

# TEG-S40SX

## Gigabit Ethernet Switch

### User's Guide

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First Edition (Feb., 2000)

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Printed In Taiwan



RECYCLABLE

## **FCC Warning**

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

## **CE Mark Warning**

This is a Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.

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# ***ABOUT THIS GUIDE***

This User's guide tells you how to install your TEG-S40SX stand-alone Switch, how to connect it to your Gigabit Ethernet network, and how to set its configuration using either the built-in console interface or Web-based management.

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## **Terms**

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For simplicity, this documentation uses the terms “Switch” (first letter upper case) to refer to the TEG-S40SX Gigabit Ethernet Switch, and “switch” (first letter lower case) to refer to all Ethernet switches, including the TEG-S40SX.

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## **Overview of this User's Guide**

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- ◆ Chapter 1, *Introduction*. Describes the Switch and its features.
- ◆ Chapter 2, *Unpacking and Setup*. Helps you get started with the basic installation of the Switch.
- ◆ Chapter 3, *Identifying External Components*. Describes the front panel, rear panel, and LED indicators of the Switch.
- ◆ Chapter 4, *Connecting the Switch*. Tells how you can connect the TEG-S40SX to your Gigabit Ethernet network.

- ◆ Chapter 5, *Switch Management*. Talks about Local Console Management via the RS-232 DCE console port and other aspects about how to manage the Switch.
- ◆ Chapter 6, *Using the Console Interface*. Tells how to use the built-in console interface to change, set, and monitor Switch performance and security.
- ◆ Chapter 7, *Web-Based Network Management*. Tells how to manage the Switch through an Internet browser.
- ◆ Appendix A, *Technical Specifications*. Lists the technical specifications of the TEG-S40SX.

# 1

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## ***INTRODUCTION***

This section describes the features of the TEG-S40SX, as well as giving some background information about Gigabit Ethernet and switching technology.

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### **Gigabit Ethernet Technology**

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Gigabit Ethernet is an extension of IEEE 802.3 Ethernet utilizing the same packet structure, format, and support for CSMA/CD protocol, full duplex, flow control, and management objects, but with a tenfold increase in theoretical throughput over 100Mbps Fast Ethernet and a one hundred-fold increase over 10Mbps Ethernet. Since it is compatible with all 10Mbps and 100Mbps Ethernet environments, Gigabit Ethernet provides a straightforward upgrade without wasting a company's existing investment in hardware, software, and trained personnel.

The increased speed and extra bandwidth offered by Gigabit Ethernet is essential to coping with the network bottlenecks that frequently develop as computers and their busses get faster and more users use applications that generate more traffic. Upgrading key components, such as your backbone and servers to Gigabit Ethernet can greatly improve network response times as well as significantly speed up the traffic between your subnets.

Gigabit Ethernet enables fast optical fiber connections to support video conferencing, complex imaging, and similar data-intensive applications. Likewise, since data transfers occur 10 times faster than Fast Ethernet, servers outfitted with Gigabit Ethernet NIC's are able to perform 10 times the number of operations in the same amount of time.

In addition, the phenomenal bandwidth delivered by Gigabit Ethernet is the most cost-effective method to take advantage of today and tomorrow's rapidly improving switching and routing internetworking technologies. And with expected advances in the coming years in silicon technology and digital signal processing that will enable Gigabit Ethernet to eventually operate over unshielded twisted-pair (UTP) cabling, outfitting your network with a powerful 1000Mbps-capable backbone/server connection creates a flexible foundation for the next generation of network technology products.

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## Switching Technology

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Another key development pushing the limits of Ethernet technology is in the field of switching technology. A switch bridges Ethernet packets at the MAC address level of the Ethernet protocol transmitting among connected Ethernet or fast Ethernet LAN segments.

Switching is a cost-effective way of increasing the total network capacity available to users on a local area network. A switch increases capacity and decreases network loading by making it possible for a local area network to be divided into different *segments* which don't compete with each other for network transmission capacity, giving a decreased load on each.

The switch acts as a high-speed selective bridge between the individual segments. Traffic that needs to go from one segment to

another is automatically forwarded by the switch, without interfering with any other segments. This allows the total network capacity to be multiplied, while still maintaining the same network cabling and adapter cards.

For Fast Ethernet or Gigabit Ethernet networks, a switch is an effective way of eliminating problems of chaining hubs beyond the “two-repeater limit.” A switch can be used to split parts of the network into different collision domains, for example, making it possible to expand your Fast Ethernet network beyond the 205 meter network diameter limit for 100BASE-TX networks. Switches supporting both traditional 10Mbps Ethernet and 100Mbps Fast Ethernet are also ideal for bridging between existing 10Mbps networks and new 100Mbps networks.

Switching LAN technology is a marked improvement over the previous generation of network bridges, which were characterized by higher latencies. Routers have also been used to segment local area networks, but the cost of a router and the setup and maintenance required make routers relatively impractical. Today's switches are an ideal solution to most kinds of local area network congestion problems.

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## **Features**

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The TEG-S40SX Gigabit Ethernet Switch was designed for easy installation and high performance in an environment where traffic on the network and the number of users increase continuously.

Switch features include:

## ***Ports***

- ◆ Four Gigabit Ethernet ports of fixed 1000BASE-SX multi-mode fiber interface.
- ◆ RS-232 DCE console port for diagnosing the Switch via a connection to a PC and Console/Out-of-band management.

## ***Performance features***

- ◆ Store and forward switching scheme capability to support rate adaptation and protocol conversion.
- ◆ Full duplex to allow two communicating stations to transmit and receive at the same time.
- ◆ Data forwarding rate 1,488,100 pps per port at 100% of wire-speed for 1000Mbps speed.
- ◆ Data filtering rate eliminates all error packets, runts, etc. at 1,488,100 pps per port at 100% of wire-speed for 1000Mbps speed.
- ◆ 12K active MAC address entry table per device with automatic learning and aging.
- ◆ 12 MB packet buffer per device.
- ◆ Supports broadcast storm rate filtering.

## ***Management***

- ◆ RS-232 console port for out-of-band network management via a PC.

- ◆ Spanning Tree Algorithm Protocol for creation of alternative backup paths and prevention of indefinite network loops.
- ◆ Fully configurable either in-band or out-of-band control via SNMP based software.
- ◆ Flash memory for software upgrade. This can be done in-band via BOOTP/TFTP. Out-of-band console can also initiate a download request.
- ◆ Built-in SNMP management: Bridge MIB (RFC 1493), Ethernet MIB (RFC 1643), RMON MIB (RFC 1757), and MIB-II (RFC 1213).

# 2

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## ***UNPACKING AND SETUP***

This chapter provides unpacking and setup information for the Switch.

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### **Unpacking**

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Open the shipping carton of the Switch and carefully unpack its contents. The carton should contain the following items:

- ◆ One TEG-S40SX Gigabit Ethernet Switch
- ◆ Accessory pack: 2 mounting brackets and screws
- ◆ Four rubber feet with adhesive backing
- ◆ One AC power cord
- ◆ This user's guide with Registration Card
- ◆ Diskette containing management software

If any item is found missing or damaged, please contact your local reseller for replacement.

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## Setup

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The setup of the Switch can be performed using the following steps:

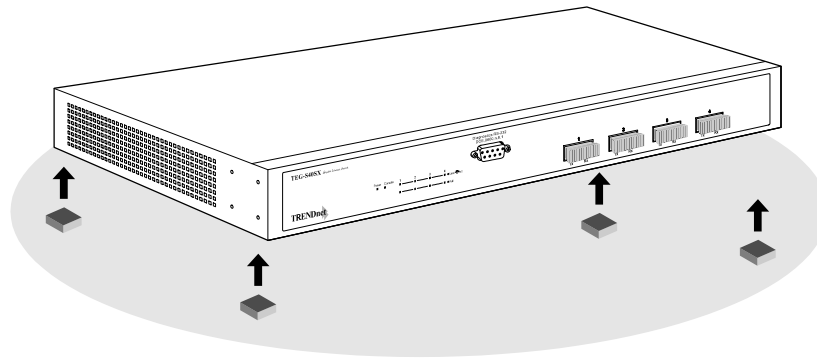
- ◆ The surface must support at least 3 kg.
- ◆ The power outlet should be within 1.82 meters (6 feet) of the device.
- ◆ Visually inspect the power cord and see that it is secured fully to the AC power connector.
- ◆ Make sure that there is proper heat dissipation from and adequate ventilation around the Switch. Do not place heavy objects on the Switch.

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## Desktop or Shelf Installation

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When installing the Switch on a desktop or shelf, the rubber feet included with the device must be first attached. Attach these cushioning feet on the bottom at each corner of the device. Allow enough ventilation space between the device and the objects around it.



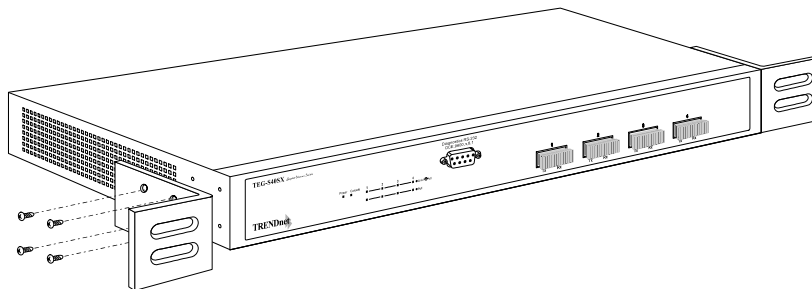
**Figure 2-1. Gigabit Ethernet Switch installed on a Desktop or Shelf**

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## Rack Installation

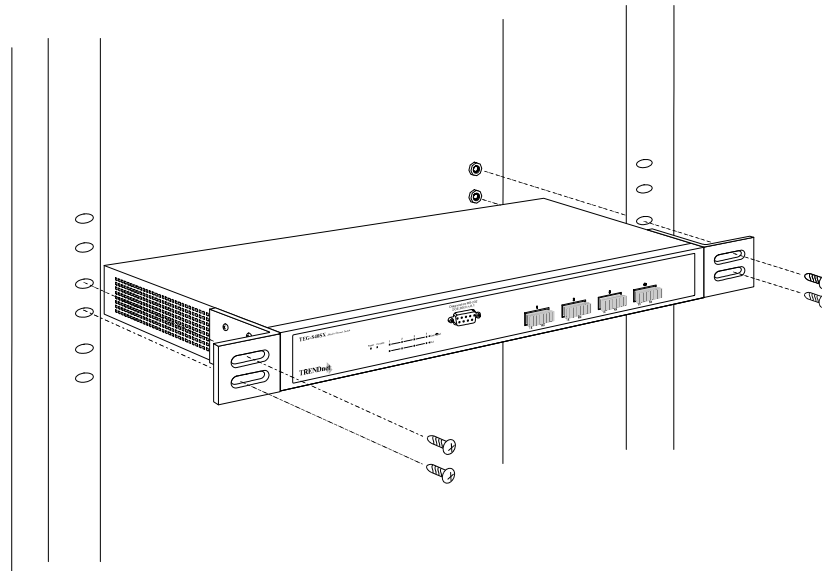
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The TEG-S40SX can be mounted in an EIA standard size, 19-inch rack, which can be placed in a wiring closet with other equipment. To install, attach the mounting brackets on the switch's front panel (one on each side) and secure them with the screws provided.



**Figure 2- 2A. Attaching the mounting brackets to the Gigabit Ethernet Switch**

Then, use the screws provided with the equipment rack to mount the Switch in the rack.



**Figure 2-2B. Installing the Gigabit Ethernet Switch in an equipment rack**

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## Power on

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The TEG-S40SX Switch can be used with AC power sources 100 - 240 VAC, 50 - 60 Hz. The Switch's power supply will adjust to the local power source automatically and may be turned on without having any or all LAN segment cables connected.

After the device is powered on, the LED indicators should respond as follows:

- ◆ The Power LED indicator will light while the Switch loads onboard software and blinks when performing a self-test.
- ◆ The Console LED indicator will remain *ON* if there is a connection at the RS-232 port, otherwise this LED indicator is *OFF*.

## ***Power Failure***

As a precaution, the Switch should be unplugged in case of power failure. When power is resumed, plug the Switch back in.

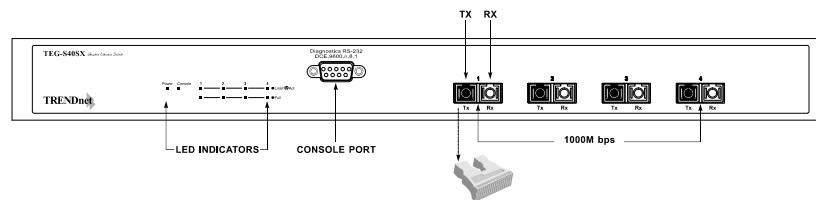
## 3

# IDENTIFYING EXTERNAL COMPONENTS

This chapter describes the front panel, rear panel and LED indicators of the Switch

## Front Panel

The front panel of the Switch consists of 4 1000BASE-SX multi-mode fiber ports, an RS-232 communication port, and LED indicators.



**Figure 3-1. Front panel view of the TEG-S40SX Switch**

- ◆ Four Gigabit Ethernet ports of fixed 1000BASE-SX multi-mode fiber interface.

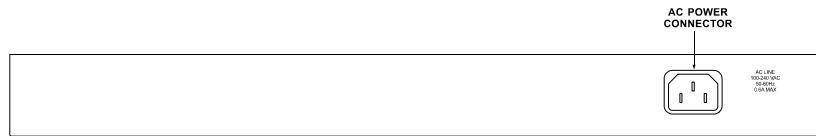
- ◆ RS-232 DCE console port for diagnosing the Switch via a connection to a PC and Local Console Management.
- ◆ Comprehensive LED indicators that display the conditions of the Switch and status of the network. A description of these LED indicators follows (see *LED Indicators*).

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## Rear Panel

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The rear panel of the Switch consists of an AC power connector. The following shows the rear panel of the Switch.



**Figure 3-2. Rear panel view of the TEG-S40SX**

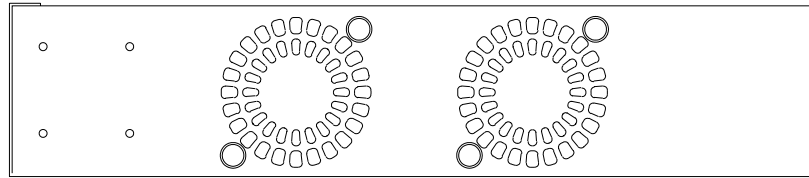
- ◆ **AC Power Connector** This is a three-pronged connector that supports the power cord. Plug in the female connector of the provided power cord into this connector, and the male into a power outlet. Supported input voltages range from 100 ~ 240 VAC at 50 ~ 60 Hz.

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## Right Side Panel

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The right side panel of the Switch contains two system fans. The following shows the right side panel of the Switch.

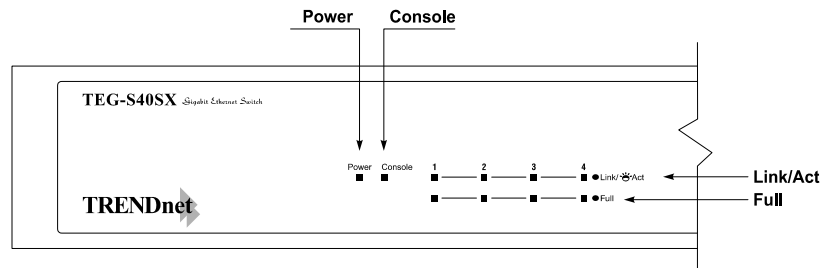


**Figure 3-3. Right side panel view of the TEG-S40SX**

- ♦ **System Fans** These fans are used to dissipate heat. The sides of the system also provide heat vents to serve the same purpose. Do not block these openings, and leave adequate space at the rear and sides of the Switch for proper ventilation. Be reminded that without proper heat dissipation and air circulation, system components might overheat, which could lead to system failure.

## LED Indicators

The LED indicators of the Switch include Power, Console, Link/Act, and Full. The following shows the LED indicators for the Switch along with an explanation of each indicator.



**Figure 3-3. The TEG-S40SX Switch LED indicators**

- ♦ **Power** After turning on the power, the Power indicator on the front panel should light to indicate the Switch is loading

onboard software and then begins to blink when performing a self-test. After approximately 2 seconds, the LED light again to indicate the ready state of the switch.

- ◆ **Console** This LED indicator is lit when the switch is being managed via out-of-band/local console management through the RS-232 console port using a straight-through serial cable. When a secured connection is established, this LED indicator is lit. Otherwise, it is *OFF*.
- ◆ **Link/Act.** These LED indicators are lighted up when there is a secure connection (or link) to a device at any of the ports. The LED indicators blink whenever there is reception or transmission (i.e. Activity--Act) of data occurring at a port.
- ◆ **Full** These LED indicators are illuminated when a port is operating in full-duplex mode.

