

# Advanced SerialRAID/X Adapter: Installation Guide

## **READ ME FIRST**

To add extra function to your Advanced SerialRAID/X Adapter, you must first download the required firmware and software from the SSA World Wide Web page at:

**<http://www.hursley.ibm.com/ssa/pcserver>**

This Installation Guide asks you to install firmware and software from CD-ROMs and also from diskettes. However, because the code is only available from the SSA World Wide Web, you must first visit the above web page, and select 'Download Latest Code Levels'.

After agreeing to the license, select the correct operating system and adapter (the Advanced SerialRAID/X Adapter is identified as 'LL05').

For Windows NT, download the 'All in one (ll05)' package. This self-extracting package will load the necessary code into the correct directories as follows:

1. *c:\issa\update\driver*  
which will contain the device-driver software. If asked to load device-driver software from the CD-ROM, you must instead load the software from this directory.
2. *c:\issa\update\rsm*  
which will contain the event logger and Remote System Management (RSM) software. If asked to load the event logger from the CD-ROM, you must instead load the code from this directory.
3. *c:\issa\update\ssaflash*  
which will contain the SSA-adapter microcode.

Refer to Chapter 5 of this manual for details about downloading the SSA-disk-drive microcode.

For NetWare, download the Host Software, Adapter Microcode and RSM for NetWare packages. These self-extracting packages allow you to create the required diskettes or data directories.



IBM Advanced SerialRAID/X Adapter

# Installation Guide



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**Note**

Before using this information and the product it supports, be sure to read the general information under "Product Warranties and Notices" included with your system unit.

**Third Edition (October 1999)**

This major revision supersedes SA33-3290-01. Technical changes are shown by a vertical line to the left of each change.

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## Safety Information

### DANGER

An electrical outlet that is not correctly wired could place a hazardous voltage on metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.

Use one hand, when possible, to connect or disconnect signal cables to prevent a possible shock from touching two surfaces with different electrical potentials.

During an electrical storm, do not connect cables for display stations, printers, telephones, or station protectors for communication lines.

### CAUTION:

A lithium battery can cause fire, explosion, or a severe burn. Do not recharge, disassemble, heat above 100°C (212°F), solder directly to the cell, incinerate, or expose cell to water. Keep away from children. Replace only with the part number specified for your system. Use of another battery might present a risk of fire or explosion.

The battery connector is polarized; do not try to reverse the polarity.

Dispose of the battery according to local regulations.

A module on the IBM Advanced SerialRAID/X Adapter contains a lithium battery.

### CAUTION:

The Fast Write Cache Option Card contains a nickel-cadmium (NiCad) battery. To avoid possible explosion, do not incinerate the battery. Exchange only with a manufacturer approved part. Recycle or discard the battery as instructed by local regulations and where recycling facilities exist.



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## About This Book

This book provides information about installing the IBM Advanced SerialRAID/X Adapter, the device drivers, support software, and the latest microcode for the SSA adapter and the SSA disk drives.

The latest copies of this book, the related publications, the device drivers and the software can be found on the SSA World Wide Web Support page. You are advised to check on that page for any updates to these items. The URL for that page is:

<http://www.hursley.ibm.com/ssa/>

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## Related Publications

Refer to your system unit and operating system documentation for information specific to your hardware and software configuration while installing the IBM Advanced SerialRAID/X Adapter.

For further details on configuring your system with the IBM Advanced SerialRAID/X Adapter, check the SSA World Wide Web Support page at:

<http://www.hursley.ibm.com/ssa/>

Refer to the *IBM Advanced SerialRAID/X Adapter: User's Guide and Maintenance Information* manual for information about updating your system configuration after you install the IBM Advanced SerialRAID/X Adapter.

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## ISO 9000

ISO 9000 registered quality systems were used in the development and manufacture of this product.

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## Chapter 1. Overview

The IBM Advanced SerialRAID/X Adapter allows you to connect SSA disk drives to certain system units with a Peripheral Component Interconnect (PCI) bus. These disk drives can be accessed individually or they can be configured in RAID arrays. RAID (Redundant Array of Independent Disks) provides a way to spread stored data among a number of hard disk drives attached to a host system. A PCI bus provides high-speed data transfer. A Fast-Write Cache feature further improves the performance of the adapter.

You can create, control, and manage a RAID configuration with supporting host software. The IBM Advanced SerialRAID/X Adapter supports data rates up to 40 MB per second on each SSA interface; and data rates up to 120 MB per second on the PCI bus. You can install up to 6 IBM Advanced SerialRAID/X Adapters in some host systems, depending on the system unit.

Serial Storage Architecture (SSA) is a high-performance serial-interconnect technology used to connect I/O devices and host adapters. SSA is an open standard, and SSA specifications have been approved by the SSA Industry Association and are in the process of being approved as an ANSI standard through the ANSI X3T10.1 subcommittee.

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### Handling the Adapter

**Attention:** Static electricity can damage this adapter and your system unit. To avoid damage, keep your adapter in its protective bag until you are ready to install. To reduce the possibility of electrostatic discharge, follow the precautions listed below.

### Electrostatic Discharge Protection

To prevent electrostatic discharge:

- Always wear an electrostatic discharge (ESD) wrist strap correctly connected to an ESD ground bracket when you handle the adapter. This prevents possible damage to the adapter and decreases any possible impact to system operations.
- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the adapter carefully and by the edges.
- Do not touch any exposed printed circuitry.
- Prevent other people from touching the components or the adapter card.
- When you are installing the adapter, touch the static-protective package containing the adapter to a metal expansion-slot screw or other unpainted metal surface on the computer, for at least 2 seconds. (This drains static electricity from the package and from your body.)
- When possible, remove the adapter and install it directly into the computer without setting it down. If this is not possible, place the adapter, component side up, on the static-protective bag on a flat surface until the adapter is installed.
- Do not place the adapter on the computer cover or on a metal table.

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## SSA Connectors

The IBM Advanced SerialRAID/X Adapter has four external connectors, arranged in two pairs. Up to 48 SSA disk drives can be connected in a loop between each pair of external connectors. If you are not using RAID-0 arrays you can connect up to two IBM Advanced SerialRAID/X Adapters in the SSA loop.

“Appendix A. Connecting SSA Devices to the Adapter” on page 31 provides more information about SSA loops. Figure 1 shows the card.

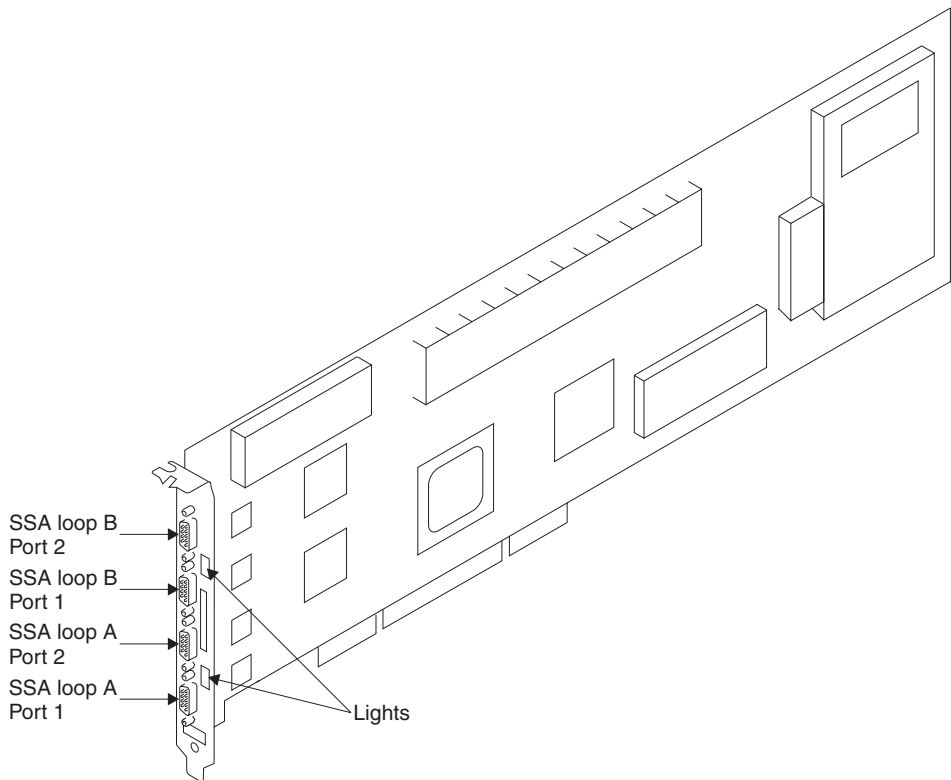


Figure 1. IBM Advanced SerialRAID/X Adapter Card

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## Adapter Card Lights

On the IBM Advanced SerialRAID/X Adapter card, there is a light next to the pair of SSA connectors (port 1 and port 2) for each SSA loop.

