



10-Gigabit Web Smart Switch - 10-Port

Installation and Getting Started Guide

- Has eight 10-Gigabit twisted-pair ports and two slots for SFP+ modules.
- Supports advanced security management and network features.



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Instrucciones de Seguridad (Normas Oficiales Mexicanas Electrical Safety Statement)

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
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.

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 are using an outdoor device connected to this device with cable then you need to add an arrester on the cable between the outdoor device and this device.

NOTE: The switch is an indoor device; if it will be used in outdoor environment or connects to an outdoor device, you must use a lightning arrester to protect the switch.

WARNING:

- *If you damage the switch by self-demolition, you will be charged a fee to repair the switch.*
- *Do not place the switch outdoors.*
- *Before installation, make sure the input power supply complies with switch specifications.*
- *To reduce the risk of electric shock, disconnect all AC or DC power cords and redundant power service (RPS) cables to completely remove power from the unit.*
- *Before importing/exporting a configuration, make sure the firmware version is the same.*
- *After a firmware upgrade, the switch will automatically replace the configuration with the latest firmware version.*

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1. Specifications

Compliances	
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
Environmental	
Operating Temperature	+32 to +122° F (0 to +50° C)
Operating Humidity	10% to 90% (non-condensing)
Management	
Spanning Tree Protocol (STP)	Standard Spanning Tree 802.1d; Rapid Spanning Tree (RSTP) 802.1w; Multiple Spanning Tree (MSTP) 802.1s
SNMP	Version 1, 2c, 3
RMON	
Web GUI Interface	
VLAN	Supports up to 4K VLANs simultaneously (out of 4096 VLAN IDs); <ul style="list-style-type: none"> • Q-in-Q VLAN • MAC-based VLAN • IP subnet-based VLAN • Protocol-based VLAN • Port-based VLAN • 802.1Q tag-based VLAN • MAC-based VLAN • Management VLAN • Private VLAN Edge (PVE)
Generic VLAN Registration (GVRP)	Protocol for automatically propagating and configuring VLANs in a bridged domain
Aggregation	Link Aggregation LACP
UPnP	
Diagnostic	Traceroute
Discovery	LLDP, LLDP (IEEE 802.1ab)
Classification	TCP/UDP (IPv4, IPv6)
Security	SSH, SSL, 802.1x, PVE, Port Security, IP Source Guard, Storm Control, Access Control List (ACL)
Performance	
Aggregate Bandwidth	200 Gbps
Buffer Architecture	2 MB on-chip frame buffer
Forwarding Mode	Store-and-forward
Switching Database	16K MAC address entries
Throughput	148.8 Mpps
Flow Control	Full-duplex: IEEE 802.3x; Half-duplex: Backpressure

Chapter 1: Specifications

Physical	
Connectors	(8) 10-Gbps RJ-45 twisted-pair ports; (2) empty slots for SFP+ fiber modules; (1) 3-prong power connector
Indicators (LEDs)	TP Ports: (8) Status (LINK/ACT) LEDs, (8) 100M/1G/10G LEDs; SFP+ Ports: (2) Status (LINK/ACT/SPD) LEDs, (2) 1G/10G LEDs; (1) Power LED
Network Interface	Ports 1-8: RJ-45 connector, auto MDI/X; 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); 10GBASE-T: RJ-45 (100-ohm, UTP or STP cable; Category 6a); NOTE: Maximum Cable Length - 100 m (328 ft) Ports 9-10: 1G/10G SFP+
Dimensions	1.7"H x 8.7"W x 9.6"D (4.4 x 22 x 24.3 cm)
Weight	1.9 kg (4.2 lb.)
Power	
Input	100–240 VAC, 50–60 Hz
Consumption	65 Watts maximum
Standards	
	IEEE 802.3u => 100Base-TX Ethernet (Twisted-pair Copper); IEEE 802.3ab => 1000Base-TX Ethernet (Twisted-pair Copper); IEEE 802.3an => 10GBase-T 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)

2. Overview

2.1 Introduction

The 10-Gigabit Web Smart Switch - 10-Port is an affordable managed switch that provides a reliable infrastructure for your business network. The switch delivers the intelligent features you need to improve the availability of your critical business applications, protect your sensitive information, and optimize your network bandwidth to deliver information and applications more effectively. Easy to set up and use, it provides the ideal combination of affordability and capabilities for entry-level networking, including small business or enterprise applications.

