

ES3002-4P-4T User Manual

Package contents

Thank you for purchasing the ES3002-4P-4T IFS 8-Port 10/100/1000T Gigabit Ethernet Switch with 4-Port 802.3at PoE+ Injector.

Unless specified, the term “**gigabit Ethernet switch**” mentioned in this user manual refers to the ES3002-4P-4T.

Open the box of the gigabit Ethernet switch and carefully unpack it. The box should contain the following items:

- Gigabit ethernet switch × 1
- CD with user manual × 1
- Power cord × 1
- Rubber feet × 4
- 19” rack-mounting brackets with attachment screws × 1

If any of these pieces are missing or damaged, please contact your dealer immediately. If possible, retain the carton including the original packing material, and use them again to repack the product in case there is a need to return it to us for repair.

Introduction

Product description

To fulfill the demand of sufficient PoE power for network applications with Gigabit speed transmission, the ES3002-4P-4T 8-Port 10/100/1000T Gigabit Ethernet Switch with 4-Port 802.3at PoE+ Injector, a member of the 802.3at PoE Gigabit Ethernet Switch family, features high-performance Gigabit IEEE 802.3at PoE (up to 30 W) and a full 60 W PoE budget on half of the switch’s eight 10/100/1000Mbps TP ports. The four 802.3at PoE+ ports provide a PoE power injector function that can drive two IEEE 802.3at or 4 IEEE 802.3af compliant powered devices. The ES3002-4P-4T also provides simple, cost-effective, and non-blocking wire-speed performance with an 8.5-inch metal housing suitable for desktop deployment for SOHO and department network applications.

All RJ45 copper interfaces in the ES3002-4P-4T support 10/100/1000Mbps auto-negotiation for optimal speed detection through RJ45 Category 6, 5, or 5e cables. It also supports standard auto-MDI/MDI-X that can detect the type of connection to any Ethernet device without requiring special straight-through or crossover cables.

Features

Physical Port

- 8-port 10/100/1000BASE-T Gigabit Ethernet RJ45 copper
- 4-port IEEE 802.3at/af PoE Injector (Port-1 to Port-4)

Power over Ethernet

- Complies with IEEE 802.3af/at Power over Ethernet end-span PSE
- Up to four ports of IEEE 802.3af/802.3at devices powered
- Supports PoE power up to 30.8 W for each PoE port
- Each port supports 53 VDC power to PoE powered device
- 60 W PoE budget
- Auto detects powered device (PD)
- Circuit protection prevents power interference between ports
- Remote power feeding up to 100 m with standard mode, 200 m with extended mode

Switching

- Hardware based 10/100/1000Mbps auto-negotiation and auto MDI/MDI-X
- Flow control for full duplex operation and back pressure for half duplex operation
- IEEE 802.1Q VLAN transparency
- Hardware DIP switch for “Standard” and “Extend” mode selection; the “Extend” mode features 30 W PoE transmit distance of 200 m at speed of 10 Mbps (only for Port1 – Port4)

Hardware

- 8.5-inch desktop size, 1U height, rack mountable
- LED indicators for system power, per port PoE ready and PoE activity, speed, Link/Act
- Fan-free design
- Supports Energy-Efficient Ethernet (EEE) function (IEEE 802.3az)

Specifications

Hardware specifications

Hardware version	2
10/100/1000BASE-T MDI/MDIX ports	8
PoE Injector Port	Four ports with 802.3at/af PoE injector function with Port-1 to Port-4
Switch Architecture	Store-and-Forward
Switch Fabric	16 Gbps/non-blocking
Switch Throughput@64 bytes	11.9 Mpps@64 bytes
MAC Address Table	4K entries, automatic source address learning and aging

Maximum Frame Size	9K bytes
Flow Control	IEEE 802.3x pause frame for full-duplex Back pressure for half-duplex
LED	System: Power (Green) PoE max. (Green) 10/100/1000BASE-T RJ45 interfaces: 10/100Mbps LNK/ACT (Orange) 1000Mbps LNK/ACT (Green) PoE interfaces: PoE-in-Use (Orange)
DIP Switch	Selectable operation mode <ul style="list-style-type: none"> Standard Extended
Dimensions (W × D × H)	135 × 87 × 32 mm
Enclosure	Metal
Weight	929 g
Power requirements	AC 100~240 V, 50/60 Hz, 2A max.
Power consumption/ dissipation	Max. 65 W/223 BTU
Thermal fan	None

