

FS970M Series

Fast Ethernet Switches

- ❑ AT-FS970M/8
- ❑ AT-FS970M/8PS
- ❑ AT-FS970M/8PS-E
- ❑ AT-FS970M/16F8-LC
- ❑ AT-FS970M/16F8-SC
- ❑ AT-FS970M/24C
- ❑ AT-FS970M/24F
- ❑ AT-FS970M/24LPS
- ❑ AT-FS970M/24PS
- ❑ AT-FS970M/48
- ❑ AT-FS970M/48PS



Installation Guide

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Electrical Safety and Emissions Standards

This product meets the following standards.

U.S. Federal Communications Commission

Radiated Energy

Note: This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of 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 this 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.

Note: Modifications or changes not expressly approved of by the manufacturer or the FCC, can void your right to operate this equipment.

Industry Canada

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

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

RFI Emissions: FCC Class A, EN55022 Class A, EN61000-3-2, EN61000-3-3, VCCI Class A, C-TICK, CE

Warning: In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

EMC (Immunity): EN55024

Electrical Safety: EN60950-1 (TUV), UL 60950-1 (cUL_{US})



Laser Safety

EN60825

Translated Safety Statements

Important: The  indicates that translations of the safety statement are available in the PDF document “Translated Safety Statements” posted on the Allied Telesis website at www.alliedtelesis.com/support.

Table of Contents

Preface	11
Document Conventions	12
Contacting Allied Telesis	13
Chapter 1: Overview	15
Features	16
FS970M Models	16
10/100 Mbps Twisted Pair Ports	16
Fiber Optic Ports	16
Power over Ethernet	17
10/100/1000 Mbps Twisted Pair Ports	17
SFP Slots	17
LEDs	18
Installation Options	18
MAC Address Table	18
Management Software and Interfaces	18
Management Methods	18
Fanless Models	18
Switches with Eight Twisted Pair Ports	19
Hardware Features	19
Front Panels	20
Front Panel Components	20
Switches with 24 or 48 Twisted Pair Ports	21
Hardware Features	21
Front Panels	22
Front Panel Components	23
Fiber Optic Switch	24
Hardware Features	24
Front Panel	25
Fiber Optic Ports	27
Back Panels	28
Management Panels	30
Model Naming Conventions	31
10/100Base-TX Twisted Pair Ports	33
Speed	33
Duplex Mode	33
Wiring Configuration	33
Maximum Distance	34
Power Over Ethernet	34
Cable Requirements	34
Port Pinouts	34
10/100/1000Base-T Twisted Pair Ports	35
Speed	35
Duplex Mode	35
Wiring Configuration	35
Maximum Distance	36
Power Over Ethernet	36
Cable Requirements	36
Port Pinouts	36
SFP Slots	37

Power Over Ethernet	39
PoE Standards	39
Powered Device Classes.....	39
Power Budget.....	40
Port Prioritization	41
Wiring Implementation.....	42
eco-friendly Button.....	43
LEDs	44
10/100Base-TX Twisted Pair Port LEDs	44
10/100/1000Base-T Twisted Pair Port LEDs.....	45
100Base-FX Port LEDs	46
SFP Slot LED	47
System ID LED.....	47
Console Port.....	49
Power Supplies.....	50
Power Connectors	52
Chapter 2: Beginning the Installation	53
Reviewing Safety Precautions.....	54
Choosing a Site for the Switch	58
Unpacking the Switch	59
Chapter 3: Installing the Switch on a Table or in an Equipment Rack	63
Installing the Switch on a Table or Desktop.....	64
Installing the Switch in an Equipment Rack.....	65
Chapter 4: Cabling the Networking Ports	71
Cabling the Twisted Pair and Fiber Optic Ports.....	72
Twisted Pair Ports	72
Fiber Optic Ports	73
General Guidelines.....	73
Installing Optional SFP Transceivers.....	74
Chapter 5: Powering On the Switch	79
Powering On an AC Switch	80
Monitoring the Initialization Processes	81
Starting a Management Session	85
Local Management.....	85
Telnet Management	85
Secure Shell Management	86
Web Browser Management	86
SNMP	87
Starting a Local Management Session.....	88
Starting a Telnet Management Session.....	90
Specifying Ports in the Command Line Interface.....	91
Chapter 6: Troubleshooting	93
Appendix A: Technical Specifications	97
Physical Specifications	97
Environmental Specifications.....	99
PoE Power Specifications	100
Power Specifications	100
Certifications	102
RJ-45 Twisted Pair Port Pinouts.....	102
Fiber Optic Port Specifications	104
RJ-45 Style Serial Console Port Pinouts	106

List of Figures

Figure 1: Front Panels of the 8-port FS970M Switches.....	20
Figure 2: Networking Ports and SFP Slots on the 8-port Switches	20
Figure 3: Front Panels of the 24 and 48-port Switches	22
Figure 4: Networking Ports and SFP Slots on the 24 and 48-port Switches	23
Figure 5: Front Panel of the AT-FS970M/16F8-LC Fiber Optic Switch	25
Figure 6: Front Panel of the AT-FS970M/16F8-SC Fiber Optic Switch	25
Figure 7: Front Panel of the AT-FS970M/24F Fiber Optic Switch	26
Figure 8: Back Panels of the Single Power Supply Switches.....	28
Figure 9: Back Panel of the Dual Power Supply Switches	29
Figure 10: FS970M Series Management Panels.....	30
Figure 11: Model Naming Conventions for the Twisted Pair Switches.....	31
Figure 12: Model Naming Conventions of the Fiber Optic Switch	31
Figure 13: 10/100Base-TX Port LEDs	44
Figure 14: 10/100/1000Base-T Port LEDs.....	45
Figure 15: 100Base-FX Port LED	46
Figure 16: SFP Slot LEDs	47
Figure 17: System LED	48
Figure 18: Components of the AT-FS970M/8, AT-FS970M/8PS, AT-FS970M/8PS-E, and AT-FS970M/24C Switches	59
Figure 19: Components of the AT-FS970M/24PS, AT-FS970M/24F, AT-FS970M/48PS, AT-FS970M/16F8-LC, and AT-FS970M/16F8-SC Switches.....	60
Figure 20: Components of the AT-FS970M/24LPS and AT-FS970M/48 Switches	61
Figure 21: Turning the Switch Upside Down	65
Figure 22: Removing the Rubber Feet	65
Figure 23: Attaching the Equipment Rack Brackets	66
Figure 24: Attaching the Equipment Rack Brackets (Continued)	67
Figure 25: Attaching the Equipment Rack Brackets	68
Figure 26: Attaching the Equipment Rack Brackets (Continued)	69
Figure 27: Mounting the Switch in an Equipment Rack.....	69
Figure 28: Removing the Dust Plug from an SFP Slot	75
Figure 29: Installing an SFP Transceiver.....	75
Figure 30: Removing the Dust Cover from the SFP Module	76
Figure 31: Positioning the SFP Handle in the Upright Position	76
Figure 32: Connecting the Fiber Optic Cable to the SFP Module.....	77
Figure 33: Plugging in the AC Power Cord.....	80
Figure 34: Switch Initialization Messages.....	82
Figure 35: Switch Initialization Messages (Continued).....	83
Figure 36: Switch Initialization Messages (Continued).....	84
Figure 37: Connecting the Management Cable to the Console Port	88
Figure 38: AlliedWare Plus Command Line Prompt	89
Figure 39: PORT Parameter in the Command Line Interface.....	91
Figure 40: RJ-45 Socket Pin Layout (Front View)	102

List of Tables

Table 1: Hardware Features of the 8-port Switches	19
Table 2: Hardware Features of the 24 and 48-port Switches	21
Table 3: Hardware Features of the AT-FS970M/16F8-LC Fiber Optic Switch	24
Table 4: General Specifications of AT-FS970M/16F8-LC and AT-FS970M/16F8-SC Fiber Optic Ports	27
Table 5: Model Naming Conventions for the Twisted Pair Switches	31
Table 6: Model Naming Conventions for the AT-FS970M/16F8-LC Fiber Optic Switch	32
Table 7: Twisted Pair Cable Requirements for the 10/100Base-TX Ports	34
Table 8: Twisted Pair Cable for the 10/100/1000Base-T Ports	36
Table 9: Combo Ports	37
Table 10: IEEE Powered Device Classes	40
Table 11: 10/100Base-TX Port LEDs	44
Table 12: 10/101000Base-T Port LEDs	45
Table 13: 100Base-FX Port LED on the AT-FS970M/16F8-LC, AT-FS970M/16F8-SC and AT-FS970M/24F Switches	46
Table 14: SFP Slot LED	47
Table 15: LEDs and Management Software Initialization	81
Table 16: Product Dimensions	97
Table 17: Product Weights	98
Table 18: Ventilation Requirements	98
Table 19: Environmental Specifications for all Switches Except the AT-FS970M/8PS-E Switch	99
Table 20: Environmental Specifications for the AT-FS970M/8PS-E Switch	99
Table 21: PoE Power Specifications	100
Table 22: Maximum Power Consumptions	100
Table 23: Input Voltages	101
Table 24: Product Certifications	102
Table 25: Pin Signals for 10 and 100 Mbps	102
Table 26: Pin Signals for 1000 Mbps	103
Table 27: Fiber Optic Port Specifications for the AT-8100S/16F8-SC Switch	104
Table 28: Fiber Optic Port Specifications for the AT-FS970M/16F8-LC, and AT-FS970M/24F Switches	105
Table 29: RJ-45 Style Serial Console Port Pin Signals	106

Preface

This guide contains the installation instructions for the FS970M Series of Fast Ethernet switches.

The preface contains the following sections:

- “Document Conventions” on page 12
- “Contacting Allied Telesis” on page 13

Document Conventions

This document uses the following conventions:

Note

Notes provide additional information.



Caution

Cautions inform you that performing or omitting a specific action may result in equipment damage or loss of data.



Warning

Warnings inform you that performing or omitting a specific action may result in bodily injury.

Contacting Allied Telesis

If you need assistance with this product, you may contact Allied Telesis technical support by going to the Support & Services section of the Allied Telesis web site at **www.alliedtelesis.com/support**. You can find links for the following services on this page:

- ❑ 24/7 Online Support — Enter our interactive support center to search for answers to your product questions in our knowledge database, to check support tickets, to learn about RMAs, and to contact Allied Telesis technical experts.
- ❑ USA and EMEA phone support — Select the phone number that best fits your location and customer type.
- ❑ Hardware warranty information — Learn about Allied Telesis warranties and register your product online.
- ❑ Replacement Services — Submit a Return Merchandise Authorization (RMA) request via our interactive support center.
- ❑ Documentation — View the most recent installation and user guides, software release notes, white papers, and data sheets for your products.
- ❑ Software Downloads — Download the latest software releases for your managed products.

For sales or corporate information, go to **www.alliedtelesis.com/purchase** and select your region.

Chapter 1

Overview

This chapter contains the following sections:

- ❑ “Features” on page 16
- ❑ “Switches with Eight Twisted Pair Ports” on page 19
- ❑ “Switches with 24 or 48 Twisted Pair Ports” on page 21
- ❑ “Fiber Optic Switch” on page 24
- ❑ “Back Panels” on page 28
- ❑ “Management Panels” on page 30
- ❑ “Model Naming Conventions” on page 31
- ❑ “10/100Base-TX Twisted Pair Ports” on page 33
- ❑ “10/100/1000Base-T Twisted Pair Ports” on page 35
- ❑ “SFP Slots” on page 37
- ❑ “Power Over Ethernet” on page 39
- ❑ “eco-friendly Button” on page 43
- ❑ “LEDs” on page 44
- ❑ “Console Port” on page 49
- ❑ “Power Supplies” on page 50
- ❑ “Power Connectors” on page 52

Features

Here are lists of the switches and their features:

FS970M Models

Here are the FS970M Series of Fast Ethernet switches:

- T-FS970M/8
- AT-FS970M/8PS
- AT-FS970M/8PS-E
- AT-FS970M/16F8-LC
- AT-FS970M/16F8-SC
- AT-FS970M/24C
- AT-FS970M/24F
- AT-FS970M/24LPS
- AT-FS970M/24PS
- AT-FS970M/48
- AT-FS970M/48PS

10/100 Mbps Twisted Pair Ports

Here are the basic features of the 10/100 Mbps twisted pair ports:

- 8, 24, or 48 ports per switch
- 10Base-T and 100Base-TX compliant
- IEEE 802.3u Auto-Negotiation compliant
- Auto-MDI/MDIX
- 100 meters (328 feet) maximum operating distance
- IEEE 802.3x flow control in 10/100Base-TX full-duplex operation
- IEEE 802.3x backpressure in 10/100Base-TX half-duplex operation
- Support for jumbo frames up to 10KB
- RJ-45 connectors

Fiber Optic Ports

Here are the basic features of the fiber optic ports on the AT-FS970M/16F8-LC and AT-FS970M/16F8-SC Switches:

- 16 ports
- 100Base-FX compliant
- Duplex SC connectors
- Maximum operating distance of 2 kilometers (1.24 miles)

Power over Ethernet

Here are the basic features of Power over Ethernet (PoE):

- ❑ PoE and PoE+ supported on the 10/100Base-TX ports on the AT-FS970M/8PS, AT-FS970M/8PS-E, AT-FS970M/24PS, AT-FS970M/24LPS and AT-FS970M/48PS Switches
- ❑ Powered device classes 0 to 4
- ❑ Power budget of 185 watts for the AT-FS970M/8PS, AT-FS970M/8PS-E and AT-FS970M/24LPS Switches
- ❑ Power budget of 370 watts for the AT-FS970M/24PS and AT-FS970M/48PS Switches
- ❑ Port prioritization

10/100/1000 Mbps Twisted Pair Ports

Here are the basic features of the 10/100/1000 Mbps twisted pair ports:

- ❑ Two ports per switch
- ❑ 10Base-T, 100Base-TX, and 1000Base-T compliant
- ❑ IEEE 802.3u Auto-Negotiation compliant
- ❑ Auto-MDI/MDIX
- ❑ 100 meters (328 feet) maximum operating distance
- ❑ IEEE 802.3x flow control in 10/100Base-TX full-duplex mode
- ❑ IEEE 802.3x backpressure in 10/100Base-TX half-duplex mode
- ❑ IEEE 803.3z 1000Base-T flow control
- ❑ Support for jumbo frames up to 10KB
- ❑ RJ-45 connectors

SFP Slots

Here are the basic features of the SFP slots:

- ❑ Two slots per switch
- ❑ Support 100Mbps, 100Base-FX, or 1000Mbps 1000Base-SX/LX transceivers

Note

The SFP slots and 10/100/1000Base-TX twisted pair ports are paired together to form combo ports. For information, refer to “SFP Slots” on page 37.