The LGB5510A switch has 10 ports for 10-Gigabit Ethernet connectivity. However, unlike other entry-level switching solutions that provide advance managed network capabilities only in the costliest models, the LGB5510A switch supports advanced security management capabilities and network features, including data, voice, security, and wireless technologies. The switches are easy to deploy and configure.

2.2 Features

- Has ten (8) 10-Gigabit twisted-pair ports and (2) slots for SFP+ modules.
- Supports data, voice, and wireless technologies.
- Easy to deploy and configure.
- Performs wire-speed, non-blocking switching to transport multiple packets at wire speed and low latency on all ports simultaneously.
- All ports operate in full-duplex mode, which effectively doubles the bandwidth of each connection.
- Uses store-and-forward technology to ensure maximum data integrity. With this technology, the entire packet must be received into a buffer and checked for validity before being forwarded. This prevents errors from being propagated throughout the network.
- The switch can also be managed over the network with a web browser application.

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

2.3 What's Included

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

- 10-Gigabit Web Smart Switch - 10-Port
- AC power cord
- (4) adhesive rubber feet
- (2) 19" mounting brackets and (2) screws to secure brackets to the switch
- This Quick Start Guide

NOTE: Mounting hardware for installing the switch/bracket assembly to the rack itself are not included.

The user's manual explains how to operate and use the management functions of the switch.

The full user manual/installation guide can be downloaded from the Black Box Web site.

To download from the Web site:

1. Go to www.blackbox.com
2. Enter the part number (LGB5510A) in the search box:
3. Click on the "Resources" tab on the product page, and select the document you wish to download.

Chapter 2: Overview

If you have any trouble accessing the Black Box site to download the manual, you can contact our Technical Support at 724-746-5500 or info@blackbox.com.

2.4 Hardware Description

The switch has eight 10GBASE-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.

Figures 2-1 and 2-2 show the front and back panels of the switch. Table 2-1 describes its components.

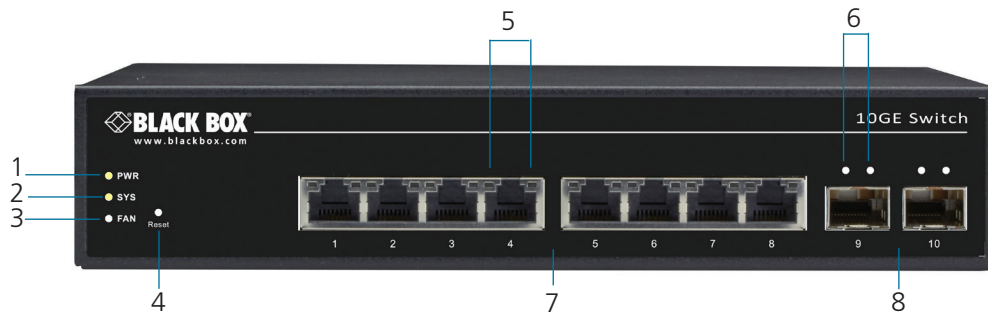


Figure 2-1. Front panel.



Figure 2-2. Back panel.

Table 2-1. Switch components.

Number in Figure 2-1 or 2-2	Component	Condition	Description
System Status LEDs			
1	(1) Power LED	Green OFF	Lights green when power is on to the switch. OFF when there is no power to the switch.
2	(1) System LED	Green OFF	Lights green when the system is ready. OFF when system is not ready.
3	(1) Fan LED	Red OFF	Lights red when fan is in error. OFF when fan is operating correctly.
User Controls			
4	(1) Reset button		Press to reset the switch.
Port Status LEDs			
5	(8) TP Speed LEDs	Green/Amber	Lights green when the TP link is 10G (Left) / 1G (Right). Lights amber when the TP link is 100 Mbps (Right).
6	(2) SFP+ Speed LEDs	Green	Lights green when the SFP+ link is 10G (Left) / 1G (Right).
Connectors			
7	(8) RJ-45 ports	10/1000/10G ports	Link to 10/100/10G devices.
8	(2) 1G/10G SFP+ transceiver slots	1G/10G network connection via optional SFP+ modules	Uplink to 1G/10G networks via SFP+ modules. <i>NOTE: See Table 2-2 for a list of compatible SFP+ modules.</i>
9	(1) 3-pin connector	AC power cord socket	Plugs into a 100–240 VAC, 50-60 Hz, 4-A power cord.

