



# **Intel N440BX Real Server Integration Guide**

## **Building an Internet Server with Red Hat\* Linux 5.1**

## Revision History

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<b>Revision</b>	<b>Revision History</b>
1.0	Initial Release
1.5	Incorporated Revisions by Technical Publications Group
1.6	Incorporated Revisions by Review, compatibility Testing

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# Integrating an Intel<sup>®</sup> N440BX as an Internet Server

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## WARNING

Whenever working in the system, ensure the power cord is fully disconnected. Power supplies that support Wake-On LAN\* or EMP provide a continuous 800 milliamps, +5v standby voltage to the system board.

## Assumptions

This installation procedure assumes you are installing Red Hat Linux 5.1 on a system built with an Intel N440BX server baseboard. In addition, it is assumed that at least one SCSI hard disk that supports the onboard SYM53C875 SCSI controller is connected to the ultra wide connector on the N440BX server board. The networking protocol is assumed to be TCP/IP and the network adapter is assumed to be the onboard Intel 82558 Ethernet\* adapter. The Intel 82558 on-board NIC is functionally equivalent to the Intel EtherExpress<sup>®</sup> PRO/100+ network interface controller. Refer to Red Hat documentation for details on network protocols and other information if necessary.

No tape drive was integrated into the server system. Intel strongly recommends integrating a backup device and running routine backups on any server that is put into production use. In addition, no UPS (uninterruptable power supply) was integrated. As with tape drives, it is also strongly recommended that a UPS be used with any server that contains critical data.

## Hardware Integration Overview

- Install the Pentium<sup>®</sup> II Processor dual retention mechanism and the Intel Pentium II Processor(s) on to the N440BX server board.
- Install the memory DIMM(s) on the N440BX Baseboard.
- Connect the floppy disk drive to the floppy port on the baseboard.
- Connect the IDE ATAPI CD-ROM as the master on the secondary IDE port on the baseboard.
- Connect the SCSI hard drive(s) in to the ultra wide connector on the N440BX server baseboard.
- For additional information on hardware integration for the N440BX server baseboard go to <http://channel.intel.com/design/servers/n440bx/index.htm>.

# Installing Red Hat\* Linux 5.1

## Pre-Installation Steps

1. Determine what protocol(s) this server will be running. Assuming TCP/IP, record information below.

IP Address	_____
Subnet Mask	_____
Default Gateway	_____
Machine Name	_____
Domain Name	_____

### NOTE

It is not recommended to use DHCP to assign the IP information of a server.

2. Power up your system and note at the initial screen what level of BIOS is installed. The BIOS used for this installation is Production Release 6.2 and may be necessary to successfully install the Operating System. The latest BIOS can be found at <http://support.intel.com/support/motherboards/server/n440bx> .
3. At the initial startup screen note what processor speed is displayed. The N440BX comes pre-configured with the processor speed set to 350Mhz. In some cases with higher speed CPU's, the user must change the speed setting in the BIOS. To enter the BIOS setup utility press the <F2> key during startup. The CPU speed setting can be found in the "Main" section of the BIOS setup utility.

### NOTE

If a boot floppy didn't come with your software, you can create one by using the DOS *rawrite* utility on the CD-ROM. For example, assuming your CD-ROM is the D: drive, you would type  
*d:\utils\rawrite -f Redhat\i386\images\boot.img.*

## Red Hat Linux 5.1 Installation Steps

### Starting the Installation and Creating Disk Partitions

1. After the system restarts, the boot floppy diskette will boot and you will see a "Welcome to Red hat Linux" screen. Press <Enter> for install or upgrade.
2. Answer the basic language and keyboard questions for your system.
3. When you come to "Installation Method" selection screen, select "local CD-ROM" and press <Enter>.
4. At the "Installation path" screen, select 'Install' and wait for system to finish scanning the SCSI bus. After a short time (normally a few seconds) it should find the Symbios SCSI controller that is integrated on the baseboard—it will display a dialog box saying "A NCR 53C8XX PCI card has been found on your system". Press <Enter> to acknowledge. Even

though a Symbios controller is on the server board, the software identifies it as a NCR SCSI device. This is standard operation and the Symbios SCSI device will function normally.

