

LynxOS Installation Guide for Vendor-Supplied BSPs

LynxOS Release 4.0
DOC 0554-01

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Preface



CAUTION! This *LynxOS Installation Guide for Vendor-Supplied BSPs* contains instructions specific for Vendor-Supplied BSP CD-ROMs. This guide is intended only for users requiring to install these Vendor-Supplied custom Board Support Packages.

Installation of the standard LynuxWorks-provided BSPs for LynxOS should refer to the standard *LynxOS Installation Guide* (DOC-0405).

This document provides detailed installation instructions for LynxOS for various configurations. This document includes topics on:

- Cross-development installations
- Native development installations
- The LynuxWorks `installit` installation utility
- Booting LynxOS

For More Information

For information on the features of LynxOS, refer to the following printed and online documentation.

- *LynxOS Release Notes*

This printed document contains details on the features and late-breaking information about the current release.

- *LynxOS User's Guide*

This manual details system administration concepts, building custom LynxOS kernels, and additional features available in LynxOS.

- *LynxOS Networking Guide*

This guide contains configuration and usage information on the networking capabilities in LynxOS. It provides information on supported protocols such as TCP/IP, NFS, DHCP, etc.

- *Writing Device Drivers*

This guide contains details on writing device drivers for LynxOS.

- Online information

The complete LynxOS documentation set is available on the Documentation CD-ROM. Books are provided in both HTML and PDF formats.

Updates to these documents are available online at the LynuxWorks Website: <http://www.lynxworks.com>.

Additional information about commands and utilities is provided online with the `man` command. For example, to find information about the GNU gcc compiler, use the following syntax:

```
man gcc
```

Typographical Conventions

The typefaces used in this manual, summarized below, emphasize important concepts. All references to filenames and commands are case-sensitive and should be typed accurately.

Kind of Text	Examples
Body text; <i>italicized</i> for emphasis, new terms, and book titles	Refer to the <i>LynxOS User's Guide</i> .
Environment variables, filenames, functions, methods, options, parameter names, path names, commands, and computer data	<code>ls</code> <code>-l</code> <code>myprog.c</code> <code>/dev/null</code>

Kind of Text	Examples
Commands that need to be highlighted within body text, or commands that must be typed as is by the user are bolded .	login: myname # cd /usr/home
Text that represents a variable, such as a filename or a value that must be entered by the user	cat <filename> mv <file1> <file2>
Blocks of text that appear on the display screen after entering instructions or commands	Loading file /tftpboot/shell.kdi into 0x4000 File loaded. Size is 1314816 Copyright 2002 LynuxWorks, Inc. All rights reserved. LynxOS (ppc) created Mon Jul 17 17:50:22 GMT 2000 user name:
Keyboard options, button names, and menu sequences	Enter , Ctrl-C

Special Notes

The following notations highlight any key points and cautionary notes that may appear in this manual.

NOTE: These callouts note important or useful points in the text.



CAUTION! Used for situations that present minor hazards that may interfere with or threaten equipment/performance.

LynxOS Overview

The LynxOS product family is comprised of many tools and features that collectively form a state-of-the-art development environment for writing, debugging, and deploying real-time embedded applications. The real-time LynxOS kernel is provided in two forms:

- A bootable, prebuilt kernel that can be loaded onto a target and executed as a full-featured development Operating System
- A set of kernel libraries, scripts, and Makefiles that can be used to create custom kernels to match the needs of users' applications

Libraries, compilers, linkers, debuggers, and other tools are provided in the LynxOS development environment for developing kernels and user applications.

Application and kernel development can take place in a supported *Cross Development Environment*, with tools installed on a host system running Windows, Solaris, or Linux. Applications and kernels compiled on a cross development environment can be downloaded and executed on a LynxOS target system.

Application and kernel development can also take place in a supported *Native Development Environment*, where all development tools run on the native CPU. Compilation, linking, debugging, and execution of the user's application occurs seamlessly on a single LynxOS target.

NOTE: See the *LynxOS Release Notes* for the supported versions of cross development hosts, supported target architecture, and processors.

Windows Cross Development Environment

The Windows *Cross Development Environment* allows users to develop LynxOS applications or kernels on a Windows desktop. The applications and kernels are built for a particular target system architecture with the LynxOS cross development tools. The cross development environment includes all the necessary tools and utilities to build applications or kernels for a specific target.

The base LynxOS Windows cross development package includes the following CD-ROMs:

- Open Development Environment for Windows (ODEW)

This CD-ROM contains:

- Cross Development Kit for Windows (CDK)
- Open Development Environment (ODE)

- Vendor-Supplied Board Support Package (BSP)

This CD-ROM is provided by a 3rd Party Vendor

- Additional Components CD-ROM
- Documentation CD-ROM

Descriptions of these CD-ROMs are provided in the section “LynxOS Media” on page 4.

Cross development environment installation instructions are provided in Chapter 2, “Installing LynxOS Cross Development Systems” on page 11.

UNIX Cross Development Environment

The *Cross Development Environment* for UNIX hosts (which includes all supported versions of Linux and Solaris) allows users to develop LynxOS applications or kernels for a particular target system architecture. The applications and kernels are built with the LynxOS cross development tools. The cross development environment includes all the necessary tools and utilities to build applications or kernels for a specific target.

The base LynxOS UNIX-hosted cross development package includes the following CD-ROMs:

- Cross Development Kit (CDK) for Solaris or Linux hosts

- Open Development Environment (ODE)
- Vendor-Supplied Board Support Package (BSP)
This CD-ROM is provided by a 3rd Party Vendor
- Additional Components CD-ROM
- Documentation CD-ROM

Descriptions of these CD-ROMs are provided in the section “LynxOS Media” on page 4.

Cross development environment installation instructions are provided in Chapter 2, “Installing LynxOS Cross Development Systems” on page 11.

Native Development Environment

NOTE: XFree86 and LessTif for LynxOS works with the Native Development Environment and is available from LynuxWorks as a separate purchase. For more information, contact your Account Manager.

The LynxOS *Native Development Environment* provides users the ability to develop LynxOS applications and kernels on the target architecture. The native development package includes tools and utilities that run natively on a target.

The native development environment includes the following CD-ROMs:

- Open Development Environment (ODE)
- Vendor-Supplied Board Support Package (BSP)
This CD-ROM is provided by a 3rd Party Vendor
- Additional Components CD-ROM
- Documentation CD-ROM

Descriptions of these CD-ROMs are provided in the section “LynxOS Media” on page 4.

Native development environment installation instructions are provided in Chapter 3, “Installing LynxOS Native Development Systems” on page 23.

LynxOS Media

The CD-ROMs included in each development environment are detailed in the following sections.

Open Development Environment (ODE) CD-ROM

The base LynxOS development package is called the Open Development Environment (ODE). The ODE contains all the components needed to develop LynxOS kernels and user applications in both native and cross development environments. The ODE includes tools, libraries, and utilities in built for a particular processor architecture (x86, or PowerPC, for example).

NOTE: By default, the LynxOS package includes support for IPv4 networks only. IPv6 support is available separately. Contact your LynuxWorks Sales Representative for more information.

Cross Development Kit (CDK) CD-ROM

The LynxOS Cross Development Kit (CDK) contains the cross development software (including the GNU compiler and debugger) for the Cross Development Host. This CD-ROM is available per operating system environment (i.e., Windows, Linux, or Solaris). Each CDK CD-ROM contains the cross development tools for supported architectures (PPC, x86, or others).

Vendor-Supplied Board Support Package (BSP) CD-ROM

Contains the Board Support Package for a particular target board. The Board Support Package includes hardware-specific files (including device drivers and applications) that provide support for a target board.

Additional Components CD-ROM

The Additional Components CD-ROM contains various components for LynxOS, including:

- Linux ABI Compatibility Layer
- Additional Linux Shared Objects

- GNU Zebra Routing Package, binary & source
- OpenSSL Encryption Package, binary only
- SNMP Toolkit Package, binary & source

These components should be installed after the base LynxOS installation.

NOTE: The OpenSSL package includes binaries only. Due to import/export restrictions, the source code for OpenSSL cannot be included in all packages. Contact LynuxWorks Technical Support for the source code for OpenSSL.

TCP/IP Binary for IPv6 CD-ROM

Binaries for IPv6, IPv6 utilities, and IPsec are included on this CD-ROM. The default distribution of LynxOS 4.0 includes support for IPv4 only. IPv6 components are installed after the base LynxOS installation.

The LynxOS IPv6 CD-ROM is not included with the base LynxOS distribution. Contact your LynuxWorks sales representative for more information on purchasing this package.

Before Installing

Review and complete the following sections before proceeding with the installation of LynxOS.

System Requirements

The following hardware requirements must be met before installing LynxOS on a system.

Table 1-1: System Requirements for LynxOS

Component	Requirement	
RAM (all platforms)	8 MB minimum 16 MB minimum for development systems 32 MB minimum for XFree86 and LessTif ¹ 64 MB recommended for full development suite	
Hard Disk Space (x86)	LynxOS XFree86 and LessTif ¹	150 MB 300 MB
Hard Disk Space (PowerPC)	LynxOS XFree86 and LessTif ¹	170 MB 300 MB

1. XFree86 and LessTif for LynxOS works with the Native Development Environment and is available from LynuxWorks as a separate purchase. For more information, contact your Account Manager.

Native Install Hardware List

Fill in the following table with your system's hardware before beginning the LynxOS installation. This list can be used as a reference during a native installation of LynxOS.

Table 1-2: System Hardware List

Hardware Type	Example	Your System
Processor Type	400 mhz. Pentium 2 (i.e., x86)	
RAM	128 MB	
Hard Disk Information		
Bus Type (SCSI/IDE)	IDE	
Adapter Name	Motherboard IDE Bus	
ID & Installation Partition	Master, IDE bus 1, partition a	
Networking Information		
Ethernet Adapter	Intel Pro100b	
IP Address	192.168.0.1	
Hostname	elmer	
Video Information		
Graphics Adapter	Diamond Stealth 64	
Monitor Max Resolution & Refresh Rate	1024x768@75hz	
Mouse Information		
Mouse Port	PS2	
Mouse Type	Logitech Mouseman	

Basic Installation Overview

Use the following table to for basic installation steps. Refer to the relevant sections in this installation guide for detailed installation information.

Table 1-3: Overview of Installing & Starting LynxOS for Native Systems

Step	Procedure	for Native Development
1	Determine Installation Type	Native
2	Locate Installation Media	<ul style="list-style-type: none"> • ODE for <code><Target_CPU></code> • Vendor-Supplied BSP
3	Begin Installation	<ol style="list-style-type: none"> 1. Insert the Vendor-Supplied BSP CD-ROM into the CD-ROM drive and boot the system. LynxOS Preboot starts. Preboot defaults to booting the <code>lynx.os</code> kernel. The <code>installit</code> utility starts automatically. 2. Set the configuration options as appropriate for your system. When finished with the configuration, begin the installation by typing “b” at the Main Menu. 3. After the Vendor-Supplied CD-ROM is installed, users are prompted to insert the LynxOS ODE CD-ROM. The LynxOS Open Development Environment is then installed. reboot the system. Secondary installation configurations are applied. Reboot the system again. The installation is complete. 4. Additional components can be installed from the Additional Components CD-ROM. As root, insert the CD-ROM into the drive, mount it, and run <code>installit</code>. <pre># mount -o ro /dev/<cdrom> /mnt # cd /mnt/<cpu>/usr/bin # ./installit</pre>
4	Start using LynxOS	<ol style="list-style-type: none"> 1. Log in as <code>setup</code>. 2. Add a user account and configure the system.
For more information, see the following sections or books:		<p>Native Installations “Installing LynxOS Native Development Systems” on page 23</p> <p>installit Chapter 4, “Using installit” on page 29</p> <p>Networking Configuration <i>LynxOS Networking Guide</i></p> <p>System Administration <i>LynxOS User’s Guide</i></p>

Table 1-4: Overview of Installing & Starting LynxOS for UNIX-hosted Systems

Step	Procedure	for UNIX-hosted Cross Development
1	Determine Installation Type	Cross, UNIX hosts (Linux or Solaris)
2	Locate Installation Media	<ul style="list-style-type: none"> • CDK for Linux, or for Solaris • ODE for <Target_CPU> • Vendor-Supplied BSP
3	Begin Installation	<p>1. Create a directory for LynxOS on the host. For example: <pre># mkdir /usr/lynx/4.0.0/ppc</pre></p> <p>1. Untar the CDK (cdk) tar file (located in the <cpu>/tar_images/ directory on the CDK CD-ROM) to the LynxOS directory on the host.</p> <p>2. Untar ODE (devos) tar file (located in the <cpu>/tar_images/ directory on the ODE CD-ROM) to the LynxOS directory on the host.</p> <p>3. Untar the Vendor-Supplied BSP tar archive (bsp) tar file (located in the <cpu>/tar_images/ directory on the Vendor-Supplied BSP CD-ROM) to the LynxOS directory on the host.</p> <p>4. Install Components from the Additional Components CD-ROM (Linux ABI, Zebra, etc). Untar the required tar archive to the LynxOS directory on the host.</p>
4	Start using LynxOS	<p>1. Change to the LynxOS installation directory <pre>\$ cd /usr/lynx/4.0.0/<cpu></pre></p> <p>where <cpu> is x86 or ppc</p> <p>2. Start the LynxOS environment: <pre>\$. SETUP.bash</pre></p>
For detailed installation information, see		<p>Linux/Solaris “UNIX Cross Development Installation” on page 13</p> <p>Networking Configuration <i>LynxOS Networking Guide</i></p> <p>System Administration <i>LynxOS User's Guide</i></p>

Table 1-5: Overview of Installing & Starting LynxOS for Windows Systems

Step	Procedure	for Windows-hosted Cross Development
1	Determine Installation Type	Cross, Windows hosts
2	Locate Installation Media	<ul style="list-style-type: none"> • ODEW for <Target_CPU> • Vendor-Supplied BSP
3	Begin Installation	<ol style="list-style-type: none"> 1. Insert the ODEW CD-ROM into the CD-ROM drive. 2. Double-Click Setup.exe. Select install options. Both the Cross Development Kit and Open Development Environment are installed. 3. Set the LynxOS environment by opening a command line window and starting a bash shell: <pre style="margin-left: 20px;">C:\> bash \$ cd /usr/lynx/4.0.0/<cpu> where <cpu> is x86 or ppc.</pre> 4. Untar the Vendor-Supplied BSP tar archive (in the <code>tar_images/</code> directory on the Vendor-Supplied BSP CD-ROM). 5. Install Components from the Additional Components CD-ROM (Linux ABI, Zebra, etc). Untar the required tar archive to the LynxOS directory on the host.
4	Start using LynxOS	<ol style="list-style-type: none"> 1. Open DOS prompt and start a bash shell: <pre style="margin-left: 20px;">C:\> bash</pre> 2. Change to the LynxOS installation directory <pre style="margin-left: 20px;">\$ cd /usr/lynx/4.0.0/<cpu> where <cpu> is x86 or ppc.</pre> 3. Start the LynxOS environment: <pre style="margin-left: 20px;">\$. SETUP.bash</pre>
For more information, see the following sections or books:		<p>Windows “Windows Cross Development Installation” on page 17</p> <p>Networking Configuration <i>LynxOS Networking Guide</i></p> <p>System Administration <i>LynxOS User's Guide</i></p>

Installing LynxOS Cross Development Systems



CAUTION! This *LynxOS Installation Guide for Vendor-Supplied BSPs* contains instructions specific for Vendor-Supplied BSP CD-ROMs. This guide is intended only for users requiring to install these Vendor-Supplied custom Board Support Packages.