- The light is on continuously when power is turned on to the adapter and both ports for that loop are operational; that is, the devices connected next to the adapter in the loop have power turned on to them, are connected correctly to the adapter, and are operational.

- The light flashes continuously if one of the ports is not operational. That occurs when the cable to that port is not connected correctly or the device connected next to the adapter in the loop is not operational.
- The light is off if both ports are not operational.

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## Summary of Installation Procedures

Installing the adapter consists of the following steps:

- Taking an inventory of all pieces necessary for installation
- Installing the adapter
- Connecting the SSA disk drives
- Installing the SSA device drivers, software, and any required microcode.





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## Chapter 2. Preparing for Installation

This section shows you the items you need to install the IBM Advanced SerialRAID/X Adapter. It also describes the cable requirements.

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### Inventory

To install the IBM Advanced SerialRAID/X Adapter, you need:

- The adapter.
- The diskettes that are supplied with the adapter.
- The CD-ROM that is supplied with the adapter contains the device-driver software, the event logger, the Remote Systems Management (RSM), the SSA-disk-drive microcode, the SSA-adapter microcode, and the product manuals in Adobe Acrobat PDF format.
- Your system unit documentation.
- Your operating system documentation.
- A flat-blade screwdriver.
- An electrostatic discharge (ESD) kit.

To connect SSA disk drives to the IBM Advanced SerialRAID/X Adapter, you need:

- External SSA cables.
- SSA Screwdriver Part Number 32H7059.
- Fibre-Optic Extenders, if you are using fibre optic cables. (The extenders are supplied in pairs as a feature of the unit in which the SSA disk drives are installed, for example, the 7133 disk system.)
- The plan for your SSA subsystem configuration.
- The documentation for the unit in which the SSA disk drives are installed.

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### Determining Your Cable Requirements

There are two types of SSA cable:

- Copper cables with conventional connectors at each end. These enable you to connect SSA nodes at distances up to 25 m (82 feet).
- Fibre-optic cables. These enable you to connect two SSA nodes at distances up to 10 km (32800 feet) in single-mode operation. These require the use of Fibre-Optic Extenders; these are supplied in pairs as a feature of the unit in which the SSA disk drives are installed, for example, the 7133 disk system.

The number and type of cables that you need and their lengths should have been decided at the time that your SSA subsystem was ordered. If the configuration plan that was created then is not available to you, use the sample configuration information that is provided in the documentation for the unit in which the SSA disk drives are installed. "Appendix A. Connecting SSA Devices to the Adapter" on page 31 provides some general information about SSA configurations.



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## Chapter 3. Installing Hardware

This section provides instructions for installing the IBM Advanced SerialRAID/X Adapter and connecting your SSA disk drives to it. (Be sure to save this guide for future reference and use.) Before you begin, be sure you have read “Handling the Adapter” on page 1.

**Attention:**

Do not remove the IBM Advanced SerialRAID/X Adapter from its anti-static package at this time.

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### Installing the Adapter

1. Be sure that you have read “Chapter 2. Preparing for Installation” on page 5. It tells you to ensure that you have all the items required to install the IBM Advanced SerialRAID/X Adapter.
2. Refer to the User’s Guide that shipped with your system unit to perform the following:
  - a. Ensure that your system unit is shut down.
  - b. Remove the cover from your system unit.
  - c. Remove the IBM Advanced SerialRAID/X Adapter from its antistatic package.
  - d. In some systems, you must remove the blue handle on the adapter before installing it. To remove the handle, remove the two screws that fasten it to the adapter.
  - e. Install the IBM Advanced SerialRAID/X Adapter into the correct PCI slot. Your system unit documents may specify which PCI slots should be used for storage adapters to optimize performance.
  - f. Reinstall the cover to your system unit.

**Attention:**

The Windows NT 4.0 SSA Device Driver supports up to 6 IBM Advanced SerialRAID/X Adapters in one machine; the Netware SSA Driver supports up to 4 IBM Advanced SerialRAID/X Adapters. Other restrictions may apply to individual machines.

If you are using a Netfinity Model 5500 or 5500M10, you can have up to two IBM Advanced SerialRAID/X Adapters on the primary bus. However, you cannot place both an IBM SerialRAID Adapter and an IBM Advanced SerialRAID/X Adapter on the primary bus of the Model 5500 or 5500M10.

Netfinity Model 5500M20 cannot use slots 5 or 6 for the IBM Advanced SerialRAID/X Adapter due to size restrictions..

If you are using a Netfinity Model 7000, do not install the adapter in slot 5 if you are using more than one Advanced SerialRAID/X Adapter. If you use slot 1 or slot 6 for SSA Adapters then any other high performance adapters should be placed on the other PCI bus.

See the SSA support World Wide Web page at:

<http://www.hursley.ibm.com/ssa/>

for the latest support information.

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## Connecting SSA Disk Drives

After you install the IBM Advanced SerialRAID/X Adapter and reinstall the cover of your system unit, you can connect the SSA disk drives.

To connect the disk drives:

1. Refer to the configuration plan that was created at the time that your SSA subsystem was ordered. If this plan is not available to you, use the sample configuration information that is provided in the documentation for the unit in which the SSA disk drives are installed. ("Appendix A. Connecting SSA Devices to the Adapter" on page 31 provides some general information on SSA configurations.)
2. Using this information connect the SSA cables to the unit in which the disk drives are installed.

**Note:** If you are adding SSA disk drives under the covers of your system unit, refer to the installation instructions in the *User's Guide* of your system unit for a description of how to route and connect the SSA cables from the adapter to the disk drives.

3. Connect the SSA cables to the IBM Advanced SerialRAID/X Adapter.
4. If not already connected, connect power to the unit in which the SSA disk drives are installed and to your system unit. The installation instructions for each unit describe how to do this.

**Notes:**

1. No terminators are needed in SSA configurations.
2. You do not need to set device-address switches or jumpers in SSA configurations.

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**Problem Determination**

If you encounter any problems with the adapter during installation or after you install it, refer to:

1. The *IBM Advanced SerialRAID/X Adapter: User's Guide and Maintenance Information* manual, which is provided on the CD-ROM.
2. Your system unit documentation for information about running diagnostics or other problem determination procedures.

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**Configuring Your System**

You must update your system configuration after you install the IBM Advanced SerialRAID/X Adapter, as described in "Chapter 4. Installing the Device Driver Software and Microcode" on page 11.



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## Chapter 4. Installing the Device Driver Software and Microcode

There are three sections in this chapter. The sections help you to install the IBM Advanced SerialRAID/X Adapter on either:

- Microsoft Windows NT 4.0
- “Novell NetWare 4.2” on page 18
- “Novell NetWare 5” on page 21

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### Microsoft Windows NT 4.0

The instructions in this section are for Windows NT 4.0. with service pack 5 (SP5) or later. If you are using the Microsoft Cluster Service you must have service pack 5 (SP5) or later.

For the latest information, see the SSA World Wide Web Support page at:  
<http://www.hursley.ibm.com/ssa/>

### Installation on an existing server

The instructions below assume that Windows NT has already been installed and that the adapter has been installed in the system unit. If you are installing Windows NT onto an SSA resource, see “Installing NT onto an SSA Resource in a New Server” on page 13.

You must first install the appropriate adapter device driver. See “Installing the Device Driver”.

After installing the device driver you must run the setup program on the CD-ROM provided. It will install all required host software to **\vissa** on your Windows NT boot disk.

