Promise SuperTrak EX4650
Disk Array Controller (SAS)

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 the controller. In addition, refer to this manual when you want to know how to use it or should some malfunction occur. Always keep the manual at hand so that you can refer to it as soon as possible if necessary.

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

Keep this User's Guide at hand for quick reference at anytime necessary.
Be sure to read this section carefully.

⚠ 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:

△	Attention	This symbol indicates the presence of a hazard. An image in the symbol illustrates the hazard type.	(Example)  Precaution against electric shock
⃠	Prohibited Action	This symbol indicates prohibited actions. An image in the symbol illustrates a particular prohibited action.	(Example)  Prohibition of disassembly
●	Mandatory Action	This symbol indicates mandatory actions. An image in the symbol illustrates a mandatory action to avoid a particular hazard.	(Example)  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

Check the package contents.

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

Third Party Transfer

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


Notice

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.
The manufacturer 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:

- Transfer all the provided software applications, and keep no backup copies.
- Uninstall software applications 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

We recommend you make a back-up copy of your valuable data on a regular basis in order to avoid severe data loss in the event of shocks, thermal changes, or operator mistakes.

Transportation

To transport the product, remove the product from the server and put it in the shipping materials 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

When installing or re-installing an operating system (called OS hereafter), update the driver using the ExpressBuilder CD-ROM after completing the installation.

If a Promise Controller SW & DOC CD-ROM was included with your disk array controller card, use the latest drivers included on this disc.

1-2. Installation of WebPAM PRO

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

- Events and errors occurred on the array system can be registered in the event log and used effectively for troubleshooting and diagnosis.
- WebPAM event information can be monitored 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 the 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 a 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, that the disk which has previously been configured as a logical drive, can be subject to media patrol even if it is in "free" status.

2. Specifications

Item		Specification	Remarks
Number of SAS connectors		4 internal ports	
Cache size		128 MB	
PCI connector		PCI-Express (x8)	
Maximum PCI bus transfer rate		3GB/sec	
Device interface		Serial Attached SCSI (SAS 1.1) supported	
Maximum data transfer rate		300MB/sec	
RAID level		0, 1, 5, or 10	
Maximum number of cards installed in server		1	
Maximum number of connectable HDDs		4	
Maximum number of logical drives		32	
Outer dimension	With full-height PCI bracket	122 (width) x 194 (length) x 24 (height) mm	
	With low-profile PCI bracket	81 (width) x 194(length) x 24 (height) mm	
Weight		Approx. 0.12 kg	
Operating voltage		12V/3.3 V	
Power consumption (max.)		17 W	3.3V/2.6A 12V/0.7A
Operating environment		Temperature: 0ºC to 50ºC Humidity: till 95%Rh	Without condensation

3. Disk Array Controller Features

The disk array controller is equipped with eight ports of interface connectors conforming to Serial-Attached SCSI(SAS 1.1). The data transfer rate per port is up to 300 MB/sec. The card realizes low cost and high performance.

The card can be connected to an additional battery N8103-106 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 128MB SDRAM
- 1 SAS 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 NEC ESMPRO enabled by installation of WebPAM PRO
- Automatic detection of fault drive
- Replacement of defected HDD enabled without system shutdown (hot-swap)
- Warning by beep available
- Low-profile board available
- Support PDM

- The card does not support the PCI hot plug feature.
- 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.

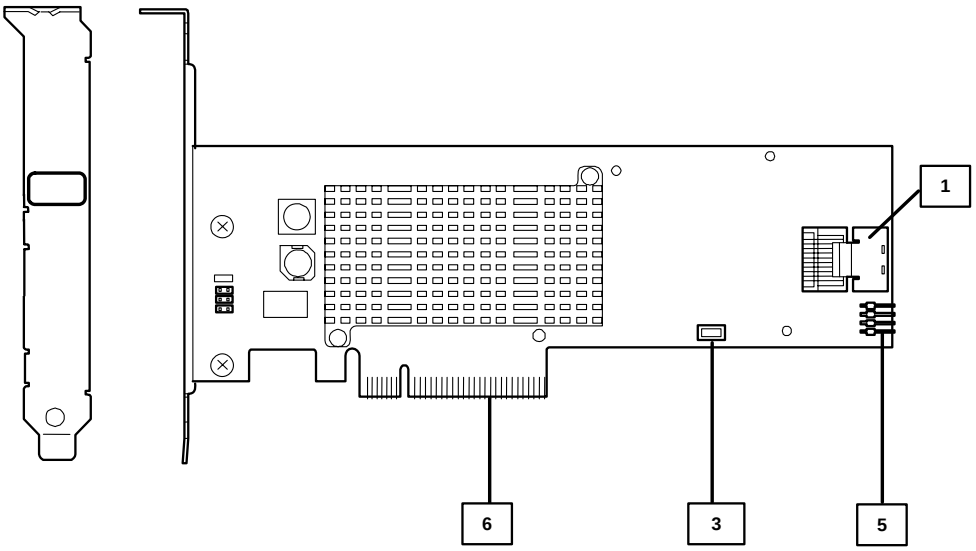
The card can be connected with the following additional HDD cages:

- SAS HDD cage

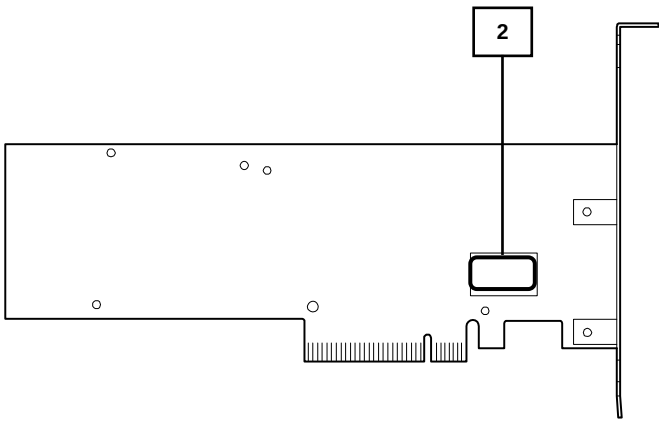
4. Names and Functions of Sections

This section describes the sections on the card.

(Front view)



(Rear view)

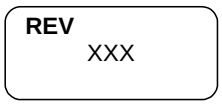


1 mini SAS connector

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

2 HW label

Indicates the management revision of the card.



3 Additional battery connector

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

5 HDD LED connector

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

6 PCI connector (PCI Express supported)

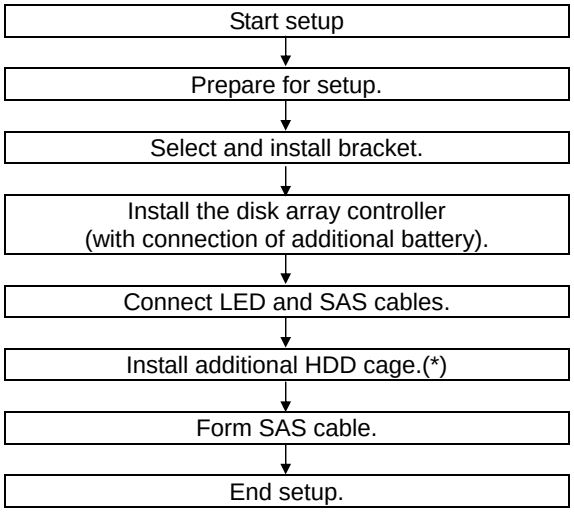
The connector allows the card to be connected to a PCI slot (or PCI Express slot) in the server.

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.



(*) 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 information on the 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), but with limitations. 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 the application programs and shutdown the 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 of the server following the procedure described in the User's Guide of the server.

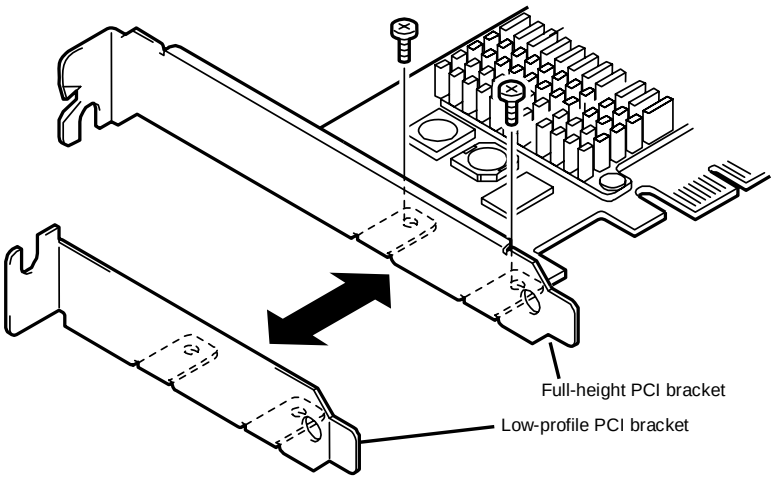
Check

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 the 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.

5. Remove the screws (2) fixing the full-height PCI bracket to the card.
6. Remove the full-height PCI bracket.
7. Install the low-profile PCI bracket on the card.
8. Secure the low-profile PCI bracket with the screws (2) removed in step 1.



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 is installed and remove the additional slot cover. To install attached
   This chapter describes the disk array controller configuration utility "SuperBuild Utility" that allows you to configure and manage the disk array.

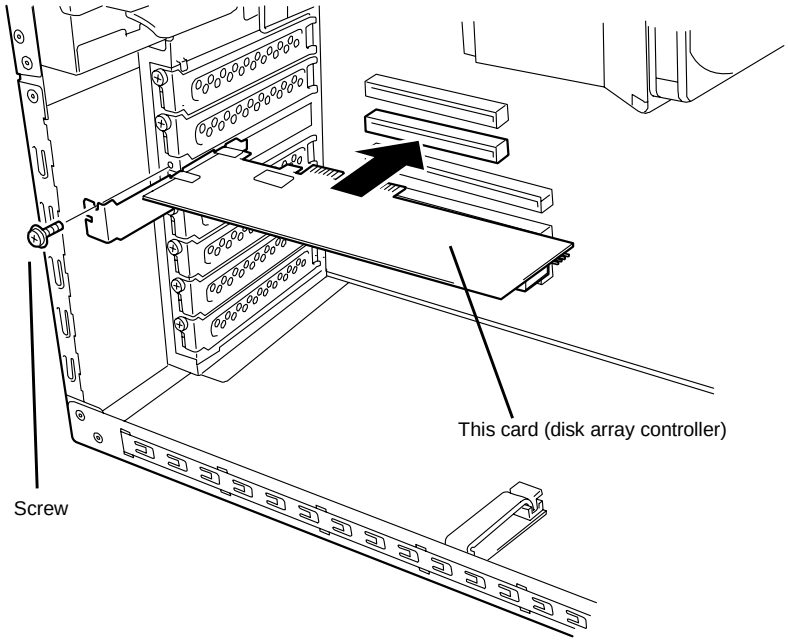
Notice

- Keep the removed additional slot cover for future use. The removed screws 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.

Tips

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: Tower model

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

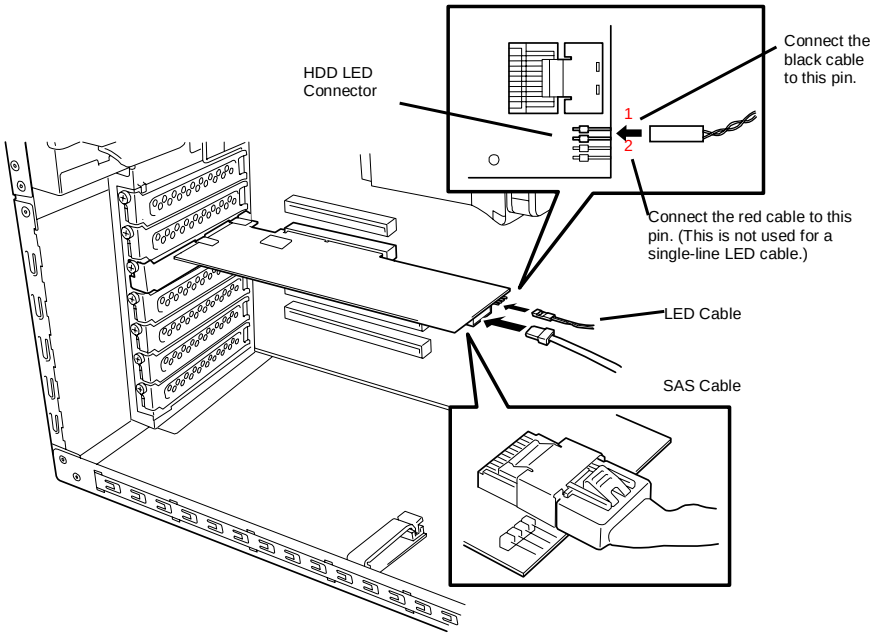
Notice

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

5-4. Connecting the LED and SATA Cables

Connect the LED cable coming with the server to the HDD LED connector (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 SAS cable to the SAS connector on the card. The port number of the SAS cable should be the same as that of the card.



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 SAS HDD Cage, connect the SAS 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 SAS cable coming with the server. Refer to the User's Guide of the server for details.

5-5. Installing an Additional HDD Cage

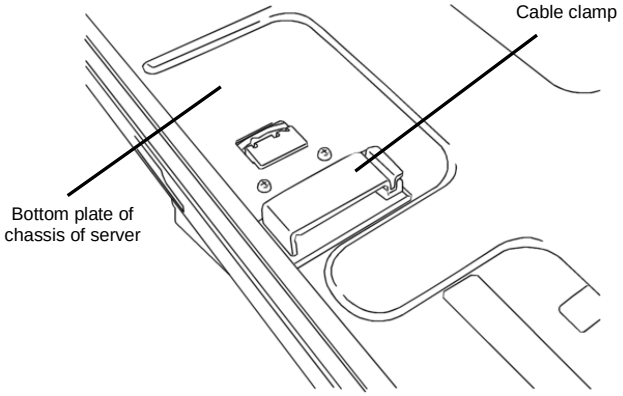
To install an additional HDD cage in the server, refer to the procedure described in the User's Guide coming with the additional HDD cage.

5-6.Forming Cables

To fix the SAS cables appropriately, form the cables in the following procedure.

