# Promise SuperTrak EX8350
Disk Array Controller (SATA2)

User's Guide

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Preface

Congratulations for your purchase of the Disk Array Controller.

The User's Guide describes how to install and use the Promise Disk Array Controller (SATA2) correctly and safely. Read the guide thoroughly before handling it. In addition, refer to this manual when you want to know how to use it or some malfunction occurs. Always keep the manual at hand so that you can see it as soon as possible if necessary.

For the server in which the disk array controller is installed, refer to the User's Guide of the server. Read "Notes on Use" carefully before handling the disk array controller.

⚠ NOTES ON USE - Always read the Notes -

The following includes information necessary for proper and safe operation of the product.

SAFETY INDICATIONS

In the User's Guide, "WARNING" or "CAUTION" is used to indicate a degree of danger. These terms are defined as follows:

⚠ WARNING Indicates the presence of a hazard that may result in death or serious personal injury.

⚠ CAUTION Indicates the presence of a hazard that may cause minor personal injury, including burns, or property damage.

Precautions against hazards are presented with the following symbols. The individual symbols are defined as follows:

			(Example)
⚠	Attention	This symbol indicates the presence of a hazard. An image in the symbol illustrates the hazard type.	Precaution against electric shock
🚫	Prohibited Action	This symbol indicates prohibited actions. An image in the symbol illustrates a particular prohibited action.	Prohibition of disassembly
⬤	Mandatory Action	This symbol indicates mandatory actions. An image in the symbol illustrates a mandatory action to avoid a particular hazard.	Unplug the power cord!

Symbols Used in This Manual and Warning Labels

Attentions

⚠	Indicates a general notice or warning that cannot be specifically identified.
⚡	Indicates that improper use may cause an electric shock.
♨	Indicates that improper use may cause personal injury.
🔥	Indicates that improper use may cause fumes or fire.

Prohibited Actions

🚫	Indicates a general prohibited action that cannot be specifically identified.
🚫	Do not disassemble, repair, or modify the server. Otherwise, an electric shock or fire may be caused.

Mandatory Action

🔌	Unplug the power cord of the server. Otherwise, an electric shock or fire may be caused.
❗	Indicates a mandatory action that cannot be specifically identified. Make sure to follow the instruction.

Safety Indications

This section provides notes on using your product safely. Read this section carefully to ensure proper and safe use of the product. For symbols, see "SAFETY INDICATIONS" provided earlier.

General

⚠ WARNING

	Do not use the product in life-critical applications or applications requiring high reliability.
	The product is not intended for integration with or control of facilities or equipment that may affect human life or that require a high degree of reliability, such as medical equipment, nuclear power facilities or instruments, aerospace instruments, transportation facilities or instruments. NEC does not assume any liability for accidents resulting in injury or death, or for any damages to property that may occur as a result of using the product in such facilities, equipment, or control systems.
	Do not use the server if any smoke, odour, or noise is present.
	If smoke, odour, or noise is present, immediately turn off the server and disconnect the power plug from the AC outlet, then contact your service representative. Using the server in such conditions may cause a fire.
	Keep needles or metal objects away from the server.
	Do not insert needles or metal objects into ventilation holes or cartridge slot of the server. Doing so may cause an electric shock.

⚠ CAUTION

	Keep water or foreign matter away from the server.
	Do not let any form of liquid (water etc.) or foreign matter (e.g., pins or paper clips) enter the server. Failure to follow this warning may cause an electric shock, a fire, or a failure of the server. When such things accidentally enter the server, immediately turn off the power and disconnect the power plug from the AC outlet. Do not disassemble the server. Contact your service representative.

Power Supply and Power Cord Use

	⚠ CAUTION
	Disconnect the power cord(s) before installing or removing the product in/from the server.
	Make sure to power off the server and disconnect the power cord(s) from a power outlet before installing/removing the product in/from the server, or connecting with the peripheral devices. All voltage is removed only when the power cords are unplugged.
	Do not use any damaged cable.
	Make sure the cable condition before connection. Using the damaged connector, bent connector pin, or dirty connector may cause a fire due to short-circuit.
	Do not hold the power plug with a wet hand.
	Do not disconnect/connect the plug while your hands are wet. Failure to follow this warning may cause an electric shock.
	Do not pull the cable when disconnecting the power cord.
	When disconnecting the power cord from the server, hold the plug and pull it straight out. Pulling the cord out by the cable portion could damage the cable to result in an electrical shock hazard or a fire.

Installation, Relocation, Storage, and Connection

	⚠ **CAUTION**
	Do not connect any interface cable with the power cord of the server plugged to a power source. Make sure to power off the server and unplug the power cord from a power outlet before connecting/disconnecting any interface cable to/from the server. If the server is off-powered but its power cord is plugged to a power source, touching a cable or connector may cause an electric shock or a fire resulted from a short circuit.
	Do not use any unauthorized interface cable. Use only interface cables authorized by NEC and locate a proper device and connector before connecting a cable. Using an unauthorized cable or connecting a cable to an improper destination may cause a short circuit, resulting in a fire. Also, observe the following notes on using and connecting an interface cable. ■ Do not step on the cable. ■ Do not place any object on the cable. ■ Do not use the server with loose cable connections. ■ Do not use any damaged cable connector. ■ Make sure the cable is securely locked with screw.
	Do not use or store the product in the place where corrosive gases exist. Make sure not to locate or use the server in the place where corrosive gases (sulphur dioxide, hydrogen sulphide, nitrogen dioxide, chlorine, ammonia, ozone, etc) exist. Also, do not install it in the environment where the air (or dust) includes components accelerating corrosion (ex. sulphur, sodium chloride) or conductive metals. There is a risk of a fire due to corrosion and shorts of an internal printed board. Consult with your service representative for the location appropriate to the server.
	Avoid installation in extreme temperature conditions. Immediately after the server is powered off, its internal components such as hard disk drives are very hot. Leave the server until its internal components fully cool down before installing/removing any component.

Cleaning and Working with the Product

⚠ WARNING
Do not disassemble, repair, or alter the server. Never attempt to disassemble, repair, or alter the product on any occasion. Failure to follow this instruction may cause an electric shock or fire as well as malfunctions of the product. **Disconnect the power plug before accessing inside the server.** Make sure to power off the server and disconnect the power plug from an AC outlet before accessing inside the server. Touching any internal device of the server with its power cord connected to a power source may cause an electric shock even if the server is off-powered.

⚠ CAUTION
Make sure to complete installation. Always connect the DC cable and/or interface cable firmly. An incompletely connected cable may cause a contact failure, resulting in smoking or fire.

During Operation

⚠ CAUTION
Avoid contact with the server during thunderstorms. Disconnect the power plug from the outlet when a thunderstorm is approaching. If it starts thundering before you disconnect the power plug, do not touch any part of the server containing the product. Failure to follow this warning may cause an electric shock. **Keep animals away from the server.** Keep animals away from the server containing the product. Pet's discharges or fur may enter the server and cause a fire or electric shock. **Do not use a cellular phone or a pager around the server.** Turn off the cellular phone or pager near the server containing the product. Radio interference may cause malfunctions of the server.

This Manual

The guide is intended for persons who are familiar with operating systems including Windows and fundamental operations of general-purpose I/O devices including the keyboard and mouse.

Text Conventions

The following conventions are used throughout this User's Guide. For safety symbols, see "SAFETY INDICATIONS" provided earlier.

Notice   Items to be observed or points to be noted when operating the product.

Check   Items to be checked when operating the product

Tips   Information useful or convenient for you

In the Package

The carton contains various accessories, as well as the product itself. See the packing list to make sure that you have everything and that individual components are not damaged. If you find any component missing or damaged, contact your sales agent.

Transfer to Third Party

Make sure to provide this manual along with the product to a third party.

About data on the hard disk

Be sure to take appropriate measures not to leak important data (e.g., customers' information or companies' management information) on the removed hard disk to any third parties.

Data seems to be erased when you empty "Recycle Bin" of Windows or execute the "format" command of the operating system. However, the actual data remains written on the hard disk. Data not erased completely may be restored by special software and used for unexpected purposes.

It is strongly recommended that the software or service (both available at stores) for data erasure should be used in order to avoid the trouble explained above. For details on data erasure, ask your sales representative.

NEC assumes no liability for data leakage if the product is transferred to third party without erasing the data.

To transfer or sell any software application that comes with the product to a third party, the following requirements must be satisfied:

All provided software applications must be transferred and no backup copies must be retained.
Software applications must be uninstalled before transferring the product.

Disposal

Dispose of the product according to all national laws and regulations.

It is the user's responsibility to completely erase or modify all the data stored in storage device such as hard disk, backup data cartridge, floppy disk, or any other media (CD-R/CD-RW) so that the data cannot be restored.

Data Backup

The device failure due to shock or thermal changes, as well as operator's misconduct, may cause loss of data. To avoid loss of data, we recommend that you should make a back-up copy of your valuable data on a regular basis.

Transportation

To transport the product, remove the product from the server and put it in the shipping carton along with accessories according to Chapter 1.

Maintenance Parts

The holding period of maintenance parts of the BBU is five years from the truncation of manufacturing.

Abbreviations

Formal title	Abbreviation
Disk Array Controller (SATA2) User's Guide	this manual
Disk Array Controller (SATA2)	disk array controller or card
Additional DAC Battery	additional battery
SATA2 HDD Cage	additional HDD cage
Web-based Promise Array Manager	WebPAM
Operation System	OS
Hard disk drive	HDD

Contents

Chapter 1 - Overview

Read this chapter first if you use the disk array controller for the first time.

This chapter describes the notes you should always follow while you use the disk array controller, the features of the disk array controller, and the hardware setup.

1. Notes on Use - Always Follow These Notes -

Follow the notes described below to allow you to use the disk array controller safely.

1-1. Installing Operating System

To install an operating system (called OS hereafter), see the online manual " Disk Array Controller (SATA2) Software User's Guide" saved in the "SATA2 Array Management Software" CD-ROM coming with the card.

1-2. Installing WebPAM

Install the Web-based Promise Array Manager (called WebPAM hereafter), management utility which manages the disk array controller on OS. The installation of WebPAM allows you to perform the following operations:

- Events and errors occurred on array system can be registered in the event log and used effectively for troubleshooting and diagnosis.
- WebPAM event information can be monitored by using ESMPRO.
- Manual rebuild, media patrol, and/or synchronization can be executed and scheduled.

For the installation of WebPAM, refer to the "Web-based Promise Array Manager User's Guide" in SATA2 Array Management Software CD-ROM that comes with the product.

1-3. Notes on Using RAID10

The RAID10 of this controller is equivalent to RAID 0+1 level of other disk array controller. See "RAID10" in Chapter 2 for details.

1-4. Preventive Maintenance by Media Patrol and Synchronization

Routine Media Patrol or Synchronization is recommended as the preventive maintenance against subsequent defects of hard disk drives (called HDDs hereafter). These features allow subsequent defects of HDDs to be found and repaired as soon as possible. Both the features can be performed routinely by using the WebPAM scheduling feature.

For the detailed features of Media Patrol and Synchronization, see "Chapter 3 Features of Disk Array Controller".

The recommended scheduling interval is once per week. Depending on the operation status of your system, the scheduling interval should be at least once per month.

✔ **Check**	■ To use the Media Patrol and Synchronization, WebPAM must be installed. ■ By shipping default, the media patrol is scheduled to be executed on every Wednesday at 0:00 for all the HDDs. You may change the schedule according to your operating condition. ■ A "free" disk cannot be subject to media patrol. Thus it is recommended to define a "free" disk as a hot-spare disk. Note, however, the disk which has previously been configured as logical drive, can be subject to media patrol even if it is in "free" status.

2. Specification

Item		Specification	Remarks
Number of SATA connectors		8 internal ports	SATA Signal: 7pin
Cache size		128 MB	
PCI connector		PCI-Express (x4)	
Maximum PCI bus transfer rate		1 GB/sec	
Device interface		Serial ATA II (expanded SATA 1.0) supported	
Maximum data transfer rate		300 MB/sec	
RAID level		0, 1, 5, or 10	
Maximum number of cards installed in server		1	
Maximum number of connectable HDDs		4	1 HDD connected per port
Maximum number of logical drives		4	
Outer dimension	With full-height PCI bracket	121 (width) x 180 (length) x 22 (height) mm	
	With low-profile PCI bracket	81 (width) x 180 (length) x 22 (height) mm	
Weight		Approx. 0.12 kg	
Operating voltage		3.3 V	
Power consumption (max.)		20.3 W	3.3V/1.472A 12V/1.288A
Operating environment		Temperature: 10ºC to 35ºC Humidity: 20% to 80%	Without condensation

3. Disk Array Controller Features

The disk array controller is equipped with eight ports of interface connectors conforming to Serial-ATA II (expanded SATA 1.0). The data transfer rate per port is up to 3000 MB/sec. The card realizes low cost and high performance.

The card can be connected to an additional battery to operate in the WriteBack mode, which can improve the access performance further. In addition, the card can be connected to an additional HDD cage to provide the hot-swap feature.

Features of disk array controller

- Data transfer rate of up to 300 MB/sec
- Installation of 128 MB SDRAM
- Up to 4 SATA HDDs connectable per board (1 HDD connectable per port)
- Support of RAID levels 0, 1, 5, and 10
- Operation in WriteBack mode enabled by connection of additional battery
- Report monitoring with use of ESMPRO enabled by installation of WebPAM
- Automatic detection of fault drive
- Replacement of defected HDD enabled without system shutdown (hot-swap)
- Warning by beep available
- Low-profile board available

Notice
- The card does not support the PCI hot plug feature.
- Ports 5 to 8 are not available.
- The hot swap feature is available only when the card is connected with the additional HDD cage or the server that supports hot swap feature.

Tips
The card can be connected with the following additional HDD cages:
- SATA2 HDD cage

4. Names and Functions of Sections

This section describes the sections on the card.

