User Guide - English

FUJITSU

Modular RAID Controllers

"RAID 0/1 SAS based on LSI MegaRAID"
"RAID 5/6 SAS based on LSI MegaRAID"
"RAID Ctrl SAS 6G 0/1 (D2607)"
"RAID Ctrl SAS 6G 5/6 512MB (D2616)"
"PY SAS RAID Mezz Card 6Gb (D3016)"
"RAID Ctrl SAS 6G 1GB (D3116)"
"PY SAS RAID HDD Module (D2816)"
"PY SAS RAID HDD Module w/o Cache (D2837)"
"PRAID EP400i / EP420i"
"PRAID EM400i"
"PRAID CM400i"
"PRAID CP400i"
"PRAID EP420e"
"PRAID EP440i"

January 2018

Comments… Suggestions… Corrections…

The User Documentation Department would like to know your opinion of this manual. Your feedback helps us optimize our documentation to suit your individual needs.

Feel free to send us your comments by e-mail to manuals@ts.fujitsu.com.

Certified documentation according to DIN EN ISO 9001:2008

To ensure a consistently high quality standard and user-friendliness, this documentation was created to meet the regulations of a quality management system which complies with the requirements of the standard DIN EN ISO 9001:2008.

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Content

1 Introduction

The PRIMERGY Modular RAID concept is designed to provide a flexible and common RAID solution for the internal disks in all PRIMERGY servers and consists of three different RAID solutions:

– Embedded RAID for SATA disks

– Entry RAID controller for SAS and SATA disks

– Full-featured RAID controller for SAS and SATA disks

1.1 Requirements

You will need hardware knowledge in order to install the board. To install the software, you will need to be familiar with the operating system used.

1.2 Further information

Information on boards, drives and other devices can be found in the manuals you received with these products.Information on your operating system and the application programs you are using is contained in the associated manuals or help texts.The latest information on our products, tips, updates, etc. can be found on the Internet at: *http://ts.fujitsu.com*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

1.3 Notational conventions

The meanings of the symbols and fonts used in this manual are as follows:

italics	indicates commands, menu items, file and path names or software programs
"quotation marks"	indicates names and terms that are being emphasized
►	indicates an operation that is to be performed
 **CAUTION!**	indicates warnings, which, if ignored, will endanger your health, destroy the system or lead to loss of data
	indicates additional information, notes and tips

Table 1: Notational conventions

2 Important information

In this chapter you will find essential information regarding safety when working with the board. Please read the instructions carefully if you want to install/remove a board.

CAUTION!

Observe the safety notes in the Operating Manual of your system unit.

2.1 Safety instructions

CAUTION!

- The actions described in these instructions should only be performed by authorized, qualified personnel. Equipment repairs should only be performed by qualified staff. Any failure to observe the guidelines in this manual, and any unauthorized openings and improper repairs could expose the user to risks (electric shock, fire hazards) and could also damage the equipment. Please note that any unauthorized openings of the device will result in the invalidation of the warranty and exclusion from all liability.
- Transport the device only in the antistatic original packaging or in packaging that protects it from knocks and jolts.
- Only install extensions that have been released. If you install other extensions, you may interfere with the requirements and rules governing safety and electromagnetic compatibility of your system. Information on which system extensions are suitable can be obtained from the customer service center or your sales outlet.
- The warranty becomes invalid if the device is damaged during the installation or replacement of system extensions.
- Components can become very hot during operation. To avoid burns, make sure you do not touch components when adding or removing system board extensions!
- Transmisson cables to peripheral devices must be adequately shielded.

- For the LAN wiring, the requirements according to standards EN 50173 and EN 50174-1/2 apply. The minimum requirement is the use of a protected LAN line of category 5 for 10/100 Mbit/s Ethernet, and/or of category 5e for Gigabit Ethernet. The requirements of specification ISO/IEC 11801 must be observed.
- Never connect or disconnect data cables during a storm (lightning hazard).

Batteries

CAUTION!

- Incorrect replacement of the battery may lead to a risk of explosion. The batteries may only be replaced with identical batteries or with a type recommended by the manufacturer.
- Do not throw batteries into the trash can. They must be disposed of in accordance with local regulations concerning special waste.

Notes about boards

- During installation/uninstallation of a board, observe the specific instructions described in the service manual for the server.
- To ensure that the system and system board are completely disconnected from the mains voltage, remove the plug from the mains outlet.
- To prevent damage to boards and the components and conductors on them, please take great care when you insert or remove them. Make sure that extension boards are slotted in straight, without damaging components or conductors on the system board, or any other components, for example EMI spring contacts.
- Be careful with the locking mechanisms (catches, centering pins etc.) when you replace boards.
- Never use sharp objects (e.g. screw drivers) for leverage.

Modules with Electrostatic-Sensitive Devices

Modules with electrostatic-sensitive devices are identified by the following sticker:

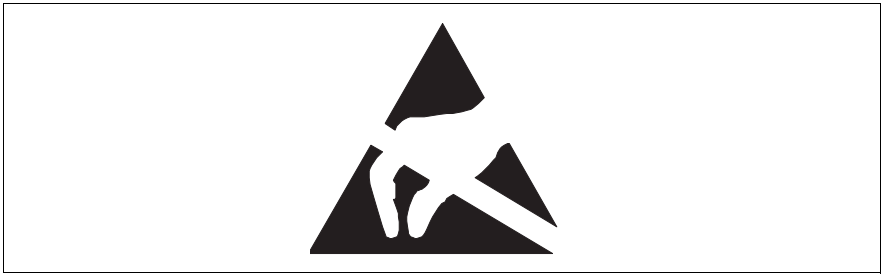


Figure 1: ESD label

When you handle components fitted with ESDs, you must always observe the following points:

- Switch off the system and remove the power plugs from the power outlets before installing or removing components with ESDs.
- You must always discharge static build-up (e.g. by touching a grounded object) before working with such components.
- Any devices or tools that are used must be free of electrostatic charge.
- Wear a suitable grounding cable that connects you to the external chassis of the system unit.
- Always hold components with ESDs at the edges or at the points marked green (touch points).
- Do not touch any connectors or conduction paths on an ESD.
- Place all the components on a pad which is free of electrostatic charge.

For a detailed description of how to handle ESD components, see the relevant European or international standards (EN 61340-5-1, ANSI/ESD S20.20).

2.2 Environmental protection

Environmentally-friendly product design and development

This product has been designed in accordance with the Fujitsu standard for "environmentally friendly product design and development". This means that key factors such as durability, selection and labeling of materials, emissions, packaging, ease of dismantling and recycling have been taken into account. This saves resources and thus reduces the harm done to the environment. Further information can be found at:
http://ts.fujitsu.com/products/standard_servers/index.html

For the reader in Japan:
http://jp.fujitsu.com/platform/server/primergy/concept/

Energy-saving information

Devices that do not need to be constantly switched on should be switched off until they are needed as well as during long breaks and after completion of work.

Packaging information

This packaging information does not apply in Japan and APAC.
Do not throw away the packaging. You may need it later for transporting the server. If possible, the equipment should only be transported in its original packaging.

Information on handling consumables

Please dispose of printer consumables and batteries in accordance with the applicable national regulations.

In accordance with EU directives, batteries must not be disposed of with unsorted domestic waste. They can be returned free of charge to the manufacturer, dealer or an authorized agent for recycling or disposal.

All batteries containing pollutants are marked with a symbol (a crossed-out garbage can). They are also marked with the chemical symbol for the heavy metal that causes them to be categorized as containing pollutants:

Cd Cadmium
Hg Mercury
Pb Lead

Labels on plastic casing parts

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

Returns, recycling and disposal

Please handle returns, recycling and disposal in accordance with local regulations.

The device must not be disposed of with domestic waste. This device is labeled in compliance with European directive 2012/19/EU on waste electrical and electronic equipment (WEEE).

This directive sets the framework for returning and recycling used equipment and is valid across the EU. When returning your used device, please use the return and collection systems available to you. Further information can be found at:
http://ts.fujitsu.com/recycling

Details regarding the return and recycling of devices and consumables within Europe can also be found in the "Returning used devices" manual, via your local Fujitsu branch, or at:
http://ts.fujitsu.com/recycling

3 Modular RAID 3Gb/s (SAS1.0)

3.1 RAID controller "RAID 0/1 SAS based on LSI MegaRAID (D2507)"

ATTENTION!

Make sure you observe the safety notes in chapter "Important information" on page 9.

The RAID controller "RAID 0/1 SAS based on LSI MegaRAID" is designed to drive the server's internal disk drive. The RAID stack is based on LSI MegaRAID® and offers powerful data throughput, extensive fault-tolerance and easy-to-use management.

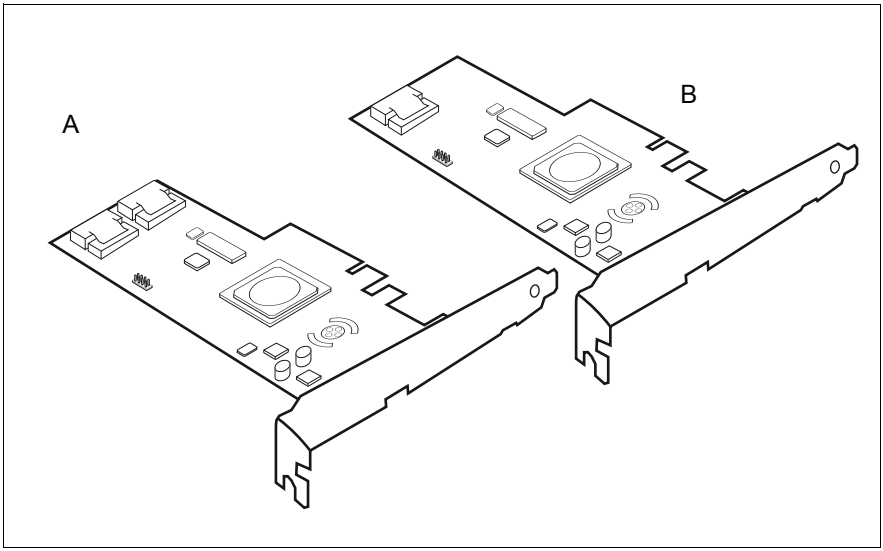


Figure 2: "RAID 0/1 SAS based on LSI MegaRAID" controllers 1068 (A) and 1064 (B)

3.1.1 Features

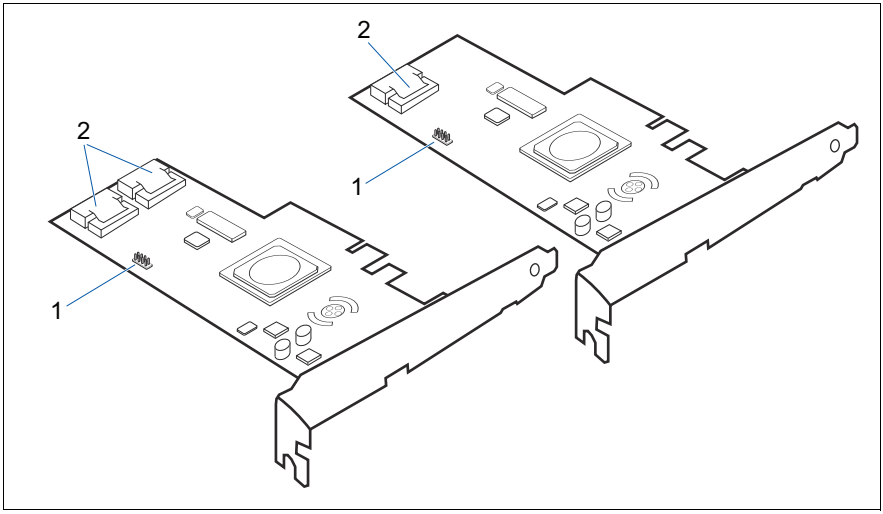
- 3.3 V PCIe (PCI Express) add-in card
- 4 / 8-Port SAS / SATA
- PCIe Interface x4 electrical, x8 mechanical
- One / two Mini 4x SFF-8087 Multilane Connectors
- 3.0 Gbit/s and 1.5 Gbit/s link rates for both SAS and SATA
- Integrated RAID (RAID 0, RAID 1, RAID 1E)
- Supports SSP, SMP, STB, and SATA Protocols
- Support of the following SATA II features:
  - 3 Gbit/s SATA
  - Staggered Spin-Up
  - Hot Plug
  - Native Command Queuing (NCQ)
- Comes without, with standard, with low-profile bracket.

3.1.2 Controller versions

Name	Chip	No. of SAS channels	Bracket type
S26361-D2507-**B**1x/**D**1x	LSISAS1064e	4	low profile full height
S26361-D2507-**A**1x/**C**1x	LSISAS1068e	8	low profile full height

3.1.3 Connectors

The following figure shows the location of the connectors on the controllers.



1	HDD LED connector	2	SAS cable connector(s)

Connector	Type	Description
SAS MLC1	x4 SAS, ports 0 - 3	SFF 8087 Mini SAS connector for SAS IO cable to backplane and HDDs (hard disk drives)
SAS MLC2	x4 SAS, ports 4 - 7	SFF 8087 Mini SAS connector for SAS IO cable to backplane and HDDs
HDD LED	HDD activity indication LED	8-pin connector Pin 6 to connect activity LED

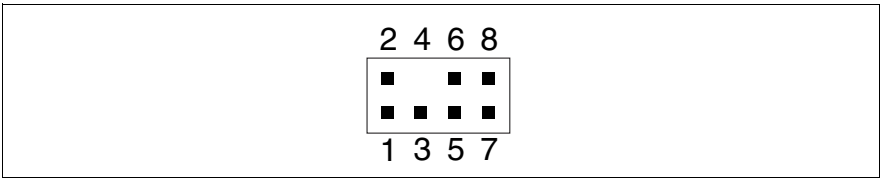


Figure 3: HDD LED connector

3.1.4 Installation

This section describes how to install the SAS RAID controller in a server.

CAUTION!

To safeguard against data loss, remember to back up your data before you change your system configuration.

To install the new controller, proceed as follows:

Step 1 **Unpack the controller**

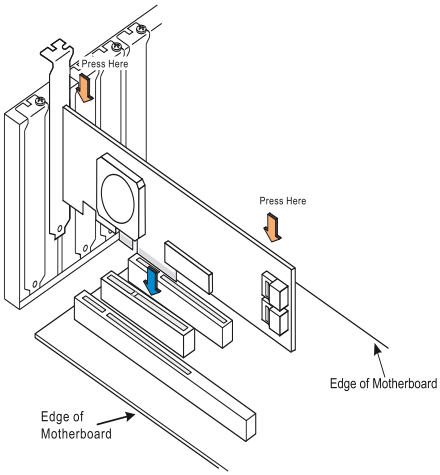
Unpack the new controller in a static-free environment. Remove it from the anti-static bag and inspect it for damage.

If the controller appears to be damaged, contact the Fujitsu support service.

Step 2 **Prepare the server**

Turn off the server and remove the cover from the chassis.

Step 3 Install the new SAS RAID controller



Insert the controller in a suitable PCIe slot on the system board, as shown in the figure above (see your system board guide for information on the PCIe slot). Press down gently but firmly to ensure the card is properly seated in the slot. Secure the controller to the server chassis with the PCI card hold down latches. Connect the SAS and/or SATA HDDs located in the system to the SAS cable connector(s) on the controller.

Step 4 Power-up the server

Replace the server cover and reconnect the power cable(s). Start up the server. Ensure that the SAS and/or SATA II devices are powered up before or at the same time as the host server. If the host server is powered up before the SAS or SATA II devices, the devices might not be recognized.

During booting, a message similar to the following is displayed:

```
LSI Logic Corp. MPT SAS Bios
MPTBIOS-6.12.00.00  (2006.10.31)
Copyright 2000-2006 LSI Logic Corp.
```

Step 5 Run the LSI Logic Configuration Utility

Run the LSI Logic Configuration Utility to configure the physical arrays and logical drives.

Press `CTRL+C` immediately to run the utility, when the following message appears on the screen:

```
Press <Ctrl><C> to start LSI Logic Configuration
Utility
```

Step 6 Install the operating system driver

The controller can operate under various operating systems. To use these operating systems, you must install software drivers.

The ServerView Suite DVD 1 includes drivers for the supported operating systems, along with documentation. You can view the supported operating systems and download the latest drivers for RAID adapters on the website at: *http://ts.fujitsu.com/support/*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

3.2 RAID controller "RAID 5/6 SAS based on LSI MegaRAID (D2516)"

ATTENTION!

Make sure you observe the safety notes in chapter "Important information" on page 9.

The RAID controller "RAID 5/6 SAS based on LSI MegaRAID" is designed to drive the server's internal disk drives. The RAID stack is based on LSI MegaRAID® and offers powerful data throughput, extensive fault-tolerance and easy-to-use management.

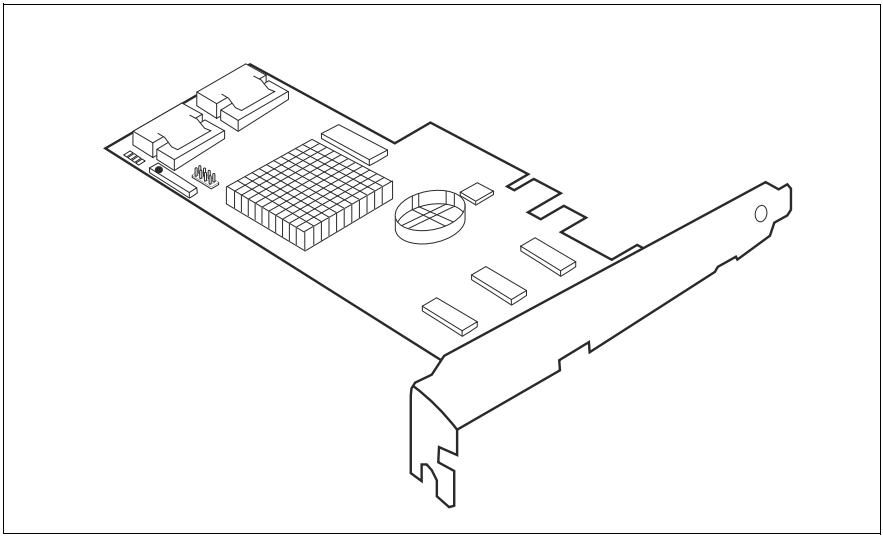


Figure 4: "RAID 5/6 SAS based on LSI MegaRAID" controller (1078)

3.2.1 Features

- Industry-proven MegaRAID® data protection
- Flexibility for both SAS and SATA II
- Advanced management and configuration suites
- Supports RAID levels 0, 1, 5, 6, 10, 50 and 60

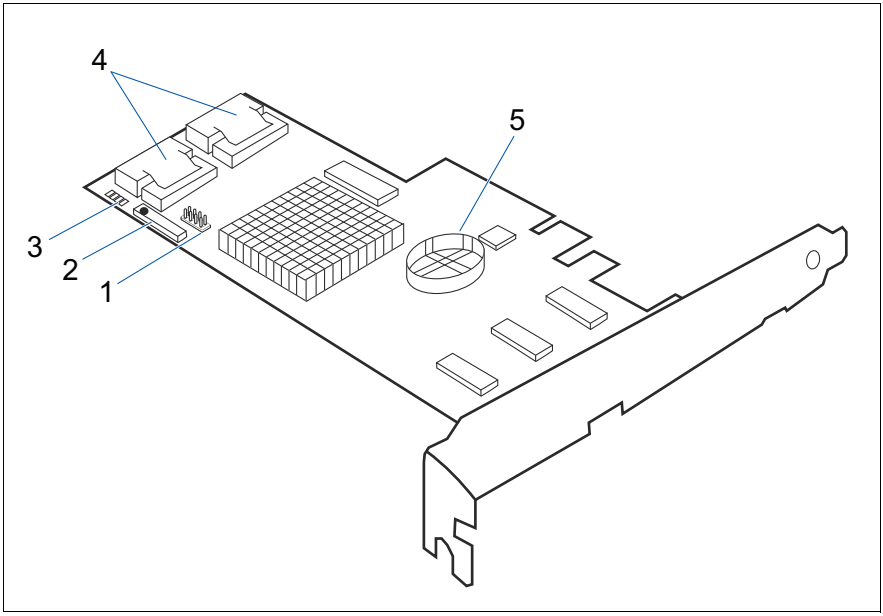
- Optionally secured with BBU
- Offers advanced MegaRAID functionality to integrated LSI SAS
- 3.3 V PCIe add-in card
- 4-lane 2.5 Gbit PCIe host bus
- 8 SAS/SATA ports
- Each SAS/SATA port supports SSP, SMP and STP
- Support for the following STP features:
  - Addressing of SATA targets through expander
  - Native Command Queuing (NCQ)
- Support of the following SSP features:
  - Wide port functionality (2 or 4 Phys from a single quad port)
  - Narrow port functionality (1 Phy)
  - Compatible with SATA target devices
- 2 Mini 4x SFF-8087 connectors
- Hot-plug drives
- SGPIO interfaces for signaling of SAS/SATA ports
- Hardware XOR for RAID parity calculations
- 72-bit wide 256 / 512 MB of DDR2 667 (with ECC)

3.2.2 Controller versions

Name	Chip	Cache	No. of SAS channels	Bracket type
S26361-D2516-**A**1x/**C**x	LSISAS1078e	256 MB	8	without low profile full height
S26361-D2516-**B**1x/**D**x	LSISAS1078e	512 MB	8	without low profile full height

3.2.3 Connectors and indicators

The following figure shows the location of the connectors and indicators on the SAS RAID controller.



