IFT-6300

12-Bay SCSI-to-IDE and Fibre-to-IDE

Rackmount Disk Array Subsystems

User's Manual

Revision: 1.2

Infortrend ®

<u>Warnings and Certifications</u>

FCC (applies in the U.S. and Canada)

This equipment has been tested and found to comply with the limits for a Class B (Class A for the Fibre model) digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this user's guide, 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.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of FCC Rules. Operation is subjected 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.

Warning:

Use only shielded cables to connect I/O devices to this equipment.

You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void you authority to operate the equipment.

CE This device is in conformity with the EMC

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About This Manual

This manual provides the necessary information for an experienced computer user, with little or no RAID knowledge to install, use, and maintain an IFT-6300 SCSI-to-IDE or Fibre-to-IDE disk array subsystem.

The manual will be updated so as to be compatible with the latest product versions.

Part Number for this manual: M6300UBR12

Date: 20 April 2002

Firmware Version: 2.11

Chapter 1	provides a brief introduction to the product, its features, options, and some information on RAID technologies and concepts.
Chapter 2	describes how to install, configure and begin using the product.
Chapter 3	explains how to use and maintain the subsystem.
Chapter 4	is an overview of the RAID controller component.
Chapter 5	gives some guidance regarding what steps to take in the event when problems are encountered.
Chapter 6	describes how the Fibre-to-IDE models differ – in firmware, software, and hardware – from SCSI models.
Appendix A	details the hardware specifications.
Appendix B	is a glossary of technology terms used in this document and more generally in discussions of RAID.
Appendix C	explains how to receive firmware and software upgrades, and other kinds of support.

Revision History

15 Mar 2002 version 1.1	Initial release; an update based on 8-bay system's user manual. Available for new features in firmware (revision 2.11 or above), management software (including a sub-module, NPC), and hardware details of 12-bay subsystems.
20 May 2002 version 1.2	Added details about Fibre-to-IDE models. Added chapter 6 Fibre operation.

Product Overview

Thank you for purchasing the IFT-6300.

The IFT-6300 RAID subsystem is a SCSI-to-IDE or Fibre-to-IDE RAID controller in a customized rackmount enclosure with drive bay space for twelve EIDE hard drives. The subsystem comes without hard drives so that users can select the drive size, speed, and other considerations that they prefer. The controller itself is completely independent of the host.

> **IMPORTANT:**
> The IFT-6300 is only designed to use IDE hard drives. It is not compatible with SCSI or other types of hard drives for installation and storage purposes.

RAID provides both increased drive access speed and fault tolerance (i.e., one drive in an array can fail but data integrity and operations are maintained). The IFT-6300 provides additional fault tolerance with dual, redundant, hot-swappable fans and power supplies. All RAID functions are performed by a PowerPC® RISC CPU with high-speed SDRAM and firmware in flash memory.

The controller has sophisticated drive failure management capabilities that allow automatic reassignment of reserved blocks when a bad sector is encountered during a write. In addition, the Bad Block Scrub function can be manually performed at regular intervals to ensure data integrity.

Hot swapping is supported through automatic disconnection of a failed drive and detection of a reserved drive, followed by background rebuilding of data. The controller also supports spare drive operation. What is particularly remarkable is all these failure recovery procedures are transparent to the host system.

Another particularly remarkable feature of the product is that it can be installed, configured, and used by users who know very little about RAID. Infortrend's Auto RAID Setup allows users to install what

drives they have and then the controller handles all setup, ID assignment, and configuration.

Standard Package Contents (12 bay models)
- IFT-6300 RAID Subsystem
- Twelve (12) drive trays
- RAID Management Software CD (RAIDGuide)
- User's Manual
- One (1) null modem port adapter
- Two (2) Power Cords
- 48 screws for HDD

SCSI Models Only:
- One SCSI Cable – external round cable x 1
- One SCSI Bus Terminator (installed) x 1

Products Covered

Model Number	Description
12 drives	
IFT-6300-12U3D	12-bay, dual port Ultra160 SCSI
IFT-6300-12F2	12-bay, single port 2Gbit Fibre

Chapter 1 Introduction

The IFT-6300 is a RAID array controller and enclosure designed to house and manage data storage on IDE hard drives. The following sections give a brief overview of the concept of RAID arrays, explain the basics of what the IFT-6300 is comprised of, and introduces some of its more important features.

1.1 RAID

Redundant Array of Inexpensive Disks (RAID) is a storage technology used to improve the processing capability of storage systems. This technology is designed to provide reliability in disk array systems and to take advantage of the performance gains offered by one or more arrays of multiple disks that each appears as single-disk storage.

RAID's two primary underlying concepts are (1) that distributing data over multiple hard drives improves performance and (2) that using multiple drives properly allows for any one drive to fail without loss of data and without system downtime. In the event of a disk failure, disk access will continue normally and the failure will be transparent to the host system.

Originally designed and implemented for SCSI drives, RAID principles have been applied to IDE drives in the IFT-6300.

> ### NOTE:
> The IFT-6300 has been designed to tolerate a single fault in any major component except the controller itself. Drives, fans and power supplies, one of any (or even "each" under worst case) can fail and data will still be maintained and available. If drives are configured into several logical drives, each logical group of drives can sustain single drive failure.

RAID has six levels: RAID 0 ~ 5. RAID levels 1, 3 and 5 are the most commonly used, while RAID levels 2 and 4 are rarely implemented.

The IFT-6300 does not support a non-RAID storage configuration, thus a minimum of two hard drives must be installed. The following sections describe in detail each of the commonly used RAID levels.

> **IMPORTANT!**
> The IFT-6300 supports RAID 0, RAID 1, RAID 3, RAID 5 with spare drive.

Non-RAID Storage

One common option for expanding disk storage capacity is simply to install multiple disk drives into the system and then combine them end to end. This method is called *disk spanning*.

(Note that the IFT-6300 does not support non-RAID storage.)

In disk spanning, the total disk capacity is equivalent to the sum of the capacities of all IDE drives in the combination. This combination appears to the system as a single logical drive. Thus, combining four 1GB IDE drives in this way, for example, would create a single logical drive with a total disk capacity of 4GB.

Disk spanning is considered non-RAID due to the fact that it provides neither redundancy nor improved performance. Disk spanning is inexpensive, flexible, and easy to implement; however, it does not improve the performance of the drives and any single disk failure will result in total data loss.
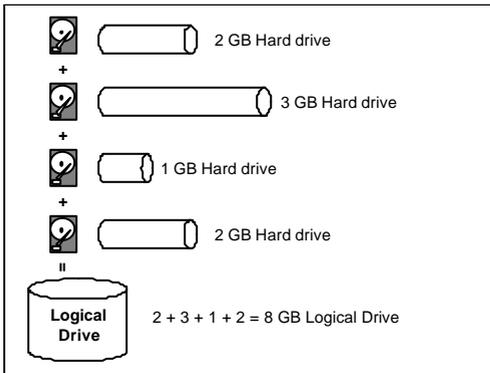
Non-RAID

RAID 0

RAID 0 implements *block striping* where data is broken into logical blocks and striped across several drives. Although called "RAID 0," this is not a true implementation of RAID because there is no facility for redundancy. In the event of a disk failure, data is lost.

In block striping, the total disk capacity is equivalent to the sum of the capacities of all IDE drives in the array. This combination of drives appears to the system as a single logical drive.

RAID 0 provides the highest performance without redundancy. It is fast because data can be simultaneously transferred to/from multiple disks. Furthermore, read/writes to different drives can be processed concurrently.

RAID 0
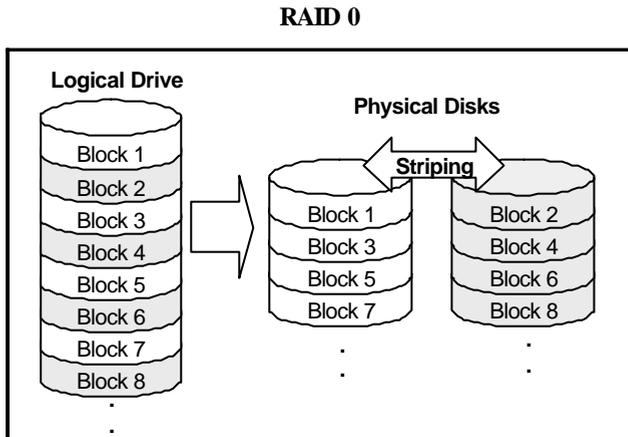
RAID 1

RAID 1 implements *disk mirroring* where a copy of the same data is recorded onto two sets of striped drives. By keeping two copies of data on separate disks or arrays, data is protected against a disk failure. If, at any time, a disk on either side fails, the remaining good disk (copy) can provide all of the data needed, thus preventing downtime.

In disk mirroring, the total disk capacity is equivalent to half the sum of the capacities of all IDE drives in the combination. Thus, combining four 1GB IDE drives, for example, would create a single logical drive with a total disk

capacity of 2GB. This combination of drives appears to the system as a single logical drive.

> **NOTE:**
> One drawback to RAID 1 is that it does not allow running expansion.
> Once a RAID 1 array has been created, to expand it, the data must be
> backed up elsewhere before a new drive can be added.   RAID levels
> 3 and 5 permit running expansion.

RAID 1 is simple and easy to implement; however, it is more expensive as it doubles the investment required for a non-redundant disk array implementation.
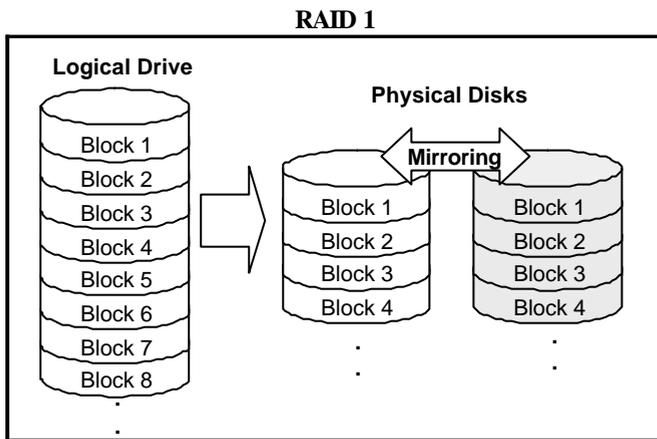
RAID 1

In addition to the data protection RAID 1 provides, this RAID level also improves performance. In cases where multiple concurrent I/Os are occurring, these I/Os can be distributed between disk copies, thus reducing total effective data access time.

RAID 1(0+1)

RAID 1(0+1) combines RAID 0 and RAID 1 – *mirroring and disk striping*. RAID (0+1) allows multiple drive failure because of the full redundancy of the hard disk drives. If more than two hard disk drives are chosen for RAID 1, RAID (0+1) will be performed automatically.

RAID 1 (0+1)
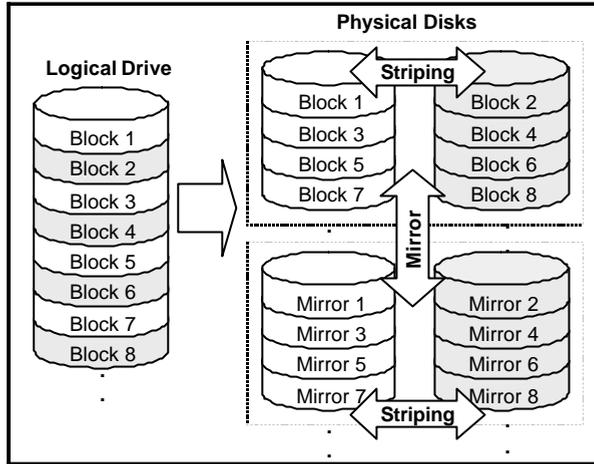
IMPORTANT:
RAID (0+1) will not appear in the list of RAID levels supported by the controller. If you wish to perform RAID 1, the controller will determine whether to perform RAID 1 or RAID (0+1). This will depend on the number of drives selected for the logical drive.

RAID 3

RAID 3 implements *block striping with dedicated parity*. This RAID level breaks data into logical blocks, the size of an IDE disk block, and then stripes these blocks across several drives. One drive is dedicated to parity. In the event a disk fails, the original data can be reconstructed from the parity information.

In RAID 3, the total disk capacity is equivalent to the sum of the capacities of all IDE drives in the combination, excluding the parity drive. Thus, combining four 1GB IDE drives, for example, would create a single logical drive with a total disk capacity of 3GB. This combination appears to the system as a single logical drive.

RAID 3 provides increased data transfer rates when data is being accessed in large chunks or sequentially. However, in write operations that do not span multiple drives, performance is reduced since the information stored in the

parity drive needs to be re-calculated and re-written every time new data is written to any of the data disks.

RAID 3
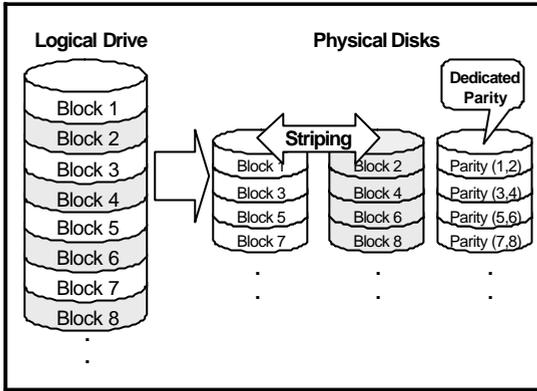
RAID 5

RAID 5 implements *multiple-block striping with distributed parity*. This RAID level offers the same redundancy available in RAID 3; though the parity information this time is distributed across all disks in the array. Data and relative parity are never stored on the same disk. In the event a disk fails, original data can be reconstructed using the available parity information.

RAID 5
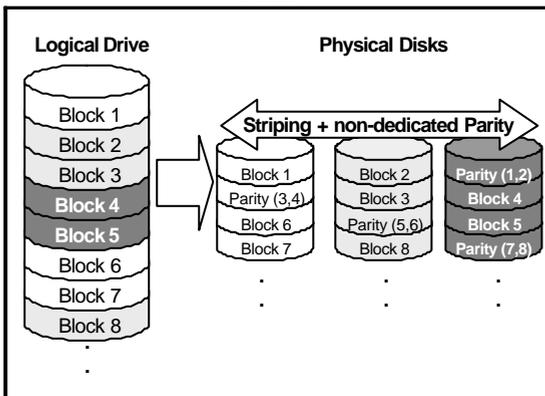
RAID 5 offers increased data transfer rates when data is accessed in large chunks (i.e., sequentially) and reduced data access time for many simultaneous I/O's when they do not span more than one drive.

Spares

RAID implementations include one other basic concept that needs to be introduced at this point: spare drives. RAID levels that have redundancy, RAID levels 1, 3, and 5, all allow users to include a drive as a "spare" (using QuickRAID Setup). Spare drives are installed, fully functioning, "hot-ready" hard drives which a RAID controller will use to replace a failed drive as soon as the failure is detected. The purpose of this, obviously, is to enhance the existing fault-tolerant capabilities of a RAID array. Spare drive implementations will be discussed in greater detail in later chapters.

If multiple-array configuration is preferred in a subsystem, drives not selected as a member drive automatically become global spares. A global spare automatically participates in the rebuild of any logical drive.

1.2 Product Elements

The IFT-6300 consists of a RAID controller (SCSI-to-IDE or Fibre-to-IDE); eight or twelve IDE drive bays and trays; redundant, hot-swappable power supplies; redundant, hot-swappable fans; and a rackmount enclosure to integrate all of these separate pieces.

RAID Controller

The controller, whether SCSI-to-IDE or Fibre-to-IDE, used in the IFT-6300 is the central element of the product. A RAID controller is, essentially, a sophisticated computer that manages data flow to and from array hard drives in the most fault-tolerant manner available. The RAID controller used in the IFT-6300 supports RAID levels 0, 1(0+1), 3, and 5; and provides various user interfaces for system management and monitoring.

IDE Drive Bays and Trays

Drive bays are the spaces provided in the IFT-6300 enclosure for hard drives. Trays are containers where drives are mounted and which permit hot-swapping. The bays and trays in the product are designed for industry-standard 3.5" x 1" high EIDE hard drives.

Power Supplies

The product comes standard with two redundant, hot-swappable power supplies. Both power supplies provide power to the product simultaneously and each is capable of supplying power to the product alone if necessary.

Note that extended single-power supply operation is not recommended and should only take place in the event of a power supply failure.

Enclosure Fans

The product comes standard with two redundant, hot-swappable enclosure fans. Both fans provide airflow to the product simultaneously and each can operate independently if necessary. Note that extended single-fan operation is not recommended and should only be used in the event of a fan failure.

Enclosure

The "box" which contains the controller, drives/drive trays and bays, power supplies, and fans is called an "enclosure." The enclosure includes various controls, ports, and other features used to connect the IFT-6300 to a host for example. The enclosure controls and ports will be described in detail later in this document.

1.3 Product Features

- Ultra160 SCSI host interface, up to 160Mbyte/sec transfer rate
  OR
- 2Gbit Fibre channel host interface, up to 200Mbytes/sec transfer rate per channel
- PowerPC 750 233MHz CPU
- Standard 64MB SDRAM SODIMM cache memory, addressable to 1GB
- Two independent 33MHz 32/64-bit PCI buses
- Easily upgraded Flash ROM for firmware
- Space for up to 12 EIDE ATA-66/UDMA-66 (ATA/UDMA-100 applicable) hard disk drives
- Supports 3.5" x 1" high EIDE drives
- RAID levels: 0, 1(0+1), 3, 5
- Smooth hot-swappable drive tray mechanism
- Quick RAID Setup provides easy installation
- User-friendly RAIDGuide GUI RAID manager
- NPC (Notification Processing Center) as a sub-module to RAIDGuide for remote notification of system events
- Convenient front LCD control panel
- Two redundant, hot-swappable power supplies
- Two independent, hot-swappable cooling fans
- Compact enclosure

Chapter 2 Installation

2.1 Physical

As described briefly in Chapter 1, the IFT-6300 consists of a RAID controller, drive bays and trays, power supplies, fans, and an enclosure.

Packing List

The box that the IFT-6300 came in should have included the following:
- IFT-6300 RAID Subsystem
- Twelve (12) Drive Trays
- RAID Management Software CD
- One (1) Null Modem Port Adapter
- Two Power Cords
- 48 screws for securing hard disks

SCSI Models Only:
- One (1) SCSI Cable
- One (1) SCSI Bus Terminator (installed)

Location Diagram

The diagram below indicates the position of controls, switches, ports, indicators, and other physical aspects of the subsystem.
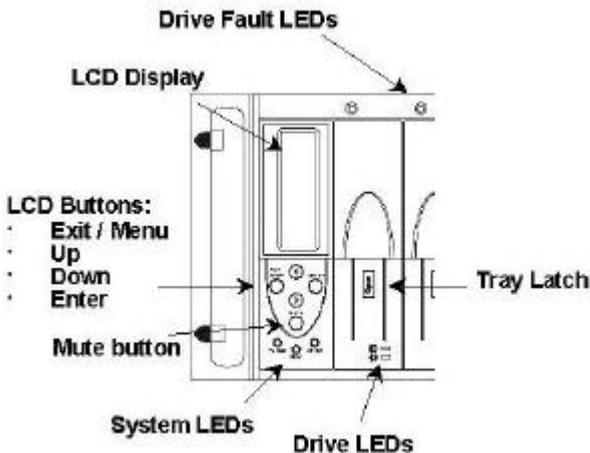
Figure 2-1: Front Panel (12-bay module)
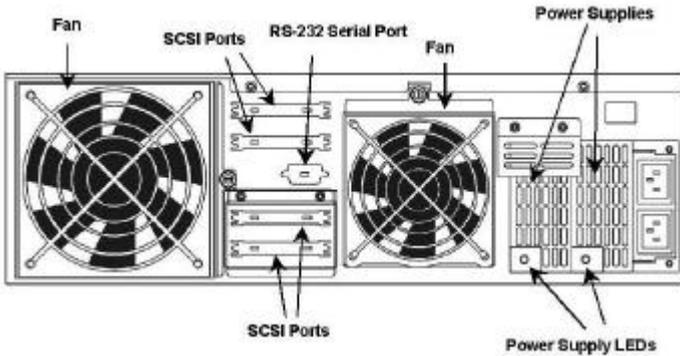
Figure 2-2: Rear Panel, SCSI Model
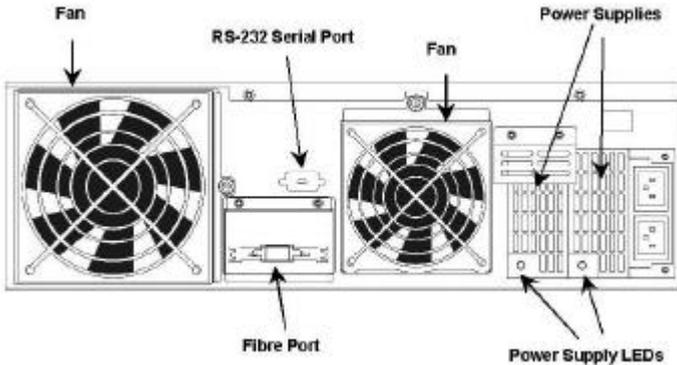
Figure 2-3: Rear Panel, Fibre Model (single channel for short wavelength optical)

Enclosure Features

The enclosure includes features designed to make installation and daily operation both easier and more secure.