(Front view)
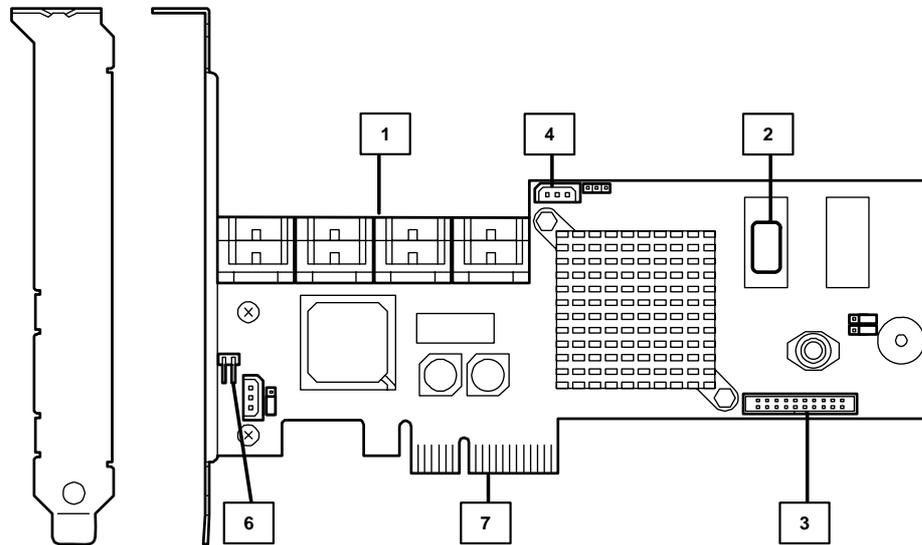
(Rear view)
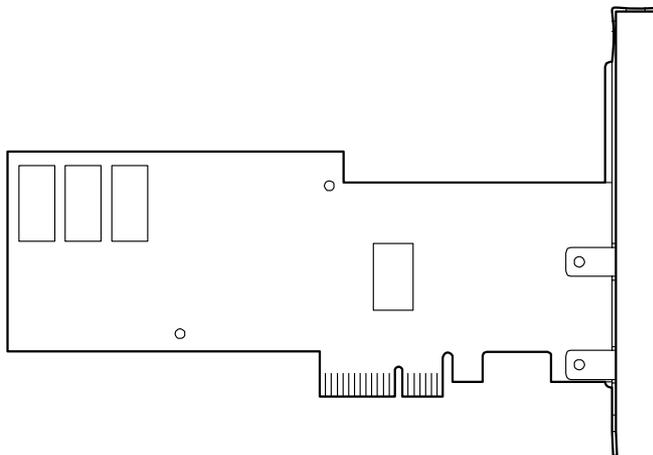
1 Ports 1 to 8

These channels allow the card to be connected to SATA devices. Port numbers 1 to 4 are available on this controller.

Port 1 Port 2 Port 3 Port 4

Port 5 Port 6 Port 7 Port 8
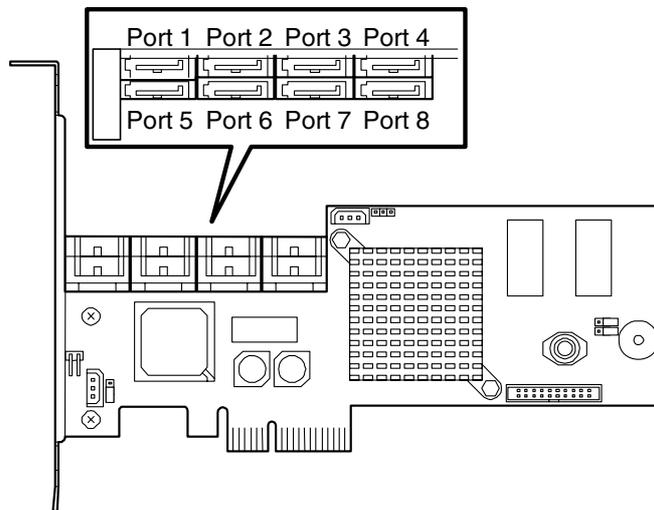
2 HW label

Indicates the management revision of the card.

REV
XXX
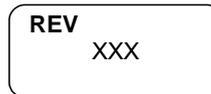
3 Additional battery connector

The connector allows the card to be connected to an additional battery.

4 I2C connector

The connector is connected with an I2C cable.

6 HDD LED connector

The connector allows the card to be connected to the motherboard in the server in order to light the DISC ACCESS lamp on the server.

7 PCI connector (PCI Express supported)

The connector allows the card to be connected to a PCI slot (or PCI Express slot) in the server.

5. Hardware Setup

Install the disk array controller in a server in the following procedure.

✔ Check Before the installation, always refer to the User's Guide of the server. The job flow varies depending on the server type, device configuration, and existence of additional HDD cage. Check the server type and device configuration before the installation to follow the correct flow.

```
┌─────────────────────────────────────────┐
│              Start setup                 │
└─────────────────────────────────────────┘
                     ↓
┌─────────────────────────────────────────┐
│           Prepare for setup.             │
└─────────────────────────────────────────┘
                     ↓
┌─────────────────────────────────────────┐
│       Select and install bracket.        │
└─────────────────────────────────────────┘
                     ↓
┌─────────────────────────────────────────┐
│      Install the disk array controller   │
│   (with connection of additional battery).│
└─────────────────────────────────────────┘
                     ↓
┌─────────────────────────────────────────┐
│       Connect LED and SATA cables.        │
└─────────────────────────────────────────┘
                     ↓
┌─────────────────────────────────────────┐
│      Install additional HDD cage. (*)     │
└─────────────────────────────────────────┘
                     ↓
┌─────────────────────────────────────────┐
│            Form SATA cable.              │
└─────────────────────────────────────────┘
                     ↓
┌─────────────────────────────────────────┐
│         Connect I2C cable. (*)            │
└─────────────────────────────────────────┘
                     ↓
┌─────────────────────────────────────────┐
│              End setup.                  │
└─────────────────────────────────────────┘
```
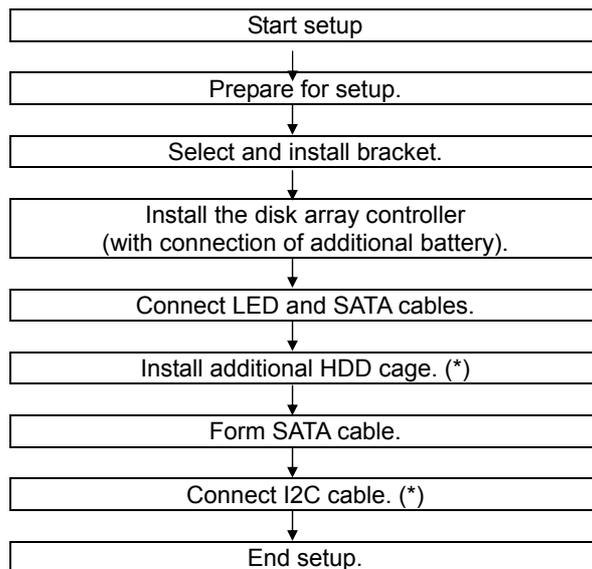
(*) These steps are not required if the additional HDD cage is not installed.

5-1. Preparing for Setup

Notice Note the following before the setup.
- Only a single disk array controller can be installed in a server.
- Some limitation may be imposed to the installation on the PCI (or PCI Express) slot depending on the type of the server. Before the installation, check the limitation following the User's Guide of the server.
- HDDs to be connected to the card should have the same specification. Contact your service representative for HDDs which can be connected to the card.
- The card may coexist with other PCI boards (including disk array controller, mirroring board, and SCSI controller) only limitedly. Before using the card together with other PCI boards, ask your service representative whether the card can coexist with the other PCI boards.

1. Exit from all application programs and shutdown OS.

2. Press the POWER switch on the server to turn off the power of the server.

3. Pull out all the power cords connected to the power unit of the server from the receptacles.

4. Remove the side cover on the server following the procedure described in the User's Guide of the server.

✔ Check For the installation or removal of the side cover and other components on the server, refer to the User's Guide of the server.

5-2. Selecting and Installing Bracket

The card is shipped with factory-installed full-height PCI bracket. To install the card on a low-profile PCI slot, the full-height PCI bracket should be replaced with the low-profile PCI bracket.

1. Remove the screws (2) fixing the full-height PCI bracket to the card.

2. Remove the full-height PCI bracket.

3. Install the low-profile PCI bracket on the card.

4. Secure the low-profile PCI bracket with the screws (2) removed in step 1.

Full-height PCI bracket
Low-profile PCI bracket
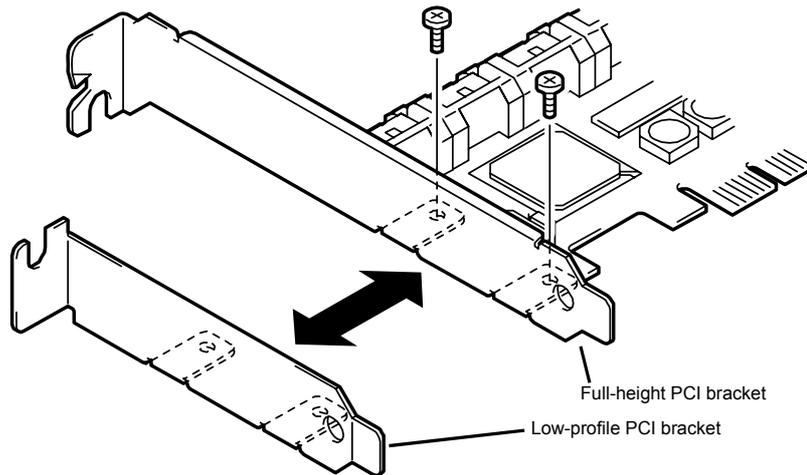
Tips Use the similar procedure to replace the low-profile PCI bracket with the full-height PCI bracket.

5-3. Installing the Disk Array Controller

1. Locate the PCI (or PCI Express) slot in which the disk array controller will be installed and remove the additional slot cover.

Notice
- Keep the removed additional slot cover for future use. The removed screw will be used to install the card. Do not lose them.
- The card does not support the PCI hot-plug feature. Before installing or removing the card from the server, always power off the server and pull out the power cord from the receptacle.

Check Some limitation may be imposed to the installation on the PCI (or PCI Express) slot depending on the type of the server. Before the installation, check the limitation following the User's Guide of the server.

2. Insert the card into the PCI (or PCI Express) slot securely and fix it. To fix the card with screws, use the screw removed from the additional slot cover.
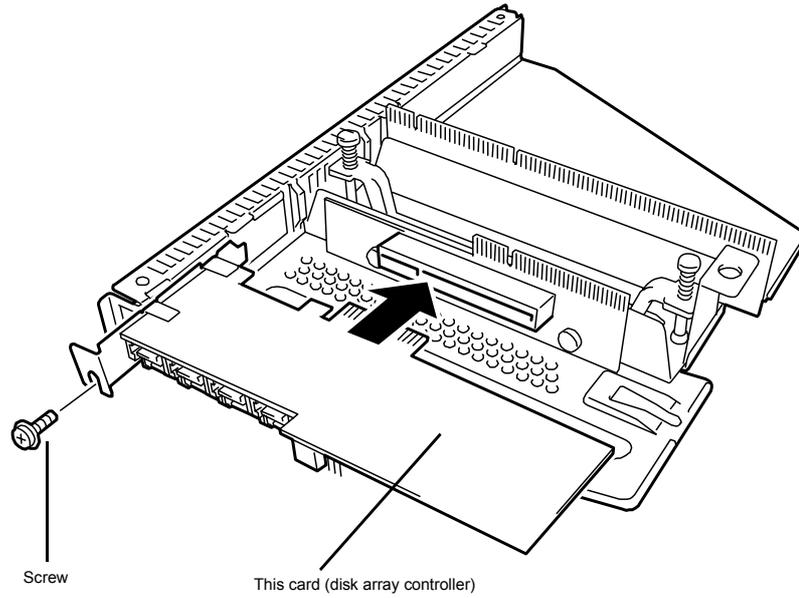
Installation example: Rack-mount model
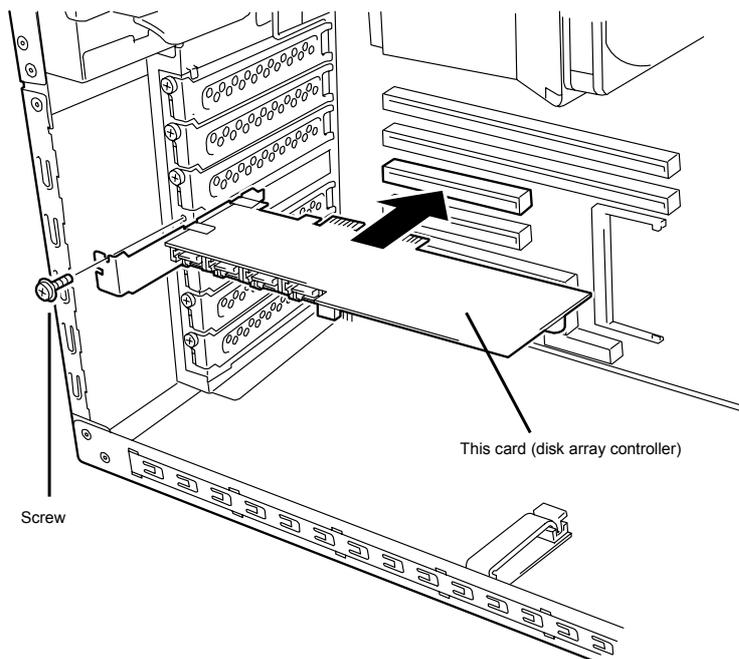
Installation example: Tower model

To connect an additional battery to the card, install the battery in the same procedure.

Notice
- When the card cannot be inserted into the PCI (or PCI Express) slot well, pull it out once and insert it again. Note that the card may be damaged if excess force is given to it.
- For details of how to install the additional battery, refer to the User's Guide of the Battery Backup Unit.

5-4. Connecting LED and SATA Cables

Connect the LED cable coming with the server to the HDD LED connector. For the connection, see the figure and the connection table below. For the connection to the motherboard, refer to the User's Guide of the server. If it is hard to connect the LED cable, pull out the card from the PCI (or PCI Express) slot once and connect the cable to the card.

Next, connect a SATA cable to the SATA connector on the card. The port number of the SATA cable should be the same as that of the card.

Connect the black cable to this pin.

Connect the red cable to this pin. (This is not used for a single-line LED cable.)

HDD LED connector

LED cable

SATA cable
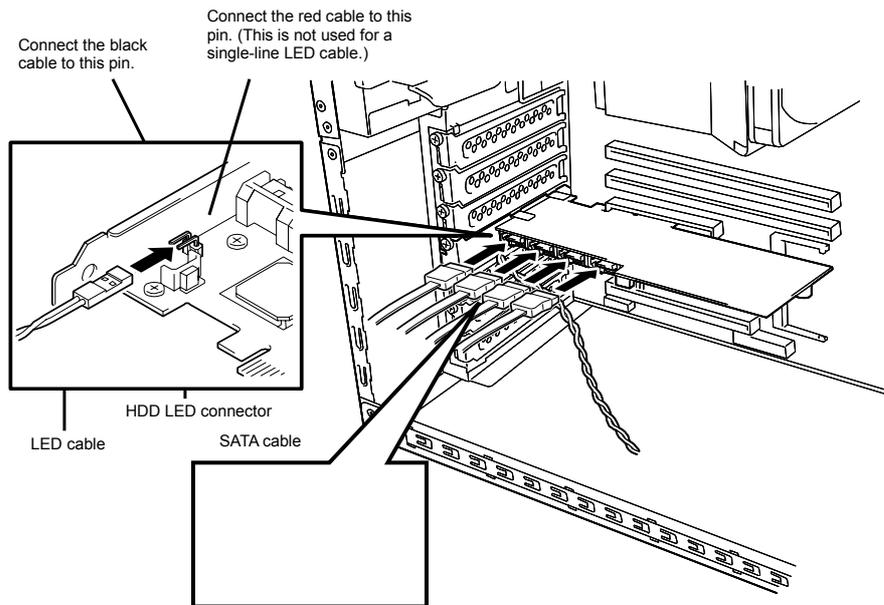
LED cable connection table

		LED cable (coming with server)	
		2-line cable	**1-line cable**
HDD LED connector	Pin 1	Connected with black cable	Connected with black cable
	Pin 2	Connected with red cable	Not used

Notice

- Depending on the type of the server, the LED cable has two lines or only a single line.
- To use the SATA2 HDD Cage, connect the SATA cable coming with the cage to the card. For the detailed connection, refer to the User's Guide of the additional HDD cage.
- To connect with the rack-mount type server, use the SATA cable coming with the server. Refer to the User's Guide of the server for details.

