Oracle FS1-2 Flash Storage System

Installation Guide (Not Racked)

Contents

List of Figures

List of Tables

Preface

Related Documentation

- *Oracle Flash Storage System Glossary*
- *Oracle FS1-2 Flash Storage System Customer Service Guide*
- *Oracle Flash Storage System Administrator's Guide*
- *Oracle FS1-2 Flash Storage System Release Notes*

Oracle Resources

Table 1: Oracle resources

For help with...	Contact...
Support	*http://www.oracle.com/support* (www.oracle.com/support)
Training	*https://education.oracle.com* (https://education.oracle.com)
Documentation	*Oracle Help Center*: (http://www.oracle.com/goto/FSStorage/docs) - From Oracle FS System Manager (GUI): Help > Documentation - From Oracle FS System HTTP access: (http://system-name-ip/documentation.php where system-name-ip is the name or the public IP address of your system)
Documentation feedback	*http://www.oracle.com/goto/docfeedback* (http://www.oracle.com/goto/docfeedback)
Contact Oracle	*http://www.oracle.com/us/corporate/contact/index.html* (http://www.oracle.com/us/corporate/contact/index.html)

CHAPTER 1

Oracle FS Systems: Installation Overview

Not-Racked Systems

Oracle FS Systems that are not racked are shipped as separate components to a customer site. Customers supply their own racks to accommodate not racked systems. A customer-supplied rack must meet the rack specifications for an Oracle FS System. Customers who order not racked systems are responsible for installing and cabling components in the rack.

The following figure shows an example of an empty customer-supplied rack where Oracle FS System components are to be installed.

Figure 1: Empty rack

Legend	1 Rack front door
	2 Empty rack
	3 Side panel

Oracle FS System components are compatible with racks that are compliant to the ANSI/EIA 310-D-1992. Use a four-post rack that can support the weight load of all Oracle FS System components.

The not racked Oracle FS System is staged at an Oracle manufacturing site. A temporary label is affixed to each component that indicates the component name and sequence number. A similar label is applied on the outside of the shipping carton for each component. Follow the labels on the shipping cartons to best facilitate the assembly of the Oracle FS System.

Power cords, network cables, and SAS cables are shipped in an accessory box, which is labeled as "Cables". The rack labels, the system serial number (SSN) labels, and the Controller World Wide Node Name (WWnN) labels are packaged in a bag and shipped inside the carton for Pilot-1.

CAUTION: A Drive Enclosure (DE2-24P) weighs up to 55 pounds (24.9 kilograms) and a Drive Enclosure (DE2-24C) weighs up to 110 pounds (49.89 kilograms). For safe handling, use two people to lift it.

CAUTION: A Controller weighs up to 41 pounds (18.59 kilograms). For safe handling, use two people to lift it.

Tip: To verify that you have retrieved all the small parts before recycling the packing material, check the packing materials.

Related Links

Unpacking Systems
Site Preparation Checklist (Not-racked Systems)
System Components
Planning for a System Installation
Installation Overview

Installation Overview

Installation of a not racked Oracle FS System is the customer's responsibility unless installation services are purchased from Oracle or a servicing partner.

Oracle recommends that the components in the rack follow the recommended rack placement and cabling guidelines to the maximum extent possible. Use the labels on the shipping cartons as a guideline for planning the installation.

Note: Several factors must be considered prior to the installation of not racked Oracle FS Systems.

- Available rack space
- Excessive heat from the non-Oracle FS System components might impact the Oracle FS System components
- Cooling requirements for non-Oracle FS System components might not be compatible with Oracle FS System components
- Power requirements for both non-Oracle FS System components andOracle FS System components
- Cable lengths

Note: Ensure that all site-preparation steps have been taken at the data center before starting the installation.

Note: Ensure that the rack is ready prior to starting the installation and meets all the rack specifications.

The following flowchart shows the sequence of tasks to perform to install a not racked Oracle FS System.

Figure 2: Oracle FS System: Installation overview
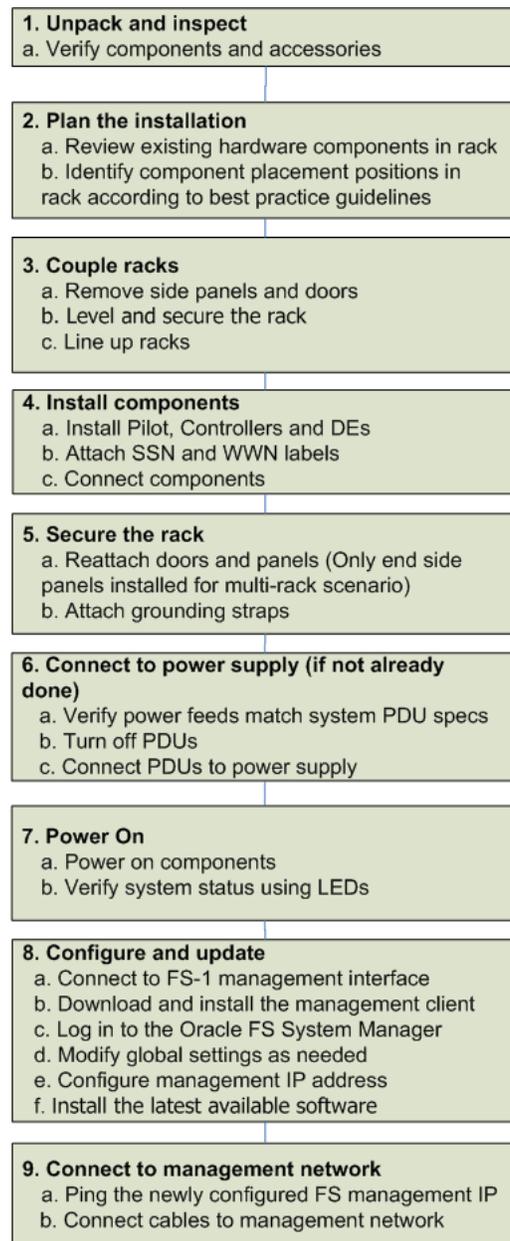
CAUTION: Do not turn on any power circuits until the installation of all ordered hardware is complete and all internal cables are in place. Turning on the power to the system prematurely can prevent the system from starting up correctly.

Note: Each circuit has its own amperage limits. Plug in the system components so that no PDU amperage limits are exceeded.

Tip: Review the information on Oracle FS System power requirements in this guide.

Related Links

Not-Racked Systems

Unpacking Systems

Planning for a System Installation

System Components

Site Preparation Checklist (Not-racked Systems)

Planning for a System Installation

Following items are a part of the planning and site preparation before the installation of an Oracle FS System:

- System weight
- Physical dimensions
- Power requirements
- Rack specifications
- Hardware specifications
- Unpacking requirements

Note: To ensure that all planning requirements have been met and the site is ready for a not racked Oracle FS System installation, follow the site preparation checklist.

Related Links

Component Chassis Hardware Specifications

System Power Requirements

PDU Hardware Specifications

Required Tools

Warnings and Cautions

Electrostatic Discharge Precautions

Site Preparation Checklist (Not-racked Systems)

System Components

System Components

An Oracle Flash Storage System consists of Pilots, Controllers, and Drive Enclosures. Replication Engines can also be added to the system for replication purposes.

The following table summarizes the components that comprise the Oracle FS System along with their model name, quantity, and description.

Table 2: Oracle FS System component descriptions

Component name	Model	Quantity and description
Pilot (X2)	1U	An Oracle FS System supports two Pilot management controllers. The Pilot nodes are designated as Pilot-1 and Pilot-2. One Pilot node actively performs management functions while the other Pilot node is in standby mode. The Pilot in an Oracle FS System operates separately from the user data and the command paths and thus provides out-of-band management.
Controllers	2U	An Oracle FS1-2 supports two storage Controllers. The Controllers are designated as Controller-1 and Controller-2. Both Controllers actively process I/O on the data path. **Note:** Controllers are identified in the CLI as CONTROLLER-01, CONTROLLER-02 and in the Oracle FS System Manager as CONTROLLER 01, CONTROLLER 02.
Drive Enclosures	• DE2-24P (2U), 24 SFF, 2.5 inches (6.35 centimeters) SAS-2 drives or 7, 13, 19 SSDs for each Drive Enclosure; • DE2-24C (4U), 24 LFF, 3.5 inches (8.89 centimeters) SAS-2 drives;	An Oracle FS1-2 supports between 1- 30 Drive Enclosures. Both DE2-24P and DE2-24C can coexist in the same system.

Table 2: Oracle FS System component descriptions (continued)

Component name	Model	Quantity and description
MaxRep Replication Engines (optional)	2U	An Oracle FS System supports a total of eight Replication Engines. The number of Replication Engines depends on customer requirements and the type of replication. While a single engine is sufficient for replication, Oracle recommends having at least two engines for redundancy purposes.
Filler panels (optional)	• 1U • 2U	The number of filler panels depends on how many empty rack unit (RU) slots exist in the rack.
Power distribution units (PDUs)	Unless using Oracle PDUs, PDUs are the responsibility of the customer or third party rack vendor.	Oracle PDUs are integrated into the rack. Non-Oracle PDUs might or might not be integrated into the rack.
Racks	Standard four-post racks (42U).	The number of racks depends on the number and the distribution of the hardware components. A minimum of 1 rack and a maximum of 4 racks can be used.

The PDUs used in a not-racked Oracle FS System installation must provide redundancy for both external AC power source and internal AC power distribution to the components. The PDUs must provide sufficient current to meet the sum of the requirements for the Oracle FS System components.

Oracle PDUs might be purchased for use with non-Oracle racks. The Oracle FS System component power cords have been designed to work with vertical style Oracle or third party PDUs. Non-Oracle PDUs must be compatible with Oracle component power cord lengths and plug types. Non-Oracle PDUs must be mounted in a manner such that the power cords provided by Oracle might be used and the PDUs do not obstruct the ability to replace field replaceable units (FRUs) and customer serviceable units (CRUs).

While planning rack-space, ensure that adequate space is also allocated for the PDUs, if using non-Oracle PDUs.

Note: Typically, enterprise class products like the Oracle FS System do not use a UPS and rely on generator backed power supply in the data centers. However, if you use a UPS, it must be based on the maximum wattage requirements of the sum total of all the Oracle FS System components. The UPS, if used, should conform to the APC PowerNet MIB specifications so that it can send SNMP traps to the Oracle FS System to indicate that it is operating in battery mode or in normal mode and that the Oracle FS System should be configured to receive the

traps. For more information about managing APC products that can be monitored and configured with SNMP, see the *Schneider Electric MIB Reference Guide* (http://www.apcmedia.com/salestools/JGAY-83UPH9/ JGAY-83UPH9_R0_EN.pdf). In short, a UPS system must be based on the maximum wattage requirements of the sum total of all the Oracle FS System components.

Related Links
Planning for a System Installation
Unpacking Systems
Check and Receive Components
System Power Requirements
PDU Hardware Specifications
Component Chassis Hardware Specifications

Component Chassis Hardware Specifications

The following tables provide information on the hardware specifications and the power characteristics of the Pilot, Controller, and Drive Enclosures.

Dimensions and Weight

Table 3: Pilot dimensions and weight

Attribute	Value
Height	1.68 in (4.26 cm)
Width	Server chassis (not including ears): 17.19 in (43.65 cm) Server chassis (with bezel): 18.9 in (48.24 cm)
Depth (not including power supply handles)	29.0 in (73.7 cm)
Weight	40 lb (18.1437 kg): Weight of one Pilot.

Table 4: Controller dimensions and weight

Attribute	Value
Height	3.45 in (8.76 cm)
Width	17.52 in (44.55 cm)
Depth	20.25 in (51.435 cm)
Weight	41 lb (18.59 kg)

Table 5: DE2-24P Drive Enclosure dimensions and weight

Attribute	Value
Height	3.46 in (8.79 cm); 2U
Weight (with drives)	55 lb (24.9 kg)
Width	Width across mounting flange: 19 in (48.26 cm) Width across body of enclosure: 17.44 in (44.29 cm)
Depth	24.8 in (62.99 cm)

Table 6: DE2-24C Drive Enclosure dimensions and weight

Attribute	Value
Height	6.92 in (17.57 cm); 4U
Weight (with drives)	110 lb (49.89 kg)
Width	Width across mounting flange: 19 in (48.26 cm) Width across body of enclosure: 17.44 in (44.29 cm)
Depth	24.8 in (62.99 cm)

Power Characteristics

Table 7: Pilot power characteristics

Power characteristic	Value
Frequency	50–60Hz
AC voltage	100–240V
Maximum power consumption for both nodes	314 VA
Current draw for both nodes	1.42A, 208V

Table 7: Pilot power characteristics (continued)

Power characteristic	Value
Maximum heat dissipation	1102 BTU/hr
AC receptacle type	IEC 60320 C14 inlet

Table 8: Controller power characteristics

Power characteristic	Value
Frequency (nominal)	50–60 Hz (47–63 Hz range)
Voltage (nominal)	100 to 127/200 to 240 Volts AC
Input current (maximum) for both nodes	13.6 A at 100–120 Volts AC (approximately) 8 A at 200–240 Volts AC (approximately)
Maximum power consumption for both nodes	874 VA (power at maximum FS1 Controller configuration)
Maximum heat dissipation	2830 BTU/hr
AC receptacle type	IEC 60320 C14 inlet

Table 9: Drive Enclosure power characteristics

Power characteristic	Value
Maximum output power	Maximum power consumption depends on the type of Drive Enclosure (DE2-24P or DE2-24C), its size (2U/4U), and configuration. • 4U HDD= 376VA (4TB HDD) • 2U SFF = 260VA (900GB SFF HDD) • 2U SSD = 307VA (19 x 1.6TB SSD)
Frequency	50–60 Hz
Voltage range	100–240 Volts AC rated
Maximum range selection	47–63 Hz
Maximum inrush current	20A
Power factor correction	95% or less at nominal input voltage
Harmonics	Meets EN61000-3-2
Operating temperature	5° –40° Celsius (41° —104° Fahrenheit)

System Power Requirements

The total power consumed by the Oracle FS1 Flash Storage System is dependent on the configuration of the system. To determine the system electrical input ratings for Oracle Flash Storage Systems that use the Oracle supported PDUs, refer to the PDU information provided for Oracle Flash Storage Systems.

Oracle Flash Storage Systems require redundant input power feeds for proper fault tolerant operation.

Note: Ensure that you have the exact power load and current requirements for your specific Oracle FS System at hand.

If non-Oracle PDUs are used, you must determine the electrical input ratings of the Oracle FS System configuration.

PDU Hardware Specifications

The PDUs used in a not-racked Oracle FS System installation must provide redundancy for both external AC power source and internal AC power

distribution to the components. The PDUs must provide sufficient current to meet the sum of the requirements for the Oracle FS System components.

Oracle PDUs might be purchased for use with non-Oracle racks. The Oracle FS System component power cords have been designed to work with vertical style Oracle or third party PDUs. Non-Oracle PDUs must be compatible with Oracle component power cord lengths and plug types. Non-Oracle PDUs must be mounted in a manner such that the power cords provided by Oracle might be used and the PDUs do not obstruct the ability to replace field replaceable units (FRUs) and customer serviceable units (CRUs).

While planning rack-space, ensure that adequate space is also allocated for the PDUs, if using non-Oracle PDUs.

The following tables provide information on the various PDUs for the Oracle FS Systems, with the assumption that there are two PDUs in each rack.

Note: The term "Ph" stands for "phase" in the above tables.

Table 10: Low voltage dual phase PDU for Oracle Flash Storage Systems

Low Voltage	2Ph (2W + ground)
kVA size	10 kVA
Marketing part number	7104982
Manufacturing part number	7051798
Phase	1 Phase No grounded neutral conductors are provided in the two input cords.
Voltage input	2x [2Ph (2W+ground)], 208Vac, 50/60 Hz, maximum. 24A per phase Can be connected to input sources in the range of 200V – 240V AC (nominal)
Number of input cords and plug type	2x NEMA L6-30P
Number of data center receptacles and type	2x NEMA L6-30R
Maximum input current for each cord	24A
Outlet receptacles (number/type)	42/C13 (seven for each outlet group) 6/C19 (one for each outlet group)

Table 10: Low voltage dual phase PDU for Oracle Flash Storage Systems (continued)

Low Voltage	2Ph (2W + ground)
Outlet groups for each PDU	6
PDU power cord length	2 meters (6.6 feet) PDU power cords are 4 m (13 ft) long, but only 2 m (6.6 ft) are usable outside of the cabinet.

Table 11: Low voltage three-phase PDU for Oracle Flash Storage Systems

Low Voltage	3Ph (3W + ground)
kVA size	15 kVA
Marketing part number	7104979
Manufacturing part number	7051909
Phase	3 No grounded neutral conductors are provided in the input cords.
Voltage input	3Ph [(3W+ground)] 208Vac, 50/60 Hz, maximum. 40A per phase Can be connected to Ph-Ph input sources in the range of 190V – 220V AC (nominal)
Number of input cords and plug type	1x IEC 309, 60A (Hubbell C460P9W or equivalent)
Number of data center receptacles and type	1x IEC 309, 60A (Hubbell 460R9S or equivalent)
Maximum input current for each cord	40A
Outlet receptacles (number/type)	42/C13 (seven for each outlet group) 6/C19 (one for each outlet group)
Outlet groups for each PDU	6
PDU power cord length	2 meters (6.6 feet) PDU power cords are 4 meters (13 feet) long, but sections are connected for internal routing in the rack.

Table 12: High voltage single phase PDU for Oracle Flash Storage Systems

High Voltage	1Ph (2W + ground)
kVA size	10 kVA
Marketing part number	7104983
Manufacturing part number	7051801
Phase	1
Voltage input	2x [2Ph. (2W+ground)] 230Vac, 50 Hz, maximum. 25A per phase Can be connected to Ph-N input sources in the range of 220V – 240V AC (nominal)
Number of input cords and plug type	2x IEC 309, 32A (Hubbell 332P6S or equivalent)
Number of data center receptacles and type	2x IEC 309, 32A (Hubbell 332R6S or equivalent)
Maximum input current for each cord	25A
Outlet receptacles (number/type)	42/C13 (seven for each outlet group) 6/C19 (one for each outlet group)
Outlet groups for each PDU	6
PDU power cord length	2 meters (6.6 feet) PDU power cords are 4 meters (13 feet) long, but sections are connected for internal routing in the rack.

Table 13: High voltage three-phase PDU for Oracle Flash Storage Systems

High Voltage	3Ph (5W + ground)
kVA size	15 kVA
Marketing part number	7104980
Manufacturing part number	7051915
Phase	3

Table 13: High voltage three-phase PDU for Oracle Flash Storage Systems (continued)

High Voltage	3Ph (5W + ground)
Voltage input	[3Ph. (4W+ground)] 230/400Vac, 50/60 Hz, maximum. 25A per phase Can be connected to Ph-N input sources in the range of 220V – 240V AC (nominal)
Number of input cords and plug type	1x IEC 309, 32A (Hubbell 532P6S or equivalent)
Number of data center receptacles and type	1x IEC 309, 32A (Hubbell 532R6S or equivalent)
Maximum input current for each cord	25A
Outlet receptacles (number/type)	42/C13 (seven for each outlet group) 6/C19 (one for each outlet group)
Outlet groups for each PDU	6
PDU power cord length	2 meters (6.6 feet) PDU power cords are 4 meters (13 feet) long, but sections are connected for internal routing in the rack.

Site Preparation Checklist (Not-racked Systems)

Before system installation, complete the tasks outlined in the pre-installation checklist as part of the site preparation and installation planning. Your Oracle Sales team can arrange for site audit and installation services.

Table 14: Site preparation checklist

Check	Site preparation or pre-installation planning items
Pre-installation site preparation: Prior to system delivery, a site audit must be conducted.	
❑	Determine the suitability of access routes to the installation location, such as carpet, doors, elevators, floor strengths, and ramps.
❑	Determine the load capacity of the floor where the system is to be installed.
❑	Verify the cleanliness of the site and inform the customer to perform any required cleaning.

Table 14: Site preparation checklist (continued)

Check	Site preparation or pre-installation planning items
❏	Note any problems or peculiarities at the site that require special equipment.
❏	Determine if there will be raised floors, where the cabling will be under the floor. For raised floors, cutout tiles with protected edges will be needed prior to installation.
❏	Determine the environmental conditions at the installation site, including temperature and humidity. The operating environment must remain between the operating temperatures of 41ºF —95ºF (5º— 35º Celsius) and the relative humidity must remain between 10% and 90% non-condensing. Operational altitude is from -200 to 10,000 feet.
❏	Ensure that the installation site provides adequate air conditioning. To bring the room to the appropriate temperature, operate the air conditioning system for 48 hours prior to the scheduled installation.
Unpacking logistics	
❏	Do not unpack components from their original packaging until you are ready to perform the Oracle FS System installation. **Note:** Stack the boxes containing the Drive Enclosures in inverse order with DE #1 on the top of the pile and DE #30 at the bottom.
Grounding requirements	
❏	Determine if all powered equipment are properly grounded for proper operation and safety. All power distribution units, branch wiring, and receptacles must be listed as grounding-type devices. Connect each component and power distribution unit into reliably grounded outlets. **CAUTION:** To reduce the risk of electric shock or damage to installed equipment, never disable the grounding plug on any power cord.
Rack requirements	
❏	Determine if the rack can support the weight load of an Oracle FS System.
❏	Determine if adequate space is available for the new racks or within existing racks.
❏	Determine if there is adequate room in the customer provided rack for all the Oracle FS System components.
Documentation requirements	
❏	Check the *Oracle FS1-2 Flash Storage System Release Notes* and MyOracle Support (MOS) (https://support.oracle.com/) portal to see if any software updates are available.

Table 14: Site preparation checklist (continued)

Check	Site preparation or pre-installation planning items
❏	Check the Oracle Technology Network (OTN) (http://www.oracle.com/technetwork/documentation/oracle-unified-ss-193371.html) for all relevant documentation: • For instructions on system unpacking, installation, and initial configuration, refer to this guide. • For instructions on installing software updates, refer to the *Oracle FS1-2 Flash Storage System Release Notes* and to the *Oracle Flash Storage System Administrator's Guide.* • For instructions on configuring the system, refer to the *Oracle Flash Storage System Administrator's Guide.* • For instruction on servicing the replaceable units within the system, refer to the *Oracle FS1-2 Flash Storage System Field Service Guide.*
Data path interface requirements	
❏	Ensure that data path interfaces or connectors meet Oracle specifications and speed requirements.
Network connectivity requirements	
❏	Two 1 Gb/10 Gb Ethernet network cables, one for each Pilot to enable Pilot connectivity to the management network.
❏	Obtain three IP addresses for the Pilot management interfaces. The shared IP address may be assigned using DHCP. The address for each Pilot may not be assigned using DHCP. DNS hostnames for the Pilot management interfaces are optional, but recommended. The standard Pilot configuration or the Oracle FS System factory default IP addresses are as follows: • Shared IP: 10.0.0.2 • Pilot–1: 10.0.0.3 • Pilot–2: 10.0.0.4 • Gateway: 10.0.0.1 • Netmask: 255.255.255.0
Global system parameters	
❏	The Oracle FS System defaults to the correct Call-Home connection parameters and IP addresses, if it uses a direct connection to the Oracle servers. If you are using a Proxy server, the information on the Call-Home connection parameters and IP addresses comes from the local network and firewall administrators. Get the Call-Home configuration modes from the site network and/or firewall administrators.

Table 14: Site preparation checklist (continued)

Check	Site preparation or pre-installation planning items
❑	Set the operating mode of the management Ethernet: auto-negotiation, or manual speed and duplex.
❑	Configure the DNS server and backup DNS server for Call-Home.
❑	Get the IP address of your primary NTP server for synchronizing system time. This is recommended for SAN and required for NAS.
❑	Configure an email server for password recovery and optionally for sending e-mail notifications.
❑	Configure SNMP servers for traps and monitoring.
❑	If a UPS is being used, get the IP address of the UPS device and the UPS SNMP community string.
Oracle FS System Manager GUI access	
❑	Ensure that you have the default customer login and the default support login.
❑	Download and install the GUI or the command line interface (CLI) or both from http://*system-name-ip*, where system-name-ip is the name or the public IP address of your system.
SAN storage parameters	
❑	Understand enough about SANs to specify capacity, type of redundancy, priority over other volumes, random or sequential file access, read or write I/O bias, and Clone LUN space requirements.

Related Links

Not-Racked Systems
Installation Overview

Unpacking Systems

Not-racked Oracle FS System components are shipped in separate cardboard cartons on a pallet.

Each shipping carton contains the following items taped on the cardboard:

- Customer system record
- Product label
- Component label

Figure 3: Shipping carton labels
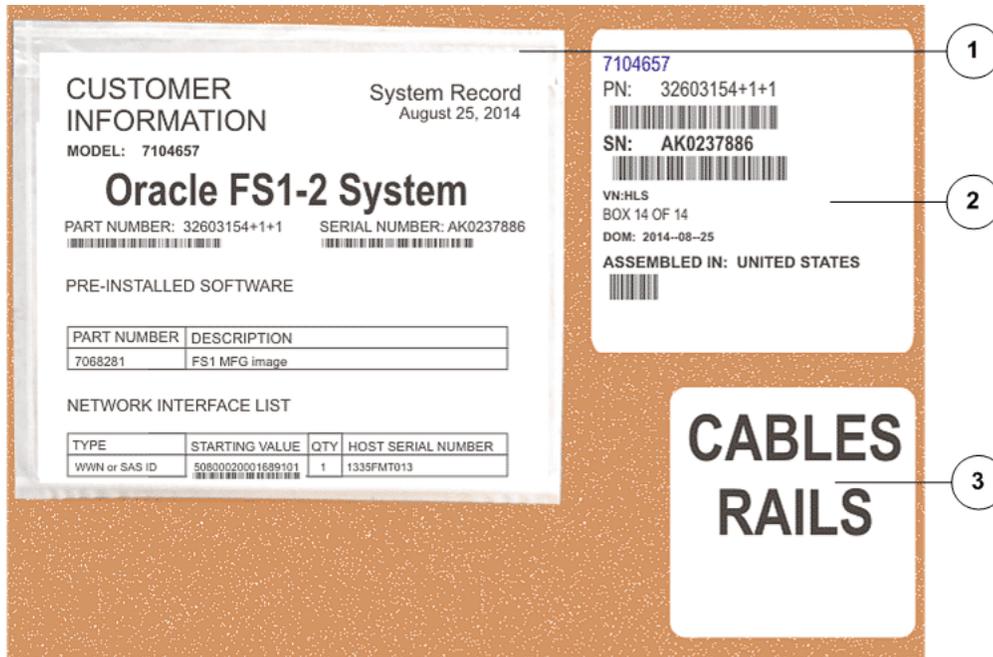
Legend	
1	Customer system record
2	Product label
3	Component label

Note: The graphic of the shipping carton labels is representative and there might be slight variations in your packaging.

The customer system record lists all the components and replaceable units along with their associated part numbers.

The product label includes the following information:

- Top level Marketing number
- Manufacturing part number
- Top level serial Number
- Site code (HLS)
- Box count
- Date of manufacturing
- Country of origin

The component labels identify the component inside the shipping carton and the sequence number of the component. For example, the Controllers are labeled as "CU 1" and "CU 2". The Pilots are labeled "PLT 1" and "PLT 2". The Drive Enclosures are labeled as "DE 1" "DE 2," and so on. The Replication Engines are labeled as "MAXREP 1", "MAXREP 2", "MAXREP 3", or "MAXREP 4". Power, network, and labeled cables are shipped in an accessory box that is labeled as

"Cables.". The component labels help facilitate the assembly of an Oracle FS System at the customer site and are usually temporary.

Note: While ordering or receiving multiple not-racked Oracle FS Systems, it is critical to make sure that all shipping cartons are grouped by the top level serial number. If components from systems with different system serial numbers are mixed, the resulting assembled systems will not boot.

Besides, Drive Enclosures and Controllers have seven segment identification displays that indicate the chassis ID. The seven segment displays on the Drive Enclosures and Controllers can be changed by the customer.

Note: To avoid a disconnect between the temporary component label and the chassis ID displayed on the seven segment display, Oracle recommends removing the temporary labels after installing a not-racked system.

A *Before You Begin* document inside the shipping carton provides some basic instructions for unpacking, cabling, and drive replacement procedures. A generic Sun Server X3-2 manual is also available in the carton along with an instruction card for installing the rack rails on the Pilot.

Related Links
Check and Receive Components
System Components
Electrostatic Discharge Precautions
Warnings and Cautions
Required Tools

Check and Receive Components

Check to verify the content of the shipping cartons for the not racked Oracle FS System prior to unpacking the system components.

1 Check all the shipping cartons for any visible damage.

2 Check the components against the packing list to verify that all components have been shipped.

   Note: Do not unpack all the cartons at once. Otherwise, items might get misplaced. Also, there might not be enough space in the data center to open all the boxes together.

3 Organize all of the boxes so that the related components are grouped together before unpacking the shipment.

   For example, organize the Drive Enclosures boxes into one group. Organize the Controller boxes into another group, and so on. Use the information on the labels that are applied to the boxes as a guideline for organizing the groups.

4 Unpack the cables and arrange them in an organized manner with the labels showing.

The labels that are applied to cables during the manufacturing process can help facilitate the process of cabling by providing you the details that define each cable attachment.

5   Remove the system record and other instructional documents from the cartons and keep them aside for reference.

6   Attach the World Wide Node Number (WWnN) label and the system serial number (SSN) label at the designated locations.

Related Links

Unpacking Systems

System Components

Required Tools

Before starting the installation of an Oracle Flash Storage System, be sure you have the required equipment and tools available.

Table 15: Required tools

Tool	Purpose	Illustration
Number 1 and Number 2 Phillips-head screwdrivers	Remove and secure Oracle Flash Storage System hardware components.	
Offset box wrench, 13/32 inches	Work with adjustable mounting rail assemblies.	
Torx® T20 screwdriver	Attach rail assemblies and secure hardware components to the rails.	
Torx® T30 screwdriver	Connect two racks.	
Wire cutters	Cut cable wraps on the power cords.	

Warnings and Cautions

Hazard signal words conform to the American National Standards Institute (ANSI) Z535.4-2002 meanings.

CAUTION: Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury.

DANGER: Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

Tip: To indicate best practices for a process.

Important: To emphasize a point, to remind you of something, or to indicate potential problems in the outcome of the in-process task.

Electrostatic Discharge Precautions

CAUTION: Before you handle a component, make sure that you have taken electrostatic discharge (ESD) precautions:

- The minimum requirement is an anti-static wrist strap connected to a hard ground. Remove components from their packaging and place them on an ESD-qualified table that is equipped with ground points for wrist straps.

- Static charges can build up rapidly on rolling carts. If you transport a hardware component by cart, ground the cart with a drag chain on an ESD floor. If there is no ESD cart available or ESD floor, ground yourself before you touch a component that has been transported on a cart.

Multiple Rack Systems

Multiple-rack systems might require removal of the side panels between the adjacent racks to allow cables to be routed between the racks. Refer to the rack vendor's documentation for more information.

Use a mini-SAS to mini-SAS HD cable (19.69 feet/6m) to connect a Controller in one rack to a Drive Enclosure in another rack.

Use a mini-SAS to mini-SAS cable (19.69 feet/6m) to connect a Drive Enclosure in one rack to a Drive Enclosure of the same string in another rack.

The following figure shows a wiring diagram for cabling a Controller in one rack to a Drive Enclosure in another rack.

Figure 4: Controller-to-Drive Enclosure cabling between two racks

Legend	1 Back of a rack	3 Cable Management Arm (CMA)
	2 Controller	4 Drive Enclosure

Related Links
Types of Internal Cables

CHAPTER 2

Prepare for System Installation

Prepare for Installation

Component Placement

Oracle recommends the following rack unit (RU) locations for installing the components in the rack:

Table 16: Default component placement in racks

Component type	RU space for installation	RU space if a DE2-24C DE follows RU 18
Drive Enclosures	RU 1 to RU 20	RU 1 to RU 18
Pilot-1	RU 21	RU 19
Pilot-2	RU 22	RU 20
Controller-1	RU 23, RU 24	RU 21, RU 22
Controller-2	RU 25, RU 26	RU 23, RU 24
Remaining Drive Enclosures	RU 27 to RU 42	RU 25 to RU 28 (next DE2-24C DE) RU 29 to RU 42

If the Oracle FS System includes one Replication Engine, then follow the placement shown in the following table:

Table 17: Component placement with one Replication Engine

Component type	RU space for installation	RU space if a DE2-24C DE follows RU 16
Drive Enclosures	RU 1 to RU 18	RU 1 to RU 16
Replication Engine-1	RU 19, RU 20	RU 17, RU 18
Pilot-0	RU 21	RU19
Pilot-1	RU 22	RU20
Controller-1	RU 23, RU 24	RU 21, RU22

Table 17: Component placement with one Replication Engine (continued)

Component type	RU space for installation	RU space if a DE2-24C DE follows RU 16
Controller-2	RU 25, RU 26	RU 23, RU 24
Remaining Drive Enclosures	RU 27 to RU 42	RU 25 to RU 28 (next DE2-24C DE) RU 29 to RU 42

If the Oracle FS System includes two Replication Engines, then follow the placement shown in the following table:

Table 18: Component placement with two Replication Engines

Component type	RU space for installation	RU space if a DE2-24C DE follows RU 14
Drive Enclosures	RU 1 to RU 16	RU1 to RU14
Replication Engine-2	RU 17, RU18	RU 15, RU 16
Replication Engine-1	RU 19, RU 20	RU 17, RU18
Pilot-0	RU 21	RU 19
Pilot-1	RU 22	RU 20
Controller-1	RU 23, RU 24	RU 21, RU 22
Controller-2	RU 25, RU 26	RU 23, RU 24
Remaining Drive Enclosures	RU 27 to RU 42	RU 25 to RU 28 (next DE2-24C DE) RU 29 to RU 42

If the Oracle FS System includes three Replication Engines, then follow the placement shown in the following table:

Table 19: Component placement with three Replication Engines

Component type	RU space for installation	RU space if a DE2-24C DE follows RU 12
Drive Enclosures	RU 1 to RU 14	RU 1 to RU 12
Replication Engine-3	RU 15, RU 16	RU 13, RU14
Replication Engine-2	RU 17, RU 18	RU 15, RU 16
Replication Engine-1	RU 19, RU 20	RU 17, RU 18
Pilot-0	RU 21	RU 19
Pilot-1	RU 22	RU 20
Controller-1	RU 23, RU 24	RU 21, RU 22

Table 19: Component placement with three Replication Engines (continued)

Component type	RU space for installation	RU space if a DE2-24C DE follows RU 12
Controller-2	RU 25, RU 26	RU 23, RU 24
Remaining Drive Enclosures	RU 27 to RU 42	RU 25 to RU 28 (next DE2-24C DE) RU 29 to RU 42

If the Oracle FS System includes four Replication Engines, then follow the placement shown in the following table:

Table 20: Component placement with four Replication Engines

Component type	RU space for installation	RU space if a DE2-24C DE follows RU 10
Drive Enclosures	RU 1 to RU 12	RU1 to RU10
Replication Engine-4	RU 13, RU 14	RU 11, RU 12
Replication Engine-3	RU 15, RU 16	RU 13, RU 14
Replication Engine-2	RU 17, RU 18	RU 15, RU 16
Replication Engine-1	RU 19, RU 20	RU 17, RU 18
Pilot-0	RU 21	RU 19
Pilot-1	RU 22	RU 20
Controller-1	RU 23, RU 24	RU 21, RU 22
Controller-2	RU 25, RU 26	RU 23, RU 24
Remaining Drive Enclosures	RU 27 to RU 42	RU 25 to RU 28 (next DE2-24C DE) RU 29 to RU 42

Component Numbering

Oracle FS Systems support two Pilots (Pilot-1 and Pilot-2). Additionally, Oracle FS Systems support two Controllers (Controller-1 and Controller-2) and 1 to 30 Drive Enclosures (DE-1 to DE-30).

The chassis ID number of the Drive Enclosure is based on the order by which the Controller identifies the Drive Enclosures. Drive Enclosures are also assigned a chassis ID number in the Oracle FS System Manager GUI that is labeled Enclosure Chassis ID. The chassis ID number can be changed using the GUI. The chassis ID number displayed on the chassis must always match the Enclosure Chassis ID displayed on the GUI.

Tip: The Drive Enclosure sticker on the back of the chassis must be removed once the Drive Enclosure is installed in the rack because the seven segment display is now the preferred method to identify the Drive Enclosure.

Tip: The chassis ID in the Drive Enclosure identification display always matches the ID shown in the GUI. Drive Enclosures are identified by the serial number and the World Wide Name (WWN). Sometimes, the physical order in which the Drive Enclosures are stacked and cabled in might differ from the cabling order recommended in this document. If the Drive Enclosures appear out of order (not, 1 through 30 in sequence bottom up), then the customer can change it through the GUI. But the GUI and the identification display on the chassis must always match.

The Pilots, Controllers, and the Replication Engines must also be numbered sequentially from the bottom to the top of the rack. Refer to the following example for more information on component numbering of the rack-ready Oracle FS Systems.

The chassis ID numbers on the Controllers can also be manually changed from the GUI.

Figure 5: Component numbering in Oracle FS Systems

RU	Component
42	
41	4U DE (12)
40	
39	
38	
37	4U DE (11)
36	
35	
34	
33	4U DE (10)
32	
31	
30	
29	4U DE (09)
28	
27	
26	Controller Node 2
25	
24	Controller Node 1
23	
22	Pilot Node 2
21	Pilot Node 1
20	Replication Appliance 2
19	
18	Replication Appliance 1
17	
16	2U DE (08)
15	
14	2U DE (07)
13	
12	2U DE (06)
11	
10	2U DE (05)
9	
8	2U DE (04)
7	
6	2U DE (03)
5	
4	2U DE (02)
3	
2	2U DE (01)
1	

RU	Component
42	
41	4U DE (14)
40	
39	
38	
37	4U DE (13)
36	
35	
34	
33	4U DE (12)
32	
31	
30	
29	4U DE (11)
28	
27	
26	Controller Node 2
25	
24	Controller Node 1
23	
22	Pilot Node 2
21	Pilot Node 1
20	2U DE (10)
19	
18	2U DE (09)
17	
16	2U DE (08)
15	
14	2U DE (07)
13	
12	2U DE (06)
11	
10	2U DE (05)
9	
8	2U DE (04)
7	
6	2U DE (03)
5	
4	2U DE (02)
3	
2	2U DE (01)
1	

Note: The above example shows eight DE2–24P Drive Enclosures (2 RU), four DE2–24C Drive Enclosures (4 RU), and two Replication Engines.

WWnN and System Serial Number Labels

The system serial number (SSN) labels and the Controller World Wide Node Number (WWnN) labels are on the Oracle FS System to facilitate system identification.

Figure 6: WWnN label

Following is a representation of the SSN label that contains the system serial number and the Oracle part number of the Oracle FS System.

Figure 7: SSN label

Attach the WWnN and System Serial Number Labels

Carefully follow these instructions to ensure that all system labels are attached at the recommended locations on the Oracle FS System components.

Important: Ensure that the bag containing the labels is not misplaced. Otherwise, errors might result in the accurate identification of the Oracle FS System.

The rack labels, the system serial number (SSN) labels, and the Controller World Wide Node Number (WWnN) labels are packaged and shipped in a bag inside the carton for Pilot-1. Attach these labels at the recommended locations on the Oracle FS System to facilitate system identification.

1   Attach one SSN label to the top left at the back of the rack.

Figure 8: SSN label location: (top of the left PDU in the rack)
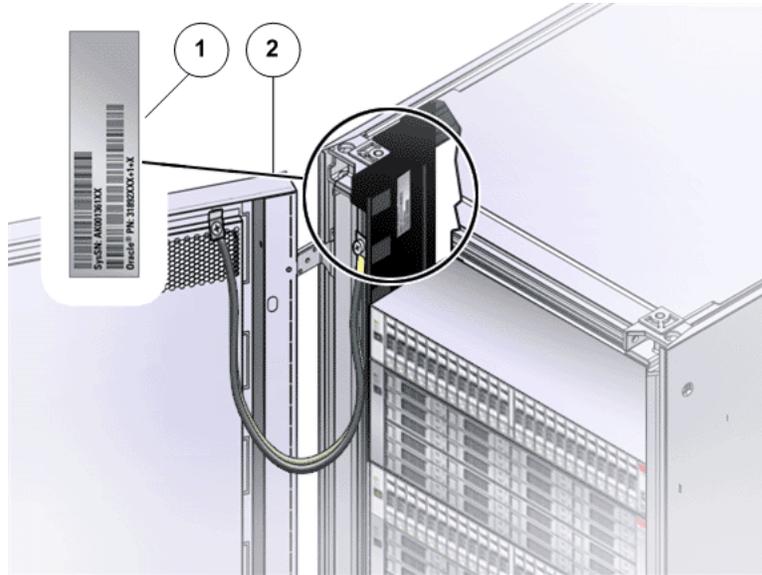
Legend	1 SSN label
	2 Rack

2   Attach one SSN label on the door jam towards the middle on the left frame at the front of the rack.

Figure 9: SSN label location: (middle of the left frame at the front of the rack)
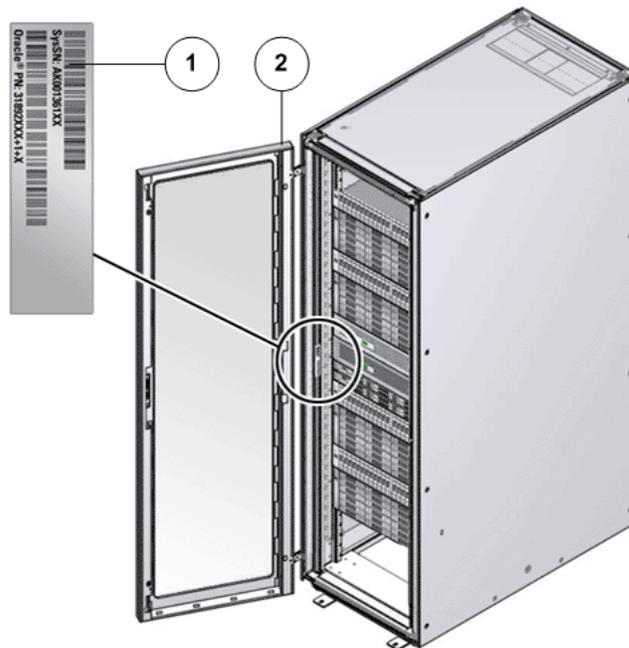
Legend	1 SSN label

2 Rack

3   Attach the World Wide Node Number (WWnN) label on the chassis of the bottom Controller at the front to the right of the Controller product serial number label.

Figure 10: WWnN location: (Controller front next to SSN label)
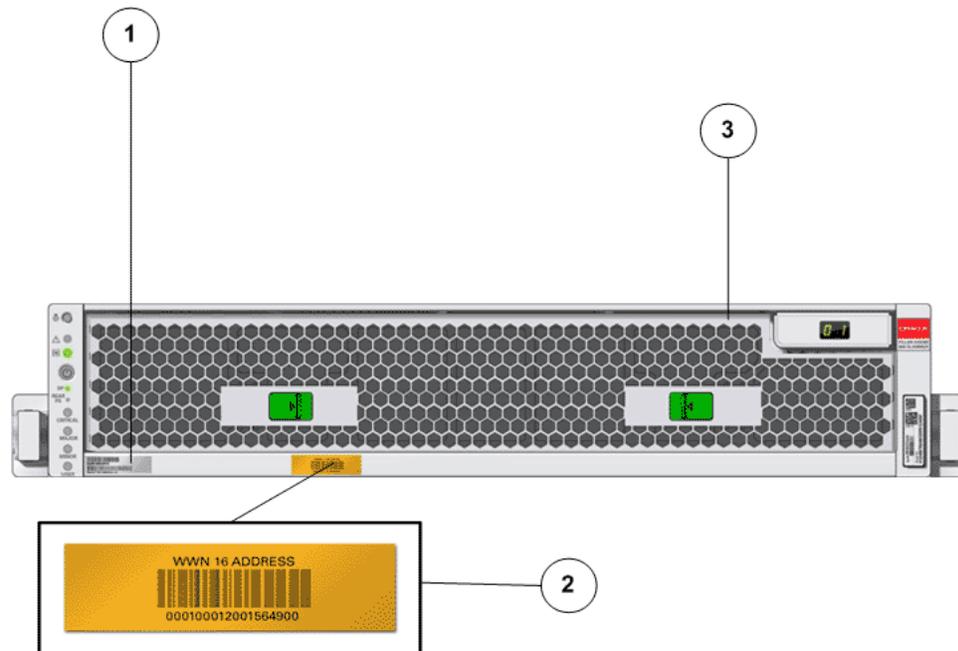
Legend	1 Pre-existing Controller SSN label on the chassis
	2 WWnN label
	3 Controller front

Prepare the Rack

Not-racked systems require preparation of the rack prior to component installation and cabling into the rack. Refer to the vendor's rack documentation for detailed information on unpacking the rack, positioning the rack, and stabilizing the rack.

