EMS10G12

12-PORT 10G IP NETWORK SWITCH

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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.

**CLASS 1
LASER PRODUCT**

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.

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CHAPTER 1: SPECIFICATIONS

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12-PORT 10G NETWORK SWITCH (EMS10G12) 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 60950-1, EN 60825-1, FDA Regulation 21 CFR 1040.10 and 1040.11
ENVIRONMENTAL	Operating Humidity: 5 to 85%, relative humidity, non-condensing Operating Temperature: 41 to 104° F (5 to 40° C) Storage Humidity: 5 to 90%, relative humidity, non-condensing Storage Temperature: -40 to +149° F (-40 to +65° C) NOTE: Reduce maximum temperature by 1°/228 ft. (1°/125 m) above 3117 ft. (950 m) Maximum Operating Altitude: 10,000 ft. (3048 m) Maximum Non-operating Altitude: 39,370 ft. (12,000 m) Shock: Dell EMC Spec SV0115

MANAGEMENT	Console port management: (1) RJ-45 serial
	Security/Authentication: RADIUS, RADIUS and IPv6, SSHv2, Security Architecture for IPSec, IPSec Authentication Header, ESP Protocol
	Network Management: SNMPv1/2, SSHv2, FTP, TFTP, SCP, Syslog, Port Mirroring, RADIUS, 802.1X, Support Assist (Phone Home,
	    Netconf APIs, XML Schema, CLI Commit (Scratchpad), sFlow
	Automation: Control Plane Services APIs, Linux Utilities and Scripting Tools
	Quality of Service (QoS): Access Control Lists, Prefix List, Route-Map, Rate Shaping (Egress), Rate Policing (Ingress);
	    Scheduling Algorithms: Round Robin, Weighted Round Robin, Deficit Round Robin, Strict Priority, Weighted Random Early Detect

PERFORMANCE	Switching Capacity: 960 Gbps; Forwarding Capacity: 720 Mpps; Frame Size: 9416 bytes; Packet Buffer Memory: 12 MB; CPU Memory: 4 GB; MAC Addresses: 272K (in Scaled L2 mode); ARP Table: 200K (in Scaled L3 routes mode); IPv4 routes: 200K (in Scaled L3 routes mode); IPv6 hosts: 64K; IPv6 routes: 130K (in scaled L3 routes mode); Multicast hosts: 8K Link aggregation: 16 links per group, 128 groups; Layer 2 VLANs: 4K; MSTP: 32 instances; LAG load balancing: Based on layer 2, IPv4 or IPv6 headers

PHYSICAL	Connectors/Interfaces: (12) 10GbE SFP+, (3) 100GbE QSFP28, (1) Micro USB-B console port, (1) RJ-45 Ethernet management port,
	(1) RS-232 console port, (2) AC PSUs, (3) Fan modules, PSU to I/O Panel Airflow
	Dimensions: 1.75" H (1 RU) x 17.7" W x 8.2" D (4.4 x 45 x 20.9 cm)
	Mounting: Rackmounted
	Rack Clearance Required:
	   Front: 5" (12.7 cm)
	   Back: 5" (12.7 cm)
	Weight: 8.3 lb. (3.76 kg) with (2) PSUs and (3) fans

POWER	Input: 100–240 VAC, 50/60 Hz Maximum Current Draw per System: 2 A/1.7 A at 100/120 VAC; 1 A/0.8 A at 200/240 VAC Maximum Power Consumption: 180 W Typical Power Consumption: 90 W Max. Thermal Output: 180 W, 614 BTU/hr. Power Supply Type: (2) hot-swappable redundant AC power Fans: (3) hot-swappable redundant fans

STANDARDS	IEEE Compliance: 802.1ab LLDP; TIA-1057 LLDP-MED; 802.1s MSTP; 802.1w RSTP; 802.3ab Gigabit Ethernet (1000BASE-T); 802.3ad Link
	    Aggregation with LACP; 802.3ae 10 Gigabit Ethernet (10GBASE-X); 802.3i Ethernet (10BASE-T); 802.3u Fast Ethernet (100BASE-TX);
	    802.3z Gigabit Ethernet (1000BASE-X); 802.1D Bridging, STP; 802.1p L1 Prioritization; 802.1Q VLAN Tagging, Double VLAN Tagging,
	    GVRP; 802.1Qbb PFC; 801.2Qaz ETS; 802.1s MSTP; 802.1w RSTP; PVST+; 802.1X Network Access Control; 802.3ac Frame Extensions
	    for VLAN Tagging; 802.3u Fast Ethernet (100BASE-TX) on mgmt ports; 802.3x Flow Control; 802.3z Gigabit Ethernet (1000BASE-X)
	    with QSA; ANSI/TIA-1057, Jumbo MTU support 9416 bytes

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CHAPTER 2: OVERVIEW

2.1 INTRODUCTION

The EMS10G12 12-Port 10G IP Network Switch is a one rack unit (1 RU), full-featured fixed form-factor top-of-rack (ToR) 1/10/25/40/50/100GbE switch for 10G servers with small form-factor pluggable plus (SFP+) and quad small form-factor pluggable 28 (QSFP28) ports.

The EMS10G12 supports 1/10/25/40/50/100GbE with 12 fixed SFP+ ports to implement 1GbE and 10GbE and three fixed QSFP28 ports to implement 4x10, 4x25, 2x50, 40, and 100GbE.

NOTE: For specific port profile details, see the OS10 Enterprise Edition User Guide.

