Fast and Gigabit Ethernet Media Converter

AT-PC2002/POE

Installation Guide

613-001049 Rev. A

Allied Telesis™

Electrical Safety and Emissions Standards

This product meets the following standards.

U.S. Federal Communications Commission

Declaration of Conformity

Manufacturer Name: Allied Telesis, Inc.

Declares that the product: **Residential Gateway**

Model Numbers: **AT-PC2002/POE**

This product complies with FCC Part 15B, Class B Limits:

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

Radiated Energy

Note: This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with instructions, may cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on. The user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes and modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications Commission rules.

Industry Canada

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

European Union Restriction of the Use of Certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment

This Allied Telesis RoHS-compliant product conforms to the European Union Restriction of the Use of Certain Hazardous Substances (RoHS) in Electrical and Electronic Equipment. Allied Telesis ensures RoHS conformance by requiring supplier Declarations of Conformity, monitoring incoming materials, and maintaining manufacturing process controls.

RFI Emissions	FCC Class B, EN55022 Class B, EN61000-3-2, EN61000-3-3, VCCI Class B, C-TICK, CE
Immunity	EN55024
Electrical Safety	EN60950 (TUV), UL 60950 ($_{C}UL_{US}$)
Laser Safety	EN60825

Translated Safety Statements

Important: The ☞ indicates that a translation of the safety statement is available in a PDF document titled “Translated Safety Statements” (613-000990) posted on the Allied Telesis website at www.alliedtelesis.com and on this product CD.

Contents

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Preface

This guide contains the installation instructions for the AT-PC2002/POE Gigabit Ethernet Media Converter. In this guide you'll learn about the features of the product and how to install the unit.

This preface contains the following sections:

Where to Find Web-based Guides

The installation and user guides for all of the Allied Telesis products are available for viewing in portable document format (PDF) from our web site at **www.alliedtelesis.com**.

Contacting Allied Telesis

This section provides Allied Telesis contact information for technical support and for sales and corporate information.

Online Support

You can request technical support online from the Allied Telesis Knowledge Base at **www.alliedtelesis.com/support/kb.aspx**. You can submit questions to our technical support staff from the Knowledge Base and review answers to previously asked questions.

Email and Telephone Support

For Technical Support via email or telephone, refer to the Allied Telesis web site at **www.alliedtelesis.com**. Select your country from the list on the web site and then select the appropriate tab.

Returning Products

Products for return or repair must be assigned Return Materials Authorization (RMA) numbers. A product sent to Allied Telesis without an RMA number will be returned to the sender at the sender's expense.

To obtain an RMA number, contact the Allied Telesis Technical Support group at **www.alliedtelesis.com/support/rma.aspx**.

Sales and Corporate Information

You can contact Allied Telesis for sales or corporate information at our web site at **www.alliedtelesis.com**.

Warranty

The AT-PC2002/POE Media Converter has a Five Year Warranty. All Allied Telesis warranties are subject to the terms and conditions set out in the Allied Telesis Limited Warranties on our web site at **www.alliedtelesis.com/warranty**.

Management Software Updates

New releases of the management software for our managed products are available from the following Internet sites:

- Allied Telesis web site: **www.alliedtelesis.com**
- Allied Telesis FTP server: **ftp://ftp.alliedtelesis.com**

If the FTP server prompts you to log on, enter "anonymous" as the user name and your email address as the password.

The AT-PC2002/POE Media Converter is not a managed product.

Chapter 1
Overview

The AT-PC2002/POE Media Converter is a simple and reliable way to connect Fast or Gigabit Ethernet devices across large geographical distances with fiber optic cable. The unit has one 10/100/1000Base-T twisted pair port for a local connection and one slot for a fiber optic 100Base-FX or 1000Base-X SFP module. The product features Power over Ethernet (PoE) on the twisted pair port for support of a Powered Device (PD), such as a wireless access point or a Voice over Internet Protocol (VoIP) telephone.

This unmanaged product is suitable for the central office or a remote site and can be installed on a table or a wall. LEDs on the front panel display the general status of the unit and the ports, and DIP switches on the back panel let you configure the port settings.

The product features low latency to minimize the impact on network performance along with cyclic redundancy check (CRC) detection to prevent the propagation of incomplete or fragmented packets on your network.

This chapter has these sections:

Introduction

Figure 1 illustrates the front and back panels of the media converter.

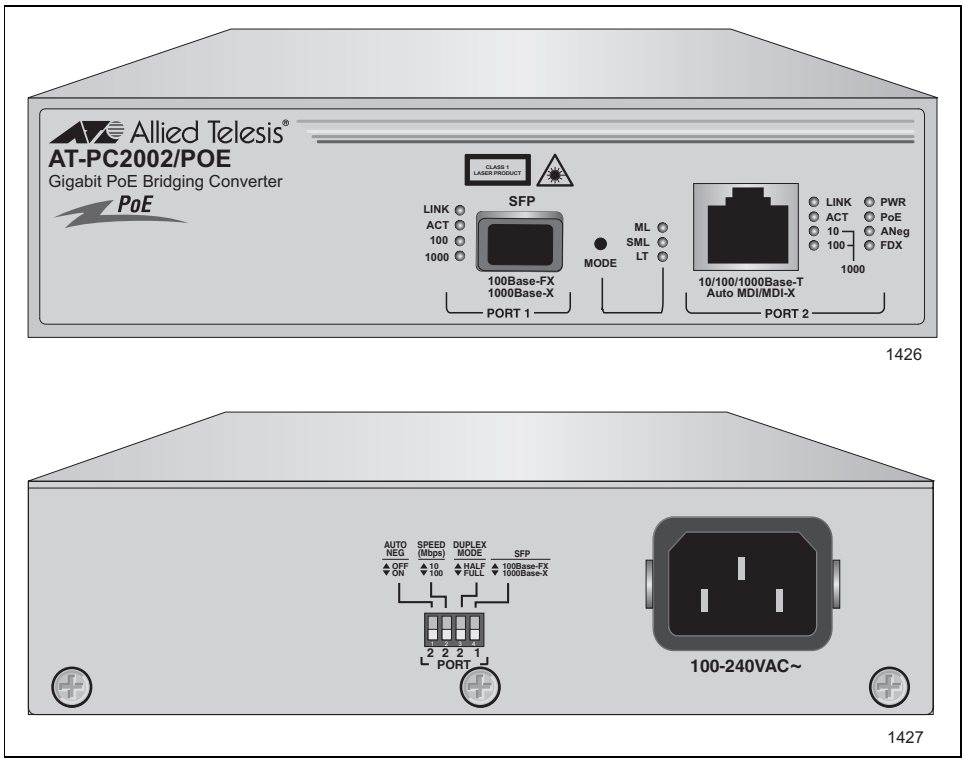


Figure 1. AT-PC2002/POEE Media Converter

The AT-PC2002/POE Media Converter has the features listed here:

- One 10/100/1000Base-T twisted pair port featuring:
  - IEEE 802.3u Auto-Negotiation
  - IEEE 802.3af Power over Ethernet (PoE) with 15.4 W of power for a powered device
  - Half- or full-duplex mode
  - Auto-MDI/MDI-X
  - RJ-45 connector
  - Back pressure in half-duplex mode at 10 or 100 Mbps
  - IEEE 802.3x flow control in full-duplex mode at 10, 100, or 1000 Mbps
- One slot for a 100Base-FX or 1000Base-X SFP module
- Jumbo Ethernet frames of up to 9,000 bytes in the payload
- DIP switches for configuring the ports

- Link Test, MissingLink™ and Smart MissingLink operating modes
- LEDs for unit and port status
- MAC address table with a storage capacity of 4,000 addresses
- Back-to-back and standalone topologies
- Transparent to IEEE802.1Q packets
- Desktop or wall-mount installation
- Internal AC power supply

10/100/1000Base-T Twisted Pair Port

The 10/100/1000Base-T twisted pair port is described below:

Type of Connector

The twisted pair port has an 8-pin RJ-45 connector. The port uses four pins when operating at 10 or 100 Mbps and all eight pins when operating at 1000 Mbps. For the port pinout details, refer to “10/100/1000Base-T Port Pinouts” on page 60.

Port Speed

The twisted pair port can operate at 10, 100, or 1000 Mbps. IEEE 802.3u-compliant, the unit can set the speed of the port automatically with Auto-Negotiation or you can set the speed manually with the DIP switches on the back panel.

Note
The twisted pair port has to be set to Auto-Negotiation to operate at 1000 Mbps.

Duplex Mode

The port can operate in either half- or full-duplex mode. If Auto-Negotiation is activated on the port, the duplex mode is set automatically. If Auto-Negotiation is disabled, you set the duplex mode manually using the DIP switches.

Note
In order for the media converter to successfully Auto-Negotiate the duplex mode of the twisted pair port with an end-node, the link partner should also be using Auto-Negotiation. Otherwise, a duplex mode mismatch can occur. While configured for Auto-Negotiation, port will default to half-duplex if it detects that its link partner is not using Auto-Negotiation. This will result in a mismatch if the end-node is operating at a fixed duplex mode of full-duplex.

Maximum Distance

The 10/100/1000Base-T twisted pair port has a maximum operating distance of 100 meters (328 feet).

Type of Cabling

Table 1 lists the cable specifications for the twisted pair port.

Table 1. Twisted Pair Cabling and Distances

Speed	Cable Type	Maximum Operating Distance
10 Mbps	Standard TIA/EIA 568-B-compliant Category 3 or better shielded or unshielded cabling with 100 ohm impedance and a frequency of 16 MHz.	100 m (328 ft)
100 Mbps	Standard TIA/EIA 568-A-compliant Category 5 or TIA/EIA 568-B-compliant Enhanced Category 5 (Cat 5e) shielded or unshielded cabling with 100 ohm impedance and a frequency of 100 MHz.	100 m (328 ft)
1000 Mbps	Standard TIA/EIA 568-A-compliant Category 5 or TIA/EIA 568-B-compliant Enhanced Category 5 (Cat 5e) shielded or unshielded cabling with 100 ohm impedance and a frequency of 100 MHz.	100 m (328 ft)

Auto MDI/MDI-X

The wiring configuration of the twisted pair port is set automatically with auto-MDI/MDI-X. Consequently, you can use a straight-through twisted pair cable to connect any type of Ethernet network device to the port. The auto-MDI/MDI-X feature is always active, even when the Auto- Negotiation feature is turned off and the speed and duplex mode on the port are set manually.

SFP Module Slot

The SFP slot can support one 100Base-FX or 1000Base-X SFP module. For the list of supported modules, contact your Allied Telesis sales representative.

