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ES3528

Layer 2 Metro Access Switch

Installation Guide

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ES3528 Layer 2 Metro Access Switch

Layer 2 Switch

with 24 Fast Ethernet Ports (RJ-45),

2 Gigabit Combination Ports (RJ-45/SFP),

2 Gigabit Extender Module Slots (RJ-45/SFP),

1 Fast Ethernet Management Port (RJ-45)

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Compliances and Safety Warnings

FCC - Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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

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

Industry Canada - Class A

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

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

Japan VCCI Class A

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CE Mark Declaration of Conformance for EMI and Safety (EEC)

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

- RFI Emission:
- Limit class A according to EN 55022:1998
 - Limit class A for harmonic current emission according to EN 61000-3-2/1995
 - Limitation of voltage fluctuation and flicker in low-voltage supply system according to EN 61000-3-3/1995
- Immunity:
- Product family standard according to EN 55024:1998
 - Electrostatic Discharge according to EN 61000-4-2:1995 (Contact Discharge: ± 4 kV, Air Discharge: ± 8 kV)
 - Radio-frequency electromagnetic field according to EN 61000-4-3:1996 (80 - 1000 MHz with 1 kHz AM 80% Modulation: 3 V/m)
 - Electrical fast transient/burst according to EN 61000-4-4:1995 (AC/DC power supply: ± 1 kV, Data/Signal lines: ± 0.5 kV)
 - Surge immunity test according to EN 61000-4-5:1995 (AC/DC Line to Line: ± 1 kV, AC/DC Line to Earth: ± 2 kV)
 - Immunity to conducted disturbances, Induced by radio-frequency fields: EN 61000-4-6:1996 (0.15 - 80 MHz with 1 kHz AM 80% Modulation: 3 V/m)
 - Power frequency magnetic field immunity test according to EN 61000-4-8:1993 (1 A/m at frequency 50 Hz)
 - Voltage dips, short interruptions and voltage variations immunity test according to EN 61000-4-11:1994 (>95% Reduction @10 ms, 30% Reduction @500 ms, >95% Reduction @5000 ms)
- LVD:
- EN 60950-1:2001

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

Attention: Les raccordeurs ne sont pas utilisés pour le système téléphonique!

Australia AS/NZS 3548 (1995) - Class A



ACN 066 352 010

Safety Compliance

Warning: Fiber Optic Port Safety



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

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



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

Warnhinweis: Faseroptikanschlüsse - Optische Sicherheit



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

Power Cord Safety

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

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

- The unit must be connected to an earthed (grounded) outlet to comply with international safety standards.
- Do not connect the unit to an A.C. outlet (power supply) without an earth (ground) connection.
- The appliance coupler (the connector to the unit and not the wall plug) must have a configuration for mating with an EN 60320/IEC 320 appliance inlet.
- The socket outlet must be near to the unit and easily accessible. You can only remove power from the unit by disconnecting the power cord from the outlet.
- This unit operates under SELV (Safety Extra Low Voltage) conditions according to IEC 60950. The conditions are only maintained if the equipment to which it is connected also operates under SELV conditions.
- When using an AC-power module, the customer must provide a 20 A listed circuit breaker on the branch circuit. When using a DC-power conversion module, a listed circuit breaker or other appropriate disconnect device must be provided as part of the building installation.

France and Peru only

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

[†] Impédance à la terre

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

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

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

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

- Ne branchez pas votre appareil sur une prise secteur (alimentation électrique) lorsqu'il n'y a pas de connexion de mise à la terre (mise à la masse).
- Vous devez raccorder ce groupe à une sortie mise à la terre (mise à la masse) afin de respecter les normes internationales de sécurité.
- Le coupleur d'appareil (le connecteur du groupe et non pas la prise murale) doit respecter une configuration qui permet un branchement sur une entrée d'appareil EN 60320/IEC 320.
- La prise secteur doit se trouver à proximité de l'appareil et son accès doit être facile. Vous ne pouvez mettre l'appareil hors circuit qu'en débranchant son cordon électrique au niveau de cette prise.
- L'appareil fonctionne à une tension extrêmement basse de sécurité qui est conforme à la norme IEC 60950. Ces conditions ne sont maintenues que si l'équipement auquel il est raccordé fonctionne dans les mêmes conditions.

France et Pérou uniquement:

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

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

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

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

- Das Gerät sollte nicht an eine ungeerdete Wechselstromsteckdose angeschlossen werden.
- Das Gerät muß an eine geerdete Steckdose angeschlossen werden, welche die internationalen Sicherheitsnormen erfüllt.
- Der Gerätestecker (der Anschluß an das Gerät, nicht der Wandsteckdosenstecker) muß einen gemäß EN 60320/IEC 320 konfigurierten Geräteeingang haben.
- Die Netzsteckdose muß in der Nähe des Geräts und leicht zugänglich sein. Die Stromversorgung des Geräts kann nur durch Herausziehen des Gerätenetzkabels aus der Netzsteckdose unterbrochen werden.
- Der Betrieb dieses Geräts erfolgt unter den SELV-Bedingungen (Sicherheitskleinstspannung) gemäß IEC 60950. Diese Bedingungen sind nur gegeben, wenn auch die an das Gerät angeschlossenen Geräte unter SELV-Bedingungen betrieben werden.

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

PSE Alarm

本製品に同梱いたしております電源コードセットは、本製品専用です。本電源コードセットは、本製品以外の製品並びに他の用途でご使用いただくことは出来ません。製品本体に同梱された電源コードセットを利用し、他製品の電源コードセットを使用しないで下さい。

Warnings and Cautionary Messages

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

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

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

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

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

Caution: Do not plug a phone jack connector in the RJ-45 port. This may damage this device. Les raccordeurs ne sont pas utilisé pour le système téléphonique!

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

Warnings (in German)

Achtung: Dieses Produkt enthält keine Teile, die eine Wartung vom Benutzer benötigen.

Achtung: Installation und Deinstallation des Gerätes müssen von qualifiziertem Servicepersonal durchgeführt werden.

Achtung: Wenn das Gerät an eine Steckdose angeschlossen wird, muß der Masseanschluß am dreipoligen Netzstecker mit Schutzterde verbunden werden, um elektrische Gefahren zu vermeiden.

Achtung: Dieses Gerät nutzt Laser zur Signalübertragung über Glasfasern. Die Laser entsprechen den Anforderungen an eine Lasereinrichtung der Klasse 1 und sind durch ihre Bauart im normalen Betrieb sicher für die Augen. Trotzdem sollte niemals direkt in den einen Übertragungskanal geblickt werden, wenn er eingeschaltet ist.

Environmental Statement

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

- Adherence to national legislation and regulations on environmental production standards.
- Conservation of operational resources.
- Waste reduction and safe disposal of all harmful un-recyclable by-products.
- Recycling of all reusable waste content.
- Design of products to maximize recyclables at the end of the product's life span.
- Continual monitoring of safety standards.

End of Product Life Span

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

Manufacturing Materials

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

Documentation

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

Purpose

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

Audience

This guide is for system administrators with a working knowledge of network management. You should be familiar with switching and networking concepts.

Zielgruppe Dieser Anleitung ist fuer Systemadministratoren mit Erfahrung im Netzwerkmanagement. Sie sollten mit Switch- und Netzwerkkonzepten vertraut sein.

Related Publications

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

The *Management Guide*

Also, as part of both switches' firmware, there is an online web-based help that describes all management related features.

Contents

Chapter 1: Introduction	1-1
Overview	1-1
Switch Architecture	1-1
Network Management Options	1-2
Description of Hardware	1-2
100BASE-TX and 1000BASE-T Ports	1-2
100BASE-TX Management Port	1-2
Console Port	1-3
SFP Slots	1-3
Alarm Interface Port	1-4
Port and System Status LEDs	1-4
Fan Tray	1-5
Power Modules	1-6
Optional Media Extender Module	1-7
1000BASE Combo Module	1-7
Features and Benefits	1-7
Connectivity	1-7
Expandability	1-8
Performance	1-8
Management	1-8

Chapter 2: Network Planning	2-1
Introduction to Switching	2-1
Application Examples	2-2
Collapsed Backbone	2-2
Network Aggregation Plan	2-3
Remote Connections with Fiber Cable	2-4
Making VLAN Connections	2-5
Application Notes	2-6

Chapter 3: Installing the Switch	3-1
Selecting a Site	3-1
Ethernet Cabling	3-1
Equipment Checklist	3-2
Package Contents	3-2
Optional Rack-Mounting Equipment	3-2
Mounting	3-3
Rack Mounting	3-3

Desktop or Shelf Mounting	3-4
Installing an Optional Module into the Switch	3-5
Installing an Optional SFP Transceiver	3-6
Grounding the Chassis	3-6
Connecting to a Power Source	3-7
Connecting DC Power	3-7
Connecting AC Power	3-9
Connecting to the Console Port	3-10
Wiring Map for Serial Cable	3-10
Connecting to the Alarm Port	3-11
Wiring Map for Alarm Cable	3-11
 Chapter 4: Making Network Connections	 4-1
Connecting Network Devices	4-1
Twisted-Pair Devices	4-1
Cabling Guidelines	4-1
Connecting to PCs, Servers, Hubs and Switches	4-2
Network Wiring Connections	4-2
Fiber Optic SFP Devices	4-3
Connectivity Rules	4-4
1000BASE-T Cable Requirements	4-4
1000 Mbps Gigabit Ethernet Cable Lengths	4-5
100 Mbps Fast Ethernet Cable Lengths	4-5
10 Mbps Ethernet Cable Lengths	4-6
Cable Labeling and Connection Records	4-6
 Appendix A: Troubleshooting	 A-1
Diagnosing Switch Indicators	A-1
Power and Cooling Problems	A-1
Installation	A-2
In-Band Access	A-2
 Appendix B: Cables	 B-1
Twisted-Pair Cable and Pin Assignments	B-1
10BASE-T/100BASE-TX Pin Assignments	B-1
Straight-Through Wiring	B-2
Crossover Wiring	B-3
1000BASE-T Pin Assignments	B-4
1000BASE-T Cable Requirements	B-4
Cable Testing for Existing Category 5 Cable	B-4
Adjusting Existing Category 5 Cabling to Run 1000BASE-T	B-5
Fiber Standards	B-5

Appendix C: Specifications	C-1
Physical Characteristics	C-1
Switch Features	C-2
Management Features	C-3
Standards	C-3
Compliances	C-3
Extender Modules	C-4
Gigabit Extender Module (RJ-45/SFP)	C-4

Appendix D: German Instructions	D-1
Eine Site Auswählen (Selecting a Site)	D-1
Montage (Rack Mounting Instructions)	D-2
Rack-Montage	D-2
Das Erden des Gehäuses (Grounding the Chassis)	D-2
Anschluss an eine Stromquelle	
(Connecting to a Power Source)	D-3
Anschluss an Gleichstrom	D-3
Wechselstromanschluss	D-5

Glossary

Index

Tables

Table 1-1	Supported SFP Transceivers	1-3
Table 1-2	Port and System Status LEDs	1-5
Table 3-1	Serial Cable Wiring	3-10
Table 3-2	Alarm Cable Wiring	3-11
Table 4-1	Maximum 1000BASE-T Gigabit Ethernet Cable Length	4-5
Table 4-2	Maximum 1000BASE-SX Gigabit Ethernet Cable Length	4-5
Table 4-3	Maximum 1000BASE-LX Gigabit Ethernet Cable Length	4-5
Table 4-4	Maximum 1000BASE-LH Gigabit Ethernet Cable Length	4-5
Table 4-5	Maximum 1000BASE-BX10-U Gigabit Ethernet Cable Length	4-5
Table 4-6	Maximum Fast Ethernet Cable Length	4-5
Table 4-7	Maximum Ethernet Cable Length	4-6
Table A-1	Troubleshooting Chart	A-1
Table B-1	10/100BASE-TX MDI and MDI-X Port Pinouts	B-2
Table B-2	1000BASE-T MDI and MDI-X Port Pinouts	B-4

