Sun™ Modular Datacenter S20/D20 Overview

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Preface

This overview describes the functionality and components of a Sun™ Modular Datacenter (Sun MD).

This document is written for data center designers, facilities management staff, architects, and installers.

The procedures described in the Sun MD product documentation are to be performed only when the following external environmental conditions are met:

- Temperature: 10 to 35ºC (50 to 95ºF)
- Relative humidity: 20 to 80%
- Dry weather
- Absence of wind-borne dust and debris

Sun MD systems that require service when these conditions cannot be met must be installed in a protected location or inside a protective structure. Customers are responsible for providing shelter for field service procedures that must be executed during such conditions. For more information about service shelter guidelines, refer to the *Sun Modular Datacenter S20/D20 Product Notes*.

Sun MD systems that will not require service when conditions are outside of the supported operating conditions are not required to be installed in a protective structure. But those systems must adhere to the operating environment limitations that are listed in the *Sun Modular Datacenter S20/D20 Site Planning Guide*.

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Before You Read This Document

To use the information in this document, you must have thorough knowledge of the topics discussed in these documents:

- *Important Safety Information for Sun Hardware Systems*
- *Sun Modular Datacenter S20 Safety and Compliance Guide*
- *Sun Modular Datacenter S20 Installation Information for the Authority Having Jurisdiction*

Safety Precautions

There are a number of safety precautions that must be followed when performing tasks inside a Sun MD. These precautions are noted adjacent to all procedures throughout the Sun MD product documentation. In addition, the following paragraphs describe general safety precautions that you must observe when working in a Sun MD. These guidelines supplement, but don't replace, the precautions noted in the other documents that comprise the Sun MD documentation set. Familiarize yourself with these precautions, in addition to those provided in the *Sun Modular Datacenter S20 Safety and Compliance Guide*. Observe all safety labels affixed to the Sun MD.

Communicating Service Activities

At least one person who will remain outside of the Sun MD should always be informed that a person is entering a Sun MD to perform service operations inside.

Ensuring Proper Egress

The interior of the Sun MD is intended to be accessed for only temporary service operations. To ensure proper egress at all times during service and maintenance, establish proper service-lockout procedures. At a minimum, these procedures must specify that when all racks will remain installed in their default transport mode, the doors at one end of the Sun MD are secured in the open position. When any rack is moved into the main service aisle, the doors at both ends of the Sun MD must be secured in the open position to ensure safe egress at both ends of the Sun MD.

Caution – Use caution inside the Sun MD when both doors are open, as interior surfaces may become slick due to condensation.

Special Considerations When Servicing a Rack

Consider the following guidelines when performing rack-related servicing procedures:

- When working on a rack, be aware of the air stream to ensure that nothing gets drawn into the fan. Be aware of loose clothing, long hair, or other items that could become entangled in the fan's blades.
- Fully loaded equipment racks can weigh up to 2000 pounds (908 kg). Service actions should be performed by two properly trained personnel to avoid injury. One person should be positioned at the front of the rack and a second person should be positioned at the back of the rack.
- The rack dolly weights 89 pounds (40 kg). The dolly should not be picked up; it should be rolled into position.
- Heavy equipment should always be loaded at the bottom of a rack.

General Safety Considerations

Consider the following guidelines before entering a Sun MD unit:

- Be careful to avoid slipping from water on the floor. There is a potential for water to pool under or around heat exchangers from condensation when the doors are left open.
- Do not smoke or introduce smoke-, dust-, or fine particulate-producing equipment within 20 feet (6 meters) of the Sun MD. Doing so could compromise the integrity of the fire suppression system.
- Be aware of possible pinch points on the Sun MD, including doors and door latch assemblies, rack and heat exchanger interface gaps, securing pins, or the rack dolly.
- Follow proper electrostatic discharge (ESD) procedures at all times.
- The noise level in a running Sun MD is estimated to be approximately 78.5 decibels. Use ear protection when needed.

How This Document Is Organized

Chapter 1 describes the dimensions, orientation, functionality, and locations of the external and internal components and features on the Sun MD. This chapter also provides operating and servicing environmental requirements.

Chapter 2 describes the racks that are provided in a Sun MD system and their related components.

Chapter 3 provides overview information for the components that are required to provide power to a Sun MD system.

Chapter 4 provides overview information for the network cabling and data components.

Chapter 5 provides overview information for the components that are required to provide water to a Sun MD system to help regulate the unit's internal temperature.

Chapter 6 describes how the environment is regulated and monitored inside the Sun MD system.

Chapter 7 describes the Fire Control System (FCS) operation and fault indicators.

Glossary is a list of words and phrases and their definitions.

Related Documentation

The documents listed are available online through a password-protected web site. Contact your Sun Sales Representative for information about accessing the Sun MD product documentation.

Application	Title	Part Number	Format	Location
General Sun safety information	*Important Safety Information for Sun Hardware Systems*	816-7190	Printed	Shipping kit
Safety and compliance notices	*Sun Modular Datacenter S20 Safety and Compliance Guide*	820-2625-10	PDF	Online
Content to assist an AHJ assess the Sun MD	*Sun Modular Datacenter S20 Installation Information for the Authority Having Jurisdication*	820-3167-10	PDF	Online
Planning and infrastructure support requirements	*Sun Modular Datacenter S20/D20 Site Planning Guide*	820-5806-10	PDF	Online
Product task map and documentation references	*Sun Modular Datacenter S20 Getting Started Guide*	820-2534-10	Printed PDF	Shipping kit Online
Product and functionality overview	*Sun Modular Datacenter S20/D20 Overview*	820-5770-10	PDF	Online
Preinstallation and installation	*Sun Modular Datacenter S20/D20 Installation Guide*	820-5809-10	Printed PDF	Shipping kit Online
Service	*Sun Modular Datacenter S20/D20 Service Manual*	820-5810-10	PDF	Online
Administration	*Sun Modular Datacenter S20/D20 Administration Guide*	820-5750-10	PDF	Online
Man page command reference	*Sun Modular Datacenter S20/D20 Reference Manual*	820-5751-10	PDF Man pages	Online With software
Late-breaking and known issues	*Sun Modular Datacenter S20/D20 Product Notes*	820-5808-10	PDF	Online
Supplemental fire suppression	*Sun Modular Datacenter S20 Fire Suppression Guide*	820-2621-10	Printed PDF	Ship with optional component and online
Supplemental fire suppression	*Sun Modular Datacenter S20/D20 Fire Suppression Guide for the NF227 Fire Control Panel*	820-5752-10	Printed PDF	Ship with optional component and online

Application	Title	Part Number	Format	Location
Supplemental power	*Sun Modular Datacenter S20 PDU and Power Strip Options Guide*	820-2622-10	Printed PDF	Ship with optional component and online
Electrical disconnect kit	*Sun Modular Datacenter S20 Electrical Disconnect Guide*	820-2624-10	Printed PDF	Ship with optional component and online
Fiber cable connectors kit	*Sun Modular Datacenter S20 Fiber Cable Connector Options Guide*	820-3744-10	Printed PDF	Ship with optional component and online
Rack dolly	*Sun Modular Datacenter S20/D20 Rack Dolly Guide*	820-5807-10	Printed PDF	Ship with optional component and online

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Please include the title and part number of your document with your feedback:

Sun Modular Datacenter S20/D20 Overview, part number 820-5770-10.

CHAPTER 1

Sun MD System Overview

Sun Modular Datacenter (Sun MD) is a rapidly deployable, mobile, energy-efficient, and high-density compute platform that can be used to quickly add data center capacity virtually anywhere that it is needed.

This chapter describes the dimensions, orientation, functionality, and locations of the external and internal components and features on the Sun MD. This chapter contains the following sections:

- "Dimensions and Weight" on page 1
- "External Orientation" on page 2
- "External Features and Components" on page 3
- "Internal Orientation" on page 6
- "Internal Features and Components" on page 7

Dimensions and Weight

Sun MD is contained in a shipping container that adheres to the specifications set by the International Organization for Standardization (ISO). This container has the following dimensions and weight:

- Length 20 feet (6.09 meters)
- Width 8 feet (2.44 meters)
- Height 8.5 feet (2.6 meters)
- Without payload, the nominal weight of the container is 18,000 pounds (8,165 kilograms). With payload installed, a Sun MD weighs a maximum of 34,000 pounds (15,422 kilograms).

External Orientation

Sun MD is oriented as follows:

- **Front.** The front of the Sun MD is located at the end farthest from the utility ports.
- **Rear.** The rear of the Sun MD is located at the end nearest to the utility ports.

You can enter the unit through either the front or rear doors.

Note – The orientation shown in FIGURE 1-1 is not meant to impact the placement of the Sun MD at your site. It is intended to serve only as a reference point.

FIGURE 1-1 Sun MD Orientation

Figure Legend

1	Front side	**4**	Rear side
2	Right side (side A)	**5**	Utility ports
3	Left side (side B)		

Note – To simplify installation and enable redundant configurations, water and networking ports are provided on both sides of the container. The power ports on both sides of the container are not provided to enable power redundancy; both power ports must be used to power a Sun MD to the full 200 kW power capacity.

External Features and Components

FIGURE 1-2 illustrates the locations of the following external features and components:

- **Installation- and setup-related features**
  - Corner blocks on all eight corners of the container can be used to attach, lift, or secure the container.
  - Forklift pockets (two on each side) are available to lift and move the container into position using a forklift. If your Sun MD has forklift pockets on the front and rear of the unit, do not use them for moving the unit into place.
- **Vents**

  There are four vents on the container: two on the right and two on the left side. The vents on the right side and the one on the rear left side of the Sun MD are sealed. The vent on the front left side of the Sun MD is open to aid in atmospheric pressure equalization. The open vent has a HEPA filter.
- **Door handles**

  There are a eight door handles on the Sun MD container, four in the front and four in the rear.
- **Power components**
  - Two electrical feeder entrances, one on each side of the container, are available to provide power to the Sun MD.

    Depending on the model, the Sun MD requires either 110/190 to 127/220VAC 3-phase 50 Hz/60 Hz electrical service (low-voltage configuration) or 220/380 to 240/415VAC 3-phase 50 Hz/60 Hz electrical service (high-voltage configuration).
  - An optional external electrical disconnect can be used to shut off power to the system from outside of the Sun MD. Refer to local building codes and the Authority Having Jurisdiction (AHJ) to determine whether this component is required at your site.

  For more information about Sun MD power components and requirements, refer to Chapter 3.

- **Data components**

  Two data boxes, one on each side of the container, house the data panels that are inside the Sun MD. Network cables are routed into the data boxes through two 1.5-inch nipples, which are located just below the door of the data box.

  Each data box has a temperature and a humidity sensor for monitoring external conditions. Only one set of sensors is monitored at a time.

  Three LEDs are provided on the data boxes. Always check these LEDs before entering the Sun MD. The LEDs indicate the following statuses:

  - Green–You can enter if no red LED is present.
  - Yellow–Service is required, but you can enter if no red LED is present.
  - Red–Only qualified service personnel should enter the Sun MD.

Note – The green LED blinks slowly when the system is performing as expected. If the LED is not blinking slowly, the LEDs might not be reporting correct statuses.

  For more information about Sun MD data components, refer to Chapter 4.

  Refer to the *Sun Modular Datacenter S20/D20 Service Manual* for detailed information about interpreting LED codes and the actions to take under specific circumstances.

- **Water supply and return components**
  - Four ports, one supply, and one return, which are located on each side of the container, are available to supply and remove water from the Sun MD environmental-control system.
  - Four valves, one supply valve, and one return valve, which are located on each side of the container, are available to open and shut water flow to and from the Sun MD cooling system.
  - Two pressure gauges and two bypass valves, one of each on each side of the Sun MD, are available to monitor and regulate the rate at which water flows into the system.

  For more information about Sun MD water components and requirements, refer to Chapter 5.

- **Drains**

  Four drains, one in each corner of the container, are provided to remove moisture from the floor of the Sun MD. Drain outlets are located on the right side of the container's base frame. The front left drain allows water from the dehumidifier to exit the unit.

