



USER'S GUIDE

ServeRAID-M Device Driver Installation

October 2012

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Preface

This manual is the primary reference for the operating system drivers provided with the ServeRAID devices. It describes the drivers for all supported operating systems and explains how to install them.

Organization

This document has the following chapters:

- [Chapter 1, Overview](#), describes the ServeRAID-M controller and lists the operating systems for which drivers are provided.
- [Chapter 2, Windows Driver Installation](#), provides installation instructions for Microsoft® Windows® operating systems.
- [Chapter 3, Red Hat Enterprise Linux 4, 5, and 6 Driver Installation](#), provides installation instructions for the Red Hat® Linux™ operating system.
- [Chapter 4, SUSE Linux Enterprise Server 10 and 11 Driver Installation](#), provides installation instructions for the SLES® Linux operating system.
- [Chapter 5, VMware ESX/ESXi 4.x and ESXi 5.0/5.1 Driver Installation](#), provide installation instructions for VMware® ESX and ESXi operating systems.
- [Appendix A, Getting Help and Technical Assistance](#), explains how to get help and technical assistance with your ServeRAID products
- [Appendix B, Notices](#), contains information about the warranty, patents, license inquiries, and trademarks.

ServeRAID-M System Installation Sequences and Document Organization

The following table outlines the installation, configuration, and management sequences for a RAID system. Each sequence consists of a series of steps and operations that the reference manual explains. Perform the sequences in the order listed when you install and configure your system.

Sequence	Task	Reference Manual
1	Understand RAID system theory and operation.	<i>ServeRAID-M Software User's Guide</i>
2	Install the ServeRAID-M SAS/SATA Controller and the related hardware.	The <i>User's Guide</i> for your ServeRAID-M controller
3	Configure the physical arrays and logical devices using either the MegaRAID Configuration Utility (CU) or the WebBIOS CU.	<i>ServeRAID-M Software User's Guide</i>
4	Install the device drivers for the operating system.	<i>ServeRAID-M Device Driver Installation User's Guide</i> (this manual)
5	Use the MegaRAID Storage Manager tool and the WebBIOS tool to configure, monitor, and maintain storage configurations on the ServeRAID-M SAS/SATA Controller.	<i>ServeRAID-M Software User's Guide</i>

Related Publications

ServeRAID-M Software User's Guide

This document explains how to use the MegaRAID Storage Manager and WebBIOS configuration utilities to configure, monitor, and maintain your ServeRAID-M controller and the storage-related devices connected to the controllers.

ServeRAID MegaCLI User's Guide

This document explains how to use the MegaCLI (Command Line Interface) utility to configure, monitor, and maintain the ServeRAID-M controller and the storage-related devices connected to the controller.

Safety Information

This document contains translated caution and danger statements. Each caution and danger statement that appears in the documentation has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.

Notices and Statements in This Document

The caution and danger statements in this document are also in the multilingual *Safety Information* document, which is on the IBM Documentation CD. Each statement is numbered for reference to the corresponding statement in your language in the *Safety Information* document.

The following notices and statements are used in this document:

- Note: These notices provide important tips, guidance, or advice.
- Important: These notices provide information or advice that might help you avoid inconvenient or problem situations.
- Attention: These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage might occur.
- Caution: These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- DANGER:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

1.1 Safety

Use the following safety guidelines to help protect your computer system from potential damage and to ensure your own personal safety.

Note: Use your ServeRAID SAS/SATA controller with UL-listed Information Technology Equipment (ITE) products only.

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Chapter 1

Overview

This chapter provides an overview of the operating system drivers provided with the ServeRAID-M SAS/SATA controllers. It describes the drivers for the supported operating systems and explains how to install them. This chapter consists of the following sections:

- [Section 1.1, “Operating System Driver Description”](#)
- [Section 1.2, “Device Driver Filenames”](#)

Subsequent chapters in this manual provide detailed installation instructions for the operating systems. Use the latest updates provided by the operating system manufacturer and review the `readme` file that accompanies the driver for any updated information.

1.1 Operating System Driver Description

You can install your ServeRAID-M SAS/SATA controller in any IBM AT-compatible computer that has a PCI Express local bus. The controller can run under various operating systems.

To use the controller with these operating systems, you must have software drivers installed. Some newer operating systems or updates have native drivers. IBM provides software drivers for the following operating systems:

- Microsoft® Windows® 2003, Windows 2008, Windows 2008 SP2, Windows 2008 R2, Windows 2008 R2 SP1, Windows Server 2012
- Red Hat® Enterprise Linux™ 4, 5, and 6
- SUSE® Linux Enterprise Server 10 and 11
- VMware® ESX/ESXi 4.x and ESXi 5.0/5.1

1.1.1 Driver Functions

IBM provides drivers for your ServeRAID-M SAS/SATA controllers. The controllers bring 6.0 Gbit/s Serial Attached SCSI and 6.0 Gbit/s SATA III performance to host adapter and server designs. The controllers support internal and external storage devices, which lets you use a system that supports enterprise-class SAS drives and desktop-class SATA III drives.

Note: The ServeRAID-M SAS/SATA controllers support SATA, SATA II, and SATA III technologies.

ServeRAID-M controllers integrate eight high-performance SAS/SATA III PHYs and a PCI Express bus master DMA core. Each of the eight PHYs is capable of 6.0 Gbit/s SAS link rates, and 6.0 Gbit/s SATA III link rates.

The ServeRAID-M controllers support the SAS protocol as described in the *Serial Attached SCSI Standard, version 2.0*, and the SATA III protocol defined by the *Serial ATA Revision 3.0 Specification*. SATA III is an extension to SATA 2.0.

The drivers perform these functions:

- They support the PCI Express protocol
- They support multiple SAS/SATA controllers
- They provide the ability to see newly configured virtual drives in the configuration software utility without rebooting the system
- They permit random deletion of virtual drives that were created using MegaRAID Storage Manager (see the *ServeRAID-M Software User's Guide* for more information)
- They support the use of the remaining array capacity by MegaRAID Storage Manager

1.1.2 Device Driver Updates

Because IBM regularly updates device drivers, a feature might be added to your driver that is not included in the most recent documentation. If you have a question about a feature, consult the readme file that accompanies the driver or contact your IBM support representative.