Power over Ethernet

PoE Standard	IEEE 802.3af Power over Ethernet/PSE IEEE 802.3at Power over Ethernet Plus/PSE
PoE Power Supply Type	End-span
PoE Power Output	Per port 53 VDC, 600 mA. max. 30 W
Power Pin Assignment	1/2(+), 3/6(-)
PoE Power Budget	60 W
Max. Number of Class 2 PDs	4
Max. Number of Class 3 PDs	4
Max. Number of Class 4 PDs	2

Standards conformance

Regulatory compliance	FCC Part 15 Class A, CE
Standards Compliance	IEEE 802.3 10BASE-T IEEE 802.3u 100BASE-TX IEEE 802.3ab Gigabit 1000BASE-T IEEE 802.3x flow control and back pressure IEEE 802.3af Power over Ethernet IEEE 802.3at Power over Ethernet Plus IEEE 802.3az Energy Efficient Ethernet (EEE)

Environment

Operating	Temperature: 0 ~ 50°C Relative Humidity: 5 ~ 95% (non-condensing)
Storage	Temperature: -10 ~ 70°C Relative Humidity: 5 ~ 95% (non-condensing)

Description

These switches provide three different running speeds (10 Mbps, 100 Mbps, and 1000 Mbps), and automatically distinguish the speed of the incoming connection.

For easier management and control of the gigabit Ethernet switch, become familiar with its display indicators and ports. Front panel illustrations in this section show the unit LED indicators. Read this section carefully before connecting any network device to the gigabit Ethernet switch.

Front panel

The front panel of the gigabit Ethernet switch consists of eight auto-sensing 10/100/1000Mbps Ethernet RJ45 ports. The LED indicators are also located on the front panel of the gigabit Ethernet switch.

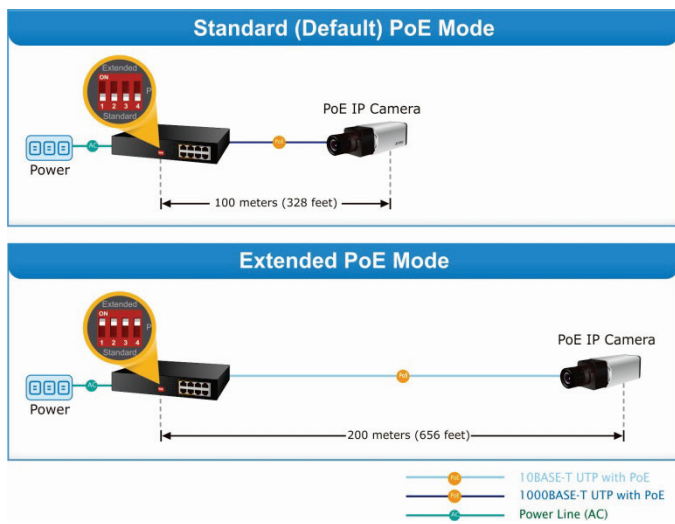
Figure 1: ES3002-4P-4T front panel



The front panel of the gigabit Ethernet switch provides one DIP switch for “Standard” and “Extended” mode selections. Detailed descriptions are shown in the following table.

DIP switch mode	Function
<p>Standard</p> <p>(default)</p>	<p>Numbers 1 to 4 correspond to PoE Port-1 to Port-4.</p> <p>In this mode, the gigabit Ethernet switch operates as a general switch and all PoE ports operate at 10/100/1000Mbps auto-negotiation.</p>
<p>Extended</p>	<p>In this mode, the gigabit Ethernet switch PoE ports operate at auto-negotiation 10Mbps speed duplex mode only, but the delivery distance of PoE power and network data can reach 200 m.</p>

Figure 2: PoE modes



LED indicators

System

LED	Color	Function
PWR	Green	Lit: indicates that the switch has power.
POE MAX	Green	Lit: indicates that the PoE usage is full.

System per 10/100/1000 Mbps port

LED	Color	Function
PoE-in-use	Orange	Lit: indicates that the port is providing 53 VDC in-line power. (1-4 ports).
	Green	Lit: indicates that the switch is successfully connecting to the network at 1000 Mbps. Blinking: indicates that the switch is actively sending or receiving data over that port.
Speed/LNK/ACT	Orange	Lit: indicates the port is successfully connecting to the network at 100 Mbps or 10 Mbps. Blinking: indicates that the switch is actively sending or receiving data over that port.

