

Red Hat Linux 7.2

The Official Red Hat Linux x86 Installation Guide

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Introduction

Welcome to the *Official Red Hat Linux x86 Installation Guide*.

The *Official Red Hat Linux x86 Installation Guide* contains useful information to assist you during the installation of Red Hat Linux. From fundamental concepts such as installation preparation (gathering information about your current system) to the step-by-step installation procedure, this book will be a valuable resource as you install Red Hat Linux.

This manual will walk you through a typical installation using the Red Hat Linux CD-ROMs. Once you have completed the installation as outlined in this manual, you will have a fully functioning Red Hat Linux desktop system.

Document Conventions

When you read this manual, you will see that certain words are represented in different fonts, type-faces, sizes and weights. This highlighting is systematic; different words are represented in the same style to indicate their inclusion in a specific category. The types of words that are represented this way include the following:

command

Linux commands (and other operating system commands, when used) are represented this way. This style should indicate to you that you can type in the word or phrase on the command line and press [Enter] to invoke a command. Sometimes a command contains words that would be displayed in a different style on their own (e.g., filenames). In these cases, they are considered to be part of the command, so the entire phrase will be displayed as a command. For example:

Use the `cat testfile` command to view the contents of a file, named `testfile`, in the current working directory.

filename

Filenames, directory names, paths and RPM package names are represented this way. This style should indicate that a particular file or directory exists by that name on your Red Hat Linux system. Examples:

The `.bashrc` file in your home directory contains bash shell definitions and aliases for your own use.

The `/etc/fstab` file contains information about different system devices and filesystems.

The `/usr/share/doc` directory contains documentation for various programs.

Install the `webalizer` RPM if you want to use a Web server log file analysis program.

application

This style should indicate to you that the program named is an end-user application (as opposed to system software). For example:

Use **Netscape Navigator** to browse the Web.

[key]

A key on the keyboard is shown in this style. For example:

To use **[Tab]** completion, type in a character and then press the **[Tab]** key. Your terminal will display the list of files in the directory that start with that letter.

[key]-[combination]

A combination of keystrokes is represented in this way. For example:

The **[Ctrl]-[Alt]-[Backspace]** key combination will restart the X Window System.

text found on a GUI interface

A title, word or phrase found on a GUI interface screen or window will be shown in this style. When you see text shown in this style, it is being used to identify a particular GUI screen or an element on a GUI screen (e.g., text associated with a checkbox or field). Examples:

On the GNOME **Control Center** screen, you can customize your GNOME window manager.

Select the **Require Password** checkbox if you would like your screensaver to require a password before stopping.

top level of a menu on a GUI screen or window

When you see a word in this style, it indicates that the word is the top level of a pulldown menu. If you click on the word on the GUI screen, the rest of the menu should appear. For example:

Under **Settings** on a GNOME terminal, you will see the following menu items: **Preferences**, **Reset Terminal**, **Reset and Clear**, and **Color selector**.

If you need to type in a sequence of commands from a GUI menu, they will be shown like the following example:

Click on **Programs=>Applications=>Emacs** to start the Emacs text editor.

button on a GUI screen or window

This style indicates that the text will be found on a clickable button on a GUI screen. For example:

Click on the **Back** button to return to the Web page you last viewed.

computer output

When you see text in this style, it indicates text displayed by the computer on the command line. You will see responses to commands you typed in, error messages and interactive prompts for your input during scripts or programs shown this way. For example:

Use the `ls` to display the contents of a directory:

```
$ ls
Desktop          axhome          logs            paulwesterberg.gif
Mail             backupfiles    mail            reports
```

The output returned in response to the command (in this case, the contents of the directory) is shown in this style.

prompt

A prompt, which is a computer's way of signifying that it is ready for you to input something, will be shown in this style. Examples:

```
$
#
[stephen@maturin stephen]$
leopard login:
```

user input

Text that the user has to type, either on the command line, or into a text box on a GUI screen, is displayed in this style. In the following example, **text** is displayed in this style:

To boot your system into the text based installation program, you will need to type in the **text** command at the boot : prompt.

Another example, with the word **root** displayed as something the user needs to type in:

If you need to log in as root when you first log into your system, and you are using the graphical login screen, at the Login prompt, type **root**. At the Password prompt, type in the root password.

glossary entry

A word that appears in the glossary will be shown in the body of the document in this style. For example:

The `lpd` **daemon** handles printing requests.

In this case, the style of the word **daemon** should indicate to you that a definition of the term is available in the glossary.

Additionally, we use several different strategies to draw your attention to certain pieces of information. In order of how critical the information is to your system, these items will be marked as a note, a caution or a warning. For example:

Note

Remember that Linux is case sensitive. In other words, a rose is not a ROSE is not a rOsE.



Do not do routine tasks as root — use a regular user account unless you need to use the root account to administer your system.

WARNING

If you choose not to partition manually, a server installation will remove all existing partitions on all installed hard drives. Do not choose this installation class unless you are sure you have no data you need to save.

How to Use This Manual

This manual focuses on a CD-ROM based installation, so it is ideal for users (both new and old) who want a quick and simple installation solution. It will help you prepare your system, walk you through the installation, and assist you in the configuration of Red Hat Linux.

Note

If you currently use Red Hat Linux 3.0.3 (or greater), you can perform an upgrade. Skim Chapter 1, *Steps to Get You Started* to review the basics, then read Chapter 3, *Installing Red Hat Linux*, following the directions as you go. Once you have chosen to perform an upgrade in the installation program, refer to Appendix A, *Upgrading Your Current System*.

If you are an experienced user who wants to perform a Red Hat Linux CD-ROM installation, and you do not need a review of the basics, you can skip ahead to Chapter 3, *Installing Red Hat Linux* to begin the installation process.

Tip

Refer to the **Red Hat Frequently Asked Questions** for answers to questions and problems that may occur before, during, or after the installation. You will find the FAQ online at:

http://www.redhat.com/support/docs/faqs/rhl_general_faq/

We Need Feedback!

If you spot a typo in the *Official Red Hat Linux x86 Installation Guide*, or if you have thought of a way to make this manual better, we would love to hear from you! Please submit a report in Bugzilla (<http://www.redhat.com/bugzilla/>) against the component *rhl-ig-x86*.

Be sure to mention the manual's identifier:

```
rhl-ig-x86(EN)-7.2-Print-RHI (2001-08-30T12:12-0400)
```

That way we will know exactly which version of the guide you have.

If you have a suggestion for improving the documentation, try to be as specific as possible when describing it. If you have found an error, please include the section number and some of the surrounding text so we can find it easily.

If you have a support question (for example, if you need help configuring X, or if you are not sure how to partition your hard drive[s]), please register your product at <http://www.redhat.com/apps/activate/> and use the online support system for those type of requests.

1 Steps to Get You Started

Before you install Red Hat Linux, you will need to perform the following steps:

Note

If you already have another operating system installed and want to create a dual boot system so that you can use both Red Hat Linux and the other operating system, please read Appendix G, *Configuring a Dual-Boot System* for more information.

1.1 Step 1 - Do You Have the Right Red Hat Linux Components?

If you have purchased the Official Red Hat Linux boxed set, you are ready to go. However, mistakes occasionally happen, so now is a good time to double-check the contents of your boxed set.

A black, red, and white Registration Information card is included in your boxed set. A list of the contents of your boxed set version is on the back of the card. Please read over the list and check to make sure that you have all the CDs and manuals that are included with the version of Red Hat Linux that you purchased.

If you have purchased the Official Red Hat Linux boxed set from Red Hat, Inc. (or one of its distributors), and you are missing one or more of the items listed, please let us know. Contact information is also available on the Registration Information card.

How to identify our official boxed set: The bottom of our box has an ISBN number next to one of the bar codes. That ISBN number should be in this form:

1-58569-x-y

(The *x* and *y* will be unique numbers.)

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If your box has a different ISBN number (or none at all), you will need to contact the company that produced your boxed set. Normally, third-party producers will include their logo and/or contact information on the outside of the box; an official Red Hat Linux boxed set lists only our name and contact information.

1.1.1 Where to Find Other Red Hat Linux Manuals

If your particular boxed set did not include all of the printed Red Hat Linux manuals, you can find them online or on the Red Hat Linux Documentation CD.

To find the manuals in both HTML and PDF formats online, go to <http://www.redhat.com/support/manuals>.

1.1.2 Why You Should Register Your Red Hat Linux Boxed Set

If you have purchased an Official Red Hat Linux 7.2 boxed set, you should register your product. Registration offers many useful services, such as installation support, access to Red Hat Network, and more.

To register your product, go to <http://www.redhat.com/apps/activate/>. You will find your *Product ID* on the Registration Information card in your Official Red Hat Linux boxed set. Once registered, you will have access to all the extras that Red Hat provides to its registered users.

For more information on registering and the scope of Red Hat's technical support offerings, see Appendix C, *Getting Technical Support*.

1.1.3 No Boxed Set? No Problem!

Of course, not everyone purchases a Red Hat Linux boxed set. It is entirely possible to install Red Hat Linux using a CD created by another company, or even via FTP. In these cases, you may need to create one or more diskettes to get started.

For information on downloading and installing Red Hat Linux, refer to http://www.redhat.com/download/howto_download.html.

For people installing Red Hat Linux from a CD-ROM not from Red Hat, you may need a boot disk, or if you are using a PCMCIA device during the installation (such as a laptop), PCMCIA boot disks. It may also be able to start the installation directly from the CD. We will discuss this in more detail when we outline the various installation methods.

For information on making diskettes, see Section 1.4.2, *Making Installation Diskettes*.

1.2 Step 2 - Is Your Hardware Compatible?

Hardware compatibility is particularly important if you have an older system or a system that you built yourself. Red Hat Linux 7.2 should be compatible with most hardware in systems that were factory built within the last two years. However, hardware specifications change almost daily, so it is hard to guarantee that your hardware will be 100% compatible.

First, gather all the system hardware information you can; Chapter 2, *Installation Options and System Requirements Tables* and Chapter 4, *Installing Red Hat Linux via Text Mode* have instructions (including instructions for Windows users) which may assist you.

1.3 Step 3 - Do You Have Enough Disk Space?

Nearly every modern-day operating system (OS) uses **disk partitions**, and Red Hat Linux is no exception. When you install Red Hat Linux, you may have to work with disk partitions. If you have not worked with disk partitions before (or need a quick review of the basic concepts) read Appendix E, *An Introduction to Disk Partitions* before proceeding.

If Red Hat Linux will share your system with another OS, you will need to make sure you have enough available disk space on your hard drive(s) for this installation. Refer to Appendix G, *Configuring a Dual-Boot System* for instructions on creating a dual boot system.

The disk space used by Red Hat Linux must be separate from the disk space used by other OSes you may have installed on your system, such as Windows, OS/2, or even a different version of Linux. At least two partitions (`/` and `swap`) must be dedicated to Red Hat Linux.

Before you start the installation process, one of the following conditions must be met:

- Your computer must have enough *unpartitioned* disk space for the installation of Red Hat Linux.
- You must have one or more partitions that may be deleted, thereby freeing up enough disk space to install Red Hat Linux.

1.3.1 Installation Disk Space Requirements

Note

These recommendations are based on an installation that only installs one language (such as English). If you plan to install multiple languages to use on your system, you should increase the disk space requirements.

Workstation

A workstation installation, choosing to install GNOME or KDE, requires at least 1.5 GB of free space. Choosing both GNOME and KDE requires at least 1.8 GB of free disk space.

Server

A server installation requires 1 GB for a minimal installation without X (the graphical environment), at least 1.3 GB of free space if all components (package groups) other than X are installed, and at least 1.8 GB to install all packages including GNOME and KDE.

Laptop

A laptop installation, when you choose to install GNOME or KDE, requires at least 1.5 GB of free space. If you choose both GNOME and KDE, you will need at least 1.8 GB of free disk space.

Custom

A custom installation requires 350 MB for a minimal installation and at least 3.5 GB of free space if every package is selected.

If you are not sure that you meet these conditions, or if you want to know how to create free disk space for your Red Hat Linux installation, please refer to Appendix E, *An Introduction to Disk Partitions*.

1.4 Step 4 - Can You Install Using the Red Hat Linux CD-ROM?

There are several methods that can be used to install Red Hat Linux. This manual focuses on installing from the CD-ROM. For instructions on alternative installation methods, refer to Chapter 4, *Installing Red Hat Linux via Text Mode*.

Installing from a CD-ROM requires that you have purchased a Red Hat Linux 7.2 boxed set, or you have a Red Hat Linux CD-ROM, and you have a CD-ROM drive. Most new computers will allow booting from the CD-ROM. If your system will support booting from the CD-ROM, it is an easy way to begin a local CD-ROM installation.

Your BIOS may need to be changed to allow booting from your CD-ROM drive. For more information about editing your BIOS, see Section 3.2.1, *Booting the Installation Program*.

1.4.1 Alternative Boot Methods

If you cannot boot from the CD-ROM drive, the following alternative boot methods are also available:

Local Boot Disk

If you need a **local boot disk**, you must create it. The local boot disk image file, `boot.img`, is located in the `images` directory on your Red Hat Linux CD-ROM. Refer to Section 1.4.2, *Making Installation Diskettes* for more information on making a boot disk.

PCMCIA Boot Disks

You may need **PCMCIA boot disks** if you are using a PCMCIA device to install Red Hat Linux. If you need PCMCIA boot disks, you must create them. Refer to Section 1.4.2, *Making Installation Diskettes* for those instructions.

The following checklist can help you determine if you will need to create PCMCIA boot disks:

- You will install Red Hat Linux from a CD-ROM, and your CD-ROM drive is attached to your computer through a PCMCIA card.
- You will use a PCMCIA network adapter during the installation.

The PCMCIA boot disks image files, `pcmcia.img` and `pcmicadd.img`, are located in the `images` directory on your Red Hat Linux/x86 CD-ROM. Refer to Section 1.4.2, *Making Installation Diskettes* for more information on making a boot disk.

Note

USB Floppies You can also boot the Red Hat Linux installation program using a USB floppy as a boot disk (if your system supports booting from a USB floppy).

Note

Although it is not required to boot your installation, you may occasionally find that a driver disk is needed to continue with the installation. Appendix F, *Driver Disks* explains why a driver disk may be necessary for your installation, and how to obtain one if needed.

1.4.2 Making Installation Diskettes

You may need to create a diskette from an **image file**; for example, you may need to use updated diskette images obtained from the Red Hat Linux errata page (<http://www.redhat.com/apps/support/updates.html>) or you may need to create a boot disk.

An image file contains an exact copy (or image) of a diskette's contents. Since a diskette contains filesystem information in addition to the data contained in files, the image file is not usable until it has been written to a diskette.

To start, you will need a blank, formatted, high-density (1.44MB), 3.5-inch diskette. You will need access to a computer with a 3.5-inch diskette drive. The computer must be able to run either an MS-DOS program or the `dd` utility found on most Linux-like operating systems.

The `images` directory on your Red Hat Linux CD-ROM contains the boot images for Red Hat Linux/x86. Once you have selected the proper image, transfer the image file onto a diskette.

Using the `rawrite` Utility

To make a diskette using MS-DOS, use the `rawrite` utility included on the Red Hat Linux CD-ROM in the `dosutils` directory. First, label a blank, formatted 3.5-inch diskette appropriately (such as "Boot Disk" or "Updates Disk"). Insert it into the diskette drive. Then, use the following commands (assuming your CD-ROM is drive `d:`):

```
C:\> d:
D:\> cd \dosutils
D:\dosutils> rawrite
Enter disk image source file name: ..\images\boot.img
Enter target diskette drive: a:
Please insert a formatted diskette into drive A: and
press --ENTER-- : [Enter]
D:\dosutils>
```

First, `rawrite` asks you for the filename of a diskette image; enter the directory and name of the image you wish to write (for example, `..\images\boot.img`). Then `rawrite` asks for a diskette drive to write the image to; enter `a:`. Finally, `rawrite` asks for confirmation that a formatted diskette is in the drive you have selected. After pressing `[Enter]` to confirm, `rawrite` copies the image file onto the diskette. If you need to make another diskette, label that diskette, and run `rawrite` again, specifying the appropriate image file.

Using the `dd` Command

To make a diskette under Linux (or any other Linux-like operating system), you must have permission to write to the device representing a 3.5-inch diskette drive (known as `/dev/fd0` under Linux).

First, label a blank, formatted diskette appropriately (such as "Boot Disk" or "Updates Disk"). Insert it into the diskette drive (but do not issue a `mount` command). After mounting the Red Hat Linux CD-ROM, change directory to the directory containing the desired image file, and use the following command (changing the name of the image file and diskette device as appropriate):

```
# dd if=boot.img of=/dev/fd0 bs=1440k
```

To make another diskette, label that diskette, and run `dd` again, specifying the appropriate image file.

1.5 Step 5 - Which Installation Class is Best For You?

Usually, Red Hat Linux is installed on its own disk partition or set of partitions, or over another installation of Linux.

WARNING

Installing Red Hat Linux over another installation of Linux (including Red Hat Linux) does *not* preserve any information (files or data) from a prior installation. Make sure you save any important files! To preserve the current data on your existing system, you should back up your data and/or consider performing an upgrade instead.

Red Hat Linux provides five different classes, or types, of installations:

Workstation

A workstation installation is most appropriate if you are new to the world of Linux, and would like to give it a try. A workstation installation will create a system for your home or desktop use. A graphical, Windows-like environment will be installed.

Server

A server installation is most appropriate for you if you would like your system to function as a Linux-based server, and you do not want to heavily customize your system configuration.

Laptop

A laptop installation has been designed to make installing Red Hat Linux on laptops even easier. Much like a workstation installation, it will make sure you have the appropriate packages needed, as well as offer you an automated installation environment.

Custom

A custom installation allows you the greatest flexibility during your installation. You choose your boot loader, which packages you want, and more. Custom installations are most appropriate for those users more familiar with Red Hat Linux installations and for those afraid of losing complete flexibility.

Upgrade

If you already have a version of Red Hat Linux (3.0.3 or greater) running on your system and you want to quickly update to the latest packages and kernel version, then an upgrade is most appropriate for you.

These classes give you the option of simplifying the installation process (with some potential for loss of configuration flexibility), or retaining flexibility with a slightly more complex installation process. Next, take a detailed look at each class, so you can see which one is right for you.

1.5.1 Workstation Installations

Most suitable for new users, the workstation installation will install your choice of the GNOME or KDE desktop environments, or both, and the X Window System (the graphical environment).

Below are the minimum recommended disk space requirements for a workstation installation where only one language (such as English) will be installed.

- Workstation choosing GNOME or KDE : 1.5 GB
- Workstation choosing both GNOME and KDE, and games: 1.8 GB

If you plan to choose all group packages (for example, GNOME is a group of packages), as well as select additional individual packages, you may want to allow yourself 1.8 GB or more of disk space. If you provide this extra space, you will have room for additional data, if needed.

Note

Unlike workstation installations previous to Red Hat Linux 7.0, performing a Red Hat Linux 7.2 workstation installation will not install the network daemon `xinetd` (inet services). When `xinetd` is not installed, you will have a more secure installation. However, in-bound network-related services such as `finger`, `telnet`, `talk`, and `FTP` will not work.¹ If you require these types of services, please go back and choose a server or a custom installation.

What a Workstation Installation Will Do

If you choose automatic partitioning, a workstation installation will create the following partitions:

- The size of the swap partition is determined by the amount of RAM in your system and the amount of space available on your hard drive. For example, if you have 128 MB of RAM then the swap partition created can be 128 MB - 256 MB (twice your RAM), depending on how much disk space is available.
- A 50 MB partition (mounted as `/boot`) in which the Linux kernel and related files reside.
- A 1100 MB root partition (mounted as `/`) in which all other files are stored (the exact size of this partition is dependent on your available disk space).

1.5.2 Server Installations

A server installation is most appropriate for you if you would like your system to function as a Linux-based server, and you do not want to heavily customize your system configuration.

¹ For example, you can `telnet` out to other systems, but other systems cannot `telnet` in to your system.

Below are the minimum recommended disk space requirements for a server installation where only one language (such as English) will be installed.

- Server (minimum, no graphical interface): 1 GB
- Server (choosing everything, no graphical interface): 1.3 GB
- Server (choosing everything, GNOME and KDE): 2.0 GB

If you plan to choose all group packages, as well as select additional individual packages, you may want to allow yourself 1.2 GB or more of disk space. This will provide space where additional data may be written.

What a Server Installation Will Do

During the server installation, *the X Window System is not configured and no GUI will be loaded* when the system boots, unless you choose to install the appropriate packages during package selection.

- The size of the swap partition is determined by the amount of RAM in your system and the amount of space available on your hard drive. For example, if you have 128 MB of RAM then the swap partition created can be 128 MB - 256 MB (twice your RAM), depending on how much disk space is available.
- A 384 MB partition (mounted as `/`).
- A partition of at least 1400 MB (mounted as `/usr`).
- A partition of at least 512 MB (mounted as `/home`).
- A 256 MB partition (mounted as `/var`).
- A 50 MB partition (mounted as `/boot`) in which the Linux kernel and related files are kept.

This disk partitioning scheme results in a reasonably flexible filesystem configuration for most server tasks.

1.5.3 Laptop Installations

The laptop installation will install your choice of the GNOME or KDE desktop environments, or both, and the X Window System.

Below are the minimum recommended disk space requirements for a laptop installation where only one language (such as English) will be installed.

- Laptop choosing GNOME or KDE: 1.5 GB
 - Laptop choosing both GNOME and KDE: 1.8 GB
-

If you plan to choose all group packages (for example, GNOME is a group of packages), as well as select additional individual packages, you may want to allow yourself 1.7 GB or more of disk space. If you provide this extra space, you will have room for additional data, if needed.

What a Laptop Installation Will Do

If you choose automatic partitioning, a laptop installation will create the following partitions:

- The size of the swap partition is determined by the amount of RAM in your system and the amount of space available on your hard drive. For example, if you have 128 MB of RAM then the swap partition created can be 128 MB - 256 MB (twice your RAM), depending on how much disk space is available.
- A 50 MB partition (mounted as `/boot`) in which the Linux kernel and related files reside.
- A 1100 MB root partition (mounted as `/`) in which all other files are stored (the exact size of this partition is dependent on your available disk space).

Note

Performing a Red Hat Linux 7.2 laptop installation will not install the network daemon `xinetd` (inet services). Withholding `xinetd` results in a more secure installation²; network-related services such as `finger`, `telnet`, `talk`, and `FTP` will not work. If you require these types of services, choose a server or a custom installation.

1.5.4 Custom Installations

The *custom installation* allows you the most flexibility during your installation. The workstation and server installations automatically go through the installation process for you and omit certain steps. During a custom installation, you have complete control over the packages that will be installed on your system.

The recommended disk space requirements for a custom installation are as follows:

- Custom (minimum): 350 MB
- Custom (choosing everything): 3.4 GB

What a Custom Installation Will Do

As you might guess from the name, a custom installation puts the emphasis on flexibility. You have complete control over which packages will be installed on your system.

² For example, you can `telnet` out to other systems, but other systems cannot `telnet` in to your system.

If you choose automatic partitioning, a custom installation will create the following partitions:

- The size of the swap partition is determined by the amount of RAM in your system and the amount of space available on your hard drive. For example, if you have 128 MB of RAM then the swap partition created can be 128 MB - 256 MB (twice your RAM), depending on how much disk space is available.
- A 50 MB partition (mounted as `/boot`) in which the Linux kernel and related files reside.
- A 700 MB root partition (mounted as `/`) in which all other files are stored (the exact size of this partition is dependent on your available disk space).

1.5.5 Upgrading Your System

Upgrading Red Hat Linux 3.0.3 (or greater) will not delete any existing data. The installation program updates the modular kernel and all currently installed software packages. See Chapter 3, *Installing Red Hat Linux* and Appendix A, *Upgrading Your Current System* for those instructions.

2 Installation Options and System Requirements Tables

This chapter provides you with several reference tables to help make the installation of Red Hat Linux go more smoothly.

The first set of tables provides an overview of each installation class (workstation, server, laptop, and custom). As each screen is encountered, you can check it off in the space to the left. On the right, a listing of each screen and the corresponding installation material as found in this manual is provided.

The last table is the system requirements table, which will help you keep a record of your current system settings and requirements.

Table 2–1 Workstation Cross-Reference Table

User Reference	Screen Reference
	Language Selection, Section 3.5, <i>Language Selection</i>
	Keyboard Configuration, Section 3.6, <i>Keyboard Configuration</i>
	Mouse Configuration, Section 3.7, <i>Mouse Configuration</i>
	Welcome to Red Hat Linux, Section 3.8, <i>Welcome to Red Hat Linux</i>
	Install Options, Section 3.9, <i>Install Options</i>
	Disk Partitioning Setup, Section 3.10, <i>Disk Partitioning Setup</i>
	Automatic Partitioning, Section 3.11, <i>Automatic Partitioning</i>
	Partitions — if you choose to manually partition using Disk Druid or need to review your automatic partition setup, Section 3.12, <i>Partitioning Your System</i>
	Partitioning with fdisk — if you chose to use the fdisk partitioning tool, Section 3.13, <i>Partitioning with fdisk</i>
	Boot Loader Installation and Configuration, Section 3.14, <i>Boot Loader Installation</i>
	GRUB Password (if you chose GRUB as your boot loader), Section 3.15, <i>GRUB Password</i>

User Reference	Screen Reference
	Network Configuration — if you have a network card, Section 3.16, <i>Network Configuration</i>
	Firewall Configuration, Section 3.17, <i>Firewall Configuration</i>
	Time Zone Selection, Section 3.19, <i>Time Zone Configuration</i>
	Language Support Selection, Section 3.18, <i>Language Support Selection</i>
	Account Configuration, Section 3.20, <i>Account Configuration</i>
	Selecting Package Groups, Section 3.22, <i>Package Group Selection</i>
	Individual Package Selection — if you choose to select individual packages, Section 3.22.1, <i>Selecting Individual Packages</i>
	Unresolved Dependencies — if you selected individual packages and there were dependency problems, Section 3.22.4, <i>Unresolved Dependencies</i>
	Video Card Configuration, Section 3.23, <i>X Configuration</i>
	About to Install, Section 3.24, <i>Preparing to Install</i>
	Installing Packages, Section 3.25, <i>Installing Packages</i>
	Boot Disk Creation, Section 3.26, <i>Boot Disk Creation</i>
	Monitor Configuration, Section 3.27.1, <i>Configuring Your Monitor</i>
	Customize Graphics Configuration, Section 3.27.2, <i>Custom Configuration</i>
	Installation Complete, Section 3.28, <i>Installation Complete</i>

Table 2–2 Server Cross-Reference Table

User Reference	Screen Reference
	Language Selection, Section 3.5, <i>Language Selection</i>
	Keyboard Configuration, Section 3.6, <i>Keyboard Configuration</i>
	Mouse Configuration, Section 3.7, <i>Mouse Configuration</i>
	Welcome to Red Hat Linux, Section 3.8, <i>Welcome to Red Hat Linux</i>

User Reference	Screen Reference
	Install Options, Section 3.9, <i>Install Options</i>
	Disk Partitioning Setup, Section 3.10, <i>Disk Partitioning Setup</i>
	Automatic Partitioning, Section 3.11, <i>Automatic Partitioning</i>
	Partitions — if you choose to manually partition using Disk Druid, Section 3.12, <i>Partitioning Your System</i>
	Partitioning with <i>fdisk</i> — if you chose to use the <i>fdisk</i> partitioning tool, Section 3.13, <i>Partitioning with fdisk</i>
	Boot Loader Installation and Configuration, Section 3.14, <i>Boot Loader Installation</i>
	GRUB Password (if you chose GRUB as your boot loader), Section 3.15, <i>GRUB Password</i>
	Network Configuration — if you have a network card, Section 3.16, <i>Network Configuration</i>
	Firewall Configuration, Section 3.17, <i>Firewall Configuration</i>
	Time Zone Selection, Section 3.19, <i>Time Zone Configuration</i>
	Language Support Selection, Section 3.18, <i>Language Support Selection</i>
	Account Configuration, Section 3.20, <i>Account Configuration</i>
	Selecting Package Groups, Section 3.22, <i>Package Group Selection</i>
	Individual Package Selection — if you choose to select individual packages, Section 3.22.1, <i>Selecting Individual Packages</i>
	Unresolved Dependencies — if you selected individual packages and there were dependency problems, Section 3.22.4, <i>Unresolved Dependencies</i>
	Video Card Configuration — if you selected the X Window System during package group selection, Section 3.23, <i>X Configuration</i>
	About to Install, Section 3.24, <i>Preparing to Install</i>
	Installing Packages, Section 3.25, <i>Installing Packages</i>
	Boot Disk Creation, Section 3.26, <i>Boot Disk Creation</i>

User Reference	Screen Reference
	Monitor Configuration, Section 3.27.1, <i>Configuring Your Monitor</i>
	Customize Graphics Configuration, Section 3.27.2, <i>Custom Configuration</i>
	Installation Complete, Section 3.28, <i>Installation Complete</i>

Table 2–3 Laptop Cross-Reference Table

User Reference	Screen Reference
	Language Selection, Section 3.5, <i>Language Selection</i>
	Keyboard Configuration, Section 3.6, <i>Keyboard Configuration</i>
	Mouse Configuration, Section 3.7, <i>Mouse Configuration</i>
	Welcome to Red Hat Linux, Section 3.8, <i>Welcome to Red Hat Linux</i>
	Install Options, Section 3.9, <i>Install Options</i>
	Disk Partitioning Setup, Section 3.10, <i>Disk Partitioning Setup</i>
	Automatic Partitioning, Section 3.11, <i>Automatic Partitioning</i>
	Partitions — if you choose to manually partition using Disk Druid, Section 3.12, <i>Partitioning Your System</i>
	Partitioning with fdisk — if you chose to use the fdisk partitioning tool, Section 3.13, <i>Partitioning with fdisk</i>
	Boot Loader Installation and Configuration, Section 3.14, <i>Boot Loader Installation</i>
	GRUB Password (if you chose GRUB as your boot loader), Section 3.15, <i>GRUB Password</i>
	Network Configuration — if you have a network card, Section 3.16, <i>Network Configuration</i>
	Firewall Configuration, Section 3.17, <i>Firewall Configuration</i>
	Time Zone Selection, Section 3.19, <i>Time Zone Configuration</i>
	Language Support Selection, Section 3.18, <i>Language Support Selection</i>
	Account Configuration, Section 3.20, <i>Account Configuration</i>

