Sun Storage F5100 Flash Array

Installation Guide

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Preface

This document contains information and procedures for installing the Sun Storage F5100 Flash Array from Oracle.

- "Related Documentation" on page v
- "Documentation, Support, and Training" on page vi
- "Documentation Feedback" on page vi

Related Documentation

The SunStorage F5100 Flash Array documentation is available in both HTML and PDF formats.

Application	Title	Format	Location
General Sun safety information	*Important Safety Information for Sun Hardware Systems*	Printed	Shipping kit
Safety and compliance notices	*Sun Storage F5100 Flash Array Safety and Compliance Guide*	PDF	Online
Requirements for Using the Array	*BEFORE USING THIS PRODUCT: Requirements for Using the Sun Storage F5100 Flash Array*	Printed PDF	Shipping kit Online
Basic setup, supported hardware, and configurations	*Sun Storage F5100 Flash Array Getting Started Guide*	Printed PDF	Shipping kit Online
Preinstallation and installation	*Sun Storage F5100 Flash Array Installation Guide*	PDF/ HTML	Online

Application	Title	Format	Location
Service	*Sun Storage F5100 Flash Array Service Manual*	PDF/ HTML	Online
Late-breaking news	*Sun Storage F5100 Flash Array Release Notes*	PDF	Online
Common Array Manager (CAM) software	*Sun Storage Common Array Manager User Guide for Open Storage*	PDF	Online

Documentation, Support, and Training

These web sites provide additional resources:

- Docmentation (http://docs.sun.com)
- Support (http://www.sun.com/support)
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Sun Storage F5100 Flash Array Installation Guide, part number E22981-02.

Installing the System

Step	Description	Links
1.	Prepare for installation.	“Verify System Components” on page 2 “Tools Required” on page 3 “Safety Requirements” on page 3 “Prepare the Data Host” on page 3 “Front Panel Diagram” on page 4 “Rear Panel Diagram” on page 5
2.	Rackmount the system.	“Install the System With the Express Rail Kit” on page 6 “(Optional) Install the System With the Standard Rail Kit” on page 8 “(Optional) Install the Cable Management Arm (CMA)” on page 9 “Remove the System From the Rack” on page 9 “Remove the Express Slide Rails from the Rack” on page 10 “Remove the Standard Slide Rails from the Rack” on page 12
3.	Install data and power cords.	“Configuring the System” on page 13 “Connect the Power Cords” on page 18 “(Optional) Install the Power Cord Retainer” on page 18
4.	Power on the system.	“Power On” on page 20
5.	Manage the system.	“Sun Storage CAM Software” on page 21 “Firmware Updates” on page 21 “Access Configuration (Zoning) Support” on page 22 “Access Configuration (Zoning) Guidelines” on page 23 “SATA Affiliation” on page 24
6.	Power off the system.	“Power Off” on page 24

Preparing for Installation

- "Verify System Components" on page 2
- "Tools Required" on page 3
- "Safety Requirements" on page 3
- "Prepare the Data Host" on page 3
- "Reviewing Front and Rear Panels" on page 4

Verify System Components

This illustration depicts standard system components. Other options might be available with your system.

FIGURE: System Inventory

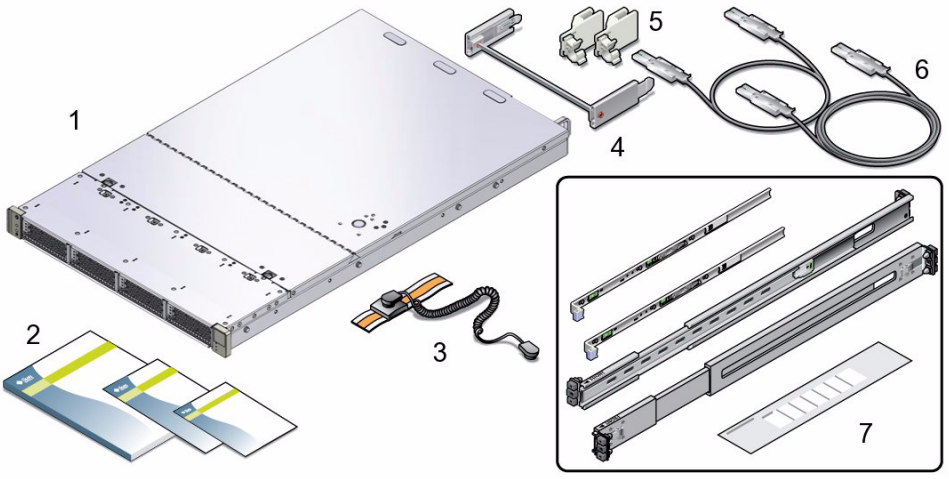


Figure Legend

1	Sun Storage F5100 Flash Array	**5**	Power cord retainers
2	Safety documentation	**6**	SAS three meter cable (2)
3	Antistatic wrist strap	**7**	Express rack rail kit: 2 slide rails, 2 mounting brackets, instruction card.
4	Cable management arm	**8**	Not pictured: 2 cable ties.

Tools Required

These tools are required for installation of the system.