Note

SFP transceivers must be purchased separately. For a list of supported transceivers, contact your Allied Telesis distributor or reseller.

- LEDs** Here are the port LEDs:
- Duplex mode and link/activity LEDs for the twisted pair ports
 - Link/activity LEDs for the 100Base-FX fiber optic ports
 - Link/activity LEDs for the SFP slots
 - eco-friendly button turns off the LEDs to conserve electricity

- Installation Options** Here are the installation options:
- 19-inch equipment rack
 - Desk or tabletop

- MAC Address Table** Here are the basic features of the MAC address tables of the switches:
- Storage capacity of 16,000 MAC address entries
 - Automatic learning and aging

- Management Software and Interfaces** Here are the management software and management interfaces:
- AlliedWare Plus Management Software
 - Command line interface
 - Web browser interface

- Management Methods** Here are the methods for managing the switches:
- Local management through the Console port
 - Remote Telnet and Secure Shell management
 - Remote HTTP and HTTPS web browser management
 - SNMPv1, v2c, and v3

- Fanless Models** Here are the FS970M switches that do not have fans:
- AT-FS970M/8 Switch
 - AT-FS970M/24 Switch
 - AT-FS970M/24C Switch
 - AT-FS970M/48 Switch

Switches with Eight Twisted Pair Ports

Here are the 8-port twisted pair models in the FS970M Series:

- AT-FS970M/8
- AT-FS970M/8PS
- AT-FS970M/8PS-E

Hardware Features Table 1 lists the hardware features of the 8-port switches.

Table 1. Hardware Features of the 8-port Switches

Feature	8	8PS	8PS-E
Number of 10/100Base-TX Ports	8	8	8
Number of 10/100/1000Base-T Ports	2	2	2
Number of SFP Slots for 100Mbps 100Base-FX or 1000Mbps 1000Base-SX/LX Transceivers ¹	2	2	2
Power over Ethernet	No	Yes	Yes
Power over Ethernet Budget (Watts)	-	185	185
Powered Device Classes	-	0 to 4	0 to 4
Number of Power Supplies	1	1	1
Power Supply Type	AC	AC	AC
Console Management Port	Yes	Yes	Yes
Ventilation Fan	No	Yes	Yes

1. The SFP transceiver slots and 10/100/1000Base-T ports are paired together to form combo ports. Refer to "SFP Slots" on page 37 for background information.

Note

The AT-FS970M/8PS-E switch has an extended operating temperature range, which is signified by the "-E" in the model name. In all other respects, it is identical to the AT-FS970M/8PS switch. The operating temperature ranges of the models are listed in "Environmental Specifications" on page 99.

Front Panels The front panels of the 8-port switches are shown in Figure 1.

AT-FS970M/8



AT-FS970M/8PS



AT-FS970M/8PS-E



Figure 1. Front Panels of the 8-port FS970M Switches

Front Panel Components

Figure 2 identifies the Fast and Gigabit Ethernet networking ports and the SFP slots on the 8-port switches.

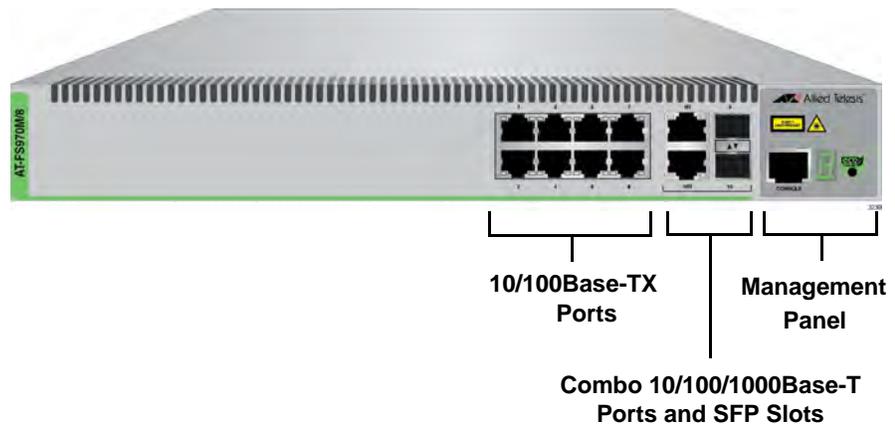


Figure 2. Networking Ports and SFP Slots on the 8-port Switches

Switches with 24 or 48 Twisted Pair Ports

The FS970M Series Switches with 24 or 48 twisted pair ports are listed here:

- ❑ AT-FS970M/24C
- ❑ AT-FS970M/24LPS
- ❑ AT-FS970M/24PS
- ❑ AT-FS970M/48
- ❑ AT-FS970M/48PS

Hardware Features Table 2 lists the hardware features of the switches.

Table 2. Hardware Features of the 24 and 48-port Switches

Feature	24C	24PS	24LPS	48	48PS
Number of 10/100Base-TX Ports	24	24	24	48	48
Number of 10/100/1000Base-T Ports	2	2	2	2	2
Number of SFP Slots for 100Mbps 100Base-FX or 1000Mbps 1000Base-SX/LX Transceivers ¹	2	2	2	2	2
Power over Ethernet	No	Yes	Yes	No	Yes
Power over Ethernet Budget (Watts)	-	370	185	-	370
Powered Device Classes	-	0 to 4	0 to 4	-	0 to 4
Number of Power Supplies	1	2	1	1	2
Power Supply Type	AC	AC	AC	AC	AC
Console Management Port	Yes	Yes	Yes	Yes	Yes
Ventilation Fan	No	Yes	Yes	No	Yes

1. The SFP transceiver slots are paired with the 10/100/1000Base-T ports to form combo ports. Refer to "SFP Slots" on page 37 for background information.

Front Panels The front panels of the 24 and 48-port switches are shown in Figure 3.

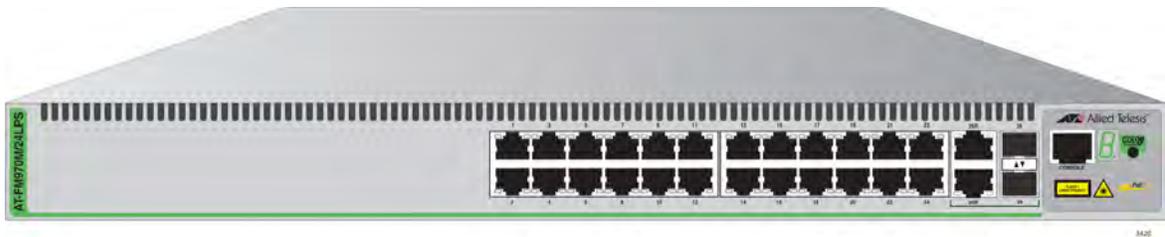
AT-FS970M/24C



AT-FS970M/24PS



AT-FS970M/24LPS



AT-FS970M/48



AT-FS970M/48PS



Figure 3. Front Panels of the 24 and 48-port Switches

Front Panel Components

Figure 4 identifies the Fast and Gigabit Ethernet networking ports and the SFP slots on the 24 and 48-port switches.

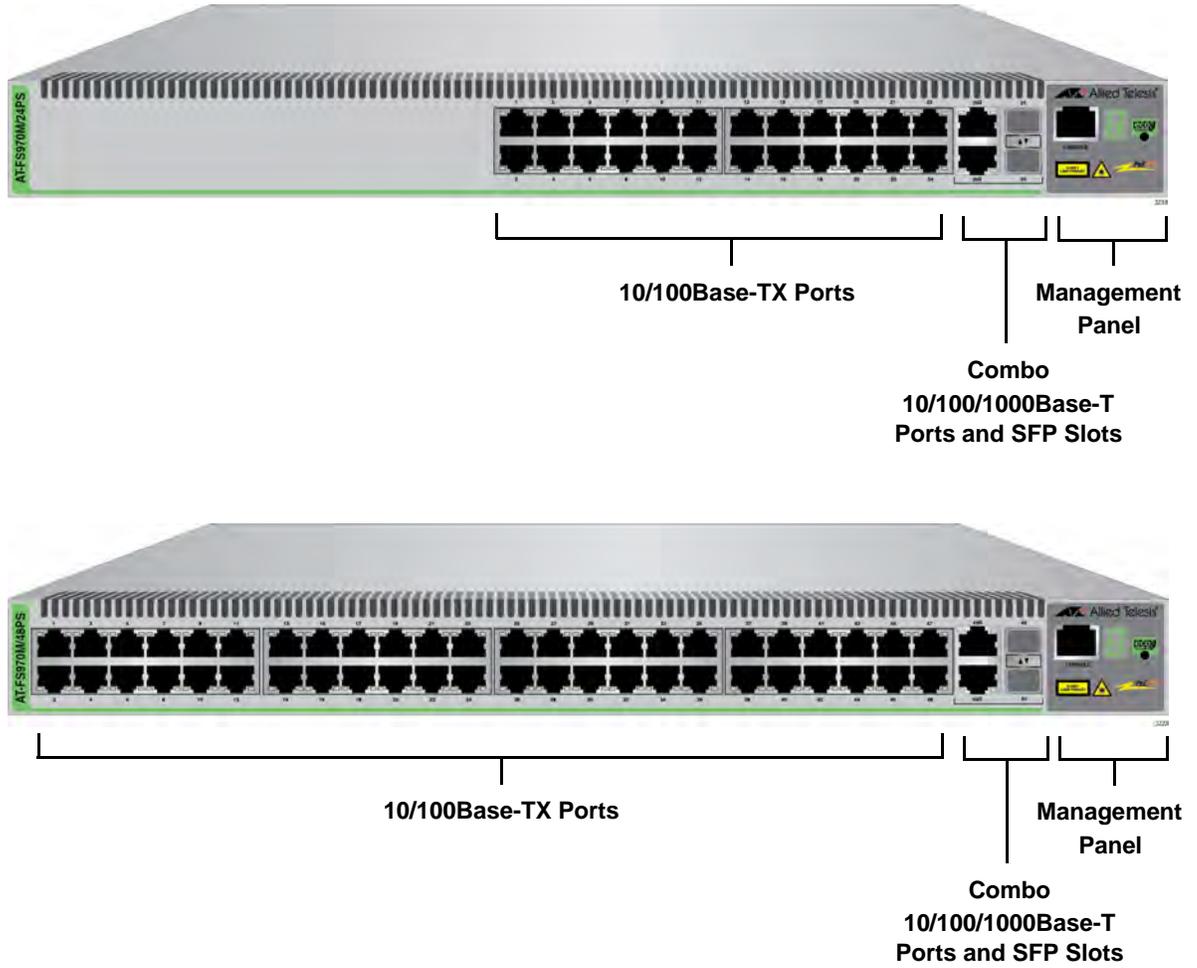


Figure 4. Networking Ports and SFP Slots on the 24 and 48-port Switches

Fiber Optic Switch

The FS970M Series has two fiber optic switches, the AT-FS970M/16F8-LC and AT-FS970M/16F8-SC.

Hardware Features Table 3 lists the hardware features of the fiber optic switch.

Table 3. Hardware Features of the AT-FS970M/16F8-LC Fiber Optic Switch

Feature	16F8-LC	16F8-SC	24F
Number of 100Base-FX Fiber Optic Ports	16	16	24
Connectors	Duplex LC	Duplex SC	Duplex LC
Maximum Distance per Port	2 kilometers (1.24 miles)	2 kilometers (1.24 miles)	2 kilometers (1.24 miles)
Number of 10/100Base-TX Ports	8	8	8
Number of 10/100/1000Base-T Ports	2	2	2
Number of SFP Slots for 100Mbps 100Base-FX or 1000Mbps 1000Base-SX/LX Transceivers ¹	2	2	2
Power over Ethernet	No	No	No
Number of Power Supplies	2	2	2
Power Supply Type	AC	AC	AC
Console Management Port	Yes	Yes	Yes
Ventilation Fan	Yes	Yes	Yes

1. The SFP transceiver slots and the 10/100/1000Base-T ports are paired together to form combo ports, as explained in “SFP Slots” on page 37.

Front Panel The front panel of the AT-FS970M/16F8-LC Switch is shown in Figure 5.