The host software consists of

- The Event Logger
- The Remote Systems Management (RSM) configurator
- The microcode download utilities

You should always run the latest versions of all host software, device drivers and microcode. You can find information about the latest levels on the SSA World Wide Web Support page. Check this page regularly for updates. The URL below contains concise information relating to all recent updates available for your SSA adapters, drives, and enclosures. The required URL is:

<http://www.hursley.ibm.com/ssa/>

### Installing the Device Driver

**Note:** It is assumed that you have Windows NT Server 4.0, with at least SP5, installed and running on your system unit, and that you have already installed the IBM Advanced SerialRAID/X Adapter in the system unit.

This section describes how to install the device driver. You must have either downloaded an updated Windows NT device driver from the SSA World Wide Web Support page, or have the diskette labeled *Windows NT Device Drivers* that is provided with your adapter.

The following steps describe how to install the device driver:

1. Select **Start**, select **Settings**, select **Control Panel**, double click on **SCSI Adapters**.
2. Select the **Drivers** tab, and click **Add**
3. When prompted, click **Have Disk** and insert the Windows NT device drivers diskette.

**Note:** Windows NT Server 4.0 may ask you for the path a second time. Enter **a:\** again.

4. Select **IBM Advanced SerialRAID/X Adapter** from the list that appears even if you have any other SSA adapters installed in the machine.
5. When finished you will be prompted to restart your computer. Click **OK**
6. When the system unit restarts, install the host software as described below.

## Installing the Host Software

**Note:** It is assumed you have Windows NT Server 4.0 installed and running on the your system unit, that you have already installed the IBM Advanced SerialRAID/X Adapter in the system unit and have installed the appropriate device driver. Windows NT Networking must also be installed, including the TCP/IP protocol if installing the stand-alone version of RSM.

1. Insert the CD-ROM provided. Go to **Start** and select **Run**. Enter the following  
<cd>:\nt\setup.exe

Where <cd> is your CD-ROM drive letter.

2. The setup program will proceed as follows:
  - a. Look for the device driver on the system and exit if not found.
  - b. Select the type of installation, either *Automatic* or *Custom*. If installing for the first time, you should select *Custom*.
  - c. Look for existing software components.
  - d. Inform you of what needs to be updated and what is at the latest level. You can choose to install any component even if you have the latest level, or wish to downgrade.
  - e. Update the host software as necessary.
  - f. Launch Adobe Acrobat Reader Setup (if required).

**Note:** Setup must stop running services before updating the program files; you will be prompted if setup needs to stop a service. If the subsequent file copy fails, the service may have failed to stop. Follow the instructions in "Checking the SSA Services Status" on page 17, but click **Stop** instead of **Start** and re-run setup.



3. When setup completes, it will open a text document which describes how to get further help, access the SSA Tools Menu, and describes what else the CD-ROM contains. You should take the time to read the readme files contained in the \docs\readme directory on the CD-ROM. They are also available in HTML format via the SSA Tools Menu.

Relevant microcode is also supplied on the CD-ROM in the \ucode directory. This microcode was correct at the date of manufacture and you should check the SSA World Wide Web Support page when you have finished installing the host software. See "Chapter 5. Downloading the Latest Microcode" on page 27 for details.

You should now verify that the installation of the software has been completed successfully. "Verifying the Installation" on page 16 describe this process.

## Installing NT onto an SSA Resource in a New Server

There are four main steps involved:

1. Upgrade the firmware on the IBM Advanced SerialRAID/X Adapter and create an SSA resource using the DOS configurator.
2. Install Windows NT, introducing an updated version of the Hardware Abstraction Layer (HAL) during the normal install procedure.
3. Install Service Pack 5 (this is the minimum level of NT Service Pack required to operate the IBM Advanced SerialRAID/X Adapter).
4. If the Intel Server is a multiprocessor machine, then upgrade the installed software to the multiprocessor version.

### Notes:

1. If you have an existing installation with Windows NT Server (at Service Pack 4) on a RAID 5 array attached to an IBM SSA RAID adapter (32H3811), then this can be transferred to an IBM Advanced SerialRAID/X Adapter (provided it meets the configuration rules for the IBM Advanced SerialRAID/X Adapter). However this **must** only be performed after the adapter firmware upgrade (step 1) has taken place.
2. We do not recommend the use of RAID-5 for the NT system disk for performance reasons.

### Before starting

Copy the updated Uniprocessor HAL (hal.dll) for your computer obtained from the Microsoft Windows NT Service Pack 5 CD to a blank diskette. Add the files txtsetup.oem, and halapic.tag provided in the \ntboot directory within the SSA driver package. If your server uses a different uniprocessor HAL DLL to "halapic.dll" then also edit txtsetup.oem, and change the line which begins: "hal = d1, ..." to point to the HAL file your computer uses.

**Note:** Even if your computer is a multiprocessor server you must use the uniprocessor HAL for installation, and then follow step 4 to upgrade to a multiprocessor HAL.

Detach or disable any SCSI, IDE, or other non-SSA devices in the Server (other than the CD-ROM and diskette drive). Install the IBM Advanced SerialRAID/X adapter into

one of the PCI slots. If your machine hardware manual describes PCI slot priority, then this adapter should be in a higher priority slot than any other storage device which may be installed later.

Attach the SSA drives to the adapter, and power them on.

## Upgrading the firmware

Upgrade the firmware on the IBM Advanced SerialRAID/X Adapter:

1. The latest level of firmware for all IBM SSA Adapters is available from the SSA World Wide Web Support page at:

<http://www.hursley.ibm.com/ssa/>

The level required is 6300 or later. The firmware should be installed under DOS, instructions for doing this are contained in the README.NOW file contained in the firmware download package for DOS.

2. Insert the bootable DOS firmware upgrade diskette in the server and power on. During the power on sequence the IBM Advanced SerialRAID/X Adapter will display a banner. If this states that the CBIOS is disabled, enable the CBIOS by pressing the *Tab* key.
3. Configure the SSA disks attached to the IBM Advanced SerialRAID/X Adapter using *ISSACFG*. Instructions for using the configurator can be found in the *IBM Advanced SerialRAID/X Adapter: User's Guide and Maintenance Information*.

You should only create one resource at this time, that is the resource that you want to install Windows NT on.

When the resource on which NT is to be installed is attached as a System Resource, ensure the Resource ID given to it is 1. If the resource is in a cluster environment, the disk or array must be made private to this server.

4. Reboot the Server using a DOS boot diskette. During the power up process, the IBM Advanced SerialRAID/X Adapter will display the line "Attached devices...". The number displayed at the end of the line should be "80" hexadecimal, this indicates the boot hard disk. If it is not, then re-run *ISSACFG* to correct the disk configuration.

## Install windows NT

Install Windows NT, introducing an updated version of the HAL during the normal install procedure.

1. Before NT can be installed, a boot partition must be created on the SSA disks using DOS. We recommend creating a 1GB partition using *FDISK*. Make this the active partition, reboot, and then *FORMAT* the partition under DOS.
2. Install the NT Server V4.0 setup diskette 1, and reboot the Server.
3. Shortly after displaying the IBM Advanced SerialRAID/X Adapter banner the text: "Setup is inspecting your computer's hardware configuration" will appear. You must press *F5* as soon as this appears.
4. Soon after this you will be prompted with the message:

#### Windows NT Setup

Setup could not determine the type of computer you have, or you have chosen to manually specify the computer type. Select the computer type from the following list, or select "Other" if you have a device support disk provided by your computer manufacturer.

Select "Other" and when prompted insert the diskette containing the updated Uniprocessor HAL for your computer.

5. When this has been read proceed with the installation. You will be asked if you wish to install any storage devices. Press "s" twice, and when asked to insert the Manufacturer's OEM diskette, place the latest SSA driver/installation diskette in the drive (the latest version is available from the SSA World Wide Web site).
6. After returning to the "search for devices" panel, press "s" again, scroll up, and select the appropriate CD-ROM driver for your server.
7. Proceed with the installation, and install NT on the 1GB partition created earlier. It may be that NT will not accept the partition created under DOS, in which case, delete and create the partition within the NT install process. We recommend that you format with FAT.
8. Proceed with the installation. At the point where networking is installed, we recommend you select:  
Do not connect this computer to a network at this time.

and complete network installation after Service Pack 5 has been installed. See "Network Installation" on page 16. You will have to re-apply SP5 after you have set networking up.

