Matrix-V Series
V2H124-24
FAST ETHERNET SWITCH

Hardware Installation Guide

P/N 9033924-05

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Networks that Know

ELECTRICAL HAZARD: Only qualified personnel should perform installation procedures.

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Regulatory Compliance Information

Federal Communications Commission (FCC) Notice

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

NOTE: 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 uses, generates, and can radiate radio frequency energy and if not installed in accordance with the operator's manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user will be required to correct the interference at his own expense.

WARNING: Changes or modifications made to this device which are not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Industry Canada Notice

This digital apparatus does not exceed the class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

AS/NZS CISPR 22

VCCI Notice

This is a class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

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ENVIRONMENTAL REQUIREMENTS

Operating Temperature:	-5°C to 50°C (23°F to 121°F)
Storage Temperature:	-40°C to 70°C (-40°F to 158°F)
Operating Relative Humidity:	5% to 95% (non-condensing)

PRODUCT SAFETY

This product complies with the following: UL 60950, CSA C22.2 No. 60950, 73/23/EEC, EN 60950, IEC 60950, EN 60825, 21 CFR 1040.10.

ELECTROMAGNETIC COMPATIBILITY (EMC)

This product complies with the following: 47 CFR Parts 2 and 15, CSA C108.8, 89/336/EEC, EN 55022, EN 61000-3-2, EN 61000-3-3, EN 55024, AS/NZS CISPR 22, VCCI V-3.

Safety Compliance

Warning: Fiber Optic Port Safety

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

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

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

Warnhinweis: Faseroptikanschlüsse - Optische Sicherheit

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

Safety Information
Class 1 Laser Transceivers
Laser Radiation and Connectors

When the connector is in place, all laser radiation remains within the fiber. The maximum amount of radiant power exiting the fiber (under normal conditions) is -12.6 dBm or 55×10^{-6} watts.

Removing the optical connector from the transceiver allows laser radiation to emit directly from the optical port. The maximum radiance from the optical port (under worst case conditions) is 0.8 W cm^{-2} or 8×10^{3} W m^{2} sr-1.

Do not use optical instruments to view the laser output. The use of optical instruments to view laser output increases eye hazard. When viewing the output optical port, power must be removed from the network adapter.

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.

- This guide is intended for use by network administrators who are responsible for setting up and installing network equipment; consequently it assumes a basic working knowledge of LANs (Local Area Networks).
- The unit must be connected to an earthed (grounded) outlet to comply with international safety standards.
- Do not connect the unit to an A.C. outlet (power supply) without an earth (ground) connection.
- The appliance coupler (the connector to the unit and not the wall plug) must have a configuration for mating with an EN 60320/IEC 320 appliance inlet.
- The socket outlet must be near to the unit and easily accessible. You can only remove power from the unit by disconnecting the power cord from the outlet.
- This unit operates under SELV (Safety Extra Low Voltage) conditions according to IEC 60950. The conditions are only maintained if the equipment to which it is connected also operates under SELV conditions.

France and Peru only

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

† Impédance à la terre

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).

Power Cord Set	
Europe	The supply plug must comply with CEE7/7 (“SCHUKO”).
	The mains cord must be <HAR> or <BASEC> marked and be of type HO3VVF3GO.75 (minimum).
	IEC-320 receptacle.

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

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

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

France et Pérou uniquement:

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

Cordon électrique - Il doit être agréé dans le pays d’utilisation	
Etats-Unis et Canada:	Le cordon doit avoir reçu l’homologation des UL et un certificat de la CSA.
	Les spe'cifications minimales pour un cable flexible sont AWG No. 18, ouAWG No. 16 pour un cable de longueur infe'rieure a` 2 me'tres. - 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).

Cordon électrique - Il doit être agréé dans le pays d'utilisation	
Danemark:	La prise mâle d'alimentation doit respecter la section 107-2 D1 de la norme DK2 1a ou DK2 5a.
Suisse:	La prise mâle d'alimentation doit respecter la norme SEV/ASE 1011.
Europe	La prise secteur doit être conforme aux normes CEE 7/7 ("SCHUKO") LE cordon secteur doit porter la mention <HAR> ou <BASEC> et doit être de type HO3VVF3GO.75 (minimum).

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

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

- Diese Anleitung ist fr die Benutzung durch Netzwerkadministratoren vorgesehen, die fr die Installation und das einstellen von Netzwerkkomponenten verantwortlich sind; sie setzt Erfahrung bei der Arbeit mit LANs (Local Area Networks) voraus.
- Das Gerät sollte nicht an eine ungeerdete Wechselstromsteckdose angeschlossen werden.
- Das Gerät muß an eine geerdete Steckdose angeschlossen werden, welche die internationalen Sicherheitsnormen erfüllt.
- Der Gerätestecker (der Anschluß an das Gerät, nicht der Wandsteckdosenstecker) muß einen gemäß EN 60320/IEC 320 konfigurierten Geräteeingang haben.
- Die Netzsteckdose muß in der Nähe des Geräts und leicht zugänglich sein. Die Stromversorgung des Geräts kann nur durch Herausziehen des Gerätenetzkabels aus der Netzsteckdose unterbrochen werden.
- Der Betrieb dieses Geräts erfolgt unter den SELV-Bedingungen (Sicherheitskleinstspannung) gemäß IEC 60950. Diese Bedingungen sind nur gegeben, wenn auch die an das Gerät angeschlossenen Geräte unter SELV-Bedingungen betrieben werden.

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

Declaration of Conformity

Application of Council Directive(s):	**89/336/EEC** **73/23/EEC**
Manufacturer's Name:	**Enterasys Networks, Inc.**
Manufacturer's Address:	**50 Minuteman Road** **Andover, MA 01810** **USA**
European Representative Address:	**ENTERASYS NETWORKS, Ltd.** **Nexus House, Newbury Business Park** **London Road, Newbury** **Berkshire RG14 2PZ, England**
Conformance to Directive(s)/Product Standards:	**EC Directive 89/336/EEC** **EN 55022** **EN 61000-3-1** **EN 61000-3-2** **EN 55024** **EC Directive 73/23/EEC** **EN 60950** **EN 60825**
Equipment Type/Environment:	**Networking Equipment, for use in a Commercial or Light Industrial Environment.**

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13. SEVERABILITY. In the event any provision of this Agreement is found to be invalid, illegal or unenforceable, the validity, legality and enforceability of any of the remaining provisions shall not in any way be affected or impaired thereby, and that provision shall be reformed, construed and enforced to the maximum extent permissible. Any such invalidity, illegality or unenforceability in any jurisdiction shall not invalidate or render illegal or unenforceable such provision in any other jurisdiction.