The switch supports the following configurations:

- (12) 10 G + (3) 100 G
- (12) 10 G + (12) 25 G
- (24) 10 G
- (12) 10 G + (6) 50 G

2.2 FEATURES

- (12) fixed 10GbE SFP+ ports, (3) fixed 100GbE QSFP28 ports
- (1) Micro USB-B serial console management port
- (1) One RJ-45 serial console management port
- (1) RS-232 serial console port
- (1) universal serial bus (USB) Type-A port for more file storage
- (1) ESD jack
- (1) 2-core Rangeley C2338 central processing unit (CPU), 75 watts TDP 1.7 GHz, one memory channel with one 4GB 1600MTS DDR3 SO-DIMM module and one 16 GB mSATA/M.2 SSD module
- (1) 7-segment stacking indicator
- (2) power supply units
- (3) integrated fan units
- 1 RU 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) EMS10G12 Switch
- (1) RJ-45 to DB9 female cable
- (2) PSUs
- (3) fan units
- (2) AC country/region-specific power cords
- (2) AC power cable clips
- (1) AC ground lug kit

CHAPTER 2: OVERVIEW

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2.4 ADDITIONAL ITEMS YOU MAY NEED (NOT INCLUDED)

- Dual tray or single rails
- Screws for rack installation
- #1 and #2 Phillips screwdrivers
- Torx screwdriver
- Ground cable screws
- Copper or fiber cables

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.
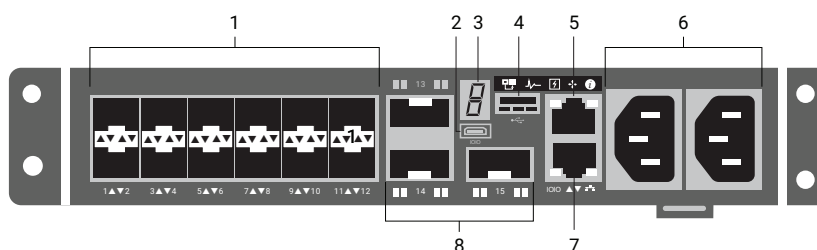
FIGURE 2-1. FRONT PANEL OF THE SWITCH

TABLE 2-1. FRONT PANEL COMPONENTS

NUMBER IN FIGURE 2-1	COMPONENT	DESCRIPTION
1	(12) SFP+ optical ports	SFP+ modules install here , Links to fiberoptic devices
2	(2) QSFP28 optical ports	SFP+ modules install here, Links to fiberoptic network
3	Stack ID	Indicates stacking master, stacking slave, or standalone mode
4	(1) Ethernet management port	Links to Ethernet for management
5	(1) RS-232 console port	Links to RS-232 console for management
6	(2) AC PSUs	100–240 VAC, 50-60 Hz power supplies, hot-swappable
7	(1) RJ-45 management port	Used for storage
8	(3) QSFP28 optical ports	SFP+ modules install here, Links to fiberoptic network

CHAPTER 2: OVERVIEW

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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
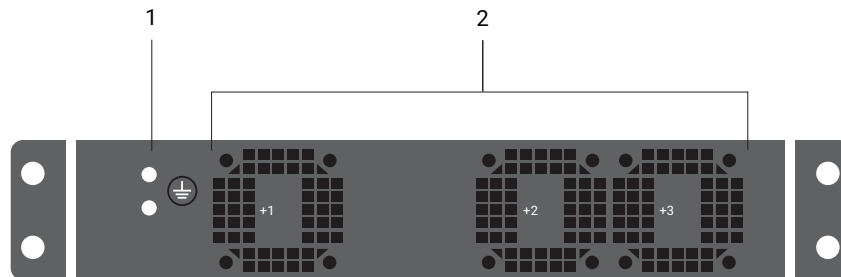
TABLE 2-3. BACK PANEL COMPONENTS

NUMBER IN FIGURE 2-2	COMPONENT	DESCRIPTION
1	(3) ground holes	Attach to ground
2	(2) fans	Keep the switch within proper operating temperature range

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2.5.3 LED INDICATORS

The EMS10G12 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 EMS10G12 switch LED behavior is seen during ONIE operations.

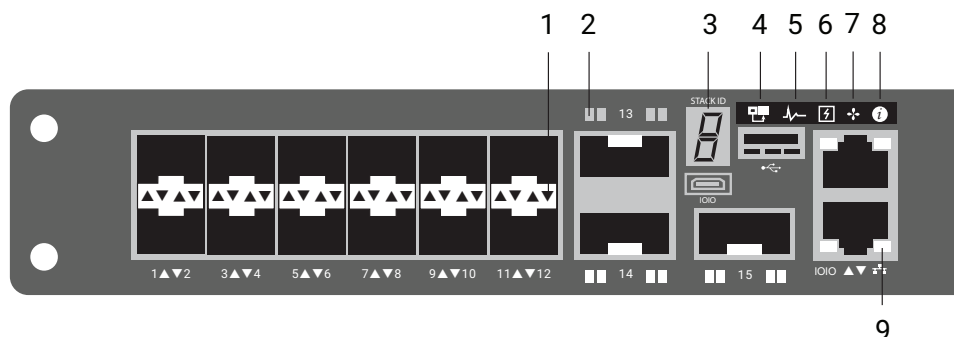Figure 2-3 shows the LEDs on the switch. Table 2-4 describes their functions.

