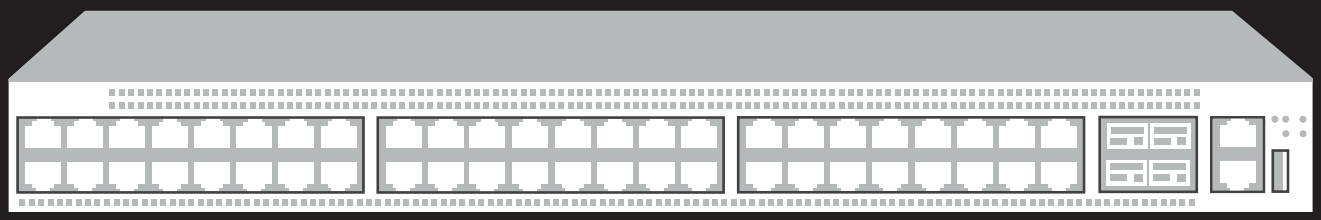
HARDWARE INSTALLATION GUIDE

EMS1G-48

48-PORT 1G IP NETWORK SWITCH

24/7 TECHNICAL SUPPORT AT 1.877.877.2269 OR VISIT BLACKBOX.COM



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SAFETY INSTRUCTIONS

This guide provides site preparation recommendations, step-by-step procedures for rack mounting and desk mounting, inserting optional modules, and connecting to a power source.

CAUTION: To avoid electrostatic discharge (ESD) damage, wear grounding wrist straps when handling this equipment.

WARNING: Only trained and qualified personnel can install this equipment. Read this guide before you install and power up this equipment. This equipment contains two power cords. Disconnect both power cords before servicing.

WARNING: This equipment contains optical transceivers, which comply with the limits of Class 1 laser radiation.

WARNING: When no cable is connected, visible and invisible laser radiation may be emitted from the aperture of the optical transceiver ports. Avoid exposure to laser radiation. Do not stare into open apertures.

CHAPTER 1: SPECIFICATIONS

48-PORT 1G NETWORK SWITCH (EMS1G-48) SPECIFICATIONS	
APPROVALS	Environmental Compliances: Japan: VCCI V3/2009 Class A; USA: FCC CFR 47 Part 15, Subpart B:2009, Class A; RoHS EMI Certifications: Australia/New Zealand: AS/NZS CISPR 32: Class A; Canada: ICES-003, Issue-4, Class A; Europe: EN 55032: 2015+A1:2007 (CISPR 32); Class A; Japan: VCCI V3/2009 Class A; USA: FCC CFR 47 Part 15, Subpart B:2009, Class A Safety Certifications: UL/CSA, EN 60959-1, EN 60825-1, FDA Regulation 21 CFR 1040.10 and 1040.11
ENVIRONMENTAL	Operating Humidity: 5 to 85%, relative humidity, non-condensing Operating Temperature: 32 to 113° F (0 to 45° C) Storage Humidity: 5 to 95%, relative humidity, non-condensing Storage Temperature: -40 to +158° F (-40 to +70° C)
MANAGEMENT	Console port management: (1) RJ-45 console management port with RS-232 signaling; Protocols: UDP, TCP, Ethernet, Telnet, FTP, IPv4, IPv6; IPv4: ICMP, ARP, DNS (client), NTPv3, CIDR, BOOTP (relay) IPv6: Telnet, FTP, TACACS, RADIUS, SSH, NTP
PERFORMANCE	Switching Capacity: 260 Gbps (full-duplex); Forwarding capacity: 131 Mpps; Packet Buffer Memory: 4 MB; CPU Memory: 2 GB MAC Addresses: Up to 80 K IPv4 Routes: 16 K; IPv6 Routes: 8K (Shared CAM space with IPv4); Link aggregation: 16 links per group, 128 groups per stack; Queues per port: 8 queues; Layer 2 VLANs: 4K; MSTP: 64 instances; VRF-lite: 64 instances; Line-rate Layer 2 switching: all protocols, including IPv4 and IPv6; Line-rate Layer 3 routing: IPv4 and IPv6; IPv4 host table size up to 40k max; IPv6 host table size 8K; IPv4 Multicast table size 8K; LAG load balancing: based on Layer 2, IPv4 or IPv6 headers; Latency: 3.7 µsec for 1000BASE-T, 1.8 µsec for SFP+;
PHYSICAL	Connectors/Interfaces: (48) 10/1000/1000BASE-T RJ-45 ports, (4) 10 GbE SFP+ uplink ports, (1) RJ-45 RS-232 serial console port Dimensions: 1.71" H (1 RU) x 17.09" W x 12.6" D (4.4 x 43.4 x 32 cm) Indicators: (1) Power LED, (48) 10/100/1000BASE-T TP Link/Activity LEDs, (48) Speed LEDs, (4) SFP Link LEDs; Mounting: Rackmounted Weight: 12.8 lb. (5.84 kg)
POWER	Input: 90–264 VAC, 50/60 Hz Maximum Power Consumption: 87 W Typical Power Consumption: 65 W Max. Thermal Output: 290 BTU/hr.; Max. Current Draw per System: <1 A at 100/120 VAC, <0.5 A at 200/240 VAC Power Supply Type: (2) hot-swappable redundant AC power Fans: (4) hot-swappable redundant fans
STANDARDS	IEEE: IEEE 802.1ab LLDP; 802.1D Bridging, STP; 802.1p L2 Prioritization; 802.1Q VLAN Tagging, Double VLAN Tagging, GVRP; 802.1s MSTP; 802.1w RSTP; 802.1X Network Access Control; 802.3ab Gigabit Ethernet (1000BASE-T); 802.3ac Frame Extensions for VLAN Tagging; 802.3ad Link Aggregation with LACP; 802.3ae 10 Gigabit Ethernet (10GBASE-X) on optical ports; 802.3az Energy Efficient Ethernet (EEE); 802.3u Fast Ethernet (100BASE-TX) on mgmt ports; 802.3x Flow Control; 802.3z Gigabit Ethernet (1000BASE-X); ANSI/TIA-1057 LLDP-MED, Force10 PVST+, MTU 12,000 bytes; RFC and I-D compliance

CHAPTER 2: OVERVIEW

2.1 INTRODUCTION

The EMS1G-48 is a low-cost top-of-rack (ToR) switch for 1 Gbps links to servers and 10 Gbps uplinks to the 40 Gbps switching fabric in the core.

