TE-100/S14

10/100 Fast Ethernet Switch

100Base-TX and 10Base-T

User's Guide

First Edition - October 31, 1995

Trademarks

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 the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user may be required to correct the interference at his or her own expense.

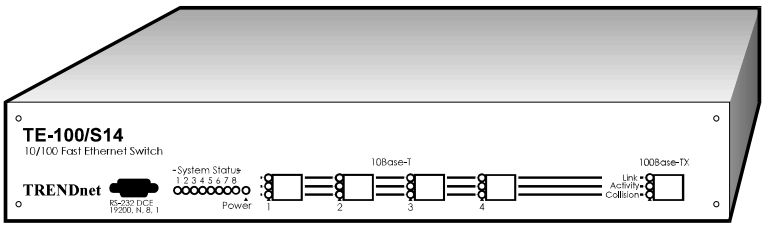
Technical support information

TRENDware provides technical support worldwide. In USA, the BBS number is 1-310-328-8191 (protocol: 14400, 8 N 1).

U.S.A. TEL 1-310-328-7795 FAX 1-714-328-7798

This Manual

This manual is the user's reference guide of the **TE-100/S14 Switch** for connecting the Fast Ethernet 100Base-TX and Ethernet 10Base-T Local Area Network. It provides detailed information on the features, functions and installation of this Switch. It also provides information regarding the network management and cabling environment in which the Switch will be installed.



The TE-100/S14 Fast Ethernet Switch

Contents at a glance:

Chapter 1, Introduction - Provides an overview of the Fast Ethernet and Switching technology; their use and benefits in the current and emerging computing and networking environment; and finally, a brief description of the major feature of the TE-100/S14 Fast Ethernet Switch.

Chapter 2, Getting Started - Describes the cabling environment, and the preparation for setting-up and integrating the TE-100/S14 Switch into a LAN network.

Chapter 3, Configuring the Switch - Details the setup procedures of the TE-100/S14 Switch to ensure its proper operation in a network.

Chapter 4, Network Management - Addresses the information regarding the operation of the TE-100/S14 Switch in a SNMP network environment.

Chapter 5, Diagnostics - Helps users to understand the status LED lights of the TE-100/S14 Switch, and to isolate problem areas that may arise during installation.

Table of Contents

Chapter 1 Introduction

Fast Ethernet Technology

The growing importance of LANs and the increasing complexity of desktop computing applications are fueling the needs for high performance networks. A number of high-speed LAN technologies are proposed or available to provide greater bandwidth and improve client/server response times. Among them, Fast Ethernet, or 100Base-T, provides a non-disruptive, smooth evolution from the current 10Base-T technology, that by statistics, is installed in over 70% of LANs worldwide. The non-disruptive and smooth evolution nature, and the dominating potential market base, virtually guarantee cost effective and high performance Fast Ethernet solutions in the years to come.

100Base-T is an IEEE standard for a 100Mbps version of 10Base-T. As Table Chapter 1 -1 shows, 100Base-T is essentially 10Base-T, only faster. It provides 10 times the performance of 10Base-T for less than twice the price. Like 10Base-T, it uses the same CSMA/CD access method with a protocol standard proven by over 70% of installed LANs over the last 20 years.

Except for reducing the "bit time" by a factor of 10 from the CSMA/CD MAC of the 10Base-T, 100Base-T uses the same packet format, packet length, error control, and management information.

As part of the 100Base-T, the media specifications - 100Base-TX, T4, FX - further enables users to retain their existing cabling infrastructure while migrating to Fast Ethernet.

	Ethernet	Fast Ethernet
Speed	10Mbps	100Mbps
Cost	x	2x or less
IEEE Standard	CSMA/CD	CSMA/CD
Topology	Star or Bus	Star
Cabling	UTP, Coax, Fiber	UTP, Fiber
UTP cable supported	Category 3,4, or 5	Category 3,4, or 5
UTP max. link distance	100 meters	100 meters
Collision domain diameter (max. w/ UTP)	500 meters	205 meters
Max. network diameter (using switches/routers)	Unlimited	Unlimited
Media Independent Interface	Yes (AUI)	Yes (MII)
Full duplex cabling	Yes	Yes

Table Chapter 1 -1, Ethernet vs. Fast Ethernet

Switching technology

Another approach to pushing beyond the limits of Ethernet technology is the development of the 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.

Switched Ethernet vs. Legacy Ethernet is analogous to using private telephone lines vs. party lines. Connecting to a switched port, each Ethernet LAN segment has dynamic full performance or "wire-speed". Therefore, a switch effectively splits a physical shared-access LAN into bridged multiple LAN segments. Each segment supports a workgroup, or even provides a dedicated connection to a desktop or server. The result is a multiple fold boost in total network bandwidth, and more predictable performance under heavy network load.

10/100 Switching technology

10/100 Switching is an integral extension of Fast Ethernet. It provides not only the 100Mbps high-speed "pipe-line" for carrying aggregated 10Mbps traffic, but also the necessary bridging between the 10Base-T and 100Base-T MAC formats.

Combining Fast Ethernet and Switching technologies, they provide bandwidth to satisfy the demand of local workgroups. They also provide a high-speed link to carry local network traffic to elsewhere in a network.

Benefits of Switching

From the technical point of view, Ethernet switching technology dramatically boosts the total bandwidth of a LAN network. It also puts configuration flexibility and bandwidth adaptability into the local workgroups where the majority of work load is generated from a business operation. Switching further eliminates the congestion problem inherent to the contention oriented Ethernet CSMA/CD protocol, thereby improving predictable response times under heavy network load. In the past, this congestion under heavy load was alleviated by the much more expensive routing technology.

From the workgroup applications point of view, the new wave of Object oriented distributed Client/Server applications demands higher bandwidth and tighter integration of client workstations with servers. The legacy shared-access 10Mbps Ethernet technology can no longer provide both bandwidth and predictable response times to this new generation of workgroup environment.

