

TigerSwitch 10/100/1000

Gigabit Ethernet Switch

- ◆ 24 auto-MDI/MDI-X 10/100/1000BASE-T ports
- ◆ 4 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
- ◆ CoS support through eight 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



TigerSwitch 10/100/1000 Installation Guide

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

SMC[®]

N e t w o r k s

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You may use unshielded twisted-pair (UTP) cable for RJ-45 connections—Category 3 or greater for 10 Mbps connections, Category 5 for 100 Mbps connections and Category 5 or 5e for 1000 Mbps connections. Use 50/125 or 62.5/125 micron multimode fiber optic cable, or 9/125 micron single-mode cable, for SFP transceiver connections.

- Warnings:**
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SMC contact for these products in Europe is:

SMC Networks Europe,
Edificio Conata II,
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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!

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.

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Australia AS/NZS 3548 (1995) - Class A



ACN 069 351 613

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



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

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



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

Warnhinweis: Faseroptikanschlüsse - Optische Sicherheit



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

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 15 A, 125 V
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 10 A, 250 V

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 Netzanschlusßsteckdose 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 autorisiertem 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 6 A und einem Gerätegewicht größer 3 kg ist eine Leitung nicht leichter als H05VV-F, 3G, 0.75 mm² einzusetzen.

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

COMPLIANCES

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CHAPTER 1

ABOUT THE

TIGERSWITCH 10/100/1000

Overview

SMC's TigerSwitch 10/100/1000 is an intelligent multilayer switch (Layer 2 and 4) with 24 10/100/1000BASE-T ports, four of which are combination ports that are shared with four SFP transceiver slots. 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 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 802.1Q compliant VLANs, and empowers multimedia applications with multicast switching and CoS services.

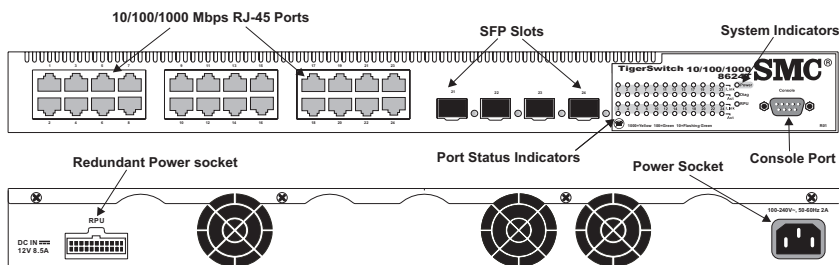


Figure 1-1. Front and Rear Panels

Switch Architecture

The TigerSwitch 10/100/1000 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.

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 management agent that allows you to configure or monitor the switch using its embedded management software, or via SNMP applications. To manage the switch, you can make a direct connection to the RS-232 console port (out-of-band), or you can manage the switch through a network connection (in-band) using Telnet, the on-board Web agent, or Windows-based network management software.

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

Description of Hardware

10/100/1000BASE-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, or 1000 Mbps) can be selected automatically. If a device connected to one of these ports does not support auto-negotiation, the communication mode of that port can be configured manually.

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

SFP Slots

The Small Form Factor Pluggable (SFP) transceiver slots are shared with four of the RJ-45 ports (Ports 21~24). In its default configuration, if an SFP transceiver (purchased separately) is installed in a slot and has a valid link on its port, the associated RJ-45 port is disabled and cannot be used. The switch can also be configured to force the use of an RJ-45 port or SFP slot, as required.

