TigerSwitch 1000

Gigabit Ethernet Switch

- 12 1000BASE-X SFP ports
- 4 RJ45 ports shared with 4 SFP transceiver slots
- Non-blocking switching architecture
- Support for a redundant power unit
- Spanning Tree Protocol
- Up to six LACP or static 4-port trunks
- Layer 2/3/4 CoS support through four priority queues
- Full support for VLANs with GVRP
- IGMP multicast filtering and snooping
- Support for jumbo frames up to 9 KB
- Manageable via console, Web, SNMP/RMON
- Security features: ACL, RADIUS, 802.1x
- Routing features: IP/RIP routing, OSPF, VRRP, CIDR

SMC® Networks

Installation Guide

SMC8612XL3

TigerSwitch 1000 Installation Guide

From SMC's Tiger line of feature-rich workgroup LAN solutions

SMC Networks
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Irvine, CA 92618
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Irvine, CA 92618

COMPLIANCES

FCC - Class A

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart B of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference. 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 greater for 10 Mbps connections, Category 5 for 100 Mbps connections, and 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.

Warnings:

1. Wear an anti-static wrist strap or take other suitable measures to prevent electro-static discharge when handling this equipment.
2. When connecting this hub 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.

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.

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

SMC contact for these products in Europe is:

SMC Networks Europe,
Edificio Conata II,
Calle Fructuós Gelabert 6-8, 2º, 4ª,
08970 - Sant Joan Despí, Barcelona, Spain.

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 (A1/1992; A2/1993; A3/1993; A4/1995; A11/1997)

Warning: 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!

Japan VCCI Class A

　この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Taiwan Class A

警告使用者：這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Australia AS/NZS 3548 (1995) - Class A

ACN 066 352 010

SMC contact for products in Australia is:

SMC Communications Pty. Ltd.
Suite 18, 12 Tryon Road,
Lindfield NSW2070,
Phone: 61-2-94160437
Fax: 61-2-94160474

Safety Compliance

Warning: Fiber Optic Port Safety

CLASS I
LASER DEVICE

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.

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

DISPOSITIF LASER
DE CLASSE I

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

LASERGERÄT
DER KLASSE I

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

Underwriters Laboratories Compliance Statement

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

Operating Voltage	Cord Set Specifications
120 Volts	UL Listed/CSA Certified Cord Set
	Minimum 18 AWG
	Type SVT or SJT three conductor cord
	Maximum length of 15 feet
	Parallel blade, grounding type attachment plug rated 15A, 125V
240 Volts (Europe only)	Cord Set with H05VV-F cord having three conductors with minimum diameter of 0.75 mm^2
	IEC-320 receptacle
	Male plug rated 10A, 250V

The unit automatically matches the connected input voltage. Therefore, no additional adjustments are necessary when connecting it to any input voltage within the range marked on the rear panel.

Wichtige Sicherheitshinweise (Germany)

1. Bitte lesen Sie diese Hinweise sorgfältig durch.
2. Heben Sie diese Anleitung für den späteren Gebrauch auf.
3. Vor jedem Reinigen ist das Gerät vom Stromnetz zu trennen. Verwenden Sie keine Flüssigoder Aerosolreiniger. Am besten eignet sich ein angefeuchtetes Tuch zur Reinigung.
4. Die Netzanschlu ßsteckdose soll nahe dem Gerät angebracht und leicht zugänglich sein.
5. Das Gerät ist vor Feuchtigkeit zu schützen.
6. Bei der Aufstellung des Gerätes ist auf sicheren Stand zu achten. Ein Kippen oder Fallen könnte Beschädigungen hervorrufen.
7. Die Belüftungsöffnungen dienen der Luftzirkulation, die das Gerät vor Überhitzung schützt. Sorgen Sie dafür, daß diese Öffnungen nicht abgedeckt werden.
8. Beachten Sie beim Anschluß an das Stromnetz die Anschlußwerte.
9. Verlegen Sie die Netzanschlußleitung so, daß niemand darüber fallen kann. Es sollte auch nichts auf der Leitung abgestellt werden.
10. Alle Hinweise und Warnungen, die sich am Gerät befinden, sind zu beachten.
11. Wird das Gerät über einen längeren Zeitraum nicht benutzt, sollten Sie es vom Stromnetz trennen. Somit wird im Falle einer Überspannung eine Beschädigung vermieden.
12. Durch die Lüftungsöffnungen dürfen niemals Gegenstände oder Flüssigkeiten in das Gerät gelangen. Dies könnte einen Brand bzw. elektrischen Schlag auslösen.
13. Öffnen sie niemals das Gerät. Das Gerät darf aus Gründen der elektrischen Sicherheit nur von authorisiertem Servicepersonal geöffnet werden.
14. Wenn folgende Situationen auftreten ist das Gerät vom Stromnetz zu trennen und von einer qualifizierten Servicestelle zu überprüfen:
    a. Netzkabel oder Netzstecker sind beschädigt.
    b. Flüssigkeit ist in das Gerät eingedrungen.
    c. Das Gerät war Feuchtigkeit ausgesetzt.
    d. Wenn das Gerät nicht der Bedienungsanleitung entsprechend funktioniert oder Sie mit Hilfe dieser Anleitung keine Verbesserung erzielen.
    e. Das Gerät ist gefallen und/oder das Gehäuse ist beschädigt.
    f. Wenn das Gerät deutliche Anzeichen eines Defektes aufweist.
15. Zum Netzanschluß dieses Gerätes ist eine geprüfte Leitung zu verwenden. Für einen Nennstrom bis 6A und einem Gerätegewicht größer 3kg ist eine Leitung nicht leichter als H05VV-F, 3G, 0.75mm2 einzusetzen.

