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# IBM ServeRAID Device Driver Installation Instructions

You can use these instructions for the following controllers:

- ServeRAID-6i
- ServeRAID-6M
- ServeRAID-5i
- ServeRAID-4H
- ServeRAID-4M
- ServeRAID-4Mx
- ServeRAID-4L
- ServeRAID-4Lx
- ServeRAID-3H
- ServeRAID-3L
- ServeRAID-II
- ServeRAID



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## Installing device drivers

This booklet contains information about the device drivers available for the IBM® ServeRAID controllers. This booklet provides instructions for installing the device drivers on the following operating systems:

- Caldera OpenLinux (versions 3.1 and 3.1.1)
- IBM OS/2 WARP® Server for e-business
- Microsoft Windows 2000 Server and Advanced Server
- Microsoft Windows 2000 Professional (ServeRAID-6i, ServeRAID-5i, and ServeRAID-4Lx controllers only)
- Microsoft Windows Server 2003 Standard Edition and Enterprise Edition
- Microsoft Windows Server 2003 Enterprise Edition 64-bit (ServeRAID-4Mx and ServeRAID-6M controllers only)
- Microsoft Windows NT Server 4.0 and Enterprise Edition 4.0
- Microsoft Windows NT 4.0 Workstation (ServeRAID-6i, ServeRAID-5i, and ServeRAID-4Lx controllers only)
- Microsoft Windows XP Professional (ServeRAID-6i, ServeRAID-5i, and ServeRAID-4Lx controllers only)
- Novell NetWare (versions 5.1 and 6.0)
- Red Hat Advanced Server 2.1
- Red Hat Linux (versions 6.2, 7.0, 7.1, 7.2, 7.3, 8.0, and 9.0)
- SCO OpenServer 5.0.6a and 5.0.7
- SCO Open UNIX 8.0
- SCO UnixWare (versions 7.1.1 and 7.1.3)
- SCO UnitedLinux 4.0
- SuSE Linux Professional (versions 7.1, 7.2, 7.3, 8.0 and 8.1)
- SuSE Linux Enterprise Server 8
- SuSE Linux Enterprise Server 8 64-bit (ServeRAID-4Mx and ServeRAID-6M controllers only)
- Turbolinux (versions 6.5 and 7.0)
- Turbolinux Enterprise Server 8

**Note:** Device drivers for the following operating systems are provided for backward compatibility only: Red Hat Linux 6.2, 7.0, 7.1, and 7.2; SuSe Linux 7.x; and Turbolinux 6.5 and 7.0. To use the latest drivers, be sure to upgrade to a supported version of your operating system before installing the ServeRAID software.

The device drivers are contained on the *IBM ServeRAID Support* diskette specific to your operating system. You must create the diskettes using the *IBM ServeRAID Support* CD. For instructions for creating the diskettes, see "Creating ServeRAID diskettes" on page 4.

If you are installing files for a RAID controller that comes as a standard feature on your IBM server system board, use the installation instructions and CDs provided with your server.

If you have multiple ServeRAID controllers in your server and are installing device drivers for Windows 2000 or Windows NT 4.0, see “Installing multiple device drivers on Windows 2000, Windows NT 4.0, and Windows Server 2003” on page 7.

**Important:**

Verify that all levels of ServeRAID software installed on your server are compatible. In addition to device drivers, the ServeRAID software includes the following:

- BIOS and firmware code
- ServeRAID Manager program
- Command-line programs

If you download ServeRAID software from the World Wide Web, download and install *all* ServeRAID software at the same time.

**When using:**

**Go to:**

Windows XP	“Installing device drivers for Windows XP, Windows 2000, and Windows Server 2003” on page 8.
Windows 2000	“Installing device drivers for Windows XP, Windows 2000, and Windows Server 2003” on page 8.
Windows Server 2003	“Installing device drivers for Windows XP, Windows 2000, and Windows Server 2003” on page 8.
Windows Server 2003 64-bit	“Installing device drivers for Windows Server 2003 Enterprise Edition 64-bit” on page 12
Windows NT 4.0	“Installing device drivers for Windows Server 2003 Enterprise Edition 64-bit” on page 12.
NetWare	“Installing device drivers for NetWare” on page 14.
OS/2®	“Installing device drivers for OS/2 WARP Server for e-business” on page 16.
Red Hat Linux	“Installing device drivers for Red Hat Linux” on page 18.
SuSE Linux	“Installing device drivers for SuSE Linux” on page 21.
SuSE Linux 64-bit	“Installing device drivers for SuSE Linux Enterprise Server 8 64-bit” on page 22.
Caldera Linux	“Installing device drivers for Caldera OpenLinux” on page 22.
Turbolinux	“Installing device drivers for Turbolinux” on page 24.
UnitedLinux	“Installing device drivers for UnitedLinux” on page 25.
OpenServer	“Installing device drivers for SCO OpenServer” on page 26.
UnixWare	“Installing device drivers for SCO UnixWare or Open UNIX” on page 27.
Open UNIX	“Installing device drivers for SCO UnixWare or Open UNIX” on page 27.

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## Creating ServeRAID diskettes

Images for the following diskettes are in the \DISKETTE directory of the *IBM ServeRAID Support* CD. Each of the operating-system specific diskettes contains device drivers and the IPSSSEND utility.

**Note:** The IPSPMON utility is available only on the *IBM ServeRAID Support CD*.

Diskette image	Diskette
biosfw1.img	<i>IBM BIOS and Firmware Update (1 of 4) for the ServeRAID-6M controller</i>
biosfw2.img	<i>IBM BIOS and Firmware Update (2 of 4) for the ServeRAID-4H, ServeRAID-II, ServeRAID on-board, and the ServeRAID controllers</i>
biosfw3.img	<i>IBM BIOS and Firmware Update (3 of 4) for the ServeRAID-4M, ServeRAID-4Mx, ServeRAID-4L, ServeRAID-4Lx, ServeRAID-3H, and ServeRAID-3L controllers</i>
biosfw4.img	<i>IBM BIOS and Firmware Update (4 of 4) for the ServeRAID-5i and ServeRAID-6i controllers</i>
caldera1.img	<i>IBM ServeRAID Support for Caldera OpenLinux (1 of 2)</i>
caldera2.img	<i>IBM ServeRAID Support for Caldera OpenLinux (2 of 2)</i>
clusnt.img	<i>IBM ServeRAID Cluster Solution for Windows NT and Windows 2000</i>
dos.img	<i>IBM ServeRAID Support for DOS</i>
failover.img	<i>IBM ServeRAID Failover Support for Windows NT and Windows 2000</i>
netware.img	<i>IBM ServeRAID Support for Novell NetWare</i>
openserv.img	<i>IBM ServeRAID Support for SCO OpenServer</i>
openunix.img	<i>IBM ServeRAID Support for SCO UnixWare and Open UNIX</i>
os2.img	<i>IBM ServeRAID Support for OS/2</i>
redhat1.img	<i>IBM ServeRAID Support for Red Hat Linux (1 of 2) for kernel versions 2.2.x</i>
redhat2.img	<i>IBM ServeRAID Support for Red Hat Linux (2 of 2) for kernel versions 2.4.x</i>
suse.img	<i>IBM ServeRAID Support for SuSE Linux Professional</i>
turbo.img	<i>IBM ServeRAID Support for Turbolinux</i>
ul.img	<i>IBM ServeRAID Support for SCO UnitedLinux, SuSE Linux Enterprise Server, and Turbolinux Enterprise Server</i>
ul64.img*	<i>IBM ServeRAID Support for SuSE Linux Enterprise Server 64-bit</i>
win2003.img	<i>IBM ServeRAID Support for Windows Server 2003</i>
winnt.img	<i>IBM ServeRAID Support for Microsoft Windows NT 4.0</i>
win2k_xp.img	<i>IBM ServeRAID Support for Microsoft Windows XP Professional, Microsoft Windows 2000 Professional, Microsoft Windows 2000 Advanced Server, and Microsoft Windows 2000 Server</i>

\*ServeRAID Support CD for 64-bit operating systems only.

## Creating diskettes on Windows

Complete the following steps to create a diskette:

1. Insert the *IBM ServeRAID Support CD* into the CD-ROM drive.
2. Insert a blank diskette into the diskette drive.
3. Open a DOS window.
4. At the DOS or command prompt, type the following and press Enter:

```
e:\diskette\tools\dsk4w32 e:\diskette\disketteimage a:
```

where

- *e* is the drive letter for the CD-ROM drive.
  - *disketteimage* is the name of the diskette image.
  - *a* is the drive letter for the diskette drive.
5. Remove the *IBM ServeRAID Support* CD from the CD-ROM drive.
  6. Remove the diskette from the diskette drive and label the diskette appropriately.

## Creating diskettes on IBM OS/2

Complete the following steps to create a diskette:

1. Insert the *IBM ServeRAID Support* CD into the CD-ROM drive.
2. Insert a blank diskette into the diskette drive.
3. Open a DOS window.
4. At the command prompt, type the following and press Enter:  
`e:\diskette\tools\dsk4wrp e:\diskette\disketteimage a:`  
where
  - *e* is the drive letter for the CD-ROM drive.
  - *disketteimage* is the name of the diskette image.
  - *a* is the drive letter for the diskette drive.
5. Remove the *IBM ServeRAID Support* CD from the CD-ROM drive.
6. Remove the diskette from the diskette drive and label the diskette appropriately.

