SmartSTACK 10
ELS10-26 USER GUIDE

CABLETRON
SYSTEMS

The Complete Networking Solution™
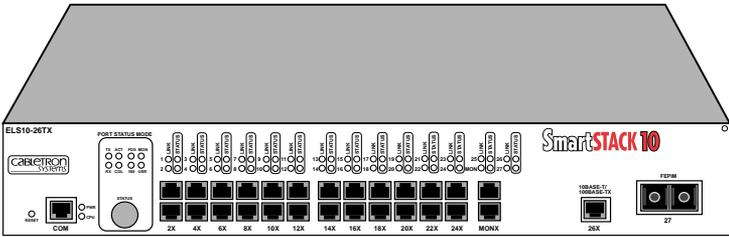
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Manufacturer's Name:	**Cabletron Systems, Inc.**
Manufacturer's Address:	**35 Industrial Way** **PO Box 5005** **Rochester, NH 03867**
European Representative Name:	**Mr. J. Solari**
European Representative Address:	**Cabletron Systems Limited** **Nexus House, Newbury Business Park** **London Road, Newbury** **Berkshire RG13 2PZ, England**
Conformance to Directive(s)/Product Standards:	**EC Directive 89/336/EEC** **EC Directive 73/23/EEC** **EN 55022** **EN 50082-1** **EN 60950**
Equipment Type/Environment:	**Networking Equipment, for use in a** **Commercial or Light Industrial** **Environment.**

We the undersigned, hereby declare, under our sole responsibility, that the equipment packaged with this notice conforms to the above directives.

Manufacturer	Legal Representative in Europe
Mr. Ronald Fotino	Mr. J. Solari
Full Name	Full Name
Principal Compliance Engineer	Managing Director - E.M.E.A.
Title	Title
Rochester, NH, USA	Newbury, Berkshire, England
Location	Location

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CHAPTER 1

INTRODUCTION

1.1 ABOUT THIS MANUAL

This manual is for system administrators responsible for configuring, monitoring, and maintaining the SmartSTACK 10 ELS10-26TX. You should have a familiarity with networking concepts and principles. In addition, a basic understanding of SNMP is helpful.

Some SmartSTACK 10 ELS10-26 configurations can only be done using an SNMP-based Network Management System (NMS). Where applicable, this manual provides instructions for using the Local Console Manager (LCM) to perform basic configuration. Where it is not possible to use LCM, general instructions and guidelines applicable to most NMSs are provided.

The contents of each chapter are described below.

- Chapter 1, **Introduction**, outlines the contents of this manual and provides an overview of the SmartSTACK 10 ELS10-26's switching functions, applications, and the Local Console Manager (LCM).

- Chapter 2, **Unpacking and Installing Your ELS10-26**, describes the SmartSTACK 10 ELS10-26 front and rear panels, how to install the SmartSTACK 10 ELS10-26, how to connect the Local Console Manager (LCM), and how to connect the ELS10-26 to the network.

- Chapter 3, **Configuring Your ELS10-26**, provides instructions for configuring the SmartSTACK 10 ELS10-26 using the Local Console Manager (LCM). It also provides some common Management Information Base (MIB) variables you may want to change.

- Chapter 4, **Monitoring and Managing Your ELS10-26**, describes how to monitor SmartSTACK 10 ELS10-26 status and statistics. It also describes how to manage the SmartSTACK 10 ELS10-26 Ethernet ports using the Local Console Manager (LCM).

- Chapter 5, **ELS10-26 Diagnostics and Troubleshooting**, describes the SmartSTACK 10 ELS10-26 diagnostics and provides information on troubleshooting common problems.

- Appendix A, **Technical Specifications**, provides the SmartSTACK 10 ELS10-26 specifications and basic cabling pin assignments.

- Appendix B, **Glossary**, provides a glossary of terms both specific to the SmartSTACK 10 ELS10-26 and common to the networking field.

1.2 GETTING HELP

If you need additional support related to the SmartSTACK 10 ELS10-26, or if you have any questions, comments, or suggestions concerning this manual, contact Cabletron Systems Global Call Center:

Phone:	(603) 332-9400
Internet mail:	support@ctron.com
FTP:	ctron.com (134.141.197.25)
Login:	anonymous
Password:	your email address
BBS:	(603) 335-3358
Modem setting:	8N1: 8 data bits, No parity, 1 stop bit

Before calling Cabletron Systems Global Call Center, have the following information ready:

- Your Cabletron Systems contract number

- A description of the failure

- A description of any action(s) already taken to resolve the problem (e.g., changing mode switches, rebooting the unit, etc.)

- The serial and revision numbers of all Cabletron Systems products in the network

- A description of your network environment (layout, cable type, etc.)

- Network load and frame size at the time of trouble (if known)

- The device history (i.e., have you returned the device before, is this a recurring problem, etc.)

- Any previous Return Material Authorization (RMA) numbers

For additional information about Cabletron Systems products, visit our World Wide Web site: http://www.cabletron.com

1.3 DOCUMENT CONVENTIONS

The following conventions are used throughout this document:

LCM commands, prompts, and information displayed by the computer appear in Courier typeface, for example:

```
Current Number of Learned Addresses: 133
```

Information that you enter appears in Courier bold typeface, for example:

```
ELS10-26 >status
```

Information that you need to enter with a command is enclosed in angle brackets < >. For example, you must enter a port number

and an IP address to execute the `ipaddr <port #> <IP address>` command:

```
ELS10-26 >ipaddr 6 192.138.217.40
```

Field value options appear in bold typeface.

The following conventions are also used in this document:

Note: *Calls the reader's attention to any item of information that may be of special importance.*

Tip: *Conveys helpful hints concerning procedures or actions.*

Caution: *Contains information essential to avoid damage to the equipment.*

Warning: *Warns against an action that could result in equipment damage, personal injury or death.*

1.4 RELATED DOCUMENTATION

The following documentation may assist the user in using this product:

- *Getting Started with the SmartSTACK 10 ELS10-26* - contains the basic information for using the SmartSTACK 10 ELS10-26.

- *SmartSTACK 10 ELS10-26 MIB Reference Guide* – contains enterprise MIB information.

- *Interconnections, Bridges and Routers*, Radia Perlman, Addison Wesley © 1992.

- *Internetworking with TCP/IP: Principles, Protocols, and Architecture* (2nd edition), Volumes I and II, Douglas Comer, Prentice Hall © 1991.

- *The Simple Book, An Introduction to Management of TCP/IP-based internets*, Marshall T. Rose, Prentice Hall © Second Edition, 1994.

1.5 OVERVIEW

The SmartSTACK 10 ELS10-26TX is an intelligent Ethernet-to-Ethernet switch that is configured with 25 IEEE 802.3 10BASE-T Full Duplex Ethernet ports, one fixed 100BASE-TX copper connection, one port supporting either a copper or fiber 100 Mbps FEPIM (Fast Ethernet Port Interface Module), and one fixed RJ45 for port monitoring of the 10 Mbps ports.

It also includes an RS232C port for out-of-band management.

Figure 1-1 shows the front panel for the SmartSTACK 10 ELS10-26TX.

ELS10-26TX Front Panel
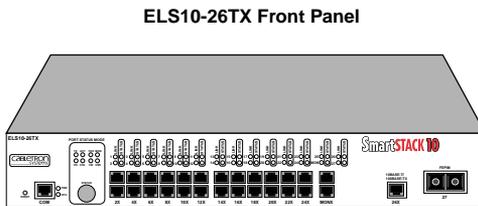
Figure 1-1. SmartSTACK 10 ELS10-26 Front Panel

The SmartSTACK 10 ELS10-26

- Provides dedicated bandwidth for each network connected to its ports.

- Provides full store and forward bridging functionality.

- Provides complete error checking functionality.

- Provides port trunking to increase bandwidth.

- Provides a dedicated monitor port for enhanced troubleshooting.

- Supports Auto-negotiation.

- Operates in either Half Duplex or Full Duplex modes on all ports.

- Implements the Spanning Tree protocol (802.1d).

- Configured with factory-set defaults for immediate plug-and-play capability (IP address is not configured at factory).

In addition, the SmartSTACK 10 ELS10-26 offers the following features that can help you manage and maintain your network:

- RMON support.

- Configuration and management using the Simple Network Management Protocol (SNMP) with either an in-band or out-of-band connection.

- Protection against broadcast/multicast storms.

- Ability to define virtual workgroups for more efficient bandwidth usage. The SmartSTACK 10 ELS10-26 ports can be segmented into 8 separate broadcast domains.

- Compilation of statistics (by port) for traffic generated by each user device connected to a SmartSTACK 10 ELS10-26 segment.

1.5.1 SmartSTACK 10 ELS10-26 Architecture

The SmartSTACK 10 ELS10-26 enables you to link two or more Local Area Networks (LANs) together. To accomplish this, the SmartSTACK 10 ELS10-26 regulates network traffic on the basis of the source and destination addresses that are in each data packet it receives.

The SmartSTACK 10 ELS10-26 is protocol-transparent, meaning it can handle different types of network traffic regardless of the network protocol, such as IP and IPX. As the SmartSTACK 10 ELS10-26 reads addresses from the packets it processes, it builds a dynamic database of addresses called the *Bridge Address Table*. In this way, the SmartSTACK 10 ELS10-26 continuously learns the addresses of all connected devices. Consequently, you can add

new devices to the network, change device addresses, and remove devices from the network without having to reconfigure the SmartSTACK 10 ELS10-26.

The Open System Interconnection (OSI) Reference Model, developed by the International Standards Organization (ISO), identifies the levels of functionality inherent in each of its seven layers. The SmartSTACK 10 ELS10-26 operates at the Media Access Control (MAC) sub-layer of the Data Link layer. Figure 1-2 shows the OSI Reference Model.

7	Application
6	Presentation
5	Session
4	Transport
3	Network
2	**Data Link**	◄— **ELS10-26 operates at Layer 2**
1	Physical
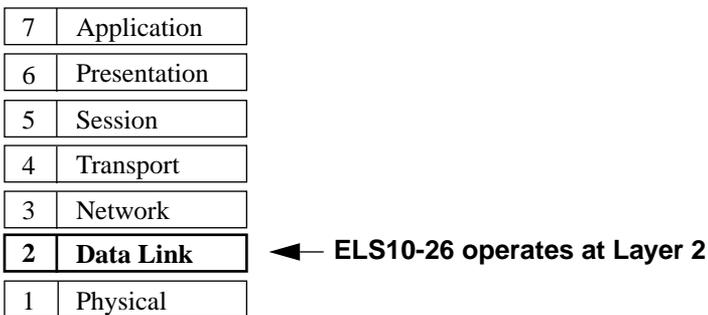
Figure 1-2. OSI Reference Model

Because the SmartSTACK 10 ELS10-26 does not process any Network Layer information, it provides a high level of performance in terms of packet throughput. In addition, the SmartSTACK 10 ELS10-26 does not need to learn network topology, requiring less programming and configuration time.

Store and Forward Switching

As an intelligent Ethernet switch, the SmartSTACK 10 ELS10-26 uses store and forward switching. Store and forward switching allows the SmartSTACK 10 ELS10-26 to temporarily store packets until network resources, typically an unused link, are available for forwarding. This allows for complete error checking, and limits the amount of time between when a device requests access to the

network and when it is granted permission to transmit. In addition, full store and forward switching ensures data integrity, thus preventing network error conditions from being generated throughout the network.

Discarding Local Traffic

The SmartSTACK 10 ELS10-26 checks all incoming packets for their destination address against the Bridge Address Table. If a packet's destination address is not on the same network segment as the originating packet, the SmartSTACK 10 ELS10-26 forwards the packet to the network segment associated with that destination address, if known. However, if the packet's source and destination address are on the same network segment, known as *local traffic*, the packet is automatically discarded (i.e., ignored by the SmartSTACK 10 ELS10-26).

For example, a file transmitted from Workstation A to Workstation C in Figure 1-3 does not need to leave LAN 1. The SmartSTACK 10 ELS10-26 connected to LANs 1 and 2 sees all traffic from LAN 1, including LAN 1 local traffic.
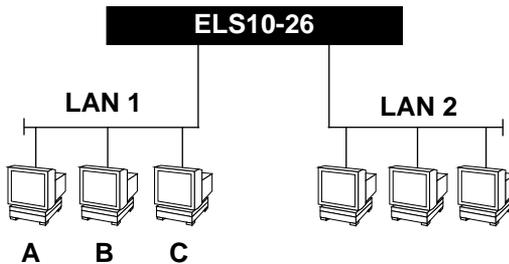
Figure 1-3. Typical Switching Application

By forwarding only packets addressed to devices on other network segments, the SmartSTACK 10 ELS10-26 reduces unnecessary traffic and thereby enhances the overall performance of the network.

Note: *If the packet address is not found in the Bridge Address Table, it will be forwarded (flooded) to all network segments.*

Spanning Tree Algorithm

The SmartSTACK 10 ELS10-26 supports the IEEE 802.1d Spanning Tree algorithm. The Spanning Tree algorithm converts multiple LANs into a "spanning tree" of networks. It is used to prevent bridging loops. This standard defines a logical (not physical) network configuration consisting of one extended LAN without active duplicate paths between spanning tree bridges.

The SmartSTACK 10 ELS10-26, along with other IEEE 802.1d Spanning Tree compliant bridges in the network, dynamically configure the network topology into a single Spanning Tree by exchanging Bridge Protocol Data Units (BPDUs). Typically, each LAN segment is sent one BPDU every two seconds (this is the default setting).

When there are multiple SmartSTACK 10 ELS10-26s connecting LANs in a loop, the Spanning Tree algorithm determines which SmartSTACK 10 ELS10-26 should forward packets to the LAN. If there is a cable break or a port failure, the network topology is automatically reconfigured by the Spanning Tree protocol to create an alternate path to the LAN.

1.5.2 SmartSTACK 10 ELS10-26 Bridge Address Table

The SmartSTACK 10 ELS10-26 creates and maintains a dynamic database of addresses called the Bridge Address Table. The SmartSTACK 10 ELS10-26 examines every packet to determine its source address and LAN segment origin. It then compares the source address and segment information it finds to the entries in the Bridge Address Table.

If a packet's address is not already stored in the Bridge Address Table, the SmartSTACK 10 ELS10-26 adds the learned address, associated segment number, and a timer value indicating the age of the observation. Consequently, the SmartSTACK 10 ELS10-26 knows the address and associated segment number the next time it sees that address. By using the information stored in the Bridge Address Table, the SmartSTACK 10 ELS10-26 is able to quickly forward each packet to the correct LAN segment.

The SmartSTACK 10 ELS10-26 learns addresses from all packets, including data transmissions and "keep alive" packets (packets sent by an idle station to let other stations know it is present and functional). When devices are added to the network, removed from it, or relocated, you do not have to reconfigure the SmartSTACK 10 ELS10-26. The unit automatically learns new device addresses, recognizes when a previously used address is missing, or when a device has been moved to a new LAN segment.