From economics point of view, Fast Ethernet switching not only satisfies both technical and business requirements, but also preserves the existing users' investment in the huge 10Base-T Ethernet installed base. This compatibility insures a path for users to add, change, and migrate to Fast Ethernet as needs arise over

time. It also provides a less expensive and more flexible bandwidth solution directly to local workgroups where the majority of work load is generated, instead of using much more expensive and management-intensive routers that usually cater to the backbone network.

Overview of the TE-100/S14 Ethernet Switch

The TRENDnet TE-100/S14 Ethernet Switch supports:

- One 100Mbps Fast Ethernet (100Base-TX) port and four 10Mbps Ethernet (10Base-T) ports, with each port supporting dedicated full duplex LAN segments.
- Store-and-forward Ethernet packet switching.
- The IEEE 802.1D Spanning Tree Algorithm for network loop detection and prevention, and topology re-configuration.
- One RS-232 port allowing local terminal access to comprehensive setup and management functions.
- The EEPROM (flash memory) implementation allowing in-field upgrade through the Out-of-Band RS-232 port.
- Comprehensive LED display of the System and individual LAN segment status.
- Self-test during power on to ensure system integrity.

These features ensure that the TE-100/S14 Switch is suitable for simple workgroups, and for large networks.

Chapter 2 Installation

Cabling Requirement and Site Preparation

Due to the scaled-down MAC address slot time, 100Base-T (-TX, -T4, -FX) has different topology rules than that of 10Base-T. Figure Chapter 2 -2 n Page 13 illustrates the topology rules of 100Base-T.

The key cabling topology rules are:

- The maximum UTP cable length is 100 meters from an end-station to a shared-access 100Base-TX hub.
- The maximum number of repeater counts (hops) is two in an un-bridged all-UTP topology[1].
- In a 2-repeater count, all-UTP topology, the maximum cabling length is 205 meters for end-station / repeater / repeater / end-station connections.
- In a single-repeater count UTP topology, a fiber cable (100Base-FX) up to 205 meters can be used to connect between a repeater and a backbone switch.
- A 400-meter half-duplex fiber cable is allowed for a MAC to MAC connection (switch-to-switch).

The TE-100/S14 Switch fits into the 100Base-T cabling architecture as an UTP end-station connecting to a 100Base-TX cabling network. Therefore, the 100m UTP end-station connection distance should be the only limitation in configuring

[1] A single or a stacked 100Mbps hub is counted as one repeater. A switch or a 10Base-T hub is not counted as a repeater, and is treated as an end-station when applying the topology rules.

the TE-100/S14 Switch under the 100Base-T cabling architecture. Figure Chapter 2 -1 shows the possible placements of the TE-100/S14 Switch in a 100Base-TX cabling network.

As required by the 100Base-TX, the TE-100/S14 Switch expects a 2-pair, data grade (EIA 568, Category 5) UTP or STP cabling system connecting to its 100 Mbps port.

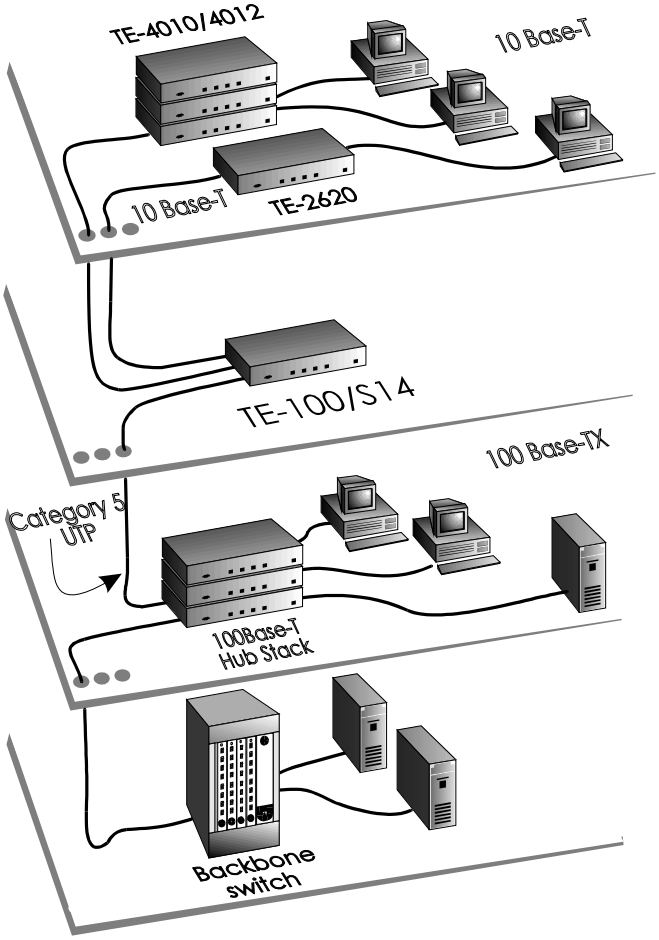


Figure Chapter 2 -1, Examples of the TE-100/S14 wiring environment

Careful planning and site preparation is the key to success for installing Fast Ethernet switches. Users should perform a network bandwidth analysis based on their workgroup network traffic needs, and to examine their workstation equipment for other performance bottlenecks.