FIGURE 2-3. LEDS ON THE I/O SIDE OF THE SWITCH

TABLE 2-4. LEDS ON THE I/O SIDE OF THE SWITCH

NUMBER IN FIGURE 2-3	NAME OF LED	DESCRIPTION
1	SFP+ port LEDs	Link/Activity LEDs. See Table 2-7 for more information.
2	QSFP28 port LEDs	Link/Activity LEDs. See Table 2-8 for more information.
3	Stack ID	• Off—No power • Solid green—Displays a hex digit representing the stack unit ID
4	Master LED	Off—Switch is in Stacking Slave mode • Solid green—System is in Stacking Master or Standalone mode
5	System 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
6	Power LED	• Off—No power • Solid Green—Normal • Solid yellow—POST is in process • Blinking yellow—Power supply failed
7	Fan LED	• Off—No power • Solid green—Normal operation; Fan powered and running at the expected RPM • Solid yellow—Fan failed, including incompatible airflow direction when you insert the PSU or fan trays with differing airflows
8	Locator LED/System beacon	• Off—Locator function is disabled • Flashing blue—Locator function is enabled
9	RJ-45/RS-232 LED	System management Ethernet port LEDs. See Table 2-6 for more information.

NOTE: Some LED behaviors change after you install your software.

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TABLE 2-5. LED BEHAVIOR

NAME OF LED	DESCRIPTION
System Status/Health LED	• Solid green—Normal operation • Flashing green—Booting • Solid yellow—Critical system error • Flashing yellow—Noncritical system error, fan failure, or power supply failure
Power LED	• Off—No power • Solid green—Normal • Solid yellow—POST in process • Flashing yellow—Power supply failure or loss of power redundancy
Fan LED	• Off—No power • Solid green—Normal operation; Fan powered and running at the expected RPM • Solid yellow—Fan failed or loss of cooling redundancy
PSU LED	• Off—No power • Solid green—Normal operation • Flashing yellow—PSU failure • Flashing green—Firmware update
Locator LED/System Beacon	• Off—Locator function is disabled • Flashing blue—Locator function is enabled
Master LED	• Off—System is the stack slave • Solid green—System is the stack master or a standalone unit
7-Segment LED	• Off—No power • Solid green—Displays a hex digit representing the stack unit ID

TABLE 2-6. SYSTEM MANAGEMENT ETHERNET PORT LEDS

NAME OF LED	DESCRIPTION
Link LED	• Off—No link • Solid green—Link operating at a maximum speed autonegotiated/forced or 1G port • Solid yellow—Link operating at a lower speed autonegotiated/force or 10/100 M port
Activity LED	• Off—No link • Flashing green—Port activity

TABLE 2-7. SFP+ PORT LEDS

NAME OF LED	DESCRIPTION
Link LED	• Off—No link • Solid green—Link operating at a maximum speed—10G on an SFP+ port • Solid yellow—Link operating at a lower speed—1G on an SFP+ port
Activity LED	• Off—No link • Flashing green—Port activity • Solid blue, 1 second ON/OFF—Port beacon

NOTE: There are four LEDs for each QSFP28 port. For each port, 100 GbE or 40 GbE uses only one LED, (2) 50GbE uses two LEDs, and (4) 25 GbE or (4) 10 GbE uses all four LEDs.

TABLE 2-8. QSFP28 PORT LEDS

NAME OF LED	DESCRIPTION
Link/Activity LED	• Off—No link • Solid green—Link operating at maximum speed—100G for QSFP28 port or 40G on a QSFP+ port • Flashing green—Link activity operating at maximum speed— 100G on a QSFP28 port • Solid yellow—Link operating at a lower speed • Flashing yelllow—Port activity at 100G on a QSFP28 port • Flashing yellow, 1 second on/off—Port beacon
Link/Activity LED—(4) 25 G mode or (4) 10 G mode	• Off—No link • Solid green—Link operating at maximum speed—4 x 25G on a QSFP28 port or 4 x 10G on a QSFP+ port • Flashing green—Link activity operating at maximum speed— 4 x 25G on a QSFP28 port • Solid yellow—Link operating at a lower speed—4 x 10G port on a QSFP28 port • Flashing yellow—Port activity at 4 x 10G on a QSFP28 port • Flashing yellow, 1 second on/off—Port beacon
Link/Activity LED—(2) 50 G	• Off—No link • Solid yellow—Port link at 2 x 50G on a QSFP28 port • Flashing yellow—Port activity at 2 x 50 G on a QSFP28 port • Flashing yellow—1 second ON/OFF—Port beacon

The EMS10G12 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 EMS10G12 switch into a rack or cabinet before installing any optional components.

CHAPTER 3: PREPARING THE SITE

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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 EMS10G12 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 continuous temperature range from 50 to 104° F (5 to 40° C).
- Operating humidity is from 5 to 85 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.
- Inside the restricted access area, positioned in a rack or cabinet, or on a desktop with adequate space in the front, rear, and sides for proper ventilation and access.
- Install the switch in information technology rooms in accordance with Article 645 of the National Electric Code and NFPA 75.

For more information about switch storage and environmental temperatures, see the Specifications chapter in this manual.

3.2 CABINET PLACEMENT

Install the EMS10G12 only in indoor cabinets designed for use in a controlled environment.

Do not install the EMS10G12 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 EMS10G12 in a common bond network (CBN).

Connect the grounding cables as described in Install the Switch.

NOTE: For this AC-powered switch, although the third conductor of the AC power cord provides a ground path, we recommend grounding your switch with a dedicated ground wire.

CHAPTER 3: PREPARING THE SITE

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3.5 FANS AND AIRFLOW

The EMS10G12 fans support two airflow options—normal and reverse.