An address stored in the Bridge Address Table is discarded if there is no subsequent activity from that address after a configured length of time (five minutes by default). This aging process ensures that the Bridge Address Table is continually updated.

Addresses are continually added to and deleted from the Bridge Address Table, reflecting the dynamic nature of internetwork traffic.

Each dynamic entry includes:

- An Ethernet MAC address

- A single port number of the LAN on which the address resides

- The age of the entry

The SmartSTACK 10 ELS10-26 stores 979 dynamic (learned) entries in its Bridge Address Table.

1.5.3 SmartSTACK 10 ELS10-26 Port Monitoring

Port monitoring allows the SmartSTACK 10 ELS10-26 to redirect network traffic (including MAC layer errors) from one port to the port monitoring port (MONX port), in effect "mirroring" all network traffic to this port. This feature allows users who have existing investments in external analyzers, external RMON probes, or devices like Network General's Distributed Sniffer System[TM] to continue to receive expert analysis and packet decode functions in a switched environment -- simply use the port mirroring function to mirror switched traffic to the designated "diagnostic" port to which the analyzer is attached.

The SmartSTACK 10 ELS10-26 supports local port mirroring. Local port mirroring is when the diagnostic port is on the same SmartSTACK 10 ELS10-26 as the mirrored port. The mirrored port has to be local to the SmartSTACK 10 ELS10-26.

Packet Capturing and Monitoring

Only the 10BASE-T ports on the SmartSTACK 10 ELS10-26 (and not the 100BASE ports) can be mirrored. The monitoring of network traffic is performed by the SmartSTACK 10 ELS10-26 hardware.

1.5.4 SmartSTACK 10 ELS10-26 Sample Applications

Just as a six lane highway allows you to travel much faster than a single lane highway, a network backbone creates high-speed connections for your network. In general, a network backbone allows you to distribute access to important network resources such as file or print servers. Additional SmartSTACK 10 ELS10-26 features, such as trunking, Fast Ethernet, and virtual workgroups allow you to optimize bandwidth and design a more efficient flow for your network traffic.

SmartSTACK 10 ELS10-26 Trunking

The SmartSTACK 10 ELS10-26 allows two trunk groups with up to eight ports each to be connected between the SmartSTACK 10 ELS10-26 and other devices in the FastNetwork and SmartSTACK families. This capability provides a scalable dedicated bandwidth of up to 160 Mbps for 10 Mbps ports and 400 Mbps for 100 Mbps ports.

For example, local traffic, such as the Manufacturing Department's internal traffic, can be easily handled by a single, 10 Mbps connection. However, when the Manufacturing Department needs access to the corporate database, the traffic could travel over a trunk line, thereby increasing the speed of transmission.

Figure 1-4 illustrates the trunking of multiple SmartSTACK 10 ELS10-26 ports to increase the bandwidth.
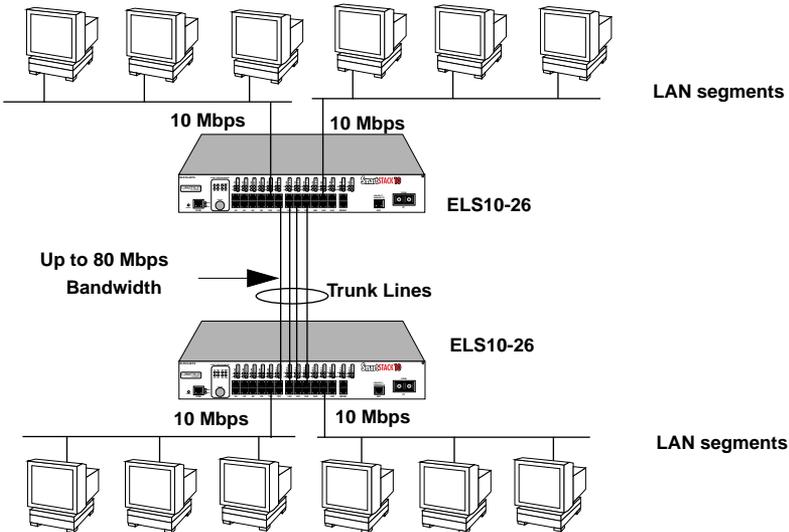
Figure 1-4. SmartSTACK 10 ELS10-26 Trunking with 10 Mbps Ports

Figure 1-5 illustrates how the SmartSTACK 10 ELS10-26 can be used in a backbone network configuration.
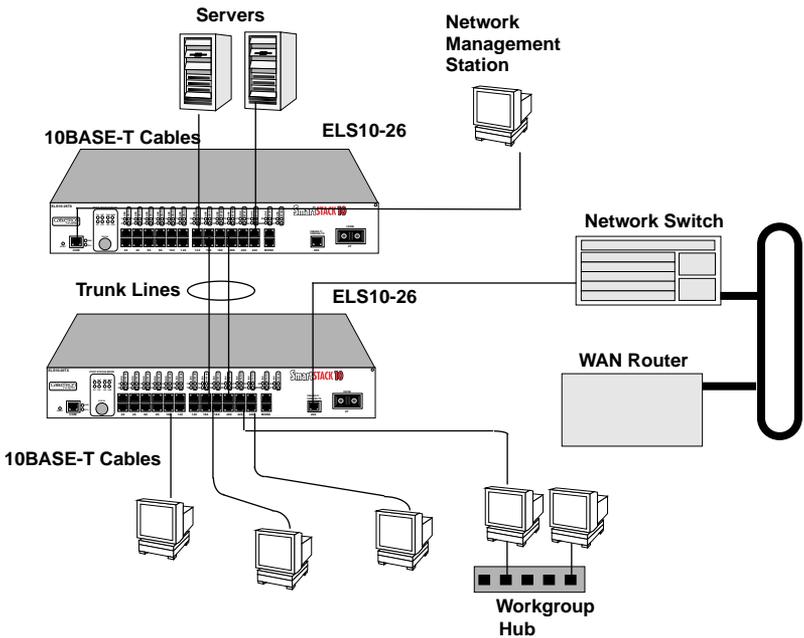
Figure 1-5. SmartSTACK 10 ELS10-26 Backbone Configuration

SmartSTACK 10 ELS10-26 Fast Ethernet

The SmartSTACK 10 ELS10-26 has two additional ports that provide fast Ethernet connections of 100 Mbps. Applying this increased bandwidth to the previous example, the Manufacturing Department's traffic to the corporate database could be transmitted to the corporate database at the 100 Mbps rate.

Figure 1-6 illustrates connecting two SmartSTACK 10 ELS10-26 Fast Ethernet ports to increase the bandwidth to 200 Mbps.
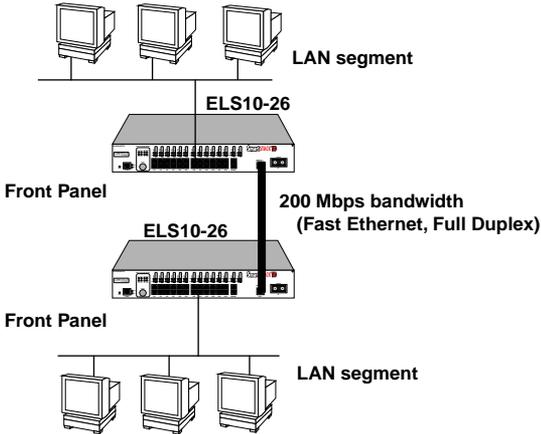
Figure 1-6. SmartSTACK 10 ELS10-26 Trunking with 100 Mbps Ports

Figure 1-7 illustrates how the SmartSTACK 10 ELS10-26 can be used in a backbone network configuration using increased bandwidth of the Fast Ethernet configuration.
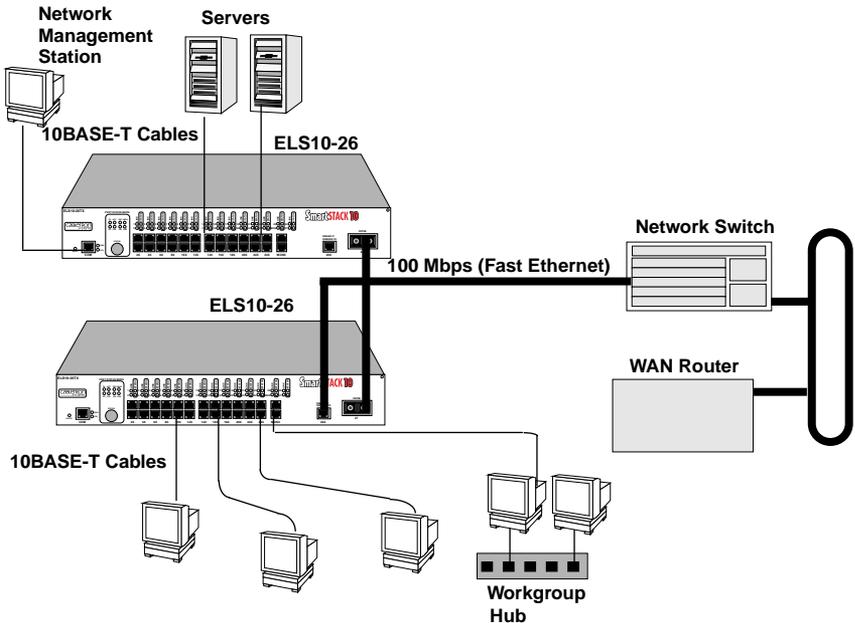
Figure 1-7. SmartSTACK 10 ELS10-26 Backbone Configuration

Virtual Workgroups

The SmartSTACK 10 ELS10-26 allows you to define ports for logical groups of associated devices (virtual workgroups) to provide a more efficient flow of traffic across your Ethernet network. You can define a maximum of eight virtual workgroups.

Virtual workgroups offer you the ability to limit broadcasts to logical domains within the network. Workgroup destinations are recognized by the SmartSTACK 10 ELS10-26 and broadcast packets are routed directly to hosts within the workgroup, eliminating the need to perform a general broadcast across each segment of the network to find specific host addresses.

Figure 1-8 shows two Ethernet segments, A and B, that do not include a SmartSTACK 10 ELS10-26.
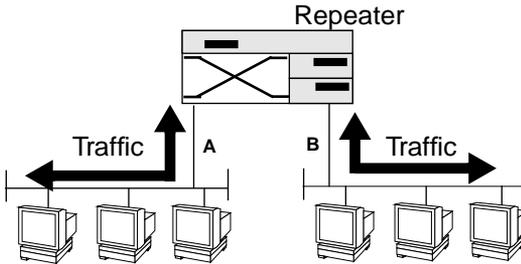
Figure 1-8. Multiple Ethernet Segments Sharing 10 Mbps Bandwidth

Each host on segments A and B is limited to sharing a network bandwidth of 10 Mbps.

Figure 1-9 shows two Ethernet segments that take advantage of the virtual workgroup feature of the SmartSTACK 10 ELS10-26 and the increased bandwidth applied to each A and B host.
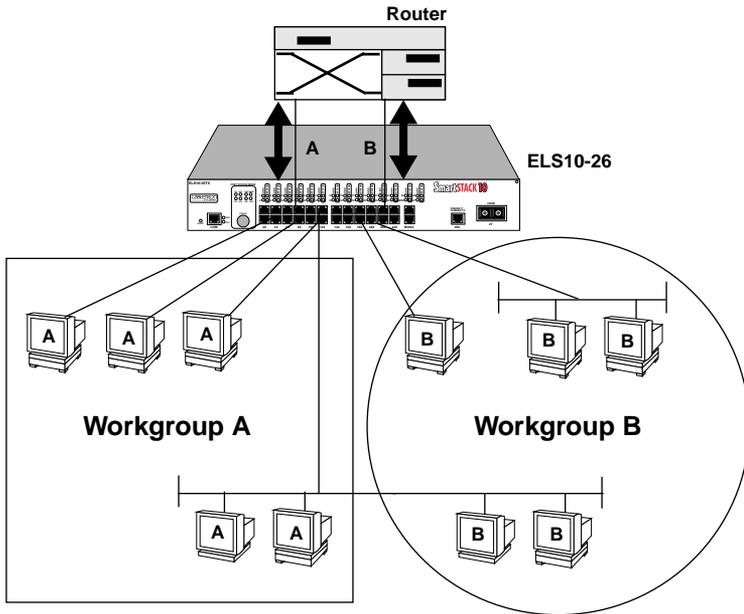
Figure 1-9. Using the SmartSTACK 10 ELS10-26 to Create Virtual Workgroups to Help Optimize Bandwidth

A host from workgroup A can limit a broadcast to all hosts within workgroup A and prevent the broadcast from going across the network and adding to the amount of contention for the limited 10 Mbps bandwidth.

Ports that are not part of a workgroup will receive and transmit packets from any ports. However, if you configure the SmartSTACK 10 ELS10-26 with workgroup A and B, as shown in Figure 1-9, broadcast traffic from workgroup A ports will not be seen on workgroup B ports, and vice versa.

As illustrated in the previous diagram, virtual workgroups allow you to associate multiple ports and define a workgroup. In reality, you are assigning workgroup IDs to SmartSTACK 10 ELS10-26 ports.

1.6 LOCAL CONSOLE MANAGER

The Local Console Manager (LCM) is a command-line interface built into the SmartSTACK 10 ELS10-26. The LCM t enables you to monitor, manage, and configure the SmartSTACK 10 ELS10-26 through the out-of-band RS232C connection attached to any non-intelligent terminal or workstation running terminal emulation.

You can also use a Cabletron Systems Network Management System, or a standard SNMP-based Network Management System, to manage the SmartSTACK 10 ELS10-26. For a list of available SmartSTACK 10 ELS10-26 network management tools, see Section 4.1, **SmartSTACK 10 ELS10-26 Management Tools.**

The following sections describe LCM command syntax and the basic LCM commands for logging in, logging out, and getting help.

- LCM commands used for configuring the SmartSTACK 10 ELS10-26 are described in Chapter 3, **Configuring Your SmartSTACK 10 ELS10-26**.

- LCM commands used for monitoring and managing the SmartSTACK 10 ELS10-26 are described in Chapter 4, **Monitoring and Managing Your SmartSTACK 10 ELS10-26**.

Note: The Getting Started with the SmartSTACK 10 ELS10-26 guide lists the available LCM commands, including each command's options.

1.6.1 Command Syntax Conventions

The following conventions apply as you use LCM commands:

- Press the **Enter** key to execute a command after you type it in.

- A **port range** is either a single port number, or a list of port numbers separated by commas or hyphens. For example, 3 is port 3; 3,7 are ports 3 and 7; 3-5 are ports 3,4, and 5; and 3-5,7 are ports 3,4,5, and 7.