To ensure that you have the current version of the driver, download the latest driver at the **Support & downloads** section of the IBM website,

<http://www.ibm.com/supportportal/>. Usage instructions and step-by-step installation instructions for your specific device driver are available in the README file that accompanies that driver on the download site. Be sure to use the latest service packs provided by the OS manufacturer.

1.2 Device Driver Filenames

The following table lists the device driver files for your ServeRAID-M controller. Refer to the readme file that accompanies the driver for any updated information.

To make a driver diskette, download the driver files from <http://www.ibm.com/supportportal/>, and extract them to a blank diskette. Label the diskette as the ServeRAID-M driver diskette for the given operating system.

Table 1.1 ServeRAID Device Driver Files

Operating System	SCSI Driver Filenames	Installation Reference
Windows Server 2003 R2 SP2 Windows 2008 R2 SP1 Windows 2008 SP2 Windows Server 2012	megasas.cat megasas2.sys NODEV.INF OEMSETUP.INF TXTSETUP.OEM	Chapter 2
Red Hat Linux 4 Red Hat Linux 5 Red Hat Linux 6	megaraid_sas.o	Chapter 3
SuSE Linux Enterprise Server 10 SP2 SuSE Linux Enterprise Server 10 SP3 SuSE Linux Enterprise Server 10 SP4 SuSE Linux Enterprise Server 11 SuSE Linux Enterprise Server 11 SP1 SuSE Linux Enterprise Server 11 SP2	megaraid_sas.ko	Chapter 4
VMware ESX/ESXi 4.x1 VMware ESXi 5.0 VMware ESXi 5.0 U1 VMware ESXi 5.1	VMware Installation Bundle (VIB) file package offline_bundle.zip file package	Chapter 5

Chapter 2

Windows Driver Installation

This chapter describes how to install the device drivers for the following Microsoft® Windows® operating systems:

- Microsoft Windows Server 2003 R2 SP2
- Microsoft Windows 2008 R2 SP1, 2008 SP2
- Microsoft Windows Server 2012

This chapter consists of the following sections:

- [Section 2.1, “ServeRAID Primary Storage”](#)
- [Section 2.2, “Primary Operating System Storage on the ServeRAID SAS/SATA Controller”](#)
- [Section 2.3, “Secondary Operating System Storage on the ServeRAID Controller with Windows 2008”](#)
- [Section 2.4, “Secondary Storage on the ServeRAID Controller with Windows 2003”](#)

2.1 ServeRAID Primary Storage

In the ServeRAID primary storage configuration, the Windows operating system is installed on virtual drives provided by the ServeRAID controller. The ServeRAID controller includes a pre-boot configuration utility (WebBIOS) that creates the virtual drive before the installation of the Windows operating system starts.

To install the Windows operating system, prepare a USB flash drive, CDROM or diskette, as appropriate, with the ServeRAID driver.

The driver is distributed in a series of nested compressed files. Using an existing Windows machine, extract the files for the driver loading

device (USB, CDROM or floppy) using the appropriate Windows driver. Only two driver choices exist across the supported Windows versions: one driver for 32-bit or one for 64-bit systems.

2.1.1 Storage Configuration

These steps describe how to create the virtual disk used for the Windows operating system. You can add other virtual drives to the running system after Windows has been installed. The ServeRAID pre-boot BIOS utility (WebBIOS) used to create the virtual disk for the Windows operating system is accessible during the power-on-self-test (POST) part of bootup.

Refer to the *ServeRAID-M Software User's Guide* for more information about the WebBIOS configuration utility (CU).

The following procedure describes the creation of a RAID 1 array. You can use other RAID levels, and the steps are the same except when selecting the RAID level. In RAID 1, the RAID controller duplicates all data from one drive to a second drive. RAID 1 provides complete data redundancy, but at the cost of doubling the required data storage capacity. It is appropriate for small databases or any other environment that requires fault tolerance but small capacity.

Follow these steps to create the virtual disk in WebBIOS:

- Step 1. When the host computer is booting, hold down the <Ctrl> key and press the <H> key when the following text appears on the screen:

```
Copyright© LSI Corporation  
Press <Ctrl><H> for WebBIOS
```

The **Controller Selection** screen appears.

- Step 2. If the system has multiple SAS/SATA controllers, select a controller.

- Step 3. Click **Start**.

The main WebBIOS CU screen appears.

- Step 4. Click **Configuration Wizard**.

The first **Configuration Wizard** screen appears.

- Step 5. Click **New Configuration**.

Attention: If you choose the first or second option, all existing data in the configuration will be deleted. Make a backup of any data that you want to keep before you choose an option.

Step 6. Click **Next**.

A dialog box warns that you will lose data if you select **Clear Configuration** or **New Configuration**.

The **Configuration Method** window appears.

Step 7. Select **Manual Configuration**.

Manual configuration lets you control all attributes of the new storage configuration as you create drive groups and virtual drives, and set their parameters.

Step 8. Click **Next**.

The **Disk Group Definition** window appears. You use this screen to select drives to create drive groups.

Step 9. Hold down the Ctrl key while you select two ready drives in the **Drives** panel on the left.

You must select an even number of drives.

Step 10. Click **Add To Array** to move the drives to a proposed drive group configuration in the Disk Groups panel on the left.

If you need to undo the changes, click **Reclaim**.

Step 11. Choose whether to use power save mode.

Step 12. Choose whether to use drive encryption.

Note: A RAID 1 virtual drive can contain up to 16 drive groups and up to 32 drives in a single span. (Other factors, such as the type of controller, can limit the number of drives.) You must use two drives in each RAID 1 drive group in the span.

Step 13. When you have finished selecting drives for the drive group, click **Accept DG**.

Step 14. Click **Next**.

The **Virtual Drive Definition** screen appears. You use this screen to select the RAID level, stripe size, read policy, and other attributes for the new virtual drives.