- Antistatic wrist strap (in shipkit)
- Antistatic mat
- Stylus, or pencil

Safety Requirements

Review and observe the safety practices in the following documents:

- T*ransporting Products With a Miscellaneous (Class 9) Dangerous Goods Classification* (820-6558)
- *Important Safety and Compliance Information for Sun Hardware Systems* (816-7190)
- *SunStorage F5100 Flash Array Safety and Compliance Manual* (820-5875). Available online at http://docs.sun.com

▼ Prepare the Data Host

1. **Confirm the data host hardware and OS support the Sun Storage F5100 Flash Array.**

   For the list of supported hardware and software, see the *Sun Storage F5100 Flash Array Product Notes* at:
   `(http://docs.sun.com/app/docs/prod/stor.f5100#hic)`

2. **Download and install required host bus adapter (HBA) firmware.**

   See the *SunStorage F5100 Flash Array Product Notes* for the latest information on supported HBA hardware and firmware at:
   `(http://docs.sun.com/app/docs/prod/stor.f5100#hic)`

3. **Load any required patches for each component. See the documentation provided with the hardware for instructions on loading patches.**

Related Information

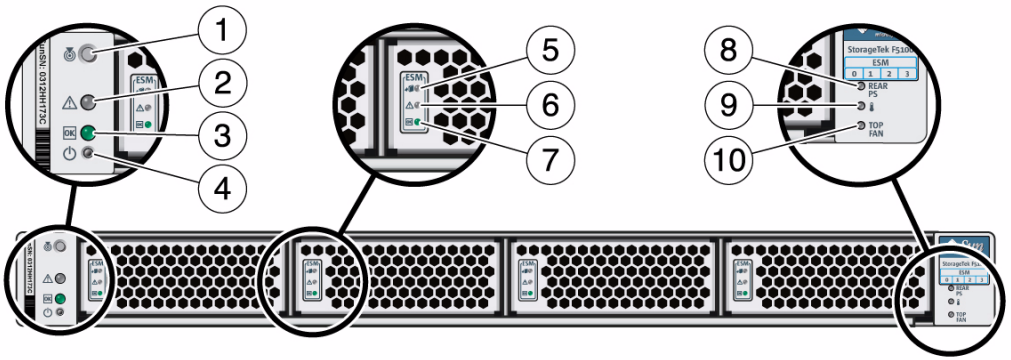
- *SunStorage F5100 Flash Array Product Notes* at:
  `http://docs.sun.com/app/docs/prod/stor.f5100#hic`
- "Managing the System" on page 20

Reviewing Front and Rear Panels

Familiarize yourself with the system components before you install the system.

- "Front Panel Diagram" on page 4
- "Rear Panel Diagram" on page 5

Front Panel Diagram

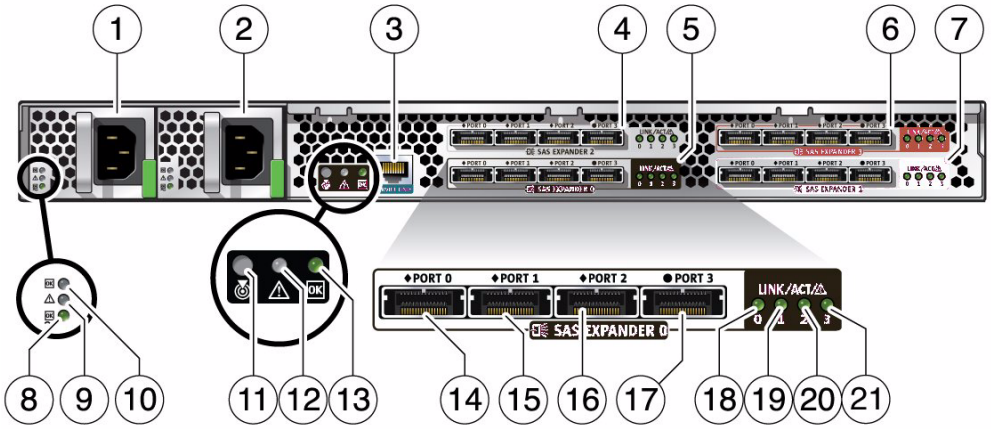


Item	Description
1	System Locate LED/button
2	System Fault LED
3	System OK LED
4	System ON/Standby button
5	ESM Ready to Remove LED
6	ESM Fault LED
7	ESM OK LED
8	Rear Power Supply Fault LED
9	System Over Temperature LED
10	Fan Fault LED

Related Information

- "Rear Panel Diagram" on page 5

Rear Panel Diagram



Item	Description	Item	Description
1	Power supply 0	**12**	System Fault LED
2	Power supply 1	**13**	System OK LED
3	Service only port	**14**	SAS port 0
4	SAS expander 2	**15**	SAS port 1
5	SAS expander 0	**16**	SAS port 2
6	SAS expander 3	**17**	SAS port 3
7	SAS expander 1	**18**	SAS expander *n* SAS port0 LED 0
8	Power supply AC OK LED	**19**	SAS expander *n* SAS port1 LED 1
9	Power supply fault LED	**20**	SAS expander *n* SAS port2 LED 2
10	Power supply OK LED	**21**	SAS expander *n* SAS port3 LED 3
11	System Locate/LED button		