AT-FS970M/16F8-LC

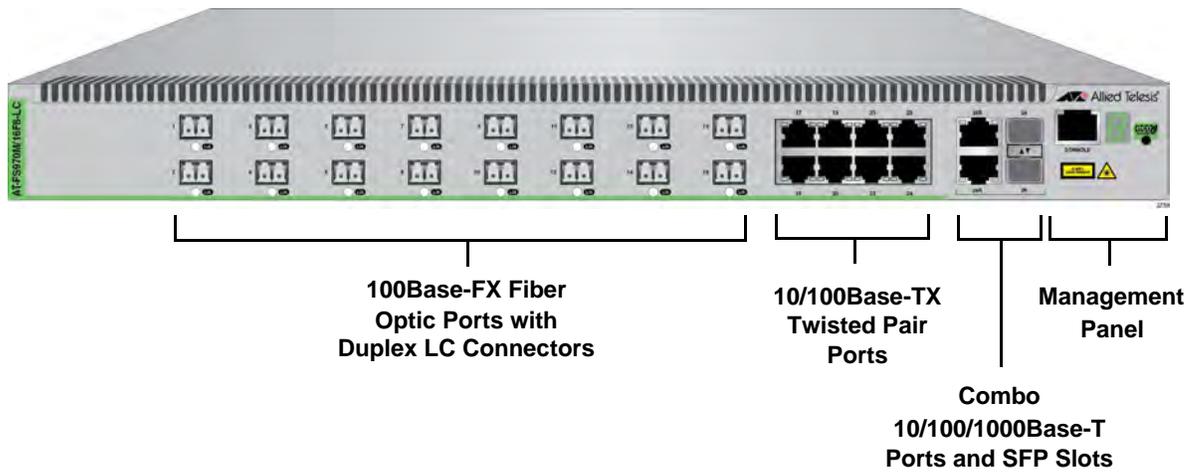


Figure 5. Front Panel of the AT-FS970M/16F8-LC Fiber Optic Switch

The front panel of the AT-FS970M/16F8-SC Switch is shown in Figure 6.

AT-FS970M/16F8-SC

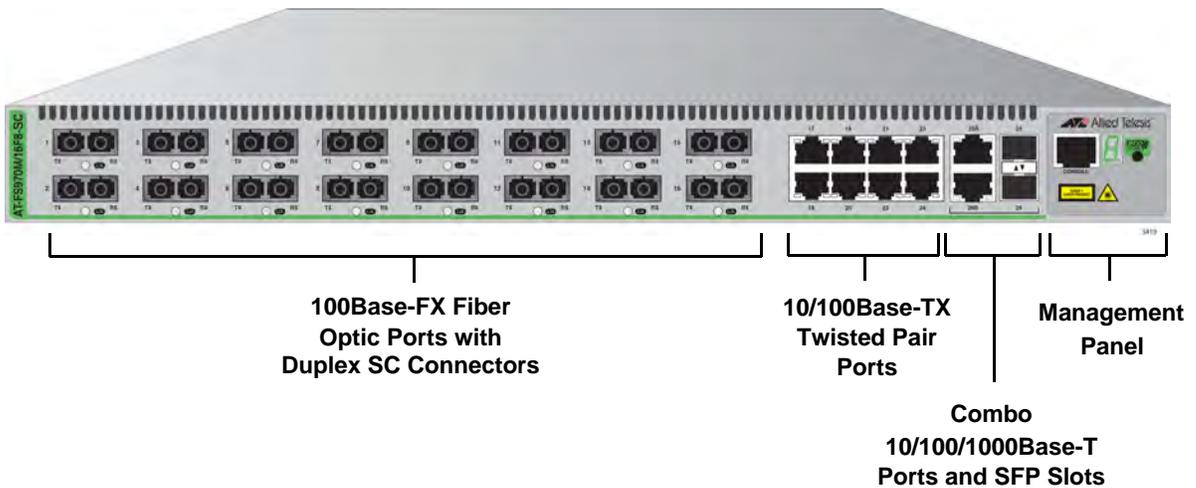


Figure 6. Front Panel of the AT-FS970M/16F8-SC Fiber Optic Switch

The front panel of the AT-FS970M/24F Switch is shown in Figure 7.

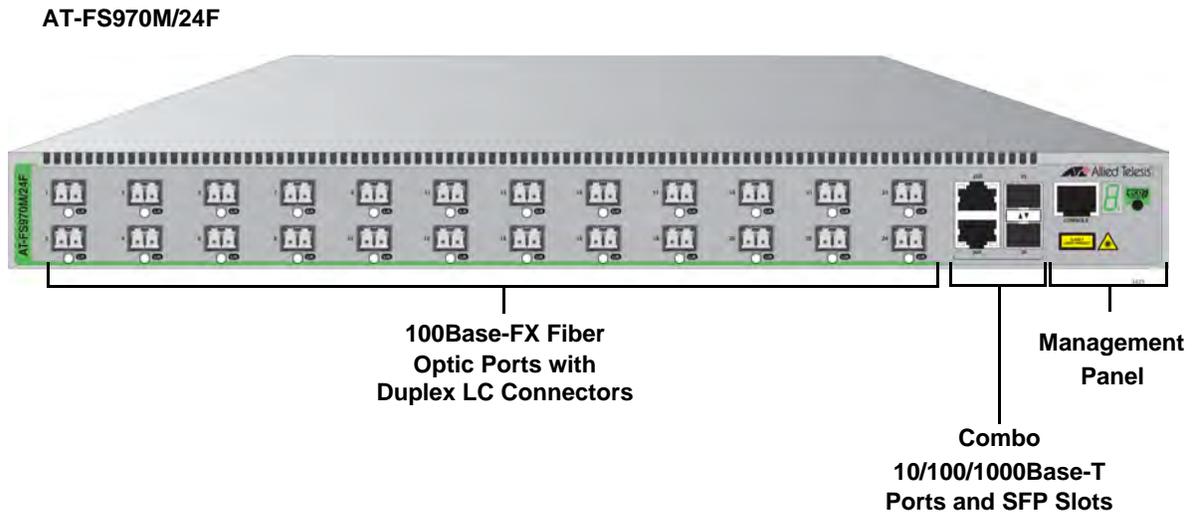


Figure 7. Front Panel of the AT-FS970M/24F Fiber Optic Switch

Fiber Optic Ports Table 4 lists the general specifications of the fiber optic ports on the AT-FS970M/16F8-LC and AT-FS970M/16F8-SC Switches.

Table 4. General Specifications of AT-FS970M/16F8-LC and AT-FS970M/16F8-SC Fiber Optic Ports

Feature	16F8-LC	16F8-SC	24F
Number of Fiber Optic Ports	16	16	24
Connector	Duplex LC	Duplex SC	Duplex LC
Wavelength	Transmit and receive: 1310 nm	Transmit and receive: 1310 nm	Transmit and receive: 1310 nm
Standard	100Base-FX	100Base-FX	100Base-FX
Speed	100 Mbps	100 Mbps	100 Mbps
Maximum Distance	2 kilometers (1.24 miles)	2 kilometers (1.24 miles)	2 kilometers (1.24 miles)
Fiber Optic Cable	50/125 or 62.5/125 μm multimode fiber optic cable	50/125 or 62.5/125 μm multimode fiber optic cable	50/125 or 62.5/125 μm multimode fiber optic cable

Back Panels

Figure 8 shows the back panels of the single power supply switches.

AT-FS970M/8, AT-FS970M/8-E, and AT-FS970M/24C Switches



AT-FS970M/8PS Switch



AT-FS970M/24LPS and AT-FS970M/48 Switches

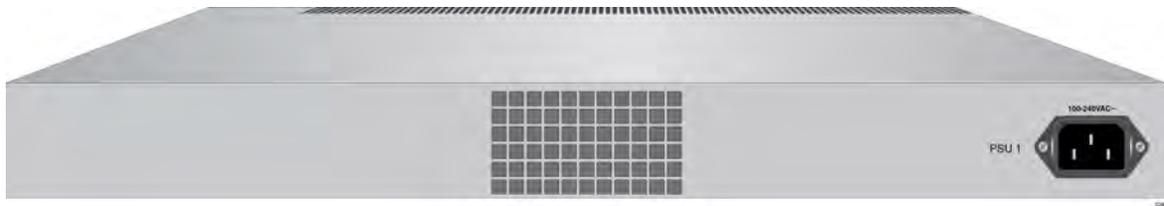


Figure 8. Back Panels of the Single Power Supply Switches

Figure 9 shows the back panel of the dual power supply switches including:

- ❑ AT-FS970M/16F8-LC
- ❑ AT-FS970M/16F8-SC
- ❑ AT-FS970M/24F
- ❑ AT-FS970M/24PS
- ❑ AT-FS970M/48PS

Switches



Figure 9. Back Panel of the Dual Power Supply Switches

Management Panels

Figure 10 identifies the components in the management panels on the FS970M Fast Ethernet Switches.

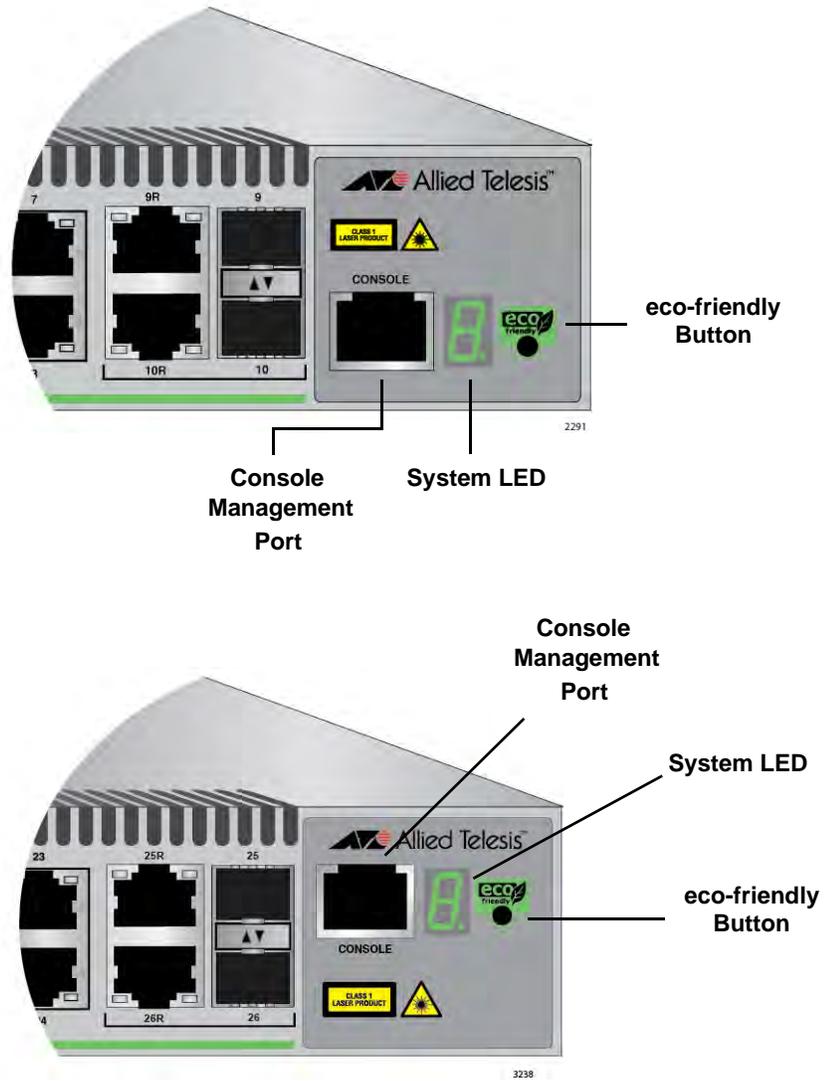


Figure 10. FS970M Series Management Panels

Model Naming Conventions

The hardware features of the switches are represented by the letters and numbers in the model names. The conventions for the twisted pair switches are identified in Figure 11.

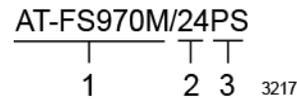


Figure 11. Model Naming Conventions for the Twisted Pair Switches

The conventions are defined in Table 5.

Table 5. Model Naming Conventions for the Twisted Pair Switches

Convention	Definition
1	This is the series name.
2	This is the number of 10/100Base-TX ports.
3	<p>This extension can be one of the following:</p> <p>PS - This extension indicates support for Power over Ethernet.</p> <p>C - The letter “C” in the AT-FS970M/24C model name denotes that the unit, which has just one power supply, has a smaller, more compact size than the other 24 and 48-port switches in the series.</p> <p>E - The “-E” in the AT-FS970M/8PS-E model name indicates that the switch has an extended operating temperature range. For details, refer to “Environmental Specifications” on page 99.</p>

The model naming conventions for the fiber optic switch is identified in Figure 12.

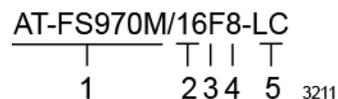


Figure 12. Model Naming Conventions of the Fiber Optic Switch

The conventions are defined in Table 6.

Table 6. Model Naming Conventions for the AT-FS970M/16F8-LC Fiber Optic Switch

Convention	Definition
1	This is the product name.
2	This is the number of 100Base-FX fiber optic ports.
3	The letter "F" signifies fiber optic.
4	This is the number of 10/100Base-TX ports.
5	This identifies the type of fiber optic connector on the ports as either LC or SC.

10/100Base-TX Twisted Pair Ports

The switches have 8, 24, or 48 10/100Base-TX ports.

Speed The ports can operate at either 10 or 100 Mbps. The speeds may be set manually using the management software or automatically with Auto-Negotiation (IEEE 802.3u), the default setting.

Duplex Mode The twisted pair ports can operate in either half- or full-duplex mode. The duplex mode determines the manner in which a port transmits data. A port set to half-duplex can either transmit or receive data at one time, while a port operating in full-duplex can transmit and receive data at the same time. The best network performance is achieved with the full-duplex setting, but not all network equipment is designed to support that duplex mode.

