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Hitachi Compute Rack 220H User's Guide

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Hitachi Data Systems

MK-90CRH003-02

Contents

Preface

This document describes monitoring, functions, precautions, maintenance and troubleshooting for the *Compute Rack 220H* (CR 220H).
Please read this document carefully, and maintain a copy for reference.

This preface includes the following information:

Notice: The use of Compute Rack and all other Hitachi Data Systems products is governed by the terms of your agreement(s) with Hitachi Data Systems.

Intended Audience

This document is intended for personnel who are involved in planning, managing, and performing the tasks to prepare your site for Compute Rack installation.

This document assumes the following:

- The reader has a background in hardware installation of computer systems.
- The reader is familiar with the location where the Compute Rack will be installed, including knowledge of physical characteristics, power systems and specifications, and environmental specifications.

Product Version

This document revision applies to Compute Rack 220H version 0021R22500.

Release Notes

Read the release notes before installing and using this product. They may contain requirements or restrictions that are not fully described in this document or updates or corrections to this document.

Document Organization

The table below provides an overview of the contents and organization of this document. Click the chapter title in the left column to go to that chapter. The first page of each chapter provides links to the sections in that chapter.

Chapter	Description
Chapter 1, Before operation	Describes what you should understand before operation.
Chapter 2, Monitoring operating status	Describes means for fault detection of the system unit and an operation monitoring method.
Chapter 3, System Unit Functions	Describes the functions of the system unit that are useful in operation.
Chapter 4, Operational precautions	Describes operational precautions.
Chapter 5, Maintenance and service parts	Describes daily maintenance procedures, service parts and consumables.
Chapter 6, Troubleshooting	Describes troubleshooting of the system unit.

Referenced Documents

Compute Rack 220H (CR 220H) documents:

- Hitachi Compute Rack 220H Getting Started Guide, MK-90CRH001
- Hitachi Compute Rack 220H CRU Replacement Guide, MK-90CRH005
- Hitachi Compute Rack 210H/220H Windows Installation Guide, MK-90CRH007
- Hitachi Compute Rack 210H/220H BIOS Guide, MK-90CRH008
- Hitachi Compute Rack 210H/220H Remote Management User's Guide, MK-90CRH006
- Hitachi Compute Blade Series / Hitachi Compute Rack Series OS Installation Guide for Windows Server, MK-99COM076

Document Conventions

The term “Compute Rack” refers to all Compute Rack models, unless otherwise noted.

This document uses the following typographic conventions:

Convention	Description
Regular text bold	In text: keyboard key, parameter name, property name, hardware labels, hardware button, hardware switch. In a procedure: user interface item
Italic	Variable, emphasis, reference to document title, called-out term
`Screen text`	Command name and option, drive name, file name, folder name, directory name, code, file content, system and application output, user input
< > (angled brackets)	Variable (used when italic is not enough to identify variable).
[ ] (square bracket)	Optional values
{ } braces	Required or expected value
| vertical bar	Choice between two or more options or arguments
_(underline)	Default value, for example, [a | b]

This document uses the following symbols to emphasize certain information.

Symbol	Label	Description
	WARNING	This indicates the presence of a potential risk that might cause death or severe injury.
	CAUTION	This indicates the presence of a potential risk that might cause relatively mild or moderate injury.
NOTICE	NOTICE	This indicates the presence of a potential risk that might cause severe damage to the equipment and/or damage to surrounding properties.
	Note	This indicates notes not directly related to injury or severe damage to equipment.
	Tip	This indicates advice on how to make the best use of the equipment.

Convention for storage capacity values

Physical storage capacity values (for example, disk drive capacity) are calculated based on the following values:

Physical capacity unit	Value
1 kilobyte (KB)	1,000 (10^3) bytes
1 megabyte (MB)	1,000 KB or $1,000^2$ bytes
1 gigabyte (GB)	1,000 MB or $1,000^3$ bytes
1 terabyte (TB)	1,000 GB or $1,000^4$ bytes
1 petabyte (PB)	1,000 TB or $1,000^5$ bytes
1 exabyte (EB)	1,000 PB or $1,000^6$ bytes

Logical storage capacity values (for example, logical device capacity) are calculated based on the following values:

Logical capacity unit	Value
1 block	512 bytes
1 KB	1,024 (2^{10}) bytes
1 MB	1,024 KB or $1,024^2$ bytes
1 GB	1,024 MB or $1,024^3$ bytes
1 TB	1,024 GB or $1,024^4$ bytes
1 PB	1,024 TB or $1,024^5$ bytes
1 EB	1,024 PB or $1,024^6$ bytes

Getting Help

The Hitachi Data Systems customer support staff is available 24 hours a day, seven days a week. If you need technical support, log on to the Hitachi Data Systems Portal for contact information: https://portal.hds.com.

Comments

Please send us your comments on this document: doc.comments@hds.com. Include the document title and number including the revision level (for example, -07), and refer to specific sections and paragraphs whenever possible. All comments become the property of Hitachi Data Systems Corporation.

Thank you!

1

Before operation

This chapter describes what you should understand before operation.

Avoiding trouble

This section describes the requirements for daily maintenance in order to avoid trouble that might occur during system unit operation.

System error check

If some error occurs with the system unit, an error message might be displayed. To resolve trouble early, verify such alerts immediately.

- Hardware errors

  Perform error monitoring based on the ERROR LED of the system unit.

  See Fault detection on page 2-2 and Operation monitoring on page 2-7

- Software errors

  Periodically monitor a software error event log. A software error, if one occurs, is recorded on the event log. For verification of the event log of software attached to the system unit, see the individual software manuals.

  See Bundled software on page 1-5

Consistency check

In a disk array, a re-assign (data migration to a reserved area) is performed if a bad block (inaccessible area) is detected on the HDD/SSD during the read/write process. However, if a bad block exists in the mirror data part as well as in the area not accessed for daily operations, no alternation process is performed. If the HDD/SSD fails in such a state, data in the bad block cannot be rebuilt normally and thus might be lost because mirror data cannot be read.

The disk array of the system unit is equipped with a patrol read function that has been set to the factory default so it can verify or fix the HDDs/SSDs periodically. Therefore, there is no need to conduct a consistency check periodically.

Network Security

Recent years have seen an increase in attacks on systems by computer viruses and in data falsification or leaks by hacking, resulting in more serious damage. Infection by computer viruses not only affects your own system unit (victim) but also might inflict damage on the unspecified number of targets through networks (victimizer). In most cases, it is often said that inflection is caused by careless downloading of data or use of data media of unknown origin. Effective means to prevent infection include installation of anti-virus software or firewall for blocking illegal access.

We recommend introducing preventive means simultaneously whenever a network connection is established. Also, security can be maintained by keeping the anti-virus software up-to-date. However, this does not mean that the anti-virus software can always prevent infection with computer viruses. It becomes important to establish and operate a system to prevent infection with such viruses.

Some computer viruses send their own copies one after another to a connected network. If your computer is infected, we recommend disconnecting your LAN cable immediately and isolating the computer from the network in order to prevent secondary infection.

- System scan

  Periodically check if computer viruses are hidden. It is convenient to use anti-virus software's scheduling function that enables automatic scanning periodically.

- Downloading the latest date

  It is essential to always update anti-virus software in order to address computer viruses that evolve on a daily basis. A virus pattern file and the version of anti-virus software are included as the data to be updated. No computer viruses can be found or eliminated if neither the pattern file nor the software version responds to the virus invaded. We recommend establishing an environment where your anti-virus software can be updated automatically and periodically. See the manual that comes with your anti-virus software for more details on how to use the anti-virus software.

Windows update check

If Microsoft Windows operating system (OS) is in use, Microsoft Corporation has released an additional program to fix errors or vulnerability of its Windows OS. Please visit the Windows Update website to confirm and install update programs periodically.

- Windows Update Website: http://windowsupdate.microsoft.com

Windows Update is also accessible from your Windows start menu.

Storing backup data

For storage devices such as HDD and SSD, or data media such as USB and memory, an incorrect operation such as a failure or wrong formatting might lose important data unexpectedly. If system data (data contained in Windows folders) are destroyed, it becomes necessary to reinstall or set up the OS or applications and thus it will take a long time to recover the system. To take proper measures, backup data can be stored on tape or similar media to restore the system to its most previous working state if data loss occurs. It is also possible to restore the system to normal by creating system information backup data if system data become lost or corrupted. We recommend backing up the system data periodically.

For details on how to create and restore backup data, see the Windows Help or visit the Microsoft website and search the page of backup technical information. If backup software is used, see the manual that comes with the software.

- Microsoft Website: http://www.microsoft.com/

Operational trouble

In case of trouble or unfamiliar matters of operation, see Solving problems on page 6-2.

Bundled Software

Install and use the following software program bundled with the system unit.

MegaRAID Storage Manager

This utility is necessary to manage disk array devices.
If this utility is not installed, no HDD failure can be detected, which will cause a double failure and loss of data.
For details about using this utility, see *MegaRAID Storage Manage Instruction Manual*.

Hardware Maintenance Agent

The Hardware Maintenance Agent is a utility necessary for maintenance of the system unit. If a failure occurs on the system unit, this utility analyzes such a failure automatically, thus facilitating identification of this failure and shortening system recovery time.
For details about using this utility, see *Hardware Maintenance Agent Windows Edition User's Guide*.

2

Monitoring operating status

This chapter describes system unit fault detection and methods monitoring operation.

- Fault detection
- Operation monitoring

Fault detection

This section describes how to detect a fault on the system unit. The system unit notifies fault occurrence by the following:

Table 2-1: Fault detection method

No	Method	Description	Remarks
1	**ERROR LED**	Turns on in case of a system unit hardware error.	The LED turns off after error recovery.
2	**MAINTENANCE LED**	Indicates a POST code, an event code, and a power consumption value alternately.	• Each code can be retained and displayed even in the standby state (with AC cord connected and POWER switch OFF). • The previous code is cleared when the power is turned on (POWER switch is turned on).
3	**OS event log**	• Records an event as a system log, a security log or an application log. • Stores an event log generated at a system level or an application leveling the following directory, as well as an error message: • %SystemRoot%\SYSTEM32\config	The logs can be referenced by using an event viewer.
4	**STOP message**	Indicates if an error occurs in the kernel due to a configuration definition mismatch between hardware and software, a hardware failure, or a software glitch (OS and drivers).	-
5	**Error notification by utility**	Gives a message notification on an error detected by utility software or drivers.	RAID management utility (MegaRAID Storage Manager) and so on

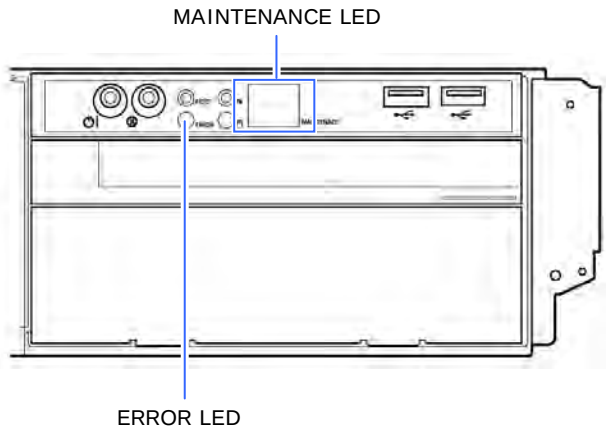

Figure 2-1: ERROR LED and MAINTENANCE LED

ERROR LED

The Baseboard Management Controller (BMC), an onboard management controller of the system unit, turns on the ERROR LED on the front of the system unit if a hardware error occurs, such as a HDD error, a fan error, a power supply error, and others.

The sensors having a threshold are lit up in the Critical State (a critical state of the system unit). But do not turn on in the Uncritical State (a state in which a component has a failure under redundancy).

MAINTENANCE LEDs

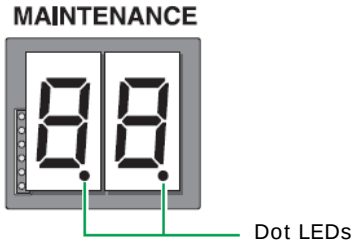

Figure 2-2: MAINTENANCE LEDs

MAINTENANCE LEDs can display the event code, the POST code or the power consumption, and you can select what to display on it by using the SERVICE switch.
A combination of ON/OFF selections of Dot LED (left), Dot LED (right), and SERVICE LED determines what is currently displayed.
A combination of ON/OFF selections of Dot LED (left), Dot LED (right), and the SERVICE LED determines what the MAINTENANCE LEDs indicate as follows:

Table 2-2: What the MAINTENANCE LEDs indicate

SERVICE LED	Dot LED (left)	Dot LED (right)	What the MAINTENANCE LEDs indicate
Off	**Off**	**Off**	Event code
On	**On**	**Off**	POST code
Off	**On**	**On**	Power consumption

Every time you press the SERVICE switch, the MAINTENANCE LEDs will change the code to display as follows.

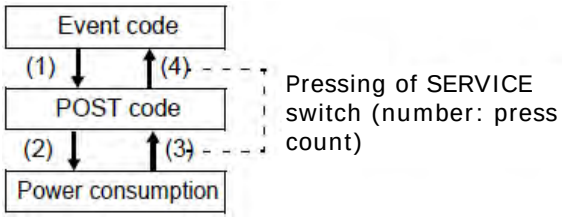

Figure 2-3: MAINTENANCE LEDs indicate pressing of SERVICE switch

- Event code

  The operation status of the system unit is displayed. Under normal operation, "00" is displayed. If an error occurs, the two-digit number corresponding to the component where the error occurred is indicated at LED.