Step 15. Change the virtual drive options from the defaults listed on the screen as needed.

Here are brief explanations of the virtual drive options:

- **RAID Level:** The drop-down menu lists the possible RAID levels for the virtual drive. Select RAID 1.
- **Strip Size:** The strip size specifies the length of the data segments that the RAID controller writes across multiple drives, not including parity drives. For example, consider a stripe that contains 64 KB of drive space and has 16 KB of data residing on each drive in the stripe. In this case, the stripe size is 64 KB and the strip size is 16 KB. You can set the strip size to 8, 16, 32, 64, 128, 256, 512, and 1024 Kbytes. A larger strip size produces higher read performance. If your computer regularly performs random read requests, choose a smaller strip size. The default setting is 64 Kbytes.

Note: The ServeRAID M1015 and M1115 controllers do not support the cache policies. These policies include access policy, read policy, write policy, IO policy, and drive cache.

- **Access Policy:** Select the type of data access that is allowed for this virtual drive:
 - RW:* Allow read/write access. This setting is the default.
 - Read Only:* Allow read-only access.
 - Blocked:* Do not allow access.
- **Read Policy:** Specify the read policy for this virtual drive:
 - Normal:* Disable the read ahead capability. This setting is the default.
 - Ahead:* Enable read ahead capability, which allows the controller to read sequentially ahead of requested data and to store the additional data in cache memory, anticipating that the data will be needed soon. This speeds up reads for sequential data, but there is little improvement when accessing random data.
- **Write Policy:** Specify the write policy for this virtual drive:

WBack: In Writeback mode the controller sends a data transfer completion signal to the host when the controller cache has received all of the data in a transaction. This setting is recommended in Standard mode.

WThru: In Writethrough mode the controller sends a data transfer completion signal to the host when the drive subsystem has received all of the data in a transaction. This setting is the default.

Write Back with BBU: Select this mode if you want the controller to use Writeback mode but the controller has no battery backup unit (BBU) or the BBU is bad. If you do not choose this option, the controller firmware automatically switches to Writethrough mode if it detects a bad or missing BBU.

Attention: You can use Writeback mode with or without a battery. You should use either a battery to protect the controller cache or an uninterruptible power supply (UPS) to protect the entire system. If you do not use a battery or a UPS, and a power failure occurs, you risk losing the data in the controller cache. Although you can enable or disable the disk cache, you should disable it. If you enable the disk cache, the drive sends a data transfer completion signal to the controller when the drive cache has received all the data in a transaction. However, because the data has not been transferred to the disk media, you risk losing the data in the disk cache if a power failure occurs. This data is unrecoverable.

- **IO Policy:** The IO Policy applies to reads on a specific virtual drive. It does not affect the read ahead cache.

Direct: Reads are not buffered in cache memory. Data is transferred to the cache and the host concurrently. If the same data block is read again, it comes from cache memory. This setting is the default.

Cached: Reads are buffered in cache memory before they are sent to the host.

- **Drive Policy:** Specify the drive cache policy:

Enable: Enable the drive cache.

Disable: Disable the drive cache.

NoChange: Leave the current drive cache policy as is. This setting is the default.

- **Disable BGI**: Specify the background initialization status:
 - *No*: Leave background initialization enabled. A new configuration can be initialized in the background while you use WebBIOS to do other configuration tasks. This setting is the default.
 - *Yes*: Select *Yes* if you do not want to allow background initializations for configurations on this controller.
- **Select Size**: Specify the size of the virtual drive(s) in MB, GB, or TB. Normally, the size is the full size for RAID 1 shown in the **Configuration** panel on the right. You may specify a smaller size if you want to create other virtual drives on the same drive group.
- **Update Size**: Click *Update Size* to update the Select size field value for the selected RAID levels

Step 16. Click **Accept** to accept the changes to the virtual drive definition, or click **Reclaim** to return to the previous settings.

Step 17. Click **Next** when you are finished defining virtual drives.
The Configuration Preview screen appears.

Step 18. Check the information in the configuration preview.

Step 19. If the virtual drive configuration is acceptable, click **Accept** to save the configuration. Otherwise, click **Back** to return to the previous screens and change the configuration.

Step 20. If you accept the configuration, click **Yes** at the prompt to save the configuration and initialize the new virtual drive.

Step 21. After the initialization is complete (the elapsed time depends on the RAID level and the disk size), click the **Home** button and then click **Exit** in the left hand window frame.

Step 22. Select **Exit Application** and reboot the computer with the Windows operating system in the DVD drive or the CD drive.

2.2 Primary Operating System Storage on the ServeRAID SAS/SATA Controller

For the Windows 2003 operating system, the ServeRAID driver is added early in the installation process with a prompt to use the F6 key. This prompt appears after you select the operating system, and before the initial Windows Setup screen appears. For Windows 2003, the only disk type supported for introducing an additional driver is a 1.44 MB diskette.

For the Windows 2003 OS, the F6 keystroke adds a step to the installation process so you can specify an additional device. If the F6 key is not recognized within the time allowed, the OS installation ultimately fails, citing the lack of a disk for the OS. If the Megasas2 files are not unzipped on the driver diskette, or if the driver bit size does not match (32 bits versus 64 bits), the Windows installation program reports that the Megasas2 file is corrupted.

For the Windows 2008 OS, the ServeRAID driver is added after other installation steps.

Perform the following steps to set up the primary operating system storage on your ServeRAID SAS/SATA controller:

- Step 1. The operating system loads and decompresses the core files from the boot DVD first.
- Step 2. After the **Install Windows Language** selection screen, the **Install Now** screen appears, followed by the operating system selection, license agreement and installation type.

On new installations, the Custom installation type is the only option.
- Step 3. On the next Windows installation screen, a Load Driver link introduces the ServeRAID driver.

For the Windows 2008 operating system, you can add the driver from CD, DVD, or USB flash drive.
- Step 4. Click **Browse** and select the device and the folder with the previously extracted drivers.
- Step 5. In the next Windows installation screen, select the driver to be installed and click **Next**.