- To quit any command, press the Control-C keys (^C or Ctrl-C).

- You can abbreviate any command where there is no ambiguity; if there is ambiguity, LCM responds with an error message.

- Commands are not case sensitive.

- Any invalid commands or misspellings will receive an error message.

- A previous command can be repeated by typing **!!**

- MAC addresses are displayed in little-endian Ethernet (least significant bit) bit order, with each octet separated by a colon. For example:

      ELS10-26 >**address 00:40:27:04:1a:0f**

- Information that you need to enter with an LCM command is enclosed in square brackets [ ]. For example, you must enter a port number and an IP address to execute the ipaddr [PORT-NUMBER] [IP ADDRESS] command:

      ELS10-26 >**ipaddr 6 192.138.217.40**

- Parameters that appear in all capital letters, for example bridge [PORT-RANGE], indicate that you must enter a value for that parameter. If a string of parameters is displayed between braces, for example [{off|on|noBPDU}], you must select one of the displayed options. For example, if you wanted to enable bridging on a port, or a range of ports, you would enter:

      ELS10-26 >**bridge 2-4 on**

1.6.2 Basic LCM Commands

If you are going to manage the SmartSTACK 10 ELS10-26 using
LCM, you first must connect the SmartSTACK 10 ELS10-26 to an
ASCII terminal or terminal emulator. See Section 2.5, **Connecting
the Local Console Manager**, for instructions.

When you want to use LCM, begin by pressing the **Enter** key
several times to get the LCM prompt (ELS10-26 >).

Help

Displays the menu of available commands. Help can also be
displayed by typing a question mark (**?**). The output from the **help**
command is displayed below.

```
ELS10-26 > help
                         ELS10-26 Local Console Manager

help or ?                                   this menu

status [PORT-RANGE]                         to display unit or port status

baud [BAUD-RATE]                            to change the console baud rate

exit or logout                              to logout

erase                                       to erase configuration information

indent                                      to display unit identification

ipaddr [PORT# IPADDR [MASK]]                to set or display IP addresses

addresses display [any] [ADDR [MASK]]       to display learned addresses

bridge [PORT-RANGE [OPTIONS]]               to set bridging methods

clearstats                                  to clear all port statistics

trunk [PORT-RANGE [{on|off}]]               to set or display trunking status

enable [PORT-RANGE [noRIP][TransmitPacing]] to enable a set of ports

disable [PORT-RANGE]                        to disable a set of ports

community                                   to change the password/community name

sttimer [TIME-VALUE]                        to set or display st age timer

workgroup [NAME [delete|PORT-RANGE [INFO]]] to set or display workgroups

speed [PORT-RANGE [{auto|10|100}]]          to set or display speed

duplex [PORT-RANGE [{auto|half|full}]]      to set or display duplex mode

mirror [PORT# [{Rx|Tx|both|off}]]           to set or display port mirroring

time [SystemTime (HHMMSS)]                  to set or display the system time

date [SystemDate (MMDDYY)]                  to set or display the system date

reboot (SECONDS|off)                        to reboot the unit after seconds

arp display                                 to display arp table information

route display                               to display routing table information

ping [-rvsx] HOST [DATASIZE [count]]        to send ICMP ECHO_REQUEST pkts

traceroute [-m MAX_TTL] [-q NQUERIES][-w WAIT] HOST_IP [DATA_SIZE]   to print the route
                                            pkts take to host

traplog                                     to display the most recent SNMP traps
```

Erase

Entering **erase** to erase the current SmartSTACK 10 ELS10-26 configuration returns all parameters to the default values.

Exit or Logout

Logs you out of LCM. (The **exit** command is functionally equivalent to the **logout** command.)

Traplog

Displays the traps messages captured by the SmartSTACK 10 ELS10-26. The following is an example of a traplog display:

```
ELS10-26TX> traplog
 Trap 16 0:00:00
      The unit has booted.
 Trap 25 0:00:00
      The unit's spanning tree maximum age has changed.
 Trap 26 0:00:00
      The unit's spanning tree hello time has changed.
 Trap 27 0:00:00
      The unit's spanning tree forward delay times has changed.
 Trap 3 0:00:02 port 1
      The current functional state of the port has changed.
    .
    .
    .

 ELS10-26TX>
```

CHAPTER 2

UNPACKING AND INSTALLING
YOUR ELS10-26

Carefully unpack the ELS10-26 from the shipping carton and inspect it for possible damage. If any damage is evident, contact your supplier. The shipping carton contains the following:

- The ELS10-26 unit

- One AC power cord

- Console Cable kit

- Two rack-mounting brackets with fasteners (for rack-mount installation)

- Documentation – In addition to this manual, the *Getting Started with the SmartSTACK 10 ELS10-26* guide, the *ELS10-26 MIB Reference Guide*, and Release Notes are also included.

2.1 ELS10-26 FRONT PANEL

The ELS10-26 provides 25 10BASE-T Ethernet ports, and one 100BASE-T Fast Ethernet connection. An additional 100 Mbps port can be added by using an FEPIM (either copper or fiber). Each ELS10-26 also includes one fixed port used for port mirroring of the 10BASE-T ports, and an RS232C port for out-of-band management. Figure 2-1 shows the ELS10-26's front panel. The LEDs and buttons are described in Tables 2-1 and 2-2.
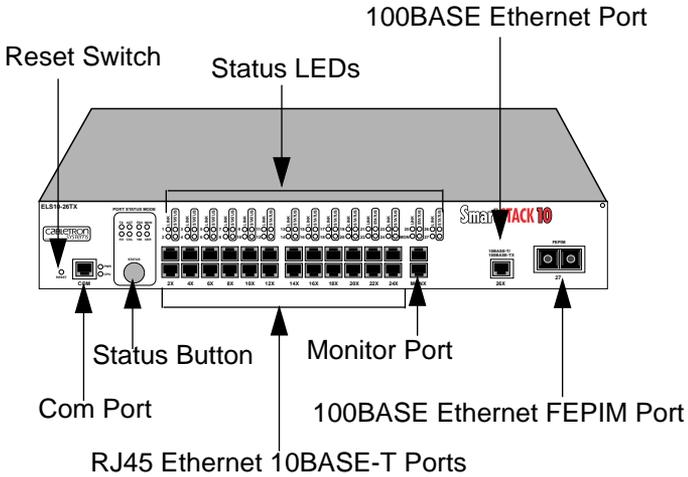
Figure 2-1. ELS10-26 Front Panel

Table 2-1.   Meaning of ELS10-26 LEDs

LED	Meaning
Port Status Mode TX	On – Indicates port is transmitting a packet.
RX	On – Indicates port is receiving a packet.
ACT	On – Indicates port is transmitting or receiving.
COL	On – Indicates a collision on a port.
FDX	On - Port is operating in Full Duplex. Off - Port is operating in Half Duplex.
100	On - Port operating at 100 Mbps. Off - Port operating at 10 Mbps.
MON	On - Indicates the port is copying to the monitor port.
USR	On - Indicates that errored packets were received.
Link (Individual Ports)	On – Indicates the link is good. Off – Indicates there is no link.
Status (Individual Ports)	On/Blinking – Indicates you are monitoring the port for a selected segment status condition. This LED always indicates the selected status mode.
CPU	On – Indicates the ELS10-26 is operational. Blinking – Indicates the ELS10-26 is running power-up diagnostics. Off – Indicates the ELS10-26 is non-operational.
Pwr	On – Indicates the ELS10-26 is receiving power and the voltage is within the acceptable range. Off – Indicates the ELS10-26 is not receiving power.

Table 2-2 describes the ELS10-26 buttons.

Table 2-2.   Description of ELS10-26 Buttons

Button	Function
Status	Cycles through the Segment Status options (TX, RX, Act, Col, FDX, 100, MON, and Usr) for all ports. The right-hand port status LEDs of the ports you are monitoring are activated based on what function you chose with the Select button.
Reset	Restarts the ELS10-26.

2.2 INSTALLING AN FEPIM

Only qualified personnel should perform installation procedures.

The ELS10-26 provides a slot for a Cabletron FEPIM (Fast Ethernet Port Interface Module). The ELS10-26 is shipped without an FEPIM. To install an FEPIM, follow the procedure below:

1. Remove the power cord.

2. Remove the cover of the ELS10-26.

3. Remove the two screws securing the plate on the side of the FEPIM slot.

4. Install the FEPIM as shown in Figure 2-2. Ensure that the rear connector is seated firmly before tightening the three mounting screws.

5. Replace the plate and two screws on the side of the FEPIM slot.

6. Replace the cover of the ELS10-26.
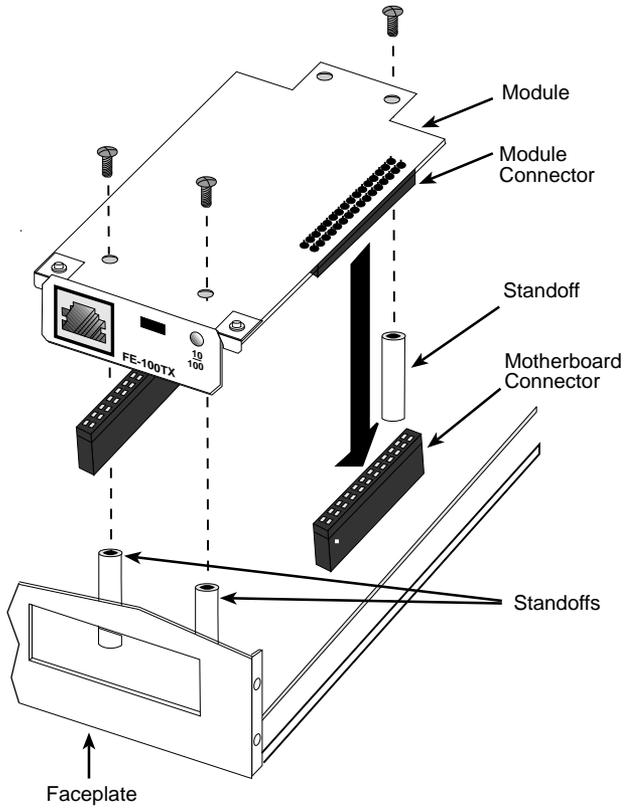
Figure 2-2. Installing an FEPIM

2.3 INSTALLING THE ELS10-26

Rack-mounting an ELS10-26

Table 2-3 describes some general considerations you should be aware of before mounting a ELS10-26 in a rack assembly.

Table 2-3.   General Considerations for Mounting an ELS10-26

Consideration	Discussion
Temperature	Since the temperature within a rack assembly may be higher than the ambient room temperature, make sure the rack environment temperature is within the Operating Temperature range specified in Appendix A.
Air Flow	Make sure there is at least 2 inches (or more) on both sides of the ELS10-26 to allow for adequate air flow.
Mechanical Loading	Do not place equipment on top of a rack-mounted ELS10-26.
Circuit Overloading	Make sure the power supply circuit to the rack assembly is not overloaded.
Grounding (Earthing)	Rack-mounted equipment should be grounded. In addition to the direct connections to the main power supplies, make sure all the other supply connections are also grounded.

The ELS10-26 can be rack-mounted in a standard 19-inch equipment cabinet. To mount the ELS10-26 in a rack assembly, apply the following steps:

1. Attach the rackmount brackets to either side of the ELS10-26 chassis, as shown in Figure 2-3.
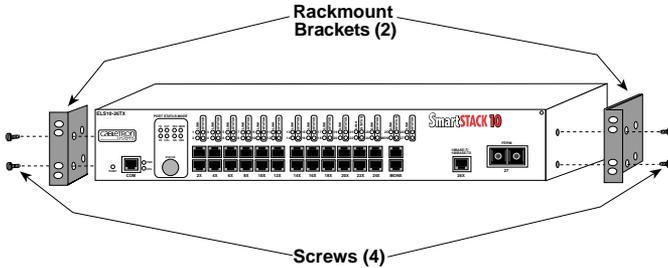
Figure 2-3. Attaching Rackmount Brackets

2. Place the ELS10-26 chassis in the cabinet.

3. Secure the ELS10-26 with the rackmount fasteners by inserting and securing a fastener through each of the four slots in the rack-mount brackets, as shown in Figure 2-4.
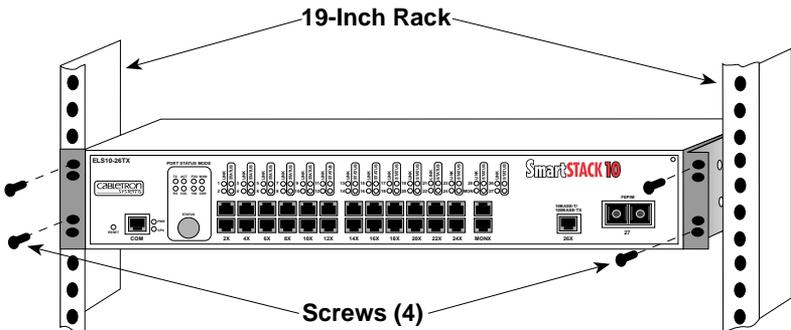
Figure 2-4. Rack-mounting the ELS10-26

4. Once the ELS10-26 is installed, plug the AC power cord into the AC power connector on the rear of the ELS10-26 chassis. Plug the other end of the power cord into a three-prong grounded outlet.

2.4 CHECKING THE POWER-UP DIAGNOSTICS SEQUENCE

Before connecting any devices to the ELS10-26, power on the unit and observe the power-up diagnostics sequence to check for proper operation.

To observe the power-up diagnostics sequence completely, you may want to repeat it. To restart the power-up sequence, press the reset button on the front panel.

When you power up the ELS10-26, the following occurs:

1. All LEDs, except the Port Link LEDs, turn on for one second.

2. The Power (Pwr) LED remains on.

3. The CPU LED starts flashing.

4. After several seconds, the Port Link LEDs turn on, individually, in sequence, from left to right until all are lit, then go off.

5. After several more seconds, the Ready LED will stay on, indicating that the power-up diagnostics sequence is complete.

6. In addition, the Port Link LEDs will turn on for those ports with good links and the Segment Status LEDs will turn on (or flash) when the selected status condition is present.

Note: If a critical component fails diagnostics, the CPU LED will turn off and the ELS10-26 will attempt to reboot. If the CPU LED does not stay on, contact Cabletron Systems Global Call Center. Refer to Section 1.2.

2.5 CONNECTING THE LOCAL CONSOLE MANAGER

The Local Console Manager (LCM) is a command-line interface for configuring, monitoring, and managing the ELS10-26 through the out-of-band RS232C connection on the front panel.

To connect the LCM:

1. Connect your ASCII terminal or terminal emulator to the out-of-band management RS232C port on the front panel of the ELS10-26 using the standard RJ-45 twisted pair cable shipped with the unit. (Only three wires are necessary: Receive Data, Transmit Data and Ground.)