Figures

Figure 1-1	Front Panel	1-1
Figure 1-2	Port and System LEDs	1-4
Figure 1-3	Fan Tray	1-6
Figure 1-4	Optional Power Modules	1-6
Figure 1-5	Single-Port 1000BASE-T/SFP Combo Module	1-7
Figure 2-1	Collapsed Backbone	2-2
Figure 2-2	Network Aggregation Plan	2-3
Figure 2-3	Remote Connections with Fiber Cable	2-4
Figure 2-4	Making VLAN Connections	2-5
Figure 3-1	RJ-45 Connections	3-2
Figure 3-2	Attaching the Brackets	3-3
Figure 3-3	Installing the Switch in a Rack	3-4
Figure 3-4	Attaching the Adhesive Feet	3-4
Figure 3-5	Installing an Optional Module	3-5
Figure 3-6	Inserting an SFP Transceiver into a Slot	3-6
Figure 3-7	DC Plug Connections	3-8
Figure 3-8	AC Power Receptacle	3-9
Figure 3-9	Serial Port (RJ-45) Pin-Out	3-10
Figure 3-10	Alarm Port (D-15) Pin-Out	3-11
Figure 3-11	External Alarm I/O Connections	3-12
Figure 4-1	Making Twisted-Pair Connections	4-2
Figure 4-2	Network Wiring Connections	4-3
Figure 4-3	Making Connections to SFP Transceivers	4-4
Figure B-1	RJ-45 Connector Pin Numbers	B-1
Figure B-2	Straight-through Wiring	B-2
Figure B-3	Crossover Wiring	B-3
Figure D-1	Gleichstromanschlüsse	D-4
Figure D-2	Wechselstromanschluss	D-6

Chapter 1: Introduction

Overview

This device is an intelligent Layer 2 switch with 24 10/100BASE-TX ports for subscriber access to the data network, two Gigabit Ethernet combination ports* for uplink traffic. The uplink ports are implemented as 10/100/1000BASE-T ports shared with SFP transceiver slots (see Figure 1-1, Ports 27-28). The switch also includes one 10/100BASE-TX port for dedicated management access (which can be operated outside the data channel), and two slots for optional Gigabit Ethernet combination modules (one 10/100BASE-TX port shared with an SFP slot).

The switch includes an SNMP-based management agent embedded on the main board, which supports both in-band and out-of-band access.

This switch can easily tame your network with full support for Spanning Tree Protocol, Multicast Switching, and Virtual LANs. It brings order to poorly performing networks by segregating them into separate broadcast domains with IEEE 802.1Q compliant VLANs, empowers multimedia applications with multicast switching and CoS services.

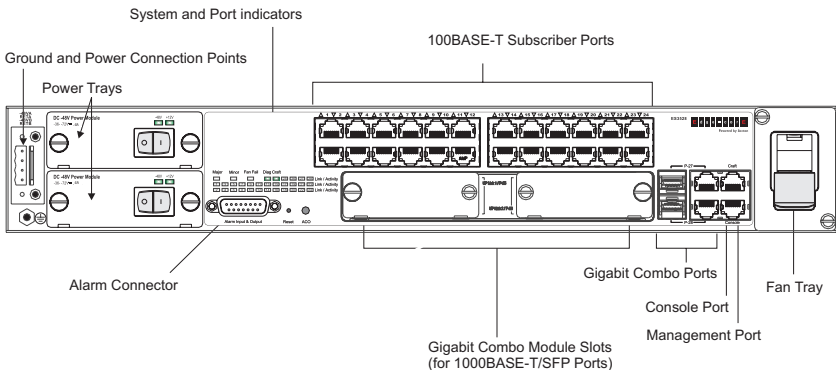


Figure 1-1 Front Panel

Switch Architecture

This switch employs a wire-speed, non-blocking switching fabric. This permits simultaneous wire-speed transport of multiple packets at low latency on all ports. The switch also features full-duplex capability on all ports, which effectively doubles the bandwidth of each connection.

* If an SFP transceiver is plugged in, the corresponding RJ-45 port is disabled for ports 27-28 built into the front panel, or ports 25-26 on the optional media expansion modules.

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

Network Management Options

This switch contains a comprehensive array of LEDs for “at-a-glance” monitoring of network and port status. It also includes a management agent that allows you to configure or monitor the switch using its embedded management software, or via SNMP applications. To manage the switch, you can make a direct connection to the console port (out-of-band), or you can manage the switches through a network connection (in-band) using Telnet, the on-board web agent, or SNMP-based network management software.

The Craft port (RJ-45) provides a dedicated management channel that operates outside of the data transport network. This makes it possible to re-configure or troubleshoot the switch over either a local or remote connection to the Craft port when access via the data channel is not possible or deemed insecure.

For a detailed description of the switch’s advanced features, refer to the Management Guide.

Description of Hardware

100BASE-TX and 1000BASE-T Ports

The switch contains 24 100BASE-TX RJ-45 ports that operate at 10/100 Mbps, half or full duplex, and two 1000BASE-T RJ-45 ports that operate at 10 Mbps or 100 Mbps, half or full duplex, or at 1000 Mbps, full duplex. Because all of the RJ-45 ports support automatic MDI/MDI-X operation, you can use straight-through cables for all network connections to PCs or servers, or to other switches or hubs. (See “1000BASE-T Pin Assignments” on page B-4.)

Each of these ports support auto-negotiation, so the optimum transmission mode (half or full duplex), and data rate (10, 100, or 1000 Mbps) can be selected automatically. If a device connected to one of these ports does not support auto-negotiation, the communication mode of that port can be configured manually.

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

100BASE-TX Management Port

The 10/100BASE-TX port labeled “Craft” provides a dedicated management interface which is segregated from the data traffic crossing the other ports.

This port supports auto-negotiation, so the optimum transmission mode (half or full duplex) and data rate (10 or 100 Mbps) can be selected automatically, if this feature

is also supported by the attached device. However, note that the interface connection parameters of this port cannot be configured.

Console Port

The console port on the switch's front panel is an RJ-45 connection using a male DB-9 connector that enables a connection to a terminal for performing switch monitoring and configuration functions. The terminal may be a PC or workstation running terminal emulation software, or a terminal configured as a Data Terminal Equipment (DTE) connection. A null-modem wired serial cable is supplied with the switch for connecting to this interface.

SFP Slots

The Small Form Factor Pluggable (SFP) transceiver slots are shared with RJ-45 ports (ports 25~26 on the front panel or ports 27~28 on the optional modules). In its default configuration, if an SFP transceiver (purchased separately) is installed in a slot and has a valid link on its port, the associated RJ-45 port is disabled and cannot be used. The switch can also be configured to force the use of an RJ-45 port or SFP slot, as required.

Table 1-1 Supported SFP Transceivers

Media Standard	Cable Diameter (microns)	Wavelength (nm)	Vendor	Part Number	Maximum Distance
1000BASE-SX	50/125	850	Agilent	HFBR-5701LP	550 m
			ApacOpto	KM28-C3S-TC-N	550 m
			Stratos	SPLC-20-4-1-B-R6	1 km
			Delta	LCP-2488A4ES	300 m
			Finisar	FTRJ-8519-7D	550 m
			Finisar	FTRJ-8519-3	550 m
			Infinion	V23818-K305-B57	700 m
			Picolight	PL-XPL-VC-S13-11	860 m
	62.5/125	850	Agilent	HFBR-5701LP	275 m
			ApacOpto	KM28-C3S-TC-N	550 m
			Stratos	SPLC-20-4-1-B-R6	500 m
			Finisar	FTRJ-8519-7D	300 m
1000BASE-LX	50/125	1300	Infineon	V23818-K15-B57	700 m
	62.5/125	1300	Infineon	V23818-K15-B57	700 m
	9/125	1300	ComXion	CX-SSP131250-10	10 km
			E2O	ES125-LP3TA-A-F1-LX1-MT	10 km
			Infinion	V23818-K15-B57	10 km
1000BASE-LH	9/125	1310	Linksys	MGBLH1	40 km
			Picolight	PL-XPL-LC-L13-11	40 km

Table 1-1 Supported SFP Transceivers (Continued)

Media Standard	Cable Diameter (microns)	Wavelength (nm)	Vendor	Part Number	Maximum Distance
1000BASE-BX10-U		1310 (TX) 1490 (RX)			10 km

Note that 1000BASE-SX transceivers use multimode duplex fiber cable, 1000BASE-LX and 1000BASE-LH transceivers use single-mode duplex fiber cable, and 1000BASE-BX10-U transceivers use single-mode simplex fiber cable.

Alarm Interface Port

The DB-15 alarm port on the switch's front panel can be used to provide alarm, service port, and BITS clock reference interfaces. The switch supports two sets of alarm relay contacts (major and minor), and 4 external customer site alarm inputs. It also provides an alarm cutoff button (labeled ACO). Refer to "Connecting to the Alarm Port" on page 3-11 for a description of the pin assignments used to connect to the alarm port.

Port and System Status LEDs

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

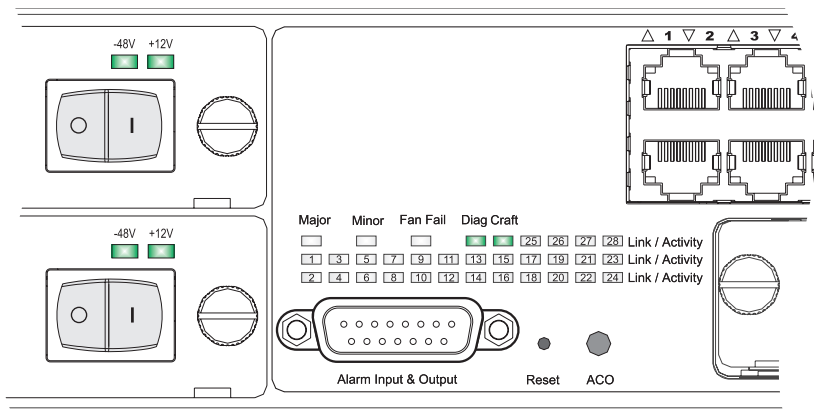


Figure 1-2 Port and System LEDs

Table 1-2 Port and System Status LEDs

LED	Condition	Status
Major	Red	Indicates presence within the system of one or more major traffic-affecting system alarm(s) that are not masked by the alarm filter.
Minor	Amber	Indicates presence within the system of one or more minor traffic-affecting system alarm(s) that are not masked by the alarm filter.
Fan Fail	Red	Indicates failure of one or more fans.
Diag	Flashing Green	System self-diagnostic test in progress.
	Green	System self-diagnostic test successfully completed.
	Off	System self-diagnostic test has detected a fault.
Link/ Activity	Green	Port has a valid link.
	Flashing Green	Flashing indicates activity on the port.
	Off	The link is down.
Power Module* -48V/+12V or AC/+12V	Green	DC or AC power is functioning normally.
	Off	External power not connected or has failed.

* The -48V/AC LEDs on the left indicate the status of external power. The +12V LED on the right indicates the status of the internal power conversion process.