Installation of the fans is done as part of the factory install,. The EMS10G12 supports the following configuration:

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

For proper ventilation, position the EMS10G12 in an equipment rack or cabinet with a minimum of 5 inches (12.7 cm) of clearance around the exhaust vents. The fan speed varies based on internal temperature monitoring. The EMS10G12 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 EMS10G12. 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 EMS10G12 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 +149° F (-40 to +65° 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 an 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.

To install the EMS10G12 switch, complete the installation procedures in the order presented in this section.

Always handle the switch and its components with care. Avoid dropping the switch or any field replaceable units (FRUs).

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. As with all electrical devices of this type, take all the necessary safety precautions to prevent injury when installing this switch.

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

4.1 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.

4.2 GROUND CABLE

NOTE: For this AC-powered switch, although the third conductor of the AC power cord provides a ground path, Black Box recommends grounding your switch with a dedicated ground wire.

The ground cable is not included. To properly ground the chassis, Black Box recommends a one- or two-hole lug, M4 hole size. The ground lugs must be a UL-recognized, crimp-type lug.

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

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

Before you install the switch into the dual-tray:

1. Cut the ground cable (not included) to the desired length. The cable length must facilitate proper operation of the fault interrupt circuits. Use the shortest cable route allowable.

2. Unscrew the two attached M4 screws and set aside.

3. Attach the ground lug and bracket to the switch using the M4 screws.

4. Using one of the two M4 threaded holes, attach the ground cable to the lug. Use the M4 screw with a captive internal tooth lock washer. Torque the screw to ± 5–6 in-lbs.

5. Attach the other end of the ground cable to a suitable ground point such as the rack or cabinet. The rack installation ears are not a suitable grounding point.

4.3 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. The dual-tray mounting rails ship with the dual tray, not the switch.

WARNING: This guide is a condensed reference.

CHAPTER 4: INSTALLING THE SWITCH

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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 grounding—Maintain reliable grounding 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.

4.4 HALF RU FRONT-RACK INSTALLATION

The dual-tray mounting rails ship with the dual tray, not with the switch. You must supply eight rack-mount screws for this installation.

To install the half-RU switch:

◆ Attach the rails to the dual tray.

◆ Install the dual tray in the rack.

◆ Install the switch in the dual tray.

NOTE: Black Box does not recommend installing the dual tray in a 2-post rack. However, it is possible. If you must install the dual tray in a 2-post rack, contact Black Box Technical Support at 877-877-2269 or info@blackbox.com.

1. Remove the dual tray and the rails from the shipping packaging and place them on a clean antistatic surface.

2. Line up the three holes on the inner switch rail with the dual-tray mounting heads.
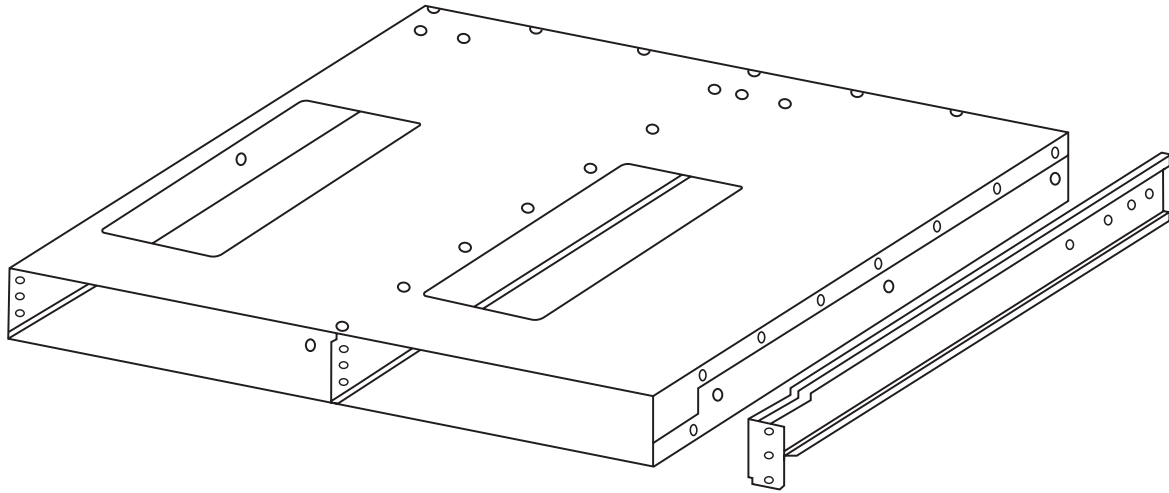
FIGURE 4-1. DUAL TRAY AND RACKMOUNTING RAIL