Der arbeitsplatzbezogene Schalldruckpegel nach DIN 45 635 Teil 1000 beträgt 70dB(A) oder weniger.

Table of Contents

APPENDICES:

Chapter 1 About the TigerSwitch 1000

Overview

SMC's TigerSwitch 1000 (SMC8612XL3) has 12 Small Form Factor Pluggable (SFP) transceiver slots, four of which are combo ports that are shared with 4 10/100/1000BASE-T ports.

There is also an SNMP-based management agent embedded on the main board. This agent supports both in-band and out-of-band access for managing the switch.

This switch can easily tame your network with full support for Spanning Tree Protocol, Multicast Switching, Virtual LANs, and IP routing. 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, and eliminates conventional router bottlenecks.

It can be used to augment or completely replace slow legacy routers, off-loading local IP traffic to release valuable resources for non-IP routing or WAN access. With wire-speed performance for Layer 2, Layer 3 and Layer 4, this switch can significantly improve the throughput between IP segments or VLANs

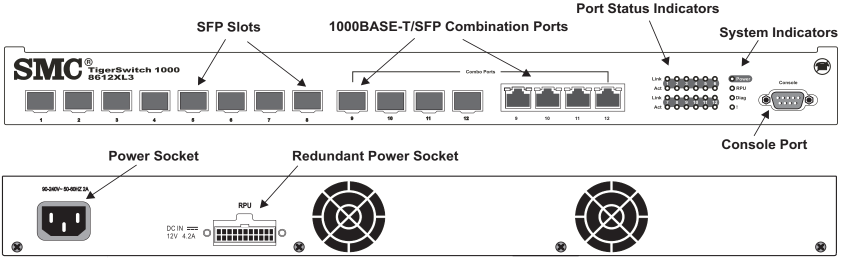

Figure 1-1. SMC8612XL3 Front and Rear Panels

Switch Architecture

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

Switching Method

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.

Management Options

This switch contains a comprehensive array of LEDs for "at-a- glance" monitoring of network and port status. It also includes a built-in network management agent that allows the switch to be managed in-band using SNMP or RMON (Groups 1, 2, 3 and 9) protocols, with a Web browser, or remotely via Telnet. It provides 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 cable. (See Appendix B: for wiring options.) For a detailed description of the advanced features, refer to the Management Guide.

The switch uses DVMRP protocol to determine the routing for multicast packets. If no hosts have subscribed to the indicated multicast service, the packet will be dropped.

Description of Hardware

1000BASE-T Ports

These ports are RJ-45 ports that operate at 10 Mbps or 100 Mbps, half or full duplex, or at 1000 Mbps, full duplex. Because all ports on this switch 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-3.)

Each of these ports support auto-negotiation, so the optimum transmission mode (half or full duplex), and data rate (10, 100, 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.

SFP Slots

The Small Form Factor Pluggable (SFP) transceiver slots are shared with the four RJ-45 ports (Ports 9~12). 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.

Status LEDs

The LEDs, which are located on the front panel for easy viewing, are shown below and described in the following table.

