The revision date for this manual is September 28, 1994.

Part Number: 900-040

WARNING

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against such interference when operating in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with this guide, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause interference in which case the user, at his or her own expense, will be required to take whatever measures may be required to correct the interference.

Warning: Changes or modifications to this device not explicitly approved by Lantronix will void the user's authority to operate this device.

Cet appareil doit se soumettre avec la section 15 des statuts et règlements de FCC. Le fonctionnement est subjecté aux conditions suivantes:

(1) Cet appareil ne doit pas causer une interférence malfaisante.
(2) Cet appareil doît accepter n'importé quelle interférence reìue qui peut causer une opération indésirable.

LSB4 Installation Guide

For Lantronix LSB4 Ethernet Switch

Contents

G   **Warranty**

Glossary

Index

iii

1 Introduction

Congratulations on the purchase of the Lantronix Model LSB4 Switch.

This chapter gives a conceptual introduction to the LSB4. Later chapters will cover installation and operation of the switch. For detailed information on LSB4 configuration and commands, refer to the *LSB4 Reference Manual*.

NOTE *The terms **bridge** and **switch** are used interchangeably in this manual; they are equivalent in meaning.*

What the LSB4 Does

The LSB4 switch switches packets between different local area network segments. The different segments are defined by where the LSB4 is placed. A local area network can be divided into four segments.

When a packet is received, the LSB4 completes the following steps:

1. The address is compared to an internal table, which contains the source and destination addresses of the different devices on the network. If the source Ethernet address of the packet (the address of the Ethernet where the packet originated) is not in the table, it is added to it.

2. The destination Ethernet address of the packet (where the packet is going) is examined. If the destination Ethernet address matches the current Ethernet, the packet is presumed to be at its final destination, and is discarded.

3. If the destination Ethernet address is recorded in the address table as one of another segment, or the destination Ethernet address is not listed in the table (not known), the packet will be forwarded to another segment. At this point, the packet is compared to any user-defined **filters** associated with that LAN port.

NOTE *User-defined filters can permit or deny packet forwarding based on the packet's network protocol, source or destination Ethernet address, or data patterns within the packet.*

Advantages of the LSB4

Dividing a LAN into segments has the following advantages:

- ♦ Reduction of packet traffic

- ♦ Management of packet traffic

Reduction of Packet Traffic

The LSB4 is designed to be connected to an Ethernet; it will divide the Ethernet into 4 network segments. The LSB4 will isolate each segment's local packet traffic; in other words, packets that are not destined for another segment of the network will not pass through the switch. This reduces unwanted packet traffic on other segments of the network.

Figure 1-1 illustrates the use of the LSB4.
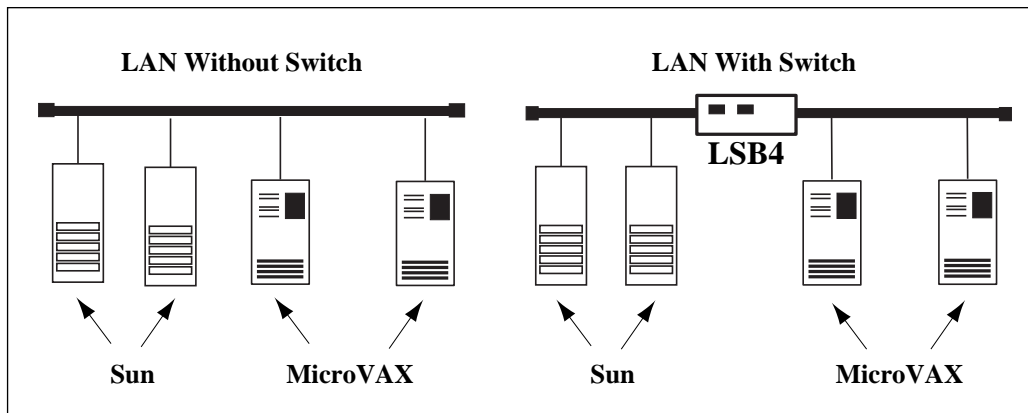
Figure 1-1: LANs With and Without LSB4

In the Local Area Network without a switch [Figure 1-1], incoming pack-
ets are examined by all hosts connected to the network. In the Local Area
Network with the LSB4 installed, the only traffic on the Sun segment of the
switch will be between the Suns plus any traffic specifically directed to a
VAX or directed to a Sun from a VAX. The same applies to the VAX seg-
ment of the network.

Management of Packet Traffic

The LSB4 does not add or change any of the information in the packets that
passes through the switch. However, it can be configured to regulate the
passage of certain packet traffic through the use of **filters**. Filters prevent
the passage of particular packets from one segment to another.

NOTE   *For more information about filters, see the Filter Commands chapter of
the LSB4 Reference Manual.*

Initial LSB4 Configuration

When the switch boots up, it will be configured in the following manner:

♦ Automatic filtering and forwarding of packets will
take place. To customize packet filtering, see the *Filter
Commands* chapter of the LSB4 Reference Manual.

♦ The Spanning Tree Algorithm will be enabled. This
can be disabled or customized to particular needs; see
Appendix B, *Spanning Tree Algorithm* for more infor-
mation.

To view diagnostic information as the LSB4 boots up, a terminal must be
connected to the LSB4. A serial cable is shipped with the switch; this may
be used to connect a terminal to the serial console port.

Networks and Protocols Supported

The LSB4 supports and processes packets for any Ethernet network. The operation of the LSB4 is fully compliant with both the IEEE 802.3 Ethernet specification and the IEEE 802.1d Bridge specification.

The LSB4 operates independently of the different protocols used in packets. Unless a particular protocol is specified using the Set/Define Filter command, the bridge will pay no attention to a packet's protocol.

Remote connections can be made through one of the LAN ports using any of the following protocols: AppleTalk, NetWare, Telnet/Rlogin, or MOP/ NCP/TSM. (The protocols may be disabled in order to improve performance.) In addition to the protocols listed above, the LSB4 responds to pings and SNMP commands.

NOTE *See Chapter 3, Set-up and Operation, for more information about logging into the LSB4 through the network.*

LSB4 vs. Other Methods

A switch differs significantly from other methods of connecting Ethernet segments together. A few examples of segment connection and the ways in which they differ from a network switch are discussed in Table 1-1.

Method of Segment Connection	Comparison to Network Switch
Connecting directly to the local area network (using a "T" or barrel connector)	An Ethernet has maximum cable lengths and maximum numbers of devices that can be connected. With a switch installed, each segment connected by the switch may use the maximum amount of cable length and maximum number of connected devices.
Connecting segments with a repeater	A repeater forwards all network traffic, including problems such as collisions. Rather than automatically forwarding all traffic, a switch forwards only packets intended for that particular Ethernet segment. Nodes no longer receive unwanted traffic; this reduces network traffic on all segments.
Connecting segments with a router	A router must be configured for the different protocols being used on the network. A switch is unaffected by the nature or contents of the data in the packets it receives; it requires no information about the different protocols being used on the network.

Table 1-1:   Comparisons to Network Switch

2 Installation

Installation

Installation Instructions

To connect the LSB4 to your Local Area Network, complete the following steps:

◆ Connect one or all of the LSB4's network ports to an Attachment Unit Interface (AUI) cable or to a transceiver.

◆ Connect a terminal to the LSB4's serial console port (optional.) The port is configured at the factory for 9600 baud, 8 data bits, no parity, and one stop bit.

◆ Plug the power cord into the AC input on the LSB4 and into an AC power source.

See Figure 2-1 on page 2-2 for an illustration of the LSB4.

NOTE *For connector specifications and configuration, see the LSB4 Reference Manual.*

The LSB4 is configured at the factory to operate in any network configuration. For specific configuration instructions, see Chapter 3, *Set-up and Operation*.

LAN Ports   Serial Console Port

AUI 1 Address::

AUI 2 Address:

AUI 3 Address::

AUI 4 Address:

Serial

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following
two conditions: (1) the device may not cause harmful interference, and (2) this device
must accept any interference received, including interference that may cause undesired
operation.

CAUTION
For continued protection against
risk of fire, replace only with
same type and ratings of fuse
Made in U.S.A.
Fabriqué in Etats-Unis

