iPECS

Installation Manual

ES-3026 Managed FE Switch
ES-3026P Managed FE POE Switch

LG-NORTEL

ES-3026 MANAGED 26-PORT FE SWITCH

Layer 2 Managed Switch
with 24 10/100BASE-T (RJ-45) Ports,
and 2 Gigabit Combination Ports (RJ-45/SFP)

ES-3026P MANAGED 26-PORT FE POE SWITCH

Layer 2 Managed Switch
with 24 10/100BASE-T (RJ-45) PoE Ports,
and 2 Gigabit Combination Ports (RJ-45/SFP)

ES-3026
ES-3026P
E122009-DT-R01
150200000056A

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.

INDUSTRY CANADA - CLASS A

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled "Digital Apparatus," ICES-003 of the Department of Communications.

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouilleur: "Appareils Numériques," NMB-003 édictée par le ministère des Communications.

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

This information technology equipment complies with the requirements of the Council Directive 2004/108/EC on the Approximation of the laws of the Member States relating to Electromagnetic Compatibility and 2006/95/EC 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 class A according to EN 55022:1998
- Limit class A for harmonic current emission according to EN 61000-3-2/2006
- Limitation of voltage fluctuation and flicker in low-voltage supply system according to EN 61000-3-3/1995+A2:2005

Immunity:

- Product family standard according to EN 55024:1998+A2:2003
- Electrostatic Discharge according to EN 61000-4-2:1995+A2:2001 (Contact Discharge: ±4 kV, Air Discharge: ±8 kV)
- Radio-frequency electromagnetic field according to EN 61000-4-3:2006 (80 - 1000 MHz with 1 kHz AM 80% Modulation: 3 V/m)
- Electrical fast transient/burst according to EN 61000-4-4:2004 (AC/DC power supply: ±1 kV, Data/Signal lines: ±0.5 kV)
- Surge immunity test according to EN 61000-4-5:2006 (AC/DC Line to Line: ±1 kV, AC/DC Line to Earth: ±2 kV)
- Immunity to conducted disturbances, Induced by radio-frequency fields: EN 61000-4-6:2007 (0.15 - 80 MHz with 1 kHz AM 80% Modulation: 3 V/m)
- Voltage dips, short interruptions and voltage variations immunity test according to EN 61000-4-11:2004 (>95% Reduction @10 ms, 30% Reduction @500 ms, >95% Reduction @5000 ms)

LVD:

- EN 60950-1:2001

SAFETY COMPLIANCE

Warning: Fiber Optic Port Safety:

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:

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:

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

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) 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).
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.

About This Guide

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

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.

September 7th 2009 Revision
This is the first revision of this guide. It is valid for the initial release for the standard version.

CONTENTS

FIGURES

TABLES

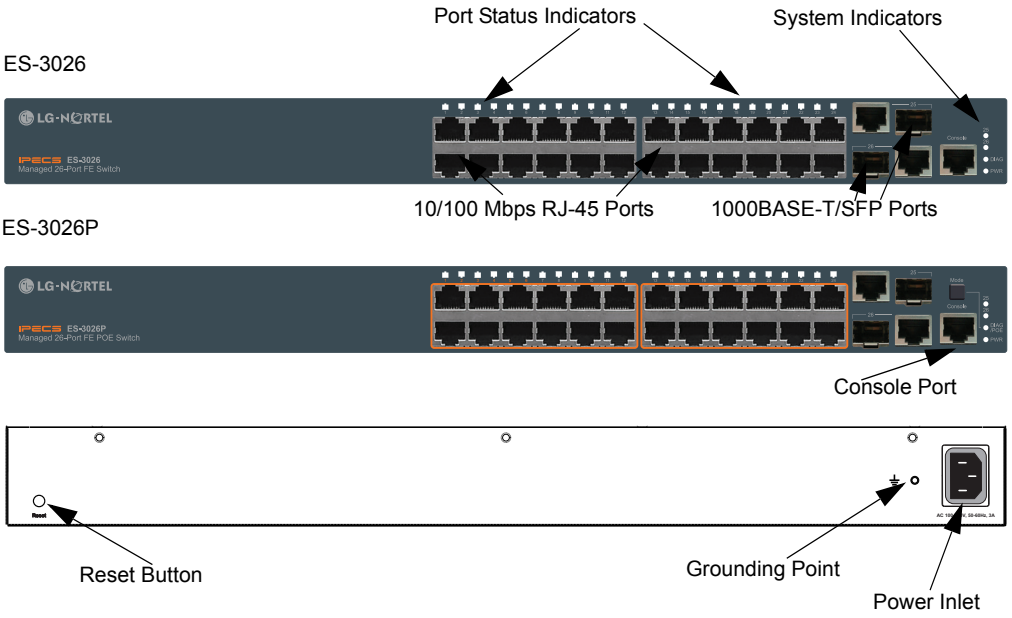
1 INTRODUCTION

OVERVIEW

The ES-3026 and ES-3026P are Fast Ethernet Layer 2 switches with 24 10/100-BASE-T ports, and two Small Form Factor Pluggable (SFP) transceiver slots that operate in combination with 1000-BASE-T ports 25~26 (see Figure 1 on page 16, Ports 25-26). The ES-3026P also provides PoE power to connected devices. The switches also include an SNMP-based management agent, which provides both in-band and out-of-band access for managing the switch.

Both switches provide a broad range of powerful features for Layer 2 switching, delivering reliability and consistent performance for your network traffic. They bring order to poorly performing networks by segregating them into separate broadcast domains with IEEE 802.1Q compliant VLANs, and empowers multimedia applications with multicast switching and CoS services.

Figure 1: Front and Rear Panels



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. The switch also features full-duplex capability on all ports, which effectively doubles the bandwidth of each connection.

This 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 (DB-9 connector) for out-of-band management. A PC may be connected to this port for configuration and monitoring out-of-band via the supplied RJ-45 to RS232 (DB-9 connector) serial cable.

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

POWER-OVER-ETHERNET

The first six ports (ports 1~6) of the ES-3026P's 24 10/100 Mbps ports support the IEEE802.3at Draft standard version that enables DC power to be supplied to attached devices using wires in the connecting Ethernet cable. The rest of the ES-3026P's 24 10/100 Mbps ports (ports 7~24) support the normal PoE (802.3af). The total PoE power delivered by all ports cannot exceed 185W power budget.

Any PoE-compliant device attached to a port can directly draw power from the switch over the Ethernet cable without requiring its own separate power source. This capability gives network administrators centralized power control for devices such as IP phones and wireless access points, which translates into greater network availability.

For each attached PoE-compliant device, the switch automatically senses the load and dynamically supplies the required power. The switch delivers power to a device using the wire pairs in UTP or STP cable. The first six ports on the switch can provide up to 30 W of power, while the remaining ports (ports 7~24) can provide 15.4W of power.

DESCRIPTION OF HARDWARE

10/100BASE-T PORTS

The switch contains 24 RJ-45 ports that operate at 10 Mbps, or 100 Mbps, half or full duplex. Because these ports support automatic MDI/MDI-X operation, you can use straight-through cables for all network connections to PCs or servers, or to other switches or hubs.

Each of these ports supports auto-negotiation, so the optimum transmission mode (half or full duplex), and data rate (10, or 100 Mbps) can be selected automatically. If a device connected to one of these ports does not support auto-negotiation, the communication mode of that port can be configured manually.

Each port also supports IEEE 802.3x auto-negotiation of flow control, so the switch can automatically prevent port buffers from becoming saturated.

SFP TRANSCEIVER SLOTS

The Small Form Factor Pluggable (SFP) transceiver slots are shared with Gigabit RJ-45 ports 25~26. In the default configuration, if an SFP transceiver (purchased separately) is installed in a slot and has a valid link on the port, the associated RJ-45 port is disabled. The switch can also be configured to force the use of an RJ-45 port or SFP slot, as required.

The following table shows a list of transceiver types which have been tested with the switch. For an updated list of vendors supplying these transceivers, contact your local dealer. For information on the recommended standards for fiber optic cabling, see "Fiber Standards" on page 50.