5-5. Installing Additional HDD Cage

To install an additional HDD cage in the server, see the procedure described in the User's Guide coming with the additional HDD cage.

5-6. Connecting I2C Cable

To use the additional HDD cage, connect the card to the cage through the I2C cable coming with the card. Connect the 3-pin connector (white) of the I2C cable to the I2C connector on the card and the 4-pin connector (black) to the backplane of the server or the additional HDD cage. For the mating connector on the additional HDD card or the server, refer to the User's Guide of the additional HDD cage or the server.

I2C connector

To additional HDD cage

3-pin connector (white)
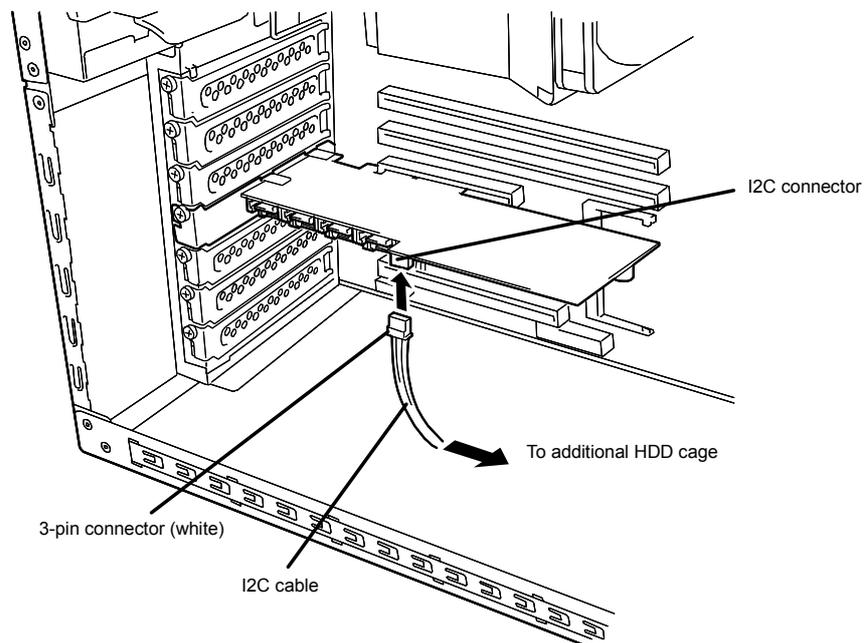
I2C cable

5-7. Forming Cables

To fix the SATA and I2C cables appropriately, form the cables in the following procedure.

1. Attachment of cable clamp

Attach the cable clamp coming with the card on the server. Attach the cable clamp at an arbitrary position where cables can be fixed securely. Some servers do not have any area available for the attachment of the cable clamp. If so, bundle cables so that they may not be disordered.

Cable clamp

Bottom plate of chassis of server
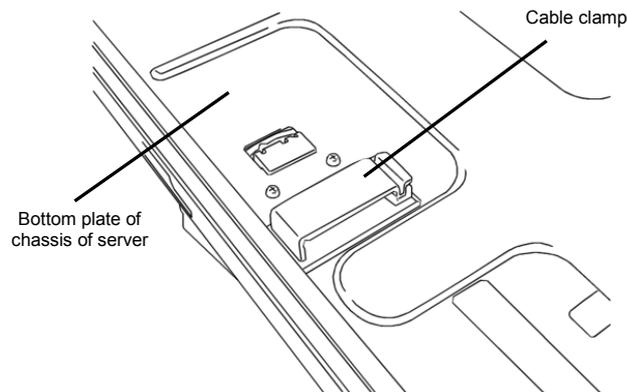
Check
- Before attaching the cable clamp on the server, wipe the area where the cable clamp will be attached with dry cloth.
- Some servers require their accessories to be used instead of the cable clamp coming with the card. For details, refer to the User's Guides of the servers.

2. Cable forming

Release the lock of the cable clamp. Bundle the cables to fix them.

SATA cable

LED cable

Cable clamp

I2C cable
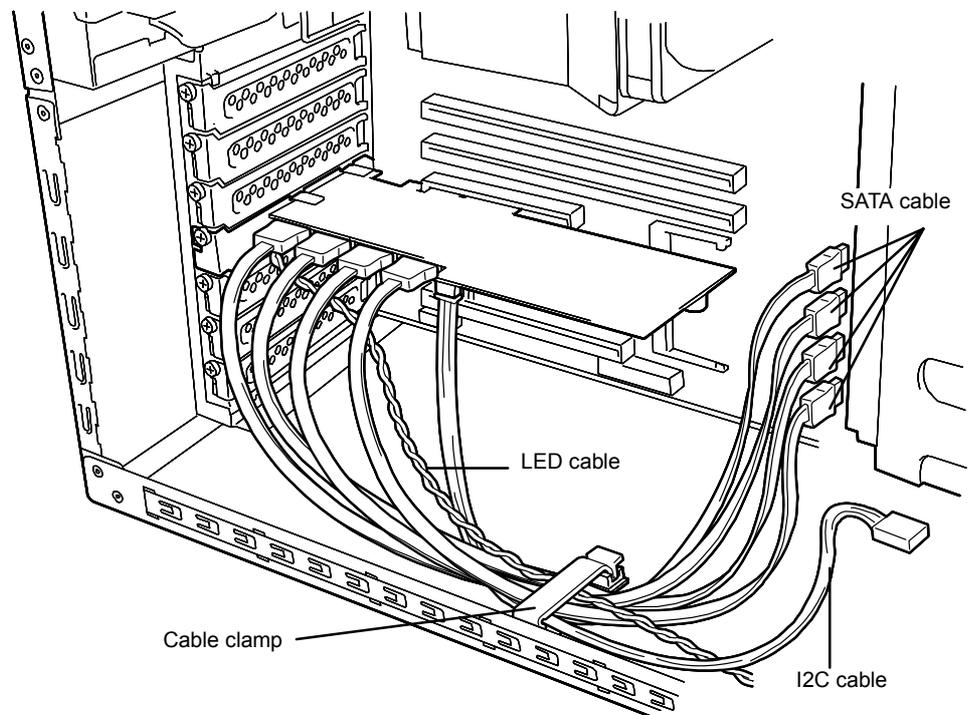
Notice
After forming the SATA cable, make sure that the cable is not loose and inserted to the mating connector straight.

Chapter 2 - RAID

This chapter describes the RAID features which the disk array controller supports.

1. Overview of RAID

1-1. What is RAID (Redundant Array of Inexpensive Disks)?

RAID is an abbreviation for "Redundant Array of Inexpensive Disks". The RAID technology allows more than one hard disk drive (HDD) to be handled collectively.

In actual, RAID can configure more than one HDD as a single array (logical drive) to operate the HDDs effectively. This can bring higher performance than a single HDD of a large capacity.

For the array (logical drive) configuration, the host computer recognizes more than one HDD as if it were a single HDD. The host computer accesses to more than one HDD configuring an array (logical drive) in parallel.

Some RAID levels can recover data from remaining data and parity by using rebuild feature if an error occurs in an HDD. This can provide high reliability for the system.

1-2. RAID Levels

The record mode enabling the RAID feature includes several levels. Among the levels, the disk array controller supports the following levels; RAID 0, RAID 1, RAID 5, and RAID10. The number of HDDs required to create a logical drive varies depending on the RAID level as shown in the table below.

RAID level	Number of required HDDs	
	Min.	Max.
RAID 0	1	4
RAID 1	2	2
RAID 5	3	4
RAID 10	4	4

For details of the RAID levels, see "2. RAID Levels" described later in this chapter.

Tips

1-3. Logical Drive

A logical drive is configured with a group of more than one HDD. It is recognized as a physical drive by OS. Up to eight logical drives are permitted by the card when four HDDs are installed in the server.

The figure below shows a sample configuration in which the disk array controller is connected with four HDDs, three of which create a logical drive and the remaining HDD is set to a single hot-spare disk.

Disk array controller

Logical drive 1

Channel 1
(Port 1)

LD 1-1

Channel 2
(Port 2)

LD 1-2

Channel 3
(Port 3)

LD 1-3

LD x-x : HDDs assigned to
          logical drive
Spare :   Hot-spare disk

Channel 4
(Port 4)

Spare
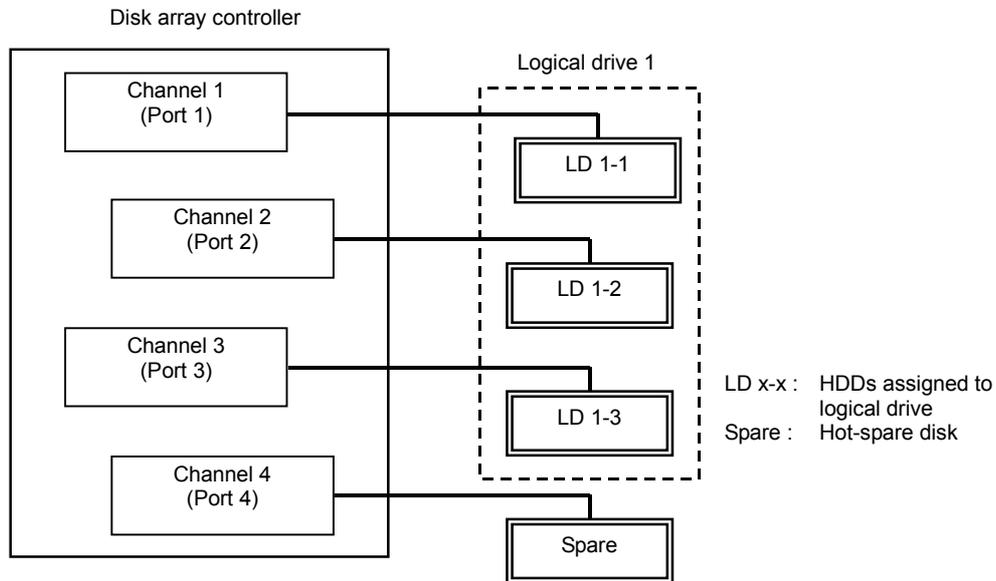
1-4. Parity

The parity means redundant data. A single set of redundant data is created from the data saved in more than one HDD.
The created redundant data is used for data recovery when a HDD is defected.

1-5. Hot-Swap

The hot-swap enables a HDD to be removed (replaced) under system operation.

✔
Check

For the hot-swap with the card, an additional HDD cage must be connected to the card.

1-6. Hot-Spare Disk

The hot-spare disk is prepared as an auxiliary HDD substituting for a defected HDD included in a logical drive which is configured at a redundant RAID level. Detecting a HDD fault, the system disconnects the HDD (or makes it offline) and starts rebuild using the hot-spare disk. The hot-spare disk can be set in two types as listed in the table below.

Setting	Feature
Global Spare	Available as a hot-spare disk if a HDD in any logical drive is defected.
Dedicated Spare	Available as a hot-spare disk only if a HDD in the specified logical disk is defected.

Check

To assign a hot-spare disk, WebPAM, the management utility of the card, must be installed.

Tips

For standby rebuild, or rebuild using hot-spare disks, see "Chapter 3   - Disk Array Controller Features ".

"Free" disk

A "free" disk (non-configured disk not assigned to a logical drive and hot-spare disk) can substitute for defected HDD in the similar way as a global spare. In the configuration including both hot-spare and "free" disks, the hot-spare disks are used preferentially.

However, "free" disks cannot be subject to media patrol. Thus it is recommended to define "free" disks as hot-spare disks.

Check

The disk which has previously been configured as logical drive can be subject to media patrol even if it is in "free" status.

2. RAID Levels

This section details the RAID levels which the disk array controller can support.

2-1. Characteristics of RAID Levels

The table below lists the characteristics of the RAID levels.

Level	Function	Redundancy	Characteristics
RAID0	Striping	No	Data read/write at the highest rate Largest capacity Capacity: (capacity of single HDD) × 　　(number of HDDs)
RAID1	Mirroring	Yes	Two HDDs required Capacity: capacity of single HDD
RAID5	Striping of both data and redundant data	Yes	Three or more HDDs required Capacity: (capacity of single HDD) × 　　((number of HDDs) - 1)
RAID10	Combination of striping and mirroring	Yes	Four HDDs required Capacity: (capacity of single HDD) × 2

2-2. RAID0

In RAID 0, data to be recorded is distributed to HDDs. The mode is called "striping".

In the figure below, data is recorded in stripe 1 (disk 1), stripe 2 (disk 2), and stripe 3 (disk 3)… in the order. Because RAID0 allows all HDDs to be accessed collectively, it can provide the best disk access performance.

Notice RAID 0 does not have data redundancy. If a HDD is defected, the data saved in the HDD cannot be recovered.
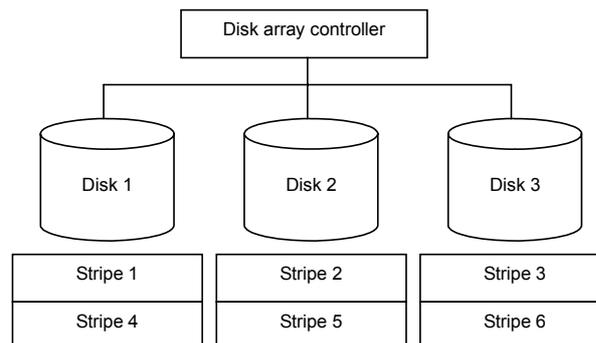
2-3. RAID1

In the RAID1 level, data saved in a HDD is recorded to another HDD without change. This mode is called "mirroring".

When data is recorded to a single HDD, the same data is recorded to another HDD. If either of the HDDs is defected, the other HDD containing the same data can substitute for the defected HDD. Thus the system can continue to operate without interruption.

