Advanced SerialRAID Adapters

Installation Guide

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Installation Guide

Third Edition (September 2000)

Contents

Safety Information

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 it. 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.

About This Book

This book provides information about installing the Advanced SerialRAID Adapter, the Advanced SerialRAID Plus Adapter, the 128 MBbyte DRAM Option Card, the device driver support software for all of the above, and the latest microcode for the SSA adapter and the SSA disk drives.

This book gives details of how to install the following:

1. The Advanced SerialRAID Adapter which is ordered as Feature Code FC 6225.

2. The Advanced SerialRAID Plus Adapter which is ordered as FC 6230.

3. The 128 MByte DRAM Option Card which is ordered by FC 6231 and which can only be installed on an Advanced SerialRAID Plus Adapter.

Related Publications

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

Refer to the *SSA Fast Write Cache Installation Instructions* if you are installing this feature (FC 6235).

For further details on configuring your system with the Advanced SerialRAID Adapter or the Advanced SerialRAID Plus Adapter, check the SSA World Wide Web page at:

http://www.storage.ibm.com/hardsoft/products/SSA

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

ISO 9000

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Chapter 1. Overview

This chapter introduces the Advanced SerialRAID Adapters.

Advanced SerialRAID Adapters

The Advanced SerialRAID and Advanced SerialRAID Plus Adapters allow 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. An optional SSA Fast-Write Cache Option Card feature further improves the performance of the adapter.

You can create, control, and manage a RAID configuration with supporting host software. The Advanced SerialRAID and Advanced SerialRAID Plus Adapters support data rates up to 40 MB per second on each SSA interface; and data rates up to 68 MB per second on the PCI bus. You can install up to 32 Advanced SerialRAID Adapters or Advanced SerialRAID Plus Adapters in some host systems, depending on the system unit.

The Advanced SerialRAID Adapter can manage disks that are configured as non-RAID, RAID-0, and RAID-5 and any of these can be configured with the SSA Fast-Write Cache option. The number of adapters that can be supported in a loop that contains the following configurations of disks are:

Non-RAID	8 adapters maximum
RAID-0	1 adapter
RAID-5	2 adapters maximum
Fast-Write Cache	1 adapter

The Advanced SerialRAID Plus Adapter can manage disks that are configured as non-RAID, RAID-0, RAID-1, RAID-5, and RAID-10 arrays and all of these can be configured with the SSA Fast-Write Cache option. The number of adapters that can be supported in a loop that contains the following configurations of disks are:

Non-RAID	8 adapters maximum
RAID-0	1 adapter
RAID-1	2 adapters maximum
RAID-5	2 adapters maximum
RAID-10	2 adapters maximum
Fast-Write Cache	2 adapters maximum

SSA Architecture

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 approved as an ANSI standard through the ANSI X3T10.1 subcommittee.

Upgrading an Adapter

The Advanced SerialRAID Adapter can be upgraded to an Advanced SerialRAID Plus Adapter by downloading new firmware to the adapter. This book also give details of how to do this upgrade, and if required, install the 128 MByte SDRAM Option Card at the same time.

If you are upgrading to an Advanced SerialRAID Plus Adapter, you will need to verify that you performed the upgrade correctly in order to take advantage of the extra features of this adapter.

To determine which kind of adapter you have installed, you need to determine the adapter microcode package ID in one of two ways:

1. On the command line, give the following command:

   ```
   lsattr -E -l adapter -a ucode
   ```

   where **adapter** is the ID of the adapter that you want to check; for example, ssa0. An example of a response to this command is:

   ```
   ucode  14109100.05.nn Name of adapter  code  download False
   ```

   where **nn** is the adapter microcode package ID.
2. Use the Display or Change Configuration or Vital Product Data (VPD) service aid to display the VPD for the adapter (see the Diagnostic Information for Multiple Bus Systems manual). The first two characters of the ROS Level field contain the adapter microcode package ID.

If the microcode package ID is at level 5000 or higher, then your adapter is already configured as an Advanced SerialRAID Plus Adapter. If the microcode package ID is less than level 5000, then your adapter is still configured as an Advanced SerialRAID Adapter.

Important Note

From this point on, the two adapters will be treated as one where possible. That is, where reference is made to the Advanced SerialRAID Adapter, the text is also applicable to the Advanced SerialRAID Plus Adapter.

In places where it is necessary to highlight differences between the two adapters, the book will identify such differences.

Handling the Adapter

Attention: Static electricity may damage your equipment. Leave the adapter in the static-protective bag until you are ready to install it.

SSA Connectors

The Advanced SerialRAID 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.

"Appendix A. Connecting SSA Devices to the Adapter" on page 31 provides more information about SSA loops. Figure 1 shows the card.
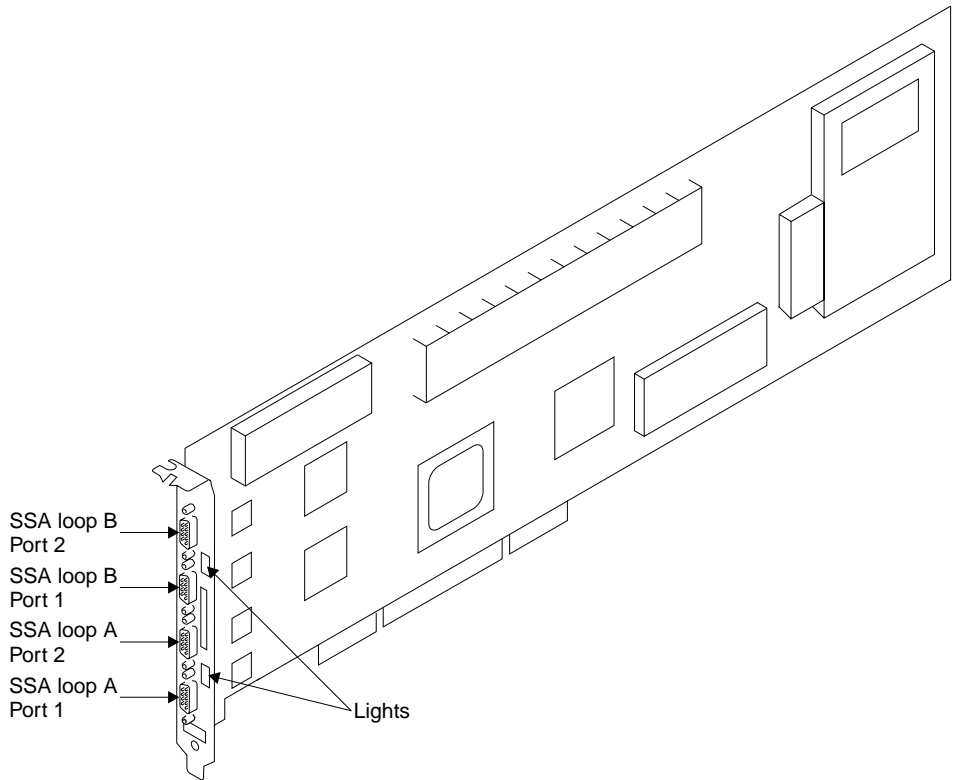
Figure 1. Advanced SerialRAID Adapter Card

Adapter Card Lights

On the Advanced SerialRAID Adapter cards, 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.