The duplex modes, like port speeds, may be set manually using the management software or automatically with Auto-Negotiation (IEEE 802.3u), the default setting.

The speed and duplex mode settings of a port may be set independently of each other. For example, a port may be configured such that its speed is set manually while its duplex mode is established through Auto-Negotiation.

Note

A switch port that is connected to a network device that does not support Auto-Negotiation and has a fixed duplex mode of full-duplex should not set its duplex mode with Auto-Negotiation. A duplex-mode mismatch in which a switch port and a network device operate at different duplex modes, may occur. The duplex modes of switch ports that are connected to network devices that do not support Auto-Negotiation should be set manually through the management software.

Wiring Configuration The wiring configuration of a port can be MDI or MDI-X. The wiring configurations of a switch port and a network device connected with straight-through twisted pair cabling have to be opposite, such that one device is using MDI and the other MDI-X. For instance, a switch port has to be set to MDI-X if it is connected to a network device set to MDI.

You may set the wiring configurations of the ports manually or let the switch configure them automatically with auto-MDI/MDI-X (IEEE 802.3ab-compliant). This feature enables the switch to negotiate with network devices to establish the proper settings, so that the ports on the devices are using different wiring configurations.

Maximum Distance The ports have a maximum operating distance of 100 meters (328 feet).

Power Over Ethernet The 10/100Base-TX ports on the AT-FS970M/8PS, AT-FS970M/8PS-E, AT-FS970M/24PS and AT-FS970M/48PS Switches support Power over Ethernet (PoE), which is a standard whereby DC power is provided by the switch to network devices over the network twisted pair cables. The switches support PoE (IEEE 802.3af) and PoE+ (IEEE 802.3at). For background information, refer to “Power Over Ethernet” on page 39.

Cable Requirements The cable requirements of the ports are given in Table 7.

Table 7. Twisted Pair Cable Requirements for the 10/100Base-TX Ports

Cable Type	10Mbps			100Mbps		
	Non-PoE	PoE	PoE+	Non-PoE	PoE	PoE+
Standard TIA/EIA 568-B-compliant Category 3 shielded or unshielded cabling with 100 ohm impedance and a frequency of 16 MHz.	Yes	No	No	Yes	No	No
Standard TIA/EIA 568-A-compliant Category 5 shielded or unshielded cabling with 100 ohm impedance and a frequency of 100 MHz.	Yes	Yes	No	Yes	Yes	No
Standard TIA/EIA 568-B-compliant Enhanced Category 5 (Cat 5e) shielded or unshielded cabling with 100 ohm impedance and a frequency of 100 MHz.	Yes	Yes	Yes	Yes	Yes	Yes
Standard TIA/EIA 568-B-compliant Category 6 or 6a shielded cabling.	Yes	Yes	Yes	Yes	Yes	Yes

Port Pinouts Refer to Table 25 on page 102 for the port pinouts of the 10/100Base-TX twisted pair ports.

10/100/1000Base-T Twisted Pair Ports

The switches have two 10/100/1000Base-T ports. These ports are paired with SFP slots to form combo ports.

Speed The ports can operate at 10, 100, or 1000 Mbps. The speeds may be set manually using the management software or automatically with Auto-Negotiation (IEEE 802.3u), the default setting.

Note

The ports must be set to Auto-Negotiation to function at 1000 Mbps. They are not compatible with devices that are not IEEE 802.3u compliant.

Duplex Mode The twisted pair ports can operate in either half- or full-duplex mode. The duplex modes, like port speeds, may be set manually using the management software or automatically with Auto-Negotiation (IEEE 802.3u), the default setting.

The speed and duplex mode settings of a port may be set independently of each other. For example, a port may be configured such that its speed is set manually while its duplex mode is established through Auto-Negotiation.

Note

A switch port that is connected to a network device that does not support Auto-Negotiation and has a fixed duplex mode of full-duplex should not set its duplex mode with Auto-Negotiation. A duplex-mode mismatch in which a switch port and a network device operate at different duplex modes, may occur. The duplex modes of switch ports that are connected to network devices that do not support Auto-Negotiation should be set manually through the management software.

Wiring Configuration The wiring configuration of a port operating at 10 or 100 Mbps can be MDI or MDI-X. The wiring configurations of a switch port and a network device connected with straight-through twisted pair cabling have to be opposite, such that one device is using MDI and the other MDI-X. For instance, a switch port has to be set to MDI-X if it is connected to a network device set to MDI.

You may set the wiring configurations of the ports manually or let the switch configure them automatically with auto-MDI/MDI-X (IEEE 802.3ab-compliant). This feature enables the switch to automatically negotiate with network devices to establish the proper settings.

The MDI and MDI-X settings do not apply when the ports are operating at 1000 Mbps.

Maximum Distance

The ports have a maximum operating distance of 100 meters (328 feet).

Power Over Ethernet

The 10/100/1000Base-T ports on the AT-FS970M/8PS, AT-FS970M/8PS-E, AT-FS970M/24PS and AT-FS970M/48PS Switches do not support PoE.

Cable Requirements

The cable requirements of the ports are given in Table 8.

Table 8. Twisted Pair Cable for the 10/100/1000Base-T Ports

Cable Type	10Mbps	100Mbps	1000Mbps
Standard TIA/EIA 568-B-compliant Category 3 shielded or unshielded cabling with 100 ohm impedance and a frequency of 16 MHz.	Yes	Yes	No
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.	Yes	Yes	Yes
Standard TIA/EIA 568-B-compliant Category 6 or 6a shielded cabling.	Yes	Yes	Yes

Port Pinouts

Refer to Table 25 on page 102 and Table 26 on page 103 for the port pinouts of the 10/100/1000Base-T twisted pair ports.

SFP Slots

The switches have two slots for 100Mbps 100Base-FX or 1000Mbps 1000Base-SX/LX fiber optic transceivers. The transceivers can be used to connect the switches to other network devices over large distances, build a high-speed backbone network between network devices, or connect high-speed devices, such as servers, to your network.

The switches support a variety of short and long distance, 100 and 1000 Mbps fiber optic SFP modules. For a list of supported SFP modules, contact your Allied Telesis representative or visit our web site.

The two SFP slots are paired with the two 10/100/1000Base-T ports. The combo ports are listed in Table 9.

Table 9. Combo Ports

Model	10/100/1000 Base-T Port	SFP Slot
AT-FS970M/8, AT-FS970M/8PS, and AT-FS970M/8PS-E	9R	9
	10R	10
AT-FS970M/24C, AT-FS970M/24F, AT-FS970M/24LPS, AT-FS970M/24PS, AT-FS970M/16F8-LC and AT-FS970M/16F8-SC	25R	25
	26R	26
AT-FS970M/48 and AT-FS970M/48PS	49R	49
	50R	50

The rules for using the combo ports are listed here:

- Only one port in a combo pair is active at a time.
- The twisted pair port is the default active port.
- The SFP slot becomes active when an SFP transceiver establishes a link to another network node.
- The twisted pair port of a combo pair remains deactivated so long as the SFP transceiver has a link to another network device.
- The switch automatically reactivates the twisted pair port if the companion SFP module loses its network link.
- The twisted pair port and SFP module of a combo port share the same settings, such as VLAN assignments, access control lists, and spanning tree.

- ❑ Port speed is an exception to the shared settings of the twisted pair port and SFP slot of a combo port. If you disable Auto-Negotiation on the twisted pair port and set the speed and duplex mode manually, the switch reactivates it when an SFP module establishes a link with an end node.

Power Over Ethernet

The AT-FS970M/8PS, AT-FS970M/8PS-E, AT-FS970M/24PS, and AT-FS970M/48PS Switches feature Power over Ethernet (PoE) on the 10/100Base-TX ports. PoE is used to supply power to network devices over the same twisted pair cables that carry the network traffic.

The main advantage of PoE is that it makes it easier to install a network. The placement of network devices is often limited by whether there are power sources nearby. This often limits equipment placement or requires the added time and cost of having additional electrical sources installed. But with PoE, you can install PoE-compatible devices wherever they are needed without having to worry about whether there are power sources nearby.

A device that provides PoE to other network devices is referred to as *power sourcing equipment (PSE)*. The AT-FS970M/8PS, AT-FS970M/8PS-E, AT-FS970M/24PS, and AT-FS970M/48PS Switches act as PSE units by adding DC power to the network cable, thus functioning as a central power source for other network devices.

Devices that receive their power from a PSE are called *powered devices (PD)*. Examples include wireless access points, IP telephones, webcams, and even other Ethernet switches.

The switch automatically determines whether or not a device connected to a port is a powered device. Ports that are connected to network nodes that are not powered devices (that is, devices that receive their power from another power source) function as regular Ethernet ports, without PoE. The PoE feature remains activated on the ports but no power is delivered to the devices.

PoE Standards

The AT-FS970M/8PS, AT-FS970M/8PS-E, AT-FS970M/24PS, and AT-FS970M/48PS Switches support these PoE standards:

- ❑ PoE (IEEE 802.3af): This standard provides up to 15.4 watts at the switch port to support powered devices that require up to 12.95 watts.
- ❑ PoE+ (IEEE 802.3at): This standard provides up to 30.0 watts at the switch port to support powered devices that require up to 25.5 watts.

Powered Device Classes

Powered devices are grouped into the five classes listed in Table 10 on page 40. The classes are based on the amount of power the devices require. The switches support all five classes.

Table 10. IEEE Powered Device Classes

Class	Maximum Power Output from a Switch Port	PD Power Range
0	15.4W	0.44W to 12.95W
1	4.0W	0.44W to 3.84W
2	7.0W	3.84W to 6.49W
3	15.4W	6.49W to 12.95W
4	30.0W	12.95W to 25.5W

Note

PoE+ Class 4 powered devices (IEEE 802.3at) with a power range of 12.95 to 25.5 watts must use LLDP to identify their power requirements to the switch. Non-compliant PoE+ powered devices that do not support LLDP will be limited to 802.3af (15.4 watts) power levels.

Power Budget

The AT-FS970M/8PS, AT-FS970M/8PS-E and AT-FS970M/24LPS Switches have a power budget of 185 watts. The AT-FS970M/24PS and AT-FS970M/48PS Switches have a power budget of 370 watts. These are the maximum amounts of power the switches can provide at one time to the powered devices.

The AT-FS970M/24PS and AT-FS970M/48PS Switches have two power supplies. Each power supply is responsible for providing 185 watts, or half, of the power budget. Both power supplies must be connected to AC power sources for the switch to provide the full 370 watts. The power budget is reduced to 185 watts if only one power supply is connected to a power source.

The power requirements of the PoE devices determine the maximum number of devices the switch can support at one time. So long as the total power requirements of the powered devices is less than the power budget of the switch, the switch can supply power to all of the devices. If the total power requirements exceed the power budget, the switch denies power to one or more ports using a mechanism referred to as port prioritization.

To determine whether the power requirements of the PoE devices you plan to connect to the switch exceed its power budget, refer to their documentation for their power requirements and add the requirements together. The switch should be able to power all of the devices simultaneously as long as the total is below its power budget. If the total exceeds the available power budget, you should consider reducing the number of PoE devices so that all of the devices receive power.

Otherwise, the switch powers a subset of the devices, based on port prioritization.

The switch can handle different power requirements on different ports. This enables you to connect different classes of PoE equipment to the ports on the switch.

Port Prioritization

If the power requirements of the powered devices exceed the switch's power budget, the switch denies power to some ports based on a system called port prioritization. You may use this mechanism to ensure that powered devices critical to the operations of your network are given preferential treatment by the switch in the distribution of power should the demands of the devices exceed the available capacity.

There are three priority levels:

- Critical
- High
- Low

Ports set to the Critical level, the highest priority level, are guaranteed power before any of the ports assigned to the other two priority levels. Ports assigned to the other priority levels receive power only if all the Critical ports are receiving power. Ports that are connected to your most critical powered devices should be assigned to this level. If there is not enough power to support all the ports set to the Critical priority level, power is provided to the ports based on port number, in ascending order.

The High level is the second highest level. Ports set to this level receive power only if all the ports set to the Critical level are already receiving power. If there is not enough power to support all of the ports set to the High priority level, power is provided to the ports based on port number, in ascending order.

The lowest priority level is Low. This is the default setting. Ports set to this level only receive power if all of the ports assigned to the other two levels are already receiving power. As with the other levels, if there is not enough power to support all of the ports set to the Low priority level, power is provided to the ports based on port number, in ascending order.

Power allocation is dynamic. Ports supplying power to powered devices may cease power transmission if the switch's power budget is at maximum usage and new powered devices, connected to ports with higher priorities, become active.

You can use port prioritization on dual power supply PoE switches to protect your important networking devices from loss of power should one of the power supplies fail or lose power. By limiting the power requirements of the critical devices connected to a switch to less than 185 watts, the PoE power provided by a single power supply, a switch will have

sufficient power to support the critical devices even if it has only one functional power supply.

Wiring Implementation

The IEEE 802.3af standard defines two methods by which a PSE, such as the switch, can transmit DC power over twisted pair cables to PDs. These methods, known as modes A and B, identify the wire strands the switch should use when sending DC power to a PD.

Twisted pair cabling typically consists of eight strands. With 10Base-T and 100Base-TX devices, the strands connected to pins 1, 2, 3, and 6 on the RJ-45 connectors carry the network traffic while strands connected to pins 4, 5, 7, and 8 are unused. With 1000Base-T devices, all eight strands are used to carry network data.

