

Gigabit PoE+ Ethernet Managed Switch Eco

Installation and Getting Started Guide

- LPB5028A has (20) 10/100/1000BASE-T access ports, (4) 100/1G copper/fiber combo ports with dual-speed SFP slots, and (4) 10 Gigabit SFP+ uplink ports with dual-speed (1G/10G).
- LPB5052A has (48) 10/100/1000BASE-T access ports, and (4) 10 Gigabit SFP+ uplink ports with dual-speed (1G/10G).



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1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
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4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá de lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquear la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.
10. El equipo eléctrico debe ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.
12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
 - A: El cable de poder o el contacto ha sido dañado; u
 - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
 - C: El aparato ha sido expuesto a la lluvia; o
 - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
 - E: El aparato ha sido tirado o su cubierta ha sido dañada.

Installation and Getting Started Guide for:

Gigabit PoE+ Ethernet Managed Switch Eco – 24-Port

Gigabit PoE+ Ethernet Managed Switch Eco – 52-Port

About this Guide

This guide gives specific information on how to operate and use the management functions of the Gigabit PoE+ Ethernet Managed Switch Eco.

The guide is intended for use by network administrators who are responsible for operating and maintaining network equipment; consequently, it assumes a basic working knowledge of general switch functions, the Internet Protocol (IP), and Simple Network Management Protocol (SNMP).

The following conventions are used throughout this guide to show information:

NOTE: Emphasizes important information or calls your attention to related features or instructions.

CAUTION: Alerts you to a potential hazard that could cause loss of data, or damage the system or equipment.

WARNING: Alerts you to a potential hazard that could cause personal injury.

Safety Information

CAUTION: Circuit devices are sensitive to static electricity, which can damage their delicate electronics. Dry weather conditions or walking across a carpeted floor may cause you to acquire a static electrical charge.

To protect your device, always:

- Touch the metal chassis of your computer to ground the static electrical charge before you pick up the circuit device.
- Pick up the device by holding it on the left and right edges only.
- If you need to connect this switch to an outdoor device, add an arrester on the cable between the outdoor device and this switch.

NOTE: The switch is indoor device, if it connects with an outdoor device, then it must use a lightning arrester to protect the switch.

WARNING:

- *Do not place the switch outdoors.*
- *Before installation, make sure the input power supply and product specifications are compatible with each other.*
- *To reduce the risk of electric shock, disconnect all AC or DC power cords and RPS cables to completely remove power from the unit.*
- *Before importing/exporting configuration, make sure the firmware version is the same.*
- *After a firmware upgrade, the switch will update automatically to the latest firmware version.*

How to Download the User Manual

The Gigabit PoE+ Ethernet Managed Switch Eco user manual gives specific information on how to operate and use the management functions of the switch:

To download the Gigabit PoE+ Ethernet Managed Switch Eco user manual from the Web site:

1. Go to www.blackbox.com
2. Enter the part number (LPB5028A or LPB5052A) in the search box:
3. Click on the "Resources" tab on the product page, and select the document you wish to download.

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1. Overview

1.1 Introduction

The Gigabit PoE+ Ethernet Managed Switch Eco provides a reliable infrastructure for your business network. The switch improves the availability of your critical business applications, protects your sensitive information, and optimizes your network bandwidth. Easy to set up and use, it provides the ideal combination of affordability and capabilities for entry-level networking. Use the switch in a small business or enterprise application.

Two models are available:

- Gigabit PoE+ Ethernet Managed Switch Eco – 24-Port (product code LPB5028A). This model has (20) 10/100/1000BASE-T access ports, (4) copper/fiber combo ports with dual-speed SFP slots, and (4) 10 Gigabit SFP+ uplink ports with dual speed (1G/10G).
- Gigabit PoE+ Ethernet Managed Switch Eco – 52-Port (product code LPB5052A). This model has (48) 10/100/1000BASE-T access ports and (4) 10 Gigabit SFP+ uplink slots with dual speed (1G/10G).

Unlike other entry-level network switching solutions that provide advance managed network capabilities only in the costliest models, the Gigabit PoE+ Ethernet Managed Switch Eco supports data, voice, security, and wireless technologies. The switch is easy to deploy and configure.

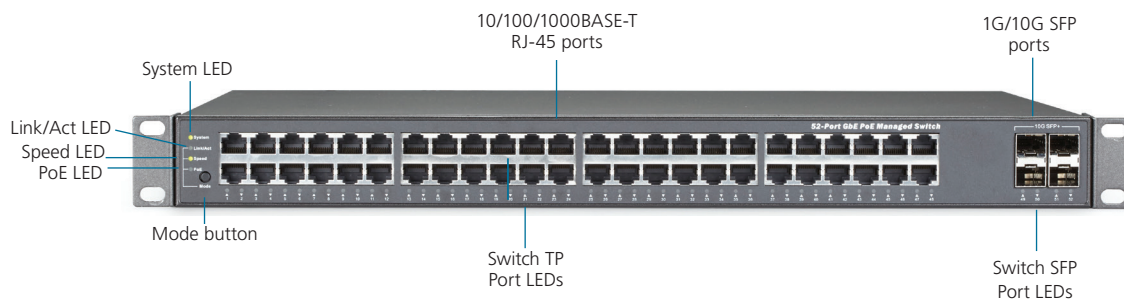


Figure 1-1. Front of the LPB5052A Switch.



Figure 1-2. Back of the LPB5028A or LPB5052A Switch.

1.2 Switch Architecture

The switch operates at wire-speed, transporting multiple packets at low latency on all ports simultaneously. The switch also operates at full-duplex, which effectively doubles the bandwidth of each connection.

For maximum data integrity, the switch uses store-and-forward technology. With this technology, the entire packet is received into a buffer and checked for validity before it is forwarded. This prevents errors from being propagated throughout the network.

1.3 Network Management Options

You can also manage the switch over the network via a Web browser or Telnet. The switch includes a built-in network management agent that allows it to be managed in-band using SNMP or RMON (Groups 1, 2, 3, 9) protocols. It also has an RS-232 console port connector on the front panel for out-of-band management. A PC may be connected to this port for configuration and monitoring out-of-band via a null-modem serial cable. (See Appendix B for wiring options.)

NOTE: For a detailed description of the management features, refer to the user's manual.

To download the Gigabit PoE+ Ethernet Managed Switch Eco user manual from the Web site:

1. Go to www.blackbox.com
2. Enter the part number (LPB5028A or LPB5052A) in the search box:
3. Click on the "Resources" tab on the product page, and select the document you wish to download.

2. Hardware Description

2.1 1000BASE-T Ports

The LPB5028A switch has 24 1000BASE-T RJ-45 ports, and the LPB5052A switch has 48 1000BASE-T RJ-45 ports. All RJ-45 ports support automatic MDI/MDI-X operation, auto-negotiation and IEEE 802.3x auto-negotiation of flow control, so the optimum data rate and transmission can be selected automatically.

2.2 SFP Transceiver Slots

The Gigabit PoE+ Ethernet Managed Switch Eco LPB5028A supports the Small Form Factor Pluggable (SFP) transceiver slots on ports 24 to 28, and the LPB5052A supports SFP on ports 48 to 52.

Table 2-1 shows a list of transceiver types that have been tested with the switch. For information on the recommended standards for fiber optic cabling, see “1000 Mbps Gigabit Ethernet Collision Domain” on page X.