Table 1: Supported SFP Transceivers

Media Standard	**Fiber Diameter** (microns)	**Wavelength** (nm)	**Maximum Distance**[a]
1000BASE-SX	50/125	850	700 m
	62.5/125	850	400 m
1000BASE-LX	50/125	1300	550 m
	62.5/125	1300	550 m
	9/125	1300	10 km
1000BASE-LH	9/125	1310	35 km
		1550	80 km
100BASE-FX	50/125 or 62.5/125	1300	2 km
	9/125	1300	20 km
1000BASE-T			100 m

a. Maximum distance may vary for different SFP vendors.

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 2: Front and Rear Panels

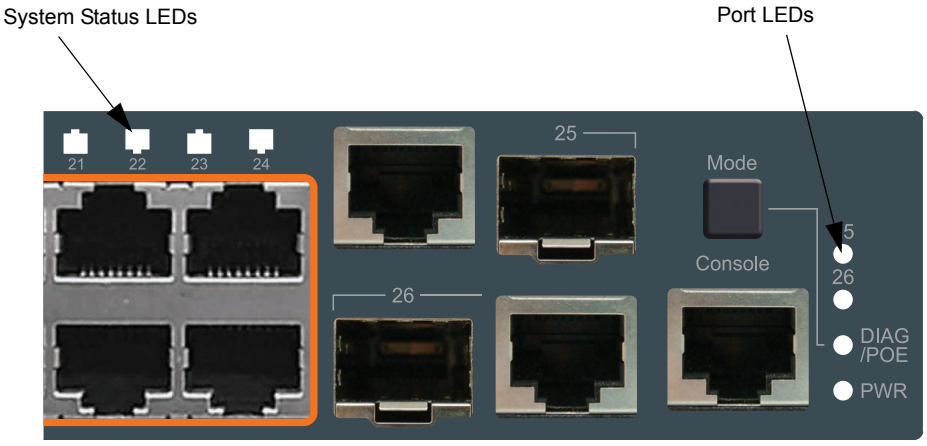


Table 2: Port Status LEDs

LED	Condition	Status
Fast Ethernet Ports (Ports 1-24)		
Link/Activity/ Speed (Mode button not depressed)	On/Flashing Amber	Port has established a valid 10 Mbps network connection. Flashing indicates activity.
	On/Flashing Green	Port has established a valid 100 Mbps network connection. Flashing indicates activity.
	Off	There is no valid link on the port.
PoE Status (Mode button is depressed)	On Amber	A PoE device is connected.
	Off	No PoE device is connected.
SFP Gigabit Ethernet Ports (Ports 25-26)		
(Link/Activity)	On/Flashing Amber	Port has established a valid 100 Mbps network connection. Flashing indicates activity.
	On/Flashing Green	Port has established a valid 1000 Mbps network connection. Flashing indicates activity.
	Off	There is no valid link on the port.

Table 3: System Status LEDs

LED	Condition	Status
PWR	On Green	The unit's internal power supply is operating normally.
	Off	The unit has no power connected.
Diag/PoE (Mode button not depressed)	On Green	The system diagnostic test has completed successfully.
	Flashing Green	The system boot up is in progress.
	On Amber	The system diagnostic test is in progress.
	Flashing Amber	The system diagnostic test has detected a fault.
Diag/PoE (Mode button depressed)	On Amber	Port LEDs display PoE status.
	Flashing Amber	Supplied PoE power has reached 95% or more of the total system power budget.

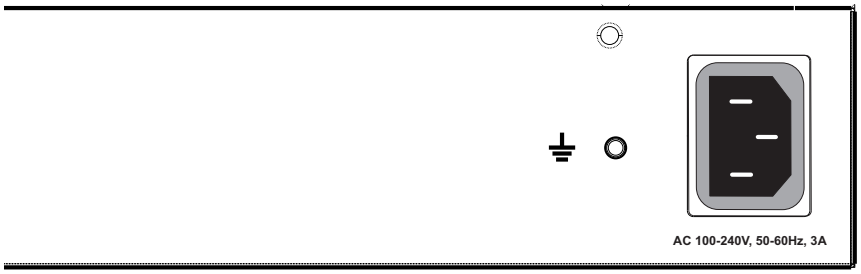
MODE BUTTON

When the Mode button is depressed, the port LEDs display PoE information. When the Mode button is not depressed, the port LEDs display link and activity information.

POWER SUPPLY INLET

There is one power inlet on the rear panel of the switch. The standard power inlet is for the AC power cord.

Figure 3: Power Supply Inlet



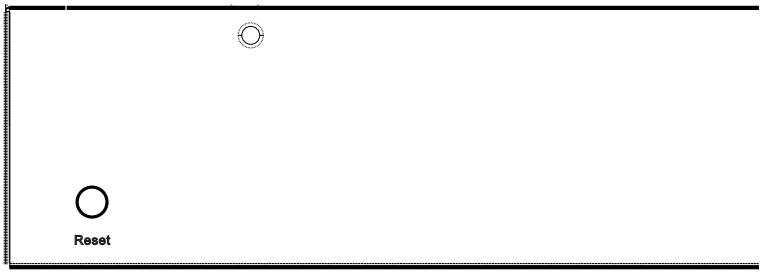
GROUNDING POINT

To prevent accidental electrical shock or damage to your switch, it is recommended that you ground the switch to an earth point by attaching a grounding wire (not supplied) to the grounding point located next to the power inlet, with a metal screw. If located in a tall building, grounding points include metal drain pipes, and other electrostatic conductive devices that lead to the ground, or if located on the first floor of a building, the ground outside itself.

RESET BUTTON

If you encounter any switch malfunctions, such as a hang or non-recoverable error, you might want to reset the switch to its default configuration by pressing and holding the reset button for six seconds. The reset button is located on the rear panel on the opposing side of the power inlet.

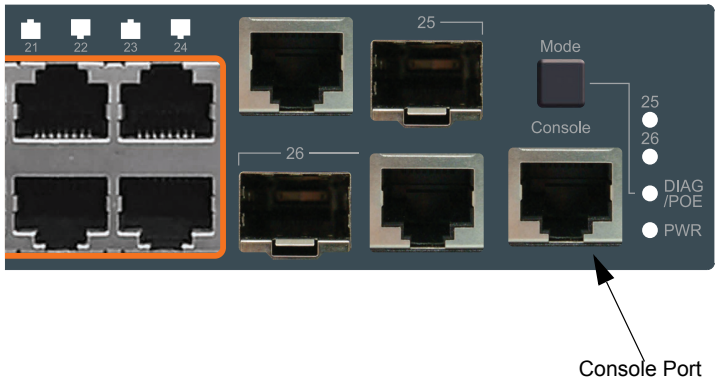
Figure 4: Reset Button



CONSOLE PORT

This port is used to connect a console device to the switch through a serial cable. The console device can be a PC or workstation running a VT- 100 terminal emulator, or a VT-100 terminal. A crossover RJ-45 to DB-9 cable is supplied with the unit for connecting to the console port.

Figure 5: Console Port



2 NETWORK PLANNING

INTRODUCTION TO SWITCHING

A network switch allows simultaneous transmission of multiple packets via non-crossbar switching. This means that it can partition a network more efficiently than bridges or routers. The switch has, therefore, been recognized as one of the most important building blocks for today's networking technology.

When performance bottlenecks are caused by congestion at the network access point (such as the network card for a high-volume file server), the device experiencing congestion (server, power user, or hub) can be attached directly to a switched port. And, by using full-duplex mode, the bandwidth of the dedicated segment can be doubled to maximize throughput.

When networks are based on repeater (hub) technology, the distance between end stations is limited by a maximum hop count. However, a switch turns the hop count back to zero. So subdividing the network into smaller and more manageable segments, and linking them to the larger network by means of a switch, removes this limitation.

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

APPLICATION EXAMPLES

The switches are not only designed to segment your network, but also to provide a wide range of options in setting up network connections. Some typical applications are described below.