Serial #

LSB4

95-250V ~ 50-60Hz 0.5A   T2A/250V

LANTRONIX

AC input

LANTRONIX   LSB4

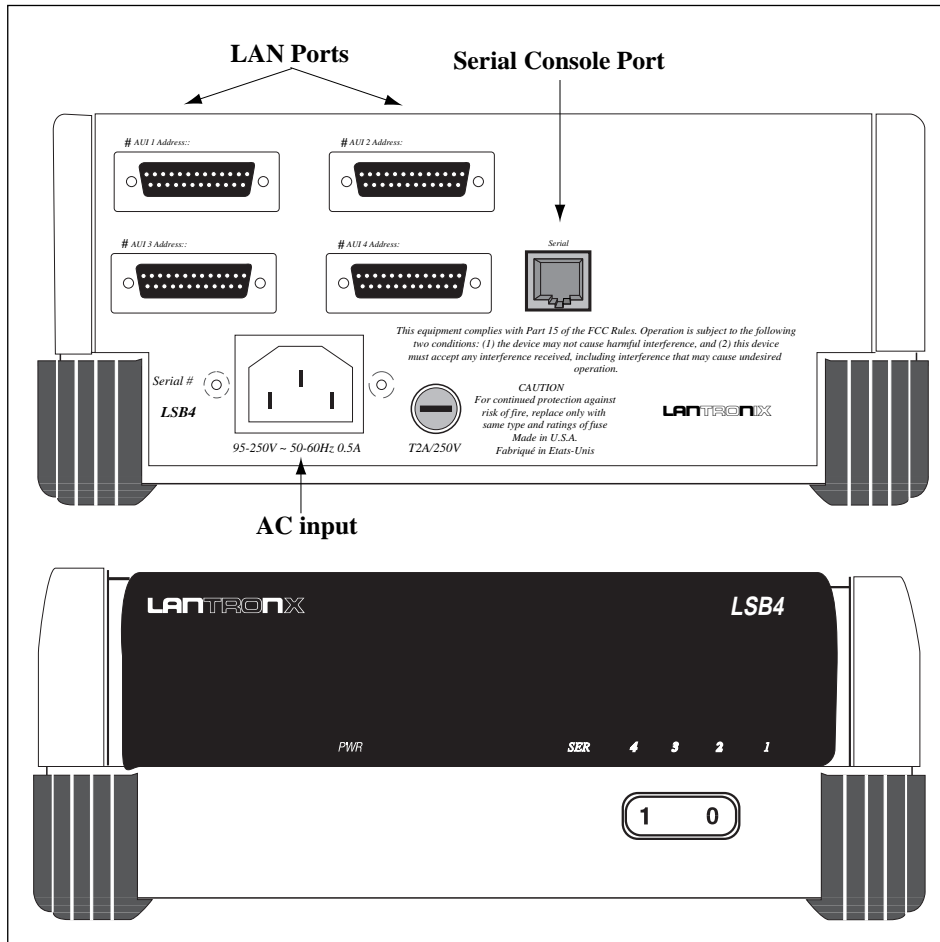PWR   SER   4   3   2   1

1   0

Figure 2-1: LSB4 Back and Front Panels

The illustrations on the following page [Figure 2-2 and Figure 2-3] are ex-
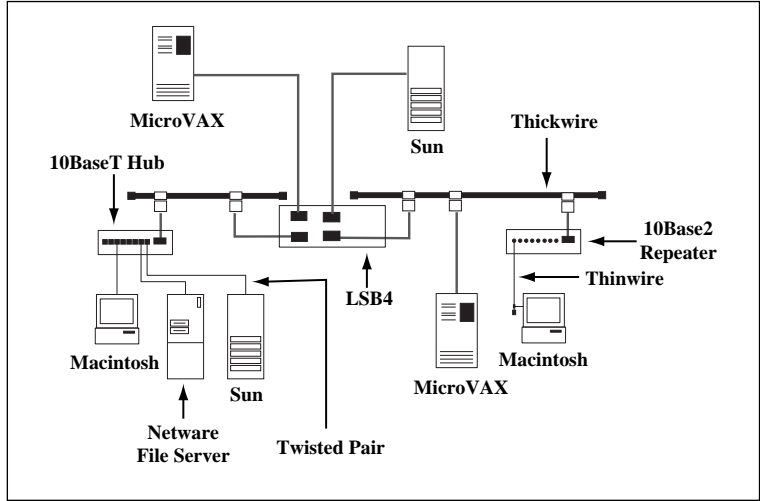amples of the placement and connection of the LSB4 to different types of
networks.

Figure 2-2: Network Configuration Example (*Thickwire*)
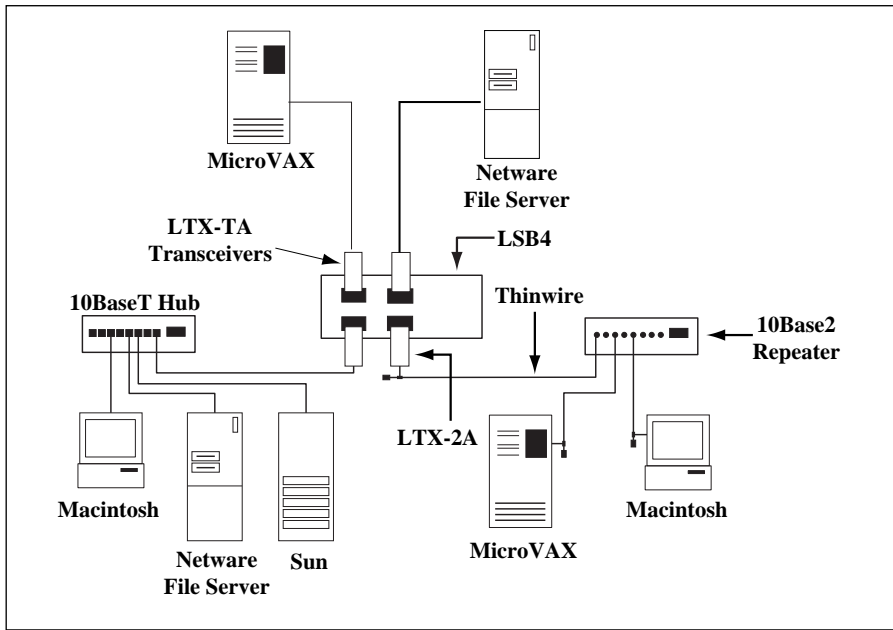
Figure 2-3: Network Configuration Example (*Thinwire/10BASE-T*)

Initializing the LSB4

Installation

Each time the LSB4 is turned on, it will go through an initialization pro-
cess. The process consists of the following steps:

♦ Power-on diagnostic tests will last approximately 5
   seconds.

♦ The contents of the LSB4's internal Flash ROM will be
   checked for validity and then executed. This will take
   approximately thirty seconds.

The LEDs will display as follows:

♦ During power-up diagnostics, the serial and network
   port LEDs will display varying patterns depending on
   the test being run. If the unit fails power-up diagnos-
   tics, it will display a fixed pattern.

NOTE   *If the LEDs display a fixed pattern, contact Lantronix technical support
   for additional information.*

♦ If the unit passes its power-up diagnostics, all serial
   and network port LEDs will show green for three sec-
   onds.

♦ When the LSB4 is operational, the serial LED will be
   green and blink every second, or more often if the se-
   rial console port is being used. The Network Port
   LEDs will blink roughly in accordance with the traffic
   on the network ports. If there is no activity on a partic-
   ular port, its LED will remain off. If there is no trans-
   ceiver connected to a port or the port has a faulty
   network connection, the Network Port LED will be
   solid orange.

NOTE	*If there is a problem during the initialization process, the serial LED will be orange after individualization is complete. If this occurs, see "Power-up Troubleshooting" on page 2-10.*

If a terminal is attached to the serial console port, text similar to the following will be displayed on the terminal during initialization [Figure 2-4].

```
Lantronix LSB4 Initialization
Boot Rom Version n.n (Month Day, Year)
   Port 1:    Ethernet Address:    00-80-A3-xx-xx-xx
   Port 2:    Ethernet Address:    00-80-A3-xx-xx-xx
   Port 3:    Ethernet Address:    00-80-A3-xx-xx-xx
   Port 4:    Ethernet Address:    00-80-A3-xx-xx-xx
   Internet Address:               (undefined)

Current Diagnostics Report:
   RISC:          3051 (4K I/2K D)   CPU Speed:       20 MHz
   RAM Size:      1 MB               Flash Size:      512 K
   Flash Version: n.n                Gate Array Rev:  n.n
   Errors:        None

Checking 8 sections from flash:
   From address 0xnnn to 0xnnn, nnn bytes) -> ....
   From address 0xnnn to 0xnnn, nnn bytes) ->
   From address 0xnnn to 0xnnn, nnn bytes) -> ....
   From address 0xnnn to 0xnnn, nnn bytes) -> ....
   From address 0xnnn to 0xnnn, nnn bytes) ->
   From address 0xnnn to 0xnnn, nnn bytes) -> ....
   From address 0xnnn to 0xnnn, nnn bytes) -> ....
   From address 0xnnn to 0xnnn, nnn bytes) ->

Loaded nnnnnn bytes.
Load Completed - Boot in Progress

   %% Lantronix LSB4
   %% Ethernet 1 Address:  00-80-A3-xx-xx-xx  Internet Address: (Undefi:
   %% Ethernet 2 Address:  00-80-A3-xx-xx-xx
   %% Ethernet 3 Address:  00-80-A3-xx-xx-xx
   %% Ethernet 4 Address:  00-80-A3-xx-xx-xx
```

Figure 2-4: Startup Messages

When all of the above is complete, the LSB4 is running normally.

NOTE *If the messages on the previous page do not appear on the terminal, see Power-up Troubleshooting on page 2-10.*

If the characters displayed on the terminal are incoherent, turn the LSB4 off, check the settings on the terminal, the cable connections, and turn the LSB4 on again.

Initial LSB4 Configuration

The LSB4 will operate properly in all local area networks without the need for any configuration changes. After the power-up initialization process, the LSB4 will automatically start learning the different node addresses connected to its ethernet ports and will start to process traffic within approximately one minute of power-up.

The LSB4 can be configured further, for example, to filter certain packet traffic, or to enable logins from other network nodes. Configuration is done through the use of specific commands. There are several ways to enter these commands:

♦ Connect a terminal to the LSB4's serial console port

♦ Log onto the LSB4 over the network using one of the network protocols: AppleTalk, NetWare, NCP/MOP/TSM, Telnet/Rlogin

♦ Use BOOTP or ARP to configure the IP address from a TCP/IP network host

♦ Send SNMP commands from an SNMP manager

NOTE *Instructions for configuring the LSB4 will be provided in Chapter 3, Set-up and Operation.*

Changing System Passwords

There are two important passwords on the LSB4: the privileged password and the login password.

The privileged password is the password that must be entered to become the privileged user. The default privileged password is **system**; it can be changed with either the **Set System Privileged Password** or **Define System Privileged Password** command.

NOTE   *The privileged user level is required before the privileged password can be changed. Use the default privileged password to obtain the privileged user level.*

The login password is required for logging into the LSB4 through a network connection. The default login password is **access**; it can be changed with either the **Set System Login Password** or **Define System Login Password** command.

NOTE   *To begin using the terminal connected to the serial console port, press Return until a user prompt appears.*

Use of the Set/Define System Privileged Password and Set/Define System Login Password are shown in Figure 2-5.

```
Local> SET PRIVILEGED
Password> SYSTEM (not echoed)
Local>> SET SYSTEM PRIVILEGED PASSWORD HOBBES
Local>> DEFINE SYSTEM PRIVILEGED PASSWORD HOBBES
Local>> SET SYSTEM LOGIN PASSWORD CALVIN
Local>> DEFINE SYSTEM LOGIN PASSWORD CALVIN
```

Figure 2-5: Set/Define Password Commands

IP Address Configuration

The LSB4's IP address must be configured before any TCP/IP functionality is available. The address can be defined using a terminal connected to the serial port, or via a host BOOTP or RARP server.

To define the IP address via the serial port, connect a terminal to the LSB4, become the privileged user and issue the **Set** and **Define Protocol IP IP-address** commands [Figure 2-6].

```
Local> SET PRIVILEGED
Password> SYSTEM (not echoed)
Local>> SET PROTOCOL IP IPADDRESS xxx.xxx.xxx.xxx
Local>> DEFINE PROTOCOL IP IPADDRESS xxx.xxx.xxx.xxx
```

Figure 2-6: Set/Define Protocol IP Commands

To configure the IP address using RARP or BOOTP, see the RARP/BOOTP server's documentation.

NOTE
Many BOOTP daemons will not reply to a BOOTP request if the download filename in the configuration file does not exist. If this is the case, create a file in the download path to get the BOOTP daemon to respond.

To configure the IP address using ARP, create an entry in the host's ARP table [Figure 2-7]. Note that this requires privileged user status.

```
# arp -s 192.0.1.228 00:80:a3:xx:xx:xx
```

Figure 2-7: Creating ARP Entry

Substitute the intended IP address and the hardware address of the switch. Then ping the switch using the following command [Figure 2-8]:

```
unix% ping xxx.xxx.xxx.xxx
```

Figure 2-8: Ping Command

When the switch receives the ping packet, it will notice that its IP address is currently not set and will send out broadcasts to see if anyone else is using this address. If no duplicates are found, the switch will use this IP address and will respond to the ping packet. The LSB4 will **not** save this learned IP address permanently. It is intended as a temporary measure to enable the administrator to telnet into the LSB4's console port.

Any host wishing to access the LSB4 will have to be told of the LSB4's IP address. This is typically configured in the file **/etc/hosts** or via a name-server. Refer to the host's documentation for additional information.