1	HDD LED connector	2	iBBU connector
3	LEDs	4	SAS cable connectors
5	RAID key holder		

Connectors

Connector	Type	Description
SAS MLC1	x4 SAS, ports 0 - 3	SFF 8087 Mini SAS connector for SAS IO cable to backplane and HDDs
SAS MLC2	x4 SAS, ports 4 - 7	SFF 8087 Mini SAS connector for SAS IO cable to backplane and HDDs

Connector	Type	Description
HDD LED	HDD activity indication LED	8-pin connector Pin 6 to connect activity LED
iBBU		Connector to attach external iBBU

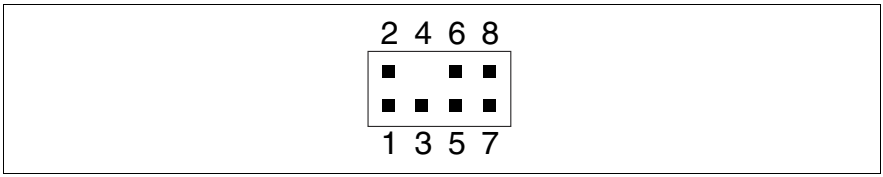


Figure 5: HDD LED connector

Indicators

LED	Description
L1 (AL)	Replacement for audible warning
L2 (CD)	Write pending (data cached)

3.2.4 Installation

This section describes how to install the SAS RAID controller in a server.

CAUTION!

To safeguard against data loss, remember to back up your data before you change your system configuration.

To install the new controller, proceed as follows:

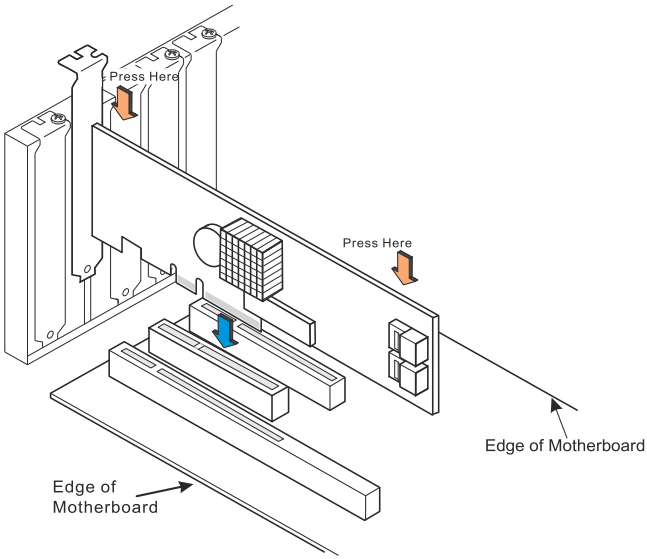
Step 1 **Unpack the controller**

Unpack the new controller in a static-free environment. Remove it from the anti-static bag and inspect it for damage.
If the controller appears to be damaged, contact the Fujitsu support service.

Step 2 **Prepare the server**

Turn off the server and remove the cover from the chassis.

Step 3 Install the new SAS RAID controller



Insert the controller in a suitable PCIe slot on the system board, as shown in the figure above (see your system board guide for information on the PCIe slot). Press down gently but firmly to ensure the card is properly seated in the slot. Secure the controller to the server chassis with the PCI card hold down latches. Connect the SAS and/or SATA HDDs located in the system to the SAS cable connector(s) on the controller.

Step 4 Power-up the server

Replace the server cover and reconnect the power cable(s). Start up the server. Ensure that the SAS and/or SATA II devices are properly connected to the controller.

During booting, a message similar to the following is displayed:

```
LSI MegaRAID SAS-MFI BIOS Version NTxx (Build ..date..)
Copyright(c) 2007, LSI Logic Corporation
HA-x (Bus x Dev y) RAID 5/6 SAS based on LSI MegaRAID
FW package: xxxx
```

Step 5 Run the WebBIOS Configuration Utility

Run the WebBIOS Configuration Utility to configure the physical arrays and logical drives. Press `CTRL+H` immediately to run the utility, when the following message appears on the screen:

```
Press <Ctrl><H> for WebBIOS
```

Step 6 Install the operating system driver

The controller can operate under various operating systems. To use these operating systems, you must install software drivers.

The ServerView Suite DVD 1 includes drivers for the supported operating systems, along with documentation. You can view the supported operating systems and download the latest drivers for RAID adapters on the website at: *http://ts.fujitsu.com/support/*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

3.2.5 Installing an optional iBBU module

3.2.5.1 Features

The MegaRAID LSIiBBU01/LSIiBBU07 is an innovative, industry-exclusive module and offers intelligent monitoring capabilities, accessible via ServerView RAID.

The capabilities of the LSIiBBU01/LSIiBBU07 include monitoring the battery status and power levels as well as the ability to recondition and calibrate the battery for improved reliability. It maintains data in the cache in the case of powerfail (see data sheet for hold time duration).

3.2.5.2 Installation

The LSIiBBU01/LSIiBBU07 supports remote connection to the Modular RAID Controller "RAID 5/6 SAS based on LSI MegaRAID".

The LSIiBBU01/LSIiBBU07 is not installed directly on the RAID controller. Instead, use one of the supplied cables to connect the LSIiBBU01/LSIiBBU07 to the RAID controller. The battery backup unit must be mounted inside the chassis.

Because server chassis vary, there is no standard mounting option that is compatible with all the different system configurations. Refer to your server's Options Guide or Upgrade and Maintenance Manual for mounting details.

Therefore, the LSIiBBU01/LSIiBBU07 battery kit contains only the battery and a set of cables, allowing you to customize the location of the remote battery to provide the most flexibility within different environments.

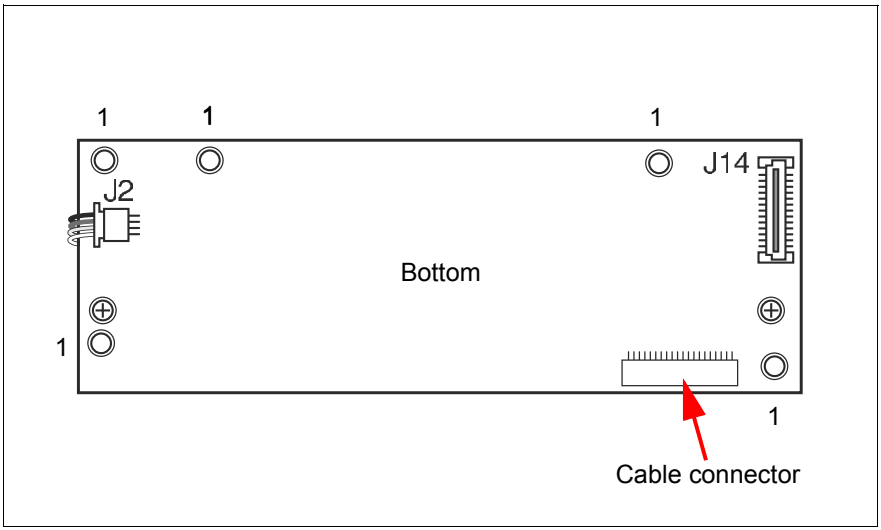


Figure 6: Position of the cable connector LSIiBBU01

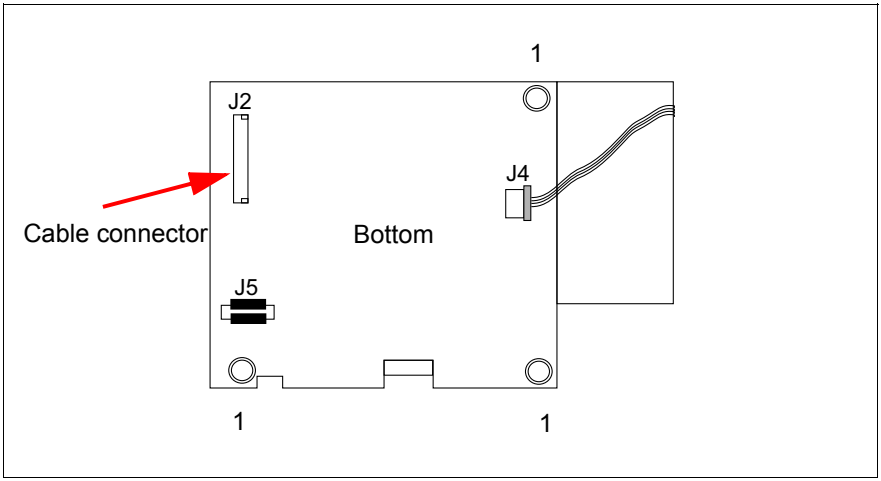


Figure 7: Position of the cable connector LSIiBBU07

Note the cable connector marked with the red arrow and the holes (1) for the screws that attach the LSIiBBU01/LSIiBBU07 to the chassis.

To install the LSIiBBU01/LSIiBBU07 remotely to the RAID controller, proceed as follows:

1. Ground yourself, then remove the LSIiBBU01/LSIiBBU07 from its package.
2. Secure the LSIiBBU01/LSIiBBU07 to the server chassis as described in the server documentation.
3. Insert the battery pack harness connector (at the end of the colored wires) into the J2 connector (LSIiBBU01, see figure 6) or J4 connector (LSIiBBU07, see figure 7) on the bottom of the iBBU.
4. Connect the cable from the cable connector (for LSIiBBU01 see figure 6 or for LSIiBBU07 see figure 7) on the iBBU to the BBU connector on the RAID controller.

The connectors are marked with a black dot to indicate pin 1.

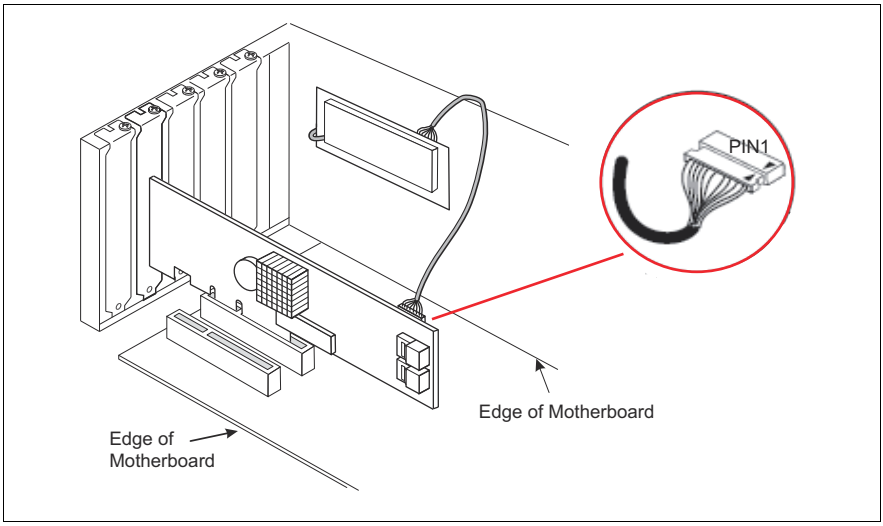


Figure 8: Example: Installing the iBBU01 in a server chassis

4 Modular RAID 6Gb/s (SAS2.0)

4.1 RAID controller "RAID Ctrl SAS 6G 0/1 (D2607)"

ATTENTION!

Make sure you observe the safety notes in chapter "Important information" on page 9.

The RAID controller "RAID 0/1 SAS based on LSI MegaRAID" is designed to drive the server's internal disk drive. The RAID stack is based on LSI MegaRAID® and offers powerful data throughput, extensive fault-tolerance and easy-to-use management.

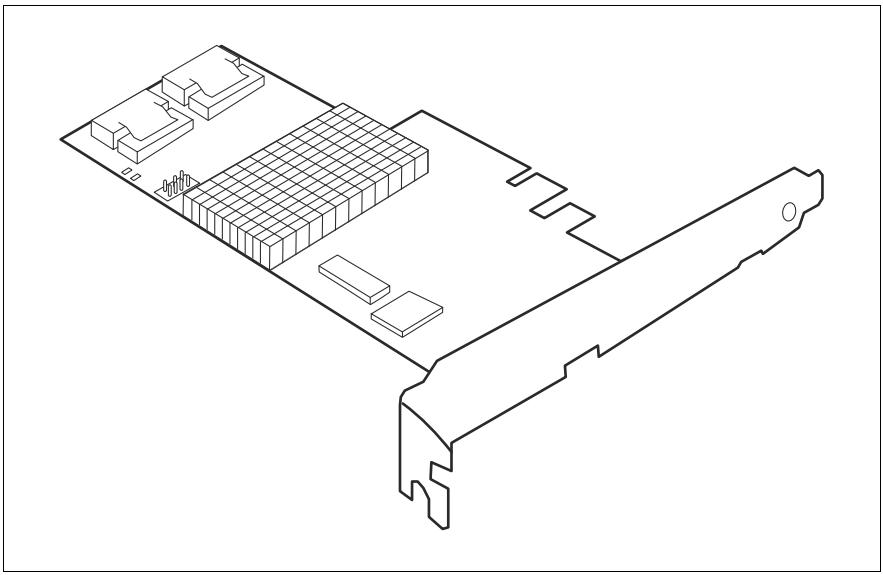


Figure 9: "RAID Ctrl SAS 6G 0/1 (D2607)" controller (based on LSI SAS2008)

4.1.1 Features

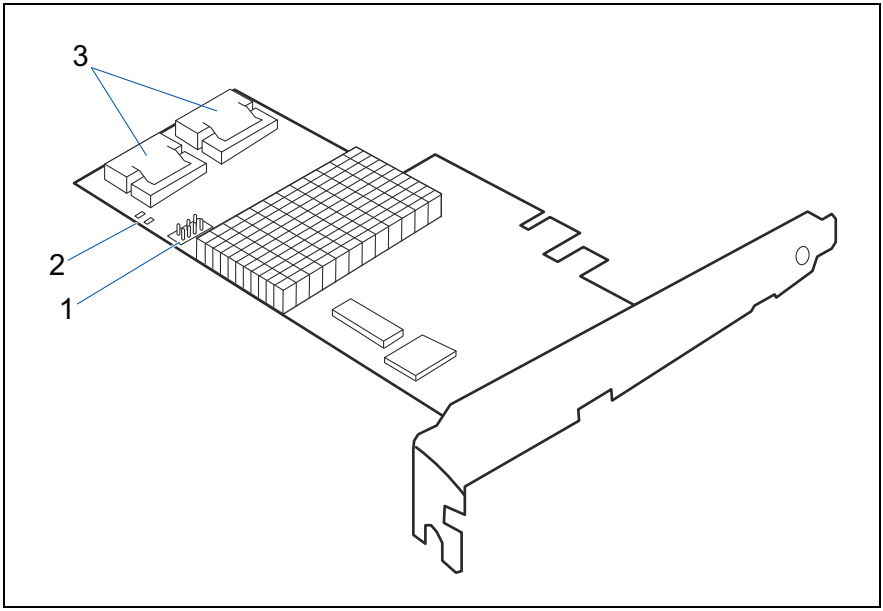
- 3.3 V / 12 V PCIe add-in card
- 8 lanes wide 5 Gbit/s PCIe host bus
- 8 SAS / SATA ports
- each SAS / SATA port supports SSP, SMP, STP, and SATA protocols
- support of the following STP features:
  - Addressing of SATA targets thru expander
  - Native Command Queuing (NCQ)
- support of the following SSP features:
  - Wide port functionality (2, 3 or 4 Phys from a single quad port)
  - Narrow port functionality (1 Phy)
  - Compatible with SATA target devices
- 2 Mini SAS 4i SFF-8087 multilane connectors
- Drive spin-up sequencing control
- Hot plug drives
- 1.5 Gbit/s, 3.0 Gbit/s and 6.0 GB/s link rates for both SAS and SATA
- Supported RAID levels: RAID 0, 1, 1E, 10
- 2 SGPIO interfaces for signaling of the 2 sets of quad SAS/SATA ports
- RAID-key chip onboard
- 2-pin connector for additional LSI RAID-key (optional)

4.1.2 Controller versions

Name	Chip	No. of SAS channels	Bracket type
S26361-D2607-Ax	LSI SAS2008	8	low profile full height

4.1.3 Connectors and indicators

The following figure shows the location of the connectors and indicators on the SAS RAID controller.



1	HDD LED connector	3	SAS cable connectors
2	LEDs		

Connectors

Connector	Type	Description
SAS MLC1	x4 SAS, ports 0 - 3	SFF Mini SAS connector for SAS IO cable to backplane and HDDs
SAS MLC2	x4 SAS, ports 4 - 7	SFF 8087 Mini SAS connector for SAS IO cable to backplane and HDDs
HDD LED	HDD activity indication LED	8-pin connector Pin 6 to connect activity LED

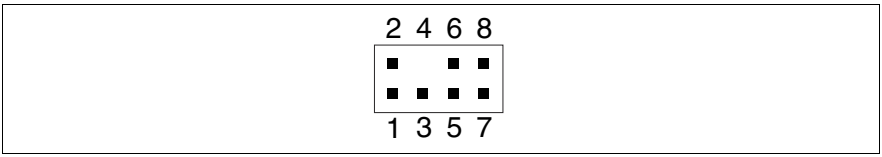


Figure 10: HDD LED connector

Indicators

LED	Description
L1 (HB)	Heart Beat
L2 (ERR)	Error

4.1.4 Installation

This section describes how to install the SAS RAID controller in a server.

CAUTION!

To safeguard against data loss, remember to back up your data before you change your system configuration.

To install the new controller, proceed as follows:

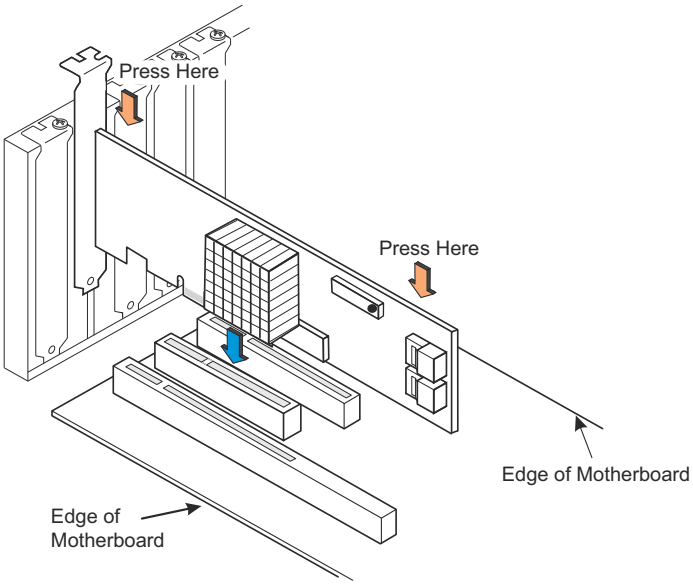
Step 1 **Unpack the controller**

Unpack the new controller in a static-free environment. Remove it from the anti-static bag and inspect it for damage.
If the controller appears to be damaged, contact the Fujitsu support service.

