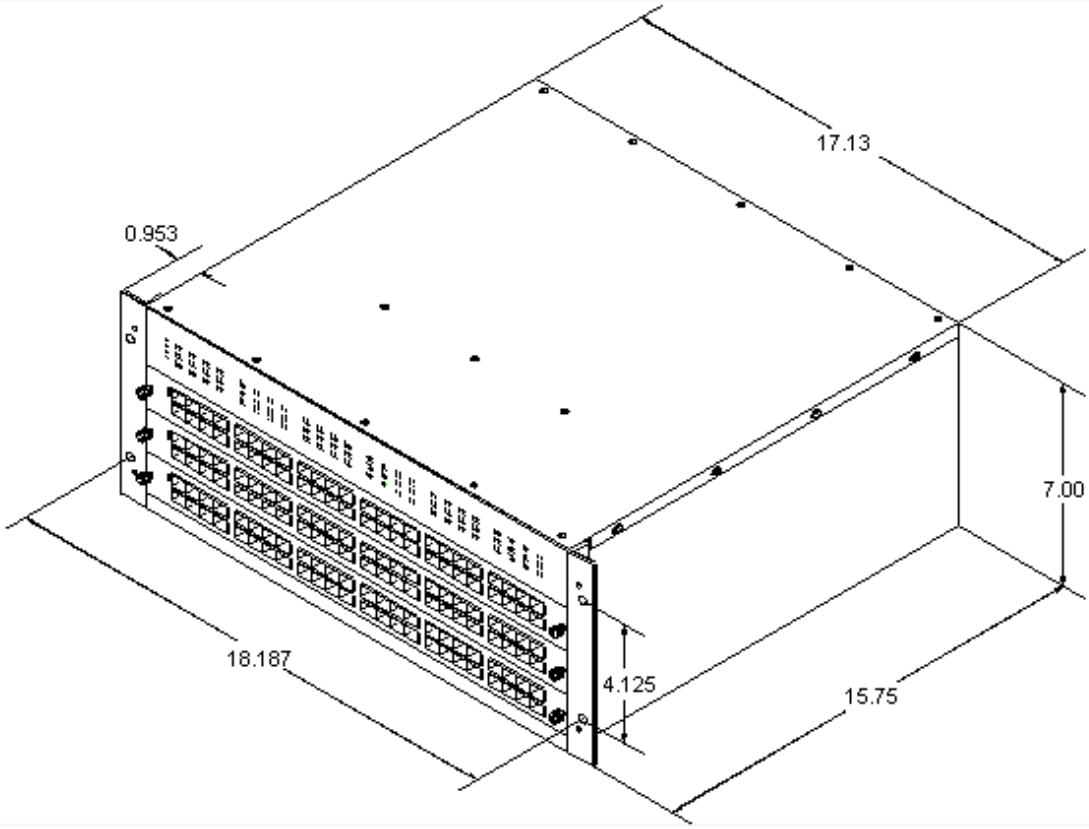


Figure A-1 GLX4000 Dimensions

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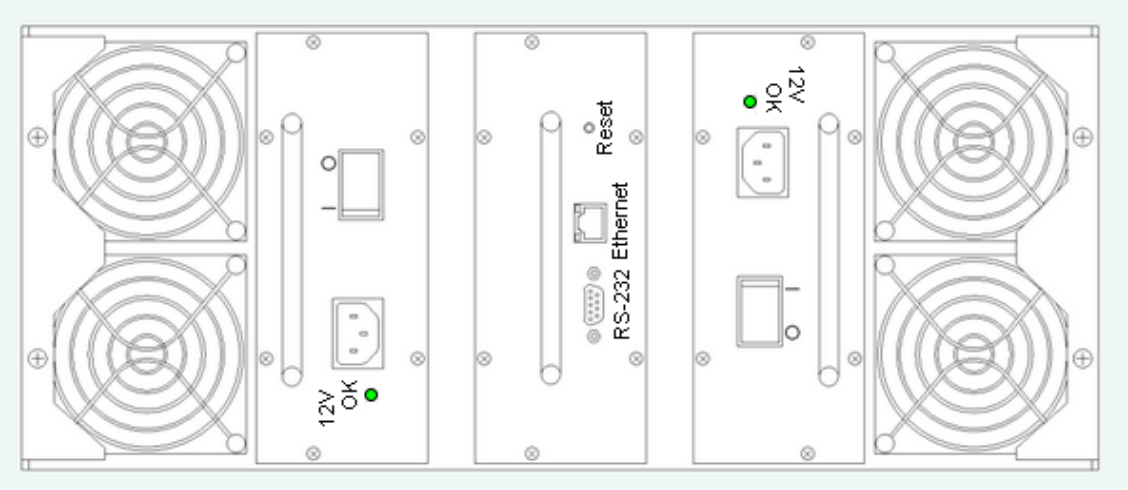