FIGURE 1-2 Exterior View of a Sun MD

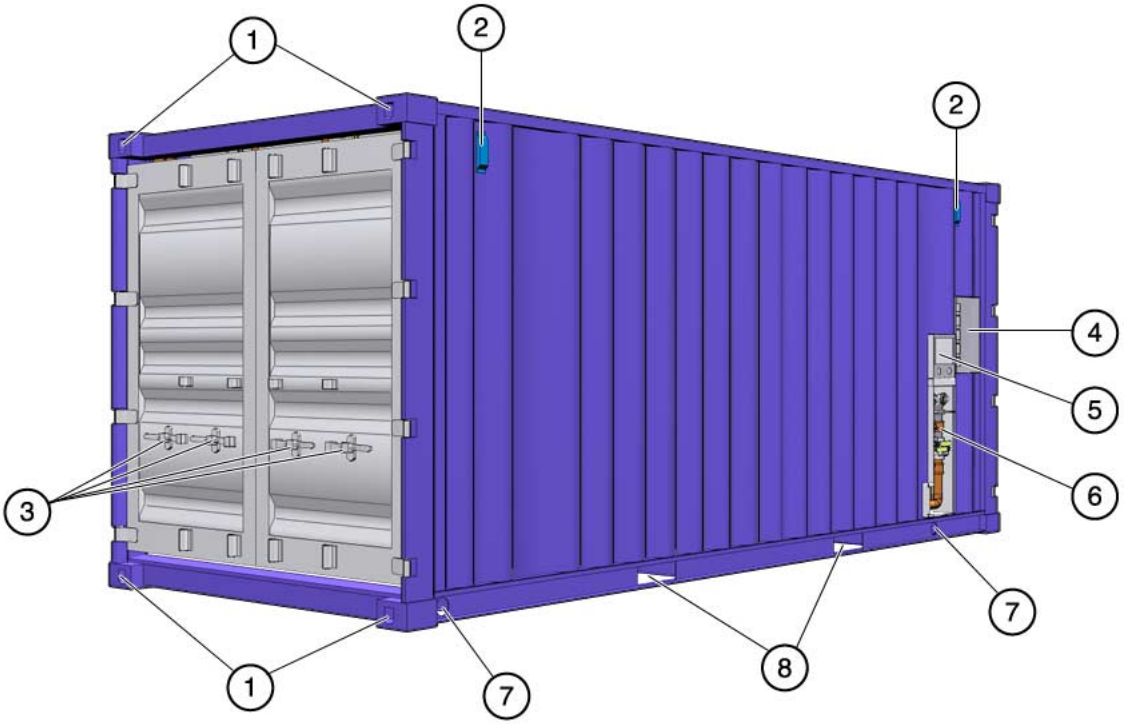


Figure Legend

1	Corner blocks (4 in front, 4 in back)	**5**	Data boxes (1 on right, 1 on left)
2	Air vents (2 on right, 2 on left)	**6**	Water supply and return ports (right side only)
3	Door handles (4 in front, 4 in back)	**7**	Drains (2 on right, 2 on left)
4	Electrical feeder entrance (1 on right, 1 on left)	**8**	Forklift pockets (2 on right, 2 on left)

Note – For detailed information about site planning, power, water, and data requirements, refer to the *Sun Modular Datacenter S20/D20 Site Planning Guide.*

Internal Orientation

This section identifies the locations of the doors used to enter and exit the Sun MD and the service aisles located inside the unit.

- **External doors.** Four doors, two front doors and two rear doors, are the first set of doors you must open to gain access to the inside of the Sun MD. The front external door maintains a plenum through which environmentally controlled air flows.
- **Rear plenum door.** The door behind the two external doors in the rear of the Sun MD. This door and its surrounding wall form an air plenum through which environmentally controlled air flows from aisle 1 on the left side of the Sun MD to aisle 2 on the right side of the Sun MD.
- **Service aisle doors.** Two doors, one in the front and one in the rear, can be used to gain access to the payload inside the Sun MD. The front service aisle door is located behind the external front door. The rear service aisle door is located behind the rear plenum door.

FIGURE 1-3 Sun MD Doors and Aisles (Top View)

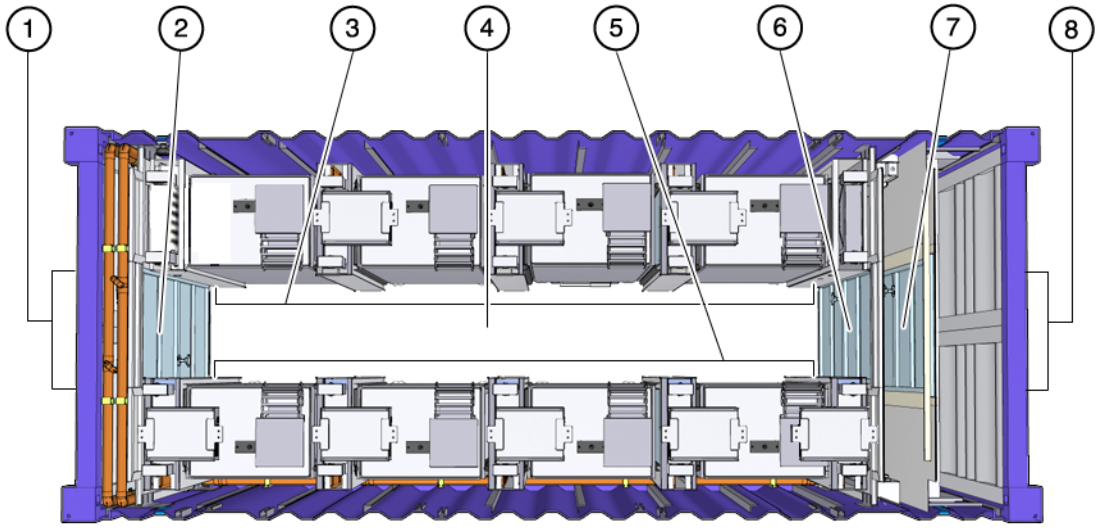


Figure Legend

1	Front external doors (total of 2)	**5**	Aisle 2 (right side of Sun MD from the front)
2	Front service aisle door (handle on right from inside Sun MD)	**6**	Rear service aisle door
3	Aisle 1 (left side of Sun MD from the front)	**7**	Rear plenum door
4	Service aisle (center)	**8**	Rear external doors (total of 2)

Caution – Refer to the *Sun Modular Datacenter S20/D20 Service Manual* for safety information that is essential to ensuring proper egress during installation, service, and maintenance procedures.

Internal Features and Components

FIGURE 1-4 (Sun MD S20) and FIGURE 1-5 (Sun MD D20) illustrate the locations of some of the following internal features and components:

- **Eight 40 rack unit (RU) racks**

- Rack 1 is partially configured with control and management equipment, with space remaining for customer-supplied networking equipment.
- Racks 2–8 in the Sun MD S20 and racks 2–7 in the Sun MD D20 are general-purpose racks that can be populated with any Sun or third-party equipment that adheres to the specifications described in *Sun Modular Datacenter S20/D20 Site Planning Guide*.

For more information, see "Rack Specifications and Configuration" on page 13.

- **Rack service accessibility components**
  - A rack dolly is provided to manually lift and slide a rack into the service aisle.
  - A rack wrench is provided to unbolt the rack from the floor of the Sun MD and then tighten the bolts to resecure the rack to the floor of the Sun MD. The wrench is also used to manipulate the position of the rack dolly.

  For more information, refer to "Rack Accessibility Components" on page 20.
- **Transportation protection**

  Helical wire rope isolators located on the bottom of the equipment racks, and rubber isolation mounts located at the top of the heat exchangers, reduce equipment shock and vibration incurred during transport. In addition, rack securing pins and floor bolts are installed to secure the racks in place during transportation.

  For more information, refer to "Rack Components" on page 16.
- **Power components**

  Two power panels are provided in the rear side of the Sun MD. These panels contain the circuit breakers for all of the components inside the Sun MD.

  For more information, refer to "Power Overview" on page 23.
- **Internal environmental regulation and monitoring components**
  - The internal temperature is regulated with water, heat exchangers, fans, and cooling core units. Plumbing runs throughout the unit, and air purge valves are provided to remove air from the cooling system.
  - Two combination temperature and humidity sensors in the data panels measure the relative humidity outside the Sun MD. One temperature/humidity sensor measures these conditions inside the Sun MD. Five temperature sensors on each heat exchanger, and one temperature and one humidity sensor on the infrastructure rack monitor the internal environment.
  - The Environmental Management System (EMS) monitors the internal environment of the Sun MD. The EMS includes the sensor module, fan control module, alarm module, and all of the associated components that monitor the Sun MD environment. The EMS also includes a dehumidifier to lower the internal dew point, and air filters to reduce particulate contamination.
  - Water sensors located in the floor drains measure whether excessive water has built up near a specific drain.

- Two timer mechanisms, one located at the front left side and one at the rear right side of the Sun MD, control how long the lights remain turned on inside the unit. The timer can be set for a maximum of two hours.

For more information, refer to Chapter 6.

- **Data components**

  Two data panels, one on each side of the Sun MD, can be used to connect external customer networks (LAN/WAN/SAN) and alarm systems to the Sun MD.

  For more information, refer to "Network Cabling Overview" on page 29.

- **Environmental safety and protection devices**
  - A fire suppression system (FSS) is provided, which includes the fire control panel (FCP), a Very Early Smoke Detection Apparatus (VESDA), smoke detectors, and a clean agent gas dispensing system. The FCP determines when the fire suppression agent will be released, and the VESDA collects data for the FCP to act upon.
  - In Sun MD systems with either the Sigma or Fike FCP, two manual fire suppression release buttons are provided. Either button can be pressed to automatically and instantly release the fire suppression agent. In systems with the Nohmi NF227 FCP, only a single release button is provided, and it is located on the FCP.
  - Drains that contain water sensors that detect the build up of excess liquid in the Sun MD are provided to remove condensation that might collect on the floor. Investigate the cause of any liquid that is found in the Sun MD, and take all appropriate measures to ensure that water does not accumulate inside the Sun MD.
  - Door sensors are provided to provide signals to the Integrated Management Server (IMS) of the doors being open or closed.
  - Two emergency power off (EPO) buttons are installed, one at the front-left end and one at the rear-right end of the service aisle to enable you to immediately remove electrical power from the Sun MD.
  - One tamper switch is provided inside each of the data panels to alert you to the possibility that someone has accessed the data ports on the Sun MD.

  For more information, refer to Chapter 7.

Note – Customer-selected equipment, including nodes, servers, storage devices, and additional hardware that populates a Sun MD, is referred to as *payload*.

Front View

FIGURE 1-4 illustrates the locations of the components and equipment that are visible from the front side of the Sun MD when the doors are open.

FIGURE 1-4 Front View of a Sun MD

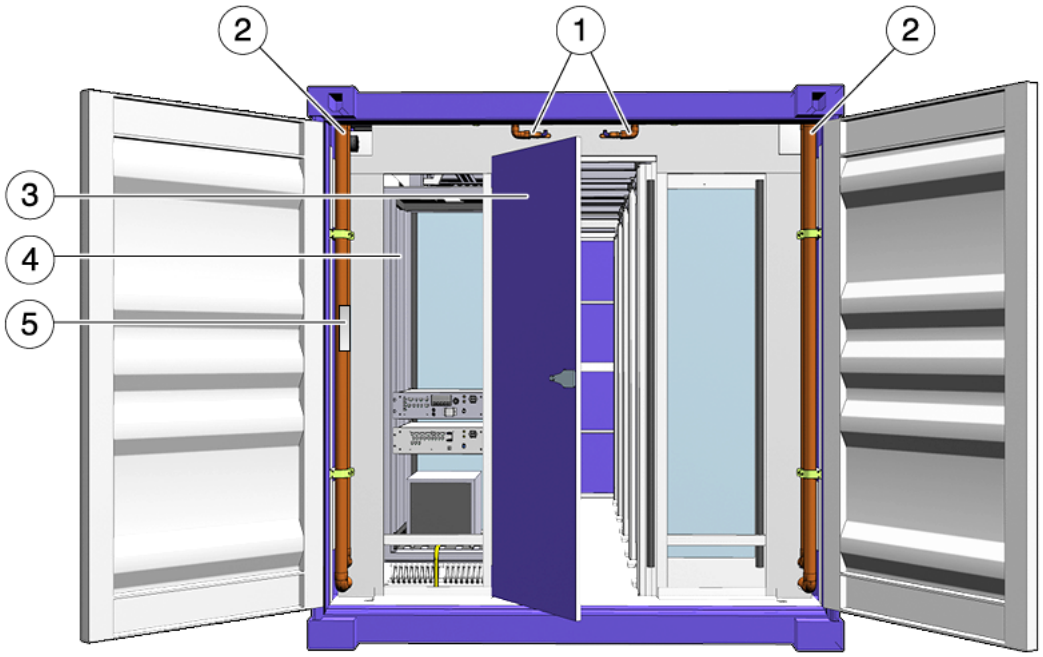


Figure Legend

1	Air purge valves - 18 total, 2 overhead front entrance, 2 at the top of each heat exchanger
2	Plumbing
3	Front service aisle door
4	Infrastructure rack (rack 1)* – See FIGURE 2-3 for all components
5	Light timer

* For information about the components and equipment that are provided in rack 1, refer to "Additional Components and Equipment in Rack 1" on page 17.

For information about the components and equipment that are provided in rack 1, refer to "Additional Components and Equipment in Rack 1" on page 17.

Rear View

FIGURE 1-5 shows a view of the components and equipment that are visible from the rear of a Sun MD when the doors are open.

Note – FIGURE 1-5 illustrates the rear view of a Sun MD that has either the Sigma or Fike FCP. Systems that have the Nohmi NF227 FCP will appear as shown in FIGURE 1-5, with the addition of clean agent gas canisters and an external VESDA panel, which are not shown here.

FIGURE 1-5 Rear View of a Sun MD

Figure Legend

1	Rear plenum door
2	Fire control box
3	Light timer
4	Power distribution panel - Panel B (EMI filter directly behind)
5	Power distribution panel - Panel A (EMI filter directly behind)

Operating Environments

The environment in which a Sun MD unit can operate must satisfy the following requirements and conditions:

- External operating conditions:
  - Temperature within -29 to 54ºC (-20 to 130ºF).
  - Up to 100% humidity.
  - Altitude of 3048m (10,000 ft), or lower, depending on payload maximum.
  - Doors must remain closed during operation.
- Internal operating conditions:
  - Temperature within 10 to 35ºC (50 to 95ºF). If outdoor temperatures may be outside of this range, the Sun MD unit should be installed in a building or enclosure to ensure that the unit's temperature is within the range required for operation.
  - 20 to 80% relative humidity, noncondensing.
  - Doors must remain closed during operation except during service activities performed by Sun or Sun-authorized providers.