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Chapter 1: Introduction

Overview

The Matrix V-Series V2H124-24 switch is a stackable Fast Ethernet switch with 24 10BASE-T / 100BASE-TX ports and two ports for 100BASE-FX, 1000BASE-T, or combination 1000BASE-T/SFP uplink modules, or a stacking module. The V2H124-24 also includes an SNMP-based management agent, which provides both in-band and out-of-band access for managing the switch.

The V2H124-24 provides a broad range of powerful features for Layer 2 switching, delivering reliability and consistent performance for your network traffic. It brings order to poorly performing networks by segregating them into separate broadcast domains with IEEE 802.3Q compliant VLANs, and empowers multimedia applications with multicast switching and CoS services.

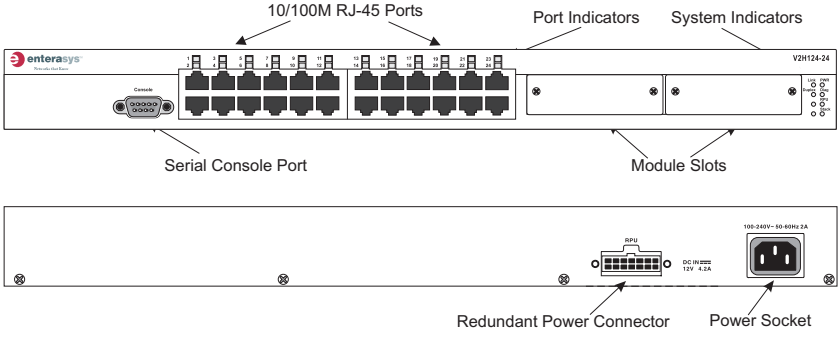

Figure 1-1. Front and Rear Panels

Switch Architecture

The V2H124-24 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.

The V2H124-24 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.

The V2H124-24 includes two ports on the front panel for slide-in 100BASE-FX, 1000BASE-T, 1000BASE-T/SFP, or stacking modules. The stacking module allows up to eight units to be linked together and managed from a master unit using one IP address.

Network Management Options

With a comprehensive arrange of LEDs, the V2H124-24 switch provides “at a glance” monitoring of network and port status. The switch can be managed over the network with a web browser or Telnet application, or via a direct connection to the console port. The switch includes a built-in network management agent that allows it to be managed in-band using SNMP or RMON (Groups 1, 2, 3, 9) protocols. It also has an RS-232 serial port (DB-9 connector) on the front panel for out-of-band management. A PC may be connected to this port for configuration and monitoring out-of-band via a null-modem serial cable. (See Appendix B for wiring options.)

For a detailed description of the advanced features, refer to the Configuration Guide.

Description of Hardware

10/100BASE-T Ports

The V2H124-24 switch base unit contains 24 10BASE-T/100BASE-TX RJ-45 ports. All 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. (See “10/100BASE-TX Pin Assignments” on page B-1.)

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

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

Port and System Status LEDs

The V2H124-24 base unit also includes a display panel for key system and port indications that simplify installation and network troubleshooting. The LEDs, which are located on the front panel for easy viewing, are shown below and described in the following tables.

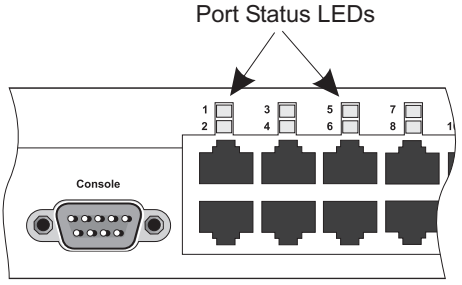

Figure 1-2. Port LEDs

Table 1-1. Port Status LEDs

LED	Condition	Status
Base Unit Ports		
1~24 (Link/Activity)	On/Flashing Amber	Port has established a valid 10 Mbps network connection. Flashing indicates activity.
	On/Flashing Green	Port has established a valid 100 Mbps network connection. Flashing indicates activity.
	Off	There is no valid link on the port.

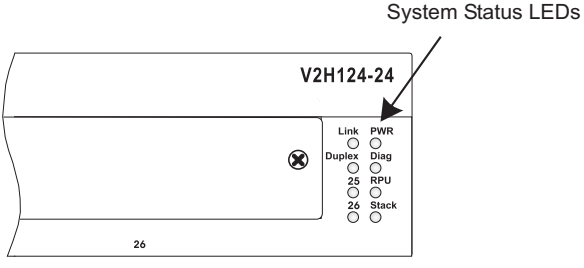

Figure 1-3. System LEDs

Table 1-2. System Status LEDs		
LED	**Condition**	**Status**
PWR	On Green	The unit's internal power supply is operating normally.
	On Amber	The unit's internal power supply has failed.
	Off	The unit has no power connected.
Diag	On Green	The system diagnostic test has completed successfully.
	Flashing Green	The system diagnostic test is in progress.
	On Amber	The system diagnostic test has detected a fault.
RPU	Green	Lights steady to indicate that a redundant power unit is attached and is in backup or active mode.
	Off	There is no redundant power unit currently attached.
Stack	Flashing Amber	An initial state of stacking configuration upon powering on.
	Green	This switch is acting as the master unit in the stack.
	Amber	This switch is acting as a slave unit in the stack.
	Flashing Green	Indicates that the unit ID of each switch in the stack is being displayed by port LEDs 1 to 8 (initiated by a CLI command).
Link	N/A	This indicator is not currently implemented.
Duplex	N/A	This indicator is not currently implemented.
Module Ports		
Port 25~26 (Link/Activity)	On/Flashing Amber	Port has established a valid 10/100 Mbps network connection. Flashing indicates activity.
	On/Flashing Green	Port has established a valid 1000 Mbps network connection. Flashing indicates activity.
	Off	There is no valid link on the port.

Power Supply Receptacles

There are two power receptacles on the rear panel of the switch. The standard power receptacle is for the AC power cord. The receptacle labeled "RPU" is for the optional Redundant Power Unit (RPU).

