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SWITCH

23 JUN 2007

LBS216AE  
LBS224AE-R2

16 / 24 Ports Fast Ethernet Switch  
High Port Co  
Cost-Effective  
Flexibility through Single-Port Fiber Module  
Support Port-Based Trunking (24 Port)  
Support MAC-Based Trunking (16 Port)  
Standards-Compliant



User's Manual

70-NX1616CD-01

## **FCC Statement**

The FCC (Federal Communications Commission) restricts the amount of radio frequency emission and radiation coming from computer equipment.

The equipment introduced in this manual 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 is required to correct the interference at his/her own expense.

Any changes or modifications not expressly approved by the manufacturer would void the user's authority to operate the equipment.

## **Trademarks**

Product names mentioned in this manual may be trademarks or registered trademarks of those products.

All trademarks or brand names mentioned are properties of their respective companies.

# Preface

This manual describes how to install and use the 16 / 24 Ports Fast Ethernet Switch. The switch introduced here auto-negotiates the presence of 10/100Mbps and full/half-duplex mode. In addition, it allows an optional 100BASE-FX multi-mode or single-mode fiber module, enabling long distance connection. The 16-Port Switch supports MAC-Based Trunking and PORT-Based VLAN. The 24-Port Switch supports PORT-Based VLAN and PORT-Based Trunking technologies.

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

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

In this manual, you will find:

- Introduction on the Switch
- Product features
- Illustrative LEDs functions
- Installation instructions
- Configuration instructions for VLAN & Trunking
- Specifications
- Tutorial information for Ethernet technologies
- Troubleshooting Guide

# Table of Contents

**FCC STATEMENT** ..... 1

**TRADEMARKS** ..... 1

**PREFACE** ..... 2

**TABLE OF CONTENTS** ..... 3

**PRODUCT OVERVIEW** ..... 5

  FRONT VIEW ..... 5

  PACKAGE CONTENTS ..... 5

  PRODUCT FEATURES ..... 5

  FRONT PANEL DISPLAY ..... 6

  PHYSICAL PORTS ..... 7

*Understanding Front Panel Design* ..... 8

**INSTALLATION** ..... 10

  SELECTING A SITE FOR THE EQUIPMENT ..... 10

  DECIDING HOW TO INSTALL ..... 11

  HOW TO INSTALL MODULE ..... 11

*Jumper Settings* ..... 12

  CONNECTING TO POWER ..... 13

  CONNECTING TO YOUR NETWORK ..... 14

*Cabling* ..... 15

*Network Segmentation* ..... 16

**SWITCH CONFIGURATION** ..... 17

  SETTING UP CONSOLE PORT CONNECTION ..... 17

  MAIN MENU ..... 18

  PORT SETTINGS ..... 20

  VLAN ..... 22

  PORT-BASED & MAC-BASED TRUNKING DIFFERENCE ..... 26

<b>MAC-BASED TRUNKING FOR THE 16-PORT SWITCH</b> .....	27
<i>Trunking Rules</i> .....	27
<i>Trunking Setting</i> .....	28
<b>PORT-BASED TRUNKING FOR THE 24-PORT SWITCH</b> .....	30
<i>Trunking Rules</i> .....	30
<i>Trunking Setting</i> .....	31
<b>TECHNICAL SPECIFICATIONS</b> .....	33
<b>PHYSICAL SPECIFICATIONS</b> .....	34
<b>APPENDIX A – CONNECTOR PINOUTS</b> .....	35
<b>APPENDIX B – INTRODUCTION TO LAN &amp; ETHERNET TECHNOLOGIES</b> .....	36
<b>LAN</b> .....	36
<b>ETHERNET TECHNOLOGIES</b> .....	37
<i>Fast Ethernet</i> .....	37
<i>Gigabit Ethernet</i> .....	37
<b>ETHERNET PRODUCTS</b> .....	38
<i>Hub</i> .....	38
<i>Switch</i> .....	38
<b>APPENDIX C – VLANs</b> .....	39
<b>APPENDIX D– TROUBLESHOOTING GUIDE</b> .....	41
<b>NO POWER TO THE SWITCH</b> .....	42
<b>POWER LED FAILURE</b> .....	43
<b>NO CONNECTIVITY TO THE DATA TERMINAL EQUIPMENT</b> .....	44
<b>NO CONNECTIVITY TO CERTAIN NODES ON THE NETWORK</b> .....	46
<b>POOR PERFORMANCE</b> .....	47
<b>ORDERING INFORMATION</b> .....	48

## Product Overview

### Front View

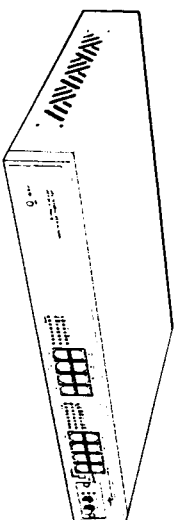


Figure 1 : 16-Port Fast Ethernet Switch

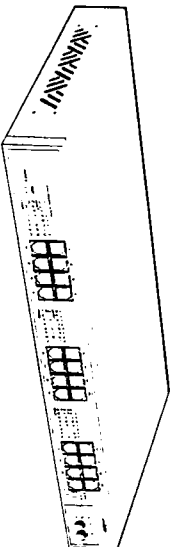


Figure 2: 24-Port Fast Ethernet Switch

### Package Contents

When you unpack the product package, you shall find these items listed below.

