Oracle FS1-2 Flash Storage System

Installation Guide (Racked)

ORACLE®

FLASH STORAGE
SYSTEMS

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

Important: For the latest version of this document, visit the *SAN Storage – Oracle Flash Storage System* section at the Oracle Help Center (http://www.oracle.com/goto/fssystems/docs).

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/fssystems/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)

Oracle FS Systems: Installation Overview

Racked Systems

When requesting racked Oracle FS Systems, customers order all of the components for the system. The system is mounted and cabled inside the rack at the factory. The manufacturing team then ships the fully-assembled system to the customer site. Racked systems can weigh up to 1800 pounds due to the additional weight of the components, cables, and the pallet.

The following figure shows an example of a racked Oracle FS System:

Figure 1: Racked Oracle FS System
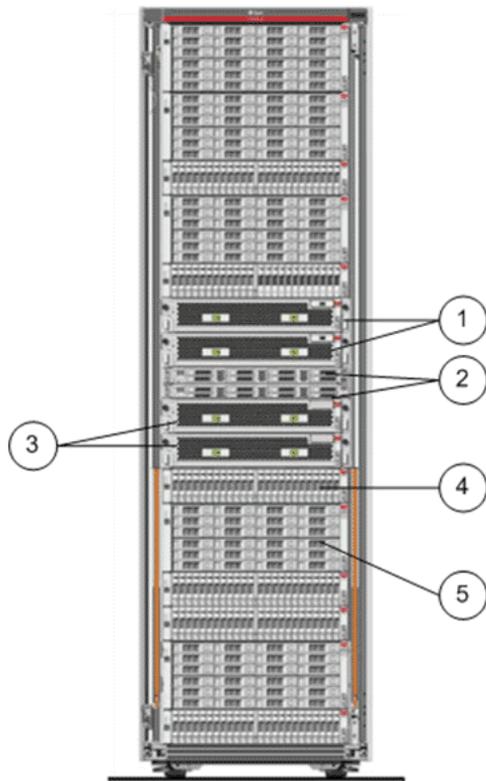
Legend	1 Controllers
	2 Pilots
	3 MaxRep Replication Engines (optional)
	4 DE2-24P Drive Enclosure (locations may vary)

5 DE2-24C Drive Enclosure (locations may vary)

Related Links
Planning for System Installation
Unpacking Systems
System Components
Installation Overview

Installation Overview

Because a racked Oracle FS System is mounted into the rack and cabled at the factory, the layout of the components inside the rack follows the Oracle recommended rack placement and cabling guidelines.

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

CAUTION: To avoid damage to the system, use the fork lift only on the designated side of the shipping pallet while moving the container with the racked system to the data center.

The following flowchart shows the sequence of tasks to install a racked Oracle FS System.

Figure 2: Racked system: Installation overview

1. Unpack and inspect
a. Verify cables are securely connected
b. verify rack screws are securely fastened
c. Verify components are securely installed

2. Couple racks
a. Remove side panels and doors
b. Level and secure rack in position using leveling feet
c. Line up racks
d. Connect components between racks

3. Secure rack
a. Re-attach doors and panels (Only end side panels installed for multi-rack scenario)
b. Attach grounding straps
c. Lock panels.

4. Connect to power supply
a. Verify power feeds match the system's PDU specs
b. Ensure the PDUs are off.
c. Connect PDUs to power supply

5. Power On
a. Verify that the power cords are secure
b. Power on components
c. Verify system status using LEDs

6. Configure and update
a. Connect to FS-1 management interface
b. Download and install the management client
c. Log in to the Oracle FS System Manager
d. Modify global settings as needed

7. Connect to management network
a. Ping the newly configured FS management IP
b. Connect cables to the management network

CAUTION: Do not turn on any power circuits until the installation 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.

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

Note: If the source of the main is from the ceiling, then care must be taken to re-anchor and re-route the main power cables properly.

Note: Depending on the Oracle FS System configuration, the system startup can take 30 minutes or longer. The process of starting up the Oracle FS System might be initiated multiple times as the Controller ports are provisioned before the ports are connected to the customer fabric.

Related Links

Unpacking Systems

Planning for System Installation

Racked Systems

Site Preparation Checklist

PDU Hardware Specifications

System Power Requirements

Component Chassis Hardware Specifications

System Components

Planning for System Installation

Following items are a part of the planning and site preparation before the installation of a racked 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 an Oracle FS System racked installation, follow the site preparation checklist.

Tip: When moving a heavy racked systems to the installation site, use steel tracks to guide the system on to the floor. We recommend that a minimum of three people are used to move the rack, with one person pushing from the front and one person pulling at the back to help guide the rack.

Tip: When transporting configured racks from one location to the other, move them at a speed of 2.13 feet for each second (0.65 meters for each second) or slower. Carefully examine the transportation path and avoid obstacles, such as doorways or elevator thresholds that can cause abrupt stops or shocks. Use ramps or lifts to avoid obstacles and to enable a smooth transport.

Related Links

Electrostatic Discharge Precautions

Warnings and Cautions

Required Tools

PDU Hardware Specifications

System Power Requirements

Component Chassis Hardware Specifications

Site Preparation Checklist

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

Unpacking Systems
Planning for System Installation
Racked Systems
PDU Hardware Specifications
System Power Requirements
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

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
Site audit: 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 installation site in preparation of the installation.

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 the power circuits are in place with adequate capacity and appropriate power outlet and cord connector types.
❑	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 5º— 35º Celsius (41ºF — 95ºF) 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	
❑	Ensure that there is a clear space of 21 feet (6.7 meters) for safely rolling the racks off the pallet using the supplied ramps.
❑	Determine if there is a standard loading dock or if a truck with a lift gate is required. Trucks with a proper lift gate might require special schedule considerations.
Grounding requirements	
❑	Determine if all powered racked 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.
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 or 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 **Note:** If the installer gets three replacement IP addresses, then those replacement IP addresses must be used instead of the factory default IP addresses.
Global system parameters	

Table 14: Site preparation checklist (continued)

Check	Site preparation or pre-installation planning items
❑	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.
❑	Get 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.
❑	Set 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.
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.
❑	If a UPS is being used, get the IP address of the UPS device and the UPS SNMP community string.
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.

Unpacking Systems

Racked Oracle FS Systems are shipped to the customer site with all components (Controllers, Pilots, and Drive Enclosures) and internal cables fully assembled and integrated into the rack. A fork lift must be used to move the shipping pallet to the specified site in the data center.

The shipping pallet is designed so that the rack can only be unloaded in one direction. Orient the shipping container so that the label RAMPS ATTACH THIS SIDE is off-loaded from the pallet. When you roll the rack off the shipping pallet,

you will need a total distance of at least 15 feet or 4.5 meters for safe maneuvering.

Note: The fork lift must only be used on the specified side of the shipping pallet to avoid causing damage to the system.

You can unpack the contents of the pallet following the rack unpacking instructions that is located in the packaging. Unpack the cartons carefully and dispose the packaging materials. Remove the system record, packing list, and other instructional documents from the cartons and keep them aside for reference.

The following tools are included in the shipping pallet:

- 13 mm and 17 mm combination open end wrench
- 19 mm open end wrench

Oracle FS Systems that use the X5-2 Pilots and have a gap of one rack unit (RU) or more, will have a 1 RU cable trough (PN: 7098533) installed directly below the bottom Pilot. The cable trough provides support to the bottom Pilot during transportation to the customer's facility and can be removed or left in place after the racked system is installed at the customer data center.

The following diagram shows an Oracle FS System configuration with a cable trough that is located at RU 20 in the rack.

Figure 3: Cable trough location in the Oracle FS System

RU	Component
42	Filler Panel
41	Filler Panel
40	Filler Panel
39	Filler Panel
38	Filler Panel
37	Filler Panel
36	Filler Panel
35	Filler Panel
34	Filler Panel
33	Filler Panel
32	Filler Panel
31	Filler Panel
30	Filler Panel
29	Filler Panel
28	Filler Panel
27	Filler Panel
26	Controller Node 2
25	
24	Controller Node 1
23	
22	Pilot Node 2 (X5-2)
21	Pilot Node 1 (X5-2)
20	Filler Panel
19	Filler Panel
18	Filler Panel
17	Filler Panel
16	2U DE (#07)
15	
14	2U DE (#06)
13	
12	2U DE (#05)
11	
10	4U DE(#04)
9	
8	
7	
6	2U DE (#03)
5	
4	2U DE (#02)
3	
2	2U DE (#01)
1	

Legend	1 Cable trough long lip that is secured under the bottom Pilot	3 Trough section that faces the back of the rack
	2 M6 cage nuts and M6 Phillips screws that secure the cable trough	4 Cable trough

The cable trough device is installed on the rear vertical rails with the long lip below the Pilot. The shorter trough section faces the back of the rack. A 1U filler panel is installed in the front of the rack in the same RU location as the cable trough. To remove the cable trough from the rack, unscrew the four M6 cage nuts and the four M6 Phillips screws that secure the cable trough to the rear vertical rails of the Pilot.

Note: Make sure that you verify all the components against the packing list that is pasted on the container.

Tip: Check the packing materials to verify that you have retrieved all the small parts before recycling.

CAUTION: The maximum weight of the racked storage system is 1970 lb (894 kg). Three people are required to off-load the rack: two at the front and one at the back.

Related Links

Racked Systems

Electrostatic Discharge Precautions

Warnings and Cautions

Required Tools

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.	
Cable management rings (included)	Route cables.	

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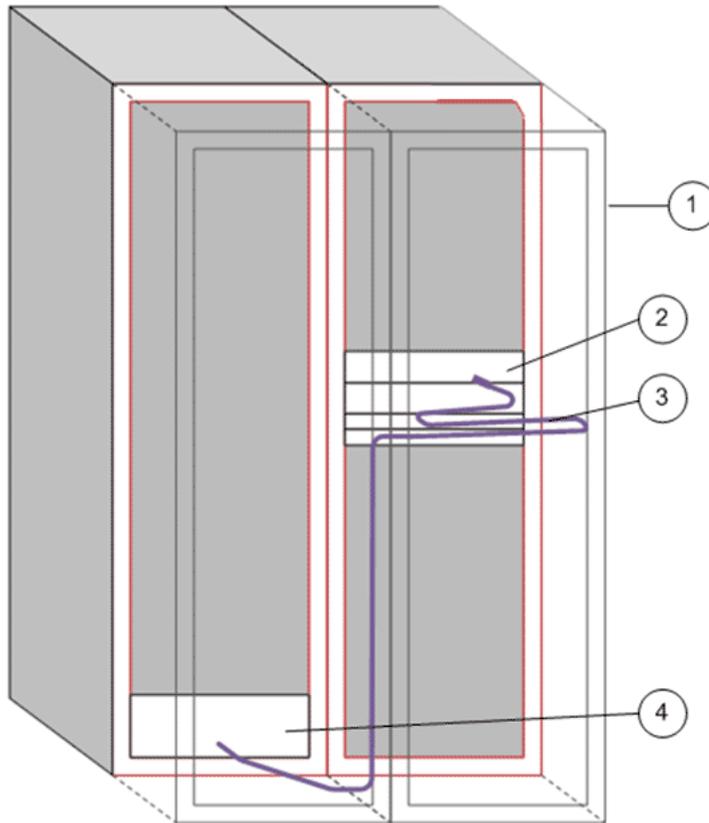
Legend	1 Back of a rack	3 Cable Management Arm (CMA)
	2 Controller	4 Drive Enclosure

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 5: 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 6: SSN label

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) 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 of a system is completed during the manufacturing process.

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

Connections to the Customer Data Network
Multiple Rack Systems
Build Map for Your Oracle FS System
Types of External Cables

Cabling Workflow

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

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

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

Figure 7: Cabling workflow

1 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

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

3 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

4 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

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

Related Links

Oracle FS System Configurations

An Oracle FS System can be configured as a base system or as a performance system.

The following table summarizes the Oracle FS System configurations.

Table 16: Oracle FS System configurations

Configuration	SAS HBAs	Number of Drive Enclosures
Base	Factory configuration of one SAS HBA for each Controller. The SAS HBA is installed in PCIe slot 3.	Maximum of 10 Drive Enclosures assigned to one or two strings.
Base	Factory configuration of two SAS HBAs for each Controller. The SAS HBAs are installed in PCIe slot 3 and PCIe slot 6.	Maximum of 20 Drive Enclosures assigned to one to four strings.
Performance	Factory configuration of three SAS HBAs for each Controller. The SAS HBAs are installed in PCIe slots 3, 6, and 2.	Maximum of 30 Drive Enclosures assigned to one to six strings.

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 8: Pilot port for external cabling
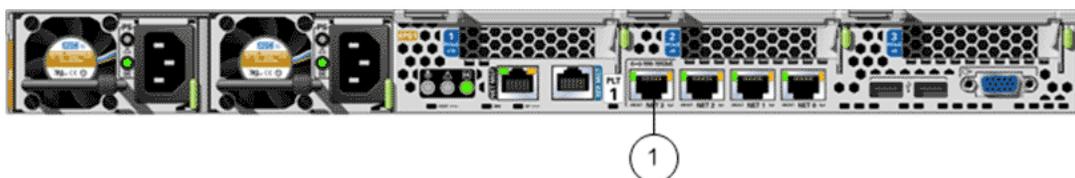
Legend	1 NET 3 port connects the Pilot nodes to the customer management network (Ethernet).

Pilot Ports for Internal Cabling

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

Figure 9: Pilot ports for internal cabling
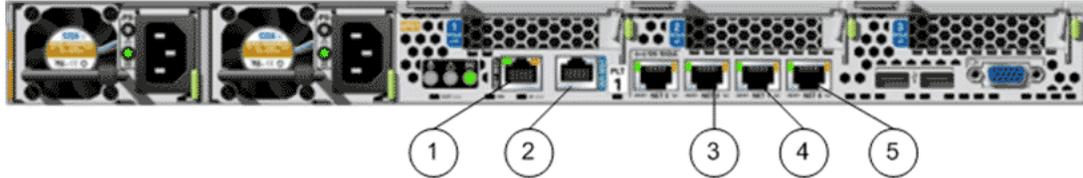
Legend	1 NET MGT port connects to the NET 2 port on the partner Pilot node (Ethernet).	4 NET 1 port connects to the NET 3 port on the Controller node (Ethernet).
	2 SER MGT port connects the SER MGT port on the partner Pilot node (serial).	5 NET 0 port connects to the NET 0 port on the partner Pilot node (Ethernet).
	3 NET 2 port connects to the NET MGT port on the partner Pilot node (Ethernet).	