Step 2 **Prepare the server**

Turn off the server and remove the cover from the chassis.

Step 3 **Install the new SAS RAID controller**



Insert the controller in a suitable PCIe slot on the system board, as shown in the figure above (see your system board guide for information on the PCIe slot). Press down gently but firmly to ensure the card is properly seated in the slot. Secure the controller to the server chassis with the PCI card hold down latches. Connect the SAS and/or SATA HDDs located in the system to the SAS cable connector(s) on the controller.

Step 4 Power-up the server

Replace the server cover and reconnect the power cable(s). Start up the server. Ensure that the SAS and/or SATA II devices are powered up before or at the same time as the host server. If the host server is powered up before the SAS or SATA II devices, the devices might not be recognized.

During booting, a message similar to the following is displayed:

```
LSI MegaRAID SAS-MFI BIOS
Version NTxx (Build..date..)
Copyright(c) 2010  LSI Corporation
HA-x (Bus x Dev y) RAID Ctrl SAS 6G 0/1 (D2607))
FW package: xxxx
```

Step 5 Run the LSI Logic Configuration Utility

Run the LSI Logic Configuration Utility to configure the physical arrays and logical drives.

Press `CTRL+H` immediately to run the utility, when the following message appears on the screen:

```
Press <Ctrl><H> to start LSI Logic Configuration
Utility
```

Step 6 Install the operating system driver

The controller can operate under various operating systems. To use these operating systems, you must install software drivers.

The ServerView Suite DVD 1 includes drivers for the supported operating systems, along with documentation. You can view the supported operating systems and download the latest drivers for RAID adapters on the website at: *http://ts.fujitsu.com/support/*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

4.2 RAID Controller "RAID Ctrl SAS 6G 5/6 512 MB (D2616)"

ATTENTION!

Make sure you observe the safety notes in chapter "Important information" on page 9.

The RAID controller "RAID 5/6 SAS based on LSI MegaRAID" is designed to drive the server's internal disk drives. The RAID stack is based on LSI MegaRAID® and offers powerful data throughput, extensive fault-tolerance and easy-to-use management.

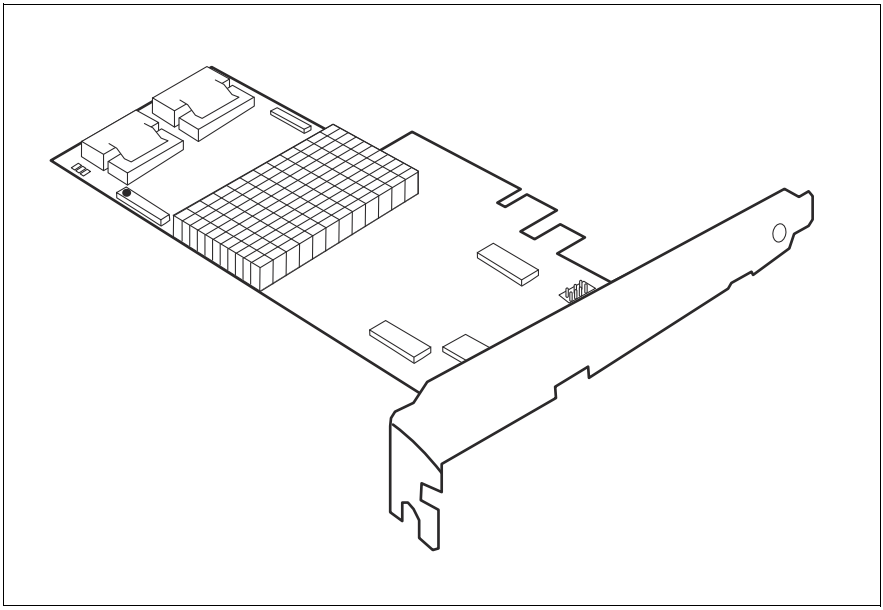


Figure 11: "RAID Ctrl SAS 6G 5/6 512 MB (D2616)" controller (based on LSI SAS2108)

4.2.1 Features

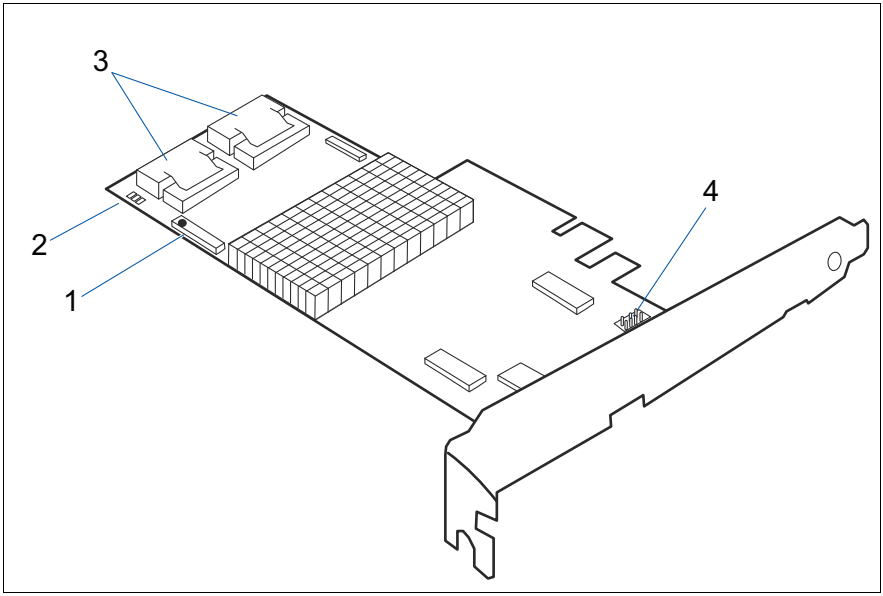
- Industry-proven MegaRAID® data protection
- Flexibility for both SAS 2.0 and SATA II
- Advanced management and configuration suites
- Supports RAID levels 0, 1, 1E, 5, 6, 10, 50 and 60
- Optionally secured with BBU
- Offers advanced MegaRAID functionality to integrated LSI SAS
- 3.3 V / 12 V PCIe add-in card
- 8-lane 5.0 Gbit PCIe host bus
- 8 SAS/SATA ports
- Each SAS/SATA port supports SSP, SMP and STP
- Support for the following STP features:
  - Addressing of SATA targets through expander
  - Native Command Queuing (NCQ)
- Support of the following SSP features:
  - Wide port functionality (2 or 4 Phys from a single quad port)
  - Narrow port functionality (1 Phy)
  - Compatible with SATA target devices
- 2 Mini SAS 4i SFF-8087 connectors
- Hot-plug drives
- SGPIO interfaces for signaling of SAS/SATA ports
- Hardware XOR for RAID parity calculations
- 72-bit wide 512 MB of DDR2 800 (with ECC)

4.2.2 Controller versions

Name	Chip	Cache	No. of SAS channels	Bracket type
S26361-D2616-Ax	LSI SAS2108	512 MB	8	low profile full height

4.2.3 Connectors and indicators

The following figure shows the location of the connectors and indicators on the SAS RAID controller.



1	iBBU connector	3	SAS cable connectors
2	LEDs	4	HDD LED connector

Connectors

Connector	Type	Description
SAS MLC1	x4 SAS, ports 0 - 3	SFF 8087 Mini SAS connector for SAS IO cable to backplane and HDDs
SAS MLC2	x4 SAS, ports 4 - 7	SFF 8087 Mini SAS connector for SAS IO cable to backplane and HDDs
HDD LED	HDD activity indication LED	8-pin connector Pin 6 to connect activity LED
iBBU	1-20	Connector to attach remote iBBU

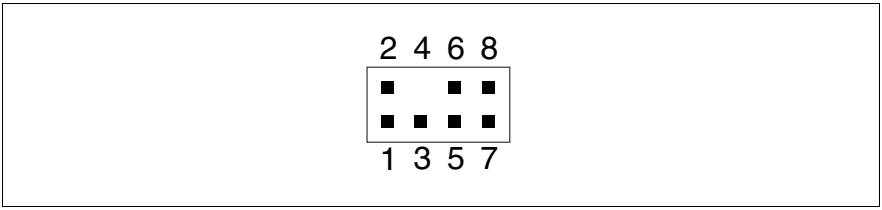


Figure 12: HDD LED connector

Indicators

LED	Description
L1 (HB)	Heart Beat
L2 (WP)	Write in cache pending
L3 (WA)	Warning

4.2.4 Installation

This section describes how to install the SAS RAID controller in a server.

CAUTION!

To safeguard against data loss, remember to back up your data before you change your system configuration.

To install the new controller, proceed as follows:

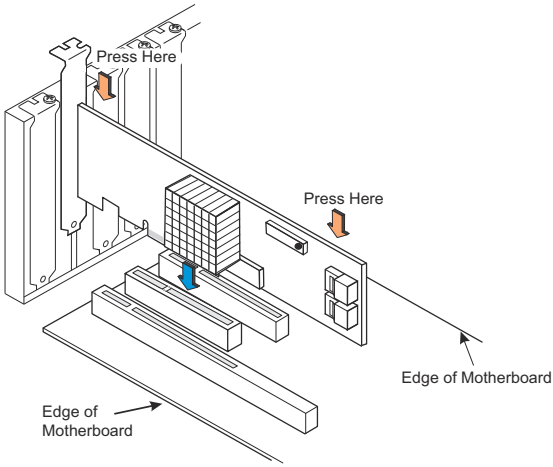
Step 1 **Unpack the controller**

Unpack the new controller in a static-free environment. Remove it from the anti-static bag and inspect it for damage.
If the controller appears to be damaged, contact the Fujitsu support service.

Step 2 **Prepare the server**

Turn off the server and remove the cover from the chassis.

Step 3 Install the new SAS RAID controller



Insert the controller in a suitable PCIe slot on the system board, as shown in the figure above (see your system board guide for information on the PCIe slot). Press down gently but firmly to ensure the card is properly seated in the slot. Secure the controller to the server chassis with the PCI card hold down latches. Connect the SAS and/or SATA HDDs located in the system to the SAS cable connector(s) on the controller.

Step 4 Power-up the server

Replace the server cover and reconnect the power cable(s). Start up the server. Ensure that the SAS and/or SATA II devices are properly connected to the controller.

During booting, a message similar to the following is displayed:

```
LSI MegaRAID SAS-MFI BIOS Version NTxx (Build ..date..)
Copyright(c) 2009, LSI Logic Corporation
HA-x (Bus x Dev y) RAID Ctrl SAS 6G 5/6 512MB (D2616)
FW package: xxxx
```

Step 5 Run the WebBIOS Configuration Utility

Run the WebBIOS Configuration Utility to configure the physical arrays and logical drives. Press `CTRL+H` immediately to run the utility, when the following message appears on the screen:

```
Press <Ctrl><H> for WebBIOS
```

Step 6 Install the operating system driver

The controller can operate under various operating systems. To use these operating systems, you must install software drivers.

The ServerView Suite DVD 1 includes drivers for the supported operating systems, along with documentation. You can view the supported operating systems and download the latest drivers for RAID adapters on the website at: *http://ts.fujitsu.com/support/*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

4.2.5 Installing an optional iBBU module

4.2.5.1 Features

The MegaRAID LSIiBBU07 / LSIiBBU08 is an innovative, industry-exclusive module and offers intelligent monitoring capabilities, accessible via ServerView RAID.

The capabilities of the LSIiBBU07 / LSIiBBU08 include monitoring the battery status and power levels as well as the ability to recondition and calibrate the battery for improved reliability. It maintains data in the cache in the case of powerfail (see data sheet for hold time duration).

4.2.5.2 Installation

The LSIiBBU07 / LSIiBBU08 supports remote connection to the Modular RAID Controller "RAID Ctrl SAS 6G 5/6 512 MB (D2616)".

The LSIiBBU07 / LSIiBBU08 is not installed directly on the RAID controller. Instead, use one of the supplied cables to connect the LSIiBBU07 / LSIiBBU08 to the RAID controller. The battery backup unit must be mounted inside the chassis.

Because server chassis vary, there is no standard mounting option that is compatible with all the different system configurations. Refer to your server's Options Guide or Upgrade and Maintenance Manual for mounting details.

Therefore, the LSIiBBU07 / LSIiBBU08 battery kit contains only the battery and a set of cables, allowing you to customize the location of the remote battery to provide the most flexibility within different environments.

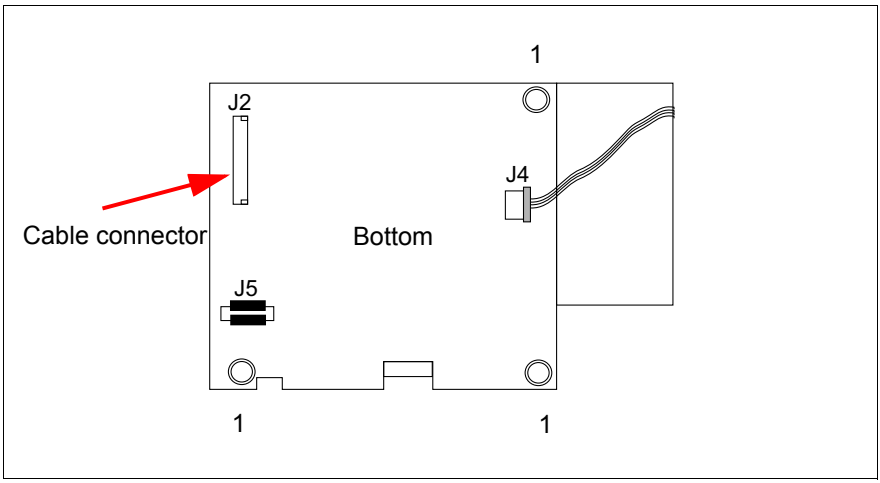


Figure 13: Position of the cable connector LSIiBBU07 / LSIiBBU08

Note the cable connector marked with the red arrow and the holes (1) for the screws that attach the LSIiBBU07 / LSIiBBU08 to the chassis.

To install the LSIiBBU07 / LSIiBBU08 remotely to the RAID controller, proceed as follows:

1. Ground yourself, then remove the LSIiBBU07 / LSIiBBU08 from its package.
2. Secure the LSIiBBU07 / LSIiBBU08 to the server chassis as described in the server documentation.
3. Insert the battery pack harness connector (at the end of the colored wires) into the J4 connector (see figure 13) on the bottom of the LSIiBBU07 / LSIiBBU08.
4. Connect the cable from the cable connector (see figure 13) on the LSIiBBU07 / LSIiBBU08 to the BBU connector on the RAID controller.

The connectors are marked with a black dot to indicate pin 1.

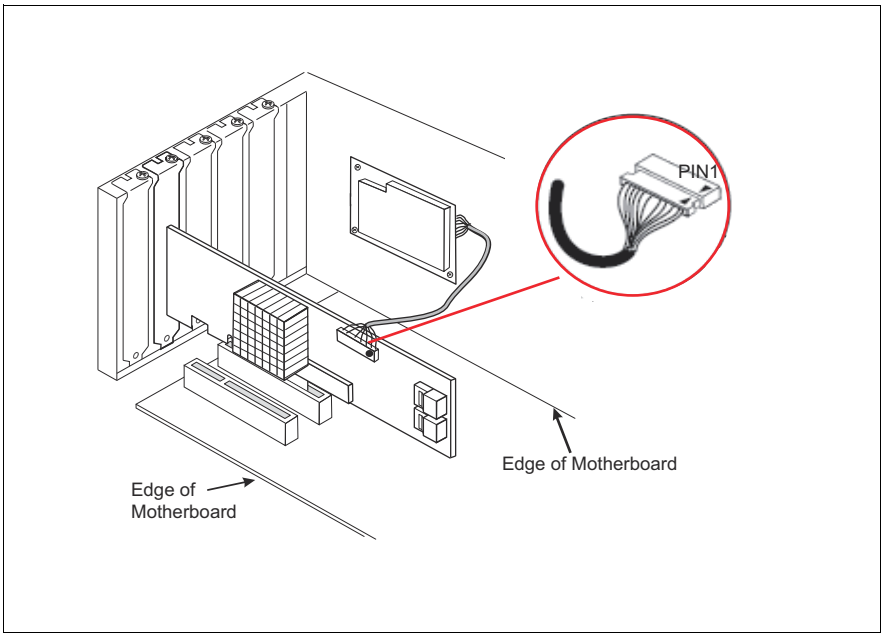


Figure 14: Installing the iBBU07 / iBBU08 in a server chassis

4.3 RAID Controller "PY SAS RAID Mezz Card 6 Gb (D3016)"

ATTENTION!

Make sure you observe the safety notes in chapter "Important information" on page 9.

The RAID controller "PY SAS RAID Mezz Card 6 Gb (D3016)" is designed to drive the BX400 and BX900 server's internal or external disk drives. The RAID stack is based on LSI MegaRAID® and offers powerful data throughput, extensive fault-tolerance and easy-to-use management.

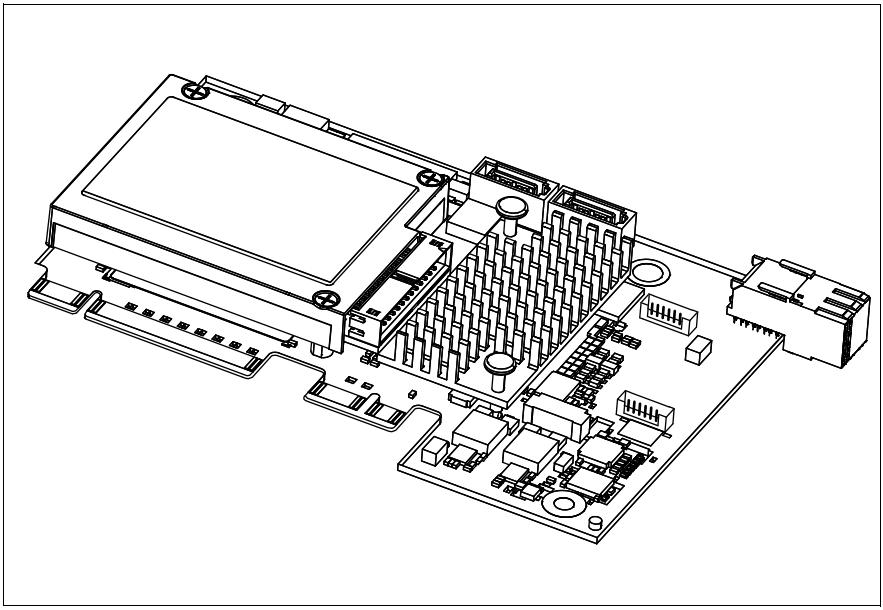


Figure 15: "PY SAS RAID Mezz Card 6 Gb (D3016)" with optional iBBU (based on LSI SAS2108)

4.3.1 Features

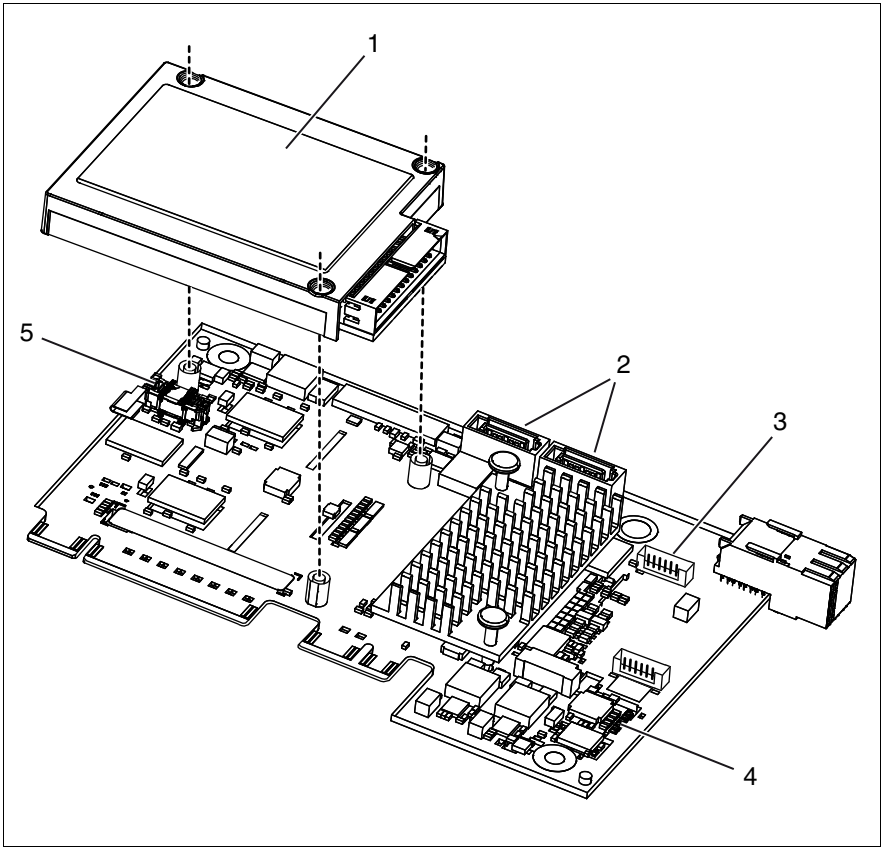
- Industry-proven MegaRAID® data protection
- Flexibility for both SAS 2.0 and SATA II
- Advanced management and configuration suites
- Supports RAID levels 0, 1, 1E, 5, 6, 10, 50 and 60
- Optionally secured with BBU
- Offers advanced MegaRAID functionality to integrated LSI SAS
- 12 V PCIe add-in card
- 8-lane 5.0 Gbit PCIe host bus
- 8 SAS/SATA ports
- Each SAS/SATA port supports SSP, SMP and STP
- Support for the following STP features:
  – Addressing of SATA targets through expander
  – Native Command Queuing (NCQ)
- Support of the following SSP features:
  – Wide port functionality (2 or 4 Phys from a single quad port)
  – Narrow port functionality (1 Phy)
  – Compatible with SATA target devices
- 2 x SATA connectors for internal hard disk drives, 1 x SAS lane each
- 1 x Midplane connector, 4 x SAS lanes
- Hot-plug drives
- SGPIO interfaces for signaling of SAS/SATA ports
- Hardware XOR for RAID parity calculations
- 72-bit wide 512 MB of DDR2 800 (with ECC)

4.3.2 Controller versions

Name	Chip	Cache	No. of SAS channels
S26361-D3016-Ax	LSI SAS2108	512 MB	2 for internal disk drives 4 for Storage Blade Connection

4.3.3 Connectors and indicators

The following figure shows the location of the connectors and indicators on the SAS RAID controller.