1. Attachment of the cable clamp (If the cable clamp is attached to the server)

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 the cables in a secure way.



Check

- Before attaching the cable clamp on the server, wipe the area where the cable clamp will be attached with dry cloth.

2. Cable forming

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

Notice

After forming the SATA cable, make sure that the cable is not loose and that it is straightly inserted in the mating connector.

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 several hard disk drives (HDDs) to be handled collectively.

RAID can configure several HDDs (at least 2) as a single array (disk group) to operate the HDDs effectively. This ensures higher performance than a single HDD of a large capacity.

This disk array controller has a feature to divide a single disk group into several logical drives (up to 40 virtual disks). The host computer recognizes these virtual disks as if it were a single HDD, and can access in parallel several HDDs configuring a disk group.

Some RAID levels can recover data from remaining data and parity by using are build feature if an error occurs in a single HDD. This ensures high system reliability.

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

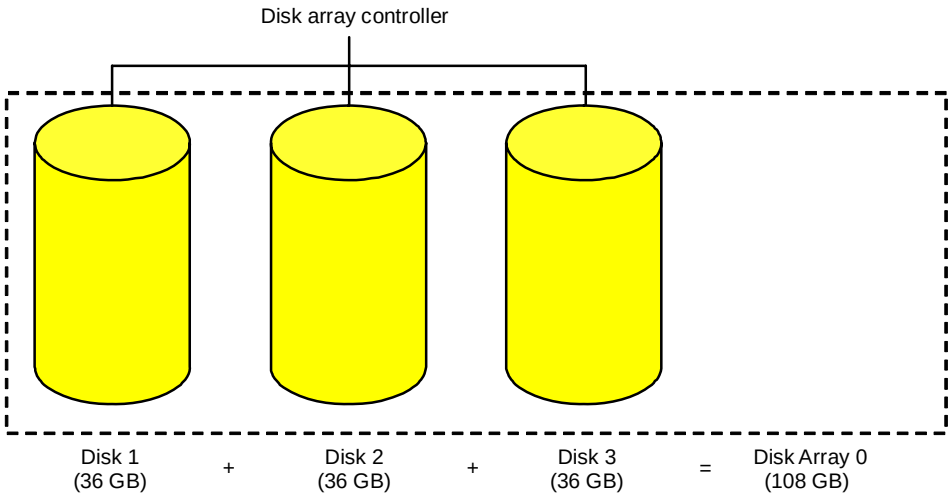
Tips

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

1-3. Disk Array

A disk array is configured with more than one HDDs.
Up to four disk groups are permitted by the disk array controller when four HDDs are installed in the server.

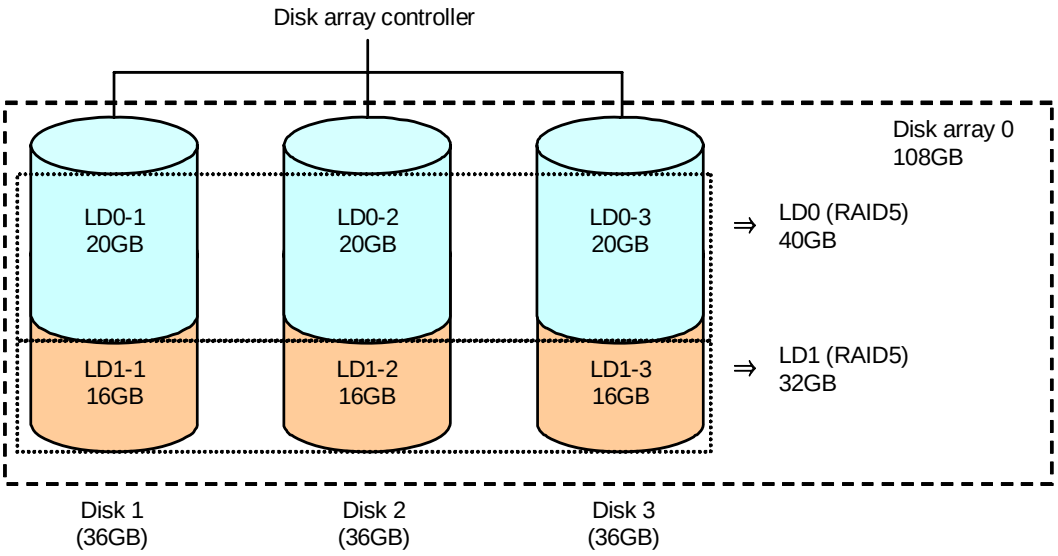
The figure below shows a sample configuration. The three HDDs are connected to the disk array controller, creating one disk array.



1-4. Logical Drive

A logical drive is defined in a disk array. It is recognized as a physical drive by the OS. Maximum number for each disk array is 32.

The figure below shows a sample configuration in which the disk array controller is connected with three HDDs, creating one disk array. Two RAID5 logical drives are defined in the disk array.



1-5 Parity

The parity means redundant data. A single set of redundant data is created from the data saved in several HDDs.
The created redundant data is used for data recovery when a HDD is defective.

1-6 Hot-Swap

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


Notice

When you perform a HDD HotSwap, take care not to pull out or insert the HDDs forcibly, it might damage the HDD.


Check

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

1-7.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 disk array is defected.
Dedicated Spare	Available as a hot-spare disk only if a HDD in the specified disk array is defected.


Tips

To rebuild using hot-spare disks, see "Chapter 3 Features of Disk Array Controller".

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

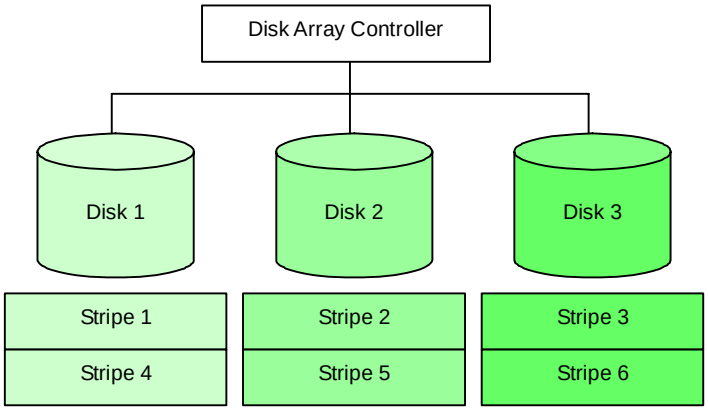
2-2. RAID0

In RAID 0, the data to be recorded is distributed to the 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 that order. Because RAID0 allows all the HDDs to be accessed collectively, it provides the best disk access performance.

Notice

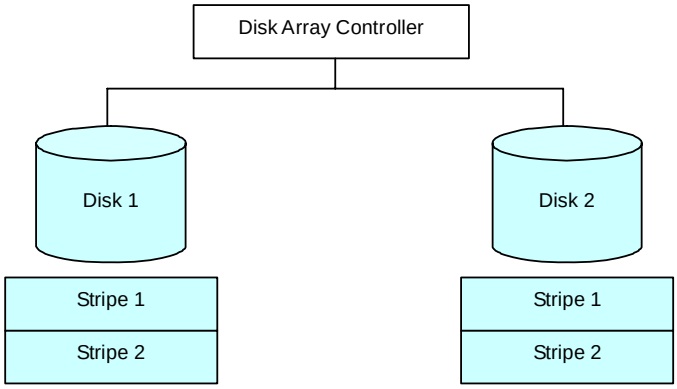
RAID 0 does not have data redundancy. If a HDD is defective, the data saved in the HDD cannot be recovered.



2-3. RAID1

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

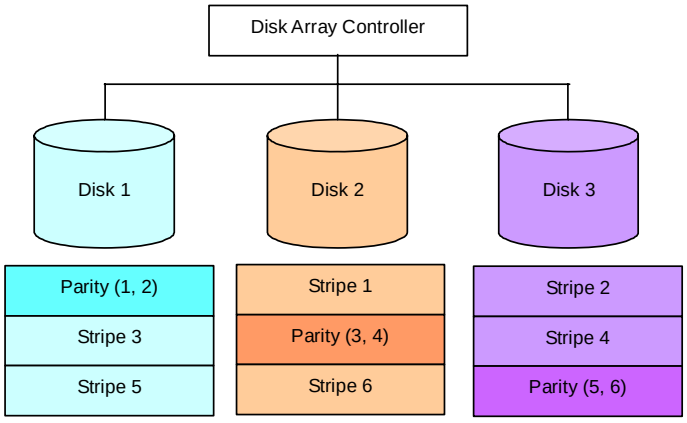
When data is recorded to a single HDD, the same data is recorded to another HDD. If either of the HDDs is defective, the other HDD containing the same data can substitute for the defective HDD. Thus the system can continue to operate without interruption.



2-4. RAID5

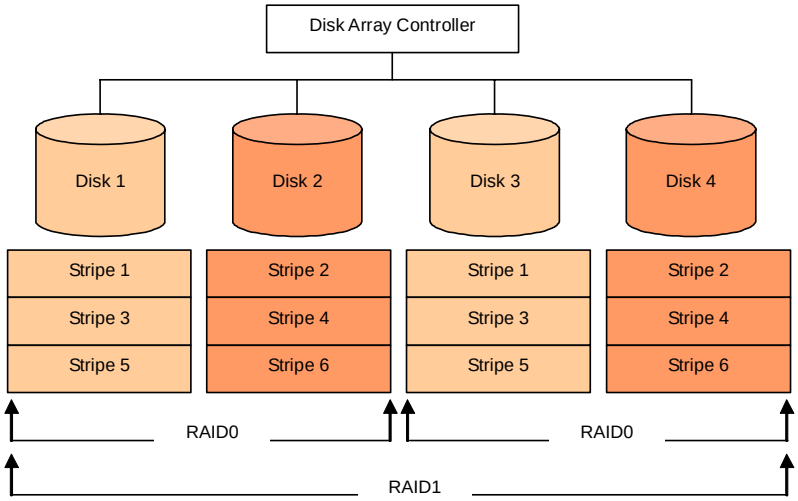
In RAID5, data is distributed to HDDs by striping as well as in RAID0 and, at the same time, the parity (redundant data) is distributed to the HDDs. This mode is called "striping with distributed parity".

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 of the HDDs configuring a logical drive is defective, data is still available without problems.



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.



Chapter 3 Features of Disk Array Controller

This chapter describes the features of the disk array controller.

1. Rebuild

If a HDD is defective, the rebuild feature can recover the data in the defective 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 [SuperBuild Utility] or [WebPAM PRO], 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 description “Manual Rebuild” in Section 5 2-6. Disk Array Managemant for using [SuperBuild Utility] or for using [WebPAM PRO], refer to the online manual "Web-based Promise Array Management Professional User’s Guide" saved in the ExpressBuilder 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 PRO.(If you want to use Standby Rebuild, It is necessary to set HotSpareDisk)

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. (Refer to “Section 5 2-8.Spare Drive Management” for using [SuperBuild Utility],or for using [WebPAM PRO] refer to the online manual "Web-based Promise Array Management Professional User’s Guide" saved in the ExpressBuilder CD-ROM coming with the card.)

- Hot-swap rebuild
  Automatic rebuild by hot-swapping defected HDD. The Hot-swap HDD must be different from the original HDD. (If you inserted back the same HDD, you can do a Manual Rebuild)

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 defective 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 accidentally such as by a power interruption, turn on the power again as soon as possible. The rebuild restarts automatically.
- The hot swap rebuild feature is available only when the card is connected with the additional HDD cage or the server that supports the hot swap feature.
- The interval between the removal of the defective HDD and 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. By reading routinely the entire data in the HDDs, the media patrol detects such faults and enables you to take a preventive action. Routine media patrol can be scheduled.

- 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 the media patrol occurs, the media patrol is interrupted temporarily and continues from the interruption point once the access is finished. The media patrol hardly decreases the system performance.

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 subjected to media patrol. Thus it is recommended to define a "free" disk as a hot-spare disk. Note, however, that disk which has previously been configured as a logical drive can be subjected to media patrol even if it is in "free" status.
- For more information, refer to the online manual "Web-based Promise Array Manager User's Guide" in the ExpressBuilder CD-ROM coming with the card.

3. Redundancy Check

Redundancy check works to check consistency among logical drives. It is available for redundant logical drives in the RAID1, RAID5, or RAID10 level.

Similar to the media patrol, the routine redundancy check can be scheduled.

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

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

Note the following for the redundancy check:

- To perform redundancy check, WebPAM PRO must be installed.
- For the detailed operation, refer to the online manual "Web-based Promise Array Management Professional User's Guide" saved in the ExpressBuilder CD-ROM coming with the card.

4. PDM (Predictive Data Migration)

Predictive Data Migration (PDM) migrates data from a suspect physical drive to a spare physical drive, similar to Rebuilding. But unlike Rebuilding, PDM acts before the disk drive fails and your Logical Drive goes Critical.

Chapter 4 Lamp Indications

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

1. Lamp Indications on the Server

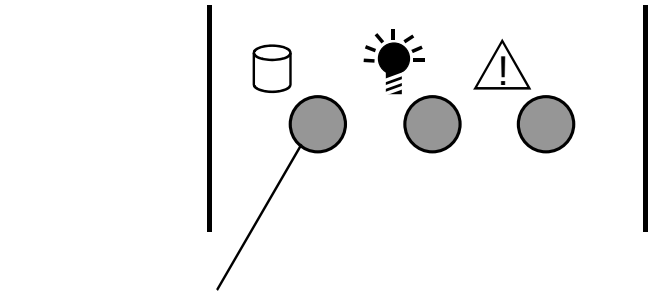
Lamp	State	Description
DISK ACCESS lamp (green)	OFF	No HDD access.
	Blink	Accesses to HDD now.