Rear panel

The rear panel of the gigabit Ethernet switch consists of an AC inlet power socket, which accepts input power from 100 to 240 VAC, 50-60 Hz, and a grounding screw.

Figure 3: ES3002-4P-4T rear panel



Note:

1. The gigabit Ethernet switch is a power-required device which means it does not work unless power is applied. If the network must be active at all times, consider using a UPS (Uninterrupted Power Supply) for the gigabit Ethernet switch. A UPS prevents network data loss or network downtime.
2. In some areas, installing a surge suppression device may also help to protect the gigabit Ethernet switch from being damaged by an unregulated surge or current.

Installation

10/100/1000BASE-T

All 10/100/1000BASE-T ports come with auto-negotiation capability. They automatically support 1000BASE-T, 100BASE-TX, and 10BASE-T networks. Users only need to plug a working network device into one of the 10/100/1000BASE-T ports, and then turn on the gigabit Ethernet switch. The port runs automatically in 10 Mbps, 20 Mbps, 100 Mbps, or 200 Mbps, and runs at 1000 Mbps or 2000 Mbps after negotiation with the connected device.

Cabling

Each of the 10/100/1000BASE-T ports uses RJ45 sockets for the connection of unshielded twisted-pair cable (UTP). The IEEE 802.3/802.3u/802.3ab Fast/Gigabit Ethernet standard requires Category 5 UTP for 100Mbps 100BASE-TX. 10BASE-T networks can use Cat.3, 4, or 5; 1000BASE-T uses 5/5e/6 UTP (see the table below). Maximum distance is 100 meters (328 feet).

Port type	Cable type	Connector
10BASE-T	Cat.3, 4, 5, 2-pair	RJ45
100BASE-TX	Cat.5, 5e UTP, 4-pair	RJ45
1000BASE-TX	Cat.5/5e/6 UTP, 4-pair	RJ45

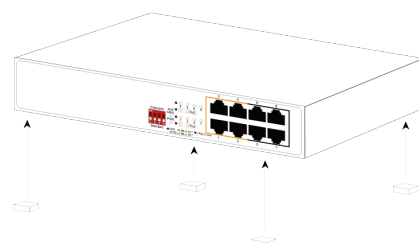
Ethernet devices (hubs and computers, for example) can be connected to the gigabit Ethernet switch by using straight-through wires. The 10/100/1000Mbps ports are auto-MDI/MDI-X and can be used with straight-through or crossover cables.

Desktop installation

Follow the steps below for gigabit Ethernet switch desktop installation:

1. Attach the rubber feet to the recessed areas on the bottom of the gigabit Ethernet switch as shown in Figure 4 below.

Figure 4: Attaching the rubber feet



- Place the gigabit Ethernet switch on the desktop near an AC power source.
- Provide adequate ventilation space between the gigabit Ethernet switch and any surrounding objects.

Note: When choosing a location, consider the environmental restrictions (airflow) detailed under “Specifications” on page 1.

- Connect the gigabit Ethernet switch to 802.3af/802.3at compliant power devices (PD) or other network devices.
 - Connect one end of a standard network cable to the 10/100/1000BASE-T RJ45 ports on the front panel of the gigabit Ethernet switch.
 - Connect the other end of the cable to a network device such as a printer server, workstation, router, etc.
- Note:** Connection to the gigabit Ethernet switch requires UTP Category 5, 5e, or 6 network cabling with RJ45 connectors. For more information, see “Appendix: Networking connection” on page 7.
- Supply power to the gigabit Ethernet switch.
 - Connect one end of the power cable to the gigabit Ethernet switch.
 - Connect the power plug of the power cable to a standard wall outlet.

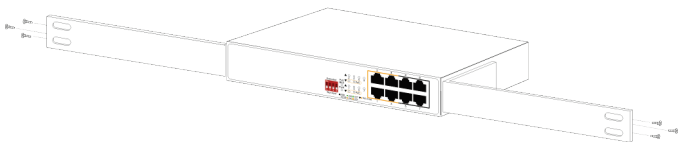
After the gigabit Ethernet switch powers up, the power LED illuminates solid green.