## 4

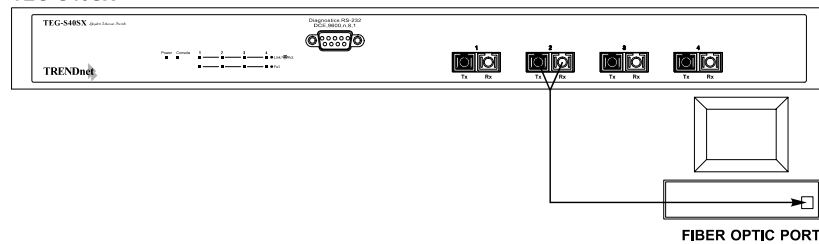
## CONNECTING THE SWITCH

This chapter describes how to connect the TEG-S40SX to your Gigabit Ethernet network.

### PC to Switch

A PC can be connected to the Switch via a fiber optic cable. The PC should be connected to any of the four ports (1x - 4x) of the TEG-S40SX.

TEG-S40SX



**Figure 4-1. TEG-S40SX Switch connected to a PC or Workstation (full-duplex mode is required)**

The LED indicators for PC connection are dependent on the LAN card capabilities. If LED indicators are not illuminated after

making a proper connection, check the PC's LAN card, the cable, Switch conditions, and connections.

The following are LED indicator possibilities for a PC to Switch connection:

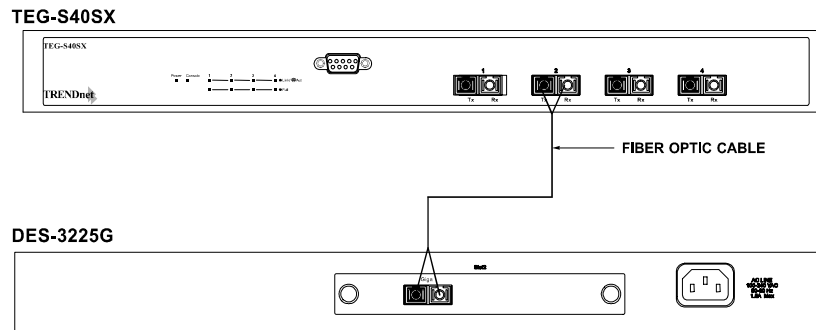
- ◆ The Link/Act LED indicator lights up upon hookup.

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## Switch to Switch (other devices)

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The Switch can be connected to another switch or other devices (routers, bridges, etc.) via a fiber optic cable.



**Figure 4-2. TEG-S40SX Switch to switch connection**

# 5

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## **SWITCH MANAGEMENT**

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### **Local Console Management**

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Local console management involves the administration of the TEG-S40SX Switch via a direct connection to the RS-232 DCE console port. From the Main Menu screen of the console program, an Administrator or Normal User (defined in the next chapter) has privilege and access to manage, control and monitor the many functions of the Switch.

The components of the Switch allow them to be part of a manageable network. These components include a CPU, memory for data storage, other related hardware, and the SNMP agent firmware. Activities on the Switch can be monitored with these components, while the Switch can be manipulated to carry out specific tasks.

Out-of-Band Management for the Switch is accomplished through a locally connected management terminal to the RS-232 console port. Through this port, a user can set up, monitor, or change the configuration of the Switch.

The Spanning Tree Algorithm (STA) provides the capability for the Switch to operate properly with other Bridges in a SNMP network supporting the STA. Using the STA, the network will prevent

network loop, and automatically establish and activate a backup path in the event of a path failure.

## ***Console port (RS-232 DCE)***

Out-of-band management requires connecting a PC (with a SNMP management platform) to the RS-232 DCE console port of the Switch. Switch management using terminal emulation/VT100 when connected to the RS-232 DCE console port is called *Local Console Management* to differentiate it from management done via management platforms.

The console port is set for the following configuration:

◇ Baud rate:	9,600
◇ Parity:	none
◇ Data width:	8 bits
◇ Stop bits:	1

## ***IP Addresses and SNMP Community Names***

Each Switch has its own IP Address, which is used for communication with an SNMP network manager or other TCP/IP application (for example BOOTP, TFTP). You can change the default Switch IP Address to meet the specification of your networking address scheme.

In addition, you can also set in the Switch an IP Address for a gateway or a router. It is useful when the network management station is not located on the same network as the Switch, making it necessary for the Switch to go through a gateway or router to reach the network manager.

For security, you can set in the Switch a list of IP Addresses of the network managers that you allow to manage the Switch. You can also change the default Community Name in the Switch and set access rights of these Community Names.

## ***Traps***

Trap managers are special users of the network who are given certain rights and access in overseeing the maintenance of the network. Trap managers can receive traps sent from the Switch; they must immediately take certain actions to avoid future failure or breakdown of the network.

Traps are messages that alert you of events that occur on the Switch. The events can be as serious as a reboot (someone accidentally turned *OFF* the Switch), or less serious like a port status change. The Switch generates traps and sends them to the network manager (trap managers). The following lists the types of events that can take place on the Switch.

- ◇ System resets
- ◇ Errors
- ◇ Status changes
- ◇ Topology changes
- ◇ Operation

You can also specify which network managers may receive traps from the Switch by setting a list of IP Addresses of the authorized network managers.

The following are trap types a trap manager will receive:

- ◆ **Cold Start** This trap signifies that the Switch has been powered up and initialized such that software settings are

reconfigured and hardware systems are rebooted. A cold start is different from a factory reset.

- ◆ **Warm Start** This trap signifies that the Switch has been rebooted, however the POST (Power On Self-Test) is skipped.
- ◆ **Authentication Failure** This trap signifies that an addressee (or manager/ user) on the Switch is not a valid user of the Switch and may have entered an incorrect community name.
- ◆ **New Root** This trap indicates that the Switch has become the new root of the Spanning Tree, the trap is sent by a bridge soon after its election as the new root. This implies that upon expiration of the Topology Change Timer the new root trap is sent out immediately after the Switch's selection as a new root.
- ◆ **Topology Change** A Topology Change trap is sent by the Switch when any of its configured ports transitions from the Learning state to the Forwarding state, or from the Forwarding state to the Blocking state. The trap is not sent if a new root trap is sent for the same transition.
- ◆ **Link Change Event** This trap is sent whenever the link of a port changes from link up to link down or from link down to link up.

## **MIBs**

The information stored in the Switch is known as the Management Information Base (MIB). The Switch uses the standard MIB-II Management Information Base module. Consequently, MIB values inside the Switch can be retrieved from any SNMP-based network manager. In addition to the standard MIB-II, the Switch also supports its own proprietary enterprise MIB as an extended Management Information Base. These MIBs may also be retrieved

by specifying the MIB's Object-Identity (OID) at the network manager. MIB values can be either read-only or read-write.

Read-only MIBs variables can be either constants that are programmed into the Switch, or variables that change while the Switch is in operation. Examples of read-only constants are the number of ports and types of ports. Examples of read-only variables are the statistics counters such as the number of errors that have occurred, or how many kilobytes of data have been received and forwarded through a port.

Read-write MIBs are variables usually related to user-customized configurations. Examples of these are the Switch's IP Address, Spanning Tree Algorithm parameters, and port status.

If you use a third-party vendors' SNMP software to manage the Switch, a diskette listing the Switch's propriety enterprise MIBs can be obtained by request. If your software provides functions to browse or modify MIBs, you can also get the MIB values and change them (if the MIBs' attributes permit the write operation). This process however can be quite involved, since you must know the MIB OIDs and retrieve them one by one.

## ***Packet Forwarding***

The Switch looks at the network configuration to forward packets. This reduces the traffic congestion on the network, because packets, instead of being transmitted to all segments, are transmitted to the destination only. Example: if Port 1 receives a packet destined for Port 2, the Switch transmits that packet through Port 2 only, and transmits nothing through Port 1.

- ◆ **Filtering Database** A Switch filters frames, i.e., does not relay frames received by a Switch Port to other Ports on that Switch, in order to prevent the duplication of frames. Frames transmitted between a pair of end stations can be

confined to LANs that form a path between those end stations.

The functions that support the use and maintenance of filtering database information are:

1. Permanent configuration of reserved addresses.
2. Explicit configuration of static filtering information.
3. Automatic learning of dynamic filtering information through observation of Switched Local Area Network traffic.
4. Aging out of filtering information that has been automatically learned.
5. Calculation and configuration of Switched Local Area Network topology.

## ***Aging Time***

The Aging Time is a parameter that affects the auto-learn process of the Switch in terms of the network configuration. Dynamic Entries, which make up the auto-learned-node address, are aged out of the address table according to the Aging Time that you set.

The Aging Time can be from 1 to 99 minutes. A very long Aging Time can result with the out-of-date Dynamic Entries that may cause incorrect packet filtering/forwarding decisions.

In the opposite case, if the Aging Time is too short, many entries may be aged out soon, resulting in a high percentage of received packets whose source addresses cannot be found in the address table.

## ***Spanning Tree Algorithm***

The Spanning Tree Algorithm (STA) in the Switch allows you to create alternative paths (with multiple switches or other types of bridges) in your network. These backup paths are idle until the Switch determines that a problem has developed in the primary paths. When a primary path is lost, the switch providing the alternative path will automatically go into service with no operator intervention. This automatic network reconfiguration provides maximum uptime to network users. The concept of the Spanning Tree Algorithm is a complicated and complex subject and must be fully researched and understood. Please read the following before making any changes.

- ♦ **Network loop detection and prevention** With STA, there will be only one path between any two LANs. If there is more than one path, forwarded packets will loop indefinitely. STA detects any looped path and selects the path with the lowest path cost as the active path, while blocking the other path and using it as the backup path.
- ♦ **Automatic topology re-configuration** When the path for which there is a backup path fails, the backup path will be automatically activated, and STA will automatically re-configure the network topology.

## ***STA Operation Levels***

STA operates on two levels: the bridge level and the port level. On the bridge level, STA calculates the Bridge Identifier for each Switch, then sets the Root Bridge and the Designated Bridges. On the port level, STA sets the Root Port and Designated Ports. Details are as follows:

## On the Bridge Level

- ◆ **Root Bridge** The switch with the lowest Bridge Identifier is the Root Bridge. Naturally, you will want the Root Bridge to be the best switch among the switches in the loop to ensure the highest network performance and reliability.
- ◆ **Bridge Identifier** This is the combination of the Bridge Priority (a parameter that you can set) and the MAC address of the switch. Example: 4 00 80 C8 00 01 00, where 4 is the Bridge Priority. A lower Bridge Identifier results in a higher priority for the switch, and thus increases it probably of being selected as the Root Bridge.
- ◆ **Designated Bridge** From each LAN segment, the attached Bridge that has the lowest Root Path Cost to the Root Bridge is the Designated Bridge. It forwards data packets for that LAN segment. In cases where all Switches have the same Root Path Cost, the switch with the lowest Bridge Identifier becomes the Designated Bridge.
- ◆ **Root Path Cost** The Root Path Cost of a switch is the sum of the Path Cost of the Root Port and the Root Path Costs of all the switches that the packet goes through. The Root Path Cost of the Root Bridge is zero.
- ◆ **Bridge Priority** This is a parameter that users can set. The smaller the number you set, the higher the Bridge Priority is. The higher the Bridge Priority, the better the chance the Switch will be selected as the Root Bridge.

## On the Port Level

- ◆ **Root Port** Each switch has a Root Port. This is the port that has the lowest Path Cost to the Root Bridge. In case there are several such ports, then the one with the lowest Port Identifier is the Root Port.

- ◆ **Designated Port** This is the port on each Designated Bridge that is attached to the LAN segment for which the switch is the Designated Bridge.
- ◆ **Port Priority** The smaller this number, the higher the Port Priority is. With higher Port Priority, the higher the probability that the port will be selected as the Root Port.
- ◆ **Path Cost** This is a changeable parameter and may be modified according to the STA specification.

## ***User-Changeable Parameters***

The factory default setting should cover the majority of installations. However, it is advisable to keep the default settings as set at the factory; unless, it is absolutely necessary. The user changeable parameters in the Switch are as follows:

- ◆ **Bridge Priority** A Bridge Priority can be from 0 to 65535. 0 is equal to the highest Bridge Priority.
- ◆ **Bridge Hello Time** The Hello Time can be from 1 to 10 seconds. This is the interval between two transmissions of BPDU packets sent by the Root Bridge to tell all other Switches that it is indeed the Root Bridge. If you set a Hello Time for your Switch, and it is not the Root Bridge, the set Hello Time will be used if and when your Switch becomes the Root Bridge.

Note that the Hello Time cannot be longer than the Max. Age. Otherwise, a configuration error will occur.

- ◆ **Bridge Max. Age** The Max. Age can be from 6 to 40 seconds. At the end of the Max. Age, if a BPDU has still not been received from the Root Bridge, your Switch will start sending its own BPDU to all other Switches for permission to become the Root Bridge. If it turns out that your Switch

has the lowest Bridge Identifier, it will become the Root Bridge.

- ◆ **Bridge Forward Delay** The Forward Delay can be from 4 to 30 seconds. This is the time any port on the Switch spends in the listening state while moving from the blocking state to the forwarding state.

Observe the following formulas when you set the above parameters:

1. Max. Age = 2 x (Forward Delay - 1 second)
2. Max. Age = 2 x (Hello Time + 1 second)

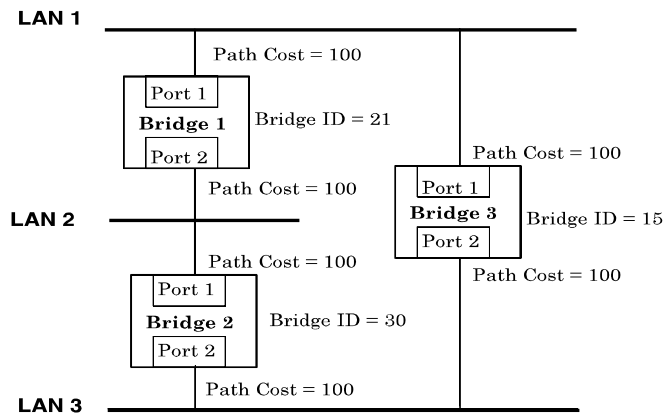
- ◆ **Port Priority** A Port Priority can be from 0 to 255. The lower the number, the greater the probability the port will be chosen as the Root Port.

## ***Illustration of STA***

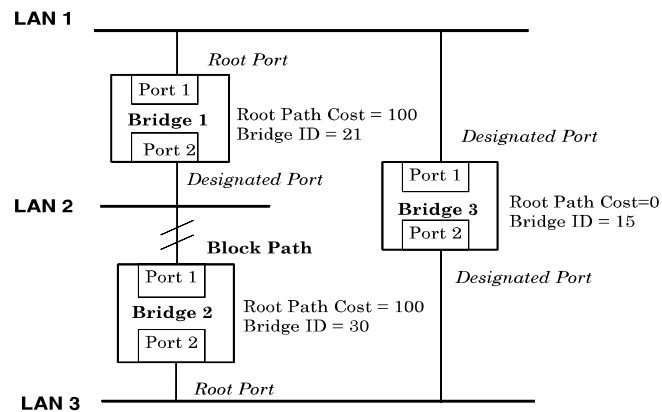
A simple illustration of three Bridges (or the Switch) connected in a loop is depicted in *Figure 5-1*. In this example, you can anticipate some major network problems if the STA assistance is not applied. For instance, if Bridge 1 broadcasts a packet to Bridge 2, Bridge 2 will broadcast it to Bridge 3, and Bridge 3 will broadcast it to Bridge 1...and so on. The broadcast packet will be passed indefinitely in a loop, causing a serious network failure.

To alleviate network loop problems, STA can be applied as shown in *Figure 5-2*. In this example, STA breaks the loop by blocking the connection between Bridge 1 and 2. The decision to block a particular connection is based on the STA calculation of the most current Bridge and Port settings. Now, if Bridge 1 broadcasts a packet to Bridge 3, then Bridge 3 will broadcast it to Bridge 2 and the broadcast will end there.

STA setup can be somewhat complex. Therefore, you are advised to keep the default factory settings and STA will automatically assign root bridges/ports and block loop connections. However, if you need to customize the STA parameters, refer to *Table 5-1*.



**Figure 5-1. Before Applying the STA Rules**



**Figure 5-2. After Applying the STA Rules**

STA parameters	Settings	Effects	Comment
<b>Bridge Priority</b>	lower the #, higher the priority	Increases chance of becoming the Root Bridge	Avoid, if the switch is used in workgroup level of a large network
<b>Hello Time</b>	1 - 10 sec.	No effect, if not Root Bridge	Never set greater than Max. Age Time
<b>Max. Age Time</b>	6 - 40 sec.	Compete for Root Bridge, if BPDU is not received	Avoid low number for unnecessary reset of Root Bridge
<b>Forward Delay</b>	4 - 30 sec.	High # delays the change in state	Max. Age $\leq 2 \times$ (Forward Delay - 1) Max. Age $\geq 2 \times$ (Hello Time + 1)
<b>Port Level STA parameters</b>			
<b>Enable / Disable</b>	Enable / Disable	Enable or disable this LAN segment	Disable a port for security or problem isolation
<b>Port Priority</b>	lower the #, higher the priority	Increases chance of become Root Port	

Table 5-1. User-selective STA parameters

# 6

---

## ***USING THE CONSOLE INTERFACE***

Your Gigabit Ethernet Switch supports a console management interface that allows you to set up and control your Switch, either with an ordinary terminal (or terminal emulator), or over the network using the TCP/IP **TELNET** protocol. You can use this facility to perform many basic network management functions. In addition, the console program will allow you to set up the Switch for management using an SNMP-based network management system. This chapter describes how to use the console interface to access the Switch, change its settings, and monitor its operation.