9. Complete the installation of NT Server V4.0 as described in "Installing the Host Software" on page 12.

### **Install Service Pack 5**

Install Service Pack 5 on the Server. (This is the minimum level of NT Service Pack required to operate the IBM Advanced SerialRAID/X adapter).

### **Upgrading a multiprocessor version**

If the Intel Server is a multiprocessor machine, then upgrade the installed software to the multiprocessor version.

1. If your machine has more than one Intel processor installed, then the HAL and associated code needs to be upgraded to the multiprocessor version.
2. Before following this procedure we recommend that you should read articles:

#### **Q156358**

How to manually add support for a second processor

#### **Q197896**

Uptomp.exe requires access to the Txtsetup.sif file

from the Microsoft support Web site.

3. The Uptomp.exe code is provided by Microsoft on their Windows NT Resource Kit (in the directory i386\config). If you do not have access to this then you will have to follow the process described in article Q156358. Otherwise follow the steps below.
4. Create a temporary directory on the NT boot partition, and copy into it all the files from the \i386 directory of the Service Pack 5 CD.
5. Create another temporary directory and copy all the *uptomp\*.\** files from the Resource Kit.
6. Copy the file Txtsetup.sif into both of these directories from the \i386 directory of the NT Installation CD.
7. Run uptomp.exe, and where it prompts for a directory containing the HAL, point to the directory created in 4. Select the correct Multiprocessor HAL for your Server (for instance, on IBM Netfinity Servers it is MPS Multiprocessor PC).
8. At the point where the process prompts to install NT files, again point to the directory created in 4 above.

### Network Installation

When networking is not installed until after SP5 has been applied, and the server is eventually added to an NT domain, the Domain Admins global group is not automatically added to the local administrators' group. This means that if a domain administrator tries to log on to the server, they will get a message that says:

The local policy of this system does not permit you to log on interactively.

This can be easily remedied by logging on as the local administrator and adding the global Domain Admins group to the local Administrators group.

### Verifying the Installation

When the adapter, the device drivers, and the host software, have been installed you can verify everything has completed successfully as described below.

If you encounter any problems during installation or after you install, refer to:

1. The *IBM Advanced SerialRAID/X Adapter: User's Guide and Maintenance Information Manual* contained in the \docs directory on the CD-ROM. You will need the Adobe Acrobat Reader to view the PDF documentation. Setup will have informed you if it did not find Version 3.01 of the Adobe Acrobat Reader. If you wish to install it manually, run the acroread.exe file in the \nt\acrobat directory on the CD-ROM.

|                     |                    |
|---------------------|--------------------|
| PDF filename        | \docs\user_mnt.pdf |
| Postscript filename | \docs\user_mnt.ps  |

2. Your system unit documentation for information about running diagnostics and other problem determination procedures.

### Adapter and Drives

1. Select **Start**, select **Settings**, select **Control Panel**, and double click the **SCSI Adapters** icon.

You should see as many IBM Advanced SerialRAID/X Adapters as you have installed in your system unit.

2. Expand an adapter and you should see all System (PC) resources you have made available to the operating system on that adapter.

## Event Logger and RSM

1. Select **Start**, select **Programs**, and select **SSA Tools** to display the SSA Tools Menu.

If the icon does not exist, setup did not find one of the supported browsers on your system unit, see the chapter about the RSM Configurator in the *IBM Advanced SerialRAID/X Adapter: User's Guide and Maintenance Information Manual* as supplied on the CD-ROM.

The SSA Tools Menu contains links to the latest information. You should take the time to view the relevant readme files, and the RSM Tutorial if required.

2. When your browser starts you should see the SSA Tools Menu. If not see "Checking the SSA Services Status".
3. Click on the **Remote Systems Management** link and enter your userid and password.

If you are running the Stand Alone version of RSM for the first time enter SSA and SSA (case sensitive).

**Note:** You should ensure you take the appropriate action after reading the section on security in the readmesa.txt file copied to: **lissa\web** on your Windows NT boot disk. If you are running the Netfinity Web extension version of RSM enter your Netfinity password (if security is enabled).

4. On the first page (Adapter List) you should see as many SSA adapters as there are installed in your system unit and any remote adapters connected to a local adapter via an SSA loop.
5. Click on the "Event Logger" button. If you see an error message and are returned to the Adapter List page, the Event Logger is probably not running. See "Checking the SSA Services Status".
6. You should now use RSM to configure any RAID arrays or single disks and add them to the System (PC) resource list. Refer to the RSM chapter in the *IBM Advanced SerialRAID/X Adapter: User's Guide and Maintenance Information Manual*, and view the tutorial available from the SSA Tools menu.

## Checking the SSA Services Status

1. Select **Start**, select **Settings**, select **Control Panel**, double click the **Services** icon.
2. Scroll down to the service you wish to check, either **PC's SSA Event Logger** or **SSA Remote Systems Management** (Stand Alone Version only) and check that **Started** appears next to the service name. If not highlight the service and click **Start**.

**Netfinity Users Note:** If using the Netfinity Web Extension version of RSM, ensure that Netfinity is running and that Web Services are enabled. See your Netfinity documentation for more details and the ssa\_readme.txt file copied to your Netfinity directory.

If you are still having problems accessing either RSM or the Event Logger see their respective sections in the *IBM Advanced SerialRAID/X Adapter: User's Guide and Maintenance Information Manual* on the CD-ROM and the appropriate readme file, also on the CD-ROM in the `\docs\readme` directory.

---

## Novell NetWare 4.2

The instructions in this section are for Novell NetWare 4.2.

- Installation on an existing server
- Installation on a new server

### Installing on an existing server

The instructions assume that the operating system has already been installed and that the adapter has been installed in the system unit.

### Installing the Device Driver

**Note:** It is assumed that you have NetWare 4.2 installed and running on your system unit, and that you have already installed the IBM Advanced SerialRAID/X Adapter in the system unit. It is also assumed that the latest service packs are applied to the system.

This section describes how to install the device drivers. You must have either downloaded an updated NetWare device driver from the SSA Customer Support Homepage (<http://www.hursley.ibm.com/ssa/>), or have the diskette labeled *Novell NetWare 4.11/4.2 Device Drivers* that is provided with your adapter.

The following steps describe how to install the device drivers:

1. From the console of your NetWare 4.2 server load the install utility by entering **load install**.
2. Select **Driver options** and press **Enter**
3. From the submenu select **Configure disk and storage device drivers** and press **Enter**
4. From the **Additional driver actions** menu choose **Select an additional driver** and press **Enter**.
5. The system will scan for new drivers. When it has finished select the **Insert** button to **Install an unlisted driver**.
6. Put the NetWare driver diskette into the drive and press **Enter**. The system will scan the diskette, present you with a menu of device drivers, and ask you to **Select a driver to install**.
7. Select **ISSAV4E0.HAM** and press **Enter**.
8. You will be asked if you want to copy the driver **ISSAV4E0.HAM**. Select **Yes** and press **Enter**.
9. You will now be asked to specify the server boot path. The default is **C:\NWSERVER**. Type in the path to **SERVER.EXE** if it is different to the default. Press **Enter** to copy the relevant files to the server.

10. When the files have been copied the **Driver ISSAV4E0 parameter actions** menu is displayed. Select **Select/Modify driver parameters** and press **Enter**.
11. Enter the **Slot Number** and press **Enter**. Press **F10** or **Esc** to **Save parameter settings**. Next, select **Save parameters and load driver** and press **Enter**. The driver will be loaded.
12. You will be asked if you want to select an additional disk driver. Select **No** and press **Enter**.
13. At the **Additional driver actions** menu select **Return to previous menu** and press **Enter**.
14. At the **Driver options** menu select **Return to previous menu** and press **Enter**.
15. At the **Installation Options** menu select **Exit** and press **Enter**. Confirm **Exit INSTALL** by selecting **Yes** and press **Enter**.
16. At the command prompt type:

```
load c:\nwserver\lissainst
```

and press **Enter**. This will add two lines to the **AUTOEXEC.NCF**. You must now restart the system to make the changes active.