Table 2-3: Event code indicate

MAINTENANCE LED	Where the error occurred	MAINTENANCE LED	Where the error occurred
00	Normal operation	**10**	PCI
01	Other hardware	**20**	Motherboard
02	Temperature	**40**	Memory
04	Fans	**80**	CPUs
08	Power / Voltage	**(Other codes)**	(Multiple locations)

- POST code

  The POST code of the system BIOS is displayed. If Power On Self Test (POST) is successful, "A.E" is displayed.

The MAINTENANCE LEDs keep the data of the POST code and the event code unless the AC power source is turned off. When the power of the system unit is turned on, the display gets cleared.

- Power consumption

  The rough estimate of the current power consumption of the system unit (W) is displayed.
  The upper digit (left side) indicates the 100's digit, and the lower digit (right side) indicates the 10's digit.

The indicated power consumption value is not accurate. Use this value as a just reference.

OS event log

An event log is the data required for investigation in Windows OS. Events that have occurred inside the OS are recorded in the event log in chronological order. The "Event Viewer" is provided as a management tool for referencing the event log. In the **Windows Start** menu, click **Start** > **Administrative Tools** > **Event Viewer**. For details, see the Event Viewer's help.

Event types include information, warnings and errors. It has been confirmed that events are temporary or known instances even if they are errors or warnings. In case of an error or a warning, see *Hitachi Compute Rack 210H/220H Windows Installation Guide* or the manual that comes with the software being used.

For general Windows instances, verify the support technical information (Knowledge Base) of Microsoft Corporation.

- Microsoft Support Online: http://support.microsoft.com/

STOP message and memory dump

If the Windows OS has been trapped in a critical state for some reason, a blue screen appears and a STOP message is displayed. At this time, Windows can save the STOP message information in a dump file. This is referred to as a memory dump.
If Windows is hung up, the cause of a failure can be narrowed down by analyzing the memory dump.

The following three types of memory dumps are available:

- Minimum memory dump (64 KB)
- Kernel memory dump
- Full memory dump

The full memory dump is effective in fault investigation. The other dumps are extremely difficult to analyze because of less information contained therein.

The following conditions are required for full memory dump. When you configure partitions, be aware of acquisition of a full memory dump during system construction.

- A page file is in the Windows-installed drive (C drive).
- A page file is larger than physical memory installed + 400 MB.
- Free space for a dump file should exist in the C drive.

For details on the setting of a page file (virtual memory), see Windows help.

Error notification by utilities

Utility programs, such as MegaRAID Storage Manager, use a popup message or an internal event log to be displayed for error notification.

For more details on error notification of those utilities, see the individual manuals.

Operation monitoring

This section describes the items to be monitored on a daily basis on the system unit.

As mentioned in Fault detection on page 2-2, the system unit has a variety of functions for giving hardware or software error notifications. Using these functions, monitor the operation so as not to overlook a fault or its symptom.

Major monitoring items are as follows:

Table 2-5: Major monitoring items

No	Item	Checking cycle
1	Check the operating status of the system unit or internal options for errors, such as turned on ERROR LED and fans abnormal noise.	Every six months
2	Check an OS event log for errors.	Every day
3	Check for error notifications by utilities.	Every day

To monitor the operation of the system unit, see the following manuals:

- Operating status of system unit and internal options
  - See Maintenance and service parts
  - See Optional PCI card instruction manual
- Monitoring of OS event logs
  - Manuals that come with the OS
  - Help of OS monitoring tools
- Monitoring by RAID management utility "MegaRAID Storage Manager"
  - See *MegaRAID Storage Manager Instruction Manual*
- Monitoring by other utilities
  - Manual that comes with each utility

3

System Unit Functions

This chapter describes the functions of the system unit that are useful in operation.

- Disk arrays
- Redundancy
- Wake On LAN
- Memory RAS
- LAN extended functions

Disk arrays

This section describes the disk array functions.

About disk arrays

The disk array is a technique used as one or more logical units (LU) by connecting two or more physical drives (HDD or SSD) to each other, which is also referred to as a Redundant Arrays of Inexpensive Disks (RAID).

The disk array has two main advantages: one is to segment data into some component and decentralize onto the HDDs/SSDs in the disk array (data striping) in order to improve I/O performance higher than a single drive in terms of a disk array, and the other is to create an array parity for data recovery in order to prevent data loss in case one of the HDDs/SSDs in the disk array should fail.

NOTICE Even the disk array cannot prevent data loss that is caused by a non-HDD/SSD failure, software overrun or operation errors. Just in case, back up your system data.

- Disk array:
  A virtual drive consisting of multiple physical drives, which cannot be recognized by the OS as it is.
- Logical drive:
  A logical drive configured in the disk array, which is recognized by the OS in the same manner as a physical drive.
- You can assign capacity larger than 2 TB (2199 GB) for the logical drive set as disk array but do not assign capacity larger than 2 TB for the logical drive the OS is installed to. Otherwise the OS cannot create a partition anymore. Use the RAID management utility or the RAID BIOS to reconstruct the disk arrays and the logical drives.

RAID level feature

Depending on a RAID level, disk arrays are typically classified into six types: RAID0 to RAID5. The system unit supports RAID0, RAID1, and RAID5 as well as RAID6, RAID10, JBOD which are specific to the array controller. The method and features of each RAID level are described below.

RAID0

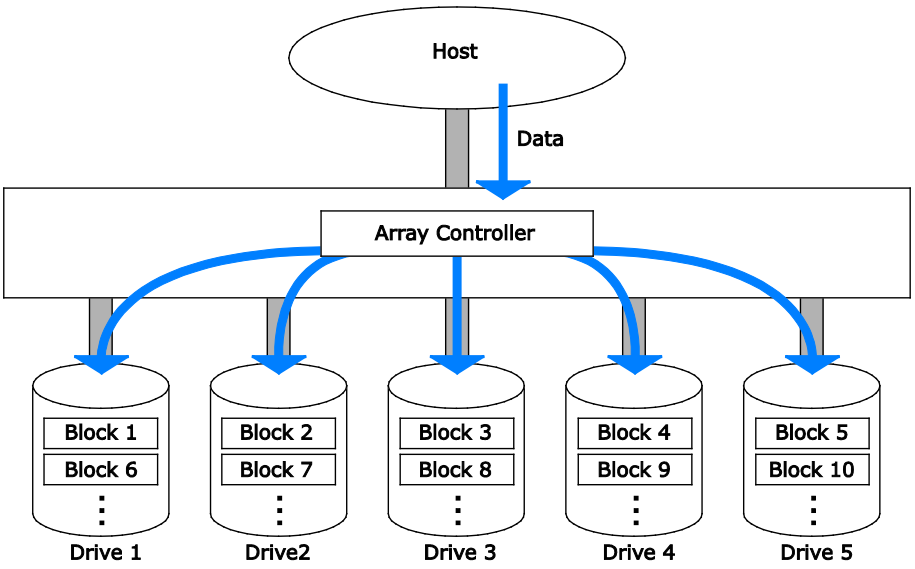

Figure 3-1: RAID0 method

Data is striped on multiple HDDs/SSDs.

- Advantage:
  Particularly, the throughput is improved for a large number of files.
- Disadvantage:
  All data is lost if one of the HDDs/SSDs in the disk array fails because of no redundancy.
- Number of HDDs/SSDs required: 2 (min.) to 8 (max.)

RAID1

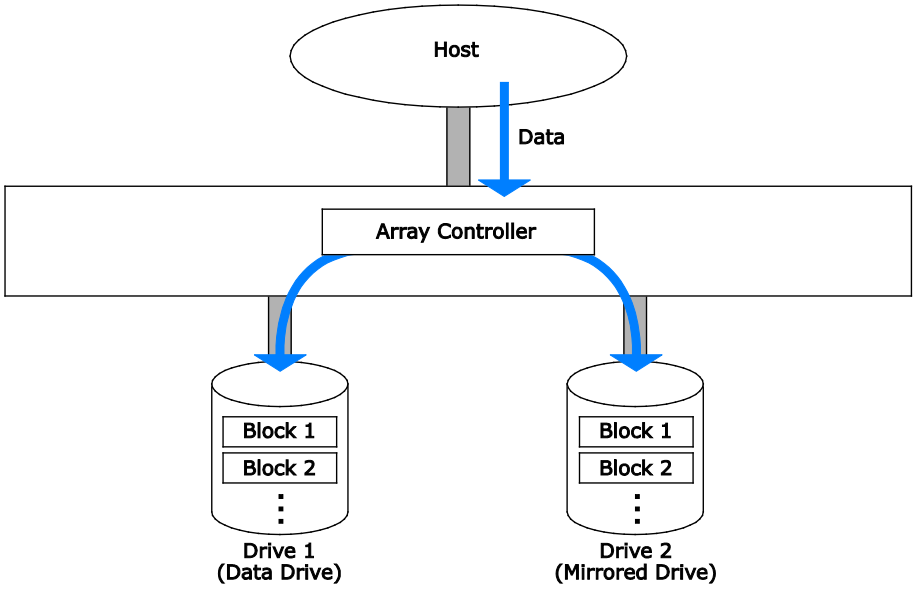

Figure 3-2: RAID1 method

Data is stored on one HDD/SSD (data drive) and the other one (mirrored drive).

- Advantage:
  Provides 100% data redundancy, thus enabling easy switching between two drives to continue read or write processing if a drive failure occurs. HDD/SSD interchange also allows data reconstruction without shutdown operations.
- Disadvantage:
  - A double HDD/SSD capacity is required because a mirrored disk of the same capacity should be installed.
  - An attempt to read or write data during data rebuild causes a decrease in processing performance.
- Number of HDDs/SSDs required: 2

RAID5

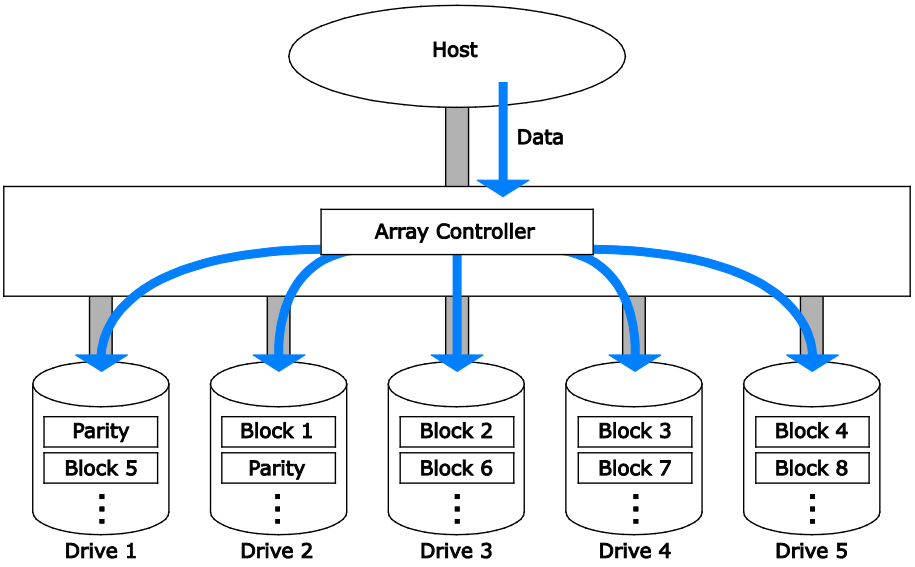

Figure 3-3: RAID5 method

Data is striped block by block on all the HDDs/SSDs together with array parity.

- Advantage:
  - As compared to RAID1, the capacity cost effectiveness is improved.
  - Data distribution onto HDDs/SSDs provides data redundancy. Therefore, a read or write can be performed on each HDD/SSD independently. Data striping on a block basis is suitable for transaction processing.
  - Even if one of the HDDs/SSDs in the disk array fails, read or write processing can be continued while array parity is computing the lost data. HDD/SSD interchange enables data reconstruction without shutting down operations.
  - The array parity distributed on each HDD/SSD has the advantage that parallel processing by independent access to HDDs/SSDs is implemented during data write operation.
- Disadvantage:
  - RAID5 is inferior to RAID0 in write performance because of an array parity generated during write processing.
  - An attempt to read or write data during data rebuild causes a decrease in processing performance.
- Number of HDDs/SSDs required: 3 (min.) to 8 (max.)

RAID6

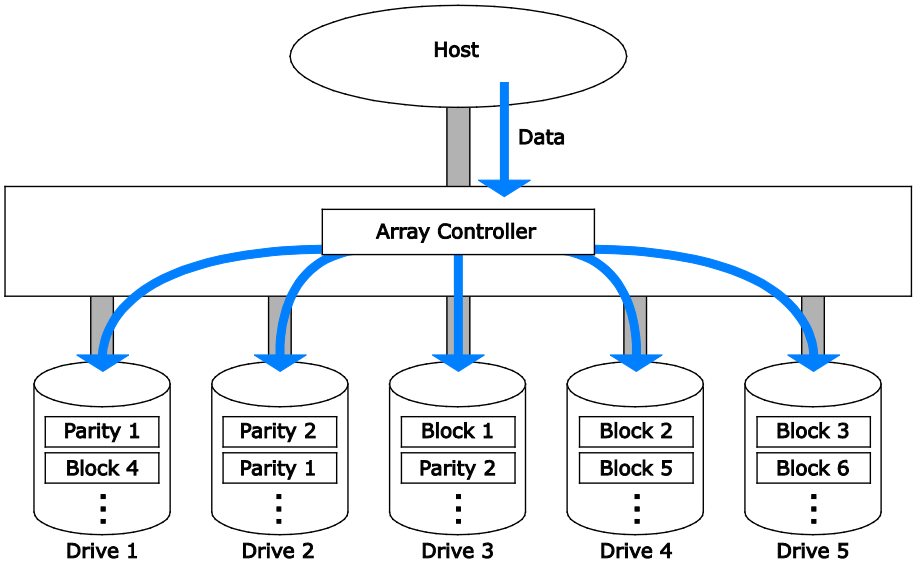

Figure 3-4: RAID6 method

Data is striped block by block on all the HDDs/SSDs together with array parity.