## Creating diskettes on Linux or UNIX

Complete the following steps to create a diskette:

1. Insert the *IBM ServeRAID Support* CD into the CD-ROM drive.
2. Insert a blank diskette into the diskette drive.
3. At a command prompt, mount the CD-ROM drive by typing one of the following:

<b>For Linux</b>	<code>mount -t iso9660 /dev/cdromdevicefile /mountpoint</code>
<b>For OpenServer</b>	<code>mount -r -f ISO9660 /dev/cdromdevicefile /mountpoint</code>
<b>For UnixWare and Open UNIX</b>	<code>mount -F cdfs /dev/cdromdevicefile /mountpoint</code>

where *cdromdevicefile* is the specific device file for the CD-ROM block device, and *mountpoint* is the mountpoint of the CD-ROM drive.

4. Press Enter.
5. At the command prompt, type the following:  
`dd if=/mountpoint/diskette/disketteimage of=/dev/diskettefile bs=32k`  
where
  - *mountpoint* is the mountpoint of the CD-ROM drive.
  - *disketteimage* is the name of the diskette image.
  - *diskettefile* is the specific device file for the diskette block device.
6. Press Enter.
7. Unmount the CD-ROM drive. Type the following and press Enter:  
`umount /mountpoint`

- where *mountpoint* is the mountpoint of the device file used in step 3.
8. Remove the *IBM ServeRAID Support* CD from the CD-ROM drive.
  9. Remove the diskette from the diskette drive and label the diskette appropriately.

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## Installing multiple device drivers on Windows 2000, Windows NT 4.0, and Windows Server 2003

If you install more than one ServeRAID controller in a server, you might need to install two ServeRAID device drivers. The following groups of ServeRAID controllers use different device drivers.

	Group 1	Group 2
Device driver	i960	powerpc
Controllers	ServeRAID-4M ServeRAID-4Mx ServeRAID-4L ServeRAID-4Lx ServeRAID-5i ServeRAID-6M (Win2K, Windows Server 2003 only) ServeRAID-6i	ServeRAID-4H ServeRAID-3H ServeRAID-3L ServeRAID-II ServeRAID

If you install *only* Group 1 or *only* Group 2 controllers in a server, you will only need to install one device driver. However, if you install both Group 1 and Group 2 ServeRAID controllers in a server, you must install two device drivers. In the following procedures, use the i960 device driver for Group 1 controllers and the powerpc device driver for Group 2 controllers.

## ServeRAID device driver order Windows 2000, Windows NT 4.0, and Windows Server 2003

If you install a Group 1 and Group 2 ServeRAID controller in a server, the order in which the devices are listed for Windows 2000, Windows NT 4.0, and Windows Server 2003 might not match the order in which the devices are listed in the startable (bootable) ServeRAID Manager program on the *IBM ServeRAID Support* CD and the ServeRAID Mini-Configuration program.

The startable ServeRAID Manager and the ServeRAID Mini-Configuration programs determine the order in which the controllers are listed in the following way. The programs scan the PCI slots until they detect a ServeRAID controller. The programs recognize controllers as members of Group 1 or Group 2 (see preceding table). They list all of the controllers in Group 1 before the controllers in Group 2.

For example, a server has four ServeRAID controllers installed in the following PCI-scan order:

1. ServeRAID-4Mx
2. ServeRAID-4H
3. ServeRAID-4Lx
4. ServeRAID-3H

Because the first controller scanned is a ServeRAID-4Mx, all ServeRAID-4M, ServeRAID-4Mx, ServeRAID-4L, and ServeRAID-4Lx controllers (Group 1) are listed first. Subsequently, all other ServeRAID models (Groups 2) are listed. In this example, the ServeRAID Manager and ServeRAID Mini-Configuration programs will list controllers in the following order:

1. ServeRAID-4Mx
2. ServeRAID-4Lx
3. ServeRAID-4H
4. ServeRAID-3H

**Note:** To determine the PCI-slot scan order, refer to your server documentation.

In contrast, Windows 2000, Windows NT 4.0, and Windows Server 2003 order SCSI controllers based on the order in which device drivers are loaded. For example, the device driver that is loaded first has its controllers listed first. Then, the device driver that is loaded second has its controllers listed second, and so on.

When you install Windows NT 4.0, the order in which you add device drivers to the server is the order in which the device driver is loaded. You can control the order in which the controllers are listed by installing the device drivers for the controllers in the same order that you want to have them listed.

However, when you install Windows 2000 or Windows Server 2003, the powerpc device driver is included on the *Windows* installation CD and is loaded before any device drivers you add at installation time, such as the i960 device driver. You can change the load order on Windows 2000 and Windows Server 2003 *only* by editing the Windows registry after installation.

**Note:** Refer to Microsoft knowledge base articles Q141832 and Q115486 for more information about editing the Windows registry to control the order in which the device drivers are loaded and the order in which the controllers are listed.

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## Installing device drivers for Windows XP, Windows 2000, and Windows Server 2003

Use the following instructions when you do one of the following:

- Install device drivers while installing Windows XP, Windows 2000, or Windows Server 2003
- Install device drivers after installing Windows XP, Windows 2000, or Windows Server 2003
- Update device drivers after installing Windows XP, Windows 2000, or Windows Server 2003

You will need one of the following diskettes:

- *IBM ServeRAID Support for Windows Server 2003 (win2003.img)*
- *IBM ServeRAID Support for Windows (win2k\_xp.img)*
- *IBM ServeRAID Failover Support for Windows NT and Windows 2000 (failover.img)*

**Note:** To install device drivers for Windows Server 2003 Enterprise Edition for 64-bit servers, see “Installing device drivers for Windows Server 2003 Enterprise Edition 64-bit” on page 12.

## Configuring a failover environment for Windows 2000

To configure a failover environment for Windows 2000, install the standard device driver for Windows 2000 first. Then, update the device driver with the *IBM ServeRAID Failover Support for Windows NT and Windows 2000* diskette. For information about updating the device driver, see “Updating device drivers after installing Windows XP, Windows 2000, or Windows Server 2003” on page 10.



**Note:** You must install a failover driver for each failover pair. Install the driver once if you have only one failover pair; twice if you have two failover pairs; and so on.

Failover is not supported on the ServeRAID-5i, ServeRAID-6i, ServeRAID-4M or ServeRAID-4L controllers.

## Installing device drivers while installing Windows XP, Windows 2000, or Windows Server 2003

Use the following instructions when you do one of the following:

- Install device drivers for a ServeRAID-4H, ServeRAID-3H, ServeRAID 3L, ServeRAID-II, or ServeRAID controller
- Install device drivers for a ServeRAID-4Mx, ServeRAID-4M, ServeRAID-4Lx, ServeRAID-4L, ServeRAID-5i, ServeRAID-6M, or ServeRAID-6i controller

### Installing device drivers for a ServeRAID-4H, ServeRAID-3, ServeRAID-II, or ServeRAID controller

- These instructions are for Windows 2000 only:

When installing Windows 2000, you must install the ServeRAID device driver that comes on the *Windows 2000* CD. The Windows installation program does not allow you to upgrade the device driver that comes with the installation CD. After installing Windows 2000, you *must* update the ServeRAID device driver to the latest version. Refer to "Updating device drivers after installing Windows XP, Windows 2000, or Windows Server 2003" on page 10.

- These instructions are for Windows Server 2003 only:

When installing Windows Server 2003, you can install the ServeRAID device driver that comes on the *Windows Server 2003* CD, or you can install the device driver from the *IBM ServeRAID Support* diskette. To install the device driver from diskette, follow the instructions described in the next section for the ServeRAID 4/5/6 family controllers. When the controller menu appears, select **IBM ServeRAID/II/3/4H/ Controller**. The Windows installation program will display a warning message that the driver on the diskette is newer than the driver on the CD. Press Enter to continue; then, follow the instructions provided by Windows to complete the installation process.

### Installing device drivers for a ServeRAID-4Mx, ServeRAID-4M, ServeRAID-4Lx, ServeRAID-4L, ServeRAID-5i, ServeRAID-6M, or ServeRAID-6i controller

**Note:** Windows 2000 Professional and Windows XP Professional are supported on the ServeRAID-4Lx, ServeRAID-5i, and ServeRAID-6i controllers only.

Complete the following steps to install the ServeRAID device driver for ServeRAID-4Mx, ServeRAID-4M, ServeRAID-4Lx, ServeRAID-4L, ServeRAID-5i, ServeRAID-6M, or ServeRAID-6i controllers while installing Windows XP, Windows 2000, or Windows Server 2003:

1. Insert the appropriate *Windows* CD into the CD-ROM drive; then, restart the server.
2. A few seconds after restarting the server, when the message  
Press F6 if you need to install a third party SCSI or RAID driver...  
is displayed, press F6.

**Note:** This message is displayed immediately after the screen changes from black to blue. You have only a few seconds to press F6.

3. After loading some files, Windows will display a screen where you can manually specify a controller. When this screen is displayed, press the S key to specify additional devices.
4. When prompted to insert the manufacturer-supplied hardware support disk, insert the appropriate *IBM ServeRAID Support* diskette into the diskette drive; then, press Enter.
5. From the menu, select the appropriate controller and operating system; then, press Enter. A message similar to the following displays:  
Setup is loading files (IBM ServeRAID 4M/4Mx/4L/4Lx/5i/6M/6i Controller (Windows Server 2003 Servers))...
6. When prompted, press Enter to continue.
7. Follow the instructions provided by Windows to complete the normal installation process.
8. After you complete the installation, install the latest operating system service pack.