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 10: Controller ports for external cabling
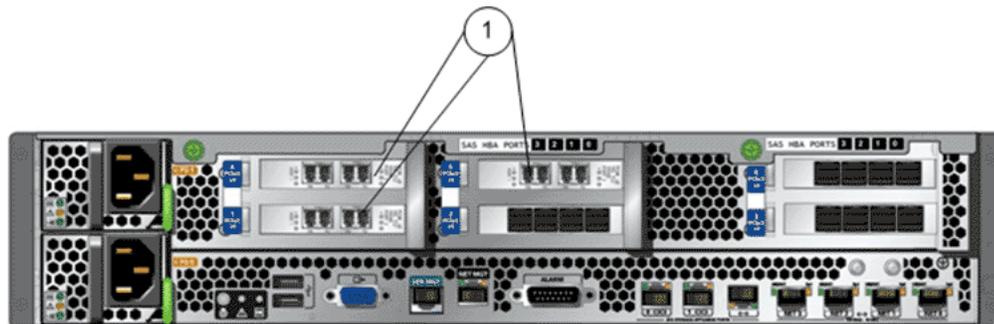
Legend	1 SAN HBA ports connect the system to the customer data network (FC only)

Controller Ports for Internal Cabling

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

Figure 11: Controller ports for internal cabling
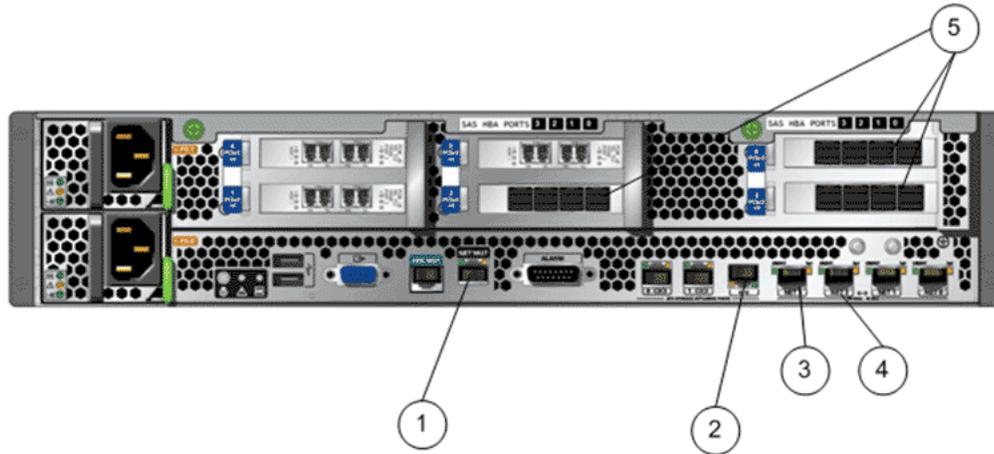
Legend	1 NET MGT port connects to the cluster interconnect port on the partner Controller (Ethernet).	4 NET 2 port connects to the NET 2 port on the partner Controller(Ethernet).
	2 Cluster interconnect network port connects to the NET MGT port on the partner Controller (Ethernet). The cluster interconnect 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).	

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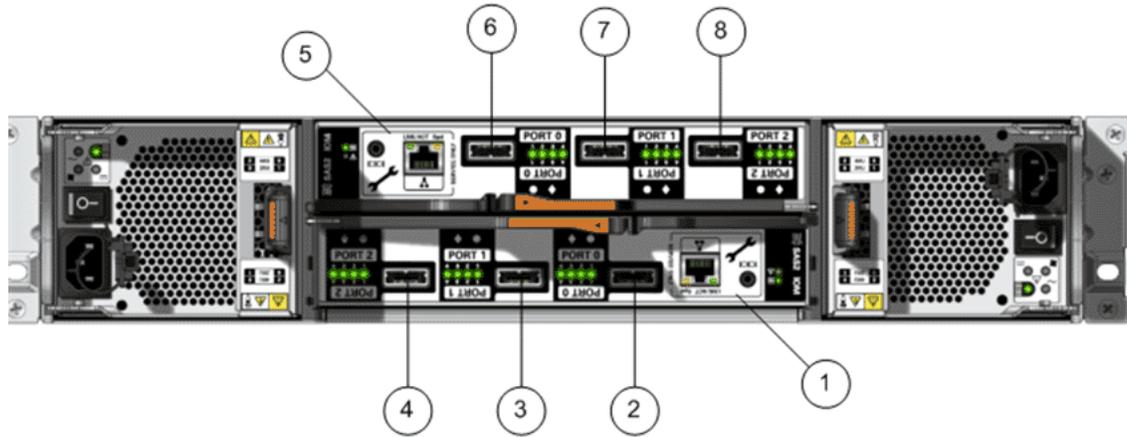
Legend	1 I/O module 0	5 I/O module 1
	2 I/O module 0, SAS port 0	6 I/O module 1, SAS port 0
	3 I/O module 0, SAS port 1	7 I/O module 1, SAS port 1
	4 I/O module 0, SAS port 2	8 I/O module 1, SAS port 2

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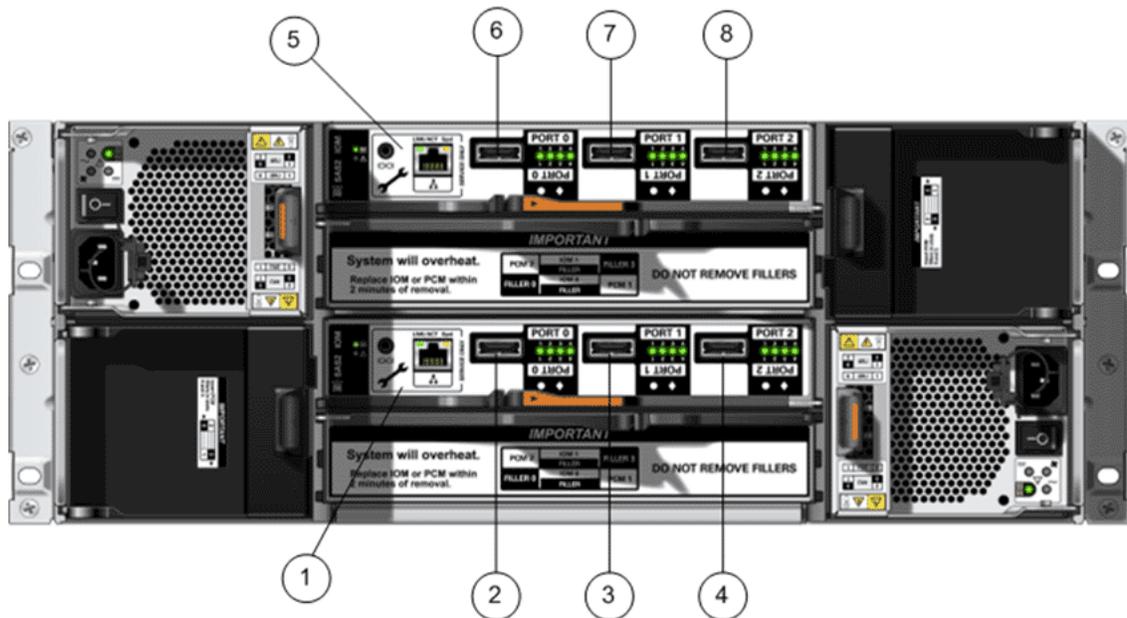
Legend	1 I/O module 0	5 I/O module 1
	2 I/O module 0, SAS port 0	6 I/O module 1, SAS port 0
	3 I/O module 0, SAS port 1	7 I/O module 1, SAS port 1
	4 I/O module 0, SAS port 2	8 I/O module 1, SAS port 2

Related Links

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 14: 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

CHAPTER 3

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 17: 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 18: 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)

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

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

Table 19: Cable length limits for FC 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)
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

Connections to the Customer Data Network
Connect to the Customer Management Network
Connect to the Customer Data Network
Handling and Care of Fiber Optic 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 20: 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 21: 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 15: 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 22: 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 16: Example of mini-SAS to mini-SAS HD cable connectors
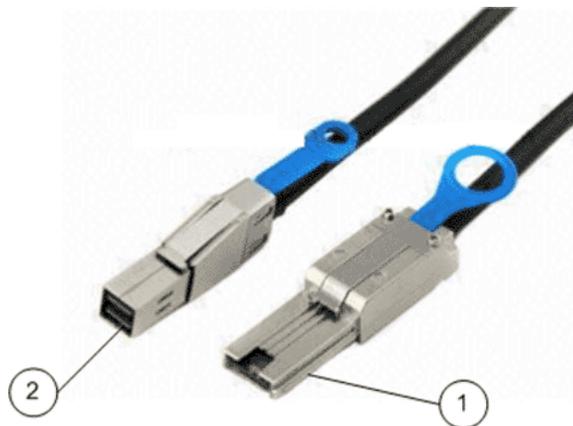
Legend	1 Mini-SAS connector	2 Mini-SAS HD connector

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 23: 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 17: 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 24: 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 18: Example of a power cord with C13 to C14 angled connectors

Related Links
Multiple Rack Systems

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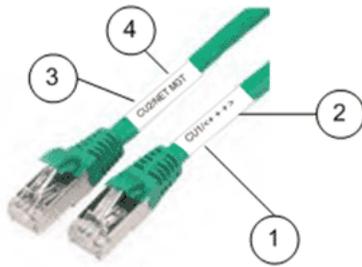
Legend	1 Controller 1	3 Controller 2
	2 Cluster interconnect network port (labeled as < - - - >)	4 NET MGT port

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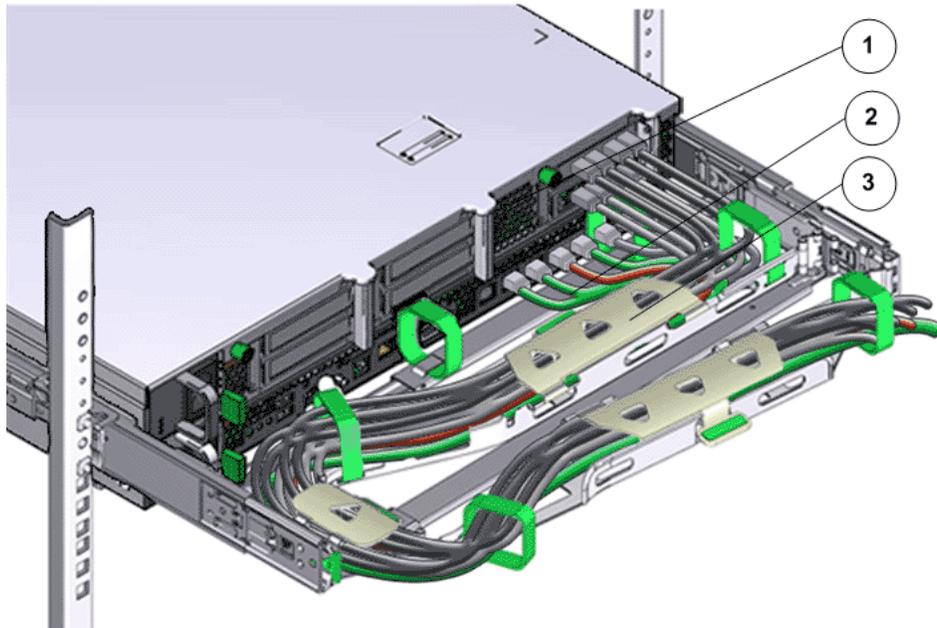
Legend	1 Back of a Controller	3 CMA
	2 Controller cables	

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

Figure 21: Pilot cables routed through the CMA
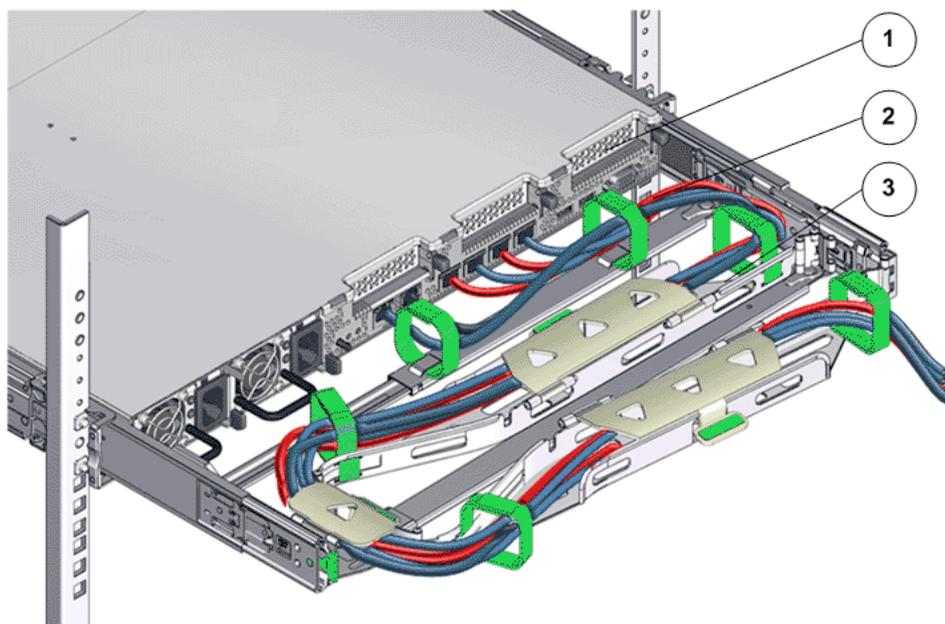
Legend	1 Back of a Pilot	3 CMA
	2 Pilot cables	

System Power

Power Distribution Units

The standard oracle 42 unit (RU) rack uses pre-installed vertical power distribution units (PDUs).

Vertical PDUs allow the 42 RU space in the rack to be used for installing system components. PDUs are always used in pairs. 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.

Related Links
PDU Outlet Amperage Ratings

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.

All 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.

Note: The LED display on the PDU is powered by power input 0. The LED display on the PDU might not power up if only one power input is used because the PDU might use the connector on input 1.

Alternately, you can use a voltmeter to verify the voltage of the available power. The Oracle vertical PDUs support multiple ranges of voltage, and the current rating on the PDU circuit breakers vary with the external available power. The external available power determines the number of Oracle FS System components that can be connected to the PDU port groups or circuit breakers (CB). If the voltage of the input power into the PDU is lower than the nominal rating of the PDU, the current rating on the circuit breakers is decreased to compensate for the lower voltage of the available power.

Important: Oracle strongly recommends that you use vertical PDUs pre-installed in Oracle racks. If you install non-Oracle PDUs, they must meet the PDU specification described in the hardware specifications appendix.

Connect the Power Cables to the Power Supply

Oracle racks have pre-installed vertical PDUs. Also, power cables that connect to the main power supply are shipped with Oracle racks.

Before connecting the 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.

In an Oracle rack, the main power cables are secured at the two lower anchor points in the PDU at the factory and the excess cabling is spooled in the bottom of the rack to enable access to the components. 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, disconnect the main power cable from the anchor points in the back of the rack. Instead, route the power cables up over the racks and behind the PDUs using the anchor points in the middle of the rack.