Summary of Installation Procedures

Installing, or upgrading, the adapter consists of the following steps:

- Taking an inventory of all pieces necessary for installation
- Installing the SSA software and disk drive microcode.

  Note: If you are installing code at level 5000 or higher, your adapter will be configured as an Advanced SerialRAID Plus Adapter.
- If required, installing the 128 MByte SDRAM Option Card.
- If required, installing the SSA Fast-Write Cache Option Card card onto the adapter
- Installing the adapter
- Connecting the SSA disk drives

Chapter 2. Preparing for Installation

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

Inventory

To install an Advanced SerialRAID Adapter, you need:

- The adapter.
- If required, the optional SSA Fast-Write Cache Option Card feature package.
- If required, the optional 128 MByte SDRAM Option Card.
- One of the three CD-ROMs that are supplied with the adapter. The three CD-ROMs are:
  - For AIX 4.2.1
  - For AIX 4.3.2
  - For AIX 4.3.3

  Each CD-ROM contains the device-driver software, the SSA-disk-drive microcode, the SSA-adapter microcode, and any AIX PTFs that you need.
- Your system unit documentation.
- *PCI Adapter Placement Reference*
- Your operating system documentation.
- A flat-blade screwdriver.

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

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

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).
- Fiber optic cables. These enable you to connect two SSA nodes at distances up to 10 km (32800 feet) in single-mode configuration. 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, 7133.

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.

Chapter 3. Installing the Device Driver Software and Microcode

The instructions in this chapter are for AIX. AIX automatically configures your system the next time you restart your system after you install the device driver software. If you have another operating system installed, refer to your operating system documentation for information about installing the device driver software and configuring your system.

The array-configuration utility program, service aids, and the latest adapter and disk microcode are loaded at the same time as the device driver software as you follow the steps in this chapter.

Installing the Software

1. Be sure that you have read "Summary of Installation Procedures" on page 4. It tells you in what order to install the adapter hardware, the device driver software, and the disk-drive microcode.

2. Turn the system unit power on.

3. Log in as **root**.

4. Insert the CD-ROM for your level of AIX (that is supplied with the adapter) into the CD-ROM drive.

5. Type the following

   `smitty install_selectable_all`

   and press Enter.

6. The next screen, titled 'Install and Update from ALL Available Software', highlights the **"INPUT device/directory for software"** option.

7. Select or type *your input device*:

   - Press **F4** to display the input device list. Select the *name of the device* (the CD-ROM drive) that you are using and press Enter.

     -- or --

   - In the Entry Field, type the *name of the input device* (the CD-ROM drive) you are using and press Enter.

8. The 'Install and Update from ALL Available Software' window highlights the **SOFTWARE to install** option.

9. Type the following

   `all`

   then press Enter.

10. The 'ARE YOU SURE' window displays. Press Enter to accept the data.

11. The **COMMAND STATUS** screen appears.

    - The term RUNNING is highlighted to indicate that the installation is in progress.

    - When RUNNING changes to OK, scroll down to the bottom of the page and locate the Installation Summary.

- After a successful installation, SUCCESS will appear in the Result column of the summary at the bottom of the page.

12. Remove the CD-ROM from the drive.

13. Press **F10** to exit SMIT.

14. To shutdown your system, type:

    shutdown -F

    then press Enter.

Now that you have shut down your system, you are ready to install the adapter. "Chapter 5. Installing Hardware" on page 21 describes how to do this.

Chapter 4. Installing the Device Driver on the RS/6000 SP System

In an SP system, you need to do on each node what you normally do on a standalone system. You must make the installation files available to all the affected nodes and then install them.

Perform the following commands on the Control Workstation. You should not need to **telnet** or **rlogin** to the individual nodes. You should be familiar with the **dsh** command. If not, please refer to the *IBM Parallel System Support Program for AIX: Administration Guide*, GC23–3897–05, or *IBM Parallel System Support Program for AIX: Command and Technical Reference*, GC23–3900–05.

If you are unable to utilize the **dsh** command because of the setup at your site, then you will have to **telnet** to each node and perform the steps below, omitting the **dsh** prefix.

Prepare for installation and check system pre-requisites

1. Login to the Control Workstation as a root user.

```
AIX Version 4
(C) Copyrights by IBM and by others 1982, 1996.
cws login:root
```

2. Go to a temporary directory by typing:

```
cd /tmp
```

3. Make a 'working collective' file containing a list of the relevant nodes that you want to perform the update on (in preparation for the dsh command). Type the following, for example, and pressing **Enter** after each line:

```
 cat > group1
nodename1
nodename2
nodename3
...
 <CTRL-D>
 export WCOLL=/tmp/group1
```

4. Test that the Working Collective is working by typing:

```
dsh date
```

The results should look similar to:

```
nodename1:    Wed Apr 10 10:37:46 EDT 1996
nodename2:    Wed Apr 10 10:37:46 EDT 1996
nodename3:    Wed Apr 10 10:37:47 EDT 1996
nodename4:    Wed Apr 10 10:37:48 EDT 1996
```

If you only need to do a few nodes, use the **dsh -w** *host1,host2,host3...* command format to explicitly exercise groups of nodes rather than using the working collective.

5. Determine if the AIX operating system on each relevant node is at the required level by typing:

```
dsh oslevel
```

-OR -

```
dsh -w <host1,host2>  oslevel
```

at the prompt, then press **Enter**. *host1,host2* is a list of the hostnames for the nodes in which adapters will be installed.

6. The required AIX Level is: **AIX 4.2.1 and higher**.

If the nodes are NOT at a supported AIX level, upgrade the AIX level on the nodes. Contact the System Administrator for help.

7. Determine if the *pssp_level* on each relevant node is at the required level by typing:

```
/usr/lpp/ssp/bin/splstdata -G -b
```

at the system prompt, then press **Enter**. The results should be similar to the following:

```
node#        hostname  hdw_enet_addr srvr     response      install_disk
last_install_image  last_install_time  next_install_image lppsource_name
             pssp_ver
-------------------------------------------------------------------------
1 eion01.ppd.pok.i   08005A75A6D4    0          disk           hdisk0
         default Thu_Dec__4_09:07:23         default        AIX421
             PSSP-2.4
```

pssp level can be found under the heading **pssp_ver** (PSSP-2.4)

8. The required PSSP Level (pssp_ver) is: **PSSP 2.4 and higher.**

If the nodes are NOT at a supported PSSP Level, then upgrade the PSSP Level on the nodes. Contact the System Administrator for help.

9. Record the name that appears below *lppsource_name* for each node that the adapters will be installed in; you will use this later:

_____

lppsource_name can be found under the heading **lppsource_name**(AIX421) in the example above.

10. The media supplied with your adapter contains all the software updates necessary for proper operation of the adapter. Unless you know for sure that this or a later maintenance or fix level has been installed, now is the time to install it.