- ✓ The 16 / 24 Ports Switch
- ✓ One AC power cord
- ✓ User's Manual
- ✓ Accessories: brackets (2 pcs) & bracket screws (6 pcs)

Please inspect the contents, and report any apparent damage or missing items immediately to your authorized reseller.

## Product Features

- ◆ PLUG-AND-PLAY
- ◆ PROVIDES 16 OR 24 × 10/100Mbps PORTS USING RJ-45 CONNECTORS
- ◆ AN OPTIONAL SINGLE-PORT FIBER MODULE ALLOWS:
  - 100BASE-FX MULTI-MODE FIBER WITH SC, ST, MT-RJ OR VF-45 CONNECTOR
  - 100BASE-FX SINGLE-MODE FIBER WITH SC CONNECTOR
  - 10BASE2 WITH BNC CONNECTOR
- ◆ AUTO-NEGOTIATION FOR SPEED AND DUPLEX MODE ON TX PORTS
- ◆ TRUE NON-BLOCKING ARCHITECTURE
- ◆ FULL WIRE SPEED FORWARDING RATE
- ◆ STORE-AND-FORWARD MECHANISM
- ◆ BACK-PRESSURE AND IEEE 802.3X COMPLIANT FLOW CONTROL
- ◆ SUPPORTS 8K MAC ADDRESSES FOR THE 16-PORT SWITCH
- ◆ SUPPORTS 2K MAC ADDRESSES FOR THE 24-PORT SWITCH
- ◆ FRONT PANEL RESET BUTTON
- ◆ ONE PUSH-BUTTON FOR UPLINK
- ◆ FRONT PANEL PORT STATUS LEDs
- ◆ STANDARD 19" RACKMOUNT SIZE, ONE-UNIT-HEIGHT
- ◆ ADEQUATE VENTILATION
  - PROVIDES COOLING FANS AT THE BACK
  - VENTILATION HOLES ON EACH SIDE
- ◆ BASIC MANAGEMENT SUPPORT
  - PORT-BASED VLAN & MAC-BASED TRUNKING FOR THE 16-PORT SWITCH
  - PORT-BASED VLAN & PORT-BASED TRUNKING FOR THE 24-PORT SWITCH
  - PROGRAMMABLE RE-CONFIGURATION FOR FIXED DUPLEX MODE

## Front Panel Display

An array of LED indicators on the front panel provides you with instant feedback on each port status, and, helps you monitor and troubleshoot the switch.

- ① Power
- ② Reset Button
- ③ Uplink Button
- ④ Port Status
- ⑤ Port Status on Fiber Module

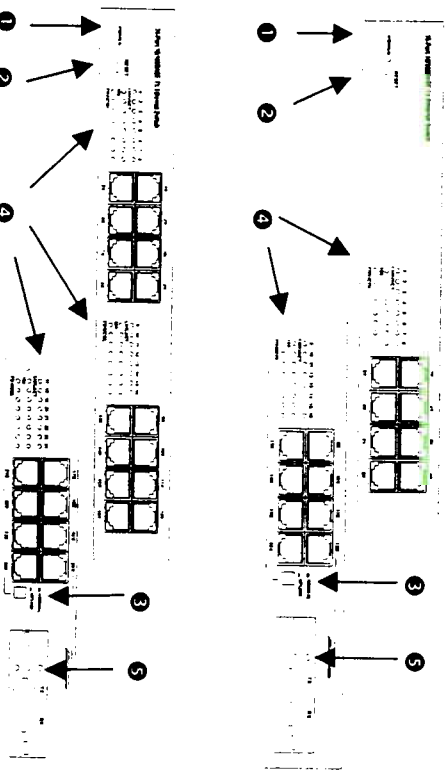


Figure 3. Front Panel LEDs

● **Power**  
This LED comes on when the switch is properly connected to power and turned on.

● **Reset Button**  
If the switch should become unresponsive, you may reset it by pressing this button.

● **Uplink Button**  
The uplink button is located at the right side of port 16X on the 16-Port Switch or port 24X on the 24-Port Switch.

Connect port 16X or 24X to another switch or hub, and depress this button for the uplink function.

● **Port Status**  
The RJ-45 ports numbered from 1X to 16X in two sections on the 16-Port Switch, or 1X to 24X in three sections on the 24-Port Switch. Each section consists of eight ports.