1	iBBU	4	LED
2	SAS cable connectors	5	iBBU connector
3	SDB connector		

Connectors

Connector	Type	Description
SAS0	x1 SAS0	SATA connectors to connect local SAS/SATA hard disk drives
SAS1	x1 SAS1	SATA connectors to connect local SAS/SATA hard disk drives
SDB	SAS side band signals	6-pin connector SAS side band connector
BBU		Connector for direct iBBU connection

Indicators

LED	Description
HB	Heart Beat
WP	Write in cache pending
WA	Warning

4.3.4 Installation

This section describes how to install the SAS RAID controller in a server.

CAUTION!

To safeguard against data loss, remember to back up your data before you change your system configuration.

To install the new controller, proceed as follows:

Step 1 **Unpack the controller**

Unpack the new controller in a static-free environment. Remove it from the anti-static bag and inspect it for damage.
If the controller appears to be damaged, contact the Fujitsu support service.

Step 2 **Prepare the server**

Shut down and power off the server and remove the server blade from the chassis.

Step 3 Install the new SAS RAID controller

Refer to the server blade specific Options Guide or Upgrade and Maintenance Manual.

Step 4 Power-up the server

Replace the server cover and reinstall the server blade to the chassis. Start up the server. Ensure that the SAS and/or SATA II devices are properly connected to the controller.

During booting, a message similar to the following is displayed:

```
LSI MegaRAID SAS-MFI BIOS Version NTxx (Build ..date..)
Copyright(c) 2010, LSI Logic Corporation
HA-x (Bus x Dev y) PY SAS RAID Mezz Card 6GB (D3016)
FW package: xxxx
```

Step 5 Run the WebBIOS Configuration Utility

Run the WebBIOS Configuration Utility to configure the physical arrays and logical drives. Press `CTRL+H` immediately to run the utility, when the following message appears on the screen:

```
Press <Ctrl><H> for WebBIOS
```

Step 6 Install the operating system driver

The controller can operate under various operating systems. To use these operating systems, you must install software drivers.

The ServerView Suite DVD 1 includes drivers for the supported operating systems, along with documentation. You can view the supported operating systems and download the latest drivers for RAID adapters on the website at: *http://ts.fujitsu.com/support/*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

4.3.5 Installing an optional iBBU module

4.3.5.1 Features

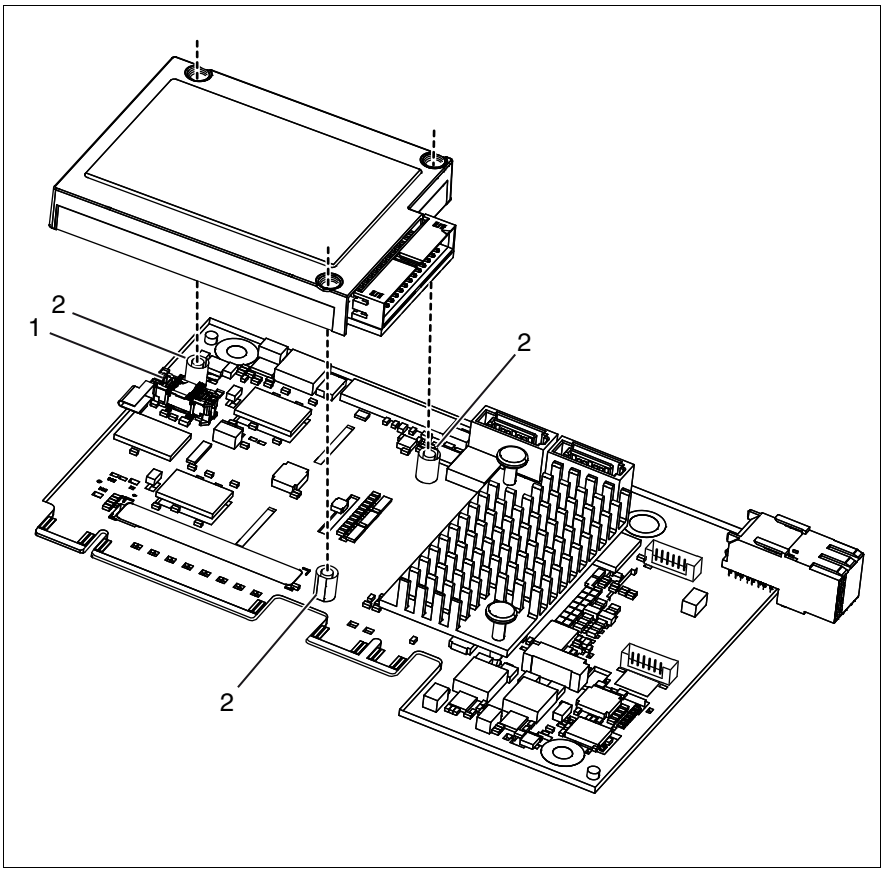
The MegaRAID LSIiBBU08 is an innovative, industry-exclusive module and offers intelligent monitoring capabilities, accessible via ServerView RAID Manager.

The capabilities of the LSIiBBU08 include monitoring the battery status and power levels as well as the ability to recondition and calibrate the battery for improved reliability. It maintains data in the cache in the case of powerfail (see data sheet for hold time duration).

4.3.5.2 Installation

The LSIiBBU08 supports board to board connection to the modular RAID controller "PY SAS RAID Mezz Card 6 Gb (D3016)".

The LSIiBBU08 is installed directly on the RAID Mezz Card.



Note the board to board connector (1) and the holes (2) for the screws that attach the LSIiBBU08 to the RAID Mezz Card.

To install the LSIiBBU08 to the RAID controller, proceed as follows:

1. Ground yourself, then remove the LSIiBBU08 from its package.
2. Align iBBU08 connector J1 with iBBU connector of RAID Mezz Card and fix the iBBU08 as described in the server documentation.

4.4 RAID Controller "RAID Ctrl SAS 6G 1GB (D3116)"

ATTENTION!

Make sure you observe the safety notes in chapter "Important information" on page 9.

The RAID controller "RAID Ctrl SAS 6G 1GB (D3116)" is designed to drive the server's internal disk drives. The RAID stack is based on LSI MegaRAID® and offers powerful data throughput, extensive fault-tolerance and easy-to-use management.

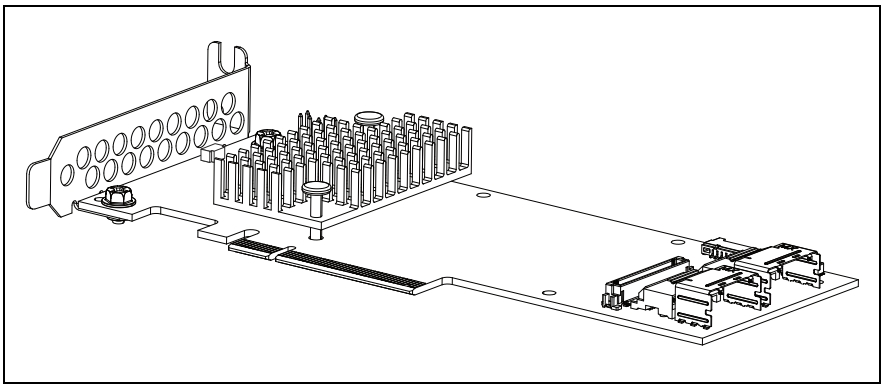


Figure 16: "RAID Ctrl SAS 6G 1GB (D3116)" controller (based on LSI SAS2208)

Depending on the target system, the following bracket types are offered:

- Full height perforated
- Full height not perforated
- Low profile perforated

4.4.1 Features

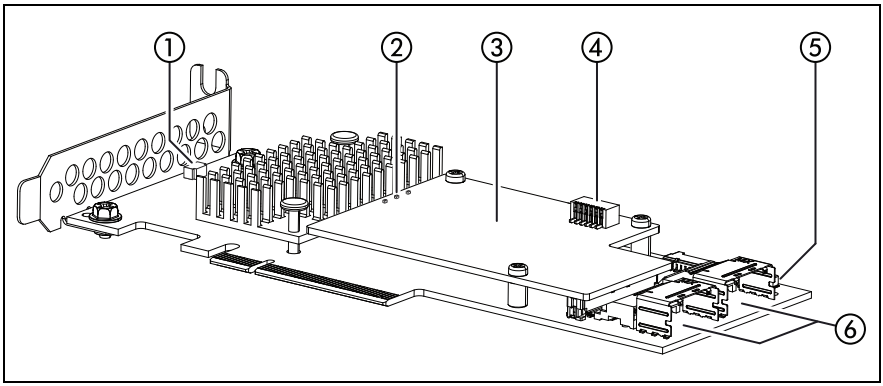
- Industry-proven MegaRAID® data protection
- Flexibility for both SAS 2.0 and SATA II / SATA III
- Advanced management and configuration suites
- Supports RAID levels 0, 1, 1E, 5, 6, 10, 50 and 60
- Optional RAID controller FBU (Flash Backup Unit)
- Offers advanced MegaRAID functionality to integrated LSI SAS
- 3.3 V / 12 V PCIe add-in card
- 8-lane 5.0 / 8.0 Gbit PCIe host bus
- 8 SAS/SATA ports
- Each SAS/SATA port supports SSP, SMP and STP
- Support for the following STP features:
  - Addressing of SATA targets through expander
  - Native Command Queuing (NCQ)
- Support of the following SSP features:
  - Wide port functionality (2 or 4 Phys from a single quad port, or or 8 Phys over two quad ports)
  - Narrow port functionality (1 Phy)
  - Compatible with SATA target devices
- 2 Mini SAS 4i SFF-8087 connectors
- Hot-plug drives
- SGPIO interfaces for signaling of SAS/SATA ports
- Hardware XOR for RAID parity calculations
- 72-bit wide 1 GB of 1333MHz DDR3 SDRAM (with ECC)

4.4.2 Controller versions

Name	Chip	PCIe	Cache	No. of SAS channels	Bracket type
S26361-D3116-Bx	LSI SAS2208	PCIe 2.0	1 GB	8	low profile full height
S26361-D3116-Cx	LSI SAS2208	PCIe 3.0	1 GB	8	low profile full height

4.4.3 Connectors and indicators

The following figure shows the location of the connectors and indicators on the SAS RAID controller.



1	HDD LED connector	4	FBU connector on TFM
2	TFM indicator LEDs	5	Indicator LEDs
3	TFM (optional)	6	SAS cable connectors

Connectors

Connector	Type	Description
SAS MLC1	x4 SAS, ports 0 - 3	SFF 8087 Mini SAS connector for SAS IO cable to backplane and HDDs
SAS MLC2	x4 SAS, ports 4 - 7	SFF 8087 Mini SAS connector for SAS IO cable to backplane and HDDs
HDD LED	HDD activity indication LED	6-pin connector Pin 4 to connect activity LED
FBU	1-6	Connector on TFM to attach FBU

RAID controller indicators

LED	Description
L1 (HB)	Heart Beat
L2 (SE0)	Error for Power PC0
L3 (SE1)	Error for Power PC1

TFM indicators

LED	Description
L1 (green)	Power available
L2 (blue)	TFM / FBU status
L3 (yellow)	Cache offload fault

4.4.4 Installation

This section describes how to install the SAS RAID controller in a server.

CAUTION!

To safeguard against data loss, remember to back up your data before you change your system configuration.

To install the new controller, proceed as follows:

Step 1 **Unpack the controller**

Unpack the new controller in a static-free environment. Remove it from the anti-static bag and inspect it for damage.

If the controller appears to be damaged, contact the Fujitsu support service.

Step 2 **Prepare the server**

Turn off the server and remove the cover from the chassis.

Step 3 **Install the new SAS RAID controller**

Insert the controller in a suitable PCIe slot on the system board. Press down gently but firmly to ensure the controller is properly seated in the slot. Secure the controller to the server chassis with the PCI card hold down latches. Connect the SAS and/or SATA HDDs located in the system to the SAS cable connector(s) on the controller. Refer to your server specific Upgrade and Maintenance Manual for information on the PCIe slot and installing the controller.

Step 4 Power-up the server

Replace the server cover and reconnect the power cable(s). Start up the server. Ensure that the SAS and/or SATA II devices are properly connected to the controller.

During booting, a message similar to the following is displayed:

```
LSI MegaRAID SAS-MFI BIOS Version NTxx (Build ..date..)
Copyright(c) 2009, LSI Logic Corporation
HA-x (Bus x Dev y) RAID Ctrl SAS 6G 1GB (D3116)
FW package: xxxx
```

Step 5 Run the WebBIOS Configuration Utility

Run the WebBIOS Configuration Utility to configure the physical arrays and logical drives. Press `CTRL+H` immediately to run the utility, when the following message appears on the screen:

```
Press <Ctrl><H> for WebBIOS
```

Step 6 Install the operating system driver

The controller can operate under various operating systems. To use these operating systems, you must install software drivers.

The ServerView Suite DVD 1 includes drivers for the supported operating systems, along with documentation. You can view the supported operating systems and download the latest drivers for RAID adapters on the website at: *http://ts.fujitsu.com/support/*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

4.4.5 Installing an optional TFM / FBU

4.4.5.1 Features

Using the LSI MegaRAID® CacheVault™ Technology offers better protection for controller cache with our eco-friendly, low-maintenance 6Gb/s LSI MegaRAID based controllers featuring CacheVault Technology.

This technology offloads data stored in the LSI MegaRAID based controller cache to the NAND flash in the event of a power failure or other system occurrence where the contents of controller cache are most at risk.

In addition, CacheVault technology eliminates the need for lithium ion (Li-ion) batteries, traditionally used to protect DRAM cache memory on PCI RAID controllers.

CacheVault technology offers:

CacheVault technology transfers the contents of the DRAM cache to NAND flash using power from the supercap module in the event of a power or server failure. With a traditional battery backup unit, after a limited time without restored power, the cached data is lost. However, CacheVault technology safely stores the contents of DRAM on NAND flash for up to three years.

4.4.5.2 Installation

The FBU supports remote connection to the Modular RAID Controller "RAID Ctrl SAS 6G 1GB (D3116)".

The FBU is not installed directly on the RAID controller. Instead, use one of the supplied cables to connect the FBU to the TFM on the RAID controller. The FBU must be mounted inside the chassis.

Because server chassis vary, there is no standard mounting option that is compatible with all the different system configurations. Refer to your server's Options Guide or Upgrade and Maintenance Manual for mounting details.

Therefore, the FBU kit contains only the cache unit and a set of cables, allowing you to customize the location of the remote FBU to provide the most flexibility within different environments.

In newer chassis models Fujitsu offers mounting options using the common holder technology. Using the common holder technology facilitates mounting the FBU into the chassis.

For mounting the TFM, remove the controller from your system.

When removing / connecting the FBU from / to the TFM, remove AC power from your system.

To install the TFM and FBU, proceed as follows:

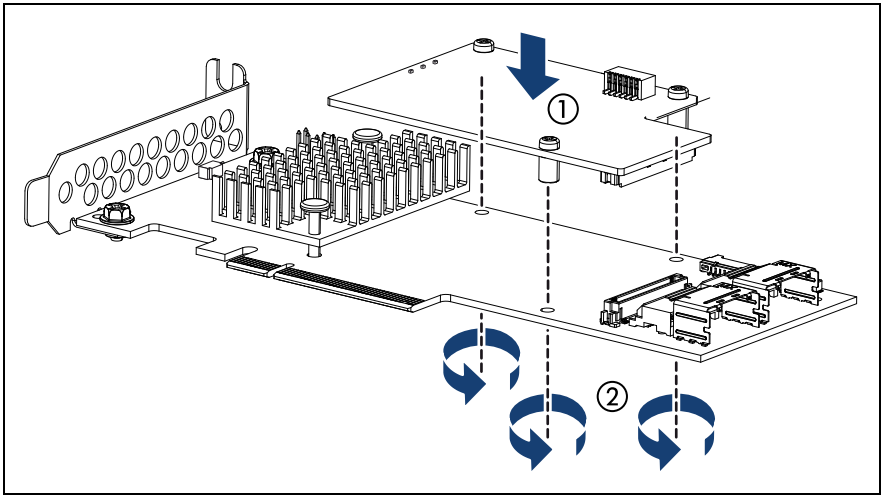


Figure 17: Installing the TFM

- ► Ground yourself, then fit the spacer bolts on the TFM on SAS RAID controller (1).
- ► Secure the TFM on the controller with the three screws from the TFM kit (2).
- ► Remove the FBU from its package.

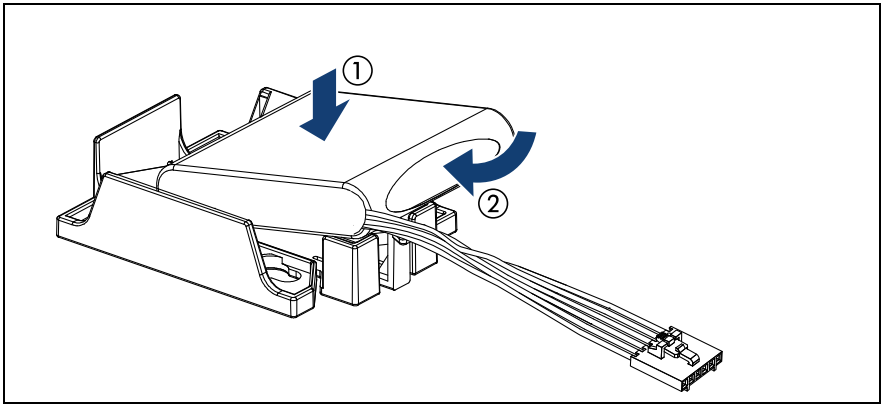


Figure 18: Installing the FBU in the FBU holder

► At a slight angle, fit the FBU under both retaining brackets of the FBU holder as shown (1). Push in the FBU until it locks in place (2).