Note – Opening the doors of the Sun MD can significantly impact the internal environmental conditions. For proper system operation, warranty, and contracted service delivery, external conditions must enable the internal temperature and humidity levels to be maintained to the specifications defined above.

If outdoor temperatures might be outside of these defined ranges, the Sun MD must be installed inside a Sun-approved, environmentally controlled enclosure or be equipped with a service shelter that maintains temperature and humidity as defined. For more information about service requirements, see the *Sun Modular Datacenter S20/D20 Site Planning Guide.*

CHAPTER 2

Sun MD Racks

This chapter describes the racks that are provided on the inside of a Sun MD and contains the following sections:

- "Rack Specifications and Configuration" on page 13
- "Rack Orientation" on page 14
- "Rack Components" on page 16
- "Rack Power Options" on page 20
- "Rack Accessibility Components" on page 20

Rack Specifications and Configuration

The Sun MD S20 is shipped with eight Electronics Industry Alliance (EIA) industry-standard, 40 rack unit (RU) standard-depth racks. The Sun MD D20 ships with four EIA 40 RU standard-depth racks, and three EIA 40 RU deep racks. The racks are distributed as follows:

- In both versions of the Sun MD, rack 1 (also referred to as the *infrastructure rack*) uses 15 RU to house the Integrated Management Server (IMS), sensor module, alarm module, dehumidifier, and Ethernet switch. 25 RU are available in rack 1 for customer-supplied networking equipment.
- Racks 2–8 of the Sun MD S20, and racks 2–7 of the Sun MD D20, are available for *payload* (servers, storage, network, and other computer equipment). Payload installed in these racks must conform to the specifications provided in the *Sun Modular Datacenter S20/D20 Site Planning Guide*. These racks slide out laterally into the aisle so they can be serviced from the front or the back.

Each of the installed racks has a width of 19 inches (48.26 cm). A standard-depth rack has a depth of 30.75 inches (78.11 cm) and can support a net payload not to exceed 1900 pounds (861.83 kg) each. A deep rack has a depth of 45.25 inches (115 cm) and can support a net payload not to exceed 1900 pounds (861.83 kg) each.

Rack Orientation

The racks in a Sun MD are arranged front-to-back, rather than side-by-side as they would be in a traditional data center. Racks in the Sun MD are oriented as follows:

- **Racks 1–4.**
  When facing the Sun MD from the front, aisle 1 on the left side of the Sun MD contains racks 1–4. Rack 1 is located in the front and rack 4 is located in the rear. The front side of the rack faces the front of the Sun MD.
- **Racks 5–8 (Sun MD S20) or racks 5–7 (Sun MD D20).**
  When facing the Sun MD from the front, aisle 2 on the right side contains racks 5–8 in the Sun MD S20 and racks 5–7 in the Sun MD D20. Rack 5 is located in the front and the last rack of the unit is located in the rear. The front side of the rack faces the rear of the Sun MD.

FIGURE 2-1 Rack Orientation Inside a Sun MD S20 (Standard Rack Configuration)

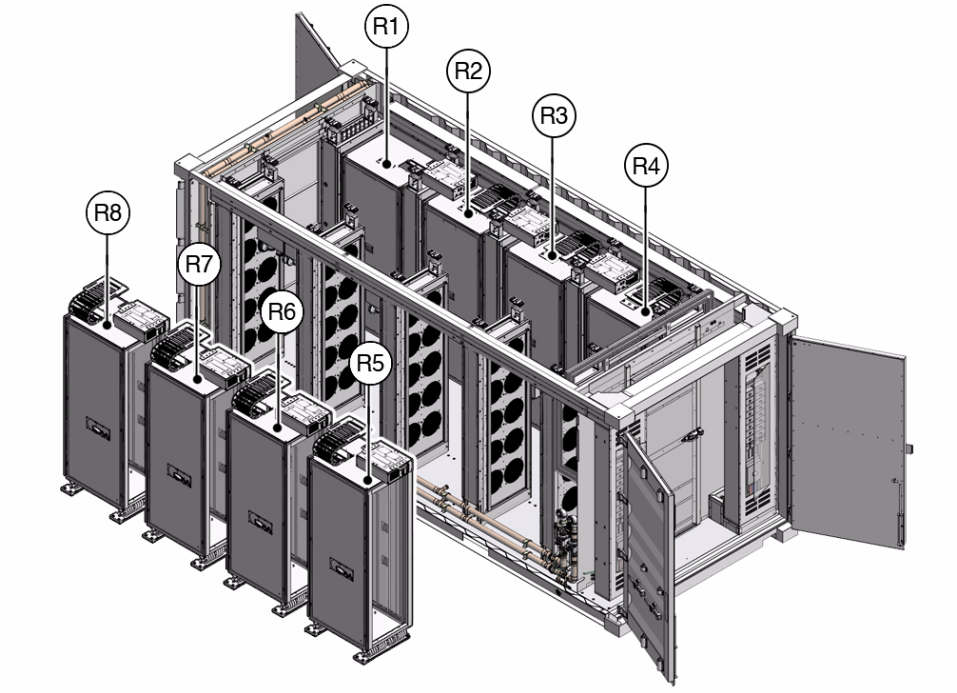


Figure Legend

R1–R4	Racks 1–4 (numbered front to back)
R5–R8	Racks 5–8 (numbered back to front)

FIGURE 2-2 Rack Orientation Inside a Sun MD D20 (Deep Rack Configuration)

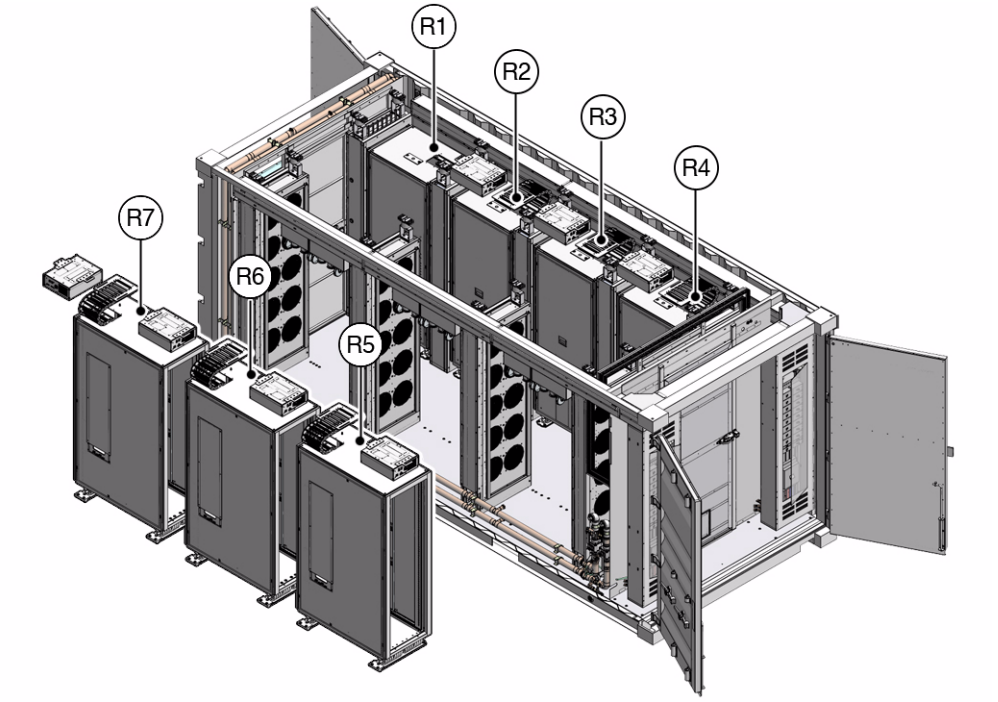


Figure Legend

R1–R4	Racks 1–4 (numbered front to back)
R5–R7	Racks 5–7 (numbered back to front)

Rack Components

Some rack components and equipment are provided for all racks, and some are available in only the infrastructure rack (rack 1). The components and equipment available in both situations are described in the following sections and illustrated in FIGURE 2-3.

Components and Equipment in All Racks

The racks that come installed in a standard Sun MD contain or are directly connected to the following components and equipment:

- **Cable tray.** This ladder-type tray runs over the service aisle and carries networking cables to each rack. There are also cable trays (referred to as *articulated cable management arms*) above and attached to the top of each rack. These trays sort the cables coming off the service aisle cable tray to the individual rack. The cable management arms are not available for the infrastructure rack
- **Shock and vibration isolators.** Wire rope isolators mounted on the bottom of each rack and rubber shear-mount isolators mounted on the top of each heat exchanger are installed to provide shake and vibration isolation to these components.
- **Rack handles.** Handles are available on the service side of a rack to help guide it into the aisle for service.
- **Securing pin.** Each rack contains a removable pin that secures the top of the rack to a bracket mounted above the racks. This pin is used to secure the top of the rack while in the installed position.
- **Cabinet power distribution units (CDUs) and power distribution units (PDUs).** CDUs are the power strips into which payload is plugged to receive power. PDUs control the distribution of power to the CDUs. The number of CDUs and PDUs available per rack vary depending on the type of cabinet employed. Rack 1 is limited to only two PDUs.
  - Racks in the standard-power cabinet have two PDUs, each of which support three CDUs, for a total of six CDUs in each rack.
  - The standard-power cabinet can be upgraded to a high-power cabinet by adding two additional PDUs per rack, each of which provide two additional CDUs. The high-power cabinet has a total of four PDUs and 10 CDUs.
  - Each CDU has six IEC C13 outlets and two IEC C19 outlets. Each CDU comes with adapter cables connected to the IEC C19 outlets so they can be utilized as IEC C13 outlets, as needed.

Additional Components and Equipment in Rack 1

In addition to the components that are provided in all racks, the following components and equipment are provided in only rack 1:

- **Dehumidifier.** The dehumidifier that is installed in rack 1 of the Sun MD reduces the amount of excess water vapor in the air being circulated throughout the Sun MD. A hose that is connected to the dehumidifier diverts water that is collected by the dehumidifier to a drain immediately below rack 1.

- **Sensor module.** The module that receives and monitors input from various sensors inside and outside the Sun MD. The sensor module also controls the fans and constructs the alarms and alerts that are passed to the management server.
- **Alarm module.** The module that receives information about and monitors various alarms and conditions within the Sun MD.
- **Integrated Management Server (IMS).** The server that ships installed in rack 1 of the Sun MD and is preloaded with system monitoring and management software. This server is the repository of all data collected by the EMS and provides external access to that data through a web server.

FIGURE 2-3 shows the locations of the components that are provided in all racks and indicates which are available in only the infrastructure rack. For more information about these components and the functions they serve, refer to "Environmental Management System" on page 47.

FIGURE 2-3 Sun MD Rack Components

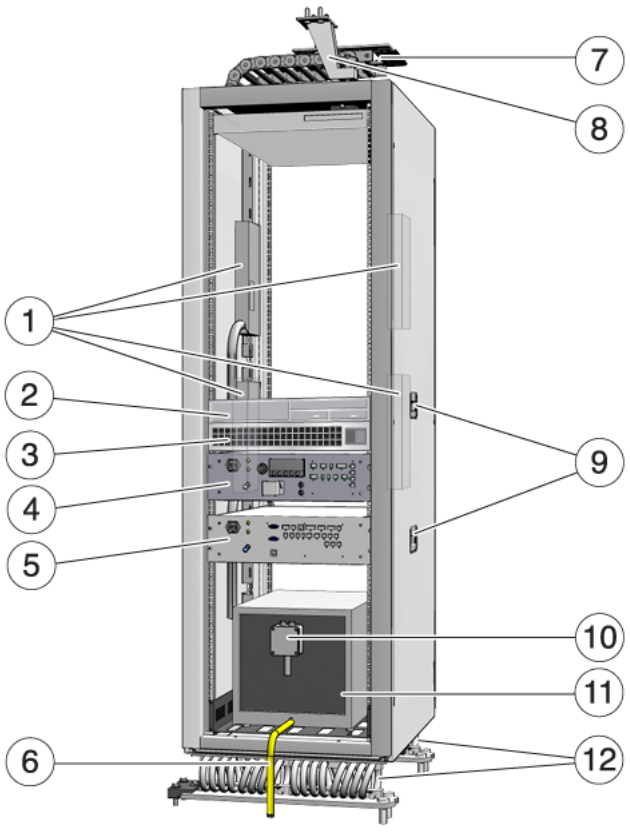


Figure Legend

1	PDUs (all racks)	**7**	Articulated cable management arm (all racks, except rack 1)
2	IMS (rack 1 only)	**8**	Securing pin mount (all racks)
3	Ethernet switch (rack 1 only)	**9**	Rack handles (all racks)
4	Alarm module (rack 1 only)	**10**	Internal temperature/humidity sensor (rack 1 only)
5	Sensor module (rack 1 only)	**11**	Dehumidifier (rack 1 only)
6	Hose connected to drain (rack 1 only)	**12**	Shock and vibration isolators (all racks)

Rack Power Options

The standard rack system for both the low- and high-voltage Sun MDs provides up to 12.5 kW of redundant power to the payload. To upgrade your system to the high-power cabinet, which supports up to 25 kW of redundant power to the equipment in the cabinet, you must order the high-power upgrade kit.