---

### **Connecting to the Switch**

---

You can use the console interface by connecting the Switch to a VT100-compatible terminal or a computer running an ordinary terminal emulator program (e.g., the **terminal** program included with the Windows operating system) using an RS-232C serial cable. Your terminal parameters will need to be set to:

- ◆ VT-100/ANSI compatible
- ◆ Arrow keys enabled

- ◆ 9,600 baud
- ◆ 8 data bits
- ◆ No parity
- ◆ One stop bit

You can also access the same functions over a **TELNET** interface. Once you have set an IP address for your Switch, you can use a **TELNET** program (in a VT-100 compatible terminal mode) to access and control the Switch. All of the screens are for the most part identical, whether accessed from the console port or from a **TELNET** interface.

---

## Console Usage Conventions

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The console interface makes use of the following conventions:

1. Items in *<angle brackets>* can be toggled on or off using the space bar, excepting the entries on the Port Configuration screen .
2. Items in *[square brackets]* can be changed by typing in a new value. You can use the backspace and delete keys to erase characters behind and in front of the cursor.
3. The up and down arrow keys, the left and right arrow keys, the tab key and the backspace key, can be used to move between selected items. It is recommended that you use the ***tab key*** and ***backspace key*** for moving around console.
4. Items in UPPERCASE are commands. Moving the selection to a command and pressing Enter will execute that command, e.g. SAVE, EXIT, etc.

---

## First Time Connecting To The Switch

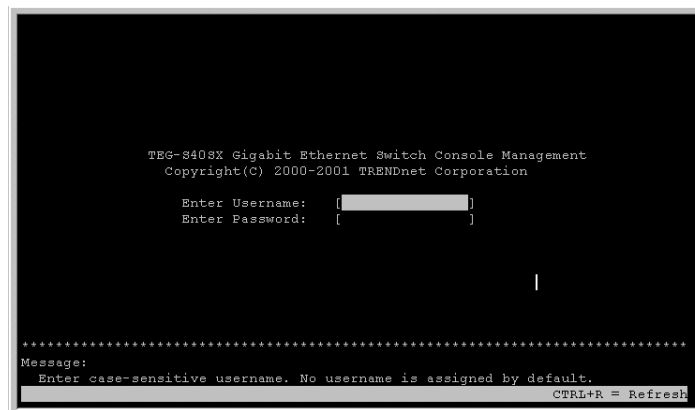
---

The Switch supports user-based security that can allow you to prevent unauthorized users from accessing the Switch or changing its settings. This section tells how to log onto the Switch.

**Note:**    *The passwords used to access the Switch are case sensitive; therefore, “S” is not the same as “s.”*

---

When you first connect to the Switch, you will be presented with the first login screen (shown below). **Press Ctrl+R (hold down the Ctrl key, press the R key, and release both keys) to call up the screen, if the initial login screen does not appear. Also Ctrl+R can be used at any time to refresh the screen.**



**Figure 6-1. Initial Screen, first time connecting to the Switch**

Press Enter (Note: Leave the *Username* and *Password* fields blank). You will see the main menu shown below:

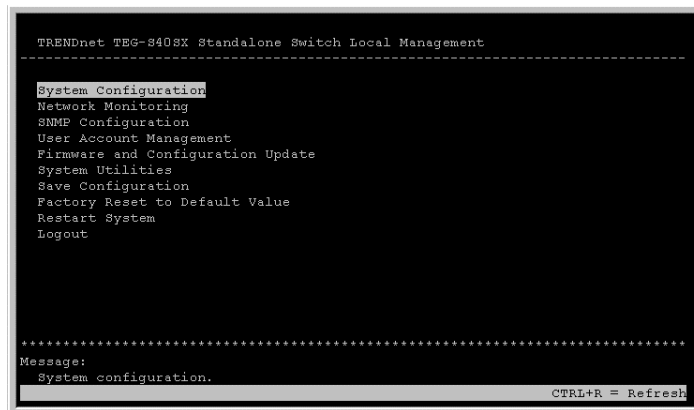


Figure 6-2. Main Menu

The first user automatically gets Administrator privileges (See *Table 6-1*). It is recommended to create at least one Administrator-level user for the Switch.

### **Steps to Create Administrator or Normal User Access**

From the screen above, move the cursor to **User Account Management** and press Enter. The **User Account Management** menu appears.

1. Choose **Add/Modify User Account** from the **User Account Management** menu. The **Add/Modify User Account** menu appears.
2. Enter the new user name, assign an initial password, and then confirm the new password. Determine whether the new user should have **Administrator** or **Normal User** privileges. (Use the space bar to toggle between the two options).
3. Press **APPLY** to let the user addition take effect.

4. Press Esc. to return to the previous screen or Ctrl+T to go to the root screen.
5. To see a listing of all user accounts and access levels, press Esc. Then choose **View/Delete User Account**. The **View/Delete User Account** screen appears.

## Administrator and Normal User Privileges.

There are two levels of user privileges: *Administrator* and *Normal User*. Some menu selections available to users with *Administrator* privileges may not be available to *Normal Users*. The main menus shown are the menus for the two types of users:

The following table summarizes Administrator and Normal User privileges:

Menu	Administrator	Normal User
	Privilege	
Configuration	Yes	Yes, view only.
Network Monitoring	Yes	Yes, view only.
Community Strings and Trap Status	Yes	Yes, view only.
Update Firmware and Configuration Files	Yes	No
User Account Management		
Add/Modify User Account	Yes	No
View/Delete User Account	Yes	No
System Utilities	Yes	Yes
Factory Reset	Yes	No
Reset System	Yes	No

**Table 6-1. Administrator and Normal User Privileges**

After establishing a User Account with **Administrator**-level privileges, press Esc. twice. Then choose the **Save Changes** menu (seen below). Pressing any key will return to the main menu. You are now ready to operate the Switch.

## **Save Configuration**

In order to retain any modifications made in the current session, it is necessary to choose **Save Configuration** from the main menu. The following screen will appear to indicate your new settings have been processed:



**Figure 6-3. Save Configuration screen**

---

## **Login On The Switch Console By Registered Users**

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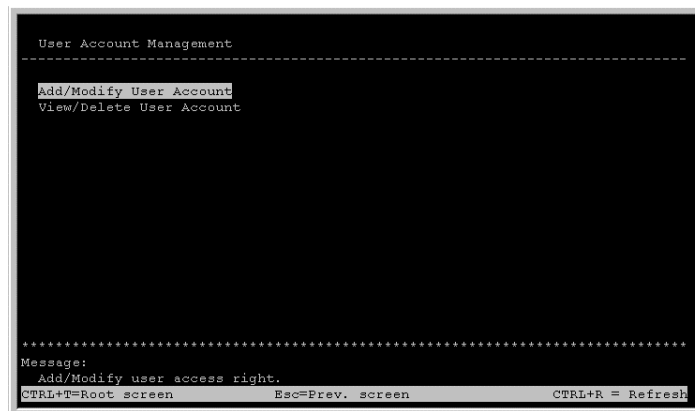
To log in once you have created a registered user,

1. Type in your **Username** and press Enter.
2. Type in your **Password** and press Enter.
3. The main menu screen will be displayed based on your Administrator or Normal User access level or privilege.

## ***Add/Modify User Account***

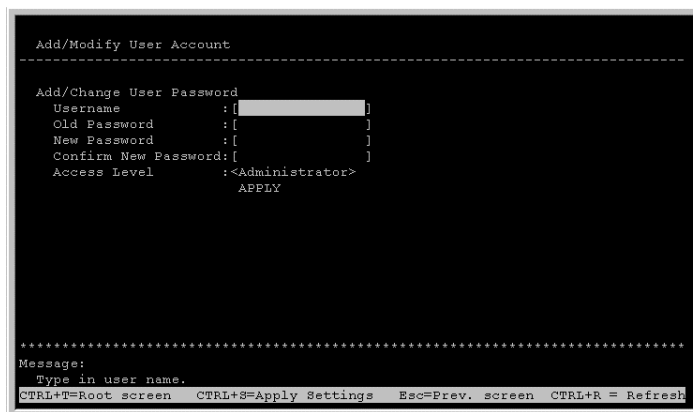
To add or change your user password:

1. Choose **User Account Management** from the main menu.  
The following **User Account Management** menu appears:



**Figure 6-4. User Account Management menu**

2. Choose **Add/Modify User Account**. The following screen appears



**Figure 6-5. Add/Modify User Account screen**

3. Type in your **Username** and press Enter.
4. If you are a new user, type in the **Old Password** and press Enter.
5. Type in the **New Password** you have chosen, and press Enter. Type in the same new password in the following field to verify that you have not mistyped it.
6. Determine whether the new user should have *Normal User* or *Administrator* privileges.
7. Choose the **APPLY** command to let the password change take effect.

This method can also be used by an *Administrator*-level user to change another user's password.

## View/Delete User Account

Access to the console, whether using the console port or via **TELNET**, is controlled using a user name and password. Up to three user names can be defined. The console interface will not let you delete the current logged-in user, however, in order to prevent accidentally deleting all of the users with *Administrator* privilege.

Only users with the *Administrator* privilege can delete users.

To view your user password:

Choose **View/Delete User Account** from the **User Account Management** menu. The following screen appears:



Figure 6-6. View/Delete User Account screen

To delete your user password:

1. Toggle the Delete field of the user you wish to remove to Yes.
2. Press APPLY to let the user deletion take effect.

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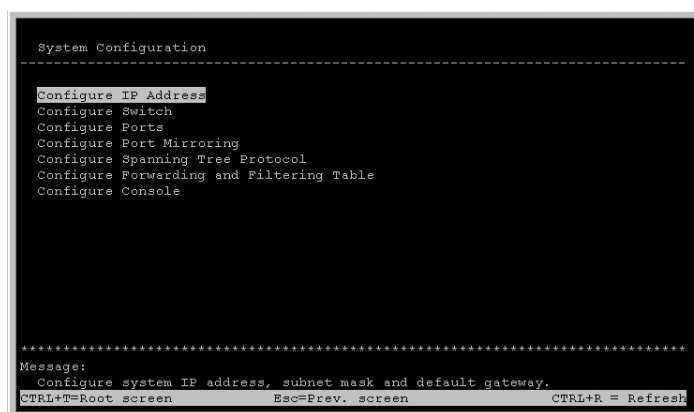
## Setting Up The Switch

---

This section will help prepare the Switch user by describing the **System Configuration**, **Firmware and Configuration Update**, **System Utilities**, and **SNMP Configuration** menus and their respective sub-menus.

### *System Configuration*

Choose **System Configuration** to access the first item on the TEG-S40SX main menu. The following menu appears:



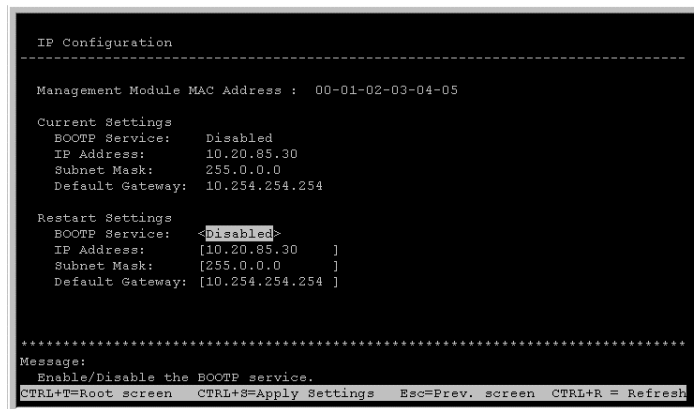
**Figure 6-7. System Configuration menu**

You will need to change some settings to allow you to be able to manage the Switch from an SNMP-based Network Management System such as SNMP v1 or to be able to access the Switch using the **TELNET** protocol. See the next chapter for Web-based network management information.

## Configure IP Address

The Switch needs to have a TCP/IP address assigned to it so that the network management system or **TELNET** client can find it on the network. The **IP Configuration** screen allows you to change the settings for the two different interfaces used on the Switch: the Ethernet interface used for in-band communication, and the SLIP interface used over the console port for out-of-band communication.

Choose **Configure IP Address** to access the first item on the **System Configuration** menu. The following screen appears:



```

IP Configuration
-----
Management Module MAC Address : 00-01-02-03-04-05

Current Settings
BOOTP Service: Disabled
IP Address:    10.20.85.30
Subnet Mask:   255.0.0.0
Default Gateway: 10.254.254.254

Restart Settings
BOOTP Service: <Disabled>
IP Address:    [10.20.85.30 ]
Subnet Mask:   [255.0.0.0 ]
Default Gateway: [10.254.254.254 ]

*****
Message:
  Enable/Disable the BOOTP service.
CTRL+T=Root screen  CTRL+S=Apply Settings  Esc=Prev. screen  CTRL+R = Refresh
  
```

**Figure 6-8. IP Configuration screen**

Each of the fields on this screen takes effect the next time the system is restarted. Fields that can be set include:

- ♦ **BOOTP Service** Determines whether the Switch should send out a BOOTP broadcast request when it is powered up. The BOOTP protocol allows IP addresses, network masks, and default gateways to be assigned on a central BOOTP server; if this option is set the Switch will first look for a

BOOTP server to provide it with this information before using the supplied settings.

- ◆ **IP Address** Determines the IP address used by the Switch for receiving SNMP and TELNET communications. Should be of the form *xxx.xxx.xxx.xxx*, where each *xxx* is a number (represented in decimal) between 0 and 255. This address should be a unique address on a network assigned to you by the central Internet authorities. The same IP address is shared by both the SLIP and Ethernet network interfaces.
- ◆ **Subnet Mask** Bitmask that determines the extent of the subnet that the Switch is on. Should be of the form *xxx.xxx.xxx.xxx*, where each *xxx* is a number (represented in decimal) between 0 and 255. If no subnetting is being done, the value should be 255.0.0.0 for a Class A network, 255.255.0.0 for a Class B network, and 255.255.255.0 for a Class C network.
- ◆ **Default Gateway** IP address that determines where frames with a destination outside the current subnet should be sent. This is usually the address of a router or a host acting as an IP gateway. If your network is not part of an internetwork, or you do not want the Switch to be accessible outside your local network, you can leave this field blank.

## Configure Console

You can use the **Console Configuration** screen to choose whether to use the Switch's RS-232C serial port for console management or for out-of-band TCP/IP communications using SLIP, and to set the bit rate used for SLIP communications.

Choose **Configure Console** to access the last item on the **System Configuration** menu. The following screen appears:



Figure 6-9. Console Configuration screen

The following fields can be set:

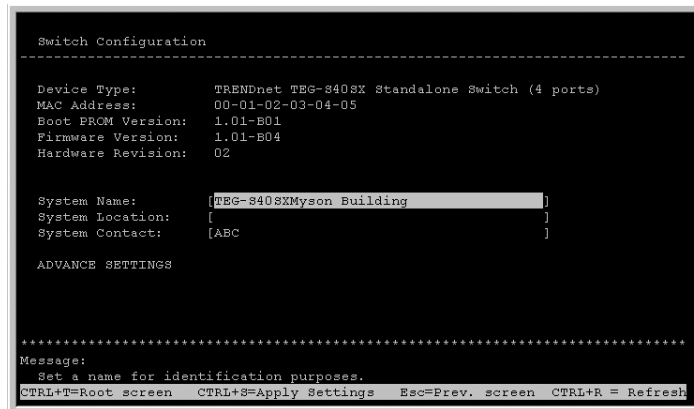
#### Restart Setting:

- ◆ **Console Timeout** This setting for the restart of the console is *15 mins*, *30 mins*, *45 mins*, *60 mins*, or *Never*.
- ◆ **Serial Port** Determines whether the serial port should be used for out-of-band (SLIP) management or for console management, starting from the next time the Switch is restarted. In this field, you can toggle between *SLIP* or *Console* port type settings.
- ◆ **Baud Rate** Determines the serial port bit rate that will be used the next time the Switch is restarted. Applies only when the serial port is being used for out-of-band (SLIP) management; it does not apply when the port is used for the console port. Available speeds are 2400, 9600, 19,200 and 38,400 bits per second. The default setting in this Switch version is 9600.

## Configure Switch

The **Switch Configuration** screen shows various pieces of information about your Switch, and allows you to set the **System Name**, **System Location**, and **System Contact**. These settings can be retrieved from the Switch using SNMP requests, allowing these settings to be used for network management purposes.

Choose **Configure Switch** to access the second item on the **System Configuration** menu. The following screen appears:



```
Switch Configuration
-----
Device Type:      TRENDnet TEG-S40SX Standalone Switch (4 ports)
MAC Address:      00-01-02-03-04-05
Boot PROM Version: 1.01-B01
Firmware Version: 1.01-B04
Hardware Revision: 02

System Name:      [TEG-S40SXMyson Building]
System Location:  [ ]
System Contact:   [ABC]

ADVANCE SETTINGS

*****
Message:
Set a name for identification purposes.
CTRL+T=Root screen  CTRL+S=Apply Settings  Esc=Prev. screen  CTRL+R = Refresh
```

**Figure 6-10. Switch Configuration screen**

The fields you can set are:

- ♦ **System Name** Corresponds to the SNMP MIB II variable **system.sysName**, and is used to give a name to the Switch for administrative purposes. The Switch's fully qualified domain name is often used, provided a name has been assigned.
- ♦ **System Location** Corresponds to the SNMP MIB II variable **system.sysLocation**, and is used to indicate

the physical location of the Switch for administrative purposes.