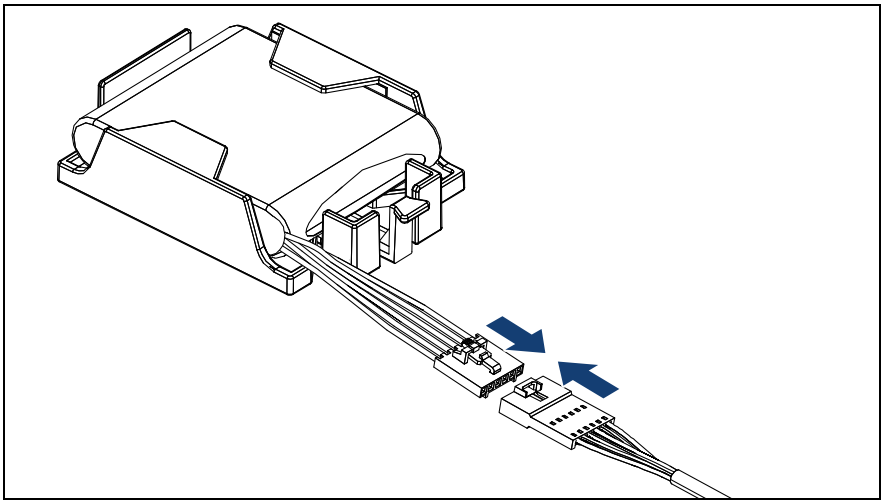


Figure 19: Connecting the FBU adapter cable to the FBU

► Connect the cable end of the FBU cable to the FBU adapter cable as shown.

► Secure the FBU to the server chassis as described in the server documentation.

► Connect the loose end of the FBU adapter cable to the TFM on the RAID controller (see section "Connectors and indicators" on page 56).

4.5 RAID Controller "PY SAS RAID HDD Module (D2816)"

ATTENTION!

Make sure you observe the safety notes in chapter "Important information" on page 9.

The RAID controller "PY SAS RAID HDD Module (D2816)" is designed to drive the BX920 server's internal or BX400 / BX900 external disk drives. The RAID stack is based on LSI MegaRAID® and offers powerful data throughput, extensive fault-tolerance and easy-to-use management.

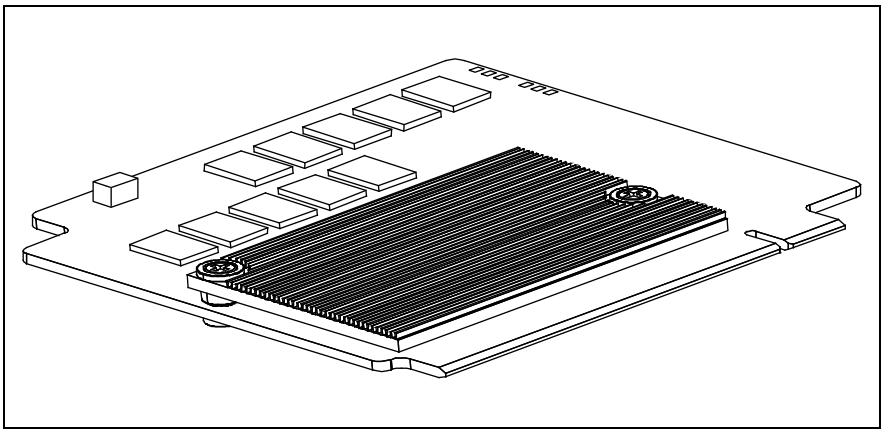


Figure 20: "PY SAS RAID HDD Module (D2816)" controller (based on LSI SAS2208)

4.5.1 Features

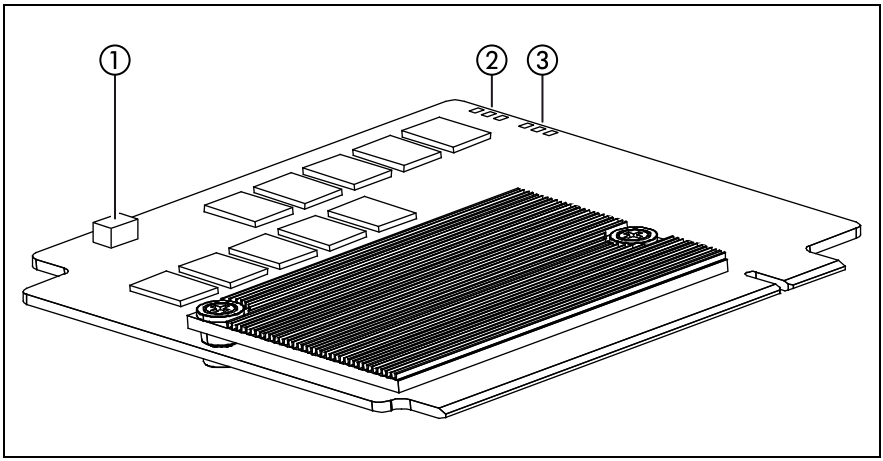
- Industry-proven MegaRAID® data protection
- Flexibility for both SAS 2.0 and SATA II / SATA III
- Advanced management and configuration suites
- 12V PCIe RAID HDD module
- Supports RAID levels 0, 1, 1E, 5, 6, 10, 50 and 60
- Optional RAID controller FBU
- Offers advanced MegaRAID functionality to integrated LSI SAS
- 8-lane 5.0 / 8.0 Gbit PCIe host bus
- 6 SAS/SATA ports, (2+2 ports for Storage Blade Connection and 2 ports for Blade internal HDD Connection)
- Each SAS/SATA port supports SSP, SMP and STP
- Support for the following STP features:
  - Addressing of SATA targets through expander
  - Native Command Queuing (NCQ)
- Support of the following SSP features:
  - Wide port functionality (2x2 Phys from a single quad port)
  - Narrow port functionality (1 Phy)
  - Compatible with SATA target devices
- Hot-plug drives
- SGPIO interfaces for signaling of SAS/SATA ports
- Hardware XOR for RAID parity calculations
- 72-bit wide 512 MB of 1333MHz DDR3 SDRAM (with ECC)

4.5.2 Controller versions

Name	Chip	PCIe	Cache	No. of SAS channels
S26361-D2816-Ax	LSI SAS2208	PCIe 2.0	512 MB	2+2 ports for Storage Blade Connection 2 ports for Blade internal HDD Connection
S26361-D2816-Cx	LSI SAS2208	PCIe 3.0	512 MB	2+2 ports for Storage Blade Connection 2 ports for Blade internal HDD Connection

4.5.3 Connectors and indicators

The following figure shows the location of the connectors and indicators on the SAS RAID controller.



1	FBU connector	3	Indicator LEDs
2	TFM indicator LEDs		

Connectors

Connector	Type	Description
FBU	1-6	Connector to attach FBU

Indicators

LED	Description
L1 (H322)	Heart Beat
L2 (H321)	Error for Power PC1
L3 (H320)	Error for Power PC0
L4 (H102)	Power available
L5 (H101)	Status
L6 (H100)	Cache offload fault

4.5.4 Installation

This section describes how to install the SAS RAID controller in a server.

CAUTION!

To safeguard against data loss, remember to back up your data before you change your system configuration.

To install the new controller, proceed as follows:

Step 1 Unpack the controller

Unpack the new controller in a static-free environment. Remove it from the anti-static bag and inspect it for damage.
If the controller appears to be damaged, contact the Fujitsu support service.

Step 2 Prepare the server

Shut down and power off the server and remove the server blade from the chassis.

Step 3 Install the new SAS RAID controller

Refer to the server blade specific Options Guide or Upgrade and Maintenance Manual.

Step 4 Power-up the server

Replace the server cover and reinstall the server blade to the chassis. Start up the server. Ensure that the SAS and/or SATA II devices are properly connected to the controller.

During booting, a message similar to the following is displayed:

```
LSI MegaRAID SAS-MFI BIOS Version NTxx (Build ..date..)
Copyright(c) 2010, LSI Logic Corporation
HA-x (Bus x Dev y) PY SAS RAID HDD Module (D2816)
FW package: xxxx
```

Step 5 Run the WebBIOS Configuration Utility

Run the WebBIOS Configuration Utility to configure the physical arrays and logical drives. Press `CTRL+H` immediately to run the utility, when the following message appears on the screen:

```
Press <Ctrl><H> for WebBIOS
```

Step 6 Install the operating system driver

The controller can operate under various operating systems. To use these operating systems, you must install software drivers.

The ServerView Suite DVD 1 includes drivers for the supported operating systems, along with documentation. You can view the supported operating systems and download the latest drivers for RAID adapters on the website at: *http://ts.fujitsu.com/support/*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

4.5.5 Installing an optional FBU

4.5.5.1 Features

Using the LSI MegaRAID® CacheVault™ Technology offers better protection for controller cache with our eco-friendly, low-maintenance 6Gb/s LSI MegaRAID based controllers featuring CacheVault Technology.

This technology offloads data stored in the LSI MegaRAID based controller cache to the NAND flash in the event of a power failure or other system occurrence where the contents of controller cache are most at risk.

In addition, CacheVault technology eliminates the need for lithium ion (Li-ion) batteries, traditionally used to protect DRAM cache memory on PCI RAID controllers.

CacheVault technology offers:

CacheVault technology transfers the contents of the DRAM cache to NAND flash using power from the supercap module in the event of a power or server failure. With a traditional battery backup unit, after a limited time without restored power, the cached data is lost. However, CacheVault technology safely stores the contents of DRAM on NAND flash for up to three years.

4.5.5.2 Installation

The FBU supports remote connection to the Modular RAID Controller "PY SAS RAID HDD Module (D2816)". The FBU is directly connected to the RAID controller.

Because server chassis vary, there is no standard mounting option that is compatible with all the different system configurations. Refer to your server’s Options Guide or Upgrade and Maintenance Manual for mounting details.

To install the FBU to the RAID controller, proceed as follows:

- ► Ground yourself.
- ► Remove the FBU from its package.

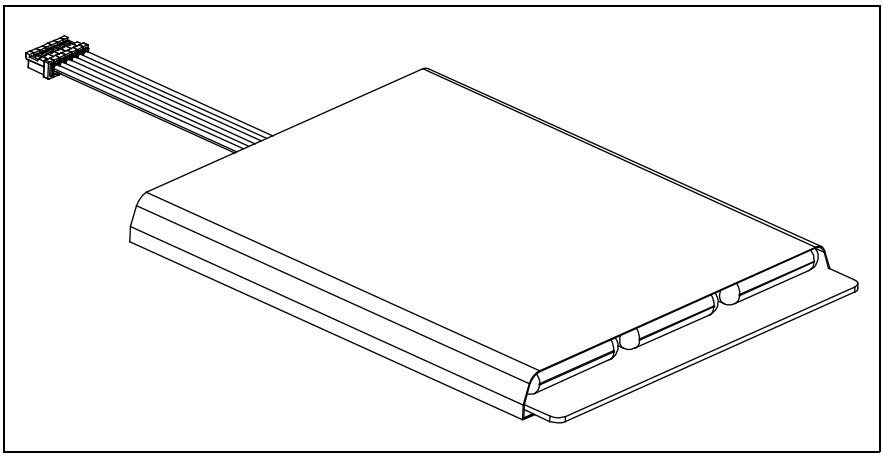


Figure 21: LSI FBU02A module

► Install the FBU into the system and connect it to the SAS RAID controller as described in the "PRIMERGY BX920 S3 Server Blade" Upgrade and Maintenance Manual.

4.6 SAS Controller "PY SAS RAID HDD Module w/o Cache (D2837)"

ATTENTION!

Make sure you observe the safety notes in chapter "Important information" on page 9.

The RAID controller "PY SAS RAID HDD Module w/o Cache (D2837)" is designed to drive the BX400 and BX900 server's internal disk drives. The RAID stack is based on LSI MegaRAID® and offers powerful data throughput, extensive fault-tolerance and easy-to-use management.

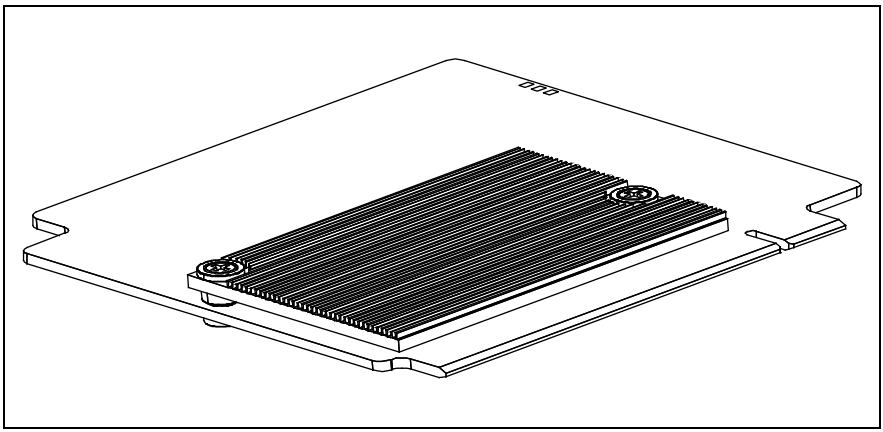


Figure 22: "PY SAS RAID HDD Module w/o Cache (D2837)" (based on LSI SAS2208)

4.6.1 Features

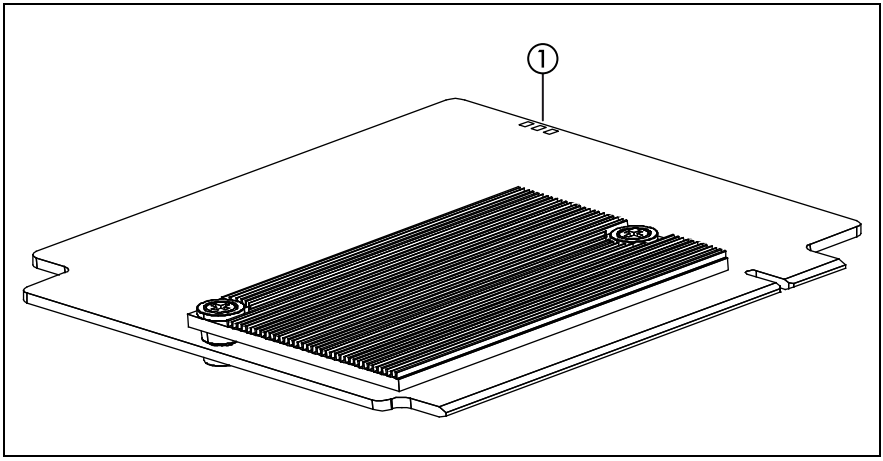
- Flexibility for both SAS 2.0 and SATA II / SATA III
- Advanced management and configuration suites
- 12V PCIe RAID HDD module
- Supports RAID levels 0, 1, 1E, 10
- Offers advanced MegaRAID functionality to integrated LSI SAS
- 8-lane 5.0 / 8.0 Gbit PCIe host bus
- 6 SAS/SATA ports, (2+2 ports for Storage Blade Connection and 2 ports for Blade internal HDD Connection)
- Each SAS/SATA port supports SSP and STP
- Support for the following STP features:
  - Addressing of SATA targets through expander
  - Native Command Queuing (NCQ)
- Support of the following SSP features:
  - Wide port functionality (2x2 Phys from a single quad port)
  - Narrow port functionality (1 Phy)
  - Compatible with SATA target devices
- SGPIO interfaces for signaling of SAS/SATA ports
- Drive spin-up sequencing control
- Hot-plug drives
- 1.5 Gbit/s, 3.0 Gbit/s and 6.0 Gbit/s link rates for both SAS an SATA

4.6.2 Controller versions

Name	Chip	PCIe	No. of SAS channels
S26361-D2837-Ax	LSI SAS2208	PCIe 2.0	2 ports for Blade internal HDD Connection
S26361-D2837-Cx	LSI SAS2208	PCIe 3.0	2 ports for Blade internal HDD Connection

4.6.3 Connectors and indicators

The following figure shows the location of the connectors and indicators on the SAS controller.



1	Indicators

Indicators

LED	Description
L1 (H322)	Heart Beat
L2 (H321)	Error for Power PC1
L3 (H320)	Error for Power PC0

4.6.4 Installation

This section describes how to install the SAS RAID controller in a server.

CAUTION!

To safeguard against data loss, remember to back up your data before you change your system configuration.

To install the new controller, proceed as follows:

Step 1 **Unpack the controller**

Unpack the new controller in a static-free environment. Remove it from the anti-static bag and inspect it for damage.
If the controller appears to be damaged, contact the Fujitsu support service.

Step 2 **Prepare the server**

Shut down and power off the server and remove the server blade from the chassis.

Step 3 **Install the new SAS RAID controller**

Refer to the server blade specific Options Guide or Upgrade and Maintenance Manual.

Step 4 **Power-up the server**

Replace the server cover and reinstall the server blade to the chassis. Start up the server. Ensure that the SAS and/or SATA II devices are properly connected to the controller.

During booting, a message similar to the following is displayed:

```
LSI MegaRAID SAS-MFI BIOS Version NTxx (Build
..date..)
Copyright(c) 2010, LSI Logic Corporation
HA-x (Bus x Dev y) PY SAS RAID HDD Module w/o Cache
(D2837)
FW package: xxxx
```

Step 5 Run the WebBIOS Configuration Utility

Run the WebBIOS Configuration Utility to configure the physical arrays and logical drives. Press CTRL+H immediately to run the utility, when the following message appears on the screen:

```
Press <Ctrl><H> for WebBIOS
```

Step 6 Install the operating system driver

The controller can operate under various operating systems. To use these operating systems, you must install software drivers.

The ServerView Suite DVD 1 includes drivers for the supported operating systems, along with documentation. You can view the supported operating systems and download the latest drivers for RAID adapters on the website at: *http://ts.fujitsu.com/support/*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

5 Modular RAID 12Gb/s (SAS3.0)

5.1 RAID Controller "PRAID EP400i / EP420i"

ATTENTION!

Make sure you observe the safety notes in chapter "Important information" on page 9.

The RAID controller "PRAID EP400i / EP420i" (D3216) is designed to drive the server's internal disk drives. The RAID stack is based on LSI MegaRAID® and offers powerful data throughput, extensive fault-tolerance and easy-to-use management.

Figure 23: "PRAID EP400i / EP420i" (based on LSI SAS3108)

Depending on the target system, the following bracket types are offered:

- Full height perforated
- Full height not perforated
- Low profile perforated

5.1.1 Features

The RAID controller "PRAID EP400i / EP420i" implements the LSI SAS3108 which is an integrated SAS and I/O controller with dual embedded Power PC 476 cores running at speeds up to 1.2 GHz. The LSI SAS3108 also provides the following functionalities:

- Provides an 8-lane 5.0 / 8.0 Gbit PCIe 3.0 host bus.
- Provides an 8-port 12Gb/s SAS3 and 6Gb/s SATA3 interface.
- Provides a 1866-MHz DDR3 SDRAM interface with a hardware RAID assist engine for parity calculations.
- Provides a full-featured hardware-based RAID solution that supports RAID levels 0, 1, 1E, 5, 6, 10, 50, and 60.
- Six I^2C interfaces used for Serial Boot strap ROM connection, memory detection, PCI-E SMBus connectivity, battery / smart charger control, and SAS sideband control.
- Integrated dual UART for MegaRAID® diagnostic use only.
- Two banks of SGPIO signals to accompany the two sets of x4 SAS / SATA ports.
- 16MB Flash
- 1kB Bootstrap EEPROM
- Mounting holes for TFM
- Raid-key chip onboard

5.1.2 Controller versions

Name	Chip	PCIe	Cache	No. of SAS channels	Bracket type
PRAID EP400i S26361-D3216-Axx	LSI SAS3108	PCIe 3.0	1 GB	8	low profile full height
PRAID EP420i S26361-D3216-Bxx	LSI SAS3108	PCIe 3.0	2 GB	8	low profile full height

5.1.3 Connectors and indicators

The following figure shows the location of the connectors and indicators on the SAS RAID controller.