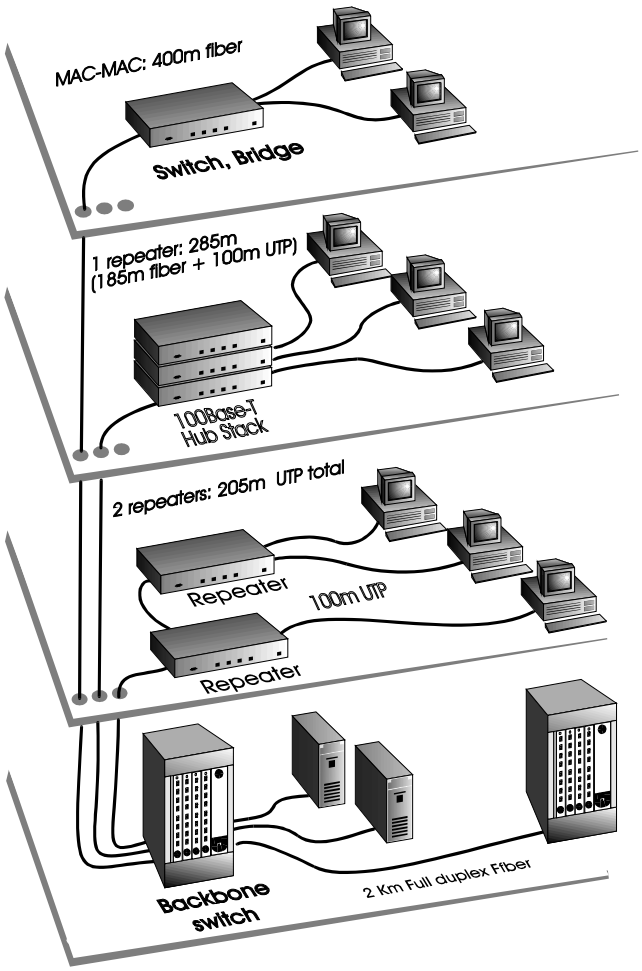


Figure Chapter 2 -2, 100Base-T cabling rules

Unpacking and Setup

Now you have a good understanding of the cabling rules, your own cabling environment, and the expected network load on your workgroups. You are ready to integrate your TE-100/S14 Switch with your network.

The following sections delineate the steps to setup, connect and integrate your newly acquired TE-100/S14 Switch into your network.

UNPACKING

The TE-100/S14 Switch shipping carton (refer to Figure Chapter 2 -3) should contain the following items:

- 1 TE-100/S14 unit
- 1 AC power cord
- 2 Mounting brackets
- This user guide

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

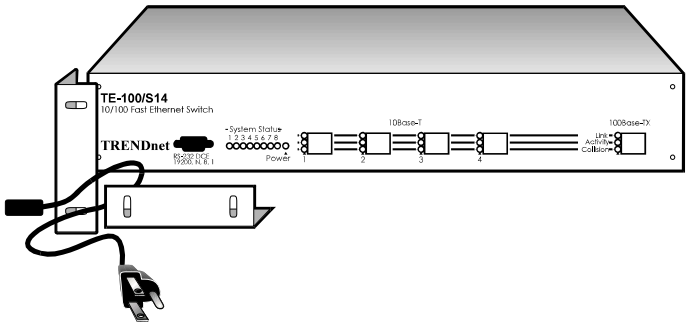


Figure Chapter 2 -3, Unpacking a TE-100/S14 Switch

OPERATIONAL FUNCTION DESCRIPTION

On the front panel, a TE-100/S14 Switch contains one 100Mbps Fast Ethernet 100Base-TX RJ-45 port (**A**, Figure Chapter 2 -4), four 10Mbps Ethernet 10Base-T RJ-45 ports (**B**), one RS-232 (DB9) Out-of-Band management port (**C**), eight System Status LED lights (**D**), 3 port status LED lights for each 10 or 100 Mbps port (**E**), and a power status LED light.

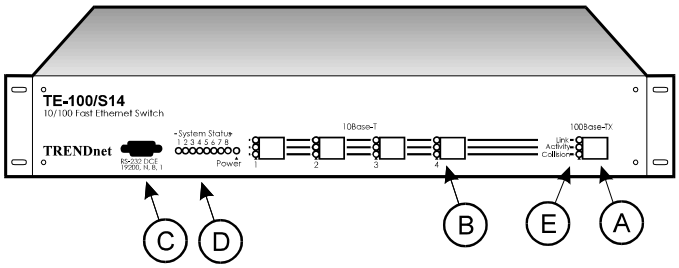


Figure Chapter 2 -4, Front panel view of a TE-100/S14 Switch

POWER ON

The TE-100/S14 Switch can be used with AC power sources 90 - 250 VAC, 50 - 60 Hz. The Switch's power supply will adjust to the local power source automatically.

You may turn ON the power of the TE-100/S14 Switch without having any or all the LAN segment cables connected. You should observe the LED lights as the Switch is going through the Power-On Self Test (POST) sequence. All System status LED lights should go off, and Power LED light on, when the POST is successful (refer to Figure Chapter 2 -6 on Page 17). The

corresponding **Link** LED light will be turned on when a LAN segment is connected to the port and functioning normally.

MOUNTING

The TE-100/S14 Switch can be either a desk-top or rack mountable unit. For rack mounting, a pair of mounting brackets is

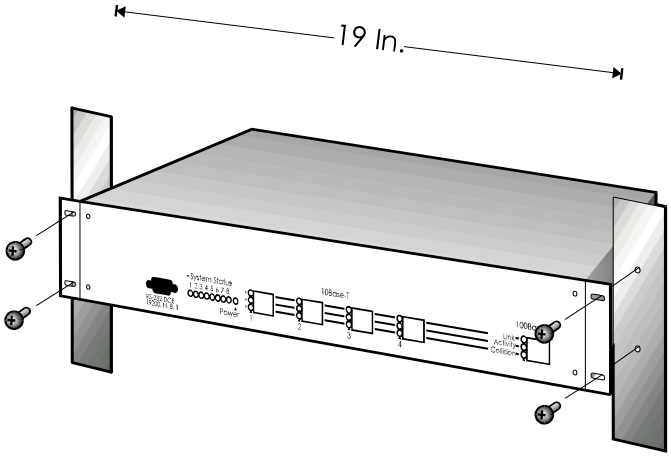


Figure Chapter 2 -5, Rack mounting a TE-100/S14

included in the packing carton. Figure Chapter 2 -5 shows the dimension and diagram for rack mounting.