Rack mount installation

Follow the steps below to install the gigabit Ethernet switch in a 19-inch standard rack:

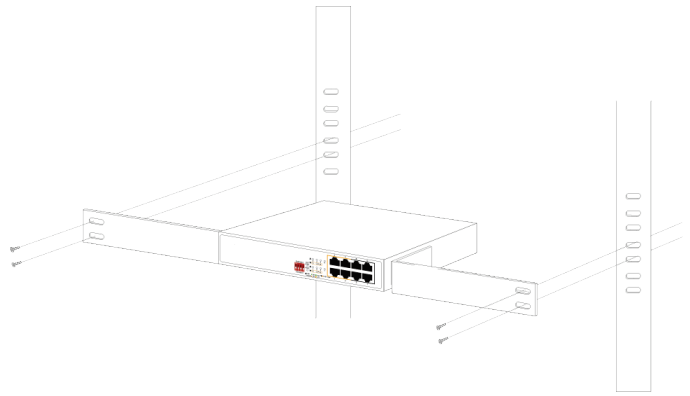
- Place the gigabit Ethernet switch on a hard flat surface, with the front panel positioned forward.
- Attach a rack-mount bracket to each side of the gigabit Ethernet switch with the supplied screws as shown in Figure 5 below.

Figure 5: Attaching the brackets



- Secure the brackets tightly.
- After the brackets are attached to the gigabit Ethernet switch, use suitable screws to securely attach the brackets to the rack, as shown in Figure 6.

Figure 6: Rack mounting



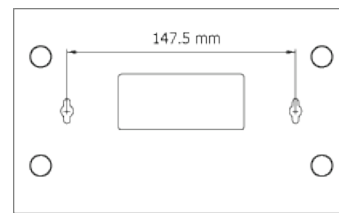
- Follow steps 4 and 5 under “Desktop installation” on page 3 to connect the network cabling and supply power to the gigabit Ethernet switch.

Wall mount installation

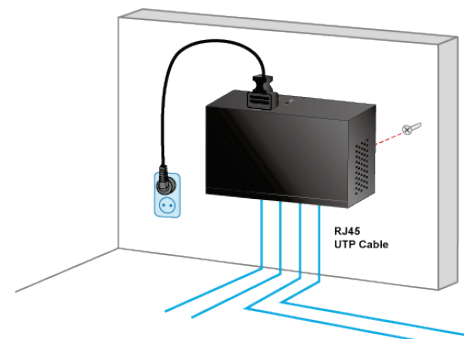
- Locate a wall suitable for mounting the ES3002-4P-4T.
- Install two screws on the wall.
- Hang the ES3002-4P-4T on the screws from the wall.
- Follow step 5 under “Desktop installation” on page 3 to power supply to the gigabit Ethernet switch.

Note: Before mounting the device to the wall, check the location of the electrical outlet and the length of the Ethernet cable.

Figure 7: Wall mounting



Switch Bottom Side



Product application

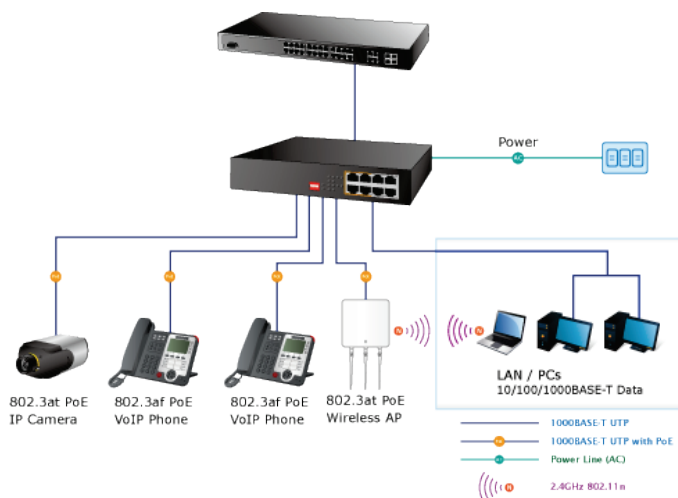
Connecting the end node or switch

- Place the gigabit Ethernet switch on a smooth surface or fasten the mounting brackets purchased separately with the provided screws in a standard 19-inch rack.
- Connect the power cord to the power inlet socket of the gigabit Ethernet switch and the other end into the local

power source outlet. When the Switch receives power, the Power LED illuminates solid green.