Operating Modes

The AT-PC2002/POE Media Converter supports these operating modes:

- ❒ “Link Test Mode,” next
- ❒ “MissingLink Mode” on page 21
- ❒ “Smart MissingLink Mode” on page 22

Link Test Mode

Contrary to its name, the Link Test operating mode is not a diagnostic utility. Rather, this mode simply reflects the states of the links on the ports on the LinK LEDs. When the media converter is operating in this mode, a port’s Link LED will be on when the port has a link to a network device and it will be off when the port does not have a link to a network device.

This operating mode is typically used when the network devices connected to the ports of the media converter cannot take advantage of the features of the MissingLink mode, or when you want to use the Link LEDs to troubleshoot a network problem. This operating mode is also useful after the installation of the media converter to verify whether or not the ports on the unit have established links to their network devices.

MissingLink Mode

The MissingLink mode allows the two ports on the media converter to share their “link” status with each other. If one of the ports is unable to establish a link with its network device or loses the link, the operating mode disables the transmitter on the other port. This action notifies the network device connected to the port that there is a loss of the link on the other port. Without the MissingLink mode, a network device connected to a port would be unaware of a loss of a link on the companion port, because its link to the media converter would be unaffected. To explain it another way, the MissingLink mode will not allow a port to form a link with its network device unless the other port on the media converter can also establish a link with its device.

When the link is reestablished on a port, the MissingLink mode automatically reactivates the transmitter on the other port so that the two port can again forward traffic to each other.

This operating mode is intended to take advantage of the fact that some network devices, such as managed Fast Ethernet switches, can respond to the loss of a link on a port by performing a specific action. For example, the network device might send a trap to a network management station, and so alert the network administrator of the problem. Or, if the device is running a spanning tree protocol, it might seek a redundant path to a disconnected node.

Here is an example of how the MissingLink mode works. Assume that the two ports on a media converter are connected to two Fast Ethernet switches, one local and the other remote. Switch 1, the remote switch, is

connected to port 1, the fiber optic port, on the media converter, while Switch 2, the local device, is connected to port 2, the twisted pair port. If the link to Switch 1 is lost, the line card disables the transmitter on port 2 to signal Switch 2 of the loss of the link to Switch 1. This notifies Switch 2 of the problem so it too, along with Switch 1, can take remedial action, such as activating a redundant path if it is running a spanning tree protocol, or sending an SNMP trap to a management workstation. Without the MissingLink mode, Switch 2 would be unaware of the problem because it would still have a valid link to the media converter.

In the example the initial loss occurred on port 1. But the operating mode operates the same when the initial loss of the link is on port 2. Here, the transmitter on port 1 is disabled to notify the node connected to that port of the loss of the link on port 2.

The states of the ports on the media converter running in this mode operate in tandem. Either both of the ports have a link or neither of the ports. This is reflected on the Link LEDs. If both ports can form links with their network devices, their Link LEDs will both be on. But if one or both ports cannot establish a link, then the Link LEDs will be off.

This operating mode is mainly used when the network devices connected to the ports of the media converter can react to a loss of a link on a port, such as managed Fast Ethernet switches running SNMP or a spanning tree protocol. Conversely, the MissingLink mode will be of little value if the network devices of the media converter cannot react to a lost link. In the latter scenario, the Link Test mode would probably be a better operating mode for the media converter during normal network operations.

Furthermore, Allied Telesis does not recommend using the MissingLink mode to troubleshoot a network problem that may have its roots with a link problem. This is because the MissingLink mode will not allow you to use the port's Link LEDs or the management software to diagnose the problem, since neither port will show a link. Rather, the Link Test mode or the Smart MissingLink mode would be more useful when troubleshooting a link problem.

Smart MissingLink Mode

The Smart MissingLink mode is nearly identical to the MissingLink mode. It, too, enables the two ports on the media converter to share the link status of their connections. This mode is different in that it does not completely shut off the transmitter of a port when the other port on the unit loses its link. Rather, this operating mode pulses the port's transmitter and flashes the port's Link LED once a second to signal that the port can still establish a link to its network device and that the loss of the link originated on the other port on the media converter.

The advantage of this operating mode over the MissingLink mode is that you can use the Link LEDs on the media converter to troubleshoot a link failure with the ports. As an example, assume that the fiber optic port on a media converter lost its link to its network device. The mode would

respond by pulsing the transmitter on the twisted pair port and flashing the port's Link LED about once a second to signal that the failure originated on the fiber optic port. When the connection is reestablished on the fiber optic port, the twisted pair port would automatically resume normal operations to permit the two ports to forward traffic again.

The operating mode functions the same if the failure starts on the twisted pair port. Here, the mode pulses the transmitter on the fiber optic port.

As with the other operating modes, this mode does not interfere with the flow of network traffic through the ports of a media converter during normal network operations of a media converter. However, Allied Telesis recommends limiting its use to diagnosing link failures, particularly if the network devices connected to the ports are managed devices. The pulsing of the transmitter on a port and the constantly changing status of a link could prove problematic for some managed devices. For example, the device might send a constant stream of SNMP traps or, if the device is running a spanning tree protocol, the protocol might become confused as the status of the device's link to the media converter constantly changes.

Setting the Operating Mode

You set the operating mode with the Mode button on the front panel of the unit. Setting the mode does not interrupt the flow of network traffic through the device. To set the operating mode, use a pointed object such as a pen to depress the Mode button.

Power over Ethernet

The twisted pair port on the AT-PC2002/POE Media Converter features Power over Ethernet (PoE), which is a mechanism for supplying power to a network device over the same twisted pair cable that is used to carry the network traffic.

A device that receives its power over an Ethernet cable is called a *powered device (PD)*. Examples include wireless access points, voice over Internet Protocol (VoIP) telephones, web cams, and unmanaged Ethernet switches.

One of the advantages of PoE is that the AT-PC2002/POE Media Converter acts as the power source for the powered device. If you add an uninterruptible power source (UPS) to the media converter, you protect both the media converter and the powered device from possible power source problems, thereby increasing the reliability of your network.

PoE can also simplify network installation. A frequent issue often encountered when selecting a location for a network device is whether there is a power source nearby. This often limits equipment placement or requires the added time and cost of installing additional electrical sources. But with PoE, you can install PoE-compatible network equipment wherever needed.

The media converter automatically determines whether or not a device connected to the twisted pair port is a powered device. A powered device has a signature resistor or capacitor that the media converter can detect over the Ethernet cabling. If the resistor or capacitor is present, the media converter assumes that the device is a powered device.

The twisted pair port on the AT-PC2002/POE Media Converter can supply up to 15.4 watts of power to a powered device, while at the same time furnishing standard 10/100/1000 Mbps Ethernet functionality. If the twisted pair port is connected to a network node that is not a powered device, it functions as a regular Ethernet port without PoE. The PoE feature remains available on the port but no power is delivered to the device.

The AT-PC2002/POE Media Converter smart power management functionality supports the IEEE 802.3af powered device classes listed in Table 2.

Table 2. IEEE 802.3af Class vs. Power Levels

Class	Usage	Minimum Power Levels Output at the PSE	Maximum Power Levels Output at the PD
0	Default	15.4W	0.44W to 12.95W
1	Optional	4.0W	0.44W to 3.84W
2	Optional	7.0W	3.84W to 6.49W
3	Optional	15.4W	6.49W to 12.95W

Implementation

A standard Ethernet twisted pair cable contains four pairs of strands for a total of eight strands. 10/100 Mbps network traffic requires only four strands (1, 2, 3, and 6), leaving four strands in the cable unused (4, 5, 7, and 8).

The PoE standard, IEEE 802.3af, describes two alternative ways for delivering power to a powered device (PD) over twisted pair cabling. Alternative A uses the same strands that carry the network traffic. Alternative B uses the spare strands. The PoE implementation on the AT-PC2002/POE Media Converter uses Alternative A, where power is transmitted over strands 1, 2, 3, and 6.

Powered devices that comply with the IEEE 802.3af standard typically support both power delivery methods. So long as a PD is compliant with the standard, it should be able to receive its power from the media converter while using either a straight or cross-over cable. The PoE feature on the AT-PC2002/POE Media Converter should also work with most legacy powered devices as long as the devices can be powered on pins 1, 2, 3, and 6.

LEDs

The LEDs on the AT-PC2002/POE, Media Converter are shown in Figure 2 and described in the following sections:

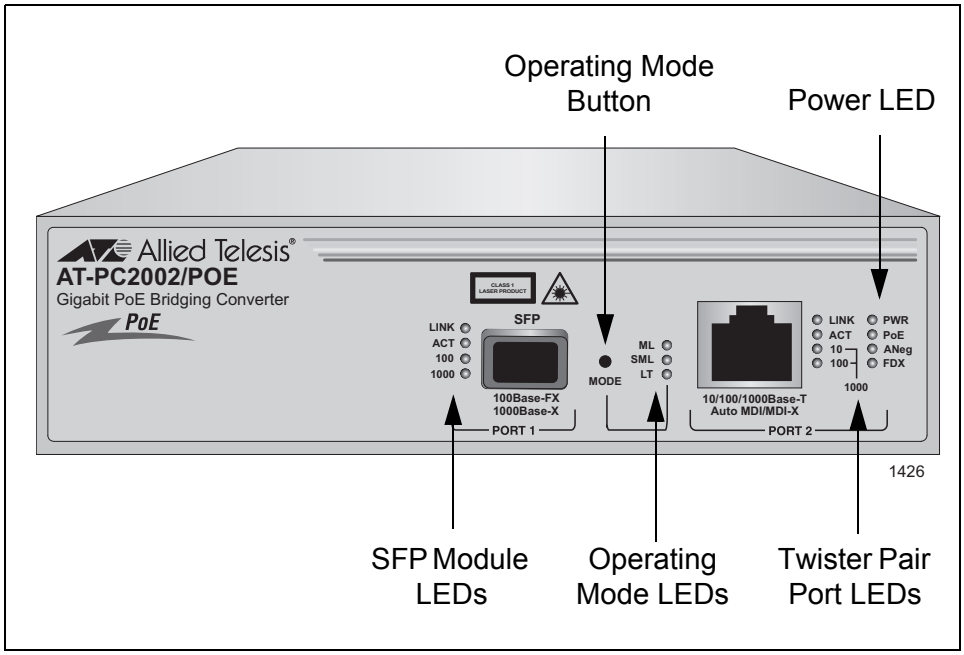


Figure 2. LEDs on the AT-PC2002/POE Media Converter

Power LED

The states of the PWR LED are described in Table 3.