- ♦ **System Contact** Corresponds to the SNMP MIB II variable **sysContact**, and is used to give the name and contact information for the person responsible for administering the Switch.

The **Configure Advanced Switch Features** screen allows you to enable or disable auto-partitioning on all ports as well as to enable or disable head of line blocking prevention. Press ADVANCE SETTINGS on the **System Configuration** window to access the **Configure Advanced Switch Features** screen:



**Figure 6-11. Configure Advanced Switch Features screen**

The field you can set is:

- ♦ **Head Of Line (HOL) Blocking Prevention** If enabled, this function is designed to prevent forwarding a packet to a “blocking” port, that is, a port where an excess of packets are queued up. Note that when a multicast packet or a packet with an unknown destination address needs

- ◆ to be forwarded to several ports, and if some of them are “blocking”, the packet will not be discarded, rather it will be forwarded only to the ports that are not “blocking”.

## Configure Ports

The port configuration screen allows you to change the port state in the case when you would like to partition a port, or for observation, device repair, or security reasons. Great caution, however, must be observed when partitioning a port; you should make sure that the partitioned port is not being used as the port to control or monitor the condition of other devices.

To change the configuration of a port:

1. Select **System Configuration** from the main menu and then choose **Configure Ports**. The following screen appears:

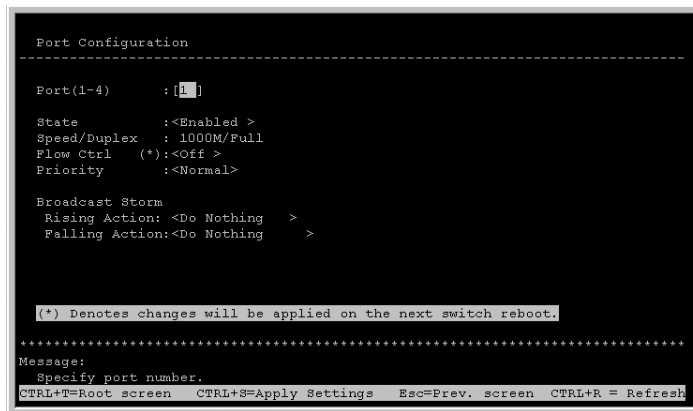


Figure 6-12. Port Configuration screen

2. Specify the port in the **Port (1-4)** field.

3. In the **State** field, change the port state to *Enabled* or *Disabled*.
4. In the **Flow Ctrl** field, toggle *Off* or *On*.
5. In the **Priority** field, select *Normal*, *High* or *Low*.
6. In the **Broadcast Storm Rising Action** and **Broadcast Storm Falling Action** fields, set the desired setting.
7. Press CTRL+S to let the changes take effect.

The **Speed/Duplex** field reflects the current condition of the port, *1000M/Full*. It is a read-only field and cannot be changed.

The fields you can set are:

- ◆ **Port (1-4)** Select the desired port in this field.
- ◆ **State** When you disable the state, the port will be partitioned from the rest of the network. In this partitioned state, it will only be able to accept management packets. All other packets will be dropped.
- ◆ **Flow Ctrl** Enables or disables IEEE 802.3x flow control on the port. Flow control allows the port to send a Pause packet to a transmitting IEEE 802.3x-compliant device, so that its buffers don't overflow and data is not lost.
- ◆ **Priority** Sets the priority for traffic arriving at this port to high, normal or low. Higher priority packets are processed first in the switch's packet queue.
- ◆ **Broadcast Storm Rising Action** This setting will be activated when the switch detects that 80% of packets on the segment connected to the port are broadcast packets and the port surpasses 30% utilization. When these criteria are met, the port can be configured to *Do Nothing*, *Blocking* or

*Blocking-Trap*. The *Do Nothing* setting causes the switch to operate normally, in other words, ignore the broadcast storm condition. The *Blocking* setting causes the port to drop all broadcast frames, thus isolating the broadcast storm. *Blocking-Trap* performs the same action as *Blocking*, except it also sends a trap to the designated Trap Recipient informing them of the situation.

- ◆ **Broadcast Storm Falling Action** This setting will be activated when a Broadcast Storm Rising Action has occurred and the switch detects that port utilization has dropped below 10%. This setting can be configured to *Do Nothing*, *Forwarding* or *Forwarding-Trap*. The *Do Nothing* setting causes the switch to operate normally, in other words, ignore the situation. If the port had met the Broadcast Storm Rising Action criteria and started *Blocking* broadcast packets, it will continue doing so. The *Forwarding* setting causes the port to begin forwarding broadcast frames, thus removing the *Blocking* state imposed by the Broadcast Storm Rising Action. *Forwarding-Trap* performs the same action as *Forwarding*, except it also sends a trap to the designated Trap Recipient informing them of the situation.

## Configure Port Mirroring

The **Port Mirroring Configuration** screen allows you to copy frames transmitted and received on a port and redirect the copies to another port. You can attach a monitoring device to the mirrored port, such as a sniffer or an RMON probe, to view details about the packets passing through the first port. This is useful for network monitoring and troubleshooting purposes.

Choose **Configure Port Mirroring** on the **System Configuration** menu to access the **Port Mirroring Configuration** screen:

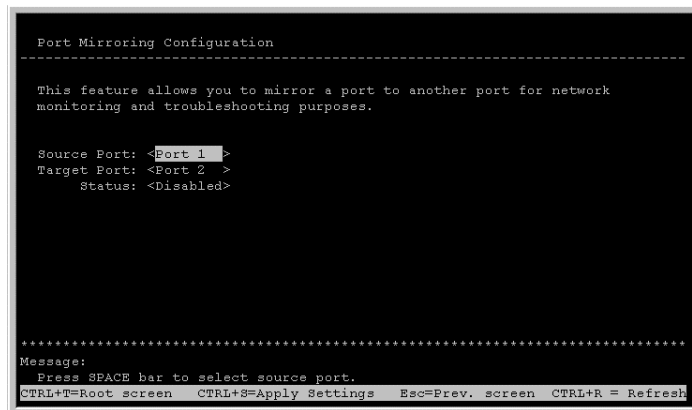


Figure 6-13. Port Mirroring Configuration screen

To configure a mirror port, select the port from where you want to copy frames in the **Source Port** field. Then select the port which receives the copies from the source port in the **Target Port** field. The target port is where you will connect a monitoring/troubleshooting device such as a sniffer or an RMON probe.

## Configure Spanning Tree Protocol

The Spanning Tree Algorithm Parameters can be used for creating alternative paths in your network. The Protocol Parameters allow you to change the behind the scene parameters of the Spanning Tree Algorithm at the bridge level. The parameters for this section have been fully explained in Chapter 5's *Switch Management*, see *STA Operation Levels: On the Bridge level*, and *User-Changeable Parameters*. It is recommended that you read these sections, as well as the introductory section in the same chapter entitled *Spanning Tree Algorithm* before changing any of the parameters.

To change the Protocol Parameters:

1. Choose **Configure Spanning Tree Protocol** from the **System Configuration** menu. The following **Spanning Tree Protocol Configuration** menu will be displayed:

```
Spanning Tree Protocol Configuration
-----
STP Parameters Setting
STP Custom Setting

*****
Message:
  Set spanning tree protocol parameters.
CTRL+T=Root screen      Esc=Prev. screen      CTRL+R = Refresh
```

**Figure 6-14. Spanning Tree Protocol Configuration menu**

2. Choose **STP Parameters Setting** to access the following screen:

```
STP Parameters Setting
-----
Spanning Tree Protocol      : <Disabled>
Time Since Topology Change(Sec) : 0 secs
Topology Change Count      : 0
Designated Root             : 00-00-00-00-00-00
Root Cost                   : 0
Root Port                   : 0
Max Age(Sec)               : 0
Forward Delay(Sec)         : 15
Hold Time(Sec)             : 0
Root Priority                : 0

Max Age(6-40 sec)          : [20  ]
Hello Time(1-10 sec)       : [2   ]
Forward Delay(4-30 sec)    : [15  ]
Bridge Priority(0-65535)   : [32768]

*****
Message:
  Enable/Disable spanning tree protocol.
CTRL+T=Root screen  CTRL+S=Apply Settings  Esc=Prev. screen  CTRL+R = Refresh
```

**Figure 6-15. STP Parameters Setting screen**

3. Change the *Disabled* setting to *Enabled* in the **Spanning Tree Protocol** field.
4. Enter the Bridge Max Age in the **Max Age(6-40 sec)** field.
5. Enter the Bridge Hello Time in the **Hello Time(1-10 sec)** field.
6. Enter the Bridge Forward Delay time in the **Forward Delay(4-30 sec)** field.
7. Enter the Bridge Priority in the **Bridge Priority(0-65535)** field.

The information on the screen is described as follows:

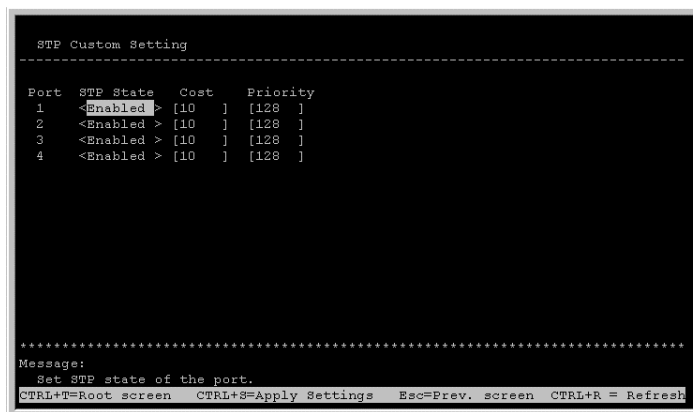
- ◆ **Spanning Tree Protocol** Select *Enabled* to implement the Spanning Tree Protocol.
- ◆ **Time Since Topology Changes(sec)** Read-only object displays the last time changes were made to the network topology. These changes usually occur when backup paths are activated due to primary path failures.
- ◆ **Topology Change Count** Read-only object displays the number of times (since the current management session with the device was started) changes were made to the network topology. Changes usually occur on the network when backup paths are activated.
- ◆ **Designated Root** Read-only object displays the MAC (Ethernet) address of the bridge/switch on the network that has been chosen as the STP root.
- ◆ **Root Cost** Read-only object displays the cost for the path between the switch and the root bridge. If the switch is the root bridge, then the root cost is zero.

- ◆ **Root Port** Read-only object identifies the port (on the bridge) that offers the least path cost from the bridge to the root bridge. In the event of a network loop, data packets will pass through the root port.
- ◆ **Max Age(Sec)** Read-only object indicates the maximum age of STP information learned from the network (on any port) before it is discarded.
- ◆ **Forward Delay(sec)** Read-only object indicates how fast any port on the bridge can change its spanning state when moving towards the forwarding state. The value determines how long the port stays in each of the listening and learning states, which precede the forwarding state.
- ◆ **Hold Time(Sec)** Read-only object displays the time interval during which no more than two configuration BPDUs shall be transmitted by the bridge.
- ◆ **Root Priority** Read-only object displays the priority number of the root bridge of the Spanning Tree. The value is used in conjunction with the bridge MAC address to set the bridge ID, which in turn is used when determining the root bridge of a multibridged network. The root bridge is responsible for processing data packets when network loops occur. The smaller the number set, the higher the bridge priority is. The higher the bridge priority, the more chance the bridge has of becoming the root bridge. A bridge priority ranges from 0 to 65535, with 0 being the highest priority.
- ◆ **Max Age(6-40 Sec)** Maximum Age is a read-write object that can be set from 6 to 40 seconds. At the end of the Maximum Age, if a BPDU has still not been received from the Root bridge, your Switch will start sending its own BPDU to all other switches for permission to become the Root Bridge. If it turns out that your Switch has the lowest Bridge Identifier, it will become the Root Bridge.

- ◆ **Hello Time(1-10 Sec)** Hello Time is a read-write object that can be set from 1 to 10 seconds. This is the interval between two transmissions of BPDU packets sent by the Root Bridge to tell all other switches that it is indeed the Root Bridge. If you set a Hello Time for your Switch, and it is not the Root Bridge, the set Hello Time will be used if and when your Switch becomes the Root Bridge.
- ◆ **Forward Delay(4-30 Sec)** The Forward Delay is a read-write object that can be set from 4 to 30 seconds. This is the time any port on the Switch spends in the listening state while moving from the blocking state to the forwarding state.
- ◆ **Bridge Priority(0-65535 Sec)** A Bridge Priority is a read-write object that can be set from 0 to 65535. This is the priority number of the bridge. The value is used in conjunction with the bridge MAC address to set the bridge ID, which in turn is used when determining the root bridge of a multibridged network. The root bridge is responsible for processing data packets when network loops occur. The smaller the number set, the higher the bridge priority is. The higher the bridge priority, the more chance the bridge has of becoming the root bridge. Zero is the highest priority.

To change the parameters on individual ports:

1. Choose **Configure Spanning Tree Protocol** from the **System Configuration** menu.
2. Choose **STP Custom Setting** from the **Spanning Tree Protocol Configuration** menu. The following screen appears:



The screenshot shows a terminal window titled "STP Custom Setting". It contains a table with four columns: Port, STP State, Cost, and Priority. The table lists four ports, all with STP State set to "<Enabled>", Cost set to "[10 ]", and Priority set to "[128 ]". Below the table, there is a "Message:" section with the text "Set STP state of the port." and a footer with navigation instructions: "CTRL+T=Root screen CTRL+S=Apply Settings Esc=Prev. screen CTRL+R = Refresh".

Port	STP State	Cost	Priority
1	<Enabled>	[10 ]	[128 ]
2	<Enabled>	[10 ]	[128 ]
3	<Enabled>	[10 ]	[128 ]
4	<Enabled>	[10 ]	[128 ]

Message:  
Set STP state of the port.

CTRL+T=Root screen CTRL+S=Apply Settings Esc=Prev. screen CTRL+R = Refresh

**Figure 6-16. STP Custom Setting screen**

3. Change the *Disabled* setting of the **STP State** field to *Enabled*.
4. Set the path cost for the port between 1 and 65535 in the **Cost** field.
5. Set the priority for the port between 0 and 255 in the **Priority** field.
6. Press CTRL+S to apply the new settings.

## Configure Forwarding and Filtering Table

When a packet hits the Switch, the Switch looks in the filtering and forwarding tables to decide what to do with the packet; either to filter it off the network, or to forward it through the port on which its destination lies. The **Configure Filtering and Forwarding table** screen allows you to stop or start address learning as well as to select an age-out time of the MAC address in the selected address table. This screen also permits you to access two additional configuration screens from the menu at the bottom of the window.

Choose **Configure Forwarding and Filtering Table** from the **Switch Configuration** menu to access the following screen:

```

Filtering and Forwarding Table Configuration
-----
Lock Address Table(STOPs Learning):<No>
MAC Address Age-out Time:[5]min.

Custom Forwarding Table
Custom Filtering Table

*****
Message:
Start/Stop address learning.
CTRL+T=Root screen  CTRL+S=Apply Settings  Esc=Prev. screen  CTRL+R = Refresh
  
```

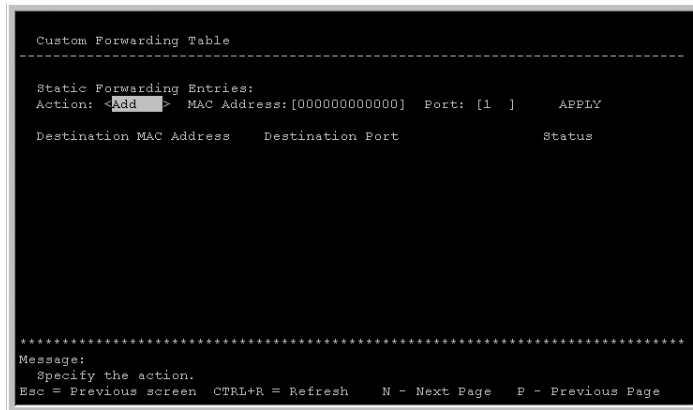
**Figure 6-17. Filtering and Forwarding Table Configuration screen**

The following fields at the top of the screen can be set:

- ♦ **Lock Address Table(STOPs Learning)** Mostly used for security purposes, when the forwarding table is locked the Switch will no longer learn the MAC addresses for new hosts. If your network configuration doesn't change, locking the forwarding table helps keep intruders off your network since any packet coming from an unknown source address will be dropped by the Switch.
- ♦ **MAC Address Age-out Time** Enter the desired MAC address age-out time in this field (1 to 9999 minutes) .

The **Custom Forwarding Table** displays a list of manually defined static MAC address entries.