Disk array controller

Disk 1

| Stripe 1 |
| Stripe 2 |

Disk 2
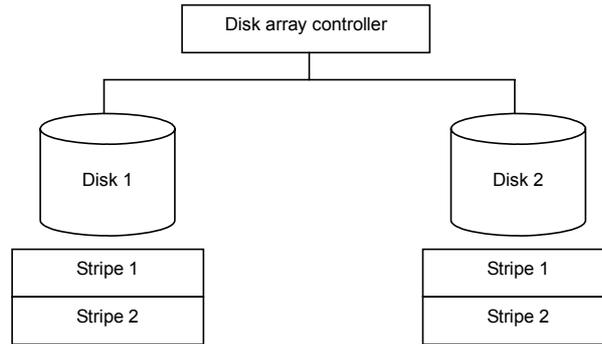
| Stripe 1 |
| Stripe 2 |

2-4. RAID5

In RAID5, data is distributed to HDDs by striping as well as in RAID0 and, at the same time, the parity (redundant data) is distributed to the HDDs. This mode is called "striping with distributed parity".

Each of stripe x, stripe x+1, and parity (x, x+1) created from stripe x and stripe x+1 is recorded to a specific HDD. Accordingly, the total capacity assigned to the parity is just the same as the capacity of a single HDD. If any one of the HDDs configuring a logical drive is defected, data is still available without problems.

Disk array controller

Disk 1

Disk 2

Disk 3

Stripe 1		Stripe 2		Parity (1, 2)
Stripe 4		Parity (3, 4)		Stripe 3
Parity (5, 6)		Stripe 5		Stripe 6
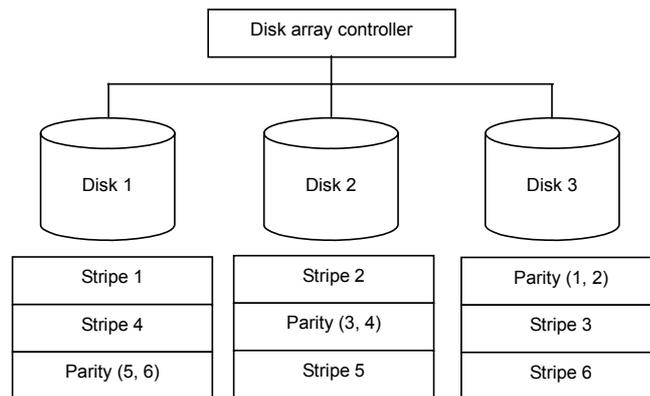
2-5. RAID10

Data is distributed to HDDs by striping and the stripes are recorded by mirroring. Therefore, RAID10 can realize the disk access performance as high as RAID0 and the reliability as high as RAID1 at a time.

Disk array controller

Disk 1

Disk 2

Disk 3

Disk 4

Stripe 1		Stripe 2		Stripe 1		Stripe 2
Stripe 3		Stripe 4		Stripe 3		Stripe 4
Stripe 5		Stripe 6		Stripe 5		Stripe 6

RAID0

RAID0

RAID1
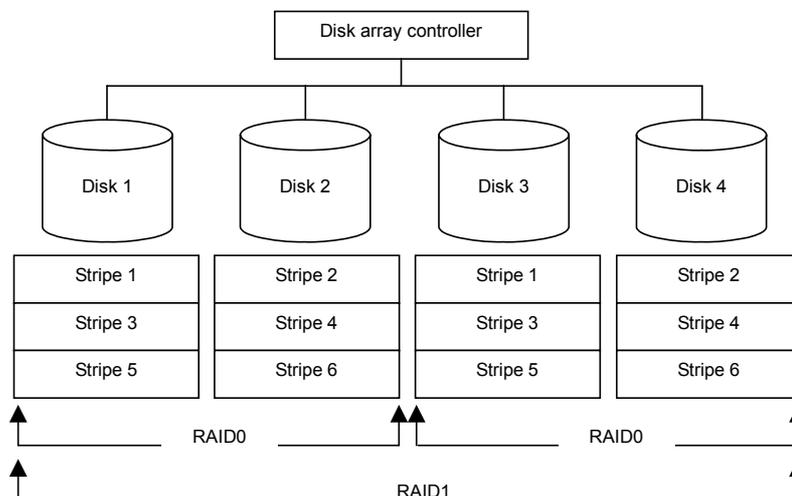
Chapter 3 - Disk Array Controller Features

This chapter describes the features of the disk array controller.

1. Rebuild

If a HDD is defected, the rebuild feature can recover the data in the defected HDD. The rebuild can be applied to redundant logical drives in the RAID1, RAID5, or RAID10 level.

1-1. Manual Rebuild

The manual rebuild can be performed by using WebPAM, the management utility of the disk array controller. Select a desired hard disk drive and start the rebuild manually.

For the detailed operation, refer to the online manual "Web-based Promise Array Manager User's Guide" in the "SATA2 Array Management Software" CD-ROM coming with the card.

1-2. Auto Rebuild

The disk array controller can automatically start the rebuild without using any utility such as WebPAM.

The auto rebuild includes two types as follows:

- Standby rebuild

  Automatic rebuild by using hot-spare disks. In the configuration including hot-spare disks, the rebuild is performed automatically if a hard disk drive assigned to a logical drive is defected.

- Hot-swap rebuild

  Automatic rebuild by hot-swapping defected HDD.

Notice	Note the following for the rebuild: ■ The HDD to be used for rebuild should have the same capacity, number of revolutions, and standard as the defected HDD. ■ During rebuild, the processing rate is decreased due to much load. ■ During rebuild, do not shutdown or reboot the server. If the server is shutdown by an accident such as power interruption, turn on the power again as soon as possible. The rebuild is automatically restarted. ■ The hot swap rebuild feature is available only when the card is connected with the additional HDD cage or the server that supports hot swap feature. ■ The interval from the removal of the defected HDD to the installation of a substitute HDD should be 90 seconds or longer. If the hot-swap rebuild does not operate, perform the manual rebuild.

2. Media Patrol

The media patrol gives the read & verify test in the entire area of HDDs. It is available for all HDDs assigned to logical drives and hot-spare disks.

The media patrol allows subsequent defects of HDDs to be detected and repaired. Accordingly, routine media patrol is recommended as preventive maintenance. Routine media patrol can be performed by scheduling.

For HDDs configuring redundant logical drives in RAID1, RAID5, or RAID10 level or those assigned to hot-spare disks, error sectors detected during media patrol can be repaired. For HDDs configuring non-redundant logical drives in RAID0 level, error sectors are registered to the bad sector list (BSL) to be managed.

If an access to a HDD being subject to media patrol occurs, the media patrol is interrupted temporarily and continued from the interrupted point at the completion of the access. Thus, the media patrol can hardly decrease the system performance.

Notice

Note the following for the media patrol:
- In an environment of frequent HDD accesses, media patrol cannot be advanced well. In such environment, it is recommended to use synchronization for preventive maintenance instead of media patrol.
- To enable media patrol, WebPAM must be installed.
- By shipping default, media patrol is scheduled to be executed on every Wednesday at 00:00 for all the HDDs. You may change the schedule according to your operating condition.
- A "free" disk cannot be subject to media patrol. Thus it is recommended to define a "free" disk as a hot-spare disk. Note, however, the disk which has previously been configured as logical drive, can be subject to media patrol even if it is in "free" status.
- For the detailed operation, refer to the online manual "Web-based Promise Array Manager User's Guide" in the "SATA2 Array Management Software" CD-ROM coming with the card.

3. Synchronization

The synchronization checks consistency among logical drives. It is available for redundant logical drives in the RAID1, RAID5, or RAID10 level.

Similar to the media patrol, routine synchronization can be performed by scheduling.

The synchronization checks consistency and also repairs detected error sectors in the same way as the media patrol. Accordingly, it can be used as preventive maintenance.

Different from media patrol, the synchronization continues its operation at a certain rate if targeting logical drives are accessed. Therefore, considerable load may be applied to the system during synchronization to decrease in the processing rate. In an environment of frequent accesses, preventive maintenance using synchronization is recommended because media patrol cannot be advanced.

Notice

Note the following for the synchronization:
- To perform synchronization, WebPAM must be installed.
- For the detailed operation, refer to the online manual "Web-based Promise Array Manager User's Guide" in the "SATA2 Array Management Software" CD-ROM coming with the card.

Chapter 4 - Lamp Indications

When the disk array controller is connected with an additional HDD cage or installed in the server that supports hot-swap feature, it allows you to check the access status of HDDs and other status including that under a failure or rebuild operation. In addition, by connecting the LED cable coming with the server, the disk array controller can blink the DISK ACCESS lamps on the front face of the server when HDD is accessed.

1. Indications of Lamps on Server

Lamp	State	Description
DISK ACCESS lamp (green)	OFF	Does not access to HDD.
	Blink	Accesses to HDD now.

Notice

While the disk array controller does not access to the HDDs, the DISK ACCESS lamps may blink frequently. This does not indicate the occurrence of a failure.
It is caused by routine monitoring accessed by ESMPRO or the disk array controller itself or periodical accesses from OS. In addition, due to the nature of the disk array controller, the blinking period against a single access is rather long. Such accesses may cause frequent blinks to occur.

Tips

The indications of the lamps on the server vary depending on the type of the server. Refer to the User's Guide of the server.

DISK ACCESS lamp
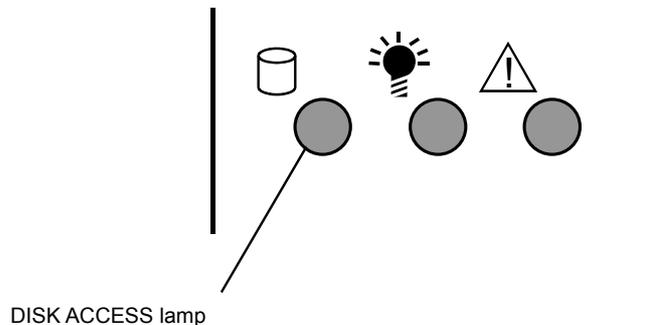
2. Indications of Disk Lamps on Trays

Disk lamp	Indication	Description
Green	OFF	Does not access to HDD.
	Rapid blink	Access to HDD now.
Amber	ON during start	Supplies power to HDD. Does not indicate that HDD is defected.
	ON during operation	Indicates that HDD is defected or SATA cable is disconnected. If HDD is defected, replace it with new one and perform rebuild process.
	Slow blink	Indicates that rebuild process is in progress.

Notice

Without accesses, the green lamp may blink frequently. This does not indicate the occurrence of a failure.
It is caused by routine monitoring accesses by ESMPRO or the disk array controller itself or periodical accesses from OS. In addition, due to the nature of the disk array controller, the blinking period against a single access is rather long. Such accesses may cause frequent blinks to occur.

Check

- Some servers cannot be connected with additional HDD cages or can only be connected with different types of additional HDD cages. Contact your service representative for details.
- The amber lamp goes on every boot of the server. However, this does not indicate the occurrence of a fault.
- Rebooting takes place with the lamp status at rebooting remaining unchanged.
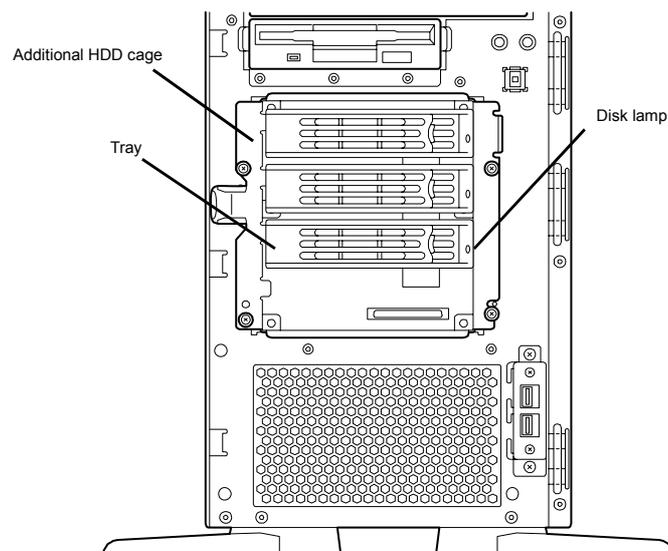
Chapter 5 - Creating Logical Drive

This chapter describes the disk array controller configuration utility "SuperBuild Utility" that allows you to configure and manage the disk array.

1. Before Using SuperBuild Utility

Before using the SuperBuild Utility, see the supported functions and notes described below.

1-1. Supported Functions

- Indicating information of the card
- Indicating information of HDDs and their status
- Creating and deleting logical drive
    - Setting RAID level
    - Setting stripe block size
    - Setting Initialize
    - Setting Write Cache mode
    - Split function
- Indicating configuration information and status of logical drives
- Indicating progress, pausing, and restarting background task
- Performing rebuild/synchronization

Split Function

The SATA2 disk array controller supports the split function which can divide a single HDD into up to two blocks. If an arbitrary capacity is specified in creation of a logical drive, SuperBuild Utility automatically uses the split function to divide a HDD into two blocks.

1-2. Notes on Creation of Logical Drive

■ Setting hot-spare disk

SuperBuild Utility cannot assign hot-spare disks. To assign hot-spare disks, use the disk array controller management utility WebPAM after OS is installed.

For free HDDs unassigned to any logical drives, standby rebuild can be performed but media patrol cannot. It is recommended to assign such free HDDs as spare disks by using WebPAM.

✔
Check

The disk which has previously been configured as logical drive can be subject to media patrol even if it is in "free" status.

■ Logical drive configuration using split function

The disk array controller can make various logical drive configurations under the support of the split function. However, note that some configurations may cause faults to occur. Examples of recommended and unsupported configurations of logical drives are described below. See the examples before creating logical drives.

