



Intel® Server RAID Controller U2-1 (SRCU21)

User's Manual Rev 2.0

June 2000



Revision History

Version	Description
1.0	Initial version: for software global build version 3.15
2.0	Updated for software global build version 3.21. See Specification Update (Intel order number: 245413) for software changes and updates.

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Quick Start Instructions

1

1.1 Summary of Contents

- Product Check List
- Intel Server RAID Controller U2-1 Hardware Setup
- Intel® Integrated RAID Software Setup and Installation
- Create a RAID Volume for the Operating System
- Setup and Installation for Microsoft Windows NT* Server
- Setup and Installation for Novell NetWare*
- Setup and Installation for UnixWare* 7.1
- Getting Help

1.2 Before You Begin

1.2.1 FCC/Emissions Disclaimer

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules, CISPR 22, and EN55022. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio and television reception. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio and television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that which the receiver is connected.
- Consult an experienced radio/TV technician for help.

1.2.2 Warning

The connection of a non-shielded equipment interface cable to this equipment will invalidate the FCC certification of this device and may cause interference levels that exceed the limits established by the FCC for this equipment. It is the responsibility of the user to obtain and use a shielded equipment interface cable with this device. If the equipment has more than one interface connector, do not leave cables connected to unused interfaces unless otherwise instructed to do so in the user manual.



Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

1.2.3 Canadian Users

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

Cet appareil numérique de la Class B respect toutes les exigences du Règlement sur matériel brouilleur du Canada.

1.2.4 Warnings and Cautions

1.2.4.1 Warnings

This guide is for qualified technical personnel with experience installing and configuring PCI adapter cards.

Read and adhere to all warnings, cautions, and notices in this guide and the documentation supplied with this product.

1.2.4.2 Cautions

Take precautions to prevent electrostatic discharge (ESD) damage before handling the Intel® Server RAID Controller U2-1 Adapter Card.

Electrostatic discharge (ESD) can damage adapter card components. Perform the described procedures only at an ESD workstation. If no such station is available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the computer chassis.

1.2.5 About the Documentation

This chapter introduces you to SRCU21 and provides the complete set of instructions to install and configure the SRCU21 product. [Table 1-1](#) gives brief descriptions of each chapter in the SRCU21 User's Manual. For information on ordering this and other Intel publications, write to:

Intel Corporation
Literature Sales
P.O. Box 5937
Denver, CO 80217-9808

You can also order manuals by phone by calling: 1-800-548-4725

Table 1-1. Documentation

Chapter/Appendix Title	Description
Chapter 1, "Quick Start Instructions"	Abbreviated version of the installation procedure.
Chapter 2, "Advanced Installation Steps"	Describes the installation procedures and where to begin to use this product. Also describes RAID Configuration Utility and Advanced RAID Configuration Utility.
Chapter 3, "Exploring the Utilities"	Describes the Intel® Server RAID Controller U2-1 Utilities, including RAID Recovery/Update Utility.
Chapter 4, "Using the Storage Console"	<i>Read this document before using the RAID Configuration Utility to initially configure the RAID subsystem. Read this document before using a browser to configure a RAID subsystem.</i> Describes how to administer and support the RAID subsystem during and after the initial configuration.
Chapter 5, "RAID Features"	Presents an introduction to RAID and describes the Intel® Server RAID Controller U2-1 and its features.
Appendix A, "Hardware Details"	Describes hardware, features and specifications of the Intel® Server RAID Controller U2-1.
Appendix B, "Troubleshooting Scenarios"	Addresses questions and issues that may be encountered when using the Intel® Server RAID Controller U2-1.
Appendix C, "Error Messages Defined"	Describes error and warning messages for the Flash Recovery Utility and Firmware Update Utility.

1.2.6 Online HTML Documentation

In addition to the printed documentation, this kit also provides an online/html version of the printed manual. This online information can be displayed and printed with any HTML-compatible browser, such as Microsoft Internet Explorer* or Netscape Navigator*. Start with <CD-ROM DRIVE>:\Docs\cover.htm

1.2.7 Intended Audience

To use this product you should be experienced in configuring computer equipment. For example, you should be able to install and configure your OS to recognize peripherals and you should be able to use software utilities to configure and troubleshoot those installed components.

1.2.8 Product Check List

The following hardware and software components are supplied with the standard shipping package:

- Intel® Server RAID Controller U2-1 (SRCU21) adapter card
- Intel® Server RAID Controller U2-1 CD-ROM
- Intel® Server RAID Controller U2-1 Quick Start Guide

1.2.8.1 Contents of the Intel® Server RAID Controller U2-1 (SRCU21) CD-ROM (bootable)

- SRCU21 User' Manual in DOS and Windows format
- Intel® Integrated RAID Software
 - Firmware
 - Drivers (OSM's)
 - Utilities (Make Diskettes, Firmware Updates, Advanced RAID Configuration, etc.)
 - Monitor Application
 - Storage Console
 - DMI Component Instrumentation
 - SNMP Extension Agents

The SRCU21 User' Manual is provided on the CD-ROM in an online/html format (at <cdromdrive>:\docs\index.htm) viewable with any HTML-compatible browser, such as Microsoft Internet Explorer* or Netscape Navigator*. The User's Manual can also be displayed and printed using Adobe Acrobat Reader* (provided on the CD-ROM).

1.3 Introduction

The SRCU21 is comprised of the i960® I/O processor based hardware, firmware and the Intel Integrated RAID software with an easy to use html interface.

This guide provides Intel Integrated RAID software installation information and provides a set of instructions to install and configure the SRCU21. For detailed information on installing and configuring the SRCU21, see [Chapter 2, “Advanced Installation Steps”](#).

Figure 1-1. Hardware/Software Installation Overview

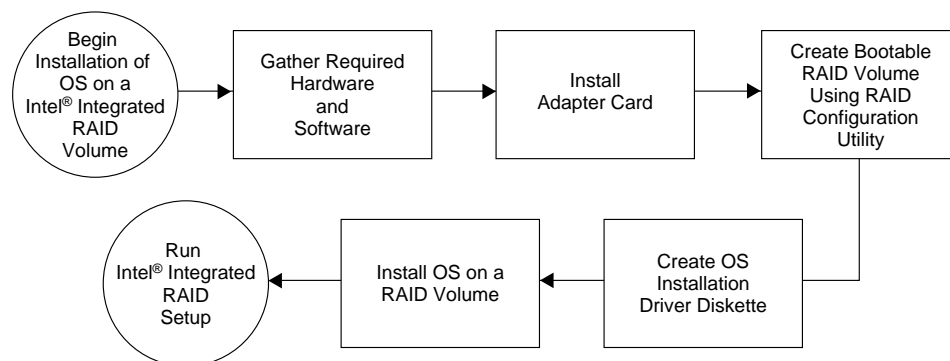
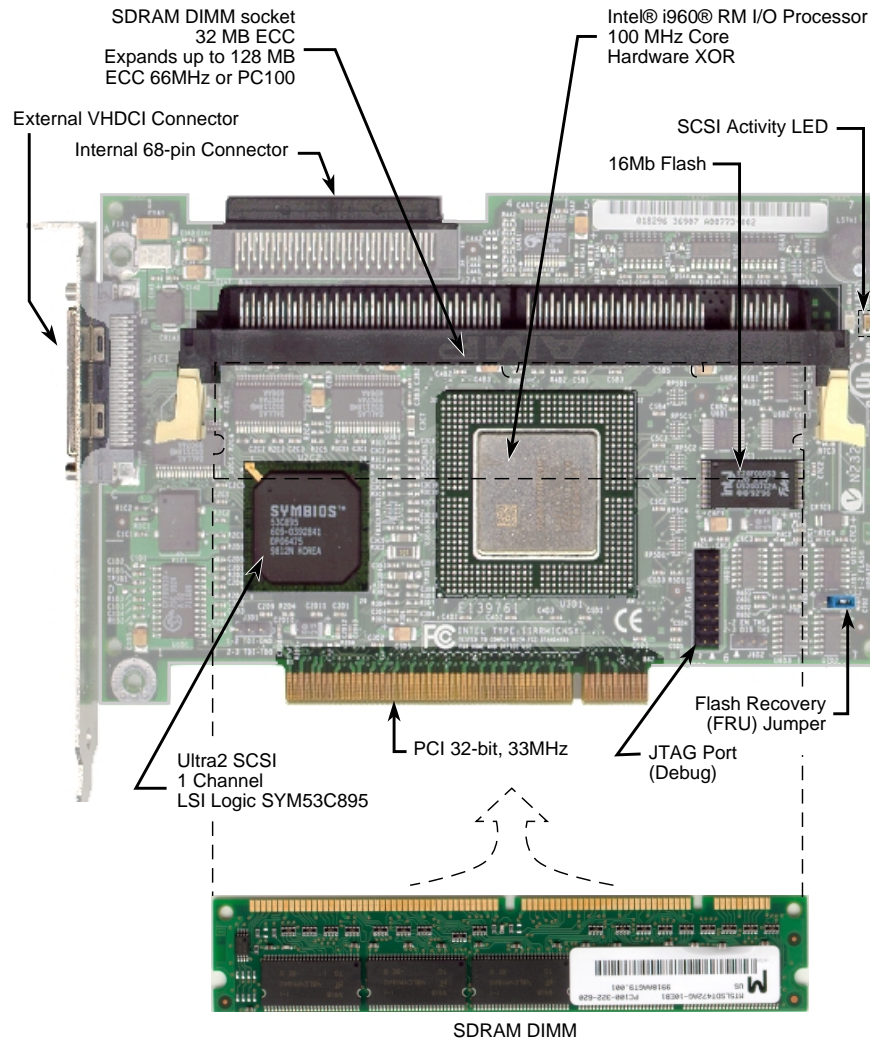


Figure 1-2. SRCU21 Adapter Card



A7469-01

1.3.1 Intel Server RAID Controller U2-1 Hardware Setup

1.3.1.1 Hardware Requirements

- Server with CD-ROM Drive *not* attached to Intel Server RAID Controller U2-1
- One available PCI slot
- Monitor display resolution of 800 x 600 or higher (recommended)
- Intel Server RAID Controller U2-1 Adapter Card



- PCI 2.2 Compliant System BIOS
- Memory: SDRAM DIMM ECC unless already installed (see supported parts at <http://support.intel.com/support/motherboards/server/srcu21>)

1.3.1.2 Installing SRCU21 into a System

The SRCU21 comes with the Intel Integrated RAID firmware already programmed into the flash memory. Note that you must install an approved SDRAM ECC DIMM into the memory socket prior to SRCU21 installation. See [Hardware Requirements](#). Refer to the approved memory list at <http://support.intel.com/support/motherboards/server/srcu21>.

1. Power down the system, disconnect power cord(s) and remove the system cover.
2. Install the SRCU21 into an available PCI slot. Connect one end of the SCSI cable to the internal (68 pin) or external (VHDCI) SCSI connector on the SRCU21. Connect the other end of the SCSI cable to the SCSI drives or drive enclosure.
3. Replace the system cover, reconnect power cord(s).

Note: Ensure that both ends of the SCSI bus are properly terminated. Consult the documentation for the drives or drive enclosure for termination details.

1.4 Intel® Integrated RAID Software Setup and Installation

This chapter details the installation of supported operating systems to a RAID volume controlled by the SRCU21. Operating systems can also be installed to a pass-through drive (drive attached to SRCU21, but controlled directly by the host) or to a drive connected to a different controller. For operating system installation instructions on pass-through drives and drives attached to another controller, refer to [Chapter 2, “Advanced Installation Steps”](#).

1.4.1 Create a RAID Volume for the Operating System

A RAID volume (or logical drive) must be set up prior to installing an operating system when installing the operating system to a RAID volume. The volume created in this step will host the operating system. Ensure that the volume's size is large enough to contain the operating system. The volume may contain more than just the host operating system if desired.

Create and configure the operating system RAID volume (boot volume) using the RAID Configuration Utility (RCU). For more information on using the RCU please refer to [Section 2.2](#).

Note: The RCU can only configure one RAID volume at a time. If more than one RAID volume is needed, use the Advanced RCU (see [Section 2.4, “Advanced RAID Configuration Utility” on page 2-17](#)). By default, the RCU uses all disks attached to the SRCU21 when creating a RAID volume. To exclude a disk from the RAID volume, make it a pass through disk. To create a pass through disk, see [Section 2.5.2.5](#) (local administration) or [Section 2.5.4.4](#) (remote administration).

1. Turn on the target system with the SRCU21 installed. During system boot-up, the message *Press Ctrl C to run the RAID Configuration Utility* appears in the display. Press *Ctrl C* when this message appears to execute the RCU.

2. Follow the screen instructions to create and configure a RAID volume. Ensure that the volume is designated as the boot device when creating the volume (you can verify it is the boot volume after it has been created by using the *custom configuration* menu option in the main menu of the RCU).
3. Reboot when finished and proceed to the appropriate operating system installation instructions to install the desired operating system.

Caution: Do not install OSMs (Operation System Service Modules) downloaded from OS vendor websites. An OSM is the operating system half of the I₂O split driver model. The OSMs provided on the SRCU21 CD-ROM are a later version than the OSMs currently provided by OS vendors. Using OSMs other than those provided on the Intel Integrated RAID CD-ROM may yield unpredictable results.

1.4.2 Setup and Installation for Microsoft Windows NT* Server

1.4.2.1 Local versus Remote Administration

Configuring Windows NT for Local Administration

If you are installing the SRCU21 in a server that is configured with Windows NT and is to be locally administered, refer to [Section 1.4.2.2](#) in this chapter or see the local configuration installation instructions in [Chapter 2, “Advanced Installation Steps”](#), [Section 2.5.1](#).

Configuring Windows NT for Remote Administration

If you are installing the SRCU21 in a server that is configured with Windows NT and is to be remotely administered, refer to the remote configuration installation instructions in [Chapter 2, “Advanced Installation Steps”](#), [Section 2.5.3](#).

1.4.2.2 Software Requirements for Local Administration

- SRCU21 CD-ROM
- Hard Disk Space: 9 MB Minimum
- SRCU21 Windows NT Installation Diskette (Microsoft Windows NT SCSI Miniport Diskette) (one blank high density floppy diskette required)
- Microsoft Windows NT Server 4.0†
- Microsoft Windows NT 4.0 Service Pack 5 or greater†
- Microsoft Internet Explorer 4.00 or greater†

† Not supplied

1.4.2.3 Installing Microsoft Windows NT Server on a Intel Integrated RAID Volume

1. Create a SRCU21 Microsoft Windows NT SCSI Miniport Diskette.
 - a. Insert the Intel Integrated RAID CD-ROM into the target system and restart the system to boot from the CD-ROM.



- b. When the ROM-DOS Startup Menu appears select option #1, *Make Diskettes*.
 - c. When the *Select a Diskette to Create* screen appears, select *Windows NT Installation*. A command window then appears.
 - d. Insert a blank high-density diskette in drive A: and press Enter to create the Windows NT SCSI Miniport Diskette. Alternatively, the CD-ROM can be inserted into a different system running Windows 95, 98 or NT. The CD-ROM's *auto-run* feature will bring up a menu that will allow creation of the SRCU21 NT Installation Diskette.
2. Install Microsoft Windows NT Server 4.0
 - a. Boot with the NT Server CD-ROM.
 - b. Press F6 as soon as the blue screen appears to ensure that the Microsoft Windows NT bypasses mass storage controller detection.
 - c. When prompted to specify a mass storage controller, select S to specify additional storage devices and then select Other. Insert the SRCU21 Microsoft Windows NT SCSI Miniport Diskette (created in [step 1.](#) above) in the floppy drive. Press Enter to select the I₂O Miniport Driver and continue with the NT installation.
 - d. After completing the NT installation, install the following components and software:
 - Microsoft Windows NT 4.0 Service Pack 5 or greater
 - Microsoft Internet Explorer 4.00 or greater

Note: If your browser is configured to use a proxy server, ensure that it is configured to bypass the proxy server for local addresses. See [Appendix B, "Troubleshooting Scenarios"](#), ["Browser Configuration During Initial Installation"](#) for details on configuring a browser to bypass the proxy server for local addresses and return to this procedure.

3. Install the Intel Integrated RAID software (run the Intel Integrated RAID setup).

Note: The system should be powered on and logged into NT with an administrator's account before proceeding.

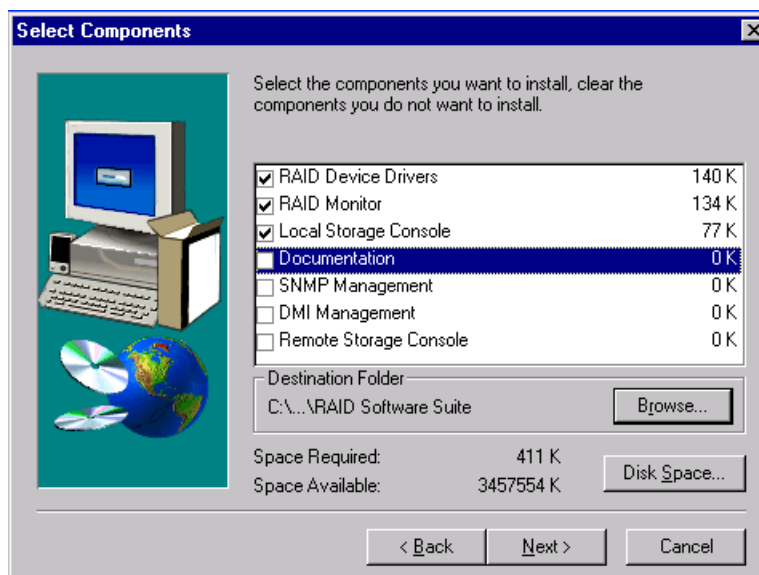
- a. Insert the Intel Server RAID Controller U2-1 CD-ROM in the CD-ROM drive. (If the RAID Installer Menu does not appear, then run the setup.exe file that resides at: <CD-ROM root>\os_setup\winnt\setup.exe on the CD-ROM and skip step B.)
- b. Click on the Setup button. See [Figure 1-3](#). Accept the default selections to complete installation.

Figure 1-3. Intel® Integrated RAID Installer Main Menu



- c. Click *Next*, *Yes*, then *Next* again to continue. The components in the *Select Components* window below are preselected. Accept this configuration by clicking on *Next*.

Figure 1-4. Preselect Components



- d. Click *Yes* to accept the installation of the documentation.
- e. Click *Next* to start the installation process. After completion, the setup will return to the main menu. Remove the CD-ROM from the CD-ROM drive and reboot.



Note: Refer to section [Section 4.2, “Intel® Integrated RAID Software Component Installation”](#) on [page 4-2](#) for information on HP Openview and RAID Monitor, SNMP, DMI components or remote storage console.

4. See [Chapter 4, Section 4.3, “Configuring RAID Volumes Using the Intel® Integrated RAID Storage Console”](#) on [page 4-12](#) to customize your RAID volumes using Storage Console.

1.4.3 Setup and Installation for Novell NetWare*

1.4.3.1 Software Requirements

- SRCU21 CD-ROM
- Hard disk space: minimum 4 MB
- MS-DOS* 5.x or later (Novell 4.2 only)
- SRCU21 NetWare Installation Diskette (one blank high density floppy diskette required)
- Novell NetWare 4.2 with Service Pack 6a or higher or Novell NetWare 5.0 with Service Pack 4a or higher†

† Not supplied

1.4.3.2 Installing Novell NetWare on a RAID Volume

There are two procedures listed below (one for each supported version of NetWare). Please follow the instructions for the version you wish to install (version 4.2 or 5.0).

NetWare 4.2

1. Create a SRCU21 NetWare Installation Diskette.
 - a. Insert the Intel Integrated RAID CD-ROM into the target system and restart the system to boot from the CD-ROM.
 - b. When the ROM-DOS Startup Menu appears select option #1, *Make Diskettes*.
 - c. When the *Select a diskette to create* screen appears, select *NetWare Installation*. A command window appears.
 - d. Insert a blank high-density diskette in drive A: and press Enter to create the SRCU21 NetWare Installation Diskette. Alternatively, the CD-ROM can be inserted into a different system running Windows 95, 98 or NT. The CD-ROM's *auto-run* feature will bring up a menu that will allow creation of the SRCU21 NetWare Installation Diskette.
2. Insert the NetWare Installation CD-ROM, reboot the server, go to the appropriate drive letter and start the NetWare 4.2 installation.
3. When the device driver installation screen appears, *Select additional or modify selected Disk/LAN drivers*.
4. Choose *Select an additional driver*. Hit *Insert* to install an unlisted driver. Ensure that the SRCU21 NetWare Installation diskette (created in [step 1.](#)) is in the floppy drive and hit *Enter*. Select *BKSTROSM.HAM* from the list.
5. Continue with the NetWare installation as normal by following the screen prompts.

6. Once the server installation is finished, complete the installation of the Intel Integrated RAID software suite by following the steps below.
7. Run *LOAD INSTALL*.
8. Select *Product Options*, then *Install product not listed*. It will tell you that it is going to scan the A: drive for installation scripts. Ensure the SRCU21 NetWare Installation diskette is in the floppy drive, hit *Enter* to continue.
9. A screen prompt will ask which components (see below) you wish to install. Select the following components and hit *F10* to continue.

BKSTROSM.HAM

HTTP and Winsock Services

RAID Management Agents

The appropriate files are copied and the AUTOEXEC.NCF and STARTUP.NCF files are modified as necessary.

Caution: Once the product is installed, check for and remove any duplicate lines in STARTUP.NCF. For example, NetWare 4.2 installations may insert an extra load line for the module PK411.NLM. *Remove the extra line.*

10. After the installation is complete, reboot the server.
11. Load Support Pack 8a and reboot.
12. See [Chapter 4, Section 4.3, “Configuring RAID Volumes Using the Intel® Integrated RAID Storage Console”](#) on page 4-12 to customize your RAID volumes using Storage Console.

NetWare 5

Note: If you do not use the boot capability of the NetWare 5 CD-ROM, then replace step 2-5 below with steps 2-4 of the NetWare 4.2 instructions above.

1. Create a SRCU21 NetWare Installation Diskette.
 - a. Insert the Intel Integrated RAID CD-ROM into the target system and restart the system to boot from the CD-ROM.
 - b. When the ROM-DOS Startup Menu appears select option #1, *Make Diskettes*.
 - c. When the *Select a diskette to create* screen appears, select *NetWare Installation*. A command window appears.
 - d. Insert a blank high-density diskette in drive A: and press *Enter* to create the SRCU21 NetWare Installation Diskette. Alternatively the CD-ROM can be inserted into a different system running Windows 95, 98 or NT. The CD-ROM's *auto-run* feature will bring up a menu that will allow creation of the SRCU21 NetWare Installation Diskette.
2. Insert the NetWare CD-ROM and reboot.
3. After booting, accept the license agreement. Then select *Create a New Boot Partition*.
4. When NetWare boots again, it will first format the newly created boot partition, and then start loading files. During this initialization, you will see a white graphical NetWare logo screen.
5. It will eventually load a Welcome screen, asking you to verify the startup directory (C:\NWSERVER). Hit *Alt F10* to exit the installation. At the console, type *Down*. The installation exits to the boot drive prompt.

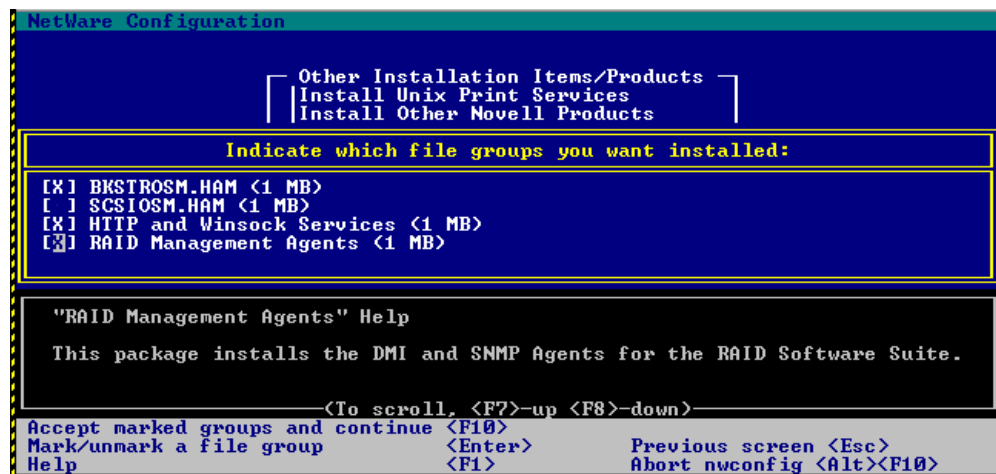
6. Insert the SRCU21 NetWare installation diskette created in [step 1](#). into the A: drive. If your boot drive is C:, then run NWUPDATE.BAT. If your boot drive is other than C:, then create an NWUPDATE subdirectory and copy all the files from A:\DRIVERS into the NWUPDATE subdirectory.
7. Remove the diskette from the A: drive and reboot the server. After booting you will be asked to accept the license agreement. Do so and then select *Continue with Existing Partition*. You are now ready to install NetWare 5 on the Intel Integrated RAID volume.
8. Continue with the NetWare installation as normal by following the screen prompts. Select the Block Storage OSM when prompted.
9. Reboot the server and install Service Pack 4 or higher. Once the server installation is completed, reboot the server.
10. To install the Intel Integrated RAID software (run the Intel Integrated RAID setup) run *NWCONFIG*.
11. Select *Product Options*, then *Install product not listed*. It will tell you that it is going to scan the A: drive for installation scripts. Ensure the SRCU21 NetWare Installation diskette is in the floppy drive, hit *Enter* to continue.
12. A screen prompt will ask which components (see below) you wish to install. Select the following components and hit *F10* to continue. See [Figure 1-5](#).

```

BKSTROSM.HAM
HTTP and Winsock Services
RAID Management Agents

```

Figure 1-5. Component Installation



The appropriate files are copied and the AUTOEXEC.NCF and STARTUP.NCF files are modified as necessary.

13. After the installation is complete, reboot the server.
14. See [Chapter 4, Section 4.3, "Configuring RAID Volumes Using the Intel® Integrated RAID Storage Console"](#) on page 4-12 to customize your RAID volumes using Storage Console.

1.4.4 Setup and Installation for UnixWare* 7.1

1.4.4.1 Software Requirements

- SRCU21 CD-ROM
- Hard disk space: minimum 20 MB
- SRCU21 UnixWare Installation Disk (HBA diskette) (one blank high density floppy diskette required)
- SCO UnixWare 7.1 software with Netscape 4.08 or greater†

† Not supplied

1.4.4.2 Installing UnixWare on a RAID Volume on a Stand Alone Server

Follow the required procedure below to install Intel Integrated RAID.

Note: When installing UnixWare, create only one RAID volume on which the operating system is to be installed.

1. Create a SRCU21 UnixWare installation disk (HBA diskette): Insert the Intel Integrated RAID CD-ROM into the target system and restart the system to boot from the CD-ROM. When the ROM-DOS Startup Menu appears select option #1, *Make Diskettes*. When the *Select a diskette to create* screen appears, select *UnixWare Installation*. A command window then appears. Insert a blank high-density diskette in drive A: and press *Enter* to create the UnixWare Installation Disk. Alternatively the CD-ROM can be inserted into a different system running Windows* 95, 98 or NT. The CD-ROM's *auto-run* feature will bring up a menu that will allow creation of the UnixWare Installation Disk. If more than one RAID volume is required, complete this installation and then use Storage Console to create multiple volumes.
2. Insert the UnixWare installation disk 1 (of 2 disks) and reboot. Install the OS using the install instruction provided in UnixWare 7 Installation Guide manual. UnixWare will prompt you to install Host Bus Adapter diskette. At that time insert the SRCU21 UnixWare Installation diskette created in [step 1](#).

Warning: Only use the version of the SRCU21 UnixWare installation disk (HBA disk) that is provided on the CD or available from the Intel Web site for installation of this adapter. Do not use a HBA disk available from the vendor to install this product.

Note: During the installation of UnixWare, you will be prompted to install the Network Information Services (NIS) package.

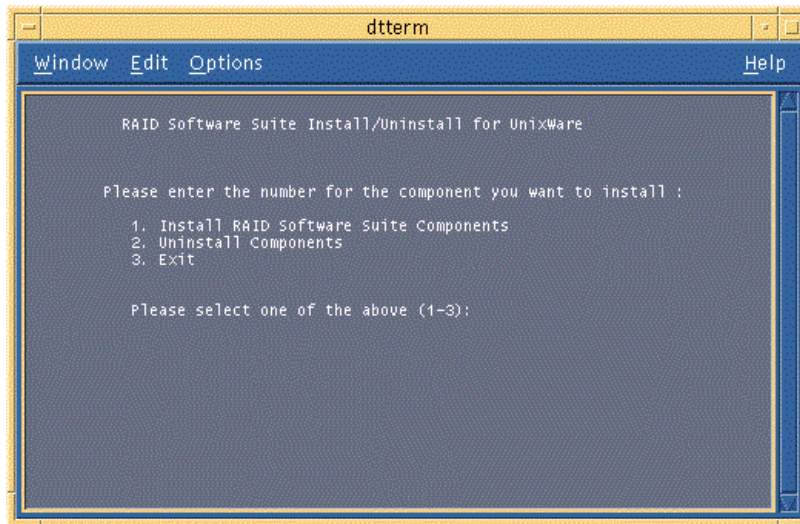
When prompted defer the installation of NIS by pressing *F8* on the NIS configuration screen. If you decide at a later time to install NIS, you can do so using the `pkgadd(1)` command.

3. Install the Netscape browser. The Netscape browser is provided in the SCO UnixWare CD-ROM Disk 2 of 3.
4. After completing the UnixWare installation insert the Intel Server RAID Controller U2-1 CD-ROM in the CD-ROM drive and mount the CD-ROM.
 - a. Create a directory to mount the file. For example, type `mkdir cdfiles` at the prompt.
 - b. Mount the CD-ROM to the folder by typing:

```
mount -F cdfs -r /dev/cdrom/cdrom1 /cdfiles
```

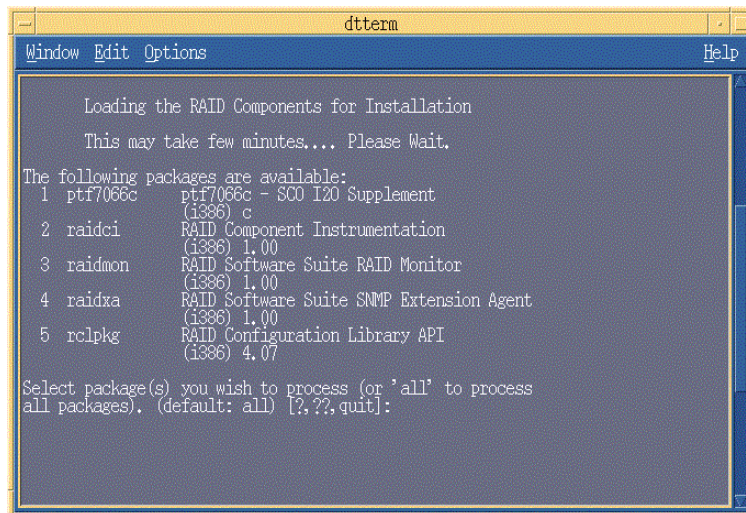
5. Launch the installer by typing the following:
 - a. Type `cd /cdfiles/os_setup/unixware`
 - b. Type `sh install` to start the install script.

Figure 1-6. Launched Scripts



- c. Select option 1 (by typing 1) to install the requirements and components. See [Figure 1-6](#). The launched scripts are shown in [Figure 1-7](#).

Figure 1-7. Install Components



6. Press *Enter* to select all packages. After completing the installation of the components reboot the server.
7. Log on to the server as root or equivalent.

8. Launch Storage Console
 - a. To launch Storage Console launch Netscape and ensure that the URL points to <http://localhost:360/>. Hit Enter.
 - b. Click on the IOP # card that you want to configure; for example, IOP0, IOP1 etc.
 - c. Click on the RAID Storage Console link. The Storage Console appears.
9. See [Section 4.3, "Configuring RAID Volumes Using the Intel® Integrated RAID Storage Console"](#) on page 4-12 to customize your RAID volumes using Storage Console.

1.5 Getting Help

1.5.1 World Wide Web

<http://support.intel.com/support/motherboards/server/srcu21>

1.5.2 Telephone

Customer Support** (Intel reserves the right to change pricing for telephone support at any time without notice).

In the U.S.: 1-900-555-5800 (M - F, 7:00 am - 5:00 pm, Th 7:00 am - 3:00 pm, PST).
Calls billed in the U.S. \$2.50 per minute.

In the U.S. and Canada: 1-800-404-2284 (M - F, 7:00 am - 5:00 pm,
Th 7:00 am - 3:00 pm, PST). Credit card calls billed at U.S. \$25 per incident.

In Europe:

English language: +44-131-458-6847
French language: +44-131-458-6848
German language: +44-131-458-6954
Italian language: +44-131-458-6951

(M, Th, F, 8:00 am - 5:00 pm, T - W, 8:00 am - 4:00 pm, UK time) Credit card calls billed at U.S. \$25 per incident (levied in local currency at the applicable credit card exchange rate plus applicable VAT).

In the Asia-Pacific region (Singapore local time, Oct - April: M - F, 6:00 am - 4:00 pm; April - Oct: M - F, 5:00 am - 4:00 pm). Credit card calls billed at U.S. \$25 per incident.

Australia (Sydney): +1-800-649-931
Hong Kong: +852-2-844-4456
Korea: +822-767-2595
PRC: +852-2-844-4456
Singapore: +65-831-1311
Taiwan: +886-2-718-9915



Rest of the world: Call the North American Service Center at +1-916-377-7000 (M - F, 7:00 am - 5:00 pm, U.S. pacific standard time). Credit card calls billed at U.S. \$25 per incident.

** Or contact your local dealer or distributor.

1.5.3 Technical Training and Support

If you are registered in the Intel Processor Dealer Program (North America), the Genuine Intel Dealer Program (Asia-Pacific Region), or the Intel Processor Integrator Program (Europe/Latin America), you are eligible for technical training and support.

In U.S. and Canada: 1-800-538-3373, ext. 442 (M - F, 5:00 *am* - 5:00 *pm*, PST)

In Europe: contact your distributor or fax your details to European Literature at +44 (0) 1793 513142.

In Asia: +65-831-1379 (M - F, 8:30 am - 5:30 pm, Singapore local time) or via e-mail: APAC_gid@ccm.isin.intel.com



Advanced Installation Steps

2

2.1 Introduction

The advanced installation steps are detailed installation procedures for installing the Intel® Server RAID Controller U2-1 (SRCU21) into servers running Windows NT* Server, Novell NetWare* and SCO UnixWare*.

2.1.1 Summary of Contents

- RAID Configuration Utility
- Advanced RAID Configuration Utility
- Overview of Setup and Installation for Local Administration of NT Server
 - Setup and Installation for Local Administration of Microsoft Windows NT* Server
 - RAID Requirements for Microsoft Windows NT Server 4.0
 - Installing Microsoft Windows NT Server 4.0 on a Intel® Integrated RAID Volume
 - Installing Microsoft Windows NT Server 4.0 on a Pass-through Disk or other Storage Device
 - Install Intel® Server RAID Controller U2-1 on an Existing NT 4.0 Server
- Overview of Setup and Installation for Remote Administration for NT Server
 - Setup and Installation for Microsoft Windows NT* Server 4.0
 - RAID Requirements for Microsoft Windows NT Server 4.0
 - Installing Microsoft Windows NT Server 4.0 on a Intel® Integrated RAID Volume
 - Installing Microsoft Windows NT Server 4.0 on a Pass-through Disk or another Storage Device
 - Install Intel Server RAID Controller U2-1 on an Existing NT 4.0 Server
- Uninstalling Intel Server RAID Controller U2-1 from NT Server
- Setup and Installation for Novell NetWare*
 - RAID Requirements for Novell NetWare
 - Installing Novell NetWare on a RAID Volume
 - Installing Intel Server RAID Controller U2-1 on an Existing Novell NetWare Server
 - Uninstalling Intel Server RAID Controller U2-1 from NetWare
- Setup and Installation for UnixWare*
 - RAID Requirements for UnixWare
 - Installing UnixWare on a RAID Volume
 - Installing UnixWare on a Pass-through Device or another Storage Device
 - Install Intel® Server RAID Controller U2-1 on an Existing UnixWare Server
 - Uninstalling Intel® Server RAID Controller U2-1 from UnixWare

2.2 RAID Configuration Utility

2.2.1 Introduction

RAID Configuration Utility is a BIOS based utility used to configure a RAID volume prior to OS installation. RAID Configuration Utility is designed to allow you to easily create a volume using the highest RAID level available based on the number of disks found in your system.

Use RAID Configuration Utility to:

- Create, name and configure a single RAID Volume
- Display Volume information
- Delete a RAID Volume
- Reset an Entire RAID Configuration
- Display Help Text
- Low Level Format disks
- Pass-through disks to OS
- Select boot device

Note: The RCU is the only utility that allows creation/configuration of a boot device.

2.2.2 How to Invoke RAID Configuration Utility (RCU)

During system boot-up the message “Press Ctrl C to run the RAID Configuration Utility” appears in the display. *If you wish to execute the RAID Configuration Utility, press “Ctrl C” when this message appears.* Follow the screen instructions to create and configure a RAID volume. If you do not wish to execute the RAID Configuration Utility, then do nothing when this message appears. The message will display for 5 seconds; if “Ctrl C” is not entered, the system will continue booting.

Note: If any disk drives in your RAID volume have failed, then a message will appear on the screen informing you that one or more disk drives have failed.

2.2.2.1 Accessing the RAID Configuration Utility with More than One SRCU21 Adapter Installed

When two SRCU21 adapters are installed in a system and the system is booted, both RAID Configuration Utilities will execute. They will execute in the order in which the system BIOS enumerates the PCI slots where the adapters are inserted. When using the RCUs you must understand the order in which the system BIOS enumerates the PCI slots to determine which adapter to configure. Once you have determined the order in which the adapter’s expansion ROM’s are loading, press Ctrl C during the expansion ROM load screen for the adapter that you wish to configure. The RAID Configuration Utility prompt (Ctrl C) will load and be shown twice, once per adapter as the system boots up.

Example Expansion ROM load screen:

```
Intel (R) Integrated RAID - RAID Configuration Utility #.##
Copyright (c) Intel Corporation 1998-2000 All Rights Reserved

Initialization in Progress. Please Wait...

Press Ctrl C to run the RAID Configuration Utility
```

Note: *Boot Volume:* Configure only one volume as the boot first volume on one of the cards. If two are configured (one on each card), which ever one is listed in the system BIOS hard drive boot priority will boot first. Note that there is no way to determine the difference in the hard drive boot priority list because both adapters are listed as “Intel Integrated RAID” in the system BIOS.

Note: One way to determine one SRCU21 adapter from another is to note the model number and size of the hard drives attached to each. Often the number or size of the attached hard drives will be different on the two controllers. By viewing the number of drives and their sizes in the RCU you can determine which adapter you are configuring.

2.2.2.2 The Number of System Drives and RAID Level

During the creation of a RAID volume by RAID Configuration Utility, a RAID level is proposed, based on the number of available SCSI disks present in your system. See [Table 2-1](#) for information regarding the number of drives and the RAID level selected.

Table 2-1. RAID Level Proposed by RAID Configuration Utility Based on the Number of System Drives

# Drives in System	RAID Level Proposed
1	0
2	1
3	5
4 - 15	5 with global hot spare
NOTE: Viewable drives are listed by their SCSI ID and BUS ID.	

If you intend to boot the operating system from a RAID volume, you must first create a RAID volume using the RAID Configuration Utility. Refer to [Section 2.3.3, “Creating a RAID Volume in RAID Configuration Utility”](#) on page 2-5 in the [Exploring the Utilities](#) chapter for information on creating a RAID volume before installing the operating system.

2.3 Configuring and Administering RAID Volumes in the RAID Configuration Utility

2.3.1 Keyboard Navigation

See [Table 2-2](#) for RAID Configuration Utility keyboard functionality.

Table 2-2. RAID Configuration Utility Keyboard Navigation

Key	Function
ESC Key	Return to Previous Screen
Arrow Keys	Navigate between options and/or input fields
Enter	Submit Selection
Hot Keys	Hot Keys are highlighted in dark blue

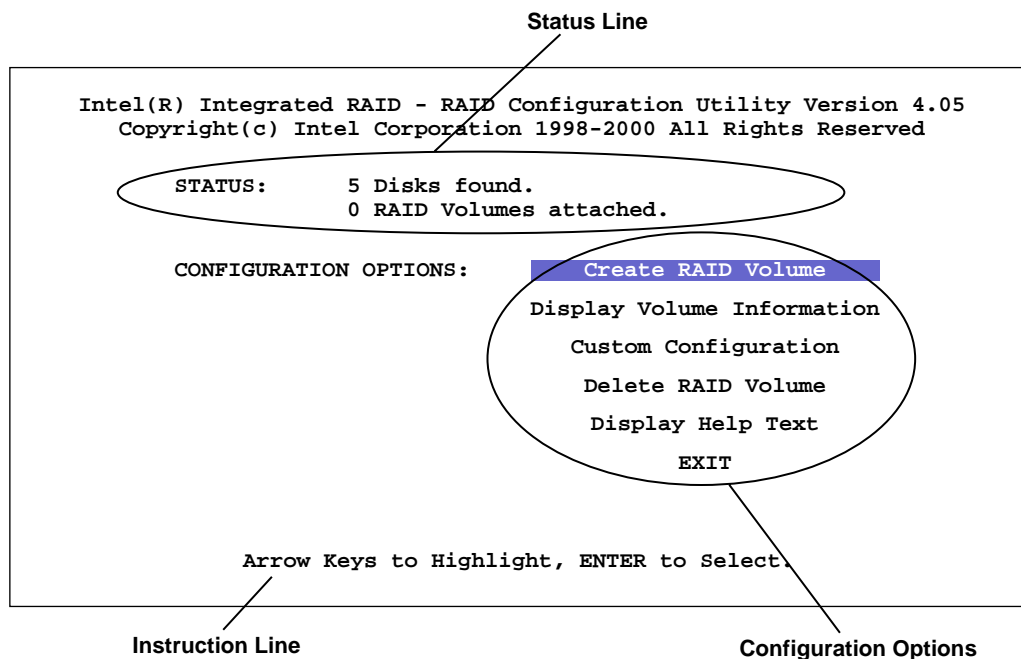
2.3.2 RAID Configuration Utility – Main Menu

Note: The RAID Configuration Utility is run from BIOS.

If you choose to run the RAID Configuration Utility (Ctrl C at boot-up), the *Main Menu* appears (see [Figure 2-1, “RAID Configuration Utility - Main Menu”](#) on page 2-4).

The *Status Line* will vary in the opening screen in [Figure 2-1](#) depending upon the number of disk drives found, number of RAID volumes configured, number of failed disk drives and the number of global hot spares declared. The status line in the [Figure 2-1](#) example displays a status of 5 disks found and no RAID volumes configured.

Figure 2-1. RAID Configuration Utility - Main Menu



2.3.2.1 Exiting RAID Configuration Utility

There are two ways to exit the RAID Configuration Utility.

- Select EXIT. The system reboots after exiting the utility.

- Hit the *Esc* key. The confirmation screen appears. Select *YES* to exit RAID Configuration Utility; the system continues booting. If you wish to remain in the RAID Configuration Utility, Select *NO* and you will return to the RAID Configuration Utility main menu.

2.3.3 Creating a RAID Volume in RAID Configuration Utility

To create a new RAID volume in RAID Configuration Utility, highlight the *Create RAID Volume* option in the RAID Configuration Utility main menu and press Enter.

Note: The RAID Configuration Utility will automatically use *ALL* the disk drives available to the Intel Integrated RAID hardware for the creation of a volume. However, you can choose how large to make the RAID volume.