Figure A-2 GLX4000 Rear Panel

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Appendix B

SFP Port Card

The Small Form Factor Pluggable (SFP) Port Card uses pluggable transceiver modules to interface to a variety of media and data rates.

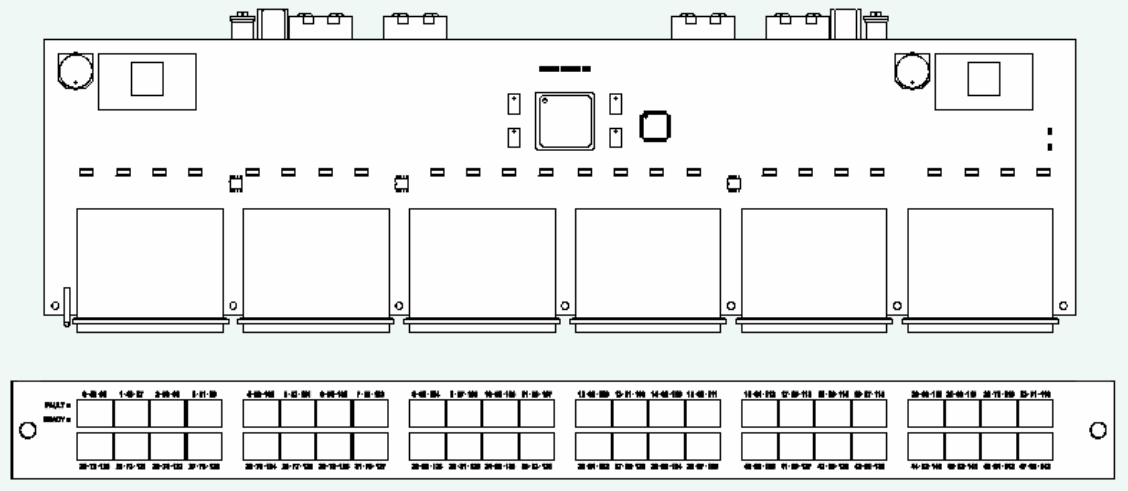


Figure B-1 SFP Port Card

Features:

- 48 bi-directional ports per card.
- Data rates up to 4.25 Gbps, depending on the SFP transceiver type.
- Individual transceivers are hot-pluggable.
- Compatibility depends on SFP type.

Operating Constraints:

Power Consumption:	30W typical
(Depends on transceivers)	65W maximum
Weight (with Curtiss-Wright Controls transceivers):	3.3 lbs (1.5 kg)
Operating Temperature Range:	-10° to 60° C
Storage Temperature Range:	-40° to 85° C
Operating Humidity Range:	5% to 95% (noncondensing)
Storage Humidity Range:	0% to 95% (noncondensing)

SFP Modules:

Any transceiver that conforms with the Small Form-factor Pluggable Multi-Source Agreement is compatible with this card. Curtiss-Wright Controls sells the SFP Port Card with the following SFP transceiver options:

- 48 Duplex LC, 850 nm multimode optical, 2.5/2.125/1.0625 Gbps transceivers.
- 48 Duplex LC, 850 nm multimode optical, 2.125/1.0625 Gbps transceivers.
- No transceivers; dust/EMI plugs only.