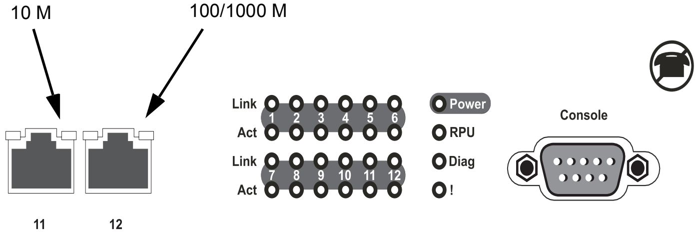

Figure 1-2. Port and System LEDs

Port Status LEDs		
LED	**Condition**	**Status**
Ports 1~12		
Link	On Green	An SFP transceiver port has established a valid network connection.
	Off	An SFP transceiver port has no valid link or there is no transceiver installed in the slot.
Act.	Flashing Green	Traffic is passing through the port.
1000Base-T Ports (Ports 9~12)		
100/1000 M	On Green	Port has established a valid 1000 Mbps network connection.
	On Amber	Port has established a valid 100 Mbps network connection.
	Off	There is no valid link on the port.
10 M	On Amber	Port has established a valid 10 Mbps network connection.
	Off	There is no valid link on the port.

System Status LEDs		
LED	**Condition**	**Status**
Power	On Green	The unit's internal power supply is operating normally.
	Off	The unit has no power connected.
RPU	On Green	The redundant power supply is operating normally.
	Off	No redundant power supply is connected.
Diag	On Green	The system diagnostic test has completed successfully.
	Flashing Green	The system diagnestic test is in progress.
!	On Orange	System diagnostic test failed, power supply failed, or any of the two fans failed.
	Off	System is in normal operation.

Optional Redundant Power Unit

The switch supports an optional Redundant Power Unit (RPU), that can supply power to the switch in the event of failure of the internal power supply.

Power Supply Receptacle

There is one power receptacle on the rear panel of the switch. The standard power receptacle is for the AC power cord.

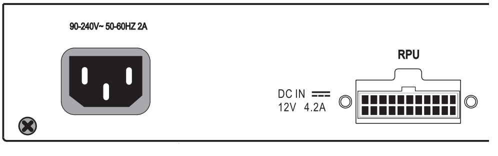

Figure 1-3. Power Supply Receptacle

Features and Benefits

Connectivity

- 12 Form Factor Pluggable (SFP) transceiver slots
- Four 10/100/1000BASE-T Gigabit Ethernet ports that are shared with four of the Small Form Factor Pluggable (SFP) transceiver slots
- 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 10/100/1000BASE-T ports with 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, 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.

Performance

- Transparent bridging
- Aggregate bandwidth of up to 24 Gbps
- Switching table with a total of 16K MAC address entries and 4K IP address entries
- Provides store-and-forward switching for intra-VLAN traffic, and IP routing for inter-VLAN traffic
- Supports wire-speed switching at Layer 2, and wire-speed routing at

Layer 3

- Supports flow control, using back pressure for half duplex and IEEE 802.3x for full duplex
- Broadcast storm control
- Desktop or rack-mountable

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. 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 TigerSwitch 1000 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 or 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 12 workstations or servers. When the time comes for further network expansion, you can easily build on this basic configuration by adding Fast Ethernet or Gigabit Ethernet links directly to one or more workgroup switches.

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

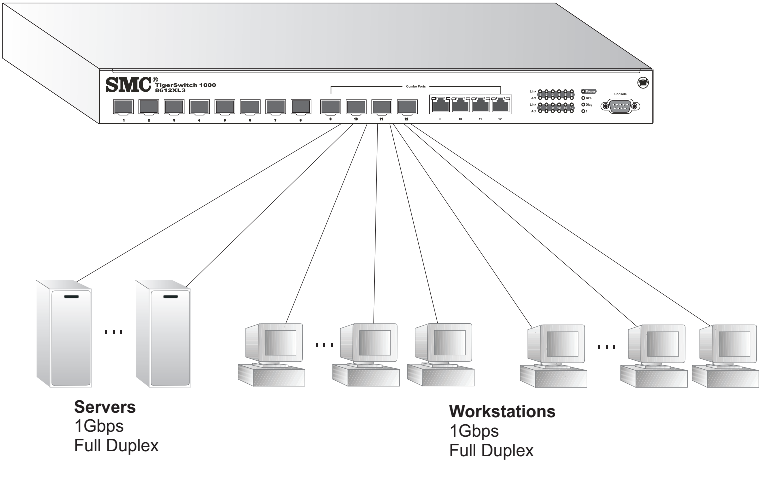

Figure 2-1. Collapsed Backbone

Central Wiring Closet

With 4 parallel bridging ports (i.e., 12 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 1000BASE-T RJ-45 ports on the switch are providing 1 Gbps full-duplex connections for up to 12 local segments. In addition, the switch is also connecting remote servers over fiber optic cable at 1 Gbps.