    Note: If your system is ″partitioned″ i.e. there are more than one operating systems among the nodes, you may **only** install this adapter in nodes whose operating system is **AIX 4.2.1 and higher**.

11. Select one of the three CD-ROMs that are supplied with the adapter. The three CD-ROMs are:

    • For AIX 4.2.1
    • For AIX 4.3.2
    • For AIX 4.3.3

    Each CD-ROM contains the device-driver software, the SSA-disk-drive microcode, the SSA-adapter microcode, the controller code for the 7133 Models D40 and T40, and any AIX PTFs that you need.

12. Insert the media into the Control Workstation's drive.

13. Transfer the files to the Control Workstation's lppsource, by:

    a. Type

    ```
    smit bffcreate
    ```

    then press **Enter**.

    ```
                    Copy Software to Hard Disk for Future Installation

    Type or select a value for the entry field.


                                                    [Entry Fields]
    * INPUT device / directory for software            []                      +
    ```

    b. Select the input device/directory. Press: **F4** then move the cursor to the appropriate input device and press **Enter**.

```
                    Copy Software to Hard Disk for Future Installation

Type or select a value for the entry field.

                                                        [Entry Fields]
* INPUT device / directory for software              []                      +




        ----------------------------------------------------------------------
        |                 INPUT device / directory for software               |
        |                                                                     |
        |  Move cursor to desired item and press Enter.                       |
        |                                                                     |
        |   /dev/cd0            (SCSI Multimedia CD-ROM Drive)                |
        |   /dev/rmt0.1         (4.0 GB 4mm Tape Drive)                       |
        |   /dev/fd0            (Diskette Drive)                              |
        |                                                                     |
        |  F1=Help              F2=Refresh              F3=Cancel             |
   F1|  F8=Image             F10=Exit                Enter=Do               |
   F5|  /=Find               n=Find Next                                    |
   F9----------------------------------------------------------------------
```
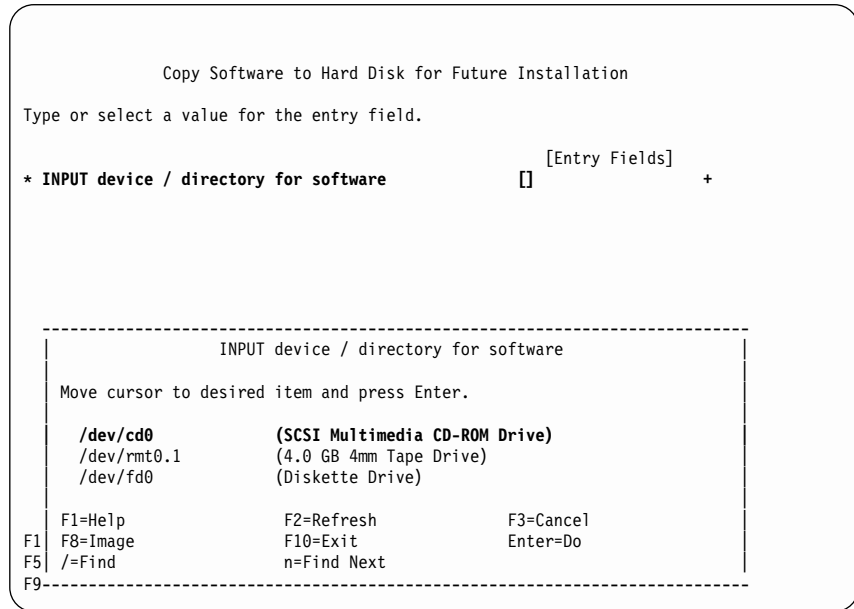
Press Enter AFTER making all desired changes.

c. The ″SOFTWARE package to copy″ will default to ″all″.

```
                    Copy Software to Hard Disk for Future Installation

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                                        [Entry Fields]
* INPUT device / directory for software               /dev/cd0
* SOFTWARE package to copy                            [all]                   +

* DIRECTORY for storing software package              [/usr/sys/inst.images]
  DIRECTORY for temporary storage during copying      [/tmp]
  EXTEND file systems if space needed?                yes                     +
```

d. Move the cursor down to ″DIRECTORY for storing software package″ and
   enter the appropriate lppsource destination directory:

   /spdata/sys1/install/lppsource_name**/lppsource**

   using the lppsource_name you recorded earlier.

e. Press **Enter** to begin copying the files.

   Note: This step may take several minutes as the directory table of contents is
            updated.

14. Update the SPOT (Shared Product Object Tree) by:
    a. Type

    ```
    smit nim_res_op
    ```

    at the system prompt. The **Resource Name** panel will display with the first line highlighted.

    ```
    ------------------------------------------------------------------------
    |                            Resource Name                             |
    |                                                                      |
    | Move cursor to desired item and press Enter.                         |
    |                                                                      |
    | [TOP]                                                                |
    |   boot                    resources       boot                      |
    |   1_migrate               resources       bosinst_data              |
    |   1_noprompt              resources       bosinst_data              |
    |   5_migrate               resources       bosinst_data              |
    |   5_noprompt              resources       bosinst_data              |
    |   8_migrate               resources       bosinst_data              |
    |   8_noprompt              resources       bosinst_data              |
    |   migrate                 resources       bosinst_data              |
    |   noprompt                resources       bosinst_data              |
    |   prompt                  resources       bosinst_data              |
    |   __smit_bundle_30118     resources       installp_bundle           |
    |   lppsource_AIX432        resources       lpp_source                |
    | [MORE...9]                                                           |
    |                                                                      |
    | F1=Help                 F2=Refresh                F3=Cancel          |
    | F8=Image                F10=Exit                  Enter=Do           |
    | /=Find                  n=Find Next                                  |
    ------------------------------------------------------------------------
    ```

    b. Move the cursor down until the *SPOT resource* is highlighted. The *SPOT resource* should look like:

    ```
    spot_AIX432     resources     spot
    ```

    c. When the *SPOT resource* is highlighted, press **Enter** to select this option.
    d. The **Network Install Operation to Perform** panel displays with the first option line highlighted for selection.

```
-------------------------------------------------------------------------
|                          Resource Name                                |
|                                                                       |
-------------------------------------------------------------------------
|                  Network Install Operation to Perform                 |
|                                                                       |
| Move cursor to desired item and press Enter.                          |
|                                                                       |
|     reset      = reset an object's NIM state                          |
|     cust       = perform software customization                       |
|     sync_roots = synchronize roots for all clients using specified SPOT|
|     showres    = show contents of a resource                          |
|     maint      = perform software maintenance                         |
|     lslpp      = list LPP information about an object                  |
|     fix_query  = perform queries on installed fixes                   |
|     showlog    = display a log in the NIM environment                 |
|     check      = check the status of a NIM object                     |
|     lppchk     = verify installed filesets                            |
|     update_all = update all currently installed filesets              |
|                                                                       |
| F1=Help              F2=Refresh            F3=Cancel                   |
| F8=Image             F10=Exit              Enter=Do                    |
| /=Find               n=Find Next                                      |
-------------------------------------------------------------------------

F1=Help            F2=Refresh         F3=Cancel          F4=List and
F5=Reset           F6=Command         F7=Edit            F8=Image
F9=Shell           F10=Exit           Enter=Do
```

e. Move the cursor until the **cust** option is highlighted and press **Enter**.