2.2 FEATURES

- Forty-eight 10/100/1000BASE-T RJ-45 ports
- Four SFP+ 10G ports
- One serial console port
- One universal serial bus 2.0 (USB Type-A) port for additional file storage
- One management port
- Central processing unit (CPU) system with 2GB DDR III RAM.
- Temperature monitoring
- Software-readable thermal monitor
- Real time clock (RTC) support
- Hot-plug redundant power supply
- Power management monitoring
- Removable fans
- Standard 1U chassis

2.3 WHAT'S INCLUDED

Your package should include the following items. If anything is missing or damaged, contact Black Box Technical Support at 877-877-2269 or info@blackbox.com

- (1) EMS1G-48 Switch
- (1) RJ-45 to DB9 female cable
- (2) sets of rail kits, no tools required
- (1) PSU, a second PSU is sold separately
- (3) fan units
- (1) AC country/region-specific power cord

2.4 ADDITIONAL ITEMS YOU MAY NEED

- Copper/fiber cables
- Extra power supply
- Extra fan module
- Extra mounting brackets if installing in a four-post rack or cabinet

2.5 HARDWARE DESCRIPTION

2.5.1 FRONT PANEL

Figure 2-1 shows the front panel of the switch. Table 2-1 describes its components.

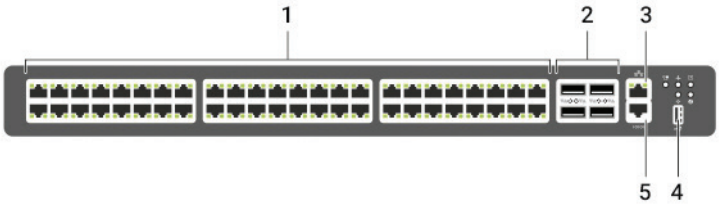

FIGURE 2-1. FRONT PANEL OF THE SWITCH

TABLE 2-1. FRONT PANEL COMPONENTS

NUMBER IN FIGURE 2-1	COMPONENT	DESCRIPTION
1	(48) RJ-45 ports	Links to 10/100/1000BASE-T devices
2	(4) SFP+ ports	SFP+ modules install here
3	(1) RJ-45 port	Links to serial console
4	(1) USB 2.0 port	Console Port (becomes primary console port when connected)
5	(1) RJ-45 port	Management port

TABLE 2-2. COMPATIBLE SFPS

PRODUCT CODE	DESCRIPTION
LSP421	SFP+, 10-Gb, Extended Diagnostics, 850-nm Multimode Fiber, 300-m, LC
LSP422	SFP+, 10GBASE-R, 1310-nm single-mode, 10 km
LSP431	SFP+, 10-Gb, Extended Operating Temperature & Diagnostics, 850-nm Multimode Fiber, 300-m

2.5.2 BACK PANEL

Figure 2-2 shows the back panel of the switch. Table 2-3 describes its components.

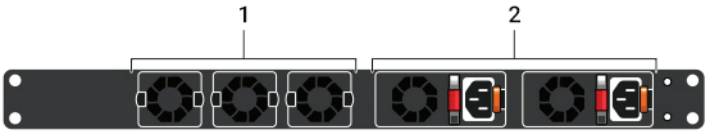

FIGURE 2-2. BACK PANEL OF THE SWITCH

TABLE 2-3. BACK PANEL COMPONENTS

NUMBER IN FIGURE 2-2	COMPONENT	DESCRIPTION
1	(3) fan modules	Provide proper ventilation
2	(2) power supply units	Provide redundant power

2.5.3 LED INDICATORS

The EMS1G-48 includes LED displays on the I/O side of the switch. This section describes open networking installation environment (ONIE) LED behaviors. Some LED behaviors may change after you install your software.

The following EMS1G-48 switch LED behavior is seen during ONIE operations.

Figure 2-3 shows the LEDs on the switch. Table 2-4 describes their functions.

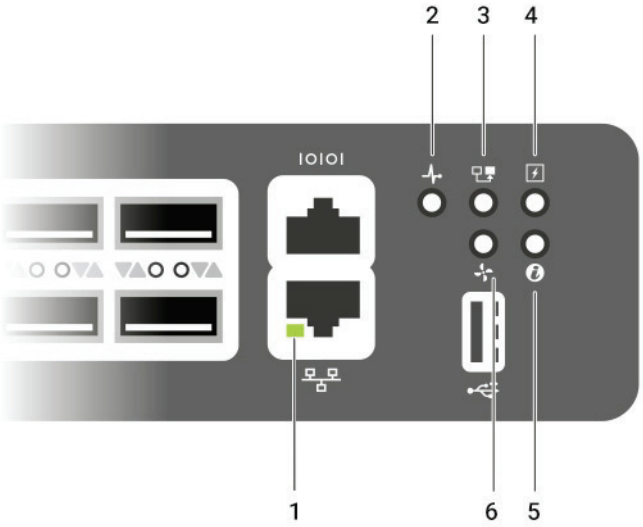

FIGURE 2-3. LEDS ON THE SWITCH

TABLE 2-4. LEDS ON THE SWITCH

NUMBER IN FIGURE 2-3	NAME OF LED	DESCRIPTION
1	System Status/Health LED	• Solid green—Normal operation • Blinking green—Booting • Solid yellow—Critical system error • Blinking yellow—Non-critical system error, fan failure, or power supply failure
2	Power LED	• Off—No power • Solid Green—Normal • Solid yellow—POST is in process • Blinking yellow—Power supply failed
3	Master LED	• Off—Switch is in Stacking Slave mode • Solid green—System is in Stacking Master or Standalone mode
4	Fan LED	• Solid green—Fan powered and running at the expected RPM
5	Locator LED	• Off—Locator function is disabled • Blinking blue—Locator function is enabled

TABLE 2-4. LEDS ON THE SWITCH

NUMBER IN FIGURE 2-3	NAME OF LED	DESCRIPTION
6	Management Ethernet Port Link LED	• Off - No Link • Solid green - Link on 1 Gbps speed • Solid yellow - Link on 10/100 Mbps speeds

CHAPTER 3: PREPARING THE SITE

The EMS1G-48 is suitable for installation as part of a common bond network (CBN).

You can install the switch in:

- Network telecommunications facilities
- Data centers
- Other locations where the National Electric Code (NEC) applies

NOTE: Install the EMS1G-48 switch into a rack or cabinet before installing any optional components.

3.1 SITE SELECTION

Install this equipment in restricted access areas.

A restricted access area is one in which service personnel can only gain access using a special tool, lock, key or other means of security. Also, access is controlled by the authority responsible for the location.

Ensure that the area where you install your EMS1G-48 switch meets the following safety requirements:

- Near an adequate power source. Connect the switch to the appropriate branch circuit protection as defined in your codes.
- Environmental temperature range i from 32 to 113° F (0 to 45° C).
- The switch operating ambient temperature range is from 50 to 95° F (10 to 35° F).
- Operating humidity is from 5 to 85 percent noncondensing.
- Storage humidity is from 5 to 95 percent noncondensing.
- In a dry, clean, well-ventilated and temperature controlled room away from heat sources such as hot air vents or direct sunlight.
- Away from sources of severe electromagnetic noise.
- Positioned in a rack or cabinet, or on a desktop with adequate space in the front, rear, and sides for proper ventilation and access.

3.2 CABINET PLACEMENT

Install the EMS1G-48 only in indoor cabinets designed for use in a controlled environment.

Do not install the EMS1G-48 in outside cabinets. For cabinet placement requirements, see Site Selection.