3. Attach the rail to the dual tray. Slide the rail back until it locks into place.
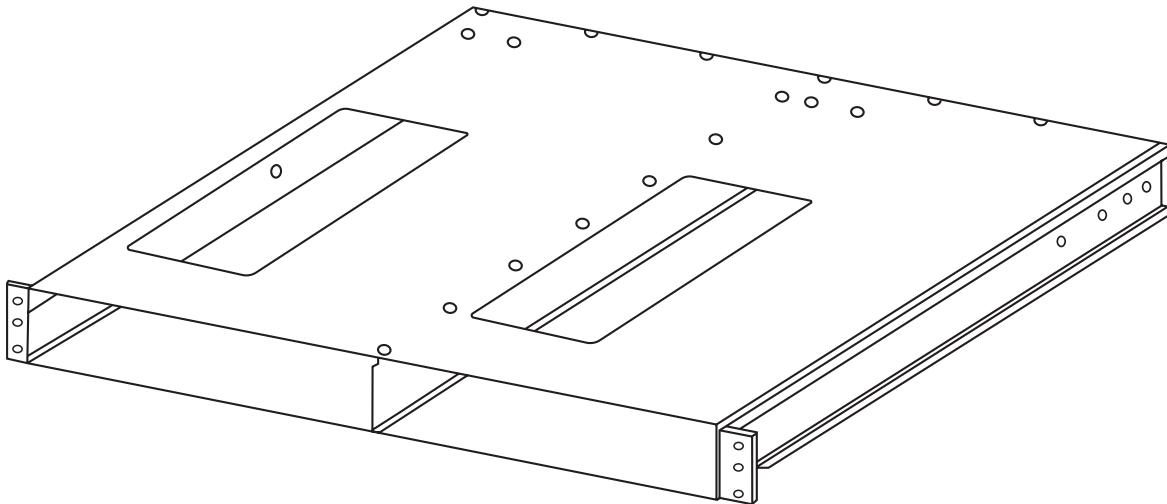
4. Repeat with the other side.

FIGURE 4-2. ATTACH DUAL TRAY AND RACKMOUNTING RAILS

CHAPTER 4: INSTALLING THE SWITCH

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5. Install the dual tray inside the 4-post rack. Rack mount screws are not included.

6. Attach the front dual-tray switch rails to the 4-post rack from the front. Secure the dual tray to the rack using two user-supplied screws for each rack post.
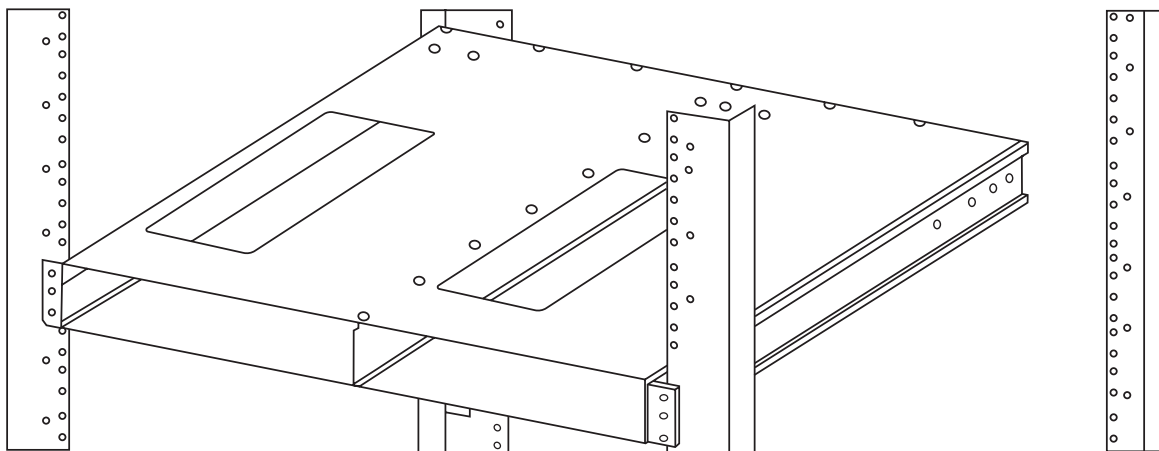

FIGURE 4-3. ATTACH DUAL TRAY FRONT TO THE 4-POST RACK FRONT

7. Attach the rear dual-tray switch rails to the 4-post rack from the rear. Secure the dual tray to the rack using two user-supplied screws for each rack post.
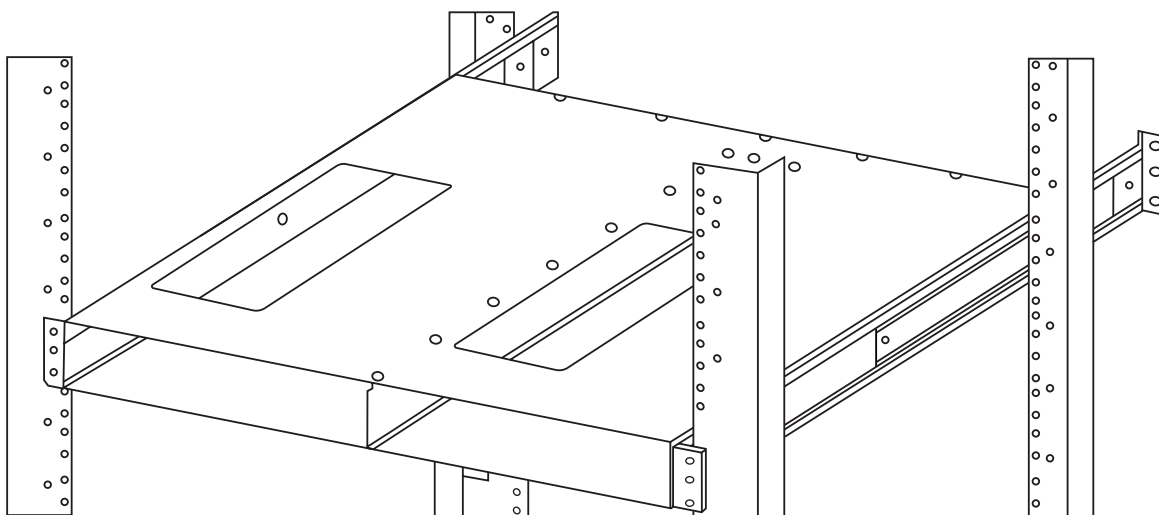
FIGURE 4-4. ATTACH DUAL TRAY REAR TO THE 4-POST RACK REAR