2.3.3.1 RAID Configuration Utility RAID Level Volume Selection

The number of drives present in your system determines the type of menu the user sees when a RAID volume is created. For example, when one SCSI disk is available, the user has the option of creating a RAID 0 level volume. When two SCSI disks are available, then the user has the option of creating a RAID 0 or 1 level volume. When three or more SCSI disks are available in your system, it is possible to create a RAID 0, RAID 1 or RAID 5 level volume. RAID 5 is the typical configuration for systems with three or more SCSI disks. See [Figure 2-2](#).

Figure 2-2. Three or More SCSI Disk RAID Configuration Selection

```

Intel(R) Integrated RAID - RAID Configuration Utility Version 4.05
Copyright(c) Intel Corporation 1998-2000 All Rights Reserved

Please select from the following RAID Volume Creation options.

RAID VOLUME LEVEL:          RAID 0
                             RAID 1
                             RAID 5  <- Typical

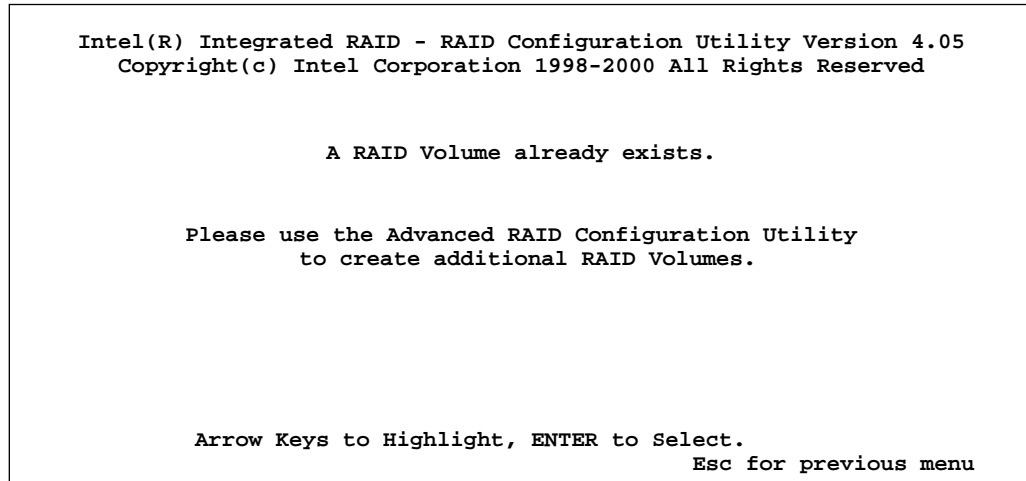
Arrow Keys to Highlight, ENTER to Select.
                             Esc for previous menu
  
```

2.3.3.2 RAID Configuration Utility - All Disks Already in a RAID Volume

If you select the *Create RAID Volume* option when *one or more RAID volumes already exist*, then the “A RAID Volume already exists” screen appears. See [Figure 2-3](#). While in RAID Configuration Utility you will be unable to create new RAID volumes without first deleting all existing RAID volume(s).

Note: The number of volumes you can create using RAID Configuration Utility is limited to one. However, you may select the size of this volume.

Figure 2-3. RAID Volume Already Exists



2.3.3.3 Create a RAID 0 Volume

A RAID 0 volume creation screen is shown in [Figure 2-4](#).

Naming the RAID Volume

In [Figure 2-4](#), RAID 0 volume is named *Volume1*. By default, the first RAID volume name will always appear as *Volume1*. You are free to rename the RAID volume providing it starts with an alpha character between A and Z in upper or lower case and does not exceed the 15 character limit. The name may include an “_” (underscore) character. Rename the existing volume name if needed.

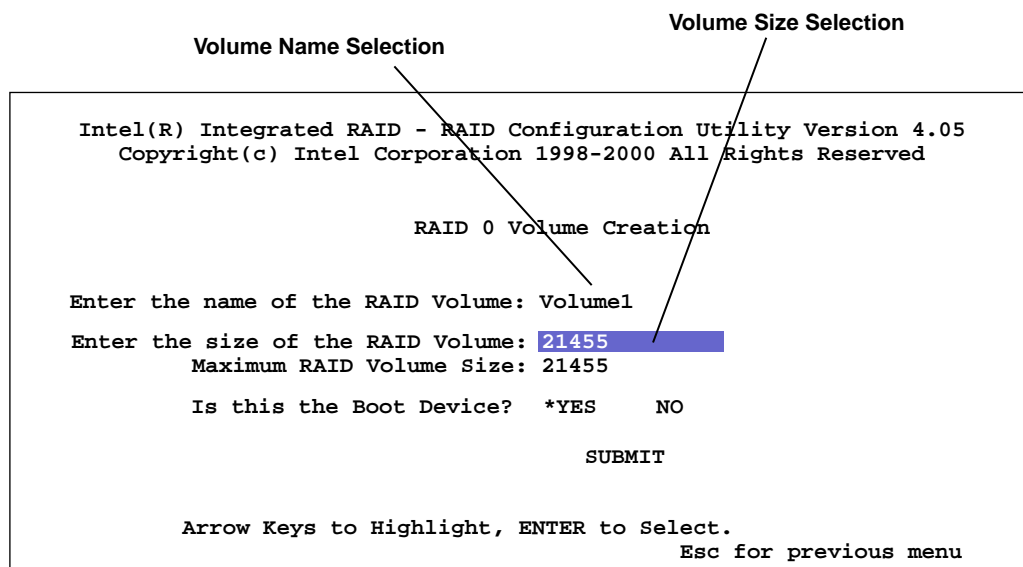
Choosing the Size of the RAID Volume

In [Figure 2-4](#), the maximum volume size available (by default the maximum size always appears), 21455, has been selected. Another way to allocate the maximum size available to a RAID volume is to enter a size value of 0. A value of 0 will automatically allocate all available space to a new RAID volume. Enter the appropriate volume size.

Choosing the RAID Volume as a Boot Device

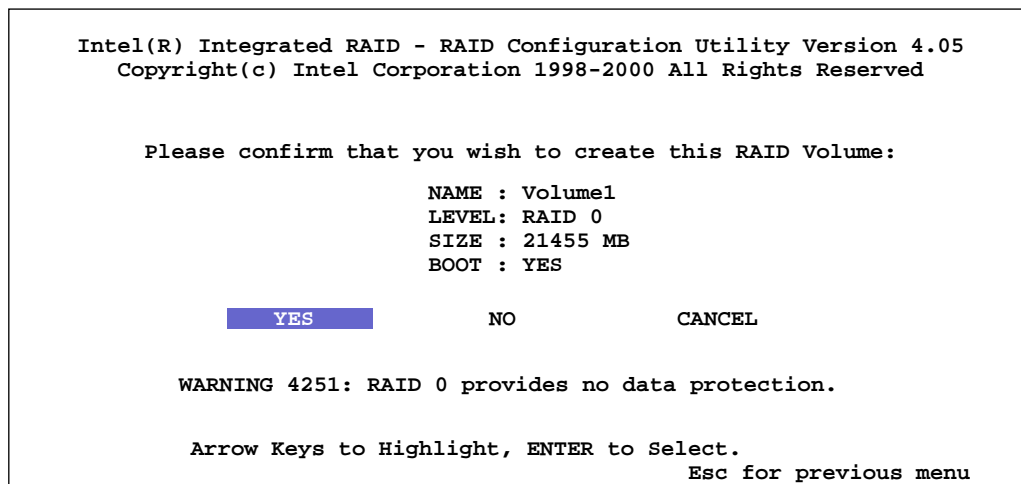
In [Figure 2-4](#), the RAID 0 Volume being created is selected by default to become the boot device. To select the RAID 0 Volume as a boot device select *Yes*, or select *No* to create the volume without selecting it as the boot device. For more information about selecting a boot device see [Section 2.3.4.3](#). The RAID 0 confirmation screen appears ([Figure 2-5](#)).

Figure 2-4. Create RAID 0 Volume



The Create RAID 0 confirmation screen confirms that the user is creating a RAID 0 volume. If you are satisfied with the selections you have made for your RAID 0 volume, select *Yes* and the volume creation process begins.

Figure 2-5. Create RAID 0 Confirmation



2.3.3.4 Create a RAID 1 Volume

RAID 1 volumes can differ based upon the number of disk drives that are installed in your system at the time of volume creation. For example, when a RAID 1 volume is created *with more than two drives* installed in your system, then you have the option of using one of the drives as a global hot spare. If there are only 2 SCSI disks, then the global hot spare option is not available.

Figure 2-6 shows the RAID 1 volume creation screen when 3 or more SCSI disks are connected.

Naming the RAID Volume

In Figure 2-6, RAID 1 volume is named *Volume1*. By default, the first RAID volume name will always appear as *Volume1*. You are free to rename the RAID volume providing it starts with an alpha character between A and Z in upper or lower case and does not exceed the 15 character limit. The name may include an “_” (underscore) character. Rename the existing volume name if needed.

Choosing the Size of the RAID Volume

In Figure 2-6, the maximum volume size available (by default the maximum size always appears), 8582, has been selected. Another way to allocate the maximum size available to a RAID volume is to enter a size value of 0. A value of 0 will automatically allocate all available space to a new RAID volume. Enter the appropriate volume size.

Create with Hot Spare

The *Create with Hot Spare* option gives you the ability to define a global hot spare. In Figure 2-6 a global hot spare is selected (an asterisk indicates the selection). Select *Yes* to create a hot spare.

Choosing the RAID Volume as a Boot Device

In Figure 2-6, the RAID 1 Volume being created is selected by default to become the boot device. To select the RAID 1 Volume as a boot device select *Yes*, or select *No* to create the volume without selecting it as the boot device. For more information about selecting a boot device see Section 2.3.4.3. The RAID 1 confirmation screen appears.

Figure 2-6. Create RAID 1 Volume

```

Intel(R) Integrated RAID - RAID Configuration Utility Version 4.05
Copyright(c) Intel Corporation 1998-2000 All Rights Reserved

                RAID 1 Volume Creation

Enter the name of the RAID Volume: Volume1
Enter the size of the RAID Volume: 8582
Maximum RAID Volume Size: 8582

        Create with Hot Spare? *YES    NO
        Is this the Boot Device? *YES  NO

                SUBMIT

        Arrow Keys to Highlight, ENTER to Select.
                                Esc for previous menu

```

Select *Submit*. The RAID 1 confirmation screen appears. If you are satisfied with the selections you have made for your RAID 1 volume, select *Yes* in the confirmation screen and the volume creation process begins.

2.3.3.5 Create a RAID 5 Volume (with 3 Disks)

Figure 2-7 shows the RAID 5 volume creation screen with 3 SCSI disks available.

Naming the RAID Volume

In [Figure 2-7](#), RAID 5 volume is named *Volume1*. By default, the first RAID volume name will always appear as *Volume1*. You are free to rename the RAID volume providing it starts with an alpha character between A and Z in upper or lower case and does not exceed the 15 character limit. The name may include an “_” (underscore) character. Rename the existing volume name if needed.

Choosing the Size of the RAID Volume

In [Figure 2-7](#), the maximum volume size available (by default the maximum size always appears), *12873*, has been selected. Another way to allocate the maximum size available to a RAID volume is to enter a size value of 0. A value of 0 will automatically allocate all available space to a new RAID volume. Enter the appropriate volume size.

Choosing the RAID Volume as a Boot Device

In [Figure 2-7](#), the RAID 5 Volume being created is selected by default to become the boot device. To select the RAID 5 Volume as a boot device select *Yes*, or select *No* to create the volume without selecting it as the boot device. For more information about selecting a boot device see [Section 2.3.4.3](#). The RAID 5 confirmation screen appears.

Figure 2-7. Create RAID 5 Volume with 3 Disks

```
Intel(R) Integrated RAID - RAID Configuration Utility Version 4.05
Copyright(c) Intel Corporation 1998-2000 All Rights Reserved

RAID 5 Volume Creation

Enter the name of the RAID Volume: Volume1
Enter the size of the RAID Volume: 12873
Maximum RAID Volume Size: 12873

Is this the Boot Device? *YES NO

SUBMIT

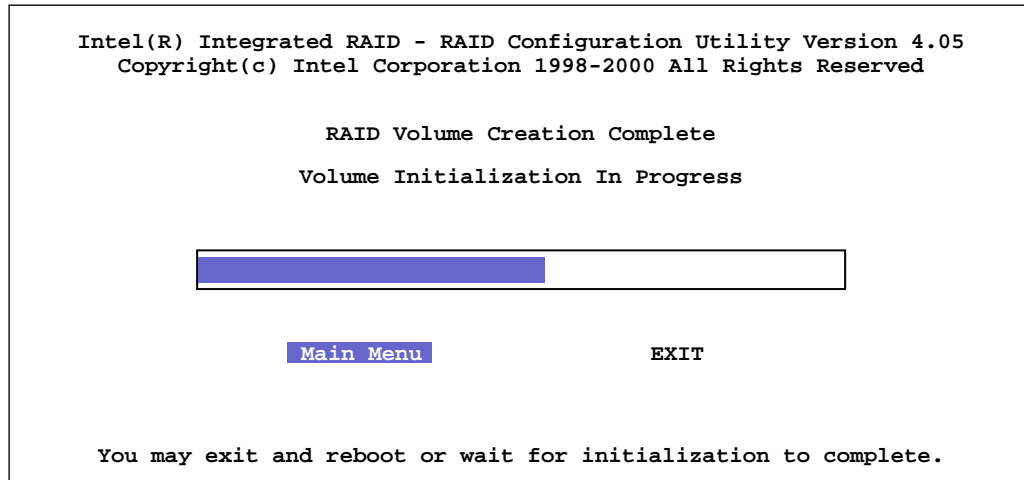
Arrow Keys to Highlight, ENTER to Select.
Esc for previous menu
```

Highlight *Submit* and press Enter. The RAID 5 confirmation screen appears. If you are satisfied with the selections you have made for your RAID 5 volume, select *Yes* in the confirmation screen. The volume is created and begins to initialize.

The RAID 5 Volume Creation Complete, Successful Initialization in Progress screen is displayed after a RAID 5 volume has been successfully created. This screen automatically updates to show the progress of the initialization of the new RAID 5 volume. See [Figure 2-8](#).

Note: You do not have to wait for this operation to complete. You may use the newly created RAID volume at any time.

Figure 2-8. RAID 5 Volume Initialization in Progress



2.3.3.6 Create a RAID 5 Volume (with more than 3 Disks)

The RAID 5 Volume Creation Screen with more than 3 SCSI disks available is shown in [Figure 2-9](#).

Naming the RAID Volume

In [Figure 2-9](#), RAID 5 volume is named *Volume1*. By default, the first RAID volume name will always appear as *Volume1*. You are free to rename the RAID volume providing it starts with an alpha character between A and Z in upper or lower case and does not exceed the 15 character limit. The name may include an “_” (underscore) character. Rename the existing volume name if needed.

Choosing the Size of the RAID Volume

In [Figure 2-9](#), the maximum size available (by default the maximum size always appears), *8010*, has been selected. Another way to allocate the maximum size available to a RAID volume is to enter a size value of 0. A value of 0 will automatically allocate all available space to a new RAID volume. Enter the appropriate volume size.

Create with Hot Spare

The *Create with Hot Spare* option gives you the ability to define a global hot spare. In [Figure 2-9](#) a Global hot spare is selected (an asterisk indicates the selection). Select *Yes* to create a hot spare.

Choosing the RAID Volume as a Boot Device

In [Figure 2-9](#), the RAID 5 Volume being created is selected by default to become the boot device. To select the RAID 5 Volume as a boot device select *Yes*, or select *No* to create the volume without selecting it as the boot device. For more information about selecting a boot device see [Section 2.3.4.3](#). The RAID 5 confirmation screen appears.

Figure 2-9. Create RAID 5 Volume with more than 3 Disks

```
Intel(R) Integrated RAID - RAID Configuration Utility Version 4.05
Copyright(c) Intel Corporation 1998-2000 All Rights Reserved

RAID 5 Volume Creation

Enter the name of the RAID Volume: Volume1
Enter the size of the RAID Volume: 8010
Maximum RAID Volume Size: 8010

Create with Hot Spare? *YES    NO
Make this Volume the Boot Device? *YES    NO

SUBMIT

Arrow Keys to Highlight, ENTER to Select.
Esc for previous menu
```

Select *Submit*. The RAID 5 confirmation screen appears. If you are satisfied with the selections you have made for your RAID 5 volume, select *Yes* in the confirmation screen. The volume is created and begins to initialize.

The RAID 5 *Volume Creation Complete, Successful Initialization in Progress* screen is displayed after a RAID 5 volume has been successfully created. This screen automatically updates to show the progress of the initialization of the new RAID 5 volume. See [Figure 2-8](#).

Note: You do not have to wait for this operation to complete. You may use the newly created RAID volume at any time.

2.3.4 Custom Configuration

Custom configuration allows the user to define pass through disks, format disks and select boot devices. Click on Custom Configuration in the Main Menu to view the options described in sections [2.3.4.1](#), [2.3.4.2](#) and [2.3.4.3](#). See [Figure 2-10](#).

Figure 2-10. Custom Configuration

```

Intel(R) Integrated RAID - RAID Configuration Utility Version 4.05
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Please select from the following Custom Configuration Options:

Custom Configuration Options: Define Pass Through Disks
                               Format Disks
                               Boot Device Select

Arrow Keys to Highlight, ENTER to Select.
                               Esc for previous menu

```

2.3.4.1 Define Pass Through Disks

Figure 2-11. Custom Configuration - Define Pass Through Disks

```

Intel(R) Integrated RAID - RAID Configuration Utility Version 4.05
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Select the disks to Pass Through to the host:

Disk ID      Size(MB)      Select?
-----      -
0:0          4291           x
0:2          4291
0:3          8678
0:4          4291
0:5          4291

SUBMIT

Arrow Keys to Highlight, ENTER to Select.
                               Esc for previous menu

```

Pass Through refers to a drive that is not controlled by the RAID firmware and thus cannot be a part of a RAID volume. The drive is available to the operating system as an individual disk.

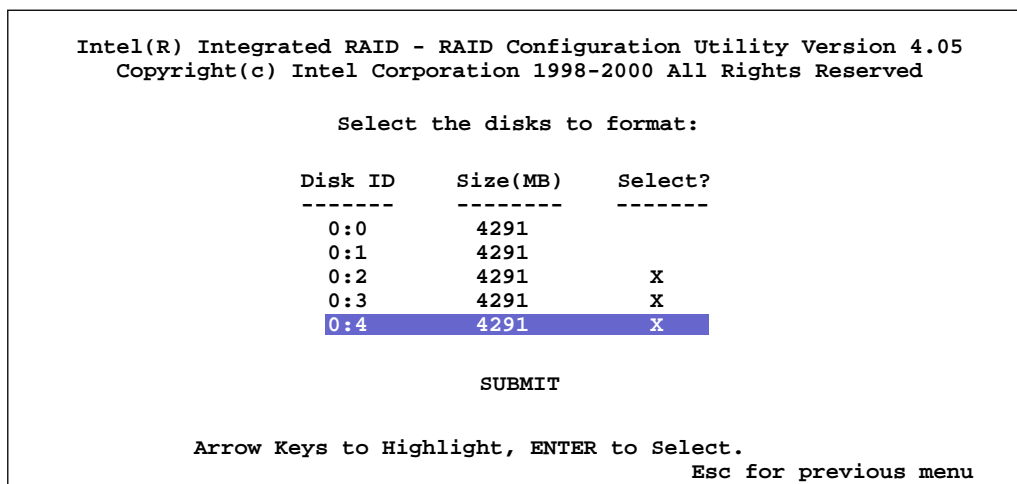
To define a pass-through disk, follow the procedure below.

1. From the main menu select Custom Configuration and press Enter.
2. Highlight the disk to be configured as a Pass Through Drive and press Enter (Disks are listed by SCSI ID). An X will appear next to the drive selected. (To unselect the drive, highlight the drive with a X in the *Select?* column and press Enter. This will unselect the drive from being a pass-through drive. To exit the Custom Configuration utility and return back to the Main Menu, press *ESC* and the utility will exit without saving changes.)

3. Highlight the *Submit* option and press Enter to view which disk will be configured as Pass-through Disks and which disks will be used by Intel Integrated RAID.
4. Highlight *Yes* and press Enter to confirm the selection. A message appears as the drive is prepared: *Disk Pass-Through in progress. Please wait.* After completion, another message appears: *Pass-Through Complete. Press any key.* Press Enter to return to the Main menu.
5. The selected drive(s) is now configured as a pass through disk(s). See [Section 2.3.4.3, Boot Device Select](#) for an explanation of how a pass through disk can be used as a boot device.

2.3.4.2 Format Disks

Figure 2-12. Custom Configuration - Format Disks



This feature allows the user to low-level format the selected disk(s). The user must double-confirm the request before the transaction begins. The user also has the opportunity to cancel the operation before any action is taken.

To format a disk, follow the procedure below.

1. From the main menu select Custom Configuration and press Enter.
2. Select *Format Disks* and press Enter.
3. Select disk(s) to format by highlighting them with the arrow keys and pressing Enter to mark the disk(s) to be formatted. See [Figure 2-12](#).
4. An X will appear under the *Select* column next to the disk. Disks are identified by channel # and then SCSI ID #.
5. Select *Submit*, press Enter to confirm the selection.
6. Select *Yes* at the first confirmation prompt, then *Yes* at the 2nd confirmation prompt to begin formatting the disk(s). You may cancel your action to format the disk(s) at anytime before pressing Enter at the 2nd confirmation screen.
7. Once the disk(s) begins to be formatted, a message appears stating the disk(s) is being formatted. After completion, a message appears confirming the format is complete. Press any key to return to the Custom Configuration screen.

2.3.4.3 Boot Device Select

Figure 2-13. Custom Configuration - Boot Device Select

```

Intel(R) Integrated RAID - RAID Configuration Utility Version 4.05
Copyright(c) Intel Corporation 1998-2000 All Rights Reserved

          Select the Boot Device:

Device          Size(MB)    Select?
-----
Volume1        8582         x
              0:0        8582
              0:1        8582

          SUBMIT

Arrow Keys to Highlight, ENTER to Select.
                               Esc for previous menu

```

The selectable boot device option allows the user to select either one RAID volume or one Pass-through disk as a boot device. This option allows the user to create an Intel Integrated RAID volume while selecting it as the boot device (booting RAID Volume) which the user will install and boot an OS from. The user may instead select a disk that is passed through to the host to be the boot device. In either case, the device is managed through the system BIOS and listed in the BIOS list of boot devices.

To select a Intel Integrated RAID volume as the boot device *when creating the volume*, follow the procedure listed under creating a RAID volume. To select a Intel Integrated RAID volume as the boot device *after creating a volume*, follow the procedure below.

1. From the main menu select Custom Configuration and press Enter.
2. Select *Boot Device Select* and press Enter.
3. Select the volume to be used as the *Boot Device* by highlighting it with the arrow keys and pressing Enter to mark. Volumes are listed alphabetically. An *x* will appear under the *Select* column next to the volume selected. See [Figure 2-13](#).

Note: To unselect a disk from becoming a boot device, highlight the disk selected as a boot device and press *Enter* to remove the *X* or select another disk. You may cancel your action at any time by selecting *Cancel* and pressing *Enter*, or hitting *Esc*.

4. Select *Submit*, press Enter to confirm the selection.

To select a Pass-through Device as the boot device, follow the procedure below.

1. From the main menu select Custom Configuration and press Enter.
2. Select *Boot Device Select* and press Enter.
3. Select the disk to be set as the Boot Device by highlighting it with the arrow keys and press *Enter* to mark the disk. See [Figure 2-13](#).
4. An *x* will appear under the *Select* column next to the disk. Disks are identified by channel number and then SCSI ID number. For example, in [Figure 2-13](#) the disk is identified by channel 0 and SCSI ID number 0 (0:0).

5. Select *Submit*, press Enter to confirm the selection. You may cancel your action at any time by selecting *Cancel* and pressing *Enter*, or hitting *Esc*.

2.3.5 Display Volume Information in RAID Configuration Utility

Click the *Display Volume Information* button in the RAID Configuration Utility main menu to view information about existing RAID Volumes. See [Figure 2-1](#). This option displays limited information. More detailed information may be obtained from Intel Integrated RAID Storage Console. [Figure 2-14](#) shows the Display Volume Information screen.

Figure 2-14. Display Volume Information

```

Intel(R) Integrated RAID - RAID Configuration Utility Version 4.05
Copyright(c) Intel Corporation 1998-2000 All Rights Reserved

                Display Volume Information

Name           Size (MB)    Level    # of Disks    Status
-----
Volume1        12873       5        5             Normal

Number of Hot Spares: 1

                                Esc for previous menu
  
```

2.3.6 Delete a RAID Volume in RAID Configuration Utility

Use the *Delete RAID Volume* screen to delete a RAID volume. See [Figure 2-15](#).

Each attached RAID volume is listed in the *Display Volume Information* screen ([Figure 2-15](#)). In [Figure 2-15](#) the first volume is selected. If no RAID volumes are listed, then the only selectable option is *Reset Entire Configuration*. In [Figure 2-15](#) *Volume1* has been selected to be deleted. Press Enter to delete the highlighted volume. Two confirmation screens appear to verify that you wish to delete the volume.

Figure 2-15. Select RAID Volume to Delete

```

Intel(R) Integrated RAID - RAID Configuration Utility Version 4.05
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                Select the RAID Volume to Delete

Name           Size (MB)   Level   # of Disks   Status
-----
Volume1       12873      5       5            Normal

                Reset Entire Configuration

                Arrow Keys to Highlight, ENTER to Select.
                                Esc for previous menu

```

The *Volume Deletion Successful* screen indicates that a RAID volume was successfully deleted. This action takes approximately 10 seconds to complete. Any key pressed returns the user to the RAID Configuration Utility main menu. The status line is updated to show the newly deleted RAID Volume.

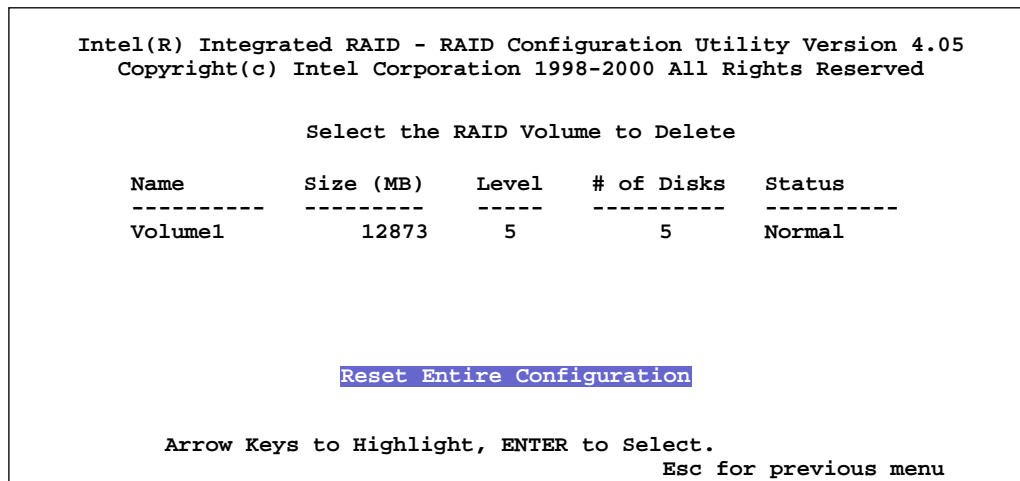
2.3.7 Reset an Entire Configuration in RAID Configuration Utility

Use the *Reset Entire Configuration* screen to reset the entire configuration of your system. To use this feature select the Delete RAID Volume option. See [Figure 2-1, “RAID Configuration Utility - Main Menu”](#) on page 2-4.

Warning: If you reset the configuration in RAID Configuration Utility, then all volumes and spares on all disks are lost. If the OS is installed on a RAID volume, then the OS will be deleted.

See [Figure 2-16](#). Press Enter to reset the configuration. The *Reset Entire Configuration Confirmation* screen appears.

Figure 2-16. Reset Entire RAID Configuration



Select *Yes* to reset the entire configuration. The Configuration Reset in Progress screen appears. This screen indicates that the configuration is being reset.

2.3.8 Display Help Text

This option displays online help.

2.4 Advanced RAID Configuration Utility

2.4.1 Introduction

Advanced RAID Configuration Utility (RCU) is a pre-OS DOS based utility used to create multiple volumes. Advanced RCU is an alternative to the RCU, which can only create more one RAID volume at a time. However, the RCU must be used to select the boot device. See [Section 2.3.4](#) for more information on selecting a boot device.

The Advanced RCU interface is organized exactly as the Storage Console graphical user interface but without the menu. For a full description of Advanced RCU functionality and its use see [Section 4.3.4, Intel® Integrated RAID Storage Console](#). (The Storage Console is the browser-based version of the Advanced RCU.)

Use Advanced RCU to:

- Create and configure more than one RAID volume
- Select specific drives to be part of a RAID volume
- Display Volume information
- Delete a RAID Volume
- Reset an Entire RAID Configuration
- Display Help Text



- Format disks
- Pass-through disks to OS
- Add disks to the server

2.4.2 Keyboard Navigation

Table 2-3. Advanced RCU Keyboard Commands

Command	Functionality
Arrow Key Right	Follow a link
Arrow Key Left	Go Back
Arrow Key Down	Move down (within a screen)
Arrow Key Up	Move up (within a screen)
Enter	Select or submit an action

2.4.3 How to Invoke Advanced RCU

1. Boot the server from the Intel® Integrated RAID CD-ROM.
2. At the ROM-DOS menu select option 3, Advanced RCU.
3. Select the Adapter to be configured. (See [Figure 2-17.](#)) They are listed in the order they are found in the system.
4. Follow the prompts (press Enter 3 times) to continue to the Advanced RCU Main menu.
5. [Figure 2-18](#) shows the main menu configuration screen.

Figure 2-17. Advanced RCU Configuration Menu

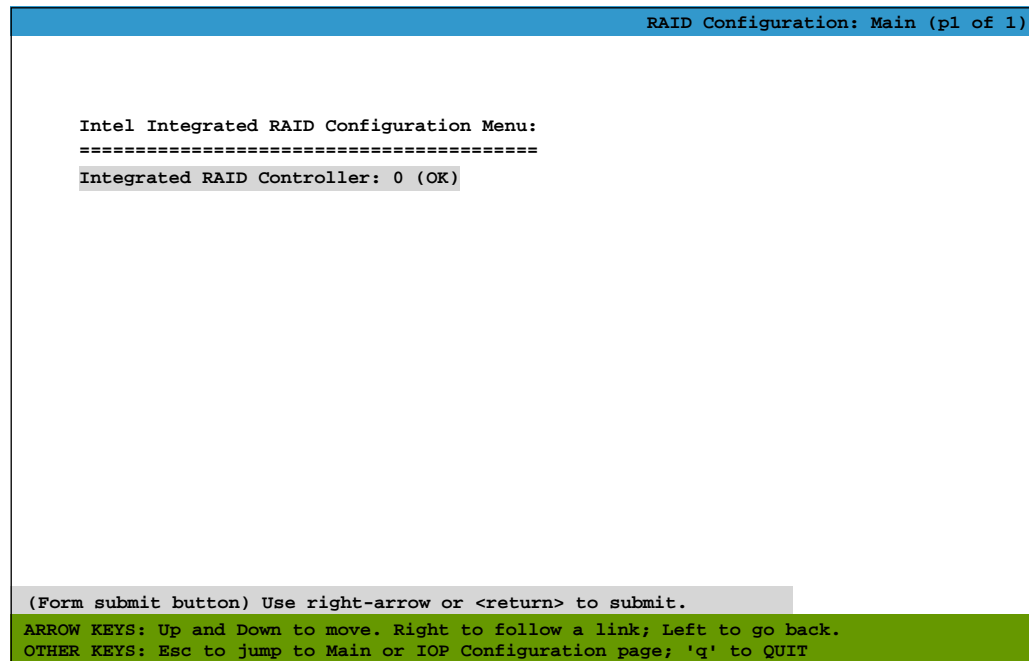


Figure 2-18. Advanced RCU Configuration Main Menu

```

Intel Integrated RAID Storage Console (3.13) (pl of 1)

RAID Volumes
--> View/Actions
--> Create Typical
--> Create Custom
--> Modify Volume

Physical Disks
--> View Actions

Logical Arrays
--> View/Actions
--> Expand Array

Enclosures
--> View

Utilities
--> View Config
--> Reset
--> Bus Scan
--> Options

Commands: Use arrow Keys to move, '<-' to go back.
ARROW KEYS: Up and Down to move. Right to follow a link; Left to go back.
OTHER KEYS: Esc to jump to Main or IOP Configuration page; 'q' to QUIT

```

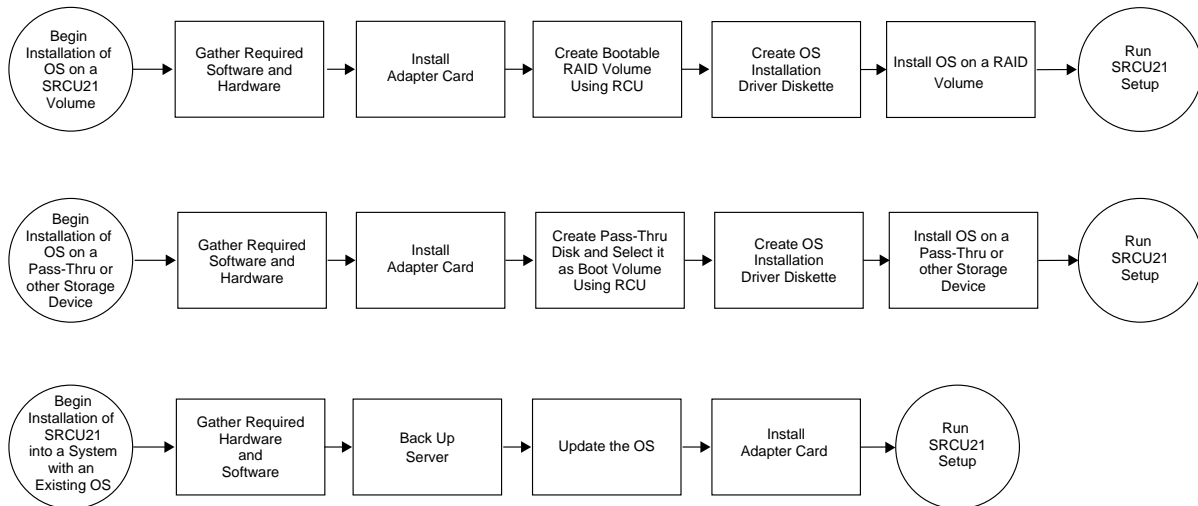
2.5 Intel® Server RAID Controller U2-1 Setup and Installation

Note: The Intel Server RAID Controller U2-1 may not come with a memory module (DIMM). If the memory socket (indicated in [Figure A-2](#)) is not populated with a DIMM, install an approved DIMM into the memory socket as indicated in [Figure A-2](#) before proceeding. Refer to the approved memory list at: <http://support.intel.com/support/motherboards/server/srcu21>.

2.5.1 Overview of Setup and Installation for Local Administration of NT Server

This chapter describes the installation procedures for SRCU21 on NT Server. These procedures include hardware installation, the creation and configuration of a RAID volume, OS installation and the installation of the SRCU21 software on servers requiring the ability to be locally managed. [Figure 2-19](#) illustrates the typical uses for this product.

Figure 2-19. Installing the Operating System on an SRCU21 RAID Volume, a Pass-through Disk or other Storage Device or Installing SRCU21 into a System with an Existing Operating System



2.5.2 Setup and Installation for Local Administration of Microsoft Windows NT* Server

2.5.2.1 In this Section

- RAID Requirements for Microsoft Windows NT Server 4.0
- Installing Microsoft Windows NT Server 4.0 on a Intel® Integrated RAID Volume
- Installing Microsoft Windows NT Server 4.0 on a Pass-through Disk or other Storage Device
- Install Intel® Server RAID Controller U2-1 on an Existing NT 4.0 Server

2.5.2.2 RAID Requirements for Microsoft Windows NT Server 4.0

Note: This document, when referring NT Server 4.0, also applies to the following Windows NT 4.0 Server subtypes:

- Microsoft Windows NT Server 4.0 Enterprise Edition

When installing the SRCU21 kit for Microsoft Windows NT Server, note the following system requirements.

Have all required system hardware and software components available before proceeding with the setup and installation.

RAID Hardware Requirements

- Server with CD-ROM Drive *not* attached to Intel® Server RAID Controller U2-1
- One available PCI slot



- Monitor display resolution of 800 x 600 or higher (recommended)
- Intel® Server RAID Controller U2-1 Adapter Card
- PCI 2.2 Compliant System BIOS
- Memory: 3.3v, 168-pin gold-plated, unbuffered PC100, ECC, SDRAM single or double row, DIMM modules that are of 32MB, 64MB, 128MB capacities (see supported parts at <http://support.intel.com/support/motherboards/server/srcu21>)

RAID Software Requirements

- SRCU21 CD-ROM
- Hard Disk Space: 9 MB Minimum
- SRCU21 Windows NT Installation Diskette (Microsoft Windows NT SCSI Miniport Diskette). See [Chapter 3, “Exploring the Utilities”](#) to create this diskette.
- Microsoft Windows NT Server 4.0[†]
- Microsoft Windows NT 4.0 Service Pack 5 or greater[†]
- Microsoft Internet Explorer 4.0 or greater[†]

Note: Microsoft Internet Explorer can be downloaded from the Microsoft website (www.microsoft.com) and is also included in the Microsoft Windows NT 4.0 Option Pack (available as web download or CD).

[†] Not supplied with SRCU21.

Warning: Do not install OSMs (Operating System Service Modules) downloaded from OS vendor websites. An OSM is the operating system driver portion of the I₂O split driver model. The OSMs provided on the SRCU21 CD-ROM are a later version than the OSMs currently provided by OS vendors. Using OSMs other than those provided on the SRCU21 CD-ROM may yield unpredictable results.

2.5.2.3 SRCU21 Hardware Installation

The SRCU21 comes with the Intel Integrated RAID firmware already programmed into the flash memory. Note that if the memory DIMM is not provided with the adapter at the time of purchase, you must install an approved unbuffered, PC100, ECC, SDRAM DIMM into the memory socket prior to SRCU21 installation. See the Hardware Requirements or refer to the approved memory list at <http://support.intel.com/support/motherboards/server/srcu21> to determine an approved memory DIMM for use in the adapter.

Warning: Shock hazards may be present inside the unit in which this card is being installed. Disconnect all power cords to the unit before the removal of any covers.

Follow the warnings noted in your computers user or service manual before installing this board. ONLY after all the covers are reinstalled should you reattach the power cords and power up the unit for the software installation and use.

Note: Take precautions to prevent electrostatic discharge (ESD) damage before handling the SRCU21 Adapter Card.

1. Power down the system, disconnect power cord(s) and remove the system cover.
2. Install the SRCU21 into an available PCI slot. Connect one end of the SCSI cable to the internal (68 pin) or external (VHDCI) SCSI connector on the SRCU21. Connect the other end of the SCSI cable to the SCSI drives or drive enclosure.

3. Replace the system cover, reconnect power cord(s).

Note: Ensure that the ends of the SCSI bus are properly terminated. Consult the documentation for the drives or drive enclosure for termination details.

2.5.2.4 Installing Microsoft Windows NT Server 4.0 on a Intel® Integrated RAID Volume

This procedure installs Microsoft Windows NT Server 4.0 on an Intel Integrated RAID volume. Have all hardware and software on hand. See system requirements in [Section 2.5.2.2](#).

SRCU21 Hardware Installation

Install the hardware before continuing with this installation. See [Section 2.5.2.3](#).

Intel Integrated RAID Software Installation

1. Create and configure a RAID volume using the RAID Configuration Utility. See [Section 2.2, RAID Configuration Utility](#) in the user's manual to create and configure a RAID volume. Once a RAID volume is created and configured, return to this procedure to install the operating system.
2. Run the latest virus scan on any downloaded diskettes used for installation or on any existing volumes.
3. Create a SRCU21 Microsoft Windows NT SCSI Miniport Diskette.
 - a. Insert the Intel Integrated RAID CD-ROM into the target system and restart the system to boot from the CD-ROM.
 - b. When the ROM-DOS Startup Menu appears select option #1, *Make Diskettes*.
 - c. When the *Select a Diskette to Create* screen appears, select *Windows NT Installation*. A command window then appears.
 - d. Insert a blank high-density diskette in drive A: and press Enter to create the Windows NT SCSI Miniport Diskette. Alternatively, the CD-ROM can be inserted into a different system running Windows 95, 98 or NT. The CD-ROM's *auto-run* feature will bring up a menu that will allow creation of the SRCU21 NT Installation Diskette.
4. Install the following required software:
 - a. Microsoft Windows NT Server 4.0

Select the scenario below (1 or 2) which matches your installation to complete the Microsoft Windows NT SCSI diskette miniport driver installation.

Warning: The miniport driver is a temporary driver used for installation only. Once NT is running, you must install the permanent RAID device drivers using the SRCU21 CD-ROM.

1. If you are installing NT *with* boot disks (booting from diskettes initially to setup NT), during install let NT detect the storage devices in your system. When device detection is complete, select *S* to specify additional storage devices, then select *Other*. Insert the Microsoft Windows NT installation diskette in the floppy drive. Press *Enter* to select the I₂O Miniport Driver and continue with the NT installation. Go to [step b](#).
2. **If you are installing NT without boot disks**, (for example, you are booting with the NT Server CD-ROM), **press F6 as soon as the blue screen appears** to ensure that the Microsoft Windows NT installation diskette can be loaded when specifying *Other*

Diskettes. Otherwise, the NT installation program will not load the I₂O Miniport Driver from the Microsoft Windows NT installation diskette. When device detection is complete, select *S* to specify additional storage devices and then select *Other*. Insert the Microsoft Windows NT installation diskette in the floppy drive. Press *Enter* to select the I₂O Miniport Driver and continue with the NT installation. Go to [step b](#).

- b. During Windows NT installation install the following component:
 - TCP/IP
- c. After the NT installation is complete, install the following components and software:
 - Microsoft Windows NT 4.0 Service Pack 5 or greater
 - Microsoft Internet Explorer 4.00 or greater
5. If your browser uses a proxy server, then configure your browser using the procedure in [Section B.6, “Browser Configuration During Initial Installation”](#) on page B-5 and return to this procedure. If you have not configured your browser to use a proxy server, then go to [step 6](#).
6. Install the SRCU21 software (run the SRCU21 setup) using the SRCU21 CD-ROM.

Note: You must have administrative level permissions to install SRCU21 software. This procedure assumes that the SRCU21 hardware and Windows NT server are installed and operational in your system.

- a. Insert the SRCU21 CD-ROM in the CD-ROM drive. If the Software Installation Main Menu does not appear, then run the setup.exe file that resides at:
<CD-ROM root>\os_setup\winnt\setup.exe on the CD-ROM.
- b. Click on the *Setup* button. See [Figure 2-20](#).

Figure 2-20. Intel® Integrated RAID Software Installer Main Menu



The three components in the window in [Figure 2-21](#) are preselected. Click *Next* and follow the on screen prompts to complete the installation.

