iPECS

Installation Manual

ES-5048XG Managed 48-port 10GE Switch

LG-ERICSSON

INSTALLATION MANUAL

ES-5048XG MANAGED 48-PORT 10GE SWITCH

*Layer 2 Managed Switch
with 48 10GBASE SFP+ Slots,
one Power Supply Unit,
and one Fan Tray Module*

COMPLIANCES AND SAFETY STATEMENTS

FCC - CLASS A

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 designed 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 and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment.

You may use unshielded twisted-pair (UTP) for RJ-45 connections - Category 3 or better for 10 Mbps connections, Category 5 or better for 100 Mbps connections, Category 5, 5e, or 6 for 1000 Mbps connections. For fiber optic connections, you may use 50/125 or 62.5/125 micron multimode fiber or 9/125 micron single-mode fiber.

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CE MARK DECLARATION OF CONFORMANCE FOR EMI AND SAFETY (EEC)

This information technology equipment complies with the requirements of the Council Directive 89/336/EEC on the Approximation of the laws of the Member States relating to Electromagnetic Compatibility and 73/23/EEC for electrical equipment used within certain voltage limits and the Amendment Directive 93/68/EEC. For the evaluation of the compliance with these Directives, the following standards were applied:

RFI Emission:
- Limit according to EN 55022:2007, Class A/B
- Limit for harmonic current emission according to EN 61000-3-2:2006, Class A
- Limitation of voltage fluctuation and flicker in low-voltage supply system according to EN 61000-3-3:2005

Immunity:
- Product family standard according to EN 55024:2001 + A2:2003
- Electrostatic Discharge according to IEC 61000-4-2:2008
- Radio-frequency electromagnetic field according to IEC 61000-4-3:2007
- Electrical fast transient/burst according to IEC 61000-4-4:2004
- Surge immunity test according to IEC 61000-4-5:2005
- Immunity to conducted disturbances, Induced by radio-frequency fields: IEC 61000-4-6:2008
- Power frequency magnetic field immunity test according to IEC 61000-4-8:2001
- Voltage dips, short interruptions and voltage variations immunity test according to IEC 61000-4-11:2004

LVD:
- EN 60950-1:2006+A11:2009

SAFETY COMPLIANCE

Warning: Fiber Optic Port Safety

| CLASS I
LASER DEVICE |

When using a fiber optic port, never look at the transmit laser while it is powered on. Also, never look directly at the fiber TX port and fiber cable ends when they are powered on.

Avertissment: Ports pour fibres optiques - sécurité sur le plan optique

| DISPOSITIF LASER
DE CLASSE I |

Ne regardez jamais le laser tant qu'il est sous tension. Ne regardez jamais directement le port TX (Transmission) à fibres optiques et les embouts de câbles à fibres optiques tant qu'ils sont sous tension.

Warnhinweis: Faseroptikanschlüsse - Optische Sicherheit

| LASERGERÄT
DER KLASSE I |

Niemals ein Übertragungslaser betrachten, während dieses eingeschaltet ist. Niemals direkt auf den Faser-TX-Anschluß und auf die Faserkabelenden schauen, während diese eingeschaltet sind.

PSE ALARM

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
製品並びに他の用途でご使用いただくことは出来ません。
製品本体に同梱された電源コードセットを利用し、他製品
の電源コードセットを使用しないで下さい。

POWER CORD SAFETY

Please read the following safety information carefully before installing the switch:

WARNING: Installation and removal of the unit must be carried out by qualified personnel only.

◆   The unit must be connected to an earthed (grounded) outlet to comply with international safety standards.

◆   Do not connect the unit to an A.C. outlet (power supply) without an earth (ground) connection.

◆   The appliance coupler (the connector to the unit and not the wall plug) must have a configuration for mating with an EN 60320/IEC 320 appliance inlet.

◆   The socket outlet must be near to the unit and easily accessible. You can only remove power from the unit by disconnecting the power cord from the outlet.

◆   This unit operates under SELV (Safety Extra Low Voltage) conditions according to IEC 60950. The conditions are only maintained if the equipment to which it is connected also operates under SELV conditions.

France and Peru only
This unit cannot be powered from IT[†] supplies. If your supplies are of IT type, this unit must be powered by 230 V (2P+T) via an isolation transformer ratio 1:1, with the secondary connection point labelled Neutral, connected directly to earth (ground).

[†] Impédance à la terre

IMPORTANT! Before making connections, make sure you have the correct cord set. Check it (read the label on the cable) against the following:

Power Cord Set	
U.S.A. and Canada	The cord set must be UL-approved and CSA certified.
	The minimum specifications for the flexible cord are: - No. 18 AWG - not longer than 2 meters, or 16 AWG. - Type SV or SJ - 3-conductor
	The cord set must have a rated current capacity of at least 10 A
	The attachment plug must be an earth-grounding type with NEMA 5-15P (15 A, 125 V) or NEMA 6-15P (15 A, 250 V) configuration.
Denmark	The supply plug must comply with Section 107-2-D1, Standard DK2-1a or DK2-5a.
Switzerland	The supply plug must comply with SEV/ASE 1011.
U.K.	The supply plug must comply with BS1363 (3-pin 13 A) and be fitted with a 5 A fuse which complies with BS1362.
	The mains cord must be <HAR> or <BASEC> marked and be of type HO3VVF3GO.75 (minimum).
Europe	The supply plug must comply with CEE7/7 ("SCHUKO").
	The mains cord must be <HAR> or <BASEC> marked and be of type HO3VVF3GO.75 (minimum).
	IEC-320 receptacle.

Veuillez lire à fond l'information de la sécurité suivante avant d'installer le Switch:

AVERTISSEMENT: L'installation et la dépose de ce groupe doivent être confiés à un personnel qualifié.

◆   Ne branchez pas votre appareil sur une prise secteur (alimentation électrique) lorsqu'il n'y a pas de connexion de mise à la terre (mise à la masse).

◆   Vous devez raccorder ce groupe à une sortie mise à la terre (mise à la masse) afin de respecter les normes internationales de sécurité.

◆   Le coupleur d'appareil (le connecteur du groupe et non pas la prise murale) doit respecter une configuration qui permet un branchement sur une entrée d'appareil EN 60320/IEC 320.

◆   La prise secteur doit se trouver à proximité de l'appareil et son accès doit être facile. Vous ne pouvez mettre l'appareil hors circuit qu'en débranchant son cordon électrique au niveau de cette prise.

◆   L'appareil fonctionne à une tension extrêmement basse de sécurité qui est conforme à la norme IEC 60950. Ces conditions ne sont maintenues que si l'équipement auquel il est raccordé fonctionne dans les mêmes conditions.

France et Pérou uniquement:
Ce groupe ne peut pas être alimenté par un dispositif à impédance à la terre. Si vos alimentations sont du type impédance à la terre, ce groupe doit être alimenté par une tension de 230 V (2 P+T) par le biais d'un transformateur d'isolement à rapport 1:1, avec un point secondaire de connexion portant l'appellation Neutre et avec raccordement direct à la terre (masse).

