DF500

Disk Array Subsystem

User's Guide

Sixth edition

Read this guide carefully and keep it.
• Before starting operation, read the safety instructions carefully and fully understand them. • After reading this guide, keep it at hand for your reference.

HITACHI

DF500
Disk Array Subsystem
User's Guide
Hardware Part

Precautions

Before using this equipment, please carefully read the instructions for safety described in this guide. Be sure to observe the precautions provided in the description.
Keep this guide in an easy-to-access place that allows the operator to refer to it any time.

Thank you very much for selecting the Hitachi DF500 Disk Array.
The Hitachi DF500 Disk Array Subsystem is an array unit used to store electronic data.

This user's guide describes the equipment operating method and precautions for the operator to operate the Hitachi DF500 Disk Array.

Note that Hitachi shall not assume the responsibility for any operation result deriving from an improper usage that is not described in this guide.

The Hitachi DF500 Disk Array Subsystem has been verified capable of being connected to all the devices listed below. Hitachi does not guarantee DF500's operation in connection with any system that has not yet been tested for connectivity with the DF500 subsystem.

For connection with a system not yet tested for the connectivity, consult your Hitachi sales representative.

Table 0.1 Typical Host Systems for which Their Connection with DF500 has Been Verified

	Vendor name	Model	OS
Server/work station connection	Sun	Ultra/Enterprise family	Solaris2.6, 7, 8
	HP	HP9000 family	HP-UX10.20, 11.00
	IBM	RS6000 family	AIX
	SGI	Origin200, Origin2000 family	IRIX6·5·7
	Compaq	Alpha family	Tru64 UNIX4.0
PC server connection		PC server	Windows 2000, Windows NT, Netware5.0, Redhat Linux 6.x

Table 0.2 Typical Rack Frame Systems for which the Mounting of DF500s on Their Racks has Been Verified

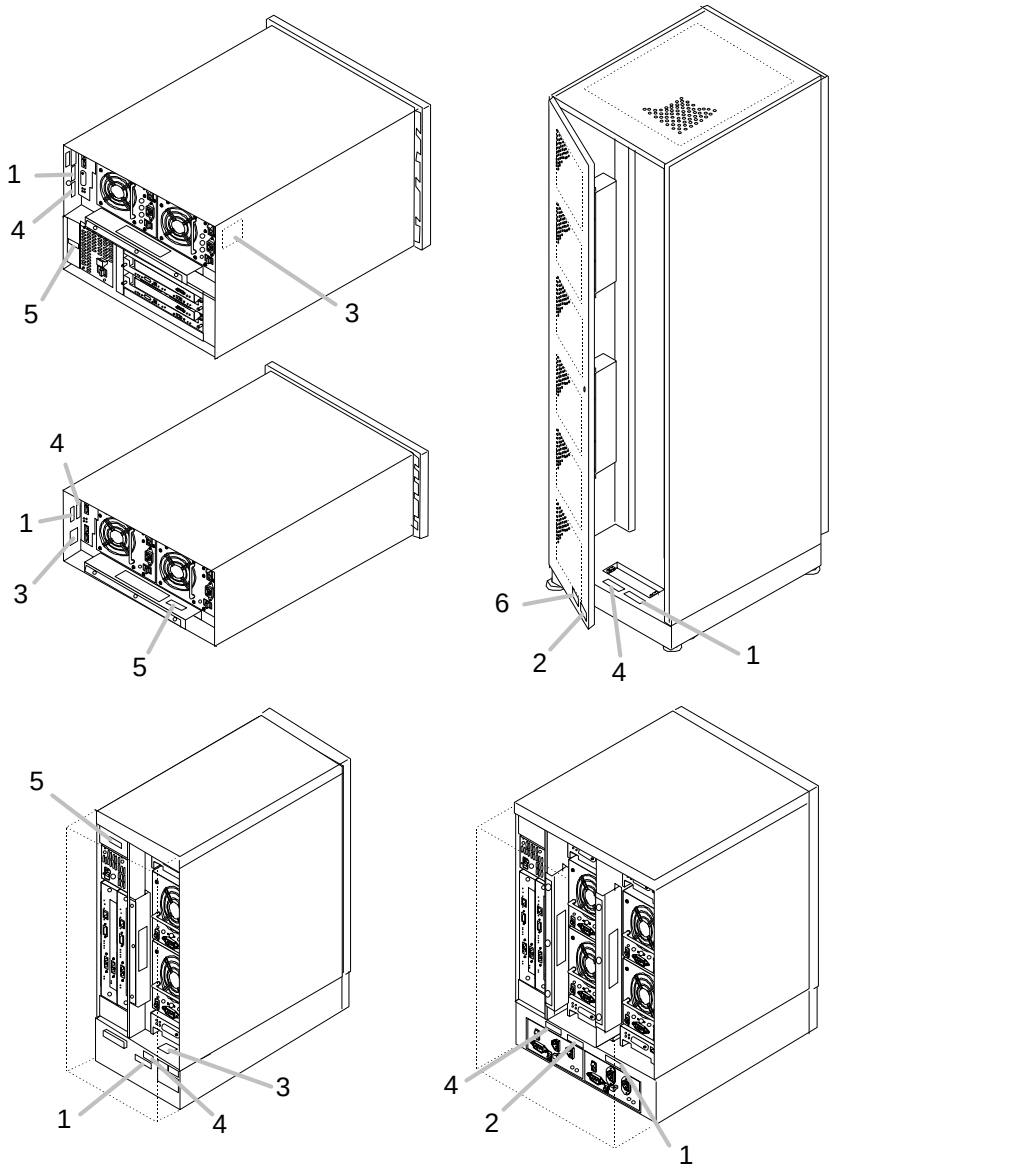
	Vendor name	Rack frame
Rack frame mounting	Hitachi	Rack frame (DF-F500-U6)
		Rack frame (DF-F500-U4)
		Hitachi common rack frame (3500, HA8000, and FLORA)
	HP	19-type rack frame (J1501A)

Equipment Warranty

The equipment free-of-charge warranty period is three years after the date of purchase.

EMI Regulation

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 in which case the user will be required to correct the interference at his own expense. Testing was done with shielded cables. Therefore, in order to comply with the FCC regulations, you must use shielded cables with you installation.



1

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,在這種情況下,使用者會被用要求採取某些適當的對策。

2

この装置は,クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI−A

3

"This equipment complies with the requirements in part 15 of FCC Rules for a Class A computing device and PartⅡ.Vol.122.No.20 of Canada Gazette for a Class A digital apparatus. Operation of this equipment in a residential area may cause unacceptable interference to radio and TV reception requiring the operator to take whatever steps are necessary to correct the interference."

4

檢磁3892W004

5

この装置は,クラスA情報技術装置です。
この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI−A

6

"This equipment complies with the requirements in part 15 of FCC Rules for a Class A computing device and PartⅡ.Vol.122.No.20 of Canada Gazette for a Class A digital apparatus. Operation of this equipment in a residential area may cause unacceptable interference to radio and TV reception requiring the operator to take whatever steps are necessary to correct the interference."

Figure 0.1 EMI Regulation Labels Affixed on the Subsystem

Registered Trademark and Copyright

- IBM is the registered trademark of the International Business Machines Corporation in U.S.A.
- Sun is the trademarks or registered trademark of the Sun Microsystems, Inc. in U.S.A.
- HP is the registered trademark of the Hewlett-Packard Corporation, Inc. in U.S.A.
- NCR is the registered trademark of the NCR Corporation in U.S.A.
- The other company names and product names described in the guide are the trademarks or registered trademarks of the respective companies.

Backup

Even if the user's data has been lost because of a failure, Hitachi cannot guarantee it. Therefore, make a backup copy of your data on your own account.
This will minimize data damage.

: For system parameter backup, refer to the User's Guide, Software Part, "Chapter 4 : Setting System Parameters" (page 63).

In addition, unit parameters are restored (set up again) after optional hardware components are added or replaced, and hence data backup is necessary.

Contents

List of Figures

List of Tables

On This Guide

Composition of This Guide

This guide is comprised of two parts, namely, hardware part and software part.
The respective parts explain the following contents.

- Hardware Part
  Contains the information required for using the equipment such as equipment installation and device-to-device cable connections.
- Software Part
  Contains the information on microprogram install processing, equipment parameter setting, and fault monitoring function.

Contents of the “Hardware” Volume

The hardware part consists of the following chapters.

“Chapter 1 : Safety Summary”
Describes important items to human accidents and equipment failures when using this equipment. Before using the equipment, read the contents of this chapter carefully with a good understanding of them.

“Chapter 2 : Precautions Before Use”
Descibes the items with which the operator must be familiar before using the equipment.
Before using the equipment, read the contents of this chapter carefully with a good understanding of them.

“Chapter 3 : On the Equipment”
Outline of the equipment is described for each model.

“Chapter 4 : Equipment Installation”
The area required for installing the equipment and method of installation are described.

“Chapter 5 : Corrective Measures for Faults”
Describes the corrective measures to be taken when any fault occurs in the equipment. Observe the corrective measures written in this guide.

“Chapter 6 : Routine Maintenance and Cleaning”
Describes the equipment inspection and cleaning methods.
Observe the procedure described in this guide when conducting the work.

“Appendix”
The following information is contained: the list of solution services, parts arrangement, locations and functions of LEDs, locations of connectors, equipment specifications, and explanation of terms used in this guide.

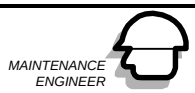
Conventions

Conventions used in this User's Guide are explained below.
The symbol marks used in this guide mean as follows.

Table 0.3 Representation in the Description

Representation example	Contents
“ ”	Represents the title of a chapter, section, or sub-section.
‘ ’	Represents a name that must be emphasized.
•	Represents that the contents having no relation with the order are itemized.

Table 0.4 Symbol Marks in the Description

Marks to be used	Contents of representation
	The contents of the description must be conducted by a maintenance engineer. (***Note 1***)
	There is a noteworthy point in the contetns of the description. (***Note 2***)
	Concerning the contents of the description, there are supplement contents.
	Concerning the contents of the description, there is a reference page.

Note 1 : Wherever this symbol mark is indicated, be sure to read and understand the notice before starting your work.
In addition, all work with this symbol mark indicated is referred to service personnel only. If the work is done by anyone other than service personnel, Hitachi does not ensure personal safety and machine operation.

Note 2 : Wherever this symbol mark is indicated, be sure to read and understand the notice before starting your work.

Conversion of Model Names

Throughout this guide, product model name is written as “DF500”. When you want to use this guide for the A-6542 seiries, please replace the model name “DF500” with “A-6542”.

REFERENCE  : For conversion of model names, refer to the “DF500 Disk Array Subsystem Specifications” manual.

Chapter 1 ⚠SAFETY SUMMARY

1.1 Common Precautions on Safety

When using the equipment, observe the following so as not to get hurt.
Read the following contents carefully with a good understanding of them.

- Perform operations in accordance with the instructions or procedures described in this manual.
- Be sure to follow the cautionary notes written on labels affixed to the equipment.
- Be sure to follow the cautionary notes written in this manual.

1.1.1 Symbol Marks

The catching heading below shows that a safety notice or instruction follows.
A combination of the heading "CAUTION" with a symbol (graphical symbol) is used.

This symbol indicates the existence of a potential hazard which may cause a rather light injury or serious damage to the equipment if the written contents are not observed.

1.1.2 Users are Requested to be Alert for Themselves

The precautions described in this manual have been reviewed enough. However, an unexpected accident may occur.
When operating the equipment, be on your own guard against an injury as well as observe the instructions written in the manual.

1.1.3 Repair, Modification, and Disassembly

Users must not repair, remodel, or disassemble the equipment. Such an action will cause an electric shock owing to a touch to a live part or a burning owing to a touch to a hot part. Or, it will cause a malfunction of the equipment.

1.2 Precautions for Using the Equipment

1.2.1 Precautions on Equipment

- If you take notice of unusual smell, abnormal heat generation, or smoke emission, shut off the power feed to the equipment and inform the maintenance engineer of it. Leave such a condition as it is will cause an electric shock or fire.
- Do not give any shock to the equipment by falling or striking, otherwise it will cause an electric shock, fire, or failure.
- Do not get on the equipment instead of a footstool. Avoid using the equipment for any use other than its original purpose.
  Otherwise, an injury or failure will be caused.
- Putting a heavy material on the equipment will result in an injury or failure due to falling.
  Do not put any heavy material on the equipment.

1.2.2 Precautions on Cables

- Route cables so that they do not catch your feet.
  If your feet are caught by cables and you fall over, this can cause personal injury.
- Do not put any heavy material on cable. Do not put cables near any apparatus that generates heat. The cable coating will break, resulting in an electric shock, fire, or failure.
- Make sure that no foreign particles are stuck on the power plug and then insert it securely to its root.
  Remove such foreign particles if they are found because they will cause a fire. Improper insertion will cause an unexpected plug slip-out, resulting in a loss of important data.

1.2.3 Precautions on Air Vent

- Cool air is taken in from the air vent on the front of the unit and exhaust air is expelled from the vent on the rear to prevent the temperature from rising inside the unit. If the vents are blocked by placing any object in front of or against the vents, the temperature will rise inside the unit, resulting in an electric shock or fire.
  Perform inspection and cleaning periodically so that the air vent may not be clocked up with foreign particles.

  REFERENCE  : For the cleaning method, refer to "Chapter 6 Routine Maintenance and Cleaning". (For the rack mount model, refer to page 78. For the floor model, refer to page 82.)

- Do not put any metallic material such as clip or any combustible material such as paper into the equipment from the air vent. It will cause an electric shock or fire.

1.2.4 Precautions on Battery Unit

The battery unit has a risk of causing an electric shock or explosion, so observe the following when handling the battery :

- Do not perform disassembly and modification.
- Do not perform deformation.
- Do not cause a short circuit by touching the section between the positive (+) terminal and the negative (-) terminal with a wire.
- Do not connect between the positibe (+) terminal and the negative (-) terminal reversely.
- Do not peel off the sheath tube.
- Do not make a direct connection to the power plug socket.
- Do not perform discharging or charging by connecting to any material other than the equipment.
- Store the battery in a cool and dark place instead of a high-temperature place.

1.2.5 Other Precautions

- When a failure occurs in the unit, take action according to this manual so as to prevent personal injury.
  If the trouble does not correspond to any corrective measure written in this manual, inform the maintenance engineer of it.

1.3 Precautions for Performing Inspection and Cleaning

- In order to prevent a human accident, observe the instructions and procedures described in the manual.
- Make sure of the equipment power shut-off method to provide against an emergency before starting the work.
- Before starting the work, check if there is any wet floor or imperfect grounding conductor, and remove probable causes for an accident of electrick shock.
- Do not put parts on the passage. They will cause an unexpected hurt or equipment failure. Arrange the area around the work place in order.
- When performing the work with the door open, take off a metal watch or ornaments to prevent an electric shock. If you wear metal-frame glasses, take care not to receive an electric shock by touching any part in the equipment.
- When approaching the rotating section or operating section in the equipment, fix the necktie and hair so that they may not be caught by these sections.
- There are high-voltage parts in the equipment.
  When performing the work with the door open, do not touch any portion other than those indicated in this manual.
  Another person should be on alert so as to shut off the power feed to the equipment.
- After the power feed to the equipment is shut off, electricity remains in some portions of the equipment for a certain time. This will lead to an electric shock. Therefore, do not touch any portion other than those indicated in this manual.
- Some parts in the equipment get hot. This will lead to a burn. Therefore, do not touch any part other than those indicated in this manual.
- When performing the work with the door open, put on cotton gloves to prevent the hands from getting hurt by sharp portions and ends of parts.

1.4 Precautions in an Emergency

1.4.1 Occurrence of an Electric Shock

- Do not touch the person struck by electricity in haste. You will be the second victim.
- To shut off the electric flow to a victim, disconnect the power feed cable of the equipment. In spite of this action, electricity cannot be shut off, separate the victim from the current source by using a non-conductive material such as dry wooden bar.
- Call an ambulance car for the victim.
- When the victim has lost consciousness, practice artificial respiration on the victim. To provide for such a case, learn how to practice artificial respiration.
- When the victim's heart has stopped, give a heart massage. The treatment should always be conducted by a person who has been trained and qualified. Unqualified person is prohibited from conducting this treatment.

1.4.2 Occurrence of a Fire

- To shut off the electric flow to the equipment, pull out the power feed cable to stop the power supply.
- If a fire cannot be extinguished though the electric flow has been shut off, perform fire fighting and inform the fire station of it.

1.5 Warning Indications

1.5.1 ⚠ CAUTION Statements

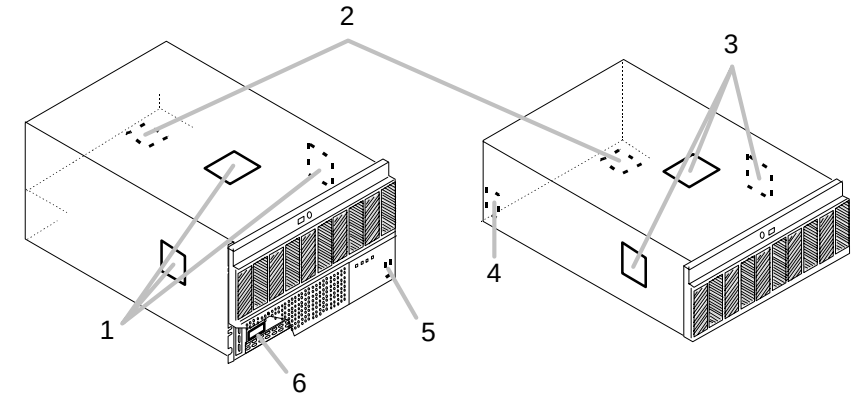
⚠ CAUTION statements described in this manual and pages where they appear are listed below.

Table 1.1 ⚠ CAUTION Statements

Warning Statement	Corresponding Page
The weight of RK is 65 kg and the weight of RKA is 40 kg. When lifting the equipment, be sure to lift it carefully with two or more workers. If a single person tries to do it, the waist will get hurt.	23
The weight of H1F is 85 kg and the weight of H2F is 140 kg. If they fall over, this can cause personal injury. Move these units slowly.	37
The fan rotates at a high speed. Take care not to cause the finger to be caught by it.	69, 76, 80
When performing cleaning, take care not to touch the powered portion, otherwise an electric shock will be caused.	78, 82
If you touch live electric parts while replacing parts, this can cause an electric shock.	62, 64, 65, 67, 69, 70, 72

1.6 Warning Labels Paseted on the Equipment

In this equipment, warning labels at pasted on portions requiring special care. These portions with the labels paseted are indicated in the following figures.
Observe the written contents and pay attention to them.



1

注 意
落下注意
上の線を超えて本装置を引き出した場合落下の危険がありますので、手を離さないで下さい。
CAUTION
DO NOT RELEASE HAND OFF
AFTER RED LINE CLEAES RACK
注 意
重量物注意
装置の質量は、65 kg です。
取り扱いには、十分注意して下さい。

2

CAUTION : THIS SUBSYSTEM HAS A DUAL POWER SUPPLY SYSTEM.
WHEN REPLACEING THE POWER SUPPLY, DISCONNECT THE POWER CABLES CONCERNED BEFOREHAND SO AS TO AVOID AN ELECTRIC SHOCK..
AVERTISSEMENT : CE SOUS-SYSTÈME A UN DOUBLE SYSTEME D' ALIMENTATION EN COURANT.
注意 この装置は、二系列の電源構成になっています。
感電防止の為、該当する 電源を交換する時は事前に
該当する電源ケーブルを分離してください。

3

注 意
落下注意
上の線を超えて本装置を引き出した場合落下の危険がありますので、手を離さないで下さい。
CAUTION
DO NOT RELEASE HAND OFF
AFTER RED LINE CLEAES RACK
注 意
重量物注意
装置の質量は、40 kg です。
取り扱いには、十分注意して下さい。

4

WARNING
Replacement of the components (HDU,PCB, Battery etc.) in this unit without procedures in the manuals may destory configuration information and user data.
警 告
このディスクアレイ装置内の HDU, PCB, バッテリー等の部品交換時に、適切な手順を行わない場合、構成情報が失われユーザーデータを破壊します。

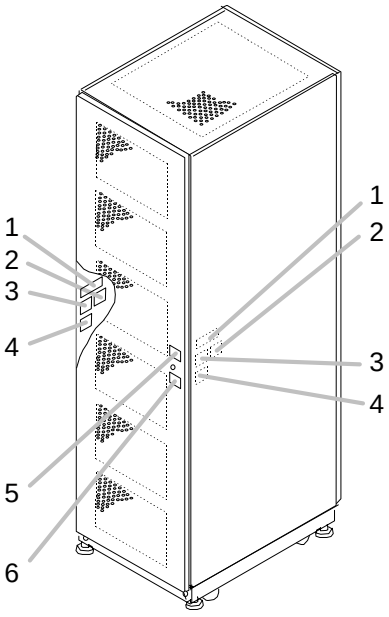
6

注 意
本部品は、バッテリを内蔵しています。
廃棄時には、リサイクル処置をして下さい。
分解しないで下さい。
落下させないで下さい。

5

警 告
このディスクアレイ装置内のHDU, PCB, バッテリ等の部品交換時に、適切な手順を行なわない場合、構成情報が失われユーザーデータを破壊します。
WARNING
Replacement of the components (HDU, PCB,Battery etc.) in this unit without procedures in the manuals may destory configuration information and user data.

Figure 1.1 Positions and Contents of Labels Pasted on the Rack mount Model



1

CAUTION
THIS UNIT HAS MORE THAN ONE POWER SUPPLY CORD. DISCONNECT TWO POWER SUPPLY CORDS BEFORE SERVICING TO AVOID ELECTRIC SHOCK.

ATTENTION
CET APPAREIL COMPORTE PLUS D'UN CORDON D'ALIMENTATION. AFIN DE PREVENIR LES CHOCS ELECTRIQUES, DEBRANCHER LES DEUX CORDONS D'ALIMENTATION AVANT DE FAIRE LE DEPANNAGE.

2

注 意

感電注意

火災・感電の原因となることがあります。
電源接続の前に設置接続が必要です。

3

WARNING

High leakage current.
Can cause electric shock.
Earth connection essential before connecting supply.

4

警 告

本装置内は2箇所から給電されています。
感電に注意して下さい。
保守の際は給電ケーブルを2箇所抜いて下さい。

5

注 意

危険箇所

けが及び感電の原因となることがあります。

保守員以外の扉の開閉を禁止します。

6

CAUTION

Hazardous area.
Can cause electric shock or injury.
Refer opening the door to trained service personnel only.

Figure 1.2 Positions and Contents of Labels Pasted on the U6 Rack Frame

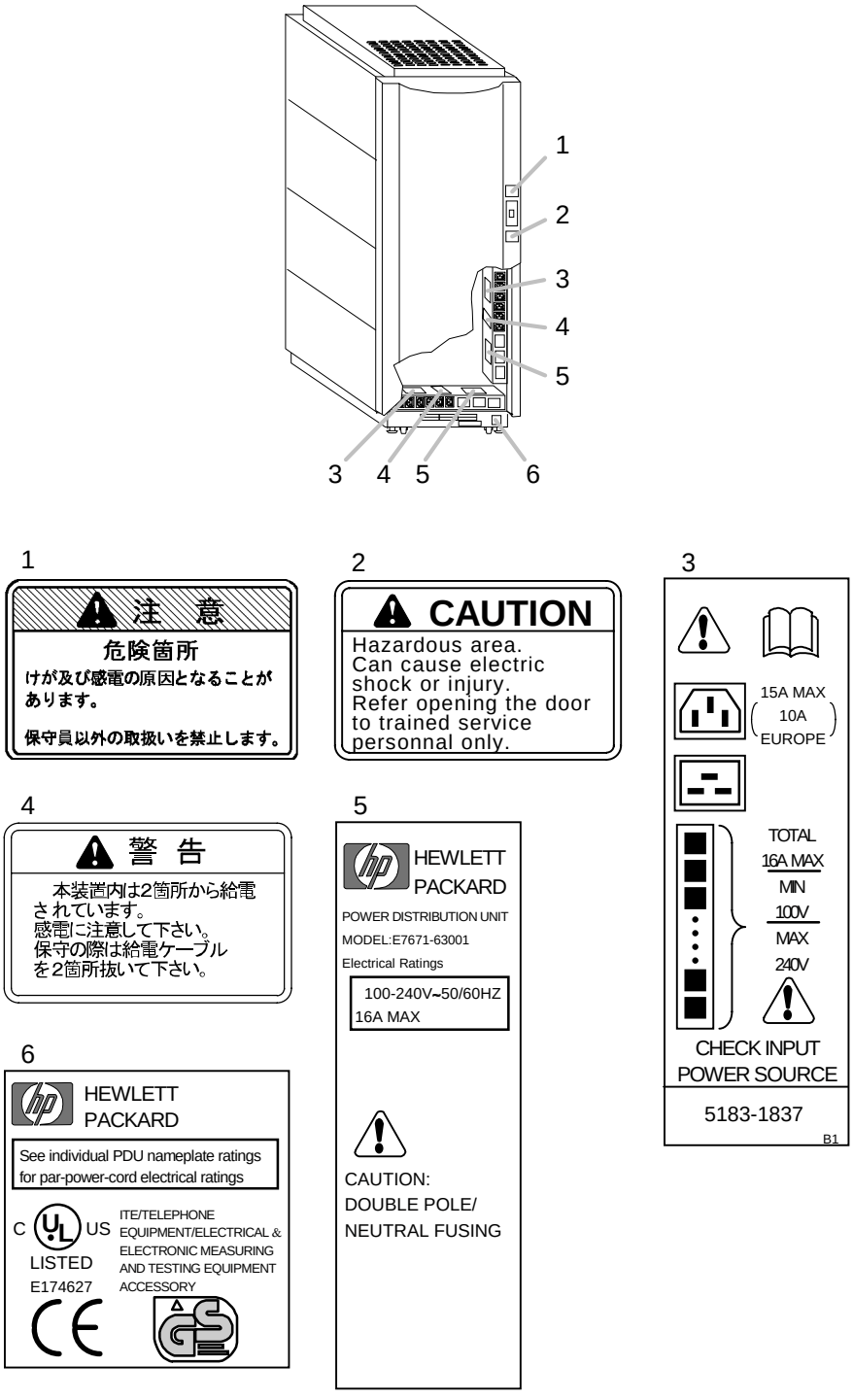
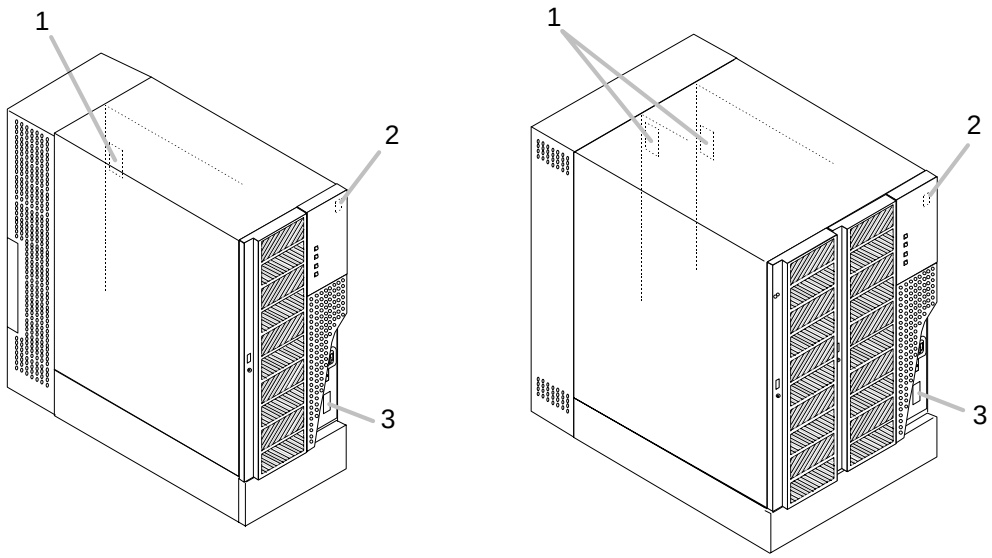


Figure 1.3 Positions and Contents of Labels Pasted on the U4 Rack Frame



1

⚠ CAUTION : THIS SUBSYSTEM HAS A DUAL POWER SUPPLY SYSTEM.
WHEN REPLACEING THE POWER SUPPLY, DISCONNECT THE POWER CABLES CONCERNED BEFOREHAND SO AS TO AVOID AN ELECTRIC SHOCK..

⚠ AVERTISSEMENT : CE SOUS-SYSTÈME A UN DOUBLE SYSTEME D' ALIMENTATION EN COURANT.