User Reference	Screen Reference
	Selecting Package Groups, Section 3.22, <i>Package Group Selection</i>
	Individual Package Selection — if you choose to select individual packages, Section 3.22.1, <i>Selecting Individual Packages</i>
	Unresolved Dependencies — if you selected individual packages and there were dependency problems, Section 3.22.4, <i>Unresolved Dependencies</i>
	Video Card Configuration, Section 3.23, <i>X Configuration</i>
	About to Install, Section 3.24, <i>Preparing to Install</i>
	Installing Packages, Section 3.25, <i>Installing Packages</i>
	Boot Disk Creation, Section 3.26, <i>Boot Disk Creation</i>
	Monitor Configuration, Section 3.27.1, <i>Configuring Your Monitor</i>
	Customize Graphics Configuration, Section 3.27.2, <i>Custom Configuration</i>
	Installation Complete, Section 3.28, <i>Installation Complete</i>

Table 2–4 Custom-Class Cross-Reference Table

User Reference	Screen Reference
	Language Selection, Section 3.5, <i>Language Selection</i>
	Keyboard Configuration, Section 3.6, <i>Keyboard Configuration</i>
	Mouse Configuration, Section 3.7, <i>Mouse Configuration</i>
	Welcome to Red Hat Linux, Section 3.8, <i>Welcome to Red Hat Linux</i>
	Install Options, Section 3.9, <i>Install Options</i>
	Disk Partitioning Setup, Section 3.10, <i>Disk Partitioning Setup</i>
	Automatic Partitioning, Section 3.11, <i>Automatic Partitioning</i>
	Partitions — if you choose to manually partition using Disk Druid, Section 3.12, <i>Partitioning Your System</i>
	Partitioning with <i>fdisk</i> — if you chose to use the <i>fdisk</i> partitioning tool, Section 3.13, <i>Partitioning with fdisk</i>

User Reference	Screen Reference
	Boot Loader Installation and Configuration, Section 3.14, <i>Boot Loader Installation</i>
	GRUB Password (if you chose GRUB as your boot loader), Section 3.15, <i>GRUB Password</i>
	Network Configuration — if you have a network card, Section 3.16, <i>Network Configuration</i>
	Firewall Configuration, Section 3.17, <i>Firewall Configuration</i>
	Time Zone Selection, Section 3.19, <i>Time Zone Configuration</i>
	Language Support Selection, Section 3.18, <i>Language Support Selection</i>
	Account Configuration, Section 3.20, <i>Account Configuration</i>
	Authentication Configuration, Section 3.21, <i>Authentication Configuration</i>
	Selecting Package Groups, Section 3.22, <i>Package Group Selection</i>
	Individual Package Selection — if you choose to select individual packages, Section 3.22.1, <i>Selecting Individual Packages</i>
	Unresolved Dependencies — if you selected individual packages and there were dependency problems, Section 3.22.4, <i>Unresolved Dependencies</i>
	Video Card Configuration, Section 3.23, <i>X Configuration</i>
	About to Install, Section 3.24, <i>Preparing to Install</i>
	Installing Packages, Section 3.25, <i>Installing Packages</i>
	Boot Disk Creation, Section 3.26, <i>Boot Disk Creation</i>
	Monitor Configuration, Section 3.27.1, <i>Configuring Your Monitor</i>
	Customize Graphics Configuration, Section 3.27.2, <i>Custom Configuration</i>
	Installation Complete, Section 3.28, <i>Installation Complete</i>

Table 2–5 System Requirements Table

<i>hard drive(s)</i> : type, label, size; ex: IDE hda=1.2 GB	
<i>partitions</i> : map of partitions and mount points; ex: /dev/hda1=/home, /dev/hda2=/ (fill this in once you know where they will reside)	
<i>memory</i> : amount of RAM installed on your system; ex: 64 MB, 128 MB	
<i>CD-ROM</i> : interface type; ex: SCSI, IDE (ATAPI)	
<i>SCSI adapter</i> : if present, make and model number; ex: BusLogic SCSI Adapter, Adaptec 2940UW	
<i>network card</i> : if present, make and model number; ex: Tulip, 3COM 3C590	
<i>mouse</i> : type, protocol, and number of buttons; ex: generic 3 button PS/2 mouse, MouseMan 2 button serial mouse	
<i>monitor</i> : make, model, and manufacturer specifications; ex: Optiquest Q53, ViewSonic G773	

<i>video card</i> : make, model number and size of VRAM; ex: Creative Labs Graphics Blaster 3D, 8MB	
<i>sound card</i> : make, chipset and model number; ex: S3 SonicVibes, Sound Blaster 32/64 AWE	
<i>IP, DHCP, and BOOTP addresses</i> : four numbers, separated by dots; ex: 10.0.2.15	
<i>netmask</i> : four numbers, separated by dots; ex: 255.255.248.0	
<i>gateway IP address</i> : four numbers, separated by dots; ex: 10.0.2.245	
<i>one or more name server IP addresses (DNS)</i> : one or more sets of dot-separated numbers; ex: 10.0.2.1	
<i>domain name</i> : the name given to your organization; ex: Red Hat's would be redhat.com	
<i>hostname</i> : the name of your computer; your personal choice of names; ex: cookie, southpark	

If any of these networking requirements or terms are unfamiliar to you, contact your network administrator for assistance.

3 Installing Red Hat Linux

This chapter explains how to install Red Hat Linux from the CD-ROM using the graphical, mouse-based installation program. The following topics are discussed:

- Getting familiar with the installation program's user interface
- Starting the installation program
- Selecting an installation method
- Configuration steps during the installation (language, keyboard, mouse, etc.)
- Finishing the installation

3.1 The Installation Program User Interface

If you have used a **graphical user interface (GUI)** before, you will be familiar with this process; simply use your mouse to navigate the screens, "click" buttons, or enter text fields. You can also navigate through the installation using the [Tab] and [Enter] keys.

Note

If you do not wish to use the GUI installation program, the text mode installation program is also available. To start the text mode installation program, use the following boot command:

```
boot: text
```

Please refer to Chapter 4, *Installing Red Hat Linux via Text Mode* for a brief overview of text mode installation instructions.

3.1.1 A Note about Virtual Consoles

The Red Hat Linux installation program offers more than the dialog boxes of the installation process. Several different kinds of diagnostic messages are available to you, in addition to providing a way to enter commands from a shell prompt. The installation program displays these messages on five **virtual consoles**, among which you can switch using a single keystroke combination.

These virtual consoles can be helpful if you encounter a problem while installing Red Hat Linux. Messages displayed on the installation or system consoles can help pinpoint a problem. Please see Table 3–1, *Console, Keystrokes, and Contents* for a listing of the virtual consoles, keystrokes used to switch to them, and their contents.

Table 3–1 Console, Keystrokes, and Contents

Console	Keystrokes	Contents
1	[Ctrl]-[Alt]-[F1]	installation dialog
2	[Ctrl]-[Alt]-[F2]	shell prompt
3	[Ctrl]-[Alt]-[F3]	install log (messages from installation program)
4	[Ctrl]-[Alt]-[F4]	system-related messages
5	[Ctrl]-[Alt]-[F5]	other messages
7	[Ctrl]-[Alt]-[F7]	X graphical display

Generally, there is no reason to leave the default console (virtual console #7) unless you are attempting to diagnose installation problems.

3.2 Starting the Installation Program

To start the installation, you must first boot the installation program. Please make sure you have all the resources you will need for the installation. If you have already read through Chapter 1, *Steps to Get You Started* and followed the instructions, you should be ready to begin.

Note

Occasionally, some hardware components require a **driver disk** during the installation. A driver disk adds support for hardware that is not otherwise supported by the installation program. Refer to Appendix F, *Driver Disks* for more information.

3.2.1 Booting the Installation Program

Note

If you need to create a boot disk¹, refer to Section 1.4.2, *Making Installation Diskettes*.

You can boot the Red Hat Linux installation program using any one of the following media (depending upon what your system can support):

- *Bootable CD-ROM* — Your machine supports a bootable CD-ROM drive and you want to perform a local CD-ROM installation.
- *Local boot disk* — Your machine will not support a bootable CD-ROM and you want to install from a local CD-ROM or a hard drive.
- *Network boot disk* — Use a network boot disk to install via NFS, FTP, and HTTP.
- *PCMCIA boot disks* — Use PCMCIA boot disks when you need PCMCIA support, but your machine does not support booting from the CD-ROM drive *or* if you need PCMCIA support in order to make use of the CD-ROM drive on your system. The PCMCIA boot disks can be used for all installation methods (CD-ROM, hard drive, NFS, FTP, and HTTP).

Insert the boot disk into your computer's first diskette drive and reboot (or boot using the CD-ROM, if your computer supports booting from the CD-ROM drive). Your BIOS settings may need to be changed to allow you to boot from the diskette or CD-ROM.

¹ A boot disk is a diskette you create during an installation that can later be used to boot the operating system. Normally, your computer boots from a hard disk, but if the hard disk is damaged, you can boot the computer from a bootable diskette.

Tip

To change your BIOS settings, watch the instructions provided on your display when your computer first begins to boot. Often you will see a line of text telling you to press the [Del] or [F1] key to enter the BIOS settings.

Once you've entered your BIOS setup program, find the section where you can alter your boot sequence. The default is often C, A or A, C (depending on whether you boot from your hard drive [C] or a diskette drive [A]). Change this sequence so that the CD-ROM is first in your boot order and that C or A (whichever is your typical boot default) is second. This instructs the computer to first look at the CD-ROM drive for bootable media; if it does not find bootable media on the CD-ROM drive, it will then check your hard drive or diskette drive.

Save your changes before exiting the BIOS. For more information, please refer to the documentation that came with your system.

After a short delay, a screen containing the `boot :` prompt should appear. The screen contains information on a variety of boot options. Each boot option also has one or more help screens associated with it. To access a help screen, press the appropriate function key as listed in the line at the bottom of the screen.

As you boot the installation program, be aware of two issues:

- Once you see the `boot :` prompt, the installation program will automatically begin if you take no action within the first minute. To disable this feature, press one of the help screen function keys.
- If you press a help screen function key, there will be a slight delay while the help screen is read from the boot media.

Normally, you only need to press [Enter] to boot. Watch the boot messages to see if the Linux kernel detects your hardware. If your hardware is properly detected, please continue to the next section. If it does not properly detect your hardware, you may need to restart the installation in expert mode.

Additional Boot Options

Enter expert mode using the following boot command:

```
boot: linux expert
```

If you do not wish to perform a CD-ROM GUI installation, you can start a text mode installation using the following boot command:

```
boot: text
```

For installation instructions, please refer to Chapter 4, *Installing Red Hat Linux via Text Mode*.

If you are having trouble booting into the graphical installation program, you can try to boot using the no framebuffer (`nofb`) boot option.

At the boot command, enter the following:

```
boot: nofb
```

This option allows you to use the graphical installation program without using a framebuffer.

The command to start a **serial installation** has changed. If you need to perform the installation in serial mode, type the following command:

```
boot: linux console=<device>
```

In the above command, `<device>` should be the device you are using (such as `ttyS0` or `ttyS1`).

Kernel Options

Options can also be passed to the kernel. For example, to instruct the kernel to use all the RAM in a system with 128 MB of RAM, enter:

```
boot: linux mem=128M
```

After entering any options, press [Enter] to boot using those options.

If you need to specify boot options to identify your hardware, please write them down. The boot options will be needed during the boot loader configuration portion of the installation (please see Section 3.14, *Boot Loader Installation* for more information).

Booting Without Diskettes

The Red Hat Linux/x86 CD-ROM can be booted by computers that support bootable CD-ROMs. Not all computers support this feature, so if your system cannot boot from the CD-ROM, there is one other way to start the installation without using a boot disk. The following method is specific to x86-based computers only.

If you have MS-DOS installed on your system, you can boot directly from the CD-ROM drive without using a boot disk. To do this (assuming your CD-ROM is drive `d:`), use the following commands:

```
C:\> d:  
D:\> cd \dosutils  
D:\dosutils> autoboot.bat
```

This method will not work if run in a DOS window — the `autoboot.bat` file must be executed with DOS as the only operating system. In other words, Windows cannot be running.

If your computer cannot boot directly from CD-ROM (and you cannot use a DOS-based autoboot), you will have to use a boot diskette to get things started.

3.3 Selecting an Installation Method

Next, you will be asked what type of installation method you wish to use. This chapter explains installation from the CD-ROM. Other installation methods are briefly discussed in Chapter 4, *Installing Red Hat Linux via Text Mode*. The following installation methods are available:

CD-ROM

If you have a CD-ROM drive and the Red Hat Linux CD-ROM, you can use this method. You will need a boot disk or a bootable CD-ROM. PCMCIA boot and driver disks may also be used.

Hard Drive

If you have copied the Red Hat Linux ISO images to a local hard drive, you can use this method. Refer to Chapter 4, *Installing Red Hat Linux via Text Mode* for hard drive installation instructions. You will need a boot disk. PCMCIA boot and driver disks may also be used.

NFS Image

If you are installing from an NFS Image server which is exporting the Red Hat Linux CD-ROM(s) or a mirror image of Red Hat Linux, you can use this method. You will need a network boot disk. PCMCIA boot and driver disks may also be used. Refer to Chapter 4, *Installing Red Hat Linux via Text Mode* for network installation instructions. Please note that NFS installations may also be performed in GUI mode.

FTP

If you are installing directly from an FTP server, use this method. You will need a network boot disk. PCMCIA boot and driver disks may also be used. Refer to Chapter 4, *Installing Red Hat Linux via Text Mode* for FTP installation instructions.

HTTP

If you are installing directly from an HTTP (Web) server, use this method. You will need a network boot disk. PCMCIA boot and driver disks may also be used. Refer to Chapter 4, *Installing Red Hat Linux via Text Mode* for HTTP installation instructions.

3.4 Beginning the Installation

If you are planning to install via CD-ROM using the graphical interface, please continue reading.

If you would rather perform a text mode installation, reboot your system and at the `boot :` prompt, type `text`. Refer to Chapter 4, *Installing Red Hat Linux via Text Mode* for a more information.

Note

If you already have another operating system installed and want to create a dual boot system so that you can use both Red Hat Linux and the other operating system, please read Appendix G, *Configuring a Dual-Boot System* for more information.

3.4.1 Installing from CD-ROM

To install Red Hat Linux from a CD-ROM, choose the **CD-ROM** option from the boot loader screen and select **OK**. When prompted, insert the Red Hat Linux CD into your CD-ROM drive (if you did not boot from the CD-ROM). Once the CD is in the CD-ROM drive, select **OK**, and press [Enter].

The installation program will then probe your system and attempt to identify your CD-ROM drive. It will start by looking for an IDE (also known as an ATAPI) CD-ROM drive. If found, you will continue to the next stage of the installation process (see Section 3.5, *Language Selection*).

Note

To abort the installation process at this time, reboot your machine and then eject the boot diskette or CD-ROM. You can safely cancel the installation at any point before the **About to Install** screen. See Section 3.24, *Preparing to Install* for more information.

If a CD-ROM drive is not detected, you will be asked what type of CD-ROM drive you have. Choose from the following types:

SCSI

Select this if your CD-ROM drive is attached to a supported SCSI adapter; the installation program will then ask you to choose a SCSI driver. Choose the driver that most closely resembles your adapter. You may specify options for the driver if necessary; however, most drivers will detect your SCSI adapter automatically.

Other

If your CD-ROM drive is neither an IDE nor a SCSI, it is an "other." Sound cards with proprietary CD-ROM interfaces are good examples of this type of CD-ROM. The installation program will display a list of drivers for supported CD-ROM drives — choose a driver and, if necessary, specify any driver options.

Tip

A partial list of optional parameters for CD-ROM drives can be found in the *Official Red Hat Linux Reference Guide*, in the *General Parameters and Modules* appendix.

What If the IDE CD-ROM Was Not Found?

If you have an IDE (ATAPI) CD-ROM, but the installation program fails to find your IDE (ATAPI) CD-ROM and asks you what type of CD-ROM drive you have, try the following boot command. Restart the installation, and at the `boot :` prompt enter `linux hdX=cdrom`. Replace the `X` with one of the following letters, depending on the interface the unit is connected to, and whether it is configured as master or slave:

- a — first IDE controller, master
- b — first IDE controller, slave
- c — second IDE controller, master
- d — second IDE controller, slave

If you have a third and/or fourth controller, continue assigning letters in alphabetical order, going from controller to controller, and master to slave.

3.5 Language Selection

Using your mouse, select the language you would prefer to use for the installation and as the system default (see Figure 3–1, *Language Selection*).

Selecting the appropriate language will also help target your time zone configuration later in the installation. The installation program will try to define the appropriate time zone based on what you specify on this screen.

Once you select the appropriate language, click **Next** to continue.

Figure 3–1 Language Selection



3.6 Keyboard Configuration

Choose the keyboard model that best fits your system (see Figure 3–2, *Keyboard Configuration*). If you cannot find an exact match, choose the best **Generic** match for your keyboard type (for example, **Generic 101-key PC**).

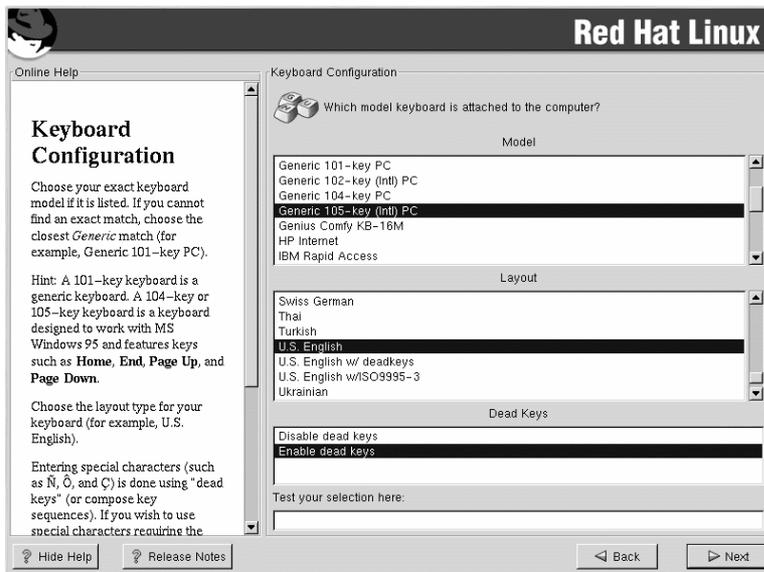
Next, choose the correct layout type for your keyboard (for example, U.S. English).

Creating special characters with multiple keystrokes (such as Ñ, Ô, and Ç) is done using "dead keys" (also known as compose key sequences). Dead keys are enabled by default. If you do not wish to use them, select **Disable dead keys**.

To test your keyboard configuration, use the blank text field at the bottom of the screen to enter text.

Once you have made the appropriate selections, click **Next** to continue.

Figure 3–2 Keyboard Configuration



Tip

To change your keyboard type after you have installed Red Hat Linux, as root use the `/usr/sbin/kbdconfig` command. Alternatively, you can type `setup` at the root prompt.

To become root, type `su -` at the shell prompt in a terminal window and then press [Enter]. Then, enter the root password and press [Enter].

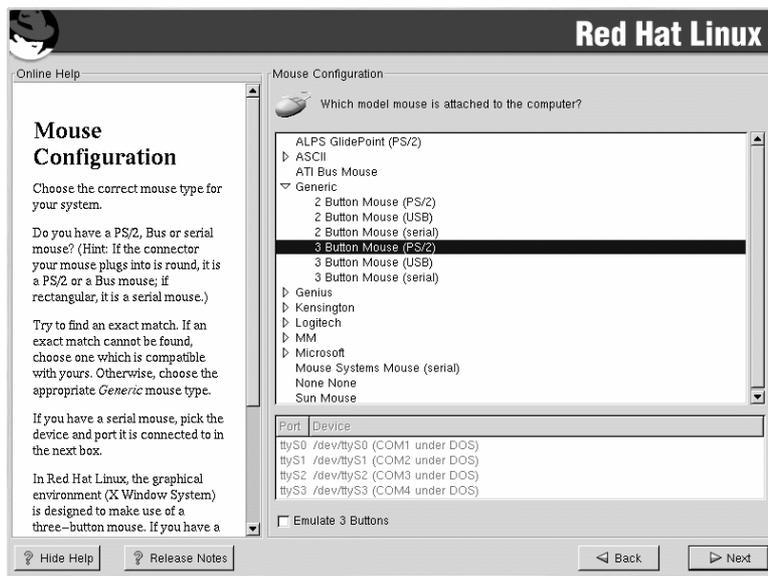
3.7 Mouse Configuration

Choose the correct mouse type for your system. If you cannot find an exact match, choose a mouse type that you are sure is compatible with your system (see Figure 3–3, *Mouse Configuration*).

To determine your mouse's interface, follow the mouse cable back to where it plugs into your system. If the connector at the end of the mouse cable plugs into a rectangular connector, you have a serial mouse; if the connector is round, you have a PS/2 mouse. If you are installing Red Hat Linux on a laptop computer, in most cases the pointing device will be PS/2 compatible.

If you cannot find a mouse that you are sure is compatible with your system, select one of the **Generic** entries, based on your mouse's number of buttons, and its interface.

Figure 3–3 Mouse Configuration



If you have a PS/2 or a bus mouse, you do not need to pick a port and device. If you have a serial mouse, you should choose the correct port and device that your serial mouse is on.

The **Emulate 3 Buttons** checkbox allows you to use a two-button mouse as if it had three buttons. In general, the X Window System is easier to use with a three-button mouse. If you select this checkbox, you can emulate a third, "middle" button by pressing both mouse buttons simultaneously.

Tip

To change your mouse configuration after you have completed the installation of Red Hat Linux, become root; then use the `/usr/sbin/mouseconfig` command from a shell prompt.

To configure your mouse to work as a left-handed mouse, reset the order of the mouse buttons. To do this, after you have booted your Red Hat Linux system, type `gpm -B 321` at the shell prompt.

3.8 Welcome to Red Hat Linux

The **Welcome** screen does not prompt you for any input. Please read over the help text in the left panel for additional instructions and information on where to register your Official Red Hat Linux product.

Please notice the **Hide Help** button at the bottom left corner of the screen. The help screen is open by default. If you do not want to view the help information, click on **Hide Help** to minimize the help portion of the screen.

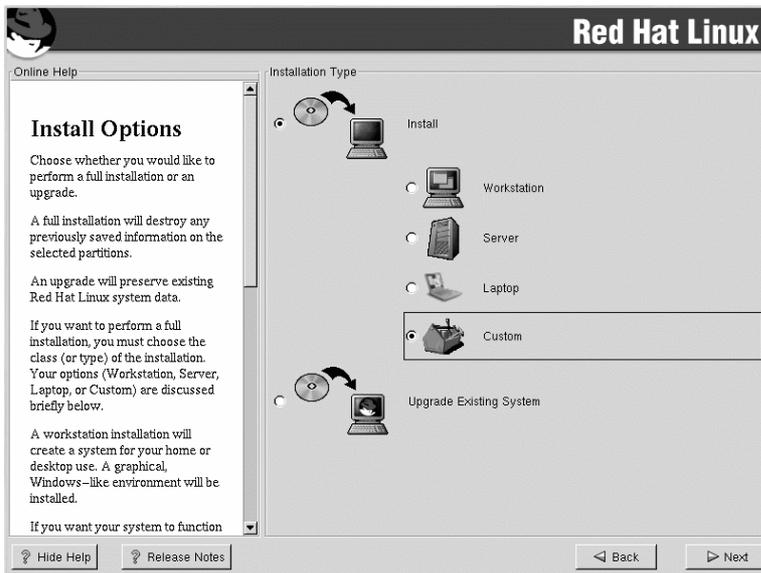
Click on the **Next** button to continue.

3.9 Install Options

Choose whether you would like to perform a full installation or an upgrade (see Figure 3–4, *Choosing Install or Upgrade*).

Red Hat Linux allows you to choose the installation type that best fits your needs. Your options are **Workstation**, **Server**, **Laptop**, **Custom**, and **Upgrade**.

Figure 3–4 Choosing Install or Upgrade



To perform an upgrade, please refer to Appendix A, *Upgrading Your Current System*.

For more information about the different installation classes, please refer to Section 1.5, *Step 5 - Which Installation Class is Best For You?*.

3.10 Disk Partitioning Setup

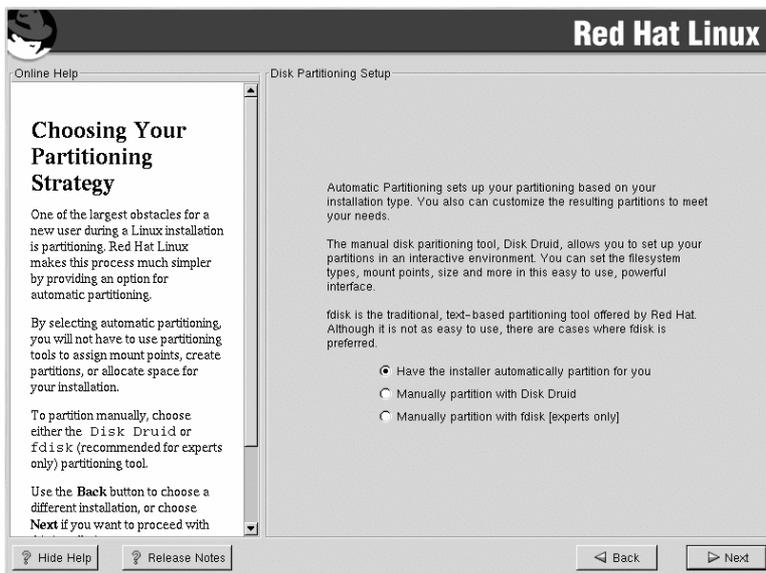
Partitioning allows you to divide your hard drive into isolated sections, where each section behaves as its own hard drive. Partitioning is particularly useful if you run more than one operating system. If you are not sure how you want your system to be partitioned, read Appendix E, *An Introduction to Disk Partitions* for more information.

In this screen, you can choose to perform automatic partitioning, to partition manually using Disk Druid, or to partition manually using fdisk (see Figure 3–5, *Disk Partitioning Setup*).

Automatic partitioning allows you to perform an installation without having to partition your drive(s) yourself. If you do not feel comfortable with partitioning your system, it is recommended that you *do not* choose to partition manually and instead let the installation program partition for you.

To partition manually, choose either the Disk Druid or fdisk (recommended for experts only) partitioning tool.

Figure 3–5 Disk Partitioning Setup

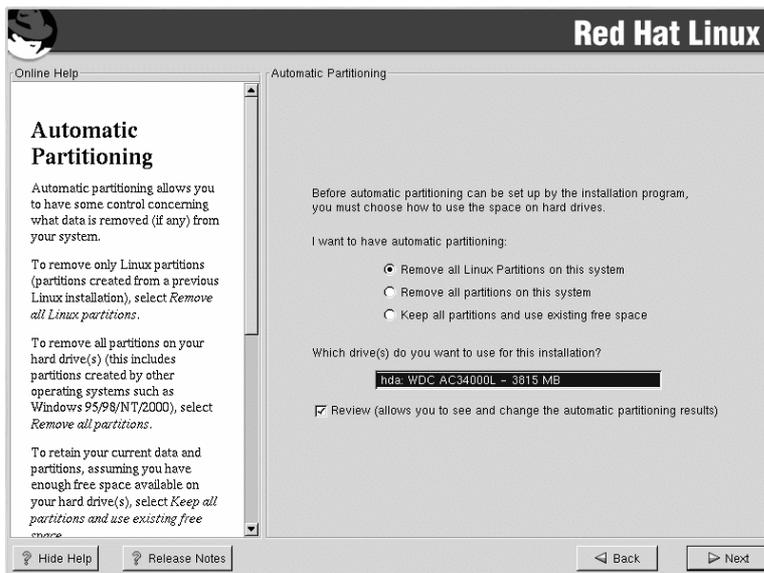


3.11 Automatic Partitioning

If you chose to manually partition using Disk Druid, refer to Section 3.12, *Partitioning Your System*.

If you chose to manually partition using `fdisk`, refer to Section 3.13, *Partitioning with `fdisk`*.

Figure 3–6 Automatic Partitioning



Automatic partitioning allows you to have some control concerning what data is removed (if any) from your system. Your options are:

- **Remove all Linux partitions on this system** — select this option to remove only Linux partitions (partitions created from a previous Linux installation). This will not remove other partitions you may have on your hard drive(s).
- **Remove all partitions on this system** — select this option to remove all partitions on your hard drive(s) (this includes partitions created by other operating systems such as Windows 95/98/NT/2000).



If you select this option, all data on the selected hard drive(s) will be removed by the installation program. Do not select this option if you have information that you want to keep on the hard drive(s) where you are installing Red Hat Linux.

- **Keep all partitions and use existing free space** — select this option to retain your current data and partitions, assuming you have enough free space available on your hard drive(s).

Using your mouse, choose the hard drive(s) on which you want Red Hat Linux to be installed. If you have two or more hard drives, you can choose which hard drive(s) should contain this installation. Unselected hard drives, and any data on them, will not be touched.

To review and make any necessary changes to the partitions created by automatic partitioning, select the **Review** option.

After selecting **Review** and clicking **Next** to move forward, you will see the partitions created for you in Disk Druid. You will also be able to make modifications to these partitions if they do not meet your needs.

Click **Next** once you have made your selections to proceed.

3.12 Partitioning Your System

If you chose automatic partitioning and did not select **Review**, please skip ahead to Section 3.16, *Network Configuration*.

If you chose automatic partitioning and selected **Review**, you can either accept the current partition settings (click **Next**), or modify the setup using Disk Druid, the manual partitioning tool.