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8. Tighten all mounting screws to securely mount the dual tray into the 4-post rack.
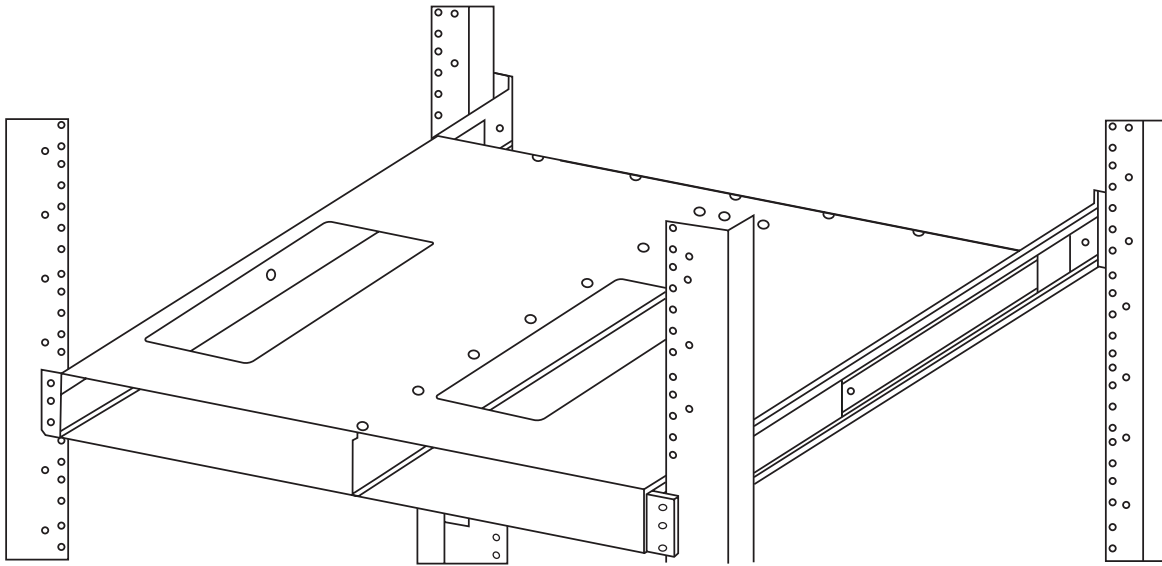
FIGURE 4-5. SECURE THE DUAL TRAY IN THE 4-POST RACK

4.5 SWITCH INSTALLATION

Install one or two half-RU switches in the four-post rack-mounted dual tray.

1. Install one switch into either dual-tray slot from the front.
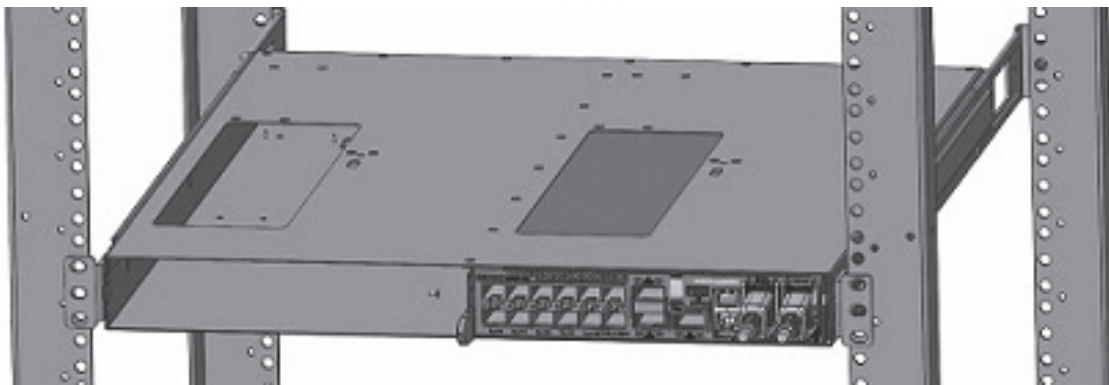
FIGURE 4-6. INSTALL AN EMS10G12 SWITCH

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The switch is fully inserted when it hits the stop feature on the dual tray. The front switch latch snaps the switch into place.
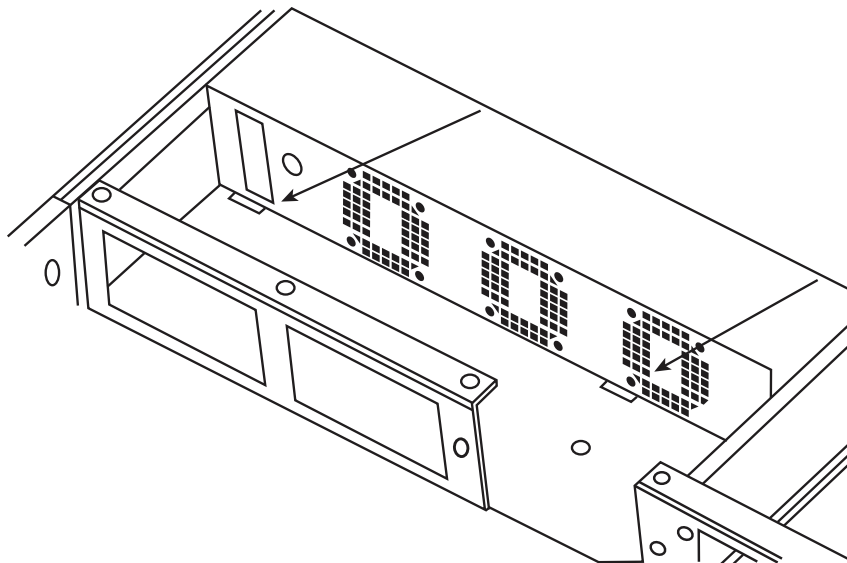
FIGURE 4-7. DUAL-TRAY STOP FEATURE

2. If you are installing two switches, insert the second switch in the open dual-tray slot.

SWITCH REMOVAL

Remove the switch from the dual tray from the front of the four-post rack.