Installation of the standard LynuxWorks-provided BSPs for LynxOS should refer to the standard *LynxOS Installation Guide* (DOC-0405).

Introduction

This chapter describes how to install the LynxOS cross development system software components.

A cross development system consists of a *host* computer, where the LynxOS cross development software components are installed for target system development. The target system is where the software is deployed.

The LynxOS cross development software can be installed on the following host operating systems:

- Solaris
- Linux
- Windows

NOTE: In this installation guide, the following terminology is used:

- *Windows* is used to collectively indicate all supported versions of Windows.
 - *UNIX* is used to collectively indicate all supported versions of Solaris and Linux.
-

Refer to the *LynxOS Release Notes* for the latest supported versions of these Operating Systems.

Cross Development Core Software Components

The two core LynxOS cross development software components are:

- The LynxOS Cross Development Kit (CDK) - includes the GNU toolchain and all other development tools.
- The LynxOS Open Development Environment (ODE) - includes the LynxOS system files.
- The Vendor-Supplied Board Support Package (BSP) -includes specific files that provide support for a particular target board.

Installation of these core components are required for the LynxOS cross development system. Additional components can also be added to increase feature functionality.

For UNIX cross development hosts, the LynxOS CDK component must be installed *first*, followed by the ODE component, and then the BSP component.

This is important to note because installation of these components is different on Windows hosts:

- For UNIX cross development systems, the CDK and the ODE software components are installed from two separate CD-ROMs.
- For Windows cross development systems, both the CDK and the ODE software components are installed simultaneously from the same CD-ROM.

In both cases, the BSP component is installed afterwards.

UNIX Cross Development Installation

Use the following instructions to install the LynxOS cross development environment on the host. Installing the LynxOS CDK requires root privileges.

It is important to note that the LynxOS CDK package *must* be installed before the LynxOS ODE package. Failure to install these components in the correct order can result in problems with LynxOS.

1. Create a directory for LynxOS. Enter the following command on the host system:

```
# mkdir /usr/lynx/<release_num>/<cpu>
```

Where *<release_num>* is the LynxOS product release number and *<cpu>* is the host CPU architecture, for example: *x86* or *ppc*.

For example, a user installing LynxOS 4.0 on an PowerPC platform would use the following command:

```
# mkdir /usr/lynx/4.0.0/ppc
```

NOTE: If it is not possible to install the LynxOS CDK directly into this directory, install it in another directory, then link that directory to a directory with the same name as the directory above:

This is done with the `ln -s` command. For example:

```
# ln -s /home/lynx/<release_num>/<cpu> /usr/lynx/<release_num>/<cpu>
```

The LynxOS CDK tools searches for all libraries and tools under the directory `/usr/lynx/<release_num>/<cpu>`.

2. Insert the LynxOS CDK CD-ROM into the CD-ROM drive and mount it. For example,

```
# mount <cdrom_dev_node> /mnt/cdrom
```

Where *<cdrom_dev_node>* is the CD-ROM device node name. Refer to the `mount` man page for additional usage options.

3. Extract the LynxOS CDK tar files using `gnutar`. Enter the following commands to move to the installation directory and extract the tar files:

```
# cd /usr/lynx/<release_num>/<cpu>
```

Where *<release_num>* is the LynxOS product release number, *<cpu>* is the CPU architecture (x86, or ppc), and *<host>* is the host Operating System (soll, linux).

```
# gnutar -xvzpf \  
/mnt/cdrom/tar_images/<media_num>.cdk<host>.tar.gz
```

Where *<media_num>* is a unique media number identifier, and *<host>* is the host Operating System (soll, linux).

The LynxOS CDK component is now installed.

NOTE: The `gnutar` utility is provided on the LynxOS CDK CD-ROM:

```
/mnt/cdrom/<cpu>/cdk/<host>-<objform>-<cpu>/bin/gnutar
```

`gnutar` can be copied from the LynxOS CDK CD-ROM to a cross development system with the `cp` command. For example,

```
# cd /mnt/cdrom/x86/cdk/sunos-elf-x86/bin  
# cp gnutar /usr/bin/gnutar
```

-
4. Unmount the LynxOS CDK and remove it from the CD-ROM drive.
 5. Insert the LynxOS ODE CD-ROM into the CD-ROM drive and mount it.
 6. Change directory to the LynxOS installation directory:

```
# cd /usr/lynx/<release_num>/<cpu>
```

where *<release_num>* represents the LynxOS product release number and *<cpu>* is the CPU architecture of the system (x86 or ppc).

7. Extract the ODE images by entering the following commands (assuming the CD-ROM mount point is `/mnt/cdrom`):

```
# gnutar -xvzpf \  
/mnt/cdrom/tar_images/<media_num>.devos.tar.gz.
```

The LynxOS ODE software component for UNIX-hosted cross development systems is now installed.

8. Insert the Vendor-Supplied BSP CD-ROM into the CD-ROM drive and mount it.

9. Extract the Vendor-Supplied Board Support Package (BSP) image with the following command:

```
# gnutar -xvzpf \  
/mnt/cdrom/tar_images/<media_num>.bsp_<bsp_name>.tar.gz
```

Where *<media_num>* is a unique number, and *<bsp_name>* is the BSP name.

10. To install the LynxWorks-provided KDI (Kernel Downloadable Image) templates, or prebuilt KDI demos, extract the tar archive to the LynxOS directory:
11. Unmount and remove the CD-ROM.
12. Before using LynxOS to develop applications, users must set the LynxOS environment with one of two `SETUP` scripts:

For bash shells:

```
$ . SETUP.bash
```

For C shells:

```
% source SETUP.csh
```

For more information on these `SETUP` scripts, see the chapter entitled “Getting Started” in the *LynxOS User’s Guide*.

This completes the LynxOS core installation for UNIX cross hosts.

Once installed, the LynxOS ODE for UNIX-hosted cross development systems provides users with the LynxOS libraries, utilities, kernel objects, and other files necessary for developing LynxOS applications.

See the chapter entitled “Getting Started” in the *LynxOS User’s Guide* for information on using LynxOS.

The host system is now ready to develop target applications. However, several optional software components are available to enhance target application development. To install these onto the host system, refer to “Additional Software Installation for UNIX” below.

Additional Software Installation for UNIX

Additional components can be installed after the LynxOS ODE installation is complete. Some additional components include:

Table 2-1: Additional Components CD-ROM Contents

Application	Filename
Linux ABI Compatibility Layer	<media_num>.linuxabi.tar.gz
Additional Linux Libraries	<media_num>.linuxabi_advanced.tar.gz
GNU Zebra Routing Package binary & source.	<media_num>.zebra.tar.gz <media_num>.zebra_src.tar.gz
OpenSSL Encryption Components binary only	<media_num>.openssl.tar.gz
SNMP Toolkit Components binary & source	<media_num>.snmptoolkit.tar.gz <media_num>.snmptoolkit_src.tar.gz

Table 2-2: IPv6 CD-ROM Contents

Application	Filename
IPv6 Support - binary only	<media_num>.tcpip6.tar.gz

NOTE: The IPv6 CD-ROM is not available with the default distribution of LynxOS. Contact your LynuxWorks sales representative for information on purchasing this package.

To install any or all of these additional components on a UNIX-hosted system, use the following instructions:

1. Mount the Additional Components CD-ROM or IPv6 CD-ROM to /mnt/cdrom. Refer to the Linux or Solaris documentation for instructions. For Linux hosts, for example:

```
# mount <cdrom_dev_node> /mnt/cdrom
```

Where <cdrom_dev_node> is the CD-ROM device node name. Refer to the mount man page for additional usage options.

2. Change to the LynxOS installation directory and source the LynxOS environment:

```
# cd /usr/lynx/<release_num>/<cpu>
# . SETUP.bash
```

where *<release_num>* is the LynxOS release number and *<cpu>* is the target system architecture.

NOTE: For the Linux ABI Layer, it is recommended that users create a separate directory specifically for the Linux ABI Layer:

```
# mkdir linuxabi
# cd linuxabi
```

3. From this directory, extract the tar file with the following command:

```
# gnutar -xvzpf \
/mnt/cdrom/<cpu>/tar_images/<media_num>.<filename>.tar.gz
```

where *<cpu>* is the CPU architecture (x86, ppc), *<media_num>* is a unique media number and *<filename>* is the name of the file.

For more information on configuring TCP/IPv6 support, see the *LynxOS Networking Guide*.

Additional tools, such as Messenger, LynxInsure++, or TotalView include separate documentation that describes their installation procedure.

Windows Cross Development Installation

The LynxOS cross development kit for Windows contains the CDK and ODE software components on the same CD-ROM. These components are installed at the same time during the InstallShield installation. After the base installation of LynxOS, the Vendor-Supplied BSP is installed.

Windows CDK/ODE Installation

The LynxOS CDK CD-ROM for Windows contains all components necessary for setting up a cross development host, including both CDK and ODE components.

To install these components, use the following instructions.

1. Close all programs.
2. Insert the LynxOS CDK CD-ROM into the CD-ROM drive.
3. When InstallShield starts, follow the instructions as appropriate for your system.

If Windows Autorun is not enabled, users can start the setup process by double-clicking on the **setup.exe** icon in the CD-ROM directory.

Install Shield displays the following installation options:

```
Win32 LynxOS <release_num> <cpu> CDK
LynxOS <release_num> <cpu> Demo KDI
```

The Win32 LynxOS <release_num> <cpu> CDK selection contains *both* the CDK and the ODE LynxOS components.

4. Select the appropriate option and proceed through the installation as instructed by the Installshield process. LynxOS can be installed to any path or drive on the system. No BSP is installed during this process.

Installing the Vendor-Supplied BSP

Use the following steps to install a Vendor-Supplied BSP.

1. Insert the LynxOS Vendor-Supplied BSP CD-ROM into the system.
2. Open a command line window and start a bash shell:

```
C:\ bash
```

3. Type the following commands to install the BSP tar file:

```
$ cd /usr/lynx/4.0.0/ppc
$ . SETUP.bash
$ gnutar -xvzpf \
<cdrom>/tar_images/<media_num>.bsp_<name>.tar.gz
```

Where <cdrom> is the CD mount point, <media_num> is a unique media number, and <name> is the name of the BSP.

Removing LynxOS CDK/ODE

The LynxOS CDK/ODE for Windows can be removed with the Windows **Add/Remove Programs** utility.

1. From the **Start** button, select **Settings** -> **Control Panel**. Double-Click on **Add/Remove Programs**.
2. Select **LynxOS** and click **Remove**.

Adding a Bash Prompt Shortcut to the Desktop

Users can create a shortcut on the desktop that starts the bash prompt, changes to the LynxOS directory and starts the LynxOS environment. Use the following instructions to create a shortcut.

1. Right-click on desktop and select **New** -> **Shortcut**.
2. Type in the path to the `bash.exe` executable in the **Location of item** field. For example,

```
C:\LynuxWorks\4p0p0\bin\bash.exe
```

When finished, click **Next**.

3. Type in a shortcut name, **LynxOS CDK**, for example, and click **Finish**.
4. Right-click on the **LynxOS CDK** shortcut and select **Properties**.
5. In the **Shortcut** tab, modify the **Target** field to automatically execute the `SETUP.bash` or `SETUP.csh` script:

```
C:\LynuxWorks\4p0p0\bin\bash.exe -rcfile SETUP.bash
```

6. Modify the **Start in** path to the LynxOS installation directory. For example,

```
C:\LynuxWorks\4p0p0\usr\lynx\4.0.0\x86
```

Additional Components Installation on Windows

The Additional Components CD-ROM contains utilities that are installed after the LynxOS ODE installation is complete. This CD-ROM includes these utilities:

Table 2-3: Additional Components CD-ROM Contents

Application	Filename
Linux ABI Compatibility Layer	<media_num>.linuxabi.tar.gz
Additional Linux Libraries	<media_num>.linuxabi_advanced.tar.gz
GNU Zebra Routing Package binary & source.	<media_num>.zebra.tar.gz <media_num>.zebra_src.tar.gz
OpenSSL Encryption Components binary only	<media_num>.openssl.tar.gz
SNMP Toolkit Components binary & source	<media_num>.snmptoolkit.tar.gz <media_num>.snmptoolkit_src.tar.gz

Table 2-4: IPv6 CD-ROM Contents

Application	Filename
IPv6 Support - binary only	<media_num>.tcpip6.tar.gz

NOTE: The IPv6 CD-ROM is not available with the default distribution of LynxOS. Contact your LynuxWorks sales representative for information on purchasing this package.

To install any or all of these additional components, use the following instructions:

1. Insert the Additional Components CD-ROM or IPv6 CD-ROM into the system.
2. Double-click on the LynxOS CDK bash shell shortcut. See “Adding a Bash Prompt Shortcut to the Desktop” on page 19.