## Installing device drivers after installing Windows XP, Windows 2000, or Windows Server 2003

You can install the ServeRAID device driver *only* when installing a new ServeRAID controller in the server. During that time, Windows detects new hardware. After the “New Hardware Found” window is displayed, do the following:

**Note:** If Windows finds a device driver for the new hardware it installs the driver automatically, without using the New Hardware Wizard.

1. Click **Next**; the Install Hardware Device Drivers window appears.
2. Select the **Search for a suitable driver for my device** check box; click **Next**.
3. The Locate Drivers File window appears. Select the **Floppy disk** check box, and insert the appropriate *IBM ServeRAID Support* diskette into the diskette drive. Click **Next**.
4. The Driver Files Search Results window appears; when Windows finds the appropriate device driver, click **Next**.  
If the Digital Signature Not Found window appears, click **Yes**.
5. The Completing the Found New Hardware Wizard window appears; click **Finish**.

## Updating device drivers after installing Windows XP, Windows 2000, or Windows Server 2003

**Note:** (Windows 2000 only) If you have more than one ServeRAID controller installed in the server and the controllers require different device drivers (see “Installing multiple device drivers on Windows 2000, Windows NT 4.0, and Windows Server 2003” on page 7), repeat the following procedure for each device driver you are updating.

Complete the following steps to update the ServeRAID device driver after installing Windows XP, Windows 2000, or Windows Server 2003:

1. Insert the appropriate *IBM ServeRAID Support* diskette into the diskette drive.  
**Note:** If you use the *IBM ServeRAID Failover Support for Windows NT and Windows 2000* diskette, this procedure also installs the IBM ServeRAID Failover Virtual Adapter.

2. Click **Start** → **Programs** → **Administrative Tools** → **Computer Management**. The Computer Management window opens.
3. In the left pane, click **Device Manager**.
4. In the right pane, click the SCSI adapters and RAID controllers to display all the controllers in the server.
5. (Windows 2000 and Windows XP only) Right-click the first ServeRAID controller in the tree; then, click **Properties**. The Properties window opens. Do the following:
 

**Note:** (Windows 2000 only) If you have more than one ServeRAID controller installed in the server *and* the controllers require different device drivers, click the first ServeRAID controller in the tree that belongs to the group for which you are installing the device driver.

  - a. Click the **Driver** tab; then, click **Update Driver**. The Update Device Driver Wizard opens.
  - b. Click **Next**.
  - c. Select **Display a list of the known drivers**; then, click **Next**. Continue with step 7.
6. (Windows Server 2003 only) Right-click the first ServeRAID controller in the tree; then, click **Update Driver**. The Update Device Driver Wizard opens. Do the following:
  - a. Select **Install from a list or specific location**; then, click **Next**.
  - b. Select **Don't search, I will choose driver to install**; then, click **Next**. Continue with step 7.
7. Click **Have Disk**.
8. In the **Copy manufacturer's files from** field, type one of the following:

<b>For ServeRAID-6i, ServeRAID-6M, ServeRAID-5i, ServeRAID-4Mx, ServeRAID-4M, ServeRAID-4Lx, ServeRAID-4L controllers</b>	If you are running Windows 2000 Server, type:
	<code>a:\win2k_xp\driver\server\i_v</code>
	If you are running Windows XP Professional or Windows 2000 Professional, type:
	<code>a:\win2k_xp\driver\pro\i_v</code>
	If you are running Windows Server 2003, type:
	<code>a:\win2003\driver\server\i_v</code>
<b>For ServeRAID-4H, ServeRAID-3H, ServeRAID-3L, ServeRAID-II, and ServeRAID controllers</b>	If you are running Windows 2000 Server, type:
	<code>a:\win2k_xp\driver\server\powerpc</code>
	If you are running Windows Server 2003, type:
	<code>a:\win2003\driver\server\powerpc</code>
<b>For a failover configuration</b>	If you are running Windows 2000 Server, type:
	<code>a:\failover\driver\win2k</code>

where *a* is the diskette drive letter.

9. Click **OK**; the Select a Device Driver window opens.
10. In the **Models** list box, select the appropriate ServeRAID controller; then, click **Next**.

**Note:** When you install the failover driver, do *not* select the IBM ServeRAID Failover Virtual Adapter; select only the driver for the failover pair. When you install the failover driver, the Failover Virtual Adapter is also installed. Some controllers do not support failover, such as the IBM ServeRAID-5i and IBM ServeRAID-6i; do not select one of these controllers.

11. The Start Device Driver Installation window opens; click **Next**.
12. After the device driver is installed, remove the diskette or the CD from the drive, and restart the server.

**Note:** If you have more than one ServeRAID controller installed in the server, the drivers are updated together but only the first driver shows the new version in the device driver properties screen. To update the device driver version for the other controllers, you must update each controller separately.

## Installing device drivers for Windows Server 2003 Enterprise Edition 64-bit

**Important:**

Windows Server 2003 Enterprise Edition for 64-bit servers is supported on the ServeRAID-4Mx and ServeRAID-6M controllers only.

To obtain the *IBM ServeRAID Support CD* for 64-bit operating systems, check for availability on the IBM Web site; then, download the ISO image from the IBM ServeRAID support area.

You can install the ServeRAID device driver for Windows Server 2003 Enterprise Edition 64-bit *only* when you install a new ServeRAID controller in the server (after the operating system is installed). During that time, Windows detects new hardware. After the “New Hardware Found” window is displayed, do the following:

1. Insert the *IBM ServeRAID Support CD* into the CD-ROM drive.
2. Windows begins to search for the appropriate driver. If the search does not begin automatically, click **Next**.

The “Connect to Internet” window appears.

3. Select **Do not connect to Internet**; click **Next**.
4. The Driver Files Search Results window appears; when Windows finds the appropriate device driver, click **Next**.

If the Digital Signature Not Found window appears, click **Continue Anyway**.

5. The Completing the Found New Hardware Wizard window appears; click **Finish**.

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## Installing device drivers for Windows NT 4.0

Use the following instructions when you do one of the following:

- Install device drivers while installing Windows NT 4.0
- Install *or* update device drivers after installing Windows NT 4.0

You will need one of the following diskettes:

- *IBM ServeRAID Support for Windows NT*
- *IBM ServeRAID Failover Support for Windows NT and Windows 2000*

To configure a failover environment for Windows NT, you must install the standard device driver first. Then, you must update the device driver with the *IBM ServeRAID*

*Failover Support for Windows NT and Windows 2000* diskette. For information about updating the device driver, see "Installing or updating device drivers after installing Windows NT 4.0" on page 13.

**Note:** You must install the failover driver for each failover pair. Install the driver once if you have only one failover pair; twice if you have two failover pairs; and so on.

Failover is not supported on the ServeRAID-5i, ServeRAID-6i, ServeRAID-4M or ServeRAID-4L controllers.

## Installing device drivers while installing Windows NT 4.0

Complete the following steps to install the ServeRAID device driver while installing Windows NT 4.0:

1. Insert the startable Windows NT 4.0 CD into the CD-ROM drive, or insert the Windows NT 4.0 startup (boot) diskette into the diskette drive.
2. Restart the server.
3. When the message  
Setup is inspecting your computer's hardware configuration...  
is displayed, press F6.  
**Note:** After the message is displayed, you have only a few seconds to press F6.
4. After loading some files, Windows displays a screen where you can manually specify a controller. When this screen appears, press the S key to specify additional devices.
5. When prompted in the next window, select **Other** from the list.
6. When prompted to insert the manufacturer-supplied hardware support disk, insert the *IBM ServeRAID Support for Windows NT 4.0* diskette into the diskette drive; then, press Enter.
7. Select **IBM ServeRAID 4M/4Mx/4L/4Lx/5i/6i Controller** if you are installing one of the following controllers: ServeRAID-4M, ServeRAID-4Mx, ServeRAID-4L, ServeRAID-4Lx, ServeRAID-5i, or ServeRAID-6i. Otherwise, select **IBM ServeRAID Controller (All Others)** if you are installing one of the following controllers: ServeRAID-2x, ServeRAID-3x, ServeRAID-4H.
8. A message similar to the following is displayed:  
Setup is loading files (IBM ServeRAID 4M/4L Controller (NT 4.0))...
9. When prompted, press Enter to continue.
10. Use the instructions provided in the Windows NT 4.0 manual to complete the normal installation process.
11. After you complete the installation, install the latest operating system service pack.

## Installing or updating device drivers after installing Windows NT 4.0

**Note:** If you have more than one ServeRAID controller installed in the server and the controllers require different device drivers (see "Installing multiple device drivers on Windows 2000, Windows NT 4.0, and Windows Server 2003" on page 7), repeat the following procedure for each device driver you are updating.

Complete the following steps to install or update the ServeRAID device driver after installing Windows NT 4.0:

1. Insert one of the following diskettes into the diskette drive:

- *IBM ServeRAID Support for Windows NT 4.0*
  - *IBM ServeRAID Failover Support for Windows NT and Windows 2000*
2. Click **Start** → **Settings** → **Control Panel**.
  3. Select SCSI Adapter; then, click the **Drivers** tab.
  4. Click **Add**; then, click **Have Disk**.
  5. In the **Copy manufacturer's files from** field, type the following:  
`a:\winnt\driver`  
 where *a* is the diskette drive letter.
  6. Click **OK**; then in the next window, click **OK** again.
  7. Select **IBM ServeRAID 4M/4Mx/4L/4Lx/5i/6i Controller** if you are installing one of the following controllers: ServeRAID-4M, ServeRAID-4Mx, ServeRAID-4L, ServeRAID-4Lx, ServeRAID-5i, or ServeRAID-6i. Otherwise, select **IBM ServeRAID Controller (All Others)** if you are installing one of the following controllers: ServeRAID-2x, ServeRAID-3x, ServeRAID-4H.
  8. After the device driver is installed, remove the diskette from the drive, and restart the server.
- Note:** If you used the *IBM ServeRAID Failover Support for Windows NT and Windows 2000* diskette, this procedure also installs the IBM ServeRAID Failover Virtual Adapter.