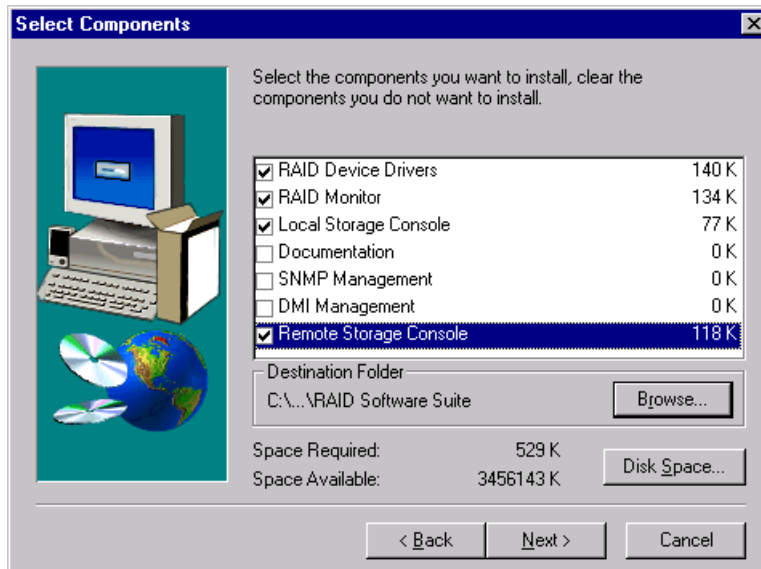
Note: The DMI and SNMP components are not selected by default. Refer to section “[Intel® Integrated RAID Software Component Installation](#)” on page 4-2 of the “[Using the Storage Console](#)” chapter for information on DMI and SNMP installation.

A progress bar appears that measures the progress of the SRCU21 software setup. When this screen completes, you have completed the SRCU21 setup.

Note: Refer to section “[Intel® Integrated RAID Software Component Installation](#)” on page 4-2 of the “[Using the Storage Console](#)” chapter for information on HP Openview and RAID Monitor.

7. See [Section 4.3](#) in the “[Using the Storage Console](#)” chapter to customize your RAID volumes using Storage Console.

Figure 2-21. Adding Components



2.5.2.5 Installing Microsoft Windows NT Server 4.0 on a Pass-through Disk or other Storage Device

This procedure installs Microsoft Windows NT Server 4.0 on a pass-through disk or other storage device. It is typically used on a system where the operating system is on a disk not controlled by SRCU21. Have all hardware and software on hand. See system requirements in [Section 2.5.2.2](#).

SRCU21 Hardware Installation

Install the hardware before continuing with this installation. See [Section 2.5.2.3](#).

Intel Integrated RAID Software Installation



1. If you are installing Microsoft Windows NT Server on a Pass-through Disk go to [step 2](#). If you are installing Microsoft Windows NT Server on another storage device, then go to [step 3](#).
2. Create a pass-through disk. Once [step a](#) is completed, return to this procedure to install the operating system.
 - a. Create a pass-through disk and select it as the boot device. Using the RAID Configuration Utility (see “[How to Invoke Advanced RCU](#)” on [page 2-18](#) for more information) create a pass-through disk and select it as the boot device (see “[Custom Configuration](#)” on [page 2-11](#) for more information on creating a pass-through disk). The operating system will be installed on this disk. You may choose to create more than one pass-through disk at this time.
3. Run the latest virus scan on on any existing volumes and any downloaded diskettes used for installation.
4. Install the following required software components. If you are installing Microsoft Windows NT Server on a Pass-through Disk, go to [step a](#). If you are installing Microsoft Windows NT Server on another storage device, then ensure the CD-ROM drivers are detected during installation and then go to [step b](#).
 - a. Microsoft Windows NT Server 4.0

Select the scenario below (1 or 2) that matches your installation to complete the Microsoft Windows NT SCSI diskette miniport driver installation.

Warning: The miniport driver is a temporary driver used for installation only. Once NT is running, you must install the permanent RAID device drivers using the SRCU21 CD-ROM.

1. If you are installing NT *with* boot disks (booting from diskettes initially to setup NT), during install let NT detect the storage devices in your system. When device detection is complete, select *S* to specify additional storage devices, then select *Other*. Insert the Microsoft Windows NT installation diskette in the floppy drive. Press *Enter* to select the I₂O Miniport Driver and continue with the NT installation. Go to [step b](#).
2. **If you are installing NT without boot disks**, (for example, you are booting with the NT Server CD-ROM), **press F6 as soon as the blue screen appears** to ensure that the Microsoft Windows NT installation diskette can be loaded when specifying *Other Diskettes*. Otherwise, the NT installation program will not load the I₂O Miniport Driver from the Microsoft Windows NT installation diskette. When device detection is complete, select *S* to specify additional storage devices and then select *Other*. Insert the Microsoft Windows NT installation diskette in the floppy drive. Press *Enter* to select the I₂O Miniport Driver and continue with the NT installation. Go to [step b](#).
- b. During Windows NT installation install the following component:
 - TCP/IP
- c. After the NT installation is complete, install the following components and software:
 - Microsoft Windows NT 4.0 Service Pack 5 or greater
 - Microsoft Internet Explorer 4.00 or greater
5. If your browser uses a proxy server, then configure your browser using the procedure in [Section B.6, “Browser Configuration During Initial Installation”](#) on [page B-5](#) and return to this procedure. If you have not configured your browser to use a proxy server, then go to [step 6](#).
6. Install the SRCU21 software (run the SRCU21 setup).

Note: You must have administrative level permissions to install SRCU21 software. This procedure assumes that the SRCU21 hardware and Windows NT server are installed and operational in your system.

- a. Insert the SRCU21 CD-ROM in the CD-ROM drive. If the Software Installation Main Menu does not appear, then run the setup.exe file that resides at:
<CD-ROM root>\os_setup\winnt\setup.exe on the CD-ROM.
- b. Click on the *Setup* button. See [Figure 2-20](#). Follow the on-screen prompts to complete installation.

The three components in the window in [Figure 2-21](#) are preselected. Add the remote storage console component by clicking on the remote storage console box.

Note: The DMI and SNMP components are not selected by default. Refer to section [Section 4.2, Intel® Integrated RAID Software Component Installation](#) for information on DMI and SNMP installation.

A progress bar appears that measures the progress of the SRCU21 setup. When this screen completes, you have completed the SRCU21 setup.

Note: Refer to section [“Intel® Integrated RAID Software Component Installation” on page 4-2](#) of the [“Using the Storage Console”](#) chapter for information on HP Openview and RAID Monitor.

7. See [Chapter 4, Section 4.3, “Configuring RAID Volumes Using the Intel® Integrated RAID Storage Console” on page 4-12](#) to customize your RAID volumes using Storage Console.

2.5.2.6 Install Intel® Server RAID Controller U2-1 on an Existing NT 4.0 Server

This procedure installs SRCU21 into a system with an existing operating system installed. The procedure ensures that the necessary software components are installed before installing SRCU21.

Follow the required procedure below to install SRCU21.

1. Have all hardware and software on hand. See system requirements in [Section 2.5.2.2](#).
2. Back up your server.
3. Run the latest virus scan on any downloaded diskettes used for installation or on any existing volumes.
4. Update Microsoft Windows NT Server 4.0 with the following component:
 - TCP/IP
5. After the NT installation update is complete, install the following components and software:
 - Microsoft Windows NT 4.0 Service Pack 5 or greater
 - Microsoft Internet Explorer 4.00 or greater
6. If your browser uses a proxy server, then configure your browser using the procedure in [Section B.6, “Browser Configuration During Initial Installation” on page B-5](#) and return to this procedure. If you have not configured your browser to use a proxy server, then go to [step 7](#).
7. SRCU21 Hardware Installation



The adapter may or may not come with a SDRAM ECC DIMM inserted into the memory socket. If it does, then the adapter is ready to be installed into the server as the Intel Integrated RAID software is programmed into the flash memory.

If the SDRAM ECC DIMM is not inserted into the memory socket, then acquire a supported 32, 64 or 128 SDRAM ECC DIMM and insert it into the memory socket of the adapter. See supported parts at <http://support.intel.com/support/motherboards/server/srcu21>.

Warning: Shock hazards may be present inside the unit in which this card is being installed. Disconnect all power cords to the unit before removal of any covers.

Follow the warnings noted in your computers user or service manual before installing this board. ONLY after all the covers are reinstalled should you reattach the power cords and power up the unit for the software installation and use.

Note: Take precautions to prevent electrostatic discharge (ESD) damage before handling the SRCU21 Adapter Card.

- a. Power down the system, disconnect power cord(s) and remove the system cover.
- b. Install the SRCU21 into an available PCI slot. Connect one end of the SCSI cable to the internal (68 pin) or external (VHDCI) SCSI connector on the SRCU21. Connect the other end of the SCSI cable to the SCSI drives or drive enclosure.
- c. Replace the system cover, reconnect power cord(s).

Note: Ensure that the ends of the SCSI bus are properly terminated. Consult the documentation for the drives or drive enclosure for termination details.

8. Intel Integrated RAID Software Installation
9. Create and configure a RAID volume using the RAID Configuration Utility. See [“How to Invoke Advanced RCU” on page 2-18](#) to create and configure a RAID volume. Once a RAID volume is created and configured, return to this procedure to install the SRCU21 software.
10. Install the SRCU21 software (run the SRCU21 setup).

Note: You must have administrative level permissions to install SRCU21 software. This procedure assumes that the SRCU21 hardware and Windows NT server are installed and operational in your system.

- a. Insert the SRCU21 CD-ROM in the CD-ROM drive. If the Software Installation Main Menu does not appear, then run the setup.exe file that resides at:
<CD-ROM root>\os_setup\winnt\setup.exe on the CD-ROM.
- b. Click on the *Setup* button. See [Figure 2-20](#). Follow the on-screen prompts to complete installation.



The three components in the window in [Figure 2-21](#) are preselected. Accept this configuration and click on *Next*.

Note: The DMI and SNMP components are not selected by default. Refer to section “[Intel® Integrated RAID Software Component Installation](#)” on page 4-2 of the “[Using the Storage Console](#)” chapter for information on DMI and SNMP installation.

A progress bar appears that measures the progress of the SRCU21 setup. When this screen completes, you have completed the SRCU21 setup.

Note: Refer to section “[Intel® Integrated RAID Software Component Installation](#)” on page 4-2 of the “[Using the Storage Console](#)” chapter for information on HP Openview and RAID Monitor.

11. See [Chapter 4, Section 4.3, “Configuring RAID Volumes Using the Intel® Integrated RAID Storage Console”](#) on page 4-12 to customize your RAID volumes using Storage Console.

2.5.3 Overview of Setup and Installation for Remote Administration for NT Server

This chapter describes the installation procedures for SRCU21. These procedures include hardware installation, the creation and configuration of a RAID volume, OS installation and the installation of the SRCU21 software on servers requiring the ability to be remotely managed. [Figure 2-23](#) illustrates the typical uses for this product.

Figure 2-22. Remote Administration for NT Server

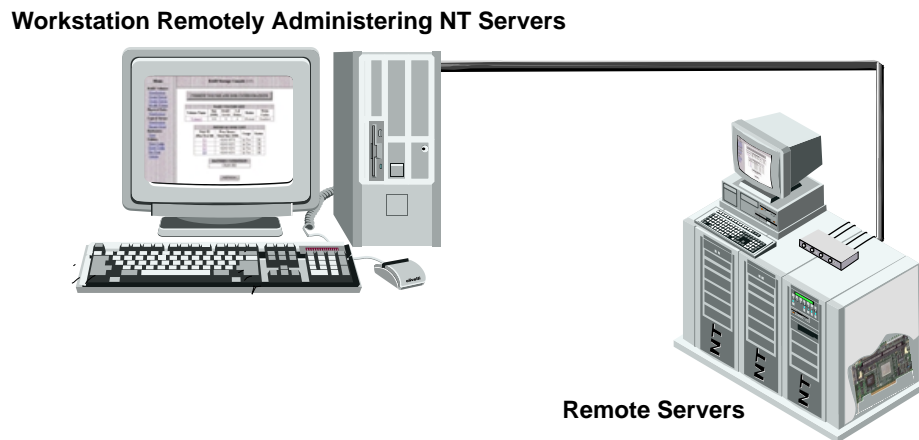
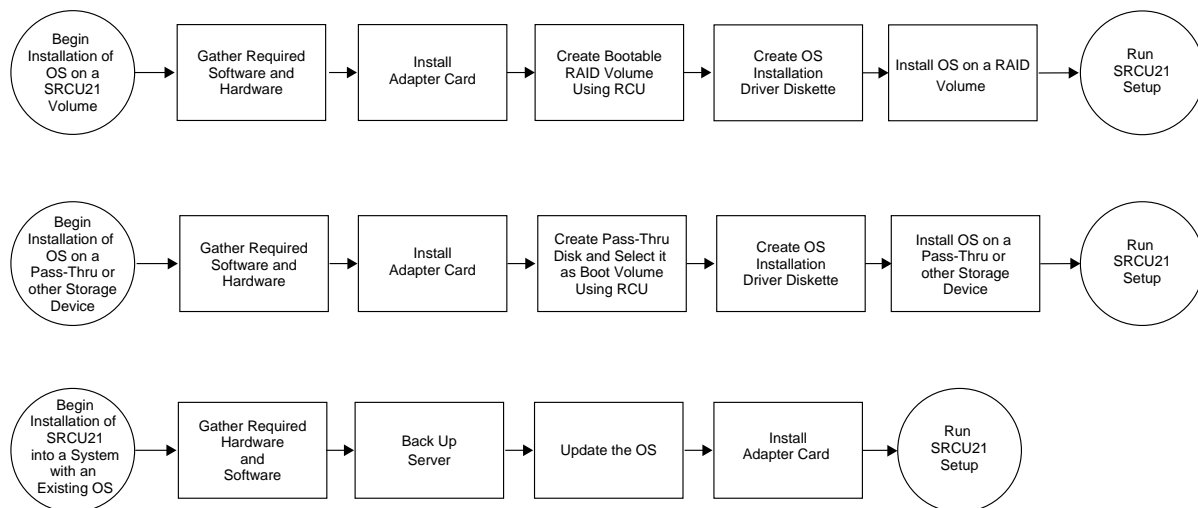


Figure 2-23. Installing the Operating System on an SRCU21 RAID Volume, a Pass-through Disk/IDE or Installing SRCU21 into a System with an Existing Operating System



2.5.4 Setup and Installation for Microsoft Windows NT* Server 4.0

2.5.4.1 In this Section

- RAID Requirements for Microsoft Windows NT Server 4.0
- Installing Microsoft Windows NT Server 4.0 on a Intel® Integrated RAID Volume
- Installing Microsoft Windows NT Server 4.0 on a Pass-through Disk or another Storage Device
- Install Intel Server RAID Controller U2-1 on an Existing NT 4.0 Server

2.5.4.2 RAID Requirements for Microsoft Windows NT Server 4.0

Note: This document, when referring to NT Server 4.0, also applies to the following Windows NT 4.0 Server subtypes:

- Microsoft Windows NT Server 4.0 Enterprise Edition

When installing the SRCU21 kit for Microsoft Windows NT Server, note the following system requirements.

Have all required system hardware and software components available before proceeding with the setup and installation.

RAID Hardware Requirements

- Server with CD-ROM Drive *not* attached to Intel® Server RAID Controller U2-1
- One available PCI slot
- Monitor display resolution of 800 x 600 or higher (recommended)
- Intel® Server RAID Controller U2-1 Adapter Card
- PCI 2.2 Compliant System BIOS
- Memory: 3.3v, 168-pin gold-plated, unbuffered PC100, ECC, SDRAM single or double row, DIMM modules that are of 32MB, 64MB, 128MB capacities (see supported parts at <http://support.intel.com/support/motherboards/server/srcu21>)

RAID Software Requirements

- SRCU21 CD-ROM
- Hard Disk Space: 9 MB Minimum
- Windows NT Installation Diskette (Microsoft Windows NT SCSI Miniport Diskette). See [Chapter 3, “Exploring the Utilities”](#) to create this diskette.
- Microsoft Windows NT Server 4.0[†]
- Microsoft Windows NT 4.0 Service Pack 5 or greater[†]
- Microsoft Internet Explorer 4.0 or greater or Netscape 4.08 or greater[†]



Note: Microsoft Internet Explorer can be downloaded from the Microsoft website (www.microsoft.com) and is also included in the Microsoft Windows NT 4.0 Option Pack (available as web download or CD).

† Not supplied with SRCU21.

Warning: Do not install OSMs (Operating System Service Modules) downloaded from OS vendor websites. An OSM is the operating system driver portion of the I₂O split driver model. The OSMs provided on the SRCU21 CD-ROM are a later version than the OSMs currently provided by OS vendors. Using OSMs other than those provided on the SRCU21 CD-ROM may yield unpredictable results.

2.5.4.3 Installing Microsoft Windows NT Server 4.0 on a Intel® Integrated RAID Volume

This procedure installs Microsoft Windows NT Server on an Intel Integrated RAID volume. Have all hardware and software on hand. See system requirements in [Section 2.5.4.2](#).

SRCU21 Hardware Installation

Install the hardware before continuing with this installation. See [Section 2.5.2.3](#).

Intel Integrated RAID Software Installation

1. Create and configure a RAID volume using the RAID Configuration Utility. See [Section 2.2, RAID Configuration Utility](#) in the user's manual to create and configure a RAID volume. Once a RAID volume is created and configured, return to this procedure to install the operating system.
2. Run the latest virus scan on any downloaded diskettes used for installation or on any existing volumes.
3. Create a SRCU21 Microsoft Windows NT SCSI Miniport Diskette.
 - a. Insert the Intel Integrated RAID CD-ROM into the target system and restart the system to boot from the CD-ROM.
 - b. When the ROM-DOS Startup Menu appears select option #1, *Make Diskettes*.
 - c. When the *Select a Diskette to Create* screen appears, select *Windows NT Installation*. A command window then appears.
 - d. Insert a blank high-density diskette in drive A: and press Enter to create the Windows NT SCSI Miniport Diskette. Alternatively, the CD-ROM can be inserted into a different system running Windows 95, 98 or NT. The CD-ROM's *auto-run* feature will bring up a menu that will allow creation of the SRCU21 NT Installation Diskette.
4. Install the following required software:
 - a. Microsoft Windows NT Server 4.0
Select the scenario below (1 or 2) which matches your installation to complete the Microsoft Windows NT SCSI diskette miniport driver installation.

Warning: The miniport driver is a temporary driver used for installation only. Once NT is running, you must install the permanent RAID device drivers using the SRCU21 CD-ROM.

1. If you are installing NT *with* boot disks (booting from diskettes initially to setup NT), during install let NT detect the storage devices in your system. When device detection is complete, select *S* to specify additional storage devices, then select *Other*. Insert the

Microsoft Windows NT installation diskette in the floppy drive. Press *Enter* to select the I₂O Miniport Driver and continue with the NT installation. Go to [step b](#).

2. **If you are installing NT without boot disks**, (for example, you are booting with the NT Server CD-ROM), **press F6 as soon as the blue screen appears** to ensure that the Microsoft Windows NT installation diskette can be loaded when specifying *Other Diskettes*. Otherwise, the NT installation program will not load the I₂O Miniport Driver from the Microsoft Windows NT installation diskette. When device detection is complete, select *S* to specify additional storage devices and then select *Other*. Insert the Microsoft Windows NT installation diskette in the floppy drive. Press *Enter* to select the I₂O Miniport Driver and continue with the NT installation. Go to [step b](#).

b. During Windows NT installation install the following components:

- TCP/IP
- Microsoft Internet Information Server 2.0.

c. After the NT installation is complete, install the following components and software:

- Microsoft Windows NT 4.0 Service Pack 5 or greater (This will automatically upgrade Internet Information Server 2.0 to Internet Information Server 3.0.).
- Microsoft Internet Explorer 4.00 or greater (recommended) or Netscape Navigator 4.08 or greater.

5. If your browser uses a proxy server, then configure your browser using the procedure in [Section B.6, “Browser Configuration During Initial Installation”](#) on page B-5 and return to this procedure. If you have not configured your browser to use a proxy server, then go to [step 8](#).
6. Configure Microsoft Internet Information Server (IIS)

Warning: Due to added security in SRCU21, anonymous connections must be disabled in Microsoft IIS in order to execute the SRCU21 configuration utility in NT. If anonymous connections are allowed to IIS on the target server, then the following message will appear on the web browser after launching the SRCU21 configuration utility shortcut:

```
Unable to open Driver
Could not open I2O Driver
```

To avoid the problem described above when attempting to run Storage Console, disable *Allow Anonymous* connections to Microsoft IIS. Follow the directions below to disable *Allow Anonymous* connections.

Note: If you need to use the World Wide Web service capabilities of Internet Information Server 4.0 to publish a web site on a server using SRCU21, install IIS 4.0. Reconfigure IIS using the IIS 4.0 instructions in [Section 2.5.5, Configuring Microsoft Windows IIS 4.0](#). Return to this procedure when completed.

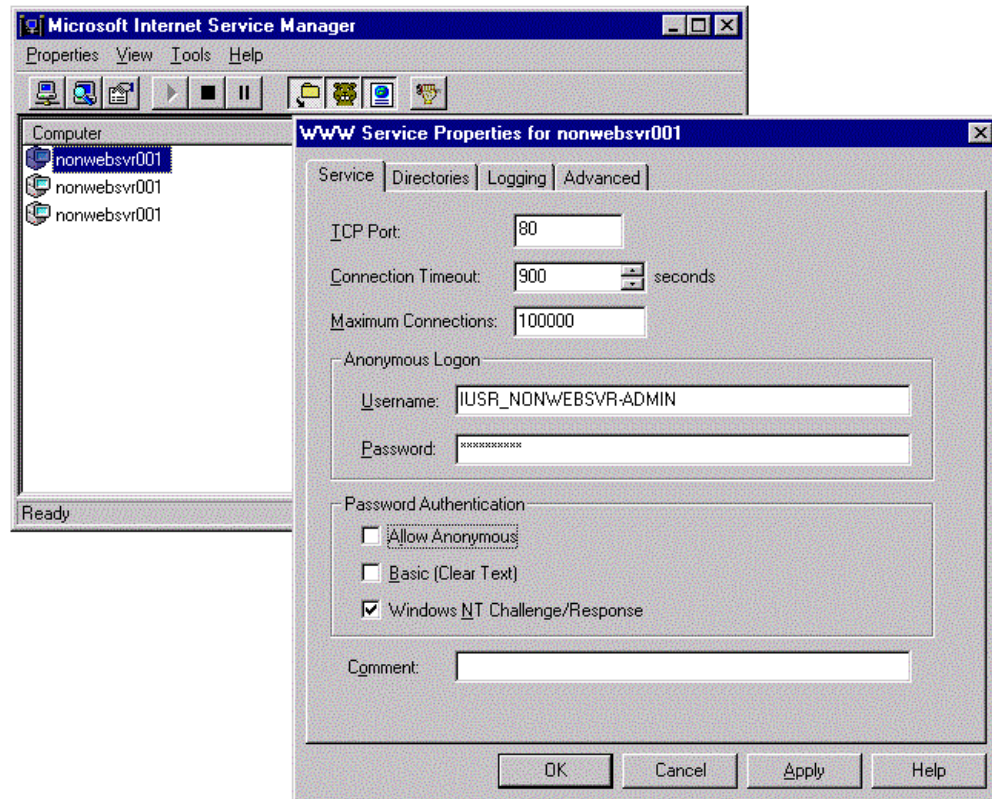
If IIS 3.0 is installed on a FAT partition go to [step 7](#). If you need to use IIS 4.0, reconfigure IIS using the IIS 4.0 instructions in [Section 2.5.5, Configuring Microsoft Windows IIS 4.0](#). Go to [step 8](#) when completed. If you are using Microsoft IIS 3.0 on an NTFS partition, proceed to [step 8](#).

7. Configuring Microsoft IIS 3.0

- a. Start *Internet Services Manager* from the *Microsoft Internet Server* program group.
- b. Double-click on the server name in the WWW Service row (top computer name).

- c. Under the *Service* tab in the *WWW Service Properties* window clear the *Allow Anonymous* checkbox in the *Password Authentication* section. See [Figure 2-24](#).

Figure 2-24. WWW Service Properties Window



- d. Select *OK* and close *Internet Service Manager*.
8. If Netscape is used as the default browser, follow the procedure in [Section 2.5.6, Configuring IIS for use with Netscape Navigator](#) and then return to this procedure. If Microsoft Internet Explorer is used continue with this procedure.
 9. Install the SRCU21 software (run the SRCU21 setup).

Note: You must have administrative level permissions to install SRCU21 software. This procedure assumes that the SRCU21 hardware and Windows NT server are installed and operational in your system.

 - a. Insert the SRCU21 CD-ROM in the CD-ROM drive. If the Software Installation Main Menu does not appear, then run the setup.exe file that resides at:
 <CD-ROM root>\os_setup\winnt\setup.exe on the CD-ROM.

- b. Click on the *Setup* button. See [Figure 2-25](#).

Figure 2-25. Intel® Integrated RAID Software Installer Main Menu



The three components in the window in [Figure 2-26](#) are preselected. Click *Next* and follow the on screen prompts to complete the installation.

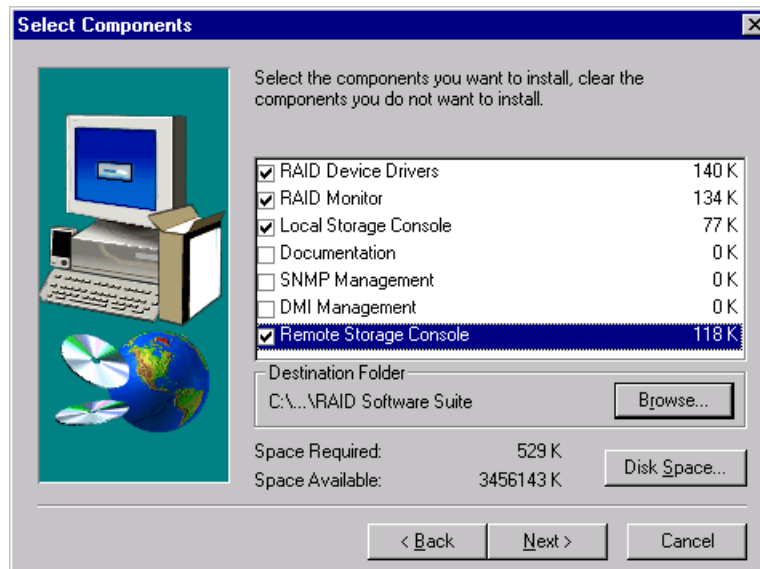
Note: The DMI and SNMP components are not selected by default. Refer to section “[Intel® Integrated RAID Software Component Installation](#)” on page 4-2 of the “[Using the Storage Console](#)” chapter for information on DMI and SNMP installation.

A progress bar appears that measures the progress of the SRCU21 software setup. When this screen completes, you have completed the SRCU21 setup.

Note: Refer to section “[Intel® Integrated RAID Software Component Installation](#)” on page 4-2 of the “[Using the Storage Console](#)” chapter for information on HP Openview and RAID Monitor.

10. See [Chapter 4, Section 4.3, “Configuring RAID Volumes Using the Intel® Integrated RAID Storage Console”](#) on page 4-12 to customize your RAID volumes using Storage Console.

Figure 2-26. Selecting Components Screen after user selects Remote Storage Console



2.5.4.4 Installing Microsoft Windows NT Server 4.0 on a Pass-through Disk or another Storage Device

This procedure installs Microsoft Windows NT Server 4.0 on a pass-through disk or another storage device. It is typically used on a system where the operating system is on a disk not controlled by SRCU21. Have all hardware and software on hand. See system requirements in [Section 2.5.4.2](#).

SRCU21 Hardware Installation

Install the hardware before continuing with this installation. See [Section 2.5.2.3](#).

Intel Integrated RAID Software Installation

1. If you are installing Microsoft Windows NT Server on a Pass-through Disk go to [step 2](#). If you are installing Microsoft Windows NT Server on another storage device, then go to [step 3](#).
2. Create a pass-through disk. Once [step a](#) is completed, return to this procedure to install the operating system.
 - a. Create a pass-through disk and select it as the boot device. Using the RAID Configuration Utility (see [“How to Invoke Advanced RCU”](#) on [page 2-18](#) for more information) create a pass-through disk and select it as the boot device (see [“Custom Configuration”](#) on [page 2-11](#) for more information on creating a pass-through disk). The operating system will be installed on this disk. You may choose to create more than one pass-through disk at this time.
3. Run the latest virus scan on on any existing volumes and any downloaded diskettes used for installation.
4. Install the following required software components. If you are installing Microsoft Windows NT Server on a Pass-through Disk, go to [step a](#). If you are installing Microsoft Windows NT

Server on another storage device, then ensure the CD-ROM drivers are detected during installation and then go to [step b](#).

a. Microsoft Windows NT Server 4.0

Select the scenario below (1 or 2) that matches your installation to complete the Microsoft Windows NT SCSI diskette miniport driver installation.

Warning: The miniport driver is a temporary driver used for installation only. Once NT is running, you must install the permanent RAID device drivers using the SRCU21 CD-ROM.

1. If you are installing NT *with* boot disks (booting from diskettes initially to setup NT), during install let NT detect the storage devices in your system. When device detection is complete, select *S* to specify additional storage devices, then select *Other*. Insert the Microsoft Windows NT installation diskette in the floppy drive. Press *Enter* to select the I₂O Miniport Driver and continue with the NT installation. Go to [step b](#).

2. **If you are installing NT without boot disks**, (for example, you are booting with the NT Server CD-ROM), **press F6 as soon as the blue screen appears** to ensure that the Microsoft Windows NT installation diskette can be loaded when specifying *Other Diskettes*. Otherwise, the NT installation program will not load the I₂O Miniport Driver from the Microsoft Windows NT installation diskette. When device detection is complete, select *S* to specify additional storage devices and then select *Other*. Insert the Microsoft Windows NT installation diskette in the floppy drive. Press *Enter* to select the I₂O Miniport Driver and continue with the NT installation. Go to [step b](#).

b. During Windows NT installation install the following components:

- TCP/IP
- Microsoft Internet Information Server 2.0.

c. After the NT installation is complete, install the following components and software:

- Microsoft Windows NT 4.0 Service Pack 5 or greater (This will automatically upgrade Internet Information Server 2.0 to Internet Information Server 3.0.).
- Microsoft Internet Explorer 4.00 or greater (recommended) or Netscape Navigator 4.08 or greater.

5. If your browser uses a proxy server, then configure your browser using the procedure in [Section B.6, “Browser Configuration During Initial Installation” on page B-5](#) and return to this procedure. If you have not configured your browser to use a proxy server, then go to [step 8](#).

6. Configure Microsoft Internet Information Server

Warning: Due to added security in SRCU21, anonymous connections must be disabled in Microsoft Internet Information Server (IIS) in order to execute the SRCU21 configuration utility in NT. If anonymous connections are allowed to IIS on the target server, then the following message will appear on the web browser after launching the SRCU21 configuration utility shortcut:

```
Unable to open Driver
Could not open I2O Driver
```

To avoid the problem described above when attempting to run Storage Console, disable *Allow Anonymous* connections to Microsoft IIS. Follow the directions below to disable *Allow Anonymous* connections.

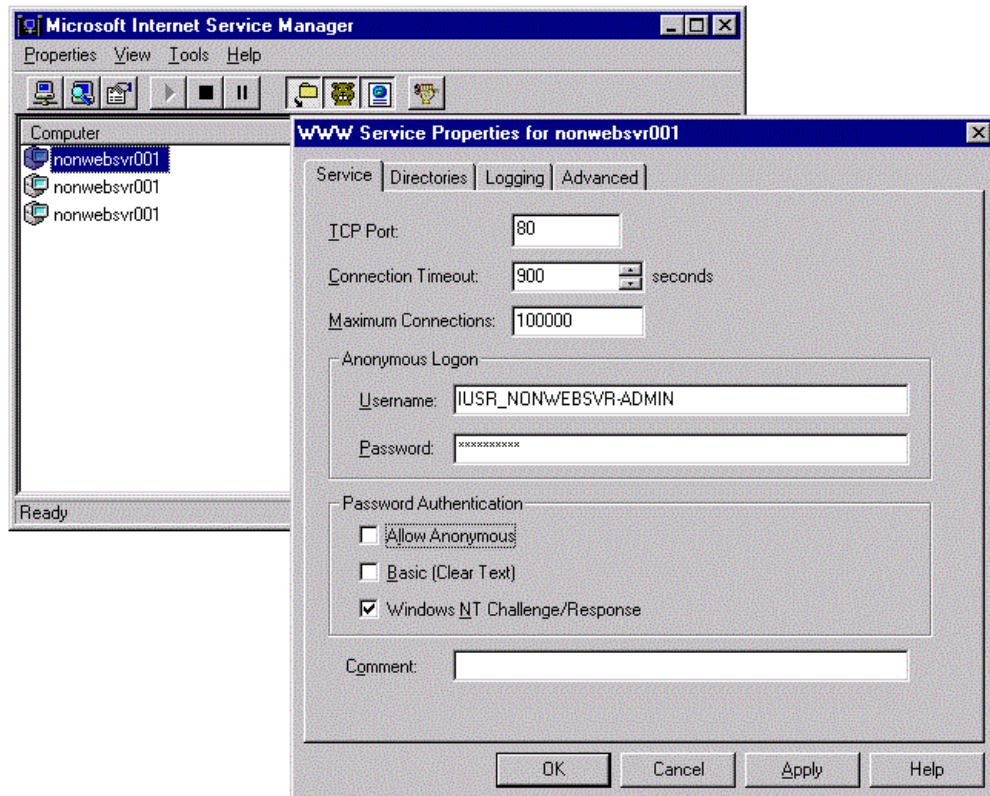
Note: If you need to use the World Wide Web service capabilities of Internet Information Server 4.0 to publish a web site on a server using SRCU21, install IIS 4.0. Reconfigure IIS

using the IIS 4.0 instructions in [Section 2.5.5, Configuring Microsoft Windows IIS 4.0](#). Return to this procedure when completed.

If IIS 3.0 is installed on a FAT partition go to [step 7](#). If you need to use IIS 4.0, reconfigure IIS using the IIS 4.0 instructions in [Section 2.5.5, Configuring Microsoft Windows IIS 4.0](#). Go to [step 8](#) when completed. If you are using Microsoft IIS 3.0 on an NTFS partition, proceed to [step 8](#).

7. Configuring Microsoft IIS 3.0
 - a. Start *Internet Services Manager* from the *Microsoft Internet Server* program group.
 - b. Double-click on the server name in the WWW Service row (top computer name).
 - c. Under the *Service* tab in the *WWW Service Properties* window, clear the *Allow Anonymous* checkbox in the *Password Authentication* section. See [Figure 2-27](#).

Figure 2-27. WWW Service Properties Window



- d. Select *OK* and close *Internet Service Manager*.
8. If Netscape is used as the default browser, follow the procedure in [Section 2.5.6, Configuring IIS for use with Netscape Navigator](#) and then return to this procedure. If Microsoft Internet Explorer is used continue with this procedure.
9. Install the SRCU21 software (run the SRCU21 setup).

Note: You must have administrative level permissions to install SRCU21 software. This procedure assumes that the SRCU21 hardware and Windows NT server are installed and operational in your system.

- a. Insert the SRCU21 CD-ROM in the CD-ROM drive. If the Software Installation Main Menu does not appear, then run the setup.exe file that resides at:
<CD-ROM root>\os_setup\winnt\setup.exe on the CD-ROM.
- b. Click on the *Setup* button. See [Figure 2-25](#). Follow the on-screen prompts to complete installation.

The three components in the window in [Figure 2-26](#) are preselected. Add the remote storage console component by clicking on the remote storage console box.

Note: The DMI and SNMP components are not selected by default. Refer to section [Section 4.2, Intel® Integrated RAID Software Component Installation](#) for information on DMI and SNMP installation.

A progress bar appears that measures the progress of the SRCU21 setup. When this screen completes, you have completed the SRCU21 setup.

Note: Refer to section “[Intel® Integrated RAID Software Component Installation](#)” on [page 4-2](#) of the “[Using the Storage Console](#)” chapter for information on HP Openview and RAID Monitor.

10. See [Chapter 4, Section 4.3, “Configuring RAID Volumes Using the Intel® Integrated RAID Storage Console”](#) on [page 4-12](#) to customize your RAID volumes using Storage Console.

2.5.4.5 Install Intel Server RAID Controller U2-1 on an Existing NT 4.0 Server

This procedure installs SRCU21 into a system with an existing operating system installed. The procedure ensures that the necessary software components are installed before installing SRCU21.

Follow the required procedure below to install SRCU21.

1. Have all hardware and software on hand. See system requirements in [Section 2.5.4.2](#).
2. Back up your server.
3. Run the latest virus scan on any downloaded diskettes used for installation or on any existing volumes.
4. Update Microsoft Windows NT Server 4.0 with the following software:
 - TCP/IP
 - Microsoft Internet Information Server (IIS) 2.0.
5. After the NT installation update is complete, install the following components and software:
 - Microsoft Windows NT 4.0 Service Pack 5 or greater (This will automatically upgrade IIS 2.0 to IIS 3.0.).
 - Microsoft Internet Explorer 4.00 or greater (recommended) or Netscape Navigator 4.08 or greater.
6. If your browser uses a proxy server, then configure your browser using the procedure in [Section B.6, “Browser Configuration During Initial Installation”](#) on [page B-5](#) and return to this procedure. If you have not configured your browser to use a proxy server, then go to [step 9](#).



7. Configure Microsoft IIS

Warning: Due to added security in SRCU21, anonymous connections must be disabled in Microsoft IIS in order to execute the SRCU21 configuration utility in NT. If anonymous connections are allowed to IIS on the target server, then the following message will appear on the web browser after launching the SRCU21 configuration utility shortcut:

```
Unable to open Driver
Could not open I2O Driver
```

To avoid the problem described above when attempting to run Storage Console, disable *Allow Anonymous* connections to Microsoft IIS. Follow the directions below to disable *Allow Anonymous* connections.

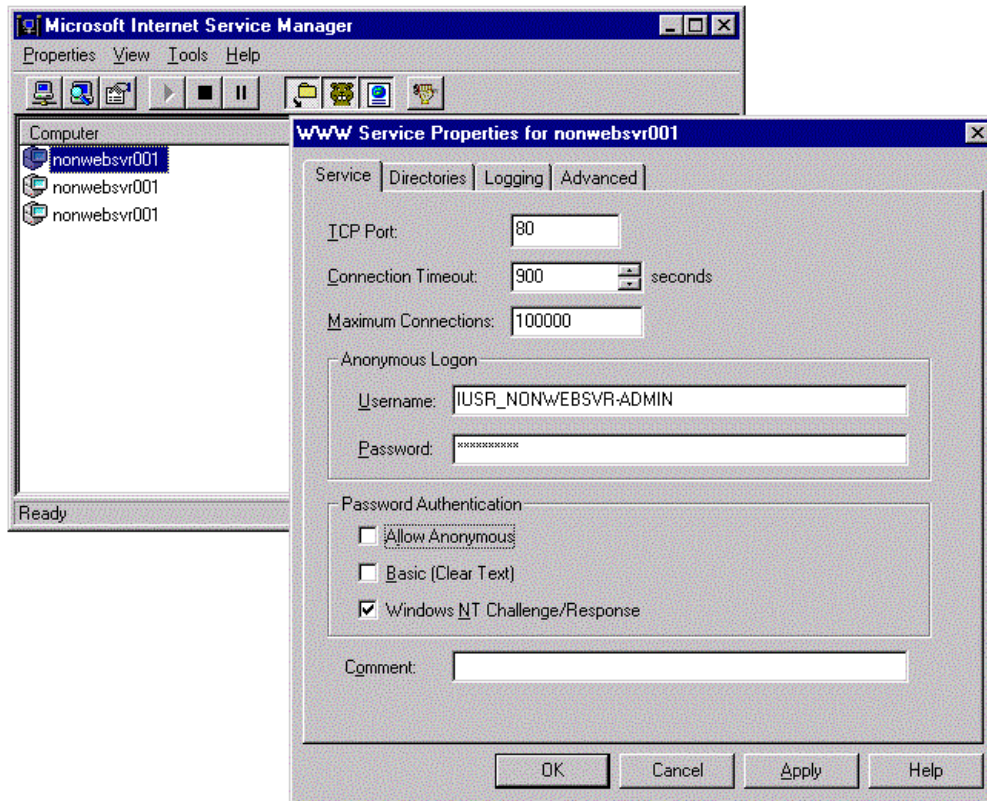
Note: If you need to use the World Wide Web service capabilities of Internet Information Server 4.0 to publish a web site on a server using SRCU21, install IIS 4.0. Reconfigure IIS using the IIS 4.0 instructions in [Section 2.5.5, Configuring Microsoft Windows IIS 4.0](#). Return to this procedure when completed.

If IIS 3.0 is installed on a FAT partition go to [step 8](#). If you need to use IIS 4.0, reconfigure IIS using the IIS 4.0 instructions in [Section 2.5.5, Configuring Microsoft Windows IIS 4.0](#). Go to [step 9](#) when completed. If you are using Microsoft IIS 3.0 on an NTFS partition, proceed to [step 9](#).

8. Configure Microsoft IIS 3.0

- a. Start *Internet Services Manager* from the *Microsoft Internet Server* program group.
- b. Double-click on the server name in the WWW Service row (top computer name).
- c. Under the *Service* tab in the *WWW Service Properties* window clear the *Allow Anonymous* checkbox in the *Password Authentication* section. See [Figure 2-28](#).

Figure 2-28. WWW Service Properties Window



- d. Select *OK* and close *Internet Service Manager*.
9. If Netscape is used as the default browser follow the procedure in [Section 2.5.6, Configuring IIS for use with Netscape Navigator](#) and then return to this procedure. If Microsoft Internet Explorer is used continue with this procedure.

Have all hardware and software on hand. See system requirements in [Section 2.5.8.2](#).

SRCU21 Hardware Installation

For complete hardware installation instructions see [Section 2.5.2.3](#).

Intel Integrated RAID Software Installation

1. Create and configure a RAID volume using the RAID Configuration Utility. See [“How to Invoke Advanced RCU” on page 2-18](#) to create and configure a RAID volume. Once a RAID volume is created and configured, return to this procedure to install the SRCU21 software.
2. Install the SRCU21 software (run the SRCU21 setup).



Note: You must have administrative level permissions to install SRCU21 software. This procedure assumes that the SRCU21 hardware and Windows NT server are installed and operational in your system.

- a. Insert the SRCU21 CD-ROM in the CD-ROM drive. If the Software Installation Main Menu does not appear, then run the setup.exe file that resides at:
<CD-ROM root>\os_setup\winnt\setup.exe on the CD-ROM.

- b. Click on the *Setup* button. See [Figure 2-25](#). Follow the on-screen prompts to complete installation.

The four components in the window in [Figure 2-26](#) are preselected. Accept this configuration and click on *Next*.

Note: The DMI and SNMP components are not selected by default. Refer to section “[Intel® Integrated RAID Software Component Installation](#)” on page 4-2 of the “[Using the Storage Console](#)” chapter for information on DMI and SNMP installation.

A progress bar appears that measures the progress of the SRCU21 setup. When this screen completes, you have completed the SRCU21 setup.

Note: Refer to section “[Intel® Integrated RAID Software Component Installation](#)” on page 4-2 of the “[Using the Storage Console](#)” chapter for information on HP Openview and RAID Monitor.

3. See [Chapter 4, Section 4.3, “Configuring RAID Volumes Using the Intel® Integrated RAID Storage Console”](#) on page 4-12 to customize your RAID volumes using Storage Console.