To access the **Custom Forwarding Table**, choose **Configure Forwarding and Filtering Table** from the **System Configuration** menu. Then select **Custom Forwarding Table** from the bottom of the **Filtering and Forwarding Table Configuration** screen. The following screen appears:



**Figure 6-18. Custom Forwarding Table screen**

- ◆ Under the **Destination MAC Address** heading a total of ten destination addresses will be seen per page. The Switch can hold up to 256 entries.
- ◆ Under the **Destination Port** heading a port number will be displayed for each corresponding destination address.
- ◆ Under the **Status** heading, the status will be displayed for each corresponding destination address. The status of the MAC address should show “in use”.

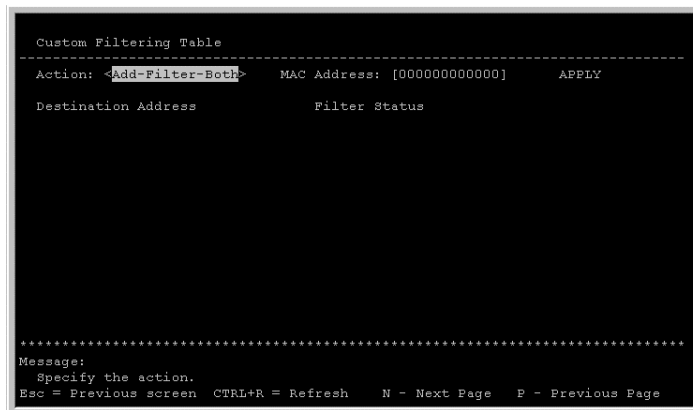
By mapping a port to a destination MAC address, the switch can permanently forward traffic to the specified device, even after long periods of network inactivity or during times of network congestion.

To make a change to the Custom Forwarding Table, choose either *Add* or *Remove* in the **Action** field. Then enter the **MAC Address**, the **Port** number that permanently forwards traffic from the specified device, regardless of the device's network activity or current network congestion, and press APPLY.

The **Custom Filtering Table** contains filtering information configured into the Switch by (local or network) management specifying the set of ports to which packets received from specific ports and containing specific destination addresses are not allowed to be forwarded. You can use the **Custom Filtering Table** for network security purposes thereby discarding unwanted addresses from the Forwarding Table.

Dynamic Filtering and Static Filtering are among the two important features of the **Custom Filtering Table**. They are defined here briefly as follows. *Dynamic Filtering* is defined when a dynamic entry is created by the Learning Process as a result of observation of network traffic in the Filtering Database. *Static Filtering* is defined as static entries that may be added and removed from the Filtering Database by the user. They are not automatically removed by any timeout mechanism.

To access the **Custom Filtering Table**, select **Configure Forwarding and Filtering Table** from the **System Configuration** menu. Then select **Custom Filtering Table** from the bottom of the **Filtering and Forwarding Table Configuration** screen. The following screen appears:



**Figure 6-19. Custom Filtering Table screen**

To make a change to the **Custom Filtering Table**, choose *Add-Filter-Both* or *Remove* in the **Action** field. Then enter the **MAC Address** and press **APPLY**.

## ***Firmware and Configuration Update***

The Switch is capable of obtaining its boot-time configuration information, as well as updated versions of its internal firmware, using TFTP (the Trivial File Transfer Protocol) and BOOTP (the BOOTstrap Protocol). You can use the **Firmware and Configuration Update** screen to control this feature.

Choose **Firmware and Configuration Update** on the Switch's main menu. The following screen appears:

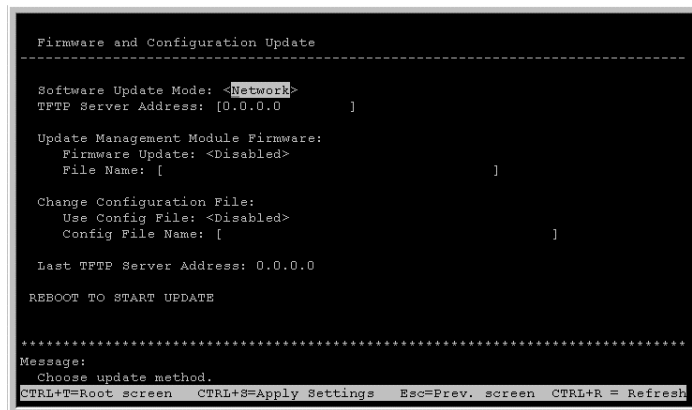


Figure 6-20. Firmware and Configuration Update screen

The fields you can set are:

- ◆ **Software Update Mode** Set to either *Network* or *SLIP*. Determines whether the configuration file should be obtained through the Ethernet network or through the console port.
- ◆ **TFTP Server Address** The IP address of the TFTP server where the configuration file is located. This entry is used only if the Firmware Update is set to *Enabled*. If BOOTP Service (see the **IP Configuration** screen under **Configure IP Address** on the **System Configuration** menu) is set to *Enabled*, the address will be obtained from the BOOTP server.
- ◆ **Firmware Update** Determines whether or not the Switch will try to look for a runtime image file over the network. If set to *Disabled*, none of the fields below have any effect.
- ◆ **File Name** The pathname of the runtime image file on your TFTP server to be downloaded.

- ◆ **Use Config File** Toggle to *Enabled* to download config file during reboot.
- ◆ **Config File Name** The name of the configuration file to be downloaded.

## System Utilities

The **System Utilities** menu features a **Ping Test** option. This sends a Ping to test network connectivity between the Switch and any other network device with an IP address.

Choose **System Utilities** on the main menu to access the **System Utilities** menu seen below.



Figure 6-21. System Utilities menu

Choose **Ping Test** to access the following screen:

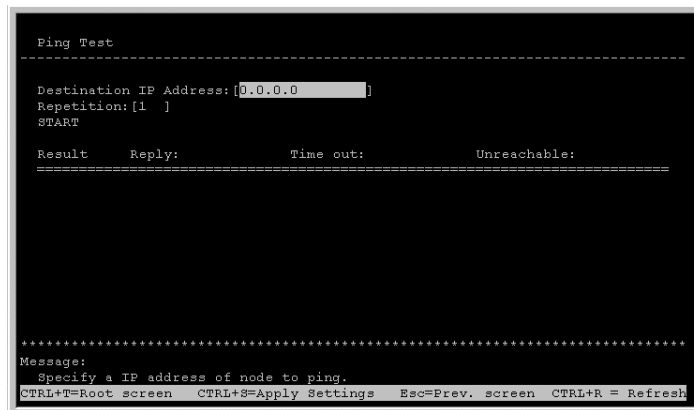


Figure 6-22. Ping Test screen

The fields you can set are:

- ◆ **Destination IP Address** The IP address to be Pinged.
- ◆ **Repetition** Amount of times the Switch should send the Ping (1-255). If zero is chosen, the Switch will continue Pinging indefinitely.

In the lower part of the **Ping Test** screen, you can view the Ping status, including Result, Reply, Time out, and Unreachable.

## SNMP Configuration

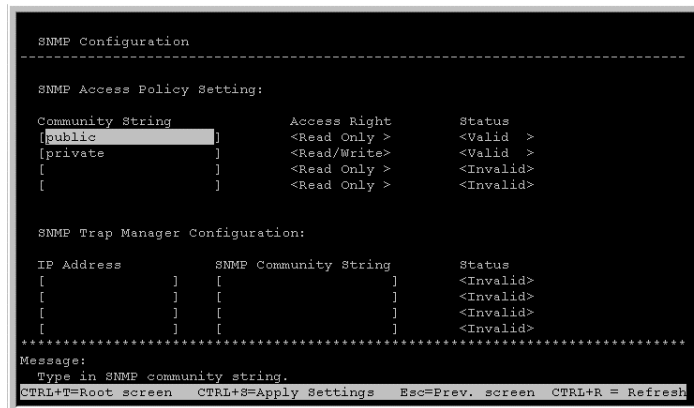
The Switch sends out SNMP *traps* to network management stations whenever certain exceptional events occur, such as when the Switch is turned on or when a system reset occurs. The Switch allows traps to be routed to up to four different network management hosts.

For a detail list of Trap Types used for this Switch, see *Chapter 5, Switch Management, Traps* section.

SNMP (version 1) implements a rudimentary form of security by requiring that each request include a *community name*. A community name is an arbitrary string of characters used as a “password” to control access to the Switch. If the Switch receives a request with a community name it does not recognize, it will trigger an authentication trap.

The SNMP allows up to four different community names to be defined. The community name **public** is defined by default; you can change this name in addition to adding others. You will need to coordinate these names with the community name settings you use in your network management system.

Choose **SNMP Configuration** from the main menu to access the following screen:



```
SNMP Configuration
-----
SNMP Access Policy Setting:

Community String      Access Right      Status
[public               ] <Read Only >    <Valid >
[private              ] <Read/Write>     <Valid >
[                     ] <Read Only >    <Invalid>
[                     ] <Read Only >    <Invalid>

SNMP Trap Manager Configuration:

IP Address            SNMP Community String      Status
[                     ] [                     ] <Invalid>
[                     ] [                     ] <Invalid>
[                     ] [                     ] <Invalid>
[                     ] [                     ] <Invalid>
.....
Message:
Type in SNMP community string.
CTRL+T=Root screen  CTRL+S=Apply Settings  Esc=Prev. screen  CTRL+R = Refresh
```

**Figure 6-23. SNMP Configuration screen**

The following parameters can be set:

- ◆ **Community String/SNMP Community String**  
Determines the community name to be included in the trap request.

- ◆ **Access Right** Allows each community to be separately set to either *Read Only* or *Read/Write*.
- ◆ **Status** Determines whether this community name entry is *Valid* or *Invalid*. An entry can be deleted by changing its status to *Invalid*.
- ◆ **IP Address** The IP address of the network management station to receive the trap.

---

## Switch Monitoring

---

The Switch allows you to keep statistics on the operation of each port. The statistics obtained can be used to monitor the conditions and general efficiency of the Switch.

### ***Network Monitoring***

This display permits you to observe the condition of each individual port.

#### **Traffic Statistics**

To display the **Port Utilization** table:

1. Choose **Network Monitoring** from the main menu.
2. Choose **Traffic Statistics** from the **Network Monitoring** menu.
3. Choose **Port Utilization** from the **Traffic Statistics** menu.

The screenshot shows a terminal window titled "Port Utilization". It contains a table with four columns: Port, TX/sec, RX/sec, and %Util. The table lists four ports, all with values of 0. To the right of the table, it says "Update Interval: < 1 sec >". Below the table, there is a "Message:" prompt and a "Specify update interval" instruction. At the bottom, there are three keyboard shortcuts: CTRL+T=Root screen, Esc=Prev. screen, and CTRL+R = Refresh.

Port	Tx/sec	Rx/sec	%Util.
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0

Update Interval: < 1 sec >

Message:  
Specify update interval

CTRL+T=Root screen      Esc=Prev. screen      CTRL+R = Refresh

**Figure 6-24. Port Utilization screen**

The information displayed above includes:

- ◆ **Update Interval** Select the desired update increment setting from: *1 sec, 5 sec, 15 sec, 30 sec, 1 min, or Suspend.*
- ◆ **TX/sec** The number of good bytes sent from the respective port per second.
- ◆ **RX/sec** The number of good bytes received per second. This also includes local and dropped packets.
- ◆ **%Util.** This shows the percentage of available bandwidth each port is using over the amount of time specified by the update interval.

To display the **Port Traffic Statistics** table:

1. Choose **Network Monitoring** from the main menu.
2. Choose **Traffic Statistics** from the **Network Monitoring** menu.

3. Choose **Port Traffic Statistics** from the **Traffic Statistics** menu.

```

Port Traffic Statistics
-----
Ports: < 1 to 4 >          Update Interval: < 1 sec >

Port: | 1 | 2 | 3 | 4 |
Speed | - | - | - | - |
% Utilization | 10 | 0 | 0 | 0 |
Bytes Recv. | 10 | 0 | 0 | 0 |
Bytes Sent | 156 | 184 | 184 | 128 |
Frames Recv. | 10 | 0 | 0 | 0 |
Frames Sent | 14 | 16 | 16 | 12 |
Total Bytes Recv. | 156 | 184 | 184 | 128 |
Total Frames Recv. | 14 | 16 | 16 | 12 |

Last Seen MAC | 10000000000000 | 10000000000000 | 10000000000000 | 10000000000000 |

*****
Message:
Specify a group of ports to display traffic statistics.
CTRL+T=Root screen      Esc=Prev. screen      CTRL+R = Refresh

```

**Figure 6-25. Port Traffic Statistics screen**

The information displayed above includes:

- ◆ **Ports** This field always displays “1 to 4” in this 4-port Switch version.
- ◆ **Update Interval** Select the desired update increment setting from: *1 sec*, *5 sec*, *15 sec*, *30 sec*, *1 min*, or *Suspend*.
- ◆ **Speed** The speed for each port is 1000M. When a link is up “1000M/Full” will be displayed. When a link is down “-” will be displayed.
- ◆ **% Utilization** This shows the percentage of available bandwidth each port is using over the amount of time specified by the update interval.
- ◆ **Bytes Recv.** The number of good bytes received. This also includes local and dropped packets.

- ◆ **Bytes Sent** The number of good bytes sent from the respective port.
- ◆ **Frames Recv.** The number of good frames received. This also includes local and dropped packets.
- ◆ **Frames Sent** The number of good frames sent from the respective port.
- ◆ **Total Bytes Recv.** The number of bytes received, good and bad.
- ◆ **Total Frames Recv.** The number of frames received, good and bad.
- ◆ **Last Seen MAC** The MAC address of the device where the port information was most recently accessed.

To display the **Port Error Packet Statistics** table:

1. Choose **Network Monitoring** from the main menu.
2. Choose **Traffic Statistics** from the **Network Monitoring** menu.
3. Choose **Port Error Packet Statistics** from the **Traffic Statistics** menu.

Port Error Packet Statistics					
Ports: < 1 to 4 >			Update Interval: < 1 sec >		
Port:	1	2	3	4	
Speed	Link Down	Link Down	Link Down	Link Down	
CRC Errors	0	0	0	0	
Oversize Frames	0	0	0	0	
Fragments	0	0	0	0	
Jabbers	0	0	0	0	
Late Collisions	0	0	0	0	
Mac Rx Errors	0	0	0	0	
Dropped Frames	0	0	0	0	
Total errors	0	0	0	0	
Collisions	0	0	0	0	

\*\*\*\*\*  
 Message:  
 Specify a group of ports to display error statistics.  
 CTRL+T=Root screen      Esc=Prev. screen      CTRL+R = Refresh

Figure 6-26. Port Error Packet Statistics table

The information displayed above includes:

- ◆ **Ports** This field always displays “1 to 4” in this 4-port Switch version.
- ◆ **Update Interval** Select the desired update increment setting from: *1 sec*, *5 sec*, *15 sec*, *30 sec*, *1 min*, or *Suspend*.
- ◆ **CRC Errors** The number of frames that fail the CRC integrity check.
- ◆ **Oversize Frames** The number of good frames with length greater than 1518 bytes and therefore are greater than the maximum legal length.
- ◆ **Fragments** The number of packets less than 64 bytes with either bad framing or an invalid CRC. These are normally the result of collisions.
- ◆ **Jabbers** The number of frames with length more than 1518 bytes and with CRC error or misalignment (bad framing).

- ◆ **Late Collisions** The number of collisions that occur at or after the 64<sup>th</sup> byte (octet) in the frame.
- ◆ **Mac Rx Errors** The number of frames with received MAC Errors.
- ◆ **Dropped Frames** Counts received packets which are dropped due to any of the following reasons: lack of available receive buffers, port-disable, link-test-fail, spanning tree, or empty distribution list.
- ◆ **Total errors** The sum of the CRC Errors, Oversize Frames, Fragments, Jabbers, Late Collisions, Mac Rx Errors, and Dropped Frames counters.
- ◆ **Collisions** The number of collision errors.

To display the **Port Packet Analysis Statistics** table:

1. Choose **Network Monitoring** from the main menu.
2. Choose **Traffic Statistics** from the **Network Monitoring** menu.
3. Choose **Port Packet Analysis Statistics** from the **Traffic Statistics** menu.

```

Port Packet Analysis Statistics
-----
Port: <1>
Update Interval:< 1 sec >

```

	Frames	Frames/sec		Frames	Frames/sec
					Unicast
64	0	0	RX	0	
65-127	4	0	TX	4	
128-255	0	0			
256-511	0	0			Multicast
512-1023	0	0	RX	0	
1024-1518	0	0	TX	0	
RX (GOOD)	0	0			
TX (GOOD)	4	0			Broadcast
Total RX	4	0	RX	0	
			TX	0	
TX Octets	56	0			
RX Octets	0	0			
Total RX	56	0			

```

*****
Message:
Specify port number.
CTRL+T=Root screen      Esc=Prev. screen      CTRL+R = Refresh

```

Figure 6-27. Port Packet Analysis Statistics table

The information displayed above includes:

- ◆ **Port** Enter the desired port in this field.
- ◆ **Update Interval** Select the desired update increment setting from: *1 sec, 5 sec, 15 sec, 30 sec, 1 min, or Suspend.*
- ◆ **64, 65-127, 128-255, 256-511, 512-1023, 1024-1518** The number of good frames of various length ranges, both valid and invalid.
- ◆ **RX (GOOD)** The number of good frames received. This also includes local and dropped packets.
- ◆ **TX (GOOD)** The number of good frames sent from the respective port.
- ◆ **Total RX** The number of frames received, good and bad.
- ◆ **TX Octets** The number of good bytes sent from the respective port.