## Installing device drivers for NetWare

Use the following instructions when you do one of the following:

- Install device drivers while installing NetWare
- Install or update device drivers after installing NetWare

You will need the *IBM ServeRAID Support for Novell NetWare* diskette. For information about creating the diskette, see "Creating ServeRAID diskettes" on page 4.

## Installing device drivers while installing NetWare

Complete the following steps to install the ServeRAID device driver while installing NetWare 5.x or 6.x:

1. Use the instructions provided in the NetWare manual to begin the installation.
2. When the Choose the Server Drivers - Disk Driver prompt appears during the installation process, select **Storage adapters**; then, press Enter.
3. If the list contains the IPSRAID.HAM driver, select the IPSRAID driver; then, press the Delete key to delete it.
4. Press the Insert key twice to **Add an unlisted driver**.
5. Insert the *IBM ServeRAID Support for Novell NetWare* diskette.
6. Press F3 to specify a path; then, type one of the following and press Enter:

---

<b>If installing NetWare 5.x</b>	<code>a:\netware5</code>
----------------------------------	--------------------------

---

<b>If installing NetWare 6.x</b>	<code>a:\netware6</code>
----------------------------------	--------------------------

---

where *a* is the diskette drive letter.

**Note:** The IPSRAID.HAM and support files will be copied to the system volume.

7. Verify that IPSRAID.HAM displays in the list of device drivers that appears in the window; then, select **Return to Driver Summary** and press Enter.
8. Select **Continue**; then, press Enter.
9. Follow the instructions in the NetWare manual to complete the installation.

## Installing or updating device drivers after installing NetWare

**Note:** If the device driver is already installed, do the following before starting this procedure:

1. From the system console, type the following and press Enter:  

```
Unload IPSRAID
```
2. Do not restart the system; go to step 1 in the following instructions.

Complete the following steps to install or update the ServeRAID device driver after installing NetWare 5.x or 6.x:

1. Start the NetWare installation utility program. From the system console, type the following and press Enter:  

```
Load nwconfig
```
2. Insert the *IBM ServeRAID Support for Novell NetWare* diskette into the diskette drive.
3. In the Installation Options list, click **Driver options**.
4. In the Driver Options window, click **Configure disk and storage**.
5. In the Additional Drivers Actions window, select **Select an additional driver**.
6. When the next window opens, press the Ins (Insert) key to install an unlisted driver.
7. When the next window opens, press F3 to specify a different path.
8. In the **Specify a directory path** field, type one of the following and press Enter:

<b>If installing NetWare 5.x</b>	<code>a:\netware5</code>
<b>If installing NetWare 6.x</b>	<code>a:\netware6</code>

where *a* is the diskette drive letter.

9. When prompted to select a device driver to install, select **IPSRAID.HAM**.
10. Click **Yes** when prompted to copy the IPSRAID.HAM device driver.
11. When the prompt appears to specify the server boot path, type the following and press Enter:

```
c:\nwserver
```

**Notes:**

- a. If you did not install NetWare in the NWSERVER directory on drive C, modify step 11 accordingly.
  - b. If any of the files you are installing already exist on the server, NetWare will prompt you to save the older files. Although it is not necessary to save the older files, it might be useful to do so.
12. After the installation program copies all the files, verify the ServeRAID slot number using the Driver IPSRAID Parameter Actions window.
  13. Click **Save Parameters and load driver** to load the ServeRAID device driver.

**Note:** If the device driver is not installed already and the operating system is installed, an error message stating that the device driver failed to load

should appear after you complete the previous step. If that happens, do the following:

- a. Press Esc to exit from the installation screens.
- b. Shut down the server.
- c. Restart the server. From the system prompt, type server and press Enter.
- d. The server automatically loads and installs the device driver.

14. Press Esc to exit from the installation screens.

15. From the system console, type the following and press Enter:

```
mount all
```

**Note:** If you want NetWare to load the ServeRAID device driver automatically during startup, you must add the appropriate LOAD command (for example, load ipsraid.ham slot=1) to the NetWare startup command file (usually C:\NWSERVER\STARTUP.NCF).

---

## Installing device drivers for OS/2 WARP Server for e-business

Use the following instructions when you do one of the following:

- Install device drivers while installing OS/2 WARP Server for e-business
- Install or update device drivers after installing OS/2 WARP Server for e-business

You will need the *IBM ServeRAID Support for IBM OS/2* diskette. For information about creating the diskette, see “Creating ServeRAID diskettes” on page 4.

## Installing device drivers while installing OS/2 WARP Server for e-business

You can use the following instructions to install the ServeRAID device driver files while installing OS/2.

**Note:** During the OS/2 installation, you might receive the following messages:

```
* Initializing Raid SCSI Subsystem.  
* Unable to allocate IRQ resources.  
* RMCreat Device Adapter failure.  
* RMCreat Device (disk) failure.  
* RMCreat Device (disk) failure.  
* RMCreat Device (disk) failure.  
* RMCreat Device (disk) failure.
```

If you receive these messages, disregard them during installation. The installation will be completed successfully. After the installation is complete, install the updated RESOURCE.SYS file available from the OS/2 Device Driver Pak On-Line Web site:

<http://service.software.ibm.com/os2ddpak/index.htm>

At this Web site, follow these steps to obtain the updated RESOURCE.SYS file:

1. Scroll down to the bottom, and click **I have read the Program License Agreement and AGREE to its terms.**
2. Scroll down, and select **OS/2 Component Updates** from the list.
3. Select **OS/2 Base Device Driver Updates.**
4. Click **RESOURCE.SYS update; pre-requisite for updated IBM RAID Driver.**



5. Follow the instructions at the Web site for installing the RESOURCE.SYS update after you have installed OS/2.

Complete the following steps to install the ServeRAID files while installing OS/2:

1. Make a copy of the *OS/2 WARP Server for e-business Diskette 1* and label it "Copy of OS/2 Diskette 1."
2. Insert the *IBM ServeRAID Support for OS/2* diskette into the diskette drive.
3. Copy the IPSRAID.ADD file from the following directory to the "Copy of OS/2 Diskette 1" diskette:

`a:\OS2\driver`

where *a* is the diskette drive letter.

If there is not enough space, delete files not needed in your installation (such as proprietary CD-ROM or SCSI device drivers). Make sure you remove all entries referring to any device drivers you delete from the CONFIG.SYS file.

4. Edit the CONFIG.SYS file on the "Copy of OS/2 Diskette 1" to add the following lines:

```
BASEDEV=IPSRAID.ADD  
SET COPYFROMFLOPPY=1
```

5. Install OS/2, but when you are prompted to insert Diskette 1, use the updated "Copy of OS/2 Diskette 1."
6. (ServeRAID-6i only) When you install to media attached to a ServeRAID-6i, you must disable OS/2 hardware detection during the installation procedure. Each time OS/2 restarts during installation, do the following:
  - a. Press ALT-F1 when you see a white square displayed in the top-left corner of your display screen.
  - b. When the menu appears, press F6 to disable hardware detection.
7. Edit the CONFIG.SYS file and verify that there is only one copy of the line `BASEDEV=IPSRAID.ADD`.

**Notes:**

- a. If you have more than one ServeRAID or SCSI adapter in your server, make sure that the BASEDEV statement for the adapter or controller controlling the startup (boot) device appears in the CONFIG.SYS file before the BASEDEV statements for the other SCSI adapters. (ServeRAID supports only one driver per OS/2 installation.)
- b. After you install any service packs, check the path for the IPSRAID.ADD device driver, and verify that the correct device driver is installed.

## Installing or updating device drivers after installing OS/2 WARP Server for e-business

Complete the following steps to install the ServeRAID files after installing OS/2:

1. After you complete the OS/2 installation, insert the *IBM ServeRAID for IBM OS/2* diskette.
2. Click **OS/2 System** → **System Setup** → **Install/Remove Device Driver**.
3. The OS/2 Device Driver Installation window opens and prompts you for the source and destination drives. The source directory is the diskette drive where you inserted the *IBM ServeRAID Device Drivers* diskette. The destination directory is where the program will copy the device driver files.
4. Click **Install**. The program does the following:

- Copies the following ServeRAID device driver statement to your CONFIG.SYS file: BASEDEV=IPSRaid.ADD
  - Copies the IPSRAID.ADD ServeRAID device driver to the OS/2 subdirectory on your hard disk.
5. Open the CONFIG.SYS file and verify that there is only one copy of the line BASEDEV=IPSRaid.ADD.

**Notes:**

- a. If you have more than one ServeRAID or SCSI adapter in your server, make sure that the BASEDEV statement for the adapter or controller controlling the startup (boot) device appears in the CONFIG.SYS file before the BASEDEV statements for the other ServeRAID or SCSI adapters.
  - b. After you install any service packs, check the path for the IPSRAID.ADD device driver, and verify that the correct device driver is installed.
6. Restart the server.