It takes four strands to deliver DC power to a PD. With Mode A, the power is delivered on pins 1, 2, 3, and 6. These are the same pins in 10Base-T and 100Base-TX devices that carry the network data. With mode B, the power is provided over the spare strands.

The ports on the AT-FS970M/24PS and AT-FS970M/48PS Switches deliver the power using pins 4, 5, 7, and 8, which corresponds to mode B in the IEEE 802.3af standard.

Powered devices that comply with the IEEE 802.3af standard are required to support both power delivery methods. Legacy devices that do not comply with the standard will work with the switch if they are powered on pins 4, 5, 7, and 8.

eco-friendly Button

You may turn off the port LEDs to conserve electricity when you are not monitoring the switch. The LEDs may be toggled with the eco-friendly button on the front panel of the switch or the ECOFRIENDLY LED and NO ECOFRIENDLY LED commands in the Global Configuration mode of the command line interface.

Toggling the LEDs on and off does not interfere with the network operations of the device. The System LED is always on.

Note

When checking or troubleshooting the network connections to the ports on the switch, you should always check to be sure that the LEDs are on by either pressing the eco-friendly button or issuing the ECOFRIENDLY LED and NO ECOFRIENDLY LED commands in the Global Configuration mode of the command line interface.

LEDs

Here are descriptions of the switch's LEDs.

10/100Base-TX Twisted Pair Port LEDs

The 10/100Base-TX twisted pair ports have link/activity and duplex mode LEDs. Refer to Figure 13.

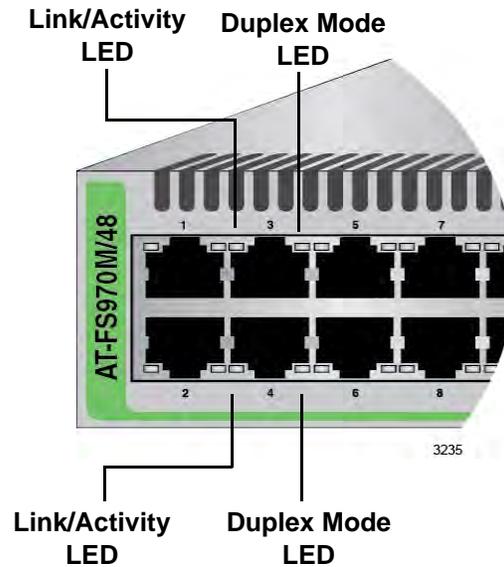


Figure 13. 10/100Base-TX Port LEDs

The LEDs are described in Table 11.

Table 11. 10/100Base-TX Port LEDs

LED	State	Description
Link/Activity	Off	The port has not established a link to an end node.
	Solid green	The port has established a link to an end node.
	Flashing green	The port is receiving or transmitting packets.
Duplex Mode	Off	The port is operating in half-duplex mode.
	Solid green	The port is operating in full-duplex mode.

Here are the LED guidelines:

- ❑ The LEDs do not display port speed. That information may be displayed using the management software.
- ❑ The LEDs do not display PoE information on the AT-FS970M/24PS and AT-FS970M/48PS Switches. That information may be viewed using the management software.
- ❑ If the port LEDs are off, the switch may be operating in the low power mode. To toggle on the LEDs, use the eco-friendly button.

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

The twisted pair ports in the combo ports have link/activity and duplex mode LEDs, just like the 10/100Base-TX ports. Refer to Figure 14.

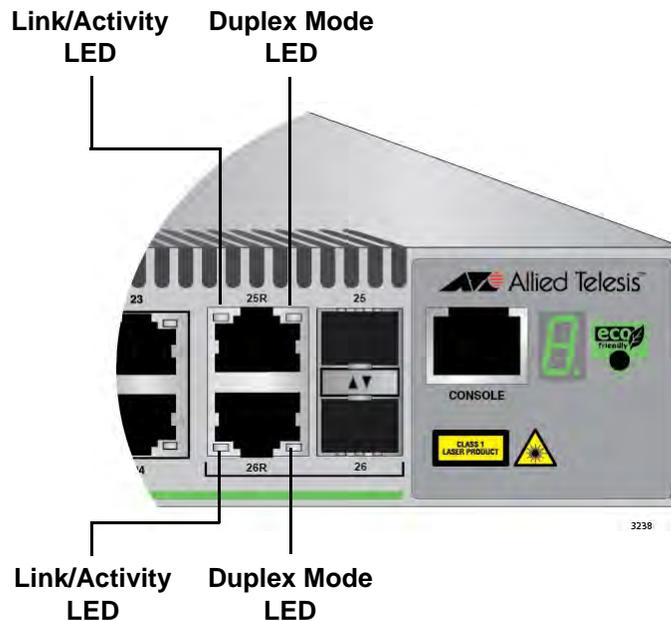


Figure 14. 10/100/1000Base-T Port LEDs

Table 12 describes the LEDs for the 10/100/1000Base-T twisted pair ports.

Table 12. 10/101000Base-T Port LEDs

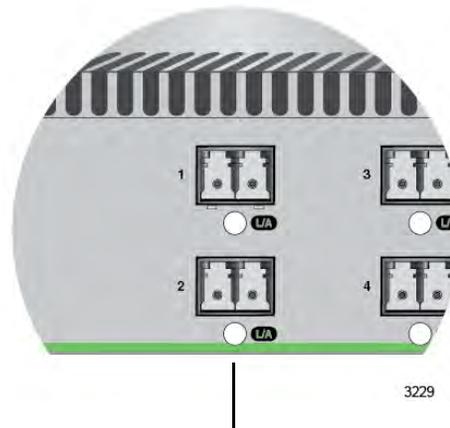
LED	State	Description
Link/Activity	Off	The port has not established a link to an end node.
	Solid green	The port has established a link to an end node.
	Flashing green	The port is receiving or transmitting packets.

Table 12. 10/101000Base-T Port LEDs (Continued)

LED	State	Description
Duplex Mode	Off	The port is operating in half-duplex mode.
	Solid green	The port is operating in full-duplex mode.

100Base-FX Port LEDs

Each 100Base-FX port on the AT-FS970M/16F8-LC, AT-FS970M/16F8-SC and AT-FS970M/24F Switches has a single LED, labeled L/A for Link/Activity.



100Base-FX Port LED

Figure 15. 100Base-FX Port LED

The 100Base-FX port LED is described in Table 13.

Table 13. 100Base-FX Port LED on the AT-FS970M/16F8-LC, AT-FS970M/16F8-SC and AT-FS970M/24F Switches

LED	State	Description
Link/Activity	Off	The port has not established a link to a network device.
	Solid green	The port has established a link to a network device.
	Flashing green	The port is receiving or transmitting packets to a network device.

SFP Slot LED Each SFP slot has one LED. Refer to Figure 16.

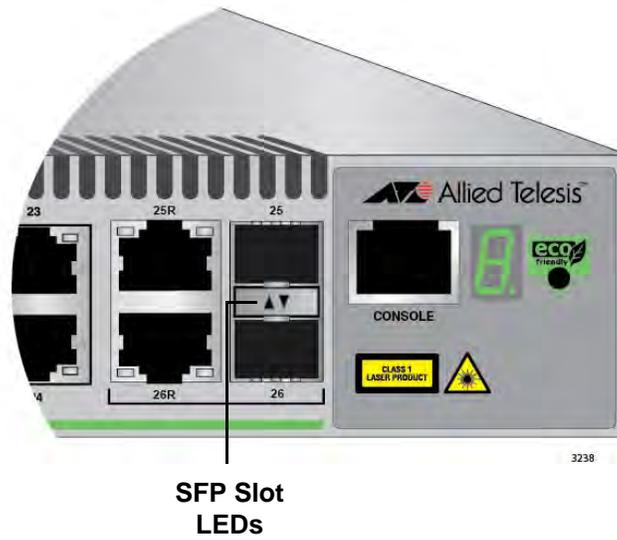


Figure 16. SFP Slot LEDs

The SFP slot LED is described in Table 14.

Table 14. SFP Slot LED

LED	State	Description
Link/Activity	Off	The SFP slot is empty or the SFP module has not established a link to a network device.
	Solid green	The SFP module has established a link to a network device.
	Flashing green	The SFP module is receiving or transmitting packets to a network device.

System ID LED The System ID LED, shown in Figure 17 on page 48, displays status information about the switch. The LED displays the number 0 during normal operations.

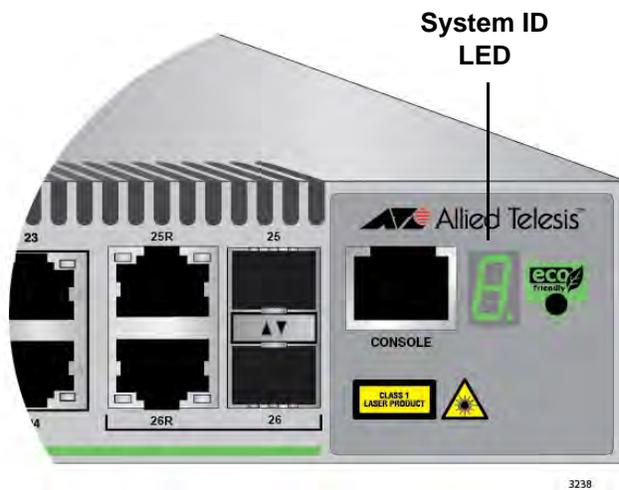


Figure 17. System LED

Console Port

The Console port is used to configure the features and parameter settings of the switch. This type of management uses serial RS-232 and is commonly referred to as local or out-of-band management because it is not conducted over your network. To perform local management, you must be at the location of the switch and must use the management cable included with the switch.

To establish a local management session with the switch, you connect a terminal or a personal computer with a terminal emulation program to the Console port, which has an RJ-45 style (8P8C) connector, using the provided management cable. The cable which has RJ-45 RJ-style (8P8C) and DB-9 (D-sub 9-pin) connectors.

The Console port is set to the following specifications:

- Default baud rate: 9600 bps (Range is 9600 to 115200 bps)
- Data bits: 8
- Parity: None
- Stop bits: 1
- Flow control: None

Note

These settings are for a DEC VT100 or ANSI terminal, or an equivalent terminal emulation program.

Power Supplies

The following switches have one power supply:

- ❑ AT-FS970M/8
- ❑ AT-FS970M/8PS
- ❑ AT-FS970M/8PS-E
- ❑ AT-FS970M/24C
- ❑ AT-FS970M/24LPS
- ❑ AT-FS970M/48

These switches have two power supplies:

- ❑ AT-FS970M/16F8-LC
- ❑ AT-FS970M/16F8-SC
- ❑ AT-FS970M/24F
- ❑ AT-FS970M/24PS
- ❑ AT-FS970M/48PS

The power supplies have separate AC connectors on the back panels. The power supplies are not field-replaceable.

The power supplies in the dual power supply switches operate in active and standby states for all hardware operations, except for PoE. One power supply is active, powering the switching functions of the device, while the second power supply operates in a redundant state. The switch automatically activates the redundant power supply if the active power supply loses power or fails. The change over is instantaneous, making it transparent to the network users. Power redundancy is available only when both AC connectors on the switch are connected to power sources.

For PoE, however, the power supplies in the AT-FS970M/24PS and AT-FS970M/48PS Switches operate in a load-sharing manner, with each power supply providing 185 watts, half the total PoE budget of the switch. The maximum 370 watts power budget of PoE is only available when both power supplies are connected to power sources.

Refer to “Technical Specifications” on page 97 for the input voltage range.



Warning

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



Warning

This unit might have more than one power cord. To reduce the risk of electric shock, disconnect all power cords before servicing the unit.

 E30

Power Connectors

The switches have either one or two power supply sockets on the back panels, depending on the number of power supplies. AC switches are powered on or off by connecting or disconnecting the power cords.

Chapter 2

Beginning the Installation

The chapter contains the following sections:

- “Reviewing Safety Precautions” on page 54
- “Choosing a Site for the Switch” on page 58
- “Unpacking the Switch” on page 59

Reviewing Safety Precautions

Please review the following safety precautions before you begin the installation procedure.

Note

The  indicates that a translation of the safety statement is available in a PDF document titled “Translated Safety Statements” posted on the Allied Telesis website at www.alliedtelesis.com.



Warning

Class 1 Laser product.  L1



Warning

Do not stare into the laser beam.  L2



Warning

Do not look directly at the fiber optic cable ends or inspect the cable ends with an optical lens.  L6



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

Note

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 Temperatures. All the switches are designed for a maximum ambient temperature of 40° degrees C, except the AT-FS970M/8PS-E Switch, which has a maximum ambient temperature of 50° degrees C.

Note

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

**Warning**

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

**Caution**

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



Caution

Risk of explosion if battery is replaced by an incorrect type. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Attention: Le remplacement de la batterie par une batterie de type incorrect peut provoquer un danger d'explosion. La remplacer uniquement par une batterie du même type ou de type équivalent recommandée par le constructeur. Les batteries doivent être éliminées conformément aux instructions du constructeur. *↪* E22



Warning

Mounting of the equipment in the rack should be such that a hazardous condition is not created due to uneven mechanical loading. *↪* E25

Note

Use dedicated power circuits or power conditioners to supply reliable electrical power to the device. *↪* E27



Warning

This unit might have more than one power cord. To reduce the risk of electric shock, disconnect all power cords before servicing the unit. *↪* E30

Note

If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than the room ambient temperature. Therefore, consideration should be given to installing the equipment in an environment compatible with the manufacturer's maximum rated ambient temperature (T_{mra}). *↪* E35



Caution

Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised. *↪* E36

**Warning**

Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuits (e.g., use of power strips).

