NOTE:
Read this manual carefully before using the unit. Keep this manual nearby as a handy reference and refer to the "CAUTION" and "WARNING" statements whenever necessary.

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FEDERAL COMMUNICATIONS COMMISSION
RADIO FREQUENCY INTERFERENCE STATEMENT

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Warning

This is a Class A product. In domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

警告使用者：
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，使用者會被要求採取某些適當的對策。
Safety Precautions

Before using this unit, read this manual carefully and keep cautions in order to use this unit safely and correctly and to avoid to be a cause of damage to the body or properties. Keep this manual to see whenever it is necessary. The following symbols are used in this manual so that you can easily understand how to operate the unit safely and correctly.

<table>
<thead>
<tr>
<th><strong>WARNING</strong></th>
<th>Indicate there is a risk of death or serious wound.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CAUTION</strong></td>
<td>Indicate there is a risk of burn or injury.</td>
</tr>
</tbody>
</table>

Risks and necessary actions to reduce risks are indicated individually by the following symbols.

| **🔥** | Indicates the risk of smoke emission or fire outbreak. |
| ** 🔥** | Indicate there is a risk of death or serious wound. |
| **Electric Shock Symbol** | Indicates the risk of electric shock. |
| **No Smoking Symbol** | Indicates the danger of an injury due to harmful material. |
| **No Device Symbol** | Indicates instructions to keep a device away from inflammable object. |
| **No Symbol** | Indicates notice of general prohibition. |
| **Exclamation Mark** | Indicates required general actions for operators. |
| **Pull Plug Symbol** | Indicates instructions to pull the plug of a power cord from outlet and to off main circuit breaker. |
Notes on Use

The following includes information necessary for proper and safe operation of the disk array unit.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Do not use the disk array unit in an area with much moisture or water usage. If so, a fault, electrical shock, or fire may occur.</td>
</tr>
<tr>
<td>▪ Do not use the disk array unit in an area where inflammable gas and/or combustible substance are placed. If so, fire or explosion may occur.</td>
</tr>
<tr>
<td>▪ Do not concentrate power cords only to some AC outlets. If so, fire may occur.</td>
</tr>
<tr>
<td>▪ Do not put a heavy substance on a power cord. If so, the coating of the power cord may be broken, fire may occur, and/or you may be electrically shocked.</td>
</tr>
<tr>
<td>▪ Do not install the disk array unit in an area of much moisture or dust. Remove dust adhering to AC outlets and the plugs of power cords, if any. If dust remains adhering to an AC outlet and/or plug, fire may occur.</td>
</tr>
<tr>
<td>▪ Do not connect the plug of a power cord to an AC outlet with a wet hand. If so, you may be electrically shocked.</td>
</tr>
<tr>
<td>▪ While the disk array unit can accept the power of 100 - 240 VAC (50/60 Hz), the power cord coming with the disk array unit can only accept 100 – 120 VAC. Use 100 – 120 VAC (50/60 Hz) when the attached power cord is used. Using power of different voltage may cause electric shock, smoke, and/or fire to occur.</td>
</tr>
<tr>
<td>▪ The LAN card of the disk array unit contains lithium battery. Do not remove the lithium battery. The lithium battery may explode when it is brought close to fire or immersed in water. Dispose of the LAN card according to local ordinance. Contact your local government for details.</td>
</tr>
<tr>
<td>▪ If the disk array unit does not operate normally due to the life of the lithium batteries, contact your service representative. Do not disassemble the LAN card, or replace or charge battery by yourself.</td>
</tr>
<tr>
<td>CAUTION</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>- Do not install the disk array unit and the host systems on unstable places. If so, some substances may be dropped to cause you to be injured.</td>
</tr>
<tr>
<td>- Do not install the disk array unit and the power cords in an area with direct sunshine or near an apparatus generating heat such as a heater. If so, a fault may occur. Further, the coating of the power cord may be melted to cause fire or electric shock to occur.</td>
</tr>
<tr>
<td>- Insert the plug of a power cord to an AC outlet securely. Any power cord shall be routed with sufficient margin to avoid excess force from being given to the plugs of the power cord or the power cord itself. If a power cord is removed from the AC outlet during operation, data may be lost and/or a fault may occur.</td>
</tr>
<tr>
<td>- To prevent electric shocks, connect a power cord to an AC outlet with earth terminal. Connection of the earth line to a gas tube is extremely dangerous. Never do it.</td>
</tr>
</tbody>
</table>

| - Connect or remove a peripheral device from the disk array unit after turning off all the powers of the disk array unit and peripherals and pulling out the power cords from the AC outlets. If not, some units may be broken and/or you may be electrically shocked. |
| - To carry or reinstall the disk array unit, disconnect all cables and power cords beforehand. If not, some units may be broken, you may be electrically shocked, and/or a fire may occur. |

<table>
<thead>
<tr>
<th>! IMPORTANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Handle optical fibers carefully and gently.</td>
</tr>
<tr>
<td>- The minimum bending radius of optical fiber shall be 30 mm.</td>
</tr>
<tr>
<td>- Dust and/or dirt may attenuate the optical power of optical fiber to cause data errors to occur. Clean any optical fiber cable whenever it is inserted into the mating connector in the following procedure.</td>
</tr>
<tr>
<td>1. Blow parts cleaning gas (e.g. air splay) to the connector of the optical fiber cable for several seconds.</td>
</tr>
<tr>
<td>2. Wipe the connector with non-woven cloth soaked with alcohol for several times.</td>
</tr>
<tr>
<td>3. Blow the parts cleaning gas to the connector again.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>! IMPORTANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>To install the unit in a rack, observe the following guidelines.</td>
</tr>
<tr>
<td>1. TMRA – If installed in a rack, consideration should be given to installing the equipment in an environment compatible with the TMRA.</td>
</tr>
<tr>
<td>2. Reduced Air Flow – Installation in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.</td>
</tr>
<tr>
<td>3. Mechanical loading – Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.</td>
</tr>
<tr>
<td>4. Circuit Overloading – Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.</td>
</tr>
<tr>
<td>5. Reliable Earthing – Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g., use of power strips).</td>
</tr>
</tbody>
</table>
Warning labels are put on parts possibly be dangerous and/or surroundings in the disk array unit. They are intended to always make you conscious of possible dangers when you handle the disk array unit. (Do not peel off the labels or do not make them dirty.) If any of the labels is not put on the proper position, is peeled off a little, or is dirty to make it unreadable, contact your sales agent or maintenance engineer.
CAUTION:
DOUBLE POLE/NEUTRAL FUSING.

ATTENTION:
DOUBLE POLE/FUSIBLE SUR LE NEUTRE.

注意 CAUTION VORSICHT
ATTENTION

高圧注意
This unit may be hot and should not be touched without taking care.

警告 WARNING

Use the power cord of the source voltage between 100 and 120 VAC.
Otherwise, it may cause electric shock, smoke and fire.
CAUTION: Be careful of handling because内部パッケージ parts become HOT.
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Momentary voltage drop prevention

This product may be affected by a momentary voltage drop caused by lightning. To prevent a momentary voltage drop, an AC uninterruptive power supply (UPS) unit should be used.

Notes

(1) No part of this manual may be photocopied in any form without prior written consent from NEC.
(2) The information in this manual is subject to change without notice.
(3) All possible efforts are being made to create this manual, but in the event that any technical or editorial errors or omissions are found, contact your dealer.
(4) Save this manual in a convenient area even after you finished reading it.
(5) When transferring this unit to other person, be sure to transfer this manual also.
(6) NEC shall not be liable for any loss or lost profits from the use of this disk array unit regardless of the item in (3).
(7) This unit is not intended to be installed into the installation or equipment associated with human life, such as medical equipment, atomic installation or equipment, aerial and space equipment, transportation installation and equipment and to be installed into and to control the installation or equipment requiring high reliability. If you use this unit for these installation, equipment, or control system, NEC shall not be liable for an accident leading to an injury or death, fire, or social loss resulting from a breakdown of our product.

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Preface

Thank you very much for your purchase of the disk array unit. This manual is intended to enable you to correctly use the disk array unit NF2300-SR4xxE connected with the NEC Express5800 series, NX7000 series, or CX5000 series system.

Before using the disk array unit, also read the manuals of several devices including NEC Express5800 series, FibreChannel controller, NX7000 series, FC-AL SCSI connection mechanism, or CX5000 series to be connected with the disk array unit and the manual of the used OS.

NEC Storage BaseProduct needs to be purchased separately for using the disk array unit.

The following options are provided for NF2300-SR4xxE disk array unit:

To expand storage capacity:
- Additional disk enclosure NF2300-SE41E
- Additional 36-GB disk drive NF2300-SM412E
- Additional 73-GB disk drive NF2300-SM413E
- Additional 147-GB disk drive NF2300-SM414E
- Additional 36-GB/15,000 rpm disk drive NF2300-SM422E

To expand cache memory size:
- Additional cache memory NF2300-SC01E and NF2300-SC02E

To expand host port:
- Additional host FC port NF2300-SP03E

To expand disk port:
- Additional control card NF2300-SP02E

After reading the manual, store it in an area where you can access it easily.

First edition, February 2003
Check of Components in Package

(1) Unpacking

Open the package and take out the disk array unit and accessories from the package without large shock. The disk array unit is greatly heavy. Accordingly, if two people or less lift the unit, their backs may be damaged. To take out the disk array unit from the package, more than three people should always support the bottom of the unit without holding the power supply on the rear face and the projections of the controller.

The package is specially designed for carriage of a precision device. Do not dispose of the package because it is required to return the disk array unit to the factory for its repair.

(2) Inspection

After unpacking, check that all the components listed in the table below are provided. If any of the components is missed, contact your sales agent. Next, inspect the disk array unit and accessories. If any of the components is damaged, contact your sales agent.

<table>
<thead>
<tr>
<th>No.</th>
<th>Product name</th>
<th>Remarks</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NEC Storage S2300 1/2</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>NEC Storage S2300 2/2</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Disk drive</td>
<td>NF2300-SR412E: 36 GB</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(Installed in NEC Storage S2300 2/2)</td>
<td>NF2300-SR413E: 73 GB</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NF2300-SR414E: 147 GB</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NF2300-SR422E: 36 GB/15K</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Power cord</td>
<td>Length 5 m (for 100-120 VAC)</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>HSSDC cable</td>
<td>Length 1 m</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>DE diagnosis cable</td>
<td>Length 1 m</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Front mask</td>
<td>For NEC Storage S2300 1/2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For NEC Storage S2300 2/2</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Key</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>User's Guide (this document)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Packing list</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Location label</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>T&amp;D program</td>
<td>DAT cartridge for NX7000 system</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Rack mount kit</td>
<td>For NEC Storage rack (L and R)</td>
<td>2</td>
</tr>
</tbody>
</table>

* Use the FC cable (HSSDC) and DE diagnosis cable provided with the additional disk enclosure or separately priced DE cable (NF9120-SJ04E) for connecting disk array unit NEC Storage S2300 with the additional disk enclosure.
(1) NEC Storage S2300 (1/2) (The figure above shows the unit with the front mask installed.)

(2) NEC Storage S2300 (2/2) (The figure above shows the unit with the front mask installed.)

(3) Disk drive

(4) Power cord

(5) HSSDC cable

(6) DE diagnosis cable

(7) Front mask

(8) Key

(9) User's Guide

(10) Packing list

(11) Location label

(12) T&D program

(13) Rack-mount kit
Legend

Symbols in the Text

This User's Guide uses the following symbols to indicate improper handling which may cause the disk array unit to be defected or frozen.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Symbol]</td>
<td>If the description is ignored to handle the disk array unit incorrectly, the unit may be defected, some software used in the unit may be broken, and/or the data created by the user may be broken.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>If the description is ignored to handle the disk array unit incorrectly, the unit may be defected and/or some software used in the unit may not operate normally.</td>
</tr>
</tbody>
</table>

This User's Guide also uses the following symbol.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Symbol]</td>
<td>Supplement of the text</td>
</tr>
</tbody>
</table>

This User's Guide uses the following terms to indicate specific devices.

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk array unit</td>
<td>Indicates NF2300-SR4xxE.</td>
</tr>
<tr>
<td>Array controller</td>
<td>Indicates the NEC Storage S2300 1/2.</td>
</tr>
<tr>
<td>Disk enclosure</td>
<td>Indicates the NEC Storage S2300 2/2 and additional disk enclosure (sold separately).</td>
</tr>
<tr>
<td>Disk drive</td>
<td>Indicates the hard disk with dedicated tray.</td>
</tr>
<tr>
<td>Dummy tray</td>
<td>Indicates the dedicated tray only, with no hard disk installed.</td>
</tr>
<tr>
<td>Host system</td>
<td>Indicates the NEC Express5800 series, NX 7000 series, or CX5000 series.</td>
</tr>
<tr>
<td>Host bus adapter</td>
<td>Indicates the FibreChannel controller for NEC Express5800 series, FC-AL SCSI connection mechanism for NX7000 series, or FibreChannel controller for CX5000 series.</td>
</tr>
</tbody>
</table>
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1. NOTES ON INSTALLATION AND HANDLING OF DISK ARRAY UNIT

1.1 Note on Carrying Disk Array Unit

Be sure to hold the bottom the disk array unit when carrying it. Hold the front or side bottom of the disk array unit if possible.
1.2 Environment in Use of Disk Array Unit

In installation of the disk array unit, take into account the following items on the location, room temperature, space required for handling, ventilation, and other conditions.

- Install the disk array unit indoors.
  Do not expose the disk array unit to direct sunlight. Use a window shade or curtain to block sunlight to the unit if necessary.

- Install the disk array unit on a level floor with sufficient strength. In addition, do not give shocks and/or vibrations to the disk array unit. If so, some components may be dropped to cause the disk array unit to be defected and/or people to be injured.

- Install the disk array unit in an area under the following conditions; temperature range between 5°C - 40°C and humidity range between 10% - 80% (without condensation).

- Do not install the disk array unit in an area with water or oil poured, area suffering liquid such as water and oil, suffering steam, area with steam, and area with much moisture. If so, a fault or electrical shock may occur.

- Do not install the disk array unit in an area with emission of chemical steam or an area where the disk array unit may be contact with inflammable substance. If so, a fault, fire, or explosion may occur.

- Do not install the disk array unit in an area with much dust. If so, a fault may occur.

- Do not install the disk array unit in an area with direct sunshine or near fire or an apparatus generating heat such as stove. If so, a fault or deformation may occur.

- Do not install the disk array unit near TV, radio, and codeless telephone. Some noise may appear in the TV, radio, and codeless telephone.

- Do not use cellular phones near the disk array unit. If so, a fault may occur.

- Do not install the disk array unit near a device generating strong magnetism. If so, a fault may occur.

- Install the disk array unit so that the ventilating holes opened on the front and rear faces are not blocked. If not, heat generation and/or fault may occur.
### 1.3 Installation and Connection of Disk Array Unit

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Do not use the disk array unit in an area with much moisture or water usage. If so, a fault, electrical shock, or fire may occur.</td>
</tr>
<tr>
<td>- Do not use the disk array unit in an area where inflammable gas and/or combustible substance are placed. If so, fire or explosion may occur.</td>
</tr>
<tr>
<td>- Do not install the disk array unit in an area of much moisture or dust. Remove dust adhering to AC outlets and the plugs of power cords, if any. If dust remains adhering to an AC outlet and/or plug, fire may occur.</td>
</tr>
<tr>
<td>- Do not concentrate power cords only to some AC outlets. If so, fire may occur.</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Make sure to disconnect all power cords and FC cables before relocating the disk array unit. If not, a malfunction of the system, an electric shock and/or fire may occur.</td>
</tr>
<tr>
<td>- While the disk array unit can accept the power of 100 - 240 VAC (50/60 Hz), the power cord coming with the disk array unit can only accept 100 – 120 VAC. Use 100 – 120 VAC (50/60 Hz) when the attached power cord is used. Using power of different voltage may cause electric shock, smoke, and/or fire to occur.</td>
</tr>
<tr>
<td>- Do not install the disk array unit and the power cords in an area with direct sunshine or near an apparatus generating heat such as a heater. If so, a fault may occur. Further, the coating of the power cord may be melted to cause fire or electric shock to occur.</td>
</tr>
</tbody>
</table>
- The array controller and the disk enclosure weigh 34 kg or more. Hold the array controller and disk enclosure firmly with at least three people to carry it. Carrying the devices only by two or less people may strain their back.

- Select the place where the disk array unit can be connected to the AC outlet by using the attached power cord or the power cord approved by NEC.

- Insert the plug of a power cord into an AC outlet securely. If some clearance remains between the plug of the power cord and the AC outlet, dust may enter into the clearance. This then may cause fire to occur.

- Provide sufficient margins for the cables connected to the disk array unit so that legs may not be trapped by the cables. Avoid power plugs and FC connectors from suffering excess forces.

- Do not use cables connected to the disk array unit with them leaving bent. If so, a fault or fire may occur.

- Use the cables approved by NEC as those connected to the disk array unit and check the destinations to which the cables are connected. In addition, always lock power cords and FC cables when they are connected.

- Use the power source independent from TV or radio. Otherwise, a noise may be generated.

- To connect a cable to the mating connector, make sure that the connector of the cable is not damaged and any pins are not bent. Using a cable not approved by NEC or a damaged cable may cause fire to occur.

- To disconnect a cable from the mating connector, always hold the connector of the cable. Do not hold the cable itself to disconnect it.
1.4 Notes on Use of Disk Array Unit

- Do not let any animal (pet) or children touch the cable connected to the disk array unit. Pulling the cable may cause the unit to fall down, resulting in failure of the unit.
- Do not enter any liquid such as water into the disk array unit. If so, you may be electrically shocked or the unit may be defected. If some liquid is entered into the disk array unit, turn off the power and contact your sales agent or maintenance engineer. If the disk array unit seems dry, only a small amount of liquid may remain to cause the unit to be defected.
- Do not enter foreign substances such as clip and screw into the disk array unit through the ventilating holes on the front or rear face. If so, a fault may occur.
- Do not disassemble or modify the disk array unit. If so, a fault or electrical shock may occur. Repair of the unit will be charged regardless of warranty.
- If the disk array unit will not be used for a long period, disconnect the plugs of the power cords from the AC outlets for safety.
- 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 unit including the cables. If any failure is found later, contact your sales agent.
1.5 Routine Inspection of Disk Array Unit

⚠️ CAUTION

- To clean the disk array unit, always turn off the power and also disconnect the plugs of power cord from AC outlets. If not, you may be electrically shocked.

⚠️ If a surface of the disk array unit becomes dirty, wipe the surface lightly with soft cloth. Wiping the surface by using chemicals such as benzene and thinner, or volatile chemicals, may cause the surface to be deformed or discolored. In addition, note that spraying insecticide on a surface may cause the surface to be deformed or discolored.

⚠️ It is recommended to clean the inside of the disk array unit periodically. It is because dust may be accumulated after the disk array unit is used for a long time.

Contact your sales agent or maintenance engineer for the cleaning of the inside of the disk array unit.

Users must not disassemble and/or repair the disk array unit because it is dangerous.

⚠️ Do not use any battery backup unit exceeding its life. If so, a fault or fire may occur. (Assumed life of battery backup unit: 2.5 years in operating environment at temperature of 27°C)
1.6 Notes on Storage or Carriage of Disk Array Unit

- Do not store the disk array unit in an area where the temperature may increase extremely or the difference between the warm and cold states is considerably large. In addition, do not store the disk array unit in an area with much moisture or dust.

- Note that foreign substances such as water and metals may not be entered into the disk array unit during storage. Using the disk array unit with some foreign substance left inside may cause a fault, electrical shock, or fire to occur.

- During the storage, do not put any substance on the disk array unit or do not place the disk array unit on an area where the unit may be dropped. To use the disk array unit after storage for longer than six months, it is recommended to contact your sales agent or maintenance engineer for inspection and/or repair.

- The array controller and the disk enclosure weigh 34 kg or more. Hold the array controller and disk enclosure firmly with at least three people to carry it. Carrying the devices only by two or less people may strain their back. Do not hold the protrusions from the power supply or controller. Doing so applies excessive force to the power supply and controller. As a result, the power supply or controller may be damaged, and/or the array controller or disk enclosure may fall and cause personal injury.

- Make sure to package the disk array unit when transporting it with the packing material that comes with the disk array unit. If any other packing materials are used, a vibration or shock generated during transportation may cause a malfunction of the unit.
2. FEATURES OF DISK ARRAY UNIT

The disk array unit has the following features.