Status LEDs

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

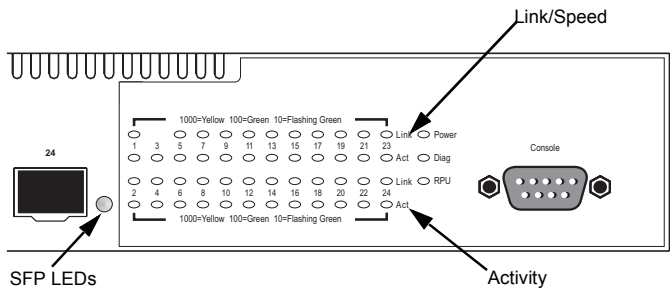
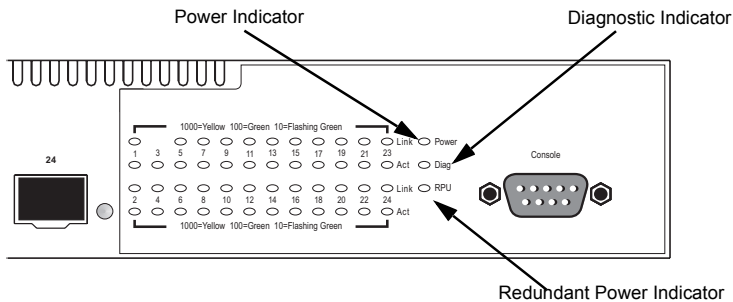


Figure 1-2. Port and System LEDs

Port Status LEDs		
LED	Condition	Status
RJ-45 Ports		
Link	On Yellow	Port has established a valid 1000 Mbps network connection.
	On Green	Port has established a valid 100 Mbps network connection.
	Flashing Green	Port has established a valid 10 Mbps network connection.
	Flashing Yellow	The port has been disabled.
Act.	Flashing Green	Traffic is passing through the port.
	Off	There is no traffic passing through the port.
SFP Transceivers Slots		
(Ports 21~24)	On Green	An SFP transceiver port has established a valid 1000 Mbps network connection. The associated RJ-45 port is disabled.
	Off	An SFP transceiver port has no valid link. The associated RJ-45 port is enabled.



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.
Diag.	Flashing Green	The system diagnostic test is in progress.
	On Green	The system diagnostic test has completed successfully.
	On Red	The system diagnostic test has detected a fault.
RPU	On Green	The redundant power unit is operating normally.
	Off	No redundant power unit is connected.

Optional Redundant Power Unit

SMC provides an optional Redundant Power Unit (RPU), SMCRPU600W, that can supply power to the switch in the event of failure of the internal power supply.

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.

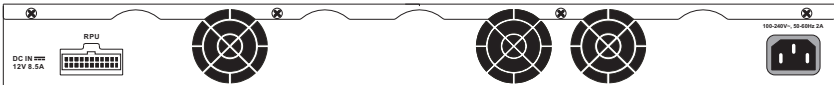


Figure 1-3. Power Supply Receptacles

Features and Benefits

Connectivity

- ◆ 24 dual-speed ports for easy Gigabit 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 10/100/1000BASE-T ports with auto MDI/MDI-X pinout selection.
- ◆ Unshielded (UTP) cable supported on all RJ-45 ports: Category 3, 4 or 5 for 10 Mbps connections, Category 5 or 5e for 100 Mbps connections, and Category 5 or better 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

- ◆ Supports 1000BASE-SX and 1000BASE-LX SFP transceivers.

Performance

- ◆ Transparent bridging
- ◆ Switching table with a total of 16K MAC address entries
- ◆ Provides store-and-forward switching
- ◆ Supports wire-speed switching
- ◆ Supports flow control, using back pressure for half duplex and IEEE 802.3x for full duplex

ABOUT THE TIGERSWITCH 10/100/1000

- ◆ Broadcast storm control
- ◆ Desktop or rack-mountable
- ◆ Limited lifetime warranty

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 Ethernet or Fast Ethernet network to significantly boost bandwidth while using conventional cabling and network cards.

Application Examples

The TigerSwitch 10/100/1000 is not only designed to segment your network, but also to provide a wide range of options in setting up network connections and linking VLANs. Some typical applications are described below.

Collapsed Backbone

The TigerSwitch 10/100/1000 is an excellent choice for mixed Ethernet, Fast Ethernet, and Gigabit 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 Gigabit Ethernet ports built into the front panel or a Gigabit Ethernet port on a plug-in SFP transceiver.