Table 3. System Status LED

LED	Color	Description
PWR	Green	The unit is receiving power.
	Off	The unit is not receiving power.

10/100/1000Base-T Twisted Pair Port LEDs

The LEDs for the 10/100/1000Base-T twisted pair port are described in Table 4.

Table 4. 10/100/1000Base-T Twisted Pair Port LEDs

LED	Color	Description
LINK	Green	The port has established a link to a network device.
	Blinking Green	The media converter is operating in the Smart MissingLink mode and there is no connection on the port on the SFP module.
	Off	The port has not established a link to a network device.
ACT	Blinking Green	The port is transmitting and/or receiving network packets.
	Off	The port is not transmitting and/or receiving network packets.
10 100	10 -Green	The port is operating at 10 Mbps.
	100 - Off	
	10 - Off	The port is operating at 100 Mbps.
	100 - Green	
	10 - Green	The port is operating at 1 Gbps.
	100 - Green	
PoE	Green	The twisted pair port is connected to a powered device and is providing power to the device.
	Off	The twisted pair port is not supplying power to the network device connected to the port.
ANeg	Green	The port is using Auto-Negotiation to control its speed and duplex mode.
	Off	The speed and duplex mode on the port are set manually.

For additional information on the Link LED, refer to “Link LEDs and the Operating Modes” on page 29.

SFP Module Slot LEDs

The LEDs for the SFP module slot are described in Table 5.

Table 5. SFP Transceiver Slot LEDs

LED	Color	Description
LINK	Green	The port on the SFP transceiver has established a link to a network device.
	Blinking Green	The media converter is operating in the Smart MissingLink mode and there is no connection on the twisted pair port.
	Off	The port has not established a link with a network device.
ACT	Blinking Green	The port is transmitting and/or receiving network packets.
	Off	The port is not transmitting and/or receiving network packets.
100	Green	The port is operating at 100 Mbps.
1000	Green	The port is operating at 1 Gbps.

For additional information on the Link LED, refer to “Link LEDs and the Operating Modes” on page 29.

Operating Mode LEDs

The three LEDs to the right of the Mode button display the media converter’s operating mode and are defined in Table 6.

Table 6. Operating Mode LEDs

LED	Color	Description
ML	Green	The media converter is in the MissingLink mode.
SML	Green	The media converter is in the Smart MissingLink mode.
LT	Green	The media converter is in the Link Test mode.

Link LEDs and the Operating Modes

The basic function of the Link LEDs is to report the states of the links of the ports. However, the meanings of the LEDs vary slightly depending on the operating mode of the unit. The following sections describe the states and meanings of the LEDs under the different operating modes.

Link Test Mode

When a media converter is set to the Link Test mode, the Link LEDs for the two ports report the current states of the connections between the ports and the local and remote network devices. As described in Table 7, a Link LED will be on when a port has a link to its network device and it will be off when a port does not have a link.

Table 7. Link LEDs in the Link Test Mode

Ports	Link LED States	Description
Twisted Pair Port	Off	Neither of the ports has established a link to a network device.
Fiber Optic Port	Off	
Twisted Pair Port	Steady Green	Both of the ports have established links to their network devices.
Fiber Optic Port	Steady Green	
Twisted Pair Port	Steady Green	The twisted pair port has established a link to its network device, but the fiber optic port has not established a link.
Fiber Optic Port	Off	
Twisted Pair Port	Off	The fiber optic port has established a link to a network device, but the twisted pair port has not established a link.
Fiber Optic Port	Steady Green	

MissingLink Mode

When the media converter is set to the MissingLink mode, the two ports pass their “Link” status to each other so that a change in the link status on one port is replicated on the other port. A port is not allowed to establish a link to its network device unless the other port can also establish a link with its device. For more information on this operating mode, refer to “MissingLink Mode” on page 21.

The Link LEDs of the two ports in this mode always work in tandem. They are either both on or off. Table 8 lists the combinations and definitions of the Link LEDs for the twisted pair port and fiber optic port operating in this mode.

Table 8. “L” Link LEDs in the MissingLink Mode

Channel Ports	Link LED States	Description
Twisted Pair Port	Off	One or both of the ports can not establish a link with a network device.
Fiber Optic Port	Off	
Twisted Pair Port	Steady Green	Both of the ports have established links with their network devices.
Fiber Optic Port	Steady Green	

Smart MissingLink Mode

The Smart MissingLink mode pulses the transmitter on a port when its companion port in a channel loses or has not established a link to its network device. The blinking Link LED can make it easier for you to identify and troubleshoot a link problem on the two ports of a channel. For more information on this operating mode, refer to “Smart MissingLink Mode” on page 22.

Table 9 lists the combinations and definitions of the Link LEDs for the twisted pair port and fiber optic port of a channel operating in this mode.

Table 9. “L” Link LEDs in the Smart MissingLink Mode

Channel Ports	Link LED States	Description
Twisted Pair Port	Off	Neither port in the channel has established a link with a network device.
Fiber Optic Port	Off	
Twisted Pair Port	Steady Green	Both ports have established links to their network devices.
Fiber Optic Port	Steady Green	
Twisted Pair Port	Flashing Green	The twisted pair port can establish a link to its network device, but the fiber optic port is unable to establish a link to its remote device.
Fiber Optic Port	Off	
Twisted Pair Port	Off	The fiber optic port of a channel can establish a link with its network device, but the twisted pair port is unable to establish a link with its local device.
Fiber Optic Port	Flashing Green	

Table 9. “L” Link LEDs in the Smart MissingLink Mode (Continued)

Channel Ports	Link LED States	Description
Twisted Pair Port	Flashing Green	Both ports can establish links to their network devices, but one of the ports is connected to another media converter that also supports the Smart MissingLink feature, forming a chain of converters. A link has been lost on one of the ports in the chain, causing a ripple affect through the chain of converters. Alternatively, one of the ports is only able to form an intermittent link with its network device.
Fiber Optic Port	Flashing Green	

DIP Switches

The DIP switches on the back panel are used to configure the operating characteristics of the 10/100/1000Base-T twisted-pair port (Port 2), such as the port speed, duplex mode, and Auto-Negotiation. There is also a DIP switch for specifying the type of SFP module in the SFP slot. For the DIP switch settings, refer to Table 11 on page 44.

Network Topologies

This section illustrates several topologies that incorporate the media converter. The network in the first example consists of a central office with the AT-9424Ts Gigabit Ethernet Switch and four remote sites that have powered devices: a security camera, two AT-WA7400 Wireless Access Points, and a VoIP telephone. Deployed at the remote sites are AT-PC2002/POE Media Converters. They are powering the powered devices over the twisted pair cables and are providing network connectivity to the AT-9424Ts Gigabit Ethernet Switch at the central office.

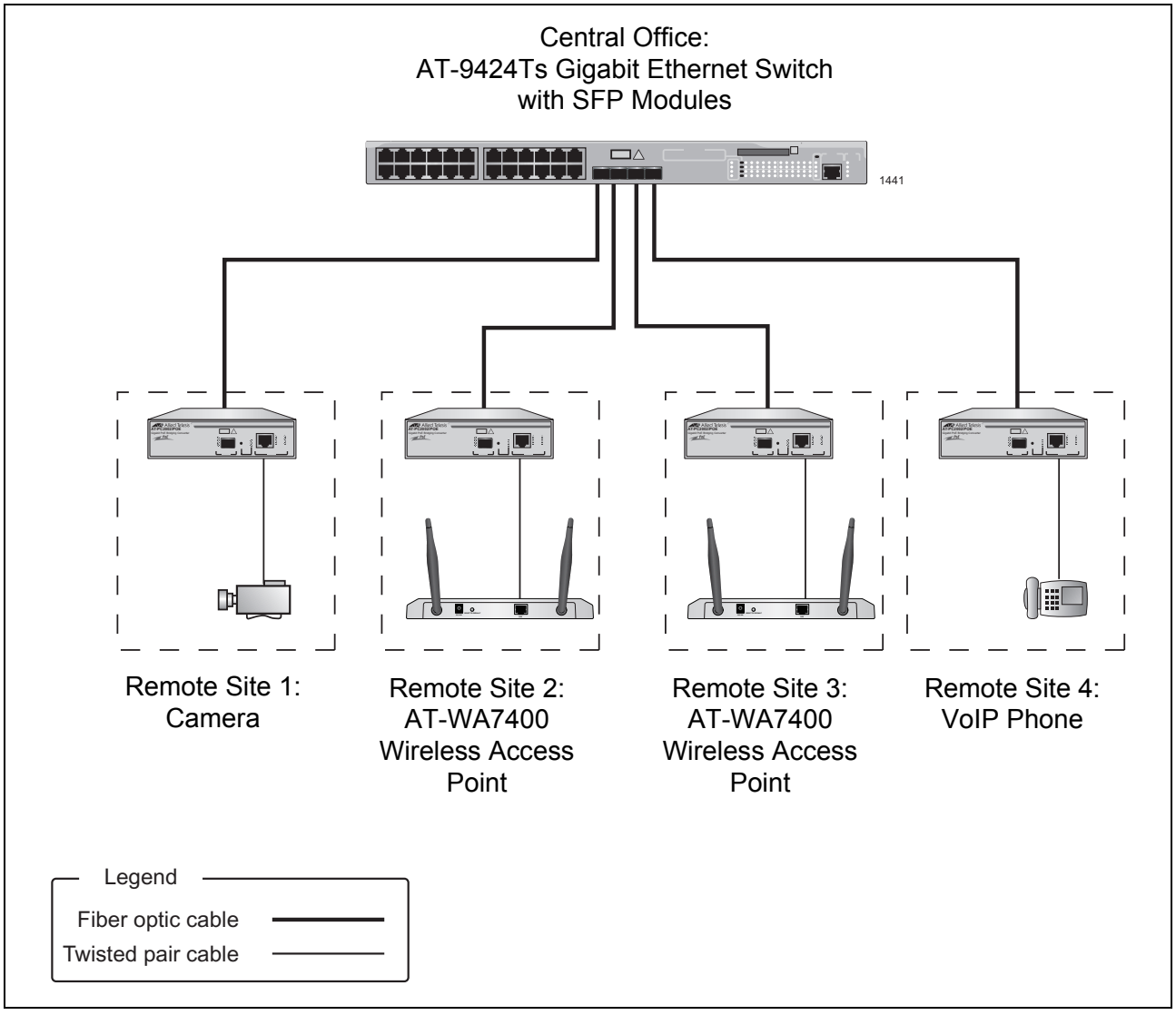


Figure 3. Topology 1

As illustrated in the next topology, the media converter can also be deployed at a central office if the remote devices have fiber optic ports. In the example, the media converters are connected to the AT-9424Ts Gigabit Ethernet Switch at the central office with twisted pair cable and to the remote devices, in this case AT-GS950/16 Gigabit Switches that have SFP transceivers, over fiber optic cables. Since the AT-9424Ts Gigabit Ethernet Switch is not a powered device, the PoE feature on the media converters is not used.