Table 2-1. Supported SFP Transceivers.	
Product Code	Description
LFP401	SFP, 155-Mbps Fiber with Extended Diagnostics, 850-nm Multimode, LC, 2 km
LFP402	SFP, 155-Mbps Fiber with Extended Diagnostics, 1310-nm Multimode, 2 km, LC
LFP403	SFP, 155-Mbps Fiber with Extended Diagnostics, 1310-nm Single-Mode, Plus, 30 km, LC
LFP411	SFP, 1.25-Gbps Fiber with Extended Diagnostics, 850-nm Multimode, LC, 300 m
LFP412	SFP, 1.25-Gbps Fiber with Extended Diagnostics, 1310-nm Multimode, LC, 2 km
LFP413	SFP, 1.25-Gbps Fiber with Extended Diagnostics, 1310-nm Single-Mode, LC, 10 km
LFP414	SFP, 1.25-Gbps Fiber with Extended Diagnostics, 1310-nm Single-Mode, LC, 30 km
LSP421	10GBASE-SR SFP+, 850-nm Multimode, 300 m, LC
LSP422	10GBASE-SR SFP+, 1310-nm Single-Mode, 10 km, LC

2.3 Port and System LEDs

The Gigabit PoE+ Ethernet Managed Switch Eco switch includes a display panel for system and port indications that simplify installation and network troubleshooting. The LEDs are located on left-hand side of the front panel for easy viewing. Details are shown below and described in the following tables.

Table 2-2. Port Status LEDs.		
LED	Condition	Status
TP (Link/ACT)	Green/Blinking	Lights Green when TP link is good. Blinks when any traffic is present.
TP SPEED	Green/Yellow	Lights Green when TP link on 1000 Mbps. Yellow when TP link on 10/100 Mbps.
PoE (Link/ACT)	Green	Lights Green when PoE links with PD and supplies power to PD.
SFP (Link/ACT)	Green/Blinking	Lights Green when SFP link good. Blinks when any traffic is present.
SFP SPEED	Blue/Green	Lights Blue when SFP link on 10Gbps. Green when SFP link on 1000Mbps

Table 2-3. System Status LED.

LED	Condition	Status
System LED	Green, OFF	Lights when power is on and the switch is ready.

2.4 Power Supply Socket

The power socket uses an AC power cord and is located on the rear panel of the switch. See Figure 1-2.

2.5 Mode Status LEDs

The Gigabit PoE+ Ethernet Managed Switch Eco has a mode switch. Each LED can switch between Link/ACT mode and Speed mode when you press the Mode button. When the switch is on Link/ACT mode, each port's LED indicates the link or activity status. When switch is in Speed mode, each port's LED shows the link speed status of the port using different colors.

Table 2-4. Mode Status LED.

LED	Condition	Status
Link/ACT	Green	Lights when the corresponding port is in Link/ACT mode.
Speed	Green	Lights when the corresponding port is in Speed mode.
PoE (Link/ACT)	Green	Lights when the corresponding port is in PoE (Link/ACT) mode.

3. Network Planning

3.1 Introduction to Switching

A network switch allows simultaneous transmission of multiple packets, and it can partition a network more efficiently than bridges or routers.

When performance bottlenecks are caused by congestion at the network access point such as file server, the device can be connected directly to a switched port. In full-duplex mode, the bandwidth of the dedicated segment can be doubled to maximize throughput.

When networks are based on repeater (hub) technology, the distance between end stations is limited by a maximum hop count. A switch can subdivide the network into smaller and more manageable segments, and link them to the larger network.

A switch can be easily configured in any Ethernet, Fast Ethernet, or Gigabit Ethernet network to significantly increase bandwidth while using conventional cabling and network cards.

3.2 Application Examples

The Gigabit PoE+ Ethernet Managed Switch Eco LPB5028A has 24 Gigabit Ethernet twisted-pair ports with auto MDI-X and 4 slots for removable SFP modules (PART NUMBER) that support LC and BiDi-LC fiberoptic modules. The LPB5052A has 48 Gigabit Ethernet twisted-pair ports with auto MDI-X and 4 SFP module slots. The switch not only segments your network, but also provides a wide range of options in setting up network connections. Some typical applications are described below.

The switch is suitable for the following applications:

- Remote site application for Enterprise or SMB.
- Peer-to-peer application for two remote offices.
- Office network
- High-performance Requirement environment
- Advanced security for network safety application.
- Suitable for data/voice and videoconferencing application.

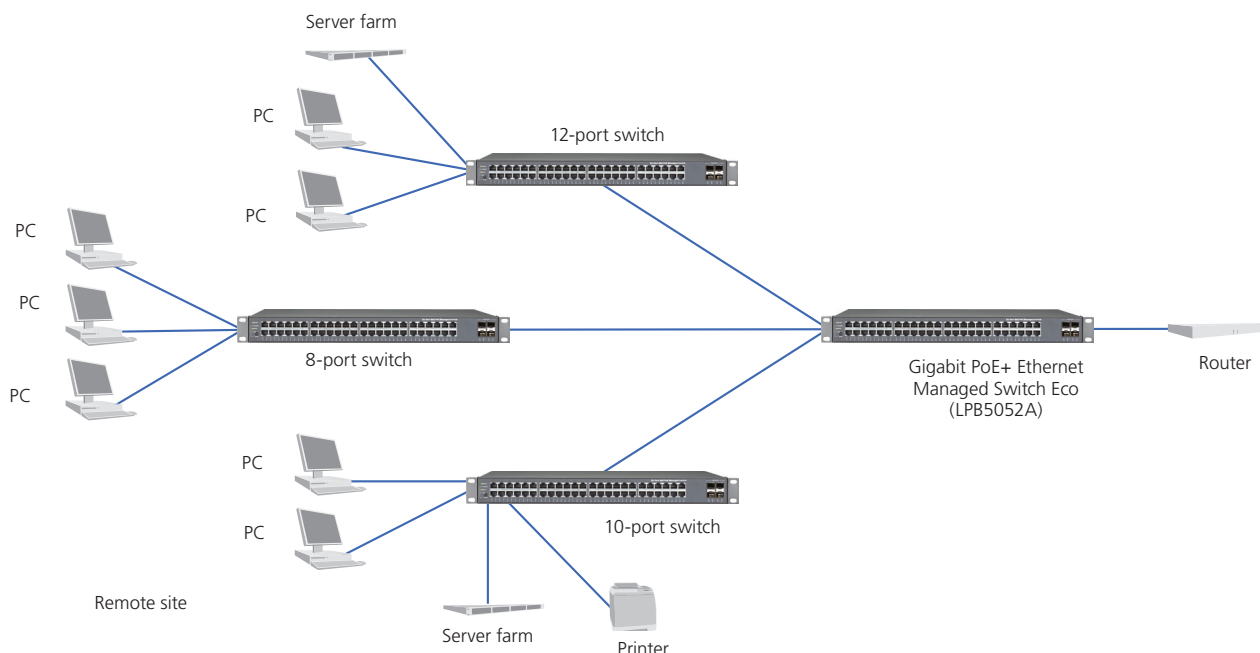


Figure 3-1. Network connection between remote site and central site.

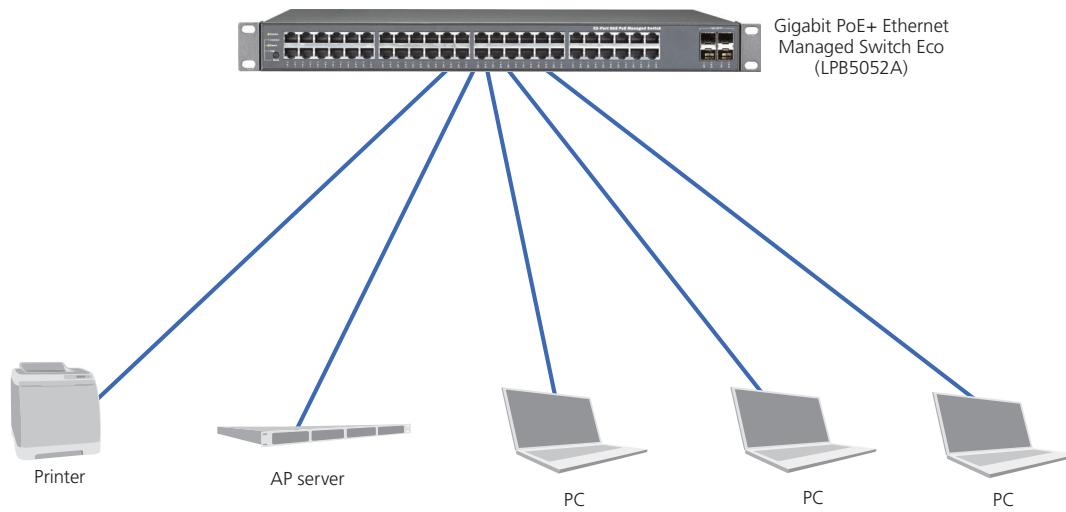


Figure 3-2. Peer-to-peer network connection.