- Advantage:
  - As compared to RAID5, two types of parities generated improve redundancy.
  - Data distribution onto HDDs/SSDs provides data redundancy. Therefore, a read or write can be performed on each HDD/SSD independently. Data striping on a block basis is suitable for transaction processing.
  - Even if up to two of the HDDs/SSDs in the disk array fail, read or write processing can be continued while array parity is computing the lost data. HDD/SSD interchange enables data reconstruction without shutting down operations.
  - The array parity distributed on each HDD/SSD has the advantage that parallel processing by independent access to HDDs/SSDs is implemented during data write operation.
- Disadvantage:
  - RAID6 is inferior to RAID5 in write performance because of two types of parities generated during write processing.
  - An attempt to read or write data during data rebuild causes a decrease in processing performance.
- Number of HDDs/SSDs required: 4 (min.) to 8 (max.)

RAID10

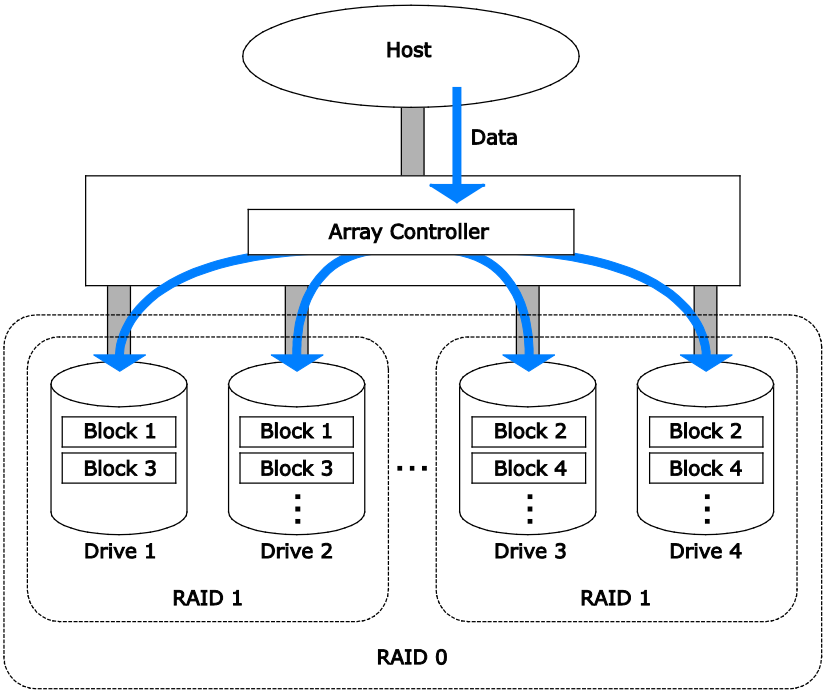

Figure 3-5: RAID10 method

Data is striped on multiple HDDs/SSDs and is duplicated. The features of both RAID0 and RAID1 are provided.

- Advantage:
  - Provides 100% data redundancy, thus enabling easy switching between two drives to continue read or write processing if a drive failure occurs. HDD/SSD interchange also allows data reconstruction without shutdown operations.
  - Particularly, the throughput is improved for a large number of files.
  - Typically, RAID10 is superior to RAID5 in write performance because no array parity is generated.
- Disadvantage:
  - A double HDD/SSD capacity is required because a mirrored disk of the same capacity should be installed.
  - An attempt to read or write data during data rebuilding causes a decrease in processing performance.
- Number of HDDs/SSDs required: Even number from 4 (min.) to 8 (max.)

JBOD

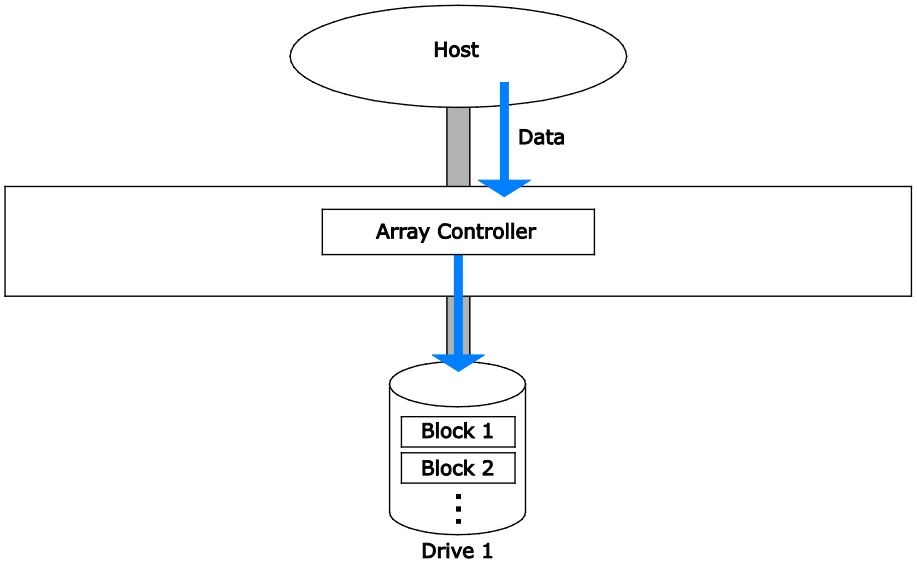

Figure 3-6: JBOD method

Data is stored only on one HDD/SSD.
JBOD performs no data redundancy and works like a HDD/SSD connected to a typical SAS/SATA controller.

- Number of HDDs/SSDs required: 1

Tip JBOD is RAID0 configured with one HDD/SSD.

Functions of Disk Array

Degraded mode

NOTICE If another HDD/SSD failure occurs while the disk array is operating in degraded mode, the disk array cannot rebuild data, thus losing all data. Replace the failed drive as soon as possible and rebuild data.

Even if one of the HDDs/SSDs in RAID1, RAID5, RAID6, or RAID10 disk array fails*, you can continue to use the disk array as usual. It is said that the disk array with one HDD/SSD failing* is operating in degraded mode. In response to a read/write request, the array controller uses the data and array parity (for RAID5 and RAID6) of the active drives to compute the data of the failed drive and continue operation as it is. However, the data computation required causes a decrease in processing performance as compared to the normal status.

*: RAID6 can operate even if two HDDs/SSDs fail.

If a HDD/SSD fails in the drive group having multiple logical drives, all the drives under the drive group will operate in degraded mode.

Rebuilding data

In the disk array of RAID1, 5, 6, or 10, after the failed drive is replaced, the array controller restores and stores data on the replaced drive. This is referred to as rebuilding data. Although the disk array can continue operating while rebuilding data, its processing performance lowers kind of degraded mode as compared to normal status.

If another HDD/SSD failure occurs while the disk array is operating in degraded mode, the disk array cannot rebuild data, thus losing all data. In such a case, replace the failed drive as soon as possible and rebuild data.

RAID0 and JBOD cannot rebuild data because neither data duplication nor parity generation is conducted on their drives.

Hot plug

If a logical drive is operating in degraded mode, the failed drive must be replaced as soon as possible. If the system unit is shut down once at this time, it takes more time to replace the drive. Above all, the system operation must be shut down. It will take longer time to replace the degraded drive after turning off power to the system unit.

A hot plug or hot swap is referred to as a function for resolving this problem, enabling the user to replace a HDD/SSD without shutting down the system unit.

Hot spare

If a failure occurs on the logical drive of RAID1, 5, 6, or 10, the failed drive must be replaced to return the system normal status. If a spare drive (reserve drive) is premounted on the array controller, data can be automatically restored on the reserve drive in case of a failure. Preparing this reserve drive so that it can be exchanged at any time is referred to as a hot spare. A function for the array controller to restore data automatically to the hot spare is referred to as standby replacement.

- Depending on a logical drive configuration, a hot spare might be unavailable.
- Hot spares include a "global hot spare" that becomes effective to all the configured logical drives (RAID1, 5, 6, and 10), and a "dedicated hot spare" that becomes effective only to one of the configured logical drives (RAID1, 5, 6, or 10).

SMART copyback function

SMART copyback is a function to replace an HDD/SSD safely. If a SMART failure occurs on an HDD/SSD in the logical drive of RAID1, 5, 6, or 10, a data of the failed HDD/SSD is copied to a reserve drive with keeping redundancy of a logical drive.

This function decreases the outbreak probability of the failure of a logical drive according to the failure of a further HDD/SSD under rebuilding.
However, the process performance decreases in comparison with normal state under copying to perform data copying by SMART copyback.

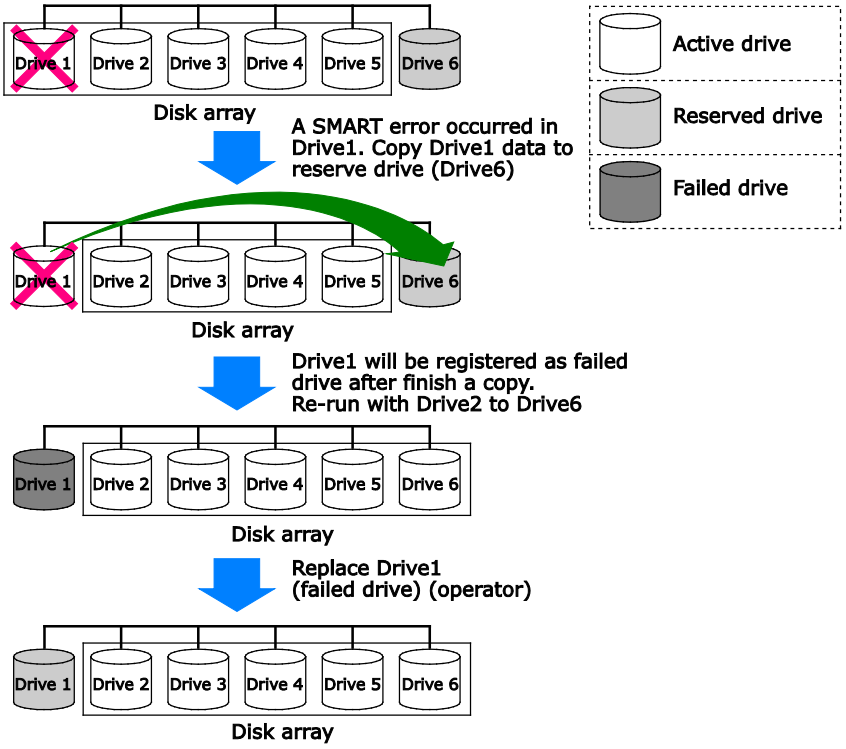

Figure 3-7: SMART copyback function

Failure recovery flow

The failure recovery flow for RAID5 with five physical drives working is illustrated below. In this illustration, two cases are explained: one with a reserve drive and the other without a reserve drive.