2.5.5 Configuring Microsoft Windows IIS 4.0

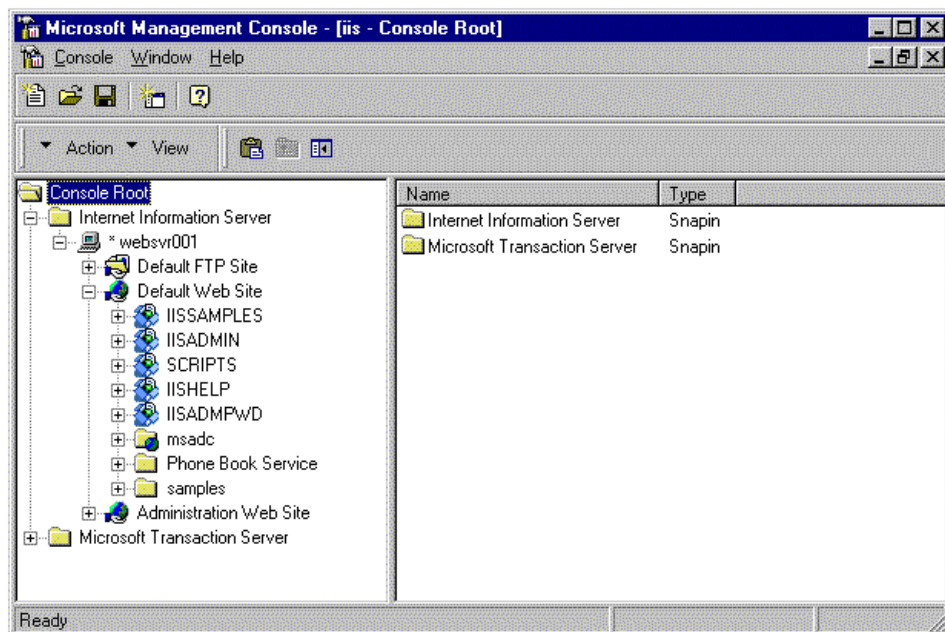
2.5.5.1 Configuring IIS 4.0 for Microsoft Windows NT Server 4.0

This procedure configures Microsoft IIS 4.0 on Microsoft Windows NT Server 4.0. Have software on hand. See system requirements in [Section 2.5.2.2](#).

If you need to use the World Wide Web service capabilities of Internet Information Server 4.0 to publish a web site on a server using SRCU21, install IIS 4.0. Reconfigure IIS using the instructions below. Return to this procedure when completed.

1. Install the following components and software:
 - Microsoft Internet Explorer 4.01 Service Pack 1 (recommended) or greater or Netscape Navigator 4.05 or greater.
 - Microsoft Windows NT Option Pack 1.0 (choose the upgrade only option; this will automatically upgrade Internet Information Server 3.0 to Internet Information Server 4.0).
2. Configure Microsoft IIS 4.0
 - a. Start *Microsoft Internet Services Manager* from the Windows NT 4.0 Option Pack program group.
 - b. Expand the *Internet Information Server* folder by selecting (clicking on) the "+" next to the folder.
 - c. Click on "+" next to the machine name.
 - d. Expand the *Default Web Site* folder by selecting the "+" next to the folder. See [Figure 2-29](#).

Figure 2-29. Expanded View of Default Web Site Folders

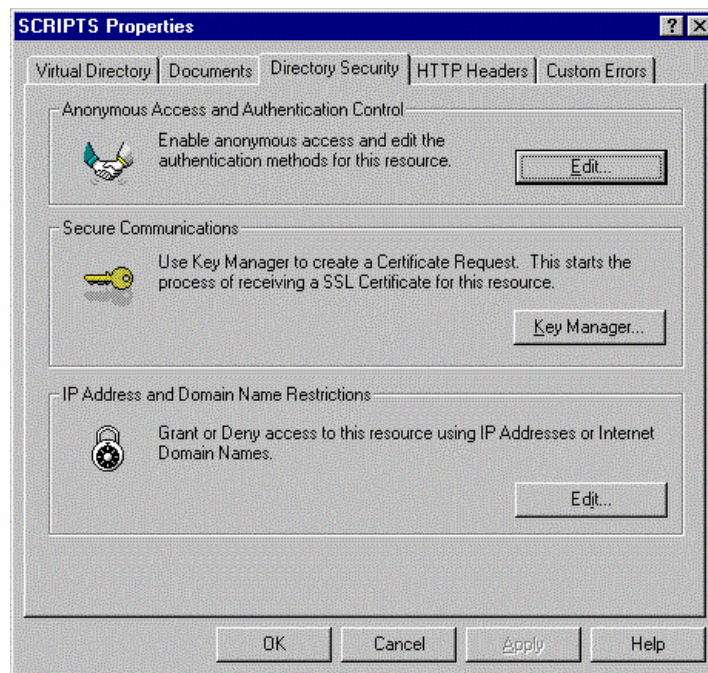


- e. Open the properties of the *Scripts* virtual directory by right clicking on the *Scripts* folder and selecting properties from the drop down menu.

Note: If you have other scripts located in the *Scripts* directory that need anonymous access, simply create a unique virtual directory that points to the *Scripts* directory and disallow *Anonymous* on the virtual directory only. Then change the SRCU21 management shortcut to point to the *Virtual* directory instead of the *Scripts* directory.

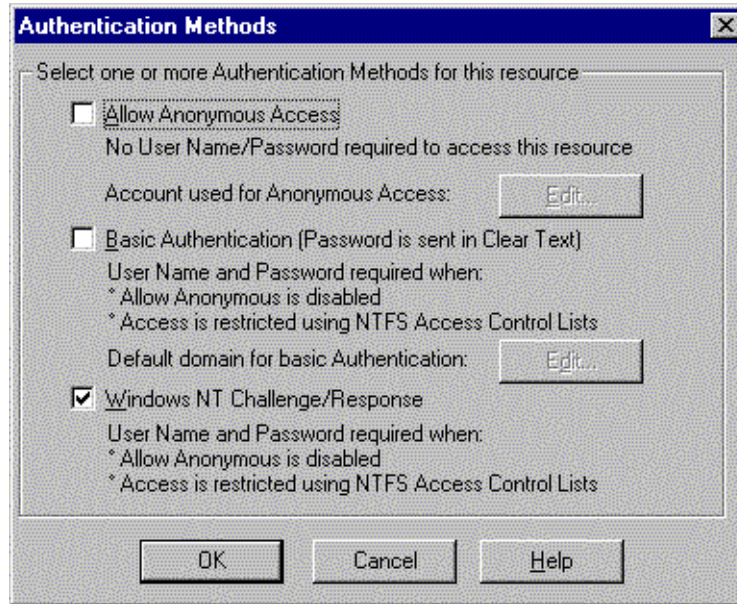
- f. Under the *Directory Security* tab on the *Scripts Properties* window select *Edit* in the *Anonymous Access and Authentication Control* section. See [Figure 2-30](#).

Figure 2-30. Directory Security Tab on the Scripts Properties Window



- g. Clear the *Allow Anonymous Access* checkbox in the *Authentication Methods* window. See [Figure 5-11](#).

Figure 2-31. Authentication Methods

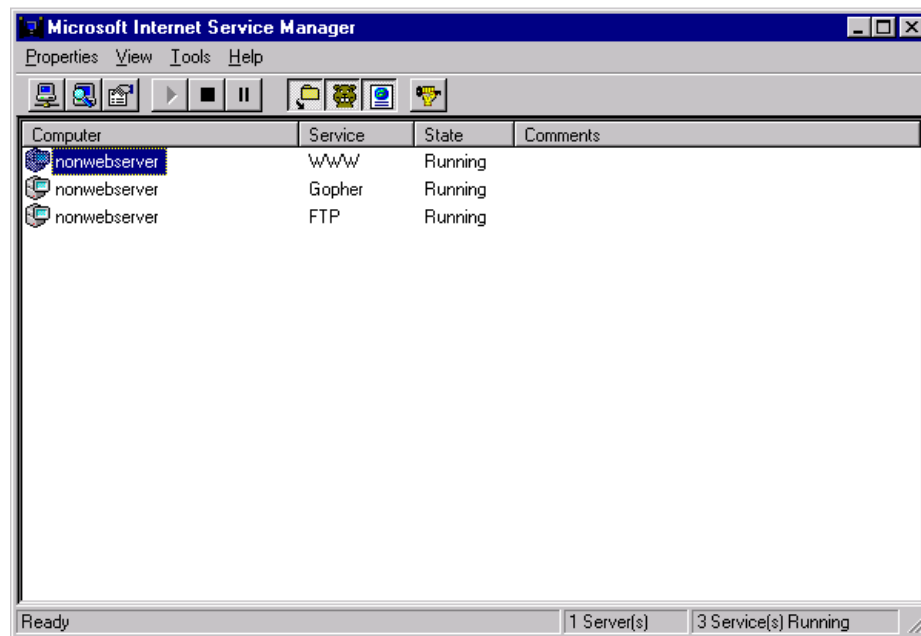


- h. Select *OK* and close *Microsoft Internet Service Manager*. Return to the NT installation procedure and complete your installation.

2.5.6 Configuring IIS for use with Netscape Navigator

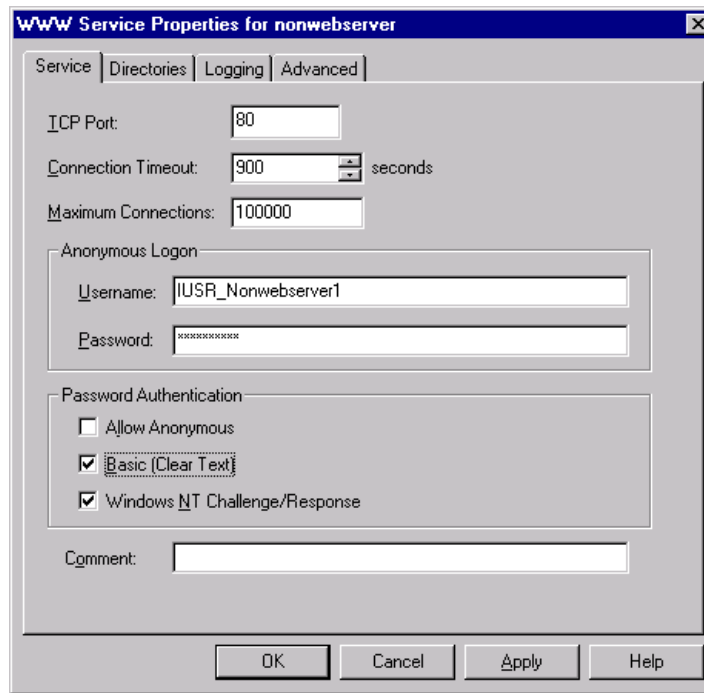
1. If Netscape Navigator is used as the default browser, use the following instructions to configure Microsoft IIS for use in Netscape Navigator.
2. If you use Netscape Navigator as the default browser where Intel® Server RAID Controller U2-1 is installed, you will have to enable Basic Authentication in Microsoft Internet Information Server to use the SRCU21 Storage Console. Netscape Navigator does not support *Windows NT Challenge/Response* authentication. If you are configuring Microsoft IIS 3.0 for use with Netscape Navigator, go to [step 3](#). If you are configuring Microsoft IIS 4.0 for use with Netscape Navigator, go to [step 4](#).
3. Configure Microsoft IIS 3.0 for Netscape Navigator
 - a. Start *Microsoft Internet Service Manager* from the *Microsoft Internet Service Manager* program group.
 - b. Double-click on the server name in the WWW Service row (top computer name). See [Figure 5-12](#).

Figure 2-32. Internet Information Service Manager



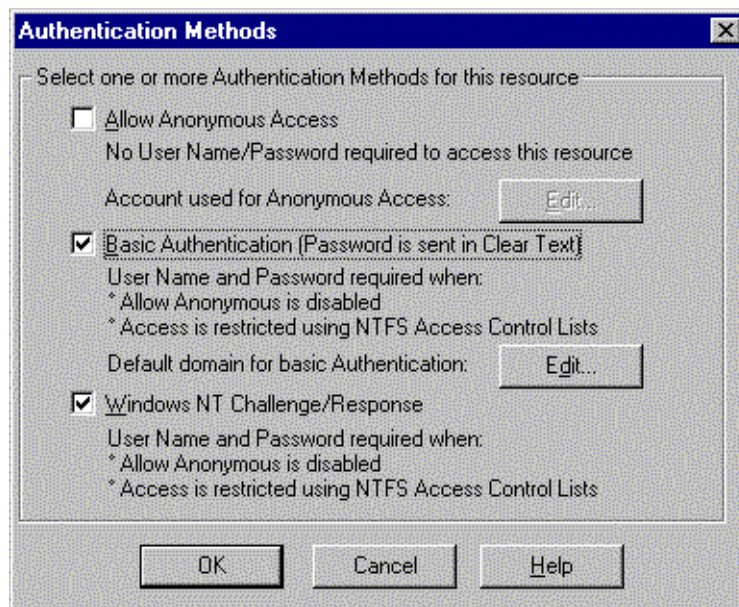
- c. Under the *Service* tab, check the *Basic Authentication* (Password is sent in Clear Text) checkbox in the password authentication section of the *WWW Service Properties for Servername* window. See [Figure 5-13](#).

Figure 2-33. WWW Service Properties Window



- d. Select *OK* and close *Internet Service Manager*.
4. Reconfiguring Microsoft IIS 4.0 for Netscape Navigator
 - a. Bring up *Microsoft Internet Service Manager* from the *Windows NT 4.0 Option Pack* program group.
 - b. Expand the *Internet Information Server* folder by selecting (clicking on) the "+" next to the folder.
 - c. Click on "+" next to the machine name.
 - d. Expand the *Default Web Site* folder by selecting the "+" next to the folder. See [Figure 5-9](#).
 - e. Right click on the *Scripts* folder and select *Properties* from the drop down menu.
 - f. Under the *Directory Security* tab on the *Scripts Properties* window select *Edit* in the *Anonymous Access and Authentication Control* section. See [Figure 5-10](#).
 - g. Check the *Basic Authentication (Password is sent in Clear Text)* checkbox in the *Authentication Methods* window. See [Figure 5-14](#).

Figure 2-34. Authentication Methods



- h. Select *OK* and close *Microsoft Internet Service Manager*.

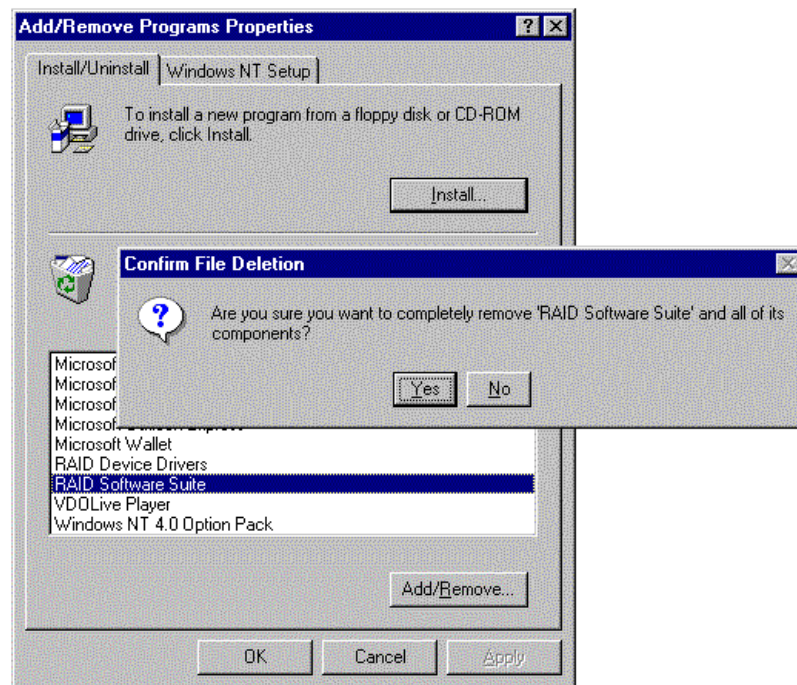
Note: Basic Authentication requires a username and password to be entered when connecting to secured web sites (including SRCU21 RAID Storage Console). Basic Authentication sends usernames and passwords over the network as clear text when connecting to remote web servers.

2.5.7 Uninstalling Intel Server RAID Controller U2-1 from NT Server

To remove the (product name) from your NT Server follow the instructions below.

1. Ensure that you have closed all applications and are logged in with administrative rights.
2. Open Control Panel and launch the Add/Remove programs icon.
3. Select the RAID Software Suite and click Add/Remove.
4. Click *Yes* to confirm removing the RAID Software Suite. The uninstallshield program will start removing files and display a progress bar. After the programs have been completely removed from your system, the unInstallShield program will show a summary of files removed and updates completed while removing files from the system. It will also recommend that the user restart the server. *Do not restart* the server here. Continue with this procedure to complete the removal of the SRCU21 software suite.

Figure 2-35. Add/Remove Properties Window



5. Click OK. A confirmation message will appear stating that the RAID Software Suite has been removed from your system.
6. Click OK to close the message box. You have successfully removed the RAID Software Suite.
7. Click on RAID Device Drivers and click the Add/Remove button.
8. Click OK at the first confirmation prompt.
9. Click OK at the second confirmation prompt to uninstall the RAID device drivers. The system will quickly prompt you to restart your system. Click OK .
10. Restart the system to complete the removal process.

2.5.8 Setup and Installation for Novell NetWare*

2.5.8.1 In this Section

- [RAID Requirements for Novell NetWare](#)
- [Installing Novell NetWare on a RAID Volume](#)
- [Installing Novell NetWare on a Pass-through Device or another Storage Device](#)
- [Installing Intel Server RAID Controller U2-1 on an Existing Novell NetWare Server](#)
- [Uninstalling Intel Server RAID Controller U2-1 from NetWare](#)

2.5.8.2 RAID Requirements for Novell NetWare

When installing the SRCU21 Kit for Novell NetWare, note the following system requirements.

RAID Hardware Requirements

- Server with CD-ROM Drive *not* attached to Intel® Server RAID Controller U2-1
- One available PCI slot
- Monitor display resolution of 800 x 600 or higher (recommended)
- Intel® Server RAID Controller U2-1 Adapter Card
- PCI 2.2 Compliant System BIOS
- Memory: 3.3v, 168-pin gold-plated, unbuffered PC100, ECC, SDRAM single or double row, DIMM modules that are of 32MB, 64MB, 128MB capacities (see supported parts at <http://support.intel.com/support/motherboards/server/srcu21>)

RAID Software Requirements

- SRCU21 CD-ROM
- Hard disk space: minimum 4 MB
- MS-DOS 5.x or later (Required for new installations of NetWare 4.x only)
- SRCU21 NetWare Installation Diskette (If you do not have an OS Installation Driver Diskette and you wish to create one, see the [Chapter 3, “Exploring the Utilities”](#).)
- Novell NetWare 4.2 - use Support Pack 8a or higher[†]
- Novell NetWare 5.0 - use Support Pack 4 or higher[†]

[†] Not supplied with SRCU21

Have all required system hardware and software components available before proceeding with the setup and installation.

Warning: Do not install OSM(s) downloaded from OS vendor websites. The OSMs provided on the SRCU21 CD-ROM are a later version than the OSMs currently provided by OS vendors. Using OSMs other than those provided on the SRCU21 CD-ROM may cause unpredictable results.

2.5.8.3 Installing Novell NetWare on a RAID Volume

Follow the required procedure below to install NetWare on an Intel® Integrated RAID volume. Have all hardware and software on hand. See system requirements in [Section 2.5.8.2](#).

NetWare 4.2

Have all hardware and software on hand. See system requirements in [Section 2.5.8.2](#).

SRCU21 Hardware Installation

For complete hardware installation instructions see [Section 2.5.2.3](#).

Intel Integrated RAID Software Installation

1. Create and configure a RAID volume using the RAID Configuration Utility. See [“How to Invoke Advanced RCU” on page 2-18](#) to create and configure a RAID volume. Once a RAID volume is created and configured, return to this procedure to install the operating system.
2. Insert MS-DOS floppy and reboot. Once you reboot, you will have to run FDISK to create a DOS partition of at least 50MB on the newly created volume (make sure it is flagged as the “Active” partition). Reboot and format the new partition. Make the new partition bootable.
3. Copy the desired MS-DOS files to the hard drive, copy the necessary CD-ROM drivers (e.g. ATAPI_CD.SYS and MSCDEX.EXE) and create a CONFIG.SYS and AUTOEXEC.BAT that loads those drivers. Insert the following lines in the CONFIG.SYS file:

```
files=30
buffer=20
```

4. Reboot the server, insert the NetWare Installation CD-ROM, go to the appropriate drive letter and run INSTALL.BAT.
5. After booting you will first be asked to Accept the License Agreement. Do so and then select “NetWare 4.2”, then select “Custom installation of NetWare 4.2”. Enter the server name and internal network number. Hit <Enter> to begin the initial file copy.
6. Confirm the locale configuration and select “Continue”. Modify the NCF files. Make any desired modifications. Next, the device driver installation screen appears.
7. Choose “Select additional or modify selected Disk/LAN drivers”.
8. Choose “Select an additional driver”. Hit <Insert> to install an unlisted driver. Make sure that the SRCU21 NetWare Installation diskette is in the floppy drive and hit <Enter>. Select “BKSTROSM.HAM” from the list.
9. Continue with the NetWare installation as normal by following the screen prompts.
10. Once the server installation is finished, complete the installation of the Intel Server RAID Controller U2-1 software suite by following the steps below.
11. Run "LOAD INSTALL".
12. Select "Product Options", then "Install product not listed". It will tell you that it is going to scan the A: drive for installation scripts. Ensure the "NetWare Installation" diskette is in the floppy drive, hit <Enter> to continue.
13. A screen prompt will ask which components you wish to install. A typical installation includes all components.

```
BKSTROSM.HAM
SCSIOSM.HAM
HTTP and Winsock Services
RAID Management Agents
```

Select the desired components and hit <F10> to continue. The appropriate files are copied and the AUTOEXEC.NCF and STARTUP.NCF files are modified as necessary.



Warning: Once the product is installed, check for and remove any duplicate lines in STARTUP.NCF. For example, NetWare 4.2 installations may insert an extra load line for the module PK411.NLM. Remove the extra line.

14. After the installation is complete, reboot the server to load the new drivers.
15. Load Support Pack 8a and reboot.
16. See [Chapter 4, Section 4.3, “Configuring RAID Volumes Using the Intel® Integrated RAID Storage Console”](#) on page 4-12 to customize your RAID volumes using Storage Console.

NetWare 5

Have all hardware and software on hand. See system requirements in [Section 2.5.8.2](#).

SRCU21 Hardware Installation

For complete hardware installation instructions see [Section 2.5.2.3](#).

Intel Integrated RAID Software Installation

If you do not use the boot capability of the NW5 CD, then replace step 2-5 below with steps 2-4 of the NetWare 4.2 instructions above.

1. Create and configure a RAID volume using the RAID Configuration Utility. See [“How to Invoke Advanced RCU”](#) on page 2-18 to create and configure a RAID volume. Once a RAID volume is created and configured, return to this procedure to install the operating system.
2. Insert the NetWare CD-ROM and reboot.

Note: The CMOS may need to be edited on some systems to be set to boot from the CD-ROM. Otherwise, if the system finds a partition on the hard drive it will attempt to boot from it and an error will result.

3. After booting you will first be asked to Accept the License Agreement. Do so. For a brand new volume, you should then select “Create a New Boot Partition”.
4. NetWare will then ask for the size of the boot partition, you can either keep the default of 50MB or hit “Modify” to change the size to suit your needs. When you are done, select “Continue”.
5. It will ask you confirm the boot partition creation. Select “Continue”. You will then press a key to reboot.
6. When NetWare boots again, it will first format the newly created boot partition, and then start loading files. During this initialization, you will see a white graphical NetWare logo screen.
7. It will eventually load a Welcome screen, asking you to verify the startup directory (C:\NWSERVER). Hit <Alt> <F10> to exit the installation. At the console, type “Down”. The installation exits to the boot drive prompt.
8. Insert the SRCU21 NetWare installation diskette into the A: drive. If your boot drive is C:, then run NWUPDATE.BAT. If your boot drive is other than C:, then create an NWUPDATE subdirectory and copy all the files from A:\DRIVERS into the NWUPDATE subdirectory.
9. Remove the diskette from the A: drive and reboot the server. After booting you will be asked to Accept the License Agreement. Do so and then select “Continue with Existing Partition”. You are now ready install NetWare 5 on the SRCU21 volume.

10. Continue with the NetWare installation as normal by following the screen prompts. Select the Block Storage OSM when prompted.
11. Reboot the server and install Support Pack 4 or higher. Once the server installation is completed, reboot the server.
12. To install the Intel Integrated RAID software (run the Intel Integrated RAID setup) run *NWCONFIG*.
13. Select "Product Options", then "Install product not listed". It will tell you that it is going to scan the A: drive for installation scripts. Ensure the "NetWare Installation" diskette is in the floppy drive, hit <Enter> to continue.
14. A screen prompt will ask which components you wish to install. Select the following components and hit <F10> to continue.
BKSTROSM.HAM
SCSIOSM.HAM
HTTP and Winsock Services
RAID Management Agents
The appropriate files are copied and the AUTOEXEC.NCF and STARTUP.NCF files are modified as necessary.
15. After the installation is complete, reboot the server to load the new drivers.
16. See [Section 4.3](#) in the "Using the Storage Console" chapter to customize your RAID volumes using Storage Console.

2.5.8.4 Installing Novell NetWare on a Pass-through Device or another Storage Device

This procedure installs Novell NetWare on a pass-through disk or another storage device. It is typically used on a system where the operating system is on a disk not controlled by SRCU21.

NetWare 4.2

Have all hardware and software on hand. See system requirements in [Section 2.5.8.2](#).

SRCU21 Hardware Installation

For complete hardware installation instructions see [Section 2.5.2.3](#).

Intel Integrated RAID Software Installation

1. If you are installing Novell NetWare on a Pass-through Disk go to [step 2](#). If you are installing Novell NetWare on another storage device, then go to [step 3](#).
2. Create a pass-through disk. Once [step a](#) is completed, return to this procedure to install the operating system.
 - a. Create a pass-through disk and select it as the boot device. Using the RAID Configuration Utility (see "[How to Invoke Advanced RCU](#)" on [page 2-18](#) for more information) create a pass-through disk and select it as the boot device (see "[Custom Configuration](#)" on [page 2-11](#) for more information on creating a pass-through disk). The operating system will be installed on this disk. You may choose to create more than one pass-through disk at this time.



3. Insert MS-DOS floppy and reboot. Once you reboot, you will have to run FDISK to create a DOS partition of at least 50MB on the newly created volume (make sure it is flagged as the “Active” partition). Reboot and format the new partition. Make the new partition bootable.
 4. Copy the desired MS-DOS files to the hard drive, copy the necessary CD-ROM drivers (e.g. ATAPI_CD.SYS and MSCDEX.EXE) and create a CONFIG.SYS and AUTOEXEC.BAT that loads those drivers. Insert the following lines in the CONFIG.SYS file:

```
files=30
buffer=20
```
 5. Reboot the server, insert the NetWare Installation CD-ROM, go to the appropriate drive letter and run INSTALL.BAT.
 6. After booting you will first be asked to Accept the License Agreement. Do so and then select “NetWare 4.2”, then select “Custom installation of NetWare 4.2”. Enter the server name and internal network number. Hit <Enter> to begin the initial file copy.
 7. Confirm the locale configuration and select “Continue”. Modify the NCF files. Make any desired modifications. Next, the device driver installation screen appears.
 8. Choose “Select additional or modify selected Disk/LAN drivers”.
 9. Choose “Select an additional driver”. Hit <Insert> to install an unlisted driver. Make sure that the SRCU21 NetWare Installation diskette is in the floppy drive and hit <Enter>. Select “BKSTROSM.HAM” from the list.
 10. Continue with the NetWare installation as normal by following the screen prompts.
 11. Once the server installation is finished, complete the installation of the SRCU21 software suite by following the steps below.
 12. Run "LOAD INSTALL".
 13. Select "Product Options", then "Install product not listed". It will tell you that it is going to scan the A: drive for installation scripts. Ensure the "NetWare Installation" diskette is in the floppy drive, hit <Enter> to continue.
 14. A screen prompt will ask which components you wish to install. A typical installation includes all components.

```
BKSTROSM.HAM
SCSIOSM.HAM
HTTP and Winsock Services
RAID Management Agents
```
- Select the desired components and hit <F10> to continue. The appropriate files are copied and the AUTOEXEC.NCF and STARTUP.NCF files are modified as necessary.
- Warning:** Once the product is installed, check for and remove any duplicate lines in STARTUP.NCF. For example, NetWare 4.2 installations may insert an extra load line for the module PK411.NLM. Remove the extra line.
15. After the installation is complete, reboot the server to load the new drivers.
 16. Load Support Pack 8a or later and reboot.
 17. See [Section 4.3](#) in the “Using the Storage Console” chapter to customize your RAID volumes using Storage Console.

NetWare 5

Have all hardware and software on hand. See system requirements in [Section 2.5.8.2](#).

SRCU21 Hardware Installation

For complete hardware installation instructions see [Section 2.5.2.3](#).

Intel Integrated RAID Software Installation

1. If you are installing Novell NetWare on a Pass-through Disk go to [step 2](#). If you are installing Novell NetWare on another storage device, then go to [step 3](#).
2. Create a pass-through disk. Once [step a](#) is completed, return to this procedure to install the operating system.
 - a. Create a pass-through disk and select it as the boot device. Using the RAID Configuration Utility (see [“How to Invoke Advanced RCU” on page 2-18](#) for more information) create a pass-through disk and select it as the boot device (see [“Custom Configuration” on page 2-11](#) for more information on creating a pass-through disk). The operating system will be installed on this disk. You may choose to create more than one pass-through disk at this time.
3. Insert the NetWare CD-ROM and reboot.

Note: The CMOS may need to be edited on some systems to be set to boot from the CD-ROM. Otherwise, if the system finds a partition on the hard drive it will attempt to boot from it and an error will result.

4. After booting you will first be asked to Accept the License Agreement. Do so. For a brand new volume, you should then select “Create a New Boot Partition”.
5. NetWare will then ask for the size of the boot partition, you can either keep the default of 50MB or hit “Modify” to change the size to suit your needs. When you are done, select “Continue”.
6. It will ask you confirm the boot partition creation. Select “Continue”. You will then press a key to reboot.
7. When NetWare boots again, it will first format the newly created boot partition, and then start loading files. During this initialization, you will see a white graphical NetWare logo screen.
8. It will eventually load a Welcome screen, asking you to verify the startup directory (C:\NWSERVER). Hit <Alt> <F10> to exit the installation. At the console, type “Down”. The installation exits to the boot drive prompt.
9. Insert the SRCU21 NetWare installation diskette into the A: drive. If your boot drive is C:, then run NWUPDATE.BAT. If your boot drive is other than C:, then create an NWUPDATE subdirectory and copy all the files from A:\DRIVERS into the NWUPDATE subdirectory.
10. Remove the diskette from the A: drive and reboot the server from the NetWare CD-ROM. After booting you will be asked to Accept the License Agreement. Do so and then select “Continue with Existing Partition”. You are now ready install NetWare 5 on the SRCU21 volume.
11. Continue with the NetWare installation as normal by following the screen prompts. Select the Block Storage OSM when prompted.
12. Remove the NetWare CD-ROM from the CD-ROM drive and reboot the server and install Support Pack 4 or higher. Once the server installation is completed, reboot the server.



13. Install the SRCU21 software (run the Intel Server RAID Controller U2-1 setup).
14. Run "NWCONFIG".
15. Select "Product Options", then "Install product not listed". It will tell you that it is going to scan the A: drive for installation scripts. Ensure the "NetWare Installation" diskette is in the floppy drive, hit <Enter> to continue.
16. A screen prompt will ask which components you wish to install. Select the following components and hit <F10> to continue.
 BKSTROSM.HAM
 SCIOSM.HAM
 HTTP and Winsock Services
 RAID Management Agents
 The appropriate files are copied and the AUTOEXEC.NCF and STARTUP.NCF files are modified as necessary.
17. After the installation is complete, reboot the server to load the new drivers.
18. See [Section 4.3](#) in the "Using the Storage Console" chapter to customize your RAID volumes using Storage Console.

2.5.8.5 Installing Intel Server RAID Controller U2-1 on an Existing Novell NetWare Server

Note: Ensure that you first create the SRCU21 *NetWare Installation* diskette from the CD-ROM. See [Chapter 3, "Exploring the Utilities"](#) for instructions on creating the diskette. Have all hardware and software on hand. See system requirements in [Section 2.5.8.2](#).

Have all hardware and software on hand. See system requirements in [Section 2.5.8.2](#).

SRCU21 Hardware Installation

For complete hardware installation instructions see [Section 2.5.2.3](#).

Intel Integrated RAID Software Installation

1. Load Support Pack 8a or later and reboot.
2. Once the server is up, run "NWCONFIG" on NetWare 5, or "LOAD INSTALL" from the prompt on NetWare 4.
3. Select "Product Options", then "Install product not listed". It will tell you that it is going to scan the A: drive for installation scripts. Ensure the "NetWare Installation" diskette is in the floppy drive, hit <Enter> to continue.
4. A screen prompt will ask which components you wish to install. A typical installation includes all components.
 BKSTROSM.HAM
 SCIOSM.HAM
 HTTP and Winsock Services
 RAID Management Agents
 Select the desired components and hit <F10> to continue. The appropriate files are copied and the AUTOEXEC.NCF and STARTUP.NCF files are modified as necessary.
5. Follow the prompts to down and restart the server.

6. See [Section 4.3](#) in the “Using the Storage Console” chapter to customize your RAID volumes using Storage Console.

2.5.8.6 Uninstalling Intel Server RAID Controller U2-1 from NetWare

To remove SRCU21 from a NetWare server, remove the following lines from STARTUP.NCF, if they exist:

```
LOAD I2OPCI.NLM
LOAD BKSTROSM.HAM
LOAD SCSIOSM.HAM
```

For NetWare 5, remove the following lines from AUTOEXEC.NCF, if they exist:

```
LOAD HTTPSTK.NLM
LOAD RAIDMON.NLM
LOAD RAIDXA.NLM
LOAD RAIDCI.NLM
```

For NetWare 4.x, remove the following lines from AUTOEXEC.NCF, if they exist:

```
LOAD CDBE.NLM
LOAD LOCNLM32.NLM
LOAD WS2_32.NLM
LOAD WSPIP.NLM
LOAD HTTP411.NLM
LOAD RAIDMON.NLM
LOAD RAIDXA.NLM
LOAD RAIDCI.NLM
```

2.5.9 Setup and Installation for UnixWare*

2.5.9.1 In this Section

- RAID Requirements for UnixWare
- Installing UnixWare on a RAID Volume
- Installing UnixWare on a Pass-through Device or another Storage Device
- Install Intel® Server RAID Controller U2-1 on an Existing UnixWare Server
- Uninstalling Intel® Server RAID Controller U2-1 from UnixWare

2.5.9.2 RAID Requirements for UnixWare

When installing SRCU21 for UnixWare 7.1, note the following system requirements.

RAID Hardware Requirements

- Server with CD-ROM Drive *not* attached to Intel® Server RAID Controller U2-1
- One available PCI slot
- Monitor display resolution of 800 x 600 or higher (recommended)
- Intel® Server RAID Controller U2-1 Adapter Card
- PCI 2.2 Compliant System BIOS
- Memory: 3.3v, 168-pin gold-plated, unbuffered PC100, ECC, SDRAM single or double row, DIMM modules that are of 32MB, 64MB, 128MB capacities (see supported parts at <http://support.intel.com/support/motherboards/server/srcu21>)

RAID Software Requirements

- SRCU21 CD-ROM
- Hard disk space: minimum 20 MB
- UnixWare Installation Diskette (to create this diskette, see Chapter 3, “Exploring the Utilities”)
- SCO UnixWare 7.1 software with Netscape 4.08 or greater (included with SCO)[†]

[†] Not supplied with SRCU21.

Have all required system hardware and software components available before proceeding with the setup and installation.

Warning: Do not install OSM(s) downloaded from OS vendor websites. The OSMs provided on the Intel Server RAID Controller U2-1 CD-ROM are a later version than the OSMs currently provided by OS vendors. Using OSMs other than those provided on the SRCU21 CD-ROM may cause unpredictable results.

2.5.9.3 Installing UnixWare on a RAID Volume

Follow the required procedure below to install UnixWare on an Intel® Integrated RAID volume. Have all hardware and software on hand. See system requirements in Section 2.5.9.2.

Have all hardware and software on hand. See system requirements in Section 2.5.9.2.

SRCU21 Hardware Installation

For complete hardware installation instructions see [Section 2.5.2.3](#).

Intel Integrated RAID Software Installation

Note: When installing UnixWare, create only one RAID volume on which the operating system is to be installed.

1. Create and configure *one* RAID volume in RAID Configuration Utility. See “[How to Invoke Advanced RCU](#)” on [page 2-18](#) to create and configure a RAID volume. Once a RAID volume is created and configured, return to this procedure to install the operating system. If more than one RAID volume is required, complete this installation and then use Storage Console to create multiple volumes.
2. Insert UnixWare 7.1 Volume: 1 of 2 diskette and reboot. Install the OS using the install instruction provided in UnixWare 7 Installation Guide manual. UnixWare will prompt you to install Host Bus Adapter diskette. At that time insert the Unix Installation diskette when prompted. To create a UnixWare Installation diskette see the “[Make Diskettes](#)” section in [Chapter 3, “Exploring the Utilities”](#).

Warning: Only use the version of the HBA disk that is provided on the CD or available from the Intel Web site for installation of this adapter. Do not use a HBA disk available from the vendor to install this product.

Note: During the installation of UnixWare, you will be prompted to install the Network Information Services (NIS) package. By default the installation will configure your system as an NIS client. See your system administrator for configuration of the NIS services.

After the installation, files such as /etc/inet/inetd.conf are supposed to be distributed to the client via NIS. If, however, you don't have a master NIS server on the network, the client will be unable to retrieve its copy of this (and other) file(s). Depending on the particular service being requested, fulfilling the request may take a long time, or may fail completely.

If you do not plan on using NIS, defer installation of NIS during the installation by pressing <F8> on the NIS configuration screen. If you decide at a later time to install NIS, you can do so using the pkgadd(1) command.

3. Install the Netscape browser. The Netscape browser is provided in the SCO UnixWare CD-ROM Disk 2 of 3.
4. After completing the UnixWare installation insert the SRCU21 CD-ROM in the CD-ROM drive and mount the CD-ROM.
 - a. Create a directory to mount the file. For example, type “mkdir cdfiles” at the prompt.
 - b. Mount the CD-ROM to the folder by typing:

```
mount -F cdfs -r /dev/cdrom/cdrom1 /cdfiles
```
5. Install all the Packages/Services Requirements first before installing the components packages. See [Table 2-4](#) for a complete list of all Packages/Services Requirements.

Table 2-4 lists the installation components and preinstallation requirements provided by Intel Server RAID Controller U2-1 for UnixWare.

Table 2-4. Installation Components and Preinstallation Requirements

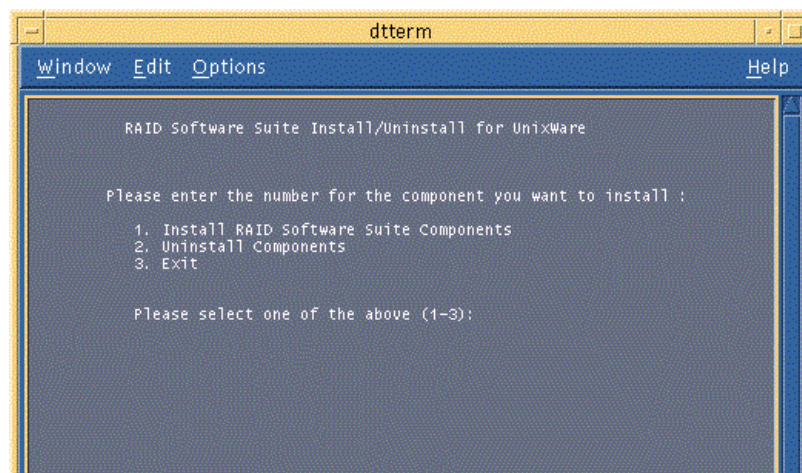
Component Name	Component Package Name	Packages/ Services Requirements	Optional Packages	Note
Storage Console	ptf7066b	inetd & Web Browser	N/A	By default inetd is installed and started. Install the web browser from the UnixWare Installation CD-ROM.
Raid Monitor	raidmon	ptf7066c	N/A	
SNMP Extension Agent	raidxa	snmpd, ptf7066c	N/A	snmpd service provided with the UnixWare CD-ROM. A typical installation should have the snmpd service running.

Table 2-5. Optional Installation Components

Component Name	Component Package Name	Packages/ Services Requirements	Optional Packages	Note
DMI Component Instrumentation	raidci	dmi, ptf7066c	DMIman & DMIdoc	DMI component instrumentation installation only.

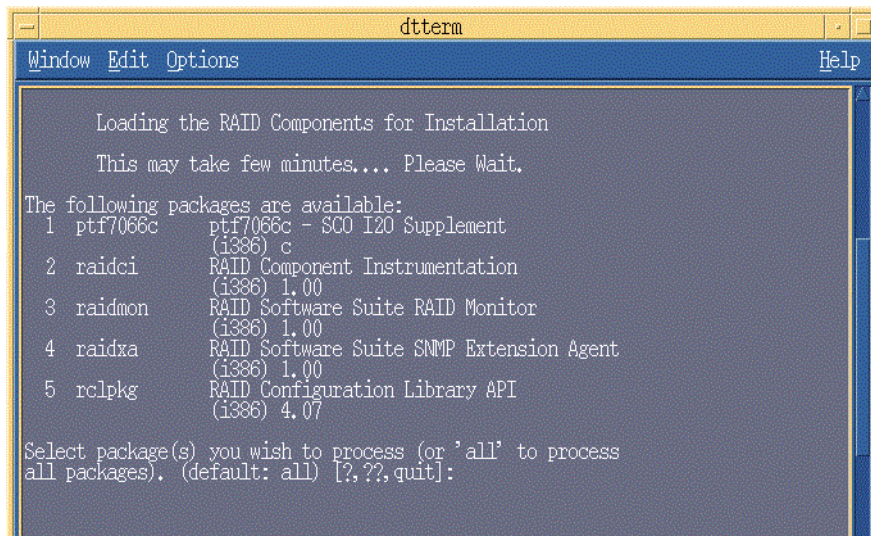
6. Launch the installer by typing the following:
 - a. Type “cd /cdfiles/os_setup/unixware”
 - b. Type “sh install” to start the install script.

Figure 2-36. Launched Scripts



- c. Select option 1 (by typing 1) to install the requirements and components (Figure 2-36). The launched scripts are shown in Figure 2-37.

Figure 2-37. Install Components



Packages can be individually installed by typing the package number listed on the screen as shown in Figure 2-37. To select all packages, press Enter. To install multiple packages, type <package number>, <package number> etc. For example, 1,2,4 etc., then press Enter. After completing the installation type *quit* and hit Enter to return to the main menu. Packages which have been previously installed will only be updated if the revision number of the currently installed package is older or newer.

7. After completing the installation of the components launch the application using the commands in Table 2-6.

Table 2-6. Component Launch Commands

Component Name	Path to Add in .cshrc file	Launch by Typing
Storage Console	N/A	Launch the browser and type the following in the http address box: "http://localhost:360/"
RAID Monitor	/opt/rss/bin	Type ".raidmon" (if path set)
SNMP Extension Agent	/opt/rss/bin	Type ".iraidxa" (if path set)
DMI Component Instrumentation	/opt/rss/bin	Type "raidci" (if path is set)

Launch Storage Console

1. Log on to the server as root or equivalent. Launch Netscape, type http://localhost:360/ and hit *Enter*.
2. Click on the IOP # card that you want to configure; for example, IOP0, IOP1 etc.
3. Click on the RAID Storage Console link. The Storage Console appears.



2.5.9.4 Installing UnixWare on a Pass-through Device or another Storage Device

This procedure installs UnixWare on a pass-through disk or another storage device. It is typically used on a system where the operating system is on a disk not controlled by SRCU21. Have all hardware and software on hand. See system requirements in [Section 2.5.9.2](#).

Have all hardware and software on hand. See system requirements in [Section 2.5.9.2](#).

SRCU21 Hardware Installation

For complete hardware installation instructions see [Section 2.5.2.3](#).