- **On/Off Switch** – because data may be in the cache at the moment power is turned off (and would be lost if power was cut at that moment), the controller protects data integrity by not allowing power off until the cache has been completely flushed.
- **Alarm** – whenever a controller, drive, array, or enclosure event occurs, an audible alarm sounds to alert the system user or manager.
- **Mute Button** – when the alarm sounds, the mute button allows you to stop the alarm until the next event.

- **LEDs** – both the controller and each drive have multiple LEDs which provide basic operating status readout. The power supplies each has a single LED which indicates whether or not the power supply is good.
- **Drive Hot-Swap** – in the event of a failure or a need to add a drive (assuming there is an open drive bay), single drive can be removed or added at a time (as a member of a logical drive) without powering down the entire array.
- **Power Hot-Swap** – the power supplies are redundant and can be swapped without powering down the entire array in the event of a failure.
- **Fan Hot-Swap** – the fans are hot swappable so that in the event of a failure, a bad fan can be removed and replaced without needing to power down the array.
- **LCD Status Indications** – the LCD displays the current operating status of all drive bays during normal operations. Error conditions and failures in enclosure devices are also indicated on the LCD as they occur.
- **Tray Latches** – to prevent drives from being accidentally removed, each drive tray has a latch to secure it in place.

Termination (SCSI)

When using SCSI devices, it is always necessary to pay careful attention to termination. A SCSI bus must be properly terminated at both ends. The IFT-6300 SCSI models come with two physical terminators attached to SCSI ports. If the RAID array is the last SCSI device on the bus, simply attach it to the host using the unterminated SCSI port and the enclosed external SCSI cable. *(For information about Fibre connections, see Chapter 6).*

If you want to daisychain other SCSI IFT-6300 arrays or other SCSI devices to your current SCSI IFT-6300, shut down all SCSI devices on the bus first. Once no devices on the bus are transmitting data, disconnect the terminator, connect the new SCSI device, terminate the bus (if it isn't already), and restart all devices. Note that termination must be on both ends of the SCSI bus, and only on both ends. Most SCSI HBAs have built-in auto-sense termination.

Notice for Fibre Channel Connection

The system Fibre port is not equipped with by-pass circuits. By-pass services should be provided outside the system. Unless the system is connected point-to-point to a single host computer, connection to the host should be made using a 3rd party hub or switch,

Host Requirements

In order for the IFT-6300 (SCSI models) to be connected to the host computer, the host must have a SCSI (wide or single-ended) host bus adapter installed. Most commonly, a host bus adapter (HBA) is an add-on card that includes external SCSI ports used to connect with external devices, including the IFT-6300 array.

Fibre IFT-6300 models need a fibre HBA installed in the host for the same reasons as given above for SCSI.

Minimum Requirements for Using RAIDGuide

In addition to an HBA, host computers that want to use the RAIDGuide Java GUI management software must meet the following minimum configuration: Pentium or above compatible (or equivalent PC or workstation) running Windows NT or Windows 2000. A host computer running RAIDGuide must also either have a network (LAN) card installed and running or MS Loopback Adapter installed and running. (See the end of Section 2.4 for more information.)

If RS-232 terminal management is used, the IFT-6300 is compatible with Solaris (SPARC, x86) and Linux workstations and computers.

2.2 Hard Drives

Now that you are familiar with the subsystem, choosing and installing the correct hard drives in the IFT-6300 is the first step in the installation process.

Guidelines

When choosing which hard drives to install, we strongly suggest that you consider the following:

- **Capacity (MB / GB) –** while it is important that you use hard drives with sufficient capacity for your storage needs, it is equally important that you use drives with the same capacity. RAID arrays use a "least-common-denominator" approach, which is to say that the array can only use the capacity of each drive up to the maximum capacity of the smallest drive. So choose big drives and use the same size.
- **RPM –** Revolutions Per Minute is one measure of hard disk speed. The higher the RPM, the faster the drive because seek times are reduced.

- **MS –** Milliseconds is another common measure of disk speed. MS is the average seek time. Lower numbers indicate faster seek times.
- **ATA/UDMA-100, ATA/UDMA-133 –** The IFT-6300 is an EIDE disk array subsystem designed to work with the latest generation of IDE hard drives. Hard drives used in the IFT-6300 must conform with the ATA-100 standard. If ATA-133 disks are installed, IFT-6300 will work in ATA-100 mode.
- **Profile –** The trays and bays of the IFT-6300 are designed for 3.5" wide x 1" high hard drives. It is highly recommended that users not try to use any other size drive.

Supported Hard Drives

The IFT-6300 supports all ATA/UDMA-100 and ATA/UDMA-133 hard drives. Drives from the following companies are, however, recommended by the manufacturer:

- IBM
- Seagate
- Maxtor
- Western Digital

Note that the IFT-6300 supports the use of different IDE drives (by manufacturer, size, speed, and so on) in a single array. The only limitation is that RAID implementation limits the maximum available space on every drive according to the maximum size of the *smallest* drive. Any additional space on larger drives in a mixed-drive array will not be used or available.

Other Considerations

The number of IDE drives installed directly relates to the available RAID levels (essentially, more drives equates to more options and higher RAID level availability). Also, with three or more drives, one drive can be used as a spare.

Finally, since a RAID array created using the IFT-6300 can be expanded by adding drives, it is important to consider using fewer large drives initially so that some drive bays will be available for future expansion needs.

Installing In Trays

Each drive bay in the IFT-6300 has a matching drive tray. To install an IDE hard drive in the enclosure, take an empty drive tray, hold the drive upside down and connect the short data and power cables to the drive, then flip the

drive over and attach it to the tray using the four screws (steps as shown below):
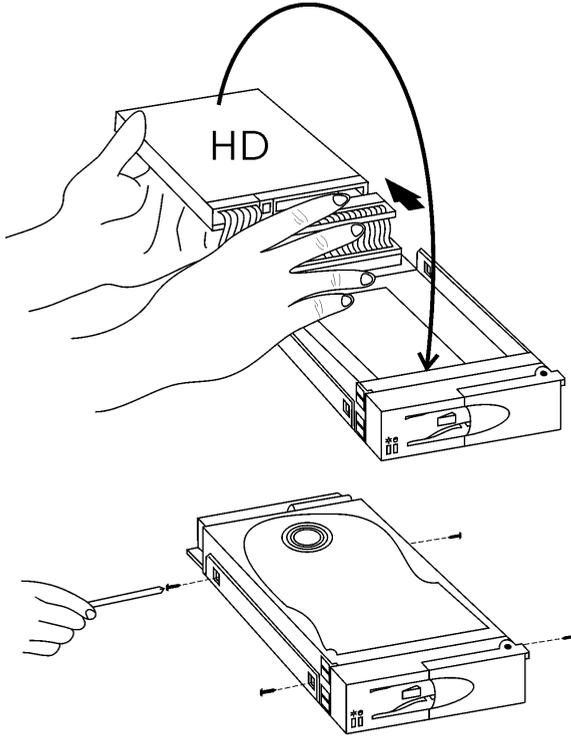
Figure 2-4: Drive-to-Tray Installation

Once the drive has been installed in a tray, insert the tray into an unoccupied drive bay and secure the tray lock:
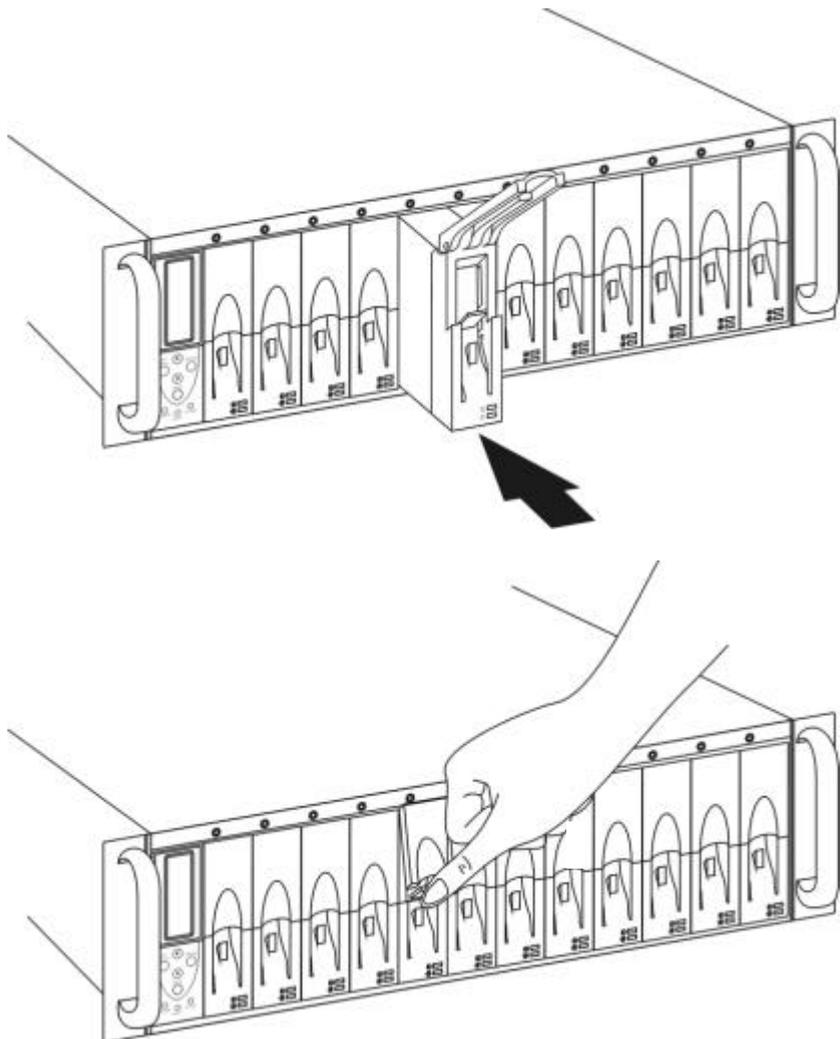
Figure 2-5: Tray-to-Bay Installation

2.3 RAID Creation

The IFT-6300 RAID controller provides two methods for creating a RAID array: Quick RAID Setup automatically and Multiple RAID setup manually, both via either the LCD panel or terminal emulation.

Quick RAID Setup

Quick RAID Setup is the simplest way to create a new RAID. When entering this mode, LCD will display available RAID levels for your selection. Quick RAID Setup collects all drives in tray slots and include them in one logical drive using a specific RAID level. When this is done, an LUN number is mapped automatically to this logical drive.

To start the **Quick RAID Setup**, after physically installing the hard drives, press the **Exit/Menu** button until the main menu appears.

IMPORTANT!
If you don't want to use the default SCSI ID setting, it is highly recommended that you change the setting before creating a new RAID using **Quick RAID Setup**.

The RAID initialization process can take a long time depending on the size of the hard drives used. Changing the SCSI ID setting requires reinitializing the array, potentially doubling setup time if not done first. *(See Chapter 6 for information on setting a Fibre ID for fibre models.)*

Step 1: If you would like to manually set the SCSI ID, do it now. The default SCSI ID setting is 0. To set the SCSI ID, display channel 1 or channel 2 **SCSI ID##** in the LCD, press the **Enter** button, use the scroll bars to choose the ID you want, and press the **Enter** button. Note that the setting will not take effect until after a power reset. To skip this step, press the down arrow. *(See Chapter 6 for information on setting a Fibre ID for fibre models.)*

Step 2: If you press the down arrow once again, the second item displayed should be "Quick RAID Setup." While Quick RAID Setup is displayed, press the **Enter** button.

Step 3: Select a RAID level using the arrow keys and press **Enter** on the level you prefer. You will be asked to confirm, select Yes using the arrow buttons and press the **Enter** button.

The LCD will display "Init Parity xx% Please Wait!" When the initialization is complete, the LCD will display the Ready screen and you may now connect a host and use your RAID array.

(See *Section 4.1 Basic Features / Setup Modes* for more information.)

LD & RAID Setup

Advanced users can also use the LCD panel, terminal emulation, or RAIDGuide manager to manually configure a single RAID array or multiple RAID arrays.

LD & RAID Setup in LCD menu allows you to create several RAID arrays (logical drives) out of the supported 12 drives. Different RAID arrays can be mapped to different ID/LUN combinations across different host channels for a flexible utilization of disk space.

Step 1: To use the LCD to create a new RAID array, press the **Exit/Menu** button for two seconds to enter the Main Menu.
Step 2: Press the **Down** button twice to display **LD & RAID Setup.**
Step 3: Press **Enter** to select.
Step 4: After choosing certain number of hard drives to be included in one logical drive, press the **Down** button to display all available RAID options (the IFT-6300 RAID controller will only list RAID options suitable for the number of hard drives selected).
Step 5: Select the RAID level by displaying it and pressing **Enter**.
Step 6: Confirm the selection by pressing the **Down** button once to display YES and then press **Enter**.

The LCD will display "Init Parity xx% Please Wait!" When the initialization is complete, the LCD will display the Ready screen and you may now set up the Host-LUN map to link the LUN to those logical drives that setup by connect a host and use your RAID array.

(See *Section 4.2 Advanced Functions* for more information.)

2.4 Software

2.4.1   RAIDGuide Manager

Introduction

This section discusses how to install RAIDGuide in your host computer system.   Before proceeding with the setup procedure, your host computer system display must (at minimum) be running in 256 color mode or some configuration items will not be visible. RAIDGuide supports Windows NT/2000.

Installation

Follow the steps below to install RAIDGuide on your host computer.

1.   Insert the Infortrend RAIDGuide installation CD into your CD-ROM drive.

2.   If you are currently running other applications, close them before proceeding with the setup process. This will minimize the possibility of encountering system errors during setup.

3.   Go to the Windows subdirectory and run the install batch file (install.bat) to start the installation process. The batch file will open a DOS window and ask first if you want to install Java Runtime Environment (JRE). Press "Y" for yes and then **<Enter>** to install JRE. (JRE is a necessary Java add-on software component that allows RAIDGuide to operate.) Follow the JRE installation process instructions. If you are installing to an NT Server, please install JRE version 1.3 or above. Updated packages are available from Sun Microsystems' web site.

4.   Once JRE has been installed, the installation script will then ask if you want to install RAIDGuide. Type "Y" and then **<Enter>** to install the program.

5.   Choosing "yes" will start the installation process. Please select *Install Packages* or *Install Packages then Configure* and click the **OK** button to continue.
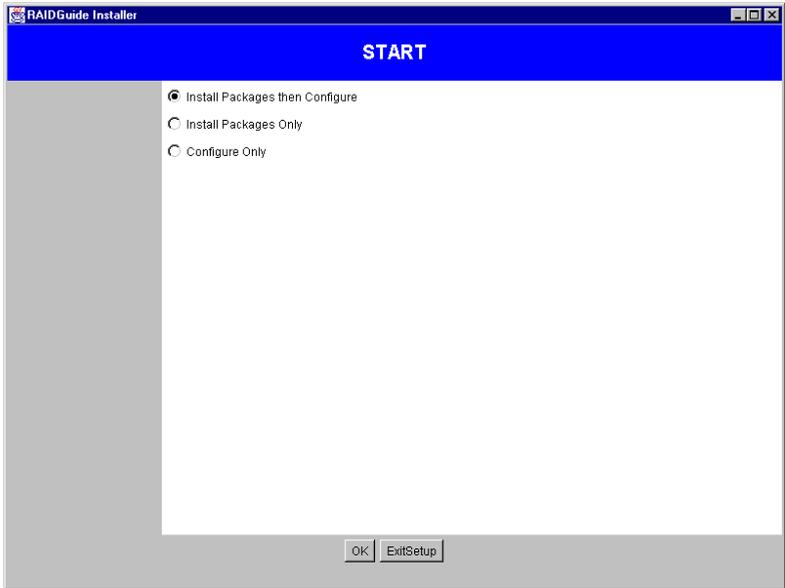
6. Click the **Next** button on the *Welcome* screen to continue.
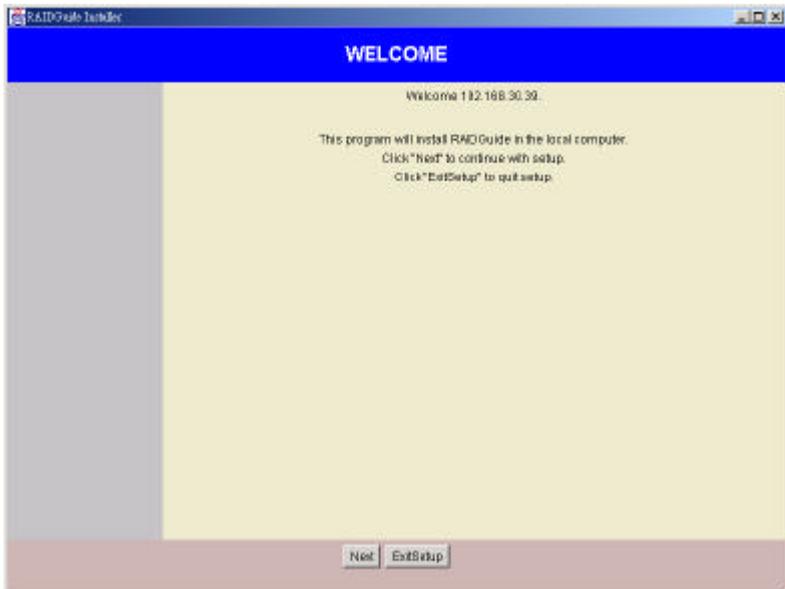
7. Read the contents of the *License* and click the "*I Agree*" button to continue.

LICENSE

"Infortrend RAIDGuide" License Agreement
PLEASE READ THIS LICENSE AGREEMENT BEFORE
USING THIS SOFTWARE.
1. Grant of License
Infortrend Inc. grants you the original license, the limited
right to use the RAIDGuide(the SOFTWARE). You may
not rent, sublicense, lease, or distribute the SOFTWARE, by
any means or in any form. You may not reverse engineer,
decompile, or disassemble the SOFTWARE.
2. Copyright
This SOFTWARE, its component parts and user
interface, and associated documentation, are owned
by Infortrend Inc.

I Agree   I Do Not Agree   ExitSetup

8. Please select **RAIDGuide** or both **RAIDGuide** and **NPC** (Notification
Processing Center) under the **Install Components** step. Then click on the
Next button to continue.

INSTALL COMPONENTS

☑ RAIDGuide
☑ Notification Processing Center(NPC)

Next   Back   ExitSetup
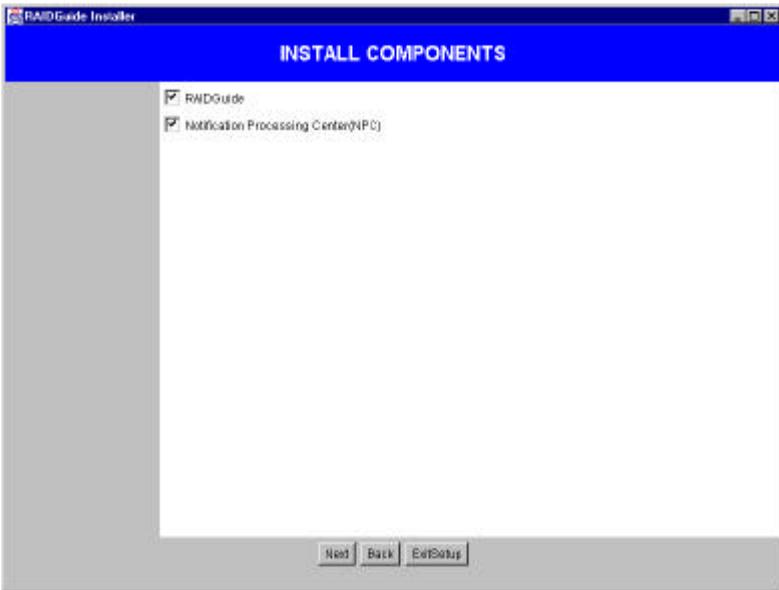
9. Click on the **Install** button under the *SELECT PATHS Window* to start installing the selected components to your system. The installer program will automatically create a new directory for these components. The default directory is: **C:\Usr\idehybrid\bin.**
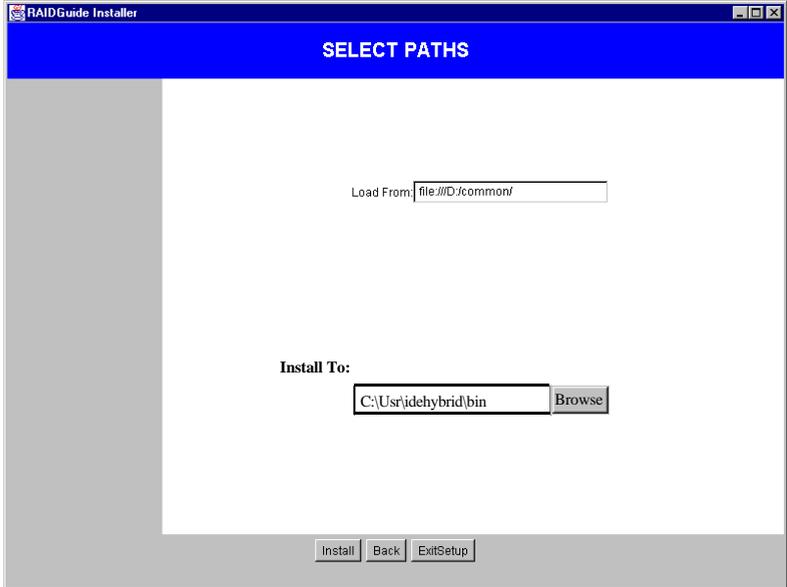
10. Before the installation procedure finishes, it will ask if you want to add shortcuts to your computer. Choosing to add them will put a shortcut icon on your desktop for starting RAIDGuide. Click the **ExitSetup** button on the final screen to finish.