The LEDs are located at the left side of each section, displaying status for each respective port. Please refer to the table below for more information.

● **Port Status on Single-Port Module**  
A set of three LEDs conveys the port status of the single-port module.

Consult the following table for details.

ⓘ Before you use this table for troubleshooting, make sure the switch is properly connected to power and turned on.

**Physical Ports**

The 16 / 24 Ports Switch has sixteen or twenty-four 10/100Mbps ports using RJ-45 connectors and provides one optional slot for single-port fiber module. The optional module allows fiber type (multi-mode or single-mode fiber) and connector (SC, ST, MT-RJ or VF-45) at user's discretion.

When the module is installed, port 20X on the 24-Port Switch is disabled. But for the 16-Port Switch, all the switch ports are available for use when the module is inserted.

**UNDERSTANDING FRONT PANEL DESIGN**

<b>Power LED</b>	On	Power feeding in	
	Off	Power switched off	
<b>Reset Button</b>	***	Press to reset	
<b>Port LED</b>	<b>LNK/ACT</b>	On	A valid network connection
		Flashing	LNK stands for LINK
	100	Flashing	Transmitting or receiving data
		ACT stands for ACTIVITY	
		Off	No connection
		On	A valid 100Mbps connection
FDX/COL	On	100 stands for 100Mbps	
	Off	A valid 10Mbps connection	
<b>Single-Port Module LED</b>	100/TX	On	Full duplex mode
		Flashing	FDX stands for Full Duplex
	10/RX	Flashing	Collision occurred
		COL stands for Collision	
		Off	Half duplex mode
		On	A valid 100Mbps connection
FDX/COL	Flashing	100 stands for 100Mbps	
	On	Transmitting data	
Off	TX stands for Transmit		
	No connection		
Flashing	Receiving data		
	RX stands for Receive		
Off	Full duplex mode		
	FDX stands for Full Duplex		
Flashing	Collision occurred		
	COL stands for Collision		
Off	Half duplex mode		
	Half duplex mode		

## Installation

### Selecting a Site for the Equipment

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

- The ambient 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 (RF) standards for IEC 801-3, Level 2 (3V/M) field strength.
- Make sure that the equipment receives adequate ventilation. Do not block the ventilation holes on each side of the switch or the fan exhaust port on the side or rear of the equipment.
- The power outlet should be within 1.8 meters of the switch.

### Deciding How to Install

#### *MOUNTED TO 19-INCH STANDARD RACK*

Locate the accessories supplied in the product package. Use the rackmount brackets and screws to install the switch into any EIA 19" standard rack.

- Step 1:** Attach the brackets to each side of the chassis.
- Step 2:** Apply the screws to each side and secure them tightly.
- Step 3:** Carefully position the switch into the rack.
- Step 4:** Align the brackets to the side holes on the rack and use rack screws to secure the chassis with the rack.
- Step 5:** Proceed to the "Connecting to Power" section.

#### *DESKTOP OR ANY FLAT SURFACE*

The switch can sit on desktop or any flat surface with adequate space and ventilation. If you want to place it onto a shelf, make sure the shelf can withstand the weight of the switch.

- Step 1:** Simply put the switch on the desired place.
- Step 2:** Ensure the switch receives good ventilation.
- Step 3:** Proceed to the "Connecting to Power" section.

## How to Install Module

Consult the following illustrations before installation.

**Step 1:** Make sure the power is switched off. The module is not hot-swappable. **Ⓢ** It may cause electric shock or any possible damage to the switch if the power is not switched off.

**Step 2:** Remove the module from the static-free container.

**Step 3:** Unscrew the cover plate of the expansion slot. (The slot for single-port module is located at the right side of the switch.)

**Step 4:** Remove the plate. (Keep it for future use when you decide to remove this module later.)

**Step 5:** Carefully slide the module into the slot, following the internal plastic guide rails.

**Step 6:** Once it is fully slid in, snap in the module to make a proper connection.

**Step 7:** Fasten the module screws then.

**Step 8:** Finally, turn on the power.

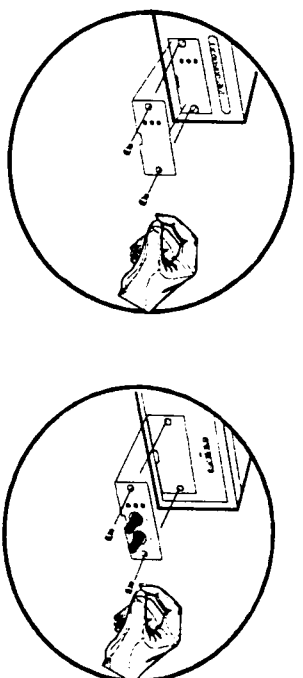


Figure 4: Removal of cover plate

Fiber module being installed

### JUMPER SETTINGS

The fiber module arrives with pre-set jumpers and should not be reset. Use the jumper settings for trouble-shooting purposes only.