Related Information

- "Front Panel Diagram" on page 4

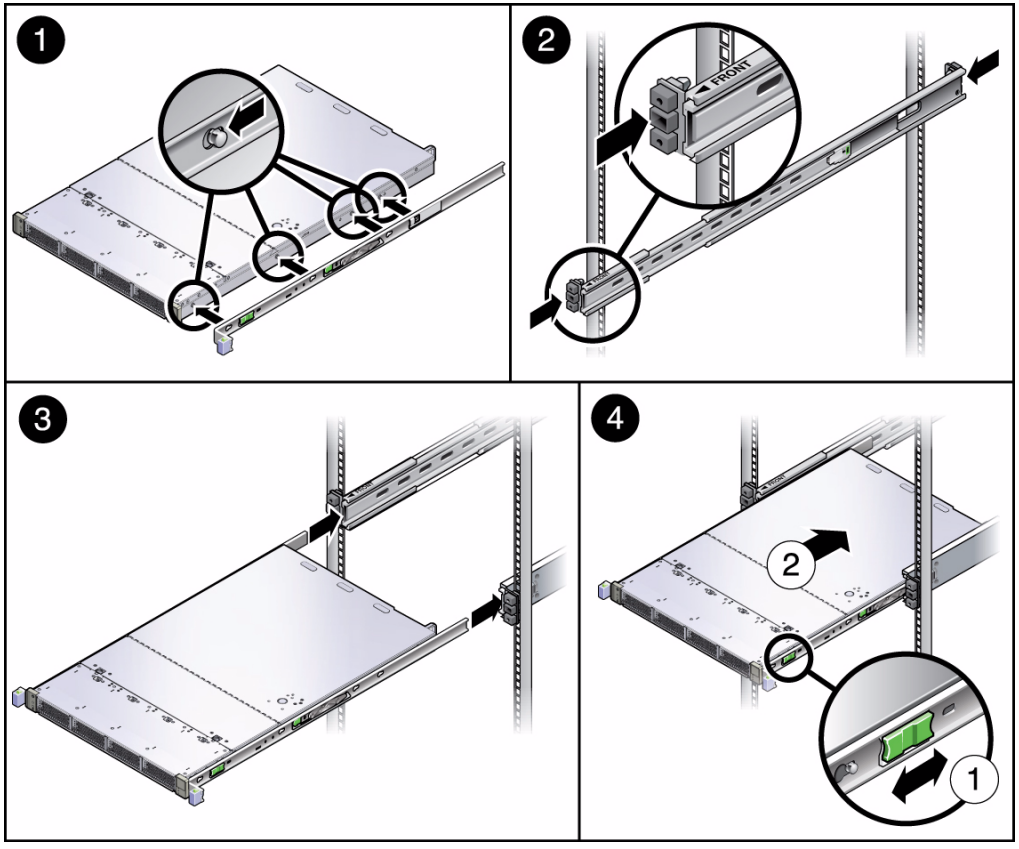
Rackmounting the System

- "Install the System With the Express Rail Kit" on page 6
- "(Optional) Install the System With the Standard Rail Kit" on page 8
- "(Optional) Install the Cable Management Arm (CMA)" on page 9
- "Remove the System From the Rack" on page 9
- "Remove the Express Slide Rails from the Rack" on page 10
- "Remove the Standard Slide Rails from the Rack" on page 12

▼ Install the System With the Express Rail Kit

1. **Attach mounting brackets to each side of the system.**

FIGURE: Express Rail Kit Installation



2. **Attach the slide rails to the rack.**

   a. **Orient the slide rails so the end marked "front" aligns with the front of the rack.**

   b. **Extend the slide rails to fit the rack, then attach each rail to the rack by clicking the ends into place.**

Caution – Stabilize the cabinet: extend the rack anti-tip device.

3. **With the rack rails *inside* the cabinet, align the mounting brackets with the slide rails and insert the server halfway.**

4. **Slide the green release tabs on the mounting bracket toward the front of the server, and push system into the rack.**

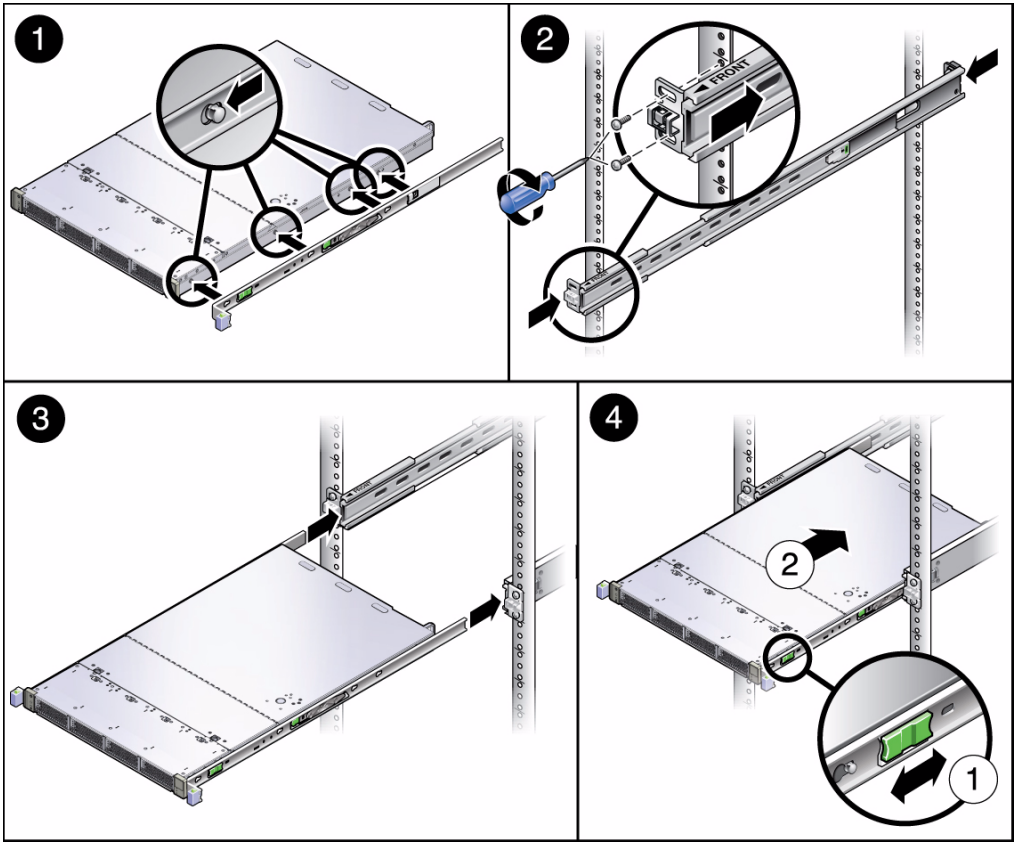
Related Information

- "(Optional) Install the System With the Standard Rail Kit" on page 8
- "(Optional) Install the Cable Management Arm (CMA)" on page 9
- "Remove the System From the Rack" on page 9
- "Remove the Express Slide Rails from the Rack" on page 10