The installation procedure is now complete. You may start managing your RAID array. Please wait one minute for the manager to initialize. For information on first time operating instructions, see *Chapter 3, Use.*

2.4.2   Notification Processing Center

Basic Requirements

In order for NPC to work, it must be installed and run on the same host computer where RAIDGuide is installed. Once NPC is installed, it must be configured to send the types of notifications you want to receive.

IMPORTANT NOTE

For NPC to function on Windows systems, the **Microsoft "Windows Messaging Service**," "**Personal Fax**," "**Internet Mail**," and **Telephony Service**" must be installed and running. Windows Messaging can be used to receive and store faxes, and for other kinds of messages.

NPC Settings: Notifier has five possible means of informing system managers that an event has occurred. They are: Fax, Pager, Broadcast, Email, and SNMP Traps. In order to use fax or pager notification, Modem parameters must also be set. For NT servers, Windows Messaging and Personal Fax must be installed and running for NPC to work.

If you have chosen **Install then Configure** in the Start menu, the NPC configuration screen will display right after RAIDGuide is installed. Click on the root directory to begin and click on the menu items to configure different notifier settings. NPC settings can also be changed later via the application shortcut under your "RAIDGuide" taskbar menu.
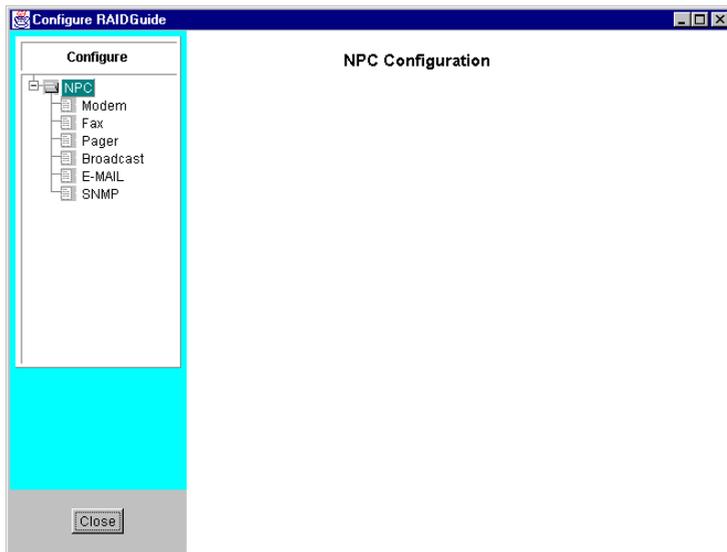
Configuring Modem Notifications

- **Modem Settings** include **Serial Port**, which is a COM port setting and **Baud Rate** which is the maximum transfer speed of the modem. A modem must be installed and setup in order to use NPC fax or pager notification.

IMPORTANT NOTE

A pre-configured modem can only be removed from the list of **Available Modems** after all references to a modem have been removed.

Configuring Fax Notification

- **Fax Settings:**
    - **Profile Name** is a collection name required for logon to a Windows Messaging profile (FAX, Email, Exchange Mail). It is usually the same with the account name. A profile name validates the available messaging services and service providers during a particular MAPI (Messaging Application

Programming Interface, another name for Windows Messaging) session.

- **Telephone** is the phone number for a receiving fax machine. (**Note** that any access dialing requirements, such as accessing an outside line, must be included in the phone number. For example: 9,,,2241603 wherein "9" is access for an outside line and ",,," indicates a pause.)
- **Message** is the text that will be sent as a fax. The message that will be printed on the fax message. You may add, for instance, the contact information of technical personnel, etc.
- **Available Modems** provides a list of installed and configured modems that may be used for sending event notices via fax.
- **Initializing String** – standard AT command set. The default is "&F1X0M0" and should be left as is for most fax modems.

NPC sends fax messages to specific destinations using the Fax Service and Windows Messaging subsystem. If these services are not available on your host computer, install them first before using the fax notification function of the system. You will also need to connect a fax/modem to your computer. Installing a fax/modem can be a tricky process, so consult your operating system manuals for instructions on how to install your fax/modem software. As a rule, the following services should be available on the host computer running NPC.

1. Personal Fax
2. Windows Messaging
3. Internet Mail and Telephony Services

To enable fax service on NT, sample steps are listed below:

1. You need to install Personal Fax and Windows Messaging. Personal Fax is usually bundled with Microsoft's Small Business Server. You may download the package from Microsoft's web site.
2. Here are some of the known issues with installing Personal Fax.
    1. Telephony service must be enabled and running.
    2. Listed below is a procedure for configuring fax service under Windows NT. Some of the parameters must be set during the installation process of Personal Fax.

3. When Personal Fax is installed, only administrators can send fax. NPC has altered the associated configurations to eliminate this limitation. However, it is recommended to log in as an "Administrator." For normal users to send faxes, you may check your write access in the register key: HKEY_LOCAL_MACHINE/SYSTEM/CurrentControlSet/Control/Print/Printers/Fax/….

   ■ The profile name necessary for logging on to personal fax/messaging service is usually the same as the account name that you use for system logon.

Fax service requires Windows Messaging to send fax via email.
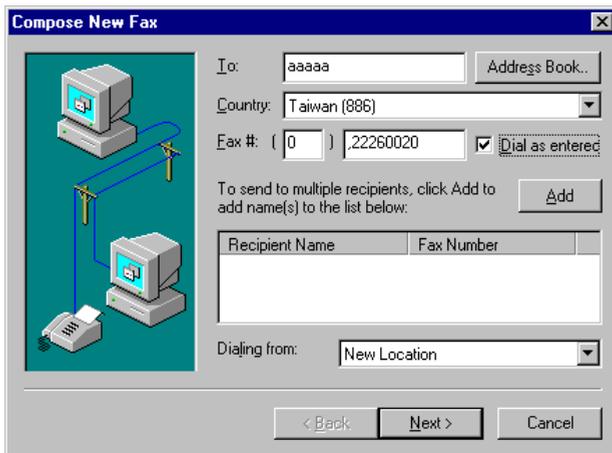
- You may add more recipient machines later using the RAIDGuide configuration utility (as will be discussed in the proceeding discussions).
- Continue to complete the installation process.

4. Add Fax Mail Transport and Internet Mail as the active services to your Windows Messaging profile.
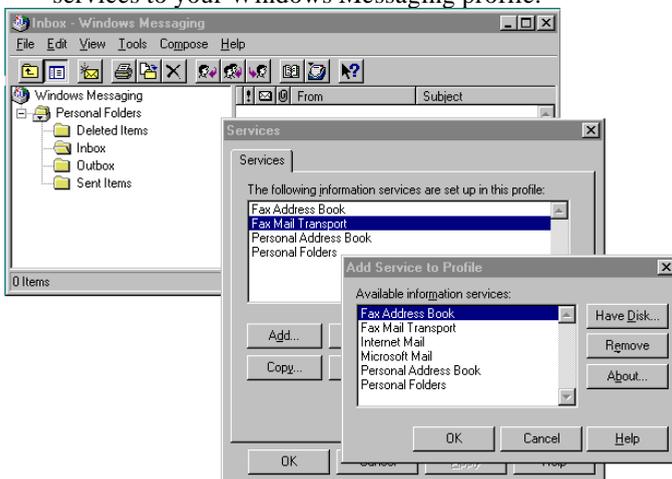
Since NPC depends largely on the fax service installed to the MAPI of Windows NT for the delivery of fax messages, most fax notification parameters are configured through this software package. NPC allows you to set a telephone number for the receiving fax machine, the message that will be sent in the fax, the modem that will be used from a list of available modems, and

the initialization string NPC will use when sending a fax
message.

When you have finished, click **Add** to have NPC send event
notifications to this fax machine. Next, either enter another fax
machine to receive notices, choose another NPC item to
configure, or click **Close** to save changes and exit the
configuration procedure.

Configuring Pager Notification

Pager notifications, like faxes, are sent using the fax/modem, so an
NPC modem configuration is required.

NPC allows you to set a telephone number for the receiving pager,
the message that will be sent to the pager, the modem will be used,
and the initialization string NPC will use when sending a pager
message.

- ▪ **Pager Settings:**
    - ▪ **Telephone** is the phone number for an event message
      receiving pager. (**Note** that any access dialing
      requirements, such as accessing an outside line or
      entering commands upon connecting with a pager
      service, must be included in the phone number. For
      example: 9,,,2241603,,,1 where "9" is access for an
      outside line, ",,," indicates a pause, and "1" is to
      leave a message to be forwarded to the pager.)
    - ▪ **Message:** is the text that will be sent to the pager.
      (Note: any pager specific limitations regarding length
      or content must be considered).
    - ▪ **Available Modems** provides a list of installed and
      configured modems that may be used for sending
      event notices via this pager number.
    - ▪ **Initializing String –** standard AT command set. The
      default is
      "V1B1E0F0L1M1Q0TV1X1Y0&C1&D2&G0S7=20"
      and should be left as is for most pagers.

Configuring Broadcast Message Notification

Broadcast messages are sent to every station on the subnetwork configured. A broadcast message should cause a window to appear that will stay visible until manually closed by a user.

Make sure NETBIOS and TCP/IP are active services on your NT for message broadcasting to work.

The broadcast settings include:

- **Host Name** – which should be a computer name for Windows NT
- **Message** – which is the message that network stations will see when events occur. Message added here can serve as a reminder and may as well be the contact information.

NOTE: Cross-platform broadcasts (i.e. Unix-based servers broadcasting to Windows-based network stations and vice versa) are not currently supported.

When you have finished, click **Add** to have NPC send event notification broadcasts to stations served by this server. Next, either enter another server to receive notices, choose another NPC item to configure, or click **Close** to save changes and exit the installation procedure.

- **Broadcast Settings** include a **Host Name** (IP address) and the **Message** to be broadcast. The host name should be the server for the LAN where the notification messages will be broadcast.

Configuring Email Notification

- **Email Settings:**
  - **Profile Name** is a collection name required for logon to a Windows Messaging profile (FAX, E-mail, Exchange Mail). It is usually the same with the account name. A profile name validates the available messaging services and service providers during a particular MAPI session.
  - **SMTP Server** is the mail server used to send event notifications via e-mail.

- **Sender's Email** is the "From" part of e-mail notification messages. It must be a valid internet e-mail address.
- **Receiver's Email** allows users to enter multiple event notification e-mail recipients with messages for each. Each entry must be a valid internet e-mail address.
- **Subject** allows users to add a subject to event notification emails. Currently, "Subject" is not available for Unix-based platforms.
- **Message** is the message sent to the particular e-mail address being added. You may list, for example, the contact information of technical personnel.

Configuring SNMP Trap Notification

Starting SNMP trap receiving capability can be as simple as keying "net start snmp" and "snmputil trap" at the DOS prompt under Windows-based systems.

Enter the IP addresses of SNMP agents for trap notifications to work.

SNMP Settings

Severity: 3

Host Ip:
192.168.40.111

Trap Receiver List:

	Trap Receivers	
RECEIVER1	192.168.40.111	

Add>>

Remove<<

Avail hosts to be listening to SNMP traps by entering its IP addresses and adding the addresses to the list of trap receivers.

Users may select a severity parameter (1, 2, or 3). The parameter determines events of what severity level(s) will be sent via SNMP.

1	All severity levels
2	Two levels: Warning and Alert
3	Only the most serious events: Alert

- **SNMP Settings:**

- **Severity** is the parameter used to determine what levels of events to be sent via SNMP.
- **Host IP** is the port number of the agents listening for traps. Click **Add** to avail agents to the **Trap Receiver List.**
- **Trap Receiver List** is a list of listening SNMP agents.

IMPORTANT NOTE:
NPC settings can be reconfigured later using the installation program. Run the installation program and select **Configure Only** from the **Start** menu to reconfigure Agent and NPC settings.

You may have to reboot your system for running RAIDGuide manager. System will load the necessary agents automatically.

IMPORTANT: All configuration entries in all notification types will send event notifications at every event. Multiple receiver destinations are available in all types, but every event notification will be sent to all configured receivers in all types. That is, over-configuring may result in an unintentional "storm" of event notifications.

Severity Levels

Array events are classified into three severity levels. The first level includes non-critical information events such as initialization of the controller and initiation of the rebuild process. Level 2 severity includes events which require the issuance of a warning message such as SCSI target alert. Level 3 severity is the most serious level, and includes events that need immediate attention.

Starting NPC

NPC must be started manually and restarted whenever host computer is reset. Click on "Start" "Programs" "RAIDGuide" "NPC" to start the program.

2.4.3 MS Loopback Adapter : Windows NT

In order to run RAIDGuide, a Windows NT or Windows 2000 host computer must either have a network (LAN) card installed and operating, or must install and run MS Loopback Adapter.

If you want to install MS Loopback Adapter under Windows NT, please do the following and check your Windows documentation (see below for Windows 2000 specific instructions):

Step 1: Open the **Control Panel**, select **Network**, choose **Adapters**, and click **<Add>**.

Step 2: Select **MS Loopback Adapter** from the list of adapters and click **<OK>**.
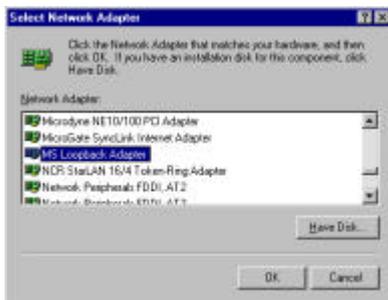
Step 3: The installation procedure will ask for the location of your Windows install CD. Enter it.

Step 4: Once the installation is complete, it will prompt you for the **Frame Type**. The default is 802.3, click **<OK>** to choose it.

Step 5: The **IP address** and **Subnet Mask** settings must now be configured. Under **Network**, choose **Protocols**, select **TCP/IP Protocol**, and click **<Properties>**.
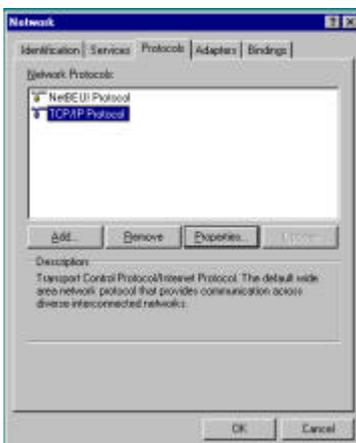
Step 6: Under **IP Address**, select **MS Loopback Adapter**, then enter an **IP Address** and a **Subnet Mask**. Next click **<OK>** to save.

You may now close the Control Panel and use RAIDGuide to operate your RAID array. Note that when prompted by RAIDGuide to enter a host IP address, you should click the **<Local>** button in the pop-up window.

MS Loopback Adapter : Windows 2000

In order to run RAIDGuide, a Windows 2000 host computer must either have a network (LAN) card installed and operating, or must install and run MS Loopback Adapter.

The step-by-step procedure below gives a brief explanation of how to install MS Loopback Adapter under Windows 2000 (see above for Windows NT):

Step 1: Open the **Control Panel** and select **Add/Remove Hardware**.
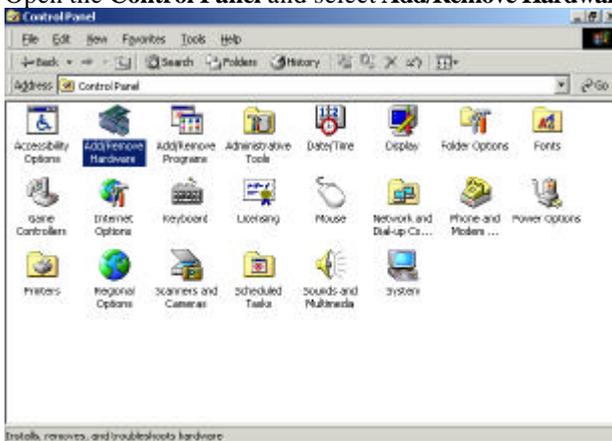
Step 2: You should see the **Welcome to Add/Remove Hardware Wizard** window, click **<Next>**.

Step 3: Under **Choose a Hardware Task**, select **Add/Troubleshoot a device,** and click **<Next>**.
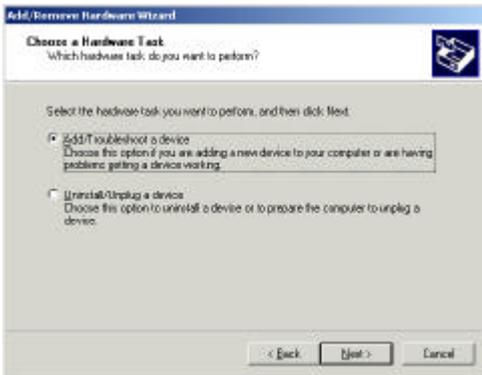
Step 4: Under **Choose a Hardware Device**, select **Add a new device** in the list, and click **<Next>**.

Step 5: Under **Find New Hardware**, select **No**, and click **<Next>**.
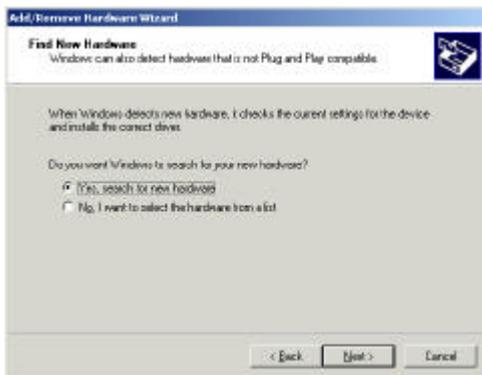
Step 6: Under the **Hardware Type** list, select **Network Adapters**, and click **<Next>**.

Step 7: Under **Select Network Adapter**, select **Microsoft** from the left hand list, choose **Microsoft Loopback Adapter**, and click **<Next>**.

Step 8: At **Start Hardware Installation** click **<Next>** to start installing Microsoft Loopback Adapter.

Step 9: When the installation process is complete, you should see the **Completing the Add/Remove Hardware Wizard** window, click **<Finish>**.

You may now close the Control Panel and use RAIDGuide to operate your array. Note that when prompted by RAIDGuide to enter a host IP address, you should click the **<Local>** button in the pop-up window.

List of Filenames

Below is a list of key RAIDGuide files installed during the installation process. All files should be found in the **C:\Usr\idehybrid\bin** (default) directory or the directory you chose during the installation.

‣ **RAIDGuide access:**
    GRM.JAR → executable .jar Java file
‣ **NPC access:**
    NPC.exe → executable program file
‣ **Install file :**
    INSATLL.JAR → executable .jar Java file

Program Updates

As Infortrend's valued customer, you are entitled to free RAIDGuide and system firmware updates. For more information about this service, call Infortrend sales or an Infortrend distributor in your area.

Chapter 3 Use

3.1 Basics

The IFT-6300 is designed to be an easy-to-use RAID disk array, requiring little maintenance or attention. This section describes the essential operating factors.

Indicators and Controls

The front panel of the IFT-6300 includes buttons for various functions and LEDs to provide information about the current operating status of the array and of each individual drive, and drive bay.

Buttons include mute and LCD controls (Exit/Menu, Up, Down, Enter).
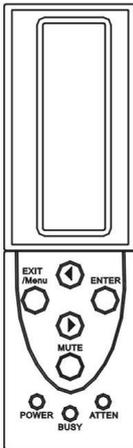
Figure 3-1: Front Panel Buttons and LEDs (12-bay)

Buttons

- **Mute –** when the controller detects an error, regardless of severity, an alarm will sound. The mute button stops the alarm until the next error.
- **LCD Exit/Menu –** in most sub-menus, this button works like "back" on a web browser or backspace on a keyboard; it takes you up one level. This key is also used to enter the Main Menu from the start-up display.
- **LCD Up and Down –** navigating buttons which correspond with the arrow icon on the right hand side of the LCD.
- **LCD Enter –** from each LCD menu, pressing Enter either takes you one step deeper into the management controls or allows you to choose to

confirm or deny an action. (More information is provided in *Chapter 4 : Controller*.)

LEDs

The front panel of the IFT-6300 provides LEDs to indicate various information about the status of the array and each drive/drive bay. Array LEDs consist of Power, Busy, and Attention.

- **Power –** the power indicator is on whenever power is being supplied by either or both redundant power supplies.
- **Busy –** the busy LED lights when either the controller or a drive or drives are currently processing data and unable to respond to new requests (such as manual entries from the LCD panel).
- **Attention –** the attention LED comes on whenever the controller detects an error, particularly involving hardware such as the power supplies, fans, or hard drives.

Each drive bay also has three LEDs: Power, Activity, and Drive Fault.