Push in the front switch latches according to the latch arrows and pull out the switch.

FIGURE 4-8. SWITCH RELEASE LATCHES

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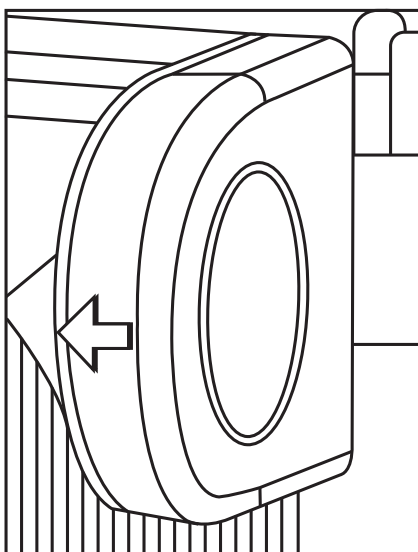
FIGURE 4-9. SWITCH RELEASE ARROW

4.6 OPTICS INSTALLATION

The EMS10G12 switch has the following optic configuration:

- 12 fixed 1/10GbE SFP+ optical ports
- 3 fixed 1/100GbE QSFP28 optical ports

The following SFP+ modules are compatible with the switch.

TABLE 4-1. COMPATIBLE SFPS

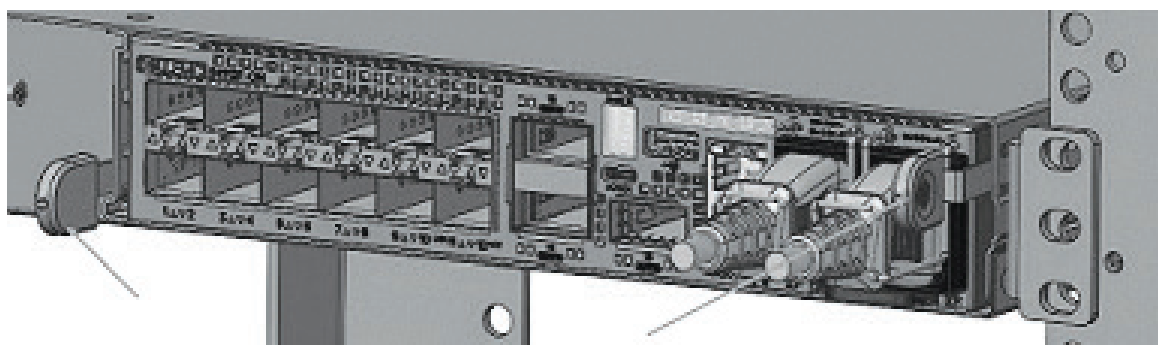| PRODUCT CODE	DESCRIPTION
LSP421	SFP+ - 10-Gb, Extended Diagnostics, 850-nm Multimode Fiber, 300-m, LC
LSP422	SFP+, 10GBASE-R, 1310-nm single-mode, 10 km
LSP431	SFP+, 10-Gb, Extended Operating Temperature & Diagnostics, 850-nm Multimode Fiber, 300-m

CAUTION: ESD damage can occur if components are mishandled. Always wear an ESD-preventive wrist or heel ground strap when handling the EMS10G12 switch 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.

CHAPTER 4: INSTALLING THE SWITCH

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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 that it is seated properly. Do not jerk or tug repeatedly on the tab.

4.7 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.
- 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.

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.

4.8 AFTER SWITCH INSTALLATION

To configure your switch, after you have securely installed and powered on the EMS10G12 switch, see your open network installation environment (ONIE)-compatible operating system documentation.

4.9 SWITCH REPLACEMENT

The following steps describe removing and replacing a switch. For further assistance when replacing a switch, contact Balck Box Technical Support at 877-877-2269 or info@blackbox.com

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

1. Back up the switch configuration to your back-up computer or laptop TFTP server.

    copy running-config tftp://hostip/filepath

    To establish a console connection to the switch CLI, assign an IP address on the switch network.

2. Disconnect the power source.

3. Label and remove all cables.

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4. Remove the switch from the dual tray.

   Press the front switch latch according to the arrow and slide the switch forward.

   If you are using the PSUs in the replacement switch, remove them from the switch.

5. Unpack the new switch.

6. Confirm that the software version of the replacement switch is the same as the previously installed switch.

   show os-version

   If the software versions do not match, upgrade the replacement switch software using the procedure included with the firmware download.

7. Copy the backed-up switch configuration to the new switch.

   copy tftp://hostip/filepath running-config

8. Install the new switch in the dual tray.

   If you are using the fan trays or PSUs from the removed switch, reinsert them in the replacement switch.

9. Connect all the cables.

10. Power on the switch.

    For more information, see Section 4.6, Powering On the Switch.

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The EMS10G12 switch ships with two AC power supplies.

The power supplies have two air-flow directions: normal and reverse. Normal is from the I/O side to the PSU side. Reverse is from the PSU side to the I/O side.