Fan Tray

A removable fan tray on the right side of the front panel contains three fans that provide cooling for the chassis. The following figure shows the fan tray removed from the switch

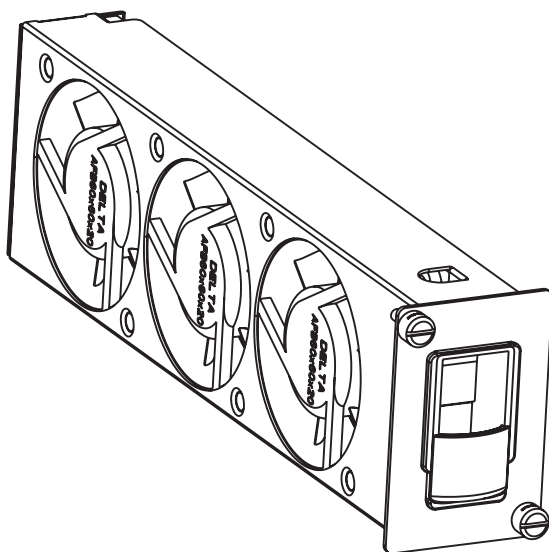


Figure 1-3 Fan Tray

Power Modules

This switch provides two power module options: -48 VDC and universal AC. For specifications on the power conversion modules and external input power requirements, see “Power Supply” on page C-2.

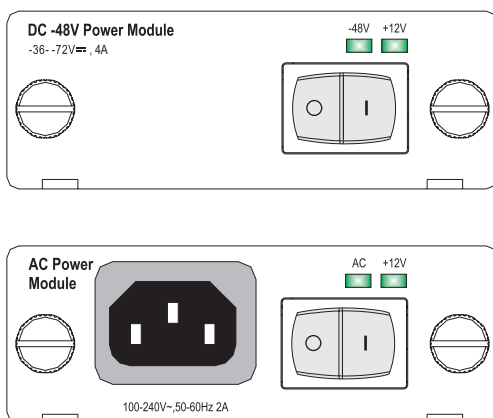


Figure 1-4 Optional Power Modules

Optional Media Extender Module

1000BASE Combo Module

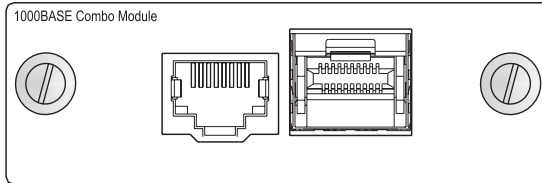


Figure 1-5 Single-Port 1000BASE-T/SFP Combo Module

The 1000BASE-T RJ-45 port and SFP slot on this module share the same internal interface. If an SFP transceiver (purchased separately) is installed in a slot and has a valid link, the associated RJ-45 port is disabled and cannot be used. The switch can also be configured to force the use of an RJ-45 port or SFP slot, as required.

When connecting to the 1000BASE-T RJ-45 port, Category 5, 5e, or 6 twisted-pair cable can be used to connect to another device up to 100 m (328 ft) away. The 1000BASE-T port operates at 10, 100, and 1000 Mbps. At 1000 Mbps it operates at full duplex and supports auto-negotiation of flow control. At 10/100 Mbps it supports auto-negotiation of speed, duplex mode (i.e., half or full duplex), and flow control. Note that you should first test the cable installation for IEEE 802.3ab compliance. See “1000BASE-T Cable Requirements” on page 4-4.

This module also provides an SFP slot that supports 1000BASE-SX, 1000BASE-LX, 1000BASE-LH, and 1000BASE-BX10-U transceivers. For a full listing of the supported transceivers, see Table 1-1, “Supported SFP Transceivers,” on page 1-3.

Features and Benefits

Connectivity

- 24 100BASE-TX ports for 10 or 100 Mbps Ethernet connections to subscribers.
- 2 1000BASE-T ports provide 4 Gbps of aggregate bandwidth for network uplink.
- Auto-negotiation enables each RJ-45 data port and uplink port to automatically select the optimum communication mode (half or full duplex) if this feature is supported by the attached device; otherwise the port can be configured manually.
- RJ-45 10/100/1000BASE-T ports support auto MDI/MDI-X pinout selection.
- Unshielded (UTP) cable supported on all RJ-45 ports: Category 3 or better for 10 Mbps connections, Category 5 or better for 100 Mbps connections, and Category 5, 5e, 6 or better for 1000 Mbps connections.

- IEEE 802.3-2005 Ethernet, Fast Ethernet, Gigabit Ethernet compliance ensures compatibility with standards-based hubs, network cards and switches from any vendor.

Expandability

- Supports 1000BASE-SX, 1000BASE-LX, 1000BASE-LH, and 1000BASE-BX10-U SFP transceivers.

Performance

- Transparent bridging.
- Aggregate duplex bandwidth of up to 12.8 Gbps.
- Switching table with a total of 16K MAC address entries and 1K static addresses
- Provides store-and-forward switching for intra-VLAN traffic.
- Supports wire-speed switching.
- Supports flow control, using back pressure for half duplex and IEEE 802.3x for full duplex.

Management

- “At-a-glance” LEDs for easy troubleshooting
- Network management agent:
 - Manages switch in-band or out-of-band
 - Supports console, Telnet, SSH, SNMP v1/v2c/v3, RMON (4 groups) and web-based interface
 - Dedicated management port for in-band access

Chapter 2: Network Planning

Introduction to Switching

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

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

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

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

Application Examples

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

Collapsed Backbone

This switch is an excellent choice for mixed Ethernet, Fast Ethernet, and Gigabit Ethernet installations where significant growth is expected in the near future. In a basic stand-alone configuration, it can provide direct full-duplex connections for up to 28 workstations or servers. You can easily build on this basic configuration, adding direct full-duplex connections to workstations or servers. When the time comes for further expansion, just connect to another hub or switch using one of the Gigabit Ethernet ports built into the front panel, or a Gigabit Ethernet port on a plug-in SFP transceiver.

In the figure below, the switch is operating as a collapsed backbone for a small LAN. It is providing dedicated 100 Mbps full-duplex connections to workstations, and 1 Gbps full-duplex connections to servers

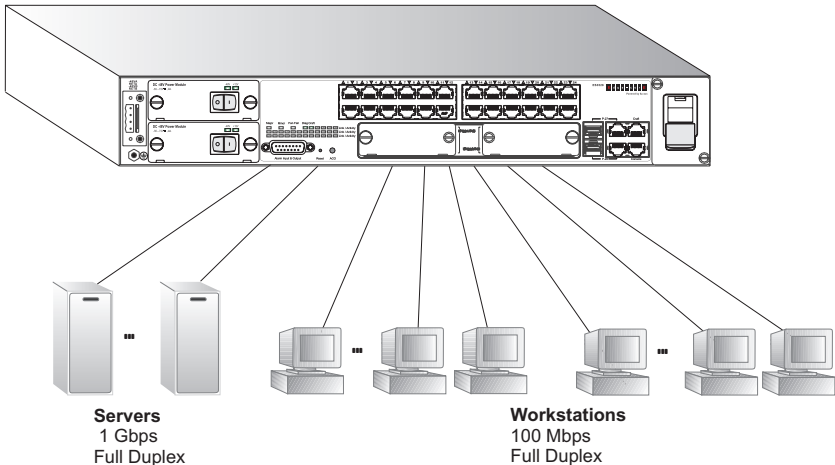


Figure 2-1 Collapsed Backbone

Network Aggregation Plan

With 28 parallel bridging ports (i.e., distinct collision domains), this switch can collapse a complex network down into a single efficient bridged node, increasing overall bandwidth and throughput.

In the figure below, the 10/100/1000BASE-T ports are providing 1 Gbps connectivity through cascaded switches. In addition, the switches are also connecting several servers at 1 Gbps.

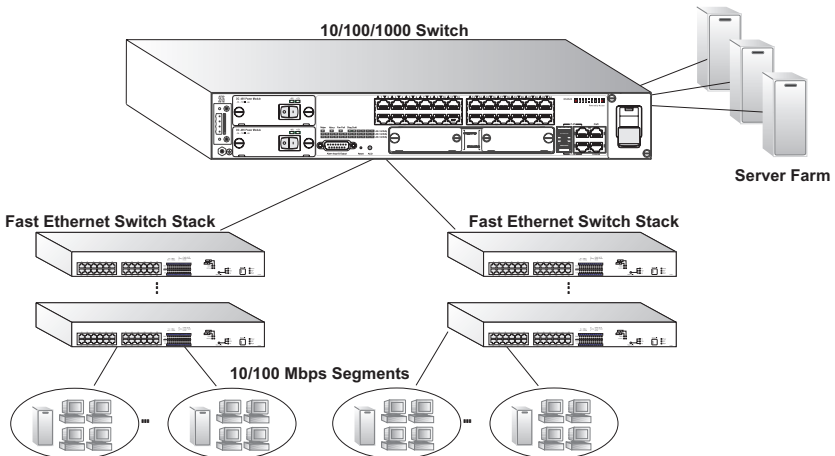


Figure 2-2 Network Aggregation Plan

Remote Connections with Fiber Cable

Fiber optic technology allows for longer cabling than any other media type. A 1000BASE-SX (MMF) link can connect to a site up to 550 meters away, a 1000BASE-LX (SMF) link up to 10 km, and a 1000BASE-LH link up to 40 km. This allows a switch to serve as a collapsed backbone, providing direct connectivity for a widespread LAN.

A 1000BASE-SX SFP transceiver can be used for a high-speed connection between floors in the same building. For long-haul connections, a 1000BASE-LH SFP transceiver can be used to reach another site up to 40 kilometers away.

The figure below illustrates three switches interconnecting multiple segments with fiber cable.

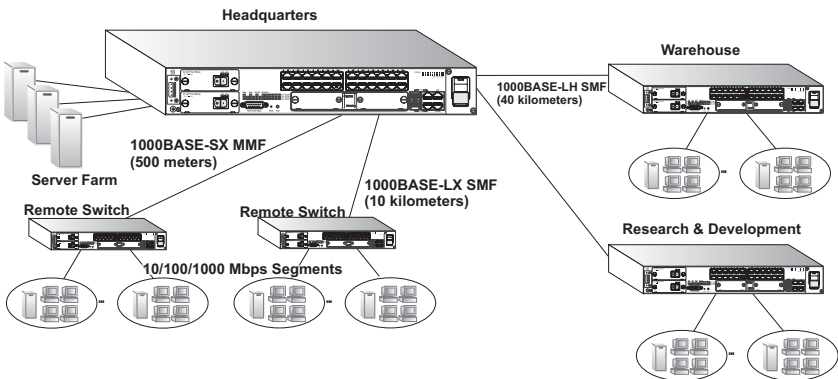


Figure 2-3 Remote Connections with Fiber Cable

Making VLAN Connections

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

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

These switches also support multiple spanning trees which allow VLAN groups to maintain a more stable path between all VLAN members. This can reduce the overall amount of protocol traffic crossing the network, and provide a shorter reconfiguration time if any link in the spanning tree fails.