⚠ 注意　この装置は、二系列の電源構成になっています。
感電防止の為、該当する 電源を交換する時は事前に
該当する電源ケーブルを分離してください。

2

⚠ 警　告

このディスクアレイ装置内のHDU, PCB,バッテリ等の部品交換時に、適切な手順を行なわない場合、構成情報が失われユーザーデータを破壊します。

⚠ WARNING

Replacement of the components (HDU, PCB,Battery etc.) in this unit without procedures in the manuals may destory configuration information and user data.

3

⚠ 注　意	本部品は、バッテリを内蔵しています。 廃棄時には、リサイクル処置をして下さい。 分解しないで下さい。 落下させないで下さい。

Figure 1.4　Positions and Contents of Labels Pasted on the Floor Model

Chapter 2 Precautions Before Use

2.1 For Correct Use

This section describes the items required to correctly use the equipment.

- This equipment belongs to “Class 1 Laser System” that emits no hazardous laser beams. To prevent a human accident and equipment failure, do not perform any operation other than those written in this manual.
- Be sure to close the unit outer cover for safety operation and noise reduction during using. In addition, the outer cover is useful to suppress radiation of radio waves and emission of acoustic noise, and to shield the unit from radio waves around.
- When the unit stops, do not restart it until one minute passes after the POWER LED (green) goes out.
  If you do so, the unit may fail to start.

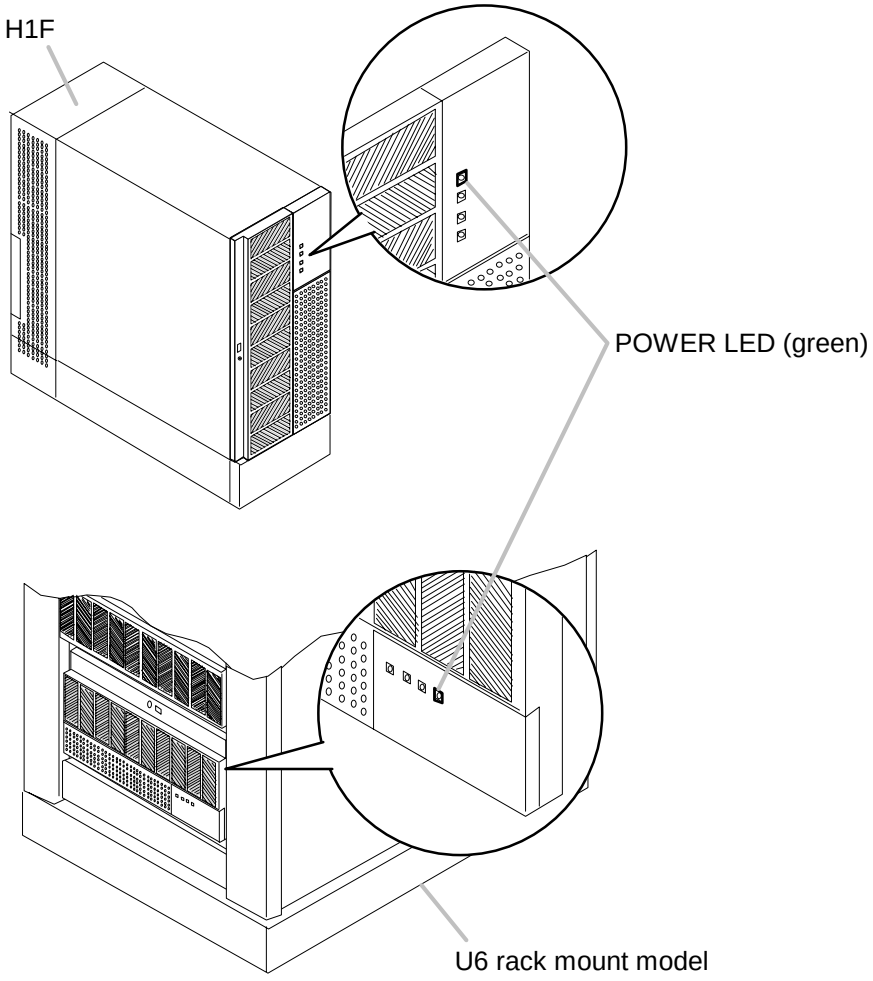


Figure 2.1 POWER LED Position

2.1.1 Battery Unit

The service life of battery units is two years from the beginning of use.
Over a period of two years, a battery unit will reduce its capability, and this can cause loss of your indispensable data. Therefore, ask your service representative to replace the battery unit.

2.1.2 Recycling

A lead-acid battery is used as a battery in the battery unit.
A lead-acid battery is a resource that is can be recycled.
Therefore, ask your service representative to replace the battery unit.

2.1.3 Measures against electrostatic discharge

In order to protect parts of the subsystem from electrostatic discharge, service person is required to put a wristband on his/her wrist before starting installation or maintenance work.

2.1.4 Acoustic noise of the disk drive

The disk drive may emit mechanical sound, click-clack, when the disk drive is started (spun up) immediately after the subsystem powering on and when the disk drive is powered off (spun down). However, since it does not mean a problem as long as the WARNING or ALARM LED of the basic frame is off, you may se the subsystem as it is.

Chapter 3 On the Equipment

3.1 Outlines of DF500 Disk Array Subsystem

The following outlines the DF500 Disk Array Subsystem.
The DF500 Disk Array Subsystem is lined up with the following models:

- Rack mount model RK
- Rack mount model RKA
- U6 rack mount model
- Floor model H1F
- Floor model H2F

The DF500 Disk Array Subsystem supports the Fibre Channel interface for connection with the host computer.
The following sections describe an outline of individual models.

The RK and RKA models can be mounted on a U4 rack frame or a standard 19-type rack frame (goods on the market), by using a rack frame, an accessory of the unit.
For details, consult your Hitachi sales representative.

3.2 Rackmount Model

The rackmount model is a equipment composed of a combination of the RK and RKA mounted on a rack frame.

The RK is capable of mounting up to 10 disk drives, and includes a controller to perform RAID control on the drives.
The following figure shows an external view of the RK.

The RKA is an additional unit that is capable of mounting up to 10 disk drives, and controls its drives through connection with an RK. The RKA is provided with no controller.
The following figure shows an external view of the RKA.

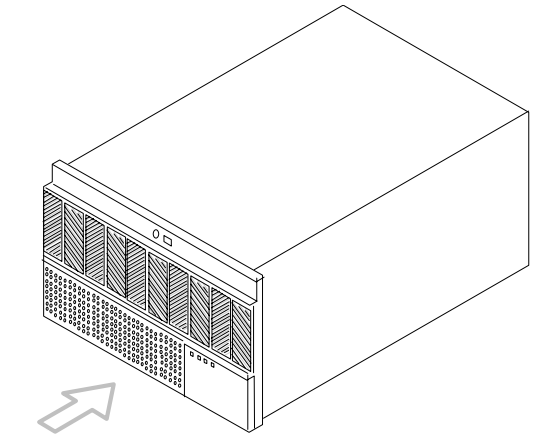


Figure 3.1 External View of the RK

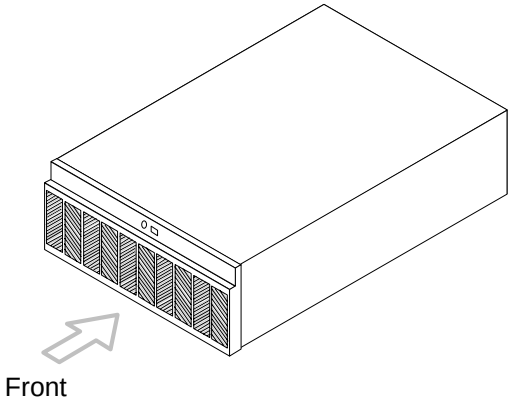


Figure 3.2 External View of the RKA

3.2.1 U6 Rackmount Model

When mounting the RK and RKA on the U6 rack frame for exclusive use, a wide variety of composition, from the single RK to a system with a hundred disk drives produces through an addition of the RKAs, is available.

SUPPLEMENT : Since the RK controls the system, at least one RK must be mounted. For details, consult with Hitachi, Sales Division in charge.

The U6 rack frame can mount a 6-EIA RK and 3.5-EIA RKAs up to 38 EIAs.
A diversified combination such as “RK (1 unit) + RKA (9 units)” and “RK (4 units) + RKA (4 units)” can be implemented.

As an example, the following figure shows an external view of a system consisting of one RK and 9 RKAs.

REFERENCE : For the specifications of the U6 rackmount model, refer to “Appendix E : Basic Specifications” (page 92) at the end of this guide.

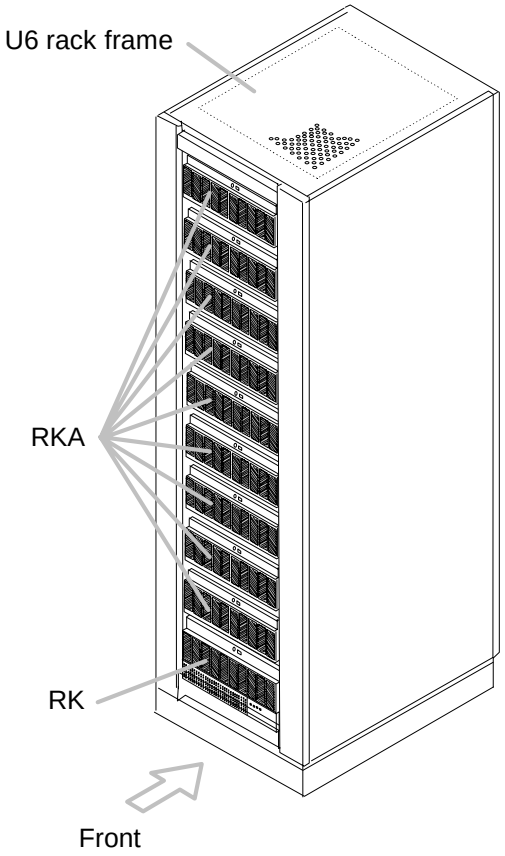


Figure 3.3 External View of the U6 Rackmount Model (1 RK + 9 RKAs)

3.3 Floor Model

There are two types of floor model, namely, H1F and H2F.

3.3.1 H1F

The H1F is capable of mounting up to 10 disk drives, and includes a controller to perform RAID control on the drives.
The following figure shows an external view of the H1F.

REFERENCE : For the specifications of the H1F, refer to “Appendix E : Basic Specifications” (page 92) at the end of this guide.

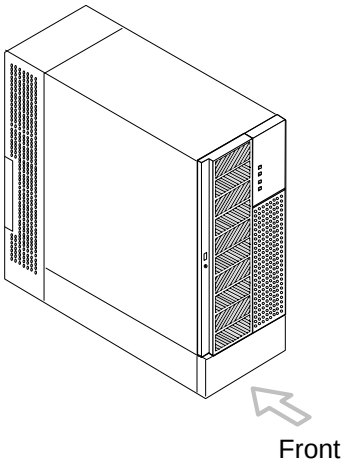


Figure 3.4 External View of the H1F

3.3.2 H2F

The H2F is capable of mounting up to 20 disk drives, and includes a controller to perform RAID control on the drives.
The following figure shows an external view of the H2F.

REFERENCE : For the specifications of the H2F, refer to “Appendix E : Basic Specifications” (page 92) at the end of this guide.

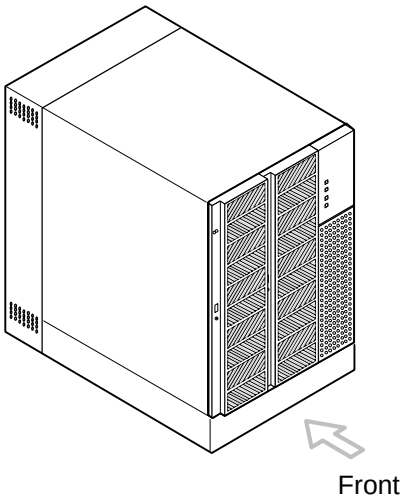


Figure 3.5 External View of the H2F

Chapter 4 Equipment Installation

4.1 Installing the Rackmount Model

: The installation of a U6 rack frame is referred to trained service personnel only. The user must not do it.

This section descibes procedures for installing the DF500 by taking the U6 rack mounting model as an example.
For the installation procedures by mounting on a rack other than a U6 rack frame, consult your Hitachi sales representative.

4.1.1 Place for Installing the Equipment

To maintain the DF500 performance, the DF500 must be installed in a proper environment.
Do not install the equipment in such places as shown below because the equipment life will be shortened or the equipment will result in a failure.

- Place exposed to direct sunlight.
- Place where the temperature and humidity varies much. (For example, near an air conditioner)
- Place near an apparatus that generates electric noise. (For example, air conditioner that is not grounded and washing machine motor)
- Place near an apparatus that generates a strong magnetic field.
- Very dusty place.
- Place exposed to frequent vibrations
- Place such as inclined floor.

4.1.2 Area Required for Installing the Equipment

The following figure shows an area required for installing the equipment.
Be sure to install the equipment in a place with the area shown in the figure so as to avoid problems; for example, the equipment door cannot be opened at maintenance work and ventilation cannot be performed enough.

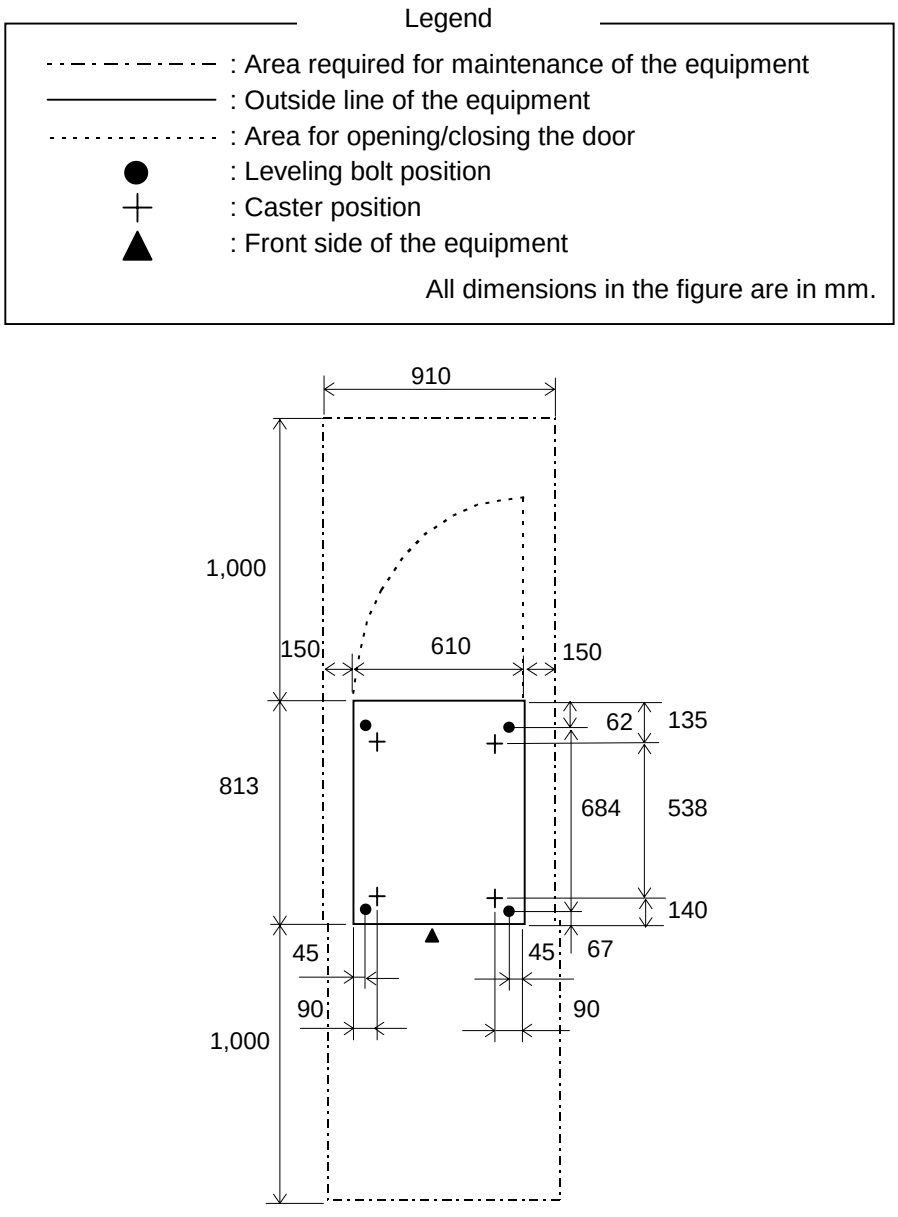


Figure 4.1 Area Required for Installing the U6 Rack Mount Model

4.1.3 Unpacking the U6 Rack Frame

: The unpacking of the shipping outer package of a U6 rack frame is referred to trained service personnel only.
The user must not do it.

The procedure for unpacking the U6 rack frame is shown below.

1. Remove the external packaging and packing materials.
2. Take the rack frame out of the polyethylene bag.
3. Check all items provided with the U6 rack frame against the table below.

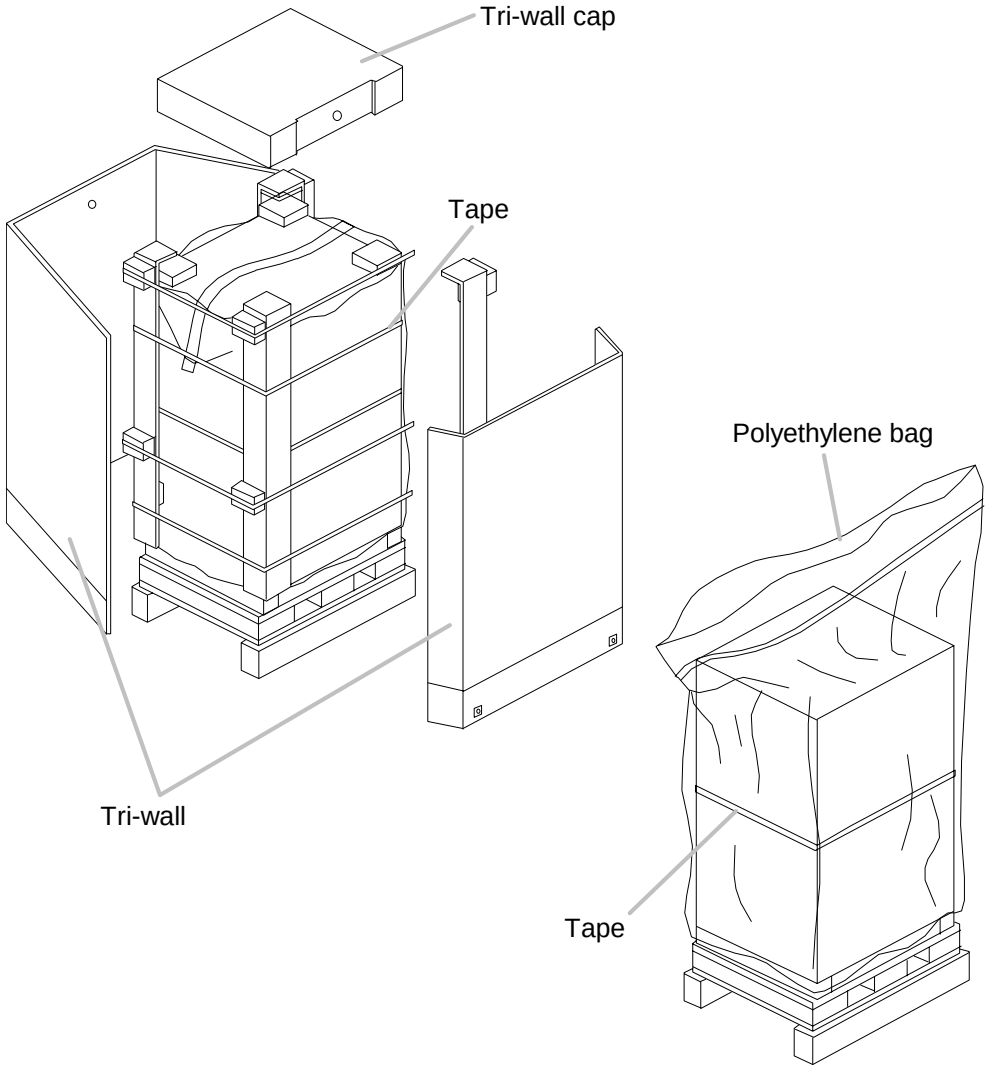
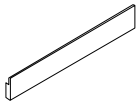
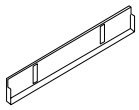
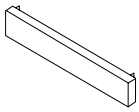
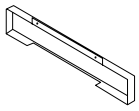
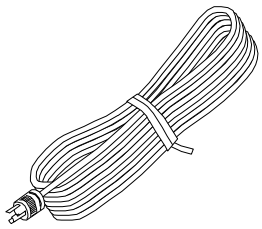


Figure 4.2 Packed Status of the U6 Rack Frame

Table 4.1 List of Component Parts (U6 rack frame)

No.	Item name	Units	External view
1	Skirt (right)	1	
2	Skirt (left)	1	
3	Skirt (front)	1	
4	Skirt (rear)	1	
5	Holder (right)	2	
6	Holder (left)	2	
7	Power cable	4	
8	Screw (For securing the Skirt, Holder)	10	

4.1.4 Checking the Attached Parts

Make sure that there is not any damage or skewness that may have been caused during transportation.
Collate the equipment configuration (model No., serial No., and quantity) witht he attached component parts list.

4.1.5 Installing the U6 Rack Frame

MAINTENANCE ENGINEER : The installing of a U6 rack frame is referred to trained service personnel only. The user must not do it.

Move the U6 rack frame to the installation place.
Install the rail in accordance with the contents to be mounted, adjust the leveling bolts, and take an earthquake-proof measure.

4.1.6 Unpacking the Equipment to be Mounted in the U6 Rack Frame

CAUTION : The weight of the RK is 65 kg and the weight of the RKA is 40 kg. When lifting the equipment, be sure to conduct the work with 2 or more workers. If the equipment is lifted by a single worker, the waist will get hurt.

When unpacking the equipment, do not give any shock to it. Otherwise, a failure of the equipment may be caused. Perform unpacking according to the following procedure.
The figure shows a case of RK. The procedure for unpacking the RKA is the same as that for the RK.

1. Open the corrugated fibreboard case and take out the component parts list and the case containing attachments.
2. Take out the equipment from the corrugated cardboard box.
   Be sure to lift it by two or more persons so as not to give it an impact by dropping it.
3. Remove the polyethylene bag covering DF500 unit, and peel off the tapes fixing labels and etc.
4. Check items are missing, please notify your Hitachi sales representative.

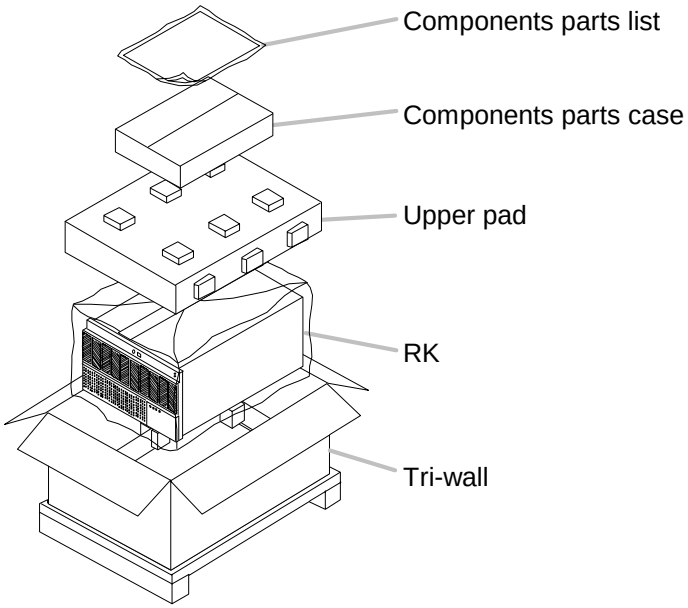


Figure 4.3 Packed Status of the RK

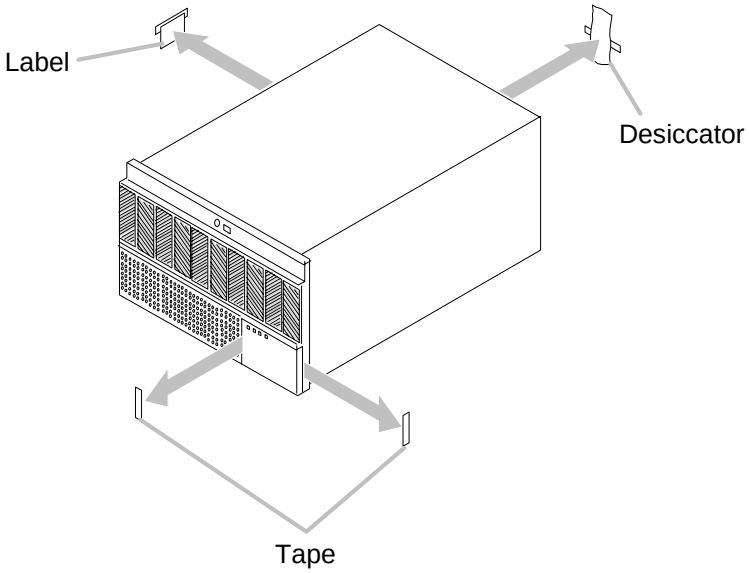


Figure 4.4 Location of Tape, etc.

Table 4.2 List of Component Parts (RK)

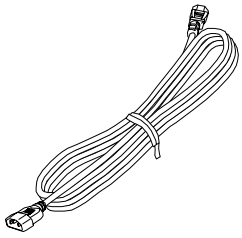
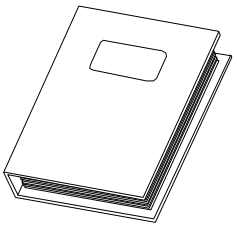
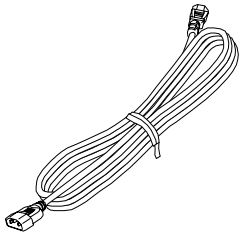
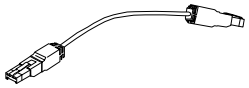
No.	Item name	Units	External view
1	Power cable (DF-F500-J2F)	2	
2	Key	2	
3	User's guide	1	

Table 4.3 List of Component Parts (RKA)

No.	Item name	Units	External view
1	Power cable (DF-F500-J2F)	2	
2	ENC cable (marked in milk white)	2	
3	ENC cable (marked in yellow)	2	

4.1.7 Checking the Attached Parts

Make sure that there is not any damage or skewness that may have been caused during transportation.
Collate the equipment configuration (model No., serial No., and quantity) with the attached component parts list.

4.1.8 Installing the U6 Rack Frame

MAINTENANCE ENGINEER : The mounting of RKs and RKAs on a U6 rack frame is referred to trained service personnel only.
The user must not do it.

1. Insert an Allen wrench into the keyhole on the rear door, and turn it counterclockwise to release the latch.
   Pull the rear door toward you with the latch released.
2. Mount RKs and RKAs on a U6 rack frame and fix them.
3. If you do not mount RKs and RKAs on a U6 rack frame up to a maximum allowed, attach a decoration panel to the front of empty rows individually.

INPORTANCE : Mount RKs and RKAs on a U6 rack frame, starting at the bottom row and progressively upward, so as to prevent a U6 rack frame from falling over.
There may be a case where it is necessary to stick the EMI gasket on the RK/RKA before mounting the RK/RKA.