**Note:** We recommend that the latest service packs are applied to the system.

You should now verify that you have successfully installed the drivers. You can find instructions for doing this at “Verifying the Installation” on page 21.

## Installing NW onto an SSA Resource in a new server

This section shows how to install and configure the adapter on a new server that will have its operating system installed on the SSA devices that it will boot from.

It is assumed that the adapter is already installed in the system unit and that all the required disks are connected with the appropriate cabling. In order for the system unit to boot from the SSA adapter you must ensure that the CBIOS on the adapter is enabled. You must have either downloaded an updated NetWare device driver from the SSA World Wide Web Support page (<http://www.hursley.ibm.com/ssa/>), or have the diskette labeled *Novell NetWare 4.11/4.2 Device Drivers* that is provided with your adapter.

1. Insert the PC DOS Configurator diskette and boot the machine. At the DOS prompt enter:

```
a:\lissacfg
```

and press **Enter**

2. This will load the DOS based configuration software. Configure the adapter and disks according to your requirements. See the *IBM Advanced SerialRAID/X Adapter: User's Guide and Maintenance Information*, SA33–3288, for further information.

3. When you have configured the adapter and disks, restart the system and install DOS. Refer to the manufacturers instructions for further information about installing DOS. Ensure that the DOS installation supports a CD-ROM drive.
4. Remove the diskette and reboot your system to DOS. Insert the Novell NetWare 4.2 CD and enter:

**d:** and then press **Enter**  
**install** and then press **Enter**

Where d: is the address of your CD-ROM drive.

5. Follow the manufacturers installation guidelines. When the screen **Choose the Server Drivers – Summary** is displayed you will see a **Driver Actions** menu. Choose **Select additional or modify selected Disk/LAN drivers** and press **Enter**. The highlight will move to **Disk and CD-ROM Drivers**: Press **Enter**. The **Additional Driver Actions** menu will appear. Choose **Select an additional driver** and press **Enter**.
6. A screen showing a list of alternative drivers will appear. Insert your SSA driver disk and press **Ins** to **Install an unlisted driver**. You will be asked for the path to your new drivers. The default is **a:\**. Press **Enter**.
7. The system will scan the disk and present you with a menu of drivers that may be installed. Select **ISSAV40E0.HAM** and press **Enter**. The driver and support files will be copied to your system.
8. The **Driver ISSAV4E0 Parameter Actions** menu will appear. Choose **Select/Modify driver parameters** and press **Enter**.
9. Enter the **Slot Number** and press **Enter**. Press **F10** or **Esc** to **Save parameter settings**. Next select **Save parameters and continue** from the **Parameter actions** menu and press **Enter**.
10. When the drivers have been copied you will be offered the opportunity to select an additional driver. Select **Yes** or **No** according to your configuration and press **Enter**.
11. When you choose the **No** option and press **Enter** you will be returned to the **Additional Driver Actions** menu. Select the **Continue installation** option and press **Enter** to return to the **Choose the Server Drivers – Summary** screen.
12. In the **Driver Actions** menu choose **Continue Installation** and press **Enter**. All your selected drivers will be loaded and the NetWare installation will continue.
13. Once the installation is complete, enter at the system console:

**load c:\nwserver\lissainst**

and then press **Enter**

14. This will modify the autoexec.ncf with two lines that load additional SSA nlms. When this has completed restart the server to implement the changes to the system startup files.

**Note:** We recommend that the latest service packs are applied to the system.



## Verifying the Installation

When the adapter, the device drivers, and the configuration utilities have been installed you can verify successful installation with the following procedure:

1. Restart the server. At the system console type:

**down**

and press **Enter**.

When the server is down type:

**restart server**

This will start the server again and run all of your startup files.

2. At the console enter:

**modules issa\***

The screen will show all the currently loaded issa files. Verify that the following files have been loaded:

```
ISSAV4E0.HAM
ISSAINJ.NLM
ISSAELOG.NLM
```

This test will show that the files have been successfully loaded into memory.

3. At the console, enter:

**load c:\nwserver\issacfg.nlm**

and then press **Enter** to load the ISSA configuration utility. Once it has started, select **SSA Adapter List** from the main menu and press **Enter**. You will see a display giving an entry for each SSA adapter installed in your system unit.

Select one of the adapters listed and the configuration utility will show all the resources available to that adapter.

---

## Novell NetWare 5

The instructions in this section are for Novell NetWare 5.

- Installation on an existing server
- Installation on a new server

### Installation on an existing server

The instructions assume that the operating system has already been installed and that the adapter has been installed in the system unit.

## Installing the Device Driver

**Note:** It is assumed that you have NetWare 5 installed and running on your system unit, and that you have already installed the IBM Advanced SerialRAID/X Adapter in the system unit. It is also assumed that the latest service packs are applied to the system.

This section describes how to install the device drivers. You must have either downloaded an updated NetWare device driver from the SSA World Wide Web Support page (<http://www.hursley.ibm.com/ssa/>), or have the diskette labeled *Novell NetWare 5 Device Drivers* that is provided with your adapter.

The following steps describe how to install the device drivers:

1. From the console of your NetWare 5 server load the install utility by entering **load nwconfig**.
2. Select **Driver options** and press **Enter**
3. From the **Driver options** submenu select **Configure disk and storage device drivers** and press **Enter**
4. From the **Additional driver actions** menu choose **Select an additional driver** and press **Enter**.
5. The **Select a driver:** menu will be displayed. Press the **Insert** button to **Install an unlisted driver**.
6. Put the NetWare driver diskette into the drive and press **Enter**. The system will scan the diskette, present you with a menu of device drivers, and ask you to **Select a driver to install**.
7. Select **ISSAV4E0.HAM** and press **Enter**.
8. You will be asked if you want to copy the driver **ISSAV4E0.HAM**. Select **Yes** and press **Enter**.
9. You will now be asked to specify the server boot path. The default is **C:\NWSERVER**. Type in the path to **SERVER.EXE** if it is different to the default. Press **Enter** to copy the relevant files to the server.
10. When the files have been copied the **Driver ISSAV4E0 Parameter Actions** menu is displayed. Choose **Select/Modify driver parameters** and press **Enter**.
11. Enter the **Slot Number** and press **Enter**.
12. Press **F10** to **Save parameter settings**.
13. Now select **Save parameters and load driver** from the menu and press **Enter**. The driver will be loaded.
14. You will be asked if you want to select an additional disk driver. Select **No** and press **Enter**.
15. At the **Additional driver actions** menu select **Return to the previous menu** and press **Enter**.
16. At the **Driver options** menu select **Return to the previous menu** and press **Enter**.
17. At the **Configuration Options** menu select **Exit** and press **Enter**. Confirm exit from the utility by selecting **Yes** and press **Enter**.

18. At the system console type:

```
load c:\nwserver\lissainst
```

and press **Enter**. This will add two lines to the **AUTOEXEC.NCF** that load the additional SSA nlms. You must now restart the system to implement the changes to the system startup files.

You should now verify that the installation of the software has been completed successfully. "Verifying the Installation" on page 24 describe this process.

## **Installing NW onto an SSA Resource in a new server**

This section describes how to install and configure the adapter on a new server that will have its operating system installed on the SSA devices that it will boot from.

It is assumed that the adapter is already installed in the system unit and that all the required disks are connected with the appropriate cabling. In order for the system unit to boot from the SSA adapter you must ensure that the CBIOS on the adapter is enabled.

You must have either downloaded an updated NetWare device driver from the SSA World Wide Web Support page (<http://www.hursley.ibm.com/ssa/>), or have the diskette labeled *Novell NetWare 5 Device Drivers* that is provided with your adapter.

1. Insert the SSA disk that contains the PC DOS Configurator and boot the machine. At the DOS prompt enter:

```
a:\lissacfg
```

and press **Enter**

2. This will load the DOS based configuration software. Configure the adapter and disks according to your requirements. See the *IBM Advanced SerialRAID/X Adapter: User's Guide and Maintenance Information*, SA33-3288, for further information.
3. When you have configured the adapter and disks, restart the system and install DOS. Refer to the manufacturers instructions for further information about installing DOS. Ensure that the DOS installation supports a CD-ROM drive.
4. Remove the diskette and reboot your system to DOS. Insert the Novell NetWare 5 CD and enter:

```
d: and then press Enter  
install and then press Enter
```

Where d: is the address of your CD-ROM drive.