To create a bay of racks, first remove the adjacent (inner) side panels from each rack and move the racks into position. You must route the cables directly from one rack to the other through the open sides of the racks because the cables are not long enough to route through a raised floor.

Related Links
Remove a Side Panel From a Rack
Remove the Doors From a Rack

Remove the Doors From a Rack

Remove the rack doors to make the placement of the components easier.

1   If locked, unlock the front and back doors of the rack.

2   Release all door hinges, as well as any grounding straps.

Figure 11: Rack door removal
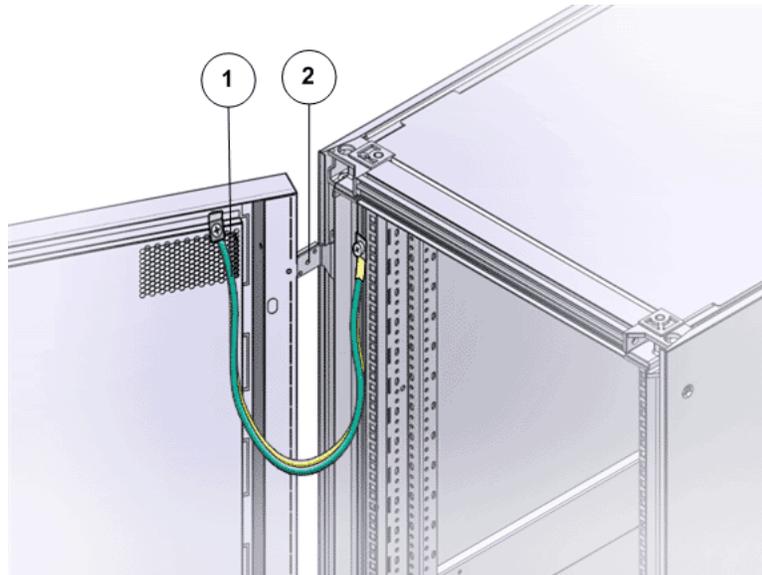
Legend	1 Ground strap
	2 Rack door hinge

Note: This is an example of removing the doors from a rack. Your rack may differ from the illustration. Consult the rack vendor's documentation for details on removing doors and ground straps.

3   Remove the doors and set them aside.

Note: Use care to place the doors where they cannot fall on people or slide and cause injury.

Important: After installing an Oracle FS System, shut all the doors, re-attach the ground straps to maintain compliance with applicable emissions requirements.

Remove a Side Panel From a Rack

You might be required to remove the rack side panels to have sufficient space to perform service actions such as replace components or cable Drive Enclosures. Consult the rack vendor's documentation for details on how to remove the side panels.

Important: Be sure not to pinch any cables that might have strayed from their proper location.

Rack Installation Safety Precautions

Follow these safety precautions when installing the components in the rack.

CAUTION: If non-Oracle FS System equipment must be installed in the rack, additional care must be taken to ensure that this equipment does not cause overheating of the Oracle FS System components or block air flow. All Oracle FS System components meet these requirements, but ONLY if the installation and rack position guidelines are carefully followed.

CAUTION: Always load components into a rack from the bottom to the top so that the rack does not become top-heavy and tip over.

CAUTION: Avoid elevated operating ambient temperature. If the component is installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment might be greater than room ambient temperature. Therefore, make sure that the environment is compatible with the maximum ambient temperature (TMA) specified for the component.

CAUTION: Make sure that there is sufficient amount of airflow required for safe operation of each component.

CAUTION: Mounting of a component in the rack should be such that a hazardous condition is not created due to uneven mechanical loading.

CAUTION: Consideration should be given to the connection of a component to the supply circuit and the effect that overloading of the circuits might have on over-current protection and supply wiring. Appropriate consideration of component nameplate power ratings should be used when addressing this concern.

CAUTION: Reliable grounding of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (for example, use of power strips).

CAUTION: Do not use slide-rail mounted equipment as a shelf.

Install Component Rails

Install Component Rails

Install the rack rails on the rack at the designated rack unit (RU) locations and the slide rails on the component chassis prior to inserting the components into the rack.

Controller Rails

Adding Controllers in the rack requires you to install rack rails in the rack and slide rails on the chassis for each Controller that you plan to add.

Controller rail kits can be installed in the Sun ™ Rack 900, the Sun Rack 1000, and third-party ANSI/EIA 310-D-1992 or IEC 60927 compliant racks with the following types of holes:

- Square
- Round
- Threaded

Figure 12: Examples of supported rack holes
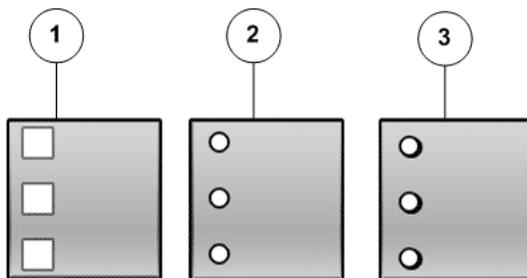
Legend	1 Square holes
	2 Round holes
	3 Threaded holes

CAUTION: Oracle recommends that you install each Controller after you install the rail kit before installing the next combination of rail kit and Controller. Installing all of the rail kits and then inserting the Controllers is not always possible because of potential space limitations at some data centers. Also, you

run the risk of not placing the Controllers in the correct rack position and causing possible cabling issues.

Note: Controller rails are packaged within the Pilot shipping carton (not the Controller shipping carton). Ensure that the Controller rails are not misplaced during unpacking.

Controller Rail Kits

The Controller rail kit contains the following items:

- One slide rail that attaches to the rack posts
- One mounting bracket that attaches to the Controller chassis
- CMA with six pre-installed cable clips
- Package of mounting screws and nuts in assorted sizes to fit various types of racks and cabinets
- Manufacturer's instruction sheet for the CMA

The following table summarizes the mounting hardware packaged with the Controller rail kits.

Table 21: Controller rail kit mounting screws

Contents of the mounting screw packet	Quantity	Usage
10-32 pan head screw	8	Assemble main and extender sections of left and right rails (Typically, left and right rails are shipped pre-assembled)
8-32 pan head screw	4	Mount left and right rails to front of cabinet rails
Metric M6 pan head screw	8	• Mount left and right rails to back of cabinet rails • Secure front of chassis to left and right cabinet rails
6–32 flat head screw	2	Secure back of chassis to left and right side rails

Tip: Ensure that you have all of the parts in the Controller rail kit before you begin the installation of the Controller rails on the rack and the Controller chassis.

Note: To locate part numbers for the rail kits, open *Oracle System Handbook* (https://support.oracle.com/handbook_private/index.html) and go to the Oracle FS1 Flash Storage System components list. Part numbers are listed in the components list.

Install the Rack Rails for the Controller

Prior to adding Controllers, install rails into the rack for each Controller that you plan to add.

Prerequisites:
- Ensure that you have adequate room to work around the rack while installing the rails and the Controller.
- Attach an electrostatic discharge (ESD) wrist strap to your wrist, and stand on an ESD mat while replacing components.
- Ensure that you have a Phillips Number 2 screwdriver with at least a 4-inch shaft.
- If you are installing the rails in a rack with threaded holes, make sure you have a Torx Number 20 screwdriver.

1 Mark the rack mount hole where you plan to mount the Controller.

The Controller requires two standard rack units (2U) of vertical space.

2 Remove the rails from the packaging.

3 Position the front of the left rail behind the left front rack rail.

Figure 13: Controller rack mount location
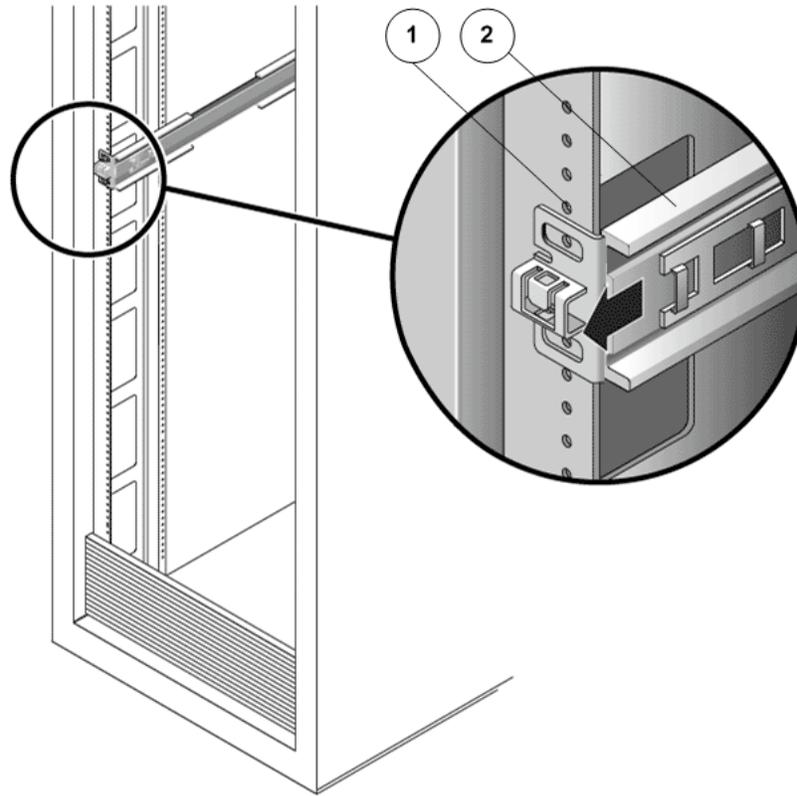
Legend	1 Rack mount holes
	2 Left rail

4   Use a Phillips Number 2 screwdriver to insert and tighten two 8-32 panhead screws to secure the left rail to the front of the rack.

Note: Each Controller requires two standard mounting units (2U) of vertical space in the rack. Each standard mounting unit (U) has three mounting holes in the left and right rack rails.

Note: Insert the screws into the lowest holes in the top two mounting units of the 2U slot in which the chassis is to be mounted. These screws pass through the rack rail holes and screw into threaded holes in the left rail.

Figure 14: Left rail secured to the front of the rack
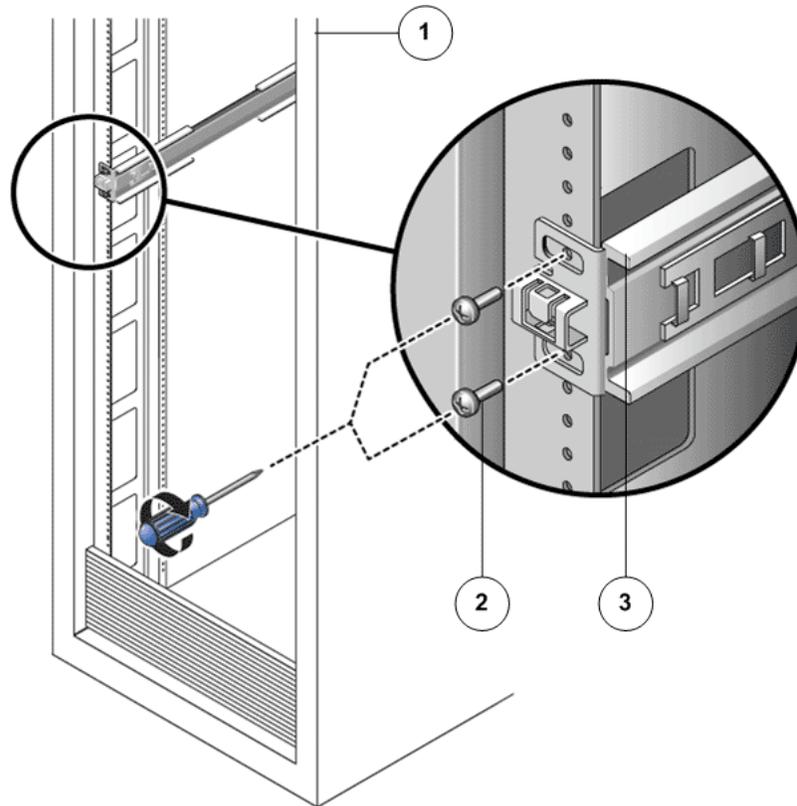
Legend	1 Rack
	2 8–32 screws to secure left rail to rack
	3 Left rail

5   Repeat the above two steps for the right rail.

6   At the back of the rack, adjust the length of the left rail as needed to fit the rack, and position the rail flange over the face of the rack rail.

Figure 15: Left rail adjusted at the back of the rack
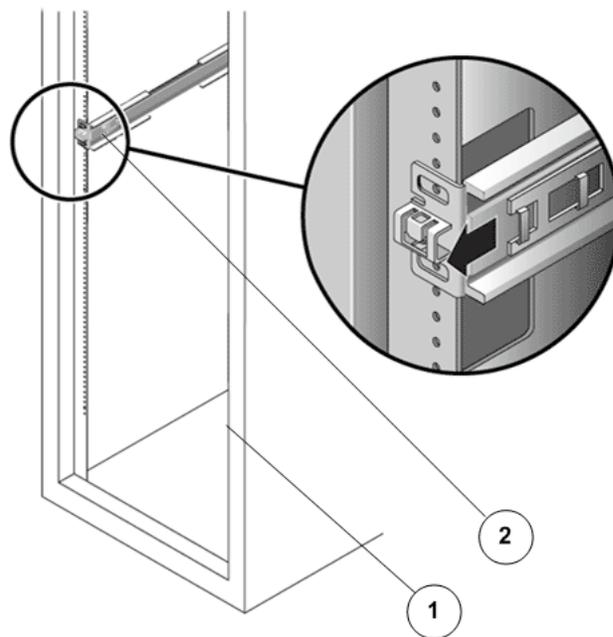
Legend	1 Back of the rack
	2 Left rail

7 Align the rail flange so that the mounting holes correspond to those at the front of the rack.

8 Use a Phillips screwdriver to insert and tighten four metric M6 screws (two on each side) at the back of the rail.

9 Repeat the above three steps for the right rail.

10 Using a Phillips Number 2 screwdriver, tighten the eight 10-32 panhead adjustment screws (four on each side) toward the back of each rail.

Install the Slide Rails for the Controller

1 Extend the mounting brackets completely out of their respective slide rails.

Tip: To extend the mounting brackets out of the slide rails, simultaneously press and hold the upper and lower lock buttons of the slide rail lock. Then, pull the mounting bracket out until it locks in the extended position.

Figure 16: Slide rail assembly unlocked
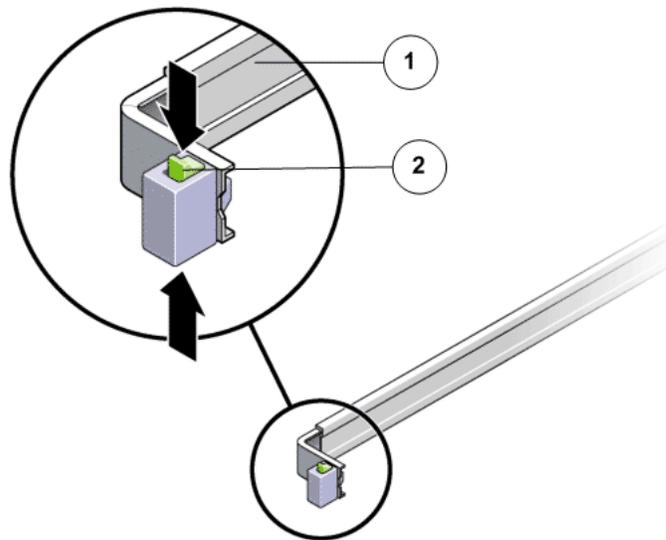
Legend

1 Slide rail assembly	
2 Slide rail lock button	

2   Slide the mounting bracket release button, and then slide the mounting bracket out of the slide rail.

Figure 17: Mounting bracket release button
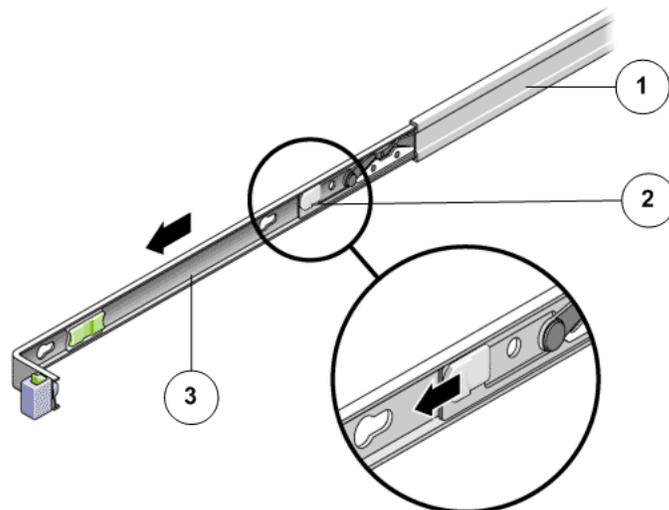
Legend

1 Slide rail	
2 Mounting bracket release button	

3 Mounting bracket

Figure 18: Slide rail middle section unlocked
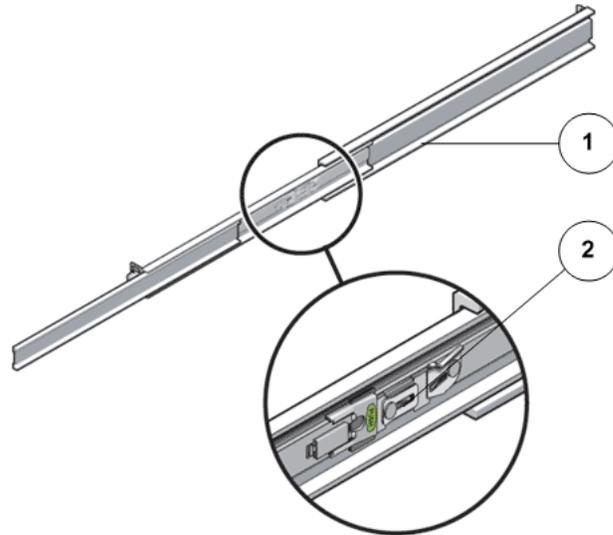
Legend	1 Slide rail
	2 Metal lever

Tip: Press the metal lever on the middle section of the slide rail to unlock the slide rail, and then push the middle section back into the rack.

3   Attach a mounting bracket to the right side of the Controller chassis.

Figure 19: Mounting bracket attached to the chassis
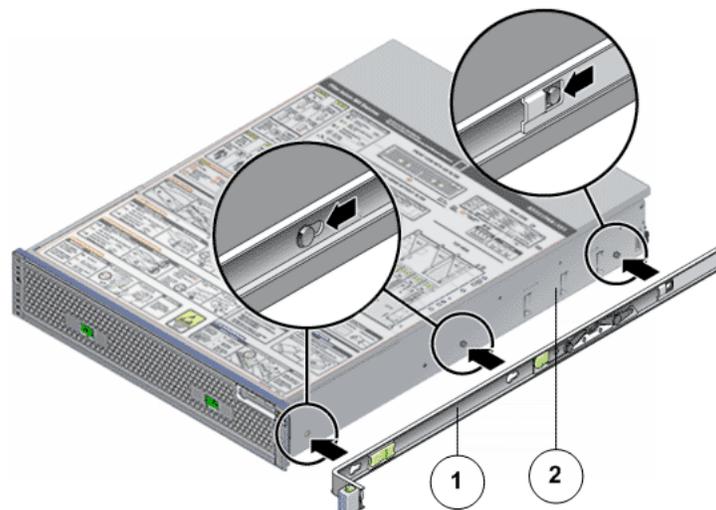
Legend	1 Mounting bracket
	2 Controller chassis

Tip: Position the mounting bracket against the Controller chassis so that the mounting bracket are aligned with screw holes and then install the screws.

4   Attach the second mounting bracket to the left side of the Controller chassis.

5   Determine which rack hole numbers to use when attaching the slide rails to the rack posts.

Note: The Controller is two rack units tall (2U). The slide rails will occupy the lower half of the 2U space.

6   Determine which screws you will use to mount the slide rails.

Tip: If your rack has threaded mounting holes in the rack posts, determine whether the threads are metric or standard. Select the appropriate screws from the package included in the mounting kit. If your rack does not have threaded mounting holes, the mounting screws are secured with a caged nut.

7   Attach a slide rail to the right front rack post.

Figure 20: Slide rail mounted on the rack post
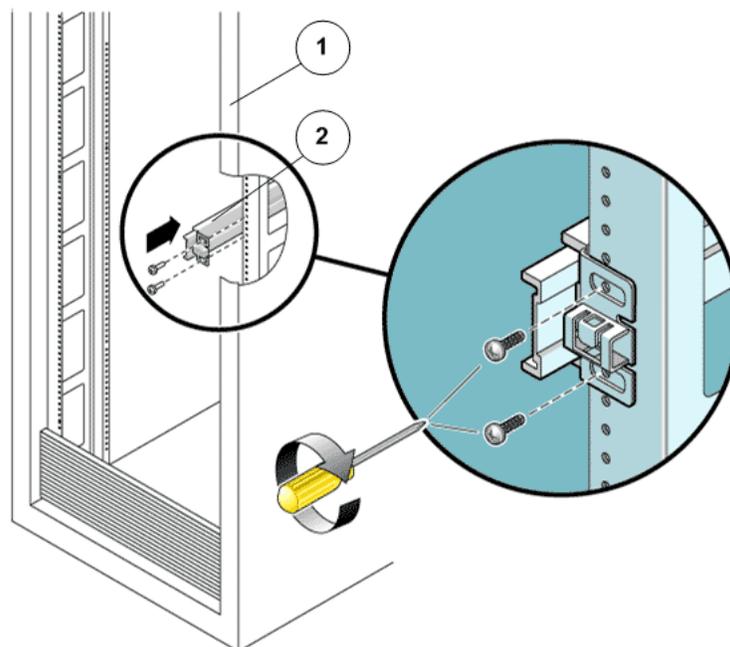
Legend	1 Rack post
	2 Slide rail

Tip: Loosely attach the front of a slide rail to the right front rack post using two screws but do not tighten the screws yet. Adjust the length of the slide rail by sliding the back mounting flange to reach the outside edge of the back rack post. Loosely attach the back of the slide rail to the back rack post with two screws.

8　Attach the second slide rail to the left rack posts in a similar manner.

Tip: Do not tighten the screws.

9　Use the slide rail spacing tool to adjust the distance between the slide rails.

Figure 21: Slide rail spacing tool
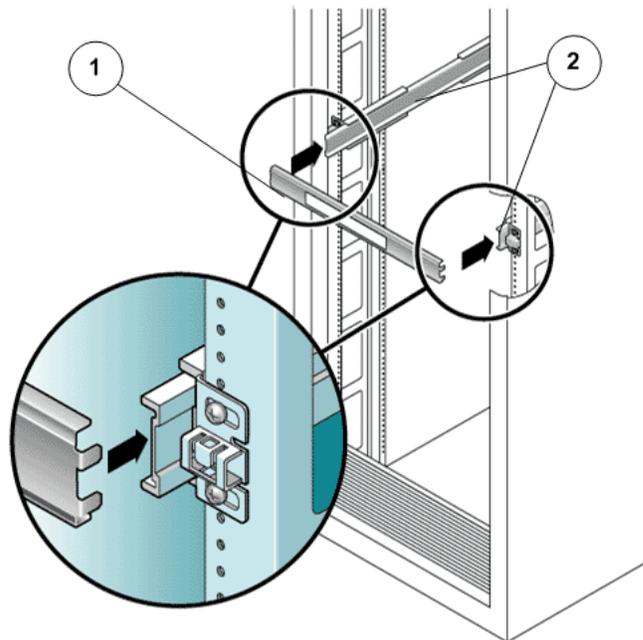
Legend	1 Spacing tool
	2 Slide rails

Tip: At the front of the rack, plug the left side of the tool into slots at the end of the left rail. Insert the right side of the tool into the front end of the right rail, while sliding the end of the rail to the right or left as needed to allow the ends of the tool to enter the ends of both rails. The distance between the rails is now equal to the width of the Controller with mounting brackets.

10　Tighten the screws to lock the front ends of the rails in place.

11　Repeat the steps for the back ends of the rails.

12　Deploy the anti-tilt mechanism on the rack, if any.

CAUTION: The weight of the Controller on extended slide rails can be enough to overturn a rack.

13　Insert the ends of the mounting brackets into the sliding rails.

Figure 22: Controller chassis mounted on the slide rails
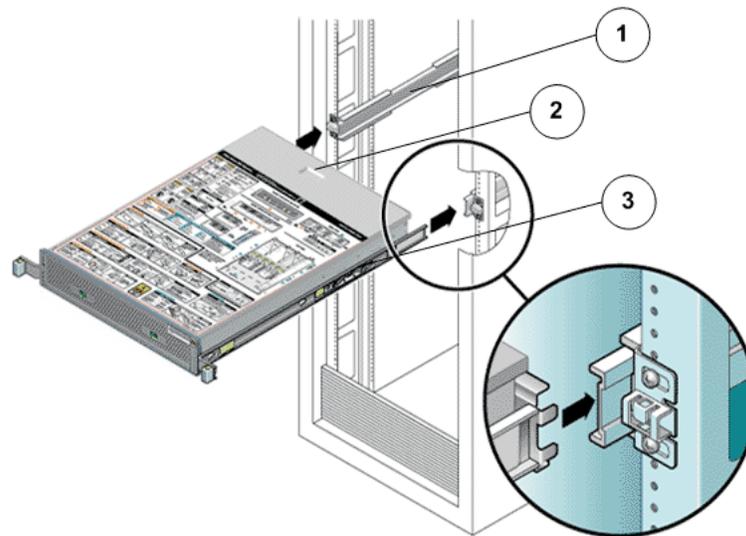
Legend	1 Slide rails
	2 Controller chassis
	3 Mounting brackets

CAUTION: Work with a partner or use a mechanical lift for assistance. The Controller weighs approximately 70 lbs (31.75 kg). Two people are required to carry the chassis.

14 Simultaneously release the rail locks on each side of the sliding rails, and guide the Controller chassis into the rack.

CAUTION: Verify that the Controller is securely mounted in the rack, and that the slide rails are locked to the mounting brackets, before continuing.

Install the Controller CMA

The cable management arm (CMA) clips into the ends of the left and right Controller slide rail assemblies. No screws are necessary for mounting the CMA. The right sides of the two CMA arms have hinged extensions. On the manufacturer's instruction sheet, the smaller extension is called the CMA Connector for Inner Member. It attaches to the right mounting bracket. The larger extension is called the CMA Connector for Outer Member, and attaches to the right sliding rail.

Note: The CMA shown in the graphics might vary slightly from the CMA shipped with your product.

1 At the back of the rack, plug the CMA rail extension into the end of the left slide rail assembly.

Figure 23: CMA rail extension inserted into the back of the left slide rail
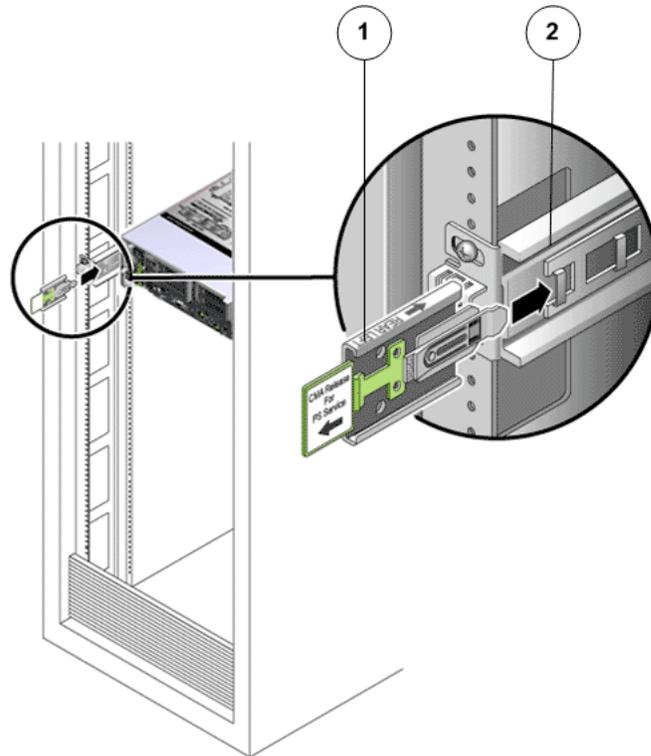
Legend	1 CMA rail extension
	2 Slide rail

CAUTION: Support the CMA during this installation. Do not allow the assembly to hang by its own weight until it is secured by all three attachment points.

2   Insert the smaller extension into the clip located at the end of the mounting bracket.

Figure 24: Inner CMA connector mounted
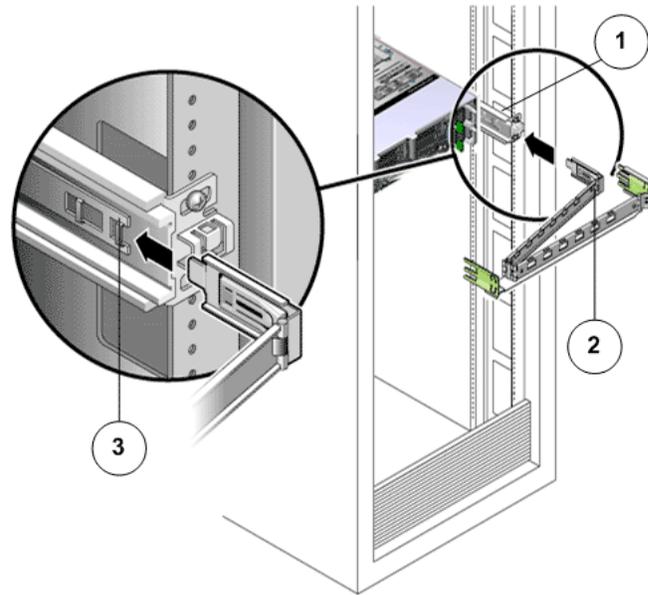
Legend	1 Slide rail
	2 Inner CMA connector
	3 Clip

3   Insert the outer CMA connector into the end of the right sliding rail.

Figure 25: Outer CMA connector attached
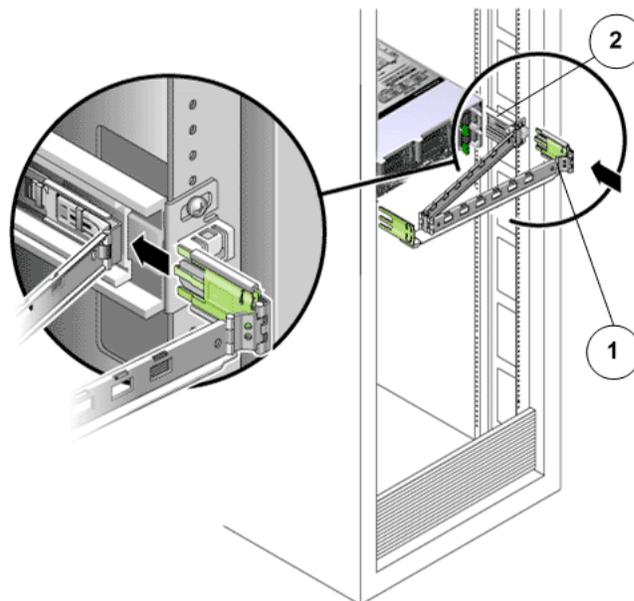
Legend	1 Outer CMA connector

2 Slide rail

4   Fully insert the hinged plastic connector at the left side of the CMA into the CMA rail extension.

Figure 26: Left side of the slide rail mounted
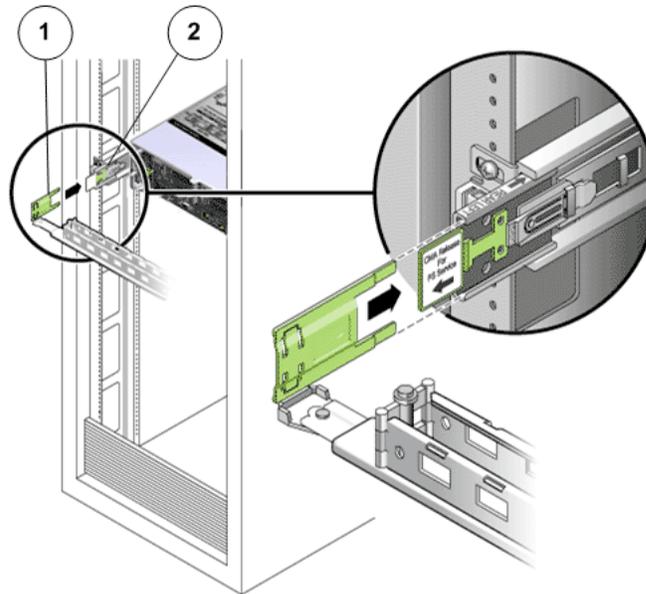
Legend	1 Plastic tab on CMA rail extension
	2 Slide rail

Drive Enclosure Rails

To prepare a rack for adding Drive Enclosures to the Oracle Flash Storage System, you must install rails in the rack for each Drive Enclosure that you plan to add. Oracle includes rail kits in the Drive Enclosure packaging.

Use one of the following racks for the Drive Enclosure:

- Sun Rack II 1042/1242 rack
- Any 19-inch wide, four-post, EIA-compatible rack with a front-to-back depth between vertical cabinet rails of 24 inches to 36 inches (61 cm to 91 cm)

Drive Enclosures rail kits can be installed in racks with the following types of holes:

- Square
- Round
- Threaded (must be M6 or 10-32 racks)

The following figure shows examples of supported rack holes.

Figure 27: Examples of supported rack holes
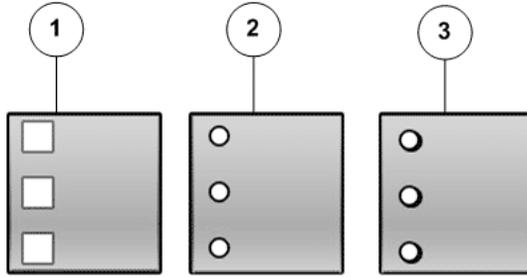
Legend	1 Square holes	3 Threaded holes
	2 Round holes	

The following figures show the rails for both Drive Enclosure types.

Figure 28: Rails for the DE2-24P Drive Enclosure
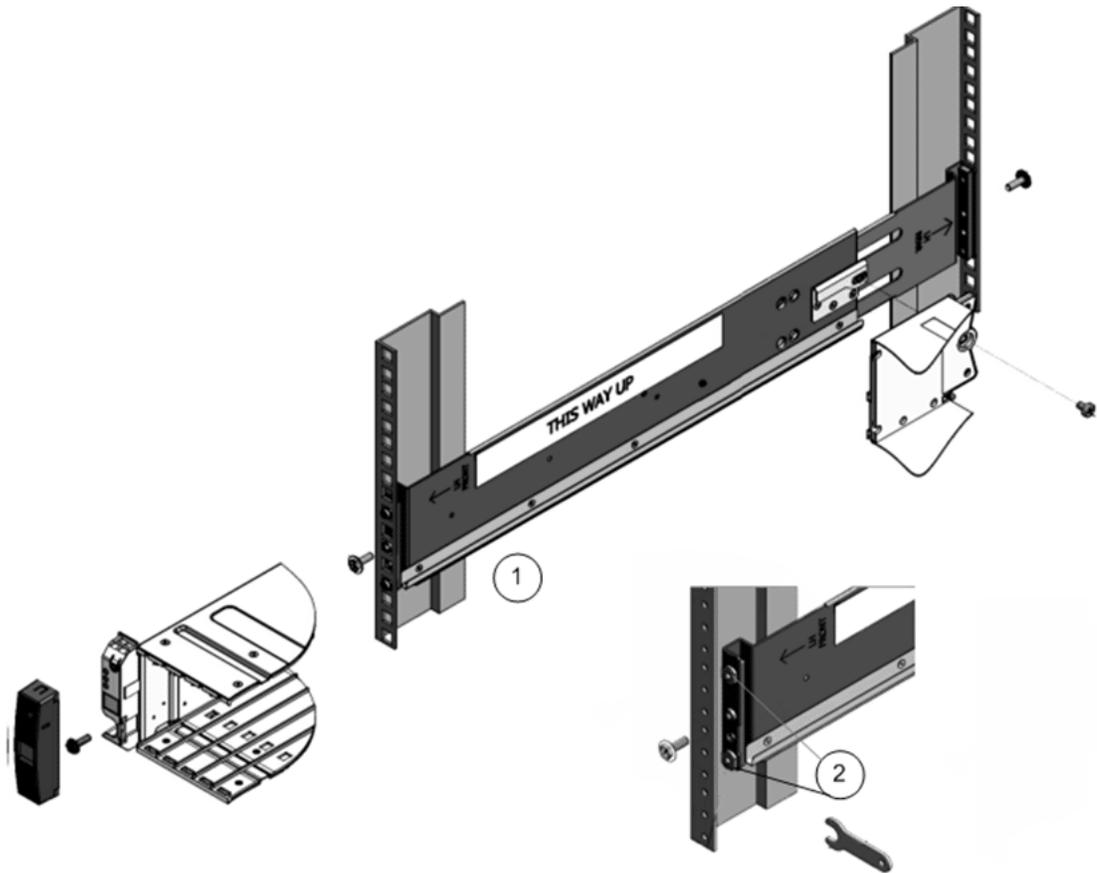
Legend	1 Left-side rail for square-hole and round-hole racks	2 Adaptor pins for threaded-hole racks

Figure 29: Rails for the DE2-24C Drive Enclosure
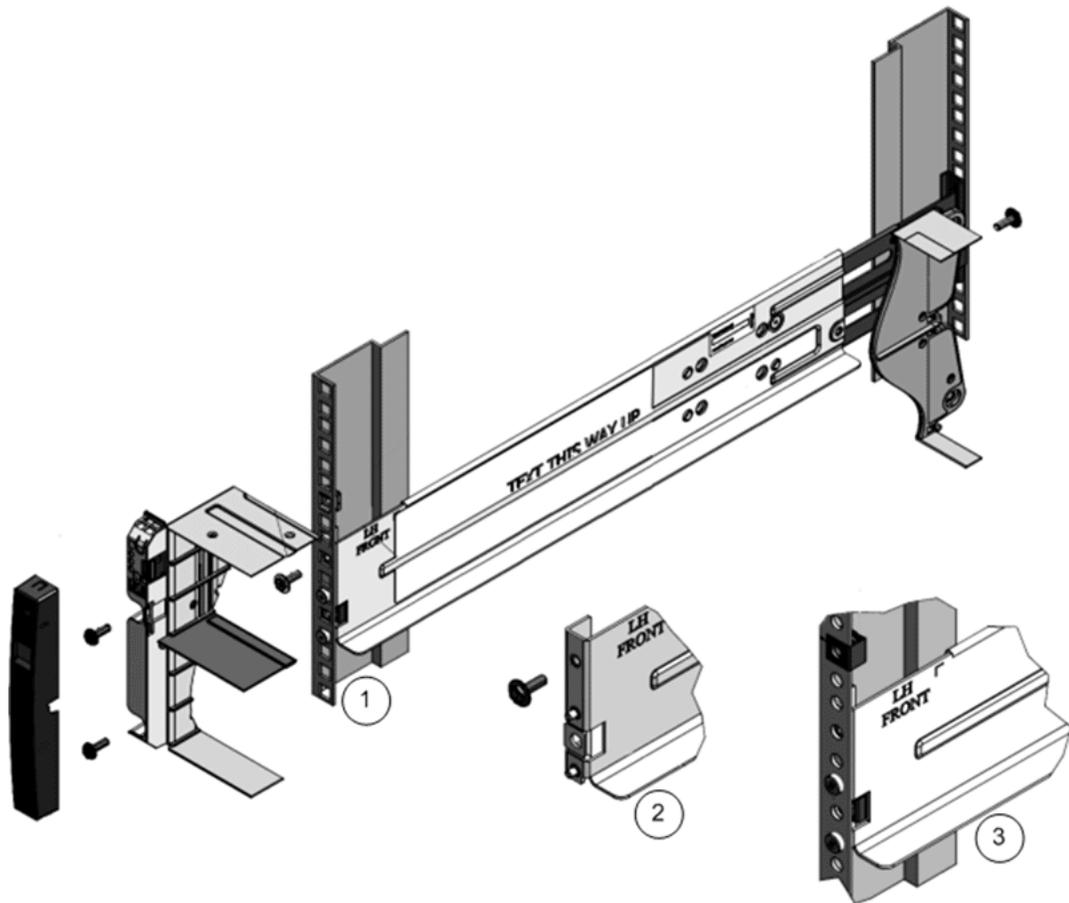
Legend	1 Left-side rail for square-hole racks	3 Round-hole racks
	2 Threaded-hole racks	

Drive Enclosure Rail Kits

The following table summarizes the contents of the Drive Enclosure rail kits.

Table 22: Drive Enclosure rail kits

Type of Drive Enclosure	Contents
DE2-24P Drive Enclosure	2 Phillips Number 2 pan head screws with patch lock 2 Phillips hex flange head screws (11mm) 1 Left-hand rail assembly 1 Right-hand rail assembly 4 Phillips Number 2 ACR hex flange screws 1 10mm wrench 8 Threaded rack adaptor pegs 1 Threaded rack adaptor kit label 4 Phillips hex flange screws (13mm)
DE2-24C Drive Enclosure	2 Phillips Number 2 pan head screws with patch lock (M5 x 16) 1 Left-hand rail assembly 2 Phillips hex flange head screws (11mm) 1 Right-hand rail assembly 2 Cage nuts 4 Orange service screw labels 2 Clip nuts 8 Special screws for round hole rack 1 Tardis rail kit user label 2 Phillips Number 2 pan head screws with patch lock (M5 x 6) 4 Phillips hex flange head screws (13mm) 4 Phillips Number 2 ACR hex flange head screws

To locate part numbers for the rail kits, open *Oracle System Handbook* (https://support.oracle.com/handbook_private/index.html) and go to the Oracle FS1 Flash Storage System components list. Part numbers are listed in the components list.

Install Drive Enclosure Rails

Prior to adding Drive Enclosures, install rails into the rack for each Drive Enclosure that you plan to add.

Prerequisites:
- Before handling a component, touch a grounded surface to discharge any static electricity.

- Attach an electrostatic discharge (ESD) wrist strap to your wrist, and stand on an ESD mat while replacing components.

- Ensure that you have a Phillips Number 2 screwdriver with at least a 4-inch shaft.

- If you are installing the rails in a rack with threaded holes, make sure you have a Torx Number 20 screwdriver.

- Ensure that you have a flashlight to use when verifying that the Drive Enclosure is seated in the rack.

Install Rails for DE2-24P Drive Enclosures

The rails for the DE2-24P Drive Enclosure are preassembled with rail-location pegs on the front and back for installation in a square hole rack and a round hole rack. If you install the rails in a threaded, universal 19-inch rack, you must replace the rail-location pegs with adaptor pins before installing the rails in the rack.

Note: To simplify the following procedures, install the left-side rail assembly first and then the right-side rail assembly.

Install Rails in Threaded Racks

1 Use a Torx Number 20 screwdriver to remove the rail-location pegs from the front and back of the rails.

2 Use a 10mm wrench to insert the adaptor pins into the ends of the rails where you removed the rail-location pegs.

A 10mm wrench and adaptor pins are included in the rail kit packaging.

Figure 30: 10mm wrench and adaptor pins
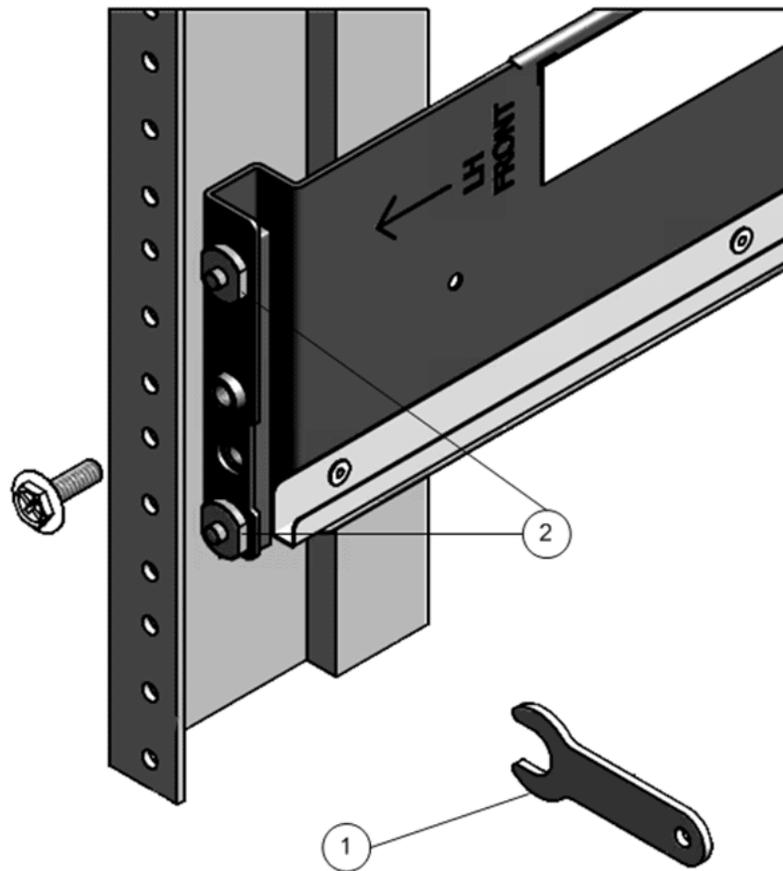
Legend	1 10mm wrench	2 Adaptor pins

3   Position the front of the rails inside of the rack, with the rail flange inside of the rack flange.

The rail label faces the inside of the rack. The pins should be fully located within the rack holes.