- **Power –** the lower LED on each drive tray indicates that power is being supplied to the drive in the tray.
- **Activity –** the upper LED on each drive tray indicates when data is being transferred to the drive in the tray.
- **Drive Fault –** on top of each drive bay is an indicator which should only come on when the drive in that bay fails.
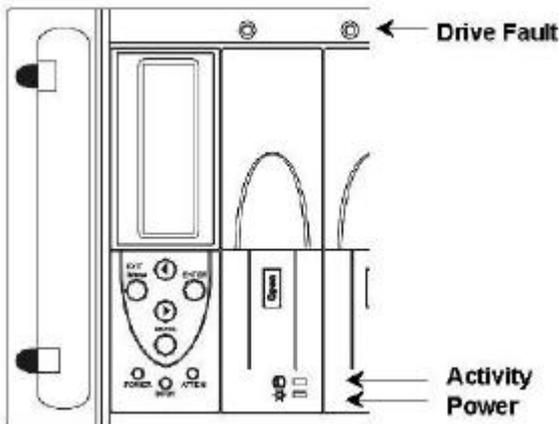
Figure 3-2: Front Panel LEDs

Rear Panel

The rear panel of the unit includes data ports, a power connector, fan and power supply access and the unit power switch.

- **Power Switch –** the power button is the on/off switch for the RAID enclosure. Note that if data is still being transmitted, received, or written to drives, there may be a delay when you press the power button to turn the unit off while data transactions are completed.

- **Power Supply Status LED** – Each power supply also has a status LED. The LEDs are at the bottom of the exposed end of the power supplies. When a power supply is operating normally, the LED will be green. If the power supply has experienced a failure, the LED will turn amber.

  If power cords are properly attached, AC power is maintained ON when the DC switch is in the "off" position. The status LED will blink steadily under this situation.

> *IMPORTANT:*
> Please note that power cords should not be removed when the DC power switch is in the "On" position. So doing may cause the power switch to fail.

Alarm

The audible warning signal built into the IFT-6300 is a notification that there has been an error of some sort in the RAID array. Fatal errors are indicated by a single, continuous signal. During non-fatal errors and array rebuilds, the signal is a series of long tones interrupted by brief pauses.

Regardless of which type of tone, it indicates that something has occurred which needs user attention. To mute the alarm, in RAIDGuide, go to the Status window and click the Mute button, or press the Mute button on the front of the unit.

RAID Access

Once the RAID array has been setup, it needs to be connected to a host computer. The host must have a SCSI or Fibre host bus adapter (HBA), but otherwise the IFT-6300 can be used by a wide variety of hardware and OS configurations.

To connect the array (SCSI models) to a host HBA, use a shielded, round SCSI cable from either SCSI port at the back of the IFT-6300 enclosure to an external port of the SCSI HBA. (See *Section 2.1 Physical / Termination* for important SCSI-related information.) Connect the second host port to another host computer in the likewise manner. Please note that each host channel has two host ports; one for connecting to host and the other for cascading.

To connect a Fibre port to host computer or Fibre hub/switch, use an optical Fibre cable recommended by the documents that came with your HBA card, hub, or switch. Note that the subsystem provides an LC port on its back panel and a different type of connector may be necessary on the other end of cable.

Once the array has been connected, you must reboot the host and then assign the RAID array a drive letter designation. Each OS has a different procedure for assigning drive letters to storage devices. Consult your particular OS's documentation and the documentation for your HBA for more information.

RAID Sharing (Network)

RAID sharing with IFT-6300 subsystems involves allowing more than just the host computer to store and retrieve data from the unit.

Once a RAID array has been created and assigned a drive designation, it can be shared to a LAN or WAN using the same OS-dependent method as other host storage devices (e.g., "local" hard drives) are shared. Consult your OS documentation for information as to how to share storage devices.

In order to connect the array to different host computers, host channel IDs or LUN numbers should be mapped with different logical configurations (logical drives). If there is only one logical configuration, different ID/LUNs can be mapped with the same array capacity. However, file-locking mechanism must be implemented with management software running to handle the sharing.

Subsystem Cascading (SCSI)

The IFT-6300 (6300U3D) provides two SCSI channels with four SCSI port connectors. The second SCSI port for a SCSI channel is for cascading to other SCSI devices (or must be terminated if there are no additional SCSI devices). The purpose of this is to allow multiple SCSI devices to share the

same bus and thus the same host. To cascade another SCSI device, connect its SCSI cable to the available (currently terminated) SCSI port.

Operating Guidelines

Once the array is installed, running, and connected to a host computer, from a user point of view it generally functions as one or several large hard drives. There are only two operating factors to consider: drive failures and powering down.

Regardless of whether or not you have included a spare drive in your array, if a drive fails it should be replaced as soon as possible. Note that all drives in the array are hot-swappable, so as long as only one drive of a logical array has a problem, it can be exchanged without powering down and without data loss (for RAID 3 and 5 configurations).

In general, RAID arrays are not intended to be regularly powered down. The best rule-of-thumb for powering down a RAID array is to always power the host computer down *first*. By the time the host is completely powered down, the RAID controller will have had time to finish writing and checking data and can be powered down.

3.2 RAIDGuide Manager

The IFT-6300 includes a variety of interfaces for controlling and monitoring the array. The RAIDGuide GUI management software provides the easiest, best way to monitor and manage your disk array.

> *NOTE:*
> 1. If the single array configuration is preferred, you can use the **Quick RAID Setup** via the LCD panel to create the array (see Section 2.3), and RAIDGuide GUI Manager to monitor and maintain it. Please note that multiple-array (logical drives) configuration can only be done manually.
> 2. You will need to wait one minute for RAIDGuide to initialize when the software is started for the first time.

RAIDGuide allows you to control all of the firmware variables and see a real-time status report regarding array usage and any problems encountered. RAIDGuide uses a type of connection called In-band SCSI or In-band Fibre

over the existing host bus connection to connect with and control the disk array.

RAIDGuide functions include a running, real-time status display; RAID setup and expansion; controller-related items such as password setting and modification, and system maintenance; information displays for drive and controller specifications; and a system event log readout. NPC is included as a sub-module for event notifications.

In-band Management

In-band SCSI and In-band Fibre are similar management data paths that allow a host computer to manage a RAID array without having any additional physical connection (aside from the data cable, either SCSI or Fibre). In-band data control paths are intended as superior replacements for RS-232 ports coupled by null modem cables. Once a SCSI or Fibre connection is made, In-band management is automatically available. No configuration is required.

Starting RAIDGuide

To start RAIDGuide and connect to your disk array, do the following:

Step 1: Once RAIDGuide has been installed on the host computer, a shortcut icon should have been added to the desktop. Double-click this icon to start the program.

Step 2: Once the program starts, you will be prompted to enter an agent IP address. If you are working from the array host computer, click the **Local** button. Otherwise, enter the full IP address of the RAID host computer and click **OK**.

Step 3: Click on the IP address icon of the host connected to the RAID you would like to manage. Then click on the controller icon displayed. Next double-click on the connection method icon (In-band).

Step 4: You will now be prompted to choose the type of enclosure you are using. Choose Rackmount configuration and click **OK**. Some later revisions of RAIDGuide can auto-detect enclosure type and skip this process.

Step 5: You will now be prompted for a password. If a controller password has been set, enter it now and click **OK**. Otherwise, leave the entry blank and click **OK**.

Step 6: You should now see the main RAIDGuide monitoring window.
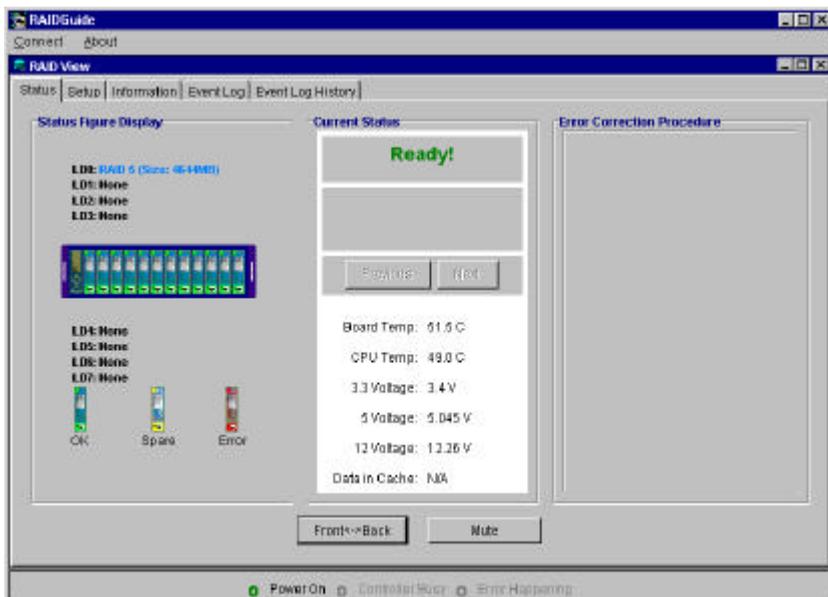
(12-bay)

Menu Items

RAIDGuide menus provide two choices: **Connect** and **About**.

Connect has the following options: Connect, Disconnect, Agent and Exit.
- **Connect** – if RAIDGuide is running but not currently connected to an array, choosing this item will connect to the currently highlighted controller.
- **Disconnect** – once RAIDGuide is connected to a controller, choosing this item will disconnect without closing the program.
- **Agent** – if RAIDGuide is running but not currently connected to an array and you would like to access an array managed by a different host,

selecting **Agent** will bring up the IP address prompt and allow you to connect.

- **Exit** – ends the current management session and closes the RAIDGuide management software.

The **About** menu has the following option: **About**. About provides copyright and version information regarding RAIDGuide.

Status

Status is the main monitoring window. It displays the current RAID level, array size, drive status (OK, Spare, Error), array status, event/error notifications, and suggested solutions to encountered error events.

Status also includes a button that allows you to mute the array alarm (**Mute** button). Note that the alarm mute button only disables the alarm until the next error event.

Setup

The **Setup** window includes six sub-windows: **Quick RAID Setup**, **LD View/Edit, LUN View/Edit, RAID Expansion, Password,** and **System Maintenance**.
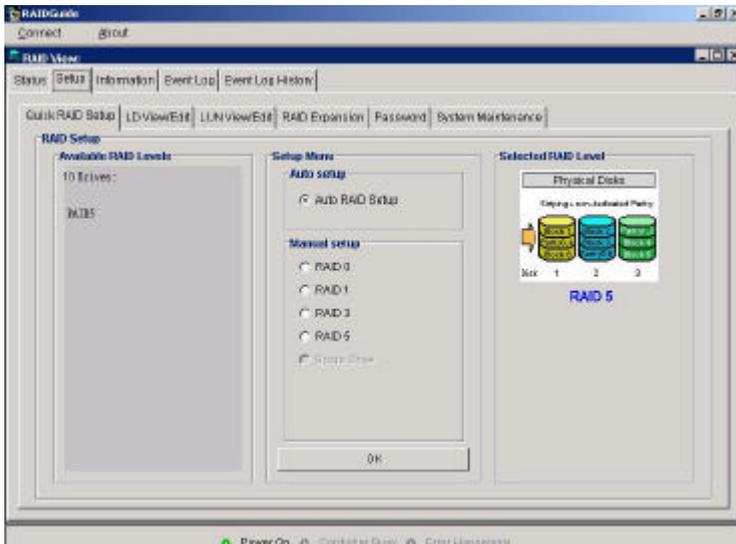
Quick RAID Setup allows you to do a simple and quick RAID setup. It configures all the drives in the array into one logical drive (in one RAID level), and automatically map this logical drive to the first available ID/LUN. You may also include a spare drive by checking the "Spare Drive" column.
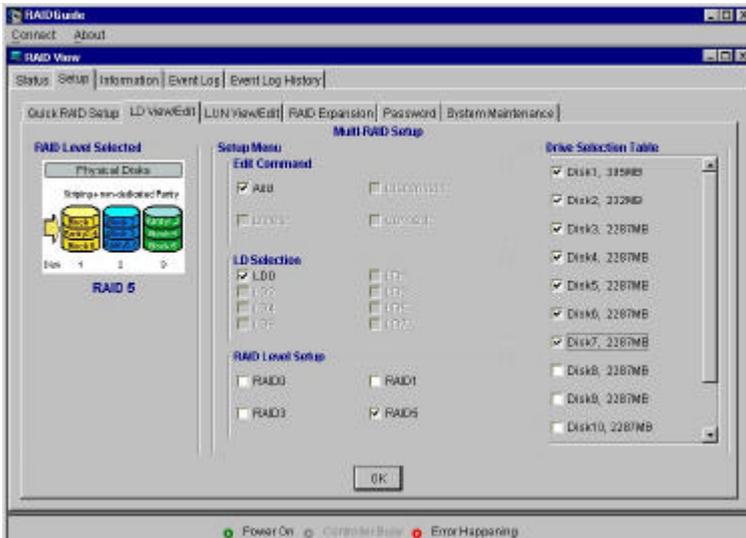
LD View/Edit allows you to do a manual RAID Setup, reconfigure the RAID level of the array, and it displays a simple representation of each RAID level (the left-hand graphic). You can create more than one logical drive by selecting members from the available drives on the right. The drives included in one logical drive will be excluded from selection when creating another logical drive.

The **Quick RAID Setup** automatically includes all available member drives into one array and the **LD View/Edit** allows you to configure drives into multiple arrays. Drives not selected as a member of logical drives become global spares. If 12 drives are installed, and 10 have been included in two logical drives, the remaining two drives will automatically become global spares.

WARNING!

1. Using **Quick RAID Setup** will *destroy* all information currently stored on the hard drives installed in the array.

---

2. Make sure you click in the appropriate check-box. Selecting the
    "delete" box will erase a logical drive configuration and all of its
    data.

LUN View/Edit allows you to map configured capacity to a specific host
ID/LUN combination. You can assign Logical Unit Numbers (LUNs) to logical
drives (or either of its partitions) to make the capacity available on a host
channel. Please note that making capacity available to two host ports will
cause data contention.

On the right of the screen is **Logical Drive-LUN Map**. This table field shows
the existing LUN mapping. The available LUN number is displayed in
sequential order each time the configuration option is started.
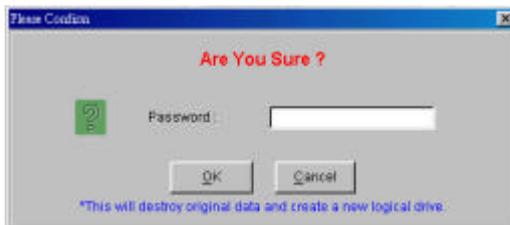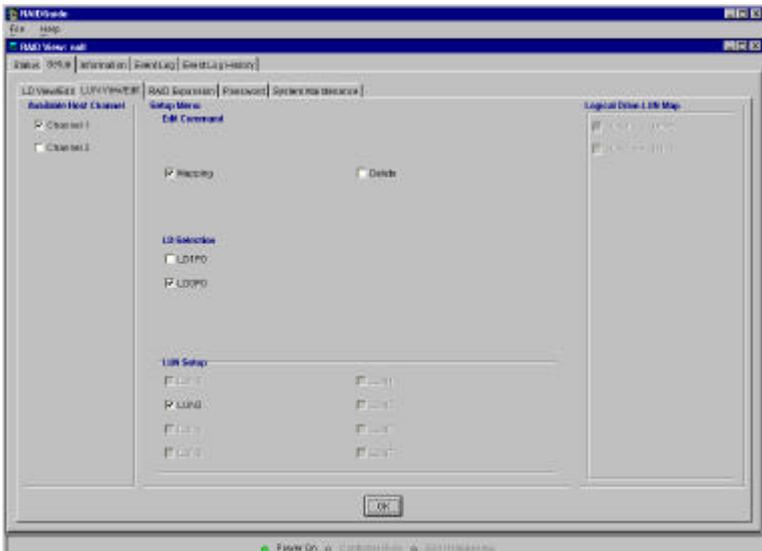
If you want to expand your RAID, after installing a new drive or drives in the
array, choose the **RAID Expansion** tab. Under the RAID Expansion window,

select the logical drive you wish to expand its capacity. The number of drives available for expansion will be displayed in the **Drive Selection Table** field. Click in the check box(es) of the drive(s) you would like to add and click **OK**.

The added capacity will appear as a new partition, and will need to be mapped to an ID/LUN combination for the host to recognize it.

You will be prompted to confirm using the controller password. Enter the password and click OK. The display will return to the **Status** window and indicate the percentage of initialization completed.
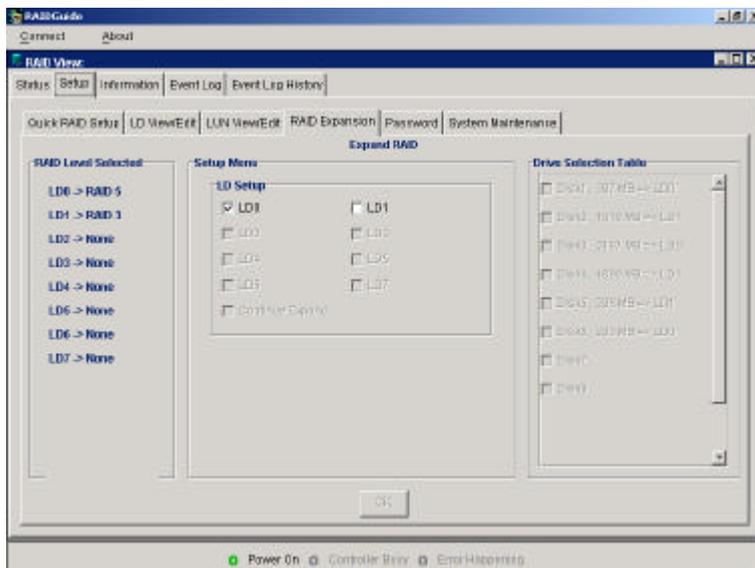
In the Quick RAID Setup window, you can add a spare drive, select a RAID level, assign a Dedicated Spare Drive and or the new RAID level from the bottom or a list on the right side of the window and click the **OK** button. You will be prompted to confirm using the controller password. Enter the password and click OK. The display will indicate the percentage of initialization completed.

> *NOTE:*
> The graphic on the right side of the **LD View/Edit** screen is a simple descriptive representation of the currently selected RAID level (not necessarily the current running RAID level). The representation is for information purposes only.

The **Password** window allows you to set and modify the controller password. To set a password or change the current password, enter the new password in the **New Password** field, press Tab and re-enter the new password in the **Verify New Password** field, then click the **OK** button.
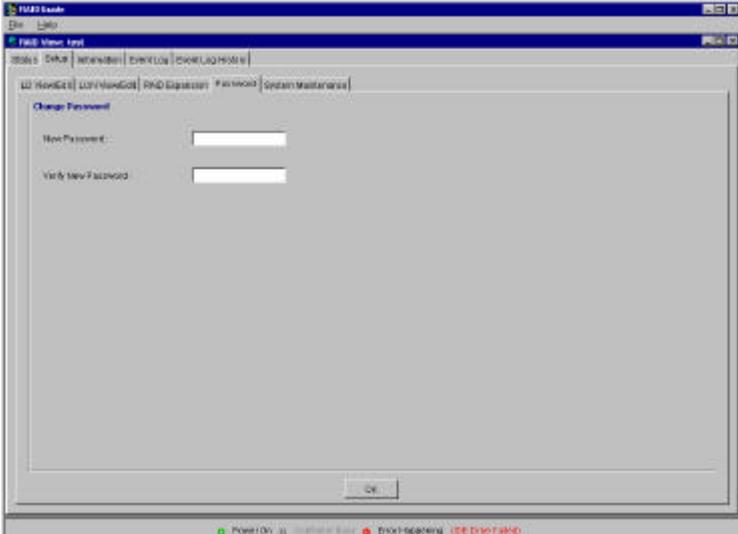
The **System Maintenance** window provides tools that relate to the RAID controller: **Name**, **Download**, **Reset**, **Bad Block Scrub**, and **Set SCSI/Fibre ID** (one or two options depending on the number of host channel).

The **Name** sub-window lets you assign a name to the controller. If the controller currently has a name, it will be listed in the **Current Name** field. To change the name or create a new one, enter the name in the **New Name** field and click the **OK** button.

The **Download** sub-window allows you to upgrade the controller firmware and bootrecord. Choose **Download Firmware** or **Download Firmware/Bootrecord.** Both functions will prompt for a file source.
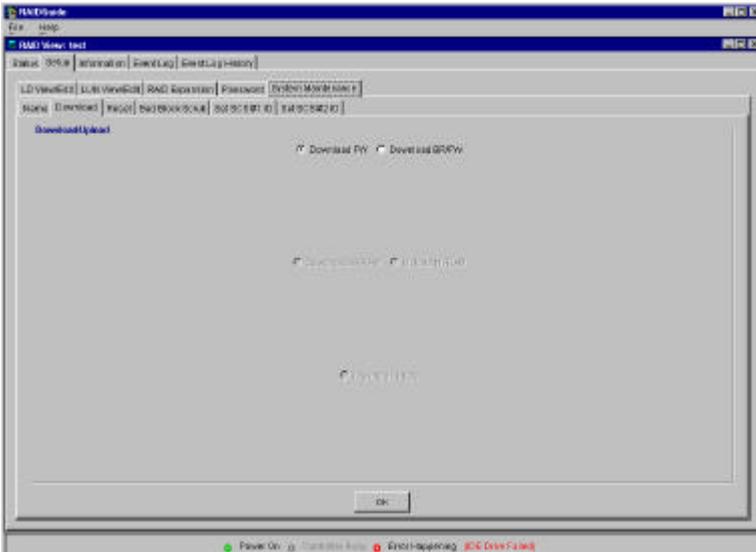
WARNING!

