COMPAQ
Installation Guide

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Compaq Computer Corporation

Brief Contents:

Linux Installation and Configuration Guide for AlphaServer DS10, DS20, DS20E, ES40, and AlphaStation XP1000 Computers

Abstract: *The purpose of this guide is to provide basic installation and configuration guidelines for the Linux operating system on AlphaServer DS10, DS20, DS20E, ES40 and AlphaStation XP1000 computers.*

Instructions are provided for the following distributions: Red Hat V6.2, SuSE V6.4, and TurboLinux V6.0. The information in this document should be applicable to most other Linux distributions for AlphaServer and AlphaStation computers.

Previous versions of this document provide information on installing Red Hat V6.0 and V6.1 and SuSE V6.1 and V6.3. These documents, and future Alpha Linux documents, can be found at: www.compaq.com/alphaserver/linux

Under Technical Information, click on Installation Guides.

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Chapter 4 Installing the TurboLinux V6.0 Distribution

Preface

Intended Audience

This manual is for system managers and others who want to install the Linux operating system on a *Compaq AlphaServer* or *AlphaStation* computer.

The instructions in this manual apply to the following Linux distributions:

- **Red Hat V6.2**
- **SuSE V6.4**
- **TurboLinux V6.0**

Document Structure

This manual has four chapters.

- **Chapter 1, SRM Overview**
- **Chapter 2, Installing the Red Hat V6.2 Distribution**
- **Chapter 3, Installing the SuSE V6.4 Distribution**
- **Chapter 4, Installing the TurboLinux V6.0 Distribution**

Documentation

In addition to using this manual, see the installation manual for the Linux distribution you are installing.

Information on the Internet

The following Web sites contain information about AlphaServer and AlphaStation systems and Linux:

http://www.compaq.com/alphaserver/Linux	Compaq Alpha Linux information site
ftp://ftp.digital.com/pub/DEC/Linux-Alpha/Images	Compaq Alpha kernel images site
http://ftp.digital.com/pub/Digital/Alpha/firmware	Compaq Alpha SRM firmware site
http://www.alphalinux.org	Web site that provides information about Linux and Alpha-based computer systems.
http://www.linux.org	Web site of Linux Online.
http://www.redhat.com	Red Hat site
http://www.suse.com	SuSE site
http://www.turbolinux.com	TurboLinux site

Chapter 1
SRM Overview

This chapter describes the SRM console, which is the console firmware used to boot the Linux operating system on Alpha platforms.

1.1 Using the SRM Console

The SRM console works much like a UNIX shell. It views your NVRAM and devices as a pseudo file system. You can see this by using the **ls** command. The SRM console contains a fairly large set of diagnostic, setup, and debugging utilities, the details of which are beyond the scope of this document. As in the UNIX shell, you can pipe the output of one command to the input of another. You can also use a **more** command that works like the UNIX **more** command. For a full listing of available commands, enter:

```
P00>>> help | more
```

Console Prompt

The SRM console prompt is some variant of >>> (three right angle-brackets). Typically, the prompt is P*nn*>>>, where *n* indicates the primary processor. In a multiprocessor system, the prompt could be P00>>>, P01>>>, and so on.

Environment Variables

SRM has environment variables, a number of which are predefined and correspond to locations in NVRAM. You can view the entire list of environment variables and their values with the **show** command (there are quite a few of them, so you will probably want to pipe its output to **more**). You can also use the * (asterisk) wildcard to show variables matching a pattern. For example, **show boot*** displays all the variables starting with "boot".

1.2 Boot Environment Variables

The most useful predefined environment variables for booting Linux are **bootdef_dev**, **boot_file**, and **boot_osflags**, and **auto_action**, all of which are cold non-volatile (they are saved across reboots). To set environment variables, use the **set** command, like this:

```
>>> set bootdef_dev dka0
```

The **boot** environment variables have the following functions:

Environment Variable	Function
bootdef_dev	Specifies the device that will be booted from if no device is specified on the **boot** command line or in an automatic boot.
boot_file	Specifies a default file name to be used for booting when no file name is specified by the **boot** command.
boot_osflags	Defines parameters to enable specific functions during the boot process.
auto_action	Specifies the action the console should take on power-up. By default, it is set to **halt**, meaning that the machine will start up in the SRM console. Once you have configured your bootloader and the boot-related variables, you can set it to **boot** in order to boot automatically on power-up.

1.3 How Does SRM Boot an OS?

SRM can boot from SCSI disks, floppy disks, and IDE devices.

Booting Linux with SRM is a two step process:

1. SRM loads and transfers control to the secondary bootstrap loader.
2. The secondary bootstrap loader sets up the environment for Linux, reads the kernel image from a disk file system, and transfers control to Linux.

The secondary bootstrap loader for used for booting Linux with the SRM firmware is **aboot,** which is shipped with the distributions documented in this book.

Loading the Secondary Bootstrap Loader

SRM knows nothing about file systems or disk partitions. It expects that the secondary bootstrap loader occupies a consecutive range of physical disk sector, starting from a given offset. The information on the size of the secondary bootstrap loader and the offset of its first disk sector is stored in the first 512-byte sector. Specifically, the long integer at offset 480 stores the *size* of the secondary bootstrap loader (in 512-byte blocks), and the long integer at offset 488 gives the *sector number* at which the secondary bootstrap loader starts. The first sector also stores a flag-word at offset 496, which is always 0, and a checksum at offset 504. The checksum is the sum of the first 63 long integers in the first sector.

If the checksum in the first sector is correct, SRM reads the *size* sectors starting from the sector given in the *sector number* field and places them in virtual memory at address `0x20000000`. If the reading completes successfully, SRM performs a jump to address `0x20000000`.

For More Information

For more information on the SRM console, see the documentation for your Alpha system.

Chapter 2
Installing the Red Hat V6.2 Distribution

This chapter explains how to install the Red Hat V6.2 distribution on Alpha systems. The following general steps are required:

- Determining the SRM firmware version
- Examining the system configuration
- Configuring SRM boot environment variables
- Preparing the system disks
- Installing the Red Hat distribution
- Creating and editing the BSD Disklabels (with Disk Druid)
- Disk Druid example
- Making final configuration changes

NOTE: *The SRM console examples in this chapter are based on the AlphaServer DS10 system. Console output will vary depending on the Alpha model.*

2.1 Determining the Firmware Version

The minimum supported version of SRM firmware for booting Linux is V5.7. To determine the firmware version on your system, power up the system to the SRM console prompt:

```
1024 Meg of system memory
probing hose 0, PCI
probing PCI-to-ISA bridge, bus 1
probing PCI-to-PCI bridge, bus 2
bus 0, slot 9 -- ewa -- DE500-BA Network Controller
bus 0, slot 11 -- ewb -- DE500-BA Network Controller
bus 0, slot 13 -- dqa -- Acer Labs M1543C IDE
bus 0, slot 13 -- dqb -- Acer Labs M1543C IDE
bus 0, slot 14 -- vga -- ELSA GLoria Synergy
bus 0, slot 15, function 1 -- dra -- Mylex DAC960
bus 0, slot 17 -- pka -- QLogic ISP10x0
System Temperature is 36 degrees C
initializing GCT/FRU at 3ff60000

COMPAQ AlphaServer DS10 466 MHz Console V5.7-8, Apr 12 2000 11:20:07

>>>
```

At the SRM console prompt, enter the following command to check the firmware version:

```
>>> show version
Version      V5.7-8 Apr 12 2000 11:20:07
```

If your system is running an earlier version, you will need to update the firmware.

2.1.1 Sources of Firmware Updates

The system firmware resides in the flash ROM located on the system board. The Alpha Systems Firmware Update Kit comes on a CD-ROM, which is updated quarterly. You can also obtain Alpha firmware updates from the Internet.

Quarterly Update Service

The Alpha Systems Firmware Update Kit CD-ROM is available by subscription from Compaq.

Alpha Firmware Internet Access

You can also obtain Alpha firmware update files from the Internet:

http://ftp.digital.com/pub/DEC/Alpha/firmware/

If you do not have a Web browser, you can access files using anonymous ftp:

ftp://ftp.digital.com/pub/DEC/

Click down the following directories: Alpha/firmware/readme.html

The README file explains how to download firmware updates.

2.2 Examining the System Configuration

Before installing the Red Hat distribution, you need to make note of your installation device (a floppy and/or CD-ROM) and your target disk drive.

2.2.1 Displaying the Boot Device

To display the devices and controllers on the system, enter the **show device** command at the SRM console prompt and make note of the installation device and target disk drive:

```
>>>show dev
dka0.0.0.17.0              DKA0            COMPAQ BB00921B91  3B05
dqa0.0.0.13.0              DQA0            COMPAQ CDR-8435    0013
dra0.0.0.115.0             DRA0                3 Member RAID 5
dva0.0.0.0.0               DVA0
ewa0.0.0.9.0               EWA0              08-00-2B-86-75-9C
ewb0.0.0.11.0              EWB0              08-00-2B-86-75-9F
pka0.7.0.17.0              PKA0            SCSI Bus ID 7  5.57
```

In this example, DKA0 is a SCSI disk, DQA0 is a CD-ROM, DRA0 is a hard disk in a RAID set, and DVA0 is a floppy drive. The device naming conventions are described in the next section.

2.2.2 Device Naming Conventions

The following table shows examples of boot device naming under SRM and corresponding Linux device names. Under SRM the first two letters (dv, dq, dk, and so on) designate a port or class driver, and the third letter (a, b, c, and so on) is an ID for a storage adapter. The number (0, 1, and so on) is the device unit number.