Panel:

- 48 SFP ports.
- "Ready" indicator lights when card is powered and initialized.

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- "Fault" indicator lights if any SFP module indicates a transmitter fault.

Tested Applications:

The SFP Port Card has been tested and found to work in the following applications:

- 1.0625 Gbps Curtiss-Wright Controls FibreXtreme SL100 and Simplex Link Series using an optical interface.
- 2.5 Gbps Curtiss-Wright Controls FibreXtreme SL240 Series using an optical interface.
- 1.0625 Gbps Fibre Channel using an optical interface.
- 2.125 Gbps Fibre Channel using an optical interface.

The above list contains all of the applications that were tested by the time this manual was printed. New applications are being tested continuously. For an up-to-date list of tested applications, please contact Curtiss-Wright Controls Data Communications Center at **(800) 252-5601**.

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Appendix C

RS-232 Connector

This appendix describes the GLX4000's RS-232 port and how it connects to a video terminal or a computer emulating such a terminal.

Table C-1 GLX4000 Pin Assignments

Pin	Signal	Direction
1	DCD	in
2	RxD	in
3	TxD	out
4	DTR	out
5	GND	
6	DSR	in
7	RTS	out
8	CTS	in
9	RI	in

Cable Connections

The null modem cable shown in Figure C-1 can be used to connect the GLX4000 DB-9 connector to a personal computer's DB-9 serial port.

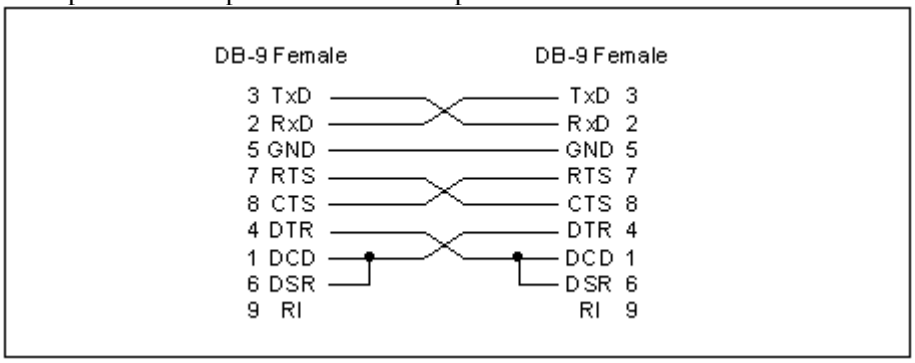


Figure C-1 DB-9-to-DB-9 Null Modem Cable

The similar cable shown in Figure C-2 can be used to connect the GLX4000 to a terminal that uses the traditional male DB-25 connector and pin assignments. Both of these cables are widely available off the shelf.

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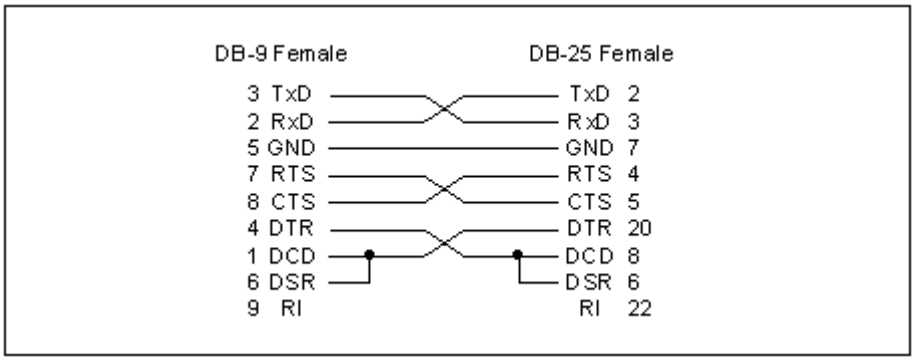


Figure C-2 DB-9-to-DB-25 Null Modem Cable

Data Rate and Format

The data rate and format for the RS-232 port is fixed at 38400 bits per second (bps), eight data bits, no parity, one stop bit, with no flow control.

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