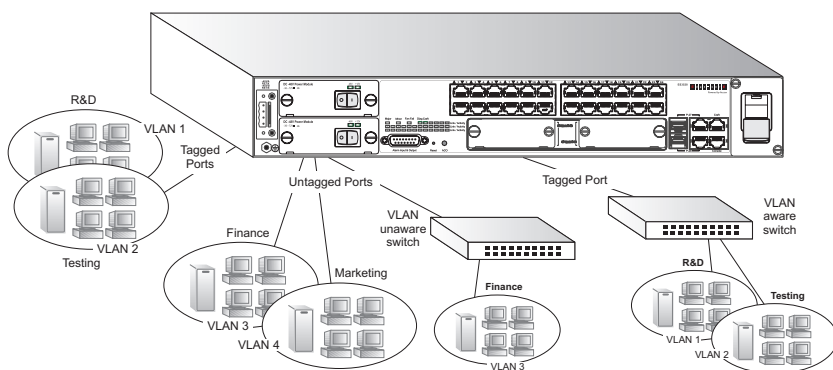


Figure 2-4 Making VLAN Connections

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

Application Notes

1. Full-duplex operation only applies to point-to-point access (such as when a switch is attached to a workstation, server or another switch). When the switch is connected to a hub, both devices must operate in half-duplex mode.
2. To interconnect distinct VLANs or IP subnets, you can attach the switch to a standard Layer 3 router. For network applications that require routing between dissimilar network types, attach the switch to a multi-protocol router.
3. As a general rule, the length of fiber optic cable for a single switched link should not exceed:
 - 1000BASE-SX: 550 m (1805 ft) for multimode fiber, duplex fiber
 - 1000BASE-LX: 10 km (6.2 miles) for single-mode fiber, duplex fiber
 - 1000BASE-LH: 40 km (24.9 miles) for single-mode fiber, duplex fiber
 - 1000BASE-BX10-U: 10 km (6.2 miles) for single-mode fiber, simplex fiber

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

Chapter 3: Installing the Switch

Selecting a Site

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

- The site should:
 - restrict access to authorized service personnel in accordance with IEC 60950-1. A restricted access location is one where access is secure and limited to service personnel who have a special key, or other means of security.
 - be at the center of all the devices you want to link and near a power outlet.
 - be able to maintain its temperature within -20 to 65 °C (-4 to 148.9 °F) and its humidity within 5% to 95%, non-condensing
 - provide adequate space (approximately five centimeters or two inches) on all sides for proper air flow
 - be accessible for installing, cabling and maintaining the devices
 - allow the status LEDs to be clearly visible
- Make sure twisted-pair cable is always routed away from power lines, fluorescent lighting fixtures and other sources of electrical interference, such as radios and transmitters.
- Make sure that the unit is connected to a separate grounded power outlet within 2 m (6.6 feet) of each device and is powered from an independent circuit breaker. As with any equipment, using a filter or surge suppressor is recommended. This switch provides two power module options: -48 VDC and universal AC. Verify that the external power requirements for the selected option can be met as listed under "Power Supply" on page C-2.

Ethernet Cabling

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

- Cable type: Unshielded twisted pair (UTP) or shielded twisted pair (STP) cables with RJ-45 connectors; Category 3 or better for 10BASE-T, Category 5 or better for 100BASE-TX, and Category 5, 5e or 6 for 1000BASE-T.
- Protection from radio frequency interference emissions
- Electrical surge suppression

3 Installing the Switch

- Separation of electrical wires (switch related or other) and electromagnetic fields from data based network wiring
- Safe connections with no damaged cables, connectors or shields

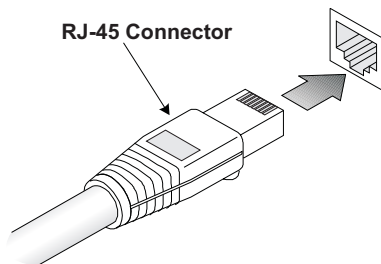


Figure 3-1 RJ-45 Connections

Equipment Checklist

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

Package Contents

- 24-port Fast Ethernet Switch (ES3528)
- Four adhesive foot pads
- Bracket Mounting Kit containing two brackets and eight screws for attaching the brackets to the switch
- Console cable (RJ-45 to RS-232)
- This Installation Guide
- Management Guide CD

Note: The switch package does not include a power module. Power modules must be ordered separately.

Optional Rack-Mounting Equipment

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

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

Mounting

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

Rack Mounting

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

- **Temperature:** Since the temperature within a rack assembly may be higher than the ambient room temperature, check that the rack-environment temperature is within the specified operating temperature range. (See page C-2.)
- **Mechanical Loading:** Do not place any equipment on top of a rack-mounted unit.
- **Circuit Overloading:** Be sure that the supply circuit to the rack assembly is not overloaded.
- **Grounding:** Rack-mounted equipment should be properly grounded.

To rack-mount devices:

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

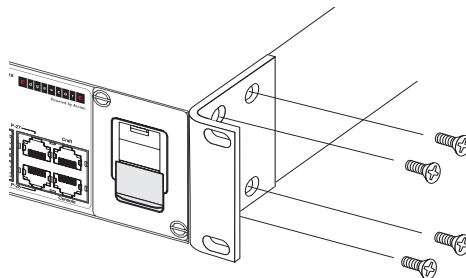


Figure 3-2 Attaching the Brackets

3 Installing the Switch

2. Mount the device in the rack, using four rack-mounting screws (not provided).

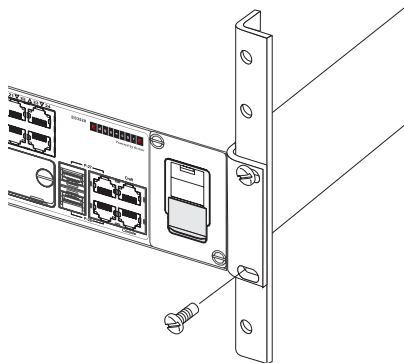


Figure 3-3 Installing the Switch in a Rack

3. If installing a single switch only, turn to “Connecting to a Power Source” at the end of this chapter.
4. If installing multiple switches, mount them in the rack, one below the other, in any order.

Desktop or Shelf Mounting

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

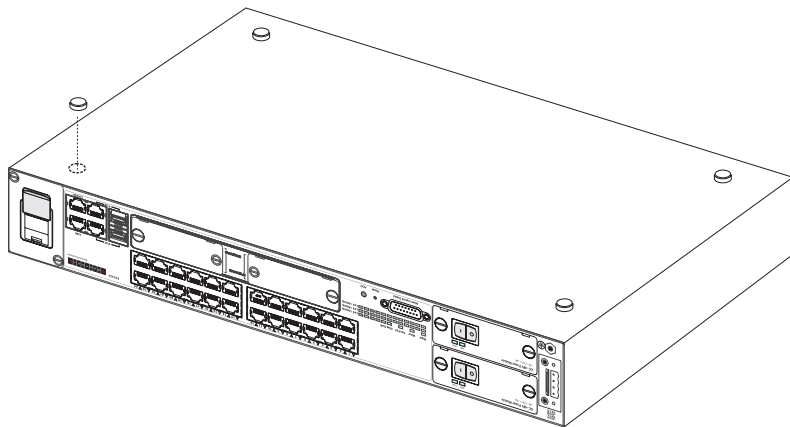


Figure 3-4 Attaching the Adhesive Feet

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

3. If installing a single switch only, go to “Connecting to a Power Source” at the end of this chapter.
4. If installing multiple switches, attach four adhesive feet to each one. Place each device squarely on top of the one below, in any order.

Installing an Optional Module into the Switch

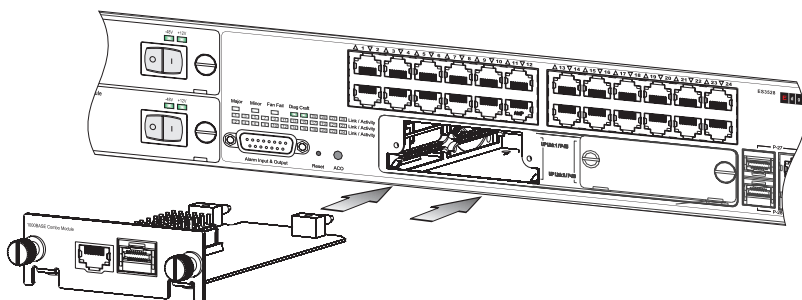


Figure 3-5 Installing an Optional Module

Note: The slide-in modules are hot-swappable, you do not need to power off the switch before installing or removing a module.

To install an optional module into the switch, do the following:

1. Remove the blank metal plate (or a previously installed module) from the appropriate slot by removing the two screws with a flat-head screwdriver.
2. Before opening the package that contains the module, touch the bag to the switch casing to discharge any potential static electricity. Also, it is recommended to use an ESD wrist strap during installation.
3. Remove the module from the anti-static shielded bag.
4. Holding the module level, guide it into the carrier rails on each side and gently push it all the way into the slot, ensuring that it firmly engages with the connector.
5. If you are sure the module is properly mated with the connector, tighten the retainer screws to secure the module in the slot.
6. To confirm that the module is correctly installed and ready to use, connect an active device to the module, and verify that the corresponding port indicator on the switch's front panel turns green to show that there is a valid link.

Installing an Optional SFP Transceiver

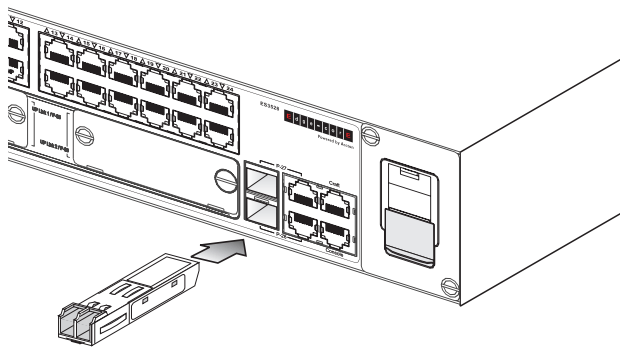


Figure 3-6 Inserting an SFP Transceiver into a Slot

This switch supports 1000BASE-SX/LX/LH and 1000BASE-BX10-U SFP-compatible transceivers. To install an SFP transceiver, do the following:

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

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

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

Grounding the Chassis

Before powering on the switch, ground the switch to earth as described below.

1. Ensure that the rack on which the switch is to be mounted is properly grounded and in compliance with ETSI ETS 300 253.
2. Ensure that there is a good electrical connection to the grounding point on the rack (no paint or isolating surface treatment).
3. Disconnect all power cables to the switch.
4. The switch chassis is connected internally to 0 V. This circuit is connected to the single-hole grounding terminal on the back of the switch. The surface area

around this terminal is not painted in order to provide for a good connection. Attach a 6 AWG stranded copper wire to the grounding terminal on the switch.

5. Then attach the grounding wire to the ground point on the rack.

Caution: The earth connection must not be removed unless all supply connections have been disconnected.

Connecting to a Power Source

This switch supports both AC and DC power conversion modules.

Connecting DC Power

When a -48 VDC power conversion module is installed in the switch, an external DC power supply must be connected to the DC power connection on the left side of the front panel.

Warning: Before wiring the DC plug or connecting power to the switch, ensure that power to the feed lines is turned off at the supply circuit breaker or disconnected from the power bus.

- Notes:**
1. To provide adequate circuit protection between the DC power supply and the switch, all intermediate wiring and circuitry should be rated to carry a load at least two times the maximum rating for this switch (see “Power Supply” on page C-2).
 2. The wiring between the DC power supply and the switch must be stranded copper wire within the range of 10 to 24 AWG.
 3. Wiring for the power input terminals on the switch are described below. Wiring of the DC power supply terminals depends on the equipment in use on the local site, but should be wired in such a way as to meet the input requirements shown in Figure 3-7 “DC Plug Connections” on page 3-8. The wiring should also be color coded according to local standards to ensure that the input power and ground lines can be easily distinguished.
 4. When using two power conversion modules with the switch, either AC or DC modules can be used – both AC, both DC, or one AC and one DC. The only restriction is that when two DC power conversion modules are used, they must be of the same type; i.e., both -48 VDC.

To connect the switch to a power source:

1. First verify that the external DC power supply can provide -36 to -72 VDC, 4 A minimum for the -48 VDC power conversion module.
2. Prepare two wires for each power source to be used (A or B). Use 10 to 24 AWG stranded copper wire. Make sure these wires are not plugged into the power source.