Notice

The DISK ACCESS lamps may blink frequently, even when the disk array controller does not access to the HDDs. This does not indicate the occurrence of a failure.
It is caused by routine monitoring 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. Disk Lamps Indications on Trays

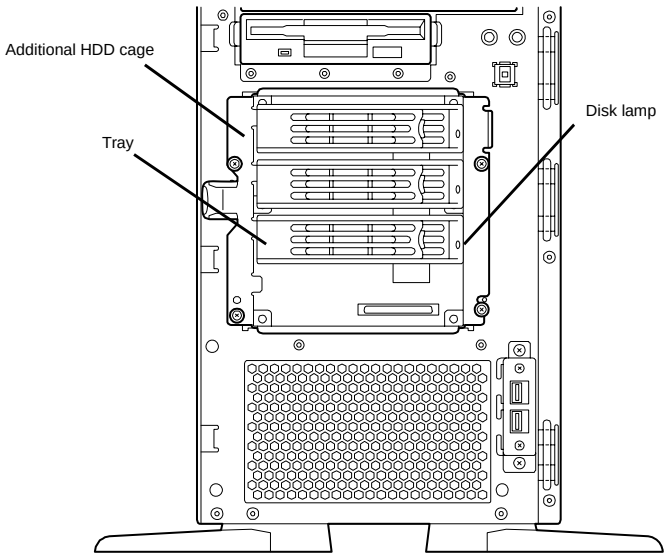
Disk lamp	Indication	Description
Green	OFF	No HDD access.
	Rapid blink	Access to HDD now.
Amber	ON during start	Supplies power to HDD. Does not indicate that the HDD is defective.
	ON during operation	Indicates that the HDD is defective or that the SATA cable is disconnected. If the HDD is defective, replace it with new one and perform a rebuild process.
	Slow blink	Indicates that a rebuild process is in progress.

Notice

The green lamp may blink frequently, even without HDD accesses. This does not indicate the occurrence of a failure.
It is caused by routine monitoring 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 lights at 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 the 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
  - Setting Read Cache mode
- Indicating configuration information and status of logical drives
- Setting/Deleting Spare Drive
- Indicating progress, pausing, and restarting background task
- Performing Manual Rebuild/Initialize

These function is not available in SuperBuild Utility. If you use them, WebPAM PRO must be installed.
- RedundancyCheck
- MediaPatrol
- PDM

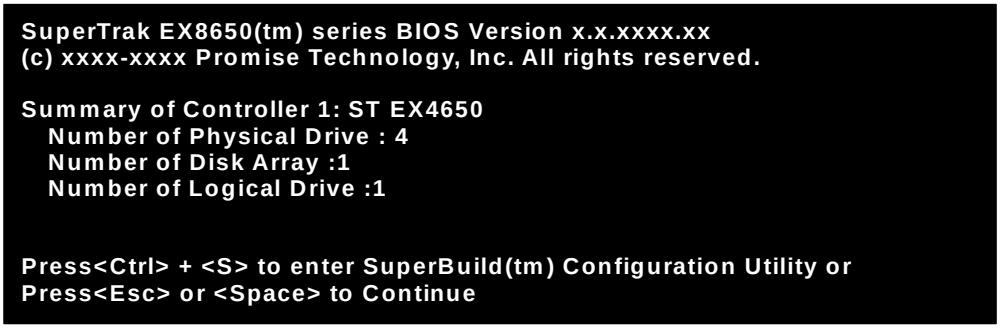
- For the detailed operation, refer to the online manual "Web-based Promise Array Manager User's Guide" saved in the ExpressBuilder CD-ROM coming with the card.

2. Starting the SuperBuild Utility and Menus

2-1. Starting the SuperBuild Utility

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

[POST screen image (operates normally)]



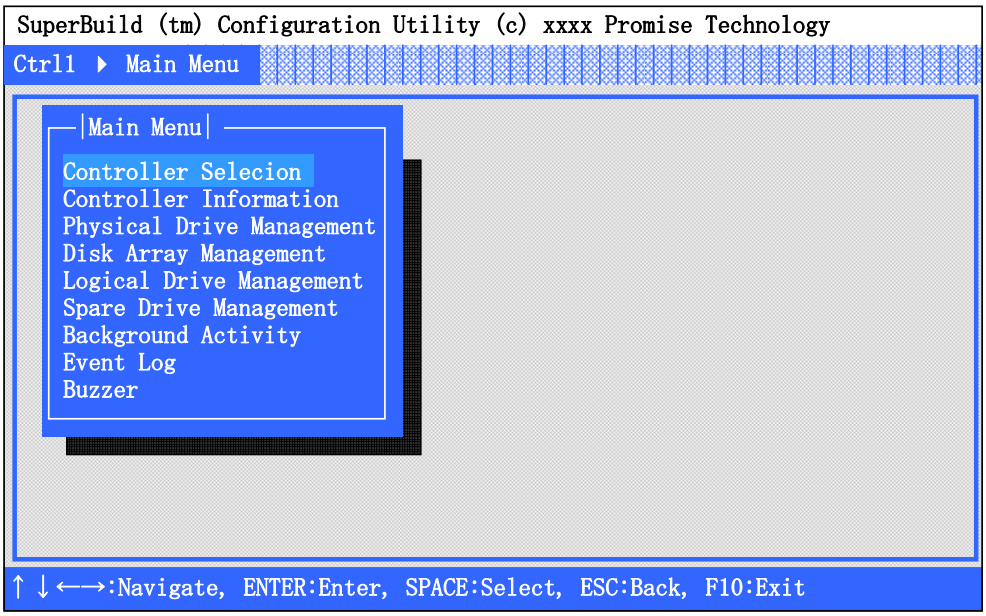
Notice

During POST, do not press any unrelated keys such as [Pause].

If a “Critical” message appears after “Number of Logical Drives”, it indicates that configured logical drive(s) are critical status. In this case, you can continue to use the array, however we suggest you recover the Logical Drive because it doesn’t have redundancy. Therefore, if another HDD becomes defected, it will be impossible to recover your data. If you want to know the procedure in detail, refer to [2.6 Manual Rebuild] of this document.

2-2. Main Menu

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



- **Controller Selection**

  Not used in this controller.

- **Controller Information**

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

- **Physical Drive Management**

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

- **Spare Drive Management**

  (You can assign or re-assign the spare drive. In addition, the assigned spare drive information and status 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 background tasks. If no logical drive has been configured, you cannot select this menu.

- **Event Log**

  The controller records events such as background task. You can check condition of the controller.

- **Buzzer**

  You can select whether the buzzer sounds. If you select ‘Enable’ , the controller sounds buzzer, or you select ‘Disable’, it does not.

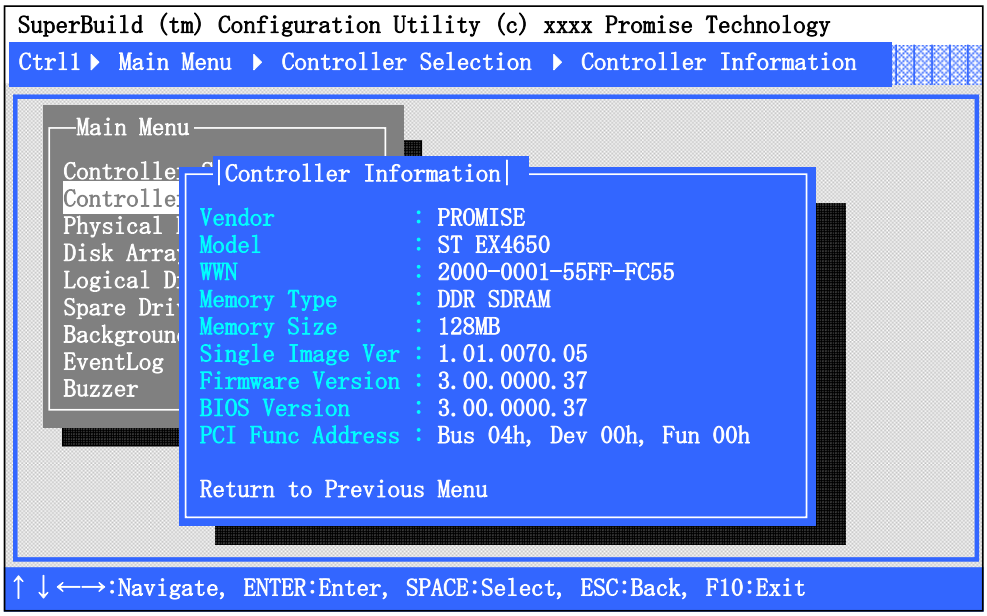
2-3. Controller Selection

When you select the [Main Menu] → [Controller Selection], the screen shown below is displayed. This menu is used to select a target controller if one or more controller is installed. Your server can contain only one controller, therefore, this menu is not used.

2-4. Controller Information

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

> **Tips**
>
> This menu is for information only.



- **Vendor/ Model**

  Indicates the vendor name and model name.

- **WWN**

  WWN is an abbreviation for ‘World Wide Name’, and indicates an original number of each disk array controller.

- **Memory Type/Memory Size**

  Indicates the type and size of the memory installed.

- **Single Image Version/Firmware Version/BIOS Version**

  Indicates the single image, firmware and BIOS versions.

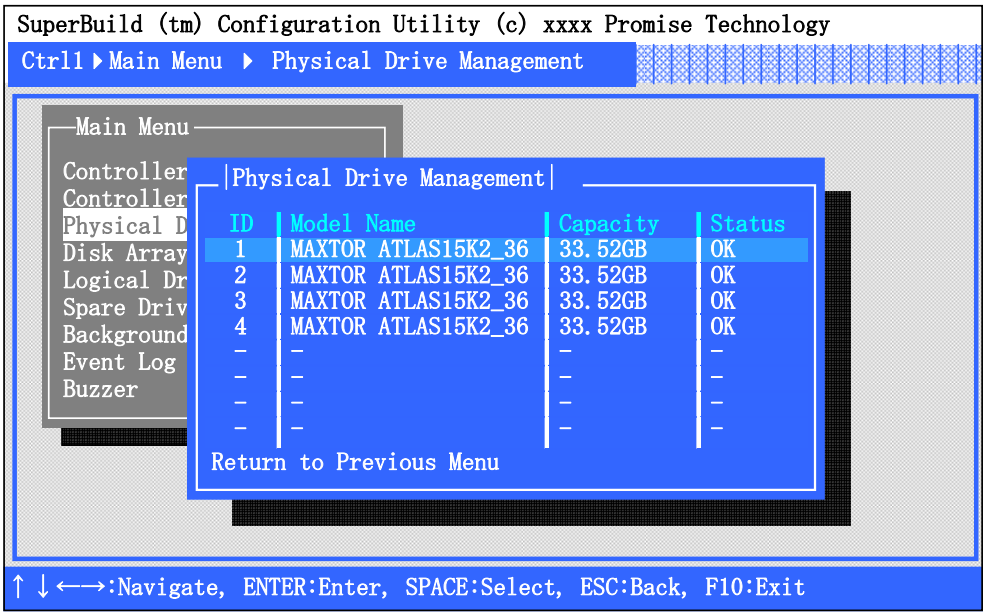
- **PCI Func Address/PCI Base Address**

  Indicates the PCI bus assignments.

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.



- **ID**

  Indicates the port number (Port 1 to Port 4) of the connected HDD.

- **Model Name**

  Indicates the vendor model name of the HDD.

- **Capacity**

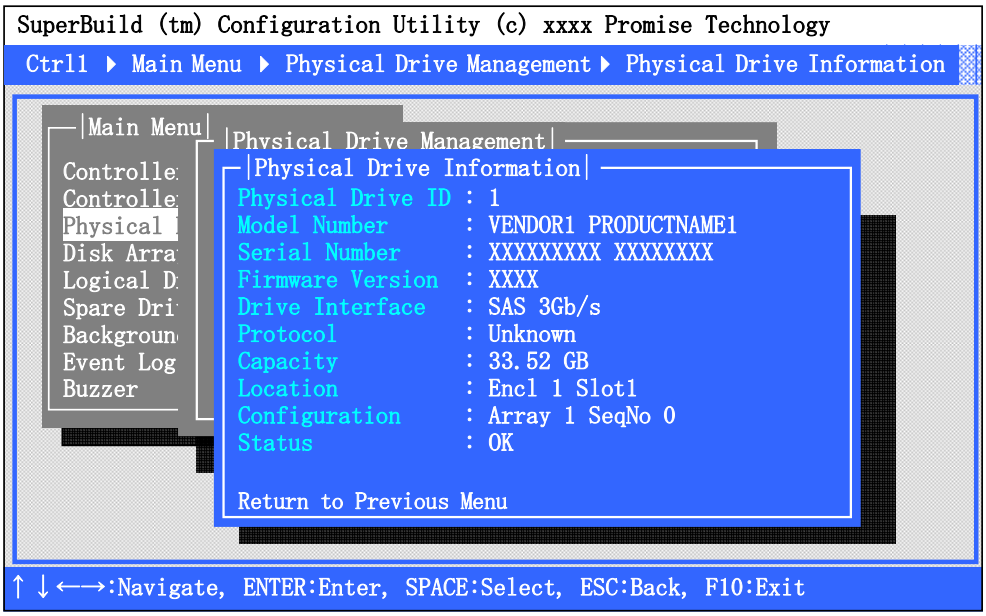
  Indicates the HDD capacity.

- **Status**

  Indicates the Physical Drive current status.

Status	Description
Ok	This is the normal state of a physical drive.
PFA	The physical drive has errors resulting in a prediction of failure.
DEAD	The drive is not accessible
Rebuild	A rebuild is in progress.
Md.Patrol	A MediaPatrol activity is in progress on this Physical drive.
Migration	A migration is in progress.
Transit	A Transition involving this physical drive is running.
PDM Run	PDM is running on this physical drive.
stale	The physical drive contains obsolete disk array information.

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 4) 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.

- **Drive Interface**

  Indicates maximum PCI bus transfer rate.

- **Protocol**

  Unsupported

- **Location**

  Indicates the location of HDD.

- **Configuration**

  Indicates the location of HDD in the Disk Array.