If no driver appears, two common problems might have occurred.

- The folder with the files was not selected.
- The wrong driver (32-bit as compared to 64-bit) was selected.

Step 6. After the driver is loaded, follow the rest of the standard Windows installation steps.

2.3 Secondary Operating System Storage on the ServeRAID Controller with Windows 2008

As the ServeRAID controller is installed, and the previously installed Windows operating system starts, the Windows 2008 operating system prompts with Found New Hardware.

Perform the following steps to set up secondary storage for the Windows 2008 operating system:

Step 1. Select **Locate and Install**.

Step 2. Select **Don't Search Online**.

Step 3. Select **Show Me Other Options**.

Step 4. Select **Browse My Computer**.

Step 5. Click **Browse**.

Step 6. In the **Browse for Folder** window, locate the previously extracted driver files from the local boot disk, CD/DVD, network, or USB device.

Step 7. Click **OK**.

Step 8. Click **Next**.

Step 9. Click **Install**.

The Hardware Wizard displays the following message: The software for this device has been successfully installed.

Step 10. Reboot the system.

The system does not require a reboot when the ServeRAID controller driver is loaded for the first time.

If you do not install the ServeRAID driver at boot time, the ServeRAID driver is added or updated in the Windows environment using Device Manager. There are many methods to start Device Manager, including one general method for all supported versions of the Windows operating system.

Perform the following steps to add or update the ServeRAID driver in the Windows environment using Device Manager:

- Step 1. Select **Start > Search > devmgmt.msc > enter key** (for all versions except the Windows 2003 operating system).

In Device Manager, a ServeRAID controller with no driver appears under the heading **Other devices as a RAID Controller or Unknown Device**, depending on the system history.

- Step 2. Right click and select either **RAID Controller** or **Unknown Device**, as appropriate.

- Step 3. If the device does not appear, double click **Storage controllers** to expose any detected controllers that are supported by an existing driver.

- Step 4. If you locate the ServeRAID controller, right click on the controller.

The driver installation steps for the Windows 2008 operating system are the same no matter where the device was found.

- Step 5. Click **Update Driver Software**.

- Step 6. Click **Browse My Computer** to search for driver software.

- Step 7. Click **Browse**.

- Step 8. In the **Browse for Folder** window, locate the previously extracted driver files from the local boot disk, CD, DVD, network, or USB device.

- Step 9. Click **OK**.

- Step 10. Click **Next**.

- Step 11. Click **Install**.

The Update Driver Software wizard displays the message: The software for this device has been successfully installed.

Step 12. Reboot the system.

2.4 Secondary Storage on the ServeRAID Controller with Windows 2003

The ServeRAID driver is added or updated in the Windows New Hardware Wizard at bootup or when using Device Manager. The driver does not install or work unless the Windows Service Pack 2 or later is installed. You can load the driver from the local hard disk, CD, DVD, or a network location. A USB device might not work even if it appears in My Computer. Put the extracted ServeRAID driver files in a usable place, and then proceed.

When a previously installed Windows OS starts for the first time after a MegaRAID controller has been installed for secondary storage, the Windows 2003 OS automatically launches the Found New Hardware Wizard.

Perform the following steps:

- Step 1. At the question *Can Windows connect to Windows Update?*, select the answer: **No, not this time.**
- Step 2. Click **Next**.
- Step 3. Select **Install from a list or specific location.**
- Step 4. Click **Next**.
- Step 5. Select **Search for the best driver in these locations.**
- Step 6. Click the checkbox **Include this location in the search.**
- Step 7. Uncheck **Search removable media.**
- Step 8. Click **Browse**.
- Step 9. In the **Browse for Folder** window, locate and click on the previously created folder with the extracted driver files.
- Step 10. Click **OK**.
- Step 11. Click **Next**.

Step 12. Click **Install**.

The Update Driver Software wizard shows the message: The software for this device has been successfully installed.

Step 13. Reboot the system.

If you do not install the ServeRAID driver at boot time, the ServeRAID driver is added or updated in the Windows environment using Device Manager. There are many methods to start Device Manager, including one general method for all supported variants of Windows 2003.

Step 1. Select **Run > Search > devmgmt.msc > enter key**.

In Device Manager, a ServeRAID controller with no driver appears under **Other devices** as a RAID controller.

Step 2. Right-click and select **RAID Controller**.

Step 3. If the device is not shown there, double click **Storage controllers** to expose any detected controllers supported by an existing driver.

Step 4. If you locate the ServeRAID controller, right-click on the controller.

The driver installation steps for the Windows 2003 operating system are the same no matter where the device was found.

Step 5. Click **Update Driver Software**.

Step 6. Click **Browse My Computer** to search for driver software.

Step 7. Click **Browse**.

Step 8. In the **Browse for Folder** window, locate the previously extracted driver files from the local boot disk, CD, DVD, network, or USB device.

Step 9. Click **OK**.

Step 10. Click **Next**.

Step 11. Click **Install**.

The Update Driver Software wizard displays the message: The software for this device has been successfully installed.

Step 12. Reboot the system.

2.5 Installing a ServeRAID Driver on the Windows Server 2012 Operating System

The Microsoft Windows Server 2012 operating system package includes a ServeRAID driver in box.

The type of installation to use depends on how you plan to use your ServeRAID controller:

If you use the ServeRAID controller as primary storage, see [Section 2.1.1, “Storage Configuration”](#) on configuring a virtual disk for the OS in a pre-boot environment. The Windows installation program recognizes the ServeRAID controller, and it installs a driver automatically.

If you use the ServeRAID controller as secondary storage, install the OS without the ServeRAID controller, shut down the system, install the controller, and let the OS automatically configure the controller with the in-box driver.

Once the Windows Server 2012 OS is running on the machine with the ServeRAID controller, an upgrade to the latest ServeRAID driver is recommended. The following section describes how to upgrade the driver.

2.5.1 Upgrading the Driver for the Windows Server 2012 Operating System

Perform the following steps to upgrade the driver.

