PRIMERGY S60
Storage Subsystem

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1 Introduction

The functionality, mechanics and design of the PRIMERGY S60 storage subsystem are optimally adapted to the PRIMERGY Nxxx server compute-nodes. It can be used as rack or as floorstand model. In the 19-inch rack, the S60 subsystem occupies three height units.

The PRIMERGY S60 storage subsystem use the fiber-channel technology and can accommodate up to fourteen 1-inch hard disk drives.

The use of fiber-channel technology ensures high transmission speeds over long distances, using a very uncomplicated infrastructure.

Components such as fans, power supply units, hard disk drives and FFx-RAID controller modules (dual controller configuration only) can be replaced with the system running. Redundancy is provided for central components, offering a high degree of data security and reliability.

Server Management/ServerView

For the first step the server management for the PRIMERGY S60 storage subsystem will be ensured by SES (SCSI Enclosure Service).

A optional Remote Service Board (RSB) with more functions can be installed. In this case remote diagnosis is available to the customer or service provider for analysis, remote system configuration and a remote restart - even if the operating system or the hardware fails.

The RSB-module is board which includes a completely independent system. It has a separate operating system with web server and SNMP agents, and can be driven by an external power supply.

The board is installed in the storage subsystem and connected to the HDD backplane.

Further informations is provided in the documentation for the Remote Service Board (see "Related publications" on page 81).

ServerView and the related agents are set up within the group of servers and storage subsystems being monitored. The received information are evaluated by ServerView and processed for display or forwarding to the administrator (manager).

> **i** When installing PRIMERGY S60 storage subsystems in connection with ServerView please install the ServerStart CD version 4.06 or higher on each of the connected servers.

See ServerView documentation for notes concerning installing and update (see also "Related publications" on page 81).

1.1 Target Group

The operating instructions are intended for the person responsible for installing the hardware and correctly operating the system. The operating manual contain all the descriptions which are of importance for commissioning your PRIMERGY S60 storage subsystem in so far as they do not form part of the publication of your server system.

To understand the different expansion options it is necessary to have a knowledge of hardware and data transmission, as well as basic knowledge of the operating system used.

1.2 Notation Conventions

Italics	identifies commands and entries in flow text
Bold	highlights text
"Quotation marks"	indicates references to other chapters or manuals
►	identifies an operation that you have to perform.
i	indicates additional information, notes and tips
⚠ **CAUTION!**	indicates warnings, which, if ignored, will endanger your health, the operability of your server or the security of your data

1.3   Structure of the Manual

The PRIMERGY S60 storage subsystem manual describes how to install and configure the subsystem and perform expansions or upgrades.

You will find further information (see also entries in the chapter "Related publications" on page 81):

● in the "Safety, Warranty and Ergonomics" manual

● in the documentation on the PRIMERGY server

This manual consists of the following chapters:

● **Important notes**
  This chapter contains instructions on the safe operation of your storage subsystem as well as information about environmental protection.

● **Operating and indicator elements**
  This chapter gives a detailed description of the operating panel and the connecting elements on the rear panel of the storage subsystem.

● **Floorstand model**
  This part of the manual describes how opening and closing the floorstand model housing.

● **Power supply**
  This part of the manual describes the power supply units and their power supply. Fitting and removing power supply units is also described in detail.

● **Fan module**
  This part of the manual describes the fitting and removal of the fan module.

● **FC drives**
  This chapter describes in detail how the hot swappable drives must be dealt with.

● **Plug-in board modules**
  This chapter describes the FFx-RAID controller and its mounting and removal.

● **Connections**
  This chapter describes the FC and the mains connection.

  The possibilities of supplying the storage subsystem with mains voltage are also described.

● **Configurations**
  This part of the manual gives configuration examples.

● **Installation**
  The activities needed to install and commission the storage subsystem are described.

● **Troubleshooting**
  This chapter contains advice on solving problems that occur on commissioning or during the operation of the storage subsystem.

1.4   Technical Data

Electrical Characteristics	
Rated voltage	100 V - 240 V
Tolerance of the rated voltage	+6 % / -10 %
Rated frequency	50 Hz / 60 Hz
Rated current	max. 1.3 A at 240 V max. 3.1 A at 100 V
Power consumption	
Active power (= heat transfer)	max. 305 W
Apparent power	max. 310 VA
Power factor (PF)	0.95-0.99

Dimensions and Weight	Floorstand model	Rack model
Height	481mm	133 mm
Width	200 mm without legs 280 mm with legs	483 mm
Depth	692 mm	646 mm
Weight	max. 32 kg	max. 30 kg

Environmental Conditions (according to DIN EN 60721-3-x)	
Climate/operation (class 3K2):	
Temperature	15 °C to 35°C
Relative humidity	5% to 85%
altitude (NN)	max. 3048 m (10000 ft.)
Climate/transport (class 2K2):	
Temperature	-25°C to 60°C
Relative humidity	15% to 98%
altitude (NN)	max. 15240 m (50000 ft.)
Mechanical environmental conditions	
Operation	Class 3M2
Transport	Class 2M1

Standards Complied With	
Product safety and ergonomics	IEC 60950 (DIN EN 60950), UL 1950, CSA 950, ZH1/618
Electromagnetic compatibility	
Emitted interference	EN 55022, class B; FCC part 15, class A
Noise immunity	EN 50082-1
CE label	Low voltage guideline LVD 73/23/EEC EMC guideline 89/339/EWG
Approval certification	GS, CSA NRTL/C, CB certificate

Noise Development (ISO 9296)	**Operation**	**Idle**
Sound level (L_{WAd})	max. 7.0 B	max. 6.2 B
Workstation-related sound pressure level (L_{pAm})	max. 56 dB(A)	max. 46 dB(A)

Maintenance Areas and Ventilation Distances	
Floorstand model	Rear 400 mm, left 1200 mm *
Rack model	Specified by the 19" rack
* The area on the left need not always be kept open. However, it must be possible to clear it without too much effort.	

2 Important Notes

2.1 Notes on Safety

In this section you will find information that you must note when using the storage subsystem.

This device complies with the relevant safety standards for IT equipment, including electronic office machines, intended for use in the office environment.

> **i** You will also find the following safety instructions in the manual entitled "Safety, Warranty and Ergonomics" which also includes other notes on guarantee and ergonomics. Also pay attention to the notes in the manual of the connected PRIMERGY system.

If you have any questions relating to setting up and operating your system in the environment where you intend to use it, please consult our service organization.

> **CAUTION!**
>
> ● The actions described in these instructions should only be performed by technicians, service personnel or technical specialists. Equipment repairs should only be performed by qualified staff. Any failure to observe the guidelines in this manual could expose the user to risks (electric shock, fire hazards) and could also damage the equipment. Note that any unauthorized opening of the device will result in the invalidation of the warranty and exclusion from all liability.
>
> ● Transport the device in its original packaging or in other suitable packaging which will protect it against shock or impact.
>
> ● Read the notes on environmental conditions in section "Technical Data" on page 4 before setting up and operating the device.
>
> ● If the device is brought in from a cold environment, condensation may form both inside and on the outside of the machine.
>
> Wait until the device has acclimatized to room temperature and is absolutely dry before starting it up. Material damage may be caused to the device if this requirement is not observed.

CAUTION!

- Check that the rated voltage specified on the device's ID plate is the same as the local line voltage.

- The device must only be connected to a properly grounded wall outlet (the device is fitted with a tested and approved power cable).

- Make sure that the protective grounded outlet of the building's wiring system is freely accessible.

- Switching off the device does not cut off the supply of power. To do this you must remove the power plugs.

- Before opening the unit, switch off the device and then pull out the power plugs.

- Route the cables in such a way that they do not form a potential hazard (make sure no-one can trip over them) and that they cannot be damaged. When connecting up a device, refer to the relevant notes in this manual.

- Never connect or disconnect data transmission lines during a storm (lightning hazard).

- Systems which comprise a number of cabinets must use a separate fused socket for each cabinet.

- The system unit and the directly connected external storage subsystems should be connected to the same power supply distributor. Otherwise you run the risk of losing data if, for example, the central processing unit is still running but the storage subsystem has failed during a power failure.

- Make sure that no objects (such as bracelets or paper clips) fall into or liquids spill into the device (risk of electric shock or short circuit).

- In emergencies (e.g. damage to housings, power cords or controls or ingress of liquids or foreign bodies), immediately power down the device, pull out the power plugs and notify your service department.

- Note that proper operation of the system (in accordance with IEC 60950/DIN EN 60950) is guaranteed only if slot covers are installed on all vacant slots and/or dummies on all vacant bays and the housing cover is fitted (cooling, fire protection, RFI suppression).

2.2   **Electrostatic Sensitive Device Label**

Electrostatic-sensitive components may be identified by the following sticker:
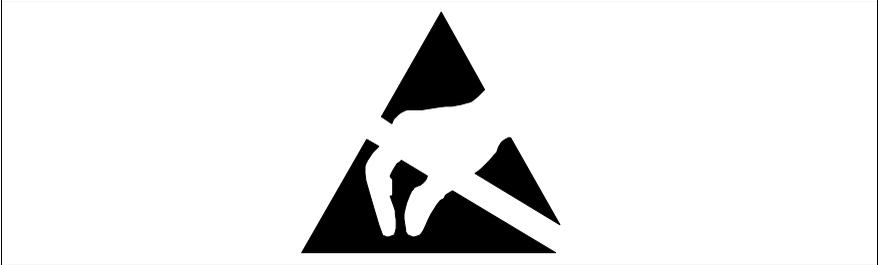
Figure 1: Electrostatic Sensitive Device (ESD) sticker

You must follow the instructions below when handling modules containing electrostatic-sensitive components

► Discharge static electricity from your body (for example by touching a grounded metal object) before handling modules containing electrostatic-sensitive components.

► The equipment and tools you use must be free of static charge.

► Remove the power plug before installing or removing modules containing electrostatic-sensitive components.

► Only hold modules containing electrostatic-sensitive components by their edges.

► Do not touch any of the pins or track conductors on a module containing electrostatic-sensitive components.

► Use a grounding strap designed for the purpose, to connect you to the system unit as you install the modules.

► Place all components on a static-safe base.

> **i** An exhaustive description of the handling of modules containing electro-static-sensitive components can be found in "Guidelines on handling electrostatic sensitive devices and modules (ESD)" or "ITS Circular 4/95".

2.3   CE certificate

The shipped version of this device complies with the requirements of the EEC directives 89/336/EEC "Electromagnetic compatibility" and 73/23/EEC "Low voltage directive". The device therefore qualifies for the CE certificate (CE=Communauté Européenne).

2.4   RFI Suppression

All other equipment which is connected to this product must also have radio noise suppression in accordance with EC Guideline 89/336/EWG.

Products which meet this requirement are accompanied by a certificate to that effect issued by the manufacturer and/or bear the CE mark. Products which do not meet this requirement may be operated only with the special permission of the BZT (Bundesamt für Zulassungen in der Telekommunikation).

2.5   FCC notices (Federal Communications Commission)

Class A digital device

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

2.6   Notes on the Rack Model

● For safety reasons, at least two people are required to install the rack model because of its weight and size.

● When connecting and disconnecting cables, observe the notes in the documentation for your PRIMERGY system and the comments in the "Important notes" chapter in the technical manual supplied with the rack.

● Ensure that the anti-tilt bracket is correctly mounted when you set up the rack.

● For safety reasons, no more than one unit may be withdrawn from the rack at any one time during installation and maintenance work.

● If more than one unit is withdrawn from the rack at any one time, there is a danger that the rack will tilt forward.

● The connection of the rack to the mains voltage must be installed by an authorized specialist (electrician).

2.7   Notes on Transportation

i Transport the storage subsystem in its original packaging or in other suitable packaging which will protect it against shock or impact.
Do not unpack it until all transport maneuvers are completed.

If you need to lift or transport the storage subsystem, ask someone to help you.

2.8 Environmental Protection

Environmentally friendly product design and development

This product has been designed in accordance with the Fujitsu Siemens Computers standard for "environmentally friendly product design and development".

This means that the designers have taken into account important criteria such as durability, selection of materials and coding, emissions, packaging, the ease with which the product can be dismantled and the extent to which it can be recycled.

This saves resources and thus reduces the harm done to the environment.

Notes on saving energy

Devices that do not have to be on permanently should not be switched on until they need to be used and should be switched off during long breaks and on completion of work

Notes on packaging

We recommend that you do not throw away the original packaging in case you need it later for transportation. If possible, devices should be transported in their original packaging.

Notes on dealing with consumables

Please dispose of batteries in accordance with local regulations.

Notes on labeling plastic housing parts

Please avoid attaching your own labels to plastic housing parts wherever possible, since this makes it difficult to recycle them.

Take-back, recycling and disposal

For details on take-back and reuse of devices and consumables within Europe, contact your Fujitsu Siemens Computers branch office/subsidiary or our recycling center in Paderborn:

Fujitsu Siemens Computers
Recycling Center
D-33106 Paderborn

Tel.   ++49 5251 8180-10

Fax   ++49 5251 8180-15

Further information on environmental protection

The Fujitsu Siemens Computers representative for environmental protection will be happy to answer any further questions you may have concerning environmental protection.