▼ (Optional) Install the System With the Standard Rail Kit

1. **Attach inner slides to the system.**

FIGURE: Standard Rail Kit Installation



2. **Attach outer glides to the rack.**

a. **Adjust the length of the outer glides to fit your rack.**

b. **Attach each slide rail to the rack with four Phillips screws. Do not fully tighten the screws.**

c. **Set the proper width between rails using the spacer provided with the rail kit.**

d. **Fully tighten the front rail screws, then the rear rail screws.**

3. **Insert system about half-way in to the rack, until system comes to a hard stop.**
4. **Slide green release tab to disengage the glides, then push system into the rack.**

Related Information

- "Install the System With the Express Rail Kit" on page 6
- "(Optional) Install the Cable Management Arm (CMA)" on page 9
- "Remove the System From the Rack" on page 9

▼ (Optional) Install the Cable Management Arm (CMA)

Use the instruction card shipped with the parts, or follow the instructions below.

1. **From the rear of the rack, push the system forward slightly.**
2. **Slide a CMA bracket into the CMA slot on the rack rail.**
3. **Attach one end of the CMA bar to the installed CMA bracket.**
4. **Attach the other CMA bracket to the free end of the CMA bar, then slide the CMA bracket into the CMA slot on the rack rail.**
5. **Connect cables to the system.**

Related Information

- "Cabling the System" on page 13
- "Install the System With the Express Rail Kit" on page 6

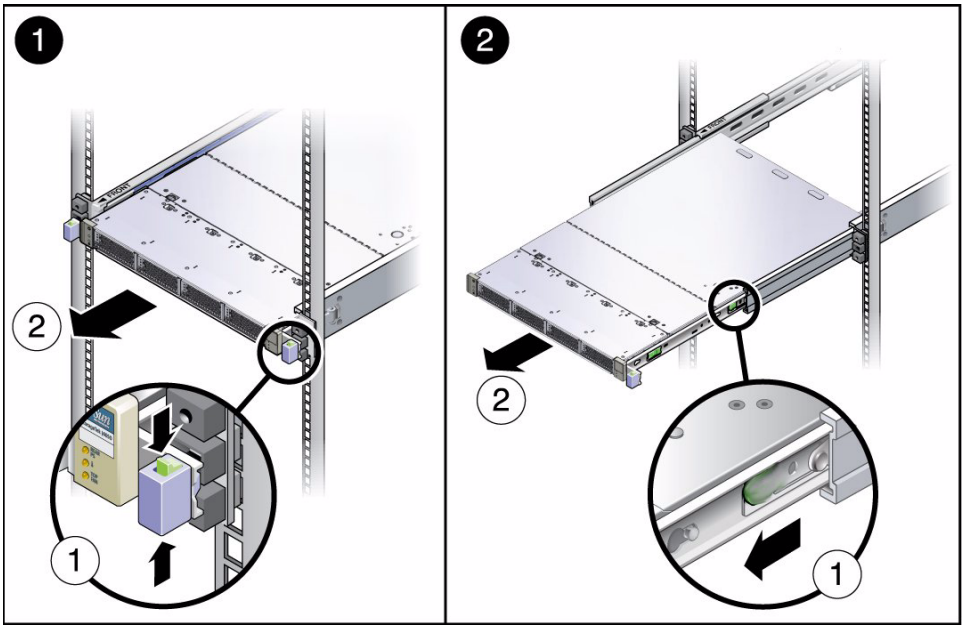
▼ Remove the System From the Rack

Caution – Stabilize the cabinet: extend the rack anti-tip device.

Before you begin, remove the cable management arm, if present, and detach all cables from the system.

1. **Squeeze the green buttons on the face of the glides to release the system, and then pull to fully extend the system.**
2. **Slide the gray release tab, on the slide rail, forward to disconnect the system from the rack.**

FIGURE: Removing the System from the Rack



3. **Remove the system from the rack.**

Related Information

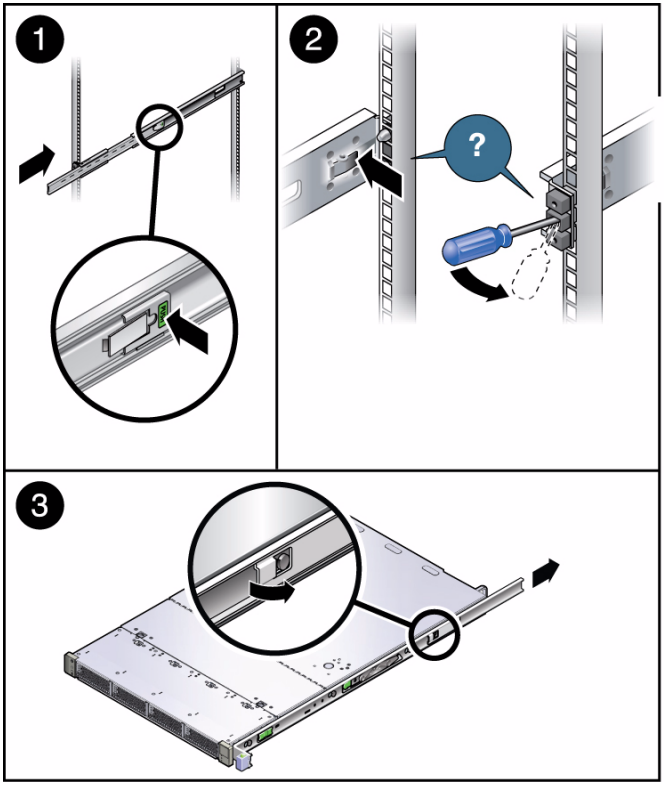
- "Remove the Express Slide Rails from the Rack" on page 10

▼ Remove the Express Slide Rails from the Rack

Before you begin, "Remove the System From the Rack" on page 9.