f. The **Customize a SPOT panel** displays with the **Source of Install Images** highlighted for selection.

```
                        Customize a SPOT

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

                                                    [Entry Fields]
* Resource Name                                  spot_AIX432
* Source of Install Images                       []                   +

  Fileset Names                                  []
  installp Bundle                                []                   +

  Fixes (Keywords)                               []
  Fix Bundle (Keyword Bundle)                    []                   +

  Expand file systems if space needed?           yes                  +

  Force                                          no                   +


  installp Flags
  PREVIEW only? (install operation will NOT occur)  no                +

  COMMIT software updates?                       no                   +

  SAVE replaced files?                           yes                  +

  AUTOMATICALLY install requisite software?      yes                  +

  OVERWRITE same or newer versions?              no                   +

  VERIFY install and check file sizes?           no                   +
```

g. Press **F4** to display the list of Install Images and select the appropriate lppsource.

```
    --------------------------------------------------------------------
                        Source of Install Images

    Move cursor to desired item and press Enter.


       lppsource_AIX432      resources        lpp_source

       lppsource_aix432      resources        lpp_source

       rmt0 Available 04-A0-00-5,0 5.0 GB 8mm Tape Drive

       cd0 Available 04-A0-00-4,0 SCSI Multimedia CD-ROM Drive




    F1=Help              F2=Refresh            F3=Cancel
F1| F8=Image             F10=Exit              Enter=Do
F5| /=Find               n=Find Next
F9--------------------------------------------------------------------
```

h. Move the cursor until the appropriate **lppsource** is displayed. For example:

   lppsource_AIX432   resources   lpp_source

i. Press **Enter** to start the SPOT update. This operation can take up to 15 minutes.

15. If boot/install server nodes are being used, it will be necessary to login to each of them and repeat this SPOT customization procedure.

16. Proceed to section "Install Device Drivers on the SP nodes"

Install Device Drivers on the SP nodes

1. Make sure that the lppsource directory is exported to the nodes by typing:

```
showmount -e
```

at the system prompt. The result should be something of the form:

```
/spdata/sys1/install/AIX432/lppsource (everyone)
```

2. If the directory is not exported, you may temporarily export the directory by typing:

```
exportfs -i /spdata/sys1/install/lppsource_name/lppsource
```

3. NFS Mount the lppsource directory by typing:

```
dsh mount cws:/spdata/sys1/install/lppsource_name/lppsource /mnt
```

at the system prompt. *controlwks* is the name of the Control Workstation known to the nodes. *lppsource_name* is the name you recorded earlier in section "Prepare for installation and check system pre-requisites" on page 9.

4. Perform a preview of the filesets to be installed on the nodes by typing:

```
dsh "installp -pacqXd /mnt filesets 2>&1" | dshbak -c |tee -a logfile
```

Alternatively, you may create a list first that contains all the files to be installed, for example, *listfile*. Then...

```
cat listfile | xargs dsh "installp -pacqXd /mnt" 2>&1 |
dshbak -c | tee logfile
```

Then review the *logfile* to make sure everything passed the installation preview successfully.

The **required** filesets are highlighted. The list includes:

- AIX 4.2
    a. **devices.mca.8f97**
    b. **devices.pci.14109100**
    c. **devices.pci.14104500**
    d. **devices.ssa.disk**
    e. **devices.ssa.IBM_raid.rte**
    f. **devices.ssa.tm**
    g. **ssamcode**
    h. **ssadiskmcode**

Following is a brief description of the files about to be installed.

devices.mca.8f97

This fileset MUST be installed, even on a PCI system. It contains most of the fundamental parts of the SSA software, including the SSA adapter device driver.

devices.pci.14109100

This contains the ODM extensions for PCI based SerialRAID adapters.

devices.pci.14104500

Required for PCI SSA multi-initiator RAID/EL adapters.

devices.ssa.disk

This contains the device drivers, disk configuration methods and various command line tools. MUST be installed to use SSA disks.

devices.ssa.IBM_raid.rte

This contains the SSA RAID configuration software. This is needed for all the RAID-capable adapters. This also contains the fast-write software, therefore must be installed to use fast write, even if not using RAID arrays.

devices.ssa.tm

This is the SSA target mode support device driver and configuration methods. Target mode is available only on SSA cards 6215, 6219, 6225, and 6230. The tmssa device driver provides cluster node to cluster node communication via the SSA interface.

ssamcode

This is the adapter firmware. Once this is installed, any adapter at a previous level will automatically be updated when the system is booted. The firmware is stored in nonvolatile RAM on the adapter.

ssadiskmcode

This is the disk firmware. Once installed, it becomes *available* to the system to update disk microcode. The disk microcode will not be updated until you use either the diagnostics SSA service aids or the **ssadload** command. The disk firmware supplied is **required** for proper operation of the disks with this adapter.

- AIX 4.3
  a. **devices.common.IBM.ssa**
  b. **devices.mca.8f97**
  c. **devices.pci.14109100**
  d. **devices.pci.14104500**
  e. **devices.ssa.disk**
  f. **devices.ssa.IBM_raid.rte**
  g. **devices.ssa.tm**
  h. **ssamcode**
  i. **ssadiskmcode**

Following is a brief description of the files about to be installed.

devices.common.IBM.ssa

This fileset MUST be installed. It contains most of the fundamental parts of the SSA software, including the SSA adapter device driver.

devices.mca.8f97

> This contains the specific ODM extensions to enable MCA based SSA adapters.

devices.pci.14109100

> This contains the ODM extensions for PCI based SSA adapters.

devices.pci.14104500

> This is required if you have PCI SSA multi-initiator RAID/EL adapters.

devices.ssa.disk

> This contains the device drivers, disk configuration methods and various command line tools. MUST be installed to use SSA disks.

devices.ssa.IBM_raid.rte

> This contains the SSA RAID configuration software. This is needed for all the RAID-capable adapters. This also contains the fast-write software, therefore must be installed to use fast write, even if not using RAID arrays.

devices.ssa.tm

> This is the SSA target mode support device driver and configuration methods. Target mode is available only on SSA cards 6215, 6219, 6225, and 6230. The tmssa device driver provides cluster node to cluster node communication via the SSA interface.

ssamcode

> This is the adapter firmware. Once this is installed, any adapter at a previous level will automatically be updated when the system is booted. The firmware is stored in nonvolatile RAM on the adapter.

ssadiskmcode

> This is the disk firmware. Once installed, it becomes *available* to the system to update disk microcode. It is a conscious decision to update disk microcode and is performed through either the diagnostics SSA service aids or by using the **ssadload** command. The disk firmware supplied is **required** for proper operation of the disks with this adapter.