- **Status**

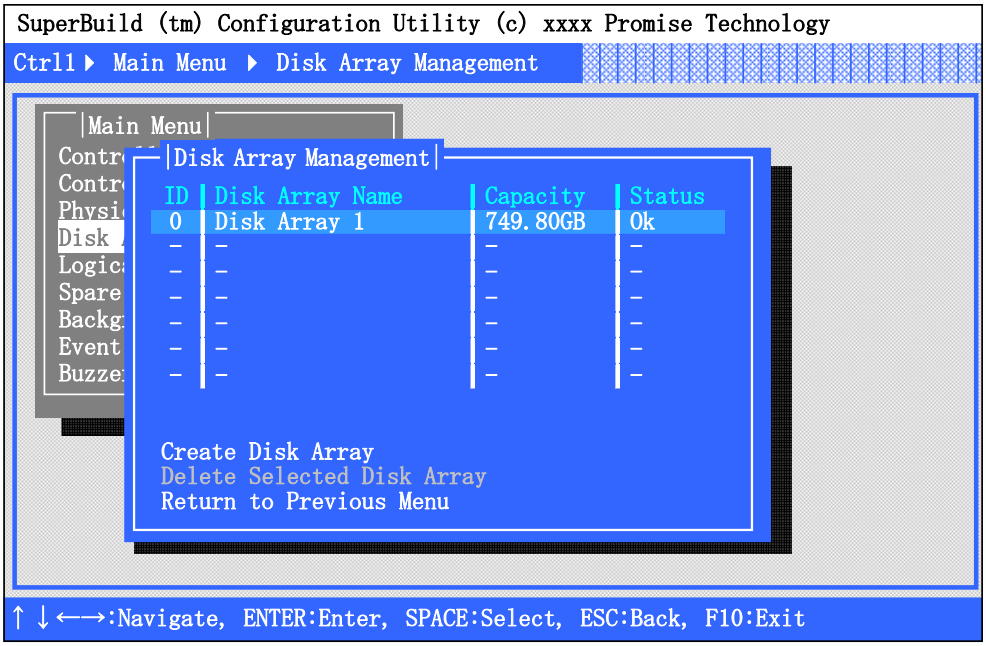
  Indicates the current status of HDD.

- **Return to Previous Menu**

  Return to previous Menu.

2-6. Disk Array Management

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



- **ID**

  Indicates the disk array number.

- **Disk Array Name**

  Indicates the disk array name which was configured.

- **Capacity**

  Indicates the capacity of the disk array.

- **Status**

  Indicates the current status of logical drive.

Status	說 明
Ok	This is the normal state of a disk array.
Degraded	One or more physical drive have failed.
Rebuild	A rebuild is in progress.
Migration	A migration is in progress.
Transit	A transition is in progress.
PDM Run	A pdm is in progress.
Offline	The disk array that is no longer accessible
Miss PD	A disk array drive flag is missing.

Tips

The rebuild process can cause a change in the disk array configuration. Therefore, 'Rebuild' indicated as a Disk Array, not as a Logical Drive status.

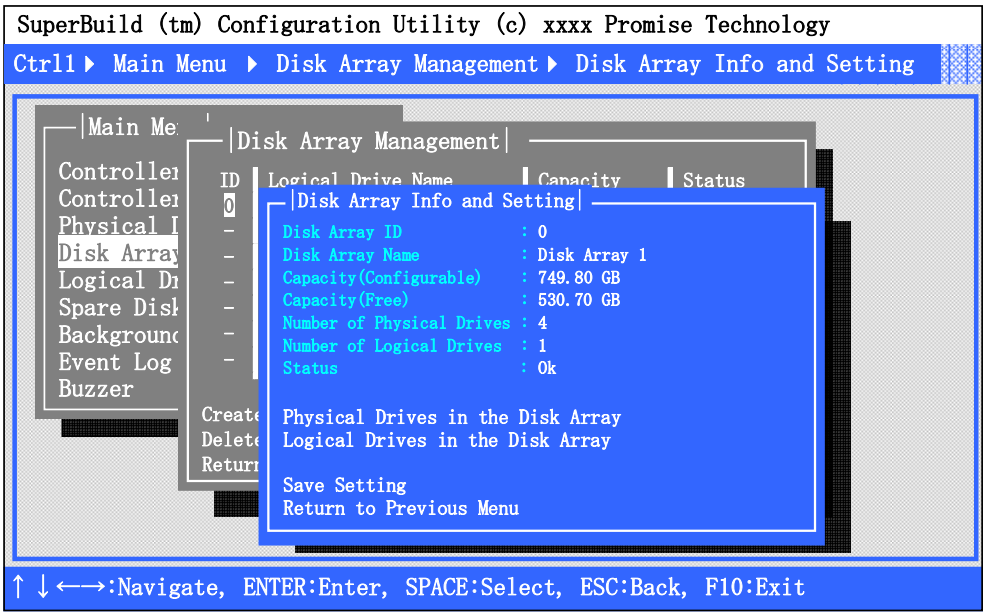
- **Create Disk Array**

  Select this menu to create a disk array. See "3-2. Creating Disk Array" for detailed procedure.

- **Delete Selected Disk Array**

  Select this menu to delete a disk array. See "4. Deleting Disk Array" 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.



- **Disk Array ID**

  Indicates the disk array ID.

- **Disk Array Name**

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

- **Capacity(Configurable)**

  Indicates the configurable capacity of the disk array.

- **Capacity(Free)**

  Indicates the free capacity of the disk array.

- **Number of Physical Drives**

  Indicates the number of the physical drives.

- **Number of Logical Drives**

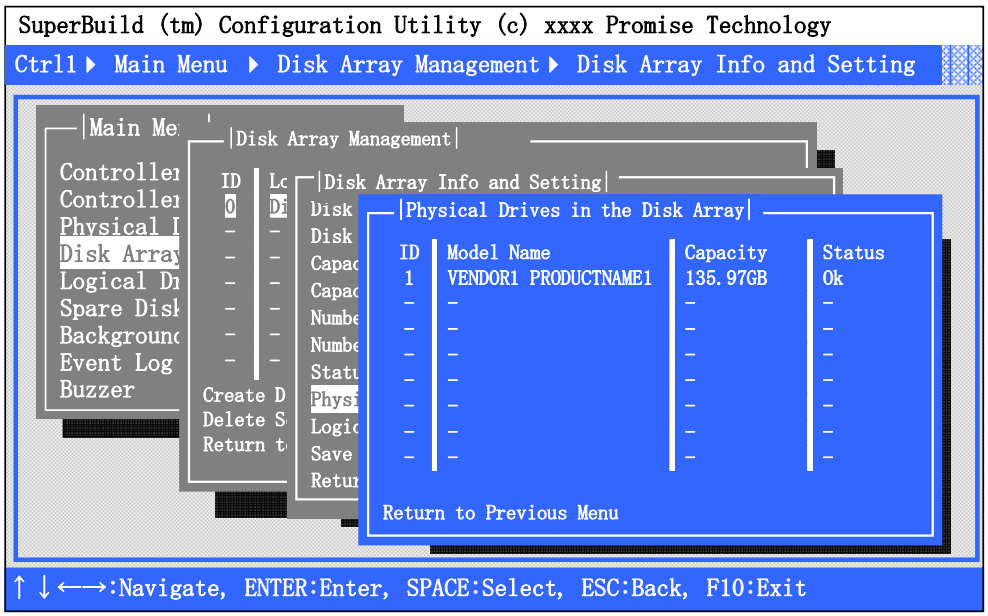
  Indicates the number of the logical drives.

- **Status**

  Indicates the current status of the disk array. It's the same one which is displayed on the previous screen.

- **Physical Drives in the Disk Array**

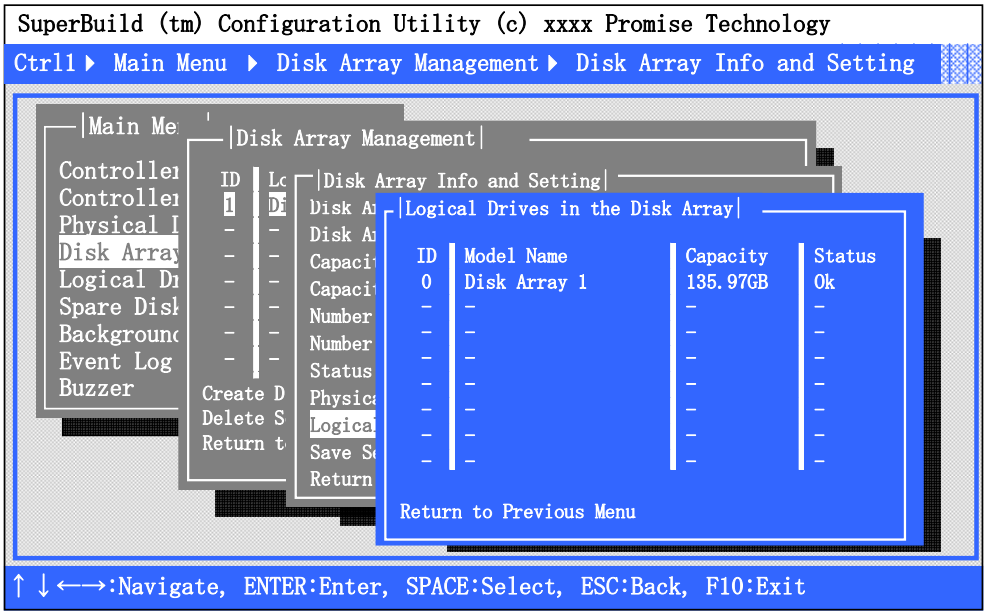
  When you select [Physical Drives in the Disk Array] → the screen shown below appears. You can view the information of the physical drives in the disk array. See "2-5. Physical Drive Management" for detailed information.



■ **Logical Drives in the Disk Array**

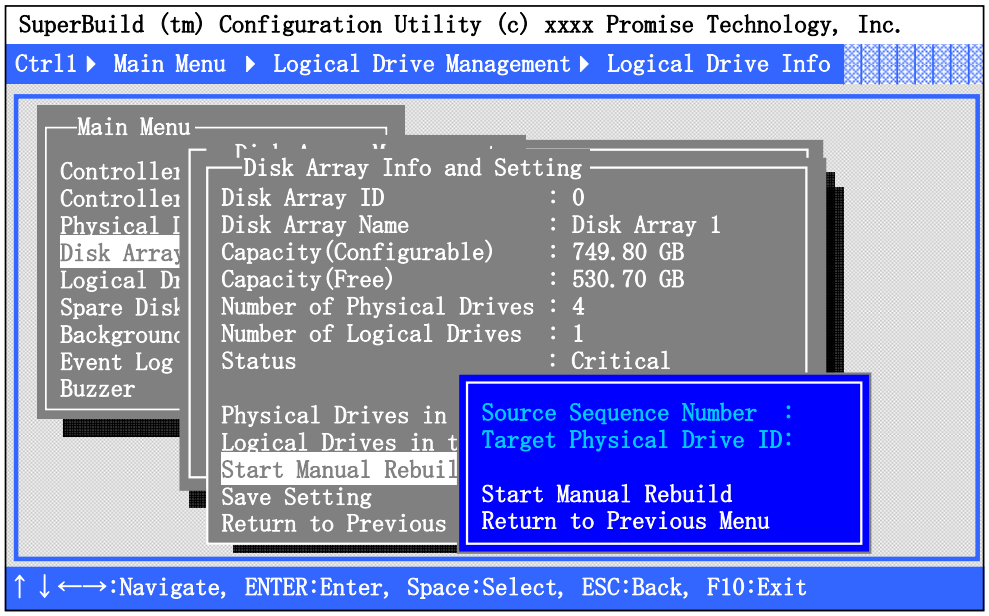
When you select [Logical Drives in the Disk Array] → the screen shown below appears. You can view the information of the logical drives in the disk array.

See “2-6.Logical Drive Management” for detailed information.



■ **Start Manual Rebuild**

Manual Rebuild can recover arrays. 'Start Manual Rebuild' is indicated when the status of logical drive status is critical. By Manual Rebuild, you can recover an array without changing the HDDs.

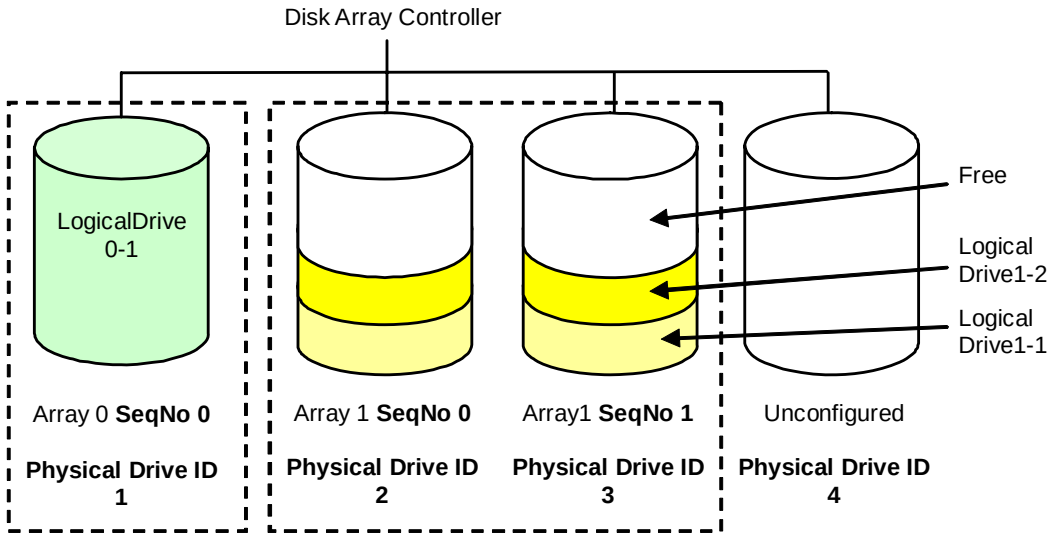


You can rebuild the disk array by specifying a Source Sequence Number and a Target Physical Drive ID

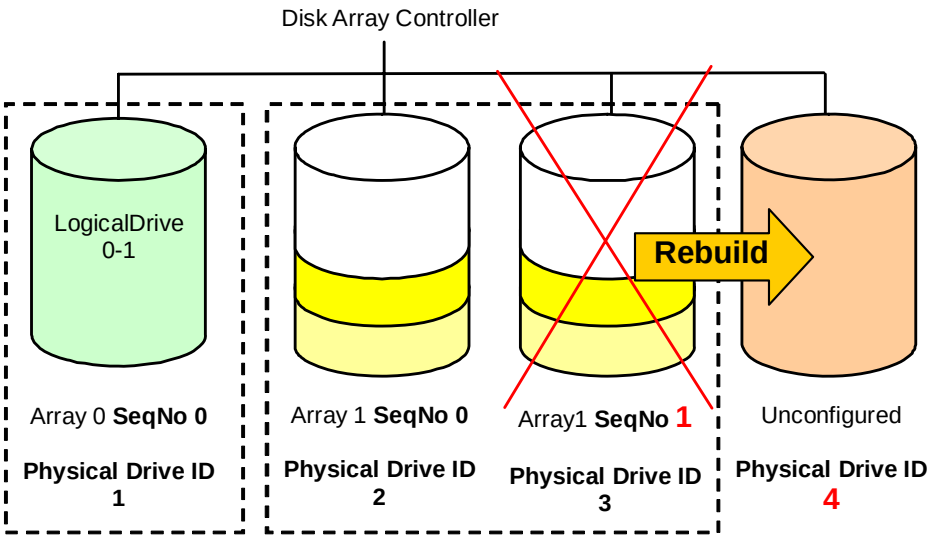
Tips

- Specifying the sequence number which is the configured critical array and status indicates trouble (such as DEAD) to Source Sequence Number
- You can select an unconfigured normal HDD (in the other slot) to ManualRebuild except for trouble HDD
- If you want to Rebuild, You have to change it for a bigger or identical HDD.
- You can't rebuild to a disk array which is configured only as a RAID0 logical drive.