Cordon électrique - Il doit être agréé dans le pays d'utilisation	
Etats-Unis et Canada:	Le cordon doit avoir reçu l'homologation des UL et un certificat de la CSA. Les spécifications minimales pour un cable flexible sont AWG No. 18, ouAWG No. 16 pour un cable de longueur inférieure à 2 mètres. - type SV ou SJ - 3 conducteurs Le cordon doit être en mesure d'acheminer un courant nominal d'au moins 10 A. La prise femelle de branchement doit être du type à mise à la terre (mise à la masse) et respecter la configuration NEMA 5-15P (15 A, 125 V) ou NEMA 6-15P (15 A, 250 V).
Danemark:	La prise mâle d'alimentation doit respecter la section 107-2 D1 de la norme DK2 1a ou DK2 5a.
Suisse:	La prise mâle d'alimentation doit respecter la norme SEV/ASE 1011.
Europe	La prise secteur doit être conforme aux normes CEE 7/7 ("SCHUKO") LE cordon secteur doit porter la mention <HAR> ou <BASEC> et doit être de type HO3VVF3GO.75 (minimum).

Bitte unbedingt vor dem Einbauen des Switches die folgenden Sicherheitsanweisungen durchlesen:

WARNUNG: Die Installation und der Ausbau des Geräts darf nur durch Fachpersonal erfolgen.

◆   Das Gerät sollte nicht an eine ungeerdete Wechselstromsteckdose angeschlossen werden.

◆   Das Gerät muß an eine geerdete Steckdose angeschlossen werden, welche die internationalen Sicherheitsnormen erfüllt.

◆   Der Gerätestecker (der Anschluß an das Gerät, nicht der Wandsteckdosenstecker) muß einen gemäß EN 60320/IEC 320 konfigurierten Geräteeingang haben.

◆   Die Netzsteckdose muß in der Nähe des Geräts und leicht zugänglich sein. Die Stromversorgung des Geräts kann nur durch Herausziehen des Gerätenetzkabels aus der Netzsteckdose unterbrochen werden.

◆   Der Betrieb dieses Geräts erfolgt unter den SELV-Bedingungen (Sicherheitskleinstspannung) gemäß IEC 60950. Diese Bedingungen sind nur gegeben, wenn auch die an das Gerät angeschlossenen Geräte unter SELV-Bedingungen betrieben werden.

Stromkabel. Dies muss von dem Land, in dem es benutzt wird geprüft werden:	
Schweiz	Dieser Stromstecker muß die SEV/ASE 1011Bestimmungen einhalten.
Europe	Das Netzkabel muß vom Typ HO3VVF3GO.75 (Mindestanforderung) sein und die Aufschrift <HAR> oder <BASEC> tragen. Der Netzstecker muß die Norm CEE 7/7 erfüllen ("SCHUKO").

WARNINGS AND CAUTIONARY MESSAGES

WARNING: This product does not contain any serviceable user parts.

WARNING: Installation and removal of the unit must be carried out by qualified personnel only.

WARNING: When connecting this device to a power outlet, connect the field ground lead on the tri-pole power plug to a valid earth ground line to prevent electrical hazards.

WARNING: This switch uses lasers to transmit signals over fiber optic cable. The lasers are compliant with the requirements of a Class 1 Laser Product and are inherently eye safe in normal operation. However, you should never look directly at a transmit port when it is powered on.

CAUTION: Wear an anti-static wrist strap or take other suitable measures to prevent electrostatic discharge when handling this equipment.

CAUTION: Do not plug a phone jack connector in the RJ-45 port. This may damage this device.

CAUTION: Use only twisted-pair cables with RJ-45 connectors that conform to FCC standards.

ENVIRONMENTAL STATEMENTS

The manufacturer of this product endeavours to sustain an environmentally-friendly policy throughout the entire production process. This is achieved though the following means:

◆ Adherence to national legislation and regulations on environmental production standards.

◆ Conservation of operational resources.

◆ Waste reduction and safe disposal of all harmful un-recyclable by-products.

◆ Recycling of all reusable waste content.

◆ Design of products to maximize recyclables at the end of the product's life span.

◆ Continual monitoring of safety standards.

END OF PRODUCT LIFE SPAN

This product is manufactured in such a way as to allow for the recovery and disposal of all included electrical components once the product has reached the end of its life.

MANUFACTURING MATERIALS

There are no hazardous nor ozone-depleting materials in this product.

DOCUMENTATION

All printed documentation for this product uses biodegradable paper that originates from sustained and managed forests. The inks used in the printing process are non-toxic.

iPECS   ES-5048XG

ABOUT THIS GUIDE

iPECS ES-5048XG

PURPOSE

This guide details the hardware features of the switch, including the physical and performance-related characteristics, and how to install the switch.

AUDIENCE

The guide is intended for use by network administrators who are responsible for installing and setting up network equipment; consequently, it assumes a basic working knowledge of LANs (Local Area Networks).

CONVENTIONS

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

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

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

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

RELATED PUBLICATIONS

The following publication gives specific information on how to operate and use the management functions of the switch:

The *User Manual*

Also, as part of the switch's software, there is an online web-based help that describes all management related features.

REVISION HISTORY

This section summarizes the changes in each revision of this guide.

APRIL 2011 REVISION

This is the first revision of this guide.

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FIGURES

1 INTRODUCTION

OVERVIEW

The ES-5048XG switch is a high-performance Layer-2 top-of-rack switch, designed for data center operating environments. The switch provides 48 10G Ethernet Small Form Factor Pluggable Plus (SFP+) transceiver slots, and includes replaceable dual power supply units and a fan tray module.

The switch supports Fibre Channel over Ethernet (FCoE), which provides lossless Ethernet connections between server racks and Fibre Channel storage networks. The switch can reduce infrastructure expenses and power consumption in the data center, enabling network and storage to be converged into one interconnected switched network. The switch also offers an option of front-to-back (F2B) or back-to-front (B2F) airflow cooling for rack deployment with either blade servers or other switches, allowing cool aisles to be maintained without creating "hot loops."

Figure 1: Front Panel
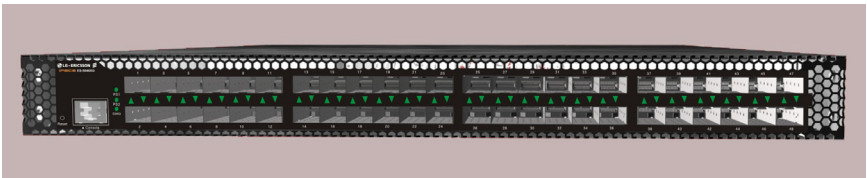
Figure 2: Rear Panel

SWITCH ARCHITECTURE

The switch employs a wire-speed, non-blocking switching fabric. This permits simultaneous wire-speed transport of multiple packets at low latency on all ports. With an impressive 960 Gbps full-duplex bandwidth, the switch allows applications to perform at maximum speed and efficiency.

The switch uses store-and-forward switching to ensure maximum data integrity. With store-and-forward switching, the entire packet must be received into a buffer and checked for validity before being forwarded. This prevents errors from being propagated throughout the network.

NETWORK MANAGEMENT OPTIONS

With a comprehensive array of LEDs, the switch provides "at a glance" monitoring of network and port status. The switch can be managed over the network with a web browser or Telnet application, or via a direct connection to the console port. The switch includes a built-in network management agent that allows it to be managed in-band using SNMP or RMON (Groups 1, 2, 3, 9) protocols. It also has an RJ-45 serial port on the front panel for out-of-band management. A PC may be connected to this port for configuration and monitoring out-of-band through an RJ-45-to-DB-9 null-modem serial cable.

For a detailed description of the management features, refer to the *User Manual*.

DATA CENTER DEPLOYMENT

In many data center configurations, Ethernet connections link servers and data networks, and Fibre Channel connections link servers to storage networks. This switch enables the creation of a converged network, which replaces Fibre Channel switches and employs lossless Ethernet connections between storage, servers, and other data network switches.