**Note:** When starting OS/2 after installing the new ServeRAID device driver, you might receive the following messages:

```
* Initializing Raid SCSI Subsystem.
* Unable to allocate IRQ resources.
* RMCreat Device Adapter failure.
* RMCreat Device (disk) failure.
* RMCreat Device (disk) failure.
* RMCreat Device (disk) failure.
* RMCreat Device (disk) failure.
```

If you receive these messages, disregard them during installation. The installation will be completed successfully. After the installation is complete, install the updated RESOURCE.SYS file available from the OS/2 Device Driver Pak On-Line Web site:

<http://service.software.ibm.com/os2ddpak/index.htm>

At this Web site, follow these steps to obtain the updated RESOURCE.SYS file:

- a. Scroll down to the bottom, and click **I have read the Program License Agreement and AGREE to its terms**.
- b. Scroll down and click **OS/2 Component Updates** from the list.
- c. Click **OS/2 Base Device Driver Updates**.
- d. Click **RESOURCE.SYS update; pre-requisite for updated IBM RAID Driver**.
- e. Follow the instructions at the Web site for installing the RESOURCE.SYS update after you have installed OS/2.

---

## Installing device drivers for Red Hat Linux

Use the following instructions when you do one of the following:

- Install device drivers while installing Red Hat Linux
- Install or update device drivers after installing Red Hat Linux

You will need one of the following diskettes:

---

**For Red Hat Linux, versions 6.2 and 7.0**     *IBM ServeRAID Support for Red Hat Linux (1 of 2)*

---

**For Red Hat Linux, versions 7.1, 7.2, 7.3, 8.0, 9.0, and AS 2.1**     *IBM ServeRAID Support for Red Hat Linux (2 of 2)*

---

For information about creating the diskettes, see “Creating ServeRAID diskettes” on page 4.

If you are installing Red Hat Linux, version 6.2, 7.0, or 7.2, you will also need an *Updated Red Hat Installation* diskette. For information on creating this diskette, see “Creating the Updated Red Hat Installation diskette” on page 19.

**Note:** To install device drivers for a Red Hat Linux kernel version that is not included on the Red Hat Linux drivers diskette, follow the instructions in Appendix A, “Compiling the ServeRAID device driver for a Red Hat Linux kernel” on page 35.

## Creating the Updated Red Hat Installation diskette

Complete the following steps to create the *Updated Red Hat Installation* diskette on Windows, Linux, or OS/2:

1. Go to the Red Hat Web site:
  - For Red Hat Linux, version 6.2 or 7.0:  
[http://www.redhat.com/support/errata/partners/ibm/ibm\\_netfinity.html](http://www.redhat.com/support/errata/partners/ibm/ibm_netfinity.html)
  - For Red Hat Linux, version 7.2:  
<http://www.redhat.com/errata/RHBA-2002-016.html>
2. Download one of the following diskette images:

<b>For Red Hat Linux, version 6.2</b>	updrh62.img
<b>For Red Hat Linux, version 7.0</b>	Netfinity-bootdisk-rh-7.0.i386.img
<b>For Red Hat Linux, version 7.2</b>	update-disk-20020117.img

Note where you download the diskette image.

3. If you are creating the diskette on Linux, go to step 4. Otherwise, insert the *IBM ServeRAID Support CD* into the CD-ROM drive.

If the ServeRAID Manager Setup program starts, click **Cancel**; then, click **Exit Setup**.

4. Insert a formatted diskette into the diskette drive.
5. Do one of the following:

<b>For Windows XP, Windows 2000, Windows Server 2003, Windows NT 4.0, Windows Me, Windows 98, or Windows 95</b>	At the DOS or command prompt, type the following: <pre>e:\diskette\tools\dsk4w32 c:\directoryname\disketteimage a:</pre>
<b>For Linux</b>	At the command prompt, type the following: <pre>dd if=/tmp/disketteimage of=/dev/diskettefile bs=32k</pre>
<b>For OS/2</b>	At an OS/2 prompt, type the following: <pre>e:\diskette\tools\dsk4wrp c:\directoryname\disketteimage a:</pre>

where

- *a* is the drive letter of the diskette drive, and *e* is the drive letter of the CD-ROM drive.

- (For Windows and OS/2 only) *c:\directoryname* is the location of the downloaded diskette image.
  - (For Linux only) *tmp* is the location of the downloaded diskette image.
  - *disketteimage* is the name of the *Updated Red Hat Installation* diskette image.
  - *diskettedevicefile* is the specific device file for the diskette block device. Typically, this is *fd0*.
6. Press Enter.
  7. Remove the diskette from the diskette drive, and label it “Updated Red Hat Installation” diskette.
  8. Remove the *IBM ServeRAID Support* CD from the CD-ROM drive.

## Installing device drivers while installing Red Hat Linux

Complete the following steps to install the ServeRAID device driver while installing Red Hat Linux:

1. If you are installing Red Hat Linux, versions 6.2 or 7.0, insert the *Updated Red Hat Installation* diskette into the diskette drive. Otherwise, insert the *Red Hat Installation* CD into the CD-ROM drive.
2. Turn on or restart the server.
3. At the command prompt, type the following if you are installing Red Hat Linux, version 7.2:  

```
linux dd updates
```

 Otherwise, type:  

```
linux dd
```

 and any other options for your installation; then, press Enter.
4. If you are installing Red Hat Linux, version 6.2 or 7.0, insert the *Red Hat Installation* CD into the CD-ROM drive. Otherwise, go to step 5.
5. Follow the prompts to complete the installation. Insert the ServeRAID driver diskette when prompted. Then, for Red Hat Linux, version 7.2, insert the update diskette when prompted.

## Installing or updating device drivers after installing Red Hat Linux

Complete the following steps to install or update device drivers after installing Red Hat Linux:

1. Insert the appropriate *IBM ServeRAID Support* diskette into the diskette drive.
2. Type the following and press Enter:  

```
mount -t vfat /dev/diskettedevicefile /mnt/floppy
```

 where *diskettedevicefile* is the specific device file for the diskette block device. Typically, this is *fd0*.
3. Type the following and press Enter:  

```
cd /mnt/floppy
```
4. Type the following and press Enter:  

```
sh updrh.sh
```
5. Type the following and press Enter:  

```
cd /
```
6. Type the following and press Enter:  

```
umount /mnt/floppy
```
7. Remove the diskette from the diskette drive.
8. Restart your server by typing:

- ```
shutdown -r now
```
9. Press Enter.

---

## Installing device drivers for SuSE Linux

Use the following instructions when you do one of the following:

- Install device drivers while installing SuSE Linux Professional version 8.0 or 8.1
- Install or update device drivers after installing SuSE Linux Professional version 8.0 or 8.1

You will need the *IBM ServeRAID Support for SuSE Linux* diskette. For information about creating the diskette, see “Creating ServeRAID diskettes” on page 4.

**Note:** Refer to the following sections to install device drivers for other SuSE Linux versions:

- To install device drivers for SuSE Linux Enterprise Server 8, see “Installing device drivers for UnitedLinux” on page 25.
- To install device drivers for SuSE Linux Enterprise Server 8 for 64-bit servers, see “Installing device drivers for SuSE Linux Enterprise Server 8 64-bit” on page 22.
- To install device drivers for a SuSE Linux kernel version that is not included on the SuSE Linux drivers diskette, see Appendix B, “Compiling the ServeRAID device driver for a SuSE Linux kernel” on page 37.

## Installing device drivers while installing SuSE Linux

Complete the following steps to install device drivers while installing SuSE Linux:

1. Insert the *SuSE Installation CD* into the CD-ROM drive.
2. Turn on or restart the server. The opening screen appears.
3. When the boot prompt appears, press the left Alt key.
4. In the Boot Options field, type the following and press Enter:  

```
acpi=oldboot
```
5. When the installation program displays the message “Driver Update floppy” in the lower right-hand corner of the screen, insert the *IBM ServeRAID Support for SuSE Linux* diskette into the diskette drive and press Enter.
6. Follow the prompts to complete the installation.

## Installing or updating device drivers after installing SuSE Linux

Complete the following steps to install or update device drivers after installing SuSE Linux:

1. Insert the *IBM ServeRAID Support for SuSE Linux* diskette into the diskette drive.
2. Type the following and press Enter:  

```
mount /dev/diskette/devicefile /floppy
```

where *diskette/devicefile* is the specific device file for the diskette block device. Typically, this is `/dev/fd0`.
3. Type `cd /floppy` and press Enter.
4. Type `sh update.sh` and press Enter.
5. Type `cd /` and press Enter.
6. Type `umount /floppy` and press Enter.

7. Remove the diskette from the diskette drive.
8. Type the following and press Enter to restart the server.

```
shutdown -r now
```

## Installing device drivers for SuSE Linux Enterprise Server 8 64-bit

### Important:

SuSE Linux Enterprise Server 8 for 64-bit servers is supported on the ServeRAID-4Mx and ServeRAID-6M controllers only.

To obtain the *IBM ServeRAID Support CD* for 64-bit operating systems, check for availability on the IBM Web site; then, download the ISO image from the IBM ServeRAID support area.