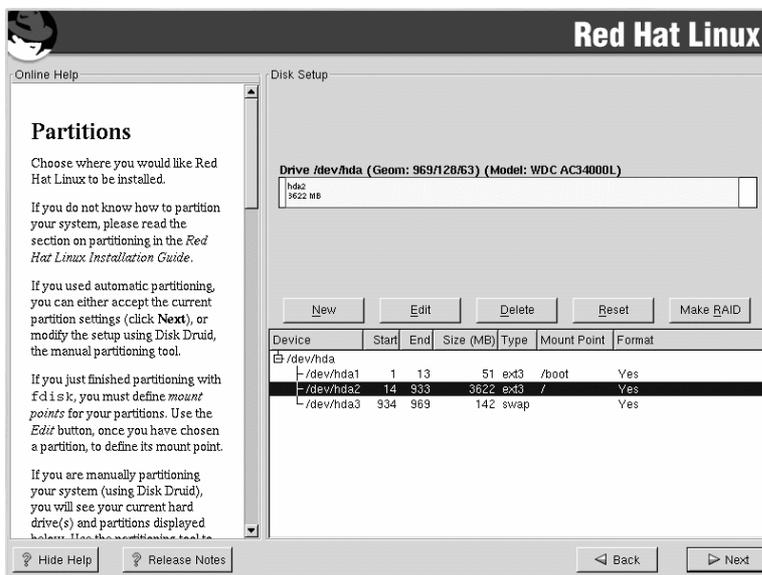
If you chose **Manually partition with fdisk**, please skip ahead to Section 3.13, *Partitioning with fdisk*.

At this point, you must tell the installation program where to install Red Hat Linux. This is done by defining mount points for one or more disk partitions in which Red Hat Linux will be installed. You may also need to create and/or delete partitions at this time (refer to Figure 3–7, *Partitioning with Disk Druid*).

Note

If you have not yet planned how you will set up your partitions, refer to Appendix E, *An Introduction to Disk Partitions*. At a bare minimum, you need an appropriately-sized root partition, and a swap partition equal to the amount of RAM you have on the system.

Figure 3–7 Partitioning with Disk Druid



The partitioning tool used in Red Hat Linux 7.2 is Disk Druid. With the exception of certain esoteric situations, Disk Druid can handle the partitioning requirements for a typical Red Hat Linux installation.

3.12.1 Graphical Display of Hard Drive(s)

Disk Druid offers a graphical representation of your hard drive(s).

Using your mouse, click once to highlight a particular Point field in the graphical display. Double-click to edit an existing partition or to create a partition out of existing free space.

Above the display, you will see the **drive** name (such as `/dev/hda`), the **geom** (which shows the hard disk's geometry and consists of three numbers representing the number of cylinders, heads, and sectors as reported by the hard disk), and the **model** of the hard drive as detected by the installation program.

3.12.2 Disk Druid's Buttons

These buttons control Disk Druid's actions. They are used to add and delete partitions, and to change partition attributes. Buttons on this screen are also used to accept the changes you have made, or to exit Disk Druid. For further explanation, take a look at each button in order.

- **New:** Used to request a new partition. When selected, a dialog box appears containing fields (such as mount point and size) that must be filled in.
- **Edit:** Used to modify attributes of the partition currently selected in the **Partitions** section. Selecting **Edit** opens a dialog box. Some or all of the fields can be edited, depending on whether the partition information has already been written to disk.

You can also edit free space as represented in the graphical display to create a new partition within that space. Either highlight the free space and then select the **Edit** button, or double-click on the free space to edit it.

- **Delete:** Used to remove the partition currently highlighted in the **Current Disk Partitions** section. You will be asked to confirm the deletion of any partition.
- **Reset:** Used to restore Disk Druid to its original state. All changes made will be lost if you **Reset** the partitions.
- **Make RAID:** **Make RAID** can be used if you want to provide redundancy to any or all disk partitions. *It should only be used if you have experience using RAID.* To read more about RAID, please refer to *RAID (Redundant Array of Independent Disks)* in the *Official Red Hat Linux Customization Guide*.

To make a RAID device, you must first create software RAID partitions. Once you have created two or more software RAID partitions, select **Make RAID** to join the software RAID partitions into a RAID device.

3.12.3 Partition Fields

Above the partition hierarchy are labels which present information about the partitions you are creating. The labels are defined as follows:

- **Device:** This field displays the partition's device name.
 - **Start:** This field shows the sector on your hard drive where the partition begins.
 - **End:** This field shows the sector on your hard drive where the partition ends.
 - **Size:** This field shows the partition's size (in MB).
-

- **Type:** This field shows the partition's type (for example, ext2, ext3, or vfat).
- **Mount Point:** A mount point is the location within the directory hierarchy at which a volume exists; the volume is "mounted" at this location. This field indicates where the partition will be mounted. If a partition exists, but is not set, then you need to define its mount point. Double-click on the partition or click the **Edit** button.

3.12.4 Recommended Partitioning Scheme

Unless you have a reason for doing otherwise, we recommend that you create the following partitions:

- A swap partition (at least 32 MB) — swap partitions are used to support virtual memory. In other words, data is written to a swap partition when there is not enough RAM to store the data your system is processing. The size of your swap partition should be equal to your computer's RAM, or 32 MB, whichever amount is larger, but no more than 2048 MB (or 2 GB). In Disk Druid, the partition field for swap should look similar to the following:

```
<Swap> hda6 64M 64M Linux swap
```

For example, if you have 1 GB of RAM or less, your swap partition should be at least equal to the amount of RAM on your system, up to two times the RAM. For more than 1 GB of RAM, 2 GB of swap is recommended. Creating a large swap space partition will be especially helpful if you plan to upgrade your RAM at a later time.

- A /boot partition (50 MB) — the partition mounted on /boot contains the operating system kernel (which allows your system to boot Red Hat Linux), along with files used during the bootstrap process. Due to the limitations of most PC BIOSs, creating a small partition to hold these files is a good idea. For most users, a 50 MB boot partition is sufficient. In Disk Druid, the partition field for /boot should look similar to:

```
/boot hda1 16M 16M Linux native
```



If your hard drive is more than 1024 cylinders (and your system was manufactured more than two years ago), you may need to create a /boot partition if you want the / (root) partition to use all of the remaining space on your hard drive.

- A root partition (1.2-3.5 GB) — this is where "/" (the root directory) will be located. In this setup, all files (except those stored in /boot) are on the root partition. A 1.2 GB root partition will permit the equivalent of a workstation installation (with *very* little free space), while a 3.5 GB
-

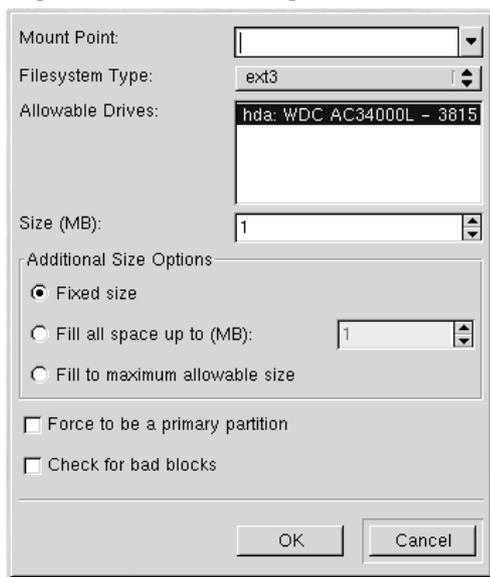
root partition will let you install every package. In Disk Druid, the partition field for / should look similar to:

```
/ hda5 3734M 3734M Linux native
```

3.12.5 Adding Partitions

To add a new partition, select the **New** button. A dialog box appears (see Figure 3–8, *Creating a New Partition*).

Figure 3–8 Creating a New Partition



Note

You must dedicate at least one partition to Red Hat Linux, and optionally more. This is discussed more completely in Appendix E, *An Introduction to Disk Partitions*.

- **Mount Point:** Enter the partition's mount point. For example, if this partition should be the root partition, enter /; enter **/boot** for the **/boot** partition, and so on. You can also use the pulldown menu to choose the correct mount point for your partition.
-

- **Filesystem Type:** Using the pulldown menu, select the appropriate filesystem type for this partition. For more information on filesystem types, see *Filesystem Types* in Section 3.12.5.
- **Allowable Drives:** This field contains a list of the hard disks installed on your system. If a hard disk's box is highlighted, then a desired partition can be created on that hard disk. If the box is *not* checked, then the partition will *never* be created on that hard disk. By using different checkbox settings, you can have Disk Druid place partitions as you see fit, or let Disk Druid decide where partitions should go.
- **Size (Megs):** Enter the size (in megabytes) of the partition. Note this field starts with a "1" in it; unless changed you will end up with a 1 MB partition.
- **Additional Size Options:** Choose whether to keep this partition at a fixed size, to allow it to "grow" (fill up the available hard drive space) to a certain point, or to allow it to grow to fill any remaining hard drive space available.

If you choose **Fill all space up to (MB)**, you must give size constraints in the field to the right of this option. This allows you to keep a certain amount of space free on your hard drive for future use.

- **Force to be a primary partition:** Select whether the partition you are creating should be one of the first four partitions on the hard drive. If unselected, the partition created will be a logical partition. See Section E.1.3, *Partitions within Partitions -- An Overview of Extended Partitions* for more information.
- **Check for bad blocks:** Checking for bad blocks can help prevent data loss by locating the bad blocks on a drive and making a list of them to prevent using them in the future. If you wish to check for bad blocks while formatting each filesystem, please make sure to select this option.

Selecting **Check for bad blocks** may dramatically increase your total installation time. Since most newer hard drives are quite large in size, checking for bad blocks may take a long time; the length of time depends on the size of your hard drive. If you choose to check for bad blocks, you can monitor your progress on virtual console #6.

- **Ok:** Select **Ok** once you are satisfied with the settings and wish to create the partition.
- **Cancel:** Select **Cancel** if you do not want to create the partition.

Filesystem Types

Red Hat Linux 7.2 allows you to create different types of partition types, based on the filesystem they will use. The following is a brief description of the different filesystems available, and how they can be utilized.

- **ext2** — An ext2 filesystem supports standard Unix file types (regular files, directories, symbolic links, etc). It provides the ability to assign long file names, up to 255 characters. Versions prior to Red Hat Linux 7.2 used ext2 filesystems by default.
-

- **ext3** — The ext3 filesystem is based on the ext2 filesystem and has one main advantage — journaling. Using a journaling filesystem reduces time spent recovering a filesystem after a crash as there is no need to fsck²the filesystem.
- **software RAID** — Creating two or more software RAID partitions allow you to create a RAID device. For more information regarding RAID, refer to the chapter *RAID (Redundant Array of Independent Disks)* in the *Official Red Hat Linux Customization Guide*.
- **swap** — Swap partitions are used to support virtual memory. In other words, data is written to a swap partition when there is not enough RAM to store the data your system is processing.
- **vfat** — The VFAT filesystem is a Linux filesystem that is compatible with Windows 95/NT long filenames on the FAT filesystem.

3.12.6 Editing Partitions

To edit a partition, select the **Edit** button or double-click on the existing partition.

Note

If the partition already exists on your hard disk, you will only be able to change the partition's mount point. If you want to make any other changes, you will need to delete the partition and recreate it.

3.12.7 Deleting a Partition

To delete a partition, highlight it in the **Partitions** section and click the **Delete** button. You will be asked to confirm the deletion.

Skip to Section 3.14, *Boot Loader Installation* for further installation instructions.

3.13 Partitioning with fdisk

This section applies only if you chose to use **fdisk** to partition your system.

To partition your system without using **fdisk**, please skip to Section 3.11, *Automatic Partitioning* for automatic partitioning or Section 3.12, *Partitioning Your System* for partitioning with Disk Druid.

If you have already completed disk partitioning, skip to Section 3.14, *Boot Loader Installation* for further installation instructions.

² The fsck application is used to check and optionally repair one or more Linux filesystems.



Unless you have previously used `fdisk` and understand how it works, we do not recommend that you use it.

Disk Druid is easier to understand than `fdisk`. To exit `fdisk`, click **Back** to return to the previous screen, deselect `fdisk`, and then click **Next**.

If you have chosen to use `fdisk`, the next screen will prompt you to select a drive to partition using `fdisk`. Once you have chosen which drive to partition, you will be presented with the `fdisk` command screen. If you do not know what command to use, type `[m]` at the prompt for help.

When you are finished making partitions, type `[w]` to save your changes and quit. You will be taken back to the original `fdisk` screen where you can choose to partition another drive or continue with your installation.

Note

None of the changes you make take effect until you save them and exit `fdisk` using the `w` command. You can quit `fdisk` at any time without saving changes using the `q` command.

After you have partitioned your drive(s), click **Next**. You will need to use Disk Druid to assign mount points to the partitions you just created with `fdisk`.

You will not be able to add new partitions using Disk Druid, but you will be able to edit mount points for the partitions you have already created. For each partition created with `fdisk`, click on the **Edit** button, choose the appropriate mount point for that partition from the pulldown menu, and click on **OK**.

3.14 Boot Loader Installation

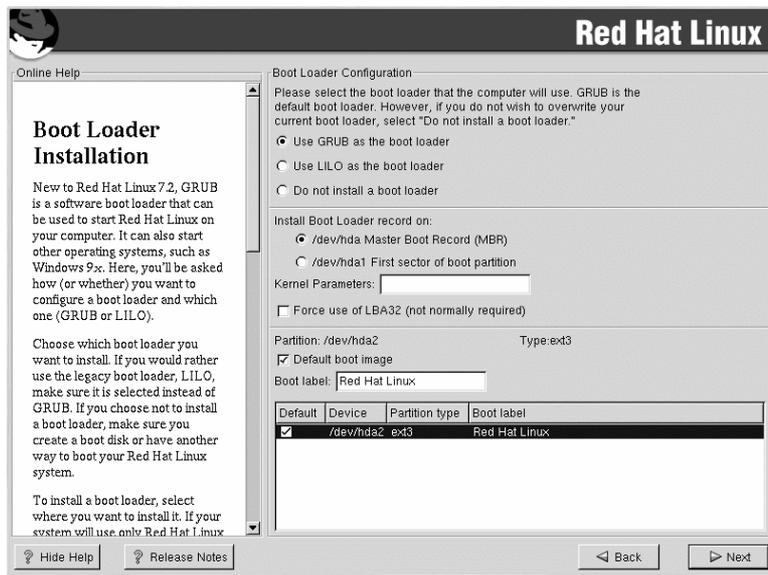
In order to boot your Red Hat Linux system without a boot disk, you usually need to install a boot loader. You can choose to install either GRUB (selected by default) or LILO.

New to Red Hat Linux 7.2, GRUB is a software boot loader that can be used to start Red Hat Linux on your computer. It can also start other operating systems, such as Windows 9x. Here, you will be asked how (or whether) you want to configure a boot loader and which one (GRUB or LILO).

Choose which boot loader you want to install. If you would rather use the legacy boot loader, LILO, make sure it is selected instead of GRUB.

If you choose not to install a boot loader, make sure you create a boot disk at the end of this installation or have another way to boot (such as a third party boot loader) your Red Hat Linux system.

Figure 3–9 Boot Loader Installation



Now that you have chosen to install a boot loader (GRUB or LILO), you must determine where it will be installed. You may install your boot loader in one of two places:

The master boot record (MBR)

The recommended place to install a boot loader, unless the MBR already starts another operating system loader, such as System Commander or OS/2's Boot Manager. The MBR is a special area on your hard drive that is automatically loaded by your computer's BIOS, and is the earliest point at which the boot loader can take control of the boot process. If you install it in the MBR, when your machine boots, GRUB (or LILO) will present a boot prompt. You can then boot Red Hat Linux or any other operating system that you have configured the boot loader to boot.

The first sector of your root partition

Recommended if you are already using another boot loader on your system (such as OS/2's Boot Manager). In this case, your other boot loader will take control first. You can then configure that boot loader to start GRUB (or LILO), which will then boot Red Hat Linux.

Select where you would like GRUB (or LILO) to be installed on your system. If your system will use only Red Hat Linux, you should choose the MBR. For systems with Windows 95/98, you should also install the boot loader to the MBR so that it can boot both operating systems.



If you choose not to install GRUB or LILO for any reason, you will not be able to boot your Red Hat Linux system directly, and you will need to use another boot method (such as a boot diskette). Use this option only if you are sure you have another way of booting your Red Hat Linux system!

If you wish to add default options to GRUB or LILO's boot command, enter them into the **Kernel parameters** field. Any options you enter will be passed to the Linux kernel every time it boots.

The **Force use of LBA32 (not normally required)** option allows you to exceed the 1024 cylinder limit for the `/boot` partition. If you have a system which supports the LBA32 extension for booting operating systems above the 1024 cylinder limit, you want to place your `/boot` partition above this limit, and the installation program has not already detected this extension from your BIOS, you should select this option.

Every bootable partition is listed, including partitions used by other operating systems. The partition holding your Red Hat Linux system's root filesystem will have a **Boot label** of `linux`. Other partitions may also have boot labels. If you would like to add boot labels for other partitions (or change an existing boot label), click once on the partition to select it. Once selected, you can change the boot label.

Note

The **Boot label** column lists what you must enter at the boot prompt in order to boot the desired operating system. However, if you forget the boot labels defined on your system, you can always press [Tab] at the prompt to display a list of defined boot labels.

3.14.1 Rescue Mode

If you need to use rescue mode, there are several options available to you.

- Using the CD-ROM to boot, type **linux rescue** at the `boot:` prompt.
 - Using the network boot disk, type **linux rescue** at the `boot:` prompt. You will then be prompted to retrieve the rescue image from the network.
-

- Using the boot disk included with the Red Hat Linux boxed set, type **linux rescue** at the `boot :` prompt. You then pick an installation method and choose a valid installation tree to load from.

For more information regarding rescue mode, refer to the *Official Red Hat Linux Customization Guide*.

3.14.2 Alternative Boot Loaders

If you do not wish to use GRUB or LILO to boot your Red Hat Linux system, you have several alternatives:

Boot disk

As previously stated, you can use the boot disk created by the installation program (if you elected to create one).

LOADLIN

You can load Linux from MS-DOS. Unfortunately, it requires a copy of the Linux kernel (and an initial RAM disk, if you have a SCSI adapter) to be available on an MS-DOS partition. The only way to accomplish this is to boot your Red Hat Linux system using some other method (for example, from LILO on a diskette) and then copy the kernel to an MS-DOS partition. LOADLIN is available from <ftp://metalab.unc.edu/pub/Linux/system/boot/dualboot/> and associated mirror sites.

SYSLINUX

SYSLINUX is an MS-DOS program very similar to LOADLIN. It is also available from <ftp://metalab.unc.edu/pub/Linux/system/boot/loaders/> and associated mirror sites.

Some commercial boot loaders

You can load Linux using commercial boot loaders. For example, System Commander and Partition Magic are able to boot Linux (but still require GRUB or LILO to be installed in your Linux root partition).

3.14.3 SMP Motherboards, GRUB, and LILO

This section is specific to SMP motherboards only. If the installation program detects an SMP motherboard on your system, it will automatically create two `/boot/grub/grub.conf` or `/etc/lilo.conf` entries (depending on the boot loader you installed), rather than the usual single entry.

The two entries in `grub.conf` will be Red Hat Linux (*kernel version*) and Red Hat Linux (*kernel versions-smp*). The Red Hat Linux (*kernel version-smp*) will boot by default. However, if you have trouble with the SMP kernel, you can elect to boot the

Red Hat Linux (*kernel version*) entry instead. You will retain all the functionality as before, but you will only be operating with a single processor.

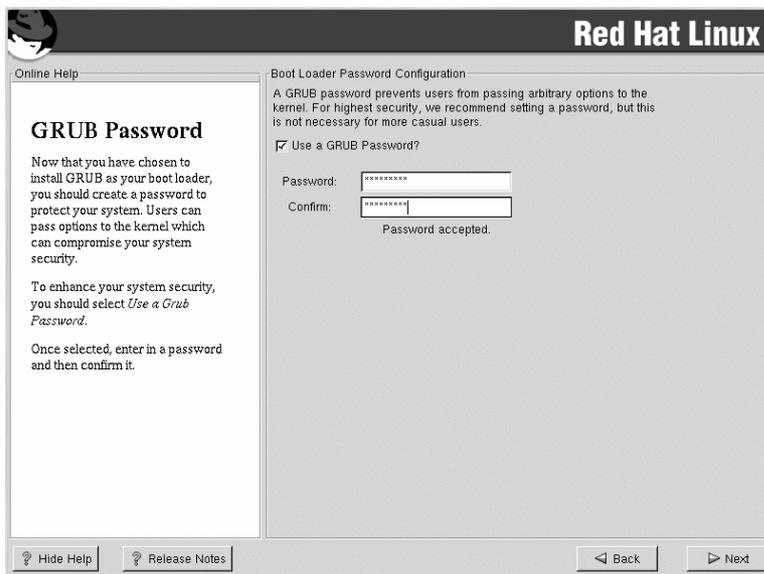
The two entries in `lilo.conf` will be `linux` and `linux-up`. The `linux` will boot by default. However, if you have trouble with the SMP kernel, you can elect to boot the `linux-up` entry instead. You will retain all the functionality as before, but you will only be operating with a single processor.

3.15 GRUB Password

If you did not select GRUB as your boot loader, or did not install a boot loader, skip to Section 3.16, *Network Configuration*.

If you are installing GRUB as your boot loader, you should create a password to protect your system. Users can pass options to the kernel which can compromise your system security.

Figure 3–10 GRUB Password



To enhance your system security, you should select **Use a Grub Password**.

Once selected, enter a password and confirm it.

3.16 Network Configuration

If you do not have a network card, you will not see this screen. Skip ahead to Section 3.17, *Firewall Configuration*.

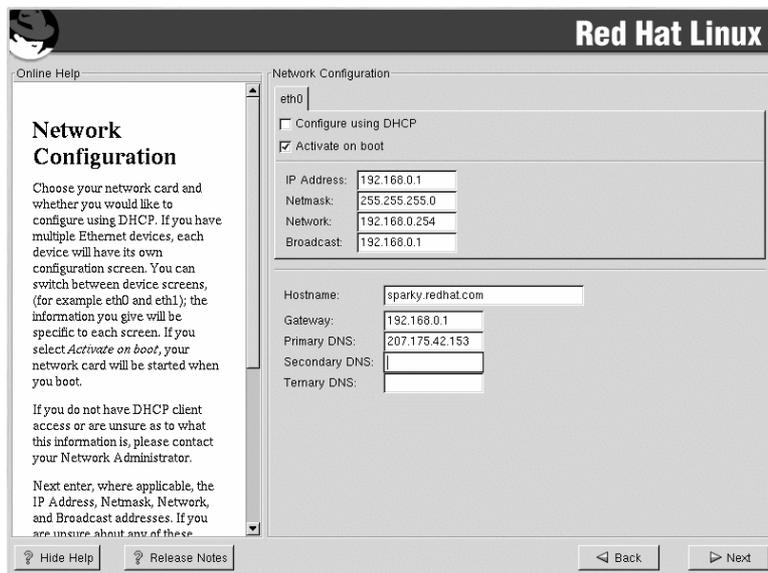
If you have a network card and you have not already configured your networking, you now have the opportunity (as shown in Figure 3–11, *Network Configuration*).

If you have multiple devices, you will see a tab for each device. You may switch between devices (for example, between eth0 and eth1) and the information you provide on each tab will be specific to each device.

Indicate if you would like to configure your IP address using DHCP (Dynamic Host Configuration Protocol). If you select **Activate on boot**, your network interface will be started when you boot. If you do not have DHCP client access or you are unsure what to provide here, please contact your network administrator.

Next enter, where applicable, the **IP Address**, **Netmask**, **Network**, and **Broadcast** addresses. If you are unsure about any of these, please contact your network administrator.

Figure 3–11 Network Configuration



Note

Do not use the numbers as seen in this sample configuration. These values will not work for your own network configuration. If you are not sure what values to enter, contact your network administrator for assistance.

If you have a fully qualified domain name for the network device, enter it in the **Hostname** field.

Tip

Even if your computer is not part of a network, you can enter a hostname for your system. If you do not take this opportunity to enter in a name, your system will be known as `localhost`.

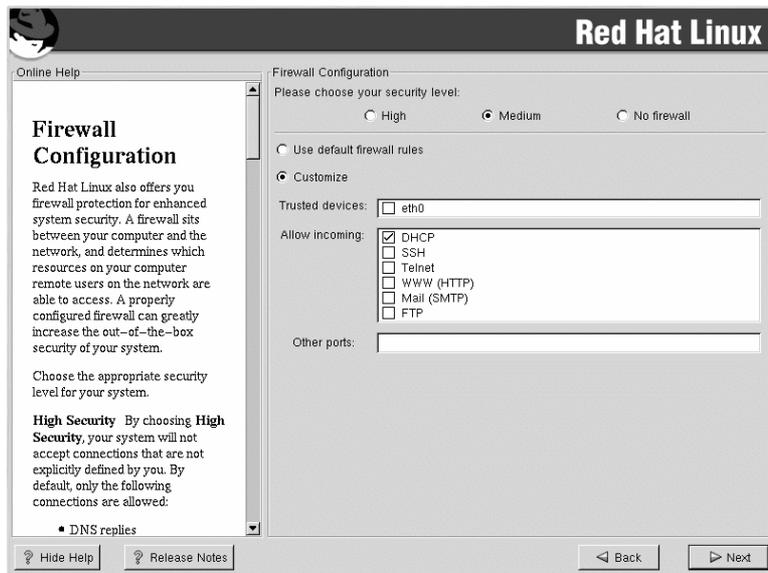
Finally, enter the **Gateway** and **Primary DNS** (and if applicable the **Secondary DNS** and **Tertiary DNS**) addresses.

3.17 Firewall Configuration

Red Hat Linux offers firewall protection for enhanced system security. A firewall exists between your computer and the network, and determines which resources on your computer remote users on the network can access. A properly configured firewall can greatly increase the security of your system.

Choose the appropriate security level for your system.

Figure 3–12 Firewall Configuration



High

If you choose **High**, your system will not accept connections (other than the default settings) that are not explicitly defined by you. By default, only the following connections are allowed:

- DNS replies
- DHCP — so any network interfaces that use DHCP can be properly configured

If you choose **High**, your firewall will not allow the following:

- Active mode FTP (passive mode FTP, used by default in most clients, should still work)
- IRC DCC file transfers
- RealAudio™
- Remote X Window System clients

If you are connecting your system to the Internet, but do not plan to run a server, this is the safest choice. If additional services are needed, you can choose **Customize** to allow specific services through the firewall.

Medium

If you choose **Medium**, your firewall will not allow remote machines to have access to certain resources on your system. By default, access to the following resources are not allowed:

- Ports lower than 1023 — the standard reserved ports, used by most system services, such as FTP, SSH, telnet, and HTTP
- The NFS server port (2049)
- The local X Window System display for remote X clients
- The X Font server port (by default, `xfs` does not listen on the network, it is disabled in the font server)

If you want to allow resources such as RealAudio™, while still blocking access to normal system services, choose **Medium**. Select **Customize** to allow specific services through the firewall.

No Firewall

No firewall provides complete access to your system and does no security checking. Security checking is the disabling of access to certain services. This should only be selected if you are running on a trusted network (not the Internet) or plan to do more firewall configuration later.

Choose **Customize** to add trusted devices or to allow additional incoming services.

Trusted Devices

Selecting any of the **Trusted Devices** allows access to your system for all traffic from that device; it is excluded from the firewall rules. For example, if you are running a local network, but are connected to the Internet via a PPP dialup, you can check **eth0** and any traffic coming from your local network will be allowed. Selecting **eth0** as trusted means all traffic over the Ethernet is allowed, but the `ppp0` interface is still firewalled. If you want to restrict traffic on an interface, leave it unchecked.

It is not recommended that you make any device that is connected to public networks, such as the Internet, a **Trusted Device**.

Allow Incoming

Enabling these options allow the specified services to pass through the firewall. Note, during a workstation installation, the majority of these services are *not* installed on the system.

DHCP

If you allow incoming DHCP queries and replies, you allow any network interface that uses DHCP to determine its IP address. DHCP is normally enabled. If DHCP is not enabled, your computer can no longer get an IP address.

SSH

Secure *SHell* (SSH) is a suite of tools for logging into and executing commands on a remote machine. If you plan to use SSH tools to access your machine through a firewall, enable this option. You need to have the `openssh-server` package installed in order to access your machine remotely, using SSH tools.

Telnet

Telnet is a protocol for logging into remote machines. Telnet communications are unencrypted, and provide no security from network snooping. Allowing incoming Telnet access is not recommended. If you do want to allow inbound Telnet access, you will need to install the `telnet-server` package.

WWW (HTTP)

The HTTP protocol is used by Apache (and by other Web servers) to serve Web pages. If you plan on making your Web server publicly available, enable this option. This option is not required for viewing pages locally or for developing Web pages. You will need to install the `apache` package if you want to serve Web pages.

Mail (SMTP)

If you want to allow incoming mail delivery through your firewall, so that remote hosts can connect directly to your machine to deliver mail, enable this option. You do not need to enable this if you collect your mail from your ISP's server using POP3 or IMAP, or if you use a tool such as `fetchmail`. Note that an improperly configured SMTP server can allow remote machines to use your server to send spam.

FTP

The FTP protocol is used to transfer files between machines on a network. If you plan on making your FTP server publicly available, enable this option. You need to install the `wu-ftpd` (and possibly the `anonftp`) package for this option to be useful.