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 Disconnect the power cable from the factory designated anchor point and secure it to an anchor point behind the PDU, midway in the rack.

4 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.

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

   Important: Do not turn on any power circuits until the installation is complete and all network cables are in place.

   CAUTION: Apply power to the Pilot only after all appropriate Ethernet cables and the CAT6a Ethernet cables are connected between the two Pilots.

Single-Phase PDU Cabling

The following table lists the specifications for single-phase power distribution units (PDUs) in various countries:

Table 25: Single-phase PDUs

Single-phase PDUs	North America, South America, Japan, and Taiwan	EMEA
Rack location	Vertical rack-mounted PDUs that occupy no rack unit (RU) space.	Vertical rack-mounted PDUs that occupy no rack unit (RU) space.
Inlet circuits	Each PDU has two 30A (de-rated to 24A) inlet circuits. The inlet plug style is NEMA L6-30.	Each PDU has two 25A inlet circuits. The inlet plug style is IEC309.
AC voltage	Each PDU supports AC voltage levels 200 – 240VAC at 50/60Hz.	Each PDU supports AC voltage levels from 200 – 240VAC at 50/60Hz.
Power	Each PDU can supply 10KW of power when both power cables are connected.	Each PDU can supply 10KW of power when both power cables are connected.

Table 25: Single-phase PDUs (continued)

Single-phase PDUs	North America, South America, Japan, and Taiwan	EMEA
Outlet groups	All PDUs have 42 outlets arranged in six groups of seven outlets.	All PDUs have 42 outlets arranged in six groups of seven outlets.
Receptacles	All 42 outlets are IEC60320 C13 style receptacles. The C13 receptacle can supply 10A. **Note:** If two outlets are configured to draw 10A each, the remaining five outlets in the group cannot be used.	All 42 outlets are IEC60320 C13 style receptacles. The C13 receptacle can supply 10A. **Note:** If two outlets are configured to draw 10A each, the remaining five outlets in the group cannot be used.
Circuit breaker	Each group of seven outlets have a 20A rated circuit breaker that can be re-set.	Each group of seven outlets have a 20A rated circuit breaker that can be re-set.

The following figure shows the outlet groups for single-phase PDUs.

Figure 22: Single phase PDU outlet groups
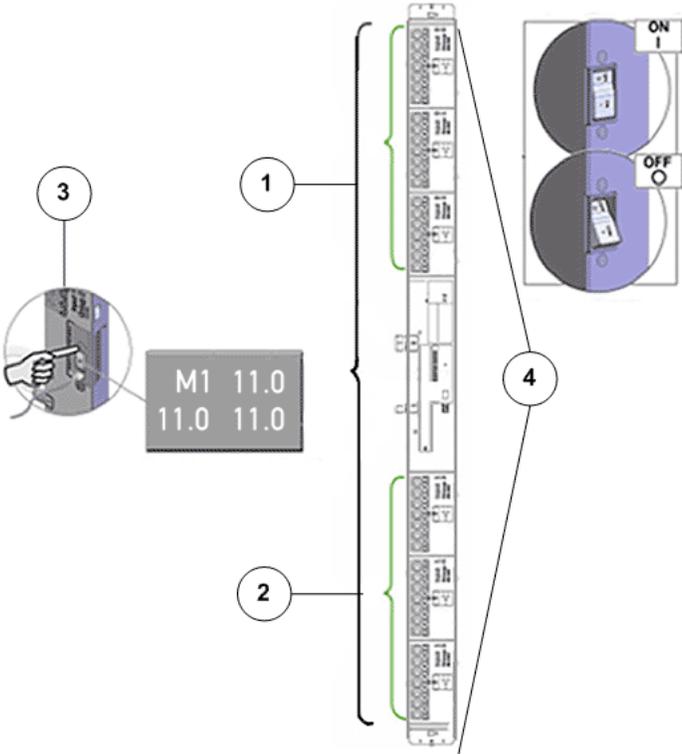
Legend	1 AC inlet circuit P1 supplies groups 0,1, and 2
	2 AC inlet circuit P2 supplies groups 3,4, and 5
	3 Current is monitored across both AC inlet circuits

4 Group of seven outlets has its own 20 A circuit breaker that can be re-set

Related Links

Wiring Diagram: Single-Phase PDU

Wiring Diagram: Single-Phase PDU

The wiring diagram for cabling a single-phase power distribution unit (PDU) shows power cord connections between the PDUs and the Oracle FS System components that are load balanced between the PDU outlet groups.

The wiring diagrams for PDU cabling and the current load shown is representative and includes Drive Enclosures, two Controllers, and two Pilots. Different component configurations within an Oracle FS System provide different results. For example, Drive Enclosures with SSDs have a lower power usage than Drive Enclosures with HDDs.

The wiring diagram illustrates the cabling of a single PDU. The second redundant PDU must be cabled identically. Cable connections to the PDU must be managed so that no outlet group exceeds 20A. The PDU groupings are reversed from one side to the other. From the back of the system, the PDU on the right are grouped 0 to 5 from the top of the rack to the bottom. The PDUs on the left are grouped 5 to 0 from the top of the rack to the bottom.

Figure 23: Wiring Diagram: Single-phase PDU cabling
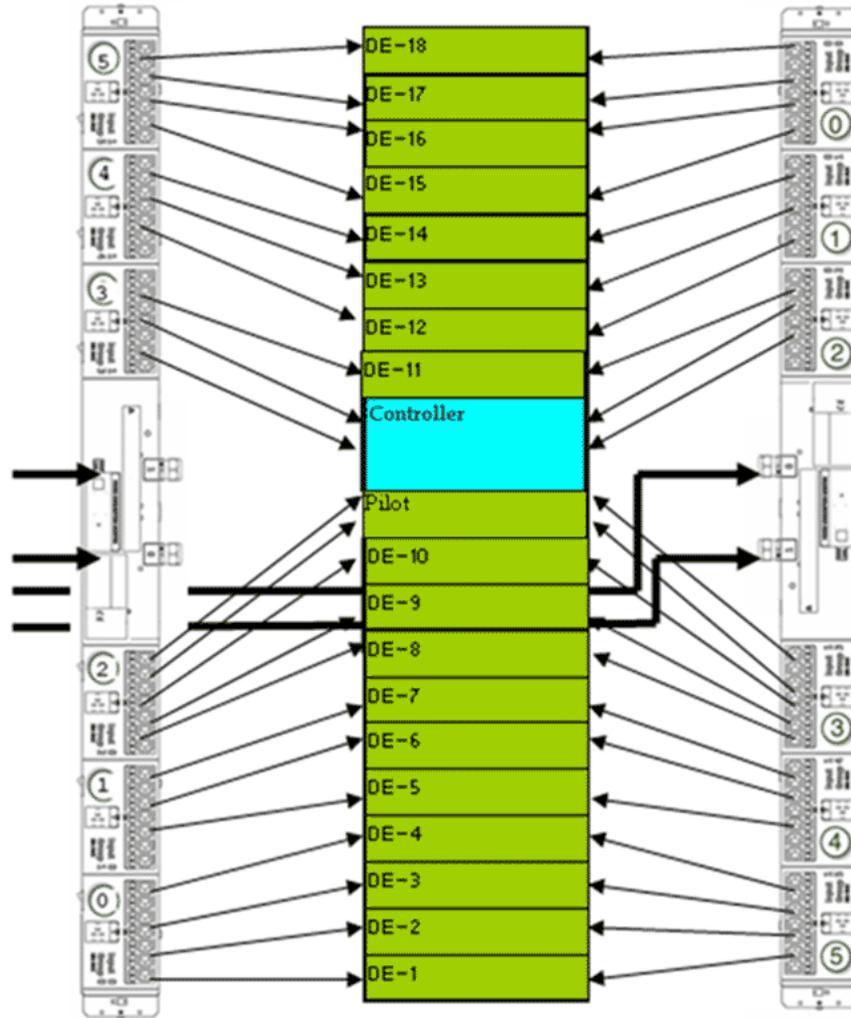
Related Links

Single-Phase PDU Cabling

Three-Phase PDU Cabling

The following table lists the specifications for three-phase power distributions units (PDUs) in various countries.

Table 26: Three-phase PDUs

Three-phase PDUs	North America, South America, Japan, and Taiwan	EMEA
Rack location	Vertical rack-mounted PDUs that occupy no rack unit (RU) space.	Vertical rack-mounted PDUs that occupy no RU space.
Inlet circuits	Each PDU has one 60 A inlet circuit. Each phase supplies a maximum of 40 A. Output is 23 A (maximum) for each phase.	Each PDU must have one 60 A inlet circuit. Each phase supplies a maximum of 40 A. Output is 23 A (maximum) for each phase.
AC voltage	The PDU supports AC input voltage levels from 200 to 240 VAC. The domestic PDU is used with 60 A 208 V three-phase Wye service.	The PDU supports AC input voltages from 200 to 240 VAC. The European PDU is used with 25 A 380 VAC three-phase Wye service.
Power	Each PDU can supply 14.4KW of power. The inlet cable has a plug style that is an IEC309 60A 4 Pin.	Each PDU can supply 14.4 KW of power. The inlet cable has a plug style that is an IEC309 32A 5 Pin.
Outlet groups	All PDUs have 42 outlets arranged in six groups of seven. Each phase drives two groups on the PDU. Phase 1 supplies power to group 0 and 3. Phase 2 supplies power to group 1 and 4. Phase 3 supplies power to groups 2 and 5.	All PDUs have 42 outlets arranged in six groups of seven. Each phase drives two groups on the PDU. Phase 1 supplies power to group 0 and 3. Phase 2 supplies power to group 1 and 4. Phase 3 supplies power to groups 2 and 5.
Receptacles	All 42 outlets are IEC60320 C13 style receptacles. The C13 receptacle can supply 10A. **Note:** If two outlets are configured to draw 10 A each, the remaining five outlets in the group cannot be used.	All 42 outlets are IEC60320 C13 style receptacles. The C13 receptacle can supply 10A. **Note:** If two outlets are configured to draw 10A each, the remaining five outlets in the group cannot be used.
Circuit breaker	Each group of seven outlets have a 20 A rated circuit breaker that can be re-set.	Each group of seven outlets have a 20 A rated circuit breaker that can be re-set.

The following figure shows the outlet groups for three-phase PDUs.

Figure 24: Three-phase PDU outlet groups
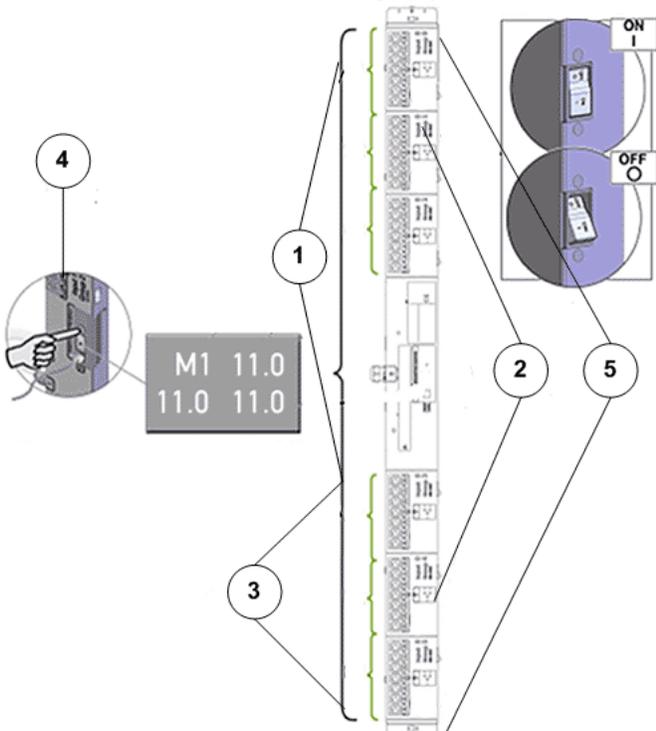
| Legend	1 AC inlet circuit P1 supplies groups 0 and 3
	2 AC inlet circuit P2 supplies groups 1 and 4
	3 AC inlet circuit P3 supplies groups 3 and 5
	4 Amps are monitored across both AC inputs
	5 Group of seven outlets has its own 20 A circuit breaker that can be re-set

Related Links
Wiring Diagram: Three-Phase PDU

Wiring Diagram: Three-Phase PDU

The wiring diagram for cabling a three-phase power distribution unit (PDU) shows power cable connections between the PDUs and the Oracle FS System components that are load balanced between the PDU outlet groups.

The wiring diagrams for PDU cabling and the current load shown is representative and includes a DE2-24C Drive Enclosure (4U), a DE2-24P Drive Enclosure (2U), two Controllers, and two Pilots. Different component configurations within an Oracle FS System provide different results. For example: Drive Enclosures with SSD drives have a lower power usage than any Drive Enclosure with SAS HDDs.

The wiring diagram illustrates the cabling of a single PDU. The second redundant PDU must be cabled identically. Cable connections to the PDU must

be managed so that no outlet group exceeds 20 A. For cabling three-phase PDUs, the load must be balanced between the three phases. The PDU groupings are reversed from one side to the other. From the back of the system, the PDU grouping to the right is 0 - 5 from top down. The PDU grouping to the left side is 5 - 0 from top down.