The cabinet must meet minimum size requirements. Airflow must be in accordance with the Electronic Industries Alliance (EIA) standard. Ensure that there is a minimum of 5 inches (12.7 cm) between the intake and exhaust vents and the cabinet wall.

3.3 RACKMOUNTING

When you prepare your equipment rack, ensure that the rack is grounded.

Ground the equipment rack to the same ground point the power service in your area uses. The ground path must be permanent.

3.4 SWITCH GROUND

Black Box recommends you ground your switch. Use the EMS1G-48 in a common bond network (CBN).

Connect the grounding cables as described in Install the Switch.

3.5 FANS AND AIRFLOW

Installation of the fans is done as part of the factory install. The EMS1G-48 supports the following configuration:

- AC PSU with fan airflow from the I/O to the PSU

For proper ventilation, position the EMS1G-48 in an equipment rack or cabinet with a minimum of 5 inches (12.7 cm) of clearance around the exhaust vents. When you install two EMS1G-48 switches near each other, to permit proper airflow, position the two chassis at least 5 inches (12.7 cm) apart. The fan speed increases when the internal temperature reaches 161.6° F (72°C) and decreases to normal speed when the temperature falls to 136.4° F (58° C). The EMS1G-48 never intentionally turns off the fans.

3.6 POWER

To connect the chassis to the applicable power source, use the appropriate power cord with the EMS1G-48. An AC power cord is included with the switch.

When installing AC switches, follow the requirements of the National Electrical Code, ANSI/NFPA 70 where applicable.

The switch is powered-up as soon as the power cord is connected between the switch and the power source.

CAUTION: Always disconnect the power cable before you service the power supply slots.

CAUTION: Use the power supply cord as the main disconnect device on the AC switch. Make sure that the socket outlet is located/installed near the equipment and is easily accessible.

3.7 STORING COMPONENTS

If you do not install your EMS1G-48 and components immediately, properly store the switch and all optional components by following these guidelines:

- Storage location temperature must remain constant. The storage range is from -40 to +158° F (-40 to +70° C).
- Store on a dry surface or floor, away from direct sunlight, heat and air conditioning ducts.
- Store in a dust-free environment.

NOTE: ESD damage can occur when components are mishandled. Always wear and ESD-preventive wrist or heel ground strap when handling the switch and its accessories. After you remove the original packaging, place the switch and its components on an anti-static surface.

CHAPTER 4: NEBS COMPLIANCE

For your switch to be network equipment building system (NEBS) compliant, you must follow the instructions detailed in this section.

To be NEBS compliant, orient your switch in the rack so that the air inlet is from the front aisle and the air exhaust is to the rear aisle.

Important information

WARNING: The form-factor pluggable plus (SFP+), 1000BASE-T, console, Ethernet management, and universal serial bus (USB) ports are suitable for connection to intrabuilding or unexposed wiring or cabing only. You must NOT metallically connect the ports to interfaces that connect to the outside plant (OSP) or its wiring. Use these interface as intrabuilding interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE, Issue 6) and they require isolation from the exposed OSP cabling. Adding primary protectors is not sufficient protection to connect these interfaces metallically to OSP wiring.

WARNING: If you install and connect the EMS1G-48 switch to a commercial AC power source, you must connect the switch to an external special protection device (SPD).

To be NEBs compliant, you must follow these regulations:

- Locate your switch in a restricted access area where only trained personnel are allowed access.
- Install and connect your switch to the common bonding network (CBN).
- You can also install and connect your switch to the central office.
- Connect the battery returns of your switch as DC-I.
- Ground your switch using a copper ground connector.
- Clean and coat all bare grounding connection points on your switch with antioxidant
- Clean and coat all bare grounding connection points on your switch with an antioxidant solution before making connections.
- Bring all unplated surfaces on your switch to a bright finish and treat them with an antioxidant solution before making connections.
- Remove any nonconductive surfaces on your switch from the threads and connection points to ensure electrical continuity.
- Use the two-hole, Listed, compression-type lug with an AWG 14 gauge wire that uses 4-in./lb. to secure your switch to the frame.

NOTE: The switch can operate at -40.5 VDC to -60 VDC at a maximum current level of 24 A.

NOTE: The switch is Earthquake Z4-compliant when you attach the rails to the frame using threaded hardware.

CHAPTER 5: INSTALLING THE SWITCH

NOTE: Before unpacking the switch, inspect the container and immediately report any evidence of damage.

5.1 UNPACKING STEPS

1. Place the container on a clean, flat surface and cut all straps securing the container.
2. Open the container or remove the container top.
3. Carefully remove the switch from the container and place it on a secure and clean surface.
4. Remove all packing material.
5. Inspect the product and accessories for damage.

5.2 RACK OR CABINET HARDWARE INSTALLATION

You may either place the switch on a rack shelf or mount the switch directly into a 19" wide, EIA-310- E-compliant rack—four-post, two- post, or threaded methods. The rack system is provided for 1U front-rack and two-post installations.

The rack system includes two separately packaged rail assemblies and two rails that are shipped attached to the sides of the switch.

WARNING: This is a condensed reference. Read the safety instructions in your Safety, Environmental, and Regulatory information booklet before you begin.

NOTE: The illustrations in this document are not intended to represent a specific switch.

NOTE: Do not the use the mounted rails as a shelf or a workplace.

5.2.1 RACKMOUNT SAFETY CONSIDERATIONS

- Rack loading—Overloading or uneven loading of racks may result in shelf or rack failure, causing damage to the equipment and possible personal injury. Stabilize racks in a permanent location before loading begins. Mount the components beginning at the bottom of the rack, then work to the top. Do not exceed your rack's load rating.
- Power considerations—Connect only to the power source specified on the unit. When multiple electrical components are installed in a rack, ensure that the total component power ratings do not exceed the circuit capabilities. Overloaded power sources and extension cords present fire and shock hazards.
- Elevated ambient temperature—If installed in a closed rack assembly, the operating temperature of the rack environment may be greater than the room ambient temperature. Use care not to exceed the 113° F (45° C) maximum ambient temperature of the switch.
- Reduced air flow—Install the equipment in the rack so that the amount of airflow required for safe operation of the equipment is not compromised.
- Reliable earthing—Maintain reliable earthing of rack-mounted equipment. Pay particular attention to the supply connections other than the direct connections to the branch circuit, for example: use of power strips.
- Do not mount the equipment with the rear panel facing in the downward position.

5.2.2 RAILS SYSTEM INSTALLATION

The rackmounting system is provided to easily configure your rack for installation of your EMS1G-48 switch.

You can install the rail system using the 1U tool-less method or one of three 1U tooled methods—two-post flush mount, two-post center mount or four-post threaded.

1. With the rail flange ears facing outward, place one rail between the left and right vertical posts.

Align and seat the rear flange rail pegs in the rear vertical post flange. In the following illustration, item 1 and its extractions show how the pegs appear in both the square and non-threaded round holes.