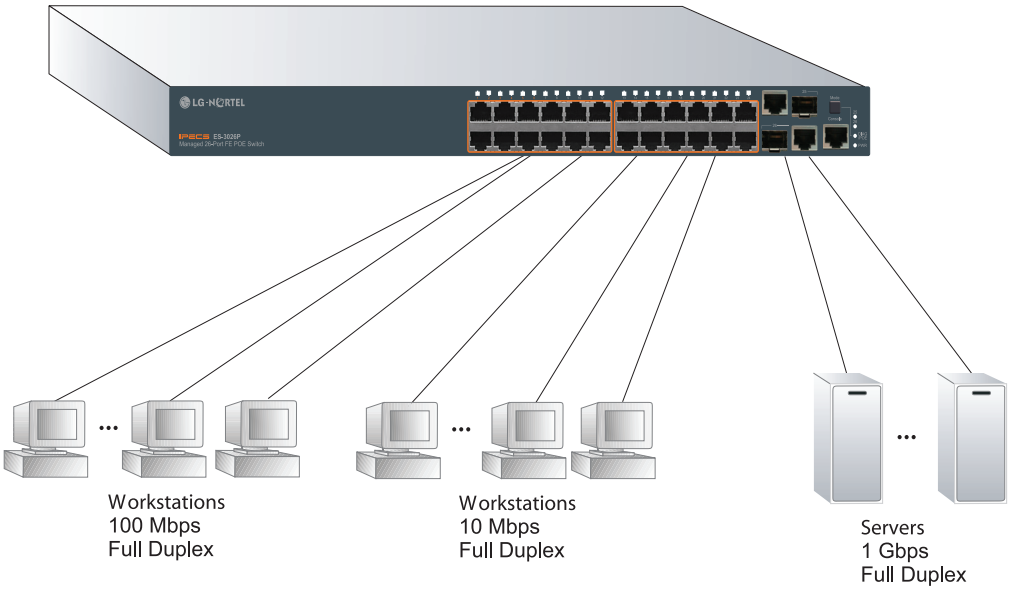
COLLAPSED BACKBONE

The switches are an excellent choice for mixed Ethernet, Fast Ethernet, and Gigabit Ethernet installations where significant growth is expected in the near future. You can easily build on this basic configuration, adding direct full-duplex connections to workstations or servers. When the time comes for further expansion, just connect to another hub or switch using one of the Fast Ethernet ports, a Gigabit Ethernet port, or a plug-in SFP transceiver on the front panel.

In the figure below, the ES-3026P is operating as a collapsed backbone for a small LAN. It is providing dedicated 10 Mbps full-duplex connections to

workstations, 100 Mbps full-duplex connections to power users, and 1 Gbps full-duplex connections to servers.

Figure 6: Collapsed Backbone



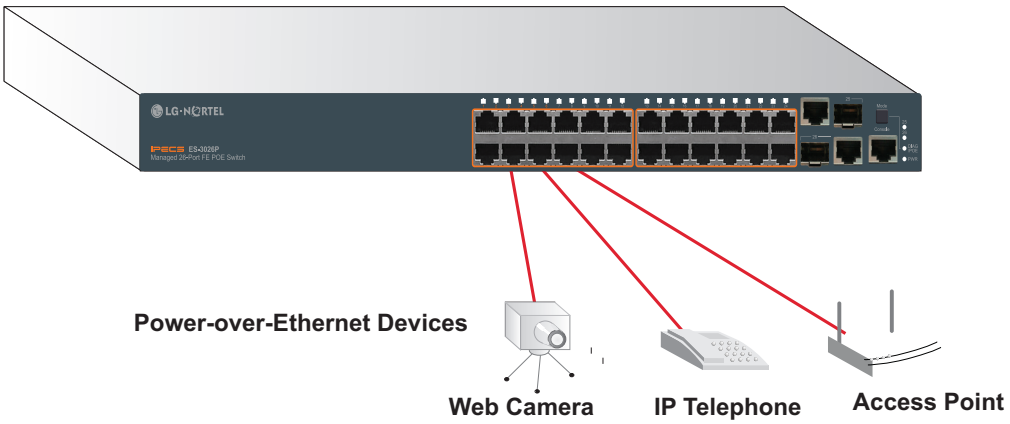
PoE Connections

The ES-3026P switch is an excellent choice for supplying power to connected PoE devices such as web cameras, IP telephones, or access points.

The first six ports on the switch can provide up to 30 W of power to a connected device. The switch can supply 15.4 W simultaneously to 12 PoE devices among 24 Fast Ethernet ports, or 30 W simultanesously to six connected PoE devices. The total power can not exceed 185 W PoE power budget.

In the figure below, the switch is supplying power to three PoE devices. It is also providing dedicated 100 Mbps full-duplex data connections to these devices. In addition, other non-PoE devices can be connected to the switch.

Figure 7: Supplying PoE Power

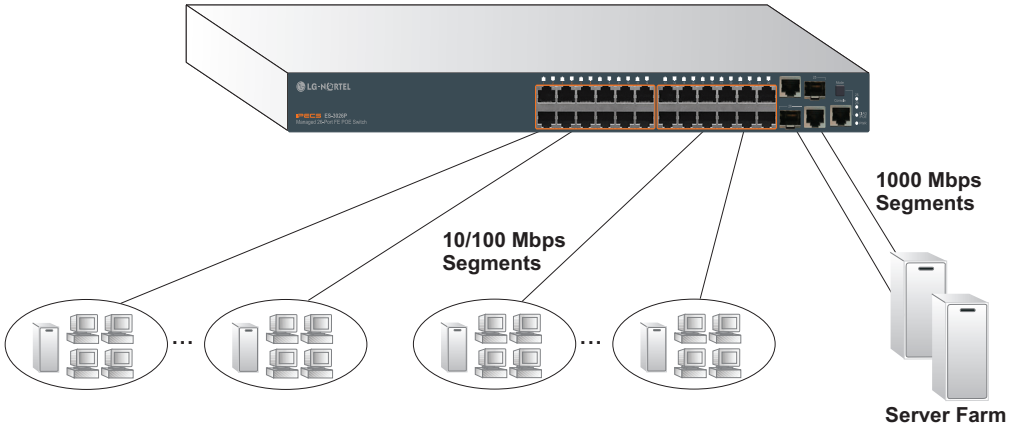


NETWORK AGGREGATION PLAN

With 26 parallel bridging ports (i.e., 26 distinct collision domains), these switches can collapse a complex network down into a single efficient bridged node, increasing overall bandwidth and throughput.

In the figure below, the 10/100BASE-TX ports on the switch are providing 100 Mbps connectivity for up to 24 segments, while the 1000BASE-T ports are providing connectivity for two Gigabit segments.

Figure 8: Network Aggregation Plan

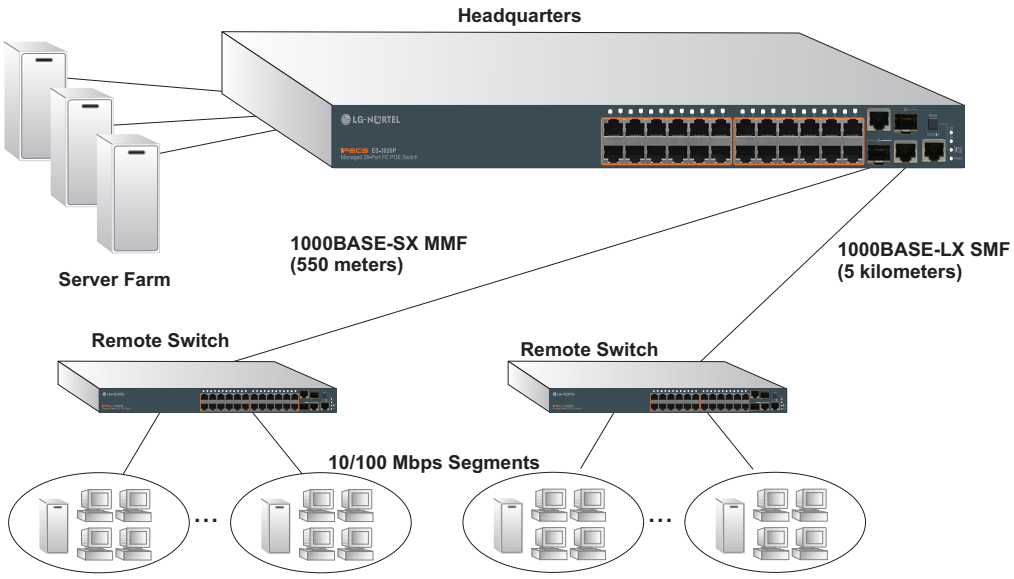


REMOTE CONNECTIONS WITH FIBER CABLE

Fiber optic technology allows for longer cabling than any other media type. A 1000BASE-SX (MMF) link can connect to a site up to 550 meters away, a 1000BASE-LX (SMF) link up to 5 km, a 1000BASE-LH link up to 70 km, and a 100BASE-FX (SMF) link up to 20 km. This allows the switches to serve as a collapsed backbone, providing direct connectivity for a widespread LAN.