NF2300-SR4xxE is a high-performance disk array unit designed for NEC Express5800, NX7000, and CX5000 systems. NF2300-SR412E, NF2300-SR413E, NF2300-SR414E and NF23200-SR422E are equipped with three 36GB, 73GB, 147GB and 36GB/15,000 rpm disk drives, respectively.

* Ask your sales agent for non-NEC servers (hosts) which are supported and compatible operating systems.

You can easily expand the storage capacity by installing additional disk drives (options) in expansion slots (at shipment: 12 slots) of the disk array unit. An additional disk enclosure (option) to enable the expansion of the storage capacity of the disk array unit is provided for the disk array unit.

NF2300-SR4xxE supports RAID levels 0, 1, 5, and 10. If a fault occurs in a single disk drive, NF2300-SR4xxE can continue the operation without loss of data (except RAID level 0).

Any defected disk drive can be replaced with a new one without system shutdown. Further, the disk array unit has the auto repair feature which automatically starts data recovery after the replacement of the defected disk drive.

If a single disk drive is specified as the spare disk, the data in the defected disk drive can be immediately recovered in the spare disk. The use of this hot spare feature as well as the auto repair feature allows the data in the defected disk drive to be automatically recovered in the spare disk as soon as a disk drive is defected. This improves the system reliability.

The disk array unit has the cache memory data hold function by using cache memory, power supply, and battery backup unit. The function allows comfortable high-speed data processing to be done under high reliability.

Further, owing to the redundant configuration of the controller, fan, power supply, and battery backup unit as well as disk drive, the entire system is not shut down if any part of the system is defected during operation.

See Section 9.2 "Optional Components" for the product names and part numbers of options.

| Above features of the disk array unit are effective only for the hardware failure (e.g., the hard disk is physically damaged or inoperative). The software failure (e.g., the data is lost or rewritten due to program excursion) is not covered by these features. When the software failure would occur, the system could seriously be damaged. To minimize the damage, be sure to back up the data periodically. |
2.1 Hot Spare Feature

Spare disks can be installed in the disk array unit. If a disk drive in the same FC loop as the spare disk, the data in the defective disk drive is recovered in the spare disk. After the data recovery, the disk array drive operates normally if another disk drive is defected (except for RAID level 0). A defective disk drive can be replaced without turning off the power of the disk array unit.

With the setting at the shipment, if the disk drive defected during the operation by using the spare disk is replaced with a normal disk drive, the data is immediately repaired from the spare disk to the normal disk drive.

Example of hot spare operation

- DRV14 Spare disk
- DRV13
- DRV12
- DRV11
- DRV10
- DRV9
- DRV8
- DRV7
- DRV6
- DRV5
- DRV4
- DRV3
- DRV2
- DRV1
- DRV0

Failure in DRV1

- DRV14 Spare disk
- DRV13
- DRV12
- DRV11
- DRV10
- DRV9
- DRV8
- DRV7
- DRV6
- DRV5
- DRV4
- DRV3
- DRV2
- DRV1
- DRV0

Replacement of DRV 1

The setting of the spare disk is invalid in RAID level 0. Use the spare disk in RAID level 1, 5, or 10.

Do not move any of the factory-installed disk drives into another slot.

* DRV: Disk drive
  LDN: Logical Disk Number
When you change a failing disk to a spare disk, confirm the following to get the spare disk to function normally:

- The capacity of the spare disk is equal to or greater than that of the failing disk.
- The rotational speed of the spare disk is equal to or faster than that of the failing disk.

Therefore, if a large-capacity disk is defined as a spare disk, it can cover all the disks of a high-speed drive. However, if your disk array unit contains disks of different capacities or different rotational speeds, you should define a spare disk matching the capacity and rotational speed of each disk in order to clarify disk management.

Up to 2 spare disks can be installed for each disk enclosure. Up to 16 spare disks can be installed for the entire disk array unit.
2.2 Write Cache Feature

For RAID level 5, the performance of the disk array unit may be decreased during writing of a small amount of data. It is because the previous data and parity data must be read to recalculate the parity.
The disk array unit is equipped with cache memory. When write data is stored in the cache memory, the disk array unit terminates the command processing and then writes the data to disk drive for improving the performance.

The cache memory is subject to battery backup by the battery backup unit. However, for higher safety of data protection, it is recommended to use UPS (uninterruptive power supply).

In general, if the power is shut down before the data saved in the cache memory is written to disk drive, the data in the cache memory will be lost. To prevent this, the disk array unit provides the battery backup by power supply and battery backup unit to retain data in the cache memory.

The backup time is restricted as follows:

• Four days in full charge status of both the two batteries in the installation of cache memory of the maximum capacity

The following conditions are imposed to make the write cache feature effective:

• Two controllers, one or more battery backup units, and power supplies for the battery backup unit (PS0 for BBU0, PS1 for BBU1) are installed to operate normally.
• The battery backup units are fully charged.

If any of the conditions is not satisfied, the write cache feature does not work sufficiently. The batteries installed in the battery backup unit are fully charged for about eight hours. If the battery switch on battery backup unit is not turned on, the battery backup unit does not operate.
2.3 Dynamic Cross Call Feature

The disk array unit is equipped with two array controllers to enable dynamic cross call control. In the configuration, the two array controllers can access to all logical disks by turning on cross call feature (factory-set is off). If either of the array controllers is defected, the disk array unit can continue the operation by using the remaining array controller. Setting can be changed by using management software.

In order to use this feature, middleware is required as well as OS.

2.4 Management Software

To view the resources of the disk array unit through the host computer in real time, use the disk array unit management software "NEC Storage Manager" of "NEC Storage BaseProduct Ver 2.1 - NEC Storage S2300" (separately priced) that is used with the disk array unit. NEC Storage Manager also enables you to set the following parameters through the host computer:

- Setting of RAID configuration (RAID0, 1, 5, 10, and hot spare disk)
- Resetting of RAID configuration
- Setting of various features such as cross-call mode
- Collection of error log

To use the disk array unit, you need to purchase "NEC Storage BaseProduct - NEC Storage Ver2.1 2300" sold separately. Before the disk array unit can be used, the license lock must be released by using the license code provided with NEC Storage BaseProduct. Be sure to release the license lock. A disk array unit without the license lock being released cannot receive any maintenance services because the operation cannot be guaranteed.
2.5 RAID Configuration

The RAID configuration in the array controller can be used in the combinations shown in the table below.

<table>
<thead>
<tr>
<th>RAID level</th>
<th>RAID0</th>
<th>RAID1</th>
<th>RAID5</th>
<th>RAID10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of logical drives in configuration</td>
<td>1, 3, 5, 10, 15</td>
<td>1+1</td>
<td>2+1 to 14+1</td>
<td>2+2 to 7+7</td>
</tr>
<tr>
<td>Number of logical drives per subsystem</td>
<td></td>
<td></td>
<td>1,024 max.</td>
<td></td>
</tr>
<tr>
<td>Storage capacity per logical drive</td>
<td>When additional 36-GB disk drive is used</td>
<td>35.7 to 536.1 GB</td>
<td>35.7 GB</td>
<td>71.4 to 500.3 GB</td>
</tr>
<tr>
<td></td>
<td>When additional 73-GB disk drive is used</td>
<td>71.6 to 1074 GB</td>
<td>71.6 GB</td>
<td>143.2 to 1002 GB</td>
</tr>
<tr>
<td></td>
<td>When additional 147-GB disk drive is used</td>
<td>142.9 to 2144 GB</td>
<td>142.9 GB</td>
<td>285.8 to 2001 GB</td>
</tr>
</tbody>
</table>

* A combination of disk drives of the same capacity and same rotational speed is required for configuring logical drives.

The RAID levels have the following characteristics.

<table>
<thead>
<tr>
<th>Level</th>
<th>Function</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAID0</td>
<td>Striping</td>
<td>Highest data read/write rate</td>
<td>Data recovery disabled (Fault in a single disk drive causes data to be lost.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maximum storage capacity</td>
<td></td>
</tr>
<tr>
<td>RAID1</td>
<td>Mirroring</td>
<td>Data recovery enabled</td>
<td>Low-speed data writing</td>
</tr>
<tr>
<td></td>
<td>All data is written to two disk drives.</td>
<td>Minimum data recovery time</td>
<td>The storage capacity is equal to that of disk drive. Therefore, two disk drives are required.</td>
</tr>
<tr>
<td>RAID5</td>
<td>Striping of data and redundant data</td>
<td>Data recovery enabled</td>
<td>Three or more disk drives are required.</td>
</tr>
<tr>
<td></td>
<td>Larger capacity is available for users because the capacity of redundant data is smaller than that of RAID1. High-speed data read</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RAID10</td>
<td>Use of both mirroring and striping</td>
<td>Data recovery enabled</td>
<td>Four or more disk drives are required.</td>
</tr>
<tr>
<td></td>
<td>High-speed data read/write</td>
<td></td>
<td>The required storage capacity of disk drive is as twice as the configured storage capacity.</td>
</tr>
</tbody>
</table>
3. NAMES AND ROLES OF SECTIONS

This chapter describes the names and functions of the sections in the disk array unit.

3.1 Array Controller (Front)

A front mask is installed on the front face of the array controller as shown in the figure above. The front mask can be removed by releasing the lock with the accessory key and pulling out toward you with your hands hooked on the both sides of the mask. Removing the front mask, you can view the battery cover shown in the figure below.

(1) POWER LED (green)

The POWER LED lights green if the AC power is supplied and the power switch is set to ON. The LED is off if the power switch is set to OFF.

(2) SERVICE LED (orange)

The SERVICE LED lights orange when the disk array unit encounters an error, and it is also on while the battery backup unit is being charged. The LED flashes during the self-test and initialization immediately after the power is turned on. The LED goes off when the disk array unit has started, and it is off while the disk array unit is operating normally.
(3) Battery cover

Opening the battery cover, you can see two battery backup units installed in the disk array unit.

(4) Battery backup units (BBU0/BBU1)

The battery backup units are installed to protect the data remaining in the cache memory at the occurrence of power interruption. See Section 3.3 "Battery Backup Unit" for details.
3.2 Array Controller (Rear)

(1) Power supplies for array controller (PS0/PS1)

The power supplies are provided to supply power to the array controller. See Section 3.4 "Power Supply for Array Controller" for details.

(2) Controllers (CONT0/CONT1)

The array controller boards are provided to control the disk array unit. See Section 3.5 "Controller" for details.

(3) LAN card

The LAN card is used to write the cache data remaining in the disk array unit into the disk drive before turning off the unit. The LAN card is provided for remote maintenance of the unit. See Section 3.6 "LAN Card" for details.
3.3 Battery Backup Unit

(1) Battery switch

If the battery switch is set to ON, the battery backup power is supplied to the cache memory at the occurrence of power interruption. Turn on this switch before the disk array unit is used. The battery switch may not be turned off if the power of the disk array unit is turned off.

⚠️ If the battery switch is set to OFF, the battery backup for cache is not provided at the occurrence of power interruption.

⚠️ Turning off the battery backup unit disables write cache feature.

(2) Check terminal

The check terminal is provided for maintenance inspection of the battery backup unit.

* This terminal is exclusively used for maintenance.

(3) Handle

Hold the handle to pull out the battery backup unit when it is replaced due to failure or its life.

⚠️ When inserting the battery backup unit into the array controller, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause a battery backup unit failure again.
3.4 Power Supply for Array Controller

(1) Power plug

The power plug is intended to supply power to the array controller. Insert the receptacle of the power cord to the power plug and the plug of the power cord to an outlet of 100-120 VAC power at 50 or 60 Hz.

The array controller has the redundant power configuration to prevent the entire unit from being shut down by a single failure. In this configuration, connect two power cords in use of the array controller.

⚠️ While the disk array unit can accept the power of 100 - 240 VAC (50/60 Hz), the power cord coming with the disk array unit can only accept 100 – 120 VAC. Use 100 – 120 VAC (50/60 Hz) when the attached power cord is used. Using power of different voltage may cause electric shock, smoke, and/or fire to occur.

(2) Power switch

The power switch is used to turn on/off the power of the array controller. The array controller has the redundant power configuration to prevent the entire disk array unit from shutting down due to a single failure. Therefore, turn on/off the two power switches when operating the array controller.
(3) Power cooling fan

When the power switch is set to ON, a cooling fan is rotating. Note that the ventilating holes are not blocked.

- Install the disk array unit so that the ventilating holes may not be blocked. If either or both of the ventilating holes are blocked, the internal temperature of the array controller may increase to cause a fault to occur.
- The power supply for the array controller is equipped with fans. Even if a fan fails, the air-cooling conditions for the entire array controller are satisfied. However, to guarantee the safety operation of the disk array unit, replace the power supply for the array controller immediately if a fan failure occurs.

(4) POWER GOOD LED (green)

The POWER GOOD LED lights green when the AC power is supplied to the array controller and the power switch is set to ON. The LED is off if the power switch is set to OFF or a fault occurs in the power supply.

(5) POWER FAIL LED (orange)

The POWER FAIL LED lights if a fault occurs in the power supply.

(6) BBU FAIL LED (orange)

The BBU FAIL LED lights when the respective battery backup unit is installed and a fault occurs in the battery backup unit.

(7) Handle

If the power supply is defected, pull out it by holding the handle.

(8) Removal protection mechanism

The removal protection mechanism prevents the power supply from being removed unexpectedly.
To remove the power supply, remove the power cord and slide the removal protection mechanism to the inner side.

- When inserting the power supply for the array controller into the array controller, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause a power supply failure again.
3.5 Controller

(1) Controller cooling fans (FAN0/FAN1)

With the power switch being ON, the two cooling fans are rotating. Note that the ventilating holes may not be blocked.

- Install the array controller so that the ventilating holes may not be blocked. If either or both of the ventilating holes are blocked, the internal temperature of the array controller may increase to cause a fault to occur.
- The controller is equipped with 4 fans in total. Even if a fan fails, the air-cooling conditions for the entire array controller are satisfied. However, to guarantee the safety operation of the disk array unit, replace the controller cooling fan immediately if a fan failure occurs.

(2) FAN LED (FAN0/FAN1) (orange)

The FAN LED lights orange if the cooling fan for the respective controller is not installed or a fault occurs in the fan. The LED is off while the respective fan operates normally.

(3) FAULT LED (orange)

The FAULT LED lights orange if a fault occurs in the controller.
(4) BATTERY BACKUP LED (orange)

With no power supplies for array controller supplying power normally in such a case as power interruption, the BAT LED lights orange if the cache is subject to battery backup.

If any of the controllers, power supplies, and batteries is replaced during the BAT LED ON with no power supplies for array controller supplying power normally, the backup data is lost.

(5) BBU READY LED (green)

The BBU READY LED lights green when the conditions for using the write cache feature are already provided (see Section 2.2 "Write Cache Feature").

(6) ACCESS LED (green)

The ACCESS LED lights while the controller is operating in the disk array unit.

(7) READY LED (green)

The READY LED lights green while the controller operates normally. The LED flashes during the self-test or initialization just after power-on.

(8) RS-232C connector

The RS-232C connector is provided for maintenance inspection of the disk array unit. This connector is not used normally because it is exclusively used for maintenance.

(9) DE-DIAG connector

The DE-DIAG connector is provided to connect a cable for diagnosing the disk enclosure. Connect the DE diagnosis cable.

(10) DIAG READY LED (green)

The DIAG READY LED lights green when the disk enclosure becomes ready for diagnosis.

(11) DISK-2G LED (green)

The DISK-2G LED lights green while the disk interface is operating at 2Gbps. The LED is off while it is operating at 1Gbps.

(12) FC connectors (for connection of disk enclosure) (DEF0/DEF1)

The FC connectors are used to connect the array controller with the disk enclosure. See Chapter 5 "CONNECTION OF DISK ARRAY UNIT" for the cable connection.
(13) FC connector (for connection of host bus adapter) (HF0)

The FC connector is used to connect the host system with the disk array unit. See Chapter 5 "CONNECTION OF DISK ARRAY UNIT" for the cable connection.

(14) LINKUP LEDs (DL0/DL1/HL0)

A LINKUP LED lights green if the respective FC connector (FC port) becomes operable (to link up). DL0, DL1, and HL0 LEDs correspond to DEF0, DEF1, and HF0 connectors, respectively. These LEDs are off during the self-test or initialization just after power-on.

(15) HOST-2G LED (green)

The HOST-2G LED lights green while the host bus adapter interface is operating at 2Gbps. The LED is off while it is operating at 1Gbps.

(16) AL-PA switch

The AL-PA switch is used to set the address of the disk array unit as a FibreChannel device in the host FC loop.
At the shipment, the addresses of CONT0 and CONT1 are set to "00" and "01", respectively. Set the AL-PA so that the address may not be the same as that of another controller or FibreChannel device in the same host FC loop.

(17) Ejector

The ejector is used to install or remove the controller. Loosen the screw before using the ejector.

When inserting the controller into the array controller, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause malfunction.
3.6 LAN Card

(1) SHUT DOWN switch (toggle switch)

Use this switch to turn off the disk array unit. Normally set this switch to OFF.
Turning on this switch starts writing the cache data remaining in the array controller into disk drive.
To power off the disk array unit, see "7.2 Power On/Off of Disk Array Unit" for details.

(2) SHUT DOWN LED (green)

The SHUT DOWN LED goes off while the LAN card operates normally.
The LED flashes green while writing the cache data remaining in array controller to the disk drive.
The LED lights when the cache data is completely written to disk drive and the disk array unit is ready to power off.
(3) READY LED (green)

The READY LED lights green while the LAN card operates normally. The LED blinks during the self-test and initialization just after power-on.

(4) LINK LED (green)

The LINK LED lights green when the LAN card receives a link pulse from Ethernet.

(5) FAULT LED (orange)

The FAULT LED lights orange if a fault occurs in the LAN card. In normal operation, the LED is off. If a write error to the disk drive occurs with the SHUT DOWN switch being ON, the LED flashes in orange.

(6) RS232C connector

The RS-232C connector is used to connect the disk array unit to the modem.

(7) UPS connectors (UPS0, UPS1)

The UPS connectors are used to connect an uninterruptive power supply (UPS) unit if the system is in a configuration for receiving AC power from the UPS. If the system configuration using the UPS is implemented, the system can continue operating in stable state even if an unexpected power failure or momentary AC power failure occurs.

- Ask your sales agent for the system configuration using the UPS.
- If you want to change the current system connection, contact your maintenance service agent. If you change the connection by yourself, the UPS starts at power failure but may fail to function normally. Consequently, the operation may stop or data may be lost.

(8) Ethernet connector

The Ethernet connector is provided to connect Ethernet (10/100BASE-T) for remote maintenance or for using the disk array unit management software "NEC Storage Manager" of "NEC Storage BaseProduct Ver2.1 - NEC Storage S2300" (separately priced).

- When inserting the LAN card into the array controller, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause malfunction.
3.7 Disk Enclosure (Front)

A front mask is installed on the front face of the disk enclosure as shown in the figure above. The front mask can be removed by releasing the lock with the accessory key and pulling out toward you with your hands hooked on the both sides of the mask. Removing the front mask, you can view the disk drive shown in the figure below.

(1) POWER LED (green)

The POWER LED lights green if the AC power is supplied and the power switch is set to ON. The LED is off if the power switch is set to OFF.

(2) SERVICE LED (orange)

The SERVICE LED lights orange if an error occurs in the disk enclosure. The LED is off while the disk enclosure operates normally.
(3) Disk drives/dummy trays

Disk drive: Contains a hard disk (HDD) with the dedicated tray.
Dummy tray: Contains only the dedicated tray with no hard disk.

When the disk array unit is shipped, disk drives are installed in 3 slots from the left viewed from the front, and dummy trays are installed in the 12 remaining slots.

* The disk drives installed in the disk enclosure are dedicated to the FC loop at 2Gbps.
  A mixture of 1Gbps and 2Gbps disk drives is not permitted.
  Do not install any 1Gbps disk drives in the disk enclosure.

(4) HDD READY LED (green)

The HDD READY LED lights green while the disk drive operates normally. The LED flashes when the disk drive transfers data.
The HDD READY LED flashes during the self-test or initialization just after power-on.

(5) HDD FAULT LED (orange)

The HDD FAULT LED lights at the occurrence of an error in the disk drive. The LED is off while the disk drive operates normally.

(6) Ejector

The ejector is used to install or remove the disk drive or dummy tray. In the normal operation status, the ejectors fix disk drives or dummy trays to the disk enclosure.