5. Follow the manufacturers installation guidelines. When the screen appears that shows the detected devices, select **Modify** from the **Options** menu.
6. Select **Storage Adapters** and press **Enter**.

7. A screen showing a list of all detected storage drivers will appear. Insert your SSA driver disk and press **Ins** to **Add an unlisted driver**. You will be asked for the path to your new drivers. The default is **a:\**. (You may change this if necessary by pressing **F3**.) Press **Enter**.
8. The system will scan the disk and copy the SSA drivers to the system. It will then present a menu of all currently selected storage drivers. In the **Additional Driver Options** menu at the bottom of the screen, select **Return to driver summary** and press **Enter**.
9. You will be returned to the **Driver Summary** screen. In the **Options** menu at the bottom of the screen select **Continue** and press **Enter**.
10. Continue with the operating system installation according to the manufacturers instructions. When this is completed you will be asked to restart the server. Do so.
11. When the server has restarted enter at the system console:

**load c:\nwserver\issainst**

and then press **Enter**

12. This will modify the autoexec.ncf with two lines that load additional SSA nlms. When this has completed restart the server to implement the changes to the system startup files.

You should now verify that the installation of the software has been completed successfully. "Verifying the Installation" describe this process.

## Verifying the Installation

When the adapter, the device drivers, and the configuration utilities have been installed you can verify successful installation with the following procedure:

1. Restart the server. At the system console type:

**down**

and press **Enter**.

When the server is down and back at the DOS prompt, type:

**server**

This will start the server again and run all of your startup files.

2. At the console enter:

**modules issa\***

The screen will show all the currently loaded issa files. Verify that the following files have been loaded:

ISSAV4E0.HAM  
ISSAINJ.NLM  
ISSAELOG.NLM

This test will show that the files have been successfully loaded into memory.

3. At the console, enter:

**load c:\nwserver\issacfg.nlm**

and then press **Enter** to load the ISSA configuration utility. Once it has started, select **SSA Adapter List** from the main menu and press **Enter**. You will see a display giving an entry for each SSA adapter installed in your system unit.

Select one of the adapters listed and the configuration utility will show all the resources available to that adapter.

**Note:** We recommend that the latest service packs are applied to the system.



---

## Chapter 5. Downloading the Latest Microcode

**Attention:** Do not download code to drives that are in use. Ensure that no I/O operations are in progress to the disk drive and that any disk drive that is a download target is not being used by any other system.

Since I/O operations may be performed by a RAID adapter without any host system involvement, for example, when rebuilding an array, you must also avoid downloading to disk drives that are members of an array that is in the rebuilding state.

---

### Downloading the Microcode

**Notes:**

1. All microcode updates may be performed under Windows NT, but we recommend that, if possible, you restart your system unit from the PC-DOS bootable diskettes that are available from the SSA World Wide Web Support page at:

**<http://www.hursley.ibm.com/ssa/>**

2. For Novell NetWare, microcode updates must be performed from PC-DOS.
3. Adapter microcode may be also referred to as firmware.

The SSA World Wide Web Support page contains the latest levels of all SSA adapter, drive and enclosure microcode. The URL below is for the microcode page; you should visit it and get the latest packages. The microcode files and download tools it copies to your hard drive (usually to `c:\vssa\update` for Windows NT) should be used in preference to those on the CD-ROM.

**<http://www.hursley.ibm.com/ssa/pcserver/>**

To download from DOS we recommend you download the relevant diskette image from the SSA World Wide Web Support page. Follow the instructions provided in the readme file. The relevant microcode is supplied on the CD-ROM in the `\ucode` directory. This microcode was correct at the date of manufacture but you should check the SSA World Wide Web Support page for the latest levels. Usage information for the DOS download utilities can be found in the DOS readme (`DOSRME.TXT`).

The instructions below describe how to download under Windows NT.

---

### Downloading Adapter Microcode

1. Ensure that no I/O is being performed by the adapter you wish to download to.
2. Copy the new adapter microcode image to the same directory as the download tool where you installed the host software (usually `c:\vssa`).

If you have downloaded a microcode update from the website above, the latest download utility and microcode will have been extracted to `c:\vssa\update\ssaflash`.

**Note:** Adapter microcode images are called:

**ADAPxxxx.Lyy**

where xxxx is the microcode level and yy is the "Loadable Microcode Level" (LL) in the adapter VPD (Vital Product Data).

For the IBM Advanced SerialRAID/X Adapter, the LL = 05.

3. Run the following command from a command prompt, after changing drive and directory to where you copied the microcode image :

```
issaadld ADAPxxxx.L05
```

4. The downloader will only download the microcode image to adapters with the appropriate LL type. That is, an adapter of type LL05 can only have microcode images of type LL05 downloaded to it. If the downloader finds another LL type, such as 04, it will ignore it and an appropriate "skipping adapter with LLxx" message is displayed.

Run `issaadld.exe` with no command line parameters to view full usage instructions, or for Windows NT, click on the **SSA Tools Help** link on the SSA Tools menu.

Optionally you can specify to only download to one adapter. You require the node number for this adapter which is available on the Adapter List page of RSM for Windows NT or by using ISSACFG for both NT and NetWare.

**Attention:** Care should be taken not to change the file extension on microcode files as damage may be caused to adapters if the wrong image file is applied.

5. When you are returned to the command prompt, you have completed updating the adapter microcode and all modified adapters will have been automatically reset.

---

## Downloading Disk Microcode

1. Ensure that no I/O is being performed to any of the target disk drives.
2. Ensure you have fully read, understood and complied with the warning notes at the start of this chapter.
3. Copy the new drive microcode image (or images) to the same directory as the download tool to the same directory as the host software (usually `c:\issa`).

If you have downloaded a microcode update from the website above, the latest download utility and microcode will have been extracted to `c:\issa\update\ssaf1ash`.

**Note:** Drive microcode images are called:

**xxxxyyyy.dl**

where xxxx is the drive type, one of DFHC, DCHC, DGHC, DRHC, DRVC, or WAAH; and yyyy is the microcode level (from the disk VPD level fields)

4. Run the following command from an NT Command Prompt, after changing drive and directory to where you copied the microcode image:

```
issaddld xxxxyyyy.dl
```

**Note:** You may required to download more than one type of drive microcode to update all drives. We recommend you apply all types of drive microcode to determine which type of drives you have.



5. The downloader will only download the microcode image to drives of the appropriate type. For example, a drive of type DCHC can only have microcode images of type DCHC downloaded to it. If the downloader finds another drive type such as DFHC it will ignore the drive and an appropriate "skipping drive of type xxxx" message is displayed. Optionally you can specify to only download to one disk. You require the SSA UID for this disk which is available on the appropriate Disk View page of RSM or ISSACFG (in Disk service Aids).

**Attention:** Care should be taken not to change the file names of microcode files as damage may be caused to drives if the wrong image file is applied.

6. When you are returned to the command prompt, downloading of this drive type has completed. Repeat for all download types, DFHC, DCHC, DGHC, DRHC, DRVC, and WAAH.

**Notes:**

- a. The downloader skips drives that are at the current level.
  - b. If a download image does not get used, in other words the downloader skips all drives, you do not need to apply this download type in the future unless you add new drives to your system.
  - c. You will need to use the same download types when later levels are released.
7. When all appropriate drive types have been updated you have completed downloading the disk microcode and all modified drives will have been automatically reset.

---

## Enclosure Controller Microcode (7133 Models D40 and T40)

Certain models of SSA drive enclosures, those with SCSI Enclosure Services (SES) controllers, can be updated with new microcode.

1. Ensure that no I/O is being performed by any of the drives in the enclosure you wish to download to.
2. Copy the new enclosure microcode image to the same directory as the download tool, usually c:\issa.

If you have downloaded a microcode update from the website above, the latest download utility and microcode will have been extracted to c:\issa\update\ssaflash.