2. Set the terminal to 9600 baud, 8N1: 8 data bits, 1 stop bit, and no parity, XON/XOFF flow control.

3. Press the Enter key several times. If the ELS10-26 and terminal are operational, LCM responds with the `ELS10-26` > prompt.

4. LCM is now ready to use.

Refer to Section 1.6, **Local Console Manager** for a general overview of LCM and the command syntax. LCM commands for configuring, monitoring, and managing the ELS10-26 are provided in the chapters dealing with those topics.

2.6 CONNECTING TO THE NETWORK

This section provides the procedures for connecting UTP and multimode fiber optic segments from the network or other devices to the ELS10-26.

Ports 1 through 26 have RJ45 connectors for UTP connections. Port 27 supports FE-100TX or FE-100FX Fast Ethernet Interface Modules. The FE-100TX has an RJ45 connector for a UTP cable connection. The FE-100FX has an SC style MMF connector.

Refer to Section 2.6.1 to make UTP connections.

Refer to Section 2.6.2 to make a UTP connection to an FE-100TX.

Refer to Section 2.6.3 to make a fiber optic connection to an FE-100FX.

2.6.1 Connecting UTP Cables

Before connecting a segment to the ELS10-26, check each end of the segment to verify wire crossover.

Caution: *To establish a link, you must have an odd number of crossovers (preferably one) between 10BASE-T devices of the same type (i.e., from repeater to repeater or transceiver to transceiver).*

Connect a twisted pair segment to the ELS10-26 as follows:

1. Ensure that the device at the other end of the segment is connected to the segment and is powered ON.

2. Refer to Figure 2-5. Connect the twisted pair segment to the ELS10-26 by inserting the RJ45 connector on the twisted pair segment into the desired RJ45 port.

Figure 2-5. ELS10-26 Twisted Pair Connection

3. Verify that a Link exists by checking that the port **LINK** LED is on (solid green). If the **LINK** LED is off, perform the following steps until it is on:

a. Check that the 10BASE-T device at the other end of the twisted pair segment is ON and connected to the segment.

b. Verify that the RJ45 connectors on the twisted pair segment have the proper pinouts (Figure 2-7) and check the cable for continuity.

TO
ELS10-26 RJ-45 Port

TO
10Base-T Device Port

TX+ 1
TX- 2

1 TX+
2 TX-

Note: RX+/RX- and
TX+/TX- must share a
common color pair.

RX+ 3
RX- 6

3 RX+
6 RX-

Figure 2-6. Cable Pinouts - (RJ45) Crossover Cable

c. Check that the twisted pair connection meets the dB loss and cable specifications.

If a link is not established, contact Cabletron Systems Global Call Center. Refer to Section 1.2, **Getting Help**, for details.

4. Repeat step 2, above, until all connections have been made.

2.6.2 Connecting a UTP Segment to the FE-100TX

An FE-100-TX installed in port slot 27 is often used to provide a connection between the ELS10-26 and a bridge, router, or switch. Usually, in this configuration, a "straight-through" cable is used and the Fast Ethernet Interface Module crossover switch shown in Figure 2-7 is set to "not crossed over."

Normally, when connecting devices to like devices, crossing over of the transmit and receive pairs must occur. Before connecting a segment to the FE-100TX, check each end of the segment to

determine if the wires have been crossed over for the proper connection.

A schematic of a crossover cable is shown in Figure 2-6. If the wires do not cross over, use the switch on the FE-100TX to internally cross over the RJ45 port. Figure 2-7 shows how to properly set the FE-100TX crossover switch.

Position =
(not crossed over)

Position X
(crossed over)

1. TX+ 5. NC
2. TX- 6. RX-
3. RX+ 7. NC
4. NC   8. NC

10
100
FE-100TX

1. RX+ 5. NC
2. RX- 6. TX-
3. TX+ 7. NC
4. NC   8. NC

166505
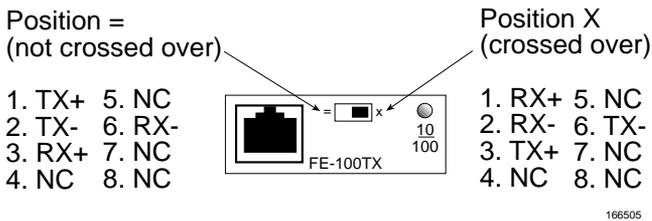
Figure 2-7. FE-100TX Crossover Switch

Connect an FE-100TX to a twisted pair segment as follows:

1. Ensure that the device at the other end of the segment is connected to the segment and is powered ON.

2. Connect the twisted pair segment to the module by inserting the RJ45 connector on the twisted pair segment into the RJ45 port on the module. See Figure 2-7.
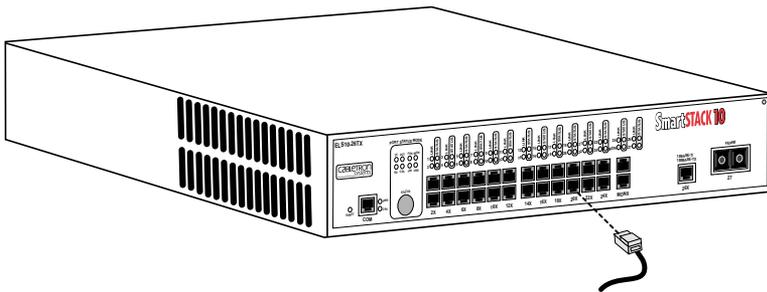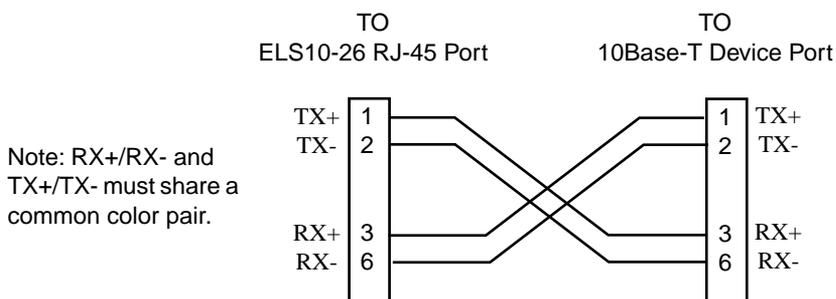
3. Verify that a Link exists by checking that the port **LINK** LED is on (solid green). If the **LINK** LED is off, perform the following steps until it is on:

   a. Check that the 100BASE-TX device at the other end of the twisted pair segment is powered up.

   b. Verify that the RJ45 connector on the twisted pair segment has the proper pinouts.

   c. Check the cable for continuity.

d. Make sure that the twisted pair connection meets dB loss and cable specifications.

e. Confirm that the crossover switch is in the correct position.

f. Confirm that the devices on each end of the link are using the correct speed (use the LCM `status` command to check actual operating speed and use the `speed` command to display the configured speed of the port).

If a Link is not established, contact Cabletron Systems Global Call Center. Refer to Section 1.2, **Getting Help**, for details.

2.6.3 Connecting a Multimode Segment to the FE-100FX

The FE-100FX has an SC style network port (see Figure 2-8). Cabletron Systems supplies fiber optic cable that uses SC style connectors that are keyed to ensure proper crossing over of the transmit and receive fibers.

Caution: *An odd number of crossovers (preferably one) must be maintained between devices so that the transmit port of one device is connected to the receive port of the other device and vice versa.*

If the fiber optic cable being used has SC style connectors that do not resemble MIC style connectors, or has SC connectors on one end and a different type on the other, such as ST connectors, ensure that the proper crossing over occurs.

Fiber Optic Network Connection

1. Remove the protective plastic covers from the fiber optic ports on the applicable port on the module and from the ends of the connectors.

Caution: *Do not touch the ends of the fiber optic strands, and do not let the ends come in contact with dust, dirt, or other contaminants. Contamination of the ends causes problems in data transmissions. If the ends become contaminated, clean them with alcohol using a soft, clean, lint-free cloth.*

2. Insert one end of the SC connector into the FE-100FX installed in the ELS10-26. See Figure 2-8.

3. At the other end of the fiber optic cable, attach the SC connector to the other device.
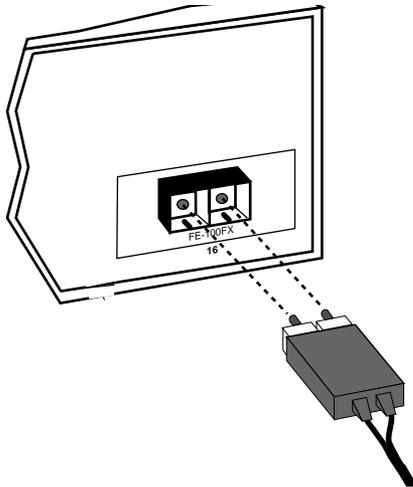
Figure 2-8. FE-100FX Port

4. Verify that a Link exists by checking that the port **LINK** LED is solid green. If the **LINK** LED is off, perform the following steps until it is on:

a. Check that the power is turned on for the device at the other end of the Link.

b. Verify proper crossing over of fiber strands between the applicable port on the ELS10-26 and the fiber optic device at the other end of the fiber optic link segment.

c. Verify that the fiber connection meets the dB loss specifications.

If a Link has not been established, contact Cabletron Systems Global Call Center. Refer to Section 1.2, **Getting Help**, for details.

The ELS10-26 is now ready to be set up through Local Management. Refer to Chapter 4, **Monitoring and Managing Your ELS10-26**, to configure the ELS10-26.

CHAPTER 3

CONFIGURING YOUR ELS10-26

The ELS10-26 does not require any additional configuration to operate as a standard, transparent switch. However, if you want to use any of the ELS10-26's advanced functions, you must first assign an IP (Internet Protocol) address to any of the ports on the ELS10-26 that you use to communicate with a Simple Network Management Protocol (SNMP) manager.

To initially assign an IP address, you can use the Local Console Manager (LCM). LCM is a command-line interface built into the ELS10-26. It allows you to configure and manage the ELS10-26 through the out-of-band RS232C connection attached to any non-intelligent terminal, or a PC emulating a non-intelligent terminal. (See Section 3.1, **Assigning IP Addresses**.)

Once you have assigned an IP address, you can use any of the following network management tools to configure and manage the ELS10-26:

- SPECTRUM

- SPEL

- SPMA

- Any SNMP-based NMS

Configuration parameters are stored in an SNMP standard Management Information Base (MIB). All ELS10-26 MIB variables are listed and described in the *ELS10-26 MIB Reference Guide*.

*Note: There are some configuration options that cannot be configured using LCM commands. You may need to modify your configuration using an NMS. See Section 3.14, **Modifying MIB Variables**.*

The following sections describe how to configure the optional parameters of the ELS10-26 using LCM commands, including:

- Assigning IP addresses

- Enabling and disabling bridging

- Displaying bridging functions

- Enabling and disabling trunking

- Displaying trunking status

- Defining and deleting virtual workgroups

- Assigning a community name

Note: *You can use the LCM* `erase` *command to erase all configuration information and return the unit to default settings on the next system reset.*

If you are using a network management tool other than LCM, refer to its accompanying documentation.

3.1 ASSIGNING IP ADDRESSES

You can assign an IP to each port, or you can assign one address that can be used for the the entire device. Addresses for each port must be unique. IP addresses are divided into classes based on what portion of the address is network or port information. The address classes are A, B, and C.

- Class A addresses are used in very large networks that support many ports. The first byte identifies the network and the other three bytes identify the node. The first byte of a class A address must be in the range 1-126. The address 100.125.110.10 would identify node 125.110.10 on network 100.

- Class B addresses are used for medium sized networks. The first two bytes identify the network and the last two identify the node. The first byte of a class B address must be in the range 128-191. The address 128.150.50.10 identifies node 50.10 on network 128.150.

- Class C addresses are used for small networks. The first three bytes identify the network and the last byte identifies the port. The first byte of a class C address must be in the range 192-223. The address 192.138.217.10 identifies node 10 on network 192.138.217.

To assign an IP address to a port, at the LCM prompt:

1. Type `ipaddr <PORT-NUMBER> <IP ADDRESS>`

   For example, `ipaddr 6 192.138.217.40` would set the IP address of Port 6 to 192.138.217.40. LCM responds by displaying the IP address table, as shown under the `ipaddr` command.

3.1.1 Displaying IP Addresses

To display IP addresses, subnet masks, and MAC addresses of all ports on the ELS10-26 you are configuring, at the LCM prompt:

1. Type **ipaddr**

   LCM displays the current IP address table, for example:

```
Port  IP Address          Address Mask          MAC Address
 1    192.138.217.1       255.255.255.0         00:40:27:00:06:1f
 2    0.0.0.0             255.0.0.0             00:40:27:00:06:c3
 3    192.138.217.10      255.255.255.0         00:40:27:00:06:3e
 4    0.0.0.0             255.0.0.0             00:40:27:00:03:7a
 5    0.0.0.0             255.0.0.0             00:40:27:00:05:c7
 6    192.138.217.20      255.255.255.0         00:40:27:00:04:4a
 7    192.138.217.50      255.255.255.0         00:40:27:00:06:9e
 8    192.138.217.30      255.255.255.0         00:40:27:00:04:b4
```

3.1.2 Deleting an IP Address

To delete an IP address, at the LCM prompt:

1. Type **ipaddr <PORT-NUMBER> 0.0.0.0**

   LCM responds by redisplaying the current IP address table.

3.1.3 Changing a Subnet Mask

You can optionally set the subnet mask for a port. A subnet mask is a 32-bit address mask used in IP to specify a particular subnet. If the subnet mask is 0.0.0.0, the ELS10-26 will automatically convert the displayed mask to the standard default, based on the port's IP address class. (Class A address masks are 255.0.0.0, Class B address masks are 255.255.0.0, Class C address masks are 255.255.255.0.)

To change the subnet mask, at the LCM prompt:

1. Type `ipaddr <PORT-NUMBER> <IP ADDRESS> <SUBNET MASK>`

   For example, `ipaddr 6 192.138.217.40 255.255.240.0` would set the subnet mask for port 6 to 255.255.240.0. LCM responds by redisplaying the current address table.

Note: *When you change the subnet mask for a port, you must also enter the IP address for that port. Make sure you enter the IP address for the port correctly; whatever you enter becomes the IP address for that port.*

3.2 ENABLING BRIDGING

The LCM `bridge` command allows you to set bridging options for a single port or a range of ports. The options include:

• off

• on (the default with BPDU enabled)

• noBPDU

BPDU (Bridge Protocol Data Unit) is a data unit transmitted as part of the IEEE 802.1d Spanning Tree protocol. The exchange of BPDUs allows bridges within a network to logically configure the network as a single spanning tree.