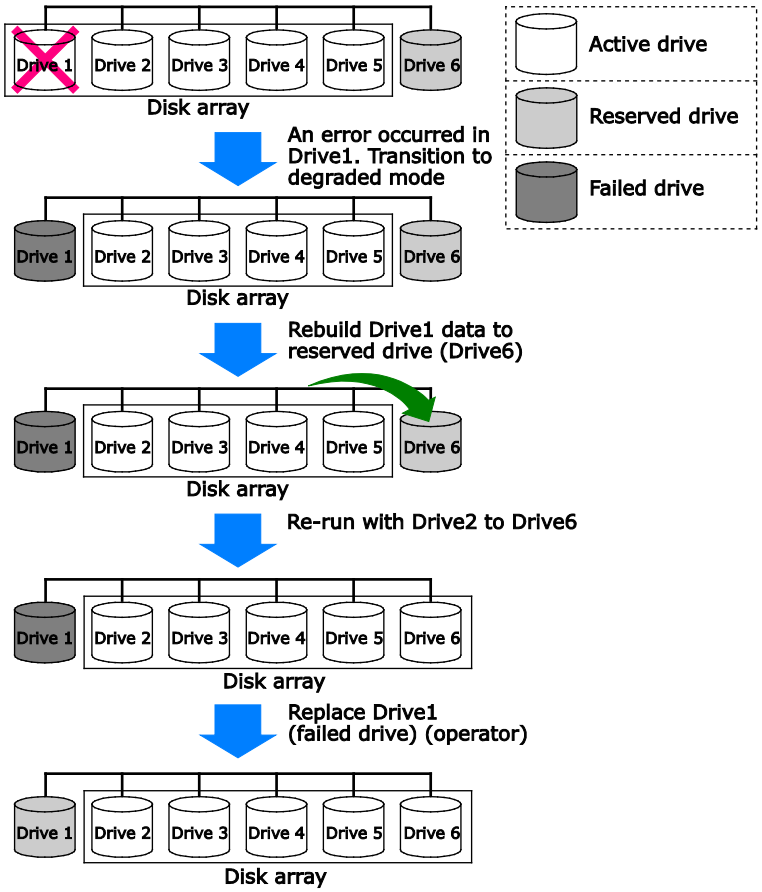

Figure 3-8: A case with a reserve drive

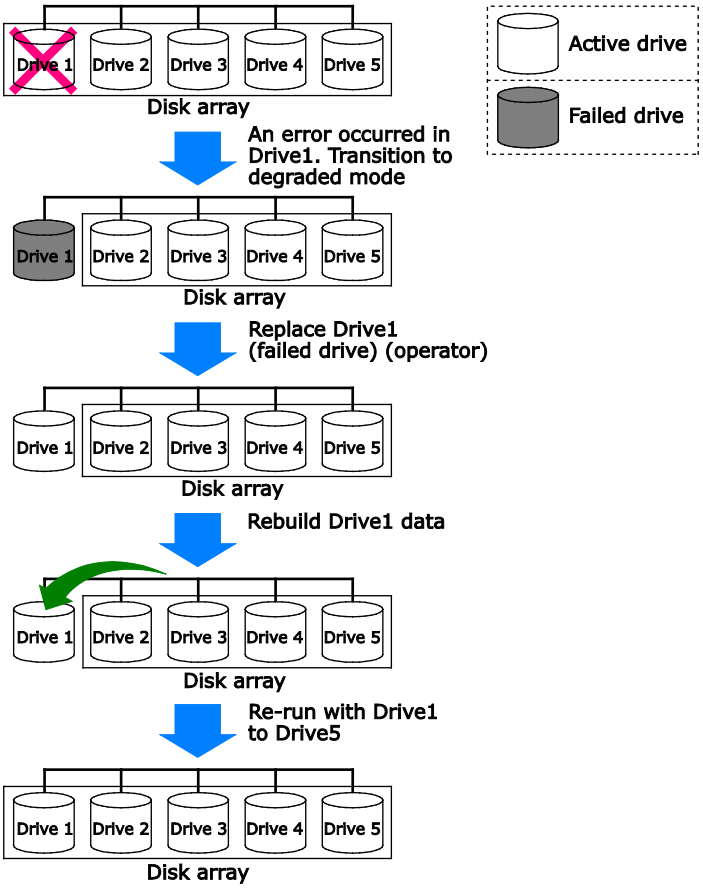

Figure 3-9: A case without a reserve drive

Precautions on building a disk array

HDDs/SSDs

The HDD/SSD used with one disk array must have the same capacity and rotating speed.

If two or more disk arrays are built on the system unit, HDDs/SSDs used with each disk array might be different. If a reserve drive is used, however, care must be taken for operation. For details, see Reserve drive on page 3-14.

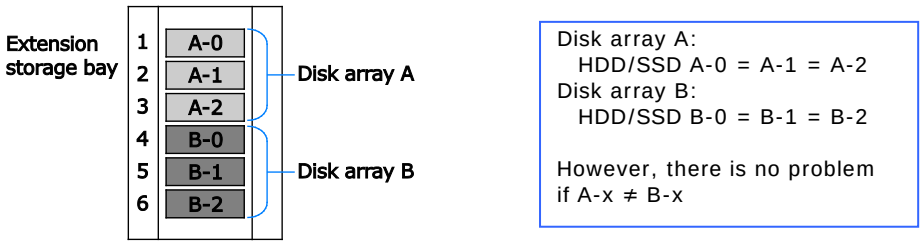

Figure 3-10: Capacity of the HDD/SSD to use for disk array

HDD/SSD installation location

In consideration of system management, install in a successive extension storage bay the HDDs/SSDs to be used with a single disk array. We also recommend to record disk array and logical drive configurations.

If a failure occurs, however, the installation location depends on whether a reserve drive is provided. For this reason, make a record each time.

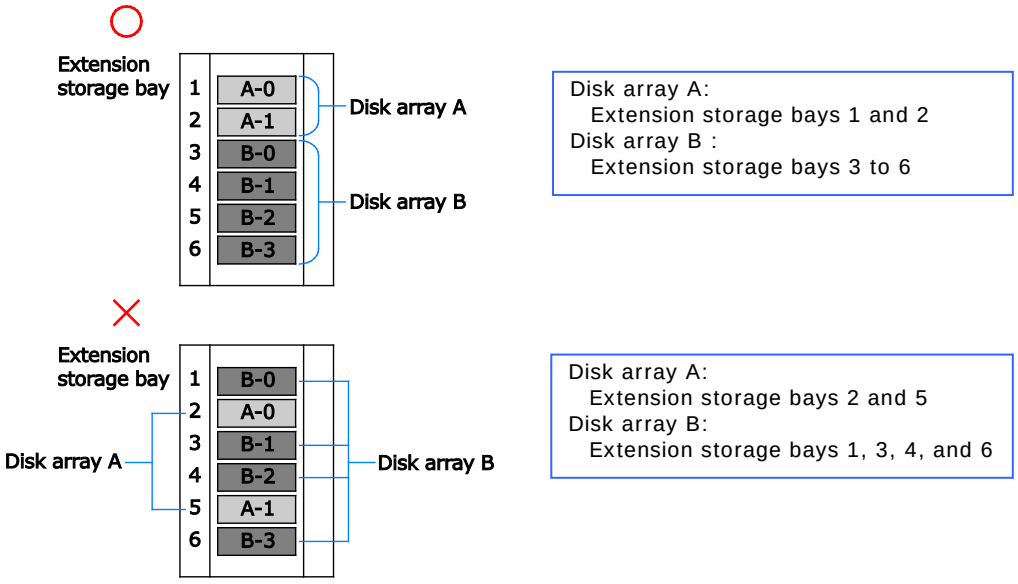

Figure 3-11: HDD/SSD installation location

Reserve drive

Install a reserve drive same as drive type, capacity and rotation speed. If set for "global hot spare", install largest-capacity HDD/SSD.

Note that if there are two or more disk arrays, an attempt to set a reserve drive as a "global hot spare" will cause the following event. Be extremely careful with the operation.

A reserve drive example is described below by using the following disk array.

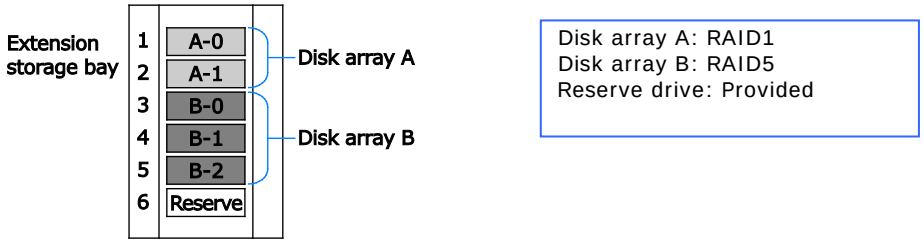

Figure 3-12: Example for install reserve drive

For the disk array configured with HDDs, install HDD as reserve drive, for the disk array configured with SSDs, install SSD as reserve drive. Other type of disk array cannot be configured as reserve drive.

Two or more disk arrays with a RAID level of 1, 5, 6, or 10

The reserve drive functions as a hot spare on either disk array. Depending on an HDD/SSD hot spare, the following configuration is applied.

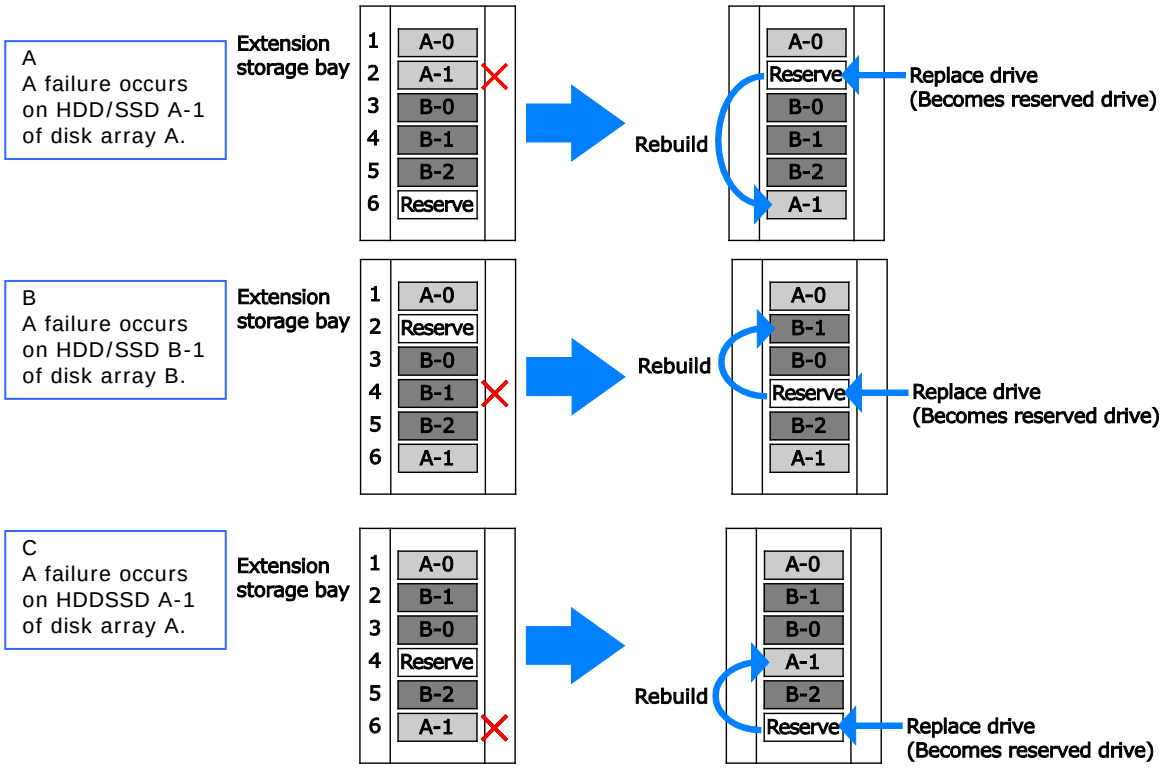

Figure 3-13: Transition of reserve drive

As the result of standby replacement, the drive A1 and B1 location move to another drive. In other words, the HDDs/SSDs constituting a disk array might be positionally interchanged.

Therefore, in consideration of system management, record the locations of HDDs/SSDs each time in case of a failure.

A difference in capacity between the HDDs/SSDs used in disk arrays A and B

Depending on the capacity of a reserve drive, a hot spare might not work. The following hot spare will be applied depending on the capacity of a reserve drive.

This description assumes disk array A < disk array B (A - x < B - x).

- If the reserve drive has the same capacity as B-x:

  The reserve drive works as a hot spare either in disk array A or B. If the hot spare is used in disk array A (A and C are applied to the case where Two or more disk arrays with a RAID level of 1, 5, 6, or 10), an unused area will exist on the rebuilt HDD/SDD because the reserve drive is greater in capacity than HDD/SDD A-x used in disk array A.

- If the reserve drive has the same capacity as A-x:

  The reserve drive works as a hot spare only in disk array A, not in disk array B.

  No data can be restored on the HDD/SSD because the reserve drive is smaller in capacity than the HDD/SSD B-x used in disk array B. Therefore, disk array B remains in degraded mode.

To prevent the above, fit the capacity of a reserve drive to the disk array or prepare a reserve drive for each disk array. The priority of a reserve drive used in case of a failure is as follows:

1 A reserve drive having the same capacity as a failed drive

2 A reserve drive with a small device ID, in order of a storage bay number.

Redundancy

This section describes the redundant components of the system unit.

Power supply

Installation of two power supplies on the system unit enables power supply duplication.

This allows continuous operation without shutting down the system unit if either of the power supplies fails. Each power supply supports a hot plug. Therefore, a failed power supply can be replaced without shutting down the system unit.

We recommend connecting two power supplies to different power sources, respectively, if installed. In case of a failure on one power source, the system unit can operate without a shutdown, as long as power is still supplied from the other source.

If a failure occurs in one power supply, contact the sales representative or maintenance personnel.

Replace the failed power supply as soon as possible.

System fans

The system unit has system fans for internal cooling. Some of these fans are designed to be redundant.

The system unit can operate without a shutdown even if one of the system fans fails.

If a system fan failure occurs, contact the sales representative or maintenance personnel.

Replace the failed system fan as soon as possible.

Wake On LAN

This section describes the Wake On LAN feature.

Overview of the remote power-on

The Wake On LAN function is a function to turn on the power to system unit through a network. The system unit, if turned off, can be turned through a remote operation by transmitting special packets from the system unit for the administrator or from a client.

You can use a remote power-on operation by using the onboard remote management function only on the Web console.

Support conditions for the Wake On LAN

The Wake On LAN function is supported under the following conditions.

- Supported OS: Windows Server 2008 R2
- Supported LAN devices: Onboard LAN controller 1

  Only network interface connector 1 on the rear of the system unit is available.

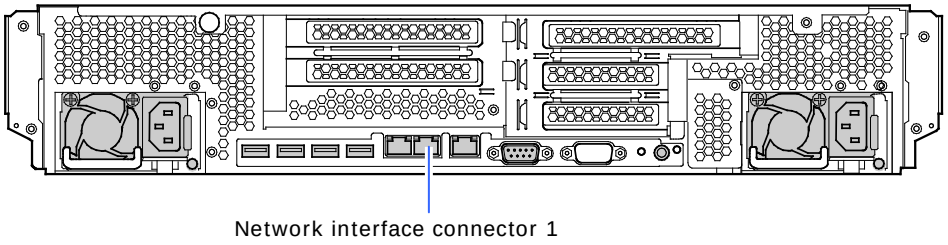

Figure 3-14: Network interface connector 1

Network interface connector 2, management interface connector, optional LAN mezzanine and LAN card are not supported.