In the figure below, this 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.

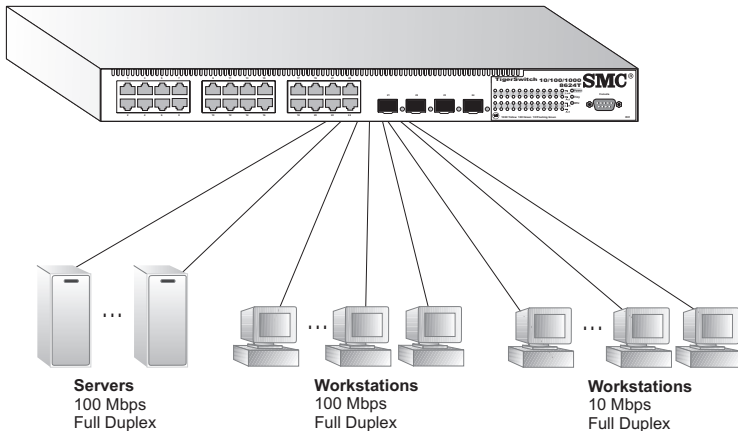


Figure 2-1. Collapsed Backbone

Network Aggregation Plan

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

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

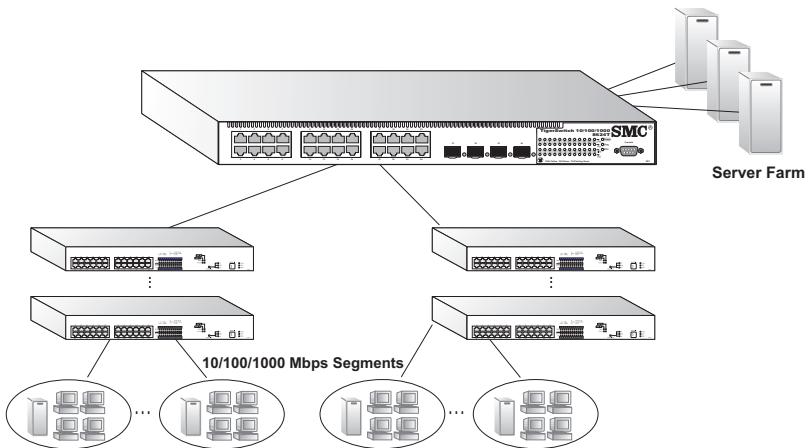


Figure 2-2. Network Aggregation Plan

Remote Connections with Fiber Cable

Fiber optic technology allows for longer cabling than any other media type. A 1000BASE-SX (MMF) link can connect to a site up to 550 meters away, and a 1000BASE-LX (SMF) link can run up to 5 km. This allows the Gigabit Ethernet Switch to serve as a collapsed backbone, providing direct connectivity for a widespread LAN.

A 1000BASE-SX SFP can be used for a high-speed connection between floors in the same building, and a 1000BASE-LX SFP can be used to connect to other buildings in a campus setting.

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

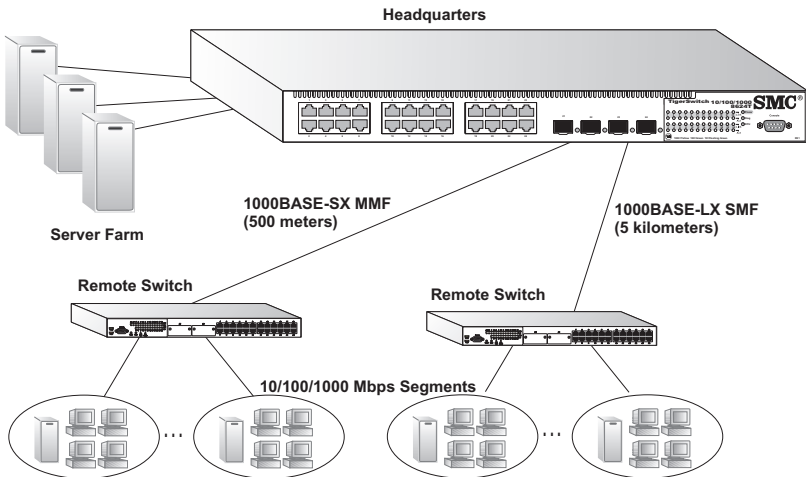


Figure 2-3. Remote Connection with Fiber Cable

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.