3. Change to the LynxOS installation directory and source the LynxOS environment:

```
$ cd /usr/lynx/<release_num>/<cpu>
$ . SETUP.bash
```

Where *<release_num>* is the LynxOS release number and *<cpu>* is the target system architecture.

NOTE: For the Linux ABI Layer, it is recommended that users create a separate directory specifically for the Linux ABI Layer:

```
# mkdir linuxabi
# cd linuxabi
```

4. From this directory, extract the tar file with the following command:

```
# gnutar -xvzpf \
<cdrom>/<cpu>/tar_images/<media_num>.<filename>.tar.gz
```

Where *<cdrom>* is the drive letter of the CD-ROM drive, *<cpu>* is the CPU architecture (x86, ppc), *<media_num>* is a unique media number, and *<filename>* is the name of the file to extract.

For more information on configuring TCP/IPv6 support, see the *LynxOS Networking Guide*.

Additional tools, such as LynxInsure++, TotalView, or SpyKer include separate documentation that describes their installation procedures.

Installing LynxOS Native Development Systems



CAUTION! This *LynxOS Installation Guide for Vendor-Supplied BSPs* contains instructions specific for Vendor-Supplied BSP CD-ROMs. This guide is intended only for users requiring to install these Vendor-Supplied custom Board Support Packages.

Installation of the standard LynuxWorks-provided BSPs for LynxOS should refer to the standard *LynxOS Installation Guide* (DOC-0405).

Introduction

This chapter provides details about installing LynxOS for native development.

The term *native development* describes a scenario in which the LynxOS host system hardware configuration is the same as that of the target system.

The Vendor-Supplied BSP and LynxOS ODE installation CD-ROMs are ISO9660-based and can be mounted on any machine that supports the ISO9660 format.

NOTE: El Torito bootable CD-ROM is available for LynxOS x86 installations.

LynxOS native installations use the provided `installit` utility to configure the LynxOS installation to the host system hardware.

Additionally, the CD-ROMs contains tar images in `/tar_images`. From a mounted CD-ROM, users can extract the compressed images. Each tar file corresponds to an installation component.

Before Installation

Review the system requirements before beginning the installation (see "System Requirements" on page 6). Additionally, review the hardware support information available on the LynuxWorks LynxOS RTOS Hardware Drivers web page (<http://www.lynuxworks.com/rtos/hardware-driver.php>).

Any existing data on the installation partition is overwritten during installation. Back up important files before installing LynxOS; see "Backing Up Existing Data" on page 25 for further information.

CAUTION! LynxOS does not support upgrade installations.



LynxOS overwrites the contents of the disk (or partition) when installed. Any existing data on the installation space will be permanently lost.

Also see "Planning Hard Disk Partitions" below for more on hard disk partitioning as it pertains to LynxOS.

LynxOS must be configured to the target system hardware. Before installing LynxOS, the user needs to draw up a list of installed hardware; see the table "System Hardware List," on page 7 for further information.

Since the LynxOS installation process supports both serial terminals and graphical consoles, the installation process is text-based only.

Planning Hard Disk Partitions

For most installations, there are no requirements for a hard disk to be partitioned. LynxOS allows partitions and file systems to span an entire IDE or SCSI hard disk. However, partitioning does provide a form of disk management and crash recovery by assigning different applications/subsystems to different partitions. In this way, applications and/or subsystems do not compete for space in the same file system.

Although LynxOS does not require partitioning, certain BIOS limitations may limit the maximum size allocatable to a partition. For hard disk sizes greater than this limit, a separate boot partition may need to reside at the start of the hard disk. The remainder of the disk may be partitioned into one or more partitions. Consult the BIOS documentation for additional information.

To allow a partition to be bootable on an x86 system IDE drive, the following rules must be followed:

- On new disks, if the BIOS permits, set the hard disk translation mode to `large` or `extended` before installation.
- On disks where another operating system has been installed, and LBA translation mode is enabled; or on new disks where the BIOS does not support hard disk translation mode, use the LynxOS `mkpart` command to force the LynxOS boot code to use LBA translation mode. LBA translation mode is enabled by entering the `1` command at the `mkpart` command prompt; this command toggles LBA translation mode between `enabled` and `disabled`.

For additional information on using `mkpart`, see “`mkpart(1)` man page” on page 81.

Backing Up Existing Data

LynxOS does not support upgrade installations; any installation of LynxOS overwrites data in the space in which it is installed. It is recommended that all existing data and files be backed up before performing installation. Refer to the *LynxOS User's Guide* for information on using `tar` to back up important data.

Installing a LynxOS Native Development System

Use the following procedure to install LynxOS onto a system for native development:

1. Insert the LynxOS Vendor-Supplied BSP CD-ROM into the CD-ROM drive, and power-up the machine.

The computer starts the LynxOS `preboot` utility, used to boot LynxOS from the CD-ROM drive. A boot prompt (Command? `<b boot_device /lynx.os>`) is displayed on the screen. If, after 10 seconds, no command is entered, `preboot` starts LynxOS from the CD-ROM.

2. Once LynxOS starts, the `installit` utility begins. The `installit` script allows the user to configure information about the target system. Users can select the components to install and the hardware available on the system. Once all configurations are set, users begin the installation. The Vendor-Supplied BSP is installed onto the system. Users are then

prompted to insert the LynxOS ODE CD-ROM, and the LynxOS development system is installed on the system.

Quit the installation at any time by selecting **Q** or by typing **Ctrl-C**. If the installation is interrupted before successful completion, the user must re-enter the `installit` command to begin the installation again.

Proceed to Chapter 4, “Using installit” for step-by-step instructions on using `installit`.

Optional Software Installation

Additional components can be installed after the LynxOS ODE installation is complete. Some additional components include:

Table 3-1: Additional Components CD-ROM Contents

Application	Filename
Linux ABI Compatibility Layer	<media_num>.linuxabi.tar.gz
Additional Linux Libraries	<media_num>.linuxabi_advanced.tar.gz
GNU Zebra Routing Package binary & source.	<media_num>.zebra.tar.gz <media_num>.zebra_src.tar.gz
OpenSSL Encryption Components binary only	<media_num>.openssl.tar.gz
SNMP Toolkit Components binary & source	<media_num>.snmptoolkit.tar.gz <media_num>.snmptoolkit_src.tar.gz

Table 3-2: IPv6 CD-ROM Contents

Application	Filename
IPv6 Support - binary only	<media_num>.tcpipv6.tar.gz

NOTE: The IPv6 CD-ROM is not available with the default distribution of LynxOS. Contact your LynuxWorks sales representative for more information.

To install any or all of these additional components on a UNIX-hosted system, use the following instructions:

1. Log into the system as `root`.
2. Mount the Additional Components CD-ROM.

```
# mount -o ro /dev/<cdrom> /mnt
```

where `<cdrom>` is the device node of the CD-ROM drive (ide.1, for example).

3. Run the `installit` command from the Additional Components CD-ROM:

```
# cd /mnt/<cpu>/usr/bin
```

```
# ./installit
```

Where `<cpu>` is `x86` or `ppc`.

4. Enter **Y** at the **Welcome Screen** to proceed.
5. At the Main Menu, select **Choose Products to Install**:

```
*** Main Menu ***

  Modify Default Values
  2) Choose Products to Install

Please make sure the Default Values and Products to
Install are correct before Beginning the Installation.

B)egin Installation
Q)uit Installation

Enter option: [2]
```

Figure 3-1: Installit Main Menu

6. At the **Product Installation Menu**, select the products to install.

```
*** Product Installation Menu ***

      Development OS:                is not available
      TCP/IP V6:                    is not available
21) GNU Zebra Routing:              yes
22) OpenSSL Encryption:            yes
23) SNMP TOOLKIT:                  yes
50) Linux ABI:                     yes

Q)uit Installation
R)eturn to Previous Menu

Enter option: [R]
```

Figure 3-2: Product Installation Menu

Follow the `installit` prompts to complete the installation. For more information on configuring TCP/IPv6 support, see the *LynxOS Networking Guide*.

Introduction

This chapter provides instructions on using `installit` (the LynxOS native development installation utility) to install LynxOS onto native development system hard disks (including removable hard disks).

Before running `installit`, complete the appropriate installation checklist for the type of system on which LynxOS is to be installed (see “Basic Installation Overview” on page 8).

The `installit` utility follows these four stages:

1. Selection of installation parameters, such as the location of the installation medium, the hard disk partition onto which LynxOS is to be installed (*destination* media), networking, and other parameters
2. Selection of the development modules from which to install LynxOS
3. Installation of LynxOS onto the development system’s hard disk
4. Reconfiguration of LynxOS boot parameters to boot from the development system’s hard disk

After reconfiguring LynxOS to boot from the development system’s hard disk, `installit` automatically reboots the system. After the system reboots, LynxOS is ready for application development, or installation of additional components.

Backing Up Important Data

LynxOS installation overwrites existing data on the disk onto which it is installed. Whether performing a new installation or an upgrade, be sure to back up important data.

If upgrading LynxOS to a newer version, LynuxWorks recommends that the following files be backed up:

- `/etc/passwd`
- `/etc/hosts`
- `/etc/fstab`
- `/etc/resolv.conf`
- `/net/rc.network`
- `/sys/cfg/pty.cfg`
- `/sys/lynx.os/CONFIG.TBL`
- `/sys/lynx.os/uparam.h`
- Any custom files under `/sys/dheaders/`
- Any custom files under `/sys/drivers/`

installit Interface, Restart and Quit Commands

Because LynxOS is designed to be installed on a wide range of systems, `installit` does not assume that a mouse is available. All `installit` menus are text-based, assuming that a monitor and a keyboard are always available on the development system.

For ease of use, `installit` is *case insensitive*, accepting either lower case or upper case commands. To select a particular menu item, simply type in the item number or first letter of that item, then hit **Enter**.

While waiting for a menu selection to be made, `installit` displays the default action for the particular menu in square brackets, for example: `[1]`. To select the default action, simply press the **Enter** key.

`installit` menus are designed so that after selecting an item, the user is presented with a new menu of increasingly detailed information. The user may return to a previous or parent menu by keying in the **R** command and pressing **Enter**. On return to a previous menu, `installit` automatically selects the next menu item as the default option. In this manner, it is possible to navigate the entire `installit` menu tree.

Typing **Q** and then pressing **Enter** in most `installit` menus causes the utility to quit without installing any files. `installit` prints the following message:

```
***** Aborting Installation *****
```

`installit` can be restarted at any time by quitting, and then typing the `installit` command at the root prompt.

Running installit

After booting the Vendor-Supplied BSP CD-ROM, `installit` should start automatically.

`installit` can also be run by simply entering the command `installit` at the prompt. On startup, `installit` displays the following message:

```
Welcome to the LynxOS Installation Utility!
This script gathers all of the information needed to install LynxOS on
your particular hardware. It obtains this information by presenting
several menus for you to complete. If you are unsure about a menu
option, please refer to the Installation Guide or choose the help option
if one is available.
You may quit the installation by selecting 'Q' during any of
the menus or by typing '<Control>-<C>' at any time. If installit is
interrupted before successful completion, you will need to run it again.

IMPORTANT NOTE: Before proceeding with this installation, you should
backup all user and data files on your system. If you
have a previous version of LynxOS, refer to the Installation
Guide for a list of some important files that should be backed up.

NOTE: Some products are distributed on additional media. If you enable
additional product installation, you will be prompted to insert
additional product media. Please refer to the Installation Guide
for more details on the additional product installation

Would you like to proceed with the installation? (y/n) [y]
```

Figure 4-1: Welcome Message

To terminate the installation, type the letter **n** then press the **Enter** key. Otherwise, simply press **Enter** to proceed with the installation.

NOTE: This initial screen is displayed on all LynxOS native development systems *except* PowerPC; see “PowerPC Initial Screen” below.

PowerPC Initial Screen

On PowerPC systems *only*, the **Terminal Type Selection** Menu (shown below) is the first screen displayed after running `installit`.

```
*** Terminal Type Selection Menu ***

Current terminal type: dumb

0) dumb terminal (dumb)
1) vt100 console (vt100at)
2) Wyse serial terminal (wyse50)
3) vt100 serial terminal
4) xterm (default mode of HyperTerm)
5) linux (default mode of MiniCom)
6) sun (default mode of TIP)

C)ontinue installation

Q)uit Installation

Enter option or new terminal type: [1]
```

Figure 4-2: PowerPC Terminal Type Selection

`installit` supports installation via a serial line console. The following terminal emulator programs can be used with `installit`:

- TIP for Solaris hosts
- MiniCom for Linux hosts
- HyperTerm for Windows hosts

Terminal emulator programs must be configured to use the serial connection in the 9600/N81 mode. The 9600/N81 mode assumes the following settings:

baud rate	9600
parity	No
data bits	8
stop bit	1

Select the terminal and then enter option **C** to continue installation.

Main Menu

The `installit` **Main Menu** displays the following options:

```
*** Main Menu ***

1) Modify Default Values

Please make sure the Default Values and Products to
install are correct before Beginning the Installation.

B)egin Installation
Q)uit Installation

Enter Option: [1]
```

Figure 4-3: Main Menu

For a typical installation, the user must verify that all default installation values are correct and choose the products to install before continuing. As such, it is best to navigate through all of the menus.

Selecting the Distribution Media

The **Modify Default Values Menu**, shown below, allows the user to select the appropriate LynxOS installation media options. For instance, a CD-ROM drive can be connected to the system either through an IDE or SCSI interface.

```
*** Modify Default Values Menu ***

1) Install From:                IDE CD-ROM (ide.1)
2) Install To:                  IDE Hard Disk (ide.0a)
3) System Parameters:          default
4) Virtual Memory:             no
   Swapfile name / size:       N/A / N/A
5) Device Drivers and
   Driver Related Features
6) Date, Time and Time Zone

Q)uit Installation
R)eturn to Previous Menu

Enter option: [1]
```

Figure 4-4: Modify Default Values Menu

The default installation device for LynxOS here is the IDE CD-ROM indicated by **ide.1**. If this is correct, press **Enter**, and continue with selecting the **Install To:** device. If unsure, select 1 to view the **Install Media Selection Menu**, shown below.

```
*** Install Media Selection Menu ***

Installing LynxOS from: IDE CD-ROM (ide.1)

1) SCSI Tape
2) SCSI CD-ROM
3) IDE CD-ROM

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [3]
```

Figure 4-5: Installation Media Selection Menu

Enter the correct option for the device from which LynxOS is being installed.