Onboard LAN controllers (network interfaces) are displayed on the device manager, as follows:

- Onboard LAN1: PCI bus 8, device 0, function 0
- Onboard LAN2: PCI bus 8, device 0, function 1

Precautions on use of the Wake On LAN

- In the following cases, the Wake On LAN function does not work. Press the POWER switch of the system unit once to activate the OS. Then, turn off the power in a normal procedure:
  - When you start the system first after connecting the power cable.
  - When the previous system end procedure was not normal
  - If the POWER switch is pressed to turn off the power before the OS is activated (during BIOS POST)
  - If the power is turned off using the UPS management software,
  - If the power is not supplied to the system unit, such as the AC cable is disconnected or the circuit breaker is tripped, or in case of a power failure.
- If the system is shut down when connected to link partner, the Wake On LAN-enabled onboard LAN controller 1 is automatically set to 10 Mbps of link rate. After the OS is activated, the link rate returns normally.
- The system unit does not support Wake On LAN, from the sleep state, hybrid sleep state, and hibernation state.

Memory RAS

This section describes the memory RAS feature supported by the system unit.

Online spare memory

Online spare memory is a function that can be switched online to spare memory if a correctable memory error (Correctable Error: 1-bit error) occurs frequently. This provides preventive maintenance of memory switching before an uncorrectable memory error (Uncorrectable Error: 2-bit error) occurs.

These are the following conditions for using the online spare memory function:

- Two or more memory boards should be installed per channel.
  8 or 12 memory boards (for 4 channels) per processor.
- All memory boards should have the same capacity and same model.
- When two processors are installed, the same memory configuration should be applied to processor 1 and processor 2.

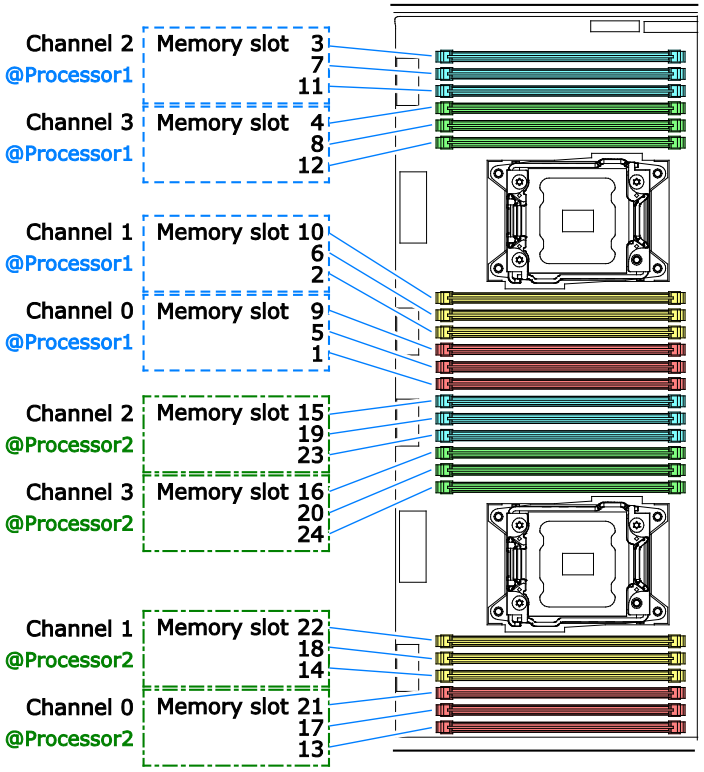

Figure 3-15: The number of the ranks of the memory board

Online spare memory is set for each channel. One rank of the memory board installed on each channel becomes spare memory, and the other memory board rank becomes system memory. A "rank" represents a memory board configuration. Memory boards include a "single rank" and a "dual rank". Each memory board operates on a "rank" basis. Therefore, the "dual rank" is physically a single board but logically operates as two memory boards.

The number of the ranks of the memory board which a system unit supports is as follows.

Table 3-1: The number of the ranks of the memory board

Product code	Memory capacity	Number of rank
MJ702GL3-Y / MJ702GL3-R **MJ7002H4-Y / MJ7002H4-R**	2048 MB	1
MJ704GL3-Y / MJ704GL3-R **MJ7004H4-Y / MJ7004H4-R**	4096 MB	1
MJ708GL3-Y / MJ708GL3-R **MJ7008H4-Y / MJ7008H4-R**	8192 MB	2
MJ716GL3-Y / MJ716GL3-R **MJ7016H4-Y / MJ7016H4-R**	16384 MB	2

In the case of a memory error, memory switching is performed on a rank basis.

For instance, on the assumption that a memory board having two rank is installed on memory slots 1 and 5 (channel 1) of processor 1, and a memory board of rank 0 in memory slot 1 is set as a spare memory.
If a correctable error occurs frequently on memory board of rank 0 in memory slot 5, all data in the memory is copied online to memory board of rank 0 in memory slot 1 which is spare memory. After the completion of copying, the system unit starts operating by using the memory boards not including the memory board of rank 0 in memory slot 5.

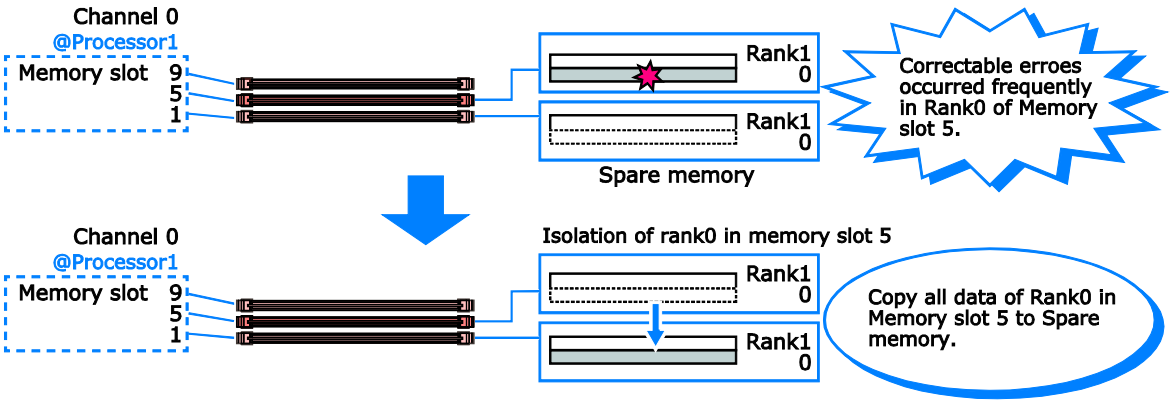

Figure 3-16: Operation of the online spare memory function

In the case of a memory board having one rank, one memory board becomes spare memory.

The online spare memory function becomes valid again when you restart the system unit. At this time, the spare memory is set again. Therefore, replace the failed memory board before restarting the system unit.

The precautions on the use of online spare memory are as follows:

- The spare memory is set to every channel of each processor.
- To validate the online spare memory function, set **Chipset** > **North Bridge** > **Memory Mode** to **Sparing** on the system BIOS setup menu.
- The online spare memory functions in the channel of each processor once. The online spare memory function does not work then to become invalid even if a memory fault occurs with other channels of the processor.
- When the online spare memory function is set valid, one rank of a memory board to be installed on each channel is used as a spare memory. Therefore, the memory capacity is displayed smaller than the actual one.
  On the system BIOS setup menu, confirm **Chipset** > **North Bridge** > **Total Memory**.
  Depending on a memory board installed, the spare memory capacity per channel is as follows:

Table 3-2: Spare memory capacity

Installed memory boards	Spare memory capacity per channel
MJ702GL3-Y / MJ702GL3-R **MJ7002H4-Y / MJ7002H4-R**	2048 MB
MJ704GL3-Y / MJ704GL3-R **MJ7004H4-Y / MJ7004H4-R**	4096 MB
MJ708GL3-Y / MJ708GL3-R **MJ7008H4-Y / MJ7008H4-R**	4096 MB
MJ716GL3-Y / MJ716GL3-R **MJ7016H4-Y / MJ7016H4-R**	8192 MB

- If memory degradation occurs, the online spare memory function becomes invalid.
- The OS might operate slowly within a range of a few seconds to ten minutes while the online spare memory function is working to change over to spare memory.
- In case of an uncorrectable memory error (Memory Uncorrectable Error: 2-bit error and so on), the online spare memory function does not work.
- When the online spare memory function works to change over to spare memory, the event cord by the MAINTENANCE LED in front of the system unit indicates as "40". See MAINTENANCE LEDs on page 2-3
- You cannot use the online spare memory function simultaneously with memory mirroring, lock step, and device tagging.

Memory mirroring

Memory mirroring is memory duplication to continue to operate the system unit without a shutdown in case of an uncorrectable memory error (Uncorrectable Error: 2-bit error and so on).

These are the following conditions for using the memory mirroring function:

- Memory boards should be installed in the same configuration for channels 0 and 1 as well as channels 2 and 3 of each processor.
- All memory boards should have the same capacity and same model.
- When two processors are installed, the same memory configuration should be applied to processor 1 and processor 2.

Memory mirroring divides memory boards into a primary mirror depending on channels installed, and configures two channels in pairs. The relationship among memory slots, channels, and channel pairs is as follows.

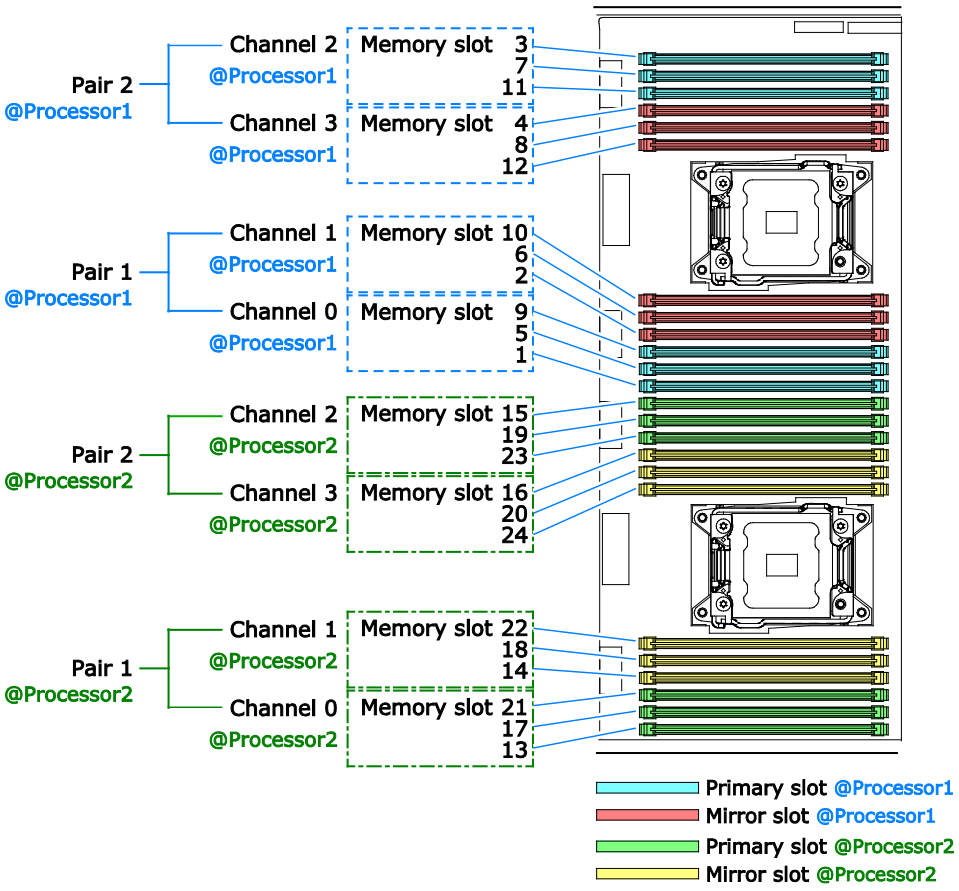

Figure 3-17: The memory pair of memory mirroring

In memory mirroring, a memory read and write are performed as follows:

- A read is performed from either the primary slot or mirror slot.
- A write is performed to both primary and mirror slots in appearance order.

If an uncorrectable memory error occurs on one of the memory boards in the primary slot, all read and write operations are performed only on the memory boards in the mirror slot. If an error occurs on one of the memory boards in the mirror slot, contrarily, all read and write operations are performed only on the memory boards in the primary slot.

The precautions on use of memory mirroring are as follows:

- To validate the memory mirroring function, set **Chipset** > **North Bridge** > **Memory Mode** to **Mirroring** on the system BIOS setup menu.
- When the memory mirroring function is set valid, the half of the memory boards installed are used as a mirror and thus the actual memory capacity used becomes half. On the system BIOS setup menu, confirm **Chipset** > **North Bridge** > **Total Memory**.
  The mirror memory slot is displayed as "0 MB" even if memory boards are installed.
- If memory degradation occurs, the memory mirroring function becomes invalid.
  In this case, the event cord by the MAINTENANCE LED in front of the system unit indicates as "40". See MAINTENANCE LEDs on page 2-3
- You cannot use the memory mirroring function simultaneously with online spare memory, lock step, and device tagging.

Lock step

A memory lock step is a function for synchronizing two channels with each other and handling two memory boards as a single memory board logically. Normal access of 64-bit data/8-bit ECC is expanded to 128-bit data/16-bit ECC for operation. This allows enhancement of multi-bit error detection and correcting functions by Single Device Data Correction (SDDC).

Typically, the memory controller supports x4 SDDC (able to correct a 4-bit DRAM device failure) and also using the lock step function allows support of x8 SDDC (able to correct an 8-bit DRAM device failure) as well as detection of two 4-bit DRAM device failures.