Two rack power configurations are available for each voltage:

- Low-voltage Sun MD (110/190 to 127/220 VAC, 3-phase, 50/60 Hz)
  - The standard-power cabinet ships with two PDUs and six CDUs.
  - A high-power cabinet upgrade kit can be ordered for the standard-power configuration to add an additional two PDUs and four CDUs to the standard-power cabinet.
- High-voltage Sun MD (220/380 to 240/415 VAC, 3-phase, 50/60 Hz)
  - The standard-power cabinet ships with two PDUs and six CDUs.
  - A high-power cabinet upgrade kit can be ordered for the high-power configuration to add an additional two PDUs and four CDUs to the standard-power cabinet.

Each CDU has eight power plugs with six C13 (10A) outlets and two C19 (16A) outlets.

Note – In both the 190-220 VAC and 380-415 VAC units, rack 1 is available only as a low-power cabinet; it cannot be upgraded with the high-power upgrade kit.

For information about ordering the high-power upgrade kit, refer to the part numbers documented in the *Sun Modular Datacenter S20 PDU and Power Strip Options Guide*.

Rack Accessibility Components

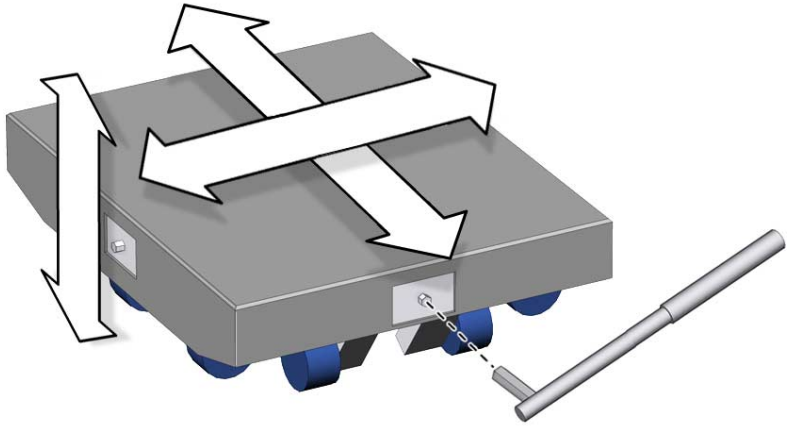
The following rack accessibility components are provided with a standard Sun MD:

- A rack wrench is provided to assist with aligning the rack prior to bolting it down. The tool can also be used to loosen and tighten the bolts that secure the rack to the container, and to turn the lead screw on the dolly.
- A rack dolly is provided with a Sun MD to manually lift and slide a rack into the service aisle.

The rack dolly has two sets of wheels that can be engaged to move a rack inside the Sun MD unit. One set of wheels enables you to roll a rack back and forth between the secured position and the service aisle. A second set of wheels enables you to roll a rack forward or backward in the service aisle.

The leadscrews on the front and rear of the dolly raise and lower the dolly. The leadscrews on the sides of the dolly raise and lower the different sets of wheels so you can engage the set you want to use.

FIGURE 2-4 Rack Dolly



Caution – The rack dolly weights 89 lbs (40 kg). Use caution when lifting the dolly; when possible, roll it into position.

For information about using the rack dolly, refer to the *Sun Modular Datacenter S20/D20 Installation Guide.*

CHAPTER 3

Sun MD Power

This chapter provides overview information for the components associated with providing power to a Sun MD.

Note – Refer to the *Sun Modular Datacenter S20/D20 Site Planning Guide* for information about specific power requirements. Refer to the *Sun Modular Datacenter S20/D20 Installation Guide* for information about supplying power to a Sun MD unit. Refer to "Rack Power Options" on page 20 for information about rack power configurations.

This chapter contains the following sections:

- "Power Overview" on page 23
- "Available Power Configurations" on page 25

Power Overview

Power can be supplied to a Sun MD through a commercial utility, an onsite utility power generator, a stand-alone power generator, or any combination of these.

3-phase AC power is delivered to the Sun MD through an electrical feeder entrance. There are two entrances on the rear of the container; one on the right side and one on the left side. FIGURE 3-1 shows the location of this entrance on the right side of the unit.

Note – The power connection box in FIGURE 3-1 is shown with the EMI filter installed.

FIGURE 3-1 Exterior Electrical Feeder Entrance

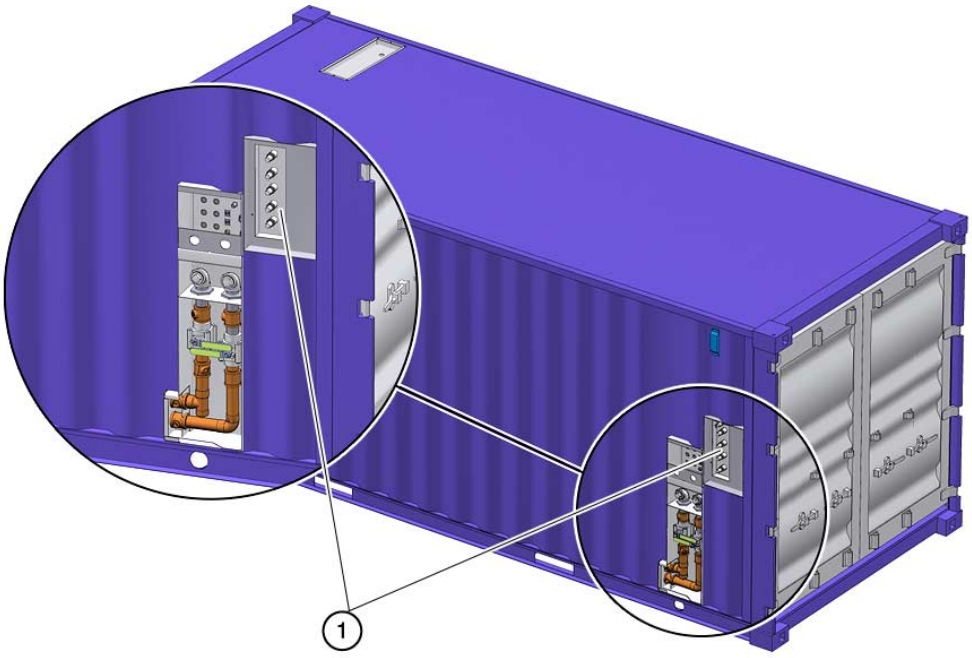


Figure Legend

1	Electrical feeder entrance (1 on right, 1 on left)

When a Sun MD is delivered to a country where electromagnetic interference (EMI) power line filters are required, each electrical feeder entrance is supplied with an EMI filter to reduce electrical interference from power lines. Inside the Sun MD, electrical feeders connect directly to the power distribution panels. These panels contain circuit breakers that protect the power source from overload and direct power to all electrical components inside the Sun MD.

When entering the Sun MD through the rear doors, Panel A is to the left, and Panel B is to the right. FIGURE 3-2 and FIGURE 3-3 illustrate the locations of these panels.

Note – Work with a certified electrician and the Authority Having Jurisdiction (AHJ) to determine which power source or combination is available at your site and best satisfies the requirements of your data center installation. The AHJ can also provide guidelines for wiring the feeder distribution panel into the Sun MD unit.

Available Power Configurations

The Sun MD can be ordered with either a low- or high-voltage power option. In either configuration, a total load of 200kW can be supported by a Sun MD. This assumes that as much as 12.5kW (low-power configuration) or 25kW (high-power configuration) will come from each rack of equipment in the Sun MD, and as much as 5kW will come from thermal loading due to environmental contributors.

The following sections describe each configuration and illustrate the power panels that are provided for each type of power configuration.

Low-Voltage Configuration

The following specifications apply for the low-voltage power configuration:

- Input voltage: 110/190 to 127/220 VAC, 3-phase, 50/60 Hz
- Internally distributed voltage: 110 to 127 VAC 1-phase 50/60Hz and 190 to 220 VAC, 3 Phase, 50/60Hz

---

Note – 110 to 127 VAC 1-phase power is distributed only for dedicated use such as lights and the dehumidifier. No general purpose single-phase outlets are available.

FIGURE 3-2 shows the locations of the primary power panel (Panel A), the secondary power panel (Panel B), the circuit breakers, and the main power disconnect in the low-voltage power configuration. For information about the function of a specific circuit breaker, refer to the *Sun Modular Datacenter S20/D20 Service Manual.*

FIGURE 3-2 Low-Voltage Power Panels

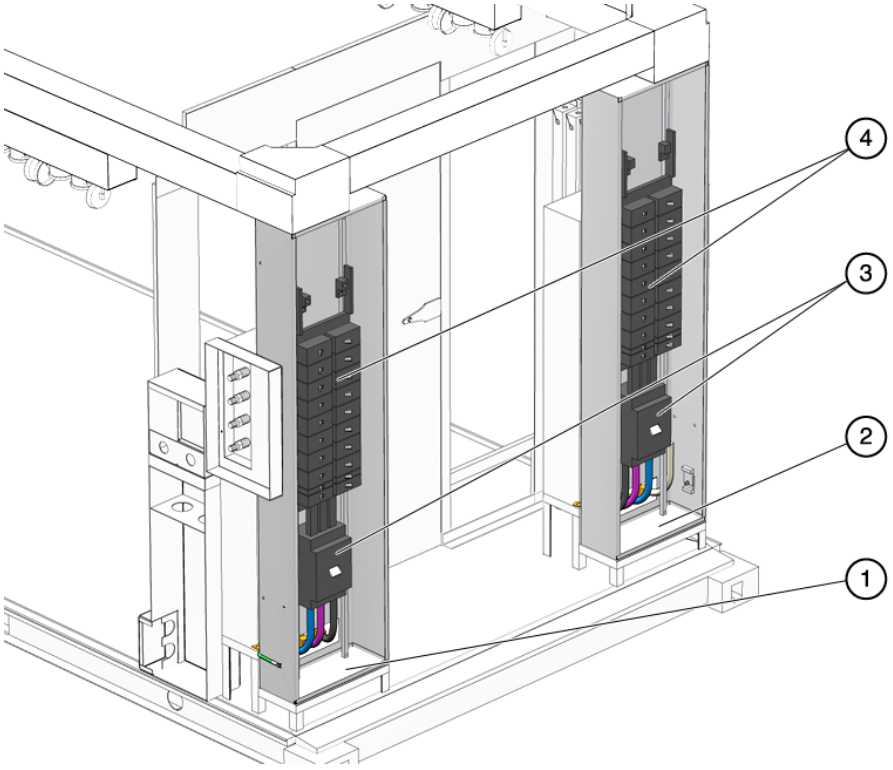


Figure Legend

1	Low-voltage power panel (Panel A)	**3**	Main power disconnect
2	Low-voltage power panel (Panel B)	**4**	Circuit breakers

Note – Circuit breakers for fans and PDUs appear in Panel A and Panel B. Circuit breakers for the lights, dehumidifier, and fire control panel are only in Panel A.

High-Voltage Configuration

The following specifications apply for the high-voltage power configuration:

- Input voltage: 220/380 to 240/415 VAC, 3-phase, 50/60 Hz
- Internally distributed voltage: 220 to 240 VAC 1 phase 50/60Hz and 220/380 to 240/415 VAC, 3-phase, 50/60Hz

---

Note – 220 to 240 VAC 1-phase power is distributed only for dedicated use such as lights and the dehumidifier. No general purpose single-phase outlets are available.

FIGURE 3-3 shows the locations of the primary power panel (Panel A), the secondary power panel (Panel B), the circuit breakers, and the main power disconnect in the high-voltage power configuration. For information about the function of a specific circuit breaker, refer to the *Sun Modular Datacenter S20/D20 Service Manual.*

FIGURE 3-3 High-Voltage Power Panels

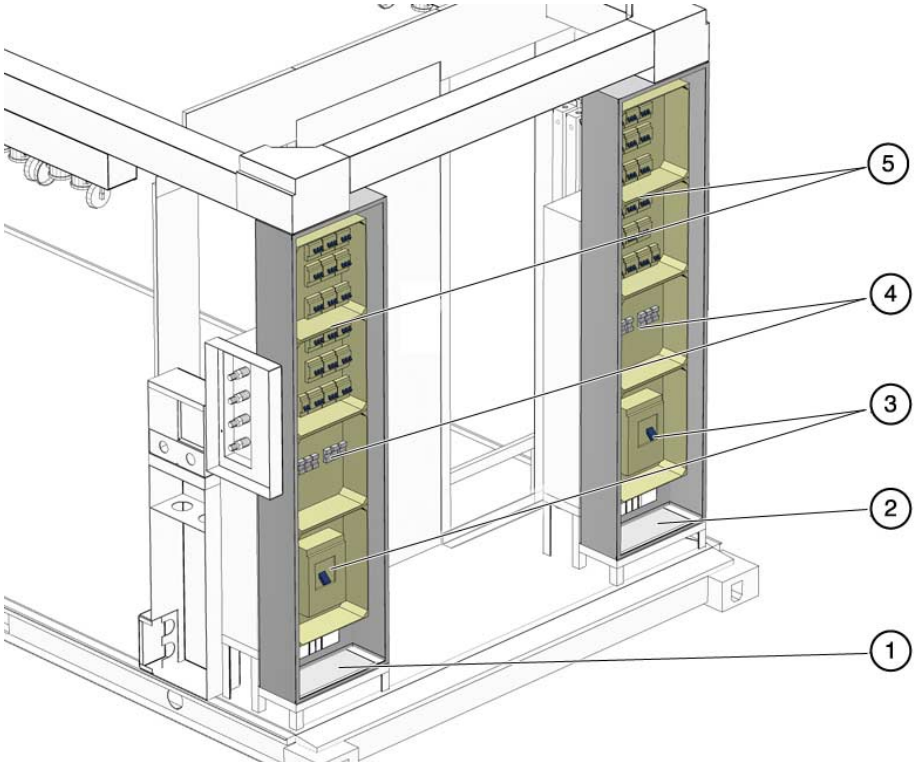


Figure Legend

1	High-voltage power panel (Panel A)	**4**	Junction blocks (connect wires of one gauge to wires of a different gauge)
2	High-voltage power panel (Panel B)	**5**	Circuit breakers
3	Main power disconnect		

Note – Circuit breakers for fans and PDUs appear in Panel A and Panel B. Circuit breakers for the lights, dehumidifier, and fire control panel are only in Panel A.