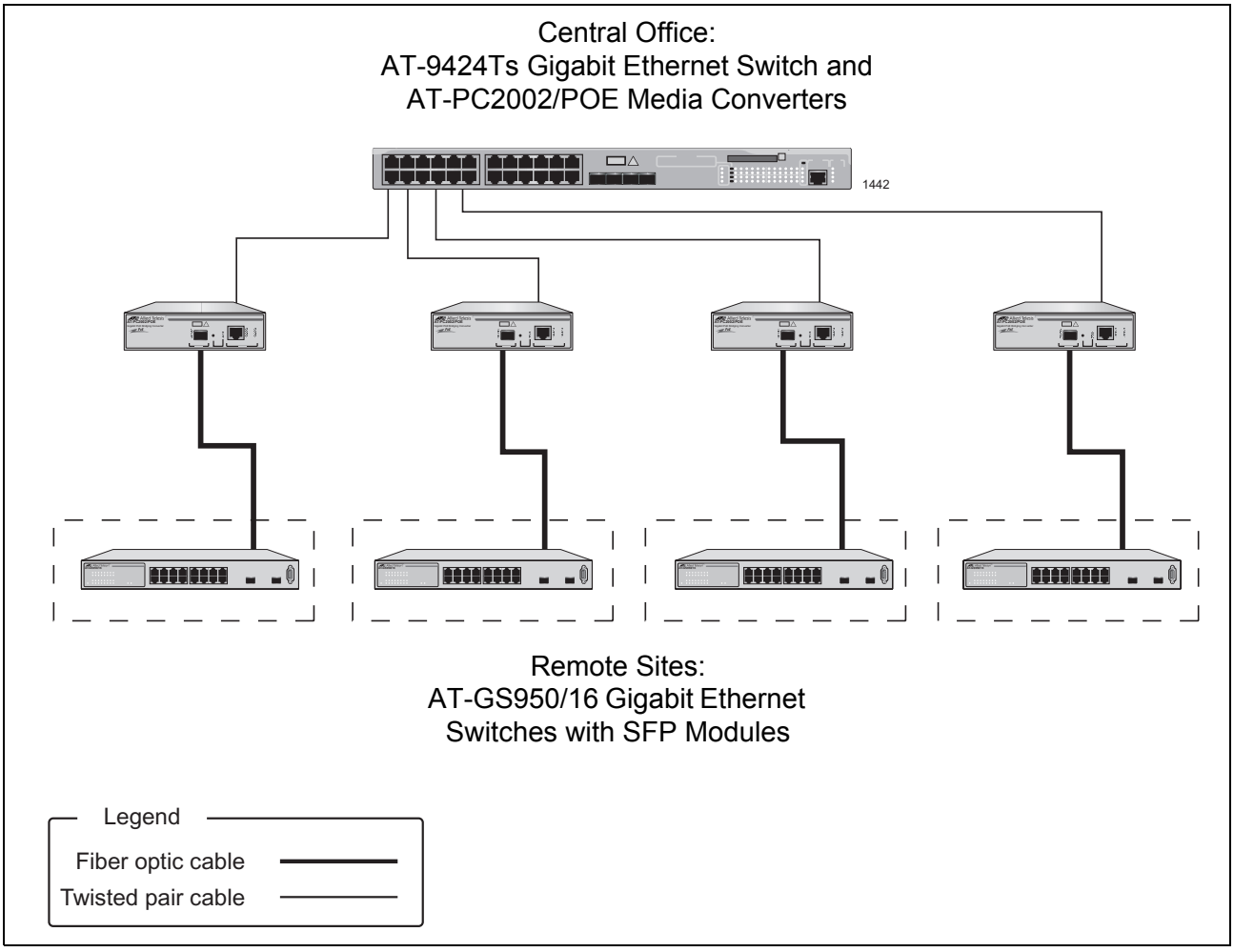


Figure 4. Topology 2

The next example illustrates a topology that is commonly referred to as a back-to-back topology. Here, media converters are deployed at both the central office and the remote sites. Each pair of converters transfers network traffic from twisted pair cable to fiber optic cable and back again to twisted pair cable. Furthermore, the media converters at the remote sites that have powered devices provide Power over Ethernet.

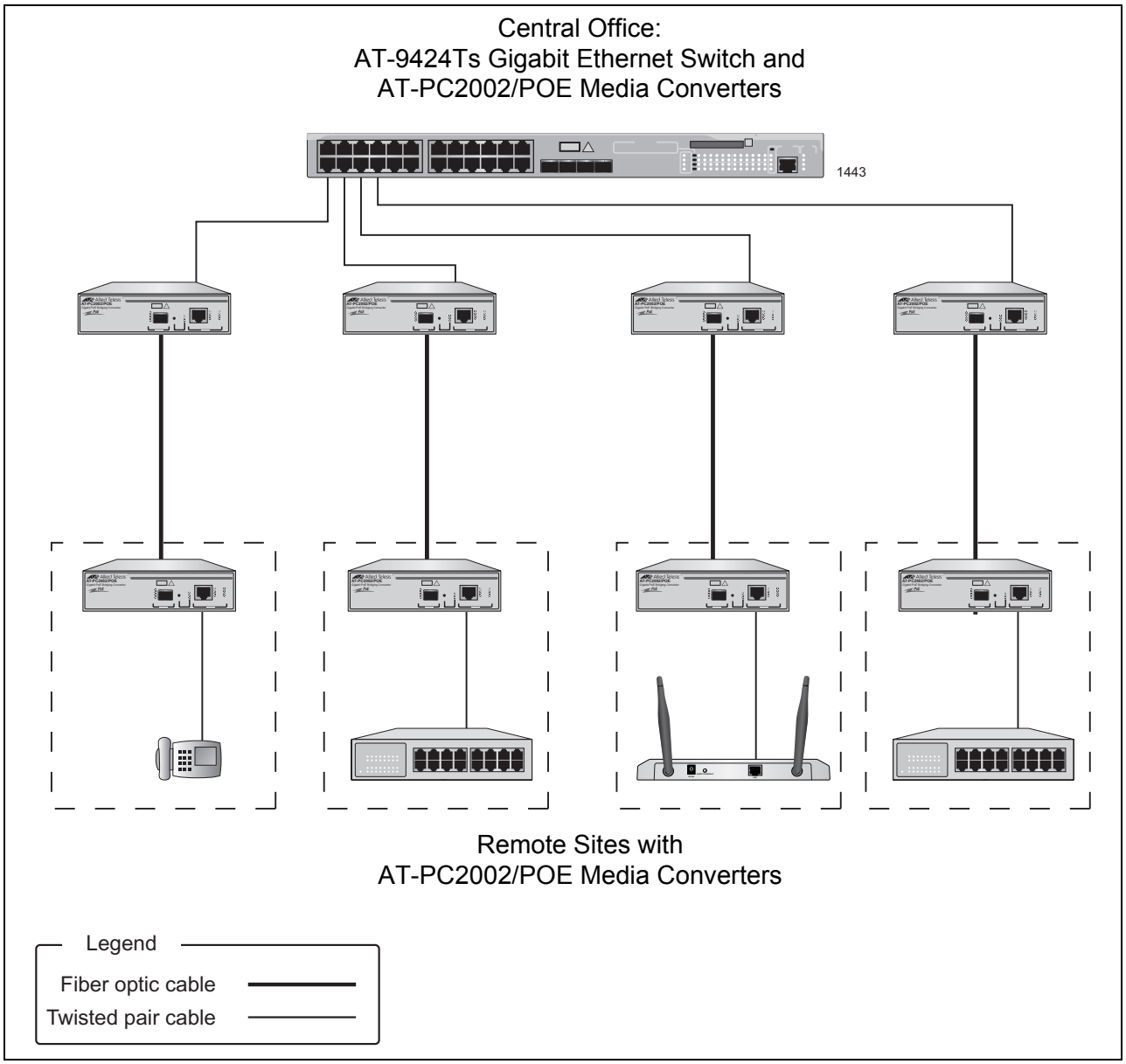


Figure 5. Topology 3

Chapter 2

Installation

The sections in this chapter contain the installation instructions for the AT-PC2002/POE Media Converter:

Reviewing the Safety Guidelines

Please review the following safety guidelines before you begin to install the AT-PC2002/POE Media Converter.

Note
The ✍ indicates that a translation of the safety statement is available in a PDF document titled “Translated Safety Statements” (613-000990) posted on the Allied Telesis website at www.alliedtelesis.com. This document is also included with the documentation CD that is shipped with the product.

Note
Refer to the documentation that comes with the SFP module to determine whether the module is a Class 1 LED product or a Class 1 Laser product.

Warning: Class 1 Laser product. ✍ L1

Warning: Do not stare into the laser beam. ✍ L2

Warning: Class 1 LED product. ✍ L3

Warning: The fiber optic ports contain a Class 1 laser device. When the ports are disconnected, always cover them with the provided plug. Exposed ports may cause skin or eye damage ✍ L4

Caution: Using controls, making adjustments to performance, or performing procedures other than those specified herein may result in hazardous radiation exposure.

The protection provided by the equipment may be impaired if the equipment is used in a manner not specified by Allied Telesis, Inc.

Do not remove the cover from the unit or change any of the internal cables or wiring. Only an authorized Allied Telesis service technician should make repairs to this device.

The TX and RX multiplexing ports contain embedded Class 3B lasers operating in Class 1 compliance. Do not make any modifications to the unit that would override the safeguards that maintain the Class 1 compliance.