Figure 31: Rack flange, rail flange, and rail label (front)
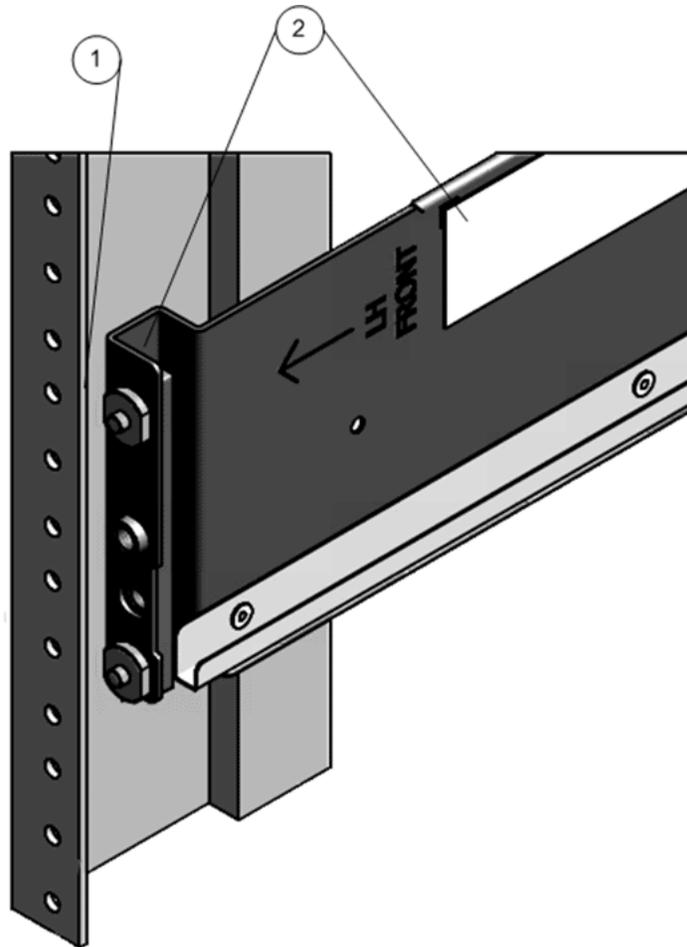
Legend	1 Rack flange	2 Rail flange and label

4   Insert and loosely tighten one screw through the front of the rack and into the top hole in the rails.

5   Adjust the rail lengths and locate the back pins inside the corresponding back rack holes.

6   Insert and loosely tighten one screw through the back of the rack and into the back of the rails.

Figure 32: Back-mounting screw
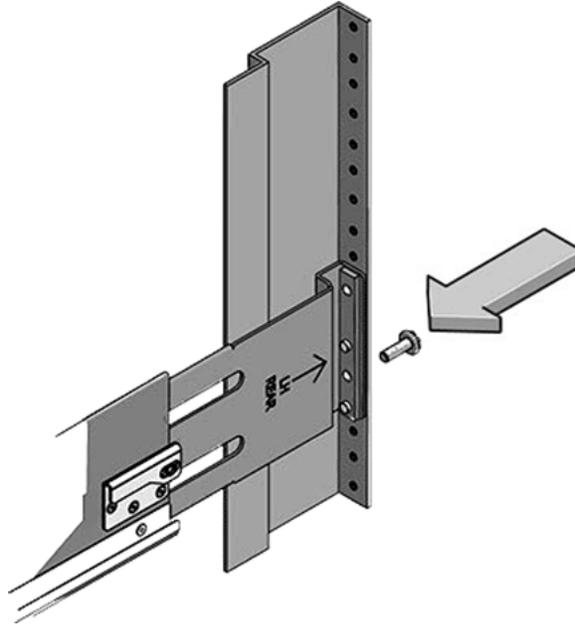
Install Rails in Square or Round Hole Racks

1   Locate the appropriate rack unit (RU) height.

The DE2-24P Drive Enclosure requires two standard mounting units (2U) of vertical space in the rack.

2   Remove the rails from the Drive Enclosure packaging.

3   Position the front rail-location pegs fully inside the holes in the front rack posts where you plan to add a Drive Enclosure.

Make sure the rail label faces the inside of the rack. Align the rail flange inside of the rack flange. Position the rail-location pegs fully within the rack holes.

Figure 33: Front of the rack and rail-location pegs
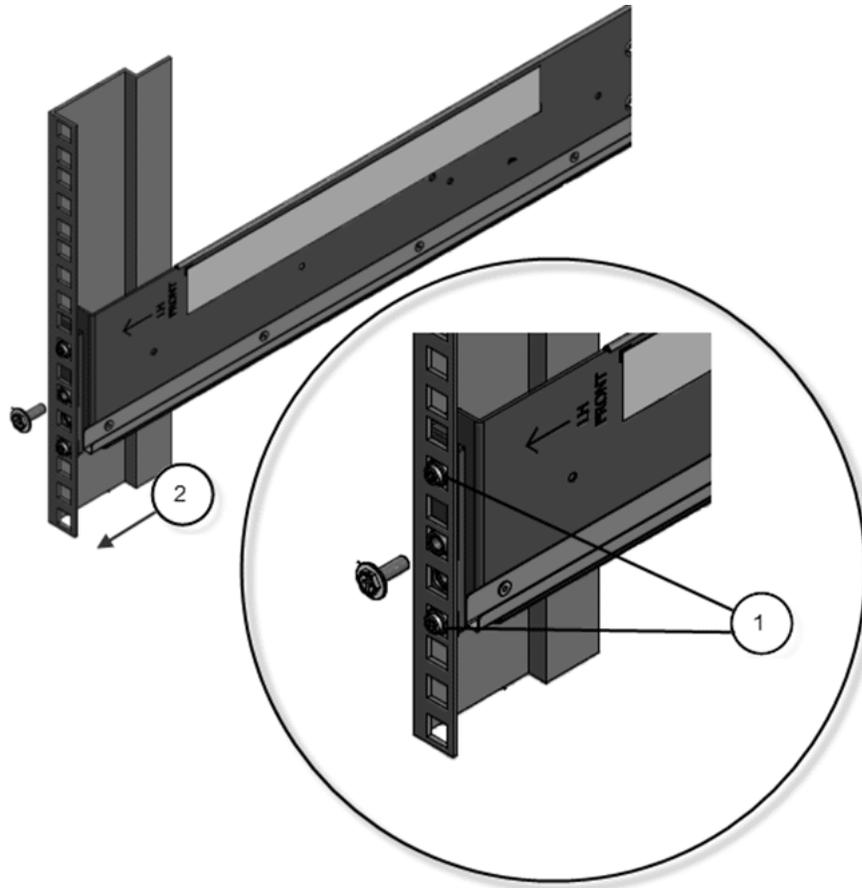
Legend	1 Rail-location pegs	2 Front rack post

4   Insert and tighten one Phillips 13mm head hex flange screw through the front rack hole and into the top hole of the rail.

Figure 34: A Phillips 13mm head hex flange screw and the front of a rack
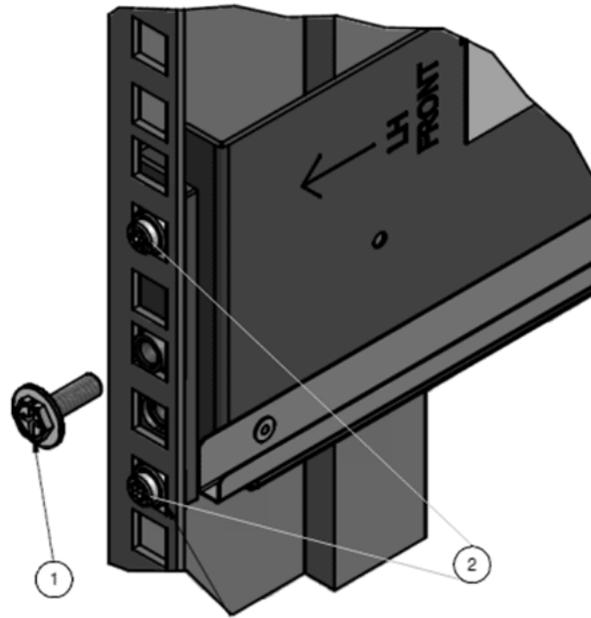
Legend	1 Phillips 13mm head hex flange screw	2 Rail-location pegs

5   From the back of the rack, position the pegs fully into the corresponding rack holes.

To position the pegs, extend the length of the rail to the back of the rack and position the pegs through the appropriate rack holes.

Figure 35: Extended rail to the back of the rack
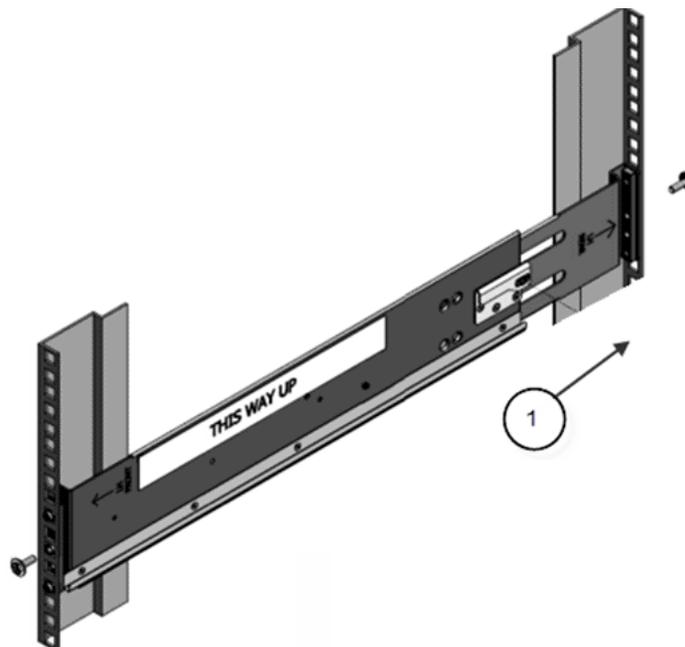
Legend	1 Back of the rack

6   Insert and tighten one Phillips 13mm head hex flange screw into the back of the rack and into the rail.

Figure 36: A Phillips 13mm head hex flange screw and the back of a rack
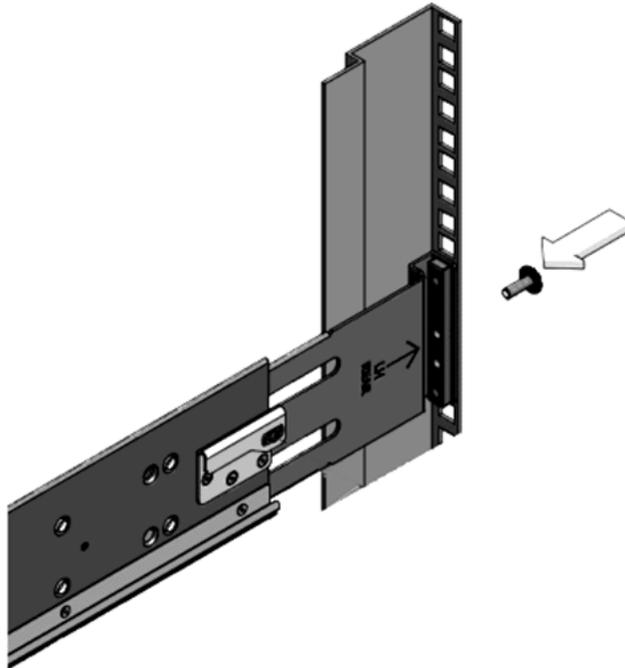
7   Repeat steps 1-6 to install the right-hand rail assembly.

Install Rails for DE2-24C Drive Enclosures

1   Locate the appropriate rack unit (RU) height.

The DE2-24C Drive Enclosure requires four standard rack units (4U) of vertical space.

2   Remove the rails from the Drive Enclosure packaging.

3   If you are installing rails in a square-hole rack, snap one cage nut into the eighth rack hole on both sides of the rack.

To locate the eighth rack hole, count eight holes upward from the bottom rail location peg.

The following figure shows a cage nut installed in a square-hole rack.

Figure 37: Cage nut installed in a square-hole rack
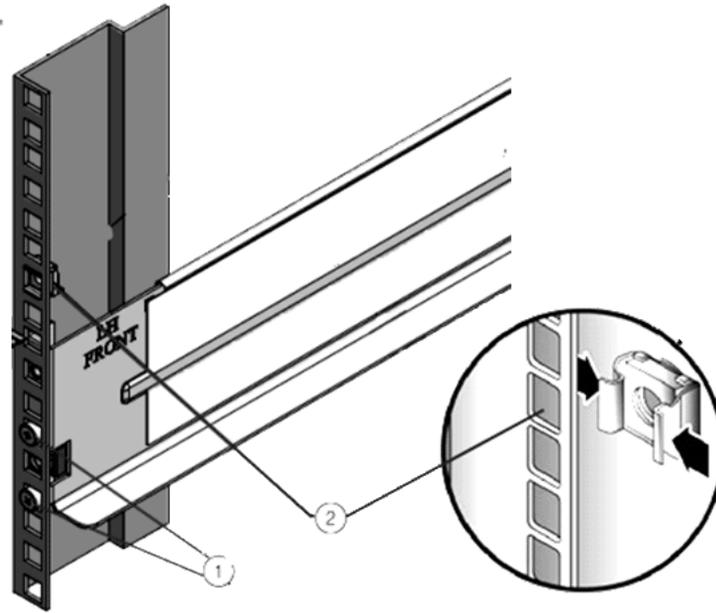
Legend	1 Rail-location pegs	2 Cage nut

4   Prepare the screws in each rail end.

Square-hole racks	No preparation is required.
Round-hole racks	Remove the two rail-location pegs from each rail end and replace them with the special screws from the rail kit. The special screws are part number 0093340-02.
Threaded-hole rack	Remove the two rail-location pegs from each rail end and replace them in the opposite direction from inside of the rail flange. Remove and discard the clip nut from the front rail.

Figure 38: Rail-location pegs from inside of the rail flange and the clip nut
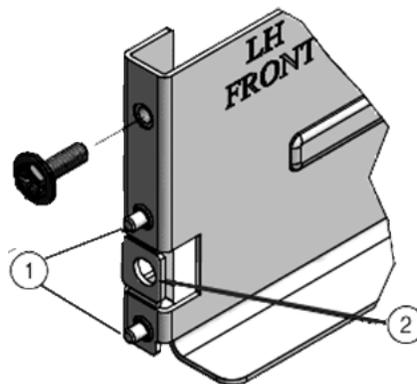
Legend	1 Rail location pegs from inside of the rail flange	2 Clip nut

5   Position the front of the rails inside of the rack.

Make sure the rail flange aligns with the inside of the rack flange and the rail label faces the inside of the rack.

Square-hole racks	The rail-location pegs fit inside of the rack holes.
Round-hole rack	The special screws fit inside of the rack holes.
Threaded-hole rack	The rail-location pegs fit inside of the rack holes.

The following figure shows an example of the rail-location pegs inserted into a square-hole rack.

Figure 39: Rail-location pegs and a square-hole rack
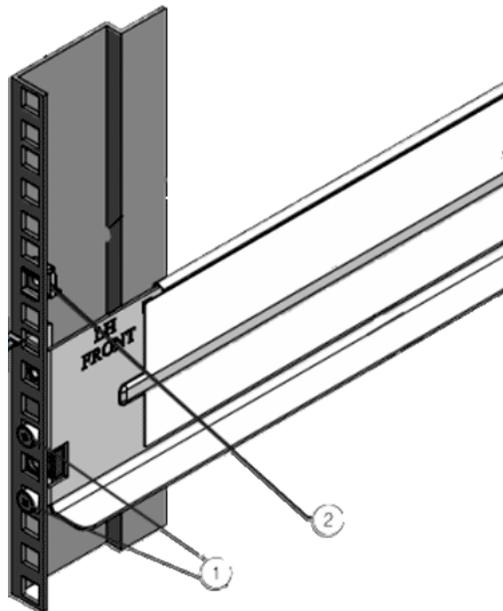
Legend	1 Rail-location pegs	2 Cage nut

6   Extend the rail length towards the back of the rack and into the rail holes at the back of the rack.

Figure 40: Rail extended to holes in the back of the rack
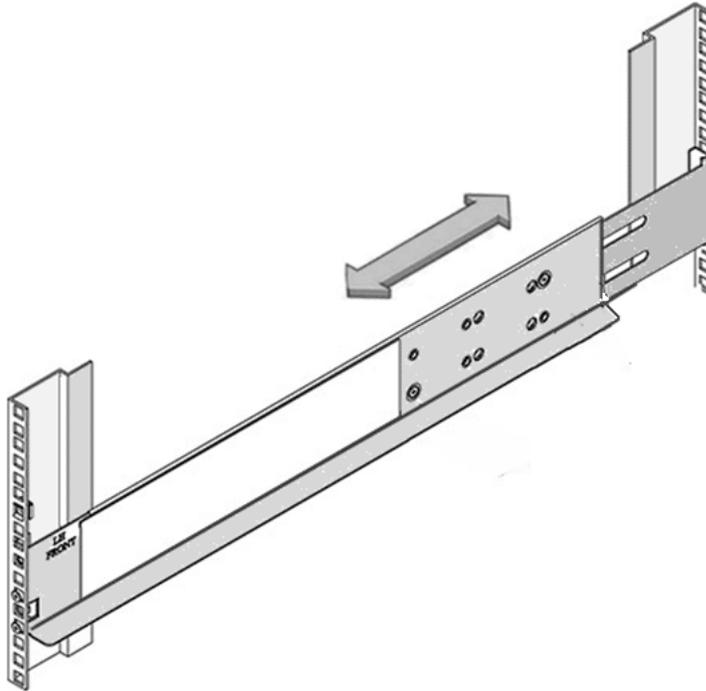
7   Insert and fully tighten one Phillips 13mm head hex flange screw through the back of the rack and into the rail.

8   Tighten the two locking screws in the side of the rail.

Figure 41: The locking screws and side of the rail
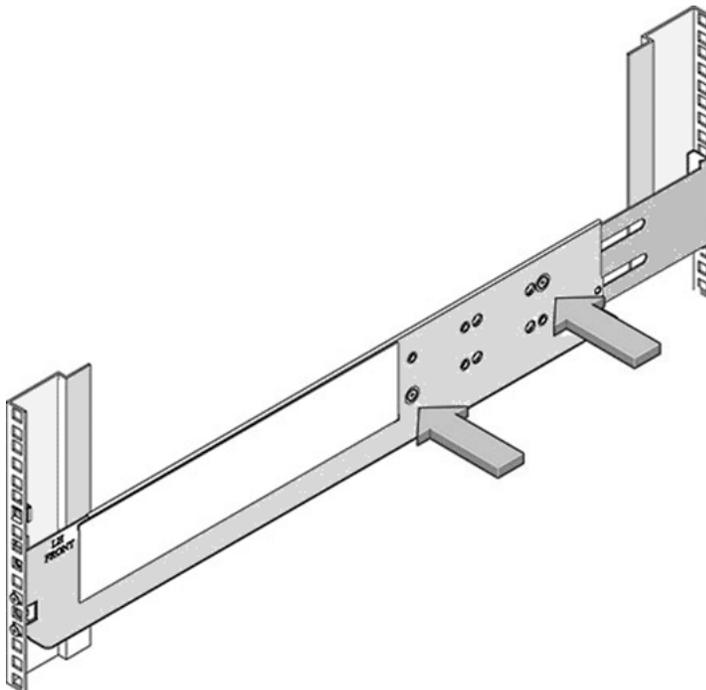
9   Repeat steps 1 - 8 to install the right-hand rail assembly.

Pilot Rails

Adding Pilots in the rack requires you to install rack rails in the rack and slide rails on the chassis for each Pilot that you plan to add.

Pilot rail kits can be installed in the Sun trademark Rack 900, the Sun Rack 1000, and third-party ANSI/EIA 310-D-1992 or IEC 60927 compliant racks with the following types of holes:

- Square (9.5 mm)
- Round (M6 or 1/4-20 threaded only)

CAUTION: We recommend that you install each Pilot after you install the rail kit before installing the next combination of rail kit and Pilot. Installing all of the rail kits and then inserting the Pilots is not always possible because of potential space limitations in some data centers. Also, you run the risk of not placing the Pilot in the correct rack position and causing possible cabling issues.

Pilot Rail Kits

The Pilot rail kit contains the following items:

- One slide rail that attaches to the rack posts
- One mounting bracket that attaches to the Pilot chassis
- CMA with six pre-installed cable clips
- Four M4 x 5 fine-pitch mounting bracket securing screws (optional)
- Manufacturer's instruction sheet

Tip: Ensure that you have all of the parts in the Pilot rail kit before you begin the installation of the Pilot rails on the rack and the Pilot chassis.

Note: To locate part numbers for the rail kits, open *Oracle System Handbook* (https://support.oracle.com/handbook_private/index.html) and go to the Oracle FS1 Flash Storage System components list. Part numbers are listed in the components list.

The following figure shows the parts in the Pilot rail kit.

Figure 42: Pilot rail kit parts
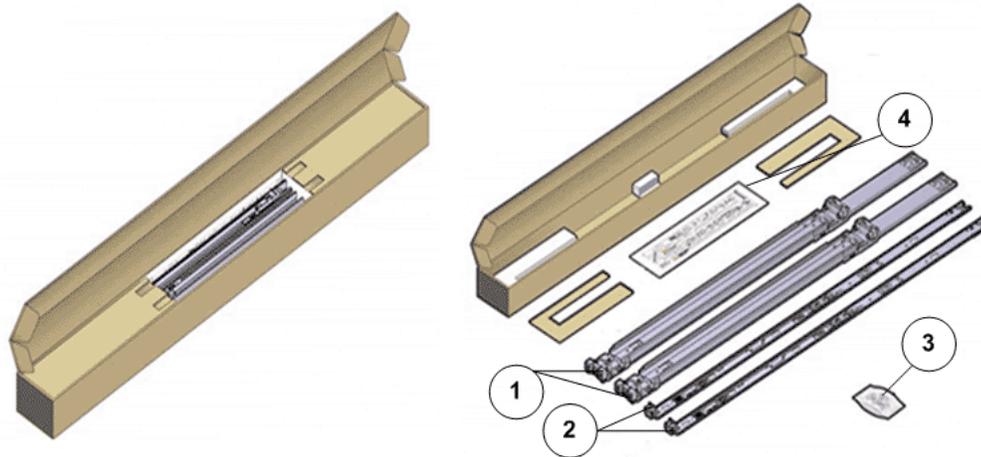
Legend	1 Slide rails
	2 Mounting brackets
	3 Four M4 x 5 fine pitch mounting bracket securing screws (optional)
	4 Installation card

Install the Rack Rails for the Pilot

Install the rack rails on the rack prior to installing the Pilot.

Prerequisite: • Ensure that you have adequate room to work around the rack while installing the rails and the Pilot.

1 Place the rack-mount installation card against the front rails to identify the correct mounting holes for the slide rails.

Figure 43: Rack-mount installation card template
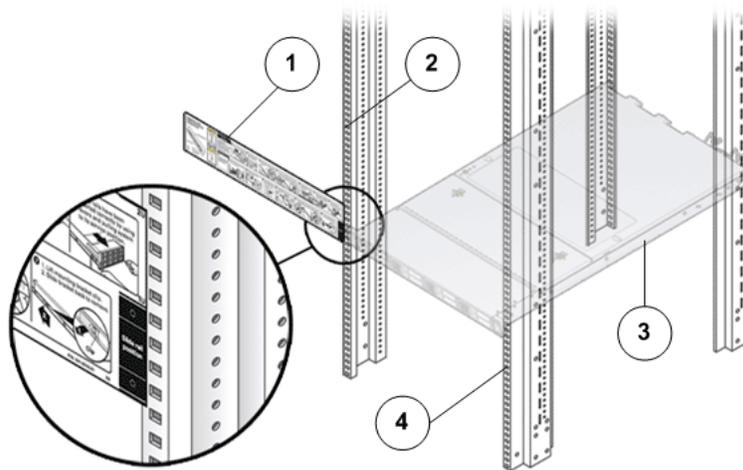
Legend	1 Installation card

2	Rack mount hole
3	Pilot chassis
4	Front rack post

Note: The Pilot requires one standard rack units (1U) of vertical space.

Tip: The bottom edge of the installation card must correspond to the bottom edge of the Pilot. Measure up from the bottom of the installation card.

2 Mark the mounting holes for the front slide rails.

3 Mark the mounting holes for the back slide rails.

4 Remove the rails from the packaging.

5 Orient the slide-rail assembly so that the ball bearing track is forward and locked in place.

Figure 44: Slide rails oriented with the ball bearing track
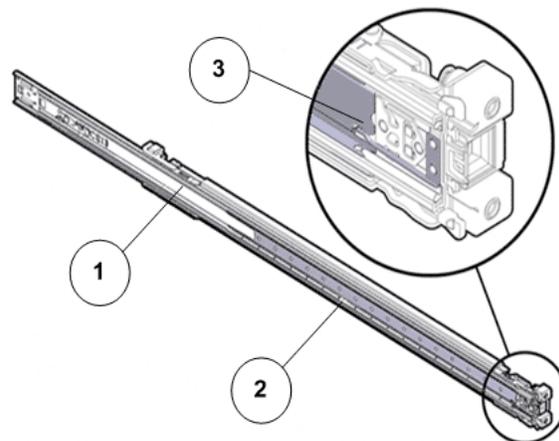
Legend	1 Slide rail
	2 Ball bearing track
	3 Locking mechanism

6 Starting with either the left or right side of the rack, align the rear of the slide-rail assembly against the inside of the rear rack rail, and push until the assembly locks into place with an audible click.

Figure 45: Slide rail assembly aligned with the rack
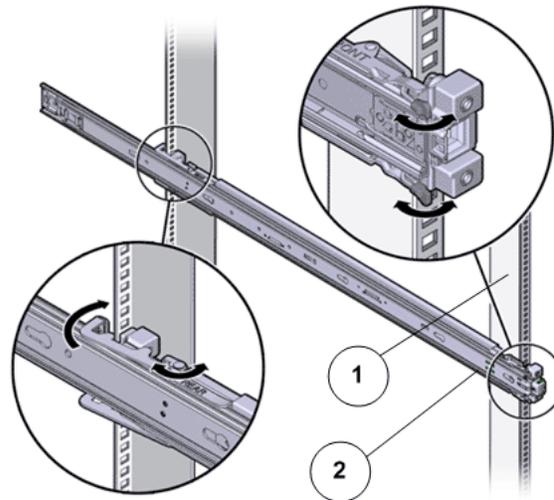
Legend	1 Back of the rack
	2 Slide rail

7   Align the front of the slide-rail assembly against the outside of the front rack rail, and push until the assembly locks into place with an audible click.

8   Repeat steps to attach the slide-rail assembly to the other side of the rack.

Install the Slide Rails for the Pilot

Install the slide rails with mounting brackets on to the Pilot chassis before inserting it into the rack.

1   Position a mounting bracket against the Pilot chassis so that the slide rail lock is at the Pilot front, and the five keyhole openings on the mounting bracket are aligned with the five locating pins on the side of the Pilot chassis.

Figure 46: Mounting bracket aligned with the Pilot chassis
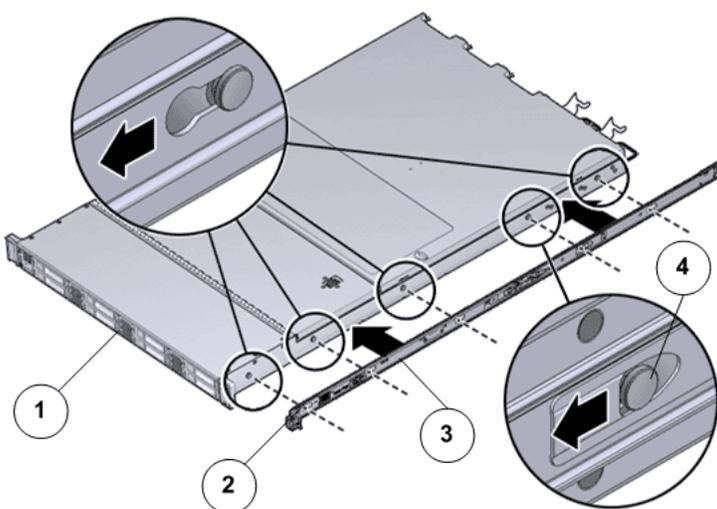
Legend	1 Pilot chassis front
	2 Slide rail lock
	3 Mounting bracket
	4 Mounting bracket clip

2   With the heads of the five chassis locating pins protruding though the five keyhole openings in the mounting bracket, pull the mounting bracket toward the front of the Pilot chassis until the mounting bracket clip locks into place with an audible click.

3   Verify that the rear locating pin has engaged the mounting bracket clip.

4   Repeat steps to install the remaining slide rail mounting bracket on the other side of the Pilot chassis.

Install the Pilot CMA

Install the cable management arm (CMA) so that you can route the Pilot cables into the rack.

The CMA clips into the ends of the left and right Pilot slide rail assemblies. No screws are necessary for mounting the CMA. The right sides of the two CMA arms have hinged extensions.

Note: The CMA shown in the graphics might vary slightly from the CMA shipped with your product.

1   Unpack the CMA parts.

2   Take the CMA to the back of the rack, and ensure that you have adequate room to work around the back of the Pilot.

3   Remove the tape to separate the parts of the CMA.

4   Insert the CMA's mounting bracket connector into the back of the right slide rail until the connector locks into place with an audible click.

5   Insert the right CMA slide rail connector into the back of the right slide rail assembly until the connector locks into place with an audible click.

Figure 47: CMA slide rail connector inserted into the back of the right slide rail
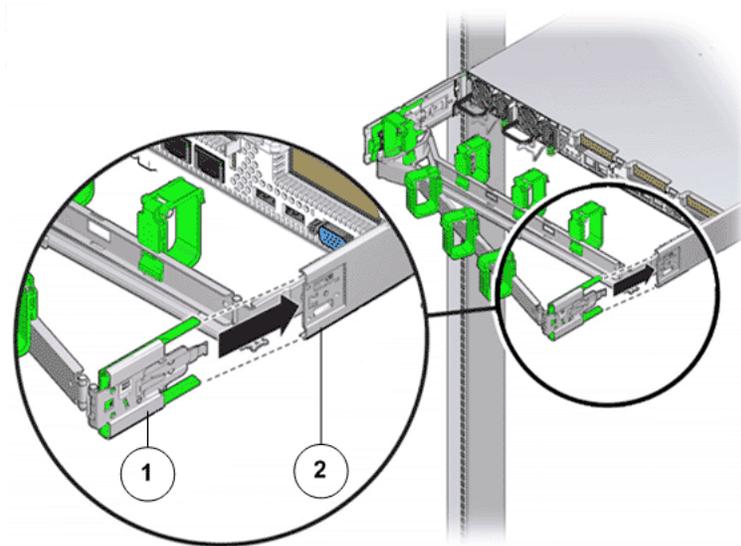
Legend	1 CMA slide rail connector
	2 Right slide rail

Note: The CMA in the graphic is for representation only. The CMA shipped with your Pilot might be slightly different.

6   Insert the left CMA slide-rail connector into the back of the left slide rail assembly until the connector locks into place with an audible click.

Figure 48: CMA slide rail connector inserted into the back of the left slide rail
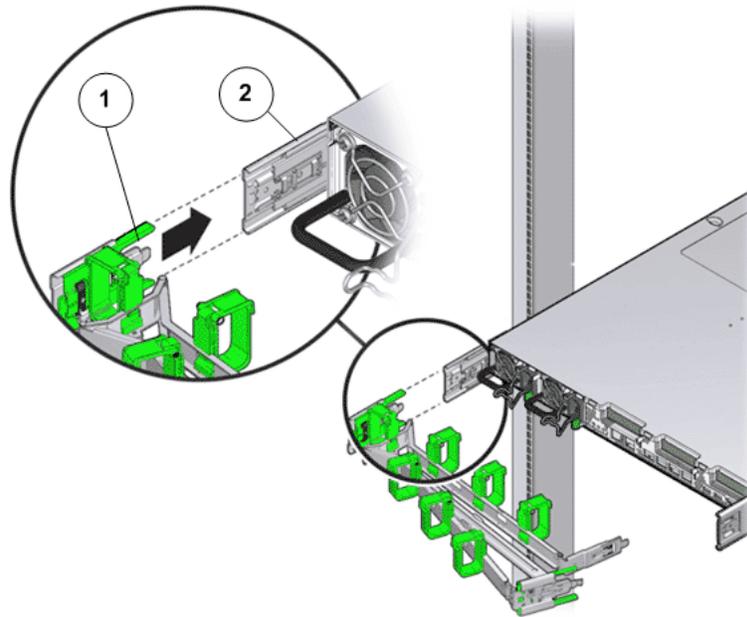
Legend	1 CMA slide rail connector
	2 Left slide rail

Note: The CMA in the graphic is for representation only. The CMA shipped with your Pilot might be slightly different.

7   Install and route cables to the Pilot, as required.

CHAPTER 4

Install Components into the Rack

Install the Components Into a Rack

Insert the Drive Enclosures, Controllers, and the Pilots into the rack in the designated rack unit (RU) locations.

Oracle FS Systems support two Pilots (Pilot-1 and Pilot-2). Additionally, Oracle FS Systems support two Controllers (Controller-1 and Controller-2) and 1 to 30 Drive Enclosures (DE-1 to DE-30).

Related Links

Insert the Pilot into a Rack
Insert the Controller Into a Rack
Insert a DE2-24P Drive Enclosure Into a Rack
Insert a DE2-24C Drive Enclosure Into a Rack

Insert a DE2-24C Drive Enclosure Into a Rack

1   With the help of a partner or mechanical lift, carefully lift the Drive Enclosure to the location of the prepared slot and rest the Drive Enclosure on the bottom ledge of the left and right rails.

CAUTION: The Drive Enclosures are heavy. Work with a partner or use a mechanical lift for assistance. The DE2-24C Drive Enclosure weighs approximately 102 lbs (46 kg) and the DE2-24P Drive Enclosure weighs approximately 53 lbs (24 kg). Be careful not to drop a Drive Enclosure. Dropping a Drive Enclosure can cause damage and can reduce the life of the drives.

CAUTION: Do not use the power supply handles to lift the chassis. Using the power supply handles to lift the chassis can damage the power cooling modules and disrupt electrical power to the Drive Enclosure.

Figure 49: DE2-24P Drive Enclosure (left) and DE2-24C Drive Enclosure (right)

2   Carefully slide the Drive Enclosure into the rack.

The DE2-24C Drive Enclosure rails have a ledge along the bottom of the rail to allow you to slide the Drive Enclosure into the rack. To verify that the Drive Enclosure is seated correctly in the rails, ensure that the bottom edges on both sides of the Drive Enclosure slide along the left and right rail ledges.

Figure 50: The rail ledge for the DE2-24C Drive Enclosure
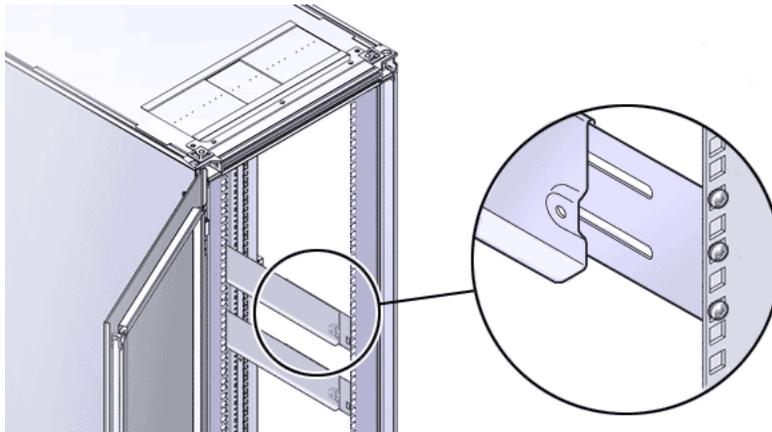
3   At the back of the chassis, insert and fully tighten a Phillips Number 2 pan head screw with patch lock into the side of the rail.

Figure 51: Phillips Number 2 pan head screw with patch lock
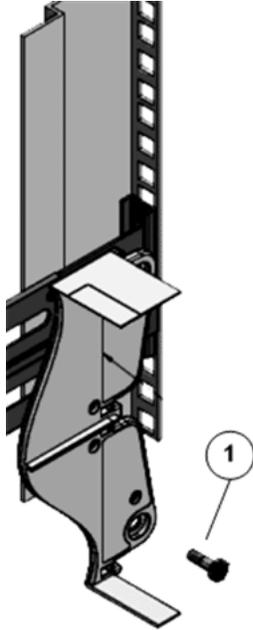
Legend 1 Phillips Number 2 pan head screw with patch lock

4   Remove the front-side caps on both sides of the Drive Enclosure and secure a Phillips 13mm head hex flange screw.

Note: The front-side cap on the right side of the Drive Enclosure contains the RFID tag, which uniquely identifies the Drive Enclosure. Take care not to mix up the right front-side caps among Drive Enclosures.

Figure 52: Left front-side cap and Phillips 13mm head hex flange screw
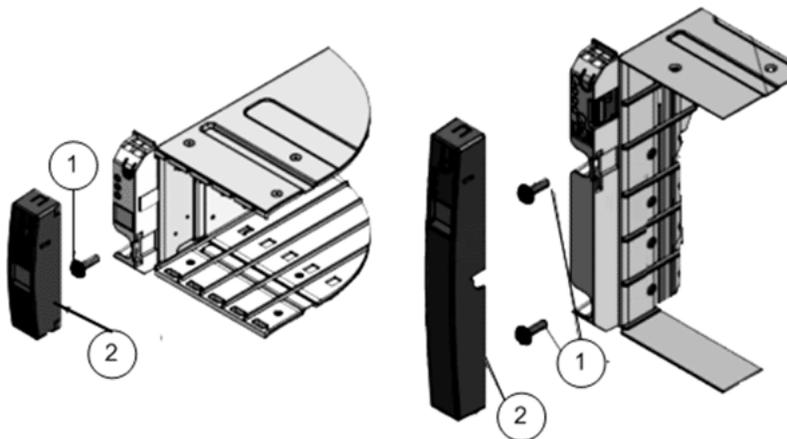
Legend	1 Phillips 13mm head hex flange screw	2 Left front-side cap

After you have secured the Drive Enclosure to the rails, attach the front-side caps to the Drive Enclosure.

5   Insert the I/O modules, the power cooling modules, and all of the drives into their corresponding slots in the chassis.

Insert a DE2-24P Drive Enclosure Into a Rack

1   With the help of a partner or mechanical lift, carefully lift the Drive Enclosure to the location of the prepared slot and rest the Drive Enclosure on the bottom ledge of the left and right rails.

CAUTION: The Drive Enclosures are heavy. Work with a partner or use a mechanical lift for assistance. The DE2-24C Drive Enclosure weighs approximately 102 lbs (46 kg) and the DE2-24P Drive Enclosure weighs approximately 53 lbs (24 kg). Be careful not to drop a Drive Enclosure. Dropping a Drive Enclosure can cause damage and can reduce the life of the drives.

CAUTION: Do not use the power supply handles to lift the chassis. Using the power supply handles to lift the chassis can damage the power cooling modules and disrupt electrical power to the Drive Enclosure.

Figure 53: DE2-24P Drive Enclosure (left) and DE2-24C Drive Enclosure (right)

2   Angle the Drive Enclosure slightly to the left and align the Drive Enclosure's left side slider so that it engages with the left rail channel.

Figure 54: Left rail channel
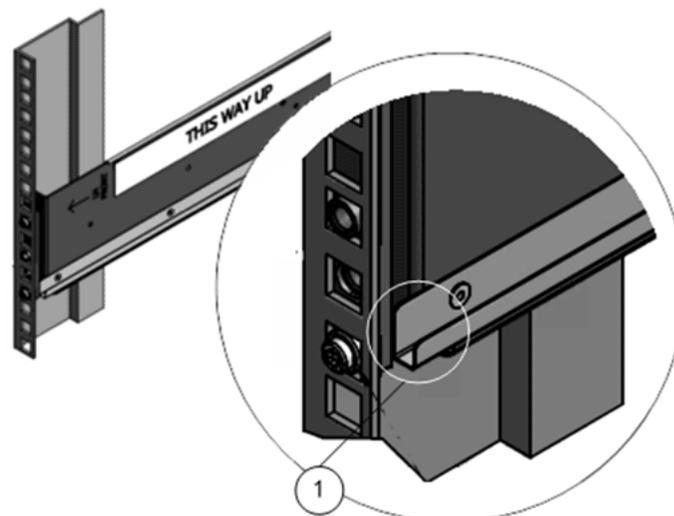
Legend | 1 Left rail channel

3   Slightly tug the Drive Enclosure to the right and align the Drive Enclosure's right side slider so that it engages with the right rail channel.

4   Apply even pressure to both sides of the Drive Enclosure and carefully slide the Drive Enclosure into the rails.

Important: The Drive Enclosure must be fully seated in the rack. To verify that the Drive Enclosure is fully seated, check for the following:

- Using a flashlight, visually check to see that the sliders on both sides of the Drive Enclosure are in the rail channels on both sides of the rack. If the Drive Enclosure side sliders are not in the rail channels, then the Drive Enclosure is not seated. You must reinsert the Drive Enclosure.

- Ensure that the Drive Enclosure slides smoothly into the rack and out of the rack. If the Drive Enclosure does not slide smoothly in and out of the rack, then the Drive Enclosure is not seated. You must reinsert the Drive Enclosure.

- Ensure that the screw hole at the back of the Drive Enclosure aligns with the screw hole on the rail. Do not secure the screw, yet. If the screw hole at the back of the Drive Enclosure does not align with the screw hole on the rail, then the Drive Enclosure is not seated. You must reinsert the Drive Enclosure.

5   On both sides of the Drive Enclosure, insert a Phillips Number 2 pan head screw with patch lock through the hole at the back of the Drive Enclosure and secure it into the screw hole on the rail.

Figure 55: Back of the Drive Enclosure and Rail secured
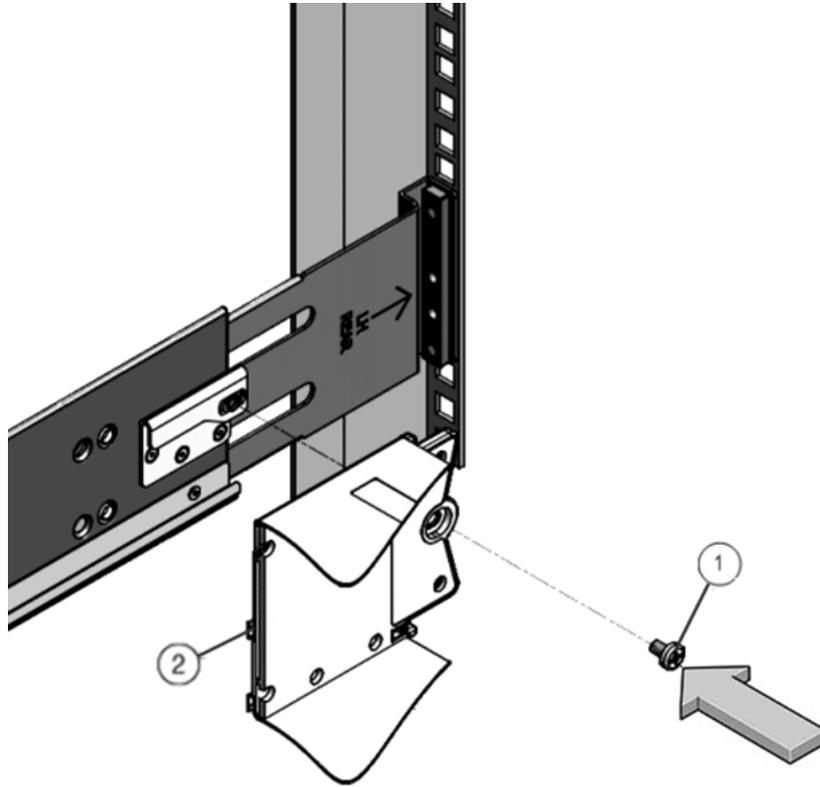
Legend	1 Phillips Number 2 pan head screw with patch lock	2 Back of the Drive Enclosure

Important: If you insert the screw through the hole at the back of the Drive Enclosure and the screw does not align with the screw hole on the rail, then the Drive Enclosure is not seated. You must reinstall the Drive Enclosure.

6   Remove the front-side caps on both sides of the Drive Enclosure and secure a Phillips 13mm head hex flange screw.

Note: The front-side cap on the right side of the Drive Enclosure contains the RFID tag, which uniquely identifies the Drive Enclosure. Take care not to mix up the right front-side caps among Drive Enclosures.