It is highly recommended that you contact your service representative before attempting any of the **Setup** / **Download** functions, since failure to do them properly can result in serious damage to your RAID controller.

The **Reset** option allows you to reset your storage system. This can be used under the situation that the system has to restart for certain configuration changes to take effect; i.e. changing host SCSI ID. You will be prompted for a password to confirm.
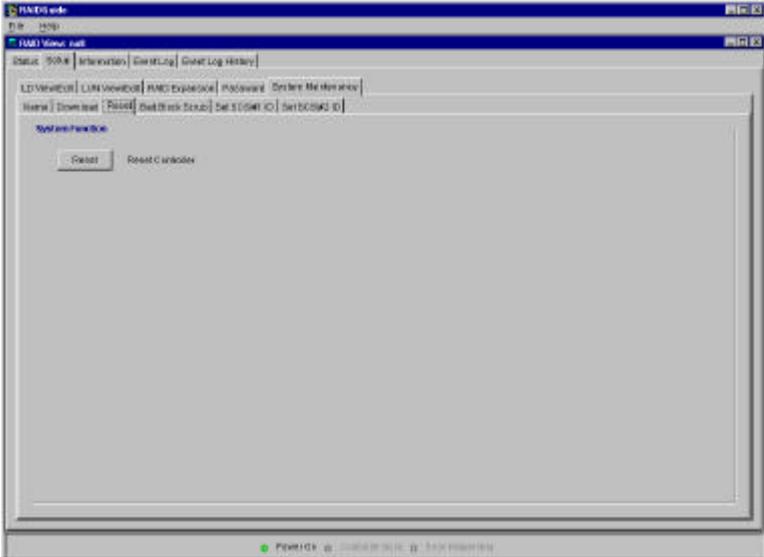
The **Bad Block Scrub** function can be performed regularly to ensure data integrity.   The function ensures all data is written onto healthy drive sectors and bad sectors are located to prevent data inconsistency.
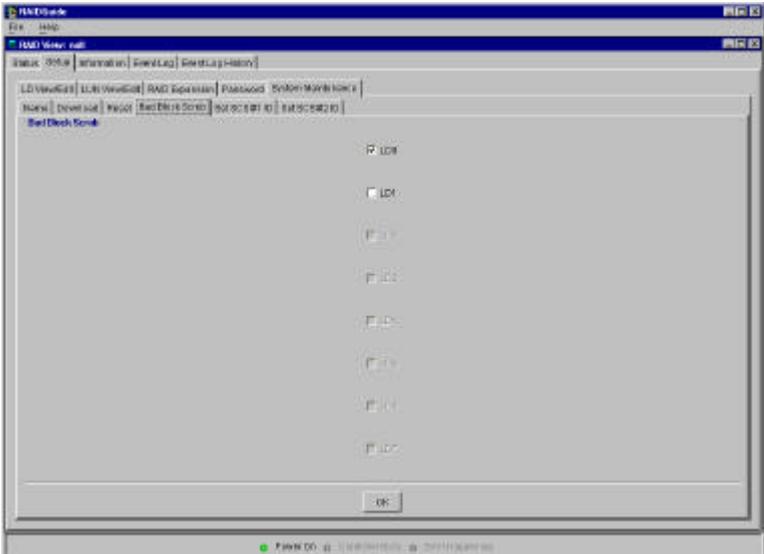
The **Set SCSI/Fibre ID** allows you to change the default ID set for the host channel(s). The default ID is 0. The SCSI ID can be set to any number from 0 to 15 (SCSI). Usually Host adapter card uses SCSI ID 7. The change will take effect after controller reset.

If your system has more than one host port, the screen will display two selection tabs.
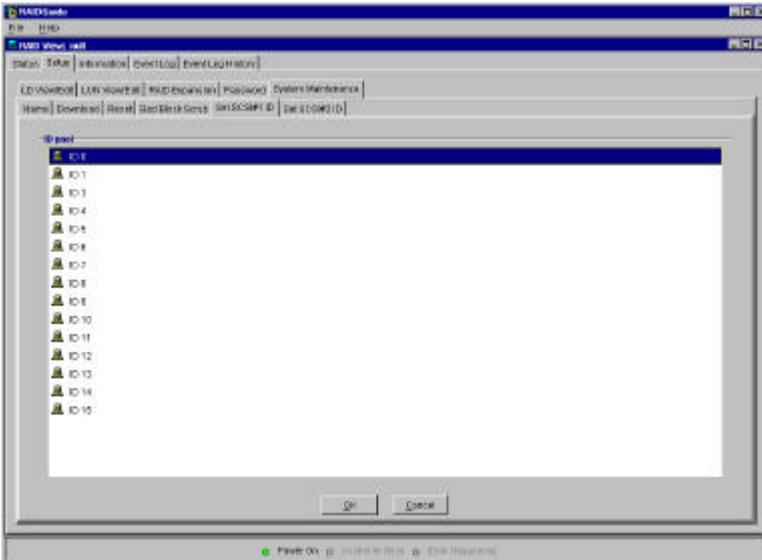
Information

The **Information** window displays data about the installed drives and system data such as the cache size and firmware version. All items listed in this window are display only (that is, they cannot be modified). Drive information includes: size, current status in the array, and vendor data.
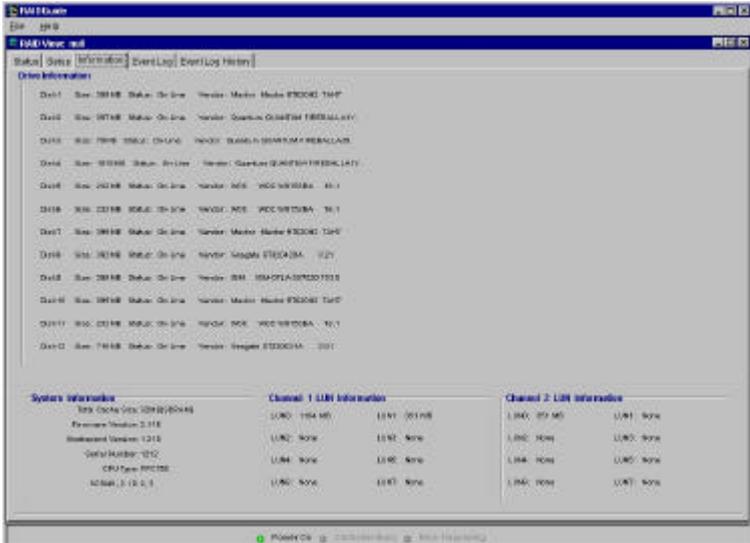
System information includes: cache size, firmware and bootrecord versions, controller serial number, controller CPU, and host channel ID(s). LUN mapping details are also included in columns at the lower right of System information.

Event Log

The **Event Log** window displays system events that have occurred while RAIDGuide was running since the last time the controller was powered on or reset.
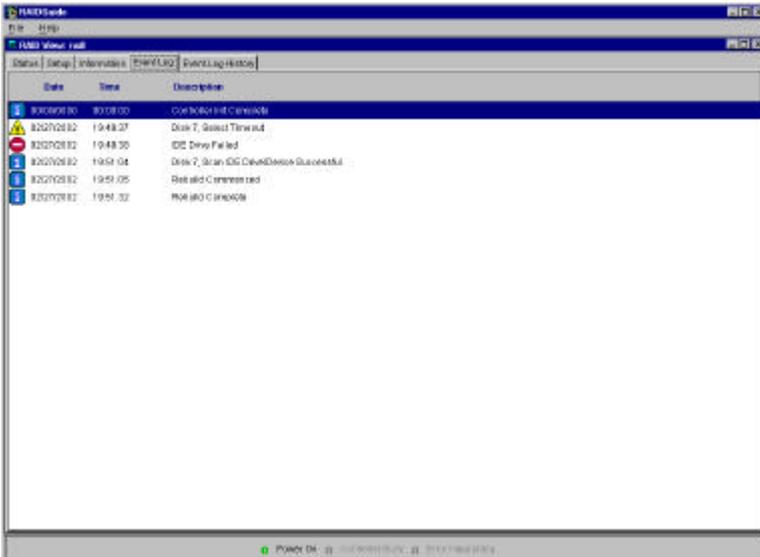
Event Log History

The Event Log History provides a record list of up to 1,000 events regardless of controller reset or power-down.
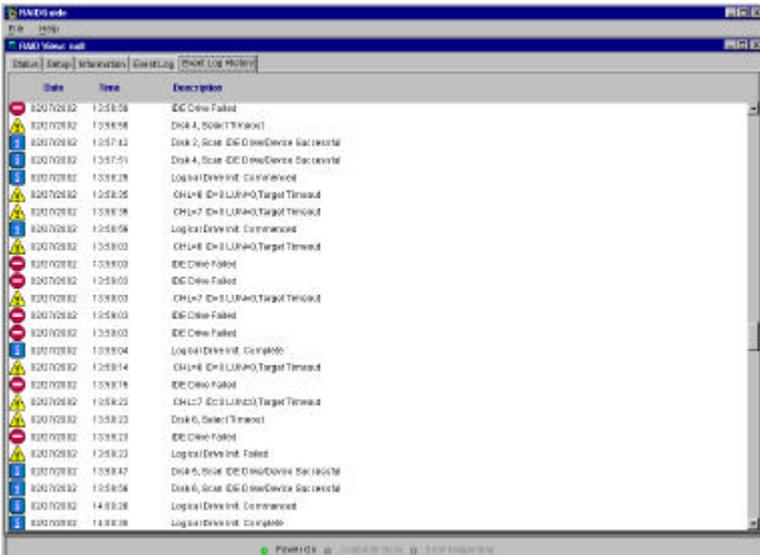
3.3 Other Management Tools

RS-232

If your data volume is large, it may improve your throughput performance to use a null modem cable for array management. The IFT-6300 comes with a standard, 9-pin RS-232 serial port, which, using a null modem cable, can be connected to any COM port on a host computer for management purposes. The firmware-based terminal array management interface can manage the array through the RS-232 port.

The port's transmission settings have the following preset values and cannot be modified:
- Baud Rate: **38400bps**
- Parity: **No**
- Bits: **8**
- Stop Bits: **1**

In order to manage the array using the RS-232 port, use the included null modem port adapter and a serial cable (not included), connect the cable to the array RS-232 port and to the appropriate COM port on the management host, set the above values in your terminal software, and activate the software. This will give you access to the firmware-based management program.

The firmware-based management program is a standard VT-100 terminal accessible program which will automatically start if you connect your host computer to the array via the RS-232 port and start any VT-100 terminal program using the communications protocol settings listed above.

LCD Panel

The LCD panel provides both a current status readout and full access to all controller functions and settings. The entire array can be installed, monitored and maintained using only the LCD panel (except the LUN Filtering function). For information on available options and using the LCD panel to manage the array, see Chapter 4.

3.4 Redundancy and Hot Swap

One of the hallmarks of a reliable RAID system is a high degree of built-in redundancy and the ability to swap failed elements out without powering down. The intended purpose is to create highly reliable, always-on data storage.

The IFT-6300 provides redundancy and hot-swap capabilities to all major components, including hard drives, fans, and power supplies.

Hard Drive Hot Swap

All hard drives are hot swappable. However, this capability is designed to serve the purpose of maintaining data integrity in the event of single drive failure in a logical group of hard drives. With the exceptions of a single drive, or RAID 0 configuration, single drive hot swapping is a data-safe operation (i.e., no data will be lost if a drive is hot swapped).

Drives included in a logical configuration (drives that have been initialized by the system) should never be removed from drive bays unless:

- A member drive has failed in a logical drive configuration and needs to be replaced.

Before removing a faulty drive, make sure you see the lit red LED on top of its drive bay. You may also verify a faulty drive's location from RAIDGuide's status window. If you mistakenly remove a healthy drive from a logical array which already has a failed drive, unrecoverable data loss will occur.

Step 1: To remove a drive, press the tray latch button to release the catch, and pull the latch until the drive is fully released then gently slide the drive out.

Step 2: Next, remove all four mounting screws.

Step 3: Then flip the drive over and disconnect the power and data cables (as shown below).
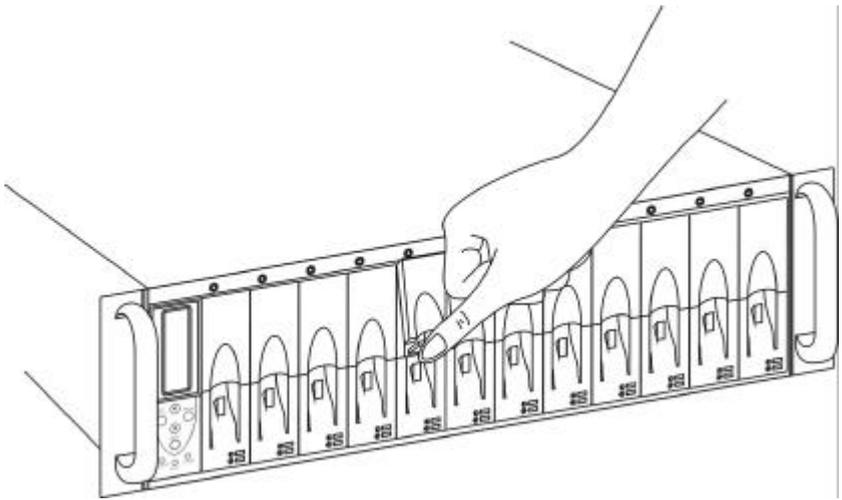
Step 1
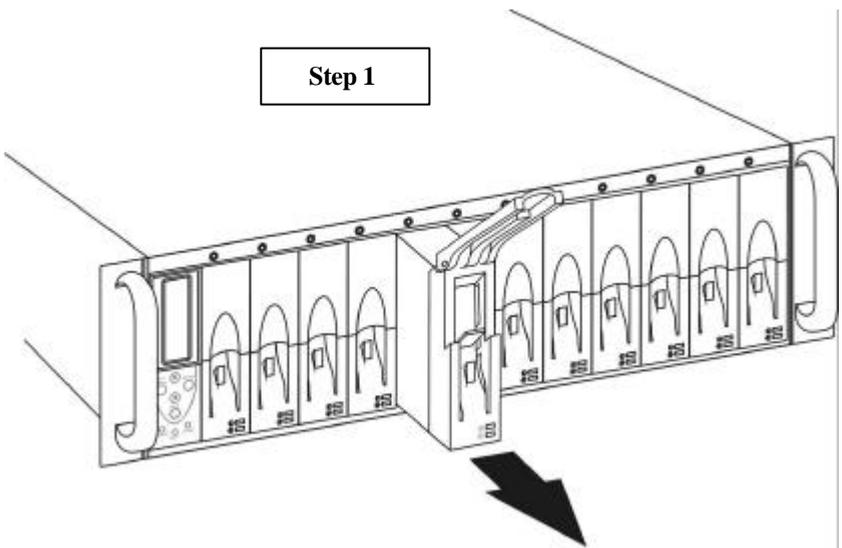
Figure 3- 3: Drive Removal – Step 1

Step 2

Step 3

HD
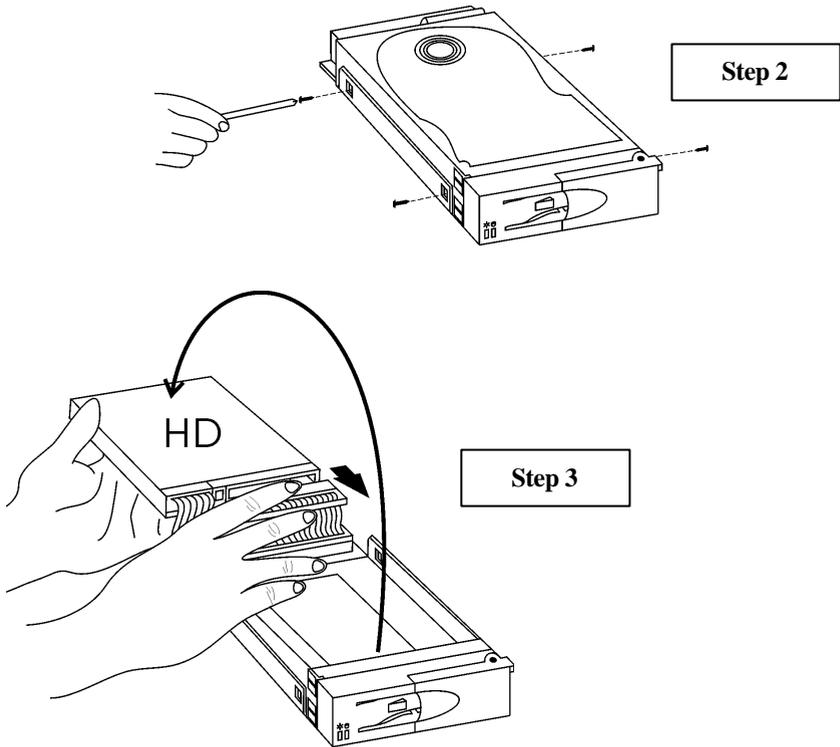
Figure 3- 4: Drive Removal – Steps 2 and 3

WARNING!

A failed drive will be indicated by a "**X**" mark on the LCD and by a lit red LED just on top of the drive bay. **DO NOT** remove the wrong drive! *Removing the wrong drive may result in complete data loss!*

In the event of a hard drive failure in a RAID 1, 3, or 5 configuration, remove the failed drive (as shown above) and replace it with a new, similar capacity drive. After a delay, the array will automatically rebuild the configuration. A spare automatically engages in array rebuild, and a new drive inserted afterward (failed drive being removed) should be configured as a spare.

Redundant Fans

The IFT-6300 has two main enclosure cooling fans accessible from the rear panel. Both fans are necessary to maintain adequate airflow for enclosure cooling. Each fan is independently hot-swappable.

To maintain sufficient airflow through the enclosure, it is not recommended to operate the IFT-6300 for long periods of time with only one fan. A fan failure will be detected by the RAID controller, the failure will be recorded in the Event Log, the Attention LED will light, and the alarm buzzer will sound.

To remove a faulty fan and replace it, follow the procedure below (note that the entire process can be accomplished while power is still on):

Unlike fans in an 8-bay system, the fan modules on a 12-bay system should be secured with four mounting screws.

Step 1: Loosen the screw fasteners on the correct fan housing. There are four on each fan. Then the fan shield can be removed.

Step 2: Loosen the hand screw. Open the housing by rotating it from right to left so that the power connector is exposed.

Step 3: Disconnect power from the faulty fan by unplugging the small power connector located at the rear-center of each fan.

Step 4: Now slide the fan out of the housing.

Step 5: Put a new fan in the housing, being careful that the front (the side with a sticker) of the fan faces out and that the fan wire runs from the top of the right side.

Step 6: swing the fan housing back into place, tighten down the hand screw, reconnect power (be careful that the fan will rotate instantly), and secure the fasteners (one piece at a time) with fan shield.
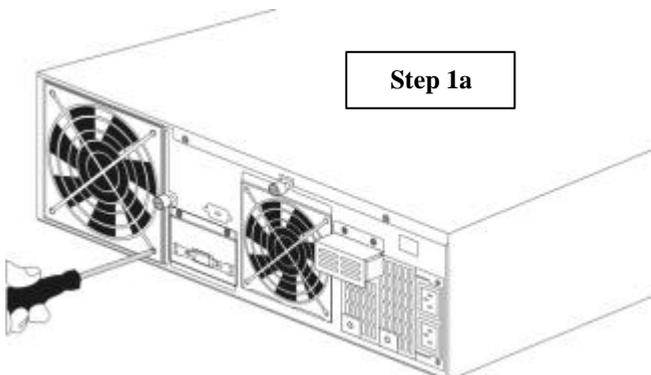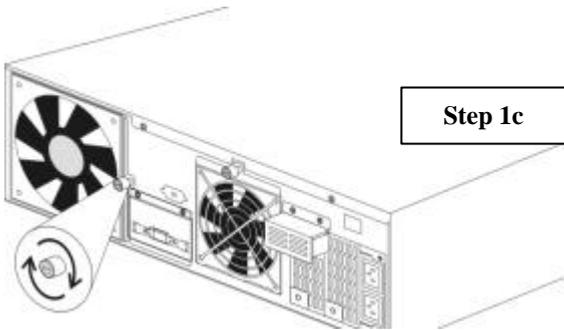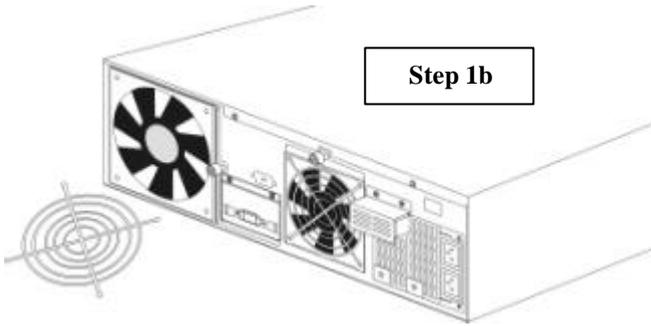
Step 1a

Figure 3-5: Fan Swap – Step 1
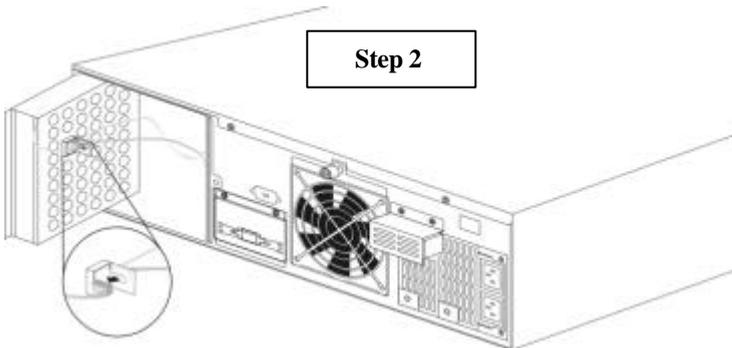
Figure 3-6: Fan Swap – Step2

If you have a fan failure, we highly recommend that you contact your supplier. They should have a replacement ready for you.