Fujitsu Siemens Computers
Referat Umweltschutz
Werner-von-Siemens-Straße 6
D-86159 Augsburg

Tel.   ++49 821 804-2386

Fax   ++49 821 804-2706

3 Operating and Indicator Elements

This section describes the position and meaning of the operating and indicator elements on the PRIMERGY S60 storage subsystem.

3.1 The Front

You can see the following indicator elements on the front of the PRIMERGY S60 storage subsystem

● The three operating status LEDs which indicate the power supply status, the cooling status and the server management status.

● Control LEDs for the hard disk drives (two LEDs on each of the HDD modules).

> **i** There is a HDD Ready and a HDD Status LED for each of the 14 possible hard disk drives.

3.1.1   Meaning of the S60 Operating Status LEDs

The state of the status LEDs located on the HDD backplane is transmitted by optical waveguides so that the power supply status, the cooling status and the server management status are indicated on the front of the storage subsystem.
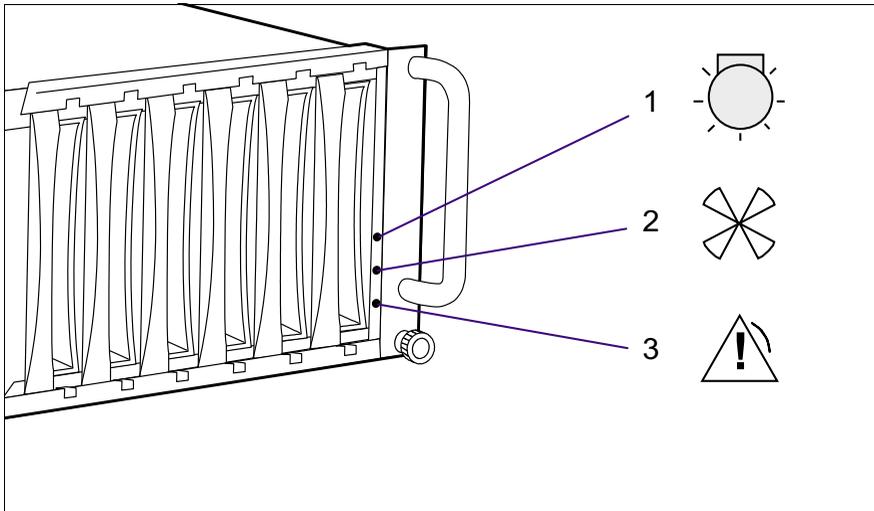
Figure 2: Operating Status LEDs and Icons on the Front of the Rack Model

(1)   Power supply status

(2)   Cooling status

(3)   Server management status

CAUTION!

In order to guarantee the server management for the PRIMERGY S60 storage subsystem over SES (SCSI Enclosure Service), at least one of the two first HDD modules (see also section "Identification Marks and Loop Addresses" on page 43) must be installed.

i Fault clearing instructions can be found in the chapter "Troubleshooting" on page 71 of this manual.

Optical Waveguide	Color	Meaning
Power supply status	none	No mains voltage present.
	green	POWER OK Equipment switched ON, all installed power supply units OK.
	yellow	POWER WARNING One power supply unit has failed.
	orange	STANDBY Equipment switched OFF, mains voltage present.
Cooling status ⚠ **CAUTION!** The PRIMERGY S60 storage subsystem (without Remote Service Board) switches OFF at an interior temperature of 55°C (see section "Cooling status LED lights orange" on page 73).	green	Cooling OK All installed fans and the interior temperature are OK.
	yellow	Fan warning One fan has failed. The temperature is OK.
	orange	Cooling fault All the fans have failed or the interior temperature exceeds the permissible values.
Server management status (global SES indicator)	none	No status indication
	orange	Identification indication (can be activated manually from ServerView). For troubleshooting see section "Server Management Status LED lights permanently" on page 74.

Table 1: Meaning of the Operating Status LEDs Indication

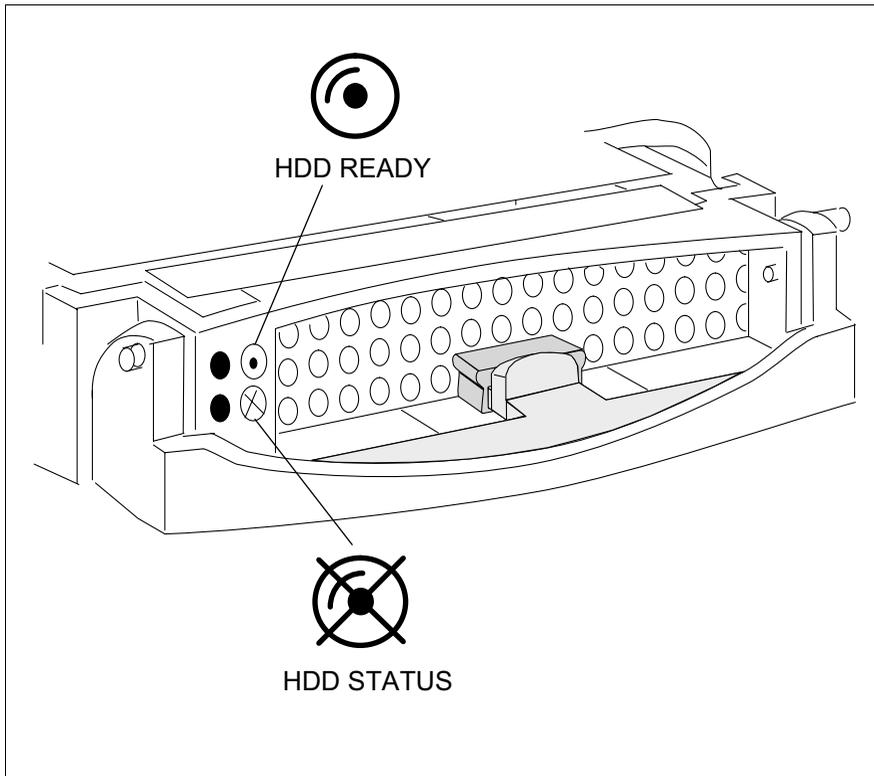## 3.1.2   The Control LEDs for the Hard Disk Drives

Figure 3: Symbols of the Control LEDs of the Hard Disk Drives

(HDD READY)   Operating indication of the hard disk drive.

This LED is driven by the hard disk drive itself.

(HDD STATUS)   Status indication of the hard disk drive.

This dual-color (yellow/orange) LED is set by the hard disk drive itself (yellow indicator) or by the SES controller (orange indicator).

LED	Indication	Meaning
HDD READY	OFF	The associated drive is not (correctly) inserted or it is spun down and it is not being accessed.
	OFF green intermittent flashes	The associated drive is spun down. The drive is being accessed.
	ON green permanently on	The associated drive is spun up and ready. The drive is not being accessed or hot spare drive.
	ON green intermittent flashes	The associated drive is spun up and ready. The drive is being accessed.
	green, flashes steadily	The associated drive is spinning up or down ("prepare to remove" command: ca. 10 sec. flashes quickly 3 times per sec., followed from slowly flashes in 3 sec. interval; see also section "Hot Swap for FC HDD Modules" on page 42).
HDD STATUS	OFF	There is no hard disk fault.
	yellow, permanently on	HDD error occurred.
	orange, flashes quickly	Drive identification.
	orange, flashes quickly	– Drive rebuild: all drives belonging to the pack blink synchronously. – Error message from controller: Critical LUN (Logical Unit Number) – A drives was set on "Make Offline" and the remaining HDD modules flash quickly.
	orange, permanently on	"Make Offline" state for the selected HDD modules.

Table 2: Meaning of the HDD Control LEDs Indication

3.2   The Rear Side

On the rear side of the PRIMERGY S60 storage subsystem there are the status LEDs for the FFx-RAID controller module(s) and for the power supply units. Also the power switch is placed on this side.
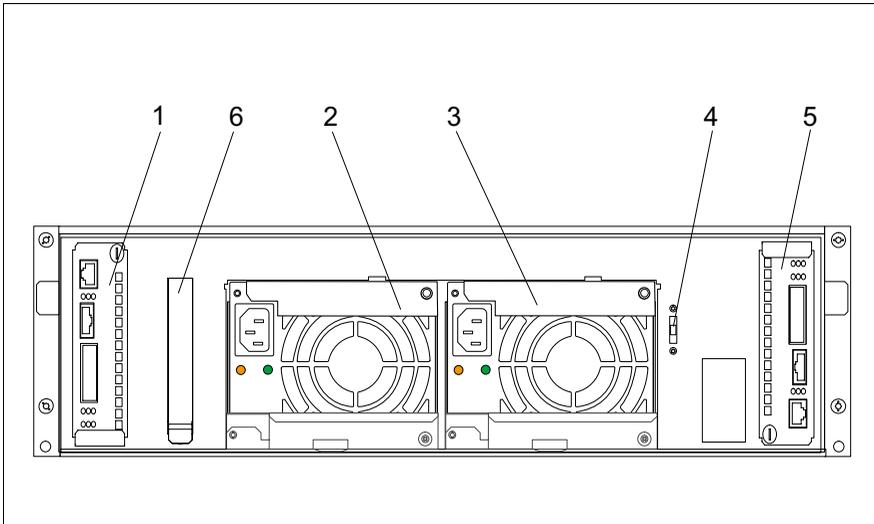

Figure 4: Rear View of the PRIMERGY S60 Storage Subsystem

(1)   FFx-RAID controller module 1

(2, 3) Power supply units

(4)   Power switch

(5)   FFx-RAID controller module 0 (default)

(6)   Location for the optional Remote Service Board

3.2.1   FFx-RAID Controller Module LEDs

The status LEDs are located on the connection panel of the FFx-RAID controller module. For description see section "The FFx-RAID Controller Module" on page 45.

3.2.2   Power Supply Unit LEDs

On the connecting side of the power supply units there are two LEDs that indicate the status of the power supply units:
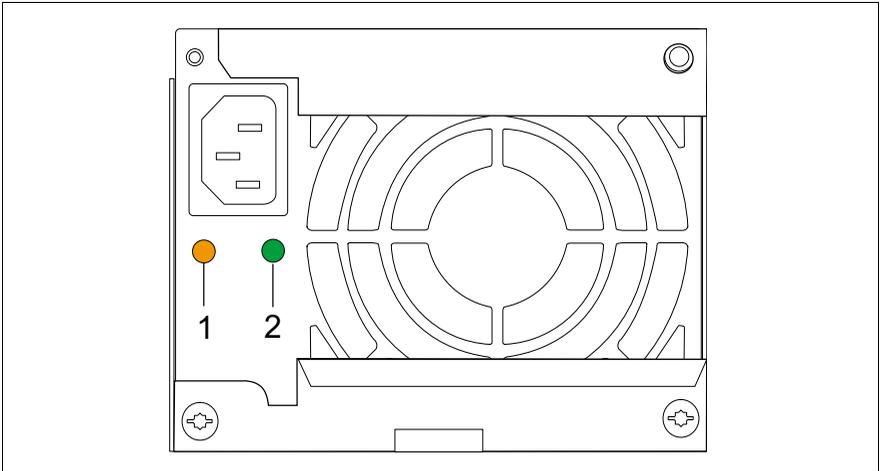

Figure 5: The Power Supply Unit LEDs

(1)   Fault indication (amber LED)

(2)   Operating indication (green LED)

Fault indication (1) (amber LED)	Operating indication (2) (green LED)	Status of the power supply unit
OFF	OFF	No AC voltage present.
OFF	flashing	AC voltage present; standby outputs ready.
OFF	ON	DC outputs ready. Power supply unit operational.
ON	OFF	No AC voltage present for this power supply unit or power supply unit has failed.
flashing	ON	Current limiting.

Table 3: Meaning of the Power Supply Unit LEDs

3.2.3 Power Switch

The power switch is located also on the rear of the PRIMERGY S60 storage subsystem. It is a slide switch with three possible settings.
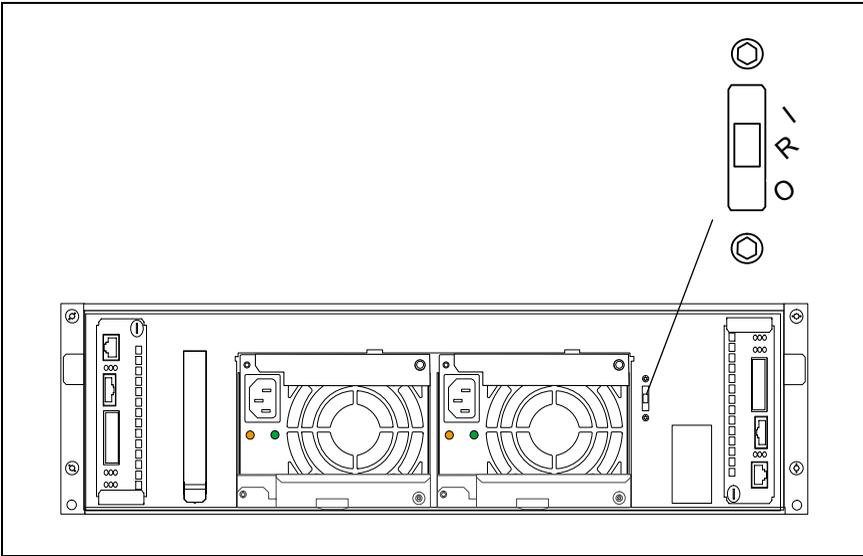

Figure 6: Power Switch on the Rear of the PRIMERGY S60 Storage Subsystem

Position	Function	Description
(I)	local ON	The storage subsystem is switched ON permanently and is connected directly to the mains (**default setting**).
(R)		The operating mode (on/off) is controlled via the Remote Service Board. In this **default setting**, the storage subsystem is switched on and off simultaneously with the server. If two servers are connected, it remains active as long as one of the servers is switched on.
(O)	OFF	The storage subsystem is switched OFF permanently.