Figure 56: Left front-side cap and Phillips 13mm head hex flange screw
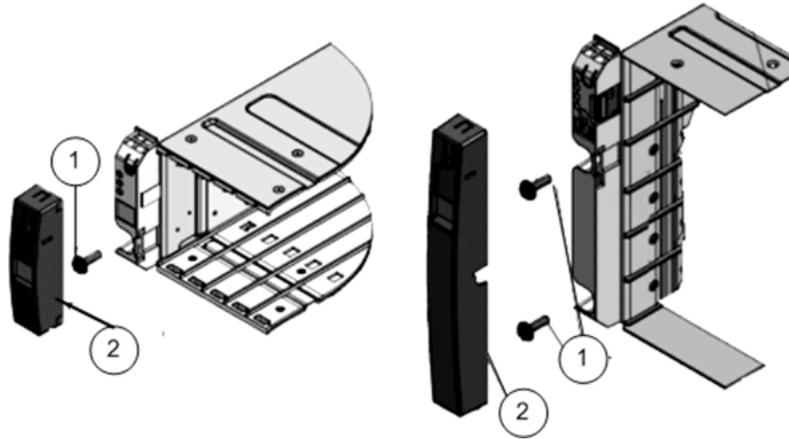
Legend	1 Phillips 13mm head hex flange screw	2 Left front-side cap

After you have secured the Drive Enclosure to the rails, attach the front-side caps to the Drive Enclosure.

7 Insert the I/O modules, the power cooling modules, and all of the drives into their corresponding slots in the chassis.

Insert the Controller Into a Rack

Prerequisites: Ensure that you have a magnetic-tipped Phillips Number 2 screwdriver with at least a four-inch shank.

CAUTION: Do not power on the Controller until all components have been installed and all internal private management interface (PMI) and private interconnect (PI) cables have been connected.

CAUTION: Work with a partner or use a mechanical lift for assistance. The Controller weighs approximately 41 lbs (18.59 kg). Two people are required to unmount and carry the chassis.

CAUTION: Deploy any rack anti-tilt mechanisms before installing the Controller into the rack to prevent the rack from tipping over during component installation.

CAUTION: Always load equipment into a rack from the bottom up so that the rack will not become top-heavy and tip over.

CAUTION: Slide-rail-mounted components are not to be used as a shelf or a work space.

CAUTION: Elevated operating ambient temperature: If the Controller is installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment might be greater than room ambient temperature. Therefore, consideration should be given to installing the components in an environment compatible with the maximum ambient temperature (TMA) specified for the Controller.

1   Using two people, one at each side of the Controller, carefully lift and position the Controller on the bottom ledge of the left and right rails.

    CAUTION: Do not use the power supply handles to lift the chassis. Using the power supply handles to lift the chassis can damage the power supplies and disrupt electrical power to the Controller.

2   Carefully slide the Controller into the rack until the front flanges of the Controller touch the vertical face of the rack.

3   Use a Phillips screwdriver to install and tighten the four M6 panhead screws (two on each side) to secure the chassis to the front of the rack.

4   Install and tighten two 6-32 screws (one on each side) at the back of the chassis, to secure the back of the chassis to the rack.

Verify Operation of the Slide Rails and the CMA

Prerequisites:
- Before handling a component, touch a grounded surface to discharge any static electricity.

- Attach an electrostatic discharge (ESD) wrist strap to your wrist, and stand on an ESD mat while replacing components.

- Two people are needed to verify the operation of the slide rails and the cable management arm (CMA): one to move the Controller in and out of the rack and one to observe the cables and CMA.

- To reduce the risk of personal injury, stabilize the expansion rack cabinet and extend all anti-tilt devices before extending the Controller from the rack.

CAUTION: Work with a partner or use a mechanical lift for assistance. The Controller weighs approximately 41 lbs (18.59 kg). Two people are required to unmount and carry the chassis.

1   Unlock the slide lock buttons at the right and left sides of the Controller chassis, and slowly pull the Controller out of the rack until the slide rails reach their stops.

Figure 57: Controller slide rails unlocked
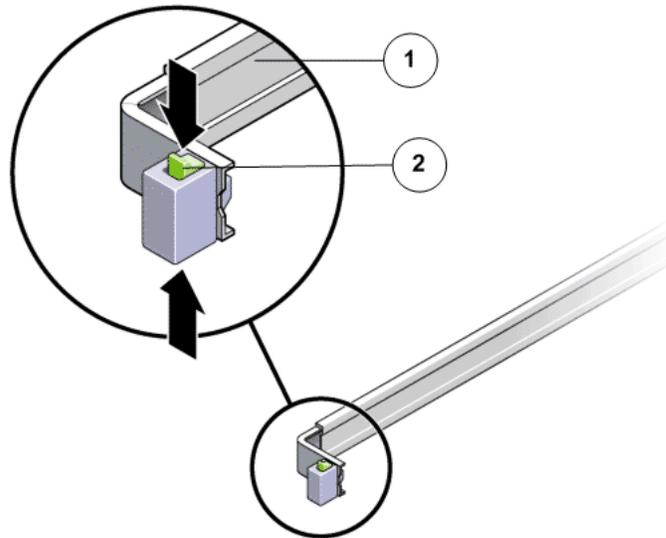
Legend	1 Slide rail assembly
	2 Slide rail lock button

2   Inspect the attached cables for any binding or kinks.

3   Verify that the CMA extends fully and does not bind in the slide rails.

4   When the Controller is fully extended out, release the mounting bracket release button.

Figure 58: Mounting bracket release button
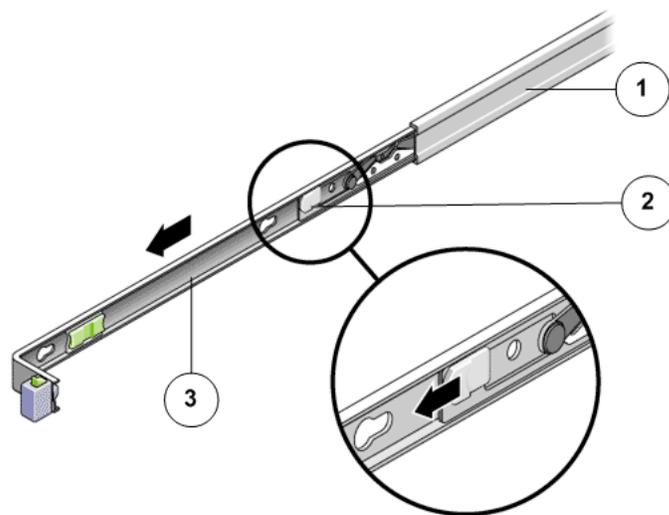
Legend	1 Slide rail

2 Mounting bracket release button
3 Mounting bracket

5   Slide the Controller back into the rack.

6   Simultaneously unlock both slide rail release buttons, and push the Controller completely into the rack.

Figure 59: Slide rail release button
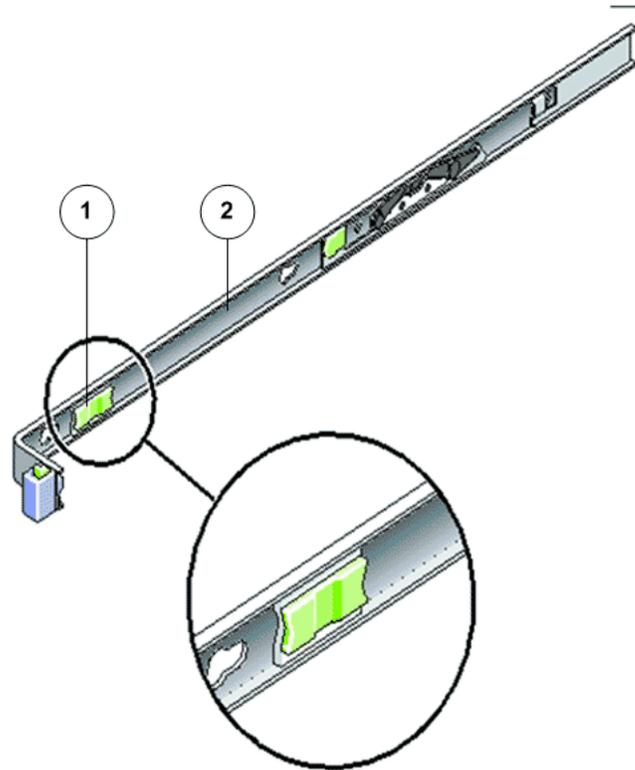
Legend	1 Slide rail release button
	2 Slide rail

Note: The Controller should stop after approximately 15 inches (40 cm) of travel.

7   Verify that the cables and the CMA retracted without binding.

8   Adjust the cable hangers and CMA as required.

Insert the Pilot into a Rack

Prerequisites: •   Before handling a component, touch a grounded surface to discharge any static electricity.

- Attach an electrostatic discharge (ESD) wrist strap to your wrist, and ensure that you have an ESD mat. Stand on the ESD mat while replacing components

CAUTION: Do not connect the PDUs to any external power source until all components and internal cables have been installed.

CAUTION: Turn off all the PDUs or do not connect component power cords to PDUs until all components have been installed and all internal private management interface (PMI) and private interconnect (PI) cables have been connected.

CAUTION: Work with a partner or use a mechanical lift for assistance. The Pilot weighs approximately 39.9 lbs (18.1 kg). Two people are required to carry the chassis.

CAUTION: Deploy any rack anti-tilt mechanisms before installing the Pilot into the rack to prevent the rack from tipping over during component installation.

CAUTION: Always load equipment into a rack from the bottom up so that the rack will not become top-heavy and tip over.

CAUTION: Slide rail mounted components are not to be used as a shelf or a work space.

1   Push the slide rails as far as possible into the slide rail assemblies in the rack.

2   Using two people, one at each side of the Pilot, position the Pilot so that the back ends of the mounting brackets are aligned with the slide rail assemblies that are mounted in the rack.

3   Insert the mounting brackets into the slide rails, and then push the Pilot into the rack until the mounting brackets encounter the slide rail stops (approximately 30 cm, or 12 inches).

Figure 60: Pilot with mounting brackets inserted into the slide rails
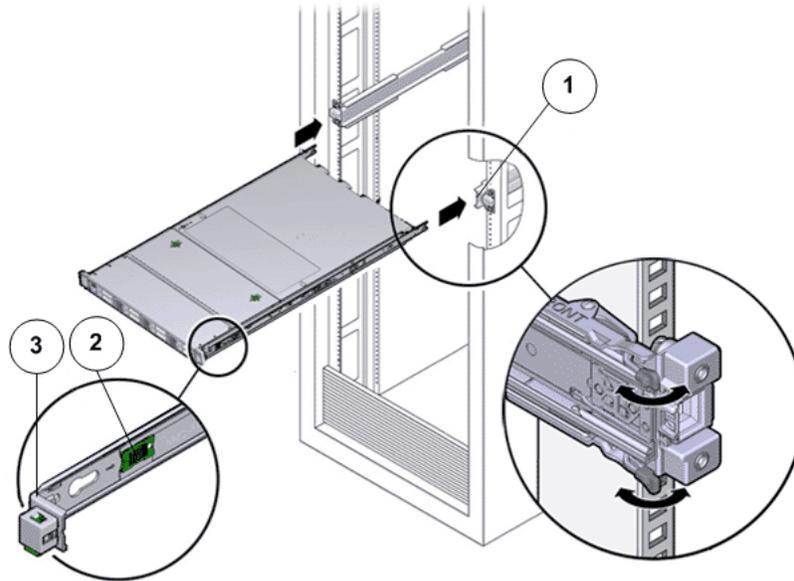
Legend	1 Mounting brackets inserted into the slide rail
	2 Slide rail release button
	3 Slide rail lock

4   Simultaneously push and hold the slide rail release buttons on each mounting bracket while you push the Pilot into the rack. Continue pushing the Pilot into the rack until the slide rail locks (on the front of the mounting brackets) engage the slide rail assemblies until you hear an audible click.

Figure 61: Pilot inserted into the rack
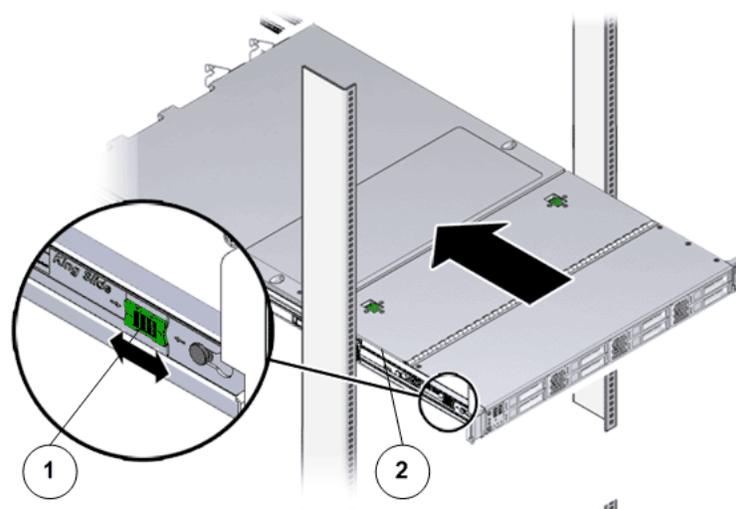
Legend	1 Slide rail button
	2 Mounting bracket

CAUTION: Verify that the Pilot is securely mounted in the rack and that the slide rail locks are engaged with the mounting brackets before you install the cable management arm.

Verify Operation of the Slide Rails and the CMA

Prerequisites:
- Two people are needed to verify the operation of the slide rails and the cable management arm (CMA): one to move the Pilot in and out of the rack and one to observe the cables and CMA.

- To reduce the risk of personal injury, stabilize the expansion rack cabinet and extend all anti-tilt devices before extending the Pilot from the rack.

CAUTION: Work with a partner or use a mechanical lift for assistance. The Pilot weighs approximately 18.1 kilograms (39.9 pounds). Two people are required to carry the chassis.

1   Slowly pull the Pilot out of the rack until the slide rails reach their stops.

2   Verify that the CMA extends fully from the slide rails.

3   Push the Pilot back into the rack.

    When the Pilot is fully extended, you must release two sets of slide rail stops to return the Pilot to the rack:

    - The first set of stops are levers, located on the inside of each slide rail, just behind the back panel of the Pilot. These levers are labeled "PUSH." Push in both levers simultaneously, and slide the Pilot toward the rack. The chassis slides in approximately 46 cm (18 inches) and stops. Verify that the cables and the CMA retract without binding before you continue.

    - The second set of stops are the slide rail release buttons, located near the front of each mounting bracket. Simultaneously push both of the green slide-rail release buttons, and push the Pilot completely into the rack until both slide-rail locks engage.

4   Adjust the cable straps and CMA, as required.

Oracle FS Systems: Cabling Overview

Cabling an Oracle FS System

The modular design of an Oracle FS System provides a highly scalable storage facility. You achieve scalability by deploying a collection of specialized subsystems that are connected by external cables and internal cables to create a system.

External cabling

External cabling involves the following types of cabling:

- External Ethernet cabling connects the Pilots to the customer's management network.

- Fibre channel (FC) and Ethernet iSCSI cabling connects the Controllers to the customer's SAN-based data paths.

- Power cables provide the AC power feed between the main power supply and the Oracle FS System.

Internal cabling

Internal cabling involves the following types of cabling:

- Ethernet cabling between the Pilot nodes and the Controller nodes provides the private management interface (PMI) messaging.

- Serial cross-connect cabling between the Pilot nodes provides a backup heartbeat path.

- SAS cabling between the Controller nodes provides the paths for cache mirroring and redundant SAS data paths through the partner Controller to the Drive Enclosures.

- SAS cabling from the Controller nodes to the Drive Enclosures supports the Backend SAS Interconnect.

- SAS cabling among the Drive Enclosures extends the internal fabric to the Drive Enclosures.

- Power cords from the hardware components to the power distribution units (PDUs) provide load balancing among the outlet groups.

Multiple rack cabling

For multiple rack systems, SAS cabling connects the hardware components across the multiple racks.

System expansion cabling

For system expansion, SAS cabling connects the added Drive Enclosures to the system.

Related Links

Cabling Workflow
Multiple Rack Systems

Cabling Workflow

A high-level workflow helps guide the process of cabling an Oracle FS System.

For best results, follow an organized plan for cabling the system. During the planning stage and before unpacking the shipment, organize all of the boxes so that the related components are grouped together. For example, organize the Drive Enclosure boxes into one group. Organize Controller boxes into another group, and so on. Use the information on the labels that are applied to the boxes as a guideline for organizing the groups.

Note: Do not connect the system to the customer management network until the initial configuration of the management interface is completed.

After the system is unpacked and mechanically set up, cable it. The following figure shows a high-level workflow sequence for cabling a system:

Figure 62: Cabling workflow

1 Connect the internal cables:
a Connect the cables to the Pilots
b Connect the cables to Controllers
c Connect the SAS cables to the Drive Enclosures

2 Connect the system to the main power supply:
a Verify that the power source feed matches the system's PDUs spec
b Make sure PDUs are off
c Connect PDUs to the main power supply

3 Power on the system:
a Connect a laptop to the NET 3 port on Pilot 1
b Power on the system

4 Configure and connect to the customer management network:
a Ping 10.0.0.2
b Download the GUI to a temporary laptop
c Configure management IP addresses
d Connect the system to the customer management network
e Download the GUI to customer management workstations
f Download the FSCLI to the customer management workstations
g Verify the Controller service type
h Update the system software and firmware

5 Configure the global settings:
a Create an additional admin 1 account
b Configure email for administrator accounts
c Configure the email server
d Configure DNS servers
e Configure Call-Home settings
f Test Call-Home

6 Connect the system to the customer data network:
a Provision the Controller ports
b Connect the Controllers to the customer data network

Related Links

Build Map for Your Oracle FS System
Pilot Management Interface Wiring Diagram
Controller Wiring Diagrams
Drive Enclosure Wiring Diagrams

Pilot Cabling

External cabling of the Pilot nodes connects the Oracle FS System to the customer management network. Internal cabling provides the private management interface (PMI) to support the internal private management protocol used for the internal functioning of the system.

Pilot Port for External Cabling

The following figure shows the external Ethernet port.

Figure 63: Pilot port for external cabling

Legend	1 NET 3 port connects the Pilot nodes to the customer management network (Ethernet).

Pilot Ports for Internal Cabling

The following figure shows the internal Ethernet ports and the serial port.

Figure 64: Pilot ports for internal cabling
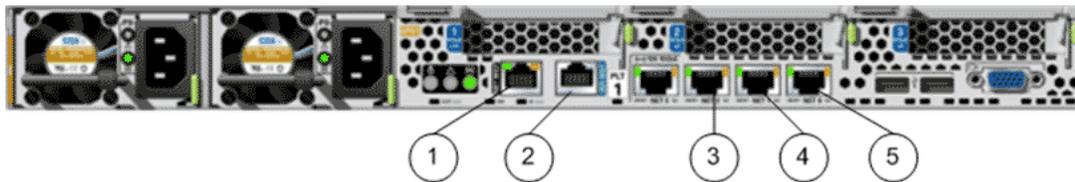
Legend	1 NET MGT port connects to the NET 2 port on the partner Pilot node (Ethernet).	4 NET 1 port connects to the NET 3 port on the Controller node (Ethernet).
	2 SER MGT port connects the SER MGT port on the partner Pilot node (serial).	5 NET 0 port connects to the NET 0 port on the partner Pilot node (Ethernet).

3 NET 2 port connects to the NET MGT port on the partner Pilot node (Ethernet).	

Related Links

Connect the Internal Cables

Connect the Cables to Pilot 1

Connect the Cables to Pilot 2

Connect to the Customer Management Network

Controller Cabling

External cabling for the Controllers provides the interface to the customer data network. Internal cabling supports the private management interface (PMI) and the Backend SAS Interconnect.

Controller Ports for External Cabling

The following figure shows the SAN HBA ports.

Figure 65: Controller ports for external cabling
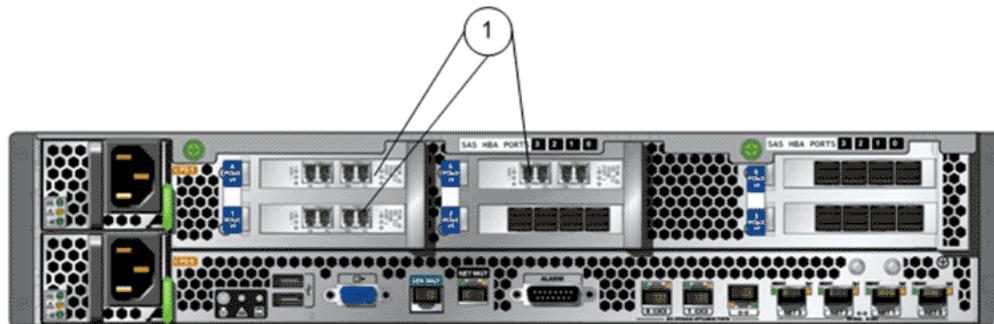
Legend	1 SAN HBA ports connect the system to the customer data network (FC or iSCSI)

Controller Ports for Internal Cabling

The following figure shows the internal Ethernet ports and the SAS ports.

Figure 66: Controller ports for internal cabling
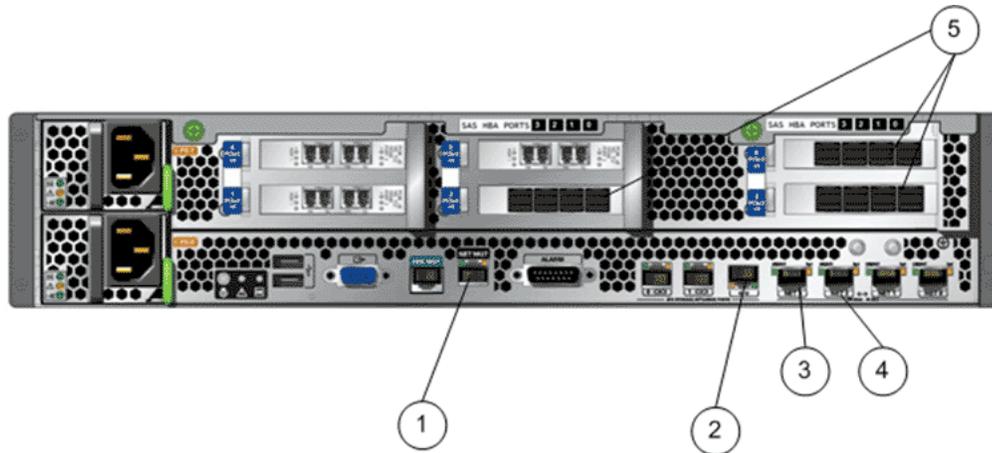
Legend	1 NET MGT port connects to the cluster interconnect port on the partner Controller (Ethernet).	4 NET 2 port connects to the NET 2 port on the partner Controller(Ethernet).
	2 Cluster interconnect network port connects to the NET MGT port on the partner Controller (Ethernet). The cluster interconnect network port is labeled as <- - ->.	5 SAS HBA ports connect between the Controllers and connect the Controllers to the Drive Enclosures (SAS).
	3 NET 3 port connects to the NET 1 port on the Pilot node (Ethernet).	

Related Links
Connections to the Customer Data Network
Connect the Cables to Controller 1
Connect the Cables to Controller 2
Connect to the Customer Data Network

Drive Enclosure Cabling

Each I/O module on a Drive Enclosure has three SAS ports. The SAS ports provide the interconnection between the Drive Enclosures and the Controllers. The SAS ports also provide the interconnections between Drive Enclosures.

DE2-24P Drive Enclosures

The following figure shows the SAS ports of a DE2-24P Drive Enclosure. Note the position of the SAS ports and the reverse orientation of the two I/O modules.

Remember the orientation of the I/O modules and the location of the SAS ports as you cable the system.

Figure 67: SAS ports for Drive Enclosure cabling (DE2-24P)
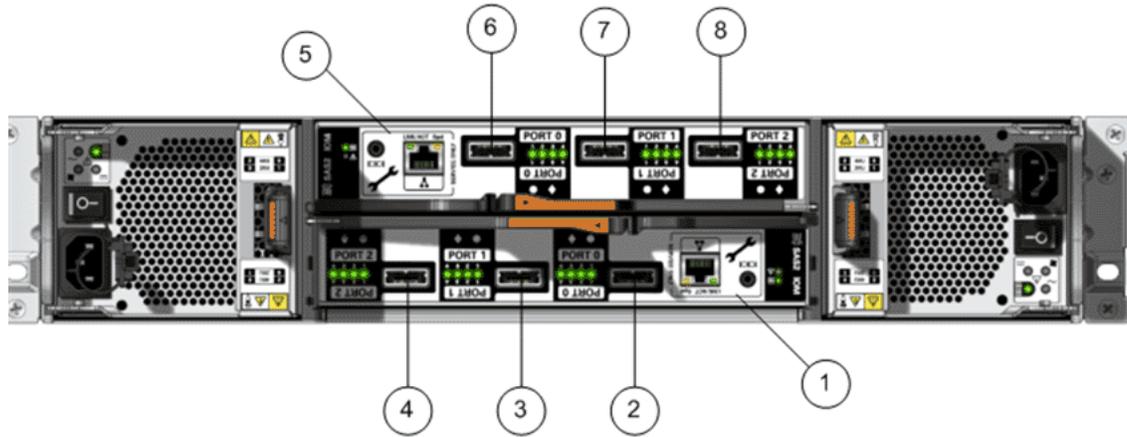
Legend	1 I/O module 0	5 I/O module 1
	2 I/O module 0, SAS port 0	6 I/O module 1, SAS port 0
	3 I/O module 0, SAS port 1	7 I/O module 1, SAS port 1
	4 I/O module 0, SAS port 2	8 I/O module 1, SAS port 2

DE2-24C Drive Enclosures

The following figure shows the SAS ports of a DE2-24C Drive Enclosure. Note the position of the SAS ports and the identical orientation of the two I/O modules. Remember the orientation of the I/O modules and the location of the SAS ports as you cable the system.

Figure 68: SAS ports for Drive Enclosure cabling (DE2-24C)
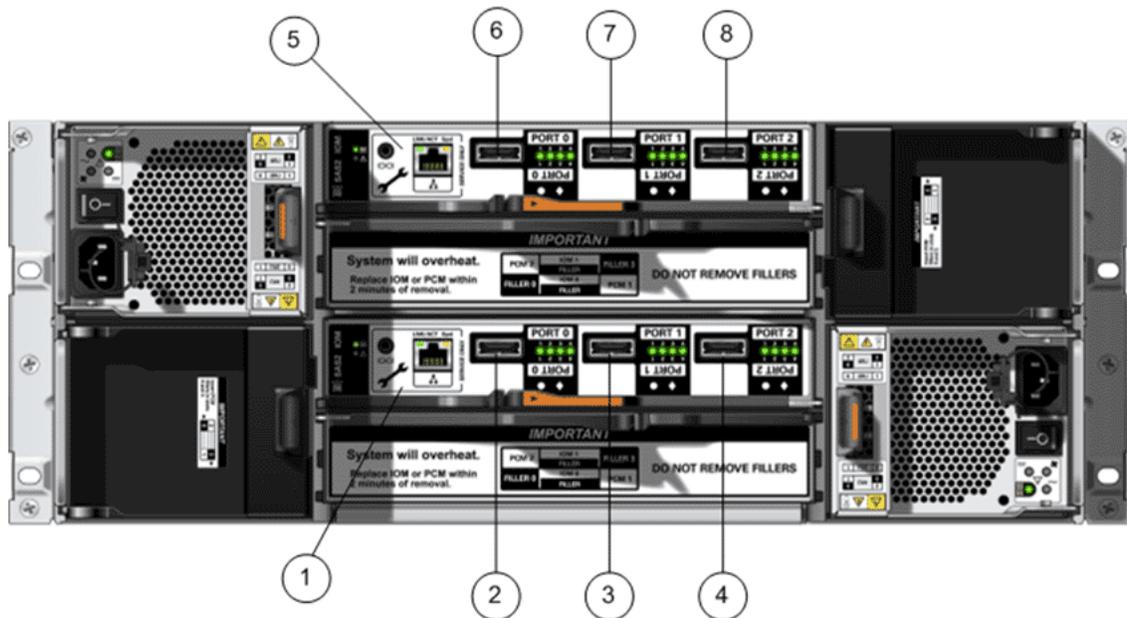
Legend		
	1 I/O module 0	5 I/O module 1
	2 I/O module 0, SAS port 0	6 I/O module 1, SAS port 0
	3 I/O module 0, SAS port 1	7 I/O module 1, SAS port 1
	4 I/O module 0, SAS port 2	8 I/O module 1, SAS port 2

Related Links

Connect the Internal Cables
Connect the Controllers to the Drive Enclosures
Connect the SAS Cables to the Drive Enclosures
Controller Wiring Diagrams
Drive Enclosure Wiring Diagrams

CHAPTER 6

Oracle FS System Cables

Types of External Cables

Customers must supply their own Ethernet cables for connecting the Pilots to the customer management network and for connecting the Controllers to the customer data network. Oracle has no cable color requirements for connecting the Oracle FS System to the customer network.

Pilot External Cables

Pilot external cables provide the management connections. Ethernet CAT6a cables connect from the NET 3 ports on the Pilot nodes to the customer management network. The connections to the customer management network must be to a highly available switch.

Controller External Cables

Controller external cables provide the connections for the host data path. Optical cables connect the SAN HBA ports on the Controller to the customer data network. Each connection requires an HBA and a specific SFP to provide the interface option.

The following table provides the part number and description of the SAN HBAs.

Table 23: SAN HBA

Part number	Description
7101673	Sun Storage 16Gb Fibre Channel PCIe Universal HBA, Qlogic, factory configure

The following table lists the SFP options.

Table 24: HBA options with SFPs

SFP option	SFP manufacturing part number	Description
16Gbs FC Optic SR	7023325	Used for Fibre Channel networks (includes one pair of SFPs)
10Gbs iSCSI Optic SR	7023315	Used for iSCSI (includes one pair of SFPs)

The SAN HBA ports on the Controller connect to SAN switches using optical cables (FC) or Ethernet cables (iSCSI) of specified lengths.

The following table summarizes the length limits for the optical cables that connect to the Controller SAN ports:

Table 25: Cable length limits for FC and iSCSI configurations

Speed	OM1	OM2	OM3	OM4
8 Gb/s	68.89 feet (21 meters)	164.042 feet (50 meters)	492.126 feet (150 meters)	623.36 feet (190 meters)
10 Gb/s (iSCSI)	108.268 feet (33 meters)	272.31 feet (83 meters)	984.252 feet (300 meters)	1804.46 feet (550 meters)
16 Gb/s	49.21 feet (15 meters)	114 .89 feet (35 meters)	328.084 feet (100 meters)	410.105 feet (125 meters)

Related Links
Handling and Care of Fiber Optic Cables
Types of Internal Cables

Types of Internal Cables

The types of internal cables for the Oracle FS System are summarized in the sections below.

Note: If you require additional internal cables, you can order them from Oracle. To find the cable part numbers for ordering purposes, open *Oracle System Handbook* (https://support.oracle.com/handbook_partner/index.html) and go to the Oracle FS1 Flash Storage System components list. Part numbers are listed in the components list.

Private Management Network Cables
The following table lists the types of internal cables and the cable lengths that are used for the Private Management Network.

Table 26: Private Management Network cables

Cable	Color	Cable path	Cable length	Quantity	Example
Ethernet CAT6a	Blue	Connects the Pilot 1 NET 0 port to the Pilot 2 NET 0 port Connects the Pilot 1 NET 2 port to the Pilot 2 NET MGT port Connects the Pilot 1 NET MGT port to the Pilot 2 NET 2 port	9.84 feet (3 m)	Three	
Serial RJ45 rollover	Black	Connects the Pilot 1 SER MGT port to the Pilot 2 SER MGT port	6.6 feet (2 m)	One	
Ethernet CAT6a	Red	Connects the NET 1 ports of the Pilots to the NET 3 ports of the Controllers	9.84 feet (3 m)	Two	
Ethernet CAT6a	Green	Connects the Controller 1 NET 2 port to the Controller 2 NET 2 port Connects the Controller 1 NET MGT port to the cluster interconnect (< - - - >) port of Controller 2 Connects the cluster interconnect (<- - - >) port of Controller 1 to the Controller 2 NET MGT port	9.84 feet (3 m)	Three	

SAS Cables for Connecting the Controllers

The following table lists the type of mini-SAS high density (HD) cable and cable length used to cross-connect the Controllers.

Table 27: Mini-SAS HD cables

Cable	Color	Cable path	Quantity	Cable length
Mini-SAS HD to mini-SAS HD	Black	Connects Controller 1 to Controller 2	Two for a base system with one SAS HBA installed Four for a base system with two SAS HBAs installed Six for a performance system	9.84 feet (3 m)

The following figure shows an example of mini-SAS HD to mini-SAS HD cable connectors.

Figure 69: Example of mini-SAS HD to mini-SAS HD cable connectors

SAS Cables for Drive Enclosure-to-Controller Connections

The following table lists the types of mini-SAS to mini-SAS HD cables and the lengths of the cables used to connect Drive Enclosures to Controllers.

Table 28: Mini-SAS to mini-SAS HD cables

Cable	Color	Cable path	Quantity	Cable length
Mini-SAS to mini-SAS HD	Black	Connects a Controller to a Drive Enclosure in the same rack	Varies based on the configuration of the system	9.84 feet (3 m)
Mini-SAS to mini-SAS HD	Black	Connects a Controller to a Drive Enclosure that is in a separate rack	Varies based on the configuration of the system	19.69 feet (6 m)

The following figure shows an example of mini-SAS to mini-SAS HD cable connectors. The mini-SAS connector on one end of the cable connects to the Drive Enclosure. The mini-SAS HD connector on the other end of the cable connects to the Controller.

Figure 70: Example of mini-SAS to mini-SAS HD cable connectors
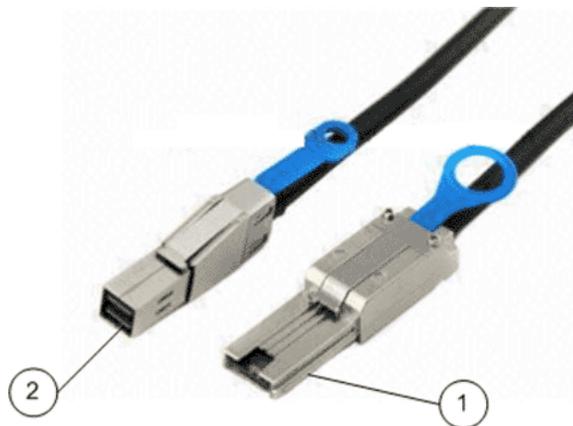
Legend	1 Mini-SAS connector	2 Mini-SAS HD connector

SAS Cables for Drive Enclosure-to-Drive Enclosure Connections

The following table lists the types of mini-SAS cables and the lengths used to cross connect Drive Enclosures.

Table 29: Mini-SAS to mini-SAS cables

Cable	Color	Cable path	Quantity	Cable length
Mini-SAS to mini-SAS	Black	Connects a Drive Enclosure to another Drive Enclosure of the same string in the same rack	Varies based on the configuration of the system	9.84 feet (3 m)
Mini-SAS to mini-SAS	Black	Connects a Drive Enclosure to another Drive Enclosure of the same string in separate racks	Varies based on the configuration of the system	19.69 (6 m)

The following figure shows an example of mini-SAS to mini-SAS cable connectors.

Figure 71: Example of mini-SAS to mini-SAS cable connectors

Internal Power Cords

The following table lists the types of power cords and lengths of power cords that connect the hardware components to the power distribution units (PDUs).

Note: The references to PDU 1 and PDU 2 in the following table indicate that the connections are to be made to separate PDUs connected to separate external power sources for system redundancy. The actual number of PDUs in a system can vary.

Table 30: Power cords and PDU connections

Cable	Color	Cable path	Quantity	Cable length
Power (C13 to C14 angled connector)	Black	Connects power cooling module 1 of a Drive Enclosure to PDU 1 Connects power cooling module 2 of a Drive Enclosure to PDU 2	Varies based on the configuration of the system	3.28 feet (1 m)
Power (C13 to C14 straight connectors)	Black	Connects power supply 1 of a Pilot to PDU 1 Connects power supply 2 of a Pilot to PDU 2 Connects power supply 1 of a Controller to PDU 1 Connects power supply 2 of a Controller to PDU 2 Connects power supply 1 of a MaxRep Replication Engine to PDU 1 Connects power supply 2 of a MaxRep Replication Engine to PDU 2	Varies based on the configuration of the system	9.84 feet (3 m)

Figure 72: Example of a power cord with C13 to C14 angled connectors

Related Links
Routing Cables
Cable Labels
Types of External Cables

Cable Labels

The SAS cables and the internal Ethernet cables provided with the Oracle FS System have labels attached at both ends. The labels designate the hardware component and the corresponding port to which the cable connects.

The following figure provides an example of a label attached to an internal Ethernet cable. One end of the cable connects to the cluster interconnect network port (<- - - >) on Controller 1. The other end of the cable connects to the NET MGT port on Controller 2.

Figure 73: Example of a cable label for an internal Ethernet cable
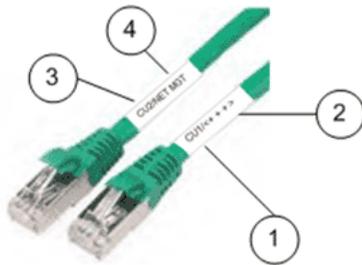
Legend	1 Controller 1	3 Controller 2
	2 Cluster interconnect network port (labeled as < - - - >)	4 NET MGT port

Related Links

Connect the Internal Cables
Types of Internal Cables

Handling and Care of Fiber Optic Cables

Fiber optic cables are delicate and can easily be damaged when you disconnect the cables from the connectors. Fiber optic cables are also sensitive to dirt and to contaminants.

Follow these tips when handling fiber optic cables:

*   Do not bend the fiber optic cable beyond its minimum bend radius (MBR). The MBR can be expressed by multiplying 10 by the diameter of the fiber optic cable with the cable not in tension.

*   Do not use force or rock the connector from side-to-side or up and down to remove the connector because this action can damage the socket.

*   Do not pull the cables using a mechanical device. If you need to pull a cable, pull the cable manually.

*   Do not pull the cables tight when dressing the cables. Leave some slack in the cables.

- Do not use tie wraps or any other crimping style of wrap on high speed cables (optical or copper) because they can crimp the cable insulation and cause data transmission problems. Only use Velcro strips to tie cables.

- Do not push or step on a fiber optic cable or fiber optic connector.

- Do not set any hardware components or other objects on top of the cables.

- Do not let the cables get pinched by closed doors or by door lock hardware.

- Do not twist the cable to secure the ends.

- Do not wrap the fiber optic cables around your hands, your arms, or your shoulders, which can cause sharp bends or a small coiling radius.

- Use the cable management arms (CMAs) so that the cables do not block access for replacing Oracle FS System components.

- Use both hands to disconnect the connector in a module. Do not disturb or deflect other plugs or cables during the removal operation.

CAUTION: To disconnect the cables from the SFP connectors, carefully grasp the cable connector and, while pushing the connector gently into the socket, press the latch on the bottom of the connector to unlatch it. Then, gently pull the connector straight out to release the connector with the cable

Follow these tips to clean fiber optic cables.

- Keep the end caps of the plugs installed whenever the plug is not installed.

- Have a fiber optic cable cleaning kit available while handling fiber optic cables.

A fiber optic cable cleaning kit includes the following items:

- Lint-free wipes

- Isopropyl alcohol (IPA)

- Special fiber optic cleaning swabs

- Canned pressurized air

Routing Cables

Proper routing of cables allows for maintenance of the Oracle FS System without the need to remove the cables. Routing cables properly also helps prevent damage to the Oracle FS System components during maintenance.

All of the Pilot and the Controller cables, as well as the power cords, route through the cable management arms (CMAs). Routing cables through the CMAs helps assure clear access to all of the replaceable units inside of the chassis after the cover is removed.

Each CMA has Velcro straps and three latching bails that secure the cables. Route cables through the CMAs so that the chassis can be extended into the service

position without interference from the cables. If you cannot extend the chassis into the service position, you will not be able to access the field replaceable units (FRUs) and customer replaceable units (CRUs) inside of the chassis. Additionally, if the cables become snagged while a chassis is extended into the service position, damage to the motherboard can occur.

The following figure shows an example of the cables routed through a Controller CMA.

Figure 74: Controller cables routed through the CMA
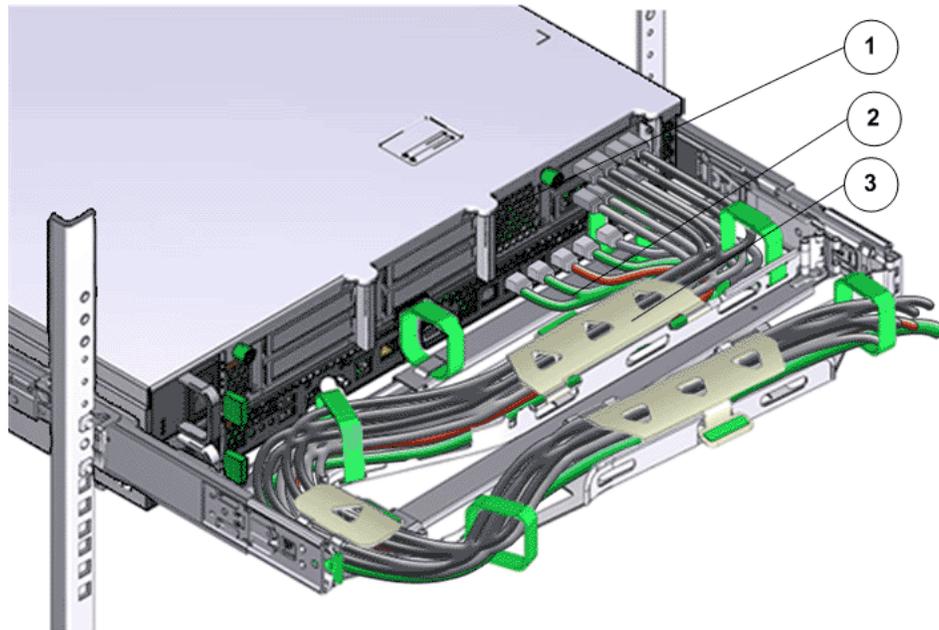
Legend	1 Back of a Controller	3 CMA
	2 Controller cables	

The following figure shows an example of the cables routed through a Pilot CMA.

Figure 75: Pilot cables routed through the CMA
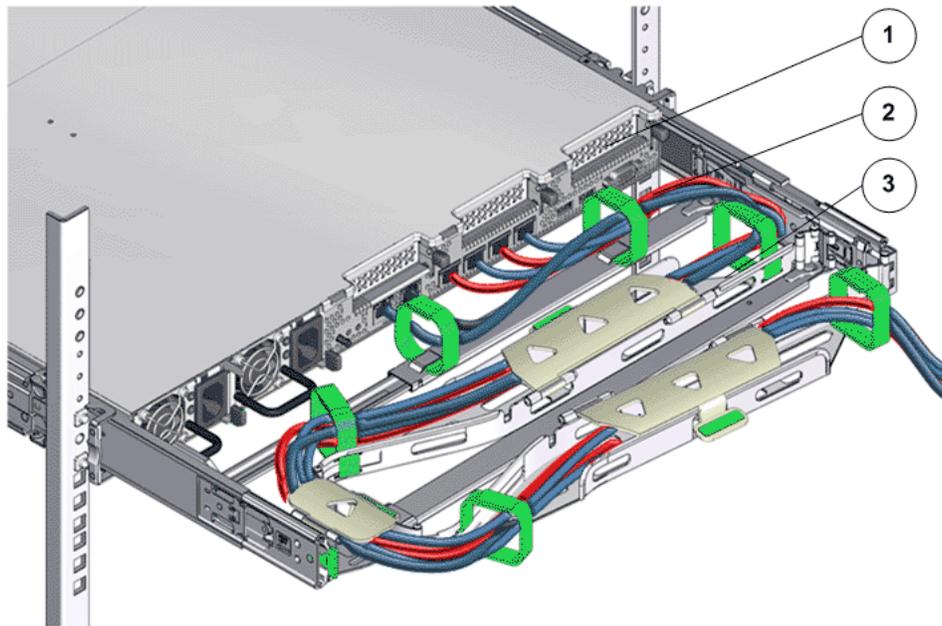
Legend	1 Back of a Pilot	3 CMA
	2 Pilot cables	

When connecting the Controller nodes to the Drive Enclosures, start at the Controller end of the cable and route the SAS cable through the CMA. Then, run the cable vertically down the side of the rack and connect the cable to the Drive Enclosure. All of the SAS cables from the Controller CMAs are routed up or down the right-side vertical rail to the elevation of the target Drive Enclosures. The cables are then routed horizontally to the target Drive Enclosures.

Route and secure the SAS cables connecting one Drive Enclosure to another Drive Enclosure to either side of the rack. If cable management hooks are available in sides of the rack, you can secure the Drive Enclosure cables to the cable management hooks. Use Velcro cable ties to secure the Drive Enclosure cables to the sides of the rack.