Table 2-2. Compatible SFP+ transceiver modules.

Part Number	Description
LFP411	SFP/1250 Extended Diagnostics, LC multimode, 850 nm, 550 m
LFP412	SFP/1250 Extended Diagnostics, LC multimode, 1310 nm, 2 km
LFP413	SFP/1250 Extended Diagnostics, LC single-mode, 1310 nm, 10 km
LFP414	SFP/1250 Extended Diagnostics, LC single-mode, 1310 nm, 40 km
LFP418	SFP/1250 Extended Diagnostics, LC single-mode, 1550 nm, 80 km
LFP420	Simplex SFP/1250, Extended Diagnostics, single-mode, 1550 nm TX, 1310 nm RX
LFP421	Simplex SFP/1250, Extended Diagnostics, single-mode, 1310 nm TX, 1550 nm RX

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. A switch is one of the most important devices for today's networking technology.

When performance bottlenecks are caused by congestion at the network access point (for example, a file server), the device can be connected directly to a switched port. Using full-duplex mode, the bandwidth of the dedicated segment will 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 subdividing the network into smaller and more manageable segments, and linking them to the larger network turns the hop count back to zero and removes the limitation.

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 LGB5510A Switch has eight 10-Gigabit Ethernet TP ports with auto MDI-X and two slots for removable SFP+ modules that support comprehensive types of fiber connection, such as LC and BiDi-LC modules. It is not only designed to segment your network, but also to provide a wide range of options in setting up network connections. Some typical applications are described below.

The switch is suitable for the following applications.

- Enterprise or SMB remote sites.
- Peer-to-peer connecting two remote offices.
- Office network.
- High performance requirements environments.
- Advanced security for network safety applications.
- Data/voice and video conferencing applications.

4. Installing the Switch

4.1 Selecting a Site

Mount the switch either in a standard 19-inch equipment rack (via the included rackmount kit) or on a flat surface. Follow the guidelines below when choosing a location.

- The site should:
 - Be located at the center of all the devices you want to link and near a power outlet.
 - Be able to maintain a temperature within +14 to +122° F (-10 to +50° C) and 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 source of electrical interference.
- Make sure that LGB5510A Switch is connected to a separate grounded power outlet that provides 100 to 240 VAC, 50 to 60 Hz.

4.2 Ethernet Cabling

To ensure proper operation when installing the switch into a network, make sure that the current cables are suitable for 1000BASE-T or 10GBASE-T operation. Check the following criteria against the current installation of your network:

- Cable type: Unshielded twisted pair (UTP) or shielded twisted pair (STP) cable with RJ-45 connectors; we recommend Category 6 or 6a with maximum length of 328 feet (100 meters) for 1000BASE-TX, and Category 6a with maximum length of 328 feet (100 meters) for 10GBASE-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.

After unpacking this switch, check the contents to be sure you have received all the components. Then, before beginning the installation, be sure you have all other necessary installation equipment.

4.3 Package Contents

- 10-Gigabit Web Smart Switch - 10-Port
- AC power cord
- (4) adhesive rubber feet
- (2) 19" mounting brackets and screws
- This Quick Start Guide

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 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 (+14 to +122° F [-10 to +50° C]) .

Chapter 4: Installing the Switch

- Mechanical Loading: Do not place any equipment on top of a rackmounted unit.
- Circuit Overloading: Do not overload the supply circuit to the rack assembly.
- Grounding: Properly ground rackmounted equipment.

To rackmount devices:

Step 1: Attach the brackets to the device using the screws provided.

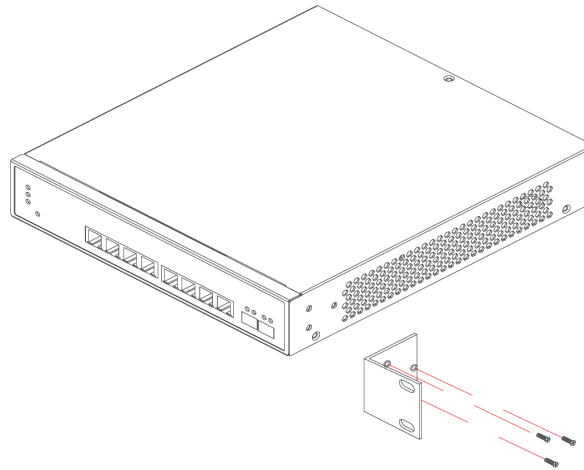


Figure 4-1. Attaching the brackets.