CONNECTING NETWORK CABLES

There are five RJ-45 ports on the TE-100/S14 Switch for connection to five LAN segments; one for the 100Base-TX Fast Ethernet segment, and four for the 10Base-T Ethernet segments. Both segment types use the same RJ-45 connectors. Two-pair Category 5, UTP cabling is required for the 100Base-TX segment. For the 10Base-T segments, all existing cabling systems under the 10Base-T requirements will continue to suffice.

If a cable is used for connecting a port to a workstation, just use the standard UTP cable connectors with the RJ-45 pin layout.

If a cable is used for connecting to a hub, bridge, or another switch, the Transmit (TD) and the Receive (RD) leads on one end of the connectors must be swapped. Please refer to Appendix D for pin layout details.

SETUP

The default setup of the TE-100/S14 Switch (shown in Appendix B) should work in the majority of installations. If a different setting is required for your specific networking environment, please refer to the Out-of-Band Management section in Chapter 3, "Configuring the Switch," for changing these default settings.

CHECKING STATUS LED LIGHTS

When the power is first turned on, the TE-100/S14 Switch performs a Power-On Self Test (POST). Please observe the status LED lights to verify a proper installation (refer to Appendix A, Page 35). These status LED lights also provide information about the system unit and its connected Ethernet or Fast Ethernet LAN segments during normal operation.

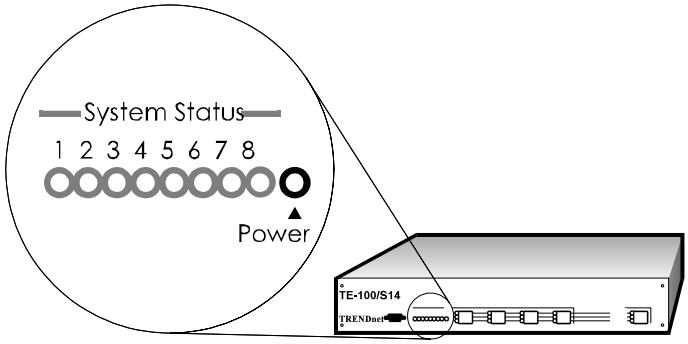


Figure Chapter 2 -6, The system status LED lights

Chapter 3 Configuring the Switch

Introduction

The TE-100/S14 Switch is designed to operate in workgroup organizations without the need of, or unable to justify for comprehensive network management software. It is also designed to operate within the SNMP network management environment. This chapter describes the details of configuring the TE-100/S14 Switch to support both environments.

Out-of-Band Management is the vehicle to access the TE-100/S14 Switch through a locally connected management terminal to the RS-232 serial 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[1] 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.

The TE-100/S14 Switch is set up to operate in either an un-managed or managed network environment. In a simple network hierarchy, the Spanning Tree Algorithm may be turned off.

[1] Please refer to footnote 2, Page 25 for Bridge definition.

RS-232 Port Connection

The TE-100/S14 Switch uses a female 9-pin RS-232 serial communication port for connection to a local management terminal.

The RS-232 port is a DCE (Data Communication Equipment). Figure Chapter 3 -1 shows the cable connection to a DTE (Data Terminal Equipment) such as a VT100 compatible terminal, or a PC with communication software emulating a VT100 terminal. Appendix C provides the pin reference to a 9-pin or 25-pin DTE port. The switch-to-terminal (DCE/DTE) serial communication speed is preset at 19,200 baud.

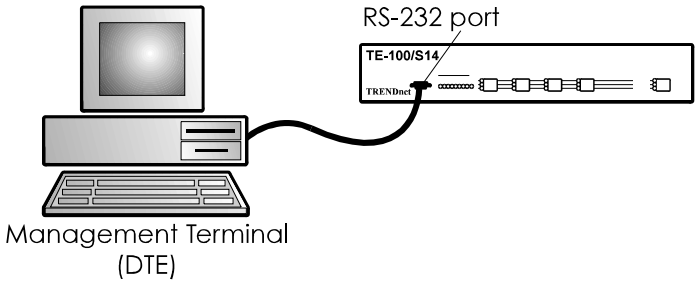


Figure Chapter 3 -1, A locally connected management terminal

Out-of-Band Management

The TE-100/S14 Switch can be configured using the Out-of-Band Management facility. A management terminal connecting to the RS-232 port on the Switch provides the access.

Table Chapter 3 -1 shows the guidelines of setting up a VT100 compatible terminal, or the VT100 terminal emulation utility under the Microsoft Windows as a management terminal for the TE-100/S14 Switch. Users can select other terminal emulation software contained in a number of communication software packages.

Once the terminal or terminal emulation software is started, the TE-100/S14 Switch will communicate with the terminal, and display the following management functions (See Table Chapter 3 -2). In the following sections, there will be further discussion on the interpretation and use of these management functions.

The TE-100/S14 Switch is factory set with an unique Ethernet MAC Address. The **Bold** type-face in Table Chapter 3 -2 indicates those parameters that are user changeable.

A user can also select **Full** / **Half** duplex support to maximize the through-put of the LAN segments. If the Switch is set to Full duplex, all ports will operate in Full duplex mode. No Full / Half duplex selection is available at the individual port level. For example, if a LAN segment is connected to a 10 Mbps shared hub, the segment is operating at half duplex. Although the Switch is set at Full duplex, the shared 10 Mbps LAN segment will not have the full duplex bandwidth. If a LAN segment connects to a TRENDnet TE-100/PCI, TE-PCI/T, TE-PCI/CT, or TE-PCI/CT+ network adapter card, or to another switch, the LAN segment will have the full duplex bandwidth. This means that a dedicated server or a high performance workstation connection to the TE-100/S14 Switch will significantly benefit from this Full duplex option.