CHAPTER 4

Sun MD Network Cabling

This chapter provides overview information for the components associated with connecting a Sun MD to a network.

Note – Refer to the *Sun Modular Datacenter S20/D20 Site Planning Guide* for information about specific networking requirements.

This chapter contains the following sections:

- "Network Cabling Overview" on page 29
- "Available Networking Configurations" on page 33

Network Cabling Overview

On the Sun MD, networking cables are run to two data boxes, one on either side of the unit. There can be up to eight network connection ports in each data box, combining RJ-45 and LC connection ports. If your configuration will require more than eight connections on one side of the Sun MD, you can order a panel for the data box that accommodates bulk cables. This optional plate has two large-diameter conduits with an environmental seal that permits 18 cables (9 cables per conduit) to be routed directly into the container and terminated on a switch or panel inside the Sun MD.

Network cables are routed into the data box through two 1.5-inch nipples, which are located just below the door of the data box, as shown in FIGURE 4-1.

FIGURE 4-1 External Location of Data Panel

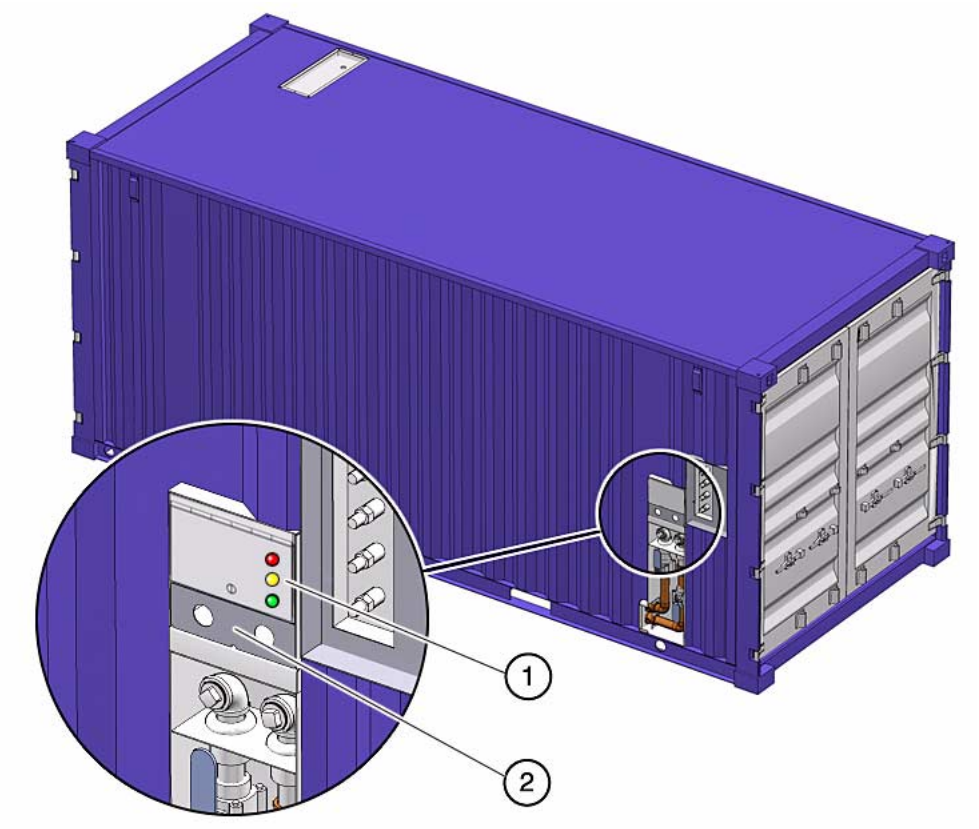


Figure Legend

1	Data box door with LED lights
2	1.5-inch network cable conduits

The LEDs on the data box doors indicate that the following statuses exist:

- **Red.** Only qualified service personnel should enter the Sun MD if a red LED is illuminated.
- **Yellow.** Service is required. The Sun MD can be entered if no red LED is illuminated.
- **Green.** The Sun MD can be entered if no red LED is illuminated. The green LED should be blinking slowly if the Environmental Management System (EMS) is operating properly.

After connecting network cables to the data box on the external side of the Sun MD, you must also connect them on the inside of the unit. On the inside of the Sun MD, the data panels are located between the rear external door and the rear plenum door, just above the locations where the water supply and return plumbing enters the unit.

The *primary data panel* (*data panel A*) is on the right side of the Sun MD (to the left when entering the Sun MD from the rear side). The *secondary data panel* (*data panel B*) is on the left side of the Sun MD (to the right when entering the Sun MD from the rear side). The data panels have the following components:

- **Dedicated RJ-45 ports.** There is one RJ-45 port provided on each of the Sun MD data panels. Both of these ports are connected to a switch that is part of the sensor module. These network ports are supported by the batteries inside the sensor module and enable you to connect to the Sun MD without opening any of the external doors.

  Refer to the *Sun Modular Datacenter S20/D20 Service Manual* for the specifics about the network attributes used for this connection.
- **LEDs.** This port connects the EMS to the LEDs on the databox door.
- **Data box alarm.** This port connects the EMS to the databox door-open sensor and alerts the EMS when the data box door is opened.
- **Chiller I/O.** This dry-contact connector has no supply voltage and is rated for 1 Amp at 30 VDC. This port connects the EMS to one input and one output:
  - A chiller alarm (input) indicates when the chiller experiences a fault.
  - The chiller shutdown (output) instructs the chiller or an external pump to stop sending water to the Sun MD.
- **Customer-configurable networking options.** These ports are available for various uses, as defined by the customer. For example, they can be used to connect Ethernet and SAN switches from the infrastructure rack to an external network, or they can be used to connect to switches in each Sun MD rack.
- **Service-only ports.** These ports are to be used by authorized service personnel only.
- **External temperature and humidity sensors.** These sensors are provided on both sides of the Sun MD. Only one sensor can be connected at any given time to the sensor module. These sensors measure the external temperature and humidity and report the findings to the EMS.
- **Fire alarm I/O.** This connects the fire control panel to an external fire alarm or building control system. This dry-contact connector has no supply voltage and is rated for 1 Amp at 30 VDC.
- **Alarm I/O port.** This two-pin output can be used to determine when the external doors are open or when the data box door is open. This enables a connection to a customer-supplied alarm system, if desired.

FIGURE 4-2 illustrates the locations of the connection points and ports described in the preceding list, as they appear from the inside of the Sun MD container.

FIGURE 4-2 Internal View of the Data Panel

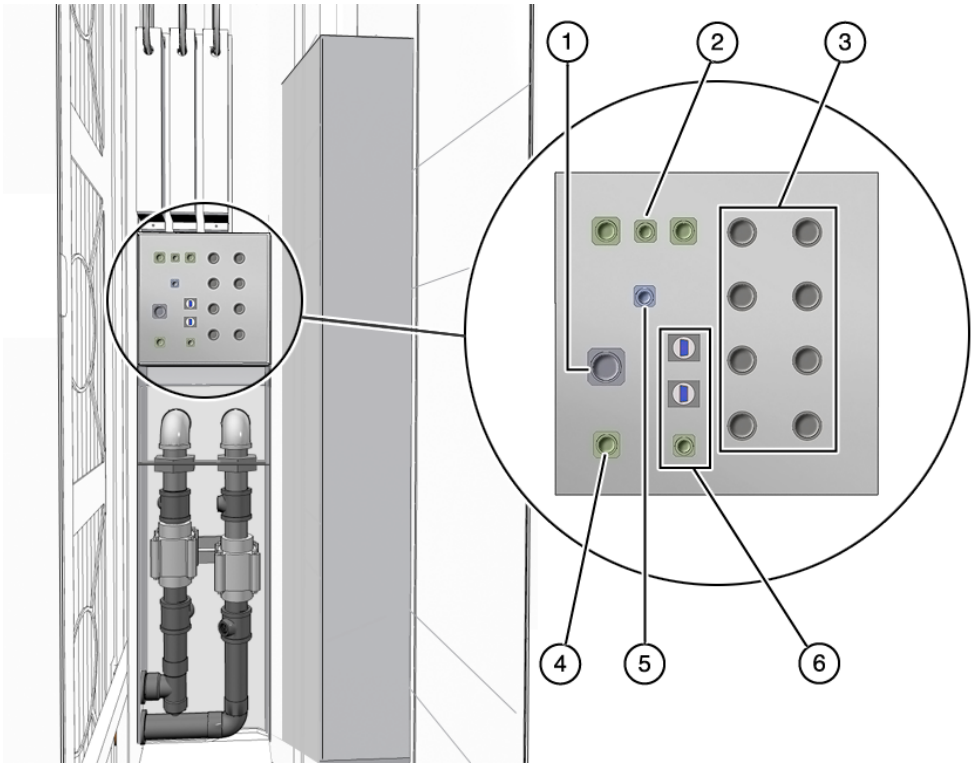


Figure Legend

1	Dedicated RJ-45 (connected to the IMS only on primary data panel)
2	LEDs (left), data box alarm (center), chiller I/O (right)
3	Customer-configurable networking options
4	Service-only ports (not for general use)
5	External temperature and humidity sensors (connected to the IMS only on primary data panel)
6	Fire alarm I/O

Available Networking Configurations

The Sun MD supports the use of the following networking configurations and options:

- Eight RJ-45 connectors
- Eight LC fiber connectors
- Four RJ-45 and four LC fiber connectors
- Two bulk cable fittings (nine per fitting)

Refer to the *Sun Modular Datacenter S20/D20 Site Planning Guide* for detailed networking specifications.

CHAPTER 5

Sun MD Water

This chapter provides overview information for the components associated with providing water to a Sun MD to regulate the unit's internal temperature.

Note – Refer to the *Sun Modular Datacenter S20/D20 Site Planning Guide* for information about specific water requirements. Refer to the *Sun Modular Datacenter S20/D20 Installation Guide* for information about connecting water to a Sun MD.

This chapter contains the following sections:

- "Water Overview" on page 35
- "Water Requirements" on page 37

Water Overview

A suitable source of water must be available to the Sun MD environmental-control system to ensure that proper internal temperatures are maintained. Options for providing water to a Sun MD to regulate the temperature of the installed payload include using excess capacity from an existing facility or using a stand-alone water chiller or heater.

Water is provided to the Sun MD through either of two sets of water supply and return fittings, which are located on opposite sides of the container. The valves that are immediately below each fitting can be used to open or shut the flow of water to the unit.

After the water lines enter the system, they drop to the lower edge of the container on both sides and loop across the top of the front side of the Sun MD. Refer to "Heat Exchanger Plumbing Components" on page 45 for information about how the main plumbing lines connect to the Sun MD heat exchangers.

FIGURE 5-1 shows the plumbing path and the locations of the water ports and valves on both sides of the Sun MD. The water pressure gauge is also shown, which can be used to detect a leak in the pipes and to determine the water line pressure.