5. At the "Disk Setup" screen, select the 'Disk Druid' tool for creating the disk partitions that Linux will reside on. Disk Druid is a more intuitive interface for setting up the disk partitions than the text-based *fdisk* utility.
6. When starting Disk Druid, the display is split into three horizontal sections. The top part of the display screen displays partition information for a selected hard disk. The middle part of the screen displays the available hard drives in the system. Along the bottom of the screen are the menu buttons that you use to create, delete, and edit partitions. At this point, the mouse driver has not been loaded and cannot be used to navigate. Instead, use the tab and arrow keys to navigate this screen.
7. Select the first SCSI hard drive in the system (sda) in the "Drive Summaries" section. If there was an existing partition on the hard drive it will be listed in the top part of the screen. Select and delete any existing partitions using the delete button (Note: this operation will delete any existing data on the hard drive).
8. Create a new root partition by selecting 'Add' or by pressing <F1>.
9. An "Edit New Partition" window will be displayed. First, you must create the root partition. Type in "/" (without the quotes) for the mount point. Select the size of the root partition. The root partition is typically less than 1024 MB due to the limitation of some hard drives. Assuming you have one 4 GB hard drive, set the size of the root partition to 700-1000 MB. The type should be set to "Linux Native," "growable" should not be checked, and "sda" should be checked under Allowable Drives. Select 'OK'. That partition should now be listed on the top part of the Disk Druid screen.

## NOTE

The size and number of partitions on a Linux system can vary widely. For example, if you only have a / partition and no other partitions, then it should be large enough for all installed packages to fit (Around 700M for full install). However, if you also create a /usr partition, the root partition doesn't need to be as large because many of the packages would install to the /usr partition.

The table below shows the minimum size for Linux partitions and the recommended sizes assuming a 4GB hard drive and 64MB of RAM:

Mount Point	Partition Type	Minimum Size	Recommended Size
None	Linux Swap	2x Installed Memory (but no greater than 127MB)	127MB
/	Linux Native	50-80MB	1000MB
/usr	Linux Native	700MB	1000MB
/home (typically holds all web data)	Linux Native	Remaining	1872MB

10. Press the <F1> key to add a swap partition. The swap partition must be no greater than 127MB. Use the same steps to create the swap partition as you did to create the root partition, except set the type as 'Linux Swap'.
11. Add another partition with the <F1> key, with mount point /usr. This partition and any other partitions you add can be as large as you want as long as the total size of all partitions does not exceed the total disk size (see table above for recommended sizes assuming a 4GB hard drive and a minimum of 64MB of RAM). Other possible mount points can include /var, /usr, /home, and others. Each can reside on other hard drives. When done allocating partitions, press <F12> to quit. When asked to save, select 'Yes'.
12. The next screens will ask you if you want to format the new partitions. Format the swap partition and any other new partitions with the "check for bad blocks" option selected.

## Selecting and Installing Packages

13. At the "Components to Install" screen, choose what software packages are to be installed. You will need to customize which packages are installed to increase disk space. Select which packages to install or scroll to the bottom of the list and select Everything by using the spacebar to put an asterisk(\*) inside the brackets. Select 'OK'.
14. At the next screen acknowledge the install log by selecting 'OK' and wait for the install to finish unpacking everything to the hard drive.

## Setting Up the X Window Graphical User Interface

### NOTE

Although X Windows is a popular addition to the Linux operating system, it is possible that it can negatively impact overall system performance when running. However, for users who are not entirely familiar or comfortable with executing commands from a command line, this interface may be necessary.

15. After all the packages have been installed to the hard drive, the configure mouse screen will be displayed. Assuming that there is a PS/2 mouse attached to the PS/2 port on the N440BX server board, select PS/2 mouse from the menu and check the box that says "Emulate Three Buttons" if you only have a two-button mouse. Select 'OK'.
16. On the next screen you need to choose the video card in the system. Scroll down the list and select Cirrus Logic\* GD5464. Select 'OK' and the installation program will install the SVGA server for X windows.
17. On the "Monitor Setup" screen select your monitor from the list and select 'OK'.
18. The next screen asks if you would like to probe the graphics adapter for best video mode/color depth. Select probe and the screen will blink on and off about three times. After the probe a default setting of 16 bit per pixel color depth and 1024x768 resolution will be displayed. Select desired setting and continue. You can run Xconfigurator from the command line later to change these settings.

## Setting Up the Network

19. The next step is setting up the network. Select 'Yes' to the "Configure LAN" dialog box.
20. The installation will probe for the Network Adapter and a dialog box saying "A Intel EtherExpress Pro 100 card has been found on your system" will be displayed. The installer has successfully found the integrated Intel network card controller. Select 'OK' to confirm.
21. At the "Boot Protocol" screen select 'Static IP Address' and select 'OK'.
22. At the "Configure TCP/IP" screen type in the network information obtained in the pre-installation step and select 'OK'.
23. At the "Configure Network" screen type in the domain name and host name and any additional nameservers and select 'OK'. This information is usually provided by your Internet Service Provider.
24. At the "Configure Timezones" dialog box, select your time zone and select 'OK'.
25. At the "Services" dialog box, select the services you want started at boot time. The default starts all common services so select 'OK'. You can run `/usr/sbin/ntsysv` or `/sbin/chkconfig` after the installation to change which services automatically start on reboot.
26. The next screen is the "Configure Printer" dialog. If you don't have or plan to use a local or network printer select No and skip to next step. You can add a printer later. If you do plan to use a printer select 'Yes' and follow the instructions for configuring the printer.