The TE-100/S14 Switch is also capable of in-field upgrade of its system firmware. A user can do so from a PC communication software package which also includes the XMODEM feature. The XMODEM will guide the user to down-load the firmware code into the TE-100/S14 Switch. If a user needs to upgrade the system firmware, please contact TRENDware technical support for the latest firmware file and the detailed down-load procedures.

Terminal Step	**VT100 Compatible terminal**	**PC VT100 terminal emulation**
Communication software	N/A	VT100 emulation in Terminal / Accessories in MS-Windows, or other terminal emulation software
DCE/DTE line setting	19,200 Baud, 8 N 1 (hardware setting)	19,200 Baud, 8 N 1 (through the Terminal software)
PC COM port hardware setting	N/A	Refer to PC COM port hardware and Software setup guidelines
Assigning control keys to a non-VT100 system software environment	N/A	Deselect "Use function, arrow, Ctrl keys for Windows" in Terminal Preference.." in Windows Terminal Accessories; or refer to specific terminal emulation software

Table Chapter 3 -1, Setting up the TE-100/S14 management terminal

Control function	**System display**	**User selection**
Switch Configuration	1. Switch Version No. 2. Switch Name 3. MAC Address 4. Technical Support 5. Full / Half duplex (all ports) **Save** change **Exit**	V1.10 (Fixed) **10/100** (changeable) (Factory preset) (Factory preset, changeable) **Enable** / **Disable** (changeable) **F2** key **F4** key
Port Configuration (for each of the 100M, and four 10M ports)	Ether State Port Status Port Priority **Save** change **Exit**	**Enable** / **Disable** Block, Learning, Listening, Forwarding, Disable **1** (Hi) - **255** (Lo) **F2** key **F4** key
Spanning Tree Configuration	Enable / Disable Bridge (switch) Priority Root Cost Hello Time Forward Delay Time Max Age Time Root Bridge Root Port	**Enable** / **Disable** **32768** (changeable) (Reflected STA result) **10** sec. (range: 1 - 10 sec.) **30** sec. (range: 4 - 30 sec.) **40** sec. (range: 6 - 40 sec.) (MAC addr. of the current Root Bridge) (Reflected STA result)
Down-load new system firmware	**Y** / **N** Exit	**Space** Key (toggle) **F4** key
Re-load factory default setting	**Y** / **N** Exit	**Space** Key (toggle) **F4** key
Exit		* Note: **Bold** typeface fields are user changeable.

Table Chapter 3 -2, The TE-100/S14 Out-of-Band management functions

Port Management

The ports on the TE-100/S14 Switch can be managed through the Out-of-Band RS-232 port. In Table Chapter 3 -2, page 23, **Port Configuration** allows a user to **enable** or **disable** a port connecting to a LAN segment.

The **Port Configuration** also allows a user to set the priority of a port. A number (ranging 1 - 255, high - low) can be entered to identify the priority setting of the Switch. This number, in conjunction with the pre-set port ID, is used under the Spanning Tree Algorithm to determine the "Root Port" for forwarding Ethernet data, and to avoid network loop.

The **Port Status** displays the state of the port at any given time. A port will display one of the states (Blocking, Learning, Listening, Forwarding, and Disable) responding to the port Enable / Disable setting, and to the dynamic changes in routing paths of the surrounding network.

Spanning Tree Algorithm

The TE-100/S14 Switch implements the Spanning Tree Algorithm (henceforth STA) to provide the following functions:

- **Network loop detection and prevention** - There can be only one path between any two bridged Ethernet LAN segments[1]. If there are more than one path, forwarded packets may loop indefinitely. STA detects any looped path and selects the path with the lowest "path cost" as the active path, while blocking the other paths.

- **Automatic topology re-configuration** - If an active path fails and there is a backup path, the backup path will be automatically activated, and the STA will automatically re-configure the network topology.

The detailed Algorithm is defined in the STA Specification. The following introduces the key information and terminology needed to interpret the parameters used in the TE-100/S14 Switch that support the STA. It is also helpful to understand the effects of changing these parameters. Appendix B lists the defaults setting used by the TE-100/S14 Switch.

STA operates at two levels, the **Bridge**[2] level and the **Port** level. In addition, STA uses several timers to periodically ensure the integrity of the Bridges and their ports in a network.

---

[1] A shared hub is a star topology cabling implementation of the same LAN segment, therefore, is not a Bridge.

[2] Bridge is the standard terminology used in the Spanning Tree Algorithm Specification, which could be a bridge or switch.

1. <u>At the Bridge level:</u>

Root Bridge: A network must first establish a reference Bridge, from which all data forwarding path values are calculated, compared, and determined. The Root Bridge has the lowest Bridge Identifier[1] (Bridge Priority + MAC address).

Bridge Priority: This is a user changeable parameter. The smaller the number is set, the higher the Bridge Priority is. This parameter enables all Bridges in a network to establish a Root Bridge. A change to the Bridge Priority may cause all the Bridges in the network to re-establish a new Root Bridge. A high Bridge Priority increases the chance for the Bridge being selected as the Root Bridge.

Root Path Cost: From each Bridge, Root Path Cost is the total Path Cost of reaching the Root Bridge from a Designated Bridge. A Root Bridge has Root Path Cost of 0.

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 case all attached Bridges on a segment have the same Root Path Cost, the Bridge with the lowest Bridge Identifier becomes the Designated Bridge.

2. <u>At Port level:</u>

Designated Port: This is the port on each Designated Bridge that forwards data packets for the attached LAN segment.

Root Port: Each Bridge has a Root Port that has the lowest Path Cost to the Root Bridge. In case there are several such ports of the same Path Cost, the one with the lowest Port Identifier (Port Priority + pre-assigned Port ID) becomes the Root Port[2].

---

[1] A Bridge's MAC address is only used to decide the Root Bridge when there are 2 or more Bridges with the same Bridge Priority.