Step 2: Mount the switch/bracket assembly using three rackmounting screws (not provided). Secure the lower rackmounting screws first to prevent the brackets from bending caused by the weight of the switch.

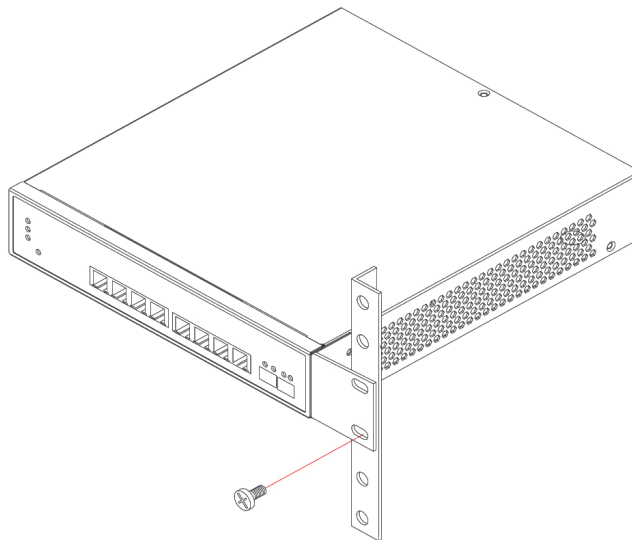


Figure 4-2. Installing the switch in a rack.

Step 3: If you are installing a single switch only, turn 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 Wallmounting

To wallmount the switch:

Step 1: Drill two holes (2.7-mm deep) through the wall with the drill (4.4-mm to 6.8-mm in diameter).

Step 2: Place the plastic conical anchors into these two holes, then fasten the screws.

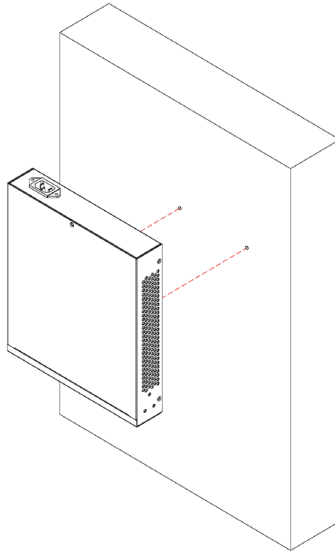


Figure 4-3. Installing the switch on a wall.

NOTES:

1. Allow proper space for ventilation.
2. Do not bend the fiber cable vertically at random.
3. The 6-foot (1.8-meter) power cord length can match the distance between the switch and the power outlet.

Chapter 4: Installing the Switch

4.4.3 Desktop or Shelf Mounting

To mount the switch on a desktop or shelf:

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

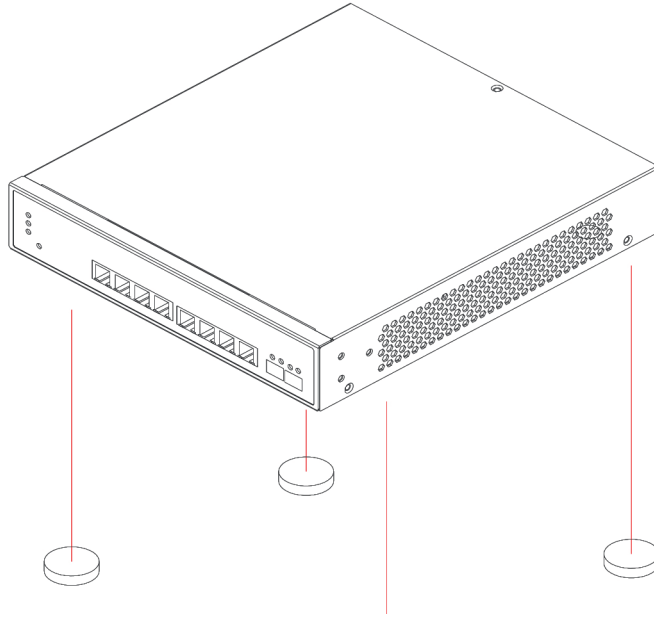


Figure 4-4. Attaching the adhesive rubber feet.