FIGURE 5-1 Exterior Connections and Valves for Water Return and Supply

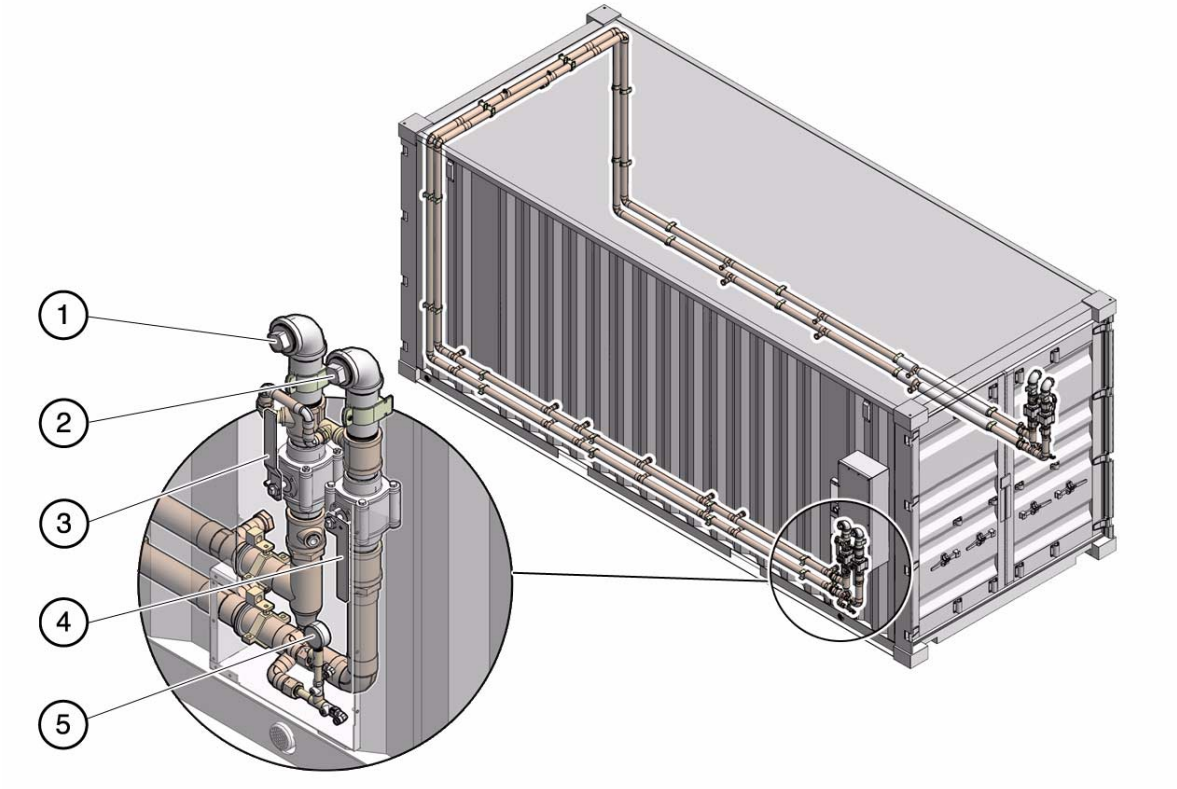


Figure Legend

1	Water return connection
2	Water supply connection
3	Water return open/shut valve
4	Water supply open/shut valve
5	Water pressure gauge

Note – On either side of the Sun MD, the supply connection is always closer to the rear doors than the return connection. In FIGURE 5-1, the supply connection is on the right and the return connection is on the left.

Water Requirements

The water that is supplied to the Sun MD must satisfy temperature, flow rate, and supply pressure specifications. This requirement is designed to ensure that the internal temperature of the Sun MD remains within the acceptable operating range of 50–95ºF (10–35ºC). In addition, there might be requirements for including additives such as corrosion inhibitors, rust inhibitors, algaecides, and fungicides to the water. Some environments might also require the use of antifreeze agents.

Specific allowable water temperatures can only be determined by considering the maximum payload installed and the maximum flow rate of water to the system. For more information about satisfying water requirements, refer to the *Sun Modular Datacenter S20/D20 Site Planning Guide*.

Note – The water supplied to the Sun MD must adhere to the specifications listed in the *Sun Modular Datacenter S20/D20 Site Planning Guide*.

CHAPTER 6

Sun MD Environmental Management

This chapter describes how the environment is regulated and monitored inside the Sun MD. This chapter contains following sections:

- "Air Quality Regulation" on page 39
- "Internal Temperature Regulation" on page 40
- "Environmental Management System" on page 47

Air Quality Regulation

The Sun MD utilizes the following components to regulate the quality of air inside the system:

- **Air filter.** Located behind rack 4, the filter inside the air filter box removes dust and debris from the air flow path. Refer to FIGURE 6-2 for the location of the filter.
- **Dehumidifier.** Located in rack 1, the dehumidifier reduces the amount of water vapor in the air. A drain is located beneath the dehumidifier. Refer to FIGURE 2-3 for the location of the dehumidifier and FIGURE 1-2 for the location of the drain beneath it.
- **Container vents.** One of the four vents in the Sun MD is left unsealed to aid in atmospheric pressure equalization of the Sun MD. This vent contains a HEPA filter to ensure that particulate matter doesn't enter the unit. Refer to FIGURE 1-2 for the locations of the vents.

Internal Temperature Regulation

Air circulates inside the Sun MD in a circular, closed-loop pattern. Moving in a clockwise direction, air travels past rack 1 and heat exchanger 1, and on to rack 2. This process repeats through positions 3 and 4 until air reaches the rear of the Sun MD, where it flows through an air filter on the outlet side of rack 4. Filtered air then flows into the rear plenum space between the service aisle and rear plenum doors and cycles through all racks and heat exchangers on the right side of the unit. After passing the final rack in the unit (rack 8 in a standard configuration, rack 7 in a deep-rack configuration), air moves through the last heat exchanger and moves through the front plenum and back to rack 1.

With this configuration, air exhausted from one equipment rack is forced through a heat exchanger (where it is cooled or warmed depending on the temperature of the water supplied to the Sun MD relative to the temperature of the exhausted air) before arriving at the next equipment rack.

The Sun MD utilizes the following components to regulate the internal temperature:

- **Heat exchangers.** Heat exchangers are provided between each rack of equipment to cool or heat air as it circulates through the Sun MD. Each heat exchanger includes five pairs of fans, five temperature sensors, and five cooling cores. A standard-configuration Sun MD has a total of eight heat exchangers: three in aisle 1, and five in aisle 2. A deep-rack configuration Sun MD has a total of seven heat exchangers: three in aisle 1 and 4 in aisle 2.

  See "Heat Exchanger Air Flow Components" on page 44 for more information.

- **Fan control modules.** One module is mounted above each heat exchanger to provide power to and control of the fans on the heat exchanger assembly. This module also receives input from the temperature sensors located on the hot, intake side of the heat exchanger assembly.
- **Water-supply components and plumbing.** Water is supplied to the Sun MD for use by the heat exchangers. For more information, refer to "Heat Exchanger Plumbing Components" on page 45.
- **Temperature and humidity sensors.** Five temperature sensors are provided in each heat exchanger, one for each pair of fans. One temperature sensor and one humidity sensor are also provided on the dehumidifier in the infrastructure rack to monitor the temperature and humidity inside the Sun MD.

  Additional sensors are provided throughout the Sun MD. Refer to "EMS Sensors and Alarms" on page 49 for more information. The data collected from these sensors is sent to the Environmental Management System (EMS), as described in "Environmental Management System" on page 47.

FIGURE 6-2 shows the locations of the heat exchangers and fan control modules inside a standard-configuration Sun MD. FIGURE 6-2 shows the locations of these components in a deep-rack configuration.

Refer to FIGURE 6-3 and FIGURE 6-4 for exploded views of the heat exchanger and related components.

FIGURE 6-1 Standard Configuration Temperature-Regulation Components

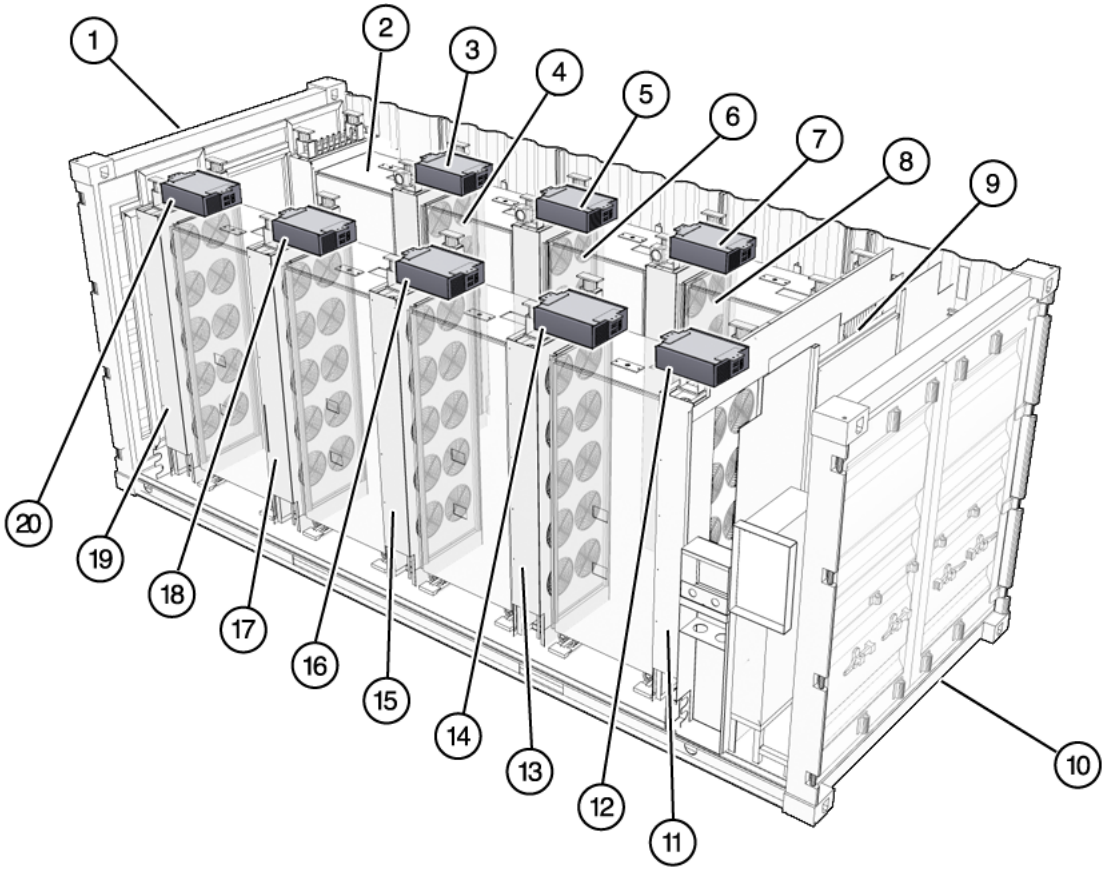


Figure Legend

1	Front side of the Sun MD	**11**	Heat exchanger 4
2	Rack 1 (infrastructure rack)	**12**	Fan control module 4
3	Fan control module 1	**13**	Heat exchanger 5
4	Heat exchanger 1	**14**	Fan control module 5
5	Fan control module 2	**15**	Heat exchanger 6
6	Heat exchanger 2	**16**	Fan control module 6
7	Fan control module 3	**17**	Heat exchanger 7
8	Heat exchanger 3	**18**	Fan control module 7
9	Filter box	**19**	Heat exchanger 8
10	Rear side of the Sun MD	**20**	Fan control module 8

FIGURE 6-2 Deep-Rack Configuration Temperature-Regulation Components

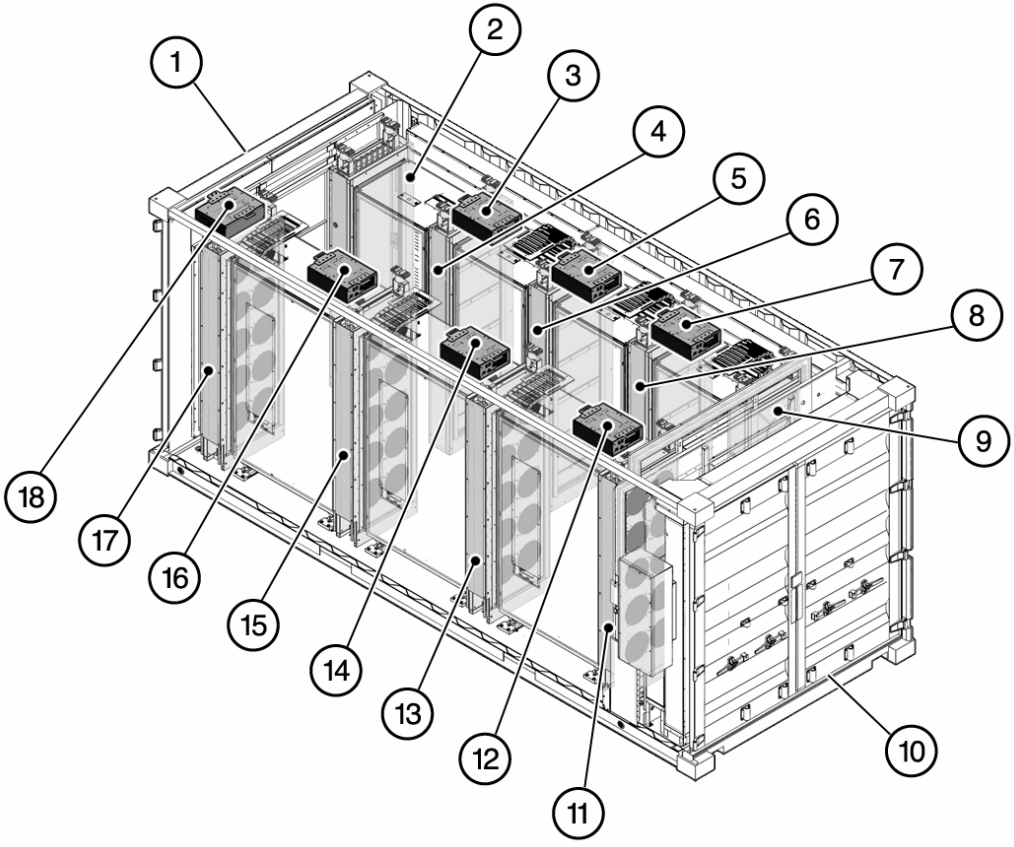


Figure Legend

1	Front side of the Sun MD	**10**	Rear side of the Sun MD
2	Rack 1 (infrastructure rack)	**11**	Heat exchanger 4
3	Fan control module 1	**12**	Fan control module 4
4	Heat exchanger 1	**13**	Heat exchanger 5
5	Fan control module 2	**14**	Fan control module 5
6	Heat exchanger 2	**15**	Heat exchanger 6
7	Fan control module 3	**16**	Fan control module 6
8	Heat exchanger 3	**17**	Heat exchanger 7
9	Filter box	**18**	Fan control module 7

Heat Exchanger Air Flow Components

Air flows through the racks in one of five horizontal planes. Each plane corresponds to a slice on a heat exchanger. There are two fans, a temperature sensor, and a cooling or heating core on each slice. The fans blow air through the core to cool or heat the air before it is consumed by the next rack. Slices are numbered from 1 through 5 starting near the floor as shown in FIGURE 6-3.