NOTE: *Under SRM, the partition number on a disk device is not given as part of the device name. As noted in Chapter 1, SRM knows nothing about partitions or disklabels. Extra numbers displayed in the* ***show device*** *output correspond to things like PCI bus and device numbers.*

SRM Device Names and Corresponding Linux Device Names

SRM	Linux	Meaning
dva0	/dev/fd0	First floppy drive
dqa0	/dev/hda	Primary IDE CD-ROM or hard disk as Master
dqa1	/dev/hdb	Primary IDE CD-ROM or hard disk as slave
dqb0	/dev/hdc	Secondary IDE CD-ROM or hard disk as slave
dqb1	/dev/hdd	Secondary IDE CD-ROM or hard disk as slave
dka0	/dev/sda	SCSI disk on first bus, Device 0
dka500	/dev/scd0	First CD-ROM or hard disk on a DS20 system
dra0 (see note)	/dev/ rd/c0d0	First hard disk on a Mylex disk controller. Not supported on RH6.2 distribution.
dwa0 or eia0	/dev/eth0	First Ethernet device

Note: The kernel that supports the Mylex RAID controller (SN-KZPBC-AA) can be found at the following ftp site:

ftp://ftp.digital.com/pub/DEC/Linux-Alpha/mylex/

2.3 Setting Boot Environment Variables

After examining the system configuration, you need to set SRM boot environment variables. The following example shows how to configure **boot** environment variables for the Linux Red Hat installation. Use the **show boot*** command to verify the settings. Details on these environment variables follow the example.

Example 2-1 Boot Settings

```
P00>>> set bootdef_dev dka0
P00>>> set boot_file
P00>>> set boot_osflags 0
P00>>> show boot*
boot_dev          dka0.0.0.17.0          ❶
boot_file                                ❷
boot_osflags      0                      ❸
boot_reset        OFF
bootdef_dev       dka0.0.0.17.0
booted_dev
booted_file
booted_osflags
```

❶ The device from which Linux will be booted (dka0)

❷ The default file name to be used for booting when no file name is specified by the **boot** command

❸ The device to be selected as the root-file system (dev/sda).

2.3.1 bootdef_dev

The bootdef_dev environment variable specifies one or more devices from which to boot the operating system. When more than one device is specified, the system searches in the order listed and boots from the first device.

Enter the **show bootdef_dev** command to display the current default boot device. Enter the **show device** command for a list of all devices in the system.

The syntax is:

set bootdef_dev *boot_device*

boot_device The name of the device on which the system software has been loaded. To specify more than one device, separate the names with commas.

NOTE: *When you set the* **bootdef_dev** *environment variable, it is recommended that you set the operating system boot parameters as well, using the* **set boot_osflags** *command.*

2.3.2 boot_file

The boot_file environment variable specifies the default file name to be used for booting when no file name is specified by the boot command.

The syntax is:

set boot_file *filename*

The *filename* is specific to the distribution of Linux.

2.3.3 boot_osflags

The boot_osflags environment variable sets the default boot flags.

Boot flags contain information used by the operating system to determine some aspects of a system bootstrap. Under normal circumstances, you can use the default boot flag settings.

To change the boot flags for the current boot only, use the *flags_value* argument with the **boot** command.

The syntax is:

set boot_osflags *flags_value*

The *flags_value* argument is specific to the operating system.

For Linux, the **boot_osflags** value is set to zero.

2.4 Preparing the System Disks

Before installing Linux, it is recommended that you erase the system disks. At the SRM prompt, enter the following commands:

```
>>>chmod +w dka*
>>>chmod +w dra*
>>>exer -a w dka0 &
>>>exer -a w dra0 &
```

Use the **show_status** command to determine the number of bytes written. Wait until the Bytes Written counter reaches 8 MB and then initialize the system.

```
P00>>> show_status
ID        Program     Device        Pass  Hard/Soft Bytes Written  Bytes Read
-------- ------------ ------------ ------ --------- ------------- -----------
00000001  idle system                0     0    0     0             0
000003c  exer_kid    dka0.0.0.17.0   0     0    0     8087040       0
00000040 exer_kid    dra0.0.0.115.0  0     0    0     8779776       0
.
.
.
>>>init
```

2.5 Installing the Red Hat Distribution

Install the Red Hat distribution as follows:

1. Insert the Red Hat V6.2 CD into the drive.
2. For IDE CD-ROM, enter the following **boot** command to boot the Red Hat installation program:

   ```
   >>>boot dqa0 –file kernels/generic.gz –flags “root=/dev/hda”
   ```

   For SCSI CD-ROM, enter the following **boot** command (assuming DKA500 is the CD-ROM):

   ```
   >>>boot dka500 –file kernels/generic.gz –flags “root=/dev/scd0”
   ```

The Red Hat distribution has a simple installation program. Most of the devices available with the Alpha systems can be correctly autodetected by Red Hat.

NOTES: *If you have trouble booting, for example, because of a typing error in setting the SRM environment variables, the system will display an* ***aboot>*** *prompt. Reset the system with the Reset button on the front panel. Then correct the error and reenter the* ***boot*** *command.*

During the boot process, messages about IDE STO errors may be displayed. You can ignore them.

When configuring "Timezones," select EST or the appropriate value for your location.

2.6 Creating and Editing the BSD Disklabels

To boot Linux from a disk using SRM, a disklabel is required. A disklabel is a partition table. The standard disklabels used by Linux are DOS partition tables. However, the SRM console's boot sector format overlaps with parts of the DOS partition table on disk, and therefore DOS partition tables cannot be used with SRM.

To boot Linux from a disk using SRM, a BSD disklabel is required. The SRM's boot block does not conflict with the BSD disklabel. In fact, the BSD disklabel resides entirely within reserved areas of the first sector.

The Red Hat V6.2 installation can create and edit the BSD disklabels through the Disk Druid utility. The distribution automatically installs and configures **aboot**, the boot program for installing Linux when using SRM. The distribution also adds a configuration file, aboot.conf, for aboot that simplifies the installation process. Section 2.6.1 gives an example of how to use Disk Druid.

After booting, the installation program displays the language screen. Click on the **next** button and follow the menus on the GUI to complete the installation.

NOTE: *If you wish to install the X Window System, the Elsa Gloria card has 8 MB of video RAM available. See the Red Hat installation guide for details.*

2.6.1 Disk Druid Example

Step 1 Disk Setup - Select "Disk Druid." Do not use fdisk

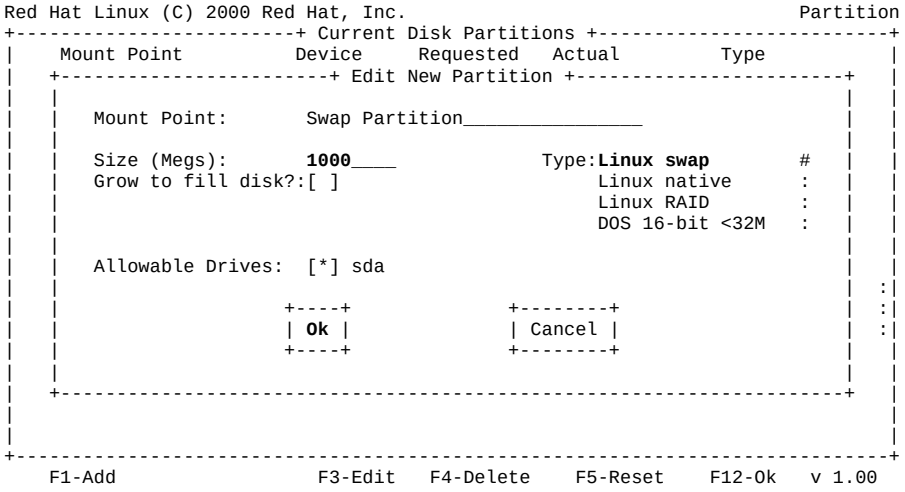
```
Red Hat Linux (C) 2000 Red Hat, Inc.
Partition
```

```
+--------------------+ Disk Setup +--------------------+
|                                                       |
| Disk Druid is a tool for partitioning and setting     |
| up mount points. It is designed to be easier to use   |
| than Linux's traditional disk partitioning software,  |
| fdisk, as well as more powerful. However, there are   |
| some cases where fdisk may be preferred.              |
|                                                       |
| Which tool would you like to use?                     |
|                                                       |
|    +------------+       +-------+       +------+     |
|    | Disk Druid |       | fdisk |       | Back |     |
|    +------------+       +-------+       +------+     |
|                                                       |
|                                                       |
+-------------------------------------------------------+
```