Table 4: Possible Settings of the Power Switch

3.3   Fan LED

If you have been notified, via corresponding warning or error messages on the server or via the cooling status LED on the front of the storage subsystem, that there is a cooling problem, the fan status can be read on the fan LED.
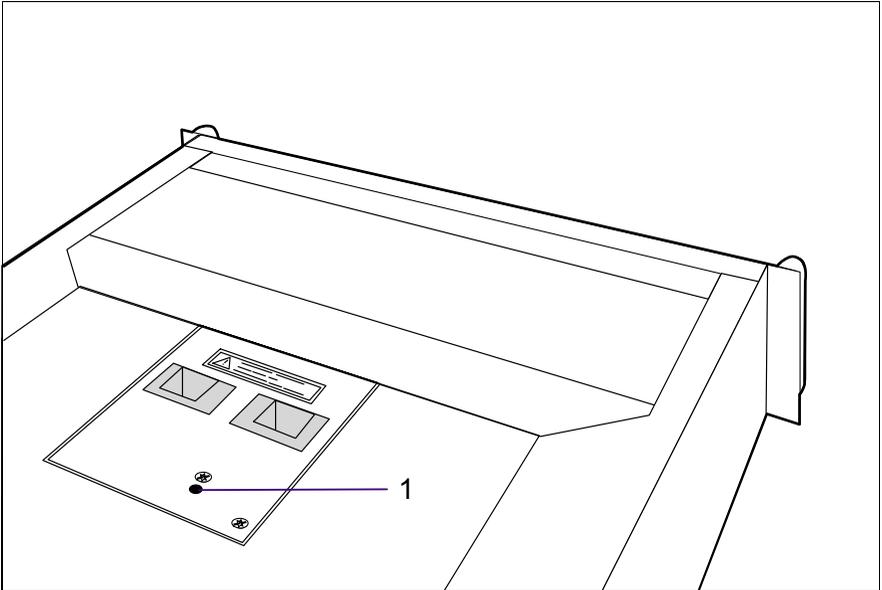

Figure 7: Installed Fan Module, View with Fan LED

(1)   Fan LED

Color	Meaning	Required Measures
green	Both fans are in operation.	No action required.
yellow	One fan has failed.	The fan module must be replaced.
orange	Both fans have failed.	The fan module must be replaced.

Table 5: Meaning of the Fan LEDs

i Replacement of the fan module is described in the chapter "Fan Module" on page 33.

4 Floorstand Model

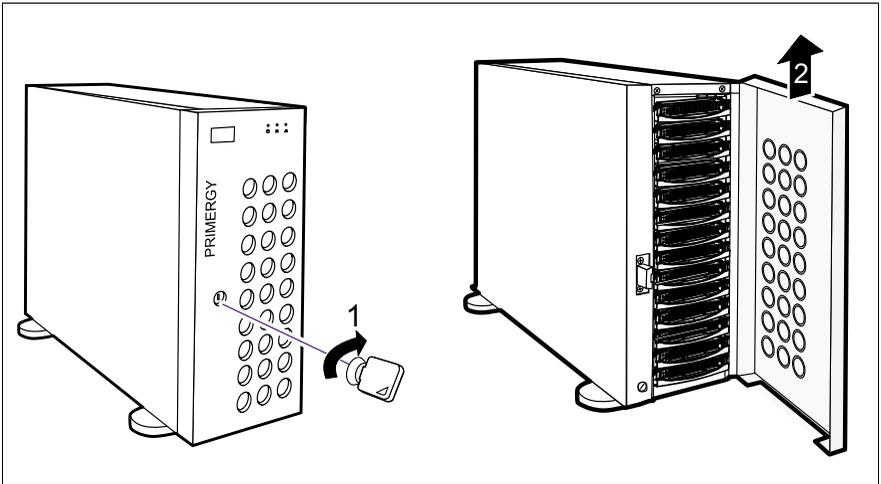## 4.1 Open the Housing

4.1.1 Removing and Mounting the door

Figure 8: Removing the Door

▶ Unlock the door with the key **(1)** and open it.

▶ Remove the door by lifting it up **(2)**.

Mounting is performed in the reverse order.

4.1.2   Removing/Mounting the left Side Cover

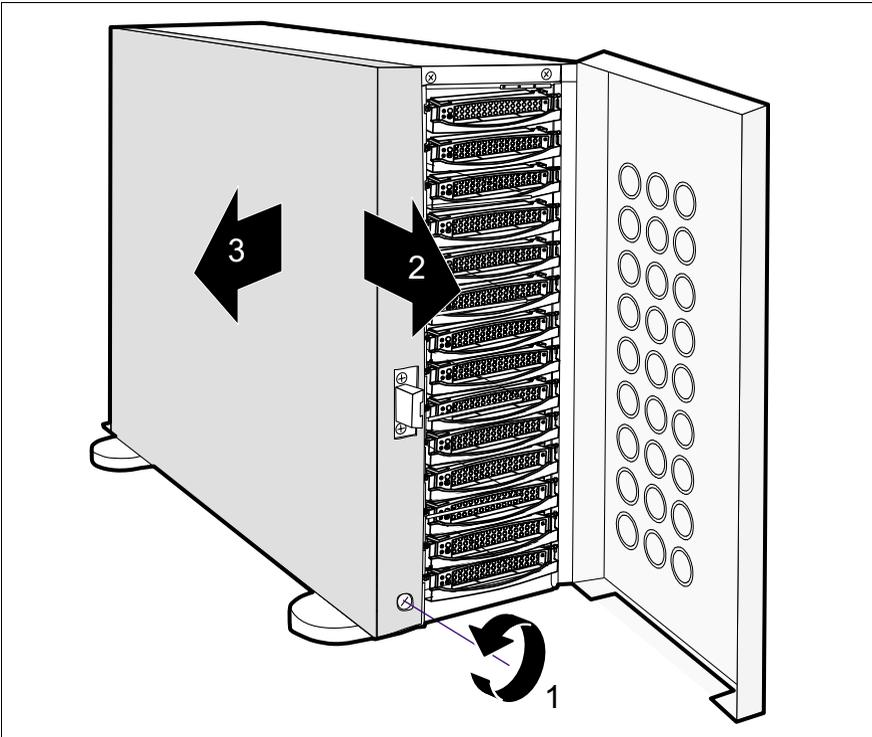| i | To replacing the fan module (see section "Installing/Removing the Fan Module" on page 34) in the floorstand model the left side cover must be removed. |

Figure 9: Removing the Side Cover

► Open the door.

► Loosen the lower left knurled screw **(1)** and slide the left side cover in the direction of the arrow for approx. 3cm **(2).**

► Remove the side cover from the six guides by sliding it in the direction of the arrow marked **(3)**.

Mounting is performed in the reverse order.

⚠ **CAUTION!**

For mounting the left side cover pay attention to the connection strip **(1)** for the door switch (see figure 10). It can be damaged.
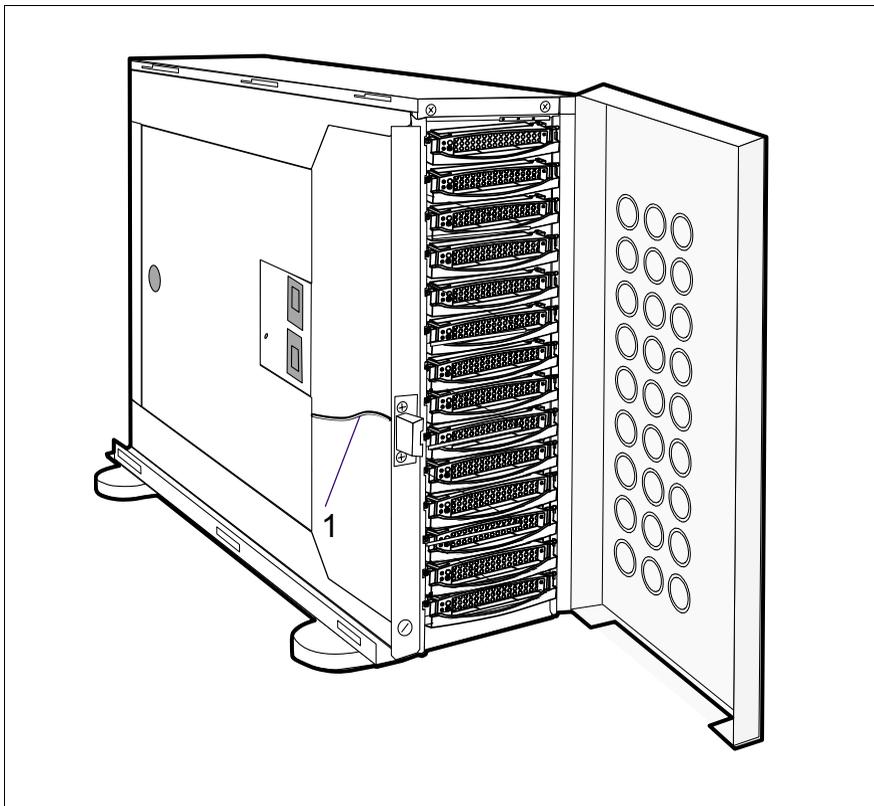

Figure 10: Floorstand model: door switch with connection strip

5 Power Supply

5.1 Power Supply Units

The PRIMERGY S60 storage subsystem contains two power supply units which guarantee the power supply to all installed components.

Using two power supply units, power supply redundancy is achieved. If a power supply unit fails, the subsystem will continue to operate without restrictions.

i	To guarantee a power supply unit redundancy, a failed power supply unit must be replaced urgently.

The power supply units are supplied with mains voltage via the supplied connecting cables.

The power supply units can be connected directly to two different phases of the in-house circuit in order to achieve phase redundancy (see section "Mains Connection with Phase Redundancy" on page 59).

5.1.1 Replacing the Power Supply Unit

⚠️ **CAUTION!**

It is imperative that you read the chapter "Important Notes" on page 7 in this manual **before** you carry out work on your storage subsystem.

If faults occur with the power supply, it could be necessary to replace a power supply unit. Information about the relevant error messages can be found in the sections "Meaning of the S60 Operating Status LEDs" on page 16, "Power Supply Unit LEDs" on page 21 and in the chapter "Troubleshooting" on page 71.
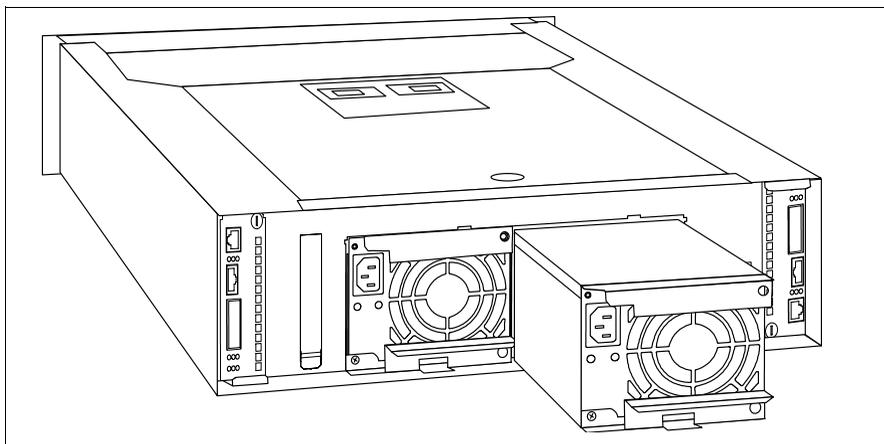

Figure 11: Power Supply Unit Removed

⚠️ **CAUTION!**

When a power supply unit is replaced in a non-redundant power supply system (only one power supply unit present) the server **must** be switched OFF and/or the FC channels deactivated.

► If only one power supply unit is present, shut down the server and switch it OFF.

► Remove the cable of the defective power supply unit.