FIGURE 6-3 Air Flow-Related Heat Exchanger Components

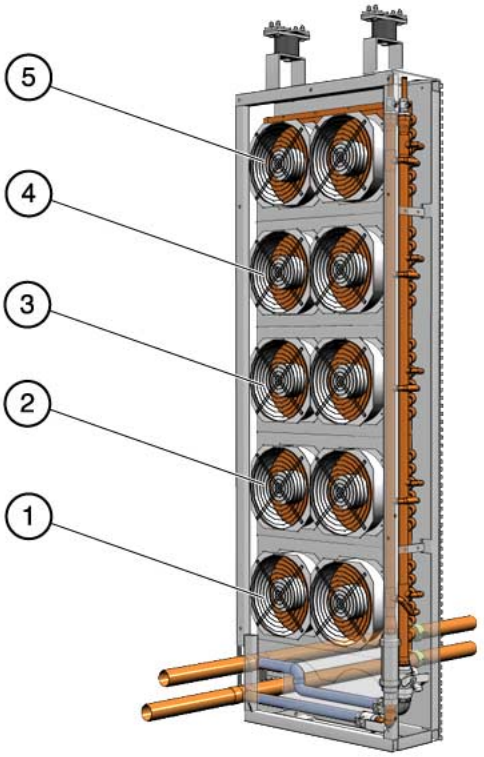


Figure Legend

1	Slice 1–Two fans, one sensor, and one cooling/heating core
2	Slice 2–Two fans, one sensor, and one cooling/heating core
3	Slice 3–Two fans, one sensor, and one cooling/heating core
4	Slice 4–Two fans, one sensor, and one cooling/heating core
5	Slice 5–Two fans, one sensor, and one cooling/heating core

Heat Exchanger Plumbing Components

The following plumbing components are involved in bringing water to and removing water from the Sun MD heat exchangers:

- **Flexible water lines.** Flexible water lines run from the primary plumbing lines to each heat exchanger, supplying and removing water to and from each heat exchanger.
- **Supply and return ball valves.** Valves located on each flexible line can be used to isolate the heat exchanger from the main water loop in the event that service is required. For more information, refer to the *Sun Modular Datacenter S20/D20 Service Manual*.

FIGURE 6-4 illustrates the various plumbing components that connect to each heat exchanger in a Sun MD.

FIGURE 6-4 Plumbing-Related Heat Exchanger Components

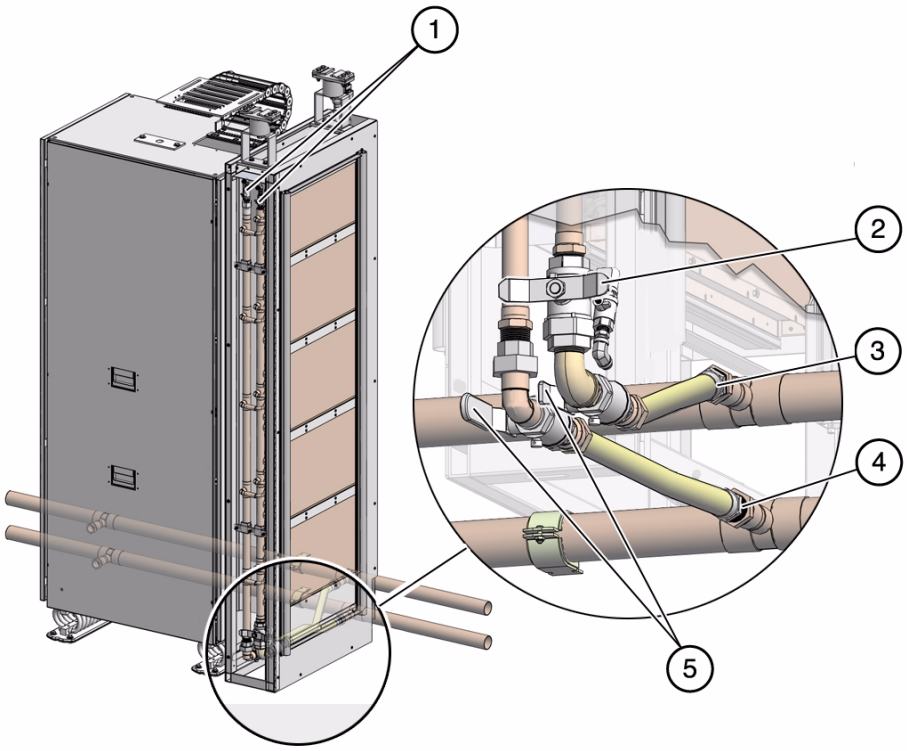


Figure Legend

1	Air purge valves
2	Balancing valve
3	Primary water return pipe with flexible line
4	Primary water supply pipe with flexible line
5	Supply and return ball valves

Environmental Management System

The Sun MD provides an Environmental Management System (EMS) that enables data collection and reporting for specific events. The data that is collected on the EMS is analyzed, processed, acted upon, and then directed to the Integrated Management Server (IMS) for display and distribution. The IMS will either save it to local storage or send it to Sun's Managed Service Offering or to an enterprise management system such as Sun Management Center, Unicenter, Tivoli, or OpenView.

EMS Components

The EMS utilizes the following components to monitor the conditions present in the Sun MD:

- **IMS.** This server is mounted in the infrastructure rack and is preinstalled with software that can be used to monitor and manage the Sun MD. The IMS fulfills the following Sun MD functions:
  - Log server for the remote terminal unit (RTU) located inside the sensor module
  - SNMP agent for Sun MD
  - Web server for outside status queries to Sun MD
  - Monitor for the phase current in PDUs
- **FCS.** The fire control system (FCS) detects and reports fire-related incidents and activates the Sun MD fire suppression system. For more information, refer to "Sun MD Fire Control System" on page 51.
- **Sensors, alarms, and controls.** Various sensors, alarms, and controls throughout the Sun MD detect, collect, and respond to environmental conditions. Refer to "EMS Sensors and Alarms" on page 49 for information about the sensors from which the alarm module collects data. Refer to "EMS Controls" on page 50 for information about the actions triggered by controls when certain conditions are detected.
- **Sensor module.** This module is the heart of the EMS. The sensor module uses a remote terminal unit (RTU) to receive input from various sensors. Refer to "EMS Sensors and Alarms" on page 49 for information about the sensors from which the sensor module collects data.

  After receiving data from sensors located throughout the Sun MD, the sensor module reports and records its findings locally, and the IMS copies that information to itself for display and distribution. The IMS also receives syslog information from the sensor module. That information is not used to provide any alarms or alerts.

Data sent to the IMS can be reported as entries in log files or as HTML renderings that serve as a near real-time snapshot of the state of the system.

Refer to the *Sun Modular Datacenter S20/D20 Service Manual* for information about the LEDs and other components on the sensor module.

- **Fan control module.** This module includes the heat exchanger fan control unit, the fan temperature sensor analog-to-digital converter, and the DC power supply that supplies power to the fans. There is one fan control module located on the top of each heat exchanger.
- **Alarm module.** This module is mounted in the infrastructure rack and is the subsystem that monitors the internal temperature, emergency power off (EPO) buttons, inputs from security sensors, data panels, and data box tamper signals. The alarm module directly controls the EPO actuation circuitry.

  Refer to the *Sun Modular Datacenter S20/D20 Service Manual* for information about the LEDs and other components on the alarm module.

FIGURE 6-5 shows the locations of the EMS-related components.

FIGURE 6-5 Infrastructure Rack Components

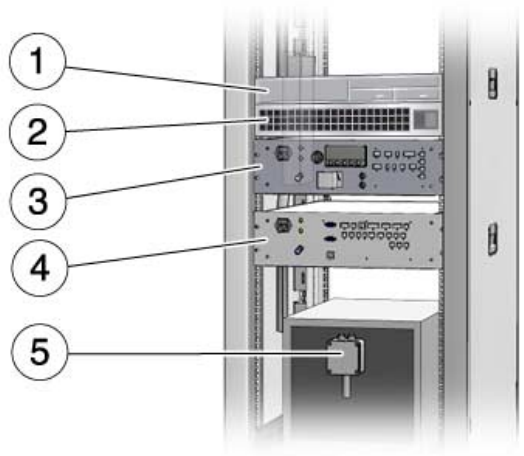


Figure Legend Components illustrated in FIGURE 6-5

1	Integrated Management Server (IMS)	**4**	Sensor module
2	Ethernet switch for PDUs	**5**	Internal temperature and humidity sensors
3	Alarm module		

For information about performing administrative tasks using the IMS, refer to the *Sun Modular Datacenter S20/D20 Administration Guide.* Accessing the EMS through the IMS should be done only by trained service personnel.

EMS Sensors and Alarms

The EMS sensors and alarms track and report the following information:

- **Temperature and humidity sensors.**
  - A set of temperature and humidity sensors are located on each data panel to monitor the external temperature and humidity.
  - A set of temperature and humidity sensors are located in the infrastructure rack in front of the dehumidifier to monitor the internal temperature and humidity.
  - Five temperature sensors are located on each heat exchanger.
  - A standalone temperature sensor is mounted on the front of the alarm module to determine whether the Sun MD should be powered off for an overtemperature condition if the EMS has stopped functioning.

  In addition to these sensors, the IMS notifies you when the EMS has determined that interior air might condense at the current external temperature. The IMS also notifies you when the EMS has determined that the exterior air might condense at the current internal temperature.
- **Water temperature sensors.** Four sensors, one at each water supply valve and one at each return, detect the current temperature of the water being supplied to and returned from the Sun MD.
- **Drain sensors.** Sensors in all four drains detect the presence of water in the drains. If the sensor module determines that water is present in at least one front drain and one rear drain, it will trigger an alert and cause an SNMP trap to be sent to an external monitoring system. This condition will also cause the system to emergency power off if it has been configured to do so.
- **Tilt sensor.** This sensor detects that the Sun MD unit has been tilted.
- **Door sensors.** Door sensors (front and rear) indicate whether doors are open or closed. Additional sensors indicate whether the exterior data panel doors on either side of the Sun MD are open or closed. Some units also have sensors on the rear plenum door.
- **Chiller alarm sensor.** A chiller alarm sensor detects a signal from the chiller or the water supply to indicate that the chiller is in need of attention.
- **Fire suppression sensors.** These sensors detect when an abnormal condition has occurred with the fire suppression system. Additional sensors indicate when the VESDA system has been triggered, when the fire suppression system's alarm has been activated, and when the clean agent gas is about to be released or is being released.

  For more information, about the fire control system, refer to Chapter 7.

EMS Controls

The fire suppression inhibit, emergency power off, and chiller controls are off during a normal operating state. The dehumidifier control is dependent on the humidity factor of the environment that you are in. When the following conditions are detected by the sensors, the controls may be enabled:

- **Fire suppression inhibiting control.** This control inhibits the fire suppression system when sensors detect that a door is open because service personnel are assumed to be occupying the Sun MD. When the doors are shut, the IMS informs you that the fire suppression system is reengaged.
- **Dehumidifier control.** This control enables the dehumidifier when the internal humidity of the Sun MD reaches a defined threshold of greater than 50 percent. When the internal humidity returns to less than 40 percent, the IMS informs you that the dehumidifier has been turned off. If humidity drops below 20 percent or exceeds 80 percent, controller software terminates all power to the Sun MD.
- **Emergency power off (EPO) and chiller controls.** When certain unsafe conditions are noted, controller software terminates all power to the Sun MD and chiller. Examples of such conditions include water in both drains, the release of the fire suppression agent, and air or water temperatures that exceed their operating ranges. Specifically, if the temperature sensor in the alarm module detects that the temperature exceeds 40ºC (104ºF) or drops below 2ºC (36ºF), an EPO will occur.

CHAPTER 7

Sun MD Fire Control System

This chapter describes the fire control system (FCS) functionality, operation, and fault indicators.

Note – No smoking or smoke, dust, or fine particulate-producing equipment should be allowed within 20 feet (6 meters) of the Sun MD, as this could compromise the integrity of the FCS.