Figure 25: Wiring Diagram: Three-phase PDU cabling
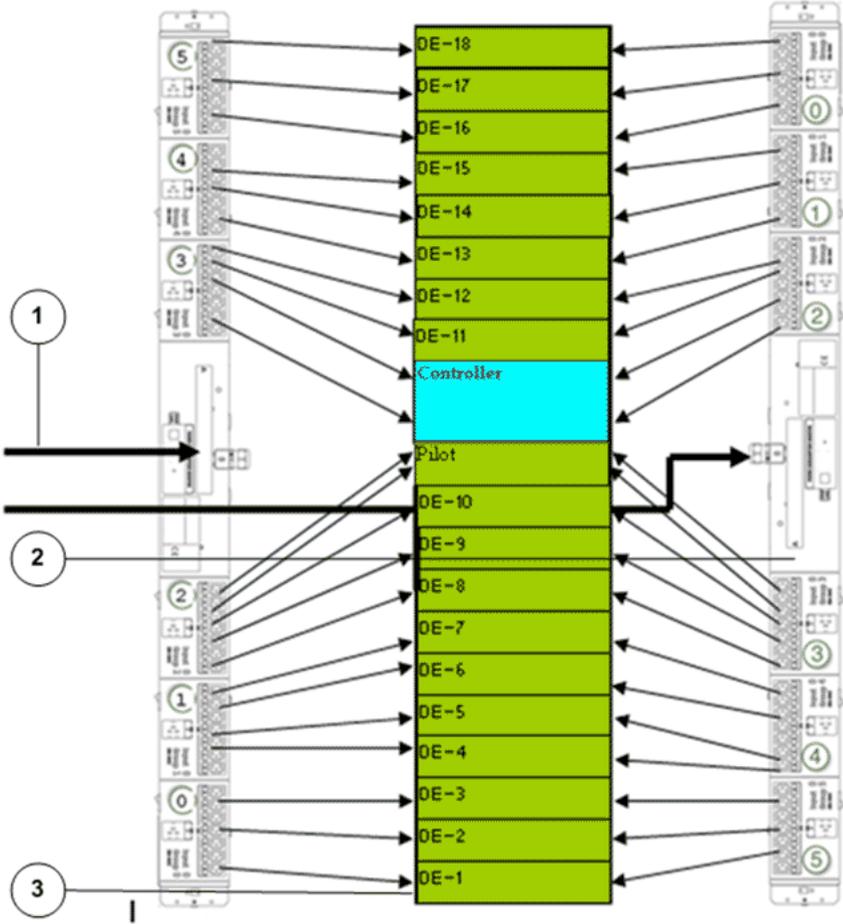
Legend	1 AC lines in
	2 Three-phase pre-installed PDU
	3 Representative Oracle FS System

Related Links
Three-Phase PDU Cabling

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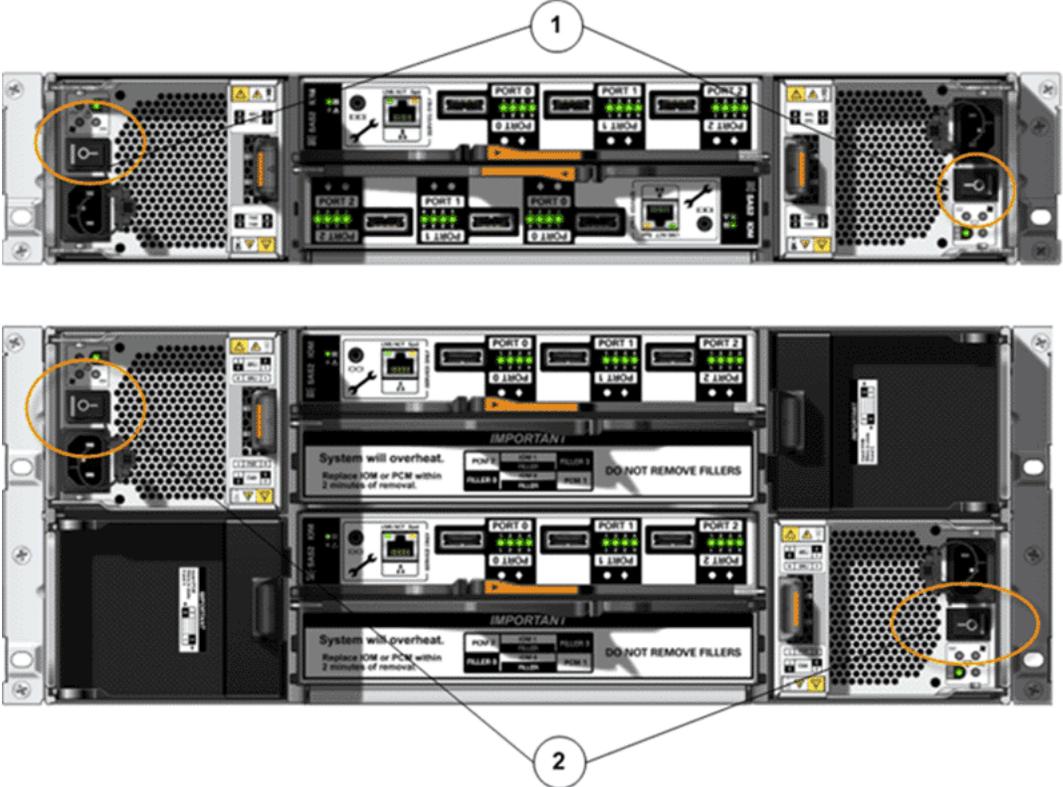
Legend	1 The power switches on the DE2-24P Drive Enclosure	2 The power switches on the DE2-24C Drive Enclosure

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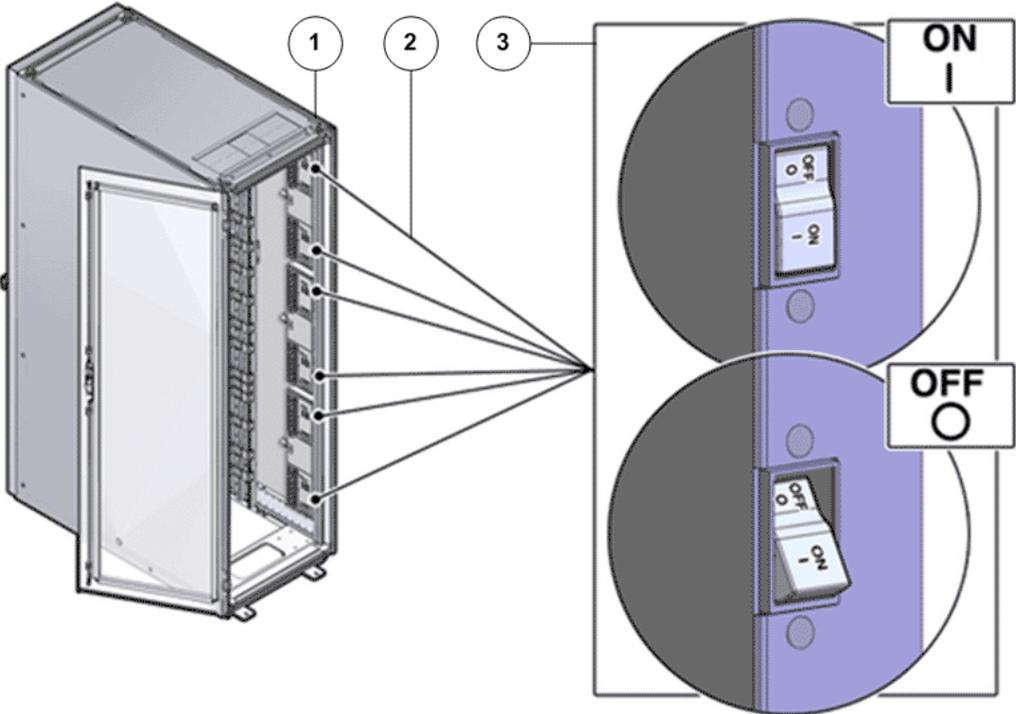
Legend	1 Rack
	2 Example of PDU circuit breakers
	3 Toggle switch

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

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 28: Workflow configure and connect to management network

1 Ping 10.0.0.2
2 Download Oracle FS System Manager to a temporary laptop
3 Configure the management IP addresses
4 Connect the Oracle FS System to the customer management network
5 Download Oracle FS System Manager to the customer management workstations
6 Download Oracle FS CLI to the customer management workstations
7 Verify the Controller service type
8 Update the Oracle FS System software and firmware

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.
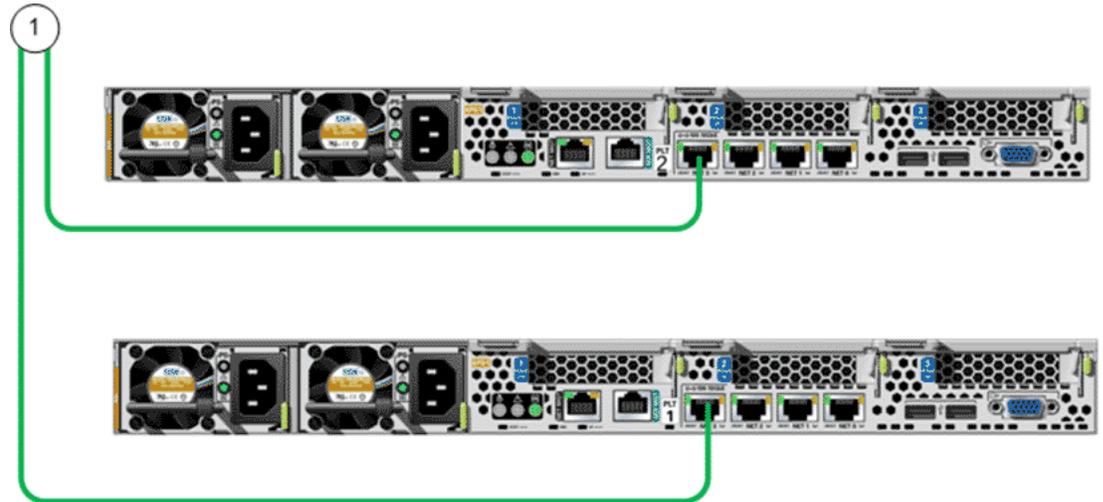
1   Disconnect the laptop from the NET 3 port on Pilot 1.

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 29: 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
Download Oracle FS System Manager to a Laptop
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 permit 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**.

Related Links
Cabling Workflow
Connections to the Customer Data Network
Connect to the Customer Data Network

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.

Prerequisite: 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.

Prerequisite:
- Place the update package on a workstation or client located on the same network as the Pilot or on a workstation located on a network that has a LAN connection speed to the Pilot of at least 100 Mb/s. The workstation must support either Oracle FS System Manager or Oracle FS CLI.

- If the above recommendation is not possible, modify the session time-out period in the security settings of the Oracle FS System Manager to a time-out of at least 90 minutes before staging the software. At the very minimum, the end-to-end connection speed should be 5 Mb/s, at which speed it will take approximately an hour to upload the software. Do not attempt to stage the software on connections that are not at least 5 Mb/s end-to-end.

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 the option later.

7   Click **OK**.

Related Links

Cabling Workflow
Connections to the Customer Data Network
Connect to the Customer Data Network

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

Cabling Workflow
Connections to the Customer Data Network
Connect to the Customer Data Network
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

Cabling Workflow
Connections to the Customer Data Network
Connect to the Customer Data Network

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**.

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.

Related Links

Cabling Workflow
Connections to the Customer Data Network
Connect to the Customer Data Network

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

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 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 setting: FC 8-16 Gbs with the 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
Connect to the Customer Data Network
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
Cabling Workflow
Connections to the Customer Data Network
Connect to the Customer Data Network

Connect to the Customer Data Network

SAN data paths require FC connections. Single-mode and multi-mode optical fiber connections are supported on PCIe cards.

Prerequisite: The fibre channel (FC) data paths require 8 GbE or 16 GbE optical FC connections.

> **Note:** The type of connection (Ethernet or FC) 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 30: SAN HBA connections to the customer data network
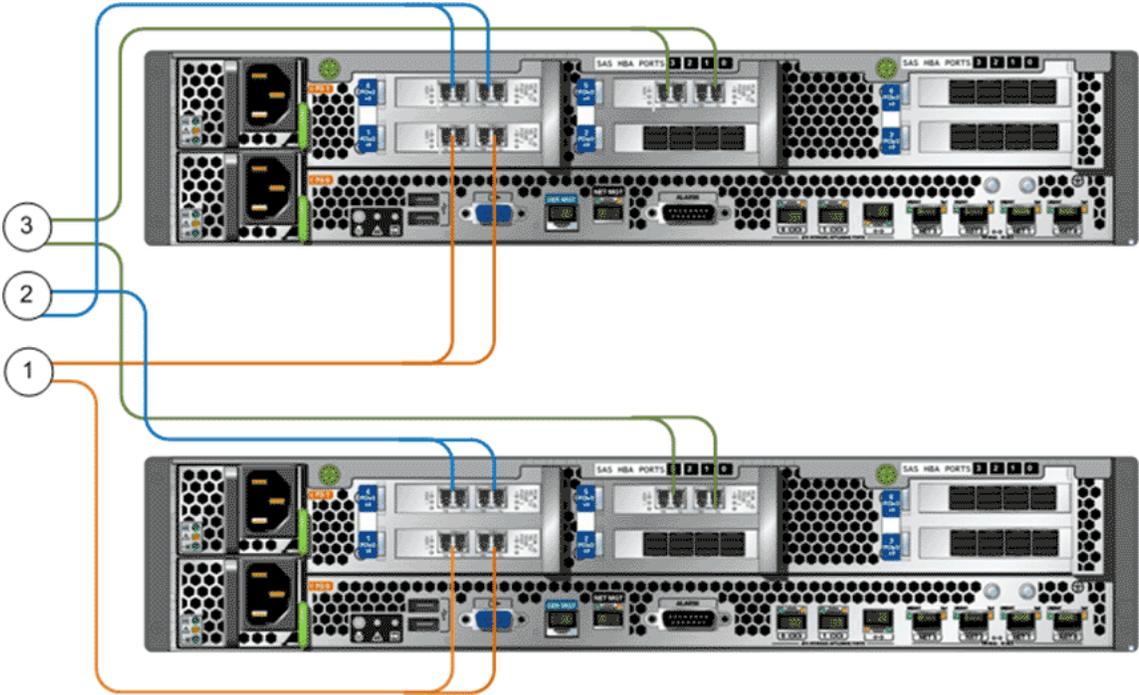
Legend	1 PCIe slot 1, HBA ports for SAN connectivity (FC only)	3 PCIe slot 5, HBA ports for SAN connectivity (FC only)

2 PCIe slot 4, HBA ports for SAN connectivity (FC only)	

1   For SAN FC connections, connect the FC cables from the SAN FC ports on the Controllers to the customer's SAN environment.