The figure below illustrates the ES-3026P connecting multiple segments with fiber cable.

Figure 9: Remote Connections with Fiber Cable

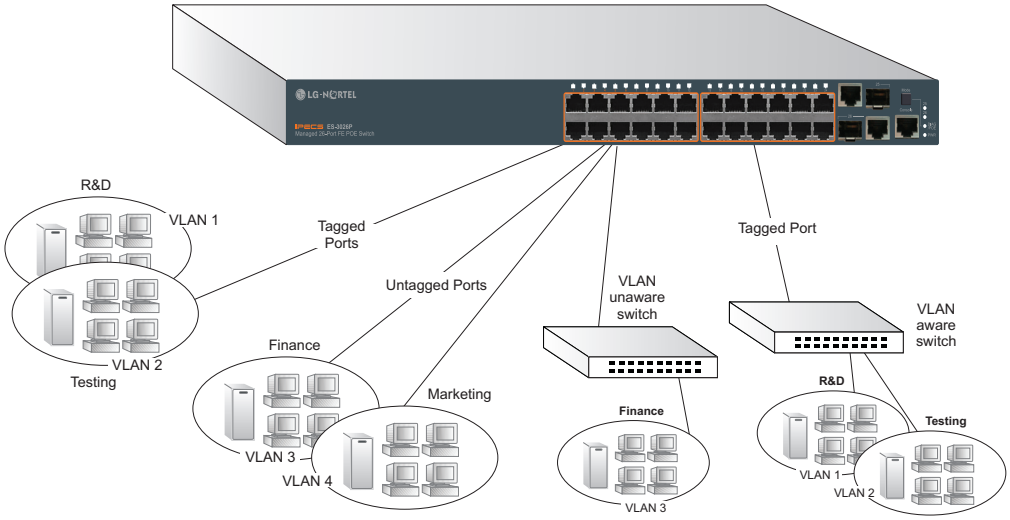


MAKING VLAN CONNECTIONS

These switches support VLANs which can be used to organize any group of network nodes into separate broadcast domains. VLANs confine broadcast traffic to the originating group, and can eliminate broadcast storms in large networks. This provides a more secure and cleaner network environment.

VLANs can be based on untagged port groups, or traffic can be explicitly tagged to identify the VLAN group to which it belongs. Untagged VLANs can be used for small networks attached to a single switch. However, tagged VLANs should be used for larger networks, and all the VLANs assigned to the inter-switch links.

Figure 10: Making VLAN Connections



NOTE: When connecting to a switch that does not support IEEE 802.1Q VLAN tags, use untagged ports.

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. As a general rule the length of fiber optic cable for a single switched link should not exceed:

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

- 1000BASE-LX: 5 km (3.1 miles) for single-mode fiber.
- 1000BASE-LH: 70 km (43.5 miles) for single-mode fiber.

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

3 INSTALLING THE SWITCH

This chapter describes how to install the switch.

SELECTING A SITE

- 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 50 °C (32 to 122 °F) and its humidity within 10% to 90%, 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.

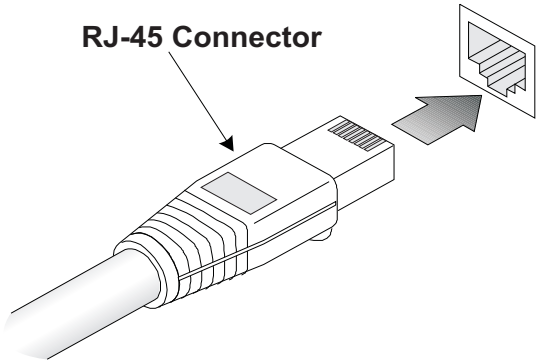
ETHERNET CABLING

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

Figure 11: RJ-45 Connections



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.

- Managed 26-Port FE Switch (ES-3026), or
  Managed 26-Port FE PoE Switch (ES-3026P)
- RJ-45 to RS232 console cable
- Four adhesive foot pads
- Grounding screw
- Bracket Mounting Kit containing two brackets and eight screws for attaching the brackets to the switch
- Power Cord
- Quick Installation Guide
- Manual CD

OPTIONAL RACK-MOUNTING EQUIPMENT

If you plan to rack-mount the switch, be sure to have the following equipment available:

- Four mounting screws for each device you plan to install in a rack—these are not included
- A screwdriver (Phillips or flathead, depending on the type of screws used)

MOUNTING

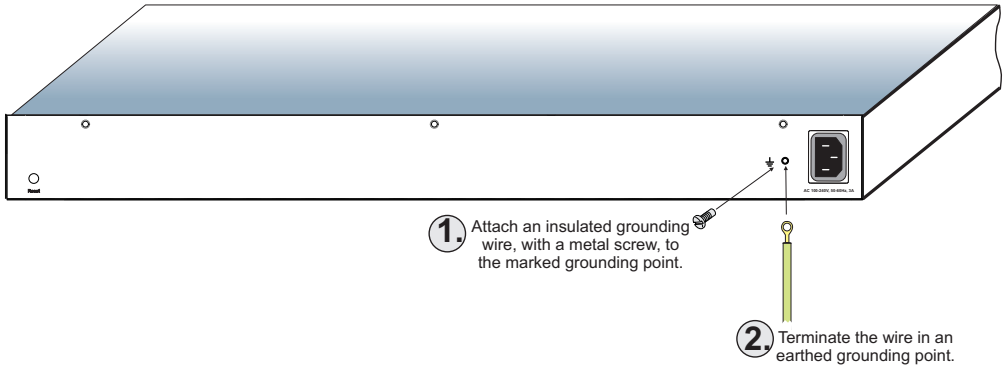
The switch can be mounted in a standard 19-inch equipment rack or on a desktop or shelf. Mounting instructions for each type of site follow.

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. ("Physical Characteristics" on page 51.)
- Mechanical Loading: Do not place any equipment on top of the 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.

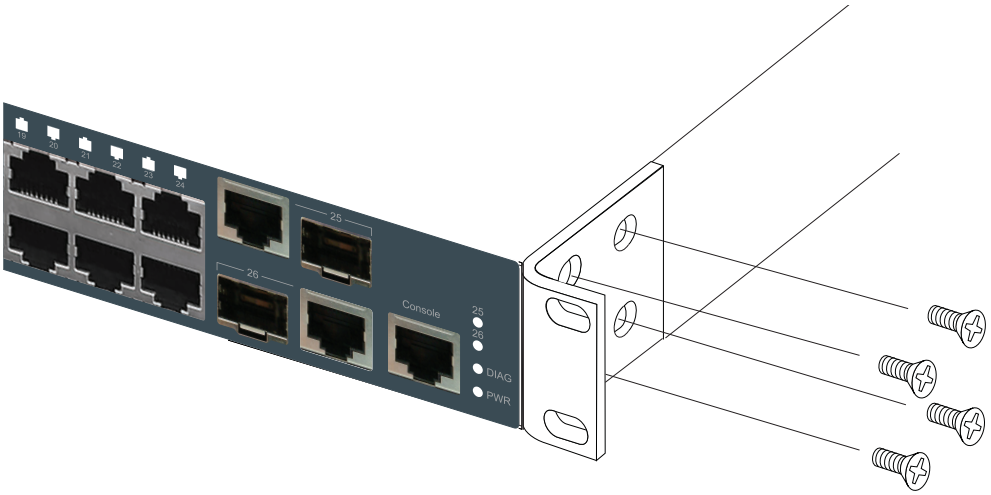
Figure 12: Grounding



To rack-mount devices:

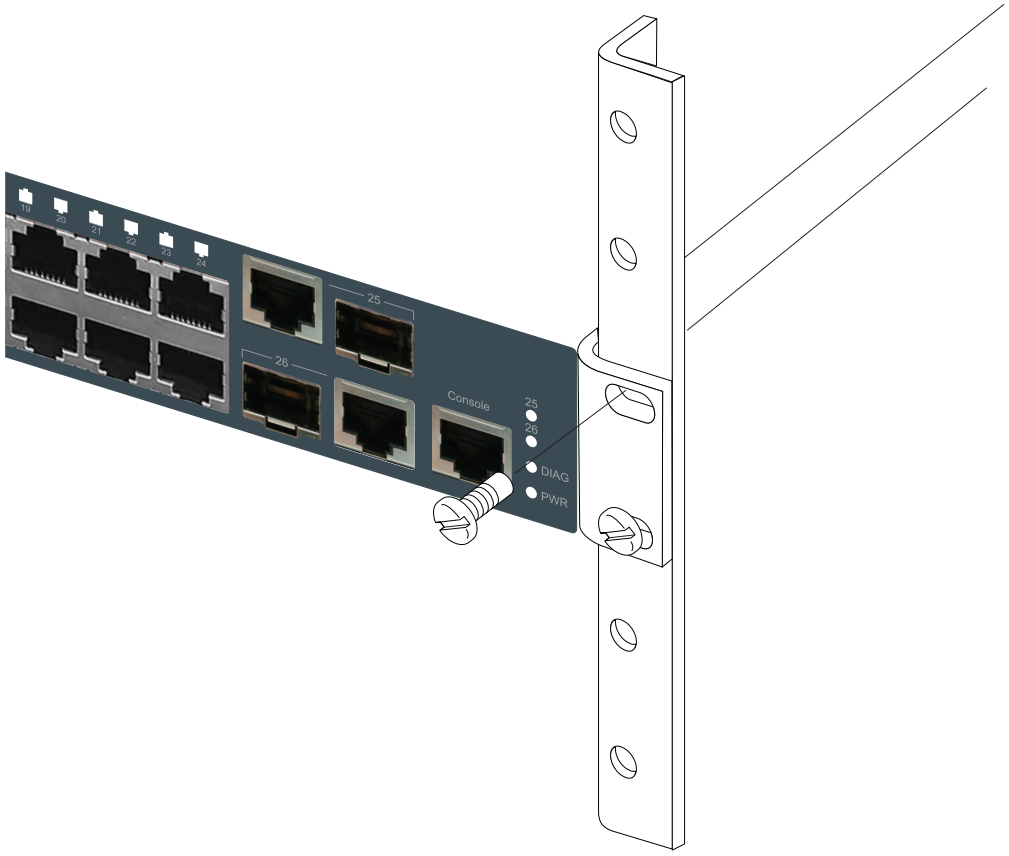
1. Attach the brackets to the device using the screws provided in the Bracket Mounting Kit.

Figure 13: Attaching the Brackets



2. Mount the device in the rack, using four rack-mounting screws (not provided). Be sure to secure the lower rack-mounting screws first to prevent the brackets being bent by the weight of the switch.

Figure 14: Installing the Switches in a Rack



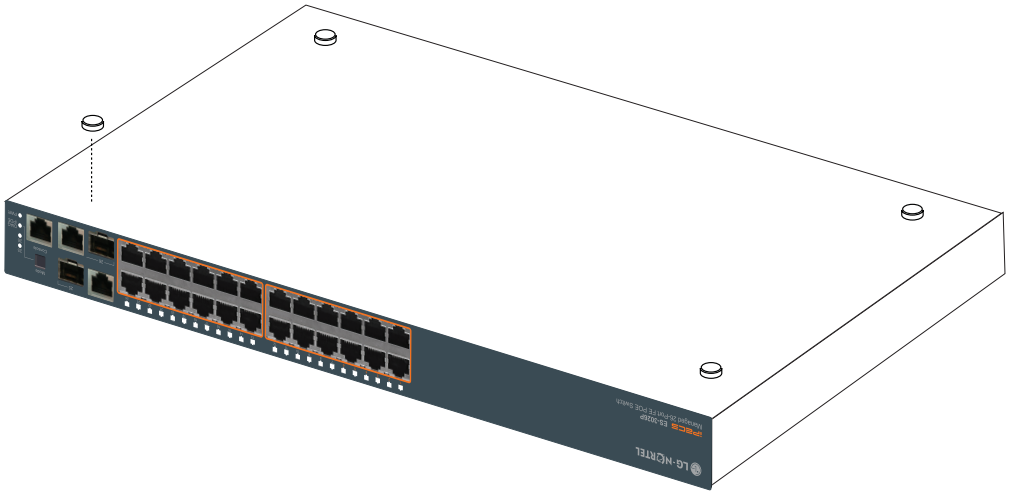
3. If installing a single switch only, turn to "Connecting to a Power Source" on page 33 at the end of this chapter.

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

DESKTOP OR SHELF MOUNTING

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

Figure 15: Attaching the Adhesive Feet



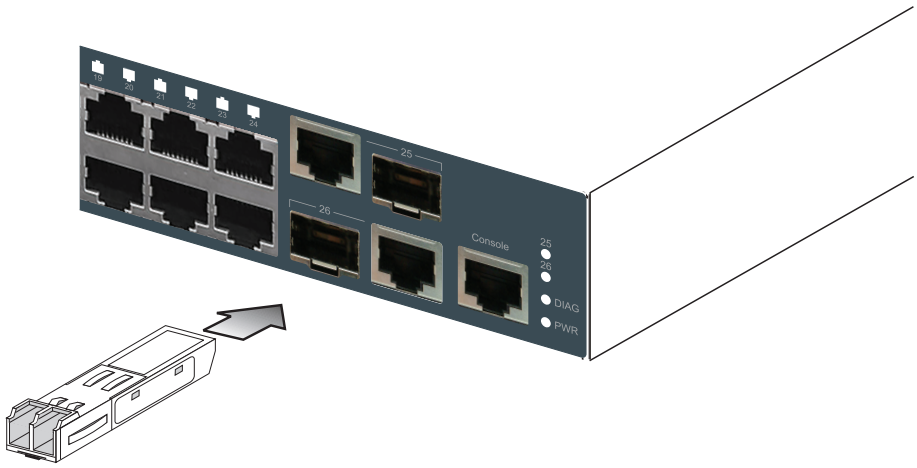
2. Set the device on a flat surface near an AC power source, making sure there are at least two inches of space on all sides for proper air flow.

3. If installing a single switch only, go to "Connecting to a Power Source" on page 33, at the end of this chapter.

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

INSTALLING AN OPTIONAL SFP TRANSCEIVER

Figure 16: Installing an Optional SFP Transceiver into a Slot



The SFP slots support the following optional SFP transceivers:

- 1000BASE-SX
- 1000BASE-LX
- 1000BASE-LH
- 100BASE-FX

To install an SFP transceiver, do the following:

1. Consider network and cabling requirements to select an appropriate SFP transceiver type.
2. Insert the transceiver with the optical connector facing outward and the slot connector facing down. Note that SFP transceivers are keyed so they can only be installed in one orientation.
3. Slide the SFP transceiver into the slot until it clicks into place.

NOTE: SFP transceivers are hot-swappable. The switch does not need to be powered off before installing or removing the transceiver. However, always first disconnect the network cable before removing the transceiver.

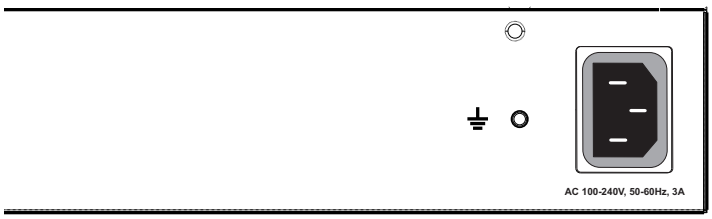
NOTE: SFP transceivers are not provided in the switch package.

CONNECTING TO A POWER SOURCE

To connect a switch to a power source:

1. Insert the power cable plug directly into the AC inlet located at the back of the switch.

Figure 17: Power Inlet



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

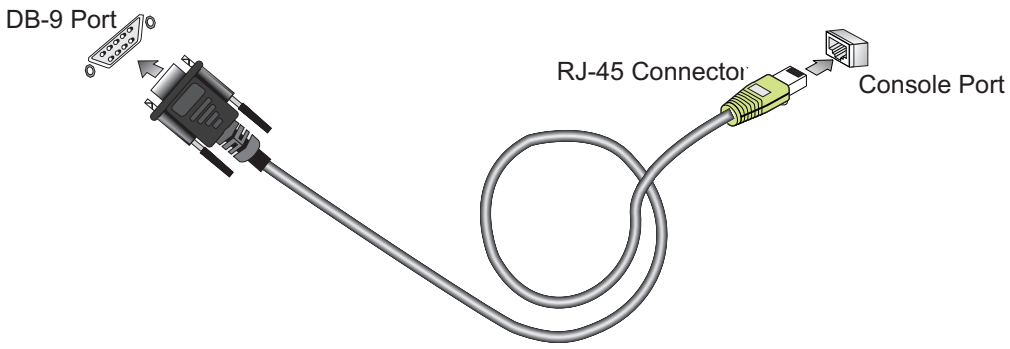
NOTE: For International use, you may need to change the AC line cord. You must use a line cord set that has been approved for the wall socket type in your country.