Note: Make sure that the cables do not interfere with the removal of CRUs from the Drive Enclosures.

The following figure shows an example of routing a cable from a Controller to a Drive Enclosure, both of which are located in the same rack.

Figure 76: Routing a cable same rack (Controller to Drive Enclosure)
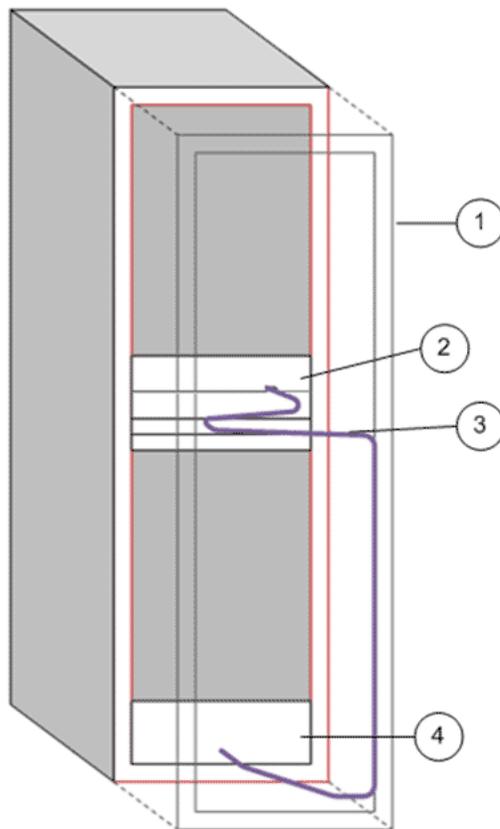
Legend	1 Back of a rack	3 CMA
	2 Controller	4 Drive Enclosure

If there is excess length after routing and connecting the SAS cables, use one of the following methods to manage the excess cable length:

- Spool the excess cable length at the bottom of the rack and slide the cable between the rack rail and the side panel. Use an anchor point that is not a FRU, CRU, or another cable.

- Identify an open space between the rack rail and the side panel and spool the excess cable length so that it can occupy the open space. Use an anchor point that is not a FRU, CRU, or another cable.

Cabling Plan

Cable Planning Worksheet

A cable planning worksheet can help facilitate the process of cabling an Oracle FS System by providing you with a method to record the string assignments and the rack placements of the hardware components.

The following table shows an example of a completed planning worksheet for an Oracle FS System. The example illustrates a populated rack by showing the RU placements of the hardware components. The example uses the following Drive Enclosure configuration to distribute the Drive Enclosures across four strings:

- Two DE2-24P Drive Enclosures with 13 400GB solid state drives (SSDs)
- Four DE2-24P Drive Enclosures with 24 900GB hard disk drives (HDDs)
- Six DE2-24C Drive Enclosures with 24 4TB HDDs

Figure 77: Completed cable planning worksheet

RU	String Number	Component	Chassis ID	Type of Drive Enclosure
42 41 40 39	4	Drive Enclosure 3	12	DE2-24C Drive Enclosure with 4TB HDDs
38 37 36 35	4	Drive Enclosure 2	11	DE2-24C Drive Enclosure with 4TB HDDs
34 33	4	Drive Enclosure 1	10	DE2-24P Drive Enclosure with 900GB HDDs
32 31 30 29	3	Drive Enclosure 3	09	DE2-24C Drive Enclosure with 4TB HDDs
28 27 26 25	3	Drive Enclosure 2	08	DE2-24C Drive Enclosure with 4TB HDDs
24 23		Controller 2	02	
22 21		Controller 1	01	
20		Pilot 2		
19		Pilot 1		
18 17	3	Drive Enclosure 1	07	DE2-24P Drive Enclosure with 900GB HDDs
16 15 14 13	2	Drive Enclosure 3	06	DE2-24C Drive Enclosure with 4TB HDDs
12 11	2	Drive Enclosure 2	05	DE2-24P Drive Enclosure with 900GB HDDs
10 9	2	Drive Enclosure 1	04	DE2-24P Drive Enclosure with 400GB SSDs
8 7 6 5	1	Drive Enclosure 3	03	DE2-24C Drive Enclosure with 4TB HDDs
4 3	1	Drive Enclosure 2	02	DE2-24P Drive Enclosure with 900GB HDDs
2 1	1	Drive Enclosure 1	01	DE2-24P Drive Enclosure with 400GB SSDs

For your planning purposes, you can print the following sample planning worksheet or create a similar planning worksheet.

Figure 78: Sample cable planning worksheet

RU	String Number	Hardware Component	Chassis ID	Type of Drive Enclosure
42				
41				
40				
39				
38				
37				
36				
35				
34				
33				
32				
31				
30				
29				
28				
27				
26				
25				
24				
23				
22				
21				
20				
19				
18				
17				
16				
15				
14				
13				
12				
11				
10				
9				
8				
7				
6				
5				
4				
3				
2				
1				

Related Links

Cabling Workflow

Pilot Management Interface Wiring Diagram

Controller Wiring Diagrams

Drive Enclosure Wiring Diagrams

Build Map for Your Oracle FS System

Included in the shipment of an Oracle FS System is a build map. The build map is a document that summarizes the configuration of the system and how the hardware components of the system were assembled and tested during the manufacturing process.

The build map provides the following details:

- The part numbers of each Controller, Oracle MaxRep, and Drive Enclosure

- The serial numbers and PCI slot assignments of each HBA

- The serial numbers of the SFP+ transceiver modules

- Each Drive Enclosure number and string assignment

- The rack unit (RU) location of each Drive Enclosure

The following figure shows an example of a build map for a system configured with 10 Drive Enclosures.

Figure 79: Build map

FS1 Storage System Config 12772465

Below is a summary that depicts how the components of this system were assembled and tested at manufacturing.

Controller *CU 2*

P/N	7079704

PCI Slot	HBA	Transceiver(s)
6	7067091	
5		
4		
3	7067091	
2	7067091	
1	7023303	7023316 7023316

Controller *CU 1*

P/N	7079704

PCI Slot	HBA	Transceiver(s)
6	7067091	
5		
4		
3	7067091	
2	7067091	
1	7023303	7023316 7023316

MaxRep *MAXREP 1*

P/N	7056355

PCI Slot	HBA	Transceiver(s)
6	371-4325	
5	7051223	530-4449-01 530-4449-01
4	7051223	530-4449-01 530-4449-01
3	371-4325	
2	7051223	530-4449-01 530-4449-01
1	7047852	

Drive Enclosures

Enclosure	String	P/N	Location
DE 1	1	7079758	1-2
DE 2	1	7068660	3-6
DE 3	2	7079758	7-8
DE 4	2	7068660	9-12
DE 5	3	7079758	13-14
DE 6	3	7068660	15-18
DE 7	4	7079758	27-28
DE 8	4	7068660	20-32
DE 9	5	7068660	33-36
DE 10	6	7068660	37-40

Drive Enclosure Strings

A string is a collection of Drive Enclosures that are connected by a common cable to the same SAS HBA port on both Controller nodes. A string consists of one to five Drive Enclosures. Drive Enclosures are assigned to strings at the factory.

Important: Temporary labels attached to the shipping boxes identify the factory configuration for the Drive Enclosure and the string assignment. Additionally, the build map included with the shipment also identifies the factory configuration for the Drive Enclosures and the string assignments. Install and cable the Drive Enclosures and strings according to the factory configuration. Installation services from Oracle Customer Support is highly recommended.

An Oracle FS System with two SAS HBAs installed can have one or two strings to support a maximum of 10 Drive Enclosures. A system with four SAS HBAs can have up to four strings to support a maximum of 20 Drive Enclosures. A performance system can have up to six strings to support a maximum of 30 Drive Enclosures.

The SAS cables connect from the Controller SAS HBA ports to the first Drive Enclosure and the third Drive Enclosure in a string. For small systems with less than three Drive Enclosures, the SAS cables connect from the Controller SAS HBA ports to the first Drive Enclosure and to the last Drive Enclosure in a string.

The following example shows the SAS cable connections for the first string configured in the system with five Drive Enclosures.

Figure 80: The first string with five Drive Enclosures
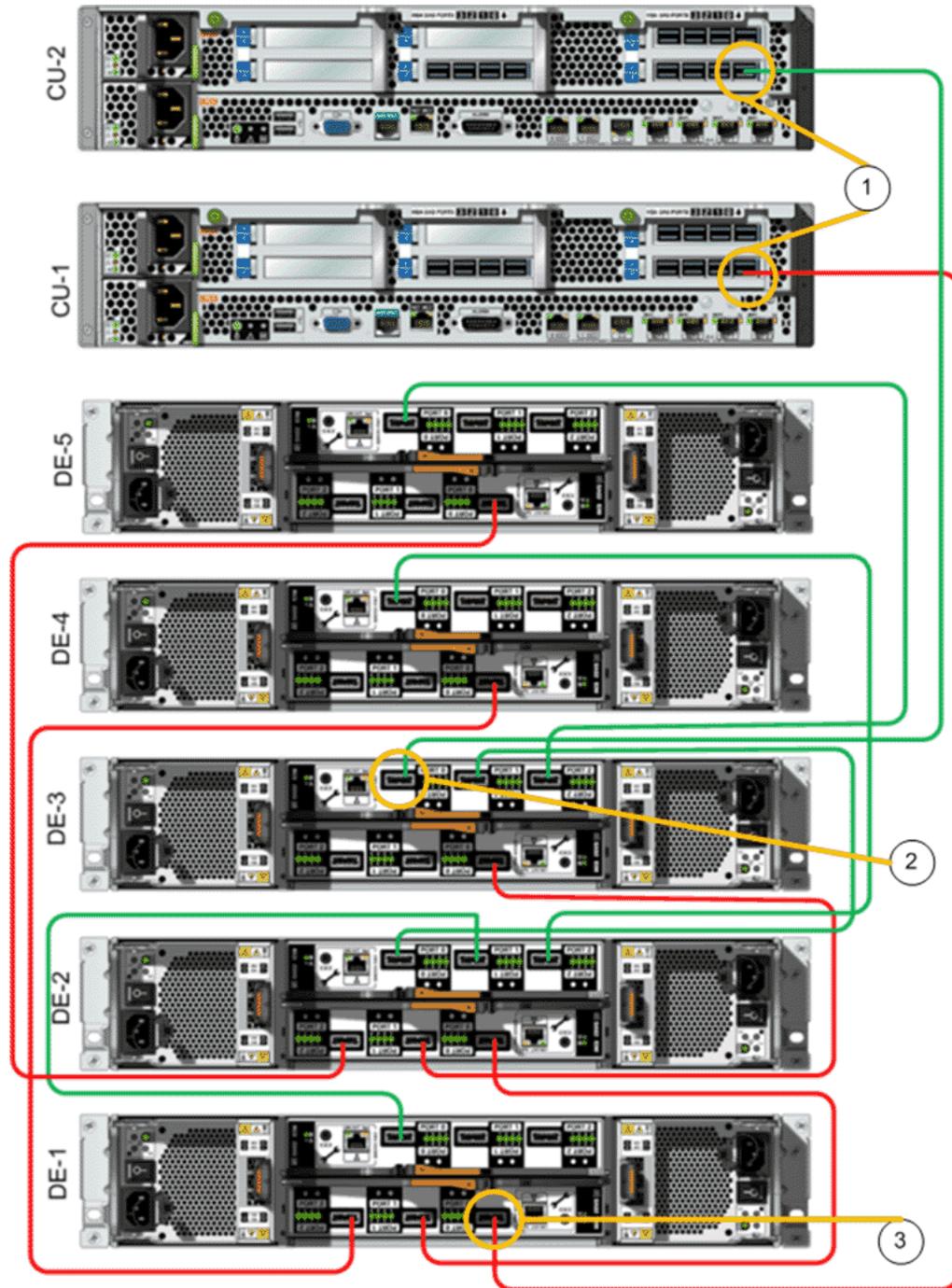
Legend	1 SAS HBA port 0 on Controller 1 and Controller 2
	2 Drive Enclosure 3 (I/O module 1, port 0) in the first string and SAS HBA port 0 on Controller 2
	3 Drive Enclosure 1 (I/O module 0, port 0) in the first string and SAS HBA port 0 on Controller 1

Each Drive Enclosure is assigned sequentially to the strings, one string at a time. The sequence of assigning strings is based on the performance capabilities of the

drives installed in the Drive Enclosures. For optimal performance, the Drive Enclosures with the highest performance drives are first assigned to strings and then continue sequentially until all of the Drive Enclosures are assigned to strings.

The following table summarizes the sequence of assigning Drive Enclosures to strings.

Table 31: Sequence summary

Drive Enclosure	Type of Drive Enclosure	Order of string assignments based on the performance capabilities of the drives
DE2-24P Drive Enclosure with seven or 13 400GB SSDs	Performance SSD	First
DE2-24P Drive Enclosure with seven, 13, or 19 1.6TB SSDs	Capacity SSD	Second
DE2-24P Drive Enclosure with 24 HDDs	Performance HDD	Third
DE2-24C Drive Enclosure with 24 HDDs	Capacity HDD	Fourth

Example of String Assignments

Referring to an example of string assignments can help you recognize string assignments for your Oracle FS System.

Drive Enclosures are distributed to strings based on the Drive Enclosure type. The following figure shows an example of four strings and the corresponding Drive Enclosure assignments for the following configuration:

- Two DE2-24P Drive Enclosures with 400GB SSDs (performance)
- Four DE2-24P Drive Enclosures with 900GB HDDs (performance)
- Six DE2-24C Drive Enclosures with 4TB HDDs (capacity)

Table 32: Example of Drive Enclosure string assignments

Drive Enclosure and Drive type	String number	Drive Enclosure number within a string
DE2-24P 400GB SSDs (peformance)	String 1	DE 1
DE2-24P 900GB HDDs (performance)	String 1	DE 2
DE2-24C 4TB HDDs (capacity)	String 1	DE 3
DE2-24P 400GB SSDs (performance)	String 2	DE 1
DE2-24P 900GB HDDs (performance)	String 2	DE 2
DE2-24C 4TB HDDs (capacity)	String 2	DE 3
DE2-24P 900GB HDDs (performance)	String 3	DE 1
DE2-24C 4TB HDDs (capacity)	String 3	DE 2
DE2-24C 4TB HDDs (capacity)	String 3	DE 3
DE2-24P 900GB HDDs (performance)	String 4	DE 1
DE2-24C 4TB HDDs (capacity)	String 4	DE 2
DE2-24C 4TB HDDs (capacity)	String 4	DE 3

CHAPTER 8

Wiring Diagrams

Pilot Management Interface Wiring Diagram

Cabling the Pilot management interface involves connecting the two Pilot nodes, connecting the Pilots to the Controllers, and connecting the Pilots to the customer management network.

The following figure illustrates the cabling of the Pilot management interface.

Note: The colors of the cables that are shown in the figure are for illustration purposes and do not reflect the actual colors of the cables that are used to cable the Oracle FS System.

Figure 81: Pilot wiring diagram (management connectivity)
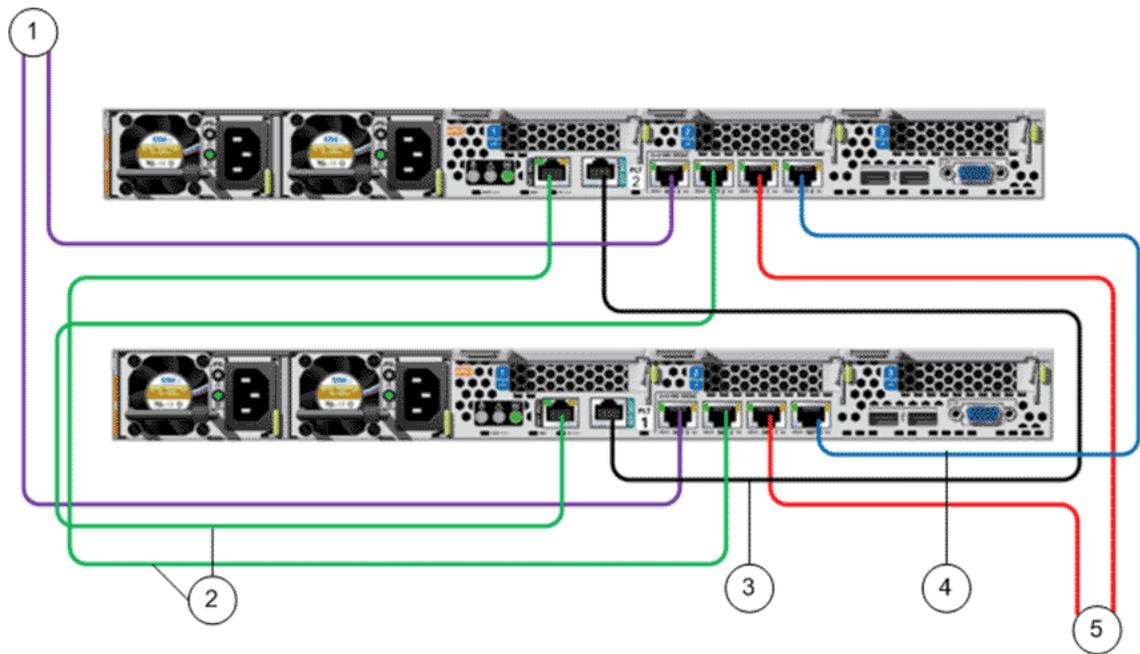
Legend	1 NET 3 port to customer management network	4 NET 0 port to NET 0 port
	2 NET MGT port to NET 2 port	5 NET 1 port to Controller NET 3 port
	3 SER MGT port to SER MGT port	

Controller Wiring Diagrams

The following figure illustrates the cabling of the Controller management interface.

Note: The colors of the cables that are shown in the figure are for illustration purposes and do not reflect the actual colors of the cables that are used to cable the Oracle FS System.

Figure 82: Controller wiring diagram (management connectivity)
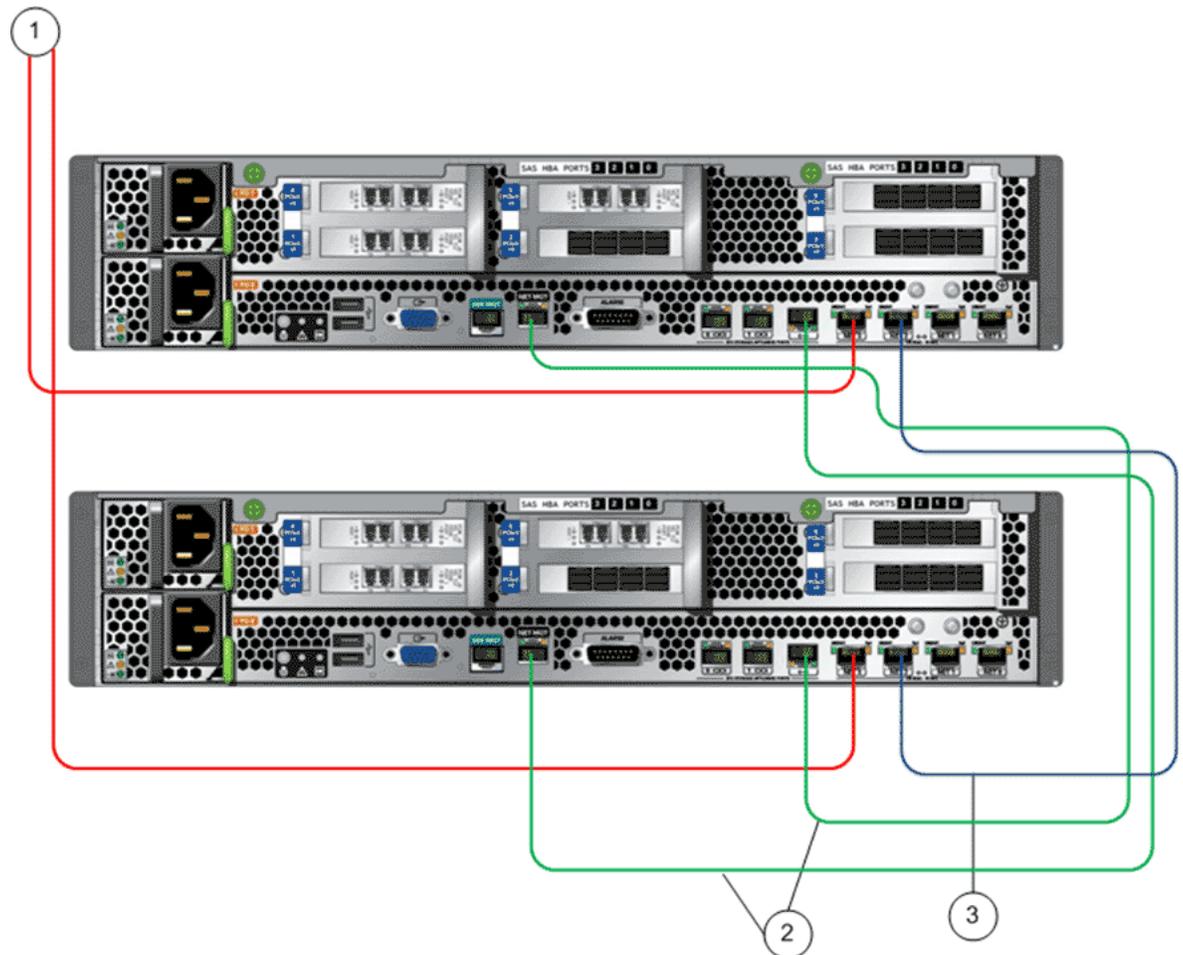
Legend	1 NET 3 port to the Pilot NET 1 port	3 NET 2 port to NET 2 port
	2 Cluster interconnect network port (labeled as <- - - >) to NET MGT port	

The following figure illustrates the cabling for SAN connectivity to the customer data network.

Note: The colors of the cables that are shown in the figure are for illustration purposes and do not reflect the actual colors of the cables that are used to cable the Oracle FS System.

Figure 83: Controller wiring diagram (customer data network)
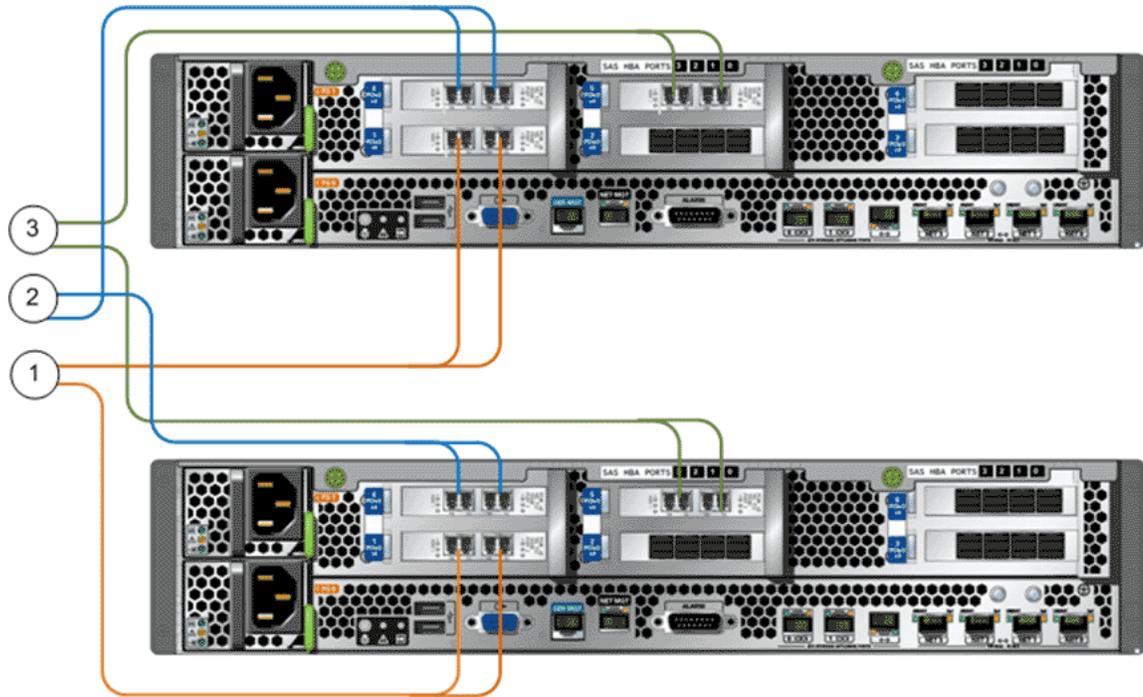
Legend	1 PCIe3 slot 1, HBA for SAN connectivity (FC or iSCSI)	3 PCIe3 slot 5, HBA for SAN connectivity (FC or iSCSI)
	2 PCIe3 slot 4, HBA for SAN connectivity (FC or iSCSI)	

SAS Wiring Diagrams (Controller to Controller)

Complete back-end data path redundancy is accomplished by providing Controller 1 and Controller 2 access to the data path channels for I/O module 0 and I/O module 1 at all times during normal operations:

- The SAS connections between the Controller HBAs provide access to the data path channels through HBA port 2 and port 3.

- Controller 1 accesses the data path channels for I/O module 0 through direct SAS connections to the Drive Enclosure strings through HBA port 1 and port 2.

- Controller 1 accesses the data path channels for I/O module 1 through Controller 2, HBA port 2 and port 3.

- Controller 2 accesses the data path channel for I/O module 1 through direct SAS connections to the Drive Enclosure strings through HBA port 1 and port 2.

- Controller 2 accesses the data path channels for I/O module 0 through Controller 1, HBA port 2 and port 3.

The following figure illustrates the SAS cabling between the Controllers.

Note: The colors of the cables that are shown in the figure are for illustration purposes and do not reflect the actual colors of the cables that are used to cable the Oracle FS System.

Figure 84: SAS wiring diagram (Controller to Controller)
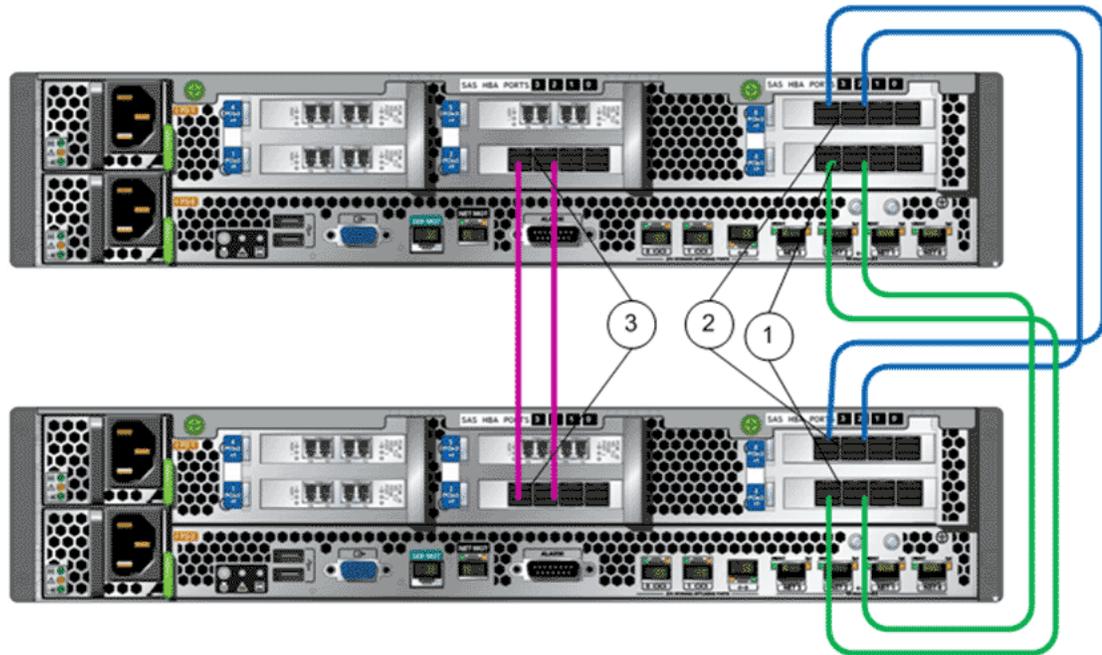
Legend	1 PCIe3 slot 3, SAS HBA port 2 and port 3	3 PCIe3 slot 2, SAS HBA port 2 and port 3
	2 PCIe3 slot 6, SAS HBA port 2 and port 3	

SAS Wiring Diagrams (Controllers to Drive Enclosures)

All of the SAS cables that connect Controller 1 to the Drive Enclosures attach to I/O module 0, port 0 on the Drive Enclosures. All of the SAS cables that connect Controller 2 to the Drive Enclosures attach to I/O module 1, port 0 on the Drive Enclosures

The following figure illustrates the SAS cabling of the Controllers in a base system that is configured with two Drive Enclosure strings.

Note: The colors of the cables that are shown in the figure are for illustration purposes and do not reflect the actual colors of the cables that are used to cable the Oracle FS System.

Figure 85: SAS wiring diagram for Controllers to Drive Enclosures (base)
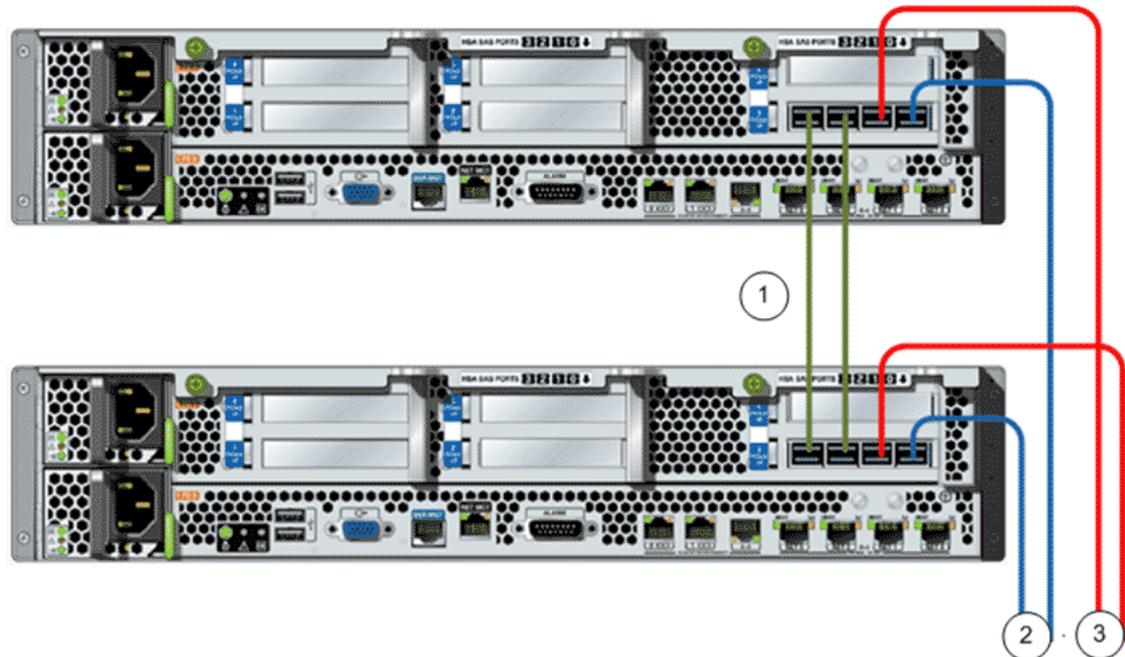
Legend	1 PCIe3 slot 3, SAS HBAs port 2 and port 3 connect the Controllers	3 PCIe3 slot 3, SAS HBAs port 1 connects to Drive Enclosure string 2
	2 PCIe3 slot 3, SAS HBAs port 0 connects to Drive Enclosure string 1	

The following figure illustrates the SAS cabling of the Controllers in a performance system configured with six Drive Enclosure strings.

Note: The colors of the cables that are shown in the figure are for illustration purposes and do not reflect the actual colors of the cables that are used to cable the Oracle FS System.

Figure 86: SAS wiring diagram for Controllers to Drive Enclosures (performance)
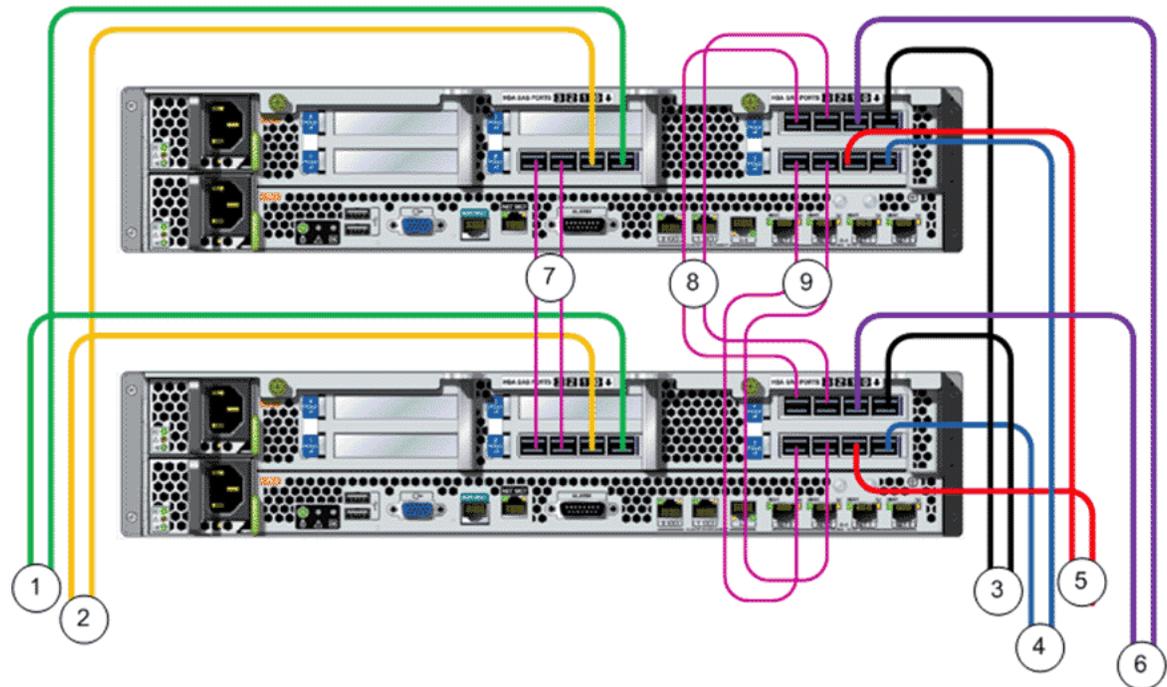
Legend		
	1 PCIe3 slot 2, SAS HBAs port 0 connects to Drive Enclosure string 3	6 PCIe3 slot 6, SAS HBAs port 1 connects to Drive Enclosure string 5
	2 PCIe3 slot 2, SAS HBAs port 1 connects to Drive Enclosure string 6	7 PCIe3 slot 2, SAS HBAs port 2 and port 3 connect the Controllers
	3 PCIe3 slot 6, SAS HBAs port 0 connects to Drive Enclosure string 2	8 PCIe3 slot 6, SAS HBAs port 2 and port 3 connect the Controllers
	4 PCIe3 slot 3, SAS HBAs port 0 connects to Drive Enclosure string 1	9 PCIe3 slot 3, SAS HBAs port 2 and port 3 connect the Controllers
	5 PCIe3 slot 3, SAS HBAs port 1 connects to Drive Enclosure string 4	

Drive Enclosure Wiring Diagrams

SAS cables establish the Backend SAS Interconnect of an Oracle FS System. SAS cables connect Drive Enclosures to Drive Enclosures and the Controller SAS HBA ports to the Drive Enclosure strings.

Usage Conventions for Cabling Drive Enclosure

The following usage conventions summarize how the ports are used when cabling Drive Enclosures:

- Controller 1 HBA ports 0 and ports 1 connect to the first Drive Enclosure (I/O module 0, port 0) in a string.

- Controller 2 HBA ports 0 and ports 1 connect to the third Drive Enclosure (I/O module 1, port 0) in strings that support three or more Drive Enclosures.

- Controller 2 HBA ports 0 and ports 1 connect to the second Drive Enclosure (I/O module 1, port 0) or to the first Drive Enclosure (I/O module 1, port 0) in strings that support less than three Drive Enclosures.

- I/O module 0, port 1 connects to the second Drive Enclosure (I/O module 0, port 0) and to the third Drive Enclosure (I/O module 0, port 0) in a string.

- I/O module 1, port 2 connects to the fourth Drive Enclosure (I/O module 1, port 0) and to the fifth Drive Enclosure (I/O module 1, port 0) in a string.

Note: The Oracle FS System supports three hops from the HBAs.

Drive Enclosure SAS Wiring Diagrams

The following wiring diagrams show the cabling of Drive Enclosures for one string in a system. The same cabling pattern applies to all of the strings in a system.

Note: The following wiring diagrams show DE2-24P Drive Enclosures. Note the position of the SAS ports and the reverse orientation of the two I/O modules on the DE2-24P Drive Enclosures. Conversely, the two I/O modules on the DE2-24C Drive Enclosures have an identical orientation. Remember the orientation of the I/O modules and the location of the SAS ports as you cable the system.

The following figure illustrates the SAS cabling for one Drive Enclosure string containing one Drive Enclosure.

Figure 87: SAS wiring diagram for one string with one Drive Enclosure
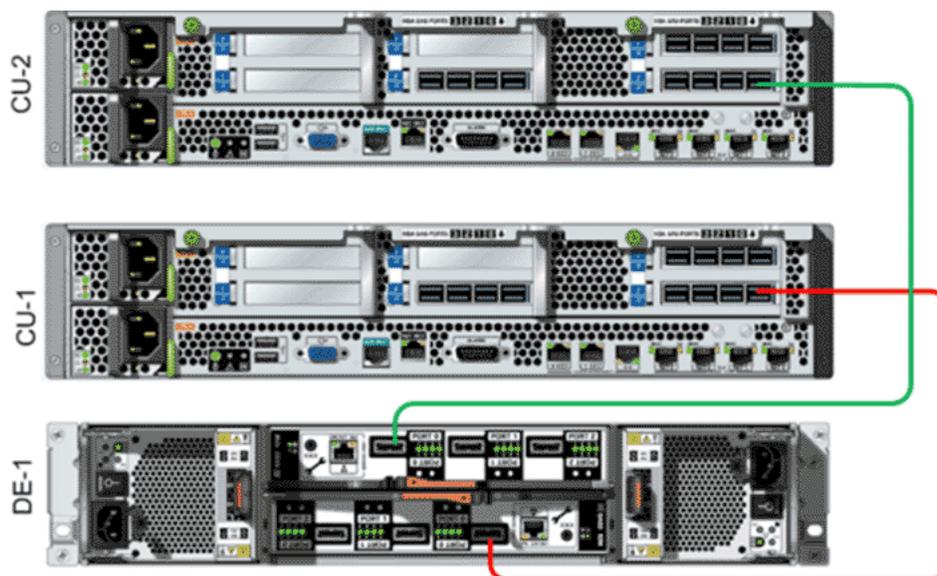
The following figure illustrates the SAS cabling in a system that is configured with one Drive Enclosure string containing two Drive Enclosures.

Figure 88: SAS wiring diagram for one string with two Drive Enclosures
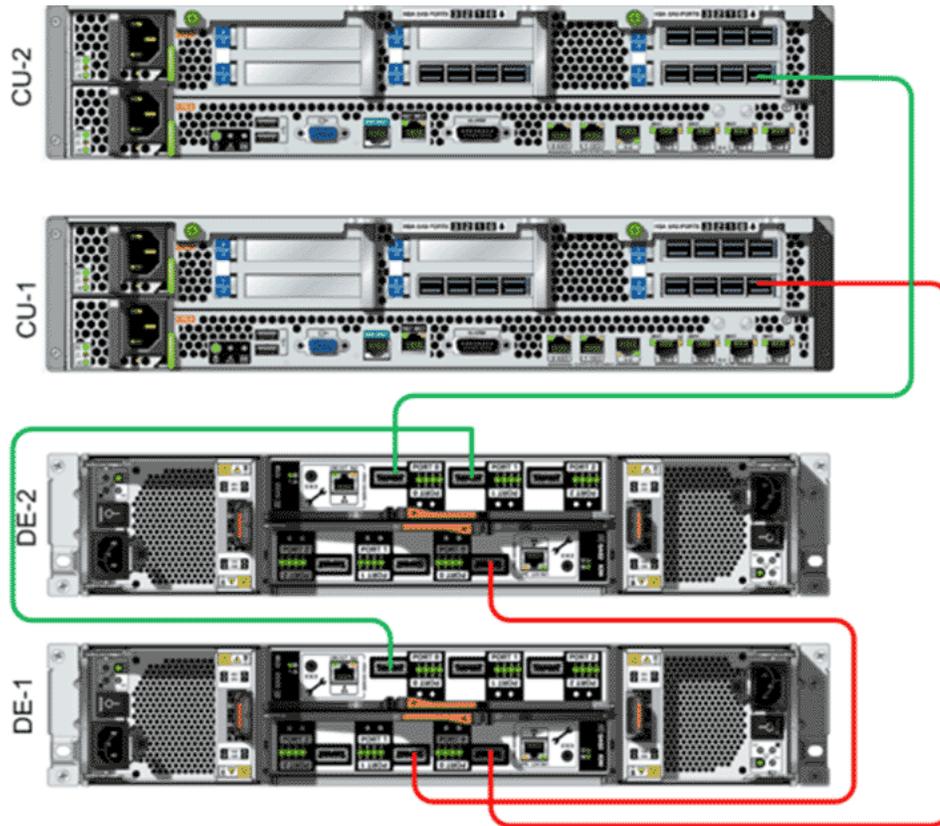
The following figure illustrates the SAS cabling in a system that is configured with one Drive Enclosure string containing three Drive Enclosures.

Figure 89: SAS wiring diagram for one string with three Drive Enclosures
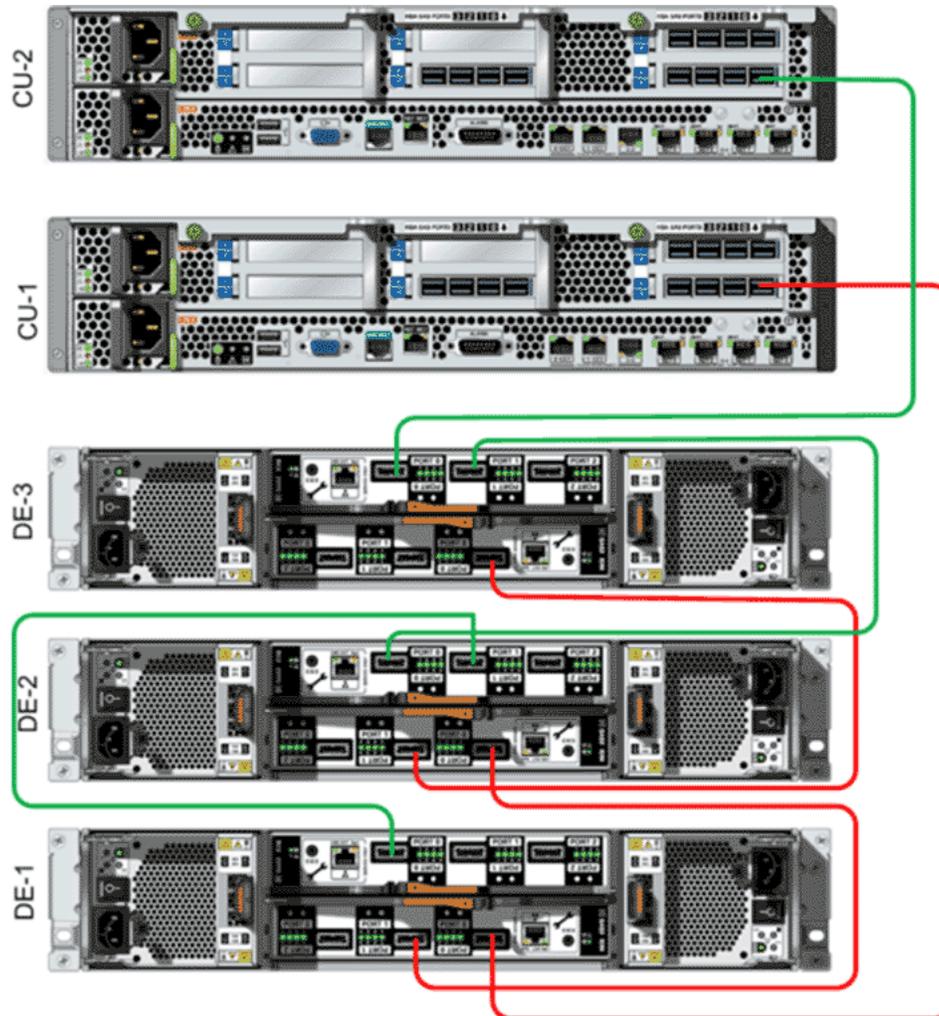
The following figure illustrates the SAS cabling in a system that is configured with one Drive Enclosure string containing four Drive Enclosures.