(1) Recommended split configuration

(1-1) Configuration of logical drives in the same RAID level by HDDs having the same capacity
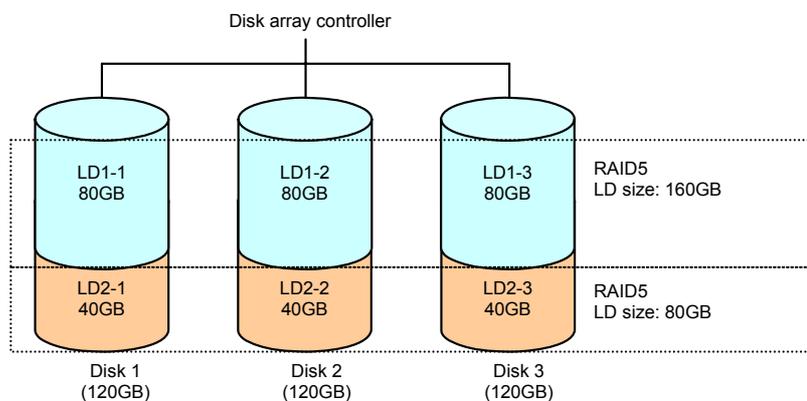
(2) Unsupported split configurations

(2-1) Configuration of logical drives in different RAID levels (1)

Disk array controller

| LD1-1 80GB | LD1-2 80GB | LD1-3 80GB | RAID5 LD size: 160GB |
| LD2-1 40GB | LD2-2 40GB | LD2-3 40GB | RAID0 LD size: 120GB |

HDD 1 (120GB)　　HDD 2 (120GB)　　HDD 3 (120GB)

(2-2) Configuration of logical drives in different RAID levels (2)

Disk array controller

| | LD1-1 80GB | LD1-2 80GB | LD1-3 80GB | LD1-4 80GB | RAID5 LD size: 240GB |
| RAID1 LD size: 40GB | LD2-1 40GB | LD2-2 40GB | LD3-1 40GB | LD3-2 40GB | RAID1 LD size: 40GB |

HDD 1 (120GB)　　HDD 2 (120GB)　　HDD 3 (120GB)　　HDD 4 (120GB)
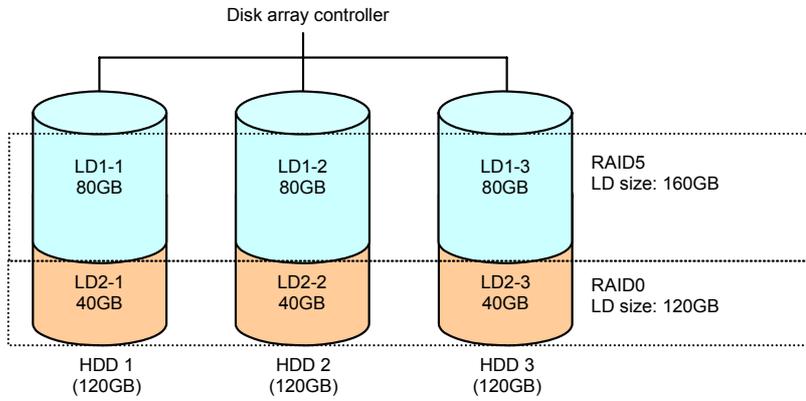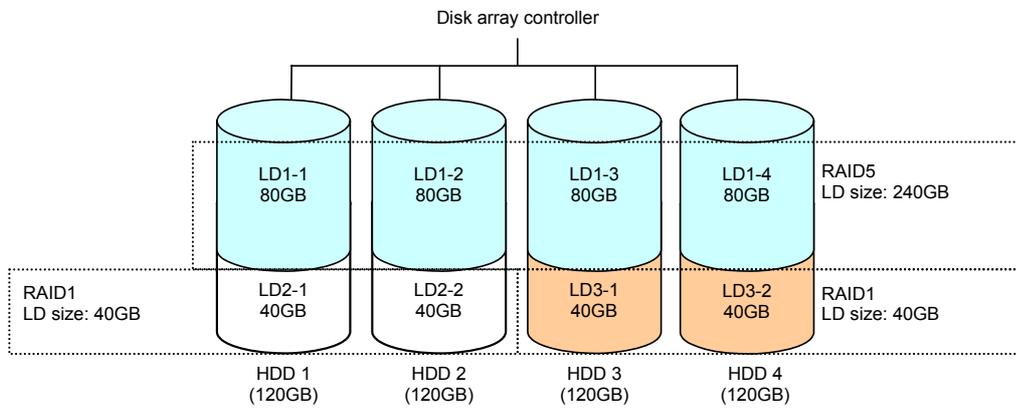
(2-3) Configuration of logical drives created by the different number of HDDs

Disk array controller

| | LD1-1 80GB | LD1-2 80GB | LD1-3 80GB | LD1-4 80GB | RAID5 LD size: 240GB |
| RAID5 LD size: 80GB | LD2-1 40GB | LD2-2 40GB | LD2-3 40GB | Free 40GB | |

HDD 1 (120GB)　　HDD 2 (120GB)　　HDD 3 (120GB)　　HDD 4 (120GB)
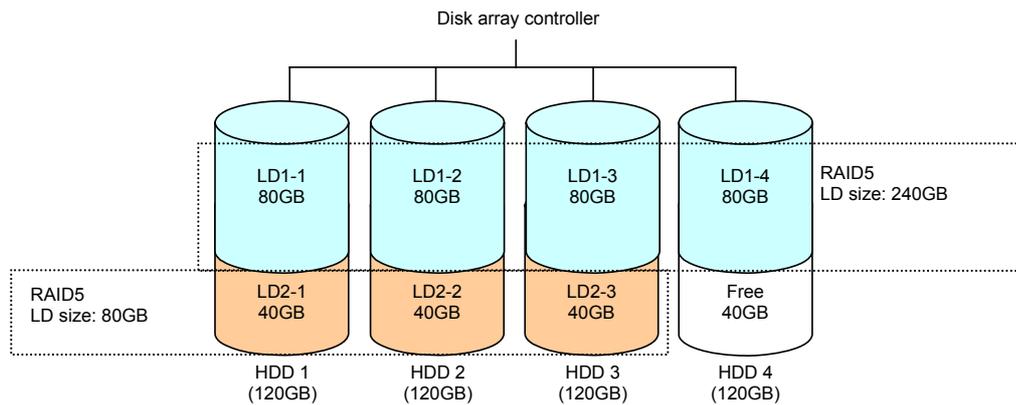
(2-4) Configuration of logical drives created by HDDs of different capacities

Disk array controller

| | | | | RAID5
LD size: 240GB |
| LD1-1
80GB | LD1-2
80GB | LD1-3
80GB | LD1-4
80GB | |

RAID1
LD size: 40GB

| LD1-1
40GB | LD1-2
40GB | | |

| HDD 1
(120GB) | HDD 2
(120GB) | HDD 3
(80GB) | HDD 4
(80GB) |
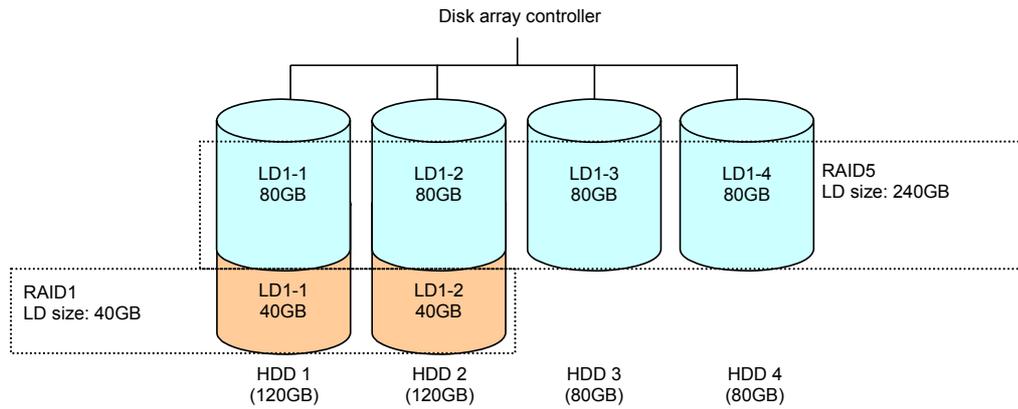
(2-5) Configuration of logical drives created by different HDDs

Disk array controller

RAID5
LD size: 120GB

| LD1-1
60GB | LD1-2
60GB | LD1-3
60GB | Free
60GB |

| Free
60GB | LD1-1
60GB | LD1-2
60GB | LD1-3
60GB |

RAID5
LD size: 120GB

| HDD 1
(120GB) | HDD 2
(120GB) | HDD 3
(120GB) | HDD 4
(120GB) |
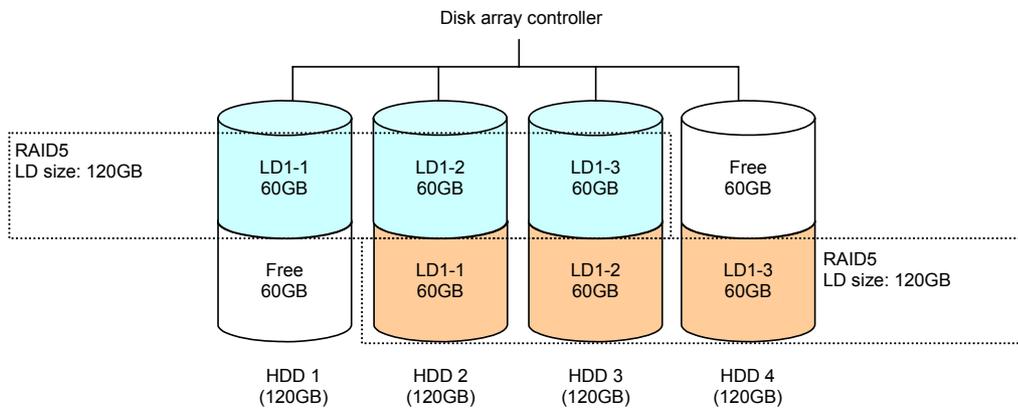
2. Starting SuperBuild Utility and Menus

2-1. Starting SuperBuild Utility

When the POST screen shown below appears, press the [Ctrl] + [S] keys to start SuperBuild Utility.

[POST screen image (with no logical drive defined)]

```
SuperTrak EX16350/16300/8350/8300(SATAII 300) BIOS Version x.x.xxxx.xx
(c) xxxx-xxxx Promise Technology, Inc. All rights reserved.
Controller 1 :
     No Logical Drive is defined ...




Press <Ctrl> + <S> to enter SuperBuild (tm) Configuration Utility or
Press <Esc> or <Space> to Continue ▐▐▐▐▐▐▐▐▐▐▐
```

Notice

During POST, do not press any keys having no relation to the operation such as [Pause].

2-2. Main Menu

When SuperBuild Utility starts, the Main Menu is displayed first. Then press arrow keys [↑], [↓], [←], or [→] or [Enter] key to display the screen on which you can make required settings.

```
SuperBuild (tm) Configuration Utility (c) xxxx Promise Technology, Inc.
▶ Main Menu

    ┌Main Menu────────────┐
    │ Controller Selection │
    │ Controller Information │
    │ Physical Drive Management │
    │ Logical Drive Management │
    │ Background Activity │
    └──────────────────────┘




↑↓←→:Navigate, ENTER:Enter, Space:Select, ESC:Back/Cancel,F10:Exit
```
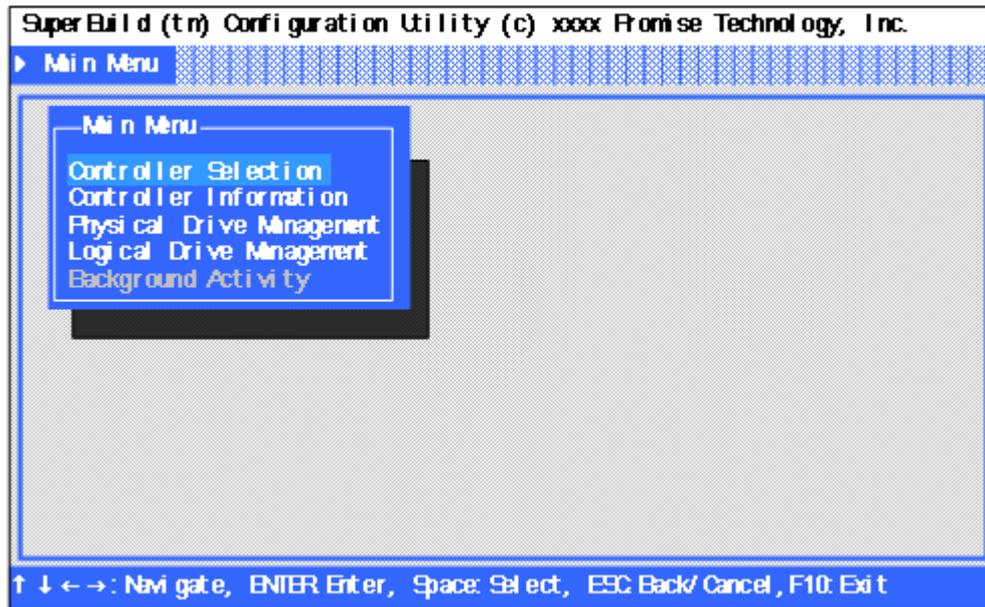
- Controller Selection

  Not used in this controller.

- Controller Information

  You can view the controller information and firmware and BIOS versions.

- Physical Drive Management

  You can view the HDD information and status of assignment to logical drives.

- Logical Drive Management

  You can create or delete the logical drive. In addition, the configuration and the status of existing logical drives can be viewed.

- Background Activity

  You can view the progress, pause, or restart the background task for logical drive (e.g., rebuild or full initialization). You can also execute some of background tasks. If no logical drive has been configured, you cannot select this menu.

2-3. Controller Selection

When you select [Main Menu] → [Controller Selection], a screen as shown below is displayed. This menu is used to select a target controller if one or more controller is installed. The Express5800 series server can contain only one controller, therefore, this menu is not used.
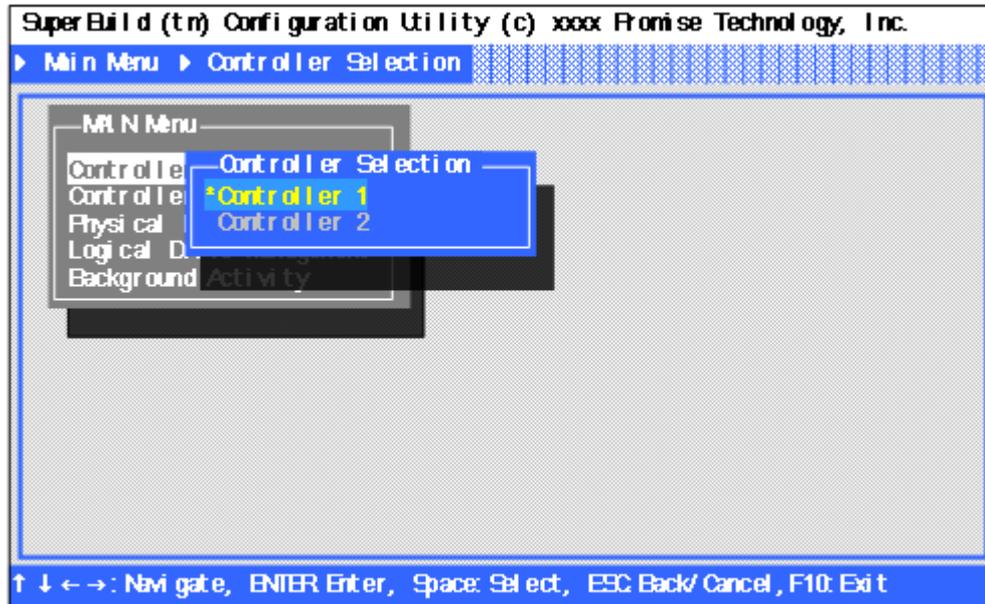
2-4. Controller Information

When you select [Main Menu] → [Controller Information], a screen as shown below is displayed. You can view the firmware and BIOS versions of this controller, and assigned status on PCI bus.