⚠️ When inserting the disk drive into the disk enclosure, push it as far as it will go and then lock the ejector.
Incorrect insertion may cause malfunction.
3.8 Disk Enclosure (Rear)

(1) Power supplies for disk enclosure (PS0/PS1)

The power supply is intended to supply power to the disk enclosure. See Section 3.9 "Power Supply for Disk Enclosure".

(2) Adapter (ADP0/ADP1)

The adapter board is used to control the disk enclosure. See Section 3.10 "Adapter".

When inserting the power supply for the disk enclosure or an adapter into the disk enclosure, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause a power supply failure or adapter failure again.

When replacing a power supply for the disk enclosure, prepare the new power supply before removing the old one, and then replace it within about 3 minutes. The following are heating units of the disk enclosure:
A) Disk drives
B) Power supplies for the disk enclosure

The fans in the power supplies for the disk enclosure serve as cooling fans for both of the above. Therefore, do not leave the disk enclosure with one of the power supplies removed. Doing so causes the disk drive temperature to rise, which may significantly decrease the reliability.
### 3.9 Power Supply for Disk Enclosure

![Diagram of disk enclosure components](image)

**1. Power plug**

The power plug is intended to supply power to the disk enclosure. Insert the receptacle of the power cord to the power plug and the plug of the power cord to an outlet of 100-120 VAC power at 50 or 60 Hz.

The disk enclosure has the redundant power configuration to prevent the entire unit from being shut down by a single failure. In this configuration, connect two power cords in use of the disk enclosure.

**WARNING:** While the disk array unit can accept the power of 100 - 240 VAC (50/60 Hz), the power cord coming with the disk array unit can only accept 100 – 120 VAC. Use 100 – 120 VAC (50/60 Hz) when the attached power cord is used. Using power of different voltage may cause electric shock, smoke, and/or fire to occur.

**2. Power switch**

The power switch is used to turn on/off the power of the disk enclosure. The disk enclosure has the redundant power configuration to prevent the entire disk array unit from shutting down due to a single failure. Therefore, turn on/off the two power switches when operating the disk enclosure.

**3. Cooling fans**

When the power switch is set to ON, two cooling fans are rotating. Note that the ventilating holes are not blocked.

**WARNING:** Install the disk enclosure so that the ventilating holes may not be blocked. If either or both of the ventilating holes are blocked, the internal temperature of the disk enclosure may increase to cause a fault to occur.

- The disk enclosure is equipped with 4 fans in total. Even if a fan fails, the air-cooling conditions for the entire disk enclosure are satisfied. However, to guarantee the safety operation of the disk array unit, replace the power supply for disk enclosure as soon as possible. Replacing the defected fan means that two fans are stopped, therefore, perform the replacing work within three minutes.
(4) POWER GOOD LED (green)

The POWER GOOD LED lights green when the AC power is supplied to the disk enclosure and the power switch is set to ON. The LED is off if the power switch is set to OFF or a fault occurs in the power supply.

(5) POWER FAULT LED (orange)

The POWER FAULT LED lights if a fault occurs in the power supply (including fan failure). The LED is off while the power supply (including fan) operates normally.

(6) Power cord stopper

The power cord stopper prevents the power supply from being removed unexpectedly.

(7) Ejector

The ejector is used to install or remove the power supply from the disk enclosure. Loosen the screw before using the ejector.

When inserting the power supply for the disk enclosure into the disk enclosure, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause a power supply failure again.

When replacing a power supply for the disk enclosure, prepare the new power supply before removing the old one, and then replace it within about 3 minutes. The following are heating units of the disk enclosure:

A) Disk drives

B) Power supplies for the disk enclosure

The fans in the power supplies for the disk enclosure serve as cooling fans for both of the above. Therefore, do not leave the disk enclosure with one of the power supplies removed. Doing so causes the disk drive temperature to rise, which may significantly decrease the reliability.
3.10 Adapter

(1) READY LED (green)
   The READY LED lights green when the adapter is powered on and the initial diagnostics in the adapter is completed normally. The LED is on while the power is on.

(2) FAULT LED (orange)
   The FAULT LED lights orange if a fault occurs in the adapter. The LED lights at the power-on and then goes off at the termination of the self-test for the adapter.

(3) FC connectors (FC-IN/FC-OUT)
   The FC connectors are used to connect a array controller with a disk enclosure or connect a disk enclosure with another disk enclosure. See Chapter 5 "CONNECTION OF DISK ARRAY UNIT" for cable connections.

(4) LINKUP LED (FC-IN/FC-OUT) (green)
   The LINKUP LED lights green when the corresponding FC connector (FC port) becomes operable (to link up). The LED is off or flashes during the self-test or initialization just after power-on.

(5) AL-PA switch
   The AL-PA switch sets the AL-PA of the disk enclosure. Set the AL-PA switches of both the adapters installed in the first disk enclosure connected to the array controller via FC cable (HSSDC) to "0". Further, set the AL-PA switches of the adapters installed in each disk enclosure to "1", "2", ..., "5", or "6" in the connection order.

   When the AL-PA switches of the left and right adapters are set differently, the FAULT LEDs on the adapters flash and the disk enclosure is not started. If different values are set for the AL-PA switches, turn off the power of the system including the disk enclosure, reset the AL-PA values properly, and turn on the power again.

   When replacing the adapter due to failure and others, make sure that the AL-PA switches of the left and right adapters are set to the same values before installation. If different values are set, a link failure may occur in the worst case.
(6) DE-DIAG ID switch

The DE-DIAG ID switch sets the DE-DIAG address of the disk enclosure.

Set "0" for all the DE-DIAG IDs of the adapters installed in the disk enclosure that is connected with the standard controller board on the array controller via the FC cable (HSSDC).

If an additional control card (NF2300-SP02E) is installed in the array controller, set "1" for all the DE-DIAG IDs of the adapters installed in the disk enclosure that is connected with the additional control card via the FC cable (HSSDC).

The DE-DIAG ID switch is factory-set to "0".

(7) DE-DIAG connectors

The DE-DIAG connectors connect the DE diagnosis cable provided with the disk array unit.
Connect the cable from the DE-DIAG connector of controller "0" (CNT0) to the PORT0 connector of adapter "0" (ADP0), and from the DE-DIAG connector of controller "1" (CNT1) to the PORT0 connector of adapter "1" (ADP1).

To connect the additional disk enclosure (NF2300-SE41E) to the disk array unit, make the following connections:
• From the PORT1 connector of adapter "0" (ADP0) installed in the disk enclosure of the disk array unit to the PORT0 connector of adapter "0" (ADP0) installed in the additional disk enclosure
• From the PORT1 connector of adapter "1" (ADP1) installed in the disk enclosure of the disk array unit to the PORT0 connector of adapter "1" (ADP1) installed in the additional disk enclosure

For each of the above connections, use the DE diagnosis cable provided with the additional disk enclosure or the DE diagnosis cable of separately priced DE cable (NF9120-SJ04E).

(8) DIAG READY LED (DRDY LED) (green)

The DIAG READY LED lights green when the disk enclosure becomes ready for diagnosis.

(9) Ejector

The ejector is used to install or remove the adapter. Loosen the screw before using the ejector.

```
When inserting an adapter into the disk enclosure, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause an adapter failure again.
```
3.11 Additional Control Card

(1) FC connectors (for connection of disk enclosure) (DEF2/DEF3)

Each FC connector is used to connect the array controller with the disk enclosure. See Section 5 "CONNECTION OF DISK ARRAY UNIT" for the cable connection.

(2) FC connector (for connection of host bus adapter) (HF1)

The FC connector is used to connect the host system with the disk array unit. See Section 5 "CONNECTION OF DISK ARRAY UNIT" for the cable connection.

(3) LINKUP LEDs (DL2/DL3/HL1)

Each LINKUP LED lights green when the corresponding FC connector (FC port) becomes operable (Link UP). DL2 LED corresponds to the DEF2 connector, DL3 LED corresponds to the DEF3 connector, and HL1 LED corresponds to the HF1 connector. The LED is off during the self-test or initialization just after power-on.

(4) DISK-2G LED (green)

The DISK-2G LED lights green while the disk interface is operating at 2Gbps. The LED is off while it is operating at 1Gbps.

(5) HOST-2G LED (green)

The HOST-2G LED lights green while the host bus adapter interface is operating at 2Gbps. The LED is off while it is operating at 1Gbps.
(6) AL-PA switch

The AL-PA switch sets the address of the disk array unit as a FibreChannel device in the host FC loop.
Set an AL-PA so that it will be different from the AL-PAs of other FibreChannel devices in the same host FC loop.

When installing or replacing the additional control card into the controller, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause malfunction.

- To use the additional control card, at least a single cache memory must be installed.
- NF2300-SP02E does not contain cache memory. Purchase the necessary additional cache memory (NF2300-SC01E or NF2300-SC02E) depending on the environment of the customer using the disk array unit.
### 3.12 Additional FC Port

1. **FC connector (for connection of host bus adapter) (HF1)**

   The FC connector is used to connect the host system with the disk array unit. See Section 5 "CONNECTION OF DISK ARRAY UNIT" for the cable connection.

2. **LINKUP LED (HL1)**

   The LINKUP LED lights green when the FC connector (FC port) becomes operable (Link UP). The LED is off during the self-test and initialization immediately after the power is turned on.

3. **HOST-2G LED (green)**

   The HOST-2G LED lights green while the host bus adapter interface is operating at 2Gbps. The LED is off while it is operating at 1Gbps.

4. **AL-PA switch**

   The AL-PA switch sets the address of the disk array unit as a FibreChannel device in the host FC loop.
   Set an AL-PA so that it will be different from the AL-PAs of other FibreChannel devices in the same host FC loop.

---

When installing or replacing the additional FC card into the controller, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause malfunction.
4. INSTALLATION AND CONNECTION PROCEDURES

This chapter describes the procedure for the installation and connection of the disk array unit. In general, follow the procedure shown in Section 4.1 for the installation and connection of the disk array unit.

Take care of the matters described in Chapter 1 "NOTES ON INSTALLATION AND HANDLING OF DISK ARRAY UNIT" in doing the jobs.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not give shock and vibration to the disk array unit. Excess shock or vibration may cause the disk array unit to be defected.</td>
</tr>
<tr>
<td>While the disk array unit can accept the power of 100 - 240 VAC (50/60 Hz), the power cord coming with the disk array unit can only accept 100 – 120 VAC. Use 100 – 120 VAC (50/60 Hz) when the attached power cord is used. Using power of different voltage may cause electric shock, smoke, and/or fire to occur.</td>
</tr>
</tbody>
</table>

4.1 Installation and Connection Procedures

- Check of components in package
  Check the components in the package following "Check of Components in Package". If any component is missed, contact your sales agent.

- Connection of host bus adapter
  Connect the host bus adapter according to the manual provided with the host system or host bus adapter. And, install the proper driver.

- Connection of FC cable
  Use the cable compatible with the disk array unit. Insert the connector until the latch emits a click.
  Do not bend the cable forcibly.
  When disconnecting the cable, be careful not to apply excessive force to it. Hold and remove the connector pushing the latch.

- Connection of power cord
  Always use the proper power cord available for the disk array unit. Do not use the power cord with it bent and under complicated cable connections.

- Set of parameters
  For setting parameters including RAID level and disk assignment, use the NEC Storage Manager or contact your maintenance service agent.

- Check of resource status for disk array unit
  Before using the disk array unit, check the resource status including controller, power supply, battery backup unit, controller cooling fans, and disk drives by using the NEC Storage Manager.
5. CONNECTION OF DISK ARRAY UNIT

The user may conduct the connection of the disk array unit described in this chapter. However, if so, NEC does not assume the responsibility for any damage of the disk array unit and components and any influence resulting from the operation of the disk array unit. NEC recommends that you ask your maintenance engineer of the maintenance service agent with expert knowledge on details of the disk array unit to install or remove the disk array unit.

This chapter describes the basic procedure for connecting the disk array unit to the host system. In the connection, also read the User's Guide of the host system or host bus adapter to which the disk array unit is connected.

**CAUTION**

To connect a peripheral device to the system, disconnect the power cord of the peripheral from the AC outlet. If not, you may be electrically shocked.

- Any FC cable and DE diagnosis cable used for the connection of the disk array unit shall be approved by NEC. Also, the length of the cable shall be within the rating range. If a cable not approved by NEC is used or the length of the cable is out of the rating range, read data may be incorrect or invalid data may be written.
- To avoid incorrect wiring, make sure that connectors are connected to the proper destinations based on the cable specification.
- Do not push any cable connector excessively. Each connector can be connected properly only when it is inserted to the mating connector in the correct direction and at the correct angle. Proper insertion allows the connector to be inserted to the mating connector smoothly without excess force. If the connector cannot be inserted smoothly, do not insert it by force but check the direction of the connector again.
- Make sure that damages such as buckling, dust adhesion, and dirt are not found on the connector and contact before connection.
- Treat any connector carefully so that it may not be dropped on the floor to be damaged. Do not drag any connector on the floor to have dust adhere to the connector.
- Do not give excess force to the connector and cable connected with each other. Do not step or put a substance on a cable to deform the cable.
- Handle optical fibers carefully and gently.
- The minimum bending radius of optical fiber shall be 30 mm.
- Dust and/or dirt may attenuate the optical power of optical fiber to cause data errors to occur. Clean any optical fiber cable whenever it is inserted into the mating connector in the following procedure.
  1. Blow parts cleaning gas (e.g. air splay) to the connector of the optical fiber cable for several seconds.
  2. Wipe the connector with non-woven cloth soaked with alcohol for several times.
  3. Blow the parts cleaning gas to the connector again.
5.1 Notes on Connection of Disk Array Unit

Confirm the following items before attempting to connect the disk array unit:

(1) Connection cable

Use the provided or NEC-specified power cord to connect the disk array unit with the power supply.
To connect the host bus adapter of the host system or the FC-AL switch with the array controller, be sure to use the NEC-specified FC cable.
To connect the array controller with the disk enclosure, be sure to use the DE cable provided with the disk array unit or additional disk enclosure, or the NEC-specified DE cable (NF9120-SJ04E).

(2) Cable length limit

FC optical cable for operating the host interface at 1Gbps: Up to [500 m]
FC optical cable for operating the host interface at 2Gbps: Up to [300 m]

(3) Settings of topology and data transfer rate

A topology and data transfer rate must be set correctly in accordance with the host bus adapter to be connected or the connection mode of the FC-AL switch.

You can change the topology and data transfer rate of the FC connector for the host bus adapter by operating the DIP switch (SW2) on the controller.

For details, see Section 9.7 "How to Change Topology and Data Transfer Rate".

Factory-set topology and data transfer rate:
Topology: FC-AL
Data transfer rate: 2Gbps
5.2 Connection of Disk Array Unit

This section shows recommended connection samples. To make any of the recommended connections, you need to connect two host bus adapters with the host system. Two LC-LC cables (or two SC-SC cables and two FC conversion cables) are necessary for connecting the host bus adapters.

a) With the host bus adapter connectors of "LC" type

The second and following disk enclosures are optional. See Section 6.2 "Addition of Disk Enclosure".
b) With the host bus adapter connectors of "SC" type

The second and following disk enclosures are optional. See Section 6.2 "Addition of Disk Enclosure".

Connect the disk array unit with the host unit by using an FC cable in the following procedure.
(1) Check of Power Supply

Check that the power switch on the disk array unit and those on the host system are set to OFF and the plugs of the power cords are removed from AC outlets.

a) Power supply for array controller

b) Power supply for disk enclosure
(2) Connection of disk array unit with host system

a) With the host bus adapter connectors of "LC" type

Use the separately priced FC cable (NF9320-SJ0xE). Push the connector at either end of the cable into the FC connector (HFx) for the host bus adapter of either controller (CONT0 or CONT1) until a click is heard. The FC cable has the same connectors at both ends. Either connector may be connected to the controller.

If the connector is pushed hard, the end face may be hurt to decrease optical output. This may cause invalid operation to occur.

Connect the connector at the other end of the FC cable to the host bus adapter installed in the host system.

<Connection sample>

b) With the host bus adapter connectors of "SC" type

Use the separately priced FC conversion cable (NF9310-SJ10E). The cable has different-size connectors at the ends. Push the smaller connector into the FC connector (HFx) for the host bus adapter of either controller (CONT0 or CONT1) until a click is heard.

If the connector is pushed hard, the end face may be hurt to decrease optical output. This may cause invalid operation to occur.

<Connection sample>

Similarly, connect the other controller with the other host bus adapter installed in the host system.

Connect the other end of the FC conversion cable to the SC-SC cable via the relay connector provided with the FC conversion cable. Push the connector so that it clicks securely. The connector at an end of the SC-SC cable is the same as that at the other end. Either of the connectors may be connected to the relay connector.

Connect the connector at the other end of the SC-SC cable to the host bus adapter installed in the host system.

Similarly, connect the other controller with another host bus adapter installed in the host system.
(3) Connection between array controllers and disk enclosures

Push the connector at either end of the FC cable (HSSDC) into the FC connector (DEF0) for the disk enclosure of the controller 0 (CONT0) until a click is heard. The FC cable (HSSDC) has the same connectors at both ends. Either connector may be connected to the controller.

Push the connector at the other end of the FC cable (HSSDC) into the FC-IN connector on adapter 0 (ADP0) of the disk enclosure until a click is heard. Similarly, connect the FC connector (DEF1) for the disk enclosure of the other controller 1 (CONT1) to the FC-IN connector on adapter 1 (ADP1) of the disk enclosure.

Do not connect any cable/connector to the DEF1 connector on controller 0 (CONT0) or DEF0 connector on controller 1 (CONT1).

Subsequently, push the connector at either end of the DE diagnosis cable into the DE-DIAG connector of the controller 0 (CONT0) until a click is heard. The DE diagnosis cable also has the same connectors at both ends. Either connector may be connected to the controller.

Push the connector at the other end of the DE diagnosis cable into the DE-DIAG connector [PORT0] on adapter 0 (ADP0) of the disk enclosure until a click is heard. Similarly, connect the DE-DIAG connector of the other controller 1 (CONT1) to the DE-DIAG connector [PORT0] on adapter 1 (ADP1) of the disk enclosure.

If you have installed the additional control card NF2300-SP02E in the NF2300-SR4xxE, push the connector at either end of the FC cable (HSSDC) into the FC connector (DEF2) for the disk enclosure on additional control card installed in controller 0 (CONT0) until a click is heard. You can use the FC cable (HSSDC) provided with the additional disk enclosure or the FC cable (HSSDC) of the separately priced DE cable (NF9120-SJ04E). The FC cable has the same connectors at both ends. Either connector may be connected to the additional control card installed in controller 0.

Push the connector at the other end of the FC cable (HSSDC) into the FC-IN connector on adapter 0 (ADP0) of the additional disk enclosure until a click is heard.

Similarly, connect the FC connector (DEF3) for the disk enclosure on additional control card installed in the other controller 1 (CONT1) to the FC-IN connector on adapter 1 (ADP1) of the additional disk enclosure.

Do not connect any cable/connector to the DEF3 connector of additional control card installed on controller 0 (CONT0) or DEF2 connector of the additional control card installed on controller 1 (CONT1).
Subsequently, use the DE diagnosis cable provided with the additional disk enclosure or the DE diagnosis cable of the separately priced DE cable (NF9120-SJ04E). Push the connector at either end of the DE diagnosis cable into the DE-DIAG connector [PORT1] on adapter 0 (ADP0) of the existing disk enclosure until a click is heard. The DE diagnosis cable has the same connectors at both ends. Either connector may be connected to the adapter of the existing disk enclosure. Push the connector at the other end of the DE diagnosis cable into the DE-DIAG connector [PORT0] on adapter 0 (ADP0) of the additional disk enclosure until a click is heard. Similarly, connect the DE-DIAG connector [PORT1] on adapter 1 (ADP0) of the existing disk enclosure to the DE-DIAG connector [PORT0] on adapter 1 (ADP1) of the additional disk enclosure.

(4) Setting of switches

a) Setting of AL-PA switch on array controller

Set AL-PA by using the AL-PA switch on each controller. The factory-set AL-PA switch is as follows:
CONT0: 00, CONT1: 01
Set AL-PA so that it may not be the same as that of another FibreChannel device in the same host FC loop.

The corresponding table between the AL-PA switch and AL-PA is shown on the next page.

b) Setting of AL-PA switch on disk enclosure

Set the AL-PA by using the AL-PA switch on each adapter. Set the AL-PA so that it may not be the same as that of another disk enclosure on the same FC loop.