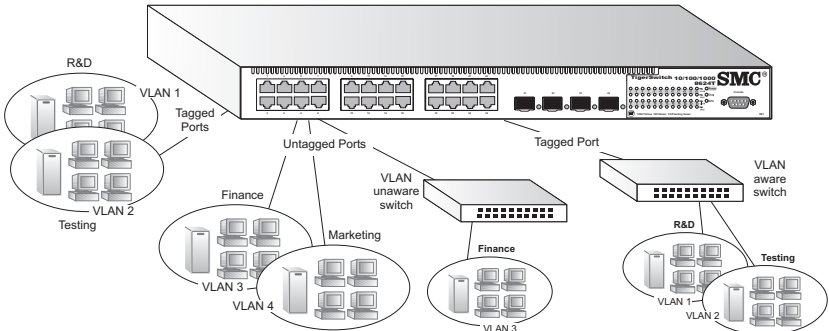


Figure 2-4. Making VLAN Connections

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

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 550 m (1805 ft) for multimode fiber or 5 km (16404 ft) 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

TigerSwitch 10/100/1000 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, 100BASE-TX or 1000BASE-T operation. Check the following criteria against the current installation of your network:

- ◆ Cable type: Unshielded twisted pair (UTP) or shielded twisted pair (STP) cables with RJ-45 connectors; Category 3 or better for 10BASE-T, Category 5 or better for 100BASE-TX, and Category 5e or better for 1000BASE-T.
- ◆ 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

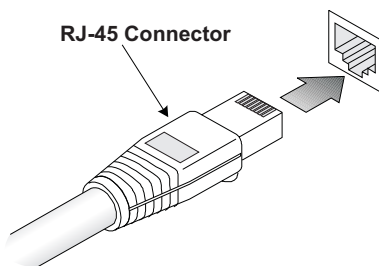


Figure 3-1. RJ-45 Connections

Equipment Checklist

After unpacking the TigerSwitch 10/100/1000, 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 10/100/1000 unit (SMC8624T)
- ◆ 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
- ◆ 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 10/100/1000 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.

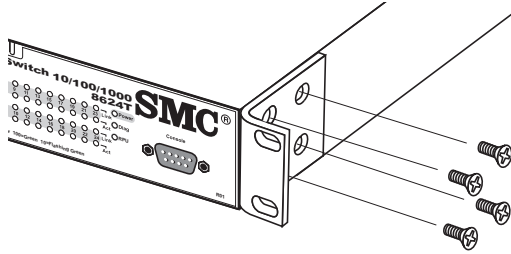


Figure 3-2. Attaching the Brackets

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

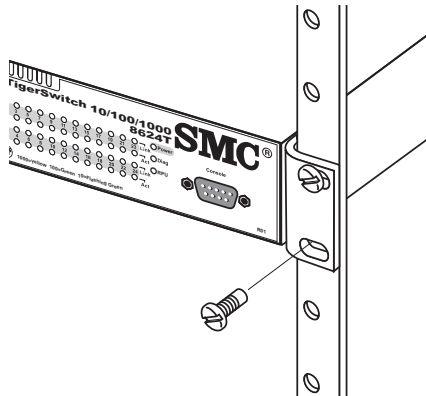


Figure 3-3. Installing the Switch in a Rack

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.
5. If also installing RPUs, mount them in the rack below the other devices.