2   Route the cables through the Controller cable management arm (CMA).

Figure 31: Controller CMA
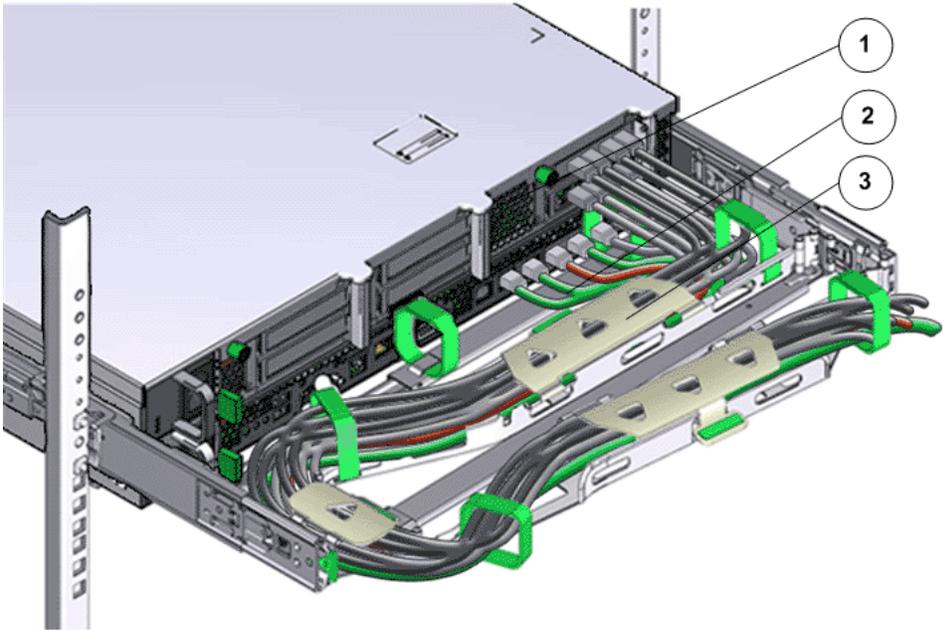
Legend	1 Controller back	3 CMA
	2 Controller data cables	

Related Links

Cabling Workflow
Provision the Controller Ports
Types of External Cables

CHAPTER 8

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 fibre 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 WN2009fffffffffffa
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 32: Pilot management interface main screen
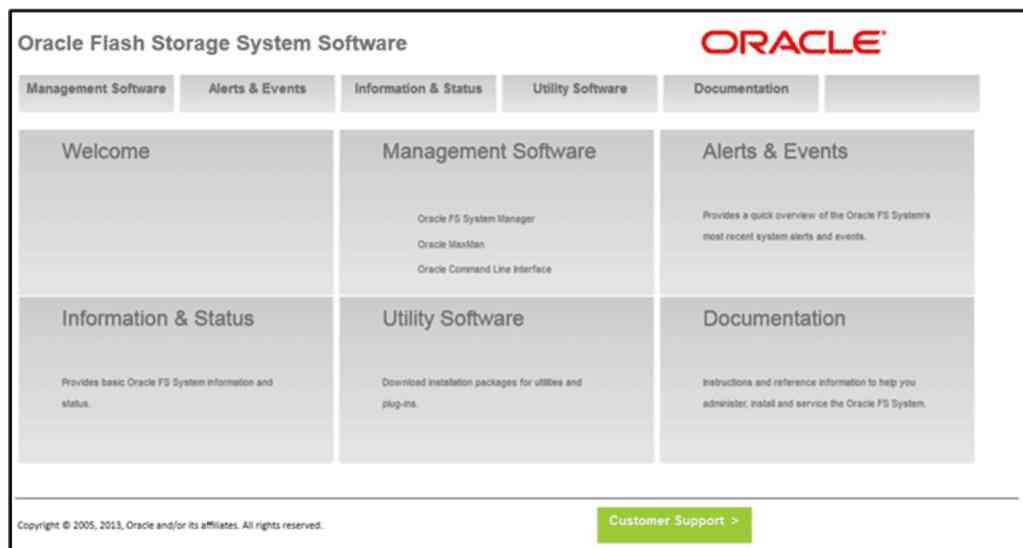
The Pilot management interface main screen appears.

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 33: 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 34: Oracle FS System Manager login screen
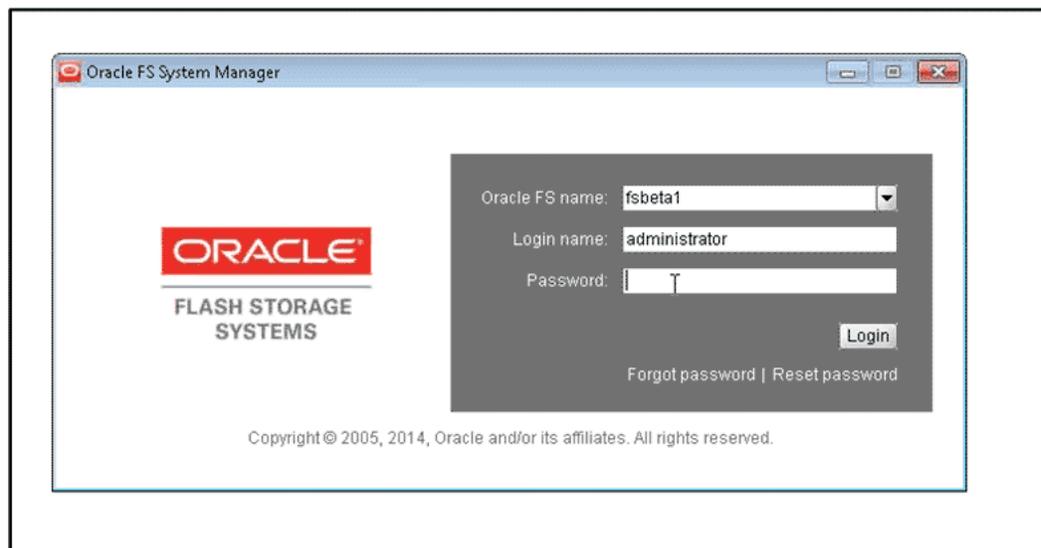
4   Click **Login**.

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

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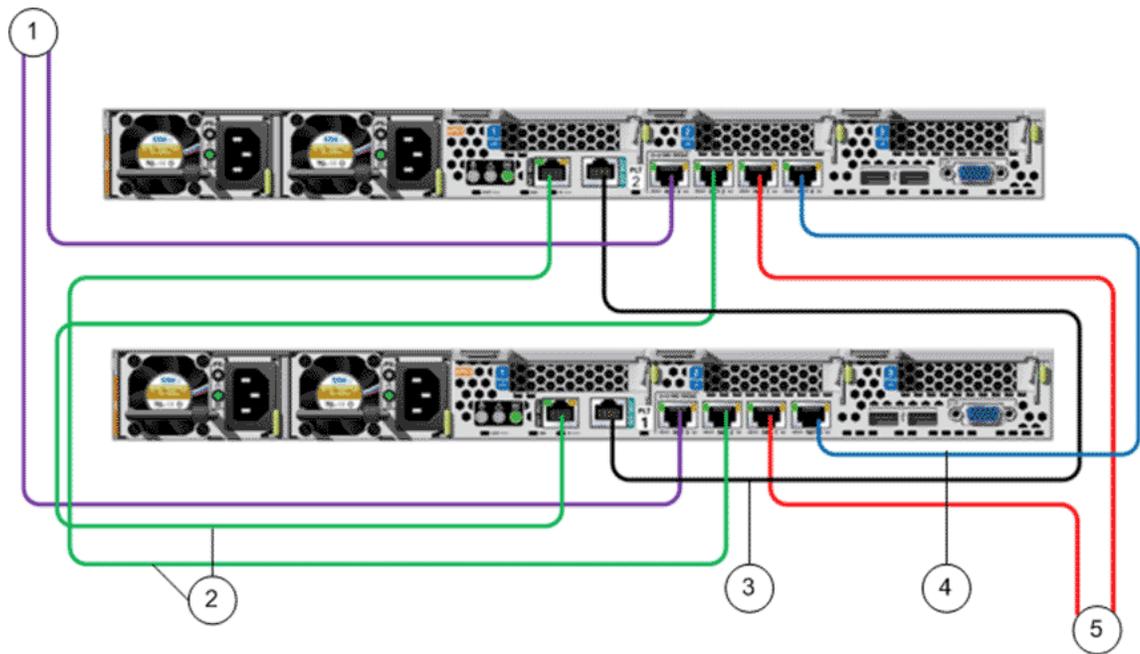
Legend	1 NET 3 port to customer management network	4 NET 0 port to NET 0 port
	2 NET MGT port to NET 2 port	5 NET 1 port to Controller NET 3 port
	3 SER MGT port to SER MGT port	

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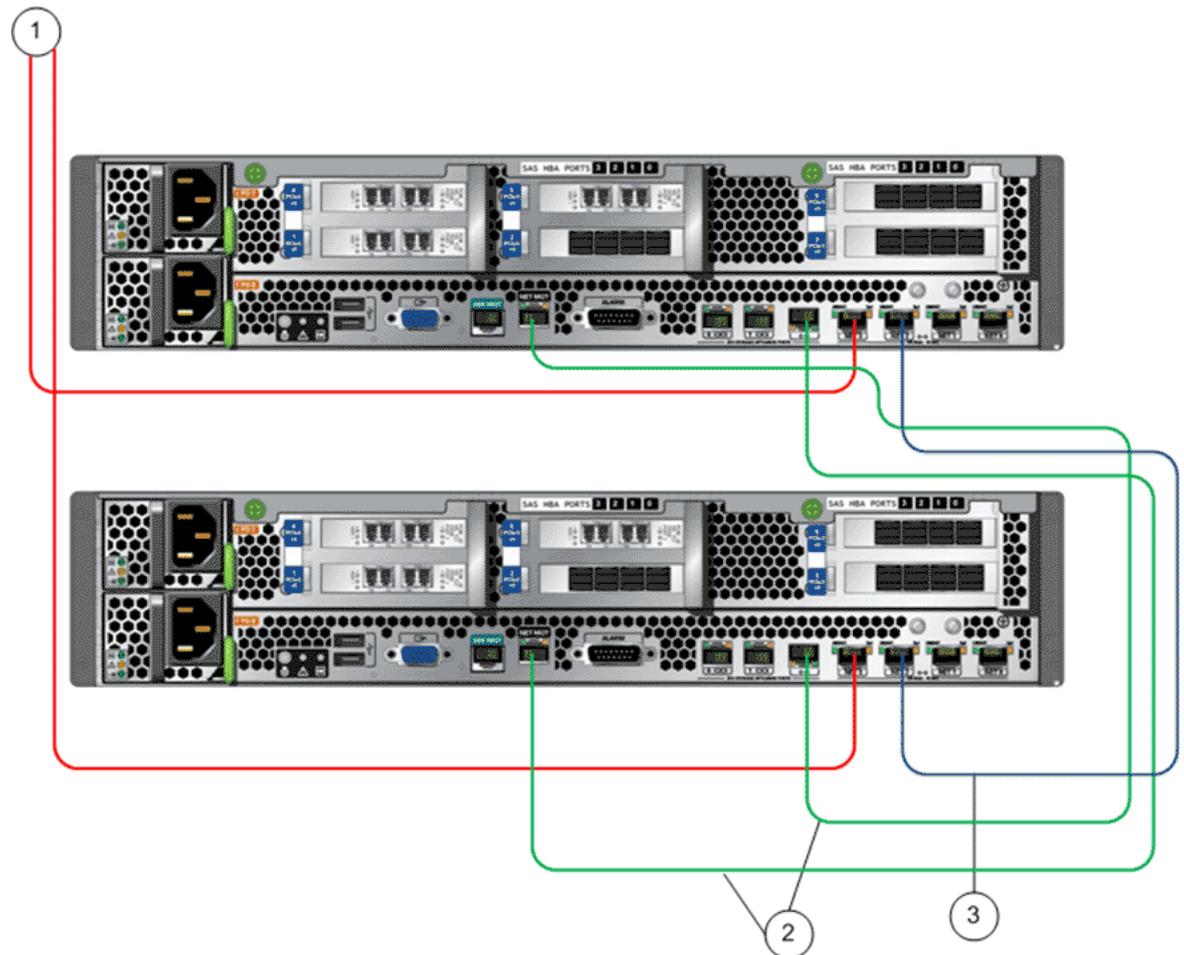
Legend	1 NET 3 port to the Pilot NET 1 port	3 NET 2 port to NET 2 port
	2 Cluster interconnect network port (labeled as <- - - >) to NET MGT port	

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 37: Controller wiring diagram (customer data network)
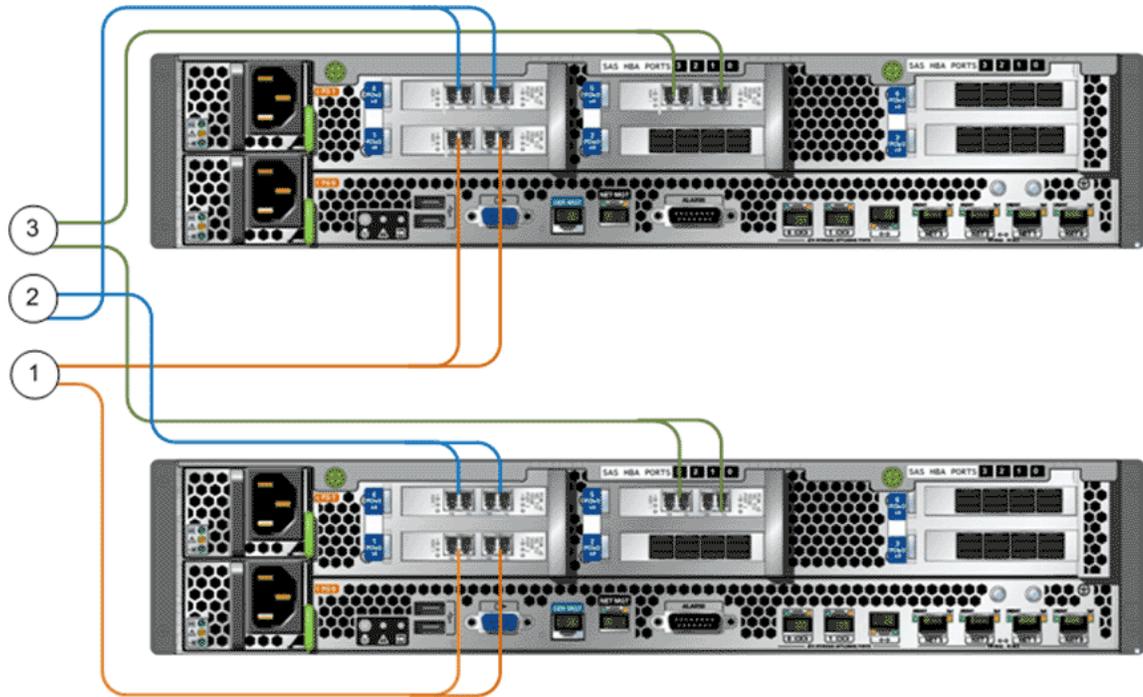
Legend	1 PCIe3 slot 1, HBA for SAN connectivity (FC only)	3 PCIe3 slot 5, HBA for SAN connectivity (FC only)
	2 PCIe3 slot 4, HBA for SAN connectivity (FC only)	

