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## Preface

This manual describes how to install and use 16/24 port Ethernet switch, TE100-S1616V/TE100-S2424V. It features 16/24 ports that auto negotiate the presence of 10/100Mbps and full or half-duplex mode. An optional 100BASE-FX multi-mode or single-mode module enables long-distance connection. An optional BNC module enables backwards compatibility.

To get the most out of this manual, you should have an understanding of networking concepts such as bridging, IEEE 802.3 Ethernet and 100BASE-TX Fast Ethernet, and local area networks (LAN).

For more information about these topics, please refer to the Appendices.

In this manual, you will find:

Benefits of Ethernet switches

Features of TE100-S1616V/TE100-S2424V

LED functions illustration

Installation instructions

Configuration instructions for VLAN and port speed

Specifications

Ethernet technology, LAN, and VLAN tutorial information

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## **Introduction**

### **Benefits of Switching**

Ethernet switching technology has dramatically boosted the total bandwidth of a network. It puts configuration flexibility and bandwidth adaptability into the local workgroups where the majority of work is generated.

It further eliminates congestion problems inherent to the CSMA/CD protocol and improves predictable response time under heavy network loads. Expensive routing equipment was used in the past to reduce the congestion under heavy loads.

The new wave of object-oriented client and server applications demands higher bandwidth and tighter integration of client workstations with servers. The old shared-access (hub/repeater)

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Ethernet technology provides neither enough bandwidth nor predictable response time for this new wave of workgroup computing.

Fast Ethernet switching not only satisfies both technical and business requirements, but also preserves the user's existing investment in the huge 10 Base-T Ethernet installed Base.

This compatibility ensures a path for users to add, change, and migrate to Fast Ethernet as demands emerge. It also provides a low cost and flexible bandwidth solution directly to local workgroups where the majority of work is generated, reducing the need for expensive network equipment.

## **TE100-S1616V/TE100-S2424V**

### **16/24-port 10/100BASE-TX Fast Ethernet Switch**

TE100-S1616V/TE100-S2424V has 16/24 10/100Mbps ports with an optional fiber-optic module, flexibly meeting fiber-optic needs. The straight-forward design enables ease of operation while providing superior performance.

Addressing the demand for fiber, we provide an optional multi-mode or single-mode fiber module for TE100-

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S1616V/TE100S2424V as an optimum solution for long-distance connectivity. The module supports one SC, ST, MT-RJ, or VF-45 port. A BNC connector is also available to address the backward compatibility issue.

This switch represent the newest generation in Ethernet switching technology by supporting both 10Mbps and 100Mbps speed and half or full duplex transmission modes on the same port. By using standard auto-negotiation, it provides a cost-effective way of integrating legacy 10Mbps segments with 100Mbps Fast Ethernet networks and an ideal solution for extending the distance between two 100Mbps network segments.

TE100-S1616V/TE100-S2424V supports port-based Virtual Local Area Networking (VLAN). This advanced feature gives the network administrator a powerful, yet easy-to-use tool to reduce unnecessary broadcast traffic, flexibly segment the network, and enhance network security.

TE100-S1616V/TE100S2424V fully complies with IEEE802.3u, 100BASE-TX/FX, and IEEE802.3, 10BASE-T standards

## **Product Features**

- 16/24 ports with auto-negotiation 10/100Mbps
- Optional 1-port ST, SC, MT-RJ, VF-45, or BNC module.

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- Plug-and-play
  - Auto-negotiation for speed and duplex mode
  - True non-blocking architecture
  - Full wire speed forwarding
  - Store-and-forward mechanism
  - Back pressure and IEEE 802.3x compliant flow control
  - Supports 2K MAC address
  - Port based VLAN
  - Programmable re-configuration for fixed speed and duplex modes
  - One uplink port activated by the push of a button
  - Front panel reset button
  - Front panel status LEDs
  - Standard 19" rack-mount size

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## Packing List

When you unpack this product, you should find the items listed below. Please inspect the contents, and report any apparent damage or missing items immediately to your authorized reseller.

- ?? TE100-S1616V or TE100-S2424V
- ?? User's Guide
- ?? AC power cord
- ?? Rack Mount Ears with screws
- ?? Serial Cable

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## Front Panel

The front panel of this switch has 16 or 24 ports, one slot for an optional fiber or BNC module and an array of LED indicators to provide you with instant feedback on the status of the switch.