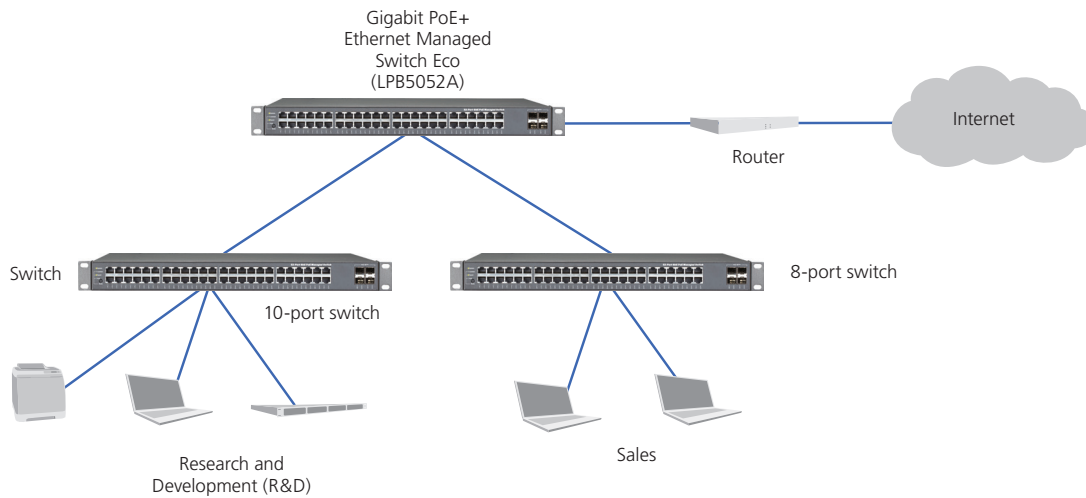


Figure 3-3. Office network connection.

4. Installing the Switch

4.1 Selecting a Site

The Switch can be mounted in a standard 19-inch equipment rack (via an optional rackmount kit, part number XXXXX??) or on a flat surface. Follow the guidelines below when choosing a location.

The site should:

- Be at the center of all the devices you want to link and near a power outlet.
- Maintain its temperature within 32 to 104 °F (0 to 40° C) and its humidity within 10% to 90%, non-condensing.
- Be accessible for installing, cabling, and maintaining the devices.
- Allow the status LEDs to be clearly visible.

Make sure the twisted-pair Ethernet cable is always routed away from power lines, radios, transmitters or any other electrical interference.

Make sure that the switch is connected to a separate grounded power outlet that provides 100 to 240 VAC, 50 to 60 Hz.

4.2 Ethernet Cabling

For proper operation when installing the switch into a network, make sure that the current cables are suitable for 100BASE-TX or 1000BASE-T operation. Check the following criteria against the current installation of your network:

- Cable type: Use unshielded twisted pair (UTP) or shielded twisted pair (STP) cable with RJ-45 connectors. Black Box recommends Category 5 or Category 5e with maximum length of 328 feet (100 meters) for 100BASE-TX, and Category 5e or 6 with maximum length of 328 feet (100 meters) for 1000BASE-T.
- Protection from radio frequency interference emissions.
- Electrical surge suppression.
- Separation of electrical wires and data based network wiring.
- Safe connections with no damaged cables, connectors, or shields.

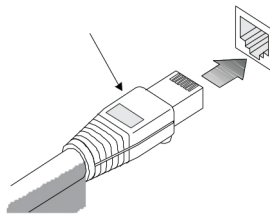


Figure 4-1. RJ-45 connection.

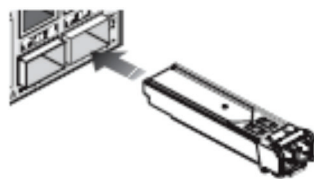


Figure 4-2. SFP transceiver.

4.3 What's Included

Your package should contain the following items. If anything is missing or damaged, contact Black Box Technical Support at 724-746-5500 or info@blackbox.com.

- Gigabit PoE+ Ethernet Managed Switch Eco
- (4) adhesive rubber feet
- 19" Rackmount kit
- This printed Installation and Getting Started Guide
- AC power cord
- RS-232 to RJ-45 Console Cable

To download the user manual from the Black Box Web site:

1. Go to www.blackbox.com
2. Enter the part number (LPB5028A or LPB5052A) in the search box:
3. Click on the "Resources" tab on the product page, and select the document you wish to download.

WARNING: The mini-GBICs are Class 1 laser devices. Avoid direct eye exposure to the beam coming from the transmit port.

4.4 Mounting

The switch can be mounted in a standard 19-inch equipment rack or on a desktop or shelf. Mounting instructions for each type of site as follow.

4.4.1 Rackmounting

Before rackmounting the switch, consider the following:

- Temperature: Since the temperature within a rack assembly may be higher than the ambient room temperature, check that the rack-environment temperature is within the specified operating temperature range 32 to 104° F (0 to 40° C).
- Mechanical Loading: Do not place any equipment on top of a rackmounted unit.
- Circuit Overloading: Be sure that the supply circuit to the rack assembly is not overloaded.
- Grounding: Rack-mounted equipment should be properly grounded.

To rackmount devices:

Step 1. Attach the brackets to the device using the screws provided in the mounting accessory.

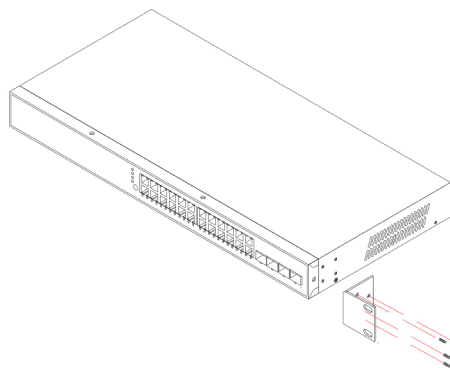


Figure 4-3. Attaching the brackets.

Chapter 4: Installing the Switch

Step 2. Mount the device in the rack (via the included ackmount kit), using four rackmounting screws (not provided). Be sure to secure the lower rackmounting screws first to prevent the brackets from bending from the weight of the switch.

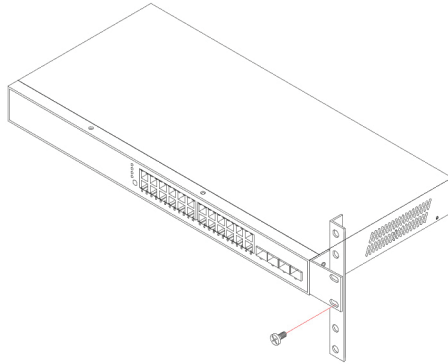


Figure 4-4. Installing the switch in a rack.

Step 3. If installing a single switch only, go to Section 4.6, Connecting to a Power Source, at the end of this chapter.

Step 4. If installing multiple switches, mount them in the rack, one below the other, in any order.

4.4.2 Desktop or Shelf Mounting

Step 1. Attach the four adhesive rubber feet to the bottom of the first switch.

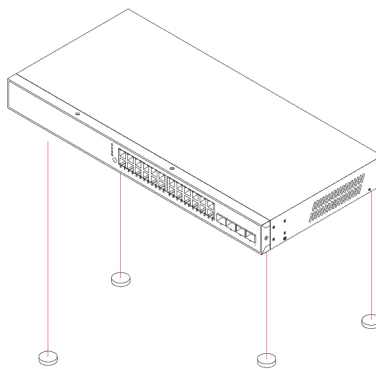


Figure 4-5. Attaching the adhesive rubber feet.