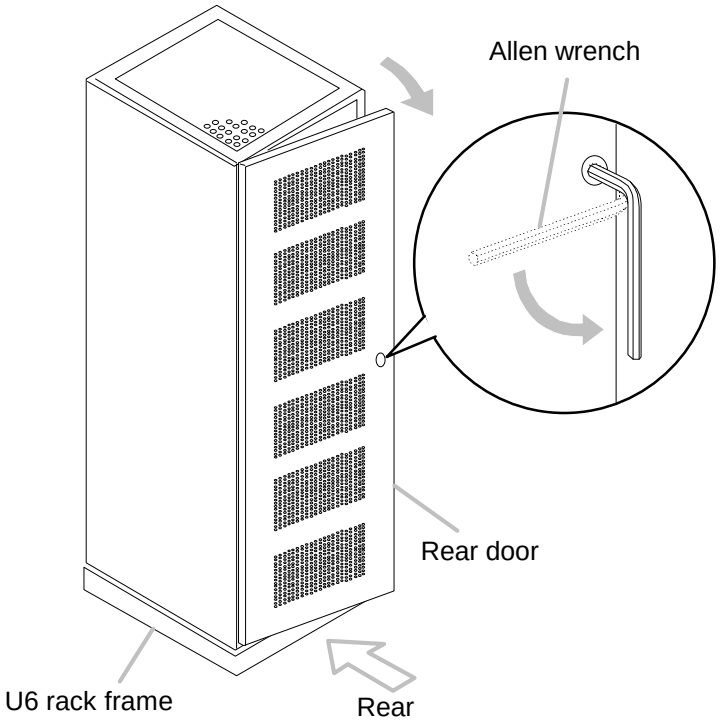


Figure 4.5 Opening the Rear Door

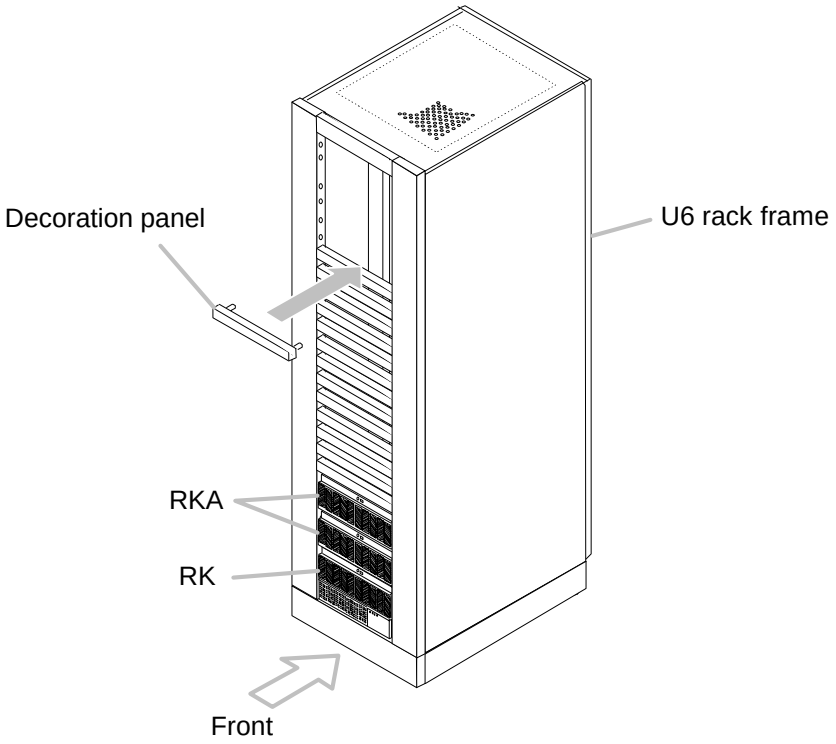


Figure 4.6 Attaching the Decoration Panel

4.1.9 Connecting Cables

MAINTENANCE ENGINEER : The connecting of cables to the DF500 unit is referred to trained service personnel only.
The user must not do it.

The following describes procedures for connecting cables.

1. Set all the breakers in the PDBs to off (four breakers).
2. Connect ENC cables.
3. Connect power cables.
4. Connect interface cables (Fibre Channel/SCSI).
5. Insert an allen wrench into the keyhole on the rear door, turn it counterclockwise to release the latch, and then close the rear door with the latch released.
   After closing the door, turn the allen wrench clockwise to set the latch in a lock position.

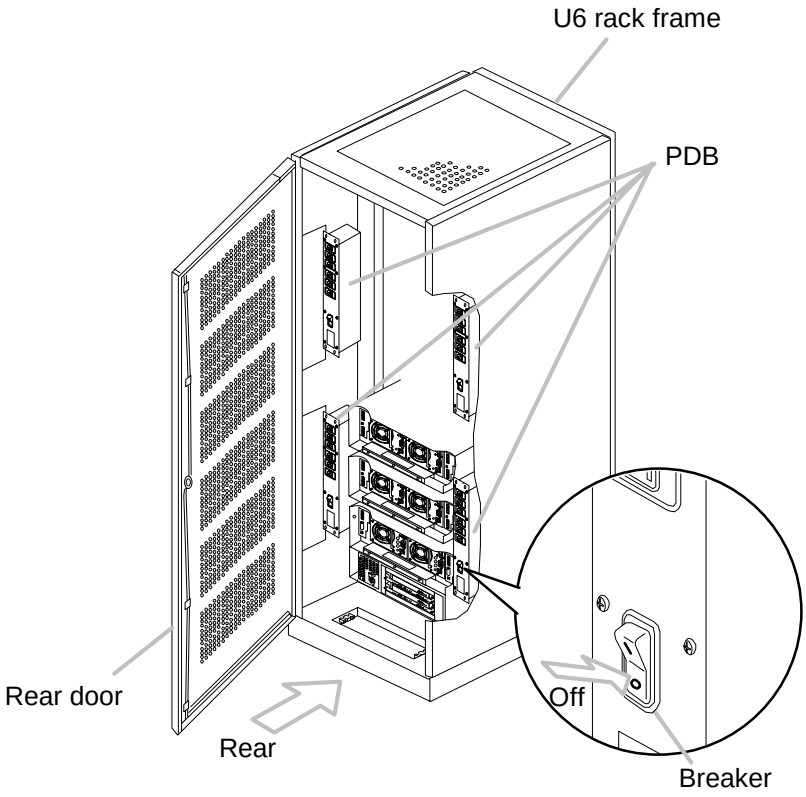


Figure 4.7 Location of Breaker

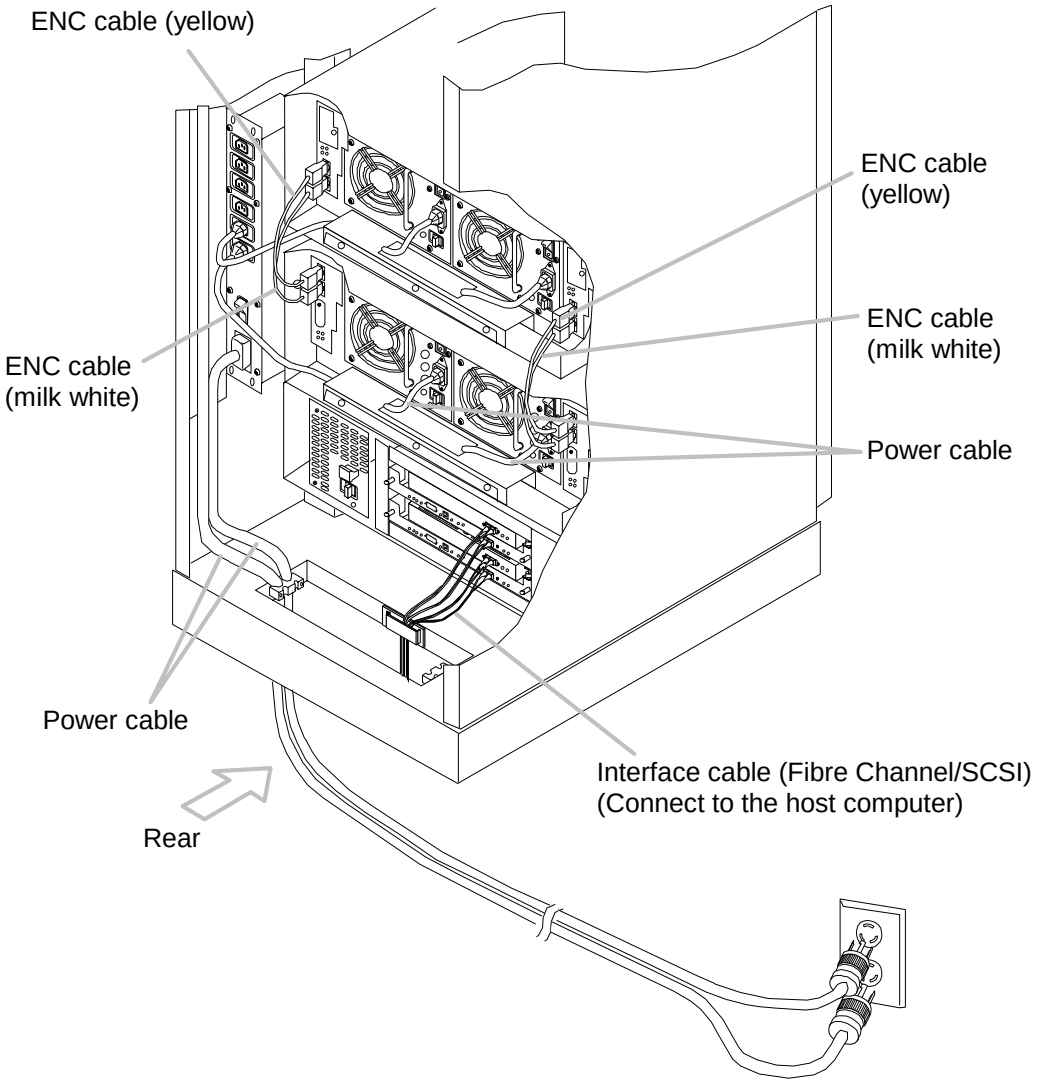


Figure 4.8 Connecting the Cables

4.1.10 Starting the Equipment

The procedure for starting the U6 rack mount model is described below.

1. Turn off the main switch. (see figure 4.9)
2. Insert the key attached to the equipment in the keyhole of the RK front bezel. Turn the key 90° clockwise for unlocking.
   Holding the front bezel with hands, slide the lock button upward. (see figure 4.10)

INPORTANCE : Remove the front bezel calmly and slowly, otherwise the user's important data will be lost.

3. Slide and hold the lock button to an upper position, and pull the upper side of the front bezel toward you about 3 cm.
   Lift the front bezel in that condition to remove it, and then set the battery switch to on. (see figure 4.11)
4. Open the rear door of a U6 rack frame, and set the AC/DC power breakers to on. (see figure 4.12)
5. Turn on the mein switch.
6. Set all the breakers in the PDBs to on.
7. Make sure that the READY LED (green) comes on in 2 or 3 minutes. (see figure 4.13)

REFERENCE : When the READY LED does not come on, refer to "Chapter 5 When you are in difficulty" (page 58)

8. Set the unit parameters.
9. Set the power control to 'Remote', the DF500 unit can be started and stopped remotely from the host computer. If set to 'Local', the unit is started and stopped by its self. (see figure 4.14)

INPORTANCE : When making the subsystem remotely controlled using the fibre channel interface connection, the optional remote adapter is required.

10. Insert the key into the keyhole and turn it clockwise 90°.
11. Engage the hooks on the unit side in the grooves on the bottom of the front bezel, and press the upper side of the bezel until you hear the lock button click into place.
    Then, turn the key counterclockwise 90° to lock the front bezel, and pull out the key. (see figure 4.15)

INPORTANCE : Attach the front bezel calmly and slowly, otherwise the user's important data will be lost.

12. Close the rear door.
13. Power on the host computer.

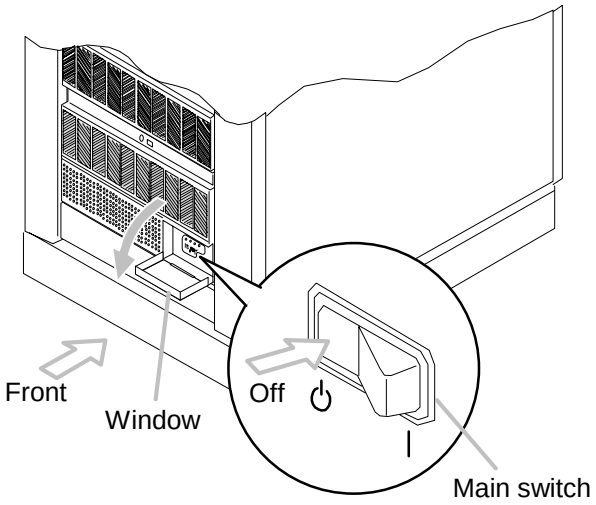


Figure 4.9 Location of Main Switch

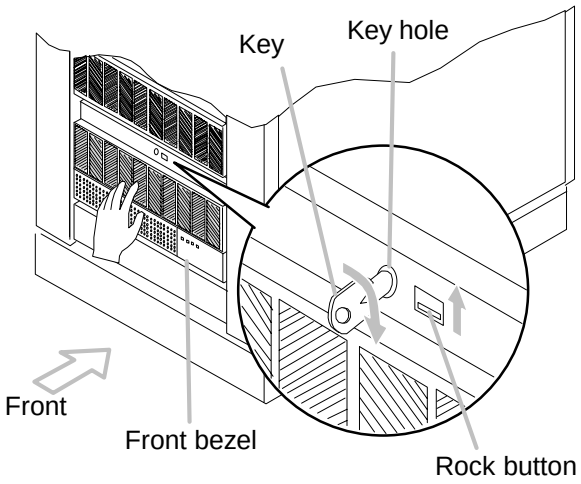


Figure 4.10 Remove the Front Bezel (1)

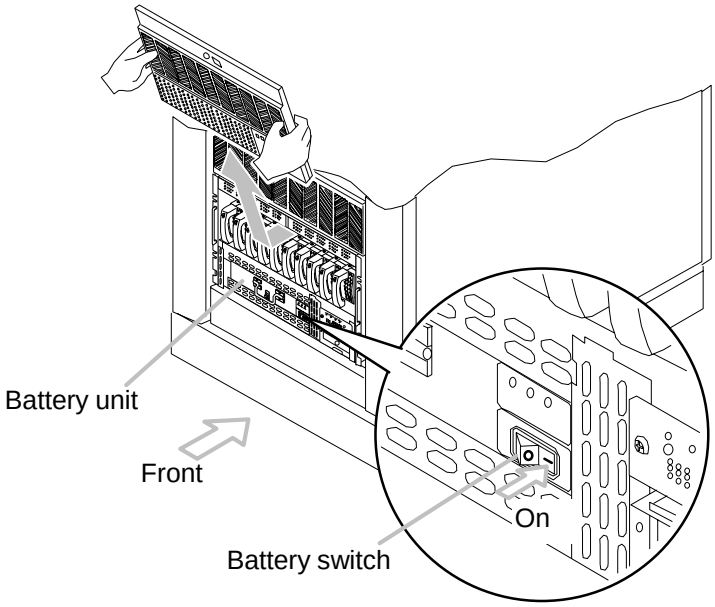


Figure 4.11 Remove the Front Bezel (2)

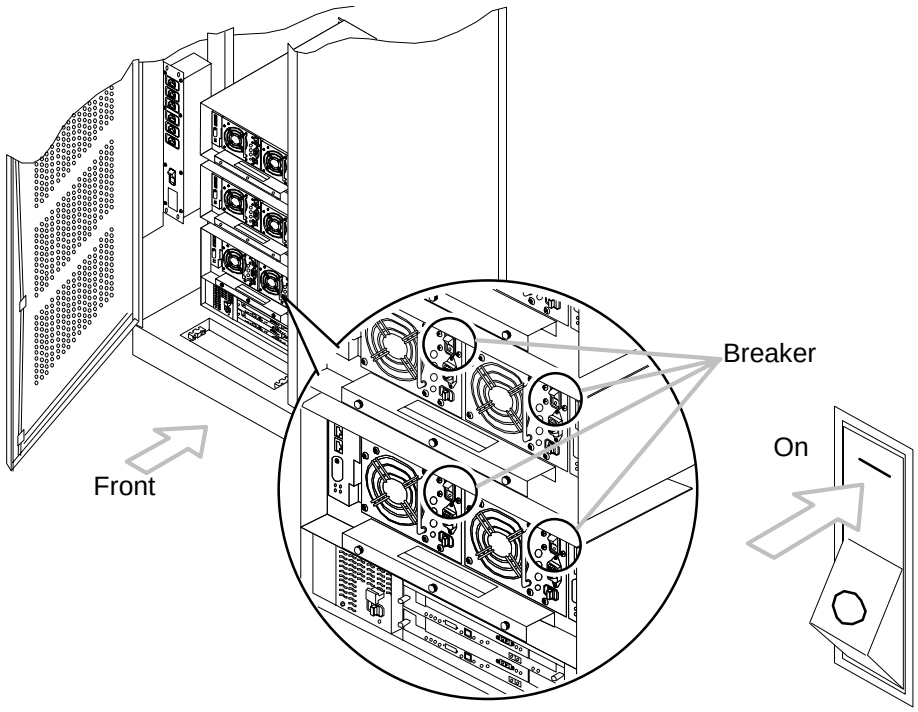


Figure 4.12 Location of Breaker

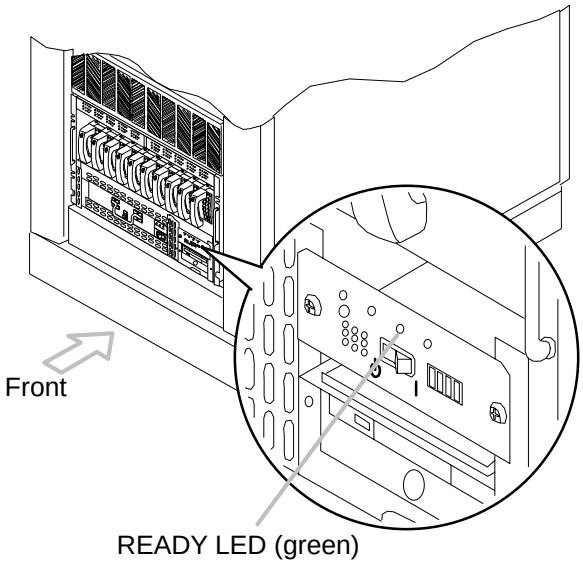
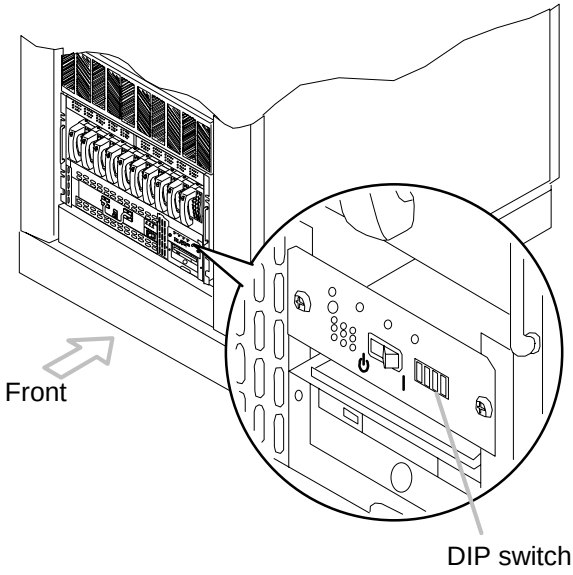
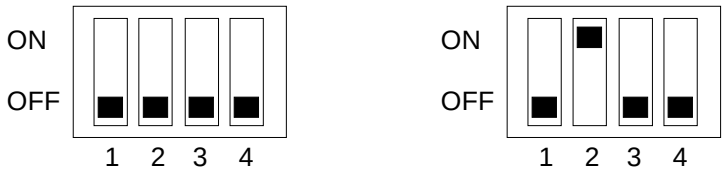


Figure 4.13 Location of READY LED





Setting to ‘Local’ control Setting to ‘Remote’ control (for SCSI)

Figure 4.14 Location of DIP Switch

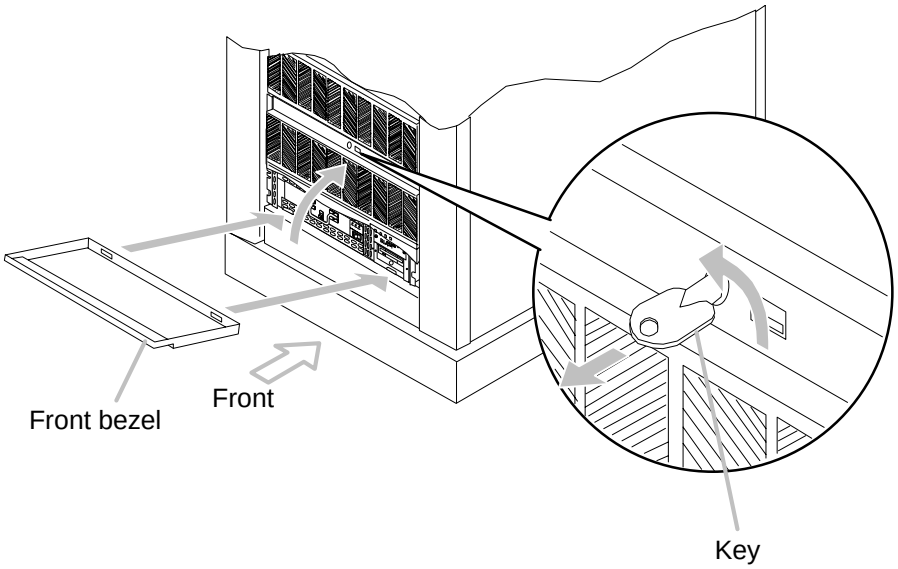


Figure 4.15 Attach the Front Bezel

4.1.11 Keeping the Key

Keep the key in a safe place.
If the DF500 unit is installed in a place whose safety has been secured, it is convenient to hook the key as shown in the figure below.

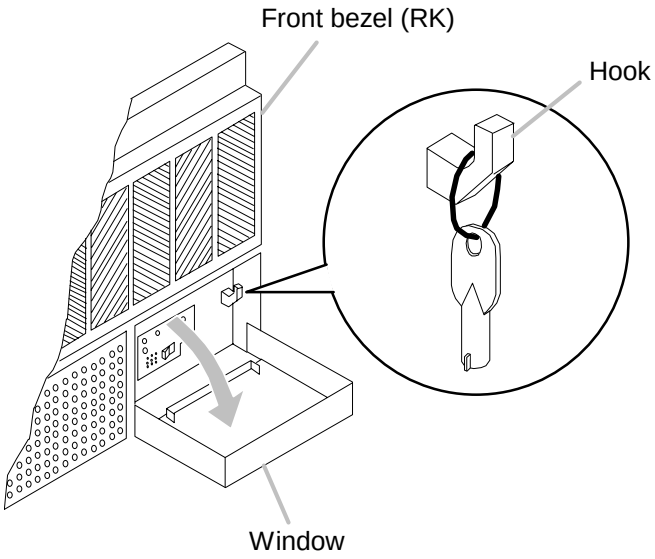


Figure 4.16 Key Storage Place

4.1.12 Stopping the Equipment

The following describes procedures for stopping the DF500 unit.

1. Set the main switch to ⏻ side, then turn off the power supply.
2. Make sure that the POWER LED (green) of the equipment goes out.
3. Turn off the AC/DC power breaker.
4. Turn off the PDB breaker.

4.2 Installing the Floor Model

: The installation of a floor model is referred to trained service personnel only. The user must not do it.

This section describes the procedure for installing the floor model.

4.2.1 Place for Installing the Equipment

To maintain the DF500 performance, the DF500 must be installed in a proper environment. Do not install the equipment in such places as shown below because the equipment life will be shortened or the equipment will result in a failure.

- Place exposed to direct sunlight.
- Place where the temperature and humidity varies much. (For example, near an air conditioner)
- Place near an apparatus that generates electric noise. (For example, air conditioner that is not grounded and washing machine motor)
- Place near an apparatus that generates a strong magnetic field.
- Very dusty place.
- Place exposed to frequent vibrations
- Place such as inclined floor.

4.2.2 Area Required for Installing the Equipment

The following figure shows an area required for installing the equipment.
Be sure to install the equipment in a place with the area shown in the figure so as to avoid problems; for example, the equipment cover cannot be removed at maintenance work and ventilation cannot be performed enough.

Legend

: Area required for maintenance of the equipment
: Outside line of the equipment
: Area required for install of the equipment
: Leveling bolt position
: Caster position
: Front side of the equipment

All dimensions in the figure are in mm.

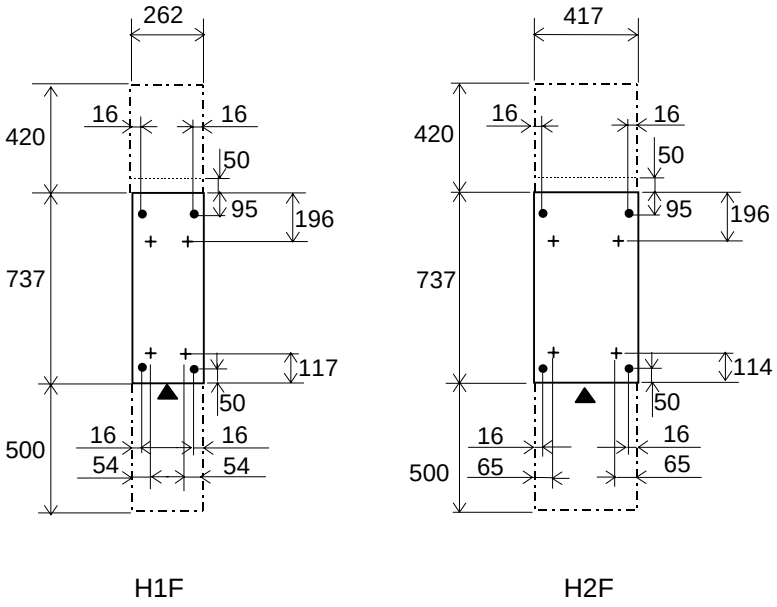


Figure 4.17 Area Required for Installing the Floor Model

4.2.3 Unpacking the Equipment

MAINTENANCE ENGINEER : The unpacking of the shipping outer package of a floor model is referred to trained service personnel only.
The user must not do it.

Take out the equipment from the package for transportation.
Take cre not to give a shock to the equipment, otherwise equipment will fail.

CAUTION : The weight of H1F is 85 kg and the weight of H2F is 140 kg.
If they fall over, this can cause personal injury. Move these units slowly.

Perform unpacking according to the following procedure.

1. Cut the polyester band and remove it. (see figure 4.18)
2. Lift the upper cover of the shipping carton to remove it.
3. Take out the component parts list and the case containing attachments.
4. Remove the inner pats (foam plastic cushions).
5. Remove the polyethylene bag covering DF500 unit, and then bring the unit down from the bottom of the shipping carton. (see figure 4.19)
6. Peel off the tapes fixing labels and etc. (see figure 4.20)
7. Check all items provided with H1F and H2F units against the table below.
   If any items are missing, please notify your Hitachi sales representative. (see table 4.4 or 4.5)

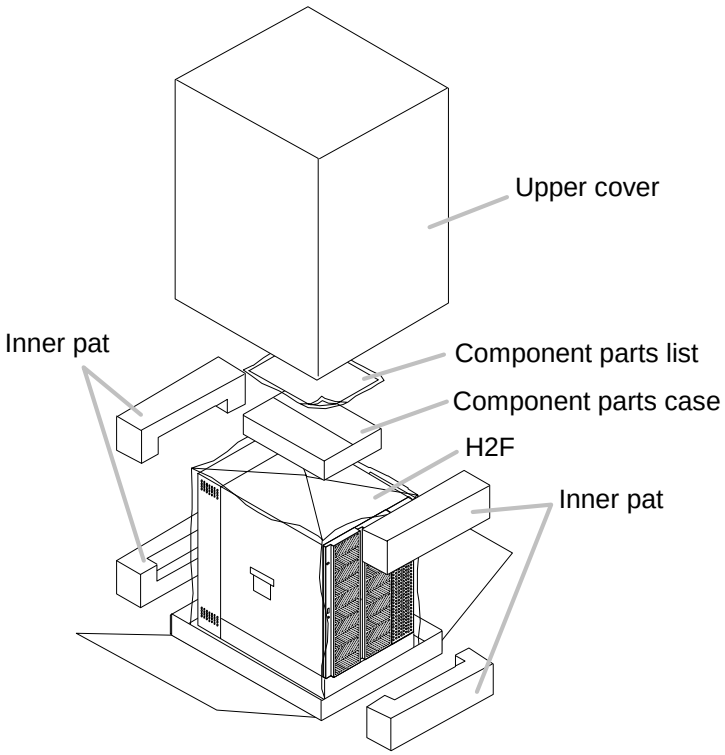


Figure 4.18 Packed Status of the H2F (1)

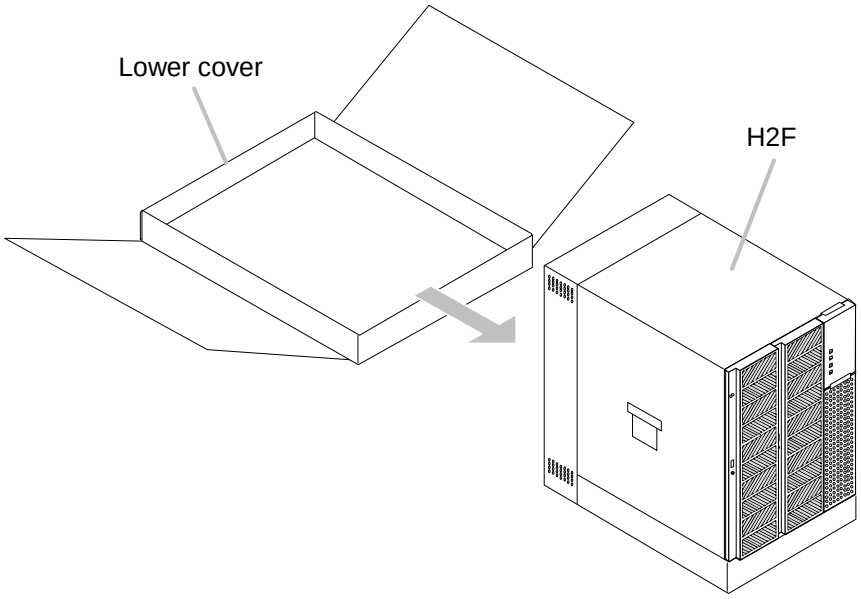


Figure 4.19 Packed Status of the H2F (2)

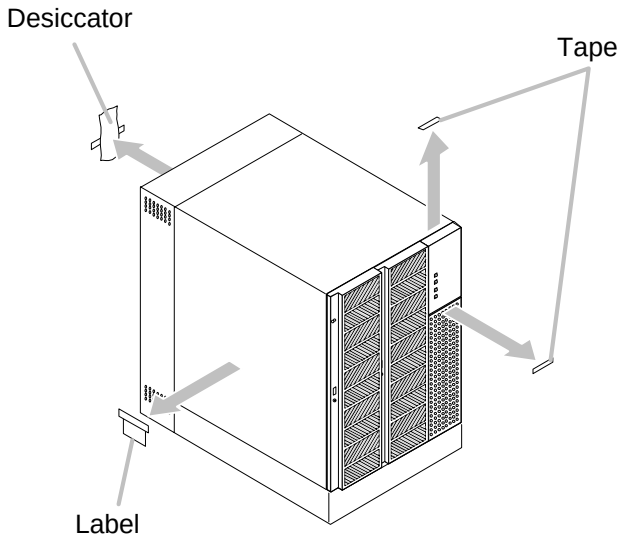


Figure 4.20 Location of Tape, etc.