Desktop or Shelf Mounting

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

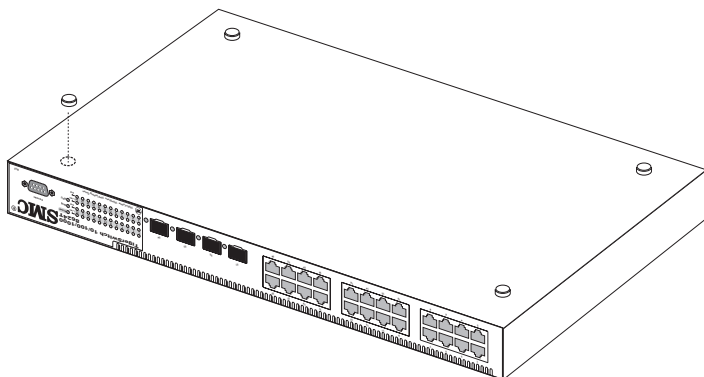


Figure 3-4. Attaching the Adhesive Feet

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.
5. If also installing RPUs, place them close to the stack.

Installing an Optional SFP Transceiver into the Switch

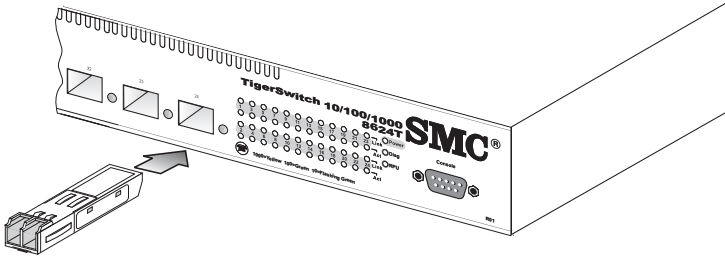


Figure 3-5. Inserting an SFP Transceiver into a Slot

To install an SFP transceiver, do the following:

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

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

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.

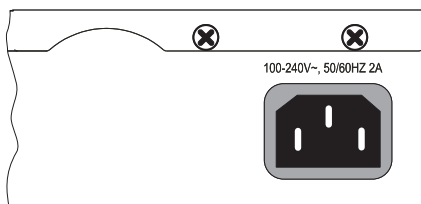


Figure 3-6. Power Receptacle

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 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.

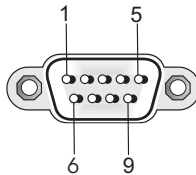


Figure 3-7. Serial Port (DB-9 DTE) Pin-Out

Wiring Map for Serial Cable

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

INSTALLING THE SWITCH

CHAPTER 4

MAKING NETWORK CONNECTIONS

Connecting Network Devices

The TigerSwitch 10/100/1000 is designed to interconnect multiple segments (or collision domains). It can be connected to network cards in PCs and servers, as well as to hubs, switches or routers. It may also be connected to devices using optional SFP transceivers.

Twisted-Pair Devices

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

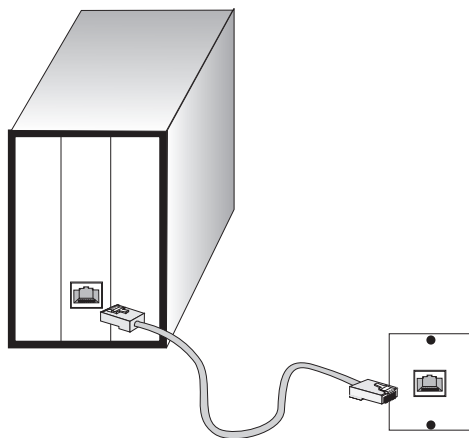


Figure 4-1. Making Twisted-Pair Connections

2. If the device is a PC card and the switch is in the wiring closet, attach the other end of the cable segment to a modular wall outlet that is connected to the wiring closet. (See “Wiring Closet Connections” on the next page.) Otherwise, attach the other end to an available port on the switch.
3. 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

4. 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. attached to the hub.

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.