► Raise the lower catch on the power supply unit and carefully remove it from its slot by pulling on the upper catch. To remove the power supply unit the lower catch must be in the up position.
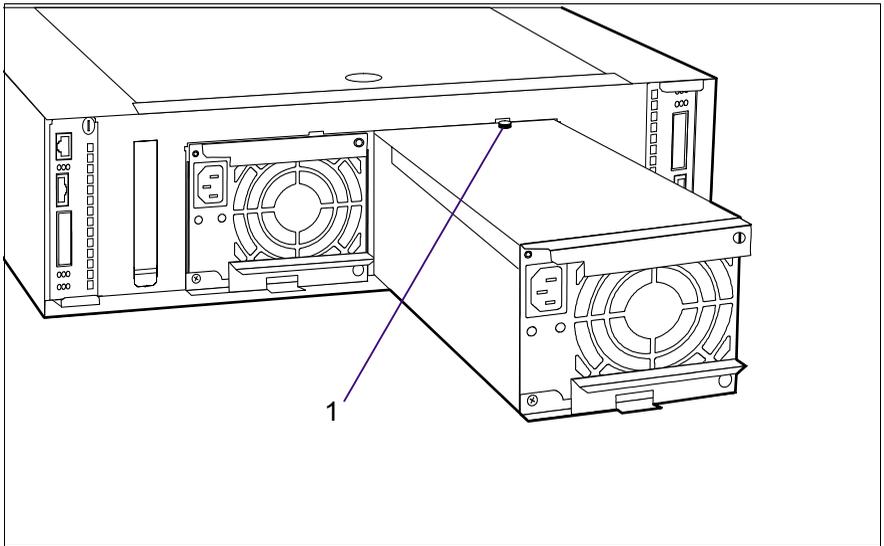
Installing occurs in reverse of order:

Figure 12: Power Supply Unit Removed with Coding Pin

► Push the new power supply unit into the empty slot.

> **i** Please note the coding of the power supply unit. Only one power supply unit, to which the coding pin **(1)** is attached in such a way that it does not adversely affect the installation, may be used in the PRIMERGY S60 storage subsystem. The coding may not be removed under any circumstances.

> ⚠ **CAUTION!**
>
> Please ensure that the power supply unit engages correctly in the mounting frame and is locked in position. This is the only way to avoid the power supply unit being shaken out of its mountings and damaged during transport.

► Connect the cable to the power supply unit (see the section "Mains Connection" on page 58).

► Connect the power cable to the mains (see section "Mains Connection" on page 58).

6 Fan Module

The redundant fan module ensures cooling of the PRIMERGY S60 storage subsystem. It is equipped with two fans. If one fails, the other working fan sufficiently guarantees cooling and prevents the components of the storage subsystem from overheating.

A temperature sensor on the rear panel of the power supply unit and a revolution monitor fitted for each fan are used to permanently check the cooling. Error messages can be read on the cooling status LED on the front of the storage subsystem (see section "Meaning of the S60 Operating Status LEDs" on page 16) and on the fan LED (see section "Fan LED" on page 23).

As soon as fan failure is detected, the fan module with the defective fan should immediately be replaced with an intact module so that the redundancy characteristics (availability) are retained.

i Only the complete fan module may be replaced.

i The fan module can be replaced during operation.

⚠ **CAUTION!**
The fan module should be replaced within 30 seconds to prevent possible overheating.

6.1   Installing/Removing the Fan Module

i	Please note the status of the fan LED before removing and after installing the fan module **(3)** (see section "Fan LED" on page 23).

Floorstand model

► Remove the left side cover (see section "Removing/Mounting the left Side Cover" on page 26).

Rack model

► Loosen the two knurled screws on the front of the rack model and pull out the storage subsystem from the rack.
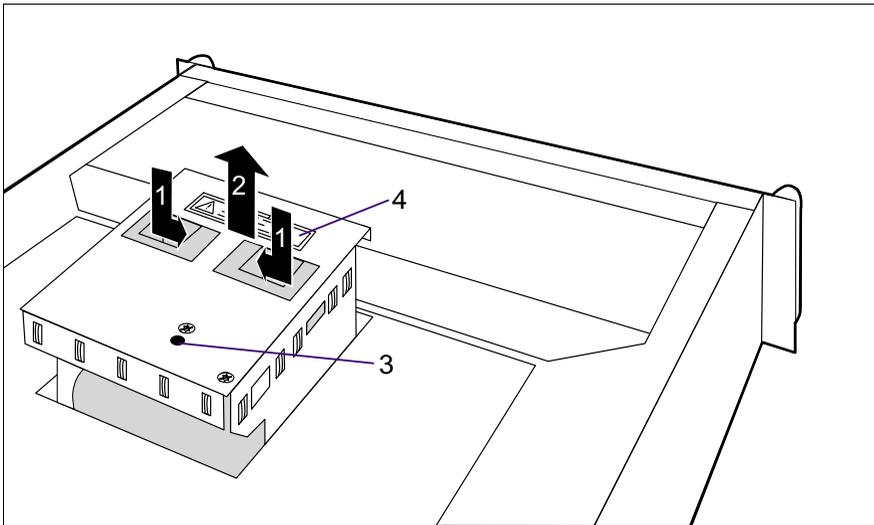
Figure 13: Releasing and Removing the Fan Module

► Release the fan module by putting two fingers into the recessed grips and push the locking mechanisms found here inwards **(1)**.

⚠	**CAUTION!**
	Note the warning label "Rotating Parts" **(4)** on the fan module. There is an increased risk of injury from rotating parts.

► Remove the fan module from the storage subsystem in the direction of the arrow **(2)**.
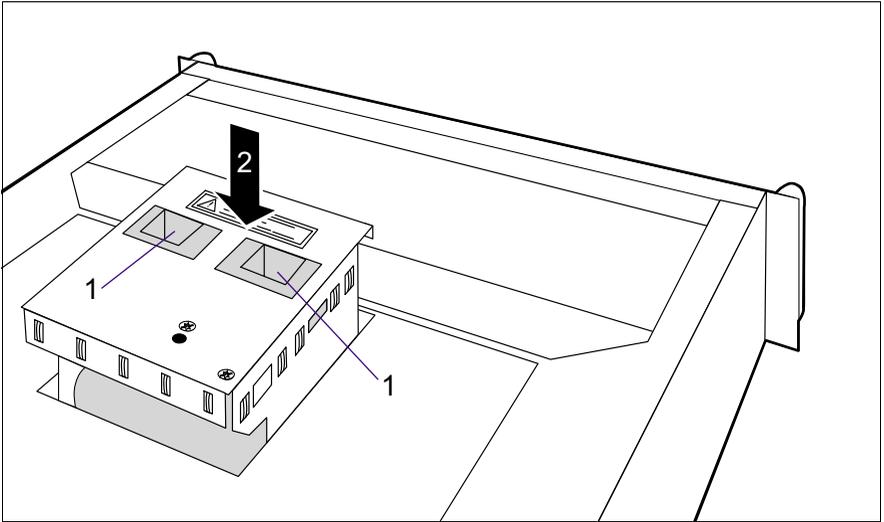
Proceed as follows when installing the fan module:

Figure 14: Installing the Fan Module

► Put two fingers into the recessed grips **(1)**. When installing, it is not necessary to push the locking mechanism inwards.

► Lift the fan module over the slot and insert it carefully **(2)**.

► Gently push the fan module down until you can feel and hear it engaging.

7 FC Hard Disk Drives

Up to fourteen one inch hard disk drives can be installed into the PRIMERGY S60 storage subsystem. The FC hard disk drives can be controlled via up to two FC ports. The two FC ports are in each case over two outward lead Nodes in one loop. This means that each port is in one FC Loop (all ports A from the FC hard disk drives are in the same loop as the channel 0 from (both) FFx-RAID controller(s) and all ports B from the FC hard disk drives are in the same loop as the channel 1 from (both) FFx-RAID controller(s)).

The FC hard disk drives are built on a carrier which allows defective drives to be replaced (hot swap) or new drives to be added during operation. The hard disk drive and the carrier constitute the hard disk drive module (HDD module).

The hot-swap function can only be performed together with a corresponding RAID configuration. Further information about the RAID configuration or RAID level can be found in the RAID controller documentation.

A hard disk drive may only be replaced if it is inactive (see description of the LEDs in the table "Meaning of the HDD Control LEDs Indication" on page 19) or if it has been marked as defective in the management tool.

The hot swap procedure increases the availability of the system operation and guarantees a high degree of data integrity and protection against failure.

7.1 Handling Hard Disk Drives/HDD Modules

Hard disk drives incorporated in the HDD modules are highly sensitive electro-magnetic devices and must be handled with great care. It is extremely likely that an incorrect handling will lead to a partially and/or total failure of the hard disk drives.

These failures will result in data errors and to loss of data or to total destruction of the hard disk drive.

Please observe following rules, which will help to avoid the occurrence of this type of problems:

● Store and transport HDD modules only within the limits stipulated in the specification.

● When transporting HDD modules (even over short distances), always use the original packaging (ESD labeling).

● Never expose a HDD module to a temperature shock. Avoid the formation of condensation inside and on the outside of the hard disk drives.

The hard disk drives may be expose only to defined temperature and climatic conditions.

● Always put the HDD module down carefully, with its largest surface facing downwards, to avoid the danger of tipping over.

7.2   Installing/Removing HDD/Dummy Module

⚠ **CAUTION!**

Under no circumstances should you remove a HDD module while the system is in operation if you are not sure that the hard disk drive is operated by a RAID controller and belongs to a disk array which is operating in RAID level 1 or 5.

⚠ **CAUTION!**

The HDD modules must all be marked clearly (see also section "Identification Marks and Loop Addresses" on page 43) so that they can be put back into the original slots after an upgrade. If this is not taken into account, existing data can be destroyed.

The hard disk drives which can be ordered for the PRIMERGY S60 storage subsystem are delivered as HDD modules which include the hard disk drive pre-installed in a carrier. Only a service technician may remove a hard disk drive from the carrier.

Free slots are provided with a dummy module (an empty carrier) which must be removed before installing an additional HDD module.

Removing the dummy module

▶ Press the upper and lower tabs on the dummy module together (see figure 15 on page 39) until the locking mechanism disengages, and remove the dummy module from the slot.

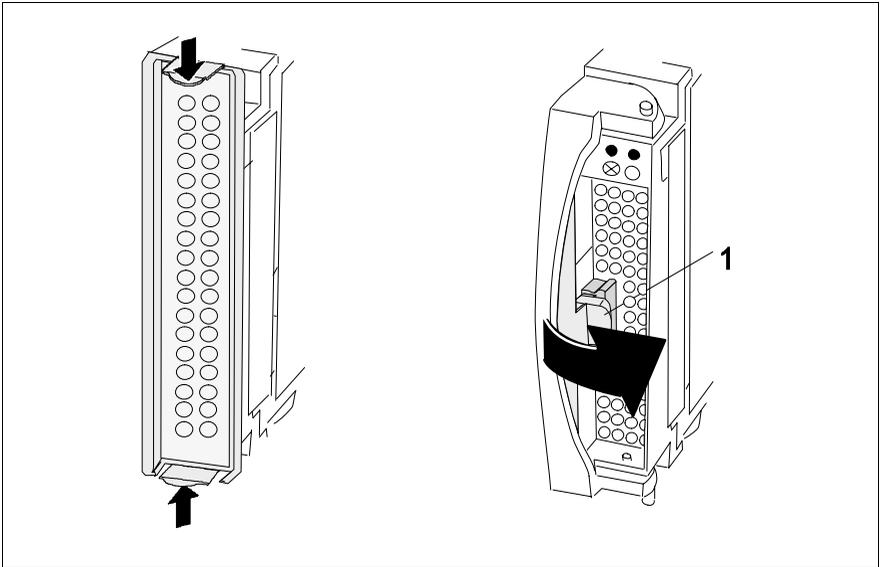Installation of the dummy module occurs in reverse order.

Figure 15: Dummy Module and corresponding HDD Module

⚠ **CAUTION!**

Keep the dummy module for future use. If the HDD module is removed again and not replaced with a new module, then the dummy module must be reinstalled due to cooling, the applicable EMC (electromagnetic compatibility) regulations and fire protection.

Installing the HDD module

▶ Solve the locking mechanism by pressing the locking button **(1)** .

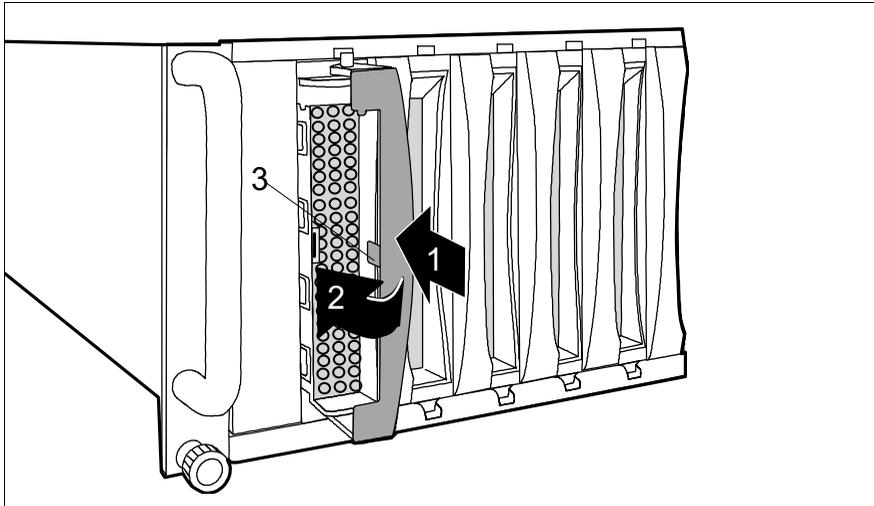▶ Push the handle of the HDD module fully in the direction of the arrow.