NOTE: If an installation device type is not found on the machine, `installit` does not display a selection number next to it, thereby directing the user to the correct choice.

There are also several parameters that need to be entered for each LynxOS installation device.

After installation, `installit` prompts the user to return to the parent menu to continue with installation.

Installing from a SCSI Tape Device

After entering option **1** (SCSI Tape) from the **Install Media Selection Menu**, the **SCSI Device Selection Menu** displays the following options:

```

*** SCSI Device Selection Menu ***

SCSI Tape attached to ISA Adaptec AHA 1520/1522 (st1522.4)

1) Select SCSI Adapter:  st1522.4 (ISA Adaptec AHA 1520/1522)
2) Select SCSI ID:      4
   Select Partition:    N/A

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [1]

```

Figure 4-6: SCSI Device Selection Menu

Installing from a SCSI CD-ROM Device

After entering option **2** (SCSI CD-ROM) from the **Install Media Selection Menu**, the **SCSI Device Selection Menu** displays the following options:

```

*** SCSI Device Selection Menu ***

SCSI CD-ROM attached to PCI Adaptec AHA2940UW/2940U2W/2940UW
PRO/19160/29160/29160N (sdascsi.6)

1) Select SCSI Adapter:  sdascsi. (PCI Adaptec
AHA2940UW/2940U2W/2940UW PRO/19160/29160/29160N)
2) Select SCSI ID:      6
   Select Partition:    N/A

Q)uit Installation
R)eturn to Previous Menu

Enter option: [1]

```

Figure 4-7: SCSI Device Selection Menu

Changing SCSI Adapter for x86 Systems

After entering **2** (SCSI CD-ROM) from the **Install Media Selection Menu**, the **SCSI Device Selection Menu** is displayed.

```
*** SCSI Device Selection Menu ***

SCSI CD-ROM attached to PCI Adaptec AHA2940UW/2940U2W/2940UW
PRO/19160/29160/29160N (sdascsi.6)

1) Select SCSI Adapter: sdascsi. (PCI Adaptec
AHA2940UW/2940U2W/2940UW PRO/19160/29160/29160N)
2) Select SCSI ID: 6
   Select Partition: N/A

Q)uit Installation
R)eturn to Previous Menu

Enter option: [1]
```

Figure 4-8: SCSI Device Selection Menu (x86)

Enter option **1** to view or change SCSI Adapter settings. The **SCSI Adapter Selection Menu** displays the following options:

```
*** SCSI Adapter Selection Menu ***

Current SCSI adapter for SCSI CD-ROM: sdascsi. (sdascsi.6) PCI
Adaptec AHA2940UW/2940U2W/2940UW PRO/19160/29160/29160N

ISA Adaptec AHA1520/1522 (does not support CD-ROMs)
2) ISA Adaptec AHA1540/1542
3) PCI Adaptec AHA2940/2940W
4) PCI NCR 810/825/860/875
5) PCI Adaptec AHA2940UW/2940U2W/2940UW PRO/19160/29160/29160N
6) PCI NCR 896

Q)uit Installation
R)eturn to Previous Menu

Enter option: [5]
```

Figure 4-9: SCSI Adapter Settings (x86)

Enter the correct values and options on this screen.

Changing SCSI Adapter for PowerPC Systems

After entering **2** from the **Install Media Selection Menu**, the **SCSI Device Selection Menu** is displayed the following options:

```

*** SCSI Device Selection Menu ***

SCSI CD-ROM attached to on-board SCSI (sdncr.6)

1) Select SCSI Adapter:      sdncr. (on-board SCSI)
2) Select SCSI ID:          6
   Select Partition:         N/A

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [1]

```

Figure 4-10: SCSI Device Selection Menu (PPC)

Enter option **1** to view or change SCSI Adapter settings; doing so displays the **SCSI Adapter Selection Menu** as follows:

```

*** SCSI Adapter Selection Menu ***

Current SCSI adapter for SCSI CD-ROM: sdncr. (sdncr.6)
on board SCSI

1) on board SCSI

Q)uit Installation
R)eturn to Previous Menu

Enter option: [1]

```

Figure 4-11: SCSI Adapter Settings (PPC)

Enter the correct values and options on this screen, then return to the **SCSI Device Selection Menu**.

Once this is done, go to the section “Selecting ID for SCSI CD-ROM” on page 38 and continue.

Selecting ID for SCSI CD-ROM

Enter option **2** from the **SCSI Device Selection Menu** to view the **SCSI ID Selection Menu**, shown below.

```
*** SCSI ID Selection Menu ***

Current SCSI ID of SCSI CD-ROM connected to PCI Adaptec
AHA2940UW/2940U2W/2940UW PRO/19160/29160/29160N: 6 (sdncr.6)

0) SCSI ID 0
1) SCSI ID 1
2) SCSI ID 2
3) SCSI ID 3
4) SCSI ID 4
5) SCSI ID 5
6) SCSI ID 6

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [6]
```

Figure 4-12: SCSI ID Selection Menu

Enter the device ID of the SCSI CD-ROM drive. Now that the correct settings have been entered, return to the **Modify Default Values Menu**.

Installing from IDE CD-ROM

After entering option **3** (IDE CD-ROM) from the **Install Media Selection Menu**, the **IDE Device Selection Menu** displays the following options:

```
*** IDE Device Selection Menu ***

IDE CD-ROM attached to (E)IDE controller (ide.1)

1) Select IDE Adapter:      ide. ((E)IDE controller)
2) Select IDE ID:          1
   Select Partition:        N/A

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [1]
```

Figure 4-13: SCSI ID Selection Menu

Selecting IDE Adapter

Enter option **1** in the **IDE Device Selection Menu** to view or change the IDE Adapter settings on the **IDE Adapter Selection Menu**, which follows.

```

*** IDE Adapter Selection Menu ***

Current Adapter for IDE-CDROM: (ide.0) (E)IDE controller

1) (E)IDE controller

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [1]

```

Figure 4-14: IDE Adapter Selection

installit supports only one IDE adapter.

Selecting IDE Device ID

Choose option **2** from the **IDE Device Selection Menu** to enter the IDE device ID from the **IDE ID Selection Menu**, shown below.

```

*** IDE ID Selection Menu ***

Current ID of IDE CD-ROM connected to (E)IDE controller: 0 (ide.0)

0) Primary IDE controller, Master drive
1) Primary IDE controller, Slave drive
2) Secondary IDE controller, Master drive
3) Secondary IDE controller, Slave drive

Q)uit Installation
R)eturn to Previous Menu

Enter option: [0]

```

Figure 4-15: IDE ID Number Selection

IDE IDs 0 and 1 refer to the primary IDE adapter master and slave devices, respectively. IDE IDs 2 and 3 refer to the secondary IDE adapter (not present on all systems) master and slave devices, respectively.

Now that the correct CD-ROM IDE settings have been entered or verified, return to the **Modify Default Values Menu** on the development system, then see “Selecting the Destination Media” on page 40.

Selecting the Destination Media

Selecting the LynxOS destination media is similar to selecting the LynxOS installation device. Return to the **Modify Default Values Menu**, shown below, and enter option 2.

```

*** Modify Default Values Menu ***

1) Install From:                IDE CD-ROM (ide.1)
2) Install To:                  IDE Hard Disk (ide.0a)
3) System Parameters:          default
4) Virtual Memory:              no
   Swapfile name / size:        N/A / N/A
5) Device Drivers and
   Driver Related Features
6) Date, Time and Time Zone

Q)uit Installation
R)eturn to Previous Menu

Enter option: [2]

```

Figure 4-16: Modify Default Values Menu

After entering option 2, the **Installation Target Selection Menu** is displayed.

```

*** Installation Target Selection Menu ***

Installing LynxOS to:  IDE Hard Disk (ide.0a)
1) SCSI Hard Disk
2) IDE Hard Disk

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [2]

```

Figure 4-17: Installation Target Selection Menu

Enter the option that is correct for the development system onto which LynxOS is to be installed. There are two installation media options:

- *SCSI Hard Disk*: go to “Installing onto SCSI Hard Disk for x86” on page 41 and “Installing onto SCSI Hard Disk for PPC” on page 42 for more information. Then read “Partitioning SCSI Devices (x86 or PPC)” on page 44.
- *IDE Hard Disk*: go to “Installing onto IDE Disk” on page 46 for more information.

Installing onto SCSI Hard Disk for x86

After entering **1** from the **Installation Target Selection Menu**, the **SCSI Device Selection Menu** displays the following options:

```
*** SCSI Device Selection Menu ***

SCSI Hard Disk attached to on-board SCSI (sdncr.0a)

1) Select SCSI Adapter:  sdncr. (PCI NCR 810/825)
2) Select SCSI ID:      0
3) Select Partition:    a

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [1]
```

Figure 4-18: SCSI Device Selection Menu (x86)

Enter option **1** in the **SCSI Device Selection Menu** to view or change SCSI Adapter settings on the **SCSI Adapter Selection Menu**, shown below.

```
*** SCSI Adapter Selection Menu ***

Current SCSI adapter for SCSI Hard Disk: sd1522. (sd1522.0a)
      ISA  Adaptec AHA1520/1522

1) ISA  Adaptec AHA1520/1522
2) ISA  Adaptec AHA1540/1542
3) PCI  Adaptec AHA2940/2940W
4) PCI  NCR 810/825

Q)uit Installation
R)eturn to Previous Menu

Enter option: [1]
```

Figure 4-19: SCSI Adapter Selection Menu (x86)

The user must enter the correct values and options for the LynxOS destination hard disk, and then return to the **SCSI Device Selection Menu**.

Enter option **2** on the **SCSI Device Selection Menu** to view the **SCSI ID Selection Menu**, shown below.

```
*** SCSI ID Selection Menu ***

Current SCSI ID of SCSI Hard Disk connected to
      PCI NCR 810/825: 0 (sdncr.0a)

0) SCSI ID 0
1) SCSI ID 1
2) SCSI ID 2
3) SCSI ID 3
4) SCSI ID 4
5) SCSI ID 5
6) SCSI ID 6

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [0]
```

Figure 4-20: SCSI ID Selection Menu (x86)

Enter the destination SCSI hard disk's ID, then return to the **SCSI Device Selection Menu**.

Installing onto SCSI Hard Disk for PPC

After entering **1** from the **Installation Target Selection Menu**, the **SCSI Device Selection Menu** displays the following:

```
*** SCSI Device Selection Menu ***

SCSI Hard Disk attached to on-board SCSI (sdncr.0b)

1) Select SCSI Adapter:  sdncr. (On-board SCSI)
2) Select SCSI ID:      0
3) Select Partition:    b

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [1]
```

Figure 4-21: SCSI Device Selection Menu (PPC)

Enter option **1** in the **Installation Target Selection Menu** to view or change SCSI Adapter settings on the **SCSI Adapter Selection Menu**, shown below.

```
*** SCSI Adapter Selection Menu ***

Current SCSI Adapter for SCSI Hard Disk: sdncr. (sdncr.0b)
On-board SCSI

1) On-board SCSI

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [1]
```

Figure 4-22: SCSI ID Selection Menu (PPC)

The user needs to enter the correct values and options for the LynxOS destination device, then return to the **SCSI Device Selection Menu**.

Enter option **2** to view the **SCSI ID Selection Menu**, shown below.

```
*** SCSI ID Selection Menu ***

Current SCSI ID of SCSI Hard Disk connected to
On-board SCSI: 0 (sdncr.0b)

0) SCSI ID 0
1) SCSI ID 1
2) SCSI ID 2
3) SCSI ID 3
4) SCSI ID 4
5) SCSI ID 5
6) SCSI ID 6

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [0]
```

Figure 4-23: SCSI ID Selection Menu (PPC)

Enter the destination hard disk's SCSI ID, then return to the **SCSI Device Selection Menu**.

Partitioning SCSI Devices (x86 or PPC)

Enter option **3** in the **SCSI Device Selection Menu** to view partitions. If the entered disk exists and partitions have already been created, the **Partition Configuration Menu** displays the following:

```

*** Partition Configuration Menu ***

Current partition: 2 (b) (sdncr.2b)

0) Partition Info
   Partition 1 (a) (This partition is reserved for booting)
2) Partition 2 (b)          9) Partition 9 (i)
3) Partition 3 (c)        10) Partition 10 (j)
4) Partition 4 (d)        11) Partition 11 (k)
5) Partition 5 (e)        12) Partition 12 (l)
6) Partition 6 (f)        13) Partition 13 (m)
7) Partition 7 (g)        14) Partition 14 (n)
8) Partition 8 (h)        15) Partition 15 (o)
16) Create/Modify Disk Partitions

Q)uit Installation
R)eturn to Previous Menu

Enter option: [2]

```

Figure 4-24: SCSI Partition Configuration Menu

If the selected disk exists, users can view the partition info by selecting option **0**. For example:

```

Current partitions:
Space Available      total blocks (mb)  largest hole blocks (mb)
base partitions:    336 ( 0.16)        336 ( 0.16)
extended partition d: 0 ( 0.00)         0 ( 0.00)
Partition  Boot      Megabytes      Id Symbolic Name
a             *         0.07           65 (PowerPC boot partition)
b             *        999.98          64 (LynxOS)
c             *       1000.00          64 (LynxOS)
d             *       6748.00*         5 (DOS Extended)
e             *        499.98          64 (LynxOS)
f             *        499.98          64 (LynxOS)
g             *        499.98          64 (LynxOS)
h             *        499.98          64 (LynxOS)
i             *        499.98          64 (LynxOS)
j             *        499.98          64 (LynxOS)
k             *        499.98          64 (LynxOS)
l             *        499.98          64 (LynxOS)
m             *        499.98          64 (LynxOS)
n             *        499.98          64 (LynxOS)
o             *       1747.98          64 (LynxOS)

Press <Enter> to continue:

```

Figure 4-25: SCSI Partition Information

NOTE: On the PowerPC, partition 1 (a) is reserved for booting.