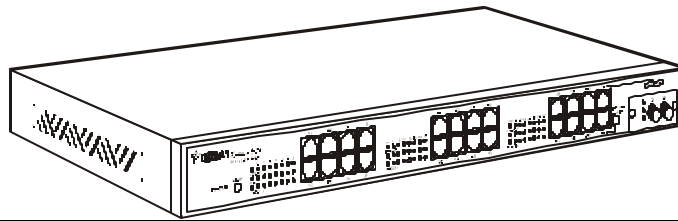


Figure 1: Front panel of TE100-S2424V

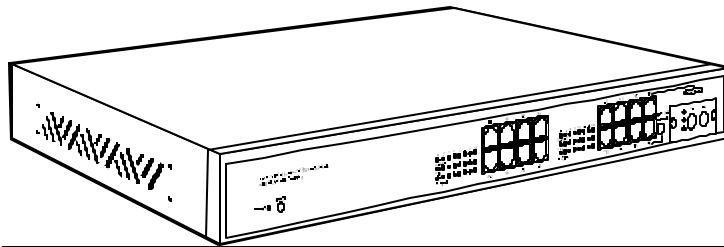


Figure 2: Front panel of TE100-S1616V



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## Ports

TE100-S1616V is similar to TE100-S2424V except that TE100-S1616V has 16 RJ-45 10/100 Ethernet ports while TE100-S2424V has 24. TE100-S1616V/TE100-S2424V also has one slot for optional module for fiber or BNC connection.

The auto-negotiation feature of TE100-S1616V/TE100-S2424V allows communication between 10Base-T(Ethernet) and 100Base-TX (Fast Ethernet) at full or half-duplex mode. If it is desirable to operate at a fixed, rather than auto-negotiated media setting, please refer to the Port Settings section on page 35.

The optional module of the switch provides an additional port for copper BNC or fiber ST, SC, MT-RJ, or VF-45. The latter are fiber-optic small-form-factor connectors that are smaller and easier to use. The optional module port also allows the use of single-mode fiber for distances up to 15 km. For information on module installation, please refer to page 23.

The maximum range of a 100BASE-TX network connected to the switch is 100 meters with Category 5 unshielded twisted-pair (UTP) cable. A 10BASE-T network may range up to 100 meters with Category 3, 4, or 5 UTP cable. As for the length of fiber link between a switch and a Data Terminal Equipment, it is capable to span at least 2 kilometers (1.24 Mile) using 62.5/125-micron multi-

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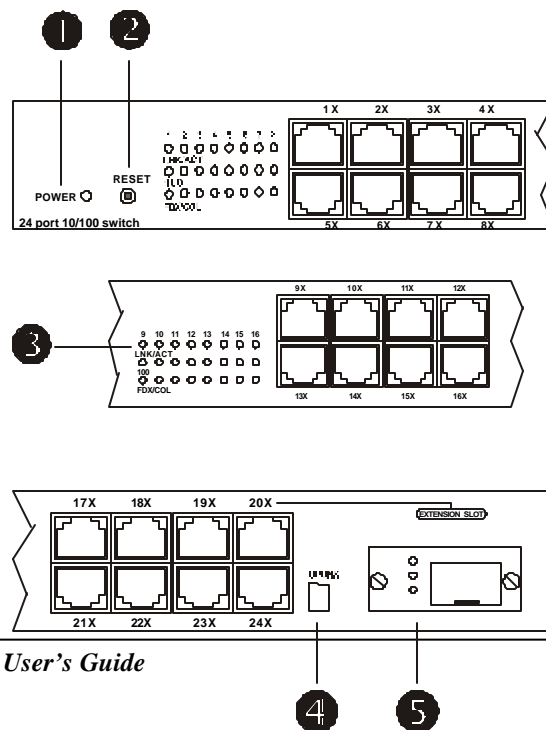
mode fiber-optic cable or up to 15 kilometers using 9 micron single-mode fiber optic cable.

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Speed	Connector	Port Speed Half/Full Duplex	Cable	Distance
10BASE-T	RJ-45	10/20 Mbps	Category 3, 4, or 5 UTP	100 meters
100BASE- TX	RJ-45	100/200 Mbps	Category 5 UTP	100 meters
100BASE- FX	ST, SC, MT-RJ, VF-45	100/200 Mbps	62.5/125 micron multi-mode fiber	2 km
100BASE- FX	ST, SC, MT-RJ, VF-45	100/200 Mbps	9 micron single-mode fiber	15 km
10BASE-2	BNC	10Mbps	Coaxial	500 meters

## LED Indicator

The array of LED indicators on the front panel conveys status and configuration information to help you monitor and trouble-shoot the switch.



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Figure 3: LED Indicator

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#### Power

This LED comes on when the switch is connected to a power supply and turned on.