1. Download the updated driver at the **Support & downloads** section of the IBM website, <http://www.ibm.com/supportportal/>, and put it on a USB, CD, or DVD.
2. Boot the Microsoft Server 2012 OS.
3. Click the Server Manager button to start Server Manager, if it does not start automatically.

The button to start Server Manager is the first item on the left of the start bar, as shown in the following figure.

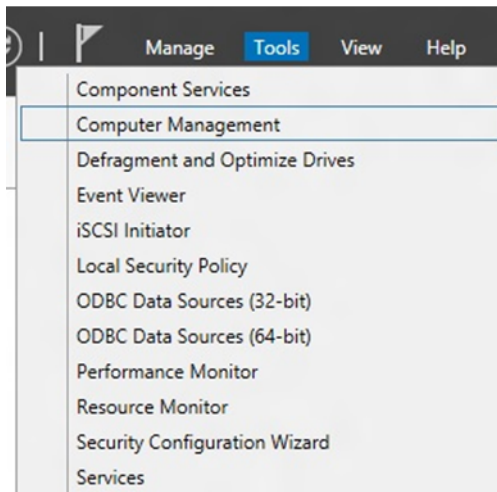
Figure 2.1 Server Manager Button



The Server Manager page appears.

4. In Server Manager, open the Tools menu, and select **Computer Management**, as shown in the following figure.

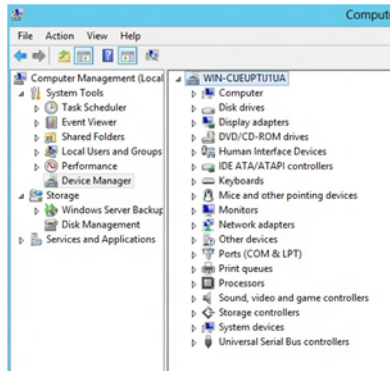
Figure 2.2 Computer Management Option



The Computer Management window appears, as shown in the following figure.

5. In the left frame of the Computer Management window, select **Device Manager**.

Figure 2.3 Device Manager Option



The Device Manager window appears.

6. In the Device Manager window, expand the submenu under **Storage Controllers**, and right-click on **Update Driver Software**, as shown in the following figure.

To find the version of the existing driver, right-click **Properties** and select the **Driver** tab.

7. In the Update Driver Software wizard, click the **Browse** button to locate the updated driver on the USB, CD, or DVD, as shown in the following figure.

After you locate the updated driver, the Windows Security dialog box appears.

8. Click the **Install** button in the Windows Security dialog box, as shown in the following figure.

The installation wizard presents progress screens and announces the completion of the installation.

9. Reboot the system after the driver is installed.

Chapter 3

Red Hat Enterprise Linux 4, 5, and 6 Driver Installation

This chapter describes how to install the device driver in new Red Hat® Enterprise Linux™ systems, and how to update the driver on existing operating systems.

Refer to the release notes that accompanied the driver for information on an existing Red Hat Enterprise Linux system.

This chapter consists of the following sections:

- [Section 3.1, “Installing the Driver in a New Red Hat Enterprise Linux 4, 5, or 6 System”](#)
- [Section 3.2, “Installing the Red Hat Enterprise Linux 4, 5, or 6 Driver in an Existing Installation”](#)
- [Section 3.3, “Installing or Updating the Red Hat Linux System Driver”](#)

3.1 Installing the Driver in a New Red Hat Enterprise Linux 4, 5, or 6 System

You can install the ServeRAID device driver in a new system from the Red Hat Enterprise Linux CD or DVD, or from a driver update disk.

3.1.1 Installing from a CD or a DVD

Perform the following steps to install the MegaSAS device driver in a new Red Hat Linux operating system from the Red Hat Enterprise Linux installation media:

- Step 1. Refer to your system documentation, if needed, and boot the server with the installation CD or DVD.
- Step 2. Follow the installation procedure for the Red Hat OS.

The driver is loaded automatically during install.

3.1.2 Installing from a Driver Update Diskette

To install the MegaSAS device driver in a new Red Hat Enterprise Linux system, create the driver update diskette using the Linux driver image.

Perform the following steps:

Step 1. Boot the server with the installation CD or DVD. Refer to your system documentation, if needed.

Step 2. Enter the following boot option to load the driver disk during installation:

```
linux dd
```

Step 3. Press Enter to continue the install.

Step 4. When prompted, insert the driver diskette.

The utility locates and loads the driver for your controller.

Step 5. Press ALT+CTRL+F4 to verify that the driver is loaded.

Step 6. Press ALT+CTRL+F1 to return to the installation.

Step 7. Follow the Red Hat installation procedure to complete the installation.

3.2 Installing the Red Hat Enterprise Linux 4, 5, or 6 Driver in an Existing Installation

You can install the device driver in an existing Red Hat Enterprise Linux 6 system from the Red Hat Enterprise Linux installation CD.

Perform the following steps to add the Red Hat Enterprise Linux 4, 5, or 6 driver to an existing installation:

Step 1. Turn on the power to the system.

The system initializes the hardware. The system then detects the controller and invokes Kudzu, the Red Hat Enterprise Linux hardware configuration utility.

The following RAID controller is added to your system:

Step 2. Select the **Configure the device** option.

Step 3. Highlight the Configure tab, and press Enter.

The system configures the controller and installs the appropriate driver in the kernel.

The system boots and displays the devices connected to or configured on the controller.

3.3 Installing or Updating the Red Hat Linux System Driver

Perform the following steps to install or update to the latest version of the megaSAS driver:

Step 1. Boot the system.

Step 2. Go to Console (your terminal GUI).

Step 3. Install the Dynamic Kernel Module Support (DKMS) driver RPM.

Uninstall the earlier version first, if needed.

Step 4. Install the megaSAS driver RPM.

Uninstall the earlier version first, if needed.

Step 5. Reboot the system to load the driver.

Chapter 4

SUSE Linux Enterprise Server 10 and 11 Driver Installation

This chapter describes how to install the device driver in new SUSE Linux Enterprise Server (SLES) operating systems, and how to update the driver on existing systems.