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

CONNECTING TO THE CONSOLE PORT

This port is used to connect a console device to the switch through a serial cable. The console device can be a PC or workstation running a VT-100 terminal emulator, or a VT-100 terminal. A crossover RJ-45 to DB-9 cable is supplied with the unit for connecting to the console port, as illustrated below. The PIN assignments used to connect to the serial port are described below.

Figure 18: Console Cable



WIRING MAP FOR SERIAL CABLE

Table 4: Serial Cable Wiring

Switches 8-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)

The serial port's configuration requirements are as follows:

- Default Baud rate—115,200 bps
- Character Size—8 Characters
- Parity—None

- Stop bit—One
- Data bits—8
- Flow control—none

4 MAKING NETWORK CONNECTIONS

CONNECTING NETWORK DEVICES

The switches are designed to be connected to 10, 100, or 1000 Mbps network cards in PCs and servers, as well as to other switches and hubs. It may also be connected to remote devices using optional 1000BASE-SX, 1000BASE-LX, 1000BASE-LH, or 100BASE-FX SFP transceivers.

TWISTED-PAIR DEVICES

Each device requires an unshielded twisted-pair (UTP) cable with RJ-45 connectors at both ends. Use Category 5, 5e, or 6 cable for 1000BASE-T connections, Category 5 or better for 100BASE-TX connections, and Category 3 or better for 10BASE-T connections.

POWER-OVER-ETHERNET CONNECTIONS

The ES-3026P switch automatically detects a PoE-compliant device by its authenticated PoE signature and senses its required load before turning on DC power to the port. This detection mechanism prevents damage to other network equipment that is not PoE compliant.

NOTE: Power-over-Ethernet connections work with all existing Category 3, 4, 5, 5e, or 6 network cabling, including patch cables and patch-panels, outlets, and other connecting hardware, without requiring modification.

The switch delivers power to a device using the wire pairs in UTP or STP cable (RJ-45 pins 1, 2, 3, and 6). The switch can provide up to 30 W of power continuously on each of the first six ports. If a device tries to draw more than 30 W from a port, an overload condition occurs and the port disables the power. The rest of the ES-3026P's 24 10/100 Mbps ports (ports 7 ~ 24) support the normal PoE (802.3af), which can provide up to 15.4 W of power.

The switch controls the power and data on a port independently. Power can be requested from a device that already has a data link to the switch. Also, the switch can supply power to a device even if the port's data connection has been disabled. The power on a port is continuously monitored by the switch and it will be turned off as soon as a device connection is removed.

CABLING GUIDELINES

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

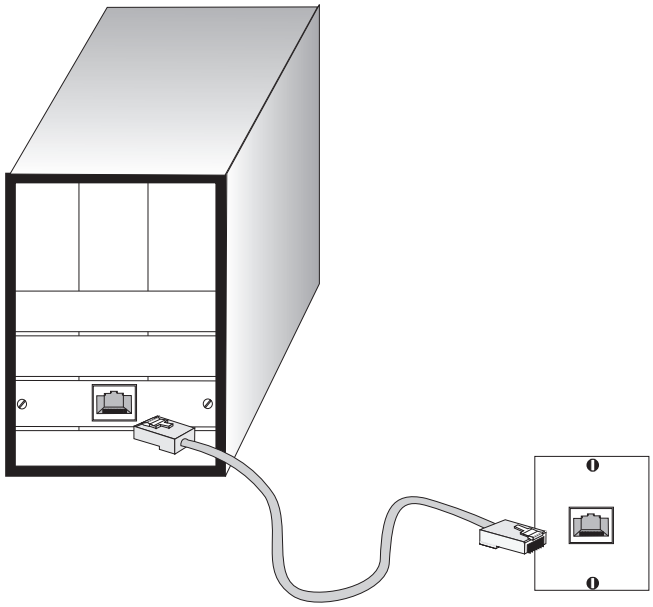
See "Cables and Pinouts" on page 46 for further information on cabling.

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.

CONNECTING TO PCS, SERVERS, HUBS, AND SWITCHES

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

Figure 19: Making-Twisted-Pair Connections



2. If the device is a network card and the switches are in the wiring closet, connect the other end of the cable segment to a modular wall outlet that is connected to the wiring closet. (See "Network Wiring Connections" on page 38.) Otherwise, connect the other end of the cable segment directly to an available port on the switch.

   Make sure each twisted pair cable does not exceed 100 meters (328 ft) in length.

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

3. As each connection is made, the Link LED (on the switch) corresponding to each port will turn on (green or amber) to indicate that the connection is valid.

NETWORK WIRING CONNECTIONS

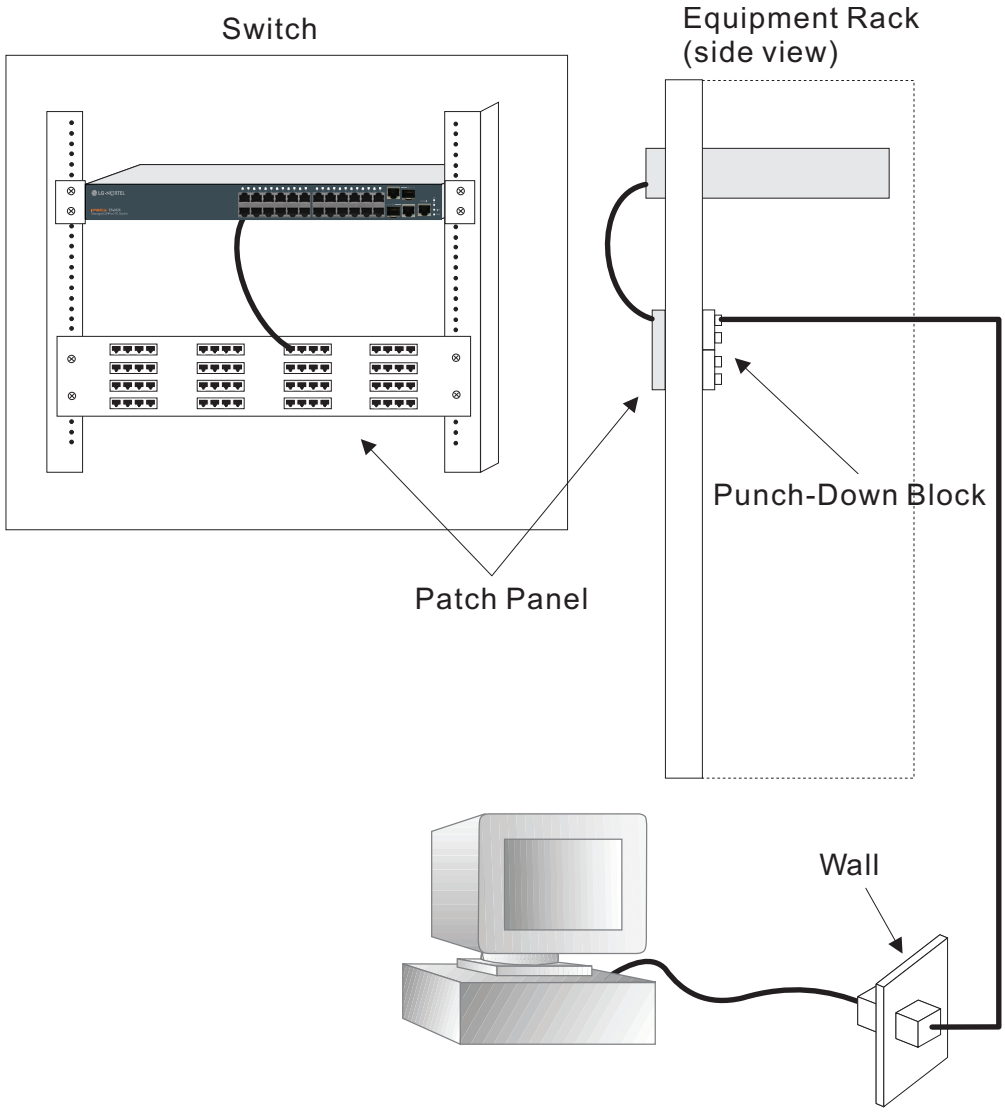
Today, the punch-down block is an integral part of many of the newer equipment racks. Actually it is a part of the patch panel. Instructions for making connections in the wiring closet with this type of equipment follows.