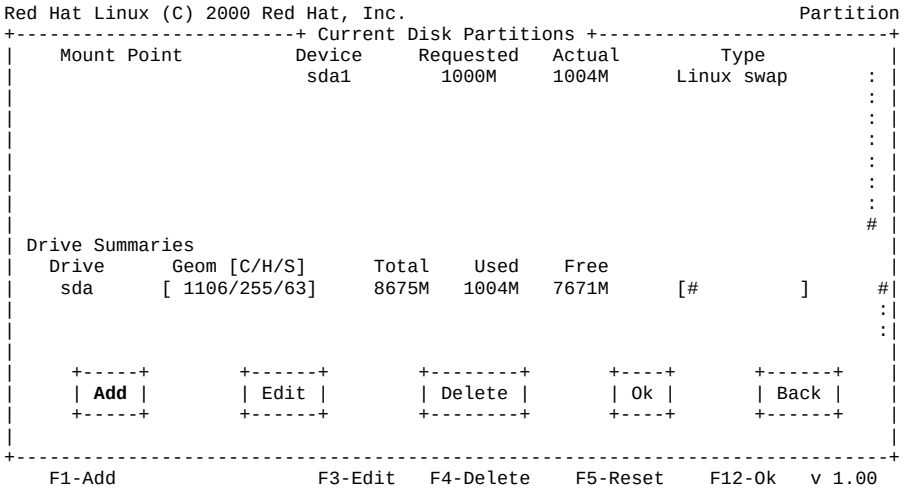
Step 2 Current Disk Partitions - Select "Add"

```
Red Hat Linux (C) 2000 Red Hat, Inc.                                  Partition
+------------------------+ Current Disk Partitions +--------------------------+
|    Mount Point          Device     Requested   Actual         Type           |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
|                                                                              |
| Drive Summaries                                                              |
|   Drive      Geom [C/H/S]      Total    Used    Free                         |
|    sda      [ 1106/255/63]     8675M      0M   8675M      [          ]      #|
|                                                                             :|
|                                                                             :|
|                                                                              |
|     +-----+        +------+        +--------+       +----+       +------+    |
|     | Add |        | Edit |        | Delete |       | Ok |       | Back |    |
|     +-----+        +------+        +--------+       +----+       +------+    |
|                                                                              |
+------------------------------------------------------------------------------+
    F1-Add                 F3-Edit   F4-Delete    F5-Reset    F12-Ok   v 1.00
```

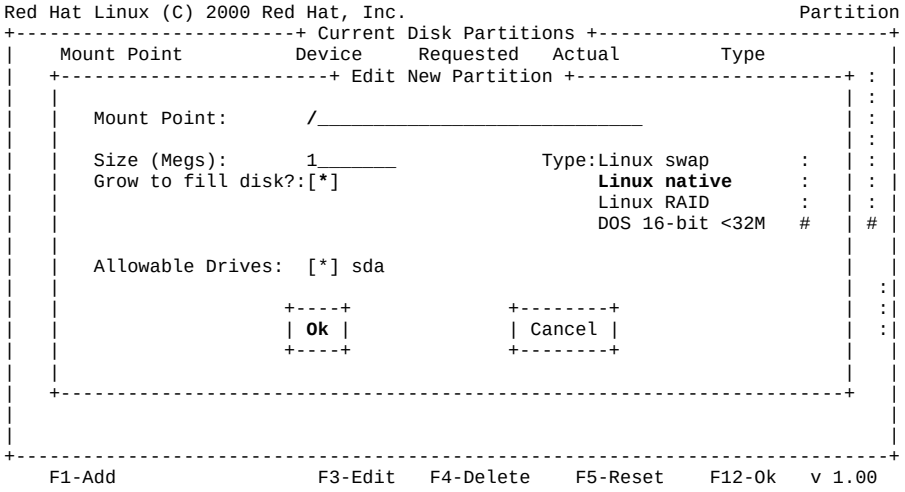
Step3 Current Disk Partitions - Select "Size (Megs): 1000 - Type: Linux swap" and press OK



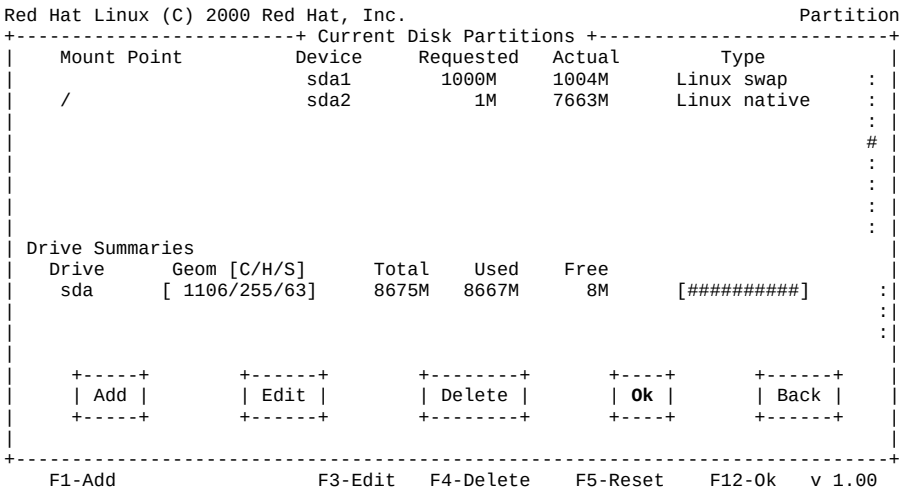
Step 4 Current Disk Partitions - Select "Add"



Step 5 Current Disk Partitions - Select "Mount Point: / - Grow to fill disk?:[*] Type: linux native" and press OK



Step 6 Current Disk Partitions - Select OK to save changes.



2.7 Making Final Configuration Changes

The final step in installing Linux on Alpha is to configure the system to enable booting from the hard drive.

After the Linux software has been loaded to the disk, the system will attempt to reboot. **Before it begins the boot process, press the Reset button on the front panel or power-cycle the system.** The system will stop at the SRM prompt. You can now boot directly from the hard drive. The boot output looks similar to the following. This example uses the AlphaServer DS10 system.

```
P00>>> boot
(boot dka0.0.0.17.0 -flags 0)
block 0 of dka0.0.0.17.0 is a valid boot block
reading 152 blocks from dka0.0.0.17.0
bootstrap code read in
base = 200000, image_start = 0, image_bytes = 13000
initializing HWRPB at 2000
initializing page table at 3ff46000
initializing machine state
setting affinity to the primary CPU
jumping to bootstrap code
aboot: Linux/Alpha SRM bootloader version 0.5
aboot: switching to OSF/1 PALcode version 1.72
aboot: valid disklabel found: 2 partitions.
aboot: booted_dev='scsi 0 17 0 0 0 0 0', guessing boot_device='sda2'
aboot: loading compressed boot/vmlinux.gz...
aboot: ok, now starting the kernel...
Linux version 2.2.15 (jestabro@linux04) (gcc version egcs-2.91.66
19990314/Linux
 (egcs-1.1.2 release)) #2 SMP Thu May 11 10:08:04 EDT 2000
Booting GENERIC on Tsunami variation Webbrick using machine vector Webbrick
from
 SRM
Command line: root=/dev/sda2 bootdevice=sda2 bootfile=boot/vmlinux.gz
SMP: 1 CPUs probed -- cpu_present_mask = 1
HWRPB cycle frequency (462962962) seems inaccurate - using the measured value
of
 462372120 Hz
Console: colour VGA+ 80x25
Calibrating delay loop... 920.65 BogoMIPS
Memory: 1032544k available
Dentry hash table entries: 131072 (order 8, 2048k)
Buffer cache hash table entries: 524288 (order 9, 4096k)
Page cache hash table entries: 131072 (order 7, 1024k)
VFS: Diskquotas version dquot_6.4.0 initialized
POSIX conformance testing by UNIFIX
SMP mode deactivated.
Alpha PCI BIOS32 revision 0.04
PCI: Probing PCI hardware
Linux NET4.0 for Linux 2.2
Based upon Swansea University Computer Society NET3.039
NET4: Unix domain sockets 1.0 for Linux NET4.0.
NET4: Linux TCP/IP 1.0 for NET4.0
IP Protocols: ICMP, UDP, TCP
TCP: Hash tables configured (ehash 524288 bhash 65536)
Starting kswapd v 1.5
parport0: PC-style at 0x3bc (0x7bc) [SPP,ECP,ECPPS2]
```

```
parport0: detected irq 7; use procfs to enable interrupt-driven operation.
Detected PS/2 Mouse Port.
Serial driver version 4.27 with no serial options enabled
ttyS00 at 0x03f8 (irq = 4) is a 16550A
ttyS01 at 0x02f8 (irq = 3) is a 16550A
pty: 256 Unix98 ptys configured
lp0: using parport0 (polling).
RAM disk driver initialized:  16 RAM disks of 4096K size
loop: registered device at major 7
hda: COMPAQ CDR-8435, ATAPI CDROM drive
ide0 at 0x1f0-0x1f7,0x3f6 on irq 14
io_request_lock is fffffc0000558d28
hda: ATAPI 32X CD-ROM drive, 128kB Cache
Uniform CDROM driver Revision: 2.56
Floppy drive(s): fd0 is 2.88M
FDC 0 is a post-1991 82077
DAC960: ***** DAC960 RAID Driver Version 2.2.5 of 23 January 2000 *****
DAC960: Copyright 1998-2000 by Leonard N. Zubkoff <lnz@dandelion.com>
DAC960#0: Configuring Mylex DAC960PRL PCI RAID Controller
DAC960#0:   Firmware Version: 4.07-0-29, Channels: 1, Memory Size: 4MB
DAC960#0:   PCI Bus: 0, Device: 15, Function: 1, I/O Address: Unassigned
DAC960#0:   PCI Address: 0xA8000000 mapped at 0xA8000000, IRQ Channel: 39
DAC960#0:   Controller Queue Depth: 124, Maximum Blocks per Command: 128
DAC960#0:   Driver Queue Depth: 123, Maximum Scatter/Gather Segments: 33
DAC960#0:   Stripe Size: 64KB, Segment Size: 8KB, BIOS Geometry: 128/32
DAC960#0:   Physical Devices:
DAC960#0:     0:0  Vendor: DEC       Model: RZ1DF-CB (C) DEC  Revision: 0372
DAC960#0:          Serial Number:       680101914A
DAC960#0:          Disk Status: Online, 17772544 blocks
DAC960#0:     0:1  Vendor: SEAGATE   Model: ST34501W          Revision: 7B00
DAC960#0:          Serial Number: LG517138
DAC960#0:          Disk Status: Online, 8386560 blocks
DAC960#0:     0:2  Vendor: SEAGATE   Model: ST34501W          Revision: 7B00
DAC960#0:          Serial Number: LG235961
DAC960#0:          Disk Status: Online, 8386560 blocks
DAC960#0:   Logical Drives:
DAC960#0:     /dev/rd/c0d0: RAID-5, Online, 16773120 blocks, Write Thru
qlogicisp : new isp1020 revision ID (5)
scsi0 : QLogic ISP1020 SCSI on PCI bus 00 device 88 irq 47 I/O base 0xb800
scsi0 : QLogic ISP1020 SCSI on PCI bus 00 device 88 irq 47 I/O base 0xb800
scsi : 1 host.
  Vendor: COMPAQ    Model: BB00921B91        Rev: 3B05
  Type:   Direct-Access                      ANSI SCSI revision: 02
Detected scsi disk sda at scsi0, channel 0, id 0, lun 0
scsi : detected 1 SCSI disk total.
SCSI device sda: hdwr sector= 512 bytes. Sectors= 17773524 [8678 MB] [8.7 GB]
PPP: version 2.3.7 (demand dialling)
TCP compression code copyright 1989 Regents of the University of California
PPP line discipline registered.
3c59x.c:v0.99H 11/17/98 Donald Becker
http://cesdis.gsfc.nasa.gov/linux/drivers/
vortex.html
tulip.c:v0.89H 5/23/98 becker@cesdis.gsfc.nasa.gov
eth0: Digital DS21142/3 Tulip at 0x8000, 08 00 2b 86 75 9c, IRQ 29.
eth0:  EEPROM default media type Autosense.
eth0:  Index #0 - Media 10baseT (#0) described by a 21142 Serial PHY (2)
block.
eth0:  Index #1 - Media 10baseT-FD (#4) described by a 21142 Serial PHY (2)
bloc
k.
eth0:  Index #2 - Media 100baseTx (#3) described by a 21143 SYM PHY (4)
block.
```

```
eth0:  Index #3 - Media 100baseTx-FD (#5) described by a 21143 SYM PHY (4)
block
.
eth1: Digital DS21142/3 Tulip at 0x8800, 08 00 2b 86 75 9f, IRQ 30.
eth1:  EEPROM default media type Autosense.
eth1:  Index #0 - Media 10baseT (#0) described by a 21142 Serial PHY (2)
block.
eth1:  Index #1 - Media 10baseT-FD (#4) described by a 21142 Serial PHY (2)
bloc
k.
eth1:  Index #2 - Media 100baseTx (#3) described by a 21143 SYM PHY (4)
block.
eth1:  Index #3 - Media 100baseTx-FD (#5) described by a 21143 SYM PHY (4)
block
.
Partition check:
 sda: sda1 sda2
 rd/c0d0: rd/c0d0p1 rd/c0d0p2
VFS: Mounted root (ext2 filesystem) readonly.
Freeing unused kernel memory: 176k freed
Adding Swap: 1028144k swap-space (priority -1)
Adding Swap: 1026032k swap-space (priority -2)
.
.
.


Red Hat Linux release 6.2 (Zoot)
Kernel 2.2.15 on an alpha
login:
```