Table 4.4 List of Component Parts (H1F)

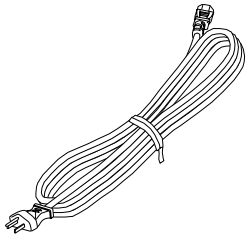
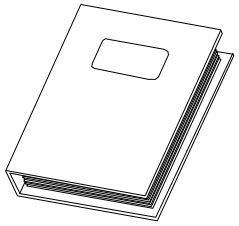
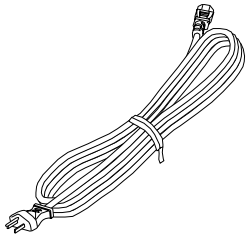
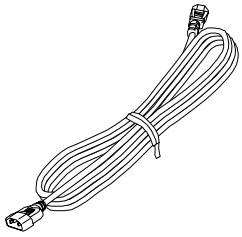
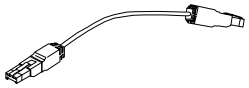
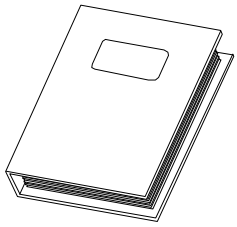
No.	Item name	Units	External view
1	Power cable (DF-F500-J1F)	2	
2	Key	2	
3	User's guide	1	

Table 4.5 List of Component Parts (H2F)

No.	Item name	Units	External view
1	Power cable (DF-F500-J1F)	2	
2	Power cable (DF-F500-J2F)	4	
3	ENC cable (milk white)	2	
4	ENC cable (yellow)	2	
5	Key	2	
6	User's guide	1	

4.2.4 Checking the Attached Parts

Make sure that there is not any damage or skewness that may have been caused during transportation.
Collate the equipment configuration (model No., serial No., and quantity) with the attached component parts list.

4.2.5 Installing the Equipment

: The installation of a floor model is referred to trained service personnel only. The user must not do it.

Move the equipment to the installation place and adjust the leveling bolts.

4.2.6 Connecting Cables

: The connecting of cables to the floor model is referred to trained service personnel only.
The user must not do it.

The following describes procedures for connecting cables.

- H1F

1. Remove the rear cover. (see figure 4.21)
2. Set all the breakers in the AC/DC power supply units to off. (see figure 4.22)
3. Connect power cables. (see figure 4.23)
4. Connect interface cables (Fibre Channel/SCSI). (see figure 4.23)

- H2F

1. Remove the rear cover. (see figure 4.24)
2. Set all the breakers in the PDBs to off. (see figure 4.25)
3. Connect ENC cables. (see figure 4.26)
4. Connect power cables. There are four power cables : two milk white cables and two yellow cables. Connect the power supply #0 to the PDB #0 with the milk white power cables and the power supply #1 to the PDB #1 with the yellow cables. (see figure 4.25, 4.26)
5. Connect interface cables (Fibre Channel/SCSI). (see figure 4.26)

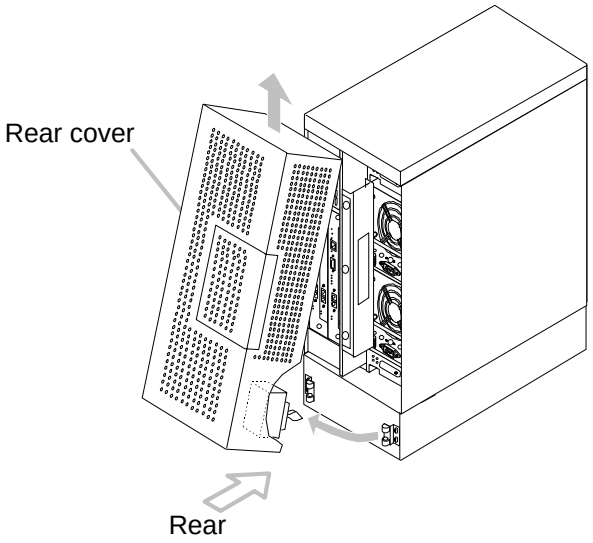


Figure 4.21 Remove the Rear Cover

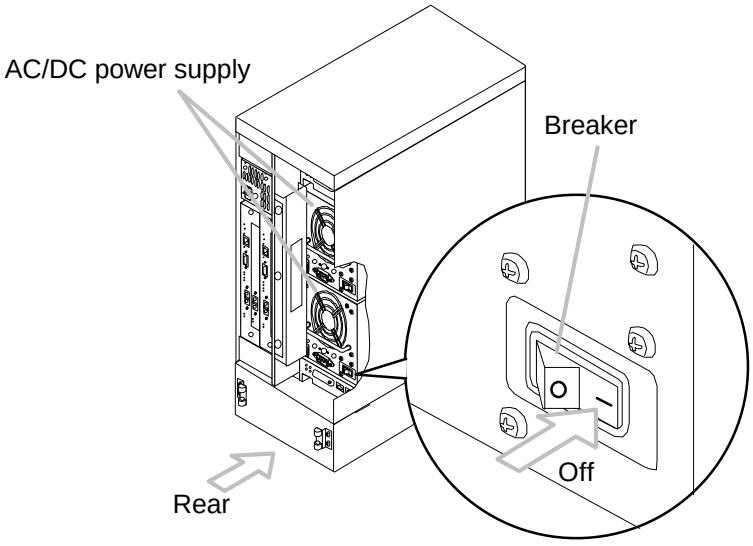


Figure 4.22 Main Switch

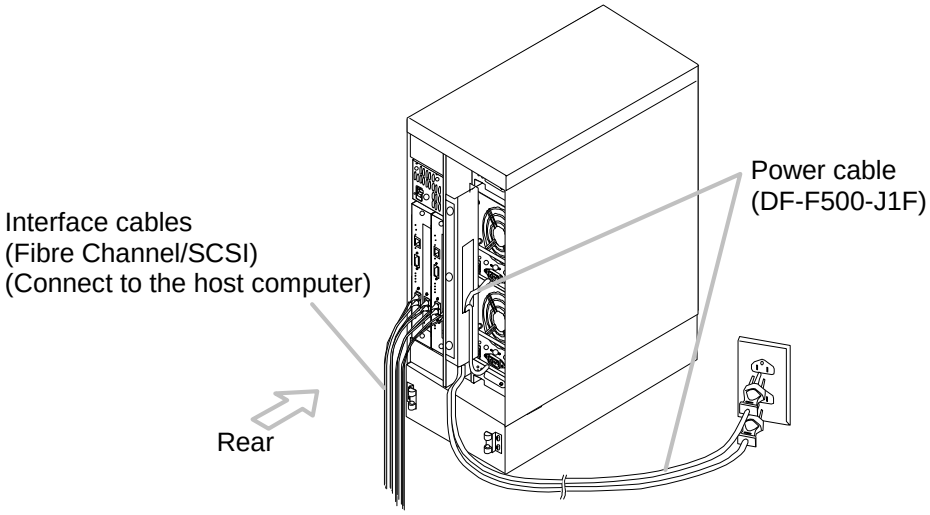


Figure 4.23 Connecting the Cables

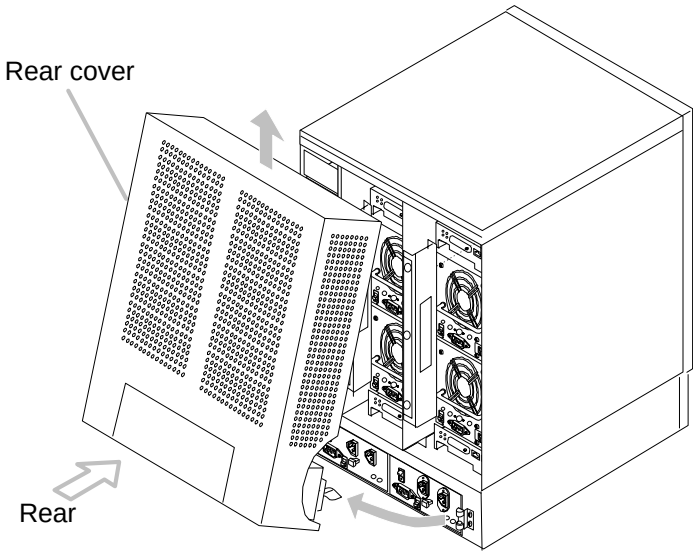


Figure 4.24 Remove the Rear Cover

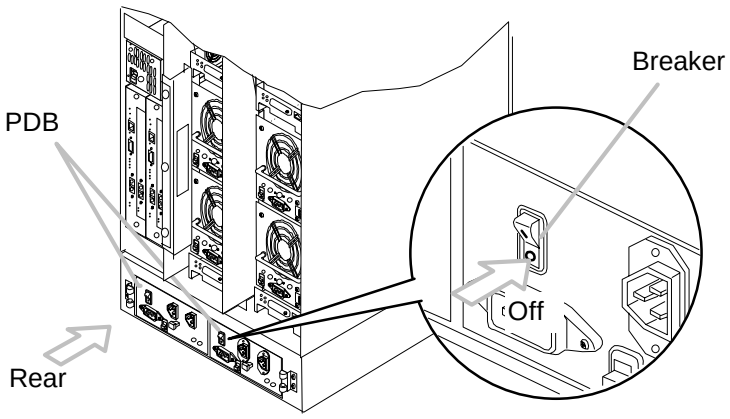


Figure 4.25 Breaker

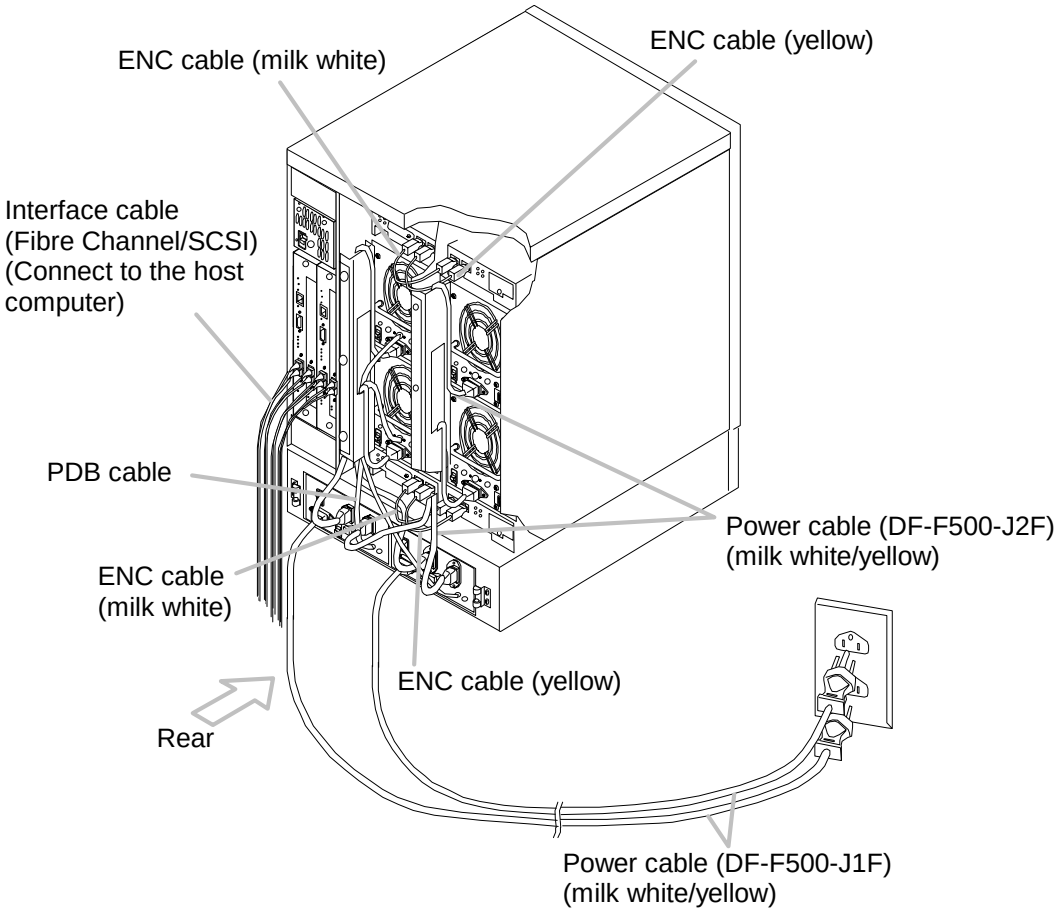


Figure 4.26 Connecting the Cables

4.2.7 Starting the Equipment

The procedure for starting the Floor model is described below.

1. Turn off the main switch. (see figure 4.27)
2. Insert the key attached to the equipment in the keyhole of the RK front bezel. Turn the key 90° clockwise for unlocking.
   Holding the front bezel with hands, slide the lock button leftward. (see figure 4.28)

INPORTANCE : Remove the front bezel calmly and slowly, otherwise the user's important data will be lost.

3. Slide and hold the lock button to a left position, and pull the left side of the front bezel toward you about 3 cm.
   Remove the front bezel in that condition in a direction shown with an arrow, and then set the battery switch to on. (see figure 4.29)
4. Set all the breakers in the AC/DC power supply units to on. (see figure 4.30)
5. For the H2F, set all the breakers in the PDBs to on. (see figure 4.31)
6. Turn on the mein switch. (see figure 4.33)
7. Make sure that the READY LED (green) comes on in 2 or 3 minutes. (see figure 4.31)

REFERENCE : When the READY LED does not come on, refer to "Chapter 5 When you are in difficulty" (page 58)

8. Set the unit parameters.
9. Set the power control to 'Remote', the DF500 unit can be started and stopped remotely from the host computer. If set to 'Local', the unit is started and stopped by its self. (see figure 4.32)

INPORTANCE : When making the subsystem remotely controlled using the fibre channel interface connection, the optional remote adapter is required.

10. Insert the key into the keyhole and turn it clockwise 90°.
11. Engage the hooks on the unit side in the grooves on the right side of the front bezel, and press the left side of the bezel until you hear the lock button click into place.
    Then, turn the key counterclockwise 90° to lock the front bezel, and pull out the key. (see figure 4.33)

INPORTANCE : Attach the front bezel calmly and slowly, otherwise the user's important data will be lost.

12. Attach the rear cover. (see figure 4.34)
13. Power on the host computer.

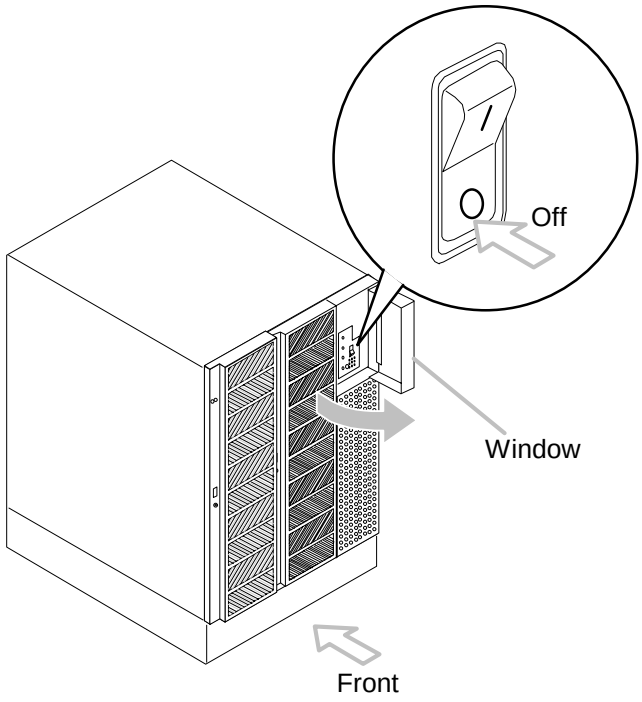


Figure 4.27 Main Switch

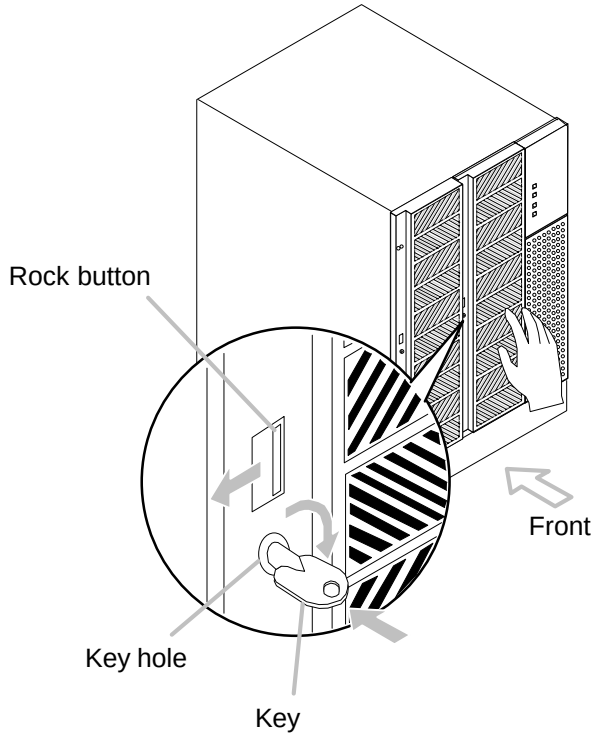


Figure 4.28 Remove the Front Bezel (1)

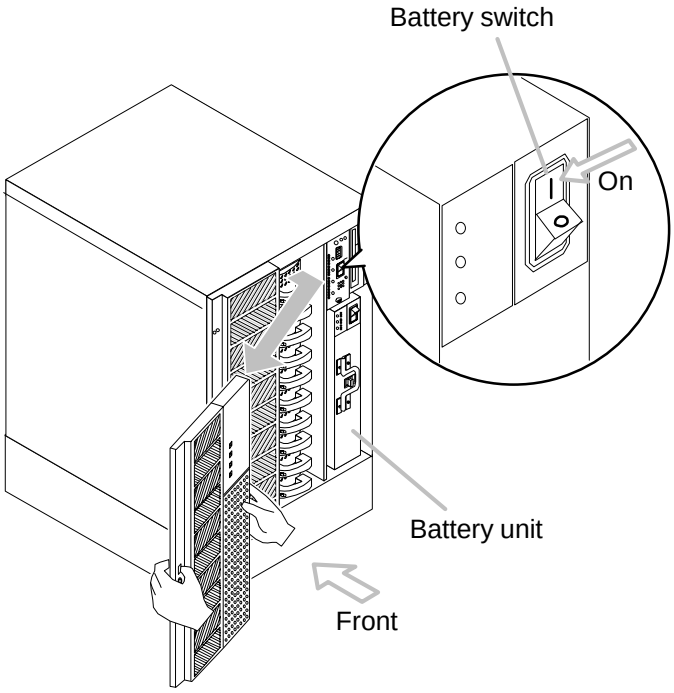


Figure 4.29 Remove the Front Bezel (2)

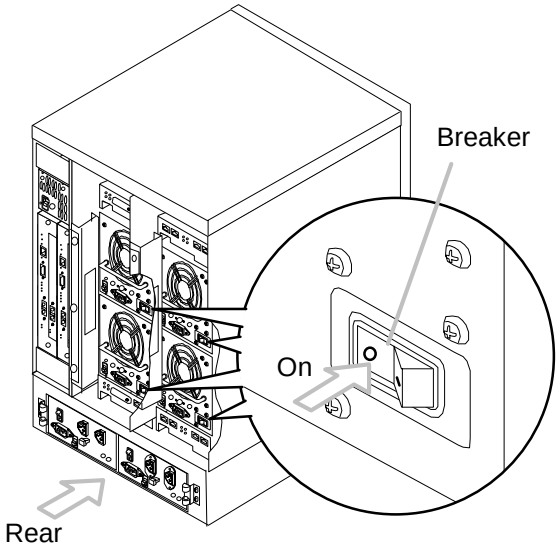


Figure 4.30 Location of Breaker

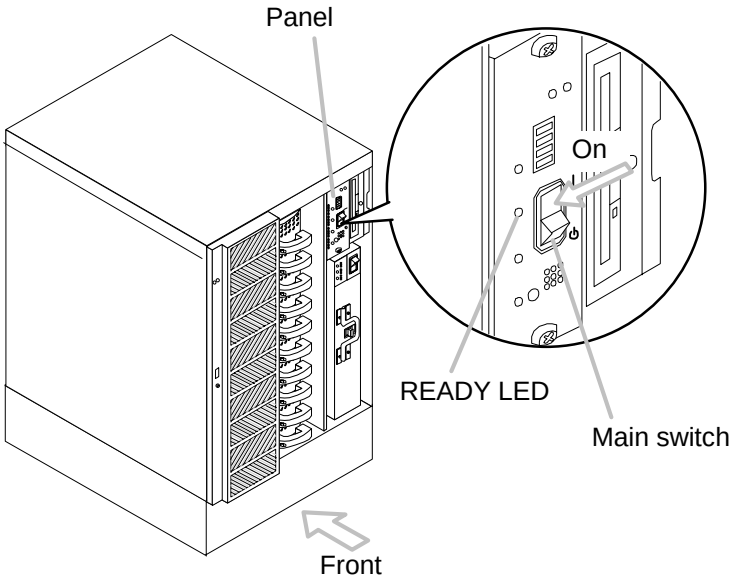


Figure 4.31 Location of Main Switch and READY LED

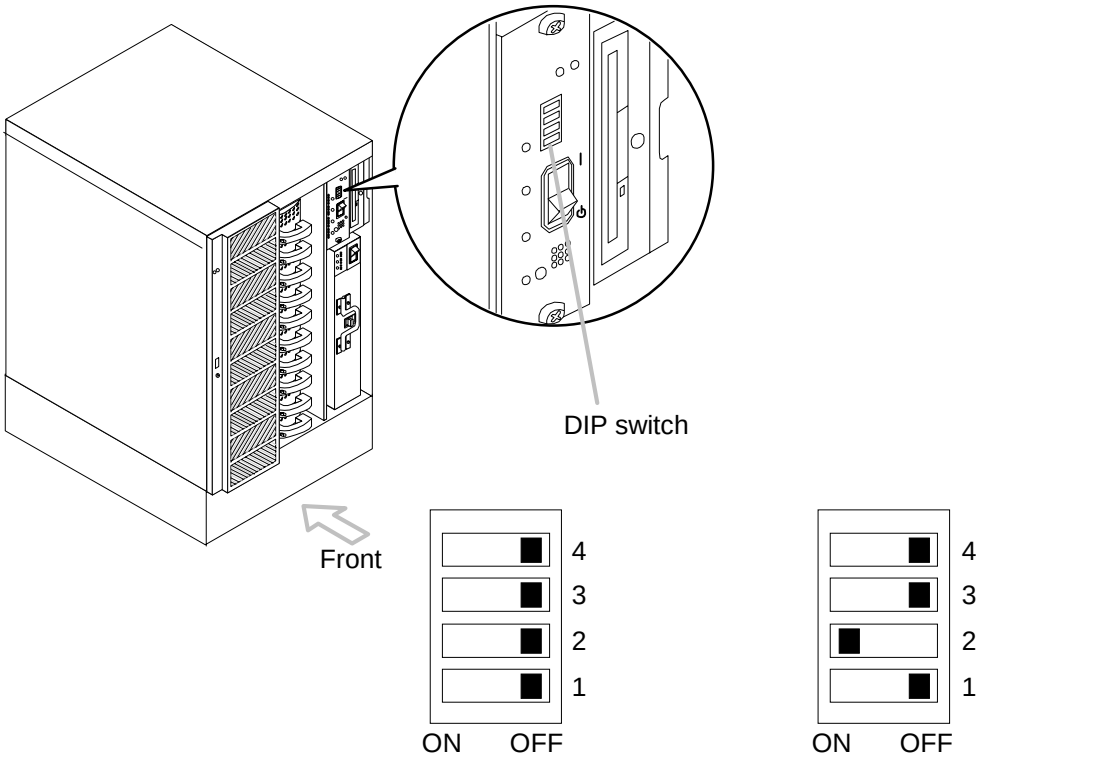


Figure 4.32 Location of DIP Switch

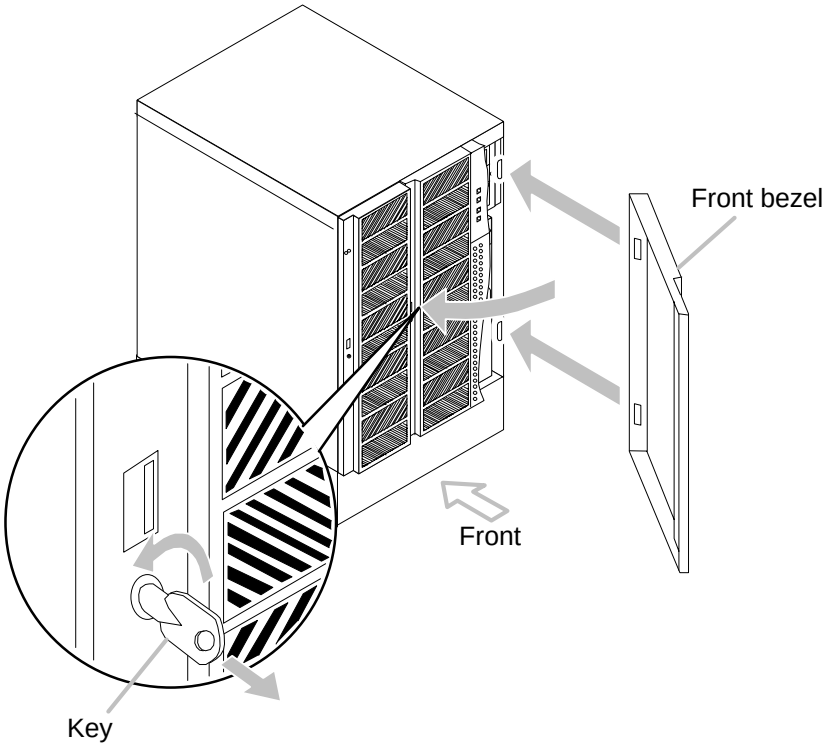


Figure 4.33 Attach the Front Bezel

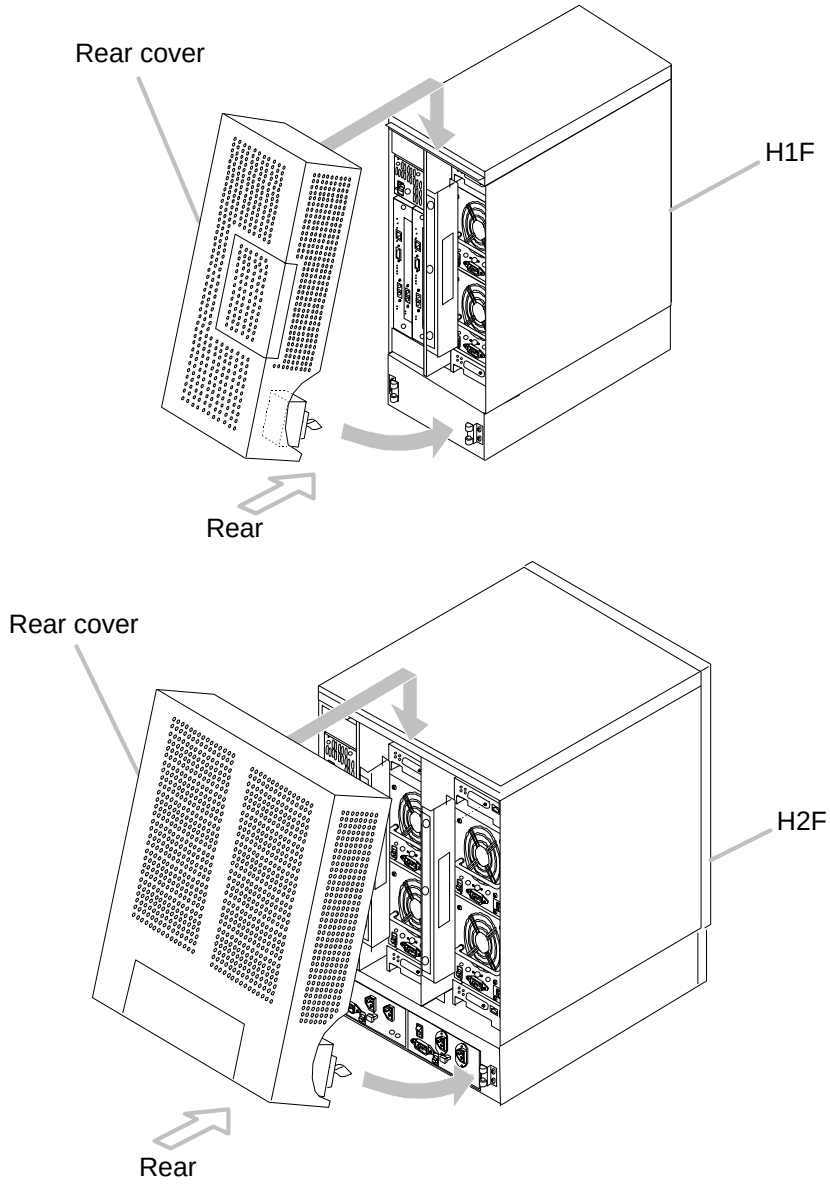


Figure 4.34 Attach the Rear Cover

4.2.8 Keeping the Key

Keep the key in a safe place.
If the DF500 unit is installed in a place whose safety has been secured, it is convenient to hook the key as shown in the figure below.