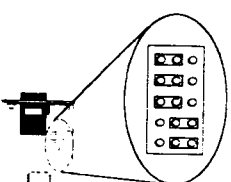


Figure 5: Proper jumper settings for fiber module.



## Connecting to Power

Locate the supplied AC power cord.

**Step 1:** Connect the AC power cord to the receptacle at the back of the switch.

**Step 2:** Attach the plug into a standard AC outlet with a voltage range from 100~260Vac.

**Step 3:** Locate the power ON/OFF switch beside the receptacle at the back. Turn on the switch by flipping the ON/OFF switch to ON position. The power LED on the front panel will come on then.

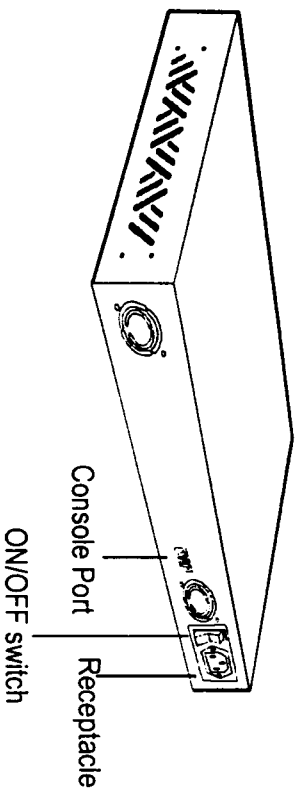


Figure 6: Rear view of the switch

## Connecting to Your Network

### CABLING

**Step 1:** First, ensure the power of the switch and end devices is turned off.

**!** It may cause electric shock or any possible harm to you if the power is not switched off.

**Step 2:** Prepare cable with corresponding connectors for each type of port in use. Consult the table below for cabling requirements based on connectors and speed considerations.

**Step 3:** Connect one end of the cable to the switch and the other end to a desired device.

**Step 4:** Once the connections between two end devices are made successfully, turn on the power and the switch is operational.

**NETWORK SEGMENTATION**

The maximum segment distance between a node and a directly connected switch port on a 100BASE-FX network is 75 km using 10/125(or 9/125) $\mu$ m single-mode fiber optic cable. It is capable of spanning at most 2 kilometers when use of 62.5/125(or 50/125) $\mu$ m multi-mode fiber-optic cable.

Cable Specifications Table

Ethernet Standards	Connector	Port Speed Half/Full Duplex	Cable	Max. Distance
10BASE2	BNC	10/20 Mbps	Coaxial	185 m
10BASE-T	RJ-45	10/20 Mbps	Cat. 3, 4 or 5 UTP/STP	100 m
100BASE-TX	RJ-45	100/200 Mbps	Cat. 5 UTP/STP	100 m
100BASE-FX Multi-mode	ST, SC, MT-RJ, VF-45	100/200 Mbps	62.5/125 $\mu$ m multi-mode fiber	2 km
100BASE-FX Single-mode	SC	100/200 Mbps	10/125 $\mu$ m single-mode fiber	15 km
100BASE-FX Single-mode	SC	100/200 Mbps	10/125 $\mu$ m single-mode fiber	40 km
100BASE-FX Single-mode	SC	100/200 Mbps	10/125 $\mu$ m single-mode fiber	75 km

**Switch Configuration**

This section explains the configuration of VLAN and trunking settings.

**Setting up Console Port Connection**

To configure your switch through the console port, it is necessary to first configure a terminal emulation program. The HyperTerminal for Windows 95, 98, and NT is suggested.

- Step 1:** First, check if the switch, cables, and computers are all proper connected.
- Step 2:** Connect a PC or any VT100 compatible terminal to the console port at the back of the switch using one RS232 serial cable.
- Step 3:** Turn on both end devices.
- Step 4:** Configure the baud rate and character format of the terminal or PC to match the default settings shown below.

Console Port Default Settings

Terminal type	VT100
Port type	(COM 1~4)
Communication Mode	8 data bits 1 stop bit No parity baud rate of 9600bps (For initial configuration)
Flow Control	Yes
Hardware Compression	N/A

**Main Menu**

- Press any key to view the main menu shown below. Here we take the 24-Port Switch for example.

```

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 >
V4 < empty >
Port Mode FLW VLAN LIST Port Mode FLW VLAN LIST
1 Auto Y V1 13 Auto Y V1
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
VLANMode/Trunking/Default (V/M/T/D)?
    
```

Mode = Speed and Duplex mode  
 FLW = Flow Control

ⓘ The main menu may have some slight changes due to a version update without any further notice.