Figure 90: SAS wiring diagram for one string with four Drive Enclosures
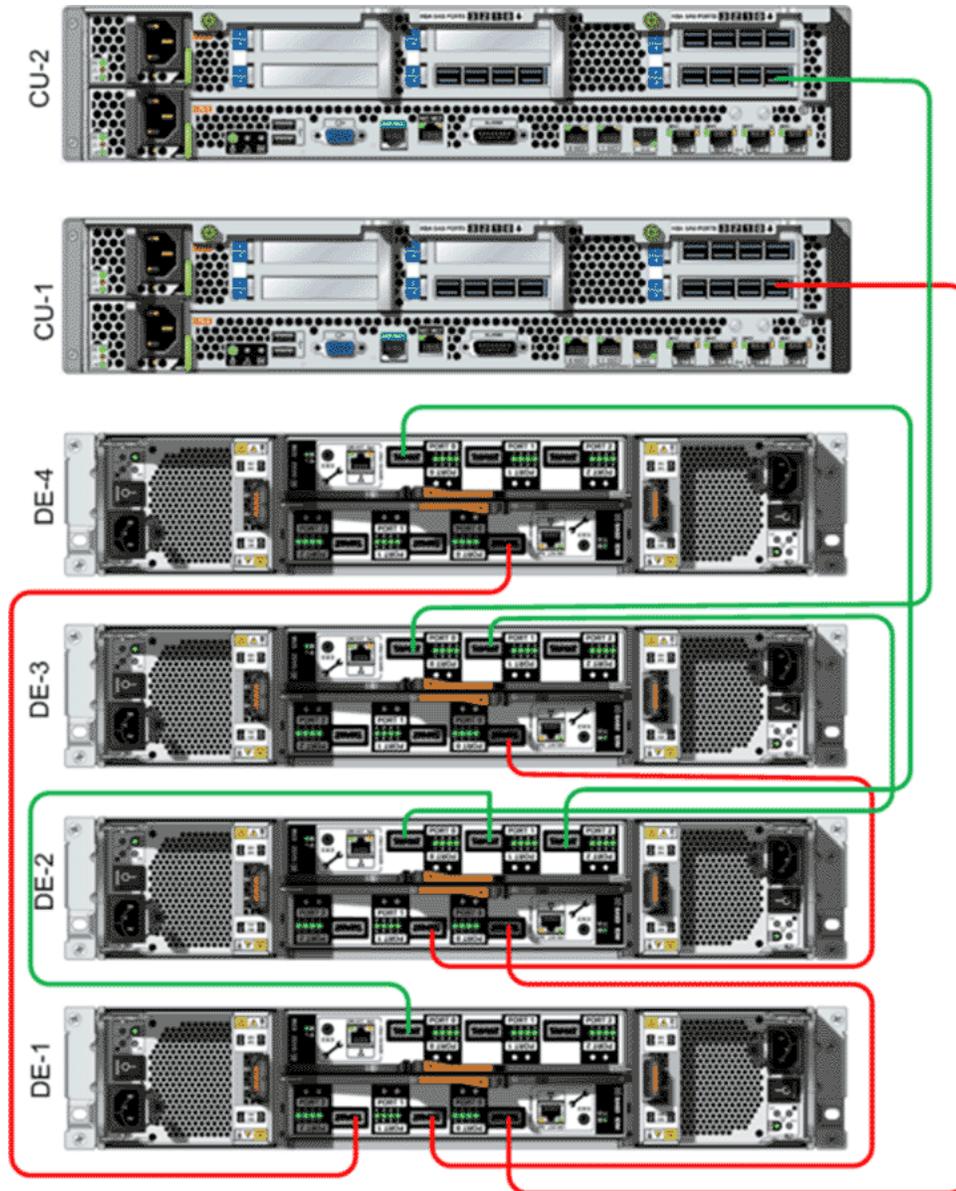
The following figure illustrates the SAS cabling in a system that is configured with one **Drive Enclosure** string containing five **Drive Enclosures**.

Figure 91: SAS wiring diagram for one string with five Drive Enclosures
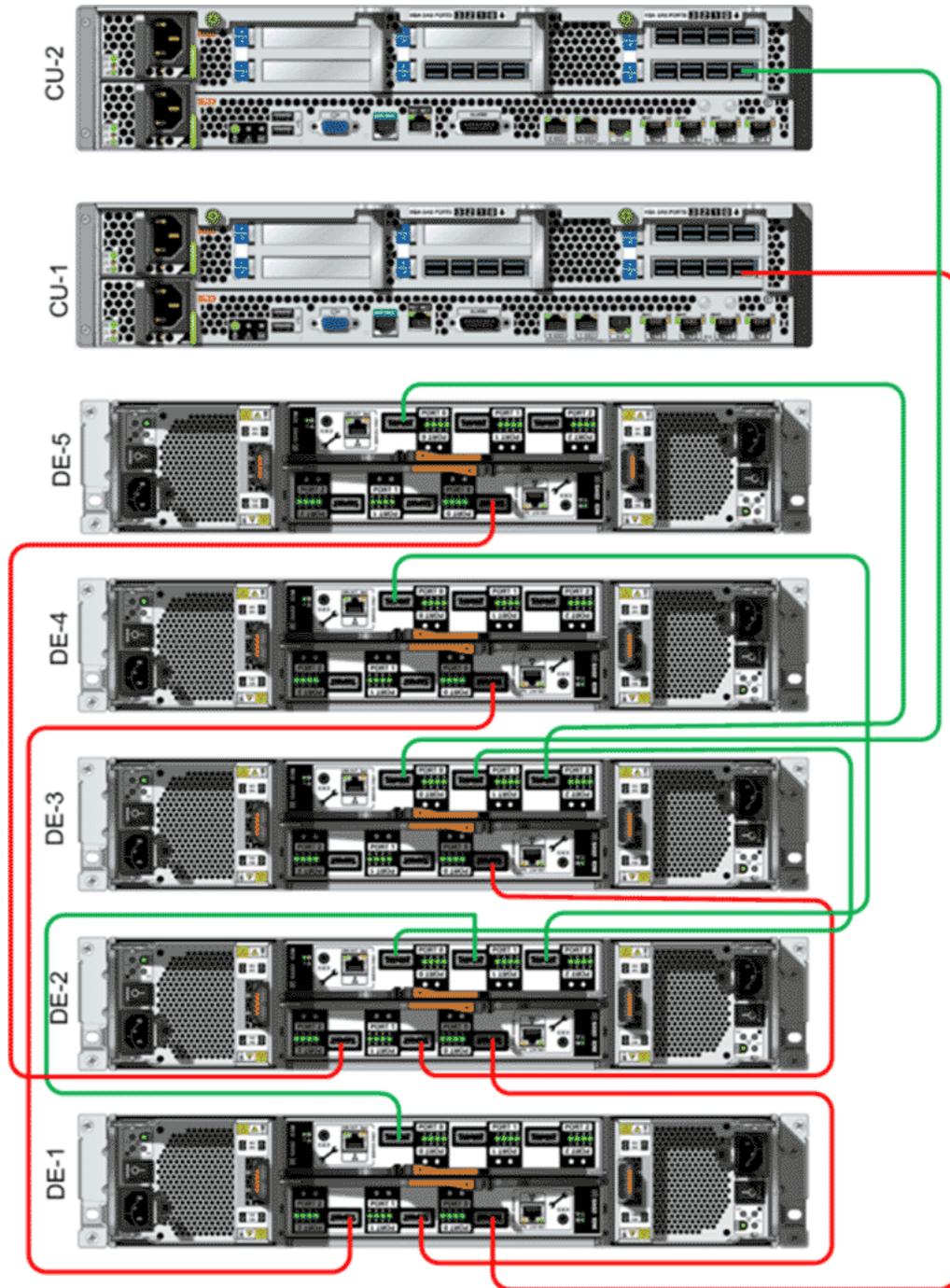
Connect the Internal Cables

Connect the Internal Cables

The internal cables are shipped with the Oracle FS System. Ethernet cables support the private management interconnect (PMI). A serial cable establishes the backup heartbeat path for the Pilots. SAS cables support the Backend SAS Interconnect.

Prerequisites:
- You unpacked the cables and the power cords from the shipping cartons.
- You are familiar with the labels on each end of the cables shipped with the Oracle FS System.
- You supplied an Ethernet CAT6a cable for connecting the Pilot to the customer management network.
- The cable management arms (CMAs) are installed on the Pilots and the Controllers.

Before you begin connecting the internal cables for the Oracle FS System, verify that you have the following cables unpacked from the shipping cartons and organized so that you can easily identify them as you cable the system:

- Three blue Ethernet CAT6a cables used to connect the Pilot nodes.
- Two red Ethernet CAT6a cables used to connect the Pilot nodes to the Controller nodes.
- Three green Ethernet CAT6a cables used to connect the Controller internal connections.
- One black serial RJ45 rollover cable used to establish the backup heartbeat path for the Pilots.
- Mini-SAS high density (HD) to mini-SAS HD cables used establish the SAS connections between the Controller nodes. The number of cables included in the shipment depends upon the configuration of the system.
- Mini-SAS to mini-SAS HD cables used to connect the Controller nodes and the Drive Enclosure strings. The number of cables included in the shipment depends upon the configuration of the system.
- Mini-SAS to mini-SAS cables used to connect the Drive Enclosures within a string. The number of cables included in the shipment depends upon the configuration of the system.

CAUTION: Do not connect the power distribution units (PDUs) to external power sources until the internal cabling is complete.

Procedure Overview

1   *Configure the Cable Covers on the CMAs*

2   *Connect the Cables to Pilot 1*

3   *Connect the Cables to Pilot 2*

4   *Connect the Cables to Controller 1*

5   *Connect the Cables to Controller 2*

6   *Connect the SAS Cables to the Controllers*

7   *Connect the Controllers to the Drive Enclosures*

8   *Connect the SAS Cables to the Drive Enclosures*

Configure the Cable Covers on the CMAs

To accommodate the volume of cables routed through the cable management arms (CMAs) of the Controllers, you might have to replace the standard cable covers on the CMAs with the large cable covers.

The large cable covers are included in the packaging. As a guideline, replace the standard cable covers with the large cable covers for Oracle FS Systems with eight SAS cables connected to the SAS HBAs on each Controller. For larger systems configured with three SAS HBAs per Controller, you can remove the cable covers completely from the CMAs to allow for the volume of SAS cables.

1   Open the cable cover currently attached to the Controller CMA.

2   Pull the cover off of the CMA.

   Start at one end of the cable cover and work towards the other end of the cable cover as you pry off the cable cover.

3   Snap the pins of the large cover into place on the CMA.

   For systems with three SAS HBAs per Controller, leave the cable cover off of the CMA.

4   Repeat these steps for the partner Controller.

Related Links

Cabling Workflow
Connect the Controllers to the Drive Enclosures
Connect the SAS Cables to the Controllers

Connect the Cables to Pilot 1

1   Slide Pilot 1 into the service position.

2   Connect the power cords with C13-to-C14 straight connectors to the power supplies on Pilot 1 and route the power cords through the cable management arm (CMA).

3 Connect the end of the cable labeled "PLT 1 SER MGT" to the SER MGT port on Pilot 1 and route the cable through the cable management arm (CMA).

4 Connect the end of the cable labeled "PLT 1 NET 0" to the NET 0 port on Pilot 1 and route the cable through the CMA.

5 Connect the end of the cable labeled "PLT 1 NET 2" to the NET 2 port on Pilot 1 and route the cable through the CMA.

6 Connect the end of the cable labeled "PLT 1 NET MGT" to the NET MGT port on Pilot 1 and route the cable through the CMA.

7 Connect the end of the cable labeled "PLT 1 NET 1" to the NET 1 port on Pilot 1 and route the cable through the CMA.

   Note: The other end of this cable connects to the NET 3 port on the Controller. Do not connect to the Controller at this time.

8 Connect a customer-supplied Ethernet cable to the NET 3 port on Pilot 1 and route the cable through the CMA.

   Important: The other end of this cable connects to the customer management network. Do not connect to the customer management network at this time. Make sure enough cable length is free from the CMA so that you can connect the cable to the customer management network later. Temporarily secure the cable so that it does not interfere with other cabling steps.

9 Spool any unconnected ends of the cables in a logical manner and use Velcro to attach the spools to a temporary location on the rack rail.

   Attaching the spooled ends of the cables to the rack rail provides a temporary strain relief to reduce the amount of stress on the cable connectors and ports. Make sure to leave enough cable slack to ensure that the chassis can be extended into the service position and returned to the rack position without interference from the cables.

10 Slide the chassis into the rack position and into the service position several times to ensure that the chassis can be extended into the service position without interference from the cables.

   CAUTION: If the cables become snagged while the chassis is extended into the service position, damage to the motherboard might occur.

Related Links

Cabling Workflow
Pilot Cabling
Routing Cables
Pilot Management Interface Wiring Diagram

Connect the Cables to Pilot 2

1   Slide Pilot 2 into the service position.

2   Connect the power cords with C13-to-C14 straight connectors to the power supplies on Pilot 2, and route the power cords through the CMA.

3   Connect the end of the cable labeled "PLT 2 SER MGT" to the SER MGT port on Pilot 2 and route the cable through the CMA.

4   Connect the end of the cable labeled "PLT 2 NET 0" to the NET 0 port on Pilot 2 and route the cable through the CMA.

5   Connect the end of the cable labeled "PLT 2 NET MGT" to the NET MGT port on Pilot 2 and route the cable through the CMA.

6   Connect the end of the cable labeled "PLT 2 NET 2" to the NET 2 port on Pilot 2 and route the cable through the CMA.

7   Connect the end of the cable labeled "PLT 2 NET 1" to the NET 1 port on Pilot 2 and route the cable through the CMA.

    Note: The other end of this cable connects to the NET 3 port on the Controller. Do not connect to the Controller at this time.

8   Connect a customer-supplied Ethernet cable to the NET 3 port on Pilot 2 and route the cable through the CMA.

    Important: The other end of this cable connects to the customer management network. Do not connect to the customer management network at this time. Make sure enough cable length is free from the CMA so that you can connect the cable to the customer management network later. Temporarily secure the cable so that it does not interfere with other cabling steps.

9   Spool any unconnected ends of the cables in a logical manner and use Velcro to attach the spools to a temporary location on the rack rail.

    Attaching the spooled ends of the cables to the rack rail provides a temporary strain relief to reduce the amount of stress on the cable connectors and ports. Make sure to leave enough cable slack to ensure that the chassis can be extended into the service position and returned to the rack position without interference from the cables.

10 Slide the chassis into the rack position and into the service position several times to ensure that the chassis can be extended into the service position without interference from the cables.

    CAUTION: If the cables become snagged while the chassis is extended into the service position, damage to the motherboard might occur.

Related Links
Cabling Workflow
Pilot Cabling
Routing Cables
Pilot Management Interface Wiring Diagram

Connect the Cables to Controller 1

1   Slide Controller 1 into the service position.

2   Connect the power cords with C13-to-C14 straight connectors to the power supplies on Controller 1 and route the power cords through the cable management arm (CMA).

3   Connect the end of the cable labeled "CU1 NET 3" to the the NET 3 port on Controller 1 and route the cable through the CMA.

    Note: The other end of this cable was connected to the NET 1 port on the Pilot when you cabled the Pilot.

4   Connect the end of the cable labeled "CU 1 NET 2" to the NET 2 port on Controller 1 and route the cable through the cable management arm (CMA).

5   Connect the end of the cable labeled "CU1 NET MGT" to the NET MGT port on Controller 1 and route the cable through the CMA.

6   Connect the end of the cable labeled "CU 1 <- - ->" to the cluster interconnect network port on Controller 1 and route the cable through the CMA.

7   Spool any unconnected ends of the cables in a logical manner and use Velcro to attach the spools to a temporary location on the rack rail.

    Attaching the spooled ends of the cables to the rack rail provides a temporary strain relief to reduce the amount of stress on the cable connectors and ports. Make sure to leave enough cable slack to ensure that the chassis can be extended into the service position and returned to the rack position without interference from the cables.

8   Slide the chassis into the rack position and into the service position several times to ensure that the chassis can be extended into the service position without interference from the cables.

    CAUTION: If the cables become snagged while the chassis is extended into the service position, damage to the motherboard might occur.

Related Links

Cabling Workflow
Controller Cabling
Routing Cables
Controller Wiring Diagrams

Connect the Cables to Controller 2

1   Slide Controller 2 into service position.

2   Connect the power cords with C13-to-C14 straight connectors to the power supplies on Controller 2, and route the power cords through the cable management arm (CMA).

3   Connect the end of the cable labeled "CU2 NET 3" to the NET 3 port on Controller 2, and route the cable through the CMA.

   Note: The other end of this cable was connected to the NET 1 port on the Pilot when you cabled the Pilot.

4   Connect the end of the cable labeled "CU 2 NET 2" to the NET 2 port on Controller 2, and route the cable through the cable management arm (CMA).

5   Connect the end of the cable labeled "CU2 NET MGT" to the NET MGT port on Controller 2, and route the cable through the CMA.

6   Connect the end of the cable labeled "CU 2 <- - ->" to the cluster interconnect network port on Controller 2, and route the cable through the CMA.

7   Spool any unconnected ends of the cables in a logical manner and use Velcro to attach the spools to a temporary location on the rack rail.

   Attaching the spooled ends of the cables to the rack rail provides a temporary strain relief to reduce the amount of stress on the cable connectors and ports. Make sure to leave enough cable slack to ensure that the chassis can be extended into the service position and returned to the rack position without interference from the cables.

8   Slide the chassis into the rack position and into the service position several times to ensure that the chassis can be extended into the service position without interference from the cables.

   CAUTION: If the cables become snagged while the chassis is extended into the service position, damage to the motherboard might occur.

Related Links
Cabling Workflow
Controller Cabling
Routing Cables
Controller Wiring Diagrams

Connect the SAS Cables to the Controllers

1   Slide Controller 1 into the service position.

2   Connect the end of the cable labeled "CU 1 PCIE3-2" to port 2 in the PCIe3 slot on Controller 1, and route the cable through the CMA.

   Note: When inserted into the SAS HBA port, the blue tab of the mini-SAS HD connector faces the bottom of the port. The following image shows an example of how a mini-SAS HD connector inserts into a SAS HBA port.

Figure 92: Mini-SAS HD connector and a SAS HBA port on the Controller
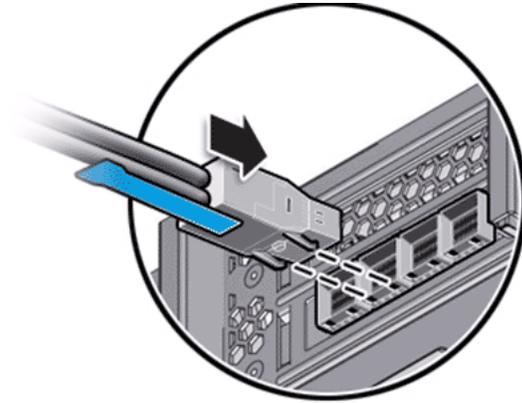
3   Connect the end of the cable labeled "CU 1 PCIE3-3" to port 3 in the PCIe3 slot on Controller 1, and route the cable through the CMA.

4   Slide Controller 1 into the rack position.

5   Slide Controller 2 into the service position.

6   Connect the end of the cable labeled "CU 2 PCIE3-2" to port 2 in the PCIe3 slot on Controller 2, and route the cable through the CMA.

7   Connect the end of the cable labeled "CU 2 PCIE3-3" to port 3 in the PCIe3 slot on Controller 2, and route the cable through the CMA.

If your system is configured with more than two SAS HBA cards, continue to connect the remaining mini-SAS HD to mini-SAS HD cables. Follow the information on the cable labels to connect and to route the remaining mini-SAS HD to mini-SAS HD cables.

Related Links

Cabling Workflow
Controller Wiring Diagrams

Connect the Controllers to the Drive Enclosures

CAUTION: Use the Drive Enclosure strings that were assigned during the manufacturing process. The build map that is included in the shipment provides information about the assignment of Drive Enclosure strings. Additionally, the labels on the SAS cables also identify the Drive Enclosure strings.

Note: For each string, cabling the Controllers to the Drive Enclosure strings follows the same, logical sequence. The following steps provide the proper sequence for cabling the Controllers to string 1. String 1, in this example, contains five Drive Enclosures.

1   Slide the Controllers into the service position.

2   Cable Controller 1 to the first Drive Enclosure in the string.

      a)   Connect the end of the cable labeled "CU 1 PCIE3-0" to port 0 in the PCIe3 slot on Controller 1.

b) Route the cable through the CMA.

c) Connect the other end of the cable, labeled "DE-1 IOM0-0," to port 0 in I/O module 0 on Drive Enclosure 1.

3 Cable Controller 2 to the third Drive Enclosure in the string.

a) Connect the end of the cable labeled "CU 2 PCIE3-0" to port 0 in the PCIe3 slot on Controller 2.

b) Route the cable through the CMA.

c) Connect the other end of the cable, labeled "DE-3 IOM1-0," to port 0 in I/O module 1 on Drive Enclosure 3.

4 If your Oracle FS System is configured with two or more SAS HBAs, continue to follow the information on the cable labels to connect and route the Controller nodes to the remaining Drive Enclosure strings.

When you are finished, return the Controllers to the rack position.

Refer to the wiring diagrams for guidance when cabling the Controller nodes to the Drive Enclosure strings.

Related Links

Cabling Workflow
Controller Wiring Diagrams

Connect the SAS Cables to the Drive Enclosures

CAUTION: Use the Drive Enclosure strings that were assigned during the manufacturing process. The build map that is included in the shipment provides information about the assignment of Drive Enclosure strings. Additionally, the labels on the SAS cables also identify the Drive Enclosure strings.

For each Drive Enclosure string, cabling the Drive Enclosures follows the same, logical sequence. The following steps provide the proper sequence for the cabling of five Drive Enclosures in the first string. Refer to the wiring diagrams for guidance when cabling Drive Enclosures.

1 Connect the straight end of the C13-to-C14 power cords to the power cooling modules on each Drive Enclosure.

Note: The C14 ends of the C13-to-C14 power cords are angled to provide a flush fit at the power distribution units (PDUs). Do not connect the power cords to the PDUs at this time.

Note: Non-Oracle PDUs might require different power cords from those included in the shipment. You can order alternate power cords from Oracle.

2 Cable Drive Enclosure 1 to Drive Enclosure 2.

    a) Connect the end of the cable labeled "DE-1 IOM0-1" to I/O module 0, port 1 on Drive Enclosure 1.

    b) Connect the other end of the cable, labeled "DE-2 IOM0-0," to I/O module 0, port 0 on Drive Enclosure 2.

    c) Connect the end of the cable labeled "DE-1 IOM1-0" to I/O module 1, port 0 on Drive Enclosure 1.

    d) Connect the other end of the cable, labeled "DE-2 IOM1-1," to I/O module 1, port 1 on Drive Enclosure 2.

3   Cable Drive Enclosure 2 to Drive Enclosure 3.

    a) Connect the end of the cable labeled "DE-2 IOM0-1" to I/O module 0, port 1 on Drive Enclosure 2.

    b) Connect the other end of the cable, labeled "DE-3 IOM0-0," to I/O module 0, port 0 on Drive Enclosure 3.

    c) Connect the end of the cable labeled "DE-2 IOM1-0" to I/O module 1, port 0 on Drive Enclosure 2.

    d) Connect the other end of the cable, labeled "DE-3 IOM1-1," to I/O module 1, port 1 on Drive Enclosure 3.

4   Cable Drive Enclosure 1 to Drive Enclosure 4.

    a) Connect the end of the cable labeled "DE-1 IOM0-2" to I/O module 0, port 2 on Drive Enclosure 1.

    b) Connect the other end of the cable, labeled "DE-4 IOM0-0," to I/O module 0, port 0 on Drive Enclosure 4.

5   Cable Drive Enclosure 2 to Drive Enclosure 4.

    a) Connect the end of the cable labeled "DE-2 IOM1-2" to I/O module 1, port 2 on Drive Enclosure 2.

    b) Connect the other end of the cable, labeled "DE-4 IOM1-0," to I/O module 1, port 0 on Drive Enclosure 4.

6   Cable Drive Enclosure 2 to Drive Enclosure 5.

    a) Connect the end of the cable labeled "DE-2 IOM0-2" to I/O module 0, port 2 on Drive Enclosure 2.

    b) Connect the other end of the cable, labeled "DE-5 IOM0-0," to I/O module 0, port 0 on Drive Enclosure 5.

7   Cable Drive Enclosure 3 to Drive Enclosure 5.

    a) Connect the end of the cable labeled "DE-3 IOM1-2" to I/O module 1, port 2 on Drive Enclosure 3.

    b) Connect the other end of the cable, labeled "DE-5 IOM1-0," to I/O module 1, port 0 on Drive Enclosure 5.

Related Links

Drive Enclosure Cabling

Build Map for Your Oracle FS System

Drive Enclosure Wiring Diagrams

Example of Two Strings

Example of Two Strings

The following figure shows an example wiring diagram with two strings of five Drive Enclosures in an Oracle FS System. The system is a standard, factory configuration with one SAS HBA per Controller. In a performance system, with three SAS HBAs installed per Controller, the arrangement of Drive Enclosures within each string is the same as with a base system.

Figure 93: Example of two strings with five Drives Enclosures
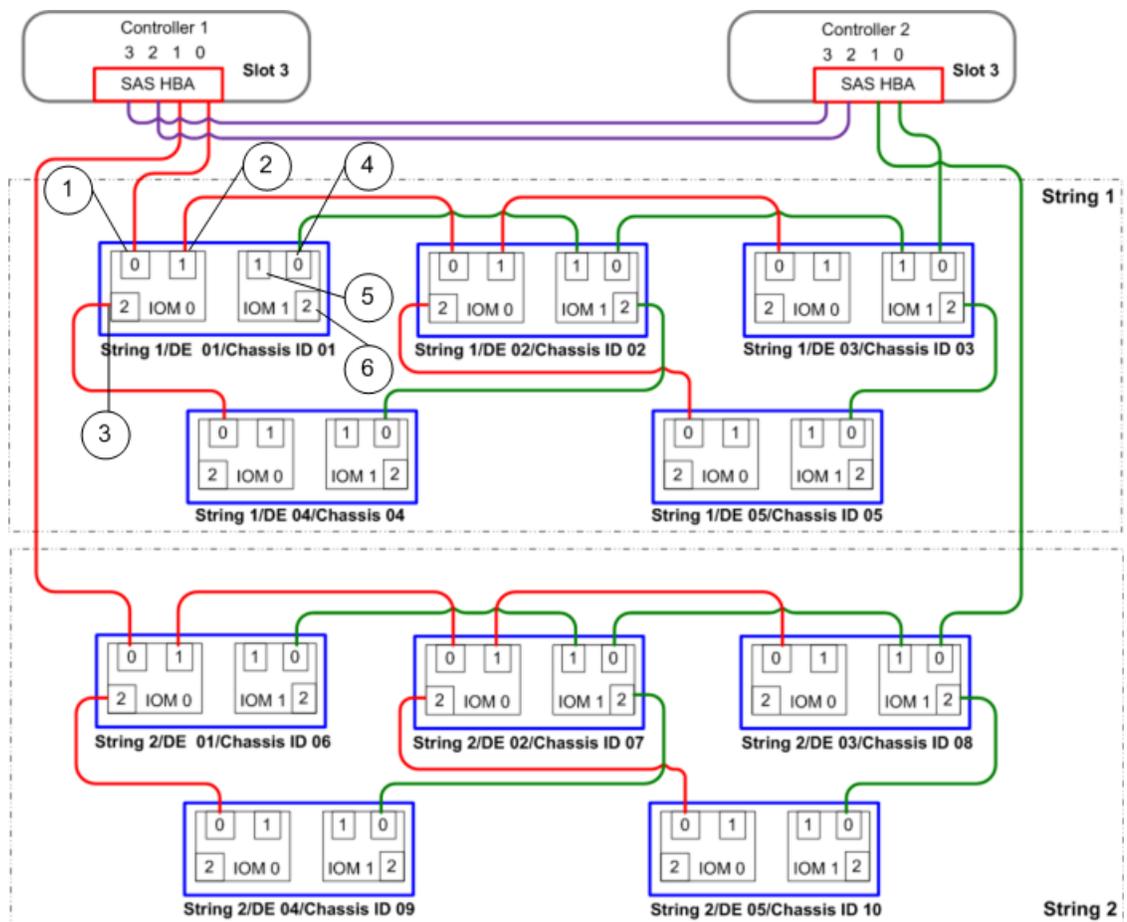
Legend	1 I/O module 0, port 2	4 I/O module 1, port 1
	2 I/O module 0, port 0	5 I/O module 1, port 0
	3 I/O module 0, port 1	6 I/O module 1, port 2

CHAPTER 10

System Power

Power Distribution Units

Each power distribution unit (PDU) must be attached to a dedicated facility circuit.

Each Oracle FS System component (Pilots, Controllers, and Drive Enclosures) must have its power supplies connected to separate PDU circuits to ensure complete redundancy of power.

The PDUs used in a not-racked Oracle FS System installation must provide redundancy for both external AC power source and internal AC power distribution to the components. The PDUs must provide sufficient current to meet the sum of the requirements for the Oracle FS System components.

Oracle PDUs might be purchased for use with non-Oracle racks. The Oracle FS System component power cords have been designed to work with vertical style Oracle or third party PDUs. Non-Oracle PDUs must be compatible with Oracle component power cord lengths and plug types. Non-Oracle PDUs must be mounted in a manner such that the power cords provided by Oracle might be used and the PDUs do not obstruct the ability to replace field replaceable units (FRUs) and customer serviceable units (CRUs).

While planning rack-space, ensure that adequate space is also allocated for the PDUs, if using non-Oracle PDUs.

PDU Outlet Amperage Ratings

Plug in the Oracle FS System components (Pilots, Controllers, and Drive Enclosures), into the PDUs so that they do not exceed the amperage rating of any outlet group. Exceeding the amperage rating, can trip the circuit breakers.

The requirements of Underwriters Laboratories (UL) limit the power draw to approximately 80% of the circuit breaker rating. For example: In the United States where the voltage supply is at 240V, the power in a 30A circuit is 24A. Thus the power available for use is 80% of the total amperage rating of the circuit. The International Electrotechnical Commission (IEC) uses a system where the exact available power is listed as the circuit breaker rating. For example: In Europe, where the voltage supply is at 230V, the power in a 24A circuit is 24A.

For data centers with an input main power of 208V (single-phase from the building), the amperes drawn increases by roughly 15% over a 240V service.

Some PDUs have a remote monitoring capability that allows monitoring the current consumption locally using an operator accessible meter and function switch or remotely through a network connection. The monitor measures consumption on each phase or inlet circuit attached to the PDU.

Alternately, you can use a voltmeter to verify the voltage of the available power. Customers of Not-Racked Oracle FS Systems are responsible for engineering the PDU connections.

Routing Power

Rack-ready systems require you to install the Oracle FS System components, cords, and PDUs manually. For rack-ready systems, power cords are shipped along with the components inside the shipping cartons.

- Routing power in an Oracle FS System involves the following steps:
- First, connect the power cords from the Oracle FS System components (Drive Enclosures, Controllers, and Pilots) to the PDU outlets inside the rack. The power cords are C13 to C14 left angled, single-phase power cords and are usually rated at 110V and carry relatively low amperage.
- Then, connect the Oracle FS System to the main power supply in the data center by using power cables. The power cables routed into a rack to supply power to the PDUs are often rated at 220V and are larger than the internal power cords. These multi-phase power cables might be connected to special 220V or 440v outlets or, sometimes, to an electrical bus.

Connecting the power cables is a two stage process with the following steps:

- Connecting the Oracle FS System components (Drive Enclosures, Controllers, and Pilots) to the PDU outlets: The Drive Enclosure to PDU connections uses 90 degree power cords. The Controllers and Pilots have straight connectors.
- Connecting the Oracle FS System to the main power supply in the data center: The main power supply connections use two power cables that are shipped with Oracle racks and enter into the PDU about mid-rack.

CAUTION: Be sure to maintain reliable grounding of all the components mounted in the rack.

Related Links
Power Distribution Units
Connect the Power Cables to the Power Supply
Connect the Power Cords to the PDUs
Power On the System
PDU Outlet Amperage Ratings

Connect the Power Cords to the PDUs

Engineering the power distribution unit (PDU) connections are the responsibility of the customer for not-racked systems. Also, component power cords must be installed into the component power supplies.

CAUTION: Do not connect the power distribution units (PDUs) to the external power until all the internal cabling and power connections are complete. Failure to observe may cause serious system malfunction.

The C13 to C14 left-angled power cords used to connect Oracle FS System components to power distribution units (PDUs) are designed to keep the power cords snug against the PDU and to enable maximum access to the Oracle FS System components.

The Controller power cords are routed through the Controller cable management arms (CMAs), one for each Controller. Route the power supply (PS–1) to one source of external power and the power supply (PS–0) to another.

The Pilot power cords are routed through the Pilot CMAs, one for each Pilot.

Figure 94: Power cords on the Pilot
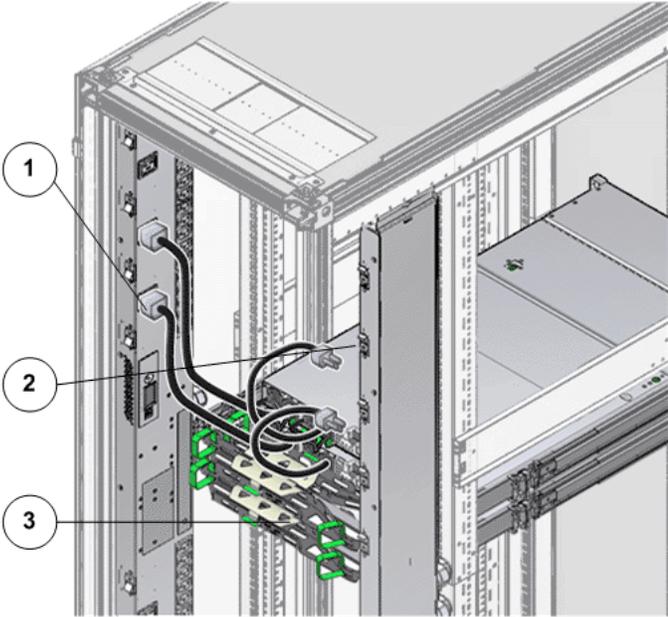
Legend	1 Pilot power cords plugged into left PDU
	2 Pilot power cords plugged into right PDU
	3 CMA

The power cords for the Drive Enclosures are routed directly to the PDU outlets without the use of CMAs. Any excess cable is fastened to the outside of the vertical rail that is nearest to the power cooling module of the Drive Enclosure. One power cooling module is connected to one PDU and the other power cooling module is connected to the other PDU.

CAUTION: Be sure to maintain reliable grounding of racked equipment. Give particular attention to supply connections other than direct connections to the branch circuit, such as connections to power strips.

1   Ensure that the power cords are secured to the component power supplies such that they do not restrict the removal of any other component or are loose.

Important: Do not connect the PDUs to the external power until all internal cables are connected.

CAUTION: Do not apply power to any component until all internal cables are connected.

2   Ensure that the power cords are securely routed.

Note: The power cords connecting the Controllers and Pilots to the PDUs must be routed through the cable management arms (CMAs). The power cords connecting the Drive Enclosures to the PDUs are direct connections.

3   Plug in your system components to the PDU in such a way so that no PDU amperage limits are exceeded.

Connect the Power Cables to the Power Supply

Before connecting the external power cables, evaluate the following conditions at your data center:

- Verify whether the power supply source is located overhead or through the floor below. The location of the main power source determines the routing of the power cables in the rack.

- Review the Oracle FS System power requirements.

The final routing of the main power cables is based on whether the source of the main power supply at the data center is overhead or through the floor.

If the main power supply is overhead, route the power cables up over the racks.

Tip: Neatly secure the main power cables with strong tie wraps and cable management hooks. Ensure that there is no interference with any other Oracle FS System cable or component. Arrange the excess power cables in the cable troughs above the rack.

Note: If the main power supply is through the data center floor, spool the excess cable at the base of the rack or on the floor. If the main power supply is overhead, spool the excess cable in the troughs above the system. The main power cables must never hang in front of the components.

CAUTION: Be sure to maintain reliable grounding of racked equipment. Give particular attention to supply connections other than direct connections to the branch circuit, such as connections to power strips.

1   Review the Oracle FS System power requirements.

2   Review the information about power cabling and verify that your PDUs meet the electrical requirements.

3   Route the power cables securely. Routing and securing power cables within the rack is essential to prevent damage due to loose or overhanging cables. Routing the cables is also required for easy access and servicing of the Oracle FS System components (Pilots, Controllers, and Drive Enclosures).

   Note: The power cables connecting the Oracle FS System to the main power supply in the data center are routed based on whether the source of the main power supply in the data center is located overhead or located at the floor level.

4   Secure the power cables to the rack such that they do not restrict the removal of any other component.

   Important: Do not connect the PDUs to external power circuits until the installation is complete and all internal cables are in place.

Power On the System

Set up a separate circuit and power outlet for each power distribution unit (PDU) as part of your site planning. These outlets must be located within reach of the PDU power cables.

CAUTION: Do not turn on any power circuits until the installation of all ordered hardware is complete and all internal cables are in place. Turning on the power to the system prematurely can prevent the system from starting up correctly.

1   Ensure that the PDU circuit breaker switches are in the "OFF" or "O" position.

2   Connect the PDUs to the power source at the data center.

   If the main circuit breakers at the data center are powered off, turn them on to supply power to the PDUs.

3   Ensure that the power switches on the Drive Enclosures are switched on.

Figure 95: Power switches on the Drive Enclosures
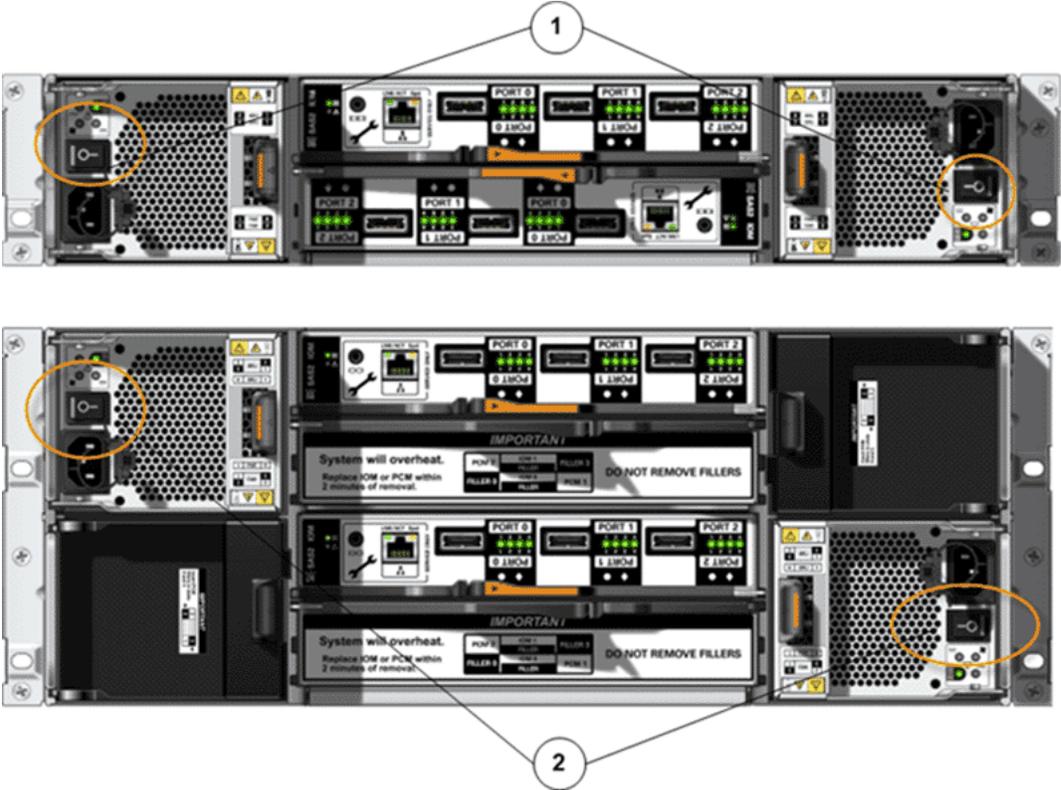
Legend	1 The power switches on the DE2-24P Drive Enclosure	2 The power switches on the DE2-24C Drive Enclosure

4   Configure the settings for the Ethernet interface on a laptop.

Valid settings:

Address	10.0.0.10
Gateway	10.0.0.1
Netmask	255.255.255.0

Note: You use the laptop to configure the management IP addresses for the Pilots.

5   Connect the laptop to the NET 3 port on Pilot 1.

Connecting a laptop to the NET 3 port on Pilot 1 ensures that Pilot 1 becomes the active Pilot when the system powers up.

Note: Both of the Pilots are clearly labeled as Pilot 1 and Pilot 2. In a standard configuration, Pilot 1 is the bottom Pilot in the rack. Pilot 2 is the top Pilot in the rack.

6   Ensure that all of the power cables plugged into the PDU are seated properly in their sockets.

Improperly seated power cables can cause the amber LEDs to flash when the system is powered on. The flashing amber LEDs can be mistaken for a faulted power supply.

7   Power on the PDU circuit breakers to apply power to the system.

Figure 96: PDU circuit breakers (example)
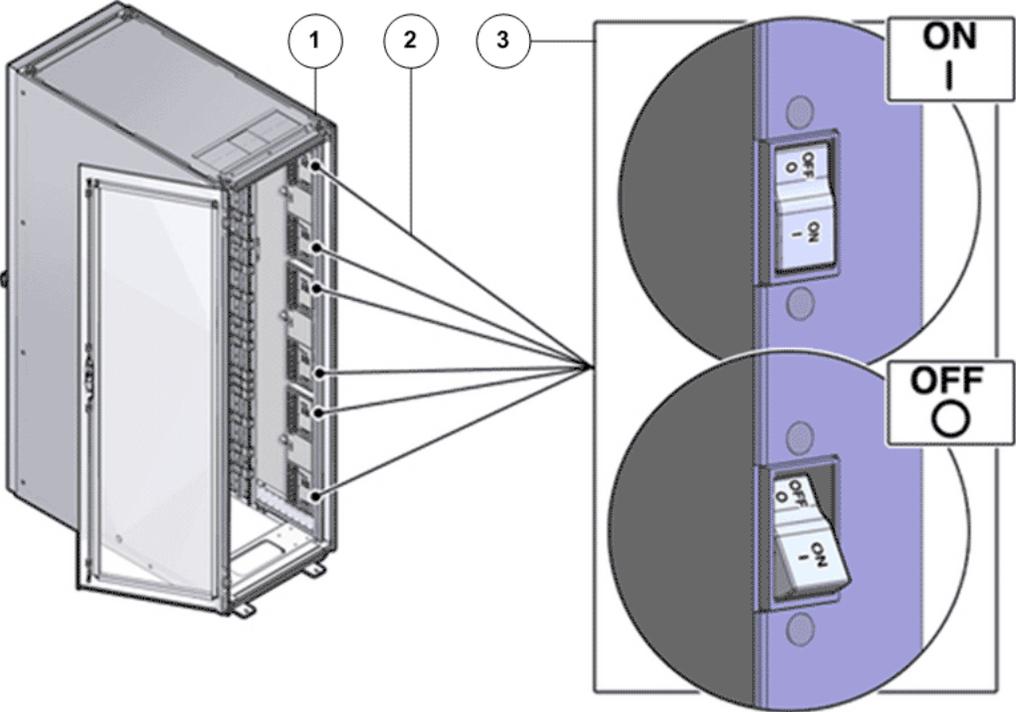
Legend	1 Rack
	2 Example of PDU circuit breakers
	3 Toggle switch

Note: The Controllers and the Pilots automatically power on when you apply power to the system.

8   As the system powers up, verify that the Link LEDs display as steady on the NET 3 port on Pilot 1 and on the Ethernet port on the laptop.

Related Links

*Connect the Power Cables to the Power Supply*
Connect the Power Cords to the PDUs

CHAPTER 11

Configure and Connect to the Customer Management Network

Workflow for Customer Management Network

A high-level workflow helps guide the process of configuring and connecting the Oracle FS System to the customer management network.