Set the AL-PA switches of both the adapters installed in the first disk enclosure connected to the array controller via FC cable (HSSDC) to "0". If additional disk enclosures are added, set the AL-PA switches of the adapters installed in each additional disk enclosure to "1", "2", ..., "5", or "6" in the connection order.

When the AL-PA switches of the left and right adapters are set differently, the FAULT LEDs on the adapters flash and the disk enclosure is not started. If different values are set for the AL-PA switches, turn off the power of the system including the disk enclosure, reset the AL-PA values properly, and turn on the power again.

c) Setting of DE-DIAG ID switch on disk enclosure

Set "0" for all the DE-DIAG IDs of the adapters installed in the disk enclosure that is connected with the standard controller in the array controller via the FC cable (HSSDC).
If an additional control card (NF2300-SP02E) is installed in the array controller, set "1" for all the DE-DIAG IDs of the adapters installed in the disk enclosure.
enclosure that is connected with the additional control card via the FC cable (HSSDC).

The DE-DIAG ID switch is factory-set to "0".

The outline of disk enclosure cable connections and the settings of AL-PA/DE-DIAG switches are shown in pages 45 and 46.

### Correspondence between AL-PA switch and AL-PA

<table>
<thead>
<tr>
<th>AL_PA switch (hex)</th>
<th>AL_PA switch (hex)</th>
<th>AL_PA switch (hex)</th>
<th>AL_PA switch (hex)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EF 00</td>
<td>E8 01</td>
<td>E4 02</td>
<td>E2 03</td>
</tr>
<tr>
<td>E1 04</td>
<td>E0 05</td>
<td>DC 06</td>
<td>DA 07</td>
</tr>
<tr>
<td>D9 08</td>
<td>D6 09</td>
<td>D5 0A</td>
<td>D4 0B</td>
</tr>
<tr>
<td>D3 0C</td>
<td>D2 0D</td>
<td>D1 0E</td>
<td>CE 0F</td>
</tr>
<tr>
<td>CD 10</td>
<td>CC 11</td>
<td>CB 12</td>
<td>CA 13</td>
</tr>
<tr>
<td>C9 14</td>
<td>C7 15</td>
<td>C6 16</td>
<td>C5 17</td>
</tr>
<tr>
<td>C3 18</td>
<td>BC 19</td>
<td>BA 1A</td>
<td>B9 1B</td>
</tr>
<tr>
<td>B6 1C</td>
<td>B5 1D</td>
<td>B4 1E</td>
<td>B3 1F</td>
</tr>
<tr>
<td>B2 20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Outline of cable connections on disk enclosures and settings of AL-PA/DE-DIAG switches

Sample configuration 1: NF2300-SR4xxE

AL-PA = 6
DE DIAG ID = 0

AL-PA = 5
DE DIAG ID = 0

AL-PA = 4
DE DIAG ID = 0

AL-PA = 3
DE DIAG ID = 0

AL-PA = 2
DE DIAG ID = 0

AL-PA = 1
DE DIAG ID = 0

AL-PA = 0
DE DIAG ID = 0
Sample configuration 2: NF2300-SR4xxE + NF2300-SP02E
5.3 Connection of Disk Array Unit as Additional Unit

This section describes the procedure of installing the disk array unit itself additionally.

- The following describes a sample connection when a single disk array unit is installed additionally in a system containing another disk array unit.
- For the actual expansion job and system configuration, contact your service engineer of the maintenance service agent with expert knowledge on the disk array unit.

To make any of the sample connections, you need to connect two host bus adapters with the host system and two FC-AL HUBs. Six LC-LC cables (or six SC-SC cables and four FC conversion cables) are necessary for connecting the FC-AL HUB and host bus adapters.

a) If the host bus adapter connectors and FC-AL HUB connectors are of "LC" type
b) If the host bus adapter connectors and FC-AL HUB connectors are of "SC" type

Connect the disk array unit with the host unit by using an FC cable in the following procedure.

(1) Power check

Make sure that the power switch of the disk array unit and that of the host unit are set to OFF and the plugs of the power cords are removed from AC outlets.
(2) Connection of disk array unit with host unit

a) If the host bus adapter connectors and FC-AL HUB connectors are of "LC" type

Use the separately priced FC cable (NF9320-SJ0xE). Push the connector at either end of the cable into the FC connector (HFx) for the host bus adapter of either controller (CONT0 or CONT1) until a click is heard. The FC cable has the same connectors at both ends. Either connector may be connected to the controller.

Connect the connector at the other end of the FC cable to either FC-AL HUB. Be sure to push the connector until a click is heard.

Pushing any connector excessively may injure the tip to decrease the optical intensity, which will then cause malfunction to occur.

Similarly, connect the controller on the other array controller board to the FC-AL HUB.

Connect the connector at one end of the FC cable to the connector for connecting the host bus adapter installed in the host system, and the connector at the other end to the above FC-AL HUB. Be sure to push the connectors until a click is heard. The FC cable has the same connectors at both ends. Either connector may be connected to the FC-AL HUB.

Subsequently, connect the FC connector (HFx) for the other host bus adapter, which is at the controller on each array controller board, to the other FC-AL HUB via the FC cable. Also connect the host bus adapter in the host system to the FC-AL HUB via the FC cable.
b) If the host bus adapter connectors and FC-AL HUB connectors are of "SC" type

Use the separately priced FC conversion cable (NF9310-SJ10E). The cable has different-size connectors at the ends. Push the smaller connector into the FC connector (HFx) for the host bus adapter of either controller (CONT0 or CONT1) until a click is heard.

Connect the connector at the other end of the FC conversion cable to either FC-AL HUB via the relay connector provided with the FC conversion cable and the SC-SC cable. Be sure to push the connector until a click is heard. The SC-SC cable has the same connectors at both ends. Either connector may be connected to the relay connector.

![Warning]

Pushing any connector excessively may injure the tip to decrease the optical intensity, which will then cause malfunction to occur.

Similarly, connect the controller on the other array controller board to the FC-AL HUB.

Connect the connector at one end of the SC-SC cable to the connector for connecting the host bus adapter installed in the host system, and the connector at the other end to the above FC-AL HUB. Be sure to push the connectors until a click is heard.

Subsequently, connect the FC connector (HFx) for the host bus adapter, which is at the controller on each array controller board, to the other FC-AL HUB via the FC conversion cable and SC-SC cable. Also connect the host bus adapter in the host system to the FC-AL HUB via the SC-SC cable.

(3) Connection of disk array unit with disk enclosure

Connect a disk enclosure to each of the disk array units. See "(3) Connection between array controllers and disk enclosures" in Section 5.2 for the procedure.

(4) Settings of switches

Set an AL-PA by using the AL-PA switch on each controller and disk enclosure. Also set a DE-DIAG ID by using the DE-DIAG switch on each disk enclosure. See "(4) Setting of switches" in Section 5.2 for the procedures.
5.4 Connection of Ethernet Cable

To enable the configuration change and fault monitoring for the disk array unit by the NEC Storage Manager through Ethernet, the Ethernet cable must be connected.

(1) Installation of Ethernet cable

Connect the separately priced Ethernet cable to the LAN modular jack on the LAN card.
Connect the host system on which the management software NEC Storage Manager is installed to Ethernet.

Only connecting the cable to the LAN card cannot make it possible to use the NEC Storage Manager through Ethernet. Contact your service engineer of the maintenance service agent with expert knowledge.
## 5.5 Connection of Power Cords

<table>
<thead>
<tr>
<th><strong>WARNING</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>▶ Do not concentrate power cords only to some AC outlets. If so, fire may occur.</td>
</tr>
<tr>
<td>▶ Do not connect the plug of a power cord to an AC outlet with a wet hand. If so, you may be electrically shocked.</td>
</tr>
<tr>
<td>▶ Do not put a heavy substance on a power cord. If so, the coating of the power cord may be broken, fire may occur, and/or you may be electrically shocked.</td>
</tr>
</tbody>
</table>

Be sure to use the power cords provided with the disk array unit or NEC-specified power cords.

The disk array unit has the redundant power configuration to prevent the entire unit from shutting down due to a single failure. Therefore, connect two power cords to both the array controller and the disk enclosure when operating the disk array unit.

Connect the power cords in the following procedure.

1. **Check of power supply**

   Check that the power switch on the disk array unit and those on the host system, host bus adapter, and FC-AL switch are all set to OFF.

   a) **Power supply for array controller**

   ![Power switch OFF](image)
   ![Power switch ON](image)

   b) **Power supply for disk enclosure**

   ![Power switch OFF](image)
   ![Power switch ON](image)
(2) Connection of power cords

Insert the receptacle of the power cord into the power plug on the power supply.

Make sure that the removal protection mechanism for the power supply of the array controller is placed outward as shown in the figure below. Then inset the power cord to the plug.

When connecting the power supply of the disk enclosure, push down the power cord stopper (for the power cord) toward the left, insert the power cord, and then secure the power cord by firmly fitting the power cord stopper into the receptacle of the power cord.
(3) Connection of power plug

Insert the plug of the power cord to an AC outlet. Because the plug has an earth pin, use an AC outlet with earth terminal for the connection as shown in the figure below.

While the disk array unit can accept the power of 100 - 240 VAC (50/60 Hz), the power cord coming with the disk array unit can only accept 100 – 120 VAC. Use 100 – 120 VAC (50/60 Hz) when the attached power cord is used. Using power of different voltage may cause electric shock, smoke, and/or fire to occur.
6. ADDITION OF OPTIONAL DEVICES

6.1 Addition of Disk Drive

CAUTION

- Keep the product in an area where high temperatures do not occur and the difference between the high and low temperatures is not large. Do not keep the product in a place with high humidity and/or much dust.
- Note that foreign substances such as water and metal may not be entered into the product during storage. Failure to follow it may cause device failure, electric shock, and/or fire to occur.
- Keep the product into the package during storage or shipment.

NF2300-SR4xxE disk array unit contains three disk drives in standard configuration.

NF2300-SR412E: 36-GB disk drives (10,000 rpm)
NF2300-SR413E: 73-GB disk drives (10,000 rpm)
NF2300-SR414E: 147-GB disk drives (10,000 rpm)
NF2300-SR422E: 36-GB disk drives (15,000 rpm)

The disk enclosure can be equipped with up to 15 disk drives.

<table>
<thead>
<tr>
<th>Product name</th>
<th>Part number</th>
<th>Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional disk drive</td>
<td>NF2300-SM412E</td>
<td>36GB / 10,000 rpm</td>
</tr>
<tr>
<td>Additional disk drive</td>
<td>NF2300-SM413E</td>
<td>73GB / 10,000 rpm</td>
</tr>
<tr>
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<td>NF2300-SM414E</td>
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<tr>
<td>Additional disk drive</td>
<td>NF2300-SM422E</td>
<td>36GB / 15,000 rpm</td>
</tr>
</tbody>
</table>

If an additional disk drive and standard disk drive are reassigned to the same logical disk, all the current data is initialized. Be sure to make backup copies of necessary data before performing the addition procedure.

To use additional disk drives for expansion, install them sequentially from left to right of the disk enclosure.

An additional disk drive can also be used as a disk drive for a spare disk. In this case, be sure to install the additional disk drive in slot 14 of the disk enclosure. If slot 14 already contains a disk drive for a spare disk, install the additional disk drive in slot 13.
When you change a failing disk to a spare disk, confirm the following to get the spare disk to function normally:

- The capacity of the spare disk is equal to or greater than that of the failing disk.
- The rotational speed of the spare disk is equal to or faster than that of the failing disk.

Therefore, if a large-capacity disk is defined as a spare disk, it can cover all the disks of a high-speed drive. However, if your disk array unit contains disks of different capacities or different rotational speeds, you should define a spare disk matching the capacity and rotational speed of each disk in order to clarify disk management.

Up to 2 spare disks can be installed for each disk enclosure. Up to 16 spare disks can be installed for the entire disk array unit.

<Installation procedure>

Disk drives may be installed in the disk enclosure with the powers of the disk array unit and host unit being ON.

For the replacement of two or more dummy trays and disk drives, replace them one by one. Do not remove two or more dummy trays at a time.

(1) Putting of location label

Before installing the disk drive, select the location label appropriate to the location where the disk enclosure is to be installed, and put it on the additional disk drive.
(2) Removal of dummy tray

Pull the ejector on the dummy tray toward you to release the lock. A click occurs when the lock is released.

If the lock is released, hold the handle and pull out the dummy tray.

Be sure to keep removed dummy trays in the designated place.
After removing an additional disk drive from the unit, be sure to install a dummy tray into the slot. If using the unit without a dummy tray being installed, cooling effect on the disk drives lowers and causes heat generation. Heat generation increases the failure rate, and at its worst it may cause data loss.
(3) Installation of disk drive

With the ejector of the disk drive opened, engage the guides on the top and bottom faces of the disk drive with the guide grooves on the disk enclosure and insert the disk drive to the end.

After the disk drive is inserted to the end securely, push down the ejector opened upward to click for locking.

⚠️ When inserting the disk drive into the disk enclosure, push it as far as it will go and then lock the ejector. Incorrect insertion may cause malfunction.

💡 The disk array unit cannot use the disk drive only if the disk drive is installed additionally. Provide the proper setting for the disk drive by using the "NEC Storage Manager" feature of the disk array unit or contact the service engineer of the maintenance service agent with the expert knowledge.
(4) Writing information on option label

To allow the options installed in the disk enclosure to be found by external view, the label indicating the options available for the installation is put on the disk enclosure.

If a disk drive is added, write down the last two digits of model number and a check mark at the corresponding field on the label to indicate the addition as shown in the figure below.

Note: The figure above indicates that a single NF2300-SM413E is installed at location '03' in NF2300-SR412E. If NF2300-SM412E is additionally installed in NF2300-SR412E, write down check marks at the locations in which the disk drives are installed, which appears in the area to the right of the model number field. If the model number of disk drive additionally installed does not appear in the model number field, enter the last two digits of model number in "NF2300-SM4  (E)" field. Write down a check mark at the location in which the disk drive is installed, which appears in the area to the right of the model number field. If disk drives are installed at locations '03' and '04,' write down check marks at the '03' and '04' fields.
6.2 Addition of Disk Enclosure

**CAUTION**

- Save the product in an area where high temperature do not occur and the difference between the high and low temperatures is not large. Do not save the product in a place with high humidity and/or much dust.
- Note that foreign substances such as water and metal may not be entered into the product during storage. Failure to follow it may cause device failure, electric shock, and/or fire to occur.
- Save the product into the package during storage or shipment.

The disk array unit can be normally equipped with up to 15 disk drives.

For larger capacity, adding one or more disk enclosures allows disk drives to be added. (Up to 105 disk drives may be installed with up to six additional disk enclosures.)

With the installation of additional control card NF2300-SP02E, up to 13 additional disk enclosures and up to 210 disk drives may be installed.

Product name: Additional disk enclosure Part number: NF2300-SE41E

Be sure to install disk drives into PD00 and PD01 of an additional disk enclosure.

- If the disk drives in both PD00 and PD13 are faulty or they have not been installed, the SERVICE LED on the additional disk enclosure and the FAULT LED on the ADP0 side light.
- If the disk drives in both PD01 and PD14 are faulty or they have not been installed, the SERVICE LED on the additional disk enclosure and the FAULT LED on the ADP1 side light.
<Addition procedure>

(1) Power check

Make sure that the power switch of the disk enclosure to be added is set to OFF and the plug of the power cords is removed from AC outlet.

The powers of the disk array and host units may be set to ON. However, it is recommended to advance the procedure with the powers set to OFF.

(2) Connection of an additional disk enclosure with the existing disk enclosure

Use the FC cable (HSSDC) provided with the additional disk enclosure or the FC cable (HSSDC) of the separately priced DE cable (NF9120-SJ04E). Push the connector at either end of the FC cable into the FC-OUT connector on adapter 0 (ADP0) of the existing disk enclosure until a click is heard. The FC cable has the same connectors at both ends. Either connector may be connected to the adapter of the existing disk enclosure.

Push the connector at the other end of the FC cable into the FC-IN connector on adapter 0 (ADP0) of the additional disk enclosure until a click is heard.

Similarly, connect the FC-OUT connector on adapter 1 (ADP1) of the existing disk enclosure to the FC-IN connector on adapter 1 (ADP1) of the additional disk enclosure.

Subsequently, use the DE diagnosis cable provided with the additional disk enclosure or the DE diagnosis cable of the separately priced DE cable (NF9120-SJ04E). Push the connector at either end of the DE diagnosis cable into the DE-DIAG connector [PORT1] on adapter 0 (ADP0) of the existing disk enclosure until a click is heard. The DE diagnosis cable has the same connectors at both ends. Either connector may be connected to the adapter of the existing disk enclosure.

Push the connector at the other end of the DE diagnosis cable into the DE-DIAG connector [PORT0] on adapter 0 (ADP0) of the additional disk enclosure until a click is heard.

Similarly, connect the DE-DIAG connector [PORT1] on adapter 1 (ADP1) of the existing disk enclosure to the DE-DIAG connector [PORT0] on adapter 1 (ADP1) of the additional disk enclosure.
(3) Connection between array controllers and disk enclosures

Use the FC cable (HSSDC) provided with the additional disk enclosure or the FC cable (HSSDC) of the separately priced DE cable (NF9120-SJ04E). Push the connector at either end of the FC cable into the FC connector (DEF2) for the disk enclosure, which is on the additional control card in the controller 0 (CONT0) of the disk array unit until a click is heard. The FC cable has the same connectors at both ends. Either connector may be connected to the additional control card in the controller.

Push the connector at the other end of the FC cable into the FC-IN connector on adapter 0 (ADP0) of the additional disk enclosure until a click is heard.

Similarly, connect the FC connector (DEF3) for the disk enclosure, which is on the additional control card in the other controller (CONT1) of the disk array unit, to the FC-IN connector on adapter 1 (ADP1) of the additional disk enclosure.

Do not connect any cable/connector to the DEF3 connector of additional control card on controller 0 (CONT0) or DEF2 connector of the additional control card on controller 1 (CONT1).

Subsequently, use the DE diagnosis cable provided with the additional disk enclosure or the DE diagnosis cable of the separately priced DE cable (NF9120-SJ04E). Push the connector at either end of the DE diagnosis cable into the DE-DIAG connector [PORT1] on adapter 0 (ADP0) of the existing disk enclosure until a click is heard. The DE diagnosis cable has the same connectors at both ends. Either connector may be connected to the adapter of the existing disk enclosure.

Push the connector at the other end of the DE diagnosis cable into the DE-DIAG connector [PORT0] on adapter 0 (ADP0) of the additional disk enclosure until a click is heard.

Similarly, connect the DE-DIAG connector [PORT1] on adapter 1 (ADP1) of the existing disk enclosure to the DE-DIAG connector [PORT0] on adapter 1 (ADP1) of the additional disk enclosure.
(4) Settings of switches

a) Setting of AL-PA switch on disk enclosure

Set an AL-PA by using the AL-PA switch on each adapter of the additional disk enclosure. The AL-PA switches on both adapters are factory-set to "1". Set an AL-PA so that it will be different from the AL-PAs of other disk enclosures in the same FC loop.

Set "0" for the AL-PA switches on both adapters in the first disk enclosure that is connected to the array controller via the FC cable (HSSDC). If you have installed additional disk enclosures, set the AL-PA switches on both adapters of each additional enclosure to "1", "2", ... "5", and then "6" in the connection order.

If you set different values for the AL-PA switches on the right and left adapters of an additional disk enclosure, the FAULT LED on each adapter flashes and the disk enclosure fails to start. If you have set different values, turn off the system including the additional disk enclosure, set the same value for the AL-PA switches, and then turn on the power.

b) Setting of DE-DIAG ID switch on disk enclosure

Set a DE-DIAG ID by using the DE-DIAG ID switch on each adapter of the additional disk enclosure.

Set "0" for all the DE-DIAG IDs of the adapters installed in the disk enclosure that is connected with the standard controller in the array controller via the FC cable (HSSDC).
If an additional control card (NF2300-SP02E) is installed in the array controller, set "1" for all the DE-DIAG IDs of the adapters installed in the disk enclosure that is connected with the additional control card via the FC cable (HSSDC).

The DE-DIAG ID switch is factory-set to "0".

The set value of each switch on a disk enclosure is shown in pages 45 and 46.
(5) Check of power supply

Confirm that the power switch of the additional disk enclosure is OFF.

(6) Connection of power cords

Insert the receptacle of the power cord provided with the additional disk enclosure, into the power plug on the power supply of the disk enclosure. You can use the NEC-specified power cord alternatively.