Chapter 3
Installing the SuSE V6.4 Distribution

This chapter explains how to install the SuSE V6.4 distribution on Alpha systems. The following general steps are required:

- Determining the firmware version
- Examining the system configuration
- Setting boot environment variables
- Preparing the system disks
- Installing the SuSE distribution
- Creating and editing the BSD Disklabels
- Making final configuration changes
- Configuring the X Window System

3.1 Determining the Firmware Version

The minimum supported version of SRM firmware for booting Linux is V5.6. To determine the firmware version on your system, power up the system.

```
512 Meg of system memory
probing hose 0, PCI
probing PCI-to-ISA bridge, bus 1
bus 0, slot 9 -- ewa -- DE500-BA Network Controller
bus 0, slot 11 -- ewb -- DE500-BA Network Controller
bus 0, slot 13 -- dqa -- Acer Labs M1543C IDE
bus 0, slot 13 -- dqb -- Acer Labs M1543C IDE
bus 0, slot 14 -- vga -- ELSA GLoria Synergy
bus 0, slot 15 -- pka -- QLogic ISP10x0
os_type: UNIX - console CIPCA driver not started
Testing the System
Testing the Disks (read only)
Testing the Network
System Temperature is 39 degrees C
initializing GCT/FRU at 1f8000

COMPAQ AlphaServer DS10 466 MHz Console V5.6-3, Nov 30 1999 08:36:11
>>>
```

1. At the SRM console prompt, enter the following command to check the firmware version:

```
>>>show version
version                V5.6-3 Nov 30 1999 08:36:11
```

If your system is running an earlier version, you will need to update the firmware.

3.1.1 Sources of Firmware Updates

The system firmware resides in the flash ROM located on the system board. The Alpha Systems Firmware Update Kit comes on a CD-ROM, which is updated quarterly. You can also obtain Alpha firmware updates from the Internet.

Quarterly Update Service

The Alpha Systems Firmware Update Kit CD-ROM is available by subscription from Compaq.

Alpha Firmware Internet Access

You can also obtain Alpha firmware update files from the Internet:

http://ftp.digital.com/pub/DEC/Alpha/firmware/

If you do not have a Web browser, you can access files using anonymous ftp:

ftp://ftp.digital.com/pub/DEC/

Click down the following directories: Alpha/firmware/readme.html

The README file explains how to download firmware updates.

3.2 Examining the System Configuration

Before installing the SuSE distribution, you need to make note of your installation device (a floppy and/or CD-ROM) and your target disk drive.

3.2.1 Displaying the Boot Device

To display the devices and controllers on the system, enter the **show device** command at the SRM console prompt and make note of the installation device and target disk drive:

```
>>>show dev
dka0.0.0.15.0              DKA0              COMPAQ BB00921B91  3B05
dqa0.0.0.13.0              DQA0                COMPAQ CDR-8435  0013
dva0.0.0.0.0               DVA0
ewa0.0.0.9.0               EWA0              08-00-2B-86-68-18
ewb0.0.0.11.0              EWB0              08-00-2B-86-66-CA
pka0.7.0.15.0              PKA0                  SCSI Bus ID 7  5.57
```

In this example, DKA0 is a hard disk, DQA0 is a CD-ROM, and DVA0 is a floppy drive. The naming conventions for devices are described in the next section.

3.2.2 Device Naming Conventions

The following table shows examples of boot device naming under SRM and corresponding Linux device names. Under SRM the first two letters (dq, dk, and so on) designate a port or class driver, and the third letter (a, b, c, and so on) is an ID for a storage adapter. The number (0, 1, and so on) is the device unit number.

NOTE: *Under SRM, the partition number on a disk device is not given as part of the device name. As noted in Chapter 1, SRM knows nothing about partitions or disklabels. Extra numbers displayed in the* ***show device*** *output correspond to things like PCI bus and device numbers.*

SRM Device Names and Corresponding Linux Device Names

SRM	Linux	Meaning
dva0	/dev/fd0	First floppy drive
dqa0	/dev/hda	Primary IDE CD-ROM or hard disk as Master
dqa1	/dev/hdb	Primary IDE CD-ROM or hard disk as slave
dqb0	/dev/hdc	Secondary IDE CD-ROM or hard disk as slave
dqb1	/dev/hdd	Secondary IDE CD-ROM or hard disk as slave
dka0	/dev/sda	SCSI disk on first bus, Device 0
dka500	/dev/scd0	First CD-ROM or hard disk on a DS20 system
dra0 (see note)	/dev/ rd/c0d0	First hard disk on a Mylex disk controller. Not supported on SuSE 6.4 distribution.
dwa0 or eia0	/dev/eth0	First Ethernet device

Note: The kernel that supports the Mylex RAID controller (SN-KZPBC-AA) can be found at the following ftp site:

ftp://ftp.digital.com/pub/DEC/Linux-Alpha/mylex/

3.3 Setting Boot Environment Variables

After examining the system configuration, you need to set SRM boot environment variables. The following example shows how to configure **boot** environment variables for the Linux SuSE installation. Use the **show boot*** command to verify the settings. Details on these environment variables follow the example.

Example 3-1 Boot Settings

```
P00>>> set bootdef_dev dka0
P00>>> set boot_file
P00>>> set boot_osflags 0
P00>>> show boot*
boot_dev          dka0.0.0.17.0          ❶
boot_file                                ❷
boot_osflags      0                      ❸
boot_reset        OFF
bootdef_dev       dka0.0.0.17.0
booted_dev
booted_file
booted_osflags
```

❶ The device from which Linux will be booted (dka0)

❷ The default file name to be used for booting when no file name is specified by the **boot** command

❸ The device to be selected as the root-file system

3.3.1 bootdef_dev

The bootdef_dev environment variable specifies one or more devices from which to boot the operating system. When more than one device is specified, the system searches in the order listed and boots from the first device.

Enter the **show bootdef_dev** command to display the current default boot device. Enter the **show device** command for a list of all devices in the system.