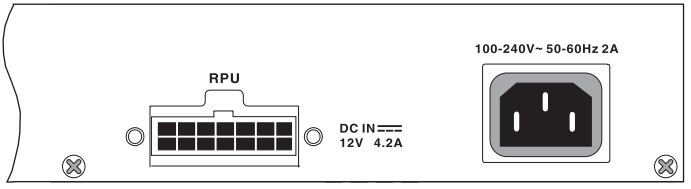

Figure 1-4. Power Supply Receptacles

Optional Media Extender Modules

100BASE-FX Multimode Module

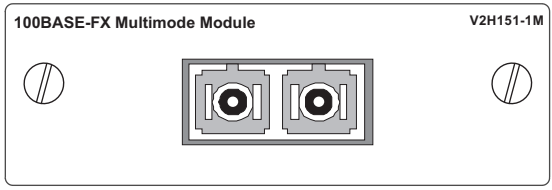

Figure 1-5. Single-Port 100BASE-FX Multimode Module

Using multimode fiber optic cable, the 100BASE-FX port can be connected to a remote site up to 2 km (1.24 miles) away. The 100BASE-FX module is fixed to operate at 100 Mbps full duplex, and supports auto-negotiation for flow control. The module is fitted with an SC connector.

100BASE-FX Single-Mode Module

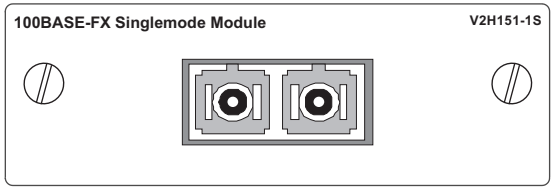

Figure 1-6. Single-Port 100BASE-FX Single-Mode Module

Using single-mode fiber optic cable, the 100BASE-FX port can be connected to a remote site up to 20 km (12.4 miles) away. The 100BASE-FX module is fixed to operate at 100 Mbps full duplex, and supports auto-negotiation for flow control. The module is fitted with an SC connector.

1000BASE-T Module

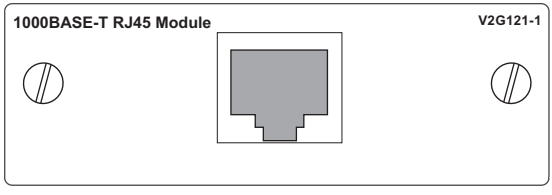

Figure 1-7. Single-Port 1000BASE-T Module

Using Category 5, 5e, or 6 twisted-pair cable you can connect to another device up to 100 m (328 ft) away. The 1000BASE-T module operates at 10, 100, and 1000 Mbps. At 1000 Mbps it operates at full duplex and supports auto-negotiation of speed and 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 4-5.

1000BASE-T/SFP Combination Module

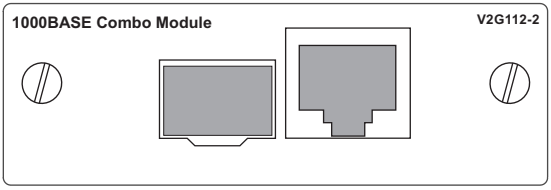

Figure 1-8. 1000BASE-T/SFP Combination Module

This is a combination module, providing use of a Gigabit RJ-45 port or a Small Form Factor Pluggable (SFP) transceiver port. If an SFP transceiver (purchased separately) is installed in the port and has a valid link on the port, the shared RJ-45 port is disabled.

The 1000BASE-T RJ-45 port supports automatic MDI/MDI-X operation, so straight-through cables can be used for all network connections to PCs or servers, or to other switches or hubs. Using Category 5, 5e, or 6 twisted-pair cable you can connect to another device up to 100 m (328 ft) away. The RJ-45 port operates at 1000 Mbps, with support for full-duplex mode and flow control.

SFP is a specification for compact, modular transceivers that are hot swappable. The SFP port supports 1000BASE-SX, 1000BASE-LX, or 1000BASE-LH transceivers for fiber optic connections to remote devices. An SFP transceiver port operates at 1000 Mbps, with support for full-duplex mode and flow control.

Stacking Module

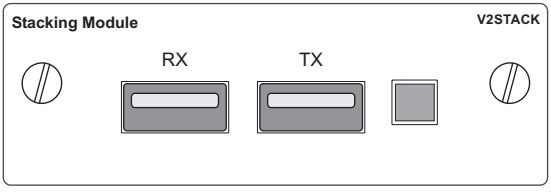

Figure 1-9. Stacking Module

The module provides two 1 Gbps ports via USB Type-A connectors. The right port is for transmit and the left port for receive. The module allows up to eight switches to be linked together using stacking cables. The push button on the module enables one switch in the stack to be selected as the master.

Features and Benefits

Connectivity

- 24 dual-speed ports for easy Fast Ethernet integration and for protection of your investment in legacy LAN equipment.
- Auto-negotiation enables each RJ-45 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.
- Independent RJ-45 10/100BASE-TX ports with auto MDI/MDI-X.
- 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 or 6 for 1000 Mbps connections.
- IEEE 802.3 Ethernet, 802.3u Fast Ethernet, 802.3z and 802.3ab Gigabit Ethernet compliance ensures compatibility with standards-based hubs, network cards and switches from any vendor.

Expandability

- Optional single-port 100BASE-FX multimode and single-mode modules
- Optional single-port 1000BASE-T Gigabit module
- Optional combination 1000BASE-T/SFP Gigabit module, providing a choice of a 1000BASE-T UTP connection or an SFP transceiver fiber connection.
- Optional stacking module providing two USB ports for stacking up to 8 units.

Performance

- Transparent bridging
- Aggregate duplex bandwidth of up to 8.8 Gbps
- Switching table with a total of 8K MAC address entries
- Provides store-and-forward switching
- Wire-speed filtering and forwarding
- Supports flow control, using back pressure for half duplex and IEEE 802.3x for full duplex
- Broadcast storm control

Management

- “At-a-glance” LEDs for easy troubleshooting
- Network management agent:
  - Manages switch in-band or out-of-band
  - Supports Telnet, SNMP/RMON and web-based interface

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. The switch has, therefore, been recognized as one of the most important building blocks for today's networking technology.

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

When networks are based on repeater (hub) technology, the maximum distance between end stations is limited. For Ethernet, there may be up to four hubs between any pair of stations; for Fast Ethernet, the maximum is two; and for Gigabit Ethernet the maximum is one. This is known as the 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 network to significantly boost bandwidth while using conventional cabling and network cards.

Application Examples

The V2H124-24 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

The V2H124-24 is an excellent choice for mixed Ethernet and Fast Ethernet installations where significant growth is expected in the near future. You can easily build on this basic configuration, adding direct full-duplex connections to workstations or servers. When the time comes for further expansion, just connect to another hub or switch using one of the Fast Ethernet ports built into the front panel or a Gigabit Ethernet port on a slide-in expansion module.