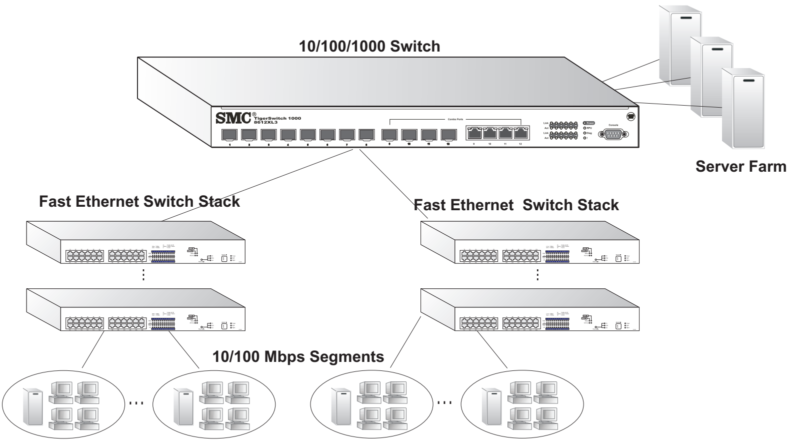

Figure 2-2. Central Wiring Closet

Remote Connections with Fiber Cable

Fiber optic technology allows for longer cabling than any other media type. A 1000BASE-LX SFP transceiver link can connect to a site up to 10km away. This allows the Gigabit Ethernet switch to serve as a collapsed backbone, providing direct connectivity for a widespread LAN. A Gigabit SFP transceiver can also be used for a high-speed connection between floors in the same building, or to connect to other buildings in a campus setting. The figure below illustrates a Gigabit Ethernet switch connecting multiple segments with fiber cable.

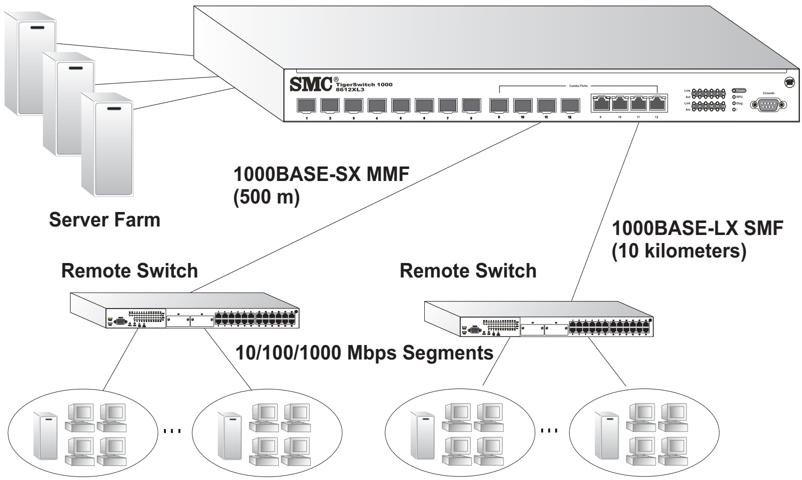

Figure 2-3. Remote Connection with Fiber Cable

Making VLAN Connections

VLANs can be based on port groups, or each data frame can be explicitly tagged to identify the VLAN group to which it belongs. When using port-based VLANs, ports can either be assigned to one specific group or to all groups. Port-based VLANs are suitable for small networks. A single switch can be easily configured to support several VLAN groups for various organizational entities (such as Finance and Marketing).

When you expand port-based VLANs across several switches, you need to make a separate connection for each VLAN group. This approach is, however, inconsistent with the Spanning Tree Protocol, which can easily segregate ports that belong to the same VLAN. When VLANs cross separate switches, you need to use VLAN tagging. This allows you to assign multiple VLAN groups to the "trunk" ports (that is, tagged ports) connecting different switches.