When connecting the power supply of the disk enclosure, push down the power cord stopper (for the power cord) toward the left, insert the power cord, and then secure the power cord by firmly fitting the power cord stopper into the receptacle of the power cord.
(7) Connection of power plug

Insert the plug of the power cord, provided with the additional disk enclosure or NEC-specified power cord, into an AC outlet. You can use the NEC-specified power cord alternatively. Since the plug has an earth pin, it must be connected to an AC outlet with an earth terminal as shown below.

![Power plug](image)

*While the disk array unit can accept the power of 100 - 240 VAC (50/60 Hz), the power cord coming with the disk array unit can only accept 100 – 120 VAC. Use 100 – 120 VAC (50/60 Hz) when the attached power cord is used. Using power of different voltage may cause electric shock, smoke, and/or fire to occur.*

*The disk array unit cannot use the disk enclosure only if the disk enclosure is installed additionally. Provide the proper setting for the disk enclosure by using the "NEC Storage Manager" feature of the disk array unit or contact the service engineer of the maintenance service agent with the expert knowledge.*
6.3 Addition of Additional Control Card

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<td>- Do not make terminals on connectors short circuited. Do not pour water or liquid on terminals. Failure to follow it may cause device fault or electric shock to occur.</td>
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<tr>
<td>- Note that your fingers may not be caught or hit on some object when your hands are entered into the disk array unit.</td>
</tr>
<tr>
<td>- Do not disassemble or modify the additional control card. Failure to follow it may cause the unit to be defected.</td>
</tr>
</tbody>
</table>

The disk array unit can be normally connected with up to six additional disk enclosures. For larger capacity, installing an additional control card allows disk enclosures to be added further. (Up to 13 additional disk enclosures and up to 210 disk drives may be installed per disk array unit.)

Product name: Additional control card  Part number: NF2300-SP02E

To use the additional control card, at least a single cache memory must be installed.

NF2300-SP02E does not contain cache memory. Purchase the necessary additional cache memory (NF2300-SC01E or NF2300-SC02E) depending on the environment of the customer using the disk array unit.

NF2300-SP02E is composed of two control cards. Install a single control card on each of two controllers.
<Addition procedure>

(1) Power check

Make sure that the power switch of the disk array unit and that of the host unit are set to OFF and the plugs of the power cords are removed from AC outlets.

(2) Settings of topology and data transfer rate

A topology and data transfer rate must be set correctly in accordance with the host bus adapter to be connected or the connection mode of the FC-AL switch.

You can change the topology and data transfer rate of the FC connector for the host bus adapter by operating the DIP switch (SW1) on the additional control card.

For details, see Section 9.7 "How to Change Topology and Data Transfer Rate".

Factory-set topology and data transfer rate:
Topology: FC-AL
Data transfer rate: 2Gbps

(3) Removal of cables

Remove all the cables connected to the controller. Write down the connections between the cables to be removed and the mating connectors.

(4) Removal of controller

Loosen a screw securing the ejector of the target controller, open the ejector pulling it by 90°, and then pull out the controller. (When the controller is pulled out, the protection shutter in the unit closes and it is locked.)
(5) Removal of blank panel

Remove the two screws securing the blank panel of the controller, and then remove the blank panel.

Be sure to keep removed blank panel in the safe place.

After removing an additional control card from the unit, be sure to install a blank panel into the slot. If using the unit without a blank panel being installed, cooling effect on the array controller lowers and causes heat generation. Heat generation increases the failure rate, and at its worst it may cause data loss.

(6) Installation of additional control card

Install an additional control card in the controller. With the screw holes as reference, place the additional control card in the controller.
When you have placed the additional control card correctly, push both sides (indicated by the bold arrows in the figure below) of the connector on the card with your thumbs until fitting in the connector firmly. After confirming that the connector is fit in, firmly secure the additional control card with five screws - two screws you removed in "(5) Removal of blank panel" and three screws provided with the additional control card. Fasten the screws of the front panel while pushing them from top so that the lined faces will be aligned.

![Diagram of control card placement](image)

When installing the additional control card to the controller, push it as far as it will go and then secure it with the screws. Incorrect installation may cause malfunction.

Install the separately purchased additional cache memory into the additional control card.

Install the required number of additional cache memories into connectors CHE4 to CHE7 according to the following procedure:

- Open the socket levers, and install the cache memory, fitting the two recesses of the cache memory to the protrusions of the socket.

- Confirm that they are fit correctly. Until the cache memory is secured by the levers, push the cache memory along the connector rail as far as it will go. Be careful not to apply excess force to the cache memory in doing so.

- The levers fit into the notches of the cache memory and secure it.

![Diagram of cache memory installation](image)

When inserting the cache memory into controller, push it as far as it will go and then secure it with the levers. Incorrect insertion may cause malfunction.
(7) Set of AL-PA

Set the AL-PA of the additional control card.

The AL-PA is set to "02" or "03" at the shipment. Set the AL-PA so that it may not be the same as that of another FibreChannel device in the same host FC loop.

(8) Installation of controller

Open the ejectors of the controller, insert the controller into the slot to the end securely. (The lock of the protection shutter closed when the controller was pulled out is automatically released by inserting the controller.)

Insert the controller as far as it will go, and close the ejector.
Strongly push the ejector (the part indicated by the arrow in the figure) until the controller is inserted firmly, and secure the ejector with the screw.

When inserting the controller into the array controller, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause malfunction.
(9) Installation of cables

Connect the cables removed from the controller in step (2) Removal of cables to the mating connectors as before.

(10) Installing in other controller

Install the additional control card in the other controller in the procedure described in steps (2) to (9) above.

(11) Writing information on option label

On the disk array unit, the label indicating the options available for installation is put to allow the installed options to be known by external view.

If the additional control card and additional host FC port are added, write a round mark at the corresponding field on the label to indicate the addition as shown in the figure below.

![Label Diagram]

Write a round mark at this field.

Note: The figure above shows the case in which NF2300-SP02E is added. If a cache memory is installed on NF2300-SP02E, write round marks by the number of installation in the corresponding field. When NF2300-SP03E is added, write a round mark at the field located to the right of "NF2300-SP03(E)".
6.4 Addition of Additional Host FC Port

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</tr>
<tr>
<td>▶ Note that your fingers may not be caught or hit on some object when your hands are entered into the disk array unit.</td>
</tr>
<tr>
<td>▶ Do not disassemble or modify the additional host FC port. Failure to follow it may cause the unit to be defected.</td>
</tr>
</tbody>
</table>

The disk array unit enables the number of host units connectable to the disk array unit to be increased by adding the additional host FC port.

Product name: Additional host FC port Part number: NF2300-SP03E

NF2300-SP03E is composed of two host FC port cards. Install a single host FC port card on each of two controllers.

When inserting the additional FC card into the array controller, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause malfunction.

<Addition procedure>

The procedure of addition of the additional host FC port is the same as that of the additional control card. See Section 6.3 "Addition of Additional Control Card". However, no cache memory is installed in the additional host FC port.
6.5 Addition of Cache Memory

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<tr>
<td>□ Note that your fingers may not be caught or hit on some object when your hands are entered into the disk array unit.</td>
</tr>
<tr>
<td>□ Do not disassemble or modify the cache memory. Failure to follow it may cause the unit to be defected.</td>
</tr>
</tbody>
</table>

The disk array unit is normally equipped with a single 256MB cache memory on each controller.

To use an additional control card or to use larger capacity of cache memory for improving the feature of the disk array unit, up to four cache memories can be added for each controller and additional control card.

Product name: Additional 512MB cache memory Part number: NF2300-SC01E
Product name: Additional 1GB cache memory Part number: NF2300-SC02E

Cache memories with different capacities may coexist in a specific controller. However, The cache memory installed on a slot, one of CHE0 to CHE3, of CONT0 must have the same capacity as that on the corresponding slot of CONT1.

The additional control cards installed in CONT0 must have cache memories with the same capacities as those installed in CONT1 at the corresponding slots (CHE4 to CHE7). However, their locations and capacities may not be the same as those of the cache memories in the controller.

Install cache memories on the slots sequentially in the ascending order of slot numbers if they are installed.

NF2300-SC01E and NF2300-SC02E are composed of two 256MB cache memory cards and two 512MB cache memory cards, respectively. Install a single cache memory card for each of two controllers or two additional controllers.
<Addition procedure>

(1) Power check

Make sure that the power switches of the disk array unit and host unit are set to OFF and the power plugs are removed from AC outlets.

When you add cache memory, confirm that the power switch of the disk array unit is off and the [BAT LED] of each controller is off. Do not add cache memory if the [BAT LED] of a controller is on. While the [BAT LED] is on, the cache memory in the array controller still contains data that is to be written into the disk drive. If you add new cache memory in this status, the data remaining in the cache memory of the array controller is lost. If [BAT LED] is on, perform the procedure explained in Section 7.2 "(2) Notes on turning off AC power" not to leave any unwritten data in the cache memory of the array controller. After that, turn off the power switch of the disk array unit and then add new cache memory.

(2) Removal of cables

Remove all the cables connected to the controllers. Write down the connections between the cables to be removed and the mating connectors.

(3) Removal of controller

Loosen a screw securing the ejector of the target controller, open the ejector pulling it by 90°, and then pull out the controller. (When the controller is pulled out, the protection shutter in the unit closes and it is locked.)

Be careful that it is hot.
(4) Installation of cache memory

Install additional cache memory in the controller or additional control card. The controller and additional control card have the same socket. Perform the following procedure for installing cache memory in the controller or additional control card:

- Open the socket levers, and install the cache memory, fitting the two recesses of the cache memory to the protrusions of the socket.
- Confirm that they are fit correctly. Until the cache memory is secured by the levers, push the cache memory along the connector rail as far as it will go. Be careful not to apply excess force to the cache memory in doing so.
- The levers fit into the notches of the cache memory and secure it.

![Image of cache memory installation]

When installing the additional cache memory to the controller or to the additional control card, push it as far as it will go and then secure it with the levers. Incorrect insertion may cause malfunction.
(5) Installation of controller

Open the ejectors of the controller, insert the controller into the slot to the end securely. (The lock of the protection shutter closed when the controller was pulled out is automatically released by inserting the controller.)

Insert the controller as far as it will go, and close the ejector. Strongly push the ejector (the part indicated by the arrow in the figure) until the controller is inserted firmly, and secure the ejector with the screw.

When inserting the controller into the array controller, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause malfunction.
(6) Installation of cables

Connect the cables removed from the controller in step (2) Removal of cables to the mating connectors as before.

(7) Installing in other controller

Install the cache memory in the other controller in the procedure described in steps (2) to (6) above.

(8) Writing information on option label

On the disk array unit, the label indicating the options available for installation is put to allow the installed options to be known by external view.

If the additional cache memory is added, write a round mark at the corresponding field on the label to indicate the addition as shown in the figure below.

Note: The figure above indicates the addition of a single NF2300-SC01E. If a single NF2300-SC02E is added, write a round mark at the field to the right of "NF2300-SC02(E)". If two or more NF2300-SC01E/NF2300-SC02E are added, write round marks by the number of additions.
7. HANDLING OF DISK ARRAY UNIT

This chapter describes how to handle the disk array unit.

7.1 Notes on Handling of Disk Array Unit

Note the following in use of the disk array unit. Invalid handling of the disk array unit may cause the unit to be defected and/or some data to be broken.

- If the ACCESS LED (green) flashes, the disk access operation is indicated on the host system, or the initialization is being operated, do not turn on/off the powers of the disk array unit or host system. Do not reset the host systems.
- If the ACCESS LED (green) lights or flashes and the disk access operation is indicated on the host system, do not give vibrations and shocks to the disk array unit.
- Because the disk array unit is a precision device, it shall not be subject to hard vibration or shock.

The features of the disk array unit are effective only for the hardware failure (e.g., the hard disk is physically damaged or inoperative). The software failure (e.g., the data is lost or rewritten due to program excursion) is not covered by these features. When the software failure would occur, the system could seriously be damaged. To minimize the damage, be sure to back up the data periodically.

It is recommended that important files are backed up to magnetic tapes. This enables the damage to be minimized in case of emergency including sudden vibration or shock and power shutdown caused by power interruption.
7.2 Power On/Off of Disk Array Unit

This section describes how to turn on or off the power of the disk array unit. Turning on or off the power carelessly may cause some data to be broken, some software to operate incorrectly, and/or the unit to be defected.

(1) Turning on AC power

a) Before turning on the AC power, check for loose disk drives by pushing each disk drive.

b) Turn on all the disk enclosures connected with the array controller, and then turn on the array controller. Alternatively, turn on the array controller and all the disk enclosures connected with the array controller at the same time. The disk array unit has the redundant power configuration to prevent the entire unit from shutting down due to a single failure. Therefore, when turning on the disk array unit, turn on all the power switches (of the array controller and disk enclosures) at the rear of the unit.

When turning on the power switches, confirm that the POWER GOOD LED (green) of the power supply and the POWER LED (green) on the front panel of the unit go on. Power supply starts, and the POWER LED (green) is on while the power switches are on.

The disk array unit performs the self-test and initialization immediately after the power is turned on. When the self-test and initialization terminate and the disk array unit becomes ready, the READY LED on the array controller stops flashing and enters the on state.

Confirm that the READY LED is on, and then turn on the host system.

The disk array unit takes four minutes (at maximum) to start.

[Power-on procedure]

Turn on the power switches in the following order (1) to (3):

(1) Power switches of disk enclosures

(2) Power switches of array controller
   (May be turned on at the same time the power switches of disk enclosures are turned on.)

(3) Host system
(2) Notes on turning off AC power

The disk array unit periodically writes data from the cache memory onto a disk drive. If you turn off the AC power before completion of write to the disk drive, the remaining data in the cache memory is backed up by the battery backup units.

However, the backup time is limited (4 days if the cache memory has the allowable maximum capacity and the two battery backup units are fully charged). To securely protect data, write all the data remaining in cache memory in the disk array unit onto the disk drive according to the following procedure. Then turn off the AC power according to the procedure explained in "(3) Turning off AC power".

1. Turn off the host system and the host bus adapter or the FC-AL switch. Alternatively, offline all the buses connected to the host system that is connected with the disk array unit.

2. If NEC Storage DynamicDataReplication is used, execute the Unpair command.

3. Turn on the shut down switch (toggle switch with SHUT DOWN indicated) of the LAN card in the array controller. (*1)

4. Confirm that [SDN LED] of the LAN card in the array controller is on, and then turn off the AC power according to the procedure explained in "(3) Turning off AC power".

[SDN LED] flashes while remaining data is being written from the cache memory onto the disk drive. Do not turn off the AC power while it is flashing. (*2)

Relationship between [SDN LED] states and operations of the disk array unit:
- Normal state: Off
- During cache data write onto disk drive: Flashing
- Completion of cache data write onto disk drive: On

Writing cache data onto a disk drive usually takes about 10 minutes and 20 minutes at maximum.

If cache data is not written onto a disk drive normally, the LEDs of the LAN card enters the following states. In this case, contact your maintenance service agent.
- RDY LED: On
- FLT LED: Flashing
- SDN LED: Off

5. Turn off the shut down switch (toggle switch with SHUT DOWN indicated) of the LAN card in the array controller. (*3)
*1  – The shut down switch has a locking mechanism. To turn on/off the switch, hold and raise the lever.
  – While the shut down switch is on, the disk array unit does not accept any I/O operation by the host system. (The LINKUP LEDs of the controller's HL0 and HL1 go off.)

*2  – If you turn off the AC power of disk array unit during write operation (with SDN LED flashing) by mistake, the backup mode is enabled. (In this case, the controller's [BAT LED] goes on.)
  – If you turn off the AC power of disk array unit during write operation (with SDN LED flashing) by mistake, turn on the AC power of the entire disk array unit again. When the disk array unit has started (when the READY LED of the controller on the array controller stops flashing and enters the on state), turn off the shut down switch and then turn it on to complete the write operation.
  – Even if you turn off the AC power after [SDN LED] goes on, [BAT LED] goes on in the following case:
    NEC Storage DynamicDataReplication is used, but you attempt to write the remaining cache data before executing the Unpair command.
    In the above case, turn on the AC power of the entire disk array unit again. When the disk array unit has started (when the READY LED of the controller on the array controller stops flashing and enters the on state), turn off the shut down switch. Then, execute the Unpair command for paired disks under NEC Storage DynamicDataReplication, and turn on the shut down switch to complete the write operation.

*3  – Even if you forget to turn off the shut down switch, the disk array unit starts normally when being turned on next time, and accepts I/O operation by the host system. (Normal operation)
  – Turning off the shut down switch does not influence general operation of the disk array unit.
  – When turning off the disk array unit again, turn off the shut down switch and then turn it on. The system starts writing data remaining in cache memory onto the disk drive.
(3) Turning off AC power

a) Turn off the host system or FC-AL switch, and then perform the procedure explained in "(2) Notes on AC power-off" before turning off the power.

b) After finishing the operation in a, turn off the array controller and then all the disk enclosures including additional disk enclosures. Alternatively, turn off the array controller and all the disk enclosures including additional disk enclosures connected with the array controller at the same time.

The disk array unit has the redundant power configuration to prevent the entire unit from shutting down due to a single failure. Therefore, when turning off the disk array unit, turn off all the power switches (of the array controller and disk enclosures) at the rear of the unit.

Be careful that data may be lost if you turn off the disk enclosures before the array controller.

[Power-off procedure]
Turn off the power switches in the following order (1) to (5):

1. Host system
2. Shut down switches
3. Power switches of array controller
4. Power switches of disk enclosures
   (May be turned off at the same time the power switches of array controller are turned off.)
7.3 LD (Logical Disk) Setting Procedure

When the disk drives are added to the disk array unit, the RAID level and LD (logical disk) must be set appropriately.

Set the RAID level and LD (logical disk) by using the "NEC Storage Manager", or contact the service engineer with expert knowledge in your service representative for setting of the RAID level and LD.

If the disk array unit is connected with NF9520-SH01E, changing the LD (logical disk) configuration may cause the OS to fail to recognize the logical disks. Be sure to restart the host system after changing the LD configuration.

7.4 Spare Disk Setting Procedure

Spare disk can be set only in RAID level 1, 5, or 10.
Set the spare disk by using the "NEC Storage Manager", or contact the service engineer with expert knowledge in your service representative for setting of the spare disk.

For spare disk, make sure to assign the disk drive in slot 14. If slot 14 already contains a disk drive for a spare disk, install the additional disk drive in slot 13.

When you change a failing disk to a spare disk, confirm the following to get the spare disk to function normally:
- The capacity of the spare disk is equal to or greater than that of the failing disk.
- The rotational speed of the spare disk is equal to or faster than that of the failing disk.
Therefore, if a large-capacity disk is defined as a spare disk, it can cover all the disks of a high-speed drive. However, if your disk array unit contains disks of different capacities or different rotational speeds, you should define a spare disk matching the capacity and rotational speed of each disk in order to clarify disk management.

Up to 2 spare disks can be installed for each disk enclosure. Up to 16 spare disks can be installed for the entire disk array unit.
8. **ACTION TAKEN AT OCCURRENCE OF FAULT OR ERROR**

The user may remove a defected component and a new component for the replacement depending on the description in this chapter. However, if so, NEC does not assume the responsibility for any damage of the disk array unit and components and any influence resulting from the operation of the disk array unit. NEC recommends that you ask your maintenance engineer of the maintenance service agent with expert knowledge on details of the disk array unit to remove any defected component and install a new component.

For the installation of more than one disk drives or the change of disk drive installation positions, perform the job for the disk drives one by one. The change of disk drive installation positions with LDNs assigned may cause some data to be lost.

**WARNING**

If a trouble including smoking and bad smell occurs or a fault such as halting of two or more cooling fans is found, turn off the power and disconnect the power plugs from the AC outlets. Then ask your sales agent or maintenance engineer to inspect and repair the disk array unit immediately. Using the disk array unit as it is may cause electric shock or fire to occur. The user must never repair the disk array unit because it is dangerous.

**CAUTION**

- Note that your fingers may not be caught or hit on some object when your hands are entered into the disk array unit.
- If a fault occurs in the disk array unit, the SERVICE LED on the array controller, the FAULT LED on the defected component, or the POWER FAIL LED lights. If a fault occurs, contact your maintenance engineer of the maintenance service agent with expert knowledge or prepare the proper maintenance component and replace the defected component immediately.
- Perform the replacement job as quick as possible. Do not operate the unit for a long time in the state that one or more existing disk drive, power supply, controller or fan is removed. Failure to follow it may cause a fault to occur.