- ◆ **RX Octets** The number of good bytes received. This also includes local and dropped packets.
- ◆ **Total RX** The number of bytes received, good and bad.
- ◆ **Unicast RX/Unicast TX** The number of good unicast frames received and sent. This includes dropped unicast packets.
- ◆ **Multicast RX/Multicast TX** The number of good multicast frames received and sent. This includes local and dropped multicast packets.
- ◆ **Broadcast RX/Broadcast TX** The number of good broadcast frames received and sent. This includes dropped broadcast packets.

## Forwarding Table

The **Forwarding Table** allows the user to view which Switch port(s) a specific network device uses to communicate on the network. You can sort this table by MAC address or port. This is useful for viewing which ports one device is using, or which devices are using one port.

To display the **Forwarding Table**,

1. Choose **Network Monitoring** from the main menu.
2. Choose **Forwarding Table** from the **Network Monitoring** menu.



```
Forwarding Table
-----
Search by <MAC Address>  MAC Address: [000000000000]  FIND
Total Address in Table: 1

Port  MAC Address  Learned
-----
0     000102030405  No

*****
Message:
Specify the search method.
Esc = Previous screen  CTRL+R = Refresh  N - Next Page  P - Previous Page
```

Port	MAC Address	Learned
0	000102030405	No

**Figure 6-28. Forwarding Table**

To browse by MAC address, select *MAC address* in the **Search by** field, enter the desired MAC address in the next field, and then press FIND.

To browse by port number, select *Port* in the **Search by** field, enter the desired port in the next field, and then press FIND.

A forwarding table containing **Port**, **MAC Address**, and **Learned** status is located on the lower part of the screen.

---

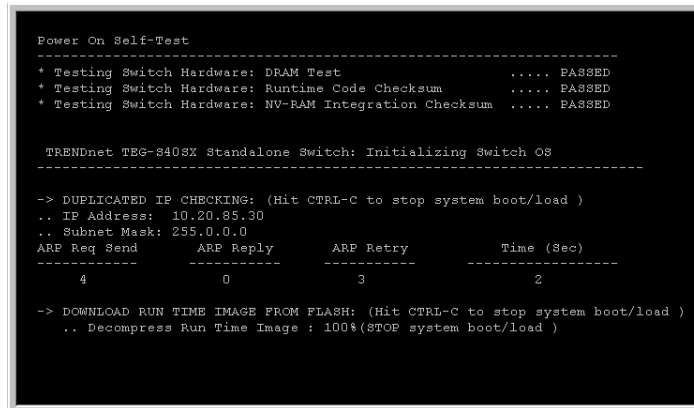
## Resetting the Switch

---

You can use the console interface to reset the Switch, either doing a Restart System (which restarts the Switch and is identical to powering the Switch off and back on again) or a Factory Reset to Default Value (which sets all of the Switch's parameters to what they were when the Switch was delivered from the factory).

## Restart System

To perform a system reset, choose **Restart System** from the main menu. Please note there is no confirmation query before the system is rebooted.



```
Power On Self-Test
-----
* Testing Switch Hardware: DRAM Test          ..... PASSED
* Testing Switch Hardware: Runtime Code Checksum ..... PASSED
* Testing Switch Hardware: NV-RAM Integration Checksum ..... PASSED

TRENDnet TEG-S40SX Standalone Switch: Initializing Switch OS
-----

-> DUPLICATED IP CHECKING: (Hit CTRL-C to stop system boot/load )
.. IP Address: 10.20.85.30
.. Subnet Mask: 255.0.0.0
ARP Req Send      ARP Reply      ARP Retry      Time (Sec)
-----
4                0                3                2

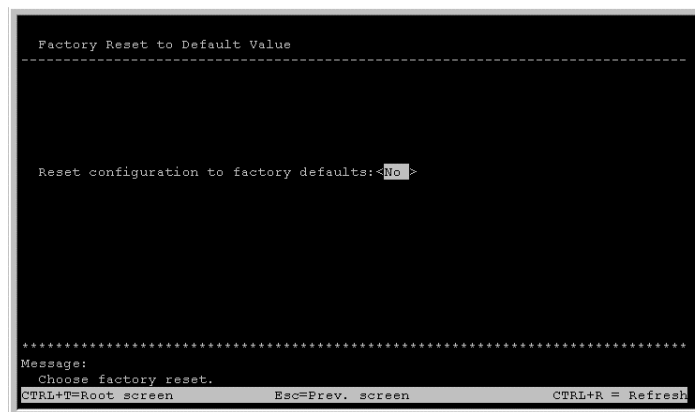
-> DOWNLOAD RUN TIME IMAGE FROM FLASH: (Hit CTRL-C to stop system boot/load )
.. Decompress Run Time Image : 100%(STOP system boot/load )
```

Figure 6-29. Restart System screen

## Factory Reset to Default Value

Before performing a factory reset, be absolutely certain that this is what you want to do. Once the reset is done, all of the Switch's settings stored in NV-RAM (including TCP/IP parameters, SNMP parameters, the enabled/disabled settings of ports, security settings, etc.) will be erased and restored to their factory default settings.

1. Choose **Factory Reset to Default Value** from the main menu. The following screen appears:



**Figure 6-30. Factory Reset to Default Value screen**

2. Move the cursor to **Yes** to confirm the reset and press Enter. The main menu screen should appear.

## ***Logout***

To exit the Switch, choose **Logout** from the main menu. You will be returned to the opening login screen.



# 7

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## ***WEB-BASED NETWORK MANAGEMENT***

---

### **Introduction**

---

The TEG-S40SX offers an embedded Web-based (hypertext) interface allowing users to manage the Switch from anywhere on the network through a standard browser such as Netscape Navigator/Communicator or Microsoft Internet Explorer. The Web browser acts as a universal access tool and can communicate directly with the Switch using HTTP protocol. Your browser screen may vary with the screen shots (pictures) in this guide.

**NOTE:** This Web-based Network Management module does not accept Chinese language input (or other languages requiring 2 bytes per character).

---

## Getting Started

---

The first step in getting started in using Web-based management for your Switch is to secure a browser. A Web browser is a program which allows a person to read hypertext, for example, Netscape Navigator or Microsoft Internet Explorer. Follow the installation instructions for the browser.

The second and last step is to configure the IP interface of the Switch. This can be done manually through a console (see the Configure IP Address section in the “Using The Console Interface” chapter).

---

## Management

---

To begin managing your Switch simply run the browser you have installed on your computer and open the IP address you have defined for the device.

In the page that opens, click on the *Login to TEG-S40SX Manager* hyperlink. This opens the main page in the management module.

The top portion of the window contains an interactive view of the Switch's front panel. Clicking on one of the four ports opens a configuration window for that particular port.

The main page contains a window along the left-hand side with a column of buttons labeled: **Configuration**, **Bridge**, **Monitor**, **User**, and **Help**. These are the major categories for Switch management. Clicking on the black button on the far left side of each category (except Help, which directly

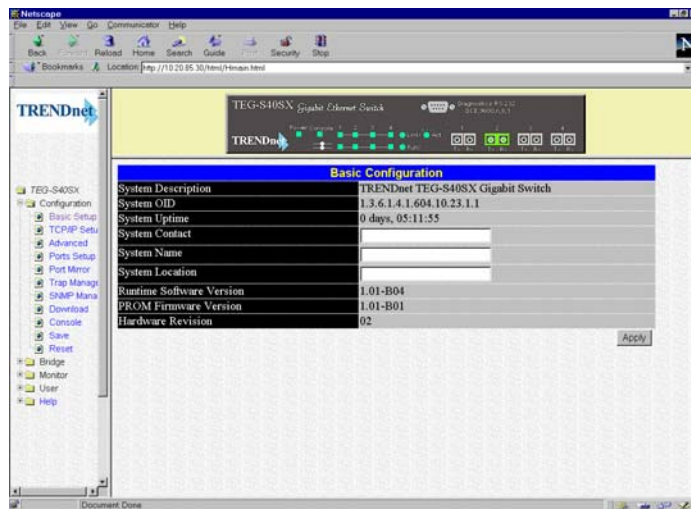
connects you to a help program) causes a list of options to appear underneath the major category.

All categories and options are explained below.

## Configuration

This is the first category and is opened by default when you login to the Web-based management program. The **Configuration** options are listed below along with explanations for each one.

### Basic Setup

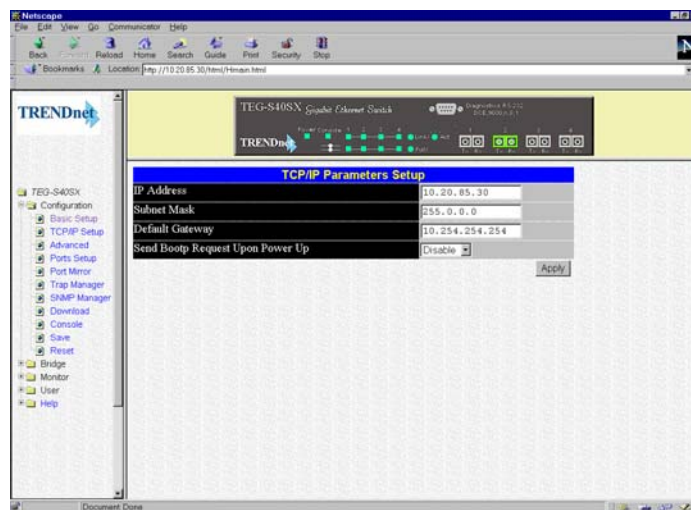


To set basic Switch settings, enter the name of the person to contact should there be any problems or questions with the system in the **System Contact** field, a name for the system in the **System Name** field, and the physical location of the Switch in the **System Location** field. Then click Apply.

The remaining information in the screen includes:

- ◆ **System Description** Description of the Switch model.
- ◆ **System OID** SNMP Object Identifier for the Switch model.
- ◆ **System Uptime** Amount of time the Switch has been powered on.
- ◆ **Runtime Software Version** This version number of the software.
- ◆ **PROM Firmware Version** Version number of the firmware stored in the Flash memory of the Switch.
- ◆ **Hardware Revision** Version number of the Switch's hardware.

### TCP/IP Setup

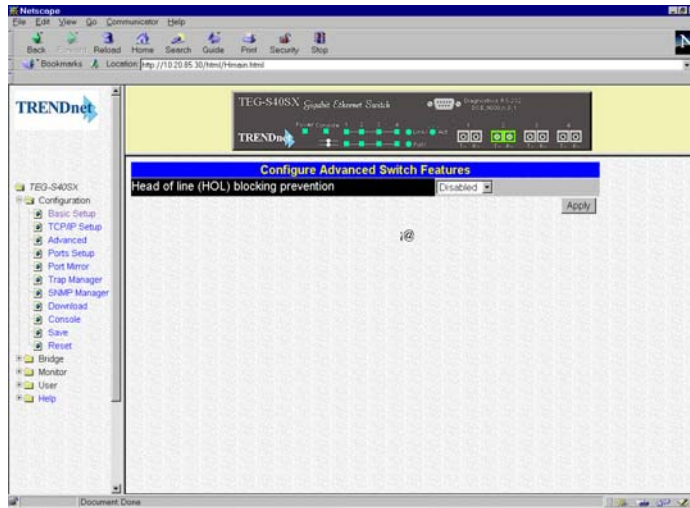


You can change the **IP Address**, **Subnet Mask**, and **Default Gateway** on the Switch. If you are not using BOOTP, enter the **IP Address**, **Subnet Mask**, and **Default Gateway** of the Switch. If you enable BOOTP, you do not need to configure any IP parameters because a BOOTP server automatically assigns IP configuration parameters to the Switch. Click Apply to activate the new settings.

The information is described as follows:

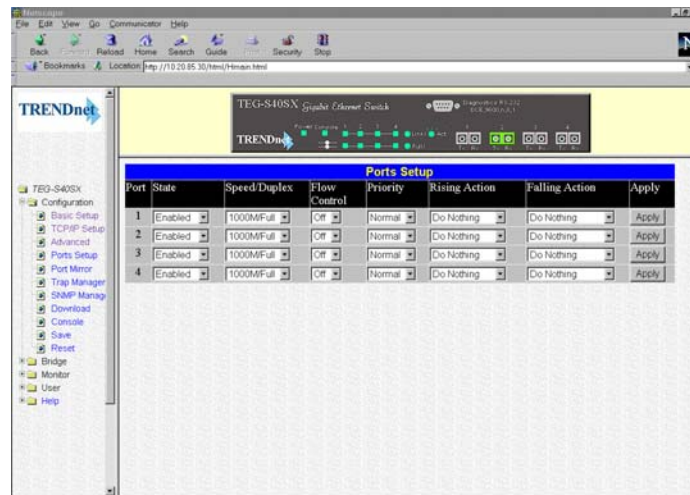
- ◆ **IP Address** The Internet address for the device.
- ◆ **Subnet Mask** The subnet mask determines the level of the subnet that the Switch is on.
- ◆ **Default Gateway** The default router for the device.
- ◆ **Send Bootp Request Upon Power Up** Toggle between *Enable* and *Disable* to determine whether the IP address, subnet mask, and default gateway settings are automatically assigned by the BOOTP server or manually.

## Advanced



The Switch features head of line (HOL) blocking prevention, a function designed to prevent forwarding a packet to a “blocking” port, that is, a port where an excess of packets are queued up. Note that when a multicast packet or a packet with an unknown destination address needs to be forwarded to several ports, and if some of them are “blocking,” the packet will not be discarded, rather it will be forwarded only to the ports that are not “blocking.” Toggle between *Disabled* and *Enabled* before clicking Apply to let your change take effect.

## Ports Setup

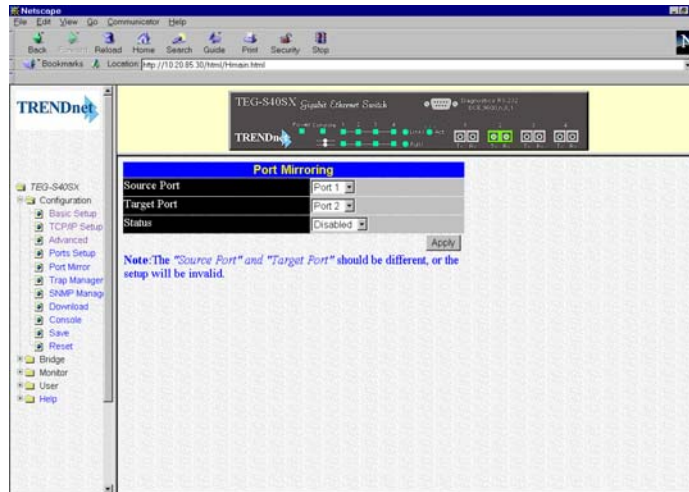


Select the port you want to configure by clicking on the port in the Switch front panel display at the top of the screen or by using the screen displayed above. Follow these steps:

1. Enable or disable the port. If you choose *Disabled*, devices connected to that port cannot use the Switch, and the Switch purges their addresses from its address table after the MAC address aging time elapses. The Switch won't purge addresses if you define them as permanent entries in the **Forwarding Table**.
2. Configure the **Speed/Duplex** setting for the port. The only option is *1000M/Full*, which means port operation at 1000 Mbps in full duplex mode.
3. Configure the **Flow Control** setting for the port. Select *On* for the switch to automatically negotiate the correct flow control setting for this port. Select *Off* for no flow control.

4. Configure the **Priority** setting for packets passing through this port, using IEEE 802.1 tagging. Select *Normal*, *High* or *Low*. If the network is congested, the switch handles packets with a higher priority before those with lower priority.
5. Click Apply to let your changes take effect.

## Port Mirror

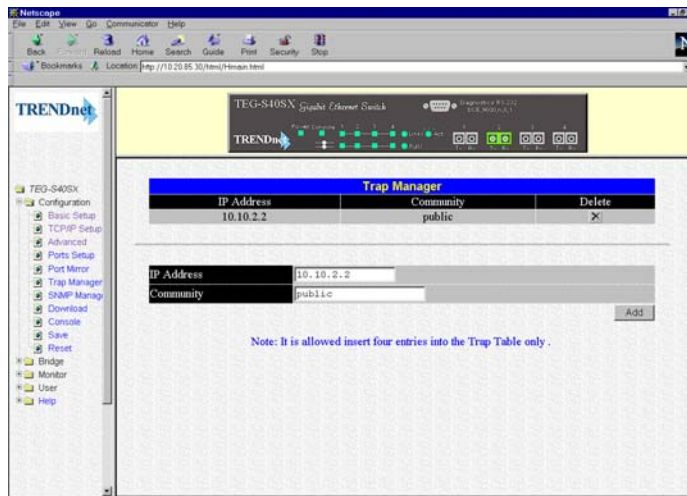


The Switch allows you to copy frames transmitted and received on a port and redirect the copies to another port. You can attach a monitoring device to the mirrored port, such as a sniffer or an RMON probe, to view details about the packets passing through the first port.