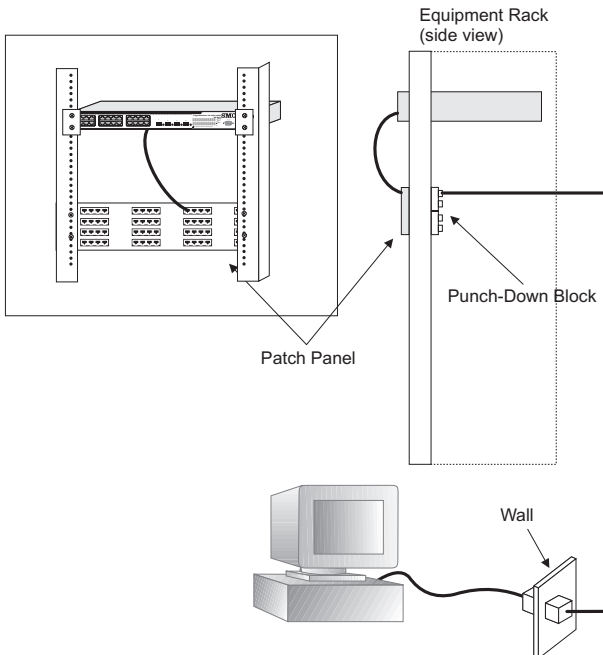


Figure 4-2. Wiring Closet Connections

Connectivity Rules

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

1000BASE-T Cable Requirements

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

1000 Mbps Gigabit Ethernet Collision Domain

Maximum 1000BASE-T Gigabit Ethernet Cable Length		
Cable Type	Maximum Cable Length	Connector
Category 5, 5e, 6 100-ohm UTP or STP	100 m (328 ft)	RJ-45

Maximum 1000BASE-SX Fiber Optic Cable Distance			
Fiber Diameter	Fiber Bandwidth	Cable Length Range	Connector
62.5/125 micron multimode fiber (MMF)	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 (MMF)	400 MHz/km	2-500 m (7-1641 ft.)	LC
	500 MHz/km	2-550 m (7-1805 ft.)	LC

Maximum 1000BASE-LX Fiber Optic Cable Distance			
Fiber Diameter	Fiber Bandwidth	Cable Length Range	Connector
9/125 micron single-mode fiber	N/A	2 m - 5 km (7 ft - 3.2 miles)	LC

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

100 Mbps Fast Ethernet Collision Domain

Maximum Fast Ethernet Cable Distance

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

10 Mbps Ethernet Collision Domain

Maximum Ethernet Cable Distance

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

Cable Labeling and Connection Records

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

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

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

APPENDIX A

TROUBLESHOOTING

Diagnosing Switch Indicators

Troubleshooting Chart	
Symptom	Action
Power LED is Off	<ul style="list-style-type: none">• Check connections between the switch, the power cord, and the wall outlet.• Contact your dealer for assistance.• Contact SMC Technical Support.
Link LED is Off	<ul style="list-style-type: none">• Verify that the switch and attached device are powered on.• Be sure the cable is plugged into both the switch and corresponding device.• Verify that the proper cable type is used and its length does not exceed specified limits.• Check the adapter on the attached device and cable connections for possible defects. Replace the defective adapter or cable if necessary.

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.

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

APPENDIX B

CABLES

Specifications

Cable Types and Specifications			
Cable	Type	Max. Length	Connector
10BASE-T	Cat. 3 or better 100-ohm UTP	100 m (328 ft)	RJ-45
100BASE-TX	Cat. 5 or better 100-ohm UTP	100 m (328 ft)	RJ-45
1000BASE-T	Cat. 5, 5e, 6 100-ohm UTP or STP	100 m (328 ft)	RJ-45
1000BASE-SX	50/125 or 62.5/125 micron core MMF	See the following table	LC
1000BASE-LX	9/125 micron SMF	2 m - 5 km (7 ft - 3.2 miles)	LC
1000BASE-ZX	9/125 micron SMF	70 - 100 km (43.5 - 62.1 miles)	LC

1000BASE-SX Fiber Specifications		
Fiber Diameter	Fiber Bandwidth	Cable Length Range
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.)