5. Then perform the device driver installation by typing:

```
dsh "installp -acqXd /mnt fileset 2>&1" | tee -a logfile
```

Alternatively, use the list generated in step 2 that contains all the filesets to be installed, for example, *listfile*. Then...

```
cat listfile | xargs dsh "installp -qacXd /mnt" 2>&1 | dshbak -c | tee logfile
```

Then review the *logfile* to make sure everything installed successfully.

6. Contact your service representative to have the adapter hardware installed into your system unit.

Adapter and Disk Microcode

The adapter microcode in the adapter may not be at the latest level. The latest level of the adapter microcode should be obtained from:

http://www.storage.ibm.com/hardsoft/products/SSA

This package includes the latest levels of the device driver and support software that may also be required.

The adapter microcode may need to be installed to other nodes if adapters are being added to your system or if you have adapters that have been previously installed. This is especially important if you have adapters that will become part of SSA loops connected to your new adapters.

Note: Error logs indicating a mismatch of adapter microcode or ″degraded performance″ may result if mixed adapter microcode levels exist in SSA loops.

The microcode was made available on the nodes when you installed ″ssamcode″ and ″ssadiskmcode″ in the previous steps. In order for the adapter or adapters to be updated, the node must either be rebooted or you must run ″cfgmgr″ or ″mkdev -l ssan″. The adapter is automatically updated with the latest microcode when the system is booted if the appropriate files (ssamcode) have been installed on the system.

The disk microcode needs to be updated once the adapter software and the adapter have been installed and the disk subsystem connected. Use the SSA Service Aids **ssadload -u** command to update the disk microcode.

Note: The disk microcode MUST be updated for proper operation of this adapter. If other subsystems are added to the configuration later, then the microcode level of those disks must also be checked, and if necessary, updated.

Attention: Wait until the installation is complete before updating the disk microcode. It is possible to render the disks unusable if an attempt is made to update the disk microcode from more than one source at the same time, as with a multi-initiator SSA loop. Special care must be taken to ensure that only one host or node is updating the disk microcode at any one time.

Chapter 5. Installing Hardware

Now that you have installed the array-configuration utility program, service aids, and the latest adapter and disk microcode, you must install the adapter hardware. This section provides instructions for installing the Advanced SerialRAID Adapter or the Advanced SerialRAID Plus 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 vii.

Attention: Do not remove the Advanced SerialRAID Adapter from its anti-static package at this time.

Installing the Adapter

1. Be sure that you have read "Chapter 2. Preparing for Installation" on page 5.
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. If you are installing a new adapter, remove it from its anti-static package.
      - If you are installing a 128 MByte SDRAM Option Card on this adapter at the same time, remove this from its anti-static package and install it using the instructions defined in "Installing the 128 MByte SDRAM Option Card" on page 22.
      - If you are replacing an existing 64 MB SDRAM card with a new 128 MByte SDRAM Option Card on an already installed adapter, remove the adapter from its slot, remove the 128 MByte SDRAM Option Card from its anti-static package and install it using the instructions defined in "Installing the 128 MByte SDRAM Option Card" on page 22.
   d. If required, install the SSA Fast-Write Cache Option Card card onto the adapter.

      Refer to the *SSA Fast Write Cache Installation Instructions* if you are installing this feature.
   e. In some systems, you must remove the blue handle on the adapter before installing it. The *PCI Adapter Placement Reference* describes when this is necessary. To remove the handle, remove the two screws that fasten it to the adapter. If the card also has a plastic stiffener along its top edge, remove it at this time by removing and discarding its screws.
   f. Install the Advanced SerialRAID Adapter into the correct PCI slot. The slots in each system into which you can install an Advanced SerialRAID Adapter are defined in the *PCI Adapter Placement Reference*.
   g. Reinstall the cover to your system unit.

Installing the 128 MByte SDRAM Option Card

This section tells you how to replace the existing 64 MB SDRAM card on the Advanced SerialRAID Adapter with the 128 MByte SDRAM Option Card that you will have received if you ordered Feature 6231.

Removing the existing 64 MB SDRAM module of an Advanced SerialRAID Adapter

Attention: The adapter assembly contains parts that are electrostatic-discharge (ESD) sensitive. Use the tools and procedures defined by your organisation to protect such parts.
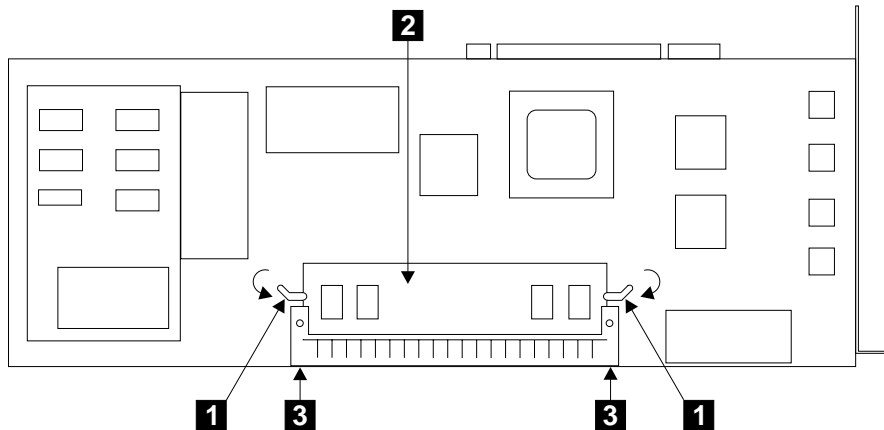
Figure 2. Removing the SDRAM Card

1. Remove the adapter from the using system if already installed (see the *Installation and Service guide* for the using system).
2. Refer to Figure 2.
3. Holding your thumbs against the connector **3**, open the clips **1** by pressing them in the directions shown by the arrows in the diagram. This action pulls the SDRAM card **2** out of the connector.
4. Remove the SDRAM card. This card may be retained for future reuse..

Installing a 128 MByte SDRAM Option Card on an Advanced SerialRAID Adapter

Attention:

- The adapter assembly contains parts that are electrostatic-discharge (ESD) sensitive. Use the tools and procedures defined by your organisation to protect such parts

- The new SDRAM is labelled with its size. Ensure that you do not accidentally replace the card you have just removed back onto the Advanced SerialRAID Adapter

.
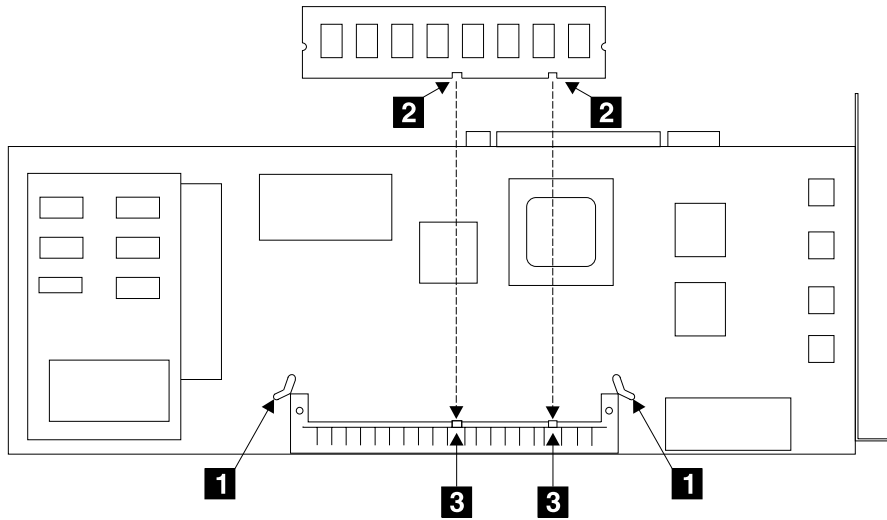
Figure 3. Checking the Clips, Slots, and Guides

1. Refer to Figure 3.
2. Ensure that the clips **1** are fully open.
3. Hold the SDRAM card so that its slots **2** align with the guides **3** of the connector.