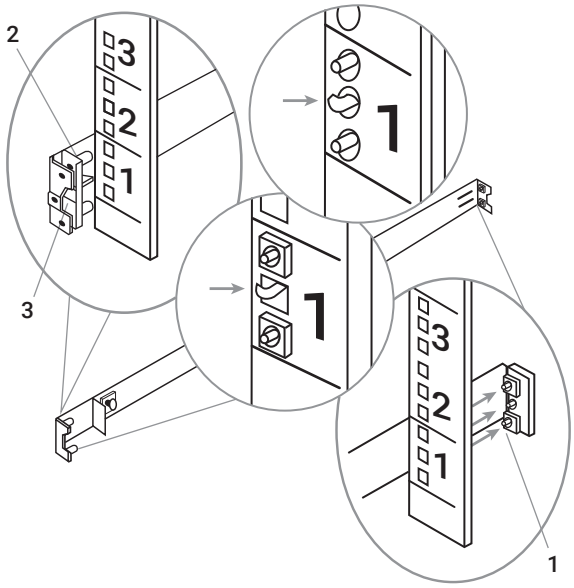

FIGURE 5-1. 1U TOOL-LESS CONFIGURATION

2. Align and seat the front flange pegs in the holes on the front side of the vertical post, item 2.

3. Repeat this procedure for the second rail.

4. To remove each rail, pull on the latch release button on each flange ear and unseat each rail, item 3.

CHAPTER 5: INSTALLING THE SWITCH

TWO-POST FLUSH MOUNT INSTALLATION

1. For this configuration, remove the castings from the front side of each rail assembly, item 1.

Use a Torx screwdriver to remove the two screws from each front flange ear on the switch side of the rail and remove each casting. Retain the castings for future rack requirements. It is not necessary to remove the rear flange castings.

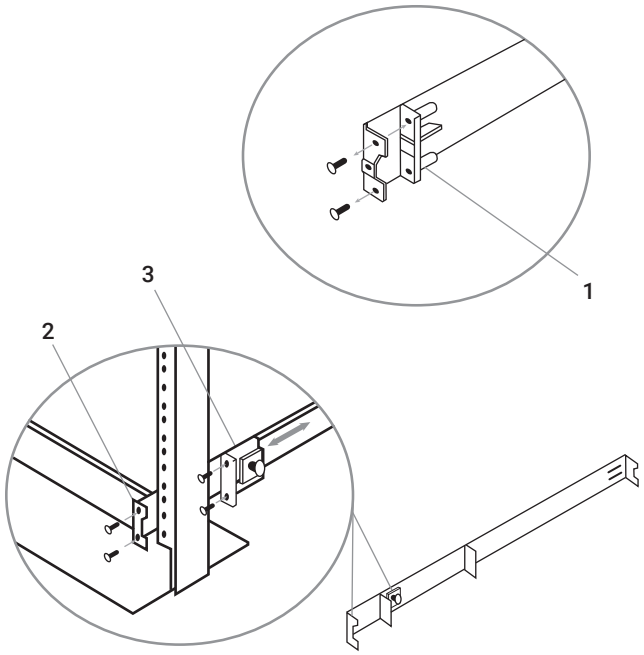

FIGURE 5-2. TWO-POST FLUSH-MOUNT CONFIGURATION

2. Attach one rail to the front post flange with two user-supplied screws, item 2.

3. Slide the plunger bracket forward against the vertical post and secure the plunger bracket to the post flange with two user-supplied screws, item 3.

4. Repeat this procedure for the second rail.

TWO-POST CENTER MOUNT INSTALLATION

1. Slide the plunger bracket rearward until it clicks into place and secure the bracket to the front post flange with two user-supplied screws, item 1.

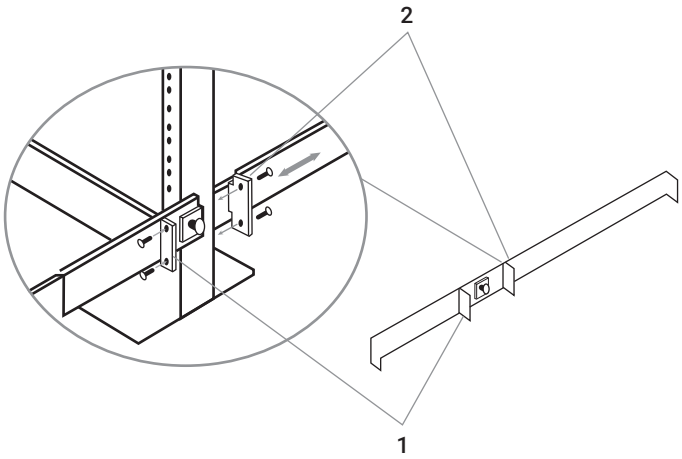

FIGURE 5-3. TWO-POST CENTER-MOUNT CONFIGURATION

2. Slide the back bracket towards the post. Secure it to the post flange with two user-supplied screws, to item 2.

3. Repeat this procedure for the second rail.

FOUR-POST THREADED INSTALLATION

1. For this configuration, remove the flange ear castings from each end of the rail assemblies.

To remove the two screws from each flange ear and remove each casting, use a Torx driver, item 1. Retain the castings for future rack requirements.

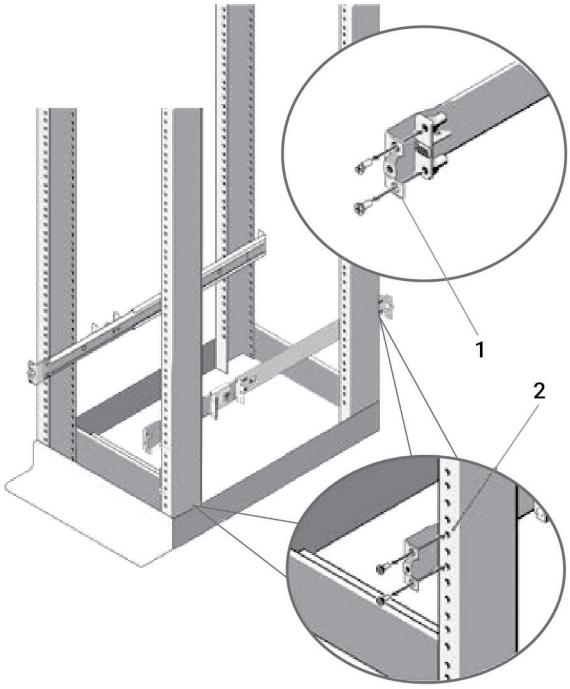

FIGURE 5-4. FOUR-POST THREADED CONFIGURATION

2. For each rail, attach the front and rear flanges to the post flanges with two user-supplied screws at each end, item 2.

5.3 SWITCH INSTALLATION

You can mount the switch in the 1U front-rack or 1U flush or center two-post configurations. Following is an example of a front-rack configuration.

For the 1U flush or center two-post configurations, slide the switch into the rails in the same manner as the four-post configurations.

1U FRONT-RACK INSTALLATION

Configure the rails that are attached to the switch.

1. Attach the inner chassis members switch rails to the EMS1G-48 switch. Item 3 shows the detail for the front standoff with the locking tab.