Power-up Troubleshooting

There are several possible error situations if the terminal connected to the serial port does not display the welcome message or the LEDs on the LSB4 do not light properly.

Condition: All serial and network port LEDs display a specific pattern denoting the exact failure. A terminal connected to the serial console port may also display an error message. The LSB4 is unable to proceed further.

Cause: The LSB4 has detected a fatal hardware fault.

Action: Contact your hardware dealer or Lantronix.

Condition: An error is detected during power-up that is non-fatal; the LSB4 continues to boot up but will not begin normal operation. The serial LED will blink orange. If a terminal is connected to the serial console port, a diagnostic message is displayed. The terminal displays a `Boot>` prompt and awaits a response.

Cause: The LSB4 has detected network errors on one or all of the ethernet ports.

Action: Connect a terminal to the serial console port if one is not connected. Check the network connection, and verify that power is reaching the MAUs.

<u>**Condition:**</u> All tests have passed successfully but the instructions stored in Flash ROM have become corrupted. The LSB4 will automatically attempt to find and load a file containing instructions from a host on the local area network. All of the Network Port LEDs will be alternating as the LSB4 looks for new software.

The following text will be displayed on the terminal connected to the serial console port [Figure 2-9]:

```
Checking X sections from flash: invalid checksum
found.

Attempting TFTP boot....
Attempting NetWare boot.....
Attempting MOP boot....

Will wait 1 minute for next download attempt...
```

Figure 2-9: LSB4 Searching For Instruction File

If the last line in the above message appears, the LSB4 has been unable to find and load the instruction file.

Cause: Usually this occurs if the LSB4 is disturbed while downloading a file containing instructions for the LSB4's Flash ROM. The stored instructions become corrupted.

Action: Reload the file containing the Flash ROM instructions.

NOTE *See Appendix E, Updating LSB4 Software for instructions on reloading Flash-ROM.*

Installation

Condition: All tests have passed and the unit is operating normally, but it appears that no packet traffic is being forwarded by the LSB4 to the different segments of the local area network.

Cause: There are several conditions that can cause this problem. Often it is caused by incorrect or faulty network cable connections or incorrect network hardware configuration.

Action: Check the LEDs of the LAN ports to see if they are green and flashing, and use the **Show Switch Status** command to determine the state of the ports.

NOTE *Where **Show /Monitor /List Switch** and **Set/Define Switch** commands are used, "Bridge" can be used in place of "Switch." For example, **List Bridge** has the same functionality as **List Switch**.*

♦ If Show Switch Status displays that a port is in the **testing** state, there is a faulty network connection. Check the cable connections.

♦ If Show Switch Status displays that a port is in the **overflow** state, there may be a "loop" in the network due to the Spanning Tree Algorithm being disabled. Ensure that the switch **state** and **spanning tree** are enabled; these parameters can be set with the Set/Define Switch command.

NOTE *If conditions occur that haven't been described in this section, contact Lantronix Technical Support. For contact information, refer to Appendix A.*

3

Set-up and Operation

Set-up and Operation

3

Accessing the LSB4

There are two ways to issue commands to the LSB4: through a terminal connected to the serial console port, or through a console somewhere on the local area network.

Connecting a terminal to the serial console port is discussed in Chapter 2, *Installation*. To start using the terminal after it is physically connected, press Return until a user prompt appears.

How the LSB4 is accessed through one of the LSB4's ethernet ports will depend on the requirements of the network host. There are several different host types:

- ◆ TCP/IP

- ◆ VAX/VMS

- ◆ NetWare

- ◆ AppleTalk

Each host type listed above requires a somewhat different approach when connecting over the network to the LSB4.

NOTE   *Remote logins via each supported protocol are enabled by default.*

Connections from TCP/IP Hosts

Connecting to the LSB4 from a TCP/IP host consists of two steps: obtaining an IP address, and logging into the LSB4.

Obtaining an IP Address

An IP address is required in order to log into the LSB4 from a TCP/IP host. The address can be defined using a terminal connected to the serial console port, or via a BOOTP or RARP host.

NOTE *Contact your network administrator to obtain an IP address.*

To define the IP address via the serial port, connect a terminal to the LSB4, become the privileged user and issue the **Set** and **Define Protocol IP IP-Address** commands [Figure 3-1].

NOTE *The **Set** command configures something now, but is not permanent. **Define** changes a setting permanently, but does not take effect until the LSB4 is rebooted or initialized. For more information on Set and Define commands, refer to the LSB4 Reference Manual.*

Please note that Figure 3-1 displays the default privileged password; this password will not be valid if the privileged password has been changed.

```
Local> SET PRIVILEGED
Password> SYSTEM (not echoed)
Local>> SET PROTOCOL IP IPADDRESS xxx.xxx.xxx.xxx
Local>> DEFINE PROTOCOL IP IPADDRESS xxx.xxx.xxx.xxx
```

Figure 3-1: Set/Define Protocol IP Commands

To configure the IP address using RARP or BOOTP, refer to the RARP/BOOTP host documentation.

Many BOOTP daemons will not reply to a BOOTP request if the download filename in the configuration file does not exist. If this is the case, create a file in the download path to get the BOOTP daemon to respond.

If the LSB4 has no IP address, it will set its address from the first directed IP address it receives. To generate such a packet, create an entry in the host's ARP table [Figure 3-2]. Note that this requires that privileged user status.

```
# arp -s 192.0.1.228 00:80:a3:xx:xx:xx
```

Figure 3-2: Creating ARP Entry

Substitute the intended IP address and the hardware address of the switch. Then ping the switch using the following command [Figure 3-3]:

```
unix% ping xxx.xxx.xxx.xxx
```

Figure 3-3: Ping Command

When the switch receives the ping packet, it will notice that its IP address is currently not set and will send out broadcasts to see if anyone else is using this address. If no duplicates are found, the switch will use this IP address and will respond to the ping packet. The LSB4 will **not** save this learned IP address permanently. It is intended as a temporary measure to enable the administrator to telnet into the LSB4's console port.

Any host wishing to access the LSB4 will have to be given the LSB4's IP address. This is typically configured in the file **/etc/hosts** or can be obtained via a nameserver. Refer to the host's documentation for additional information.

Set-up and Operation

3-3

Logging into the LSB4

At the prompt type one of the following [Figure 3-4]:

```
unix% telnet nnn.nnn.nnn.nnn
unix% rlogin nnn.nnn.nnn.nnn
```

Figure 3-4: Login Commands

where ***nnn.nnn.nnn.nnn*** is the IP address of the LSB4. ***nnn*** is a decimal number from 0 to 255.

The following text will be displayed [Figure 3-5]:

```
Trying nnn.nnn.nnn.nnn
Connected to nnn.nnn.nnn.nnn
Escape character is '^]'
```

Figure 3-5: Text Displayed Before Login

At the # prompt, type the login password. The password will not be displayed.

NOTE   *The default login password is **access**. This password can be changed using the Set/Define System Login Password command.*

The following text will be displayed [Figure 3-6]:

```
Lantronix LSB4 Version n.n/n(yymmdd)
Type Help at the 'Local>' prompt for assistance.
Username>
```

Figure 3-6: Text Displayed Upon Login

Type a username at the prompt and press the Return key. The LSB4 can then be configured as if at a terminal connected to the serial console port.

The session can be ended by typing **Ctrl-D** or **logout**.

NOTE

*Any privileged user can prevent TCP/IP host logins by entering the **Set/ Define System Incoming None** command. Port 7000 (see **Console Connections** on page 3-5) and existing logins will not be affected. For more information on this command, see the System Commands chapter of the LSB4 Reference Manual.*

Console Connections

The LSB4 enables a TCP/IP user to configure the server via a single telnet connection to the remote console port. The remote console port is desig-nate as **port 7000**. To make a connection to this port, use the **telnet** com-mand [Figure 3-7].

```
% telnet xxx.xxx.xxx.xxx 7000
Trying xxx.xxx.xxx.xxx
Connected to xxx.xxx.xxx.xxx
Escape character is '^]'

# access (not echoed)

Lantronix LSB4 Version n.n/n (yymmddd)

Type Help at the 'Local_4>' prompt for assistance.

Enter Username> xxxx
```

Figure 3-7: Connecting to Console Port

Note that the # prompt requires that the login password be entered before the connection can be made. The default login password is **access**. This password can be changed with the Set System Login Password command. See the LSB4 Reference Manual for details on this command.

Set-up and Operation

Connections from VMS Hosts

To access the LSB4 using a VMS network host, type the following [Figure 3-8]:

```
$ RUN SYS$SYSTEM:NCP
NCP> CONNECT NODE LSB4name
#
```

Figure 3-8: VMS Connect Commands

LSB4name represents the name of the LSB4 as identified in the NCP address database.

NOTE *See your NCP documentation for information about the address database.*

At the # prompt, type the login password. The password will not be displayed.

NOTE *The default login password is **access**. This password can be changed using the Set/Define System Login Password command.*

The following will be displayed [Figure 3-9]:

```
Lantronix LSB4 Version n.n/n(yymmdd)
Type Help at the 'Local>' prompt for assistance.
Username>
```

Figure 3-9: Text Displayed Before Login

Type a username at the prompt and press the Return key. The LSB4 can then be configured as if at a terminal connected to the serial console port.

The session can be ended by typing **Ctrl-D** or **logout**.

Connections from Netware Hosts

For PC hosts using Netware, the BRCON utility program is provided with the LSB4 on a DOS diskette. BRCON enables a PC host to log into or issue commands to the LSB4.

NOTE   *To use the BRCON utility, a Netware file server connection must be open, or the NetWare workstation shell program must be running.*

Copy the BRCON utility program to the hard disk being used or insert the LSB4 diskette into the A: drive and type the following command [Figure 3-10]:

```
C:> BRCON
```

Figure 3-10: BRCON Command

A list of the parameters that can be used with the BRCON command will be displayed [Figure 3-11].

```
Brcon Ver. 1.5
------------------
brcon list              list available switches
brcon <LSB4name>        establish a console connect:
brcon <LSB4name> reload  reload a switch
```

Figure 3-11: BRCON Command List

LSB4name represents the LSB4 service name. The service name is **LSB4_** (underscore), followed by the last three bytes of port 1's hardware address. For example, if the hardware address (listed above port 1 on the rear of the unit) is 00-80-A3-08-02, the service name would be **LSB4_A30802**.

Set-up and Operation

3-7

Enter the following to log into the LSB4 [Figure 3-12]:

```
C:\> BRCON LSB4_xxxxxx
```

Figure 3-12: Login Command

The display will show [Figure 3-13]:

```
Connection established (Ctrl-break to terminate)
#
```

Figure 3-13: Login Prompt

At the # prompt, type the login password. The password will not be displayed.

NOTE *The default login password is **access**. This password can be changed using the Set/Define System Login Password command.*

The following will be displayed [Figure 3-14]:

```
Lantronix LSB4 Version n.n/n(yymmdd)
Type Help at the 'Local>' prompt for assistance.

Username>
```

Figure 3-14: Username Prompt

Type a username at the prompt and press the Return key. The LSB4 can then be configured as if at a terminal connected to the serial console port.