If you find the occurrence of an abnormal state such as smoking or bad smell, turn off the power and pull out the power plugs from AC outlets. Ask your maintenance service agent for inspection and repair immediately.
### 8.1 Countermeasures Taken When Occurrence of a Fault is Suspected

If you suspect the occurrence of a fault during the use of the disk array unit, check the status based on the tables below. If a symptom which is not described in the tables at all or the specified countermeasures cannot recover the proper operation, contact the maintenance service agent.

<table>
<thead>
<tr>
<th>The Power LED (green) does not light if the power switch is turned on.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cause</td>
<td>Countermeasures</td>
</tr>
<tr>
<td>The power cord is not connected.</td>
<td>Check the connection of the power cord after setting the power switch to OFF.</td>
</tr>
<tr>
<td>The AC power (100 - 240 VAC) is not supplied.</td>
<td>Check whether 100 - 240 VAC ±10% (50/60 Hz) is supplied.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The LINKUP LED (green) of the controller on the array controller connected with the FC cable, LINKUP LED (green) of the adapter in the disk enclosure, or the LOOP STATUS LED (green) of the host bus adapter connected with the FC cable does not go on.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cause</td>
<td>Countermeasures</td>
</tr>
<tr>
<td>The FC cable is not connected correctly.</td>
<td>Insert the connector of the FC cable until a click is heard. See Chapter 5 &quot;CONNECTION OF DISK ARRAY UNIT&quot;.</td>
</tr>
<tr>
<td>The length of the FC cable exceeds the rating value.</td>
<td>See Chapter 5 &quot;CONNECTION OF DISK ARRAY UNIT&quot;.</td>
</tr>
<tr>
<td>The setting of the host bus adapter or that of the FC-AL switch is not correct.</td>
<td>Provide the proper setting referring to the user's manuals of the host bus adapter, host unit, and those of added peripherals.</td>
</tr>
<tr>
<td>The used host bus adapter is unavailable for the disk array unit.</td>
<td>Use the host bus adapter available for the disk array unit. Contact your sales agent if unknown.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The FAULT LEDs (orange) on both adapters of the disk enclosure blink.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cause</td>
<td>Countermeasures</td>
</tr>
<tr>
<td>The AL-PA switch on the adapter is set incorrectly.</td>
<td>After setting the power switch to OFF, set the AL-PA switches on the left and right adapters to be the same. See Section 3.10 &quot;Adapter&quot;.</td>
</tr>
</tbody>
</table>
The host system cannot recognize the disk array unit.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Countermeasures</th>
</tr>
</thead>
<tbody>
<tr>
<td>The FC cable is not connected correctly.</td>
<td>Connect the FC cable correctly according to 5 &quot;CONNECTION OF DISK ARRAY UNIT&quot;.</td>
</tr>
<tr>
<td>After turning on the power switch of the host system, host bus adapter, or FC-AL switch, the power of the disk array unit is turned on.</td>
<td>See Section 7.2 &quot;Power On/Off of Disk Array Unit&quot;.</td>
</tr>
<tr>
<td>Each AL-PA must be unique. The same AL-PA is specified in duplicate.</td>
<td>Set an AL-PA different from the AL-PAs of other FC devices according to 5 &quot;CONNECTION OF DISK ARRAY UNIT&quot;.</td>
</tr>
<tr>
<td>The setting of host bus adapter or FC-AL switch is incorrect.</td>
<td>Set it correctly according to the user's manuals of the host bus adapter, the host system, FC-AL switch, and additionally installed peripherals.</td>
</tr>
<tr>
<td>The used host bus adapter is unavailable for the disk array unit.</td>
<td>Use the host bus adapter available for the disk array unit. Contact your sales agent if unknown.</td>
</tr>
<tr>
<td>The disk array unit is installed in an area in which it easily suffers vibration and/or shocks.</td>
<td>Install the disk array unit referring to Chapter 1 &quot;NOTES ON INSTALLATION AND HANDLING OF DISK ARRAY UNIT&quot;.</td>
</tr>
<tr>
<td>The power is turned off or the reset button on the host system is pressed with the ACCESS LED (green) being on.</td>
<td>Contact your service representative.</td>
</tr>
<tr>
<td>The logical disk of the disk array unit is not assigned.</td>
<td>Assign the logical disk number appropriately using the &quot;NEC Storage Manager&quot; or contact your service representative.</td>
</tr>
</tbody>
</table>

8.2 Computer Virus

Computer virus is one of major computer troubles.
If a computer is infected with a computer virus, the computer may suddenly play music or display abnormal messages. The computer may suffer damages including data destruction and initialization of disk array units in the worst case.
To suppress the damage at the minimum level, take proper measures such as backup of important data.
8.3 Indication at Occurrence of Fault

If the disk array unit is defected, the SERVICE LED on the array controller lights orange and also the LED specific for each unit lights to indicate defected unit. The table below shows the relation between the LED indicating the occurrence of a fault and the defected unit.

<table>
<thead>
<tr>
<th>LED display</th>
<th>Defected unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>The FAULT LED on the controller lights orange.</td>
<td>The controller with the FAULT LED being on is defected.</td>
</tr>
<tr>
<td>A FAN LED on the controller lights orange.</td>
<td>The controller cooling fan corresponding to the FAN LED being on is defected.</td>
</tr>
<tr>
<td>The FAULT LED on a LAN card lights orange.</td>
<td>The LAN card with the FAULT LED being on is defected.</td>
</tr>
<tr>
<td>The FAULT LED of the LAN card is flashing orange.</td>
<td>The controller with the FAULT LED being on or a disk drive is probably defected. Check if another FAULT LED is on. Contact your maintenance service agent.</td>
</tr>
<tr>
<td>(Error during cache data write onto a disk)</td>
<td></td>
</tr>
<tr>
<td>The POWER FAIL LED on a array controller power supply lights orange.</td>
<td>The array controller power supply with the POWER FAIL LED being on is defected.</td>
</tr>
<tr>
<td>The BBU FAIL LED on a array controller power supply lights orange.</td>
<td>The battery backup unit corresponding to the BBU FAIL LED being on (BBU0 for PS0 or BBU1 for PS1) is defected.</td>
</tr>
<tr>
<td>The SERVICE LED on the disk enclosure lights orange and also the FAULT LED on the disk drive lights orange.</td>
<td>The disk drive with the FAULT LED being on is defected.</td>
</tr>
<tr>
<td>The SERVICE LED on the disk enclosure lights orange and also the FAULT LED on the adapter lights orange.</td>
<td>The adapter with the FAULT LED being on is defected.</td>
</tr>
<tr>
<td>The SERVICE LED of the disk enclosure lights orange and also the POWER FAULT LED of the power supply for the disk enclosure lights orange.</td>
<td>The power supply for the disk enclosure with the POWER FAULT LED being on is defected. (Including a cooling fan failure)</td>
</tr>
</tbody>
</table>


8.4 Fault of Controller

If a controller is defected, the SERVICE LED on the array controller lights orange. In addition, the FAULT LED on the controller lights orange. The defected controller may be replaced with new one with the power of the disk array unit remaining ON.

If a cache or additional card installed in the controller is defected, the SERVICE LED on the relevant array controller and the FAULT LED on the controller are lit.

If so, replace all the caches and additional cards as well as the controller or contact the maintenance service agent to identify the defected unit for the replacement.

<Replacement procedure>

(1) Identify the defected controller with the FAULT LED on the controller being lit. Remove all the cables connected to the defected controller. Write down the connections between the cables to be removed and the mating connectors.

(2) Loosen a screw securing the ejector of the target controller, open the ejector pulling it by 90°, and then pull out the controller. (When the controller is pulled out, the protection shutter in the unit closes and it is locked.)

Be careful that it is hot.
(3) Set the DIP switch and AL-PA switch on the new controller for replacement to be the same as that of the defected controller.

(4) Open the ejectors of the controller for replacement, insert the controller into the slot to the end securely. (The lock of the protection shutter closed when the controller was pulled out is automatically released by inserting the controller.)
Insert the controller as far as it will go, and close the ejector. Strongly push the ejector (the part indicated by the arrow in the figure) until the controller is inserted firmly, and secure the ejector with the screw.

When inserting the controller into the array controller, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause malfunction.

(5) Connect the cables removed in step (1) to the mating connectors as before.
8.5 Fault of Controller Cooling Fan

If a controller cooling fan is defected, the SERVICE LED on the array controller lights orange. In addition, the FAN LED on the corresponding controller lights orange. The defected controller cooling fan may be replaced with the power of the disk array unit remaining ON.

<Replacement procedure>

(1) Check whether the defected controller cooling fan is FAN0 or FAN1 depending on the FAN LED being on.

(2) Loosen the two set screws at the upper right and lower left corners of the defected controller cooling fan to pull out it from the slot. (Note that the fan may be rotated by inertia.)

(3) Insert the controller cooling fan for replacement into the slot.

(4) Fasten the two set screws at the upper right and lower left corners of the controller cooling fan to fix it.

When inserting the cooling fan into the controller, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause malfunction.
8.6 Fault of LAN Card

**WARNING**

- The LAN card contains lithium battery. Do not remove the lithium battery. The lithium battery may explode when it is brought close to fire or immersed in water. Dispose of the LAN card according to local ordinance. Contact your local government for details.

If a LAN card is defected, the SERVICE LED on the array controller lights orange. In addition, the FAULT LED on the LAN card lights orange. The defected LAN card may be replaced with the power of the disk array unit remaining ON.

**<Replacement procedure>**

1. Loosen a single set screw of the defected LAN card. Then pull out the card from the slot. You should not disconnect the cables from the defected LAN card when pulling it out.

2. Remove all the cables from the defected LAN card and connect them to the LAN card for replacement, to the same connectors as the defected LAN card.

3. Insert the LAN card for replacement with the cables being connected, and fix it with a single screw.

When inserting the LAN card into the array controller, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause malfunction.
8.7 Fault of Power Supply for Array Controller

If a power supply is defected, the SERVICE LED on the array controller lights orange. In addition, the POWER FAIL LED on the power supply lights orange. The defected power supply may be replaced with the other power supply remaining ON.

<Replacement procedure>

(1) Check the defected power supply by the POWER FAIL LED of the power supply.

(2) Set the switch of the defected power supply to OFF and pull out the power cord from the power plug.

(3) Loosen the screw fixing the power supply and slide the removal protection mechanism inward as shown in the figure below.
(4) Hold the handle of the defected power supply and pull out it.

(5) Make sure that the switch of the power supply for replacement is set to OFF and the power cord is removed from the power plug.

(6) Slide the removal protection mechanism inward as shown in the figure below and insert the power supply for replacement into the slot securely.
(7) Slide the removal protection mechanism outward and fix it with a single screw.

| ! | When inserting the power supply into the array controller, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause malfunction. |

(8) Connect the power cord of the replaced power supply to the power plug. Then set the power switch to ON.
8.8 Fault of Battery Backup Unit

If the battery backup unit is defected, the SERVICE LED on the array controller lights orange. In addition, the BBU FAIL LED on the power supply corresponding to the defected battery backup unit, PS0 for BBU0 or PS1 for BBU1, lights orange. The defected battery backup unit may be replaced with the power supply of the disk array unit remaining ON.

<Replacement procedure>

(1) Open the front mask key and remove the front mask from the array controller.

(2) Loosen the three screws fixing the battery cover of the array controller to remove the cover.

(3) Set the battery switch of the defected battery backup unit to OFF.

(4) Loosen the two set screws of the defected battery backup unit and pull out the battery backup unit from the slot.

Because the battery backup unit has a drop protection claw, it cannot be pulled out only by pulling it straight. If the claw is caught by the chassis, push the battery backup unit to the depth a little, slide the battery backup unit to the right, and pull out it.

The battery backup unit is as heavy as 4.5 kg. Pull out the battery backup unit slowly and carefully so that the unit may not be dropped.
(5) Make sure that the battery switch of the battery backup unit for replacement is set to OFF.

(6) Insert the battery backup unit for replacement into the slot and fix it with two screws. For the insertion, fit the drop protection claw to the notch on the chassis, slide the unit to the left, and insert it slowly.

(7) Set the battery switch of the replaced battery backup unit to ON.

(8) Install the battery cover on the array controller.

(9) Install the front mask on the array controller and lock it with a key.
8.9 Fault of Disk Drive

If a disk drive is defected, the SERVICE LED on the array controller lights orange. In addition, the SERVICE LED on the disk enclosure in which the defected disk drive is installed and the FAULT LED on the defected disk drive are lit orange.

The defected disk drive may be replaced with the powers of the disk array unit and disk enclosure remaining ON.

If the FAULT LED on a disk drive lights, the fault of the other disk drive of the same logical disk causes the data to be lost due to interruption of redundancy. If the FAULT LED on a disk drive lights, replace the disk drive immediately. Perform the replacement job as quick as possible. Do not operate the disk enclosure for a long time in the state that the disk drive is pulled out.

Replace the defected disk drive with a disk drive having the same storage capacity.

<Replacement procedure>

(1) Confirm the defected disk drive with the FAULT LED on the disk drive being on.

(2) Pull the ejector of the defected disk drive toward you to release the lock.
When the lock is released, a click occurs.
After the lock is released, hold the handle to pull out the disk drive.

While the disk drive is pulled out, wait until the revolution of the installed disk drive is stopped (for about 30 seconds) in the middle of the slot.
(3) Select the location label having the same location as that of the defected disk drive from the location label provided with the replacing disk drive, and then put the label on the replacing disk drive.

(4) With the ejector of the new disk drive opened, engage the guides on the top and bottom faces of the disk drive with the guide grooves on the disk enclosure and insert the disk drive to the end slowly.

After the disk drive is inserted to the end securely, push down the ejector opened upward to click for locking.

When inserting the disk drive into the disk enclosure, push it as far as it will go and then lock the ejector. Incorrect insertion may cause malfunction.
(5) Inserting a new disk drive allows the data recovery to be started automatically.

- If the auto repair feature is set to OFF, issue a recovery instruction from the management software in manual mode to start recovery. Otherwise, the reduced state ("reduce" shown as the logical disk status) remains.
- Setting the auto pair feature to ON in recovery wait state does not start recovery. The setting is enabled starting with the next recovery.

(6) The disk array unit operates normally during the data recovery. At the termination of the data recovery, the SERVICE LEDs on the array controller and disk enclosure go off.
8.10 Fault of Power Supply for Disk Enclosure

If the power supply for the disk enclosure is defected, the SERVICE LED on the array controller lights orange. In addition, the SERVICE LED on the disk enclosure in which the defected power supply is installed and the POWER FAULT LED on the defected power supply are lit orange.

The defected power supply for the disk enclosure may be replaced with the powers of the array controller and disk enclosure remaining ON.

<Replacement procedure>

(1) Turn off the power switch of the defected power supply for the disk enclosure. Push down the power cord stopper toward the left, release the power cord stopper from the receptacle of the power cord, and then remove the power cord.
(2) Loosen a screw securing the ejector, put your finger on the protrusion (shown in the figure) of the ejector, and pull it toward you.

When the ejector turns by 90°, pull out the defected power supply. When the defected power supply comes out, hold it with both hands and slowly remove it.

(3) Confirm that the power switch of the new power supply for the disk enclosure is off and the power cord is disconnected from the power plug.
(4) With the ejector pulled toward you, hold the new power supply for the disk enclosure with both hands and insert it into the slot.

(5) Push the protrusion (shown in the figure) of the ejector to turn the ejector and push in the new power supply.

(6) Strongly push the ejector (the part indicated by the arrow in the figure) until the new power supply for the disk enclosure is inserted firmly, and secure the ejector with the screw.

When inserting the power supply for the disk enclosure into the disk enclosure, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause a power supply failure again.
(7) When connecting the power supply of the disk enclosure, push down the power cord stopper toward the left, insert the power cord, and secure the power cord by firmly fitting the power cord stopper into the receptacle of the power cord. After that, turn on the power switch.
8.11 Fault of Adapter

If an adapter is defected, the SERVICE LED on the array controller lights orange. In addition, the SERVICE LED on the disk enclosure in which the defected adapter is installed and the FAULT LED on the defected adapter are lit orange.

The defected adapter may be replaced with the powers of the array controller and disk enclosure remaining ON.

<Replacement procedure>

(1) Confirm the defected adapter with the FAULT LED on the adapter being on. Remove all the cables connected to the defected adapter. Write down the connections between the cables to be removed and the mating connectors.

(2) Loosen a screw securing the ejector, put your finger on the protrusion (shown in the figure) of the ejector, and pull it toward you.

(3) When the ejector turns by 90°, pull out the defected adapter.

⚠️ Be careful that it is hot.
(4) Set the AL-PA and DE-DIAG ID of the adapter for replacement to be the same as those of the defected adapter.

Before replacing the adapter, make sure that the AL-PA switch of the adapter for replacement is set to the same value as that of the defected adapter, as well as the sound adapter. If the adapter is installed with different setting of AL-PA switch, a link failure may occur in the worst case.

(5) Insert the adapter for replacement to the slot with the ejector remaining opened until the adapter is carried to the end securely.

(6) Insert the adapter as far as it will go, and close the ejector.
(7) Strongly push the ejector (the part indicated by the arrow in the figure) until the adapter is inserted firmly, and secure the ejector with the screw.

When inserting the adapter into the disk enclosure, push it as far as it will go and then secure it with the screws. Incorrect insertion may cause malfunction.

(8) Connect the cables removed in step (1) to the mating connectors as before.
8.12 Check of Type Name and Manufacturing Numbers

The types name and manufacturing number of the disk array unit are shown at the locations in the figure below.
Manufacturing number label of disk enclosure

Manufacturing number label of basic enclosure

Manufacturing number label of adapter

Manufacturing number label of power supply for disk enclosure
8.13 Preparation before Phone Call

When you have any question or desire to contact us on the occurrence of a fault or error on the unit, do the following preparations before calling us:

- Write down the failure or fault status and questions.
- Write down the configuration of the peripherals connected to the host unit and the software products used in the disk array unit.
- Keep this manual, the manuals on the peripherals connected to the host unit, and the manuals of used software products.

8.14 Service and Support

If you have any question on this product or attached software, contact your service representative.

8.15 Unit Life/Repair Service Period

The service life of the disk array unit and the repair service period after stopping of the production are as shown below.

Some components (e.g., cooling fans and battery backup units) of the disk array unit need replacement when they reach their lives. They may have a shorter life than the disk array unit. The service life of the disk array unit may become shorter than 5 years depending on the operating environment. Therefore, the components should be replaced periodically. For their replacement and lives, contact your maintenance service agent.

- Service life of the disk array unit: 5 years (*1)
- Extended life after overhaul: 2 years (*2)
- Repair service period: 5 years after stopping of the production

Note that the following disk array units may not be repaired:
- Unit damaged due to dropping, incorrect handling, etc.
- Unit modified by the customer
- Unit which has reached the end of its useful life
- Unit damaged by a natural disaster (e.g., earthquake, lightning, or fire) or by an external factor (e.g., incident)

*1 The repair service is not available for the disk array unit that has reached its service life.
Be sure to make a hardware maintenance contract, and get the disk array unit to be overhauled (at a cost).

*2 Even if the disk array unit is overhauled when it is 5 years old, the repair service is no longer available when it becomes 7 years old.

8.16 Disposal of Disk Array Unit

Dispose of the disk array unit according to local ordinance. Contact your local government for details.
9. PRODUCT SPECIFICATION

9.1 Basic Specification of Disk Array Unit

The table below shows the basic specification of the disk array unit.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical sector length (bytes/sector)</td>
<td>512</td>
</tr>
<tr>
<td>Number of standard disk drives per unit</td>
<td>3</td>
</tr>
<tr>
<td>Maximum number of disk drives per unit</td>
<td>15</td>
</tr>
<tr>
<td>Hot spare feature</td>
<td>Provided</td>
</tr>
<tr>
<td>Host interface specification (*1)</td>
<td>FC-AL / Fable (Point to Point) [Optical]</td>
</tr>
<tr>
<td>Data transfer rate of host interface (*1)</td>
<td>200 MB/S, 100 MB/S</td>
</tr>
<tr>
<td>Disk drive interface specification</td>
<td>FC-AL [Copper]</td>
</tr>
</tbody>
</table>

*1 See Section 9.7 for how to change the topology and data transfer rate.