Note: *Selecting the **noBPDU** option could make your network inoperable because the ELS10-26 would be unable to detect loops.*

Using LCM to enable bridging for a port or port range, at the LCM prompt:

1. Type **bridge [PORT-RANGE [{off|on|noBPDU}]]**

   For example, **bridge 2 on** would enable bridging on port 2.

   LCM responds:

   ```
   Port 2 bridging: Transparent Bridging
   ```

3.3 DISABLING BRIDGING

To turn off the bridging function for a port or port range, at the LCM prompt:

1. Type **bridge [PORT-RANGE] off**

   For example, **bridge 2 off** would disable bridging on port 2.

   LCM responds:

   ```
   Port 2 bridging: off
   ```

3.4 DISPLAYING BRIDGING FUNCTIONS

To display the bridging functions that are enabled for all ports, at the LCM prompt:

1. Type **bridge**

   LCM responds with a list of all ports and the bridging function that is enabled. For example, typing **bridge** would display the bridging status for all ports.

```
Usage: bridge [PORT-RANGE [{off|on|noBPDU{]]
  Port 1 bridging: Transparent Bridging
  Port 2 bridging: Transparent Bridging
  Port 3 bridging: Transparent Bridging
  Port 4 bridging: Transparent Bridging
                    .
                    .
                    .
  Port 27 bridging: off
```

You could also type `bridge [PORT-RANGE]` to look at a specific range of ports. For example `bridge 2-4` would display bridging functions for ports 2, 3, and 4.

3.5 ENABLING TRUNKING

If your network configuration requires you to connect two or more ELS10-26s (or other devices capable of trunking) together, but the applications you are running over the network require more than 10 Mbps of bandwidth per connection, you can use the built-in trunking feature to increase bandwidth up to 160 Mbps, or 400 Mbps using 100Base ports, without installing additional hardware on your network.

Trunking is a Cabletron Systems proprietary extension to the 802.1D Spanning Tree algorithm. It enables you to use multiple 10BASE-T Ethernet segments to connect ELS10-26s together, while maintaining first-in, first-out ordering of Ethernet packets. In addition, if any of the Ethernet segments configured for trunking become inoperable, those Ethernet segments are automatically bypassed.

Figure 3-1 shows two ELS10-26s connected by four 10BASE-T crossover cables. You can connect up to eight ports for sharing the traffic load. Any additional connected ports will become *standby* ports. The connections must be point-to-point. That is, there cannot be any other devices on the Ethernet segments.
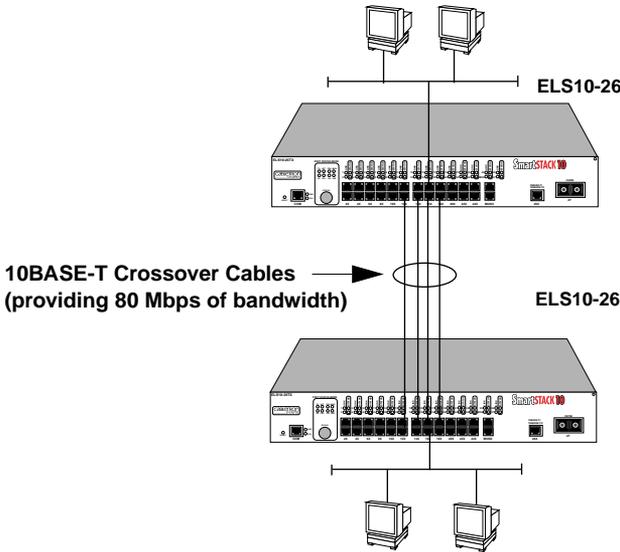
Figure 3-1. Trunk Connections

Trunk Groups

Each set of connections between two ELS10-26s is called a *Trunk Group*. You can create two Trunk Groups, each having up to eight ports, to interconnect your ELS10-26s.

For example, if you have three ELS10-26s (A, B, and C), as shown in Figure 3-2, you could connect them using a single Ethernet segment. However, that would limit the interconnection to 10 Mbps. To solve this problem, you could connect **A to B** with one Trunk Group, and connect **B to C** with a second Trunk Group.
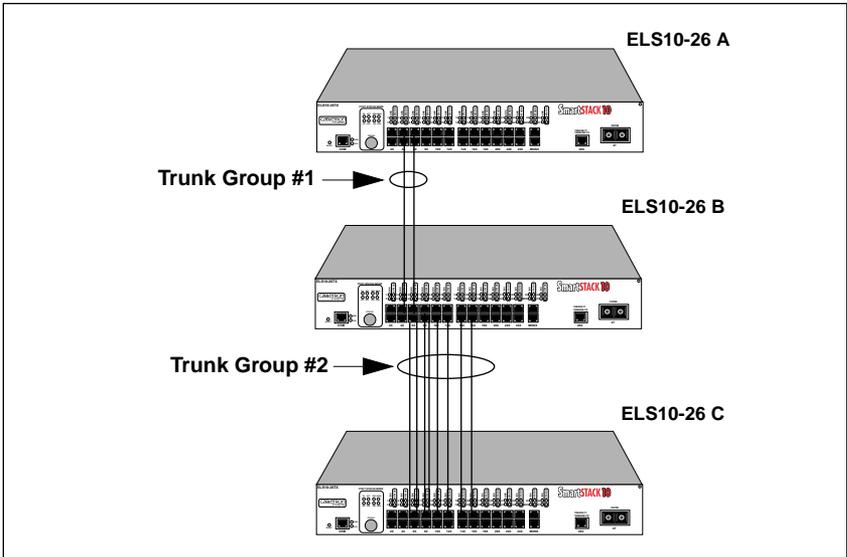
Figure 3-2. Trunk Groups

To enable trunking for the example shown, perform the following:

1. Connect the desired ports of the ELS10-26s together using 10BASE-T crossover cables.

   If ELS10-26 A is handling only a small number of users, the **A to B** Trunk Group could have just two ports per ELS10-26. If ELS10-26 B and C are expected to interconnect many users, you could use up to eight ports in the **B to C** Trunk Group.

2. Using LCM or a NMS, turn on trunking for the connected ports on each ELS10-26.

   For ELS10-26 A, at the LCM prompt:

   a. Type `trunk 2,3 on`

For ELS10-26 B, at the LCM prompt:

b. Type `trunk 3-10,14-15 on`

For ELS10-26 C, at the LCM prompt:

c. Type `trunk 3-10 on`

Each ELS10-26 determines which ports are part of which Trunk Group. After Trunk Group configuration, the ELS10-26s complete the standard 802.1D Spanning Tree state changes, treating each Trunk Group as a single 802.1D Spanning Tree port.

802.1D Spanning Tree takes about thirty seconds to resolve which ELS10-26 ports are to become forwarding ports. As ports within a Trunk Group become forwarding ports, traffic within the Trunk Group is momentarily halted to guarantee the first-in, first-out ordering of the Ethernet packets.

Note: The ELS10-26-to-ELS10-26 connections must be point-to-point. There cannot be any other devices on those Ethernets. The ports used for trunking can be in any order. However, both ends of the ELS10-26-to-ELS10-26 connections must have trunking turned on for the ports that are being used for the connections.

3.6 DISABLING TRUNKING

To turn off trunking, at the LCM prompt:

1. Type `trunk <PORT-RANGE> off`

   For example, `trunk 2-4 off`

3.7 DISPLAYING TRUNKING STATUS

To check the status of your current trunking configuration, at the LCM prompt:

1. Type **trunk <PORT-RANGE>**

The display could look like the following:

Note: IP Addresses are not required for trunking to function.

```
ELS10-26 > trunk 2-4

Port 2 trunking joined to Bridge MAC Addr 00:40:27:00:06:1f IP Addr 192.138.217.1
Port 3 trunking joined to Bridge MAC Addr 00:40:27:00:06:c3 IP Addr 192.138.200.2
Port 4 trunking joined to Bridge MAC Addr 00:50:36:00:07:4a IP Addr 192.140.250.7
```

To check the status for ports configured for trunking, at the LCM prompt:

1. Type **status <PORT-RANGE>**

The display could look like the following:

```
 ELS10-26 > status 1

          Port 1 Status
Type/Speed:              10B-TPX/10Mbits
Port Mirroring:          No
Duplex Mode:             Half Duplex
Bridging:                Transparent Bridging
Enabled/Disabled:        Enabled, Rip listening
Spanning Tree:           Forwarding
Trunking State:          Off
Pkts Transmitted:        1693
Pkts Received:           0
Carrier Losses:          1693
Total Collisions:        0
Excess Collisions:       0
RX Missed pkts:          0
RX Runt pkts:            0
RX FCS/Align Errs:       0
Internal TX Errs:        0

Type <CR> to display port 2 status...>
```

The following conditions can be displayed:

- Broken — Trunking is enabled, but the port in non-operational.

- Closed (or Oneway) — Trunking is enabled, and the Trunking Protocol is attempting to establish a trunk connection.

- Heldown — Trunking is enabled, but the trunk connection was rejected. After a short time-out period, another attempt is automatically initiated to establish a good trunk connection.

- Joined — Trunking is enabled, and the Trunking Protocol has established a good trunk connection.

- Off — Trunking is not enabled.

- Perturbed — Trunking is enabled, and a good trunk connection has been established. However, the forwarding of data packets is temporarily suspended to allow for a change in the membership of the Trunk Group.

3.8 ENABLING PORT MONITORING

The ELS10-26 allows you to monitor the 10BASE-T ports on the ELS10-26 (you cannot monitor the 100BASE ports). The monitoring of network traffic is performed by the ELS10-26 hardware, and the monitor image reflects the original packet. The ELS10-26 monitoring function maintains the original packet ordering of bridging frames between the inbound and outbound interfaces.

Using the LCM or a NMS, you can monitor a port, and select to monitor only packets received, only packets transmitted, or packets both received and transmitted by a port (if the port is operating in half duplex). In full duplex you can mirror either recieved packet or transmitted packet (not both).

To enable port monitoring on the ELS10-26:

1. Connect a network analyzer to the port labeled MONX on the ELS10-26.

2. Using the LCM or NMS, select the port or range of ports you want to monitor. Also select to monitor the received packets (Rx) or transmitted packets (Tx). If you do not select either the transmit or recieve options, the ELS10-26 will monitor both types of packets.

    For example, `mirror 2 Tx`

    This will turn on monitoring for packets transmitted on port 2.

3.9 DISABLING MONITORING

To turn off monitoring, at the LCM prompt:

1. Type **Mirror <PORT> off**

    For example, **mirror 2 off**

3.10 DISPLAYING MONITORING STATUS

To check the status of your current monitoring configuration, at the LCM prompt:

1. Type **mirror <PORT>**

The display could look like the following:

```
ELS10-26> mirror 2

Port Mirroring: Port 2 is mirroring Tx traffic
```

To check the status for ports configured for monitoring:

1. Type **status <PORT>**

The display could look like the following:

```
 ELS10-26 > status 1
           Port 1 Status
Type/Speed:             10B-TPX/10Mbits
Port Mirroring:         No
Duplex Mode:            Half Duplex
Bridging:               Transparent Bridging
Enabled/Disabled:       Enabled, Rip listening
Spanning Tree:          Forwarding
Trunking State:         Off
Pkts Transmitted:       1693
Pkts Received:          0
Carrier Losses:         1693
Total Collisions:       0
Excess Collisions:      0
RX Missed pkts:         0
RX Runt pkts:           0
RX FCS/Align Errs:      0
Internal TX Errs:       0

Type <CR> to display port 2 status...>
```

The following conditions can be displayed:

- Rx only — Monitoring is enabled, but monitoring only packets received by the port.

- Tx only — Monitoring is enabled, but monitoring only packets transmitted by the port.

- Rx and Tx — Monitoring is enabled, monitoring both transmit and receive packets.

- No — Monitoring is not enabled.

3.11 DEFINING AND DELETING WORKGROUPS

The ELS10-26 allows you to define logical groups of associated ports (virtual workgroups) to provide a more efficient flow of traffic across your Ethernet network.

Virtual workgroups offer you the ability to limit broadcasts to logical domains within the network. Workgroup destinations are recognized by the ELS10-26 and packets are routed directly to ports within the workgroup, eliminating the need to perform a general broadcast across each segment of the network to find specific host addresses.

Figure 3-3 shows an ELS10-26 that has been programmed to identify workgroups A and B. Workgroup A uses ports 3 through 5,13 and 16 and workgroup B uses ports 7, 11, 16 and 24. Port 16 connects a segment that contains both workgroup A and workgroup B hosts.
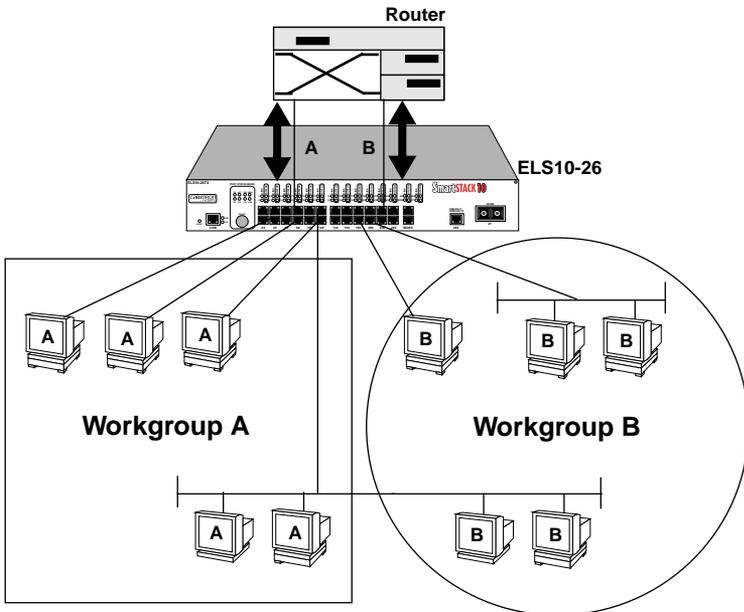

Figure 3-3. Defining Virtual Workgroups

The LCM commands used to create the previous configuration are
as follows:

1. To create workgroup A on ports 3, 4, 5, 13, and 16:

    ```
    ESL10-26 > workgroup A 3-5,13,16
    ```

    LCM responds with the following display:

    ```
    Name: a
    Ports: 3, 4, 5, 13, 16
    Info: all
    ```

2. To create workgroup B on ports 7, 11, 16, and 24:

    ```
    ESL10-26 > workgroup B 7,11,16,24
    ```

    LCM responds with the following display:

    ```
    Name: b
    Ports: 7, 11, 16, 24
    Info: all
    ```

Port 16 has been assigned to a segment that includes ports that
belong to workgroup A and workgroup B. Port 13 connects
workgroup A to the router and port 24 connects workgroup B to
the router.

In the above example, both displays show that all broadcasts will
remain with the workgroup.