[2] In a Bridge, a port is Blocked, if it is not a Root or a Designated Port.

Port Priority: This is a user changeable parameter for each port on a Bridge. In conjunction with a pre-set port ID, this parameter is used by the Bridge to determine the Root Port of a Bridge.

Path Cost: This parameter is fixed[1], therefore not displayed by the TE-100/S14 Switch, in order to ensure that the Fast Ethernet LAN segment will always be used. The 100Mbps segment has an assigned Path Cost of 10, and each 10Mbps segment has assigned Path Cost of 100, based on the STA Specification.

3. Timers:

Max. Age Time: This is a user changeable parameter. Should a Bridge fail to receive an identifier packet from the current Root Bridge within this time, it assumes that the current Root Bridge has failed. An attempt will be initiated to establish a new Root Bridge for the network.

Hello Time: This is a user changeable parameter. Should a Bridge take over as the Root Bridge, the Hello Time setting will be used as the interval timer to send out identifier packets to other Bridges for notifying its existence as the Root Bridge. The Hello Time cannot be set longer than the Max. Age Time as configuration errors will occur.

Forward Delay: This is a user changeable parameter. This is the delay time that each port on a Bridge waits in the Listening state before changing from the Blocking state to the Forwarding state.

---

[1] This is changeable parameter, based on the STA specification. However, it is fixed by the TE-100/S14 Switch implementation.

4. Example:

Figure Chapter 3 -2 gives an example of the parameters of three Bridges prior to applying the STA. In this simplified example, Bridge 1 has three ports with Port 1 connecting to a 100Base-TX segment (LAN 1), and Port 2 connecting to a 10Base-T segment (LAN 2). Port 3 is not connected to any LAN segment. One may consider Bridge 1 as the TE-100/S14 Switch, with one port connecting to a Fast Ethernet LAN segment, and only one of the four ports connecting to a Ethernet segment. Both Bridge 2 and 3 connect to another Ethernet segment (LAN 3). In this example, there will be a network loop problem.

Figure Chapter 3 -3 shows that, after applying the STA, Bridge 3 became the Root Bridge as it has the lowest Bridge ID, it is also the Designated Bridge for both LAN 1 and 3. Bridge 1 became the Designated Bridge for LAN 2. Port 1 of Bridge 1, and Port 2 of Bridge 2 became the Root Ports as they have the lowest Root Path Costs to Bridge 3. Port 1 of Bridge 2, after applying the STA, became neither a Root Port or a Designated Port, therefore will not forward data packets. As the result, this port is Blocked.

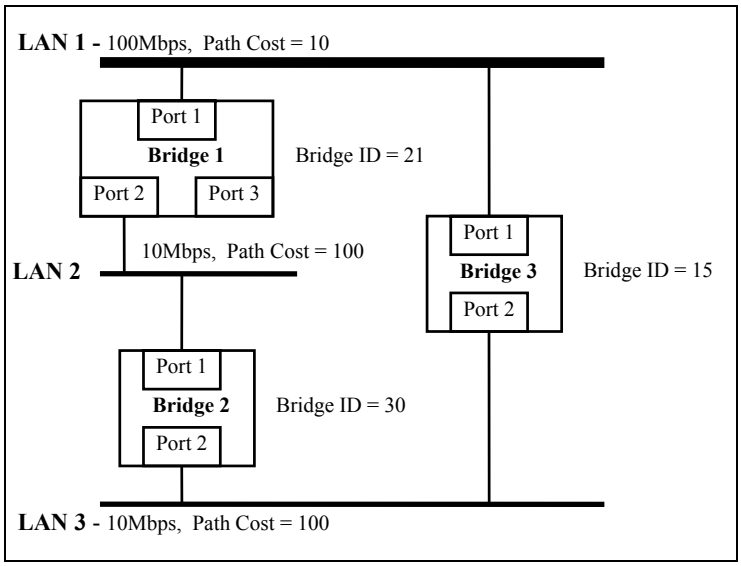


Figure Chapter 3 -2, STA parameters at Set-Up

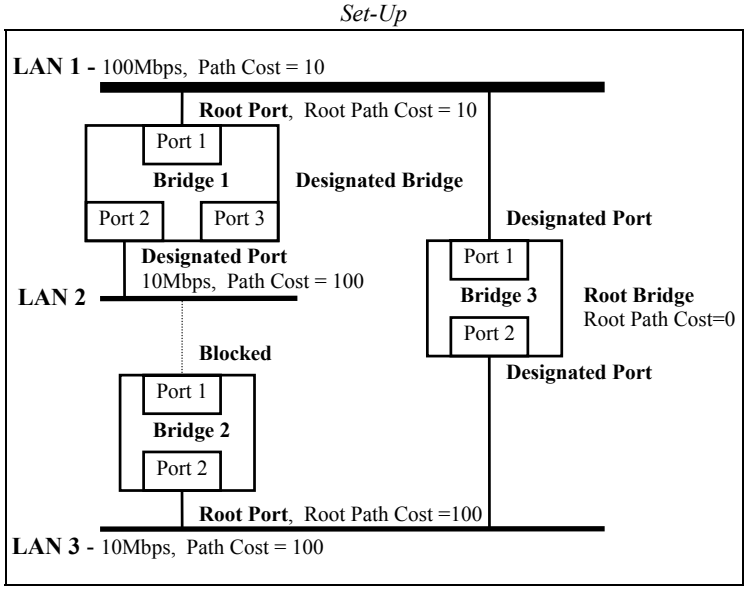


Figure Chapter 3 -3, STA parameters after applying the STA

Chapter 4 Network Management

Operating within the SNMP environment

The TE-100/S14 Switch operates easily with other Bridges[1] within a network managed by the SNMP network management protocol, although, it does not appear as a manageable SNMP agent from a SNMP management terminal. Make sure that the STA is enabled to avoid network looping or possible blocking of forwarding paths.