(Example) Made 2 disk arrays which is configured of 1 HDD/2HDDs. Remaining 1 is unconfigured.



In this case, if the Physical drive 3 is defective and you want to rebuild physical drive4, you must specify Source Sequence Number = **1**,Target Physical Drive ID = **4**.



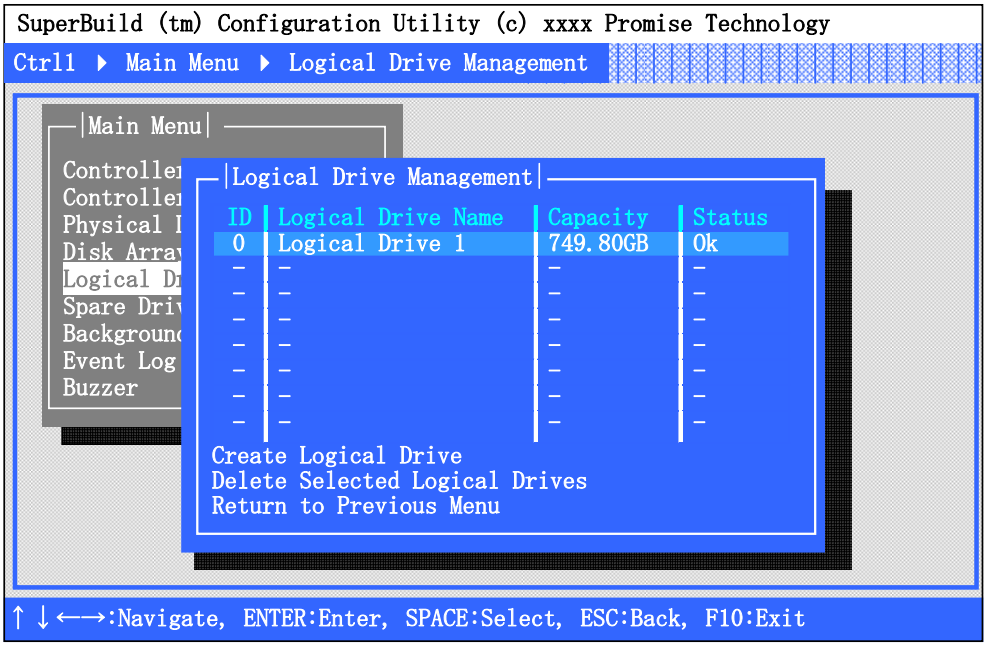
Tips

The Physical Drive ID Assigned to HDD is different among the system. Confirm to which HDD is assigned the Physical Drive ID. For more information, refer to 2.5 Physical Drive Management

- **Save Setting**
  You can change items which are indicated with white characters, but can't change those with gray characters. You can change items by using the arrow keys, and pressing the [Enter] key. After changing those items, you can settle the change by selecting ' Save Setting'.

2-7. Logical Drive Management

When you select [Main Menu] → [Logical Drive Management], the screen shown below appears. 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 the capacity of the logical drive.

- Status

  Indicates the current status of logical drive.

Status	說 明
Ok	This is the normal state of a logical drive.
Critical	The Logical drive is no longer fault-tolerant but data is still accessible
Offline	The Logical Drive is no longer accessible
Initial	The Logical Drive is being initialized.
Redun.Chk	A redundancy check is in progress.

Tips

During Rebuild, indicates ‘Rebuild’ at the status of disk array, and indicates ‘Critical’ at the status of logical drive.

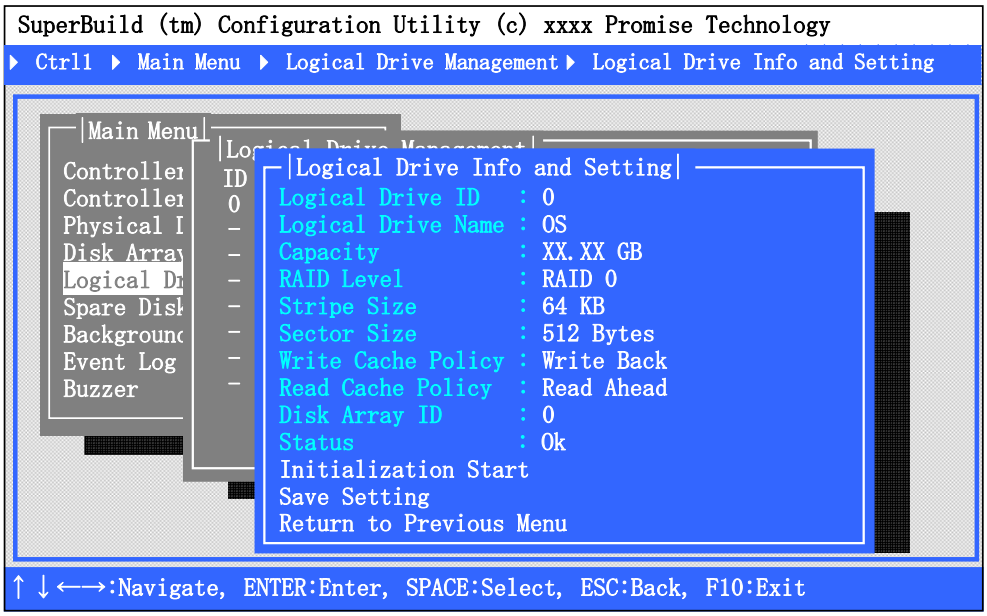
- Create Logical Drive

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

- Delete Logical Drive

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

Selecting a desired logical drive and pressing <Enter> key 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 the capacity of the logical drive.

- **RAID Level**

  Indicates the RAID level.

- **Stripe Size**

  Indicates the stripe size.

- **Sector Size**

  Indicates the sector size.

- **Write Cache Policy**

  Indicates the Write Cache policy currently set.

- **Read Cache Policy**

  Indicates the Write Cache policy currently set.

- **Disk Array ID**

  Indicates the number of Disk Array

- **Status**

  Indicates the current status of the logical drive.

- **Initialization Start**

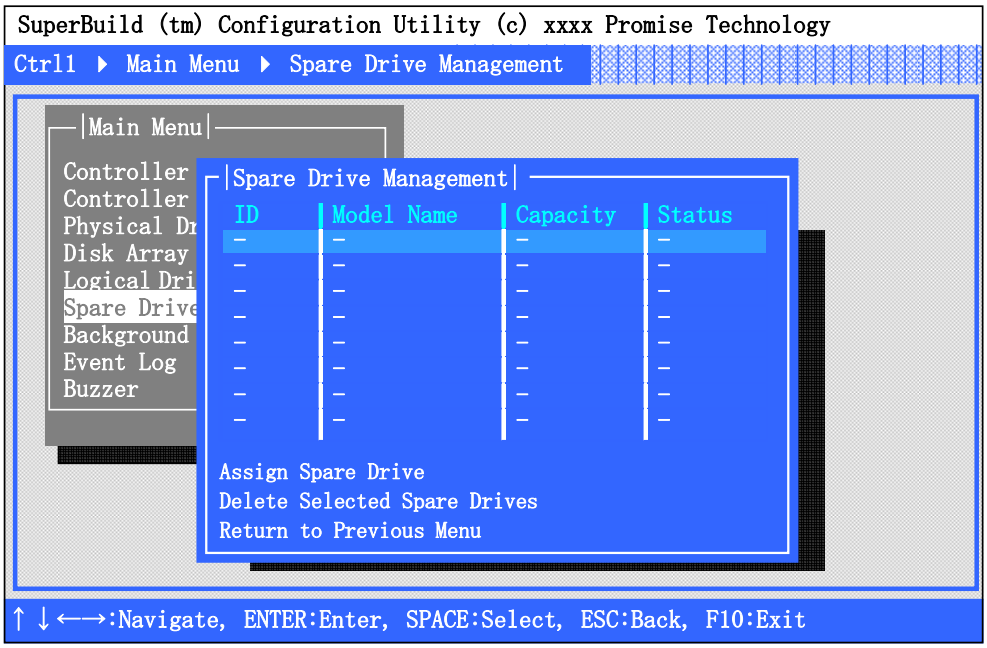
  You can perform a full initialization on the logical drives. If it being initialized, it indicates Initialization Stop, and you can stop initialization by selecting it.

- **Save Setting**

  You can change the items indicated with white letters.
  You can settle the configuration to select [Save Setting].

2-8. Spare Drive Management

When you select [Main Menu] → [Spare Drive Management], the screen shown below appears. You can assign the spare drive for disk arrays. You can also confirm or change the spare drives which have already been assigned.



- **ID**

  Indicates the ID of the connected HDD.

- **Model Name**

  Indicates the vendor model name of the HDD.

- **Capacity**

  Indicates the disk capacity

- **Status**

  Indicates the current status of the drive.
  Refer to the status listed in Physical Drive Management for more information.

- **Assign Spare Drive**

  You can set free HDDs as spare drives.

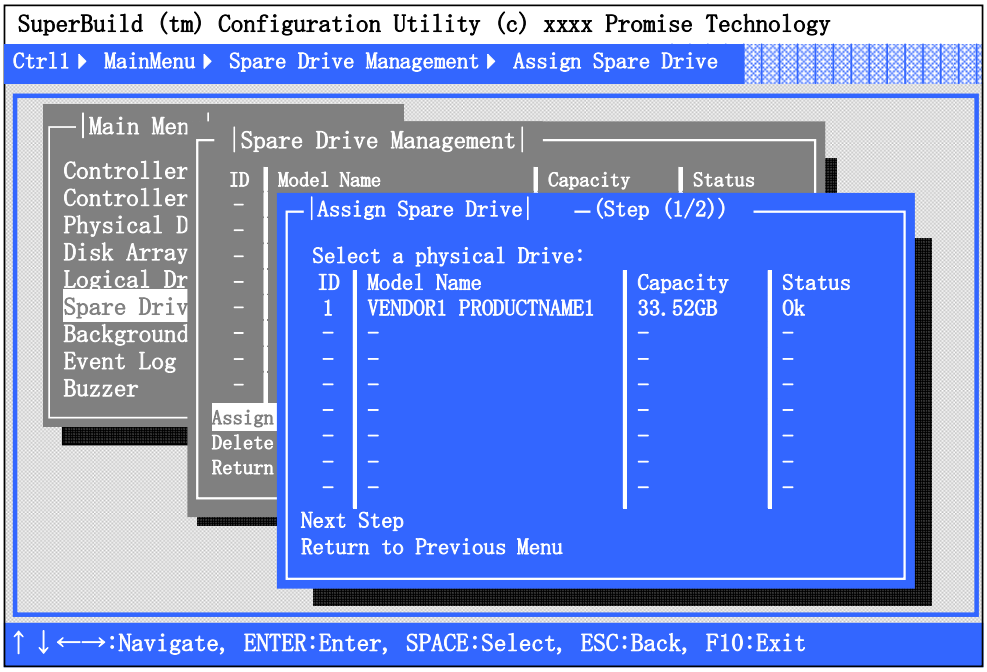
- **Delete Selected Spare Drive**

  You can delete spare drives.

- **Return to Previous Menu**

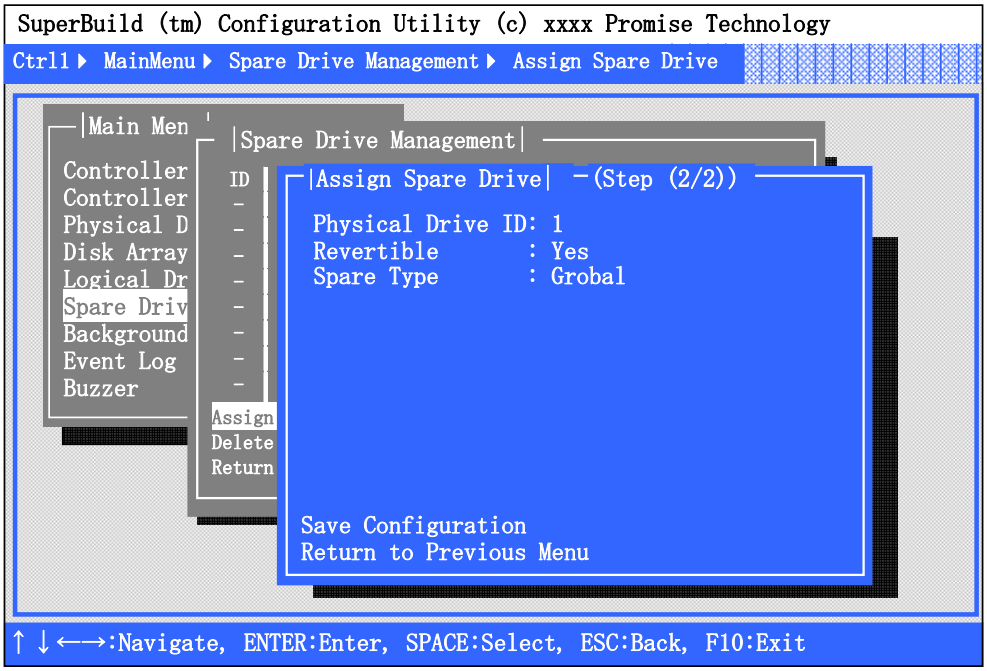
  Return to the Previous Menu.