#### Reset Button

If the switch should become unresponsive, you may perform a reset of the switch by pressing this button.

#### Port Status

The front panel of the switch has two segments of eight ports numbered from 1X to 16X on TE100-S1616V or three segments of eight ports numbered from 1X to 24X on TE100-S2424V. The LEDs are located at the left side of each segment, display status for each respective port. Consult the following chart for clarification.

Table 1: Port Status

LED	State	Indication
LNK/ACT	Steady	LINK: The port has established a valid network connection
	Flashing	ACTIVITY: The port is transmitting or receiving data
100	Steady	100Mbps: The port has established a valid 100Mbps network connection

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	Off	10Mbps: The port has established a valid 10Mbps network connection.
<b>FDX/COL</b>	Steady	FULL-DUPLEX: The connection is in full duplex mode
	Flashing	COLLISION: Collision occurred in the 10/100 domain.
	Off	The connection is in half duplex mode

† Uplink Button

Depress when connecting to another switch or hub's MDI-X port using a regular straight through twisted pair cable. Affects port 16X on TE100-S1616V or port 24X on TE100-S2424V only.

† Optional Module LEDs Status

A set of three LEDs displays the status of the optional modular port. Consult the following chart for clarification.

Table 2: Optional module port status

LED	State	Indication
100/TX	Steady	100Mbps: The port has established a valid network connection
	Flashing	The port is transmitting data



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10/RX	Steady	10Mbps: The port has established a valid network connection
	Flashing	The port is receiving data
FDX/COL	Steady	The connection is in full duplex mode
	Flashing	The port is receiving data

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## Installation

This chapter presents step-by-step installation instructions for TE100-S1616V/TE100-S2424V.

### Selecting a Site for the Switch

As with any electronic device, you should place the switch where it will not be subjected to extreme temperatures, humidity, or electromagnetic interference. The site you select should meet the following requirements:

The room temperature should be between 32 and 104 degrees Fahrenheit (0 to 40 degrees Celsius).

The relative humidity should be less than 90 percent, non-condensing.

Surrounding electrical devices should not exceed the electromagnetic field (RFC) standards for IEC 801-3, Level 2 (3V/M) field strength.

Make sure that the switch receives adequate ventilation. Do not block the ventilation holes on the side of the switch or the fan exhaust port on the rear of the switch.

The power outlet should be within 1.8Meter of the switch.

Detailed specifications may be found on page 46.

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## Connecting to Power

Connect the supplied AC power cord to the receptacle on the back of the switch, and then plug the cord into a standard AC outlet with a voltage range from 100 to 240 VAC.

Turn the switch on by flipping the ON/OFF switch on the rear of the unit to the **I**(ON) position. The **O** position is OFF.

## Connecting to Your Network

Prepare cable with corresponding connectors for each type of port in use. Consult Table 3 below for cabling requirements based on connectors and speed. Once the connections are made, the switch is operational.

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Table 3: Cable Specifications

Speed	Connector	Port Speed Half/Full Duplex	Cable	Distance
10BASE-T	RJ-45	10/20 Mbps	Category 3, 4, or 5 UTP	100 meters
100BASE- TX	RJ-45	100/200 Mbps	Category 5 UTP	100 meters
100BASE- FX	ST, SC, MT-RJ, VF-45	100/200 Mbps	62.5/125 micron multi-mode fiber	2 km
100BASE- FX	ST, SC, MT-RJ, VF-45	100/200 Mbps	9 micron single-mode fiber	15 km
10BASE-2	BNC	10Mbps	Coaxial	500 meters

When the uplink button is pressed down, port 16X on TE100-S1616V or port 24X on TE100-S2424V can be used to connect to any regular port of another hub or switch using a regular straight through twisted pair cable. To connect two regular RJ-45 ports between any switches or hubs, you need a cross-wire cable. The

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cable must be a Category 5 shielded twisted-pair or unshielded twisted-pair (STP/UTP) cable for 100BASE-TX, or Category 3, 4, or 5 STP/UTP cable for 10BASE-T.

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## Optional Module Installation

The switch offers an optional one-port module for fiber or BNC connection. The fiber module is available in either single or multi-mode, it supports SC, ST, MT-RJ or VF-45 connector.

The optional module should be inserted into the extension slot located at the right side of the switch. Port 16X (for TE100-S1616V) or port 20X (for TE100-S2424V) will be automatically disabled when optional module is installed. **Before installation, ensure that the power is disconnected. The module is not hot-swappable.** Unscrew the cover plate in the extension slot. Pull out the cover plate and slide the module in the metal guides slowly. Once the module is fully seated in the slot, tighten the screws.