The Out-of-Band Management facility enables a user to examine the status of the Switch and the LAN ports as the Switch interacts with other Bridges in the network.

STA is a complex subject. Therefore, it is best to keep the default settings as set in the factory. The factory default setting should cover the majority of installations. Table Chapter 4 -1 shows the user changeable parameters in the TE-100/S14 Switch, and the effect of changing them. Appendix B shows the default settings and ranges of these parameters.

Operating without the SNMP environment

In a simple network installation where there is a network hierarchy without any possibility of network looping, you may turn off the STA in the TE-100/S14 Switch at the Bridge level[2].

---

[1] Please see footnote at page 25 for the Bridge definition.

[2] Please see "Bridge level" at page 25.

If the possibility of network loop exists, just leave the STA enabled along with other Bridges in the network. The TE-100/S14 Switch will interact with other Bridges to dynamically establish forwarding paths in the network.

Bridge level STA parameters	**Settings**	**Effects**	**Comment**
Enable / Disable	Enable / Disable	Participate in or remove from STA path establishment	Enable in a SNMP network
Bridge Priority	lower the number, higher prio.	Increase chance becoming the Root Bridge	Avoid, if the switch is used in workgroup level of a large network
Hello Time	1 - 10 sec.	No effect, if not Root Bridge	Never set greater than Max. Age Time
Max. Age Time	6 - 40 sec.	Contend for Root Bridge, if not receive a BPDU in this period	Avoid low number for un-necessary reset of Root Bridge
Forward Delay	4 - 30 sec.	High number delays the change in state	Max. Age ≤ 2 x (Forward Delay - 1) Max. Age ≥ 2 x (Hello Time + 1)
Port level STA parameters			
Enable / Disable	Enable / Disable	Enable or disable this LAN segment	Disable a port for security or problem isolation
Port Priority	lower the number, higher prio.	Increase chance to become Root Port	

Table Chapter 4 -1, Effects of changing the user changeable STA parameters

Chapter 5 Diagnostics

Power-On Self Test

A Power-On Self Test (POST) sequence takes place when the TE-100/S14 Switch is first turned on (cold boot). Software reset (warm boot) through the RS-232 port is not supported to prevent unauthorized remote re-boot.

The POST sequence checks the system integrity by performing the following component tests:

- System boot
- RAM test
- Timer and interrupt controller tests
- Cache controller test
- RS-232 diagnostic port test
- BIOS test
- EEPROM checksum test
- Program load checksum test
- Ethernet ports test

Besides the Power On/Off LED, there are eight System LED lights used to display the results of these tests during the POST sequence. The LED status lights further display test results in two categories, the System component test status, and the LAN port test status. Any error that arises from the System component tests means that the Switch failed to function. Any LAN port error(s) indicates that, although the displayed LAN port(s) is not functioning, the TE-100/S14 Switch is operational with the remaining LAN ports.

The following two sections describe the meaning of the LED status lights (See Appendix A, Page 35).

System Status

If the System passes the POST sequence and all LAN ports are operational, all LEDs ① - ⑧ will be off (See Figure Chapter 2 - 6 on Page 17).

If there is a System error, the LED ❷ light will be On, and the LEDs ❺-❽ will display the System error code.

Some of the System errors and LAN port errors can be resolved by restarting the System, or with remote technical support from TRENDware (See shaded areas in Appendix A, Page 35, The TE-100/S14 system POST status LED lights). The remaining System errors require that the unit be returned to your nearest TRENDnet reseller for repair.

LAN segment LED Status

In addition to the System Status LED lights, there are three LED lights (See Page 36) for each port displaying the operating status of the connected 10Mbps or 100Mbps LAN segment.

Each **Link** LED light displays the status of correspondi*ng LAN* segment during Power-On.

During active switching of LAN data traffic, **Link** LED lights display the change in the state of the segment, **Activity** LED lights display the transmitting and receiving of data on the corresponding LAN segments. The **Collision** LED lights reflect the efficiency of carrying meaningful data traffic. Users should re-arrange workgroups sharing a LAN segment when the Collision LED stays on consistently for this segment. For example, on a segment with dedicated end-station connection, the Collision LED should stay off all the time.

Appendices

Appendix A Status LED Indicators

SYSTEM & LAN PORT STATUS

System error LED Off -①②③ ④⑤⑥⑦⑧ On - ❶❷❸ ❹❺❻❼❽		Error Status	Action
①②③	④⑤⑥⑦⑧	No error	Normal
①❷③	④⑤⑥⑦❽	Boot	Record LED error code and contact TRENDware for support
①❷③	④⑤⑥❼⑧	RAM	Record LED error code and return the unit.
①❷③	④⑤⑥❼❽	Interrupt controller	Record LED error code and return the unit.
①❷③	④⑤❻⑦⑧	Timer controller	Record LED error code and return the unit.
①❷③	④⑤❻⑦❽	Cache controller	Record LED error code and return the unit.
①❷③	④⑤❻❼⑧	RS-232 port	Record LED error code and return the unit.
①❷③	④⑤❻❼❽	BIOS	Record LED error code and contact TRENDware for support
①❷③	④❺⑥⑦⑧	EEPROM	Record LED error code and contact TRENDware for support
①❷③	④❺⑥⑦❽	Program down-load	Record LED error code and contact TRENDware for support
LAN port error LED			
❶②③ Note: LED ③ is reserved.	❹❺❻❼❽ port positions: 1 2 3 4 ↑ (100Mbps)	Port 1 - 5 error (s)	The system board is OK, the reported LED port(s) disabled. Record LED status and contact TRENDware for support.