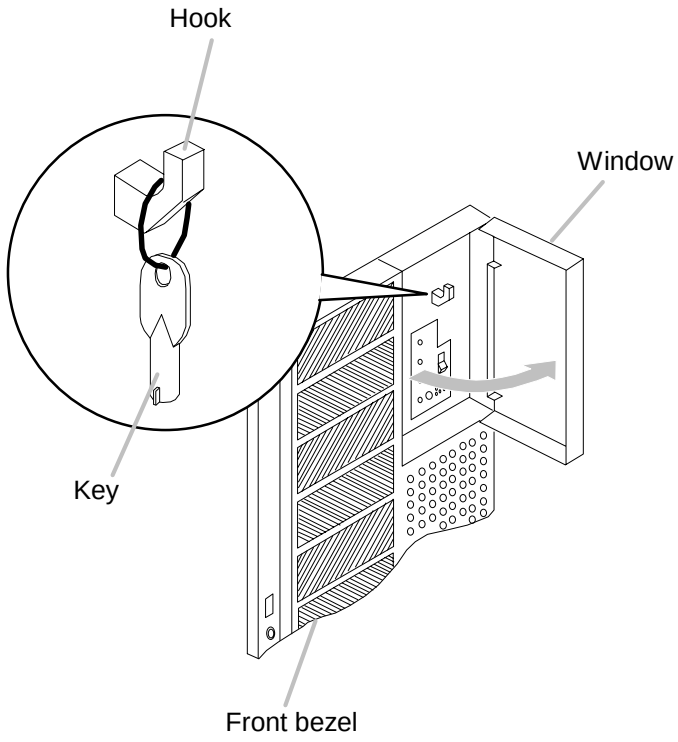


Figure 4.35 Key Storage Place

4.2.9 Stopping the Equipment

The following describes procedures for stopping the DF500 unit.

1. Set the main switch to ⏻ side, then turn off the power supply.
2. Make sure that the POWER LED (green) of the equipment goes out.
3. Turn off the AC/DC power breaker.
4. Turn off the PDB breaker.

Chapter 5 When You Are in Difficulty

5.1 Troubleshooting of Failures by LEDs and Action to Be Taken for Them

For troubleshooting of failures in the software and action to be taken for them, refer to the “User’s Guide, Software Part.”
The following describes action to be taken when LEDs visible through the window of the RK turn on, blinks, or turn off.

5.1.1 Functions of LEDs on Front of DF500 Unit

Shown in the figure below are the locations and names of LEDs visible through the window.

REFERENCE : For other LEDs, see Appendix C, “Locations and Functions of LEDs” on page 88.

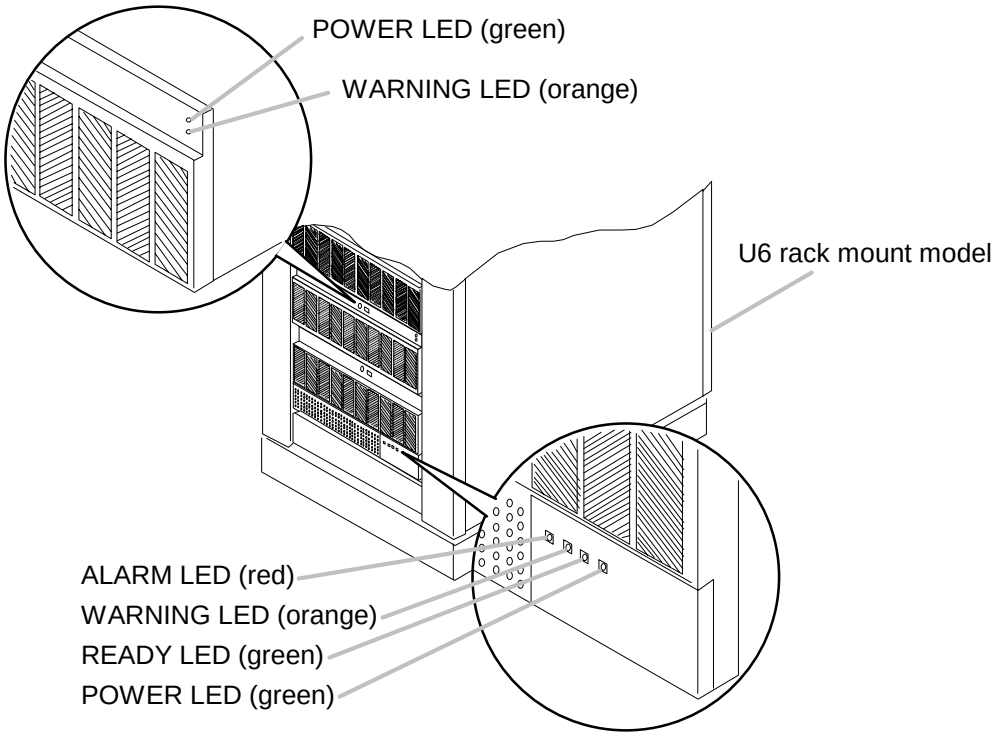


Figure 5.1 Locations and Names of LEDs (U6 Rackmount Model)

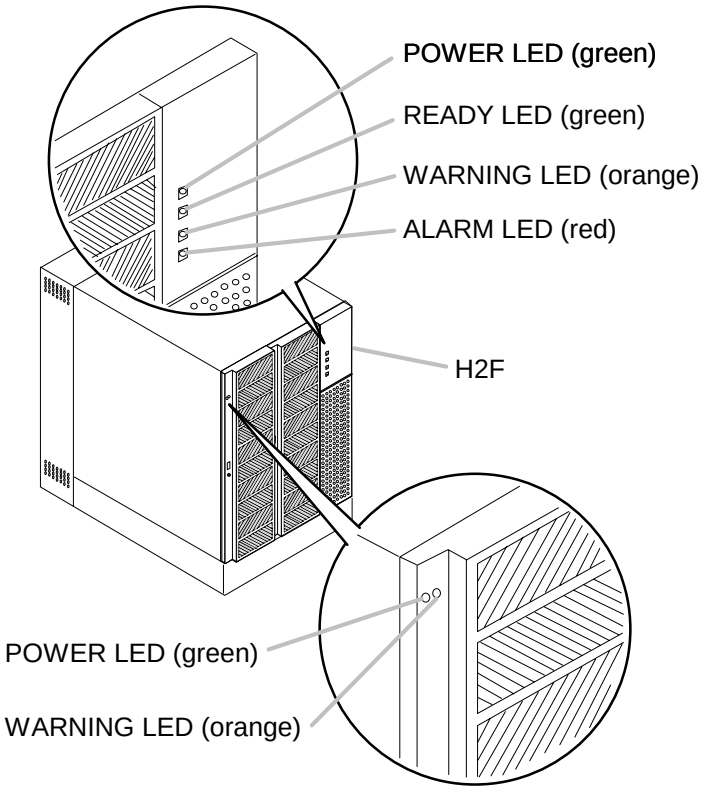


Figure 5.2 Locations and Names of LEDs (Floor Model)

Table 5.1 Functions of LEDs Visible Through the Window

LED	Function
POWER LED (green)	When on, it indicates that electricity is supplied to the unit.
READY LED (green)	When on, it indicates that the unit is operable.
WARNING LED (orange)	When on or flashing, it indicates that a failure occurs in the unit, but the unit still is operable.
ALARM LED (red)	When on, it indicates that a failure occurs in the unit, so the unit is in operable.

5.1.2 Troubleshooting

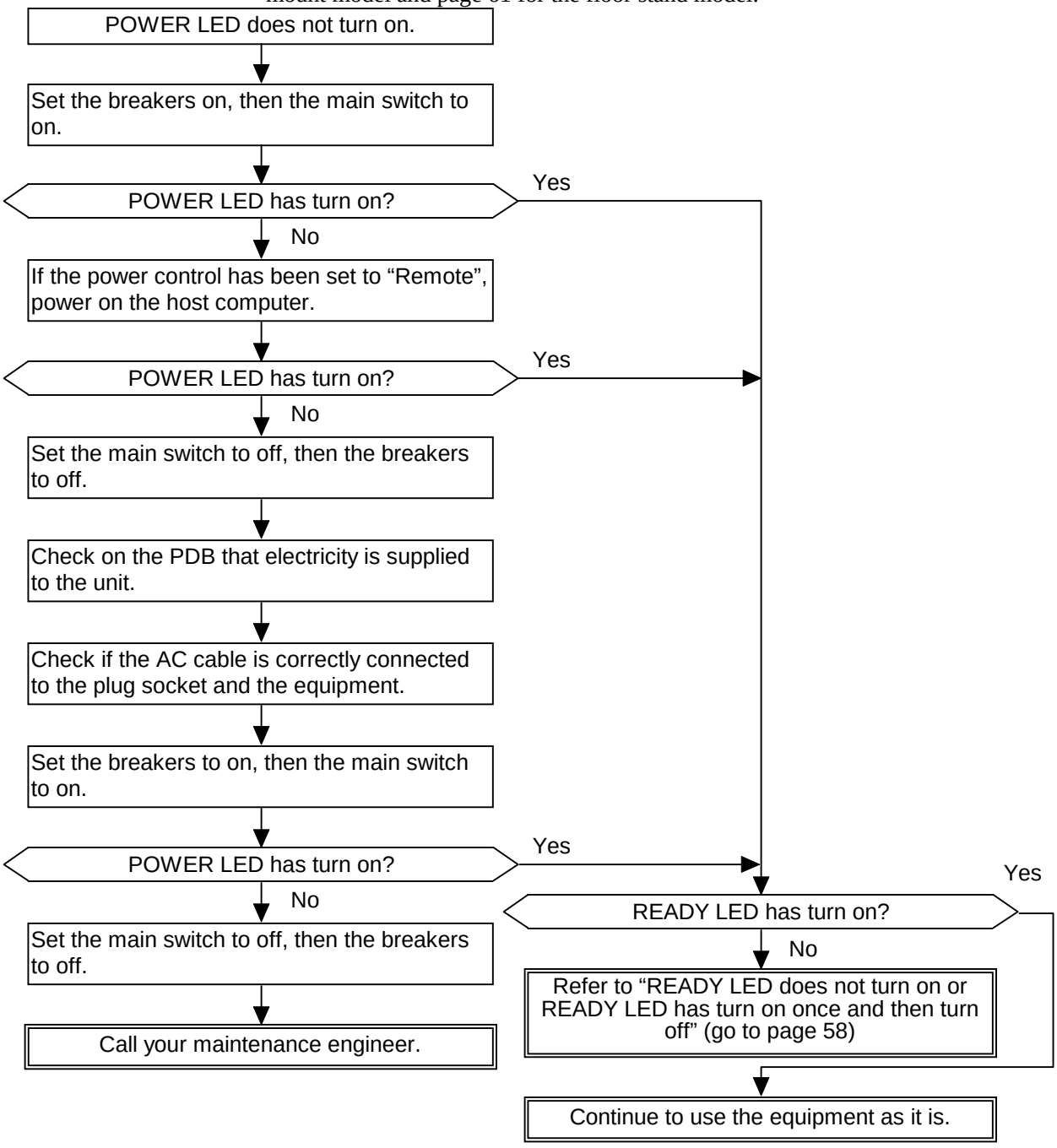
The contents of a fault to be notified differ depending on each LED.
Proceed to the item corresponding to the LED status.
Take a corrective measure according to the flowchart of the corresponding item.

- The POWER LED does not turn on
  ---------- Proceed to “POWER LED does not turn on” (go to page 56).
- The POWER LED in on status turn off
  ---------- Proceed to “POWER LED has turn off” (go to page 57).
- READY LED does not turn on or READY LED has turn on once and then turn off
  ---------- Proceed to “READY LED does not turn on or READY LED has turn on once and then turn off” (go to page 58).
- ALARM LED has turn on
  ---------- Proceed to “ALARM LED has turn on” (go to page 59).
- WARNING LED has turn on or blinks
  ---------- Proceed to “WARNING LED has turn on or blinks” (go to page 59).

5.1.3 POWER LED Does Not Turn On

When the POWER LED does not turn on, take a corrective measure according to the following flowchart.

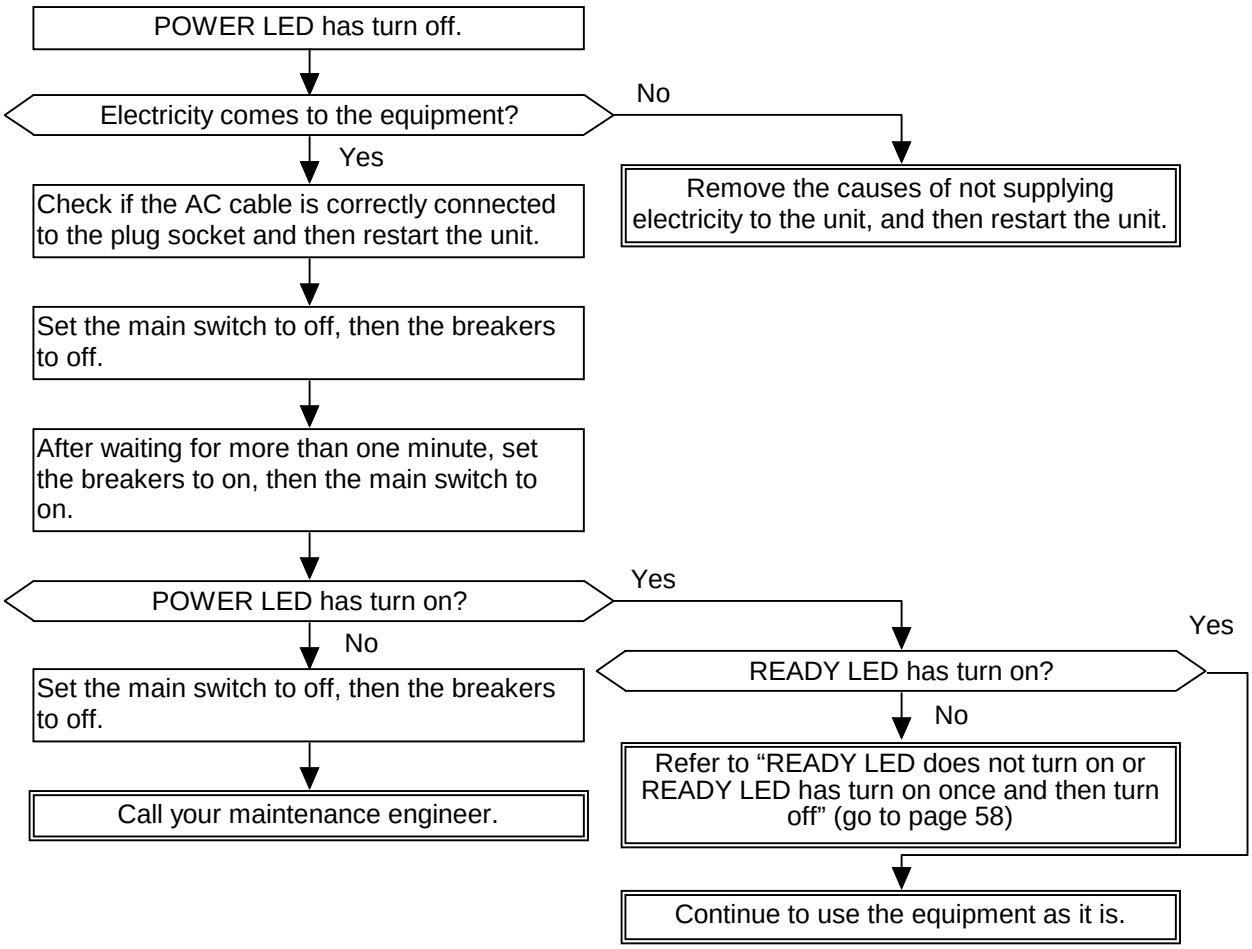
REFERENCE : For the locations of breakers and the main switch, see page 60 for the U6 rack mount model and page 61 for the floor stand model.



5.1.4 POWER LED has Turn Off

When the lighted POWER LED turn off while the unit is operational, take action according to the flowchart below.

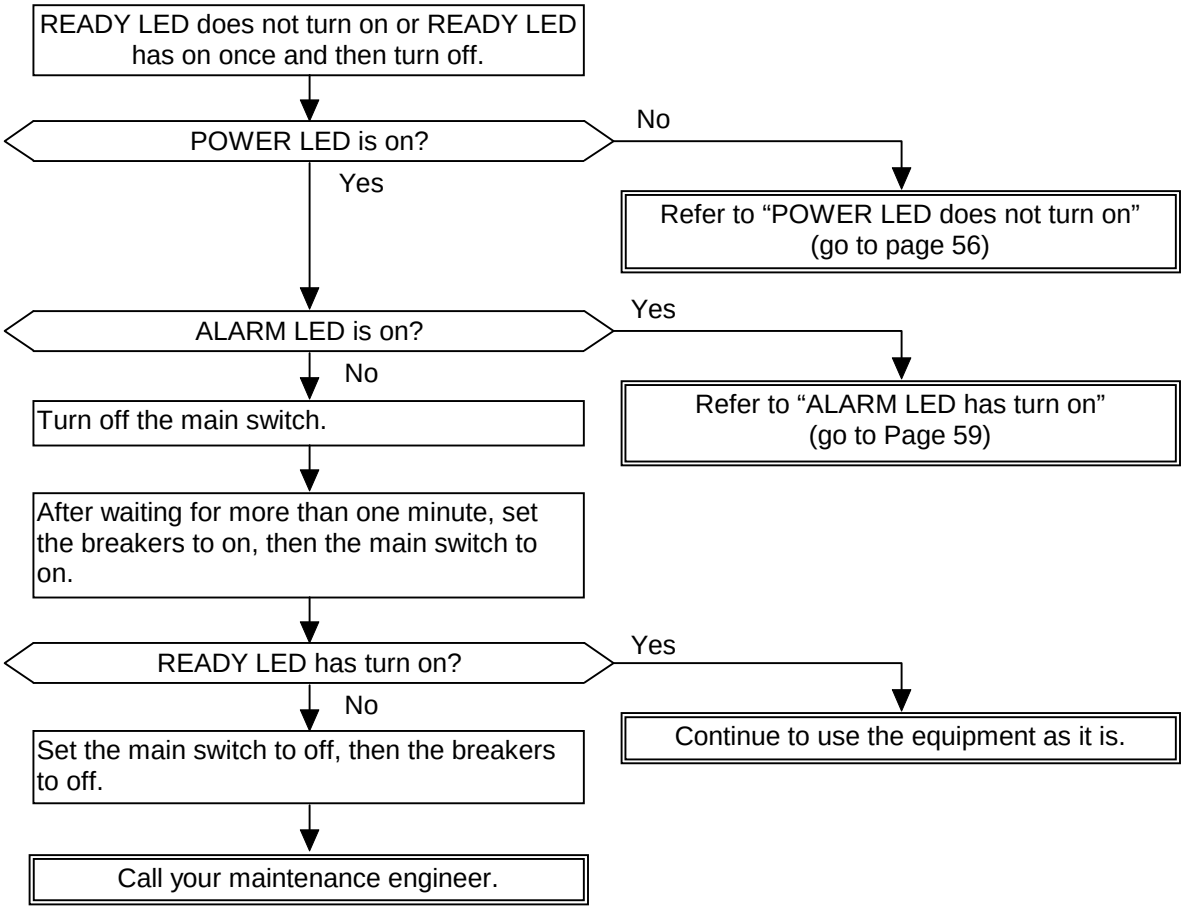
REFERENCE : For the locations of breakers and the main switch, see page 60 for the U6 rack mount model and page 61 for the floor stand model.



5.1.5 READY LED Does Not Turn On or READY LED has Turn On Once and Then Turn Off.

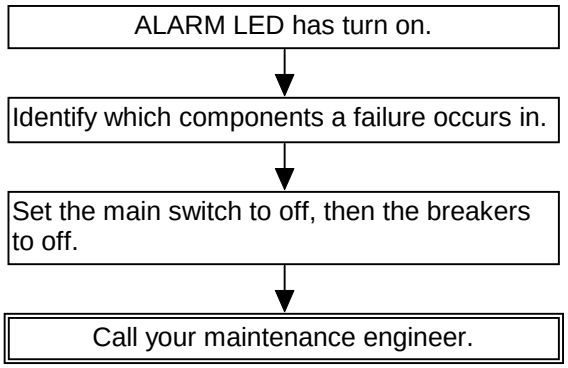
When the READY LED does not turn on, or when it turn off after it lighted once, take action according to the flowchart below.

REFERENCE : For the locations of breakers and the main switch, see page 60 for the U6 rack mount model and page 61 for the floor stand model.



5.1.6 ALARM LED has Turn On

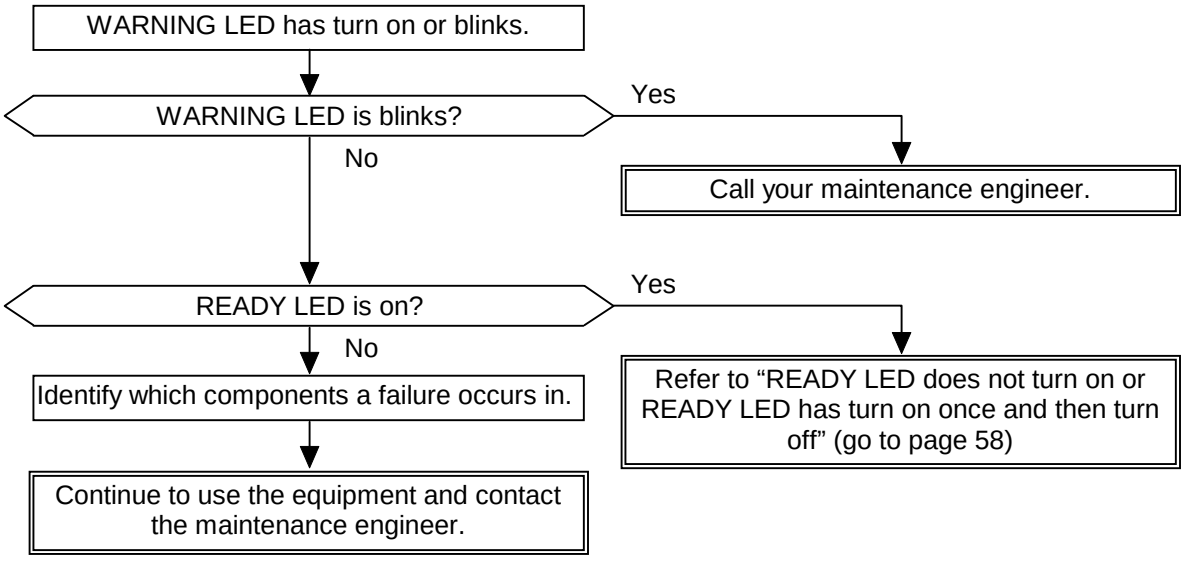
When the ALARM LED has turn on, take a corrective measure according to the following flowchart.



REFERENCE : By seeing Appendix C, “Locations and Functions of LEDs” on page 87, identify failed components whose LEDs are indicating their respective failures.

5.1.7 WARNING LED has Turn On or Blinks

When the WARNING LED turn on or blinks, take action according to the flowchart below.



REFERENCE : By seeing Appendix C, “Locations and Functions of LEDs” on page 88, identify failed components whose LEDs are indicating their respective failures.