To configure a mirror port, select *Enabled* from the **Status** pull-down list. In the first field, select the source port from where you want to copy frames. In the second field, select the port which receives the copies from the source port. This is

the port where you will connect a monitoring/troubleshooting device such as a sniffer or an RMON probe.

## Trap Manager

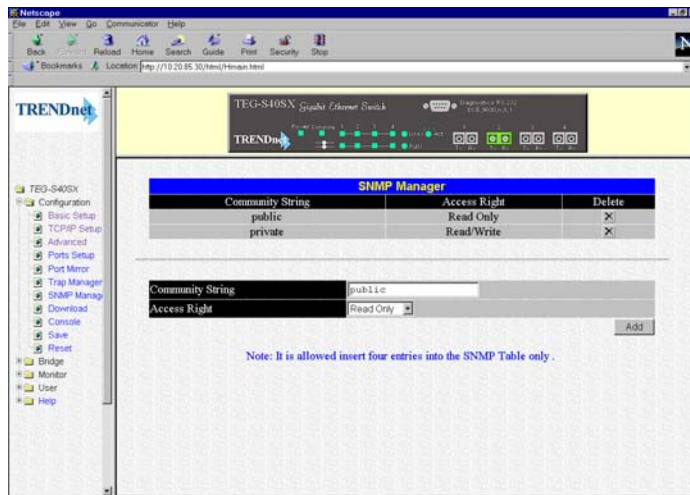


To use the trap manager function featured on this Switch, enter the desired community string and IP address of the trap receiving station (up to four are allowed). A trap receiving station is a device that constantly runs a network management application to receive and store traps. Click apply to put the settings into effect

The information is described as follows:

- ◆ **IP Address** The IP address of the trap receiving station.
- ◆ **Community** A user-defined community name.

## SNMP Manager

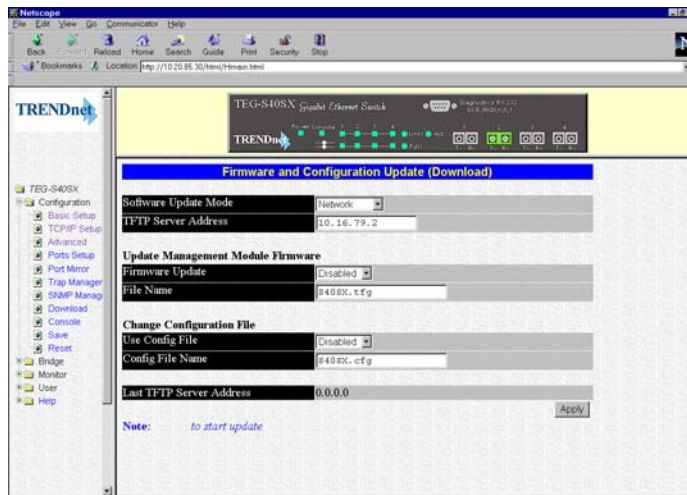


To use the functions on this screen, enter the desired community string for SNMP management on the Switch in the **Community String** field and the desired **Access Right** setting in the next field. You may enter up to four IP addresses of trap receiving stations in the Trap Manager window of the Configuration section. Then click Apply to put the settings into effect.

The information is described as follows:

- ◆ **Community String** A user-defined SNMP community name.
- ◆ **Access Right** The permitted access of *Read Only* or *Read/Write* using the SNMP community name.

## Download



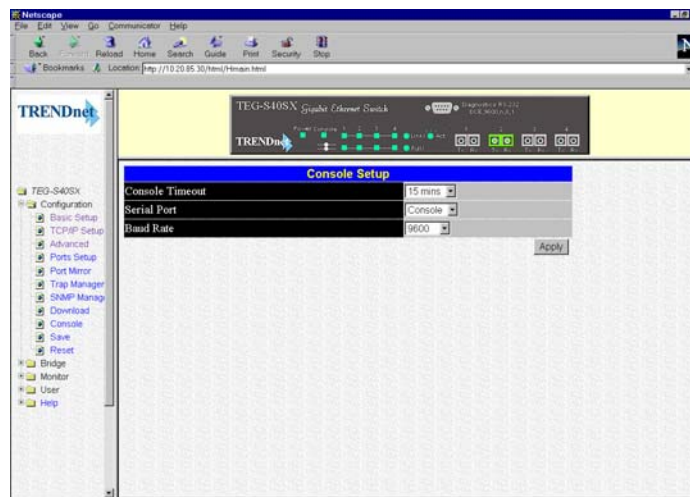
Firmware and configuration updating can be done from the screen above.

The information is described as follows:

- ◆ **Software Update Mode** Set to either *Network* or *Out of Band*. Determines whether the new firmware code should be obtained through the Ethernet network or through the console port.
- ◆ **TFTP Server Address** The IP address of the TFTP server where the new firmware code is.
- ◆ **Firmware Update** Determines whether or not the Switch should download its new firmware code the next time it is booted.
- ◆ **File Name** The path and the name of the file which holds the new firmware code on the TFTP server.

- ◆ **Use Config File** Determines whether or not the Switch should download its configuration file the next time it is booted.
- ◆ **Config File Name** The path and configuration name on the TFTP server.
- ◆ **Last TFTP Server Address** The IP address of the TFTP server where the configuration file was located in the last configuration change.

## Console



This screen allows you to select the protocol for communicating through the console port, *Console* or *SLIP*, in the **Serial Port** field. Use SLIP for out-of-band management. You can also specify the refresh rate in the **Console Timeout** field and the desired setting in the **Baud Rate** field. Click Apply and then reboot the Switch for console port settings to take effect.

The default serial port settings are:

Baud Rate=9600

Data Bits=8

Flow Control=X on/X off

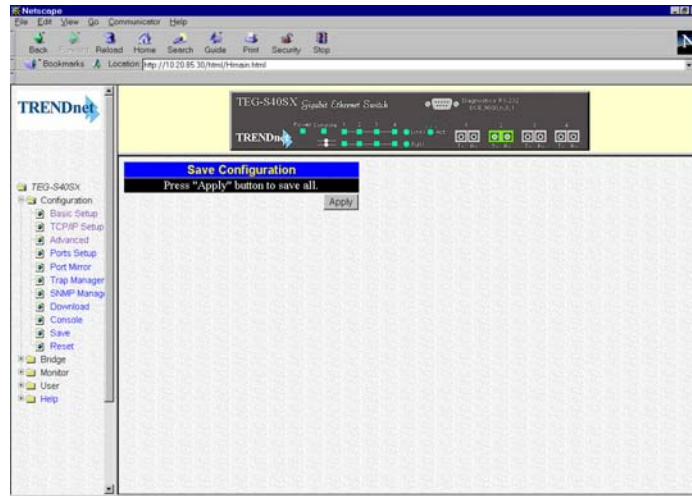
Parity=None

Stop Bits=1

The information is described as follows:

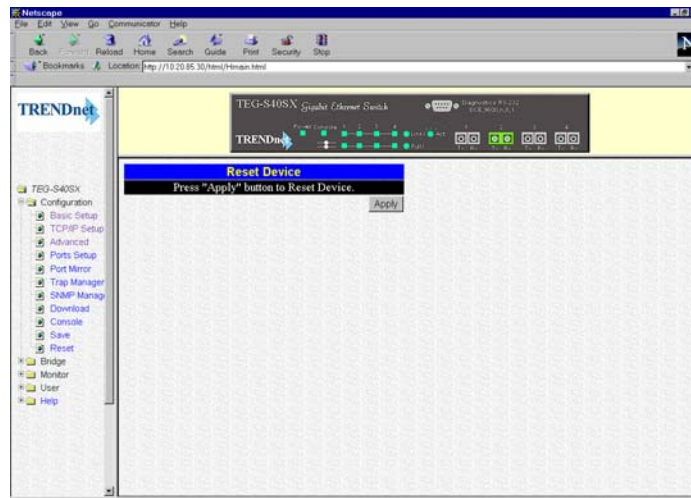
- ◆ **Console Timeout** Choose *Never*, *15 minutes*, *30 minutes*, *45 minutes*, or *60 minutes* for the desired refresh setting.
- ◆ **Serial Port** The options for the current console port setting are *Console* or *Slip*.
- ◆ **Baud Rate** Determines the serial port bit rate that will be used the next time the Switch is restarted. Applies only when the serial port is being used for out-of-band (SLIP) management; it does not apply when the port is used for the console port. Available speeds are 2400, 9600, 19,200 and 38,400 bits per second. The default setting in this Switch version is 9600.

## Save



To save all changes made in the current session to the Switch's flash memory, click the Apply button on this screen.

## Reset

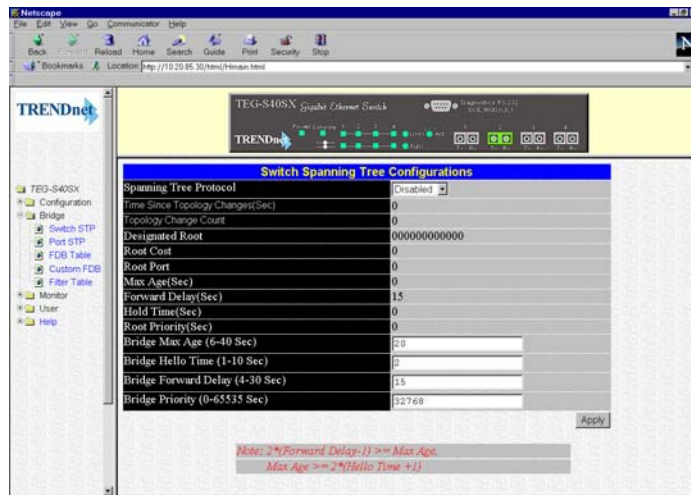


Doing a remote reset is equivalent to turning the Switch off and on again. All parameters are returned to the values stored in EEPROM.

## Bridge

This is the second category of the Web-based management program. The **Bridge** options are listed below along with explanations for each one.

## Switch STP



The Switch supports 801.2d Spanning Tree Protocol, which allows you to create alternative paths (with multiple switches or other types of bridges) in your network. See the Spanning Tree Algorithm section of the “Switch Management” chapter for a detailed explanation.

To configure Spanning Tree Protocol functions for the Switch or individual ports, enter the desired information in the fields on this screen (see the descriptions below for assistance) and then click Apply.

The information on the screen is described as follows:

- ◆ **Spanning Tree Protocol** Select *Enabled* to implement the Spanning Tree Protocol.
- ◆ **Time Since Topology Changes(sec)** Read-only object displays the last time changes were made to the network topology. These changes usually occur when backup paths are activated due to primary path failures.

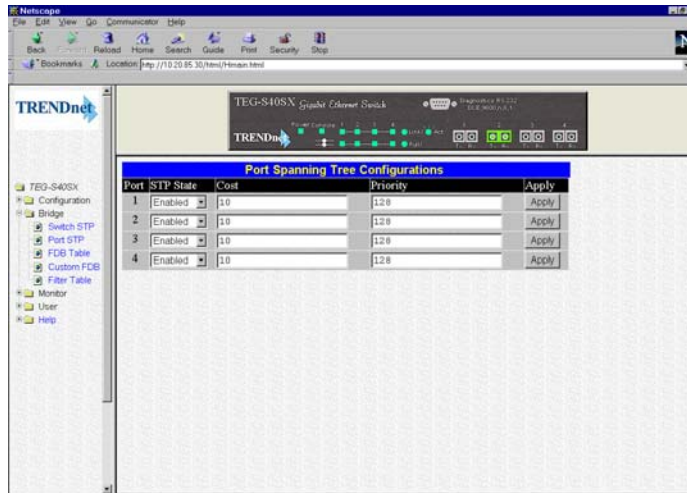
- ◆ **Topology Change Count** Read-only object displays the number of times (since the current management session with the device was started) changes were made to the network topology. Changes usually occur on the network when backup paths are activated.
- ◆ **Designated Root** Read-only object displays the MAC (Ethernet) address of the bridge/switch on the network that has been chosen as the STP root.
- ◆ **Root Cost** Read-only object displays the cost for the path between the switch and the root bridge. If the switch is the root bridge, then the root cost is zero.
- ◆ **Root Port** Read-only object identifies the port (on the bridge) that offers the least path cost from the bridge to the root bridge. In the event of a network loop, data packets will pass through the root port.
- ◆ **Max Age(Sec)** Read-only object indicates the maximum age of STP information learned from the network (on any port) before it is discarded.
- ◆ **Forward Delay(sec)** Read-only object indicates how fast any port on the bridge can change its spanning state when moving towards the forwarding state. The value determines how long the port stays in each of the listening and learning states, which precede the forwarding state.
- ◆ **Hold Time(Sec)** Read-only object displays the time interval during which no more than two configuration BPDUs shall be transmitted by the bridge.
- ◆ **Root Priority(Sec)** Read-only object displays the priority number of the root bridge of the Spanning Tree. The value is used in conjunction with the bridge MAC address to set the bridge ID, which in turn is used when determining the root bridge of a multibridged network. The root bridge is responsible for processing data packets

when network loops occur. The smaller the number set, the higher the bridge priority is. The higher the bridge priority, the more chance the bridge has of becoming the root bridge. A bridge priority ranges from 0 to 65535, with 0 being the highest priority.

- ◆ **Bridge Max Age (6-40 Sec)** The Maximum Age is a read-write object that can be from 6 to 40 seconds. At the end of the Maximum Age, if a BPDU has still not been received from the Root bridge, your Switch will start sending its own BPDU to all other switches for permission to become the Root Bridge. If it turns out that your Switch has the lowest Bridge Identifier, it will become the Root Bridge.
- ◆ **Bridge Hello Time (1-10 Sec)** The Hello Time is a read-write object that can be from 1 to 10 seconds. This is the interval between two transmissions of BPDU packets sent by the Root Bridge to tell all other switches that it is indeed the Root Bridge. If you set a Hello Time for your Switch, and it is not the Root Bridge, the set Hello Time will be used if and when your Switch becomes the Root Bridge.
- ◆ **Bridge Forward Delay (4-30 Sec)** The Forward Delay is a read-write object that can be from 4 to 30 seconds. This is the time any port on the Switch spends in the listening state while moving from the blocking state to the forwarding state.
- ◆ **Bridge Priority (0-65535 Sec)** The Bridge Priority is a read-write object that can be from 0 to 65535. This is the priority number of the bridge. The value is used in conjunction with the bridge MAC address to set the bridge ID, which in turn is used when determining the root bridge of a multibridged network. The root bridge is responsible for processing data packets when network loops occur. The smaller the number set, the higher the

bridge priority is. The higher the bridge priority, the more chance the bridge has of becoming the root bridge. Zero is the highest priority.

## Port STP

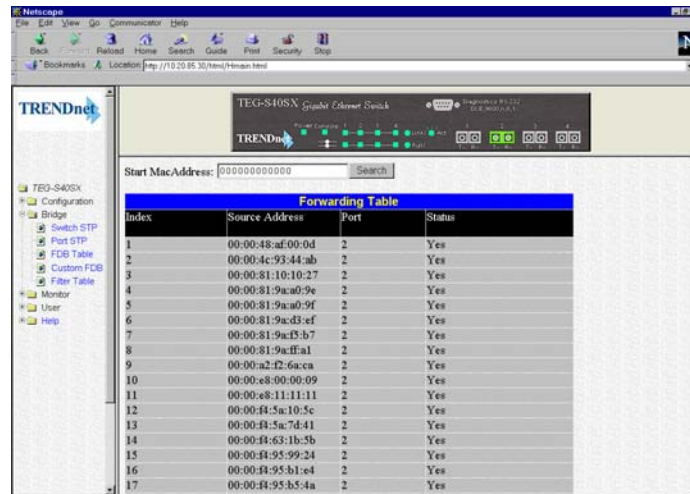


The information on the screen is described as follows:

- ◆ **STP State** The Spanning Tree Protocol state for a selected port can either be *Enabled* or *Disabled*.
- ◆ **Cost** The Path Cost is a changeable parameter and may be modified according to the Spanning Tree Algorithm specification. The 100Mbps segment has an assigned Path Cost of 10, and each 10Mbps segment has an assigned Path Cost of 100.
- ◆ **Priority** The read-write object displays the priority number of the port. The value is used in conjunction with the physical port number to set the port ID, which in turn is used when determining the root port of the bridge. The

smaller the number set, the higher the port priority is. The higher the port priority, the more chances the port has of becoming the root port. Port priority ranges from 0 to 255, with 0 being the highest port priority.