Redundant Power Supplies

The IFT-6300 has two independent, redundant power supplies. Each supply is capable of providing all necessary power to the array and enclosure. Both power supplies provide power to the system when both are functioning.

If a power supply fails, the failure will be detected by the RAID controller, the failure will be recorded in the Event Log, the Attention LED will light, and the alarm will sound. Each power supply also has a status LED. The LED is green when the power supply is operating properly and turns amber if the power supply fails.
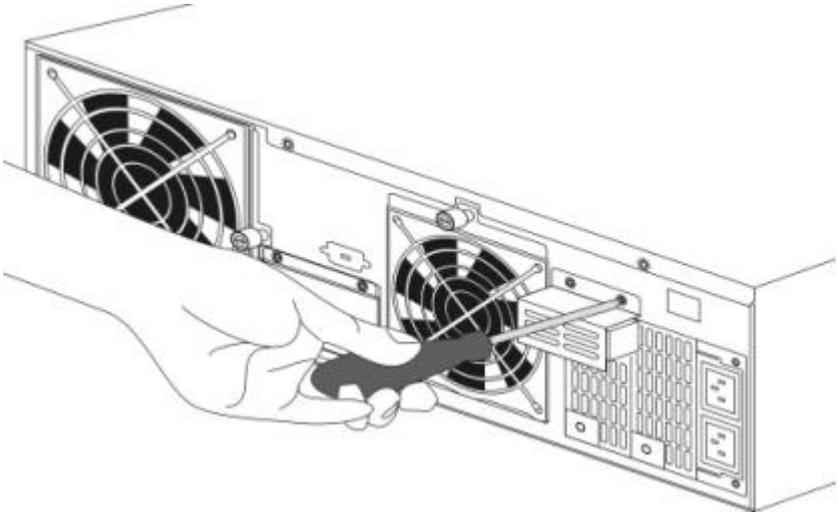
Figure 3-7: Removing a Power Supply (12 bay system)
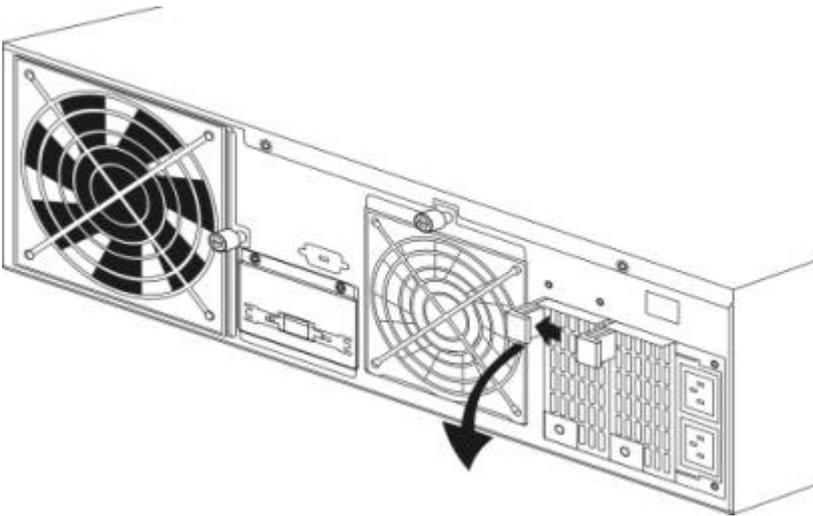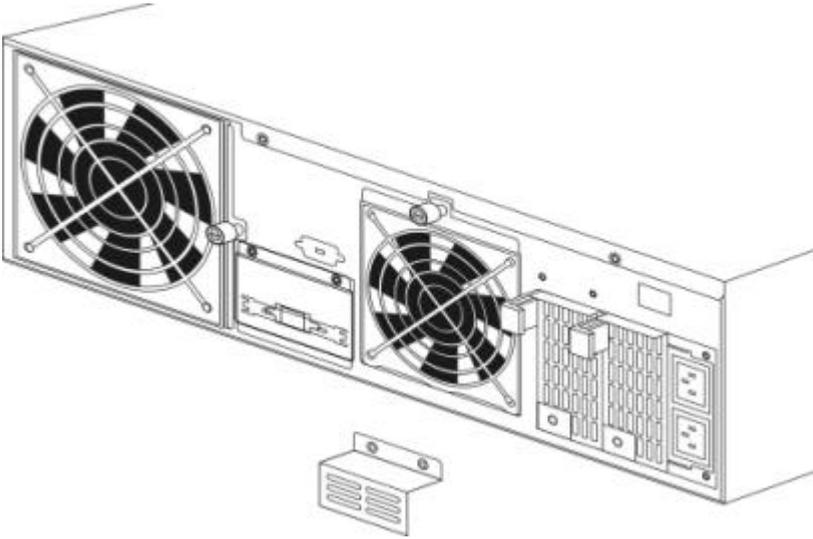
1. Remove the two screws that secure the guard cover on enclosure bulkhead right over the back of the power supply modules.
2. Snatch the ends of retention latch together to release the module from canister. While pulling the module out of the enclosure, exert a downward force on the retention latch until it is tilted forward at a thirty degree angle.
3. Note that a new module can only be installed into the enclosure when the latch is pulled outward to a thirty degree angle.

Before sliding a new power supply into the unoccupied bay, you must suspend data transmissions from the array host. In general, to do this requires pausing all services and software that may access the data on the array.

WARNING!

If data is still being sent and received when a new power supply is installed in the unit, it is possible you will encounter data errors.

Once data I/O has been suspended by the host, a new power supply can then be gently slid into the unoccupied space. We recommend that you contact your supplier to acquire a replacement power supply to maintain the security provided by power supply redundancy.

3.5 Expansion

After a RAID has been created and operated for a time, it may be necessary to make it bigger. If you have left an open drive bay, it is possible to add a new drive to the array, and thus expand the total available storage space.

Follow the instructions in *Section 2.2 Hard Drives* to physically add drives to the array. The existing RAID configuration will be reinitialized and new drives will either be included (and listed) as spares or not yet identified.

To add the new drive to the array, start RAIDGuide and select **Setup / RAID Expansion**.
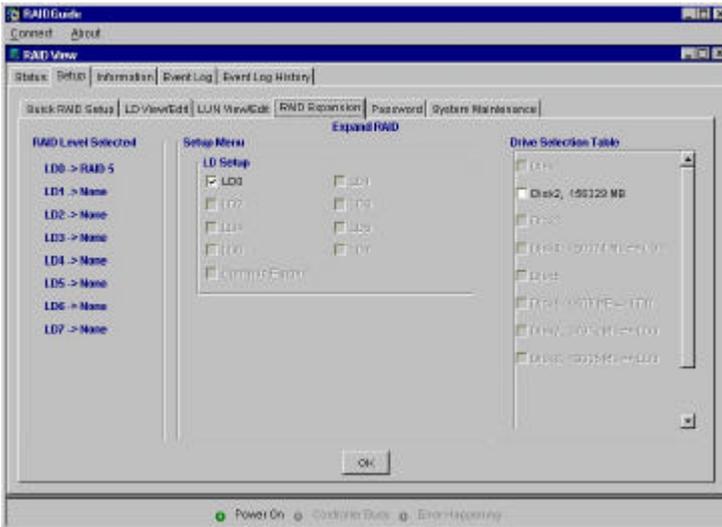
Important Notice:

Please note that RAID 1 expansion is not possible. RAID 0 expansion is supported but not recommended for users. Unrecoverable data loss might occur if media errors should appear during the expansion process on any of the member drives.

Note also that if the size (MB capacity) of the new drive is smaller than the already installed drives, the controller will not permit the expansion.

A new drive will be configured as a hot spare. (See *Section 3.2 RAIDGuide Manager / Setup* for more information.)

3.6 Spares and Rebuilds

Spares

The controller in the IFT-6300 permits you to include a hot-spare drive that will be used in the event of a drive failure. When a drive has been installed and configured in the array as a spare, any drive failure will cause an automatic rebuild of the array without data loss or any need for user management. (See *Section 3.2 RAIDGuide Manager / Setup* for information on adding a spare drive.)

Spare drives are indicated by a cross on the LCD display and are highlighted yellow in the RAIDGuide Status window.

> ### *Important Notice:*
> With multiple-array configuration, only global spare is supported. Global means the spare drive is ready to rebuild any of the logical drives.

Rebuilding

If your array has a drive failure without an installed spare, it will be necessary for you to remove the failed drive and install a new replacement.
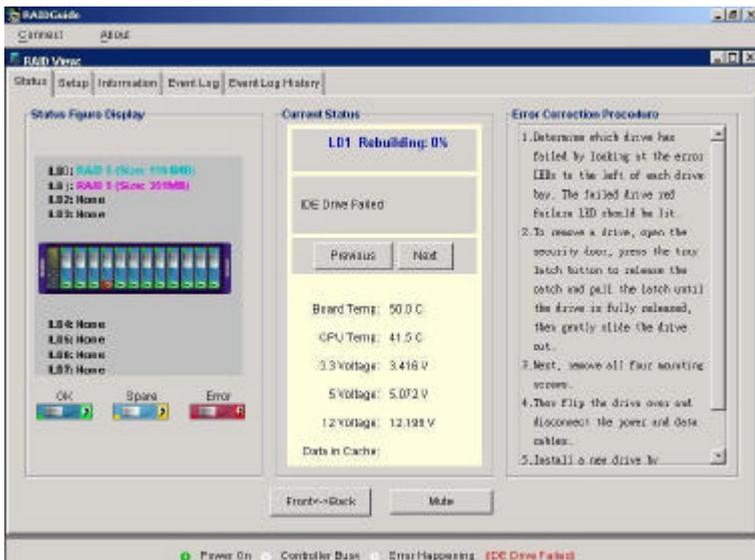
Once you have replaced the failed drive, the array will automatically rebuild data onto the spare without data loss. The percentage of completion will be displayed in the RAIDGuide Status window and in the LCD display.

After the rebuild is complete, the array will return to normal functioning (and will again be capable of sustaining a drive failure without loss of function or data).

Chapter 4 Controller

This chapter is primarily a description and explanation of the system firmware and the commands and information available via the LCD.

4.1 Basic Features

The controller firmware's basic features allow you to create, monitor and maintain a RAID array directly via the LCD panel. This section describes the basic displays and functions provided via the LCD.

Front Panel Ready Mode

After a RAID has been setup and is operating normally, the controller will operate in ready mode and will display the following information via the LCD, pressing the up and down arrow keys on the front panel navigates from one display to another:

Ready – indicates the array status and shows the status of each drive bay. (Default display.)

```
Ready           ↓
D: ◊◊◊◊◊---
```
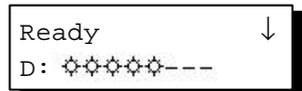
Event [01] – if there is a currently pending serious error event, the error event log entry will be listed immediately after the Ready screen. Note that if no errors are pending, the display immediately after array status will be the cache status below.

```
[01] Disk3:     ↕
Drive Failure
```
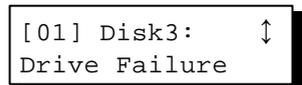
Data in Cache – displays how much of the cache is currently used.

```
Data in cache: ↕
Empty
```
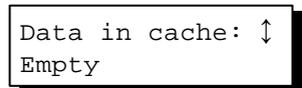
Controller ID – displays which type of controller is installed.

```
Controller ID: ↕
IFT-7250
```
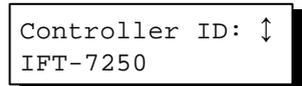
I/F Card Type – indicates the type of host interface(s) currently installed in the unit (SCSI Ultra2, SCSI Ultra160, or Fibre).

```
I/F Card Type: ↕
Chan1 SCSI U160
```
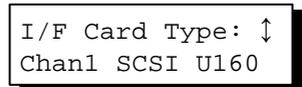
Connect Speed – indicates the optimum host speed (based on the type of interface) of the currently connected host.

```
Connect Speed: ↕
Chan1 160MB/S
```
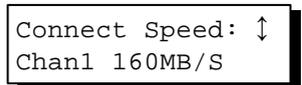
> **IMPORTANT NOTE :** At this point, Fibre-to-IDE subsystems will display three readouts that are not necessary for SCSI operations. Fibre subsystem operators should refer to Chapter 6 for more information.

SCSI ID – displays the current SCSI ID(s) assigned to the RAID array. *(Fibre models will display "Fibre ID" – see Chapter 6.)*

```
┌────────────────────┐
│ Chan1 SCSI ID:     │
│ ↕                  │
└────────────────────┘
```

RAID Capacity – indicates the size and capacity of the RAID array storage (does not include capacity of spares). The display is possibly followed by other logical drive configurations.

```
┌────────────────────┐
│ LD1: Ready      ↕  │
│ RAID5 608GB        │
└────────────────────┘
```

LUN # – shows the size of a partition possibly followed by other partitions).

```
┌────────────────────┐
│ Chan1 LUN0:     ↕  │
│ LD1 624256MB       │
└────────────────────┘
```

Disk # – displays information about a hard drive, including the manufacturer (if known), to which logical drive it belongs, and the size. Each drive bay will be listed regardless of whether or not it has a drive installed. Empty bays will be listed as "Vacant."

```
┌────────────────────┐
│ Disk1:Online    ↕  │
│ IBM  L1  19569MB   │
└────────────────────┘
```

CPU Type – lists an abbreviation of the name of the controller CPU (e.g., "PPC750" means PowerPC 750). Note that different models may be powered by different CPUs.

```
┌────────────────────┐
│ CPU Type:       ↕  │
│ PPC750             │
└────────────────────┘
```

IDE Chip– lists an abbreviation of the name of the IDE interface control chip.

```
┌────────────────────┐
│ IDE Chip:       ↕  │
│ HPT370             │
└────────────────────┘
```

RAM Size – indicates the size of the controller RAM.

```
┌────────────────────┐
│ RAM Size:       ↕  │
│ 64MB               │
└────────────────────┘
```

CPU Temperature – a constant, real-time measurement of the controller CPU temperature. The first number is the current

```
┌────────────────────┐
│ CPU Temp:       ↕  │
│ 33°C/43°C          │
└────────────────────┘
```

CPU surface temperature, the second number is the peak temperature since the unit was last powered on.

Board Temperature – a constant, real-time measurement of the controller temperature. The first number is the current board temperature, the second number is the peak temperature since the unit was last powered on.

```
Board Temp:      ↕
43°C/50°C
```

Voltage Monitor – shows the system voltage status.

```
Voltage (mV)     ↕
33xx/5xxx/12xx
```

Backplane ID – describes the type of backplane installed in the subsystem. Useful when contacting tech support for troubleshooting.

```
BackPlane ID:    ↕
12-Standard
```

Bootrecord Version – provides important information for technical support troubleshooting.

```
Bootrecord Ver:↕
1.21D
```

Firmware Version – shows the version number of the currently running firmware.

```
Firmware Ver:    ↕
2.11E
```

Upgradability Level – shows the firmware upgradability for the controller/subsystem

```
Upgradability
Level: A         ↕
```

Serial Number – shows the manufacturer's serial number for this controller/subsystem unit.

```
Serial No.:      ↑
12345
```

Front Panel Configuration Options

This section explains how to use the basic setup and configuration functions available via the LCD panel. Choices are displayed in order.

To access these menus, press the Exit/Menu button for two seconds. The following display will appear prior to the first menu:

```
Press 2 seconds
for Main Menu
```

Set SCSI ID## – *(see 4.2 below) (For information about setting* **Fibre IDs** *for Fibre-to-IDE subsystems, see Chapter 6.)*

QuickRAID Setup – to start an Auto RAID installation, press the Enter button. You will be asked to confirm. Use the arrow keys to display your choice and press the Enter button again. Quick setup will use all the hard drives available to create a single RAID array.

```
QuickRAID Setup↓
```

WARNING!

Using the drives already included in an existing RAID configuration to create a new RAID will destroy all currently stored data.

If you choose Yes, the display will show a parity initialization percentage.
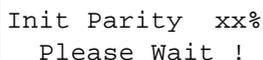
```
Init Parity  xx%
  Please Wait !
```

LD & RAID Setup – *(see 4.2 below)*

LD View/Edit – *(see 4.2 below)*
This option will only appear when there is a configured array.

Host-LUN Setup – *(see 4.2 below)*

Host-LUN View/Edit – *(see 4.2 below)*

Bad Block Scrub – *(see 4.2 below)*
Note that this menu item will only appear when there is a configured RAID1, RAID3 or RAID5 array.

RAID Expansion – *(see 4.2 below)*

```
Password Option↕
```

Password Option – if you would like to set a controller password, press the Enter button. The Set/Change screen will be displayed. Press the Enter button to create or change the

```
Password
Cancel          ↑
```

password. If you would like to cancel an existing password, scroll down to the Cancel screen and press the Enter button.

```
Password
Set/Change      ↓
```

The password is a four-digit code consisting of numbers from 0 to 9. To change a digit, use the arrow keys to scroll to your choice and press Enter to move to the next digit. You will be asked to re-type the password to confirm and will receive an error message if the two passwords do not match. Otherwise, you will see a confirmation that the password was successfully changed.

```
Key in Password
```

```
Change Password
Successful
```

If later you want to modify the password, it will be necessary for you to enter the old password in order to set a new one.

View Event Log – if you would like to view the contents of the current event log press the Enter button.

```
View Event Log  ↑
```

Event log items will be listed, most recent first, and numbered from 01 to 99. All items are as of the last time the unit was powered on. Press the arrow buttons to navigate through the list of events to display the one you want. Note that the events listed will match the listings in both the terminal manager and RAIDGuide event logs.

```
[03]Controller
Init Completed
```

4.2 Advanced Functions

This section explains how to use advanced features of the controller firmware via the LCD panel. Because misuse of these functions can cause operational problems including data loss, we recommend that only experienced users access them.

Set SCSI ID# – SCSI IDs permit SCSI devices to be daisy-chained onto the same bus. The default ID is 0. The SCSI ID can be set to any number from 0 to 15 but no two SCSI devices on the same bus can have the same ID.
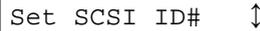
```
Set SCSI ID#    ↕
```

If your system has more than one host port, the screen will display "Select Chan#". Use arrow keys to select a channel.
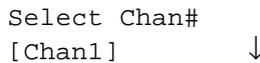
```
Select Chan#
[Chan1]         ↓
```

Select an ID from 0 to 15 choose yes and press the Enter button.
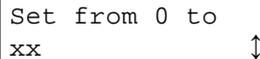
```
Set from 0 to
xx              ↕
```

The new ID setting will not take effect until the unit is reset or powered down and then back on. *(For information about setting* **Fibre IDs** *for Fibre-to-IDE subsystems, see Chapter 6.)*

LD & RAID Setup – this menu allows users to control the parameters of the RAID setup including the RAID level. Press the Enter button to access it. Through this menu, you may configure more than one logical configuration of drives.

```
LD & RAID Setup↕
```

First, you will be prompted to confirm creating the first logical drive. Then you should select member drives for the logical array you want to create. Press Enter to select/deselect the drive. An asterisk (*) mark will appear on the selected drive. Use the Down arrow key to move to another drive. Press the Down arrow key at the end of the list of drives to continue.

```
LD1, to Define?
```
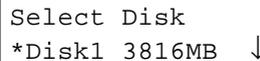
```
Select Disk
*Disk1 3816MB   ↓
```

Press the Enter button to confirm.

```
LD0 RAID Create?
```

The next step is to select a RAID level. Display the level you want to use (only those levels for which there are sufficient drives installed will be displayed) and press the Enter button. You will be prompted to confirm. Display Yes and press the Enter button to confirm the selected RAID level.

```
Select RAID Type
[RAID5]         ↓
```

The LCD will display the parity percentage as the new RAID is created.

```
Init Parity  xx%
  Please Wait !
```

LD View/Edit – this menu allows you to view or delete a configured logical drive.

Host-LUN Setup – Press the Enter button to start mapping your logical drive(s) to host channel/LUN combinations.

```
Host-LUN Setup ↕
```

If your system has multiple host channels, choose a host port and press the Enter button to proceed. Repeat the process and assign a different host LUN to every array capacity.

```
Map LD1
[Chan1]         ↓
```

You will be asked to confirm. Use the arrow keys to display your choice and press the Enter button again to complete the process.

```
Map to Ch1 LUN0?
NO              ↓
```

Host-LUN View/Edit –
This option allows you to view or delete a created Host ID/LUN mapping.