To logout of the LSB4, press **Ctrl-D** or type **logout**.

Connections from Macintosh Hosts using AppleTalk

The MACCON utility program is supplied with the LSB4 on a Macintosh diskette. MACCON enables a Macintosh using AppleTalk to log into or issue commands to the LSB4.

To install MACCON, copy it onto a hard disk drive or run it directly from the diskette. Double click on the MACCON icon to launch the program. The screen will display AppleTalk zones and known Lantronix devices connected to the network.

Clicking on any AppleTalk zone name will display the devices in that zone. Double-click on any node name to log into that node, or enter configuration commands. Click the Quit button to exit MACCON.

Editing Command Entries

The LSB4 offers two features to assist you when entering commands: editing keys, and automatic command completion.

NOTE *These features are not available in boot mode.*

Editing Keys

Table 3-1 on page 3-10 lists the special keys used for command line editing.

Key	Purpose
Return	Executes the command line
Delete	Deletes the character immediately left of the cursor
Ctrl-A	Toggles insert mode (insert or overwrite)
Ctrl-D or Ctrl-Z	Logs out of the switch
Ctrl-E	Moves the cursor to the end of the line
Ctrl-H or Backspace	Moves the cursor to the beginning of the line
Ctrl-R	Displays the current command
Ctrl-U	Deletes the entire current line
Right Arrow	Moves the cursor to the right
Left Arrow	Moves the cursor to the left
Up Arrow or Ctrl-P	Recalls the previous command
Down Arrow or Ctrl-N	When scrolling through previously-entered commands, displays the next command entered
!!Return	Executes the previously entered command
!*text*Return	Recalls the last command starting with *text*

Table 3-1: Command Line Editing Keys

Automatic Command Completion

The LSB4 supports two types of automatic command completion: command recall, and partial command completion.

Command Recall

Pressing the Up Arrow and Down Arrow keys displays previously-entered commands at the input prompt. This feature is called **command recall**. The Up Arrow key scrolls backward through the previously-entered commands, and the Down Arrow key scrolls forward.

Once recalled, the command can be executed again, or edited and then executed. Up to nine previous commands can be scrolled through. If no commands have previously been entered, a blank line will be displayed when the Up Arrow or Down Arrow keys are pressed.

In addition to **command recall**, the LSB4 supports the UNIX **command history list** feature, which is activated by typing exclamation (!) marks. Entering two exclamation marks (!!) executes the previous command. Typing a single exclamation mark and one or more text characters will search for and display the previous command starting with the text characters.

Partial Command Completion

Partial command completion completes a partially-typed command when the Space Bar or Tab key is pressed. If the LSB4 cannot determine the remainder of a partially-typed command, it will beep and wait for user in put.

For example, if the following is entered [Figure 3-15]:

```
Local> SET FI
```

Figure 3-15: Partially-typed Command

and the space bar or the Tab key is pressed, the word **filter** will appear at the prompt.

Set-up and
Operation

3-11

NOTE *Partial command completion can be enabled or disabled; see **Set/Define Port Command Completion** in Chapter 4 of the LSB4 Reference Manual.*

Common Configuration Changes

As stated in Chapter 2, the LSB4 does not require additional configuration to operate properly in a local area network. Customization of the LSB4 is optional, and includes the following:

- ◆ Password protection
- ◆ System configuration
- ◆ Serial console port characteristics
- ◆ Switch configuration
- ◆ Filter configuration

NOTE *This section does not cover all configuration options; for a complete discussion of LSB4 configuration and commands, refer to the LSB4 Reference Manual.*

Password Protection

The LSB4 is protected with two levels of passwords: the login password and the privileged password. Using and changing these passwords is described in *Changing System Passwords* on page 2-7.

System Configuration

Three of the system configuration options are: modification of the system name, restriction of incoming network logins, and specification of the AppleTalk zone.

System Name

The system name is used by NetWare and AppleTalk networks to remotely access the LSB4.

The LSB4 will be identified as LSB4_*xxxxxx*. The x's represent the last six digits of the switch's ethernet address. The switch name can be changed using the Set/Define System Name command, shown in Figure 3-16.

NOTE   *Privileged access must be obtained before the Set/Define System Name command can be used. Use the **Set Privileged** command (displayed in the following example) to obtain privileged status.*

```
Local> SET PRIVILEGED
Password> SYSTEM (not echoed)
Local>> SET SYSTEM NAME LAB_SWITCH
Local>> DEFINE SYSTEM NAME LAB_SWITCH
```

Figure 3-16: Changing Switch Name

Incoming Network Logins

By default, the LSB4 will prevent all incoming network logins, with the exception of remote console logins using Telnet NCP/TSM connections. To prevent **all** network logins, use the **Set/Define System Incoming None** command [Figure 3-17, page 3-13].

```
Local>> SET SYSTEM INCOMING NONE
Local>> DEFINE SYSTEM INCOMING NONE
```

Figure 3-17: Preventing All Network Logins

Set-up and Operation

NOTE *For more information on the Set/Define System Incoming None com-*
mand, see Chapter 2 of the LSB4 Reference Manual.

AppleTalk Zone

If the LSB4 is connected to an AppleTalk network that includes a router,
the LSB4 will join the default zone specified by the router. In this case, the
LSB4 and other Macintosh devices in the same zone will be seen by each
other. Devices outside the zone will not be visible.

If the LSB4 is connected to an AppleTalk network without a router, zones
will not be configured and all devices on the network (including the LSB4)
will be visible and accessible to all other Macintosh clients.

A different AppleTalk zone may be specified by entering a Set/Define
Protocol AppleTalk Zone command [Figure 3-18]:

```
Local> SET PRIVILEGED
Password> SYSTEM (not echoed)
Local>> SET PROTOCOL APPLETALK ZONE RADON_LAB
Local>> DEFINE PROTOCOL APPLETALK ZONE RADON_LAB
```

Figure 3-18: Specifying AppleTalk Zone

NOTE *The MACCON utility program and the specified zone are of consequence*
only when connecting to the LSB4 through the AppleTalk network.

Customizing Serial Console Port Settings

The default characteristics of the serial console port are listed in
Figure 3-19.

```
Local> LIST PORT

Port 1: Username:        Physical Port 1 (Idle)

Char Size/Stop Bits:    8/1
Input Speed:            9600

Flow Ctrl:              Xon/Xoff
Output Speed:           9600

Parity:                 None
Modem Control:          None

Terminal Type:          Soft

Characteristics:
```

Figure 3-19: Serial Port Default Characteristics

These settings can be changed using the **Set Port** and **Define Port** com-
mands. Some examples of Set/Define Port commands are shown below
[Figure 3-20]:

```
Local> SET PORT SPEED 38400
Local> SET PORT FLOW XON
Local> SET PORT COMMAND ENABLED
```

Figure 3-20: Set/Define Port Examples

To make Set Port commands permanent, use the **Save Port** or the **Define
Port** command.

NOTE *For information about the Save command, refer to the LSB4 Reference
Manual.*

The LSB4 doesn't need to be rebooted in order for Define Port commands to take effect; they will take effect as soon as the port is logged out or finishes a print job.

NOTE   *When the port characteristics are changed, the terminal characteristics may have to be changed to match.*

Switch Configuration

The Set Switch and Define Switch commands can be used to configure two areas of the LSB4: LAN port characteristics, and Spanning Tree Algorithm specifications. Table 3-2 on page 3-17 describes the available Set/Define Switch commands.

NOTE   *The Spanning Tree Algorithm is enabled by default, but can be completely disabled if necessary. For a more detailed explanation of the Spanning Tree Algorithm, see Appendix B.*

Command	Command Type	Functionality
Set/Define Switch Forward Delay *delay*	Spanning Tree	Controls the delay interval between the LSB4's **listening**, **learning**, and **forwarding** states; is also the weed time during topology changes
Set/Define Switch Hello Time *time*	Spanning Tree	Controls the interval between Spanning Tree packet multicasts
Set/Define Switch Maximum Age *age*	Spanning Tree	Controls the time period that the LSB4 will wait after the last Spanning Tree packet before it looks for a new root switch
Set/Define Switch Ethernet *port* Path Cost *value*	Spanning Tree	Controls how expensive a port is in terms of packet forwarding time
Set/Define Switch Spanning Tree Enabled/Disabled	Spanning Tree	Enables or disables the Spanning Tree Algorithm
Set/Define Switch Weed *weed*	Spanning Tree	Controls the time period that the LSB4 will wait before it removes a node's hardware address when it has not heard from that node
Set/Define Switch Ethernet *port* State Enabled/Disabled	Ethernet Port	Will prevent packet traffic through an ethernet port
Set/Define Switch Ethernet *port* Priority *value*	Ethernet Port	Assigns a value that will be used to determine if the switch will become the root switch
Set/Define Switch Ethernet *port* Filter *filtr*	Ethernet Port	Associates a filter list with one of the LSB4's ethernet ports

Table 3-2: Switch Configuration Commands

Set-up and Operation

Filter Configuration

When a packet is received at an LSB4 port, the source and destination addresses of the packet are compared. If the address of the source and destination of a packet are the same, the packet is presumed to be at its final destination and doesn't need to travel any further. Once it is determined that a packet is **not** at its destination (the source and destination addresses do not match), a packet may then be subject to any existing **filters**.

Filters are used to permit or deny passage of data packets through the LSB4. The **Set Filter** and **Define Filter** commands are used to specify filters. Related filter commands are **Show/List Filters** and **Clear/Purge Filters**.

Creating a "Firewall"

A firewall is often used to prevent all but one type of traffic (for example, traffic from a specific node) from reaching a particular network segment. When traffic destined for a specific segment reaches the LSB4, it will be compared to a list of **filters**; if it is any but a specified type of traffic, it hits a "firewall" and goes no further--the packet is discarded.

The commands listed below [Figure 3-21] create a firewall between LAN 1 and any other network segment. Filter 1 is configured to deny access to IP packets; this filter is assigned to port 1, preventing IP packets from traveling from port 1 to other segments.

```
Local_1> SET PRIVILEGED
Local_1> SYSTEM (not echoed)
Local_1>> SET FILTER 1 APPEND PROTOCOL IP DENY
Local_1>> SET SWITCH ETHERNET 1 FILTER 1
```

Figure 3-21: Preventing IP Traffic Out of Port 1

NOTE *Figure 3-21 included a **Set Privileged** command before the Set Filter command. The Set Filter command requires privileged status; if privileged status is currently enabled, the Set Privileged command will not be necessary.*

The commands in Figure 3-22 prevent any IP traffic between LSB4 ports; for example, IP packets from LAN 1 cannot reach LAN 2, and IP packets from LAN 2 cannot reach LAN 4.

```
Local> SET PRIVILEGED
Password> SYSTEM (not echoed)
Local_1>> SET FILTER 1 APPEND PROTOCOL IP DENY
Local_1>> SET SWITCH FILTER 1
```

Figure 3-22: Preventing IP Traffic Between All Segments

The **Set Switch** command used above did not specify a particular ethernet port to be used with filter 1, as a result, all LSB4 ports will deny IP traffic.