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

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

3. Label the cables to simplify future troubleshooting. See "Cable Labeling and Connection Records" on page 42.

Figure 20: Network Wiring Connections



FIBER OPTIC SFP DEVICES

An optional Gigabit SFP (1000BASE-SX, 1000BASE-LX, 1000BASE-LH, or 100BASE-FX) transceiver can be used for a backbone connection between switches, or for connecting to a high-speed server.

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

WARNING: These switches use 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.

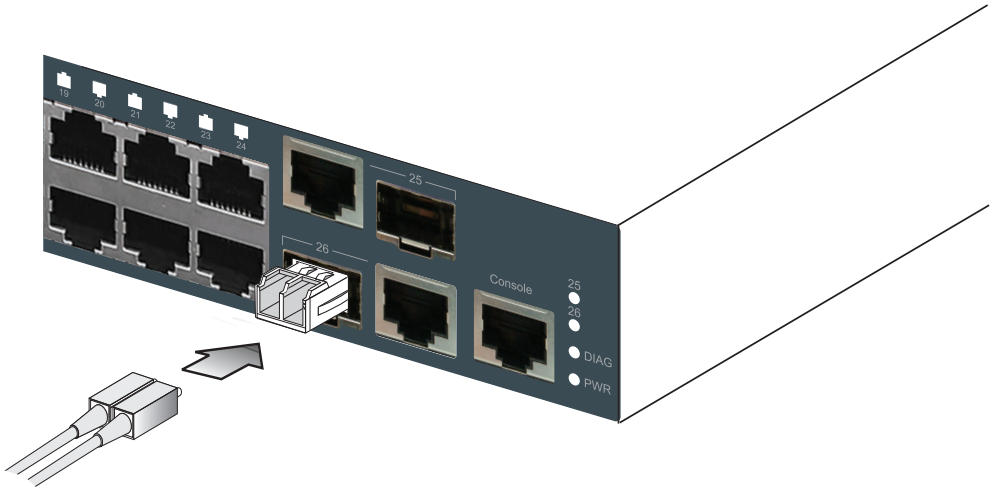
WARNING: When selecting a fiber SFP device, considering safety, please make sure that it can function at a temperature that is not less than the recommended maximum operational temperature of the product. You must also use an approved Laser Class 1 SFP transceiver.

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 LC port on the other device. Since LC connectors are keyed, the cable can be attached in only one orientation.

Figure 21: Making Fiber Port 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 1000BASE-SX, 1000BASE-LX, 1000BASE-LH 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 will depend on the fiber type as listed under "1000 Mbps Gigabit Ethernet Collision Domain" on page 41.

The 100BASE-FX fiber optic ports operate at 100 Mbps, full duplex, with auto-negotiation of flow control. The maximum length for fiber cable operating at 100 Mbps is listed under "100 Mbps Fast Ethernet Collision Domain" on page 42.

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.

1000 MBPS GIGABIT ETHERNET COLLISION DOMAIN

Table 5: 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 6: 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 7: 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 - 5 km (7 ft - 3.2 miles)	LC

Table 8: Maximum 1000BASE-LH Gigabit Ethernet Cable Length

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
9/125 micron single-mode fiber	N/A	2 m - 70 km (7 ft - 43.5 miles)	LC

100 Mbps Fast Ethernet Collision Domain

Table 9: Maximum 100BASE-FX Cable Length

Type	Fiber Type	Max. Cable Length	Connector
100BASE-FX	9/125 micron single-mode fiber	2 m - 20 km (7 ft - 12.43 miles)	LC
	62.5/125 or 50/125 multimode fiber	up to 2 km (1.24 miles)	LC

Table 10: Maximum Fast Ethernet Cable Length

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 11: 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

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.

A TROUBLESHOOTING

DIAGNOSING LED INDICATORS

Table 12: LED Indicators

LED Status	Action
Power LED is Off	◆ Check connections between the switch, the power cord, and the wall outlet. ◆ Contact your dealer for assistance.
Diag LED is Flashing Amber	◆ Power cycle the switch to try and clear the condition. ◆ If the condition does not clear, contact your dealer for assistance.
Link 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. ◆ If the switch is installed in a rack, check the connections to the punch-down block and patch panel. ◆ Verify that the proper cable type is used and its length does not exceed specified limits. ◆ Check the adapter on the attached device and cable connections for possible defects. Replace the defective adapter or cable if necessary.

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 internal power supply. However, if the unit powers off after running for a while, check for loose power connections, power losses, or surges at the power outlet. If you still cannot isolate the problem, the internal power supply may be defective.

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.

IN-BAND ACCESS

You can access the management agent in the switch from anywhere within the attached network using 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 port which you are connecting to the switch has not been disabled. If it has not been disabled, then check the network cabling that runs between your remote location and the switch.

CAUTION: The management agent can accept 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.

B CABLES AND PINOUTS

TWISTED-PAIR CABLE ASSIGNMENTS

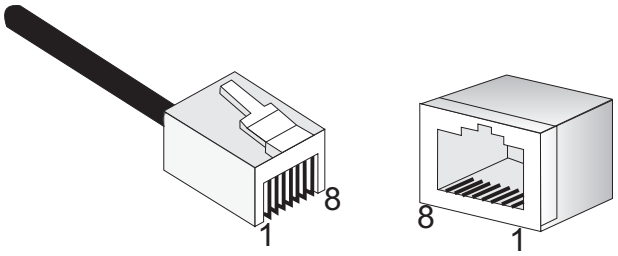
For 10/100BASE-TX connections, a twisted-pair cable must have two pairs of wires. For 1000BASE-T connections the twisted-pair cable must have four pairs of wires. Each wire pair is identified by two different colors. For example, one wire might be green and the other, green with white stripes. Also,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

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

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

The following figure 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 22: RJ-45 Connector



10/100BASE-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. 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 support automatic MDI/MDI-X operation, so you can use straight-through or crossover cables for all network connections to PCs, 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.

Table 13: 10/100BASE-TX MDI and MDI-X Port Pinouts

PIN	MDI Signal Name[a]	MDI-X Signal Name
1	Transmit Data plus (TD+) -52V power (Negative V_{port})	Receive Data plus (RD+) GND (Positive V_{port})
2	Transmit Data minus (TD-) -52V power (Negative V_{port})	Receive Data minus (RD-) GND (Positive V_{port})
3	Receive Data plus (RD+) GND (Positive V_{port})	Transmit Data plus (TD+) -52V power (Negative V_{port})
4	-52V power (Negative V_{port})	GND (Positive V_{port})
5	-52V power (Negative V_{port})	GND (Positive V_{port})
6	Receive Data minus (RD-) GND (Positive V_{port})	Transmit Data minus (TD-) -52V power (Negative V_{port})
7	GND (Positive V_{port})	-52V power (Negative V_{port})
8	GND (Positive V_{port})	-52V power (Negative V_{port})

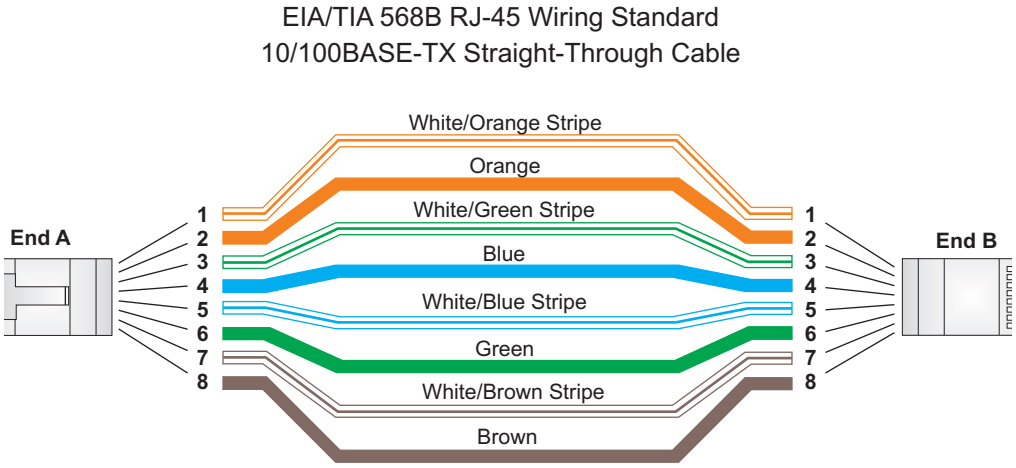
a. The "+" and "-" signs represent the polarity of the wires that make up each wire pair.