3. Connect the other switch or computer to one port of the gigabit Ethernet switch using Category 3/4/5/5e/6 UTP/STP cabling.
4. Connect another switch or computer to the other port of gigabit Ethernet switch by following the same process as described in step 3 above.

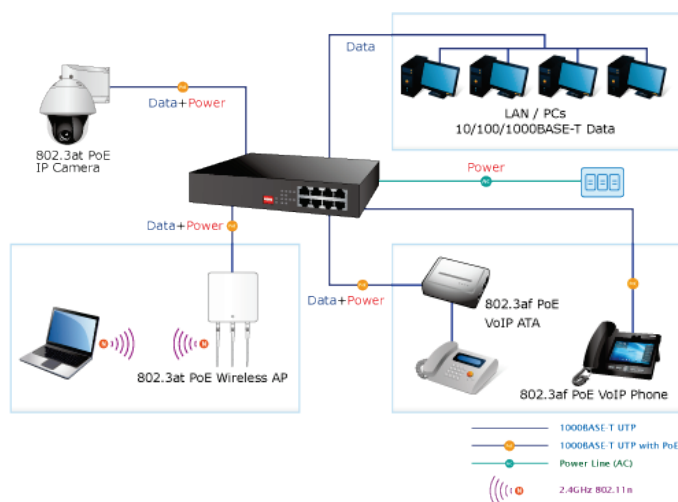
Figure 8: End node or switch connection



Department/workgroup PoE+ switch

With 4 PoE+ in-line power interfaces, the ES3002-4P-4T can provide central power to an IP phone system, IP camera system, and a wireless AP group for the enterprise. For example, up to four cameras can be installed for surveillance demands or up to four wireless APs can be utilized to build a wireless roaming environment in the office. Without a power socket limitation, the Switch makes the installation of cameras or wireless APs easy and efficient.

Figure 9: Department/workgroup PoE+ switch connection



PoE powered devices



3~5 W

Voice over IP phones

Enterprises can install PoE VoIP Phone, ATA and other Ethernet/non-Ethernet end-devices in the central area where UPS is installed for an uninterruptible power and control system.



6~12 W

Wireless LAN Access Points

Museums, airports, hotels, scenic places, campuses, factories, and warehouses can install access points.



8~25 W

IP Surveillance

Enterprises, museums, campuses, hospitals, and banks can install IP cameras without restrictions on installation location as electricians are not required to install AC sockets.



3~12 W

PoE Splitter

A PoE Splitter is used to split the PoE 52 VDC over the Ethernet cable into 5/12 VDC power output.

It frees the device deployment from restrictions due to power outlet locations, which eliminate the costs for additional AC wiring and reduces installation time.

Power over Ethernet (PoE) overview

What is PoE?

PoE technology comprises of a system that safely transmits both power and data on an Ethernet UTP cable. The IEEE standard for PoE technology requires a Cat5 or higher cable for high power PoE levels, but can operate with a Cat3 cable for low power levels. Power is supplied in common mode over two or more of the differential pairs of wires found in the Ethernet cables and comes from a power supply within a PoE-enabled network device such as an Ethernet switch, or can be injected into a cable run with a mid-span power supply.

The original IEEE 802.3af-2003 PoE standard provides up to 15.4 W of DC power (minimum 44 VDC and 350 mA) to each device. Only 12.95 W is assured to be available at the powered device as some power is dissipated in the cable.

The updated IEEE 802.3at-2009 PoE standard, also known as PoE+ or PoE plus, provides up to 25.5 W of power. The 2009 standard prohibits a powered device from using all four pairs for power. The 802.3af/802.3at defines two types of source equipment: mid-span and end-span.

Mid-span

A mid-span device is placed between a legacy switch and the powered device. Mid-span taps the unused wire pairs 4/5 and 7/8 to carry power; the other four are for data transmission.

End-span

An end-span device is directly connected to the powered device. End-span can also tap the 1/2 and 3/6 wire pairs.

PoE system architecture

The specification of PoE typically requires two devices: the Powered Source Equipment (PSE) and the Powered Device (PD). The PSE is either an end-span or a mid-span, while the PD is a PoE-enabled terminal, such as IP phones, wireless LAN, etc. Power can be delivered over data pairs or spare pairs of standard Cat5 cabling.