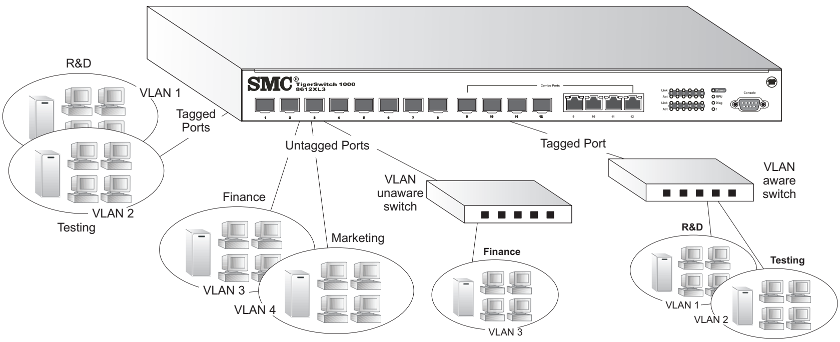

Figure 2-4. Making VLAN Connections

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

Using Layer 3 Routing

VLANs can significantly enhance network performance and security. However, if you use conventional routers to interconnect VLANs, you can lose most of your performance advantage. The Gigabit Ethernet Routing Switch provides wire-speed routing, which allows you to eliminate your conventional IP routers, except for a router to handle non-IP protocols and a gateway router linked to the WAN. Just assign an IP address to any VLANs that need to communicate. The switch will continue to segregate Layer 2 traffic based on VLANs, but will now provide inter-VLAN connections for IP applications. This switch will perform IP routing for specified VLAN groups, a directly connected subnetwork, a remote IP subnetwork or host address, a subnetwork broadcast address, a switch IP address on a specific IP subnetwork, or an IP multicast address.

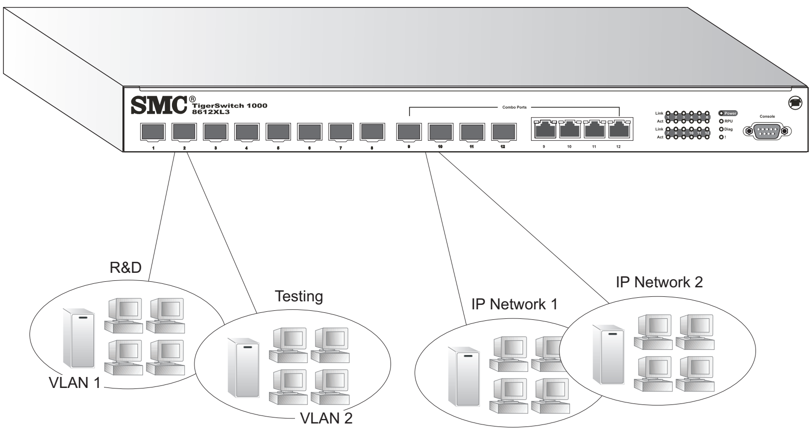

Figure 2-5. IP Routing for Unicast Traffic

Connectivity Rules

When adding hubs (repeaters) to your network, please follow the connectivity rules listed below 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.

1000 Mbps Gigabit Ethernet Collision Domain

Maximum 1000BASE-T Gigabit Ethernet Cable Length	
Cable Type	**Maximum Cable Length**
Category 5, 5e, or 6 100-ohm UTP or STP	100 m (328 ft)

Maximum 1000BASE-SX Gigabit Ethernet Cable Length		
Fiber Size	**Fiber Bandwidth**	**Maximum Cable Length**
62.5/125 micron multimode fiber	160 MHz/km	2-220 m (7-722 ft)
	200 MHz/km	2-275 m (7-902 ft)
50/125 micron multimode fiber	400 MHz/km	2-500 m (7-1641 ft)
	500 MHz/km	2-550 m (7-1805 ft)

Maximum 1000BASE-LX Gigabit Ethernet Cable Length		
Fiber Size	**Fiber Bandwidth**	**Maximum Cable Length**
9/125 micron single-mode fiber	N/A	10 km (7 - 16404 ft)

Maximum 1000BASE-ZX Fiber Optic Cable Distance		
Fiber Diameter	**Fiber Bandwidth**	**Cable Length Range**
9/125 micron single-mode fiber (SMF)	N/A	70* - 100 km (43.5 - 62.1 miles)

100 Mbps Fast Ethernet Collision Domain

Maximum Fast Ethernet Cable Distance		
Type	**Cable Type**	**Max. Cable Length**
100BASE-TX	Category 5 or better 100-ohm UTP or STP	100 m (328 ft.)

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. For network applications that require routing between dissimilar network types, you can attach this switch directly to a router.