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 10BASE-T/100BASE-TX connections, a twisted-pair cable must have two 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.)

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.

10BASE-T/100BASE-TX Pin Assignments

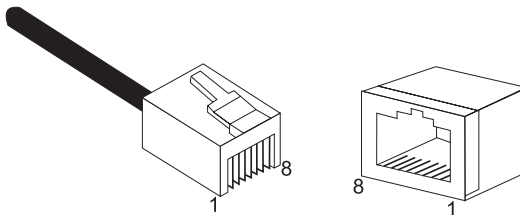


Figure B-1. RJ-45 Connector Pin Numbers

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

The RJ-45 ports on the switch base unit support automatic MDI/MDI-X

operation, 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 -
4,5,7,8	Not used	Not used

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

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).

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-)

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 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.

Cable Testing for Existing Category 5 Cable

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

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

Adjusting Existing Category 5 Cabling to Run 1000BASE-T

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

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

Fiber Standards

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

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

Backbone 62.5/125 micron multimode or singlemode.

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.

CABLES

APPENDIX C

SPECIFICATIONS

Physical Characteristics

Ports

24 10/100/1000BASE-T, with auto-negotiation

4 SFP (Small Form-factor Pluggable), 1000 Mbps only

Network Interface

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

10BASE-T: RJ-45 (100-ohm, UTP cable; Categories 3, 4, 5)

Maximum Cable Length - 100 m (328 ft)

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

Maximum Cable Length - 100 m (328 ft)

1000BASE-T: RJ-45 (100-ohm, UTP or STP cable; Category 5, 5e, or 6)

Maximum Cable Length - 100 m (328 ft)

Buffer Architecture

2 Mbytes data packet memory

Aggregate Bandwidth

48 Gbps

Switching Database

16K MAC address entries

LEDs

System: Power (Power Supply), Diag (Diagnostics), RPU (Redundant Power Unit)

Port: Link, Act (Activity)

Weight

4.3 kg (9.46 lbs)

SPECIFICATIONS

Size

44.0 x 41.0 x 4.4 cm (17.4 x 17.3 x 1.7 in.)

Temperature

Operating: 0 to 40 °C (32 to 98 °F)

Storage: -40 to 70 °C (-40 to 158 °F)

Humidity

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

AC Input

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

Power Consumption

70 Watts maximum

Maximum Current

1.2 A @ 110 VAC

0.6 A @ 240 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 (TUV/GS)

Warranty

Limited Lifetime

SPECIFICATIONS

APPENDIX D

ORDERING INFORMATION

TigerSwitch 10/100/1000 Products and Accessories	
Product Number	Description
SMC8624T	24 10/100/1000BASE-T ports switch with four Gigabit combo ports with RJ-45 connectors and associated SFP transceiver slots
SMCBGSLCX1	1-port 1000BASE-SX Small Form Pluggable (SFP) mini-GBIC transceiver
SMCBGLLCX1	1-port 1000BASE-LX Small Form Pluggable (SFP) mini-GBIC transceiver
SMCBGZLCX1	1-port 1000BASE-ZX Small Form Pluggable (SFP) mini-GBIC transceiver
SMCRPU600W*	Redundant power unit with cables, supports one device

* Also available in models for Continental Europe and the UK.

ORDERING INFORMATION

GLOSSARY

10BASE-T

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

100BASE-TX

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

1000BASE-SX

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

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

Auto-Negotiation

Signalling method allowing each node to select its optimum operational mode (e.g., 10 Mbps or 100 Mbps and half or full duplex) 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 Fast 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.

Local Area Network (LAN)

A group of interconnected computer and support devices.

GLOSSARY

LAN Segment

Separate LAN or collision domain.

LED

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

Local Area Network

A group of interconnected computers 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.

Redundant Power Unit (RPU)

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

RJ-45 Connector

A connector for twisted-pair wiring.

Switched Ports

Ports that are on separate collision domains or LAN segments.

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.

GLOSSARY

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