This chapter consists of the following sections:

- [Section 4.1, “Installing the Driver in a New SUSE Linux Enterprise Server System”](#)
 - [Section 4.2, “Installing or Updating the SUSE Linux Enterprise Server 10 or 11 Driver”](#)
-

4.1 Installing the Driver in a New SUSE Linux Enterprise Server System

You can install the ServeRAID device driver in a new system from the SUSE Linux Enterprise Server CD or DVD, or from a driver update diskette.

Note: If you use Service Pack (SP) 1 or SP 2, you need to load the driver. If you use SP 3 RC 2, the MegaSAS driver is already on the SuSE SLES Linux CD.

4.1.1 Installing from a CD or a DVD

Perform the following steps to install the driver in a new SUSE Linux Enterprise Server system from the SUSE Linux Enterprise Server installation CD or DVD:

Step 1. Boot the server with the SUSE Linux Enterprise Server SP CD or DVD.

The system BIOS must support booting from a CD-ROM. BIOS settings might require changes to allow CD-ROM booting. Refer to your system documentation.

- Step 2. Follow the installation procedure for the SUSE operating system.

The driver is loaded automatically during installation.

4.1.2 Installing from a Driver Update Diskette

To install the MegaSAS device driver in a new SUSE Linux Enterprise Server, create the driver update diskette using the Linux driver image.

Perform the following steps to install the driver:

- Step 1. Refer to your system documentation, if needed, and boot the server with the installation CD or DVD.
- Step 2. At the installation message, do one of these actions:
- Press F5 for SUSE Linux Enterprise Server 10.
 - Press F6 for SUSE Linux Enterprise Server 11.
- Step 3. Continue the installation procedure, and when prompted, insert the driver diskette.
- The utility locates and loads the driver for your controller.
- Step 4. Press ALT+CTRL+F4 to verify that the driver is loaded.
- Step 5. Press ALT+CTRL+F1 to return to the installation.
- Step 6. Follow the SUSE installation procedure to complete the installation.

4.2 Installing or Updating the SUSE Linux Enterprise Server 10 or 11 Driver

Perform the following steps to install or upgrade to the latest version of the megaSAS driver:

- Step 1. Boot the system.
- Step 2. Go to Console (your terminal GUI).

- Step 3. Run the Dynamic Kernel Module Support (DKMS) driver RPM.
Uninstall the earlier version first, if needed.
- Step 4. Install the megaSAS driver RPM.
Uninstall the earlier version first, if needed.
- Step 5. Reboot the system to load the driver.

Chapter 5

VMware ESX/ESXi 4.x and ESXi 5.0/5.1 Driver Installation

This chapter describes how to install and update the VMware device drivers on VMware ESX/ESXi 4.x and ESXi 5.0/5.1 operating systems.

This chapter consists of the following sections:

- [Section 5.1, “Installing Async Drivers on the VMware ESX/ESXi 4.x Operating System”](#)
 - [Section 5.2, “Installing Async Drivers on the VMware ESXi 5.0/5.1 Operating System”](#)
-

5.1 Installing Async Drivers on the VMware ESX/ESXi 4.x Operating System

You can use several methods to install Async drivers on the VMware ESX/ESXi 4.x operating system. Some of these methods are applicable only to VMware ESX or ESXi operating systems. Some methods copy the <offline-bundle>.zip file to the ESX host over the network or use a local CD-ROM. You must choose the appropriate method for your environment.

5.1.1 Installing Async Drivers During a New ESX Installation

Perform the following steps during a new ESX installation:

- Step 1. Place the ESX installation DVD in the DVD drive of the host system.
- Step 2. Restart the host.
- Step 3. Accept the terms of the license agreement.
- Step 4. Select a keyboard type.

- Step 5. When prompted for custom drivers, click **Yes** to install custom drivers.
 - Step 6. Click **Add** to eject the ESX installation DVD.
 - Step 7. Place the driver CD in the DVD drive of the ESX host.
 - Step 8. Select the driver module to import drivers to the ESX host.
 - Step 9. Click **Next**.
 - Step 10. When prompted to load the system drivers, click **Yes**.
 - Step 11. After you load the driver module, continue installing ESX.
- Note: After the drivers are installed, you are prompted to remove the driver CD and re-insert the ESX installation DVD.
- Step 12. Follow the on-screen instructions to complete the installation.

5.1.2 Existing ESX Installation Using esxupdate and a CD

An existing ESX host can mount the Async driver CD and install the offline bundles within using the `esxupdate` utility.

Perform the following steps to install the Async driver using the `esxupdate` utility:

- Step 1. Log in to the ESX host using an account with administrator privileges, such as root.
- Step 2. Enter the host into maintenance mode.

Note: You can enter host into maintenance mode through the vSphere Client, or by adding the `--maintenancemode` option to the `esxupdate` command.

- Step 3. Place the driver CD in the CD-ROM drive of the ESX host.
- Step 4. To mount the driver CD, type the following command, and press Enter.

```
mount -r /dev/cdrom /mnt/cdrom
```

- Step 5. Navigate to `<cd mount point>/offline-bundle/` and locate the file `<offline-bundle>.zip`.
- Step 6. To install drivers using the offline bundle, type the following command, and press Enter.

```
esxupdate --bundle=<offline-bundle>.zip update
```

- Step 7. Reboot the ESX host.
- Step 8. Exit Maintenance mode.

5.1.3 Existing ESX or ESXi Installation Using esxupdate and Datastore Browser

An existing ESX host or ESXi host can install offline bundles that have been copied from the Async release ISO to the ESX host or the ESXi host.

- Step 1. Extract the contents of the ISO file.
- Step 2. Identify the <offline-bundle>.zip file(s).
- Step 3. Using Datastore Browser, upload the <offline-bundle>.zip file(s) to an ESX or ESXi host's datastore.
- Step 4. Log in to the ESX host or the ESXi host using an account with administrator privileges, such as root.
- Step 5. Enter the host into maintenance mode.

Note: You can enter host into maintenance mode through the vSphere Client, or by adding the `--maintenancemode` option to the `esxupdate` command.