**Note:** Enclosure microcode images are called mcodexxx.hex where xxx is the controller code level.

3. Run the following command from an NT Command Prompt after changing drive and directory to the location where you copied the microcode image to:  
`issaedld mcodexxx.hex`
4. The downloader will only download the microcode image to enclosures containing the appropriate controller.
5. When you are returned to the command prompt, you have updated all enclosure controller microcode and all modified controllers will have been automatically reset.

---

## Checking the Existing Levels of Microcode and Host Software

You can check the microcode and software levels by using ISSACFG for NetWare or by using the RSM for Windows NT, Netware 4.2, and Netware 5.

RSM provides an online level check function that allows you to check the level of your adapter microcode over an internet connection. Simply click any of the check levels links within RSM on an internet connected browser.

RSM provides level checking for :

- The device drivers
- The event logger
- The RSM configurator itself
- All adapter, drive, and enclosure microcode

To find out what level of software, device driver, or microcode you are using:

- View the device driver version (on the RSM Adapter List page, above the list of adapters).
- View the Event Logger version (on the RSM Event Logger page).
- View the RSM Configurator version (in the browser title bar)
- Determine the adapter type and microcode level (on the Adapter View pages, the VPD ROS and "Loadable Microcode level" fields)
- Determine the drive type and microcode level (on the Disk View pages, the product ID, and the combination of the VPD level fields)
- Determine the 7133 Models D40 and T40 enclosure controller microcode level (on the Enclosure View pages, click on the **Ctrl link**).

---

## Appendix A. Connecting SSA Devices to the Adapter

SSA devices can be connected to the adapter and to each other in many ways. Sample configurations are given in the documentation for the units (for example, the 7133) in which SSA devices can be installed. Marketing representatives have additional information on configuring for performance and availability.

The configuration must be planned at the time that the SSA subsystem is ordered. This must be done so that the correct cables are ordered. This plan should be made available to whoever installs the adapter and the devices.

This section provides general information on SSA configurations.

---

### SSA Loops and Links

In the simplest SSA configuration, SSA devices are connected through two or more links to an SSA adapter that is located in a using system. The devices, SSA links, and SSA adapter are configured in loops. Each loop provides a data path that starts at one connector of the SSA adapter and passes through a link (SSA cable) to the devices. The loop continues through the devices, then returns through another link to a second connector on the SSA adapter.

The maximum permitted length for an external copper cable that connects two SSA nodes (for example, disk drives) is 25 meters (82 feet).

The maximum permitted length for an external fiber optic cable that connects two SSA nodes (for example, disk drives) is 10 kilometers (32808 feet).

Details of the rules for configuring SSA loops are given for this SSA adapter in “Rules for SSA Loops” on page 34.

### Loops and Data Paths

All devices that are attached to an SSA adapter, **1** in Figure 2 on page 32, are connected through SSA links **2**. The SSA links are configured as loops. Data and commands to a particular device pass through all other devices on the link between the adapter and the target device.

Data can travel in either direction round a loop. The adapter can, therefore, get access to the devices **3** (disk drives in this example) through two data paths. The using system cannot detect which data path is being used.

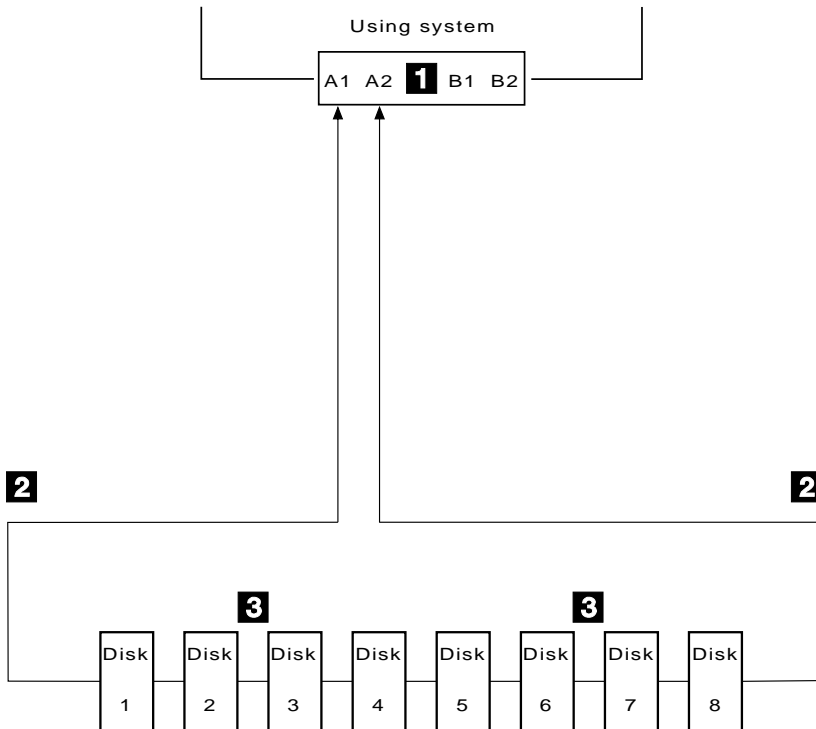


Figure 2. SSA Loop

If a disk drive fails, or is turned off, the loop is broken, and one of the data paths to a particular disk drive is no longer available. The disk drives on the remainder of the loop continue to work, but an error is reported to the system.

In Figure 3 on page 33, disk drive number 3 has failed. Disk drives 1 and 2 can communicate with the using system only through connector A1 of the SSA adapter. Disk drives 4 through 8 can communicate only through connector A2 of the SSA adapter.

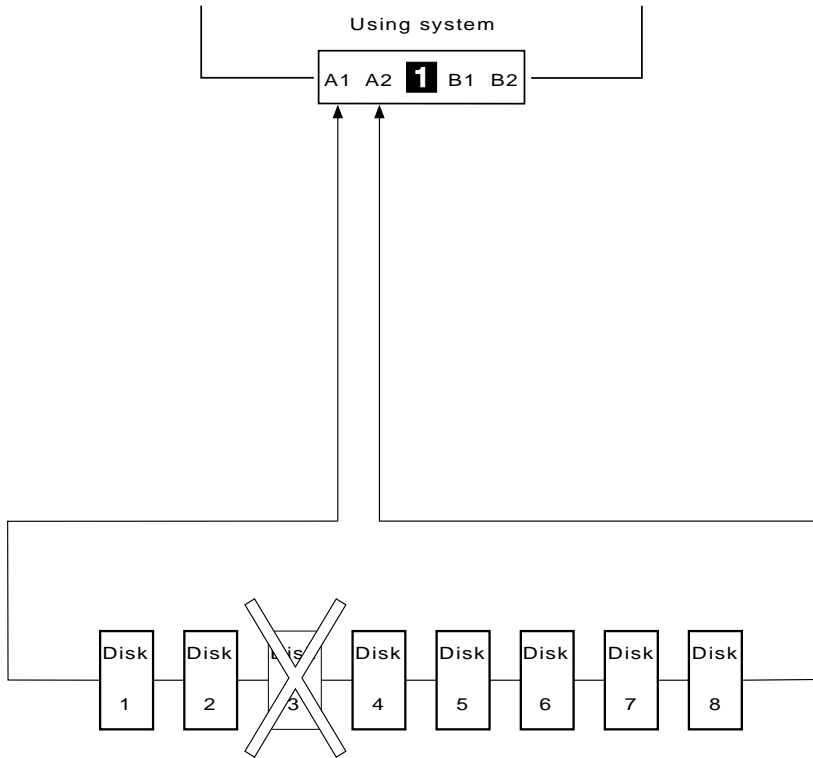


Figure 3. SSA Loop with failed disk

If two or more disk drives are turned off, fail, or are removed from the loop, some disk drives might become isolated from the SSA adapter

In Figure 4 on page 34, disk drives 3 and 7 have been removed. Disk drives 1 and 2 can communicate with the system only through connector A1 of the SSA adapter. Disk drive number 8 can communicate with the system only through connector A2 of the SSA adapter. Disk drives 4, 5, and 6 are isolated from the SSA adapter.