Other ports

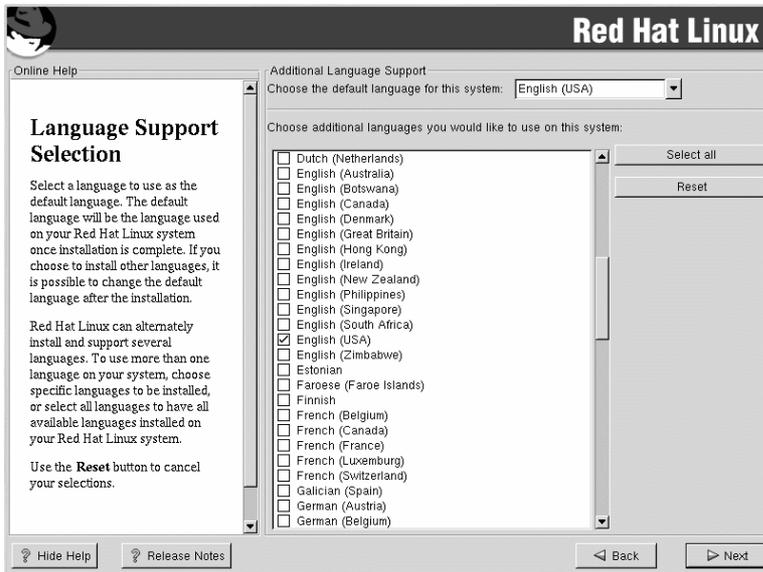
You can allow access to ports which are not listed here, by listing them in **Other ports** field. Use the following format: `port:protocol`. For example, if you want to allow IMAP access through your firewall, you can specify `imap:tcp`. You can also explicitly specify numeric ports; to allow UDP packets on port 1234 through the firewall, enter `1234:udp`. To specify multiple ports, separate them with commas.

3.18 Language Support Selection

Red Hat Linux can install and support multiple languages for use on your system.

You must select a language to use as the default language. The default language will be used on your Red Hat Linux system once installation is complete. If you choose to install other languages, you can change your default language after the installation.

Figure 3–13 Language Support Selection



If you are only going to use one language on your system, selecting only that language will save significant disk space. The default language is the language you selected to use during the installation. However, if you select only one language, you will only be able to use that specified language after the Red Hat Linux installation is complete.

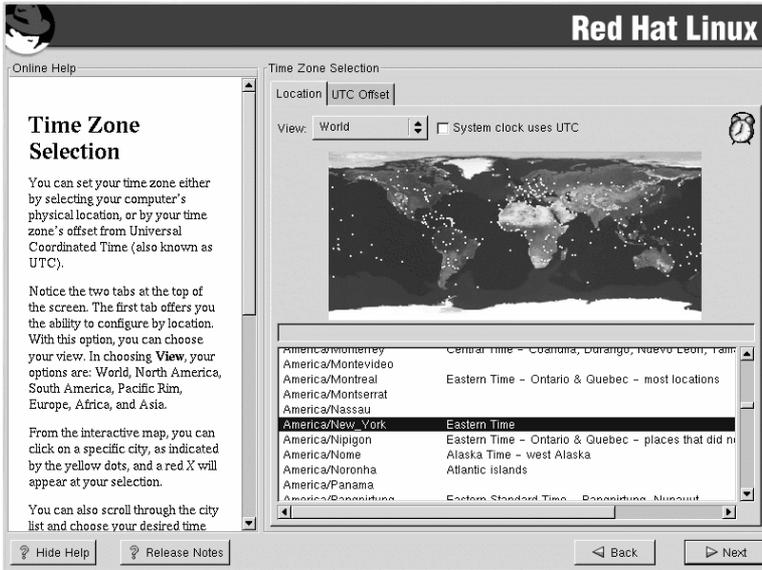
To use more than one language on your system, choose specific languages to be installed or select all languages to have all available languages installed on your Red Hat Linux system.

Use the **Reset** button to cancel your selections. Resetting will revert to the default; only the language you selected for use during the installation will be installed.

3.19 Time Zone Configuration

You can set your time zone by selecting your computer's physical location or by specifying your time zone's offset from Coordinated Universal Time (UTC).

Figure 3–14 Configuring the Time Zone



Notice the two tabs at the top of the screen (see Figure 3–14, *Configuring the Time Zone*). The first tab allows you to configure your time zone by your location. You can specify different areas to view: **World, North America, South America, Pacific Rim, Europe, Africa, and Asia**.

On the interactive map, you can also click on a specific city, which is marked by a yellow dot; a red **X** will appear indicating your selection. You can also scroll through a list and choose a time zone.

The second tab allows you to specify a UTC offset. The tab displays a list of offsets to choose from, as well as an option to set daylight saving time.

On both tabs, you can select **System Clock uses UTC**. Please select this if you know that your system is set to UTC.

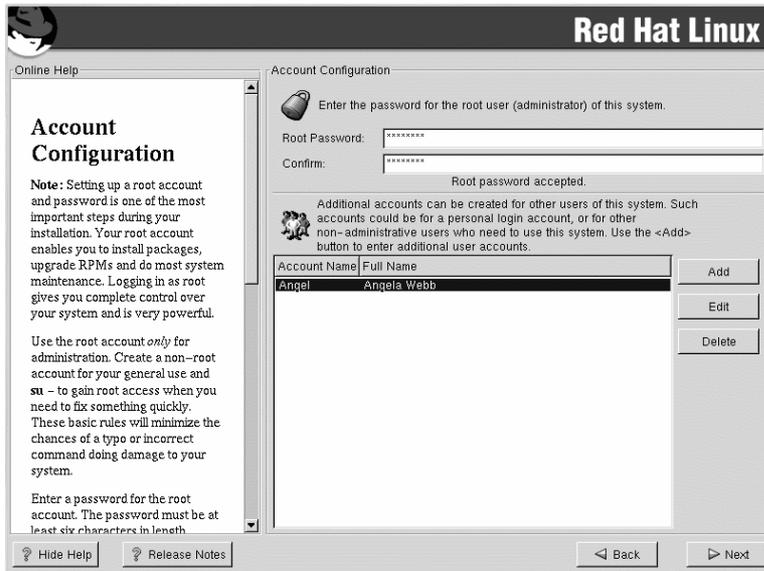
Tip

If you wish to change your time zone configuration after you have booted your Red Hat Linux system, become root and use the `/usr/sbin/time-config` command.

3.20 Account Configuration

The **Account Configuration** screen allows you to set your root password. Additionally, you can set up user accounts for you to log in to once the installation is complete (see Figure 3–15, *Account Creation*).

Figure 3–15 Account Creation



3.20.1 Setting the Root Password

Setting up a root account and password is one of the most important steps during your installation. Your root account is similar to the administrator account used on Windows NT machines. The root account is used to install packages, upgrade RPMs, and perform most system maintenance. Logging in as root gives you complete control over your system.

Use the root account only for system administration. Create a non-root account for your general use and `su -` to root when you need to fix something quickly. These basic rules will minimize the chances of a typo or an incorrect command doing damage to your system.

The installation program will prompt you to set a root password³ for your system. You must enter a root password. The installation program will not let you proceed to the next section without entering a root password.

The root password must be at least six characters long; the password you type is not echoed to the screen. You must enter the password twice; if the two passwords do not match, the installation program will ask you to enter them again.

You should make the root password something you can remember, but not something that is easy for someone else to guess. Your name, your phone number, **qwerty**, **password**, **root**, **123456**, and **anteater** are all examples of bad passwords. Good passwords mix numerals with upper and lower case letters and do not contain dictionary words: **Aard387vark** or **420BMttNT**, for example. Remember that the password is case-sensitive. If you write down your password, keep it in a secure place. However, it is recommended that you do not write down this or any password you create.

Note

Do not use one of the example passwords offered in this manual. Using one of these passwords could be considered a security risk.

Note

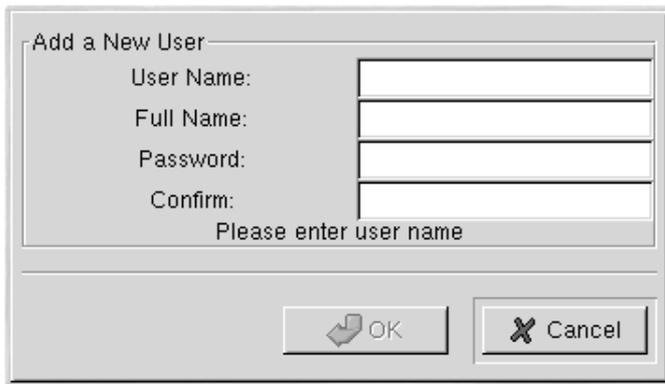
The root user (also known as the superuser) has complete access to the entire system; for this reason, logging in as the root user is best done *only* to perform system maintenance or administration.

3.20.2 Setting Up User Accounts

If you choose to create a user account now, you will have an account to log in to once the installation has completed. This allows you to safely and easily log into your computer without having to be root to create your user account.

Enter an account name. Then enter and confirm a password for that user account. Enter the full name of the account user and press **Add**. Your account information will be added to the account list, and the user account fields will be cleared so that you can add another user.

³ A root password is the administrative password for your Red Hat Linux system. You should only log in as root when needed for system maintenance. The root account does not operate within the restrictions placed on normal user accounts, so changes made as root can have implications for your entire system.

Figure 3–16 Creating a User Account

The image shows a dialog box titled "Add a New User". It contains four text input fields labeled "User Name:", "Full Name:", "Password:", and "Confirm:". The "User Name" field is currently empty, and a red error message "Please enter user name" is displayed below it. At the bottom of the dialog, there are two buttons: "OK" with a right-pointing arrow icon and "Cancel" with an "X" icon.

You can also choose **New** to add a new user. Enter the user's information and use the **Add** button to add the user to the account list.

You can also **Edit** or **Delete** the user accounts you have created and no longer want.

3.21 Authentication Configuration

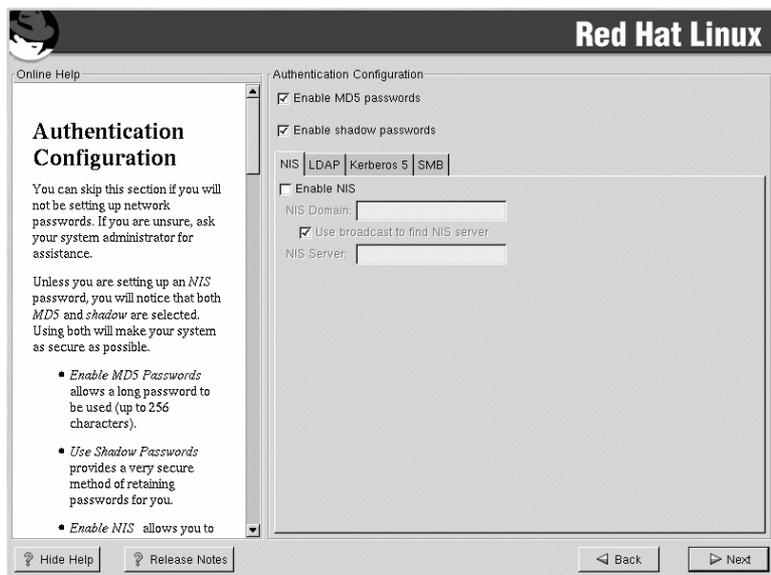
If you are performing a workstation or server installation, please skip ahead to Section 3.22, *Package Group Selection*.

You may skip this section if you will not be setting up network passwords. If you do not know whether you should do this, please ask your system administrator for assistance.

Unless you are setting up **NIS** authentication, you will notice that only **MD5** and **shadow** passwords are selected (see Figure 3–17, *Authentication Configuration*). We recommend you use both to make your machine as secure as possible.

To configure the NIS option, you must be connected to an NIS network. If you are not sure whether you are connected to an NIS network, please ask your system administrator.

Figure 3–17 Authentication Configuration



- **Enable MD5 passwords** — allows a long password to be used (up to 256 characters), instead of the standard eight letters or less.
- **Enable shadow passwords** — provides a secure method for retaining passwords. The passwords are stored in `/etc/shadow`, which can only be read by root.
- **Enable NIS** — allows you to run a group of computers in the same Network Information Service domain with a common password and group file. You can choose from the following two options:
 - **NIS Domain** — allows you to specify the domain or group of computers your system belongs to.
 - **Use broadcast to find NIS server** — allows you to broadcast a message to your local area network to find an available NIS server.
 - **NIS Server** — causes your computer to use a specific NIS server, rather than broadcasting a message to the local area network asking for any available server to host your system.
- **Enable LDAP** — tells your computer to use LDAP for some or all authentication. LDAP consolidates certain types of information within your organization. For example, all of the different lists of users within your organization can be merged into one LDAP directory. For more information

about LDAP, refer to *Official Red Hat Linux Reference Guide, Lightweight Directory Access Protocol (LDAP)*. You can choose from the following options:

- **LDAP Server** — allows you to access a specified server (by providing an IP address) running the LDAP protocol.
- **LDAP Base DN** — allows you to look up user information by its Distinguished Name (DN).
- **Use TLS (Transport Layer Security) lookups** — this option allows LDAP to send encrypted user names and passwords to an LDAP server before authentication.
- **Enable Kerberos** — Kerberos is a secure system for providing network authentication services. For more information about Kerberos, see *Using Kerberos 5 on Red Hat Linux* in the *Official Red Hat Linux Reference Guide*. There are three options to choose from here:
 - **Realm** — this option allows you to access a network that uses Kerberos, composed of one or a few servers (also known as KDCs) and a potentially large number of clients.
 - **KDC** — this option allows you access to the Key Distribution Center (KDC), a machine that issues Kerberos tickets (sometimes called a Ticket Granting Server or TGS).
 - **Admin Server** — this option allows you to access a server running kadmind.
- **Enable SMB Authentication** — Sets up PAM to use an SMB server to authenticate users. You must supply two pieces of information here:
 - **SMB Server** — Indicates which SMB server your workstation will connect to for authentication.
 - **SMB Workgroup** — Indicates which workgroup the configured SMB servers are in.

3.22 Package Group Selection

After your partitions have been selected and configured for formatting, you are ready to select packages for installation.

Note

Unless you choose a custom installation, the installation program will automatically choose most packages for you. However, you must select either GNOME or KDE (or both) to install a graphical environment.

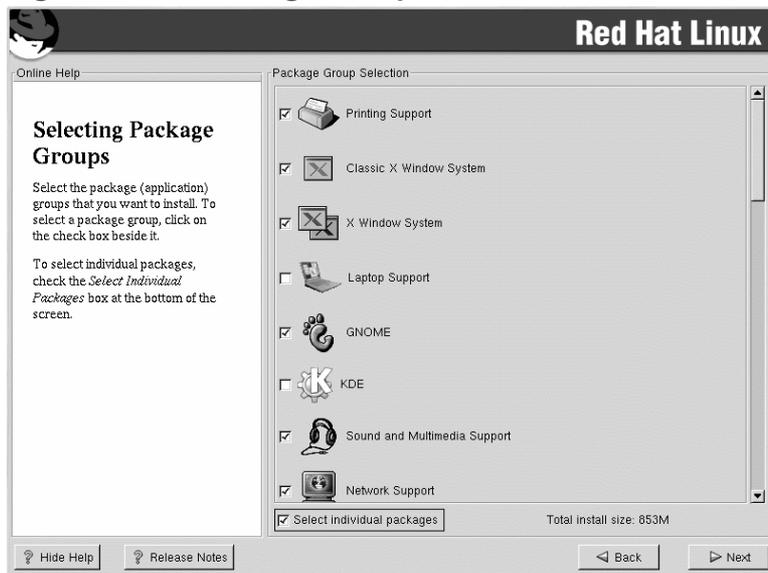
GNOME and KDE are both graphical desktop environments⁴ that handle the overall look and feel of your system. You must choose one of these to have a default graphical setup, but you can also install both to determine for yourself which you prefer.

If you do not have unlimited space (at least 1.7 GB) to install both GNOME and KDE, Section 3.22.2, *A Brief Introduction to GNOME* and Section 3.22.3, *A Brief Introduction to KDE* should make the choice a little easier for you.

You can select components, which group packages together according to function (for example, **C Development**, **Networked Workstation**, or **Web Server**), individual packages, or a combination of the two.

To select a component, click on the checkbox beside it (see Figure 3–18, *Package Group Selection*).

Figure 3–18 Package Group Selection



Select each component you wish to install. Selecting **Everything** (at the end of the component list) during a custom installation installs all packages included with Red Hat Linux. If you select every package, you will need approximately 1.7 GB of free disk space.

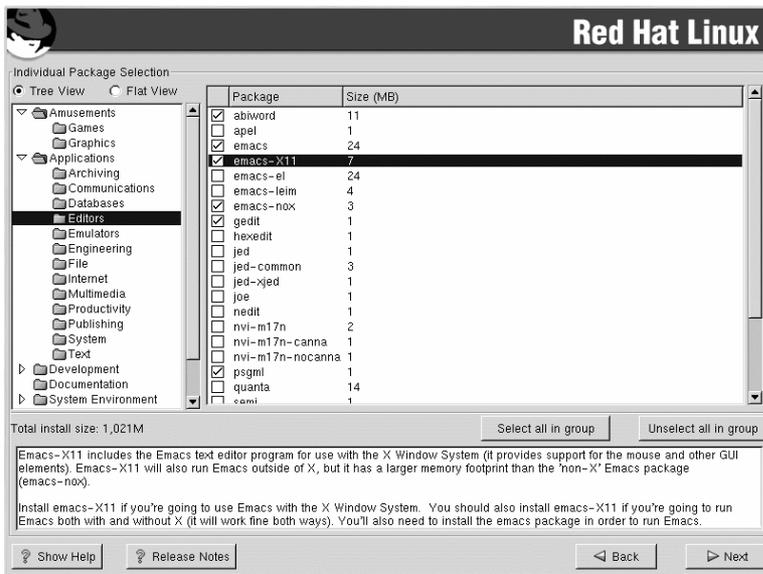
To select packages individually, check the **Select Individual Packages** box at the bottom of the screen.

⁴ A desktop environment in Linux is similar to the environment you might see in other operating systems. However, environments differ in their look and feel and are easily customized for your individual needs.

3.22.1 Selecting Individual Packages

After selecting the components you wish to install, you can select or deselect individual packages. You can select or deselect packages using your mouse (see Figure 3–19, *Selecting Individual Packages*).

Figure 3–19 Selecting Individual Packages



You can choose to view the individual packages in **tree view** or **flat view**.

Tree view allows you to see the packages grouped by application type.

Flat view allows you to see all of the packages in an alphabetical listing on the right of the screen.

Using **Tree view**, you see a listing of package groups. When you expand this list and pick one group, the list of packages in that group appears in the panel on the right.

To sort alphabetically, click on the **Package** tab. To sort packages by size, click on the **Size (MB)** tab.

To select an individual package, double-click the checkbox beside the package name. A check mark in the box means that a package has been selected.

For more information about a specific package, click on the individual package name. The package information will appear at the bottom of the screen.

You can also select or deselect all packages listed within a particular group, by clicking on the **Select all in group** or **Unselect all in group** buttons.

Note

Some packages (such as the kernel and certain libraries) are required for every Red Hat Linux system and are not available to select or deselect. These base packages are selected by default.

3.22.2 A Brief Introduction to GNOME

GNOME is a powerful graphics-driven desktop environment. GNOME includes a panel (for starting applications and displaying status), a desktop (where data and applications can be placed), multiple window managers (which control the look and feel of your desktop), and a standard set of desktop tools and applications.

GNOME allows you to set your desktop the way you want it to look and "feel." GNOME's session manager remembers settings and currently running programs. So, once you have set things the way you like, they will stay that way.

Figure 3–20 Sample GNOME User Screen

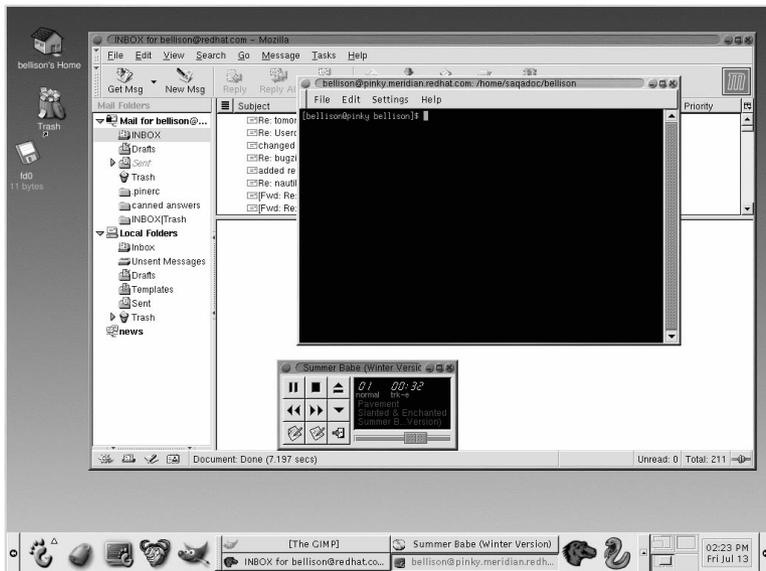


Figure 3–20, *Sample GNOME User Screen* shows a typical graphical environment using the GNOME desktop environment. A typical graphical environment for KDE would be similar.

Refer to the Official Red Hat Linux Getting Started Guide to learn more about GNOME.

3.22.3 A Brief Introduction to KDE

KDE provides a complete desktop environment, including a file manager, a window manager, an integrated help system, a configuration system, numerous tools and utilities, and an ever increasing number of applications.

KDE offers a contemporary desktop, a searchable help system with convenient access to help on the use of the KDE desktop and its applications, standardized menu and toolbars, keybindings, color schemes, and more.

Refer to the Official Red Hat Linux Getting Started Guide to learn more about KDE.

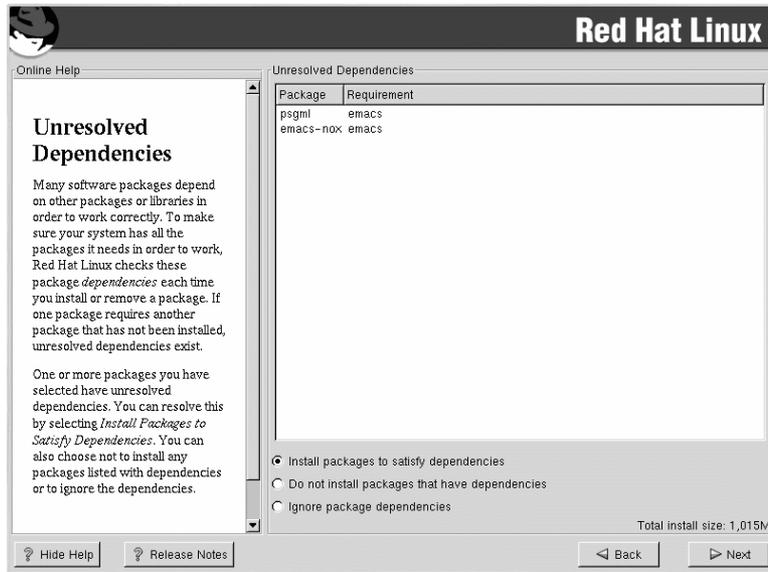
3.22.4 Unresolved Dependencies

Many software packages, in order to work correctly, depend on other software packages that must be installed on your system. For example, many of the graphical Red Hat system administration tools require the `python` and `pythonlib` packages. To make sure your system has all the packages it needs in order to be fully functional, Red Hat Linux checks these package **dependencies** each time you install or remove software packages.

If any package requires another package which you have not selected to install, the program presents a list of these unresolved dependencies and gives you the opportunity to resolve them (see Figure 3–21, *Unresolved Dependencies*).

The **Unresolved Dependencies** screen appears only if you are missing packages that are needed by the packages you have selected. At the bottom of the screen, under the list of missing packages, an **Install packages to satisfy dependencies** checkbox is selected by default. If you leave this checked, the installation program will resolve package dependencies automatically by adding all required packages to the list of selected packages.

Figure 3–21 Unresolved Dependencies



3.23 X Configuration

The first part of X configuration deals with video card configuration.

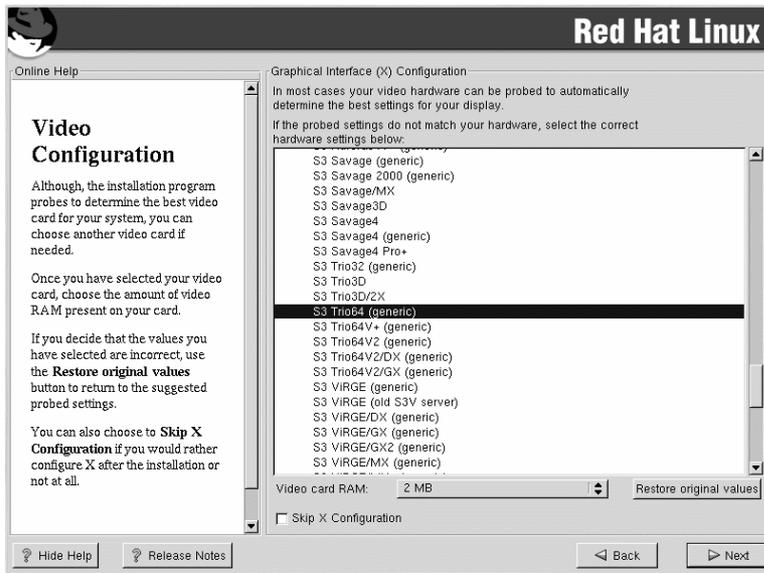
3.23.1 Video Card Configuration

Xconfigurator will now present a list of video cards for you to choose from.

If you decided to install the X Window System packages, you now have the opportunity to configure an X server for your system. If you did not choose to install the X Window System packages, skip ahead to Section 3.25, *Installing Packages*.

If your video card does not appear on the list (see Figure 3–22, *Video Card Setup*), X may not support it. However, if you have technical knowledge about your card, you may choose **Unlisted Card** and attempt to configure it by matching your card's video chipset with one of the available X servers.

Figure 3–22 Video Card Setup



Next, enter the amount of video memory installed on your video card. If you are not sure, please consult the documentation accompanying your video card. You will not damage your video card by choosing more memory than is available, but the X server may not start correctly if you do.

If you decide that the values you have selected are incorrect, you can click the **Restore original values** button to return to the suggested settings.

You can also select **Skip X Configuration** if you would rather configure X after the installation or not at all.

3.24 Preparing to Install

You should now see a screen preparing you for the installation of Red Hat Linux.

WARNING

If, for some reason, you would rather not continue with the installation process, this is your last opportunity to safely cancel the process and reboot your machine. Once you press the Next button, partitions will be written and packages will be installed. If you wish to abort the installation, you should reboot now before your hard drive(s) are rewritten.

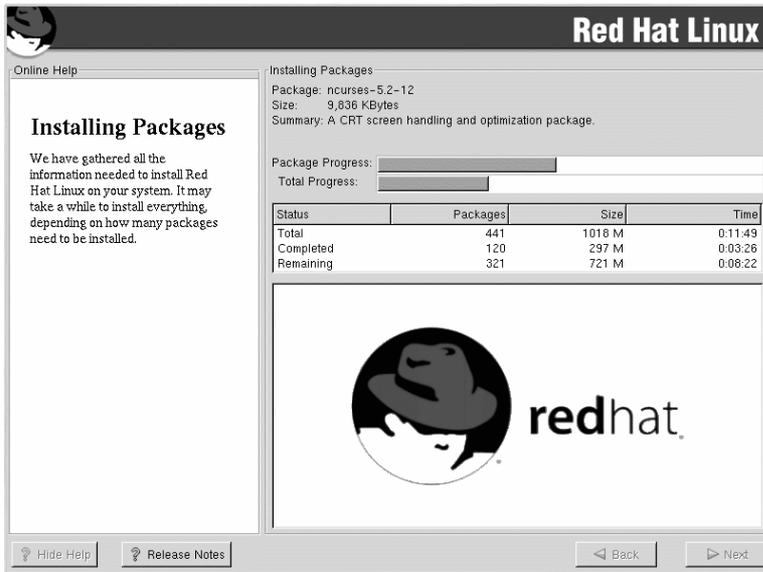
To cancel this installation process, press your computer's Reset button or use the [Control]-[Alt]-[Delete] key combination to restart your machine.

For your reference, a complete log of your installation can be found in `/tmp/install.log` once you reboot your system.

3.25 Installing Packages

At this point there is nothing left for you to do until all the packages have been installed (see Figure 3-23, *Installing Packages*). How quickly this happens depends on the number of packages you have selected and your computer's speed.

Figure 3–23 Installing Packages



3.26 Boot Disk Creation

If you chose to create a boot disk, you should now insert a blank, formatted diskette into your diskette drive (see Figure 3–24, *Creating Your Boot Disk*).

It is highly recommended that you create a boot disk. If your system were not able to boot properly using GRUB or LILO, or a third-party boot loader, a boot disk would enable you to properly boot your Red Hat Linux system.

After a short delay, your boot disk will be created; remove it from your diskette drive and label it clearly. Note that if you would like to create a boot disk after the installation, you will be able to do so. For more information, please see the `mkbootdisk` man page, by typing `man mkbootdisk` at the shell prompt.

If you boot your system with the boot disk (instead of GRUB or LILO), make sure you create a new boot disk if you make any changes to your kernel.

Figure 3–24 Creating Your Boot Disk



3.27 X Configuration

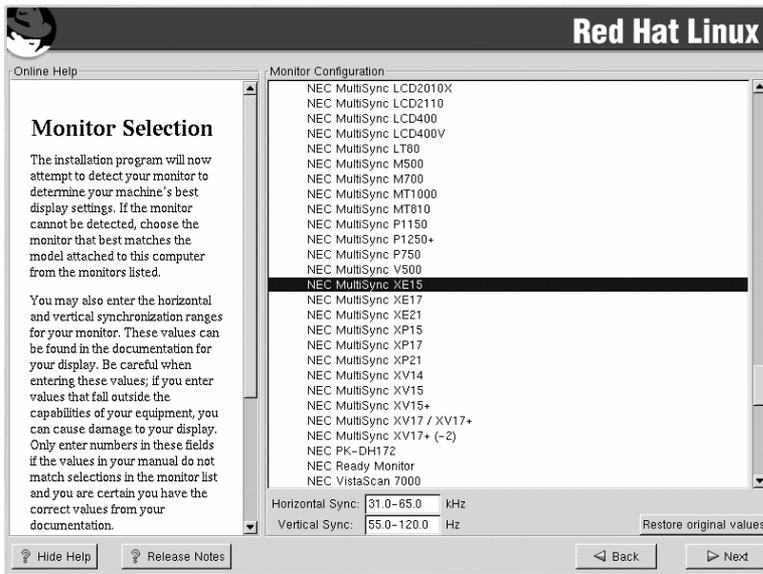
In order to complete X configuration, you must configure your monitor and customize your X settings.