Step 2. Set the device on a flat surface near an AC power source, making sure there are at least two inches of space on all sides for proper air flow.

Step 3. If installing a single switch only, go to Section 4.6, Connecting to a Power Source, at the end of this Chapter.

Step 4. If installing multiple switches, attach four adhesive feet to each one. Place each device squarely on top of the one below, in any order.

4.5 Installing an Optional SFP Transceiver

You can install or remove a mini-GBIC SFP from a mini-GBIC slot without having to power off the switch. Use only compatible mini-GBICs.

NOTE:

- The mini-GBIC slots are shared with the two 10/100/1000BASE-T RJ-45 ports. If a mini-GBIC is installed in a slot, the associated RJ-45 port is disabled and cannot be used.
- The mini-GBIC ports operate only at full duplex. Half-duplex operation is not supported.
- Make sure the network cable is NOT connected when you install or remove a mini-GBIC.

CAUTION: Use only supported mini-GBICs with your switch. Using unsupported mini-GBICs may cause the switch to malfunction.

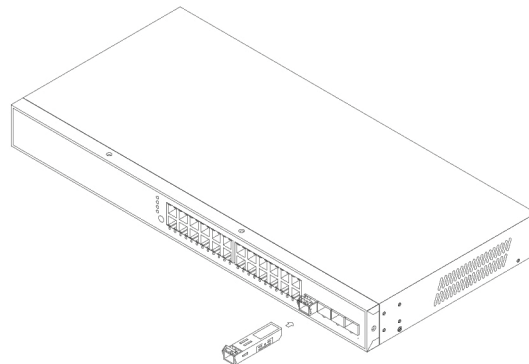


Figure 4-6. Inserting an SFP transceiver into a slot.

The SFP slots support the optional SFP transceivers listed in Table 4-1.

Table 4-1. Supported SFP Transceivers.	
Product Code	Description
LFP401	SFP, 155-Mbps Fiber with Extended Diagnostics, 850-nm Multimode, LC, 2 km
LFP402	SFP, 155-Mbps Fiber with Extended Diagnostics, 1310-nm Multimode, 2 km, LC
LFP403	SFP, 155-Mbps Fiber with Extended Diagnostics, 1310-nm Single-Mode, Plus, 30 km, LC
LFP411	SFP, 1.25-Gbps Fiber with Extended Diagnostics, 850-nm Multimode, LC, 300 m
LFP412	SFP, 1.25-Gbps Fiber with Extended Diagnostics, 1310-nm Multimode, LC, 2 km
LFP413	SFP, 1.25-Gbps Fiber with Extended Diagnostics, 1310-nm Single-Mode, LC, 10 km
LFP414	SFP, 1.25-Gbps Fiber with Extended Diagnostics, 1310-nm Single-Mode, LC, 30 km
LSP421	10GBASE-SR SFP+, 850-nm Multimode, 300 m, LC
LSP422	10GBASE-SR SFP+, 1310-nm Single-Mode, 10 km, LC

Chapter 4: Installing the Switch

To install an SFP transceiver, follow these steps:

Step 1. Consider network and cabling requirements to select an appropriate SFP transceiver type.

Step 2. Insert the transceiver with the optical connector facing outward and the slot connector facing down. Note that SFP transceivers are keyed so they can only be installed in one orientation.

Step 3. Slide the SFP transceiver into the slot until it clicks into place.

NOTE: SFP transceivers are not provided in the switch package.

4.6 Connecting to a Power Source

To switch the power on or off, plug or unplug the power cord from AC power socket.

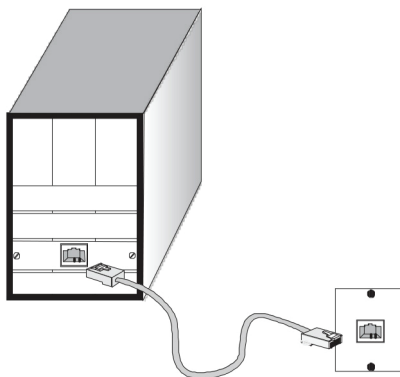


Figure 4-7. Inserting the power cord into AC power socket.

Step 1. Insert the power cable plug directly into the AC socket located on the back of the switch.

Step 2. Plug the other end of the cable into a grounded, 3-pin, AC power source.

Step 3. Check the front-panel LEDs as the device is powered on to be sure the Power LED is lit. If not, check that the power cable is correctly plugged in.

WARNING: For international use, you may need to change the AC line cord. You must use a line cord set that has been approved for the socket type in your country.

4.7 Connecting to the Console Port

The DB9 serial port on the switch's front panel connects to the switch for out-of-band console configuration. You can access the command-line-driven configuration program from a terminal or a PC running a terminal emulation program.

The pin assignments used to connect to the serial port are provided in Table 4-2.

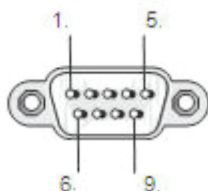


Figure 4-8. Serial port (DB9 DTE) pinout.

The DB9 cable is used to connect a terminal or terminal emulator to the switch's RS-232 command-line interface.

Table 4-2. Serial cable wiring.		
Function	Mnemonic	Pin
Carrier	CD	1
Receive Data	RXD	2
Transmit Data	TXD	3
Data Terminal Ready	DTR	4
Signal Ground	GND	5
Data Set Ready	DSR	6
Request to Send	RTS	7
Clear to Send	CTS	8

NOTE: No other pins are used.

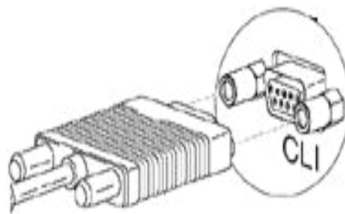


Figure 4-9. Plug in the console port.

The Gigabit PoE+ Ethernet Managed Switch Eco's terminal console port default values are listed below:

The serial port's configuration requirements are as follows:

- Default baud rate—115,200 bps
- Character size—8 characters
- Parity—None
- Stop bit—One
- Data bits—8
- Flow control—none

4.8 Operation of Web-based Management

The default values of the managed switch are listed below:

IP Address: 192.168.1.1

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.1.254

Username: admin

Password: blank

After you configure the switch in the CLI via the switch's serial interface, you can browse to it. For instance, type `http://192.168.1.1` in the address row in a browser, and the following screen will appear and prompt you to input username and password to login and access authentication. The default username is "admin" and password is blank (just press enter at password prompt). For first-time use, enter the default username and password, and then click the Enter button. The login process is now completed.

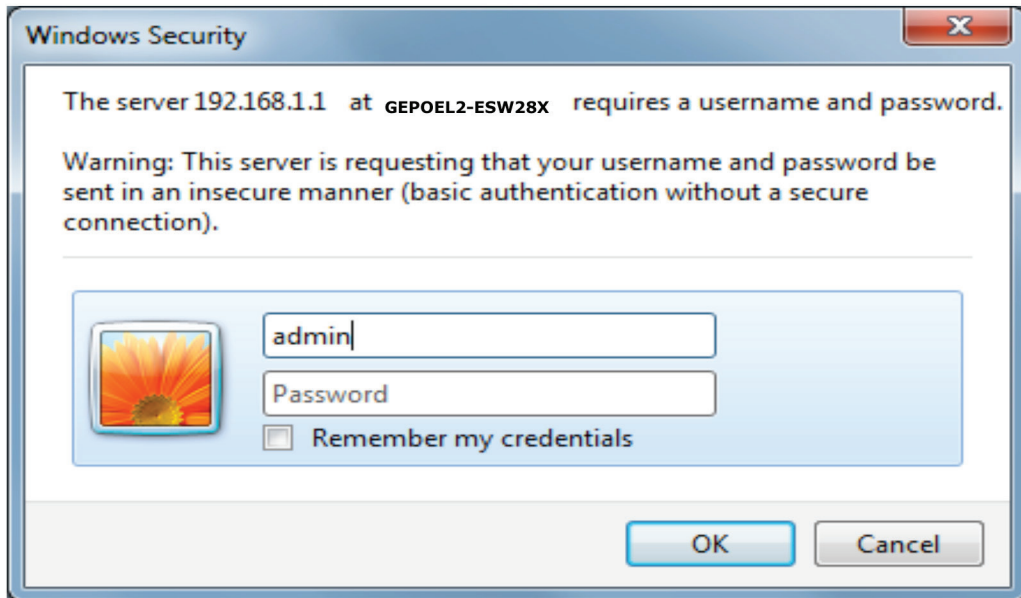


Figure 4-10. Windows security screen.