Complete the following steps to install device drivers after installing SuSE Linux Enterprise Server 8 64-bit:

1. Insert the *IBM ServeRAID Support CD* into the CD-ROM drive.
2. Type the following and press Enter:  

```
mount /media/cdrecorder
```
3. Type the following and press Enter:  

```
mkdir /mountpoint
```

where *mountpoint* is the mount point for the CD-ROM device.
4. Type the following and press Enter:  

```
mount -o loop /media/cdrecorder/diskette/u164.img /mountpoint
```

where *mountpoint* is the mount point for the CD-ROM device.
5. Type `cd /mountpoint` and press Enter.
6. Type `sh update.sh` and press Enter.
7. Type `cd /` and press Enter.
8. Type `umount /mountpoint` and press Enter.
9. Type `umount /media/cdrecorder` and press Enter.
10. Remove the CD from the CD-ROM drive.
11. Type the following and press Enter to restart the server.

```
shutdown -r now
```

---

## Installing device drivers for Caldera OpenLinux

Use the following instructions when you do one of the following:

- Install device drivers while installing Caldera OpenLinux
- Install or update device drivers after installing Caldera OpenLinux

You will need one of the following diskettes:

---

**For Caldera OpenLinux,  
version 3.1**

*IBM ServeRAID Support for Caldera OpenLinux (1 of 2)*

---

**For Caldera OpenLinux,  
version 3.1.1**

*IBM ServeRAID Support for Caldera OpenLinux (2 of 2)*

---

**Note:** If you are installing Caldera OpenLinux on a ServeRAID-6M adapter, you must obtain special boot diskettes from Caldera. To obtain the diskette images, go to <http://support.caldera.com/caldera/> and Search the Knowledge Base for “ServeRAID 6M”. Follow the installation instructions provided at the Web site.

For information about creating the diskettes, see “Creating ServeRAID diskettes” on page 4.

## Installing device drivers while installing Caldera OpenLinux

Complete the following steps to install the ServeRAID device driver while installing Caldera OpenLinux:

1. Insert the *Caldera Installation* CD into the CD-ROM drive.
2. Turn on or restart the server.
3. When the Caldera Systems OpenLinux screen appears, select **Select install mode (recommend)**. Press E.
4. Using the Down Arrow (↓) key, select **kernel/vmlinuz**. Press E.
5. At the end of the line, type the following and press Enter.  

```
er=modules insmod=ips
```
6. Press B.
7. When the “Mounting module disk” message appears, insert the appropriate *IBM ServeRAID Support for Caldera OpenLinux* diskette into the diskette drive.
8. Follow the prompts to complete the installation.

## Installing device drivers after installing Caldera OpenLinux

Complete the following steps to install or update device drivers after installing Caldera OpenLinux:

1. Insert the appropriate *IBM ServeRAID Support for Caldera OpenLinux* diskette into the diskette drive.
2. Type the following and press Enter:  

```
mount /dev/diskettefile /mnt/floppy
```

where *diskettefile* is the specific device file for the diskette block device.
3. Type the following and press Enter:  

```
cd /mnt/floppy
```
4. Type the following and press Enter:  

```
sh update.sh
```
5. Type the following and press Enter:  

```
cd /
```
6. Type the following and press Enter:  

```
umount /mnt/floppy
```
7. Remove the *IBM ServeRAID Support for Caldera OpenLinux* diskette from the diskette drive.
8. Restart your server by typing the following and pressing Enter:  

```
shutdown -r now
```

---

## Installing device drivers for Turbolinux

Use the following instructions when you do one of the following:

- Install device drivers while installing Turbolinux
- Install or update device drivers after installing Turbolinux

You will need the *IBM ServeRAID Support for Turbolinux* diskette. For information about creating the diskette, see “Creating ServeRAID diskettes” on page 4.

**Note:** To install device drivers for Turbolinux Enterprise Server 8, see “Installing device drivers for UnitedLinux” on page 25.

## Installing device drivers while installing Turbolinux

Complete the following steps to install the ServeRAID device driver while installing Turbolinux:

1. Insert the *Turbolinux Installation* CD into the CD-ROM drive.
2. At the boot prompt, type one of the following and press Enter:

---

|                                  |                              |
|----------------------------------|------------------------------|
| <b>If installing version 6.5</b> | <code>install noprobe</code> |
| <b>If installing version 7.0</b> | <code>dd updates</code>      |

---

3. When the “Choose a Language” screen appears, select the appropriate language.
4. Insert the *IBM ServeRAID Support for Turbolinux* diskette into the diskette drive. If you are installing Turbolinux version 7.0, go to step 9 on page 24. Otherwise, go to step 5.
5. When prompted “Would you like to load any special device driver now,” select **Add Device**.
6. For the device type, select **SCSI**.
7. Press F2 to access your driver disk.
8. Select **IBM ServeRAID driver**, and then select **Done**.
9. Follow the prompts to complete the installation.

## Installing or updating device drivers after installing Turbolinux

Complete the following steps to install or update device drivers after installing Turbolinux:

1. Insert the *IBM ServeRAID Support for Turbolinux* diskette into the diskette drive.
2. Type the following and press Enter:  

```
mount /dev/diskettefile /mnt/floppy
```

where *diskettefile* is the specific device file for the diskette block device. Typically, this is fd0.
3. Type the following and press Enter:  

```
cd /mnt/floppy
```
4. Type the following and press Enter:  

```
sh update.sh
```
5. Type the following and press Enter:  

```
cd /
```



6. Type the following and press Enter:  
`umount /mnt/floppy`
7. Remove the diskette from the diskette drive.
8. Restart your server by typing the following and pressing Enter:  
`shutdown -r now`

---

## Installing device drivers for UnitedLinux

Use the following instructions when you do one of the following:

- Install device drivers while installing SCO UnitedLinux 4.0, SuSE Linux Enterprise Server 8, or Turbolinux Enterprise Server 8
- Install *or* update device drivers after installing SCO UnitedLinux 4.0, SuSE Linux Enterprise Server 8, or Turbolinux Enterprise Server 8

You will need the *IBM ServeRAID Support for UnitedLinux* diskette. For information about creating the diskette, see “Creating ServeRAID diskettes” on page 4.

## Installing device drivers while installing UnitedLinux

Complete the following steps to install device drivers while installing SCO UnitedLinux 4.0, SuSE Linux Enterprise Server 8, or Turbolinux Enterprise Server 8:

1. Insert your operating system installation CD into the CD-ROM drive.
2. Turn on or restart the server. The opening screen appears.
3. When the boot prompt appears, press the left Alt key.

**Note:** For SuSE Linux Enterprise Server 8, you may need to enter the following parameter in the Boot Options field if the server has more than one processor or if Intel Hyper-Threading Technology is enabled:

```
acpi=oldboot
```

Using this parameter ensures that the system loads the required drivers. It usually solves the problem if the system fails to boot correctly. For more information, refer to RETAIN Tip H091921 at the IBM support Web site.

4. When the installation program displays the message “Driver Update floppy” in the lower right-hand corner of the screen, insert the *IBM ServeRAID Support for UnitedLinux* diskette into the diskette drive and press Enter.
5. Follow the prompts to complete the installation.

## Installing or updating device drivers after installing UnitedLinux

Complete the following steps to install or update device drivers after installing SCO UnitedLinux 4.0, SuSE Linux Enterprise Server 8, or Turbolinux Enterprise Server 8:

1. Insert the *IBM ServeRAID Support for UnitedLinux* diskette into the diskette drive.
2. Type the following and press Enter:  
`mount /dev/diskettedevicefile /media/floppy`  
where *diskettedevicefile* is the specific device file for the diskette block device. Typically, this is `/dev/fd0`.
3. Type `cd /media/floppy` and press Enter.
4. Type `sh update.sh` and press Enter.
5. Type `cd /` and press Enter.
6. Type `mount /media/floppy` and press Enter.

7. Remove the diskette from the diskette drive.
8. Type the following and press Enter to restart the server.

```
shutdown -r now
```

---

## Installing device drivers for SCO OpenServer

Use the following instructions when you do one of the following:

- Install device drivers while installing SCO OpenServer
- Install or update device drivers after installing SCO OpenServer

You will need the *IBM ServeRAID Support for SCO OpenServer* diskette. For information about creating the diskette, see “Creating ServeRAID diskettes” on page 4.

## Installing device drivers while installing SCO OpenServer

Before you begin the installation, review the following information:

- If you have more than one ServeRAID controller in your server, you must remove all but the first before installing the SCO OpenServer driver. After you install the driver for the first controller, install the next controller; then, repeat the driver installation procedure.

**Note:** If the system fails to boot after adding a controller, you may need to redefine the boot string to identify the correct boot device. For more information, see “Locating the startup device (SCO OpenServer only)” in the *IBM ServeRAID User’s Reference*; also see “Using Boot-Time Loadable Drivers” in the *SCO OpenServer Handbook*

- You must install logical drives as Bus Number 0 when using the MKDEV program, regardless of the channel that the physical drives are on.
- You must install a nondisk device, such as a CD-ROM drive or tape drive, as Bus Number 1, 2, 3, or 4 relative to the channel to which it is attached. Internal Channel 1 is Bus Number 1, Internal Channel 2 is Bus Number 2, External Channel 1 is Bus Number 1, External Channel 2 is Bus Number 2, External Channel 3 is Bus Number 3, and External Channel 4 is Bus Number 4.

Complete the following steps to configure the default nondisk devices during the initial installation:

1. Redefine the default tape drive in the initial boot string. For example, to install the boot-time loadable driver IPSRAID BTLD and redefine the tape drive, go to the B00T prompt and type:

```
link Stp=ips(0, 1, 2, 0)
```

where the numbers in parentheses represent the host adapter number, the bus number, the SCSI ID, and the logical unit number (LUN) respectively.

2. When prompted for the location of the installation CD, change the bus number and SCSI ID, as required.

### Adding IPSRAID BTLD at startup time

Complete the following steps to install the ServeRAID device driver for SCO OpenServer 5.0.6a and 5.0.7:

1. At the B00T prompt, type the following and press Enter:

```
restart link="ipsraid" Sdsk=ips(c,0,y,0) Srom=wd(0,0,0,0)
```

where *c* is the controller number and *y* is the logical drive number where the operating system will be installed.