In the following example [Figure 3-23], only traffic from source hardware address 00-80-a3-01-02-03 and source hardware address 00-80-a3-aa-bb-cc will be forwarded by the LSB4. Nothing else will be forwarded, except for multicast packets.

```
Local_1> SET PRIVILEGED
Password> SYSTEM (not echoed)
Local_1>> SET FILTER 1 APPEND SOURCE 00-80-a3-01-02-03 AL
Local_1>> SET FILTER 1 APPEND SOURCE 00-80-a3-aa-bb-cc AL
Local_1>> SET FILTER 1 APPEND MULTICAST ALLOW
Local_1>> SET FILTER 1 APPEND ALL DENY
Local_1>> SET SWITCH FILTER 1
```

**Figure 3-23: Only Permitting Specific Source Packets**

An incoming packet is compared to the third filter ("multicast allow") only if its source address does not match the source addresses specified in the first two filters. The fourth filter ("all deny") specifies that any packet that is compared to the first three filters without matching them (has neither of the mentioned source addresses and is not a multicast packet) will not be forwarded to any other segments.

NOTE *The commands listed in this section are only a few examples of the use of filters. For detailed information about filters and filter configuration, refer to the LSB4 Reference Manual.*

Set-up and Operation
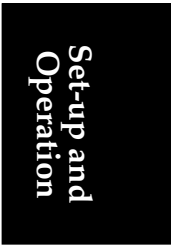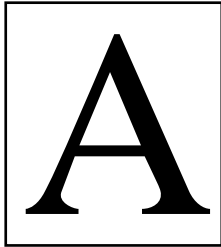
A Technical Support

If you are experiencing problems with the LSB4 or have suggestions for improving the product, please contact Lantronix Technical support at the address or phone number listed below. We are also reachable via Internet electronic mail; the address is **support@lantronix.com**.

> LANTRONIX
> 15353 Barranca Parkway
> Irvine, California 92718   USA
> 714-453-3990 • FAX 714-453-3995 • Toll Free 800-422-7044

When you report a problem, please provide the following information:

♦ Your name, and your company name, address, and phone number

♦ Lantronix model number

♦ Serial number of the unit

♦ Software version (use the **Show System** command to display)

♦ Network configuration, including the information from a **Netstat** command

♦ Description of the problem

♦ **Debug** report (stack dump) if applicable

♦ Status of the unit when the problem occurred (please try to include information on user and network activity at the time of the problem)
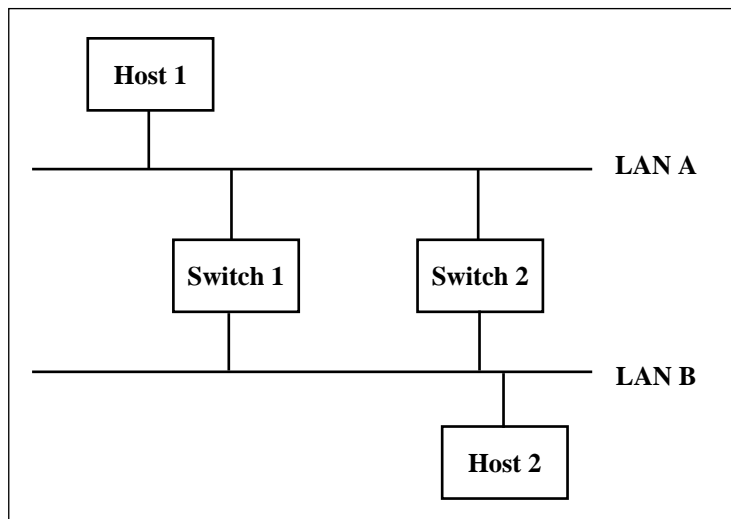
Technical
Support

A-2

B Spanning Tree Algorithm

Whenever two or more switches are connected to a local area network, the possibility exists that more than one switch could connect the same segments. This could result in endless loops of packet traffic on the network [Figure B-1].

Figure B-1: Multiple Paths Between Segments

The Spanning Tree Algorithm is a method used to sense the structure of the network and prevent multiple paths between network segments. The LSB4 uses the Spanning Tree Algorithm as defined by the IEEE specification 801.2d.

The Spanning Tree Algorithm looks at the network and, if it senses more than one path from one segment to another, it will disable all except one path [Figure B-2]. A disabled path may affect more than one port on more than one switch.
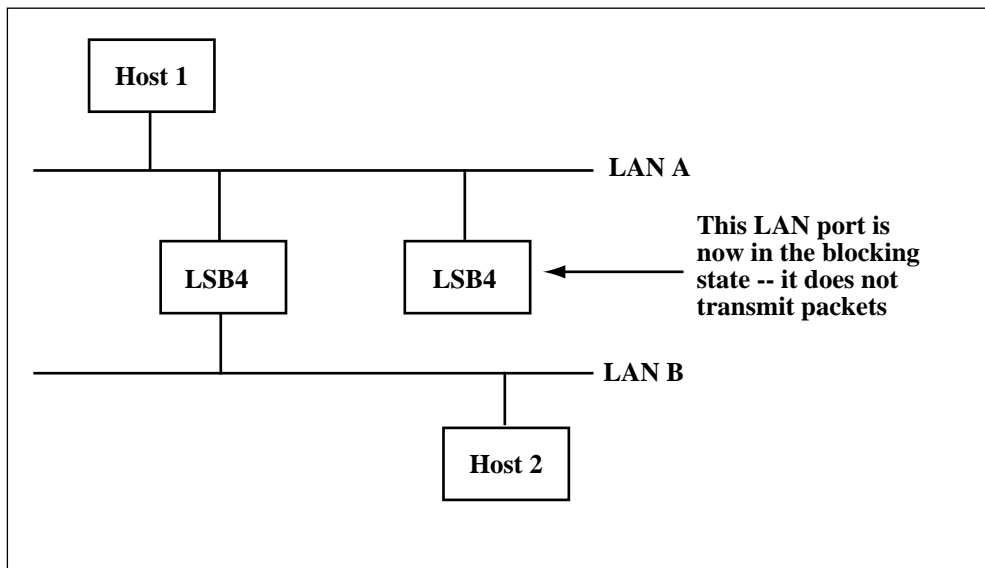

Figure B-2: Network Using Spanning Tree Algorithm

Each disabled port will continue to listen to packet traffic, but will not forward any packets through the switch or transmit any packets out of the disabled port. When multiple paths to the same segment have been identified, the path(s) with the highest path cost will be disabled.

The Spanning Tree Algorithm will respond to changes in network configuration. If an ethernet port has been disabled due to duplicate paths and the single operational path becomes inoperable, a disabled ethernet port will be re-enabled in order to recreate the path.

The Spanning Tree Algorithm is fully incorporated into the LSB4 and will be enabled by default. To disable the algorithm, use the **Set/Define Switch Spanning** command.

Spanning Tree Algorithm

B-2

NOTE

Caution should be exercised when disabling the Spanning Tree Algorithm. If there are multiple paths, packets could be forwarded continuously, resulting in packet storms and node crashes. It is highly recommended that all switches on a network enable the Spanning Tree Algorithm. If one or more switches have the Spanning Tree Algorithm disabled, care must be taken to avoid network loops.

The Spanning Tree Algorithm designates one of the switches as the **primary** or **root** on the network. If there is only one switch, it is obviously the root. If there is more than one, the hardware addresses and priority factors will be used to select the root.

Once a root is chosen, it will send out packets called **Bridge Protocol Data Units** (BPDUs) to each of its segments. Switches receiving the BPDUs will send them to their other segment, propagating BPDUs throughout the network.

Each switch throughout the network will then know from which ethernet port it should be receiving Bridge Protocol Data Units. If a switch receives one on a different port, it knows that there has been a change in the network configuration and it will re-establish a single path to each LAN segment. Conversely, if the switch stops hearing Bridge Protocol Data Units completely, it will know a link has failed and a new path must be established.

If the root stops operating, a new root will be selected based on switch priority and hardware address.

Spanning Tree
Algorithm

B-3

When using the Spanning Tree Algorithm ethernet ports can be in one of seven different conditions or states:

♦ **Listening:**   An ethernet port will listen for multicast Bridge Protocol Data Unit packets from other switches for the interval specified by the Set/Define Switch Forward Delay command. The switch starts in this state when it is initialized.

♦ **Learning:**   The switch will collect hardware address information for its internal address table. The learning state is entered when the **listening** Forward Delay interval has expired; the LSB4 will remain in the **learning** state for another Forward Delay interval.

♦ **Forwarding:**   The switch will forward packets from one segment to another unless the port is blocked or disabled, or there is a user-defined filter preventing the passage.

♦ **Blocked:**   A port is prevented from passing packets from one segment to another. This is brought about by the Spanning Tree Algorithm (there are multiple paths to the segment and forwarding a packet through this port onto the segment will cause a loop.)

♦ **Disabled:**   A port has been disabled with a Set/Define Switch State command.

♦ **Testing:**   The switch has detected an error in a particular segment (for example, it is disconnected), and is testing the segment to determine if the error has been fixed.

♦ **Overflow:**   There is no memory left on the switch to retrieve incoming packets. This may occur if the Spanning Tree Algorithm is disabled and there is a "loop" in the network.

Spanning Tree Algorithm

B-4

Particular events on the network can cause the switch to return to the Listening and Learning states. Selection of a new root is usually the event that will cause this transition.

NOTE

If the Spanning Tree Algorithm is disabled with a Set/Define Switch Spanning command, the port state can only be Disabled, Forwarding, Testing, or Overflow. The other three states are only reachable when the Spanning Tree Algorithm is enabled.