Tips

This menu is for information only.

```
SuperBuild (tm) Configuration Utility (c) xxxx Promise Technology, Inc.
▶ Main Menu ▶ Controller Information

┌─Main Menu─────────────────────┐
│ Controlle ┌─Controller Information ─────────────────────┐
│ Controlle │                                             │
│ Physical  │ Vendor          : Promise Technology, Inc   │
│ Logical D │ Model           : SuperTrak EX8350          │
│ Backgroun │ Memory Type     : ECC                       │
│           │ Memory Size     : 128MB                     │
│           │ Firmware Version: x.x.xx.xx                 │
│           │ BIOS Version    : x.x.xxxx.xx               │
│           │ PCI Func Address: Bus xxh, Dev xxh, Fun xxh │
│           │ PCI Base Address: xxxxxxxh                  │
│           │ Controller Speed: SATAII 3Gb/s              │
│           └─────────────────────────────────────────────┘

↑↓←→:Navigate, ENTER:Enter, Space:Select, ESC:Back/Cancel,F10:Exit
```

■ Vendor/ Model

Indicates vendor name and model name.

■ Memory Type/Memory Size

Indicates the type and size of memory installed.

■ Firmware Version/BIOS Version

Indicates firmware and BIOS versions.

■ PCI Func Address/PCI Base Address

Indicates assignment on PCI bus.

■ Controller Speed

Indicates transfer rate of SATA2 bus.

2-5. Physical Drive Management

When you select [Main Menu] → [Physical Drive Management], a screen as shown below is displayed. You can view the model name and capacity of HDDs connected on this menu.

Tips This menu is for information only.

```
SuperBuild(tm) Configuration Utility (c) xxxx Promise Technology, Inc.
▶ Main Menu ▶ Physical Drive Management

   ┌─Main Menu──────────────────┐
   │ Controller                 │
   │ Controller                 │
   │ Physical    ┌─Physical Drive Management ──────────────┐
   │ Logical D   │ ID │ Model Number          │ Capacity   │
   │ Background  │  1 │ HDT722525DLA380       │ 250GB      │
   │             │  2 │ HDT722525DLA380       │ 250GB      │
   │             │  3 │ HDT722525DLA380       │ 250GB      │
   │             │  4 │ HDT722525DLA380       │ 250GB      │
   │             │  - │ -                     │ -          │
   │             │  - │ -                     │ -          │
   │             │  - │ -                     │ -          │
   │             │  - │ -                     │ -          │
   │             └────────────────────────────────────────┘

↑↓←→:Navigate, ENTER:Enter, Space:Select, ESC:Back/Cancel,F10:Exit
```

- ID
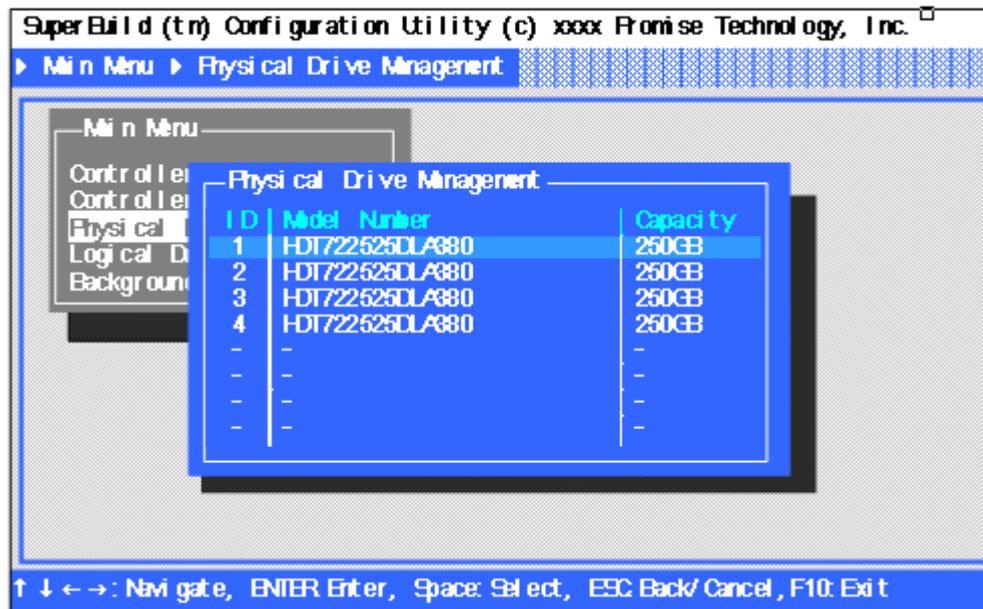
    Indicates the port number (Port 1 to Port 8) of connected HDD.

- Model Number

    Indicates the vendor model name of HDD.

- Capacity

    Indicates the capacity of HDD.

Selecting a desired HDD and pressing <Enter> key opens the [Physical Drive Information] screen which shows the detailed information of the selected HDD.
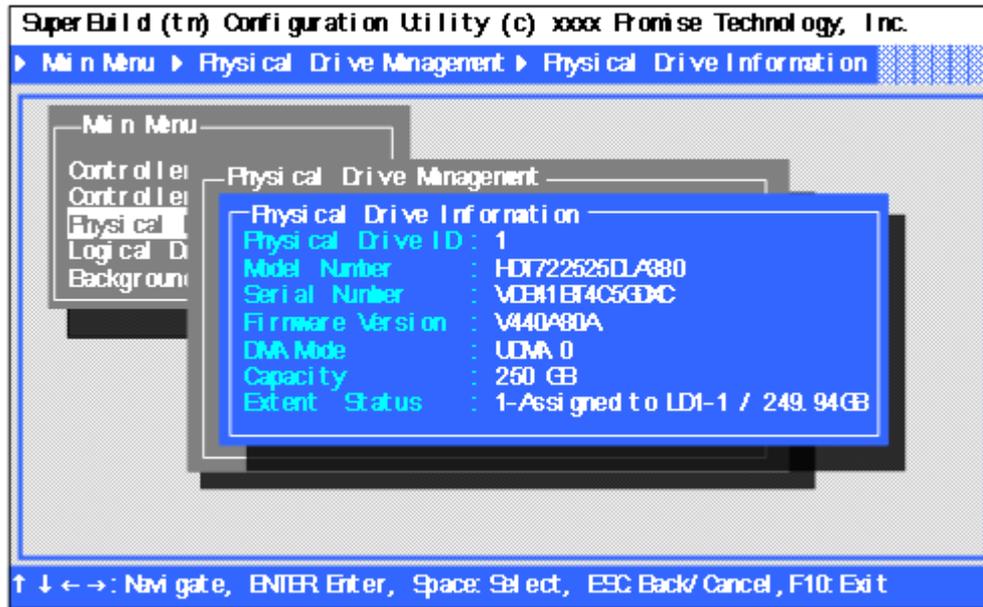
■ Physical Drive ID

Indicates the port number (Port 1 to Port 8) of the connected HDD.

■ Model Number

Indicates the vendor model name of HDD.

■ Serial Number

Indicates the vendor serial number.

■ Firmware Version

Indicates the firmware version.

■ DMA Mode

Indicates DMA mode.

■ Capacity

Indicates the capacity of HDD.

■ Extent Status

Indicates the status and size assigned to logical drive.

Indication	Description
1-Free/xxxGB	Indicates that this HDD is not assigned to logical drive. The capacity shown here is smaller than that shown in [Physical Drive Management] screen because the space required for management area is excluded.
1-Spare/xxxGB	Indicates that this HDD is assigned to hot spare disk. "xxxGB" indicates the capacity assigned.
1-Assigned to LD X-M/xxxGB	X indicates the logical drive number (explained later). The HDD is assigned as M-th HDD in logical drive X. "xxxGB" is the assigned capacity.
1-Assigned to LD X-M/xxxGB 2-Assigned to LD Y-N/yyyGB	This indication is displayed when HDD is divided into two blocks by splitting feature. X and Y are logical drive numbers (explained later). The either block of HDD is assigned as M-th HDD in logical drive X, and the other block as N-th HDD in logical drive Y. xxxGB and yyyGB indicate assigned capacities.

2-6. Logical Drive Management

When you select [Main Menu] → [Logical Drive Management], a screen as shown below is displayed. You can create or delete a logical drive on this menu.
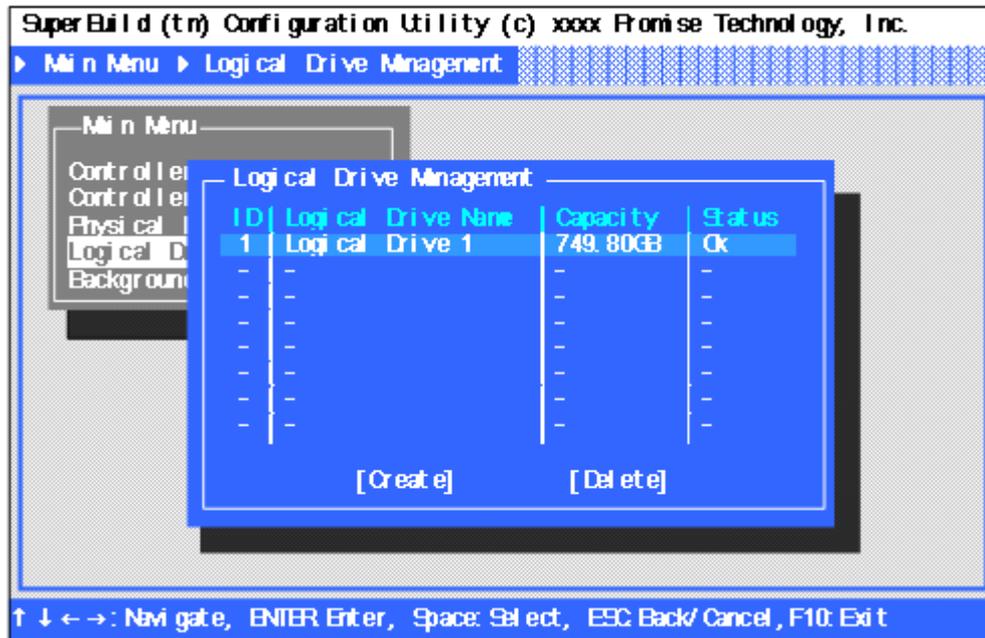
■ ID

Indicates the logical drive number.

■ Logical Drive Name

Indicates the logical drive name specified in logical drive creation procedure.

■ Capacity

Indicates capacity of logical drive.

■ Status

Indicates the current status of logical drive.

Status	Description
Ok	The logical drive operates normally and in online status.
Critical	The logical drive is in critical status. One of the HDDs configuring the logical drive is in offline status. The rebuild process should be performed as soon as possible because the redundancy is lost. If any other HDD fails in this state, the data cannot be restored.
Offline	The logical drive is in offline status. Two or more HDDs are in offline status. The data processing is disabled for the logical drive in offline status.
Rebuild	The logical drive is being rebuilt.
Initial	The logical drive is being fully initialized.
Synchron	The logical drive is being synchronized.

■ [Create]

Select this menu to create a logical drive. See "3. Creating Logical Drive" for detailed procedure.

■ [Delete]

Select this menu to delete a logical drive. See "4. Deleting Logical Drive" for detailed procedure.

Selecting a desired logical drive and pressing <Enter> opens the [Logical Drive Information] screen which shows the detailed information of the selected logical drive.
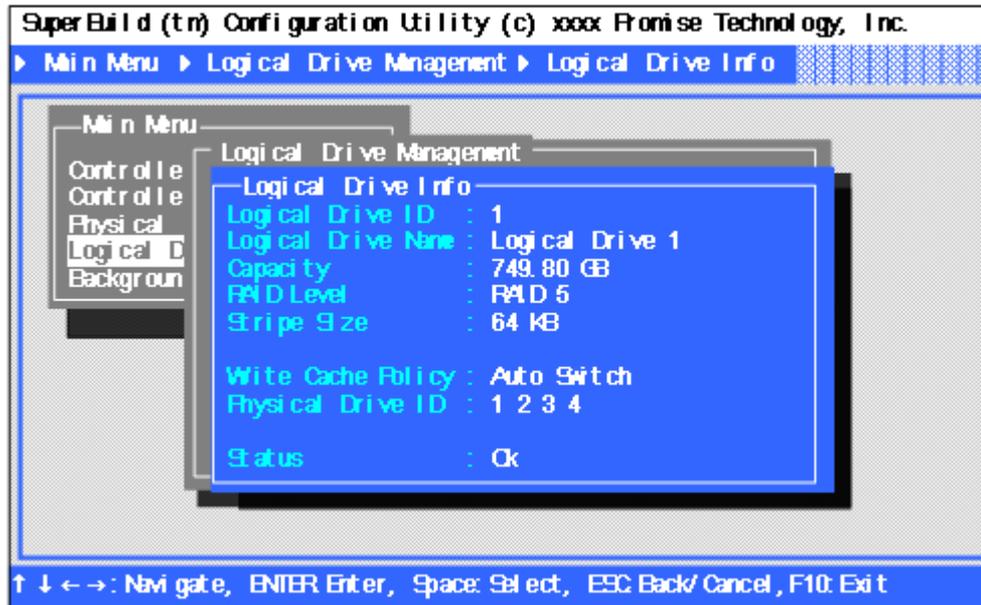

- Logical Drive ID

  Indicates the logical drive number.

- Logical Drive Name

  Indicates the logical drive name specified in logical drive creation procedure.

- Capacity

  Indicates capacity of logical drive.

- RAID Level

  Indicates RAID level.

- Stripe Size

  Indicates stripe size.

- Write Cache Policy

  Indicates the Write Cache policy currently set.

- Physical Drive ID

  Indicates assignment of HDD. The number of numerals indicates the number of HDDs configuring the logical drive. Each number indicates the port number. If any of HDDs is in offline state or disconnected, "?" is indicated instead of numerals. If the logical drive is in offline status, "??" is indicated.

  Example 1: Physical Drive ID: 4 1 2 3
	(When sorted in ascending order of port number)
LD x-1: Port 4	Port 1: LD x-2
LD x-2: Port 1	Port 2: LD x-3
LD x-3: Port 2	Port 3: LD x-4
LD x-4: Port 3	Port 4: LD x-1

  Example 2: Physical Drive ID : 4 1 2 ?
	(When sorted in ascending order of port number)
LD x-1: Port 4	Port 1: LD x-2
LD x-2: Port 1	Port 2: LD x-3
LD x-3: Port 2	Port 4: LD x-1
LD x-4: Port ? (*)	Port ?: LD x-4 (*)

(*) Cannot be identified because the HDD is in offline status or is not connected.