4. As a general rule the length of Gigabit fiber optic cable for a single switched link should not exceed 550 m (1805 ft) for 1000BASE-SX multimode fiber or 10km (16404 ft) for 1000BASE-LX 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

TigerSwitch 1000 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 0 to 50 °C (32 to 122 °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 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

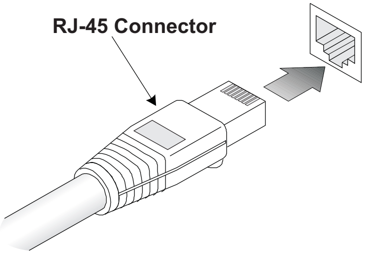

Figure 3-1. RJ-45 Connections

Equipment Checklist

After unpacking the TigerSwitch 1000, 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

- TigerSwitch 1000 unit, SMC8612XL3
- Four adhesive foot pads
- Bracket Mounting Kit containing two brackets and four screws for attaching the brackets to the switch
- Power Cord—either US, Continental Europe or UK
- RS-232 console cable
- This Installation Guide
- Management Guide
- SMC Warranty Registration Card—be sure to complete and return to SMC

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

A TigerSwitch 1000 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. 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.

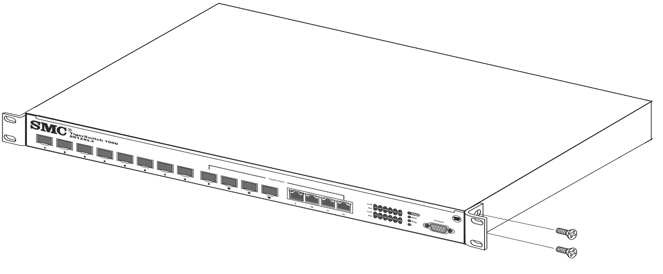

Figure 3-2. Attaching the Brackets

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

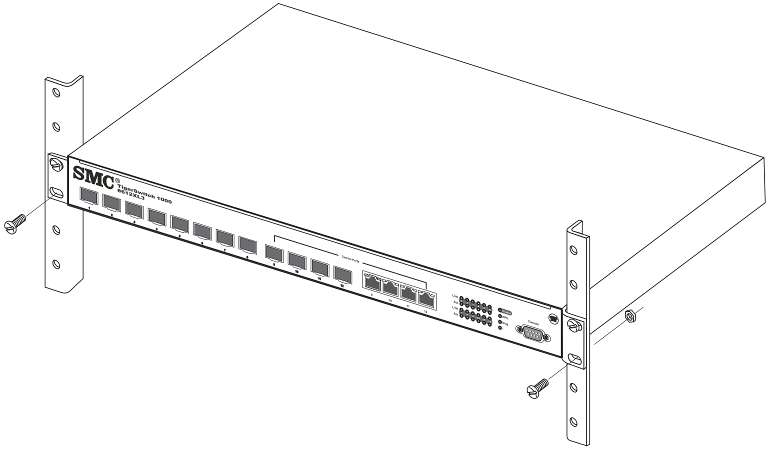

Figure 3-3. Installing the Switch in a Rack

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.

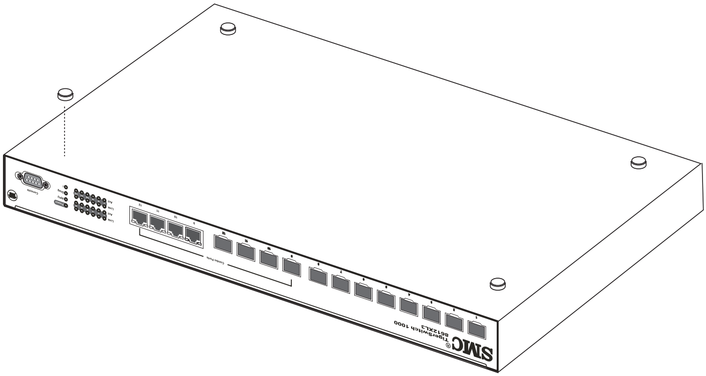

Figure 3-4. Attaching the Adhesive Feet

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.

Connecting to a Power Source

To connect a device to a power source:

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

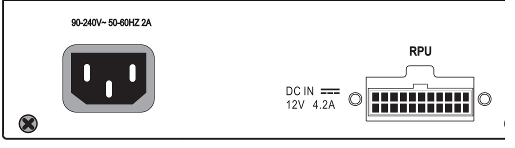

Figure 3-5. Power Receptacle

2. Plug the other end of the cable into a grounded, 3-pin socket.

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 Power 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 device 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 on-board menu-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 tables.