Powered Source Equipment (PSE)

Power sourcing equipment (PSE) is a device such as a switch that provides (sources) power on the Ethernet cable. The maximum allowed for continuous output power per cable in IEEE 802.3af is 15.4 W. A later specification, IEEE 802.3at, offers 25.50 W. When the device is a switch, it is commonly called an end-span (although IEEE 802.3af refers to it as endpoint). Otherwise, if it is an intermediary device between a non PoE capable switch and a PoE device, it is called a mid-span. An external PoE injector is a mid-span device.

Powered Device

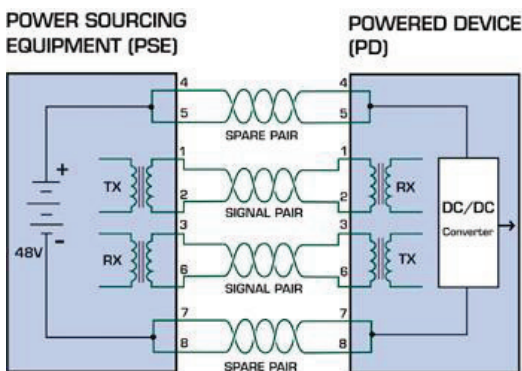
A powered device (PD) is a device powered by a PSE and thus consumes energy. Examples include wireless access points, IP phones, and IP cameras. Many PDs have an auxiliary power connector for an optional, external power supply. Depending on the PD design, some, none, or all power can be supplied from the auxiliary port, with the auxiliary port sometimes acting as backup power in case of a PoE power failure.

How power is transferred through the cable

A standard Cat5 Ethernet cable has four twisted pairs, but only two of these are used for 10BASE-T and 100BASE-TX. The specification allows two options for using these cables for power, shown in Figure 10 and Figure 11.

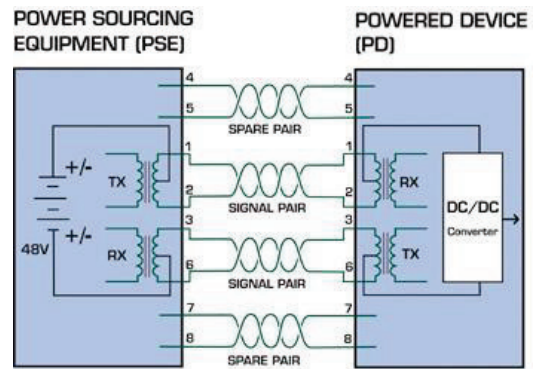
The spare pairs are used. Figure 10 below shows the pair on pins 4 and 5 connected together and forming the positive supply, and the pair on pins 7 and 8 connected and forming the negative supply (either polarity can be used).

Figure 10: Power supplied over spare pins



The data pairs are used. Since Ethernet pairs are transformers coupled at each end, it is possible to apply DC power to the center tap of the isolated transformer without disrupting the data transfer. In this mode of operation, the pair on pins 3 and 6 and the pair on pins 1 and 2 can be of either polarity.

Figure 11: Power supplied over the data pins



Troubleshooting

This section contains issue-solving information. If the gigabit Ethernet switch is not functioning properly, ensure that it was set up according to the instructions in this manual.

Issue	Solution
The link LED does not illuminate.	<p>Check the cable connection and try swapping out a cable.</p> <p>Ensure that the attached device is not set to full duplex. Some devices use a physical or software switch to change duplex modes. Auto-negotiation may not recognize this type of full-duplex setting.</p>
The 1000BASE-T port link LED illuminates, but the traffic is irregular.	<p>Check the LNK/ACT LED and/or try another port on the gigabit Ethernet switch. Ensure that the cable is installed properly and is the correct type. Turn off the power and then, after a while, turn on the power again.</p>
The gigabit Ethernet switch isn't connected to the network	<ul style="list-style-type: none"> Check the cable type making the connection to the device. The cable should be an 8-wire UTP, Cat5 or above, and EIA568 cable within 100 meters. A 4-wire, short loop cable, or a cable over 100 meters, affects the power supply. Ensure that the device is fully compliant with IEEE 802.3af/IEEE 802.3at standards.
A PoE device connected to the gigabit Ethernet switch is not receiving power	<ul style="list-style-type: none"> Each PoE port supports 53 V-54 DC, 600 mA, and a maximum of 30 W of power output. Detect and inject by the IEEE 802.3at standard. Each PoE port supports 53 V-54 DC, 300 mA and a maximum of 15.4 W of power output. Detect and inject by the IEEE 802.3af standard.
How can the power output of each PoE port be determined?	