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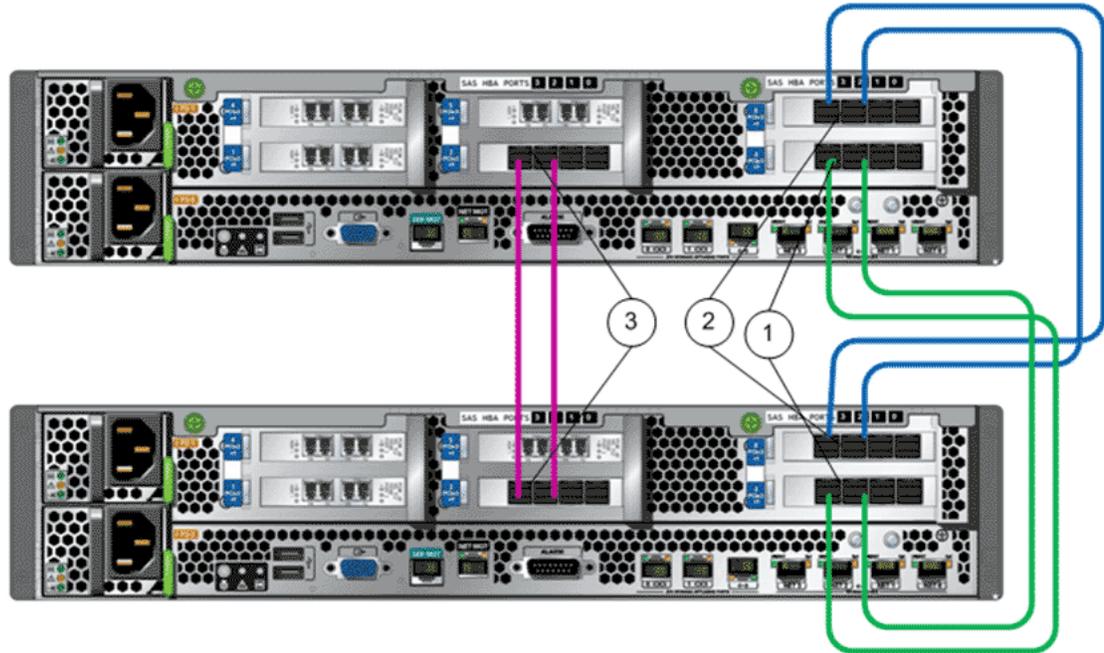
Legend	1 PCIe3 slot 3, SAS HBA port 2 and port 3	3 PCIe3 slot 2, SAS HBA port 2 and port 3
	2 PCIe3 slot 6, SAS HBA port 2 and port 3	

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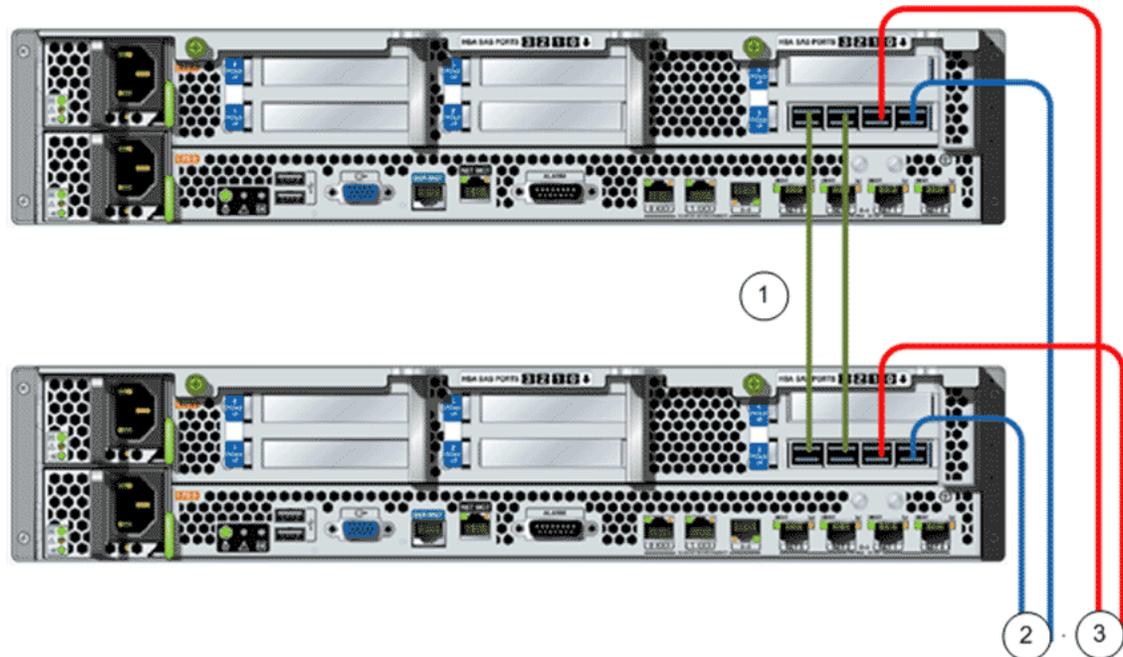
Legend	1 PCIe3 slot 3, SAS HBAs port 2 and port 3 connect the Controllers	3 PCIe3 slot 3, SAS HBAs port 1 connects to Drive Enclosure string 2
	2 PCIe3 slot 3, SAS HBAs port 0 connects to Drive Enclosure string 1	

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 40: SAS wiring diagram for Controllers to Drive Enclosures (performance)
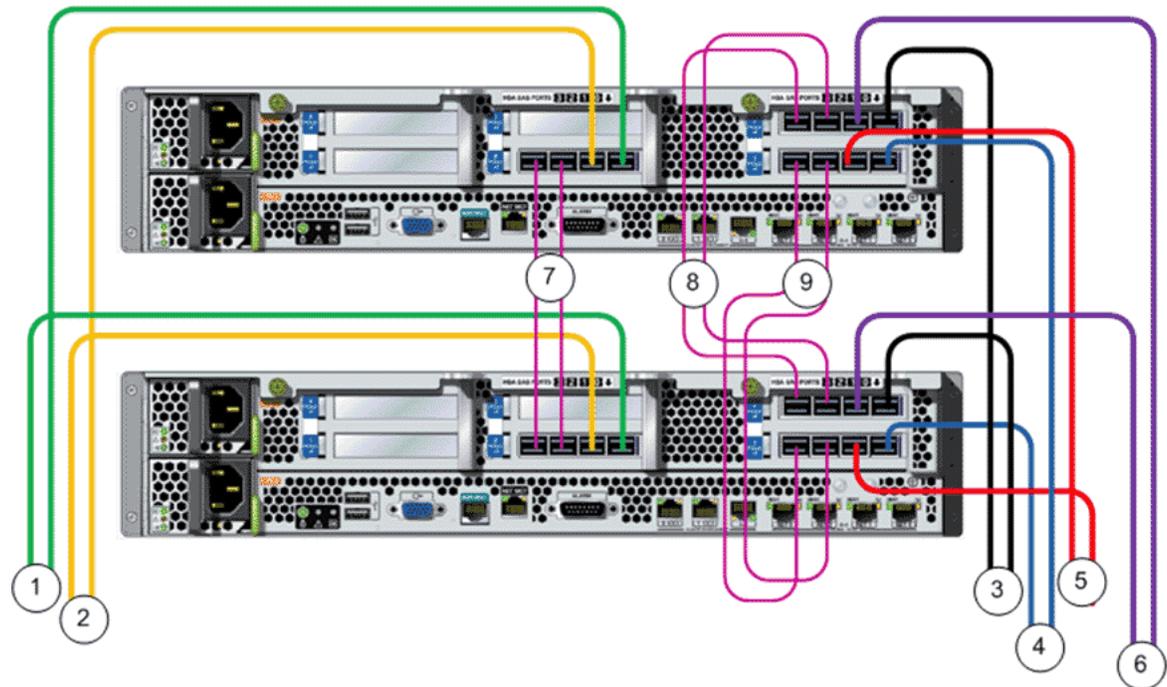
Legend	1 PCIe3 slot 2, SAS HBAs port 0 connects to Drive Enclosure string 3	6 PCIe3 slot 6, SAS HBAs port 1 connects to Drive Enclosure string 5
	2 PCIe3 slot 2, SAS HBAs port 1 connects to Drive Enclosure string 6	7 PCIe3 slot 2, SAS HBAs port 2 and port 3 connect the Controllers
	3 PCIe3 slot 6, SAS 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 String Distribution

Drive Enclosures are distributed among the strings so that all of the available SAS HBA ports designated for Drive Enclosures are used as equally as possible. The sequence of distributing strings is based on the performance capabilities of the drives installed in the Drive Enclosures.

For optimal performance, first distribute the Drive Enclosures with the highest performance drives across the strings and then continue sequentially until all of the Drive Enclosures are distributed to the strings. The number of Drive Enclosures on the shortest string should not differ from the number Drive Enclosures on the longest string by more than one Drive Enclosure.

The following table summarizes the string distribution for systems with one SAS HBA per Controller. A system with one SAS HBA per Controller can have one to 10 Drive Enclosures distributed across two strings.

Table 27: One SAS HBA per Controller

DE Add Order	String number	SAS HBA PCI slot	Port on SAS HBA	DE number within string
1	1	Slot 3	0	1
2	2	Slot 3	1	1
3	1	Slot 3	0	2
4	2	Slot 3	1	2
5	1	Slot 3	0	3
6	2	Slot 3	1	3

Table 27: One SAS HBA per Controller (continued)

DE Add Order	String number	SAS HBA PCI slot	Port on SAS HBA	DE number within string
7	1	Slot 3	0	4
8	2	Slot 3	1	4
9	1	Slot 3	0	5
10	2	Slot 3	1	5

The following table summarizes the string distribution for systems with two SAS HBAs per Controller. A system with two SAS HBAs per Controller can have one to 20 Drive Enclosures distributed across four strings.

Table 28: Two SAS HBAs per Controller

DE Add Order	String number	SAS HBA PCI slot	Port on SAS HBA	DE number within string
1	1	Slot 3	0	1
2	2	Slot 6	0	1
3	3	Slot 3	1	1
4	4	Slot 6	1	1
5	1	Slot 3	0	2
6	2	Slot 6	0	2
7	3	Slot 3	1	2
8	4	Slot 6	1	2
9	1	Slot 3	0	3
10	2	Slot 6	0	3
11	3	Slot 3	1	3
12	4	Slot 6	1	3
13	1	Slot 3	0	4
14	2	Slot 6	0	4
15	3	Slot 3	1	4

Table 28: Two SAS HBAs per Controller (continued)

DE Add Order	String number	SAS HBA PCI slot	Port on SAS HBA	DE number within string
16	4	Slot 6	1	4
17	1	Slot 3	0	5
18	2	Slot 6	0	5
19	3	Slot 3	1	5
20	4	Slot 6	1	5

The following table summarizes the string distribution for systems with three SAS HBAs per Controller. A system with three SAS HBAs per Controller can have one to 30 Drive Enclosures distributed across six strings.

Table 29: Three SAS HBAs per Controller

DE Add Order	String number	SAS HBA PCI slot	Port on SAS HBA	DE number within string
1	1	Slot 3	0	1
2	2	Slot 6	0	1
3	3	Slot 2	0	1
4	4	Slot 3	1	1
5	5	Slot 6	1	1
6	6	Slot 2	1	1
7	1	Slot 3	0	2
8	2	Slot 6	0	2
9	3	Slot 2	0	2
10	4	Slot 3	1	2
11	5	Slot 6	1	2
12	6	Slot 2	1	2
13	1	Slot 3	0	3
14	2	Slot 6	0	3

Table 29: Three SAS HBAs per Controller (continued)

DE Add Order	String number	SAS HBA PCI slot	Port on SAS HBA	DE number within string
15	3	Slot 2	0	3
16	4	Slot 3	1	3
17	5	Slot 6	1	3
18	6	Slot 2	1	3
19	1	Slot 3	0	4
20	2	Slot 6	0	4
21	3	Slot 2	0	4
22	4	Slot 3	1	4
23	5	Slot 6	1	4
24	6	Slot 2	1	4
25	1	Slot 3	0	5
26	2	Slot 6	0	5
27	3	Slot 2	0	5
28	4	Slot 3	1	5
29	5	Slot 6	1	5
30	6	Slot 2	1	5

Drive Enclosure SAS Wiring Diagrams

The following wiring diagrams show the cabling of Drive Enclosures for one complete string in a system. The same cabling pattern applies to all of the strings in a system. Remember to distribute Drive Enclosures among the strings so that all of the available SAS HBA ports designated for Drive Enclosures are used as equally as possible.

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 41: SAS wiring diagram for one string with one Drive Enclosure
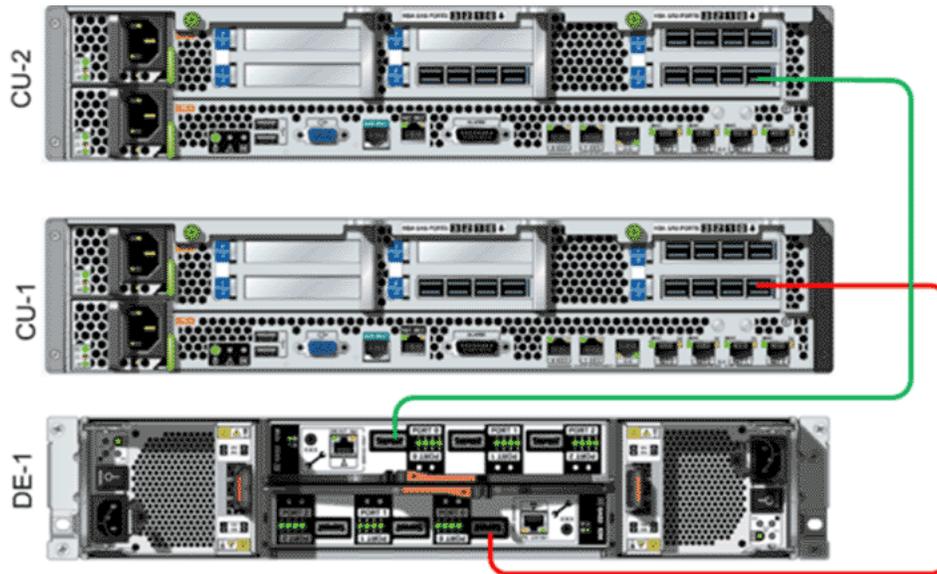
The following figure illustrates the SAS cabling in a system that is configured with one Drive Enclosure string containing two Drive Enclosures. The same cabling pattern applies to all of the strings in a system. Remember to distribute Drive Enclosures among the strings so that all of the available SAS HBA ports designated for Drive Enclosures are used as equally as possible.