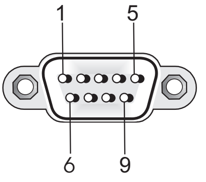

Figure 3-6. Serial Port (DB-9 DTE) Pin-Out

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 TigerSwitch 1000 is designed to interconnect multiple segments (or collision domains). It may be connected to network cards in PCs and servers, as well as to hubs, switches or routers.

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 for 100BASE-TX connections, and Category 3, 4 or 5 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.

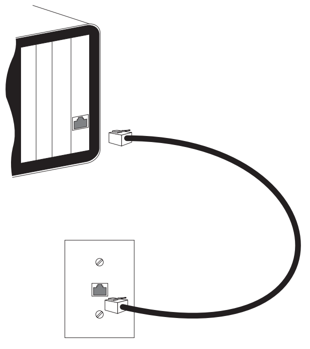

Figure 4-1. Making Twisted-Pair Connections

2. If the device is a network card and this 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 "Wiring Closet Connections" on the next page). 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: When connected to a shared collision domain (such as a hub with multiple workstations), switch ports must be set to half-duplex mode and back pressure flow control disabled.

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

Wiring Closet 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.

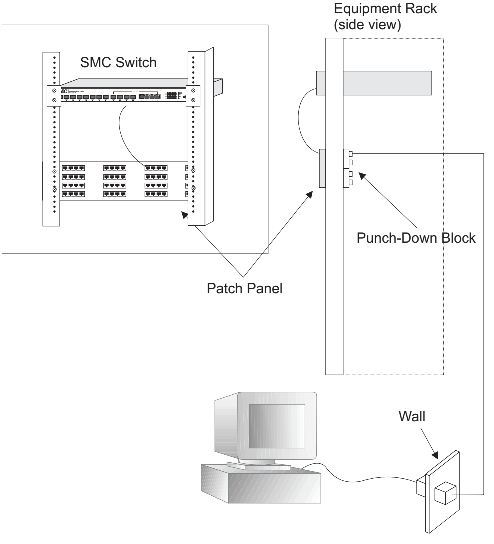

Figure 4-2. Wiring Closet Connections

Appendix A Troubleshooting

Diagnosing Switch Indicators

Troubleshooting Chart	
Symptom	**Action**
Power LED is Off	• Internal power supply is disconnected. • Check connections between the switch, the power cord, and the wall outlet. • Contact your local dealer for assistance.
Link LED is Off	• Verify that the switch and attached device is 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.

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 one 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

Specifications

Cable Types and Specifications			
Cable	**Type**	**Max. Length**	**Connector**
10BASE-T	Cat. 3, 4, 5 100-ohm UTP	100 m (328 ft)	RJ-45
100BASE-TX	Cat. 5 100-ohm UTP	100 m (328 ft)	RJ-45
1000BASE-SX	50/125 or 62.5/125 micron core MMF	See the following table	LC
1000BASE-LH	9/125 micron SMF	70 km (229,659 ft)	LC
1000BASE-LX	9/125 micron SMF	10 km (3.12 miles)	LC
1000BASE-T	Cat. 5, 5e, 6 100-ohm UTP	100 m (328 ft)	RJ-45

1000BASE-SX Fiber Specifications		
Fiber Diameter	**Fiber Bandwidth**	**Maximum Cable Length**
62.5/125 micron MMF	160 MHz/km	2-220 m (7-722 ft)
	200 MHz/km	2-275 m (7-902 ft)
50/125 micron MMF	400 MHz/km	2-500 m (7-1641 ft)
	500 MHz/km	2-550 m (7-1805 ft)

Maximum 1000BASE-ZX Fiber Optic Cable Distance		
Fiber Diameter	**Fiber Bandwidth**	**Cable Length Range**
9/125 micron single-mode fiber (SMF)	N/A	70* - 100 km (43.5 - 62.1 miles)

Maximum 1000BASE-LX Gigabit Ethernet Cable Length		
Fiber Size	**Fiber Bandwidth**	**Maximum Cable Length**
9/125 micron single-mode fiber	N/A	10 km (7 - 16404 ft)

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.

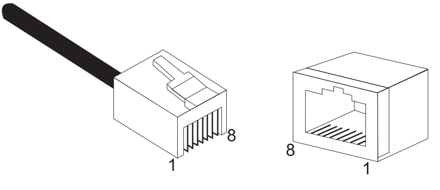

Figure B-1. RJ-45 Connector Pin Numbers

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.