4. Refer to Figure 4.
5. Carefully insert the SDRAM card into the connector.
6. Press strongly on the card until it is fully home.
7. Close the clips ◼1 by pivoting them in the directions shown by the arrows in the diagram. You hear a click when the clips are fully closed. if you cannot close the clips, the card is not fully home. Press the card fully home, then close the clips.
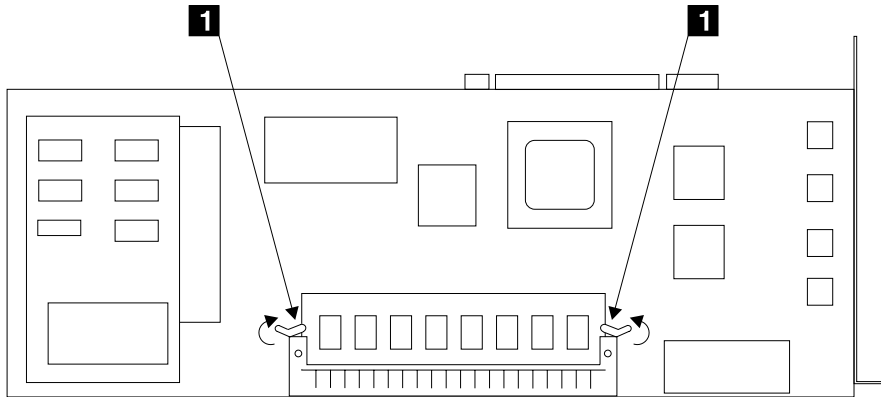
Figure 4. Installing the SDRAM Card

Connecting SSA Disk Drives

After you install the Advanced SerialRAID 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 Advanced SerialRAID 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.

Verifying the Installation

To verify your newly installed Advanced SerialRAID Adapter is available for use:

1. Restart your system unit. If you are running AIX, this automatically configures your system.

2. At the system prompt, log in as **root**.

3. Type:

   ```
   lsdev -Cs pci
   ```

   at the prompt and press Enter. A list of PCI devices displays. **Available** status should appear; this indicates that the IBM SSA 160 SerialRAID Adapter (14109100) (also known as an Advanced SerialRAID Adapter) is installed.

Problem Determination

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

1. The *Advanced SerialRAID Adapters: User's Guide and Maintenance Information* manual, which is provided with the adapter

2. Your system unit documentation

for information about running diagnostics or other problem determination procedures.

Configuring Your System

You need to update your system configuration after you install the Advanced SerialRAID Adapter, refer to your operating system documentation for the correct procedure to follow.

Chapter 6. Downloading the Latest Disk Microcode

Instructions for installing the latest disk microcode are given in "Chapter 3. Installing the Device Driver Software and Microcode" on page 7.

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

To install the disk drive microcode:

1. Install the microcode using the Display/Download Disk Drive Microcode Service Aid. To do this:

   a. Start the system diagnostics. The *User's Guide* for your system unit describes how to do this.

   b. Select **Service Aids** from the **Function Selection** menu.

   c. Select **SSA Service Aids** from the **Service Aids** menu.

   The SSA Service Aids menu is displayed.

```
 SSA SERVICE AIDS                                                      802380

 Move cursor onto selection, then press Enter.


             Set Service Mode
             Link Verification
             Configuration Verification
             Format Disk
             Certify Disk
             Display/Download Disk Drive Microcode
             Link Speed
             Physical Link Configuration
             Enclosure Configuration
             Enclosure Environment
             Enclosure Settings
             SMIT-SSA RAID Arrays
             SMIT-SSA Disks





  F3=Cancel        F10=Exit
```

Note: In some configurations of the system console:

> **Esc** and **0** = Exit
> **Esc** and **3** = Cancel

In such configurations, however, the displayed instructions for the function keys remain the same as those shown in the screen above.

d. Select **Display/Download Disk Drive Microcode** The following menu is displayed:

```
SSA SERVICE AIDS                                                802380


MICROCODE DOWNLOAD                                              802420

Move cursor onto selection, then press Enter.


  Display the Microcode levels of all SSA Physical Disk Drives
    Select this option to display the microcode levels installed
    on all 'Available' SSA disk drives.
  Download Microcode to selected SSA Physical Disk Drives
    Select this option to change the level of microcode that is
    installed on selected 'Available' SSA disk drives.
  Download Microcode to all SSA Physical Disk Drives
    Select this option to load the latest level of microcode
    on all 'Available' SSA disk drives.








 F3=Cancel        F10=Exit
```

e. Select **Download Microcode to all SSA Physical Disk Drives**. The following screen is displayed:

```
SSA SERVICE AIDS                                                802380


MICROCODE DOWNLOAD                                              802420
```

```
┌─────────────────────────────────────────────────────────────────────────────┐
│                                                                               │
│  MICROCODE DOWNLOAD                                              802423        │
│                                                                               │
│  If you have not already done so then record the current level                │
│  of microcode on the SSA Disk Drives.  This will enable you to                │
│  restore the original microcode if this should be necessary.                  │
│                                                                               │
│                                                                               │
│    Display the microcode levels for all SSA physical disk drives              │
│                                                                               │
│    Continue with the microcode installation                                   │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│    F3=Cancel         F10=Exit                                                 │
│                                                                               │
└─────────────────────────────────────────────────────────────────────────────┘
```

f. Select **Continue with the microcode installation**; (the other actions described
    on this screen are for service representatives only).

    The following screen is displayed:

```
┌─────────────────────────────────────────────────────────────────────────────┐
│  SSA SERVICE AIDS                                               802380         │
└─────────────────────────────────────────────────────────────────────────────┘
```

```
┌─────────────────────────────────────────────────────────────────────────────┐
│  MICROCODE DOWNLOAD                                             802420         │
└─────────────────────────────────────────────────────────────────────────────┘
```

```
┌─────────────────────────────────────────────────────────────────────────────┐
│  MICROCODE DOWNLOAD                                             802423         │
└─────────────────────────────────────────────────────────────────────────────┘
```

```
┌─────────────────────────────────────────────────────────────────────────────┐
│  MICROCODE DOWNLOAD                                             802425         │
│                                                                               │
│  Do you have the microcode on a diskette?                                     │
│                                                                               │
│                                                                               │
│    YES                                                                        │
│    NO                                                                         │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│                                                                               │
│    F3=Cancel         F10=Exit                                                 │
│                                                                               │
└─────────────────────────────────────────────────────────────────────────────┘
```

g. Select **NO**.