Figure 16: Installing the HDD Module

▶ Push the HDD module into the empty slot **(1)** until it stops .

▶ Push the module handle completely in the direction of the arrow **(2)** until the locking mechanism **(3)** engages.

⚠ **CAUTION!**

The HDD module must be acclimatized in its operating environment for an acclimatization time.

Temperature difference (°C) (operating environment/outside)	Minimum acclimatization time (hours)
5	3
10	5
15	7
20	8
25	9
30	10

Table 6: Acclimatization Time for the HDD Module
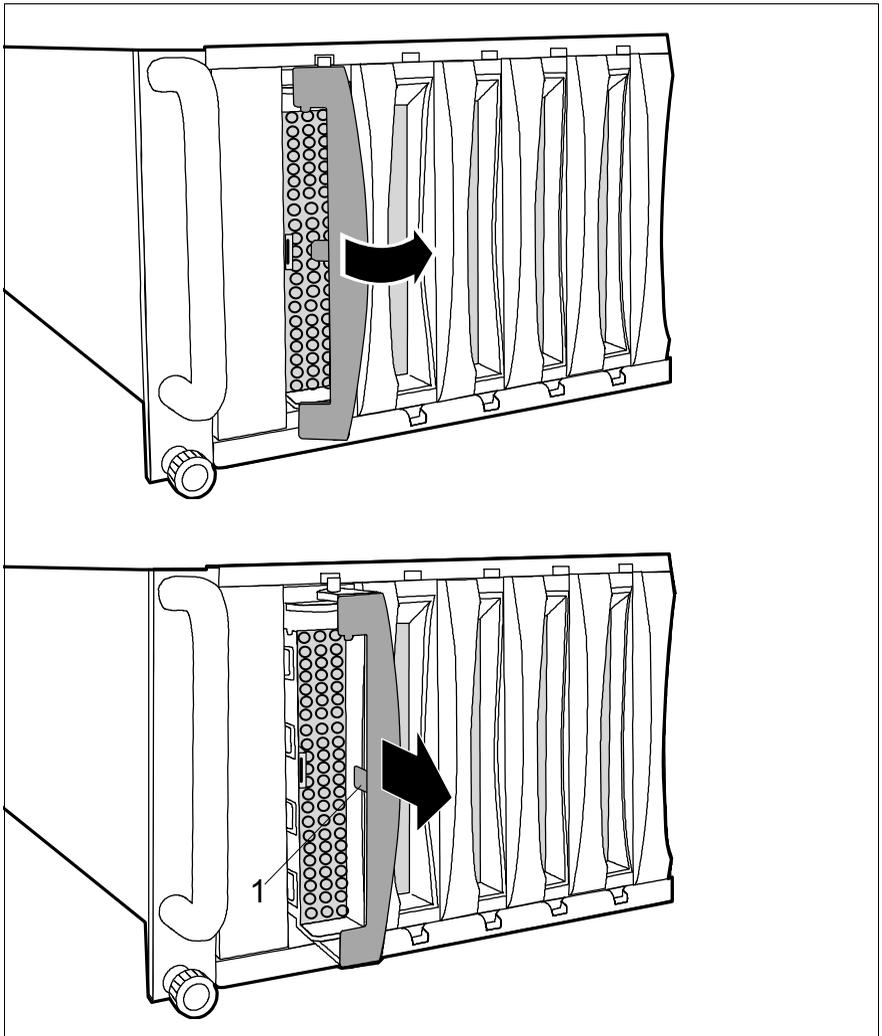
Removing occurs in reverse order:

Figure 17: Removing the HDD Module

► Pull out the HDD module. Observe the notes in the section "Handling Hard Disk Drives/HDD Modules" on page 37.

7.3 Hot Swap for FC HDD Modules

⚠ **CAUTION!**

The hot-swap function can only be performed together with a corresponding RAID configuration.

Only pull out a HDD module if the drive is not being accessed. Observe the control LEDs for the corresponding HDD module (see section "The Control LEDs for the Hard Disk Drives" on page 18).

If you want to replace an FC HDD module during operation, proceed as follows:

► If you want to pull out a HDD module which is not defective, it must be set to "Offline" via software (RAID controller configuration software), and/or it must be prepared for removal by the "prepare to remove" command.

► Pull out the HDD module (defective/not defective) by a few centimeters.

► Wait for at least 60 seconds.

    i   This period is necessary for the RAID controller to recognize that a HDD module has been pulled out and for the hard disk drive to come to a stop.

► Pull out the HDD module right.

► Insert the new HDD module.

When you have removed the HDD module and are not replaced with a new module, then insert a dummy module into the empty slot. Ensure that the dummy module engages in the slot correctly.

7.4   Identification Marks and Loop Addresses

The identification of the hard disk drives with marks as **HDD1 through HDD14** must be performed from the bottom up (floorstand model) or from left to right (rack model).

The loop addresses of the FC hard disk drives are hardware-predefined as follows:

HDD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
ID (Dec.)	0	1	2	3	4	5	6	7	8	9	10	11	12	13
ID (hex)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D

Table 7: Address IDs

8 Plug-in Board Modules

8.1 The FFx-RAID Controller Module

The module will be inserted in an individual slot on the rear of the storage subsystem. The two modules in figure 4 on page 20 are marked **(1)** for the FFx-RAID controller module 1 and **(5)** for the FFx-RAID controller module 0.

> ⚠️ **CAUTION!**
>
> In a simplex configuration the storage subsystem **can be accessed only via the FFx-RAID controller module 0** (see figure 4 on page 20).

In a dual-active configuration both FFx-RAID controller modules must have the same size of cache memory and the same firmware version.

The module incorporates the FFx-RAID controller itself **(1)**, the device adapter (DA) **(2)** and the host adapter (HA) **(3)**.
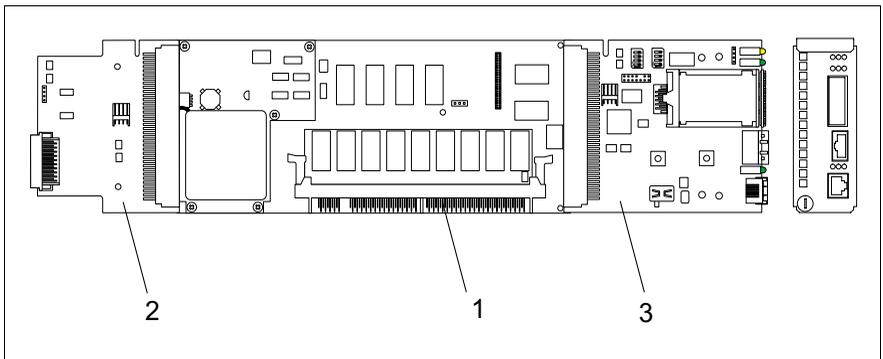

Figure 18: The FFx-RAID controller module

The FFx-RAID controller is a high-performance FC host to FC disk array controller. The device adapter makes the connection between the FFx-RAID controller and the FC hard disk drives, the host adapter the connection to the server.

8.1.1   Indicators and Connectors

The integrated FC-HUB provides the standard host-interface (two nodes) for the storage subsystem. One node will be connected via a fixed HSSDC connector **(11)** (see figure 19 on page 47) available only for cooper cable up to 10 m.

The other node will be connected via a GBIC (Gigabit Interface Converter) **(12)**. The FC-transmission medium (CU/HSSDC, MMF or SMF) depends on the type of GBIC being used.

> **i**   Perfect functioning will be ensured only by the use of the GBIC types released by Fujitsu Siemens Computers GmbH.

LEDs indicate the operating status of the module, of the corresponding nodes and/or loop and the channel activity (see tables under „Description of the LED indicators" on the following pages).

To configure the FFx-RAID controller, use the VT100 Terminal-Emulation-Interface (see "Related publications" on page 81) or SAM (SAN Array Manager) software. The VT100 Terminal-Emulation-Interface can be connected via the VT100-DEBUG connector **(10)**.

Following indicators and connectors are located on the connection panel of the module (figure 19):

No.	Element	Label on the connection panel
1	LED green	1 DAC DEVICE ACTIVITY
2	LED yellow/green	2 VT100/DEBUG STATUS
3	LED yellow/green	3 HSSDC NODE STATUS
4	LED green	4 DAC HOST ACTIVITY
5	LED yellow/green	5 DAC NODE STATUS
6	LED yellow/green	6 GBIC NODE STATUS
7	LED yellow	7 CACHE
8	LED green	8 DAC STATUS
9	LED red	9 DAC POWER ALARM
10	VT100-DEBUG connector	VT100/DEBUG
11	HSSDC connector	HSSDC NODE
12	GBIC connector	GBIC NODE
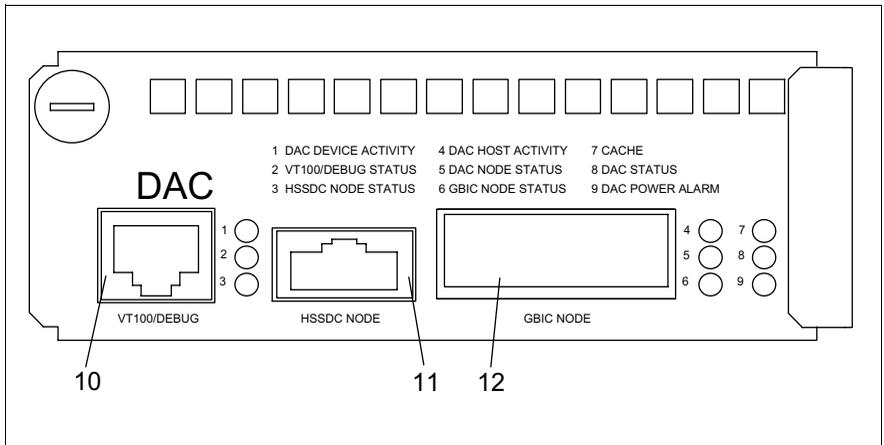
Figure 19: FFx-RAID Controller Module / Connectors and Indicators

Description of the LED indicators

LED			
7 **CACHE** **(yellow)**	**8** **DAC** **STATUS** **(green)**	**9** **DAC** **POWER** **ALARM** **(red)**	**Description**
OFF	ON	OFF	Normal operation, module ready and partner OK ⓘ This signal is activated only if two FFx-RAID controller modules are used; only the **non-defective** module can indicate that the other one has failed.
OFF	flashing 0.5 sec.	OFF	Normal operation, FFx-RAID controller module not ready and partner OK.
OFF	flashing 1 sec.	OFF	Normal operation, FFx-RAID controller module ready and partner failed ⓘ This signal is activated only if two FFx-RAID controller modules are used; only the **non-defective** module can indicate that the other one has failed.
OFF	OFF	ON	Alarm: FFx-RAID controller not powered (5 VDC; 3.3 VDC)
OFF	OFF	flashing 0.5 sec.	Alarm: FFx-RAID controller 5 VDC failed
OFF	OFF	flashing 1 sec.	Alarm: FFx-RAID controller 3,3 VDC failed
ON	OFF	OFF	Cache dirty: Data in cache and on the hard disk drives are not identical (cache active)
flashing 0.5 sec.	OFF	OFF	Conservative Cache activated (DIP switch K1 see "DIP Switches" on page 51)
flashing 0.5 sec.	flashing 0.5 sec.	flashing 0.5 sec.	Diagnosis Mode activated (DIP switch J1 see "DIP Switches" on page 51)

Table 8: FFx-RAID Controller Module: Status Indicators

LED		Description
1 DAC DEVICE ACTIVITY (green)	**4 DAC HOST ACTIVITY (green)**	
--	OFF	No FC channel activity on the host side
--	ON	FC channel activity on the host side
OFF	--	No FC channel activity on the device side
ON	--	FC channel activity on the device side

Table 9: FFx-RAID Controller Module: FC channel Activity Indicators

LED		Description
DAC (5); GBIC (6); HSSDC (3) NODE STATUS (yellow/green)		
green	**yellow**	
OFF	OFF	Module not inserted or not powered
ON	OFF	Full Operation: node in the loop active
OFF	ON	Node not in the loop (generally). Possible causes on GBICs: GBIC HW-Error status signals active: RX_LOS, i. e. the received signal is not valid, or TX_FAULT, i. e. sender works not correctly
OFF	flashing 0.5 sec.	Node disabled from Service Processor (RSB)
ON flashing between green and yellow approx. 0.5 sec.	ON	Module OK; missing or corrupted data

Table 10: FFx-RAID Controller Module: Node Status Indicators

LED		Description
VT100/DEBUG STATUS (3b yellow/green)		
green	**yellow**	
flashing between green and yellow approx. 0.3 sec.		Voltage OK, FFx-RAID controller ready
OFF	ON	RS232 switch* on position "**1**" (ext) and "debug mode" not activated
OFF	flashing 2 sec.	RS232 switch* on position "**1**" (ext) and "debug mode" activated
ON	OFF	RS232 switch* on position "**2**" (RSB) and "debug mode" not activated
flashing 0.5 sec.	OFF	RS232 switch* on position "**2**" (RSB) and "debug mode" activated
* The switches will be described in the section "Switches".		