9.2 Optional Components

<table>
<thead>
<tr>
<th>P/N</th>
<th>Product name</th>
<th>Qty</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>NF2300-SE41E</td>
<td>Additional disk enclosure</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>NF2300-SM412E</td>
<td>Additional disk drive</td>
<td>1</td>
<td>36 GB/10,000 rpm</td>
</tr>
<tr>
<td>NF2300-SM413E</td>
<td>Additional disk drive</td>
<td>1</td>
<td>73 GB/10,000 rpm</td>
</tr>
<tr>
<td>NF2300-SM414E</td>
<td>Additional disk drive</td>
<td>1</td>
<td>147 GB/10,000 rpm</td>
</tr>
<tr>
<td>NF2300-SM422E</td>
<td>Additional disk drive</td>
<td>1</td>
<td>36 GB/15,000 rpm</td>
</tr>
<tr>
<td>NF2300-SC01E</td>
<td>Additional 512-MB cache memory</td>
<td>1</td>
<td>For 2 controllers (256MB×2)</td>
</tr>
<tr>
<td>NF2300-SC02E</td>
<td>Additional 1-GB cache memory</td>
<td>1</td>
<td>For 2 controllers (512MB×2)</td>
</tr>
<tr>
<td>NF2300-SP02E</td>
<td>Additional control card</td>
<td>1</td>
<td>For 2 controllers</td>
</tr>
<tr>
<td>NF2300-SP03E</td>
<td>Additional host FC port</td>
<td>1</td>
<td>For 2 controllers</td>
</tr>
<tr>
<td>NF9100-SK01E</td>
<td>Rack mount kit</td>
<td>1</td>
<td>For HP rack</td>
</tr>
<tr>
<td>NF9100-SK02E</td>
<td>Rack mount kit</td>
<td>1</td>
<td>For Sun StorEdge expansion rack</td>
</tr>
<tr>
<td>NF9100-SK03E</td>
<td>Rack mount kit</td>
<td>1</td>
<td>For old Express-series rack</td>
</tr>
<tr>
<td>NF9120-SJ04E</td>
<td>DE cable</td>
<td>1</td>
<td>2 HSSDC cables (5 m)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 DE diagnosis cables (5 m)</td>
</tr>
<tr>
<td>NF9310-SJ10E</td>
<td>FC conversion cable</td>
<td>1</td>
<td>2 LC-SC connector conversion cable (2 m)</td>
</tr>
<tr>
<td>NF9320-SJ01E</td>
<td>FC cable</td>
<td>1</td>
<td>2 LC-LC cables (5 m)</td>
</tr>
<tr>
<td>NF9320-SJ02E</td>
<td>FC cable</td>
<td>1</td>
<td>2 LC-LC cables (10 m)</td>
</tr>
<tr>
<td>NF9320-SJ03E</td>
<td>FC cable</td>
<td>1</td>
<td>2 LC-LC cables (20 m)</td>
</tr>
<tr>
<td>NF9320-SJ04E</td>
<td>FC cable</td>
<td>1</td>
<td>2 LC-LC cables (50 m)</td>
</tr>
</tbody>
</table>
9.3 Environmental Conditions of Disk Array Unit

The table below shows the environmental conditions of the disk array unit.

<table>
<thead>
<tr>
<th></th>
<th>Operating</th>
<th>Halting *2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>5°C to 40°C</td>
<td>-10°C to 60°C</td>
</tr>
<tr>
<td>Relative humidity *1</td>
<td>10% to 80%</td>
<td>5% to 80%</td>
</tr>
<tr>
<td>Wet-bulb temperature</td>
<td>0°C to 27°C</td>
<td>-8°C to 29°C</td>
</tr>
<tr>
<td>Allowable vibration level</td>
<td>0.25 G</td>
<td>0.5 G</td>
</tr>
</tbody>
</table>

*1 Without condensation
*2 The halting status includes the packaged status in shipping carton and the storage status.

9.4 Power Specification

The table below shows the power specification of the disk array unit.

<table>
<thead>
<tr>
<th></th>
<th>Array controller</th>
<th>Disk enclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>100 to 240 VAC ±10%, 50/60 Hz</td>
<td></td>
</tr>
<tr>
<td>Maximum power consumption*</td>
<td>330 VA</td>
<td>520 VA</td>
</tr>
</tbody>
</table>

While the disk array unit can accept the power of 100 - 240 VAC (50/60 Hz), the power cord coming with the disk array unit can only accept 100 – 120 VAC. Use 100 – 120 VAC (50/60 Hz) when the attached power cord is used.

9.5 External Dimension and Weight of Disk Array Unit

The table below shows the external dimension and weight of the disk array unit.

<table>
<thead>
<tr>
<th></th>
<th>Array controller</th>
<th>Disk enclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>482 mm</td>
<td>482 mm</td>
</tr>
<tr>
<td>Height</td>
<td>131 mm (3U)</td>
<td>131 mm (3U)</td>
</tr>
<tr>
<td>Depth (including front mask)</td>
<td>594 mm</td>
<td>594 mm</td>
</tr>
<tr>
<td>Weight (in the maximum configuration)</td>
<td>Approx. 36 kg</td>
<td>Approx. 41 kg</td>
</tr>
</tbody>
</table>

9.6 Life Expectancies of Components

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery backup unit</td>
<td>2.5 years</td>
</tr>
<tr>
<td>Fan</td>
<td>50,000 hours</td>
</tr>
</tbody>
</table>
9.7 How to Change Topology and Data Transfer Rate

You can change the topology and data transfer rate for each port by the DIP switch (SW2) on the controller or the DIP switch (SW1) on the additional control card or additional host FC port.

To change the topology or data transfer rate, slide the DIP switch with the tip of a ballpoint pen or the like.

- The topology and data transfer rate must be set correctly in accordance with the host bus adapter to be connected, the FC-AL switch, and the connection mode.
- Before attempting to change the settings, contact your maintenance service agent.
- Changing the settings needs time for setting and confirming new values. You need to provide enough time during which you can stop the system.

### DIP switch of controller

If the FC port connector of the controller is placed on the right side, use the DIP switch in the rear of the right side.

<table>
<thead>
<tr>
<th>Bit position</th>
<th>Setting and function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fixed to OFF (Reserved)</td>
</tr>
<tr>
<td>2</td>
<td>Factory-set to OFF (Topology OFF: FC-AL / ON: Fabric)</td>
</tr>
<tr>
<td>3</td>
<td>Factory-set to OFF (HOST MODE OFF: 2 Gbps / ON: 1 Gbps)</td>
</tr>
<tr>
<td>4 to 8</td>
<td>Fixed to OFF (Reserved)</td>
</tr>
</tbody>
</table>
DIP switch of additional control card or additional host FC port

If the FC port connector of the additional control card or additional host FC port is placed on the right side, use the DIP switch in the rear of the right side.

<table>
<thead>
<tr>
<th>Bit position</th>
<th>Setting and function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fixed to OFF (Reserved)</td>
</tr>
<tr>
<td>2</td>
<td>Factory-set to OFF (Topology OFF: FC-AL / ON: Fabolic)</td>
</tr>
<tr>
<td>3</td>
<td>Factory-set to OFF (HOST MODE OFF: 2 Gbps / ON: 1 Gbps)</td>
</tr>
<tr>
<td>4 to 8</td>
<td>Fixed to OFF (Reserved)</td>
</tr>
</tbody>
</table>
Appendix A Features of Disk Array Unit

1. Battery Backup

The disk array unit keeps memory data with battery while the power is off. Accordingly, to make the power off for a period longer than the battery hold period, it is necessary to make sure that the BAT LED on the controller is off (this indicates that no data is saved in cache). In addition, pairing must be released during use of DDR (Dynamic Data Replication).

If the batteries exceed the battery hold period in the backup state, the following operation will be done. The cache data is lost. The data must be recovered from the backup data saved in magnetic tapes.

1) At the first start, the SERVICE LED repeats 5-sec flashing/7-sec OFF. The disk array unit is not started normally.

2) The event log contains the following code:
   6830 Controller Event

3) The disk array unit is started normally by turning the array controller off once and then on again.

2. Cross Call Feature

The disk array unit contains several features on the cross call.

2.1 Initial Assignment Feature

(1) The path-side controller with a logical disk bound is subject to the assignment of the logical disk.

If an attempt is made to access to the logical disk from the controller which does not assign the disk, error 05/04/00 (illegal request - not assigned) is returned. When an attempt is made to unbind the logical disk from the controller which does not assign the disk, the same response is returned. However, the changing operation moves the assignment to the local controller.

(2) The assignment state is retained at re-entry of the power.

This is called the default assignment. In the unbinding, the path free status occurs in which any controller can access to logical disks. If so, logical disks are undefined for I/O from the host.
2.2 **Auto Assignment Feature**

If the assigned controller is shut down, the auto assignment feature allows the controller not assigned to access to any logical disk within the subsystem. Accordingly, this feature has no meaning if the cross call feature is set to ON. When an I/O on a logical disk not assigned to the local controller, it is checked whether the adjacent controller is shut down. If so, the assignment of logical disk to the shut down controller is released and the logical disk is reassigned to the local controller. The assignment modification status is retained until the power is turned on again or the assignment is changed by the management software (NEC Storage Manager). See "Several Settings on Disk Array (Set of Auto Assignment Mode)" in "Guide to Setting of NEC Storage Manager Configuration" for the use of the management software (NEC Storage Manager).

2.3 **Cross Call Feature**

The disk array unit originally has the dynamic cross call feature. The feature may be made on or off.

(1) Default state:
Off

(2) Cross call enable state:
The cross call feature is set to ON.
In the state, both controllers can access to every logical disk.

(3) Modification method:
The cross call feature can be set by using the management software.
See "Several Settings on Disk Array (Set of Cross Call)" in "Guide to Settings of NEC Storage Manager Configuration" for the use of the management software (NEC Storage Manager).

*Note 1:* It is recommended that the alternate path feature by middleware such as NEC Storage PathManager is made valid from the viewpoint of data protection if the cross call feature is set to ON.

*Note 2:* To use the access control feature, the cross call feature must be set to ON.
3. **Expand LUN Feature**

The Expand LUN feature specifies the measures to increase the number of logical disks that the host can use. However, the maximum number of logical disks and recognition method depends on the OS in use.

This feature can be set to ON/OFF per port (default is OFF). The feature must be set to OFF (default) in ports connected with the NEC Express 5800 series system or the CX5000 system.

When the NX7000 system is connected to a port setting the Expand LUN feature to OFF, only logical disks 0 to 7 are recognized by the NX7000 system. When the Expand LUN feature is set to ON, eight logical disks or larger are also recognized by the NX7000 system. On this occasion, the NEC Express 5800 series system and the CX5000 system cannot be connected to this port mixedly.

If eight logical disks or larger is not recognized in Windows NT, make the AL-PA switch value of the controller having the LUN0 ownership lower than the controller in the opposite side.

However, the following restriction is applied:
- For Windows NT, the installation of Service Pack 4 or later and the addition of registries are required. (Refer to the manual of the Service Pack for the procedure.)

The settings may be done in ports. The management software (NEC Storage Manager) can provide the settings. See "Several Settings on Disk Array (Set of Expand LUN)" in the "Guide to Setting Configuration of NEC Storage Manager" for how to use the management software (NEC Storage Manager).

4. **Auto Repair Mode**

It is possible to indicate whether the repair operation is started automatically or manually in the repair waiting state by using the management software (NEC Storage Manager).

The default auto repair mode is on (auto repair). However, if the auto repair mode is set to "OFF" (no auto repair) during repair operation, the operation is not interrupted. The mode is reflected from the next repair operation. In addition, if the auto repair mode is set to "ON" in the repair waiting state, the repair is not started. The mode is reflected from the next repair operation.

See "Several Settings on Disk Array (Set of Auto Repair Mode)" and "Repair Start Direction Command" in "Guide to Settings of NEC Storage Manager Configuration" for the use of the management software (NEC Storage Manager).
5. **Hot Spare Mode**

The operation after replacement of the defected disk by the hot spare repair can be specified by using the management software (NEC Storage Manager).

ON (Level-b0):
- Restores data after replacement of defected disk (default).

OFF (Level-A):
- Does not restore data after replacement of defected disk. The new disk is changed to the spare disk.

Contact the service engineer with expert knowledge in your sales agent for the operation.

6. **1-BBU Cache Enable Mode**

If only a single BBU is installed, the write cache operation mode can be set by using the management software (NEC Storage Manager).
However, immediate replacement by maintenance personnel is required at the occurrence of a fault for a single BBU because redundancy of data may be lost. Further, be careful because retention time of data becomes half on this occasion.

OFF: Provides operation in the write cache disable mode in the 1-BBU status.
ON: Provides operation in the write cache enable mode even in the 1-BBU status. (default)

The 1-BBU status means that only a single BBU is installed in the system or the available number of installed BBUs is 1 due to occurrence of a fault.

To set the mode, contact the service engineer with expert knowledge in your sales agent.

7. **1-Controller Cache Enable Mode**

If only a single controller is installed, the write cache operation mode can be set by using the management software (NEC Storage Manager).
However, it is recommended to set the mode to OFF because data may be lost at the occurrence of a fault for a single controller.

OFF: Provides the operation in the write cache disable mode for the 1-controller status. (default)
ON: Provides the operation in the write cache enable mode even for the 1-controller status.

The 1-controller status means that only a single controller is installed in the system or the available number of installed controllers is 1 due to occurrence of a fault.

To set the mode, contact the service engineer with expert knowledge in your sales agent.
8. **Repair Time**

The repair time is set to 10 hours in default. The repair time can be set in the range from 0 (fastest) to 24 hours. Depending on the disk capacity, the repair may not be terminated within the defined time. Without commands from the higher system, the repair operates in the fastest mode.

See "Several Settings on PD (Set of Repair Time)" in "Guide to Setting of NEC Storage Manager Configuration" for the use of the management software (NEC Storage Manager).

9. **Dummy Logical Disk**

If there are no logical disks, the OS is unable to recognize a disk array unit. To avoid this problem, logical disk 0 of RAID0 (with a single disk drive) is automatically created when no logical disks exist.

Do not use the created logical disk as it is. After the OS recognizes the logical disk, be sure to unbind it by using the management software (NEC Storage Manager), and then bind it.

For how to use the management software (NEC Storage Manager), see "Several settings on PD (RANK unbind and LD unbind)" in "Guide to Setting of NEC Storage Manager Configuration".

10. **Dynamic Capacity Expansion**

The addition of a single disk drive to the rank configured with RAID 5 allows the logical disk capacity to be expanded in the rank. The configurations subject to the expansion range from 2+P and 13+P.

Disk drives should be added one by one. Only after an expansion is completed, the next expansion operation can be started.

The expansion operation may be started by the management software (NEC Storage Manager).

For the setting, contact your service engineer of the maintenance service agent with the expert knowledge.
Rank capacity expansion (for Solaris)

Note: Always provide the data backup before the rank capacity expansion. It is because the job may cause some data to be lost. The dynamic capacity expansion is not available in the environment in which Veritas volume management software VxVM is used.

Without the label replacement job, only the rank capacity expansion (dynamic capacity expansion) cannot make the logically expanded capacity recognized. Accordingly, the capacity logically expanded cannot be used effectively.

The following describes the label replacement job as well as the jobs around the rank capacity expansion by actual job samples (including an actual evaluation example).
Operation before rank capacity expansion:
Confirm connection devices

# format
Searching for disks...done
AVAILABLE DISK SELECTIONS:
0. c0t1d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
   /pci@1f,4000/scsi@3/sd@0,0
1. c3t4d0 <NEC-NEC Storage2000-W269 cyl 1020 alt 2 hd 16 sec 128>
   /pci@6,2000/scsi@1/sd@0,0
2. c3t4d1 <NEC-NEC Storage2000-W269 cyl 1020 alt 2 hd 16 sec 128>
   /pci@6,2000/scsi@1/sd@0,1
3. c3t4d2 <NEC-NEC Storage2000-W269 cyl 1020 alt 2 hd 16 sec 128>
   /pci@6,2000/scsi@1/sd@0,2
4. c3t4d3 <NEC-NEC Storage2000-W269 cyl 1020 alt 2 hd 16 sec 128>
   /pci@6,2000/scsi@1/sd@0,3
5. c3t4d4 <NEC-NEC Storage2000-W269 cyl 1020 alt 2 hd 16 sec 128>
   /pci@6,2000/scsi@1/sd@0,4
Specify disk (enter its number): 1 ←Select target disk.
selecting c3t4d0
[disk formatted]

FORMAT MENU:
- select a disk
- select (define) a disk type
- select (define) a partition table
- describe the current disk
- format and analyze the disk
- repair a defective sector
- write label to the disk
- surface analysis
- defect list management
- search for backup labels
- read and display labels
- save new disk/partition definitions
- show vendor, product and revision
- set 8-character volume name
- execute <cmd>, then return

format: p ←Select p indicating partition.
PARTITION MENU:
0 - change '0' partition
1 - change '1' partition
2 - change '2' partition
3 - change '3' partition
4 - change '4' partition
5 - change '5' partition
6 - change '6' partition
7 - change '7' partition
select - select a predefined table
modify - modify a predefined partition table
name - name the current table
print - display the current table
label - write partition map and label to the disk
!<cmd> - execute <cmd>, then return
quit

partition> p ←Select p indicating print (check the contents of partition).

<table>
<thead>
<tr>
<th>Part</th>
<th>Tag</th>
<th>Flag</th>
<th>Cylinders</th>
<th>Size</th>
<th>Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>root</td>
<td>wm</td>
<td>0 - 31</td>
<td>32.00MB (32/0/0)</td>
<td>65536</td>
</tr>
<tr>
<td>1</td>
<td>swap</td>
<td>wu</td>
<td>32 - 95</td>
<td>64.00MB (64/0/0)</td>
<td>131072</td>
</tr>
<tr>
<td>2</td>
<td>backup</td>
<td>wu</td>
<td>0 - 1019</td>
<td>1020.00MB (1020/0/0)</td>
<td>2088960</td>
</tr>
<tr>
<td>3</td>
<td>unassigned</td>
<td>wm</td>
<td>0</td>
<td>0 (0/0/0)</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>unassigned</td>
<td>wm</td>
<td>0</td>
<td>0 (0/0/0)</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>unassigned</td>
<td>wm</td>
<td>96 - 545</td>
<td>450.00MB (450/0/0)</td>
<td>921600</td>
</tr>
<tr>
<td>6</td>
<td>usr</td>
<td>wu</td>
<td>996 - 1019</td>
<td>24.00MB (24/0/0)</td>
<td>49152</td>
</tr>
<tr>
<td>7</td>
<td>unassigned</td>
<td>wm</td>
<td>546 - 995</td>
<td>450.00MB (450/0/0)</td>
<td>921600</td>
</tr>
</tbody>
</table>

Record the information appearing above entirely.
# Perform rank capacity expansion. #
Operation after rank capacity expansion.
Halt the job and conduct unmount ("label" cannot be done in the mount state).

format
See (1) (This area appears to be the same as area (1)).
Specify disk (enter its number): 1 ← Select target disk.
See (2) (This area appears to be the same as area (2)).

format> type ← Select type from the menu.

AVAILABLE DRIVE TYPES:

0. Auto configure
1. Quantum ProDrive 80S
2. Quantum ProDrive 105S
3. CDC Wren IV 94171-344
4. SUN0104
5. SUN0207
6. SUN0327
7. SUN0340
8. SUN0424
9. SUN0535
10. SUN0669
11. SUN1.0G
12. SUN1.0S
13. SUN1.3G
14. SUN2.1G
15. SUN2.9G
16. Zip 100
17. Zip 250
18. SUN9.0G
19. NEC-NEC Storage2000-W269
20. NEC-NEC Storage2000-W269
21. other

Specify disk type (enter its number)[19]: 0 ← Select Auto configure.

c3t4d0: configured with capacity of 1.50GB
<NEC-NEC Storage2000-W269 cyl 1532 alt 2 hd 16 sec 128>

Recognition of logically expanded capacity
PARTITION MENU:

See (3) (This area appears to be the same as area (3)).

Recover the capacities of partitions 0, 1, 5, 6, and 7 to the original cylinder capacities.
(Recover the capacities of partitions other than the backup of partition 2 to the original cylinder capacities shown in (4).)