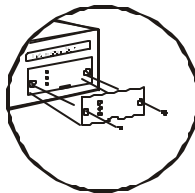


Figure 4: Removal of cover plate

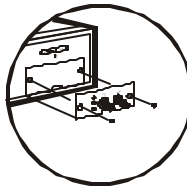
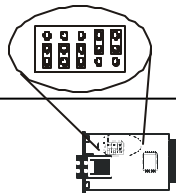


Figure 5: Module being installed

## Jumper Settings

The module arrives with pre-set jumpers and should not be reset.





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Figure 6: Proper jumper settings for fiber module (BNC connection does not have a jumper)

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## Switch Configuration

Configurable features such as VLAN, port setting, flow-control, and trunking are gradually becoming necessary functions of a switch for setting up networks.

TE100-S1616V/TE100-S2424V incorporates those features into a configuration manual, where you can easily assign individual port to one or several VLAN groups, set fixed speed or duplex mode, link together several ports to act as a single port with higher bandwidth (Trunking), and enable or disable flow-control. This section explains, in detail, how to configure these features through serial port connection. A serial cable is provided with the switch. Use it to connect the console port at the back of the switch and a COM port on the computer. Information on next page explains steps for setting up the console port connection.

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## Setting up Console Port Connection

Check the switch, cables, and computer; make sure they are functioning properly before the configuration.

Attach a PC or any VT100 compatible terminal to the console port on the back of the switch (see figure 7) using the following settings:

Terminal type	VT100
Port type	(COM 1~4)
Communication Mode	8 data bits, 1 stop bit, no parity and 9600bps (for initial configuration)
Flow Control	None
Hardware Compression	NA

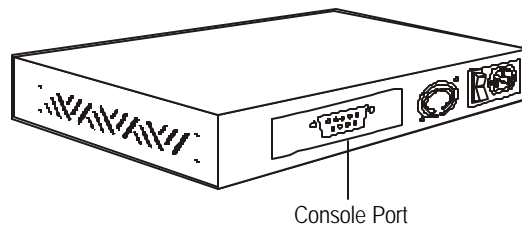


Figure 7: Console Port

After DOS or Hyper Terminal programs have been set up properly, turn on the switch, use terminal program to connect to the switch and press any key to view the main menu shown below:

```
24-port 10/100 Base Ethernet Switch
VLAN Port List
V1, 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24
V2 < empty >
V3 < empty>
V4 < empty >
Port  Mode  FLW  VLAN          Port  Mode  FLW  VLAN
1      Auto   Y    V1            13     Auto   Y    V1
```

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2	Auto	Y	V1	14	Auto	Y	V1
3	Auto	Y	V1	15	Auto	Y	V1
4	Auto	Y	V1	16	Auto	Y	V1
5	Auto	Y	V1	17	Auto	Y	V1
6	Auto	Y	V1	18	Auto	Y	V1
7	Auto	Y	V1	19	Auto	Y	V1
8	Auto	Y	V1	20	Auto	Y	V1
9	Auto	Y	V1	21	Auto	Y	V1
10	Auto	Y	V1	22	Auto	Y	V1
11	Auto	Y	V1	23	Auto	Y	V1
12	Auto	Y	V1	24	Auto	Y	V1

VLAN/Mode/Trunking/Default (V/M/T/D) ?

*Note: The terminal mode setup command and options are the same for TE100-S1616V and TE100-S2424V. Only the number of ports shown on the screen is different.*

Mode = Speed and Duplex mode  
 FLW = Flow Control

This main menu shows you the default configuration of the switch. By default, all ports are set at auto-negotiation, flow control on, and all ports are grouped into V1 (VLAN group 1).

These are the valid commands:

[V]   Configure VLAN groups

[M]   Select 10/100Mbps and half or full-duplex mode

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*User's Guide*

- 
- [T] Select Trunking
  - [D] Restore the default settings
  - [ESC] Abort the menu at any time

Note: [Esc] will not function when you are in the Trunking Menu. In the Trunking setup menu, you must select trunk “a” or “b”. To cancel the trunking selection, select “**D**” at main menu to restore to default settings. When “**D**” is selected and confirmed, all settings will go back to default.

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## VLAN

Virtual Local Area Networking (VLAN) enables efficient traffic separation, provides better bandwidth utilization, and alleviates scaling issues by logically segmenting the physical LAN so that packets are switched only between ports within the same VLAN. This also creates secure segments within the existing network. Nodes residing in different VLAN segments cannot communicate with each other although they are connected to the same switch. The resulting security is yet another reason to use VLAN.