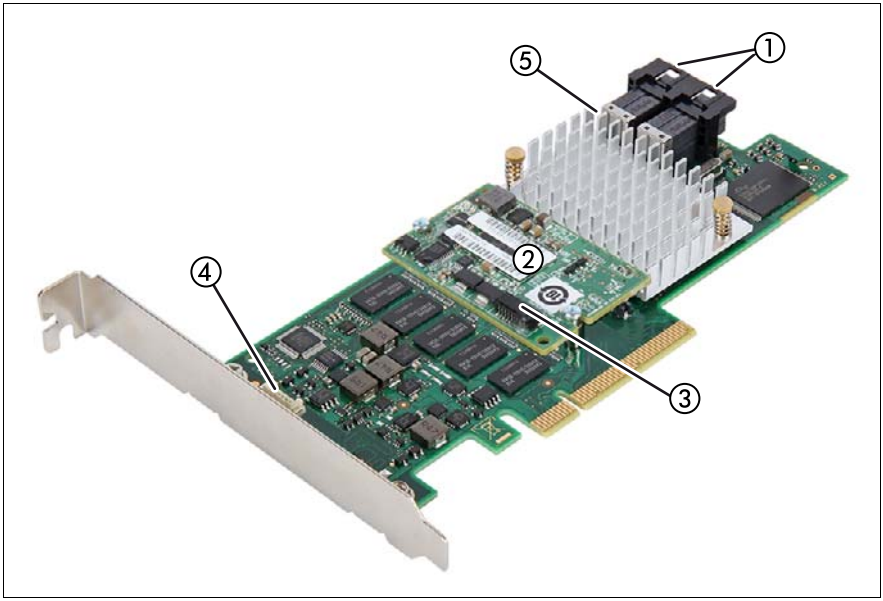


Figure 24: "PRAID EP400i / EP420i" board layout

1	SAS cable connectors
2	TFM (optional)
3	FBU connector on TFM
4	HDD LED connector
5	RAID controller indicator

Connectors

Connector	Type	Description
SAS MLC1	x4 SAS, ports 0- 3	SFF 8643 Mini SAS HD 4i connector for SAS IO cable to backplane and HDDs
SAS MLC2	x4 SAS, ports 4- 7	SFF 8643 Mini SAS HD 4i connector for SAS IO cable to backplane and HDDs
HDD LED	HDD activity indication LED	6-pin connector Pin 4 to connect activity LED
FBU	1-6	Connector on TFM to attach FBU

Indicators

LED	Description
L1 (green blinking)	Heart Beat

5.1.4 Installation

This section describes how to install the SAS RAID controller in a server.

CAUTION!

To safeguard against data loss, remember to back up your data before you change your system configuration.

To install the new controller, proceed as follows:

Step 1 **Unpack the controller**

Unpack the new controller in a static-free environment. Remove it from the anti-static bag and inspect it for damage.

If the controller appears to be damaged, contact the Fujitsu support service.

Step 2 **Prepare the server**

Turn off the server and remove the cover from the chassis.

Step 3 Install the new SAS RAID controller

Insert the controller in a suitable PCIe slot on the system board. Press down gently but firmly to ensure the controller is properly seated in the slot. Secure the controller to the server chassis with the PCI card hold down latches. Connect the SAS and/or SATA HDDs located in the system to the SAS cable connector(s) on the controller. Refer to your server specific Upgrade and Maintenance Manual for information on the PCIe slot and installing the controller.

Step 4 Power-up the server

Replace the server cover and reconnect the power cable(s). Start up the server. Ensure that the SAS and/or SATA II devices are properly connected to the controller.

During booting, a message similar to the following is displayed:

```
LSI MegaRAID SAS-MFI BIOS Version NTxx (Build ..date..)
Copyright(c) 2014, LSI Corporation
HA-x (Bus x Dev y) PRAID EP400i / EP420i (D3216)
FW package: xxxx
```

Step 5 Run the BIOS Configuration Utility

Run the BIOS Configuration Utility to configure the physical arrays and logical drives. Press `CTRL+R` immediately to run the utility, when the following message appears on the screen:

```
Press <Ctrl><R> to Run MegaRAID Configuration Utility
```

Step 6 Install the operating system driver

The controller can operate under various operating systems. To use these operating systems, you must install software drivers.

The ServerView Suite DVD 1 includes drivers for the supported operating systems, along with documentation. You can view the supported operating systems and download the latest drivers for RAID adapters on the website at: *http://ts.fujitsu.com/support/*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

5.1.5 Installing an optional TFM / FBU

5.1.5.1 Features

Using the LSI MegaRAID® CacheVault™ Technology offers better protection for controller cache with our eco-friendly, low-maintenance LSI MegaRAID based controllers featuring CacheVault Technology.

This technology offloads data stored in the LSI MegaRAID based controller cache to the NAND flash in the event of a power failure or other system occurrence where the contents of controller cache are most at risk.

In addition, CacheVault technology eliminates the need for lithium ion (Li-ion) batteries, traditionally used to protect DRAM cache memory on PCI RAID controllers.

CacheVault technology offers:

CacheVault technology transfers the contents of the DRAM cache to NAND flash using power from the supercap module in the event of a power or server failure. With a traditional battery backup unit, after a limited time without restored power, the cached data is lost. However, CacheVault technology safely stores the contents of DRAM on NAND flash for up to three years.

5.1.5.2 Installation

The FBU supports remote connection to the Modular RAID Controller "PRAID EP400i / EP420i".

The FBU is not installed directly on the RAID controller. Instead, use one of the supplied cables to connect the FBU to the TFM on the RAID controller. The FBU must be mounted inside the chassis.

Because server chassis vary, there is no standard mounting option that is compatible with all the different system configurations. Refer to your server's Upgrade and Maintenance Manual for mounting details.

Therefore, the FBU kit contains only the cache unit and a set of cables, allowing you to customize the location of the remote FBU to provide the most flexibility within different environments.

In newer chassis models Fujitsu offers mounting options using the common holder technology. Using the common holder technology facilitates mounting the FBU into the chassis.

For mounting the TFM, remove the controller from your system.

When removing / connecting the FBU from / to the TFM, remove AC power from your system.

Depending on the controller cache size, two different TFM kits are available.

Name	Cache	TFM kit
PRAID EP400i S26361-D3216-Axx	1 GB	PRAID EP400i TFM (LSZ:03-25444-05)
PRAID EP420i S26361-D3216-Bxx	2 GB	PRAID EP420i TFM (LSZ:03-25444-01)

Installing the TFM

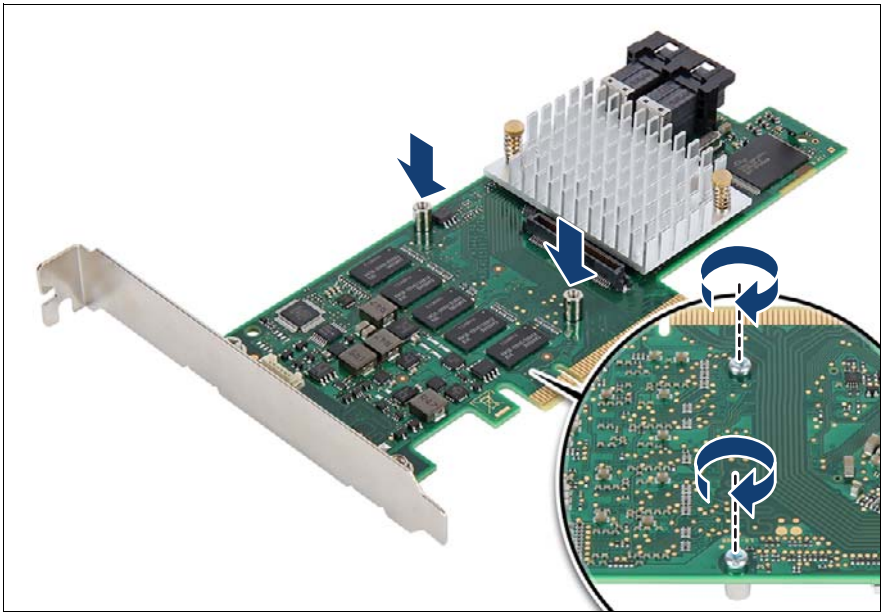


Figure 25: Installing the TFM (A)

► Ground yourself, then fit the two spacer bolts on the controller.

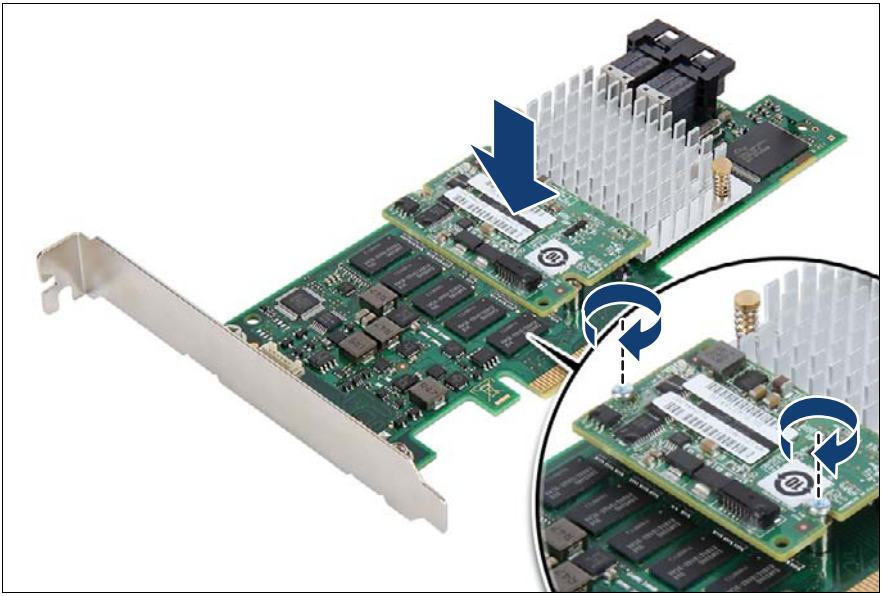


Figure 26: Installing the TFM (B)

► Secure the PRAID EP400i/EP420i TFM on the controller with the two screws from the TFM kit.

Installing the FBU

This description is only an example. The delivered FBU can be different depending on your server. Refer to your server's Upgrade and Maintenance Manual for mounting details.

► Remove the FBU from its package.

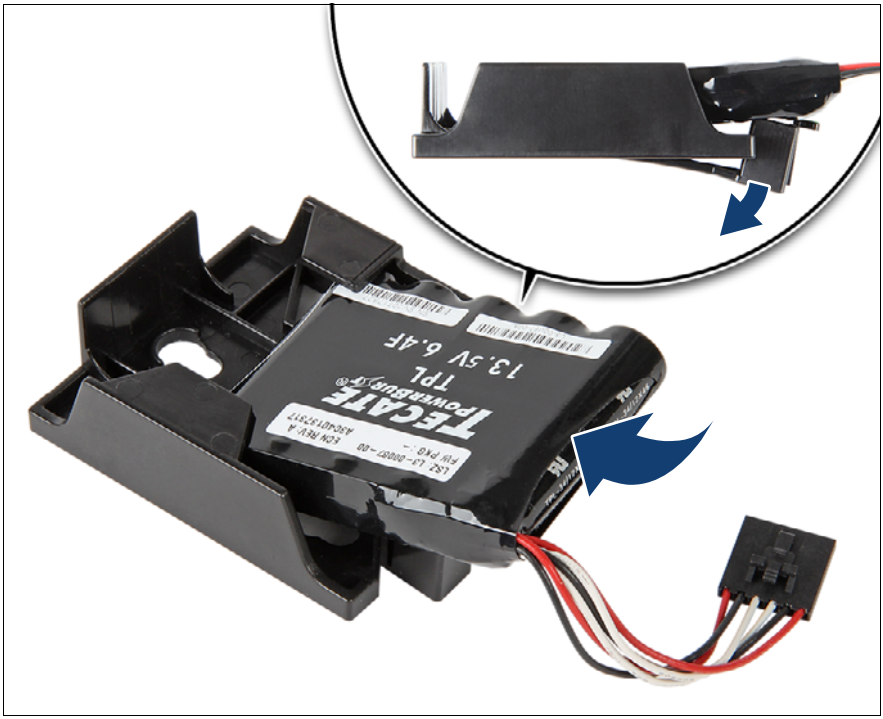


Figure 27: Installing the FBU in the FBU holder

► At a slight angle, fit the FBU under both retaining brackets of the FBU holder as shown. Push in the FBU until it locks in place.

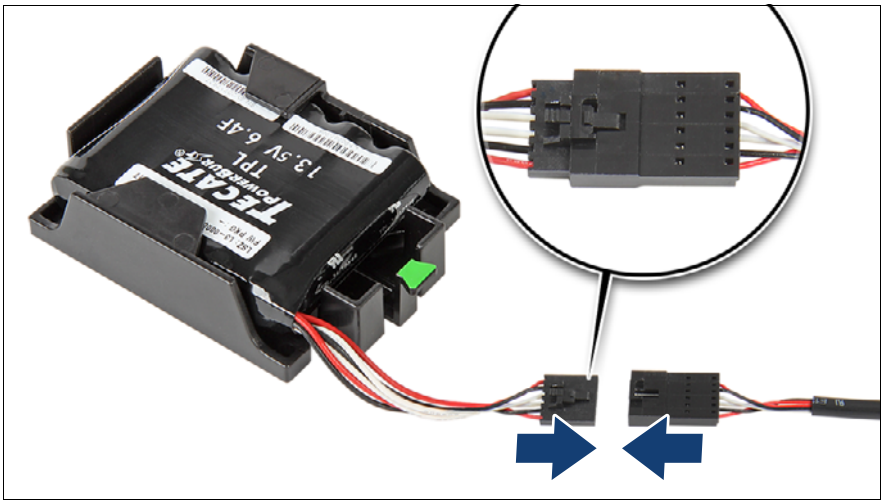


Figure 28: Connecting the FBU adapter cable to the FBU

- ► Connect the cable end of the FBU cable to the FBU adapter cable as shown.
- ► Secure the FBU to the server chassis as described in the server documentation.

Connecting the FBU adapter cable

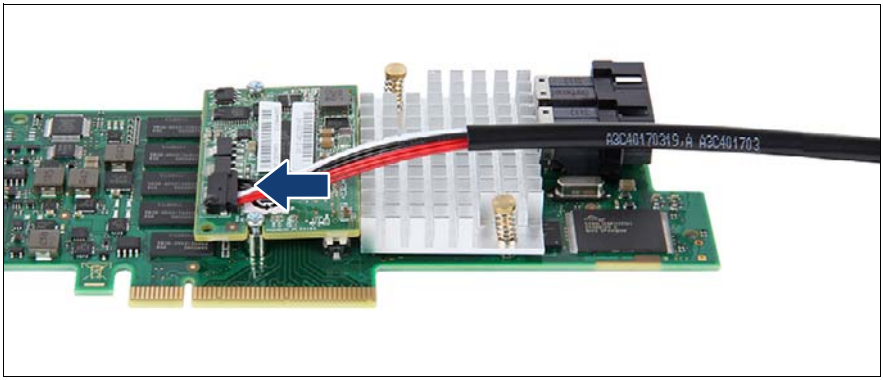


Figure 29: Connecting the FBU adapter cable

- ► Connect the loose end of the FBU adapter cable to the TFM on the RAID controller (see section "Connectors and indicators" on page 77).

5.2 RAID Controller "PRAID EM400i"

ATTENTION!

Make sure you observe the safety notes in chapter "Important information" on page 9.

The RAID controller "PRAID EM400i" (D2916) is a high-performance PCIe Gen3 x 8 to 8-port SAS/SATA bridge built on the LSI SAS3108 dual core ROC with 72-bit DDRIII interface that drives 1GB cache memory. It supports 1.5Gb/s, 3.0Gb/s, 6.0Gb/s and 12Gb/s SAS, SATA and solid state drives (SSDs) with different RAID levels.

It includes onboard flash, for performing DDR3 SDRAM cache offload function to protect data cache in case of host power failure. Furthermore it includes monitoring and control circuitry for the remotely located SuperCap Module, as well as onboard voltage regulator circuitry to create the proper voltage levels.

Figure 30: "PRAID EM400i " (based on LSI SAS3108)

5.2.1 Features

The RAID controller "PRAID EM400i " implements the LSI SAS3108 which is an integrated SAS and I/O controller with dual embedded Power PC 476 cores running at speeds up to 1.2 GHz. The LSI SAS3108 also provides the following functionalities:

- Provides an 8-lane 8.0 Gbit PCIe 3.0 host bus.
- Provides an 8-port 12Gb/s SAS3 and 6Gb/s SATA3 interface.
- Provides a 40-bit or a 72-bit 1866-MHz DDR3 SDRAM interface with a hardware RAID assist engine for parity calculations.
- Provides a full-featured hardware-based RAID solution that supports RAID levels 0, 1, 5, 6, 10, 50, and 60.
- Six I^2C interfaces used for Serial Boot strap ROM connection, memory detection, PCI-E SMBus connectivity, battery / smart charger control, and SAS sideband control.
- Integrated dual UART for MegaRAID® diagnostic use only.
- Two banks of SGPIO signals to accompany the two sets of x4 SAS / SATA ports.
- 16MB Flash
- 1kB Bootstrap EEPROM
- Raid-key chip onboard
- Onboard Flash for performing DDR3 SDRAM cache offload function to protect data cache in case of host power failure.

5.2.2 Controller versions

Name	Chip	PCIe	Cache	No. of SAS channels	Bracket type
PRAID EM400i S26361-D2916-A10	LSI SAS3108	PCIe 3.0	1 GB	8	low profile full height

5.2.3 Connectors and indicators

The following figure shows the location of the connectors and indicators on the SAS RAID controller.

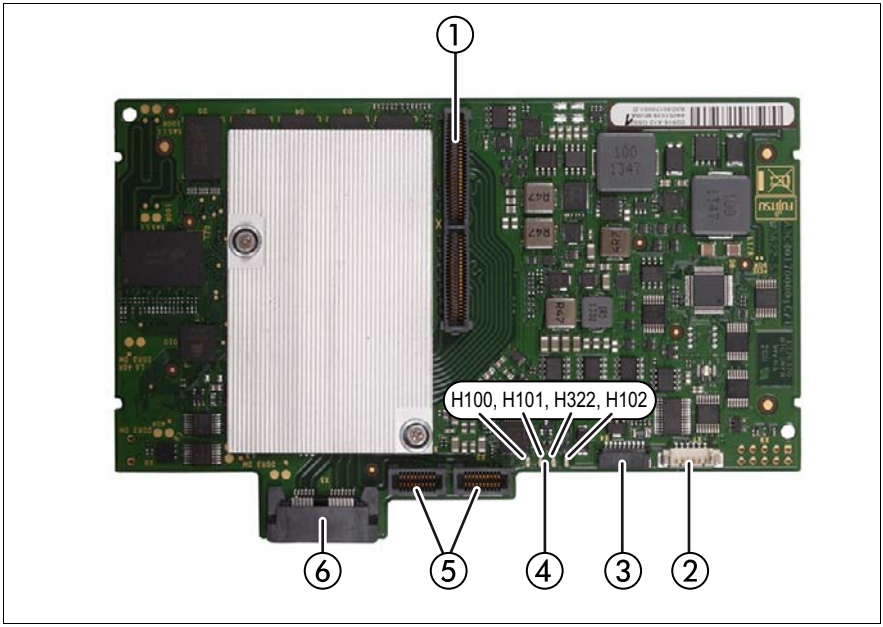


Figure 31: "PRAID EM400i" board layout

1	HSEC8 connector for PCIe
2	UART connector
3	SuperCap Module connector
4	Indicators
5	2x SAS connectors (port 0-1)
6	SAS connector (port 4-7)

Indicators

LED	Description
H322 (green blinking)	Heart Beat
H100 (orange)	Fault LED One surface mounted ORANGE LED (H100) indicates FAULT condition. When LED is on, it indicates that SuperCap pack is in FAULT condition.
H101 (blue)	Activity (ONFI) LED One surface mounted BLUE LED (H101) indicates activity on ONFI interface. When LED is on, it indicates that either Cache Offload from DDR3 memory to NAND Flash or Restore Operation from NAND flash to DDR3 memory is in progress.
H102 (green)	Power LED One surface mounted GREEN LED (H102) indicates the status of back-up Power. When LED is on, it indicates that SuperCap backup Power is enabled and SuperCap is powering the controller when host system's power is lost. Once turned on this LED remains on during entire Cache offload operation.