- Step 6. Navigate to `/vmfs/volumes/<datastorename>/` and locate the file `<offline-bundle>.zip`.
- Step 7. To install drivers using the offline bundle, type the following command, and press Enter.

```
esxupdate --bundle=<offline-bundle>.zip update
```
- Step 8. Reboot the ESX host or the ESXi host.
- Step 9. Exit maintenance mode.

5.1.4 Existing ESX or ESXi Installation Using vihostupdate and a CD

An ESX host or an ESXi host can be updated remotely using the `vihostupdate` utility, which is part of the vSphere CLI. For more details on `vihostupdate`, refer to the *vSphere Command-Line Interface Installation and Reference Guide*.

- Step 1. Power on the ESX host or the ESXi host.

- Step 2. Place the driver CD in the CD-ROM drive of the host where either the vSphere CLI package is installed or vMA is hosted.
- Step 3. Mount the driver CD.
- Step 4. Navigate to the `<cd mount point>/offline-bundle/` directory and locate the file `<offline-bundle>.zip`.
- Step 5. Enter the following `vihostupdate` command to install drivers using the offline bundle:

```
vihostupdate <conn_options> --install --bundle  
<offline-bundle>.zip
```

For example:

```
vihostupdate --server myesxhost --username root --  
password mypassword --install --bundle driver-  
offline-bundle.zip
```

5.2 Installing Async Drivers on the VMware ESXi 5.0/5.1 Operating System

An existing ESXi host can install drivers from a specific VIB file or from an `<offline-bundle>.zip` file.

5.2.1 Existing ESXi Installation Using `esxcli` and Async Driver VIB File

An existing ESXi host can install async drivers from an async driver VIB file. The VIB file is copied to the ESXi host using the datastore browser, and then installed using the `esxcli` utility in the ESXi Shell.

Note: This procedure requires remote ESXi network connectivity using vSphere client.

Perform the following steps to install the async drivers:

- Step 1. Extract the contents of the async driver zip file.
- Step 2. Identify the `offline-bundle.zip` file.
- Step 3. Extract the contents of the `offline-bundle.zip` file.
- Step 4. Identify the `async-driver.vib` file.

- Step 5. Log in to the ESXi host using vSphere client with administrator privileges, such as root.
- Step 6. Using Datastore Browser, upload the `async-driver.vib` file to an ESXi host's datastore.
- Step 7. Enter the host into Maintenance mode.

Note: You can enter host into maintenance mode through the vSphere Client, or by adding the `--maintenancemode` option to the `esxcli` command.

- Step 8. Log in as root to the ESXi console through SSH or iLO/DRAC.

- Step 9. To install drivers from the VIB file (this action requires an absolute path), type the following command, and press Enter.

```
esxcli software vib install -v /path/async-  
driver.vib
```

For example:

```
esxcli software vib install -v  
/vmfs/volumes/datastore/async-driver.vib
```

- Step 10. Reboot the ESXi host.
- Step 11. Exit maintenance mode.

Note: You can update an ESX host remotely using the `esxcli` utility, which is part of the vSphere CLI. For more details on using this utility, refer to the vSphere Command-Line Interface Documentation page.

5.2.2 Existing ESXi installation Using `esxcli` and Offline Bundle Async Driver Zip File

In this procedure, you copy the offline bundle zip file to the ESXi host by using the datastore browser and install it by using the `esxcli` utility in the ESXi Shell.

Note: This procedure requires remote ESXi network connectivity using vSphere client.

Perform the following steps to install the async drivers:

- Step 1. Extract the contents of the async driver zip file.

- Step 2. Identify the `offline-bundle.zip` file.
- Step 3. Log in to the ESXi host by using vSphere client with administrator privileges, such as root.
- Step 4. Using Datastore Browser, upload the `offline-bundle.zip` file to an ESXi host's datastore.
- Step 5. Enter the host into Maintenance mode.

Note: You can enter host into Maintenance mode through the vSphere Client, or by adding the `--maintenancemode` option to the `esxcli` command.

- Step 6. Log in as root to the ESXi console through SSH or iLO/DRAC.
- Step 7. To install drivers using the offline bundle (this action requires an absolute path), type the following command, and press Enter.

```
esxcli software vib install -d /path/offline-  
bundle.zip
```

For example:

```
esxcli software vib install -d  
/vmfs/volumes/datastore/offline-bundle.zip
```

- Step 8. Reboot the ESXi host.
- Step 9. Exit Maintenance mode.

5.2.3 Upgrade Installation

The upgrade process is similar to a new installation, except for the `esxcli` command. To upgrade, type the following commands, and press Enter.

```
esxcli software vib update -v {VIBFILE}
```

Note: Before you run the `esxcli` command, enter the ESXi host into maintenance mode. You can enter host into maintenance mode through the vSphere Client, or by adding the `--maintenancemode` option to the `esxcli` command.

5.2.4 VUM Installation

The VMware Update Manager (VUM) is a plugin for the Virtual Center Server (vCenter Server). You can use the VUM utility to install a VIB by importing the associated offline bundle package (a zip file that contains the VIB and metadata). You can then create an add-on baseline and remediate the host or hosts with this baseline.

Refer to the vCenter Server documentation for more information about VUM.

Appendix A Getting Help and Technical Assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. Use this information to obtain additional information about IBM and IBM products, determine what to do if you experience a problem with your IBM system or optional device, and determine whom to call for service, if it is necessary.

A.1 Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated firmware and operating-system device drivers for your IBM product. The IBM Warranty terms and conditions state that you, the owner of the IBM product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your IBM service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
- If you have installed new hardware or software in your environment, check <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/> to make sure that the hardware and software is supported by your IBM product.
- Go to <http://www.ibm.com/supportportal/> to check for information to help you solve the problem.
- Gather the following information to provide to IBM Support. This data will help IBM Support quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.
 - Hardware and Software Maintenance agreement contract numbers, if applicable
 - Machine type number (IBM 4-digit machine identifier)
 - Model number
 - Serial number
 - Current system UEFI and firmware levels
 - Other pertinent information such as error messages and logs
- Go to http://www.ibm.com/support/entry/portal/Open_service_request/ to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to IBM Support quickly and efficiently. IBM service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documentation that is provided with your IBM product. The documentation that comes with IBM systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

A.2 Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/supportportal/>. Also, some documents are available through the IBM Publications Center at <http://www.ibm.com/shop/publications/order/>.