3 Installing the Switch

3. Use a wire stripper to carefully strip about a half an inch of the outer insulation off the end of each wire, exposing the copper core.
4. Twist the copper wire strands together to form a tight braid. If possible, solder the exposed braid of wire together for better conductivity.
5. Connect the external power feed and power ground/return lines to the DC plug (provided with the switch) as shown below. The power leads are labeled on the front of the chassis, above the DC power connection block. The -48 VDC power feed uses the “-48VDC” input and RETA/B (Return) lines for power source A and B respectively. Use a small flat-tip screwdriver to loosen the screws on the power plug and open the wire clamps.
6. Insert the wire leads into the openings shown in the figure below. Each lead inserted in the power plug must match the lead attached to the power source. Use the label above the DC power connection block to identify the appropriate power input and return or ground lines.

Warning: If the power leads are plugged into the wrong holes, the power supply will not work properly and may damage the switch.

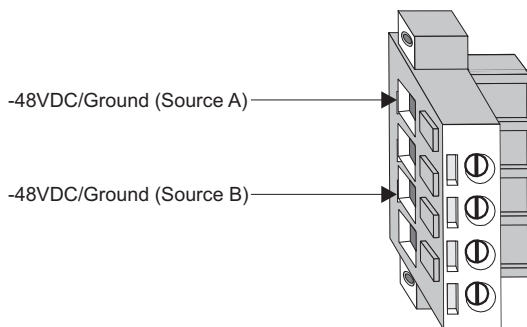


Figure 3-7 DC Plug Connections

7. Push each wire about half an inch into the opening on the plug, and tighten down the clamp screw. You should not be able to pull on the wire and dislodge it.
8. Insert the power plug in the power receptacle on the left side of the front panel.
9. At the power source, turn on the power for the feed lines or power bus.
10. After the power source is tuned on, set the power button on the front of the power conversion module to the ON position (marked “-”).
11. Check the indicators on the power conversion module as the switch is powered on to verify that the -48V LED indicating external power status is on, and that the +12V LED indicating internal power conversion is on. If not, recheck the power supply and power cable connections at the supply source and at power conversion module.

12. If you have installed both a primary and redundant power conversion module, verify that the LEDs on both modules are lit as indicated in the preceding step.

Connecting AC Power

When a universal AC power module is installed in the switch, external AC power must be supplied to the module.

To connect the switch to a power source:

1. First verify that the external AC power supply can provide 100 to 240 VAC, 50-60 Hz, 2 A minimum.
2. Plug the power cable into a grounded, 3-pin, AC power source.

Note: For international use, you may need to change the AC line cord. You must use a line cord set that has been approved for the receptacle type in your country.

3. Insert the plug on the other end of the power cable directly into the receptacle on the AC power module.

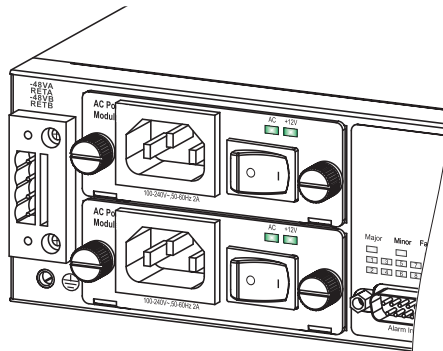


Figure 3-8 AC Power Receptacle

4. Check the indicators on the power module as the switch is powered on to verify that the AC LED indicating external power status is on, and that the +12V LED indicating internal power conversion is on. If not, recheck the power supply and power cable connections at the supply source and at power module.
5. If you have installed both a primary and redundant power conversion modules, verify that the LEDs on both modules are lit as indicated in the preceding step.

Connecting to the Console Port

The RJ-45 serial port on the switch's front panel is used to connect to the switch for out-of-band console configuration. The on-board configuration program can be accessed from a terminal or a PC running a terminal emulation program. The pin assignments used to connect to the serial port are provided in the following table.

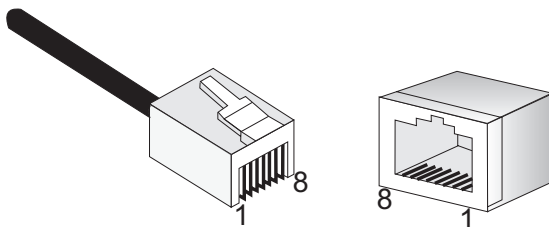


Figure 3-9 Serial Port (RJ-45) Pin-Out

Wiring Map for Serial Cable

Table 3-1 Serial Cable Wiring

Switch's 8-Pin Serial Port	Null Modem	PC's 9-Pin DTE Port
6 RXD (receive data)	<-----	3 TXD (transmit data)
3 TXD (transmit data)	----->	2 RXD (receive data)
5 SGND (signal ground)	-----	5 SGND (signal ground)

No other pins are used.

The serial port's configuration requirements are as follows:

- Default Baud rate—9,600 bps
- Character Size—8 Characters
- Parity—None
- Stop bit—One
- Data bits—8
- Flow control—none

Connecting to the Alarm Port

The DB-15 alarm port on the switch's front panel is used to provide alarm, service port, and BITS clock reference interfaces. The switch supports two sets of alarm relay contacts (major and minor), and 4 external customer site alarm inputs. It also provides an alarm cutoff button (labeled ACO). The pin assignments used to connect to the alarm port are provided in the following table.

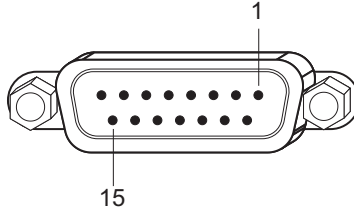


Figure 3-10 Alarm Port (D-15) Pin-Out

Wiring Map for Alarm Cable

The signals include relay contacts for major and minor system alarms, and external alarm inputs.

Table 3-2 Alarm Cable Wiring

Switch's Alarm Port	Function
1 (MJR_ALARM_CNTR)	Common contact for major alarm relay.
2 (MNR_ALARM_CNTR)	Common contact for minor alarm relay.
3 (ALARM_IN3_EXT_P*)	External alarm input 3 (external relay dry contact closure to pin 13).
4 (ALARM_IN4_EXT_P)	External alarm input 4 (external relay dry contact closure to pin 8).
5 (No Contact)	
6 (MJR_ALARM_NO)	Normally open during major alarm state.
7 (MNR_ALARM_NO)	Normally open during minor alarm state.
8 (ALARM_IN4_EXT_RTN†)	External alarm input 4 (external relay dry contact closure from pin 3).
9 (ALARM_IN1_EXT_P)	External alarm input 1 (external relay dry contact closure to pin 14).
10 (ALARM_IN2_EXT_P)	External alarm input 2 (external relay dry contact closure to pin 15).
11 (MJR_ALARM_NC)	Normally closed during major alarm state.
12 (MNR_ALARM_NC)	Normally closed during minor alarm state.
13 (ALARM_IN3_EXT_RTN)	External alarm input 3 (external relay dry contact closure from pin 3).
14 (ALARM_IN1_EXT_RTN)	External alarm input 1 (external relay dry contact closure from pin 9).
15 (ALARM_IN2_EXT_RTN)	External alarm input 2 (external relay dry contact closure from pin 10).

* P indicates positive input.

† RTN indicates return to Ground.

3 Installing the Switch

The following figure shows the pinout information for the DB-15 ALARM connector on the front panel.

Alarm Connector

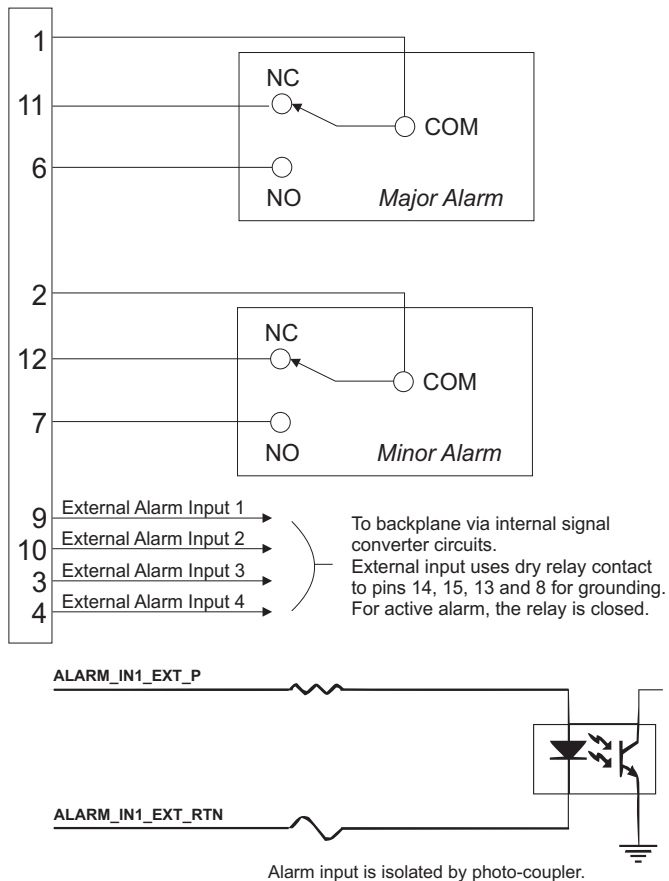


Figure 3-11 External Alarm I/O Connections

Chapter 4: Making Network Connections

Connecting Network Devices

This switch is designed to interconnect multiple segments (or collision domains). It can be connected to network cards in PCs and servers, as well as to hubs, switches or routers. It may also be connected to devices using optional SFP transceivers.

Twisted-Pair Devices

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

Cabling Guidelines

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

See Appendix B for further information on cabling.

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

Connecting to PCs, Servers, Hubs and Switches

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

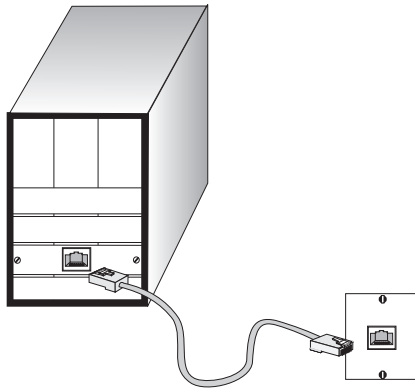


Figure 4-1 Making Twisted-Pair Connections

2. If the device is a PC card and the switch is in the wiring closet, attach the other end of the cable segment to a modular wall outlet that is connected to the wiring closet. (See “Network Wiring Connections” on page 4-2.) Otherwise, attach the other end to an available port on the switch.

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

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

Network Wiring Connections

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

1. Attach one end of a patch cable to an available port on the switch, and the other end to the patch panel.
2. If not already in place, attach one end of a cable segment to the back of the patch panel where the punch-down block is located, and the other end to a modular wall outlet.
3. Label the cables to simplify future troubleshooting. See “Cable Labeling and Connection Records” on page 4-6.

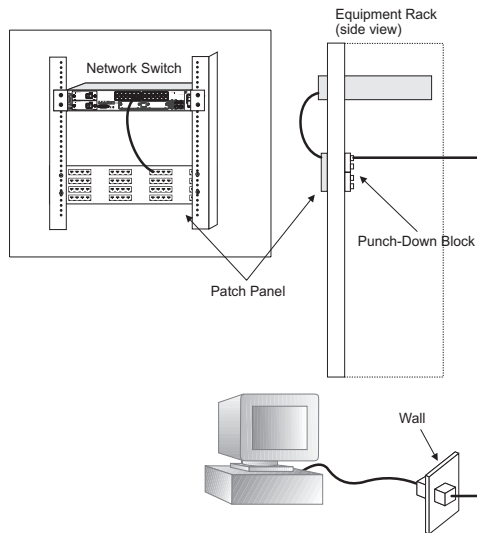


Figure 4-2 Network Wiring Connections

Fiber Optic SFP Devices

An optional Gigabit SFP transceiver (1000BASE-SX, 1000BASE-LX, 1000BASE-LH or 1000BASE-BX10-U) can be used for a backbone connection between switches, or for connecting to a high-speed server.