Spanning Tree
Algorithm

B-5

C Pinouts

Figure C-1 shows the pinouts for wiring the LSB4 serial connector. Note that these pinouts assume that the 8-conductor cable connecting the LSB4 and the Adapter block is a swapped cable.
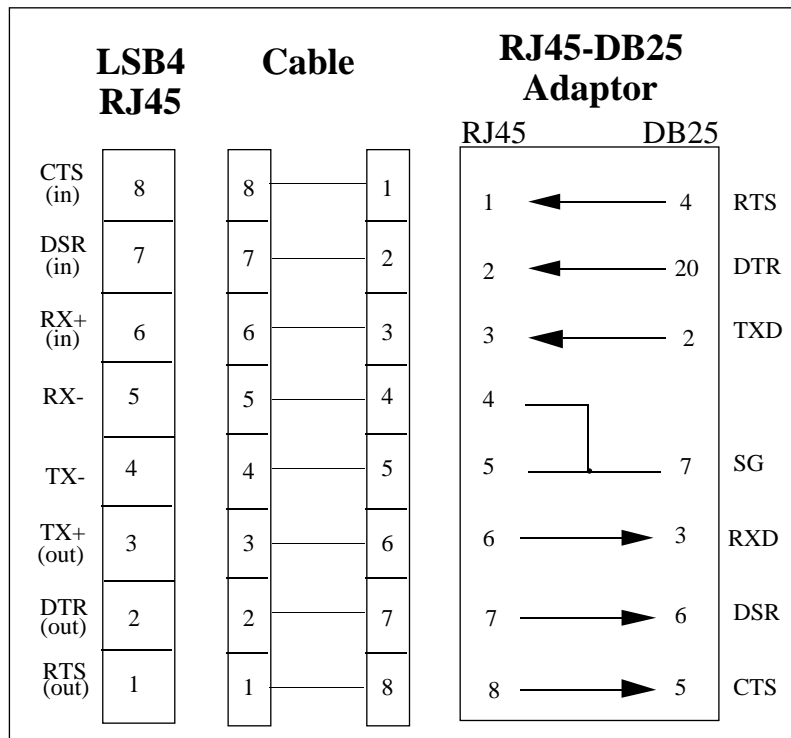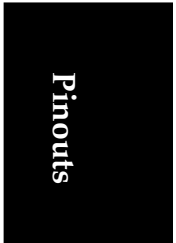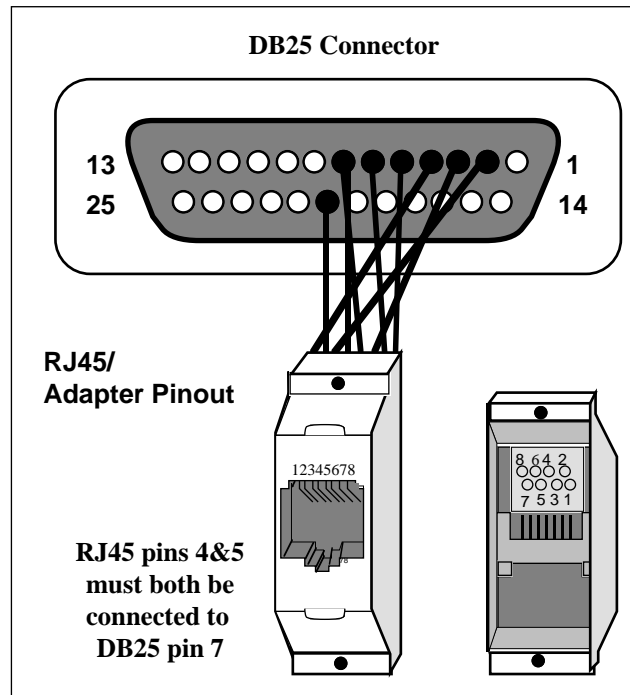
LSB4 RJ45	Cable		RJ45-DB25 Adaptor

					RJ45		DB25	
CTS (in)	8	8	1		1	←	4	RTS
DSR (in)	7	7	2		2	←	20	DTR
RX+ (in)	6	6	3		3	←	2	TXD
RX-	5	5	4		4			
TX-	4	4	5		5		7	SG
TX+ (out)	3	3	6		6	→	3	RXD
DTR (out)	2	2	7		7	→	6	DSR
RTS (out)	1	1	8		8	→	5	CTS

Figure C-1: LSB4 Serial Connector Pinouts

Pinouts

C-1

Figure C-2 shows how to wire the RJ45 to DB25 adapter.

DB25 Connector

13 ⚪⚪⚪⚪⚪⚪●●●●●●⚪ 1
25 ⚪⚪⚪⚪⚪●●●●●⚪⚪ 14

**RJ45/
Adapter Pinout**

12345678

**RJ45 pins 4&5
must both be
connected to
DB25 pin 7**

8 64 2
7 5 3 1

Figure C-2: RJ45 to DB25 Adapter

A small square connector is provided with the LSB4 adapters. This connector is used to connect both transmit and receive grounds from the RJ45 cable to the single signal ground on the DB25. The connector internally splices the two wires together and provides one wire into the DB25 connector. It is used as shown in Figure C-3 on the following page.

Pinouts

C-2

Sealed at this end

RJ45 Tx Return (Pin 4)

RJ45 Rx Return (Pin 5)   **DB25 Signal Ground (Pin 7)**
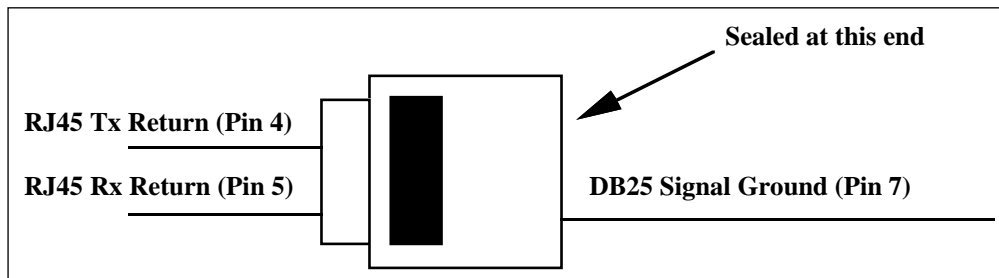
Figure C-3: Wire Splicer

To splice the wires, cut off the end of the wire that does not extend through the connector and insert both wires into the connector. Make sure that the wire that does not extend through the connector is in as far as possible to ensure a solid connection. Carefully squeeze the connector using a pair of pliers to ensure that it is fully latched.

Pinouts

RJ45 to DB9 (IBM PC Standard) Pinouts

To connect the LSB4 serial port to a DB9 connector using IBM PC standard pinouts, the following pinouts should be used [Figure C-4].
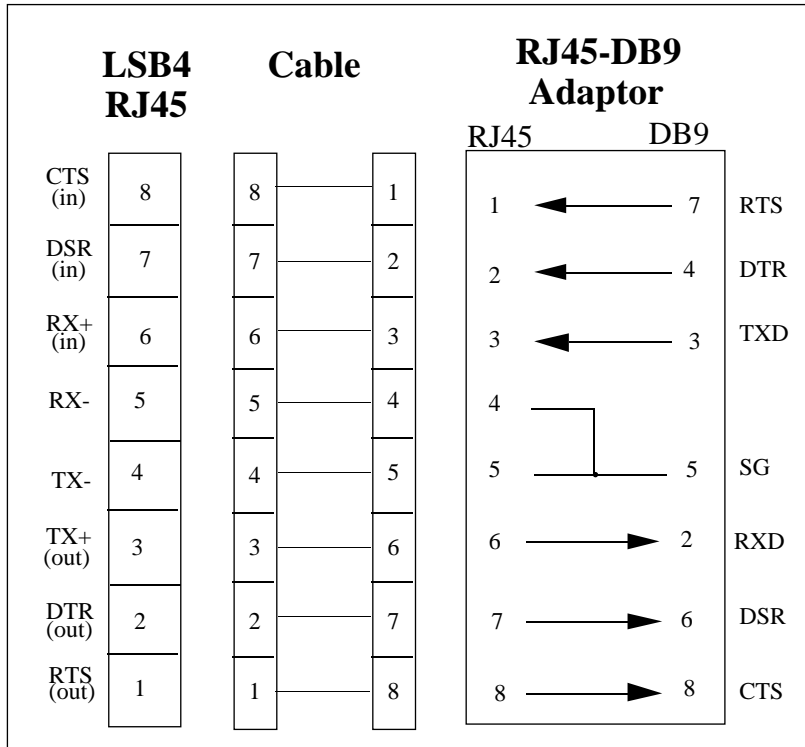

Figure C-4: IBM PC Standard Pinouts

Serial Cable Limits

Lantronix switches are RS-423 compliant, and are thus limited by the equipment at the remote end of the serial line. If the LSB4 is connected to an RS-232 device, it is subject to the RS-232 limits shown below. If connected to an RS-422 device, it is subject to the RS-422 limitations.

RS-232 lines are limited to 15m (50 ft) in length at 9600 baud. They will generally work at longer lengths. RS-422 lines are limited to 300m (1000 ft).
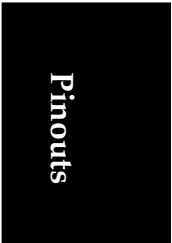
D SNMP Support

SNMP is an abbreviation for Single Network Management Protocol. SNMP commands enable users (usually system administrators) to get information from and control other nodes on a local area network.

Information about SNMP can be obtained in RFCs (Request For Comments.) RFCs can be obtained via anonymous FTP from **nisc.jvnc.net**. To obtain a specific RFC, use the pathname **pub/RFC/ rfc***nnn*, where *nnn* is the name of the desired RFC. To obtain the RFC index, use the pathname **pub/RFC/rfc-index.txt**.

The LSB4 implements the Management Information Bases MIB-2 and Bridge MIB. The MIBs and SNMP in general are documented in RFCs 1066, 1286, 1067, 1098, and 1213.

NOTE   *The LSB4 supports RFC 1286.*

The LSB4 has the ability to access the facilities of the Management Information Base for SNMP command management on TCP/IP-based networks.

D-1

The following SNMP object groups are supported:

system	OBJECT IDENTIFIER ::= {mib-2 1}
interfaces	OBJECT IDENTIFIER ::= {mib-2 2}
at	OBJECT IDENTIFIER ::= {mib-2 3}
ip	OBJECT IDENTIFIER ::= {mib-2 4}
icmp	OBJECT IDENTIFIER ::= {mib-2 5}
tcp	OBJECT IDENTIFIER ::= {mib-2 6}
udp	OBJECT IDENTIFIER ::= {mib-2 7}
ethernet transmission	OBJECT IDENTIFIER ::= {mib-2 10}
snmp	OBJECT IDENTIFIER ::= {mib-2 11}
dot1dbridge	OBJECT IDENTIFIER ::= {mib-2 17}

E Updating LSB4 Software

The latest version of the Lantronix LSB4 software and its associated release note can obtained in three ways: from a diskette or other media (if, for example, a diskette was mailed from Lantronix), by downloading directly from the Lantronix development systems through the Lantronix bulletin board system (BBS), or by using anonymous ftp through the Internet. Using the Lantronix BBS and using anonymous ftp are discussed in *Downloading from the Lantronix BBS* on page E-10 and *Obtaining Software via the Internet* on page E-12.

Questions or comments regarding the ftp or downloading processes can be addressed via electronic mail: the Internet mailing address is **ftp@lantronix.com**.

In addition to loading new software, this Appendix discusses reloading current system software (if, for example, the LSB4 doesn't boot.) Current LSB4 software can be reloaded from the LSB4's internal Flash ROM; this procedure is discussed in *Reloading Flash ROM* on page E-2.

E-1

Reloading Flash ROM

The LSB4 stores its software in Flash ROM. This software controls the ini-
tialization process, the operation of the LSB4, and the processing of com-
mands. The contents of Flash ROM can be updated by downloading a new
version of the operational software.

The Flash ROM software is contained in a file called LSB.SYS, provided
with the LSB4 on a floppy diskette. This file must be accessible when up-
dating Flash ROM.