This switch is able to support up to four port-based Virtual LAN (VLAN) domains. Follow these steps to assign ports to a VLAN group.

- ?? Enter **[V]** from the Main Menu
- ?? Select a VLAN group:  
**[V1], [V2], [V3], or [V4]**
- ?? Enter the port number.

*Note: If entering more than one port to a VLAN group, separate each port number by commas. For setting consecutive number of ports to the same VLAN, use – between the first and last port numbers to save time.*

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Only one VLAN group can be defined at a time. Repeat the steps until all ports are assigned to at least one VLAN group. Though each VLAN grouping does not need to be utilized, each port must be assigned to at least one VLAN group. Hit the [ESC] key when done.

To return to the default settings (in which each port is assigned to V1), enter [D] from the main menu and enter Y to confirm the action.

### **VLAN Example:**

VLAN/Media/Default (V/M/D)? V  
Please enter the VLAN# or ESC to abort (V1-V4) -> V1  
The current V1 is 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24  
Please enter the new port list ->

Key 1-3,8,10,14,15, 17-20,22,24

Proceed with the assignment of the remainder of the ports into any VLAN grouping:

Enter [V2]



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Key 1,4,5,6,8,12,13,19,21,23  
Enter [**V3**]  
Key 1,7,9,11,16,19,21,23

Note: Until assigned, the menu displays **\*\*error\*\*** for each unassigned port. While any port is in the **\*\*error\*\*** status, the [**ESC**] key will not return the screen to the main menu. Assign each port to a VLAN grouping prior to exiting program.

---

View the results on the following illustration.

24-port 10/100 Base Ethernet Switch							
VLAN Port List							
V1, 1,2,3,8,10,14,15,17,18,19,20,22,24							
V2, 1,4,5,6,8,12,13,19,21,23							
V3, 1,7,9,11,16,19,21,23							
V4 < empty >							
Port	Mode	FLW	VLAN	Port	Mode	FLW	VLAN
1	Auto	Y	V1 V2 V3	13	Auto	Y	V2
2	Auto	Y	V1	14	Auto	Y	V1
3	Auto	Y	V1	15	Auto	Y	V1
4	Auto	Y	V2	16	Auto	Y	V3
5	Auto	Y	V2	17	Auto	Y	V1
6	Auto	Y	V2	18	Auto	Y	V1
7	Auto	Y	V3	19	Auto	Y	V1 V2 V3
8	Auto	Y	V1 V2	20	Auto	Y	V1
9	Auto	Y	V3	21	Auto	Y	V2 V3
10	Auto	Y	V1	22	Auto	Y	V1
11	Auto	Y	V3	23	Auto	Y	V2 V3
12	Auto	Y	V2	24	Auto	Y	V1
VLAN/Mode/Trunking/Default (V/M/T/D) ?							

---

## Port Setting

When connecting the Switch to legacy networking equipments, it may be necessary to disable auto-negotiation and flow control. This can be done by selecting “M” at the terminal mode main menu and then select the desire port speed, duplex mode, and flow control on /off.

## Auto-Negotiation

Every TX ports on the switch is capable of auto-negotiate 10/100Mbps and full or half- duplex. However, at times it might need to disable this function in order to accommodate operations involving legacy equipment. The duplex and speed can be altered by enter [M] on the configuration manual. Please see next page for detailed information.

## Flow-Control

This flow control mechanism is set up between the two stations on the point-to-point link. If the receiving station at the end becomes congested, it can send back a frame called a "pause frame" to the source at the opposite end of the connection that instructs that

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station to stop sending packets for a specific period of time. The sending station will wait the requested time before sending more data. The receiving station can also send a frame back to the source with a time-to-wait of zero and instruct the source to begin sending data again.

The flow-control mechanism of this switch can be turned off to accommodate special needs at different network environments. Information below illustrate steps of changing the speed/duplex mode setting or to toggle flow control ON/OFF:

Enter **[M]** (don't need to hit **[ENTER]** after this )

Select a port

Select the media (0~5) from the list that appears on the screen

Note: Only one port can be configured at a time.

Consult the following chart for a brief description:

#	Communication Media	Description
0	Flow control	Toggles off/on
1	Auto	Auto-Negotiation
2	100FD	100Mbps at full duplex mode

---

3	100HD	100Mbps at half duplex mode
4	10FD	10Mbps at full duplex mode
5	10HD	10Mbps at half duplex mode

---

Example:

Enter [M]

Select port 6

Select communication media 5

View the results on the following illustration.