3.27.1 Configuring Your Monitor

If you chose to skip X configuration, go to Section 3.28, *Installation Complete*.

Xconfigurator, the X Window System configuration tool, presents a list of monitors for you to choose from. In the list, you can either use the monitor that is autodetected for you, or choose another monitor.

Figure 3–25 Monitor Selection



If your monitor does not appear on the list, select the most appropriate **Generic** model available. If you do select a **Generic** monitor, Xconfigurator will suggest horizontal and vertical sync ranges. These values are generally available in the documentation which accompanies your monitor, or from your monitor's vendor or manufacturer; please check your documentation to make sure these values are set correctly.



Do not select a monitor *similar* to your monitor unless you are certain that the monitor you are selecting does not exceed the capabilities of your monitor. Doing so may overclock your monitor and damage or destroy it.

The horizontal and vertical ranges that Xconfigurator suggests for your monitor are also displayed on this screen.

If you decide that the values you have selected are incorrect, you can click the **Restore original values** button to return to the suggested settings.

Click **Next** when you have finished configuring your monitor.

3.27.2 Custom Configuration

Choose the correct color depth and resolution for your X configuration. Click **Test Setting** to try out this configuration. If you do not like what you see during the test, click **No** to choose another resolution.

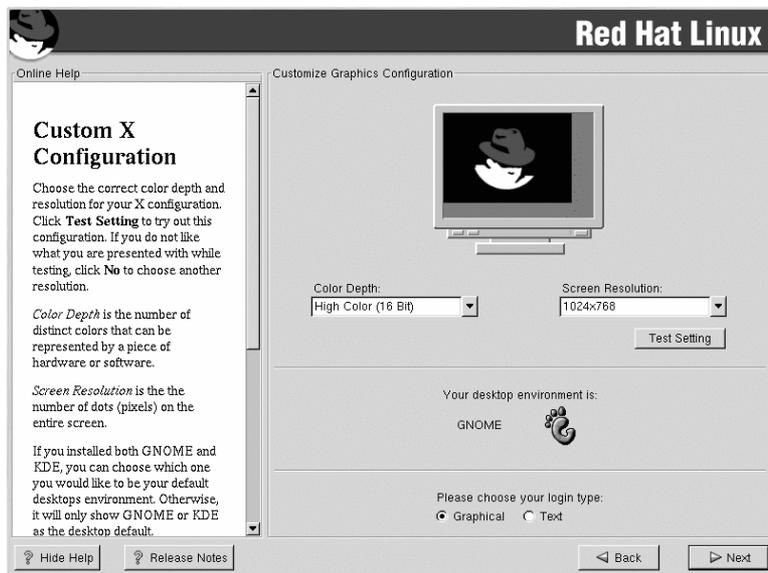
Note

If you need to exit out of the X test, use the [Ctrl]-[Alt]-[Backspace] key combination. Also note that this will not work in some test cases.

We recommend that you test your configuration, to make sure the resolution and color settings are usable.

If you installed both GNOME and KDE, you can choose which one to use as your default desktop environment. If you installed one or the other, it will only show GNOME or KDE as the desktop default.

Figure 3–26 X Customization



You can also choose whether you want to boot your system into a text or graphical environment once Red Hat Linux is installed. Unless you have special needs, booting into a graphical environment (similar to a Windows environment) is recommended. If you choose to boot into a text environment, you will be presented with a command prompt (similar to a DOS environment).

3.28 Installation Complete

Congratulations! Your Red Hat Linux 7.2 installation is now complete!

The installation program will prompt you to prepare your system for reboot. Do not forget to remove any diskette in the diskette drive or CD in the CD-ROM drive. If you did not install a boot loader, you will need to use your boot disk now.

After your computer's normal power-up sequence has completed, you should see the graphical boot loader prompt, at which you can do any of the following things:

- Press [Enter] — causes the default boot entry to be booted.
- Select a boot label, followed by [Enter] — causes the boot loader to boot the operating system corresponding to the boot label. (Press [?] at the text mode boot loader prompt for a list of valid boot labels.)
- Do nothing — after the boot loader's timeout period, (by default, five seconds) the boot loader will automatically boot the default boot entry.

Do whatever is appropriate to boot Red Hat Linux. You should see one or more screens of messages scroll by. Eventually, you should see a `login:` prompt or a GUI login screen (if you installed the X Window System and chose to start X automatically).

Tip

If you are not sure what to do next, we suggest you begin with the *Official Red Hat Linux Getting Started Guide* (available online at <http://www.red-hat.com/support/manuals> if not included as part of your boxed set), which covers topics relating to the basics of your system and is an introduction to using Red Hat Linux.

If you are a more experienced user looking for information on administration topics, you may find the *Official Red Hat Linux Reference Guide* to be more helpful.

If you are looking for information on system configuration, you may find the *Official Red Hat Linux Customization Guide* to be helpful.

4 Installing Red Hat Linux via Text Mode

This release of Red Hat Linux features a graphical, mouse-based installation program, but you can also install Red Hat Linux using a text mode, keyboard-based installation program. This chapter briefly explains how to use the text mode installation program. Here are some recommendations:

- If you are new to Linux installations, read Chapter 3, *Installing Red Hat Linux* first. The main focus of the chapter is the graphical installation process, but most of the concepts apply to the text mode installation as well. After reading that chapter, Section 4.1, *Things You Should Know* will give you more in-depth information regarding the aspects of installing Red Hat Linux that do not apply to the graphical installation process.

Additionally, the *An Introduction to Disk Partitions* appendix in the *Official Red Hat Linux Reference Guide* may be helpful to you, since it discusses disk partition resizing. If you plan to install Red Hat Linux on a disk where another operating system is currently installed, this knowledge will be crucial.

- If you will need PCMCIA support to perform the installation (for example, you are installing on a laptop equipped with a PCMCIA card), you must make PCMCIA boot disks. Chapter 1, *Steps to Get You Started* explains how to do this.
- If you plan to install over a network (via NFS, FTP, or HTTP), you must make a network boot disk. Chapter 1, *Steps to Get You Started* explains how to do this.
- If you have never used the text mode installation program, or need a refresher on its user interface, read the next sections.
- To begin installation without further delay, turn to Section 4.3, *Starting the Installation Program*.

4.1 Things You Should Know

Before attempting to install Red Hat Linux, you should collect information about your system. This information will help prevent any surprises during the installation. You can find most of this information in the documentation that came with your system, or from the system's vendor or manufacturer.

At the end of Chapter 2, *Installation Options and System Requirements Tables* is a table for you to fill out with your specific system requirements, which helps you keep up with any information needed during your installation. Please review the hardware table at Table 2-5, *System Requirements Table*.

The most recent list of supported hardware can be found at <http://hardware.redhat.com>. You should check your hardware against this list before proceeding.

Note

You can perform a text mode installation of Red Hat Linux 7.2 by following the instructions in this chapter. However, if you are installing from a CD-ROM, you might prefer to use the graphical installation mode, which is easy to use and provides a flexible, custom installation mode. For more information on graphical installations, turn to Chapter 3, *Installing Red Hat Linux*.

4.1.1 Basic Hardware Configuration

You should have a basic understanding of the hardware installed in your computer, including the following:

- Hard drive(s) — specifically, the number, size, and type. If you have more than one, it is helpful to know which one is first, second, and so on. It is also good to know if your drives are IDE or SCSI. If you have IDE drives, you should check your computer's BIOS to see if you are accessing them in linear mode. Please refer to your computer's documentation for the proper key sequence to access the BIOS. Note that your computer's BIOS may refer to linear mode by other names, such as "large disk mode." Again, your computer's documentation should be consulted for clarification.
- Memory — the amount of RAM installed in your computer.
- CD-ROM — most importantly, the unit's interface type (IDE, SCSI, or other interface) and, for non-IDE, non-SCSI CD-ROMs, the make and model number. IDE CD-ROMs (also known as AT-API) are the most common type of CD-ROM in recently manufactured, PC-compatible computers.
- SCSI adapter (if one is present) — the adapter's make and model number.
- Network card (if one is present) — the card's make and model number.
- Mouse — the mouse's type (serial, PS/2, or bus mouse), protocol (Microsoft, Logitech, MouseMan, etc.), and number of buttons; also, for serial mice, the serial port it is connected to.

On many newer systems, the installation program is able to automatically identify most hardware. However, it is a good idea to collect this information anyway, just to be sure.

Learning About Your Hardware with Windows

If your computer is already running Windows 9x, you can use the following steps to get additional configuration information:

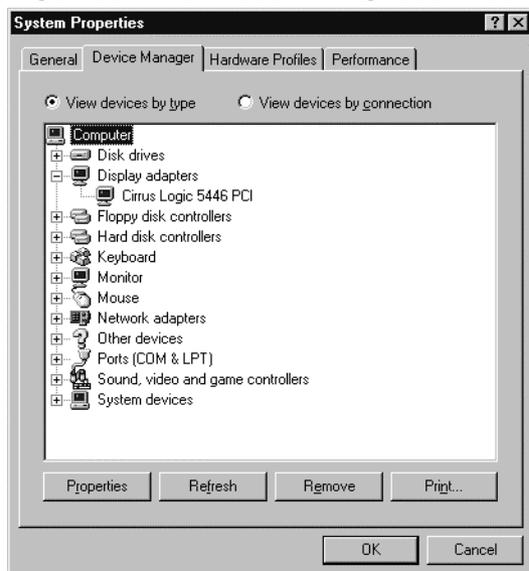
Figure 4–1 Windows System Properties



- In Windows, click on the **My Computer** icon using the secondary (normally the right) mouse button. A pop-up menu should appear.
- Select **Properties**. The **System Properties** window should appear. Note the information listed under **Computer** — in particular the amount of RAM listed.
- Click on the **Device Manager** tab. You will then see a graphical representation of your computer's hardware configuration. Make sure the **View devices by type** radio button is selected.

At this point, you can either double-click on the icons (or single-click on the plus sign **+**) to look at each entry in more detail. Look under the following icons for more information:

Figure 4–2 Device Manager Under Windows 95



- **Disk drives** — the type (IDE or SCSI) of hard drive will be found here. (IDE drives will normally include the word "IDE," while SCSI drives will not.)
- **Hard disk controllers** — information about your hard drive controller.
- **CDROM** — information about any CD-ROM drives connected to your computer.

Note

In some cases, there may be no CD-ROM icon, yet your computer has a functioning CD-ROM drive. This is normal, depending on how Windows was originally installed. In this case, you may be able to learn additional information by looking at the CD-ROM driver loaded in your computer's `config.sys` file.

- **Mouse** — the type of mouse present on your computer.
 - **Display adapters** — if you are interested in running the X Window System, you should write down the information you find here.
-

- **Sound, video and game controllers** — if your computer has sound capabilities, you will find more information about them here.
- **Network adapters** — information on your computer's network card (if you have one).
- **SCSI controllers** — if your computer uses SCSI peripherals, you will find additional information on the SCSI controller here.

This method is not a complete substitute for opening your computer's case and physically examining each component. However, in many cases it can provide sufficient information to continue with the installation.

Note

This information can also be printed by clicking on the **Print** button. A second window will appear, allowing you to choose the printer, as well as the type of report. The **All Devices and System Summary** report type is the most complete.

4.1.2 Video Configuration

If you will be installing the X Window System, you should also be familiar with the following:

- Your video card — the card's make and model number (or the video chipset it uses) and the amount of video RAM it has. (Most PCI-based cards are auto-detected by the installation program.)
- Your monitor — the unit's make and model number, along with allowable ranges for horizontal and vertical refresh rates. (Newer models may be auto-detected by the installation program.)

4.1.3 Network-related Information

If you are connected to a network, be sure you know the following:

- IP address — usually represented as a set of four numbers separated by dots, such as 10 . 0 . 2 . 15.
 - Netmask — another set of four numbers separated by dots; an example netmask would be 255 . 255 . 248 . 0.
 - Gateway IP address — another set of four dot-separated numbers; for example, 10 . 0 . 2 . 254.
 - One or more name server IP addresses — one or more sets of dot-separated numbers; for example, 10 . 0 . 2 . 1 might be the address of a name server.
 - Domain name — the name your organization uses; for example, Red Hat has a domain name of redhat . com.
-

- Hostname — the name assigned to your individual system; for example, a computer might be named pooh.

Note

The information provided here is as an example only! Do *not* use it when you install Red Hat Linux! If you do not know the proper values for your network, ask your network administrator.

4.2 The Installation Program User Interface

The Red Hat Linux text mode installation program uses a screen-based interface that includes most of the on-screen "widgets" commonly found on graphical user interfaces. Figure 4–3, *Installation Program Widgets as seen in Configure TCP/IP* and Figure 4–4, *Installation Program Widgets as seen in Disk Druid* illustrate the screens you will see.

Figure 4–3 Installation Program Widgets as seen in Configure TCP/IP

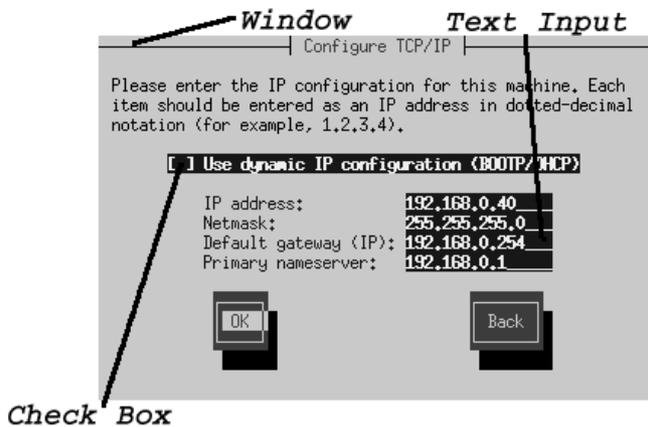
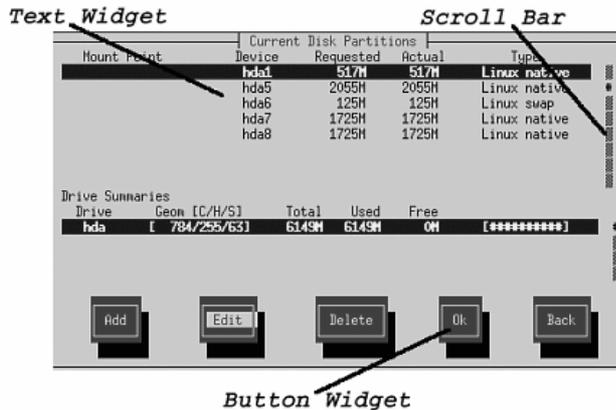


Figure 4–4 Installation Program Widgets as seen in Disk Druid



Here is a list of the most important widgets shown in Figure 4–3, *Installation Program Widgets as seen in Configure TCP/IP* and Figure 4–4, *Installation Program Widgets as seen in Disk Druid*:

- **Window** — windows (usually referred to as **dialogs** in this manual) will appear on your screen throughout the installation process. At times, one window may overlay another; in these cases, you can only interact with the window on top. When you are finished in that window, it will disappear, allowing you to continue working in the window underneath.
- **Text Input** — text input lines are regions where you can enter information required by the installation program. When the cursor rests on a text input line, you may enter and/or edit information on that line.
- **Checkbox** — checkboxes allow you to select or deselect a feature. The box displays either an asterisk (selected) or a space (unselected). When the cursor is within a checkbox, press [Space] to select an unselected feature or to deselect a selected feature.
- **Text widget** — text widgets are regions of the screen for the display of text. At times, text widgets may also contain other widgets, such as checkboxes. If a text widget contains more information than can be displayed in the space reserved for it, a scroll bar appears; if you position the cursor within the text widget, you can then use the [Up] and [Down] arrow keys to scroll through all the information available. Your current position is shown on the scroll bar by a # character, which moves up and down the scroll bar as you scroll.

- **Button widget** — button widgets are the primary method of interacting with the installation program. You progress through the windows of the installation program by navigating these buttons, using the [Tab] and [Enter] keys. Buttons can be selected when they are highlighted.
- **Cursor** — although not a widget, the cursor is used to select (and interact) with a particular widget. As the cursor is moved from widget to widget, it may cause the widget to change color, or you may only see the cursor itself positioned in or next to the widget. In Figure 4–3, *Installation Program Widgets as seen in **Configure TCP/IP***, the cursor is positioned on the **OK** button. Figure 4–4, *Installation Program Widgets as seen in **Disk Druid*** shows the cursor on the **Edit** button.

4.2.1 Using the Keyboard to Navigate

Navigation through the installation dialogs is performed through a simple set of keystrokes. To move the cursor, use [Left], [Right], [Up], and [Down] arrow keys. Use [Tab], and [Alt]-[Tab] to cycle forward or backward through each widget on the screen. Along the bottom, most screens display a summary of available cursor positioning keys.

To "press" a button, position the cursor over the button (using [Tab], for example) and press [Space] or [Enter]. To select an item from a list of items, move the cursor to the item you wish to select and press [Enter]. To select an item with a checkbox, move the cursor to the checkbox and press [Space] to select an item. To deselect, press [Space] a second time.

Pressing [F12] accepts the current values and proceeds to the next dialog; it is equivalent to pressing the **OK** button.



Unless a dialog box is waiting for your input, do not press any keys during the installation process (doing so may result in unpredictable behavior).

4.3 Starting the Installation Program

The following methods can be used to start the installation:

- Insert a boot diskette that you have created (or a network boot disk, or PCMCIA boot disks, that you have created) into the primary diskette drive and reboot your computer.
 - Insert the Red Hat Linux CD 1 into the drive and reboot, if your computer can boot from the CD-ROM drive.
-

- Boot MS-DOS, and start a program in the `dosutils` directory of the Red Hat Linux CD-ROM named `autoboot.bat` (this will work from DOS only; it will not work in a DOS window started from within Windows).

While the installation program loads, messages will scroll on your screen. When the installation program has loaded, this prompt appears:

```
boot:
```

4.3.1 Text Mode Boot Options

If you press [Enter] at the `boot:` prompt, or if you take no action within the first minute after the `boot:` prompt appears, the graphical installation program will start. Pressing one of the help screen function keys as described above disables this autostart feature.

To start the text mode installation program, before pressing [Enter], type:

```
boot: text
```

If the installation program does not properly detect your hardware, you may need to restart the installation in "expert" mode. To start an expert mode installation, type:

```
boot: text expert
```

Expert mode disables most hardware probing, and gives you the option of entering options for the drivers loaded during the installation.

Note

The initial boot messages will not contain any references to SCSI or network cards. This is normal; these devices are supported by modules that are loaded during the installation process.

Note that the command to start a serial installation has changed. If you must perform the installation in serial mode, use the following command:

```
boot: linux text console=<device>
```

In this command, `<device>` should be the device you are using (such as `ttyS0` or `ttyS1`).

You can also pass options to the kernel as you are booting the installation program. For example, to instruct the kernel to use all the RAM in a 128 MB system, enter:

```
boot: linux text mem=128M
```

4.3.2 Displaying Online Help

Once the installation program is loaded into memory, you can obtain information about the installation process and options by pressing [F1] through [F6]. For example, press [F2] to see general information about the online help screens.

4.4 Installation Cross-reference Table

Most text mode installation screens can be cross-referenced with their GUI screen counterparts. This table lists the installation screens in order and where you can go to get the necessary information for each part of the installation.

For those screens which do not have adequate GUI counterparts, installation-related instructions and screenshots will be provided in this chapter.

Table 4–1 Installation Cross-reference Table

Text Mode Screen	Text Mode Reference Point
Language Screen	Section 3.5, <i>Language Selection</i>
Keyboard Screen	Section 3.6, <i>Keyboard Configuration — Layout</i>
Installation Method	Section 3.3, <i>Selecting an Installation Method</i>
Identify Disk Partition to Install From	Section 4.5, <i>Identify Disk Partition to Install From</i>
Installing over a Network	Section 4.6, <i>Installing over a Network</i>
Mouse Selection	Section 3.7, <i>Mouse Configuration</i>
Welcome Screen	Section 3.8, <i>Welcome to Red Hat Linux</i>
Installation Type	Section 3.9, <i>Install Options</i>
Upgrade Only — Customize Packages to Upgrade	Section A.4, <i>Customizing Your Upgrade</i>
Disk Partitioning Setup	Section 3.10, <i>Disk Partitioning Setup</i>
Automatic Partitioning	Section 3.11, <i>Automatic Partitioning</i>
Disk Druid	Section 3.12, <i>Partitioning Your System</i>
fdisk	Section 3.13, <i>Partitioning with fdisk</i>
Boot Loader Installation	Section 3.14, <i>Boot Loader Installation</i>

Text Mode Screen	Text Mode Reference Point
GRUB Password	Section 3.15, <i>GRUB Password</i>
Boot Loader Configuration — Where to install boot loader, kernel options, boot labels	Section 3.14, <i>Boot Loader Installation</i>
Hostname Configuration	Section 3.16, <i>Network Configuration</i>
Firewall Configuration	Section 3.17, <i>Firewall Configuration</i>
Network Configuration	Section 3.16, <i>Network Configuration</i>
Language Support and Default Language	Section 3.18, <i>Language Support Selection</i>
Time Zone Selection	Section 3.19, <i>Time Zone Configuration</i>
Root Password	Section 3.20, <i>Account Configuration</i>
Add User/User Account Setup	Section 3.20, <i>Account Configuration</i>
Authentication Configuration	Section 3.21, <i>Authentication Configuration</i>
Package Installation (Group, Individual, Dependencies)	Section 3.22, <i>Package Group Selection</i>
Video Card Configuration	Section 3.23, <i>X Configuration</i>
Package Installation	Section 3.24, <i>Preparing to Install</i> and Section 3.25, <i>Installing Packages</i>
Boot Disk Creation	Section 3.26, <i>Boot Disk Creation</i>
Monitor Configuration	Section 3.27.1, <i>Configuring Your Monitor</i>
Custom X Configuration	Section 3.27.2, <i>Custom Configuration</i>
Installation Complete	Section 3.28, <i>Installation Complete</i>

4.5 Identify Disk Partition to Install From

Note

Hard drive installations only work from ext2, ext3, or FAT filesystems. If you have a filesystem other than those listed here, such as reiserfs, you will not be able to perform a hard drive installation.

Hard drive installations require the use of the ISO (or CD-ROM) images rather than copying an entire installation tree. After placing the required ISO images (the binary Red Hat Linux CD-ROMs) in a directory, choose to install from the hard drive. You will then point the installation program at that directory to perform the installation.

Verifying that the ISO images are intact before you attempt an installation, will help to avoid problems that are often encountered during a hard drive installation. To verify the ISO images are intact prior to performing an installation, use an `md5sum` program (many `md5sum` programs are available for various operating systems). An `md5sum` program should be available on the same server as the ISO images.

The **Select Partition** screen (Figure 4–5, *Selecting Partition Dialog for Hard Drive Installation*) applies only if you are installing from a disk partition (that is, if you selected **Hard Drive** in the **Installation Method** dialog). This dialog allows you to name the disk partition and directory from which you are installing Red Hat Linux.

Enter the device name of the partition containing the Red Hat ISO images. There is also a field labeled **Directory holding images**. If the ISO images are not in the root directory of that partition, enter the path to the ISO images (for example, if the ISO images are in `/test/new/RedHat`, you would enter `/test/new`).

After you have identified the disk partition, you will next see the **Welcome** dialog. See Table 4–1, *Installation Cross-reference Table* for more information.

Figure 4–5 Selecting Partition Dialog for Hard Drive Installation



4.6 Installing over a Network

If you are performing a network installation, the **Configure TCP/IP** dialog appears; for an explanation of this dialog, go to Section 3.16, *Network Configuration* and then return here.

4.6.1 Setting Up the Server

Because the Red Hat Linux 7.2 installation program is capable of installing Red Hat Linux from multiple CD-ROMs, if you intend to support NFS, FTP, or HTTP installations you must copy the RedHat directory from each CD-ROM comprising Red Hat Linux 7.2 onto a disk drive:

- Insert CD-ROM 1 and execute the following commands:
 - `mount /mnt/cdrom`
 - `cp -var /mnt/cdrom/RedHat /location/of/disk/space`
Where */location/of/disk/space* is a directory you create such as */export/7.2/*.
 - `umount /mnt/cdrom`
- Insert CD-ROM 2 and execute the following commands:
 - `mount /mnt/cdrom`

```
- cp -var /mnt/cdrom/RedHat /location/of/disk/space
```

Where */location/of/disk/space* is a directory you create such as */export/7.2/*.

```
- umount /mnt/cdrom
```

- Next, make */location/of/disk/space* accessible to the installation program (for example, exporting it for NFS installations).

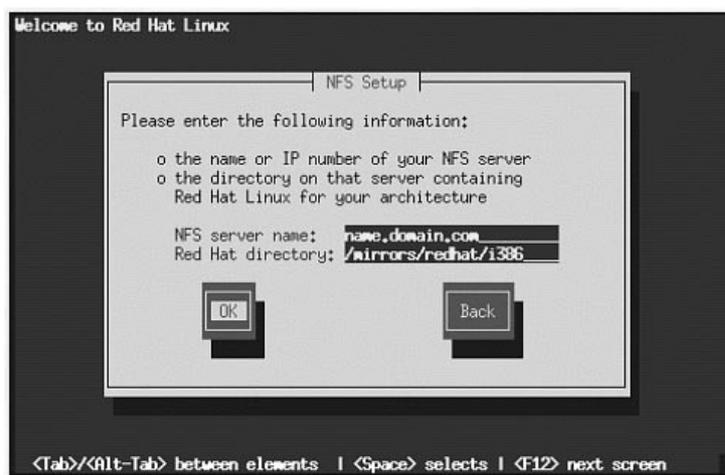
```
Export /location/of/disk/space
```

If you are not sure how to do this, refer to the *Official Red Hat Linux Customization Guide* and the *Official Red Hat Linux Reference Guide* for more information.

4.6.2 NFS Setup

The NFS dialog (Figure 4–6, *NFS Setup Dialog*) applies only if you are installing from an NFS server (if you booted from a network or PCMCIA boot disks and selected **NFS Image** in the **Installation Method** dialog).

Figure 4–6 NFS Setup Dialog



Enter the fully-qualified domain name or IP address of your NFS server. For example, if you are installing from a host named `eastcoast` in the domain `redhat.com`, enter `eastcoast.redhat.com` in the **NFS Server** field.

Next, enter the name of the exported directory. If you followed the setup described in Section 4.6, *Installing over a Network*, you would enter the directory `/location/of/disk/space/` which contains the RedHat directory.

If the NFS server is exporting a mirror of the Red Hat Linux installation tree, enter the directory which contains the RedHat directory. (If you do not know this directory path, ask your system administrator.) For example, if your NFS server contains the directory `/mirrors/redhat/i386/RedHat`, enter `/mirrors/redhat/i386`.

Next you will see the **Welcome** dialog. See Table 4–1, *Installation Cross-reference Table* for more information.

4.6.3 FTP Setup

The FTP dialog (Figure 4–7, *FTP Setup Dialog*) applies only if you are installing from an FTP server (if you selected **FTP** in the **Installation Method** dialog). This dialog allows you to identify the FTP server from which you are installing Red Hat Linux.

Figure 4–7 FTP Setup Dialog



Enter the name or IP address of the FTP site you are installing from, and the name of the directory containing the RedHat installation files for your architecture. For example, if the FTP site contains the directory `/mirrors/redhat/i386/RedHat`, enter `/mirrors/redhat/i386`.

If everything has been specified properly, a message box appears indicating that `base/hdlist` is being retrieved.

Next you will see the **Welcome** dialog. See Table 4–1, *Installation Cross-reference Table* for more information.

4.6.4 HTTP Setup

The HTTP dialog (Figure 4–8, *HTTP Setup Dialog*) applies only if you are installing from an HTTP server (if you selected **HTTP** in the **Installation Method** dialog). This dialog prompts you for information about the HTTP server from which you are installing Red Hat Linux.

Figure 4–8 HTTP Setup Dialog



Enter the name or IP address of the HTTP site you are installing from, and the name of the directory there containing the RedHat installation files for your architecture. For example, if the HTTP site contains the directory `/mirrors/redhat/i386/RedHat`, enter `/mirrors/redhat/i386`.

If everything has been specified properly, a message box appears indicating that `base/hdlist` is being retrieved.

Next you will see the **Welcome** dialog. See Table 4–1, *Installation Cross-reference Table* for more information.

A Upgrading Your Current System

This appendix walks you through a typical Red Hat Linux 7.2 upgrade.

A.1 What it Means to Upgrade

The installation process for Red Hat Linux 7.2 includes the ability to upgrade from prior versions of Red Hat Linux (version 3.0.3 and later) which are based on RPM technology.

Upgrading your system installs the modular 2.4.x kernel as well as updated versions of the packages which are currently installed on your system.

The upgrade process preserves existing configuration files by renaming them with an `.rpm_save` extension (for example, `sendmail.cf.rpm_save`). The upgrade process also creates a log of its actions in `/tmp/upgrade.log`. As software evolves, configuration file formats can change, so you should carefully compare your original configuration files to the new files before integrating your changes.