The laser light used by the multiplexing ports and SFP modules is invisible. Standard safety precautions (e.g. avoid looking directly into a fiber optic port) should always be observed when installing or maintaining this product. ✍L5

Warning: To prevent electric shock, do not remove the cover. No user-serviceable parts inside. This unit contains hazardous voltages and should only be opened by a trained and qualified technician. To avoid the possibility of electric shock, disconnect electric power to the product before connecting or disconnecting the LAN cables. ✍E1

Warning: Do not work on equipment or cables during periods of lightning activity. ✍E2

Warning: Power cord is used as a disconnection device. To de-energize equipment, disconnect the power cord. ✍E3

Warning: Class I Equipment. This equipment must be earthed. The power plug must be connected to a properly wired earth ground socket outlet. An improperly wired socket outlet could place hazardous voltages on accessible metal parts. ✍E4

Pluggable Equipment. The socket outlet shall be installed near the equipment and shall be easily accessible. ✍E5

Caution: Air vents must not be blocked and must have free access to the room ambient air for cooling. ✍E6

Warning: Operating Temperature. This product is designed for a maximum ambient temperature of 40° degrees C. E7

All Countries: Install product in accordance with local and National Electrical Codes. E8

Warning: Only trained and qualified personnel are allowed to install or to replace this equipment. E14

Caution: Do not install in direct sunlight, or a damp or dusty place. E16

Circuit Overloading: Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern. E21

Warning: Do not look directly at the fiber optic cable ends or inspect the cable ends with an optical lens. E29

Warning: To reduce the risk of electric shock, the PoE port on this product must not connect to cabling that is routed outside the building where this device is located. E40

Caution: The unit does not contain serviceable components. Please return damaged units for servicing.

Caution: The AT-PC2002/POE Ethernet Media Converter is only intended for installation in Environment A as defined in IEEE 802.3af. All interconnected equipment must be contained in the same building including the interconnected equipment's associated LAN connections.

Caution: During normal operations, the SFP module may have a case temperature that exceeds 70° C (158° F). If you remove the module, exercise caution when handling with unprotected hands.

Verifying the Package Contents

Unpack the unit and verify that all of the items listed in Table 10 are included in the shipping container. If an item is missing or damaged, contact your Allied Telesis sales representative for assistance.

Note
You should retain the original packaging material so that you'll have it available if you ever need to return the unit to Allied Telesis.

Table 10. Components in the Shipping Container

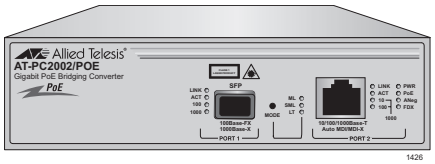
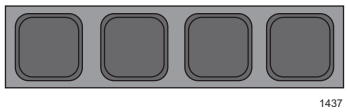
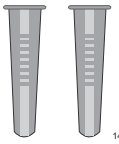
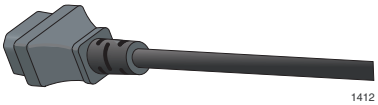
Component	Description
	One AT-PC2002/POE Media Converter
 1437	Four rubber feet for table or desktop installation
 1438	Two wall anchors
 1439	Two wall-mount screws
 1412	One regional AC power cord

Table 10. Components in the Shipping Container

Component	Description
	One power cord retaining clip
	One documentation CD

Selecting a Location

Here are the guidelines for choosing a location for the media converter:

- The power outlet should be located near the unit and be easily accessible.
- The site should provide easy access to the ports on the front of the chassis so that you can easily connect and disconnect the network cables, as well as view the unit's LEDs.
- Air flow around the unit and through the side and rear vents should be unrestricted.
- Do not place objects on top of the chassis.
- Do not expose the device to moisture or water.
- Make sure that the site is in a dust-free environment.
- Use dedicated power circuits or power conditioners to supply reliable electrical power to the network devices
- If you are installing the chassis on a table, be sure the table is level and secure.
- Keep the media converter chassis and the twisted pair cable away from sources of electrical noise, such as radios, electric motors, transmitters, broadband amplifiers, power lines, and fluorescent fixtures.

Configuring the DIP Switches

To configure the DIP switches on the back panel, refer to Table 11.

Table 11. DIP Switch Settings

DIP Switch	Port	Function	Position	Description
1	Twisted pair port	Auto-Negotiation	Off	Auto-negotiation is disabled on the twisted pair port.
			On	Auto-negotiation is activated on the port.
2	Twisted pair port	Speed (Mbps)	10	The speed of the twisted pair port is set to 10 Mbps.
			100	The speed of the port is set to 100 Mbps.
3	Twisted pair port	Duplex mode	Half	The duplex mode of the twisted pair port is set to half-duplex mode.
			Full	The duplex mode of the port is set to full-duplex mode.
4	SFP module	Module type	100Base-FX	The SFP module is 100Base-FX.
			1000Base-X	The SFP module is 1000Base-X.

Here are several guidelines to setting the DIP switches:

- The twisted pair port has to be set to Auto-Negotiation to operate at 1000 Mbps.
- Setting DIP switch 1 to On to activate Auto-Negotiation disables DIP switches 2 and 3.
- To manually configure the speed and duplex mode of the twisted pair port with DIP switches 2 and 3, you have to disable Auto-Negotiation with DIP switch 1.
- The setting of DIP switch 4 must match the type of SFP module the unit contains. If this DIP switch is set incorrectly. the port on the SFP module will not establish a link with the remote network device.
- You can change the DIP switches even when the unit is powered on. A change to a DIP switch setting is immediately implemented by the unit.
- The wiring configuration of the twisted pair port is always set with Auto-MDI/MDI-X, even when Auto-Negotiation is disabled. You cannot manually set the port’s wiring configuration.

Installing the Feet

If you are installing the AT-PC2002/POE Media Converter on a table or a desktop, perform this procedure to install the rubber feet on the bottom of the unit:

1. Turn the media converter over and place it on a secure surface.
2. Attach the four rubber feet included with the unit to the corners of the bottom of the media converter.

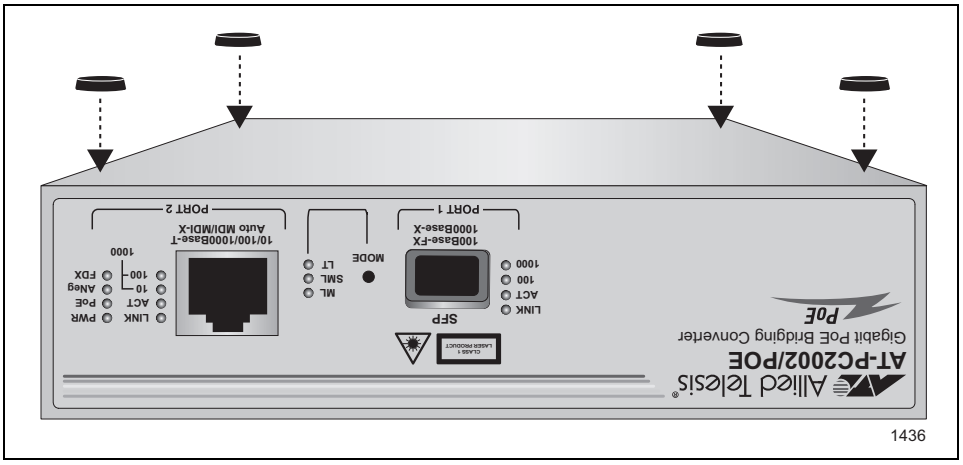


Figure 6. Attaching the Rubber Feet for Table or Desktop Installation

Installing the Media Converter on a Wall

To wall-mount the media converter:

1. Select a wall location for the unit.
2. Install the two wall anchors included with the bracket into the wall so that they are level with each other and are spaced 64 mm (2.52 in) apart.
3. Install the two Phillips flat-head screws into the wall anchors. The screws should protrude from the wall approximately 5 mm (0.2 in.).

> **Note**
> Depending on the location you have chosen for the unit, you may find it convenient to skip the next step, which mounts the unit on the screws, and instead assemble the unit on a table first before mounting it on the wall.

4. Place the two keyholes in the unit over the two wall screws and slide the bracket down to secure the bracket on the screws.

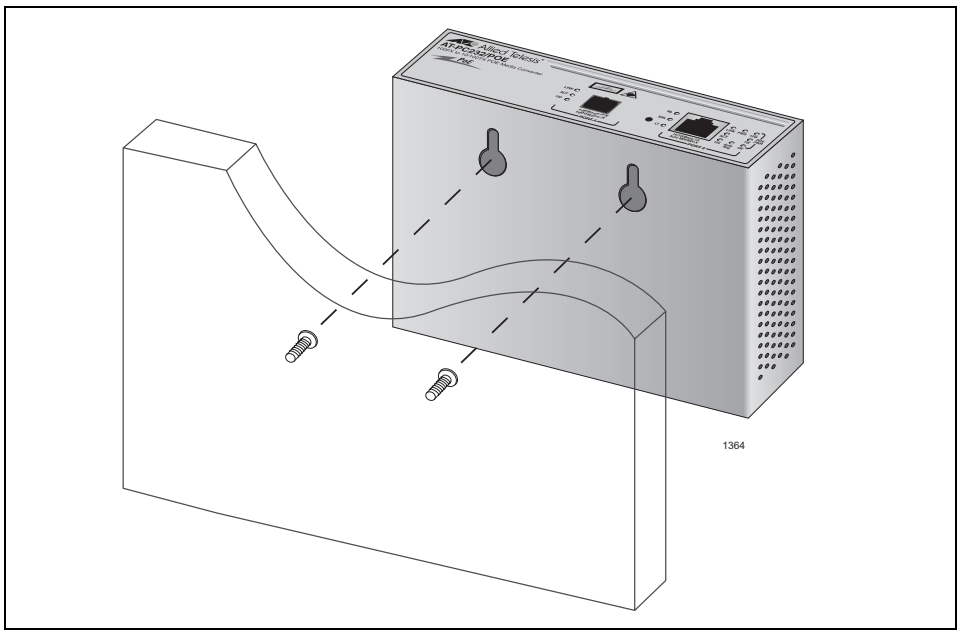


Figure 7. Positioning the Media Converter on the Wall Screws

Installing the SFP Module

To install the SFP module:

1. Remove the SFP module from its shipping container and store the packaging material in a safe location.

> **Caution**
> The SFP module is sensitive to and can be damaged by electrostatic discharge. Wear a grounding device and observe electrostatic discharge precautions when installing the module in the device.