Figure 42: SAS wiring diagram for one string with two Drive Enclosures
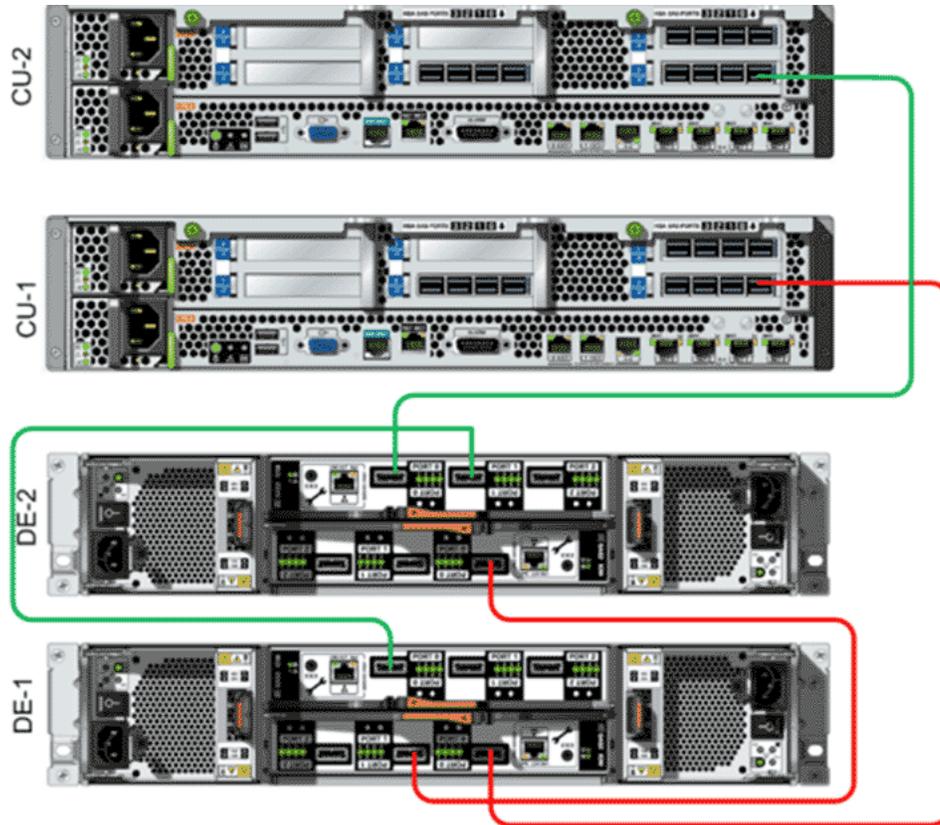
The following figure illustrates the SAS cabling in a system that is configured with one Drive Enclosure string containing three Drive Enclosures. The same cabling pattern applies to all of the strings in a system. Remember to distribute Drive Enclosures among the strings so that all of the available SAS HBA ports designated for Drive Enclosures are used as equally as possible.

Figure 43: SAS wiring diagram for one string with three Drive Enclosures
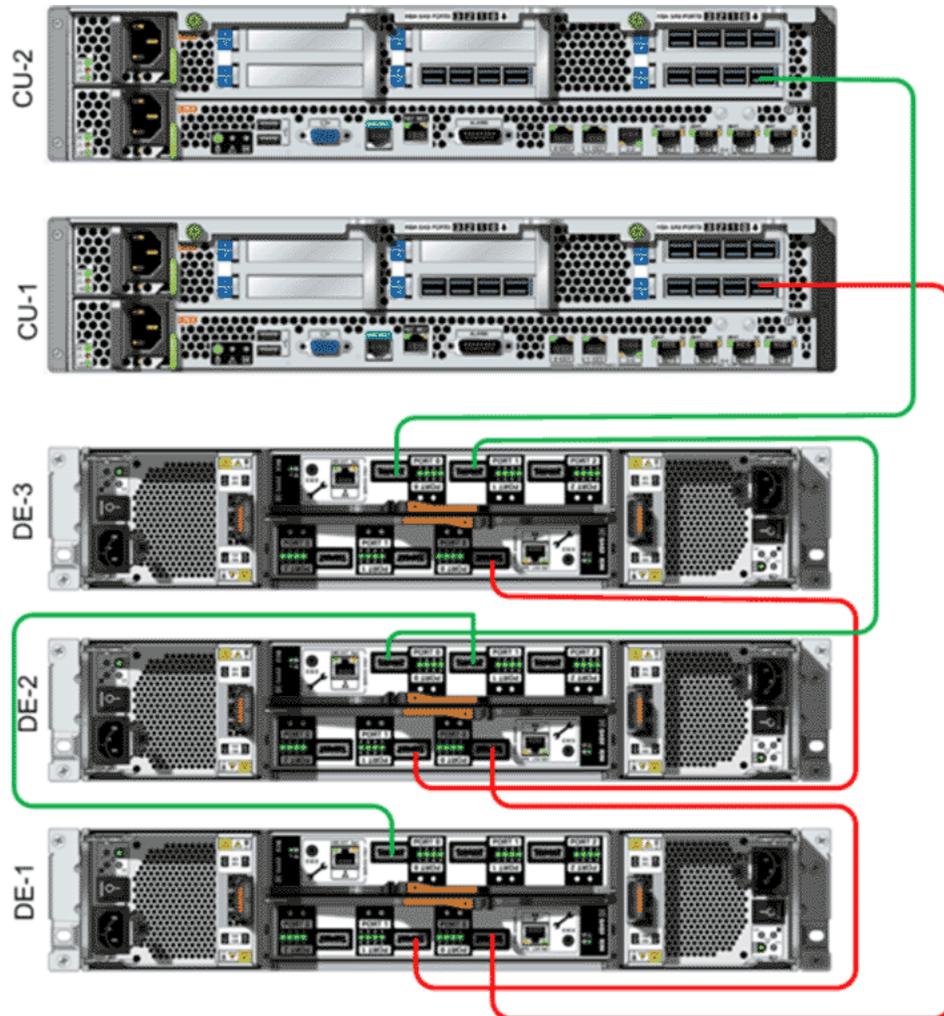
The following figure illustrates the SAS cabling in a system that is configured with one Drive Enclosure string containing four Drive Enclosures. The same cabling pattern applies to all of the strings in a system. Remember to distribute Drive Enclosures among the strings so that all of the available SAS HBA ports designated for Drive Enclosures are used as equally as possible.

Figure 44: SAS wiring diagram for one string with four Drive Enclosures
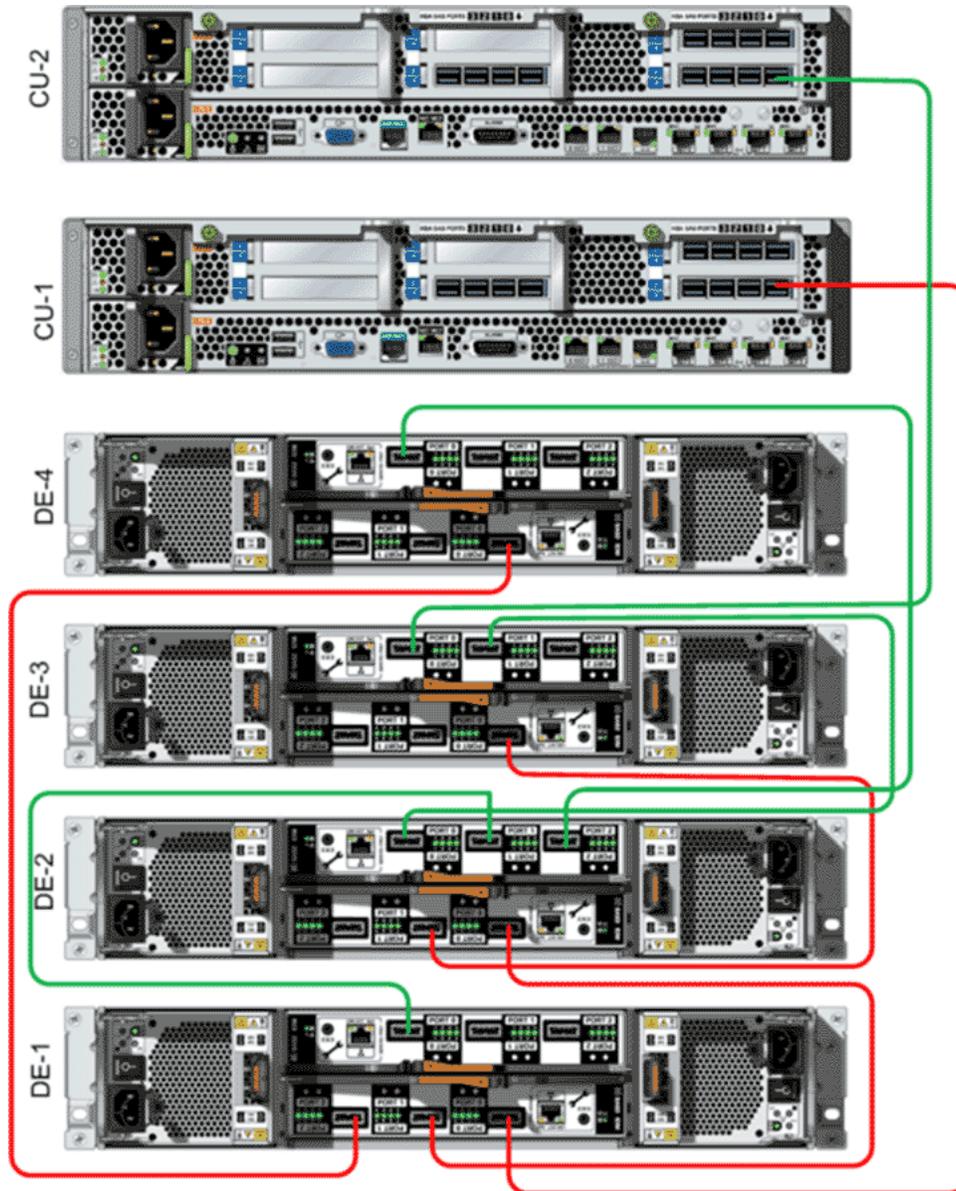
The following figure illustrates the SAS cabling in a system that is configured with one Drive Enclosure string containing five Drive Enclosures. The same cabling pattern applies to all of the strings in a system. Remember to distribute Drive Enclosures among the strings so that all of the available SAS HBA ports designated for Drive Enclosures are used as equally as possible.

Figure 45: SAS wiring diagram for one string with five Drive Enclosures
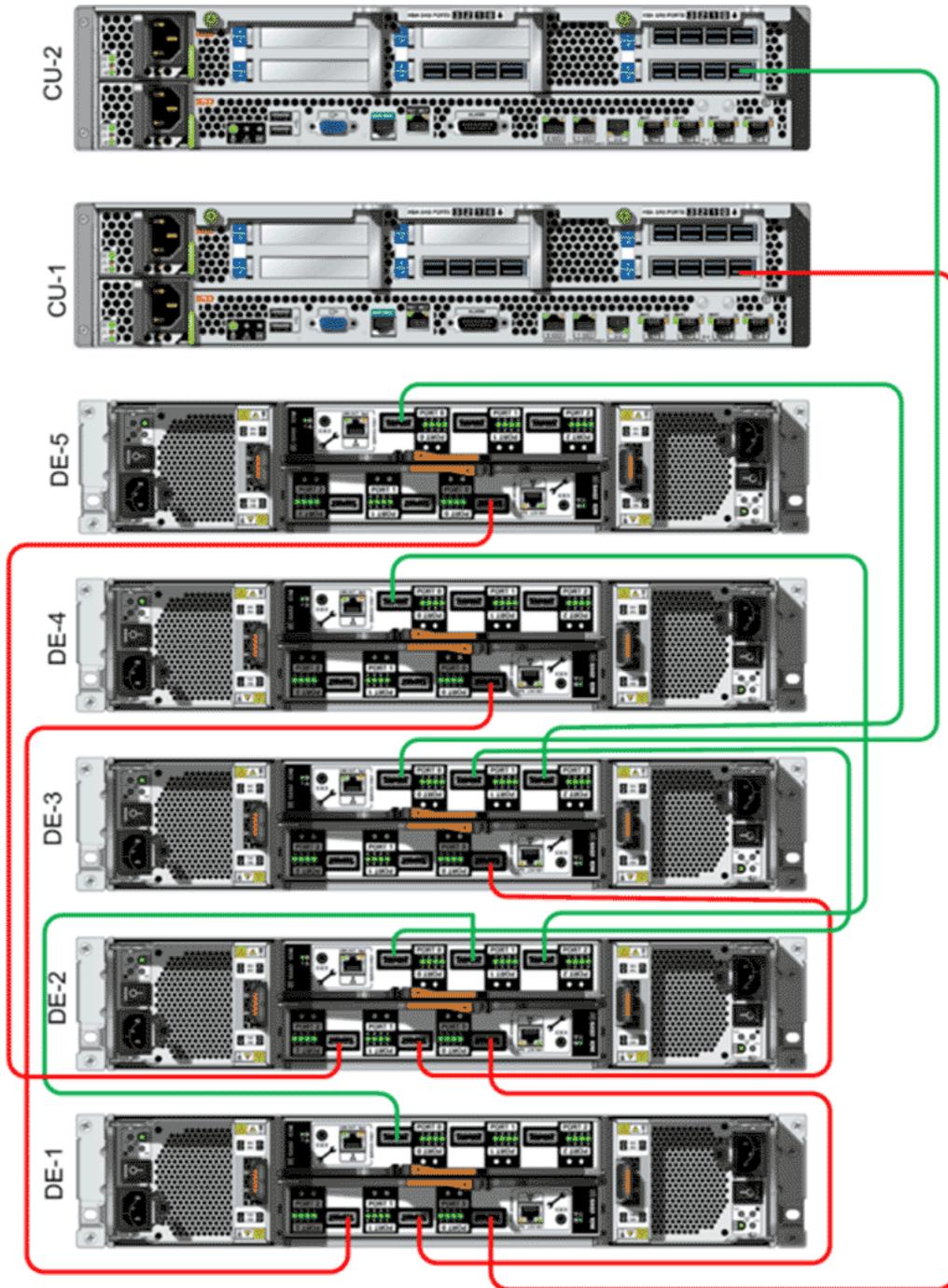
Oracle FS System Data

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 30: 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 31: 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 46: LED alarm assembly front display
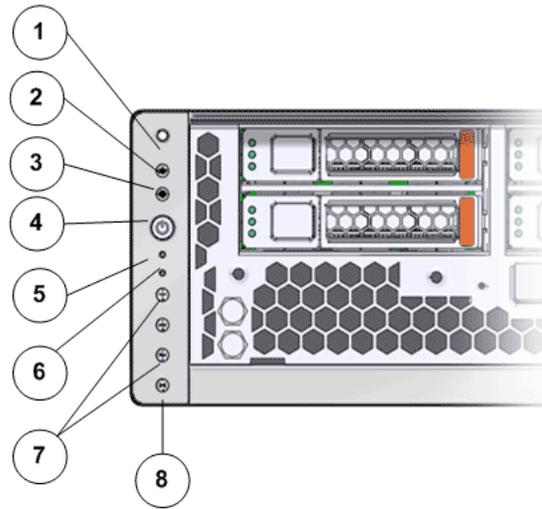
Legend	1 Chassis identification LED or Locator LED	5 Service processor LEDs
	2 Service Action Required LED or Caution or Fault LED	6 Back power supply LED
	3 Motherboard or Power or OK LED	7 Fault or Alarm LEDs (Critical, Major, Minor)
	4 Power switch	8 User Alarm LED