To create or modify a disk partition, select option **16**.

```
*** Disk Partitioning Menu ***

Modify partitions on SCSI Hard Disk (sdncr.0)

DISK PARTITIONING DESTROYS ALL DATA ON THE MODIFIED PARTITIONS!

1) Modify current partitioning (using mkpart)
2) Use default partitioning
   partition 1 (a): entire disk

H)elp
Q)uit Installation
R)eturn to Previous Menu

Enter Option: [R]
```

Figure 4-26: Disk Partition Menu

If the user enters option **1** to modify or create new partitions, `installit` invokes `mkpart`. For additional information on using `mkpart`, see “`mkpart(1)` man page” on page 81.

NOTE: The boot partition on SCSI disks cannot be greater than 1 GB. If your SCSI hard disk is greater than 1 GB, it must be divided into two or more partitions.

Now that the correct partition settings have been entered or verified, return to the **Modify Default Values Menu** on the development system, then see “Setting System Parameters” on page 50.

Installing onto IDE Disk

After entering option **2** from the **Installation Target Selection Menu**, the **IDE Device Selection Menu** displays the following options:

```
*** IDE Device Selection Menu ***

IDE Hard Disk attached to (E)IDE controller (ide.0a)

1) Select IDE Adapter:   ide. ((E)IDE controller)
2) Select IDE ID:       0
3) Select Partition:    a

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [1]
```

Figure 4-27: IDE Device Selection Menu

Changing IDE Adapter

Enter option **1** on the **IDE Device Selection Menu** to view or change IDE Adapter settings. The **IDE Adapter Selection Menu** appears, as shown below, confirming the selection.

```
*** IDE Adapter Selection Menu ***

Current Adapter for IDE-CDROM:(ide.0) (E)IDE controller

1) (E)IDE controller

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [1]
```

Figure 4-28: IDE Adapter Selection Menu

`installit` supports only one IDE adapter; press the **Enter** key to select option **1**.

IDE Device ID

Select **2** from the **IDE Device Selection Menu** to display the **IDE ID Selection Menu**, shown below.

```
*** IDE ID Selection Menu ***

Current ID of IDE Hard Disk connected to (E)IDE controller: 0
(idc.0a)

0) Primary IDE controller, Master drive
1) Primary IDE controller, Slave drive
2) Secondary IDE controller, Master drive
3) Secondary IDE controller, Slave drive

Q)uit Installation
R)eturn to Previous Menu

Enter option: [0]
```

Figure 4-29: IDE ID Selection Menu

Device IDs **0** and **1** refer to the primary IDE adapter master and slave devices, respectively. Device IDs **2** and **3** refer to the secondary IDE adapter (not present on all systems) master and slave devices, respectively.

Enter the device ID of the destination hard disk.

Partitioning an IDE Disk

Return to the **IDE Device Selection Menu** and enter option **3** to view partitions. If the selected disk exists and partitions have already been created, the **Partition Configuration Menu** displays partition information, as shown below.

```

*** Partition Configuration Menu ***

Current partition: 1 (a) (ide.0a)

0) Partition Info
1) Partition 1 (a)
2) Partition 2 (b)
3) Partition 3 (c)
4) Partition 4 (d)
5) Partition 5 (e)
6) Partition 6 (f)
7) Partition 7 (g)
8) Partition 8 (h)
16) Create/Modify Disk Partitions

9) Partition 9 (i)
10) Partition 10 (j)
11) Partition 11 (k)
12) Partition 12 (l)
13) Partition 13 (m)
14) Partition 14 (n)
15) Partition 15 (o)

Q)uit Installation
R)eturn to Previous Menu

Enter option: [1]

```

Figure 4-30: IDE Partition Configuration Menu

If the selected disk exists, users can view its partition info by selecting option **0**. For instance:

```

Current partitions:
Space Available      total blocks (mb)   largest hole blocks (mb)
base partitions:    10080 ( 4.92)      10080 ( 4.92)
Partition  Boot     Megabytes          Id  Symbolic Name
a             *           7000.84           64  (LynxOS)
b             *           7000.88           64  (LynxOS)
c             *           5551.88           64  (LynxOS)
d             *           15.75             64  (LynxOS)

Press <Enter> to continue:

```

Figure 4-31: IDE Partition Information

NOTE: In some instances, partition information may also be automatically displayed, followed by partition configuration choices.

Selecting option **16** from the **Partition Configuration Menu** displays the **Disk Partitioning Menu**.

```
*** Disk Partitioning Menu ***

Modify partitions on IDE Hard Disk (ide.0)

DISK PARTITIONING DESTROYS ALL DATA ON THE MODIFIED PARTITIONS!

1) Modify current partitioning (using mkpart)
2) Use default partitioning
   partition 1 (a): entire disk

H)elp
Q)uit Installation
R)eturn to Previous Menu

Enter option: [R]
```

Figure 4-32: IDE Disk Partitioning Menu

Enter option **1** to modify or create new partitions. `installit` invokes `mkpart`. For additional information on using `mkpart`, see “`mkpart(1)` man page” on page 81.

NOTE: The boot partition on IDE disks must be located starting in the first 8 GB (0 to 8 GB) of storage space in the hard disk.

Now that the correct partition settings have been entered or verified, return to the **Modify Default Values Menu** on the development system, and see “Setting System Parameters” on page 50.

Setting System Parameters

To set the system parameters, return to the **Modify Default Values Menu**, shown below, and enter option **3**.

```
*** Modify Default Values Menu ***

1) Install From:                IDE CD-ROM (ide.1)
2) Install To:                  IDE Hard Disk (ide.0a)
3) System Parameters:          default
4) Virtual Memory:             no
   Swapfile name / size:       N/A / N/A
5) Device Drivers and
   Driver Related Features
6) Date, Time and Time Zone

Q)uit Installation
R)eturn to Previous Menu

Enter option: [3]
```

Figure 4-33: Modify Default Values Menu

After entering **3**, the **System Parameter Configuration Menu** displays the following:

```
*** System Parameter Configuration Menu ***

Current System Parameters: default

1) Default values
2) Development System Values (requires at least 10MB RAM)

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [1]
```

Figure 4-34: System Parameter Configuration Menu

The **Default values** are recommended for most LynxOS installations. If LynxOS is going to be used for software development and debugging, the **Development Systems Values** option is recommended. As noted in the menu, the development system values require at least 10 MB of memory (RAM).

Setting Virtual Memory Options

To set or verify the virtual memory (swap file system) options, the user must return to the **Modify Default Values Menu**, shown below.

```
*** Modify Default Values Menu ***

1) Install From:                IDE CD-ROM (ide.1)
2) Install To:                  IDE Hard Disk (ide.0a)
3) System Parameters:          default
4) Virtual Memory:              no
   Swapfile name / size:        N/A / N/A
5) Device Drivers and
   Driver Related Features
6) Date, Time and Time Zone

Q)uit Installation
R)eturn to Previous Menu

Enter option: [4]
```

Figure 4-35: Modify Default Values Menu

All LynxOS processes and threads run in virtual memory, that is, addressing is virtual and is mapped to the underlying physical RAM by the system's memory management unit (MMU).

LynxOS also supports demand-paged virtual memory (sometimes just called "virtual memory"). When demand-paging is not enabled, the number of simultaneously executable processes is limited by the amount of available physical RAM. When demand-paging is enabled, LynxOS (as needed and on demand) clears up physical RAM to make room for more processes. To do this, LynxOS copies pages of RAM to the *swapfile* residing on a hard disk or any other mass storage device. When these pages are needed again, LynxOS makes space for them in physical RAM (by *paging out* other pages) and *paging in* the needed pages.

For most embedded applications, demand-paging *should not* be enabled. The main reason for this is to avoid performance penalties associated with paging in and paging out of required pages of memory. Demand paging is *disabled by default*.

To enable or disable demand-paging, enter option **4** from the **Modify Default Values Menu**, which displays the **Virtual Memory Configuration Menu** as follows:

```

*** Virtual Memory Configuration Menu ***

1) Install Virtual Memory:      no
   Swapfile type:              N/A
   Swapfile name:              N/A
   Size:                        N/A

Q)uit Installation
R)eturn to Previous Menu

Enter option: [1]

```

Figure 4-36: Virtual Memory Configuration Menu, disabled

To enable demand paging, enter option **1**. This option acts as a toggle switch for enabling/disabling demand paging.

NOTE: The swapfile type, swapfile name, and size *cannot* be modified until demand paging is enabled.

Entering **1** on the **Virtual Memory Configuration Menu**, shown below, toggles demand-paged virtual memory. When it is enabled, the menu allows the user to select virtual memory type, name, and size parameters.

```

*** Virtual Memory Configuration Menu ***

1) Install Virtual Memory:      yes
   Swapfile type:              Contiguous File
   Swapfile name:              /.swap
   Size:                        32M

Q)uit Installation
R)eturn to Previous Menu

Enter option: [1]

```

Figure 4-37: Virtual Memory Configuration Menu, enabled

There are two swapfile types supported by LynxOS:

- A contiguous file created in the root file system - To select this option, enter **1** (Contiguous File) on the **Swapfile Type Menu**.
- A separate disk partition that is used *only* for swapping (paging) pages in and out. To select this option, enter **2** (Raw Partition) on the **Swapfile Type Menu**.

Virtual Memory Contiguous File Settings

To change the swapfile name, enter option **3** in the **Virtual Memory Configuration Menu**. The following is displayed:

```

*** Swapfile Name Menu ***

Current Swapfile Name: /.swap

Q)uit Installation
R)eturn to Previous Menu

Enter option or New Swapfile Name: [/.swap]

```

Figure 4-38: Swapfile Name Menu

To change the name of the file, simply key in the new swapfile name in the `Enter option or New Swapfile Name:` field.

To change the swapfile size, enter option **4** from the **Virtual Memory Configuration Menu**. Doing this displays the **Swapfile Size Configuration Menu**, shown below.

```

*** Swapfile Size Configuration Menu ***

Current Swapfile Size: 32M

H)elp
Q)uit Installation
R)eturn to Previous Menu

Enter option or Swapfile size: [32M]

```

Figure 4-39: Swapfile Size Configuration Menu

To change the swapfile size, simply enter the new Swapfile size at the `Enter option or Swapfile size:` prompt. For help on this topic, enter the **H** option. In most cases, setting the swapfile size to twice the amount of physical RAM provides optimal performance. For systems running large applications, such as XFree86 and LessTif Windows-based applications, additional swap space may be required.[†]

Return to the **Modify Default Values Menu** on the development system, and see “Configuring Device Driver Parameters” on page 55.

[†]. XFree86 and LessTif for LynxOS works with the Native Development Environment and is available from LynuxWorks as a separate purchase. For more information, contact your Account Manager.

Virtual Memory Raw Partition Settings

After selecting raw swapfile type from the **Swapfile Type Menu**, the **Virtual Memory Configuration Menu** displays the following information:

```

*** Virtual Memory Configuration Menu ***

1) Install Virtual Memory:      yes
2) Swapfile type:              Raw Partition
3) Swapfile device:            ide.0b
   Size:                        N/A
Q)uit Installation
R)eturn to Previous Menu

Enter Option: [3]

```

Figure 4-40: Virtual Memory Configuration Menu

The swapfile partition *must not* be the same as the LynxOS installation partition. To change the swapfile partition, enter option **3** the **Virtual Memory Configuration Menu**. Doing this displays the **Swap Partition Menu**, as shown below.

```

*** Swap Partition Menu ***

Current Swap Partition: IDE Hard Disk (ide.0b)
1) SCSI Hard Disk
2) IDE Hard Disk

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [2]

```

Figure 4-41: Swap Partition Menu

Selecting swap partition is identical to selecting the installation partition; see the following sections depending on the development system: “Installing onto SCSI Hard Disk for x86” on page 41, “Installing onto SCSI Hard Disk for PPC” on page 42, “Installing onto IDE Disk” on page 46.

Return to the **Modify Default Values Menu** on the development system, then see “Configuring Device Driver Parameters” below.

Configuring Device Driver Parameters

To configure device driver parameters, enter option **5** on the **Modify Default Values Menu**:

```

*** Modify Default Values Menu ***

1) Install From:                IDE CD-ROM (ide.1)
2) Install To:                  IDE Hard Disk (ide.0a)
3) System Parameters:          default
4) Virtual Memory:              no
   Swapfile name / size:        N/A / N/A
5) Device Drivers and
   Driver Related Features
6) Date, Time and Time Zone

Q)uit Installation
R)eturn to Previous Menu

Enter option: [5]

```

Figure 4-42: Modify Default Values Menu

After entering option **5**, the **Modify Device Driver/Driver Related Features Menu** displays the following:

```

*** Modify Device Driver / Driver Related Features Menu ***

1) Networking
2) PS2 Compatible Mouse Driver: no

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [1]

```

Figure 4-43: Modify Device Driver/Driver Related Features Menu

To install a PS2 compatible mouse, enter option **2**; see “Selecting a PS2 Mouse” on page 60. If networking parameters need to be configured, see “Configuring Networking Parameters” below.

Configuring Networking Parameters

To configure networking parameters, enter option **1** from the **Modify Device Driver/Driver Related Features Menu**.

`installit` allows for choosing the primary ethernet interface, IP address configuration, setting the host name, and provides the option to install NFS.

NOTE: The default options are *not* suitable; at a minimum the IP address needs to be changed. In addition, the default Ethernet interface may not be correct.

The second and subsequent network devices (or devices not shown here) cannot be configured from `installit` and must be added after installation, either by running the `/usr/bin/Install.tcpip` script, or manually, after the addition of appropriate device drivers.

After entering **1** from the **Modify Device Driver/Driver Related Features Menu**, the **Modify Networking Default Values Menu** displays the following:

```
*** Modify Networking Default Values Menu ***

1) Network Interfaces
   Ethernet Card:          SMC EtherPower (epic0)
2) TCP/IP:                yes
   Hostname / IP Address:  lynxdemo / 10.0.0.1
3) NFS:                   yes
   NFS Server / File Locking: yes / yes
   NFS Client / Client Cache: yes / yes

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [1]
```

Figure 4-44: Modify Networking Default Values Menu

To select a network interface card, enter option **1**. To enable/disable TCP/IP, or to change the host name or IP address, enter option **2**. To enable/disable NFS and to change NFS parameters, enter option **3**.