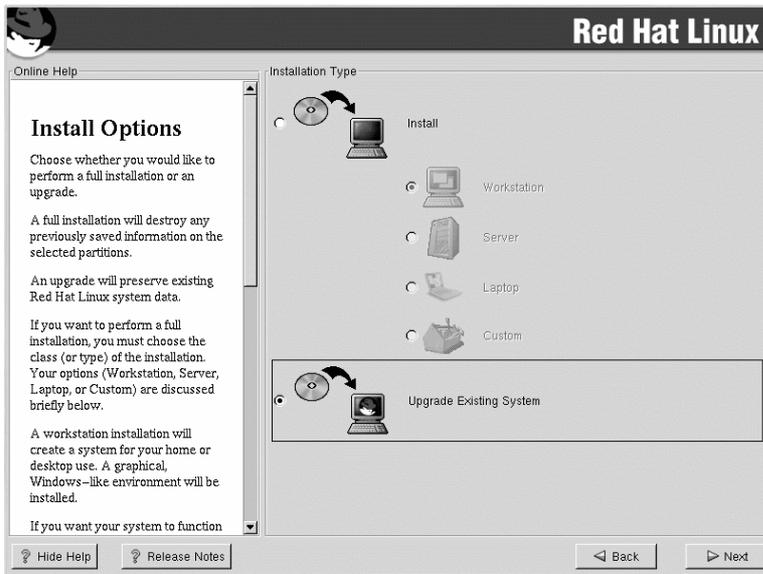
Note

Some upgraded packages may require the installation of other packages for proper operation. If you choose to customize your packages to upgrade, you may be required to resolve dependency problems. Otherwise, the upgrade procedure takes care of these dependencies, but it may need to install additional packages which are not on your system.

A.2 Upgrading Your System

At this point, you should have chosen **Upgrade** as your preferred installation type (see Figure A-1, *Choosing Install or Upgrade*).

Figure A–1 Choosing Install or Upgrade



A.3 Upgrading Your Filesystem

The installation program has detected the ext2 filesystem on your Red Hat Linux system. At this time you can choose to retain your current ext2 filesystem or migrate to the ext3 filesystem.

It is recommended, but not required, that you choose to migrate to the ext3 filesystem.

If you choose to migrate to the ext3 filesystem, existing system data will not be modified.

The following is a brief description of the ext2 and ext3 filesystems, and how they can be utilized.

- **ext2** — An ext2 filesystem supports standard Unix file types (regular files, directories, symbolic links, etc). It provides the ability to assign long file names, up to 255 characters. Versions prior to Red Hat Linux 7.2 used ext2 filesystems by default.
- **ext3** — The ext3 filesystem is based on the ext2 filesystem and has one main advantage — journaling. Using a journaling filesystem reduces time spent recovering a filesystem after a crash as there is no need to `fsck`¹ the filesystem.

¹ The `fsck` application is used to check and optionally repair one or more Linux filesystems.

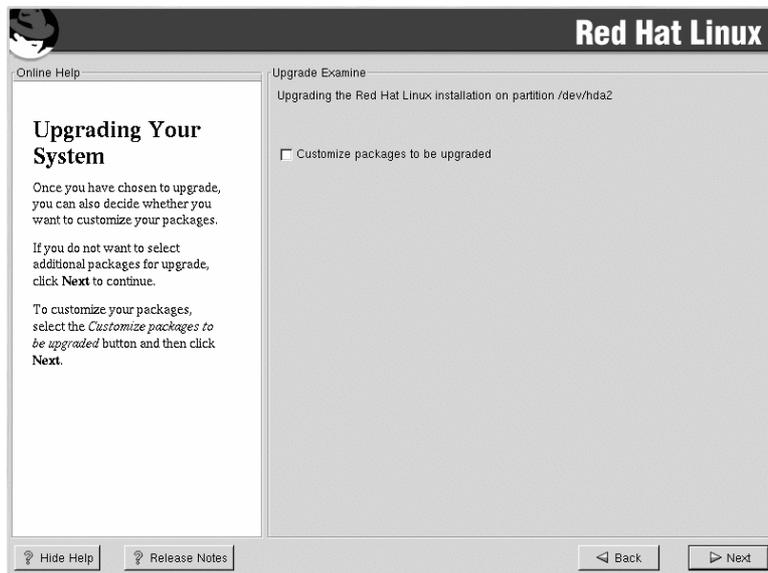
A.4 Customizing Your Upgrade

Do you want to choose the packages to be upgraded or let the installation program perform an automated installation (see Figure A-2, *Upgrade Customization*)?

To let the installation program begin the upgrade process for you, make sure **Customize packages to be upgraded** is *not* selected and click **Next** (see Section A.8, *Upgrading Packages*).

To customize your upgrade packages, select this option and then click **Next**.

Figure A-2 Upgrade Customization



A.5 Installing a Boot Loader

In order to be able to boot your Red Hat Linux system, you usually need to install a boot loader. In Red Hat Linux 7.2 you have two options, GRUB or LILO (the *Linux LOader*). You may install the boot loader in one of two places:

The master boot record (MBR)

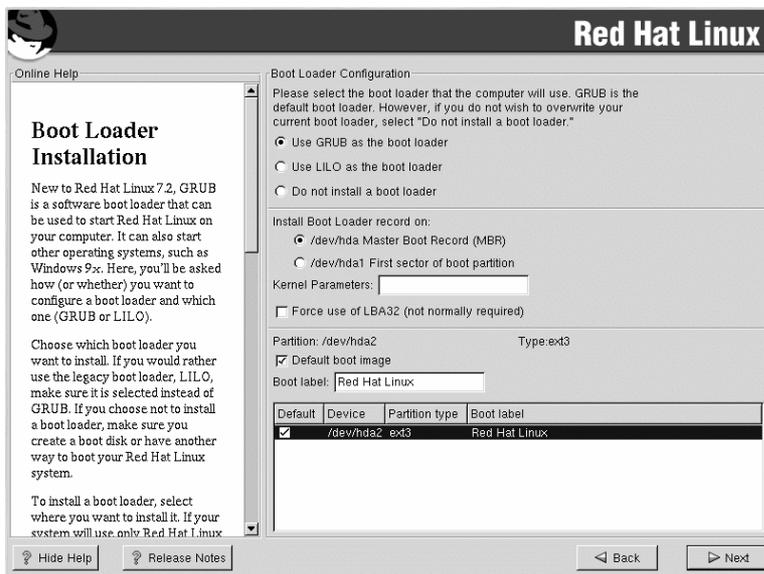
The recommended place to install a boot loader, unless the MBR already starts another operating system loader, such as System Commander or OS/2's Boot Manager. The MBR is a special area on your hard drive that is automatically loaded by your computer's BIOS, and is the earliest point

at which the boot loader can take control of the boot process. If you install it in the MBR, when your machine boots, GRUB (or LILO) will present a boot prompt. You can then boot Red Hat Linux or any other operating system that you have configured the boot loader to boot.

The first sector of your root partition

Recommended if you are already using another boot loader on your system (such as OS/2's Boot Manager). In this case, your other boot loader will take control first. You can then configure that boot loader to start GRUB (or LILO), which will then boot Red Hat Linux.

Figure A-3 Boot Loader Installation



Select where you would like GRUB (or LILO) to be installed on your system. If your system will use only Red Hat Linux, you should choose the MBR. For systems with Windows 95/98, you should also install the boot loader to the MBR so that it can boot both operating systems.



If you choose not to install GRUB or LILO for any reason, you will not be able to boot your Red Hat Linux system directly, and you will need to use another boot method (such as a boot diskette). Use this option only if you are sure you have another way of booting your Red Hat Linux system!

If you wish to add default options to GRUB or LILO's boot command, enter them into the **Kernel parameters** field. Any options you enter will be passed to the Linux kernel every time it boots.

The **Force use of LBA32 (not normally required)** option allows you to exceed the 1024 cylinder limit for the `/boot` partition. If you have a system which supports the LBA32 extension for booting operating systems above the 1024 cylinder limit, you want to place your `/boot` partition above this limit, and the installation program has not already detected this extension from your BIOS, you should select this option.

Every bootable partition is listed, including partitions used by other operating systems. The partition holding your Red Hat Linux system's root filesystem will have a **Boot label** of `linux`. Other partitions may also have boot labels. If you would like to add boot labels for other partitions (or change an existing boot label), click once on the partition to select it. Once selected, you can change the boot label.

Note

The **Boot label** column lists what you must enter at the boot prompt in order to boot the desired operating system. However, if you forget the boot labels defined on your system, you can always press [Tab] at the prompt to display a list of defined boot labels.

A.5.1 Rescue Mode

If you need to use rescue mode, there are several options available to you.

- Using the CD-ROM to boot, type **linux rescue** at the `boot :` prompt.
 - Using the network boot disk, type **linux rescue** at the `boot :` prompt. You will then be prompted to retrieve the rescue image from the network.
 - Using the boot disk included with the Red Hat Linux boxed set, type **linux rescue** at the `boot :` prompt. You then pick an installation method and choose a valid installation tree to load from.
-

For more information regarding rescue mode, refer to *Official Red Hat Linux Customization Guide*.

A.5.2 Alternative Boot Loaders

If you do not wish to use GRUB or LILO to boot your Red Hat Linux system, you have several alternatives:

Boot disk

As previously stated, you can use the boot disk created by the installation program (if you elected to create one).

LOADLIN

You can load Linux from MS-DOS. Unfortunately, it requires a copy of the Linux kernel (and an initial RAM disk, if you have a SCSI adapter) to be available on an MS-DOS partition. The only way to accomplish this is to boot your Red Hat Linux system using some other method (for example, from LILO on a diskette) and then copy the kernel to an MS-DOS partition. LOADLIN is available from <ftp://metalab.unc.edu/pub/Linux/system/boot/dualboot/> and associated mirror sites.

SYSLINUX

SYSLINUX is an MS-DOS program very similar to LOADLIN. It is also available from <ftp://metalab.unc.edu/pub/Linux/system/boot/loaders/> and associated mirror sites.

Some commercial boot loaders

You can load Linux using commercial boot loaders. For example, System Commander and Partition Magic are able to boot Linux (but still require GRUB or LILO to be installed in your Linux root partition).

A.5.3 SMP Motherboards, GRUB, and LILO

This section is specific to SMP motherboards only. If the installation program detects an SMP motherboard on your system, it will automatically create two `/boot/grub/grub.conf` or `/etc/lilo.conf` entries (depending on the boot loader you installed), rather than the usual single entry.

The two entries in `grub.conf` will be `Red Hat Linux (kernel version)` and `Red Hat Linux (kernel versions-smp)`. The `Red Hat Linux (kernel version-smp)` will boot by default. However, if you have trouble with the SMP kernel, you can elect to boot the `Red Hat Linux (kernel version)` entry instead. You will retain all the functionality as before, but you will only be operating with a single processor.

The two entries in `lilo.conf` will be `linux` and `linux-up`. The `linux` will boot by default. However, if you have trouble with the SMP kernel, you can elect to boot the `linux-up` entry instead. You will retain all the functionality as before, but you will only be operating with a single processor.

A.6 GRUB Password

If you did not install GRUB as your boot loader, skip to Section A.7, *Selecting Packages to Upgrade*.

If you are installing GRUB as your boot loader, you should create a password to protect your system. Users can pass options to the kernel which can compromise your system security.

Figure A-4 GRUB Password



To enhance your system security, you should select **Use a Grub Password**.

Once selected, enter a password and confirm it.

A.7 Selecting Packages to Upgrade

On this screen, you can choose which packages you would like to upgrade (see Figure A-5, *Individual Package Selection*).

You can choose to view the individual packages in **tree view** or **flat view**.

Tree view allows you to see the packages grouped by application type.

Flat view allows you to see all of the packages in an alphabetical listing on the right of the screen.

Using **Tree view**, you see a listing of package groups. When you expand this list and pick one group, the list of packages in that group appears in the panel on the right.

To sort alphabetically, click on the **Package** tab. To sort packages by size, click on the **Size (MB)** tab.

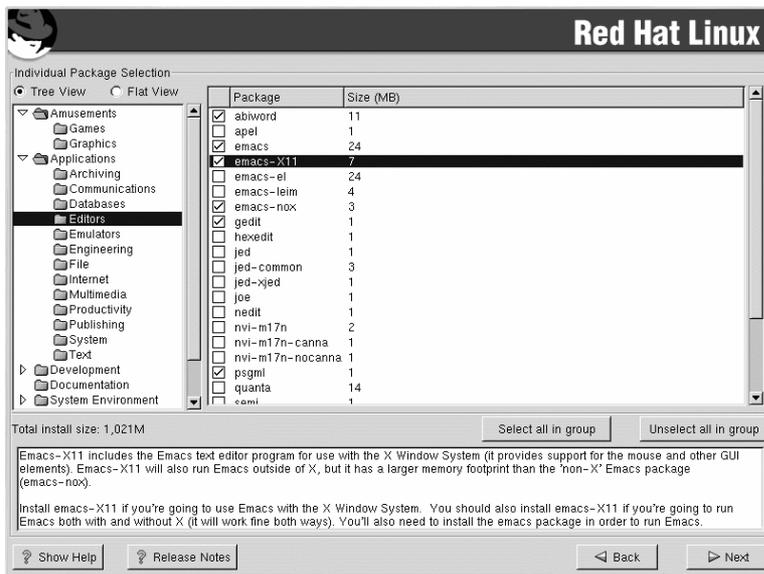
To select an individual package, double-click the checkbox beside the package name. A check mark in the box means that a package has been selected.

For more information about a specific package, click on the individual package name. The package information will appear at the bottom of the screen.

You can also select or deselect all packages listed within a particular group, by clicking on the **Select all in group** or **Unselect all in group** buttons.

Certain packages (for example, the kernel and certain libraries) are required for every Red Hat Linux system and are not available to select or deselect. These base packages are selected by default.

Figure A-5 Individual Package Selection

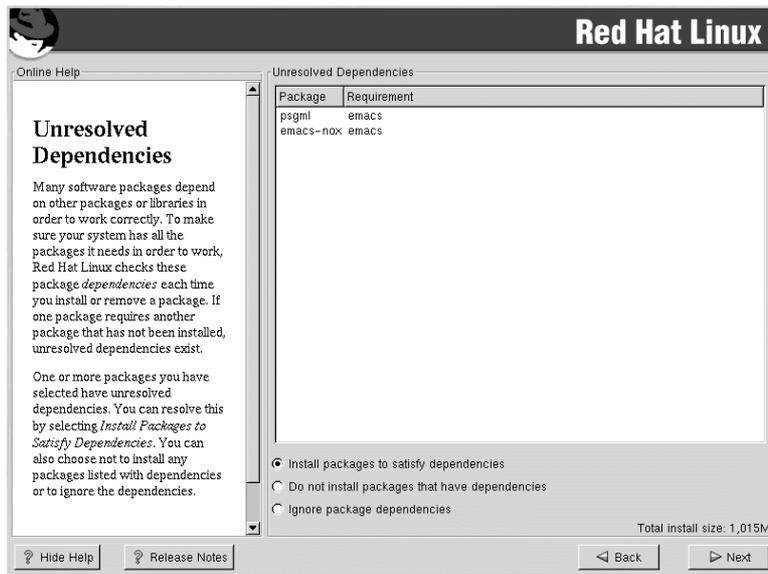


A.7.1 Unresolved Dependencies

If any package requires another package which you have not selected to install, the program presents a list of these **unresolved dependencies** and gives you the opportunity to resolve them (see Figure A–6, *Unresolved Dependencies*).

The **Unresolved Dependencies** screen appears only if you are missing packages that are needed by your customized package selection. At the bottom of the screen, under the list of missing packages, an **Install packages to satisfy dependencies** checkbox is selected by default. If you leave this checked, the installation program will resolve package dependencies automatically by adding all required packages to the list of selected packages.

Figure A–6 Unresolved Dependencies



A.8 Upgrading Packages

At this point there is nothing left for you to do until all the packages have been upgraded or installed (see Figure A–7, *Installing Packages*).

Figure A-7 Installing Packages



A.9 Upgrade Complete

Congratulations! Your Red Hat Linux 7.2 upgrade is now complete!

You will now be prompted to prepare your system for reboot. Do not forget to remove any diskette in the floppy drive or CD in the CD-ROM drive. If you do not have GRUB or LILO installed, you will need to use your boot disk now.

Tip

If you need a quick review of some of the basic concepts of Red Hat Linux refer to the *Official Red Hat Linux Getting Started Guide*.

For information dealing with system configuration and administration, refer to the *Official Red Hat Linux Reference Guide*.

B Removing Red Hat Linux

To uninstall Red Hat Linux from your system, you will need to remove the GRUB or LILO information from your master boot record (MBR).

In DOS, NT, and Windows 95 you can use `fdisk` to create a new MBR with the "undocumented" flag `/mbr`. This will ONLY rewrite the MBR to boot the primary DOS partition. The command should look like the following:

```
fdisk /mbr
```

If you need to remove Linux from a hard drive, and have attempted to do this with the default DOS `fdisk`, you will experience the "Partitions exist but they do not exist" problem. The best way to remove non-DOS partitions is with a tool that understands partitions other than DOS.

You can do this with the installation media by typing **linux expert** at the `boot :` prompt:

```
boot: linux expert
```

Select `install` (versus `upgrade`) and at the point when you should partition the drive, choose `fdisk`. In `fdisk`, type `[p]` to print out the partition numbers, and remove the Linux partitions with the `[d]` command. When you are satisfied with the changes you have made, you can quit with a `[w]` and the changes will be saved to disk. If you deleted too much, type `[q]` and no changes will be made.

Once you have removed the Linux partitions, you can reboot your computer using `[Control]-[Alt]-[Delete]` instead of continuing with the install.

C Getting Technical Support

C.1 Remember to Sign Up

If you have an official edition of Red Hat Linux 7.2, please remember to sign up for the benefits you are entitled to as a Red Hat customer.

You will be entitled to any or all of the following benefits, depending upon the Official Red Hat Linux product you purchased:

- Official Red Hat support — Get help with your installation questions from Red Hat, Inc.'s support team.
- Red Hat Network — Easily update your packages and receive security notices that are customized for your system. Go to <http://rhn.redhat.com> for details.
- Under the Brim: The Official Red Hat E-Newsletter — Every month, get the latest news and product information directly from Red Hat.

To sign up, go to <http://www.redhat.com/apps/activate/>. You will find your **Product ID** on the Registration Information Card in your Official Red Hat Linux boxed set.

C.2 An Overview of Red Hat Support

Note

Refer to the service level agreement at <http://www.redhat.com/support/sla/> for more information on how Red Hat's technical support staff can assist you.

Red Hat provides installation assistance for Official Red Hat Linux boxed set products and covers installation on a single computer. This assistance is intended to help customers successfully install Red Hat Linux. Assistance with installation is offered via telephone and the Web. Note, telephone support is only available with certain Red Hat Linux products. Please check your boxed set to see what types of support are available to you.

Red Hat Support will attempt to answer any questions you may have before the installation process is initiated. This includes the following:

- Hardware compatibility questions
- Basic hard drive partitioning strategies

Red Hat, Inc. Support can also provide assistance during the installation process:

- Getting supported hardware recognized by the Red Hat Linux operating system
- Assistance with drive partitioning
- Configuring Red Hat Linux and Windows 9x, ME, NT, or 2000 to dual-boot using the Linux boot loaders GRUB or LILO (please note that third party boot loaders and partitioning software are not supported)

We can also help you with basic post-installation tasks, such as:

- Successfully configuring the X Window System using Xconfigurator
- Configuring a local parallel port printer to print text
- Configuring a mouse

Our installation assistance service is designed to get Red Hat Linux running on your system as quickly and as easily as possible. However, there are many other things that you may want to do with your Red Hat Linux system, from compiling a custom kernel to setting up a Web server, which are not covered.

For assistance with these tasks, there is a wealth of online information available in the form of HOWTO documents, Linux-related websites, and commercial publications. The various Linux HOWTO documents are included with Red Hat Linux on the Documentation CD in the `/HOWTOS` directory. These HOWTOS are provided in text files that can easily be read from within Red Hat Linux and other operating systems.

A large number of Linux-related websites are available. The best starting point for finding information on Red Hat Linux is the Red Hat, Inc. website:

`http://www.redhat.com/`

Many Linux-related books are available. If you are new to Linux, a book that covers Linux basics will be invaluable. We can recommend several titles: *The Official Red Hat Linux Getting Started Guide*; *Using Linux*, by Bill Ball; *Linux Clearly Explained*, by Bryan Pfaffenberger; *Linux for Dummies*, by Jon "maddog" Hall; and *Learning Red Hat Linux*, by Bill McCarty.

Red Hat also offers various incident-based support plans to assist with configuration issues and tasks that are not covered by installation assistance. Please see the Red Hat Support website for more information. The Red Hat technical support website is located at the following URL:

`http://www.redhat.com/support/`

C.3 Scope of Red Hat Support

Red Hat, Inc. can only provide installation assistance to customers who have purchased an Official Red Hat Linux boxed set. If you have obtained Linux from any other company, you must contact that company for support. Other companies include:

- Macmillan
- Sams/Que
- Linux Systems Labs (LSL)
- Mandrake
- CheapBytes

Additionally, Red Hat Linux obtained via any of the following methods does not qualify for support from Red Hat:

- Red Hat Linux PowerTools Archive
- Downloaded via FTP on the Internet
- Included in a package such as Motif or Applixware
- Copied or installed from another user's CD
- A CD-ROM (or CD-ROM set) included in a Linux book or other publication.

C.4 How to Get Technical Support

In order to receive technical support for your Official Red Hat product, you must register your product on Red Hat's website.

Every Official Red Hat product comes with a Product Identification code: a 16-character alphanumeric string. The Product ID for Red Hat Linux 7.2 is located on the Registration Information Card that can be found inside the box. Your Product ID is included in your boxed set, and you should keep it in a safe place. You need this code, so do not lose the card!

Note

Do not throw away the card with your Product ID. You need the Product ID to get technical support. If you lose the certificate, you may not be able to receive support.

The Product ID is the code that will enable your technical support and any other benefits or services that you purchased from Red Hat, depending upon which Red Hat product you purchased.

C.4.1 Signing up for Technical Support

To sign up for technical support, you will need to:

1. Create a customer profile at <http://www.redhat.com/apps/activate/>. You may have already completed this step; if you have, continue to the next step. If you do not already have a customer profile on the Red Hat website, please create a new one.
2. Using the login name and password you created during the customer profile, please log in at the Red Hat Support website at <http://www.redhat.com/support>.

If you created a new customer profile, once you activate your product you will see a webpage that shows your registered products. There is also a button, **Access Web Support**, on this page that will take you to the support website.

3. Update your contact information if necessary.

Note

If your email address is not correct, communications regarding your technical support requests CANNOT be delivered to you, and you will not be able to retrieve your login and password by email. Be sure that you give us your correct email address.

If you are worried about your privacy, please see Red Hat's privacy statement at http://www.redhat.com/legal/privacy_statement.html.

4. Add a product to your profile. Please enter the following information:
 - The Product ID for your boxed set product
 - The Support Certificate Number or Entitlement Number if the product is a contract
5. Set your customer preferences.
6. Answer the optional customer questionnaire.
7. Submit the form.

If the previous steps were completed successfully, you can now login at <http://www.redhat.com/support> and open a new technical service request. However, you must still use your Product ID in order to obtain technical support via telephone (if the product you purchased came with phone support). You will also be asked for your login name when contacting the technical support team via telephone.

C.5 Questions for Technical Support

Technical support is both a science and a mystical art form. In most cases, support technicians must rely on customer observations and communications with the customer in order to diagnose and solve

the problem. Therefore, it is extremely important that you are as detailed and clear as possible when you state your questions and report your problems. Examples of what you should include are:

Note

Refer to the service level agreement at <http://www.redhat.com/support/sla/> for more information on how Red Hat's technical support staff can assist you.

- Symptoms of the problem (for example: "Linux is not able to access my CD-ROM drive. When it tries, I get timeout errors.")
- When the problem began (for example: "My system was working fine until yesterday, when a lightning storm hit my area.")
- Any changes you made to your system (for example: "I added a new hard drive and used Partition Wizzo to add Linux partitions.")
- Other information that may be relevant to your situation, such as the installation method (CD-ROM, NFS, HTTP)
- Specific hardware devices that may be relevant to your problem (for example: If you cannot setup networking, what kind of network card do you have?)

C.5.1 How to Send Support Questions

Please login at <http://www.redhat.com/support> and open a new service request, or call the phone number for support. If your product came with phone support, or you have purchased a phone support contract, the phone number you will need to call will be provided to you during the sign up process.

For more information on using Red Hat's online support system go to <http://www.redhat.com/support/services/access.html>.

D Troubleshooting Your Installation of Red Hat Linux

This appendix discusses some common installation problems and their solutions.

D.1 You are Unable to Boot Red Hat Linux

D.1.1 Are You Unable to Boot from the CD-ROM?

If you cannot boot from your Red Hat Linux CD-ROM, you have two options:

Note

There are a few cases where the system BIOS will not allow the Red Hat Linux CD-ROM to boot because of the size of the boot image on the CD-ROM itself. In cases such as these, a boot disk should be made to boot Red Hat Linux. Once booted, the CD-ROMs will work properly for the installation.

1. You can change your BIOS so that booting from the CD-ROM is recognized first in the boot order, or
2. Boot using a boot disk you have created.

To change your BIOS, refer to your system manual for the correct keyboard combination that allows you to access your BIOS, or you can read the key sequence needed while the system begins to boot.

To create a boot disk, follow the instructions in Section 1.4.2, *Making Installation Diskettes*.

To boot Red Hat Linux using a boot disk, insert the diskette you have created into your floppy drive and then boot/reboot your computer. Make sure that your BIOS is set to use the floppy or removable disk (A:) to boot.

D.1.2 Are You Unable to Boot from the Local Boot Disk?

If you are experiencing difficulties in getting a local boot disk to boot your system correctly, you may need an updated boot disk.

Check the online errata (<http://www.redhat.com/support/errata>) for updated diskette images (if available) and follow the instructions in Section 1.4.2, *Making Installation Diskettes* to make an updated boot disk for your system.

D.1.3 Are You Unable to Boot from PCMCIA Boot Disks?

If you are experiencing difficulties in getting the PCMCIA boot disks you made to boot your system correctly, you may need an updated boot disk.

Check the online errata for updated diskette images (if available) and follow the instructions provided to make an updated boot disk for your system.

D.1.4 Is Your System Displaying Signal 11 Errors?

If you receive a fatal signal 11 during your installation, it is probably due to a hardware error in memory on your system's bus. A hardware error in memory can be caused by problems in executables or with the system's hardware. Like other operating systems, Red Hat Linux places its own demands on your system's hardware. Some of this hardware may not be able to meet those demands, even if they work properly under another OS.

Check to see if you have the latest installation and supplemental boot diskettes from Red Hat. Review the online errata to see if newer versions are available. If the latest images still fail, it may be due to a problem with your hardware. Commonly, these errors are in your memory or CPU-cache. A possible solution for this error is turning off the CPU-cache in the BIOS. You could also try to swap your memory around in the motherboard slots to see if the problem is either slot or memory related.

For more information concerning signal 11 errors, refer to <http://www.bitwizard.nl/sig11/>.

D.1.5 Are You Unable to Boot from a Network Boot Disk?

If you are experiencing difficulties in getting the network boot disk you made to boot your system correctly, you may need an updated boot disk.

Check the online errata for updated diskette images (if available) and follow the instructions provided to make an updated boot disk for your system.

D.2 Trouble Beginning the Installation

D.2.1 Trouble Using PCMCIA Boot Disks?

If you booted using PCMCIA boot disks and want to install via FTP (or NFS or HTTP), but do not see these installation options, you may have a problem with your network card.

If the network card is not initialized during the boot process, the Red Hat Linux installation program will not enable you to configure your system for networking, either during or after the installation itself.

Check the hardware compatibility list (<http://hardware.redhat.com>) to see if your network card is compatible and/or supported. If your card is not listed, it may not be compatible with Red Hat Linux.

D.2.2 Is Your Mouse Not Detected?

If the **Mouse Not Detected** screen (see Figure D–1, *Mouse Not Detected*) appears, then the installation program was not able to identify your mouse correctly.

You can choose to continue with the GUI installation or use the text mode installation, which does not require using a mouse. If you choose to continue with the GUI installation, you will need to provide the installation program with your mouse configuration information (see Figure 3–3, *Mouse Configuration*).

Figure D–1 Mouse Not Detected



For an overview of text mode installation instructions, please refer to Chapter 4, *Installing Red Hat Linux via Text Mode*.

D.2.3 Problems with Booting into the Graphical Installation

The Red Hat Linux installation program uses frame buffers by default. However, there are some video cards that will not work with this setting. The end result will be a problem booting into the graphical installation program.

The installation program will first try to run in frame buffer mode. If that fails, it will try to run in a lower resolution mode. If that still fails, the installation program will run in text mode.

Video cards that will not run at 800 x 600 resolution should type **lowres** at the `boot :` prompt to run the installation program in 640 x 480 resolution.

If this still does not work, you can run the installation program without frame buffers by typing `nofb` at the `boot:` prompt.

D.3 Trouble During the Installation

D.3.1 Partition Creation Problems

If you are having trouble creating a partition (for example, a root (`/`) partition), make sure you are setting its partition type to Linux Native.

Unless your BIOS supports otherwise, make sure `/boot` does not exceed the 1023 cylinder head. If you do not, the installation program will not allow you to create a `/boot` or `/` partition. Some new systems allow you to exceed the 1023 limit (with GRUB and the newer LILO versions that are available), but most machines with older BIOS will not.

D.3.2 Using Remaining Space

You have a `swap` and a `/` (root) partition created, and you have selected the root partition to use the remaining space, but it does not fill the hard drive.

If your hard drive is more than 1024 cylinders, you must create a `/boot` partition if you want the `/` (root) partition to use all of the remaining space on your hard drive.

D.3.3 Other Partitioning Problems

If you are using Disk Druid to create partitions, but cannot move to the next screen, you probably have not created all the partitions necessary for Disk Druid's dependencies to be satisfied.

You must have the following partitions as a bare minimum:

- A `/boot` partition of type Linux native
- A `/` (root) partition of type Linux native
- A `<swap>` partition of type Linux swap

Tip

When defining a partition's type as Linux swap, you do not have to assign it a mount point. Disk Druid automatically assigns the mount point for you.

D.3.4 Are You Seeing Python Errors?