Intel Integrated RAID Software Installation

1. If you are installing UnixWare on a Pass-through Disk go to [step 2](#). If you are installing UnixWare on an IDE disk go to [step 4](#).
2. Create a pass-through disk. Once [step a](#) is completed, return to this procedure to install the operating system.
 - a. Ensure that only one pass-through disk is the only disk connected to the system. The remaining SCSI disks are connected to the SRCU21 after the OS is installed. Create the single disk as a pass-through disk and select it as the boot device. Using the RAID Configuration Utility (see “[How to Invoke Advanced RCU](#)” on page 2-18 for more information) create a pass-through disk and select it as the boot device (see “[Custom Configuration](#)” on page 2-11 for more information on creating a pass-through disk). The operating system will be installed on this disk.
3. If you are installing UnixWare on an IDE disk, go to [step 4](#). If you are installing UnixWare on a pass through disk, then go to [step 5](#).
4. If you are installing UnixWare on an IDE disk, ensure that the IDE disk is the only disk connected to the system. The SCSI disks are connected to the SRCU21 after the OS is installed.
 - a. Insert UnixWare 7.1 Volume: 1 of 2 diskette and reboot. Install the OS using the install instruction provided in UnixWare 7 Installation Guide manual. UnixWare will prompt you to install the Host Bus Adapter diskette. Insert any needed host bus adapter disks and press F10 to continue. If you do have vendor supplied HBA disk, then use the HBA disks supplied with UnixWare. Do not install the Intel Integrated RAID HBA disk.

Warning: Only use the version of the HBA disk that is provided on the CD or available from the Intel Web site for installation of this adapter. Do not use a HBA disk available from the vendor to install this product.

Note: During the installation of UnixWare, you will be prompted to install the Network Information Services (NIS) package. By default the installation will configure your system as an NIS client. See your system administrator for configuration of the NIS services.

After the installation, files such as /etc/inet/inetd.conf are supposed to be distributed to the client via NIS. If, however, you don't have a master NIS server on the network, the client will

be unable to retrieve its copy of this (and other) file(s). Depending on the particular service being requested, fulfilling the request may take a long time, or may fail completely.

If you do not plan on using NIS, defer installation of NIS during the installation by pressing <F8> on the NIS configuration screen. If you decide at a later time to install NIS, you can do so using the `pkgadd(1)` command. Go to [step 6](#).

5. Insert UnixWare 7.1 Volume: 1 of 2 diskette and reboot. Install the OS using the install instruction provided in UnixWare 7 Installation Guide manual. UnixWare will prompt you to install Host Bus Adapter diskette. At that time insert the Unix Installation diskette when prompted. To create a UnixWare Installation diskette see the “[Make Diskettes](#)” section in [Chapter 3, “Exploring the Utilities](#)”.

Note: During the installation of UnixWare, you will be prompted to install the Network Information Services (NIS) package. By default the installation will configure your system as an NIS client. See your system administrator for configuration of the NIS services.

After the installation, files such as `/etc/inet/inetd.conf` are supposed to be distributed to the client via NIS. If, however, you don't have a master NIS server on the network, the client will be unable to retrieve its copy of this (and other) file(s). Depending on the particular service being requested, fulfilling the request may take a long time, or may fail completely.

If you do not plan on using NIS, defer installation of NIS during the installation by pressing <F8> on the NIS configuration screen. If you decide at a later time to install NIS, you can do so using the `pkgadd(1)` command. Go to [step 6](#).

6. Install the Netscape browser. The Netscape browser is provided in the SCO UnixWare CD-ROM Disk 2 of 3.
7. After completing the UnixWare installation, connect the remaining SCSI disks to be configured as part of the RAID subsystem.
8. Boot the system, then insert the SRCU21 CD-ROM in the CD-ROM drive and mount the CD-ROM.
 - a. Create a directory to mount the file. For example, type “`mkdir cdfiles`” at the prompt.
 - b. Mount the CD-ROM to the folder by typing “`mount -F cdfs -r /dev/cdrom/cdrom1 /cdfiles`”
9. Install all the Packages/Services Requirements first before installing the components packages. See [Table 2-4](#) for a complete list of all Packages/Services Requirements.

[Table 2-4](#) lists the installation components and preinstallation requirements provided by SRCU21 for UnixWare.

10. Launch the installer by typing the following:
 - a. Type “`cd /cdfiles/os_setup/unixware`”
 - b. Type “`sh install`” to start the install script.
 - c. Select option 1 (by typing 1) to install the requirements and components ([Figure 2-36](#)). The launched scripts are shown in [Figure 2-37](#).

Packages can be individually installed by typing the package number listed on the screen as shown in [Figure 2-37](#). To select all packages, press Enter. To install multiple packages, type `<package number>, <package number>` etc. For example, `1,2,4` etc., then press Enter. After completing the installation type *quit* and hit Enter to return to the main menu.

Packages which have been previously installed will only be updated if the revision number of the currently installed package is older or newer.

11. After completing the installation of the components launch the application using the commands in [Table 2-6](#).
12. Reboot the system and create a RAID volume. See [Section 2.2, RAID Configuration Utility](#).
13. Reboot the system into UnixWare and install the browser if necessary. The Netscape browser is provided in the SCO UnixWare CD-ROM Disk 2 of 3.
14. After completing the installation of the components launch the application using the commands in [Table 2-6](#).

Launching Storage Console

1. Log on to the server as root or equivalent. Launch Netscape, type `http://localhost:360/` and hit *Enter*.
2. Click on the IOP # card that you want to configure; for example, IOP0, IOP1 etc.
3. Click on the RAID Storage Console link. The Storage Console appears.

2.5.9.5 Install Intel® Server RAID Controller U2-1 on an Existing UnixWare Server

This procedure installs SRCU21 into a system with an existing operating system installed. The procedure ensures that the necessary software components are installed before installing SRCU21.

1. Backup your system.
2. Insert the SRCU21 CD-ROM and mount the CD-ROM drive as follows:
 - a. Create a directory to mount the file from the root of the local drive. For example type `mkdir cdfiles` at the prompt.
 - b. Mount the CD-ROM to the folder by typing `mount -F cdfs -r /dev/cdrom/cdrom1 /cdfiles`
3. To install the SRCU21 components for UnixWare:
 - a. Type `cd /cdfiles/os_setup/unixware`
 - b. Type `sh install` to start the install script.
4. Select the install option by entering 1.
5. Install the ptf7066c package by selecting 1, and following the prompts. A confirmation message will appear confirming the installation of the package. Begin the hardware installation. See the procedure below.

Have all hardware and software on hand. See system requirements in [Section 2.5.9.2](#).

SRCU21 Hardware Installation

For complete hardware installation instructions see [Section 2.5.2.3](#).

Intel Integrated RAID Software Installation

1. Reboot the system into UnixWare and install the browser if necessary. The Netscape browser is provided in the SCO UnixWare CD-ROM Disk 2 of 3.
2. Insert the SRCU21 CD-ROM in the CD-ROM drive and mount the CD-ROM.

- a. Mount the CD-ROM to the folder by typing

```
mount -F cdfs -r /dev/cdrom/cdrom1 /cdfiles
```
3. Install any other required components (RAID Monitor, SNMP Extension Agent or DMI Component Instrumentation).

[Table 2-4](#) lists the installation components and preinstallation requirements provided by SRCU21 for UnixWare.

4. Launch the installer by typing the following:
 - a. Type “cd /cdfiles/os_setup/unixware”
 - b. Type “sh install” to start the install script.
 - c. Select option 1 (by typing 1) to install the requirements and components. Packages can be individually installed by typing the package number listed in the far left corner of the screen as shown in [Figure 2-37](#). To install multiple packages type <package number>, <package number> etc. For example, 1,2,4 etc. Hit Enter. After completing the installation type *quit* and hit Enter to return to the main menu. Packages which have been previously installed will only be updated if the revision number of the currently installed package is older or newer.
5. After completing the installation of the components launch the application using the commands in [Table 2-6](#).

Launching Storage Console

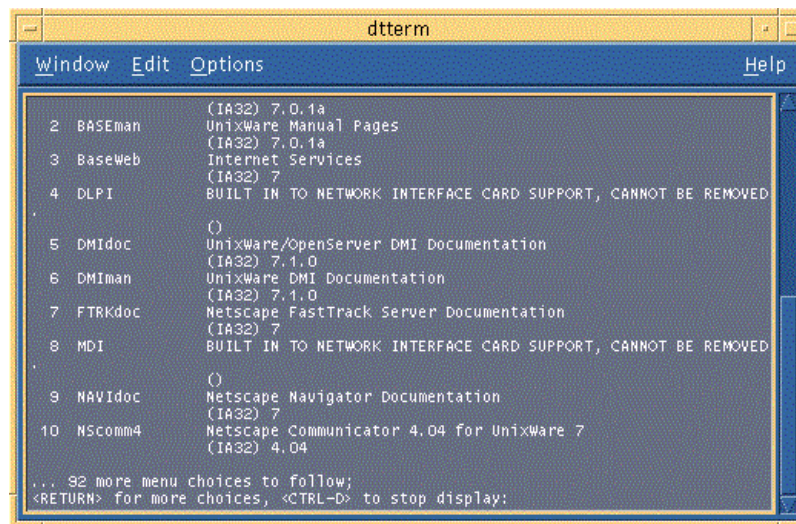
1. Log on to the server as root or equivalent. Launch Netscape, type `http://localhost:360/` and hit *Enter*.
2. Click on the IOP # card that you want to configure; for example, IOP0, IOP1 etc.
3. Click on the RAID Storage Console link. The Storage Console appears.

2.5.9.6 Uninstalling Intel® Server RAID Controller U2-1 from UnixWare

1. Insert the SRCU21 CD-ROM and mount the CD-ROM drive as follows:
 - a. Create a directory to mount the file. For example type “mkdir cdfiles” at the prompt.
 - b. Mount the CD-ROM to the folder by typing “mount -F cdfs -r /dev/cdrom/cdrom1 /cdfiles
2. To uninstall the Intel Server RAID Controller U2-1 components for UnixWare:
 - a. Type “cd /cdfiles/os_setup/unixware”
 - b. Type “sh install” and select option 2 for uninstallation. See [Figure 2-36](#).
3. All the packages installed on the components are displayed. Hit CTRL-D after you know the number of components to uninstall.
4. Packages can be individually uninstalled by typing the package number listed on the screen as shown in [Figure 2-37](#). To uninstall multiple packages type <package number>, <package number> etc. For example, 1,2,3,6 etc. Remove all SRCU21 components and packages/services listed in [Table 2-4](#). Hit Enter. After completing the uninstall type *quit* and hit Enter to return to the main menu.

The launched uninstall scripts are shown in [Figure 2-38](#).

Figure 2-38. Launched Uninstall Scripts



2.6 Support

World Wide Web Site: <http://support.intel.com/support/motherboards/server/srcu21>

2.6.1 Telephone

Talk to a Customer Support Technician** (Intel reserves the right to change pricing for telephone support at any time without notice).

In U.S.: 1-900-555-5800 (M-F, 7:00 am-5:00 pm, Th 7:00 am-3:00 pm, PST). Calls billed at U.S. \$2.50 per minute.

In U.S. and Canada: 1-800-404-2284 (M-F, 7:00 am-5:00 pm, Th 7:00 am-3:00 pm, PST). Credit card calls billed at U.S. \$25 per incident.

In Europe:

English language: +44-131-458-6847

French language: +44-131-458-6848

German language: +44-131-458-6954

Italian language: +44-131-458-6951

(M, Th, F, 8:00 am-5:00 pm, T-W, 8:00 am - 4:00 pm, UK time) Credit card calls billed at U.S. \$25 per incident (levied in local currency at the applicable credit card exchange rate plus applicable VAT).

In Asia-Pacific region (Singapore local time, Oct-April: M-F, 6:00 am-4:00 pm; April-Oct: M-F, 5:00 am - 4:00 pm). Credit card calls billed at U.S. \$25 per incident.



Australia (Sydney): +1-800-649-931

Hong Kong: +852-2-844-4456

Korea: +822-767-2595

PRC: +852-2-844-4456

Singapore: +65-831-1311

Taiwan: +886-2-718-9915

Rest of the world: Call the North American Service Center at +1-916-377-7000
(M-F, 7:00 *am*-5:00 *pm*, U.S. pacific standard time).

Credit card calls billed at U.S. \$25 per incident.

** Or contact your local dealer or distributor.

3.1 Introduction

The Intel® Server RAID Controller U2-1 (SRCU21) Utilities chapter provides information on OS-independent utilities including the Make Diskettes option (to create these utilities onto backup diskettes), the Update Flash Utility (for updating a valid image in flash), the Advanced RAID Configuration Utility (an alternative to the RCU to create multiple volumes before installing the OS), RAID Recovery Utility (which provides an emergency download recovery capability if the SRCU21 firmware becomes corrupted), and a DOS based PDF reader to view the user's manual.

These utilities are primarily intended to be accessed from CD-ROM via the ROM-DOS startup menu which is launched when the system is booted using the SRCU21 CD-ROM. (This may require changes to your BIOS to enable the CD-ROM to be booted first before other devices).

3.1.1 Summary of Contents

- ROM-DOS Startup Utilities
 - Make Diskettes
 - Update Flash
 - Update Flash Procedure
 - Advanced RAID Configuration Utility
 - RAID Recovery (Recover Flash)
 - User's Manual via DOS PDF

3.2 ROM-DOS Startup Utilities

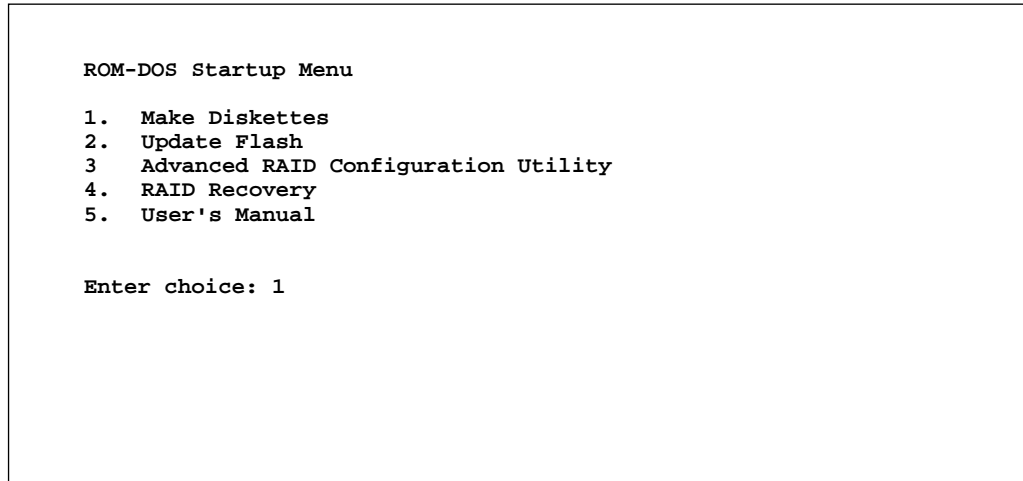
The SRCU21 CD-ROM is self-booting, assuming that your system supports booting from the CD-ROM drive. This feature is useful because the utilities discussed below are run directly from the CD-ROM.

1. Change the BIOS setup so that your system boots from the CD-ROM. Insert the SRCU21 CD-ROM into the system CD drive and power up the system. The *ROM-DOS Startup Menu* appears ([Figure 3-1](#)).
2. From the menu, select the type of update or SRCU21 configuration function you wish to perform. The ROM-DOS Startup Menu provides four options. See [Figure 3-1](#). Those options include Make Diskettes, Update Flash, RAID Troubleshooting and RAID Recovery.
3. Enter the appropriate number in the *Enter Choice* field and hit *Enter*. The appropriate screen appears.

The ROM-DOS Startup Menu options are discussed below.

3.2.1 ROM-DOS Startup Menu

Figure 3-1. ROM-DOS Startup Menu



3.2.1.1 Make Diskettes

The Make Diskettes option generates self-extracting diskettes for firmware updates, RAID troubleshooting (bootable diskette) and RAID recovery (bootable diskette). It also generates diskettes for Windows NT*, Novell Netware* and Unixware* NOS installation drivers. These utilities are discussed below.

To generate a diskette, insert the SRCU21 CD-ROM in the CD-ROM drive in system running Windows* 95, 98 or NT. When the SRCU21 Main Menu appears click on the *Make Utility and Drivers Diskettes* button. The *Make Utility and Drivers Diskettes* window appears. Click on the appropriate utility button. A DOS window appears. Insert a blank high-density diskette in drive A: and press Enter to extract the software.

Figure 3-2. Make Diskettes Options

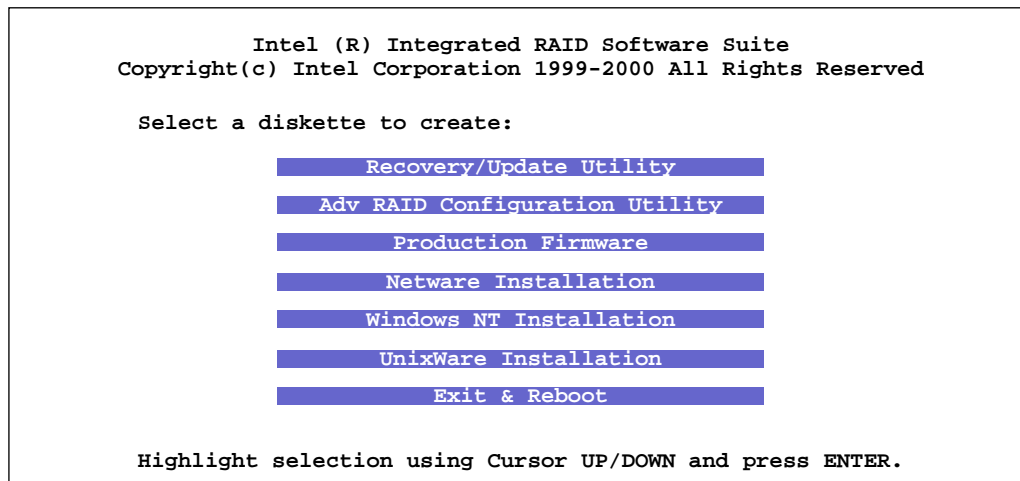


Table 3-1. Make Diskettes Options

Make Diskettes Options	Description
Recovery/Update Utility	Secondary method of updating the SRCU21 firmware.
Advanced RAID Configuration Utility	Used in place of the RAID Configuration Utility to create multiple RAID volumes. Also enables the user to quickly view the SRCU21 subsystem without booting the operating system, for example, it ensures all attached disks are recognized by the SRCU21 adapter.
Production Firmware	Used in conjunction with the Recovery/Update Utility. This utility creates the firmware diskette that contains the software (.bin file) that is loaded into SRCU21.
NetWare Installation	Create the Novell RAID Device Drivers for the SRCU21 solution. This installs the OSM drivers needed for booting an SRCU21 volume that contains the operating system.
Windows NT Installation	Create the Microsoft RAID Device Drivers for the SRCU21 solution. This diskette is also known as the Microsoft Windows NT SCSI miniport diskette. Installing these device drivers allows an operating system to boot when installed on an SRCU21 volume.
UnixWare Installation	Create the RAID Device Drivers for the SRCU21 solution. This diskette is also known as the HBA (Host Bus Adapter) Diskette. This installs the OSM drivers needed for booting an SRCU21 volume that contains the operating system.

3.2.1.2 Update Flash

The Update Flash Utility provides a function for programming SRCU21 firmware.

The Update Flash Utility provides the primary method of updating the IOP firmware (SRCU21 firmware). Executing under ROM-DOS, the Update Flash Utility uses I₂O messages to perform all functions. Therefore, the SRCU21 hardware must be fully operational for the Update Flash Utility to function. Contact Technical Support should you be unable to update the Flash successfully. Follow the procedure in [Section 3.2.1.3](#) to update SRCU21.

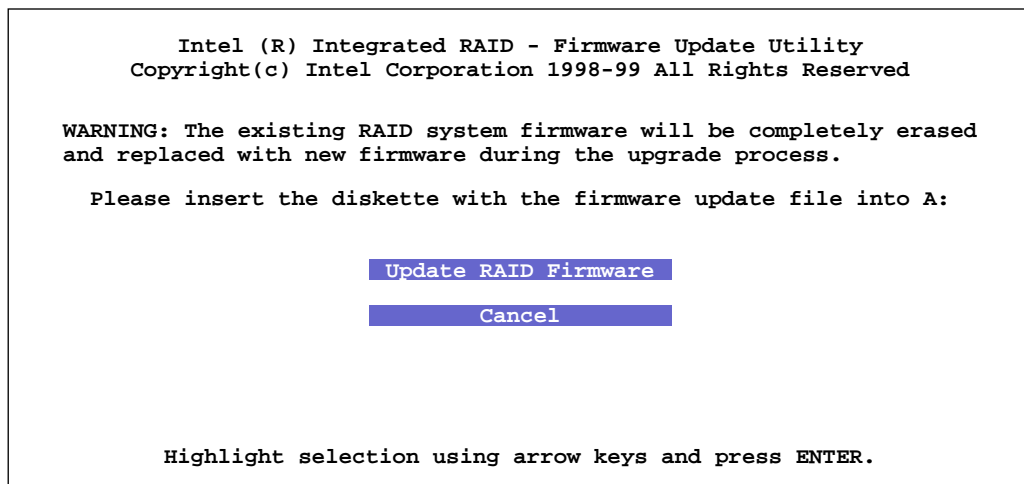
Note: Only one card can be in the system at a time when using the Firmware Update Utility. FUU only works with one IOP. If two are found an error message indicates that two are found and that you must exit.

3.2.1.3 Update Flash Procedure

Note: This procedure assumes that SRCU21 hardware is functional. No jumper setting changes are required. The update flash procedure requires that the array and volumes are in normal status.

1. Back up the data from the disk connected to the SRCU21 adapter before updating the flash.
2. Get the firmware update for your SRCU21 hardware. For example, download the bin file from the Intel web site onto a floppy disk: <http://support.intel.com/support/motherboards/server/srcu21>
3. To flash the firmware using the CD-ROM, boot the system with the SRCU21 CD-ROM. At the Main Menu enter number 2 (*Update Flash*) and hit Enter. The splash message and opening screens appear followed by the Update RAID Firmware screen. See [Figure 3-3](#).

Figure 3-3. Update RAID Firmware Screen

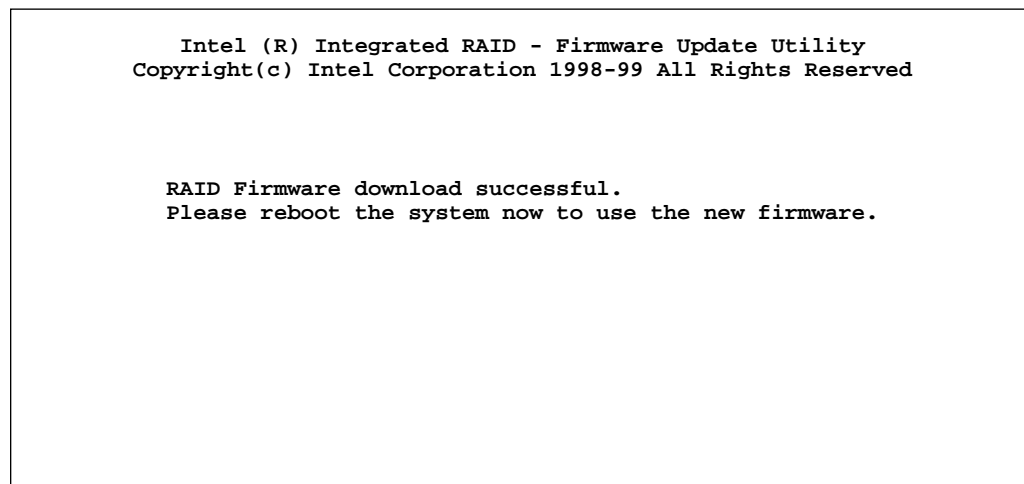


4. Insert the diskette containing the firmware update image into the floppy drive A:. Select the Update RAID Firmware ([Figure 3-3](#)) option and hit Enter to initiate the process of downloading the firmware update image from the floppy disk to the flash on your SRCU21 hardware. If the program cannot find the file on the floppy disk inserted in drive A, then the *Update Flash Utility Could Not Find Firmware Update File* screen appears.

The *RAID Firmware Download Successful* screen is shown in [Figure 3-4](#).

5. Remove the CD-ROM from the CD-ROM drive and reboot the system to use the new firmware update.

Figure 3-4. RAID Firmware Download Successful



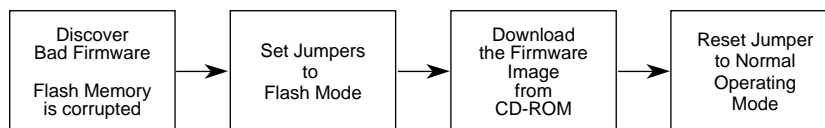
3.2.1.4 Advanced RAID Configuration Utility

The Advanced RAID Configuration Utility (RCU) is used to create and configure multiple volumes before installing the operating system. See [Section 2.4, “Advanced RAID Configuration Utility](#) for complete instructions for starting and working in Advanced RCU.

3.2.1.5 RAID Recovery (Recover Flash)

The RAID Recovery utility (RRU) erases and writes a new binary image in the flash memory of SRCU21 hardware. Note that this procedure requires that you manually open the server and change jumper settings. The RRU requires that the array and volumes are in a normal status. [Figure 3-5](#) illustrates the Flash Recovery process.

Figure 3-5. RAID Firmware Recovery Overview



Follow the procedure below to flash the SRCU21 hardware.

- 1. Back up the data from the disk connected to the SRCU21 adaptor before recovering the firmware to flash memory.**
- 2. Set the Jumpers to Flash Mode**

To reprogram the SRCU21 hardware, you must change jumper settings.

If you are using the SRCU21 adapter card, change the jumper settings as follows:

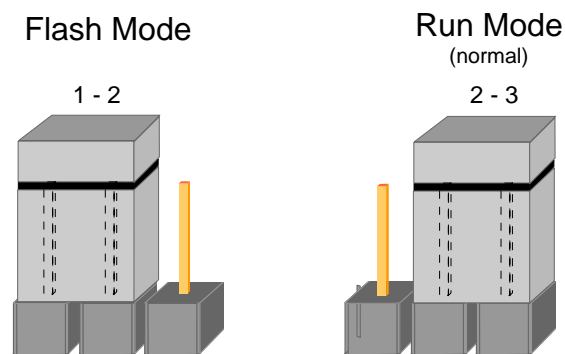
- a. Take all precautions to prevent ESD damage before handling the SRCU21 adapter card.

- b. Power off all system components and disconnect their power cords.

Warning: Shock hazards may be present inside the unit in which this card is being installed. Disconnect all power cords to the unit before removal of any covers. Follow the warnings noted in your computer's user or service manual before installing this board. ONLY after all the covers are reinstalled should you reattach the power cords and power up the unit for the software installation and use.

- c. Remove the cover from the system to gain access to the PCI slots.
- d. Remove the SRCU21 adapter card from your system.
- e. On Jumper block J7 D1 (bottom right corner of card) move jumper 1 from position 2-3 to position 1-2. Re-install the SRCU21 adapter card in the PCI slot in which it was previously installed. Reattach the SCSI drives to the adapter card.
- f. Replace the cover, reconnect all power cords and power up the system.

Figure 3-6. Jumper Settings (View of Bottom Right Corner of Card)



3. Flash the Firmware

To Flash the firmware using the CD-ROM, boot the system with the SRCU21 CD-ROM. At the Main Menu, select #4 (*RAID Recovery*) and press Enter. Then select #1 (*Production Firmware*), press Enter and follow the on screen prompts to download the firmware.

Note: To Flash the firmware using a diskette, contact Technical Support.

4. Reset the Jumpers to Run mode

Warning: Shock hazards may be present inside the unit in which this card is being installed. Disconnect all power cords to the unit before removal of any covers. Follow the warnings noted in your computer user or service manual before installing this board. ONLY after all the covers are reinstalled should you reattach the power cords and power up the unit for the software installation and use.

- a. Power off all system components and disconnect their power cords.
- b. Remove the system cover.
- c. Remove the SRCU21 adapter card from your system.
- d. On Jumper block J7 D1 move jumper from position 1-2 to position 2-3. Reinstall the SRCU21 adapter card in the PCI slot in which it was previously installed. Reattach the SCSI drives to the adapter card.
- e. Replace the cover, reconnect all power cords and power up the system.



- f. Boot the system.

Your firmware has been restored.

3.2.1.6 User's Manual via DOS PDF

A DOS-based compatible PDF of the user's manual is provided on the Intel Integrated RAID CD-ROM.

4.1 Intel® Integrated RAID Software Suite

4.1.1 Summary of Contents

- Intel® Integrated RAID Software Component Installation
 - RAID Monitor
 - Using Intel Server Control (ISC) to Monitor RAID Events
 - HP OpenView* Network Node Manager Integration
- Configuring RAID Volumes Using the Intel® Integrated RAID Storage Console
 - Launching the Intel® Integrated RAID Storage Console for Local Administration
 - Launching the Intel® Integrated RAID Storage Console for Remote Administration
 - Intel® Integrated RAID Storage Console
 - RAID Volumes
 - Physical Disks
 - Logical Arrays
 - Enclosures
 - Utilities
 - Management Utilities (including Storage Console)

4.1.2 Introduction

The Intel® Integrated RAID Software Suite refers to Intel Integrated RAID software on the CD-ROM delivered with your system. This CD-ROM contains installation software that is required for the configuration and support of Intel Integrated RAID. [Table 4-1](#) outlines their functions.

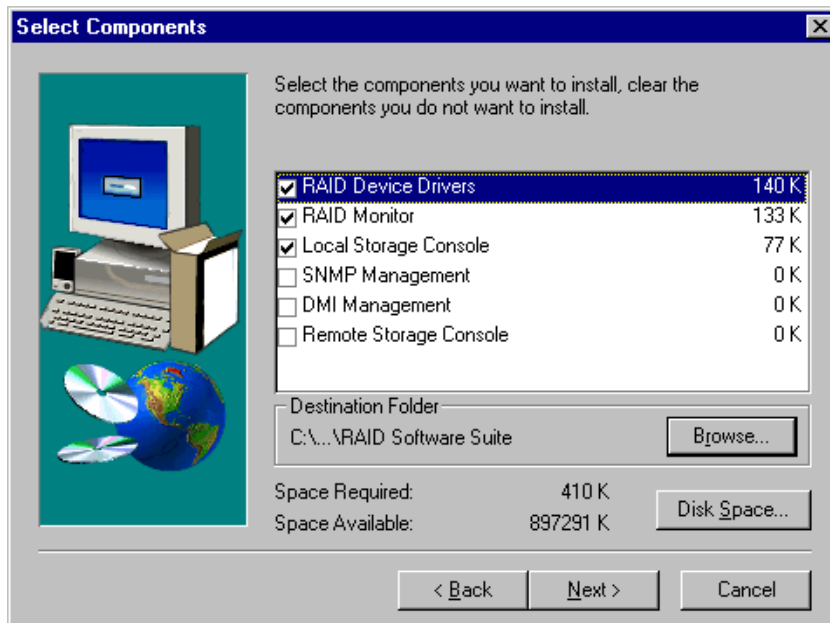
Table 4-1. Intel® Integrated RAID Software

	Software	Use	Function
OS-Independent ¹	RAID Configuration Utility (BIOS)	RAID Configuration	Configures a RAID volume (prior to boot up during BIOS initialization). <ul style="list-style-type: none"> Configure, delete or display information about a RAID Volume. Reset the configuration of the Intel® Integrated RAID hardware. Define a global hot spare.
	Advanced RAID Configuration Utility (ROM-DOS)	RAID Configuration	Configures Multiple RAID volumes (ROM DOS). <ul style="list-style-type: none"> Configure, delete or display information about a RAID Volume. Reset the configuration of the Intel® Integrated RAID hardware. Define a global hot spare.
OS-Specific ²	RAID Monitor	Monitor and report state changes of Intel® Integrated RAID	The RAID Monitor consists of two software components: <ul style="list-style-type: none"> RAID Monitor Application RAID Monitor Service
	HP OpenView Network Node Manager	Network Management	Integrates the management of Intel® Integrated RAID devices into the OpenView framework.
	Storage Console	RAID Configuration	Configures a RAID volume using your browser. <ul style="list-style-type: none"> Configure, delete or display information about a RAID Volume. Reset the configuration of the Intel® Integrated RAID hardware. Define a global hot spare. Perform a bus scan.
<p>1. Software tools that do not require a network operation system to run.</p> <p>2. Software tools that do require a network operation system to run.</p>			

4.2 Intel® Integrated RAID Software Component Installation

This section reviews Intel Integrated RAID software installations of RAID Monitor, DMI and SNMP for Microsoft Windows NT* Server, Novell NetWare* and UnixWare*. It also covers the installation for HP Openview for Windows NT Server.

Figure 4-1. Software Components



4.2.1 RAID Monitor

4.2.1.1 Overview

The RAID Monitor Service detects events from the Intel Integrated RAID subsystem and provides a local console alert. The RAID Monitor consists of two software components, the RAID Monitor Application and the RAID Monitor Service. An entry is made in the appropriate event logging mechanism for the host OS. The location of the events are logged as shown below.

Windows NT Server

Utilizes the event log and displays and alert using the local dialog box.

Novell NetWare

Creates a raid.log in SYS:System/raid.log. Displays a system console alert.

SCO UnixWare

Creates a syslog in /usr/adm/syslog that can be configured send an administrative email upon detecting an event.

4.2.1.2 Using RAID Monitor with NT Server

RAID Monitor Application

RAID Monitor provides a user interface to configure and enable/disable the RAID Monitor Service. Run the RAID Monitor Application every time the server starts by creating a short cut to it in the Startup program group. The RAID Monitor Application is configured using the RAID Monitor Application Configuration Dialog.

RAID Monitor Service

The RAID Monitor Service is a Win32 service which monitors the status of RAID volumes. The RAID Monitor Service runs in the background and has no interface.

Configuring the RAID Monitor

When the RAID Monitor application is loaded, it creates an icon in the system tray. When users click the right mouse button on the icon, a configuration menu appears. The configuration menu is described below.

Configuration Menu

The following are the components of the configuration menu.

- Properties. Displays the RAID Monitor Application Configuration Dialog (see [Figure 4-2](#)).
- Enable/disable the RAID Monitor Service. When disabled, RAID Monitor Service does not send events to a local monitor.
- Exit the RAID Monitor Application.

RAID Monitor Application Configuration Dialog

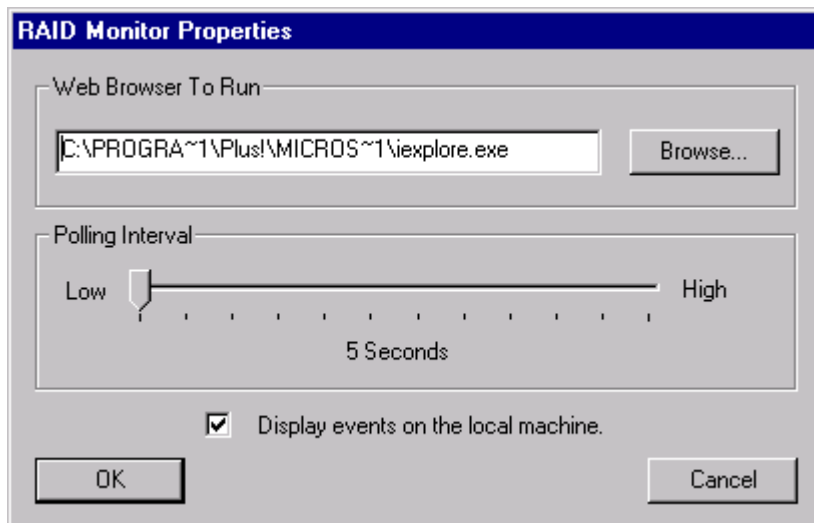
Use the RAID Monitor Application Configuration Dialog to configure the RAID Monitor. See [Figure 4-2](#).

Note: The RAID Monitor Application Configuration Dialog can be invoked by double clicking on the system tray icon.

The components of the RAID Monitor Application Configuration Dialog are discussed below. Refer to [Figure 4-2](#).

- Enter the path and filename of the HTML browser.
- Adjust the RAID Monitor Service polling interval or frequency. The polling interval determines how frequently the RAID Monitor Service checks the status of disks and RAID volumes. Use the slider bar to adjust the polling interval. The default polling interval is five seconds. One tick in the slider bar increments/decrements the polling interval by five seconds. Whenever a RAID volume causes an event, the RAID Monitor Service sends a notification to the registered applications.
- Check or uncheck the check box to enable or disable the RAID monitor service, respectively. Unchecking the box disables RAID events from displaying a message on the screen.

Figure 4-2. RAID Monitor Application Configuration Dialog



4.2.1.3 DMI Monitoring

Select this option to install the DMI Component Instrumentation (CI) for Intel Server RAID Controller U2-1 (SRCU21). This allows the SRCU21 subsystem to be monitored from a local or remote DMI Browser. A DMI browser and Service Layer must be installed on the machine before the CI will load and function. The DMI browser and Service Layer are not supplied with SRCU21 software. DMI components are not selected by default to be installed. Install the SRCU21 DMI Component Instrumentation (CI) using the procedure below.

Note: You must have administrative level permissions to install SRCU21 DMI CI software.

1. Insert the SRCU21 CD-ROM in the CD-ROM drive. (If the RAID Installer Menu does not appear, then run the setup.exe file that resides at: <CD-ROMroot>\os_setup\winnt\setup.exe on the CD-ROM).
2. Click on the Setup button and follow the prompts to the *Preselected Components* window.
3. Three components in the *Preselected Components* window below are preselected. See [Figure 4-1](#). If the RAID device drivers, RAID monitor or local or remote storage console are already installed, then uncheck the appropriate boxes. If the RAID device drivers, RAID monitor or local or remote storage console are not installed, then proceed to step 4.
4. Select the DMI Management checkbox to install the DMI CI. Follow the on-screen prompts to complete installation.

DMI Installation for NetWare

By selecting the RAID Management Agents component during installation of NetWare, the DMI (CI), SNMP Extension Agents and RAID Monitor Service are installed. See [Section 2.5.8, Setup and Installation for Novell NetWare*](#) when selecting the RAID Management Agents component during NetWare 4.2 or 5.0 installations.

DMI Installation for UnixWare

See [Section 2.5.9, Setup and Installation for UnixWare*](#) for DMI installation details.

4.2.1.4 SNMP Management

Select this option to install the SNMP Extension Agent for SRCU21. This allows the SRCU21 subsystem to be managed from an SNMP Console such as HP OpenView Network Node Manager. An SNMP Service must already be installed on the machine before the Extension Agent will load and function. Install the SRCU21 SNMP Extension Agent using the procedure below.

SNMP Installation for NT Server

Note: You must have administrative level permissions to install SRCU21 SNMP software.

1. Insert the SRCU21 CD-ROM in the CD-ROM drive. (If the RAID Installer Menu does not appear, then run the setup.exe file that resides at: <CD-ROMroot>\os_setup\winnt\setup.exe on the CD-ROM).
2. Click on the Setup button and follow the prompts to the *Preselected Components* window.
3. Three components in the *Preselected Components* window below are preselected. See [Figure 4-1](#). If the RAID device drivers, RAID monitor or local or remote storage console are already installed, then uncheck the appropriate boxes. If the RAID device drivers, RAID monitor or local or remote storage console are not installed, then proceed to step 4.
4. Select the SNMP Management checkbox to install the SNMP Management agent. Follow the on-screen prompts to complete installation.

SNMP Installation for NetWare

By selecting the RAID Management Agents component during installation of NetWare, the DMI (CI), SNMP Extension Agents and RAID Monitor Service are installed. See [Section 2.5.8, Setup and Installation for Novell NetWare*](#) when selecting the RAID Management Agents component during NetWare 4.2 or 5.0 installations.

SNMP Installation for UnixWare

See [Section 2.5.9, Setup and Installation for UnixWare*](#) for SNMP Extension Agent installation details.

4.2.2 Using Intel Server Control (ISC) to Monitor RAID Events

Intel Server Control (ISC) is a server-management tool targeted for the departmental LAN Environment, such as file, print, and/or application servers. ISC is provided with the CD that ships with your Intel server baseboard. ISC has many server-based monitoring and management functions, however, this section focuses on its ability to monitor events from the SRCU21. A brief overview of ISC is provide below followed by instructions on viewing RAID events from the SRCU21 via ISC. Use the documentation provided with your Intel server board for detailed instructions on installing and using ISC.

4.2.2.1 Overview of ISC

ISC uses the Desktop Management Interface (DMI) 2.0 framework to manage Windows NT, NetWare, and UnixWare server hardware components. ISC provides real-time monitoring and alerting for server hardware sensors. ISC has two main software components:

- The managed server: ISC Server Instrumentation is installed on the NetWare, Windows NT, or UnixWare server that is going to be managed by the ISC Console software.
- The managing console: ISC Console software is installed on the user console that manages the server.

On a Windows NT network, it is possible to install both parts of the software on the same server. It is also possible to install both the Server Instrumentation and the Console software on multiple systems.

A DMI browser is also included with ISC that allows administrators to view information from devices that provide DMI component instrumentation (CI). The SRCU21's Intel Integrated RAID software provides an option for installing RAID DMI CI. The RAID CI allows events from the SRCU21 to be viewed via ISC's DMI browser.

4.2.2.2 Managing and Monitoring via DMI

The ISC DMI Service Provider runs on each managed Windows NT, NetWare, or UnixWare server and stores the various MIF files in a database. The service provider manages component information by collecting it from the MIF database and component instrumentation code. The service provider then passes the information to the DMI browser or other management applications upon request. Any changes made by the management application or DMI browser are set via the service provider. The service provider either writes changes to the MIF database or changes attribute values via component instrumentation code.

Each DMI component must provide a MIF file. Some of the attributes listed in the MIF files are read-only, so you can view only their current values. Other attributes are read-write. Changing the value of this attribute through a DMI browser changes the setting in the instrumentation software. Whether attributes are read-only or read-write depends on whether the component has instrumentation code to enable DMI to change its value. The SRCU21 MIF attributes are read only meaning that information provided by the DMI CI is for monitoring purposes only.

4.2.2.3 Installing DMI Software

To monitor the SRCU21 component instrumentation and MIF files, the ISC DMI Explorer browser must be used. Two pieces of software must be installed in order to use the Explorer Browser to view the RAID DMI information. First ISC must be installed on the system and second the RAID CI must be installed.

Install the ISC DMI Explorer Browser

The DMI Explorer Browser is installed automatically when ISC is installed into systems with an Enterprise Management Console (such as HP's Network Node Manager or CA—Unicenter TNG) or the ISC Stand-alone environment. The Browser is not installed with LANDesk Server Manager. Please refer to the documentation supplied with Intel server base-board for instructions on installing ISC.

Install the Intel Integrated RAID DMI Component Instrumentation (CI)

Note: You must have administrative level permissions to install Intel Integrated RAID DMI CI software.

1. Insert the Intel Server RAID Controller U2-1 CD-ROM in the CD-ROM drive. (If the RAID Installer Menu does not appear, then run the setup.exe file that resides at: <CD-ROMroot>\os_setup\winnt\setup.exe on the CD-ROM.)
2. Click on the Setup button
3. The four components in the *Preselected Components* window below are preselected. See [Figure 4-1](#).
4. Select the DMI Management checkbox and clear all other checkboxes to install the DMI CI only. Follow the on-screen prompts to complete installation.