Use the LCM command, *workgroup,* to create, modify, and delete
virtual workgroups. The full syntax of the command is as follows:

```
workgroup [NAME [{delete | PORT-RANGE [INFO]}]]
```

To display all of the workgroups defined by the ELS10-26, at the
LCM prompt:

1. Type **workgroup**

To display information about a specific workgroup, at the LCM prompt:

1. Type `workgroup NAME`

To create or modify a workgroup, at the LCM prompt:

1. Type `workgroup NAME PORT-RANGE INFO`

To delete a workgroup, at the LCM prompt:

1. Type `workgroup NAME delete`

To create or modify the port list for a specific workgroup, at the LCM prompt:

1. Type `workgroup NAME PORT-RANGE`

To display the network classification of a specific workgroup, at the LCM prompt:

1. Type `workgroup NAME INFO`

3.12 ASSIGNING A COMMUNITY NAME

A community name is similar to a password. You use the same steps to assign a new community name or to change an existing community name. You can then enter a community name to perform any SNMP *sets*. The default password is *public* the first time you access the device.

To assign a community name, at the LCM prompt:

1. Type `community`

2. Enter the old community name.

3. If one has not been assigned, `public` is the default name.

4. Enter the new community name.

5. LCM prompts you to verify the new community name by retyping it.

6. Retype the new community name.

3.13 CONFIGURING BROADCAST/MULTICAST STORM PROTECTION

The ELS10-26 provides automatic protection against broadcast/multicast storms. Multicast storms are excessive broadcasts to all ports, typically caused by a malfunctioning device. They can result in severe network performance problems, including causing the network to crash.

To protect against broadcast/multicast storms, you must define an acceptable rate for multicast traffic across a port. In many ways, this feature is similar to filtering.

Each ELS10-26 port can be individually configured for automatic multicast storm protection. You define what level of multicasts the ELS10-26 will recognize as a multicast storm by specifying the number of multicast packets that can be transmitted within a given time period.

Note: *LCM does not allow you to configure for multicast storm protection. You must use an SNMP-based NMS. See the documentation that came with your NMS for configuration instructions.*

For example, if you configure ELS10-26 to transmit onto Port 3 no more than five multicasts per 60 seconds, any multicasts destined for Port 3 are discarded after the first five multicasts. After 60 seconds have elapsed, another five multicasts to Port 3 will be allowed. This maintains an effective maximum rate of five multicast packets per minute.

The two Management Information Base (MIB) variables for configuring multicast storm protection are:

- `lxifTxStormCnt` – specifies the maximum number of multicasts that can be broadcast within the given time.

- `lxiTxStormTime` – specifies the period of time that the maximum number of multicasts can be broadcasted.

Refer to the *ELS10-26 MIB Reference Guide* for a complete listing and description of MIB variables.

3.14 MODIFYING MIB VARIABLES

Specific instructions for controlling ELS10-26 operations, modifying parameters, and so on, depend on the NMS you are using. This manual provides instructions for using LCM commands. However, LCM commands do not exist for all configuration options. You may need to modify your configuration using an NMS.

This section provides several common MIB variables you may want to change. Refer to the *ELS10-26 MIB Reference Guide* for a complete listing and description of MIB variables.

Each variable is first described in words, and is then identified in MIB form, for example, `lxadminGetPass - {lxadmin 3}`. The Display String line shows the range of values that can be used for the given parameter. In each case, the DisplayString is a string of ASCII characters.

3.15 SYSTEM CONTACT

The system contact parameter identifies the contact person who is responsible for operating the ELS10-26. Typically, this parameter includes the person's name, company or division name, and telephone number.

```
        sysContact - {system 4}
     DisplayString (SIZE (0..255))
```

3.16 SYSTEM NAME

The system name is a name assigned to the ELS10-26 by the network administrator. By convention, the system name is the fully qualified domain name. (This name then becomes the LCM prompt.)

```
        sysName - {system 5}
    DisplayString (SIZE (0..255))
```

3.16.1 System Location

The system location identifies the physical location of the ELS10-26.

```
        sysLocation - {system 6}
    DisplayString (SIZE (0..255))
```

3.16.2 Community Names

The set community name variable (from the Cabletron proprietary MIB), must be initialized with the correct community name passwords.

All requests from any SNMP manager contain a community name field. For set requests, the community name must match the set password; otherwise, the request will be rejected by the ELS10-26. For get requests, the community name must match either the set or the get community name.

Set Community Name

The set community name variable (`lxadminAnyPass`) and get community name variable (`lxadminGetPass`) must be set to the value of the community name used by the SNMP manager for performing either set or get operations. A zero length community name means that any community name is acceptable.

```
       lxadminAnyPass - {lxadmin 2}
   DisplayString (SIZE (0..24))

     lxadminGetPass - {lxadmin 2}
   DisplayString (SIZE (0..24))
```

3.16.3 Aging Parameter

Dynamic (learned) addresses are automatically deleted from the ELS10-26 Bridge Address Table after a certain length of time. The aging time default is five minutes, as set by the IEEE 802.1d standard. However, you can change the aging parameter with the MIB variable `dot1dTpAgingTime`.

The ELS10-26 continually compares the actual age of each dynamic address against the age specified by the `dot1dTpAgingTime` parameter, and deletes any addresses that are older than the age specified (or older than five minutes if you are using the default). Typically, there is no need to set the aging time to a very small number because the ELS10-26 Bridge Address Table supports 979 addresses.

CHAPTER 4

MONITORING AND MANAGING
YOUR ELS10-26

Monitoring the ELS10-26 consists of collecting and analyzing statistics and system status information.

You can use the Select button on the front panel of the ELS10-26 to monitor segment status on any of the Ethernet ports. Refer to Section 2.1 for a description of the segment status options.

Basic management of the ELS10-26 consists of disabling or enabling Ethernet ports, changing subnet masks, setting the community name for the ELS10-26, and changing the baud rate for your Local Console Manager (LCM) connection.

4.1 ELS10-26 MANAGEMENT TOOLS

LCM is a command-line interface built into the ELS10-26 that enables you to monitor and manage the ELS10-26 through the out-of-band RS232C connection attached to any non-intelligent terminal. You can also use one of the following Cabletron Systems Network Management Stations (NMSs), or a standard SNMP-based NMS to manage the ELS10-26:

- SPECTRUM

- SPMA

- SPEL

- Any SNMP-based NMS

4.2 ELS10-26 STATISTICS

The ELS10-26 gathers statistics that can help you build a comprehensive profile of the network traffic flow between each Local Area Network (LAN) you are connecting, as well as the network traffic flow between each Ethernet port on the ELS10-26.

ELS10-26 statistics are divided into four groups:

- System statistics

- Ethernet port statistics

- Traffic analysis statistics

- SNMP statistics

You can use this information to analyze your overall network performance and to make configuration changes as necessary. For example, Ethernet port statistics can help you identify network devices that require high bandwidth, and therefore should be connected through a dedicated, rather than a shared, network connection. In addition, Ethernet port statistics can help you identify a network device that is the source of numerous multicast packets due to a possible malfunction.

4.2.1 Gathering Statistics

For purposes of network management, managed objects must be identified. Creation of a managed object is achieved by placing its identifier, and a set of management information appropriate to its class, in the Management Information Database (MIB).

Using the MIB variables, you can obtain a detailed analysis of your network by combining statistics for each source network, destination network, and source and destination port. The *ELS10-26 MIB Reference Guide* contains the SNMP MIB variables you need to monitor and manage the ELS10-26.

4.2.2 System Statistics

For each ELS10-26, the following system statistics are available:

- The number of seconds since the ELS10-26 was last reset.

- The number of spanning tree topology changes that have occurred since the ELS10-26 was last reset.

- The time since a topology change was last initiated.

- The physical location of the ELS10-26.

- The name and address of the contact person for the ELS10-26.

- The name of the ELS10-26.

- The current number of dynamic (learned) addresses.

Note: *To check ELS10-26 system status using LCM, see Section 4.3.*

4.2.3 Ethernet Port Statistics

For each Ethernet port connection on the ELS10-26, a number of statistics are available. They can help you analyze both network activity and utilization, and in some cases, indicate faulty equipment or cabling.

Note: *All statistics counters are cleared when the ELS10-26 is reset or when the LCM* `clearstat` *command is used.*

- The number of non-unicast (multicast and broadcast) and unicast packets received from the port.

The following statistics are available with SNMP:

- The number of bytes in the received packets.

- The number of bytes in the packets that were filtered.

- The number of bytes in the packets that were forwarded.

- The total number of packets transmitted to the LAN.

4.3 USING LCM TO CHECK ELS10-26 STATUS

The LCM commands that enable you to quickly check on the status of the ELS10-26 include:

- Status

- Address display

- Ipaddr

- Ident

These LCM commands are described in the sections that follow.

4.3.1 Displaying Status

The `status` command displays the status of the ELS10-26 and automatically pages through the status of all of the Ethernet ports, pausing at each screen of information.

Note: *You can also use the* `status` *command to display status for individual Ethernet ports by typing* `status` *and specifying a port number.*

At the LCM prompt:

  1. Type `status`

     LCM displays the following type of information.

```
Software Currently Running: version xx.xx.xx software, Tue 08/23/94 15:0
Next Bootstrap (1st bank): version xx.xx.xx software Tue 08/23/94 15:03:
Power-up test failures: none
System Up Time: 2:25:57
Current Number of Learned Addresses: 133
CPU utilization is light.
```

Port	RX Packets	TX Packets	Collisions	Erred Packets
1	0	1676	0	1676
2	6978	8	0	0
3	0	0	0	0
4	0	0	0	0
.	.	.	.	.
.	.	.	.	.
.	.	.	.	.
24	0	0	0	0

```
Type <CR> to display port 1 status...>
```

If you do not want to view the status of each Ethernet port, use the Ctrl-C keys to return to the LCM prompt.

```
ELS10-26 > status 1

           Port 1 Status
Type/Speed:            10B-TPX/10Mbits
Port Mirroring:       No
Duplex Mode:          Half Duplex
Bridging:             Transparent Bridging
Enabled/Disabled:     Enabled, Rip listening
Spanning Tree:        Forwarding
Trunking State:       Off
Pkts Transmitted:     1693
Pkts Received:        0
Carrier Losses:       1693
Total Collisions:     0
Excess Collisions:    0
RX Missed pkts:       0
RX Runt pkts:         0
RX FCS/Align Errs:    0
Internal TX Errs:     0

Type <CR> to display port 2 status...>
```

If you do not want to view the status of port 2, use the Ctrl-C keys to return to the LCM prompt.

You can view the status for multiple of ports by typing `status` and indicating the range of port numbers, for example `status 2-6`.

4.3.2 Displaying MAC Addresses

The `addresses display` command displays all MAC addresses in the ELS10-26 Bridge Address Table. The display includes:

- The MAC address

- Type of address, including:

    - Dynamic (learned)

    - Ethernet port (for the MAC address of an Ethernet port)

    - BPDU (the MAC address to which all BPDUs are directed)

    - Reserved (an address reserved by 802.1d, but not yet assigned)

    - All LANs (addresses reserved by 802.1d for network management)

- Port number

- Age (in seconds since a packet was last received from that address)

The display automatically pauses with each screen of information. Addresses are displayed in random order; for example, address 02:00:00:00:00:00 may appear after address 04:00:00:00:00:00.

The age will be the time since a packet was last received from that address.

To display all MAC addresses, at the LCM prompt:

1. Type **addresses display any**

   LCM responds with a list of all MAC addresses, their associated ports, the type, age, and number of frames from and to that address.

```
Address           Type     Port  Age(secs)  Frames-From   Frames-To
08:00:20:02:3a:44 Learned    3        26             1           0

 Enter <CR> to continue, Ctrl-C to exit:
```

If you do not specify **any**, only the learned addresses are displayed.

To display a specific address, at the LCM prompt:

1. Type **addresses display <MAC-ADDRESS>**

   For example, if you typed, **addresses display 02:04:06:03:2a:43**, LCM would display the following information:

```
 Address           Type     Port  Age(secs)  Frames-From   Frames-To
 02:04:06:03:2a:43 Learned    5        21          1181          73
```

You can display a range of addresses by using a net mask. This is helpful when determining the status associated with stations containing the same make of Ethernet network interface cards. At the LCM prompt:

1. Type **addresses display <MAC-ADDRESS> <NET-MASK>**

   For example, to see all addresses that begin with 02:04:06, you would enter:

```
     addresses display 02:04:06:00:00:00 ff:ff:ff:00:00:00
```

LCM would display:

```
Address              Type    Port   Age(secs)   Frames-From    Frames-To
02:04:06:03:2a:43   Learned   5        21           1181           73
02:04:06:00:2a:67   Learned   4         1           3421            0
02:04:06:a3:70:2b   Learned   6         0          15339          235

Enter <CR> to continue, Ctrl-C to exit:
```

The `ipaddr` command displays the IP addresses, subnet masks, and MAC addresses of all ELS10-26 ports. At the LCM prompt:

1. Type **ipaddr**

   LCM displays the current IP address table, for example.

```
Port    IP Address        Address Mask         MAC Address
 1     192.138.217.1     255.255.255.0      00:40:27:00:06:1f
 2     0.0.0.0           255.0.0.0          00:40:27:00:06:c3
 3     192.138.217.10    255.255.255.0      00:40:27:00:06:3e
 4     0.0.0.0           255.0.0.0          00:40:27:00:03:7a
 5     0.0.0.0           255.0.0.0          00:40:27:00:05:c7
 6     192.138.217.20    255.255.255.0      00:40:27:00:04:4a
 7     192.138.217.50    255.255.255.0      00:40:27:00:06:9e
 8     192.138.217.30    255.255.255.0      00:40:27:00:04:b4
```

4.3.3 Displaying Manufacturing Information

The `ident` command identifies ELS10-26 manufacturing information, including the part number and any power-up test codes and diagnostic data. To display the manufacturing information, at the LCM prompt:

1. Type **ident**

   LCM displays the following type of information:

```
Part Number:   501-3000-002    X70002e4-0006891
Up-Link Module Part Number: 123-4567-891 X1234567-1234567
Power-up test codes:  00000000 00000000 00000000 00000000
Diagnostic data:  00000000 00000000 ffffffffc ffffffffc
                  00000000 ff006000
```

4.4 MANAGING THE ELS10-26

Managing the ELS10-26 consists of:

- Disabling and enabling Ethernet ports

- Changing a subnet mask

- Changing a community name

- Setting the baud rate of your terminal connection

- Setting a reboot time

You can use the Local Console Manager (LCM), any of the Cabletron Systems NMSs, or a standard SNMP-based NMS to manage the ELS10-26. Refer to Section 4.1.

4.5 USING LCM TO MANAGE THE ELS10-26

The LCM commands that enable you to manage the ELS10-26 include:

- Disable

- Enable

- Ipaddr

- Community

- Baud

- Reboot

These LCM commands are described in the sections that follow.