Figure 97: Workflow configure and connect to management network
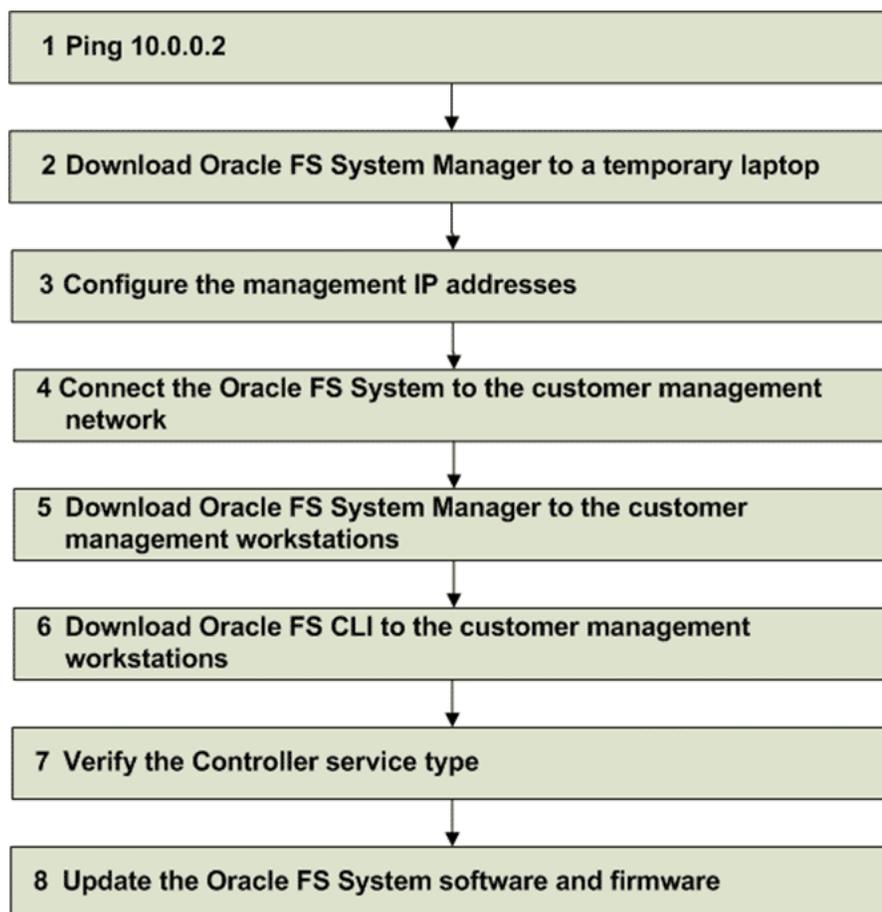
Ping 10.0.0.2

Ping 10.0.0.2 to verify the network connections between the laptop and Pilot 1.

Prerequisites:
- A laptop is connected to the NET 3 port on Pilot 1, and the laptop was connected to the NET 3 port when the Oracle FS System was powered on.
- The system is powered on.

1 Verify that the laptop is securely connected to the NET 3 port on Pilot 1.

   A label on the chassis clearly identifies Pilot 1.

2 Using the laptop that is connected to the NET 3 port on Pilot 1, ping 10.0.0.2.

   A ping response indicates that the connections are valid and you can proceed with configuring and connecting the system to the customer management network.

   If the ping response fails, double check that the cables are securely connected on the laptop and Pilot 1. Additionally, verify that the TCP/IP configuration of the laptop is set to the following values:

Address	10.0.0.10
Gateway	10.0.0.1
Netmask	255.255.255

   Try to ping 10.0.0.2 again. If the ping response fails, connect the laptop to the NET 3 port on Pilot 2 and ping 10.0.0.2. If Pilot 2 responds to the ping, continue with the network configuration process using Pilot 2. If the ping response fails, reconnect the laptop to the NET 3 port on Pilot 1 and power cycle Pilot 1. Ping 10.0.0.2. If the ping response fails, contact Oracle Customer Support.

Download Oracle FS System Manager to a Laptop

Use Oracle FS System Manager (GUI) to configure the management IP addresses for the Pilots. You install the GUI on the laptop that is connected to the NET 3 port on Pilot 1.

Prerequisites:
- Pilot 1 has completed the start up cycle.
- Pilot 1 responds to a ping.

1 From the laptop that is connected to Pilot 1, open a web browser and enter **http://10.0.0.2**.

2 Click Management Software.

3 Select the link for the version of the GUI installer that you want to download, and save the file.

4 Run the installer to install the software.

Configure the Management IP Addresses

Prior to connecting the Oracle FS System to the customer management network, configure the settings for the Pilot management interface using the default IP addresses on the Pilots.

Prerequisites:
- The customer-supplied Ethernet cables are connected to the NET 3 ports on the Pilots.
- A laptop is connected to the NET 3 port on Pilot 1 and you can successfully ping 10.0.0.2.
- The customer-supplied Ethernet cables are not connected to the customer management network.
- The system is powered on and has a status of Normal. Do not continue if the system status is not Normal. Configuration updates fail if the system does not have a status of Normal.
- The software for Oracle FS System Manager (GUI) is installed on a laptop, and the laptop is connected to the NET 3 port on Pilot 1.

1 From the laptop that is connected to the NET 3 port on Pilot 1, log into the GUI using the administrator account.

   The default password is `pillar`.

   Use the default IP address of the Pilot (10.0.0.2) in the Oracle FS Name field to connect to the Oracle FS System.

   When you first log in to the GUI, you might receive a notice that the administrator password has expired. Enter a new password and set a password expiration that allows sufficient time to complete the installation and the configuration of the system, such as 10 days.

   Important: When you complete the installation and configuration, give the new password to the person who is responsible for managing the system.

2 Navigate to **Global Settings** > Networking.

3 Select Actions > Modify.

4 Update the default IP addresses, netmask, and the gateway to match the customer's network environment.

5 If the customer management network requires auto-negotiation to be disabled, make sure that the interface speed and duplex setting of the Pilot are set exactly the same as the settings on the switches that connect the system to the customer management network.

   Important: Auto-negotiation is strongly recommended. If the customer's Ethernet switch supports 1 GbE or 10 GbE, do not disable auto-negotiation. Disabling auto-negotiation should be avoided.

6 Verify that you entered the correct settings for the IP address, netmask, and gateway.

> **CAUTION:** Do not proceed to the next step until after you have verified the new settings for the IP address, netmask, and gateway.

7   Click OK.

     With the updated IP address, your laptop will lose connectivity to the active Pilot.

8   To reconnect the laptop to the active Pilot, update the TCP/IP configuration of the laptop to match the Pilot's newly configured IP address, netmask, and gateway.

9   From the laptop, verify that you can log into the GUI using the updated IP address.

Connect to the Customer Management Network

To enable the customer to manage the Oracle FS System, connect the Pilots to the customer management network.

Prerequisites:
- The IP addresses of the Pilot management interface must be configured before you connect the system to the customer management network.
- Ensure that the IP address of the customer management network and the IP addresses of the Pilots respond to a ping
- The customer's firewalls allow the following TCP ports bi-directional access between the management workstations and the IP addresses configured for the Pilots:
  - TCP Port 80 for downloading the management software
  - TCP Port 26012 for access to the GUI and FSCLI

To ensure that Pilot 1 remains as the active Pilot, the laptop must be connected to the NET 3 port on Pilot 1 until you are ready to connect the Pilots to the customer management network. To avoid a fail over from Pilot 1, connect the Pilots to the customer management network within five minutes of disconnecting the laptop from Pilot 1.

If the laptop is disconnected from Pilot 1 and not connected to the customer management network within five minutes, Pilot 1 will fail over to Pilot 2. Pilot 2 then becomes the active Pilot. Power cycle both of the Pilots to make Pilot 1 active again.

Note: If you power cycle the Pilots prior to connecting to the customer management network, it might take up to 10 minutes for the Pilot IP addresses to respond to the ping. It might take an additional five minutes for the IP address for the customer management network to respond to the ping.
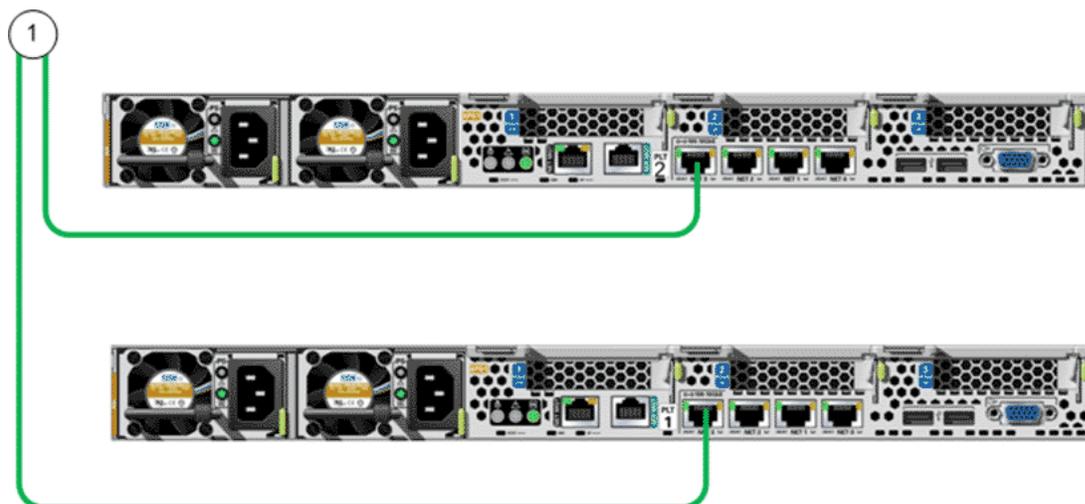
1   Disconnect the laptop from the NET 3 port on Pilot 1.

Note: Do not disconnect the Ethernet cables from the NET 3 ports on the Pilots.

2   Connect the Ethernet cables from the NET 3 ports on the Pilots to the customer management network.

The following figure shows the NET 3 ports on the Pilots.

Figure 98: The NET 3 ports on the Pilots

Legend   1 Customer management network from the NET 3 ports on the Pilots

3   From a workstation on the customer management network, ping the IP addresses for the customer management network, Pilot 1, and Pilot 2.

Issue the ping from a workstation on the same subnet as the three IP addresses.

Related Links

Cabling Workflow
Configure the Management IP Addresses
Types of External Cables

Download Oracle FS System Manager to Workstations

After connecting the Oracle FS System to the customer management network, download and install Oracle FS System Manager (GUI) to the customer's management workstations. The customer uses the GUI for long-term management and monitoring of the Oracle FS System.

Prerequisites: • Management workstations must be on a network that can access the management IP addresses of the Pilot on port 80 or port 8080.

• Workstations using the Oracle FS System Manager (GUI) or the Oracle FS Command Line Interface (FSCLI) to

manage or monitor the system must be on a network configured to allow that workstation to reach the Pilot management IP Ethernet interfaces on port 26012.

- The system is powered on.

- The IP addresses are set on the Pilots.

- For JAVA Archive (JAR) installers, Java 1.7 or higher must be installed on the workstations.

    Note: The Windows MSI installers do not require Java to be installed on the workstation.

1   From the customer's management workstation, open a web browser and enter the IP address or the hostname of the customer management network.

2   Click Management Software.

3   Select the link for the version of the GUI installer that you want to download, and save the file.

4   Run the installer to install the software.

Download Oracle FS Command Line Interface

You can use Oracle FS Command Line Interface (FSCLI) to configure and manage the Oracle FS System. To install FSCLI, download the software from the Pilot and install the software on the customer's management workstations.

Prerequisite: The system is powered on.

1   From the customer's management workstation, open a web browser and enter the IP address or the hostname of the customer management network.

2   Click Management Software.

3   Select the link for the version of the CLI installer that you want to download and save the file to the workstation.

4   Run the installer to install the software.

Verify the Controller Service Type

Set at the factory during the configuration of an Oracle FS System, the Controller service type defines how the Controller resources are allocated for the supported service types. Verify that the Controller service type was set correctly for your system.

Refer to the Release Notes for the most current list of supported service types.

1   Navigate to System > Hardware > Controllers.

2   Select a Controller.

3   Select Actions > Modify Controller Service Type.

4   From the Desired Service Type field, verify that the setting is correct for your system.

If necessary, update the setting. The system restarts if you update the Service Type setting.

5   Click OK.

Update the Oracle FS System Software and Firmware

The Oracle FS System software and firmware are updated on a regular basis. To ensure that your system has the latest versions available, update the software and firmware.

Download Software and Firmware Updates

Download the latest software and firmware updates from My Oracle Support (MOS) to ensure that your Oracle FS System is up to date. You can download general availability releases, as well as patches specific to your system, from MOS.

Prerequisites Log into MOS to check for the latest firmware and software updates.

1   Using your registered username and password, log in to *My Oracle Support* (https://support.oracle.com).

For more information about all the features and functionality of MOS, including information about patches and updates, see *My Oracle Support Documentation* (http://docs.oracle.com/cd/E25290_01/index.htm).

2   In the menu bar, select Patches and Updates.

3   In the Patch Search pane, choose one of the following search methods:

Number/Name or Bug Number (Simple)	Search for the patch name, the patch number, or the platform.
Product or Family (Advanced)	Search for the product, the release, and the platform, as well as other criteria.
	Note: The product you want to search for is *Oracle FS1-2 Flash Storage System*.
Recommended Patch Advisor	Search for recommended patches for products, releases, and platforms.

4   Complete all the fields necessary to perform your search.

5   Click Search.

6   On the Patch Search window, review all patch information.

Check the file size of the download and ensure that your workstation has sufficient space for the download.

7   Click the row of the patch that you want to download, and then click Read Me.

Important: Always review the Read Me file before downloading the patch or update to ensure that you are downloading the correct version. Note if there are any special installation requirements.

8   To download the software and firmware package, click Download.

The system displays a dialog box that displays the software package to be downloaded. A single patch or software update might contain multiple files. Review the ReadMe file to determine the correct files to download.

Tip: If your browser window displays an information bar that states that the download is blocked, click the appropriate options to allow the download to proceed.

9   On the File Download screen, click Show Digest Details to display the SHA-1 and MD5 checksums for each of the ZIP files.

10 To begin the download, click the filename of the selected file.

11 To save the software package on your workstation, click Save.

After you successfully download the software update package, close the original dialog box.

12 Using the Digest Information from the Patch Download screen, verify the integrity of the downloaded files before proceeding.

13 Extract the ZIP files.

Important: You cannot stage the ZIP file. You must stage the RPM Package Manager (.rpm) file.

Upload (stage) the extracted software or firmware RPM Package Manager (.rpm) file to the Oracle FS System.

Upload the Software and Firmware Package

After downloading a software and firmware update package from My Oracle Support (MOS), and extracting the RPM files from the ZIP archive, you can stage the RPM files on the Pilot to prepare the system for the software and firmware update.

1   Navigate to Support > Software and Firmware.

2   From the Software and Firmware page, click Upload Software Package.

3   From the Upload Software Package dialog, click the browse button […].

4   In the Upload Software Package dialog, navigate to the software package you downloaded, highlight it, and click Open.

5   Click OK.
    The software package is placed onto the Pilot. When the upload is complete, the update package displays in the Staged Software and Firmware panel.

Tip: Click Tasks on the Software and Firmware screen to view the staging progress in Oracle FS System Manager. The staging task only appears on the screen after the RPM file has been uploaded.

After staging is complete, verify that the software or firmware module and the version number of a software or firmware module match what you intended to upload.

Update the Oracle FS System Software

After staging the software package on the Pilot, update the system software.

Note: Use the primary administrator account to perform the update operation. The default password is `pillar`.

1   Navigate to Support > Software and Firmware.

The summary page displays the software and firmware packages currently installed on the Drive Enclosures, Drives, Pilots, and Controllers, as well as any staged software and firmware packages.

2   Select Actions > Update Software.

3   Select Restart and update software (disrupts data access).

4   Select the options in the Software Update Options pane.
Valid options:

Shutdown Controller	Select this option.
Ignore Current Requests	Select this option.
Ignore compatibility	Select this option only if the Patch Readme or Release Notes instructs you to do so.
Ignore hardware status	Select this option if there is a minor condition, such as a single failed hard drive. For a more serious error, attempt to resolve the condition. If you are unable to resolve the condition, contact Oracle Customer Support.
Ignore system alerts	Select this option if there are system alerts for failed email, failed call-home, or a failure to connect to an NTP server.
Ignore Compatibility Override failed software update	Select these two options if the software update fails but the system returns to a Normal status with only a compatibility error. If a second attempt to upgrade the software fails, contact Oracle Customer Support.

5   Click OK.

6   Click Yes.

When prompted to confirm the software override options, continue to click Yes until the upgrade starts.

7   After the upgrade completes, check that the software versions are correct and that the system status is Normal.

Update the Drive Firmware

During the initial installation of an Oracle FS System, make sure the drive firmware for all of the drives is current. Installing the updates of the drive firmware is a separate process from the software updates.

Note: Updating the drive firmware is a disruptive process and requires restarting the system.

Note: Use the primary administrator account to perform the update operation. The default password is `pillar`.

1   Navigate to Support > Software and Firmware.

The summary page displays the software and firmware packages currently installed on the Drive Enclosures, Drives, Pilots, and Controllers, as well as any staged software and firmware packages.

2   Compare the version numbers of the drive firmware displayed in Installed Software and Firmware with the version numbers of the drive firmware displayed in Staged Software and Firmware.

If the version numbers of the drive firmware displayed in Staged Software and Firmware are higher than the version numbers of the drive firmware displayed in Installed Software and Firmware, proceed with the following steps.

3   Select Actions > Update Drive Firmware.

4   Select the Install? checkboxes for each of the drive types with a current version of firmware that is lower than the pending version of firmware.

5   Click OK.

The system restarts. The drive firmware is installed as the system restarts.

Note: Depending on the number of Drive Enclosures and the number of drives in the system, the update to the drive firmware can be time consuming.

6   After the upgrade completes, check that the version numbers of drive firmware are correct and that the system status is Normal.

Configure Global Settings

Create an Additional Administrator 1 Account

The Administrator 1 account has full privileges to perform all administrative, configuration, and recovery tasks for the Oracle FS System. Create an additional Administrator 1 account for your system to ensure that you have an additional account that can be used for password recovery.

1   From Oracle FS System Manager (GUI), navigate to System > **Global Settings** > Administrator Accounts.

2   Select Actions > Create.

3   Enter the name of the account in the Login Name field.

4   From the Role list, select Administrator 1.

5   Enter the remaining information about the account owner.
     Required information:

     •   Full Name

     •   Email Address

     •   Phone Number

     •   Password

     •   **Confirm Password**

     Note: If you do not enter an email address for an administrator account, administrators cannot reset their own passwords using the Reset password feature in Oracle FS System Manager.

6   (Optional) To disable the account, select the Disable Account option.
     Use the Disable Account option when you want to create accounts that you want to enable at a later time.

7   Click OK.

Related Links

Configure Email for Administrator Accounts
Configure the Email Server

Configure Email for Administrator Accounts

Configuring email for the administrator accounts is critical for account password recovery and ensures that the administrators receive the email messages that are generated by the Oracle FS System.

1   Navigate to System > **Global Settings** > Administrator Accounts.

2   Select an account name from the list of login names.

3   Select Actions > Modify.

4   Verify that the email address is valid for the administrator account.

    If necessary, modify the email address.

5   Clear the Disable Account checkbox.

6   Click OK.

    Note: If you do not configure an email address for the primary administrator account to allow password recovery, the system sends a system alert at every subsequent login.

Related Links

Create an Additional Administrator 1 Account
Configure the Email Server
Test Administrator Password Recovery

Configure the Email Server

Configuring the email server enables the Oracle FS System to send notifications to selected individuals. The email server is also used for recovery of account passwords.

1   Navigate to System > **Global Settings** > Networking.

2   Select Actions > Modify.

3   Click the Notification tab.

4   To be notified by email of selected system events, select **Enable Email Notification**.

5   Enter the configuration settings for the email server.

6   Click OK.

Related Links

Create an Additional Administrator 1 Account
Configure Email for Administrator Accounts

Test Administrator Password Recovery

Test the process of recovering the administrator password to ensure that the administrator's password can be recovered in the event that the password is lost or forgotten.

Prerequisites:
- A configured email server
- A configured email address for the administrator account
- Access to the administrator's email account

1   If you are currently logged into Oracle FS System Manager (GUI), log off.

2   From the Oracle FS System Manager login dialog, enter `administrator` in the Login name field.

    Note: Do not enter a password.

3   Click Forgot password.

    The system sends an email containing the password recovery instructions and a token to the email address configured for the administrator account.

4   Verify whether the administrator's email account received the email containing the password recovery instructions and the token.

    If the administrator's email account did not receive the email, log into the GUI and verify that the email address is configured correctly for the administrator account.

    If the administrator's email account received the email, delete the email. Proceed to log in to the GUI.

Related Links

Configure Email for Administrator Accounts
Configure the Email Server

Configure DNS Settings

DNS servers are used by the Pilot to resolve the address of the Oracle Auto Service Request (ASR) server and to locate mail servers for sending password recovery instructions.

You can set the primary and secondary DNS server to resolve host names to IP addresses, for example. Also, the DNS settings allow the Oracle FS System to send Call-Home information, password recovery instructions, and event notifications to designated email recipients.

1   Navigate to System > **Global Settings** > Networking.

2   Select Actions > Modify.

3   From the Interfaces tab, enter the Primary DNS Server IP address.

4 Enter the Secondary DNS Server IP address.

5 Click OK.

Related Links

Configure NTP Servers
Configure the Email Server

Configure NTP Servers

Configure the Oracle FS System time so that event timestamps and logging timestamps are accurate and so that time-dependent applications work properly.

1 Navigate to System > **Global Settings** > System Time.

2 Select Actions > Modify.

3 Select the option for configuring the system time.

4 Depending on which option you select, enter the NTP server details for up to three NTP servers, or choose the system time using the date and time dialog.

   Note: Using system time is not recommended.

   Important: If either option that you choose changes the time to be prior to the current time, the Pilot restarts to implement the new time.

5 Click OK.

After approximately 15 minutes, ensure that there are no Oracle FS System alerts and events indicating that the NTP sync has failed.

Note: Microsoft Windows systems can be used for NTP servers only if a third party UNIX-compatible NTP application is installed on them.

Auto Service Requests

Oracle Auto Service Request (ASR) is a feature of Oracle hardware warranty and Oracle Premier Support for Systems. The ASR feature automatically generates a service request for specific Oracle FS System software and hardware events. This automated feature securely expedites system diagnostics, prioritizes your service requests, and dispatches parts, if needed.

The ASR feature performs the following activities automatically:

• Generates a service request (SR) when needed

• Handles service requests according to priority

• Dispatches parts when needed

• Attaches Call-Home logs and log bundles to the SR

My Oracle Support (MOS) allows you, or a customer user administrator (CUA), to associate your Oracle FS System with a customer support identifier (CSI), which indicates that your system is licensed for Oracle Customer Support. The

CSI information includes the Oracle FS System serial number, organization, and the level of support. The CUA is typically a technical representative from your organization.

The ASR feature relies on the Call-Home feature of the Oracle FS System to communicate system events to MOS. After you configure and activate the ASR in MOS, your system is ready to notify Oracle Customer Support of certain system events.

For additional ASR support information, refer to *Oracle Auto Service Request* (http://www.oracle.com/us/support/auto-service-request/index.html) on the Oracle Support website.

Related Links
ASR Activation Overview
Settings for ASR (Call-Home)

ASR Activation Overview

The process to activate the Auto Service Request (ASR) feature consists of three main activities. Two of the activities require access to the Oracle FS System Manager (GUI), and the third activity requires access to My Oracle Support (MOS).

Enable ASR	Enabling the ASR feature requires the initial configuration and test of the Call-Home feature. Call-Home provides a secure network connection between the Oracle FS System and MOS. If your network does not have direct access to the Internet, you can enter the necessary proxy server information.

The following options enable the ASR feature for your system:

Call-Home Triggering	The Call-Home configuration page contains options for when Call-Home triggers notifications to MOS.
Oracle Server	The default setting for the Call-Home server connects directly to MOS. Make sure that you do not change the HTTPS name of the Oracle server.

Send an Activation Request	When you use the Test Call-Home action for the first time, the system sends an ASR activation request to MOS. MOS, then, sends an email to the customer user administrator (CUA) with instructions for completing the activation process. Depending on your network connection, MOS should receive your activation request in a few minutes, but no more than 60 minutes.

The activation request sets the ASR feature to "pending". The pending state means that the ASR activation request has been received by MOS, but the ASR feature is not activated to receive and to respond to event notifications.

Activate the ASR Asset

The ASR asset is the Oracle FS System that has a valid service contract in MOS. After activation, MOS shows the ASR asset as "active". Activating the ASR asset allows MOS to receive system event notifications for automated processing.

Note: The CUA should not ignore the ASR activation notice. MOS continues to send notices to the CUA until the CUA responds to the notice.

For information that describes how to complete the activation process, login to *My Oracle Support* (https://support.oracle.com/). Search for the article titled "How to complete Auto Service Request (ASR) asset activation using My Oracle Support."

After the initial Call-Home configuration, and the activation of the ASR asset in MOS, the Oracle FS System sends daily and weekly system heartbeats to MOS. The heartbeats keep the ASR feature in an active state. If MOS does not receive these heartbeat events, MOS opens a service request for the heartbeat loss.

Related Links

Auto Service Requests
Settings for ASR (Call-Home)
Configure Call-Home for ASR
Activate ASR (Test Call-Home)

Settings for ASR (Call-Home)

Call-Home is a feature that, when enabled, works with the Auto Service Request (ASR) feature to send all notifications and associated logs about specific Oracle FS System events to My Oracle Support (MOS). Configure the Call-Home settings correctly to ensure that the MOS system properly manages the events.

Note: No customer data is sent in a Call-Home transmission.

The Oracle FS System sends log bundles that contain information about the system event. The log bundles assist Oracle Customer Support to diagnose the system event. The collection of the log bundles is initiated by one of the following methods:

Manual

The administrator has requested a log bundle collection. You can manually send the logs to MOS and associate the logs with an existing SR number.

Event-triggered | When a system event occurs, the Oracle FS System triggers the following activities:

- Collects log bundles that contain information about the event
- Uploads the logs to MOS

If necessary, MOS creates an SR for the system event and then dispatches replacement parts, if appropriate.

Periodic | The system sends a notification as scheduled in Oracle FS System Manager (GUI) configuration.

After the ASR feature is activated, MOS expects to receive an event, known as a heartbeat, each day from the Oracle FS System. The daily heartbeat keeps the ASR feature in an active state. The following options ensure that MOS receives daily and weekly heartbeat event notifications:

- Standard periodic Call-Home
- Larger periodic Call-Home

For both options, do not change the option schedules.

If the daily heartbeats are not received, MOS creates an SR indicating that the periodic heartbeat is overdue. MOS then dispatches the SR to Oracle Customer Support for resolution.

The Oracle FS System maintains a directory of log collections, each of which represents an event or a manual log bundle. You can select a log bundle file, a range of log bundle files, or a group of log bundle files to download or transmit to MOS. The name of each log bundle indicates the reason, date, and time (GMT) that the bundle was created, as well as the reason, date, and time the previous bundle was created.

Oracle Customer Support might request that you send multiple log bundles to MOS. When you create a manual log bundle, you can add an SR number in the Notes field. MOS then automatically associates that log bundle with your active SR.

You can send the log bundles to a local server, if necessary. However, sending log bundles to the local server disables all ASR functionality.

Related Links

Auto Service Requests
Configure Call-Home for ASR
Create a Log Bundle

Configure Call-Home for ASR

Configure the Call-Home options to ensure that the Oracle FS System sends specific event notifications to My Oracle Support (MOS). MOS then receives these notifications and, if necessary, initiates a service request (SR).

Prerequisites

- If the Oracle FS System is configured for Call-Home options and Auto Service Request (ASR), and the connection to the Call-Home server is direct, without a proxy, then all firewalls must allow all three Pilot IP addresses to make outbound connections on TCP Port 443 to the Call-Home server at Oracle.

- If the Oracle FS System is configured for Call-Home options and ASR, but is configured to use a proxy, then the proxy must be configured to accept connections from all three Pilot IP addresses and allow them to connect from the proxy to the Oracle Call-Home server on port 443.

- Any firewalls between the Pilots and the proxy must allow the TCP port configured for the Pilot to the proxy connections to pass through firewalls for all three Pilot IP addresses.

You also configure Call-Home options that keep the ASR feature active. MOS expects to receive an event, known as a heartbeat, each day from the Oracle FS System. This heartbeat is controlled by the Enable standard periodic Call-Home option.

1   Navigate to System > **Global Settings** > Networking.

2   Select Actions > Modify.

3   Click the **Notification** tab.

4   Select the Enable event triggered Call-Home option.

5   Select the Enable standard periodic Call-Home option.

    Note: Accept the default daily periodic interval. The ASR feature expects a daily Call-Home notification.

6   Select the Enable larger periodic Call-Home option.
    Accept the default weekly periodic interval.

7   Verify that the Use Oracle Server option is selected.

8   Accept the default settings for the Use Oracle Server option.

    Note: Do not alter the server name of the HTTP Server address.

    Note: If your environment does not use a proxy, you must configure at least one DNS server. Ensure that the DNS server resolves to the host name of the Oracle server: callhome.support.pillardata.com.

9   (Optional) Select Use Proxy and enter the proxy server address, port number, and protocol type as provided by your proxy administrator.

Note: Ensure that the proxy server, if used, resolves the host name of the Oracle server: callhome.support.pillardata.com.

10 Select **Enable large file transfers**.

Note: This option ensures that Oracle Customer Support receives the detailed logs that are created for an event.

11 Accept the default value for the Number of recent events to send in header option.

Note: An Oracle Customer Support professional might request that you change this value for a specific purpose.

12 Click OK.

You can test the Call-Home settings from the Networking overview page of the System tab.

Related Links
Auto Service Requests
Settings for ASR (Call-Home)
Activate ASR (Test Call-Home)

Activate ASR (Test Call-Home)

After you have configured Call-Home for the Auto Service Request (ASR) feature, send an ASR activation request to My Oracle Support (MOS).

Prerequisites:
- Call-Home is configured to access the ASR functions in MOS.
- Event triggering and periodic triggering for Call-Home are enabled and, the parameters are set to the default settings.
- Administrator privileges exist to the ASR asset that is registered in MOS.

1 Navigate to System > **Global Settings** > Networking.
2 To send the ASR activation request, select Actions > Test Call-Home.
3 Confirm that you want to send test Call-Home information, and click OK.

The Call-Home test is an ASR activation request in MOS. MOS should receive your request in a few minutes, but no longer than 60 minutes.

Note: You can repeat the activation request again, as necessary.

You or the customer user administrator (CUA) performs the following steps to verify that the ASR activation request was successful.

4 Verify the receipt of an email from MOS with instructions to complete the ASR activation process.

For information that describes how to complete the activation process, login to *My Oracle Support* (https://support.oracle.com/). Search for the

article titled "How to complete Auto Service Request (ASR) asset activation using My Oracle Support."

5   Log in to MOS and verify that the ASR asset status shows "pending".

An "inactive" state means that MOS has not received your activation request.

If you did not receive an email from MOS, or if the ASR asset in MOS is "inactive", then perform the detailed ASR activation (Call-Home) troubleshooting.

Note: Do not contact Oracle Customer Support until you have completed the troubleshooting checks.

Related Links

Auto Service Requests
Settings for ASR (Call-Home)
ASR Activation (Call-Home) Troubleshooting
Configure Call-Home for ASR

ASR Activation (Call-Home) Troubleshooting

You might need to troubleshoot the Oracle Auto Service Request (ASR) activation request when you have not received an email from My Oracle Support (MOS) in response to an activation request.

You can check the following resources to troubleshoot where the ASR activation request communications might be failing.

Call-Home Succeeded	A `Call-Home Succeeded` Event Log message means that the Oracle FS System has successfully sent the Call-Home event or activation request.
	If you see the `Call-Home Succeeded` Event Log message, check the following items:
	• Receipt of an email notification from MOS within 60 minutes
	• ASR asset in MOS has a "pending" status
	If either of these checks fail, and your system has a proxy configured, then check the proxy logs to determine if the connection to the Oracle server was successful. If the proxy logged an error, correct the proxy settings in your network or correct the Oracle FS System proxy configuration. Verify your updates by running the ASR activation request again.
Call-Home Failed	A `Call-Home Failed` event creates a System Alert and an Event Log records the system fault.
	View the properties of the event. If you received the error `EventParameters.Callhome.error.`

`1:HTTPS_UNKNOWN_HOST`, then Call-Home failed to locate a server.

Verify the following criteria:

- The Oracle FS System can contact the configured DNS servers.

- The DNS servers can resolve the host name of the Oracle server, callhome.support.pillardata.com.

If another error message is present, save the event message by using the Copy to Clipboard option from the Event Properties dialog. Contact Oracle Customer Support, if further assistance is required.

Related Links

Settings for ASR (Call-Home)
Activate ASR (Test Call-Home)
Display the Event Properties
Manage the System Alerts

CHAPTER 13

Connect to the Customer Data Network

Connections to the Customer Data Network

To enable the Controller to serve the customer data stored in the Oracle FS System, connect the Controller to the customer data network.

SAN HBA cards connect using FC and iSCSI cables to the SAN hosts for SAN connectivity. The connectors on the SAN HBA are SFP+ or SFP++ and can be provisioned with the following settings:

- FC 8-16 Gbs with the appropriate SFPs for optical cables
- iSCSI 10GbE, with appropriate SFPs for optical cables

CAUTION: Route the customer data cables through the existing Controller cable management arm (CMA) and secure the cables within the CMA using the existing velcro straps. If the cables become snagged while the Controller chassis is extended to the service position, damage to the system motherboard might occur.

Related Links
Cabling Workflow
Provision the Controller Ports
Types of External Cables

Provision the Controller Ports

The Controller ports are provisioned during the manufacturing process. Prior to connecting the Oracle FS System to the customer data network, verify that the Controller ports are provisioned to meet the requirements of your installation.

1 From Oracle FS System Manager (GUI), navigate to System > **Global Settings** > Controller Ports

2 Select a Controller.

3 Select Actions > **Modify Port Settings**.

4 If necessary, modify the protocol properties.

Note: Refer to the Release Notes for a list of the supported protocols for your release.

5 Click OK.

Any changes that you make are mirrored to the partner Controller, and the system restarts.

Note: During startup, if the SFP detected does not match the port provisioning, the system generates an "Incorrect SFP" event.

Related Links

Connections to the Customer Data Network

Download Oracle FS System Manager to a Laptop

Connect to the Customer Data Network

SAN data paths require FC and iSCSI connections. Single-mode and multi-mode optical fiber connections are supported on PCIe cards.

Prerequisites:
- The Fiber Channel (FC) data paths require 8 GbE or 16 GbE optical FC connections.
- The iSCSI connections require 10 GbE copper or optical connections.

Note: The iSCSI SFPs are Gigabit Ethernet type, either 1 GbE or 10 GbE.

Note: The type of connection (Ethernet, FC, or iSCSI) was defined when the Oracle FS System was ordered.

CAUTION: Use only the Oracle-supplied SFP modules for the external cabling.

The following figure shows the SAN HBA connections from the Controllers to the customer data network.

Figure 99: SAN HBA connections to the customer data network
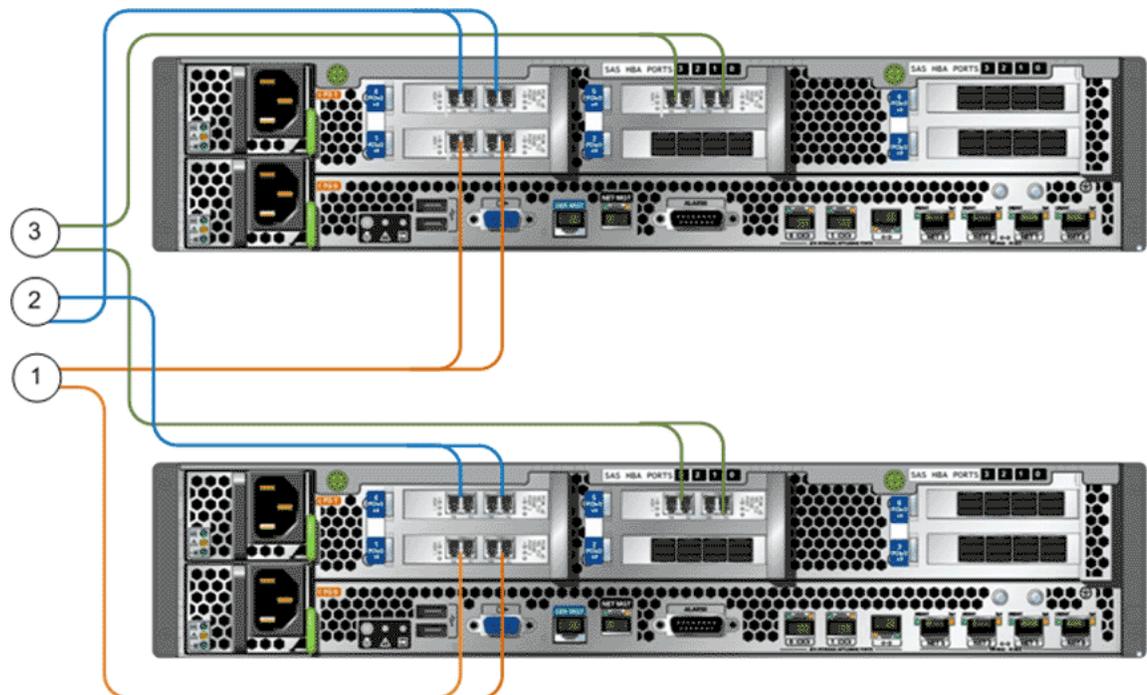
Legend	1 PCIe slot 1, HBA ports for SAN connectivity (FC or iSCSI)	3 PCIe slot 5, HBA ports for SAN connectivity (FC or iSCSI)
	2 PCIe slot 4, HBA ports for SAN connectivity (FC or iSCSI)	

1   For SAN FC connections, connect the FC cables from the SAN FC ports on the Controllers to the customer's SAN environment.

2   For SAN iSCSI connections, connect the 10 GbE optical or copper cables from the SAN ISCSI ports on the Controller to any open data ports available on two separate Ethernet network switches.

3   Route the cables through the Controller cable management arm (CMA).

Figure 100: Controller CMA
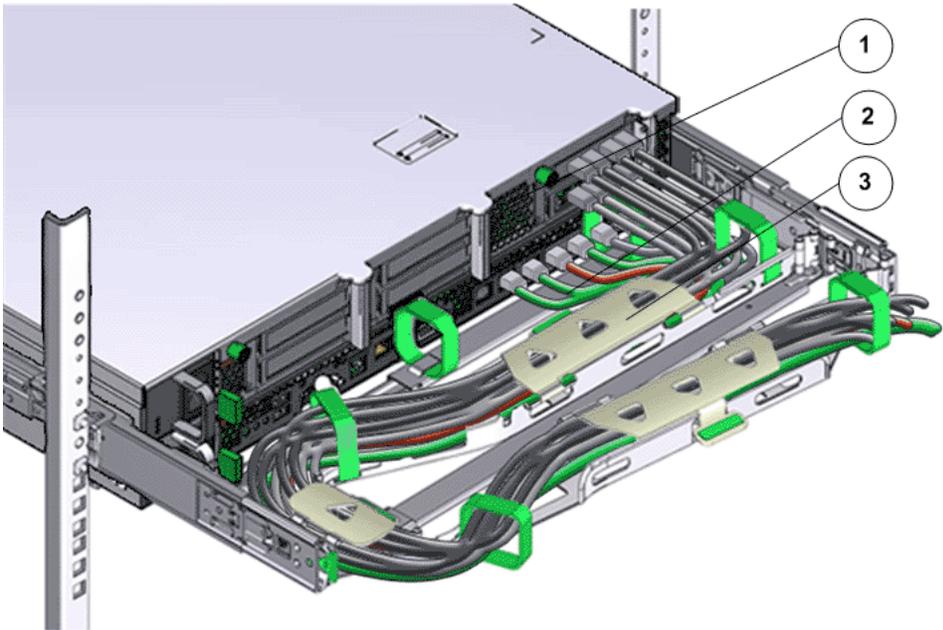
Legend	1 Controller back	3 CMA
	2 Controller data cables	

Related Links
Cabling Workflow
Provision the Controller Ports
Types of External Cables

Complete the Installation

Perform a Controller Failover Test

Verify that the Controller failover functionality is operational prior to approving the Oracle FS System for production. Controller failover is performed by the installation engineer or the customer.

Prerequisites:

SAN hosts with multipath Fiber Channel (FC) connectivity to the Oracle FS System.
SAN hosts zoned to communicate with the Oracle FS System.
SAN hosts with a supported operating system (OS) to enable the use of an Iometer, which is a free utility to generate IOPs on the Oracle FS System.
PuTTY or similar terminal emulation program.
Client workstation with connectivity to the Oracle FS System Manager
A LUN created on Controller-01.
A LUN created on Controller-02.
Both the newly created LUNs on the Controllers must be mapped to the SAN hosts on which the Iometer is used.

Note: While the I/O is performed on both Controller, monitor the IOPs using the Iometer interface and the Oracle FS System Manager.

You can failover a Controller using one of the following methods:

- Command Line Interface (CLI)
- Controller power button
- ILOM interface

Generate IO on the System

Generate Input Output operations per second (IOPs) on the Oracle FS System from the SAN host to verify that the Controller failover functionality is operational.

1   Install the Oracle FS System Manager on the client workstation to ensure that all prerequisites to verify the Controller failover are met and to ensure multi-pathing is installed and configured.

2   Using PuTTY or a terminal emulation program, connect the client workstation to the SAN host.

3 Use the Iometer to generate the IOPs on the Oracle FS System from the SAN hosts that are connected to the Oracle FS System.

4 Monitor the IOPs using the Iometer interface.

5 Monitor the IOPs using the Oracle FS System Manager for each of the LUNs located under: SAN—>Statistics and Trending—>LUNs.

Failover a Controller Using the CLI

You can failover the Controller to the alternate or buddy Controller using the CLI.

1 Log in to the FSCLI using the support account.

2 Obtain a list of the Controllers by executing the following command:

`./fscli controller -list`

`/CONTROLLER-01/CONTROLLER-02`

3 Run the following command:

`./fscli controller -forceFailure -controller [controller_name]`Command Succeeded

4 Verify the Controller failure using the Oracle FS System Manager under: System—>Alerts and Events—>Status Summary.

5 Verify that the LUN and its resources are failed over to the alternate or buddy Controller and monitor the IOPs being generated from the LUNs and the SAN host using the Iometer interface.

Important: The LUN should never lose connectivity to the Oracle FS System.

Note: The Controller will automatically restart after the failover.

Bring the Controller Online Using the CLI

Bring the Controller online after testing that the Controller can failover to the alternate or buddy Controller.

1 Log in to the FSCLI using the primary administrator account.

2 Run the following command:

`./fscli controller -reenable -controller [controller_name]`Command Succeeded

3 Verify the Controller is back online using the Oracle FS System Manager under: System—>Alerts and Events—>Status Summary.

Clear the Controller Failure History Using the CLI

After testing the Controller failover to the alternate or buddy Controller, clear the failure history using the Command Line Interface (CLI).

1 Log in to the FSCLI using the support account.

2   Run the following command:

```
./fscli controller -reenable -controller
[controller_name]Command Succeeded
```

3   Monitor the Oracle FS System Manager to verify that all the Controllers are in a healthy state under: System—>Alerts and Events—>Status Summary.

Failover a Controller Using the ILOM

You can use the Oracle Integrated Lights Out Manager (ILOM) to failover a Controller.

1   Log in to the Oracle FS System using the `fscli` with the primary administrator account.

2   Run the following command to enable secure shell (SSH) access:

```
fscli system -modify -enableSsh [number of minutes]
```

3   Connect to the Pilot using SSH with the shared IP address of the Oracle FS System and log in using `root / [root_password]`.

4   Connect to the Controller using SSH by running the following command on the Pilot:

```
[root@pilot1 ~] cat /etc/nodenames
172.30.80.2 WN2008ffffffffff2 WN2008000101000000 mgmtnode
172.30.80.129 WN508002000158bb61 WN2008000101000001
172.30.80.3 WN2009ffffffffffa
172.30.80.128 WN508002000158bb60
```

Note: You can connect to the Controller using SSH using either of the two IP addresses: 172.30.80.128 or 172.30.80.128

5   Fail over the Controller by running the following command to shut down the Controller host:

```
ipmitool chassis power off
Chassis Power Control: Down/Off
```

6   Verify the Controller failure using the Oracle FS System Manager under: System->Alerts and Events—>Status Summary.

Note: Verify that the LUN and its resources are failed over to the alternate or buddy Controller and monitor the IOPs being generated from the LUNs and the SAN host using the Iometer interface.

Bring a Controller Online Using the ILOM

You can use the Oracle Integrated Lights Out Manager (ILOM) to bring a Controller online after testing the failover process works smoothly.

1   From the Pilot, connect to the alternate or buddy Controller using secure shell (SSH).

2   Identify the alternate Controller by running the following command from the Pilot:

`cat /etc/nodenames`

3   On the alternate Controller, run the following command:

`ipmitool -H 169.254.2.9 -U root -P changeme chassis power on`

This brings the failed Controller online.

4   Monitor the Oracle FS System Manager to verify that the Controller is back online under: System->Alerts and Events—>Status Summary

5   Clear the failure history by logging in to the Oracle FS System using the primary administrator account and running the following command:

`./fscli controller -reenable -controller [controller_name]`

`Command Succeeded`

Failover and Bring Controller Online Using the Power button

You can failover the Controller to the alternate or buddy Controller using the power button on the Controller.

1   Manually press and hold the power button on the Oracle FS SystemController for several seconds until the red LED is illuminated.

2   Bring the Controller back online after verifying that I/O is being performed by manually pressing the power button for several seconds until the green LED is illuminated on the Controller.