- ◆ THIS MAIN MENU SHOWS YOU THE DEFAULT CONFIGURATION OF THE SWITCH.
- ◆ DEFAULT SETTINGS:
  - ALL TX PORTS ARE SET AUTO-NEGOTIATION
  - ALL PORTS ARE SET AT FLOW CONTROL ON
  - ALL PORTS ARE ASSIGNED TO V1 (VLAN GROUP 1)
- ◆ THESE ARE THE VALID COMMANDS; CAPITALIZATION IS NOT REQUIRED:
  - [M]** Configure VLAN groups
  - [M]** Select half or full-duplex mode, Flow control
  - [T]** Select Trunking
  - [D]** Restore the default settings
  - [ESC]** Abort the menu at any time
  - ◆ A PROMPT APPEARS TO VERIFY THE COMMAND YOU KEY.

## Port Settings

For each port, the duplex mode and speed can be altered and the flow control can be turned off to accommodate special needs.

Follow these steps to change the duplex/speed mode setting or to toggle flow control ON/OFF:

**Step 1:** Enter [M] (no need to press [Enter])

**Step 2:** Select a port

**Step 3:** Select a desired mode from the list that appears on the screen

**Step 4:** Only one port can be changed at a time.

### TX PORTS

Consult the following table for a brief mode description on ports:

Mode Setting on TX Ports

#	Communication Mode	Description
0	Flow control on/off	Toggles off/on
1	AUTO	Auto-negotiation
2	100 FD	100Mbps at full duplex mode
3	100 HD	100Mbps at half duplex mode
4	10 FD	10Mbps at full duplex mode
5	10 HD	10Mbps at half duplex mode

### FX PORTS

#### For the 24-Port Switch

When the fiber module is in use, port 20X on the 24-Port Switch is automatically disabled; however, on the switch configuration program, port 20X will show the status of the optional fiber module.

#### For the 16-Port Switch

All the switch ports are available for use when the fiber module is inserted. The port status of the module will be shown as port 17X in the Main Menu for the 16-Port Switch.

Port setting for the fiber port is slightly different from the TX ports.

Consult the following table for a brief mode description on ports:

Mode Setting on FX Ports

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

## VLAN

Virtual Local Area Networks (VLANs) can be seen as a group of end stations or PCs can communicate as if they were on a common LAN, even though they are on multiple physical LAN segments. Basically, the implementation of VLANs brings a limited broadcast domain, meaning that all members of a VLAN receive every broadcast packet sent by members of the same VLAN but not packets sent by members of a different VLAN. All the members of a VLAN are grouped logically into the same broadcast domain independent of their physical location.

### **BENEFITS**

VLAN technology 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 VLANs.

Adds, moves, and changes of nodes on a LAN are achieved within a VLAN via software such as a configuration program. Some end stations or PCs need to be connected to more than one VLAN. For example, a network manager creates a VLAN for every department in a company, and each department manager may need to connect to an executive VLAN as well as a VLAN for their respective departments.

### **VLAN TYPES**

There are several types of VLAN, and port-based VLAN is the most common method of defining VLAN membership. The 16 / 24 Ports Fast Ethernet Switch supports port-based VLAN technology. The deployment of port-based VLANs will help efficiently confine the broadcast traffic to the switch ports.

Please refer to Appendix C – VLANs for basic concepts.

## PORT-BASED VLAN & SETTINGS

The switch supports up to four port-based VLAN domains. Assign each port to a VLAN group or a couple of VLAN groups according to accessibility needs.

Follow these steps to assign ports to a VLAN group:

**Step 1:** Enter [N] (no need to press [Enter])

**Step 2:** Select a VLAN group:  
VLAN# (V1-V4) →

**i** Only one VLAN group can be defined at a time.

**Step 3:** Enter the port # you want to assign to this VLAN.

E.g. type 1,2,3,4,5-24

**i** If you enter more than one port to a VLAN group, separate each port # by a comma without any space.

**Step 4:** Repeat the process of selecting VLAN groups and assigning ports until all ports are assigned to at least one VLAN group.

**i** Although not all VLAN groups need to be utilized, each port must be assigned to at least one VLAN group.

**Step 5:** Press [ESC] when done, or press [D] to return to the default settings

**VLAN Example:**

```
VLANMode/Trunking/Default (V/M/T/D)? V
VLAN ( 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
New port list ->
```

- Enter [V1]
- Key 1,2,3,8,10,14,15, 17,18,19,20,22,24

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

- Enter [V2]
- Key 1,4,5,6,8,12,13,19,21,23
- Enter [V3]
- Key 1,7,9,11,16,19,21,23

**i** The menu displays "error" for each unassigned port. While any port is in the "error" status, you cannot press [ESC] to return to the main menu. Assign each port to a VLAN grouping prior to exiting program.