The following table provides status information on the LEDs on the front display panel of the LED alarm assembly on the Controller:

Table 32: 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 32: 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 32: 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 47: Controller back LEDs
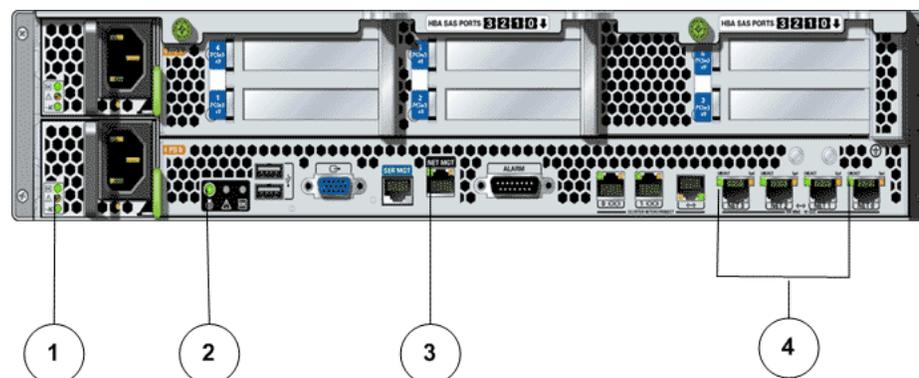
Legend	1 Power supply status LEDs
	2 Chassis Status LEDs
	3 Network management LED
	4 Net0 to Net3 status LEDs

The following table provides information on the LEDS at the back of the Controller:

8

Table 33: 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 33: 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 33: 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 34: 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 35: 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 48: Controller drive LEDs
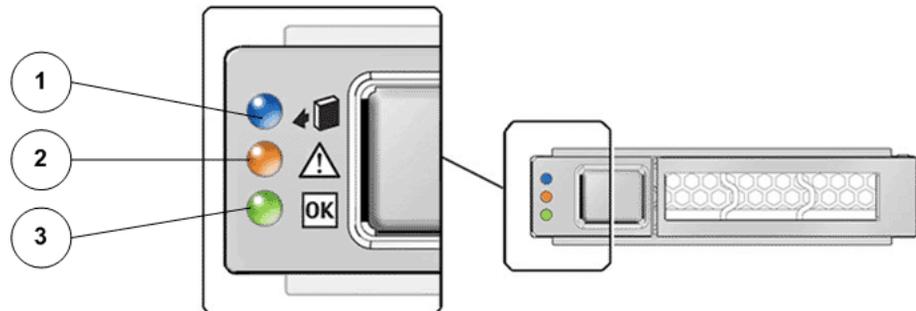
Legend	1 Ready to Remove LED
	2 Attention Service Required LED
	3 OK/Activity LED

This following table describes the functionality of the ESM LEDs:

Table 36: Controller ESM LED status and description
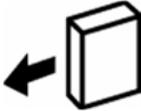
Icon	Location	Name	Color	Status and meaning
	Top	Ready to Remove	Blue	• On – ESM can be removed as a hot-swap operation. • Off – Do not remove the ESM. • Flashing – ESM is initializing.
	Middle	Attention Service Required	Amber	• On – Normal fault is detected. • Off – No faults are detected. • Flashing – 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 49: Operator panel LEDs (DE2-24P Drive Enclosure)
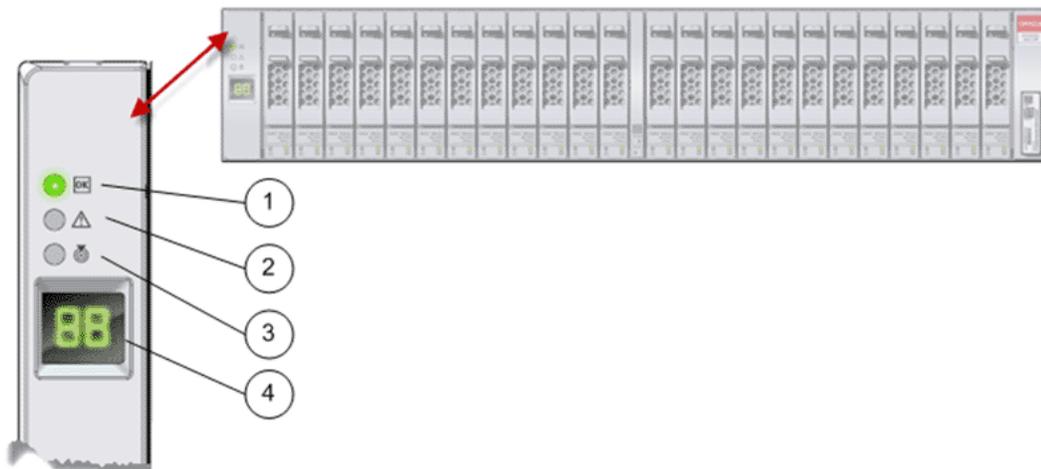
Legend	1 System power indicator	3 Locate indicator and logical fault indicator
	2 Module fault indicator	4 Chassis ID

Figure 50: Operator panel LEDs (DE2-24C Drive Enclosure)
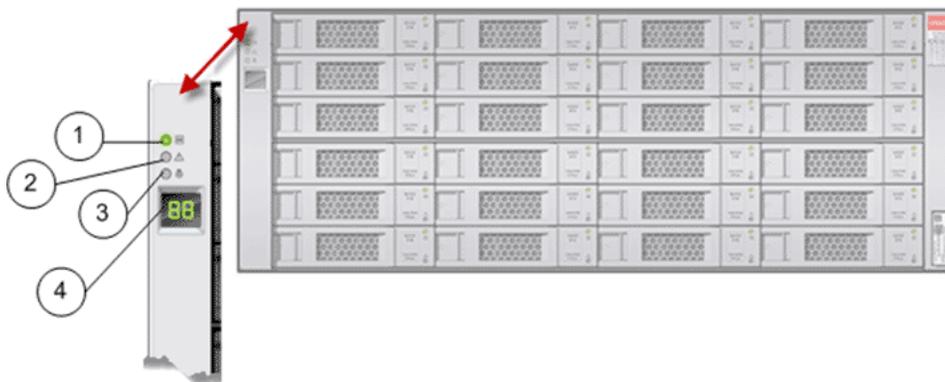
Legend	1 System power indicator	3 Locate indicator and logical fault indicator
	2 Module fault indicator	4 Chassis ID

The following table provides status information on the operator panel LEDs.

Table 37: 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 51: Power cooling module LEDs
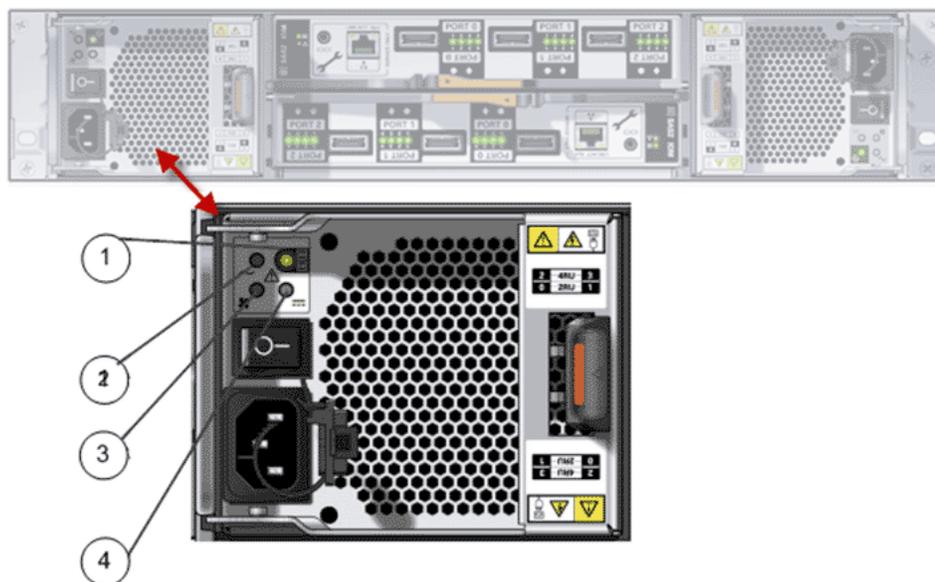
Legend	1 Status indicator	3 Fan fail indicator
	2 AC fail indicator	4 DC output fail indicator

The following table provides status information on the power cooling module LEDs.

Table 38: 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 52: I/O module LEDs
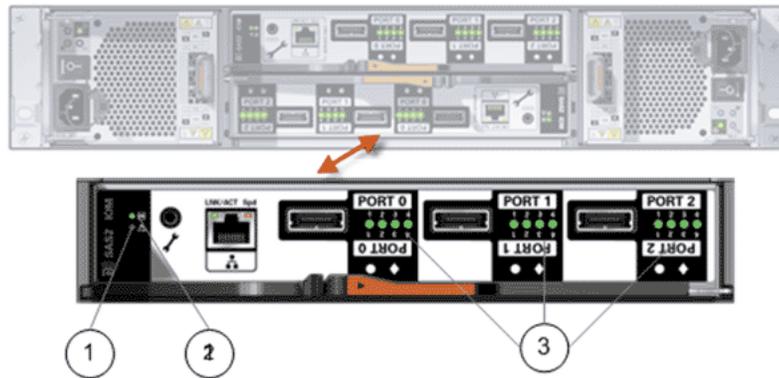
Legend	1 Fault and locate indicator	3 Host port activity indicator
	2 Power and OK indicator	

The following table provides status information on the I/O module LEDs.

Table 39: 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 53: Drive LEDs (DE2-24P Drive Enclosure)
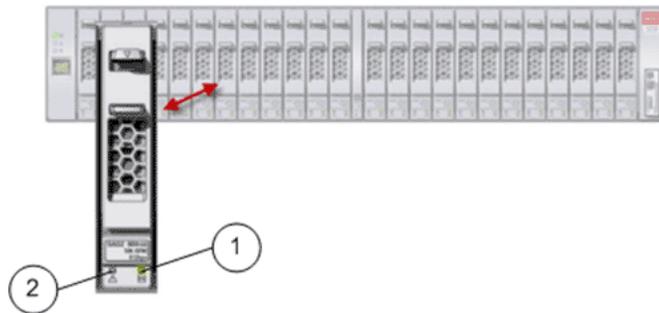
Legend	1 Power and activity indicator	2 Drive fault indicator

Figure 54: Drive LEDs (DE2-24C Drive Enclosure)
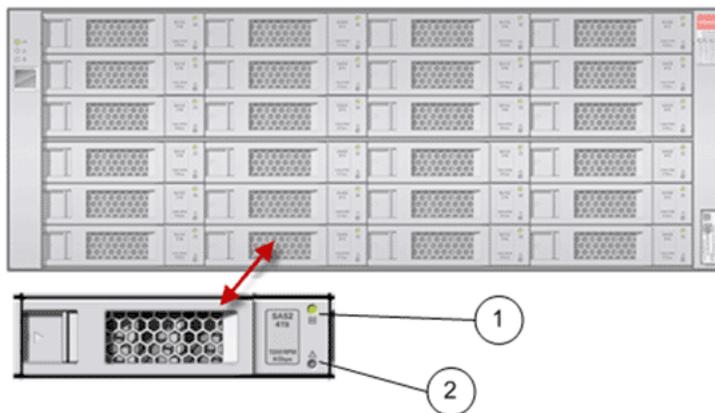
Legend	1 Power and activity indicator	2 Drive fault indicator

The following table provides status information on the drive LEDs.

Table 40: 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 40: 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 55: LEDs at the front of the Pilot
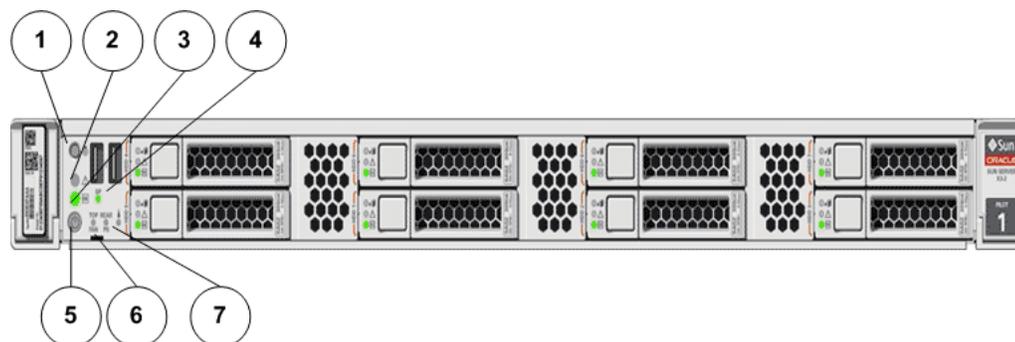
Legend	1 Locator LED / Locator button: white	5 Power button
	2 Service Action Required LED or Caution or Fault LED: Amber	6 Fan fault LED: amber
	3 OK LED: green	7 Power supply fault LED: amber
	4 Service processor LED: green	

The following figure shows the LEDs at the back of the Pilot:

Figure 56: LEDs at the back of the Pilot
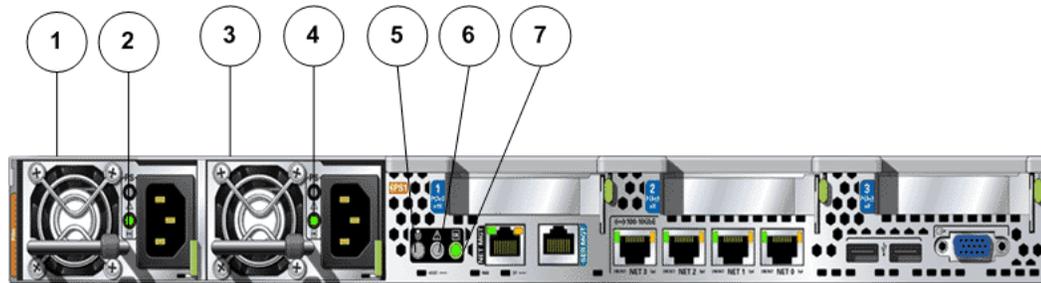
Legend	1 Poser supply 0 (PS0)	5 Locator LED: white
	2 Power supply LEDs: Service Required LED (amber) and AC OK LED (green)	6 Service Required LED: amber
	3 Power supply 1 (PS1)	7 Power or OK LED: green
	4 Power supply LEDs: Service Required LED (amber) and AC OK LED (green)	

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 41: 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 41: 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 41: 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 42: 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 43: 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 44: 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 45: 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 46: 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 46: 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 47: 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