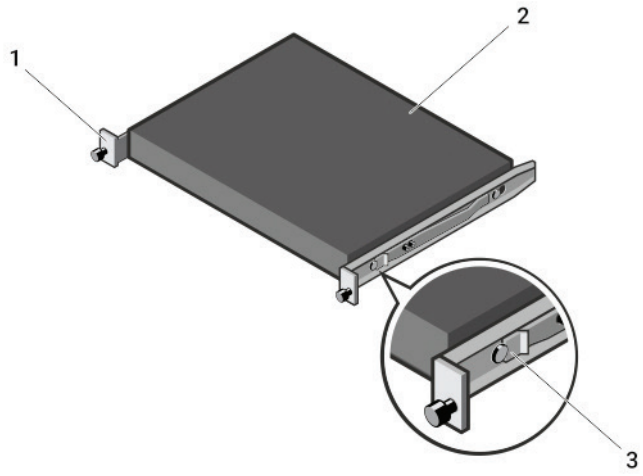

FIGURE 5-5. SWITCH RAILS ATTACHMENT

2. After you have installed both switch rails, line them up on the previously mounted rails and slide the switch in until it is flush with front of rack.

About three inches before you fully insert your switch, the rail locking feature engages to keep the switch from inadvertently sliding out of the rack and falling.

CHAPTER 5: INSTALLING THE SWITCH

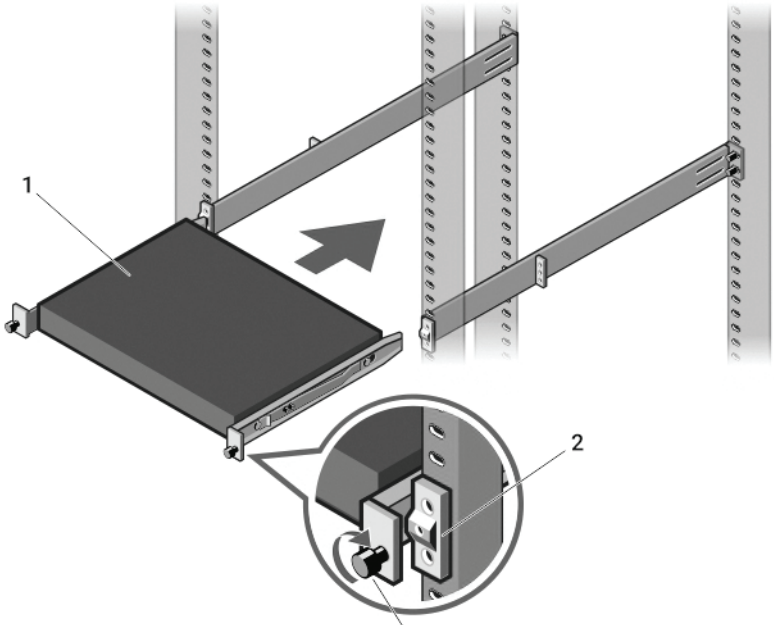

FIGURE 5-6. FRONT RACK INSTALLATION

NOTE: Do not the use the mounted rails as a shelf or a workplace.

5.4 GROUND CABLE

Black Box recommends that you ground your switch. To attach the ground cable to the chassis, use a single M4x0.7 screw. The cable itself is not included with the switch.

To properly ground the chassis, Black Box recommends using a 6 AWG one-hole lug, #10 hole size, 63” spacing, not included in shipping. The one-hole lug must be a UL recognized, crimp-type lug.

CAUTION: Grounding conductors must be made of copper. Do not use aluminum conductors.

NOTE: The rack installation ears are not suitable for grounding.

NOTE: Coat the one-hole lug with an antioxidant compound before crimping. Also, bring any unplated mating surfaces to a shiny finish and coat with an antioxidant before mating. Plated mating surfaces must be clean and free from contamination.

1. Cut the ground cable to the desired length.

The cable length must facilitate proper operation of the fault interrupt circuits. Black Box recommends using the shortest cable route allowable.

2. Take the one M4x0.7 screw from the package.

3. Attach the one-hole lug to the chassis using the supplied 10–32 screw with the captive internal tooth lock washer. Torque the screw to 20 in-lbs.

4. Attach the other end of the ground cable to a suitable ground point. The rack installation ears are not a suitable grounding point.

5.5 OPTICS INSTALLATION

The EMS1G-48 has four SFP+ optical ports.

The following SFP+ modules are compatible with the switch.

TABLE 5-1. COMPATIBLE SFPS

PRODUCT CODE	DESCRIPTION
LSP421	SFP+ - 10-Gb, Extended Diagnostics, 850-nm Multimode Fiber, 300-m, LC
LSP422	SFP+, 10GBASE-R, 1310-nm single-mode, 10 km
LSP431	SFP+, 10-Gb, Extended Operating Temperature & Diagnostics, 850-nm Multimode Fiber, 300-m

CAUTION: ESD damage can occur if components are mishandled. Always wear an ESD-preventive wrist or heel ground strap when handling the EMS1G-48 and its components.

WARNING: When working with optical fibers, follow all warning labels and always wear eye protection. Never look directly into the end of a terminated or unterminated fiber or connector as it may cause eye damage!

1. Position the optic so it is in the correct position. The optic has a key that prevents it from being inserted incorrectly.

2. Insert the optic into the port until it gently snaps into place.

NOTE: When you cable the ports, be sure not to interfere with the airflow from the small vent holes above and below the ports.

5.6 OPTICS REMOVAL

Remove an optic by pushing the tab on the optic and sliding the optic from the port.

When removing optics with direct attach cables (DACs) from the port, pull the release tab firmly and steadily. Before pulling the release tab, you may need to gently push the optic into the port to ensure it is seated properly. Do not jerk or tug repeatedly on the tab.

5.7 POWERING UP THE SWITCH

Supply power to the switch after it is mounted in a rack or cabinet.

Black Box recommends reinspecting your switch before powering up. Verify the following:

- The equipment is properly secured to the rack and properly grounded, optional.
- The equipment rack is properly mounted and grounded, optional.
- The ambient temperature around the unit, which may be higher than the room temperature, is within the limits specified for the switch. For more information, see Chapter 1, Specifications.
- There is sufficient airflow around the unit.
- The input circuits are correctly sized for the loads and that you use sufficient overcurrent protection devices.
- All protective covers are in place.
- Blank panels are installed if you do not install optional modules.

NOTE: A US AC power cable is included for powering up an AC power supply. You must order all other power cables separately.

NOTE: ESD damage can occur if components are mishandled. Always wear an ESD-preventive wrist or heel ground strap when handling the switch and its components.

CHAPTER 5: INSTALLING THE SWITCH

Power up sequence

When the switch powers up, the fans immediately come on at high speed. The fan speed slows as the switch continues to boot up.

CHAPTER 6: POWER SUPPLIES

The switch ships with one AC power supply. We recommend purchasing a second power supply.

• AC power supply with integrated fan

The EMS1G-48 switch includes an AC power supply with airflow from the I/O side to the PSU side. Two PSUs are required for full redundancy, but the switch can operate with a single PSU.