During some upgrades or installations of Red Hat Linux, the installation program (also known as Anaconda) may fail with a Python or traceback error. This error may occur after the selection of individual packages or while trying to save the upgrade log in `/tmp`. The error may look similar to:

```
Traceback (innermost last):
  File "/var/tmp/anaconda-7.1//usr/lib/anaconda/iw/progress_gui.py",
line 20, in run
    rc = self.todo.doInstall ()
  File "/var/tmp/anaconda-7.1//usr/lib/anaconda/todo.py", line 1468, in
doInstall
    self.fstab.savePartitions ()
  File "fstab.py", line 221, in savePartitions
    sys.exit(0)
SystemExit: 0

Local variables in innermost frame:
self: <fstab.GuiFstab instance at 8446fe0>
sys: <module 'sys' (built-in)>

ToDo object:
(itodo
ToDo
p1
(dp2
S'method'
p3
(iimage
CdromInstallMethod
p4
(dp5
S'progressWindow'
p6

<failed>
```

This error occurs in some systems where links to `/tmp` are symbolic to other locations or have been changed since creation. These symbolic or changed links are invalid during the installation process, so the installation program cannot write information and fails.

If you experience such an error, first try to download any available errata for Anaconda. Errata can be found at <http://www.redhat.com/support/errata>.

You can also search for bug reports related to this problem. To search Red Hat's bug tracking system, go to <http://bugzilla.redhat.com/bugzilla>.

Finally, if you are still facing problems related to this error, register your product and contact our support team. To register your product, go to <http://www.redhat.com/apps/activate>.

D.4 Problems After Installation

D.4.1 Trouble With the Graphical GRUB Screen?

If, for some reason, you need to disable the graphical boot screen, you can do so, as root, by editing the `/boot/grub/grub.conf` file and then rebooting your system.

To do this, comment out the line which begins with `splashimage` in the `grub.conf` file. To comment out a line, insert the `;` character at the beginning of the line.

Once you reboot, the `grub.conf` file will be reread and your changes will take place.

You may re-enable the graphical boot screen by uncommenting (or adding) the above line back into the `grub.conf` file and rebooting.

D.4.2 Trouble With the Graphical LILO Screen?

If, for some reason, you need to disable the graphical boot screen, you can do so, as root, by editing the `/etc/lilo.conf` file and then rerunning LILO.

First, as root, comment out (or delete) the line which reads `message=/boot/message` in the `/etc/lilo.conf` file. To comment out a line, insert the `;` character at the beginning of the line. Next, rerun LILO by typing `/sbin/lilo -v`. The next time you boot, you will see the text `LILO:` prompt, as used in previous Red Hat Linux releases.

You may re-enable the graphical boot screen by adding the above line back into the `lilo.conf` file and rerunning LILO.

D.4.3 Problems with Server Installations and X

If you performed a server installation and you are having trouble getting X to start, you may not have installed the X Window System during your installation.

If you want the X Window System, you can perform an upgrade to install X. During the upgrade, select the X Window System packages, and choose GNOME, KDE, or both.

Alternatively, you can install the XFree86 RPMs. For more information, refer to <http://www.redhat.com/support/docs/howto/XFree86-upgrade/XFree86-upgrade.html>.

D.4.4 Problems When You Try to Log In

If you did not create a user account during the installation you will need to log in as root and use the password you assigned to root.

If you cannot remember your root password, you will need to boot your system as `linux single` at the GRUB or LILO `boot:` prompt. Then at the `#` prompt, you will need to type `passwd root`, which will allow you to enter a new password for root. At this point you can type `shutdown -r now` and the system will reboot with your new password.

If you cannot remember your user account password, you must become root. To become root, type `su -` and enter your root password when prompted. Then, type `passwd <username>`. This allows you to enter a new password for the specified user account.

If you selected either the custom or workstation installation and do not see the graphical login screen, check your hardware for compatibility issues. The *Hardware Compatibility List* can be found at <http://hardware.redhat.com>.

D.4.5 Does Netscape Navigator Crash on JavaScript Pages?

If Netscape Navigator continuously crashes on pages that contain JavaScripts, you may need to edit your `~/ .mailcap` file.

Edit the file using `pico` by typing `pico ~/ .mailcap` at the prompt in a terminal window. (You may use any text editor.)

Remove the following lines from the file:

```
application/x-javascript; ;\
x-mozilla-flags=save
```

You can also turn off JavaScript within Netscape Navigator itself. Click on **Edit=>Preferences=>Advanced** and make sure the **Enable JavaScript** checkbox is not selected.

If these do not help, you can also try to use a newer version of Netscape Navigator if available. Check the Red Hat Linux errata website under security advisories for more information.

D.4.6 Your Printer Will Not Work Under X

If you are not sure how to set up your printer or are having trouble getting it to work properly, try using the graphical `printconf` program. Log in as root, open a terminal window, and type `printconf -gui`.

D.4.7 Is Your RAM Not Being Recognized?

Sometimes, the kernel does not recognize all of your memory (RAM). You can check this with the following command:

```
cat /proc/meminfo
```

Find out if the displayed quantity is the same as the known amount of RAM in your system. If they are not equal, add the following line to the `/boot/grub/grub.conf` or `/etc/lilo.conf` file (depending on the boot loader you installed):

```
append="mem=xxM"
```

Replace `xx` with the amount of RAM you have in megabytes. Remember that per-image append lines completely overwrite the global append line. It might be worth adding this to the per-image descriptions, as shown in this example:

```
append="hdd=ide-scsi mem=128M"
```

In `/boot/grub/grub.conf`, the above example would look similar to the following:

```
#NOTICE: You have a /boot partition. This means that
#       all kernel paths are relative to /boot/
default=0
timeout=30
splashimage=(hd0,0)/grub/splash.xpm.gz
title Red Hat Linux (2.4.6-2)
    root (hd0,0)
    kernel /vmlinuz-2.2.6-2 ro root=/dev/hda3
    append="mem=128M"
```

Once you reboot, the changes made to `grub.conf` will be reflected on your system.

In `/etc/lilo.conf`, the above example would look similar to the following:

```
boot=/dev/sda
map=/boot/map
install=/boot/boot.b
prompt
timeout=50

image=/boot/vmlinuz-2.2.12-20
    label=linux
    root=/dev/sda1
    initrd=/boot/initrd-2.2.12-20.img
    read-only
    append="mem=128M"
```

Remember to run `/sbin/lilo -v` after changing `/etc/lilo.conf`.

Note that you can also produce the same effect by actually passing this option when you are specifying the label/image to use in GRUB or LILO. For example if you had a label named `linux`, at the boot loader menu you could type:

```
linux mem=xxM
```

Remember to replace `xx` with the amount of RAM in your system.

D.4.8 Problems with Sound Configuration

If you do not have sound after your installation, you may need to run the sound configuration utility. As root, type `sndconfig` in a terminal window.

Note

`sndconfig` must be run in runlevel 3. More information about runlevels can be found in the *Official Red Hat Linux Reference Guide*, in chapter *Boot Process, Init, and Shutdown*.

If the `sndconfig` application does not help, you may need to select the `Enable sound server startup` option under the **Multimedia=>Sound** in the GNOME Control Center.

To do this, click on **Panel=>Programs=>Settings=>GNOME Control Center** to launch the GNOME Control Center. In the GNOME Control Center, select the **Sound** submenu of the **Multimedia** menu. On the right, a **General** sound menu will appear. Select `Enable sound server startup` and then click **OK**.

E An Introduction to Disk Partitions

Disk partitions are a standard part of the personal computer landscape and have been for quite some time. However, with many people purchasing computers featuring preinstalled operating systems, relatively few people understand how partitions work. This chapter attempts to explain the reasons for and use of disk partitions so your Red Hat Linux installation will be as simple and painless as possible.

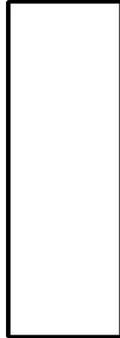
If you are reasonably comfortable with disk partitions, you could skip ahead to Section E.1.4, *Making Room For Red Hat Linux* for more information on the process of freeing up disk space to prepare for a Red Hat Linux installation. This section also discusses the partition naming scheme used by Linux systems, sharing disk space with other operating systems, and related topics.

E.1 Hard Disk Basic Concepts

Hard disks perform a very simple function — they store data and reliably retrieve it on command.

When discussing issues such as disk partitioning, it is important to know a bit about the underlying hardware. Unfortunately, it is easy to become bogged down in details. Therefore, we will use a simplified diagram of a disk drive to help explain what is really happening when a disk drive is partitioned. Figure E–1, *An Unused Disk Drive* shows a brand-new, unused disk drive.

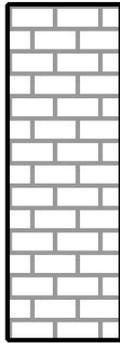
Figure E-1 An Unused Disk Drive



Not much to look at, is it? But if we are talking about disk drives on a basic level, it will do. Say that we would like to store some data on this drive. As things stand now, it will not work. There is something we need to do first...

E.1.1 It is Not What You Write, it is How You Write It

Experienced computer users probably got this one on the first try. We need to **format** the drive. Formatting (usually known as "making a **filesystem**") writes information to the drive, creating order out of the empty space in an unformatted drive.

Figure E–2 Disk Drive with a Filesystem

As Figure E–2, *Disk Drive with a Filesystem* implies, the order imposed by a filesystem involves some trade-offs:

- A small percentage of the drive’s available space is used to store filesystem-related data and can be considered as overhead.
- A filesystem splits the remaining space into small, consistently-sized segments. For Linux, these segments are known as **blocks**.¹

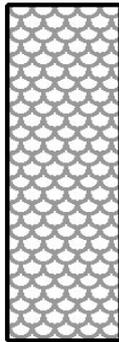
Given that filesystems make things like directories and files possible, these tradeoffs are usually seen as a small price to pay.

It is also worth noting that there is no single, universal filesystem. As Figure E–3, *Disk Drive with a Different Filesystem* shows, a disk drive may have one of many different filesystems written on it. As you might guess, different filesystems tend to be incompatible; that is, an operating system that supports one filesystem (or a handful of related filesystem types) may not support another. This last statement is not a hard-and-fast rule, however. For example, Red Hat Linux supports a wide variety

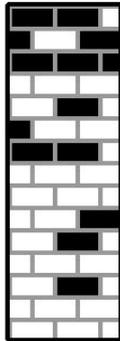
¹ Blocks really *are* consistently sized, unlike our illustrations. Keep in mind, also, that an average disk drive contains thousands of blocks. But for the purposes of this discussion, please ignore these minor discrepancies.

of filesystems (including many commonly used by other operating systems), making data interchange between different filesystems easy.

Figure E–3 Disk Drive with a Different Filesystem



Of course, writing a filesystem to disk is only the beginning. The goal of this process is to actually *store* and *retrieve* data. Let us take a look at our drive after some files have been written to it.

Figure E–4 Disk Drive with Data Written to It

As Figure E–4, *Disk Drive with Data Written to It* shows, 14 of the previously-empty blocks are now holding data. However, by simply looking at this picture, we cannot determine exactly how many files reside on this drive. There may be as few as one or as many as 14 files, as all files use at least one block and some files use multiple blocks. Another important point to note is that the used blocks do not have to form a contiguous region; used and unused blocks may be interspersed. This is known as **fragmentation**. Fragmentation can play a part when attempting to resize an existing partition.

As with most computer-related technologies, disk drives changed over time after their introduction. In particular, they got bigger. Not larger in physical size, but bigger in their capacity to store information. And, this additional capacity drove a fundamental change in the way disk drives were used.

E.1.2 Partitions: Turning One Drive Into Many

As disk drive capacities soared, some people began to wonder if having all of that formatted space in one big chunk was such a great idea. This line of thinking was driven by several issues, some philosophical, some technical. On the philosophical side, above a certain size, it seemed that the additional space provided by a larger drive created more clutter. On the technical side, some filesystems were never designed to support anything above a certain capacity. Or the filesystems *could* support larger

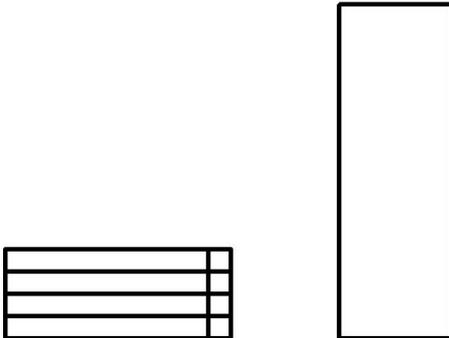
drives with a greater capacity, but the overhead imposed by the filesystem to track files became excessive.

The solution to this problem was to divide disks into **partitions**. Each partition can be accessed as if it was a separate disk. This is done through the addition of a **partition table**.

Note

While the diagrams in this chapter show the partition table as being separate from the actual disk drive, this is not entirely accurate. In reality, the partition table is stored at the very start of the disk, before any filesystem or user data. But for clarity, we will keep it separate in our diagrams.

Figure E–5 Disk Drive with Partition Table



As Figure E–5, *Disk Drive with Partition Table* shows, the partition table is divided into four sections. Each section can hold the information necessary to define a single partition, meaning that the partition table can define no more than four partitions.

Each partition table entry contains several important characteristics of the partition:

- The points on the disk where the partition starts and ends
-

- Whether the partition is "active"
- The partition's type

Let us take a closer look at each of these characteristics. The starting and ending points actually define the partition's size and location on the disk. The "active" flag is used by some operating systems' boot loaders. In other words, the operating system in the partition that is marked "active" will be booted.

The partition's type can be a bit confusing. The type is a number that identifies the partition's anticipated usage. If that statement sounds a bit vague, that is because the meaning of the partition type is a bit vague. Some operating systems use the partition type to denote a specific filesystem type, to flag the partition as being associated with a particular operating system, to indicate that the partition contains a bootable operating system, or some combination of the three.

Table E-1, *Partition Types* contains a listing of some popular (and obscure) partition types, along with their numeric values.

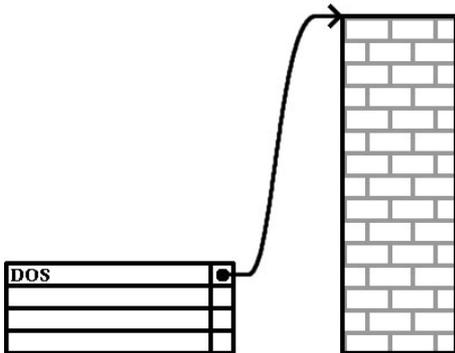
Table E-1 Partition Types

Partition Type	Value	Partition Type	Value
Empty	00	Novell Netware 386	65
DOS 12-bit FAT	01	PIC/IX	75
XENIX root	02	Old MINIX	80
XENIX usr	03	Linux/MINUX	81
DOS 16-bit <=32M	04	Linux swap	82
Extended	05	Linux native	83
DOS 16-bit >=32	06	Linux extended	85
OS/2 HPFS	07	Amoeba	93
AIX	08	Amoeba BBT	94
AIX bootable	09	BSD/386	a5
OS/2 Boot Manager	0a	OpenBSD	a6
Win95 FAT32	0b	NEXTSTEP	a7
Win95 FAT32 (LBA)	0c	BSDI fs	b7
Win95 FAT16 (LBA)	0e	BSDI swap	b8
Win95 Extended (LBA)	0f	Syrinx	c7

Partition Type	Value	Partition Type	Value
Venix 80286	40	CP/M	db
Novell	51	DOS access	e1
Microport	52	DOS R/O	e3
GNU HURD	63	DOS secondary	f2
Novell Netware 286	64	BBT	ff

By this point, you might be wondering how all this additional complexity is normally used. See Figure E-6, *Disk Drive With Single Partition* for an example.

Figure E-6 Disk Drive With Single Partition



In many cases, there is only a single partition spanning the entire disk, essentially duplicating the method used before partitions. The partition table has only one entry used, and it points to the start of the partition.

We have labeled this partition as being of the "DOS" type. Although it is only one of several possible partition types listed in Table E-1, *Partition Types*, it is adequate for the purposes of this discussion.

This is a typical partition layout for most newly purchased computers with a consumer version of Microsoft Windows™ preinstalled.

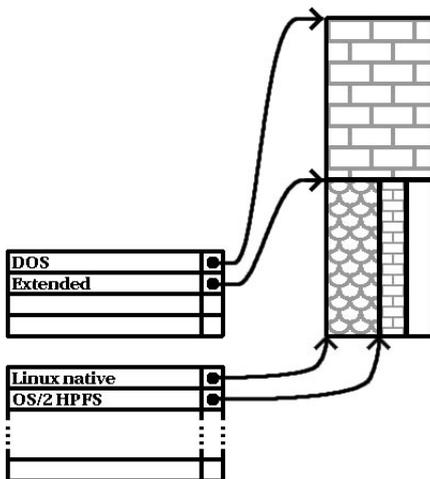
E.1.3 Partitions within Partitions – An Overview of Extended Partitions

Of course, over time it became obvious that four partitions would not be enough. As disk drives continued to grow, it became more and more likely that a person could configure four reasonably-sized partitions and still have disk space left over. There needed to be some way of creating more partitions.

Enter the extended partition. As you may have noticed in Table E-1, *Partition Types*, there is an "Extended" partition type. It is this partition type that is at the heart of extended partitions.

When a partition is created and its type is set to "Extended," an extended partition table is created. In essence, the extended partition is like a disk drive in its own right — it has a partition table that points to one or more partitions (now called **logical partitions**, as opposed to the four **primary partitions**) contained entirely within the extended partition itself. Figure E-7, *Disk Drive With Extended Partition* shows a disk drive with one primary partition and one extended partition containing two logical partitions (along with some unpartitioned free space).

Figure E-7 Disk Drive With Extended Partition



As this figure implies, there is a difference between primary and logical partitions -- there can only be four primary partitions, but there is no fixed limit to the number of logical partitions that can exist. (However, in reality, it is probably not a good idea to try to define and use more than 12 logical partitions on a single disk drive.)

Now that we have discussed partitions in general, let us see how to use this knowledge to install Red Hat Linux.

E.1.4 Making Room For Red Hat Linux

There are three possible scenarios you may face when attempting to repartition your hard disk:

- Unpartitioned free space is available
- An unused partition is available
- Free space in an actively used partition is available

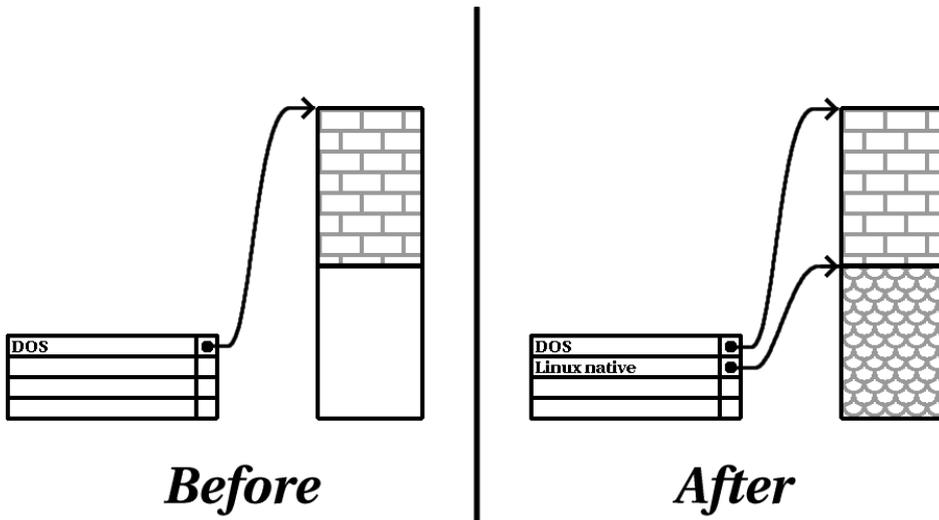
Let's look at each scenario in order.

Note

Please keep in mind that the following illustrations are simplified in the interest of clarity and do not reflect the exact partition layout that you will encounter when actually installing Red Hat Linux.

Using Unpartitioned Free Space

In this situation, the partitions already defined do not span the entire hard disk, leaving unallocated space that is not part of any defined partition. Figure E-8, *Disk Drive with Unpartitioned Free Space* shows what this might look like.

Figure E–8 Disk Drive with Unpartitioned Free Space

If you think about it, an unused hard disk also falls into this category. The only difference is that *all* the space is not part of any defined partition.

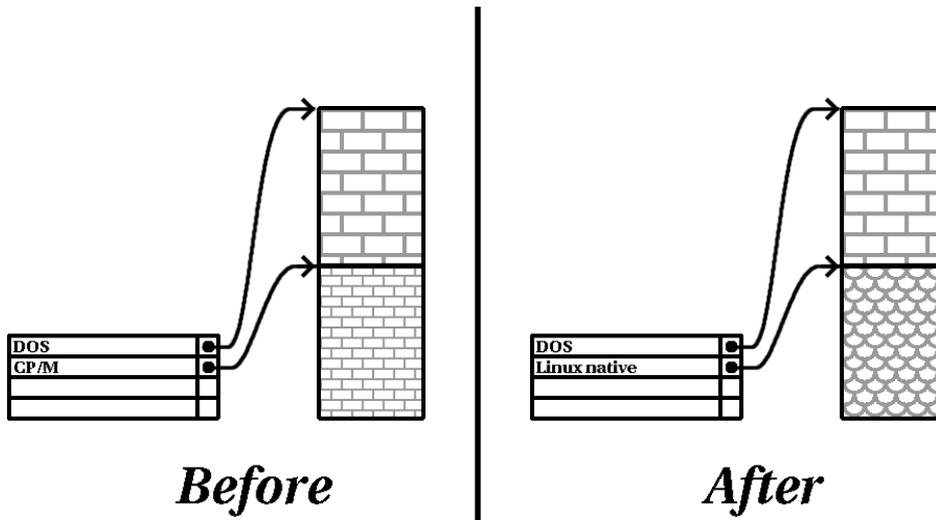
In any case, you can simply create the necessary partitions from the unused space. Unfortunately, this scenario, although very simple, is not very likely (unless you have just purchased a new disk just for Red Hat Linux). Most pre-installed operating systems are configured to take up all available space on a disk drive (see *Using Free Space from an Active Partition* in Section E.1.4).

Let's move on to a slightly more common situation.

Using Space from an Unused Partition

In this case, maybe you have one or more partitions that you do not use any longer. Perhaps you have dabbled with another operating system in the past, and the partition(s) you dedicated to it never seem to be used anymore. Figure E–9, *Disk Drive With an Unused Partition* illustrates such a situation.

Figure E-9 Disk Drive With an Unused Partition



If you find yourself in this situation, you can use the space allocated to the unused partition. You will first need to delete the partition, and then create the appropriate Linux partition(s) in its place. You can either delete the partition using the DOS `fdisk` command, or you will be given the opportunity to do so during a custom installation.

Using Free Space from an Active Partition

This is the most common situation. It is also, unfortunately, the hardest to handle. The main problem is that, even if you have enough free space, it is presently allocated to a partition that is already in use. If you purchased a computer with pre-installed software, the hard disk most likely has one massive partition holding the operating system and data.

Aside from adding a new hard drive to your system, you have two choices:

Destructive Repartitioning

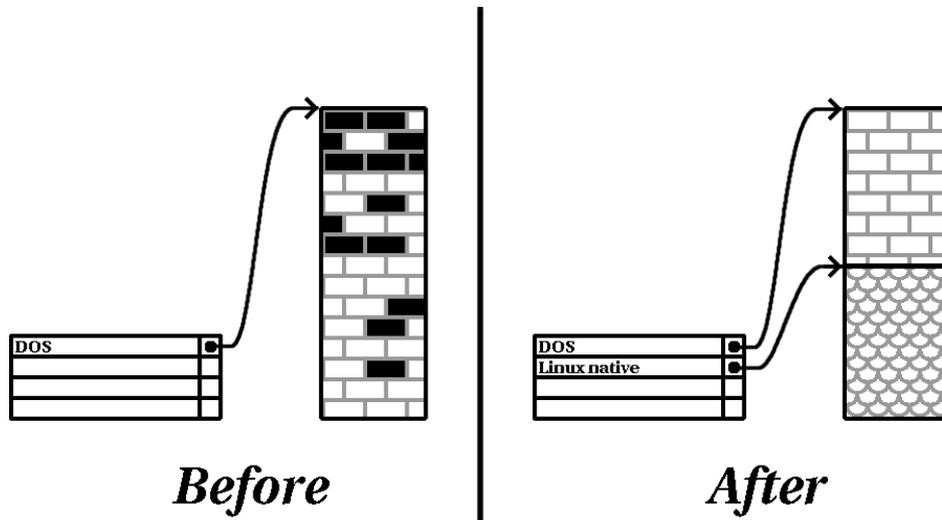
Basically, you delete the single large partition and create several smaller ones. As you might imagine, any data you had in the original partition is destroyed. This means that making a complete backup is necessary. For your own sake, make two backups, use verification (if available in your backup software), and try to read data from your backup *before* you delete the partition.



If there was an operating system of some type installed on that partition, it will need to be reinstalled as well. Be aware that some computers sold with pre-installed operating systems may not include the CD-ROM media to reinstall the original operating system. The best time to notice if this applies to your system is *before* you destroy your original partition and its operating system installation.

After creating a smaller partition for your existing software, you can reinstall any software, restore your data, and continue your Red Hat Linux installation. Figure E–10, *Disk Drive Being Destructively Repartitioned* shows this being done.

Figure E–10 Disk Drive Being Destructively Repartitioned





As Figure E–10, *Disk Drive Being Destructively Repartitioned* shows, any data present in the original partition will be lost without proper backup!

Non-Destructive Repartitioning

Here, you run a program that does the seemingly impossible: it makes a big partition smaller without losing any of the files stored in that partition. Many people have found this method to be reliable and trouble-free. What software should you use to perform this feat? There are several disk management software products on the market. You will have to do some research to find the one that is best for your situation.

While the process of non-destructive repartitioning is rather straightforward, there are a number of steps involved:

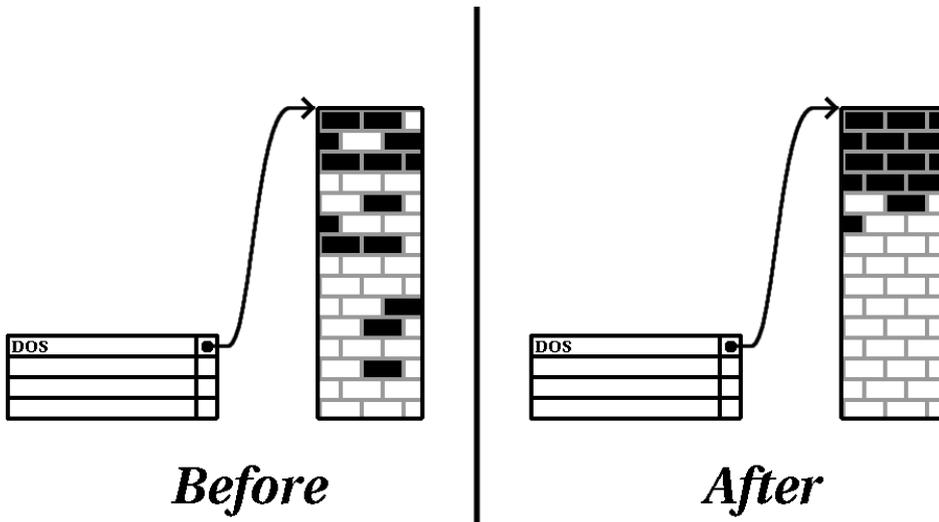
- Compress existing data
- Resize the existing partition
- Create new partition(s)

Let's take a look at each step in a bit more detail.

Compress existing data

As Figure E–11, *Disk Drive Being Compressed* shows, the first step is to compress the data in your existing partition. The reason for doing this is to rearrange the data such that it maximizes the available free space at the "end" of the partition.

Figure E-11 Disk Drive Being Compressed

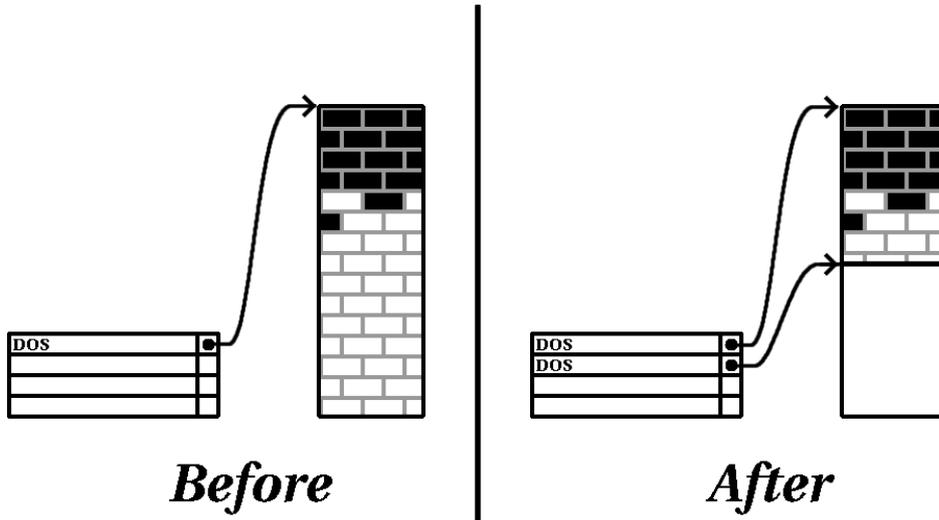


This step is crucial. Without it, the location of your data could prevent the partition from being resized to the extent desired. Note also that, for one reason or another, some data cannot be moved. If this is the case (and it severely restricts the size of your new partition(s)), you may be forced to destructively repartition your disk.

Resize the existing partition

Figure E-12, *Disk Drive with Partition Resized* shows the actual resizing process. While the actual result of the resizing operation varies depending on the software used, in most cases the newly freed space is used to create an unformatted partition of the same type as the original partition.