Selecting an Ethernet Card (x86)

To select an Ethernet card on x86 development systems, enter option **1** on the **Ethernet Adapter Selection Menu**.

NOTE: Option **1** corresponds to a default value. Select it anyway for a list of available options.

```
*** Ethernet Adapter Selection Menu ***

Current ethernet adapter: SMC EtherPower (epic0)

0) None
1) WD/SMC Elite
2) SMC Elite Ultra
3) 3Com 3C509
4) 3Com 3C579
5) SMC EtherPower
6) AMD Am79C970A
7) SMC EtherPower II
8) NE2000 compatible
9) Intel 82558 Pro
10) 3Com 3C900,3C905,3C905B
11) 3Com 3C589
12) Intel 8254X

Q)uit Installation
R)eturn to Previous Menu

Enter option: [5]
```

Figure 4-45: Ethernet Adapter Selection Menu (x86)

The list of Ethernet Adapters displays supported chips and/or cards/card series.

Enter the appropriate Ethernet adapter, then return to the **Modify Networking Default Values Menu** on the development system to continue configuring the appropriate network parameters.

NOTE: An ethernet device, specific to the custom board may appear in this list.

Selecting an Ethernet Card (PPC)

To select an Ethernet card on PPC development systems, enter option **1** on the **Ethernet Adapter Selection Menu**.

```
*** Ethernet Adapter Selection Menu ***

Current ethernet adapter: dec21040 / SMC EtherPower (dec0)

0) None
1) dec21040 / SMC EtherPower
2) Am79c970 / AMD Am79C970A
3) PowerQUICC SCC1 (821/860 only)
4) Intel 82558 Pro

Q)uit Installation
R)eturn to Previous Menu

Enter option: [1]
```

Figure 4-46: Ethernet Adapter Selection Menu

Enter the appropriate Ethernet adapter, then return to the **Modify Networking Default Values Menu** on the development system to continue configuring network parameters as appropriate.

Configuring TCP/IP

To configure TCP/IP parameters, enter option **2** on the **Modify Networking Default Values Menu**. This displays the **TCP/IP Configuration Menu** as follows:

```
*** TCP/IP Configuration Menu ***

1) Install TCP/IP:           yes
2) Hostname:                 lynxdemo
3) IP Address:               10.0.0.1

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [2]
```

Figure 4-47: TCP/IP Configuration Menu

TCP/IP is enabled by default. To toggle TCP/IP, enter option **1**.

NOTE: Changing the host name or the IP address is not permitted by `installit` unless TCP/IP is enabled.

Setting Host Name

To change the host name, enter option **2** on the **TCP/IP Configuration Menu**. Doing this displays the **Hostname Configuration Menu** as follows:

```
*** Hostname Configuration Menu ***

Current Hostname: lynxdemo

H)elp
Q)uit Installation
R)eturn to Previous Menu

Enter option or new Hostname: [lynxdemo]
```

Figure 4-48: Hostname Configuration Menu

To change the host name, key in the name, then press **Enter**.

Configuring IP Address

After entering the host name, return to the **TCP/IP Configuration Menu** and enter option **3**. Doing this displays the **IP Address Configuration Menu**, shown below.

```
*** IP Address Configuration Menu ***

Current IP Address: 10.0.0.1

H)elp
Q)uit Installation
R)eturn to Previous Menu

Enter option or new IP address: [10.0.0.1]
```

Figure 4-49: IP Address Configuration Menu

To change the IP address, simply type the new IP address and press **Enter**.

After completing the TCP/IP configuration, return to the **Modify Networking Default Values Menu**.

NOTE: Any special netmask requirements must be added after installation. This is typically done by creating a `/net/rc.local` file and inserting appropriate `ifconfig` commands into it.

The user may also install TCP/IP but configure networking parameters (host name, IP address) after installation using DHCP, for example.

Configuring NFS

To configure NFS, enter option **3**, which brings up the **NFS Configuration Menu**, as shown below.

```
*** NFS Configuration Menu ***

1) Install NFS:                yes
2) Enable Server:              yes
3) Enable Client:              yes
4) Enable Client Cache:        yes
5) Enable File Locking:        yes

Q)uit Installation
R)eturn to Previous Menu

Enter Option: [2]
```

Figure 4-50: NFS Configuration Menu

NFS installation is *enabled by default*. To enable or disable NFS, enter option **1**. If NFS installation is disabled, `installit` does not permit the other NFS parameters to be changed. To enable or disable any of the other parameters (assuming NFS is enabled), simply enter the appropriate option and press **Enter**.

If **Enable Server** and **Enable Client** are both disabled, `installit` automatically disables **Install NFS**.

Selecting a PS2 Mouse

To select a PS2 mouse, choose option **2** from the **Modify Device Driver/Drive Related Features Menu**. This toggles the PS2 mouse selection.

```
**** Modify Device Driver/ Driver Related Features Menu ****

1) Networking
2) PS2 compatible Mouse Driver: yes

Q)uit Installation
R)eturn to Previous Menu

Enter Option [R].
```

Figure 4-51: Selecting PS2 Mouse

Setting Date, Time and Time Zone

To set or verify the date, time and time zone values, return to the **Modify Default Values Menu** and select option **6**.

```

*** Modify Default Values Menu ***

1) Install From:                IDE CD-ROM (ide.1)
2) Install To:                  IDE Hard Disk (ide.0a)
3) System Parameters:          default
4) Virtual Memory:             no
   Swapfile name / size:       N/A / N/A
5) Device Drivers and
   Driver Related Features
6) Date, Time and Time Zone

Q)uit Installation
R)eturn to Previous Menu

Enter option: [6]

```

Figure 4-52: Modify Default Values Menu

The following menu is displayed.

```

*** Modify Date, Time and Time Zone Menu ***

1) Date:                        2001/10/31
2) Time:                        05:28:40
3) Use TZ environment variable: no
4) Time Zone:                   480 minutes east(-)/west(+) of
   Greenwich
5) Daylight Savings Type:      1 (USA)

Q)uit Installation
R)eturn to Previous Menu

Enter option: [1]

```

Figure 4-53: Modify Date, Time, and Time Zone Menu

Enter option **1** to modify the date. Note that the date is in the format *YYYY/MM/DD*.

```

*** Modify Date Menu ***

Current date: 2001/10/31

Q)uit Installation
R)eturn to the previous menu

Enter a new date: [2001/10/31]

```

Figure 4-54: Modify Date Menu

After changing the date, return to the **Modify Date, Time and Time Zone Menu** and select option **2** to enter a new time. New time should be entered in a 24 hour clock.

```

*** Modify Time Menu ***

Current time: 05:44:48

Q)uit Installation
R)eturn to Previous Menu

Enter a new time: [05:44:48]

```

Figure 4-55: Modify Time Menu

There are two ways to set a time zone. One way (default) is to use a value of minutes east (-) or west (+) of Greenwich Mean Time and setting a daylight savings type. The second way is to use the `TZ` environment variable. To enable or disable use of the `TZ` environment variable, select option **3** from the **Modify Date, Time and Time Zone Menu**. The **Modify Date, Time and Time Zone Menu** changes appropriately.

```

*** Modify Date, Time and Time Zone Menu ***

1) Date:                2001/10/31
2) Time:                06:42:53
3) Use TZ environment variable: yes
4) TZ environment variable: PST8PDT9,M4.1.0/02:00:00,M10.5.0/02:00:00

Q)uit Installation
R)eturn to Previous Menu

Enter option: [4]

```

Figure 4-56: Modify Date, Time and Time Zone Menu, TZ enabled

```

*** Modify Date, Time and Time Zone Menu ***

1) Date:                2001/10/31
2) Time:                05:28:40
3) Use TZ environment variable: no
4) Time Zone:          480 minutes east(-)/west(+) of
Greenwich
5) Daylight Savings Type: 1 (USA)

Q)uit Installation
R)eturn to Previous Menu

Enter option: [4]

```

Figure 4-57: Modify Date, Time and Time Zone Menu, GMT enabled

To set the time zone using the default way, select option **4** from the **Modify Date, Time and Time Zone Menu** when use of the TZ environment variable is turned off. The following menu is displayed.

```

*** Modify Time Zone Menu ***

Current time zone: 480 Minutes east (-) or west (+) of Greenwich
1) 720 KJT (Kwajalein Is.)          18) -180 MSK/MSD (Asia: W Russia)
2) 660 SST (Samoa)                 19) -210 IT (Iran)
3) 600 HST (US Hawaii)             20) -240 SMT (Asia: Seychelles)
4) 540 AKST/AKDT (US Alaska)       21) -270 APT (Afghanistan)
5) 480 PST/PDT (US Pacific)        22) -300 PKT (Asia: Pakistan)
6) 420 MST/MDT (US Mountain)       23) -330 IST (India)
7) 360 CST/CDT (US Central)        24) -345 NPT (Nepal)
8) 300 EST/EDT (US Eastern)        25) -360 NSK/NSD (Asia:Bangladesh)
9) 240 AST/ADT (Atlantic)          26) -390 BMT (Burma)
10) 210 NST (Newfoundland)         27) -420 ISK/ISD (Asia: China)
11) 180 WGT/WGT DST (Western Greenland) 28) -480 WST (Western Australia)
12) 120 MGT/MGT DST (Middle Greenland) 29) -540 JST (Asia: Japan)
13) 60 EGT/EGT DST (Eastern Greenland) 31) -570 CST (Central Australia)
14) 0 WET/WET DST (Western Europe)    32) -600 EST (Eastern Australia)
16) -60 MET/MET DST (Middle Europe)   33) -660 PSK/PSD (Asia: E Russia)
17) -120 EET/EET DST (Eastern Europe) 34) -720 NZST/NZDT (New Zealand)

Q)uit Installation
R)return to Previous Menu

Enter option or new time zone as minutes east(-)/west(+) of Greenwich:
[480]

```

Figure 4-58: Modify Time Zone Menu

After changing the time zone, return to the **Modify Date, Time and Time Zone Menu** and select option **5** to select daylight savings type. The **Modify Daylight Savings Type Menu** is shown.

```

*** Modify Daylight Savings Type Menu ***

Current daylight savings type: 1 (USA)

0) None
1) USA
2) Australia
3) Eastern Europe
4) Central Europe
5) Western Europe

Q)uit Installation
R)return to Previous Menu

Enter option: [1]

```

Figure 4-59: Modify Daylight Savings Type Menu

To set the time zone using the TZ environment variable, select option 4 from the **Modify Date, Time and Time Zone Menu** when the TZ environment variable is enabled.

```
*** Modify Date, Time and Time Zone Menu ***

1) Date:                2001/10/31
2) Time:                06:42:53
3) Use TZ environment variable: yes
4) TZ environment variable: PST8PDT9,
M4.1.0/02:00:00,M10.5.0/02:00:00

Q)uit Installation
R)eturn to Previous Menu

Enter option: [4]
```

Figure 4-60: Modify Date, Time and Time Zone Menu, TZ enabled

The following menu is used to configure the TZ environment variable.

```
*** Modify TZ Environment Variable Menu ***

Current TZ variable: PST8PDT9,M4.1.0/02:00:00,M10.5.0/02:00:00

0) Select from predefined TZ variables
1) Standard Time Zone Name:      PST
2) Standard Offset from GMT:    8
3) Daylight Savings Time Zone Name: PDT
4) Daylight Savings Offset From GMT: 9
5) Start Date:                  M4.1.0 (first Sunday in
April)
6) Start Time:                  02:00:00
7) End Date:                    M10.5.0 (last Sunday in
October)
8) End Time:                    02:00:00

H)elp
Q)uit Installation
R)eturn to Previous Menu

Enter option: [0]
```

Figure 4-61: Modify TZ Environment Variable

To select from predefined TZ variables, select option **0** from the **Modify TZ Environment Variable Menu**.

```

*** Select Predefined TZ Environment Variable ***

Current TZ area:      US (Pacific)
Current TZ variable: PST8PDT9,M4.1.0/02:00:00,M10.5.0/02:00:00

1) US (Hawaii)        14) Russia (Kaliningrad)  27) Australia(Western)
2) US (Alaska)        15) Russia (Moscow)       28) Australia(Central)
3) US (Pacific)       16) Russia (Samara)       29) Australia(Eastern)
4) US (Mountain)     17) Russia (Yekaterinburg) 30) Asia (Japan)
5) US (Central)       18) Russia (Omsk)         31) Asia (China)
6) US (Indiana)       19) Russia (Novosibirsk)  32) Asia (Hong Kong)
7) US (Eastern)       20) Russia (Krasnoyarsk)  33) Asia (Korea)
8) UK (London)        21) Russia (Irkutsk)     34) Asia (India)
9) UK (Belfast)       22) Russia (Yakutsk)
10) UK (Dublin)       23) Russia (Vladivostok)
11) Europe (Western)  24) Russia (Magadan)
12) Europe (Central)  25) Russia (Kamchatka)
13) Europe (Eastern)  26) Russia (Anadyr)

Quit Installation
R)return to Previous Menu

Enter option: [R]

```

Figure 4-62: Select Predefined TZ Environment Variable

To set the standard time zone name, select option **1** from the **Modify TZ Environment Variable Menu**.

```

*** Set Time Zone Name Menu ***

Current standard time zone name: PST
Current TZ variable: PST8PDT9,M4.1.0/02:00:00,M10.5.0/02:00:00

H)elp
Q)uit Installation
R)return to Previous Menu

Enter new time zone name: [PST]

```

Figure 4-63: Select Time Zone Menu

To set the standard offset from GMT, select option **2** from the **Modify TZ Environment Variable Menu**.

```
*** Set Time Zone Offset Menu ***

Current standard time zone offset: 8
Current TZ variable: PST8PDT9,M4.1.0/02:00:00,M10.5.0/02:00:00

H)elp
Q)uit Installation
R)eturn to Previous Menu

Enter new time zone offset: [-3]
```