2. After the kernel loads but before it runs, the `link` program prompts you to insert the *IBM ServeRAID Support for SCO OpenServer* diskette.

While the installation program copies the files, one or both of the following messages might appear:

- Extracting BTLD distribution for ipsraid... /etc/uadmin  
getdev b ips: No such device (error 19)
- dynamic linker: dlvr\_audit: Cannot open /dev/zero for file  
/lib/libprot.so.1

You can ignore the first message; if the second message appears, however, you must press Enter when prompted to continue the installation.

3. Keep the *IBM ServeRAID Support for SCO OpenServer* diskette available. You will need it to configure the device driver into the link kit.

For additional information about adding a boot-time loadable driver at boot time, refer to “Using Boot-Time Loadable Drivers” in the *SCO OpenServer Handbook*.

## Installing or updating device drivers after installing SCO OpenServer

Complete the following steps to install or update device drivers after installing SCO OpenServer:

1. Start the server in system maintenance mode, and log in as R00T.
2. Type the following and press Enter:  
`installpkg`
3. Select the diskette drive into which you will insert the installation diskette.
4. When prompted, insert the *IBM ServeRAID Support for SCO OpenServer* diskette.
5. When prompted for the name of the package, type the following and press Enter:  
`ipsraid`
6. To relink the kernel (as described in “Relinking the kernel” in the *SCO OpenServer Handbook*), type the following command and press Enter:  
`cd /etc/conf/cf.d`
7. Type the following and press Enter:  
`./link_unix`
8. After the kernel rebuilds, the following message appears:  
The UNIX kernel has been rebuilt.  
Do you want this kernel to boot by default?  
To continue, type y  
The system backs up the old kernel by moving /unix to /unix.old.
9. When the system asks for the kernel environment to be rebuilt, type y  
The system will respond with a message.
10. Remove the *IBM ServeRAID Support for SCO OpenServer* diskette from the diskette drive.
11. Shut down the server; then, restart the server.

---

## Installing device drivers for SCO UnixWare or Open UNIX

Use the following instructions when you do one of the following:

- Install device drivers while installing SCO UnixWare or Open UNIX

- Install or update device drivers after installing SCO UnixWare or Open UNIX

You will need the *IBM ServeRAID Support for SCO UnixWare and Open UNIX* diskette. For information about creating the diskette, see “Creating ServeRAID diskettes” on page 4.

## Installing device drivers while installing SCO UnixWare or Open UNIX

The instructions that you use for installing the ServeRAID files when using SCO UnixWare or Open UNIX depend on the number of IDE and SCSI disk-storage adapters and controllers installed in the server. If all of the direct-access-storage devices (DASD) in the server are attached to a single disk-storage adapter or controller (such as the ServeRAID controller), go directly to “Installing the device drivers while installing SCO UnixWare or Open UNIX” on page 30.

### Attaching devices to multiple disk-storage adapters or controllers

If you are attaching devices to multiple disk-storage adapters or controllers (including IDE and SCSI controllers integrated on the system board), use the following instructions.

- If you are installing SCO UnixWare or Open UNIX on a drive attached to a ServeRAID controller, follow the instructions in “Installing SCO UnixWare or Open UNIX on a ServeRAID drive:” on page 28.
- If you are installing SCO UnixWare or Open UNIX on a drive attached to a non-ServeRAID adapter or controller and you intend to store only data on the drives attached to your ServeRAID controllers, follow the instructions in “Installing SCO UnixWare or Open UNIX on a non-ServeRAID drive:” on page 29.

### Installing SCO UnixWare or Open UNIX on a ServeRAID

**drive:** Use the following instructions if you are using multiple disk-storage adapters or controllers and you are installing UnixWare or Open UNIX on a drive attached to a ServeRAID controller.

1. Install all ServeRAID controllers that you intend to use in your server.
2. Using the ServeRAID Manager program, create all of your arrays, and define all of your logical drives.
3. Make a list of all of the ServeRAID controllers, including the order and slot number, installed in the server. To do this:
  - a. Turn on the server.
  - b. If the ServeRAID Mini-Configuration prompt appears, press Ctrl+I. When a server contains more than one ServeRAID controller, a selection window appears.
  - c. The menu lists the ServeRAID controllers in order. Select the first ServeRAID controller from the menu.
  - d. Select **Advanced Functions** from the Main Menu.
  - e. Select **View Controller and PCI Information** from the Advanced Functions menu.
  - f. Record the slot number for the ServeRAID controller; then, press Esc three times to return to the controller-selection window.
  - g. Repeat step 3c through step 3f until you record the slot number for each ServeRAID controller that appears on the selection screen.
4. Turn off the server; then, remove all ServeRAID controllers except the first one on your list.

**Note:** If one of the ServeRAID controllers that you need to remove is on the system board, you must do one of the following:

- If the CD-ROM drive that you are using to install your operating system is attached to the integrated ServeRAID controller, disconnect or remove all disk drives attached to the integrated controller.
- If only disk drives are attached to the integrated controller, disconnect the SCSI cable from the ServeRAID connector on the system board. See the label inside the server cover for the location of the ServeRAID connector.

5. Remove all other non-ServeRAID IDE and SCSI disk-storage adapters or controllers.

**Note:** If one of the disk-storage controllers that you need to remove is on the system board, you must do one of the following:

- If the CD-ROM drive that you are using to install your operating system is attached to the integrated disk-storage controller, disconnect or remove all disk drives attached to the integrated controller.
- If only disk drives are attached to the integrated controller, disconnect the cable for the integrated controller from the IDE or SCSI connector on the system board. See the label inside the server cover for the location of the IDE or SCSI controller connector.

6. Follow the instructions in “Installing the device drivers while installing SCO UnixWare or Open UNIX” on page 30; then, return to this procedure and continue with step 7.
7. Turn off the server.
8. Install any non-ServeRAID disk-storage adapters or controllers in the server; then, attach the drives to the disk-storage adapters and controllers.
9. Install the second ServeRAID controller from the list you created in step 3f on page 28; then, attach the drives to the ServeRAID controller.
10. Turn on the server and wait for the operating system to detect the new disk-storage adapters and controllers.
11. Turn off the server.
12. Repeat steps 9 through 11 until all ServeRAID adapters, ServeRAID controllers, and drives are installed.
13. You can now partition and format the logical drives attached to the additional ServeRAID adapters and controllers. See the information provided with SCO UnixWare or Open UNIX for more instructions.

#### **Installing SCO UnixWare or Open UNIX on a non-**

**ServeRAID drive:** Use the following instructions if you are using multiple disk-storage adapters or controllers, you are installing SCO UnixWare or Open UNIX on a drive attached to a non-ServeRAID adapter or controller, and you intend to store only data on the drives attached to your ServeRAID adapters and controllers.

1. Install all ServeRAID controllers that you intend to use in your server.
2. Using the ServeRAID Manager program, create all of your arrays, and define all of your logical drives.
3. Make a list of all of the ServeRAID controllers, including the order and slot numbers, installed in the server. To do this:
  - a. Turn on the server.
  - b. When the ServeRAID Mini-Configuration prompt appears, press Ctrl+I. When a server contains more than one ServeRAID controller, a selection screen appears.

- c. The menu lists the ServeRAID controllers in order. Select the first ServeRAID controller from the menu.
  - d. Select **Advanced Functions** from the Main Menu.
  - e. Select **View Controller and PCI Information** from the Advanced Functions menu.
  - f. Record the slot number for the ServeRAID controller; then, press Esc three times to return to the controller-selection screen.
  - g. Repeat steps 3c through 3f until you have recorded the slot number for each ServeRAID controller that appears on the selection screen.
4. Turn off the server; then, remove all ServeRAID, IDE, and SCSI disk-storage adapters and controllers except the one attached to the drive where you intend to install SCO UnixWare or Open UNIX.
 

**Note:** If one of the disk-storage or ServeRAID controllers that you need to remove is on the system board, do one of the following:

    - If the CD-ROM drive that you are using to install your operating system is attached to the integrated controller, disconnect or remove all disk drives attached to the integrated controller.
    - If only disk drives are attached to the integrated controller, disconnect the SCSI or IDE cable for the integrated controller from the connector on the system board. See the label inside the server cover for the location of the SCSI and IDE cable connectors.
  5. Follow the instructions in "Installing the device drivers while installing SCO UnixWare or Open UNIX" on page 30; then, return to this procedure and continue with step 6.
  6. Turn off the server.
  7. Install any non-ServeRAID disk-storage adapters or controllers in the server; then, attach the drives to the disk-storage adapters and controllers.
  8. Install the first ServeRAID controller from the list you created in step 3f on page 30; then, attach the drives to the ServeRAID controller.
  9. Turn on the server and wait for the operating system to detect the new disk-storage adapters and controllers.
  10. Turn off the server.
  11. Repeat steps 8 through 10 until all ServeRAID adapters, ServeRAID controllers, and drives are installed.
  12. You can now partition and format the logical drives attached to the ServeRAID adapters and controllers. See the information provided with SCO UnixWare or Open UNIX for more instructions.