Pin	MDI-X Assignment	MDI Assignment
1	Input Receive Data +	Output Transmit Data +
2	Input Receive Data -	Output Transmit Data -
3	Output Transmit Data +	Input Receive Data +
6	Output Transmit Data -	Input Receive Data -

No other pins are used.

1000BASE-T Pin Assignments

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).

Pin	**MDI Signal Name**	**MDI-X Signal Name**
1	Transmit Data plus (TD1+)	Transmit Data plus (TD2 +)
2	Receive Data minus (RD1-)	Receive Data minus (RD2-)
3	Transmit Data plus (TD2+)	Transmit Data plus (TD1+)
4	Transmit Data plus (TD3+)	Transmit Data plus (TD4+)
5	Receive Data minus (RD3-)	Receive Data minus (RD4-)
6	Receive Data minus (RD2-)	Receive Data minus (RD1-)
7	Transmit Data plus (TD4+)	Transmit Data plus (TD3+)
8	Receive Data minus (RD4-)	Receive Data minus (RD3-)

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 802.3ab 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.

Console Port Pin Assignments

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 on-board menu-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 tables.

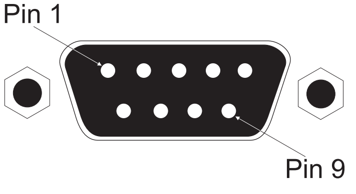

Figure B-2. DB-9 Console Port Pin Numbers

DB-9 Port Pin Assignments

EIA Circuit	CCITT Signal	Description	Switch's DB9 DTE Pin #	PC DB9 DTE Pin #	PC DB25 DTE Pin #
BB	104	**RxD** (Received Data)	2	2	3
BA	103	**TxD** (Transmitted Data)	3	3	2
AB	102	**SG** (Signal Ground)	5	5	7

No other pins are used.

Console Port to 9-Pin DTE Port on PC

Switch's 9-Pin Serial Port	Null Modem	PC's 9-Pin DTE Port
2 RXD	<--------- TXD ------------	3 TXD
3 TXD	----------- RXD ---------->	2 RXD
5 SGND	----------- SGND ----------	5 SGND

No other pins are used.

Console to 25-Pin DTE Port on PC

Switch's 9-Pin Serial Port	Null Modem	PC's 25-Pin DTE Port
2 RXD	<--------- TXD ------------	2 TXD
3 TXD	----------- RXD ---------->	3 RXD
5 SGND	----------- SGND ----------	7 SGND

No other pins are used.

Appendix C
Specifications

Physical Characteristics

Base Unit

Ports
12 SFP transceiver slots
4 10/100/1000BASE-T shared with four SFP transceiver slots

Network Interface

Ports 9-12: 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)
10/100/1000BASE-T: RJ-45 (100-ohm Category 5, 5e, or 6 UTP or STP cable)

Buffer Architecture
1 Mbytes

Switching Database
16K MAC address entries

LEDs
System: Power, RPU, Diag,
Port: Link/Act., 100/1000M, 10M

Weight
3.24 kg (7 lb. 5 oz.)

Size
44 x 22.9 x 4.3 cm (17.32 x 9.01 x 1.69 in.)

Temperature
Operating: 0 to 50 °C (32 to 122 °F)
Storage: -40 to 70 °C (-40 to 158 °F)

Humidity
Operating: 5% to 95% (non-condensing)
100 to 240 V, 50/60 Hz

Power Supply
Internal, auto-ranging transformer: 90 to 240 VAC, 47 to 63 Hz
External, supports connection for redundant power supply

Heat Dissipation
72.8 BTU/hr maximum

Power Consumption
21.35 Watts maximum

Maximum Current
1.2 A @ 110 VAC
0.6 A @ 230 VAC

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 3548 (1995) Class A

Immunity
EN 61000-4-2/3/4/5/6/8/11

Safety
CSA/NRTL (CSA 22.2.950 & UL 1950)

EN60950 (TÜV/GS)

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

100BASE-TX

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

1000BASE-LH

IEEE 802.3z specification for Gigabit Ethernet over two strands of 50/125, 62.5/125 or 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.

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.

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.

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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FOR TECHNICAL SUPPORT, CALL:

From U.S.A. and Canada (24 hours a day, 7 days a week)

(800) SMC-4-YOU; (949) 679-8000; Fax: (949) 679-1481

From Europe (8:00 AM - 5:30 PM UK Time)

44 (0) 118 974 8700; Fax: 44 (0) 118 974 8701

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Driver updates:

http://www.smc.com/index.cfm?action=tech_support_drivers_downloads

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