1. **With slide rails fully extended, press and hold the green metal lever while pushing the slide rail middle section into rack.**

FIGURE: Removing the Slide Rails



2. **Disconnect slide rails from the rack using one of these methods:**
   - If there is room to reach above and over the slide rails, press the release tab on the outside of the slide rail.

     Repeat for the rest of the slide rail ends.
   - If the rack is fully populated, insert a #0 screw driver in the hole on the face of the slide rail, and press the screwdriver against the release tab.

     Repeat for the rest of the slide rail ends.
3. **(Optional) Remove the mounting brackets from the server.**

Related Information

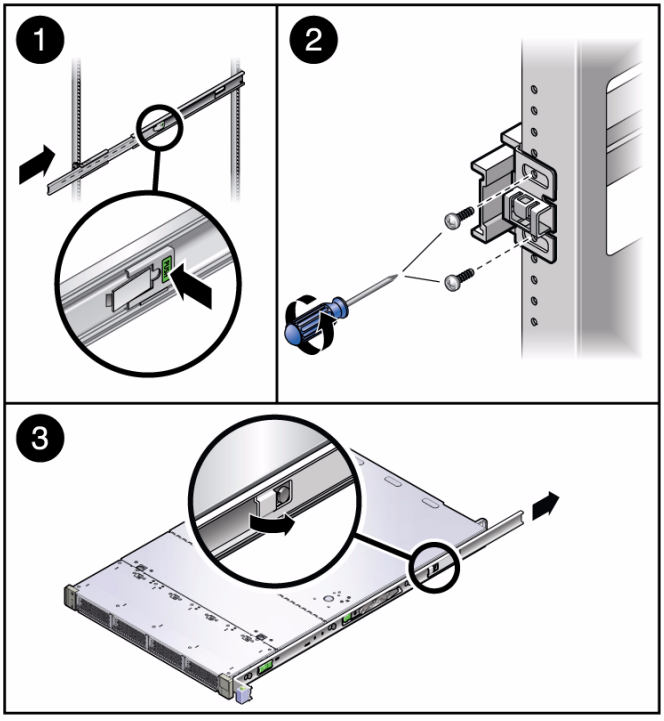
- "Remove the System From the Rack" on page 9
- "Install the System With the Express Rail Kit" on page 6

▼ Remove the Standard Slide Rails from the Rack

Before you begin, "Remove the System From the Rack" on page 9.

1. **With slide rails fully extended, press and hold the green metal lever while pushing the slide rail middle section into rack.**

FIGURE: Removing the Slide Rails



2. **Disconnect slide rails from the rack by removing the screws (2 per rail) connecting the slide rail to the rack.**
3. **(Optional) Remove the mounting brackets from the server.**

Related Information

- "Remove the System From the Rack" on page 9
- "Install the System With the Express Rail Kit" on page 6

Cabling the System

Description	Links
How to configure your array.	"Connectivity Terms" on page 14 "General Connectivity Rules" on page 14 "Connecting to Host Bus Adapters (HBAs)" on page 15
Connect the power cords.	"Connect the Power Cords" on page 18
Using the power cord retainers.	"(Optional) Install the Power Cord Retainer" on page 18

Configuring the System

- "Connectivity Terms" on page 14
- "General Connectivity Rules" on page 14
- "Connecting to Host Bus Adapters (HBAs)" on page 15

Connectivity Terms

Term	Definition
HBA	Host Bus Adapter (HBA) is a storage device controller and its associated circuitry, contained on an expansion card (i.e., a PCI-Express card), to control a set of storage devices (HDDs, SSDs, DVDs, FMods, etc.).
Single path	A single host with a single HBA connection to a set of storage devices.
Dual path	A dual path interconnect for connecting a set of storage devices. Only supported on the SunStorage F5100 Flash Array when using the SG-SAS6-EXT-Z HBA.
Multi path	A method for two or more HBAs to connect to a single storage device or a single group of storage devices. Not supported on the SunStorage F5100 Flash Array.
Cascade	A method for linking several storage enclosures together to increase the total amount of storage drives available to an HBA, also called daisy chain. Not supported on the SunStorage F5100 Flash Array.
Access Configuration (Zoning)	A configuration method that partitions the total number of storage devices based on the number of hosts connected. This allows each host to manage dedicated FMods within the total device pool. Zoning is done on a per FMod level and FMods are not shared (i.e. each FMod can only be owned by one host).
SAS fabric	A SAS fabric is conceptually similar to a network segment. A SAS fabric is comprised of initiators, targets and set of linked expanders that work like network switches linking initiators and targets together.
Domain	A discrete storage system utilizing a SAS fabric. The SunStorage F5100 Flash Array has four independent domains, called SAS Expanders 0 - 3. Domains can *not* be connected together. See the "Rear Panel Diagram" on page 5 for expander numbering information.

Related Information

- "General Connectivity Rules" on page 14
- "Connecting to Host Bus Adapters (HBAs)" on page 15
- "Access Configuration (Zoning) Support" on page 22

General Connectivity Rules

- Connecting multiple SunStorage F5100 Flash Arrays together is not supported.
- Connecting the SunStorage F5100 Flash Array to other JBODs is not supported.
- Connecting SunStorage F5100 Flash Array expanders together is not supported.

- Use only supported external mini-SAS 4x cables (SFF-8088) to connect the SunStorage F5100 Flash Array. Maximum supported cable lengths between devices is 3 meters, while the minimum cable length supported is 0.5 meters. Non-Sun certified cables are not supported.