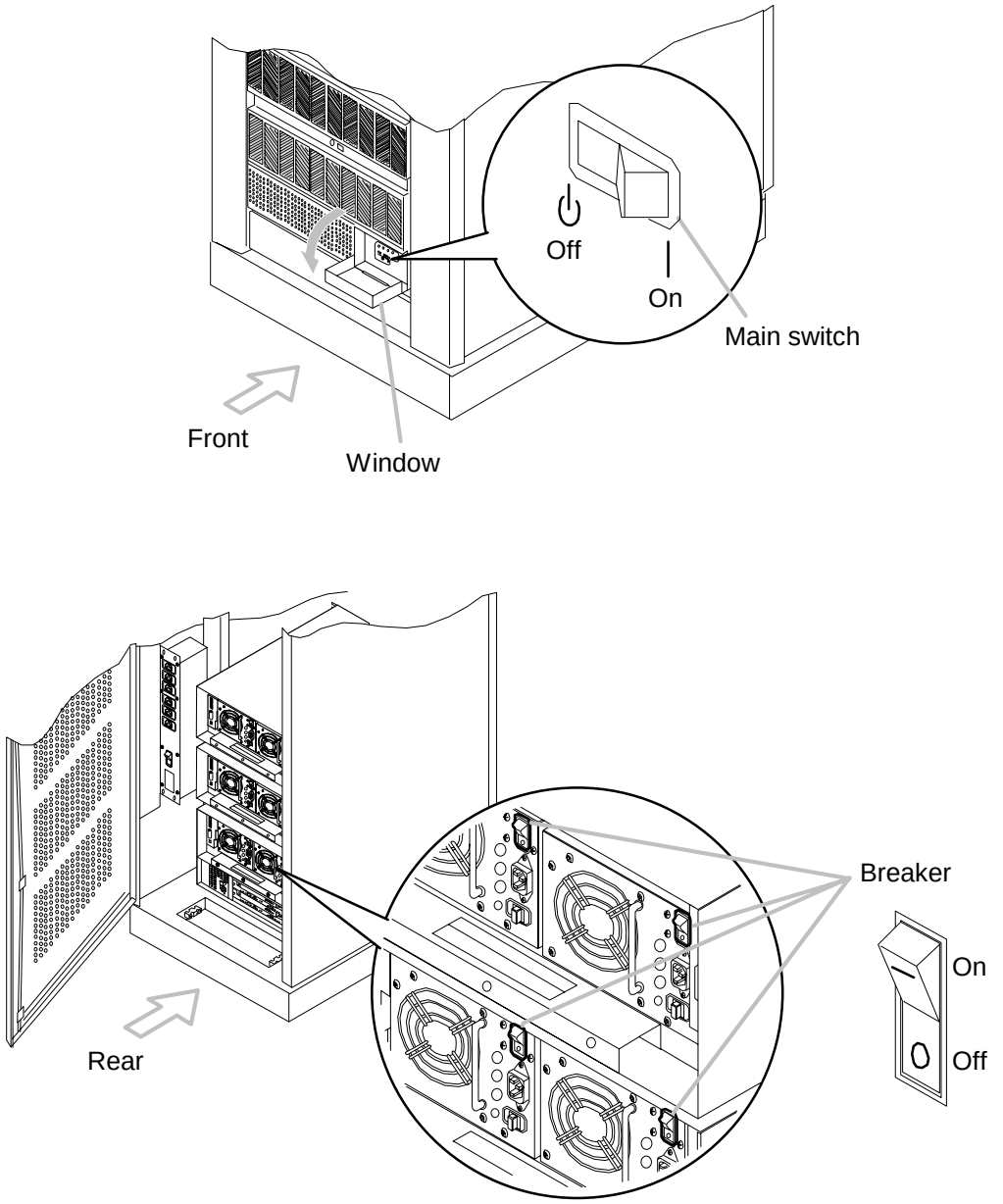


Figure 5.3 Locations of Main Switch and Breakers in U6 Rackmount Model

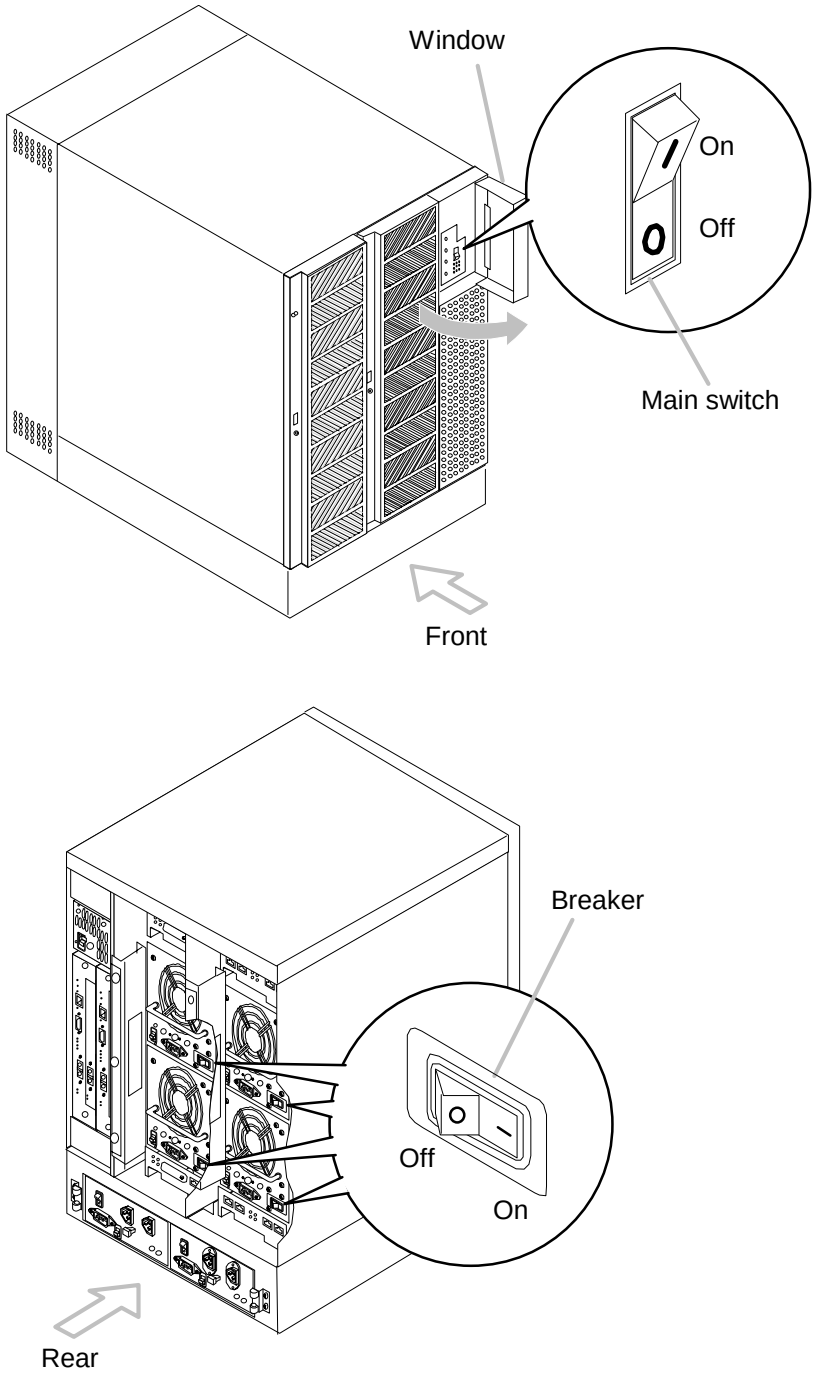


Figure 5.4 Locations of Main Switch and Breakers in Floor Model

5.2 Procedure for Replacing Faulty Parts

The procedure for replacing faulty parts is described below.

5.2.1 Replacing a Disk Drive

: The replacing of a disk drive is referred to trained service personnel only. The user must not do it.

CAUTION : If you touch live electric parts while replacing parts, this can cause an electric shock.

The procedure for replacing the disk drive.
The procedure for replacing the disk drive differs depending on the RAID configuration.

- For RAID 1, 5, or 0+1 configuration with a spare disk
  Replace the disk drive with the equipment power on.

1. Check if a data recovery to the spare disk has been completed.

: A disk drive, in which the SPARE LED (orange) is lighted on the disk drive display section (page 88), is a spare disk drive.

2. Take out a disk drive in which the FAIL LED (red) is on.
   While shifting the lock release button on the handle, pull out the drive toward you slowly without giving any shock.
3. Wait for more than 20 seconds, and then insert a new disk drive.
   By holding onto the handle, push the drive slowly without giving any shock until you hear the lock release button click into place.
4. Check that the FAIL LED (red) turn off.
5. Check if a data recovery has been completed from the spare disk to the new disk drive.
6. Select “Information Message” from the WEB and make sure that the data recovery is completed normally (I151xy Data recovery completed).
7. Check that the WARNING LED (orange) turn off.

- For RAID 1, 5, or 0+1 configuration without a spare disk
  Replace the disk drive with the equipment power on.

1. Take out a disk drive in which the FAIL LED (red) is on.
   While shifting the lock release button on the handle, pull out the drive toward you slowly without giving any shock.
2. Wait for more than 20 seconds, and then insert a new disk drive.
   By holding onto the handle, push the drive slowly without giving any shock until you hear the lock release button click into place.
3. Check that the FAIL LED (red) turn off.
4. Check if data has been recovered ona new disk drive.
5. Select “Information Message” from the WEB and make sure that the data recovery is completed normally (I151xy Data recovery completed).
6. Check that the WARNING LED (orange) turn off.

- For RAID 0 configuration
  Replace the disk drive with the equipment power on.

1. Make a backup of user data.
2. Make sure whether the Disk drive to be replaced is blocked or not by viewing the message of the WEB.
3. Take out a disk drive.
   While shifting the lock release button on the handle, pull out the drive toward you slowly without giving any shock.
4. Wait for more than 20 seconds, and then insert a new disk drive.
   By holding onto the handle, push the drive slowly without giving any shock until you hear the lock release button click into place.
5. Restart the unit.
6. Check that the FAIL LED (red) turn off.
7. Format the LU.

REFERENCE : For the format the LU, see the “User’s Guide, Software Part, “Chapter 4 ; Setting Subsystem parameters ” (page 13).

8. Recover data by using its backup copy that you made usually.
9. Check that the WARNING LED (orange) turn off.

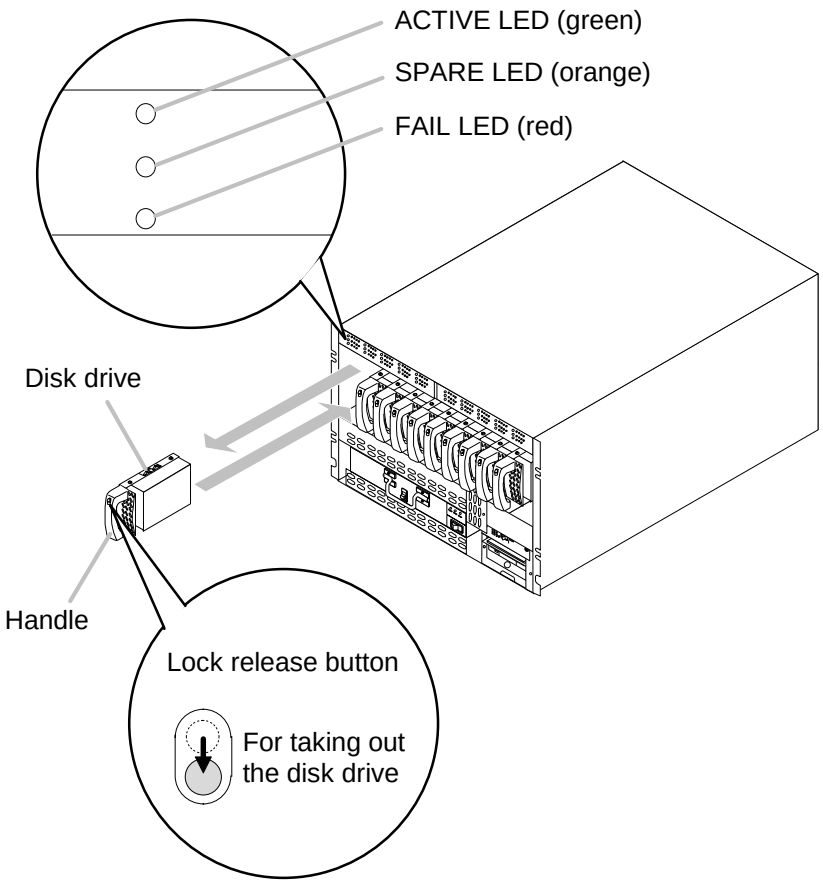


Figure 5.5 Replacing a Disk Drive

5.2.2 Replacing a Floppy Disk Drive

MAINTENANCE ENGINEER : The replacing of a floppy disk drive is referred to trained service personnel only. The user must not do it.

CAUTION : If you touch live electric parts while replacing parts, this can cause an electric shock.

The procedure for replacing the floppy disk drive.

- Procedure for replacement with the power turned on

1. Take out the Floppy disk drive by pulling it toward you holding its knob.
2. Holding the knob of a new floppy disk drive, insert the floppy disk drive into the specified position of the equipment.

- Procedure for replacement with the power turned off

1. Set the main switch to off, and then check that the POWER LED (green) turn off.
2. Set the breakers in the RK unit to off.
3. Holding the knob of the floppy disk drive, draw it toward you to take out the floppy disk drive.
4. Holding the knob of a new floppy disk drive, insert the floppy disk drive into the specified position of the equipment.
5. Turn on the breaker of RK.
6. Turn on the main switch.
7. Check that the WRNING LED (orange) turn off.

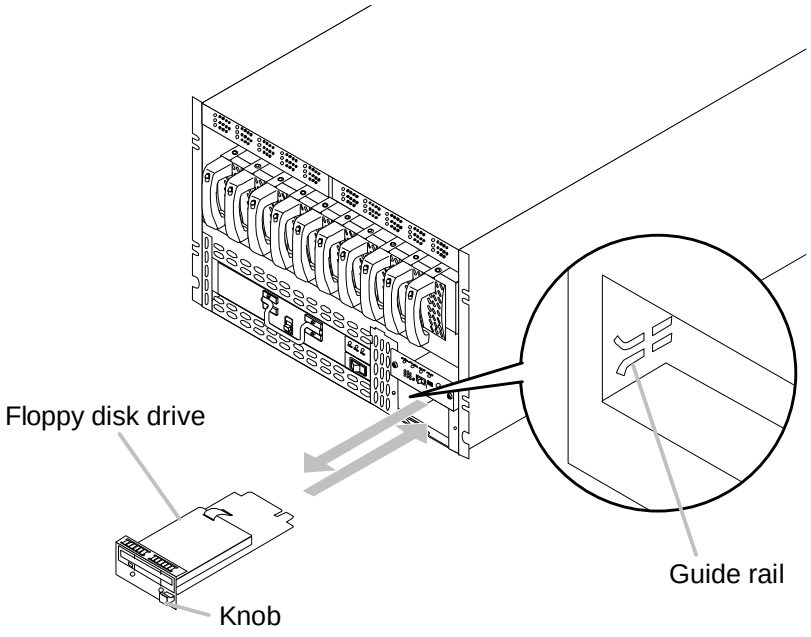


Figure 5.6 Replacing a Floppy Disk Drive

5.2.3 Replacing the Battery Unit

: The replacing of a battery unit is referred to trained service personnel only. The user must not do it.

CAUTION : If you touch live electric parts while replacing parts, this can cause an electric shock.

: When replacing a battery unit over a period of the service life, do it by the same procedure.

The procedure for replacing the battery unit.

- For replacement with the equipment power supply on

1. Turn off the battery switch of the faulty battery unit. Consequently, the WARNING LED (orange) turn on and the buzzer sounds.
2. Press the TRACE SW/BUZZER OFF SW to stop the buzzer.
3. Releasing the lock by the latch on the front of the battery unit, pull out the battery slowly toward you until it stops.
4. Supporting the battery unit, unlock the latch on the lateral side and take out the battery unit.
5. Wait for more than 20 seconds, and then insert the new battery unit into the specified position of the equipment.
6. Turn on the battery switch of a new battery unit.
7. Make sure that the READY LED (green) on the battery unit is on.
8. Check that the WARNING LED (orange) turn off.

: To recharge a replaced battery, keep the unit operational for more than 2 hours. When charging is completed, the CHARGE LED (orange) on the battery (page 88) turn off.

- For replacement with the equipment power supply off

1. Turn off the main switch, and the POWER LED (green) on the panel section will go out.
2. Turn off the battery switch of the battery unit.
3. Releasing the lock by the latch on the front of the battery unit, pull out the battery slowly toward you until it stops.
4. Supporting the battery unit, unlock the latch on the lateral side and take out the battery unit.
5. Inser the new battery unit into the specified position of the equipment.
6. Turn on the battery switch of a new battery unit.
7. Turn on the main switch.
8. Make sure that the READY LED (green) on the battery unit is on.
9. Check that the WARNING LED (orange) turn off.

: To recharge a replaced battery, keep the unit operational for more than 2 hours. When charging is completed, the CHARGE LED (orange) on the battery (page 88) turn off.

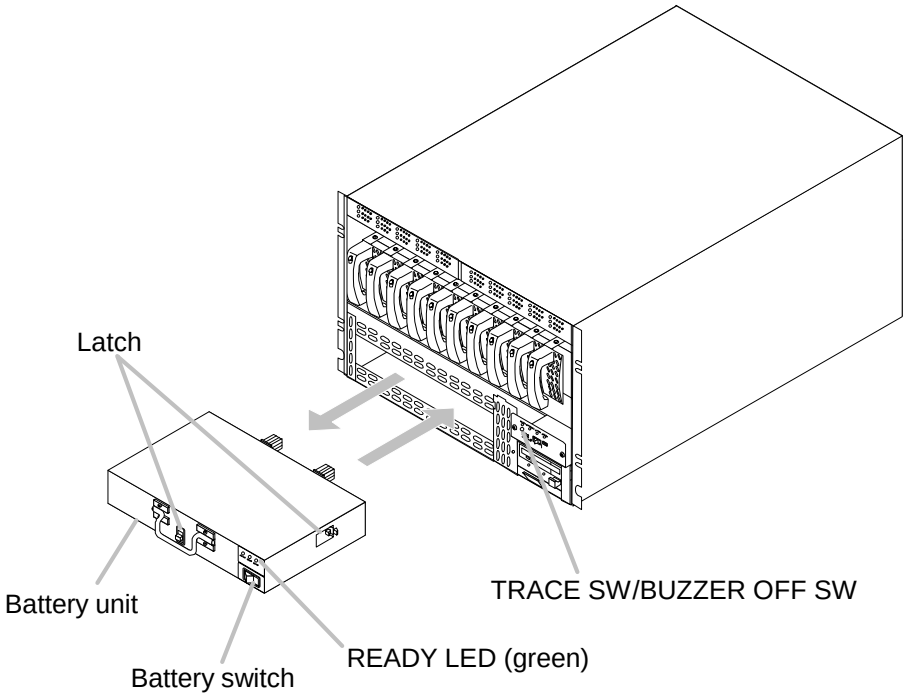


Figure 5.7 Replacing a Battery Unit

5.2.4 Replacing the ENC Board

: The replacing of a ENC board is referred to trained service personnel only. The user must not do it.

CAUTION : If you touch live electric parts while replacing parts, this can cause an electric shock.

The procedure for ENC board.

- For replacement with the equipment power supply on

1. Check that the FAIL LED is on.
   If it is off, follow the replacement procedure used when the power is off.
2. Move the failed ENC board to a position where the lever of the board can be pull out.
3. Remove the cable connected with a failed ENC board, and then pull out the lever toward you.
4. Wait for more than 20 seconds, and then insert a new ENC board at a position where the lever of the new board can be pull out.
5. Push in the lever to fix the ENC board.

: Perform the operation to return the levers within one second. If the returning of the levers takes longer time, it is possible that the recovery from the error fails. When this happens, execute the replacement procedure again. If the subsystem is not recovered from the failure nevertheless, replace the ENC board because the ENC board has failed.

6. Connect the removed cable as connected originally.
7. Check that the FAIL LED (red) does not turn on.
8. Check that the WARNING LED (orange) turn off.

- For replacement with the equipment power supply off

1. Turn off the main switch, and the POWER LED (green) will go out.
2. Turn off the breaker.
3. Move the failed ENC board to a position where the lever of the board can be pull out.
4. Remove the cable connected with a failed ENC board, and then pull out the lever toward you.
5. Insert a new ENC board at a position where the lever of the new board can be pull out.
6. Push in the lever to fix the ENC board.
7. Connect the removed cable as connected originally.
8. Turn on the breaker.
9. Turn on the main switch.
10. Check that the FAIL LED (red) does not turn on.
11. Check that the WARNING LED (orange) turn off.

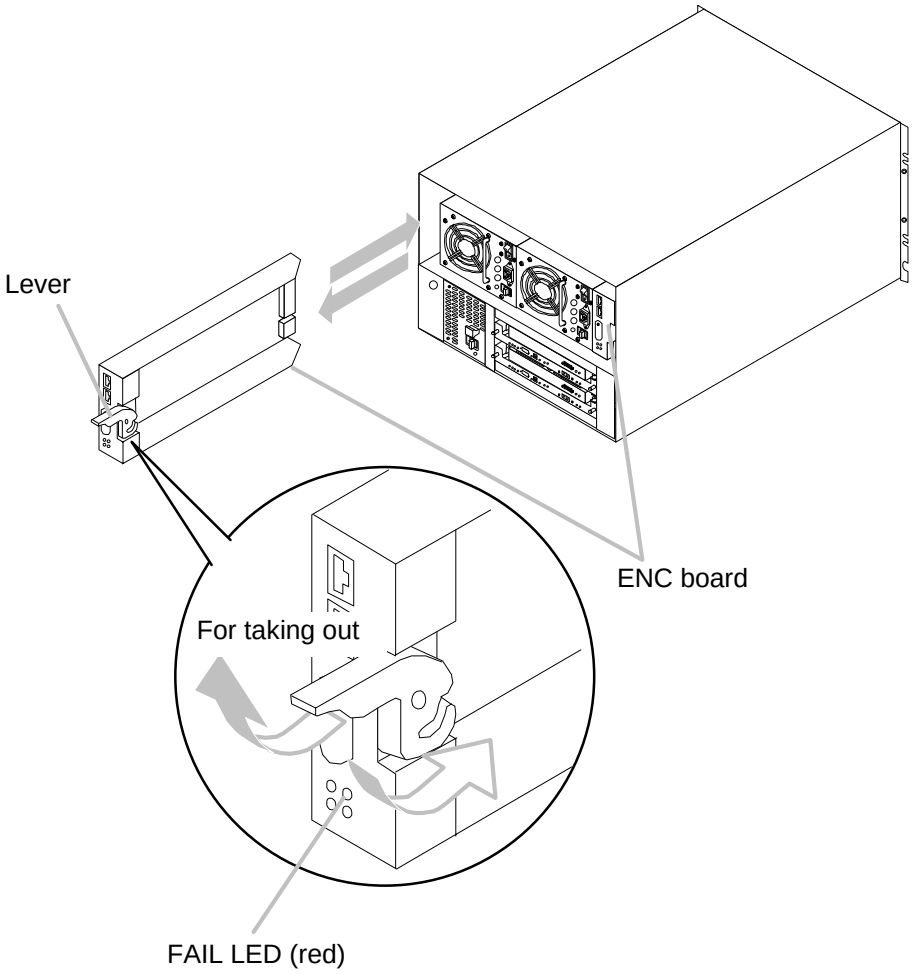


Figure 5.8 Replacing a ENC Board

5.2.5 Replacing the FAN Unit

MAINTENANCE ENGINEER : The replacing of a fan unit is referred to trained service personnel only. The user must not do it.

CAUTION :
- If you touch live electric parts while replacing parts, this can cause an electric shock.
- The fan rotates at a high speed. Take care not to entangle fingers.

The procedure for replacing the fan unit.
The temperature within the unit continues rising during replacement, so finish the replacement work within 10 minutes.

1. Shift the latch on the fan unit to release the lock, and in that released condition, pull out the fan unit toward you by holding onto the knob.
2. Wait for more than 20 seconds. And then push in a new fan unit until you hear the latch of the new unit click into place.
3. Check that the FAIL LED (red) does not turn on.
4. Check that air blows out from the attached fan unit.
5. Check that the WARNING LED (orange) turn off.

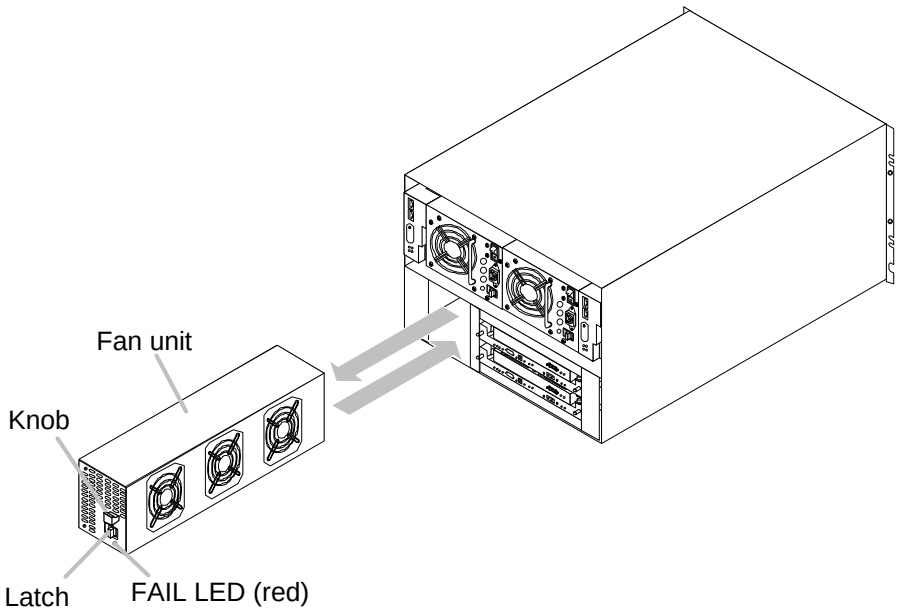


Figure 5.9 Replacing a FAN Unit

5.2.6 Replacing the AC/DC Power Supply

: The replacing of a AC/DC power supply is referred to trained service personnel only.
The user must not do it.

CAUTION : If you touch live electric parts while replacing parts, this can cause an electric shock.

The procedure for replacing the AC/DC power supply.
When replacing only one AC/DC power supply unit, it can be replaced without having to turn off the power. When both units must be replaced, be sure to replace them one by one or replace them under the condition in which the power is off.

- For replacement with the equipment power supply on

1. Check that the PS RDY LED (green) of a AC/DC power supply unit to be replaced is off.
2. Check that the PS RDY ED (green) of a AC/DC power supply unit not to be replaced is on.
3. Turn Off the breaker of a AC/DC power supply unit to be replaced.

:In this case, though the breaker on either side is set to off, the fan continues rotating to prevent the temperature from rising within the unit.

4. Remove the cables connected to the power supply unit to be replaced.
5. Pull out the AC/DC power supply with its latch being slid.
6. Wait for more than 20 seconds. And then push in a new AC/DC power supply until it is latched with a click.
7. Reconnect the removed cables.
8. Turn On the breaker of new AC/DC power supply unit.
9. Check that the PS RDY LED (green) of the mounted AC/DC power supply unit turn on.
10. Check that the WARNING LED (orange) turn off.

- For replacement with the equipment power supply off

1. Turn off the main switch, and the POWER LED (green) will go out.
2. Set both breakers to off.
3. Remove the cables connected to the power supply unit to be replaced.
4. Pull out the AC/DC power supply with its latch being slid.
5. Push in a new AC/DC power supply until it is latched with a click.
6. Reconnect the removed cables.
7. Set both breakers to on.
8. Check that the PS RDY LEDs of both power supply units turn on.
9. Check that the WARNING LED (orange) turn off.

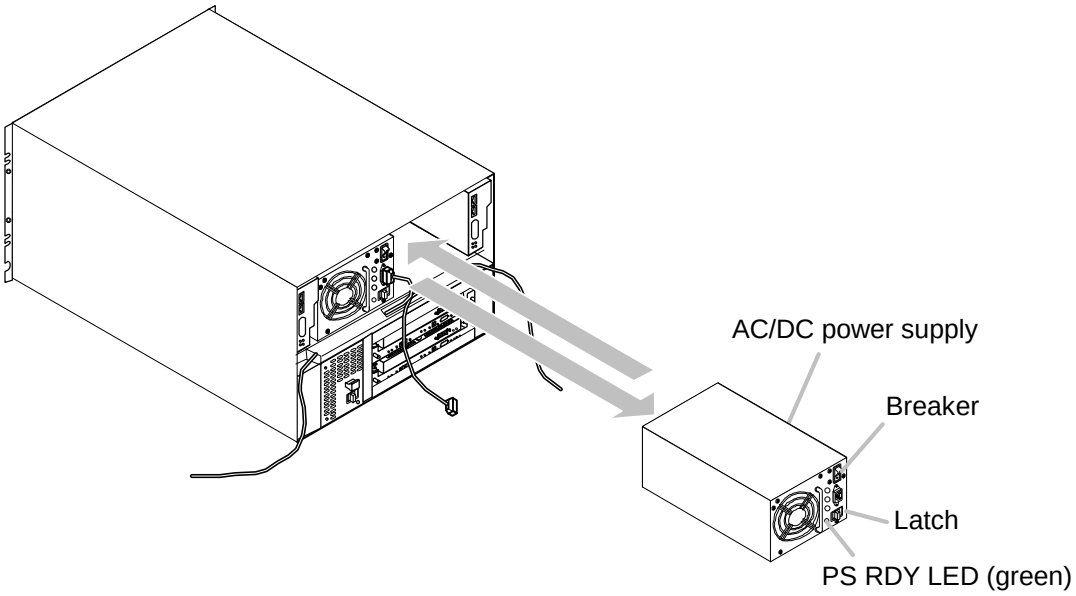


Figure 5.10 Replacing a AC/DC Power Supply

5.2.7 Replacing Controllers and Their Hardware Components

: The replacing of Controllers and their hardware components is referred to trained service personnel only.
The user must not do it.

CAUTION : If you touch live electric parts while replacing parts, this can cause an electric shock.

The procedure for replacing the controller, interface board, and cache memory.
When replacing only one controller with its FAIL LED (red) lighted and its hardware components in a dual controller configuration, they can be replaced without having to turn off the power. When both controllers must be replaced, be sure to replace them one by one or replace them under the condition in which the power is off.

- For replacement with the equipment power supply on

1. Check that the FAIL LED (red) is on.
   If it is off, follow the replacement procedure used when the power is off.
2. Remove the LAN cables and RS232C cables connected to the controller to be replaced.

:Do not remove the interface cable connected to the interface adapter assy. Because, in the case of the SCSI connection, lower devices connected in the daisy chain become unable to be recognized by the host.

3. Loose screws fixing a controller in which the FAIL LED (red) is on.
4. Pull both levers together in the directions marked with arrows (⋯⋯>) to take out the controller.
5. Remove the interface board and cache memory to which the interface cables are still left connected.

:Because the interface adapter assy to which the cable is left connected is live, do not let any of its live parts contact the other articles.

:Temporarily put the removed cache assy in the place where anti-electrostatic discharge measures have been taken.

6. If the controller has failed, replace it with a new one.
7. Attach the interface board and the cache memory to the new controller at the same positions as before replacement.
   When the interface board has a failure, remove the interface cable and replace it with a new one. Connect the interface cable to the new interface board.
   When the cache memory has a failure, also replace it with a new one.

8. Insert the controller with both levers opened, and push in the levers together in the directions marked with arrows (⟶).


INPORTANCE : Perform the operation to return the levers within one second. If the returning of the levers takes longer time, it is possible that the recovery from the error fails. When this happens, execute the replacement procedure again. If the subsystem is not recovered from the failure nevertheless, replace the controller because the controller has failed.

9. Fixing the screw of controller.
10. Remove the cables connected to the controller to be replaced.
11. Check that the WARNING LED (orange) turn off.

- For replacement with the equipment power supply off

1. Axcertain the location of the controller whose FAIL LED (red) is on.
2. Make sure that the system parameter backup FD is inserted, and then back up the system parameters.
3. Turn off the main switch, and the POWER LED (green) will go out.
4. Turn off the breaker.
5. Remove the LAN cables and RS232C cables connected to the controller to be replaced.