These are the following conditions for using the lock step function:

- Memory boards should be installed in the same configuration for channels 0 and 1 as well as channels 2 and 3 of each processor.
- All memory boards should have the same capacity and same model.
- When two processors are installed, the same memory configuration should be applied to processor 1 and processor 2.

SDDC is also referred to as advanced ECC, which assigns the data of each DRAM chip to individual ECC controllers so that a single DRAM chip does not affect one or more bits of data to be processed on an ECC basis.

If the entire one DRAM chip fails, an error occurs on multiple bits. Each ECC controller can handle such an error as a 1-bit error for error correction.

The x4 SDDC functions image is as follows.

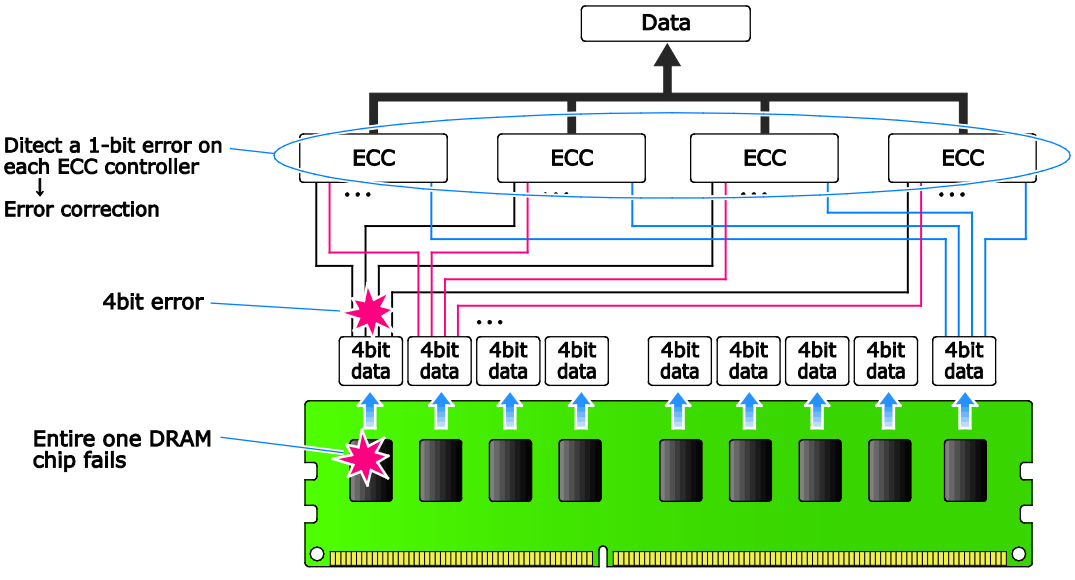

Figure 3-18: The function of x4 SDDC

The precautions on use of lock step are as follows:

- To validate the lock step function, set **Chipset** > **North Bridge** > **Memory Mode** to **Lock Step** on the system BIOS setup menu.
- Interleave between channels is not performed, so the memory access performance becomes lower than independent mode.
- In case of a correctable memory error, such as a 1-bit error or single DRAM chip error, automatic correction is continued. At this time, the ERROR LED does not turned on.
- If an uncorrectable memory error occurs, ECC-based error correction becomes unavailable and thus the system is shut down.
- You cannot use the lock step function simultaneously with online spare memory, memory mirroring, and device tagging.

Device tagging

Memory device tagging is a function for providing redundancy on a DRAM chip basis so that the system can operate without a shutdown even if one DRAM chip on a memory board breaks down.

Normally, memory generates an ECC from data and stores on each DRAM chip separately from data.

If the entire single DRAM chip fails, the data stored on the failed DRAM chip is calculated according to the data and ECC stored on other DRAM chips in order to rewrite the data on the DRAM chip storing ECC. This can avoid an uncorrectable memory error caused by a multi-bit error.

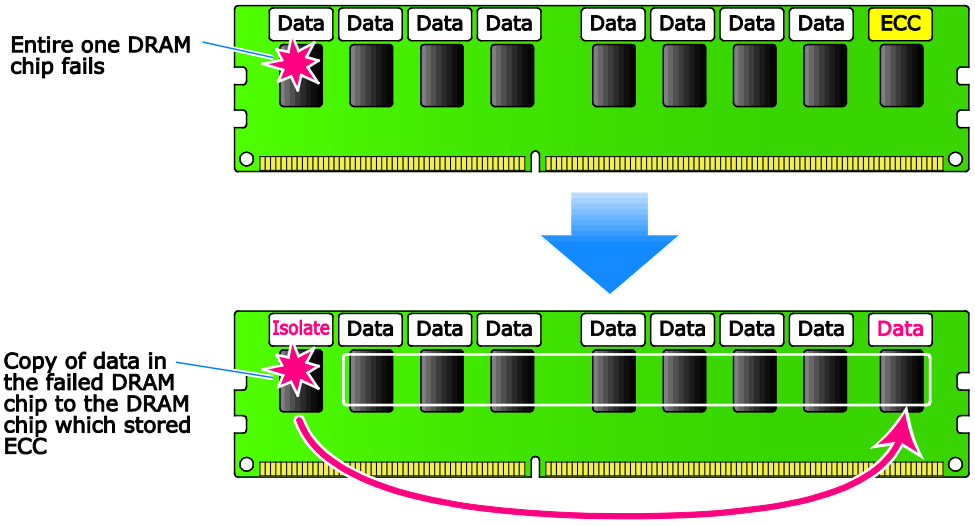

Figure 3-19: The function of device tagging

The precautions on use of device tagging are as follows:

- To validate the device tagging function, set **Chipset** > **North Bridge** > **Device Tagging** to **Enabled** on the system BIOS setup menu.
- The device tagging operates in independent mode to interleave between channels.
- In case of a correctable memory error, such as a 1-bit error or single DRAM chip error, automatic correction is continued. At this time, the ERROR LED does not turned on.
- For the device tagging function, only one memory board is used for operation per channel. If DRAM chips on multiple memory boards in one channel fail, the device tagging function does not work and the system is shut down.
- If an uncorrectable memory error occurs, ECC-based error correction becomes unavailable and thus the system is shut down.
- You cannot use the device tagging function simultaneously with online spare memory, memory mirroring, and lock step.

LAN extended functions

This section describes the extended functions available with the standard onboard LAN of the system unit, an optional LAN mezzanine and a LAN card.

The network adapter, such as an onboard LAN or optional LAN of the system unit, can use the LAN extended functions such as network redundancy, load distribution, and confidential security.

The following types of LAN extended functions are available:

- LAN device redundancy function

  Provides network redundancy and fault tolerance by combining two network adapters. In case of network connection failure, the failed network adapter is changed over to the backup adapter automatically to shift processing.

- LAN device load distribution function

  Provides expanded band width of a network by combining two network adapters. This function distributes the traffic load of transmit data to each adapter.

- Switch redundancy function

  Provides high reliability of a network by combining two network adapter with two switching hubs (current one and standby) supporting STP (IEEE802.1d) for the purpose of redundancy.

- Tag VLAN (IEEE802.1q VLAN)

  Provides logical segmentation by identify a VLAN group. VLAN group is identified according to an ID specified on a tag in a packet.

These expansion functions are set from the LAN utility "Broadcom Advanced Control Suite 4" (BACS4).

For details on how to use the LAN utility, see *Windows Server 2008 R2 LAN Extended Functions User's Guide*.

4

Operational precautions

This chapter describes operational precautions.

Precautions on LAN controller

This section describes precautions when using the standard onboard LAN of the system unit, and an optional LAN mezzanine and LAN card.

TCP Checksum Offload function

The standard onboard LAN of the system unit, LAN mezzanine (CN7M0T-Y/CN7M0T-R), and LAN card (CN7721-Y/CN7721-R/CN7723-Y/CN7723-R/CN7741-Y/CN7741-R/CN7743-Y/CN7743-R) are equipped with a function for their LAN controller to perform TCP/IP protocol checksum calculations. However, we recommend not to use this function but to use the standard TCP/IP checksum calculation function of the OS.

If the calculation by the OS is set up, the integrity of packet data received from a network will be checked in the final stage of protocol processing of the OS, thus enabling construction of a more reliable system.

If you use the LAN mezzanine (CN7M1S-Y/CN7M1S-R/CN7M1T-Y/CN7M1T-R) or the LAN card (CN7821-Y/CN7821-R/CN7823-Y/CN7823-R/CN7841-Y/CN7841-R), do not change these settings. The network performance will be degraded.

Setup method in Windows Server 2008 R2

1. Double-click **Control Panel** > **Device Manager**.
2. Open the **Details** tab page of the properties windows of each network adapter in **Network adapters**.
3. Change the settings according to the following table if the setup items are displayed:

Table 4-1: Settings of network adapter properties

Item	settings	
	Broadcom Advanced Control Suite 4 not installed	**Broadcom Advanced Control Suite 4 installed**
IPv4 Checksum Offload	Rx & Tx Enabled -> None	Rx & Tx Enabled -> None
TCP/UDP Checksum Offload (Ipv4)	Rx & Tx Enabled -> None	Rx & Tx Enabled -> None
TCP/UDP Checksum Offload (Ipv6)	Rx & Tx Enabled -> None	Rx & Tx Enabled -> None
Large Send Offload (IPv4)	Enable -> Disable	Enable -> Disable
Large Send Offload v2(IPv4)	Enable -> Disable	Enable -> Disable
Large Send Offload v2(IPv6)	Enable -> Disable	Enable -> Disable
Receive Side Scaling	Enable -> Disable	Enable -> Disable

4. After setting all items, click **OK** and restart the OS.

Precautions on internal devices

This section describes precautions when using the internal devices of the system unit.

SSD

- The built-in SSD is a storage device that uses a flash memory device as a semiconductor recording device. HDD adopts a system of magnetic recording on media but SSD uses a flash memory device as a nonvolatile semiconductor recording device.
  The SSD is excellent in random access performance, impact resistance and low power consumption. But the SSD has a write capacity limit. It is assumed that the write environment of a typical server is about 50 GB/day.
  The SSD might reach the maximum write capacity limit under an environment where a write operation is conducted frequently.
- If the defragmentation tool is used for SSD, it might be short life. SSD is different from HDD. Do not use the defragmentation tool on SSD.
- When the built-in SSD (MLC: Multiple Level Cell type) is near the end of life, the built-in SSD data is lost due to drained of recorded electric charge while powering off for a long time. SSD that is near the end of life notify the S.M.A.R.T.(Self-Monitoring, Analysis and Reporting Technology) error. Monitor the error of SSD using the RAID management utility. If the S.M.A.R.T. error is detected, change a new SSD for prevention.

5

Maintenance and service parts

This chapter describes daily maintenance procedures, service parts and consumables.

- ☐ Daily maintenance items
- ☐ Cleaning
- ☐ Service parts
- ☐ Consumables

Daily maintenance items

Both system unit and internal devices should be maintained periodically. Conduct daily maintenance according to the table below. If either system unit or internal devices are found abnormal during daily maintenance, contact the sales representative or maintenance personnel.

For optional devices, see their individual manuals.

Table 5-1: Maintenance items

Location	Cleaning or check item		Cleaning or check cycle
System unit	Clean	Cleanup dust from the air vents	6 months*
	Check	Check ERROR and MAINTENANCE LEDs on the operational panel.	6 months
		Check fans for abnormal noise	6 months
Internal DVD-ROM	Clean	Clean pickup lens with cleaning kits.	In case of a media read error
* If the system unit is used in a dusty environment, clean the unit once every month.			

Cleaning

This section describes how to clean the system unit and its standard devices. For the cleaning of other optional devices, see their individual manuals.

System unit

For the following procedure, see *Hitachi Compute Rack 220H Getting Started Guide* together.

NOTICE

- Turn off the system unit and disconnect the power cable whenever you clean the unit. Otherwise, a component failure can occur.
- Keep the system unit free of water. Do not wipe the unit with a wet cloth. Otherwise, a component failure can occur.

1. Power off the system unit.
2. Disconnect all the power cables from the outlet or the rear side of system unit.
3. Disconnect the interface cable from the system unit.

4. Clean dust off the following vents of the system unit with a dry cloth or vacuum cleaner.

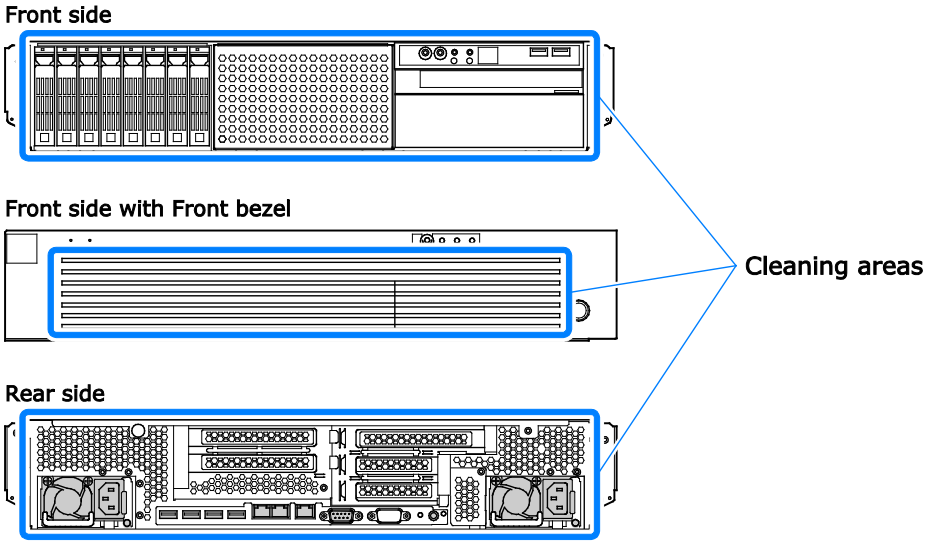

Figure 5-1: Cleanup location of the system unit

5. Before connection, remove dust from the connectors of interface cable and system unit using a dry cloth.
6. Wipe dust off the plug of the power cable and connect the cable to an outlet and system unit.