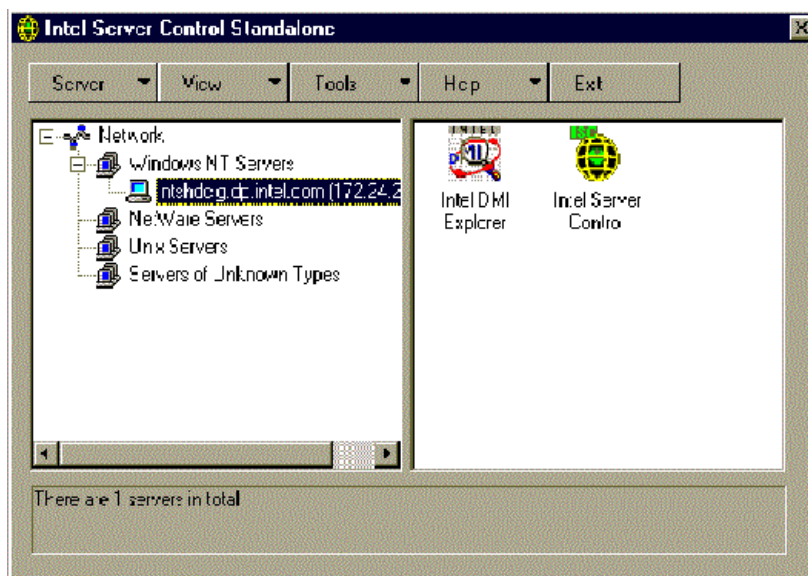
Note: The DMI and SNMP components are not selected by default.

4.2.2.4 Using the ISC DMI Explorer Browser to Monitor SRCU21

Starting the DMI Explorer

The DMI Explorer Browser appears as an applet in the Enterprise Management Console or as a supported tool under the ISC Stand-alone environment. See [Figure 4-3](#).

Figure 4-3. ISC Standalone



Viewing Attributes

You can use DMI Explorer to view attribute values for each DMI-compliant component. To view the attributes:

- In the left pane, select a component and group you are interested in. The attributes and values appear in the right pane.

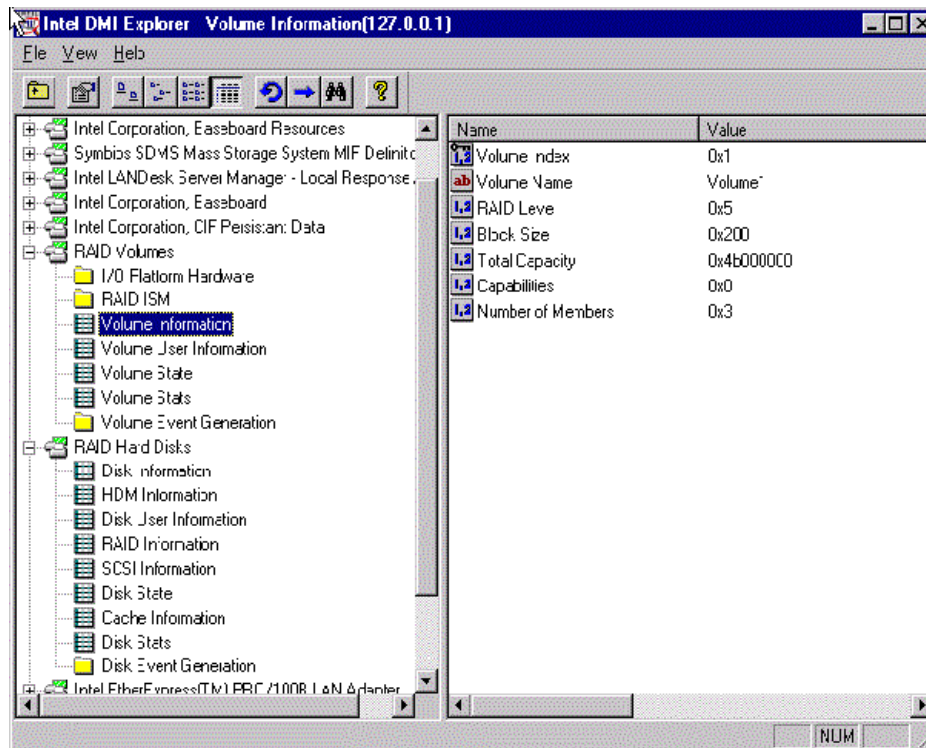
Navigate through a table of attribute values:

- To move to the next row in the table, click the *Next Row* button on the toolbar.

- To move to the first row in the table, click the *First Row* button.
- To search the table for a specific row, click the *Search Row* button.

Note: You may see the number 2147483648 when viewing attribute information with DMI Explorer. This number is equivalent to 80000000 hex, which indicates that the item is unsupported.

Figure 4-4. Browsing SRCU21 DMI Information



Refreshing Attributes

Attribute values change from time to time. Whenever you select a group or display a new row in a table, DMI Explorer displays a snapshot of the data that is accurate at that time.

You may want to refresh the information manually if you suspect that it might have changed. To refresh the data click *View/Refresh*.

Viewing Properties

You can use DMI Explorer to view properties for the computer, components, groups, or attributes. To display properties:

1. Select an item.
2. Click Properties.

Setting the View Options

DMI Explorer offers several different view options.

To turn the toolbar on or off click *View/Toolbar*.

To turn the status bar on or off click *View/Status Bar*.

To change the view of the right pane click *View/Large Icons*, *Small Icons*, *List*, or *Details*.

To sort the items in the right pane in a different order click *View/Arrange Icons* and select the text that corresponds to the column you want to sort by or click the button above the column.

Note: All of the options above are available by right-clicking while the cursor is over white space in the right pane.

To specify whether each view is displayed in a single window or separate windows:

1. Click *View/Options*.
2. Click the *Browsing Format* tab.
3. Choose the display format.
4. Click OK.

To change the view of integer values to hex or decimal format:

1. Click *View/Options*.
2. Click the *Attribute Format* tab.
3. Choose a display format.
4. Click *OK*.

4.2.3 HP OpenView* Network Node Manager Integration

HP OpenView Network Node Manager (NNM) is an SNMP management console available for the NT operating system. If you are using NNM to manage your network, we have provided some files that will allow you to integrate the management of your Intel Integrated RAID devices into your OpenView framework. Use the following procedure to install the Intel Integrated RAID tools into NNM.

Note: HP OpenView is an optional software program for remote management of the server.

Installation Procedure

1. Go to the HP OpenView NNM console.
2. Insert the Intel Integrated RAID CD-ROM in the CD-ROM drive.
3. If you have disabled Autorun on your system, you should manually run the setup.exe file located on the CD-ROM.
4. From the Menu, select “Console Integration”. Follow the prompts to complete installation of HP OpenView NNM.

Installation Overview

This overview reviews what happens during the installation of the HP OpenView NNM integration software. The [Table 4-2](#) lists the files that are copied during installation.

Table 4-2. HP OpenView Installation Files

File Name	Location Copied To
RAID.MIB	c:\openview\snmp_mibs
IRAID.CON	c:\openview\conf\c
IRAID.ARF	c:\openview\registration\c
IRAID.BMP	c:\openview\bitmaps\c\toolbar
IRAID.FRF	c:\openview\fields\c
IRAID.ICO	c:\openview\bitmaps\c
IRAID.LRF	c:\openview\lrf
IRAID.SRF	c:\openview\symbols\c\cards
IRDISC.EXE	c:\openview\bin
IRSTAT.EXE	c:\openview\bin

During installation, there is an option to complete the integration by automatically running the necessary HP OpenView NNM utilities. If this option is not selected, the operations listed in [Table 4-3](#) should be performed manually. These utilities are in the C:\OPENVIEW\BIN directory.

Note: This command-line syntax assumes that you have installed NNM to the default directory of `c:\openview`. If you have installed NNM to a different directory, then substitute that directory for `c:\openview`.

Table 4-3. HP OpenView Installation Operations

Command	Description
<code>xnmevents -replace c:\openview\conf\c\iraid.con</code>	This command adds the Intel Integrated RAID Trap definitions to the Event database, which enables NNM to identify and correctly format incoming events.
<code>xnmloadmib -silent -load c:\openview\snmp_mibs\raid.mib</code>	This command adds the Intel Integrated RAID MIB to the MIB database. This enables the devices to be managed via the SNMP browser.
<code>ovw -fields</code>	This command adds the "isIRAID" field to the object database. This action permanently modifies the database schema. It allows NNM to identify whether or not a managed node also contains a manageable Intel Integrated RAID subsystem.
<code>ovaddobj c:\openview\lrf\iraid.lrf</code>	This command adds the Discovery Utility (IRDISC.EXE) as an OpenView process controlled by the OpenView Process Manager.

4.3 Configuring RAID Volumes Using the Intel® Integrated RAID Storage Console

4.3.1 Getting Started

Before using the Intel Integrated RAID browser software, do the initial setup and installation of this product. See [Intel® Server RAID Controller U2-1 Setup and Installation on page 2-20](#) for complete installation instructions.

If you intend to boot the operating system from a RAID volume, you must first create a RAID volume by using the RAID Configuration Utility. Refer to [Section 2.3.3, "Creating a RAID Volume in RAID Configuration Utility"](#) on page 2-5 for information on creating this initial RAID volume.

Configuration of the Intel Integrated RAID Storage Console is an HTML-based application which utilizes the browser installed on your operating system. Storage Console can be used to create and modify RAID volumes, set the migration rate, add global hot spares and monitor RAID volume status.

Note: Use the confirmation and cancellation buttons in place of the Back, Forward, and Refresh buttons on the HTML browser.

4.3.2 Launching the Intel® Integrated RAID Storage Console for Local Administration

4.3.2.1 Microsoft Windows NT

Launch your web browser by clicking on the local Storage Console icon. If this icon is missing, you may execute the Storage Console by entering [iop://localhost/0/8/0](http://localhost/0/8/0) in your HTML browser.

4.3.2.2 Novell NetWare

Intel Integrated RAID software includes a text based browser to manage and configure your Intel Integrated RAID subsystem. Follow the procedure below to launch Storage Console.

1. At the NetWare Graphical Console screen, hit *Ctrl Esc* to go to the Text Console.
2. Select *I₂O Configuration Screen*. Hit *Enter*.
3. In the *I₂O Configuration Manager* screen select *Configure IOPs*. Hit *Enter*.
4. In the *I₂O System IOP List* screen, select the IOP ID# of the card you are configuring and hit *Enter*.
5. In the *I₂O IOP Configuration Options* screen, select the *IO Processor Main Page* link and hit *Enter*.
6. Select *RAID Storage Console* and hit *Enter*. Follow the prompts to launch Storage Console.

4.3.2.3 SCO UnixWare

Execute the Storage Console by entering <http://localhost:360> in the Netscape* browser provided with UnixWare. Note that UnixWare prompts you to login to the machine with a User ID of root.

4.3.3 Launching the Intel® Integrated RAID Storage Console for Remote Administration

4.3.3.1 Microsoft Windows NT

To configure Intel Integrated RAID on a remote machine, you will need to know its hostname or IP Address. Execute the Storage Console by entering [http://\[hostname or IP Address\]/scripts/iop.exe/0/8/0](http://[hostname or IP Address]/scripts/iop.exe/0/8/0) in your HTML browser. Note that you must be logged in as Administrator or equivalent in the domain of the remote machine to remotely configure it.

4.3.3.2 Novell NetWare

To configure Intel Integrated RAID on a remote machine, you will need to know its hostname or IP Address. Execute the Storage Console by entering [http://\[hostname or IP Address\]/i2o/2/8/index.htm](http://[hostname or IP Address]/i2o/2/8/index.htm) in your HTML browser. Note that Novell requires you to authenticate to the tree in which the remote server resides. NetWare 4.x requires a fully qualified login name. For example, .CN=ADMIN.0=ORG_NAME.T=TREE_NAME.

If you have another web server product, like Apache Web Server*, installed on the remote server, you will need to specify port 8008 in the URL. For example, [http://\[hostname or IP Address\]:8008/i2o/2/8/index.htm](http://[hostname or IP Address]:8008/i2o/2/8/index.htm)

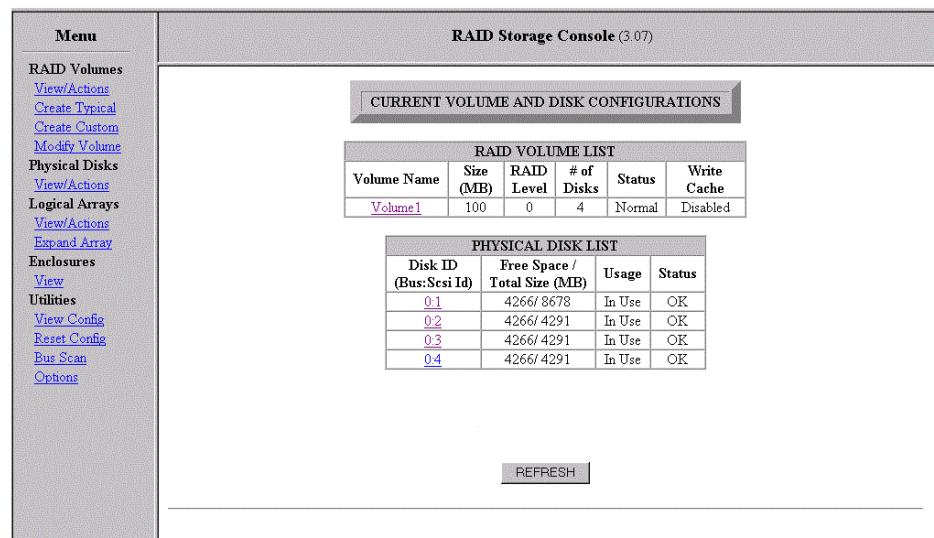
4.3.3.3 SCO UnixWare

To configure Intel Integrated RAID on a remote machine, you will need to know its hostname or IP Address. Execute the Storage Console by entering [http://\[hostname or IP Address\]:360](http://[hostname or IP Address]:360) in your HTML browser. Note that UnixWare requires you to login to the remote machine with a User ID of root.

4.3.4 Intel® Integrated RAID Storage Console

The Storage Console Current Configuration screen displays the current configuration of your RAID subsystem. It displays the RAID Volume List and Physical Disk List. The current configuration can also be viewed by clicking on [View Config](#) in the *Menu*. See [Figure 4-5](#).

Figure 4-5. Current Configuration with Volume Created



The screenshot shows the RAID Storage Console (3.07) interface. On the left is a menu with options: RAID Volumes (View/Actions, Create Typical, Create Custom, Modify Volume), Physical Disks (View/Actions), Logical Arrays (View/Actions, Expand Array), Enclosures (View), and Utilities (View Config, Reset Config, Bus Scan, Ophons). The main content area is titled 'CURRENT VOLUME AND DISK CONFIGURATIONS' and contains two tables.

RAID VOLUME LIST

Volume Name	Size (MB)	RAID Level	# of Disks	Status	Write Cache
Volume1	100	0	4	Normal	Disabled

PHYSICAL DISK LIST

Disk ID (Bus:Scsi Id)	Free Space / Total Size (MB)	Usage	Status
0.1	4266/ 8678	In Use	OK
0.2	4266/ 4291	In Use	OK
0.3	4266/ 4291	In Use	OK
0.4	4266/ 4291	In Use	OK

At the bottom of the main content area is a 'REFRESH' button.

4.3.4.1 The Menu

The Menu (located in the left panel of the Storage Console) enables the user to execute actions by clicking on the appropriate link. See [Table 4-4](#) for a summary of Menu functions.

Table 4-4. Intel® Integrated RAID Storage Console Menu

	Category	Description
RAID Volumes	View/Actions	View volume information or take a volume action.
	Create Typical	Create a typical RAID volume (the Wizard suggests a configuration) (modify volume name and size only).
	Create Custom	Create a customized RAID volume (RAID level, volume name, strip size and the number of disks).
	Modify Volume	Modify a volume (RAID level and strip size only).
Physical Disks	View/Actions	View individual disk configurations or take a disk action.
Logical Arrays	View/Actions	View all logical arrays.
	Expand Array	Expand the capacity of an array (by adding new drives).
Enclosures	View	This option is available if your system has an intelligent drive enclosure that supports SAF-TE.
Utilities	View Config	View the current configuration of all volumes.
	Reset	Reconfigure your system. All volumes are deleted and all data is lost and spares are reset to normal.
	Bus Scan	Scans drives to recognize a failed or newly installed drive.
	Options	Support information for the product. Allows the user to select the type of bus scan used to bring new drives online.

The following sections describe the Storage Console Menu functions.

4.3.5 RAID Volumes

4.3.5.1 View/Actions

Use this feature to view RAID volume information: volume name, volume size, RAID level, number of disks and status ([Figure 4-6](#)). Click on a volume name to view volume attributes and the member disks list. Actions include *Modify a Volume* (see [Modify Volume on page 4-20](#)) or *Delete a Volume*. Delete a volume from the RAID Volume List or Volume Configuration screens. Select Delete in the action menu and click on the *Submit* button.

Figure 4-6. RAID Volume List

RAID Storage Console (3.07)

CURRENT VOLUME AND DISK CONFIGURATIONS

RAID VOLUME LIST						
Volume Name	Size (MB)	RAID Level	# of Disks	Status	Write Cache	
Volume 1	100	0	4	Normal	Disabled	

PHYSICAL DISK LIST				
Disk ID (Bus:Scsi Id)	Free Space / Total Size (MB)	Usage	Status	
0.1	4266/ 8678	In Use	OK	
0.2	4266/ 4291	In Use	OK	
0.3	4266/ 4291	In Use	OK	
0.4	4266/ 4291	In Use	OK	

REFRESH

Click on *Volume Name* (Figure 4-6) to open the Volume Configuration screen (Figure 4-7).

Figure 4-7. Volume Configuration

RAID Storage Console (3.07)

Volume Volume1 Configuration

ATTRIBUTES		MEMBER DISKS	
Volume Name	Volume 1	Bus:Scsi Id	Status
Status	Normal	0.1	In Use
Volume Size	100 MB	0.2	In Use
RAID Level	0	0.3	In Use
Member Disks	4	0.4	In Use
Strip Size	64 KB		
Write Cache	Disabled		
Errors Logged	None		
Migration Priority	Medium		

Select Action:

SUBMIT ACTION FOR THIS VOLUME

From this screen modify the volume migration priority, apply actions to the volume (modify, delete) and view member disk configurations.

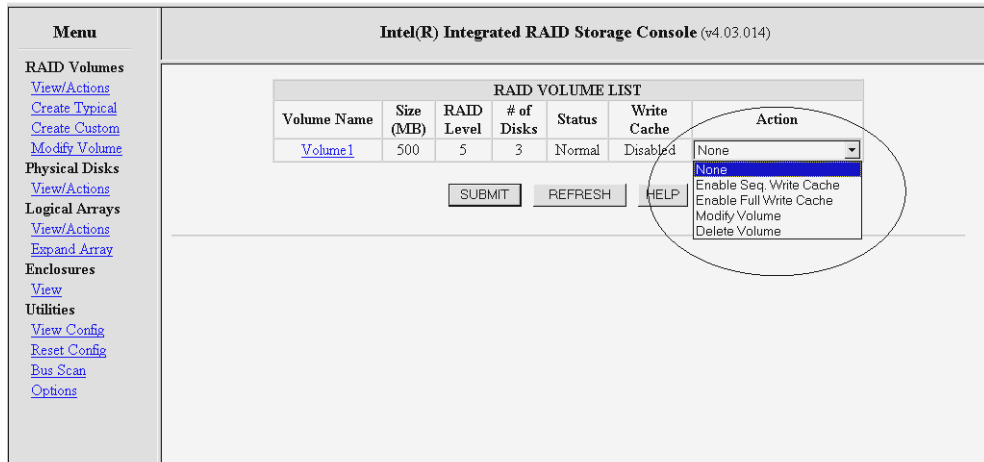
- Errors Logged column - If errors occur on the volume, they will be reported in the Volume Error Log table. This table reports technical data for use by technical support personnel only. If errors occur, click on the number listed in the column next to Errors Logged to view the Error Log table.

Note: If there is no serial number for a disk listed in the Error Log table, this indicates the error is against the volume and not against a particular disk. Please contact technical support for more information.

For more information on Migration Priority, see [Section 5.1.3.3, Online Volume Migration](#). For more information on Member Disks, see [Section 4.3.6, Physical Disks](#).

Take a Volume action by using the drop down Action menu. See [Figure 4-8](#). Select *None*, *Enable Sequential Write*, *Enable Full Write* or *Modify Volume*. Select the appropriate action and submit. For more information on these actions see [Section 5.2.8, Caching](#).

Figure 4-8. RAID Volume Actions



4.3.5.2 Create Typical

Use the RAID Volume Creation Wizard to create a typical RAID volume configuration. The user may change volume name and size *only*. A global hot spare is created depending upon the existing configuration.

Note: In Create Typical your volume is automatically configured based on the number of disks, volumes, and arrays in your system. Use Create Custom if you prefer to customize your system.

How it Works

When a volume is created, it is placed on available disks or on an existing array depending on the maximum number of disks available in each. For example, if you have two available disks, and an existing array of three disks that has space on it, the wizard will create the volume on the array even if a smaller volume is created because a higher RAID level is achieved with more disks (providing greater fault protection). RAID level takes precedence over disk space. If you would rather create a larger two disk RAID 1 than a smaller three disk RAID 5, do so manually using *Create Custom* (see [Create Custom on page 4-19](#)).

Global Hot Spares

You must have at least three disks available on your system for the wizard to create a global hot spare. When selecting a global hot spare, the wizard selects the largest available disk in your system (unless there are no disks available or a global hot spare already exists). When the wizard

chooses a global hot spare it scans all existing arrays and volumes to ensure that the drive is large enough to protect existing configurations. If you have only two available disks on your system, then the Wizard does not prompt you to create a global hot spare.

Table 4-5. RAID Level Selected by Storage Console Based on the Number of System Drives

# Available Drives in System	RAID Level Selected
1	0
2	1
3	5 or 1 if global hot spare is selected
4+	5 with global hot spare

Procedure

To create a volume using this feature:

1. Click on the *Create Typical* link. In Step 1 click on *Yes* if you would like to dedicate a global hot spare. If a global hot spare already exists or if there is only one available disk in your system, then this step is skipped. See [Figure 4-9](#).
2. In Step 2 edit the volume name and size if desired and click on *Yes* to create the volume. See [Figure 4-10](#).
3. Confirm the new volume configuration by clicking on the *Yes* button.

Figure 4-9. Create Typical Step 1

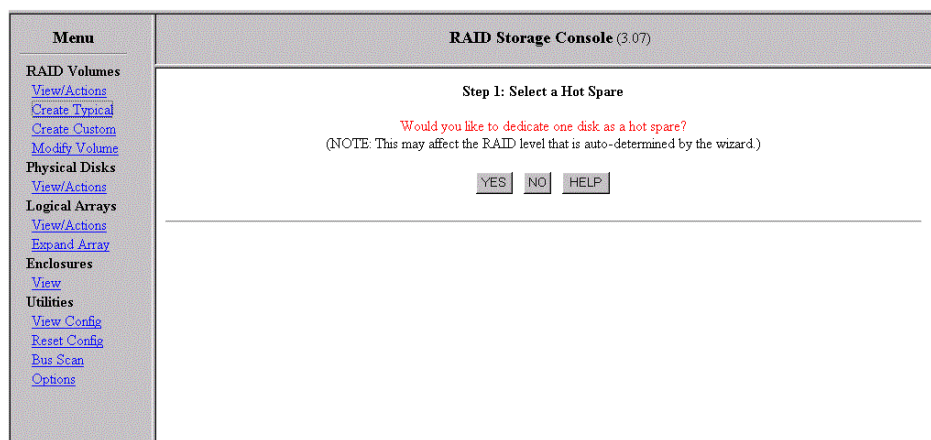
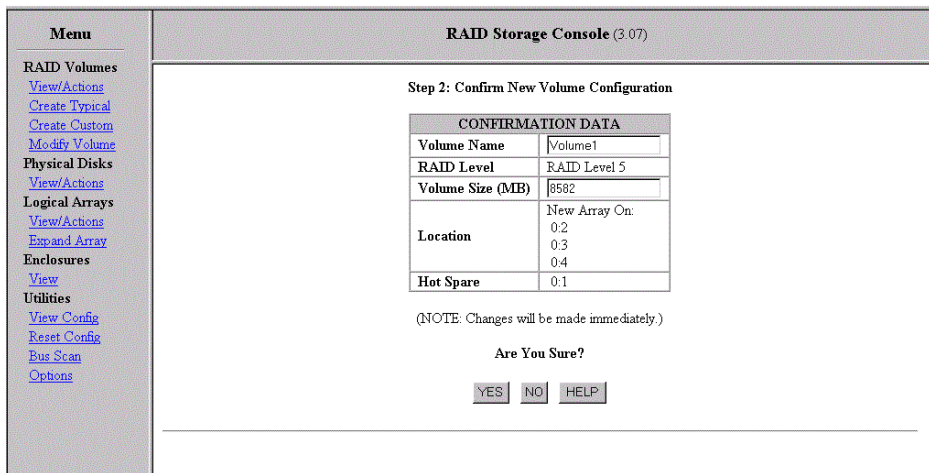


Figure 4-10. Create Typical Step 2



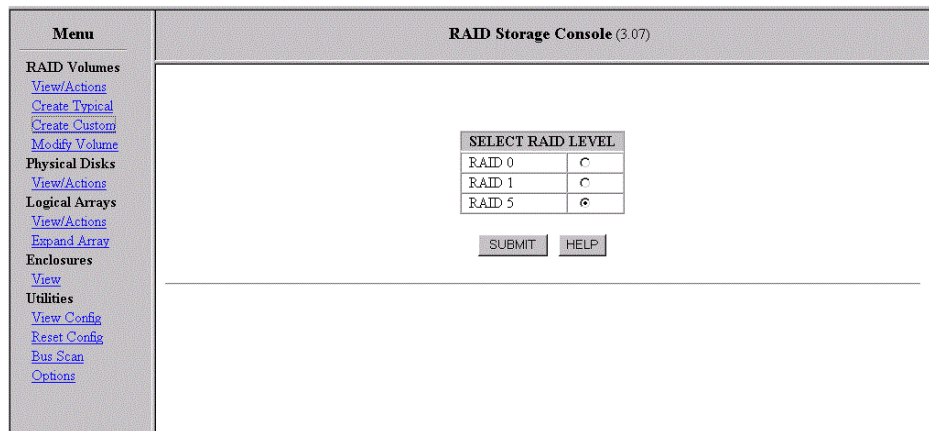
4.3.5.3 Create Custom

The Create Custom option allows you to select the volume name and size, RAID level, strip size and define which disks or arrays upon which to place your volume. Create Custom does not automatically select global hot spares.

To create a custom RAID volume configuration click, on the *Create Custom* link.

1. Select the appropriate RAID Level (0, 1 or 5) and submit your selection. See Figure 4-11.

Figure 4-11. Select RAID Level



2. Edit the volume information as appropriate. Edit volume name, volume size (zero for largest possible size), strip size and select the disks you wish to include in the volume. See Figure 4-12. Click on the *Create Volume* button when finished. The create confirmation screen appears. If you wish to create a global hot spare after the volume is created, go to the *Physical Disk List* (Figure 4-18) and convert the available disk(s) as appropriate.
3. Click on *Yes* to create the volume. The *Volume Created Successfully* screen appears.

Figure 4-12. Add Volume Information

CREATE RAID 5 VOLUME		
Volume Name	Volume1	(no spaces/special chars)
Volume Size (MB)	0	(zero for largest possible)
Strip Size (KB)	16K <input type="radio"/> 32K <input type="radio"/> 64K <input checked="" type="radio"/> 128K <input type="radio"/>	
SELECT DISK(S)		
Disk ID	Size (MB)	Include
0.1	8678	<input checked="" type="checkbox"/>
0.2	4291	<input checked="" type="checkbox"/>
0.3	4291	<input checked="" type="checkbox"/>

CREATE VOLUME CANCEL HELP

4.3.5.4 Modify Volume

To modify a volume:

1. Click on the *Modify Volume* link.
2. Select the volume from the list you wish to change. Click on *Submit*. See Figure 4-13. The modify volume RAID level screen appears.

Figure 4-13. Modify Volume List

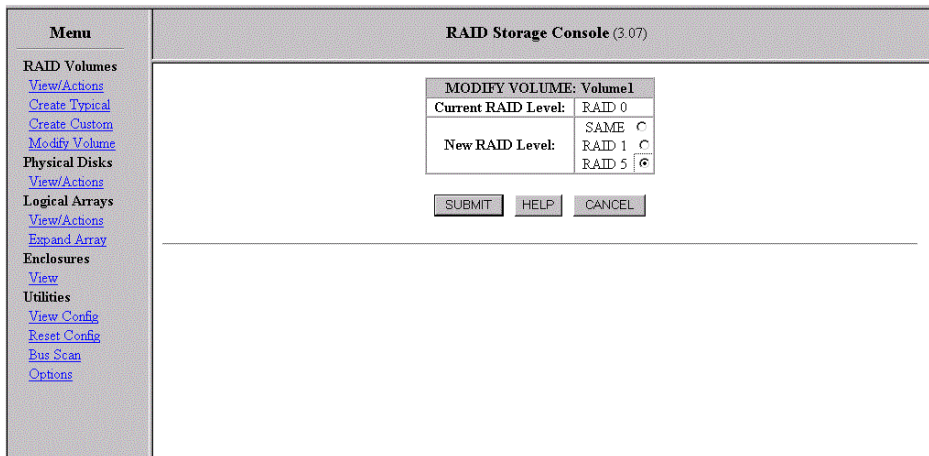
MODIFY VOLUME

MODIFY VOLUME: Volume1

SUBMIT HELP

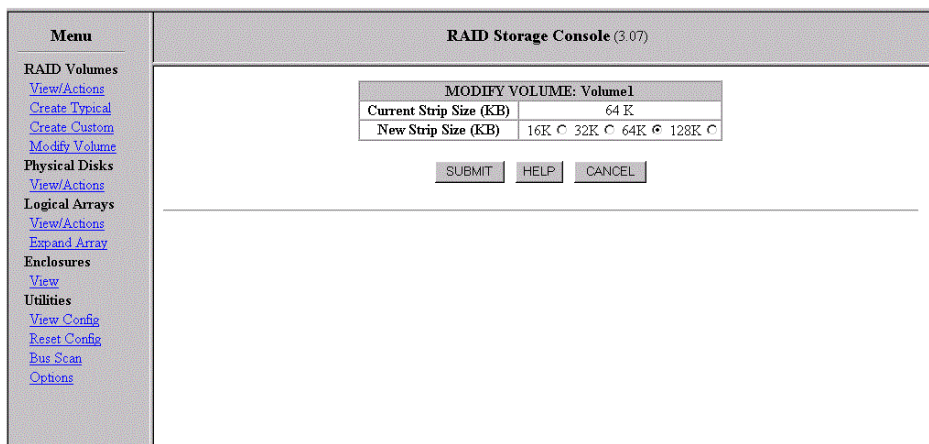
3. Select the RAID level. Click on *Submit*. The modify strip size screen appears. See Figure 4-14.

Figure 4-14. Modify Volume RAID Level



4. Select the appropriate strip size (16, 32, 64 and 128K) and click on *Submit*. The modify volume confirmation screen appears. See Figure 4-15.

Figure 4-15. Modify Volume Strip Size



5. Click on *Yes* to implement the changes to the volume.

4.3.6 Physical Disks

4.3.6.1 View/Actions

Use the View/Actions feature to view physical disk information. See Figure 4-16. View individual disk configurations (by clicking on a Disk ID) or take a disk action. Table 4-6 shows the possible usage states a disk may be in. Table 4-7 shows the actions that are available for each usage state.

Figure 4-16. Physical Disk List

The screenshot shows the RAID Storage Console interface. On the left is a 'Menu' sidebar with options like RAID Volumes, Physical Disks, Logical Arrays, Enclosures, and Utilities. The main area is titled 'RAID Storage Console (3.07)' and contains a 'PHYSICAL DISK LIST' table. Below the table are 'SUBMIT' and 'HELP' buttons.

Disk ID (Bus:Scsi Id)	Free Space / Total Size (MB)	Usage	Status	Disk Actions
0.1	4266/ 8678	In Use	OK	None
0.2	4266/ 4291	In Use	OK	None
0.3	4266/ 4291	In Use	OK	None
0.4	4266/ 4291	In Use	OK	None

Note: The serial number displayed in the disk ID in Figure 4-17 may not exactly match the drive label serial number.

The Physical Disk List screen displays the attributes and capacity usage of the disk selected. Refer to Table 5-13 Disk Actions, Usage and Status on page 5-12 to determine which disk action can be completed based upon the usage and status of the drive. If the disks enclosed are S.M.A.R.T capable, then a field for S.M.A.R.T events will appear in the display. You may also view details about the volume which the selected disk is a part of by clicking on the volume's name which is highlighted under Volume Name. You may view the Enclosure configuration screen by clicking on the enclosure number which is highlighted under the Attributes column. You may return to the Physical Disk configuration screen by clicking on the View/Actions option under Physical Disks.

Figure 4-17. Physical Disk Configuration

The screenshot shows the RAID Storage Console interface for the Physical Disk Configuration screen. The title is 'RAID Storage Console (3.07)'. The main area is titled 'Disk #LG427557 Configuration' and contains two tables: 'ATTRIBUTES' and 'CAPACITY USAGE'. Below the tables are a 'Select Action:' dropdown menu and a 'SUBMIT ACTION FOR DISK' button.

ATTRIBUTES		CAPACITY USAGE		
Manufacturer	UNISYS	Volume Name	(MB)	Start Block
Model #	003201ST34501W	Volume 1	100	0x00000000
Serial #	#LG427557	** free space **	4191	0x00032000
Revision #	8A03			
Additional Info.	SCSI Drive			
Usage	In Use			
Status	OK			
Capacity (MB)	4291			
Total Blocks	8789085			
Bus:Scsi Id	0.0			
Enclosure 0	00000001			
Slot	0			

Table 4-6. Physical Disk Usage

Usage	Description
Available	Drive is available to be configured as part of a RAID volume, defined as a global hot spare or set as pass-through for direct control by the host operating system.
Normal	Drive is fully operational and functional as a member of a RAID volume. This is the desired state.
Failed	Accesses to the drive have not completed successfully. The RAID firmware does not access a failed drive.
Missing	Drive configured as a member of a RAID volume is not detected. The RAID firmware does not access a missing drive.
Offline	Drive is unusable. This state is used to prepare disks for removal from a SAF-TE enclosure.
Pass-Through	Drive is not controlled by RAID firmware and thus cannot be a part of a RAID volume. The drive is available to the operating system as an individual disk.
Spare	Drive is configured as a global hot spare. See Section 5.1.4.1, "Global Hot Spare" on page 5-4 for more information.

Table 4-7. Physical Disk Actions

Action	Usage	Description
Begin Format	Available	Formats a drive.
Pass-Through to Host	Available	Gives control of the drive to the Host.
Claim for RAID	Pass-Through	Gives control of the drive to the RAID subsystem.
Identify Drive	Normal, Available, Spare	Identify a drive.
Mark as Normal	Failed	Marks drive as no longer failed.
Mark as Failed	Normal	Alert a user not to use this drive.
Mark Offline	Normal, Available Spare	Removes all RAID configuration data from drive and prepares the drive for removal was added to the large table as well.
Mark Online	Offline	Marks a drive for use. Drive is ready for power.
Release Spare	Spare	Convert a spare to an available drive.
Mark as Spare	Available	Mark drive as a global hot spare.

4.3.6.2 Replacing a Failed Drive

If a disk fails, it will eventually need to be replaced. If you need help physically locating the failed drive, select the *Identify Drive* option and click on *Submit* as indicated in [Figure 4-17](#). This will cause activity on the failed drive giving you the opportunity to identify it by observing the activity light on the drive.

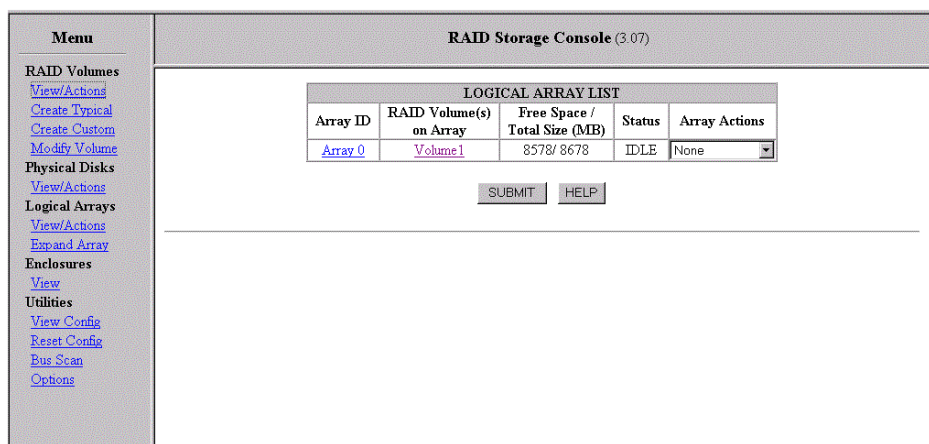
After replacing the failed drive with a new drive, any volume in degraded mode will use the new drive to replace its failed member following a reboot or bus scan. If you reinstall the same failed drive, it will not automatically be used to replace the failed member disk unless you manually mark it as normal.

4.3.7 Logical Arrays

4.3.7.1 View/Actions

Use this feature to view the *Logical Array List*. See [Figure 4-18](#). View array information or take an action. View Array ID, RAID Volumes on Array, Free Space/Total Size and Status. Click on Array ID to view member disks and capacity usage or click on a volume name to view a volume configuration.

Figure 4-18. Logical Array List



RAID Storage Console (3.07)				
LOGICAL ARRAY LIST				
Array ID	RAID Volume(s) on Array	Free Space / Total Size (MB)	Status	Array Actions
Array 0	Volume 1	8578 / 8678	IDLE	None

4.3.7.2 Expand Array

Use this feature to expand an array, for example, when a drive is added to your system. This feature is active when at least one drive is available, for example, when the drive is not offline, marked as a spare, or part of another array.

Note: To expand an array you must first bring the available drive online. For example, in the Physical Disk List, mark the drive as Online and submit.

To expand an array:

1. Click on *Expand Array*. If there is an available disk, then the Add Disks to Array screen appears. See [Figure 4-19](#).
2. Select the target array by clicking on the appropriate radial button. Select the target disk by clicking on the appropriate check box.
3. Click the Expand Array button.

Figure 4-19. Add Disks to Array

ADD DISK(S) TO ARRAY			
SELECT ARRAY			
Array ID	RAID Volume(s) already on Array	Free Space / Total Size (MB)	Select
Array 0	Volume1	8578/ 8678	<input checked="" type="checkbox"/>

SELECT DISK(S)			
Disk ID	Size (MB)	Include	
0.2	4291	<input type="checkbox"/>	
0.3	4291	<input type="checkbox"/>	

EXPAND ARRAY CLEAR FORM HELP

4.3.7.3 Migration

Migration occurs when a volume is migrating from one RAID level to another, a volume strip size changes or when a disk is added to an array. See [Table 5.2.7, “Physical Drive Usage”](#) on page 5-11 for more information. Migration status is displayed in the status area of the RAID Volume List. See [Figure 4-20](#).

Figure 4-20. Migration in Progress

CURRENT VOLUME AND DISK CONFIGURATIONS

RAID VOLUME LIST					
Volume Name	Size (MB)	RAID Level	# of Disks	Status	Write Cache
Volume 1	100	0	2	Migration: 38% Complete	Disabled

PHYSICAL DISK LIST			
Disk ID (Bus:Scsi Id)	Free Space / Total Size (MB)	Usage	Status
0.1	8678/ 8678	Available	OK
0.2	4191/ 4291	In Use	OK
0.3	4191/ 4291	In Use	OK

(screen will auto-refresh every 10 secs or click below to refresh now)


REFRESH

4.3.8 Enclosures

4.3.8.1 View

The *View* link is available if an intelligent drive enclosure which houses the SCSI devices is detected. The option displays information pertaining to the components of the enclosure and the disks inserted into the enclosure.

Figure 4-21. List of Enclosures

Menu	RAID Storage Console (3.10)					
RAID Volumes View/Actions Create Typical Create Custom Modify Volume	STORAGE ENCLOSURE CONFIGURATION					
Physical Disks View/Actions	Enclosure ID	Manufacturer	SCSI Bus	Slots	Devices	Status
Logical Arrays View/Actions Expand Array	00000001	ESG-SHV 	0	5	5	OK
Enclosures View						
Utilities View Config Reset Config Bus Scan Options						

Click on the *View* link to view information such as Enclosure ID, the enclosure's Manufacturer, SCSI Bus number used, the number of slots available within the enclosure, the number of disks inserted into the enclosure and the status of enclosures. To get the usage and status information for components in the enclosure (for items such as the fan(s), the power supply(s), the SCSI disk(s), and the temperature of the enclosure) click on the Enclosure ID. To view specific information about a particular disk, click on the *Disk ID* to view. Disks are listed by Slot number and SCSI ID.

Figure 4-22. Enclosure Configuration

Menu		RAID Storage Console (3.07)				
RAID Volumes View/Actions Create Typical Create Custom Modify Volume Physical Disks View/Actions Expand Array Logical Arrays View/Actions Enclosures View Utilities View Config Reset Config Bus Scan Options		Enclosure 00000001 Configuration				
ENCLOSURE COMPONENTS			INSTALLED DISKS			
Component	Usage	Status	Slot	Disk ID	Sesi Id	Usage
Fan 0	operational	OK				
Fan 1	operational	OK	0	#LG427557	0	In Use
Power Supply 0	operational and on	OK	1	#3300000193125ML	1	Available
Slot 0, SCSI ID 0	Inserted, Prepared for operation	OK	2	#010000019250FSZ	2	Available
Slot 1, SCSI ID 1	Inserted, Prepared for operation	OK				
Slot 2, SCSI ID 2	Inserted, Prepared for operation	OK				
Slot 3, SCSI ID 3	Inserted, Ready for removal, Not prepared for operation	OK				
Slot 4, SCSI ID 4	Inserted, Ready for removal, Not prepared for operation	OK				
Temperature Sensor 0	82 F	none				
Temperature	OK	OK				

4.3.9 Utilities

4.3.9.1 View Config

Use this feature to view current volume and disk configurations. See [Figure 4-5](#).

4.3.9.2 Reset Config

Use this feature to reset the entire RAID configuration on the system. This feature deletes all volumes (all data on the volumes will be lost) and resets spares as available drives.

Warning: If your host operating system is installed on a RAID volume, using this feature will delete the operating system.

4.3.9.3 Bus Scan

Use the Bus Scan feature to scan the SCSI buses to recognize a newly inserted disk(s). There are two modes for bus scan: *Destructive* and *Add Disk(s)* methods. *Unless changed by the user, Destructive method is always used.*

Changing the Default Bus Scan Method

To change the default mode of Bus Scan use the following instructions to manually configure the default mode.

1. Click on *Options* from the Menu. The Options page appears. See [Figure 4-27](#). Click on the *Default Bus Scan Type* link. You are presented with two bus scan types. See [Figure 4-23](#).
2. Click on the Bus Scan Type radial button that you would like to set as the default bus scan, then click on submit. Your default bus scan selection is confirmed.

The most recently selected method is the default bus scan method. You may select the non default bus scan method during a bus scan but your non default settings will only be valid for one bus scan session.