5.2.4 Installation

This section describes how to install the SAS RAID controller in a server.

CAUTION!

To safeguard against data loss, remember to back up your data before you change your system configuration.

To install the new controller, proceed as follows:

Step 1 **Unpack the controller**

Unpack the new controller in a static-free environment. Remove it from the anti-static bag and inspect it for damage.
If the controller appears to be damaged, contact the Fujitsu support service.

Step 2 Prepare the server

Shut down and power off the server.

Step 3 Install the new SAS RAID controller

Refer to your server specific Upgrade and Maintenance Manual for information on the PCIe slot and installing the controller.

Step 4 Power-up the server

Start up the server. Ensure that the SAS and/or SATA II devices are properly connected to the controller.

During booting, a message similar to the following is displayed:

```
LSI MegaRAID SAS-MFI BIOS Version NTxx (Build ..date..)
Copyright(c) 2014, LSI Corporation
HA-x (Bus x Dev y) PRAID EM400i (D2916)
FW package: xxxx
```

Step 5 Run the BIOS Configuration Utility

Run the BIOS Configuration Utility to configure the physical arrays and logical drives. Press `CTRL+R` immediately to run the utility, when the following message appears on the screen:

```
Press <Ctrl><R> to Run MegaRAID Configuration Utility
```

Step 6 Install the operating system driver

The controller can operate under various operating systems. To use these operating systems, you must install software drivers.

The ServerView Suite DVD 1 includes drivers for the supported operating systems, along with documentation. You can view the supported operating systems and download the latest drivers for RAID adapters on the website at: *http://ts.fujitsu.com/support/*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

5.3 RAID Controller "PRAID CM400i"

ATTENTION!

Make sure you observe the safety notes in chapter "Important information" on page 9.

The RAID controller "PRAID CM400i" (D2937) is a high-performance PCIe Gen3 x 8 to 8-port SAS/SATA bridge built on the LSI SAS3108 dual core. It supports 1.5Gb/s, 3.0Gb/s, 6.0Gb/s and 12Gb/s SAS, SATA and solid state drives (SSDs) with different RAID levels.

The MPI solution offered with this design includes a basic integrated RAID (IR) capability consisting of RAID 0, 1, and 1E provided at no charge beyond the silicon cost. IR operation requires no Cache, but does require a small non-volatile SRAM.

Figure 32: "PRAID CM400i" (based on LSI SAS3108)

5.3.1 Features

The RAID controller "PRAID CM400i" implements the LSI SAS3108 which is an integrated SAS and I/O controller with dual embedded Power PC 476 cores running at speeds up to 1.2 GHz. The LSI SAS3108 also provides the following functionalities:

- Provides an 8-lane 8.0 Gbit PCIe 3.0 host bus.
- Provides an 8-port 12Gb/s SAS3 and 6Gb/s SATA3 interface.
- Provides a 40-bit or a 72-bit 1866-MHz DDR3 SDRAM interface with a hardware RAID assist engine for parity calculations.
- Six I^2C interfaces used for Serial Boot strap ROM connection, memory detection, PCI-E SMBus connectivity, battery / smart charger control, and SAS sideband control.
- Integrated dual UART for MegaRAID® diagnostic use only.
- Two banks of SGPIO signals to accompany the two sets of x4 SAS / SATA ports.
- 16MB Flash
- 1kB Bootstrap EEPROM
- Raid-key chip onboard

5.3.2 Controller versions

Name	Chip	PCIe	Cache	No. of SAS channels	Bracket type
PRAID CM400i S26361-D2937-A10	LSI SAS3108	PCIe 3.0	no	8	low profile full height

5.3.3 Connectors and indicators

The following figure shows the location of the connectors and indicators on the SAS RAID controller.

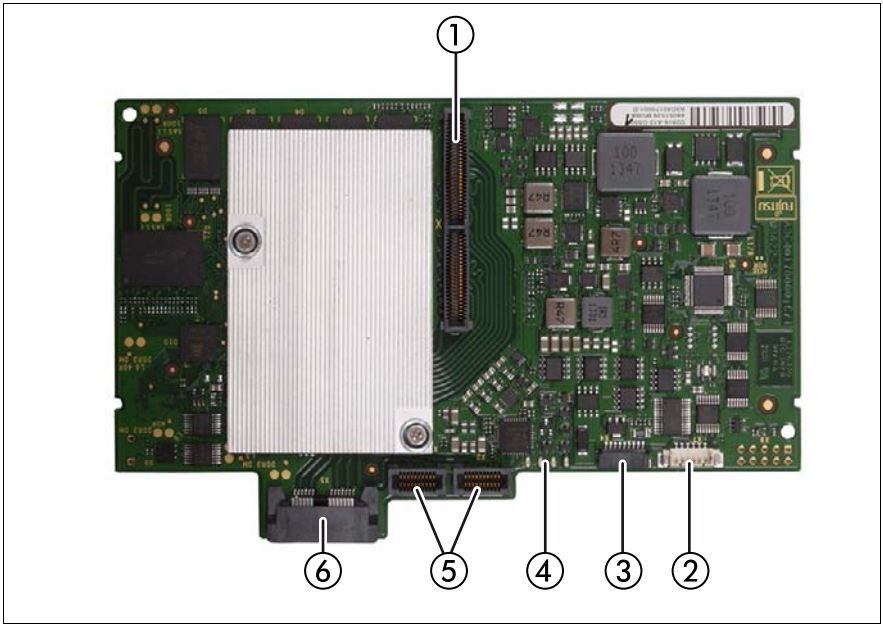


Figure 33: "PRAID CM400i" board layout

1	HSEC8 connector for PCIe
2	UART connector
3	SuperCap Module connector
4	Indicator (H322 Heart Beat)
5	2x SAS connectors (port 0-1)
6	SAS connector (port 4-7)

Indicators

LED	Description
H322 (green blinking)	Heart Beat

5.3.4 Installation

This section describes how to install the SAS RAID controller in a server.

CAUTION!

To safeguard against data loss, remember to back up your data before you change your system configuration.

To install the new controller, proceed as follows:

Step 1 **Unpack the controller**

Unpack the new controller in a static-free environment. Remove it from the anti-static bag and inspect it for damage.
If the controller appears to be damaged, contact the Fujitsu support service.

Step 2 **Prepare the server**

Shut down and power off the server.

Step 3 **Install the new SAS RAID controller**

Refer to your server specific Upgrade and Maintenance Manual for information on the PCIe slot and installing the controller.

Step 4 **Power-up the server**

Start up the server. Ensure that the SAS and/or SATA II devices are properly connected to the controller.

During booting, a message similar to the following is displayed:

```
LSI MegaRAID SAS-MFI BIOS Version NTxx (Build
..date..)
Copyright(c) 2014, LSI Corporation
HA-x (Bus x Dev y) PRAID CM400i (D2937)
FW package: xxxx
```

Step 5 Run the BIOS Configuration Utility

Run the BIOS Configuration Utility to configure the physical arrays and logical drives. Press CTRL+R immediately to run the utility, when the following message appears on the screen:

```
Press <Ctrl><R> to Run MegaRAID Configuration Utility
```

Step 6 Install the operating system driver

The controller can operate under various operating systems. To use these operating systems, you must install software drivers.

The ServerView Suite DVD 1 includes drivers for the supported operating systems, along with documentation. You can view the supported operating systems and download the latest drivers for RAID adapters on the website at: *http://ts.fujitsu.com/support/*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

5.4 RAID Controller "PRAID CP400i"

ATTENTION!

Make sure you observe the safety notes in chapter "Important information" on page 9.

The RAID controller "PRAID CP400i" (D3307) is a dual-PHY, SAS PCIe RAID controller and is used in a system with a PCIe slot. PCIe goes beyond the PCI specification in that it is intended as a unifying I/O architecture for various systems.

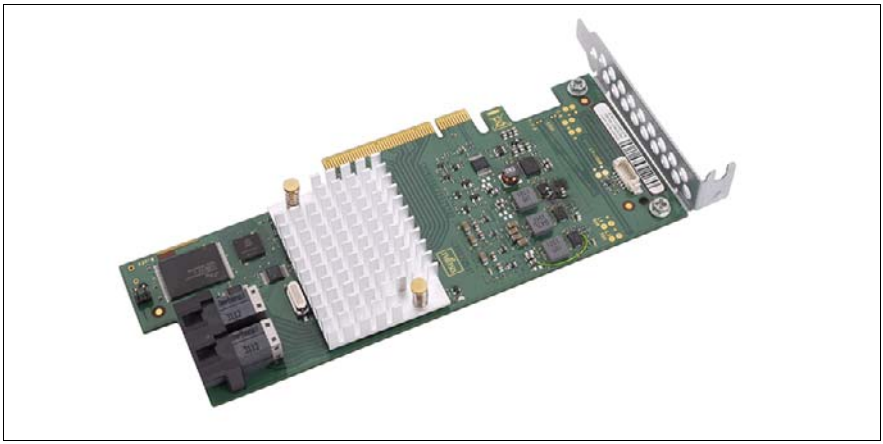


Figure 34: "PRAID CP400i"

Depending on the target system, the following bracket types are offered:

- Full height perforated
- Full height not perforated
- Low profile perforated

5.4.1 Features

The RAID controller "PRAID CP400i" implements the LSI Corp. 3008 SAS ROC which is an integrated SAS and I/O controller with embedded Power PC 476 core running at speeds up to 1.2 GHz. The 3108 SAS ROC also provides the following functionalities:

- Provides an 8-lane 8.0 Gbit PCIe 3.0 host bus.
- Provides an 8-port 12Gb/s SAS3 and 6Gb/s SATA interface.
- Six I^2C interfaces used for Serial Boot strap ROM connection, PCI-E SMBus connectivity and SAS sideband control.
- Integrated dual UART for MegaRAID® diagnostic use only.
- Two banks of SGPIO signals to accompany the two sets of x4 SAS / SATA ports.
- 16MB Flash
- 1kB Bootstrap EEPROM
- Raid-key chip onboard
- Provides a full-featured hardware-based RAID solution that supports RAID levels 0, 1, 1E, 5, 10.

5.4.2 Controller versions

Name	Chip	PCIe	No. of SAS channels	Bracket type
PRAID CP400i S26361-D3307-A10	LSI SAS3008	PCIe 3.0	8	low profile full height

5.4.3 Connectors and indicators

The following figure shows the location of the connectors and indicators on the SAS RAID controller.

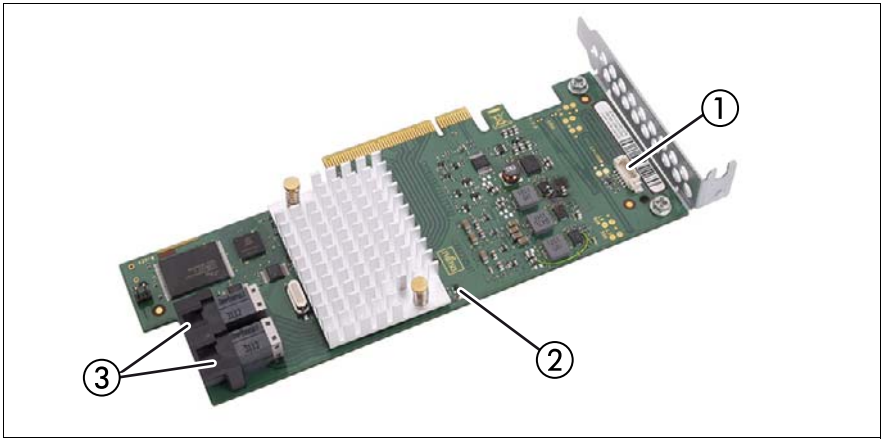


Figure 35: "PRAID CP400i" board layout

1	HDD LED connector
2	Indicators
3	SAS connectors

Connectors

Connector	Type	Description
SAS MLC1	x4 SAS, ports 0- 3	SFF 8643 Mini SAS HD 4i connector for SAS IO cable to backplane and HDDs
SAS MLC2	x4 SAS, ports 4- 7	SFF 8643 Mini SAS HD 4i connector for SAS IO cable to backplane and HDDs
HDD LED	HDD activity indication LED	6-pin connector Pin 4 to connect activity LED

Indicators

LED	Description
LED1 (green blinking)	Heart Beat

5.4.4 Installation

This section describes how to install the SAS RAID controller in a server.

CAUTION!

To safeguard against data loss, remember to back up your data before you change your system configuration.

To install the new controller, proceed as follows:

Step 1 Unpack the controller

Unpack the new controller in a static-free environment. Remove it from the anti-static bag and inspect it for damage.
If the controller appears to be damaged, contact the Fujitsu support service.

Step 2 Prepare the server

Shut down and power off the server.

Step 3 Install the new SAS RAID controller

Refer to your server specific Upgrade and Maintenance Manual for information on the PCIe slot and installing the controller.

Step 4 Power-up the server

Start up the server. Ensure that the SAS and/or SATA II devices are properly connected to the controller.

During booting, a message similar to the following is displayed:

```
LSI MegaRAID SAS-MFI BIOS Version NTxx (Build ..date..)
Copyright(c) 2014, LSI Corporation
HA-x (Bus x Dev y) PRAID CM400i (D3307)
FW package: xxxx
```

Step 5 Run the BIOS Configuration Utility

Run the BIOS Configuration Utility to configure the physical arrays and logical drives. Press CTRL+R immediately to run the utility, when the following message appears on the screen:

```
Press <Ctrl><R> to Run MegaRAID Configuration Utility
```

Step 6 Install the operating system driver

The controller can operate under various operating systems. To use these operating systems, you must install software drivers.

The ServerView Suite DVD 1 includes drivers for the supported operating systems, along with documentation. You can view the supported operating systems and download the latest drivers for RAID adapters on the website at: *http://ts.fujitsu.com/support/*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

5.5 RAID Controller "PRAID EP420e"

ATTENTION!

Make sure you observe the safety notes in chapter "Important information" on page 9.

The RAID controller "PRAID EP420e" brings 12Gb/s Serial Attached SCSI and 6Gb/s SATA III performance to workstation, and server designs.

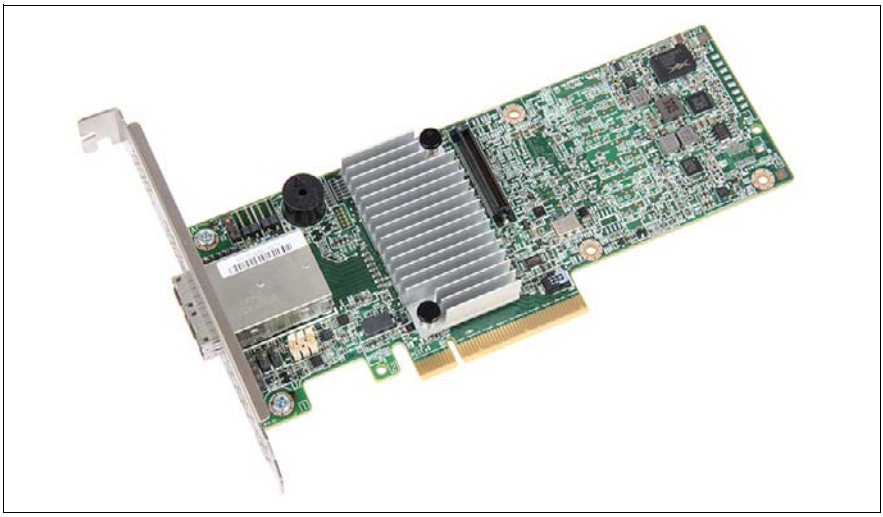


Figure 36: "PRAID EP420e"

Depending on the target system, the following bracket types are offered:

– Full height perforated
– Low profile perforated

5.5.1 Features

The RAID controller "PRAID EP420e" implements the LSI Corp. 3108 SAS ROC. The 3108 SAS ROC also provides the following functionalities:

- PCIe x8 lane width
- PCIe 3.0 performance up to 8Gb/s per lane
- Support for 2-GB DDR3 at 1866 MHz with ONFI cache offload support
- Two external connectors
- Support for RAID levels 0, 1, 5, 6, 10, 50, and 60
- Advanced array configuration and management utilities
- Support for global hot spares and dedicated hot spares
- Support for user-defined strip sizes: 64 KB, 128 KB, 256 KB, 512 KB, or 1024 KB
- Mounting holes for TFM

5.5.2 Controller versions

Name	Chip	PCIe	No. of SAS channels	Bracket type
PRAID EP420e	LSI SAS3108	PCIe 3.0	8	low profile full height

The following TFM kit is available.

Name	Cache	TFM kit
PRAID EP420e	2 GB	PRAID EP420i TFM (LSZ:03-25444-01)

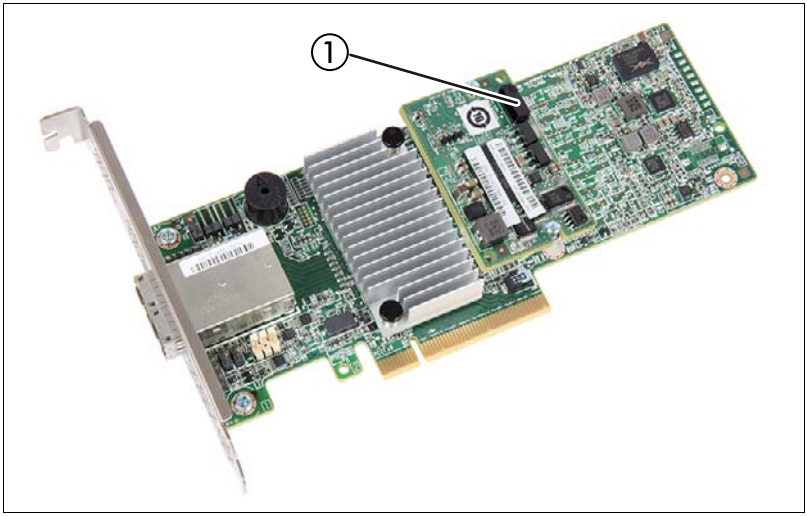


Figure 37: "PRAID EP420e" with installed TFM

1	Connector for FBU adapter cable

5.5.3 Connectors and jumpers

The following figure shows the location of the connectors and jumpers on the SAS RAID controller.

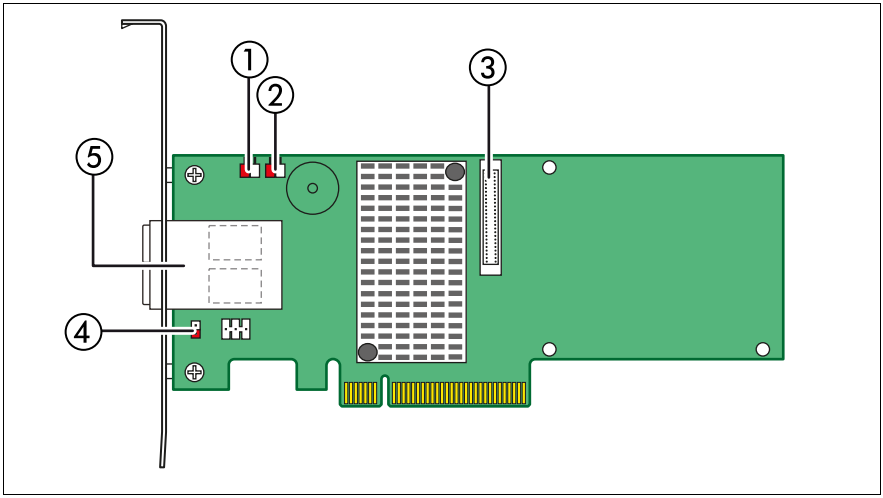


Figure 38: "PRAID EP420e" board layout

1	HDD LED1 connector
2	HDD LED2 connector
3	CacheVault Flash Module (ONFI) interface
4	Cache write pending connector
5	Two SAS connectors

Connectors

Connector	Type	Description
HDD LED1 Global hard disk drive (HDD) activity	2-pin connector	Connects to an LED that indicates activity on the drives connected to the controller.
HDD LED2 Global drive fault LED	2-pin connector	Connects to an LED that indicates activity on the drives connected to the controller.