The syntax is:

set bootdef_dev *boot_device*

boot_device The name of the device on which the system software has been loaded. To specify more than one device, separate the names with commas.

NOTE: *When you set the* **bootdef_dev** *environment variable, it is recommended that you set the operating system boot parameters as well, using the* **set boot_osflags** *command.*

3.3.2 boot_file

The boot_file environment variable specifies the default file name to be used for booting when no file name is specified by the boot command.

The syntax is:

set boot_file *filename*

The *filename* is specific to the distribution of Linux.

3.3.3 boot_osflags

The boot_osflags environment variable sets the default boot flags.

Boot flags contain information used by the operating system to determine some aspects of a system bootstrap. Under normal circumstances, you can use the default boot flag settings.

To change the boot flags for the current boot only, use the *flags_value* argument with the **boot** command.

The syntax is:

set boot_osflags *flags_value*

The *flags_value* argument is specific to the operating system.

For Linux, the *boot_osflags* is set to zero.

3.4 Preparing the System Disks

Before installing Linux it is recommended that you erase the system disks. Enter the following commands at the SRM prompt:

```
>>>chmod +w dka*
>>>exer -a w dka0 &
```

Use the **show_status** command to determine the number of bytes written. Wait until the Bytes Written counter reaches 8 MB and then initialize the system.

```
P00>>> show_status
ID        Program     Device        Pass  Hard/Soft Bytes Written  Bytes Read
-------- ------------ ------------ ------ --------- ------------- -----------
00000001  idle system                0     0    0     0             0
000003c  exer_kid    dka0.0.0.17.0   0     0    0     8087040       0
.
.
.
>>>init
```

3.5 Installing the SuSE Distribution

Install the SuSE distribution as follows:

1. Insert the SuSE 6.4 CD into the drive.
2. For IDE CD-ROM, enter the following **boot** command to boot the SuSE installation program.

   ```
   >>>boot dqa0 –flags 0
   ```

   For SCSI CD-ROM, enter the following **boot** command (assuming DKA500 is the CD-ROM):

   ```
   >>>boot dka500 –flags 0
   ```

The SuSE distribution has a simple installation program. Most of the devices available with the Alpha systems can be correctly auto-detected by SuSE.

NOTE: *If you have trouble booting, for example, because of a typing error in setting the SRM environment variables, the system will display an* ***aboot>*** *prompt. Reset the system with the Reset button on the front panel. Then correct the error and reenter the* ***boot*** *command.*

Boot example:

```
>>>boot dqa0 –flags 0
(boot dqa0.0.0.13.0 -flags 0)
block 0 of dqa0.0.0.13.0 is a valid boot block
reading 165 blocks from dqa0.0.0.13.0
bootstrap code read in
base = 200000, image_start = 0, image_bytes = 14a00
initializing HWRPB at 2000
initializing page table at 1ff48000
initializing machine state
setting affinity to the primary CPU
jumping to bootstrap code
aboot: Linux/Alpha SRM bootloader version 0.7
aboot: switching to OSF/1 PALcode version 1.72
aboot: booting from device 'IDE 0 13 0 0 0 0 0'
aboot: no disklabel found.
iso: Max size:332303   Log zone size:2048
iso: First datazone:22   Root inode number 45056
aboot: loading compressed /etc/vm_full.gz...
aboot: segment 0, 2684800 bytes at 0xfffffc0000310000
aboot: zero-filling 267584 bytes at fffffc000059f780
aboot: loading initrd (2213196 bytes/2161 blocks) at
0xfffffc001fc46000
aboot: starting kernel /etc/vm_full.gz with arguments rw
root=/dev/fd0
...etc.
```

3.6 Creating and Editing the BSD Disklabels

To boot Linux from a disk using SRM, a disklabel is required. A disklabel is a partition table. The standard disklabels used by Linux are DOS partition tables. However, the SRM console's boot sector format overlaps with parts of the DOS partition table on disk, and therefore DOS partition tables cannot be used with SRM.

To boot Linux from a disk using SRM, a BSD disklabel is required. The SRM's boot block does not conflict with the BSD disklabel. In fact, the BSD disklabel resides entirely within reserved areas of the first sector.

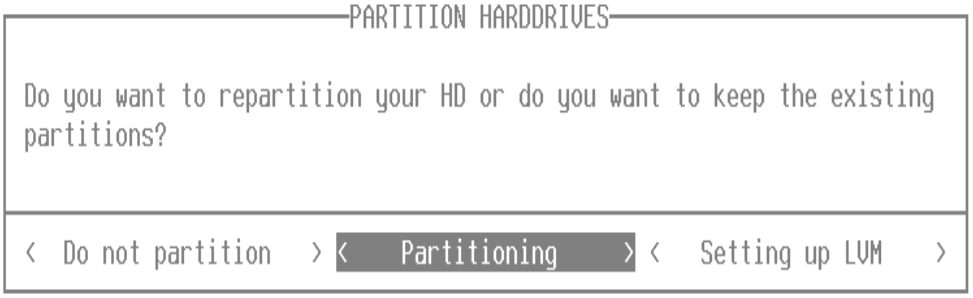
The SuSE V6.4 installation can create and edit the BSD disklabels through the disk partitioning utility. The distribution automatically installs and configures **aboot**, the boot program for installing Linux when using SRM. The distribution also adds a configuration file, aboot.conf, for aboot that simplifies the installation process. Follow the example shown to automatically partition the disk drive.

After booting, the installation program displays the language screen. Click on the **OK** button and follow the menus on the screen to complete the installation.

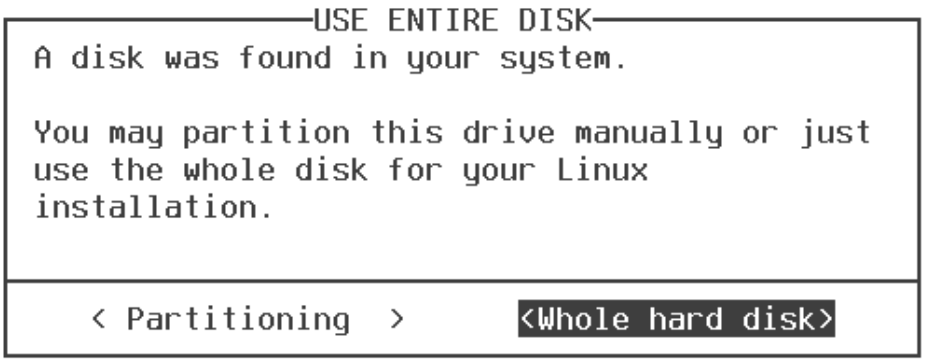
NOTE: *If you wish to install the X Window System, the Elsa Gloria card has 8 MB of video RAM available. See the SuSE installation guide for details.*

3.6.1 SuSE Auto Disk Partitioning Procedure

Step 1 Select "Partitioning"

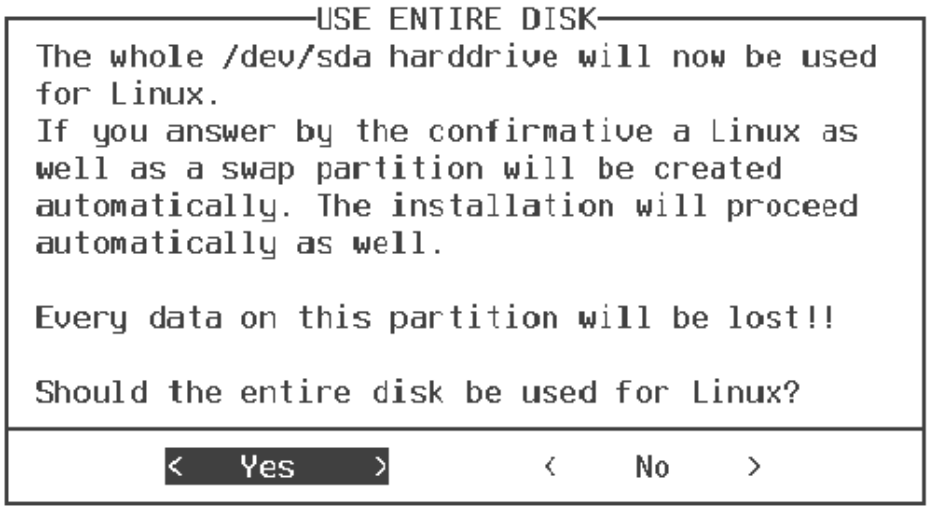


Step 2 Select "Whole hard disk"

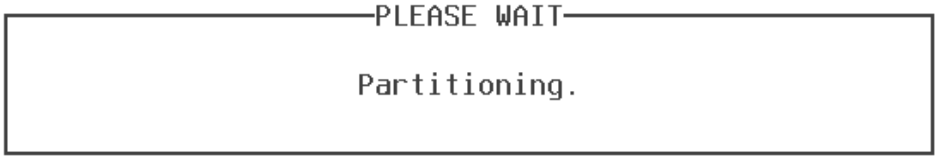


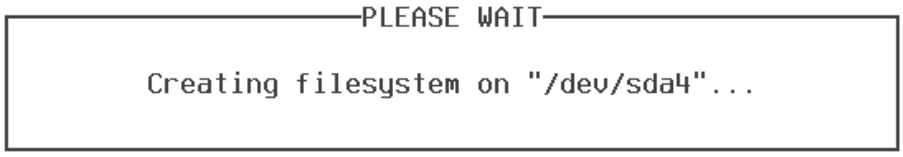
Continued on next page

Step 3 Select "Yes"



Step 4 Wait for partitioning to be completed





3.7 Making Final Configuration Changes

The final step in installing Linux on Alpha is to configure the system to enable booting directly from the hard drive.