NOTE: If you need to re-configure a function or parameter, refer the detail in the User Guide. Or you could access the Switch and click "help" under the web GUI and a help screen will pop-up to teach you how to set the parameters.

5. Making Network Connections

5.1 Connecting Network Devices

You can connect the switch to 10-, 100- or 1000-Mbps network cards in PCs and servers, as well as to other switches and hubs. You can also connect the switch to remote devices using optional SFP transceivers.

5.2 Twisted-Pair Devices

Each device requires an unshielded twisted-pair (UTP) cable with RJ-45 connectors at both ends. Use Category 5, 5e, or 6 cable for 100BASE-T connections, or Category 5 or better for 100BASE-TX connections.

5.2.1 Cabling Guidelines

The RJ-45 ports on the switch support automatic MDI/MDI-X pinout configuration, so you can use standard straight-through twisted-pair cables to connect to any other network device (PCs, servers, switches, routers, or hubs).

See Appendix B for more information on cabling.

CAUTION: Do not plug a phone jack connector into an RJ-45 port. This will damage the switch. Use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

5.2.2 Connecting to PCs, Servers, Hubs, and Switches

Step 1. Attach one end of a twisted-pair cable segment to the device's RJ-45 connector.

Step 2. If the device is a network card and the switch is in the wiring closet, attach the other end of the cable segment to a modular wall outlet that is connected to the wiring closet. (See the section "Network Wiring Connections.") Otherwise, attach the other end to an available port on the switch.

Make sure each twisted pair cable is 328 feet (100 meters) long or less.

NOTE: Avoid using flow control on a port connected to a hub unless it is actually required to solve a problem. Otherwise, back-pressure jamming signals may degrade overall performance for the segment attached to the hub.

Step 3. As each connection is made, the Link LED (on the switch) corresponding to each port will light green (1000 Mbps) or yellow (100 Mbps) to indicate that the connection is valid.

5.2.3 Network Wiring Connections

A punch-down block is an integral part of many equipment racks. It is actually part of the patch panel. Instructions for making connections in the wiring closet with this type of equipment follow.

Step 1. Attach one end of a patch cable to an available port on the switch, and the other end to the patch panel.

Step 2. If not already in place, attach one end of a cable segment to the back of the patch panel where the punch-down block is located, and the other end to a modular wall outlet.

Step 3. Label the cables to simplify future troubleshooting. See Chapter 6, Cable Labeling and Connection Records.

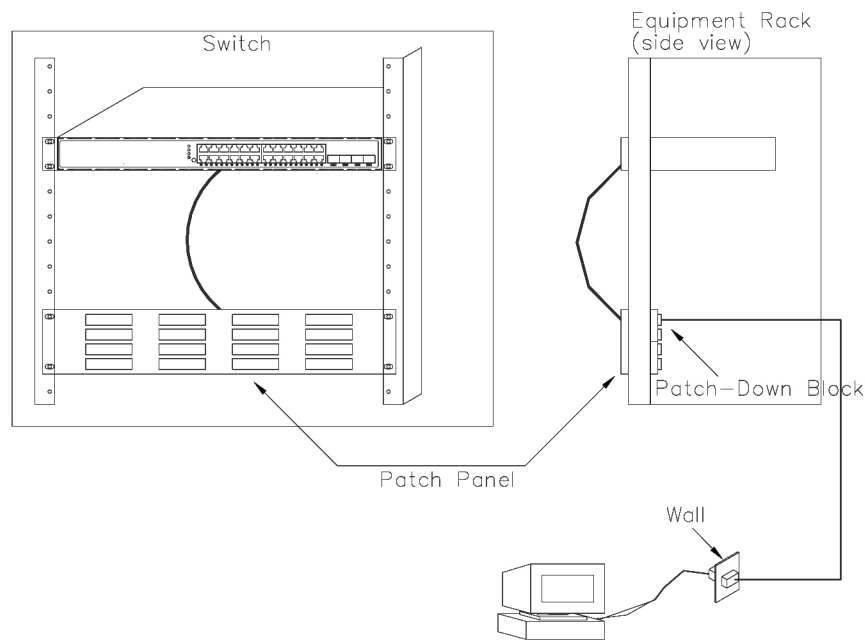


Figure 5-1. Network wiring connections.

5.3 Fiber Optic SFP Devices

An optional Gigabit SFP transceiver can be used for a backbone connection between switches, or for connecting to a high-speed server.

Each single-mode fiber port requires 9/125 micron single-mode fiber optic cable with an LC connector at both ends. Each multimode fiber optic port requires 50-/125- or 62.5-/125-micron multimode fiber optic cabling with an LC connector at both ends.

WARNING: This switch uses lasers to transmit signals over fiber optic cable. The lasers are inherently eye safe in normal operation. Users should never look directly at a transmit port when it is powered on.

WARNING: When selecting a fiber SFP device, make sure that it can function at a temperature that is not less than the recommended maximum operational temperature of the product. You must also use an approved laser SFP transceiver.

Step 1. Remove and keep the LC port's rubber plug. When not connected to a fiber cable, the rubber plug should be replaced to protect the optics.

Step 2. Check that the fiber terminators are clean. You can clean the cable plugs by wiping them gently with a clean tissue or cotton ball moistened with a little ethanol. Dirty fiber terminators on fiber optic cables will impair the quality of the light transmitted through the cable and lead to degraded performance on the port.

Step 3. Connect one end of the cable to the LC port on the switch and the other end to the LC port on the other device. Since LC connectors are keyed, the cable can be attached in only one orientation.

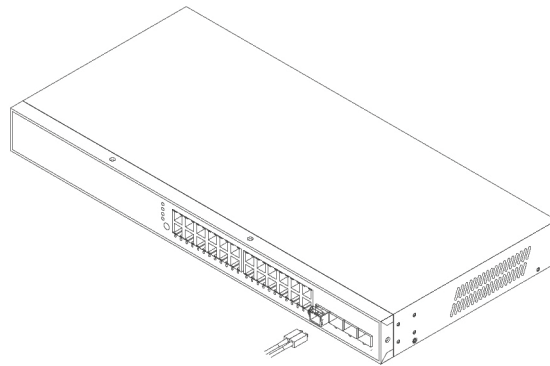


Figure 5-2. Making fiber port connections.

Step 4. As a connection is made, check the Link LED on the switch corresponding to the port to be sure that the connection is valid.

The fiber optic ports operate at 1 Gbps. The maximum length for fiber optic cable operating at Gigabit speed will depend on the fiber type as listed under 1000 Mbps Gigabit Ethernet Collision Domain in Section 5.4.

5.4 Connectivity Rules

When adding hubs to your network, note that because switches break up the path for connected devices into separate collision domains, you should not include the switch or connected cabling in your calculations for cascade length involving other devices.

1000BASE-T Cable Requirements

All Category 5 UTP cables that are used for 100BASE-TX connections should also work for 1000BASE-T, if all four wire pairs are connected. For all critical connections, or any new cable installations, we recommend using Category 5e or Category 6 cable. The Category 5e and 6 specifications include test parameters that are only recommendations for Category 5. The first step in preparing existing Category 5 cabling for running 1000BASE-T is a simple test of the cable installation to be sure that it complies with the IEEE 802.3-2005 standards.