24-port 10/100 Base Ethernet Switch							
VLAN Port List							
V1, 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24							
V2 < empty >							
V3 < empty >							
V4 < empty >							
Port	Mode	FLW	VLAN	Port	Mode	FLW	VLAN
1	Auto	Y	V1 V2 V3	13	Auto	Y	V2
2	Auto	Y	V1	14	Auto	Y	V1
3	Auto	Y	V1	15	Auto	Y	V1
4	Auto	Y	V2	16	Auto	Y	V3
5	Auto	Y	V2	17	Auto	Y	V1
6	10HD	Y	V2	18	Auto	Y	V1
7	Auto	Y	V3	19	Auto	Y	V1 V2 V3
8	Auto	Y	V1 V2	20	Auto	Y	V1
9	Auto	Y	V3	21	Auto	Y	V2 V3

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10	Auto	Y	V1	22	Auto	Y	V1
11	Auto	Y	V3	23	Auto	Y	V2 V3
12	Auto	Y	V2	24	Auto	Y	V1
VLAN/Mode/Trunking/Default (V/M/D) ?							

---

When the optional module is installed, port 16 (for TE100-S1616V) or port 20 (for TE100-S2424V) will be automatically disabled. However, on the switch configuration program, port #16 or #20 will show status of the optional module. The port setting for the optional module is slightly different from the regular port.

Consult the following chart for a brief description:

#	Communication Media	Description
0	Flow control	Toggles off/on
1	FX FD	100Mbps at full duplex mode
2	FX HD	100Mbps at half duplex mode



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## Trunking

Trunking is a method of physically links several ports together to act as a single port with higher bandwidth. This switch offers you the choices of 2 ports or 4 ports trunking. Follow these steps to configure trunking.

?? Enter [T]

Select [A] for 2-port trunking or select [B] for 4-port trunking

View the results on the following illustration.

24-port 10/100 Base Ethernet Switch						
VLAN/Media/Default/Trunk (V/M/D/T) ? T						
Select Trunk Port						
A. 1, 2						
B. 1, 2, 3, 4						
? A						
Port	Mode	FLW		Port	Mode	FLW
1	Auto	Y	Trunk	13	Auto	Y
2	Auto	Y	Trunk	14	Auto	Y
3	Auto	Y		15	Auto	Y
4	Auto	Y		16	Auto	Y
5	Auto	Y		17	Auto	Y
6	10HD	Y		18	Auto	Y
7	Auto	Y		19	Auto	Y

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8	Auto	Y	20	Auto	Y
9	Auto	Y	21	Auto	Y
10	Auto	Y	22	Auto	Y
11	Auto	Y	23	Auto	Y
12	Auto	Y	24	Auto	Y