You can now boot directly from the hard drive. The boot output looks similar to the following. This example uses the AlphaServer DS10 system.

```
>>>boot
(boot dka0.0.0.15.0 -flags 0)
block 0 of dka0.0.0.15.0 is a valid boot block
reading 165 blocks from dka0.0.0.15.0
bootstrap code read in
base = 200000, image_start = 0, image_bytes = 14a00
initializing HWRPB at 2000
initializing page table at 1ff52000
initializing machine state
setting affinity to the primary CPU
jumping to bootstrap code
aboot: Linux/Alpha SRM bootloader version 0.7
aboot: switching to OSF/1 PALcode version 1.62
aboot: booting from device 'SCSI 0 15 0 0 0 0 0'
aboot: valid disklabel found: 4 partitions.
aboot: loading compressed vmlinux.gz...
aboot: segment 0, 2719584 bytes at 0xfffffc0000310000
aboot: zero-filling 269856 bytes at fffffc00005a7f60
aboot: starting kernel vmlinux.gz with arguments ro root=/dev/sda4
Linux version 2.2.14 (root@AlphaSerial.suse.de) (gcc version 2.95.2 19991024
(release)) #1 Thu May 11 18:10:58 GMT 2000
Booting GENERIC on Tsunami variation Webbrick using machine vector Webbrick
from SRM
Command line: ro root=/dev/sda4
Console: colour VGA+ 80x25
Calibrating delay loop... 460.32 BogoMIPS
Memory: 513392k available
Dentry hash table entries: 65536 (order 7, 1024k)
Buffer cache hash table entries: 524288 (order 9, 4096k)
Page cache hash table entries: 65536 (order 6, 512k)
VFS: Diskquotas version dquot_6.4.0 initialized
POSIX conformance testing by UNIFIX
Alpha PCI BIOS32 revision 0.04
PCI: Probing PCI hardware
Linux NET4.0 for Linux 2.2
Based upon Swansea University Computer Society NET3.039
NET4: Unix domain sockets 1.0 for Linux NET4.0.
NET4: Linux TCP/IP 1.0 for NET4.0
IP Protocols: ICMP, UDP, TCP, IGMP
TCP: Hash tables configured (ehash 524288 bhash 65536)
Initializing RT netlink socket
Starting kswapd v 1.5
Detected PS/2 Mouse Port.
Serial driver version 4.27 with no serial options enabled
ttyS00 at 0x03f8 (irq = 4) is a 16550A
ttyS01 at 0x02f8 (irq = 3) is a 16550A
pty: 256 Unix98 ptys configured
Real Time Clock Driver v1.09
RAM disk driver initialized:  16 RAM disks of 64000K size
loop: registered device at major 7
Uniform Multi-Platform E-IDE driver Revision: 6.30
```

```
ide: Assuming 40MHz system bus speed for PIO modes; override with idebus=xx
ALI15X3: IDE controller on PCI bus 00 dev 68
ALI15X3: not 100% native mode: will probe irqs later
    ide0: BM-DMA at 0xb000-0xb007, BIOS settings: hda:pio, hdb:pio
    ide1: BM-DMA at 0xb008-0xb00f, BIOS settings: hdc:pio, hdd:pio
hda: COMPAQ CDR-8435, ATAPI CDROM drive
ide0 at 0x1f0-0x1f7,0x3f6 on irq 14
hda: ATAPI 32X CD-ROM drive, 128kB Cache, DMA
Uniform CDROM driver Revision: 2.56
Floppy drive(s): fd0 is 2.88M
FDC 0 is a post-1991 82077
LVM version 0.8e  by Heinz Mauelshagen  (4/1/2000)
lvm -- Driver successfully initialized
md driver 0.36.6 MAX_MD_DEV=4, MAX_REAL=8
linear personality registered
raid0 personality registered
raid1 personality registered
qlogicisp : new isp1020 revision ID (5)
scsi0 : QLogic ISP1020 SCSI on PCI bus 00 device 78 irq 39 I/O base 0xb800
scsi : 1 host.
  Vendor: COMPAQ    Model: BB00921B91        Rev: 3B05
  Type:   Direct-Access                      ANSI SCSI revision: 02
Detected scsi disk sda at scsi0, channel 0, id 0, lun 0
scsi : detected 1 SCSI disk total.
SCSI device sda: hdwr sector= 512 bytes. Sectors= 17773524 [8678 MB] [8.7 GB]
Partition check:
 sda: sda1 sda2 sda3 sda4
VFS: Mounted root (ext2 filesystem) readonly.
Freeing unused kernel memory: 208k freed
Adding Swap: 136544k swap-space (priority -1)
VFS: Disk change detected on device ide0(3,0)
ISO 9660 Extensions: RRIP_1991A
tulip.c:v0.91g-ppc 7/16/99 becker@cesdis.gsfc.nasa.gov
eth0: Digital DS21143 Tulip rev 65 at 0x8000, 08:00:2B:86:68:18, IRQ 29.
eth0:  EEPROM default media type Autosense.
eth0:  Index #0 - Media 10baseT (#0) described by a 21142 Serial PHY (2)
block.
eth0:  Index #1 - Media 10baseT-FD (#4) described by a 21142 Serial PHY (2)
block.
eth0:  Index #2 - Media 100baseTx (#3) described by a 21143 SYM PHY (4)
block.
eth0:  Index #3 - Media 100baseTx-FD (#5) described by a 21143 SYM PHY (4)
block.
eth1: Digital DS21143 Tulip rev 65 at 0x8800, 08:00:2B:86:66:CA, IRQ 30.
eth1:  EEPROM default media type Autosense.
eth1:  Index #0 - Media 10baseT (#0) described by a 21142 Serial PHY (2)
block.
eth1:  Index #1 - Media 10baseT-FD (#4) described by a 21142 Serial PHY (2)
block.
eth1:  Index #2 - Media 100baseTx (#3) described by a 21143 SYM PHY (4)
block.
eth1:  Index #3 - Media 100baseTx-FD (#5) described by a 21143 SYM PHY (4)
block.
.
.
.
```

```
Welcome to SuSE Linux 6.4 (AXP) - Kernel 2.2.14 (0).

peng3 login: root
Password:
You have new mail in /var/spool/mail/root.
Last login: Thu Jun 29 16:10:06 on tty1
Have a lot of fun...
peng3:~ #
```

3.8 Configuring the X Window System

To complete the installation, configure the X Window System:

1. At the Linux console prompt, enter the following command to configure the X Window System:

```
peng3:~ # sax
SaX: searching card...done
SaX: using XF86_3DLabs for configuration
SaX: if not correct set server manually using the -s option
SaX: go up again within 8 seconds [ Ctrl-c to abort ]
sax: .........

SaX: start new XF86_3DLabs server
.
.
.
```

2. To start the X Window System, enter the following command:

```
peng3:~ # startx
XFree86 Version 3.3.6 / X Window System
(protocol Version 11, revision 0, vendor release 6300)
Release Date: January 8 1999
       If the server is older than 6-12 months, or if your card is
newer
       than the above date, look for a newer version before reporting
       problems.  (see http://www.XFree86.Org/FAQ)
Operating System: Linux 2.2.13 alpha [ELF] SuSE
Configured drivers:
  GLINT: accelerated server for 3DLabs GLINT graphics adapters
(Patchlevel 0)
(using VT number 8)

XF86Config: /etc/XF86Config
(**) stands for supplied, (--) stands for probed/default values
(**) XKB: rules: "xfree86"
(**) XKB: model: "pc104"
(**) XKB: layout: "us"
(**) Mouse: type: PS/2, device: /dev/psaux, samplerate: 60
(**) Mouse: buttons: 3
(**) GLINT: Graphics device ID: "Primary-Card"
(**) GLINT: Monitor ID: "Primary-Monitor"
.
.
.
```

Chapter 4
Installing the TurboLinux V6.0 Distribution

This chapter explains how to install the TurboLinux V6.0 distribution on Alpha systems. The following general steps are required:

- Determining the SRM firmware version
- Examining the system configuration
- Setting SRM boot environment variables
- Preparing the system disks
- Installing the TurboLinux distribution
- Creating and editing the BSD Disklabels (with fdisk)
- Making final configuration changes

NOTE: *The SRM console examples in this chapter are based on the AlphaServer DS10 system. Console output will vary depending on the Alpha model.*

4.1 Determining the Firmware Version

The minimum supported version of SRM firmware for booting Linux is V5.7. To determine the firmware version on your system, power up the system:

```
1024 Meg of system memory
probing hose 0, PCI
probing PCI-to-ISA bridge, bus 1
probing PCI-to-PCI bridge, bus 2
bus 0, slot 9 -- ewa -- DE500-BA Network Controller
bus 0, slot 11 -- ewb -- DE500-BA Network Controller
bus 0, slot 13 -- dqa -- Acer Labs M1543C IDE
bus 0, slot 13 -- dqb -- Acer Labs M1543C IDE
bus 0, slot 14 -- vga -- ELSA GLoria Synergy
bus 0, slot 15, function 1 -- dra -- Mylex DAC960
bus 0, slot 17 -- pka -- QLogic ISP10x0
System Temperature is 36 degrees C
initializing GCT/FRU at 3ff60000

COMPAQ AlphaServer DS10 466 MHz Console V5.7-8, Apr 12 2000 11:20:07

>>>
```

At the SRM console prompt, enter the following command to check the firmware version:

```
P00>>> show version
Version             V5.7-8 Apr 12 2000 11:20:07
```

If your system is running an earlier version, you will need to update the firmware.