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: Connect the power supply to the appropriate branch circuit protection as defined by your local electrical codes and verify that the remote power source complies with the switch input power specifications.

NOTE: ESD damage can occur if components are mishandled. Always wear an ESD-preventive wrist or heel ground strap when handling the EMS10G12 and its components.

5.1 COMPONENTS

The following power supply is available for the EMS10G12 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.
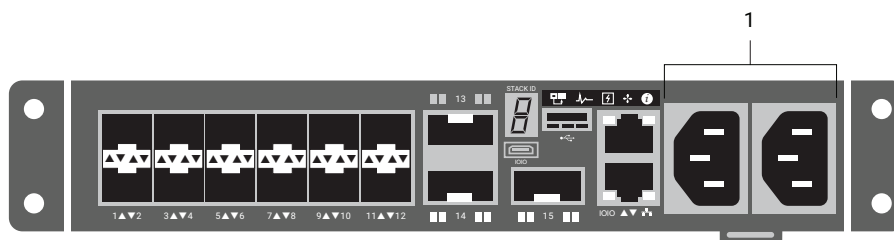
FIGURE 5-1. EMS10G12 SWITCH PSUS

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.

AC POWER CABLE CLIPS

After you connect the AC power cable to the switch, attach the metal wire clip to the switch over each AC power cable, as shown.
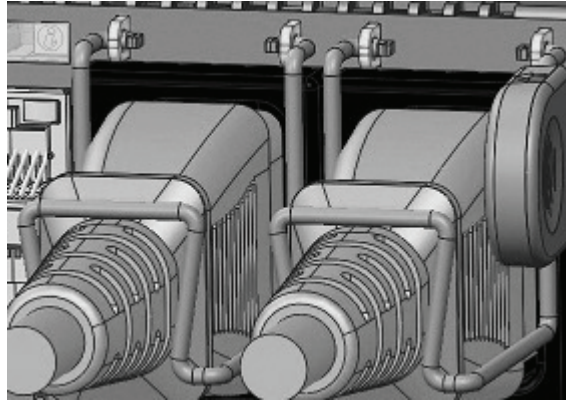
FIGURE 5-2. AC POWER CABLE CLIPS

PSU LEDS

- Solid green: Input is OK.
- Flashing yellow: There is a fault with the PSU.
- Flashing green: system update.
- Off: PSU is off.

CHAPTER 6: FANS

The switch comes from the factory with three integrated fans installed in the chassis.

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

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.

6.1 COMPONENTS

The following are the EMS10G12 fan components.

• EMS10G12 Fan module

• EMS10G12 Fan module—Reverse flow

FIGURE 6-1. FAN MODULES

FAN LEDs

◆ Solid green: Fan function is normal.

◆ Flashing yellow: There is a fan fault.

◆ Off: Fan is off.

Besides the 10/100/1000BASE-T RJ-45 ports, the switch provides several ports for management and storage.
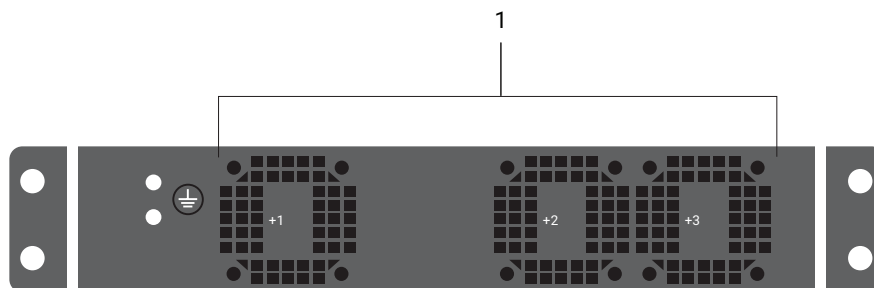
NOTE: The output examples in this section are for reference only. Your output may vary.

7.1 RS-232 CONSOLE PORT ACCESS

The RS-232 console port is on the I/O-side of the switch chassis, as shown.
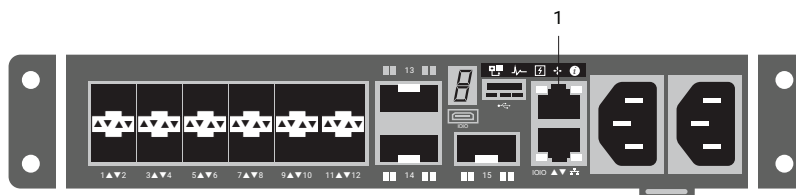
FIGURE 7-1. SWITCH RS-232 CONSOLE PORTS

1. RS-232 Console Port, top

2. Ethernet management port, bottom

NOTE: Make sure that any equipment attached to the serial port can support the required 115200 baud rate.

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

7.1.1 USB-B CONSOLE

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

CHAPTER 7: MANAGEMENT PORTS

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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

7.1.2 USB STORAGE

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
```

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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. Add a device to the file systems table, fstab, and mount the file systems—recommended.

```
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
```

The `mount -a` command mounts all the file systems as indicated in the /etc/fstab file.

7.2 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 an entry, 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.

7.2.1 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.

7.2.2 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 EMS10G12
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:).

7.2.3 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

CHAPTER 7: MANAGEMENT PORTS

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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
```

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CHAPTER 8: TROUBLESHOOTING

8.1 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.

8.2 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.

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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.

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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

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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。

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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

APPENDIX A: REGULATORY INFORMATION

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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.

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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

Black Box and the Black Box logo type and mark are registered trademarks of Black Box Corporation.

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

NOTES

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