Perform a Drive Failure Test

Prior to copying production data to the Oracle FS System, perform a drive failure test. A drive failure test verifies that the system is using the spare drive and that the system can successfully rebuild a failed drive.

1   Using the Administrator account, log in to Oracle FS System Manager (GUI), and navigate to System > Hardware > Drive Enclosure.

2   Select Actions > Drive Enclosure Console.

3   Click Next.

4   From the Drive Enclosure list, select a Drive Enclosure.

Note: You can select any Drive Enclosure from the list. To ensure expedient rebuild times, perform a drive failure test on the highest-tier Drive Enclosure in the system.

5   From the I/O Module list, select 0 or 1, and click Next.

A large amount of data displays in the Drive Enclosure Console. To confirm that the console commands succeed, copy and paste the information into a text editor and review the information in the text editor.

6   From the View Drive Enclosure Console command field, type **SCSI** and click Send.

7   Type **CHK** and click Send.

The console displays a list of the drives installed on the Drive Enclosure. The following example shows a list of drives displayed in the console.

```
Drv Owner Media BSize   AccessOn   PhySt        LogSt
00    00    00    520.   CU0CU1    64_Online   06_InUse
01    00    00    520.   CU0CU1    64_Online   06_InUse
02    00    00    520.   CU0CU1    64_Online   05_Partitioned
03    00    00    520.   CU0CU1    64_Online   06_InUse
04    00    00    520.   CU0CU1    64_Online   06_InUse
05    00    00    520.   CU0CU1    64_Online   06_InUse
06    00    00    520.   CU0CU1    64_Online   06_InUse
07    00         (No info)         01_Missing 00_Unknown
08    00         (No info)         01_Missing 00_Unknown
09    00         (No info)         01_Missing 00_Unknown
0A    00         (No info)         01_Missing 00_Unknown
0B    00         (No info)         01_Missing 00_Unknown
0C    00         (No info)         01_Missing 00_Unknown
0D    00         (No info)         01_Missing 00_Unknown
0E    00         (No info)         01_Missing 00_Unknown
0F    00         (No info)         01_Missing 00_Unknown
10    00         (No info)         01_Missing 00_Unknown
11    00         (No info)         01_Missing 00_Unknown
12    00         (No info)         01_Missing 00_Unknown
13    00         (No info)         01_Missing 00_Unknown
14    00         (No info)         01_Missing 00_Unknown
15    00         (No info)         01_Missing 00_Unknown
16    00         (No info)         01_Missing 00_Unknown
17    00         (No info)         01_Missing 00_Unknown
```

Note: If any of the drives are offline, select a different Drive Enclosure.

8   Type **ATA** and click Send.

9   Type **FPOFF XX**, where **XX** is the number from the Drv column for one of the drives displayed in the console output.

10 Click Send.

The drive fails from both nodes. Use the GUI to confirm the status of the drive.

11 To bring the drive back online, type **FPON XX**, where **XX** is the number from the Drv column for the drive displayed in the console, and click Send.

The drive returns online. Use the GUI to confirm the status of the drive.

12 Type **SCSI** and click Send.

13 Type **CHK** and click Send.

The list of the drives installed on the Drive Enclosure is displayed in the console. Verify that the drive is back online.

14 Clear the drive failure history.

    a) Log in to the Oracle FS System Command Line Interface (fscli).

    b) Issue the following command:
```
fscli enclosure -clearDriveHistory -enclosure
[enclosure-id-or-fqn] -driveSlot X
```

The **enclosure-id-or-fqn** is the fully qualified name (FQN) or the unique identifier (ID) of the Drive Enclosure. The FQN includes the chassis ID, which is displayed on the front of the Drive Enclosure.

Note: The **driveSlot** value is derived from the HEX value listed in the Drv column from the results of the **SCSI CHK** command.

After the command completes, the system returns a success message.

System Status Verification

The status of the installation of the Oracle FS System can be verified using the Oracle Flash Storage Portal web interface or the Oracle FS System Manager (GUI) or the FSCLI.

To verify system status on the Oracle Flash Storage Portal, use a web browser on a computer, tablet, or mobile device that has access to the customer management network. In the browser, enter the IP address of the Oracle FS System or, if the system name is resolvable, enter the name of the system. To verify system status on the Oracle FS System Manager (GUI), download and install the GUI client on a client workstation with access to the Pilot. Alternatively, you can download and install the `fscli` on a workstation with access to the Pilot.

To verify the wiring topology using the `fscli`, use the following commands:

- `fscli topology -list —enclosure` **<output-text-filename1.txt>**

  For example: `fscli topology -list —enclosure` **<sas-encl-list.txt>**

- `fscli topology –download –topomap` **<output-text-filename2.txt>**

  For example: `fscli topology –download –topomap` **<sas-conn-map.txt>**

The `topology -list -enclosure` command generates an output file containing the list of Drive Enclosures with their world wide names (WWN) and chassis ID values. The `topology -download -topomap` command generates an output file containing the SAS connection map. Evaluate the output files to determine the necessary corrections.

Other `fscli` topology commands to verify system status include:

- To identify the overall status of the system: **fscli system -list**

- To verify that no system alerts exist: `fscli system_alert -list`
- To verify the system topology: `fscli topology -list`

Related Links
Verify System Status Using the FS System Manager
Verify System Status Using the Oracle FS Portal

Verify System Status Using the Oracle FS Portal

You can verify the status of an Oracle FS System by using the Oracle Flash Storage Portal web interface on a computer, tablet, or a mobile device that has access to the customer management network.

Note: The Oracle FS System configuration cannot be changed using the Oracle Flash Storage Portal.

1 Enter the IP address of the Pilot management interface.

Figure 101: Pilot management interface main screen
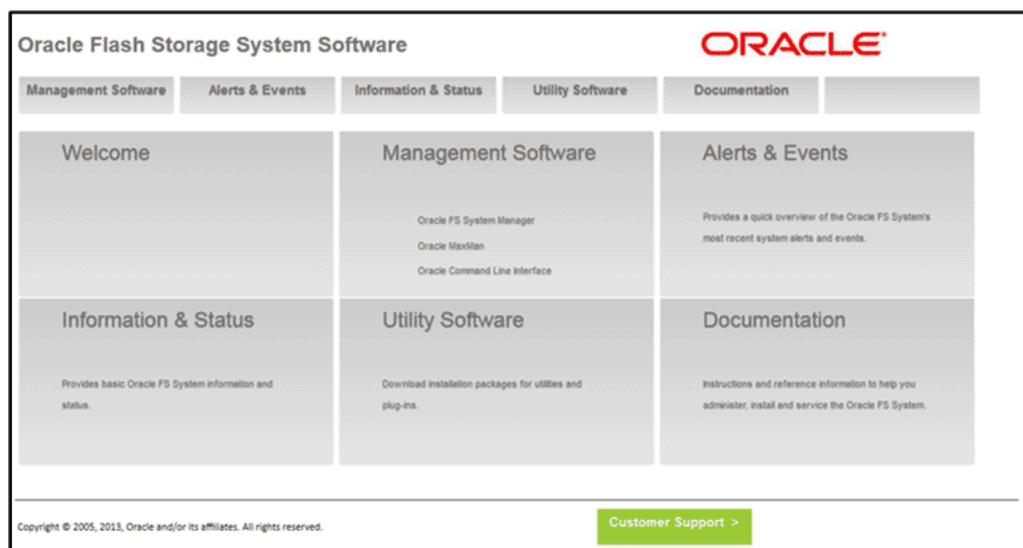
The Pilot management interface main screen appears.

2 Click Information and Status tab to see the status of the system.
The login prompt appears.

3 Log in to the Oracle FS System using a username and password.

Figure 102: Oracle FS System login screen

> **Note:** You can set the username and password using the Oracle FS System Manager (GUI).

4 Review the system status summary.
   The system name, the model number, the serial number, the system status, and the version of the installed software are displayed after logging in to the GUI.

5 Verify if there are any alerts or recent events for the Oracle FS System by clicking on the Alerts and Events tab.
   Current system alerts are displayed at the top of the Alerts and Events Overview page.

   > **Note:** If any system alerts are displayed, use the Oracle FS System Manager (GUI) to gather more information about the alerts and to manage the alerts.

Verify System Status Using the FS System Manager

You can verify the status of an Oracle FS System, by using the Oracle FS System Manager (GUI).

1 Start the GUI,

   The GUI client should have been downloaded on the Pilot while setting up Call-Home.
   The login screen appears.

2 For Oracle FS name, specify the Oracle FS System to which you want to connect.

   Valid values:

   • IP address of the Pilot management controller

   • Name of the Oracle FS System as configured in your site naming services for the Pilot.

3 Log in as the primary administrator.

   Valid values:

- • Login name: administrator or another administrator or support account
- • Default password: pillar or the current password if it has been changed.

Note: If the Oracle FS System was upgraded during the installation, you will receive a warning message after entering the login information if your GUI client does not match the installed software version. You might then either download the new version of the client or indicate that you wish to continue with your current client version.

Figure 103: Oracle FS System Manager login screen
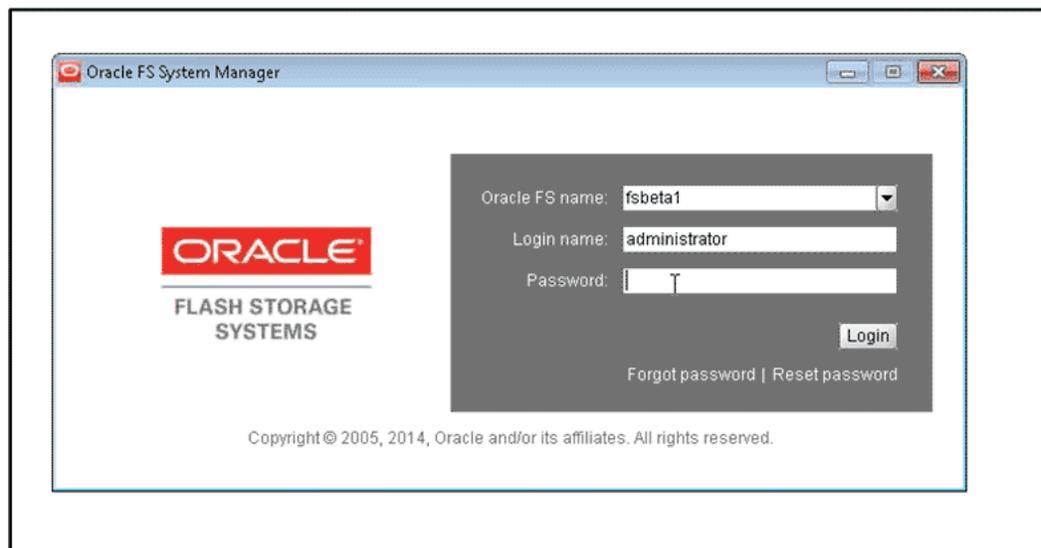
4 Click Login.

Note: If any system alerts exist during login, the dashboard screen directs your to the alerts.

5 (optional) When prompted, enter a new password .

Note: You can log in to the Oracle FS System Manager with the default password even when the prompt to change the password appears.

Note: Verify that there is a valid e-mail address for the primary administrator account after the installation of the Oracle FS System. Also verify that a valid email server is configured to allow password recovery.

Note: Obtain the password from the Site Preparation Checklist or use the default passwords for the system. Oracle recommends that the customer change the default passwords for security purposes. Be sure that the primary system administrator also obtains this password. Keep the password secure.

Note: Oracle recommends that you set up an additional Type 1 Administrator account when you install the Oracle FS System. A Type 1

Administrator can modify account passwords without knowing the previous password for any accounts.

6   Verify the system status by navigating to System->System Information.

A summary of the system status is displayed along with a system status icon displayed in the bottom left corner of the status bar. The overall status is displayed by a green, red, or yellow icon. The round green icon indicates that all hardware components in the Oracle FS System have successfully started and are operating normally.

If the System Status icon is a yellow triangle (which indicates a warning condition) or a red circle (which indicates a critical condition), click System>Hardware>Controllers / Pilots / Drive Enclosures and note which components do not display a green icon and do not have a Normal status. Clicking on the status icon, provides the Hardware status summary from which you can select individual hardware types.

7   Verify the system summary by navigating to System->Alerts and Events—>Status Summary.

Note: If the overall system status is a yellow triangle, selecting the yellow triangle displays all system alerts along with a timestamp that indicates the time of the most recent system alert. If there is a system alert, you will automatically be directed to the system dashboard screen that displays all existing alerts. Click on the flashing yellow triangle to go to the dashboard that shows recent alerts and events.

All the system components and their hardware and software status icons are displayed. Detailed information for any system component is available by selecting any of the icons.

Note: Selecting the Oracle FS System hardware status image displays the hardware status. The hardware status summary screen displays the hardware types and the summary status for each hardware type. Clicking on any of the hardware icons displays the complete list for each hardware type and the status of each hardware item.

8   Verify the system events by navigating to System > Alerts and Events > Event Log.

CAUTION: Setting a filter does not display any events that do not match the filter options. Clear the filter if checking for a particular event class so that others with the same login can also see the event log.

9   Verify the installed version of the software, as well as any other staged software on the system by navigating to Support > Software and Firmware.

If the combination of software and firmware versions that are installed on the various widgets of the Oracle FS System are invalid, the system displays a warning message and generates an alert.

10 Confirm that all of the system components are powered on and that all of the cables are correctly and securely connected.

If a cabling problem exists, the Oracle FS System might show the affected system components with a warning status and a topology alert.

If a flashing inverted triangle appears in the lower left corner of the status bar, click the triangle to view the system alerts.

If there is a connection error, verify that the cables are fully seated and properly connected. If the error persists, contact Oracle Customer Support.

Note: The Hardware Overview screen helps you identify the error through the following icons for the following items:

- Private management interface (PMI) links
- Backend SAS Interconnect cabling errors
- Oracle FS System components

APPENDIX A

Oracle FS System Data

System Packaging and Transportation

All packaging and transportation are tested in accordance with Oracle Shipping
Package Test, Doc. No. 950-1291-01.

System Environmentals

Table 33: System altitude specifications

Mode	Elevation
Operational	–196 to 10498.7 feet (–60 to 3,200 meters)
Non-operational	–196 to 40026.2 feet (–60 to 12,200 meters)

Table 34: System temperature and humidity specifications

Mode	Ambient temperature	Non-condensing humidity	Max wet bulb temperature	Gradient
Operational	Up to 7000–feet elevation: +41 to 104°F (+5 to 40°C) Up to 10,000–feet elevation: +41 to 95°F (+5 to 35°C)	10–85% 10%/hr gradient	86°F (30°C)	36°F/hr (20°C/hr)
Non-operational	-45.4 to 154.4 °F (-43 °C to 68 °C)	5–95% 10%/hr gradient	104°F (40°C)	54°F/hr (30°C/hr)

Oracle FS System LED Status

Oracle FS System LEDs

An Oracle FS System includes LEDs to indicate the status of the hardware components. To restore reliability to the Oracle FS System, locate the specific failed component so that you can replace it. Hardware LED configuration helps you identify the failed component.

Important: If you cannot locate the hardware component that must be replaced, contact Oracle Customer Support.

The Guided Maintenance feature of the Oracle FS System Manager triggers the chassis with the failed component to blink, or it triggers all of the other chassis to blink, except for the one with the failed component. This blinking pattern helps you to identify component status.

Note: LED interpretations in this appendix apply to a system after it has been powered on.

Related Links
Pilot LED Indicators
Drive Enclosure LED Indicators
Controller LED Indicators

Controller LED Indicators

The LED alarm assembly is a high-level status indicator of the Controller and Controller components. Use these diagnostic LEDs to determine if a component has failed in the Controller. The LED alarm assembly also includes a power button to power on the Controller. Besides, the LED alarm assembly there is the Controller Identification Display (CID) that identifies the Controller by its numeric identifier.

The following figure shows the front display panel of the LED alarm assembly on the Controller:

Figure 104: LED alarm assembly front display
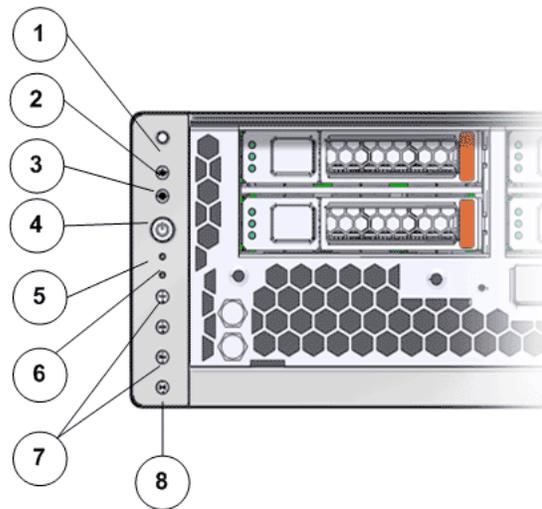
Legend	1 Chassis identification LED or Locator LED	5 Service processor LEDs
	2 Service Action Required LED or Caution or Fault LED	6 Back power supply LED
	3 Motherboard or Power or OK LED	7 Fault or Alarm LEDs (Critical, Major, Minor)
	4 Power switch	8 User Alarm LED

The following table provides status information on the LEDs on the front display panel of the LED alarm assembly on the Controller:

Table 35: Controller LED status and description (front panel)

No.	LED	LED color	Status
1	Chassis identification LED or Locator LED button	White	The Locator LED can be turned on to identify a particular system. When on, the LED blinks rapidly. Pressing and holding the Locator button for 5 seconds initiates a test of all LEDs in the LED assembly.
2	Service Action Required LED	Amber	Indicates that service is required. Under some fault conditions, individual component fault LEDs are turned on in addition to the Service Required LED.

Table 35: Controller LED status and description (front panel) (continued)

No.	LED	LED color	Status
3	Power or OK LED	Green	Indicates these conditions: • Off – Indicates that the system is not running in its normal state. System power might be off. The SP might be running. • Steady on – Indicates that the system is powered on and is running in its normal operating state. No service actions are required. • Fast blink: Indicates that the system is running in standby mode and can be quickly returned to full function. • Slow blink: Indicates that a normal but transitory activity is taking place. Slow blinking might indicate that system diagnostics are running or that the system is booting.
5	Service processor LED	Green	Indicates the state of the service processor: • Flashing: Indicates the SP is booting. • Steady: Indicates a steady state, no service action is required.
6	Back power supply LED	Amber	Indicates the state of the power supplies: • Off – Indicates a steady state, no service action is required. • On – Indicates a fault with one of the power supplies.

Table 35: Controller LED status and description (front panel) (continued)

No.	LED	LED color	Status
7	Fault or Alarm LEDs (Critical, Major, Minor)	• Critical Alarm LED : Red • Major Alarm LED: Red • Minor Alarm LED: Amber	**Note:** The alarm indicators appear on the front panel of the Controller but are not applicable for the Oracle FS System.
8	User Alarm LED	Amber	Indicates a user alarm condition. **Note:** The alarm indicators appear on the front panel of the Controller but are not applicable for the Oracle FS System.

The following figure shows the LEDs at the back of the Controller:

Figure 105: Controller back LEDs
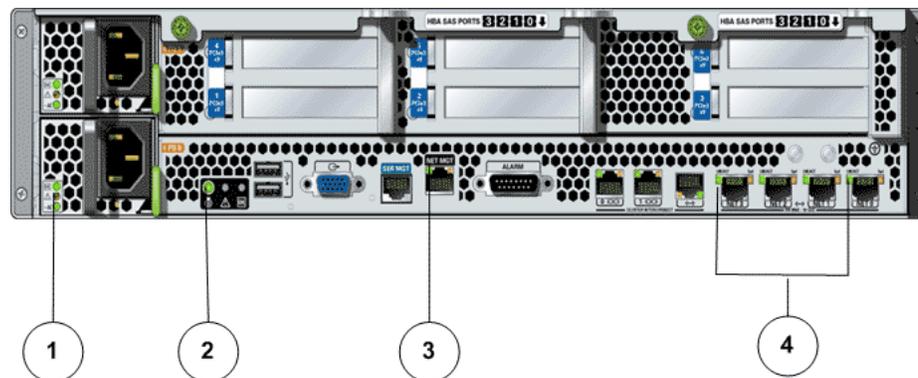
Legend	1 Power supply status LEDs
	2 Chassis Status LEDs
	3 Network management LED
	4 Net0 to Net3 status LEDs

The following table provides information on the LEDS at the back of the Controller:

Table 36: Controller LED status and description (back panel)

No.	LED	LED color	Status
1	Power supply status LEDs:	• (Top) Output Power OK LED: Green • (Middle) Service Action Required LED: Amber • (Bottom) AC or DC Input Power OK LED: Green	• Output Power OK LED: Indicates that output power is without fault. • Service Action Required LED: Indicates that service for the power supply is required. • AC or DC Input Power OK LED: Indicates that input power is without fault.

2	Chassis Status LEDs	• (Left) Locator LED and button: White
		
		• (Center) Service Action Required LED: Amber
		
		• (Right) Main Power OK LED: Green
			• Locator LED and button: The Locator LED can be turned on to identify a particular system.
			
			• Service Action Required LED: Indicates that service is required. Under some fault conditions, individual component fault LEDs are turned on in addition to the Service Required LED.
			
			• Main Power OK LED: Indicates these conditions:
			
			  • Off – System is not running in its normal state. System power might be off. The SP might be running.
			
			  • Steady on – System is powered on and is running in its normal operating state. No service actions are required.
			
			  • Fast blink – System is running in standby mode

Table 36: Controller LED status and description (back panel) (continued)

No.	LED	LED color	Status
			and can be quickly returned to full function. • Slow blink – A normal but transitory activity is taking place. Slow blinking might indicate that system diagnostics are running or that the system is booting.

Table 36: Controller LED status and description (back panel) (continued)

No.	LED	LED color	Status

3	Network management LED	• (Left) Link and Activity LED: Green
		• (Right) Speed LED: Green, amber, or OFF
			Indicates these conditions:
			• Link and Activity LED:
			   • On or blinking – A link is established.
			   • Off – No link is established.
			• Speed LED:
			   • On or blinking – The link is operating as a 100-Mbps connection.
			   • Off – The link is operating as a 10-Mbps connection.

4	Net0 to Net3 status LEDs	• (Left) Link and Activity LED: Green
		• (Right) Speed LED: Amber
			Indicates the state of the service processor:
			• Link and Activity LED:
			   • On or blinking – A link is established.
			   • Off – No link is established.
			• Speed LED:
			   • Amber – The link is operating as a Gigabit connection (1000-Mbps).
			   • Green – The link is operating as a 100-Mbps connection.
			   • Off – The link is operating as a 10-Mbps connection or there is no link.

Controller Power Supply LED Indicators

The LED indicators on the power supplies are at the left of the fan of each power supply and provide power activity status.

Table 37: Controller power supply LED status and description

Icon	Location	Name	Color	Status and meaning
OK	Top	OK	Green	• On – Power supply is functional without fault. • Off – Power supply is off or initializing. • Flashing – No function.
⚠	Middle	Attention Service Required	Amber	• On – Normal fault detected. • Off – No faults detected. • Flashing – No function.
~ AC	Bottom	AC or DC	Green	• On – Input power present and good. • Off – Input power not present. • Flashing – No function.

Controller Fan LED Indicators

A single bi-color LED represents the status of each fan module. The LEDs are on the motherboard near each fan module, and are visible from the back panel of the Controller when you look through the grill below the risers.

Table 38: Controller fan LED status and description

Color	Status and meaning
Green	The fan module is functional without fault.
Amber	The fan module has experienced a fault.

Note: There are two LEDs near the status LED for the third fan module. Do not confuse the FPGA Good and FPGA Diagnostic LEDs with the status LED for the third fan module.

Controller ESM LED Indicators

Three LEDs represent the status of each energy storage module (ESM). The LEDs are above the release button of each drive.

Figure 106: Controller drive LEDs
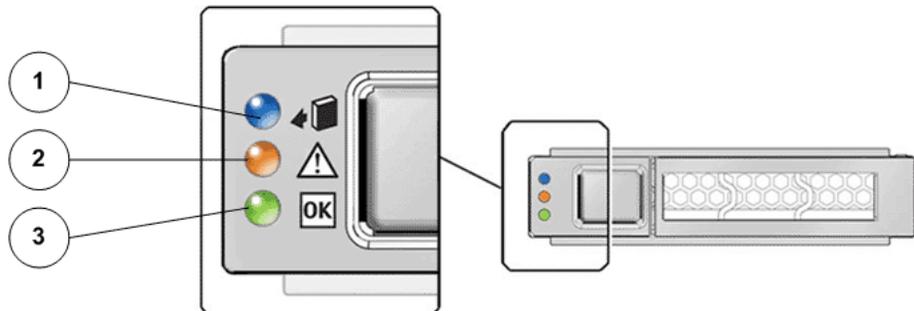
Legend	1 Ready to Remove LED
	2 Attention Service Required LED
	3 OK/Activity LED
	4 Power switch

This following table describes the functionality of the ESM LEDs:

Table 39: Controller ESM LED status and description

Icon	Location	Name	Color	Status and meaning
	Top	Ready to Remove	Blue	• On – ESM can be removed as a hot-swap operation. • Off – Do not remove the ESM. • Flashing – ESM is initializing.
	Middle	Attention Service Required	Amber	• On – Normal fault is detected. • Off – No faults are detected. • Flashing – No function.
OK	Bottom	OK/Activity	Green	• On – ESM is functional without fault. • Off – ESM is off or initializing. • Flashing – ESM read and write activity.

Drive Enclosure LED Indicators

The LED indicators on the operator panel of the Drive Enclosures provide system status. The LED display identifies the Drive Enclosure by its numeric identifier.

The following figures show the operator panel LEDs for both types of Drive Enclosure.

Figure 107: Operator panel LEDs (DE2-24P Drive Enclosure)

Legend	1 System power indicator	3 Locate indicator and logical fault indicator
	2 Module fault indicator	4 Chassis ID

Figure 108: Operator panel LEDs (DE2-24C Drive Enclosure)
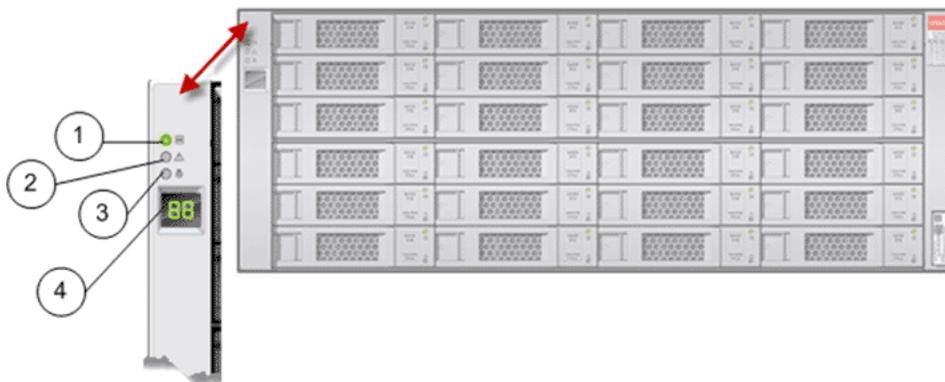
Legend	1 System power indicator	3 Locate indicator and logical fault indicator
	2 Module fault indicator	4 Chassis ID

The following table provides status information on the operator panel LEDs.

Table 40: Drive Enclosure LED status and description (operator panel)

LED	LED color	Status
System power indicator	Green	The status is normal.
Module fault indicator	Amber	A module fault is present.
Locate indicator	White	The DE is located.
LED display	Green number between 01 and 30	The numeric identifier of a DE is displayed.

Power Cooling Module LED Indicators

The LED indicators on the power cooling modules provide power activity status, fan and temperature fault conditions, and firmware upgrade status.

The following figure shows the power cooling module LEDs.

Figure 109: Power cooling module LEDs
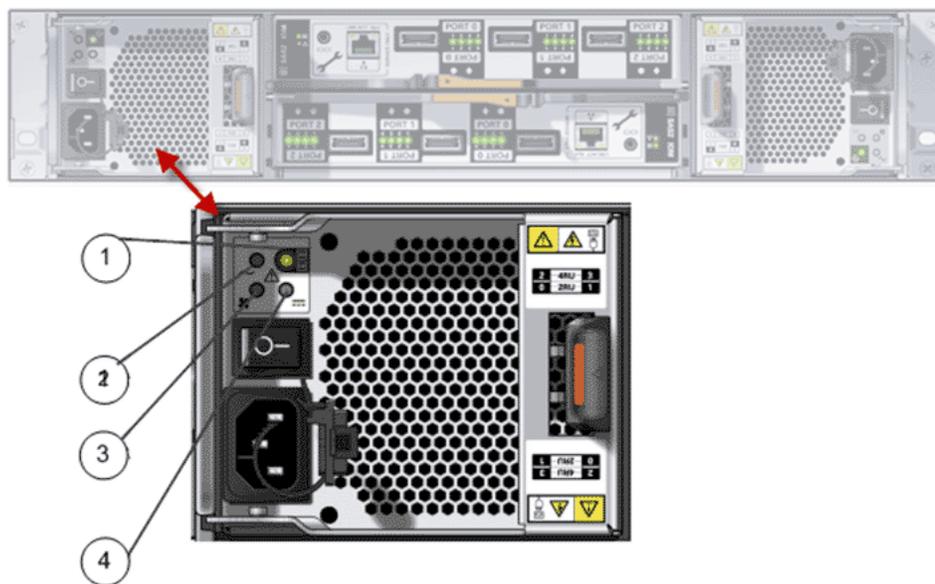
Legend	1 Status indicator	3 Fan fail indicator
	2 AC fail indicator	4 DC output fail indicator

The following table provides status information on the power cooling module LEDs.

Table 41: Drive Enclosure LED status and description (power cooling module)

Status	Status indicator (green)	Fan fail indicator (amber)	AC fail indicator (amber)	DC fail indicator (amber)
AC power is not available on either power cooling module.	Off	Off	Off	Off
AC power is not available on this power cooling module.	Off	Off	On	On
AC power is present, and the status of the power cooling module is normal.	On	Off	Off	Off
The power cooling module fan is outside of acceptable limits.	Off	On	Off	Off
The power cooling module fan failed.	Off	On	Off	Off
A fault is present (over temperature, over volts, over current).	Off	On	On	On
The power cooling module is in standby mode.	Flashing	Off	Off	Off
The power cooling module is downloading firmware.	Off	Flashing	Flashing	Flashing

I/O Module LED Indicators

The LED indicators on the I/O modules provide power activity status, locate indicators, fault conditions, and host port activity.

The following figure shows the I/O module LEDs.

Figure 110: I/O module LEDs
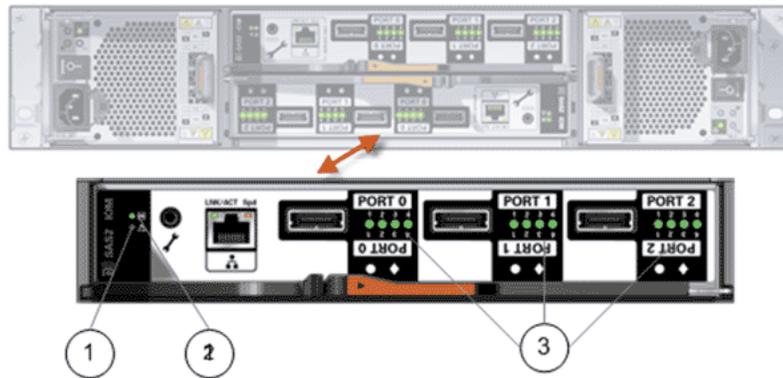
Legend	1 Fault and locate indicator	3 Host port activity indicator
	2 Power and OK indicator	

The following table provides status information on the I/O module LEDs.

Table 42: Drive Enclosure LED status and description (I/O module)

Status	Fault and locate indicator (amber)	Power and OK indicator (green)	Host port activity (green)
The status is normal.	Off	On	Not applicable
An I/O module fault is present.	On	Off	Not applicable
The I/O module is located.	Flash	On	Not applicable
A vital product data (VPD) error is present.	Not applicable	Flash	Not applicable
The host port is not connected.	Not applicable	Not applicable	Off
The host port is not active.	Not applicable	Not applicable	On
The host port activity is normal.	Not applicable	Not applicable	Flashing

Drive LED Indicators

The LED indicators on the Drive Enclosure drives provide power activity status, locate indicators, and fault conditions of each drive.

The following figures show the drive LEDs for both types of Drive Enclosure.

Figure 111: Drive LEDs (DE2-24P Drive Enclosure)
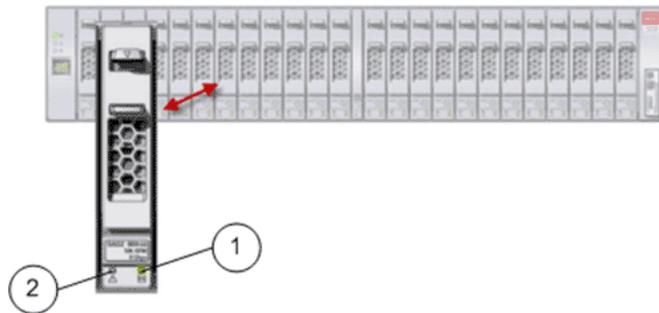
Legend	1 Power and activity indicator	2 Drive fault indicator

Figure 112: Drive LEDs (DE2-24C Drive Enclosure)
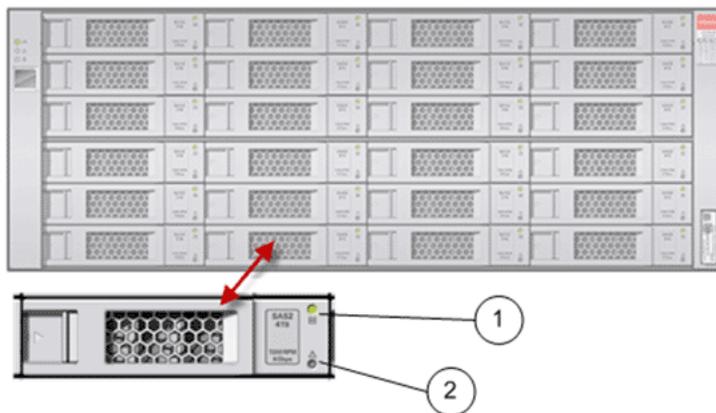
Legend	1 Power and activity indicator	2 Drive fault indicator

The following table provides status information on the drive LEDs.

Table 43: Drive Enclosure LED status and description (drives)

Status	Power/Activity Indicator (green)	Drive Fault indicator (amber)
Drive is installed and operational.	On and blinking with startup or activity	Off
The drive is located.	On	Flash one second on and one second off
A drive fault is present.	On	On In addition to the continuous amber light on the Drive Fault LED, the Locate LED on the operator panel is also a continuous amber light.

Table 43: Drive Enclosure LED status and description (drives) (continued)

Status	Power/Activity Indicator (green)	Drive Fault indicator (amber)
A failure occurred in the power control circuit.	Off	On In addition to the continuous amber light on the Drive Fault LED, the Module Fault LED on the operator panel is also a continuous amber light.
A failure occurred in the disk array.	On	Flash three seconds on and one second off. In addition to the flashing amber light on the Drive Fault LED, the Locate LED on the operator panel is also a continuous amber light.

Pilot LED Indicators

The Pilot LEDs are on the front panel of the Pilot. Use these diagnostic LEDs to determine if a component has failed in the Pilot.

The following figure shows the LEDs at the front of the Pilot:

Figure 113: LEDs at the front of the Pilot
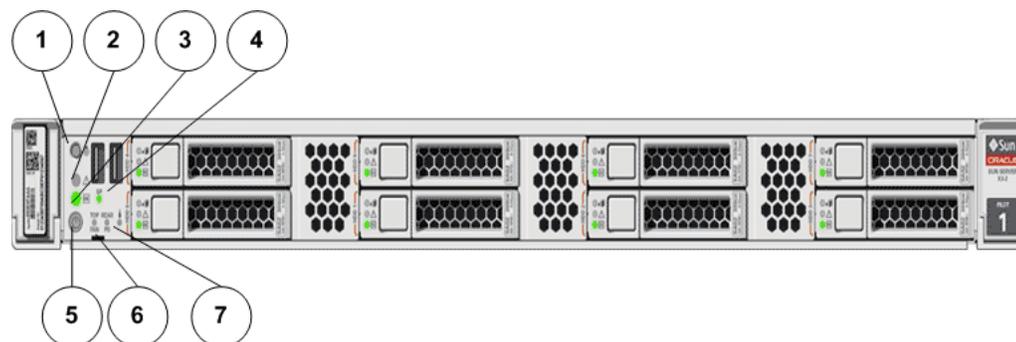
Legend	1 Locator LED / Locator button: white	5 Power button
	2 Service Action Required LED or Caution or Fault LED: Amber	6 Fan fault LED: amber
	3 OK LED: green	7 Power supply fault LED: amber
	4 Service processor LED: green	

The following figure shows the LEDs at the back of the Pilot:

Figure 114: LEDs at the back of the Pilot
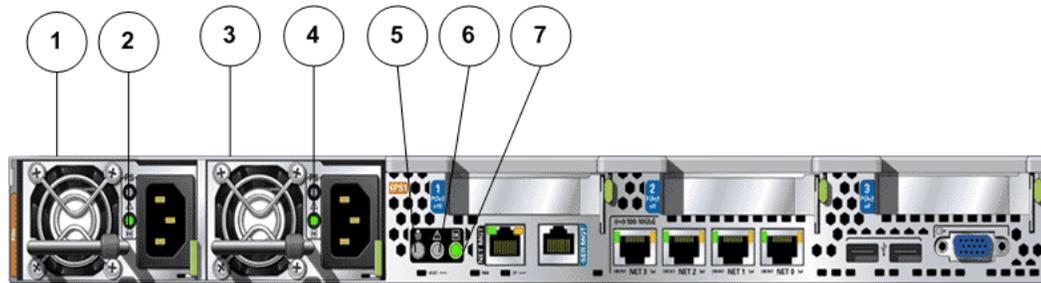
Legend	1 Poser supply 0 (PS0)	5 Locator LED: white
	2 Power supply LEDs: Service Required LED (amber) and AC OK LED (green)	6 Service Required LED: amber
	3 Power supply 1 (PS1)	7 Power or OK LED: green
	4 Power supply LEDs: Service Required LED (amber) and AC OK LED (green)	

There are six, system-level status indicators (LEDs), that are on the Pilot front panel and the Pilot back panel. The following table provides status information on these Pilot LEDs:

Table 44: Pilot LED status and description

LED	Icon	LED color	Status
Locator LED button		White	• OFF – Pilot is operating normally • FAST BLINK – To locate a particular system quickly and easily. • Pressing the Locate button toggles the LED fast blink on or off.
Service Action Required LED		Amber	• OFF – Normal operation • STEADY ON – Fault present on the Pilot. This LED lights whenever a fault indicator lights for a Pilot replaceable component. **Note:** When this indicator lights up, there is a system console message that includes a recommended service action.

Table 44: Pilot LED status and description (continued)

LED	Icon	LED color	Status

Power or OK LED	OK	Green	Indicates the operational state of the chassis. This indicator can be in the following states:
			
			• OFF – AC power is not present.
			
			• STEADY BLINK – Standby power is on, but the chassis power is off.
			
			• SLOW BLINK – Startup sequence has been initiated on the host. This pattern begins soon after you power on the Pilot. This status indicates either: (1) POST code checkpoint tests are running on the Pilot host system, or (2) the host is transitioning from the powered-on state to the standby state on shutdown.
			
			• STEADY ON – The Pilot is powered on, and all host POST code checkpoint tests are complete. The Pilot is in one of the following states:
			
			  • 1) The Pilot host is booting the operating system (OS).
			
			  • 2) The Pilot host is running the OS.

Service Processor LED	SP	Green	• OFF – Service processor (SP) is not running. • SLOW BLINK – SP is booting. • STEADY ON – SP is fully operational.
Top Fan, Processor, Memory Failure LED	TOP	Amber	Indicates that one or more of the internal fan modules, processors, or memory DIMMs have failed. • OFF – Indicates steady state; no service is required. • STEADY ON – Indicates service required; service the fan modules, processors, or memory DIMMs.

Table 44: Pilot LED status and description (continued)

LED	Icon	LED color	Status
Rear Power Supply Failure LED	REAR	Amber	Indicates that one of the Pilot power supplies has failed. • OFF – Indicates steady state; no service is required. • STEADY ON – Indicates service required; service the power supply.
Over Temperature Warning LED		Amber	• OFF – Normal operation; no service is required. • STEADY ON – The system is experiencing an over-temperature warning condition. **Note:** This is a warning indication, not a fatal over temperature. Might result in the system overheating and shutting down unexpectedly.

Pilot Drive LED Indicators

There are three LEDs on each Pilot drive. There is only one drive in each Pilot.

Table 45: Pilot drive LED status and description

LED	Icon	LED color	Status
OK to Remove		Blue	The storage drive can be removed safely during a hot-swap operation.
Service Required		Amber	• OFF – Normal operation. • STEADY ON – The system has detected a fault with the storage drive.
OK/ Activity	OK	Green	• OFF – Power is off or the system does not recognize the installed drive. • STEADY ON – The drive is engaged and is receiving power. • STEADY BLINK – There is disk activity. Indicator blinks on and off to indicate activity

Pilot Fan LED Indicators

Each Pilot fan module has one bicolored LED. These LEDs are on the Pilot side wall next to the fan modules and are visible when the top cover fan door is open.

Table 46: Pilot fan LED status and description

LED	Icon	LED color	Status
Fan Status LED	NONE	Bicolored: Amber/ Green	• Amber – There is a fan fault. • Green – Fan is properly installed and operating correctly. No fan errors detected.

Pilot Port LED Indicators

The Pilot has LED indicators for Network Management ports and the Ethernet ports.

Network Management Port Status LEDs

The Pilot has one 10/100BASE-T Ethernet management domain interface, labeled NET MGT. There are two LEDs on this port. These indicators are visible from the back of the Pilot.

Table 47: Network management port LED status and description

LED	Location	LED color	Status
Link speed	Top left	Amber or Green	• Amber on - 10BASE-T link • Green on - 100BASE-T link • Off - No link or link down • Flashing - No function
Activity	Top right	Green	• On - No function • Off - No activity • Flashing - Packet activity

Ethernet Port Status LEDs

The Pilot has four Ethernet ports (NET 3, NET 2, NET 1, NET 0). There are two LEDs on each port. These LEDs are visible from the back of the Pilot.

Table 48: Ethernet port LED status and description

LED	Location	LED color	Status
Link speed	Top left	Green	• On - No function. • Off - No activity • Flashing - Packet activity
Activity	Top right	Amber or Green	• Amber on - 100BASE-T link • Green on - 1000/10GBBASE-T link • Off - No link or link down • Flashing - No function

Pilot Motherboard LED Indicators

The Pilot motherboard and modules that are installed on the motherboard contain several LEDs.

Table 49: Motherboard LED status and description

LED	Description
DDR3 DIMM Fault LED	Each of the 16 DDR3 DIMM slots on the motherboard has an amber fault LED associated with it. If a DIMM is faulty, pressing the Fault Remind button on the motherboard signals the service processor to light the fault LEDs associated with the faulted DIMMs.
Processor Fault LED	The motherboard includes a fault status indicator (LED) next to each of the two processor (CPU) sockets. These LEDs indicate when a processor is faulty. For example, if on reboot the BIOS detects that there are uncorrectable processor errors recorded in the machine check architecture (MCA) registers apparently left over from the previous boot, then the BIOS records and diagnoses these errors. If it is determined that a processor is faulty, pressing the Fault Remind button on the motherboard signals the service processor to light the fault LED associated with the faulted processor.

Table 49: Motherboard LED status and description (continued)

LED	Description
Fault Remind Power LED	This LED is located next to the Fault Remind button and is powered from the super capacitor that powers the fault LEDs on the motherboard. This LED lights to indicate that the fault remind circuitry is working properly in cases where no components have failed and, as a result, none of the component fault LEDs illuminate.
Standby Power Good LED	The service instructions for all internal components require that all AC power is removed from the power supplies before the top cover of the Pilot is removed. This green LED is labeled STBY PWRGD and is located on the back of the Pilot near PCIe slot 2. This LED lights to inform a service technician that the motherboard is receiving standby power from at least one of the power supplies. This LED is provided to help prevent service actions on the Pilot's internal components while the AC power cords are installed and power is being supplied to the Pilot.

Pilot Power Supply LED Indicators

There are two LEDs on each power supply. These LEDs are visible from the back of the Pilot.

Table 50: Pilot Drive LED status and description

LED	Icon	LED color	Status
AC OK/ DC OK	OK	Green	• OFF – No AC power is present. • SLOW BLINK – Normal operation. Input power is within specification. DC output voltage is not enabled. • STEADY ON – Normal operation. Input AC power and DC output voltage are within specification.
Service Required	⚠	Amber	• OFF – Normal operation; no service required. • STEADY ON – The power supply (PS) has detected a PS fan failure, PS over-temperature, PS over current, or PS over or under voltage.

Index