CAUTION: Do not mix power supplies with different airflow directions in the same switch chassis.

The PSUs are field replaceable. When running with full redundancy—two power supplies installed and running, you can remove and replace one PSU without disrupting traffic.

CAUTION: To prevent electrical shock, ensure that the switch is grounded properly. If you do not ground your equipment correctly, excessive emissions may result. Use a qualified electrician to ensure that the power cables meet your local electrical requirements.

NOTE: If you use a single PSU, install a blank plate in the other PSU slot. Black Box recommends using power supply 2 (PSU2) as the blank plate slot. Use a #1 Philips screw driver to install the blank plate.

NOTE: ESD damage can occur if components are mishandled. Always wear an ESD-preventive wrist or heel ground strap when handling the EMS1G-48 and its components.

6.1 COMPONENTS

The following power supply option is available for the EMS1G-48 switch:

- AC power supply with integrated fan

Power supply 1 (PSU1) is on the left side of the chassis; power supply 2 (PSU2) is on the right side of the chassis.

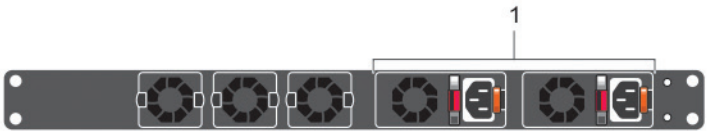

FIGURE 6-1. EMS1G-48 SWITCH PSUS

PSU 1 and 2

The PSUs have an integrated fan that you cannot replace individually. If the fan integrated in a PSU fails, you must replace the entire PSU. You can replace the fan trays individually. For fan tray replacement procedures, see Fans.

WARNING: Prevent exposure and contact with hazardous voltages. Do not attempt to operate this switch with the safety cover removed.

CAUTION: Remove the power cable from the PSU prior to removing the PSU. Also, do not connect the power cable before you insert the PSU in the chassis.

NOTE: To comply with the GR-1089 Lightning Criteria for Equipment Interfacing with AC Power Ports, use an external surge protection device (SPD) at the AC input of the router.

6.2 AC POWER SUPPLY INSTALLATION

NOTE: The PSU slides into the slot smoothly. Do not force a PSU into a slot as this action may damage the PSU or the switch chassis.

NOTE: Make sure that you correctly install the PSU. When you install the PSU correctly, the power connector is on the right side of the PSU.

NOTE: If you use a single PSU, install a blank plate in the other PSU slot. If you are only using one power supply, Black Box recommends installing the power supply in the first slot (PSU1) and installing a blank plate in the second slot (PSU2).

1. Remove the PSU slot cover from the switch using a small #1 Phillips screwdriver.
2. Remove the PSU from the electro-static bag.
3. Insert the PSU into the switch PSU slot. Insert the PSU exposed PCB edge connector first. The PSU slot is keyed so that the PSU can only be fully inserted in one orientation.

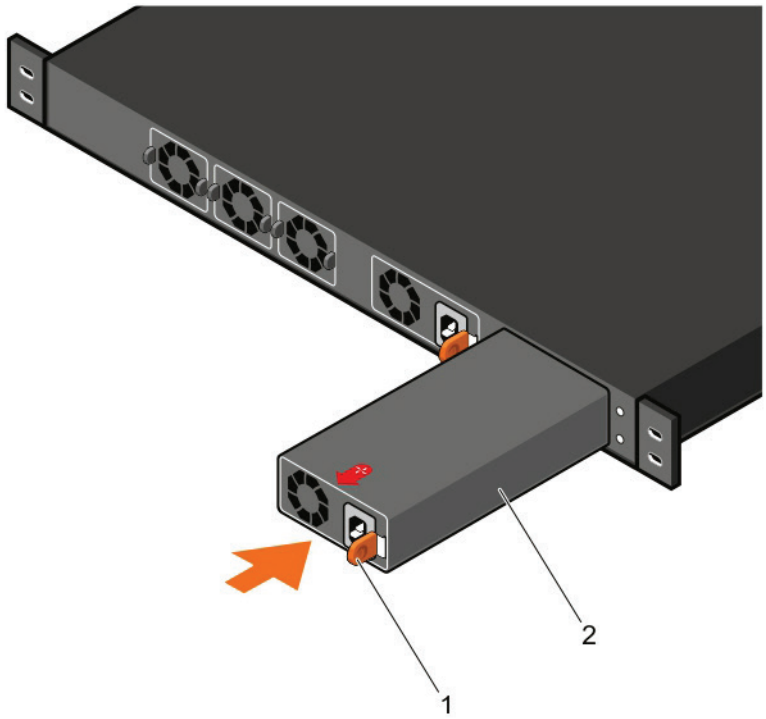

FIGURE 6-2. PSU INSTALLATION

When you install the PSU correctly, it snaps into place and is flush with the back of the switch.

4. Plug in the appropriate AC three-prong power cord from the switch PSU to the external power source.
5. If you have a redundant PSU, repeat steps 1 through 4 above using the second PSU slot on the switch.

NOTE: The switch powers up when you connect the cables between the power supply and the power source.

6.3 AC POWER SUPPLY REPLACEMENT

CAUTION: Disconnect the power cord before removing the power supplies. Also, disconnect all power cords before servicing.

NOTE: The PSU slides into the slot smoothly. Do not force a PSU into a slot as this action may damage the PSU or the switch chassis.

NOTE: If a PSU fails, you must replace the entire unit. There are no field serviceable components in the PSU. To request a hardware replacement, contact Black Box Technical Support at 877-877-2269 or info@blackbox.com

NOTE: If you use a single PSU, install a blank plate in the other PSU slot. If you are only using one power supply, we recommend installing the power supply in the first slot (PSU1) and installing a blank plate in the second slot (PSU2).

1. Disconnect the power cable from the PSU.

2. Use the grab handle to slide the PSU out of the power supply bay.

3. Use the grab handle on the replacement PSU to slide it into the power supply bay.

4. Attach the power cord to the replacement PSU.

NOTE: The switch powers up when you connect the cables between the power supply and the power source.

CHAPTER 7: FANS

The switch comes from the factory with one PSU and three fan modules installed in the chassis. The fan modules and the power supplies, which have integrated fans, are hot-swappable.

NOTE: To run the switch, all slots must have operating fan units. If you do not install a module in each slot either as part of the PSU or as an independent fan module, the switch shuts down in one minute.

In addition to the power supply modules, you can order and install fan modules separately.

The switch supports two airflow direction options. Do not mix airflow types in a chassis; you can use only a single airflow direction in a chassis. If the airflow directions are mismatched, the switch issues an alarm. You must correct the mismatched airflow direction.

- Normal—airflow is from the I/O panel to the PSU.
- Reversed—airflow is from the PSU to the I/O panel.

All fans and PSUs in a configuration must be in the same airflow direction.

Environmental factors can decrease the amount of time required between fan replacements. Check the environmental factors regularly. An increase in temperature and/or particulate matter in the air might affect performance; for example, new equipment installation.