- View the following results:  
Three VLAN groups have been created successfully.

```
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 LIST	Port	Mode	FLW	VLAN LIST
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	V1
12	Auto	Y	V2	24	Auto	Y	V2 V3

VLANMode/Trunking/Default (V/M/T/D)?

## PORT-Based & MAC-Based Trunking Difference

PORT-Based Trunking was developed based upon the idea of using the physical ports on a PORT-Based Trunking switch that could work with another switch without the trunking function. This makes trunking simpler to implement in an environment where a variety of switches are used. When trunking is enabled on a PORT-Based Trunking switch, it can parallel-link to another switch with or without this feature -- but once the PORT-Based Trunking is enabled, the VLAN on the PORT-Based Trunking switch will be disabled.

One MAC-Based Trunking switch cannot have the trunking function enabled unless another MAC-Based Trunking switch has enabled trunking port. Using the MAC-Based Trunking approach, the trunking and VLAN functions can work together without any problems. Where the trunking and VLAN functions need to be used together, the MAC-Based Trunking approach works more effectively than the PORT-Based Trunking switch.

## MAC-Based Trunking for the 16-Port Switch

The 16-Port Switch supports MAC-Based Trunking, which is capable of a trunking group of either 2 or 4 ports. For a 100BASE-TX/FX network, the 2-port trunking provides a 400Mbps bandwidth connection, while the 4-port trunking an 800Mbps bandwidth connection.

The MAC address is the address of the network interface card. When the packet is transmitting, it will contain the source address and destination address of the NIC. The combination of source and destination address give the switches a direction to determine the trunking ports to depart from if the destination address is on another switch.

### TRUNKING RULES

There are some rules for MAC-Based Trunking setting:

- a. The 16-Port Switch provides two selections of trunking:  
Two-port trunking (Ports # 1X & 2X) with 400Mbps bandwidth  
Four-port trunking (Ports # 1X, 2X, 5X & 6X) with 800Mbps bandwidth
- b. Trunking port setting is only available for Ports # 1X, 2X, 5X & 6X.
- c. For MAC-Based Trunking, it requires two MAC-Based Trunking switches to parallel, and all the trunking ports must be linked together in order to function properly. Therefore, one MAC-Based Trunking switch cannot have the trunking function enabled unless it is linked to another MAC-Based Trunking switch that has enabled trunking port as well.

**TRUNKING SETTING**

Follow these steps to configure trunking.

**Step1:** Enter [T] (no need to press [Enter])

**Step2:** Select [1] for two-port trunking, or [2] for four-port trunking

**①** Selection [1]: The two fixed ports are Ports #s 1X & 2X.  
Selection [2]: The four fixed ports are Ports #s 1X, 2X, 5X & 6X.

**Step3:** Turn off the power of the two connected devices for re-initialization.

**Step4:** Turn on the power again, and the trunking is completed successfully.

**①** For the 16-Port Switch, the VLAN and trunking functions can work together without any problems.

- View the following results:  
You have completed the four-port trunking.

```

16-port 10/100 Base Ethernet Switch
VLAN/Mode/Trunking/Default (V/M/T/D)? T
0 disable
1. 2-port
2. 4-port
Select Trunking Group (0-2)? 2

VLAN Port List
V1 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16
V2 <empty>
V3 <empty>
V4 <empty>
    
```

Port	Mode	FLW	VLAN LIST	Port	Mode	FLW	VLAN LIST
1	Auto	Y	TRUNK V1	9	Auto	Y	V1
2	Auto	Y	TRUNK V1	10	Auto	Y	V1
3	Auto	Y	V1	11	Auto	Y	V1
4	Auto	Y	V1	12	Auto	Y	V1
5	Auto	Y	TRUNK V1	13	Auto	Y	V1
6	Auto	Y	TRUNK V1	14	Auto	Y	V1
7	Auto	Y	V1	15	Auto	Y	V1
8	Auto	Y	V1	16	Auto	Y	V1

```

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



## PORT-Based Trunking for the 24-Port Switch

The 24-Port Switch supports PORT-Based Trunking and provides you the capability of trunking either 2 or 4 ports. For a 100BASE-TX/FX network, the 2-port trunking provides a 400Mbps bandwidth connection, while the 4-port trunking an 800Mbps bandwidth connection.

### TRUNKING RULES

There are some rules for setting up Trunking:

- a. When configuring Trunking, the VLAN function will be automatically disable for the entire switch.
- b. The 24-Port Switch provides two selections of Trunking: Two-port trunking (Ports #1X & 2X) with 400Mbps bandwidth Four-port trunking (Ports # 1X, 2X, 3X & 4X) with 800Mbps bandwidth
- c. Trunking port setting is only available for Ports # 1X, 2X, 3X & 4X.
- d. The trunking port must connect to any ports on another device with the Trunking setting disabled. That means when using Trunking, the ports connected in the two switches cannot be set as a trunking port at the same time; only one switch's ports need to be defined as trunking ports, and the other switch's ports have trunking disabled.
- e. The trunking port can connect to another dual-speed hubs, desktop switches, or any device without a trunking function.

## TRUNKING SETTING

Follow these steps to configure the desired trunking.