Figure 3: Converged Ethernet Data Center Deployment
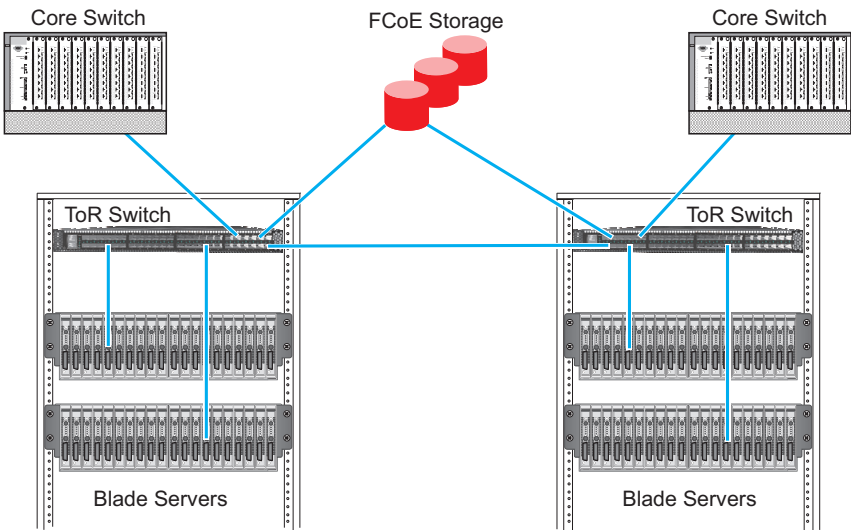
RACK COOLING

The top-of-rack switch is a high-performance, high-density unit that generates a substantial amount of heat. When mounted in a rack with other equipment, it is important that the switch has the same airflow direction to avoid "hot loops" in the data center ailses. Hot loops increase cooling requirements since warm air is drawn into rack devices instead of cool air.

Most rack-mounted blade servers draw cool air from the front and expel hot air at the rear. The top-of-rack switch includes power supply units and a fan tray module that have a front-to-back (F2B) airflow direction that maintains cool ailses in the data center.

Figure 4: F2B Airflow Cooling

Cool Aisle   Hot Aisle

Cool Air

ToR Switch

Hot Air

Blade Server

Blade Server

Front of Rack   Rack Side View   Rear of Rack
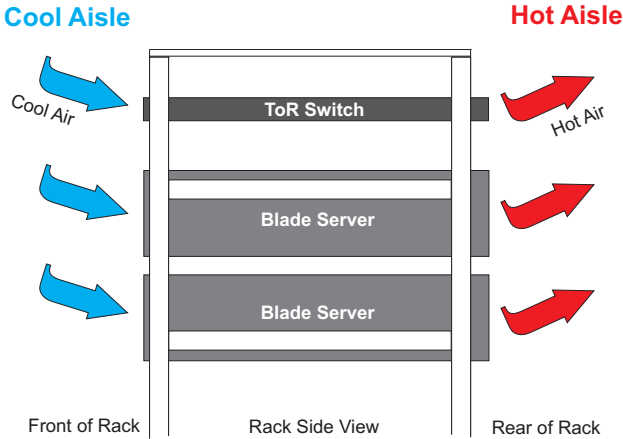
When mounted in a rack with other network equipment that may have a back-to-front (B2F) airflow direction, the top-of-rack switch includes power supply and fan tray modules that reverse the airflow direction through the switch. This enables various deployment options for the switch in the data center.

Figure 5: B2F Airflow Cooling

Hot Aisle   Cool Aisle

Hot Air

ToR Switch

Cool Air

Network Switches

Front of Rack   Rack Side View   Rear of Rack
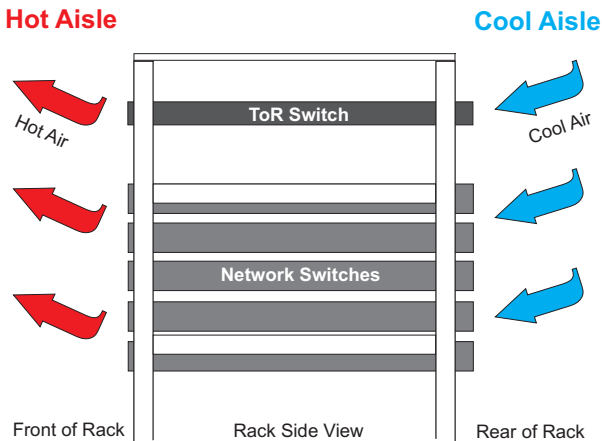
DESCRIPTION OF HARDWARE

The figure below shows the main features on the switch's front panel.

Figure 6: Front Panel Features
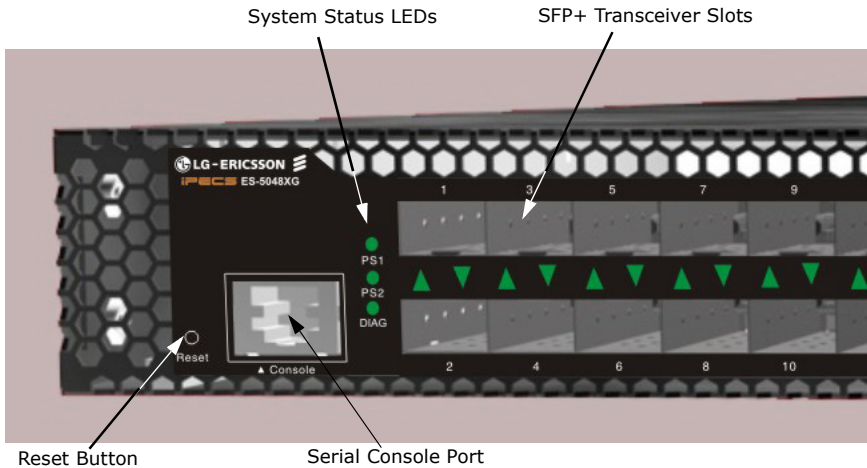
SFP+ TRANSCEIVER SLOTS

The switch contains 48 Small Form Factor Pluggable Plus (SFP+) transceiver slots that operate up to 10 Gbps full duplex. These slots support 10G Ethernet SFP+ transceivers, or Gigabit Ethernet SFP transceivers. The supported transceiver types are listed below:

◆ 10G Ethernet SFP+ transceivers

   ▪ 10GBASE-CR (Direct Attach Cable)

   ▪ 10GBASE-SR

   ▪ 10GBASE-SRL

   ▪ 10GBASE-LRM

- ■ 10GBASE-LR

◆ 1G Ethernet SFP transceivers

- ■ 1000BASE-SX

- ■ 1000BASE-LX

- ■ 1000BASE-T

For information on the recommended standards for fiber optic cabling, see
"1000 Mbps Gigabit Ethernet Collision Domain" on page 51.

CONSOLE PORT

An RJ-45 serial console port is provided on the switch front panel for a
connection to a console device through an RJ-45-to-DB-9 null-modem cable.
The console device can be a PC or workstation running a VT-100 terminal
emulator, or a VT-100 terminal. An RJ-45-to-DB-9 null-modem serial cable is
supplied with the unit for connecting to the console port.

> (i) **NOTE:** The switch can also be managed in-band through any SPF+ slot
> using a 1000BASE-T SFP transceiver.

RESET BUTTON

Pressing the reset button on the front panel causes the switch to preform a hard
reset.