Table 11: RS232 and FFx Status Indicators-

8.1.2   Switches

The RS232 Switch

This switch (figure 20 on page 51) enables the RS232-FFx receiver to be switched between an external (default) and an internal (service processor on the Remote Service Board) means of control.

| Pos.	Description
1	ext. RS232 (default) The external controlling means will be attached via the VT100/DEBUG connector (see figure 19 on page 47).
2	RSB Internal controlling means via the service processor on the optional Remote Service Board. **i** When the PRIMERGY S60 storage subsystem operates without the optional Remote Service Board the switch must be set on position "**1**".

Table 12: RS232 switch settings
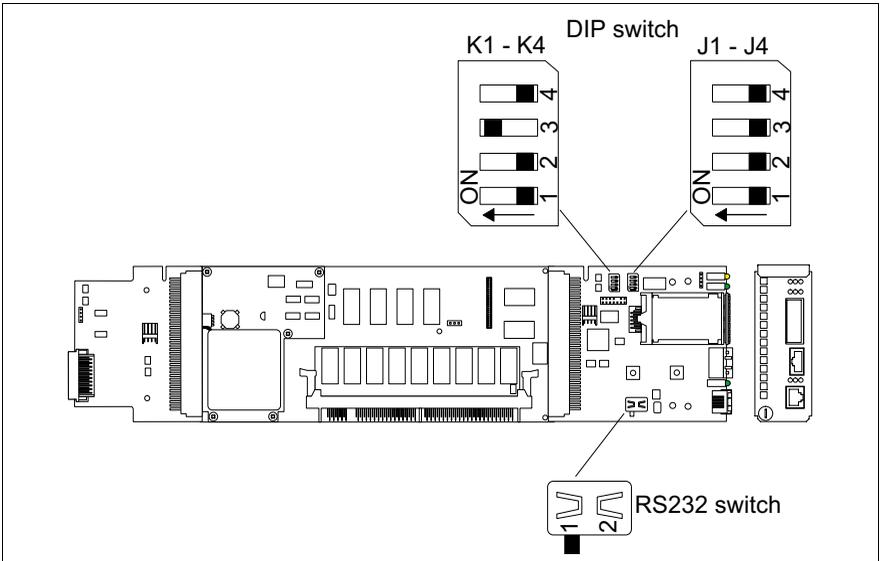
Figure 20: FFx-RAID Controller Module: Switches on the Host Adapter

DIP Switches

DIP switches J1-J4 and K1-K4 (functionality switches) for the setting test and analyzing possibilities in arrangement with the service are available on the host adapter.

For normal operation the DIP switches J1-J4, K1, K2 and K4 must be set to **OFF**, the DIP switch K3 to **ON**.

The individual DIP switch positions ON have the following function:

DIP switch		Function
J1	ON	Manufactory Diagnosis Mode activated: status indicator LEDs (red, green, yellow) for the FFx-RAID controller flash 0.5 sec.
J2	ON	Debug Mode
J3	ON	Disable HSSDC NODE
J4	ON	Disable GBIC NODE
K1	ON	Conservative Cache active
K2	ON	Enable delayed FFx-RAID controller power ON (delay ca. 17 sec.)
K3	ON	Enable/Reset FFx-RAID controller from I2C bus active
K4	ON	Multi Frame Mode: node ON/OFF after 4 consecutive erroneous or error-free frames

Table 13: DIP Switches: Functions

8.1.3   Installing/removing the FFx-RAID controller module

⚠ **CAUTION!**

Observe the notes on safety and the information on electrostatic sensitive device labeling in chapter "Important Notes" on page 7.

The FFx-RAID controller module can be installed and removed while the subsystem is running provided that the configuration involved is a dual-active configuration (two modules with dual-active configuration have been installed) and the *MultiPath* software is active. If one FFx-RAID controller module is removed, the second module automatically takes over its function (hot swap).

⚠ **CAUTION!**

As condition for a hot swap action the replaced FFx-RAID controller modules (FFx-RAID controller) must have the same firmware version and the same cache memory size.

i | Refer also to the *MultiPath* software requirements for the FFx-RAID controller settings, e. g.: both controller must be configured identically.

In a single-mode configuration (with only one module installed), the storage subsystem must be turned OFF before removing the module.

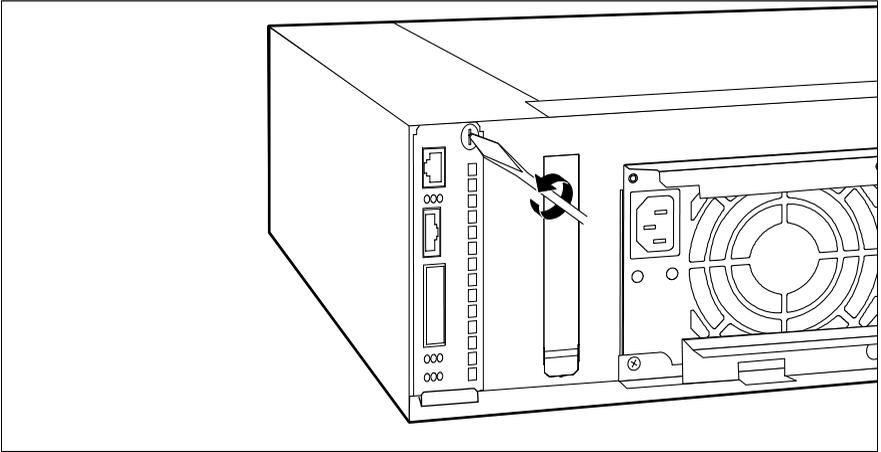► Remove all connection cables from the FFx-RAID controller module connectors.

Figure 21: Loosening the Knurled Screw

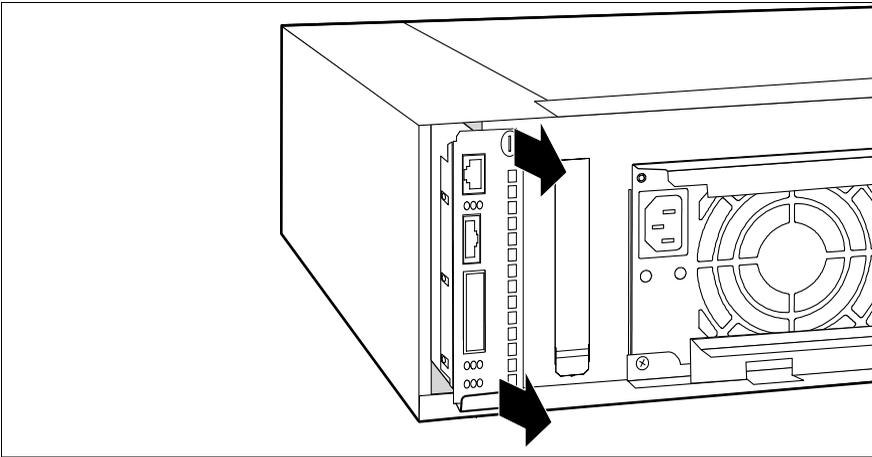► Loosen the knurled screw on the FFx-RAID controller module.

Figure 22: Removing the Module

▶ Carefully pull out the FFx-RAID controller module from the slot. Grasp the module on the knurled screw and on the bracket so that it does not tilt.

Installing occurs in reverse order:

▶ Make sure that the FFx-RAID controller module engages correctly in the plug connection on the HDD backplane.

8.1.4   Adding a Second FFx-RAID Controller Module

i	The addition of a second FFx-RAID controller module may be carried-out when upgrading the simplex configuration to a dual-active configuration. The action **cannot** be accomplished during normal operation.

In a dual-active configuration, the two FFx-RAID controller modules must accept each other as partners. This requires both modules to have the same FW status and the same cache configuration.

▶ Check (with SAM software) whether the FW status of the existing FFx-RAID controller module matches that of the new FFx-RAID controller module.

▶ If the FW statuses do no match, use the SAM software to load the firmware with the status of the new FFx-RAID controller module onto the existing FFx-RAID controller module.

► Install the second FFx-RAID controller module in the free slot as module 1 (see figure 4 on page 20).

► Switch the storage subsystem OFF and ON again.

► Configure both FFx-RAID controller modules identically.

► Reboot the host system.

8.1.5   The FFx-BBU (Battery Backup Unit) Module

The purpose of the FFx-BBU module is to provide AC glitch ride-through wherein power loss is momentary for maintaining cache data content.

A short power loss cycle may result in loss of FFx-RAID controller availability while the controllers re-boot. The FFx-BBU module guaranties that in this time no cache memory data will be lost.

Depending on the cache memory size and the battery condition the FFx-BBU module is capable to maintaining cache memory content for many hours.

CAUTION!

The FFx-BBU module is not intended to protect memory contents in the event of accidental removal while the FFx-RAID controller module is in operation. A normally operating FFx-RAID controller module should be shut down prior to removal from the system.

Conditioning the Battery

Prior to beginning normal operation, it is recommended that you condition the battery for maximum longevity.

i | During the conditioning, the FFx-RAID controller will be in write-through cache mode. This may slow normal operations. Therefore, schedule this operation accordingly.

To ensure that the battery is fully charged and properly conditioned:

► From SAM software, select *Administration/Intelligent BBU*.

► Make sure the % *Charge Level* is 100. If the battery is currently charging, do not continue until the Charge Level is 100%.

► Select *Recondition Battery* and *Apply*.

Refer to the SAM software documentation (see "Related publications" on page 81) for more information.

9 Connections

If you would like to put the PRIMERGY S30 storage subsystem into operation, the FC and the mains connections must be attached.
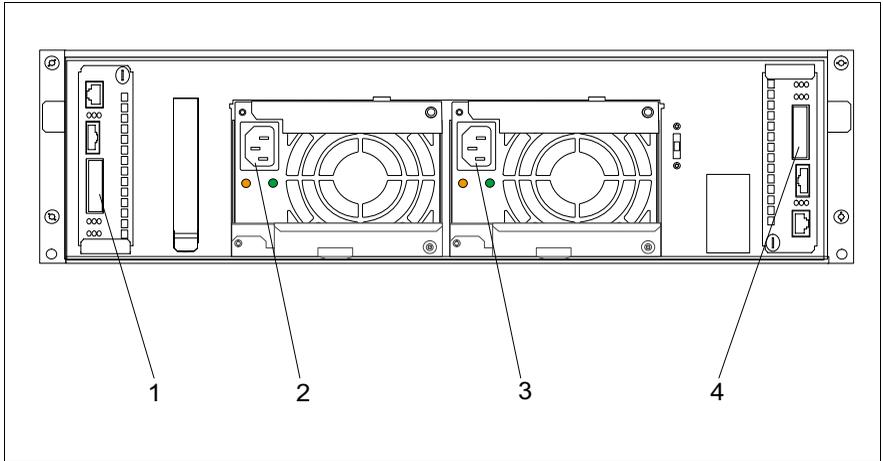
Figure 23: The Terminals on the Rear Panel

(1) FC connection (module 1)

(2) Mains connection 2

(3) Mains connection 1

(4) FC connection (module 0)-default

9.1 Fibre Channel (FC) Connection

The required connectors are on the connection panel of the corresponding FFx-RAID controller module at the rear of the storage subsystem (see figure 19 on page 47).

The possibilities to configure and connect the storage subsystem are described in an additional manual ("PRIMERGY S60 Technical Configuration Guide", see"Related publications" on page 81).

► Set up the data connection between the system unit and the storage subsystem by connecting the plug on the cable from the system unit with the corresponding FC connector of the storage subsystem.

| **i** | Pay attention that the plug is securely attached to the FC connector. Only in this way a smooth data transfer between the system unit and the storage subsystem can be ensured. |

9.2 Mains Connection

The storage subsystem is supplied with the mains voltage via the delivered power cables.
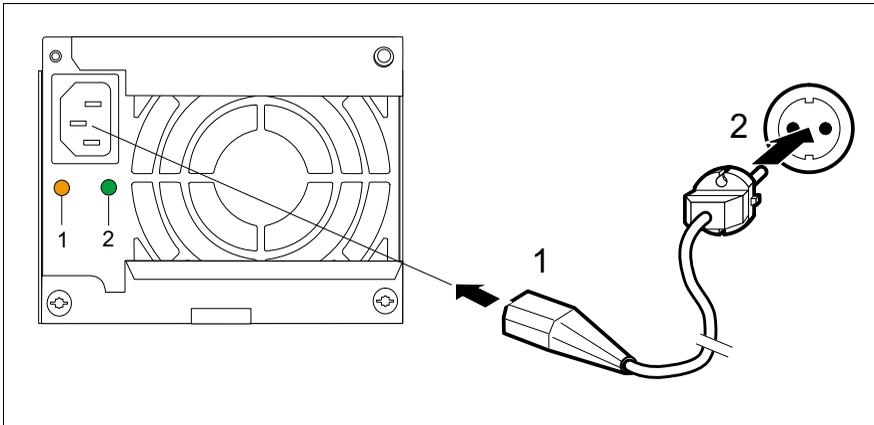
Figure 24: Connecting the Power Cable

► Plug the end of the power cable marked **(1)** into the socket of the power supply unit on the rear of the storage subsystem.