**Step 1:** Enter [T] (no need to press [Enter])

**Step 2:** Select [A] for two-port trunking, or [B] for four-port trunking

- ① Selection [A]: The two fixed ports are Ports #s 1X & 2X.
- Selection [B]: The four fixed ports are Ports #s 1X, 2X, 3X & 4X.

**Step 3:** Turn off the power of the two connected devices for re-initialization.

**Step 4:** Turn on the power again, and the trunking is completed successfully.

- ① The VLAN and trunking functions are not allowed to operate at the same time; only one of them is operational at a time. Therefore, the VLAN will be disabled while selecting this PORT-Based Trunking function.

- View the following results:  
You have completed the two-port trunking.

24-port 10/100 Base Ethernet Switch			
VLAN/Mode/Trunking/Default (V/M/T/D)? T			
Select Trunk Port			
A. 1, 2			
B. 1, 2, 3, 4			
? A			
Port	Mode	FLW	Port Mode FLW
1	Auto	Y	13 Auto Y
2	Auto	Y	14 Auto Y
		Trunk	15 Auto Y
3	Auto	Y	16 Auto Y
4	Auto	Y	17 Auto Y
5	Auto	Y	18 Auto Y
6	10HD	Y	19 Auto Y
7	Auto	Y	20 Auto Y
8	Auto	Y	21 Auto Y
9	Auto	Y	22 Auto Y
10	Auto	Y	23 Auto Y
11	Auto	Y	24 Auto Y
12	Auto	Y	
VLAN/Mode/Trunking/Default (V/M/T/D)?			

## Technical Specifications

### 16 / 24 Ports Fast Ethernet Switch

<b>Applicable Standards</b>	IEEE 802.3 10BASE-T IEEE 802.3u 100BASE-TX/FX
<b>Fixed Ports</b>	Sixteen ports for the 16-Port Switch Twenty-four ports for the 24-Port Switch
<b>Optional 1-port Module Type</b>	100BASE-FX multi-mode or single-mode module 10BASE2 BNC module 100BASE-TX/FX
<b>Speed</b>	200Mbps for full-duplex; 100Mbps for half-duplex <b>10BASE-T:</b> 20Mbps for full-duplex; 10Mbps for half-duplex Store-and-Forward
<b>Switching Method</b>	148,800pps forwarding rate per port for 100Mbps 14,880pps forwarding rate per port for 10Mbps
<b>Performance</b>	Power
<b>Chassis LED Indicators</b>	For fixed ports: LNK/ACT; 100; FDX/COL (3 LEDs) For 1-port module: 100/TX; 10/RX; FDX/COL (3 LEDs)
<b>Module LED Indicators</b>	

## Physical Specifications

### 16 / 24 Ports Fast Ethernet Switch

<b>Dimensions</b>	440 x 205 x 45 mm (17.3 x 8.1 x 1.8 inch) 19" Rackmount Size, 1U
<b>Weight</b>	Approx. 2.8kg
<b>Power Input</b>	100 ~ 260 Vac, 47~63 Hz
<b>Input Fuse</b>	2A
<b>Power Consumption</b>	15W Max. for the 16-Port Switch 30W Max. for the 24-Port Switch
<b>Operating Temperature</b>	0° ~ 40°C (32° ~ 104°F)
<b>Storage Temperature</b>	-25° ~ 70°C (-13° ~ 158°F)
<b>Humidity</b>	10 ~ 90%, non-condensing
<b>Emissions</b>	FCC part 15 Class A, CISPR Class A, VCCI Class A, CE Mark
<b>Safety</b>	UL

## Appendix A – Connector Pinouts

Pin arrangement of RJ-45 connectors:

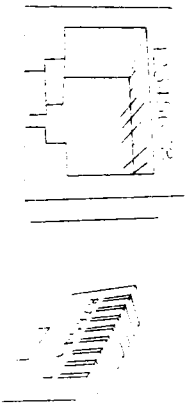


Figure 7: RJ-45 Connector and Cable Pins

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

Table 6: 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

## 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 gives 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).

### Ethernet Technologies

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.

#### *FAST ETHERNET*

For networks that need higher transmission speed, 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. Watch for 10Giga Ethernet.

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

## Appendix C – VLANs

Virtual local area network (VLAN) is a network configuration in which nodes are grouped into logical rather than physical networks. Figures 11 & 12 below show 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.