PORT AND SYSTEM STATUS LEDS

The switch includes a display panel for key system and port indications that simplify installation and network troubleshooting. The LEDs, which are located on the front panel for easy viewing, are shown below and described in the following tables.

Figure 7: Status LEDs

System Status LEDs   SFP+ Port Status LEDs
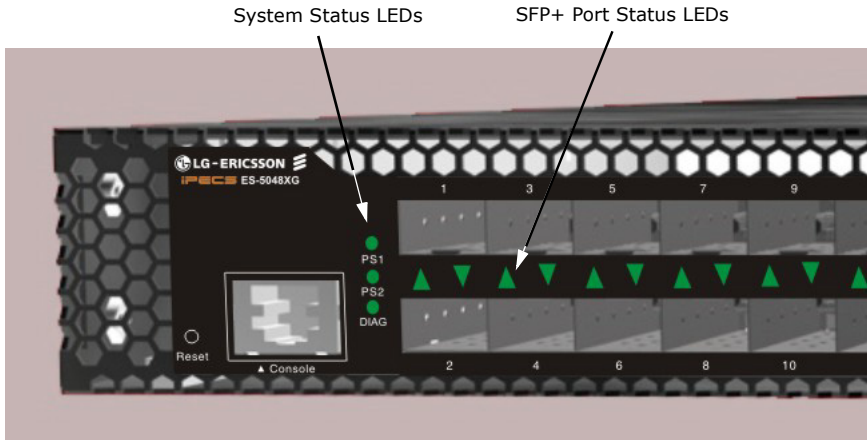
Table 1: 10G SFP+ Port Status LEDs (1~48)

LED	Condition	Status
Link/Activity	On/Flashing Green	Port has established a valid network connection. Flashing indicates activity.
	Off	There is no valid link on the port.

Table 2: System Status LEDs

LED	Condition	Status
PS1/PS2	On Green	Power supply 1/2 is installed and operating normally.
	On Amber	The power supply has detected a fault.
	Off	The power supply unit is either not connected or not installed.

Table 2: System Status LEDs (Continued)

LED	Condition	Status
Diag	On Green	The system diagnostic test has completed successfully.
	Flashing Green	The system diagnostic test is in progress.
	On Amber	The system self-diagnostic test has detected a fan, thermal, or interface fault.

POWER SUPPLY MODULES

The power supply modules are hot-swappable power supply units (PSUs) for the switch. You can install up to two PSUs with matching airflow direction in the switch. The PSUs operate in a load-sharing mode and provides 1+1 redundancy.

> **NOTE:** 1+1 redundancy is a system where a switch power supply is backed up by another switch power supply in a load-sharing mode. If one power supply fails, the other power supply takes over the full load of the switch.

The available power supply modules are listed below:

◆ ESA-PUAC10 (front-to-back airflow)

◆ ESA-PUAC10B (back-to-front airflow)

A standard AC power socket is located on the rear panel of the PSU. The power socket is for the AC power cord.

The PSU also includes an AC power status LED. When the PSU is receiving AC power, the LED turns on green.

> **CAUTION:** The switch includes plug-in power supply and fan tray modules that are installed into its chassis. All installed modules must have a matching airflow direction. That is, all modules must have a front-to-back (F2B) airflow direction, or all modules must have a back-to-front (B2F) airflow direction.

Figure 8: Power Supply Unit

FAN TRAY MODULE

The fan tray module is part of the switch air cooling system that provides cooling for the switch. You must install the fan tray module in the switch that matches the airflow direction of the installed power supply unit.

The available fan tray modules are listed below:

◆ ESA-FAN50 (front-to-back airflow)

◆ ESA-FAN50B (back-to-front airflow)

The fan tray module includes four fixed fans and supports fan speed control. The fan speed is dynamically controlled as a function of temperature: the higher the internal temperature, the faster the speed of the fans. The fan tray module does not have LED indicators.

Figure 9: Fan Tray Module

2 INSTALLING THE SWITCH
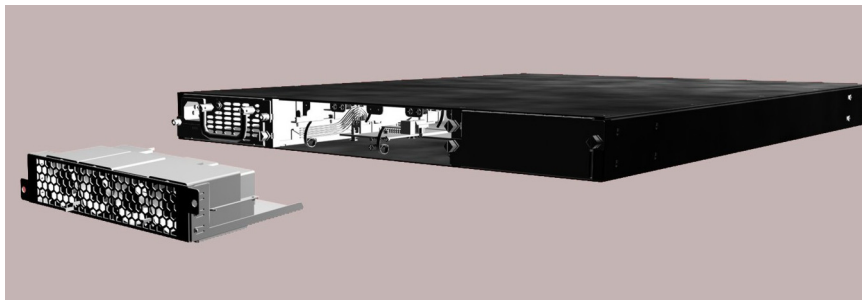
SELECTING A SITE

Switch units can be mounted in a standard 19-inch equipment rack or on a horizontal surface. Be sure to follow the guidelines below when choosing a location.

◆ The site should:

- be at the center of all the devices you want to link and near a power outlet.

- be able to maintain its temperature within 0 to 40 °C (32 to 104 °F) and its humidity within 5% to 95%, non-condensing.

- provide adequate space (approximately two inches) on all sides for proper air flow.

- be accessible for installing, cabling and maintaining the devices.

- allow the status LEDs to be clearly visible.

◆ Make sure twisted-pair cable is always routed away from power lines, fluorescent lighting fixtures and other sources of electrical interference, such as radios and transmitters.

◆ Make sure that the unit is connected to a separate grounded power outlet that provides 100 to 240 VAC, 50 to 60 Hz, is within 2 m (6.6 feet) of each device and is powered from an independent circuit breaker. As with any equipment, using a filter or surge suppressor is recommended.

EQUIPMENT CHECKLIST

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

PACKAGE CONTENTS

◆   48-Port 10G Managed Ethernet Switch (ES-5048XG)

◆   Power Cord—either US, Continental Europe or UK

◆   Four adhesive foot pads for horizontal surface mounting

◆   Rack-mounting kit (two brackets and eight M4 screws)

◆   RJ-45 to DB-9 serial console cable

◆   This Installation Manual

◆   User Manual CD

OPTIONAL RACK-MOUNTING EQUIPMENT

To rack-mount the switch, be sure to have a screwdriver (Phillips or flathead, depending on the type of screws used) available.

MOUNTING

This switch can be mounted in a standard 19-inch equipment rack or on a horizontal surface. Mounting instructions for each type of site follow.

RACK MOUNTING

Before rack mounting the switch, pay particular attention to the following factors:

◆ Temperature: Since the temperature within a rack assembly may be higher than the ambient room temperature, check that the rack-environment temperature is within the specified operating temperature range.

◆ Mechanical Loading: Do not place any equipment on top of a rack-mounted unit.

◆ Circuit Overloading: Be sure that the supply circuit to the rack assembly is not overloaded.

◆ Grounding: Rack-mounted equipment should be properly grounded. Particular attention should be given to supply connections other than direct connections to the mains.

To rack-mount devices:

1. Attach the two brackets to the device using the eight M4 screws provided in the rack-mounting kit.

> **NOTE:** The switch can also be mounted in a rack using a rack shelf or rack "L" brackets.