Figure 4-23. Default Bus Scan Type

Menu		RAID Storage Console (v4.03c.013)							
RAID Volumes	View/Actions	<table border="1"> <thead> <tr> <th colspan="2">DEFAULT BUS SCAN TYPE</th> </tr> </thead> <tbody> <tr> <td><input checked="" type="radio"/> Destructive Method</td> <td> <p>In this mode a bus scan will always bring disk(s) on-line as 'Available' and erase any pre-existing RAID information on the newly inserted disk(s). Insertion into Intelligent Enclosures will automatically present the new disk(s) in the Storage Console as 'Available'. Note that this mode is called 'Destructive' because inserting disk(s) while in this mode will destroy any previous RAID information on those disk(s). This mode does not support array roaming.</p> </td> </tr> <tr> <td><input type="radio"/> Add Disk(s) Method</td> <td> <p>In this mode a bus scan will always attempt to bring new drives on-line and preserve any existing RAID information that may have previously been on them. If the disk(s) had previous information, the volume(s) on the disk(s) will be visible in Storage Console after the completion of the bus scan. Note that while in this mode, Intelligent Enclosures will not automatically present new disks in the Storage Console, a manual bus scan will be required even with an Intelligent Enclosure in order to bring the disk(s) on line. This mode supports array roaming and is the mode used for the initial boot scan.</p> </td> </tr> </tbody> </table>		DEFAULT BUS SCAN TYPE		<input checked="" type="radio"/> Destructive Method	<p>In this mode a bus scan will always bring disk(s) on-line as 'Available' and erase any pre-existing RAID information on the newly inserted disk(s). Insertion into Intelligent Enclosures will automatically present the new disk(s) in the Storage Console as 'Available'. Note that this mode is called 'Destructive' because inserting disk(s) while in this mode will destroy any previous RAID information on those disk(s). This mode does not support array roaming.</p>	<input type="radio"/> Add Disk(s) Method	<p>In this mode a bus scan will always attempt to bring new drives on-line and preserve any existing RAID information that may have previously been on them. If the disk(s) had previous information, the volume(s) on the disk(s) will be visible in Storage Console after the completion of the bus scan. Note that while in this mode, Intelligent Enclosures will not automatically present new disks in the Storage Console, a manual bus scan will be required even with an Intelligent Enclosure in order to bring the disk(s) on line. This mode supports array roaming and is the mode used for the initial boot scan.</p>
DEFAULT BUS SCAN TYPE									
<input checked="" type="radio"/> Destructive Method	<p>In this mode a bus scan will always bring disk(s) on-line as 'Available' and erase any pre-existing RAID information on the newly inserted disk(s). Insertion into Intelligent Enclosures will automatically present the new disk(s) in the Storage Console as 'Available'. Note that this mode is called 'Destructive' because inserting disk(s) while in this mode will destroy any previous RAID information on those disk(s). This mode does not support array roaming.</p>								
<input type="radio"/> Add Disk(s) Method	<p>In this mode a bus scan will always attempt to bring new drives on-line and preserve any existing RAID information that may have previously been on them. If the disk(s) had previous information, the volume(s) on the disk(s) will be visible in Storage Console after the completion of the bus scan. Note that while in this mode, Intelligent Enclosures will not automatically present new disks in the Storage Console, a manual bus scan will be required even with an Intelligent Enclosure in order to bring the disk(s) on line. This mode supports array roaming and is the mode used for the initial boot scan.</p>								
Create Typical									
Create Custom									
Modify Volume									
Physical Disks	View/Actions								
Logical Arrays									
View/Actions									
Expand Array									
Utilities	View Config								
Reset Config									
Bus Scan									
Options									

Destructive Method

In this mode a bus scan will always bring disk(s) on-line as *Available* and *erase* any pre-existing RAID information on the newly inserted disk(s). Insertion into intelligent enclosures will automatically present the new disk(s) in the Storage Console as *Available*. Note that this mode is called *Destructive* because inserting disk(s) while in this mode will destroy any previous RAID information on those disk(s). Destructive mode does not support array roaming.

This is the default method selected when bus scan is run for the first time following a RAID recovery. See [Section 3.2.1.5](#) for details about RAID recovery utility.

Performing a Bus Scan using the Destructive Method

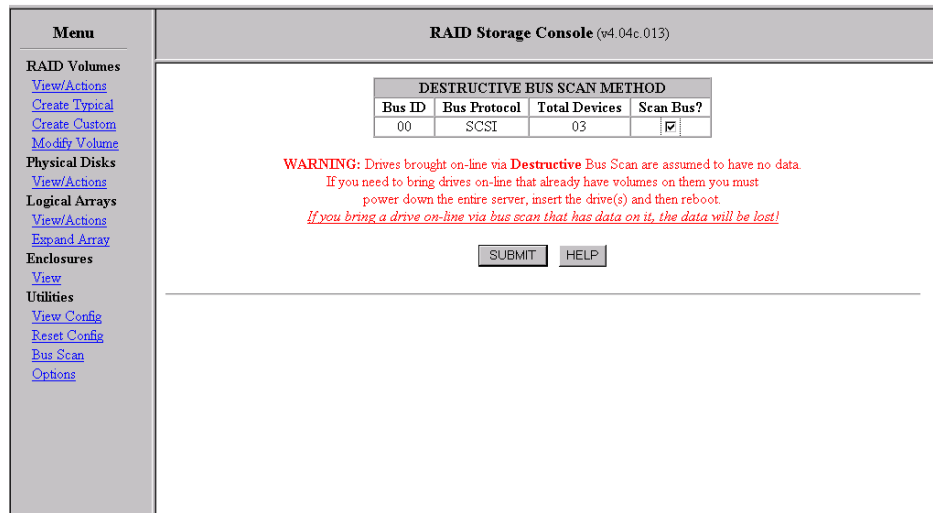
1. Ensure disks are inserted into the system.

2. In the Menu click on *Bus Scan*. The *Select Bus Scan Type* page appears. See [Figure 4-25](#). Click on the *Destructive Method* radial button. Click on *Submit*. The *Bus Scan* screen appears. Your system is now in destructive mode. See [Figure 4-24](#).
3. Click on the check box (check the box).

Warning: Bus scans performed in destructive mode will destroy all data and configuration information on newly installed disks.

4. Click on *Submit* to scan all buses ([Figure 4-25](#)).
5. Click on View/Config under Utilities to view all volumes and disks.

Figure 4-24. Destructive Bus Scan



Add Disk(s) Method

In this mode a bus scan will always attempt to bring new drives on-line and preserve any existing RAID information that has previously been stored on them. If the disk(s) had previous information stored on them, the volume(s) on the disk(s) will be visible in Storage Console after the completion of the bus scan. Note that while in this mode, intelligent enclosures will not automatically present new disks in the Storage Console, a manual bus scan will be required even with an intelligent enclosure in order to bring the disk(s) on line. Add Disk(s) method supports array roaming and is the method used for the initial boot scan.

Performing a Bus Scan using the Add Disk(s) Method

1. Ensure disks are inserted into the system.
2. In the Menu click on *Bus Scan*. The *Select Bus Scan Type* page appears. See [Figure 4-25](#). Click on the *Add Disk(s) Method* radial button. Click on *Submit*. The *Bus Scan* screen appears. See [Figure 4-26](#).
3. Click on the check box (check the box) and then click on *Submit* to scan all buses ([Figure 4-26](#)).
4. Click on View/Config under Utilities to view all volumes and disks.

Note: For the system to *see* the disks when the system is powered up, the user must insert the disk(s) into the system and then bus scan the disks.

Figure 4-25. Select Bus Scan Type

The screenshot shows the RAID Storage Console interface. On the left is a 'Menu' sidebar with options like RAID Volumes, Physical Disks, Logical Arrays, and Utilities. The main content area is titled 'RAID Storage Console (v4.03c.013)'. In the center, a dialog box titled 'SELECT BUS SCAN TYPE' is displayed. It contains two rows of options: 'Destructive Method' with a radio button, and 'Add Disk(s) Method' with a radio button that is selected. Below the dialog are 'SUBMIT' and 'HELP' buttons.

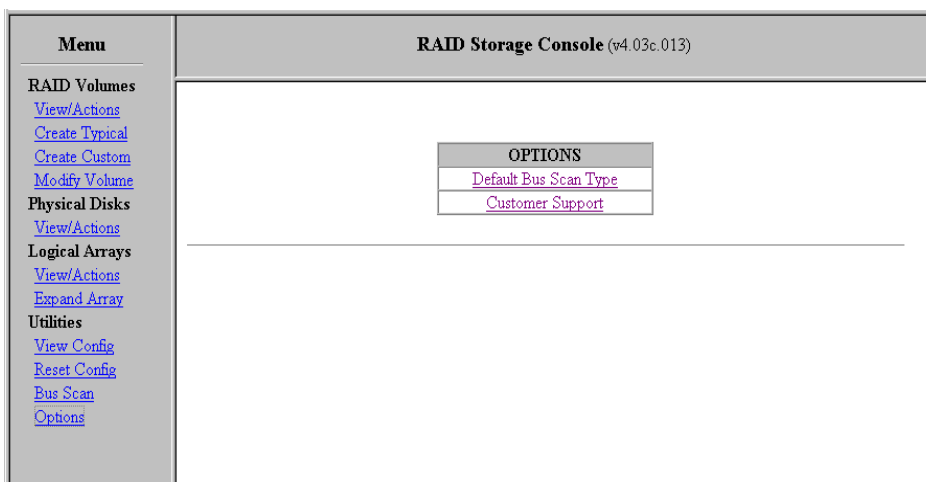
Figure 4-26. Bus Scan

The screenshot shows the RAID Storage Console interface. The main content area is titled 'RAID Storage Console (v4.04c.013)'. In the center, a table titled 'ADD DISK(S) BUS SCAN METHOD' is displayed. The table has four columns: 'Bus ID', 'Bus Protocol', 'Total Devices', and 'Scan Bus?'. The first row contains the values '00', 'SCSI', '03', and a checked checkbox. Below the table are 'SUBMIT' and 'HELP' buttons.

Bus ID	Bus Protocol	Total Devices	Scan Bus?
00	SCSI	03	<input checked="" type="checkbox"/>

4.3.9.4 Options

Figure 4-27. Options Page



Bus Scan Type

Select the desired Bus Scan, Default or Destructive. See [Bus Scan on page 4-28](#) for details.

Customer Support

Describes customer technical support information, including company name, contact number, product ID and product version number. Use this support contact information if you need technical assistance.

4.3.10 Management Utilities (including Storage Console)

4.3.10.1 Storage Console

The storage console icon points to only 1 card by default. This adapter card will be the first SRCU21 that is enumerated by the system BIOS (based on PCI slot) when the system is booted. This first adapter is assigned as IOP (Input/Output Processor) “0”. To switch to the second SRCU21 adapter, you must manual modify the URL in the browser to indicate that you wish to configure IOP “1” (which will be the second adapter that is enumerated by the system BIOS). There are three parameters that are listed after iop.exe (which is the I₂O RAID CGI script) in the URL. The first of these is the IOP number. The default setting is the following:

Local Administration for NT Server

Default setting (the first parameter indicates the IOP #)

iop://localhost/0/8/0



Note: The “/0” parameter directly after “localhost” indicating the first IOP is being configured. To switch from the first adapter to the second simply change the first parameter from “0” to “1” to indicate that you wish to configure the second SRCU21. For example:

To configure the first SRCU21 (default) use:

```
iop://localhost/0/8/0
```

To configure the second SRCU21 (change first “0” to a “1”) use:

```
iop://localhost/1/8/0
```

The Storage Console functions in the same way as with one card, except that only the devices that are attached to it can be configured.

Remote Administration for all OSs

Default setting (the first parameter indicates the IOP #)

```
http://localhost/scripts/iop.exe/0/8/0
```

Note: The “/0” parameter directly after “iop.exe” indicating the first IOP is being configured. To switch from the first adapter to the second simply change the first parameter from “0” to “1” to indicate that you wish to configure the second SRCU21. See the example below:

To configure the first SRCU21 (default) use:

```
http://localhost/scripts/iop.exe/0/8/0
```

To configure the second SRCU21 (change first “0” to a “1”) use:

```
http://localhost/scripts/iop.exe/1/8/0
```

The Storage Console functions in the same way as with one card, except that only the devices that are attached to it can be configured.

5.1 Introduction

5.1.1 In this Chapter

This chapter describes how RAID is implemented in the Intel® Integrated RAID solution.

5.1.2 Summary of Contents

- Overview of the RAID Subsystem
 - Ease of Use Features
 - High Availability/Redundancy
 - System Management
 - Summary of RAID Levels
 - RAID Volume Characteristics
 - Factors to Consider When Selecting a RAID Level
 - RAID Configuration Parameters
 - Arrays
 - RAID Volumes
 - Physical Drive Usage
 - Caching
 - RAID Levels Examples

5.1.3 Ease of Use Features

5.1.3.1 Instant Availability/Background Initialization

RAID 0 and RAID 1 volumes do not require initialization. RAID 5 volumes must be initialized. Initialization of a RAID volume begins automatically upon its creation. While the initialization proceeds as a background task, the RAID volume is fully accessible for reads and writes. Supported OS's provide instant access to the newly created arrays without requiring a reboot. Furthermore, the RAID volume, while initializing, is protected against a single disk failure just as if it were completely initialized. A single disk failure would cause the volume to transition from the normal mode, initializing state to the degraded mode, idle state. Volume initialization is not impacted by system reboots and will continue if the system is rebooted. While initializing, the user might notice some performance degradation especially under heavy load.

5.1.3.2 Online RAID Reconfiguration

SRCU21 can migrate an existing RAID volume to a new RAID level and/or strip size. Online RAID reconfiguration can prove helpful during performance tuning activities as well as in the event that additional physical disks are added to a RAID subsystem, for example, the addition of a third disk to a RAID subsystem that currently has a two disk RAID 1 volume. With the addition of this third disk, you have the option of adding this disk to your existing RAID volume and migrating the RAID level from 1 to 5.

RAID transformation is only permitted to begin if all volumes to be transformed are in normal mode. During the transformation, they are protected against data loss from a single disk failure provided that neither the source nor destination RAID levels are 0. In the case of a single disk failure, the RAID volume in a transforming state transitions from normal mode to degraded mode. When the transformation is completed, the volume transitions to an idle state in degraded mode and if a global hot spare were present, it would transition to a rebuilding state in degraded mode. When there is more than one RAID volume on an array, certain types of transformations may be applied to individual RAID volumes, while other types of transformations must be applied to all RAID volumes on the array.

Some transformations may be physically impossible due to insufficient disk capacity or an incorrect number of physical disks in the destination array. The SRCU21 Storage Console performs background validation to determine which migrations are possible.

5.1.3.3 Online Volume Migration

Online Volume Migration allows the user to change a volume's RAID level or stripe size while the server is online and the volume is in-use. Since the subsystem (the IOP, the secondary PCI bus, the volume itself and the SCSI bus) incurs a load during a migration or during a rebuild of a degraded volume, the SRCU21 allows the user to select the migration priority (low, medium, high). Adjusting migration priority appropriately balances volume access and rebuild tasks during the volume's migration or volume rebuild.

Migration Priority determines the amount of time that the I/O processor in your server/workstation spends on migrating from one RAID level to another. Migration priority can be set at low, medium or high. As with volume initialization, a system reboot does not require the rebuild process to restart from the beginning. The settings are defined as:

- Low - the I/O processor spends a majority of its time handling normal input/output activities of the server/workstation while spending a small amount of time on the migration. This setting has the smallest affect on the performance of the array.
- Medium - the I/O processor spends an equal amount of time processing the migration while spending the other half of its time handling normal input/output activities of the server/workstation.
- High - the I/O processor spends most of its time handling the migration. This setting will impact performance of the array while the migration is taking place.

5.1.3.4 Online Capacity Expansion Without Reboot

An array is a group of disks containing 1 or more RAID volumes. An array is implicitly created whenever a RAID volume is created on a group of unused disks. Data from that RAID volume is evenly spread across all disks in the array. If an array has unused capacity, additional RAID volumes may be created on that array. The data from additional RAID volumes is likewise evenly spread across all the disks in the group.

One or more physical disks may be added to an array to expand its capacity without rebooting. When disks are added to an array, unused capacity is added to the end of the array. Data on RAID volumes residing on that array is redistributed evenly across all the disks (including the new disks). As a result, a contiguous block of unused capacity (disk space) is made available on the array. The additional capacity created from adding disks can be used to create one or more RAID arrays and/or new volumes.

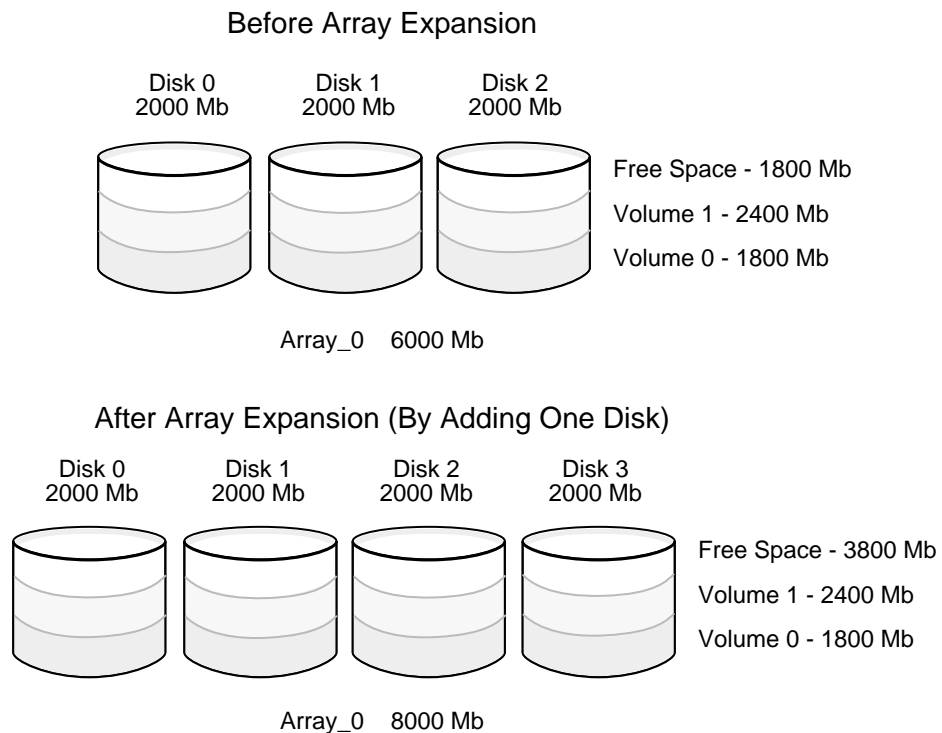
A disk, to be added to an array, must be in normal mode (not failed), unused (not in an array, a spare, or passed through to host) and must have at least the same capacity as the smallest disk already in the array. Normally, all disks in an array should have the same capacity, since any capacity on a disk beyond that of the smallest disk would be wasted.

Capacity expansion is only permitted to begin if all volumes on the array are in normal mode (not degraded or failed) and a idle state (not rebuilding, initializing, transforming etc.). During the expansion process, the RAID volumes being expanded are accessible by the system. In addition, RAID volumes with RAID levels 1 or 5 are protected against data loss in the event of a single disk failure. In the case of a single disk failure, the RAID volume transitions from normal mode, expanding state to degraded mode, expanding state. When the expansion is completed, the volume transitions to degraded mode, idle state. If a global hot spare is present, then it further transitions to degraded mode, rebuilding state. After the rebuild is complete, the volume transitions from rebuilding state to idle state, normal mode.

To begin an expansion, an array must be in an idle state (not already expanding).

The result of array expansion is illustrated in [Figure 5-1](#).

Figure 5-1. Array Expansion



5.1.3.5 Array Roaming

Array Roaming allows the user the ability to move a complete array to another system (with drives in any SCSI ID slot) and still preserve RAID configuration and user data on that array. SRCU21 firmware versions do not have to be the same on both systems (firmware updates are backwards compatible). The array being moved must be connected to the destination server while it is offline.

Summary

- New physical disks can be added without rebooting.
- RAID volumes are re-allocated across arrays, maintaining capacity.
- Available array capacity increases by the size of the added disk(s).
- RAID volumes presented to the operating system do not increase in capacity.

Additional capacity may be made available to the OS by adding a new volume(s) on the newly created free space on the array.

5.1.4 High Availability/Redundancy

5.1.4.1 Global Hot Spare

The global hot spare is one of the most important features that SRCU21 provides to deliver a high degree of fault-tolerance. A global hot spare is a spare physical disk drive that has been marked as a global hot spare and therefore is not passed through to the host OS and is not a member of an array. If a disk drive used in a RAID volume fails, then the global hot spare will automatically take its place and the data previously located on the failed drive is reconstructed on the global hot spare.

For this feature to work properly, the global hot spare must have at least the same capacity as the drive it replaces. Global hot spares only work with RAID 1 and RAID 5 volumes. You may configure up to 4 global hot spares with SRCU21. Global hot spares count toward the maximum number of disks that are supported by SRCU21.

During the automatic rebuild process, system activity will continue as normal, however, there may be a slight degradation in performance as the data on the global hot spare is rebuilt.

To effectively use the global hot spare feature, you must always maintain at least one drive that is marked as a global hot spare.

5.1.4.2 Hot Plug Disk Drive Support

SRCU21 supports the replacement of failed hard disk drives without having to shut down the system. However, your RAID storage backplane must support hot plug disk drives for this feature to be active.

Warning: Never remove a drive or insert a disk drive into your system while the power is on without confirming with both the disk drive and drive enclosure documentation that both the drive and enclosure are capable of supporting this action. Removing or inserting a new drive not designed for 'hot swap' may result in damage to your hardware and data. Even when both drive and enclosure support 'hot swap' it is strongly recommended that 'hot swapping' *not* be done while the drives are being accessed (active I/O). LVD drives and enclosures are especially susceptible to electrical

transients on the SCSI bus itself and even the best drives and enclosures may not ‘hot swap’ correctly while the bus is experiencing heavy traffic.

5.1.4.3 Auto Declare Spare

If a disk drive is brought online into a system with a degraded volume, SRCU21 will automatically declare the new disk as a spare and begin rebuilding the degraded volume. The auto declare spare function requires that the new disk be of equal or greater capacity than the failed disk. Auto declare also requires that the new disk have a different serial number than the failed disk. If you remove a drive from a system and reinstall the *same* drive in the same system, the auto declare will not declare the reinstalled disk as a spare.

- With a SAF-TE enclosure a bus scan occurs automatically when the drive is inserted. No manual intervention is required.
- For the Auto Declare Spare feature to work with an enclosure without SAF-TE support, a reboot or bus scan is required before the system will be able to claim the disk as a spare. See [Section 4.3.9.3, “Bus Scan](#) for more information on using the bus scan feature.
- When inserting a new drive into the enclosure to replace a failed drive, it may have the same SCSI ID as the failed drive.

5.1.5 System Management

SRCU21 supports DMI and SNMP protocols. In addition, SRCU21 provides a local host monitor application referred to as *RAID Monitor*. See [Section 4.2.1, “RAID Monitor](#).

5.1.6 What is RAID?

Redundant Array of Independent Disks (RAID) refers to a method of organizing data on one or more physical disks to provide increased I/O performance and data protection. The different methods for organizing the data are referred to as RAID Levels. The RAID levels offered by Intel Server RAID Controller U2-1 are 0, 1, 5 and 10. A summary of RAID levels, their performance and protection can be found in [Table 5-1](#). RAID levels examples are given in [Section 5.2.9](#).

5.2 Overview of the RAID Subsystem

5.2.1 Summary of RAID Levels

SRCU21 supports RAID Levels 0,1, 5 and 10. [Table 5-1](#) provides a summary of RAID levels.

Table 5-1. Summary of RAID Levels

Intel® Server RAID Controller U2-1 Features and Performance						
RAID Level	Description	Minimum Number of Drives Supported	Maximum Number of Drives Supported	Data Reliability (protection)	Data Transfer Rates	Relative I/O Rates
0	Striping of data across multiple drives in an array. This is a high performance solution, however there is no data protection.	1	15	No data protection.	Very High	Very high for both reads and writes.
1	Also known as mirroring. Mirroring refers to the 100% duplication of data from one disk to another. This is a high availability solution, but due to the 100% duplication, it is also a costly solution.	2	2	Highest reliability; much higher reliability than a single drive (no RAID).	Reads are higher than a single drive. Writes are about the same as a single drive.	Reads are up to two times faster than a single drive. Writes are about the same as a single drive.
5	Striping with parity. Data and parity information is spread among each drive in the drive group. Parity is equal to the total number of disks in the volume minus one drive. That one drive must be equal to the smallest drive capacity in the array.	3	15	Lower reliability than RAID 1; higher reliability than a single drive or RAID 0.	Reads are similar to RAID 0. Writes are slower than a single drive due to penalty of writing parity.	Reads are similar to RAID 0. Writes are usually slower than a single drive.
10	RAID 10 is a combination of RAID 0 and RAID 1. This feature is not user selectable. It is a function of how Intel® Server RAID Controller U2-1 writes data on RAID 1 arrays with 3 or more disks.	3	15	Higher reliability than RAID 5; much higher reliability than a single drive (no RAID).	Transfer rates more similar to RAID 1 than RAID 0.	Reads are up to two times faster than a single drive. Writes are about the same as a single drive.

5.2.2 RAID Volume Characteristics

5.2.2.1 RAID 0 Volume Characteristics

Table 5-2 lists the characteristics of a RAID Level 0 volume.

Table 5-2. RAID 0 Volume Characteristics

Characteristic	Minimum	Maximum
Capacity	1 MB	n x smallest single drive capacity where n is the number of drives in a RAID 0 volume.
Drives	1	15
Strip Size	4 KB, 8 KB, 16 KB, 32 KB, 64 KB, 128 KB	
Status	Normal, Migrating, Failed	
States	Idle, Migrating	

5.2.2.2 RAID 1 Volume Characteristics

Table 5-3 lists the characteristics of a RAID Level 1 volume.

Table 5-3. RAID 1 Volume Characteristics

Characteristic	Minimum	Maximum
Capacity	1 MB	½ (n x smallest single drive capacity) where n is the number of drives in the RAID 1 volume.
Drives	2	2
Strip Size	64 KB	
Status	Normal, Degraded, Migrating, Failed	
States	Idle, Copying, Expanding, Transforming	

5.2.2.3 RAID 5 Volume Characteristics

Table 5-4 lists the characteristics of a RAID Level 5 volume.

Table 5-4. RAID 5 Volume Characteristics

Characteristic	Minimum	Maximum
Capacity	1 MB	(n-1) x smallest single drive capacity where n is the number of drive in the RAID 5 volume.
Drives	3	15
Strip Size	16 KB, 32 KB, 64 KB, 128 KB	
Status	Normal, Degraded, Migrating, Failed	
States	Idle, Initializing, Rebuilding, Expanding, Transforming	

5.2.2.4 RAID 10 Volume Characteristics

Table 5-5 lists the characteristics of a RAID Level 10 volume.

Note: This feature is not user selectable. RAID Level 10 is a function of how SRCU21 writes data on a RAID 1 volume with 3 or more disks in the array.

Table 5-5. RAID 10 Volume Characteristics

Characteristic	Minimum	Maximum
Capacity	1 MB	RAID 10 is a combination of RAID 0 and RAID 1. $\frac{1}{2} (n \times \text{smallest single drive capacity})$ where n is the number of drives in the RAID 1 volume.
Drives	3	15
Strip Size	64 KB	
Status	Normal, Degraded, Migrating, Failed	
States	Idle, Initializing, Rebuilding, Expanding, Transforming	

5.2.3 Factors to Consider When Selecting a RAID Level

When choosing the appropriate RAID levels for your implementation, use the criteria below.

- Application Performance Requirements
- Data Protection
- Number of Drives in the Array
- Disk Capacity

5.2.4 RAID Configuration Parameters

SRCU21 allows you to configure RAID configuration parameters. See Table 5-6. See Chapter 4, “Using the Storage Console” for details when changing these parameters.

Table 5-6. RAID Configuration Parameters (Sheet 1 of 2)

Parameter	Description
Specify Volume Name	Enter 1 to 15 alphanumeric characters to define a unique identifier for a RAID volume. The first character must be an alpha character.
Specify the Data Capacity	Enter either the size in MB or leave the entry at 0 and the Intel® Server RAID Controller U2-1 software creates the largest available volume size.
Select the Strip Size	Select the strip size for a new RAID volume. It is recommended that you leave the stripe size at the default of 64K.

Table 5-6. RAID Configuration Parameters (Sheet 2 of 2)

Parameter	Description
Select Existing Array	Selecting the existing array allows the user to create, or migrate a volume on the array. An array is a group of disks containing one or more RAID volumes. The data from each RAID volume on an array is evenly spread across all disks in the array. A RAID volume must be created either on an existing array or on a group of unused individual disks. If an array already exists and has available capacity, then you may elect to create a new volume on the existing array.
Select Member Disks	Select the drives you wish to use in this RAID volume. Select either an existing array or individual member disks. Select the drives with available capacity that you would like to include in this new RAID volume. Creating a RAID volume on a group of unused disks, also, implicitly, creates an array consisting of that group of disks.
Volume Caching	Change the caching options for each volume.

5.2.5 Arrays

An array is a group of disks containing one or more RAID volumes. A RAID volume must be created either on an existing array or on a group of available individual disks. Creating a RAID volume on a group of available disks (disks that are not yet a part of an array) also implicitly creates an array consisting of that group of disks. If there are pre-existing arrays with available capacity and enough disks for the specified RAID level desired, then the RAID volume will be created in the existing array of the user’s choice. These arrays are listed on the various RAID Storage Console configuration screens, most notably on the View / Actions screens under both RAID Volumes and Logical Arrays sections.

Additional RAID volumes created in a specific array will reside on all the physical disks in the array. Thus each RAID volume on the array will have its data spread evenly across all the disks in the array. RAID volumes of different RAID levels may coexist on the same array. It is not possible to have multiple arrays on the same disk(s). If physical disks of different capacity are grouped together in an array, then the capacity of the smallest disk will become the usable capacity of all the disks in the array. It is, therefore, wasteful of capacity to have disks of different capacity in the same array.

Table 5-7. Array Status

Status	Description
Idle	Array is fully operational and functional.
Volume Initialization	This state occurs when a volume is created on an array. Initialization occurs automatically after the creation of a new RAID 5 volume.
Changing	When a RAID volume in an array is undergoing a migration, the array is in the changing state.
Expanding	Array is undergoing an Online Capacity Expansion, for example, a disk has been added to the array. Upon completion of the expansion, the volume’s state returns to normal.

5.2.6 RAID Volumes

The logical disk capacity that is organized in a RAID level with one or more physical disks is referred to as a RAID volume. RAID level refers to the level of data performance and protection of a RAID volume. A RAID volume refers to the group of physical disks which are used to hold the data. A RAID volume may consume all or a portion of the disk capacity available in a system. Multiple RAID volumes can exist on a group of disks in a system. SRCU21 supports up to 15 volumes per channel. A RAID volume is accessible by the host operating system as a physical disk.

5.2.6.1 RAID Volume Status

RAID volumes may be in 1 of 6 statuses at any one time. The status of a RAID volume describes its fault tolerance and the integrity of the data it contains. The six types of status are normal, degraded, failed, initializing, rebuilding and migrating. RAID volume statuses are described in Table 5-8.

Table 5-8. RAID Volume Status

RAID Volume Status	Description
Normal	A RAID volume in normal mode has data integrity and a normal degree of fault tolerance (single disk failure in most RAID levels).
Failed	A RAID volume in failed mode lacks data integrity and because of this, SRCU21 blocks access to it.
Degraded	A RAID volume in degraded mode has experienced one or more disk failures, however, it still has data integrity. Fault tolerance is compromised or non-existent.
Initializing	A RAID volume is generating parity. Initialization occurs automatically after the creation of a new RAID 5 volume (RAID 5 volumes only). A percent sign (%) is displayed which refers to the percent towards completion.
Rebuilding	A degraded RAID volume is currently rebuilding a failed member disk. There is always a value listed after rebuilding which indicates the percentage of completion. Upon completion of the rebuild, the volume's state returns to idle and the status returns to normal.
Migrating	The RAID volume is being migrated from one RAID configuration to a new RAID configuration (RAID level migration). Upon completion of the migration, the volume's state returns to idle. The following activities can cause a migration to take place: <ul style="list-style-type: none"> RAID level change a strip size change member disks added (array expansion)

Table 5-9. RAID Volume Status and Array Status

Array Status	Volume Status						
	Normal	Failed	Migrating ¹	Degraded ¹	Uninitialized	Initializing	Rebuilding ¹
Idle	X	X		RAID Levels 1, 5	RAID Level 5		
Changing							
Expanding			X	X			

1. Indicates that a volume may be migrating and degraded at the same time. If the volume becomes degraded during a migration, then the migration completes, and completes the rebuild.

Table 5-9. RAID Volume Status and Array Status

Array Status	Volume Status						
	Normal	Failed	Migrating ¹	Degraded ¹	Uninitialized	Initializing	Rebuilding ¹
Volume Initialize						RAID Level 5	
Rebuilding				X			RAID Levels 1, 5
Contracting							

1. Indicates that a volume may be migrating and degraded at the same time. If the volume becomes degraded during a migration, then the migration completes, and completes the rebuild.

Table 5-10. Available Volume Actions and Volume Status

Volume Actions	Volume Status					
	Un-initialized	Initializing	Migrating	Normal	Degraded	Failed
None	YES	YES	YES	YES	YES	YES
Delete Volume	YES	YES	YES	YES	YES	YES
Mark as Normal	NO	NO	NO	NO	NO	YES
Initialize Parity	YES	NO	NO	NO	NO	NO
Disable Write Cache	YES	YES	YES	YES	YES	YES
Enable Sequence Write Cache	YES	YES	YES	YES	YES	YES
Enable Full Write Cache	YES	YES	YES	YES	YES	YES
Modify Volume	NO	NO	NO	YES	NO	NO

YES indicates the volume action is available during the indicated volume status.
 NO indicates the volume action is *not* available during the indicated volume status.

5.2.7 Physical Drive Usage

This section addresses the usage of physical drives.

Table 5-11. Physical Drive Status

Status	Description
OK	Drive is configured as a member.
Failed	Accesses to drive have not completed successfully. The RAID firmware does not access a failed drive.
Offline	Drive is unusable. This state is used to prepare disks for removal from a SAF-TE enclosure.
Missing	Drive configured as a member of a RAID volume is not detected. The RAID firmware does not access a missing drive.
Formatting	Drive is being formatted.
Formatted OK	Format completed successfully.

Table 5-11. Physical Drive Status

Status	Description
Formatted Failed	Disk is unusable.
ALARM-SERVICE	Indicates that the disk drive has reported a S.M.A.R.T event and may be in need of service or replacement. See the specific disk drive manufacturer documentation for details including error codes, utilities, etc.
Incompatible Version	The drive is not compatible with the firmware on SRCU21 adapter card. To gain access to this drive, use it with the adapter card with appropriate firmware or low level format the drive.

Table 5-12. Physical Drive Usage

Usage	Description
Available	Drive is available to be configured as part of a RAID volume, defined as a global hot spare, reformatted or set as pass-through for direct control by the host operating system.
In Use	Drive is configured as part of a RAID volume.
Spare	Drive is configured as a global hot spare. See Section 5.1.4.1, "Global Hot Spare" on page 5-4 for more information.
Pass-through	Drive is not controlled by RAID firmware and thus cannot be a part of a RAID volume. The drive will be available to the operating system as an individual disk.
Claim on Reboot	Gives control of the device to the Intel Integrated RAID subsystem. A reboot may be required depending on previous usage.

Table 5-13 lists available disk actions depending on current usage and status of the disk(s). See [Section 4.3.6, "Physical Disks" on page 4-21](#).

Table 5-13. Disk Actions, Usage and Status

Disk Action	Usage	Status	Description if Submitted and Confirmed
Begin Format	Available	OK	Formats a drive or allows the drive to be reformatted after a format session has failed.
Begin Format	In Use	Failed	
Begin Format	Available (in red)	Failed	
Claim for RAID	Pass-through	OK	Gives control of the drive to the Intel Integrated RAID subsystem.
	Claim on Reboot	OK	
Identify Drive	Available	OK	Identify a drive. Useful for determining the location of a drive within a storage enclosure.
Identify Drive	In Use	Failed	
Identify Drive	In Use	OK	
Identify Drive	Spare	OK	
Mark as Failed	Available	Formatted OK	Alerts a user not to use this drive. Usually utilized in testing scenarios to simulate a failed drive.
Mark as Failed	In Use	OK	
Mark as Normal	Available	Formatted OK	Marks drive as no longer failed.
Mark as Normal	In Use	Failed	

Table 5-13. Disk Actions, Usage and Status

Disk Action	Usage	Status	Description if Submitted and Confirmed
Mark as Spare	Available	OK	Mark drive as a global hot spare.
Mark Offline	Available	OK	Marks a drive to an unusable state and removes all RAID configuration data from drive. Useful for pulling a drive out of a storage enclosure that does not support drives from being removed while online.
Mark Offline	In Use	Failed	
Mark Offline	In Use	OK	
Mark Offline	Spare	OK	
Mark Online	Available	Offline	Marks a drive for use. Drive is ready for power.
Mark Online	In Use	Offline	
None	Available	Formatted OK	No action can be taken while the drive is being formatted.
None	Available	Formatting	
None	Available	Offline	
None	Available	OK	No action will be taken.
None	In Use	Failed	
None	In Use	OK	
None	Pass-through	Ok	
None	Spare	OK	
None	In Use	Offline	
Pass-through to Host	Available	OK	Drive is not controlled by RAID firmware and thus cannot be a part of a RAID volume. The drive will be available to the operating system as an individual disk.
Release Spare	Spare	OK	Convert a spare to an available drive.
None	Available, In Use, Pass-through, Spare	Alarm-service	Indicates that the disk drive has reported a S.M.A.R.T event and may be in need of service or replacement. See the specific disk drive manufacturer documentation for details including error codes, utilities, etc.
None	In Use	Incompatible Version	Drive is not controlled by RAID firmware and thus cannot be a part of a RAID volume. The drive will be available to the operating system as an individual disk.

5.2.8 Caching

5.2.8.1 Downstream Write-Through

The RAID controller cache is used to buffer write data until it is written to disk. Data in the cache is not available to be read from the cache directly. This type of caching is enabled by default when no other cache type (Sequential or Full Write Back) is selected.

5.2.8.2 Sequential Write-Back

The host operating system is given a successful write reply immediately while the write data is held in the RAID controller cache until the actual write to disk occurs. Only data determined to be sequential is cached.

5.2.8.3 Full Write-Back

The host operating system is given a successful write reply immediately while the write data is held in the RAID controller cache until the actual write to disk occurs. Caching occurs for both sequential and random data.

Note: Intel Integrated RAID software provides write-back cache capability to improve host performance for certain types of applications. Applications which may benefit from the write-back cache typically exhibit irregular patterns of write intensity over time. Such applications normally write short bursts of data. Such applications may include transaction processing (perhaps sorting applications or accounting software). Also, enabling the write-cache will usually improve sequential write performance for RAID-5 volumes.

Some applications may incur some performance degradation with the write-cache enabled. Example applications would include video editing, graphics intensive applications, video streaming, or other applications which access or copy large files. It is recommended that the user try both modes of operation (cache enabled and cache disabled) to determine which mode operation provides the best performance for the applications that are commonly used.

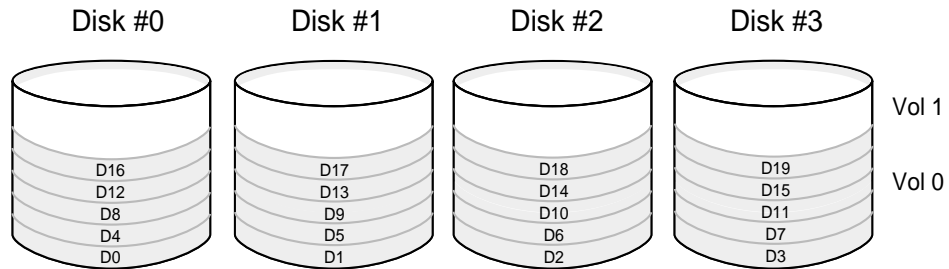
5.2.9 RAID Levels Examples

5.2.9.1 Striping

Disk striping is the *interleaving* of data across multiple drives in an array. Data is sequentially stored in allocated sizes, based on the RAID level. Striping improves performance because it makes data available for reading and writing on multiple disks simultaneously. See [Table 5-1](#) for more information on RAID levels and the level of performance and protection they offer.

Strip size refers to the allocated space on a disk. *Stripe* size is the number of drives x the strip size. For example, 4 drives x a strip size of 64k is equal to a stripe size of 256k in a Raid level 5 configuration. Figure 5-2 illustrates how data is striped across a group of disks. Strip size is specified when you create a RAID volume.

Figure 5-2. Stripes and Strips in a RAID Volume



Strips D0, D1, D2 and D3 constitute the first stripe in Volume 0. Strip size is specified when you create a RAID volume.

Strip size is specified when you create a RAID volume. Strip size options for RAID levels 0, 1, 5, and 10 are specified below.

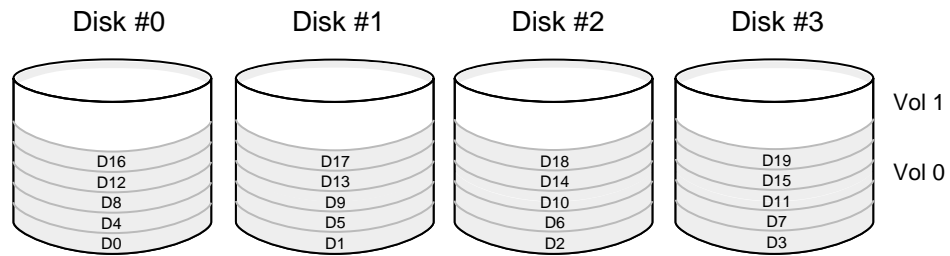
Table 5-14. Strip Size Availability and RAID Level

RAID Level	Strip Size					
	4K	8K	16K	32K	64K	128K
RAID0 (with < 2 drives RAID 10)	X	X	X	X	X	X
RAID1	X	X	X	X	X	X
RAID5			X	X	X	X

5.2.9.2 RAID Level 0 Example

Data on a RAID 0 volume is striped across all of its member disks. The strip size is the amount of logically contiguous data striped on each disk. Since data is spread across several physical disks, accesses tend to be evenly distributed across all the disks. This sharing of the workload increases the throughput when compared to a single physical disk. There is neither parity nor mirroring, so a RAID 0 volume will lose data if one of its member disks fails.

Figure 5-3. Data Map of a RAID Level 0 Volume with 4 Disks, Showing the First 5 Stripes

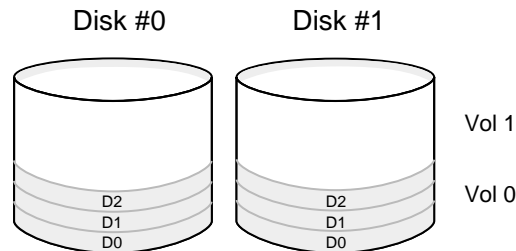


Data Map of a RAID Level 0 Volume
Di is the i'th data strip

5.2.9.3 RAID Level 1 Example

A RAID 1 volume *mirrors* the same data on two of its members. This type of array gives good performance and high reliability but its usable capacity is one half of its physical capacity. See [Figure 5-4](#). In a two disk RAID 1 volume, each disk has an identical copy of the data. In the event a disk fails, data integrity is maintained.

Figure 5-4. Data Map of a RAID Level 1 Volume, Volume on 2 Disks with Mirroring

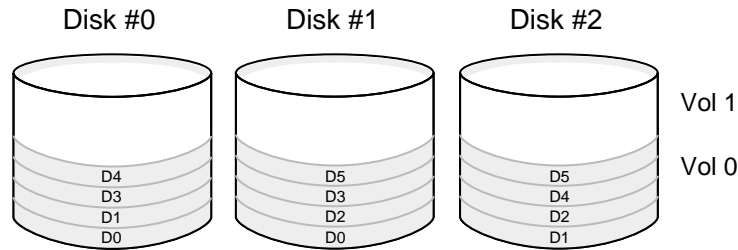


Data Map of a RAID Level 1 Volume
Di is the i'th data strip

5.2.9.4 RAID Level 10 Example

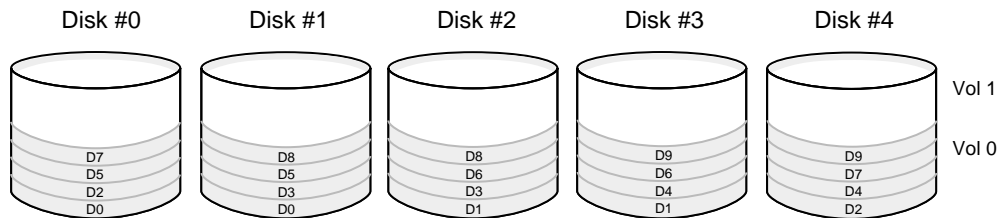
This RAID level is not user selectable. In arrays with more than 2 disks (see [Figure 5-5](#) and [Figure 5-6](#)) a RAID 1 volume stills write each data element twice, but it utilizes all the disks in the array. Some vendors refer to this as RAID 10 or 0+1, since it is a combination of RAID 0 and 1. This increases performance by spreading the load across all the disks. In addition to good performance, this type of array also provides high reliability but its usable capacity is one half of its physical capacity. In the event one disk fails, data integrity is maintained.