Bad Block Scrub – users are encouraged to regularly perform this function to ensure data integrity and to prevent media errors from causing unrecoverable data loss. If drive media errors should be found, the controller calculates the parity, regenerates the data, and writes the data on healthy drive sectors.

```
Bad Block       ↕
Scrub
```

```
Select LD#
[LD1]           ↓
```

Press the Enter button and you will be asked to confirm performing this function. To proceed with performing this function, press the Down

```
Confirm
NO              ↓
```

button and the Enter button again.

The controller will start scanning drives. Bad blocks found on drives will be recorded in the system event log. The scanning process will be displayed in percentage until the process is finished.

```
Scanning      XX%
Please Wait!
```

RAID Expansion – if, after adding a new drive, you would like to make your RAID bigger, select RAID expansion. Note that you can also use an already installed spare drive to do a RAID expansion although this method will leave your array without a backup spare and is not recommended.

```
RAID Expansion ↕
```

```
Select LD#
[LD1]          ↓
```

You will first be prompted to select how many drives to add to the RAID. The number available will depend on how many new drives or spares are installed.

```
Select # of disk
[1]
```

Scroll through the available numbers using the arrow buttons and press Enter to select.

Next, you will be asked to confirm the new LUN1 size. Choose Cancel or OK and press the Enter button. The creation of the new RAID will be displayed as an expansion percentage complete until the process is finished.

```
New LUN1: xxMB
OK             ↑
```

Chapter 5 Troubleshooting

5.1 Controller

Problems with the controller fall into two categories, serious and disastrous. The controller is the only major component in the IFT-6300 that can cause a fatal failure on its own.

After the system POST is complete, the controller will begin initializing the RAID. The following message will be displayed by the LCD panel:

```
Initializing...
   Please Wait...
```

If everything is working normally, shortly after this message, the system should be up and running. The LCD panel will display the Ready screen and the status in RAIDGuide will indicate Ready.

Problems at Startup

Controller failure at startup will most likely result in a failure to initialize the RAID. If your system hangs at this point of the power-up (wait at least 5 minutes before deciding that the system is stuck), power off, wait 10 seconds, and try again.

Attempt this remedy three times, if the system still does not initialize, check all other components for good connections and status as indicated by LEDs.

Other Problems

The controller is the heart and brain of a RAID array. If, during normal operations, the controller fails the most obvious symptoms will be that the LCD does not light and the array is inaccessible.

> *NOTE:*
>
> Once the POST and RAID initialization are completed (meaning that the controller is functioning properly), any subsequent failures or problems will most likely generate an event message in the array event log.

5.2 Enclosure

The enclosure elements (power supplies, fans, drive trays, LED indicators, ports) are, in most cases, monitored by the RAIDGuide GUI software through the controller (which also monitors and records problems), so problems with them will be displayed in the status window of RAIDGuide.

> **NOTE:**
> Detailed information about how to remove and replace power supplies and fans is included in *Section 3.4 Redundancy and Hot Swap.*

Power Supplies

The system comes with two, hot-swappable, redundant power supplies, each of which can supply sufficient power for the entire array indefinitely.

If a power supply fails, a variety of things will happen. The event will be recorded in the array event log by the controller. At the same time, the system alarm will sound and the Attention LED will light. If you are using RAIDGuide to monitor the array, you will see the Status change from Ready to Error, and the array symbol will display the back of the unit with the power supplies highlighted red. On the power supply itself, the status LED will change from Green to Amber, indicating which power supply has failed.
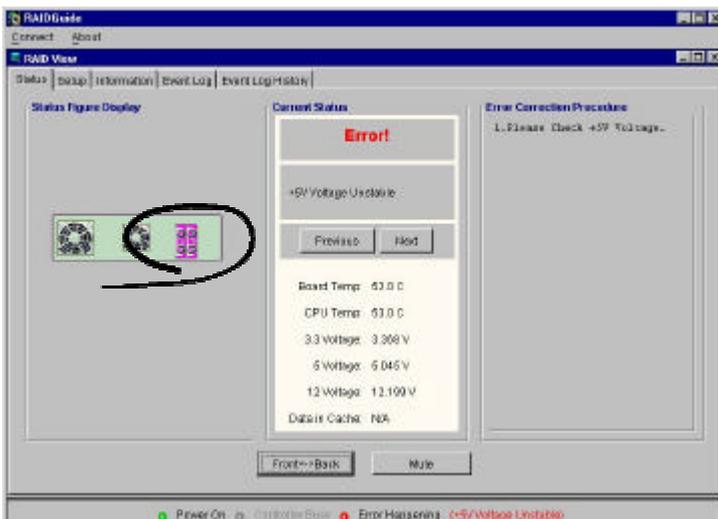
The status LED of a power supply will change from green to amber on the back of system.

Because the unit comes with redundant power supplies, it is possible to replace a failed power supply without powering down the system.

To determine which power supply has failed, carefully examine the LED of both supplies. The LED of a failed power supply should be amber or red. If you are uncertain which power supply has failed, power down the host and make certain that the array cache is empty BEFORE removing a power supply.

To check the cache, press the down arrow button once from the LCD Ready display. If it reads "Empty," there is no data in the cache and you may safely power down or remove a suspect power supply.

> ### *NOTE:*
> The RAIDGuide error readout for the power supplies is unable to display *which* power supply has failed. The display highlights both power supplies, but that does not mean both have failed.

> **To remove a power supply,** Face the back of the system and determine which power supply has failed. Power cord on the upper position connects to the power supply unit on the left, while power cord on the bottom connects to the unit on the right.
>
> To replace the unit, remove the guard cover and snatch the ends of the retention latch on the back of the unit together to release it from chassis. The guard cover prevents unauthorized access to the power supply units. Pull the unit with sufficient and slightly downward force to disengage the power supply module from the chassis.

Before sliding a new power supply into the unoccupied bay, it's better to suspend data transmissions from the array host. In general, to do this requires pausing all services and software that may access the data on the array.

WARNING!

> If data is still being sent and received when a new power supply is
> installed in the unit, it is possible you will encounter data errors.

Once data I/O has been suspended by the host, a new power supply can then
be gently slid into the unoccupied space.

Fans

The system also comes with two hot-swappable cooling fans. Both fans are
necessary to maintain adequate airflow throughout the enclosure, particularly
over extended periods of time.

If a fan fails, it will register as an error event and be logged and available both
via the LCD panel and in RAIDGuide.
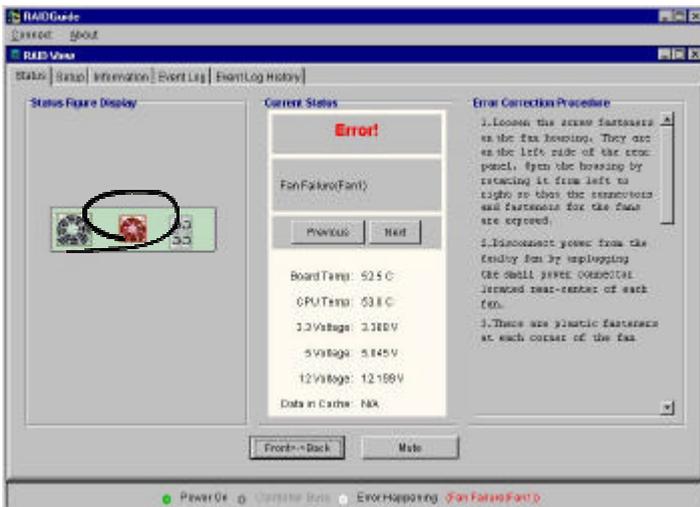
Removing a failed fan and installing a replacement is a fairly complex process:

12-bay System –

Step 1: Use a Phillips #1 screwdriver to remove the four fasteners that secure the fan and the fan shield.

Step 2: Each fan housing is mounted on a swivel. To open the housing, loosen the hand screw to the right of the fan.

Step 3: Disconnect the power cable for the failed fan. It is located in the middle of the fan and can be disconnected by squeezing the connector to release it and then pulling gently.

Step 4: Gently slide the fan out of the housing.

Step 5: Put a new fan in the unoccupied space, being careful that the front of the fan (the side with a sticker) faces out and that the fan wire runs from the top right corner of the fan.

Step 6: To install the replacement, slide it into the housing, noting the top-bottom and front-back orientation of the fan. The back of the fan should be towards the power connector and the cable at the top right of the fan should be oriented for ease of installation.

Step 7: Secure the mounting screws from the front of the fan housing with the fan shield, and reconnect power. Please be careful when connecting power cable, assuming that the system is still running, the fan will start up immediately. Swivel the housing back in place, and tighten down the hand screw.

More information on this process is available in Chapter 3.

All displays and readouts should reflect that the fan error has been repaired.

Drive Trays

Drive trays as a component separate from drives are unlikely to encounter problems unrelated to a drive failure. In the event that you suspect a drive failure may in fact be a problem with a drive tray, shut down the host, remove the questionable drive and tray, and examine the power and data cables to see if they have come loose or are damaged. Please note that only one drive can be removed (among those configured into a logical drive) at any time when the system is powered on. Having two drives (trays) removed at a time will fail the array. Although in most cases, provided there is no host access, reinstall drives into the original position will make the controller to recognize the original RAID.

If, after checking the cables and returning the drive to its bay in the enclosure, the drive is still showing a failure, the drive itself has probably failed.

LEDs

LEDs, both on the enclosure and on each drive tray, are primarily used to indicate the status of the drives, power supplies, and array. Each of the LEDs listed below has a warning function:

- **Attention LED –** front panel, left side – when lit, indicates that some error has occurred.
- **Drive Fault LEDs –** at the top of the front panel, one for each drive bay – when lit, indicates that the drive in the corresponding bay has failed.
- **Power Supply LEDs –** On the bottom left of each power supply module – when lit green, the power supply is working; when lit amber, the power supply has failed. (Note that these are distinct from the power LEDs on each drive tray and on the main front panel.)

Ports

The ports on the IFT-6300 are not likely to fail even under the most strenuous circumstances. It is much more likely that a cable has failed, so the first thing to do if you suspect a port or cable failure is to replace the cable with one that is known to be good. If replacing the cable repairs the problem, the failure is with the old cable not the port. Note that a SCSI bus must be terminated at both ends.

Termination (SCSI)

When using SCSI devices, it is always necessary to pay careful attention to termination. A SCSI bus must be properly terminated at both ends. The IFT-6300 SCSI models come with a physical terminator attached to the port or to the SCSI port on the bottom. If the RAID array is the last SCSI device on the bus, simply attach it to the host using the unterminated SCSI port and an external SCSI cable.

If you want to daisychain other SCSI IFT-6300 arrays or other SCSI devices to your current SCSI IFT-6300, shut down all SCSI devices on the bus first. Once no devices on the bus are transmitting data, disconnect the terminator, connect the new SCSI device, terminate the bus (if it isn't already), and restart all devices. Note that termination must be on both ends of the SCSI bus, and only on both ends. (For information about Fibre connections, see Chapter 6.)

Replacement Parts

New fans, power supplies, trays, and other similar enclosure parts may be available from your supplier. Please note that replacement parts are **_not_** available directly from the manufacturer. We suggest that you contact your

supplier in the event of a failure or damage to inquire about replacement part availability.

SODIMM

Instructions on SODIMM removal and replacement are available through your supplier should you wish to upgrade the memory yourself. Contact your supplier for information.

5.3 Drives

Drives sometimes fail. One purpose for a RAID array is to protect data integrity in the event of a drive failure. In a RAID1, RAID3, or RAID5 configuration, a single drive failure is not catastrophic. Data is not only protected, it remains available despite the drive failure.

If a drive fails, the Attention LED will light, the red Fault LED to the top of the bay will also light, the alarm will sound, the LCD will display an error icon, and the event log will record the drive failure.

Spare Installed

If the array has a spare drive already installed, the spare will automatically replace the failed drive.

> *NOTE:*
> It is highly recommended that you replace a failed drive even if you already have a spare. An installed spare provides an additional safeguard against future drive failures.

No Spare Installed

If there is no hot-ready spare drive installed, a single drive failure in a RAID1, RAID3, or RAID5 array will still not result in data loss or downtime. If a drive fails without a spare, remove the failed drive and replace it with a new one of equal or greater capacity.

The RAID controller will automatically rebuild the array once a new drive has been installed to replace the failed drive. The new drive can be installed in any unoccupied drive bay.

5.4 Bad Media Handling

Grouping drives into RAID configurations can guarantee data integrity in the event of single drive failure. An automatic rebuild is performed by the controller to regenerate those data in the failed drive using the parity data on its members. However, sometimes bad blocks might occur on yet another drive that striped data should be read for rebuild. If rebuild is performed under this situation, you may not be able to complete the rebuild process because two of the original data stripes are missing. When a drive fails, regenerating the original data requires that data stripes on all other member drives are healthy.

Controller firmware version 1.42 and above can pinpoint the bad blocks found on the second drive (also the corresponding blocks on other member drives) as invalid. The rebuild process can continue by skipping these bad blocks. With additional command selection on the LCD or terminal interfaces, users can choose to retry or ignore the faulty sectors. Bad blocks found during the process will have invalid data but the rest of the unaffected data can be salvaged.

Following are the messages and configuration options displayed under the situation described above.

This is the message displayed when a drive fails in a RAID array.

```
RAID Failed     ↓
```

The subsystem will begin rebuilding the array using the existing spare drive or after a failed drive is replaced by a new drive.

```
Rebuilding 35%
```

Once bad blocks are encountered on yet another drive, the "Rebuild Failed" event will prompt.

```
[02] RAID       ↕
Rebuild Failed
```

Shown on the right is the error message displayed when the rebuild process is halted upon the discovery of media errors on another member drive. The alarm will sound with the event message.

```
[01] Disk1: Bad↕
Block Detected
```

Press **Exit** to return to the initial screen.

Press **Exit** for two seconds to enter the command mode. Press the Down arrow button for several times to see the "Rebuild Retry" command. Press **Enter** to select the retry options. You may then choose to:

```
Rebuild Retry        ↓
```

1. Retry the rebuild and let it stop if error occurs again;

```
Stop if rebuild error  ↓
```

   - Or -

   Or

2. Skip those bad blocks, continue the rebuild to salvage the unaffected data. Controller will mark those bad blocks as invalid.

```
Skip if rebuild error   #
```

IMPORTANT NOTE:
To prevent data loss caused by the situation, we recommend performing the "Bad Block Scrub" function regularly. The function helps to ensure that all data is properly written on healthy sectors.

5.5 Notes and Warnings

These notes and warnings are also included within the text of relevant sections of the User's Manual and are added here for reference and in the order in which they appear in the text.

NAME and TYPE	NOTE or WARNING
Fault Tolerance (Note)	The IFT-6300 has been designed to tolerate a single fault in any major component except the controller itself. Drives, fans, power supplies, one of any (or even "each" under worst case) can fail and data will still be maintained and available.
RAID Level Support (Important)	The IFT-6300 only supports RAID 0, RAID 1, RAID 3, RAID 5, RAID 1+Spare, RAID 3+Spare, and RAID 5 +Spare by **Quick RAID Setup**. While setting multiple arrays, no dedicated spare is available with each logical drive. Drives not selected as a member of a logical drive will automatically become Global spares. Global spare(s) automatically participate in any rebuild action.
RAID0 Expansion (Important)	One imminent danger of RAID 0 Expansion is that bad block(s) might be encountered during the expansion process. Should this happen, all array data will be lost. Backup your data before performing expansion on a RAID 0 array.
RAID1 Expansion (Note)	One drawback to RAID 1 is that it does not allow running expansion. Once a RAID 1 array has been created, to expand it, the data must be backed up elsewhere before a new

	drive can be added. Other RAID levels permit running expansion.
RAID 0+1 (Important)	RAID (0+1) will not appear in the list of RAID levels supported by the controller. If you wish to perform RAID 1, the controller will determine whether to perform RAID 1 or RAID (0+1). This will depend on the number of drives selected for the logical drive.
SCSI Default Settings (Important) *[SCSI Models Only]*	If you don't want to use the default SCSI ID setting, it is highly recommended that you change the setting before creating a new RAID. The RAID initialization process can take a long time depending on the size of the hard drives used. Changing the SCSI ID setting requires reinitializing the array, potentially doubling setup time if not done first.
Contact Service (Warning)	It is highly recommended that you contact your service representative before attempting any of the **Setup** / **Main** / **Download** functions, since failure to do them properly can result in serious damage to your RAID controller.
Failed Drive Removal (Warning)	A failed drive will be indicated by a "**X**" mark on the LCD and by a lit red LED on top of the drive bay. DO NOT remove the wrong drive! Removing the wrong drive may result in complete data loss!
New Power Supply Install (Warning)	If data is still being sent and received when a new power supply is installed in the unit, it is possible you will

	encounter data errors.
New RAID Data Wipe (Warning)	Creating a new RAID will destroy all currently stored data.
Using Two Host Channels (Warning)	Using two host channels requires a third-party "volume management" software to prevent data loss. DO NOT USE two redundant channels to connect to a single host unless you have installed software to manage data flow to the RAID array. Failure to do heed this warning will result in data corruption.

Chapter 6 Fibre

The Fibre-to-IDE model of the IFT-6300 is currently only available in a single channel configuration. The model has a single Fiber, LC port connector (a small form factor PTH transceiver installed) and user-configurable fibre ID.

Important Notice:

The subsystem uses fiber-optic devices. Do not remove the covers of or disassemble the devices. Doing so may result in exposure to hazardous laser radiation.

The LC port on the back panel is certified for International Class 1 laser safety.

6.1 Physical

The primary physical difference between SCSI-to-IDE IFT-6300 models and Fibre-to-IDE models are the host data ports. The SCSI ports have been replaced by a single LC port. See figure 6-1 below.
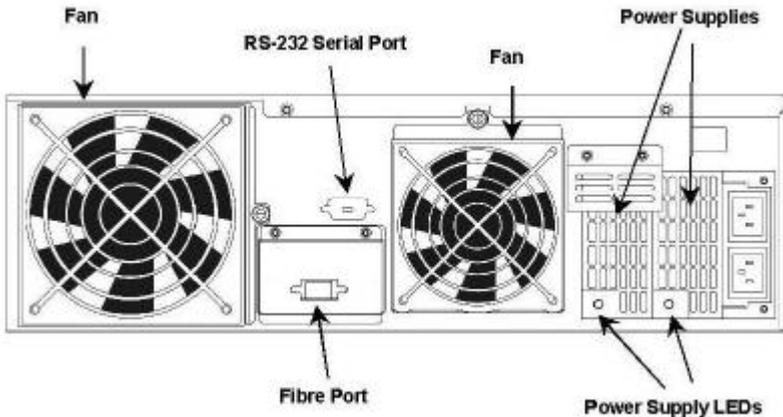

Figure 6-1 : Rear Panel, Single Channel Fibre-to-IDE Model

Note too that the SCSI ports are not present on Fibre-to-IDE models (for obvious reasons). All other physical aspects of Fibre-to-IDE models, front

panel indicators and controls, hard disk compatibilities and tolerances, power supplies and fans, are identical to SCSI-to-IDE models as described throughout this User's Manual.

Host Requirements

In order for the IFT-6300 (Fibre models) to be connected to the host computer, the host must have a fibre host bus adapter (HBA) installed. An HBA is an add-on card with external fibre ports that are able to connect to fibre devices, like the IFT-6300 RAID array.

Use fiber-optic cables to connect to the host. Only use cables recommended by the HBA manufacturer. Be careful not to bend or damage the cable. Carefully follow the instructions that are provided by the cable manufacturer.

Please note that there are no by-pass circuits installed on the host port. By-pass circuitry must be provided with the Fibre hub or switch that is being used.

Once the array has been connected, you must reboot the host and then assign the RAID array a drive letter designation. Each OS has a different procedure for assigning drive letters to storage devices. Consult your particular OS's documentation and the documentation for your HBA for more information.

RAID Management

In addition to an HBA, host computers that want to use the RAIDGuide Java GUI management software must have the following minimum system requirements: Pentium or above compatible (or equivalent PC or workstation) running Windows NT or Windows 2000. A host computer running RAIDGuide must also either have a network (LAN) card installed and running or MS Loopback Adapter installed and running. (See the end of Section 2.4 for more information.)

If RS-232 terminal management is used, the IFT-6300 is compatible with Solaris (SPARC, x86) and Linux workstations and computers.

6.2 Front Panel Commands : 1 Channel

This section is a description and explanation of changes made to the system front panel navigation for one channel Fibre-to-IDE subsystems. The additional commands and information, which are described in this section, are only available via the LCD on Fibre-to-IDE models. (See Chapter 4 for more information about other front panel commands.)

The controller firmware's basic features allow you to create, monitor and maintain a RAID array directly via the LCD panel. This section describes the basic displays and functions provided via the LCD.