Figure 10: Attaching the Brackets
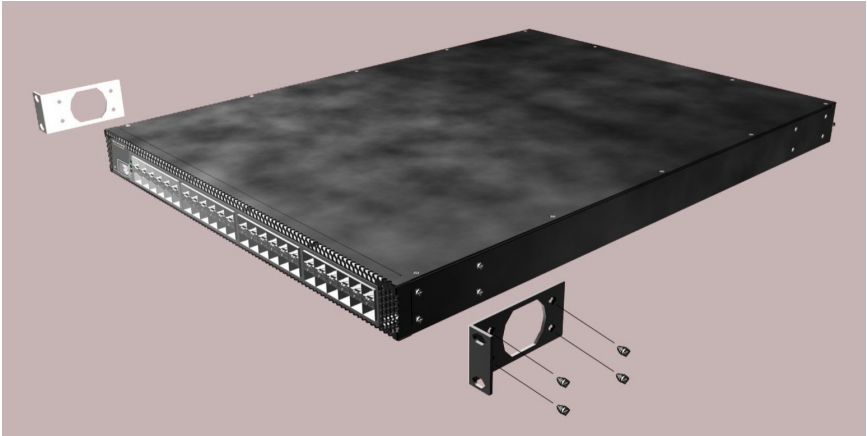
2. Mount the device in the rack, using four 12-24 rack-mounting screws.

Note that rack screws and clip nuts are not supplied in the rack-mounting kit and should be provided by the rack vendor.

CAUTION: Due to the switch's weight, it should be installed by at least two people.

Figure 11: Installing the Switch in a Rack

3. If installing a single switch only, go to "Connecting to a Power Source" on page 41.

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

HORIZONTAL SURFACE MOUNTING

The switch includes four pre-installed rubber feet for horizontal surface mounting.

To mount devices on a horizontal surface, follow these steps:

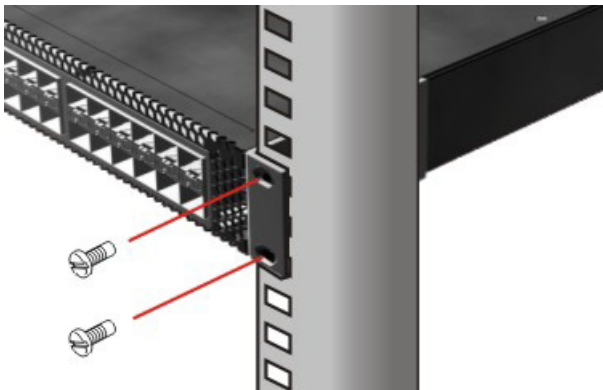**1.** Attach the four adhesive feet to the bottom of the first switch.

Figure 12: Attaching the Adhesive Feet

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

3. If installing a single switch only, go to "Connecting to a Power Source" on page 41.

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

INSTALLING AN OPTIONAL SFP/SFP+ TRANSCEIVER

The SFP+ slots support the following optional SFP+ and SFP transceivers:

◆ 10GBASE-CR

◆ 10GBASE-SR

◆ 10GBASE-SRL

◆ 10GBASE-LRM

◆ 10GBASE-LR

◆ 1000BASE-SX

◆ 1000BASE-LX

◆ 1000BASE-T

Figure 13: Inserting an SFP/SFP+ Transceiver into a Slot
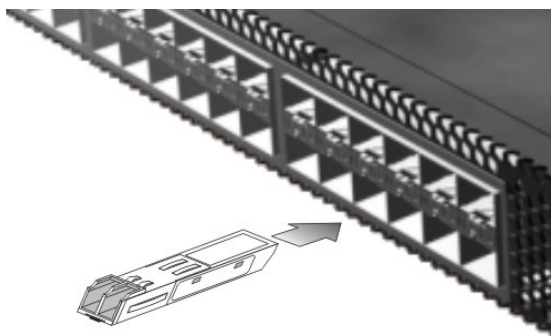
To install an SFP/SFP+ transceiver, follow these steps:

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

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

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

> **NOTE:** SFP/SFP+ transceivers are hot-swappable. The switch does not need to be powered off before installing or removing a transceiver. However, always first disconnect the network cable before removing a transceiver.
>
> **NOTE:** SFP/SFP+ transceivers are not provided in the switch package.

CONNECTING TO A POWER SOURCE

To connect a switch to a power source:

1. Insert the power cable plug directly into the AC socket of a PSU located at the back of the switch.

Figure 14: Power Socket

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

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

3. Check the PSU and front-panel LEDs as the device is powered on to be sure that AC power is being received and the PS1/PS2 LED is on. If not, check that the power cable is correctly plugged in.

4. Repeat steps 1 and 2 when a second PSU module is installed.

Two installed PSU modules operate in a load-sharing mode and provide 1+1 redundancy.

CONNECTING TO THE CONSOLE PORT

This port is used to connect a console device to the switch through a null-modem serial cable. The console device can be a PC or workstation running a VT-100 terminal emulator, or a VT-100 terminal. An RJ-45-to-DB-9 cable is supplied with the switch for connecting to a PC's RS-232 serial DB-9 DTE port. The pin assignments used in the RJ-45-to-DB-9 cable are described below.

Figure 15: Console Port Connection
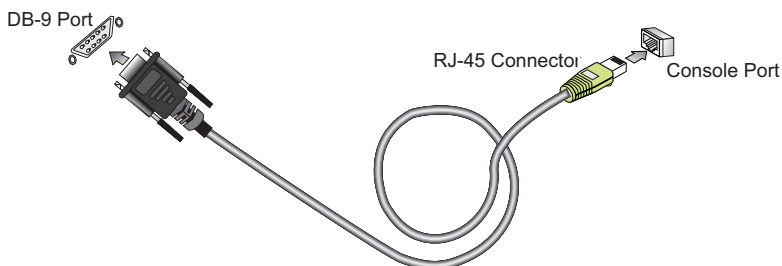
WIRING MAP FOR SERIAL CABLE

The following table describes the pin connections for the RJ-45-to-DB-9 serial cable.

Table 3: Serial Cable Wiring

Switch's 9-Pin Serial Port	Null Modem	PC's 9-Pin DTE Port
6 RXD (receive data)	<---------------------	3 TXD (transmit data)
3 TXD (transmit data)	--------------------->	2 RXD (receive data)
5 SGND (signal ground)	-----------------------	5 SGND (signal ground)

No other pins are used.

The serial port's configuration requirements are as follows:

◆ Default Baud rate—115,200 bps

◆ Character Size—8 Characters

◆ Parity—None

◆ Stop bit—One

◆ Data bits—8

◆ Flow control—none

3 MAKING NETWORK CONNECTIONS

The ES-5048XG switch is designed to provide high-speed, lossless Ethernet connections between server racks and Fibre Channel storage networks through its 10G SFP+ ports. This chapter descibes how to make network connections to the switch.

TWISTED-PAIR CONNECTIONS

Connections to 1000BASE-T SFP transceivers require unshielded twisted-pair (UTP) cable with RJ-45 connectors at both ends. Use Category 5, 5e or 6 cable for 1000BASE-T connections, Category 5 or better for 100BASE-TX connections, and Category 3 or better for 10BASE-T connections.

CABLING GUIDELINES

All 1000BASE-T RJ-45 ports support an automatic MDI/MDI-X pinout configuration, so you can use a standard straight-through twisted-pair cable to connect to any other network device (PCs, servers, switches, routers, or hubs).

See Appendix B for further information on cabling.