The following screen is displayed:

```
SSA SERVICE AIDS                                            802380
```

```
MICROCODE DOWNLOAD                                          802420
```

```
MICROCODE DOWNLOAD                                          802423
```

```
MICROCODE DOWNLOAD                                          802425
```

```
CAUTION                                                    802430

Microcode may be downloaded to SSA disk drives while they are in use.
However, if you choose to perform the download while a disk drive
is busy, the AIX operating system or applications may experience
some temporary delays.

Downloading microcode to the selected drives may take up to
XX minutes.

Do you want to continue?


  YES
  NO






 F3=Cancel       F10=Exit
```

Downloading may take up to 2 minutes for each disk drive.

h. Select **YES**.

   This reads the microcode from your system hard disk and automatically
   downloads the microcode only to those disk drives whose level of microcode is
   lower than that of the new microcode.

   Note: Different types of SSA disk drive might need different versions of the
           microcode. Microcode download files are provided for each type of disk
           drive. Where a system contains more than one type of SSA disk drive,
           this Service Aid selects the correct microcode file for each of those types.

i. Exit from diagnostics.

Note: After installing the Advanced SerialRAID Adapter, update your system
        configuration. Refer to your system documentation for instructions on how to do
        this.

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.

Before connecting SSA devices to the adapter, ensure that the configuration will not violate any of the SSA configuration rules of other adapters that are already connected in the loop. The SSA configuration rules for the Advanced SerialRAID adapter are defined in 'Rules for SSA loops' on page 35; for other adapters, these rules are listed in the installation guides for those adapters.

This section provides general information on SSA configurations.

SSA Loops and Links

In the simplest SSA configuration, SSA devices are connected through SSA 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. Two SSA loops can be connected to an adapter.

The maximum permitted length for an external copper cable that connects two SSA nodes (for example, disk drives) is 25 meters (82 feet).
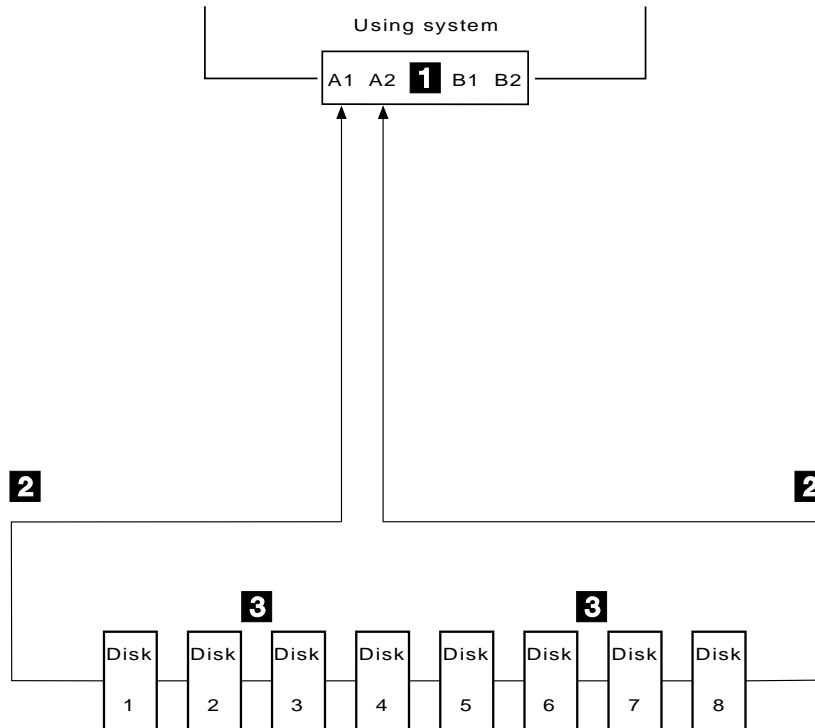
The maximum permitted length for an external fiber optic cable that connects two SSA nodes (for example, disk drives) is 10 kilometers (32808 feet).

Details of the rules for configuring SSA loops are given for this SSA adapter in "Rules for SSA Loops" on page 35.

Loops and Data Paths

All devices that are attached to an SSA adapter **1** 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 but always uses the path that has the fewest interconnecting devices between it and the destination device. The using system cannot detect which data path is being used.

```
                        Using system
                  ┌─────────────────────┐
                  │ A1  A2  1  B1  B2    │
                  └─────────────────────┘
                          ↑   ↑

  2                                                    2

┌─────────────────────────────────────────────────────────┐
│                                                           │
│   3                      3                                │
│  ┌────┬────┬────┬────┬────┬────┬────┬────┐               │
│  │Disk│Disk│Disk│Disk│Disk│Disk│Disk│Disk│               │
│  │    │    │    │    │    │    │    │    │               │
│  │ 1  │ 2  │ 3  │ 4  │ 5  │ 6  │ 7  │ 8  │               │
│  └────┴────┴────┴────┴────┴────┴────┴────┘               │
```

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. The adapter may now use the alternate path to some of the devices.

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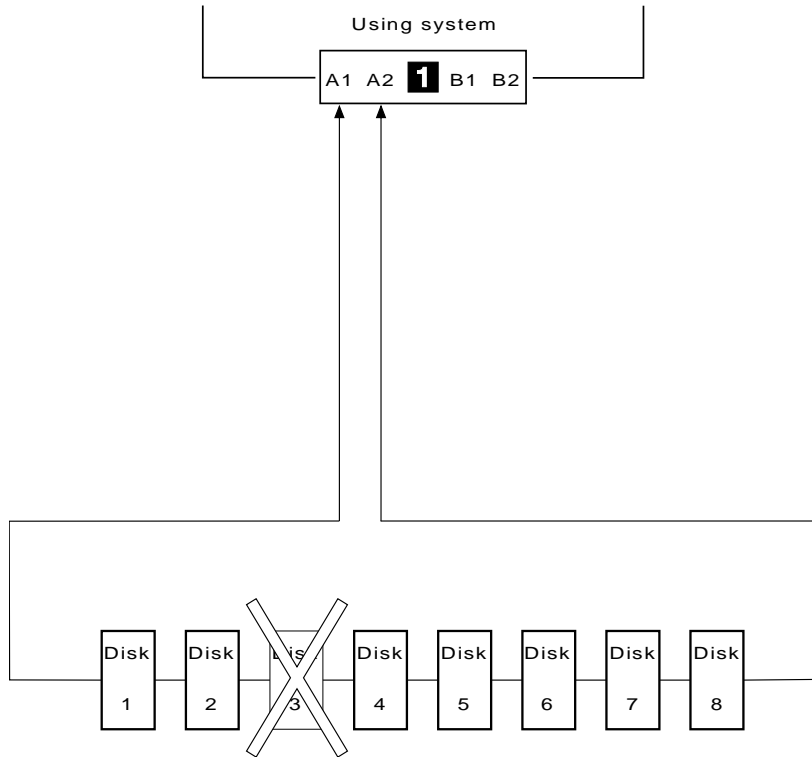
If two or more disk drives are turned off, fail, or are removed from the loop, some disk drives might become isolated from the SSA adapter