CAUTION: Check the fans at six-month intervals and replace them as necessary. Regularly monitor the speeds of the fans to accurately determine replacement intervals.

7.1 COMPONENTS

The following are the EMS1G-48 fan components.

• EMS1G-48 Fan module

• EMS1G-48 Fan module—Reverse flow

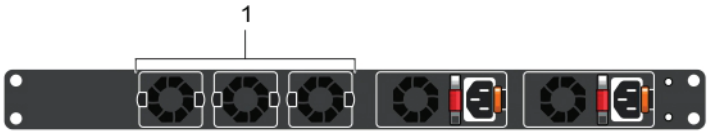

FIGURE 7-1. FAN MODULES

7.2 FAN MODULE INSTALLATION

The fan modules in the switch are field replaceable.

Module slot 1 is on the left side of the chassis, module slot 2 is in the middle of the chassis, and module slot 3 is on the right side of the chassis.

CAUTION: DO NOT mix airflow directions. All fans must use the same airflow direction—reverse or normal. If you mix the airflow direction, the switch detects the discrepancy and issues an alarm. You must correct the mixed airflow direction.

1. Take the fan module out of the shipping box.

2. Slide the module into the bay.

7.3 FAN MODULE REPLACEMENT

CAUTION: Complete steps 1 and 2 within one minute or the switch powers down.

1. Slide the fan module out of the bay.
2. Slide the replacement module into the bay.

7.4 AFTER INSTALLING THE SWITCH

After you have securely installed and powered on the switch, to configure your switch, see your ONIE-compatible operating system documentation.

CHAPTER 8: MANAGEMENT PORTS

Besides the 10/100/1000BASE-T RJ-45 ports, the switch provides several ports for management and storage.

8.1 RS-232 CONSOLE PORT ACCESS

The RS-232 console port is on the I/O-side of the switch chassis, as shown.

FIGURE 8-1. SWITCH RS-232 CONSOLE PORTS

1. RS-232 Console Port, top
2. Ethernet management port, bottom

NOTE: Before starting this procedure, make sure that your PC has a 9-pin serial port and that you have a terminal emulation program already installed and running on the PC.

NOTE: If your PC's serial port cannot accept a female DB9 connector, acquire a DB9 male-to-male adapter.

1. Install the provided RJ-45 connector side of the provided cable into the switch console port.
2. Install the DB9 female side of the provided copper cable into your PC's serial port or into other data terminal equipment (DTE) server hardware that you intend to use.
3. Keep the default terminal settings on the console as follows:

- 115200 baud rate
- No parity
- 8 data bits
- 1 stop bit
- No flow control

8.1.1 USB-B CONSOLE PORT ACCESS

The USB-B console port is on the I/O side of the switch.

The terminal settings are the same for the serial console port and the RS-232/RJ-45 console port:

- 115200 baud rate
- No parity
- 8 data bits
- 1 stop bit
- No flow control

When you connect the USB-B port, it becomes the primary connection and, while connected, all messages are sent to the USB-B port.

NOTE: Before starting this procedure, be sure you have a terminal emulation program already installed on your PC. You will need to install the appropriate drivers to support the USB-B port. For assistance, contact Black Box Technical Support at 877-877-2269 or info@blackbox.com to download the drivers.

To access the USB-B console port, follow these steps.

1. Power on the PC.
2. Connect the USB-A end of cable into an available USB port on the PC.
3. Connect the USB-B end of cable into the USB-B console port on the switch.
4. Power on the switch.
5. Install the necessary USB device drivers.

To download the drivers, contact Black Box Technical Support at 877-877-2269 or info@blackbox.com

6. Open your terminal software emulation program to access the switch.
7. Confirm the terminal settings on your terminal software emulation program are as follows:

- 115200 baud rate
- No parity
- 8 data bits
- 1 stop bit
- No flow control

8.1.2 USB STORAGE MOUNT

The USB storage supports the FAT file system. The USB storage does not automatically mount. To use USB storage, you must first mount the device.

1. Create a mount directory for the USB.

   ONIE:/ # mkdir /mnt/usb

2. View the fixed disks using the fdisk command.

   ONIE:/mnt # fdisk -l

For internal storage:

```
Disk /dev/sda: 15.8 GB, 15829303296 bytes
255 heads, 63 sectors/track, 1924 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes

Device Boot   Start  End    Blocks        Id System
/dev/sda1     1      1925   15458303+ ee  EFI GPT
```

For USB storage:

```
Disk /dev/sdb: 30.9 GB, 30942946304 bytes
64 heads, 32 sectors/track, 29509 cylinders
Units = cylinders of 2048 * 512 = 1048576 bytes
Device Boot   Start  End    Blocks       Id System
```

3. Mount the device /dev/sdb to the /mnt/usb directory.

```
ONIE:/ # mount -t vfat /dev/sdb /mnt/usb
```

NOTE: The following message displays if the /mnt/usb directory is missing:

```
mount: mounting /dev/sdb on /mnt/usb failed: No such file or directory.
```

NOTE: The following message displays if the USB device is not seen:

```
mount: mounting /dev/sdb on /mnt/usb failed: No such device or address.
```

4. OPTIONAL: Add a device to the file systems table, fstab, and mount the file systems.

```
ONIE:/ # vi /etc/fstab
```

```
# FSTAB entry for the ONIE-BOOT partition mounted on /boot
LABEL=ONIE-BOOT     /mnt/onie-boot      ext4   defaults,rw,errors=remount-ro     0 1
/dev/sdb            /mnt/usb            vfat   defaults                          0 1
ONIE:/ # mount -a
```

8.2 BEFORE YOU INSTALL AN OS

After powering on the switch, it goes through a power-on self-test (POST).

POST runs every time the switch is initialized and checks the hardware components to determine if the switch is fully operational before booting. After POST, the switch uses the Grub bootloader.

To select which entry is highlighted, use the up and down arrow keys. Press Enter to select an OS or enter e to edit the commands before booting. Enter c for a command line. The highlighted entry executes automatically in the operating system.

8.2.1 EXAMPLE OF THE GRUB BOOTLOADER

```
GNU GRUB version 2.02~beta2+e4a1fe391
+----------------------------------------------+
|*ONIE: Install OS                             |
| ONIE: Rescue                                 |
| ONIE: Uninstall OS                           |
| ONIE: Update ONIE                            |
| ONIE: Embed ONIE                             |
| ONIE: Diag ONIE                              |
| ONIE: Diag ONIE                              |
+----------------------------------------------+
```

Your switch comes with ONIE installed.

8.2.2 EXAMPLE OF ONIE

```
ONIE: Install OS
       For downloading and installing an OS from a URL
       Starts ONIE with ONIE Discovery Service
       (factory default boot)
ONIE: Rescue
       Starts ONIE without ONIE Discovery Service Useful for running Diagnostics manuall
ONIE: Uninstall OS Restore to factory defaults erases any installed OS
ONIE: Update ONIE For downloading and updating ONIE from a URL
ONIE: Embed ONIE For downloading and updating ONIE from a URL and erases any installed O
ONIE: Diag ONIE Run Diagnostic package for EMS1G-48
Run Black Box Networking Diagnostic package for <platform>
```

During the initial setup, the switch boots to ONIE Install. ONIE Install boots with ONIE Discovery to the console (ONIE:).