2. With the label on the module facing up, slide the module into the slot until it clicks into place.

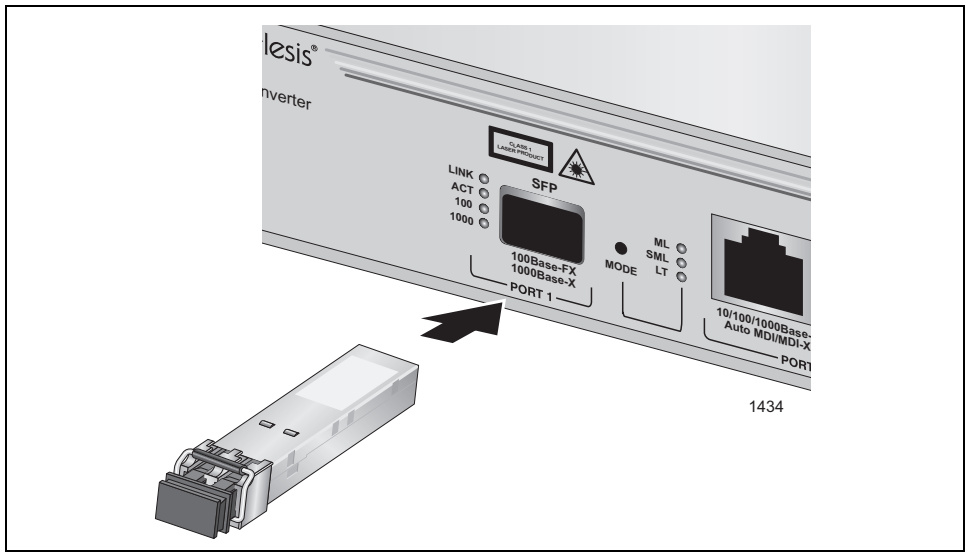


Figure 8. Installing the SFP Module

3. Verify that its handle is in the upright position.

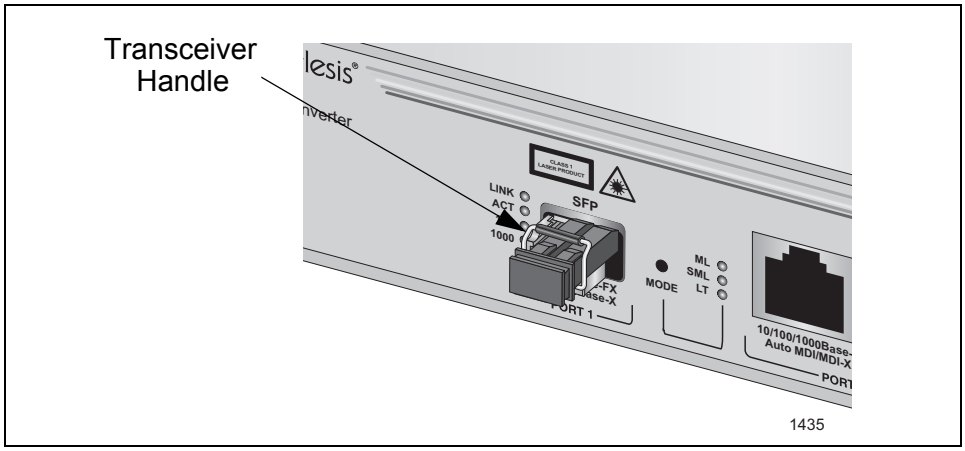


Figure 9. Positioning the SFP Handle

Note
To protect the transceiver from dust contamination, do not remove its dust cap until you are ready to connect the fiber optic cable.

For the optical and cabling specifications for the SFP modules, consult the SFP documentation.

Cabling the Ports

Here are the guidelines for connecting a network cable to the twisted pair port:

- The RJ-45 connector should fit snugly into the port on the module and the tab on the connector should lock the connector into place.
- The default setting for a twisted pair port is Auto-Negotiation and auto-MDI/MDI-X.

Here are the guidelines for connecting the fiber optic cable to the SFP module:

- Do not remove the dust cover from the fiber optic port until you are ready to connect the cable. Dust contamination can adversely affect the operation of the port. For directions on how to clean a fiber optic port, refer to Chapter B, “Cleaning Fiber Optic Connectors” on page 63.
- The connector on the fiber optic cable should firmly lock into place on the port.
- You should verify that the fiber optic ports on the SFP module and the remote device are compatible and that you are using the correct type of fiber optic cable.

Installing the Power Cord Retaining Clip

To install the power cord retaining clip, position the clip as shown in Figure 10 and press the sides of the clip toward the center. Then insert the short ends into the holes in the retaining bracket.

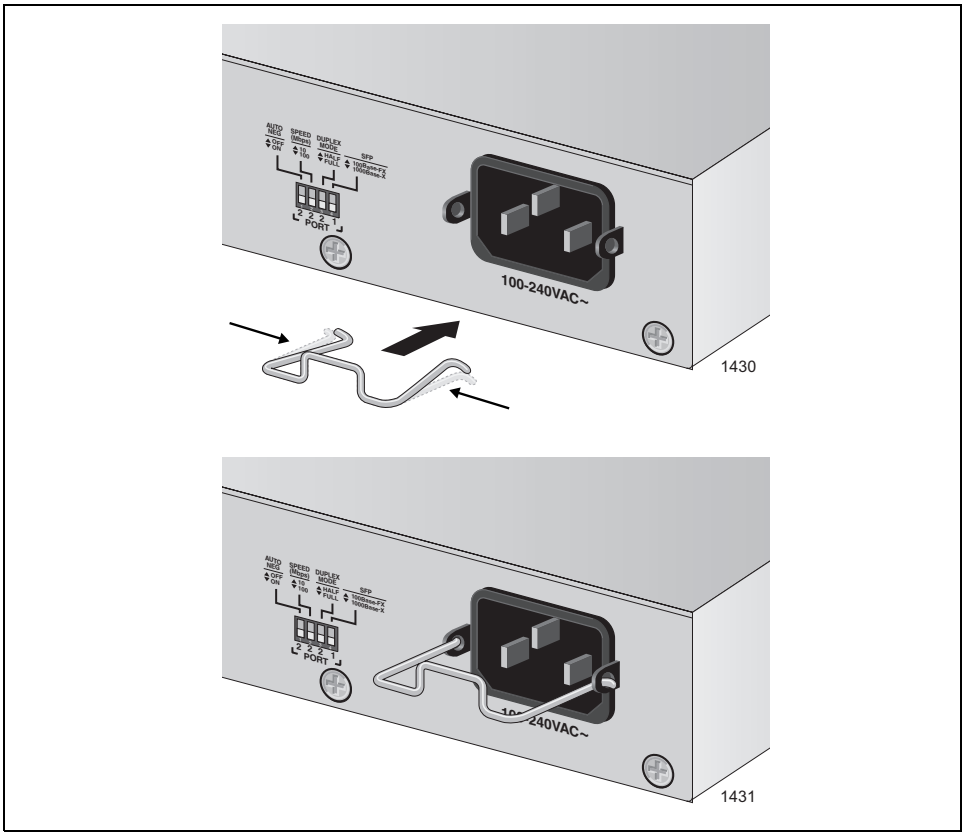


Figure 10. Inserting the AC Power Cord Retaining Clip

Powering On the Media Converter

To power on the AT-PC2002/POE Media Converter:

1. Position the power cord retaining clip in the upright position.

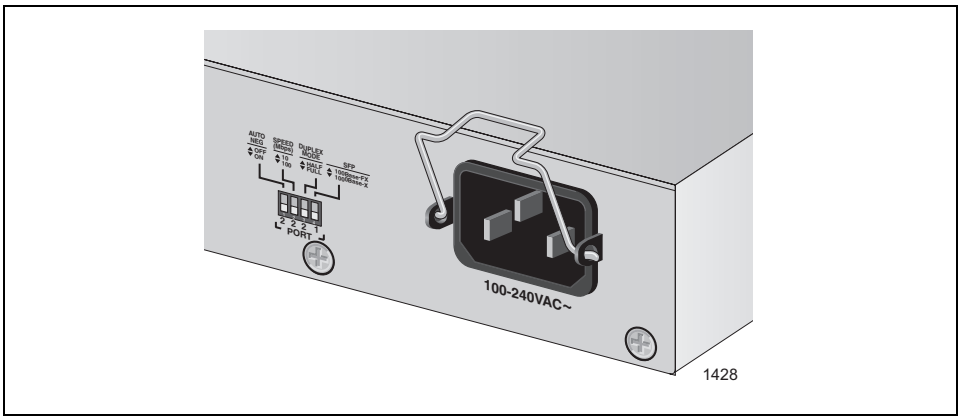


Figure 11. Power Cord Retaining Clip in the Upright Position

2. Plug the power cord into the AC power connector.

> **Warning:** Power cord is used as a disconnection device. To de-energize equipment, disconnect the power cord. E3

.

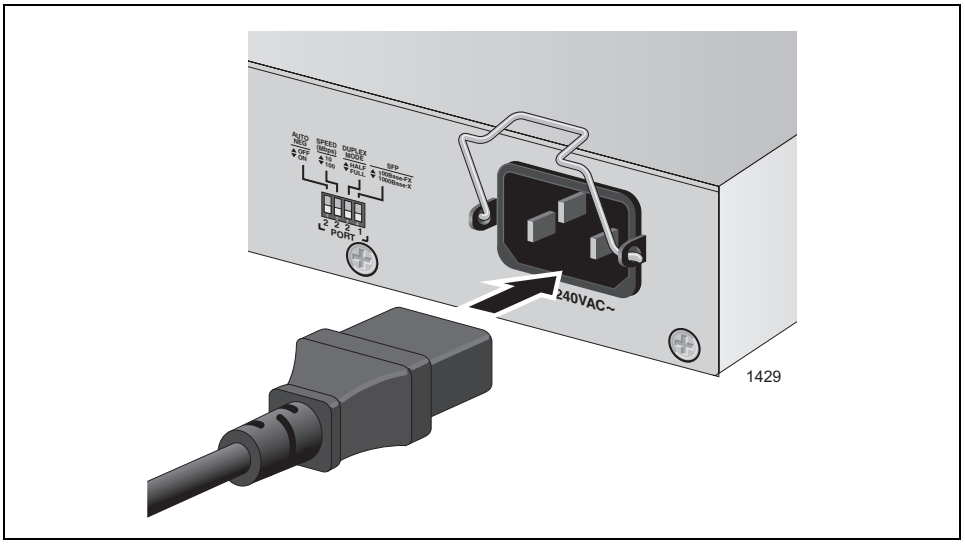


Figure 12. Connecting the AC Power Cord

3. Lower the power cord retaining clip to secure the cord to the AT-PC2002/POE Media Converter.

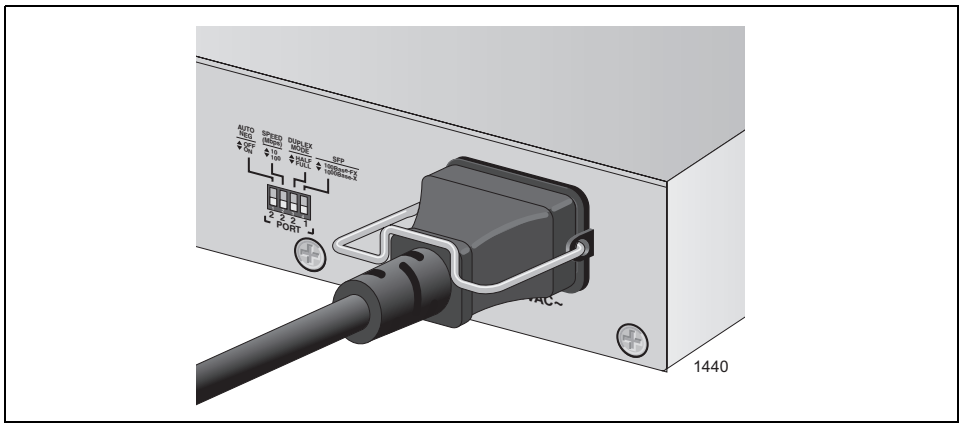


Figure 13. Securing the Power Cord with the Retaining Clip

4. Connect the other end of the power cord to an appropriate AC power outlet. For the power specifications of the media converter, refer to “Electrical Specifications” on page 59.