Each single-mode fiber port requires 9/125 micron single-mode fiber optic cable with an LC connector at both ends. Each multimode fiber optic port requires 50/125 or 62.5/125 micron multimode fiber optic cabling with an LC connector at both ends. 1000BASE-SX/LX/LH uses duplex fiber, operating at the same wavelength for both transmit and receive signals (SX: 850 nm, LX: 1310 nm, LH: 1550 or 1310 nm). 1000BASE-BX10-U uses simplex fiber, operating at a wavelength of 1310 nm for transmit signals and 1490 nm for receive signals.

Hinweis: Bei der Wahl eines Glasfasertransceivers muß für die Beurteilung der Gesamtsicherheit beachtet werden, das die maximale Umgebungstemperatur des Transceivers für den Betrieb nicht niedriger ist als die für dieses Produkts. Der Glasfasertransceiver muß auch ein überprüftes Gerät der Laser Klasse 1 sein.

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

4 Making Network Connections

2. Check that the fiber terminators are clean. You can clean the cable plugs by wiping them gently with a clean tissue or cotton ball moistened with a little ethanol. Dirty fiber terminators on fiber cables will impair the quality of the light transmitted through the cable and lead to degraded performance on the port.
3. Connect one end of the cable to the LC port on the switch and the other end to the LC port on the other device. Since LC connectors are keyed, the cable can be attached in only one orientation.

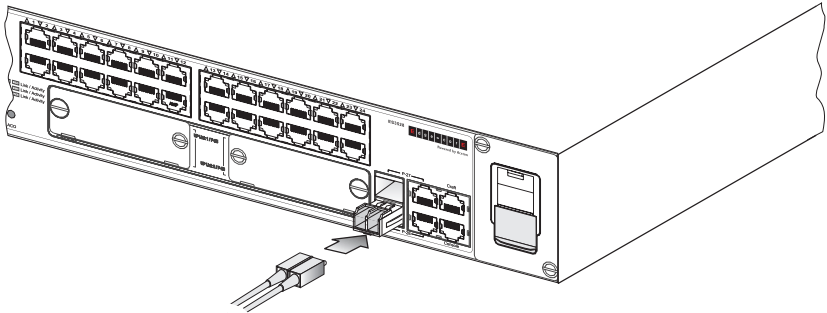


Figure 4-3 Making Connections to SFP Transceivers

4. As a connection is made, check the Link LED on the switch corresponding to the port to be sure that the connection is valid.

The 1000BASE-SX/LX/LH and 1000BASE-BX10-U fiber optic ports operate at 1 Gbps full duplex. The maximum length for fiber optic cable operating at Gigabit speeds will depend on the fiber type as listed under “1000 Mbps Gigabit Ethernet Cable Lengths” on page 4-5. Also, remember to consider power budget constraints when calculating the maximum cable length for each specific connection.

Connectivity Rules

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

1000BASE-T Cable Requirements

All Category 5 UTP cables that are used for 100BASE-TX connections should also work for 1000BASE-T, providing that all four wire pairs are connected. However, it is recommended that for all critical connections, or any new cable installations, Category 5e (enhanced Category 5) or Category 6 cable should be used. The

Category 5e specification includes test parameters that are only recommendations for Category 5. Therefore, the first step in preparing existing Category 5 cabling for running 1000BASE-T is a simple test of the cable installation to be sure that it complies with the IEEE 802.3-2005 standards.

1000 Mbps Gigabit Ethernet Cable Lengths

Table 4-1 Maximum 1000BASE-T Gigabit Ethernet Cable Length

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

Table 4-2 Maximum 1000BASE-SX Gigabit Ethernet Cable Length

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

Table 4-3 Maximum 1000BASE-LX Gigabit Ethernet Cable Length

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

Table 4-4 Maximum 1000BASE-LH Gigabit Ethernet Cable Length

Fiber Size	Fiber Bandwidth	Maximum Cable Length	Connector
9/125 micron single-mode fiber	N/A	2 m - 40 km (7 ft - 24.9 miles)	LC

Table 4-5 Maximum 1000BASE-BX10-U Gigabit Ethernet Cable Length

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

100 Mbps Fast Ethernet Cable Lengths

Table 4-6 Maximum Fast Ethernet Cable Length

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

10 Mbps Ethernet Cable Lengths

Table 4-7 Maximum Ethernet Cable Length

Type	Cable Type	Maximum Length	Connector
100ASE-T	Twisted Pair, Categories 3, 4, 5 or better 100-ohm UTP	100 m (328 ft)	RJ-45

Cable Labeling and Connection Records

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

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

- Clearly label the opposing ends of each cable.
- Using your building's floor plans, draw a map of the location of all network-connected equipment. For each piece of equipment, identify the devices to which it is connected.
- Note the length of each cable and the maximum cable length supported by the switch ports.
- For ease of understanding, use a location-based key when assigning prefixes to your cable labeling.
- Use sequential numbers for cables that originate from the same equipment.
- Differentiate between racks by naming accordingly.
- Label each separate piece of equipment.
- Display a copy of your equipment map, including keys to all abbreviations at each equipment rack.

Appendix A: Troubleshooting

Diagnosing Switch Indicators

This switch can be easily monitored through panel indicators to identify problems. The table below describes common problems you may encounter and possible solutions.

Table A-1 Troubleshooting Chart

Symptom	Action
Power Module LED is off -48 VDC or AC	• If using a DC power conversion module, check the connections between the switch and the external DC power supply. If using an AC power module, check connections between the switch, the power cord, and the wall outlet. • Contact your dealer for assistance.
Power Module LED is off +12 VDC	• Internal power supply has failed. Contact your local dealer for assistance.
Diag LED is off	• Power cycle the switch to try and clear the condition. • If the condition does not clear, contact your local dealer for assistance.
Link LED is Off	• Verify that the switch and attached device are powered on. • Be sure the cable is plugged into both the switch and corresponding device. • Verify that the proper cable type is used and its length does not exceed specified limits. • Check the adapter on the attached device and cable connections for possible defects. Replace the defective adapter or cable if necessary.
Major LED is Red	• One or more major system alarm(s) affecting traffic have occurred. Check the alarm filter mask to determine potential cause(s) of alarm.
Minor LED is Amber	• One or more minor system alarm(s) affecting traffic have occurred. Check the alarm filter mask to determine potential cause(s) of alarm.
Fan Fail LED is Red	• One or more fans in the fan tray have failed. Replace the fan tray.

Power and Cooling Problems

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

Installation

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

In-Band Access

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

Note: The management agent can accept up to four simultaneous Telnet sessions. If the maximum number of sessions already exists, an additional Telnet connection will not be able to log into the system.

Appendix B: Cables

Twisted-Pair Cable and Pin Assignments

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

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

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

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

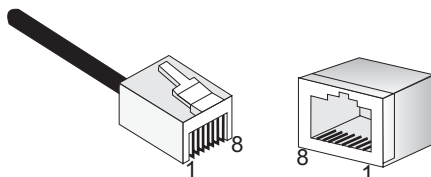


Figure B-1 RJ-45 Connector Pin Numbers

10BASE-T/100BASE-TX Pin Assignments

Use unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable for RJ-45 connections: 100-ohm Category 3, 4 or 5 cable for 10 Mbps connections or 100-ohm Category 5 cable for 100 Mbps connections. Also be sure that the length of any twisted-pair connection does not exceed 100 meters (328 feet).

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

Table B-1 10/100BASE-TX MDI and MDI-X Port Pinouts

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

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

Note: Auto-negotiation must be enabled for automatic MDI/MDI-X pinout configuration.

Straight-Through Wiring

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

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

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

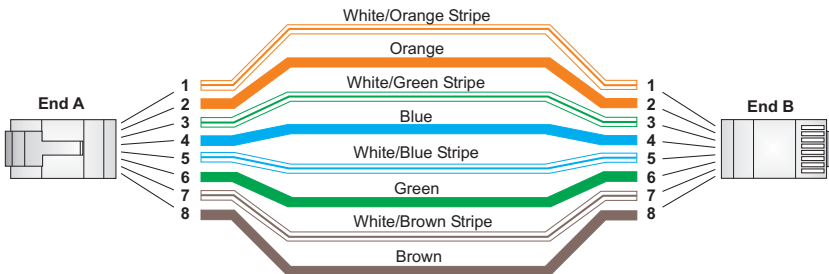


Figure B-2 Straight-through Wiring

Crossover Wiring

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

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

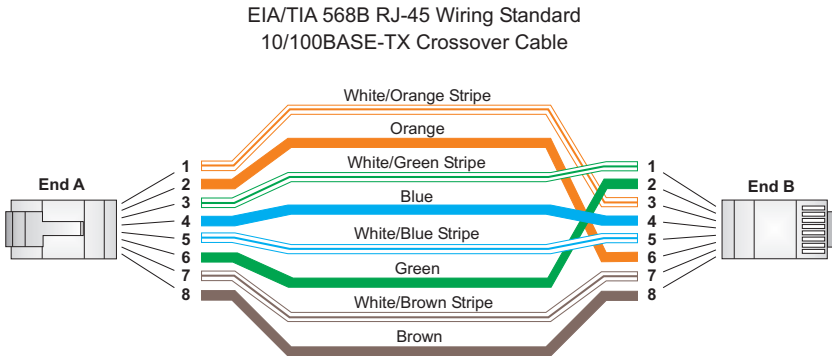


Figure B-3 Crossover Wiring

1000BASE-T Pin Assignments

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

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

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

Table B-2 1000BASE-T MDI and MDI-X Port Pinouts

Pin	MDI Signal Name	MDI-X Signal Name
1	Bi-directional Data One Plus (BI_D1+)	Bi-directional Data Two Plus (BI_D2+)
2	Bi-directional Data One Minus (BI_D1-)	Bi-directional Data Two Minus (BI_D2-)
3	Bi-directional Data Two Plus (BI_D2+)	Bi-directional Data One Plus (BI_D1+)
4	Bi-directional Data Three Plus (BI_D3+)	Bi-directional Data Four Plus (BI_D4+)
5	Bi-directional Data Three Minus (BI_D3-)	Bi-directional Data Four Minus (BI_D4-)
6	Bi-directional Data Two Minus (BI_D2-)	Bi-directional Data One Minus (BI_D1-)
7	Bi-directional Data Four Plus (BI_D4+)	Bi-directional Data Three Plus (BI_D3+)
8	Bi-directional Data Four Minus (BI_D4-)	Bi-directional Data Three Minus (BI_D3-)

1000BASE-T Cable Requirements

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

Cable Testing for Existing Category 5 Cable

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

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

Adjusting Existing Category 5 Cabling to Run 1000BASE-T

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

1. Replace any Category 5 patch cables with high-performance Category 5e or Category 6 cables.
2. Reduce the number of connectors used in the link.
3. Reconnect some of the connectors in the link.

Fiber Standards

The current TIA (Telecommunications Industry Association) 568-A specification on optical fiber cabling consists of one recognized cable type for horizontal subsystems and two cable types for backbone subsystems.

Horizontal 62.5/125 micron multimode (two fibers per outlet).

Backbone 62.5/125 micron multimode or single mode.

TIA 568-B will allow the use of 50/125 micron multimode optical fiber in both the horizontal and backbone in addition to the types listed above. All optical fiber components and installation practices must meet applicable building and safety codes.