In the diagram, 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.
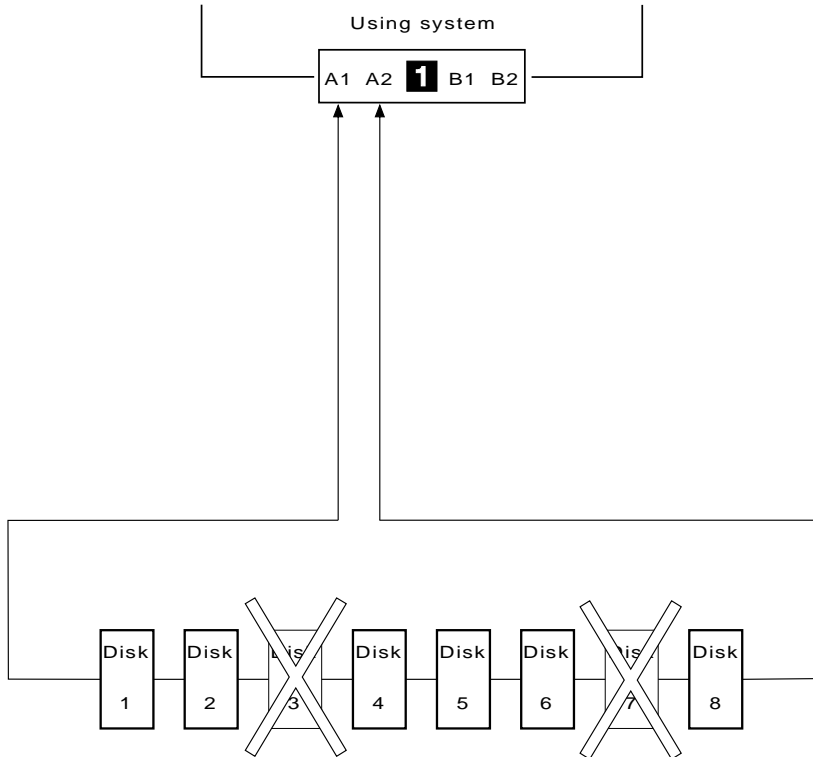
Rules for SSA Loops

For SSA loops that include an Advanced SerialRAID 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 one pair of adapter connectors can be connected in a particular SSA loop.
- All member disks of an array must be on the same SSA loop.
- A maximum of 48 devices can be connected in a particular SSA loop.
- If an SSA adapter that is in a two-way configuration is connected to two SSA loops, and a second adapter is connected to each loop, both loops must be connected to the same second adapter.
- Each SSA loop can be connected to no more than two adapters on any one using system.
- The number of adapters that are supported in an SSA loop is determined by whether any disk drives are configured for RAID or fast-write operations, and by the type of adapter, (Table 1)

Table 1. Numbers of Adapters that are Supported in an SSA Loop

Array Type	Number of Adapters in Loop	Type of Adapters Allowed
Non-RAID	8	Advanced SerialRAID Adapter
		PCI SSA Multi-Initiator/RAID EL Adapter
		Micro Channel SSA Multi-Initiator/RAID EL Adapter
RAID-0	1	Advanced SerialRAID Adapter
RAID-1	2	Advanced SerialRAID Adapter at microcode level above 5000
RAID-5	2	Advanced SerialRAID Adapter
		PCI SSA Multi-Initiator/RAID EL Adapter
		Micro Channel SSA Multi-Initiator/RAID EL Adapter
RAID-10	2	Advanced SerialRAID Adapter at microcode level above 5000
Fast-Write	1	Advanced SerialRAID Adapter at microcode level above 5000
	2	Advanced SerialRAID Adapter at microcode level above 5000

See the *SSA Adapters: User's Guide and Maintenance Information* manual, SA33-3272 (Version 01 or above) for more information about the level of code that is required in the Micro Channel SSA Multi-Initiator/RAID EL Adapter (type 4–M) or the PCI SSA Multi-Initiator/RAID EL Adapter (type 4–N).

Rules for the Physical Relationship between Disk Drives and Adapters

The physical relationship between the disk drives and the adapters in an SSA loop can affect the performance of the subsystem. The following sequence enables you to determine the best relationship between the disk drives and the adapter on an SSA loop that contains a Advanced SerialRAID Adapter.

1. Determine which data is accessed most frequently.

2. Assign that data to those disks 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 5.
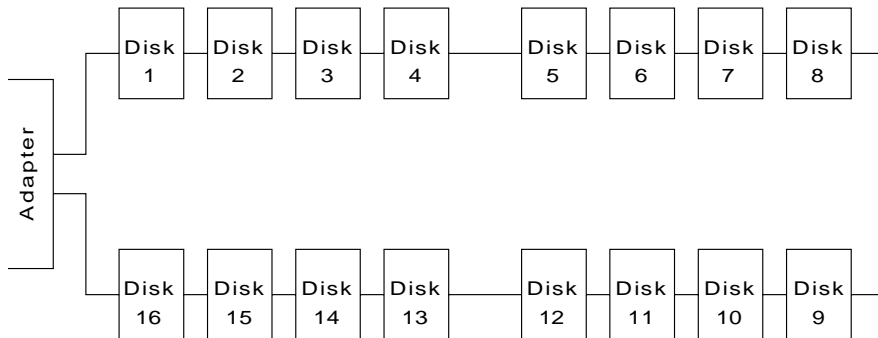

Figure 5. Physical relationships

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.

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.

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.

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.

International Electrotechnical Commission (IEC) Statement

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

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.

Industry Canada Compliance Statement

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

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.

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.

Radio Protection for Germany

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 30. August 1995 (bzw. der EMC EG Richtlinie 89/336):.

Dieses Gerät ist berechtigt in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen. Verantwortlich für die Konformitätserklärung nach Paragraph 5 des EMVG ist die:
IBM Deutschland Informationssysteme GmbH, 70548 Stuttgart.
Informationen in Hinsicht EMVG Paragraph 3 Abs. (2) :

Das Gerät erfüllt die Schutzanforderungen nach EN 50082-1 und EN 55022 Klasse A.

EN 55022 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden:
″Warnung: dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Massnahmen durchzuführen und dafür aufzukommen.″

EN 50082-1 Hinweis:
″Wird dieses Gerät in einer industriellen Umgebung betrieben (wie in EN 50082-2 festgelegt), dann kann es dabei eventuell gestört werden. In solch einem Fall ist der Abstand bzw. die Abschirmung zu der industriellen Störquelle zu vergrössern.″

Anmerkung:
Um die Einhaltung des EMVG sicherzustellen, sind die Geräte wie in den Handbüchern angegeben zu installieren und zu betreiben.

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