4.1.1 Sources of Firmware Updates

The system firmware resides in the flash ROM located on the system board. The Alpha Systems Firmware Update Kit comes on a CD-ROM, which is updated quarterly. You can also obtain Alpha firmware updates from the Internet.

Quarterly Update Service

The Alpha Systems Firmware Update Kit CD-ROM is available by subscription from Compaq.

Alpha Firmware Internet Access

You can also obtain Alpha firmware update files from the Internet:

http://ftp.digital.com/pub/DEC/Alpha/firmware/

If you do not have a Web browser, you can access files using anonymous ftp:

ftp://ftp.digital.com/pub/DEC/

Click down the following directories: Alpha/firmware/readme.html

The README file explains how to download firmware updates.

4.2 Examining the System Configuration

Before installing the TurboLinux distribution, you need to make note of your installation device (a floppy and/or CD-ROM) and your target disk drive.

4.2.1 Displaying the Boot Device

To display the devices and controllers on the system, enter the **show device** command at the SRM console prompt and make note of the installation device and target disk drive:

```
>>>show dev
dka0.0.0.17.0              DKA0              COMPAQ BB00921B91  3B05
dqa0.0.0.13.0              DQA0              COMPAQ CDR-8435  0013
dra0.0.0.115.0             DRA0                3 Member RAID 5
dva0.0.0.0.0               DVA0
ewa0.0.0.9.0               EWA0              08-00-2B-86-75-9C
ewb0.0.0.11.0              EWB0              08-00-2B-86-75-9F
pka0.7.0.17.0              PKA0                  SCSI Bus ID 7  5.57
```

In this example, DKA0 is a SCSI disk, DQA0 is a CD-ROM, DRA0 is a hard disk in a RAID set, and DVA0 is a floppy drive. The naming conventions for devices are described in the next section.

4.2.2 Device Naming Conventions

The following table shows examples of boot device naming under SRM and corresponding Linux device names. Under SRM the first two letters (dq, dk, and so on) designate a port or class driver, and the third letter (a, b, c, and so on) is an ID for a storage adapter. The number (0, 1, and so on) is the device unit number.

NOTE: *Under SRM, the partition number on a disk device is not given as part of the device name. As noted in Chapter 1, SRM knows nothing about partitions or disklabels. Extra numbers displayed in the* ***show device*** *output correspond to things like PCI bus and device numbers.*

SRM Device Names and Corresponding Linux Device Names

SRM	Linux	Meaning
dva0	/dev/fd0	First floppy drive
dqa0	/dev/hda	Primary IDE CD-ROM or hard disk as Master
dqa1	/dev/hdb	Primary IDE CD-ROM or hard disk as slave
dqb0	/dev/hdc	Secondary IDE CD-ROM or hard disk as slave
dqb1	/dev/hdd	Secondary IDE CD-ROM or hard disk as slave
dka0	/dev/sda	SCSI disk on first bus, Device 0
dka500	/dev/scd0	First CD-ROM or hard disk on a DS20 system
dra0 (see note)	/dev/ rd/c0d0	First hard disk on a Mylex disk controller. Not supported on TurboLinux 6.0 distribution.
dwa0 or eia0	/dev/eth0	First Ethernet device

Note: The kernel that supports the Mylex RAID controller (SN-KZPBC-AA) can be found at the following ftp site:

ftp://ftp.digital.com/pub/DEC/Linux-Alpha/mylex/

4.3 Setting Boot Environment Variables

After examining the system configuration, you need to set SRM boot environment variables. The following example shows how to configure **boot** environment variables for the TurboLinux installation. Use the **show boot*** command to verify the settings. Details on these environment variables follow the example.

Example 4-1 Boot Settings

```
P00>>> set bootdef_dev dka0
P00>>> set boot_file
P00>>> set boot_osflags 0
P00>>> show boot*
boot_dev          dka0.0.0.17.0          ❶
boot_file                                ❷
boot_osflags      0                      ❸
boot_reset        OFF
bootdef_dev       dka0.0.0.17.0
booted_dev
booted_file
booted_osflags
```

❶ The device from which Linux will be booted (dka0)

❷ The default file name to be used for booting when no file name is specified by the **boot** command

❸ The device to be selected as the root-file system (dev/sda).

4.3.1 bootdef_dev

The bootdef_dev environment variable specifies one or more devices from which to boot the operating system. When more than one device is specified, the system searches in the order listed and boots from the first device.

Enter the **show bootdef_dev** command to display the current default boot device. Enter the **show device** command for a list of all devices in the system.

The syntax is:

set bootdef_dev *boot_device*

boot_device The name of the device on which the system software has been loaded. To specify more than one device, separate the names with commas.

NOTE: *When you set the* **bootdef_dev** *environment variable, it is recommended that you set the operating system boot parameters as well, using the* **set boot_osflags** *command.*

4.3.2 boot_file

The boot_file environment variable specifies the default file name to be used for booting when no file name is specified by the boot command.

The syntax is:

set boot_file *filename*

The *filename* is specific to the distribution of Linux.

4.3.3 boot_osflags

The boot_osflags environment variable sets the default boot flags.

Boot flags contain information used by the operating system to determine some aspects of a system bootstrap. Under normal circumstances, you can use the default boot flag settings.

To change the boot flags for the current boot only, use the *flags_value* argument with the **boot** command.

The syntax is:

set boot_osflags *flags_value*

The *flags_value* argument is specific to the operating system.

For Linux, the **boot_osflags** value is set to zero.

4.4 Preparing the System Disks

Before installing Linux, it is recommended that you erase the system disks. At the SRM prompt, enter the following commands:

```
>>>chmod +w dka*
>>>chmod +w dra*
>>>exer -a w dka0 &
>>>exer -a w dra0 &
```

Use the **show_status** command to determine the number of bytes written. Wait until the Bytes Written counter reaches 8 MB and then initialize the system.

```
P00>>> show_status
ID        Program     Device        Pass  Hard/Soft Bytes Written  Bytes Read
-------- ----------- ------------ ------ --------- ------------- -----------
00000001  idle system                0     0    0     0             0
000003c  exer_kid    dka0.0.0.17.0   0     0    0     8087040       0
00000040 exer_kid    dra0.0.0.115.0  0     0    0     8779776       0
.
.
.
>>>init
```

4.5 Installing the TurboLinux Distribution

Install the TurboLinux distribution as follows:

1. Insert the TurboLinux V6.0 CD into the drive.
2. For IDE CD-ROM, enter the following **boot** command to boot the TurboLinux installation program.

   ```
   >>>boot dqa0
   ```

   For SCSI CD-ROM, enter the following **boot** command (assuming DKA500 is the CD-ROM):

   ```
   >>>boot dka500
   ```

The TurboLinux distribution has a simple installation program. Most of the devices available with the Alpha systems can be correctly autodetected by TurboLinux.

NOTES: *If you have trouble booting, for example, because of a typing error in setting the SRM environment variables, the system will display an* ***aboot>*** *prompt. Reset the system with the Reset button on the front panel. Then correct the error and reenter the* ***boot*** *command.*

During the boot process, messages about IDE STO errors may be displayed. You can ignore them.

When configuring "Timezones," select EST or the appropriate value for your location.

4.6 Creating and Editing the BSD Disklabels

To boot Linux from a disk using SRM, a disklabel is required. A disklabel is a partition table. The standard disklabels used by Linux are DOS partition tables. However, the SRM console's boot sector format overlaps with parts of the DOS partition table on disk, and therefore DOS partition tables cannot be used with SRM.

To boot Linux from a disk using SRM, a BSD disklabel is required. The SRM's boot block does not conflict with the BSD disklabel. In fact, the BSD disklabel resides entirely within reserved areas of the first sector.

The TurboLinux V6.0 installation can create the BSD disklabels through the fdisk utility. The distribution manually asks to installs and to configure **aboot**, the boot program for installing Linux when using SRM. The distribution also adds a configuration file, aboot.conf, for aboot that simplifies the installation process.

After booting, the installation program displays the language screen. Select the language and then press Enter to continue with the installation. When prompted to enter the Extra Hardware Floppy, select "skip" and continue with the installation.

NOTE: *If you wish to install the X Window System, the Elsa Gloria card has 8 MB of video RAM available (8192 kilobytes). It uses the 3Dlabs Permedia2 (generic driver). See the TurboLinux installation guide for details.*

4.6.1 Partitioning Guidelines

Before you start the partitioning, note the following:

- Partitions are letters from a–h (not numbers). Partition "**c**" covers the whole of the disk. You will need to delete partition "**c**" to install Linux correctly. See Section 4.6.2.
- While the disk parameters are viewable, make note of them, because you will use them more often than in making a DOS disklabel.
- Creating a new partition uses the same procedure as the DOS disklabel method except that the partitions are referred to by letter instead of number. That is, **n** to make a new partition, followed by the partition letter, followed by the starting block, followed by the end block.
- Setting partition type is slightly different from the DOS disklabel method because the numbering scheme is different (1 is swap, 8 is ext2).

The following multi-partition layout is strongly recommended:

Swap partition	A swap partition is used to support virtual memory. A swap partition of two times the computer RAM is recommended.
Root partition	The root partition is where the */root_directory* resides.