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

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

Step 4: If you are 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 SFP+ modules from an SFP+ slot without powering off the switch. Use only compatible SFP+ modules.

WARNING: *Your eyes might be harmed! The SFP+ modules are Class 1 laser devices. Avoid direct eye exposure to the beam coming from the transmit port.*

NOTES:

1. *The SFP+ ports operate only at full duplex. Half-duplex operation is not supported.*
2. *Make sure the network cable is NOT connected when you install or remove an SFP+ module.*

CAUTION: *Use only supported SFP+ modules with your switch. Other products might not be compatible and could cause the switch to malfunction.*

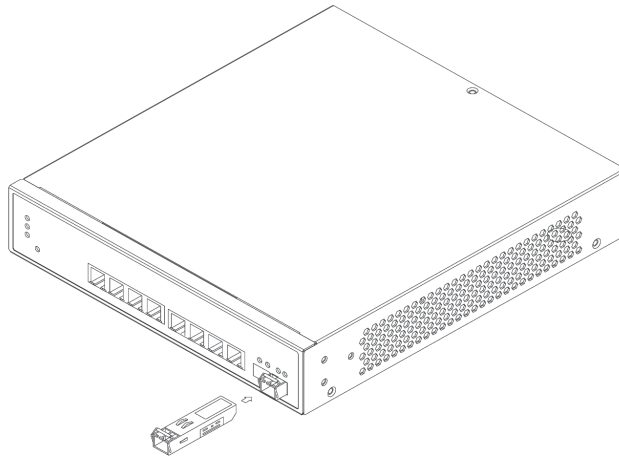


Figure 4-5. Inserting an SFP+ transceiver module into a slot on the switch.

The SFP+ slots support the following optional SFP+ transceivers shown in Table 4-1.

Table 4-1. Compatible SFP+ transceiver modules.

Part Number	Description
LFP411	SFP/1250 Extended Diagnostics, LC multimode, 850 nm, 550 m
LFP412	SFP/1250 Extended Diagnostics, LC multimode, 1310 nm, 2 km
LFP413	SFP/1250 Extended Diagnostics, LC single-mode, 1310 nm, 10 km
LFP414	SFP/1250 Extended Diagnostics, LC single-mode, 1310 nm, 40 km
LFP418	SFP/1250 Extended Diagnostics, LC single-mode, 1550 nm, 80 km
LFP420	Simplex SFP/1250, Extended Diagnostics, single-mode, 1550 nm TX, 1310 nm RX
LFP421	Simplex SFP/1250, Extended Diagnostics, single-mode, 1310 nm TX, 1550 nm RX

To install an SFP+ transceiver:

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: 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 included in the switch package. Order them separately.

Chapter 4: Installing the Switch

4.6 Connecting to a Power Source

You can plug or remove power cord from AC power socket, to switch the power on and off.

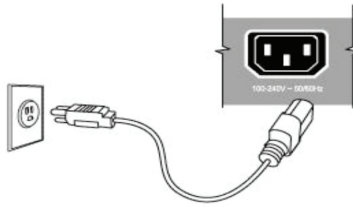


Figure 4-6. Inserting the power cord into the AC socket.

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 System LED is lit. If not, make sure 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.*

5. 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:

To access the web management of the LGB5510A switch, enter the default IP Address in a Web browser and press enter.

For example:

`http://192.168.1.1`

Once you have entered the IP address into the web browser you will be prompted to enter a username and password so you can access the web management interface.

Enter the default values (username: admin, password: press the enter key).

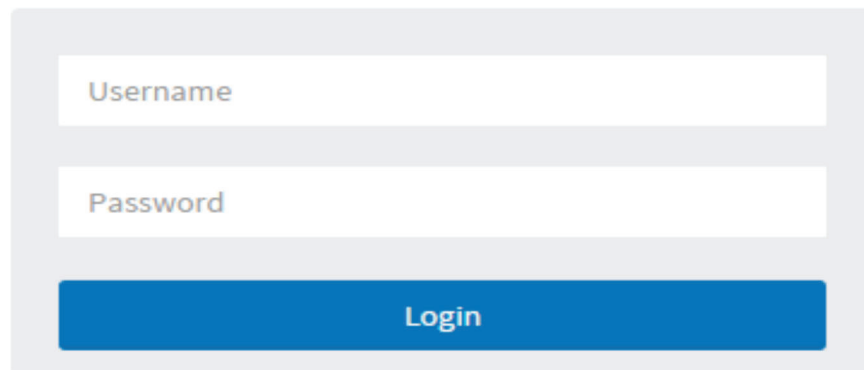
The image shows a login screen with a light gray background. It contains two white input fields stacked vertically. The top field is labeled 'Username' in a light gray font. The bottom field is labeled 'Password' in a light gray font. Below these fields is a solid blue rectangular button with the word 'Login' in white text.