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 connections.

Figure 23: Straight Through Wiring

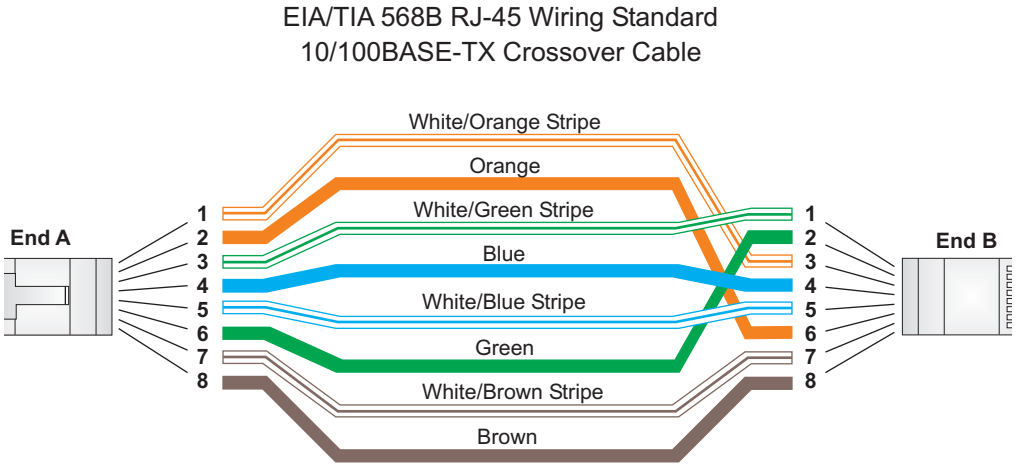


CROSSOVER WIRING

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 connections.

Figure 24: Crossover Wiring



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, 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 14: 1000BASE-T MDI and MDI-X Port Pinouts

Pin	MDI Signal Name	MDI-X Signal Name
1	Bi-directional Pair A Plus (BI_DA+) -52V power (Negative V_{port})	Bi-directional Pair B Plus (BI_DB+) GND (Positive V_{port})
2	Bi-directional Pair A Minus (BI_DA-) -52V power (Negative V_{port})	Bi-directional Pair B Minus (BI_DB-) GND (Positive V_{port})
3	Bi-directional Pair B Plus (BI_DB+) GND (Positive V_{port})	Bi-directional Pair A Plus (BI_DA+) -52V power (Negative V_{port})
4	Bi-directional Pair C Plus (BI_DC+) -52V power (Negative V_{port})	Bi-directional Pair D Plus (BI_DD+) GND (Positive V_{port})
5	Bi-directional Pair C Minus (BI_DC-) -52V power (Negative V_{port})	Bi-directional Pair D Minus (BI_DD-) GND (Positive V_{port})
6	Bi-directional Pair B Minus (BI_DB-) GND (Positive V_{port})	Bi-directional Pair A Minus (BI_DA-) -52V power (Negative V_{port})
7	Bi-directional Pair D Plus (BI_DD+) GND (Positive V_{port})	Bi-directional Pair C Plus (BI_DC+) -52V power (Negative V_{port})
8	Bi-directional Pair D Minus (BI_DD-) GND (Positive V_{port})	Bi-directional Pair C Minus (BI_DC-) -52V power (Negative V_{port})

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

Table 15: Fiber Standards

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

C HARDWARE SPECIFICATIONS

PHYSICAL CHARACTERISTICS

PORTS
24 10/100-BASE-T, with auto-negotiation
2 10/100/1000BASE-T shared with two SFP transceiver slots

NETWORK INTERFACE
Ports 1-24: RJ-45 connector, auto MDI/X
- 10BASE-T: RJ-45 (100-ohm, UTP cable; Category 3, or better)
- 100BASE-TX: RJ-45 (100-ohm, UTP cable; Category 5, or better)
- *Maximum Cable Length - 100 m (328 ft)

Ports 25-26: RJ-45 connector, auto MDI/X
- 10BASE-T: RJ-45 (100-ohm, UTP cable; Category 3, or better)
- 100BASE-TX: RJ-45 (100-ohm, UTP cable; Category 5, or better)
- 1000BASE-T: RJ-45 (100-ohm, UTP or STP cable; Category 5, 5e, or 6)
- *Maximum Cable Length - 100 m (328 ft)

BUFFER ARCHITECTURE
4M bits

AGGREGATE BANDWIDTH
8.8 Gbps

SWITCHING DATABASE
8K MAC address entries

LEDS
System: Power, Diag (Diagnostic)/PoE,
Port: status (link, speed, activity, and PoE)

WEIGHT
ES-3026P: 3.28kg
ES-3026: 1.7kg

SIZE
ES-3026P:
44.0 x 28.0 x 4.4 cm (17.32 x 11.0 x 1.73 in.)

ES-3026:
44.0 x 21 x 4.4 cm (17.32 x 8.27 x 1.73 in.)

TEMPERATURE
Operating: 0°C to 50°C (32°F to 122°F)
Storage: -40°C to 70°C (-40°F to 158°F)

HUMIDITY
Operating: 10% to 90% (non-condensing)

AC INPUT
ES-3026P:
AC 100-240V, 50-60Hz, 3A

ES-3026:
AC 100-240V, 50-60Hz, 0.3A

POWER SUPPLY
Internal, auto-ranging SMPS: AC 100-240V, 50-60Hz

POWER CONSUMPTION
ES-3026P:
245 Watts (Maximum power consumption from AC inlet)

ES-3026:
17 Watts (Maximum power consumption from AC inlet)

MAXIMUM CURRENT
ES-3026P:
2.7A@100VAC;1.1A@240VAC

ES-3026:
0.3A@100VAC;0.2A@240VAC

SWITCH FEATURES

FORWARDING MODE
Store-and-forward

THROUGHPUT
Wire speed

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

MANAGEMENT FEATURES

IN-BAND MANAGEMENT Web, Telnet, SSH, or SNMP manager

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

SOFTWARE LOADING HTTP, HTTPS, TFTP in-band, or XModem out-of-band

STANDARDS

IEEE 802.3-2005

Ethernet, Fast Ethernet, Gigabit Ethernet
Full-duplex flow control
Link Aggregation Control Protocol

IEEE802.3at Power-over-Ethernet Draft standard version

IEEE 802.1Q

IEEE 802.1P

ISO/IEC 8802-3

COMPLIANCES

EMISSIONS EN55022:2006 (CISPR 22) Class A
EN 61000-3-2/3
EN50081-1:
EN50082-1:
IEC 1000-4-2/3/4/6)
FCC Class A
CE Mark
KCC Class A

IMMUNITY EN 61000-4-2/3/4/5/6/8/11

SAFETY cUL (CSA 22.2 NO 60950-1 & UL 60950-1)

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-FX IEEE 802.3 specification for 100 Mbps Ethernet over two strands of 50/125, 62.5/125 micron, or 9/125 micron core fiber 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-LH Specification for long-haul Gigabit Ethernet over two strands of 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).

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 802.3U 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.

RJ-45 CONNECTOR A connector for twisted-pair wiring.

STP Shielded Twisted Pair.

SMPS Switching Mode Power Supply.

SWITCHED PORTS Ports that are on separate collision domains or LAN segments.

TIA Telecommunications Industry Association

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.

INDEX

O

P

R

S

T

V

CE

NOV/2009/ISSUE 1.0