Flash ROM can be updated using any of the following host protocols:
TCP/IP, VAX/VMS, or Netware. In addition, Boot Configuration Pro-
gram (BCP) commands can be used.

Using TCP/IP Hosts

Updating the LSB4 using a TCP/IP host consists of two steps: making the
LSB.SYS file accessible on the host machine, and downloading the
LSB.SYS file from the host machine to the LSB4.

As stated in the previous section, the LSB.SYS file is shipped with the LSB4
on a DOS diskette. This diskette may be used to put the LSB.SYS file on the
host machine.

Downloading the LSB.SYS file from a TCP/IP host to the LSB4 is accom-
plished using the TFTP (Trivial File Transfer Protocol.) TFTP requires the
following: the LSB4's IP address, the host's IP address, and that the
LSB.SYS file name be identified.

If the TCP/IP host provides BOOTP support, BOOTP commands can be
used to identify the LSB4's name, IP address, hardware address, and the
pathname of the BOOTP information file. The pathname of the BOOTP
configuration file is usually **/usr/etc/bootptab**.

To download the LSB.SYS file to the LSB4, enter the following commands
[Figure E-1]:

```
Local> SET PRIVILEGED
Password> SYSTEM (not echoed)
Local>> DEFINE PROTOCOL IP IPADDRESS xxx.xxx.xxx.xxx
Local>> DEFINE SYSTEM SOFTWARE "/path/LSB.SYS"
Local>> DEFINE PROTOCOL IP LOADHOST xxx.xxx.xxx.xxx
Local>> INITIALIZE RELOAD
```

Figure E-1: Downloading LSB.SYS File

If the pathname contains lower-case characters, the name must be en-
closed in quotation marks. There is an 32 character length limit for the path
name and a 16 character limit for the file name.

NOTE   *See the Set/Define System command in the LSB4 Reference Manual for
more details.*

The **Initialize Reload** command will initialize the LSB4. As Set System
commands will be lost when this occurs, Define System commands should
be used (see the example above.) Use the List System command to check
the LSB4 settings before entering the Initialize Reload command.

The initialization process will take approximately one minute from the
time the Initialize command is entered. If the LSB.SYS file cannot be found
or accessed during initialization, the LSB4 will re-initialize using the cur-
rent contents of the LSB4's Flash ROM.

As described in Chapter 2, the serial LED and LAN port LEDs will quickly
blink orange while the LSB4 is in boot mode (and reloading code), then
slowly blink green when the LSB4 returns to normal operational mode.

Using VAX/VMS Hosts

Updating the LSB4 using a VAX/VMS host consists of two steps: making the LSB.SYS file available in the host machine's MOM$LOAD directory, and downloading the LSB.SYS file from the host to the LSB4.

When the LSB.SYS file is to be loaded using MOP, the file name is the only parameter required by the LSB4.

The LSB4's service characteristic must be enabled on the host's Ethernet circuit. See the NCP documentation for more details about the service characteristics.

To download the LSB.SYS file from the host to the LSB4, enter the following commands [Figure E-2]:

```
Local> SET PRIVILEGED
Password> SYSTEM (not echoed)
Local>> INITIALIZE RELOAD
```

Figure E-2: Downloading LSB.SYS File

The initialization process will take approximately one minute from the time the Initialize command is entered. If the LSB.SYS file cannot be found or accessed, the LSB4 will re-initialize using the current contents of the LSB4's Flash ROM.

NOTE *During the initialization process, the serial LED and LAN port LEDs will quickly blink orange while the LSB4 is in boot mode (and reloading code) and then slowly blink green when it returns to normal operational mode.*

E-4

Using Netware Hosts

Updating With BRCON

For PC hosts using Netware, the BRCON utility program is provided with the LSB4 on a DOS diskette. BRCON enables a PC host to log into or easily issue commands to the LSB4.

BRCON will copy the new version of LSB.SYS from a floppy diskette into the LOGIN directory of the file server, configure the LSB4 with the proper download file name and path, and issue the re-load command.

After becoming the supervisor on the NetWare host, type the following [Figure E-3]:

```
A:> BRCON BR_xxxxxx RELOAD
```

Figure E-3: Reload Command

The following text will be displayed [Figure E-4]:

```
File Server: file_server_name
Download filename [LSB.SYS]:
File Destination [F:\LOGIN]:
Reloading LSB4_xxxxxx. This will take about 2 minutes.
A:>
```

Figure E-4: Reloading LSB.SYS

After logging into the LSB4 and entering the **Show System** command, the new software version will be displayed.

NOTE   *If the LSB.SYS file cannot be found or accessed, the LSB4 will re-initialize using the current contents of the LSB4's Flash ROM.*

E-5

Updating Without BRCON

Copy the LSB.SYS into the LOGIN directory on the NetWare file server. Without the BRCON utility, an LSB4 connection cannot be established; the LSB4 will only be able to access files in the LOGIN directory.

Enter the following commands to re-load the LSB.SYS file into the LSB4 [Figure E-5].

```
Local> SET PRIVILEGED
Password> SYSTEM (not echoed)
Local>> DEFINE SYSTEM SOFTWARE "sys:\login\LSB.SYS"
Local>> DEFINE SYSTEM NETWARE LOADHOST fileserver
Local>> INITIALIZE RELOAD
```

Figure E-5: Reloading LSB.SYS File

There is a twenty-four character length limit for the path and file name. If the path/file name contains lower case characters, it must be enclosed in quotation marks.

NOTE *See the Set/Define System command in the LSB4 Reference Manual for more details.*

The **Initialize Reload** command will initialize the LSB4. As Set System commands will be lost when this occurs, Define System commands should be used (see Figure E-5 above.) Use the List System command to check the LSB4 settings before entering the Initialize Reload command.

Updating
LSB4 Software

Updating the LSB4 using BCP

The Boot Configuration Program enables a user to configure the LSB4 in the following situations: when the LSB4 fails during initialization, or when an Initialize Noboot command is entered.

BCP commands are entered at a terminal connected to the serial console port. (No additional software is required.) The following BCP commands may be used:

◆ Help:

Displays a one page summary of the BCP commands.

◆ Init 451:

Re-initializes the LSB4. Use this command after other configuration commands have been entered.

◆ Set System Hardware *xx-xx-xx*:

Specifies the LSB4's base hardware address. *xx-xx-xx* is the last three bytes (hexadecimal characters) of the switch's Ethernet address; the first three bytes will be supplied automatically. The addresses of the other LAN ports are automatically computed from this base address.

◆ Set System IPaddress *address***:**

Specifies the LSB4's IP address. *address* must be entered in the following form: *nnn.nnn.nnn.nnn* where *nnn* is a decimal number from 0 to 255.

◆ Set System Loadhost:

The LSB4 will check this host address when attempting to load the LSB.SYS file. *address* must be entered in the following form: *nnn.nnn.nnn.nnn* where *nnn* is a decimal number from 0 to 255.
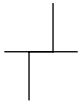
♦ Set System Netserver *fileserver*:

Specifies the name of the NetWare file server from which the LSB4 will attempt to load the LSB.SYS file. *fileserver* is any combination of characters.

♦ Set System Software *filename*:

Specifies the name of the file to load. The LSB4 will automatically add .**SYS** to the specified file name.

♦ Show System:

This command is used to display the current LSB4 settings.

♦ Flash:

Reloads Flash ROM software.

Troubleshooting Flash ROM Updates

If an attempt to load new Flash ROM software fails, examine the error message displayed on the terminal connected to the serial console port; it can often indicate the problem.

In the event that the error cannot be determined, examine the following list of common errors.

♦ For NetWare users, verify that the LSB.SYS file is in the LOGIN directory. As the LSB4 cannot actually log into the NetWare file server, it has very limited access to the file server's directories.

♦ For TCP/IP hosts using TFTP, check the file and directory permissions. Verify that the loadhost name and address are specified correctly and that their case matches the case of the file names on the host system. In addition, verify that the host has TFTP enabled. Several major UNIX vendors ship their systems with TFTP disabled.

♦ For VMS hosts using MOP, the Ethernet circuit must have the **service** characteristic enabled. Verify that the MOM$LOAD search path includes the directory containing the LSB.SYS file.

Updating
LSB4 Software

Downloading from the Lantronix BBS

The Lantronix bulletin board system (BBS) uses Telebit T2500 modems capable of v.32, v.42, v.42bis, 9600/2400/1200 baud operation. Kermit and PEP file transfer protocols are available to download the file. Make sure that the Kermit file type is set to **binary mode**.

BBS phone number: (714) 367-1051

Account name: LSB4

Password: LANSWITCH

The BBS system will display the following information [Figure E-6, page E-11]:

```
Username: LSB4
Password: LANSWITCH (not echoed)

Welcome to the Lantronix Software Distribution System.

File Name                      Version

----------------------------------------
LSB.SYS                        V1.0/10
[.1010]LSB.SYS


Please download and read release notes before installing
new code. (Note: this is important...)


NOTE: All software is also available via anonymous ftp at
      ftp.lantronix.com. Questions and/or comments can be
      mailed to support@lantronix.com.


Please enter your first name: xxx

Please enter your last name:  xxx

Please enter your company name:  xxx


                Lantronix Product Menu

1) Use Kermit to Download Software
2) Use Kermit to Download Release Notes
3) Send Mail Message to Lantronix
4) List the Currently Available Uploadable Files
5) Logout

Please enter option:
```

Figure E-6: Lantronix BBS

When downloading has been completed, use option 5 to log out of the bulletin board system.

Obtaining Software via the Internet

The latest version of the Lantronix LSB4 software and its associated release notes can be obtained directly from Lantronix using ftp (file transfer protocol) through Internet.

To access the Lantronix ftp file server, use **ftp.lantronix.com.** This currently resolves to IP address 192.73.220.81, but is subject to change at any time.

NOTE   *The machine issuing the ftp command must be resolvable via the INADDR.ARPA DNS record for the connection to succeed.*

If access is denied, try using a known machine as a gateway or nameserver.

NOTE   *If the connection should work and it does not, send email to ftp@lantronix.com with the machine name(s) and IP address(es) and the DNS information will be checked.*

The file (LSB.SYS) is image data and should only be transferred in binary mode. If binary mode is not used, the files will be corrupted and unusable.

Enter the following to connect to the Lantronix ftp file server [Figure E-7]:

```
% ftp ftp.lantronix.com

Connected to ftp.lantronix.com

220 Welcome to the Lantronix FTP server.

220 [...]                (Welcome message)

Name: (ftp.lantronix.com:xxxx): anonymous

331: Guest login ok, send ident as password.

Password:               Enter your email address here

Guest login ok, access restrictions apply.

ftp>
```
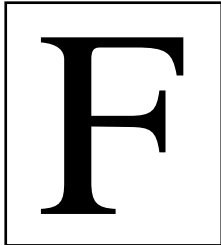
Figure E-7: Lantronix ftp File Server

All released files are in the **pub** directory. Always transfer the README file in the **pub** directory before transferring anything else; the README file contains a directory of available versions.