INPORTANCE : Do not remove the interface cable connected to the interface adapter assy. Because, in the case of the SCSI connection, lower devices connected in the daisy chain become unable to be recognized by the host.

6. Loose screws fixing a controller in which to be replaced.
7. Pull both levers together in the directions marked with arrows (⇢) to take out the controller.
8. Remove the interface board and cache memory to which the interface cables are still left connected.


INPORTANCE : Because the interface adapter assy to which the cable is left connected is live, do not let any of its live parts contact the other articles.


INPORTANCE : Temporarily put the removed cache assy in the place where anti-electrostatic discharge measures have been taken.

9. If the controller has failed, replace it with a new one.
10. Attach the interface board and the cache memory to the new controller at the same positions as before replacement.
    When the interface board has a failure, remove the interface cable and replace it with a new one. Connect the interface cable to the new interface board.
    When the cache memory has a failure, also replace it with a new one.
11. Insert the controller with both levers opened, and push in the levers together in the directions marked with arrows (⟶).
12. Fixing the screw of controller.
13. Remove the cables connected to the controller to be replaced.
14. Confirm that an FD which includes a backup copy, made at Step 2, of system parameters has been inserted in the floppy disk drive, and then set the breaker to on.
15. When the controller has been replaced, restore (reconstruct) the system parameters from the FD.
16. Turn on the main switch.
17. Check that the WARNING LED (orange) turn off.

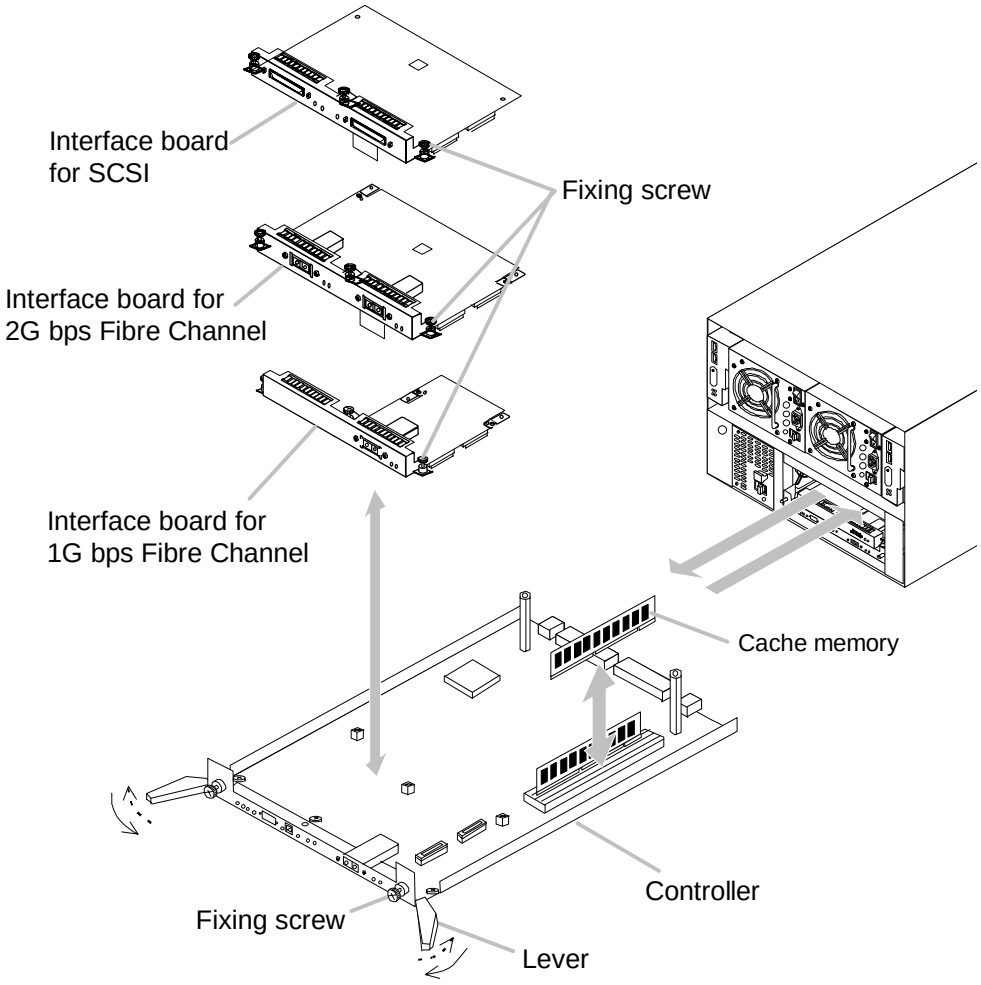


Figure 5.11 Replacing Controllers and Their Hardware Components

Chapter 6 Periodic Maintenance

6.1 Periodic Maintenance

To maintain the performance of the DF500 unit, the unit must be inspected and cleaned periodically.
Procedures for inspecting and cleaning the unit are described for the U6 rack mounting model and the floor standing model separately.
In addition, for the RK and RKA models, inspect and clean them in the same way by referring to the procedures for the U6 rack mounting model.

In addition, if you find any dirt, clean the unit even at a shorter period than a described one.

Table 6.1 Check Items and Their Frequencies

No.	Checking items	Frequency of checking		
		U6 rack mount model	Floor model	
			CK1	CK2
1	Inspecting the Fan	Once every one year	Once every one year	Once every one year
2	Inspecting the Battery unit	Once every two years	Once every two years	Once every two years
3	Cleaning the cabinet	Once every one year	Once every one year	Once every one year

: The maintenance intervals were set on the assumption that the average operation hours of the subsystem is 400 hours/month. Therefore, in the following cases, consult the customer to decide whether to change the intervals or not taking the actual operation hours in consideration. (See Table 6.2.)

Table 6.1.2 Change of Maintenance Interval

Object item	Factors requiring change of maintenance interval		Remarks
	Case of shortening the interval	Case of lengthening the interval	
• Inspection of fans • Cleaning of the subsystem	• Operation hours are long. • Installation environment is bad. • To fit the interval for user's operation schedule. • To improve service for user • Necessity to shorten the interval is recognized for other reason.	• Operation hours are short. • Installation environment is excellent.	Also examine items to be added to the factors shown on the left such as the frequency of the subsystem failure occurrence and items common to the subsystem and a connected system.

6.2 Periodic Maintenance the Rackmount Model

This section describes the procedure for inspecting the fan, the procedure for checking the battery validity, and the procedure for cleaning the equipment with regard to the U6 rack mount model.

INPORTANCE : When performing each work, do not move the equipment violently or give a shock to the equipment, otherwise the user's important data will be lost.

6.2.1 Inspecting the Fan

CAUTION : The fan rotates at a high speed. The care not to entangle fingers.

Check if fans of operational RK and RKA units rotate normally.
Perform this inspection at intervals of once a year.
If any fault is found, a fire or failure will be caused by leaving this fault as it is. Be sure to contact the maintenance engineer.
If any fan abnomality is found in the normal operation status, contact the maintenance engineer.

Perform the following checks:

- Check visually that fans of AC/DC power supply units rotate normally.
- Check that the FAIL LED (red) of the fan unit is off.

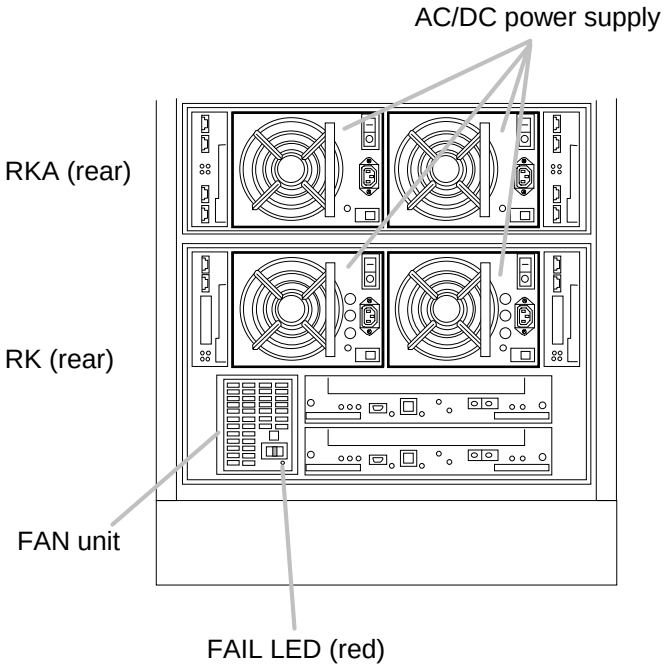


Figure 6.1 Locations of Checks on U6 Rackmount Model

6.2.2 Inspecting the Battery Unit

Battery units mounted on the DF500 unit are a replacement part with a service life.
The service life of battery units is two years from the beginning of use.
Over a period of two years, a battery unit can cause the unit to fail due to leakage of a battery solution or a shortage of electricity supply. Therefore, ask your service representative to replace the battery unit.
The starting date of usage is described on the label attached to a battery unit.

REFERENCE : For replacement of battery unit, see Chapter 5, “When you are in difficulty” on page 65.

The following figure locates a label on which the starting date of usage is described.

Be sure to use a specified battery unit for a replacement battery.

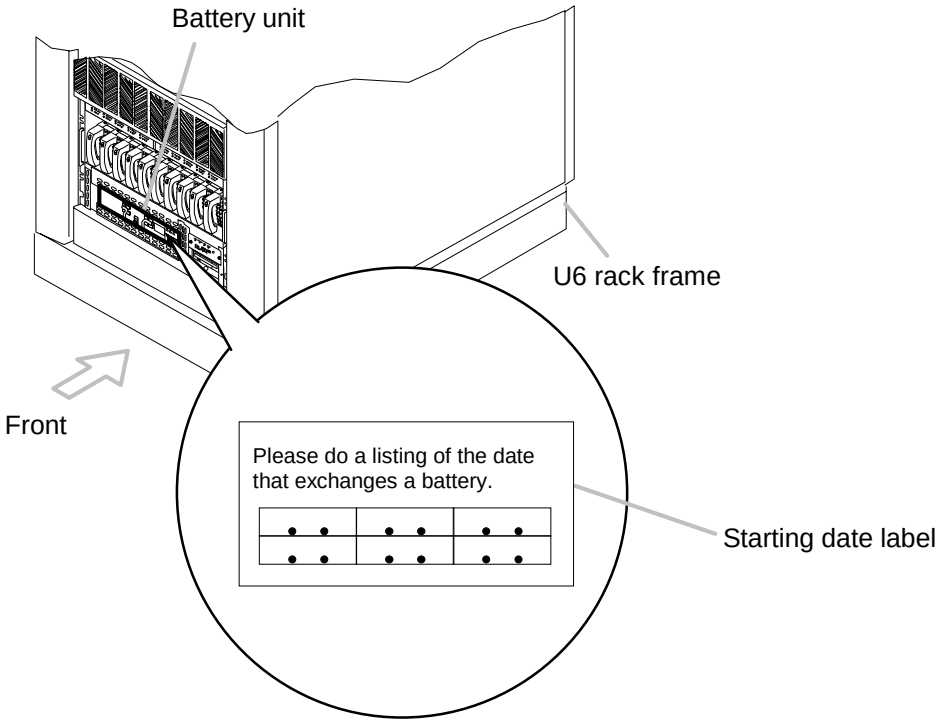


Figure 6.2 Locations of Label on which the Starting Date of Usage is Described

6.2.3 Cleaning the Cabinet

CAUTION : When performing cleaning, take care not to touch the powered portion, otherwise an electric shock will be caused.

Perform cleaning for the cabinet once a year.
Remove clogging at the air vent of the equipment with a vacuum cleaner. If the air vent is much stained, wipe off the stain with a dry cloth.
Usually, whenever you find the air vent clogged, perform cleaning at once.

INPORTANCE :If cleaning is omitted, the internal temperature of the equipment goes high, causing a fire or failure.

Clean the following sections:

- Outside and inside of the front bezels mounted on RK and RKA units
- Outside of the rear door

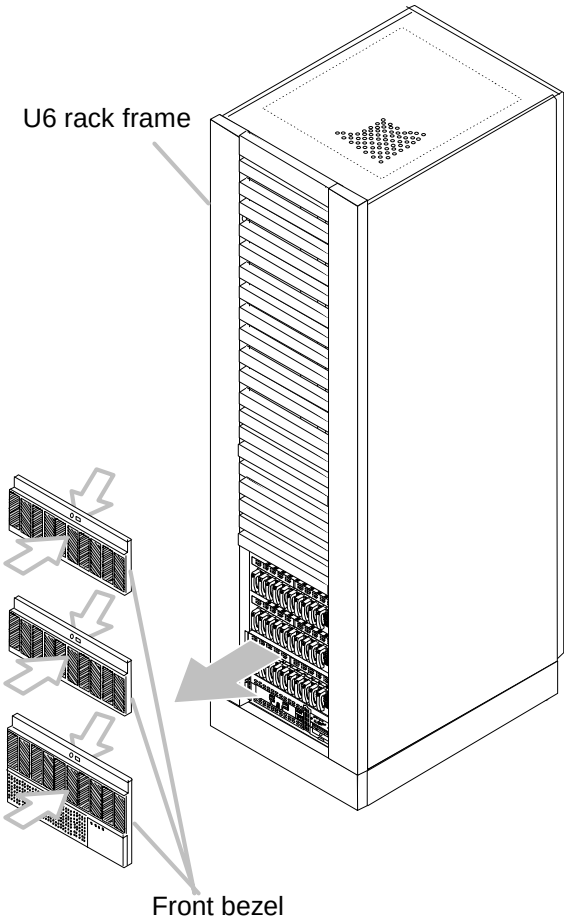


Figure 6.3 Locations of Sections to be Cleaned on U6 Rackmount Model (front)

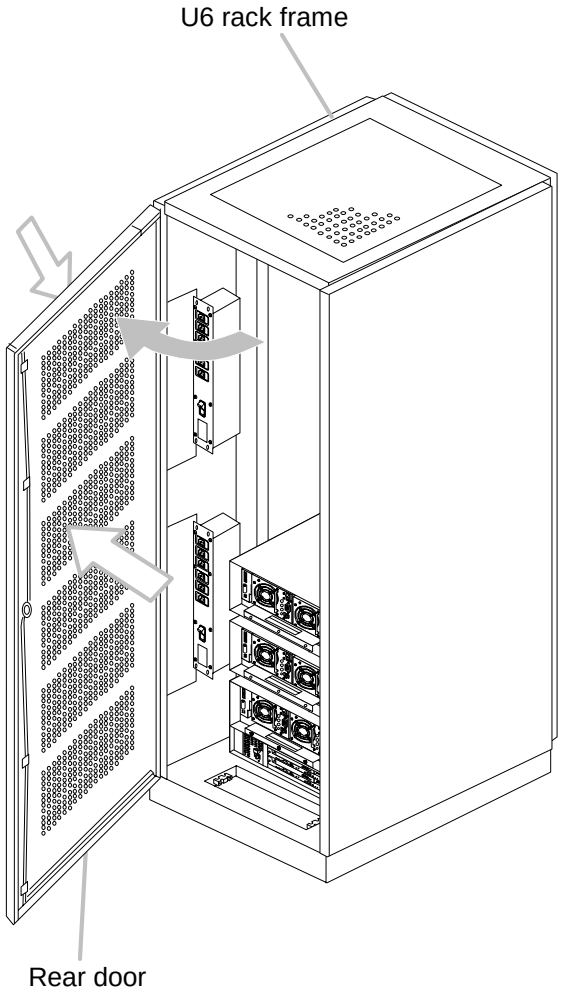


Figure 6.4 Locations of Sections to be Cleaned on U6 Rackmount Model (rear)

6.3 Periodic Maintenance the Floor Model

This section describes the procedure for inspecting the fan, the procedure for checking the battery validity, and the procedure for cleaning the equipment with regard to the floor model.

INPORTANCE : When performing each work, do not move the equipment violently or give a shock to the equipment, otherwise the user's important data will be lost.

6.3.1 Inspecting the Fan

CAUTION : The fan rotates at a high speed. The care not to entangle fingers.

Check if fans of operational RK and RKA units rotate normally.
Perform this inspection at intervals of once a year.
If any fault is found, a fire or failure will be caused by leaving this fault as it is. Be sure to contact the maintenance engineer.
If any fan abnomality is found in the normal operation status, contact the maintenance engineer.

Perform the following checks:

- Check visually that fans of AC/DC power supply units rotate normally.
- Check that the FAIL LED (red) of the fan unit is off.

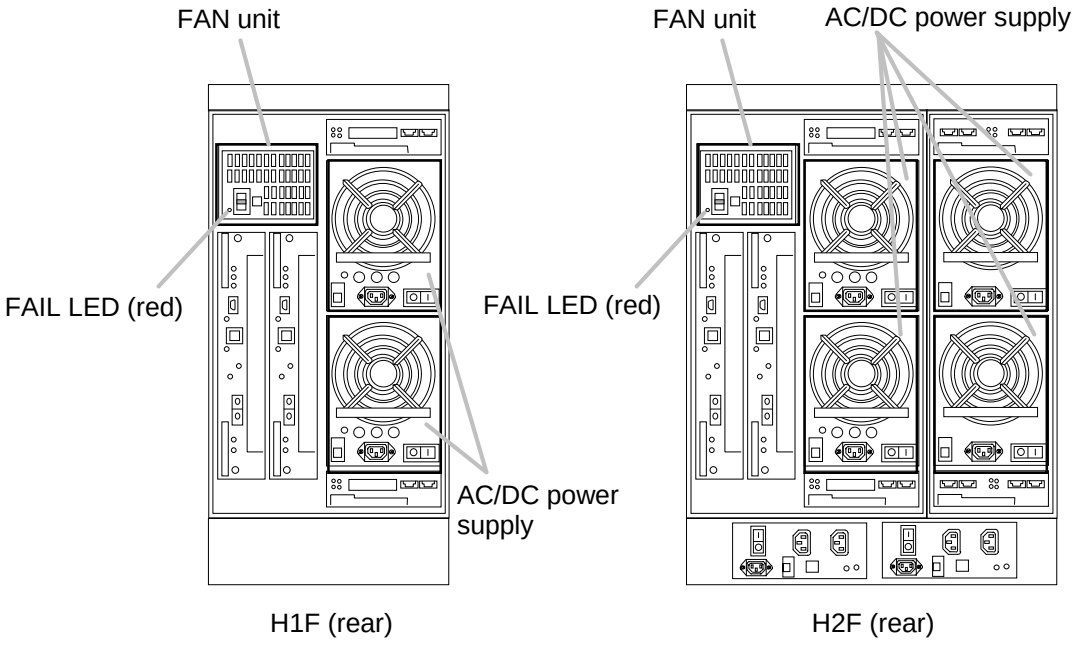


Figure 6.5 Locations of Checks on Floor Model

6.3.2 Inspecting the Battery Unit

Battery units mounted on the DF500 unit are a replacement part with a service life.
The service life of battery units is two years from the beginning of use.
Over a period of two years, a battery unit can cause the unit to fail due to leakage of a battery solution or a shortage of electricity supply. Therefore, ask your service representative to replace the battery unit.
The starting date of usage is described on the label attached to a battery unit.

REFERENCE : For replacement of battery unit, see Chapter 5, “When you are in difficulty” on page 65.

The following figure locates a label on which the starting date of usage is described.

Be sure to use a specified battery unit for a replacement battery.

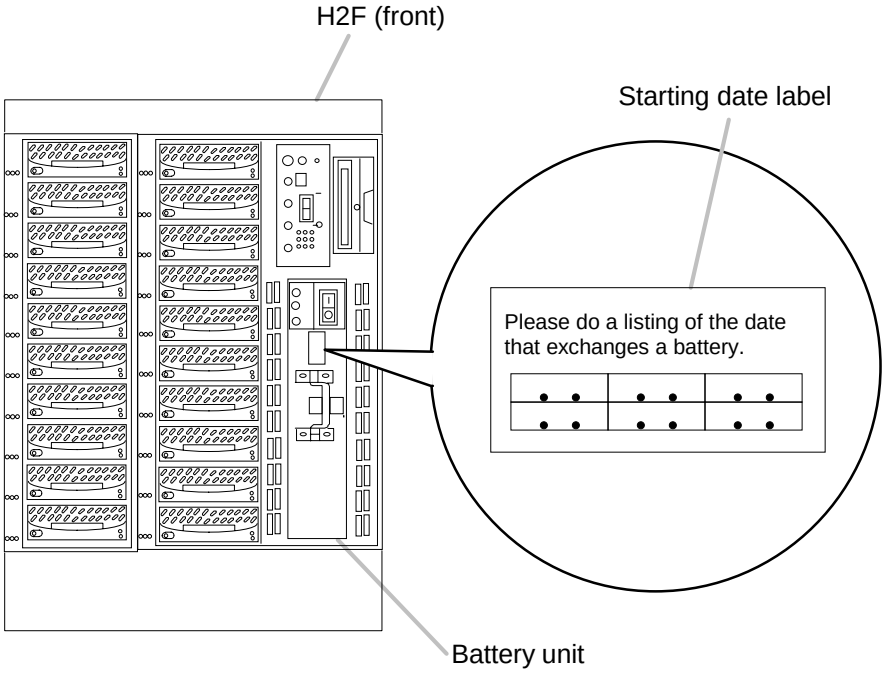


Figure 6.6 Locations of Label on which the Starting Date of Usage is Described

6.3.3 Cleaning the Cabinet

CAUTION : When performing cleaning, take care not to touch the powered portion, otherwise an electric shock will be caused.

Perform cleaning for the cabinet once a year.
Remove clogging at the air vent of the equipment with a vacuum cleaner. If the air vent is much stained, wipe off the stain with a dry cloth.
Usually, whenever you find the air vent clogged, perform cleaning at once.

INPORTANCE :If cleaning is omitted, the internal temperature of the equipment goes high, causing a fire or failure.

Clean the following sections:

- Outside and inside of the front bezel
- Outside of the rear cover

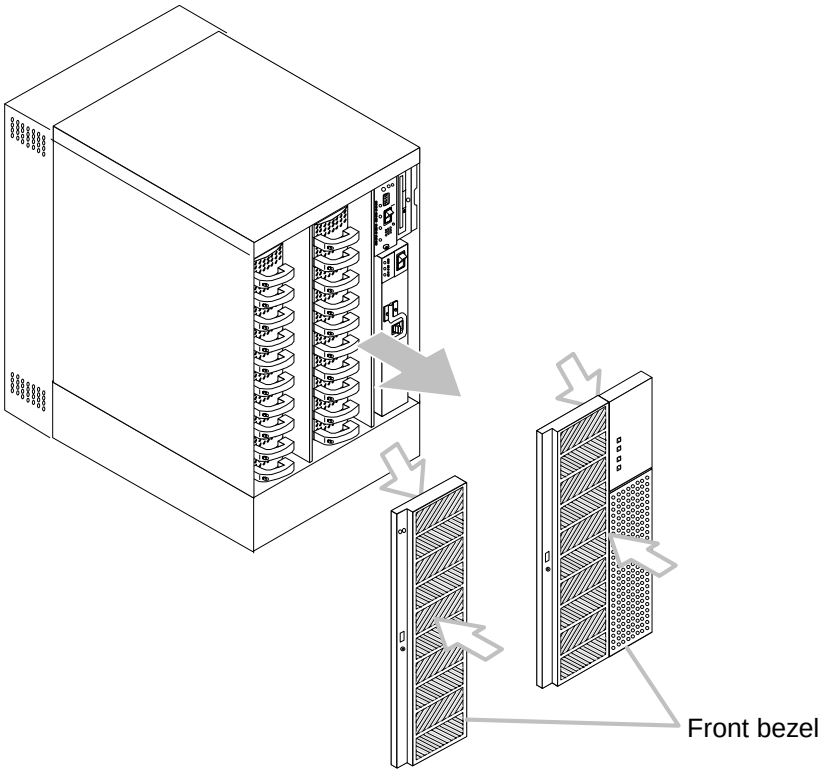


Figure 6.7 Locations of Sections to be Cleaned on Floor Model (front)

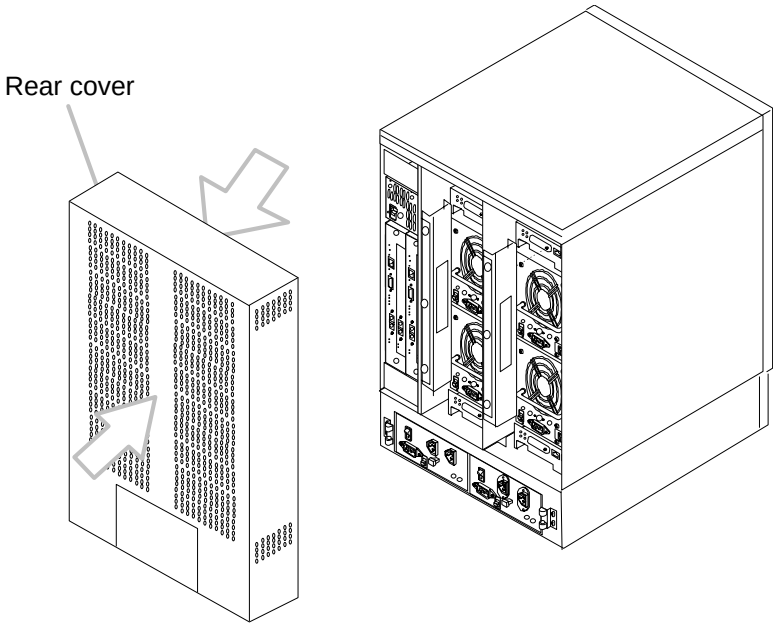


Figure 6.8 Locations of Sections to be Cleaned on Floor Model (rear)

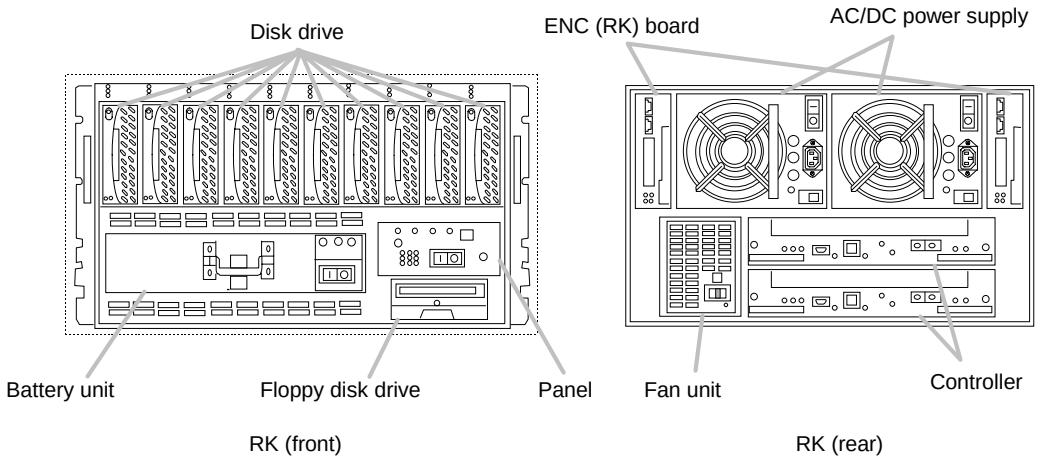
Appendix

Appendix A Locations of Components

The following shows locations of the hardware components of the RK and RKA models.

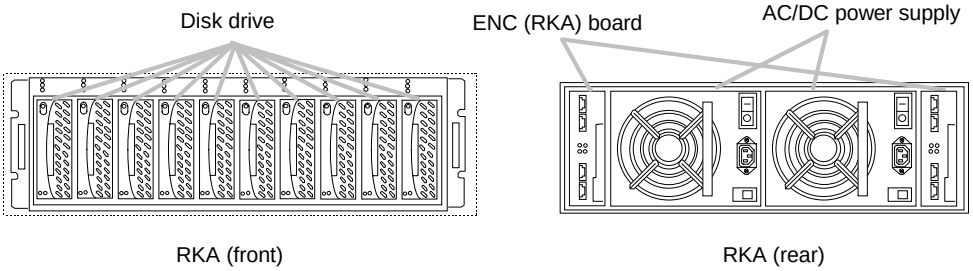
Appendix A.1 The Hardware Components of the RK

Locations of components (RK).



Appendix A.2 The Hardware Components of the RKA

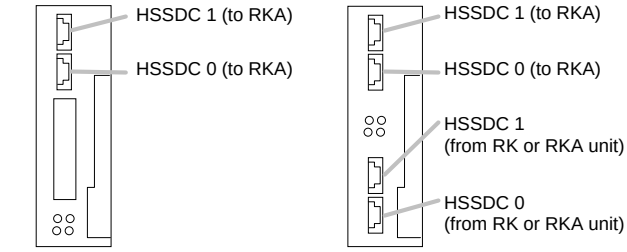
Locations of components (RKA).