The AT-PC2002/POE Media Converter is now ready for network operations.

Verifying the Installation

This procedure is used to verify the installation of the media converter. It explains how to determine whether or not the fiber optic port on the SFP module and the twisted pair port have established links to their network devices. This procedure assumes the following:

- The media converter is powered on.
- The network cables are connected to the ports on the media converter and to the local and remote devices.
- The local and remote network devices are powered on.

To verify the installation of the media converter:

1. Place the media converter in the Link Test operating mode by pressing the Mode button until the LT LED is on.
2. Observe the Link LEDs for the twisted pair port and the fiber optic port on the media converter.
    - If the Link LEDs for both of the ports are on, the ports have established links with their network devices and may already be forwarding network traffic. You can either leave the unit in the Link Test mode or, by pressing the Mode button again, change it to the MissingLink mode or the Smart MissingLink mode. The MissingLink mode is active when the ML LED is on and the Smart MissingLink mode is active when the SML LED is on.
    - If the Link LED for a port is off, the port is unable to establish a link to its network device. For suggestions on how to resolve the problem, go to Chapter 3, Troubleshooting on page 47.

Chapter 3
Troubleshooting

Here are suggestions on how to troubleshoot the AT-PC2002/POE Media Converter.

Problem 1: The PWR LED is off.

Solutions: The media converter is not receiving power or the power supply in the unit has failed. Try the following:

- Verify that the power cord is firmly connected to the media converter and to the power source.
- Verify that the power source is operating properly by plugging a different device into it.
- Verify that the power from the power source meets the operating specifications of the media converter, listed in “Electrical Specifications” on page 59.

Problem 2: The Link LED for the twisted pair port is off.

Solutions: Set the unit to the Link Test mode. If the Link LED for the twisted pair port remains off, try the following:

- Verify that the twisted pair cable is securely connected to the port on the media converter and to the port on the remote network device.
- Verify that the network device connected to the twisted pair port is powered on and is operating properly.
- Try connecting another network device to the twisted pair port with a different cable. If the twisted pair port is able to establish a link, then the problem is with the cable or the other network device.
- Verify that you are using the correct type of cable and have not exceeded the maximum distance. For the cable specifications, refer to “Type of Cabling” on page 19.
- Verify the settings of DIP switches 1, 2 and 3. For information, refer to Table 11 on page 44.

Problem 3: The Link LED for the fiber optic port is off.

Solutions: Set the unit to the Link Test mode. If the Link LED for the fiber optic port remains off, try the following:

- Verify that the SFP module is firmly seated in the SFP slot.

- ❒ Verify that the fiber optic cable is securely connected to the port on the media converter and to the port on the remote network device.
- ❒ Verify that the network device connected to the fiber optic port is powered on and is operating properly.
- ❒ Verify that the operating specifications of the fiber optic ports on the SFP module and on the remote network device are compatible. The operating specifications for the SFP module can be found in the module's instructions.
- ❒ Check that DIP switch 4 is set correctly for the SFP module.
- ❒ Verify that the correct type of fiber optic cabling is being used and that the maximum operating distance has not been exceeded.
- ❒ Try connecting another network device to the fiber optic port using a different cable. If the port is able to establish a link, then the problem is with the cable or the other network device.
- ❒ If the remote network device is a managed device, use its management firmware to verify that the fiber optic port is enabled.
- ❒ Test the attenuation on the fiber optic cable with a fiber optic tester to determine whether the optical signal is too weak or too strong. The specifications of the fiber optic port on the SFP module can be found in the module's instructions.

Problem 4: One of the Link LEDs is blinking and the other Link LED is off.

Solutions: The unit is in the Smart MissingLink mode and the port whose Link LED is off is unable to form a link to its network device. Change the unit to the Link Test mode and go to Problem 2 for the twisted pair port or to Problem 3 for the fiber optic port for suggestions on how to resolve the problem.

Problem 5: The Link LEDs for the two ports are on but the network devices are not forwarding traffic to each other through the media converter.

Solutions: Try the following:

- ❒ If the network devices are managed devices, use their management firmware to determine whether they are configured and operating properly.
- ❒ If one of the network devices is a switch that is using a spanning tree protocol, use its management firmware to determine the state of the port that is connected to the media converter. The port may have been placed in the blocking mode by the switch if it was determined to be part of a redundant path.

Problem 6: Two network devices are forwarding traffic through the media converter, but performance is slow.

Solutions: Try the following:

- There might be a duplex mode mismatch between the twisted pair port and the network device connected to the port. A duplex mode mismatch occurs when a twisted pair port using Auto-Negotiation is connected to a device with a fixed duplex mode of full duplex. If this is the cause of the problem, you must adjust the duplex mode of the port on the network device or the twisted pair port on the media converter so that both ports are using the same duplex mode.
- There could be an intermittent problem with one of the network devices connected to the media converter or with a cable. To determine whether this might be the problem, set the unit to the Link Test mode and observe the Link LEDs of the ports. If one of the Link LEDs periodically blinks, it could mean that the link is intermittent. See Problem 2 or 3 for suggestions on how to resolve this issue.

Problem 7: The media converter is operating in the Link Test mode and the Link LED of one of the ports is blinking.

Solutions: This could be an indication of an intermittent link between the port and the network device. There could be a problem with the cable or the network device connected to the port. See Problem 2 or 3 for suggestions on how to resolve this issue.

Problem 8: The media converter is operating in the Smart MissingLink mode and the Link LEDs for both ports are blinking.

Solutions: This could have several possible causes. This can occur when a port is connected to another media converter that also supports the Smart MissingLink mode, forming a chain of media converters. Media converters that support the Smart MissingLink mode will pass the loss of a link on a port to all the media converters in the chain. This can result in situations where the Link LEDs on both ports of a media converter are blinking, indicating that the source of the problem has its origins in another media converter in the chain. To identify the source of the problem, set the operating modes on all of the media converters in the chain to Link Test and then examine the Link LEDs of the ports. The Link LED of the port that cannot establish a link to its network device will be off.

Another possibility is an intermittent link on one of the ports, perhaps because of a problem with the cable or the network device. To identify which port is having the problem, use the Link Test mode.

Note
If you need further assistance, please contact Allied Telesis Technical Support. Refer to “Contacting Allied Telesis” on page 13.

Appendix A

Technical Specifications

Physical

Dimensions:	W x D x H 15.5 cm x 13.1 cm x 4.0 cm (6.10 in x 5.16 in x 1.58 in)
Weight:	0.77 Kg (1.7 lb.)

Temperature

Operating Temperature:	0° C to 40° C (32° F to 104° F)
Storage Temperature:	-25° C to 70° C (-13° F to 158° F)
Operating Humidity:	5% to 90% noncondensing
Storage Humidity:	5% to 95% noncondensing
Maximum Operating Altitude:	3,048 m (10,000 ft)
Maximum Non-Operating Altitude:	4,000 m (13,100 ft)

Electrical Specifications

AC Input Supply Requirements:	100-240 VAC, 1.0 A maximum, 50/60 Hz
AC Input Power:	30 Watts maximum
Power-over-Ethernet on the Twisted Pair Port:	15.4 Watts Maximum

Agency Certifications

RFI Emissions	FCC Class B, EN55022 Class B, C-TICK, CE
Immunity	EN55024
Electrical Safety	EN60950 (TUV), UL 60950 ($_{C}UL_{US}$)
Standard	IEEE 802.3, IEEE 802.3u
RoHS	RoHS/China RoHS compliant
MTBF	550,000 Hrs

10/100/1000Base-T Port Pinouts

Figure 14 illustrates the pin layout to an RJ-45 connector and port.

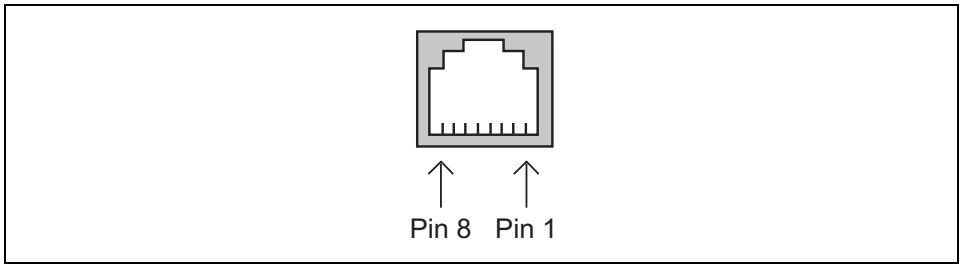


Figure 14. RJ-45 Connector and Port Pin Layout

Table 12 lists the RJ-45 pin signals when the twisted pair port is operating in the MDI configuration at 10 or 100 Mbps.

Table 12. MDI Pin Signals (10 or 100 Mbps)

Pin	Signal
1	TX+
2	TX-
3	RX+
6	RX-

Table 13 lists the RJ-45 port pin signals when the port is operating in the MDI-X configuration at 10 or 100 Mbps.

Table 13. MDI-X Pin Signals (10 or 100 Mbps)

Pin	Signal
1	RX+
2	RX-
3	TX+
6	TX-

Table 14 lists the pin signals when the twisted pair port is operating at 1000 Mbps.

Table 14. Pin Signals - 1000 Mbps

Pinout	Pair
1	Pair 1 +
2	Pair 1 -
3	Pair 2 +
4	Pair 3 +
5	Pair 3 -
6	Pair 2 -
7	Pair 4 +
8	Pair 4 -

Appendix B

Cleaning Fiber Optic Connectors

A fiber optic connector consists of a fiber optic plug and its adapter. The end of the fiber optic cable is held in the core of the ferrule in the plug. Light signals are transmitted through the core of the fiber. Even minor smudges or dirt on the end face of the fiber, completely invisible to the naked eye, can disrupt light transmission and lead to failure of the component or of the entire system. Therefore, it is of utmost importance to clean all fiber optic connectors before use.