In the figure below, the switch is operating as a collapsed backbone for a small LAN. It is providing dedicated 10 Mbps full-duplex connections to workstations and 100 Mbps full-duplex connections to power users and servers.

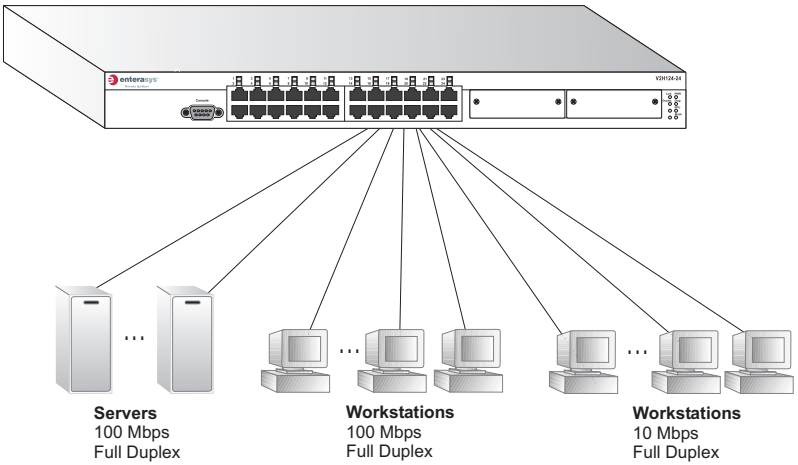

Figure 2-1. Collapsed Backbone

Network Aggregation Plan

With 24 parallel bridging ports (i.e., 24 distinct collision domains), the V2H124-24 can collapse a complex network down into a single efficient bridged node, increasing overall bandwidth and throughput.

In the figure below, the 10BASE-T/100BASE-TX ports on the switch are providing 100 Mbps connectivity for up to 24 segments. In addition, the switch is also connecting several servers at 1000 Mbps.

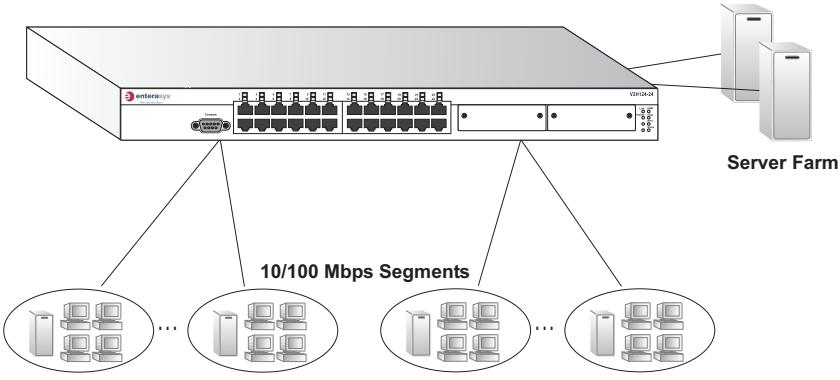

Figure 2-2. Network Aggregation Plan

Remote Connections with Fiber Cable

Fiber optic technology allows for longer cabling than any other media type. Using a 100BASE-FX multimode fiber (MMF) slide-in module, you can run a link up to 2 km. A 100BASE-FX single-mode fiber (SMF) link can run up to 20 km. This allows the switch to serve as a collapsed backbone, providing direct connectivity for a widespread LAN.

A 100BASE-FX slide-in module can be used to interconnect remote network segments. While an SFP transceiver in a 1000BASE-T/SFP module can be used for a Gigabit fiber connection between floors in the same building, or can be used to provide a link to other buildings in a campus setting.

The figure below illustrates this switch connecting multiple segments with fiber cable.

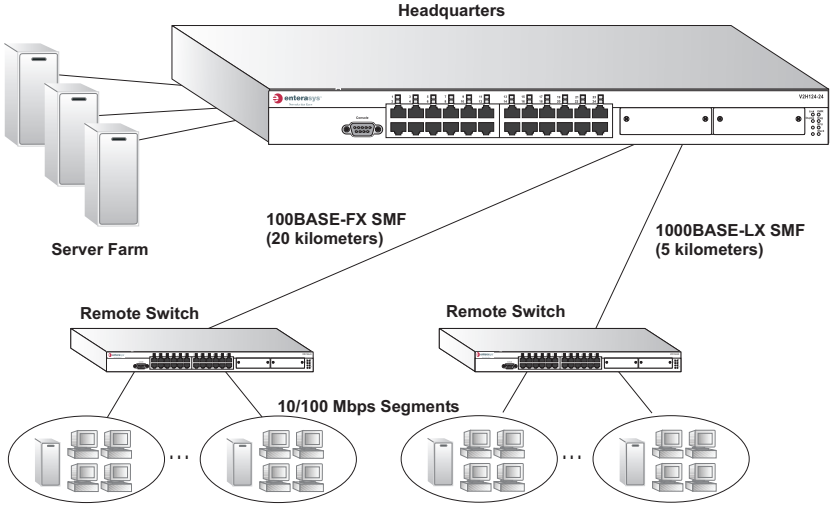

Figure 2-3. Remote Connections with Fiber Cable

Making VLAN Connections

This switch supports 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. Unttagged 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.

The switch also supports multiple spanning trees which allow VLANs 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 when any link in the spanning tree fails.

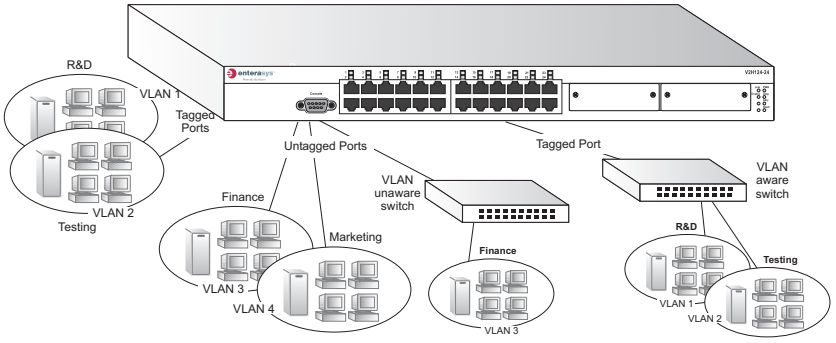

Figure 2-4. Making VLAN Connections

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. Avoid using flow control on a port connected to a hub unless it is actually required to solve a problem. Otherwise back pressure jamming signals may degrade overall performance for the segment attached to the hub.
3. As a general rule the length of fiber optic cable for a single switched link should not exceed:

   - 1000BASE-SX/LX: 550 m (1805 ft) for multimode fiber or 5 km (3.2 miles) for single-mode fiber.
   - 100BASE-FX: 2 km (1.24 miles) for multimode fiber or 20 km (12.43 miles) for single-mode 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

Switch units 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:
  - be at the center of all the devices you want to link and near a power outlet.
  - be able to maintain its temperature within -5 °C to 50 °C (23 to 121 °F) and its humidity within 5% to 95%, non-condensing
  - provide adequate space (approximately two inches) on all sides for proper air flow
  - be accessible for installing, cabling and maintaining the devices
  - allow the status LEDs to be clearly visible
- Make sure twisted-pair cable is always routed away from power lines, fluorescent lighting fixtures and other sources of electrical interference, such as radios and transmitters.
- Make sure that the unit is connected to a separate grounded power outlet that provides 100 to 240 VAC, 50 to 60 Hz, is within 2.44 m (8 feet) of each device and is powered from an independent circuit breaker. As with any equipment, using a filter or surge suppressor is recommended.

Ethernet Cabling

To ensure proper operation when installing the switch into a network, make sure that the current cables are suitable for 10BASE-T or 100BASE-TX 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 and Category 5 or better for 100BASE-TX.
- Protection from radio frequency interference emissions
- Electrical surge suppression
- Separation of electrical wires (switch related or other) and electromagnetic fields from data based network wiring
- Safe connections with no damaged cables, connectors or shields

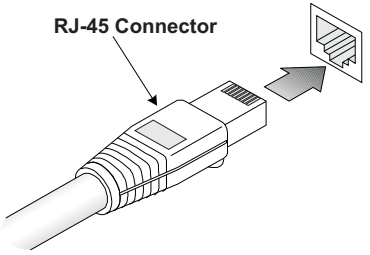

Figure 3-1. RJ-45 Connections

Equipment Checklist

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

Package Contents

Matrix V-Series V2H124-24 switch

- Four adhesive foot pads
- Bracket Mounting Kit containing two brackets and eight screws for attaching the brackets to the switch
- Power Cord—either US, Continental Europe or UK
- RS-232 console cable

Optional Rack-Mounting Equipment

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

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

Mounting

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

Installing Optional Modules: Before mounting the switch, you may want to install optional modules. If you have purchased optional slide-in 100BASE-FX, 1000BASE-T, 1000BASE-T/SFP, or stacking modules, install these modules now, following the instructions “Installing an Optional Module into the Switch” on page 3-5.

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-1.)
- 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. Particular attention should be given to supply connections other than direct connections to the mains.

To rack-mount devices:

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

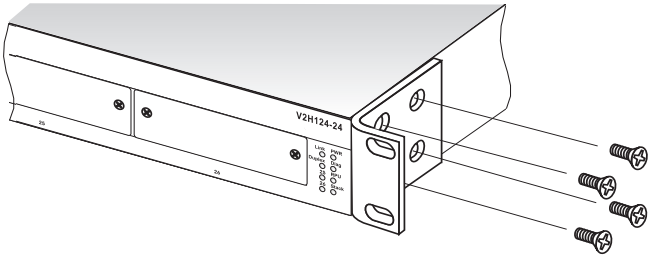

Figure 3-2. Attaching the Brackets

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

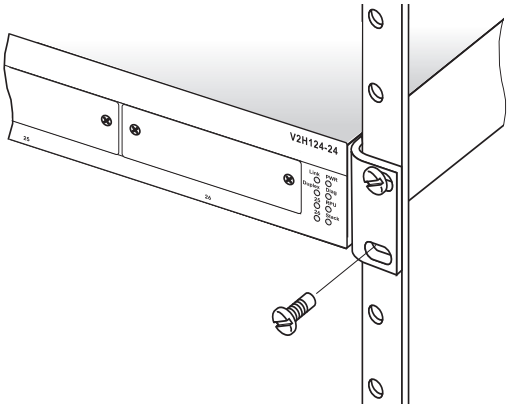

Figure 3-3. Installing the Switch in a Rack

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.

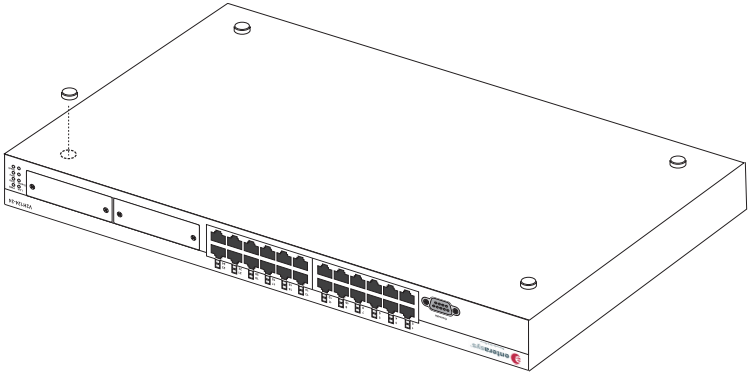

Figure 3-4. Attaching the Adhesive Feet

2. Set the device on a flat surface near an AC power source, making sure there are at least two inches of space on all sides for proper air flow.
3. If installing a single switch only, go to “Connecting to a Power Source” 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

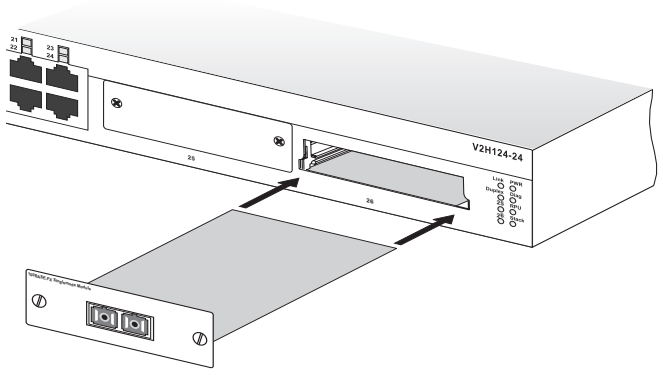

Figure 3-5. Installing an Optional Module

Caution: DO NOT install slide-in modules with the switch powered on. Be sure you power off the switch before installing any module.

Note: The stacking module must only be installed in port 25.