E-13

**Updating
LSB4 Software**

F LSB4 Specifications

Power Requirements

Input Voltage:	95-250 VAC 3-wire single phase
Operating Current:	.5 Amp at 120 Volts (maximum)
Power Consumption:	30 Watts (maximum)
Frequency:	50 to 60 Hz

Temperature Limitations

Operating:	5° to 50° C (41° to 122° F)
Storage:	-40° to 66° C (-40° to 151° F)

Maximum temperature change per hour is 20° C (36° F). Rapid temperature changes may affect operation.

Altitude Limitations

Operating:	2.4 km (8000 ft.)
Storage:	9.1 km (30,000 ft.)

If operating the LSB4 above 2.4 km (8000 ft.), decrease the operating temperature rating by 1.8° C for each 1000 m (1° F for each 1000 ft.)

Relative Humidity Limitations

Operating: 10% to 90% (noncondensing)

                       40% to 60% recommended

Storage: 10% to 90% (noncondensing)

Power Supply Cord Specifications

Cord type: 3 conductors, 1.0 mm^2 minimum conductor size
                       (approx. 18 AWG)

Rated for 250 Volts AC, 10 Amps

Length: ≤ 3.0 meters

The cord should have a harmonized cable type number.

NOTE   *"Harmonized" refers to an internationally standardized cable descrip-
tion, and is prefixed by the letters HAR.*

An example of a valid harmonized cord type is:

HAR HO5VV-F 3G1.00

Connectors

The cord should terminate in a molded-on IEC 320-C13 female connector
body at one end for proper insertion into the terminal server. The other
end should be a plug configuration appropriate to the country in question.

Approvals

The cord connectors used should bear the approval mark of at least one of the following regulatory and safety agencies [Figure F-1]:
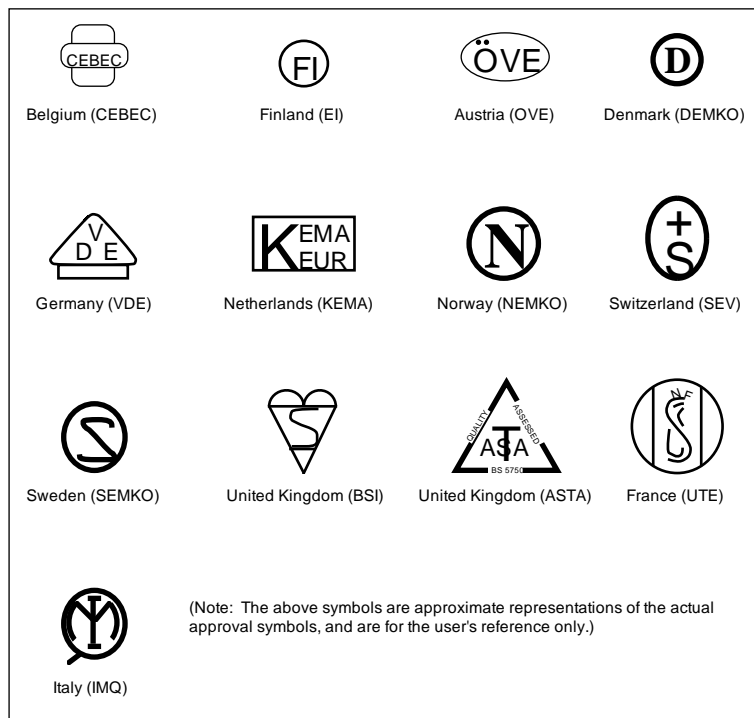

Belgium (CEBEC)   Finland (EI)   Austria (OVE)   Denmark (DEMKO)

Germany (VDE)   Netherlands (KEMA)   Norway (NEMKO)   Switzerland (SEV)

Sweden (SEMKO)   United Kingdom (BSI)   United Kingdom (ASTA)   France (UTE)

Italy (IMQ)

(Note: The above symbols are approximate representations of the actual approval symbols, and are for the user's reference only.)

Figure F-1: Approval Marks

Warranty Statement

Lantronix warrants for a period of FIVE YEARS from the date of shipment that each Lantronix LSB4 Switch supplied shall be free from defects in material and workmanship.

During this period, if the customer experiences difficulties with a product and is unable to resolve the problem by phone with Lantronix Technical Support, a Return Material Authorization (RMA) will be issued. Following receipt of a RMA number, the customer is responsible for returning the product to Lantronix, freight prepaid.

Lantronix, upon verification of warranty will, at its option, repair or replace the product in question, and return it to the customer freight prepaid.

If the product is not under warranty, Lantronix will contact the customer who then has the option of having the unit repaired on a fee basis or having the unit returned.

No services are handled at the customer's site under this warranty.

Lantronix warrants software for a period of sixty (60) days from the date of shipment that each software package supplied shall be free from defects and shall operate according to Lantronix specifications. Any software revisions required hereunder cover supply of distribution media only and do not cover, or include, any installation. The customer is responsible for return of media to Lantronix and Lantronix for freight associated with replacement media being returned to the customer.

Lantronix shall have no obligation to make repairs or to cause replacement required through normal wear and tear of necessitated in whole or in part by catastrophe, fault or negligence of the user, improper or unauthorized use of the Product, or use of the Product in such a manner for which it was not designed, or by causes external to the Product, such as, but not limited to, power or failure of air conditioning.

There are no understandings, agreements, representations or warranties, express or implied, including warranties of merchantability or fitness for a particular purpose, other than those specifically set out above or by any existing contract between the parties. Any such contract states the entire obligation of Lantronix. The contents of this document shall not become part of or modify any prior or existing agreement, commitment or relationship

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Lantronix liability is limited (at its election) to (1) refund of buyer's purchase price for such affected products (without interest); (2) repair of such products, or (3) replacement of such products, provided however, that the buyer follows the procedures set forth herein

Warranty claims must be received by Lantronix within the applicable warranty period. A replaced product, or part thereof, shall become the property of Lantronix and shall be returned to Lantronix at the Purchaser's expense. ALL RETURN MATERIAL MUST BE ACCOMPANIED BY A RETURN MATERIAL AUTHORIZATION NUMBER ASSIGNED BY LANTRONIX.

Warranty

Warranty
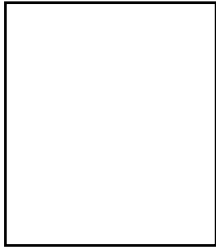
Glossary

Address Table   A table maintained by the LSB containing the addresses of all devices currently on the network. When the LSB4 receives a packet from a node on a network segment, it stores the node's address and the segment on which the node is located in the address table. This enables the LSB4 to know which of its ports to forward traffic to.

If no packets are received by the LSB4 from an address within a certain time period (**weed time**; see page v), the address is deleted from the table. Up to 4096 node addresses may be stored in the LSB4 table.

BCP   Boot Configuration Program. BCP commands enable the user to configure the LSB4 when it fails during initialization, or when the Initialize Noboot command is entered. See page E-7 for a listing of all BCP commands.

BPDU   Bridge Protocol Data Unit. A type of packet that is sent out by a root (see **Root** on page iv) to notify switches on the network of its existence. Used to monitor that the root is up and running; in addition, it enables the switch receiving the packet to monitor the path to the root.

BRCON

A program that enables a user to connect to the LSB4 from a NetWare host. To use BRCON, see Appendix E.

Bridge

A device that moves ("switches") packets from one network segment to another.

The LSB4 moves packets according to the scheme described in the IEEE 802.1d bridging specification.

Broadcast

A packet sent out to all other nodes on a network. For example, a special broadcast packet called an Address Resolution Packet (ARP) is often used. All broadcasts have the same destination address.

Collision

Only one node can transmit packets on the ethernet at a time; a collision occurs when two nodes send packets simultaneously. When a collision is detected, both nodes will wait for a random period of time. When that time is elapsed, the nodes will attempt to send their packets again.

Filter

A filter controls the passage of particular packets from one network segment to another. Users can specify a number of filters (called a filter list) to be used with a particular port; for example, a port can be configured to prevent all broadcast packets but allow all IP traffic. For details, refer to Chapter 6 of the LSB4 Reference Manual.

Glossary

Filtering Rate	The maximum number of packets that a switch can receive and discard at the same time. The maximum possible forwarding rate of any switch is the speed of the ethernet (14880 packets per second) multiplied by the number of ports.
Firewall	A method used to block all but a particular type of traffic from reaching a network segment. Often used to limit traffic to packets originating from specific nodes.
Flood	When the LSB4 receives a packet destined for a specific address that is not in its address table, it forwards the packet to all of its ports. This is called flooding. All multicast packets (see page iv) are automatically flooded.
Forwarding Rate	A measurement of the maximum rate at which a switch can forward packets from one network segment to another. Using ethernet, the maximum possible forwarding rate is 14880 packets per second.
Learning State	When the Spanning Tree Algorithm is enabled, the LSB4 can be in a number of different states. During the Learning state, the LSB4 collects hardware address information for its internal address table.
Listening State	When the Spanning Tree Algorithm is enabled, the LSB4 can be in a number of different states. During the Listening state, an LSB4 ethernet port will listen for BPDU packets from other switches.
MACCON	A program that enables Macintosh users to connect to the LSB4. To use MACCON, see Appendix E.

Glossary

MIB   Management Information Base; a list of entries that may be queried or modified. The LSB4 supports the Bridge MIB, which contains lists of bridge-specific information. The information contained in MIBs can be retrieved or modified using SNMP commands; for more information, refer to Appendix D.

Multicast   A packet to be sent to more than one network address. There are many different types of multicast packets; for example, IP multicasts, sent only to IP addresses.

Overrun   An overrun results when there is not sufficient memory on the LSB4 for it to receive packets. Overruns may occur when the network is extremely busy; for example, when the number of packets per second traveling on the network exceeds the LSB4's forwarding or filtering rate.

                          When an overrun occurs, the LSB4 will ignore packets (rather than forward them) until sufficient memory becomes available.

RFC   Request for Comments; a document that lists a standard method of completing a particular task. RFCs are available over the internet at no cost; for details, refer to Appendix D.

Root   A particular switch designated by the Spanning Tree Algorithm. This switch regularly sends out **BPDU** packets (see page i) to enable other switches to monitor the network (in order to prevent network loops). For details, see page B-3.

Glossary

Spanning Tree Algorithm   A method used to ensure that there is only one possible path between network segments. The Spanning Tree Algorithm is enabled by default on the LSB4. For details, refer to Appendix B.

Switch   A device that moves ("switches") packets from one network segment to another.

The LSB4 moves packets according to the scheme described in the IEEE 802.1d bridging specification.

Unicast   A packet that is destined for only one node on a network.

Weed Time   If the LSB4 doesn't hear from a hardware address for a period of time, it will remove the address from its **address table** (see page i). This time interval is the weed time -- the time that the LSB4 will wait before "weeding out" the hardware address from the table.

Glossary

Glossary

Index

Index