■ **Status**

Indicates the current status of logical drive.

Status	Description
Ok	The logical drive operates normally and in online status.
Critical	The logical drive is in critical status. One of the HDDs configuring the logical drive is in offline status. The rebuild process should be performed as soon as possible because the redundancy is lost. If any other HDD fails in this state, the data cannot be restored.
Offline	The logical drive is in offline status. Two or more HDDs are in offline status. The data processing is disabled for the logical drive in offline status.
Rebuild Running	The logical drive is being rebuilt.
Initialize Running	The logical drive is being fully initialized.
Synchronize Running	The logical drive is being synchronized.

2-7. Background Activity

When you select [Main Menu] → [Background Activity], a screen as shown below is displayed.

You can view the progress, pause, or restart the background task for logical drive (e.g., rebuild or full initialization). You can also execute some of background tasks.

```
SuperBuild (tm) Configuration Utility (c) xxxx Promise Technology, Inc.
▶ Main Menu ▶ Background Activity

 ┌─Main Menu─────────────────┐
 │ Controller               │
 │ Controller     ┌─ Background Activity ──────────────────┐
 │ Physical       │ Device│Type      │Status    │Percentage │
 │ Logical D      │ LD 1  │No BGA    │OK        │N/A        │
 │ Backgroun      │ LD 2  │Rebuild   │Running   │18%        │
 │                │ -     │-         │-         │-          │
 └────────────    │ -     │-         │-         │-          │
                  │ -     │-         │-         │-          │
                  │ -     │-         │-         │-          │
                  │ -     │-         │-         │-          │
                  │ -     │-         │-         │-          │
                  │                                         │
                  │        [Rebuild]         [Pause]        │
                  │ [Initialize]   [Synchronize]  [Migration]│
                  └─────────────────────────────────────────┘

↑↓←→: Navigate, ENTER: Enter, Space: Select, ESC: Back/Cancel, F10: Exit
```
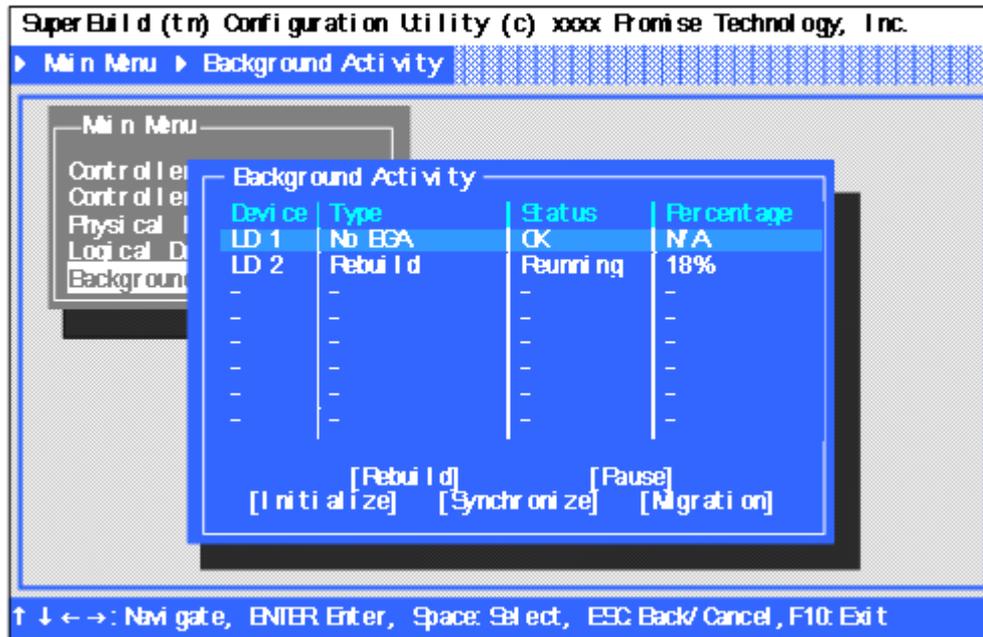
- Device

  Indicates the existing logical drives.

- Type

  Indicates the type of background task being executed.

Type	Description
No BGA	Indicates that no background task is executed.
Rebuild	Indicates that rebuild is in progress, or in halt status.
Initial	Indicates that full initialization is in progress, or in halt status.
Synchron	Indicates that synchronization is in progress, or in halt status.

- Status

  Indicates the status of background task currently being executed. If no background task is being executed, the status of logical drive is displayed instead.

Status	Description
Ok	Indicates that the logical drive is in online status. There is no running background task.
Critical	Indicates that the logical drive is in critical status. There is no running background task.
Offline	Indicates that the logical drive is in offline status. There is no running background task.
Running	Indicates that the background task indicated in "Type" field is running.
Paused	Indicates that the background task indicated in "Type" field is in pause status.

- Percentage

    Indicates the progress of background task in percentage (%). If no background task is running, "N/A" is indicated.

- [Rebuild]

    Select this menu to execute rebuild process or restart rebuild process that has been paused.

- [Pause]

    Select this menu to pause the running background task.

- [Initialize]

    Select this menu to restart full initialization process that has been paused.

- [Synchronize]

    Select this menu to execute synchronization or restart synchronization that has been paused.

- [Migration]

    Unavailable in this controller.

2-8. Exiting SuperBuild Utility

1. Press the [Esc] key several times to return to the Main Menu.

2. If you press [F10] on the Main Menu, the message asking you whether SuperBuild Utility may be terminated appears.


Exit Configuration Utility? [Y]
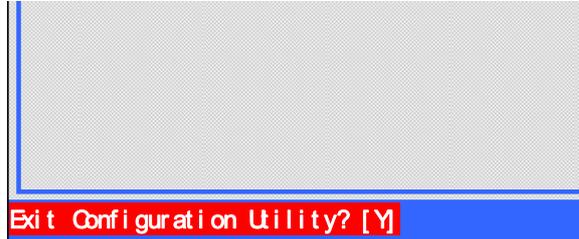
3. To exit from SuperBuild Utility, press [Y] to reboot the server or turn off the power. If not, press any key (such as [Esc]) to cancel.

3. Creating Logical Drive

This section describes the creation of a logical drive on SuperBuild Utility.

3-1. Job Flow of Creation of Logical Drives

```
┌─────────────────────┐
│   Start creation of  │
│    logical drive     │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│ Start SuperBuild Utility │
└─────────────────────┘
           │
           ▼
      ◇ Are there existing ◇ ──── No ────────────────────┐
        logical drives?                                    │
           │                                               │
          Yes                                              │
           ▼                                               │
      ◇ Are logical drives ◇ ──── Yes ───────────────────┤
          added?                                           │
           │                                               │
          No                                               │
           ▼                                               │
┌─────────────────────┐   ● [Logical Drive Management] → [Delete]
│ Delete logical drives. │        See "4. Delete LD".
└─────────────────────┘                                    │
           │◄──────────────────────────────────────────────┘
           ▼
┌─────────────────────┐   ● [Logical Drive Management] → [Create]
│ Create logical drives. │    (Step 1/2)
└─────────────────────┘       1) Checking connection of HDD
           │                  2) Selecting HDD
           │                (Step 2/2)
           │                  1) Setting RAID level
           │                  2) Setting logical drive name
           │                  3) Setting stripe size
           │                  4) Setting capacity
           │                  5) Setting initialization mode
           │                  6) Setting write cache mode
           ▼
┌─────────────────────┐
│   Reboot the server.  │
└─────────────────────┘
           │
           ▼
┌─────────────────────┐
│   End creation of    │
│    logical drives    │
└─────────────────────┘
```

3-2. Logical Drive Creation Procedure

1. Start SuperBuild Utility.

2. Select [Main Menu] → [Logical Drive Management].
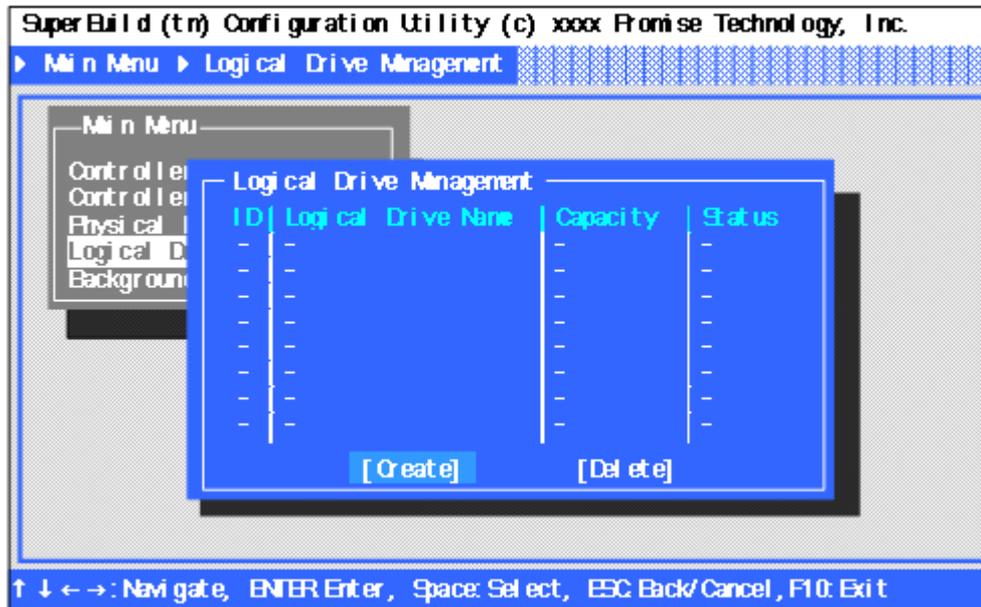
3. Use an arrow key [↑] or [↓] to move cursor to [Create], and press [Enter] key. The [Create (Step 1/2)] screen is displayed.
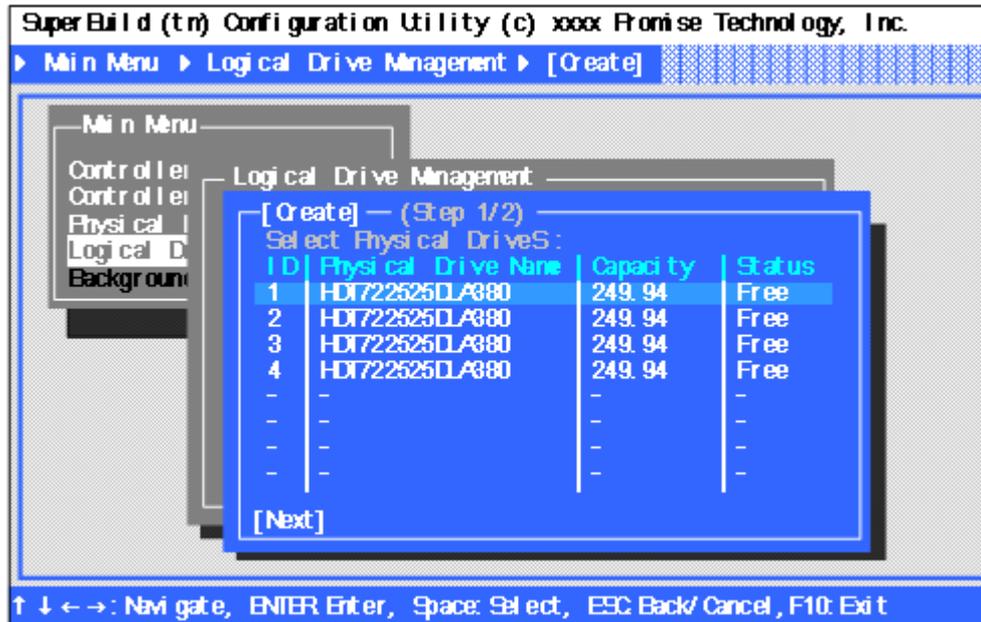
4. Check the connection status of HDDs connected to each port.

[Check items]

- Whether all HDDs connected to the disk array controller are recognized.

- Whether the capacities of the HDDs are indicated correctly and whether all the HDDs have the same capacity.

- Whether every "Status" indicates "Free".

<table>
<tr>
<td>
Notice
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- If HDDs of different capacities are connected, contact your service representative.
- If a new HDD or a HDD replaced for maintenance is connected and "Status" is not "Free", contact your service representative.

</td>
</tr>
</table>

5. Use an arrow key [↑] or [↓] to move cursor to HDD to be used for logical drive, and press the <Space> key to select it. The selected HDD is preceded by an asterisk (*) and displayed in yellow. When you have selected all the HDDs to be used, move the cursor to [Next] and press the <Enter> key to open [Create (Step 2/2)] screen.
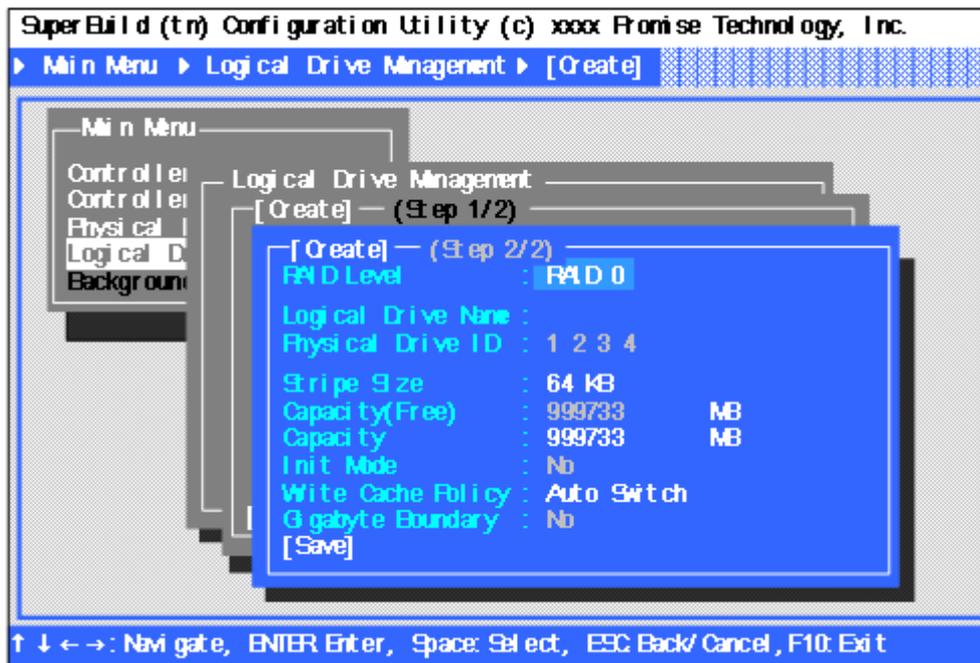
6. Provide settings required for creating logical drive.