Appendix B Locations of Connectors

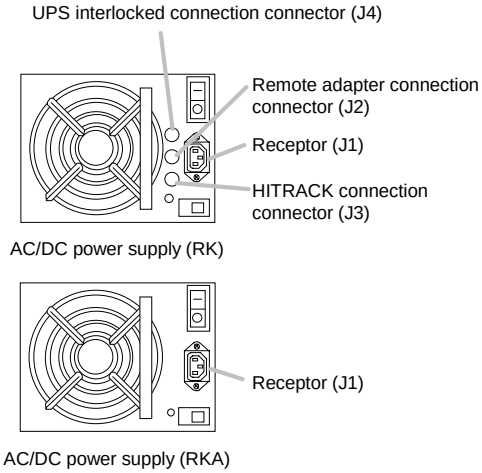
The following shows locations and functions of connectors in individual hardware components.

Appendix B.1 Connectors on ENC Board



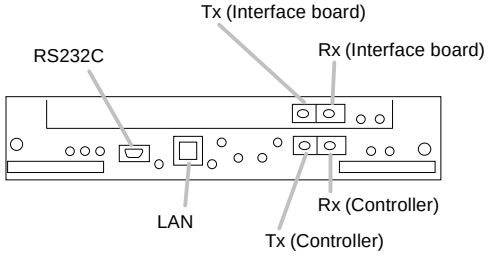
Connector	Function
HSSDC 0	RK/RKA connection connector of PC-AL (loop 0 side)
HSSDC 1	RK/RKA connection connector of PC-AL (loop 1 side)

Appendix B.2 Connectors on AC/DC Power Supply Unit



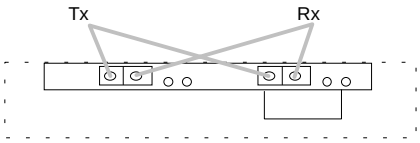
Connector	Function
UPS interlocked connection connector (J4)	Used to connect an UPS for DF500.
Remote adapter connection connector (J2)	Used to connect a Remote adapter.
Receptor (J1)	Power cable receptacle on the unit side.
HITRACK connection connector (J3)	Connector used to connect a LAN cable.

Appendix B.3 Connectors on Controller/Interface Board (Fibre Channel(1 G bps))



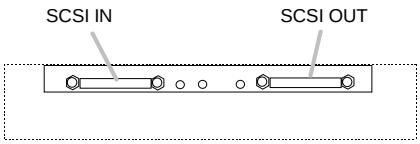
Connector	Function
RS232C	Connector used to connect an RS232C cable.
Tx	Connector for the output signal connection side of a Fibre channel interface cable.
Rx	Connector for the input signal connection side of a Fibre channel interface cable.
LAN	Connector used to connect a LAN cable.

Appendix B.4 Connectors on Interface Board (Fiber Channel(2 G bps))



Connector	Function
Tx	Connector for the output signal connection side of a Fibre channel interface cable.
Rx	Connector for the input signal connection side of a Fibre channel interface cable.

Appendix B.5 Connectors on Interface Board (SCSI)

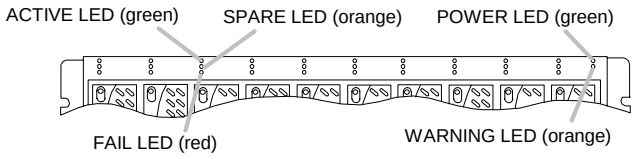


Connector	Function
SCSI IN	Connector for the input signal connection side of a SCSI interface cable. The connector connects a cable from a host or another SCSI device connected to a host.
SCSI OUT	Connector for the output signal connection side of a SCSI interface cable. When nothing is connected to the connector, the interface board is put in the state, by the automatic terminating function, same as that in which a terminating resistor is connected to the connector.

Appendix C Locations and Functions of LEDs

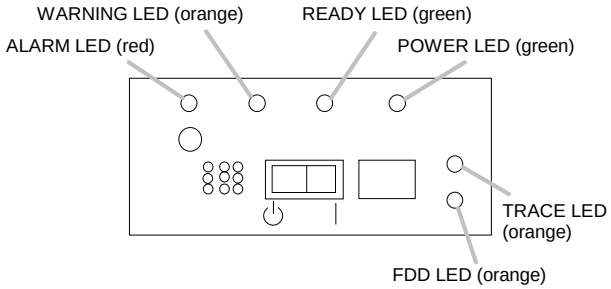
The following shows locations and functions of LEDs in individual hardware components.

Appendix C.1 LEDs on Disk Drive Display Section



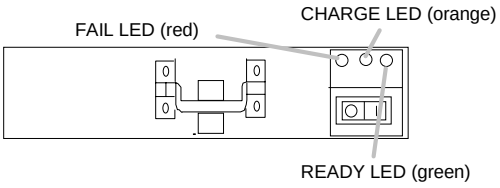
LED	Function
ACTIVE LED (green)	When on or flashing, it indicates that the disk drive is operational.
SPARE LED (orange)	When on, it indicates that the disk drive is designated as a spare disk drive.
POWER LED (green)	When on, it indicates that electricity is supplied to the RKA unit.
WARNING LED (orange)	When on, it indicates that a failure occurs in the unit, so the unit is inoperable.
FAIL LED (red)	When on, it indicates that a failure occurs in the disk drive, so the disk drive is inoperable.

Appendix C.2 LEDs on Panel



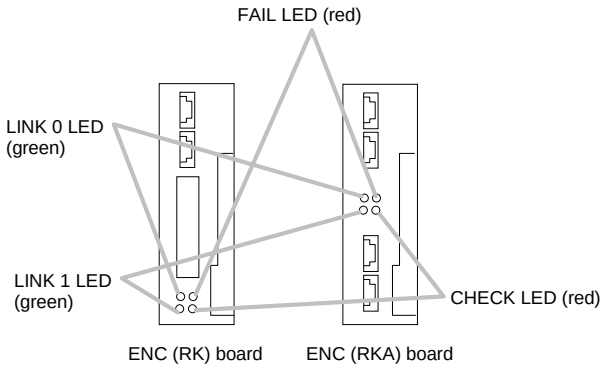
LED	Function
ALAM LED (red)	When on, it indicates that a failure occurs in the unit, so the unit is inoperable.
WARNING LED (orange)	When on or flashing, it indicates that a failure occurs in the unit, but the unit still is operable.
READY LED (green)	When on, it indicates that the unit is operable.
POWER LED (green)	When on, it indicates that electricity is supplied to the unit.
TRACE LED (orange)	When on, it indicates that tracing is under execution.
FDD LED (orange)	When on, it indicates that the floppy disk drive (FDD) is operational.

Appendix C.3 LEDs on Battery Unit



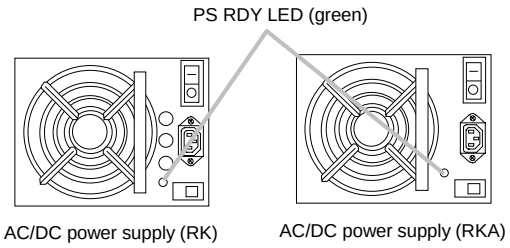
LED	Function
FAIL LED (red)	When on, it indicates that a failure occurs in the battery unit.
CHARGE LED (orange)	When on or flashing, it indicates the charging status of the battery.
READY LED (green)	When on, flashing, or off, it indicates the condition of the battery.

Appendix C.4 LEDs on ENC Board



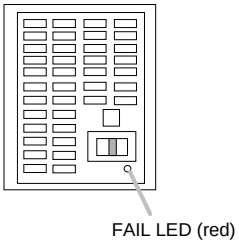
LED	Function
LINK 0 LED (green)	When on, it indicates that the link status of FC-AL (loop 0 side) is normal.
FAIL LED (red)	When on, it indicates that a failure occurs in the ENC board, so the ENC board is inoperable.
CHECK LED (red)	It indicates, according to the number of times the LED flashes, what voltage is abnormal. Once : Abnormal voltage on logic +5 V Twice : Abnormal voltage on drive +12 V Three times : Abnormal voltage on logic +3.3 V Five times : Abnormal voltage on battery output Six times : Abnormal voltage on controller (The reset of the controller is not yet released.)
LINK 1 LED (green)	When on, it indicates that the link status of FC-AL (loop 1 side) is normal.

Appendix C.5 LEDs on AC/DC Power Supply



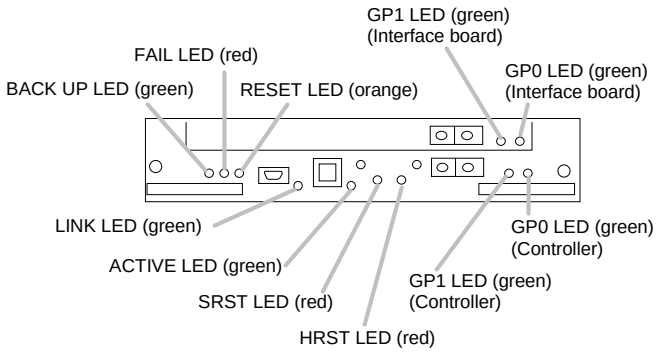
LED	Function
PS RDY LED (green)	When on or off, it indicates the operating status of the AC/DC power supply unit. On : It is operating normally. Off : It is abnormal or in a stop state.

Appendix C.6 LEDs on FAN Unit



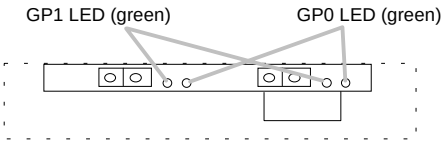
LED	Function
FAIL LED (red)	When on or off, it indicates the operating status of the fan unit. On : It is abnormal. Off : It is operating normally or in a stop state.

Appendix C.7 LEDs on Controller/Interface Board (Fibre Channel(1 G bps))



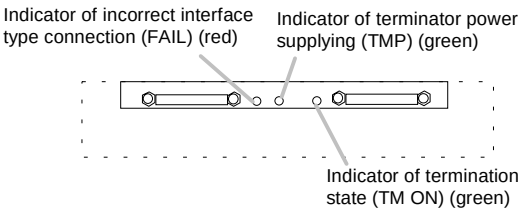
LED	Function
BACK UP LED (green)	When on or off, it indicates the status of the cache memory backup operation. On : Backup operation is in execution. Off : Backup operation is not in execution.
FAIL LED (red)	When on, it indicates that a failure occurs in the controller, so the controller is inoperable.
RESET LED (orange)	When on, it indicates that the controller is under resetting.
GP0 LED (green)	It indicates the status of the interface installed in the controller as standard.
GP1 LED (green)	It indicates the status of the interface installed in the controller as standard.
HRST LED (red)	When on, it indicates that the HRST switch has been pressed.
SRST LED (red)	When on, it indicates that the SRST switch has been pressed.
ACTIVE LED (green)	When on, it indicates that data is being transferred through the LAN.
LINK LED (green)	When on, it indicates that the link status of the LAN is normal.

Appendix C.8 LEDs on Interface Board (Fibre Channel(2 G bps))



LED	Function
GP0 LED (green)	It indicates the status of the interface installed in the controller as standard.
GP1 LED (green)	It indicates the status of the interface installed in the controller as standard.

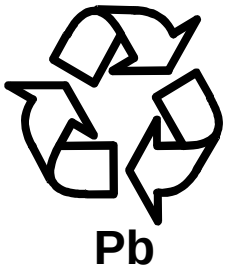
Appendix C.9 LEDs on Interface Board (SCSI)



LED	Function
Indicator of incorrect interface type connection (FAIL) (red)	This LED lights in red when an incorrect interface type is connected. It is off in a normal state.
Indicator of terminator power supplying (TMP) (green)	This LED lights in green when the terminator power is being supplied. If it is off when the power is internally supplied, it means that a failure has occurred. When the power is supplied from outside, it shows a normal state even if the LED is off.
Indicator of termination state (TM ON) (green)	This LED lights in green when the automatic terminating function operates.

Appendix D Recycling Battery Units

The mark posted on the battery unit is a three-arrow mark that means a recyclable part.



Appendix E Basic Specifications

Item			Model: Rackmount model RK	Rackmount model RKA	Rackmount model With U6 rack frame	Rackmount model With U4 rack frame	Floor model H1F	Floor model H2F
Host interface	Interface type		• 2 G bps Fibre Channel Optical (Non-OFC) • Fibre Channel Optical (Non-OFC, 100-M5-SN-I) • Ultra-Wide Single-ended/ Differential • Ultra_2-Wide SCSI Low Voltage Differential (LVD)	—	• 2 G bps Fibre Channel Optical (Non-OFC, 100-M5-SN-I) • Fibre Channel Optical (Non-OFC, 100-M5-SN-I) • Ultra-Wide Single-ended/Differential • Ultra_2-Wide SCSI Low Voltage Differential (LVD)			
	Data transfer speed (i.e. maximum speed for transfer to host)		• 200 M bytes/s (Fibre Channel) • 100 M bytes/s (Fibre Channel) • 80 M bytes/s (Ultra_2-Wide SCSI) • 40 M bytes/s (Ultra-Wide SCSI)	—	• 200 M bytes/s (Fibre Channel) • 100 M bytes/s (Fibre Channel) • 80 M bytes/s (Ultra_2-Wide SCSI) • 40 M bytes/s (Ultra-Wide SCSI)			
	Number of ports	Single controller	Fibre Channel : 1 to 2 SCSI : 1	—	Fibre Channel : 1 to 2 SCSI : 1			
		Dual controller	Fibre Channel : 2 to 4 SCSI : 2	—	Fibre Channel : 2 to 4 SCSI : 2			
	Transferred block size (bytes)		512					
RAID specifications	RAID level		0/1/5/0+1	—	0/1/5/0+1			
	RAID configuration (unit of addition)	RAID 0	2D to 10D	—	2D to 16D		2D to 10D	2D to 16D
		RAID 1	1D+1P	—	1D+1P			
		RAID 5	2D+1P to 9D+1P	—	2D+1P to 15D+1P		2D+1P to 9D+1P	2D+1P to 15D+1P
		RAID 0+1	2D+2P to 5D+5P	—	2D+2P to 8D+8P		2D+2P to 5D+5P	2D+2P to 8D+8P
Physical Specifications	Start-up time (min)		Standard : 3(*1)	—	Standard : 3(*1)			
	Chassis size [mm] (W×D×H)		482.6×656×262	482.6×656×152	610×813×1,880	596×996×1,606	262×737×600	417×737×600
	Mass [kg] (*1)		Applox.65	Applox.40	Applox.620	Applox.400	Applox.85	Applox.140
	Acoustic noise [dB]		60 or less		65 or less		60 or less	65 or less
	Required height [EIA]		6	3.5	Max. 38	Max. 32	—	
Input power specifications	Input voltage [V]		AC 100/200 (89 to 127/178 to 254)		AC 200 (178 to 254)		AC 100/200 (89 to 127/178 to 254)	
	Frequency [Hz]		50/60 ± 1					
	Number of phases, cabling		Single-phase with protective grounding					
	Steady-state current [A]		3.5×2/1.8×2	2.8×2/1.4×2	—/16.0 (One PDB/PDU)		3.5×2/1.8×2	6.7×2/3.4×2
	Breaking current [A]		20.0	15.0	20.0			
	Reuired power	Steady state [VA]	700	550	3,000 (One PDB/PDU)		700	1,250
		Starting state [VA] (*2)	800	650	3,700 (One PDB/PDU)		800	1,450

(Continued)

*1 : Value of maximum configuration (in the case where all the mountable Disk drives and Controller are mounted).

*2 : Power requirement in the case of the maximum configuration is shown. When planning facilities such as the uninterrupted power supply (UPS), specify the power factor as 100% for calculation. Value at 100 V/200 V is shown. (Example : 300 W=300 VA) The actual required power may exceed the value shown in the table when the tolerance is included.

*3 : The start-up time may be longer than three minutes depending on the configuration.

Item			Model	Rackmount model				Floor model	
				RK	RKA	With U6 rack frame	With U4 rack frame	H1F	H2F
Environmental specifications	Temperature	In operation [°C]		10 to 40					
		In non-operation [°C]		-10 to 50					
		In transport/storage [°C]		-30 to 60					
		Temperature change rate [°C/h]		10					
	Humidity	In operation [%]		8 to 80					
		In non-operation [%]		8 to 90					
		Maximum wet bulb temperature [°C]		29					
Environmental specifications	Vibration	In operation [m/s^2]		2.5 or less					
		In non-operation [m/s^2]		5.0 or less					
		In transport (packed) [m/s^2]		5.0 or less					
	Impact	In operation [m/s^2]		20 or less					
		In non-operation [m/s^2]		50 or less					
		In transport (packed) [m/s^2]		80 or less					
	Angle at which the subsystem will turn over			15° or more					

Option parts list.

Classification	Name/Model	Configuration and specification	RK	RKA	U6 rack mount model	U4 rack mount model	H1F	H2F
RK	Disk array system (DF-500-RK)	—	—	—	■	■	—	—
RKA	Disk array system (DF-500-RKA)	—	—	—	■	■	—	—
Frame (RK)	—	—	●	—	—	—	—	—
Frame (RKA)	—	—	—	●	—	—	—	—
Controller	(DF-F500-F1F)	—	●	—	—	—	●	●
AC/DC power supply	AC/DC power supply (RK)	AC/DC power supply for RK	●	—	—	—	●	●
	AC/DC power supply (RKA)	AC/DC power supply for RKA	—	●	—	—	—	●
Battery unit	—	—	●	—	—	—	●	●
Fan unit	—	—	●	—	—	—	●	●
Floppy disk drive	—	—	●	—	—	—	●	●
ENC (RK) board	—	—	●	—	—	—	●	●
ENC (RKA) board	—	—	—	●	—	—	—	●
Power cable	Power cable (DF-F500-J1F)	2.5 m, 2-pole power cable with grounding terminal (AC 125 V, 13 A)	—	—	—	—	●	●
	Power cable (DF-F500-J2F)	2.5 m, 2-pole power cable with grounding terminal (AC 250 V, 10 A)	●	●	—	—	—	●
	Power cable (DF-F500-J4F)	5.0 m, 2-pole power cable with grounding terminal (AC 250 V, 10 A)	—	—	—	—	—	—
	Power cable (DF-F500-J5F)	10.0 m, 2-pole power cable with grounding terminal (AC 250 V, 10 A)	—	—	—	—	—	—
Interface cable (Fibre Channel)	Fibre channel cable (DF-F500-K10P)	For optical, 5 m	■	—	—	—	■	■
	Fibre channel cable (DF-F500-K20P)	For optical, 10 m	■	—	—	—	■	■
	Fibre channel cable (DF-F500-K30P)	For optical, 20 m	■	—	—	—	■	■
	Fibre channel cable (DF-F500-K40P)	For optical, 50 m	■	—	—	—	■	■
	Fibre channel cable (DF-F500-K50P)	For optical, 100 m	■	—	—	—	■	■
	Fibre channel cable (DF-F500-KB1P)	LC-SC conversion cable For optical, 5 m	■	—	—	—	■	■
	Fibre channel cable (DF-F500-KB2P)	LC-SC conversion cable For optical, 10 m	■	—	—	—	■	■
	Fibre channel cable (DF-F500-KB3P)	LC-SC conversion cable For optical, 20 m	■	—	—	—	■	■
	Fibre channel cable (DF-F500-KB4P)	LC-SC conversion cable For optical, 50 m	■	—	—	—	■	■
	Fibre channel cable (DF-F500-KB5P)	LC-SC conversion cable For optical, 100 m	■	—	—	—	■	■
	Fibre channel cable (DF-F500-KC1P)	LC-LC cable For optical, 5 m	■	—	—	—	■	■
	Fibre channel cable (DF-F500-KC2P)	LC-LC cable For optical, 10 m	■	—	—	—	■	■
	Fibre channel cable (DF-F500-KC3P)	LC-LC cable For optical, 20 m	■	—	—	—	■	■
	Fibre channel cable (DF-F500-KC4P)	LC-LC cable For optical, 50 m	■	—	—	—	■	■
	Fibre channel cable (DF-F500-KC5P)	LC-LC cable For optical, 100 m	■	—	—	—	■	■

● :Component provided with the unit

■ :Optional component installed in the unit to operate the DF500 unit

(Continued)

Classification	Name/Model	Configuration and specification	RK	RKA	U6 rack mount model	U4 rack mount model	H1F	H2F
interface cable (SCSI)	SCSI cable (DF-F500-K350L)	5 m, 50-pin, pin/latch type	■	—	—	—	■	■
	SCSI cable (DF-F500-K450L)	5 m, 50-pin, bellows/latch type	■	—	—	—	■	■
	SCSI cable (DF-F500-K550L)	1.5 m, 50-pin, pin/latch type	■	—	—	—	■	■
	SCSI cable (DF-F500-K650L)	3 m, 50-pin, pin/latch type	■	—	—	—	■	■
	SCSI cable (DF-F500-K750L)	1.5 m, 50-pin, bellows/latch type	■	—	—	—	■	■
	SCSI cable (DF-F500-K850L)	3 m, 50-pin, bellows/latch type	■	—	—	—	■	■
	SCSI cable (DF-F500-K068L)	1.5 m, 68-pin, bellows/latch type	■	—	—	—	■	■
	SCSI cable (DF-F500-K168L)	3 m, 68-pin, bellows/latch type	■	—	—	—	■	■
	SCSI cable (DF-F500-K268L)	5 m, 68-pin, bellows/latch type	■	—	—	—	■	■
	SCSI cable (DF-F500-K568L)	20 m, 68-pin, bellows/latch type	■	—	—	—	■	■
	SCSI cable (DF-F500-K068M)	1.5 m, 68-pin, mini bellows/screw-locked type	■	—	—	—	■	■
	SCSI cable (DF-F500-K168M)	3 m, 68-pin, mini bellows/screw-locked type	■	—	—	—	■	■
	SCSI cable (DF-F500-K268M)	5 m, 68-pin, mini bellows/screw-locked type	■	—	—	—	■	■
	SCSI cable (DF-F500-K368M)	15 m, 68-pin, mini bellows/screw-locked type	■	—	—	—	■	■
	SCSI cable (DF-F500-K468M)	10 m, 68-pin, mini bellows/screw-locked type	■	—	—	—	■	■
	SCSI cable (DF-F500-K068S)	1.5 m, 68-pin, pin/screw-locked type	■	—	—	—	■	■
	SCSI cable (DF-F500-K168S)	5 m, 68-pin, pin/screw-locked type	■	—	—	—	■	■
	SCSI cable (DF-F500-K268S)	3 m, 68-pin, pin/screw-locked type	■	—	—	—	■	■
	SCSI cable (DF-F500-K368S)	10 m, 68-pin, pin/screw-locked type	■	—	—	—	■	■
	SCSI cable (DF-F500-K468S)	15 m, 68-pin, pin/screw-locked type	■	—	—	—	■	■
	SCSI cable (DF-F500-K568S)	0.5 m, 68-pin, pin/screw-locked type	■	—	—	—	■	■
Interface board	Interface1 G bps Fibre Channel (Optical) Non-OFC (DF-F500-DFFM5)	1 G bps Fibre Channel optical (Non-OFC) 100-M5-SN-I, DC connector For additional port	■	—	—	—	■	■
	Interface2 G bps Fibre Channel ×2 port (Optical) Non-OFC (DF-F500-DF2G2)	2 G bps Fibre Channel optical (Non-OFC) 200-M5-SN-I, LC connector For additional port	■	—	—	—	■	■
	Interface W/D (DF-F500-DFUDS)	Wide differential, 68-pin, pin-type, screw-locked (with built in terminator)	■	—	—	—	■	■
	Interface U/2 (DF-F500-DFU2S)	LVD, 68-pin, pin-type, screw-locked (with built in terminator)	■	—	—	—	■	■
Disk drive	3.5-type disk drive 8.7 G bytes (DF-F500-AAF8)	3.5-type disk drive (8.7 G bytes) installed in a canister. (Disk rotational speed : 10,000 min^{-1})	■	■	—	—	■	■
	3.5-type disk drive 17.8 G bytes (DF-F500-AAF18)	3.5-type disk drive (17.8 G bytes) installed in a canister. (Disk rotational speed : 10,000 min^{-1})	■	■	—	—	■	■
	3.5-type disk drive 17.8 G bytes (DF-F500-AAH18)	3.5-type disk drive (17.8 G bytes) installed in a canister. (Disk rotational speed : 15,000 min^{-1})	■	■	—	—	■	■
	3.5-type disk drive 35.7 G bytes (DF-F500-AAF36)	3.5-type disk drive (35.6 G bytes) installed in a canister. (Disk rotational speed : 10,000 min^{-1})	■	■	—	—	■	■
	3.5-type disk drive 71.6 G bytes (DF-F500-AAF72)	3.5-type disk drive (71.6 G bytes) installed in a canister. (Disk rotational speed : 10,000 min^{-1})	■	■	—	—	■	■

● :Component provided with the unit

■ :Optional component installed in the unit to operate the DF500 unit

Classification	Name/Model	Configuration and specification	RK	RKA	U6 rack mount model	U4 rack mount model	H1F	H2F
Cache memory	Cache memory 256 M bytes (DF-F500-C256)	Cache memory of 256 M bytes (128 M bytes × 2)	■	—	—	—	■	■
	Cache memory 512 M bytes (DF-F500-C512)	Cache memory of 512 M bytes (256 M bytes × 2)	■	—	—	—	■	■
	Chache memory 1 G bytes (DF-F500-C1G)	Cache memory of 1,024 M bytes (512 M bytes × 2)	■	—	—	—	■	■
Rack frame	U6 rack frame (DF-F500-U6)	Exclusive rack frame for mounting an RK and RKA (s) Supplied with four AC power cables (Can mount the RK (s) and RKA (s) up to a height of 38 EIA units.)	—	—	●	—	—	—
	U4 rack frame (DF-F500-U4)	Rack frame for rack mount type UPS Supplied with an AC power cable (Can mount the RK (s) and RKA (s) up to a height of 32 EIA units.)	—	—	—	●	—	—
Rack rail	Rack rail for U6 (DF-F500-URHT5)	Rail kit for mounting the RK (s) and RKA (s) on the U6 rack frame	—	—	■	—	—	—
	Rack rail for U4 (DF-F500-URHP5)	Rail kit for mounting the RK (s) and RKA (s) on the U4 or HP rack frame	—	—	—	■	—	—
Floor stand kit	Floor stand kit (DF-F500-H1F)	Kit for remaking the RK to floor model	—	—	—	—	●	—
	Floor stand kit (DF-F500-H2F)	Kit for connecting the RK and RKA and remaking them to floor model	—	—	—	—	—	●
	Additional slot kit (DF-F500-H3F)	A frame unit to be joined to the floor model H1F or floor model H2F in order to install an accessory device such as a remote adapter	—	—	—	—	—	—
Decoration panel	Decoration panel for U6 (DF-F500-U10D)	Panel to cover vacant space (1U) of the U6 rack frame	—	—	■	—	—	—
	Decoration panel for U6 (DF-F500-U05D)	Panel to cover vacant space (0.5U) of the rack frame	—	—	■	—	—	—

● :Component provided with the unit

■ :Optional component installed in the unit to operate the DF500 unit

Appendix F Glossary

- EIA
  Electronic Industries Alliance
  EIA standard 1 EIA unit = 44.45 mm
- FC-AL
  Fibre Channel Arbitrated Loop
- Fibre channel
  A set of standards of interfaces that are connected through optical fiber, etc. to achieve high-speed data transfer between devices.
- LED
  Light-Emitting Diode
- LU
  Logical Unit
- PDB
  Power Distribution Box
- RAID
  Redundant Array of Independent (Inexpensive) Disks
  A concept proposed in 1987 by a research group of the University of California, Berkeley.
  RAID distributes accesses among multiple disk drives, and thereby realizes a storage subsystem with high-speed accessibility, a large capacity, and high reliability.
  The University of California defined six levels of configurations from RAID 0 through RAID 5, and one of the levels is selected based on the trade-off in terms of cost and speed to meet the user's need.
- UPS
  Uninterrupted Power Supply
  A backup power supply, which is mounted on the DF500 unit to prevent shutdown of the unit even when power stoppage or momentary power interruption occurs.
- Spare disk
  A disk drive which is mounted separately from the disk drives for usual write and read operation, and when a failure occurs in a disk drive, data stored in the failed drive is copied to the spare disk drive so that the disk subsystem can continue to be available equivalently to the original subsystem.
- Flash memory
  ROM that can be electrically erased and reprogrammed.
  A type of EEPROM (Electrically Erasable and Programmable).
  It can retain information without electricity and is widely used as an external storage, etc.
- Host computer
  A computer which manages devices. In the case of the disk array, a computer which makes the disk array store data is applicable to the term.
- Microprogram
  A program that controls the basic operation of hardware when a CPU processes a programmed instruction.

DF500
Disk Array Subsystem
User's Guide

Hardware Part

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