▶ Plug the end of the power cable marked **(2)** into a properly grounded power outlet of the in-house mains or into the mains socket strip of the rack.

> **i** Ensure that the power outlet used to connect the storage subsystem is adequately protected with a 16 A or 15 A (USA) automatic circuit breaker.

9.3 Mains Connection with Phase Redundancy

In order to provide phase redundancy in the power supply of the subsystem, each of the power supply units are directly connected either to two different phases or to two different power circuits of in-house mains.
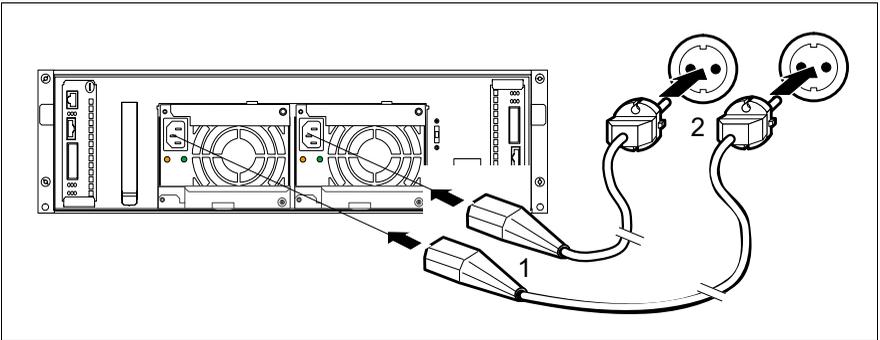
Figure 25: Mains Connection with Phase Redundancy

▶ Connect one end of each power cable marked **(1)** to one of the power supply units of the storage subsystem.

Floorstand Model

▶ Connect the ends of the power cables marked **(2)** to two different phases or to two different circuits of the in-house mains.

Rack Model

▶ Connect the ends of the power cables marked **(2)** to two different phases of the mains socket strip of the rack.

9.4   Power connection via UPS

The availability of the storage subsystem can be improved further by using
Uninterrupted Power Supplies (UPS) and/or a Redundant PowerSwitch.

> **i** IWhen the PRIMERGY S60 works in the higher performance Cache
> Write Back mode, you should use a APC UPS to secure the cache
> contents (256 MB).

In such cases, the storage subsystem is connected to one of the outlets of the
UPS or to the Redundant PowerSwitch. It is generally advisable to connect both
the server and the storage subsystem to a shared UPS.

A further possibility to secure the PRIMERGY S60 storage subsystem against
power failure is given by the following configuration:

– one power supply unit is connected via an UPS
– the second power supply unit is connected directly (without UPS) to the
  same phase as the UPS

If a power failure occurs the UPS will secure the first power supply unit, the
second (unsecured) power supply unit will fail. This failure causes the FFx-RAID
Controller to switch into the degraded mode and the current cache content will
be secured (duration approx. 5 minutes).

The power supply unit secured over UPS is able to supply the subsystem alone
with current. Further data accesses on the storage subsystem are executed
however, without cache memory of the controller and are written directly on the
hard disks. Data security is ensured if the duration of the power failure is such
that the UPS switches the subsystem OFF.

If power failure is restored briefly (before the subsystem was switched OFF),
then the failed second power supply unit again becomes active and the
degraded mode of the FFx-RAID Controller is deactivated.

> **i** Phase redundancy can be easily achieved by the additional use of a
> Redundant PowerSwitch.

10 Installation

10.1 Installation Steps

⚠️ **CAUTION!**

The storage subsystem should not be subjected to any extreme environmental conditions (see section "Technical Data" on page 4). Protect it from dust, moisture and heat.

The storage subsystem must be acclimatized in its operating environment for an acclimatization time.

Temperature difference (°C) (operating environment/outside)	Minimum acclimatization time (hours)
5	3
10	5
15	7
20	8
25	9
30	10

Table 14: Acclimatization Time

The following installation steps are described in detail in other sections of this chapter:

● Unpacking the storage subsystem.

● Setting up the floorstand model or mounting the rack model into the rack.

● Cabling the storage subsystem (see chapter "Connections" on page 57).

● Setting the desired system parameters.

● Connecting the storage subsystem to the mains voltage (see section "Mains Connection" on page 58 or section "Mains Connection with Phase Redundancy" on page 59).

● Switching ON the storage subsystem.

10.2 Unpacking the Storage Subsystem

⚠ **CAUTION!**

Please note the safety instructions in chapter "Important Notes" on page 7.

If you need to lift or transport the storage subsystem, ask someone to help you.

You should retain the original packaging of the storage subsystem for possible further transport.

► Unpack all the individual parts.

► Check the contents of the package for visible transport damage.

► Check whether the delivery matches the information given on the delivery note.

► Check whether the first page of the guarantee booklet has been completed in full.

If you find transport damage or inconsistencies between the contents of the package and the delivery note, inform your supplier immediately!

10.3 Setting Up the Floorstand Model

Position the storage subsystem at the intended location.

Note the following:

– The device must be protected against direct sunlight.
– The required minimum distances for operation and maintenance areas must be adhered to.
– In order to connect the server, the rear of the storage subsystem must be accessible.
– The mains plug must be accessible easily and safely.
– To ensure sufficient ventilation of the storage subsystem, a minimum clearance of 200 mm must be provided at the front and rear of the storage subsystem.

10.4   Mounting the Rack Model

⚠ **CAUTION!**

Please take note of the safety information and the notes on mounting in the rack in the chapter "Important Notes" on page 7.

At least two people are needed to position the storage subsystem in the rack.

The rack may tip over if more than one heavy unit (e.g. PRIMERGY K400) is removed.

For mounting the subsystem in the DataCenter Rack at first a support bracket must be mounted on the rear left support upright of the DataCenter Rack. This support bracket is used for the rear fixing of the left slide rail and must be mounted level with the lower edge of the subsystem. Cage nuts and/or spring nuts also must be inserted in the support uprights. The cage nuts are used for fixing the support bracket and the subsystem, the spring nuts for fixing the slide rails.

► Take the installation instruction in the Technical Manual for the corresponding rack model for aid.

► Using the mounting aid (stencil) mark the position of the attachment points of the storage subsystem on the support uprights (three height units).

   Refer to the information on the mounting aid.

► Mark the mounting points of the subsystem (knurled screws on the front) on the front support upright. Also mark the fastening points of the slide rails on the inside grooves of the support uprights facing backwards. The bottom edge of the fastening flange must be flush with the top housing cover of any device already mounted.

► Place the cage nuts and/or the spring nuts in the groove of the support uprights and/or of the support bracket at the marked attachment points. If necessary, adjust the position of the nuts in the groove until they lock into the correct position.

► If required, you can mount one additional cable clip for vertical cable routing.

10.4.1 Preparing the Slide Rails

Before the slide rails can be screwed to the support uprights, a holding-down clamp must be secured to each slide rail. Seen from the front of the rack, the holding-down clamps are secured to the front area of the slide rails. They prevent the storage subsystem from tilting down on removing it from the rack.
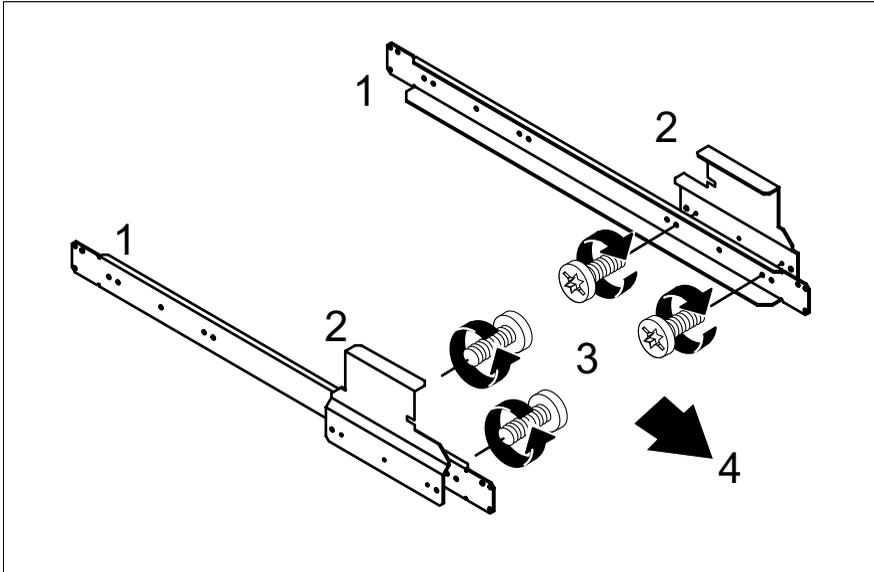

Figure 26: Securing the Support brackets to the Slide Rails

► Position the slide rails **(1)** on your work surface in the same way as they are to be mounted in the rack, with the longer angular edge onto which the storage subsystem will be placed at the bottom and on the inside.

► Position the holding-down clamps **(2)** on the slide rails from the outside so that the drilled holes for your assembly match up on the slide rails and on the holding-down clamps.

► For each holding-down clamp, insert two of the screws supplied **(3)** from the inside through the drilled holes into the slide rails and into the holding-down clamps and tighten the screws.

10.4.2   Mounting Slide Rails

▶ Fasten the slide rails with the holding-down clamps to the cage nuts
  provided on the support uprights, for this purpose, using four of the screws
  supplied in the rack mounting kit for each rail.

10.4.3   Mounting the Subsystem

▶ Lift the storage subsystem onto the two slide rails at the front of the rack and
  move it back on the rails so that you can work comfortably from behind on
  the rear of the rack.
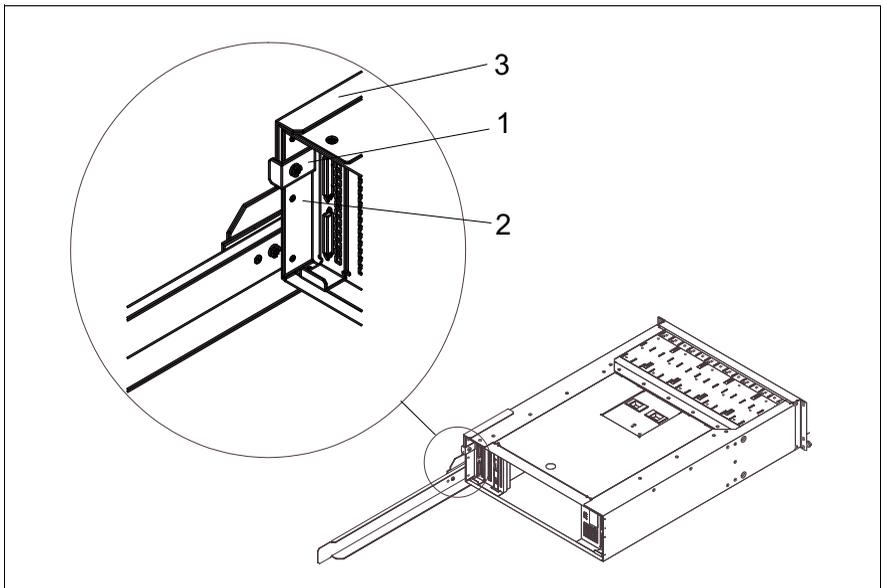
Figure 27: Rear Left Stop

▶ Fasten the stop **(1)** on the left rear edge of the casing box **(2)**. The stop
  prevents the storage subsystem from being pulled forwards too far since
  there is resistance on the rear edge of the holding-down clamp **(3)**.

▶ Secure the storage subsystem with the two knurled screws to the front
  support uprights of the rack.

10.4.4 Routing the Cables

The cables of the storage subsystem are routed in the rack in such a way that the unit can be pulled forwards without the cables having to be loosened.

The articulated cable guides on which the cables are routed are located in the interior of the DataCenter Rack (on the right if seen from the rear of the rack). The procedure can be found in the chapter "Cable Management" in the DataCenter Rack manual.
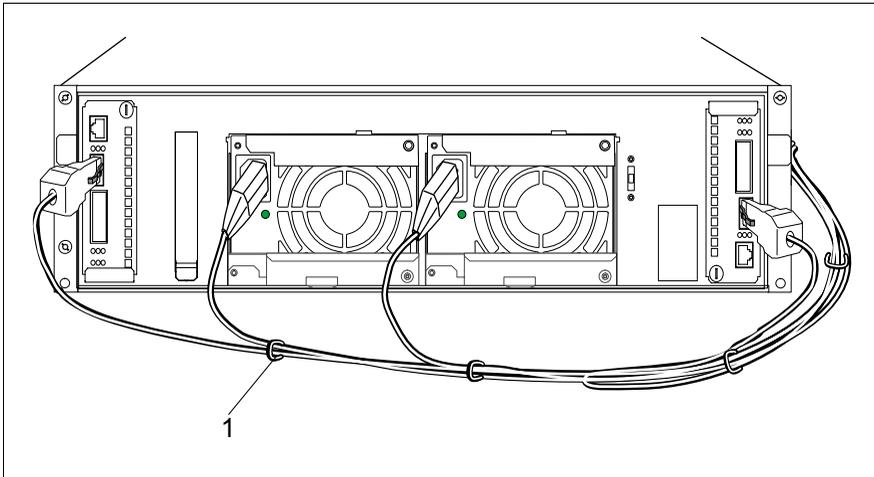
Figure 28: Leads Routing

▶ Connect the cables to the system unit and to the storage subsystem.