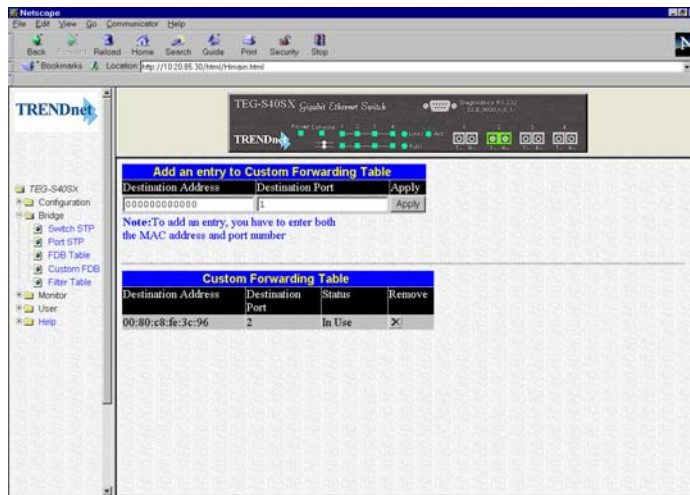
## FDB Table



Index	Source Address	Port	Status
1	00-00-48-a4-00-0d	2	Yes
2	00-00-4c-93-44-a6	2	Yes
3	00-00-81-10-10-27	2	Yes
4	00-00-81-9a-a0-9e	2	Yes
5	00-00-81-9a-a0-9f	2	Yes
6	00-00-81-9a-d3-ef	2	Yes
7	00-00-81-9a-d3-b7	2	Yes
8	00-00-81-9a-ff-a1	2	Yes
9	00-00-a2-f2-6a-ca	2	Yes
10	00-00-e8-00-00-09	2	Yes
11	00-00-e8-11-11-11	2	Yes
12	00-00-f1-5a-10-5c	2	Yes
13	00-00-f1-5a-7d-41	2	Yes
14	00-00-f1-63-1b-5b	2	Yes
15	00-00-f1-95-99-24	2	Yes
16	00-00-f1-95-b1-e4	2	Yes
17	00-00-f1-95-b5-4a	2	Yes

MAC forwarding allows the Switch to permanently forward outbound traffic to specific destination MAC addresses over a specified port. You can also use this feature to restrict inbound traffic based on source MAC addresses.

## Custom FDB

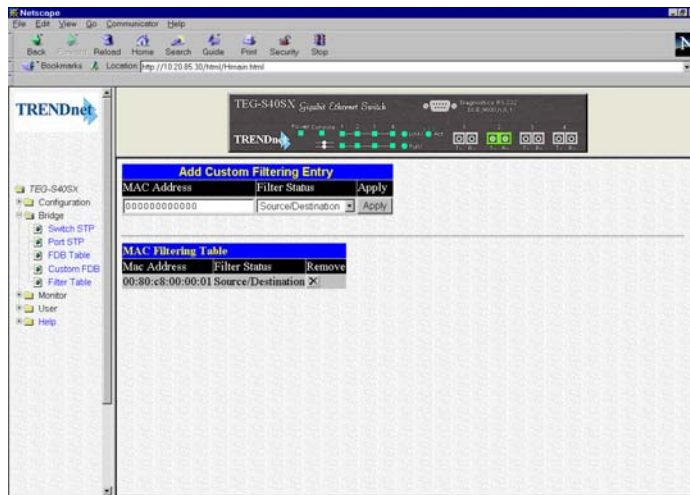


To use the MAC forwarding function, enter the MAC address of the device to which the specified port permanently forwards traffic in the **Destination Address** field and enter the port number that permanently forwards traffic from the specified device in the **Destination Port** field. Then click Apply.

The information in the screen is described as follows:

- ◆ **Destination Address** The MAC address of the device to which the specified port permanently forwards traffic.
- ◆ **Destination Port** The port number that permanently forwards traffic from the specified device, regardless of the device's network activity or current network congestion.

## Filter Table



MAC filtering allows the Switch to block inbound traffic from unknown or unwanted devices by mapping a port to a source MAC address.

To use the MAC filtering function, enter the MAC address of the device allowed to send traffic in the **MAC Address** field and select the desired setting in the **Filter Status** field. Then click Apply.

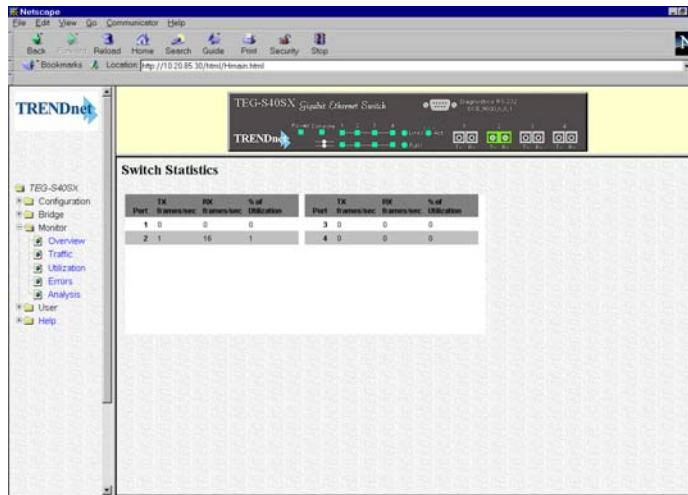
The information in the screen is described as follows:

- ◆ **MAC Address** The Ethernet address of the MAC filtering table entry.
- ◆ **Filter Status** One filter status option is available, *Source/Destination*.

## Monitor

This is the third category of the Web-based management program. The **Monitor** options are listed below along with explanations for each one.

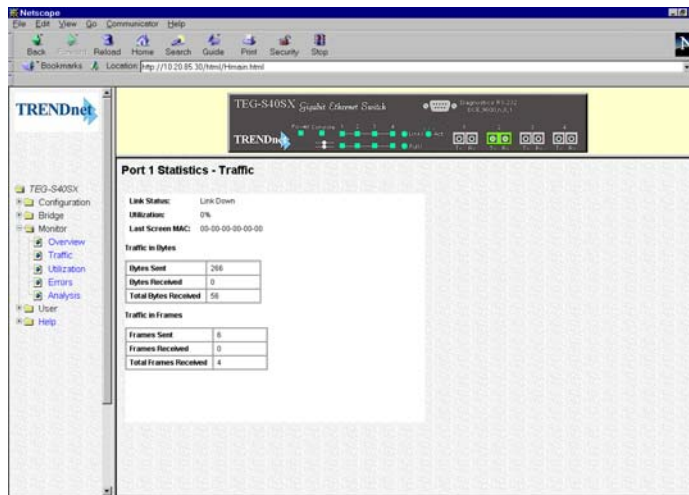
### Overview



The information on the Switch Statistics table is described as follows:

- ◆ **TX frames/sec** Counts the total number of frames transmitted from a selected port per second since the Switch was last rebooted.
- ◆ **RX frames/sec** Counts all valid frames received on the port per second since the Switch was last rebooted.
- ◆ **% of Utilization** This shows the percentage of available bandwidth each port is using over the amount of time specified by the update interval.

## Traffic



The port statistics shown by default are those for the port you last configured. Once in the Port Statistics screens, you can click any port on the switch graphic to show statistics for that port.

The information is described as follows:

- ◆ **Link Status** Indicates whether the port is online and working (*1000/Full/Flow control off* or *1000/Full/Flow control on*) or not (*Link Down*).
- ◆ **Utilization** Current utilization for the port, as a percentage of total available bandwidth.
- ◆ **Last Screen MAC** The MAC address of the most recent screen.

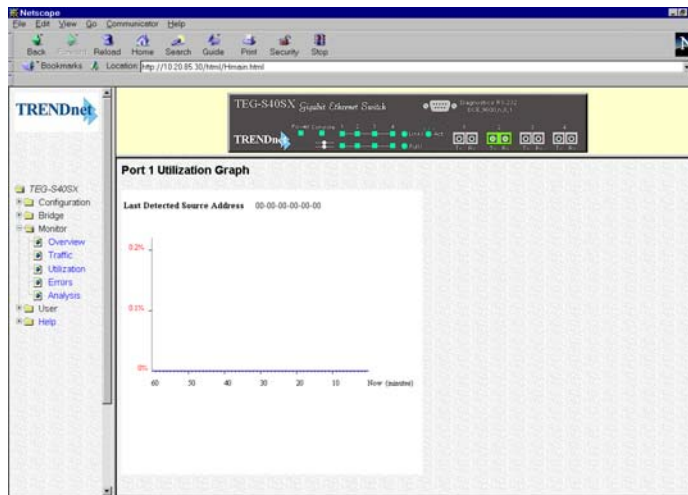
Traffic in Bytes:

- ◆ **Bytes Sent** Counts the number of bytes successfully sent from the port.
- ◆ **Bytes Received** Counts the total number of bytes (octets) included in valid (readable) frames.
- ◆ **Total Bytes Received** Counts the total number of bytes received on the port, whether in valid or invalid frames.

#### Traffic in Frames:

- ◆ **Frames Sent** Counts the total number of frames transmitted from the port.
- ◆ **Frames Received** Counts all valid frames received on the port.
- ◆ **Total Frames Received** Counts the number of frames received on the port, whether they were valid or not.

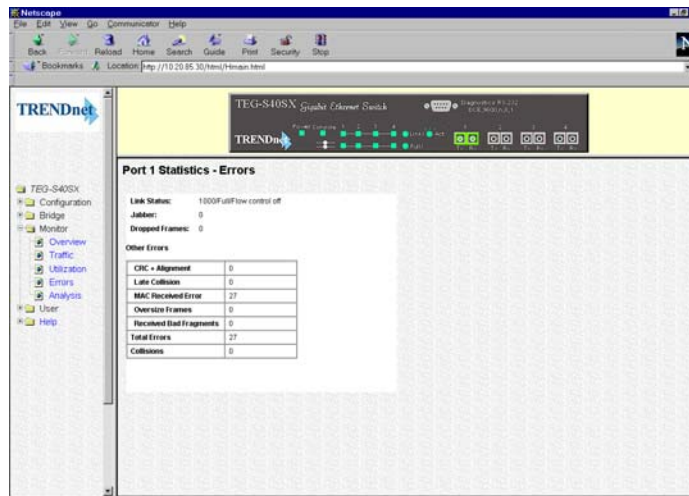
## Utilization



The information is described as follows:

- ◆ **Last Detected Source Address** MAC address of the last source accessed.

## Errors



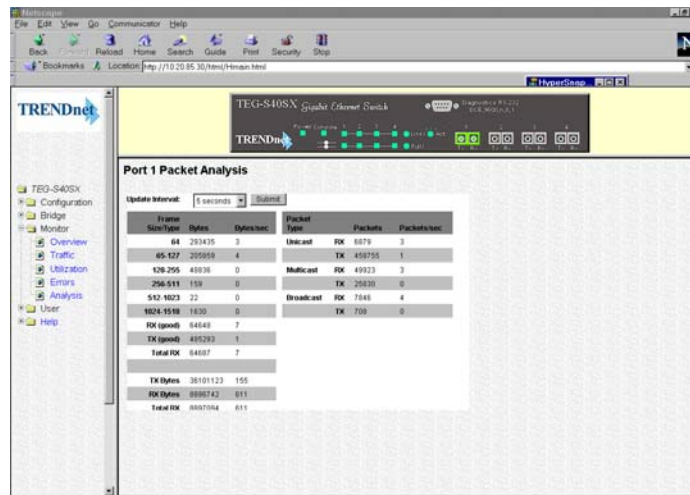
The information is described as follows:

- ◆ **Link Status** Indicates whether the port is online and working (*1000/Full/Flow control off* or *1000/Full/Flow control on*) or not (*Link Down*).
- ◆ **Jabber** Counts frames longer than the maximum 1518 bytes (octets) with either bad framing or an invalid CRC.
- ◆ **Dropped Frames** Counts received packets which are dropped due to any of the following reasons: lack of available receive buffers, port-disable, link-test-fail, spanning tree, or empty distribution list.

Other errors:

- ◆ **CRC + Alignment** Counts otherwise valid frames that did not end on a byte (octet) boundary.
- ◆ **Late Collision** Counts collisions that occur at or after the 64<sup>th</sup> byte (octet) in the frame. This may indicate that delays on your Ethernet are too long, and you have either exceeded the repeater count or cable length specified in the Ethernet standard.
- ◆ **MAC Received Error** Counts bit patterns with illegal encodings. This may indicate noise on the line.
- ◆ **Oversize Frames** Counts packets received that were longer than 1518 octets (excluding framing bits, but including FCS octets) and were otherwise well formed.
- ◆ **Received Bad Fragments** The number of good frames with length less than the 64-byte (octet) minimum defined by the Ethernet standard. These are usually caused by collisions.
- ◆ **Total Errors** The sum of the CRC + Alignment, Late Collision, MAC Received Error, Oversize Frames, and Received Bad Fragments counters.
- ◆ **Collisions** The best estimate of the total number of collisions on this Ethernet segment.

## Analysis



The information is described as follows:

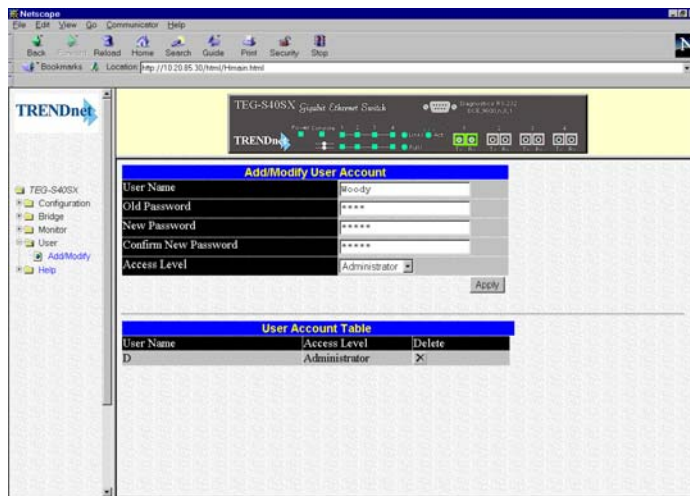
- ◆ **Update Interval** The polling time interval can be set from 5 to 60 seconds, in 5 second increments. Click the Submit button once the update interval has been selected.
- ◆ **64** The total number of packets (including bad packets) received that were 64 octets in length (excluding framing bits but including FCS octets).
- ◆ **65-127** The total number of packets (including bad packets) received that were between 65 and 127 octets in length inclusive (excluding framing bits but including FCS octets).
- ◆ **128-255** The total number of packets (including bad packets) received that were between 128 and 255 octets in length inclusive (excluding framing bits but including FCS octets).

- ◆ **256-511** The total number of packets (including bad packets) received that were between 256 and 511 octets in length inclusive (excluding framing bits but including FCS octets).
- ◆ **512-1023** The total number of packets (including bad packets) received that were between 512 and 1023 octets in length inclusive (excluding framing bits but including FCS octets).
- ◆ **1024-1518** The total number of packets (including bad packets) received that were between 1024 and 1518 octets in length inclusive (excluding framing bits but including FCS octets).
- ◆ **RX (good)** The number of good frames received. This also includes local and dropped packets.
- ◆ **TX (good)** The number of good frames sent from the respective port.
- ◆ **Total RX** The number of frames received, good and bad.
- ◆ **TX Bytes** The number of good bytes sent from the respective port.
- ◆ **RX Bytes** The number of good bytes received. This also includes local and dropped packets.
- ◆ **Total RX** The number of bytes received, good and bad.
- ◆ **Unicast** The total number of good packets that were directed to a unicast address. Note that this does not include dropped unicast packets
- ◆ **Multicast** The total number of good packets received that were directed to a multicast address. Note that this number does not include packets directed to the broadcast address

- ◆ **Broadcast** The total number of good packets received that were directed to the broadcast address. Note that this does not include multicast packets.

## User

This is the fourth category of the Web-based management program. The **Monitor** option is listed below along with an explanation.



To add or change a User Account, fill in the appropriate information in the **User Name**, **Old Password**, **New Password**, and **Confirm New Password** fields. Then select *General User* or *Administrator* in the **Access Level** control and click Apply.

To delete a User Account, click the “X” icon in the delete column on the User Account Table at the bottom of the screen.

## ***Help***

Click this button to access the online help files for the Switch.



---

# ***TECHNICAL SPECIFICATIONS***

General	
Standards:	IEEE 802.3z on each port  IEEE 802.3 Frame types: Transparent  IEEE 802.3 MAC layer frame size: 64–1518 bytes
Protocol:	CSMA/CD
Data Transfer Rate:	Gigabit Ethernet:  2000Mbps (full duplex)
Topology:	Star
Network Cables:	525 m 50/125-mm, 275 m 62.5/125-mm multimode fiber
Number of Ports:	4 x 1000 Mbps ports

Physical and Environmental	
AC inputs:	100 – 240 VAC, 50/60 Hz (internal universal power supply)
Power Consumption:	30 watts maximum
DC fans:	2 built-in 40 x 40 mm fans
Operating Temperature:	0 ~ 40 degrees Celsius
Storage Temperature:	-20 ~ 60 degree Celsius
Humidity:	0% ~ 90% RH non-condensing
Dimensions:	441 mm x 207 mm x 44 mm (1U), 19 inch rack-mount width
Weight:	3 kg
EMI:	FCC Class A, CE Mark Class A, VCCI Class A, BSMI Class A, C-Tick Class A
Safety:	UL (UL 1950), CSA (CSA950), TUV/GS (EN60950)

Performance	
Transmission Method:	Store-and-forward
RAM Buffer:	12 Mbytes per device *83.3 MHz
Filtering Address Table:	12K MAC address per device
Packet Filtering/Forwarding	1,416,202 pps per port

Performance	
Rate:	
MAC Address Learning:	Self-learning, auto-aging

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