A.3 Getting help and information from the World Wide Web

On the World Wide Web, up-to-date information about IBM systems, optional devices, services, and support is available at <http://www.ibm.com/supportportal/>. The address for IBM System x® information is <http://www.ibm.com/systems/x/>. The address for IBM BladeCenter® information is <http://www.ibm.com/systems/bladecenter/>. The address for IBM IntelliStation® information is <http://www.ibm.com/systems/intellistation/>.

A.4 How to send Dynamic System Analysis data to IBM

Use the IBM Enhanced Customer Data Repository to send diagnostic data to IBM. Before you send diagnostic data to IBM, read the terms of use at <http://www.ibm.com/de/support/ecurep/terms.html>.

You can use any of the following methods to send diagnostic data to IBM:

- **Standard upload:** http://www.ibm.com/de/support/ecurep/send_http.html
- **Standard upload with the system serial number:**
http://www.ecurep.ibm.com/app/upload_hw
- **Secure upload:** http://www.ibm.com/de/support/ecurep/send_http.html#secure
- **Secure upload with the system serial number:**
https://www.ecurep.ibm.com/app/upload_hw

A.5 Creating a personalized support web page

At <http://www.ibm.com/support/mynotifications/>, you can create a personalized support web page by identifying IBM products that are of interest to you. From this personalized page, you can subscribe to weekly email notifications about new technical documents, search for information and downloads, and access various administrative services.

A.6 Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with your IBM products. For information about which products are supported by Support Line in your country or region, see <http://www.ibm.com/services/supline/products/>.

For more information about Support Line and other IBM services, see <http://www.ibm.com/services/>, or see <http://www.ibm.com/planetwide/> for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378)

A.7 Hardware service and support

You can receive hardware service through your IBM reseller or IBM Services. To locate a reseller authorized by IBM to provide warranty service, go to <http://www.ibm.com/partnerworld/> and click **Find Business Partners** on the right side of the page. For IBM support telephone numbers, see <http://www.ibm.com/planetwide/>. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

A.8 IBM Taiwan product service

台灣 IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路 7 號 3 樓
電話：0800-016-888

IBM Taiwan product service contact information:

IBM Taiwan Corporation
3F, No 7, Song Ren Rd.
Taipei, Taiwan
Telephone: 0800-016-888

Appendix B Notices

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Microsoft, Windows, and Windows NT are trademarks of Microsoft Corporation in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

B.2 Important Notes

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

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1,024 bytes, MB stands for 1,048,576 bytes, and GB stands for 1,073,741,824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1,000,000 bytes, and GB stands for 1,000,000,000 bytes. Total user-accessible capacity can 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 that are available from IBM.

Maximum memory might require replacement of the standard memory with an optional memory module.

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Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

B.3 Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the device that is described in this document. Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the device to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If IBM determines that the levels of particulates or gases in your environment have caused damage to the device, IBM may condition provision of repair or replacement of devices or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 5. Limits for particulates and gases

Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2¹. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%². • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985³ • Silver: Corrosion rate of less than 300 Å in 30 days

¹ ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

² The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.

³ ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.

B.4 Documentation format

The publications for this product are in Adobe Portable Document Format (PDF) and should be compliant with accessibility standards. If you experience difficulties when you use the PDF files and want to request a web-based format or accessible PDF document for a publication, direct your mail to the following address:

- *Information Development*
- *IBM Corporation*
- *205/A015*
- *3039 E. Cornwallis Road*
- *P.O. Box 12195*
- *Research Triangle Park, North Carolina 27709-2195*
- *U.S.A.*

In the request, be sure to include the publication part number and title.

When you send information to IBM, you grant IBM a nonexclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you.

B.5 Telecommunication regulatory statement

This product is not intended to be connected directly or indirectly by any means whatsoever to interfaces of public telecommunications networks, nor is it intended to be used in a public services network.

B.6 Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Australia and New Zealand Class A statement

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

Attention: This is an EN 55022 Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Responsible manufacturer:

International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
914-499-1900

European Community contact:

IBM Technical Regulations, Department M456
IBM-Allee 1, 71137 Ehningen, Germany
Telephone: +49 7032 15-2937
E-mail: tjahn@de.ibm.com

Germany Class A statement

Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der IBM empfohlene Kabel angeschlossen werden. IBM übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung der IBM verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung der IBM gesteckt/eingebaut werden.

EN 55022 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden: "Warnung: Dieses ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funk-Störungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen zu ergreifen und dafür aufzukommen."

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)". Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC EG Richtlinie 2004/108/EG) für Geräte der Klasse A

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Einhaltung der EMV Vorschriften ist der Hersteller:

International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
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Der verantwortliche Ansprechpartner des Herstellers in der EU ist:

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Technical Regulations, Department M456
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Telephone: +49 7032 15-2937
E-mail: tjahn@de.ibm.com

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

VCCI Class A statement

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用する
と電波妨害を引き起こすことがあります。この場合には使用者が適切な対策
を講ずるよう要求されることがあります。

VCCI-A

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

Korea Communications Commission (KCC) statement

이 기기는 업무용(A급)으로 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

This is electromagnetic wave compatibility equipment for business (Type A). Sellers and users need to pay attention to it. This is for any areas other than home.

Russia Electromagnetic Interference (EMI) Class A statement

ВНИМАНИЕ! Настоящее изделие относится к классу A. В жилых помещениях оно может создавать радиопомехи, для снижения которых необходимы дополнительные меры

People's Republic of China Class A electronic emission statement

中华人民共和国“A类”警告声明

声 明

此为A级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取切实可行的措施。

Taiwan Class A compliance statement

警告使用者：
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

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