⌚ E37

**Warning**

To reduce the risk of electric shock, the PoE ports 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. *⌚* E42

**Warning**

When you remove an SFP module from this product, the case temperature of the SFP may exceed 40° C (158° F). Exercise caution when handling with unprotected hands. *⌚* E43

Choosing a Site for the Switch

Observe these requirements when planning the installation of the switch.

- ❑ If you plan to install the switch in an equipment rack, the rack should be safely secured so that it will not tip over. Devices in a rack should be installed starting at the bottom, with the heavier devices near the bottom of the rack.
- ❑ If you plan to install the switch on a table, the table should be level and stable.
- ❑ The power outlet should be located near the switch and be easily accessible.
- ❑ The site should allow for easy access to the ports on the front of the switch, so that you can easily connect and disconnect cables, and view the port LEDs.
- ❑ The site should allow for adequate air flow around the unit and through the cooling vents on the front and rear panels. (The ventilation direction in units that have a cooling fan is from front to back, with the fan on the back panel drawing the air out of the unit.)
- ❑ The site should not expose the switch to moisture or water.
- ❑ The site should be a dust-free environment.
- ❑ The site should include dedicated power circuits or power conditioners to supply reliable electrical power to the network devices.
- ❑ The site should not be a wiring or utility box because the switch will overheat and fail from inadequate airflow.



Warning

Switches should not be stacked on top of one another on a table or desktop because that could present a personal safety hazard if you need to move or replace switches.

Unpacking the Switch

Refer to the following figures to verify the contents of the shipping containers of the switches: If any item is missing or damaged, contact your Allied Telesis sales representative for assistance.

Note

You should retain the original packaging material in the event you need to return the unit to Allied Telesis

The AT-FS970M/8, AT-FS970M/8PS, AT-FS970M/8PS-E, and AT-FS970M/24C Switches come with the components listed in Figure 18.



One 2 m (6.6 ft) local management cable with RJ-45 (8P8C) and DB-9 (D-sub 9-pin) connectors.



One short rack mounting bracket



One long rack mounting bracket



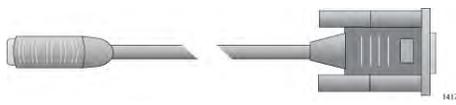
One regional AC power cord



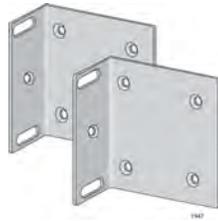
Eight bracket screws

Figure 18. Components of the AT-FS970M/8, AT-FS970M/8PS, AT-FS970M/8PS-E, and AT-FS970M/24C Switches

The AT-FS970M/24PS, AT-FS970M/24F, AT-FS970M/48PS, AT-FS970M/16F8-LC, and AT-FS970M/16F8-SC Switches come with the components listed in Figure 19.



One 2 m (6.6 ft) local management cable with RJ-45 (8P8C) and DB-9 (D-sub 9-pin) connectors.



Two rack mounting brackets



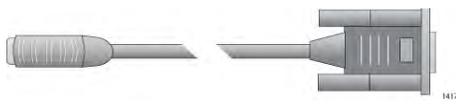
Two regional AC power cords



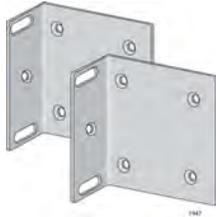
Eight bracket screws

Figure 19. Components of the AT-FS970M/24PS, AT-FS970M/24F, AT-FS970M/48PS, AT-FS970M/16F8-LC, and AT-FS970M/16F8-SC Switches

The AT-FS970M/24LPS and AT-FS970M/48 Switches come with the items listed in Figure 20 on page 61.



One 2 m (6.6 ft) local management cable with RJ-45 (8P8C) and DB-9 (D-sub 9-pin) connectors.



Two rack mounting brackets



One regional AC power cords



Eight bracket screws

Figure 20. Components of the AT-FS970M/24LPS and AT-FS970M/48 Switches

Chapter 3

Installing the Switch on a Table or in an Equipment Rack

This chapter contains the following procedures:

- “Installing the Switch on a Table or Desktop” on page 64
- “Installing the Switch in an Equipment Rack” on page 65

Installing the Switch on a Table or Desktop

You may install the switch on a table or desktop. Here are the guidelines to selecting a site:

- The table should be level and stable.
- The power outlet should be located near the switch and be easily accessible.
- The site should allow for easy access to the ports on the front of the switch, so that you can easily connect and disconnect cables, and view the port LEDs.
- The site should allow for adequate air flow around the unit and through the cooling vents on the front and rear panels. (The ventilation direction in units that have a cooling fan is from front to back, with the fans on the back panels drawing the air out of the units.)
- The site should not expose the switch to moisture or water.
- The site should be a dust-free environment.
- The site should include dedicated power circuits or power conditioners to supply reliable electrical power to the network devices.
- The rubber feet on the bottom of the switch should be left on for table or desktop installation.



Warning

Do not stack switches on top of one another on a table or desktop because that could present a personal safety hazard if you need to move or replace switches.

After placing the switch on the table or desktop, go to Chapter 4, “Cabling the Networking Ports” on page 71 to connect the network cables to the ports on the switch.

Installing the Switch in an Equipment Rack

This procedure requires the following items:

- Eight bracket screws (included with the switch)
- Two equipment rack brackets (included with the switch)
- Flat-head screwdriver (not provided)
- Cross-head screwdriver (not provided)
- Four standard equipment rack screws (not provided)

Installation guidelines can be found in “Choosing a Site for the Switch” on page 58. Here is the procedure for installing the switch in a 19-inch equipment rack.



Caution

The chassis may be heavy and awkward to lift. Allied Telesis recommends that you get assistance when mounting the chassis in an equipment rack. *GS* E28

1. Place the unit upside down on a level, secure surface. Refer to Figure 21.



Figure 21. Turning the Switch Upside Down

2. Using a flat-head screwdriver, pry the rubber feet from the bottom of the switch. Refer to Figure 22.

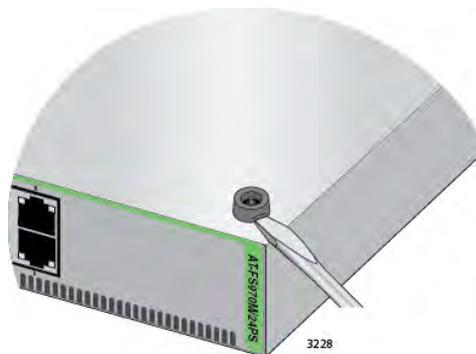


Figure 22. Removing the Rubber Feet

3. Turn the switch over.
4. For all switches except the AT-FS970M/8, AT-FS970M/8PS, AT-FS970M/8PS-E, and AT-FS970M/24C Switches, secure the two rack mount brackets to the sides of the switch using the eight bracket screws included with the unit. Figure 23 here and Figure 24 on page 67 illustrate the four possible bracket positions.



Figure 23. Attaching the Equipment Rack Brackets



Figure 24. Attaching the Equipment Rack Brackets (Continued)

The AT-FS970M/8, AT-FS970M/8PS, AT-FS970M/8PS-E, and AT-FS970M/24C Switches come with one short bracket and one long bracket. Allied Telesis recommends installing the short bracket on the right side and the long bracket on the left side, as you face the front of the unit, so that the system LEDs align with the same LEDs on other FS970M Switches in the equipment rack. The possible positions of the brackets are shown in Figure 25 on page 68 and Figure 26 on page 69.



Figure 25. Attaching the Equipment Rack Brackets



Figure 26. Attaching the Equipment Rack Brackets (Continued)

5. While another person holds the switch in the equipment rack, secure it using standard equipment rack screws (not provided). Refer to Figure 27.



Figure 27. Mounting the Switch in an Equipment Rack

Go to Chapter 4, “Cabling the Networking Ports” on page 71 to connect the network cables to the ports on the switch.

Chapter 4

Cabling the Networking Ports

This chapter contains the following procedures:

- “Cabling the Twisted Pair and Fiber Optic Ports” on page 72
- “Installing Optional SFP Transceivers” on page 74

Cabling the Twisted Pair and Fiber Optic Ports

This section contains the guidelines to cabling the twisted pair and fiber optic ports.

Twisted Pair Ports

Here are the guidelines to cabling the 10/100Base-TX and 10/100/1000Base-T twisted pair ports:

- ❑ The cable specifications for the 10/100Base-TX and 10/100/1000Base-T twisted pair ports are listed in Table 7 on page 34 and Table 8 on page 36, respectively.
- ❑ The connectors on the cables should fit snugly into the ports, and the tabs should lock the connectors into place.
- ❑ The default setting for the wiring configurations of the ports is auto-MDI/MDI-X. The default setting is appropriate for switch ports that are connected to 10/100Base-TX network devices that also support auto-MDI/MDI-X.
- ❑ The default auto-MDI/MDI-X setting is not appropriate for switch ports that are connected to 10/100Base-TX network devices that do not support auto-MDI/MDI-X and have a fixed wiring configuration. For switch ports connected to those types of network devices, you should disable auto-MDI/MDI-X and set the wiring configurations manually.
- ❑ The appropriate MDI/MDI-X setting for a switch port connected to a 10/100Base-TX network device with a fixed wiring configuration depends on the setting of the network device and whether the switch and network device are connected with straight-through or crossover cable. If you are using straight-through twisted pair cable, the wiring configurations of a port on the switch and a port on a network device must be opposite each other, such that one port uses MDI and the other MDI-X. For example, if a network device has a fixed wiring configuration of MDI, you must disable auto-MDI/MDI-X on the corresponding switch port and manually set it to MDI-X. If you are using crossover twisted pair cable, the wiring configurations of a port on the switch and a port on a network device must be the same.
- ❑ The default speed setting for the ports is Auto-Negotiation. This setting is appropriate for ports connected to network devices that also support Auto-Negotiation.
- ❑ The default speed setting of Auto-Negotiation is not appropriate for ports connected to 10/100Base-TX network devices that do not support Auto-Negotiation and have fixed speeds. For those switch ports, you should disable Auto-Negotiation and set the port's speed manually to match the speeds of the network devices.

- ❑ The 10/100/1000Base-T ports must be set to Auto-Negotiation, the default setting, to operate at 1000Mbps.
- ❑ The default duplex mode setting for the ports is Auto-Negotiation. This setting is appropriate for ports connected to network devices that also support Auto-Negotiation for duplex modes.
- ❑ The default duplex mode setting of Auto-Negotiation is not appropriate for ports connected to network devices that do not support Auto-Negotiation and have a fixed duplex mode. You should disable Auto-Negotiation on those ports and set their duplex modes manually to avoid the possibility of duplex mode mismatches. A switch port using Auto-Negotiation defaults to half-duplex if it detects that the end node is not using Auto-Negotiation, which can result in a mismatch if the end node is operating at a fixed duplex mode of full-duplex.

Fiber Optic Ports

Here are the guidelines to cabling the 100Base-FX fiber optic ports:

- ❑ The cable specifications for the 100Base-FX fiber optic ports are listed in Table 4 on page 27.
- ❑ Do not remove the dust covers from the fiber optic ports until you are ready to connect the fiber optic cables. Dust contamination can adversely affect the operations of the ports.
- ❑ The connectors on the cables should fit snugly into the ports, and the tabs should lock the connectors into place.

General Guidelines

These guidelines apply to both the twisted pair and fiber optic ports:

- ❑ If the switch will have a static or an LACP port trunk, you should create the trunk first using the switch's management software before connecting the cables of the trunk. Otherwise, a network loop will result which can adversely affect network performance.
- ❑ If your network topology contains a loop where two or more network devices can communicate with each other over more than one network path, do not connect the network cables that form the loop until after you activate one of the spanning tree protocols on the switch. Data loops can adversely affect network performance. For background information on the spanning tree protocols, refer to the *FS970M Series AlliedWare Plus Command Line Interface User's Guide*.

Installing Optional SFP Transceivers

Review the following guidelines before installing optional SFP transceivers in the switch:

- ❑ The SFP slots are part of combo ports, with 10/100/1000Base-T ports. For operational information, refer to “SFP Slots” on page 37.
- ❑ SFP transceivers can be hot-swapped while the switch is powered on. However, you should always disconnect the fiber optic cable first before removing a transceiver.
- ❑ You should install the transceiver before connecting the fiber optic cable.
- ❑ Fiber optic transceivers are dust sensitive. Always keep the plug in the optical bores when a fiber optic cable is not installed, or when you store the transceiver. When you do remove the plug, keep it for future use.
- ❑ Unnecessary removal and insertion of a transceiver can lead to premature failure.



Warning

A transceiver can be damaged by static electricity. Be sure to observe all standard electrostatic discharge (ESD) precautions, such as wearing an antistatic wrist strap, to avoid damaging the device.

Note

The cable specifications of optional SFP transceivers are found in the installation guides that ship with the devices.

To install an SFP transceiver:

1. Remove the dust plug from a transceiver slot on the switch. Refer to Figure 28 on page 75.



Figure 28. Removing the Dust Plug from an SFP Slot

2. Remove the transceiver from its shipping container and store the packaging material in a safe location.
3. If you are installing the transceiver in the top SFP slot, position the transceiver with the Allied Telesis label facing up. If you are installing the transceiver in the bottom slot, position the transceiver with the label facing down.
4. Slide the transceiver into the slot until it clicks into place, as shown in Figure 29.



Figure 29. Installing an SFP Transceiver

5. Remove the dust cover from the module, as shown in Figure 30 on page 76.



Figure 30. Removing the Dust Cover from the SFP Module

6. If the transceiver is installed in the top slot, verify that the handle is in the upright position, as shown in Figure 31. If the transceiver is installed in the bottom slot, verify that the handle is in the down position.