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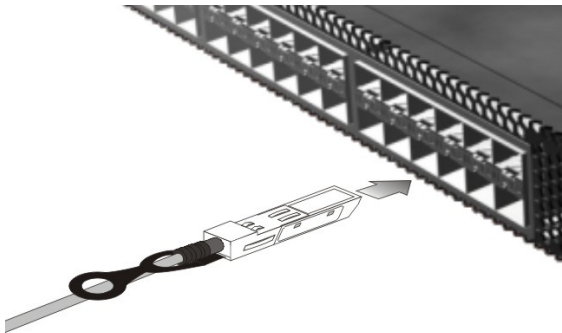
DAC CONNECTIONS

Direct Attach Cable (DAC) is a method of connecting two SFP+ interfaces without using optics and fiber cable. A fixed length of twinax copper cable is terminated at each end with physically-compliant SFP+ transceivers that do not include all their normal electronic and optical components. The result is a low cost, low-latency, 10G Ethernet solution for short distances, ideal for connections within the data center.

DAC is also known as twinax copper, or 10GBASE-CR. DAC copper cables are available in pre-terminated lengths up to 7 m (22.9 ft).

MAKING 10GBASE-CR DAC CONNECTIONS

1. Plug the SFP+ transceiver connector on one end of a twinax copper cable segment into an SFP+ slot on the link device.

Figure 16: Making DAC Connections

2. Plug the other end of the twinax cable into an SFP+ slot on the switch.

3. Check that the Link LED on the switch turns on green to indicate that the connection is valid.

FIBER OPTIC CONNECTIONS

Optional 10G SFP+ or 1G SFP transceivers can be used for fiber connections from the switch to other network devices in the data center. An SFP or SFP+ transceiver may also be used for long distance connections to devices at another site.

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

WARNING: This switch uses lasers to transmit signals over fiber optic cable. The lasers are compliant with the requirements of a Class 1 Laser Product and are inherently eye safe in normal operation. However, you should never look directly at a transmit port when it is powered on.

WARNING: When selecting a fiber SFP/SFP+ device, considering safety, please make sure that it can function at a temperature that is not less than the recommended maximum operational temperature of the product. You must also use an approved Laser Class 1 SFP transceiver.

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

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

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

Figure 17: Making SFP/SFP+ Port Fiber Connections
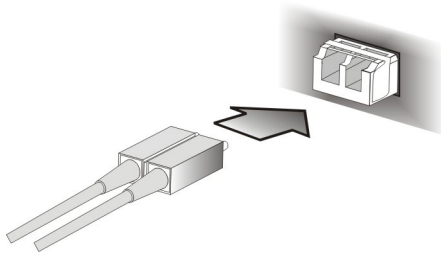
4. As a connection is made, check the Link LED on the switch corresponding to the port to be sure that the connection is valid.

The SFP+ fiber optic ports operate at 10 Gbps, full duplex, with auto-negotiation of flow control. The maximum length for fiber optic cable operating at 10G speed depends on the transceiver and fiber type, as listed under "1000 Mbps Gigabit Ethernet Collision Domain" on page 51.

The SFP fiber optic ports operate at 1 Gbps, full duplex, with auto-negotiation of flow control. The maximum length for fiber optic cable operating at Gigabit speed depends on the transceiver and fiber type, as listed under "1000 Mbps Gigabit Ethernet Collision Domain" on page 51.

CONNECTIVITY RULES

When adding hubs (repeaters) to your network, please follow the connectivity rules listed in the manuals for these products. However, note that because switches break up the path for connected devices into separate collision domains, you should not include the switch or connected cabling in your calculations for cascade length involving other devices.

1000BASE-T CABLE REQUIREMENTS

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

10 GBPS ETHERNET COLLISION DOMAIN

Table 4: Maximum 10GBASE-CR 10 Gigabit Ethernet Cable Lengths

Cable Type	Cable Lengths	Connector
Pre-terminated Direct Attach Cable (DAC) — (twinax copper cable)	1 m (3.28 ft) 2 m (6.56 ft) 3 m (9.8 ft) 5 m (16.4 ft) 7 m (22.9 ft)	SFP+

Table 5: Maximum 10GBASE-SR 10 Gigabit Ethernet Cable Lengths

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
62.5/125 micron multimode fiber	160 MHz/km	2-26 m (7-85 ft.)	LC
62.5/125 micron multimode fiber	200 MHz/km	2-33 m (7-108 ft.)	LC

Table 5: Maximum 10GBASE-SR 10 Gigabit Ethernet Cable Lengths

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
50/125 micron multimode fiber	400 MHz/km	2-66 m (7-216 ft.)	LC
50/125 micron multimode fiber	500 MHz/km	2-82 m (7-269 ft.)	LC
50/125 micron multimode fiber	2000 MHz/km	2-300 m (7-984 ft.)	LC

Table 6: Maximum 10GBASE-SRL 10 Gigabit Ethernet Cable Lengths

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
62.5/125 micron multimode fiber	200 MHz/km	2-11 m (7-36 ft.)	LC
50/125 micron multimode fiber	400 MHz/km	2-22 m (7-72 ft.)	LC
50/125 micron multimode fiber	500 MHz/km	2-27 m (7-88 ft.)	LC
50/125 micron multimode fiber	2000 MHz/km	2-100 m (7-328 ft.)	LC

Table 7: Maximum 10GBASE-LR 10 Gigabit Ethernet Cable Length

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
9/125 micron single-mode fiber	N/A	10 km (6.2 miles)	LC

Table 8: Maximum 10GBASE-LRM 10 Gigabit Ethernet Cable Lengths

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
62.5/125 micron multimode fiber	500 MHz/km	2-220 m (7-721 ft.)	LC
50/125 micron multimode fiber	400 MHz/km	2-100 m (7-328 ft.)	LC
50/125 micron multimode fiber	500 MHz/km	2-220 m (7-721 ft.)	LC

1000 MBPS GIGABIT ETHERNET COLLISION DOMAIN

Table 9: Maximum 1000BASE-T Gigabit Ethernet Cable Length

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

Table 10: Maximum 1000BASE-SX Gigabit Ethernet Cable Lengths

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
62.5/125 micron multimode fiber	160 MHz/km	2-220 m (7-722 ft)	LC
	200 MHz/km	2-275 m (7-902 ft)	LC
50/125 micron multimode fiber	400 MHz/km	2-500 m (7-1641 ft)	LC
	500 MHz/km	2-550 m (7-1805 ft)	LC

Table 11: Maximum 1000BASE-LX Gigabit Ethernet Cable Length

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
9/125 micron single-mode fiber	N/A	2 m - 10 km (7 ft - 6.2 miles)	LC

100 MBPS FAST ETHERNET COLLISION DOMAIN

Table 12: Maximum Fast Ethernet Cable Lengths

Type	Cable Type	Max. Cable Length	Connector
100BASE-TX	Category 5 or better 100-ohm UTP or STP	100 m (328 ft)	RJ-45

10 MBPS ETHERNET COLLISION DOMAIN

Table 13: Maximum Ethernet Cable Length

Type	Cable Type	Max. Cable Length	Connector
10BASE-T	Category 3 or better 100-ohm UTP	100 m (328 ft)	RJ-45

ETHERNET CABLING

To ensure proper operation when installing the switch into a network, make sure that the current cables are suitable for 10BASE-T, 100BASE-TX or 1000BASE-T operation. Check the following criteria against the current installation of your network:

◆   Cable type: Unshielded twisted pair (UTP) or shielded twisted pair (STP) cables with RJ-45 connectors; Category 3 or better for 10BASE-T, Category 5 or better for 100BASE-TX, and Category 5, 5e or 6 for 1000BASE-T.