Figure 4-64: Set Time Zone Offset

To set the daylight savings time zone name, select option **3** from the **Modify TZ Environment Variable Menu**.

```
*** Set Time Zone Name Menu ***

Current daylight savings time zone name: PDT
Current TZ variable: PST8PDT9,M4.1.0/02:00:00,M10.5.0/02:00:00

H)elp
Q)uit Installation
R)eturn to Previous Menu

Enter new time zone name: [MSD]
```

Figure 4-65: Set Time Zone Name Menu

To set the daylight savings offset from GMT, select option **4** from the **Modify TZ Environment Variable Menu**.

```
*** Set Time Zone Offset Menu ***

Current daylight savings time zone offset: 9
Current TZ variable: PST8PDT9,M4.1.0/02:00:00,M10.5.0/02:00:00

H)elp
Q)uit Installation
R)eturn to Previous Menu

Enter new time zone offset: [-2]
```

Figure 4-66: Set Time Zone Offset Menu

To set the time zone start date, select option **5** from the **Modify TZ Environment Variable Menu**.

```
*** Set Time Zone Date Menu ***

Current time zone start date: M4.1.0 (first Sunday in April)
Current TZ variable: PST8PDT9,M4.1.0/02:00:00,M10.5.0/02:00:00

H)elp
Q)uit Installation
R)eturn to Previous Menu

Enter new time zone date: [M3.5.0]
```

Figure 4-67: Set Time Zone Date Menu (start date)

To set the time zone start time, select option **6** from the **Modify TZ Environment Variable Menu**.

```
*** Set Time Zone Time Menu ***

Current time zone start time: 02:00:00
Current TZ variable: PST8PDT9,M4.1.0/02:00:00,M10.5.0/02:00:00

H)elp
Q)uit Installation
R)eturn to Previous Menu

Enter new time zone time: [02:00:00]
```

Figure 4-68: Set Time Zone Date Menu (start time)

To set the time zone end date, select option **7** from the **Modify TZ Environment Variable Menu**.

```
*** Set Time Zone Date Menu ***

Current time zone end date: M10.5.0 (last Sunday in October)
Current TZ variable: PST8PDT9,M4.1.0/02:00:00,M10.5.0/02:00:00

H)elp
Q)uit Installation
R)eturn to Previous Menu

Enter new time zone date: [M10.5.0]
```

Figure 4-69: Set Time Zone Date Menu (end date)

To set the time zone end time, select option **8** from the **Modify TZ Environment Variable Menu**.

```
*** Set Time Zone Time Menu ***

Current time zone end time: 02:00:00
Current TZ variable: PST8PDT9,M4.1.0/02:00:00,M10.5.0/02:00:00

H)elp
Q)uit Installation
R)eturn to Previous Menu

Enter new time zone time: [02:00:00]
```

Figure 4-70: Set Time Zone Date Menu (end time)

Completing the LynxOS Installation

After configuring the development system, begin the installation. This installs LynxOS onto the development system. To run `installit`, return to the **Main Menu**, shown below, and enter option **B**:

```
*** Main Menu ***

1) Modify Default Values

B)egin Installation
Q)uit Installation

Enter Option: [B]
```

Figure 4-71: Main Menu

`installit` displays the **Final Installation Menu** as follows:

```
*** Final Installation Menu ***

Continuing now will result in the loss
of all data on the IDE Hard Disk (ide.0a)!

C)ontinue installation

Q)uit Installation
R)eturn to Previous Menu

Enter Option [R]
```

Figure 4-72: Final Installation Menu

NOTE: If the wrong installation CD-ROM option is entered, `installit` prints the message shown below:

```
Please make sure that the Vendor Supplied CD-ROM is in
the IDE drive (/dev/ide.0)
Press <Enter> to continue.
```

Enter the command **C** to continue. `installit` immediately begins installing LynxOS. This process includes first removing any existing data on the destination hard disk partition. During the installation process, `installit` displays status information, including names of files as they are being copied to the hard disk.

After the Vendor-Supplied BSP components are installed onto the system, the user is prompted to insert the LynxOS ODE CD-ROM.

```
Please insert the LynxOS Open Development Environment CD-ROM
in the IDE drive (/dev/ide.0)
```

Figure 4-73: installit Prompt for LynxODE CD-ROM

Once the LynxOS ODE components are extracted onto the system, installation is complete.

Rebooting

At the end of the installation, `installit` configures a LynxOS kernel to boot from the hard disk. A reboot message is printed by `installit`, prompting the user to press **Enter** and remove the media.

NOTE: The CD-ROM can be ejected only after pressing **Enter** to reboot the system.

Secondary Installation Configurations

After rebooting, the installation procedure starts the secondary installation process. This includes changing LynxOS configuration files and rebuilding the kernel, if needed. The following message is printed during the secondary installation:

```
The host database (/etc/hosts) supplied is just a sample and it may not
reflect the exact network addresses and hostnames at your site. If you
already have a host data base, copy it to /etc/hosts. Otherwise you will
need to edit /etc/hosts to add your network addresses and hostnames to the
database.
```

```
Press <Enter> to continue...
```

The file `/etc/fstab` can be edited to include mount commands for any directories that are to be NFS mounted each time the machine is booted.

Press <Enter> to continue...

The file `/etc/exports` needs to be edited to include any directories that can be exported to NFS clients. If you already have a database of exportable NFS directories, copy it to `/etc/exports`. If you need to create a new database, please refer to the section on file formats in the LynxOS Reference Manual (`man-4,5,9`) for the format of the file `/etc/exports`.

Secondary configuration is complete!
Press <Enter> to reboot your system...

Reboot the system again to complete the LynxOS installation.

Users new to LynxOS should read the Getting Started chapter of the *LynxOS User's Guide* to familiarize themselves with the basics of LynxOS.

Introduction

This chapter provides instructions for booting LynxOS, platform-specific details, and troubleshooting solutions.

Before booting LynxOS from the hard disk for the first time, it may be necessary to set up the development system's BIOS or hardware for LynxOS operation; see "Working with BIOS" below for more information.

The LynxOS boot process starts with **preboot** (the LynxOS preboot utility), that allows the user to select the hard disk, partition, and file to boot from. `preboot` uses built-in defaults that are set with the **makeboot** command. The default settings of `preboot` boot LynxOS from the same hard disk and partition from where `preboot` was loaded.

Once `preboot` is running, the user can change the root and boot devices, and boot LynxOS. Typically, both the root device and the boot device are the same, and are the defaults. The `preboot` utility can boot from the default devices; see "LynxOS preboot Utility" on page 72 for details.

If LynxOS fails to boot successfully, some problems are due to minor BIOS and/or hardware variations. For further information, see "Troubleshooting Booting" on page 78.

Working with BIOS

LynuxWorks regularly installs and boots LynxOS on PCs from various vendors using several kinds of BIOS and x86-compatible processors. However, due to the large number of PC vendors and rapid changes and upgrades to PC models, it is not possible to test LynxOS on all commercially available PCs.

For up-to-date information on supported hardware, see the hardware support information available on the LynuxWorks LynxOS RTOS Hardware Drivers web page (<http://www.lynuxworks.com/rtos/hardware-driver.php>).

LynxOS also requires the BIOS to set up the serial ports, parallel ports, and IDE channels. Setting `Disable PnP OS` and setting these devices to `not autodetect` in the BIOS ensures that these devices can be set up in the BIOS as required by LynxOS.

On PCI systems, if an ISA ethernet adapter is used, allocate IRQ 5 (or the adapter's chosen IRQ) to `Legacy ISA` mode from within the BIOS. When IRQ 5 is used for an ISA ethernet device, the on-board audio port (if present) should be disabled to prevent IRQ overlap. In general, ISA interrupts cannot be shared.

If an SMC EtherEZ/Ultra/Elite series Ethernet adapter is used, the memory range `CC000-CFFFF` (or the adapter's RAM region) should be allocated as ISA RAM space. Shadowing for this RAM segment should be disabled.

If a PC has multiple ethernet adapters, only one of the ethernet cards can be chosen during installation. All other interfaces should be disconnected from the network. Once LynxOS is installed, multiple network adapters can be configured.

NOTE: LynxOS supports some PC Card (PCMCIA) devices and drivers in certain configurations. Please contact LynuxWorks for more information.

The BIOS in many x86 development systems includes an option called `LFB SIZE` and a start address. In some development systems, this memory range is write-protected and used by system components such as `himem.sys`. This feature should be disabled when running LynxOS. If not, LynxOS may not recognize memory above this reserved write-protected region.

See the *LynxOS User's Guide* for default x86 DMA channels and IRQ allocations.

LynxOS preboot Utility

`preboot` is the LynxOS loader that provides a user interface prior to LynxOS boot-up. This utility supports the loading of any LynxOS kernel located on any partition. With `preboot`, users can also load kernels on non-bootable partitions.

`preboot` defines two different devices for booting LynxOS: the *root* device and the *boot* device. The root device is where the LynxOS root file system is located. The boot device is the LynxOS image used to boot the system. In many cases, the

boot device is the same as the root device; these two devices are discussed in detail in “Setting the Root Device” on page 75 and “Setting the Boot Device” on page 75.

Major and Minor Device Numbers

Both `preboot` and LynxOS identify each device driver in the development system with a unique pair of numbers: major and minor device numbers. The major device number defines the device controller/adaptor (such as IDE or SCSI) that a given device is attached to. The minor device number defines the logical unit (or, in some cases, a software-defined subunit such as a disk partition) of a given device. For example, on x86 development systems all IDE drives on the primary bus have a major number of 0 to indicate that the drive is accessed through the IDE controller.

x86 Device Numbers

Major numbers for device nodes are determined by the order in which the drivers are included in the `CONFIG.TBL` file. Rearranging the driver entries in this file changes the major numbers allocated to devices controlled by those drivers. The following table lists the major number allocations based on the default `CONFIG.TBL` file. Any modification to `CONFIG.TBL` by the user may cause the major number allocations change. The default major device numbers are shown in the table below.

Table 5-1: Default Major Numbers for Disk Devices (x86)

Major Number	Description	Driver
0	Primary and Secondary IDE/EIDE	<code>ide</code>
1	Floppy	<code>fd</code>
2	Adaptec 1542 SCSI	<code>sim1542</code>
3	Adaptec 2940	<code>sim2940</code>
4	Adaptec 2940 U2W SCSI ¹ Adaptec 2940 UW Pro SCSI Adaptec Ultra160 SCSI	<code>simascsi</code> ²
5	SimBios 8xx	<code>scsi810</code>

1. The Adaptec 2940 U2W and 2940 UW Pro SCSI Adapters are controlled by the `ascsi` driver. All other Adaptec 2940 SCSI cards are supported by the `2940` driver.
2. This driver is available on the x86 DRM BSP *only*.

The default *minor device numbers* for x86 systems are shown in the table below.

Table 5-2: Default Minor Numbers for Disk Devices (x86)

Type		Device ID	Minor Numbers					
SCSI	IDE		Disk	Partition A	Partition B	Partition C	Partition D	Add'l Partition
		0	0	16	32	48	64	→ +16
		1	1	17	33	49	65	+16
		2	2	18	34	50	66	+16
		3	3	19	35	51	67	+16
		4	4	20	36	52	68	+16
		5	5	21	37	53	69	+16
		6	6	22	38	54	70	+16
		+1 (15 max)	↓ +1	+1	+1	+1	+1	+1

To determine the device ID for an IDE disk, refer to the following table.

Table 5-3: Device IDs for IDE Disks

IDE Disk Device	Device ID
Primary Master	0
Primary Slave	1
Secondary Master	2
Secondary Slave	3

PowerPC Device Numbers

The default major device numbers are shown below.

Table 5-4: Default Major Numbers for Disks (PowerPC)

Major Number	Description
0	RAM disk
1	SCSI devices including hard disk, CD-ROM, and tape
2	IDE Primary and Secondary

The default minor device numbers are the same as on x86 development systems; see the table “Default Minor Numbers for Disk Devices (x86)” on page 74.

Setting the Root Device

The *root device* is the location of a LynxOS root file system. With the major and minor number of the device, the root device can be set using `preboot`.

On x86 and PowerPC Systems

To display the current default root device, enter the following at the `preboot` prompt:

```
Command? R ?
```

To set the root device to something other than the default, enter the following at the `preboot` prompt:

```
Command? R <major> <minor>
```

To set the root device for partition **b** of an Adaptec 2940 SCSI disk at ID 2, on an x86 system, enter the following at the `preboot` prompt:

```
Command? R 3 34
```

Setting the Boot Device

The boot device is the location of the LynxOS kernel that is to be booted. In most cases, `preboot` automatically detects and selects the correct boot device. The

preboot **boot** command is used to determine the boot device. The **boot** command has the following syntax:

```
Command? b <controller>.<device_id> <boot_dev_args> \  
<root_dev_args> <boot_file>
```

In the example above, <controller> can be: ide, sd1542, sd2940, sdnocr, or another driver. Additionally, other SCSI buses may be available. <device_id> is the desired drive's ID. <boot_file> is the name of the file on the selected drive to boot (normally /lynx.os). <boot_dev_args> and <root_dev_args> for ISA devices is a 16-bit I/O address of a specific ISA card. For PCI devices the argument is two 8-bit numbers, <PCIBus> and <PCIDev>, representing a specific PCI device. If one PCI or ISA card is present, the arguments are redundant.

For example, to set the boot device to partition **b** of a SCSI (2940 Adaptec) device at ID 3, enter the following at the preboot prompt:

```
Command? b sd2940.3b
```

To set the boot device to partition **c** of an IDE secondary slave device, enter the following at the preboot prompt:

```
Command? b ide.3c h3c
```

Specifying a Serial Port for Preboot on x86 Systems

The preboot output can be changed to a specific serial port or all serial ports in addition to the video console. To configure preboot with a specific port, use the following instructions. Note that these instructions are for x86 systems only.

NOTE: Be sure to make backups of any files edited or removed in the following instructions.