Item	Default	Available value
RAID Level	RAID0	RAID0/RAID1/RAID5/RAID10
Logical Drive Name	-	Alphanumeric and symbol characters
Physical Drive ID	X X X X	Do not change.
Stripe Size	64 KB	32 KB/64 KB/128 KB (*1)
Capacity (Free)	xxxxxx MB	Do not change.
Capacity	xxxxxx MB	Numeral
Init Mode	No	No/Quick/Full (*2)
Write Cache Policy	Auto Switch	Auto Switch/Write Back/Write Through
Gigabyte Boundary	OFF	Do not change.

*1: Fixed to 64 KB in RAID 1.
*2: Fixed to "No" in RAID 0.

■ RAID Level

Set the RAID level according to your requirements.

■ Logical Drive Name

Specify the desired name for logical drive you are going to create. Alphanumeric and symbol characters can be used. To enter a numeric character, always use the standard keyboard. Entering a numeric character from the numeric keyboard will not be accepted.

■ Physical Drive ID

Indicates the port number of the selected HDD (view only).

■ Stripe Size

Specify the data size to be divided for striping. Specifying the larger data size increases the speed to read/write sequential data. It is recommended to specify the stripe size of 64 KB.

■ Capacity (Free)

Indicates the maximum capacity allowable for the selected HDD and RAID level (view only).

■ Capacity

Specify the logical drive capacity. Enter the value not exceeding the "Capacity (Free)". To enter a numeric character, always use the standard keyboard. Entering a numeric character from the numeric keyboard will not be accepted. If no value is entered, the maximum allowable capacity is set.

■ Init Mode

Select the mode to initialize HDD at creation of logical drive. Use quick initialization mode in normal case.

Init Mode	Description
No	Does not initialize HDD.
Quick	Quick initialization Initializes the master boot record (MBR). Data stored in HDD is erased.
Full	Full Initialization Initializes the logical drive entirely as well as in synchronization. Data stored in HDD is retained.

■ Write Cache Policy

Specify the write cache mode of the disk array controller.

Cache Mode	Description
Auto Switch (Default)	If an additional battery is connected and charged enough, the operation takes place in the "Write Back" mode. When the battery power remains only a little, battery is not connected, or the battery failure is detected, the operation mode is automatically changed to "Write Through". This protects the data even if a power failure occurs. Thus, to use "Auto Switch" is recommended.
Write Back	This asynchronous control method writes data into cache memory of the controller, then writes it onto HDD based on the data stored in

	cache memory. The access performance is improved compared with the Write Through mode. However, if an accident such as instantaneous power failure occurs, the data may be lost.
Write Through	This control method writes data into both cache memory and HDD simultaneously. The access performance is not good as in Write Back mode.

■ Gigabyte Boundary

This feature is fixed to "No" and cannot be changed.

7. Upon completion of setting, move cursor to [Save] and press the <Enter> key to save the configuration data.

8. When the configuration data is successfully saved, the screen returns to [Logical Drive Management]. Check the status of the logical drive you have created. If you are going to create another logical drive, select [Create] and repeat Steps 3 through 7 described above.
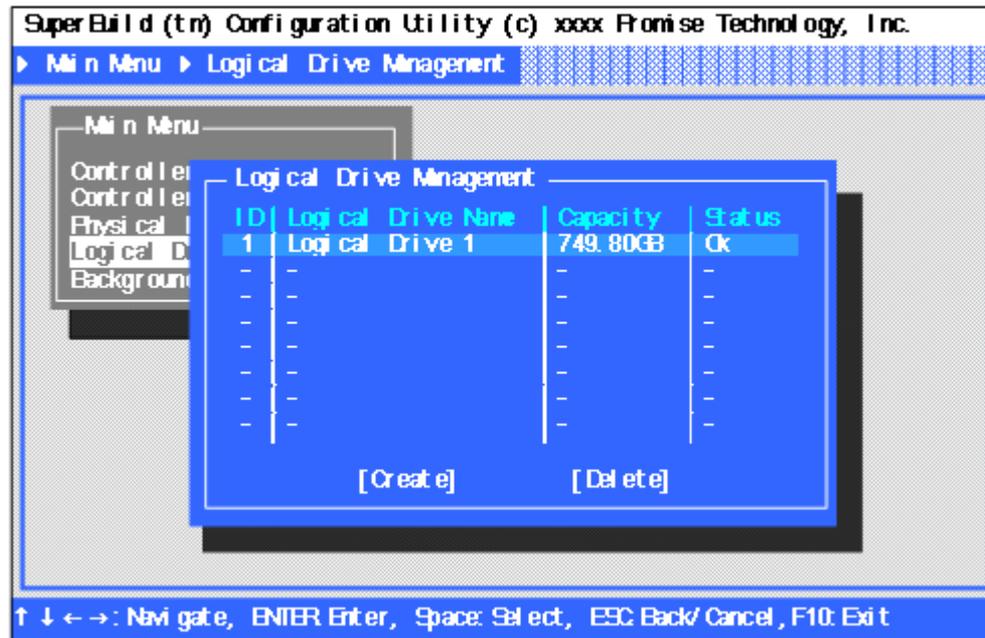
9. When you have configured all logical drives, exit from SuperBuild Utility and restart the server.

10. On the POST screen, make sure that "Ok" is indicated in "Status" field.

Example: Logical drive configured with four HDDs and in RAID5 level.

4. Deleting Logical Drive

This section describes the deletion of a logical drive on SuperBuild Utility.

4-1. Logical Drive Deletion Procedure

1. Start SuperBuild Utility.

2. Select [Main Menu] → [Logical Drive Management].

3. Move cursor to the logical drive to be deleted, and press the <Space> key to select it. The selected logical drive is preceded by an asterisk (*) and displayed in yellow.
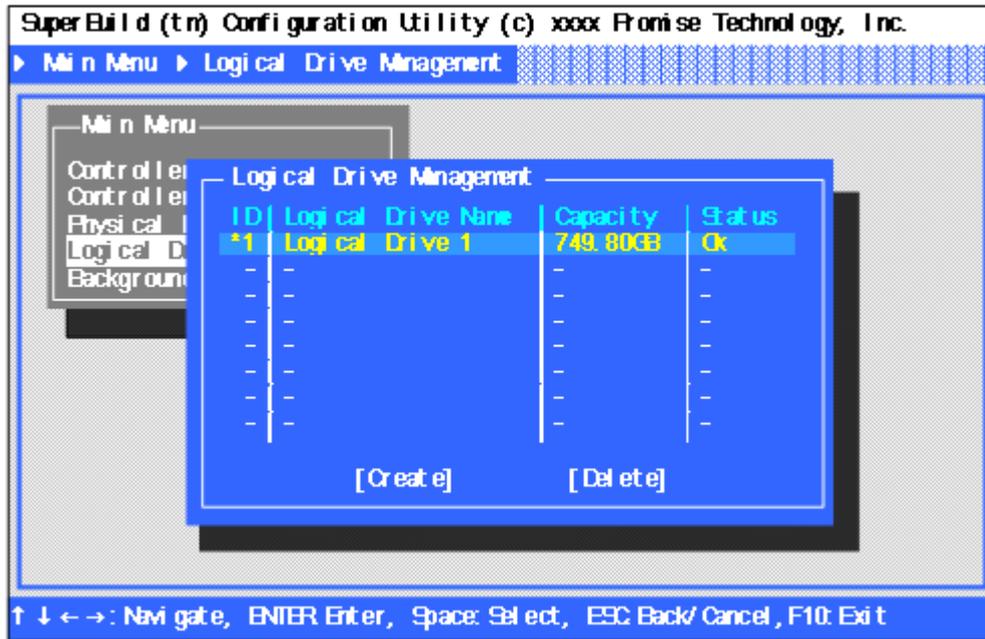
Tips You can select one or more logical drives.

4. Move the cursor to [Delete] and press the <Enter> key. The confirmation message appears at the bottom left of the screen. Press the <Y> key to delete the selected logical drive. Press any other key than the <Y> key (e.g., <Esc> key) to cancel.
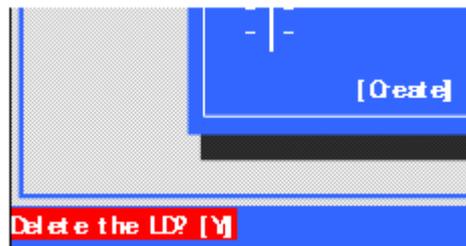
5. If the target logical drive is not displayed on [Logical Drive Management] screen, the deletion procedure is completed.

Chapter 6 - Operation and Maintenance

1. Maintenance Service

Service representatives subordinate to or authorized by us provide services of the disk array controller with use of genuine parts and high technical capabilities. You can get the services for your own convenience.

For the services, contact your sales representative.

2. Preventive Maintenance

2-1. Data Backup

In case of an unexpected accident, it is recommended to back up data in HDDs regularly.

For the data backup, refer to the User's Guide of the server.

2-2. Preventive Maintenance by Media Patrol/Synchronization

It is recommended to perform media patrol or synchronization regularly as preventive maintenance against subsequent defects of HDDs. These features allow subsequent defects of HDDs to be found and repaired as soon as possible. Both features can be performed regularly by using the scheduling function of WebPAM.

For details on the media patrol and synchronization, see "Chapter 3 - Disk Array Controller Features".

The recommended scheduling interval is once per week. Depending on the operation status of your system, the scheduling interval should be at least once per month.

<table>
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Check
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- To use the media patrol or synchronization, WebPAM must be installed.
- By shipping default, the media patrol is scheduled to be executed on every Wednesday at 00:00 for all the HDDs. You may change the schedule according to your operating condition.
- A "free" disk cannot be subject to media patrol. Thus it is recommended to define a "free" disk as a hot-spare disk. Note, however, the disk which has previously been configured as logical drive, can be subject to media patrol even if it is in "free" status.
</td>
</tr>
</table>

3. Maintenance

The disk array controller supports the following maintenance features:

- Configuration on Disk (COD) feature
- Rebuild feature
- Critical boot feature

3-1. Configuration on Disk (COD) Feature

The COD feature records the configuration information in HDDs. The feature prevents the configuration information from being lost if the disk array controller is defected and replaced. After the disk array controller is replaced, the COD feature reads the configuration information from HDDs to operate the controller normally.

> The disk array controller does not store the configuration information within it. Instead, it records and stores the configuration information in HDDs.
>
> **Check**

3-2. Rebuild Feature

When a HDD is defected, the rebuild feature recovers the data in the defected HDD. The feature is available for redundant logical drives in the RAID1, RAID5, or RAID10 level.

See "Chapter 3 Features of Disk Array Controller" for details.

3-3. Critical Boot Feature

The disk array controller supports the critical boot feature. If an error occurs in the HDD configuring the system drive during the boot of the server and the system drive does not respond normally, the critical boot feature automatically excludes the defected HDD and boots the server.

4. Replacement of Disk Array Controller

Replace the disk array controller as follows:

> **Check** For the handling of the server, refer to the User's Guide of the server.

1. With the power of the server being ON, shutdown OS, turn off the power of the server, and pull out the power cords from the receptacles.

2. Remove the side cover and several components on the server appropriately.

3. Remove the SATA. I2C, and LED cables from the card.

   > **Notice** Before removing the SATA cables, confirm the port numbers of the SATA connectors on the card and those of the SATA cables to write down the connecting configuration.

4. Remove the screw fixing the card and remove the card from the server.

   > **Notice**
   > - If an additional battery is connected, remove the additional battery from the server before removing the card.
   > - Connect the removed additional battery to the card installed after the replacement following the "Additional DAC Battery User's Guide".
   > - Always write down the position of the PCI slot from which the card has been removed.

5. Insert the card for replacement into the same PCI slot and fix it with the screw.

6. Connect all the cables removed in step 3 following the connecting configuration written down previously.

7. Install the side cover and other components removed in step 2 on the server.

8. Connect the power cords to the receptacles and turn on the power of the server. Make sure that the server is booted normally.

5. Troubleshooting

If the server equipped with the disk array controller does not operate normally or some utilities are disabled, check the following. Follow the action described in the relevant item if found.

■ **OS cannot be installed.**

❑ Have logical drives been created?

→ Create logical drives using SuperBuild Utility.

❑ Is the correct driver used?

→ Insert the online manual "Disk Array Controller (SATA2) Software User's Guide" saved in the "SATA2 Array Management Software" CD-ROM coming with the card.

■ **OS cannot be booted.**

❑ Is the disk array controller inserted into the mating PCI slot to the end straight?

→ If not, install the disk array controller correctly.

❑ Is the disk array controller inserted into a PCI slot to which some installation limitation is imposed?

→ Check the limitation imposed to the installation of the disk array controller and insert the controller into a correct slot.

If OS is not recognized despite the above actions, the disk array controller may be defected. Contact your service representative.

❑ Are HDDs inserted to the end of the additional HDD cage (when the cage is used)?

→ Install the HDDs in the additional HDD cage correctly.

❑ Are SATA cables connected to the disk array controller, HDDs and/or additional HDD cage correctly?

→ Connect the cables correctly.

If OS is not recognized despite the above actions, one or more HDDs may be defected. Contact your service representative.

■ **HDD failed**

→ Contact your service representative.

■ **Rebuild is disabled.**

❑ Is the capacity of the HDD to be rebuilt rather small, isn't it?

→ Use a disk having the same capacity as the defected HDD.

❑ Is the RAID level of the logical drive RAID0, isn't it?

→ Rebuild is not possible because of no redundancy in RAID0. Replace the defected HDD and create the logical drive again.

❑ Is WebPAM configured correctly?

→ Some setting items of WebPAM restrict rebuild operation. For details, refer to the online manual "Web-based Promise Array Manager User's Guide" saved in the "SATA2 Array Management Software" CD-ROM coming with the card.

■ **Media patrol is disabled.**

❑ Is the HDD in the free state, isn't it?

→ Media patrol is unavailable for free disks.
Assign the HDD as a hot-spare disk by using WebPAM.

■ **Synchronization is disabled.**

 ❑ Is the logical drive in the critical state, isn't it?

  → Replace the defected HDD and perform rebuild.

 ❑ Is the RAID level of the logical level RAID0, isn't it?

  → Synchronization is not possible because of no redundancy in RAID0. Use media patrol for preventive maintenance of HDDs.

■ **LED does not go on.**

 ❑ Are the I2C and LED cables connected correctly?

  → Connect cables correctly.

■ **Additional battery is not recognized.**

 ❑ Is the additional battery connected correctly?

  → Connect the additional battery correctly.

 ❑ Is the additional battery charged enough?

  → The additional battery may not be recognized if it is not charged at all.
Turn on the power of the server and leave it for six hours or longer. Then start the additional battery to check whether it is recognized.

If the additional battery is not recognized still despite the above actions, the battery may be defected. Contact your sales representative.

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