◆   Protection from radio frequency interference emissions

◆   Electrical surge suppression

◆   Separation of electrical wires (switch related or other) and electromagnetic fields from data based network wiring

◆   Safe connections with no damaged cables, connectors or shields

CABLE LABELING AND CONNECTION RECORDS

When planning a network installation, it is essential to label the opposing ends of cables and to record where each cable is connected. Doing so will enable you to easily locate inter-connected devices, isolate faults and change your topology without need for unnecessary time consumption.

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

◆   Clearly label the opposing ends of each cable.

◆   Using your building's floor plans, draw a map of the location of all network-connected equipment. For each piece of equipment, identify the devices to which it is connected.

◆   Note the length of each cable and the maximum cable length supported by the switch ports.

◆ For ease of understanding, use a location-based key when assigning prefixes to your cable labeling.

◆ Use sequential numbers for cables that originate from the same equipment.

◆ Differentiate between racks by naming accordingly.

◆ Label each separate piece of equipment.

◆ Display a copy of your equipment map, including keys to all abbreviations at each equipment rack.

APPLICATION NOTES

1. Full-duplex operation only applies to point-to-point access (such as when a switch is attached to a workstation, server or another switch). When the switch is connected to a hub, both devices must operate in half-duplex mode.

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

3. Based on recommended standards, the length of fiber optic cable for a single switched link should not exceed:

   ▪ 10GBASE-SR: 300 m (984 ft) for multimode fiber.

   ▪ 10GBASE-SRL: 100 m (328 ft) for multimode fiber.

   ▪ 10GBASE-LRM: 220 m (721 ft) for multimode fiber.

   ▪ 10GBASE-LR: 10 km (6.2 miles) for single-mode fiber.

   ▪ 1000BASE-SX: 550 m (1805 ft) for multimode fiber.

   ▪ 1000BASE-LX: 10 km (6.2 miles) for single-mode fiber.

   However, power budget constraints must also be considered when calculating the maximum cable length for your specific environment.

A TROUBLESHOOTING

DIAGNOSING SWITCH INDICATORS

Table 14: Troubleshooting Chart

Symptom	Action
PS1/PS2 LED is Off	◆ Check connections between the PSU, the power cord and the wall outlet. ◆ Contact your dealer for assistance.
PS1/PS2 LED is on Amber	◆ Power cycle the PSU to try and clear the condition. ◆ If the condition does not clear, contact your dealer for assistance.
Diag LED is on Amber	◆ Power cycle the switch to try and clear the condition. ◆ If the condition does not clear, contact your dealer for assistance.
Link/Act LED is Off	◆ Verify that the switch and attached device are powered on. ◆ Be sure the cable is plugged into both the switch and corresponding device. ◆ Verify that the proper cable type is used and its length does not exceed specified limits. ◆ Check the attached device and cable connections for possible defects. Replace the defective cable if necessary.

POWER AND COOLING PROBLEMS

If the power indicator does not turn on when the power cord is plugged in, you may have a problem with the power outlet, power cord, or power supply unit. However, if the unit powers off after running for a while, check for loose power connections, power losses or surges at the power outlet. If you still cannot isolate the problem, the power supply unit may be defective.

INSTALLATION

Verify that all system components have been properly installed. If one or more components appear to be malfunctioning (such as the power cord or network cabling), test them in an alternate environment where you are sure that all the other components are functioning properly.

MANAGEMENT ACCESS

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

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

TWISTED-PAIR CABLE AND PIN ASSIGNMENTS

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

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

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

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

Figure 18: RJ-45 Connector Pin Numbers
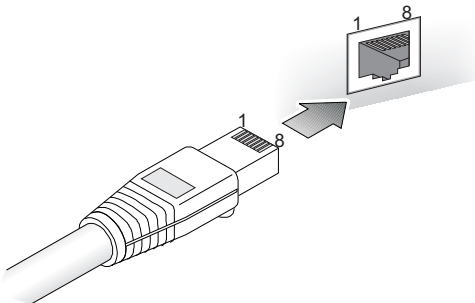
10BASE-T/100BASE-TX PIN ASSIGNMENTS

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

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

Table 15: 10/100BASE-TX MDI and MDI-X Port Pinouts

Pin	MDI Signal Name	MDI-X Signal Name
1	Transmit Data plus (TD+)	Receive Data plus (RD+)
2	Transmit Data minus (TD-)	Receive Data minus (RD-)
3	Receive Data plus (RD+)	Transmit Data plus (TD+)
6	Receive Data minus (RD-)	Transmit Data minus (TD-)
4,5,7,8	Not used	Not used

**Note:** The "+" and "-" signs represent the polarity of the wires that make up each wire pair.

STRAIGHT-THROUGH WIRING

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

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

Figure 19: Straight-through Wiring

EIA/TIA 568B RJ-45 Wiring Standard
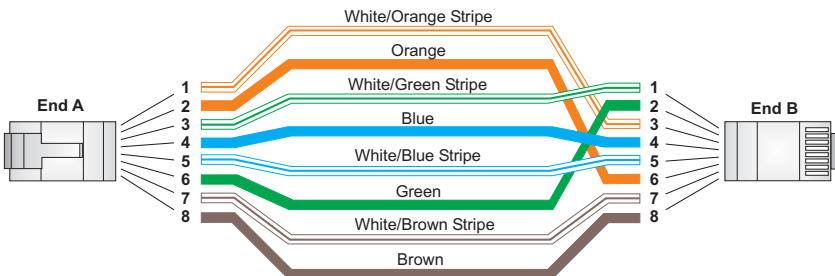10/100BASE-TX Straight-through Cable
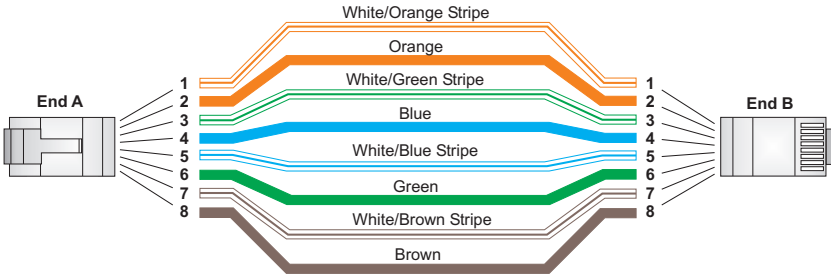
CROSSOVER WIRING

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

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

Figure 20: Crossover Wiring

EIA/TIA 568B RJ-45 Wiring Standard
10/100BASE-TX Crossover Cable

1000BASE-T PIN ASSIGNMENTS

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

The table below shows the 1000BASE-T MDI and MDI-X port pinouts. These ports require that all four pairs of wires be connected. Note that for 1000BASE-T operation, all four pairs of wires are used for both transmit and receive.

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

Table 16: 1000BASE-T MDI and MDI-X Port Pinouts

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

CABLE TESTING FOR EXISTING CATEGORY 5 CABLE

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

Note that when testing your cable installation, be sure to include all patch cables between switches and end devices.

ADJUSTING EXISTING CATEGORY 5 CABLING TO RUN 1000BASE-T

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

1. Replace any Category 5 patch cables with high-performance Category 5e or Category 6 cables.

2. Reduce the number of connectors used in the link.

3. Reconnect some of the connectors in the link.

FIBER STANDARDS

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

Table 17: Fiber Standards

ITU-T Standard	Description	Application
G.651	**Multimode Fiber** 50/125-micron core	Short-reach connections in the 1300-nm or 850-nm band
G.652	**Non-Dispersion-Shifted Fiber** Single-mode, 9/125-micron core	Longer spans and extended reach. Optimized for operation in the 1310-nm band. but can also be used in the 1550-nm band
G.652.C	**Low Water Peak Non-Dispersion-Shifted Fiber** Single-mode, 9/125-micron core	Longer spans and extended reach. Optimized for wavelength-division multiplexing (WDM) transmission across wavelengths from 1285 to 1625 nm. The zero dispersion wavelength is in the 1310-nm region.
G.653	**Dispersion-Shifted Fiber** Single-mode, 9/125-micron core	Longer spans and extended reach. Optimized for operation in the region from 1500 to 1600-nm.