Recover the cylinder capacities for other partitions as shown above.
See the information below for the recovered result.

```
partition> p
Current partition table (unnamed):
Total disk cylinders available: 1532 + 2 (reserved cylinders)
Part  Tag  Flag  Cylinders  Size       Blocks
0    root  wm   0   - 31  32.00MB  (32/0/0)  65536
1    swap  wu   32  -  95  64.00MB  (64/0/0) 131072
2    backup wu   0  - 1531 1.50GB  (1532/0/0) 3137536
3    unassigned  wm  0   0   0   (0/0/0)  0
4    unassigned  wm   0   0   0   (0/0/0)  0
5    unassigned  wm  96  - 545 450.00MB  (450/0/0) 921600
6    usr    wm  996 - 1019 24.00MB  (24/0/0) 49152
7    unassigned  wm  546 - 995 450.00MB  (450/0/0) 921600

Assign the logical extension to partition 4 additionally.
partition> 4
Part  Tag  Flag  Cylinders  Size       Blocks
4    unassigned  wm   0   32.00MB  (0/0/0)  0

Enter partition id tag[unassigned]:
Enter partition permission flags[wm]:
Enter new starting cyl[0]: 1020
Enter partition size[0b, 0c, 0.00mb, 0.00gb]: 100mb
partition> p
Current partition table (unnamed):
Total disk cylinders available: 1532 + 2 (reserved cylinders)
Part  Tag  Flag  Cylinders  Size       Blocks
0    root  wm   0   - 31  32.00MB  (32/0/0)  65536
1    swap  wu   32  -  95  64.00MB  (64/0/0) 131072
2    backup wu   0  - 1531 1.50GB  (1532/0/0) 3137536
3    unassigned  wm  0   0   0   (0/0/0)  0
4    unassigned  wm  1020 - 1119 100.00MB  (100/0/0) 204800
5    unassigned  wm  96  - 545 450.00MB  (450/0/0) 921600
6    usr    wm  996 - 1019 24.00MB  (24/0/0) 49152
7    unassigned  wm  546 - 995 450.00MB  (450/0/0) 921600

partition> label  ← Select label (write information).
Ready to label disk, continue? y
partition> q

FORMAT MENU:
See (2) (This area appears to be the same as area (2)).
```

format> p
See (3) (This area appears to be the same as area (3)).
partition> p  ← Check whether label is written correctly.
Current partition table (unnamed):
Total disk cylinders available: 1532 + 2 (reserved cylinders)

<table>
<thead>
<tr>
<th>Part</th>
<th>Tag</th>
<th>Flag</th>
<th>Cylinders</th>
<th>Size</th>
<th>Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>root</td>
<td>wm</td>
<td>0 - 31</td>
<td>32.00MB</td>
<td>(32/0/0)</td>
</tr>
<tr>
<td>1</td>
<td>swap</td>
<td>wu</td>
<td>32 - 95</td>
<td>64.00MB</td>
<td>(64/0/0)</td>
</tr>
<tr>
<td>2</td>
<td>backup</td>
<td>wu</td>
<td>0 - 1531</td>
<td>1.50GB</td>
<td>(1532/0/0)</td>
</tr>
<tr>
<td>3</td>
<td>unassigned</td>
<td>wm</td>
<td>0</td>
<td>0 (0/0/0)</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>unassigned</td>
<td>wm</td>
<td>1020 - 1119</td>
<td>100.00MB</td>
<td>(100/0/0)</td>
</tr>
<tr>
<td>5</td>
<td>unassigned</td>
<td>wm</td>
<td>96 - 545</td>
<td>450.00MB</td>
<td>(450/0/0)</td>
</tr>
<tr>
<td>6</td>
<td>usr</td>
<td>wu</td>
<td>996 - 1019</td>
<td>24.00MB</td>
<td>(24/0/0)</td>
</tr>
<tr>
<td>7</td>
<td>unassigned</td>
<td>wm</td>
<td>546 - 995</td>
<td>450.00MB</td>
<td>(450/0/0)</td>
</tr>
</tbody>
</table>

partition> q
FORMAT MENU:
See (2) (This area appears to be the same as area (2)).

format> q
See (3) (This area appears to be the same as area (3)).
# format  ← LUN recognition
Searching for disks...done
AVAILABLE DISK SELECTIONS:
0. c0t1d0 <SUN9.0G cyl 4924 alt 2 hd 27 sec 133>
   /pci@1f,4000/scsi@3/sd@1,0
1. c3t4d0 <NEC-NEC Storage2000-W269 cyl 1532 alt 2 hd 16 sec 128>
   /pci@6,2000/scsi@1/sd@4,0
2. c3t4d1 <NEC-NEC Storage2000-W269 cyl 1020 alt 2 hd 16 sec 128>
   /pci@6,2000/scsi@1/sd@4,1
3. c3t4d2 <NEC-NEC Storage2000-W269 cyl 1020 alt 2 hd 16 sec 128>
   /pci@6,2000/scsi@1/sd@4,2
4. c3t4d3 <NEC-NEC Storage2000-W269 cyl 1020 alt 2 hd 16 sec 128>
   /pci@6,2000/scsi@1/sd@4,3
5. c3t4d4 <NEC-NEC Storage2000-W269 cyl 1020 alt 2 hd 16 sec 128>
   /pci@6,2000/scsi@1/sd@4,4

Specify disk (enter its number): 1
selecting c3t4d0
[disk formatted]

End of job
11. Logical Disk Capacity

11.1 Arbitrary Logical Disk Capacity

An arbitrary logical disk capacity can be bound by using the management software. To bind logical disks, enter the capacity in MBs (M=1024^2).

See "Several Settings on PD (Rank and LD build-ups)" or "Execution of Batch Setting (Rank setting and LD build-up)" in "Guide to Setting of NEC Storage Manager Configuration" for the use of the management software (NEC Storage Manager).

For NEC Storage Manager, the logical disk capacity can be specified with an integer multiple of the basic capacity, or the least common multiple of (stripe size) × (number of data disks) and 1024 (400h).

Ex: Capacity secured in RAID-5 (6+P)
   Stripe size (100h) × number of data disks (6h) = 600h (768 KB)
   The basic capacity is the least common multiple of 400h and 600h.
   The capacity must be an integer multiple of C00h (1536 KB).

11.2 Maximum Logical Disk Capacity

The maximum capacity per logical disk is shown in the table below (including the system capacity of 2 MB).
The capacity can be set by using the management software (NEC Storage Manager).

See "Several Settings on PD (Rank and LD build-ups)" or "Execution of Batch Setting (Rank setting and LD build-up)" in "Guide to Setting of NEC Storage Manager Configuration" for the use of the management software (NEC Storage Manager). Enter the value resulting from subtracting the system capacity (2 MB) from the capacity in the table below as the LD capacity.
## Maximum Logical Disk Capacity (MB) M=1024^2

<table>
<thead>
<tr>
<th>RAID Type</th>
<th>Number of PDs</th>
<th>36G</th>
<th>73G</th>
<th>147G</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single unit</td>
<td></td>
<td>34087</td>
<td>68284</td>
<td>136325</td>
</tr>
<tr>
<td>RAID0 (1)</td>
<td>1</td>
<td>34087</td>
<td>68284</td>
<td>136325</td>
</tr>
<tr>
<td>RAID0 (3)</td>
<td>3</td>
<td>102261</td>
<td>204852</td>
<td>408975</td>
</tr>
<tr>
<td>RAID9 (5)</td>
<td>5</td>
<td>170435</td>
<td>341420</td>
<td>681625</td>
</tr>
<tr>
<td>RAID0 (10)</td>
<td>10</td>
<td>340870</td>
<td>682840</td>
<td>1363251</td>
</tr>
<tr>
<td>RAID0 (15)</td>
<td>15</td>
<td>511305</td>
<td>1024260</td>
<td>2044876</td>
</tr>
<tr>
<td>RAID1 (1+1)</td>
<td>2</td>
<td>34087</td>
<td>68284</td>
<td>136325</td>
</tr>
<tr>
<td>RAID5 (2+P)</td>
<td>3</td>
<td>68174</td>
<td>136568</td>
<td>272650</td>
</tr>
<tr>
<td>RAID5 (3+P)</td>
<td>4</td>
<td>102261</td>
<td>204852</td>
<td>408975</td>
</tr>
<tr>
<td>RAID5 (4+P)</td>
<td>5</td>
<td>136348</td>
<td>273137</td>
<td>545300</td>
</tr>
<tr>
<td>RAID5 (5+P)</td>
<td>6</td>
<td>170435</td>
<td>341420</td>
<td>681625</td>
</tr>
<tr>
<td>RAID5 (6+P)</td>
<td>7</td>
<td>204522</td>
<td>409704</td>
<td>817950</td>
</tr>
<tr>
<td>RAID5 (7+P)</td>
<td>8</td>
<td>238609</td>
<td>477988</td>
<td>954275</td>
</tr>
<tr>
<td>RAID5 (8+P)</td>
<td>9</td>
<td>272697</td>
<td>546274</td>
<td>1090600</td>
</tr>
<tr>
<td>RAID5 (9+P)</td>
<td>10</td>
<td>306783</td>
<td>614556</td>
<td>1226926</td>
</tr>
<tr>
<td>RAID5 (10+P)</td>
<td>11</td>
<td>340870</td>
<td>682840</td>
<td>1363251</td>
</tr>
<tr>
<td>RAID5 (11+P)</td>
<td>12</td>
<td>374957</td>
<td>751124</td>
<td>1499576</td>
</tr>
<tr>
<td>RAID5 (12+P)</td>
<td>13</td>
<td>409044</td>
<td>819411</td>
<td>1635901</td>
</tr>
<tr>
<td>RAID5 (13+P)</td>
<td>14</td>
<td>443131</td>
<td>887692</td>
<td>1772226</td>
</tr>
<tr>
<td>RAID5 (14+P)</td>
<td>15</td>
<td>477218</td>
<td>955976</td>
<td>1908551</td>
</tr>
<tr>
<td>RAID10 (2+2)</td>
<td>4</td>
<td>68174</td>
<td>136568</td>
<td>272650</td>
</tr>
<tr>
<td>RAID10 (3+3)</td>
<td>6</td>
<td>102261</td>
<td>204852</td>
<td>408975</td>
</tr>
<tr>
<td>RAID10 (4+4)</td>
<td>8</td>
<td>136348</td>
<td>273137</td>
<td>545300</td>
</tr>
<tr>
<td>RAID10 (5+5)</td>
<td>10</td>
<td>170435</td>
<td>341420</td>
<td>681625</td>
</tr>
<tr>
<td>RAID10 (6+6)</td>
<td>12</td>
<td>204522</td>
<td>409704</td>
<td>817950</td>
</tr>
<tr>
<td>RAID10 (7+7)</td>
<td>14</td>
<td>238609</td>
<td>477988</td>
<td>954275</td>
</tr>
</tbody>
</table>

*Note: The capacities in the table above include the system capacity (in T&D area) of 2 MB.*
12. **Access Control**

Access Control sets an accessible logical disk for each host (HBA) or each port. The use of the access control feature enables the division of logical disks into logical disk groups. The division extends the flexibility of the system configuration. The feature also ensures data protection and security protection by limiting access to each host (HBA) or each port.

As a rule, do not use the two modes below in the same disk array unit. In consideration of the system configuration/design and the complexity of operation, the use of only Port Mode or WWN Mode in each disk array unit is strongly recommended.

Dedicated software (NEC Storage AccessControl), which is to be purchased separately, is necessary for using the access control feature. For details on the usage, refer to the instruction manual provided with the software.

Before the access control feature can be used on this disk array unit, the license key provided with the software must be entered from "NEC Storage Manager" in order to release the license lock.

You can release the license lock and make settings by yourself. NEC maintenance service representative provides the installation service (additionally charged) for releasing the license lock and making settings. Contact your maintenance service representative if necessary.

*Note: Set the CROSS CALL feature to ON when you use the access control feature.*

12.1 **Port Mode**

Accessible logical disks are set in ports in the port mode.

The access control in the port mode has the following features.

- Conversion between logical disk number for management in unit and that on host interface
- Masking by setting logical disks accessible from port
- Addition/deletion of logical disks accessible from port
- Registration of host permitting accesses

12.2 **WWn Mode**

Accessible logical disks in the system are set for each host (HBA) in the WWn mode.

The access control in the WWn mode has the following features.

- Conversion between logical disk number for management in unit and that on host interface
- Masking by setting logical disks accessible from host (HBA)
- Addition/deletion of logical disks accessible from host (HBA)
13. **Dynamic Data Replication**

This feature creates the replication of a logical disk in a single unit. To create the replication, the source logical disk must have the same capacity as the destination disk.

To use this feature, the specific software NEC Storage DynamicDataReplication sold separately is required. Refer to the manual provided with the software.

Before the Dynamic Data Replication can be used on this disk array unit, the license key provided with the software must be entered from "NEC Storage Manager" in order to release the license lock.

You can release the license lock and make settings by yourself.

NEC maintenance service representative provides the installation service (additionally charged) for releasing the license lock and making settings. Contact your maintenance service representative if necessary.

14. **Miscellaneous Settings**

Miscellaneous information shown below can be set by using the management software (NEC Storage Manager):

- Time in disk array
- Rank bind/unbind
- Logical disk bind/unbind
- Change of ownership of logical disk
- Hot spare settings
- Change of repair time

See "Guide to Setting of NEC Storage Manager Configuration" for the above settings.

The time in disk array is set at system activation by the time synchronization among controllers.

15. **Various Default Values**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross call</td>
<td>Off</td>
</tr>
<tr>
<td>Auto assignment</td>
<td>Off</td>
</tr>
<tr>
<td>Expand LUN</td>
<td>Off (Peripheral device addressing)</td>
</tr>
<tr>
<td>Auto repair mode</td>
<td>On</td>
</tr>
<tr>
<td>Hot spare mode</td>
<td>On (Level-b0: restoration executed)</td>
</tr>
<tr>
<td>1-BBU cache enable mode</td>
<td>On</td>
</tr>
<tr>
<td>1-CNT cache enable mode</td>
<td>Off</td>
</tr>
<tr>
<td>Access control</td>
<td>Off</td>
</tr>
<tr>
<td>Dynamic Data Replication</td>
<td>Off</td>
</tr>
</tbody>
</table>
16. **Notes on Use of NEC Storage DynamicDataReplication**

The following explains notes (state transition) if the event below occurs while Dynamic Data Replication is used:

- A controller is replaced
- The holding of cache memory data by the battery backup unit in power-off state exceeds the specified time.

<table>
<thead>
<tr>
<th>Activity State</th>
<th>Sync State</th>
<th>Pairing state</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separate</td>
<td>Separated</td>
<td>Entire difference. No status change</td>
</tr>
<tr>
<td></td>
<td>Sep-SYNCING</td>
<td>Change to fault state and abort of copy operation</td>
</tr>
<tr>
<td>Replicate</td>
<td>Rep-SYNCING</td>
<td>Entire difference. Replication retried automatically from</td>
</tr>
<tr>
<td></td>
<td>SYNCEDE</td>
<td>the first step. No status change</td>
</tr>
<tr>
<td>Restore</td>
<td>Res-SYNCING</td>
<td>Change to fault state and abort of copy operation</td>
</tr>
<tr>
<td></td>
<td>SYNCEDE</td>
<td></td>
</tr>
</tbody>
</table>

Any pair in which a fault has occurred is recovered by the following operation:

1. Issues Forced Separate in the RV target.
2. Executes the commands in the previous state again (Replicate → Separate or Restore).

The copy operation started again for the entire logic.
17.  **Disk Enclosure Movement**

For the movement of the position to which the disk enclosure is connected (including the change of the AL-PA switch on the disk enclosure), the disk enclosure movement feature reconfigures the disk drives within the disk enclosure with no destruction of ranks and LDs configured by the disk drives in the disk enclosure to make the host see that the disk enclosure operates normally.

However, do not conduct the following operations.

1. Movement of only a part of the disk enclosures when a rank configured over more than one disk enclosure exist
2. Movement of disk enclosure for which data is recovered in the spare disk
3. Movement of disk enclosure in which the disk array unit is operating
4. Movement of disk enclosure in which cache is subject to battery backup
5. Movement of disk enclosure in which defected disk drive is installed.
6. Movement of disk enclosure with the AL-PA switch set to "0"

If the disk enclosure movement fails, the SERVICE LED on the array controller repeats the operation of flashing for six times and turning-off.

If so, return the disk enclosure to the original state.

18.  **Setting of OS Type**

The OS type must be set for each port connected to the host when the Port Mode is used or when the Access Control is not used. If the host containing several kinds of operating systems is connected to one port, you may specify one of them. However, if the host using Solaris or AIX is contained, specify it in preference to other operating systems. If the host using both Solaris and AIX is contained, specify either one operating system. The OS type can be set with the "Configuration Setting" of the management software (NEC Storage Manager). In the WWn mode, use "LD Set Type" of the NEC Storage Manager to specify the OS.
19. Program Products

To use the disk array unit, the following program product is required:

NEC Storage BaseProduct Ver 2.1 - NEC Storage2300

To use the disk array unit, release the license lock using the license code that is provided with "NEC Storage BaseProduct Ver2.1 - NEC Storage2300."

A designated maintenance person is responsible for releasing the license lock of "NEC Storage BaseProduct Ver2.1-NEC Storage2300" during the installation of the disk array unit. Please give him the license code provided with the product.

Before the disk array unit can be used, the license lock must be released by using the license code provided with NEC Storage BaseProduct.
Be sure to release the license lock. A disk array unit without the license lock being released cannot receive any maintenance services because the operation cannot be guaranteed.

For any other program product available for the disk array unit, ask your sales representative.

20. Updating of Control Software

The disk array unit may upgrade the version of storage control software when a function or the like is additionally installed.

You can use the added function by updating the storage control software of which version has been upgraded.

You can update the storage control software by yourself. However, if you fail to update it, the disk array unit can no longer operate at the worst. NEC maintenance service representative provides the installation service (additionally charged) for updating the storage control software. It is strongly recommended that you should ask your maintenance service representative who has technical knowledge to update it.
Appendix B Installation Procedure

1. Creation of Logical Disks

The following procedure is required to create a logical disk.

The disk array unit contains three factory-installed disk drives that are bound (RAID-configured) through RAID-5 (2+P).

You can use this logical disk as is or after rebinding in accordance with the operating environment of your system.

Perform the procedure below to rebind a logical disk.

1. Unbind the logical disk that is already bound.
2. Bind the logical disk.
3. Set the CROSS CALL feature to ON (if necessary).

1.1 Unbinding Logical Disk Already Bound

To unbind the logical disk, 2-step procedure consisting of LD unbind and RANK unbind is required.

For how to use the management software (NEC Storage Manager), see "Several settings on PD (RANK unbind and LD unbind)" in "Guide to Setting of NEC Storage Manager Configuration".

Example: Unbinding logical disk 0 Already Bound

- LD unbind
  
  Select "5. LD Unbind" from the management software (NEC Storage Manager) menu and specify LUN=0.

- RANK unbind
  
  Select "2. RANK Unbind" from the management software (NEC Storage Manager) menu and specify PDG=0 and RANK=0.
1.2 Binding Logical Disk

To create a logical disk, 2-step procedure consisting of RANK bind and LD bind is required.

The RANK bind requires the specification of a RAID level. Select the RAID level carefully because it has certain influences on system performance and capacity. See Section 2.5 "RAID Configuration" for details.

The LD bind requires the specification of capacity. The specified capacity defines the number of logical disks in a single RANK. Select the capacity carefully because the unused area remaining may affect the performance on the capacity. See Chapter 11 "Logical Disk Capacity" in Appendix A for details.

See "Several Settings on PD (RANK and LD Bindings" in the "Guide to Setting Configuration of NEC Storage Manager" for how to use the management software (NEC Storage Manager).

Example: Creation of logical disk 0 of the maximum capacity in 36GB HDD of RAID 5 (6+P)

- Creation of RANK
  
  Select "1. RANK Bind" from the management software (NEC Storage Manager) menu and enter the values of the parameters as follows to bind the RANK:

  | Parameter Type | = s |
  | Raid Type      | = 5 |
  | Number of PD   | = 7 |
  | Number of RANK | = 1 |
  | Rebuilding Time| = 10|

- Creation of LD

  Select "4. LD Bind" from the management software (NEC Storage Manager) menu and enter the values of the parameters as follows to bind the logical disk:

  | Parameter Type | = s |
  | PDG No.        | = 0 |
  | RANK No.       | = 0 |
  | LD Capacity    | = 204520 |
  | Number of LD   | = 1 |
  | Format Time    | = 0 |
1.3 Turning on Cross Call Feature

To enable both controllers to access to all logical disks, it is necessary to turn on the cross call feature.

However, data destruction may occur if the transmission path feature is not provided by middleware such as NEC Storage PathManager. If so, it is recommended to use the logical disks with the cross call feature set to OFF.

See "Several Settings on Disk Array (Set of Cross Call)" in the "Guide to Setting Configuration of NEC Storage Manager".

Example: Turning on cross call

- Select "21. Cross Call" from the management software (NEC Storage Manager) menu to turn on the cross call setting.