Figure 31. Positioning the SFP Handle in the Upright Position

7. Connect the fiber optic cable to the SFP module, as shown in Figure 32.



Figure 32. Connecting the Fiber Optic Cable to the SFP Module

8. Repeat this procedure if you have another SFP transceiver to install.

Chapter 5

Powering On the Switch

This chapter contains the following procedures:

- ❑ “Powering On an AC Switch” on page 80
- ❑ “Starting a Management Session” on page 85
- ❑ “Starting a Local Management Session” on page 88
- ❑ “Starting a Telnet Management Session” on page 90
- ❑ “Specifying Ports in the Command Line Interface” on page 91

Powering On an AC Switch

To power on an AC switch, connect the power cords to the connectors on the back panels and to appropriate power sources. The AT-FS970M/24PS, AT-FS970M/24F, AT-FS970M/48PS, AT-FS970M/16F8-LC, and AT-FS970M/16F8-SC Switches have two power supplies with separate connectors. The AT-FS970M/24C, AT-FS970M/24LPS, AT-FS970M/48, and 8-port switches have one power supply. Refer to Figure 33.



Figure 33. Plugging in the AC Power Cord

Consider the following items as you power on the switch:

- ❑ Connecting the two power cords to power sources that are on different circuits will provide power redundancy to the switch in the event a circuit fails.
- ❑ The AT-FS970M/24PS and AT-FS970M/48PS Switches support 370 watts of PoE only when both internal power supplies are connected to power sources. The switches have a PoE budget of 185 watts if just one power supply is functional. For background information, refer to “Power Supplies” on page 50.
- ❑ Refer to “Power Specifications” on page 100 for the power specifications of the switches.



Warning

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

Note

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

Monitoring the Initialization Processes

It takes a minimum of forty seconds for the switch to initialize its management software programs and features, and load the configuration file. You may monitor the progress of the initialization process by watching the LEDs on the front panel. Table 15 on page 81 provides the various LED states and the approximate time intervals of the initialization phases. The time length of phase 4, loading the configuration file, varies from a few seconds to a minute, depending on the number and complexity of the commands in the file. The System LED acts differently depending on whether the unit is powered on or reset with the RELOAD or RESET command.

Table 15. LEDs and Management Software Initialization

LEDs	Initialize Management Software		Initialize Features	Load Configuration File
	Phase 1: 15 seconds	Phase 2: 15 seconds	Phase 3: 10 seconds	Phase 4: varies
Base port LEDs	On	On	Off	Off
10/100/1000Base-T port and SFP slot LEDs	On	Off	Off	Off

Table 15. LEDs and Management Software Initialization (Continued)

LEDs	Initialize Management Software		Initialize Features	Load Configuration File
	Phase 1: 15 seconds	Phase 2: 15 seconds	Phase 3: 10 seconds	Phase 4: varies
System LED				
Power cycle	Off	Off	Flashing	On
RELOAD or RESET command	On	On	Flashing	On

The base port LEDs are on in phases 1 and 2 if they are connected to live network devices. Otherwise, they are off. The 10/100/1000Base-T port LEDs are on in phase 1 regardless of whether they are connected to active network devices.

You may also monitor the processes by connecting a terminal or computer that has a terminal emulator program, to the Console port on the master switch. You will see the messages in Figure 34 to Figure 36 on page 84.

```

CFE-NTSW-5.0.0 for BCM956218 (32bit, SP, BE, MIPS)
Build Date: Wed Jan 23 13:47:51 PDT 2014 (jwong@tiramisu)
Copyright (C) 2000, 2001, 2002, 2003, 2004, 2005 Broadcom Corporation.

Initializing Arena.
Initializing Devices.
Board : BCM956218K48
CPU type 0x2901A: 266MHz
Total memory: 0x8000000 bytes (128MB)
Total memory used by CFE: 0x87EBB000 - 0x87FFF6C0 (1328832)
Initialized Data: 0x87EFA224 - 0x87EFC4F0 (8908)
BSS Area: 0x87EFC4F0 - 0x87EFD6C0 (4560)
Local Heap: 0x87EFD6C0 - 0x87FFD6C0 (1048576)
Stack Area: 0x87FFD6C0 - 0x87FFF6C0 (8192)
Text (code) segment: 0x87EBB000 - 0x87EF9AE3 (256739)
Boot area (physical): 0x07E7A000 - 0x07EBA000
Relocation Factor: I: E82BB000 - D: E82BB000
Loader: elf Filesys: raw Dev: flash0.os-Linux File: AT! Options: (null)
Loading: 0x80001000/2341892 0x8023e000/12135086 0x80dd0aae/185714 Entry
at 0x8026c000
Starting program at 0x8026c000
    
```

Figure 34. Switch Initialization Messages

```

/usr/bin: /bin: /usr/sbin: /sbin
Starting SNMP...
Starting MainTask...

Initializing System ..... done!
Initializing Board ..... done!
Initializing Serial Interface ..... done!
Initializing Timer Library ..... done!
Initializing IPC ..... done!
Initializing Event Log ..... done!
Initializing Switch Models ..... done!
Initializing File System ..... done!
Initializing Database ..... done!
Initializing Configuration ..... done!
Initializing AW+ CLI ..... done!
Initializing Drivers ..... done!
Initializing Port ..... done!
Initializing Trunk ..... done!
Initializing Port Security ..... done!
Initializing LACP ..... done!
Initializing PORT VLAN ..... done!
Initializing Port Mirroring ..... done!
Initializing Port Statistics ..... done!
Initializing Snmp Service ..... done!
Initializing Web Service ..... done!
Initializing Monitor ..... done!
Initializing STP ..... done!
Initializing SPANNING TREE ..... done!
Initializing L2_MGMT ..... done!
Initializing LLDP_RX ..... done!
Initializing LLDP_TX ..... done!
Initializing GARP ..... done!
Initializing GARP Post Init Task ..... done!
Initializing IGMPsnoop ..... done!
Initializing SYS_MGMT ..... done!
Initializing SWITCH_MGMT ..... done!
Initializing L2APP_MGMT ..... done!
Initializing SNMP_MGMT ..... done!
Initializing Authentication ..... done!
Initializing TCPIP ..... done!
Initializing Default VLAN ..... done!
Initializing ENCO ..... done!
Initializing PKI ..... done!
Initializing PortAccess ..... done!
Initializing PAAcctRcv ..... done!
Initializing SSH ..... done!
Initializing IFM ..... done!

```

Figure 35. Switch Initialization Messages (Continued)

```
Initializing IFMV6 ..... done!
Initializing RTM ..... done!
Initializing FTAB ..... done!
Initializing FTABV6 ..... done!
Initializing ACM ..... done!
Initializing Filter ..... done!
Initializing L3_MGMT ..... done!
Initializing L3APP_MGMT ..... done!
Initializing SFLOW ..... done!
Initializing NTP ..... done!
Initializing CPU_HIST ..... done!
Initializing EStacking ..... done!
Initializing MGMT_MGMT ..... done!

Loading configuration file "boot.cfg" ..... done!

Press <ENTER> key to connect...
```

Figure 36. Switch Initialization Messages (Continued)

After the switch has initialized its management software, go to “Starting a Management Session” on page 85.

Starting a Management Session

You may use the following methods and tools to manage FS970M Switches:

- Local management
- Telnet client
- Secure shell client
- HTTP non-secure and HTTPs secure Web browser
- SNMPv1, v2C, v3

Local Management

Local management uses the Console port on the switch. It is commonly referred to as out-of-band management because the management sessions are not conducted over your network. Listed here are the requirements for local management:

- A terminal or computer with a terminal emulator program
- The management cable included with the switch.

This management method uses the command line interface, which gives you access to all of the features and parameters on the switch. For instructions on how to start a local management session, refer to “Starting a Local Management Session” on page 88.

Telnet Management

The switch has a Telnet server. You may use the server to manage the unit over your network with the Telnet application protocol. Commonly referred to as in-band management because it is conducted over the network, this management method has these requirements:

- Your management workstation must have a Telnet client.
- The Telnet server on the switch has to be activated. This is the server’s default setting.
- The switch must have an IP address. You may use the factory 169.254.1.1 address assigned to the Default VLAN, which contains all of the ports on the switch. For instructions on how to assign the switch a different address, refer to the *FS970M Series AlliedWare Plus Command Line Interface User’s Guide*.
- You need to assign your management workstation an IP address in the 169.254.*n.n* subnet or your workstation must have access to that subnet through routing devices.

Telnet management uses the Command Line Interface, giving you access to all of the features and parameter settings on the switch. For instructions on how to start a Telnet management session on the switch, refer to “Starting a Telnet Management Session” on page 90.

Telnet management sessions are not secure and are vulnerable to snooping because the packets exchanged between the switch and your workstation are sent in plain text. The security of the switch may be jeopardized if an intruder captures the packet containing your username and password. For secure remote management, use the secure shell protocol.

Secure Shell Management

Secure shell management is similar to Telnet management in that you may use it, together with the Command Line Interface, to manage all of the features and functions of the switch, from a workstation on your network. The difference is that this management method encrypts the packets exchanged by your computer and the switch to protect your management sessions.

Here are the requirements for SSH management:

- Your management workstation must have an SSH client.
- The SSH server on the switch has to be activated. The server's default setting is disabled.
- You have to create an encryption key on the switch.
- The switch must have an IP address. You may use the factory 169.254.1.1 address assigned to the Default VLAN.
- You need to assign your management workstation an IP address in the 169.254.*n.n* subnet or your workstation must have access to that subnet through routing devices.

For instructions on how to configure the switch for SSH management, refer to the *FS970M Series AlliedWare Plus Command Line Interface User's Guide*.

Web Browser Management

Yet another way to remotely manage the switch is with a web browser. A special web browser interface, featuring both non-secure (HTTP) and secure (HTTPS) operation, lets you monitor and configure many of the switch's features from a series of windows. The interface, however, may only be used to configure a subset of the features. To configure those features the web browser interface does not support, you have to use the command line interface from another management method.

Here are the requirements for non-secure HTTP web browser management:

- Your management workstation must have a web browser.
- The web browser server on the switch has to be activated. This is the default setting in the default BOOT.CFG and QSTART.CFG files.
- The switch must have an IP address. You may use the factory 169.254.1.1 address assigned to the Default VLAN.

- ❑ You need to assign your management workstation an IP address in the 169.254.*n.n* subnet or your workstation must have access to that subnet through routing devices.

Refer to the *FS970M Series AlliedWare Plus Command Line Interface User's Guide* for instructions on how to configure the switch for secure HTTPS web browser management.

SNMP

Refer to the *FS970M Series AlliedWare Plus Command Line Interface User's Guide* for instructions on how to configure the switch for SNMP management. The switch does not have any default SNMP community strings.

Starting a Local Management Session

This procedure requires a terminal or a terminal emulator program and the management cable that comes with the switch. Perform the following procedure to start a local management session on the switch:

1. Connect the RJ-45 connector on the management cable to the Console port on the front panel of the switch.



Figure 37. Connecting the Management Cable to the Console Port

2. Connect the other end of the cable to an RS-232 port on a terminal or PC with a terminal emulator program.
3. Configure the terminal or terminal emulator program as follows:
 - Baud rate: 9600 bps (The baud rate of the Console Port is adjustable from 1200 to 115200 bps. The default is 9600 bps.)
 - Data bits: 8
 - Parity: None
 - Stop bits: 1
 - Flow control: None

Note

The port settings are for a DEC VT100 or ANSI terminal, or an equivalent terminal emulator program.

4. Press Enter.

You are prompted for a user name and password.

5. Enter the user name and password to log on the switch. If this is the initial management session of the switch, enter “manager” as the user name “friend” as the password. The user name and password are case sensitive.

The local management session starts when the AlliedWare Plus™ command line prompt, shown in Figure 38. is displayed.



```
awpl us>
```

Figure 38. AlliedWare Plus Command Line Prompt

For information on the command line interface, refer to the *FS970M Series AlliedWare Plus Command Line Interface User's Guide*.

Starting a Telnet Management Session

To perform this procedure, you must have Telnet client software on your computer. This procedure assumes that you will be connecting your computer to a twisted pair port on the switch. But you may use a fiber optic port. To start a Telnet management session on the switch using the factory IP address, perform the following procedure:

1. Assign your computer the IP address 169.254.*n.n* with the subnet mask 255.255.0.0. The variable *n* can be from 1 to 255. You may not use the switch's IP address 169.254.1.1. Refer to your computer's documentation for instructions on how to set the address.

Note

If your computer is running a DHCP client, it automatically defaults to an 169.254.*n.n* address if it does not receive a response from a DHCP server. To have the DHCP client assign the address, disconnect your computer from your network, power it on, wait for the DHCP client to generate the IP address 169.254.*n.n*, and then connect the computer to your new FS970M Series switch.

2. Connect a twisted pair cable to one of the networking ports on the switch. You may connect the cable to any of the ports, except the Console port.
3. Connect the other end of the cable to the Ethernet port on your computer.
4. Start the Telnet client on your computer and specify the switch's IP address, 169.254.1.1.

You are prompted for a user name and password.

5. Enter the user name and password to log on the switch. If this is the initial management session of the switch, enter "manager" as the user name "friend" as the password. The user name and password are case sensitive.

The local management session starts when the AlliedWare Plus™ command line prompt, shown in Figure 38 on page 89, is displayed. For information on the command line interface, refer to the *FS970M Series AlliedWare Plus Command Line Interface User's Guide*.