Figure E-12 Disk Drive with Partition Resized

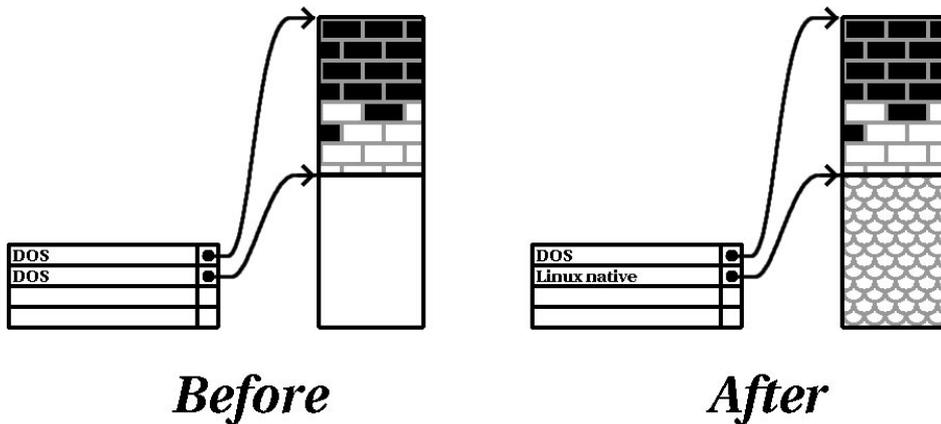


It is important to understand what the resizing software you use does with the newly freed space, so that you can take the appropriate steps. In the case we have illustrated, it would be best to simply delete the new DOS partition, and create the appropriate Linux partition(s).

Create new partition(s)

As the previous step implied, it may or may not be necessary to create new partitions. However, unless your resizing software is Linux-aware, it is likely you will need to delete the partition that was created during the resizing process. Figure E-13, *Disk Drive with Final Partition Configuration* shows this being done.

Figure E–13 Disk Drive with Final Partition Configuration



Note

The following information is specific to Intel-based computers only.

As a convenience to Red Hat Linux users, the DOS `fips` utility is included on the Red Hat Linux/x86 CD 1 in the `dosutils` directory. This is a freely available program that can resize FAT (File Allocation Table) partitions.

WARNING

Many people have successfully used `fips` to resize their hard drive partitions. However, because of the nature of the operations carried out by `fips` and the wide variety of hardware and software configurations under which it must run, Red Hat cannot guarantee that `fips` will work properly on your system. Therefore, no installation support is available for `fips`. *Use it at your own risk.*

That said, if you decide to repartition your hard drive with `fips`, it is *vital* that you do two things:

- *Perform a backup* — Make two copies of all the important data on your computer. These copies should be to removable media (such as tape or diskettes), and you should make sure they are readable before proceeding.
- *Read the documentation* — Completely read the `fips` documentation, located in the `dosutils/fipsdocs` subdirectory on Red Hat Linux/x86 CD 1.

Should you decide to use `fips`, be aware that after `fips` runs you will be left with *two* partitions: the one you resized, and the one `fips` created out of the newly freed space. If your goal is to use that space to install Red Hat Linux, you should delete the newly created partition, either by using `fdisk` under your current operating system or while setting up partitions during a custom installation.

E.1.5 Partition Naming Scheme

Linux refers to disk partitions using a combination of letters and numbers which may be confusing, particularly if you are used to the "C drive" way of referring to hard disks and their partitions. In the DOS/Windows world, partitions are named using the following method:

- Each partition's type is checked to determine if it can be read by DOS/Windows.
- If the partition's type is compatible, it is assigned a "drive letter." The drive letters start with a "C" and move on to the following letters, depending on the number of partitions to be labeled.
- The drive letter can then be used to refer to that partition as well as the filesystem contained on that partition.

Red Hat Linux uses a naming scheme that is more flexible and conveys more information than the approach used by other operating systems. The naming scheme is file-based, with filenames in the form:

```
/dev/xxxyN
```

Here is how to decipher the partition naming scheme:

/dev/

This string is the name of the directory in which all device files reside. Since partitions reside on hard disks, and hard disks are devices, the files representing all possible partitions reside in `/dev/`.

xx

The first two letters of the partition name indicate the type of device on which the partition resides. You will normally see either `hd` (for IDE disks) or `sd` (for SCSI disks).

y

This letter indicates which device the partition is on. For example, `/dev/hda` (the first IDE hard disk) or `/dev/sdb` (the second SCSI disk).

N

The final number denotes the partition. The first four (primary or extended) partitions are numbered 1 through 4. Logical partitions start at 5. So, for example, `/dev/hda3` is the third primary or extended partition on the first IDE hard disk, and `/dev/sdb6` is the second logical partition on the second SCSI hard disk.

Note

There is no part of this naming convention that is based on partition type; unlike DOS/Windows, *all* partitions can be identified under Red Hat Linux. Of course, this does not mean that Red Hat Linux can access data on every type of partition, but in many cases it is possible to access data on a partition dedicated to another operating system.

Keep this information in mind; it will make things easier to understand when you are setting up the partitions Red Hat Linux requires.

E.1.6 Disk Partitions and Other Operating Systems

If your Red Hat Linux partitions will be sharing a hard disk with partitions used by other operating systems, most of the time you will have no problems. However, there are certain combinations of Linux and other operating systems that require extra care. Information on creating disk partitions compatible with other operating systems is available in several HOWTOs and Mini-HOWTOs, available on the Red Hat Linux Documentation CD in the HOWTO and HOWTO/mini directories. In particular, the Mini-HOWTOs whose names start with `Linux+` are quite helpful.

Note

If Red Hat Linux/x86 will coexist on your machine with OS/2, you must create your disk partitions with the OS/2 partitioning software — otherwise, OS/2 may not recognize the disk partitions. During the installation, do not create any new partitions, but do set the proper partition types for your Linux partitions using the Linux `fdisk`.

E.1.7 Disk Partitions and Mount Points

One area that many people new to Linux find confusing is the matter of how partitions are used and accessed by the Linux operating system. In DOS/Windows, it is relatively simple: Each partition gets a "drive letter." You then use the correct drive letter to refer to files and directories on its corresponding partition.

This is entirely different from how Linux deals with partitions and, for that matter, with disk storage in general. The main difference is that each partition is used to form part of the storage necessary to support a single set of files and directories. This is done by associating a partition with a directory through a process known as **mounting**. Mounting a partition makes its storage available starting at the specified directory (known as a **mount point**).

For example, if partition `/dev/hda5` were mounted on `/usr`, that would mean that all files and directories under `/usr` would physically reside on `/dev/hda5`. So the file `/usr/share/doc/FAQ/txt/Linux-FAQ` would be stored on `/dev/hda5`, while the file `/etc/X11/gdm/Sessions/Gnome` would not.

Continuing our example, it is also possible that one or more directories below `/usr` would be mount points for other partitions. For instance, a partition (say, `/dev/hda7`) could be mounted on `/usr/local`, meaning that `/usr/local/man/whatis` would then reside on `/dev/hda7` rather than `/dev/hda5`.

E.1.8 How Many Partitions?

At this point in the process of preparing to install Red Hat Linux, you will need to give some consideration to the number and size of the partitions to be used by your new operating system. The question of "how many partitions" continues to spark debate within the Linux community and, without any end to the debate in sight, it is safe to say that there are probably as many partition layouts as there are people debating the issue.

Keeping this in mind, we recommend that, unless you have a reason for doing otherwise, you should at least create the following partitions:

- *A swap partition* — Swap partitions are used to support virtual memory. In other words, data is written to swap when there is not RAM to hold the data your system is processing. You *must* create a swap partition to correctly use Red Hat Linux. The minimum size of your swap partition should be equal to twice the amount of your computer's RAM or 32 MB, whichever is larger.
 - *A /boot partition* — The partition mounted on `/boot` contains the operating system kernel (which allows your system to boot Red Hat Linux), along with a few other files used during the bootstrap process.
-



Make sure you read Section E.1.9, *One Last Wrinkle: Using GRUB or LILO* — the information there applies to the `/boot` partition!

Due to the limitations of most PC BIOSs, creating a small partition to hold these files is a good idea. For most users, a 32 MB boot partition is sufficient.

- *A root partition (/)*— The root partition is where `/` (the root directory) resides. In this partitioning layout, all files (except those stored in `/boot`) reside on the root partition. Because of this, it is in your best interest to maximize the size of your root partition. A 1.2 GB root partition will permit the equivalent of a workstation installation (with *very* little free space), while a 3.4 GB root partition will let you install every package. Obviously, the more space you can give the root partition, the better.

Specific recommendations concerning the proper size for various Red Hat Linux partitions can be found in Section 1.5, *Step 5 - Which Installation Class is Best For You?*.

E.1.9 One Last Wrinkle: Using GRUB or LILO

GRUB and LILO are the most commonly used methods to boot Red Hat Linux on Intel-based systems. As operating system loaders, they operate "outside" of any operating system, using only the Basic I/O System (or BIOS) built into the computer hardware itself. This section describe GRUB and LILO's interactions with PC BIOSs and is specific to Intel-compatible computers.

BIOS-Related Limitations Impacting GRUB and LILO

GRUB and LILO are subject to some limitations imposed by the BIOS in most Intel-based computers. Specifically, most BIOSs cannot access more than two hard drives, and they cannot access any data stored beyond cylinder 1023 of any drive. Note that some recent BIOSs do not have these limitations, but this is by no means universal.

All the data GRUB and LILO need to access at boot time (including the Linux kernel) are located in the `/boot` directory. If you follow the partition layout recommended above or are performing a workstation or server install, the `/boot` directory will be in a small, separate partition. Otherwise, it may reside in the root partition (`/`). In either case, the partition in which `/boot` resides must conform to the following guidelines if you are going to use GRUB or LILO to boot your Red Hat Linux system:

On First Two IDE Drives

If you have 2 IDE (or EIDE) drives, `/boot` must be located on one of them. Note that this two-drive limit also includes any IDE CD-ROM drives on your primary IDE controller. So, if you have one IDE hard drive, and one IDE CD-ROM on your primary controller, `/boot` must

be located on the first hard drive *only*, even if you have other hard drives on your secondary IDE controller.

On First IDE or First SCSI Drive

If you have one IDE (or EIDE) drive and one or more SCSI drives, `/boot` must be located either on the IDE drive or the SCSI drive at ID 0. No other SCSI IDs will work.

On First Two SCSI Drives

If you have only SCSI hard drives, `/boot` must be located on a drive at ID 0 or ID 1. No other SCSI IDs will work.

Partition *Completely* Below Cylinder 1023

No matter which of the above configurations apply, the partition that holds `/boot` must be located entirely below cylinder 1023. If the partition holding `/boot` straddles cylinder 1023, you may face a situation where GRUB and LILO will work initially (because all the necessary information is below cylinder 1023) but will fail if a new kernel is to be loaded and that kernel resides above cylinder 1023.

As mentioned earlier, it is possible that some of the newer BIOSs may permit GRUB and LILO to work with configurations that do not meet these guidelines. Likewise, some of GRUB and LILO's more esoteric features may be used to get a Linux system started, even if the configuration does not meet our guidelines. However, due to the number of variables involved, Red Hat cannot support such efforts.

Note

Disk Druid, as well as the workstation- and server installations, takes these BIOS-related limitations into account.

F Driver Disks

F.1 Why Do I Need a Driver Disk?

While the Red Hat Linux installation program is loading, you may see a screen that asks you for a driver disk. The driver disk screen is most often seen in three scenarios:

- If you run the installation program in `expert` mode
- If you run the installation program by entering `linux dd` at the `boot :` prompt
- If you run the installation program on a computer which does not have any PCI devices

F.1.1 So What Is a Driver Disk Anyway?

A driver disk adds support for hardware that is not otherwise supported by the installation program. The driver disk could be produced by Red Hat, it could be a disk you make yourself from drivers found on the Internet, or it could be a disk that a hardware vendor includes with a piece of hardware.

There is no need to use a driver disk unless you need a particular device in order to install Red Hat Linux. Driver disks are most often used for non-standard or very new CD-ROM drives, SCSI adapters, or NICs. These are the only devices used during the installation that might require drivers not included on the Red Hat Linux CD-ROMs (or boot disk, if you created an installation boot disk to begin the install process).

Note

If an unsupported device is not needed to install Red Hat Linux on your system, continue with the installation and add support for the new piece of hardware once the installation is complete.

F.1.2 How Do I Obtain a Driver Disk?

The Red Hat Linux CD-ROM 1 includes a driver disk image (`images/drivers.img`) containing many rarely used drivers. If you suspect that your system may require one of these drivers, you should create the driver disk before beginning your Red Hat Linux installation.

Another option for finding specialized driver disk information is on Red Hat's website at <http://www.redhat.com/support/errata> under the section called **Bug Fixes**. Occasionally, popular hardware may be made available after a release of Red Hat Linux that will not work with drivers already in the installation program or included on the driver disk image on the Red Hat Linux CD-ROM 1. In such cases, the Red Hat website may contain a link to a driver disk image.

Creating a Driver Disk from an Image File

If you have a driver disk image that you need to write to a floppy disk, this can be done from within DOS or Red Hat Linux.

To create a driver disk from a driver disk image using Red Hat Linux:

1. Insert a blank, formatted floppy disk into the first floppy drive.
2. From the same directory containing the driver disk image, such as `dd.img`, type `dd if=dd.img of=/dev/fd0` as root.

To create a driver disk from a driver disk image using DOS:

1. Insert a blank, formatted floppy disk into the a: drive.
2. From the same directory containing the driver disk image, such as `dd.img`, type `rawrite dd.img a:` at the command line.

F.1.3 Using a Driver Disk During Installation

Having a driver disk is not enough; you must specifically tell the Red Hat Linux installation program to load that driver disk and use it during the installation process.

Note

A driver disk is different than a boot disk. If you require a boot disk to begin the Red Hat Linux installation, you will still need to create that floppy and boot from it before using the driver disk.

If you do not already have an installation boot disk and your system does not support booting from the CD-ROM, you should create an installation boot disk. For instructions on how to make a boot disk, see Section 1.4.2, *Making Installation Diskettes*.

Once you have created your driver disk, begin the installation process by booting from the Red Hat Linux CD-ROM 1 (or the installation boot disk). At the `boot:` prompt, enter either **linux expert** or **linux dd**. Refer to Section 3.2.1, *Booting the Installation Program* for details on booting the installation program.

The Red Hat Linux installation program will ask you to insert the driver disk. Once the driver disk is read by the installer, it can apply those drivers to hardware discovered on your system later in the installation process.

G Configuring a Dual-Boot System

Sharing a computer between two operating systems requires dual booting. You can use either operating system on the computer, but not both at once. Each operating system boots from and uses its own hard drives or disk partitions.

This chapter explains how to configure your system to boot into both Red Hat Linux and another operating system. For clarity, we will assume that the other operating system is Microsoft Windows™. But the general procedures are similar for other operating systems.

Note

If Red Hat Linux will coexist on your system with OS/2, you must create your disk partitions with the OS/2 partitioning software — otherwise, OS/2 may not recognize the disk partitions. During the installation, do not create any new partitions, but do set the proper partition types for your Linux partitions using `fdisk`.

If you do not have any operating systems installed on your computer, install Windows first and then install Red Hat Linux.

- If you are installing Windows 9x or Windows ME, you can not define partitions during the Windows installation. Install Windows, and then refer to Section G.3, *Partitioning with FIPS* for instructions on using `fips` to repartition your hard drive and create free space for Linux.
- If you are installing Windows NT or Windows 2000, you can create partitions of a specific size for Windows. Leave enough free space (space that is not partitioned or formatted) on the hard drive to install Linux.

Tip

While partitioning your hard drive, keep in mind that the BIOS in some systems cannot access more than the first 1024 cylinders on a hard drive. If this is the case, leave enough room for the `/boot` Linux partition on the first 1024 cylinders of your hard drive to boot Linux. The other Linux partitions can be after cylinder 1024.

Refer to Section 1.3, *Step 3 - Do You Have Enough Disk Space?* to determine how much disk space to leave. After installing Windows, refer to Section G.2, *Installing Red Hat Linux in a Dual-Boot Environment*.

If the computer you want to install Red Hat Linux on is currently running Windows (or some other operating system), you have an important decision to make. Your choices are:

- Do you want Red Hat Linux to be the only operating system on your computer, despite the fact that you already have Windows on your computer? If yes, you do not have to configure a dual-boot system. Backup any information that you want to save and start the installation. During the installation, if you choose to have the installation program automatically partition your system on the **Disk Partitioning Setup** screen, choose **Remove all partitions on this system**. If you choose manual partitioning with Disk Druid or fdisk, delete all the existing DOS (Windows) partitions and then create your Linux partitions.
- Do you want to install Red Hat Linux and then have the option of booting either Red Hat Linux or your other operating system? A Red Hat Linux installation can be performed so that Red Hat Linux is installed on your system, but the other operating system is not affected. Since you already have Windows installed, you need to allocate disk space for Linux. Refer to Section G.1, *Allocating Disk Space for Linux*, and then refer to Section G.2, *Installing Red Hat Linux in a Dual-Boot Environment*.

G.1 Allocating Disk Space for Linux

WARNING

Remember to back up all important information before reconfiguring your hard drive. Be sure to create a boot disk for both operating systems in case the boot loader fails to recognize either of them.

If you already have Windows installed on your system, you need free hard drive space on which to install Red Hat Linux. Your choices are as follows:

- Add a new hard drive.
- Use an existing hard drive or partition.
- Create a new partition.

For all three options, be aware that the BIOS in some older systems cannot access more than the first 1024 cylinders on a hard drive. If this is the case, the `/boot` Linux partition must be located on the first 1024 cylinders of your hard drive to boot Linux.

G.1.1 Add a New Hard Drive

The simplest way to make room for Red Hat Linux is to add a new hard drive to the computer and then install Red Hat Linux on that drive. For example, if you add a second IDE hard drive to the computer, the Red Hat Linux installation program will recognize it as `hdb` and the existing drive (the one used by Windows) as `hda`. (For SCSI hard drives, the newly installed hard drive would be recognized as `sdb` and the other hard drive as `sda`.)

If you choose to install a new hard drive for Linux, all you need to do is start the Red Hat Linux installation program. After starting the Red Hat Linux installation program, just make sure you tell it to install Linux on the newly installed hard drive (such as `hdb` or `sdb`) rather than the hard drive used by Windows.

G.1.2 Use an Existing Hard Drive or Partition

Another way to make room for Linux is to use a hard drive or disk partition that is currently being used by Windows. For example, suppose that **Windows Explorer** shows two hard drives, `C:` and `D:`. This could indicate either that the computer has two hard drives, or a single hard drive with two partitions. In either case (assuming the hard drive is large enough), you can install Red Hat Linux on the hard drive or disk partition that Windows recognizes as `D:`.

This choice is available to you only if the computer has two or more hard drives or disk partitions.

Note

Windows uses letters to refer to removable drives (for example, a ZIP drive) and network storage (virtual drives) as well as for local hard drive space; you cannot install Linux on a removable or network drive.

If a local Windows partition is available in which you want to install Linux, complete the following steps:

1. Copy all data you want to save from the selected hard drive or partition (`D:` in this example) to another location.
 2. Start the Red Hat Linux installation program and tell it to install Linux in the designated drive or partition — in this example, in the hard drive or partition that Windows designates as `D:`. Note that Linux distinguishes between hard drives and disk partitions. Thus:
 - If `C:` and `D:` on this computer refer to two separate hard drives, the installation program will recognize them as `hda` and `hdb` (IDE) or `sda` and `sdb` (SCSI). Tell the installation program to install on `hdb` or `sdb`.
-

- If C: and D: refer to partitions on a single drive, the installation program will recognize them as hda1 and hda2 (or sda1 and sda2). During the partitioning phase of the Red Hat Linux installation, delete the second partition (hda2 or sda2), then partition the unallocated free space for Linux. You do not have to delete the second partition prior to starting the Red Hat Linux installation.

G.1.3 Create a New Partition

The third way to make room for Linux is to create a new partition for Red Hat Linux on the hard drive being used by the other operating system. If Windows Explorer shows only one hard drive (C:), and you do not want to add a new hard drive, you must partition the drive. After partitioning, Windows Explorer will see a smaller C: drive; and, when you run the Red Hat Linux installation program, you can partition the remainder of the drive for Linux.

You can use a destructive partitioning program, such as `fdisk`, to divide the hard drive, but doing so will require you to re-install Windows. (This is probably not your best option.)

A number of non-destructive third-party partitioning programs are available for the Windows operating system. If you choose to use one of these, consult their documentation.

For instructions on how to partition with FIPS, a program that is on the Red Hat Linux CD-ROM, refer to Section G.3, *Partitioning with FIPS*.

G.2 Installing Red Hat Linux in a Dual-Boot Environment

After Windows is installed and you have free disk space ready for Linux, you can start the Red Hat Linux installation program. Go to Chapter 1, *Steps to Get You Started* to begin. At this point, the only difference between a Red Hat Linux installation and configuring a dual-boot system during the Red Hat Linux installation is partitioning the hard drive and configuring the boot loader. When you are at the **Disk Partitioning Setup** screen as described in Section 3.10, *Disk Partitioning Setup*, return to this section.

G.2.1 Disk Partitioning

At the **Disk Partitioning Setup** screen of the installation program, you have a few options. Depending on which option you choose, the steps for configuring a dual-boot system vary. If you do not know how many Linux partitions to create, refer to Section 3.12, *Partitioning Your System* for a recommended partitioning scheme. If you choose:

- Automatic partitioning — Choose **Keep all partitions and use existing free space**. This option will leave your Windows partitions on the hard drive and partition the free space or additional hard drive for Red Hat Linux.
-

- Manual partitioning with Disk Druid — Do not delete the existing Windows partitions (they are the partitions of type `vfat`). Create your Linux partitions on the additional hard drive or in the free space you have reserved for Red Hat Linux.
- Manual partitioning with `fdisk` — Similiar to using Disk Druid except you will not have the graphical interface. The basic procedure is the same. Do not delete the existing partitions of type `FAT16`, `FAT32`, or `NTFS`. Create your Linux partitions on the additional hard drive or in the free space you have reserved for Red Hat Linux.

G.2.2 Configuring the Boot Loader

When you arrive at the **Boot Loader Installation** screen during the Red Hat Linux installation, choose to install the boot loader. You can use a different boot loader to boot both Red Hat Linux and Windows. Red Hat does not support alternate boot loaders. Thus, this section will discuss how to configure GRUB or LILO to boot both operating systems.

The Red Hat Linux installation program will usually detect Windows and automatically configure the boot loader (GRUB or LILO) to boot either Red Hat Linux or Windows. This can be seen on the boot loader screen of the installation program. An entry named **DOS** appears in the list of operating systems to boot.

G.2.3 Post-Installation

After the installation, whenever you start the computer, you can indicate whether you want to start Red Hat Linux or the other operating system from the boot loader screen. Choose **Red Hat Linux** to boot into Red Hat Linux, and choose **DOS** to boot into Windows.

If you did not partition all the free space on your hard drive for Red Hat Linux, you can partition it for Windows after installing Red Hat Linux. You can use `cdisk` or `fdisk` to create these partitions. `cdisk` is easier to use than `fdisk` because it is more interactive and has a menu from which to choose.

WARNING

It is highly recommended that you use `cdisk` or `fdisk` to create partitions after installing Red Hat Linux. Other partitioning software has been known to change the partitioning table of the hard drive and move the Linux partitions. If this happens, the boot loader will not be able to find the Linux partitions and will not boot into Red Hat Linux.

To access the files on the Windows partitions while using Red Hat Linux, refer to the *Accessing a Windows Partition* FAQ in the *Official Red Hat Linux Getting Started Guide*. If you formatted the Windows partitions in NTFS format, this method will not work.

G.3 Partitioning with FIPS

As a convenience to our customers, we provide the FIPS utility. This is a freely available program that can resize FAT (File Allocation Table) partitions. It is included on the Red Hat Linux CD-ROM in the `dosutils` directory. If you're using NTFS partitions, FIPS will not work.

Note

Many people have successfully used FIPS to repartition their hard drives. However, because of the nature of the operations carried out by FIPS, and the wide variety of hardware and software configurations under which it must run, Red Hat cannot guarantee that FIPS will work properly on your system. Therefore, no installation support whatsoever is available for FIPS; use it at your own risk.

That said, if you decide to repartition your hard drive with FIPS, it is vital that you do two things:

- *Perform a Backup* — Make two copies of all the important data on your computer. These copies should be to removable media (such as tape, CD-ROM, or diskettes), and you should make sure they are readable before proceeding.
- *Read the Documentation* — Completely read the FIPS documentation, located in the `dosutils/fipsdocs` directory on the Red Hat Linux CD-ROM 1.

Should you decide to use FIPS, be aware that after FIPS runs you will be left with two partitions: the one you resized, and the one FIPS created out of the newly freed space. If your goal is to use that space to install Red Hat Linux, you should delete the newly created partition, either by using `fdisk` under your current operating system, or while setting up partitions during a custom-class installation.

The following instructions are a simplified version of the FIPS documentation file, `fips.doc`, located in the FIPS directory (`/dosutils/fips20/*`). These instructions should apply in most instances. If you encounter any problems, see the documentation file.

1. From Windows:
 - Do a full backup.
 - Run `scandisk` to verify that the hard drive contains no bad clusters.
-

- Decide how to distribute the available space on the hard drive between the operating systems. Use Windows Explorer to see the free space on the drive. Make a note of the space (in megabytes) that each operating system will have.
- If you do not have one, create a Windows boot disk.

Creating a boot disk varies between different versions of Windows. Consult the Windows documentation for instructions on creating a Windows boot disk.

The diskette will be formatted, and COMMAND.COM, along with the associated hidden files (IO.SYS, MSDOS.SYS, and DBLSPACE.BIN), will be copied to the diskette.

- Copy the following files on the Red Hat Linux CD-ROM to the DOS boot disk.

```
dosutils/fips20/fips.exe
dosutils/fips20/restorrb.exe
dosutils/fips20/errors.txt
dosutils/fips20/fips.doc
dosutils/fips20/fips.faq
```

- Defragment the hard drive so that all the data on the hard drive is located at the beginning of the drive.
2. Insert the Windows boot disk into the floppy drive and reboot the system.
 3. Start FIPS (type `fips` at the prompt).

When FIPS begins, you'll find a welcome screen similar to the following:

```
FIPS version 2.0, Copyright (C) 1993/4 Arno Schaefer
FAT32 Support, Copyright (C) 1997 Gordon Chaffee
```

```
DO NOT use FIPS in a multitasking environment like Windows, OS/2, Desqview,
Novell Task manager or the Linux DOS emulator; boot from a DOS boot disk first.
```

```
If you use OS/2 or a disk compressor, read the relevant sections in FIPS.DOC.
```

```
FIPS comes with ABSOLUTELY NO WARRANTY, see file COPYING for details.
```

```
This is free software, and you are welcome to redistribute it
under certain conditions; again, see file COPYING for details.
```

```
Press any key.
```

When you press a key, a root partition screen will appear. (Note that, if the computer has more than one hard drive, you'll be asked to select which one you want to partition.)

When you press a key, details about the hard drive, such as the following, will appear.

```

Boot sector:
Bytes per sector: 512
Sectors per cluster: 8
Reserved sectors: 1
Number of FATs: 2
Number of rootdirectory entries: 512
Number of sectors (short): 0
Media descriptor byte: f8h
Sectors per FAT: 145
Sectors per track: 63
Drive heads: 16
Hidden sectors: 63
Number of sectors (long): 141057
Physical drive number: 80h
Signature: 29h

```

```

Checking boot sector ... OK
Checking FAT ... OK
Searching for free space ... OK

```

```

Do you want to make a backup copy of your root and boot sector before
proceeding? (y/n)

```

You should select [y], for yes, to make a backup copy of your root and boot sector before proceeding with FIPS.

Next, you will be presented with the following message:

```

Do you have a bootable floppy disk in drive A: as described in the
documentation? (y/n)

```

Verify that a DOS boot disk is in the floppy drive, and type [y], for yes. A screen similar to the following will appear, allowing you to resize the partition.

Figure G-1 Partition Resizing Screen

```

Writing file a:\rootboot:000

Enter start cylinder for new partition (33-526)

Use the cursor keys to choose the cylinder, <enter> to continue

Old partition          Cylinder          New partition

```

258.9 MB

33

3835.8 MB

The initial values allocate *all* free space on the disk to the new partition. This is not what you want, because this setting would leave no free space on your Windows partition. Press the [right arrow] to increase the size of the Windows partition and decrease the size of the new (Linux) partition; press the [left arrow] to decrease the size of the Windows partition and increase the size of the Linux partition. When the sizes are what you want, press [Enter]. A verification screen will appear.

If you type **r** (to re-edit the partition tables), Figure G-1, *Partition Resizing Screen* reappears, allowing you to change the partition sizes. If you answer **c**, a confirmation screen, Figure G-2, *FIPS Confirmation Screen*, appears:

Figure G-2 FIPS Confirmation Screen

```

New boot sector:

Boot sector:
Bytes per sector: 512
Sectors per cluster: 8
Reserved sectors: 1
Number of FATs: 2
Number of rootdirectory entries: 512
Number of sectors (short): 0
Media descriptor byte: f8h
Sectors per FAT: 145
Sectors per track: 63
Drive heads: 16
Hidden sectors: 63
Number of sectors (long): 141057
Physical drive number: 80h
Signature: 29h

Checking boot sector ... OK

Ready to write new partition scheme to disk
Do you want to proceed (y/n)?

```

Answering **y** completes the resizing operation. A harmless error message may occur, stating in effect that FIPS cannot reboot the system.

After a successful operation, the disk will have two partitions. The first partition (hda1 or sda1) will be used by Windows. We recommend that you start Windows (remember to remove the boot disk from drive A:) and run `scandisk` on drive C:.

If you encounter any problems (for example, Windows will not boot), you can reverse the FIPS resizing operation with the `restorrb.exe` command, which you copied to your DOS boot disk. In case of

any errors, read the **FIPS** documentation files (`fips.doc` and `fips.faq`), which describe a number of factors that could cause the resizing operation to fail. If all else fails, you can restore Windows with the backup you made.

The second partition (`hda2` or `sda2`) contains the space that the Red Hat Linux installation program will use. When the **Disk Druid** screen appears during installation, delete this partition (the installation manual explains how), then proceed with Linux partitioning.

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