Appendix C: Specifications

Physical Characteristics

Ports

- 24 Fast Ethernet subscriber ports (RJ-45)
- 2 Gigabit Ethernet combination uplink ports (RJ-45/SFP)
- 2 Gigabit Ethernet extender module slots for uplink (RJ-45/SFP)
- 1 Fast Ethernet management port (RJ-45)

Network Interface

- Ports 1-24: RJ-45 connector, auto-negotiation, auto MDI/X
 - 10BASE-T: RJ-45 (100-ohm, UTP cable; Category 3 or better)
 - 100BASE-TX: RJ-45 (100-ohm, UTP cable; Category 5 or better)
 - 1000BASE-T: RJ-45 (100-ohm, UTP or STP cable; Category 5, 5e, or 6)
- Ports 25-28: RJ-45/SFP combo port connector, auto-negotiation, auto MDI/X
 - RJ-45 port shared with SFP transceiver slot
- Management Port: RJ-45 connector, auto MDI/X
- *Maximum Cable Length - 100 m (328 ft)

Alarm Port

- DB-15 connector
- 4 inputs: local choice
- 2 outputs: Major and minor mechanical/environmental alarms

Buffer Architecture

- 32 Mbytes

Aggregate Bandwidth

- 12.8 Gbps

Switching Database

- 16K MAC address entries, 1K static MAC addresses;
- 255 multicast groups

LEDs

- System: Power Module (-48/+12 VDC, AC/+12VDC), Alarm (Major, Minor, Fan Fail), Diagnostics
- Port: Status (link, activity)

Weight

4.43 kg (9.77 lbs)

Size

44.0 x 26 x 6.7 cm (17.3 x 10.2 x 2.6 in.)

Temperature

Operating: -20 to 65 °C (-4 to 149 °F)

Storage: -40 to 70 °C (-40 to 158 °F)

Humidity

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

Power Supply

Two power modules are offered:

-48 VDC: (-36 to -72 VDC input range), 1.5 A @ -48 VDC

100-240 VAC: (100 to 240 VAC, 50-60 Hz input range), 1 A

Power Consumption

60 Watts (with two expansion modules)

Maximum Current

1.20 A @ -38 VDC (with two expansion modules)

0.60 A @ -75 VDC (with two expansion modules)

0.59 A @ 110 VAC (with two expansion modules)

0.36 A @ 240 VAC (with two expansion modules)

Switch Features

Forwarding Mode

Store-and-forward

Throughput

Wire speed

Flow Control

Full Duplex: IEEE 802.3x

Half Duplex: Back pressure

Management Features

In-Band Management

Web, Telnet, SSH, or SNMP manager

Out-of-Band Management

Console port (RJ-45 interface, RS-232 signals)

Isolated management port, Fast Ethernet (RJ-45)

Software Loading

TFTP in-band, or XModem out-of-band

Standards

IEEE 802.3-2005

Ethernet, Fast Ethernet, Gigabit Ethernet

Link Aggregation Control Protocol (LACP)

Full-duplex flow control (ISO/IEC 8802-3)

IEEE 802.1D Spanning Tree Protocol

IEEE 802.1w Rapid Spanning Tree Protocol

IEEE 802.1s Multiple Spanning Tree Protocol

IEEE 802.1p Priority Tags

IEEE 802.1Q Virtual LAN

IEEE 802.1v Protocol-based VLANs

IEEE 802.3ac VLAN tagging

ISO/IEC 8802-3 CSMA/CD

Compliances

CE Mark

Emissions

FCC Class A

Industry Canada Class A

EN55022 (CISPR 22) Class A

EN 61000-3-2/3

VCCI Class A

C-Tick - AS/NZS CISPR 22 Class A

89/336/EEC

EN 300-386 (2000)

CFR 47 Part 15 Subpart B

Immunity

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

89/336/EEC

EN 300-386 (2000)

Safety

UL/CUL (CSA 22.2. NO 60950-1 & UL60950-1)

TÜV/GS (EN60950-1)

CB (IEC60950-1)

Extender Modules

Gigabit Extender Module (RJ-45/SFP)

Ports

1 10/100/1000BASE-T RJ-45/SFP combo port

Communication Speed

1 Gbps

Communication Mode

Full duplex

Network Interface

RJ-45/SFP slot

Standards

IEEE 802.3-2005 Gigabit Ethernet

SFP Transceiver Support

1000BASE-SXDuplex fiber, Multimode LC connector

1000BASE-LXDuplex fiber, Single Mode LC connector

1000BASE-LHDuplex fiber, Single Mode LC connector

1000BASE-BX10USimplex fiber, Single Mode LC connector

Appendix D: German Instructions

Eine Site Auswählen (Selecting a Site)

Die Schalter können in ein Standard-19-Zoll-Ausrüstungsgestell oder auf eine flache Ebene montiert werden.

Zum Auswählen eines Standortes beachten Sie bitte die nachstehenden Richtlinien.

- Die Site sollte:
 - Sich in der Mitte aller anzuschließenden Geräte sowie in der Nähe einer Netzsteckdose befinden;
 - Imstande sein, eine Temperatur zwischen -20 und 65 °C (-4 und 148.9 °F) und eine Feuchtigkeit innerhalb von 5% bis 95% (nichtkondensierend) beizubehalten;
 - In einem genügend weiten Abstand (ungefähr 5 cm oder zwei Zoll) von allen Seiten für eine ausreichende Belüftung aufgestellt werden;
 - Für das Installieren, die Kabelverlegung und für Wartungen und Reparaturen leicht zugänglich sein.
 - Die LED-Statusanzeigedioden müssen stets klar und leicht sichtbar sein.
- Sicherstellen, dass das verdrehte Kabel stets weg von anderen Stromkabeln, Neonleuchteinrichtungen und anderen Quellen von möglichen elektrischen Störungen verlegt wird, wie z. B. von Radios und Transmittern.
- Sicherstellen, dass das Gerät an eine separate Stromquelle mit Erdanschluss mit einer Netzspannung von 100 bis 240 V AC (Wechselstromspannung), 50 bis 60 Hz, und innerhalb in einem Abstand von 2,44 m (8 Fus) zu jedem Gerät installiert wird und an einem separaten Trennschalter bzw. Leistungsschalter mit Strom versorgt wird. Für alle Geräte wird empfohlen, einen Filter oder einen Überspannungsschutz zu verwenden.

Montage (Rack Mounting Instructions)

Switch-Einheiten können an ein standardmäßiges 19-Zoll Einrichtungsrack, einen Arbeitstisch oder ein Regal montiert werden. Folgend finden Sie die Montageanweisungen für jeden Positionstyp.

Rack-Montage

Beachten Sie die folgenden Faktoren, bevor Sie die Rack-Montage beginnen:

- **Temperatur:** Da die Temperatur innerhalb einer Rackeinheit höher als die Raumumgebungstemperatur sein kann, stellen Sie bitte sicher, dass die Rackumgebungstemperatur innerhalb des angegebenen Betriebstemperaturbereichs liegt. (Temperatur zwischen -20 und 65°C.)
- **Mechanische Last:** Stellen Sie kein Gerät auf eine Rack-Montageeinheit.
- **Stromüberlastung:** Stellen Sie sicher, dass der Netzkreis der Rackeinheit nicht überlastet wird.
- **Erdung:** Die Rack-Montageeinheit muss richtig geerdet werden. Besondere Acht sollten Sie bei Verbindungen geben, die nicht direkt zum Netz führen.

So montieren Sie Geräte an ein Rack:

1. Befestigen Sie die Metallwinkel mit den im Metallwinkel-Montageset erhältlichen Schrauben an dem Gerät.
2. Befestigen Sie das Gerät mit vier Rackmontageschrauben (nicht beigelegt) an dem Rack.
3. Wenn Sie nur einen Switch installieren, dann springen Sie bitte über zu "Verbinden mit einer Stromquelle" auf Seite 3-7 am Ende dieses Kapitels.
4. Wenn Sie mehrere Switches installieren möchten, dann montieren Sie sie untereinander in einer beliebigen Reihenfolge.

Das Erden des Gehäuses (Grounding the Chassis)

Bevor Sie den Switch anschalten, erden Sie den Switch mit dem Erdboden, wie im Folgenden beschrieben.

1. Vergewissern Sie sich, dass das Rack, auf welchem der Switch montiert werden soll, regelrecht geerdet ist und ETSI ETS 300 253 genügt.
2. Vergewissern Sie sich, dass eine gute elektrische Verbindung zum Erdungspunkt des Racks besteht (keine Farbe oder isolierende Oberflächenbehandlung).
3. Entfernen Sie alle Stromkabel vom Switch.

4. Das Switchgehäuse ist intern an 0 V angeschlossen. Der Schaltkreis ist mit dem Einzelloch-Erdungspunkt auf der Rückseite des Switches verbunden. Die Oberfläche um diesen Punkt ist nicht bemalt, um eine gute Verbindung zu gewährleisten. Schließen Sie einen 6 AWG verdrehten Kupferdraht an den Erdungspunkt des Switches an.
5. Dann schließen Sie das Erdungskabel an den Erdungspunkt des Racks an.

Vorsicht: Die Erdungsverbindungen dürfen nicht entfernt werden, es sei denn, alle Verbindungen zu den Stromquellen sind abgezogen.

Anschluss an eine Stromquelle (Connecting to a Power Source)

Dieser Switch unterstützt sowohl Gleichstrom- als auch Wechselstrom-Umwandlungsmodule.

Anschluss an Gleichstrom

Wenn ein -48 VDC Stromwandlungsmodul im Switch installiert ist, muß eine externe Gleichstromquelle an den Gleichstromanschluss auf der linken Seite der Vorderfront angeschlossen werden

Warnung: Vor dem Anschließen des DC Steckers oder Anschluß des Geräts ans Versorgungsnetz sicherstellen, daß die Stromversorgung ausgeschaltet ist oder keine Verbindung dazu besteht.

- Bemerkung:**
1. Um einen ausreichenden Schaltkreisschutz zwischen der Gleichstromquelle und dem Switch zu bieten, sollten alle Drähte und Schaltungen mindestens das zweifache der maximalen Ladung dieses Switches führen können (Siehe "Power Supply" auf Seite C-2).
 2. Die Drähte zwischen der Gleichstromquelle und dem Switch sollen aus gedrehtem Kupfer bestehen und im Bereich von 10 bis 24 AWG liegen.
 3. Die Verdrahtung der Stromeingangspunkte des Switches ist unten beschrieben. Die Verdrahtung der Gleichstromquellenpunkte hängen vom Einsatzort ab, sollten aber so angelegt sein, dass die Eingangsanforderungen, wie sie in Figure 3-7 "DC Plug Connections" auf Seite 3-8 beschrieben sind, erfüllt sind. Die Drähte sollten auch gemäß der örtlichen Normen gefärbt sein, um sicherzustellen, dass die Stromeingangskabel und die Erdungsdrähte leicht unterschieden werden können.
 4. Wenn Sie die zwei Stromwandlungsmodule benutzen, können Sie sowohl Wechsel- als auch Gleichstrommodule verwenden – beide Wechselstrom, beide Gleichstrom oder ein Wechselstrom und ein Gleichstrom. Die einzige Einschränkung besteht darin, dass, wenn Sie zwei Gleichstromwandlungsmodule benutzen, beide Module vom

gleichen Typ sein müssen, z.B. beide -48 V Gleichstrom oder beide 24 V Gleichstrom.