Specifying Ports in the Command Line Interface

The command line interface of the Local, Telnet, and SSH management methods gives you the ability to configure all the features and parameters on the switch. Many of the commands have the PORT parameter, which you use to identify the networking ports on the switch. This parameter has the following format:

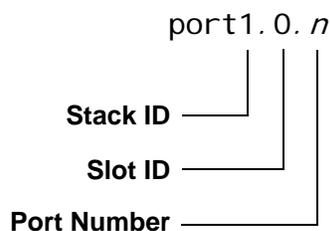


Figure 39. PORT Parameter in the Command Line Interface

The first number is the switch's stack ID number. This number is always 1 for FS970M Series switches because they are not stacking switches.

The slot ID value, which is used to specify slot numbers in a multi-module chassis, also does not apply to the FS970M Series switches and is always 0.

The third value is a port number on the switch. You may specify only one port number in a PORT parameter, but you may specify more than one PORT parameter in many of the commands where the parameter is supported.

Here is an example of the PORT parameter. It uses the INTERFACE command to enter the Port Interface mode for ports 15 and 17:

```
awpl us> enable
awpl us# configure terminal
awpl us(config)# interface port1.0.15, port1.0.17
```

You can also specify port ranges. This example displays the port settings for ports 21 to 23:

```
awpl us# show interface port1.0.21-port1.0.23
```

Note that you must include the prefix "port1.0." in the last number of a range.

You can also combine individual ports and port ranges in the same command, as illustrated in these commands, which enter the Port Interface mode for ports 5 to 11 and ports 16 and 18:

```
awpl us> enable  
awpl us# configure terminal  
awpl us(config)# interface port1.0.5-port1.0.11, port1.0.16,  
port1.0.18
```

For instructions on the command line interface and the PORT parameter, refer to the *FS970M Series AlliedWare Plus Command Line Interface User's Guide*.

Chapter 6

Troubleshooting

This chapter contains suggestions on how to troubleshoot the switch if a problem occurs.

Note

For further assistance, please contact Allied Telesis Technical Support at www.alliedtelesis.com/support.

Problem 1: All the LEDs on the switch are off.

Solutions: Try the following:

- ❑ Press the eco-friendly button on the front panel to see if the switch is operating in the low power mode with the LEDs off. You can also toggle the LEDs off and on with the ECOFRIENDLY LED and NO ECOFRIENDLY LED commands in the Global Configuration mode of the command line interface.
- ❑ Verify that the power cord is securely connected to the power source and the AC connector on the back panel of the switch.
- ❑ Verify that the power outlet has power by connecting another device to it.
- ❑ Try connecting the unit to another power source.
- ❑ Try a different power cord.
- ❑ Verify that the voltage from the power source is within the required levels for your region.

Problem 3: A twisted pair port on the switch is connected to a network device but the port's LINK/ACT LED is off.

Solutions: The port is unable to establish a link to a network device. Try the following:

- ❑ Verify that the cable is securely connected to the ports on the switch and network device.
- ❑ Verify that the port is connected to the correct twisted pair cable.
- ❑ 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 the twisted pair cable does not exceed 100 meters (328 feet).
- ❑ Verify that you are using the appropriate category of twisted pair cable. The cable types are listed in Table 7 on page 34 for the 10/100Base-TX ports and Table 8 on page 36 for the 10/100/1000Base-T ports.

Note

A 1000Base connection may require five to ten seconds to establish a link.

Problem 4: The LINK/ACT LED for an SFP transceiver is off.

Solutions: The fiber optic port on the transceiver is unable to establish a link to a network device. Try the following:

- ❑ Check that the SFP module is fully inserted in the slot.
- ❑ Verify that the remote network device connected to the fiber optic port is powered on and operating properly.
- ❑ Verify that the fiber optic cable is securely connected to the ports on the SFP module and remote network device.
- ❑ Verify that the operating specifications of the fiber optic ports on the SFP transceiver and the remote network device are compatible.
- ❑ Verify that the correct type of fiber optic cabling is being used.
- ❑ Verify that the port is connected to the correct fiber optic cable.
- ❑ 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 network device.
- ❑ Use the switch's management software to verify that the port is enabled.
- ❑ If the remote network device is a managed device, use its management firmware to determine whether its port is enabled.
- ❑ Test the attenuation of both directions on the fiber optic cable with a fiber optic tester to determine whether the optical signal is too weak (sensitivity) or too strong (maximum input power).

Problem 5: Network performance between a twisted pair port on the switch and a network device is slow.

Solution: There might be a duplex mode mismatch between the port and the network device. This 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, adjust the duplex mode of the port on the network device or switch so that both ports are using the same duplex mode.

Problem 6: The switch functions intermittently.

Solutions: Check the system hardware status through the management software:

- ❑ Use the SHOW SYSTEM ENVIRONMENT command in the Privileged Exec mode to verify that the input voltage from the power source to the switch is stable and within the approved operating range. The unit will shutdown if the input voltage fluctuates above or below the approved operating range.
- ❑ For switches that have a ventilation fan, use the SHOW SYSTEM ENVIRONMENT command in the Privileged Exec mode to verify that it is operating correctly.
- ❑ Verify that the location of the switch provides adequate airflow. The unit will shutdown if it is in danger of overheating.

Appendix A

Technical Specifications

This section contains the following product technical specifications:

- "Physical Specifications" on page 97
- "Environmental Specifications" on page 99
- "PoE Power Specifications" on page 100
- "Power Specifications" on page 100
- "Certifications" on page 102
- "RJ-45 Twisted Pair Port Pinouts" on page 102
- "Fiber Optic Port Specifications" on page 104
- "RJ-45 Style Serial Console Port Pinouts" on page 106

Physical Specifications

Dimensions (H x W x D)

Table 16. Product Dimensions

Model	Dimensions
AT-FS970M/8 AT-FS970M/8PS AT-FS970M/8PS-E AT-FS970M/24C	33.0 cm x 20.3 cm x 4.4 cm (13.0 in. x 8.1 in. x 1.7 in.)
AT-FS970M/48 AT-FS970M/24F	44.1 cm x 29.1 cm x 4.4 cm (17.3 in. x 11.5 in. x 1.7 in.)
AT-FS970M/24LPS AT-FS970M/24PS AT-FS970M/48PS AT-FS970M/16F8-LC AT-FS970M/16F8-SC	44.1 cm x 32.2 cm x 4.4 cm (17.3 in. x 12.7 in. x 1.7 in.)

Weights

Table 17. Product Weights

Model	Weight
AT-FS970M/8	1.9 kg (4.2 lb.)
AT-FS970M/8PS	2.3 kg (5.1 lb.)
AT-FS970M/8PS-E	2.3 kg (5.1 lb.)
AT-FS970M/16F8-LC	4.4 kg (9.75 lb.)
AT-FS970M/16F8-SC	4.4 kg (9.75 lb.)
AT-FS970M/24C	2.2 kg (4.8 lb.)
AT-FS970M/24F	4.4 kg (9.75 lb.)
AT-FS970M/24LPS	4.4 kg (9.75 lb.)
AT-FS970M/24PS	5.0 kg (11.0 lb.)
AT-FS970M/48	4.0 kg (8.9 lb.)
AT-FS970M/48PS	5.6 kg (12.3 lb.)

Ventilation

Table 18. Ventilation Requirements

Description	Specification
Recommended Minimum Ventilation on All Sides	10 cm (4.0 in)

Environmental Specifications

Table 19. Environmental Specifications for all Switches Except the AT-FS970M/8PS-E Switch

Description	Specification
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 Nonoperating Altitude	4,000 m (13,100 ft)

Table 20. Environmental Specifications for the AT-FS970M/8PS-E Switch

Description	Specification
Operating Temperature	0° C to 50° C (32° F to 122° 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 Nonoperating Altitude	4,572 m (15,100 ft)

PoE Power Specifications

Table 21. PoE Power Specifications

Product	PoE Power Available	Maximum PoE Ports Supported		
		IEEE 802.3af Class 2	IEEE 802.3af Class 3	IEEE 802.3af Class 4
AT-FS970M/8PS	185 watts	8	8	6
AT-FS970M/8PS-E	185 watts	8	8	6
AT-FS970M/24LPS	185 watts	24	12	6
AT-FS970M/24PS	370 watts	24	24	12
AT-FS970M/48PS	370 watts	48	24	12

Power Specifications

Maximum Power Consumptions

Table 22. Maximum Power Consumptions

Model	Max Power Consumption
AT-FS970M/8	9.1 watts
AT-FS970M/8PS	230 watts
AT-FS970M/8PS-E	230 watts
AT-FS970M/16F8-LC	22 watts
AT-FS970M/16F8-SC	22 watts
AT-FS970M/24C	18.3 watts
AT-FS970M/24F	22 watts
AT-FS970M/24LPS	230 watts
AT-FS970M/24PS	460 watts
AT-FS970M/48	23.2 watts
AT-FS970M/48PS	463 watts

Input Voltages

Table 23. Input Voltages

Model	Specification
AT-FS970M/8	AC model: 100-240 VAC, 1.0 A maximum, 50/60 Hz
AT-FS970M/8PS	AC model: 100-240 VAC, 3.0 A maximum, 50/60 Hz per input
AT-FS970M/8PS-E	AC model: 100-240 VAC, 3.0 A maximum, 50/60 Hz per input
AT-FS970M/16F8-LC	AC model: 100-240 VAC, 1.0 A maximum, 50/60 Hz per input
AT-FS970M/16F8-SC	AC model: 100-240 VAC, 1.0 A maximum, 50/60 Hz per input
AT-FS970M/24C	AC model: 100-240 VAC, 1.0 A maximum, 50/60 Hz per input
AT-FS970M/24F	AC model: 100-240 VAC, 1.0 A maximum, 50/60 Hz per input
AT-FS970M/24LPS	AC model: 100-240 VAC, 1.0 A maximum, 50/60 Hz per input
AT-FS970M/24PS	AC model: 100-240 VAC, 3.0 A maximum, 50/60 Hz per input
AT-FS970M/48	AC model: 100-240 VAC, 1.0 A maximum, 50/60 Hz per input
AT-FS970M/48PS	AC model: 100-240 VAC, 3.0 A maximum, 50/60 Hz per input

Certifications

Table 24. Product Certifications

Description	Certification
EMI (Emissions)	FCC Class A, EN55022 Class A, EN61000-3-2, EN61000-3-3, VCCI Class A, CISPR Class A, C-TICK, CE
EMC (Immunity)	EN55024
Electrical and Laser Safety	EN60950-1 (TUV), UL 60950-1 (CULUS), EN60825
Compliance Marks	CE, CULUS, TUV, C-Tick

RJ-45 Twisted Pair Port Pinouts

Figure 40 illustrates the pin layout of the RJ-45 connectors and ports.

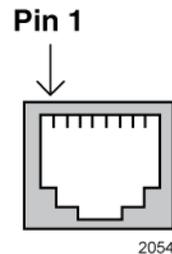


Figure 40. RJ-45 Socket Pin Layout (Front View)

Table 25 lists the pin signals for 10 and 100 Mbps.

Table 25. Pin Signals for 10 and 100 Mbps

Pin	MDI Signal	MDI-X Signal
1	TX+	RX+
2	TX-	RX-
3	RX+	TX+
4	Not used	Not used

Table 25. Pin Signals for 10 and 100 Mbps (Continued)

Pin	MDI Signal	MDI-X Signal
5	Not used	Not used
6	RX-	TX-
7	Not used	Not used
8	Not used	Not used

Table 26 lists the pin signals when a port operating at 1000 Mbps.

Table 26. Pin Signals for 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 -

Fiber Optic Port Specifications

Table 27 lists the specifications of the 100Base-FX fiber optic ports on the AT-FS970M/16F8-SC Switch.

Table 27. Fiber Optic Port Specifications for the AT-8100S/16F8-SC Switch

General	
Maximum Distance	2 km
Fiber Optic Cable	50/125 or 62.5/125 μm (core/cladding) multimode fiber optic cable
Transmitter	
Wavelength	1310 nm
Output optical power with 50/125 μm (core/cladding) multimode fiber optic cable (BOL)	minimum: -22.5 dBm maximum: -14 dBm
Output optical power with 62.5/125 μm (core/cladding) multimode fiber optic cable (BOL)	minimum: -19 dBm maximum: -14 dBm
Receiver	
Wavelength	1310 nm
Sensitivity	Maximum: -31.8 dBm
Maximum Input Power	Minimum: -14 dBm

Table 28 lists the specifications of the 100Base-FX fiber optic ports on the AT-FS970M/16F8-LC and AT-FS970M/24F Switches.

Table 28. Fiber Optic Port Specifications for the AT-FS970M/16F8-LC, and AT-FS970M/24F Switches

General	
Maximum Distance	2 km
Fiber Optic Cable	50/125 or 62.5/125 μm (core/cladding) multimode fiber optic cable
Transmitter	
Wavelength	1310 nm
Output optical power with 50/125 μm (core/cladding) multimode fiber optic cable (BOL)	Minimum: -23.5 dBm Maximum: -14 dBm
Output optical power with 62.5/125 μm (core/cladding) multimode fiber optic cable (BOL)	Minimum: -20 dBm Maximum: -14 dBm
Receiver	
Wavelength	1310 nm
Sensitivity	Maximum: -31 dBm
Maximum Input Power	Minimum: -8 dBm

RJ-45 Style Serial Console Port Pinouts

Table 29 lists the pin signals of the RJ-45 style serial Console port.

Table 29. RJ-45 Style Serial Console Port Pin Signals

Pin	Signal
1	Looped to pin 8.
2	Looped to pin 7.
3	Transmit Data
4	Ground
5	Ground
6	Receive Data
7	Looped to pin 2.
8	Looped to pin 1.