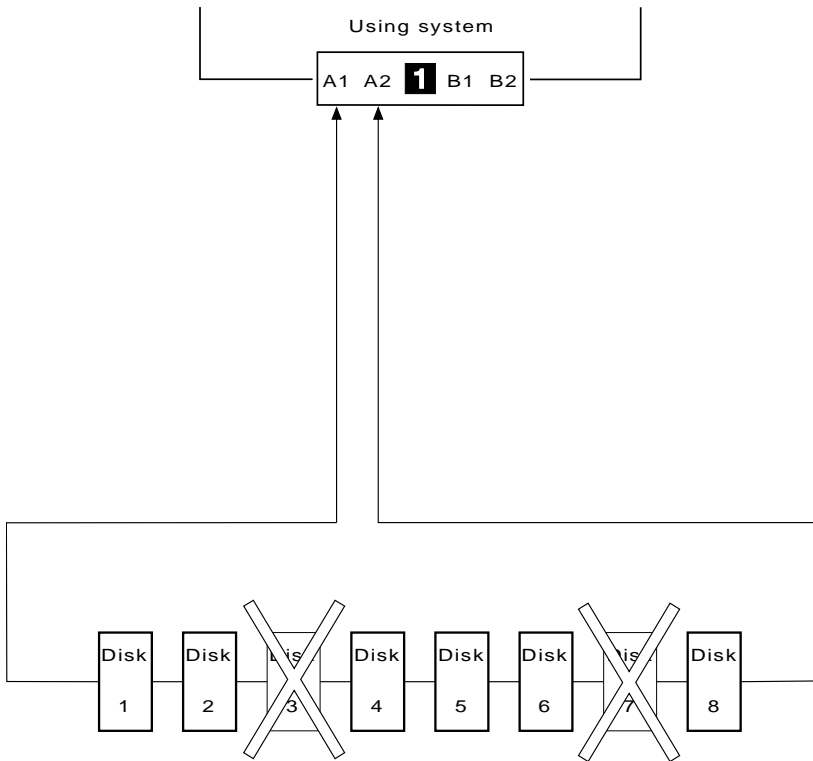


Figure 4. SSA Loop with two failed disks

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## Rules for SSA Loops

For SSA loops that include the IBM Advanced SerialRAID/X Adapter, the following rules apply:

- Each SSA loop must be connected to a valid pair of connectors on the SSA adapter (that is, either connectors A1 and A2, or connectors B1 and B2).
- A maximum of 48 disk drives can be connected in a particular SSA loop.
- If you are not using RAID-0 arrays, a second pair of adapter connectors can be connected in a particular SSA loop. The second adapter must be another IBM Advanced SerialRAID/X Adapter. If an adapter is connected in two SSA loops and each loop contains a second adapter, the same two adapters must be in both loops, as shown in Figure 5 on page 35.

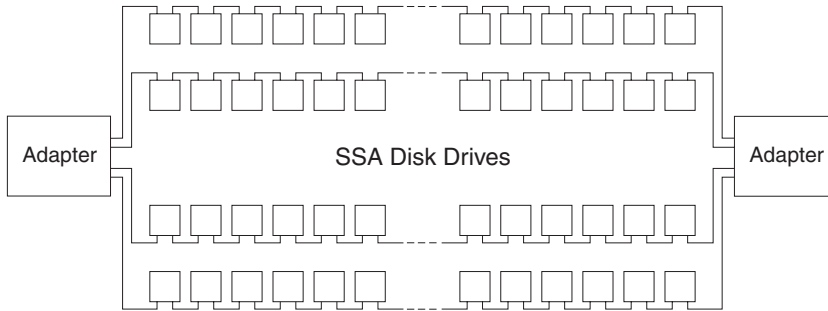


Figure 5. Two Adapters Connected in Two SSA Loops

## Subsystem Performance Recommendations

The physical relationship between the disk drives and the adapters in an SSA loop can affect the performance of the subsystem. The guidance below helps you to get best performance from your subsystem.

The following sequence enables you to determine the best relationship between the disk drives and the adapter on an SSA loop that contains an IBM Advanced SerialRAID/X Adapter.

1. Determine which data is accessed most frequently.
2. Assign that data to those disk drives that are farthest (round the loop) from the adapter connectors. By doing this, you prevent the activity of the busiest disk drive from obstructing the data path to the other disk drives.

For example, if a loop contains 16 disk drives, and the adapter connectors are between disk drives 1 and 16, the most-frequently-accessed data should be on disk drives 8 or 9 as shown in Figure 6.

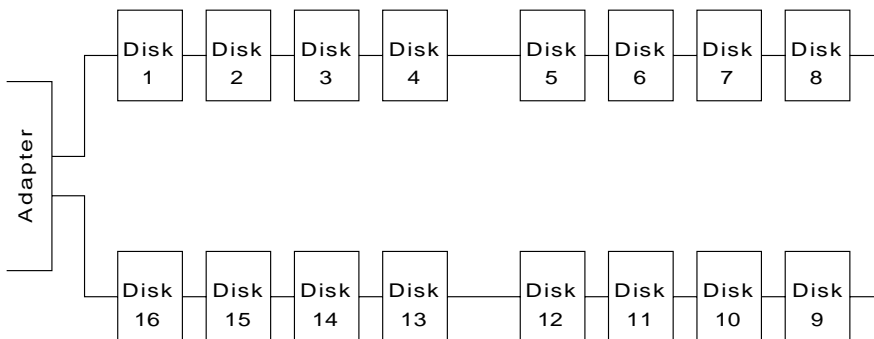


Figure 6. Physical relationships





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## Appendix B. Communications Statements

The following statements apply to this product. The statements for other products intended for use with this product appear in their accompanying manuals.

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### 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 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. Neither the provider nor the manufacturer is 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 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.

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### VCCI Statement

電波障害自主規制 届出装置の記述

注意:

この装置は、情報処理装置等電波障害自主規制協議会(VCCI)の基準に基づく第一種情報技術装置です。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。

The following is a summary of the VCCI Japanese statement in the box above.

This equipment is Type 1 Data Processing Equipment and is intended for use in commercial and industrial areas. When used in a residential area, or areas of proximity, radio and TV reception may be subject to radio interference. VCCI-1.

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## Electromagnetic Interference (EMI) Statement - Taiwan

### 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。

The following is a summary of the EMI Taiwan statement above.

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

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## International Electrotechnical Commission (IEC) Statement

This product has been designed and built to comply with (IEC) Standard 950.

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## Avis de conformité aux normes de l'Industrie Canada

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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## Industry Canada Compliance Statement

This Class A digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.

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## United Kingdom Telecommunications Requirements

This apparatus is manufactured to the International Safety Standard EN60950 and as such is approved in the U.K. under approval number NS/G/1234/J/100003 for indirect connection to public telecommunications systems in the United Kingdom.

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## European Union (EU) Statement

This product is in conformity with the protection requirements of EU council directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. Neither the provider or the manufacturer can accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of option cards not supplied by the manufacturer. Consult your dealer or sales representative for details for your specific hardware.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22 / European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communications devices.

**Attention:** This is a Class A product. In a domestic environment, this product might cause radio interference. In such an instance, the user might be required to take adequate measures.

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## Radio Protection for Germany

Dieses Gerät ist berechtigt in Übereinstimmung mit dem deutschen EMVG vom 9.Nov. das EG-Konformitätszeichen zu führen.

Der Aussteller der Konformitätserklärung ist die IBM Germany.

Dieses Gerät erfüllt die Bedingungen der EN 55022 Klasse A. Für diese Klasse von Geräten gilt folgende Bestimmung nach dem EMVG:

Geräte dürfen an Orten, für die sie nicht ausreichend entstört sind, nur mit besonderer Genehmigung des Bundesministers für Post und Telekommunikation oder des Bundesamtes für Post und Telekommunikation betrieben werden. Die Genehmigung wird erteilt, wenn keine elektromagnetischen Störungen zu erwarten sind.

(Auszug aus dem EMVG vom 9.Nov.92, Para.3, Abs.4)

### **Hinweis:**

Dieses Genehmigungsverfahren ist von der Deutschen Bundespost noch nicht veröffentlicht worden.





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