1000-Mbps Gigabit Ethernet Collision Domain

Table 5-1. Maximum 1000BASE-T Gigabit Ethernet cable length.

Cable Type	Maximum Cable Length	Connector
Category 5, 5e, or 6 100-ohm UTP or STP	328 feet (100 m)	RJ-45

Table 5-2: Maximum 1000BASE-SX Gigabit Fiber cable lengths.

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
62.5/125 micron multimode fiber	165 MHz/km	722 ft. (220 m)	LC
	200 MHz/km	902 ft. (275 m)	LC
50/125 micron multimode fiber	400 MHz/km	1641 ft. (500 m)	LC
	500 MHz/km	1805 ft. (550 m)	LC

Table 5-3. Maximum 1000BASE-LX/LHX/XD/ZX Gigabit Fiber cable length.

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
9/125 micron single-mode fiber 1310 nm	N/A	6.2 miles (10 km)	LC
9/125 micron single-mode fiber 1550 nm	N/A	18.64 miles (30 km) 31.06 miles (50 km)	LC LC

Table 5-4. Maximum 1000BASE-LX Single Fiber Gigabit fiber cable length.

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
Single-mode TX-1310 nm RX-1550 nm	N/A	12.42 miles (20 km)	BIDI LC
Single-mode TX-1550 nm RX-1310 nm	N/A	12.42 miles (20 km)	BIDI LC

Table 5-5. Maximum Fast Ethernet cable lengths.

Cable Type	Maximum Cable Length	Connector
Category 5, 5e or 6 100-ohm UTP or STP	328 ft (100 m)	RJ-45

6. Cable Labeling and Connection Records

When planning a network installation, it is essential to label the opposing ends of cables and to record where each cable is connected. This will allow users to easily locate interconnected devices, isolate faults, and change your topology easily.

To best manage the physical implementations of your network, follow these guidelines:

- Clearly label the opposing ends of each cable.
- Using your building's floor plans, draw a map of the location of all network-connected equipment. For each piece of equipment, identify the devices to which it is connected.
- Note the length of each cable and the maximum cable length supported by the switch ports.
- For ease of understanding, use a location-based key when assigning prefixes to your cable labeling.
- Use sequential numbers for cables that originate from the same equipment.
- Differentiate between racks by naming accordingly.
- Label each separate piece of equipment.
- Display a copy of your equipment map, including keys to all abbreviations, at each equipment rack.

7. Troubleshooting

7.1 Basic Troubleshooting Tips

Most problems are caused by the following situations. Check for these items first when starting your troubleshooting:

Connecting to devices that have a fixed full duplex configuration.

The RJ-45 ports are configured as “Auto,” that is, when connecting to the attached devices, the switch will operate in one of two ways to determine the link speed and the communication mode (half duplex or full duplex):

- If the connected device is also configured to Auto, the switch will automatically negotiate both link speed and communication mode.
- If the connected device has a fixed configuration, for example 100 Mbps, at half- or full-duplex, the switch will automatically sense the link speed, but will default to a communication mode of half-duplex.

Because the Gigabit PoE+ Ethernet Managed Switch Eco behaves in this way (in compliance with the IEEE 802.3 standard), if a device connected to the switch has a fixed configuration of full-duplex, the device will not connect correctly to the switch. The result will be high error rates and very inefficient communications between the switch and the device.

Make sure all devices connected to the Gigabit PoE+ Ethernet Managed Switch Eco are configured to auto negotiate, or are configured to connect at half-duplex (all hubs are configured this way, for example).

Faulty or loose cables.

Look for loose or obviously faulty connections. If they appear to be OK, make sure the connections are snug. If that does not correct the problem, try a different cable.

Non-standard cables.

Non-standard and miswired cables may cause network collisions and other network problems, and can seriously impair network performance. Use a new correctly-wired cable. For pinouts and correct cable wiring. A category 5 cable tester is a recommended tool for every 100BASE-TX and 1000BASE-T network installation.

Improper Network Topologies.

Make sure you have a valid network topology. If you no longer experience the problems, the new topology is probably at fault. In addition, you should make sure that your network topology contains no data path loops.

Check the port configuration.

A port on your Gigabit PoE+ Ethernet Managed Switch Eco may not be operating as you expect because it has been put into a “blocking” state by Spanning Tree, GVRP (automatic VLANs), or LACP (automatic trunking). (Note that the normal operation of the Spanning Tree, GVRP, and LACP features may put the port in a blocking state.) Or, the port just may have been configured as disabled through software.

Table 7-1. Troubleshooting chart.

Symptom	Action
System LED is Off	<ul style="list-style-type: none"> Check connections between the switch, the power cord, and the wall outlet. Contact your dealer for assistance.
Link LED is Off	<ul style="list-style-type: none"> Verify that the switch and attached device are powered on. • Be sure the cable is plugged into the switch and corresponding device. If the switch is installed in a rack, check the connections to the punch-down block and patch panel. Verify that the proper cable type is used and its length does not exceed specified limits. Check the adapter on the attached device and cable connections for possible defects. Replace the defective adapter or cable if necessary.

7.2 Power and Cooling Problems

7.2.1 Installation

If the System indicator does not turn on when the power cord is plugged in, you may have a problem with the power outlet, power cord, or internal power supply. However, if the unit powers off after running for a while, check for loose power connections, power losses, or surges at the power outlet. If you still cannot isolate the problem, the internal power supply may be defective. Verify that all system components have been properly installed. If one or more components appear to be malfunctioning (such as the power cord or network cabling), test them in an alternate environment where you are sure that all the other components are functioning properly.

7.2.2 In-Band Access

You can access the management agent in the switch from anywhere within the attached network using Telnet, a Web browser. However, you must first configure the switch with a valid IP address, subnet mask, and default gateway. If you have trouble establishing a link to the management agent, check to see if you have a valid network connection. Then verify that you entered the correct IP address. Also, be sure the port through which you are connecting to the switch has not been disabled. If it has not been disabled, then check the network cabling that runs between your remote location and the switch.

NOTE: The management agent accepts up to four simultaneous Telnet sessions. If the maximum number of sessions already exists, an additional Telnet connection will not be able to log into the system.

7.3 Cables

7.3.1 Twisted-Pair Cable and Pin Assignments

For 10/100BASE-TX connections, the twisted-pair cable must have two pairs of wires. For 1000BASE-T connections, the twisted-pair cable must have four pairs of wires. Each wire pair is identified by two different colors. For example, one wire might be green and the other, green with white stripes. Also, an RJ-45 connector must be attached to both ends of the cable.

CAUTION: DO NOT plug a phone jack connector into any RJ-45 port. Use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

CAUTION: Each wire pair must be attached to the RJ-45 connectors in a specific orientation.

The figure below illustrates how the pins on the RJ-45 connector are numbered. Be sure to hold the connectors in the same orientation when attaching the wires to the pins.

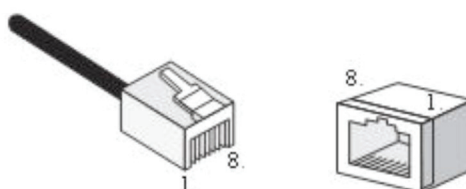


Figure 7-1. RJ-45 connector pin numbers.

7.3.2 10BASE-T/100BASE-TX Pin Assignments

Use unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable for RJ-45 connections: 100-ohm Category 3 or better cable for 10 Mbps connections, or 100-ohm Category 5 or better cable for 100 Mbps connections. Also be sure that the length of any twisted-pair connection does not exceed 328 feet (100 meters).

The RJ-45 ports on the switch base unit support automatic MDI/MDI-X operation, so you can use straight-through cables for all network connections to PCs or servers, or to other switches or hubs. In straight-through cable, pins 1, 2, 3, and 6, at one end of the cable, are connected straight through to pins 1, 2, 3, and 6 at the other end of the cable. When using any RJ-45 port on this switch, you can use either straight-through or crossover cable.