Related Information

- "Connectivity Terms" on page 14
- "Connecting to Host Bus Adapters (HBAs)" on page 15

Connecting to Host Bus Adapters (HBAs)

- System performance is directly related to the number of FMods connected to each HBA. The lower the HBA-to-FMod ratio, the higher the performance. For example, in the first table below, highest performance is achieved with a 1:5 HBA-to-FMod ratio, while lowest performance is achieved using a 1:20 HBA-to-FMod ratio. The numbers below assume a system fully populated with 80 FMods. The first table shows configuration information for the SGX-PCIE8SAS-E-Z HBA, and the second table shows configuration information for the SGX-SAS6-EXT-Z HBA.

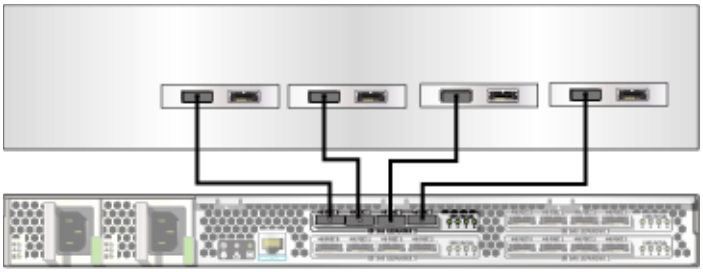
Model	HBAs (SGX-PCIE8SAS-E-Z)	FMods per HBA	HBA Ports	Zones per Domain
Highest Performance	16	5	1	4
Medium Performance	8	10	1	2
HBA Economy	4	20	1	0

Model	HBAs (SGX-SAS6-EXT-Z)	FMods per HBA	HBA Ports	Zones per Domain
Highest Performance	16	5	1	4
High Performance	8	10	2	2
Medium Performance	4	20	2	0
HBA Economy	2	40	2	0

Highest Performance Example

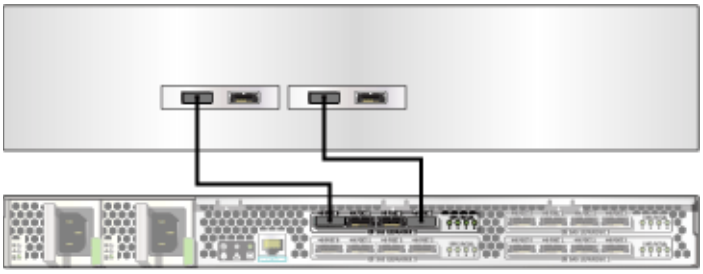
To achieve maximum performance on the SunStorage F5100 Flash Array, use zoning supported by Oracle's Sun Storage Common Array Manager software.To configure this model, connect a separate HBA to each port of a given domain, divide the domain into four zones, and distribute FMods evenly across the zones.

For example, install 20 FMods in SAS Expander 2, then create 4 zones, each containing 5 FMods. Scale this model to all four domains for maximum system performance.



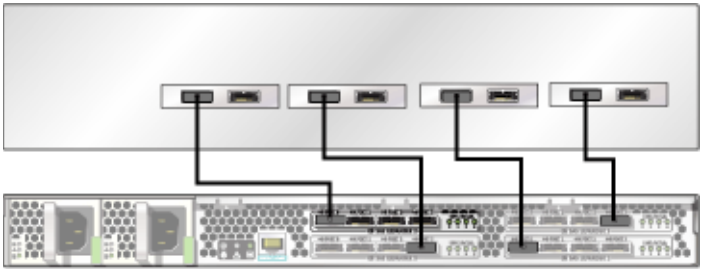
Medium Performance Example

To achieve a blend of performance and HBA economy, use zoning supported by Sun Storage CAM software. To configure this model, connect two HBAs per domain, divide the domain into two zones, and distribute FMods evenly across the zones. For example, install 20 FMods in SAS Expander 2, then create two zones, each containing 10 FMods. Scale this model to all four domains for a blend of performance and HBA economy.



HBA Economy Example

When slots or HBAs are limited, connect one HBA per domain, and distribute your FMods evenly across the domains. This configuration enables domain mirroring if supported by the host.



- Connect a maximum of 20 FMods per SG-XPCIE8SAS-EZ HBA. When this HBA includes two ports, you are still limited to 20 FMods per HBA.

- Connect a maximum of 40 FMods per SGX-SAS-EXT-Z HBA. When this HBA includes two ports, you are still limited to 40 FMods per HBA.
- HBAs can be installed in multiple hosts and connected to the same array.
- Install HBAs in 8-lane PCI-E slots, if possible.
- Use only Sun-supported HBAs with the SunStorage F5100 Flash Array. For the most recent list of supported HBA, see the *SunStorage F5100 Flash Array Product Notes*.
- Connect only a single HBA to a single domain on the SunStorage F5100 Flash Array, when not using zoning.

Caution – Attempting to connect more than one HBA to a SAS expander or domain (without zoning) may result in data loss.

- In instances where slot restrictions constrain the number of HBAs that can be used for connection to the array, the connection of the second HBA port may be used to obtain higher performance over single port connections. Note that due to host bus and HBA controller bandwidth limitations, for a given FMod count a single HBA with a dual port connection does not approach the performance of two HBAs with single port connections. For these configurations follow these guidelines:

  For the SGX-PCIE8SAS-E-Z HBA:

  - FMod count should be split evenly across the two ports for best performance.
  - Each port must be connected to a different physical domain on the F5100.

    Given the limitation of 20 FMods for this HBA card, this would limit each domain to 10 FMods assuming a balanced FMod configuration. A second HBA could be used to drive up to 20 FMods spread across the remaining two domains for a maximum of 40 total FMods in the array.