Networking Examples

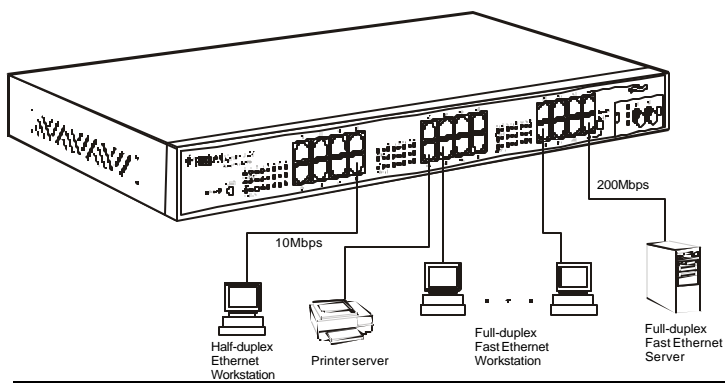


Figure 8: High-speed connections for a small workgroup

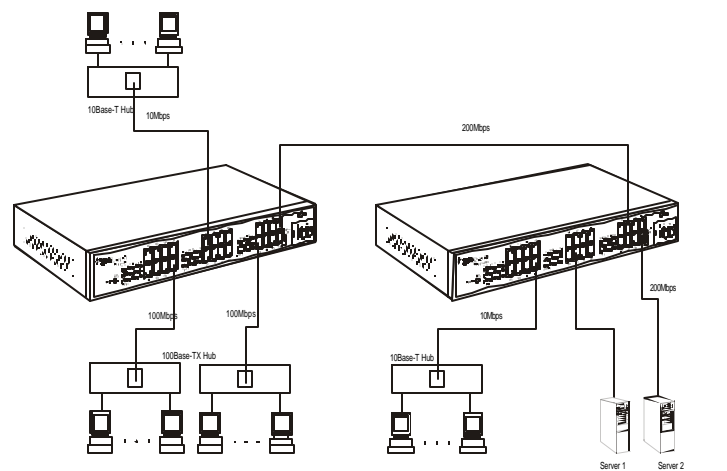


Figure 9: Collapsed backbone for workgroups

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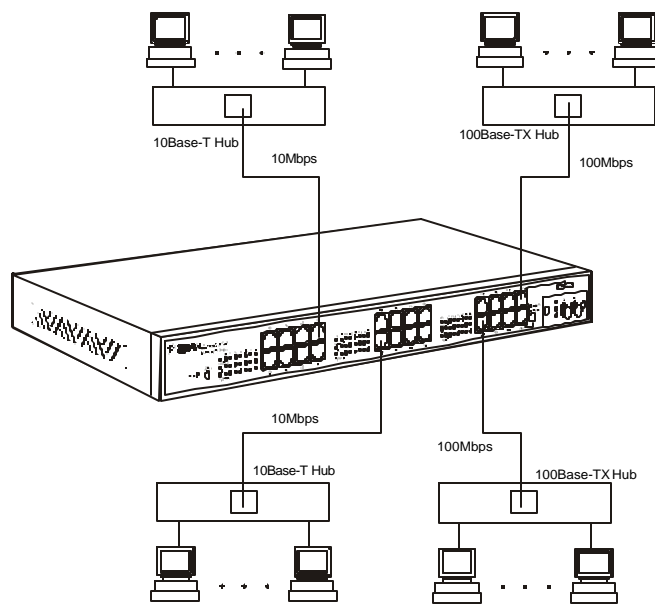


Figure 10: Bridging existing hub-based 100BASE-TX and 10BASE-T network

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## Specifications

TE100-S1616V/TE100-S2424V

Applicable Standards	10BASE-T, IEEE 802.3 100BASE-TX & 100BASE-FX, IEEE 802.3u		
Ports	16/24 10/100-BASE-T/TX		
Speed	100BASE-FX:	200Mbps	full-duplex
		100Mbps	half-duplex
	100BASE-TX:	200Mbps	full-duplex
		100Mbps	half-duplex
	10BASE-TX:	20Mbps	full-duplex
		10Mbps	half-duplex
Performance	148,800bps forwarding rate per port for 100Mbps.		
LED Indicators	Power, Link, Activity, 100Mbps, Full-duplex, Collision		
Module LED Indicators	100/TX, 10/RX, FDX/COL		

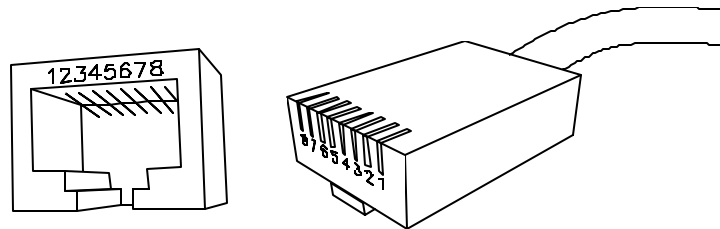
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Dimensions	440 X 205 X 45 mm Rackmount Size 17.3 X 8.1 X 1.8 inch Rackmount Size
Weight	2.8kg 6.2lb
Power Input	100 ~ 250 Vac, 47/63 Hz, 2 A
Power Consumption	20 W
Operating Temperature	0° ~ 40°C 32° ~ 104°F
Humidity	10 ~ 90%, non-condensing
Altitude	3048 m 10,000 ft
Emissions	FCC part 15 Class A, CISPR Class A, VCCI-I CE Mark
Safety	UL, CSA, TUV/GS

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## Appendix A - Connector Pinouts

Pin arrangement of RJ-45 connectors



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Figure 11: RJ-45 Connector and Cable Pins

The following table lists the pinout of 10/100BASE-T/TX ports

Table 4: Connector Pin-Out

Pin	Regular Ports	Uplink port
1	Input Receive Data +	Output Transmit Data +
2	Input Receive Data -	Output Transmit Data -
3	Output Transmit Data +	Input Receive Data +
4	NC	NC
5	NC	NC
6	Output Transmit Data -	Input Receive Data -
7	NC	NC
8	NC	NC



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## **Appendix B - Introduction to LAN & Ethernet Technologies**

As communication and business applications become increasingly complex, computer networking has evolved as a very important part of the infrastructure.

Communication systems like Local Area Network (LAN) evolved into sophisticated, powerful, yet flexible technology. Among the different types of LAN technologies, Ethernet represents the best in speed, cost, ease of installation, and supportability.