Figure 5-5. Data Map of a RAID Level 10 Volume with 3 Disks, Showing the First 4 Stripes - Striping with Mirroring with Three Disks



Data Map of a RAID Level 10 Volume
Di is the i'th data strip

Figure 5-6. Data Map of a RAID 10 Volume with 5 Disks, Showing the First 4 Stripes Using Double Mirroring - Striping with Mirroring with Four Disks

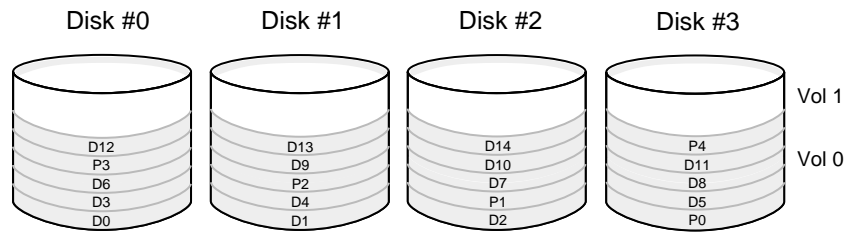


Data Map of a RAID Level 10 Volume
Di is the i'th data strip

5.2.9.5 RAID Level 5 Example

Data and parity on a RAID 5 volume are striped across all of its members. If one of its member disks fails, then a RAID 5 volume does not lose data and continues to run in degraded mode. When a failing disk is replaced, data and parity is reconstructed onto the replacement disk automatically while the volume continues to operate. Parity calculates the data in two drives and stores the result on a third drive (a bit from drive 1 is XOR'd with a bit from drive 2, and the resultant bit is stored on drive 3). This provides a balance between performance and cost. Parity calculates the data in two drives and stores the result on a third drive (a bit from drive 1 is XOR'd with a bit from drive 2, and the resultant bit is stored on drive 3). This provides a balance between performance and cost.

Figure 5-7. Data Map of a Raid 5 Volume with 4 Disks, Showing the First 5 Stripes



Data Map of a RAID Level 5 Volume
 Di is the i'th data strip
 Pi is the parity strip for the i'th stripe

A.1 About this Chapter

This chapter provides installation information, product features and specifications of the Intel® Server RAID Controller U2-1 (SRCU21) hardware.

A.1.1 Summary of Contents

- Features and Specifications
 - Intel® Server RAID Controller U2-1 Functions and Features
 - Intel® Server RAID Controller U2-1 Specifications
- Disk Drive Connectivity
 - SCSI Specifics
- Regulatory Information

A.2 Features and Specifications

A.2.1 Intel® Server RAID Controller U2-1 Functions and Features

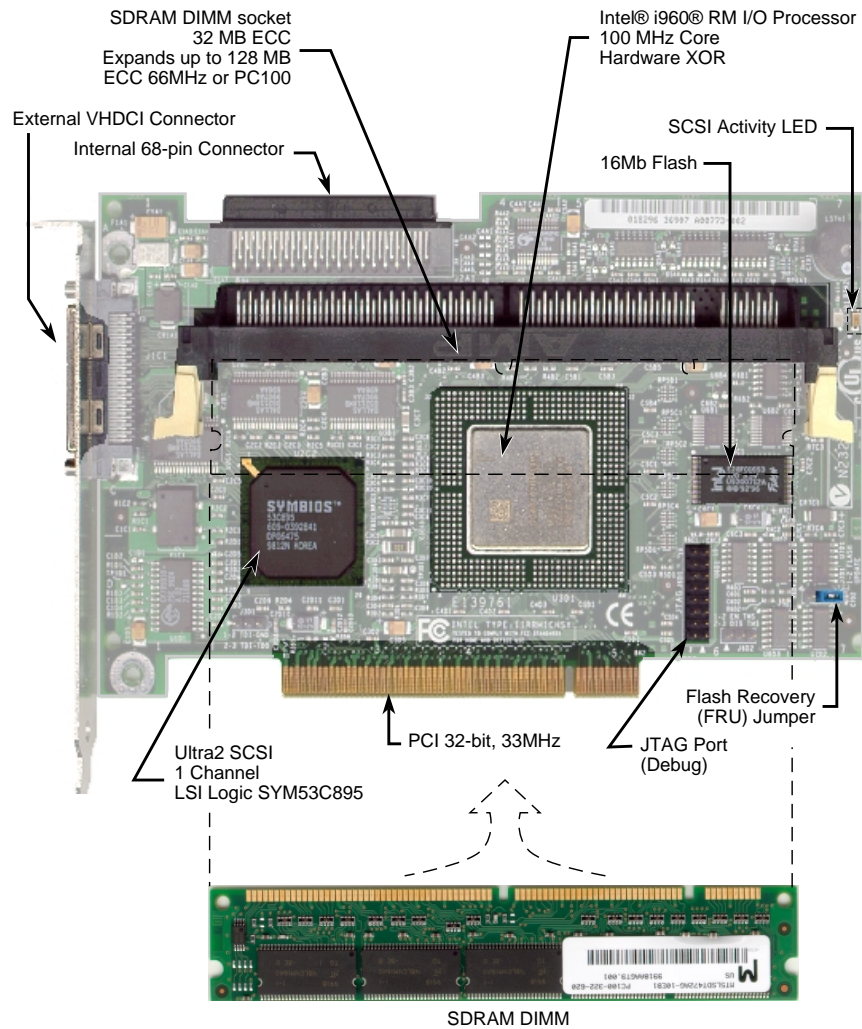
This section provides information on key features, configuration options and support interface technology for SRCU21. [Figure A-2](#) shows the key features of SRCU21.

Figure A-1. Intel® Server RAID Controller U2-1 Key Features

- LSI Logic SYM53C895 controller with support for up to 15 Ultra2 LVD SCSI Drives
- RAID Levels 0, 1, 5, 10 Supported
- I₂O* core compliant
- IxWorks* IRTOS
- SMART Support
- PCI 2.2 compliant
- Selectable Write-Back Cache
- Online RAID reconfiguration (RAID level, strip size)
- Selectable RAID Rebuild Rate, Automatic Rebuild
- Bootable BIOS Configuration Utility
- Flash-Updateable Firmware
- Configuration via Standard HTML Browser
- Concurrent Multiple Stripe Size
- SAF-TE intelligent enclosure support
- Hot Swap Disk Drive support (if disk drive enclosure supports this feature)

- Maximum of 15 Drives supported
- Instant availability/background initialization of RAID Volumes
- Global Hot Spares
- Event Notification

Figure A-2. Intel® Server RAID Controller U2-1 Adapter Card



A7469-01

A.2.2 Intel® Server RAID Controller U2-1 Specifications

Table A-1. Hardware Architecture Features

Component	Feature
CPU	Intel i960® RM I/O Processor, 100MHz, RISC 32-bit core. This controller features hardware XOR support for highspeed RAID 5 parity calculations.
Memory/Cache	3.3V, unbuffered PC100, ECC, SDRAM DIMM expandable to 32, 64 or 128MB
Cache	Downstream Write Through, Full and Sequential Write-Back - Selectable per volume.
Firmware	ROM Type, Flash EEPROM, 2Mbits x 8 (flashable)
PCI	Transfer Rate: 264MB/second Burst
Voltages	+12V, +5V and 3.3V (all +/- 5%)
Array Interface to Host	Interface to Host PCI 2.2
PCI Signaling	Capable of being used in a 5 volt or 3.3 volt slot.

Table A-2. Environmental Specifications

Attribute	Conditions
Temperature	Operating 0° to +55° C Storage -40° to +70° C
Humidity	Operating 90% relative humidity Storage 90% relative humidity
Form Factor	Length 6.75 inches Height 4 inches

Table A-3. SCSI Controller Technology

SCSI Controller Supported	Description
SCSI Controller: LSI SYM53C895	LSI Ultra2 SCSI Controller

A.3 Disk Drive Connectivity

A.3.1 SCSI Specifics

This section provides information on supported SCSI technology and form factors.

A.3.1.1. Drives Supported

SRCU21 supports up to 15 SCSI devices. It supports up to 15 disks (or 14 disks if one of the SCSI ID's is occupied by an Intelligent SCSI Enclosure).

Use Single-ended (SE) and Low Voltage Differential (LVD) devices but it is recommended that you use only one type of drive (SE or LVD) on any one channel at a time. Each is explained below.

Note: If both an SE and LVD device are attached to the same channel the entire bus switches to single ended mode. See [Table A-4](#) for the maximum cable length distances that apply to each mode.

SRCU21 is an Ultra2 implementation and is backward compatible with older SCSI specifications. See [Table A-4](#) for the SCSI standards supported.

Single-ended (SE) Support

SRCU21 supports single-ended drives which operate at up to 40MB/sec depending upon the speed of the drives attached.

Low Voltage Differential (LVD) Support

SRCU21 supports Ultra-2 LVD SCSI operating at up to 80MB/sec.

Table A-4. SCSI Drive Standards for the Intel® Server RAID Controller U2-1

SCSI Drive Standard	Speed MB/Sec	Bus Width in Bits	Maximum Cable Length in Meters		Intel® Server RAID Controller U2-1 Maximum Devices
			Single-Ended	LVD	
SCSI-1	5	8	6	NA	8
Fast SCSI	10	8	3	NA	8
Fast Wide SCSI	20	16	3	NA	15
Ultra SCSI	20	8	1.5	NA	8
Ultra SCSI	20	8	3	NA	4
Wide Ultra SCSI	40	16	NA	NA	15
Wide Ultra SCSI	40	16	1.5	NA	8
Wide Ultra SCSI	40	16	3	NA	4
Ultra2 SCSI	40	8	NA	12	8
Wide Ultra2 SCSI	80	16	NA	12	15

A.3.1.2. SCSI Connectors

SRCU21 includes an internal SCSI-3 Ultra Wide 68 pin connector and an external VHDCI (Very High Density Connector Interface) 68 pin connector. Each connector can be fully populated with up to 15 SCSI devices (not to exceed an additive total of 15 devices) as long as cable length limitations for each segment are not exceeded.

Termination

This is a commonly overlooked requirement when connection SCSI devices together. When these devices are connected together, the resulting set of devices is typically referred to as a SCSI bus. SCSI devices such as hard disks and tape drives must be terminated if they are the last physical devices at either end of the SCSI bus (if nothing else is actively terminating the end of the bus such as a terminator or backplane). If a device is inserted into the middle of the SCSI bus, then it (the device itself) should not be terminated. Only each end of the bus should be terminated.

The SRCU21 is a self terminating adapter. This means that the end of the SCSI cable that is connected to the SRCU21 will be terminated automatically. The other end of the SCSI cable will not be automatically terminated. Ensure that the other end is properly terminated. Refer to one of the methods below to terminate the other end of the SCSI bus.

Install a SCSI terminator at the end of the SCSI bus or terminate the last device on the bus by doing one of the following:

- Change a switch setting on the device's switch block (typically on external storage cabinets).
- Insert or remove the terminator resistors from the terminator sockets (typically on hard disks).
- Insert a jumper on the device to enable automatic termination.
- Install a terminator cap (for external SCSI devices).
- Install a physical terminator onto the end of the SCSI connector.

A.3.1.3. Support for SCSI Devices Other than Disk Drives

The SRCU21 does not support SCSI non-disk drive devices.

A.4 Regulatory Information

Note: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

If necessary, the user should consult the dealer or an experienced radio/TV technician for help.



Troubleshooting Scenarios

B

B.1 Summary of Contents

- Hardware Troubleshooting
- Software Troubleshooting
- RAID Configuration Utility
- Windows NT
- Browser Configuration During Initial Installation
- Running a Browser on the Unixware Server
- Remote Management (Windows Terminal Server configured with Service Pack 4 and Internet Information Server 4.0)

B.2 Hardware Troubleshooting

Problem: The system does not recognize the adapter card after it is inserted into the server.

Solution: If the system does not list the card as one of the PCI devices in the BIOS, then:

- Ensure the adapter card is inserted correctly into the PCI slot.
- Ensure 3.3 Volts are being supplied to the PCI slot.
- Try another PCI slot.
- Ensure the PCI slot is not specified for any special purpose other than standard PCI configuration.

Problem: The boot device cannot be found.

Solution: Enter the system BIOS utility per manufacturer directions and configure it so that the RAID volume is once again selected as the primary boot device (or first in the boot device list).

If the RAID card is physically moved from one PCI slot to another and the boot device is a RAID volume controlled by the RAID card, some systems will automatically reconfigure some of the system BIOS settings (boot device order). This issue is related to how the system BIOS operates and may not occur with all systems.

Problem: If you have two Intel® Server RAID Controller U2-1 (SRCU21) adapters installed in the system, there is no hyperlink in Storage Console to view the second card.

Using two SRCU21 controllers in one system is a supported configuration, however, there are some caveats that must be understood before setting up two SRCU21 adapters in one system. *Only the advanced user should configure two SRCU21 controllers in one system.* It is important to understand how to use the following tools and software when working with or configuring two



SRCU21 adapters in the same system. Note that only the items that require special attention for a two-adapter usage model are listed below. All other features and components work in exactly the same as a single-adapter per server usage model.

Solution: Change the first numeric zero (0) in the address to a (1) to view and configure the second SRCU21 in Storage Console. For example, change <http://localhost/scripts/iop.exe/0/8/0> in your HTML browser to <http://localhost/scripts/iop.exe/1/8/0>. If you are locally administrating an NT Server, then type `iop://localhost/1/8/0` to load Storage Console for the second SRCU21.

Problem: Unexpected results occur when the user selects the *Mark as Normal/Recover Volume* option.

Solution: The *Mark as Normal/Recover Volume* option enables access to the disk after the system has marked it as failed. By selecting this option, the system will again have access to the disk.

Problem: The system does not boot and issues the message "missing operating system". After creating a SRCU21 RAID volume, the SRCU21 sets itself to be the boot device ahead of the non-RAID (IDE) boot device in the system BIOS. Setting the SRCU21 as the boot device ahead of the non RAID (IDE) device was completed when no options were selected to do so. How do I get my non-RAID volume to be the default boot device again?

Solution: After creating a SRCU21 RAID volume, go into the BIOS setup and set the desired boot device as the first bootable device in the hard disk list. For example, move the IDE disk drive above the SRCU21 RAID volume in the boot order.

Problem: The Windows NT 4.0 setup program has some issues during installation when there are multiple drives available for installation. Two of these issues are visible when the drive that the system BIOS has determined to be the first bootable drive, also known as drive 0x80, does not have a MBR (Master Boot Record) on it. In the case of the SRCU21, this can be the pass-through drive or volume that is selected as the boot device (if there are no other hard drive controllers in the system). Drive 0x80 may not have an MBR if it has been low-level formatted, is new, or was part of a RAID array in the past. The NT installation program does not correct this situation. There are two issues that occur in this situation, which are visible to the end-user attempting to install NT. The workaround is listed in the next section. The visible symptoms of these two issues are itemized below:

- **When attempting to install to a drive other than the 0x80 drive, NT reports a message referencing drive 0x80.** The message indicates that the 0x80 drive "does not contain a partition suitable for starting Windows NT". This message is in reference to drive 0x80 even though you did not select drive 0x80 to install NT.

When installing NT, the screen that prompts the user to select a partition to install NT, will not allow using any drive other than drive 0x80 if there is no MBR on drive 0x80. If there is no MBR on drive 0x80 and you select a drive other than drive 0x80 to install NT, the NT installation program will automatically prompt you to create a partition on drive 0x80, instead of the drive you just selected. There is no correlation between the drive designated in the BIOS as drive 0x80 and the ID NT assigns to the drives (ex: Disk 0 ID 0). Nor is there any correlation to the SCSI ID of a drive and the ID that NT assigns to a drive. If you are prompted to create a partition on a drive other than the one you selected, it means that the drive that you are being prompted to create a partition on is drive 0x80 and it does not have an MBR. Note that if there is already an MBR on drive 0x80 then this issue will not occur (a partition can be setup and selected to have NT installed on any drive).

In this situation NT may also incorrectly assign and reference drive letters. For example, it is possible to get into a situation where NT has assigned the drive letter C: to drive 0x81 and D: to 0x80 yet when attempting to format what NT is calling C: drive 0x80 actually gets formatted (what NT is calling drive D:).

- **The NT Installation program shows a partition size of only 1024 MB regardless of drive/volume size.** When this occurs you cannot create a partition greater than 1024 MBs even though the drive (or logical drive or volume) is larger than 1GB. This is an issue caused by the NT installation program's inaccurate handling of the 0x80 drive not having an MBR.

Solution: While still at the screen where a partition must be selected (to install NT to) in the NT setup program, simply create a partition on drive 0x80 using the default partition size. Format the drive and exit the installation program (rebooting the system). After creating the partition on 0x80, an MBR is also created on 0x80. This will allow you to install NT on any partition on any drive. Return to the installation program (boot the computer into the NT setup program) and delete this partition via the NT setup program, and finally create a partition on the drive that you wish to install NT on. There is no issue with deleting the partition on drive 0x80 after it has been created because when the partition was created an MBR was also created. The MBR will not be removed by deleting the partition.

To avoid this problem in the future, it is good practice to always install NT to the drive designated as 0x80 by the system BIOS (BIOS will sometimes call this Hard Disk 0, and 0x81 will be called Hard Disk 1). In addition, create a temporary partition on drive 0x80 before starting the NT installation so that an MBR is present. When installing NT and choosing a partition location, delete the temporary partition and create the desired partition on 0x80.

When using the SRCU21, by choosing a boot device (RAID volume or pass through drive) you are offering this device to the system BIOS as drive 0x80. The BIOS of some systems may have additional settings, such as a list of hard drive priorities, that also need to be setup correctly before SRCU21 actually gets 0x80 (if there are other controllers in the system with boot devices).

B.3 Software Troubleshooting

Problem: The link does not display in Storage Console to view my SAF-TE enclosure's information. What can I do to resolve this?

Solution: The SRCU21 does not support certain SAF-TE enclosures. For example, a GEM-based SAF-TE enclosure is not supported.

Problem: If you have two SRCU21 adapters installed in the system, there is no hyperlink to click on to view Storage Console for the second card.

Solution: Change the first numeric zero (0) in the address to a (1) to load the Storage Console for the second SRCU21 to be viewed and configured. Example: Change <http://localhost/scripts/iop.exe/0/8/0> in your HTML browser to <http://localhost/scripts/iop.exe/1/8/0>. If you are locally administering an NT Server, then type <http://localhost/1/8/0> to load Storage Console for the second SRCU21.

Problem: When installing Windows NT to a RAID volume, only the volumes (or logical drives) that are attached to the first SRCU21 enumerated by the system BIOS will be available to install the NT



operating system. Any volumes created on drives attached to the second SRCU21 will not be recognized by the NT installation program and therefore NT cannot be installed on those volumes.

Solution: The workaround to this is to have only one SRCU21 installed (the one that hosts the volume upon which NT will be installed) during the installation of NT. *The second card can be inserted and configured after NT is installed.*

Another workaround is to swap the PCI slots in which the SRCU21's are installed so that the card that houses the desired boot volume is enumerated first by the system BIOS.

The reason for the NT installation program recognizing only the first card is that the I₂O miniport driver (NT installation driver used only for installing NT to a RAID volume) can only bind to one SRCU21 card at a time. This recognized card will always be the first one enumerated by (presented to) the system BIOS. Therefore NT will only see one SRCU21 until the miniport driver is replaced with the block storage OSM (after install). After NT and the Intel Integrated RAID software has been installed, NT is able to see all SRCU21's installed in the system.

The Intel Integrated RAID software replaces the NT miniport driver (NT install driver) with the NT block storage OSM. The block storage OSM can bind to multiple cards and thus all SRCU21's in the system can be configured and controlled. Therefore, the I₂O miniport behavior is limited to the install process of the card on an SRCU21 RAID volume.

B.4 RAID Configuration Utility

Problem: An array created by the RAID Configuration Utility uses too many drives.

Solution: The RAID Configuration Utility is designed to create your first RAID volume. It automatically creates an array using up to eight available disks and places a volume on the array. If you would like a certain number of disks to be in the first array, then disable the additional disks in the system by disconnecting them from the SCSI controller or their power supply. Once you have created a volume on the remaining disks using RAID Configuration Utility, you may bring additional disks online and configure them with the SRCU21 Storage Console. See [Section 4.3, "Configuring RAID Volumes Using Intel® Integrated RAID Storage Console"](#) on page 4-12.

Problem: When trying to create a volume name I receive the following error message: Internal Error 4016 - please report this error to customer support, then error 4105: Volume Creation Failed. What might be wrong?

Solution: Ensure that you create a volume name that starts with an alphanumeric character A to Z in upper or lower case. See [Chapter 2, Section 2.2, RAID Configuration Utility](#) for more details about naming RAID volumes.

B.5 Windows NT

Problem: Windows NT still shows a drive letter for a RAID volume which has been deleted.

Solution: When a RAID Volume is deleted from a Windows NT system, NT still shows the drive in Windows NT Explorer, My Computer, and other locations. Also, the Disk Administrator tool shows the drive as offline. When the server is restarted, the deleted volumes no longer appear in Windows NT.

Problem: During the installation of Microsoft BackOffice Small Business Server (SBS) when you try to install the Microsoft Windows Installation disk (Mini-port driver) you receive the following error message after the first reboot:

STOP: 0x0000007b Inaccessible Boot device

What can I do to resolve this?

Solution: This is a known issue with the Microsoft BackOffice Small Business Server (SBS) product. Complete the following steps to complete the installation:

1. Boot from the three setup disks supplied with Windows NT Small Business Server.
2. While loading the first setup disk, when the message "Setup is inspecting your hardware configuration..." is displayed, press F6. Windows NT will eventually ask you to specify devices to install. When you are prompted to insert the compact disc containing your SCSI miniport drivers, choose to skip the files it requests because this compact disc does not exist.
3. During the next reboot, a blue screen STOP 0x0000007b message will be displayed. At this point, the system has not yet been converted to NTFS. Boot from an MS-DOS floppy disk and copy the missing drivers (the ones you had to skip in step 2) to the winnt.sbs\system32\drivers folder. Restart and the setup process continues normally. For more information please refer to the Microsoft web site <http://support.microsoft.com/support/kb/articles/q177/2/05.asp>.

Once the installation for Backoffice Small Business Server (SBS) completes, including all service packs and packaged software, ensure that the security settings within IIS 4.0 are configured correctly for your browser. See the installation procedures for configuring Microsoft IIS 4.0 Web Server under Installing Microsoft Windows NT Server on a SRCU21 volume for details.

B.6 Browser Configuration During Initial Installation

Problem: SRCU21 may encounter problems with accessing the Storage Console if the server is also used as a proxy server in a networked environment.

Solution: For Internet Explorer 4.0 Browsers

1. From the *View* Menu bar in Internet Explorer select *Internet Options*.
2. Select the *Connection* Tab from the *Internet Options* window.
3. Check (ensure there is a check mark in the checkbox) the *Bypass Proxy server for local (Intranet addresses)* in the *Proxy server* section (if a proxy server is configured).
4. Select O.K.
5. Select O.K.

Solution: For Internet Explorer 5.0 Browsers

1. From the *Tools* menu bar in Internet Explorer select *Internet Options*.



2. Select the *Connection* tab from the *Internet Options* window.
3. Select the *LAN Settings...* button in the *LAN Settings* section.
4. Check (ensure there is a check mark in the checkbox) the *Bypass Proxy server for local (Intranet addresses)* in the *Proxy server* section (if a proxy server is configured).
5. Select O.K.
6. Select O.K.

Solution: For Netscape Browsers 4.05 or higher

Note: Do not use a Proxy Server for local addresses.

1. From the *Edit* menu bar in Netscape Navigator select *Preferences*.
2. In the *Preferences* window select the "+" (plus) next to the *Advanced* tree option under *Category* (bottom left) to expand the *Advanced Category*.
3. Select the *Proxies* subcategory under *Advanced* but single clicking with the mouse.
4. Select the *View* button next to the *Manual Proxy Configuration* to bring up the *Manual Proxy Configuration* window.
5. Place the cursor in the *Exceptions* text box at the bottom of the *Manual Proxy Configuration* window by single clicking in the text box under *Do not use proxy servers for domains beginning with:*.
6. Type in the localhost.
7. Select *OK*.
8. Select *OK*.

Problem: Javascript Errors

Solution: In the event that your browser reports error messages relating to Javascript problems, simply acknowledge the error by clicking on either *OK* or *YES* to get past the error. The errors are not critical and will occur when the server is too busy to respond in the time period expected by the browser. Try again after replying to the prompts. For example:

```
! An error has occurred in the script on this page.
Line: 2
Char: 1
Error: Object expected
Do you want to continue?
```

Clicking *Yes* allows the bus scan to continue and complete.

Problem: SRCU21 receives errors when connecting with a CGI if the server is part of a proxy server chain.

Solution: Do not run the SRCU21 as a proxy server in a network where it will filter messages from other clients and servers.

B.7 Running a Browser on the Unixware Server

Problem: During the installation of the Unixware components it mentions that you can use a browser to attach to the Storage Console at [HTTP://LOCALHOST:360/](http://LOCALHOST:360/), and lists these examples: (Netscape, Internet Explorer or Mosaic). I cannot find a copy of MS Internet Explorer for UnixWare to install.

Solution: The installation is expecting that the user uses a browser such as Netscape or Internet Explorer from a remote client to attach to the server running the Storage Console. You may use the version of Netscape (4.08) or higher or other supported java-based browsers on the Unixware server to connect to the Storage Console. See UnixWare's web site for more details.

B.8 Remote Management (Windows Terminal Server configured with Service Pack 4 and Internet Information Server 4.0)

Problem: When using a remote web browser to connect to a Windows Terminal Server's (WTS) Storage Console, the credentials of the user logged in on the remote workstation do not pass properly.

Solution: The remote connection to the Storage Console feature works properly in this sense on a standard NT Server. The only way to get proper access to the WTS's Storage Console is to authenticate with a local (to the WTS server) administrative account as opposed to a trusted account in the local accounts database. This also requires that the user log into the Windows Terminal Server at the machine itself as opposed to connecting remotely from another client.

Problem: When I try to connect to Storage Console running on Windows NT 4.0 Terminal Server Edition from another machine, I am prompted to authenticate but am denied access. This occurs even though the name and password I am entering has administrative access on the Terminal Server.

Solution: Under Windows NT 4.0 Terminal Server Edition, Storage Console cannot utilize the authentication from an account in a trusted domain. You must authenticate with an administrative account from the Terminal Server's local accounts database. For example, if your server was named WTS01, then the account Administrator from the domain WTS01 would work.

Problem: While logged in as local administrator from a Terminal Server client, attempting the execute Storage Console yields the following:

```
CGI Error: The specified CGI application misbehaved by not returning a complete set of HTTP headers. The headers it did return are:
```

(The remainder of the page is blank.)

Solution: Execute Storage Console from the local console as the local administrator at Terminal Server.



Error Messages Defined

C

C.1 Summary of Contents

- Error Messages
- RAID Configuration Utility Error Messages
- Flash Recovery Utility (FRU) Error Messages
 - High Level Errors
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 - Warning Messages
- Firmware Update Utility (FUU) Error Messages
 - Firmware Update Utility (FUU) Internal Errors (Error Code Range = 1500 to 1599)
 - Firmware Update Utility Errors (Error Code Range = 1600 to 1749)
 - Firmware Update Utility Warnings (Error Code Range = 1750 to 1999)

C.2 Error Messages

C.2.1 RAID Configuration Utility Error Messages

For Internal Errors 4000 – 4099, contact your server OEM for support.

C.2.2 Flash Recovery Utility (FRU) Error Messages

C.2.2.1. High Level Errors

```
"ERROR 2100: Either RAID Adapter card is not present or Flash Programming Jumper on the RAID Adapter card is not set. Please turn off the system and perform following checks:
```

1. Check if the RAID Adapter card is present in the system
2. Check if the Flash Programming Jumper is set as specified in the User's Manual

```
And then restart the program."
```

This message is generated when the FRU fails to find any IOP in reset mode 0. This means that either there is no IOP hardware present at all in the computer or the Flash Programming Jumper on the IOP hardware is not properly set. The FRU can not perform any action without having an IOP in reset mode 0. Hence the only option is to exit the program. The user is prompted to press any key to exit the FRU.

```
"ERROR 2101: Multiple RAID Adapter cards found in the system. Please turn off the system. Keep only one RAID Adapter card in the system and restart."
```



The FRU is designed to work only on one IOP hardware at a time. If it finds multiple IOP hardware in the computer in reset mode 0, then it has no way to determine as to which one should be upgraded. In this case the user is instructed to remove one or more IOP hardware out of the system and leave only one IOP hardware at a given time. The only option is to turn off the machine, remove the necessary hardware out of the machine and restart the FRU.

"ERROR 2102: This program does not run under Virtual-86 mode. The Flash Recovery Utility has been exited. Please reboot the system to continue."

The FRU needs total control of the computer hardware to accomplish the programming of the IOP hardware flash memory. It can only accomplish this while running under DOS. If a user tries to run the FRU under Virtual-86 mode (e.g. from DOS prompt in Windows NT*), then this error message is printed and the FRU exits. The only option to the user is to run the FRU under DOS.

"ERROR 2103: Specified file was not found."

This message is printed when the FRU does not find the file specified by the user for the Update or Verify operations. The possible causes of this error are an incorrectly typed filename or file is not accessible, for example, the floppy is not in the floppy drive. Re-type the correct filename or ensure the file is accessible.

"ERROR 2105: Cannot perform unknown operation."

When an unrecognized operation is received as an action to be performed (e.g. update, verify), this message is displayed. A corrupted binary image of the FRU could cause this unexpected behavior. The user should retry the operation again and if the problem persists, recreate the FRU floppy and retry the operation.

"ERROR 2108: FLASH update was unsuccessful."

Contact Technical Support.

"ERROR 2109: Error attempting to read FLASH device."

Power your system down and retry this operation. If the operation fails again, contact technical support.

"ERROR 2112: Could not allocate memory."

Power your system down and retry this operation. If the operation fails again, contact technical support.

"ERROR 2113: RAID Adapter flash memory erasure failed."

Rerun the FRU and if the operation fails again, contact Technical Support.

"ERROR 2118: Unsupported flash memory. The Flash Recovery Utility has been exited. Please reboot the system to continue."

Contact Technical Support.

"ERROR 2119: Insufficient Memory to complete specified action. Free additional memory and try again"

The FRU displays this error message when it tries to allocate RAM memory in the host computer and the Operating System (DOS) can not allocate memory and returns an error. The FRU can not continue under such conditions. This means that the FRU needs more RAM than what is available in the computer on which it is run. It could also be possible that some other programs running before FRU are not releasing the memory allocated to them. To solve the problem the user should try to run FRU immediately after booting DOS. Another remedy is to install more RAM in the computer or to run the FRU on a computer that has more RAM.

```
"ERROR 2120: The specified disk is not ready. Either close door or insert disk."
```

When a user specifies a file for an operation, the FRU tries to access the file. It checks for the accessibility of the storage medium where the file resides. If the storage medium is found not accessible then the above message is displayed. Typically this error will be generated when there is no disk in the floppy drive or the door of the drive is open. In such cases, the user should insert the disk in the specific drive or close the door and retry the operation.

```
"ERROR 2122: Specified file is too big."
```

The FRU displays this error message when the size of the specified file is too large while accounting for the "s" option at the command-line of FRU. The "s" option specifies the number of blocks to be skipped from address zero of the IOP flash memory before the operation begins. If the file specified can not be fitted in the remaining part of the IOP flash memory, this message is displayed. To solve this problem, change the "s" option at the command-line to accommodate the larger file, or use a smaller file to program the IOP flash memory.

```
"ERROR 2123: Can not open file for reading"
```

When the user specifies a file for an operation, the FRU tries to open the file for reading and obtain some information on the file. If it fails to do so, it displays this error message. Possible causes are the file is not present, the storage medium on which the file resides is not accessible, or not enough permission is available. The user should check for the presence and accessibility of the file on the specified storage medium.

```
"ERROR 2124: Can not seek the file"
```

When the user specifies a file for the update operation, the FRU obtains certain information about the file. If it fails to do so, it displays this error message. The possible causes are the specified file is corrupt, the specified file is non-existent, or the storage medium of the specified file is not accessible. The user should check for the presence and accessibility of the file on the specified storage medium. The user should also ensure the file or the storage medium is not corrupt.

```
"ERROR 2125: Can not read the file"
```

When the user specifies a file for the update operation, the FRU obtains certain information about the file. If it fails to do so, it displays this error message. The possible causes are the specified file is corrupt, the specified file is non-existent, or the storage medium of the specified file is not accessible. The user should check for the presence and accessibility of the file on the specified storage medium. The user should also ensure the file or the storage medium is not corrupt.

C.2.2.2. Internal Errors

For Internal Errors 2000 – 2099, please contact your Server OEM for support.

C.2.2.3. Warning Messages

"WARNING 2301: This operation will update contents of RAID Adapter flash memory with file: <filename>"

This warning message is displayed after the user successfully selects a filename for the Update operation. It warns the user that the FRU is about to program the flash memory on IOP hardware with the file selected. The user may choose to continue or escape the operation selected. If the user escapes the operation then no action is performed.

"WARNING 2302: File to be programmed is empty. If you CONTINUE the action, the flash memory will be erased and nothing will be programmed in flash memory. If you ESCAPE, no action will be performed."

This warning message is displayed when the user selects a file for the Update operation that is empty (zero bytes in size). It warns the user that if the operation continues, it will erase the flash memory on IOP hardware but will not program anything since the file to be programmed is empty. The user has two choices: Continue or Escape. If the user selects to escape the operation, no action is performed.

"WARNING 2303: File to be programmed is in HEX format. This format is not supported by this software. If you CONTINUE the file will be programmed in RAID Adapter flash memory as it is (without Hex to Binary conversion). If you ESCAPE, no action will be performed."

When a user tries to Update the flash memory on IOP hardware, the FRU checks for the contents of the file to be programmed. If at the end of file, the FRU finds the End Of File Hex File Format Record, it displays this message. It warns the user that the FRU only accepts binary file. It does not convert a hex format file to binary file. The user has two choices: Continue or Escape. If the user continues, then the file is programmed as it is in the flash memory of IOP hardware without any hex to binary conversion. If the user escapes the operation, then no action is performed.

C.2.3 Firmware Update Utility (FUU) Error Messages

C.2.3.1. Firmware Update Utility (FUU) Internal Errors (Error Code Range = 1500 to 1599)

For Internal Errors 1500-1599, contact your Server OEM for support.

These error messages are reported in the following format:

```
INTERNAL ERROR xxxx: Fatal internal error
```

The phrase 'Internal Error xxxx' is shown in blinking red. The xxxx is the internal error code number.

Internal Error Codes

1500 - Downloaded Firmware Error

1501 - Generic Internal Error

1502 - Cannot Allocate Operations List Buffer

1503 - Cannot Allocate Results List Buffer

- 1504 - Set Parameters Message Returned Error Status
- 1505 - Bad Result Count Returned from Message
- 1506 - Get/Set Parameters Function Returned Error Status
- 1507 - IOP Could Not Respond to Get Capabilities Query
- 1508 - Get Parameters Message Returned Error Status
- 1509 - Get Capabilities Query returned Bad Result Count
- 1510 - Unable To Get Status of the Firmware Download File
- 1511 - Unable to Read the Firmware Download File
- 1512 - Send Message to Initiate Firmware Download Returned Error Status
- 1513 - Could Not Allocate Memory for IOP Info Structure
- 1514 - Could Not Allocate Memory for Internal Buffers During IOP Init
- 1515 - Could Not Allocate Memory for List of IOP Handles
- 1516 - Get Configuration Dialog Request Failed

C.2.3.2. Firmware Update Utility Errors (Error Code Range = 1600 to 1749)

These error messages are reported in the following format:

```
ERROR xxxx: Error description
```

The xxxx is the error code. The phrase 'ERROR xxxx:' is in red text and will be blinking. The error description then describes the error and how to resolve the problem.

Error Codes

- 1600 - No IOP Found
- 1607 - DIT Not Present
- 1608 - More Than One IOP Found

C.2.3.3. Firmware Update Utility Warnings (Error Code Range = 1750 to 1999)

A warning message informs the user of a situation that will not prevent the software from running, but could have undesirable consequences. For example, a warning could be a message that informs the user that deleting a RAID volume would result in the loss of all data.

These error messages are reported in the following format:

```
WARNING xxxx: Warning description
```

The xxxx is the warning code. The phrase 'WARNING xxxx:' is in light yellow text and will be blinking. The warning description describes the warning symptom.

Warning Codes

- 1751 - Do you want to exit the RAID Configuration Utility?



Glossary

Array

An array is a group of disks containing one or more RAID volumes. The data from each RAID volume on an array is evenly spread across all disks in the array. A RAID volume must be created either on an existing array or on a group of unused individual disks. Creating a RAID volume on a group of unused disks implicitly creates an array consisting of that group of disks.

Automatic Rebuild

When the SRCU21 detects a drive failure, the SRCU21 automatically rebuilds the failed drive's data onto the global hot spare if a global hot spare is defined.

Bootable Array Support

The ability of the system to boot from a RAID volume which is configured as a boot device.

Cache mode select

Allows the user to change the selection of cache they desire without requiring a reboot (online changes).

Cache Size Max

The maximum size of cache that may be on the RAID controller.

Concurrent Multiple Strip Size

The ability to support multiple strip sizes. However, only one stripe size is allowable per disk group.

DMI

Desktop Management Interface, a standard framework for managing desktops and servers, developed by the Distributed Management Task Force, Inc. Since management framework requirements can use DMI and SNMP, both are provided with SRCU21. See <http://www.dmtf.org/> for more information about DMI and Component Instrumentation.

DMI Protocol

DMI stands for Desktop Management Interface. The DMI protocol describes the rules by which a DMI-managed device communicates with a DMI management application.

Downstream Write Through Cache

Downstream Write Through Cache uses cache memory to buffer write data until written to disk. This does not allow a read from cache following a write, but all read commands get data from disk, eliminating cache lookup.

ECC Data Protection (Error-Correcting Code memory)

A memory system that tests for and corrects errors on the fly. It uses circuitry that generates checksums to correct errors.

Event Notification

The detection of a disk failure will result in an event being posted in the Host Operating System that will execute an application that will warn the user of the failure.

Full Sequential Write Cache (write back)

Allows Write Back Cache algorithms to detect sequential blocks of write data and only cache when data is sequential. Selectable per volume. Configured in Storage Console. Write to disk is delayed until a full stripe is accumulated or until 4 seconds has elapsed since the last write to that stream whichever occurs first.

Full Write Cache (write back)

Allows selecting Write Back Cache on a per volume basis. Configured in Storage Console. All written data is cached (random, sequential, etc.).

Global Hot Spares

A global hot spare drive that may be used by any array when a failure occurs.

Hot Swap

To pull out a component from a system and plug in a new one while the power is still on and the unit is still operating. Note: Ensure that your system supports hot swappable drives before executing this operation.

I/O Processor (IOP)

SRCU21 uses an 80960 RM I/O processor which has an integrated 100MHz core, a 33MHz/32-bit PCI-to-PCI bridge, and a memory controller that supports 66MHz SDRAM (32-bit) and 8-bit Flash.

Instant Initialization

The ability to begin writing data as soon as the drive configuration is configured. This removes the disk initialization wait time.

LVDS (Low Voltage Differential SCSI)

A type of SCSI signaling that supports cable lengths up to 39.4 feet (12 meters) with up to 15 devices and throughput rates up to 80MB/sec. The devices should be Ultra 2 SCSI LVD devices to take advantage of the LDV signal. The advantage to using LVD is that it does not consume as much power as a single ended device and it can sense single ended devices when attached, and revert to single ended (conventional SCSI) signalling. When single ended devices and LVD devices are attached to the same cable, conventional SCSI signalling is used.

Mirroring

A data protection technique that duplicates the data from one drive to another. This is known as RAID Level 1.

Online RAID Reconfiguration

Ability to switch the RAID level configuration without having to take the system offline.

Operating System Service Module (OSM)

The I₂O OSM that handles the communication between the host CPU operating system and the I₂O Messaging Layer. The OSM is unique for each operating system.

Parity

A technique used to protect a system from data loss due to faults. When parity is implemented (RAID3 and RAID 5), data written is logically XOR'd together to calculate parity which is stored on the drives along with the data. In a system with three drives, the data is written to two drives and the calculated parity is stored on a third drive. If one drive fails, data on the failed drive is reconstructed from other data and parity.

RAID

Redundant Array of Independent Disks (RAID) refers to a method of organizing data on one or more physical disks to provide increased I/O performance and data protection. The different methods for organizing the data are referred to as RAID Levels. The RAID levels offered by SRCU21 are 0, 1, 5 and 10.

RAID 0+1

A combination of RAID 1 and RAID 0. Provides high performance and high availability. Also known as RAID 10.

RAID Level 0

Striping of data across multiple drives in an array. Very fast performance, however there is no data protection.

RAID Level 1

Also known as mirroring. Mirroring refers to the 100% duplication of data from one disk to another. Due to the 100% duplication, this is a costly solution.

RAID Level 10

A combination of RAID 1 and RAID 0. Provides high performance and high availability. Also known as RAID 0+1.

RAID Level 5

Striping with parity. Data and parity information is spread among each drive in the drive group. Parity requires 33% of the entire drive capacity in a 3 disk group and 20% of the entire drive capacity in a 5 disk group. This provides a balance between performance and cost.

SAF-TE Support (SCSI Accessed Fault-Tolerant Enclosures)

A standard that allows third party disks and controllers to be automatically integrated with peripheral enclosures that support status signals, hot swapping of drives and monitoring of fans, power supplies and monitoring of the enclosure temperature of the disk drives.

SCSI Channel

A bus that uses SCSI protocol to move data to and from disks.

Selectable RAID Rebuild Rate

A selectable parameter that specifies how much time the controller devotes to rebuilding a failed drive. A higher rebuild rate will speed the rebuilding of the array but may slow the performance of the host operating system during the rebuild.

SMART Support (Self Monitoring Analysis and Reporting Technology)

A drive technology that reports its own degradation, enabling the operating system to warn the user of potential failure.

SNMP

Simple Network Management Protocol, a standard for management network devices. Since management framework requirements can use DMI and SNMP, both are provided with SRCU21.

SNMP Protocol

SNMP stands for Simple Network Management Protocol. The SNMP protocol describes the rules by which a SNMP-managed device communicates with an SNMP management application.

Storage Console

The application used to configure RAID volumes via an html browser. This tool is used to set up the RAID Levels, cache policies, rebuild rate and global hot spares of the controller.

Stripe

A stripe is interleaved data across multiple drives in an array. Data is sequentially stored in allocated sizes across disks, based on the RAID level. Stripe size is the number of drives x the strip size.

Variable Strip Size

Stripe size is the size of the logically contiguous data block recorded on all drives connected to the controller. A variable strip size allows for the configuration of the stripe size. The strip size for a volume can be configured to one of several sizes (4k - 128k depending on the RAID level). Note: a two disk RAID level 1 volume will always have a 64k strip size.

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