Connector	Type	Description
CacheVault Flash Module (ONFI) interface	80-pin connector	Connects the RAID controller to a TFM (optional)
Cache write pending connector	2-pin connector	Connector for an LED mounted on the system enclosure. The LED indicates that the data in the cache has yet to be written to the storage devices.
SAS MLC1	x4 SAS, ports 0- 3	SFF 8644 Mini SAS HD 4e connector for SAS IO cable to backplane and HDDs
SAS MLC2	x4 SAS, ports 4- 7	SFF 8644 Mini SAS HD 4econnector for SAS IO cable to backplane and HDDs

5.5.4 Installation

This section describes how to install the SAS RAID controller in a server.

CAUTION!

To safeguard against data loss, remember to back up your data before you change your system configuration.

To install the new controller, proceed as follows:

Step 1 Unpack the controller

Unpack the new controller in a static-free environment. Remove it from the anti-static bag and inspect it for damage.
If the controller appears to be damaged, contact the Fujitsu support service.

Step 2 Prepare the server

Enable PCI Option ROM scan for appropreated PCI slot in BIOS setup.
Shut down and power off the server.

Step 3 Install the new SAS RAID controller

Refer to your server specific Upgrade and Maintenance Manual for information on the PCIe slot and installing the controller.

Step 4 Power-up the server

Start up the server. Ensure that the SAS and/or SATA II devices are properly connected to the controller.

During booting, a message similar to the following is displayed:

```
LSI MegaRAID SAS-MFI BIOS Version NTxx (Build ..date..)
Copyright(c) 2014, LSI Corporation
HA-x (Bus x Dev y) PRAID EP420e (Dnnnn)
FW package: xxxx
```

Step 5 Run the BIOS Configuration Utility

Run the BIOS Configuration Utility to configure the physical arrays and logical drives. Press `CTRL+R` immediately to run the utility, when the following message appears on the screen:

```
Press <Ctrl><R> to Run MegaRAID Configuration Utility
```

Step 6 Install the operating system driver

The controller can operate under various operating systems. To use these operating systems, you must install software drivers.

The ServerView Suite DVD 1 includes drivers for the supported operating systems, along with documentation. You can view the supported operating systems and download the latest drivers for RAID adapters on the website at: *http://ts.fujitsu.com/support/*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

5.5.5 Installing an optional TFM / FBU

The "PRAID EP420e" can be equipped with the same TFM as for "PRAID EP420i". Please proceed in the same way as described in section "Installing an optional TFM / FBU" on page 80.

The FBU type, the FBU mounting position and the FBU adapter cable may be different for your server. Please refer to your server specific Upgrade and Maintenance Manual for detailed information.

5.6 RAID Controller "PRAID EP440i"

ATTENTION!

Make sure you observe the safety notes in chapter "Important information" on page 9.

The RAID controller "PRAID EP440i" is designed to drive the server's internal disk drives. The RAID stack is based on LSI MegaRAID® and offers powerful data throughput, extensive fault-tolerance and easy-to-use management.

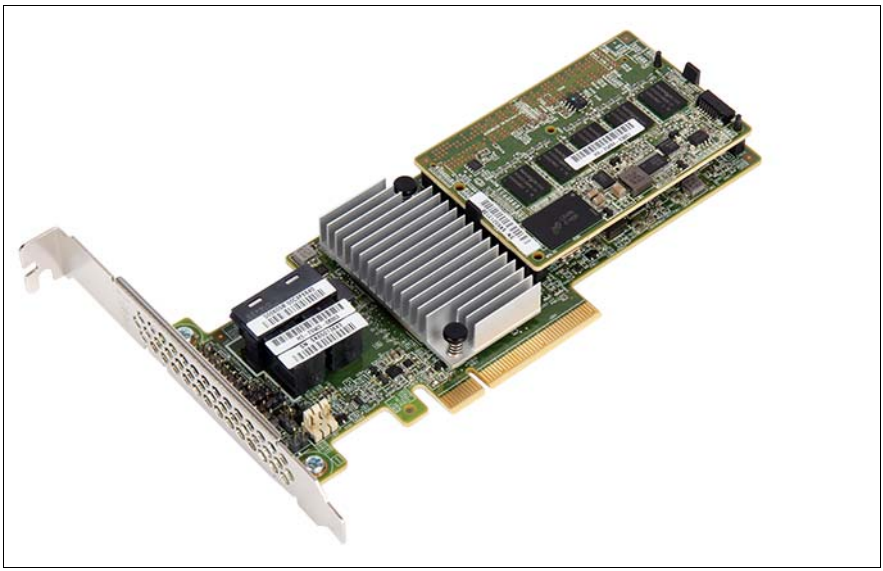


Figure 39: "PRAID EP440i"

Depending on the target system, the following bracket types are offered:

- Full height perforated
- Low profile perforated

5.6.1 Features

The RAID controller "PRAID EP440i" implements the LSI SAS3108 which is an integrated SAS and I/O controller with dual embedded Power PC 476 cores running at speeds up to 1.2 GHz. The LSI SAS3108 also provides the following functionalities:

- Provides an 8-lane 5.0 / 8.0 Gbit PCIe 3.0 host bus.
- Provides an 8-port 12Gb/s SAS3 and 6Gb/s SATA3 interface.
- Provides a 1866 MHz DDR3 SDRAM interface with a hardware RAID assist engine for parity calculations.
- Provides a full-featured hardware-based RAID solution that supports RAID levels 0, 1, 1E, 5, 6, 10, 50 and 60.
- Six I^2C interfaces used for Serial Boot strap ROM connection, memory detection, PCI-E SMBus connectivity, battery / smart charger control, and SAS sideband control.
- Integrated dual UART for MegaRAID® diagnostic use only.
- Two banks of SGPIO signals to accompany the two sets of x4 SAS / SATA ports.
- 16MB Flash
- 1kB Bootstrap EEPROM
- Mounting holes for TFM
- Raid-key chip onboard

5.6.2 Controller versions

Name	Chip	PCIe	Cache	No. of SAS channels	Bracket type
PRAID EP440i	LSI SAS3108	PCIe 3.0	4 GB	8	low profile full height

5.6.3 Connectors

The following figure shows the location of the connectors on the SAS RAID controller.

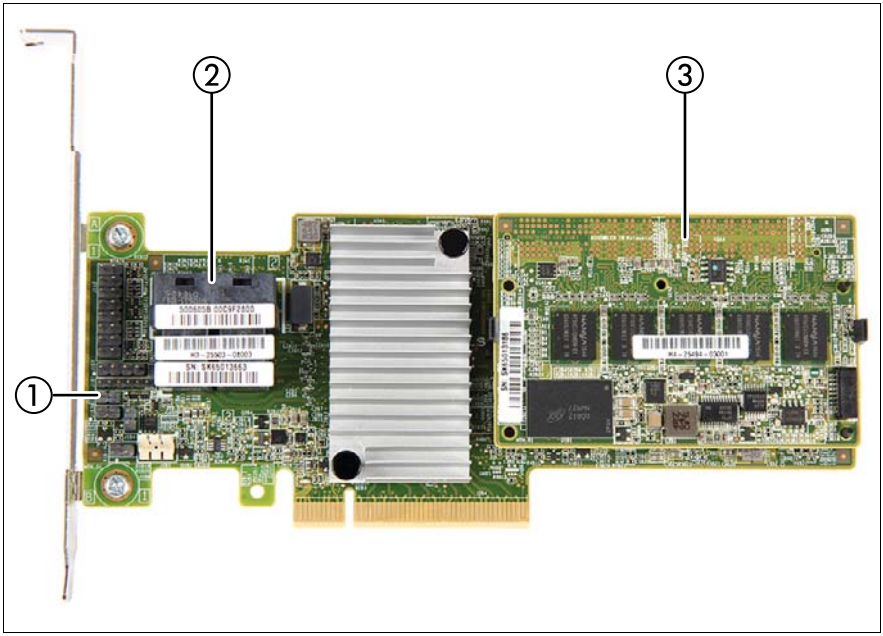


Figure 40: "PRAID EP440i" board layout

1	Global Drive Activity LED connector
2	SAS cable connectors
3	assembled TFM

Connecting the Global Drive Activity LED cable

To activate the HDD activity indicator at the front of the system a cable must be connected to the Global Drive Activity LED connector of the RAID controller "PRAID EP440i" (see figure 40).

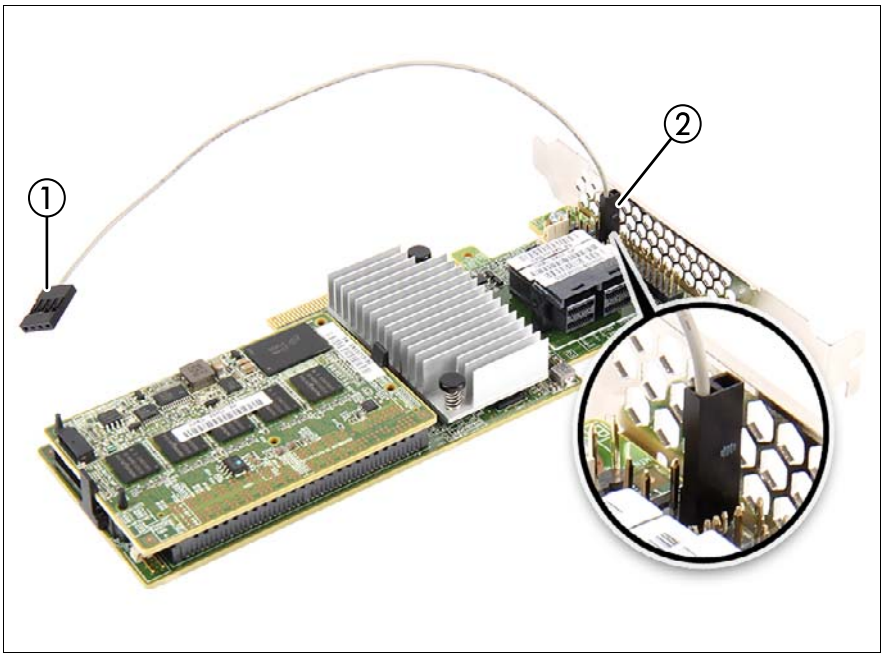


Figure 41: Connecting the Global Drive Activity LED cable - variant 1

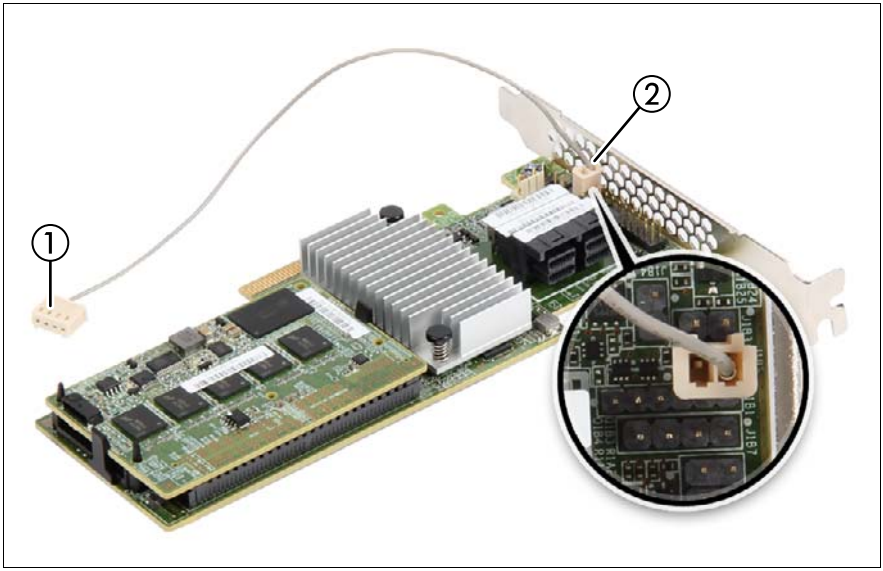


Figure 42: Connecting the Global Drive Activity LED cable - variant 2

- ► Connect the 2-pin connector (2) of the Global Drive Activity LED cable with the "•" marking plugged to pin 1.
- ► Connect the 4-pin connector (1) of the Global Drive Activity LED cable to the system board. Please refer to the system specific manual to locate the connector.

5.6.4 Installation

This section describes how to install the SAS RAID controller in a server.

CAUTION!

To safeguard against data loss, remember to back up your data before you change your system configuration.

To install the new controller, proceed as follows:

Step 1 Unpack the controller

Unpack the new controller in a static-free environment. Remove it from the anti-static bag and inspect it for damage.
If the controller appears to be damaged, contact the Fujitsu support service.

Step 2 Prepare the server

Turn off the server and remove the cover from the chassis.

Step 3 Install the new SAS RAID controller

Insert the controller in a suitable PCIe slot on the system board. Press down gently but firmly to ensure the controller is properly seated in the slot. Secure the controller to the server chassis with the PCI card hold down latches. Connect the SAS and/or SATA HDDs located in the system to the SAS cable connector(s) on the controller. Refer to your server specific Upgrade and Maintenance Manual for information on the PCIe slot and installing the controller.

Step 4 Power-up the server

Replace the server cover and reconnect the power cable(s). Start up the server. Ensure that the SAS and/or SATA II devices are properly connected to the controller.

During booting, a message similar to the following is displayed:

```
LSI MegaRAID SAS-MFI BIOS Version NTxx (Build ..date..)
Copyright(c) 2014, LSI Corporation
HA-x (Bus x Dev y) PRAID EP440i
FW package: xxxx
```

Step 5 Run the BIOS Configuration Utility

Run the BIOS Configuration Utility to configure the physical arrays and logical drives. Press `CTRL+R` immediately to run the utility, when the following message appears on the screen:

```
Press <Ctrl><R> to Run MegaRAID Configuration Utility
```

Step 6 Install the operating system driver

The controller can operate under various operating systems. To use these operating systems, you must install software drivers.

The ServerView Suite DVD 1 includes drivers for the supported operating systems, along with documentation. You can view the supported operating systems and download the latest drivers for RAID adapters on the website at: *http://ts.fujitsu.com/support/*

For Japan please use the URL:
http://www.fujitsu.com/jp/products/computing/servers/primergy/downloads/

5.6.5 Installing an optional FBU

5.6.5.1 Features

Using the LSI MegaRAID® CacheVault™ Technology offers better protection for controller cache with our eco-friendly, low-maintenance LSI MegaRAID based controllers featuring CacheVault Technology.

This technology offloads data stored in the LSI MegaRAID based controller cache to the NAND flash in the event of a power failure or other system occurrence where the contents of controller cache are most at risk.

In addition, CacheVault technology eliminates the need for lithium ion (Li-ion) batteries, traditionally used to protect DRAM cache memory on PCI RAID controllers.

CacheVault technology offers:

CacheVault technology transfers the contents of the DRAM cache to NAND flash using power from the supercap module in the event of a power or server failure. With a traditional battery backup unit, after a limited time without restored power, the cached data is lost. However, CacheVault technology safely stores the contents of DRAM on NAND flash for up to three years.

5.6.5.2 Installation

The FBU supports remote connection to the RAID controller "PRAID EP440i". The FBU is not installed directly on the RAID controller. Instead, use one of the supplied cables to connect the FBU to the TFM on the RAID controller. The FBU must be mounted inside the chassis.

Because server chassis vary, there is no standard mounting option that is compatible with all the different system configurations. Refer to your server's Upgrade and Maintenance Manual for mounting details. Therefore, the FBU kit contains only the cache unit and a set of cables, allowing you to customize the location of the remote FBU to provide the most flexibility within different environments. In newer chassis models Fujitsu offers mounting options using the common holder technology. Using the common holder technology facilitates mounting the FBU into the chassis.

When removing / connecting the FBU from / to the TFM, remove AC power from your system.

Installing the FBU

This description is only an example. The delivered FBU can be different depending on your server. Refer to your server's Upgrade and Maintenance Manual for mounting details.

► Remove the FBU from its package.

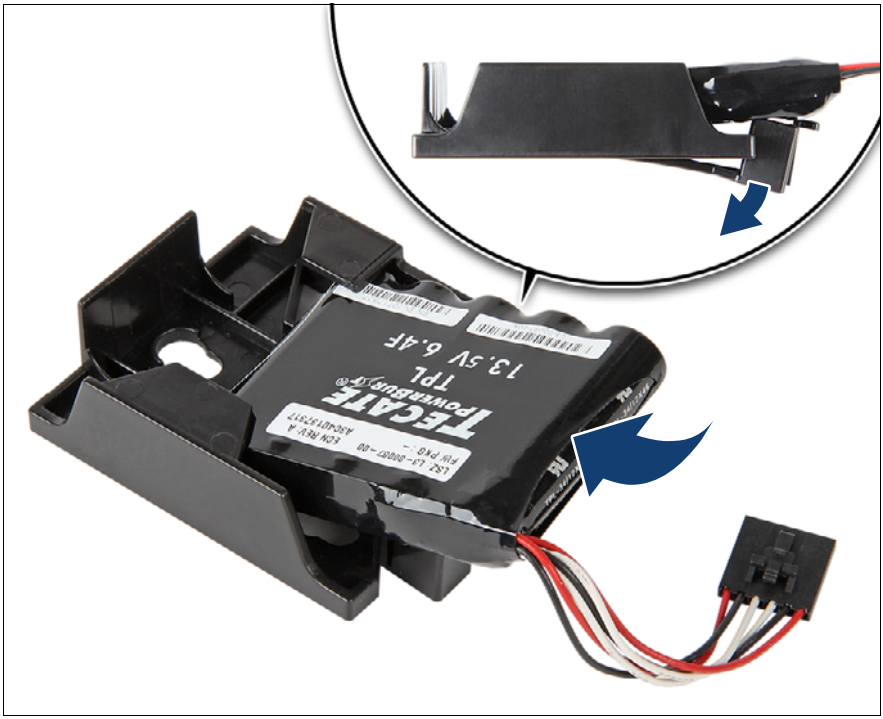


Figure 43: Installing the FBU in the FBU holder

► At a slight angle, fit the FBU under both retaining brackets of the FBU holder as shown. Push in the FBU until it locks in place.

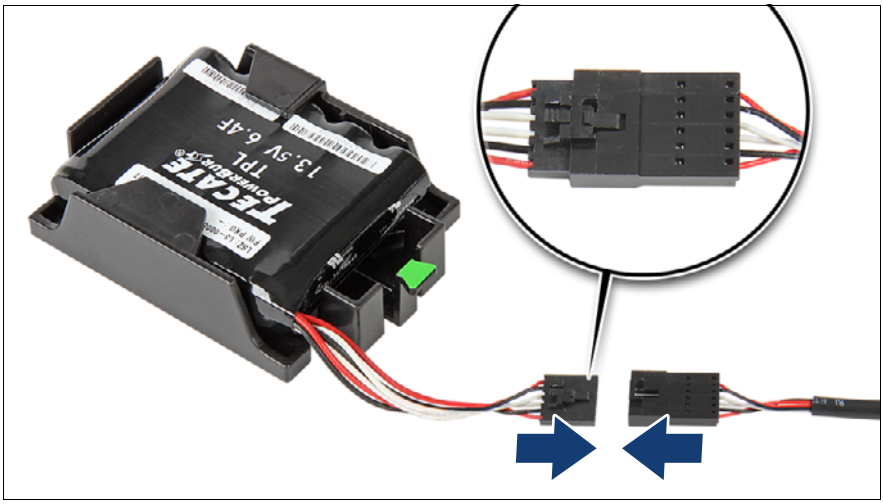


Figure 44: Connecting the FBU adapter cable to the FBU

- Connect the cable end of the FBU cable to the FBU adapter cable as shown.
- Secure the FBU to the server chassis as described in the server documentation.

Connecting the FBU adapter cable

Figure 45: Connecting the FBU adapter cable

- Connect the loose end of the FBU adapter cable to the TFM on the RAID controller (see section "Connectors" on page 109).