Table 7-2. 10/100BASE-TX MDI and MDI-X port pinouts.		
Pin	MDI Signal Name	MDI-X Signal Name
1	Transmit Data plus (TD+)	Receive Data plus (RD+)
2	Transmit Data minus (TD-)	Receive Data minus (RD-)
3	Receive Data plus (RD+)	Transmit Data plus (TD+)
6	Receive Data minus (RD-)	Transmit Data minus (TD-)
4, 5, 7, 8	Not used	Not used

NOTE: The “+” and “-” signs represent the polarity of the wires that make up each wire pair.

If the twisted-pair cable is to join two ports and only one of the ports has an internal crossover (MDI-X), the two pairs of wires must be straight-through. (When auto-negotiation is enabled for any RJ-45 port on this switch, you can use either straight-through or crossover cable to connect to any device type.)

You must connect all four wire pairs as shown in the following diagram to support Gigabit Ethernet.

7.3.3 Straight-through Wiring

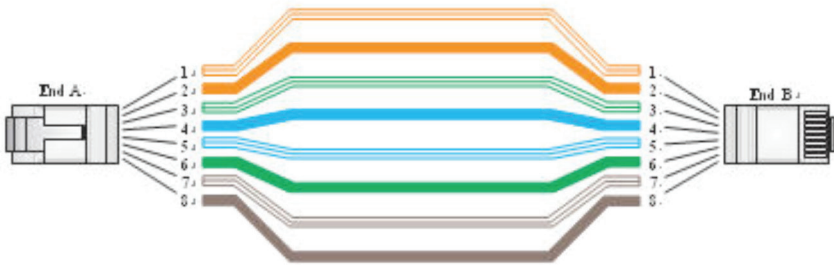


Figure 7-2. EIA/TIA 568B RJ-45 wiring standard 10/100BASE-TX straight-through cable.

7.3.4 Crossover Wiring

If the twisted-pair cable is to join two ports and either both ports are labeled with an “X” (MDI-X) or neither port is labeled with an “X” (MDI), a crossover must be implemented in the wiring. (When auto-negotiation is enabled for any RJ-45 port on this switch, you can use either straight-through or crossover cable to connect to any device type.)

You must connect all four wire pairs as shown in the following diagram to support Gigabit Ethernet.

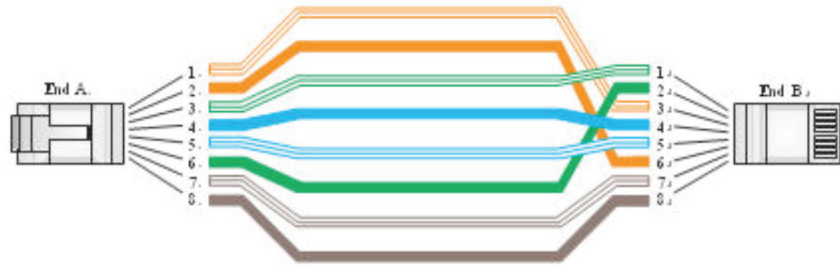


Figure 7-3. EIA/TIA 568B RJ-45 wiring standard 10/100BASE-TX crossover cable.

7.3.5 1000BASE-T Pin Assignments

All 1000BASE-T ports support automatic MDI/MDI-X operation, so you can use straight-through cables for all network connections to PCs or servers, or to other switches or hubs.

The table below shows the 1000BASE-T MDI and MDI-X port pinouts. These ports require that all four pairs of wires be connected.

NOTE: For 1000BASE-T operation, all four pairs of wires are used for both transmit and receive.

Use 100-ohm Category 5, 5e or 6 unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable for 1000BASE-T connections. Also be sure that the length of any twisted-pair connection does not exceed 328 feet (100 meters).

Table 7-3. 1000BASE-T MDI and MDI-X port pinouts.

Pin	MDI Signal Name	MDI-X Signal Name
1	Bi-directional Pair A Plus (BI_DA+)	Bi-directional Pair B Plus (BI_DB+)
2	Bi-directional Pair A Minus (BI_DA-)	Bi-directional Pair B Minus (BI_DB-)
3	Bi-directional Pair B Plus (BI_DB+)	Bi-directional Pair A Plus (BI_DA+)
4	Bi-directional Pair C Plus (BI_DC+)	Bi-directional Pair D Plus (BI_DD+)
5	Bi-directional Pair C Minus (BI_DC-)	Bi-directional Pair D Minus (BI_DD-)
6	Bi-directional Pair B Minus (BI_DB-)	Bi-directional Pair A Minus (BI_DA-)
7	Bi-directional Pair D Plus (BI_DD+)	Bi-directional Pair C Plus (BI_DC+)
8	Bi-directional Pair D Minus (BI_DD-)	Bi-directional Pair C Minus (BI_DC-)

7.3.6 Cable Testing for Existing Category 5 Cable

Installed Category 5 cabling must pass tests for Attenuation, Near-End Crosstalk (NEXT), and Far-End Crosstalk (FEXT). This cable testing information is specified in the ANSI/TIA/EIA-TSB-67 standard. Additionally, cables must also pass test parameters for Return Loss and Equal-Level Far-End Crosstalk (ELFEXT). These tests are specified in the ANSI/TIA/EIA-TSB-95 Bulletin, "The Additional Transmission Performance Guidelines for 100 Ohm 4-Pair Category 5 Cabling."

NOTE: When testing your cable installation, be sure to include all patch cables between switches and end devices.

7.3.7 Adjusting Existing Category 5 Cabling to Run 1000BASE-T

If your existing Category 5 installation does not meet one of the test parameters for 1000BASE-T, there are basically three measures that can be applied to try and correct the problem:

1. Replace any Category 5 patch cables with high-performance Category 5e or Category 6 cables.
2. Reduce the number of connectors used in the link.
3. Reconnect some of the connectors in the link.

7.3.8 Fiber Standards

The International Telecommunication Union (ITU-T) has standardized various fiber types for data networks. These are summarized in the following table.

Table 7-4. Fiber standards.		
ITU-T Standard	Description	Application
G.651	Multimode Fiber 50/125-micron core	Short-reach connections in the 1300-nm or 850-nm band
G.652	Non-Dispersion-Shifted Fiber Single-mode, 9/125-micron core	Longer spans and extended reach. Optimized for operation in the 1310-nm band, but can also be used in the 1550-nm band.
G.652.C	Low Water Peak Non-Dispersion-Shifted Fiber Single-mode, 9/125-micron core	Longer spans and extended reach. Optimized for wavelength-division multiplexing (WDM) transmission across wavelengths from 1285 to 1625 nm. The zero dispersion wavelength is in the 1310-nm region.
G.653	Dispersion-Shifted Fiber Single-mode, 9/125-micron core	Longer spans and extended reach. Optimized for operation in the region from 1500 to 1600-nm.
G.654	1550-nm Loss-Minimized Fiber Single-mode, 9/125-micron core	Extended long-haul applications. Optimized for high-power transmission in the 1500 to 1600-nm region, with low loss in the 1550-nm band.
G.655	Non-Zero Dispersion-Shifted Fiber Single-mode, 9/125-micron core	Extended long-haul applications. Optimized for high-power dense wavelength-division multiplexing (DWDM) operation in the region from 1500 to 1600-nm.