When no spare drive is set, nothing is displayed in the list. You can assign a new spare drive by selecting Assign Spare Drive.



Indicates the HDD which you can assign as a spare drive in the list.

You can select the HDD, and advance to next step.



- **Physical Drive ID**

  Indicates the ID of the HDD which is set as a spare drive.

- **Revertible**

  You can set a revertible hot spare drive.

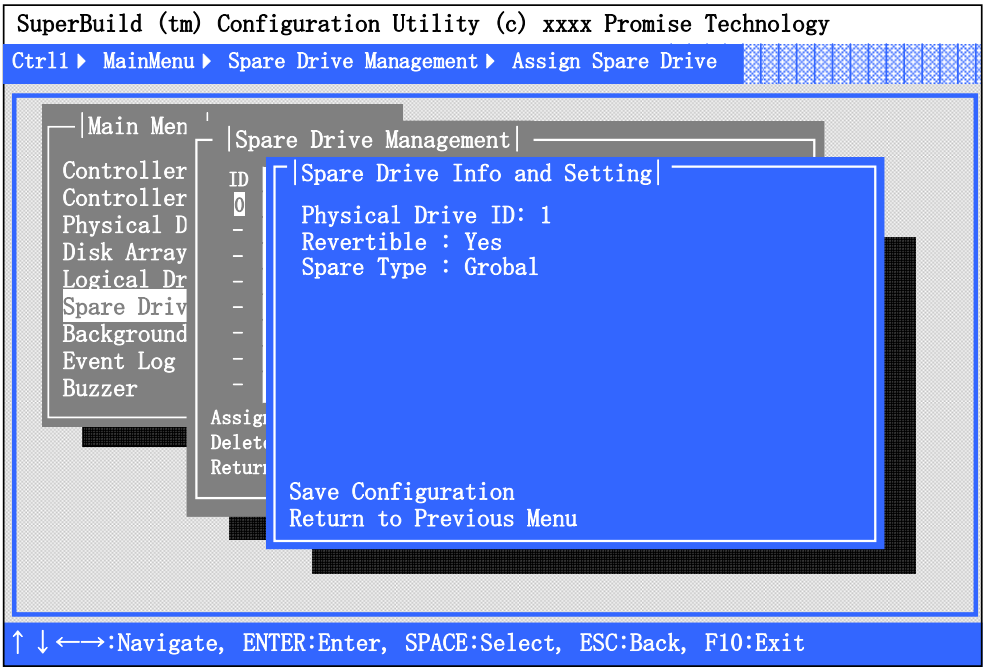
- **Spare Type**

You can select the range of the spare drive.

If you select ‘Global’, the spare drive functions for all disk arrays.

If you select ’Dedicated’, the spare drive functions for selected disk arrays.

You can see the assigned spare drive on the spare drive management screen.

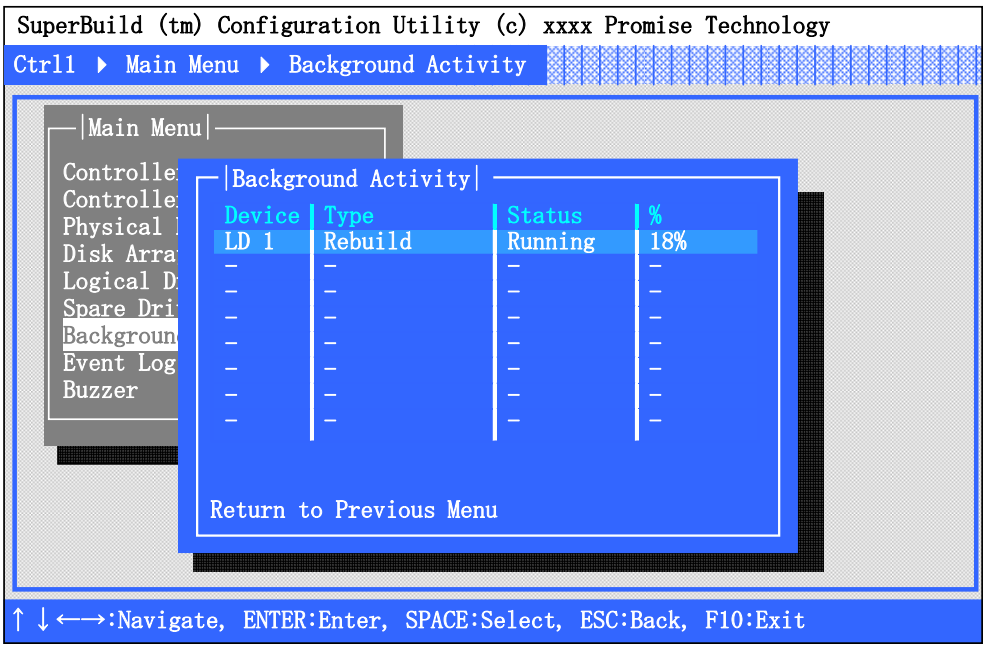


You can see the [Spare Drive Info and Setting] screen using an arrow key (up/down) to move cursor to the spare drive. You can save the configuration by selecting Save Configuration.

2-9. Background Activity

When you select [Main Menu] → [Background Activity], the screen shown below appears.

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



- Device

  Indicates the existing logical drives.

- Type

  Indicates the type of background task being executed.

Type	Explanation
Rebuild	A rebuild is in progress.
Md.Patrol	The MP activity in progress on this Physical drive.
Migration	A migration is in progress.
Transit	A Transition is running that involves this physical drive.
PDM Run	PDM is running on this physical drive.
Initial	A Logical Drive is being initialized.
Redun.Chk	A redundancy check is in progress.

- Status

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

Ok	Indicates that the logical drive is in online status. There is no running background task.
Running	Indicates that the background task indicated in the "Type" field is running.
Paused	Indicates that the background task indicated in the "Type" field is paused.
Queued	Indicates that the condition of the background task is queued.

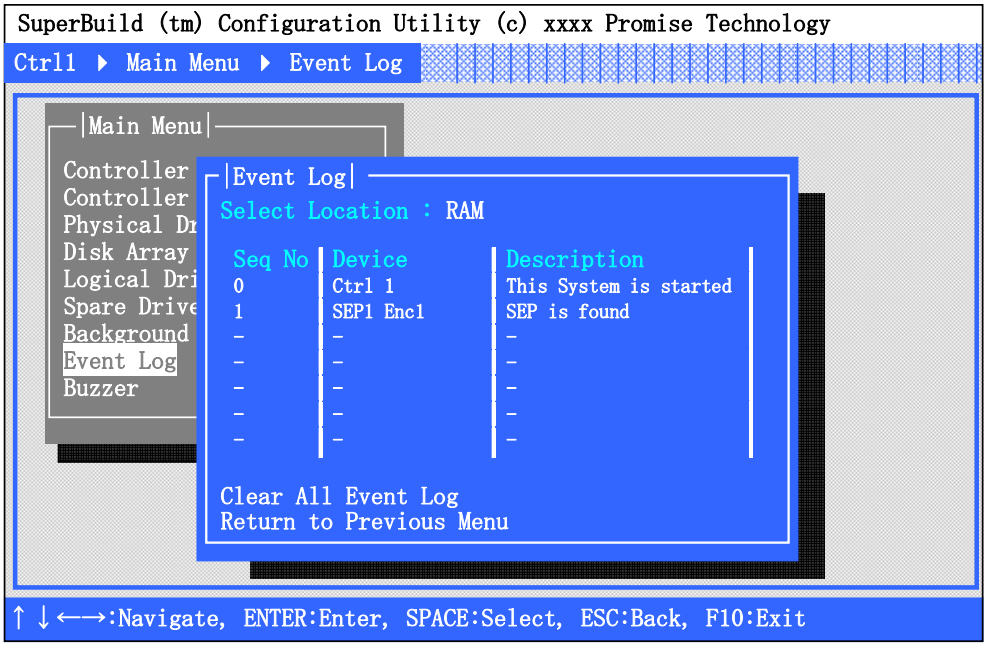
- %

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

2-10. Event Log

When you select [Main Menu] → [Event Log], the screen shown below appears.

Each time an event (background task start/processing/finish) occurs, this information is added automatically to the EventLog. You can confirm Runtime Events(RAM) and NvRAM events.You can clear the log information by selecting Clear All Event Log.

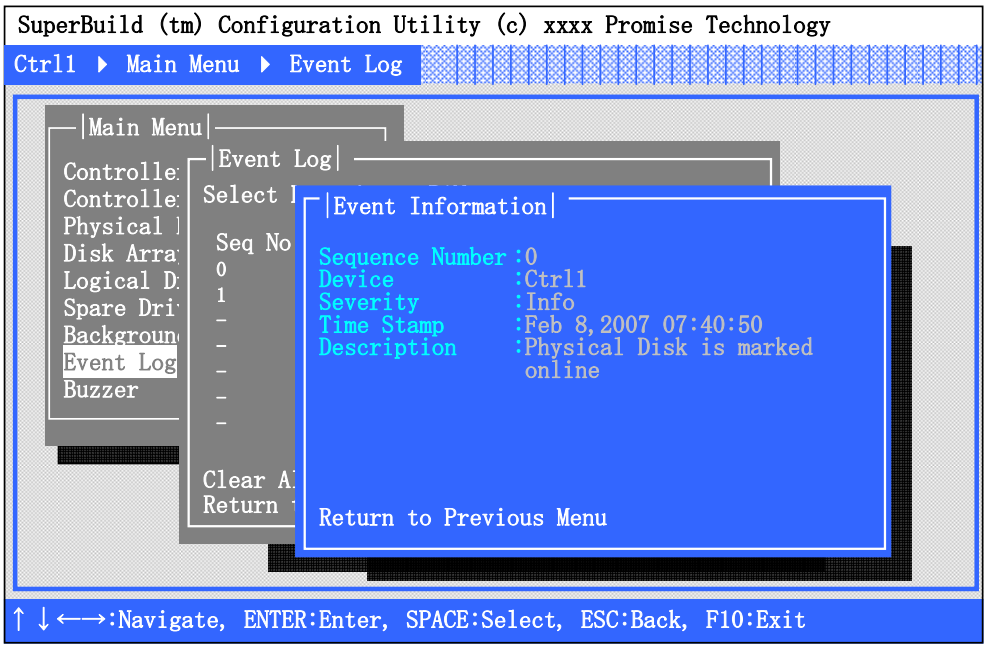


Tips

Whenever the background task reaches 10%, the log is registered. Therefore, 10 events are registered by completion.

You can see more detailed information on this screen.

You can see Event Information by using the arrow key up/down to move cursor to the event, and press the <Enter> key. The Event Information screen appears.



- **Sequence Number**

  Indicates the Sequence Number.

- **Device**

  Indicates the device for which the event occured.

- **Severity**

  Indicates the severity level of the event.

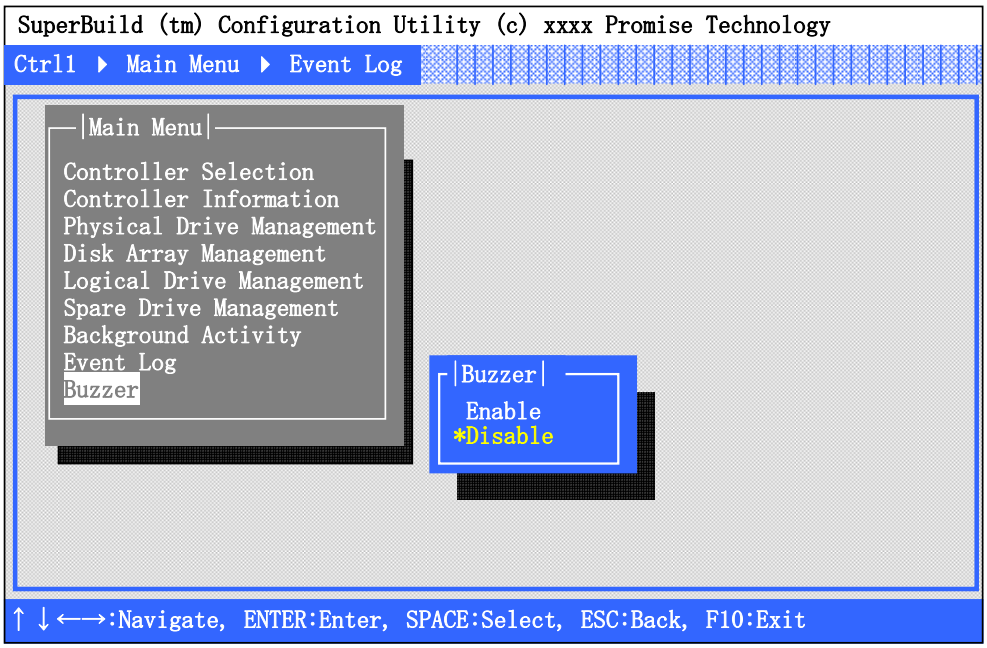
- **Time Stamp**

  Indicates the date and the time of the event.

- **Description**

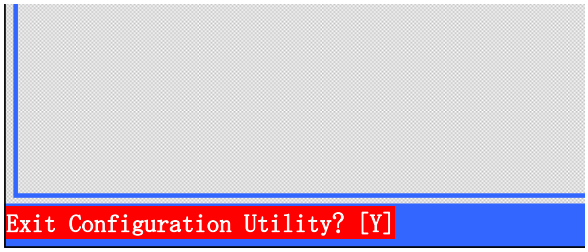
  Indicates the contents of the event.

2-11. Buzzer



2-12. 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, you are prompted to confirm you wish to exit.