4.5.1 Disabling a Port

There can be times when you need to disable a specific Ethernet port, for example, after you have determined that there is faulty equipment. Disabling a port effectively stops all bridging functions for that port. Disabled ports do not accept SNMP packets, and therefore cannot communicate with an NMS.

To disable a port, or port range, at the LCM prompt:

1. Type `disable <PORT-RANGE>`

   For example, `disable 7-9` would disable ports 7, 8, and 9.

   LCM responds:

   ```
   Port 7: Disabled
   Port 8: Disabled
   Port 9: Disabled
   ```

Once an Ethernet port is disabled, it will be disabled until you enable it again. Resetting the ELS10-26 will not enable a port that has been disabled.

Caution: *If you disable the port through which someone is remotely managing the ELS10-26, that person will not be able to communicate with the ELS10-26. Use the LCM command* `addresses display` *to find the port number you are using to manage the ELS10-26.*

4.5.2 Enabling a Port

When you enable an Ethernet port that has been disabled, whatever bridging functions you had previously configured for that port are re-enabled.

To enable a port, or a range of ports, at the LCM prompt:

1. Type `enable <PORT-RANGE>`

For example, `enable 7-9` would enable ports 7, 8, and 9.

LCM responds:

```
Port 7: Enabled, Rip listening
Port 8: Enabled, Rip listening
Port 9: Enabled, Rip listening
```

Note: `Rip listening` *means that the ELS10-26 is in listening mode only. No RIP packets are created.*

noRIP Option

The Routing Information Protocol (RIP) is one of the protocols that allows the ELS10-26 to build an accurate, current routing table. This table includes the networks it knows about, the next hop, and the number of hops to get there. RIP enables you to use an NMS to remotely manage the ELS10-26 through a router.

The `noRIP` option allows you to turn off the routing information that builds the routing table. You would use this option when you are connecting network devices that do not support RIP.

4.5.3 Changing a Subnet Mask

You can optionally set the subnet mask for a port. A subnet mask is a 32-bit address mask used in IP to specify a particular subnet. If the subnet mask is 0.0.0.0, the ELS10-26 automatically converts the displayed mask to the standard default, based on the port's IP address class. (Class A address masks are 255.0.0.0, Class B address masks are 255.255.0.0, Class C address masks are 255.255.255.0.)

To display IP addresses, subnet masks, and MAC addresses of all ports on the ELS10-26 you are managing, at the LCM prompt:

1. Type `ipaddr`

LCM displays the current IP address table, for example:

```
Port IP Address          Address Mask              MAC Address
  1   192.138.217.1      255.255.255.0        00:40:27:00:06:1f
  2   0.0.0.0            255.0.0.0            00:40:27:00:06:c3
  3   192.138.217.10     255.255.255.0        00:40:27:00:06:3e
  4   0.0.0.0            255.0.0.0            00:40:27:00:03:7a
  5   0.0.0.0            255.0.0.0            00:40:27:00:05:c7
  6   192.138.217.20     255.255.255.0        00:40:27:00:04:4a
  7   192.138.217.50     255.255.255.0        00:40:27:00:06:9e
```

To change the subnet mask, at the LCM prompt:

1. Type **ipaddr <PORT-NUMBER> <IP ADDRESS> <SUBNET MASK>**

   For example, **ipaddr 6 192.138.217.40 255.255.240.0** would set
   the subnet mask for port 6 to 255.255.240.0. LCM responds by
   redisplaying the address table.

*Note: When you change the subnet mask for a port, you must also enter
the IP address for that port. Make sure you enter the IP address for
the port correctly; whatever you enter becomes the IP address.*

To assign a new IP address, refer to Section 3.1.

4.5.4 Changing a Community Name

A community name is similar to a password. You use the same
steps to assign a new community name or to change an existing
community name. This sets the MIB variable sxadminAnyPass. You
can then enter a community name to perform any SNMP *sets*.

To assign a community name, at the LCM prompt:

1. Type **community**

2. Enter the old community name.

   If one has not been assigned, you do not need to enter
   anything. LCM prompts you for the new community name.

3. Enter the new community name.

   LCM prompts you to verify the new community name by retyping it.

4. Retype the new community name.

4.5.5 Setting the Baud Rate

You can set the baud rate for your LCM console connection. The options for baud rate include:

- 1200

- 2400

- 4800

- 9600

- 19200

The default rate is 9600.

Note: Make sure that the baud rate you set matches the baud rate setting for the terminal you are using.

To display the current baud rate setting, at the LCM prompt:

1. Type **baud**

   LCM responds:

   ```
   Usage: baud [1200|2400|4800|9600|19200]
       Baud rate is 4800.
   ```

To change the baud rate setting, at the LCM prompt:

1. Type **baud <baud rate>**

    For example, **baud 9600** would set the baud rate to 9600.

    LCM responds:

    ```
                    Baud rate is 9600.
    ```

4.5.6 Setting a Reboot Time

You can enter the number of seconds the ELS10-26 waits before rebooting. At the LCM prompt:

1. Type **reboot <time interval>**

    For example, **reboot 60**

    LCM responds:

    ```
              Reboot pending in 59 seconds.
    ```

CHAPTER 5

ELS10-26 DIAGNOSTICS AND TROUBLESHOOTING

The ELS10-26 incorporates built-in diagnostic and testing capabilities which are convenient to use and cause minimal or no disruption to the rest of the operational network. These capabilities are effective for isolating problems within the ELS10-26 unit. Built-in diagnostic capabilities include:

- System-wide power-up diagnostics, which are run every time the system is powered up or reset.

5.1 POWER-UP DIAGNOSTICS

The ELS10-26 performs an extensive set of diagnostic self-tests whenever any of the following events occur:

- Power-up

- Reset using the front panel Reset button (a hard reset)

- Reset via the NMS (a soft reset)

- Automatic reset in response to a non-recoverable failure

The power-up diagnostics test processors, memory, and other critical hardware components of the ELS10-26. All diagnostic software is stored in non-volatile memory.

5.1.1 Power-up LED Sequence

When you power-up the ELS10-26, the following occurs:

1. All LEDs turn on for one second.

2. The Power (Pwr) LED and all of the status LEDs remain on.

3. The CPU LED starts flashing.

4. All LEDs on ports 1 - 24 will go on in sequence and then go out.

5. After several more seconds, the CPU LED will stay on, indicating that the power-up diagnostics sequence is complete.

   In addition, the Port Link LEDs will turn on for those ports with good links and the Segment Status LEDs will turn on (or flash) when the selected status condition is present.

Note: If a critical component fails diagnostics, the CPU LED will turn off and the ELS10-26 will attempt to reboot. If the CPU LED does not stay on, contact Cabletron Systems Global Call Center. Refer to Section 1.2.

5.1.2 Specific Power-up Tests

The power-up diagnostic tests performed on the ELS10-26 include:

- ROM checksum test

- Instruction/Data memory test

- FLASH checksum test

- NVRAM checksum test

- Ethernet data loopback test

5.1.3 Software Checksum Comparison

When the ELS10-26 reboots, its operational software is verified by a checksum comparison before it is loaded. If the software fails the checksum test due to an interrupted new software distribution procedure, the ELS10-26 will automatically use its backup version of software. A backup version of software is always stored in non-volatile memory.

The operational parameters of the ELS10-26 software are also protected by a checksum comparison. When the ELS10-26 reboots, if the operational parameters of the ELS10-26 fail a checksum test due to a power failure in the midst of a previous update, the ELS10-26 automatically uses its backup version of the parameters.

Note: A backup version of the operational parameters is always stored in non-volatile memory before any update is attempted.

5.1.4 Power-up Diagnostics Results

After completion of the power-up diagnostic sequence, both the Power (Pwr) and Ready LEDs located on the front panel of the ELS10-26 should be on.

5.2 RESPONSES TO FAILURES AT POWER-UP

How the ELS10-26 responds to failures detected during power-up depends on the seriousness of the failure. For example, it will operate if a non-critical component, such as the out-of-band management port, fails diagnostics. However, in the event of a critical failure, such as a failure of the main element processor, the ELS10-26 will halt execution and will not boot to operational mode.

5.3 STATUS AND ACTIVITY INDICATORS

The front panel of the ELS10-26 includes LEDs that indicate the status or activity of various system components. Figure 5-1 shows the ELS10-26 front panel LEDs and buttons. The LEDs and buttons are described in Tables 5-1 and 5-2.
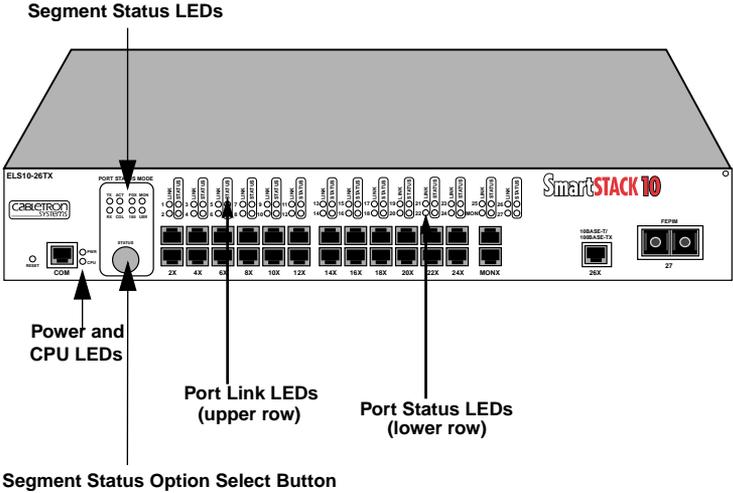
Figure 5-1. ELS10-26 Front Panel LEDs

Table 5-1. Meaning of ELS10-26 LEDs

LED	Meaning
Port Status Mode TX RX ACT COL FDX 100 MON USR	 On – Indicates port is transmitting a packet. On – Indicates port is receiving a packet. On – Indicates port is transmitting or receiving. On – Indicates a collision on a port. On - Port is operating in Full Duplex. Off - Port is operating in Half Duplex. On - Autonegotiatian status, port operating at 100 Mbps. Off - Port operating at 10 Mbps. On - Indicates the port is copying to the monitor port. On - Indicates that errored packets were received.
Link (Individual Ports)	On – Indicates the link is good. Off – Indicates there is no link.
Status (Individual Ports)	On/Blinking – Indicates you are monitoring the port for a selected segment status condition. This LED always indicates one of the status modes.

Table 5-2 describes the ELS10-26 buttons.

Table 5-2   Description of ELS10-26 Buttons

Button	Function
Status	Cycles through the Segment Status options (TX, RX, Act, Col, and Usr) for all ports. The lower port status LEDs of the ports you are monitoring are activated based on what function you chose with the Select button.
Reset	Restarts the ELS10-26.

5.4 TROUBLESHOOTING

This section lists several situations that could happen while using the ELS10-26, and suggests appropriate action. Because every situation is potentially unique, the corrective actions suggested here should be considered as guidelines only.

5.5 ELS10-26 DOES NOT POWER UP

If your ELS10-26 does not power up, check each one of the following:

• Make sure the power source is operational.

• Make sure the power cord is securely connected.

If the ELS10-26 still does not power up, contact Cabletron Systems Global Call Center. Refer to Section 1.2 for more information.

5.5.1 Connectivity Problems

• Check for LED abnormalities.

• Check port status using LCM.

• Check for loose port connections.

• Check to see if the number of carrier losses is increasing using LCM. This indicates that the connection is suspect.

• Check to see if the number of total collisions has dramatically increased using LCM.

5.5.2 ELS10-26 Has Rebooted

• Use the LCM `ident` command to check the ELS10-26 diagnostic codes, and call your authorized Cabletron Systems representative.

5.5.3 ELS10-26 Does Not Respond to NMS

• Check the port status using LCM.

• Check to see if the Spanning Tree topology is stable using LCM.

• Check that a pathway to the ELS10-26 exists.

• Verify the ELS10-26's IP address using LCM.

APPENDIX A

TECHNICAL SPECIFICATIONS

A.1 ELS10-26 SPECIFICATIONS

Physical

Height	1.75 in (4.45 cm)
Width	17 in (43.18 cm)
Depth	15.75 in (40 cm)
Weight	9 lb (4.1 kg)
Installation options	Tabletop or rack-mount

Electrical

Input voltage	Auto-ranging from 100-120, 200-240 Vac
Frequency	50/60 Hz
AC power consumption	80 watts

Connector Ports

25 RJ45 Ethernet ports (MDI-X)

1 RJ45 Fast Ethernet port

1 RJ45 Monitor Port (MDI-X)

1 RS232C port for Local Console Manager (LCM)

1 slot for optional Fast Ethernet Port Interface Module

Environmental

Operating temperature	5° to 40° C (41° to 104° F)
Storage temperature	-30° to 73° C (-22 ° to 164° F)
Operating relative humidity	5% to 90% (non-condensing)

Diagnostic LEDs

Individual port link status

Individual port segment status

Segment status, specifying:

- Transmit activity

- Receive activity

- Both Transmit and Receive activity

- Collision

- 100 (Mbps)

- Duplex

- MON (monitor)

- User-defined

CPU

Power (Pwr)

Standard Support

- IEEE 802.1 Part D

- IEEE802.2 (Logical Link Control)

- IEEE 802.3 (CSMA/CD, 10BASE-T) Ethernet

- Transparent Bridging with Spanning Tree

- Ethernet Version 2

- EIA RS232C (DTE-to-DCE Interface Specification)

- EIA RS-310-C (Rack-mount Specification)

Address Table Size

979 dynamic entries

Management Support

- MIB II, 802.1d, 802.3, and Cabletron Enterprise MIB

- Cabletron Systems Local Console Manager (LCM)

- Any SNMP-based network management system

Regulatory Compliance

Safety   UL 1950, CSA C22.2 No. 950,
                                    EN 60950, and IEC 950, 73/23/EEC

Electromagnetic Compatibility FCC Part 15 , EN 55022,
                                    EN50082-1, 89/336/EEC CSA
                                    C108.8, VCCI V-3 AS/NZS 3548
                                    EN 50082-1

A.2 SERIAL CABLE PIN ASSIGNMENTS

For a PC running a Windows terminal connected to the RS232C
Network Management Port on the front panel of the ELS10-26, the
following serial cable pin assignments (tables A-1 and A-2) are
required to manage the ELS10-26 using the Local Console Manager
(LCM).

Table A-1. DB25 Pin Assignments

ELS10-26 RJ45 (female)	DB25-pin (female)
Pin 1 (Tx)	Pin 3
Pin 4 (Rx)	Pin 2
Pin 5 (GND)	Pin 7

Table A-2. DB9 Pin Assignments

ELS10-26 RJ45 (female)	DB9 pin (female)
Pin 1 (Rx)	Pin 2
Pin 4 (Tx)	Pin 3
Pin 5 (GND)	Pin 5

A.3 10BASE-T PIN ASSIGNMENTS

An Ethernet twisted-pair link segment requires two pairs of wires. Each wire pair is identified by solid and striped colored wires. For example, one wire in the pair might be red and the other wire, red with white stripes.