Figure 15 shows the ferrule in an SC connector.

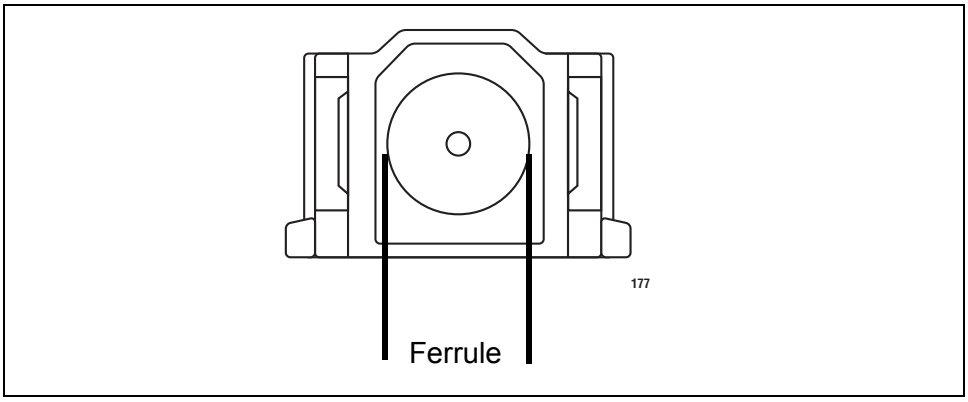


Figure 15. Ferrule in an SC Connector Plug

Figure 16 shows part of the end face of an unclean and clean ferrule.

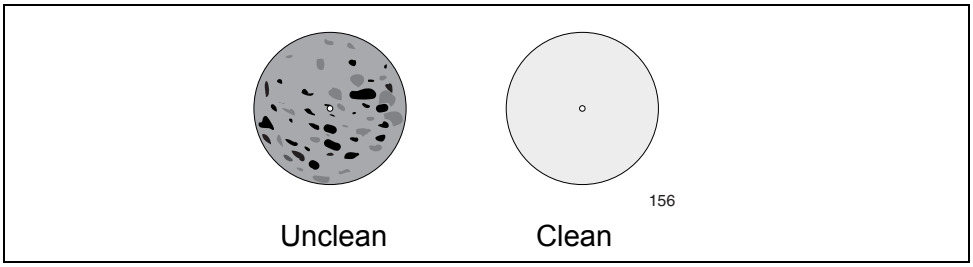


Figure 16. Unclean and Clean Ferrule

This appendix provides the following procedures

- “Using a Cartridge-Type Cleaner” on page 64
- “Using a Swab” on page 66

Using a Cartridge-Type Cleaner

Fiber optic cartridge cleaners are available from many vendors and are typically called “cartridge cleaners,” as shown in Figure 17.

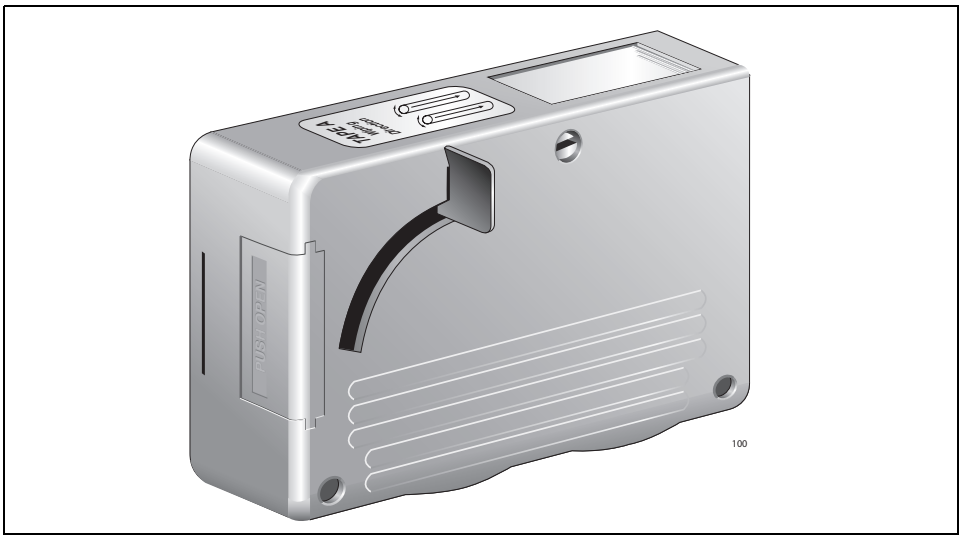


Figure 17. Cartridge Cleaner

Note
Do not use compressed air or aerosol air to clean a fiber optic connector.

Warning: Do not stare into the laser beam. L2

To clean a fiber optic connector using a cartridge cleaner, perform the following procedure.

1. With one hand, hold the cartridge cleaner and push the lever on the cleaning cartridge in the direction of the arrow to expose the cleaning surface, as shown in Figure 18 on page 65.

2. Place the ferrule tip on the exposed cleaning surface and rub the ferrule in a downward direction, as shown in Figure 18.

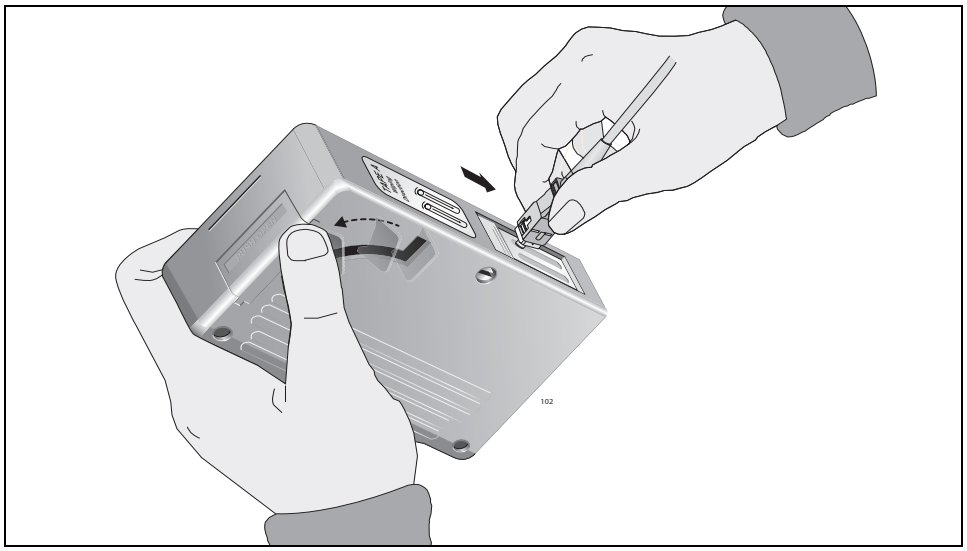


Figure 18. Rubbing the Ferrule Tip on the Cleaning Surface

Note
Rub the ferrule tip on the cleaning surface in one direction only.

3. When you reach the end of the cleaning surface, pick up the ferrule tip, rotate and place it at the top and rub downwards at least 2 times.

Caution
Failing to pick up the ferrule tip when you reach the bottom of the cleaning surface can result in static electricity that can damage the fiber optic cable.

4. If desired, repeat steps 3 and 4.

5. If a fiber inspection scope is available, use the scope to inspect the ferrule end face to make sure that it is clean.

6. Reconnect the cable to the port or protect the ferrule tip with a dust cap.

Note
Always keep a dust cap on a fiber optic cable when it is not in use.

Note
Do not touch the end face of the ferrule in the connector.

Using a Swab

Specially treated swabs (stick cleaners) are available for cleaning inside connector adapters or hard-to-reach ferrule tips. These swabs, often referred to as “lint free” or “alcohol free” swabs, are available from many vendors, as shown in Figure 19. Stick cleaners are available in both 2.5 mm and 1.25 mm sizes for use on SC and MU connectors respectively.

Note
NEVER use a household cotton swab and/or alcohol to clean a fiber optic connector. This may leave a residue on the ferrule tip.

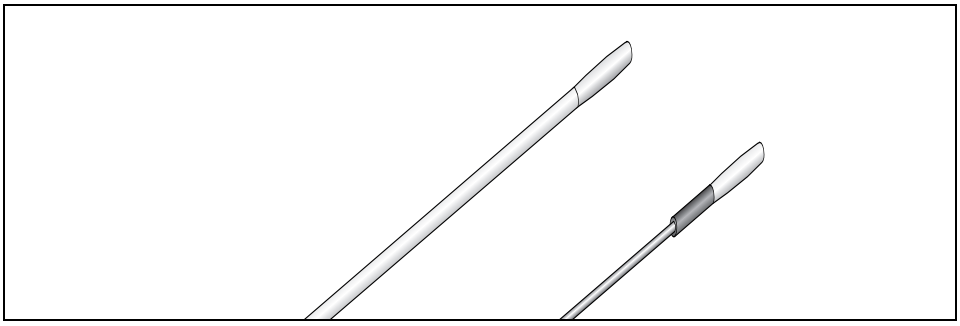


Figure 19. Lint-Free and Alcohol-Free Swabs

Note
Do not use compressed air or aerosol air to clean a fiber optic connector.

Warning: Do not stare into the laser beam. L2

To clean a recessed ferrule using a swab, perform the following procedure.

1. Insert the swab into the adapter as shown in Figure 20 and rub the ferrule tip with the swab.

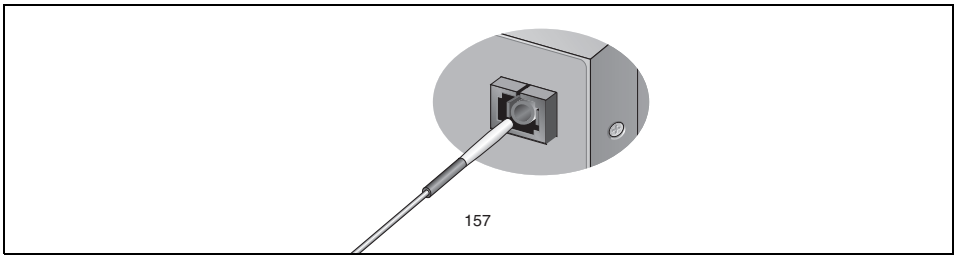


Figure 20. Cleaning a Recessed Ferrule

2. If desired, repeat step 1.

3. If a fiber inspection scope is available, use the scope to inspect the connector to make sure that it is clean and to check for scratches, pits, or other problems that may affect performance.

Note
Always keep a dust cap on a fiber optic cable when it is not in use.

Note
Do not touch the end face of the ferrule in the connector.