Ready Mode Supplement

After a RAID has been setup and is operating normally, the controller will operate in ready mode and will display various information via the LCD. Pressing the up and down arrow keys on the front panel navigates from one display to another. The displays described here only appear on the single channel fibre model:

After the "I/F Card Type" display –

Connect Speed – indicates the optimum host speed on the fibre channel (based on the type of interface) of the currently connected host.
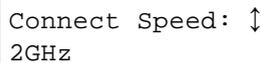
```
Connect Speed: ↕
2GHz
```

Fibre ID – displays the current Fibre ID assigned to the disk array (see below for information about setting the fibre ID).
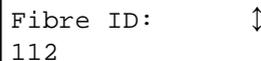
```
Fibre ID:      ↕
112
```

(**Fibre ID** replaces the **SCSI ID** variable described in *Section 4.1 Basic Features.)*

WWNN ID – the WWNN ID is a unique identifying number assigned to each unit at the factory. A WWNN is a **W**orld **W**ide **N**ode **N**ame used to differentiate between fibre devices.
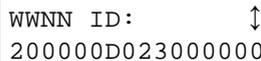
```
WWNN ID:        ↕
200000D023000000
```

WWPN ID – the WWPN ID is a unique identifying number assigned to each unit at the

```
WWPN ID:        ↕
210000D023000000
```

factory. A WWPN is similar to a WWNN in that it is used to help identify the particular fibre interface port from all other fibre ports. A Fibre node (device) may have several ports and only one node name. WWPN stands for **W**orld **W**ide **P**ort **N**ame.

Neither the WWNN nor the WWPN is user-configurable.

Set Fibre ID Option

This section explains how to set the Fibre ID number. It is a supplement to *Section 4.2 Advanced Options for Fibre-to-IDE models only.* Because misuse of this function (as well as those functions described in the related Section 4.2) can cause operational problems including data loss, we recommend that only experienced users access them.

To access the Fibre ID set menu, press the Menu/Exit button for two seconds. The following display will appear before the first menu:

```
Press 2 seconds
for Main Menu
```

The first option available after two seconds to Fibre-to-IDE subsystems is "Set Fibre ID#".

Set Fibre ID# – Fibre IDs permit Fibre devices to be connected on the same bus. The default ID is 112.

```
Set Fibre ID#   ↕
```

The Fibre ID option can be set to any number from 0 to 125 but no two Fibre devices on the same channel can have the same ID.

```
Key in Fibre ID
xxx             ↕
```

Select an ID from 0 to 125, choose yes and press the Enter button.

The new ID setting will not take effect until the unit is reset or powered down and then back on.

(The **Set Fibre ID** option replaces the **Set SCSI ID** option described in *Section 4.2 Advanced Options.)*

6.3 Software

The RAIDGuide management software for both SCSI-to-IDE and Fibre-to-IDE is identical. There are no additional functions or options related to fibre operations.

6.4 LUN Filtering: RAID-based Access Control

LUN Filtering: (RAID-Based Mapping)

LUN Filtering is a method used for separating and controlling access to data from the RAID controller.

One major benefit of a Fibre channel is its ability to share a storage pool with many servers or workstations over network. However, allocation becomes a problem if every server in the network can access the data in a storage RAID array. LUN Filtering provides a means to control access to data. It can be used to prevent servers from gaining access to restricted data that is stored in the same pool.

Please note that the LUN Filtering function is only accessible via terminal emulation. You can create a **LUN Map** using the pre-assigned HBA WWPN port names.

Consideration:

RAID-based mapping provides access control over a Fibre channel network where:

1. Servers share common storage;
2. File integrity becomes an issue where access contentions might occur;
3. File access must be coordinated among multiple servers.

How does Filtering Work?

The total capacity of a storage pool (a RAID subsystem) can be divided into several portions (logical drives or one of their partitions). Once created, these portions are mapped to different Logical Unit Numbers (LUNs). Servers are able to recognize these numbers and the storage capacity becomes manageable in the context of a LUN map.
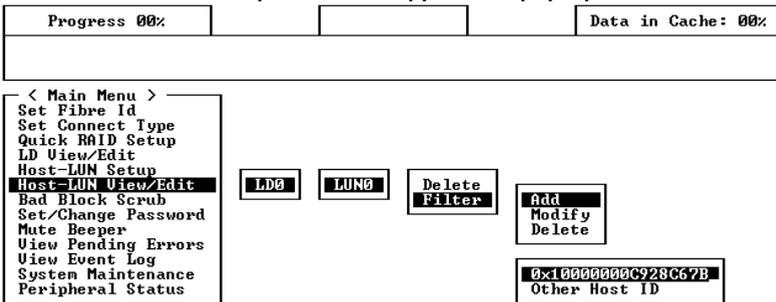
To restrict access to LUNs, Filtering Mask(s) can be appended to the LUNs making specified capacity accessible or inaccessible to one or several servers.

Creating a LUN Map:

1. **Selecting the Host Bus Adapter (HBA) Names**
   The controller can automatically detect the port names of the host adapters. If a host computer is currently powered down, its port names can also be manually added.

   Select "**Host-LUN View/Edit**" from the main configuration menu. Select a previously configured logical drive, and then choose a LUN number. LUN numbers can be added from the "Host-LUN Setup." Select "Filter" then "Add" or "Modify." The port names of the connected host adapters should appear in a pop-up window.

```
┌─────────────────────┬──────────────┬─────────────┬──────────────────────┐
│  Progress 00%       │              │             │  Data in Cache: 00%  │
├─────────────────────┴──────────────┴─────────────┴──────────────────────┤
│                                                                          │
└──────────────────────────────────────────────────────────────────────────┘
┌─ < Main Menu > ──────┐
│  Set Fibre Id        │
│  Set Connect Type    │
│  Quick RAID Setup    │
│  LD View/Edit        │
│  Host-LUN Setup      │      ┌─────┐   ┌──────┐   ┌────────┐
│ ▉Host-LUN View/Edit▉ │      │ LD0 │   │ LUN0 │   │ Delete │   ┌──────────┐
│  Bad Block Scrub     │      └─────┘   └──────┘   │ Filter │   │▉Add▉     │
│  Set/Change Password │                           └────────┘   │ Modify   │
│  Mute Beeper         │                                         │ Delete   │
│  View Pending Errors │                                         └──────────┘
│  View Event Log      │
│  System Maintenance  │                           ┌───────────────────────┐
│  Peripheral Status   │                           │▉0x10000000C928C67B▉    │
└──────────────────────┘                           │ Other Host ID         │
                                                    └───────────────────────┘
```

   Use the arrow keys to select a port name. Press Enter on the port name to continue.

2. **Host Mask Configuration**

The **Host Mask** is used to compose an ID range. The ID range is generated when the Host ID is "AND'ed" with the mask value. It is similar to the way routing tables are setup on a LAN/WAN.

```
┌─────────────────┬──────────┬──────────┬──────────────────────┐
│  Progress 00%   │          │          │  Data in Cache: 47%  │
├─────────────────┴──────────┴──────────┴──────────────────────┤
│                                                              │
├──────────────────────┬───────────────────────────────────────┤
│ ┌ < Main Menu > ─     │   Host ID: 10000000C928C67B          │
│   Set Fibre Id        │   Host Mask: FFFFFFFFFFFFFFFF         │
│   Set Connect Type    │   Filter Type: Include               │
│   Quick RAID Setup    │   Access Mode: Read/Write            │
│   LD View/Edit        │                                      │
│   Host-LUN Setup      │                                      │
│   Host-LUN View/Edit  │   Host Mask: 0x_____         │
│   Bad Block Scrub     │                              ify     │
│   Set/Change Password │                           Delete     │
│   Mute Beeper         │                                      │
│   View Pending Errors │                                      │
│   View Event Log      │             0x10000000C928C67B       │
│   System Maintenance  │             0x10000000C928C67B       │
│   Peripheral Status   │                                      │
└──────────────────────┴───────────────────────────────────────┘
```

In this menu you can configure **Host Mask**, **Filter Type**, and **Access Mode**.

Host Mask: This is a mask value that is "AND'ed" with a HBA port name to produce an ID range. If a default value "0xFFFFFFFFFFFFFFFF" is selected, the ID range will match the HBA's port name, and only this HBA will be given access to the logical drive. "0x" means that all values are presented in hexadecimal format.

Multiple masking values can be associated with a logical configuration of drives.

If, for instance, a value "0xFFFFFFFFFFFFFFFC" is used, and the HBA port name is "0x11111111111111," port names ranging from "0x....1110" to "0x....1113" will fall within the ID range.

Filter Type (Include or Exclude):
An ID range can also be used to exclude certain HBA(s) from accessing the logical drive you selected. Filter type defines any host computer with its port name ID fallen within the ID range as "**Include**(d)" or "**Exclude**(d)" from access to data.

Listed below are the conditions for a port name to be considered as Included in or Excluded from access to data:

- If a port name falls within one or more Include ranges and does not fall in any Exclude range, then it is included.
- If a port name falls within ANY Exclude range no matter if it also falls in another Include range, then it is excluded.
- If a port name falls in none of the ranges and there is at least one Include range specified, then it should be considered as excluded.
- If a port name falls in none of the ranges and only Exclude ranges are specified, then it is considered as included.

Access Mode (**Read Only or Read/Write**):
A LUN map can be setup with a "Read Only" attribute. This option may be set if certain hosts have to read data but are not permitted to change it.

Sample Configuration:
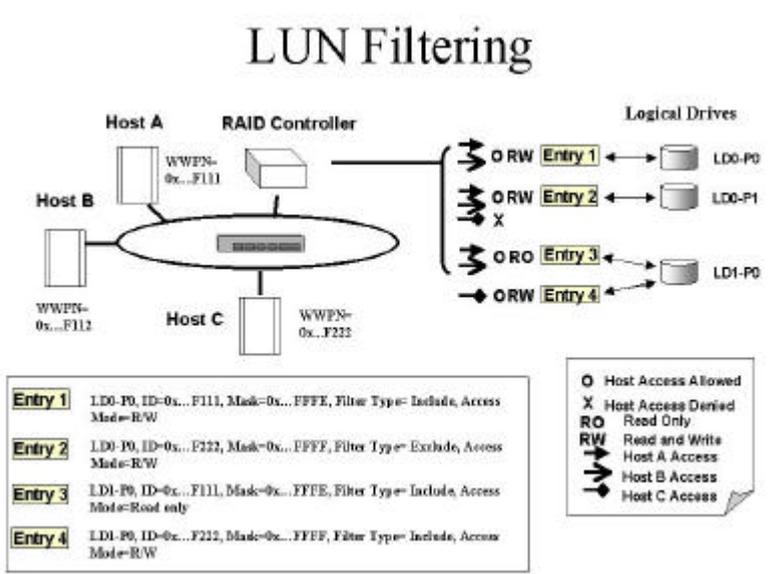
Figure 6- 2 LUN Filtering - Configuration Sample

1. Host HBA port name (WWPN) list:
   Host A = 0x…F111
   Host B = 0x…F112

Host C = 0x…F222

2. Controller Configuration:

- Logical drives are LD0 and LD1. LD0 is partitioned into two: P0 and P1.
- Filter Entry (LUN map) list

Configuration Procedure:

1. Create an entry list for the specific logical unit from "Host LUN View and Edit."

2. Select Host Channel ID, and then select a configured logical unit (a logical drive or one of its logical partitions) to create the entry. The entry submenu will appear.

3. Enter and modify the **Host ID**, **Host Mask**, **Filter Type**, and **Access Mode**.

   The exemplary entry list is shown below. Please refer to the diagram above:

   Entry 1: "LD0-P0, ID=0x…F111, Mask=0x…FFFE, Filter Type = Include, Access Mode = Read/Write." It means Host A and B can read/write P0 of LD0.

   Entry 2: "LD0-P1, ID=0x…F222, Mask=0x…FFFF, Filter Type = Exclude, Access Mode = Read/Write." It means Host A and B can read/write P1 of LD0, but this partition is inaccessible for Host C.
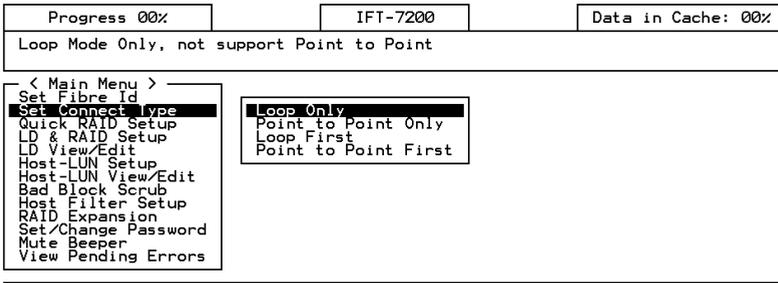
   Entry 3: "LD1-P0, ID=0x…F111, Mask=0x…FFFE, Filter Type = Include, Access Mode = Read Only." It means P0 of LD1 is 'Read Only ' for Host A and B.

   Entry 4: "LD1-P0, ID=0x…F222, Mask=0x…FFFF, Filter Type = Include, Access Mode = Read/Write." It means Host C can read/write P0 of LD1.

Connection Type:

The connection type default is "Loop Only." Do not change this setting unless your subsystem is directly connected to a switch port or to a host computer in a point-to-point topology. Most HBA card support FC-AL mode.

Check the documents that came with your Fibre hub or switch. Some switch OSes may have configuration requirements for its F_port or FL_port settings.

```
┌─────────────────┬─────────────────┬──────────────────────┐
│  Progress 00%   │    IFT-7200     │  Data in Cache: 00%  │
├─────────────────┴─────────────────┴──────────────────────┤
│ Loop Mode Only, not support Point to Point               │
│                                                          │
├──────────────────────────┬───────────────────────────────┤
│┌─ < Main Menu > ─────┐   ┌──────────────────────┐        │
││ Set Fibre Id        │   │ Loop Only            │        │
││ Set Connect Type    │   │ Point to Point Only  │        │
││ Quick RAID Setup    │   │ Loop First           │        │
││ LD & RAID Setup     │   │ Point to Point First │        │
││ LD View/Edit        │   └──────────────────────┘        │
││ Host-LUN Setup      │                                    │
││ Host-LUN View/Edit  │                                    │
││ Bad Block Scrub     │                                    │
││ Host Filter Setup   │                                    │
││ RAID Expansion      │                                    │
││ Set/Change Password │                                    │
││ Mute Beeper         │                                    │
││ View Pending Errors │                                    │
├──────────────────────────────────────────────────────────┤
│                                                          │
```

Appendices

These appendices provide basic information about the IFT-6300 IDE RAID subsystem, some vocabulary assistance to users who are new to RAID, and specifics about how to receive software support and product upgrades.

> **Appendix A :** Specifications (primarily hardware)
> **Appendix B :** Glossary of Terms (primarily RAID-related)
> **Appendix C :** Upgrades and Software Support

A Specifications

Controller
• PowerPC-750 233MHz RISC processor
• 64MB cache memory on SDRAM SODIMM
• 2 independent 33MHz 32/64-bit PCI buses
• Firmware in Flash ROM for easy upgrades

RAID Operation
• RAID level 0, 1(0+1), 3 and 5
• Hot-spare drive operation
• Drive hot-swapping
• Automatic background rebuild
• On-line drive expansion

Drive Interface
• IDE ATA/UDMA-100 (ATA/UDMA-133 applicable)
• 12 hot-swap drive bays and trays
• Support for one inch height form factor

Host Interface
• Ultra160-Wide LVD SCSI, transfer rate up to 160Mbytes/sec or 2Gbit Fibre channel, transfer rate up to 200Mbytes/sec
• Concurrent I/O commands
• Tagged Command Queuing
• Automatic bad-sector reassignment
• Up to 14m cable length *(SCSI model);* Up to 500km *(short wavelength Fibre models)*

Controls / Indicators

- Front LCD control panel for setup and configuration
- 3 drive LED indicators: power, activity, drive fault
- Device failure indication through LCD
- Built-in alarm / Alarm Mute button

Accessories

- External SCSI cable *(SCSI models only)*
- Installed SCSI terminator *(SCSI models only)*
- RS-232 Null Modem port adapter

Management Software

- **RAIDGuide** management software for Windows 2000/NT via In-band Management (SCSI or Fibre)
- Firmware-embedded manager via RS232C (platform independent)

Physical / Electrical

• **Interfaces**	**SCSI** : 68-pin, LVD SCSI host channel		
	Fibre : LC port adapter (short wavelength)		
	All Models : One DB-9 RS-232C serial port (38400, n, 8, 1) for terminal connection		
• **Power Supply**	Two redundant hot-swappable power supplies with PFC		
• **Input**	90~260VAC, 47 to 63 Hz		
• **Output**	@12V (25A max.), 5V (20A max.), 350Watts in max for combined output power		
• **Cooling Fan**	Two cooling fans in two separate modules, one is 12cm, the other is 9.2cm, ball bearing for both, 12V DC in, thermal variable speed		
		9.2cm	12cm
	Rated current	0.23A	0.41A
	Max. airflow	72.2CFM	44CFM
	Rated speed	2600RPM	2250RPM
	Acoustic noise	35dBA	36.8dBA
	Measured when operating at 30ºC		

•	**Operating Temp.**	5 to 40ºC
•	**Relative Humidity**	10-95%, non-condensing
•	**Altitude**	Sea level to 10,000 ft
•	**Body Dimension**	3U x 16.8W x 24.4D inches

B *Glossary*

ATA **AT A**ttachment – ATA is a disk drive implementation that integrates the controller on the disk drive itself. Also known as IDE, straight ATA supports one or two hard drives and a 16-bit interface.

ATA-100 Also known as DMA-100, this is a version of ATA with throughput at 100 MBps.

ATA-133 Also known as UDMA-133, this is a new version of ATA that increases ATA's throughput to 133 MBps.

EIDE **E**nhanced **IDE** – one version of the IDE mass storage device interface standard developed by Western Digital. It supports data rates of between 4 and 16.6 MBps. EIDE is sometimes referred to as Fast ATA or Fast IDE, which are all essentially the same standard. It is also sometimes called ATA-2.

FC-AL **F**ibre **C**hannel-**A**rbitrated **L**oop – a high bandwidth, full duplex mass storage data transfer standard for use over optical cable.

HBA **H**ost-**B**us **A**dapter – an HBA is a device that permits a PC bus to pass data to and receive data from a storage bus (such as SCSI or fibre channel).

Host A computer, typically a server, which uses a RAID system (internal or external) for data storage.

IDE Abbreviation of either **I**ntelligent **D**rive **E**lectronics or **I**ntegrated **D**rive **E**lectronics. An IDE interface is an interface for mass storage devices, in which the controller is integrated into the disk drive. Although the term actually refers to a general technology, most people use it to refer the ATA specification. Refer to ATA for more information.

In-Band SCSI or **Fibre** (sometimes "in-band" or "In-band" and also known as "In-band Management") A means

whereby RAID management software can use SCSI or Fibre Channel cabling and protocols to manage a controller. (Note: in-band management is typically used in place of RS-232 for controller management.)

JBOD   **J**ust a **B**unch **o**f **D**rives – non-RAID use of multiple hard disks for data storage.

JRE   **J**ava **R**untime **E**nvironment – the Solaris Java program used to run .JAR applications locally or over a network or the internet.

LUN   **L**ogical **U**nit **N**umber **–** A 3-bit identifier used on a SCSI bus to distinguish between up to eight devices (logical units) with the same SCSI ID.

Mapping   The assignment of a protocol or logical ID to a device for purposes of data storage, data transfer, or device management.

Mirroring   A form of RAID where two or more identical copies of data are kept on separate disks. Used in RAID 1.

NRAID   **N**on **RAID**

Parity   Parity checking is used to detect errors in binary-coded data. The fact that all numbers have parity is commonly used in data communications to ensure the validity of data. This is called parity checking.

RAID   Redundant Arrays of Independent Disks (Originally "Redundant Arrays of Inexpensive Disks"). The use of two or more disk drives instead of one disk, which provides better disk performance, error recovery, and fault tolerance, and includes interleaved storage techniques and mirroring of important data.

SCSI   **S**mall **C**omputer **S**ystems **I**nterface (pronounced "scuzzy") – a high-speed interface for mass storage that can connect computer devices such as hard drives, CD-ROM drives, floppy drives, and tape drives. SCSI can connect up to sixteen devices.

Spare (Local / Global) A drive designation used in RAID systems for drives that are not used but are instead "hot-ready" and used to automatically replace a failed drive. RAIDs generally support two types of spare, Local and Global. Local spares only replace drives that fail in the same logical drive. Global spares replace any drive in the RAID that fails.

Stripe A contiguous region of disk space. Stripes may be as small as one sector or may be composed of many contiguous sectors.

Striping Also called RAID-0. A method of distributing data evenly across all drives in an array by concatenating interleaved stripes from each drive.

Ultra-ATA Also called Ultra-DMA, ATA-33, and DMA-33, this ATA standard supports multiword DMA mode 3 running at 33 MBps.

WWNN **W**orld **W**ide **N**ode **N**ame – a unique 64-bit identifier assigned to fibre devices to distinguish them from all other fibre devices.

WWPN **W**orld **W**ide **P**ort **N**ame – a unique identifier assigned to fibre devices to help distinguish them from all other fibre devices.

C   Updates and Upgrades

Java Runtime Environment

JRE (Java Runtime Environment) is a shareware product from Sun/Solaris. Two websites that may be of use relative to JRE are: The main Java website URL:

java.sun.com

The JRE download website URL:

www.sun.com/software/solaris/jre/download.html

Software and Firmware Updates

Infortrend will provide RAIDGuide and controller firmware updates periodically via our distributors and sales offices.

Uninstalling RAIDGuide

RAIDGuide agents and RAIDGuide Manager can be uninstalled. Choose the Uninstall icon in the RAIDGuide group.

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