4.6.2 Partitioning Procedure

NOTE: *Type "p" after each main step in the procedure to verify the information you have specified.*

CAUTION: *If there is partition information already configured for the disk, delete it with the "d" option. Be sure you want to zero out this drive. All data on the drive will be lost.*

1. Choose option "**b**" to make a BSD disklabel. Answer Y to the following message:

   /dev/sda contains no disklabel. Do you want to create a disklabel? (y/n) Y

2. Delete the "**c**" partition.
3. Create the "**a**" (swap) partition and type the starting and ending cylinder numbers. Always start at cylinder 2 for the first partition (swap). Do the same to create the "**b**" (/root) partition.
4. Type "**p**" to print the partition table. The fstype is set to unused for each of the partitions. You will set each partition's filesystem ID. For each partition, type "**t**" to change the partitions' filesystem ID, enter the letter for the partition, then enter the system ID for the partition, as indicated below:

Partition	Filesystem ID
a (swap)	1
b (/ root)	8

5. Type "**p**" to print the partition table and verify all your settings.
6. Type "**w**" to write the disklabel to the disk.
7. Type "**q**" to quit.

NOTE: *For more information on creating partitions, see the Installation Guide provided by the software distribution vendor.*

4.7 Making Final Configuration Changes

The final step in installing Linux on Alpha is to configure the system to enable booting from the hard drive.

After the Linux software has been loaded to the disk, the system will attempt to reboot. **Before it begins the boot process, press the Reset button on the front panel or power-cycled the system.** The system will stop at the SRM prompt. You can now boot directly from the hard drive. The boot output looks similar to the following. This example uses the AlphaServer DS10 system.

```
P00>>> boot
(boot dka0.0.0.17.0 -flags 0)
block 0 of dka0.0.0.17.0 is a valid boot block
reading 152 blocks from dka0.0.0.17.0
bootstrap code read in
base = 200000, image_start = 0, image_bytes = 13000
initializing HWRPB at 2000
initializing page table at 3ff46000
initializing machine state
setting affinity to the primary CPU
jumping to bootstrap code
aboot: Linux/Alpha SRM bootloader version 0.5
aboot: switching to OSF/1 PALcode version 1.72
aboot: valid disklabel found: 2 partitions.
aboot: booted_dev='scsi 0 17 0 0 0 0 0', guessing boot_device='sda2'
aboot: loading compressed boot/vmlinux.gz...
aboot: ok, now starting the kernel...
Linux version 2.2.15 (jestabro@linux04) (gcc version egcs-2.91.66
19990314/Linux
 (egcs-1.1.2 release)) #2 SMP Thu May 11 10:08:04 EDT 2000
Booting GENERIC on Tsunami variation Webbrick using machine vector Webbrick
from
 SRM
Command line: root=/dev/sda2 bootdevice=sda2 bootfile=boot/vmlinux.gz
SMP: 1 CPUs probed -- cpu_present_mask = 1
HWRPB cycle frequency (462962962) seems inaccurate - using the measured value
of
 462372120 Hz
Console: colour VGA+ 80x25
Calibrating delay loop... 920.65 BogoMIPS
Memory: 1032544k available
Dentry hash table entries: 131072 (order 8, 2048k)
Buffer cache hash table entries: 524288 (order 9, 4096k)
Page cache hash table entries: 131072 (order 7, 1024k)
VFS: Diskquotas version dquot_6.4.0 initialized
POSIX conformance testing by UNIFIX
SMP mode deactivated.
Alpha PCI BIOS32 revision 0.04
PCI: Probing PCI hardware
Linux NET4.0 for Linux 2.2
Based upon Swansea University Computer Society NET3.039
NET4: Unix domain sockets 1.0 for Linux NET4.0.
NET4: Linux TCP/IP 1.0 for NET4.0
IP Protocols: ICMP, UDP, TCP
TCP: Hash tables configured (ehash 524288 bhash 65536)
Starting kswapd v 1.5
parport0: PC-style at 0x3bc (0x7bc) [SPP,ECP,ECPPS2]
```

```
parport0: detected irq 7; use procfs to enable interrupt-driven operation.
Detected PS/2 Mouse Port.
Serial driver version 4.27 with no serial options enabled
ttyS00 at 0x03f8 (irq = 4) is a 16550A
ttyS01 at 0x02f8 (irq = 3) is a 16550A
pty: 256 Unix98 ptys configured
lp0: using parport0 (polling).
RAM disk driver initialized:  16 RAM disks of 4096K size
loop: registered device at major 7
hda: COMPAQ CDR-8435, ATAPI CDROM drive
ide0 at 0x1f0-0x1f7,0x3f6 on irq 14
io_request_lock is fffffc0000558d28
hda: ATAPI 32X CD-ROM drive, 128kB Cache
Uniform CDROM driver Revision: 2.56
Floppy drive(s): fd0 is 2.88M
FDC 0 is a post-1991 82077
DAC960: ***** DAC960 RAID Driver Version 2.2.5 of 23 January 2000 *****
DAC960: Copyright 1998-2000 by Leonard N. Zubkoff <lnz@dandelion.com>
DAC960#0: Configuring Mylex DAC960PRL PCI RAID Controller
DAC960#0:   Firmware Version: 4.07-0-29, Channels: 1, Memory Size: 4MB
DAC960#0:   PCI Bus: 0, Device: 15, Function: 1, I/O Address: Unassigned
DAC960#0:   PCI Address: 0xA8000000 mapped at 0xA8000000, IRQ Channel: 39
DAC960#0:   Controller Queue Depth: 124, Maximum Blocks per Command: 128
DAC960#0:   Driver Queue Depth: 123, Maximum Scatter/Gather Segments: 33
DAC960#0:   Stripe Size: 64KB, Segment Size: 8KB, BIOS Geometry: 128/32
DAC960#0:   Physical Devices:
DAC960#0:     0:0  Vendor: DEC       Model: RZ1DF-CB (C) DEC  Revision: 0372
DAC960#0:          Serial Number:       680101914A
DAC960#0:          Disk Status: Online, 17772544 blocks
DAC960#0:     0:1  Vendor: SEAGATE   Model: ST34501W          Revision: 7B00
DAC960#0:          Serial Number: LG517138
DAC960#0:          Disk Status: Online, 8386560 blocks
DAC960#0:     0:2  Vendor: SEAGATE   Model: ST34501W          Revision: 7B00
DAC960#0:          Serial Number: LG235961
DAC960#0:          Disk Status: Online, 8386560 blocks
DAC960#0:   Logical Drives:
DAC960#0:     /dev/rd/c0d0: RAID-5, Online, 16773120 blocks, Write Thru
qlogicisp : new isp1020 revision ID (5)
scsi0 : QLogic ISP1020 SCSI on PCI bus 00 device 88 irq 47 I/O base 0xb800
scsi0 : QLogic ISP1020 SCSI on PCI bus 00 device 88 irq 47 I/O base 0xb800
scsi : 1 host.
  Vendor: COMPAQ    Model: BB00921B91        Rev: 3B05
  Type:   Direct-Access                      ANSI SCSI revision: 02
Detected scsi disk sda at scsi0, channel 0, id 0, lun 0
scsi : detected 1 SCSI disk total.
SCSI device sda: hdwr sector= 512 bytes. Sectors= 17773524 [8678 MB] [8.7 GB]
PPP: version 2.3.7 (demand dialling)
TCP compression code copyright 1989 Regents of the University of California
PPP line discipline registered.
3c59x.c:v0.99H 11/17/98 Donald Becker
http://cesdis.gsfc.nasa.gov/linux/drivers/
vortex.html
tulip.c:v0.89H 5/23/98 becker@cesdis.gsfc.nasa.gov
eth0: Digital DS21142/3 Tulip at 0x8000, 08 00 2b 86 75 9c, IRQ 29.
eth0:  EEPROM default media type Autosense.
eth0:  Index #0 - Media 10baseT (#0) described by a 21142 Serial PHY (2)
block.
eth0:  Index #1 - Media 10baseT-FD (#4) described by a 21142 Serial PHY (2)
bloc
k.
eth0:  Index #2 - Media 100baseTx (#3) described by a 21143 SYM PHY (4)
block.
```

```
eth0:  Index #3 - Media 100baseTx-FD (#5) described by a 21143 SYM PHY (4)
block
.
eth1: Digital DS21142/3 Tulip at 0x8800, 08 00 2b 86 75 9f, IRQ 30.
eth1:  EEPROM default media type Autosense.
eth1:  Index #0 - Media 10baseT (#0) described by a 21142 Serial PHY (2)
block.
eth1:  Index #1 - Media 10baseT-FD (#4) described by a 21142 Serial PHY (2)
bloc
k.
eth1:  Index #2 - Media 100baseTx (#3) described by a 21143 SYM PHY (4)
block.
eth1:  Index #3 - Media 100baseTx-FD (#5) described by a 21143 SYM PHY (4)
block
.
Partition check:
 sda: sda1 sda2
 rd/c0d0: rd/c0d0p1 rd/c0d0p2
VFS: Mounted root (ext2 filesystem) readonly.
Freeing unused kernel memory: 176k freed
Adding Swap: 1028144k swap-space (priority -1)
Adding Swap: 1026032k swap-space (priority -2)
.
.
.


TurboLinux release 6.0 English Server (Coyote)
Kernel 2.2.15 on an alpha (peng1)
VC: tty1

peng1 login:
```