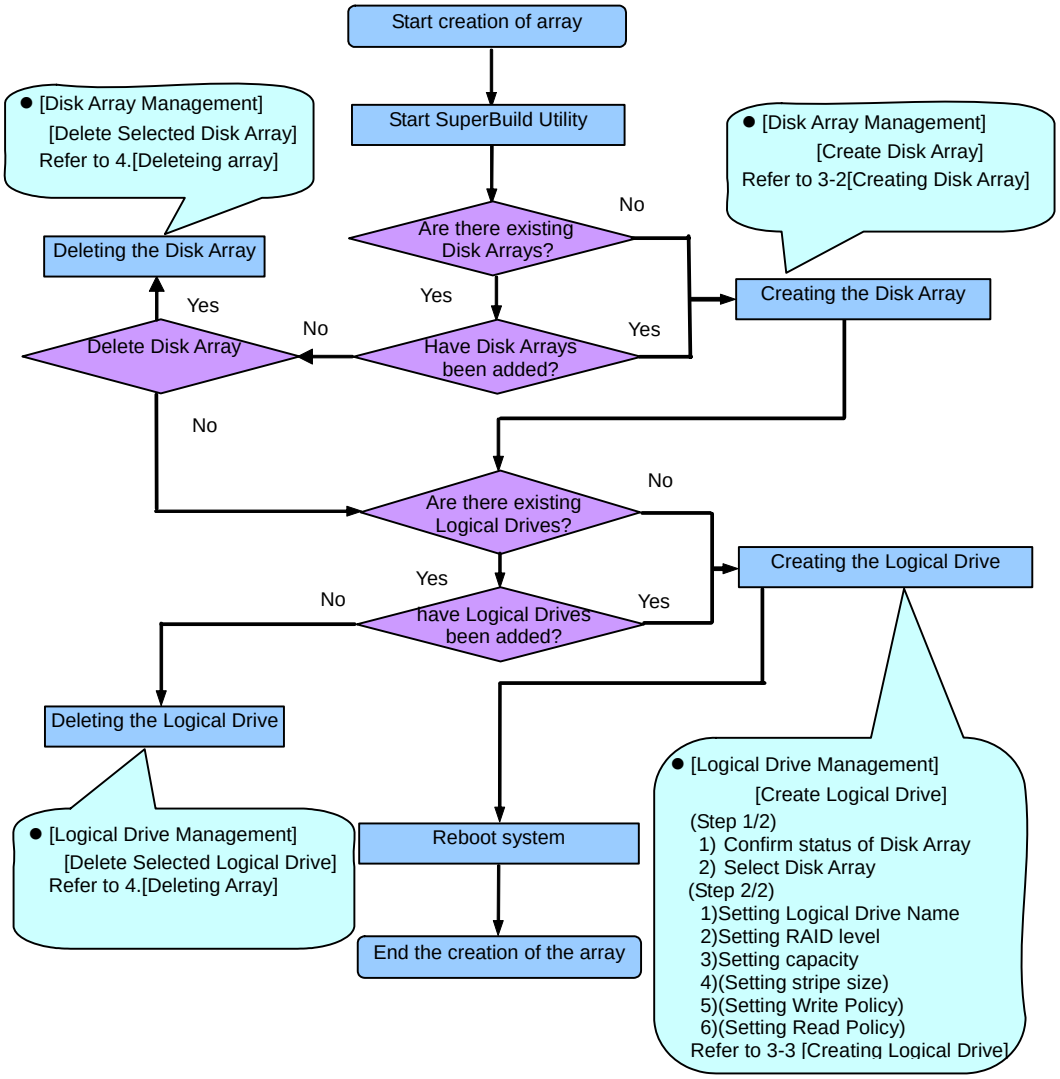


3. To exit from the SuperBuild Utility, press [Y] to reboot the server or turn off the power. Press any key (such as [Esc]) to cancel.

3. Creating a Logical Drive

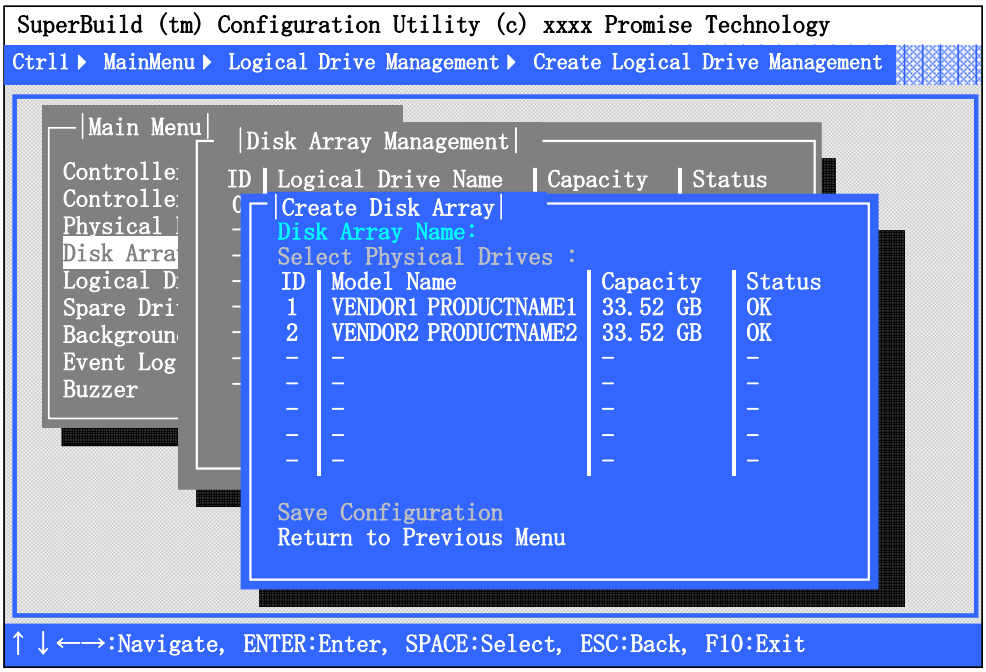
This section describes the creation of a logical drive on SuperBuild Utility.

3-1. Job Flow of Creation of Logical Drives



3-2. Disk Array Creation Procedure

4. Select [Main Menu]->[Disk Array Management]
5. If there is a Disk Array in the list, it means that Disk Array has already been created. In case there are disk arrays or you wish to add a new disk array, select [Create Disk Array] with arrow key(up/down) and press <Enter>.



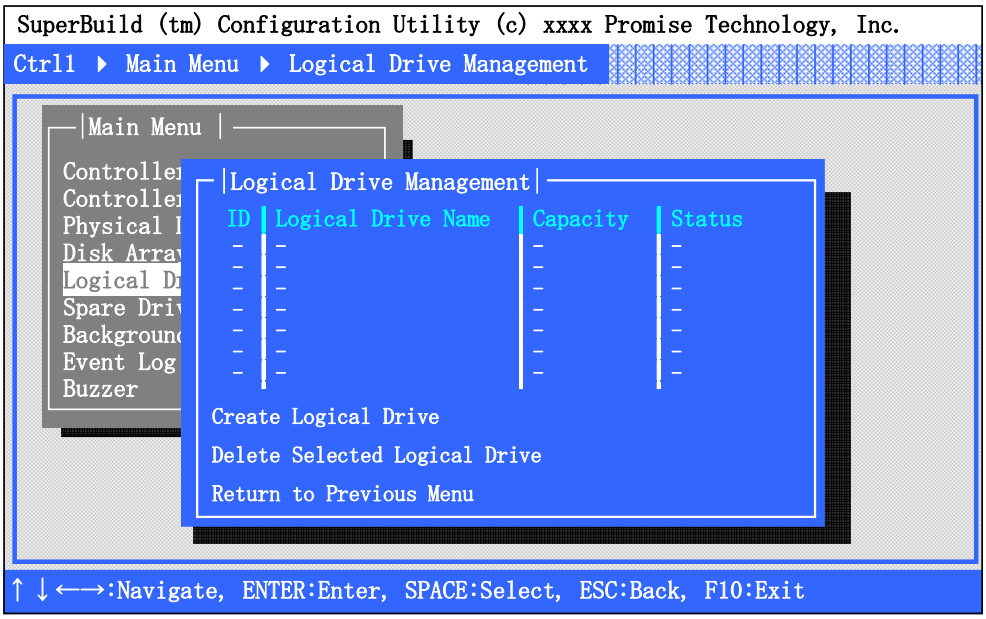
6. Indicates the HDDs available to configure a Disk Array. Select all the HDDs which you want to use to create a Disk Array with the <space> key and select [Save Configuration].

Notice

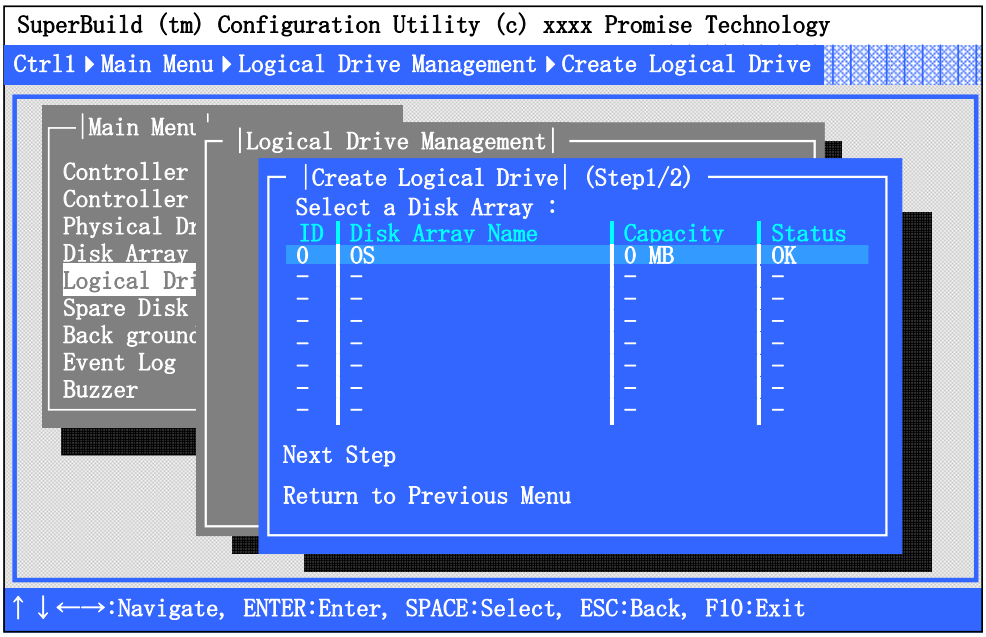
- If you use several HDDs, use HDDs of the same capacity.
- If a HDD with a different capacity is connected, ask your sales representative.
- If the Physical Drive status is not 'OK' when you use new disks or for maintenance, ask your sales representative.

3-3. Logical Drive Creation Procedure

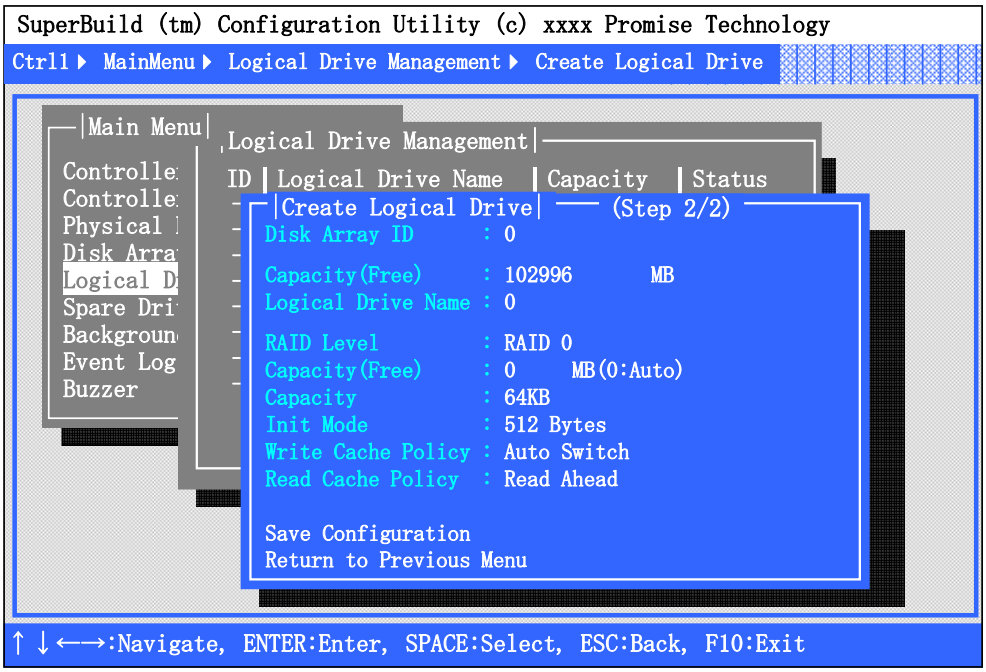
1. Start SuperBuild Utility.
2. Select [Main Menu] → [Logical Drive Management].



3. Use an arrow key (up/down) to move the cursor to [Create], and press the [Enter] key. The [Create Logical Drive (Step1/2)] screen appears.



4. Indicates the list of configured disk arrays. When you can confirm the status of the disk array where you try to make a logical drive is 'OK', select a disk array by pressing the <space> key and press [Next Step].



6. Provide the settings required to create a logical drive.

Item	Default	Available value
Disk Array ID	x	can not change
Capacity (Free)	xxxxxx MB	Do not change.
Logical Drive Name		Alphanumeric and symbol characters
RAID Level	RAID0	RAID0/RAID1/RAID5/RAID10
Capacity	xxxxxx MB	Numeral
Stripe Size	64KB	64KB/128KB/256KB/512KB/1024KB
Sector Size	512Byte	can not change
Write Cache Policy	Write Back	Write Back/Write Through
Read Cache Policy	Read Ahead	No Cache/Read Cache/ Read Ahead

- Disk Array ID

  Indicates the Disk Array Number (View only).

- Capacity (Free)

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

- Logical Drive Name

  Specify the desired name for the 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.

- RAID Level

  Set the RAID level according to your requirements.

- 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 (selected default 0 value), the maximum allowable capacity is set. Minimum size is 100MB.

- Stripe Size

  Specify the data size to be divided for striping. Specifying the larger data size increases the speed to read/write sequential data. We recommend you specify a stripe size of 64KB.

- Sector Size

  Specify the sector size of the disk array (view only).

- Write Cache Policy

  Specify the write cache mode of the disk array controller.