1. Edit the Makefile file in /src/bin/preboot.customer
2. Remove the comment (#) for the serial port(s) to define. For example, change

```
#P1=DCOM1
```

to

```
P1=DCOM2
```

3. Remove the `uarts.o` file:

```
# mv uarts.o uarts.o.bak
```

4. Rebuild preboot and use this binary with the `makeboot` command. The preboot output will now sent to the chosen COM port(s) in addition to the video console.



CAUTION! Do not use `make clean` or `make clobber` rules when rebuilding preboot.

To disable the normal keyboard input, `keyboard.c` must be edited to change the `kybd_ready()` routine to return 0. This prevents Preboot from performing keyboard checks. Change the line:

```
int kybd_ready(void) {  
    return((__inb(KBCOM) & 1));
```

to the following:

```
int kybd_ready(void) {  
    return(0);
```

Troubleshooting Booting

The following table provides troubleshooting tips for problems that users may encounter when booting LynxOS.

Troubleshooting All Platforms

Table 5-5: Problems and Solutions: All Platforms

Problem	Solution
When I boot a kernel, the message "main file device not present" is printed.	This error message indicates that <code>preboot</code> cannot access the root file system. The message can appear if incorrect major or minor device numbers for the root file system are specified.
I made a new kernel and now it won't boot. How can I boot LynxOS?	<p>This answer assumes that the development system had a bootable kernel at one time and that currently <code>preboot</code> boots successfully. When making a new kernel, (make <code>install</code> in <code>/sys/lynx.os</code>), the old kernel is moved to <code>/lynx.os.old</code> and the new kernel becomes <code>/lynx.os</code>. Try to boot the old kernel (<code>/lynx.os.old</code>) from the <code>preboot</code> command prompt. If this works, determine what changes were made to the new kernel that may have caused it not to boot.</p> <p>If the above procedure has not been effective, observe what is happening with the kernel:</p> <ul style="list-style-type: none"> • Did it display the LynxOS message when it tried to boot? If the message did not appear, it is probably a driver issue. Drivers are installed before the message is displayed for the kernel. If a new driver has been added, it may be what is crashing the kernel. • Did the message come up and then nothing appeared on the screen? If so, see "My kernel prints the banner message..." on the following page. • Did the "main file system not present" message appear on the screen? If so, see above.
<code>preboot</code> hangs when I try to boot a kernel.	Ensure that the boot devices are set to <code>preboot</code> default values. If you have made your own bootable disk device, <code>preboot</code> will not contain the driver needed to boot the kernel. The <code>preboot</code> source code and must be obtained and the driver added to <code>preboot</code> .
How do I boot from a different partition from the one specified in <code>preboot</code> ?	See "Setting the Boot Device" on page 75.

Table 5-5: Problems and Solutions: All Platforms (Continued)

Problem	Solution
Is there a limit on kernel size for booting?	The boot size limit, if using <code>preboot</code> , is 8 MB on the PowerPC and unlimited on the x86. However, when booting directly, the x86 image is limited to 512 KB.
My kernel prints the banner message, does some disk activity, then hangs. What's wrong?	<p>The kernel prints a banner message when it first comes up, then <code>/init</code> is executed. Before <code>init</code> creates the login shell, it runs the script <code>/etc/rc.d/rc</code>. All output is displayed on <code>/dev/atc0</code>. If the internal device number for <code>/dev/atc0</code> and the major number of <code>/dev/atc0</code> do not match, no output is displayed on the screen.</p> <p>To fix this problem, reboot the development system and specify the old kernel <code>/lynx.os.old</code> at the <code>preboot</code> command prompt. Rebuild the device nodes as follows:</p> <pre># cd /dev # rm * # mknod -a /etc/nodetab # reboot -a</pre> <p>If there is no backup kernel, use the LynxOS installation media to access the kernel and make the device nodes.</p> <ul style="list-style-type: none"> • Boot the installation CD-ROM/disk. Ignore the message about the <code>installit</code> utility. • Mount the device that contains the problem kernel onto the directory <code>/mnt</code>. • Change to the device node directory in <code>/mnt</code>. <pre># cd /mnt/dev</pre> <ul style="list-style-type: none"> • Make the nodes. <pre># /mnt/bin/mknod -a /mnt/etc/nodetab</pre>

Troubleshooting x86 Platforms

The following troubleshooting table is specific to x86 platforms.

Table 5-6: Problems & Solutions: x86-Specific

Problem	Solution
I have successfully booted LynxOS, but can't access all of the available memory. Why?	In some instances, BIOS has allocated memory regions that LynxOS cannot access. From the BIOS setup, delete these memory allocations.
How do I boot LynxOS from a removable disk drive?	A removable device must be recognized by the development system BIOS in order to boot. The Adaptec BIOS, for example, has an option to "Support Removable Disks as Fixed Disk." This option should be set to <code>All devices</code> so all removable drives are treated as fixed disks and can be used as boot devices.
I moved my disk from an Adaptec 1542 SCSI controller to an Adaptec 2742/2940 SCSI controller. Now, <code>preboot</code> won't load the kernel. Why?	The major device used by <code>preboot</code> is incorrect for the current controller. Refer to "Setting the Root Device" on page 75 for details on getting the new kernel to boot. Once LynxOS boots, type the following: <code>makeboot /preboot</code> This command updates the major number in <code>preboot</code> .
The SCSI controller on the PCI system works with DOS but not LynxOS.	There are usually two buses on PCI-based systems: the ISA bus and the PCI bus. PCI devices on the system communicate with the PCI bus about interrupts, DMA channels, and the like, so that the PCI bus knows how to assign resources. The ISA devices do not communicate this information to the PCI bus and resource conflicts may result. To fix this problem, use the PCI BIOS setup utility to enable the ISA cards on the development system. See BIOS documentation.
Why must <code>preboot</code> be used to boot a LynxOS kernel that is greater than 512 KB?	The LynuxWorks secondary boot loader begins in real-mode and is currently limited to the first 640 KB of memory. The boot loading code must be less than 512 KB to safely load in this memory region.

APPENDIX A *mkpart(1) man page*

NAME

`mkpart` - An interactive utility to modify partitions

SYNOPSIS

```
mkpart <device_name>
```

DESCRIPTION

`mkpart` is an interactive utility that modifies the partitions of a disk. `mkpart` works with all types of hard disks and devices that emulate hard disks (flash, magneto optical drives, ram disks, etc.).

`mkpart` works on devices with non-512 byte block sizes: it determines the physical block size of the device and gets the data to the right spot on the device. Beware though, as booting of greater than 512 byte physical devices with BIOS on the x86 is likely to fail.

`mkpart` does not work on read-only devices, for good reason. The argument to `mkpart` is the raw device that corresponds to the whole disk. e.g., `/dev/rhd0`, `/dev/rsd2940.0`, `/dev/rsd3`.

The commands available for `mkpart` are:

- **a** - set active partition, **s** partition-letter--Only the base partitions may be selected for booting. An extended partition cannot be made bootable.
- **c** - clear all in memory partitions
- **d** - delete a partition

```
  d <partition_letter>
```

This command deletes the partition letters specified.

- **e** - save changes then exit
- **h** or **?** - print instructions
- **m** - make a partition:
`m <size>`
- **p** - print partition information
- **q** - exit and do not save changes
- **v** - verbose, toggles the information level, off by default
- **r** - reload partitions from disk
- **s** - set partition.
`s <partition_letter> <partition_type>`
- **G** - specify drive geometry--This command is rarely needed. In some cases a user may want to specify the physical geometry of the disk.
- **command ?** - Gives a mini help screen detailing how to use the command. For example, the command **m ?** gives help on the **m** command.

A partition is a contiguous set of blocks that is pointed to by the partition pointer. The `mkpart` utility manipulates the partition pointers. The partition pointers can be located in block 0 of the disk or within an extended partition.

The **m** command is used to create a base partition pointer or a logical partition pointer. The size of the partition with the **m** command is always given in megabytes. The partition's actual size is rounded up to the next cylinder boundary so the size of a partition might not exactly be the size given.

For example, to make a 100 megabyte base partition:

```
m 100
```

The **m** command can be used to create partitions without excessive typing by:

```
m 10 20 30 40
```

This will create four base partitions of 10, 20, 30 and 40 megabytes, assuming that you have four free base partitions, and 100 megabytes available on the device. If you want to use the last available chunk of space on the device then the `all` size can be used for the last partition size given.

```
m 10 20 30
```

`all` creates a 10, 20 and 30 megabyte partition, and a fourth partition with the remaining space available. Since partitions are rounded up to cylinder boundaries

there can be disks that have less than a cylinder's worth of blocks left. This space cannot be claimed by `mkpart` and goes unused. This is typically less than 1 MB, though.

The default partition type is 64. This indicates a LynxOS partition. To create a partition of a different type use the `/` option with the `m` command.

```
m 100/20
```

This creates a 100 megabyte partition of type 20.

If you want more than four partitions, then an extended partition must be used. One of the base partition pointers must be an extended partition type. The extended partition type is 5. The command

```
m 400/5
```

creates a 400 megabyte extended partition. The extended partition contains partition pointers and partitions.

NOTE: If the extended partition is written to as a block or raw device, the logical partitions within the extended partitions are lost.

Once the extended partition has been created, the `l` option of the `m` command can be used. This creates a logical partition within the extended partition. Given an extended partition, the command

```
m l 30 40 50
```

creates three logical partitions of 30, 40 and 50 megabytes within the extended partition. Logical partitions can be of various types as well; just specify the partition-type option after the size to override the default type.

NOTE: DOS® `fdisk` does not display non-DOS logical partition types. You can either guess the correct DOS logical partition type for logical partitions intended to be used by DOS or just create all extended partitions with DOS `fdisk`. Then run `mkpart` and change the logical partition types to LynxOS types for use with LynxOS.

The base partitions are named `a`, `b`, `c` and `d`. The extended partitions start with letter `e` and proceed through letter `o`. Partition `o` is the limit because there are 4 bits available in the minor number allocated to the partitions. This means there are 14 usable (mountable) partitions. 0 is allocated to the entire disk and one of the base partitions is used up by pointing to an extended partition, leaving 14.

For all partition types except type 65, a size must be specified. A type 65 partition is reserved to represent a PowerPC boot partition. The first partition created must be type 65 in order for the disk to be able to boot on the PowerPC. `m /65` creates a 0 length type 65 partition. This partition uses up a base partition pointer.

NOTE: If `makeboot` is run on a PowerPC, this partition becomes non-zero in size. This is alright. What happens is that `makeboot` modifies the type 65 partition to point to a contiguous file that looks like a bootable partition. This contiguous file is located within another partition.

Upon executing the `exit` command, `mkpart` modifies the 0 block of each partition displayed by `mkpart`. So experimenting and exiting with `mkpart` results in various blocks on the device being written.

The `d` command is used to delete partitions. Just type `d <partition_letter>` to delete the partition. To delete lots of partitions at once, specify more partition letters after the `d` command. When deleting logical partitions beware of partition jumbling. When logical partitions are created physical space is reserved. This space could contain important data like file systems and cannot be moved around. When a logical partition is deleted the physical space pointed to by the logical partition pointer is still there but it is available for use by the `m` command. This space is referred to as a hole. Adjacent holes are automatically coalesced.

The `s` command is used to change the partition type. There are various reasonable restrictions placed on the `s` command, such as:

- An extended partition containing logical partitions cannot be changed from an extended partition type.
- A PowerPC boot partition type cannot be changed.
- A bootable partition cannot have its type changed to an extended partition.

When `mkpart` is first run, it reads the labels on the disk and loads the internal partition tables with that data. After some modification it may be desirable to reload this information. The `r` command accomplishes this. Quitting and then restarting `mkpart` accomplishes the same thing.

The `c` command clears the internal partition tables. Think of it as a fresh start command.

When verbose mode is enabled, the starting block, end block, and number of blocks allocated for the partition are also displayed.

The **p** command prints the partition information. With extended partitions the number of lines can be excessive, so the **p** command takes an optional integer argument that can limit the number of lines displayed, e.g., **p 20** prints twenty lines of information.

The **a** command is used to set an active partition. Only the x86 and PowerPC platforms need to have an active partition for booting. The **makeboot** command for the x86 and PowerPC also set the active partition when they are run. This command is most useful when booting another operating system on a different partition.

Definitions

- **hole** - A set of contiguous blocks that had previously been allocated as a partition and is now available for use by the **m** command.
- **partition jumbling** - A side effect of deleting logical partitions. If a logical partition is deleted, then all logical partitions located after the deleted logical partition are assigned a new letter. This could adversely affect the disks that get automatically mounted in `/etc/fstab`. Partition jumbling never occurs for base partitions.
- **extended partition** - A partition, of type 5, that is used to provide more than four partitions. There are only four base partitions available in the 0 block of the disk, limiting the number of partitions available (without the extended partition) to four. The extended partition contains partition pointers and partitions that allow for more than four partitions.
- **partition type** - A number in the range 0-255 that is associated with a partition--Different partitions can be of different types.
- **partition letter** - A letter in the range a-zz. a, ab, cf, yy, b, and zz are examples of legal partition letters.
- **logical partition** - A partition located within the extended partition.
- **partition pointer** - information to locate the start and size of a partition.
- **base partition** - A partition pointed to by a partition pointer located in the 0 block of the disk. There are only four base partition pointers available, meaning that only four base partitions are available.
- **0 block** - The first block for the given device--For example the 0 block of device `/dev/rhd0` is the first block of the entire disk and is referred to as the 0 block of the disk, where the 0 block of `/dev/rhd0a` is the first block of partition `a` and is referred to as the 0 block of the partition.

- **physical block** - The number of bytes that make up a block on the device--This is usually 512 bytes for hard disks and 2048 bytes for CD-ROM and MO drives.
- **logical block** - The number of bytes in each block of the file system--The logical blocks must be a multiple of the physical block of the device.
- **start block** - The physical starting block where the partition begins
- **partition size** - The number of contiguous physical blocks that are dedicated to the partition
- **bootable partition** - The partition that firmware boots from--This only applies to the x86 and PowerPC. x86 BIOS and PPCBug look for an active partition to boot.
- **CHS** - Cylinder head sector--This term is used to describe the geometry of the disk. The geometry of the disk is used by `mkpart` to calculate the number of blocks in a cylinder.

SEE ALSO

Utility Program - `setactive(1)`

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