Appendix: Networking connection

RJ45 pin assignments

1000Mbps, 1000BASE-T

Contact	MDI	MDI-X
1	BI_DA+	BI_DB+
2	BI_DA-	BI_DB-
3	BI_DB+	BI_DA+
4	BI_DC+	BI_DD+
5	BI_DC-	BI_DD-
6	BI_DB-	BI_DA-
7	BI_DD+	BI_DC+
8	BI_DD-	BI_DC-

Implicit implementation of the crossover function within a twisted-pair cable or at a wiring panel, while not expressly forbidden, is beyond the scope of this standard.

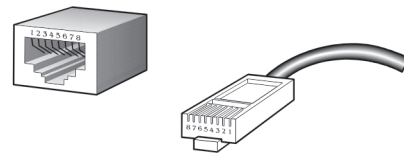
10/100Mbps, 10/100BASE-TX

When connecting the gigabit Ethernet switch to another Fast Ethernet switch, a straight-through or crossover cable might be

necessary. Each port of the gigabit Ethernet switch supports auto-MDI/MDI-X detection, which enables direct connection to any Ethernet device without making a crossover cable. The following table and diagram show the standard RJ45 receptacle/connector and their pin assignments:

RJ45 connector pin assignment		
Contact	MDI Media Dependent Interface	MDI-X Media Dependent Interface -Cross
1	Tx + (transmit)	Rx + (receive)
2	Tx - (transmit)	Rx - (receive)
3	Rx + (receive)	Tx + (transmit)
4, 5	Not used	
6	Rx - (receive)	Tx - (transmit)
7, 8	Not used	

The standard RJ45 receptacle/connector



There are eight wires on a standard UTP/STP cable and each wire is color-coded. Figure 12 below shows the pin allocation and color of straight-through cable and crossover cable connection.

Figure 12: Straight-through and crossover cable

Straight-through Cable		SIDE 1	SIDE 2						
1	2	3	4	5	6	7	8	1 = White / Orange	1 = White / Orange
2	3	4	5	6	7	8	2 = Orange	2 = Orange	
3	4	5	6	7	8	1 = White / Green	3 = White / Green		
4	5	6	7	8	4 = Blue	4 = Blue			
5	6	7	8	5 = White / Blue	5 = White / Blue				
6	7	8	6 = Green	6 = Green					
7	8	7 = White / Brown	7 = White / Brown						
8	8 = Brown	8 = Brown							
Crossover Cable		SIDE 1	SIDE 2						
1	2	3	4	5	6	7	8	1 = White / Orange	1 = White / Green
2	3	4	5	6	7	8	2 = Orange	2 = Green	
3	4	5	6	7	8	3 = White / Green	3 = White / Orange		
4	5	6	7	8	4 = Blue	4 = Blue			
5	6	7	8	5 = White / Blue	5 = White / Blue				
6	7	8	6 = Green	6 = Orange					
7	8	7 = White / Brown	7 = White / Brown						
8	8 = Brown	8 = Brown							

Ensure that the connected cables have the same pin assignment and color as described above before deploying them in a network.

Regulatory information

Manufacturer	Interlogix. 2955 Red Hill Avenue, Costa Mesa, CA 92626 5923, USA Authorized EU manufacturing representative: UTC Fire & Security B.V. Kelvinstraat 7, 6003 DH Weert, The Netherlands
FCC compliance	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.
FCC conditions	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference. (2) This Device must accept any interference received, including interference that may cause undesired operation.
ACMA compliance	Notice! This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.
Canada	This Class A digital apparatus complies with CAN ICES-003 (A)/NMB-3 (A). Cet appareil numérique de la classe A est conforme à la norme CAN ICES-003 (A)/NMB-3 (A).

Certification



European Union directives

This product complies with the applicable harmonized European standards listed under the EMC Directive 2014/30/EU, the RoHS Directive 2011/65/EU.



2012/19/EU (WEEE directive): Products marked with this symbol cannot be disposed of as unsorted municipal waste in the European Union. For proper recycling, return this product to your local supplier upon the purchase of equivalent new equipment, or dispose of it at designated collection points. For more information see: www.recyclethis.info.

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