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

1. Disconnect power to the switch.
2. Remove the blank metal plate (or a previously installed module) from the appropriate port by removing the two screws with a flat-head screwdriver.
3. With the module still in the anti-static bag, touch the metal frame of the switch to prevent damage caused by static electricity discharge. Also, it is recommended to use an ESD wrist strap during installation.
4. Remove the module from the anti-static shielded bag.
5. Holding the module level, guide it into the carrier rails on each side and gently push it all the way into the port, ensuring that it firmly engages with the connector.

Installing an SFP Transceiver

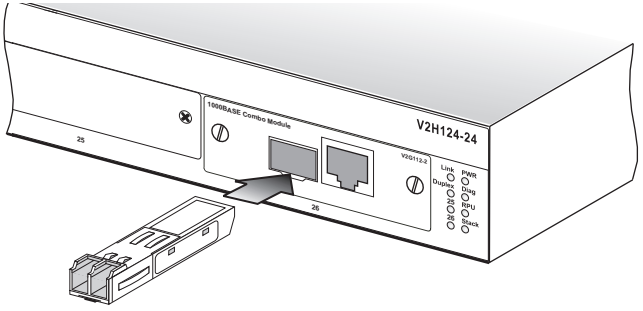

Figure 3-6. Installing an SFP Transceiver

To install an SFP transceiver, perform the following steps:

1. Consider your network and cabling requirements to select an appropriate SFP transceiver type.
2. Insert the transceiver with the optical connector facing outward and the port 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 port 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.

Connecting Switches in a Stack

An optional Stacking Module ships with one stacking cable. Figure 3-6 shows how the stack cables are cascaded between switches in a stack.

Note: The stacking module must only be installed in port 25.

Note: Only switches with firmware version 2.2.x.x. and above are capable of stacking.

To connect up to eight switches in a stack, perform the following steps:

1. Plug one end of a stack cable into the TX (right) port of the top unit
2. Plug the other end of the stack cable into the RX (left) port of the next unit.
3. Repeat steps 1 and 2 for each unit in the stack. Form a simple chain starting at the TX port on the top unit and ending at the RX port on the bottom unit (stacking up to 8 units).

4. Complete the stack connections by plugging one end of a stack cable into the TX port on the bottom unit and the other end into the RX port on the top unit.

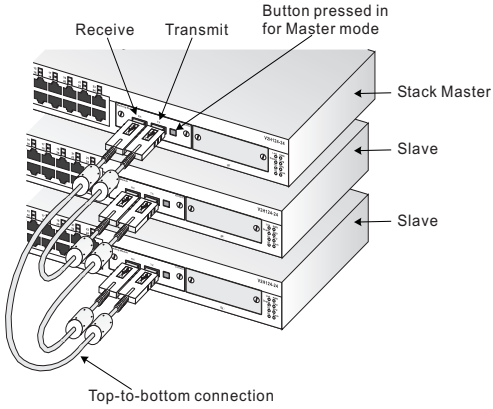

Figure 3-7. Connecting Switches in a Stack

5. Select the Master unit in the stack by pressing the push button in on only one of the stacking modules. Only one switch in the stack can operate as the Master, all other units operate in slave mode. If more than one switch in the stack is selected as Master, or if no switches are selected, the stack will not function.

Note: The stacking feature requires that all stacking module ports be connected and the switches powered on. If one stack link is not connected, or if a switch is powered off, the stack will not function.

Note: If the stacking connection is broken, the switches will become multiple standalone switches.

Connecting to a Power Source

To connect a switch to a power source:

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

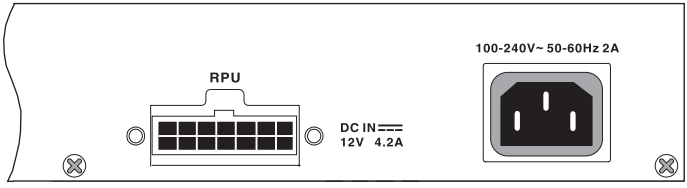

Figure 3-8. Power Receptacles

2. Plug the other end of the cable into a grounded, 3-pin socket, 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. Check the front-panel LEDs as the device is powered on to be sure the PWR LED is lit. If not, check that the power cable is correctly plugged in.

4. If you have purchased a Redundant Power Unit, connect it to the switch and to an AC power source now, following the instructions included with the package.

Connecting to the Console Port

The DB-9 serial port on the switch's front panel is used to connect to the switch for out-of-band console configuration. The command-line-driven 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.

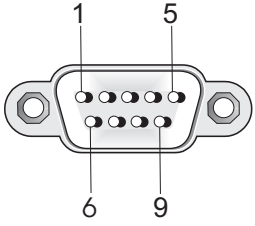

Figure 3-9. Serial Port (DB-9 DTE) Pin-Out

Wiring Map for Serial Cable

Table 3-1. Serial Cable Wiring		
Switch's 9-Pin Serial Port	**Null Modem**	**PC's 9-Pin DTE Port**
2 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

Chapter 4: Making Network Connections

Connecting Network Devices

The V2H124-24 switch is designed to be connected to 10 or 100 Mbps network cards in PCs and servers, as well as to other switches and hubs. It may also be connected to remote devices using the optional 100BASE-FX or 1000BASE-T/SFP modules.

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.

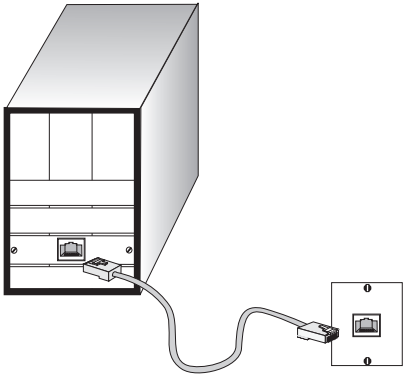

Figure 4-1. Making Twisted-Pair Connections

2. If the device is a network 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 the section "Network Wiring Connections.") 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.