### **LAN**

Local Area Network (LAN) technology gave personal computers the power to share resources of hardware and software. LAN connects personal computers, file servers, printers, etc. together within a geographical area, usually a single building. Multiple, widely dispersed LAN systems are referred to as a wide area network (WAN).

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### **Ethernet Technologies**

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More than 80 percent of all LANs utilize Ethernet technology. The Institute of Electrical and Electronic Engineers (IEEE) standardized Ethernet in IEEE 802.3, which provides for configuration rules, interaction requirements, types of media, and data rate.

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## **Fast Ethernet**

For networks that need higher transmission speeds, a faster speed was developed and IEEE next established IEEE 802.3u, raising the Ethernet speed from 10 Mbps to 100 Mbps. Thus, fast Ethernet arose and users quickly began converting from 10Mbps to 100Mbps.

## **Gigabit Ethernet**

The demand for even higher speed created the gigabit Ethernet at 1000Mbps (or 1Gbps). The newer IEEE standard for gigabit Ethernet is IEEE 802.3z. The only cabling media approved is the fiber-optic pair. Watch for 10gig Ethernet.

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## **Ethernet Products**

### **Hub**

One of the earlier connection solutions for Ethernet, a hub (also called a repeater) operates by broadcasting data to all ports simultaneously, only to repeat it when it is not received. The hub works through a “shared network” with all of the nodes in the network segment sharing the same collision domain. Switches and bridges emerged because of a need to separate collision domains that are too large, therefore improving performance and network reliability.

### **Switch**

A switch solves the collision problem by working as a single domain. A Switch maps the physical Ethernet addresses of the nodes residing on each network segment and then allows only the necessary traffic to pass through. Packets of data are transmitted along with the destination and source segment.

There are two basic architectures of LAN switches, cut-through and store-and-forward. Cut-through switches consider only the destination address before forwarding it on to its destination segment, but store-and-forward architecture accepts and then analyzes the entire packet before forwarding. This allows the switch to stop certain packet errors from propagating through the

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network. The store-and forward switch eliminates redundant or corrupted packets, thus increasing the efficiency of the network transmission.

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## Appendix C – VLANs

Virtual local area network (VLAN) is a network configuration in which nodes are grouped into logical, rather than physical networks. Figure 12 & 13 below shows the difference between LAN and VLAN. The segmentation in VLAN creates secured areas where sensitive information is not shared and creates its own broadcast domain within the group to effectively reduce broadcast traffic, providing higher network efficiency and security.

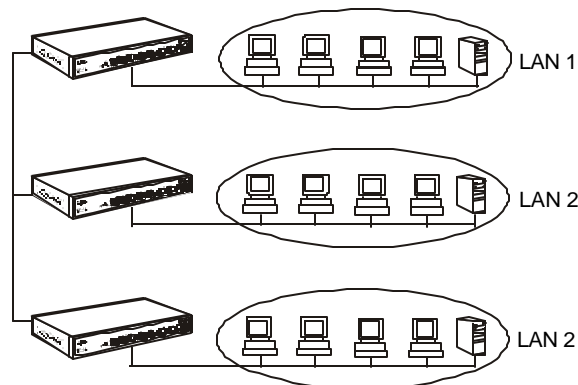


Figure 12: LAN Segmentation

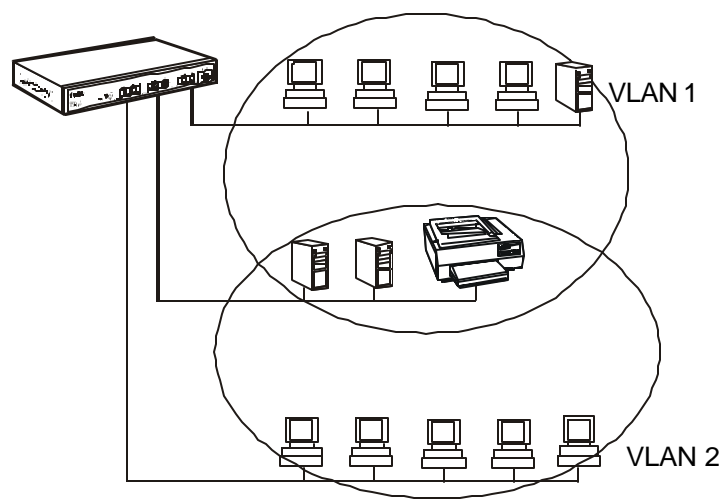


Figure 13: VLAN Segmentation