The TE-100/S14 system POST status LED lights

LAN SEGMENT STATUS

Port LED	Status	LAN segment state	Action
Link	On Off	LAN segment Normal	 Check connections on this cable segment
Activity	Off Blinking On	No packet traffic TD or RD packets on this LAN segment Heavy packet traffic	 Check if consistently heavy
Collision	Off Blinking On	No collision - Collision on this LAN segment - Jabber, serious problem -	Normal Normal Check this LAN segment

LAN segment status LED lights

Appendix B Switch Default setting

Parameter	Default	Range	Data type
Device Name	**10/100**		String (32 bytes)
Location			String (32 bytes)
Bridge State	**Enable**		
Bridge Priority	**32768**	0 - 65535	Integer
Hello Time	**10 sec.**	1 - 10 sec.	Integer
Max. Time	**40 sec.**	6 - 40 sec.	Integer
Forward Delay	**5 sec.**	5 - 30 sec.	Integer
Aging Time	**300 sec.**	0 - 10 ∧ 6	Integer
MAC Address	0080C8xxx		
Port State (for each port)	**Enable**		
Port(s) Priority	**128**	0 - 255	Integer
Path Cost (100Mbps)	10		Integer
Path Cost (10Mbps)	100		Integer
Note: **Bold** type face indicates changeable parameters.			

The TE-100/S14 default parameter settings for the Spanning Tree Algorithm

Appendix C RS-232 Pin Specification

The RS-232 serial port of a TE-100/S14 Switch uses a 9-pin female connector. The port can be connected to a VT100 type of terminal, or a PC, or a workstation emulating a VT100 terminal.

For a local connection, the table below shows the pin layout of a 9-pin to 9-pin, or a 9-pin to 25-pin cable connection between the TE-100/S14 Switch and the management terminal.

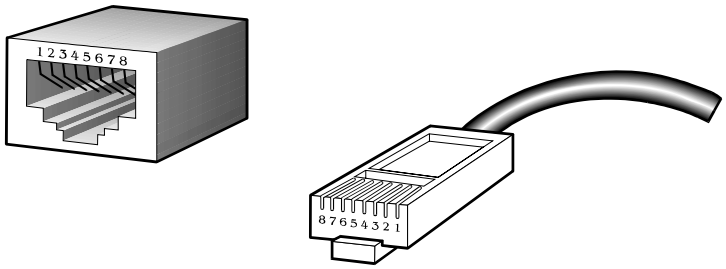
TE-100/S14 (DCE)		Terminal (DTE)		
Pin number	Signal name	for 9-pin	for 25-pin	Signal name
1	not used	1	-	not used
2	transmit (TD)	2	3	RD
3	Receive (RD)	3	2	TD
4	Data Carrier Detect (DCD)	4	20	DTR
5	signal ground (SG)	5	7	SG
6	Data Terminal Ready (DTR)	6	8	DCD
7	clear to send (CTS)	7	4	RTS
8	request to send (RTS)	8	5	CTS
9	not used	9	-	not used

The TE-100/S14 Switch to Terminal RS-232 pin connections

Appendix D RJ-45 Pin Specification

When connecting the TE-100/S14 Switch to another switch, a bridge or a hub, a modified cross-over cable is necessary. Please review these products for matching cable pin assignments.

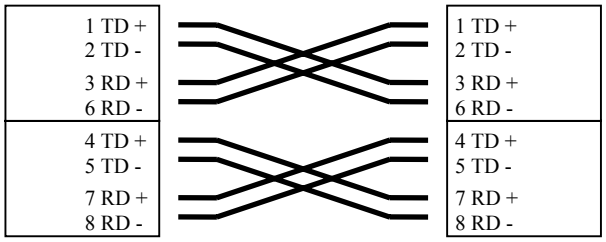
The following diagram and tables show the standard RJ-45 receptacle/connector and their pin assignments for the switch-to-network adapter card connection, and the cross-over cable for the switch-to-switch/hub/bridge connection.



The standard RJ-45 receptacle/connector

Contact	Media Direct Interface Signal
1	**TD +** (transmission)
2	**TD -** (transmission)
3	**RD +** (reception)
4	not used
5	not used
6	**RD -** (reception)
7	not used
8	not used

The Standard Category 3 cable, RJ-45 pin assignment



The pin assignment for Category 5, 4-pair cross-over cable

Appendix E Specifications

PORT CONFIGURATION

1 x 100Mbps LAN port -

- Complies to IEEE 802.3, ISO 8802-3 10Base-T Ethernet
- IEEE 802.3 Frame types: Transparent
- Switched IEEE 802.3 MAC layer frame size: 64 - 1518
- RJ-45 port connector with built-in transceiver
- Max. data rate: 100 Megabits/sec. (full duplex)
- Topology: Star
- Protocol: CSMA/CD
- VLSI LAN controller chip

4 x 10Mbps LAN ports -

- Complies to IEEE 802.3, ISO 8802-3 10Base-T Ethernet standard
- IEEE 802.3 Frame types: Transparent
- IEEE 802.3 MAC layer frame size: 64 - 1518
- RJ-45 port connector with built-in transceiver
- Data rate: 10 Megabits/sec. (Full duplex)
- Topology: Star
- Protocol: CSMA/CD
- VLSI LAN controller chips

HARDWARE

- Bus master LAN controller with custom design board
- Field upgradeable 128 KB non-volatile EEPROM for configuration, program code
- 1 x DB9 RS-232D DCE port; async. 8-bit data, 1 stop bit, no parity, 19.2K baud

LAN cabling support -

- For 10Base-T ports: Two-pair Category 3,4,5 UTP cabling
- For 100Base-TX port: Two-pair Category 5 UTP or STP cabling

Physical aspects -

Operating temperature:	5 - 50 degrees Celsius
Humidity:	5 - 95% non-condensing
Input power:	90 - 250 VAC, 50 - 60 Hz auto-select
Power consumption:	20 watts maximum
Ventilation:	2 built-in DC fans
Dimension:	17.36 in (w), 2.85 in (h), 9.37 in (d)
Weight:	8 lbs

Index