  For the SGX-SAS6-EXT-Z HBA:

  - If connected to different domains, FMod count should be split evenly across the two ports for best performance
  - If desired, both ports may be connected to the same physical domain on the F5100 without zoning.

Related Information

- "Connectivity Terms" on page 14
- "General Connectivity Rules" on page 14

▼ Connect the Power Cords

1. "(Optional) Install the Power Cord Retainer" on page 18.

   The instructions are also provided with the power cord retainers.

2. **Attach power cords to power supplies.**

3. **Connect power cords to separate power source.**

   Once AC power is connected to the system, the system status OK LED illuminates to a standby blink (repeating short flash on, then long pause), indicating the system is ready to be powered on.

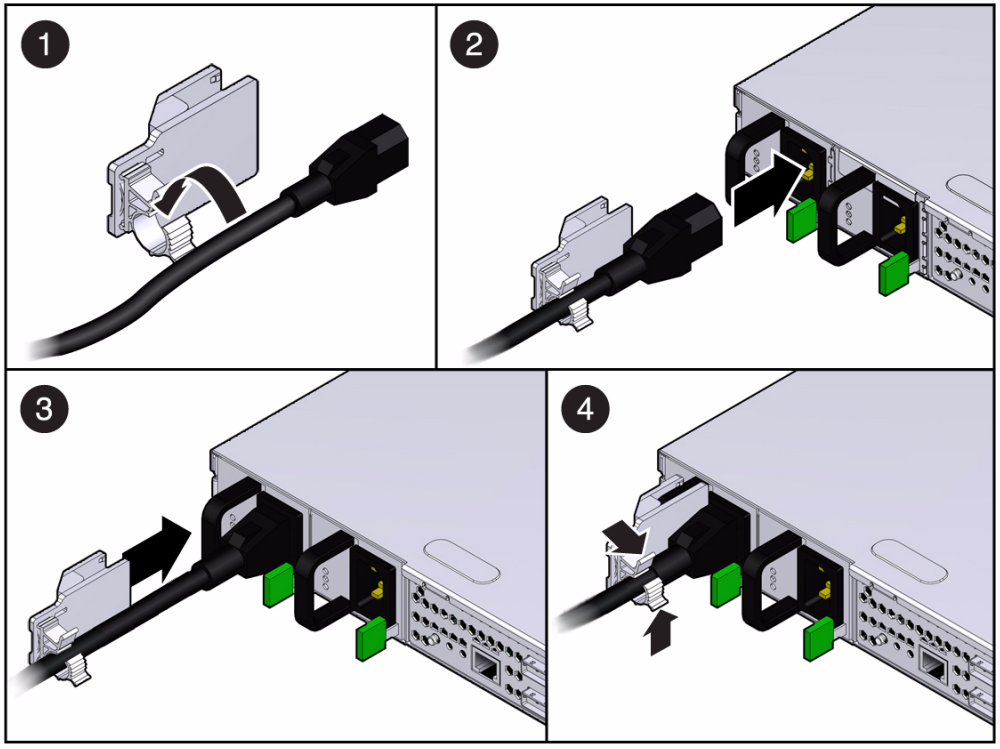
Related Information

- "Power On" on page 20

▼ (Optional) Install the Power Cord Retainer

Use the instruction card shipped with the parts, or follow the instructions below.

1. **Loosely attach the cable clip on the cord retainer to the power cable.**



2. **Connect the power cable into the power supply.**
3. **Push the power cord retainer onto the power supply handle, until it clicks into place.**
4. **Close the reusable cable clip tightly around the power cable.**

Related Information

- "Connect the Power Cords" on page 18
- "Power On" on page 20

▼ Power On

- **Press the On/Standby button on the front of the system.**

  System fans start and the green system OK LED changes to steady on.

  During power on, the green ESM OK LEDs blink until they are fully charged. Once ESMs are fully charged, the ESM OK LEDs turn solid green.

Note – ESMs can take up to ten minutes to fully charge. To protect against potential data loss, wait until the ESMs are fully charged before using the system.

Item	Description
1	On/Standby button

Related Information

- "Power Off" on page 24
- "Managing the System" on page 20

Managing the System

- "Sun Storage CAM Software" on page 21
- "Firmware Updates" on page 21
- "Access Configuration (Zoning) Support" on page 22

- “Access Configuration (Zoning) Guidelines” on page 23
- “SATA Affiliation” on page 24

Sun Storage CAM Software

Oracle’s Sun Storage Common Array Manager (CAM) software provides administrators with a powerful, easy-to-use, Java based graphical user interface or command-line interface for administering the Sun Storage arrays. The software enables online administration, a consistent interface across all operating systems, and the ability to monitor and manage one or all arrays from any location on the network.

Use Sun Storage CAM software to update system firmware, configure zoning (Access Configuration) and monitor your array. Sun Storage CAM software installation media and instructions are available online. For more information, see:
`http://www.oracle.com/us/products/servers-storage/storage/storage-software/031603.htm`