Figure 5-1. Login screen.

NOTE: For full configuration details of the LGB5510A switch, refer to the user manual.

Chapter 6: Making Network Connections

6. Making Network Connections

6.1 Connecting Network Devices

The switch is designed to be connected to 100M, 1G, 10Gbps network cards in PCs and servers, as well as to other switches and hubs. It may also be connected to remote devices using optional SFP+ transceivers.

6.2 Twisted-Pair Devices

Each device requires an unshielded twisted-pair (UTP) cable with RJ-45 connectors at both ends. Use Category 6 or 6a cable for 10GBASE-T connections, and Category 6 or better for 1000BASE-TX connections.

6.3 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).

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.

6.4 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.

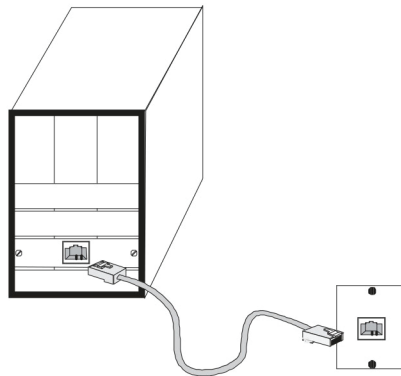


Figure 6-1. Making twisted-pair connections.

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 does not exceed 328 ft (100 meters) in length.

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

6.5 Network Wiring Connections

A punch-down block is an integral part of 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 7, Cable Labeling and Connection Records.

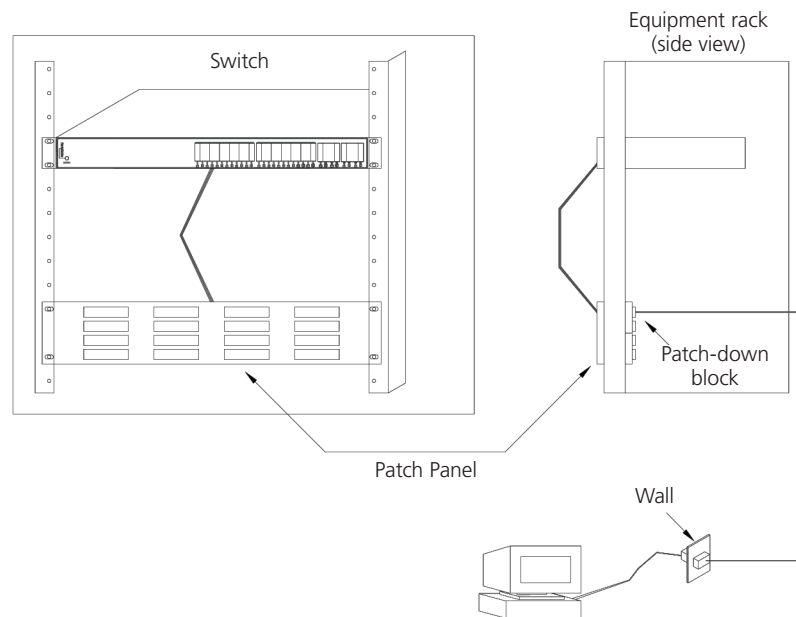


Figure 6-2. Network wiring connections.

6.6 Fiber Optic SFP+ Devices

An optional 10Gigabit 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 multi-mode fiber 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. Never look directly at a transmit port when it is powered on. Your eyes might be damaged!*

CAUTION: *When selecting a fiber SFP+ device, make sure 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, replace the rubber plug 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, you can attach the cable in only one orientation.