So schließen Sie den Switch an eine Stromquelle an:

1. Stellen Sie zunächst sicher, dass die externe Gleichstromquelle -36 bis -72 V Gleichstrom, mit mindestens 4 A für das -48 V Gleichstrom Stromwandlungsmodul.
2. Halten Sie zwei Drähte für jede Stromquelle, die benutzt wird, bereit (A oder B). Benutzen Sie 10 bis 24 AWG verdrehte Kupferdrähte. Vergewissern Sie sich, dass diese Drähte nicht in die Stromquelle gesteckt werden.
3. Entfernen Sie mit einer Abstreifzange etwa 2 cm von der Isolierung am Ende des Drahtes, um den Kupferkern freizulegen.
4. Verdrehen Sie die Kupferstränge, um eine feste Litze zu erhalten. Wenn es möglich ist, verlöten Sie die freigelegten Litzen des Drahtes, um eine bessere Leitfähigkeit zu erreichen.
5. Verbinden Sie die externen Stromleitungen und Erdungsdrähte mit dem Gleichstromstecker (mit dem Switch mitgeliefert) wie unten gezeigt. Die Netzanschlusskabel sind auf der Vorderseite des Gehäuses, über dem Gleichstromblock, gekennzeichnet. Die -48 V Gleichstromzuleitung benutzt den "-48VDC" Eingang und die RETA/B (Return) Leitungen für die Stromquellen A bzw. B. Benutzen Sie einen Flachkopfschraubendreher, um die Schrauben des Steckers zu lösen und öffnen Sie die Drahtklammern.
6. Fügen Sie die Verbindungsleitungen in die Öffnungen, wie im unteren Bild gezeigt, ein. Jede Leitung, welche in den Stecker eingefügt wird, muß der Leitung, die an die Stromquelle angeschlossen ist, entsprechen. Benutzen Sie die Kennzeichnungen über dem Gleichstromblock, um die passenden Stromeingangs- und Rückleitung bzw. die Erdungskabel zu identifizieren.

Warnung: Sollten die Leitungen in die falschen Löcher eingesteckt sein, wird die Stromversorgung nicht richtig funktionieren und der Switch könnte beschädigt werden.

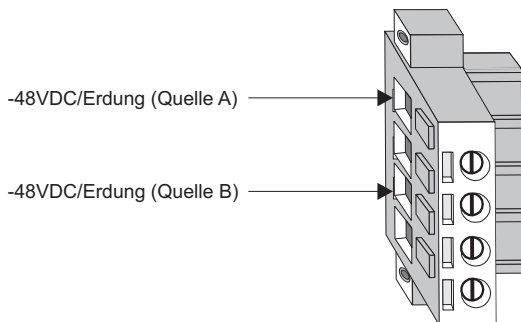


Figure D-1 Gleichstromanschlüsse

7. Schieben Sie jeden Draht etwa einen Zentimeter in die Öffnung des Steckers und ziehen Sie die Klammerschrauben fest. Es sollte Ihnen möglich sein, an den Drähten zu ziehen und diese zu entfernen.
8. Stecken Sie den Stromstecker in die Strombuchse links auf der Vorderfront.
9. An der Stromquelle stellen Sie nun den Strom für die Leitungen an.
10. Nachdem Sie die Stromquelle angestellt haben, stellen Sie den Stromschalter auf der Vorderseite des Stromwandlungsmoduls auf AN (mit "–" markiert).
11. Überprüfen Sie die Anzeigen auf den Stromwandlungsmodulen, wenn der Schalter angeschaltet ist, um sicherzugehen, dass die -48V LEVD, die den externen Stromstatus anzeigt, an ist, und dass auch die +12V LED, die den internen Stromstatus anzeigt, an ist. Wenn nicht, überprüfen Sie noch einmal die Stromquelle und die Stromverbindungen an der Stromquelle und am Stromwandlungsmodul.
12. Wenn Sie sowohl ein primäres als auch ein freigesetztes Stromwandlungsmodul installiert haben, vergewissern Sie sich, dass die LEDs beider Module so leuchten, wie in den vorherigen Schritten angegeben.

Wechselstromanschluss

Wenn ein universelles Wechselstrommodul im Switch installiert ist, muß dem Modul externer Wechselstrom zugeführt werden.

So schließen Sie den Switch an eine Stromquelle an:

1. Vergewissern Sie sich zunächst, dass die externe Wechselstromquelle 100 bis 240 V Wechselstrom, 50-60 Hz, mit mindestens 2 A liefern kann.
2. Stecken Sie den Stromkabel in eine geerdete, 3-Pin Wechselstromquelle.

Bemerkung: Für den internationalen Gebrauch kann es sein, dass Sie das Wechselstromkabel austauschen müssen. Sie müssen ein Kabel benutzen, das für die Anschlusstypen in Ihrem Land genehmigt ist.

3. Stecken Sie den Stecker am anderen Ende des Stromkables direkt in die Anschlussbuchse des Wechselstrommoduls.

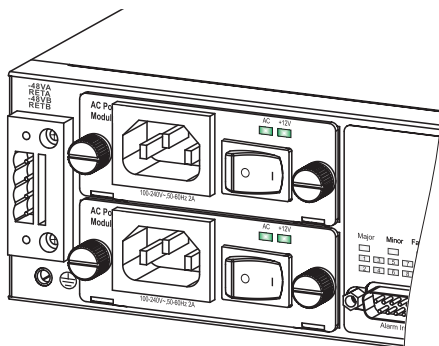


Figure D-2 Wechselstromanschluss

4. Wenn der Switch angeschaltet ist, überprüfen Sie die Anzeigen des Strommoduls, um sicherzugehen, dass sowohl die Wechselstrom LED, die den externen Stromstatus anzeigt, als auch die +12V LED, die die interne Stromwandlung anzeigt, leuchtet. Wenn nicht, überprüfen Sie noch einmal die Stromquelle und die Stromverbindungen an der Stromquelle und am Stromwandlungsmodul.
5. Wenn Sie sowohl ein primäres als auch ein freigesetztes Stromwandlungsmodul installiert haben, vergewissern Sie sich, dass die LEDs beider Module so leuchten, wie in den vorherigen Schritten angegeben.

Glossary

10BASE-T

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

100BASE-TX

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

1000BASE-BX

IEEE 802.3-2005 specification for Gigabit Ethernet over a single strand of 9/125 micron core fiber cable.

1000BASE-LH

Long-haul Gigabit Ethernet over two strands of 9/125 micron core fiber cable.

1000BASE-LX

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

1000BASE-SX

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

1000BASE-T

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

Auto-Negotiation

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

Bandwidth

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

Collision

A condition in which packets transmitted over the cable interfere with each other. Their interference makes both signals unintelligible.

Collision Domain

Single CSMA/CD LAN segment.

CSMA/CD

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

End Station

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

Ethernet

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

Fast Ethernet

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

Full Duplex

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

Gigabit Ethernet

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

IEEE

Institute of Electrical and Electronic Engineers.

IEEE 802.3

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

IEEE 802.3ab

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

IEEE 802.3u

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

IEEE 802.3z

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

LAN Segment

Separate LAN or collision domain.

LED

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

Local Area Network (LAN)

A group of interconnected computer and support devices.

Media Access Control (MAC)

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

MIB

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

Modal Bandwidth

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

Network Diameter

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

Redundant Power Supply (RPS)

A backup power supply unit that automatically takes over in case the primary power supply should fail.

RJ-45 Connector

A connector for twisted-pair wiring.

Switched Ports

Ports that are on separate collision domains or LAN segments.

TIA

Telecommunications Industry Association

Transmission Control Protocol/Internet Protocol (TCP/IP)

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

UTP

Unshielded twisted-pair cable.

Virtual LAN (VLAN)

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

Index

Numerics

- 10 Mbps connectivity rules 4-6
- 100 Mbps connectivity rules 4-5
- 1000 Mbps connectivity rules 4-5
- 1000BASE combo module 1-7
- 1000BASE-BX fiber cable lengths 4-5
- 1000BASE-LH fiber cable lengths 4-5
- 1000BASE-LX fiber cable lengths 4-5
- 1000BASE-SX fiber cable lengths 4-5
- 1000BASE-T
 - cable lengths 4-5
 - pin assignments B-4
 - ports 1-2
- 100BASE-TX
 - cable lengths 4-5
 - management port 1-2
 - pin assignments B-1
 - ports 1-2
- 10BASE-T
 - cable lengths 4-6
 - pin assignments B-1
 - ports 1-2

A

- adhesive feet, attaching 3-4
- air flow requirements 3-1
- alarm interface port 1-4
- alarm port, pin assignments 3-11
- applications
 - collapsed backbone 2-2
 - network aggregation 2-3
 - remote connections 2-4
 - VLAN connections 2-5

B

- brackets, attaching 3-3
- buffer size C-1

C

- cable
 - Ethernet cable compatibility 3-1
 - labeling and connection records 4-6
- cleaning fiber terminators 4-4

compliances

- EMC C-3
- safety C-4
- connectivity rules
 - 10 Mbps 4-6
 - 100 Mbps 4-5
 - 1000 Mbps 4-5
- console port 1-3
- console port, pin assignments 3-10
- contents of package 3-2
- cooling problems A-1
- cord sets, international 3-9
- Craft port 1-2

D

- desktop mounting 3-4
- device connections 4-1

E

- electrical interference, avoiding 3-1
- equipment checklist 3-2

F

- fan tray 1-5
- features C-3
 - management 1-8
 - switch 1-7
- fiber cables 4-3
 - duplex fiber 4-3
 - multimode 4-3
 - simplex fiber 4-3
 - single mode 4-3
- full-duplex connectivity 2-1

I

- IEEE 802.3 Ethernet 1-8
- IEEE 802.3u Fast Ethernet 1-8
- IEEE 802.3z Gigabit Ethernet 1-8
- indicators, LED 1-4
- installation
 - connecting devices to the switch 4-2
 - desktop or shelf mounting 3-4
 - port connections 4-1

- power requirements 3-1
- problems A-2
- site requirements 3-1
- wiring closet connections 4-2

L

- LC port connections 4-3
- LED indicators
 - Diag 1-5
 - Fan Fail 1-5
 - Major 1-5
 - Minor 1-5
 - port 1-5
 - power 1-5
 - problems A-1
- location requirements 3-1

M

- management
 - agent 1-2
 - Craft port 1-2
 - features 1-8, C-3
 - out-of-band 1-2
 - SNMP 1-2
 - web-based 1-2
- media expansion module 1-7
- mounting the switch
 - on a desktop or shelf 3-4
- multimode fiber optic cables 4-3

N

- network
 - connections 4-1
 - examples 2-2

O

- optional module, installation 3-5
- out-of-band management 1-2

P

- package contents 3-2
- pin assignments B-1
 - 100BASE-T B-4
 - 10BASE-T/100BASE-TX B-1
- alarm port 3-11

- console port 3-10
- ports, connecting to 4-1
- power
 - connecting to AC supply 3-9, D-6
 - connecting to DC supply 3-8
 - indicators 1-5
 - modules 1-6
- problems, troubleshooting A-1

R

- RJ-45 port 1-2
 - connections 4-1
 - pinouts B-4
- rubber foot pads, attaching 3-4

S

- screws for rack mounting 3-2
- serial port, management port 1-3
- SFP
 - slots 1-3
 - supported transceivers 1-3
 - transceiver connections 4-3
- single-mode fiber optic cables 4-3
- site selection 3-1
- SNMP agent 1-2
- specifications
 - compliances C-3
 - environmental C-2
 - media extender module C-4
 - physical C-1
 - power C-2
- standards, IEEE C-3
- status LEDs 1-4
- surge suppressor, using 3-1
- switch architecture 1-1
- switching, introduction to 2-1

T

- troubleshooting
 - in-band access A-2
 - power and cooling problems A-1
 - switch indicators A-1
 - Telnet A-2
- twisted-pair connections 4-1

V

VLANs, tagging 2-5

W

web-based management 1-2

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