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

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

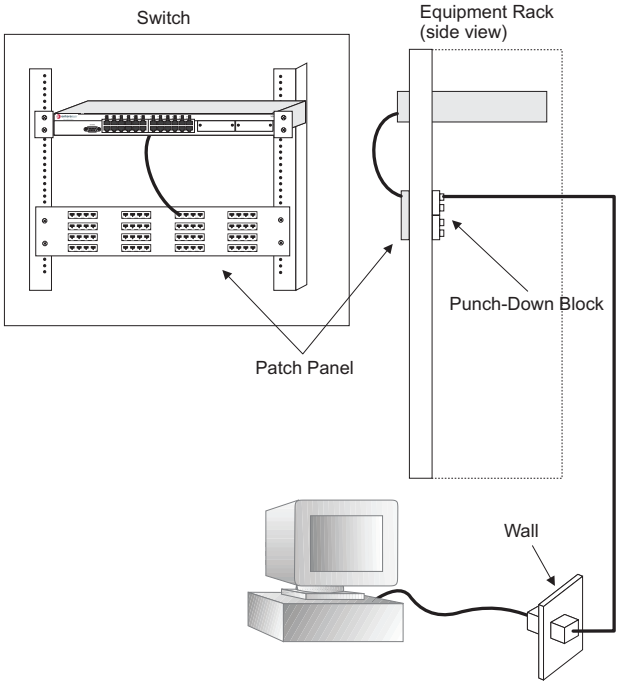

Figure 4-2. Network Wiring Connections

Fiber Optic Devices

An optional slide-in 100BASE-FX module or 1000BASE-LX SFP transceiver may be used for backbone or remote connections. A 1000BASE-SX or 100BASE-LX SFP transceiver may also be for connecting to a high-speed server.

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

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.

1. Remove and keep the SC port's rubber plug. When not connected to a fiber cable, the rubber plug should be replaced to protect the optics.
2. Check that the fiber terminators are clean. You can clean the cable plugs by wiping them gently with a clean tissue or cotton ball moistened with a little ethanol. Dirty fiber terminators on fiber optic cables will impair the quality of the light transmitted through the cable and lead to degraded performance on the port.
3. Connect one end of the cable to the SC or LC port on the switch and the other end to the port on the other device. Since SC and LC connectors are keyed, the cable can be attached in only one orientation.

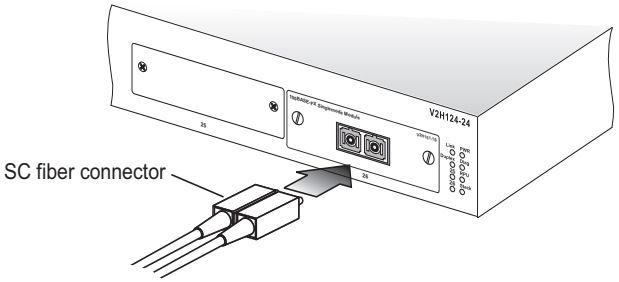

Figure 4-3. Making Fiber Port Connections

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

The 100BASE-FX fiber optic ports operate only at 100 Mbps, full duplex. You can run a single-mode fiber link up to 20 kilometers (12.43 miles). However, note that power budget constraints must also be considered when calculating the maximum cable length for your specific environment.

A 1000BASE-LX or 1000BASE-SX SFP fiber optic ports operate at 1000 Mbps full duplex, with auto-negotiation of flow control. The maximum length for fiber optic cable operating at Gigabit speed will depend on the fiber type as listed under “1000 Mbps Gigabit Ethernet Collision Domain” on page 4-5.

Connectivity Rules

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

1000BASE-T Cable Requirements

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

1000 Mbps Gigabit Ethernet Collision Domain

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

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

Table 4-2. Maximum 1000BASE-SX Gigabit Ethernet Cable Lengths

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

Table 4-3. Maximum 1000BASE-LX Gigabit Ethernet Cable Length			
Fiber Size	**Fiber Bandwidth**	**Maximum Cable Length**	**Connector**
9/125 micron single-mode fiber	N/A	2 m - 5 km (7 ft - 3.2 miles)	LC

Table 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 - 70 km (7 ft - 43.5 miles)	LC

100 Mbps Fast Ethernet Collision Domain

Table 4-5. Maximum Fast Ethernet Cable Lengths			
Type	**Cable Type**	**Max. Cable Length**	**Connector**
100BASE-TX	Category 5 or better 100-ohm UTP or STP	100 m (328 ft)	RJ-45
100BASE-FX Multimode	50/125 or 62.5/125 micron core multimode fiber (MMF)	2 km (1.24 miles)	SC
100BASE-FX Single-mode	9/125 micron core single-mode fiber (SMF)	20 km (12.43 miles)	SC

10 Mbps Ethernet Collision Domain

Table 4-6. Maximum Ethernet Cable Length		
Cable Type	**Maximum Length**	**Connector**
Twisted Pair, Category 3 or better 100-ohm UTP	100 m (328 ft)	RJ-45

Cable Labeling and Connection Records

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

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

- Clearly label the opposing ends of each cable.
- Using your building's floor plans, draw a map of the location of all network-connected equipment. For each piece of equipment, identify the devices to which it is connected.
- Note the length of each cable and the maximum cable length supported by the switch ports.

- For ease of understanding, use a location-based key when assigning prefixes to your cable labeling.
- Use sequential numbers for cables that originate from the same equipment.
- Differentiate between racks by naming accordingly.
- Label each separate piece of equipment.
- Display a copy of your equipment map, including keys to all abbreviations at each equipment rack.

Appendix A: Troubleshooting

Diagnosing Switch Indicators

Table A-1. Troubleshooting Chart	
Symptom	**Action**
PWR LED is Off	• Internal power supply may be disconnected. Check connections between the switch, the power cord, the wall outlet.
PWR LED is Amber	• Internal power supply has failed. 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. • If the switch is installed in a rack, check the connections to the punch-down block and patch panel. • Verify that the proper cable type is used and its length does not exceed specified limits. • Check the adapter on the attached device and cable connections for possible defects. Replace the defective adapter or cable if necessary.

Power and Cooling Problems

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

Installation

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

In-Band Access

You can access the management agent in the switch from anywhere within the attached network using 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 accepts 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

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.

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: Each wire pair must be attached to the RJ-45 connectors in a specific orientation. (See “Cabling Guidelines” on page 4-1 for an explanation.)

The Figure B-1 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.

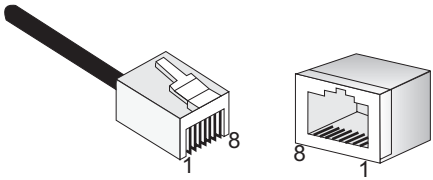

Figure B-1. RJ-45 Connector Pin Numbers

10/100BASE-TX Pin Assignments

Use unshielded twisted-pair (UTP) or shielded twisted-pair (STP) cable for RJ-45 connections: 100-ohm Category 3 or better cable for 10 Mbps connections, or 100-ohm Category 5 or better 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, 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 this switch, you can use either straight-through or crossover cable.