27. At the next screen select a password for the root account (otherwise known as the superuser or administrator account).
28. At the "Bootdisk" screen it is recommended that you create a boot disk. Select 'Yes'. Insert a blank floppy in the drive and select 'OK' to continue. This will create the boot disk and take you to the next section. Remove the floppy and label it when finished.

## Installing the LILO (Linux Loader) Boot Manager and Starting Up the System

29. LILO is the boot manager used to boot Linux and can be used to boot other operating systems as well. At the "LILO Installation" dialog box select the master boot record as the location for the boot loader and select 'OK'.
30. At the next "LILO installation" dialog box you need to check the "Use Linear Mode" check box if you are using an LBA (Logical Block Addressing) SCSI hard drive. Select 'OK' and the boot loader will install.
31. Installation is now complete. Remove the Red Hat Linux 5.1 CD-ROM and any floppy diskettes and select 'OK' to reboot.
32. After the system restarts you will see the LILO prompt. This will allow you to boot other operating systems or kernels by using the TAB key to view a list of installed operating systems. To launch an operating system, type the listed name at the LILO prompt and press <Enter>. Since Linux is the default OS just pressing <enter> or waiting 5 seconds for it to time out will boot the system. After Linux boots, log in as root with the password you selected earlier in the setup process (step #27).
33. Optional: At the prompt type startx to start the X Windows graphical user interface. At the left of the screen is the control panel with icons that start applications for administrative tasks such as network, filesystem and web server configuration. See the documentation for further information on using X-Window.

## Setting up the Apache Web Server

The Apache web server service (httpd) should have started at boot time. You should be able to view the Apache default web page on a remote machine by simply typing in the fully qualified domain name (for example [www.mydomain.com](http://www.mydomain.com)). The web documents are stored in the directory /home/httpd by default but all aspects of the web server can be changed through either the graphical tool in the control panel or from editing the configuration files in /etc/httpd/conf/ using an editor like vi or emacs. For additional help visit the Apache web site at [www.apache.org](http://www.apache.org).

### Test Point

Your Web server is now running. You should be able to access it through a browser from a remote machine over the network or Internet. Type in the domain name of the server (for example [www.mydomain.com](http://www.mydomain.com)) or the IP address of the server (for example 10.0.0.1) into your browser. The homepage should appear.

### NOTE

Red Hat Linux 5.1 does support multi-processor systems like the N440BX. However, at this time multi-processor support is experimental. In order to implement SMP (Symmetric Multi-Processing) the kernel needs to be recompiled after installation with the SMP=1 line in the Makefile uncommented. Instructions for recompiling the kernel can be found in /usr/src/linux.

# INTEGRATION & COMPATIBILITY RESULTS

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## Introduction

This section encompasses the results of testing Red Hat Linux 5.1 on an Intel N440BX Server motherboard. The primary objective of our compatibility testing is to ensure:

- Robust functionality of Xserver and support for the Cirrus Logic GD5480 graphics controller
- Robust and continuous platform operation as an Internet Web server under sustained HTTP network load

## Hardware/Operating System Compatibility

To ensure robust web server functionality the server platform was tested under network stress in a representative Web server environment. A Web server benchmarking utility was used to generate HTTP requests over a local area network. In this environment the Web server must continuously stream data from a large file system to remote network software load generators which tally number of operations per second and report network throughput. For this particular configuration, the HTML files were randomly selected from directory structure of about 500MB with file sizes of up to 1MB. **The test executive was configured to deliver a constant, random request rate of 300 pages per second for duration of 48 hours.** At a sustained 300 pages per second request rate the network bandwidth utilization for the integrated Network Interface Card approaches 50%.

**The tests were considered to have passed if**

- the test suite executed successfully,
- test/data files created in the correct directories without error,
- clients remained connected,
- test suites ran to completion with no errors reported, and
- server remained responsive to user commands during and after testing.

## Compatibility Test Results

The following table represents the server configurations tested with the Red Hat Linux 5.1.