8.2.3 ONIE SERVICE DISCOVERY

ONIE attempts to locate the installer through several discovery methods, as shown. To download and run an installer, the ONIE Service Discovery feature uses the first successful method found.

1. Passed from the boot loader.
2. Search locally attached storage devices for one of the ONIE default installer filenames; for example, USB.
3. Exact URLs from DHCPv4.
4. Inexact URLs based on DHCPv4 responses.
5. Query to IPv6 link-local neighbors using HTTP for an installer.
6. TFTP waterfall—from DHCPv4 option 66

Examples of the ONIE ifconfig eth0 Commands

If none of the ONIE Service Discovery methods are successful, you can disable this using the `onie-discovery-stop` command.

You can install an operating system manually from HTTP, FTP, or TFTP using the `onie-nos-install <URL>` command.

NOTE: If you have a recovery USB plugged into your switch, you must remove it before installing the DIAG-OS using the `onie- nos-install` command.

The ONIE Install environment uses DHCP to assign an IP address to the management interface, eth0. If that fails, it uses the default IP address 192.168.3.10/255.255.255.0.

To display the IP address, use the `ifconfig eth0` command, as shown.

```
ONIE:/ # ifconfig eth0
eth0 Link encap:Ethernet HWaddr 90:B1:1C:F4:9C:76
       inet addr:10.11.53.33 Bcast:10.255.255.255 Mask:255.0.0.0
       inet6 addr: fe80::92b1:1cff:fef4:9c76/64 Scope:Link
       UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1
       RX packets:18 errors:0 dropped:0 overruns:0 frame:0
       TX packets:24 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:1000
       RX bytes:1152 (1.1 KiB) TX bytes:6864 (6.7 KiB)
       Interrupt:21 Memory:ff300000-ff320000
```

To assign an IP address to the management interface, eth0, and verify network connectivity, use the ifconfig eth0 <ip address> command, as shown.

```
ONIE:/ # ifconfig eth0 10.11.53.33/16
Verify the network connection with ping.
ONIE:/ # ping 10.11.8.12
PING 10.11.8.12 (10.11.8.12): 56 data bytes
64 bytes from 10.11.8.12: seq=0 ttl=62 time=1.357 ms
64 bytes from 10.11.8.12: seq=1 ttl=62 time=0.577 ms^C
```

CHAPTER 9: TROUBLESHOOTING

9.1 CONTACTING BLACK BOX

If you determine that your switch is malfunctioning, do not attempt to alter or repair the unit. It contains no user-serviceable parts. Contact Black Box Technical Support at 877-877-2269 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.

9.2 SHIPPING AND PACKAGING

If you need to transport or ship your switch:

- 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.

APPENDIX A: REGULATORY INFORMATION

A.1 USA FEDERAL COMMUNICATIONS COMMISSION STATEMENT

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designated to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy. If it is not installed and used in accordance to the instructions, it may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case users will be required to take whatever measures necessary to correct the interference at their own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Dell Networking is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications in the equipment. Unauthorized changes or modification could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

APPENDIX A: REGULATORY INFORMATION

A.2 NOM 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 a 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 bloquea 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 deber 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 connectado 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 fisica 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 lineas de energia.

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 objectos liquidos 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: Objectos 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.

APPENDIX A: REGULATORY INFORMATION

A.3 EUROPEAN UNION EMC DIRECTIVE CONFORMANCE STATEMENT

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. Black Box can not accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of this product, including the fitting of non-Black Box option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/ European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

WARNING: This is a Class A product. In a domestic environment, this device may cause radio interference, in which case, you may be required to take adequate measures.

A.4 JAPAN VCCI COMPLIANCE FOR CLASS A EQUIPMENT

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

This is Class A product based on the standard of the Voluntary Control Council For Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

WARNING: Use the AC power cords with Black Box equipment only.

本製品に同梱いたしております電源コードセットは、本製品専用です。本電源コードセットは、本製品以外の製品ならびに他の用途でご使用いただくことは出来ません。製品本体には同梱された電源コードセットを使用し、他製品の電源コードセットを使用しないで下さい。

APPENDIX A: REGULATORY INFORMATION

A.5 KOREAN CERTIFICATION OF COMPLIANCE

A급 기기 (업무용 방송통신기자재)	이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

A.6 SAFETY CERTIFICATIONS AND COMPLIANCE AGENCY CERTIFICATIONS

- CUS UL 60950-1, 2nd Edition – Meets or exceeds Hi Pot and Ground Continuity testing per UL 60950-1.
- CSA 60950-1-03, 2nd Edition
- EN 60950-1, 2nd Edition
- EN 60825-1, 1st Edition
- EN 60825-1 Safety of Laser Products—Part 1: Equipment Classification Requirements and User's Guide
- EN 60825-2 Safety of Laser Products—Part 2: Safety of Optical Fibre Communication Systems
- FDA Regulation 21CFR 1040.10 and 1040.11
- IEC 60950-1, 2nd Ed, including all National Deviations and Group Differences

A.7 ELECTROMAGNETIC COMPATIBILITY

A.7.1 EMISSIONS

- International: CISPR 22: 2006, Class A
- Australia/New Zealand: AS/NZS CISPR 22:2009, Class A
- Canada: ICES-003, Issue-4, Class A
- Europe: EN55022 2006 (CISPR 22: 2006), Class A
- Japan: VCCI V-3/2011.04 Class A
- USA: FCC CFR47 Part 15, Subpart B, Class A

A.7.2 IMMUNITY

- EN 300 386 v1.5.1:2010 EMC for Network Equipment
- EN55022 2006, Class A
- EN 55024 1998 + A1: 2001 + A2: 2003
- EN 61000-3-2 Harmonic Current Emissions
- EN 61000-3-3 Voltage Fluctuations and Flicker
- EN 61000-4-2 ESD
- EN 61000-4-3 Radiated Immunity
- EN 61000-4-4 EFT
- EN 61000-4-5 Surge
- EN 61000-4-6 Low Frequency Conducted Immunity

A.8 PRODUCT RECYCLING AND DISPOSAL (WEEE)

You must recycle or discard this system according to applicable local and national regulations. Black Box encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed.

Waste Electrical and Electronic Equipment (WEEE) Directive for Recovery, Recycle and Reuse of IT and Telecommunications Products

Black Box switches are labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

APPENDIX B: DISCLAIMER/TRADEMARKS

B.1 DISCLAIMER

Black Box Corporation shall not be liable for damages of any kind, including, but not limited to, punitive, consequential or cost of cover damages, resulting from any errors in the product information or specifications set forth in this document and Black Box Corporation may revise this document at any time without notice.

B.2 TRADEMARKS USED IN THIS MANUAL

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Any other trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.