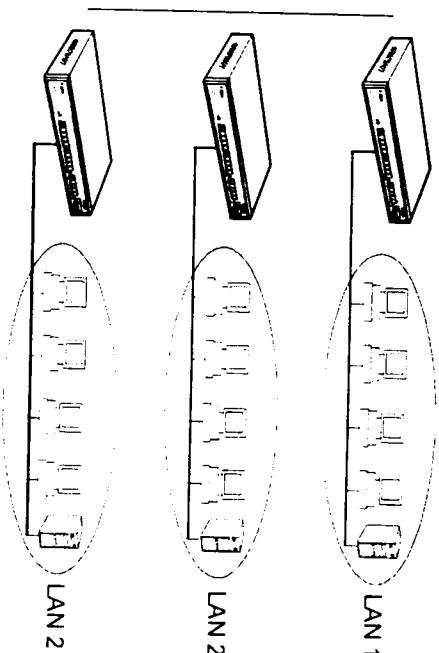


Figure 8: LAN Segmentation

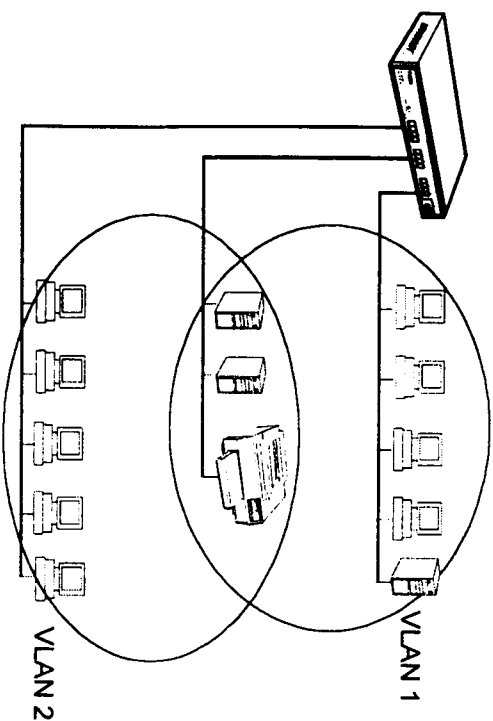


Figure 9: VLAN Segmentation

## Appendix D– Troubleshooting Guide

This section is to help you diagnosing common switch problems. The guide describes possible causes and solutions to several regular problems. The problems are grouped into states from startup to where the unit is up and running.

The front panel indicators of the switch provide an easy way for network manager to monitor status and identify problems.

Make sure that all system peripherals are properly installed. If any items appear to be malfunctioning such as the power cord or network cabling or the adaptor, test one at a time in an environment where all the other peripherals are functioning properly.

- ❗ Do not change any components in the switch by yourself. Please return the switch to your authorized re-seller for proper handling when necessary.

**No Connectivity to the Data Terminal Equipment****Symptom:**

Link LED does not come up when the connection is established; the switch cannot communicate with the directly connected computers or network segment.

**Possible Cause & Solution:**

1. Power Not Turned On
    - Make sure the power of both connected devices is turned on.
  2. Incorrect or Faulty Cabling
    - Make sure you are using the correct cable, which meets the specifications, e.g. type, length.
      - \* Use a straight-through cable to connect to a PC or a NIC.
      - \* Use a straight-through cable to connect to the Uplink port on the switch with the Uplink button pressed down.
      - \* Use Cat. 5 UTP for 100BASE-TX.
      - \* Use Cat. 3, 4, 5 UTP for 10BASE-TX.
      - \* Use fiber optic for 100BASE-FX.
  - Make sure the cable is correctly wired. Refer to the user's manual for information on cable pinouts. Use a TDR or other cable-checking device to verify that the cable has no opens, shorts, or other problems.
3. Loose Connection
    - Make sure the cable is properly and firmly connected to both devices.
  4. Malfunctioning NIC on Attached Devices
    - Run the diagnostic supplied by the NIC vendor to determine if it is functioning properly. If not, replace it.
  5. Packet Overflow or Hardware Problem
    - If the Link LED is not on and the cabling is intact, then reset the switch by pressing the reset button.
    - After resetting, if the switch still cannot communicate with other segments of the network, contact our authorized reseller then.

## Ordering Information

For your convenience, you may copy this page for ordering service.

Please tick the items you desired and return this paper to us by facsimile.

16 / 24 Fixed Ports		Single-Port Module			
Cable Connector	Distance	Speed	Cable (/125µm) Connector	Distance	✓
100BASE-TX: Cat. 5 UTP/STP RJ-45	100m	10BASE2	Coaxial BNC	185m	
		100FX	MMF (50µm or 62.5µm) SC	2km	
OR	100FX	100FX	MMF (50µm or 62.5µm) ST	2km	
		100FX	MMF (50µm or 62.5µm) MT-RJ	2km	
10BASE-T: Cat. 3, 4 or 5 UTP/STP RJ-45	100FX	100FX	MMF (50µm or 62.5µm) VF-45	2km	
		100FX	SMF (9µm or 10µm) SC	15km	
	100FX	100FX	SMF (9µm or 10µm) SC	40km	
		100FX	SMF (9µm or 10µm) SC	75km	

- i** The maximum node-to-node network distance is in full-duplex operation.
- ii** MMF denotes Multi-Mode Fiber. SMF denotes Single-Mode Fiber.
- iii** Fiber wavelength is 1300nm unless specified.