⚠ **CAUTION!**

The cables must have enough over-length when connecting to the storage subsystem (see figure 28). This is necessary to prevent them being pulled out of the connectors when the subsystem is withdrawn from the rack (the mains connectors could be pulled out unintentionally).

▶ Route the cables as shown in the figure.

▶ Insert the cables through the articulated cable guides.

▶ Secure the cables with the cable ties **(1)**.

In other rack models, the leads are secured to articulated cable guides delivered with the installation kit for the 42-HE rack. The screw and the spring nut which are used for installation form part of the racks or the installation kit for the rack.
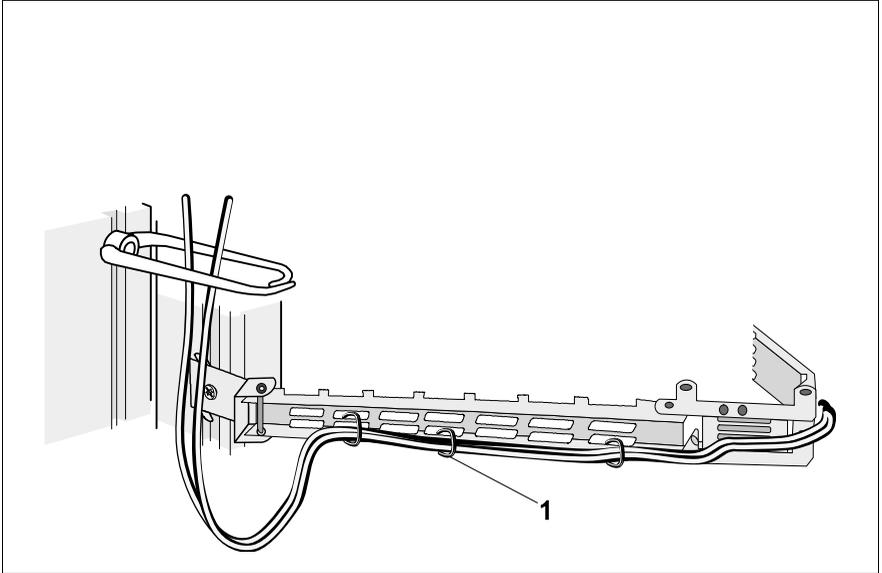
Figure 29: Articulated Cable Guide

Proceed as follows:

▶ Secure the articulated cable guide with the screw to the spring nut placed in the support uprights according to the description in the rack manual. The articulated cable guide must be fitted within the height range of the storage subsystem.

⚠ **CAUTION!**

The articulated cable guide should be fixed on the support uprights only. **Do not fix it on the storage subsystem**.

10.5   Connecting and Disconnecting Cables

⚠ **CAUTION!**

The power plug must be pulled out!

Read the documentation for the external device before connecting any cables.

Cables may neither be connected nor disconnected during thunderstorms.
When disconnecting a cable, always hold it by the plug, never pull on the wire!

When connecting or disconnecting cables, follow the sequence described below:

Connecting leads

▶ Switch off all the relevant devices.

▶ Pull the power plugs of all the relevant devices out of their sockets.

▶ Connect all the cables to the server and the storage subsystem. Mark the cables and make a note of the function of each cable. Always note the safety instructions in chapter "Important Notes" on page 7.

▶ Connect the power plugs to appropriately properly grounded power outlets. For rack models make sure that the power cables of the devices are connected in such a way that a even distribution of power to the three phases (L1, L2, L3) in the rack is achieved (you can find further information in the manual for the corresponding rack).

▶ For devices mounted in a rack, secure the cables to the articulated cable guides with cable ties.

Disconnecting leads

▶ Switch off all the relevant devices.

▶ Pull the power plugs of all the relevant devices out of their sockets.

▶ Disconnect all the cables on the server and on the storage subsystem.

10.6   Switching the Storage Subsystem ON/OFF

The PRIMERGY S60 storage subsystem can be switched ON or OFF via its own power switch.

⚠ **CAUTION!**

The storage subsystem must always be switched ON **before** the connected server.

⚠ **CAUTION!**

The PRIMERGY S60 storage subsystem (without Remote Service Board) switches OFF at an interior temperature of 55°C (see section "Cooling status LED lights orange" on page 73).

11 Troubleshooting

> ⚠ **CAUTION!**
>
> Note the safety instructions in the "Safety, Warranty and Ergonomics" manual and in section "Connecting and Disconnecting Cables" on page 68.

If a fault occurs, try to correct it as described

● in this chapter,

● in the documentation for the connected devices and the controller used.

If you fail to correct the problem, proceed as follows:

► Make a note of the steps and the circumstances that led to the fault. Note also any error message which may have been displayed.

► Switch OFF the connected server and the storage subsystem.

► Contact our Service organization.

11.1 Problem Solutions and Tips

The following sections describe irregularities which can be observed on the storage subsystem in case of faults. Their possible causes are named and there are instructions for troubleshooting.

11.1.1 Power Supply Status Indicator (Front)

If the power supply status indicator is green the device is switched ON and the power supply and power supply units are OK.

11.1.1.1 Power supply status indicator remains dark

Power cable not connected correctly

► Ensure that the power cable on the storage subsystem and the grounded outlet are connected correctly.

Power supply units defective

▶ Check the LEDs of the power supply units.

If the operating indication (green LED) on the power supply units is dark and the fault indication (amber LED) is on, the power supply units are defective.

▶ Replace the power supply units.

11.1.1.2 Power supply status indicator lights yellow

One of the installed power supply units has failed.

▶ Check which one of the power supply units has failed. If only the amber LED is on, the power supply unit is defective or the power supply don't receive power.

▶ Replace the defective power supply unit (see section "Replacing the Power Supply Unit" on page 30).

The problem is cleared if:

– the green LED on the power supply unit is ON and

– the power supply status indicator on the front of the storage subsystem lights green.

11.1.1.3 Power supply status indicator lights orange

The device is switched OFF and in the standby mode.

▶ Switch the device ON (see section "Switching the Storage Subsystem ON/OFF" on page 69).

▶ If the LED remains orange, the power supply units may have failed. Replace the power supply units. If the LED then still remains orange, contact our Service organization.

11.1.2 Cooling Status

If the cooling status LED lights green, both the installed fans and the interior temperature of the storage subsystem are OK.

11.1.2.1 Cooling status LED lights yellow

| **i** | This indication means that a redundant fan is defective, but the temperature is OK. |

One of the fans is defective

| **i** | In this case, the status LED on the fan module lights yellow (see section "Fan LED" on page 23). |

▶ Replace the fan module (see section "Installing/Removing the Fan Module" on page 34).

⚠ **CAUTION!**

It is imperative when replacing the fan module during operation that you take no longer than 30 seconds, since otherwise the temperature in the storage subsystem can exceed the permissible limit values.

After the fan module has been replaced successfully, both the status LED on the fan module and the cooling status LED must light green again.

11.1.2.2 Cooling status LED lights orange

In this case there is a cooling fault.

▶ Check whether or not all the fans have failed. In this case the status LED on the fan module lights orange (see chapter "Fan Module" on page 33).

⚠ **CAUTION!**

The PRIMERGY S60 storage subsystem (without Remote Service Board) switches OFF at an interior temperature of 55°C (see section "Storage Subsystem Switches OFF" on page 75).

If the status LED on the fan module lights green or yellow, the temperature in the device is too high although the fans (or at least one of the fans) are working. Check whether or not the ambient temperature is too high or the air outlet on the rear of the device is obstructed.

All the fans have failed

▶ Immediately shut down the system to prevent overheating damage in the device.

▶ Replace the fan module (see section "Installing/Removing the Fan Module" on page 34).

> ⚠ **CAUTION!**
>
> It is imperative when replacing the fan module during operation that you take no longer than 30 seconds, since otherwise the temperature in the storage subsystem exceeds the permissible limit values.

11.1.3 Server Management Status

In order to guarantee the server management for the PRIMERGY S60 storage subsystem over SES (SCSI Enclosure Service), at least one of the two first HDD modules (HDD1 and HDD2, see also section "Identification Marks and Loop Addresses" on page 43) must be installed.

This indication can be activated manually from the ServerView. Evaluation is performed with a later version of the storage subsystem.

11.1.3.1 Server Management Status LED lights permanently

Identification indication (can be activated manually from ServerView)

The following disturbances can have occurred:

– A power supply unit has failed
– Short interruption of the power supply
– An out-of-limit temperature condition exists
– Controller partner has failed
– SES monitoring has failed

▶ Recover the disturbance as described in this section. You find further information in the GAM software documentation.

11.1.4 Storage Subsystem Switches OFF

Temperature too high

The actually internal temperature (°C) of the storage subsystem can be monitored from the server management via SES. If the temperature is higher as 42°C additionally an OverTemperature Flag will be set (which can be monitored also via SES) and the cooling status LED on the front lights orange (see also section "Cooling status LED lights orange" on page 73). Additionally the FFx-RAID controller switches in the degraded mode.

If the internal temperature achieve 55°C the storage subsystem switches OFF.

▶   Wait until the storage subsystem has cooled down.

11.1.5 System will not boot after Installation of New HDD Modules

┌───┐
│ **i** │   HDD modules should be inserted only while the system is in operation.
└───┘

Configuration incorrect (FFx-RAID controller)

▶   Call up the configuration menu and check the hard disk drives settings (device configuration) and the additional settings (advanced configuration options).

11.1.6 HDD READY Indicator does not light up

▶   Check whether the HDD module has been correctly installed and locked (see section "Installing/Removing HDD/Dummy Module" on page 38).

HDD module or HDD backplane is defective

▶   Replace the HDD module. If the HDD READY indicator is still off, the HDD backplane is defective. Contact the Service organization.

11.1.7 Hard Disk Drives" dead" on System Start

Configuration of the FFx-RAID controller incorrect

▶ Correct the settings for the hard disk drives.

You will find further notes in the documentation of the configuration software.

11.1.8 Controller reports Added Hard Disk Drive as defective

This error message can have the following cause:

FFx-RAID controller not configured for the hard disk drive

The HDD module was installed with the system switched OFF.

▶ Configure the FFx-RAID controller retroactively for the drive.

or

▶ Re-install the HDD module with the system switched ON.

Abbreviations

AC
Alternating Current

BBU
Battery Backup Unit

CE
Communauté Européenne (European Community)

DAC
Disk Array Controller

DC
Direct Current

DIP
Dual In-Line Package

EEC
European Electrotechnical Commission

ESD
Electrostatic Sensitive Device

FC
Fiber Channel

FCC
Federal Communications Commission

GAM
Global Array Manager

GBIC
Gigabit Interface Converter

HDD
Hard Disk Drive

Abbreviations

HSSDC
    High Speed Serial Direct Connect

IEC
    International Electrotechnical Commission

LAN
    Local Area Network

LED
    Light Emitting Diode

LUN
    Logical Unit Number

MIA
    Media Interface Adapter

MMF
    Multi Mode Fibre

NVRAM
    Non Volatile Random Access Memory

PCI
    Peripheral Component Interconnect

RAID
    Redundant Arrays of Independent Disks

RAM
    Random Access Memory

RFI
    Radio Frequency Interference

RSB
    Remote Service Board

SAM
    SAN Array Manager

SCA
> Single Connector Attachment

SCSI
> Small Computer System Interface

SES
> SCSI Enclosure Service

SMF
> Single Mode Fibre

UHD
> Ultra High Density

UPS
> Uninterrupted Power Supply

Related publications

Please apply to your local office for ordering the manuals.

[1]   **Safety, Warranty and Ergonomics**

[2]   **19-inch Rack for PRIMERGY and RM Systems**
      Technical Manual

[3]   **PRIMERGY DataCenter Rack**
      Technical Manual

[4]   **DACFFx**
      Fibre Channel to Fibre Channel RAID Controller
      Quick Installation and Configuration Guide

[5]   **Global Array Manager™**
      Client Software with Workstation Array Manager
      Installation Guide and User Manual

[6]   **Global Array Manager™ Server Software**
      Installation Guide and User Manual

[7]   **SANArray Manager™ Client Software**
      Installation Guide and User Manual

[8]   **Embedded Configuration Utility**
      User's Guide

[9]   **PRIMERGY S60**
      Technical Configuration Guide

[10] **Remote Service Board**
      Installationsanleitung/Installation Guide

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Submitted by

Comments on PRIMERGY S60
                Storage Subsystem

Comments
Suggestions
Corrections

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                Storage Subsystem