Internal DVD-ROM

Clean the pickup lens in case of a media read error. For purchasing a cleaning kit, contact the sales representative. For the cleaning method, obey the cleaning kit usage.

Service parts

The system unit is designed to have an estimated life of five years (when running 24 hours a day/30 days a month). Service parts that deteriorate and wear out during use are contained in the parts of the system unit.

NOTICE Some of service parts use an aluminum solid electrolytic capacitor with a service life. An attempt to use such parts beyond their life will leak or exhaust their electrolytic solution, thus causing smoking or bad smell. To prevent these risks, replace service parts whenever exceeding their design life.

Major service parts are as follows:

Table 5-2: Service parts

Part name	Product code	Remarks
Internal DVD-ROM	(Standard of system unit)	*1

Notes:

(*1) If the drive is used under the installation environment provided in *Hitachi Compute Blade 2000/1000/320 and Hitachi Compute Rack 220/210 Site Planning Guide*, the energization life time is approximately 13,000 hours. If the drive is used for 24 hours a day and for 30 days a month, its lifetime will be approximately 1.5 years. If the drive is used beyond the above environmental conditions, a failure might be caused or its life might be shortened.

When the built-in SSD (MLC: Multiple Level Cell type) is near the end of life, the built-in SSD data is lost due to drained of recorded electric charge while powering off for a long time. SSD that is near the end of life notify the S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) error. Monitor the error of SSD using the RAID management utility. If the S.M.A.R.T. error is detected, change a new SSD for prevention.

Lifetime is a rough estimate, which does not assure that those devices will not fail within this period of time.

Consumables

For the consumables, contact the sales representative.

NOTICE Use the specified consumables, such as data media and cleaning media. Otherwise, product reliability will deteriorate and a risk of failure increases.

6

Troubleshooting

This chapter describes troubleshooting of the system unit.

- Solving problems
- Corrective actions for error

Solving problems

This section describes how to take measures against various cases.

Table 6-1: Solving problems

No	Description	Point to be checked and action to be taken
1	**Initial failure or missing part**	• Check the system unit for missing parts or damage against the accessories checklist. • After delivery, check the operation of system unit for initial failures. • If initial failures or missing parts are found, contact the sales representative.
2	**Some users do not know how to use equipment or have questions about manual's descriptions.**	• See the documents of devices. • For any questions on a manual's description, contact the sales representative.
3	**System unit does not work normally or an error occurs.**	• See Corrective actions for error on page 6-3.
4	**System unit infected with a computer virus.**	• Disconnect the network cable and follows the instructions mentioned in the manual attached to your anti-virus software.
5	**Want to change the disk array or know the operation of disk array**	• Start setup with the RAID BIOS "MegaRAID WebBIOS". For details on the RAID BIOS, see *Hitachi Compute Rack 210H/220H BIOS Guide*. • Also, see *MegaRAID Storage Manage Instruction Manual*.
6	**Want to extend a function.**	• For addition of another optional device or software, contact the sales representative.
7	**Others**	• For any other questions, contact the sales representative.

Corrective actions for error

This section describes how to take action depending on the symptom of an error or a system unit failure.

Specific problems and corrective actions

This section lists problems that cause abnormal operation of the system unit or peripheral, and the actions to be taken.
If the system does not recover from a failure even when the following actions are taken, contact the sales representative or maintenance personnel.

Table 6-2: Problems and actions

No	Problems	Point to be checked and action to be taken
1	**The POWER LED does not light. (The power is not turned on).**	• Check if the AC cable is connected normally. See *Hitachi Compute Rack 220H Getting Started Guide*. • Check if the POWER switch is set to ON.
2	**Abnormal heat or smoke, or a short circuit occurred.**	• Turn off the power immediately and disconnect all the AC cables. Contact the sales representative or maintenance personnel.
3	**An error message appears at the start time.**	• See When an error message appears on page 6-5.
4	**The ERROR LED on the system unit lights.**	• See Errors during use on page 6-16.
5	**Memory capacity is smaller than the actual one.**	• Check if memory is installed normally. See *Hitachi Compute Rack 220H CRU Replacement Guide*. • The available memory capacity might decrease due to the effect of a memory hole. • Check if the online spare memory function or memory mirroring function has been set valid. An attempt to use this function uses part or the half of memory, thus reducing the capacity. See *Hitachi Compute Rack 210H/220H BIOS Guide*.
6	**Internal device does not work (HDD, DVD-ROM).**	• Check if internal devices are installed normally. See *Hitachi Compute Rack 220H CRU Replacement Guide*. • Check if the system BIOS or RAID BIOS is set up normally. See *Hitachi Compute Rack 210H/220H BIOS Guide*. • Check if the applicable drive has been installed.
7	**The keyboard is out of order, some of the keys are unusable, or the mouse does not work normally.**	• Check if the keyboard cable is connected normally or if the mouse cable is connected normally. See *Hitachi Compute Rack 220H Getting Started Guide*.
8	**Serial port does not operate.**	• Check if the system BIOS is set up normally. See *Hitachi Compute Rack 210H/220H BIOS Guide*.

No	Problems	Point to be checked and action to be taken
9	**Nothing appears on the display, or garbage appears on the screen.**	• Check if the display's power switch is turned on, if the display's contrast or brightness control volume is adjusted properly, or if the power cable is normally connected to both display and outlet. • Check if the display cable is normally connected to both display and system unit. See *Hitachi Compute Rack 220H Getting Started Guide*.
10	**Abnormal window appears.**	• Check if precision equipment is installed around the system unit. • Check if the system unit or display positions changed during its use. Geomagnetic effects or color shading might occur on the display. Turn off the power once and leave at least 30 minutes before restart. • Check if the system unit is too close to the display. Keep the system unit properly distant from the display or increase the refresh rate setting.
11	**Only the mouse cursor appears.**	• Any cause cannot be identified. Contact the sale representative, or maintenance personnel.
12	**Anything appearing on the display is unreadable or distorted.**	• Check if the refresh rate is set beyond the display's specification.
13	**Changed setup on the system BIOS cause abnormal operation.**	• Return the settings on the system BIOS to factory defaults. See *Hitachi Compute Rack 210H/220H BIOS Guide*.
14	**Use of other company's product causes abnormal operation.**	• Abnormal operation can be attributed to the other company's product. Ask the product manufacturer.

When an error message appears

This section describes how to take action if an error message appears.

When a system BIOS error message appears

If an error is detected during POST, an error message appears on the display. Take action according to the description mentioned in the "Action" of the table below. If a message not described in the table should appear, write down the message and contact the sales representative or maintenance personnel.

Table 6-3: System BIOS error messages during POST

Error code	Error message	Description	Action
2004	Last power event was caused by CPU1 Thermal Trip	A processor error has been detected.	(*1)
2005	Last power event was caused by CPU2 Thermal Trip	A processor error has been detected.	(*1)
2008	CPU1 BIST Error is found	A processor error has been detected.	(*1)
2009	CPU2 BIST Error is found	A processor error has been detected.	(*1)
2710	FRU checksum bad	A BMC error has been detected.	(*1)
2714	Cannot set BMC network configuration	A BMC error has been detected.	(*1)
2716	BMC is not ready	A BMC error has been detected.	(*1)
2717	Power supply configuration error	A power supply configuration error has been detected.	(*1)
3B01	System battery is dead	A battery error has been detected.	(*1)
3B02	Check date and time settings	A system clock error has been detected.	(*2)
-	BMC hard fail	A BMC error has been detected.	(*1)
-	BMC soft fail	A BMC error has been detected.	(*1)
-	BMC communication error	A BMC error has been detected.	(*1)
-	Cannot access SDR Repository	A BMC error has been detected.	(*1)
-	Cannot access BMC FRU device	A BMC error has been detected.	(*1)
-	IPMB Signal lines do not respond	A BMC error has been detected.	(*1)
-	SDR Repository empty	A BMC error has been detected.	(*1)
-	Internal Use Area of BMC FRU corrupted	A BMC error has been detected.	(*1)
-	Controller updated 'boot block' firmware corrupted	A BMC error has been detected.	(*1)
-	Controller operational firmware corrupted	A BMC error has been detected.	(*1)
-	BMC is in force update mode	A BMC error has been detected.	(*1)
2630	ME Firmware has stopped	A firmware error has been detected.	(*1)

Error code	Error message	Description	Action
2631	BIOS and ME are not compatible	A firmware error has been detected.	(*1)
2632	HECI is disabled	A HECI error has been detected.	(*1)
2633	ME Status is Invalid	A firmware error has been detected.	(*1)
2634	Cannot initialize HECI	A HECI error has been detected.	(*1)
2250	Cannot enable Memory Mirroring Mode	A memory error has been detected.	(*3)
2251	Cannot enable Memory Lock Step Mode	A memory error has been detected.	(*3)
2252	Cannot enable Memory Sparing Mode	A memory error has been detected.	(*3)

Notes:

(*1) Contact the sales representative or maintenance personnel.

(*2) Set correct information on the system BIOS setup menu.
If an error recurs, contact the sales representative or maintenance personnel.

(*3) Check if the memory boards are of correct configuration or installed normally.
If an error recurs, contact the sales representative or maintenance personnel.

When a RAID BIOS error message appears

A RAID BIOS "MegaRAID WebBIOS" message might appear. Take action according to the description under "Action" in the table below.

Table 6-4: RAID BIOS error messages during POST

Error message	Description	Action
Cache data was lost because of an unexpected power-off or reboot during a write operation, but the adapter has recovered. This could be because of memory problems, bad battery, or you may not have a battery installed. **Press any key to continue or press C to load the configuration utility.**	If this message appears even though an illegal power shutdown or reboot is not conducted during write operation, contact the sales representative, or call maintenance personnel.	(*1)
The memory/battery problems were detected. The adapter was recovered, but cached data was lost. Press any key to continue or press C to load the configuration utility.	If this message appears even though an illegal power shutdown or reboot is not conducted during write operation, contact the sales representative, or call maintenance personnel.	(*1)
Cache data was lost, but the controller has recovered. **This could be due to the fact that your controller had protected cache after an unexpected power loss and your system was without power longer than the battery backup time.** **Press any key to continue or press C to load the configuration utility.**	If this message appears even though an illegal power shutdown or reboot is not conducted during write operation, contact the sales representative, or call maintenance personnel.	(*1)

Error message	Description	Action
The cache contains dirty data, but some VDs are missing. **The cached data cannot be written to the disk. If this is an unexpected error, then power off your system and check your cables to ensure all disks are present. If you continue, the data in the cache will be permanently discarded.** **Press X to acknowledge and permanently destroy the cached data.**	If this message appears even though an illegal power shutdown or reboot is not conducted during write operation, contact the sales representative, or call maintenance personnel.	(*1)
Foreign configurations found on adapter. **Press any key to continue or press C to load the configuration utility.**	Some HDDs found in the disk array controller do not match the disk array configuration information.	(*2)
The battery hardware is missing or malfunctioning, the battery is unplugged, or the battery could be fully discharged. **If you continue to boot the system, the battery-backed cache will not function.** **If the battery is connected and has been allowed to charge for 30 minutes and if this message continues to appear, contact technical support for assistance.** **Press D to disable this warning (if your controller does not have a battery).**	Cache backup module information is not set correctly. Press D while this message is appearing.	(*3)
The battery hardware is missing or malfunctioning, the battery is unplugged, or the battery could be fully discharged. **If you continue to boot the system, the battery-backed cache will not function.** **If the battery is connected and has been allowed to charge for 30 minutes and if this message continues to appear, contact technical support for assistance.**	Cache backup module information is not set correctly. Press D while this message is appearing.	(*3)
Some configured disks have been removed from your system, or are no longer accessible. Check your Cables and also ensure all disks are present. **Press any key to continue or press C to load the Configuration utility.**	Some HDDs with the disk array configuration information have been removed.	(*4)
The following VDs have missing disks: **- If you proceed (or load the configuration utility), these VDs will be marked OFFLINE and will be inaccessible.** **- Check your cables and ensure all disks are Present.** **Press any key to continue or press C to load the configuration utility.**	The disk array is set to OFFLINE because some HDDs have been removed.	(*4)
A discovery error has occurred. **Power-cycle the system and all the enclosures attached to this system.**	The disk array or HDDs were not recognized correctly.	(*1)