10. Specifications

Physical Characteristics	
Aggregate Bandwidth	28 Gbps
Buffer Architecture	4096 bytes on-chip frame buffer
Network Interface	Ports 1–24 (LPB5028A) or Ports 1–48 (LPB5052A): RJ-45 connector, auto MDI/X 10BASE-T: RJ-45 (100-ohm, UTP cable; Category 3 or better); 100BASE-TX: RJ-45 (100-ohm, UTP cable; Category 5 or better); 1000BASE-T: RJ-45 (100-ohm, UTP or STP cable; Category 5, 5e, or 6) *Maximum Cable Length = 328 ft (100 m) Ports 24–28 (LPB5028A) or 48–52 (LPB5052A): 1G/10G SFP ports
Ports	LPB5028A: (20) 10/100/1000BASE-T access ports, (4) copper/fiber combo ports with dual-speed SFP slots, and (4) 10 Gigabit SFP+ uplink ports with dual speed (1G/10G); LPB5052A: (48) 10/100/1000BASE-T access ports and (4) 10 Gigabit SFP+ uplink slots with dual speed (1G/10G).
Switching Database	32K MAC address entries
Connectors	LPB5028A: (24) RJ-45, (4) SFP slots, (4) SFP+ slots; LPB5052A: (48) RJ-45, (4) SFP+ slots
Indicators	LEDs: System: Power; TP Port: Status (LINK/ACT/SPD), 10/100/1000M; SFP Port: Status (LINK/ACT/SPD), 1G/10G
Temperature	Operating: 32°F to 104°F (0°C to 40°C)
Humidity	Operating: 5% to 90% (non-condensing)
Power	Input: 100–240 VAC, 50–60 Hz; Power Supply: Internal: 100 to 240 VAC, 50 to 60 Hz; Consumption: 60 Watts maximum
Dimensions	1.7"H x 17.4"W x 11.8"D (4.4 x 44.2 x 30 cm)
Weight	LPB5028A: 8.6 lb. (3.9 kg); LPB5052A: 9.0 lb. (4.1 kg)
Switch Features	
Flow Control	Full-duplex: IEEE 802.3x; Half-duplex: Backpressure
Forwarding Mode	Store-and-forward
Throughput	95.23 Mbps
Management Features	
In-Band Management	SSH/SSL, Telnet, SNMP, or HTTP
Out-of-Band Management	RS-232 (RJ-45) console port
Software Loading	HTTP, TFTP in-band, Console out-of-band

Switch Features (continued)	
Approvals	Emissions: EN55022 (CISPR 22) Class A EN 61000-3; FCC Class A; CE Mark; Immunity: EN 61000-4-2/3/4/5/6/8/11; EN 55024
Standards	IEEE 802.3 => 10Base-T Ethernet (Twisted-pair Copper); IEEE 802.3u => 100Base-TX Ethernet (Twisted-pair Copper); IEEE 802.3ab => 1000Base-TX Ethernet (Twisted-pair Copper); IEEE 802.3z => 1000Base-X Ethernet; IEEE 802.3x => Flow Control Capability; ANSI/IEEE 802.3 => Auto-negotiation; IEEE 802.1Q => VLAN; IEEE 802.1p => Class of Service; IEEE 802.1X => Access Control; IEEE 802.1D => Spanning Tree; IEEE 802.1w => Rapid Spanning Tree; IEEE 802.1s => Multiple Spanning Tree; IEEE 802.3ad => Link Aggregation Control Protocol (LACP); IEEE 802.1AB => Link Layer Discovery Protocol (LLDP)

Glossary

10BASE-T: IEEE 802.3 specification for 10 Mbps Ethernet over two pairs of Category 3, 4, or 5 UTP cable.

100BASE-TX: IEEE 802.3u specification for 100 Mbps Ethernet over two pairs of Category 5 UTP cable.

1000BASE-LH: Specification for long-haul Gigabit Ethernet over two strands of 9/125 micron core fiber cable.

1000BASE-LX IEEE 802.3z: Specification for Gigabit Ethernet over two strands of 50/125, 62.5/125 or 9/125 micron core fiber cable.

1000BASE-SX: IEEE 802.3z specification for Gigabit Ethernet over two strands of 50/125 or 62.5/125 micron core fiber cable.

1000BASE-T: IEEE 802.3ab specification for Gigabit Ethernet over 100-ohm Category 5, 5e or 6 twisted-pair cable (using all four wire pairs).

Autonegotiation: Signaling method allowing each node to select its optimum operational mode (speed and duplex mode) based on the capabilities of the node to which it is connected.

Bandwidth: The difference between the highest and lowest frequencies available for network signals. Also synonymous with wire speed, the actual speed of the data transmission along the cable.

Collision Domain: Single CSMA/CD LAN segment.

CSMA/CD: CSMA/CD (Carrier Sense Multiple Access/Collision Detect) is the communication method employed by Ethernet, Fast Ethernet, and Gigabit Ethernet.

End Station: A workstation, server, or other device that does not forward traffic.

Ethernet: A network communication system developed and standardized by DEC, Intel, and Xerox, were using baseband transmission, CSMA/CD access, logical bus topology, and coaxial cable. The successor IEEE 802.3 standard provides for integration into the OSI model and extends the physical layer and media with repeaters and implementations that operate on fiber, thin coax and twisted-pair cable.

Fast Ethernet: A 100-Mbps network communication system based on Ethernet and the CSMA/CD access method.

Full-Duplex: Transmission method that allows two network devices to transmit and receive concurrently, effectively doubling the bandwidth of that link.

Gigabit Ethernet: A 1000-Mbps network communication system based on Ethernet and the CSMA/CD access method.

IEEE: Institute of Electrical and Electronic Engineers.

IEEE 802.3: Define carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.

IEEE 802.3AB: Define CSMA/CD access method and physical layer specifications for 1000BASE-T Gigabit Ethernet. (Now incorporated in IEEE 802.3-2005.)

IEEE 802.3U: Define CSMA/CD access method and physical layer specifications for 100BASE-TX Fast Ethernet. (Now incorporated in IEEE 802.3-2005.)

IEEE 802.3X: Define Ethernet frame start/stop requests and timers used for flow control on full-duplex links. (Now incorporated in IEEE 802.3-2005.)

IEEE 802.3Z: Define CSMA/CD access method and physical layer specifications for 1000BASE Gigabit Ethernet. (Now incorporated in IEEE 802.3-2005.)

LAN Segment: Separate LAN or collision domain.

LED: Light emitting diode used for monitoring a device or network condition.

Local Area Network (LAN): A group of interconnected computer and support devices,

Media Access Control (MAC): A portion of the networking protocol that governs access to the transmission medium, facilitating the exchange of data between network nodes.

MIB: An acronym for Management Information Base. It is a set of database objects that contains information about the device.

Modal Bandwidth: Bandwidth for multimode fiber is referred to as modal bandwidth because it varies with the modal field (or core diameter) of the fiber. Modal bandwidth is specified in units of MHz per km, which indicates the amount of bandwidth supported by the fiber for a one km distance.

Network Diameter: Wire distance between two end stations in the same collision domain.

RJ-45 Connector: A connector for twisted-pair wiring.

Switched Ports: Ports that are on separate collision domains or LAN segments.

TIA: Telecommunications Industry Association.

Transmission Control Protocol/Internet Protocol (TCP/IP): Protocol suite that includes TCP as the primary transport protocol, and IP as the network layer protocol.

User Datagram Protocol (UDP): UDP provides a datagram mode for the packet-switched communications. It uses the IP as the underlying transport mechanism to provide access to IP-like services.

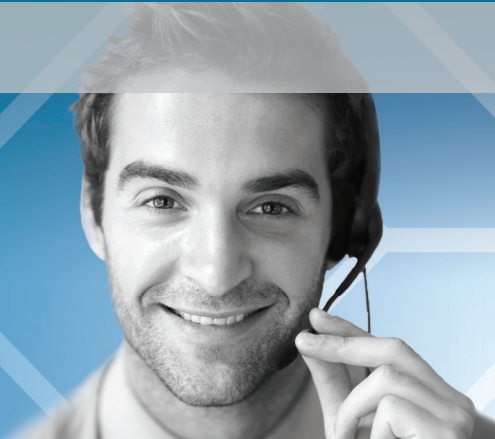
UDP packets are delivered just like IP packets—connection-less data grams that may be discarded before reaching their targets. UDP is useful when TCP would be too complex, too slow, or just unnecessary.

UTP: Unshielded twisted-pair cable.

Virtual LAN (VLAN): A Virtual LAN is a collection of network nodes that share the same collision domain regardless of their physical location or connection point in the network. A VLAN serves as a logical workgroup with no physical barriers, allowing users to share information and resources as though located on the same LAN.

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