Cache Mode	Description
Write Back	This asynchronous control method writes data into cache memory of the controller, then writes it onto a 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 an instantaneous power failure occurs, the data may be lost.
Write Through	This control method writes data into both the cache memory and the HDD simultaneously. The access performance is not good as in Write Back mode.

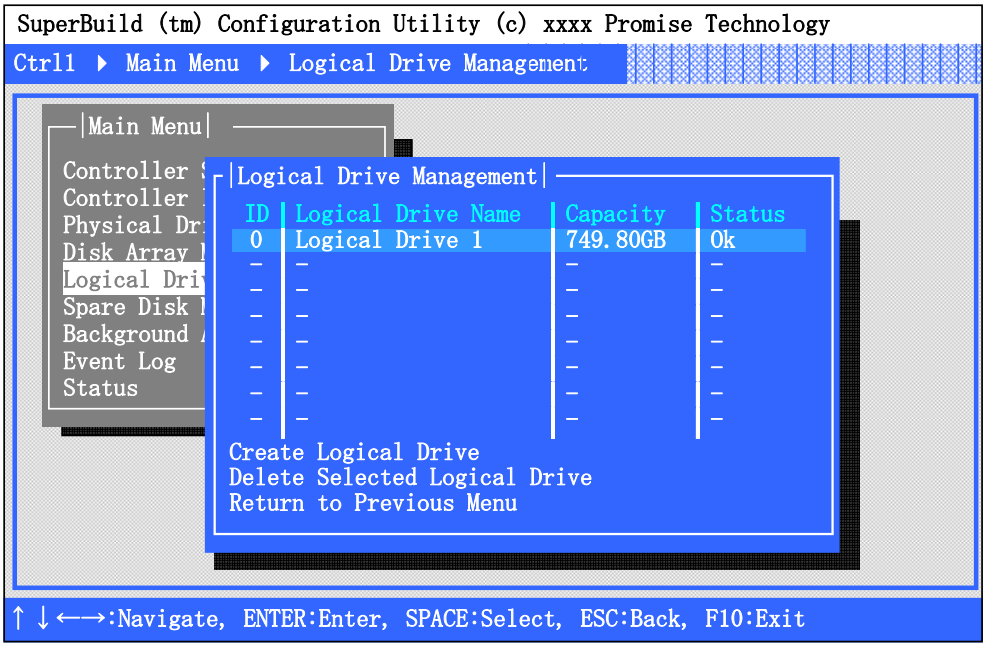
Tips

Adaptive Writeback Cache (in WebPAM PRO) is provided to detect a battery status error (battery capacity is low) and change the WritePolicy to WriteThrough.
We suggest you keep Adaptive Writeback Cache to 'ON'. (If you want to change a value, refer to the online manual "Web-based Promise Array Manager User's Guide" saved in the ExpressBuilder CD-ROM coming with the card.)

- Read Cache Policy

Cache Mode	Description
No Cache	The read cache is disabled.
Read cache	The read cache is enabled.
Read Ahead	The read cache and the read-ahead feature are enabled. Read-ahead anticipates the next read and performs it before the request is made. Can increase read performance.

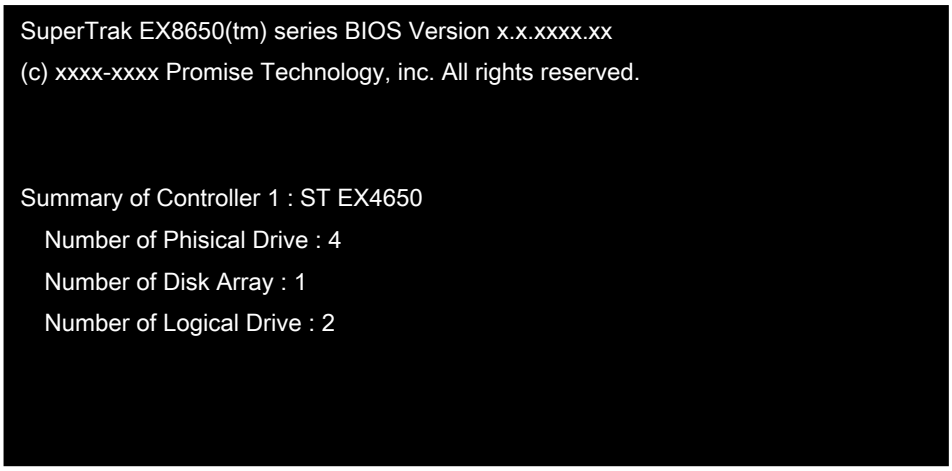
7. Upon the completion of the settings, move the cursor to [Save Configuration] and press the <Enter> key to save the configuration data.
8. Once the configuration data is successfully saved, the screen returns to [Logical Drive Management]. Check the status of the logical drive you have created. If you are going to create another logical drive, select [Create] and repeat Steps 3 through 7 described above.



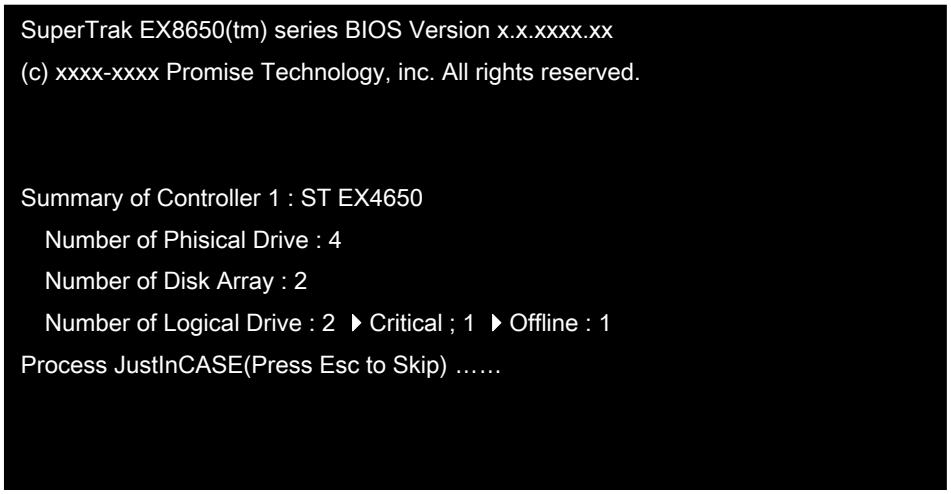
9. Once you have configured all the logical drives, exit from the SuperBuild Utility and restart the server.

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

Example1: Operation Normally.



Example2: There is existed critical logical drive and offline logical drive.



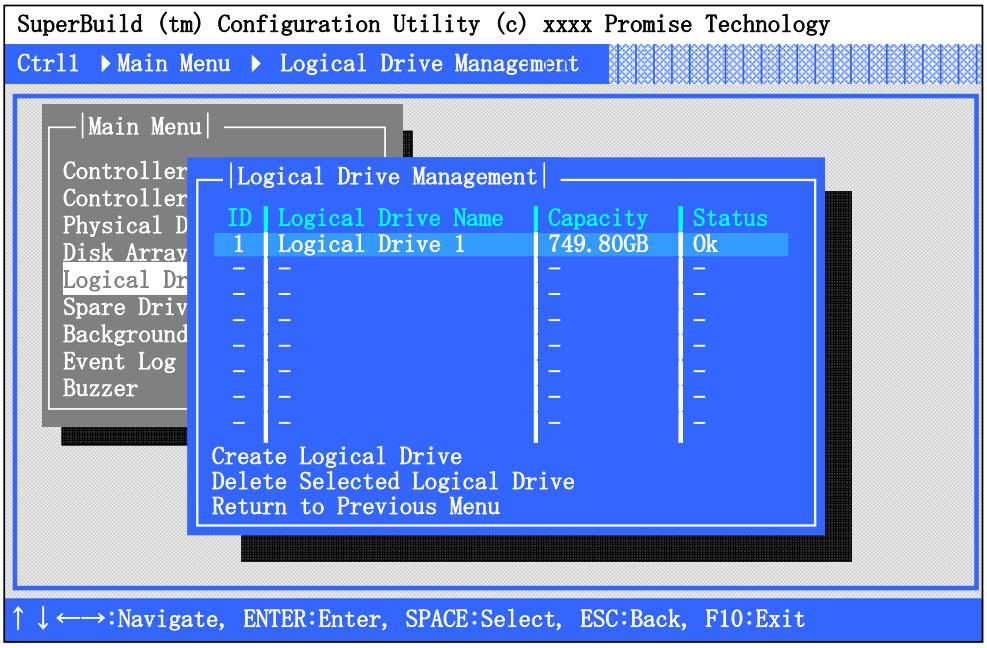
4. Deleting Logical Drive

This section describes the deletion of a logical drive on the SuperBuild Utility.
You can delete a Disk Array as explained in the procedure below.

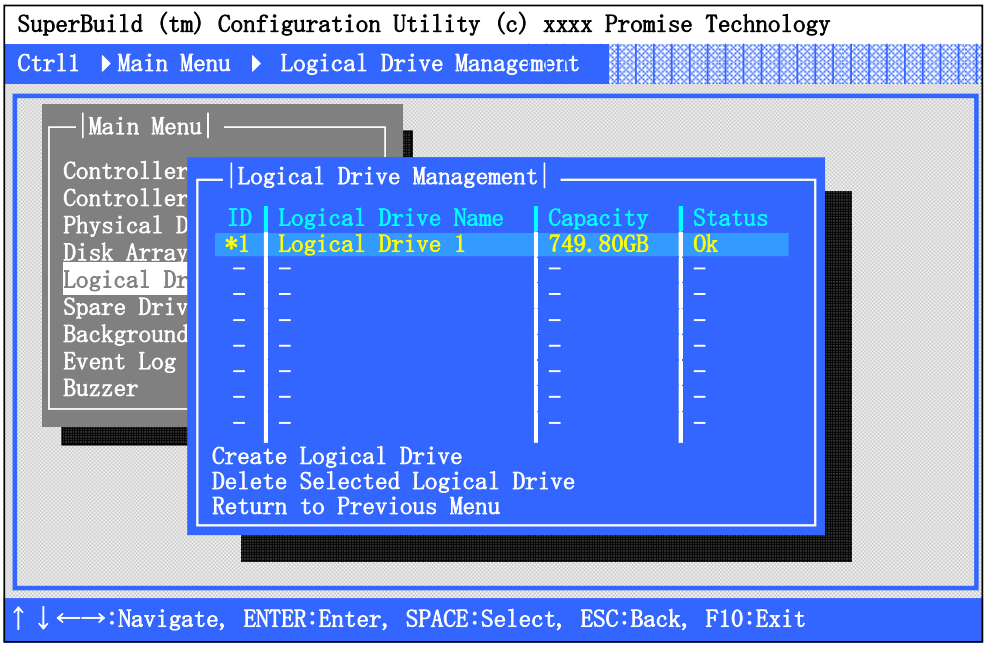
> **Notice**
>
> If you delete a Disk Array, note that the logical drive is deleted at the same time.

4-1. Logical Drive Deletion Procedure

1. Start the SuperBuild Utility.
2. Select [Main Menu] → [Logical Drive Management].



3. Move the 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 several 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. The deletion procedure is completed once the target logical drive is not displayed anymore on the [Logical Drive Management] screen.

Chapter 6 Operation and Maintenance

1. Maintenance Service

Contact your service representative for all maintenance services related to your disk array controller.

2. Preventive Maintenance

2-1. Data Backup

We recommend you regularly backup the data in your HDD should an unexpected incident occur.

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

2-2. Preventive Maintenance by Media Patrol/Redundancy Check

It is recommended to perform media patrol or redundancy check 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 PRO.

For more information on the media patrol and RedundancyCheck, 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 Media Patrol or RedundancyCheck, WebPAM PRO 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, that a disk which has previously been configured as logical drive, can be subjected to media patrol even if it is in "free" status.

3. Maintenance

The disk array controller supports the following maintenance features:

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

3-1. Configuration on Disk (COD) Feature

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

Check

The configuration information is not stored on the disk array controller. It is recorded and stored in the HDDs.

3-2. Rebuild Feature

When a HDD is defective, the rebuild feature recovers the data in the defective 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.

3-4. PDM

Predictive Data Migration (PDM) migrates data from the suspect physical drive to a spare physical drive, similar to Rebuilding. But unlike Rebuilding, PDM acts before the disk drive fails and your Logical Drive goes Critical.

4. Replacement of the Disk Array Controller

Replace the disk array controller as described in the following procedure:


Check

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

1. Shutdown the OS while the server is powered on, then 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 SAS, and LED cables from the card.
4. Remove the screw fixing the card and remove the card from the server.
5. If an additional battery is implemented, remove it from the disk array controller and attach the removed battery to the new controller. Refer to the Additional Battery User's Guide.
6. Insert the replacement card into the same PCI slot and fix it with the screw.
7. Connect all the cables removed in step 3 following the connecting configuration written down previously.
8. Install the side cover and other components removed in step 2 on the server.
9. Connect the power cords to the receptacles and power on the server. Make sure that the server boots 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?

  → When installing or re-installing an operating system (called OS hereafter), update the driver using the ExpressBuilder CD-ROM after completing the installation.

If a Promise Controller SW & DOC CD-ROM was included with your disk array controller card, use the latest drivers included on this disc.

■ **OS cannot be booted.**

- ❑ Is the disk array controller fully and straightly inserted into the mating PCI slot?

  → 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 theOS is not recognized despite the above actions, the disk array controller may be defective. Contact your service representative.

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

  → Connect the cables correctly.

If the 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 smaller than that of the defected one?

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

- ❑ Is the RAID level of the logical drive RAID0?

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

- ❑ Is the WebPAM PRO configured correctly?

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

■ **Media patrol is disabled.**

- ❑ Is the HDD in the free state?

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

■ **Redundancy check is disabled.**

- ❑ Is the logical drive in the critical state?

  → Replace the defected HDD and perform a rebuild.

- ❑ Is the RAID level of the logical level RAID0?

  → Redundancy check is not possible because there is no redundancy in RAID0. Use the media patrol for preventive maintenance of the HDDs.

■ **LED does not go on.**

- ❑ Are the LED cables connected correctly?

  → Connect the 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 still not recognized despite the above actions, the battery may be defective. Contact your sales representative.

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