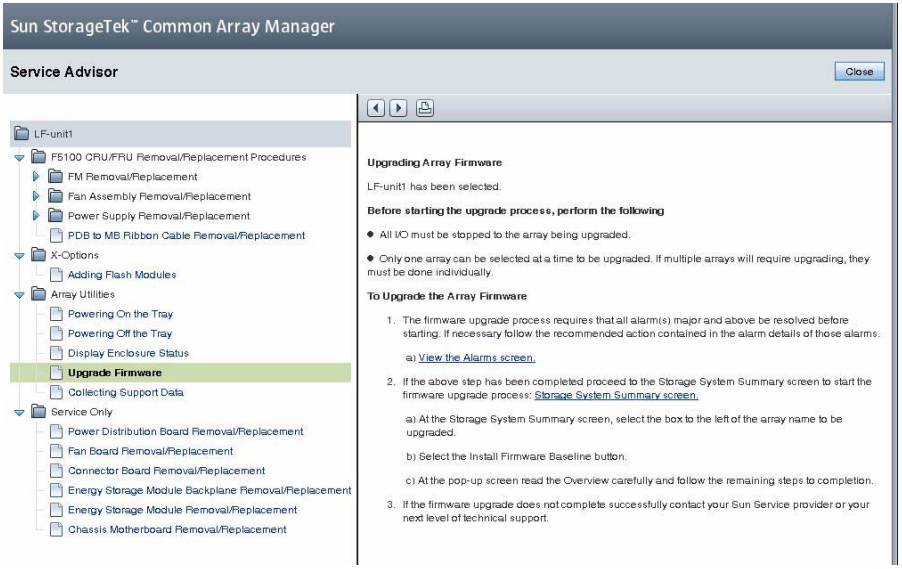
Related Information

- “Firmware Updates” on page 21
- “Access Configuration (Zoning) Support” on page 22
- “Access Configuration (Zoning) Guidelines” on page 23
- “SATA Affiliation” on page 24

Firmware Updates

Update the Sun Storage F5100 Array FMODs and expander firmware using the Service Advisor feature of the Sun Storage CAM software. Instructions for the update procedure are provided in the Sun Storage CAM interface.

FIGURE: Sun Storage CAM Update Screen



Related Information

- "Sun Storage CAM Software" on page 21

Access Configuration (Zoning) Support

The SunStorage F5100 Flash Array supports Access Configuration (also known as zoning) using Sun Storage Common Array Manager. Zoning is a configuration method that allows each host, or host port, to have its own dedicated storage resources. Zoning allows for storage resource segregation, controlled resource sharing, protection, and topology control. Zoning is done on a per host, per FMod basis for the SunStorage F5100 Flash Array.

The minimum requirements for zoning are:

- Sun Storage CAM version 6.7 or higher running on a management host directly connected to the F5100 Array, or a supported Sun Storage CAM data host directly connected to the F5100 running the Sun Storage CAM proxy agent software.
- A supported LSI-based HBA connected to the array, with the required firmware patch.

  See the *SunStorage F5100 Flash Array Product Notes* for the latest information on supported HBA information, including where to download the required firmware patch.

For more information on Access Configuration, see the Sun Storage CAM documentation available online at:
http://download.oracle.com/docs/cd/E19377-01/index.html

Related Information

- "Sun Storage CAM Software" on page 21
- "Access Configuration (Zoning) Support" on page 22
- "SATA Affiliation" on page 24

Access Configuration (Zoning) Guidelines

Use the following guidelines when configuring access for array storage resources, whether you are performing an initial setup, or adding to an existing setup.

- Use zoning to achieve maximum performance from the SunStorage F5100 Flash Array.
- Creating an even number of zones per expander (2 or 4), in conjunction with a balanced distribution of FMods across the zones, works best and maximizes performance.
- When using Linux hosts, if you add or remove array disks either physically, or through Sun Storage CAM Access Configuration, the host might hang or panic due to known Linux kernel issues. If you encounter this problem, a reboot of the host should resolve it.
- To avoid SATA Affiliation conflicts when multiple hosts are connected to the array, un-register all Sun Storage CAM proxy agents on any hosts other than the one being used to configure the Access Configuration until the Access configuration (zoning) is complete. This can also be accomplished by un-installing the Sun Storage CAM proxy agent or by not installing the Sun Storage CAM proxy agent until Access Configuration is complete.
- To avoid SATA Affiliation conflicts when multiple hosts are connected to the array, do not run commands on hosts other than the one used to configure the Access Configuration (i.e., `format`, `cfgadm`, etc.) which might attempt to access the attached storage.
- After the desired Sun Storage CAM Access Configuration is completed, you should save the zoning configuration by exporting the current SAS domain settings using the import/export functionality within the Sun Storage CAM Access Configuration page.

Related Information

- "Sun Storage CAM Software" on page 21

- "Access Configuration (Zoning) Support" on page 22
- "SATA Affiliation" on page 24

SATA Affiliation

Oracle's Sun Storage F5100 Flash Array with SATA FMods has the potential for SATA affiliation conflicts. Conflict can occur when more than one initiator tries to access the drive via the same SIM or Controller path (i.e., more than one host attached to a F5100 array domain).

Possible symptoms of SATA Affiliation conflicts are: operating system hangs, zoning operations take longer than 10 minutes to complete, and/or disk utilities like `format` will not return device lists in a timely fashion.

When more than one instance of Sun Storage CAM probes a SATA FMod from a single SAS domain, SATA affiliation issues occur which lead to possible symptoms as stated above. For this reason, connect only a single Sun Storage CAM host to a SAS domain unless drives have already been zoned to prevent SATA affiliation issues. After the access configuration (zoning) is completed from a Primary Sun Storage CAM Server (or a Primary Sun Storage CAM Server with only one active proxy agent), Sun Storage CAM can be installed or enabled on additional proxy hosts as desired.

Related Information

- "Access Configuration (Zoning) Support" on page 22
- "Access Configuration (Zoning) Guidelines" on page 23
- "Sun Storage CAM Software" on page 21

▼ Power Off

1. **Press and hold the On/Standy button on the front of the system for two seconds.**

   The green system OK LED changes from solid on to standby blink. The system is now at standby state.

Item	Description
1	On/Standby button

Note – ESMs continue to discharge after the system OK LED changes to standby blink. Wait for all ESMs to discharge and light their Ready-to-Remove LEDs, before disconnecting AC power. Discharging the ESMs can take up to ten minutes.

2. To remove all power from the system, disconnect the power supply cords.

Related Information

- "Power On" on page 20
- "Remove the System From the Rack" on page 9