### **Installing the device drivers while installing SCO UnixWare or Open UNIX**

Complete the following steps to install the ServeRAID device drivers while installing SCO UnixWare or Open UNIX:

1. Use the instructions provided with SCO UnixWare or Open UNIX to begin the installation.
2. When a message appears asking if you want to install any HBA diskettes, insert the *IBM ServeRAID Support for SCO UnixWare and Open UNIX* diskette; then, select **Install HBA diskette**.
3. Use the instructions provided in the SCO manual to complete the normal installation process.

## Installing or updating device drivers after installing SCO UnixWare or Open UNIX

Use the following instructions when you do one of the following:

- Use the UnixWare Pkgadd to install or upgrade the ServeRAID device drivers after installing UnixWare or Open UNIX.
- Use the UnixWare SCOAdmin utility program to install or upgrade the ServeRAID device drivers after installing UnixWare or Open UNIX.

### Using Pkgadd to install device drivers

Complete the following steps to install or upgrade ServeRAID device drivers using the Pkgadd utility program:

1. Insert the *IBM ServeRAID Support for SCO UnixWare and Open UNIX* diskette into the diskette drive.
2. Type the following and press Enter:  

```
pkgadd -d /dev/dsk/f0t
```
3. When the message Insert diskette into Floppy Drive 1 appears, press Enter.
4. When the message Installation of IBM ServeRAID SCSI IHV HBA (ips) was successful appears, type the following and press Enter:  

```
q
```
5. After the device driver is installed, shut down and restart the server.

### Using SCOAdmin to install device drivers

Complete the following steps to install or upgrade ServeRAID device drivers using the SCOAdmin utility program:

1. Insert the *IBM ServeRAID Support for SCO UnixWare and Open UNIX* diskette into the diskette drive.
2. Start the SCOAdmin utility program by typing SCOADMIN at the system prompt.
3. Click **Software\_Management**.
4. Click **Application Installer**.
5. Click the **Install From** tab.
6. Click **Disk\_A**.
7. If nothing appears in the window, click **Update View**.
8. When the icon labeled "ips" appears in the window, click **Install**.
9. After the device driver is installed, remove the diskette from the diskette drive; then, shut down and restart the server.





---

# Appendixes



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## Appendix A. Compiling the ServeRAID device driver for a Red Hat Linux kernel

Use the following instructions to use the latest ServeRAID device driver with a Red Hat Linux kernel version that is not included on the Red Hat Linux drivers diskette.

**Note:** Before you upgrade the kernel or driver, make sure you have a bootable system disk. To build a bootable system disk, insert a diskette into the floppy drive; then, type the following command and press Enter:

```
mkbootdisk --device /dev/fd0 <kernel-version>
```

Confirm that you can restart the server with this diskette.

Complete the following steps to compile the ServeRAID device driver for a Red Hat Linux kernel:

1. Login as root; then, make sure that the kernel source is installed:

```
rpm -q kernel-source
```

If it is not installed, install it now.

2. Insert the IBM ServeRAID Support CD into the CD-ROM drive. Mount the CD-ROM drive:

```
mount /mnt/cdrom
```

Then, create a directory:

```
mkdir /home/<username>/ServeRAID
```

3. Copy the driver source package from the IBM ServeRAID Support CD to the directory you created in step 2:

```
cp /mnt/cdrom/linux/driver/ips-610.tgz /home/<username>/ServeRAID/.
```

4. Change to that directory:

```
cd /home/<username>/ServeRAID
```

Then, unpack the ServeRAID source package:

```
tar -xzvf ips-610.tgz
```

**Note:** Before you continue, confirm that the files `ips.c` and `ips.h` are in the current directory:

```
ls -l
```

5. Change to the directory with the kernel source:

```
cd /usr/src/<kernel-version>/drivers/scsi
```

Rename the files `ips.c` and `ips.h`:

```
mv ips.h ips-orig.h
```

```
mv ips.c ips-orig.c
```

Copy the new files to this directory:

```
cp /home/<username>/ServeRAID/ips.* .
```

6. Change back to the base directory for this kernel version and prepare the source tree:

```
cd /usr/src/<kernel-version>
```

```
make clean mrproper
```

7. Copy the appropriate config file from the `/usr/src/<kernel-version>/configs` directory to "config" :

```
cp configs/kernel-<x.x.x>-i686<-type>.config .config
```

Where `<x.x.x>` is the kernel version and `<-type>` is the kernel type; for example, `-smp` or `-bigmem` (if any).

8. Run the kernel configuration utility:

```
make menuconfig
```

Select **SCSI Support** → **SCSI Low Level Drivers**. Scroll to the IBM ServeRAID option; select **M**.

**Note:** If the server is configured with symmetric multi-processors (SMP), verify that the symmetric multi-processing support option is enabled in the Processor Type and Features menu.

Save the changes and exit.

9. Update the Makefile to reflect the kernel version you are running. Use any text editor to load `/usr/src/<kernel-version>/Makefile`; then, change the text on the EXTRAVERSION line to match the extraversion value of your kernel.

For example:

- The extraversion value of 2.4.9-34 is “-34”.
- The extraversion of kernel 2.4.9-34smp is “-34smp”.

Save the updated Makefile.

10. Build the SCSI modules; type the following commands:

```
make dep
make SUBDIRS=drivers/scsi modules
```

11. After the compilations are finished, rename the old driver. Be sure you enter all of the following commands on the same line!

```
mv /lib/modules/<kernel-version>/kernel/drivers/scsi/ips.o
/lib/modules/<kernel-version>/kernel/drivers/scsi/ips.orig
```

Copy the newly compiled driver to the modules directory:

```
cp drivers/scsi/ips.o /lib/modules/<kernel-version>/kernel/drivers/scsi/.
```

12. Rename your current initial ramdisk:

```
mv /boot/initrd-<kernel-version>.img /boot/initrd-<kernel-version>.old.img
```

Build a new initial ramdisk; type the following command and press Enter:

```
mkinitrd /boot/initrd-<kernel-version>.img <kernel-version>
```

(lilo users only) Restart lilo to ensure that it detects the new initial ramdisk:

```
/sbin/lilo -v
```

13. Restart the operating system; the ServeRAID software displays the device driver version.

**Note:** You can also examine `/var/log/messages` or `/proc/scsi/ips/` to determine the current version of the ServeRAID device driver.

---

## Appendix B. Compiling the ServeRAID device driver for a SuSE Linux kernel

Use the following instructions to use the latest ServeRAID device driver with a SuSE Linux kernel version that is not included on the SuSE Linux drivers diskette.

**Note:** Before you upgrade the kernel or driver, make sure you have a bootable system disk. To build a bootable system disk, insert a diskette into the floppy drive; then, type the following command and press Enter:

```
/sbin/yast2 bootdisk &
```

Select **Standard boot floppy**; then, follow the instructions to complete the procedure. Confirm that you can restart the server with this diskette.

Complete the following steps to compile the ServeRAID device driver for a SuSE Linux kernel:

1. Login as root; then, make sure that the kernel source and ncurses-devel are installed:

```
rpm -q kernel-source
rpm -q ncurses-devel
```

If these components are not installed, install them now.

2. Insert the IBM ServeRAID Support CD into the CD-ROM drive. Mount the CD-ROM drive:

```
mount /media/cdrom
```

Then, create a directory:

```
mkdir /home/<username>/ServeRAID
```

3. Copy the driver source package from the IBM ServeRAID Support CD to the directory you created in step 2:

```
cp /media/cdrom/linux/driver/ips-610.tgz /home/<username>/ServeRAID/.
```

4. Change to that directory:

```
cd /home/<username>/ServeRAID
```

Then, unpack the ServeRAID source package:

```
tar -xzvf ips-610.tgz
```

**Note:** Before you continue, confirm that the files ips.c and ips.h are in the current directory:

```
ls -l
```

5. Change to the directory with the kernel source:

```
cd /usr/src/<kernel-version>/drivers/scsi
```

Rename the files ips.c and ips.h:

```
mv ips.h ips-orig.h
mv ips.c ips-orig.c
```

Copy the new files to this directory:

```
cp /home/<username>/ServeRAID/ips.* .
```

6. Change back to the base directory for this kernel version and prepare the source tree:

```
cd /usr/src/<kernel-version>
make clean
```

7. Prepare the kernel configuration:

```
make cloneconfig
```

8. Run the kernel configuration utility:

```
make menuconfig
```

Save the changes and exit.

9. Build the SCSI modules; type the following commands:

```
make dep
make SUBDIRS=drivers/scsi modules
```

10. After the compilations are finished, rename the old driver. Be sure you enter all of the following commands on the same line!

```
mv /lib/modules/<kernel-version>/kernel/drivers/scsi/ips.o
/lib/modules/<kernel-version>/kernel/drivers/scsi/ips.orig
```

Copy the newly compiled driver to the modules directory:

```
cp drivers/scsi/ips.o /lib/modules/<kernel-version>/kernel/drivers/scsi/.
```

11. Rename your current initial ramdisk:

```
mv /boot/initrd /boot/initrd.old
```

Build a new initial ramdisk; type the following command and press Enter:

```
mk_initrd
```

(lilo users only) Restart lilo to ensure that it detects the new initial ramdisk:

```
lilo -v
```

12. Restart the operating system; the ServeRAID software displays the device driver version.

**Note:** You can also examine `/var/log/messages` or `/proc/scsi/ips/` to determine the current version of the ServeRAID device driver.

---

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## Important notes

Processor speeds indicate the internal clock speed of the microprocessor; other factors also affect application performance.

CD-ROM drive speeds list the variable read rate. Actual speeds vary and are often less than the maximum possible.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1 000 000 bytes, and GB stands for approximately 1 000 000 000 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1000000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity may vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives available from IBM.

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