Connectors
Refer to the diagram below and note how the pins are numbered. Be sure to hold the connectors in the same orientation when connecting the wires to the pins.
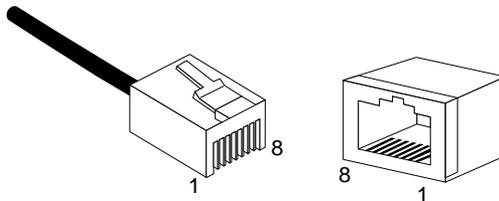
Figure A-1. Connector Pin Numbers

Each twisted-pair link segment must have a male connector attached to both ends. According to the 10BASE-T specification, pins 1 and 2 on the connector are used for receiving data; pins 3 and 6 are used for transmitting data, as shown in Table A-3.

Table A-3. 10BASE-T Pin Assignments

Pin	Assignment[a]
1	Rx+
2	Rx-
3	Tx+
6	Tx-

a. The "+" and "-" signs are used to represent the polarity of the two wires that make up each wire pair.

A.4 STRAIGHT-THROUGH WIRING

If the twisted-pair link segment is to join two ports on a switch, and only one of the ports has an internal crossover, the two pairs of wires must be straight-through, as shown in Table A-4.

Table A-4. Straight-Through RJ45 Pin Assignments

ELS10-26 (Crossed)	Device (Not Crossed)
1 (Rx+)	1 (Tx+)
2 (Rx-)	2 (Tx-)
3 (Tx+)	3 (Rx+)
6 (Tx-)	6 (Rx-)

A.5 CROSSOVER WIRING

Two ELS10-26s can communicate only if the transmitter on one unit is connected to the receiver on the other unit. This reversal, or crossover function, can be implemented either in the wiring or in the device itself. When connecting ELS10-26s, a crossover must be implemented in the wiring. Refer to Table A-5 for crossover pin assignments.

Table A-5. Crossover RJ45 Pin Assignments

ELS10-26	ELS10-26
1 (Rx+)	3 (Tx+)
2 (Rx-)	6 (Tx-)
3 (Tx+)	1 (Rx+)
6 (Tx-)	2 (Rx-)

A.6 5 - 4 - 3 RULE

Between any two nodes (i.e., PCs or other stations) on the network, there can be:

- Up to five segments in series

- Up to four repeaters or multi-port hubs

- Up to three populated segments (that is, segments attached to two or more PCs). The remaining two segments are unpopulated; these are known as inter-repeater links or IRLs. This distinction between populated and unpopulated segments is significant for coax networks only.

Note: *This rule is completely consistent with the IEEE 802.3 specification, and is meant only to summarize the configuration specification.*

A.7 FEPIM SPECIFICATIONS

The ELS10-26 uses a Fast Ethernet Interface Module (FEPIM) to provide front panel cable connections. FEPIMs are user-installable. See Section 2.2, **Installing an FEPIM**.

FE-100TX

The FE-100TX is an RJ45 connector supporting Unshielded Twisted Pair (UTP) cabling.

The slide switch on the FE-100TX determines the crossover status of the cable pairs. If the switch is on the **X** side, the pairs are internally crossed over. If the switch is on the **=** side, the pairs are not internally crossed over. Figure A-2 shows the pinouts for the FEPIM-100TX in both positions.

Position =
(not crossed over)

Position X
(crossed over)

1. TX+	5. NC		1. RX+	5. NC
2. TX-	6. RX-		2. RX-	6. TX-
3. RX+	7. NC		3. TX+	7. NC
4. NC	8. NC		4. NC	8. NC

FE-100TX   10 100
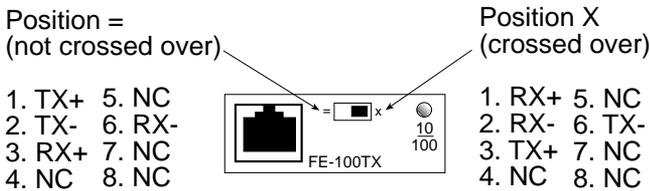
Figure A-2. FE-100TX Pinouts

FE-100FX

The FE-100FX shown in Figure A-3 supports multimode fiber optic cabling. The FE-100FX is equipped with an SC style port. Specifications for the FE-100FX are listed below.

Figure A-3. FE-100FX

Table A-6. Transmitter Power

Cable Type	Worst Case Budget	Typical Budget
50/125 µm fiber	6.0 dB	9.0 dB
62.5/125 µm fiber	9.0 dB	12.0 dB
100/140 µm fiber	15.0 dB	18.0 dB

The transmitter power levels and receive sensitivity levels listed are Peak Power Levels after optical overshoot. A Peak Power Meter must be used to correctly compare the values given above to those measured on any particular port. If Power levels are being measured with an Average Power Meter, add 3 dBm to the measurement to compare the measured values to the values listed above.

APPENDIX B

GLOSSARY

address
A set of characters that uniquely identifies a station, peripheral device, node, or other unit in a network.

address table
A database of device addresses and their associated ports maintained by a switch or bridge for use in making data packet forwarding and filtering decisions.

agent
Network management software that runs within a managed network device.

alarm
See *trap*.

ANSI
American National Standards Institute – One of several organizations that establishes standards that apply to internetworking.

ARP
Address Resolution Protocol – An auxiliary protocol of the IP layer used to perform dynamic address translation between MAC addresses and internet addresses. Binds IP addresses to specific MAC addresses.

attenuation
The amount of power (or light) lost as power travels through a medium from the transmitter to the receiver. Difference between transmitted and received power, in decibels (dB).

AUI (attachment unit interface)
A standard connector type used for Ethernet connections.

backbone
The major, central transmission path for a network. A backbone usually handles high-volume, high-density traffic. Typically a backbone connects various LANs into an integrated network.

bandwidth
A measure of the amount of traffic a given medium can handle at one time: The communications capacity (measured in bits per second), of a transmission line or of a specific path through a network. Greater bandwidth generally means more information can be sent through a circuit during any given period of time.

BPDU (bridge protocol data unit)
A data unit transmitted as part of the IEEE 802.1d Spanning Tree Protocol. The exchange of BPDUs allows bridges within a network to logically configure the network as a single spanning tree.

bps (bits per second)
The basic unit of data communications rate measurement.

bridge
An intelligent, protocol independent device used to connect similar or dissimilar LANs.

bursty
Adjective used to describe sporadic heavy volumes of network traffic (e.g., bursty traffic).

bypass
Optical or electronic isolation of a station from the network. A bypass situation typically occurs as a result of a station failure or shutdown; the bypass allows the network to function normally, except for the absence of the missing station.

concentrator
A device that provides attachment points for stations that are not connected to the ELS10-26. The concentrator is connected directly to the network; the stations connect to the concentrator.

congestion
A condition where a portion of the network is overloaded with more data than can be transmitted in the desired time period.

CSMA/CD (carrier-sense multiple access with collision detection)
A channel access (contention) method that requires each station to wait for an idle channel before transmitting. In addition, stations are able to detect overlapping transmissions (collisions) and retransmit in the event of a data collision.

data link layer
Layer 2 in the OSI model. Defines frame construction, addressing, error detection, and other services to higher layers.

datagram
Abbreviated and connectionless single-packet message sent from one station to another.

data rate (or speed)
The maximum number of bits of information that can be transmitted per second.

downstream
Refers to the relative position of a station in a network to another station in the same network. A station is downstream from another station if it receives data after the other station receives data.

dynamic address
An address "learned" by the ELS10-26, as opposed to addresses that are manually entered into the Bridge Address Table. The ELS10-26 "learns" addresses by reading them from the data packets it processes.

EIA (Electronic Industries Association)
Organization that sets standards for electrical interfaces (connectors).

encapsulation
A method for moving messages across networks that use different types of protocols. The message is encapsulated (rather than translated), so it can move across a network that otherwise could not understand its protocol. Encapsulating bridges and switches generally use proprietary encapsulation schemes.

encode
To translate data into a series of electrical or optical pulses that can travel efficiently over a cable or other medium.

entity
An active element within an Open Systems Interconnection (OSI) network layer or sublayer.

extended LAN
A collection of LANs interconnected by protocol-independent bridges or switches.

filtering rate
A measure (in packets per second) of the ELS10-26's efficiency in examining each frame, comparing it with an address table, and then deciding whether to discard the frame or forward it.

forwarding rate
The rate (in packets per second) at which the ELS10-26 can receive a stream of packets from one network segment, complete all processing, and transmit the packets to another network segment.

frame
A data message that includes a source address, destination address, data, frame check sequence (FCS), and control information.

full wire speed
Refers to packet forwarding at the maximum rate at which data can be transmitted on a given LAN.

ICMP (Internet control message protocol)
An auxiliary protocol of IP used to convey advice and error
messages about events in the IP layer.

IEEE (Institute of Electrical and Electronic Engineers)
International professional society which issues networking and
other standards. The IEEE created the 802 family of LAN
standards.

IEEE 802.2
The data link layer standard; used with IEEE 802.3, 802.4, 802.5,
and other LAN/WAN protocols.

IEEE 802.3
The physical layer standard that uses the CSMA/CD access
method on a bus topology LAN.

IEEE 802.6
Standard for metropolitan area networks (MANs) currently under
development.

initialization
Transition of a device or network from startup state to operational
state.

intelligent bridge/switch
A bridge/switch that is able to identify source and destination
addresses.

internet
A large communications infrastructure composed of wide and
local area networks. A generic reference to a network built using
internetworking technology.

Internet
A large collection of connected networks which use TCP/IP. (Also
referred to as the DARPA Internet, NSF/DARPA Internet or the
Federal Research Internet.)

internetworking
The linking of one or more networks to facilitate communication across networks.

interoperability
The ability of equipment from multiple vendors to exchange information using standardized protocols.

IP (Internet protocol)
IP is the basic datagram protocol used at the network layer of the TCP/IP stack.

ISO (International Standards Organization)
An organization that creates, controls and publishes standards.

jitter
Clocking deviation on a network.

Kbps (kilobits per second)
1,000 bits per second.

LAN (local area network)
A network that interconnects a variety of devices (computers, printers, servers, and so on), within a limited geographical area. A LAN typically connects devices within a building or campus.

link-loss budget
Each connection (link) in an optical system results in a certain amount of signal strength loss. Link-loss budget refers to the process of calculating link loss for the entire system. If the total link loss exceeds a certain limit, the system will not function.

LLC (logical link control)
A part of the data link layer of the OSI model that defines the transmission of a frame of data between two stations (with no intermediate switching nodes).

local traffic
Traffic within a given network segment.

MAC (media access control)
The data link layer sublayer responsible for scheduling, transmitting, and receiving data on a shared medium local area network.

mask
Specified a subset of a larger set of data to be included for comparison and analysis. For example, in switch filtering, a mask might be configured to include only the first four address bits as the basis for filtering decisions.

Mbps (megabits per second)
1 million bits per second.

MIB (management information base)
A collection of objects unique to a specific device that can be accessed via a network management protocol. The ELS10-26 has its own MIB.

multicast
Packets destined for more than one address.

multicast (broadcast) storm
Excessive multicast packet traffic, typically generated by a faulty device. Multicast storms can cause severe network performance problems.

network
Interconnected computer systems, terminals, and data communication facilities. A network must have at least three endpoints and may have any number of links and nodes.

node
Any device connected to a communication network, for example a computer, workstation, printer, server, concentrator, bridge, and switch.

OSI (Open Systems Interconnection)
Refers to the OSI reference model, a logical structure for network operations. OSI is the internationally accepted framework of standards for internetwork communication.

packet
A group of bits including data and control elements arranged in a specific format that are transmitted and switched as a composite whole. Control elements include a source address, destination address, frame control and status indicators, and a Frame Check Sequence (FCS).

PDU (protocol data unit)
The portion of a datagram that contains the data associated with a particular protocol.

peer-to-peer
Term used to describe data transmission between entities in the same sublayer of the OSI model.

physical layer
Layer 1 of the OSI model. Defines and handles the electrical and physical connections between systems.

power budget
The difference between transmit power and receiver sensitivity, including any safety margins.

PPP (point-to-point protocol)
A protocol for transmitting datagrams (IP or MAC packets) over a serial point-to-point link (e.g., the out-of-band management port).

pps (packets per second)
Unit of measure used to express packet data throughput. 18 pps is approximately equal to 9600 bps.

propagation delay
The time it takes for a signal to travel across a network.

protocol
A set of rules used by computers and related devices to communicate with each other.

protocol suite
A group of protocols related to a common framework.

RARP (reverse address resolution protocol)
A protocol that binds MAC addresses to specific IP addresses.

RISC (Reduced Instruction Set Computing)
A data processing technology in which functions are performed using the least possible number of instructions to yield very fast processing.

segment
When two or more networks are interconnected to form an internetwork, the original networks are referred to as segments.

service
A set of functions offered to a user by a provider.

SNMP (simple network management protocol)
A TCP/IP protocol for communication between a network management system and a network device.

source address filtering
A switch or bridge function that forwards or rejects data, depending on the data's source address.

static address
Addresses manually entered into the Bridge Address Table (as opposed to those automatically learned by the ELS10-26).

STP (spanning tree protocol)
A protocol that ensures that only one path will be used between two devices; prevents active loops (multiple paths to devices), by closing redundant paths. With STP operating, a redundant link serves as a backup link only if a normal path fails.

switch
An intelligent, protocol independent device used to connect similar or dissimilar LANs.

symbol
The smallest signaling element used by the MAC sublayer. Each symbol corresponds to a specific sequence of code bits to be transmitted by the physical layer.

synchronous transmission
A transmission technique in which an uninterrupted block of data is transmitted, using no redundant information such as stop and start bits to identify the beginning and end of a unit of data.

TCP/IP (transmission control protocol/Internet protocol)
Internetworking protocols sometimes referred to as the Internet suite of protocols.

topology
The arrangement of devices and cable paths that make up a network.

translating bridge
A bridge that can pass data between LANs that use different protocols.

translation
Modification of data packets from one type of network so they can be used on a different type of network (e.g., Ethernet to FDDI translation).

trap
Alarm; notification of an event that has occurred on a network. Some alarms require intervention or action by the network administrator; some are merely informational.

UDP (user datagram protocol)
A TCP/IP protocol for the connectionless transport layer.

upstream
Refers to the relative position of a station in a network to another
station in the same network. A station is upstream from its
neighbor if it receives data before its neighbor receives the data.

WAN (wide area network)
A communication network that spans a large geographic area.

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