Table 17: Fiber Standards (Continued)

ITU-T Standard	Description	Application
G.654	**1550-nm Loss-Minimized Fiber** Single-mode, 9/125-micron core	Extended long-haul applications. Optimized for high-power transmission in the 1500 to 1600-nm region, with low loss in the 1550-nm band.
G.655	**Non-Zero Dispersion-Shifted Fiber** Single-mode, 9/125-micron core	Extended long-haul applications. Optimized for high-power dense wavelength-division multiplexing (DWDM) operation in the region from 1500 to 1600-nm.

C SPECIFICATIONS

PHYSICAL CHARACTERISTICS

PORTS
48 10 Gbps SFP+ transceiver slots

NETWORK INTERFACE
Ports 1~48: SFP+
   10 Gbps SFP+ transceivers: 10GBASE-CR, 10GBASE-SR, 10GBASE-SRL,
      10GBASE-LR, 10GBASE-LRM
   1 Gbps SFP transceivers: 1000BASE-SX, 1000BASE-LX, 1000BASE-T

BUFFER ARCHITECTURE
32 Mbit packet buffer

AGGREGATE BANDWIDTH
960 Gbps

SWITCHING DATABASE
32K MAC address entries

LEDs
System: PS1, PS2, Diag (Diagnostic)
Ports 1~48: Status (link and activity)

WEIGHT
11.18 kg (24.65 lbs), with one installed power supply module

SIZE
(W x D x H): 440 x 596 x 44 mm (17.32 x 23.46 x 1.75 inches)

TEMPERATURE
Operating: 0 °C to 40 °C (32 °F to 104 °F)
Storage: -40 °C to 70 °C (-40 °F to 158 °F)

HUMIDITY
Operating: 5% to 95% (non-condensing)

POWER SUPPLY MODULE

AC INPUT
100-240 VAC, 50-60 Hz, 6A

DC OUTPUT
12VDC @ 29A

POWER SUPPLY
100-240 VAC, 50-60 Hz, auto-sensing; hot pluggable
350 Watts@ 220V/110V per module

POWER CONSUMPTION
258 Watts maximum

MAXIMUM CURRENT
6 A @ 100 VAC
3 A @ 240 VAC

SIZE
(W x D x H): 107 x 229 x 41 mm (4.2 x 9.0 x 1.6 inches)

WEIGHT
1.24 kg (2.73 lbs)

FAN TRAY MODULE

POWER CONSUMPTION
12VDC @ 3.76A, 45 Watts maximum

MAXIMUM AIRFLOW
119 CFM (107 CFM minimun)

SIZE
(W x D x H): 160 x 40 x 56 mm (6.3 x 1.6 x 2.2 inches)

WEIGHT
384 g (0.85 lbs)

SWITCH FEATURES

FORWARDING MODE
Store-and-forward

THROUGHPUT
Wire speed

FLOW CONTROL
Full Duplex: IEEE 802.3x
Half Duplex: Back pressure

MANAGEMENT FEATURES

OUT-OF-BAND MANAGEMENT
RS-232 RJ-45 console port

IN-BAND MANAGEMENT
SSH, Telnet, SNMP, or HTTP

SOFTWARE LOADING
HTTP, TFTP in-band

STANDARDS

IEEE 802.3ae 10 Gigabit Ethernet
IEEE 802.3-2005
    Ethernet, Fast Ethernet, Gigabit Ethernet
    Full-duplex flow control
    Link Aggregation Control Protocol
IEEE 802.1D -2004
    Spanning Tree Protocol
    Rapid Spanning Tree Protocol
    Multiple Spanning Tree Protocol
ISO/IEC 8802-3

COMPLIANCES

EMISSIONS
EN 55022:2007, Class A/B
EN 61000-3-2:2006, Class A
EN 61000-3-3:2005
FCC Class A
CE Mark

IMMUNITY
EN 55024:2001 + A2:2003
IEC 61000-4-2/3/4/5/6/8/11

SAFETY
TUV c us (CSA 22.2 No 60950-1 & UL60950-1)
CB (IEC/EN60950-1)

GLOSSARY

10BASE-T

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

100BASE-TX

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

1000BASE-LX

IEEE 802.3z specification for Gigabit Ethernet over two strands of 50/125, 62.5/125 or 9/125 micron core fiber cable.

1000BASE-SX

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

1000BASE-T

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

10GBASE-CR

Specification for 10 Gigabit Ethernet over twinax copper cable terminated by SFP+ connectors.

10GBASE-LR

IEEE 802.3ae specification for 10 Gigabit Ethernet over two strands of 9/125 micron core single-mode fiber cable.

10GBASE-LRM

Specification for 10 Gigabit Ethernet over two strands of 62.5/125 micron core multimode fiber cable.

10GBASE-SR

IEEE 802.3ae specification for 10 Gigabit Ethernet over two strands of 62.5/125 micron core multimode fiber cable.

10GBASE-SRL

Specification for 10 Gigabit Ethernet over two strands of 62.5/125 micron core multimode fiber cable.

AUTO-NEGOTIATION

Signalling method allowing each node to select its optimum operational mode (e.g., speed and duplex mode) based on the capabilities of the node to which it is connected.

BANDWIDTH

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

COLLISION DOMAIN

Single CSMA/CD LAN segment.

CSMA/CD

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

END STATION

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

ETHERNET

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

FAST ETHERNET

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

FULL DUPLEX

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

GIGABIT ETHERNET

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

IEEE

Institute of Electrical and Electronic Engineers.

IEEE 802.3

Defines carrier sense multiple access with collision detection (CSMA/CD) access method and physical layer specifications.

IEEE 802.3AB

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

IEEE 802.3AE

Defines the physical layer specifications for 10 Gigabit Ethernet.

IEEE 802.3U

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

IEEE 802.3X

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

IEEE 802.3Z

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

LAN SEGMENT

Separate LAN or collision domain.

LED

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

LOCAL AREA NETWORK (LAN)

A group of interconnected computer and support devices.

MEDIA ACCESS CONTROL (MAC)

A portion of the networking protocol that governs access to the transmission medium, facilitating the exchange of data between network nodes.

MIB

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

MODAL BANDWIDTH

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

NETWORK DIAMETER

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

RJ-45 CONNECTOR

A connector for twisted-pair wiring.

SWITCHED PORTS

Ports that are on separate collision domains or LAN segments.

TIA

Telecommunications Industry Association

TRANSMISSION CONTROL PROTOCOL/INTERNET PROTOCOL (TCP/IP)

Protocol suite that includes TCP as the primary transport protocol, and IP as the network layer protocol.

USER DATAGRAM PROTOCOL (UDP)

UDP provides a datagram mode for packet-switched communications. It uses IP as the underlying transport mechanism to provide access to IP-like services. UDP packets are delivered just like IP packets – connection-less datagrams that may be discarded before reaching their targets. UDP is useful when TCP would be too complex, too slow, or just unnecessary.

UTP

Unshielded twisted-pair cable.

VIRTUAL LAN (VLAN)

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

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