	Linux Red hat, Version 5.1 W/ XWindows	OS functionality	128MB of RAM	512MB of RAM
<b>PCI Host Bus Adapter</b>				
Symbios 53c875 Wide SCSI	Passed	*Passed	Passed	passed
Integrated IDE controller	Passed	Passed	Passed	Passed
Integrated Cirrus Logic GD5480	Passed	*Passed	Passed	passed
Quantum 4.5 GB SCSI HD	Passed	Passed	Passed	passed
Seagate ST34572W HD	Passed	Passed	Passed	passed

<b>CPU</b>				
Intel Pentium II 350 MHz	Passed	Passed	Passed	passed
Intel Pentium II 400 MHz	Passed	Passed	Passed	passed
<b>PCI Network Interface</b>				
Integrated Intel 82558 controller	Passed	Passed	Passed	passed
Intel EtherExpress Pro/100c Server	Passed	Passed	Passed	passed

Table 1 – Compatibility Test Results

\* Operating system Default settings selected for these components as outlined in the OS install guide

## Xserver Functionality

XServer functionality was tested during the test sessions and proved to be functional, responsive and stable. The initial default configuration was selected during the installation of the OS. Changes to video resolution characteristics were later made and X11 utilities and administration tools were executed successfully. Several of the native utilities and applications, including the Netscape browser were run simultaneously without failure while using the following video resolutions using the recommended driver for the OS and on board video controller.

<b>Cirrus Logic GD5480 Video Controller Using Cirrus Logic GD5464 Video Driver in Red Hat 5.1</b>	<b>Linux Red hat, Version 5.1 W/ XWindows</b>	<b>OS functionality &amp; Stability</b>	<b>2MB of video RAM</b>
Resolution 648x480	Passed	Passed	Passed
Resolution 800x600	Passed	Passed	Passed
Resolution 1024/768	Passed	Passed	Passed

Table 2

## Special Considerations for Installation

Installation configuration for memory support over 64MB must be given prior to installation of Red Hat Linux 5.1. The Lilo boot loader must have the line “append MEM=128M” or 512M, input at boot time of the LILO.CONF file must contain this statement. This is the only way that the OS will recognize memory amounts greater than 64MB.

# Appendix A: Detailed Equipment List

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## Hardware

Baseboard	Intel N440BX Server Board
Processor	One Intel Pentium II microprocessor operating at 400MHz and a termination card in the other processor slot.
Memory	Four 128MB Micron PC/100 compliant DIMM. Always check approved memory list before buying DIMMs for your N440BX Server Board.
SCSI Controller	Integrated Symbios Logic 53C875 SCSI controller
NIC	Integrated Intel 82558 controller (EtherExpress PRO/100+)
Video	Integrated Cirrus Logic* GD 5480 PCI w/2MB of Video RAM
IDE Controller	Integrated dual channel IDE controller
Floppy Controller	Integrated floppy controller
Floppy drive	1.44MB Floppy Drive
CD-ROM	IDE ATAPI Hitachi* 8130/8335 CD-ROM drive connected as master on 2nd IDE channel
Hard Drives	One 4.3GB capacity wide SCSI
Monitor	17" NEC* MultiSync E700/P750
Mouse	PS/2 compatible
Keyboard	PS/2 compatible

## Software

OS	Red Hat Linux 5.1 on CD-ROM
Apps	Apache Web Server

## Miscellaneous

BIOS	Production Release 6.2
BMC	Revision 05010040

## Reference Web Sites

N440BX reference chassis list	<a href="http://channel.intel.com/motherboards/server/N440BX/compat.htm">channel.intel.com/motherboards/server/N440BX/compat.htm</a>
N440BX memory list	<a href="http://channel.intel.com/motherboards/server/N440BX/compat.htm">channel.intel.com/motherboards/server/N440BX/compat.htm</a>
N440BX BIOS	<a href="http://channel.intel.com/motherboards/server/N440BX/software.htm">channel.intel.com/motherboards/server/N440BX/software.htm</a>
General Intel Server information	<a href="http://channel.intel.com/go/serverbuilder">channel.intel.com/go/serverbuilder</a>
Red Hat On-Line Documentation	<a href="http://www.redhat.com/support/docs/">www.redhat.com/support/docs/</a>
Red Hat Linux 5.1 FAQs	<a href="http://www.redhat.com/support/docs/faq-list.phtml">www.redhat.com/support/docs/faq-list.phtml</a>
Apache Web Services	<a href="http://www.apache.org/">www.apache.org/</a>
Apache FAQs	<a href="http://www.apache.org/docs/misc/FAQ.html">www.apache.org/docs/misc/FAQ.html</a>