Table B-1. 10/100BASE-TX MDI and MDI-X Port Pinouts		
Pin	**MDI-X Signal Name**	**MDI Signal Name**
1	Receive Data plus (RD+)	Transmit Data plus (TD+)
2	Receive Data minus (RD-)	Transmit Data minus (TD-)
3	Transmit Data plus (TD+)	Receive Data plus (RD+)
6	Transmit Data minus (TD-)	Receive Data minus (RD-)
4,5,7,8	Not used	Not used

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

Straight-Through Wiring

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

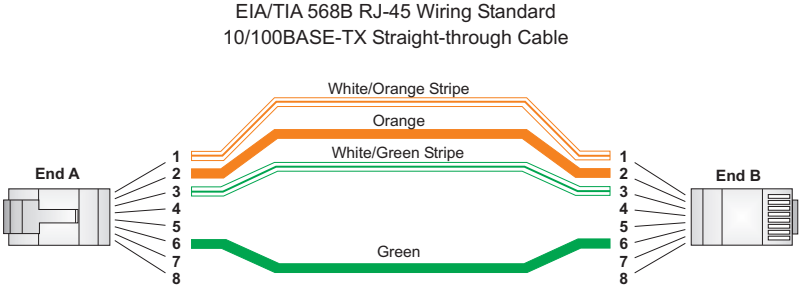

Figure B-2. Straight-through Wiring

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 this switch, you can use either straight-through or crossover cable to connect to any device type.)

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

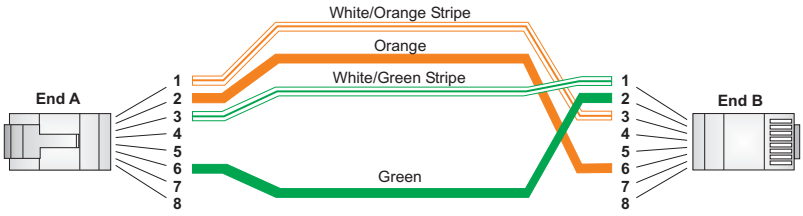

Figure B-3. Crossover Wiring

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 One Plus (BI_D4+)	Bi-directional Data One Plus (BI_D3+)
8	Bi-directional Data Four Minus (BI_D4-)	Bi-directional Data Three Minus (BI_D3-)

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 subsytems 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 10/100BASE-TX, with auto-negotiation

Media Slots

2 ports for optional 100BASE-FX, 1000BASE-T, 1000BASE-T/SFP, or stacking modules

Network Interface

Ports 1-24: RJ-45 connector, auto MDI/X

10BASE-T: RJ-45 (100-ohm, UTP cable; Categories 3 or better)

100BASE-TX: RJ-45 (100-ohm, UTP cable; Category 5 or better)

Buffer Architecture

8 Mbytes

Aggregate Bandwidth

8.8 Gbps

Switching Database

8K MAC address entries

LEDs

System: PWR, Diag

Ports: Link/Activity

Weight

3.08kg (6lbs 13oz)

Size

44.0 x 23 x 4.3 cm (17.32 x 9 x 1.69 in.)

Temperature

Operating: -5°C to 50°C (23°F to 121°F)

Storage: -40°C to 70°C (-40°F to 158°F)

Humidity

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

Power Supply
Internal, auto-ranging transformer: 100 to 240 VAC, 50 to 60 Hz
External, supports connection for redundant power supply

Power Consumption
45 Watts maximum

Maximum Current
0.8 A @ 110 VAC
0.5 A @ 240 VAC

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
Telnet, or SNMP manager

Out-of-Band Management
RS-232 DB-9 console port

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

MIB Support
MIB II (RFC1213), Bridge MIB (RFC 1493, without Static Table)

Standards

IEEE 802.3 Ethernet
IEEE 802.3u Fast Ethernet
IEEE 802.3z and 802.3ab Gigabit Ethernet
IEEE 802.1D (Bridging)
IEEE 802.3x full-duplex flow control
ISO/IEC 8802-3

Compliances

Safety

UL 60950
CSA C22.2 No. 60950
73/23/EEC
EN 60950
IEC 60950
EN 60825
CFR 1040.10

Electromagnetic Compatibility (EMC)

47 CFR Parts 2 and 15
CSA C108.8
89/336/EEC
EN 55022
EN 55024
EN 61000-3-2
EN 61000-3-3
AS/NZS CISPR 22
VCCI V-3

100BASE-FX Extender Modules

Ports

1 100BASE-FX, SC connector

Communication Speed

100 Mbps

Communication Mode
Full duplex

Network Interface
Single-mode transceiver: 9/125 micron single-mode fiber cable
Multimode transceiver: 50/125 or 62.5/125 micron multimode fiber cable

Standards
IEEE 802.3u Fast Ethernet
ISO/IEC 8802-3

1000BASE-T Extender Module

Ports
1 1000BASE-T, RJ-45 connector

Communication Speed
10, 100, and 1000 Mbps

Communication Mode
Full duplex only at 1000 Mbps
Full and half duplex at 10/100 Mbps

Network Interface
RJ-45 (100-ohm, UTP cable; Category 5, 5e, or 6)

Standards
IEEE 802.3ab Gigabit Ethernet
IEEE 802.3u Fast Ethernet
IEEE 802.3 Ethernet

1000BASE-T/SFP Module

Ports
1 1000BASE-T, RJ-45 connector
1 port for SFP transceivers

Communication Speed
10, 100, and 1000 Mbps

Communication Mode

Full duplex only at 1000 Mbps
Full and half duplex at 10/100 Mbps

Standards

IEEE 802.3z Gigabit Ethernet
IEEE 802.3ab Gigabit Ethernet
IEEE 802.3u Fast Ethernet
IEEE 802.3 Ethernet

Stacking Module

Ports

2 USB Type-A ports

Glossary

10BASE-T

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

100BASE-FX

IEEE 802.3 specification for 100 Mbps Ethernet over two strands of 50/125, 62.5/125 micron, or 9/125 micron core fiber cable.

100BASE-TX

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

1000BASE-LX

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

1000BASE-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, and Gigabit Ethernet.

End Station

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

Ethernet

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

Fast Ethernet

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

Gigabit Ethernet

A 1000 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.

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.

IEEE 802.3u

Defines CSMA/CD access method and physical layer specifications for 100BASE-TX Fast Ethernet.

IEEE 802.3x

Defines Ethernet frame start/stop requests and timers used for flow control on full-duplex links.

IEEE 802.3z

Defines CSMA/CD access method and physical layer specifications for 1000BASE Gigabit Ethernet.

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.

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.

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.

Network Diameter

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

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.

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