Error message	Description	Action
The following VDs are missing: **If you proceed (or load the configuration utility), these VDs will be removed from your configuration.** **If you wish to use them at a later time, they will have to be imported.** **If you decide these VDs should be present, power off your system and check your cables to ensure all disks are present.** **Press any key to continue or press C to load the configuration utility.**	Some of the disk array configurations have been removed.	(*4)
The following VDs are missing complete spans. If you proceed (or load the configuration utility), these VDs will be removed from your configuration and the remaining drives marked as foreign. **If you wish to use them at a later time, restore the missing spans and use foreign import to recover the VDs.** **If you believe these VDs should be present, please power off your system and check your cables to ensure all disks are present.** **Press any key to continue, or 'C' to load the configuration utility.**	Some of the disk array configurations have been removed.	(*4)
All of the disks from your previous configuration are gone. **If this is an unexpected message, then power off your system and check your cables to ensure all disks are present.** **Press any key to continue or press C to load the configuration utility.**	All the HDDs with the disk array configuration information have been removed.	(*4)
Your battery is either charging, bad, or missing and you have VDs configured for write-back mode. Because the battery is not currently usable, these VDs will actually run in the write-through mode until the battery is fully charged or replaced if it is bad or missing. **Press any key to continue.**	Cache backup module information is illegal.	(*1)
Multibit ECC errors were detected on the RAID controller. **The DIMM on the controller needs replacement.** **Contact technical support to resolve this issue.** **If you continue, data corruption can occur.** **Press X to continue or else power off the system and replace the DIMM module and reboot.** **If you have replaced the DIMM press X to continue.**	A cache memory error has occurred in the disk array controller.	(*1)

Error message	Description	Action
Single-bit ECC errors were detected during the previous boot of the RAID controller. **The DIMM on the controller needs replacement. Contact technical support to resolve this issue. Press X to continue or else power off the system and replace the DIMM module and reboot.** **If you have replaced the DIMM press X to continue.**	A cache memory error has occurred in the disk array controller.	(*1)
Single-bit overflow ECC errors were detected during the previous boot of the RAID controller. **The DIMM on the controller needs replacement. Contact technical support to resolve this issue. If you continue, data corruption can occur.** **Press X to continue or else power off the system and replace the DIMM module and reboot.** **If you have replaced the DIMM press X to continue.**	A cache memory error has occurred in the disk array controller.	(*1)
Single-bit overflow ECC errors were detected during the previous boot of the controller. **The DIMM on the controller needs replacement. If you continue, data corruption can occur.** **Press X to continue or else power off the system and replace the DIMM module and reboot.** **If you have replaced the DIMM press X to continue.**	A cache memory error has occurred in the disk array controller.	(*1)
Multibit ECC errors were detected on the RAIDcontroller. **If you continue, data corruption can occur.** **Contact technical support to resolve this issue.** **Press X to continue or else power off the system, replace the controller and reboot.**	A cache memory error has occurred in the disk array controller.	(*1)
Multiple Single-bit ECC errors were detected during the previous boot of the controller. **The DIMM on the controller needs replacement. If you continue, data corruption can occur.** **Press X to continue or else power off the system, replace the DIMM module, and reboot.** **If you have replaced the DIMM, press X to continue.**	A cache memory error has occurred in the disk array controller.	(*1)
Single-bit overflow ECC errors were detected on the RAID controller. **If you continue, data corruption can occur.** **Contact technical support to resolve this issue. Press X to continue or else power off the system, replace the controller and reboot.**	A cache memory error has occurred in the disk array controller.	(*1)

Error message	Description	Action
Memory Error. Please check the SDRAM connection. If problems persist contact Tech Support.	A cache memory error has occurred in the disk array controller.	(*1)
Memory Error. Detected Unsupported RAID Controller Memory. **Contact Tech support.**	A cache memory error has occurred in the disk array controller.	(*1)
Unrecoverable Error. Please check the SDRAMconnection. **If problems persist contact Tech Support.**	A cache memory error has occurred in the disk array controller.	(*1)
This is a TEST message. **Press any key to ignore it, or wait 5 seconds.** **No further action is required.** **Press any key to continue, or C to load the configuration utility.**	Test message	(*1)
This firmware is an ALPHA version. **It has not completed all validation.**	The firmware is of alpha version.	(*1)
This firmware is a BETA version. **It has not completed all validation.**	The firmware is of beta version.	(*1)
This firmware is a TEST version. **It has not completed any validation.**	The firmware is of test version.	(*1)
The firmware version inconsistency was detected. The adapter was recovered, but cached data was lost. **Press any key to continue or press C to load the configuration utility.**	Firmware version inconsistency has been detected.	(*1)
Firmware Failed Validation. Adapter needs to be refreshed.	Firmware version inconsistency has been detected.	(*1)
The most recent configuration command could not be committed and must be retried. **Press any key to continue, or press C to load the configuration utility.**	The disk array configuration information has been cleared or missing.	(*1)
Previous configuration cleared or missing. Importing configuration created on X/Y X:Y **Press any key to continue or press C to load the configuration utility.**	The disk array configuration information has been cleared or missing.	(*1)
An enclosure was found that contains both SAS and SATA drives, but this controller does not allow mixed drive types in a single enclosure. **Correct the problem and restart your system.** **Press any key to continue or press C to load the configuration utility.**	The disk array controller is working with illegal parameters.	(*1)
SAS drives were detected, but this controller does not support SAS drives. **Remove the SAS drives and restart your system.** **Press any key to continue or press C to load the configuration utility.**	The disk array controller is working with illegal parameters.	(*1)

Error message	Description	Action
SATA drives were detected, but this controller does not support SATA drives. **Remove the SATA drives, and restart your system. Press any key to continue or press C to load the configuration utility.**	The disk array controller is working with illegal parameters.	(*1)
Raid Key Missing. **Please check the Raid Key connection.** **If problems persist contact Tech Support.**	The disk array controller is working with illegal parameters.	(*1)
Raid Key Authentication Error. **Please check the RAID Key installed for this solution.** **If problems persist, contact Tech Support.**	The disk array controller is working with illegal parameters.	(*1)
Raid Key OEM Authentication Error. **Install the correct RAID key for this System.** **If problems persist contact Tech Support.**	The disk array controller is working with illegal parameters.	(*1)
There are more enclosures connected to the port than what is allowed for a single SAS port. **Remove the extra enclosures, and then restart your system.**	An illegal enclosure has been detected.	(*1)
Invalid SAS topology detected. **Check your cable configurations, repair the problem, and restart your system.**	An invalid SAS topology has been detected.	(*1)
Invalid SAS Address present in SBR. Contact your system support. **Press any key to continue with the default SAS address.**	An invalid SAS address exists.	(*1)
Invalid SAS Address present in MFC data. Program the valid SAS Address, and restart your system.	An invalid SAS address exists.	(*1)
Invalid memory configuration detected. Contact your system support. **System has halted.**	Invalid memory configuration information has been detected.	(*1)
Entering the configuration utility in this state will result in drive configuration changes. **Press Y to continue loading the configuration utility or power off your system and check your cables to ensure that all the disks are present, and then restart.**	The HDD configuration information has been changed.	(*1)
External Enclosure does not support in controller's Direct mapping mode. **Contact your system support.** **System has halted due to unsupported configuration.**	Illegal information has been detected from the enclosure.	(*1)
Expander Detected in controller with Direct mapping mode. **Reconfiguring automatically to persistent mapping mode.** **Automatic reboot would happen in 10 seconds.**	An unsupported device (expander) has been detected.	(*1)

Error message	Description	Action
The controller's I/O processor has a fault that can potentially cause data corruption. **Your controller needs replacement. Contact your system support. Press Y to acknowledge.**	The disk array controller's processor is illegal.	(*1)
Number of disks exceeded the maximum supported count of X disks. **Remove the extra drives and reboot the system to avoid losing data.** **Press Y to continue with extra drives.**	An illegal HDD has been detected.	(*1)
Number of devices exceeded the maximum limit of devices per quad. **Remove the extra drives and reboot the system to avoid losing data.** **System has halted due to unsupported configuration.**	An illegal HDD has been detected.	(*1)
Drive security is enabled on this controller and a pass phrase is required. **Please enter the pass phrase.**	The HDD security function is not supported.	(*1)
Invalid pass phrase. **Please enter the pass phrase.**	The HDD security function is not supported.	(*1)
There was a drive security key error. **All secure drives will be marked as foreign.** **Press any key to continue, or C to load the configuration utility.**	The HDD security function is not supported.	(*1)
Invalid pass phrase. If you continue, there will be a drive security key error and all secure configurations will be marked as foreign. **Reboot the machine to retry the pass phrase or press any key to continue.**	The HDD security function is not supported.	(*1)
Unable to communicate to EKMS. **If you continue, there will be a drive security key error and all secure configurations will be marked as foreign.** **Please check connection with the EKMS, reboot the machine to retry the EKMS or press any key to continue.**	The HDD security function is not supported.	(*1)
Unable to change security to EKMS was not able to communicate to EKMS. **If you continue, the drive security will remain to existing security mode.** **Please check connection with the EKMS, reboot the machine to retry the EKMS or press any key to continue.**	The HDD security function is not supported.	(*1)
DKM existing key request failed; existing secure configurations will be labeled foreign and will not be accessible. **Reboot server to retry.**	The HDD security function is not supported.	(*1)
DKM new key request failed; controller security mode transition was not successful. **Reboot server to retry request, or press any key to continue.**	The HDD security function is not supported.	(*1)

Error message	Description	Action
The native configuration is no longer supported by the current controller settings. **Please ensure that correct controller, iButton or key vault is being used.** **If you continue, the configuration will be marked foreign and part of it may be imported if possible.** **Press any key to continue.**	The original configuration information is not supported for setup of the disk array controller.	(*1)
The battery is currently discharged or disconnected. Verify the connection and allow 30 minutes for charging. **If the battery is properly connected and it has not returned to operational state after 30 minutes of charging, contact technical support for additional assistance.** **Press D to disable this warning (if your controller does not have a battery).**	The cache backup module information is illegal.	(*1)
The battery is currently discharged or disconnected. VDs configured in write-back mode will run in write-through mode to protect your data, and will return to write-back policy when the battery is operational. **If VDs have not returned to write-back mode after 30 minutes of charging then contact technical support for additional assistance.** **The following VD is affected: X.** **Press any key to continue.**	The cache backup module information is illegal.	(*1)
Two BBUs are connected to the adapter. **This is not a supported configuration. Battery and caching operations are disabled.** **Remove one BBU and reboot to restore battery and caching operations.** **If dirty cache is lost in this boot, that could have been because of dual battery presence.**	The cache backup module information is illegal.	(*1)
Firmware did not find valid NVDATA image. Program valid NVDATA image and restart your system. **Press any key to continue.**	Firmware did not find valid NVDATA image. Program valid NVDATA image and restart your system. Press any key to continue.	(*1)
IR to MR Migration failed. **Press any key to continue with MR defined NVDATA values.**	Migration is not supported.	(*1)
There are offline or missing virtual drives with preserved cache. **Check the cables and ensure that all drives are present. Press any key to enter the configuration utility.**	No logical drive is found.	(*1)
There are offline or missing virtual drives with preserved cache. **Check the cables and ensure that all drives are present.**	No logical drive is found.	(*1)

Error message	Description	Action
Incompatible secondary iButton present! **Please insert the correct iButton and restart the system.** **Press any key to continue but OEM-specific features will not be upgraded.**	iButton is illegal.	(*1)
Upgrade Key Missing! **An upgrade key was present on a previous power cycle, but it is not connected.** **This can result in inaccessible data unless it is addressed.** **Reattach the upgrade key and reboot.**	An upgrade key is not supported.	(*1)
Serial Boot ROM(SBR) device is corrupt or bad. Please contact Tech Support.	Serial Boot ROM (SBR) device malfunction	(*1)

Notes:

(*1) Contact the sales representative or maintenance personnel.

(*2) Set correct information on the RAID BIOS "MegaRAID WebBIOS".

(*3) If the system does not recover from the problem, contact the sales representative or maintenance personnel.

(*4) If this message appears with the device installed normally, contact the sales representative or maintenance personnel.

When a beep sounds

When an error occurs before the display is initialized, the system unit sounds a beep.

When the Power On Self Test ends, a beep sounds once but this is not an error.

In this table below, beep is expressed as "1-1-1…", for example. This means a beep sounds once with intervals.

Table 6-5: Beep sounds

Beep	Error	Action
1-1-1… **(Sounds continuously)**	Memory error	Contact the Sales representative or maintenance personal.

Errors at the time of boot from HDD

The following messages might appear if the OS fails to boot the system unit after POST during system startup:

- Insert bootable media in the appropriate drive
- Missing OS
- OS not found

If the above messages appear, verify the setup of the system BIOS or RAID BIOS. See *Hitachi Compute Rack 210H/220H BIOS Guide*.

If the system does not recover, the boot information storage area of the HDD might be destroyed. Re-install the OS.

If the OS cannot be booted after re-installation, replace the HDD. In this case, contact the sales representative or maintenance personnel.

Errors during use

This section describes how to handle an error during system use.

Table 6-6: Errors during use

Error symptom	Description	Measures
ERROR LED lights*	Abnormal temperature inside the system unit. Alternately, a failure has occurred in the hardware such as fans or the mother board inside the system unit.	Review the ambient temperature range of the system unit and make an adjustment so as to keep a temperature within the allowable range. Remove dirt from the vent at the front and rear of the system unit in order to improve emissions. If the ERROR LED is still lit, contact the sales representative or maintenance personnel.
ERROR LED lights* **+ HDD status LED lights amber**	A failure has occurred on the internal HDD/SSD.	Replace the HDD/SSD. Contact the sales representative or maintenance personnel.
ERROR LED lights* **+ Power supply LED lights amber**	A power supply failure has occurred.	Replace the power supply. Contact the sales representative or maintenance personnel.
Power supply LED blinks amber	A power supply is warning status.	Review the ambient temperature range of the system unit and make an adjustment so as to keep a temperature within the allowable range. Remove dirt from the vent at the front and rear of the system unit in order to improve emissions. If the power supply LED is still blinks amber, contact the sales representative or maintenance personnel.
* When the ERROR LED lights, the MAINTENANCE LED's event code indicator denotes what hardware an error has occurred in. See MAINTENANCE LEDs on page 2-3.		

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