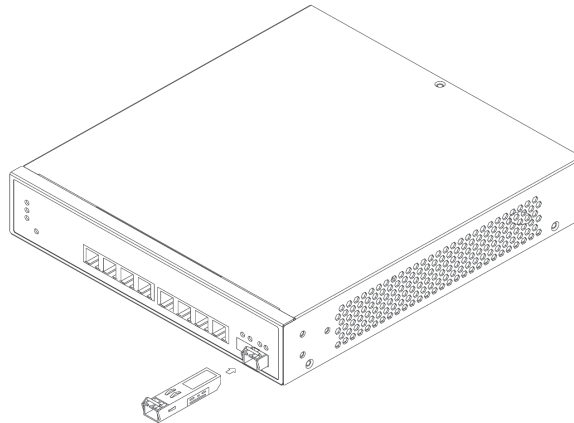


Figure 6-3. Making fiber port connections.

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.

6.7 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.

6.8 10GBASE-T Cable Requirements

All Category 6a UTP cables used for 1000BASE-TX connections should also work for 10GBASE-T, providing that all four wire pairs are connected. We recommend using Category 6 or Category 6a cable for all critical connections, and for any new cable installations. Category 6 and 6a specifications include test parameters that are only recommendations for Category 6a.

The first step in preparing existing Category 6a cabling for running 10GBASE-T is a simple test of the cable installation to be sure that it complies with the IEEE 802.3-2005 standards.

6.9 10-Gbps Gigabit Ethernet Collision Domain

Table 6-1. Maximum cable lengths.

10GBASE-T Gigabit Ethernet cable.			
Cable Type		Maximum Cable Length	Connector
Category 6a 100-ohm UTP or STP		328 ft. (100 m)	RJ-45
1000BASE-T Gigabit Ethernet cable.			
Cable Type		Maximum Cable Length	Connector
Category 5, 5e or 6 100-ohm UTP or STP		328 ft. (100 m)	RJ-45
10GBASE-SR Gigabit Fiber cable.			
Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
OM3 50/125 micron multimode fiber	1500 MHz/km	984 ft. (300 m)	LC
1000BASE-SX Gigabit Fiber cable.			
Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
50/125 micron multimode fiber	400 MHz/km	500 m (1641 ft)	LC
50/125 micron multimode fiber	500 MHz/km	550 m (1805 ft)	LC
62.5/125 micron multimode fiber	160 MHz/km	220 m (722 ft)	LC
62.5/125 micron multimode fiber	200 MHz/km	275 m (902 ft)	LC
1000BASE-LC/LHX/XD/ZX Gigabit Fiber cable.			
Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
9/125 micron single-mode fiber 1310 nm	N/A	10 km (6.2 miles)	LC
9/125 micron single-mode fiber 1550 nm	N/A	30 km (18.64 miles)	LC
9/125 micron single-mode fiber 1550 nm	N/A	50 km (31.06 miles)	LC
1000BASE-LX Single Fiber Gigabit Fiber cable.			
Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
Single-mode TX-1310nm RX-1550nm	N/A	20 km (12.42 miles)	BIDI LC
Single-mode TX-1550nm RX-1310nm	N/A	20 km (12.42 miles)	BIDI LC

7. 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 inter-connected devices, isolate faults, and change your topology without unnecessary time consumption.

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.
- 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.

8. Troubleshooting

8.1 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 10 Gbps, 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 LGB5510A switch devices behave in this way (in compliance with the IEEE 802.3 standard), if a device connected to the switch has a fixed configuration at 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 LGB5510A switch devices are configured to autonegotiate, 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 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. We recommend using a Category 6a cable tester for every 1000BASE-TX and 10GBASE-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.

Table 8-1. 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 Black Box Technical Support at 7234-746-5500 or info@blackbox.com.
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.

8.2 Contacting Black Box

If you determine that your 10-Gigabit Web Smart Switch - 10-Port is malfunctioning, do not attempt to alter or repair the unit. It contains no user-serviceable parts. Contact Black Box Technical Support at 724-746-5500 or info@blackbox.com.

Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the nature and duration of the problem.
- when the problem occurs.
- the components involved in the problem.
- any particular application that, when used, appears to create the problem or make it worse.

8.3 Shipping and Packaging

If you need to transport or ship your 10-Gigabit Web Smart Switch - 10-Port:

- Package it carefully. We recommend that you use the original container.
- If you are returning the unit, make sure you include everything you received with it. Before you ship for return or repair, contact Black Box to get a Return Authorization (RA) number.

9. Power and Cooling Problems

9.1 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.

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.

9.2 In-Band Access

You can access the management agent in the switch from anywhere within the attached network using 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.

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