This chapter contains the following sections:

- "Fire Control System Configurations" on page 51
- "Fire Control System Overview" on page 52
- "Accessing Additional Information" on page 61

Fire Control System Configurations

The following FCS configurations are supported for use in the Sun MD:

- The Sigma XT fire control panel (FCP) with the Xtralis Very Early Smoke Detection Apparatus (VESDA) VLF-250 system. This configuration is typically used in European markets.
- The Fike Single Hazard Panel Professional (SHP Pro) FCP with the Xtralis VESDA VLF-250 system. This configuration is typically used in U.S. markets.
- The Nohmi NF227 FCP with the Xtralis VESDA VLC system. This configuration is typically used in Japanese markets.

Each configuration performs similar functions. However, while configurations with the Sigma and Fike FCPs are very similar to each other, configurations that use the NF227 FCP are configured, activated, and serviced differently from the others.

Fire Control System Overview

The two primary components of the Sun MD FCS are the VESDA system, which samples the air inside the Sun MD to detect the presence of smoke long before the smoke detectors would detect it, and the FCP, which determines when the fire suppression clean agent gas will be released. These components work together to detect and report fire-related incidents and to activate the Sun MD fire suppression system.

To initiate the release of the clean agent gas, you can program the FCP to release the gas when certain conditions are met. In the event that you need to override the FCP programming, you can release the clean agent gas by using one of the manual release triggers.

Fire Control System Components

The FCS includes the following components:

- **Manual fire suppression release buttons.** Buttons are available to manually release the clean agent gas instantly. Using these buttons is the preferred method for manually releasing the clean agent gas when you need to override the response from the FCP. These buttons are operational even when the Sun MD doors are open.
  - In systems with Sigma or Fike FCPs, one of these buttons is on the filter access door, and the other is on the infrastructure rack frame located in the service aisle.
  - In systems with the NF227 FCP, the button that is recommended for use is located behind the access panel on the FCP.
- **Emergency manual release valve or button.** A valve can be used to release the clean agent gas. This is not the preferred method for manually releasing the clean agent gas. This valve is operational when the Sun MD doors are open.
  - In systems with Sigma or Fike FCPs, the valve is located on the top of the clean agent tank.
  - In systems with the NF227 FCP, the valve is located on the top of the FM227 gas bottle that is closest to the right wall of the container, above the line-filter, and between the power distribution panel A and the containment wall, and facing away from the operator. This button can be used even if the FCP is not powered up and no other elements are active or powered.

Caution – In systems with the Sigma or Fike FCP, the manual fire suppression release buttons are identical in appearance to the emergency power off button. Read the labels carefully to make sure you know the difference between the two buttons.

- **Smoke detectors.** Two smoke detectors are provided to report the presence of smoke in the Sun MD to the FCP. These smoke detectors report status directly to the FCP.

  In all fire suppression system configurations, the smoke detectors are mounted to the ceiling of the Sun MD.

- **VESDA sample pipe and ports.** The orange sample pipe that runs across the top of the Sun MD contains several ports that sample the air in the Sun MD on a continuous basis to detect fire at a pre-combustion stage.

  The VESDA system continually draws air into the sampling tube and passes the air through a dual-stage filter to remove dirt. Clean air is sent to a separate chamber where it is tested for the presence of smoke. The smoke level displays graphically on the VESDA smoke dial and is communicated to the FCP.

- **Fire control box.** The box that contains the FCP, the LED display, and an RJ-45 port. For the Sigma and Fike designs, the VESDA panel is inside the fire control box. For the Nohmi NF227, the VESDA panel is adjacent to the fire control box, under a red access panel. See "Detailed Fire Control Box View" on page 56.

- **Clean agent tank.** In all models of FCS, clean agent gas is used for fire suppression inside the Sun MD. For the Sigma and Fike designs, one tank is installed behind Panel A, on the rear side of the container. For the Nohmi NF227, three tanks are installed behind Panel A.

- **Clean agent release nozzle.** Clean agent gas is released through this nozzle and immediately disperses throughout the container.

- **AC switch in the primary power panel (Panel A).** A breaker in the power Panel A can be used to terminate AC power to the FCS.

FIGURE 7-1 shows the locations of the FCS components in systems that have the Sigma or Fike FCP.

FIGURE 7-1 FCS Components for the Sigma and FIKE Fire Suppression Systems

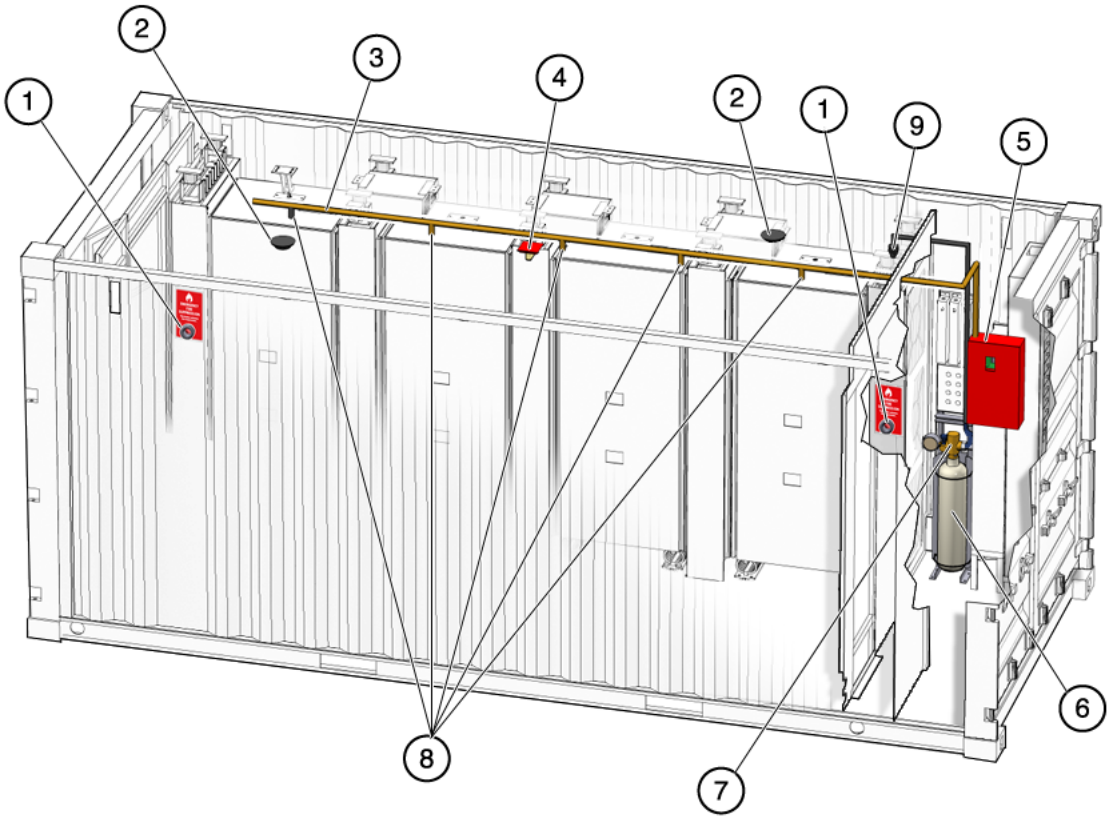


Figure Legend

1	Manual fire suppression release button (2)	**6**	Clean agent tank
2	Smoke detectors (2)	**7**	Manual release valve on clean agent tank
3	VESDA sampling pipe	**8**	VESDA sampling points
4	Visual and audible alarm	**9**	Dispersal nozzle
5	Fire control box and VESDA		

FIGURE 7-2 shows the locations of the FCS components in systems with the Nohmi NF227 FCP.

FIGURE 7-2 FCS Components for the NF227 Fire Suppression System

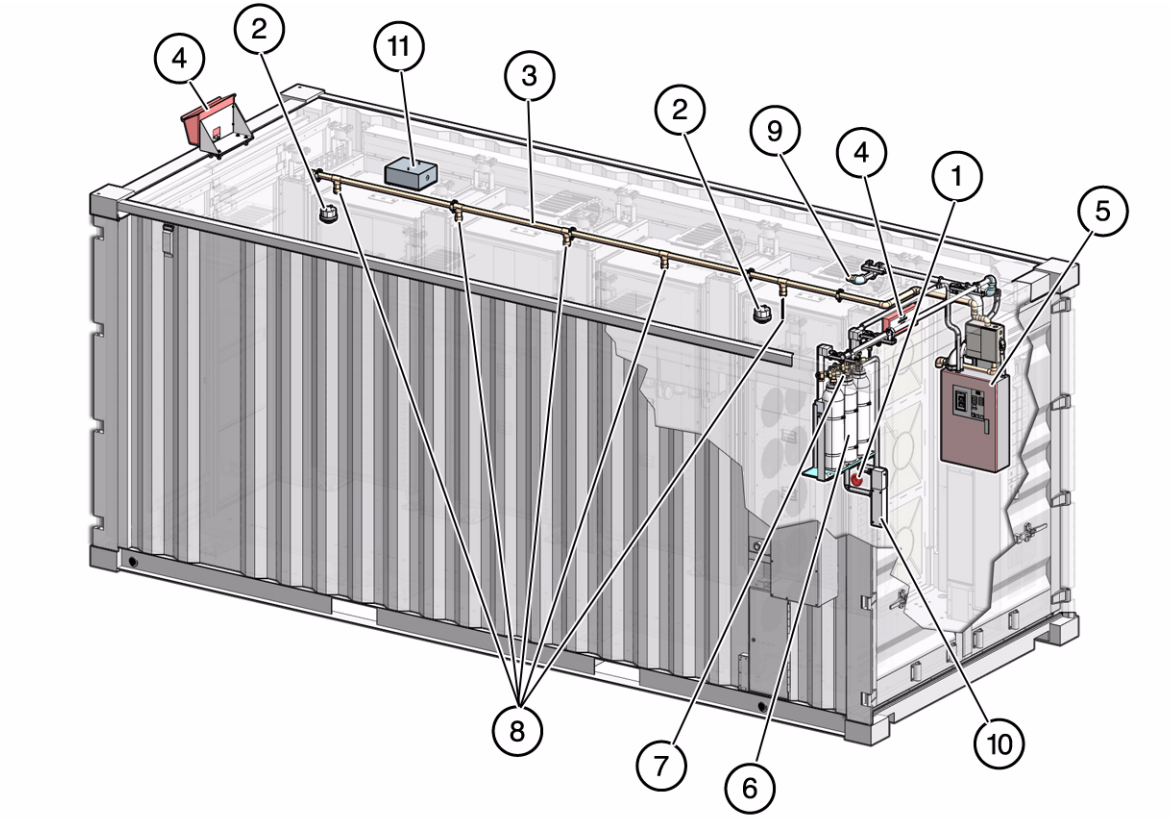


Figure Legend

1	Manual fire suppression release buttons (2)	**6**	Gas bottle rack with clean agent tanks (3)
2	Smoke detectors	**7**	Solenoid gas release valves
3	VESDA sampling pipe	**8**	VESDA sampling points
4	Gas release lights	**9**	Clean agent dump tube
5	Fire suppression control panel	**10**	Pressure switch

Detailed Fire Control Box View

The following components comprise the fire control box:

- **FCP.** This circuit board monitors signals from the VESDA sampling points and smoke detectors to determine when to change the status LEDs, trigger audible and visual alarms, and release the clean agent gas. The FCP also monitors the signal sent by the EMS to prevent the release of the clean agent gas.
- **RJ-45 connector.** An RJ-45 connector can be used to connect the FCP to an external facility-monitoring system through the fire alarm I/O connector on either data panel.
- **VESDA panel.** This panel contains the controls and display for the VESDA system, including a smoke dial, alarm, and status indicators. The VESDA sampling tube is connected to the panel.
- **LED display panel.** The LEDs located on this panel will vary depending on the FCP model that is installed in your Sun MD. Refer to the manufacturer's documentation for information about LED indicators located inside the fire control box.
- **Batteries.** Batteries serve as a redundant power source for the FCS and VESDA in the event that AC power is lost.
- **Battery power switch.** Turns power to the batteries on or off.

Note – To open the fire control box, you must use the key that was shipped in the Sun MD internal packaging.

FIGURE 7-3 shows the locations of the components that are inside the Fike fire control box.

FIGURE 7-3 Components Inside the Fike Fire Control Box

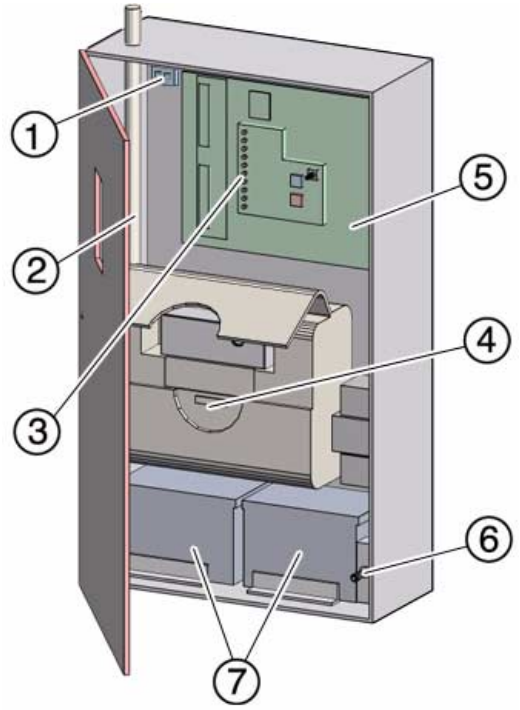


Figure Legend

1	RJ-45 to connect to the data panel	**5**	Fire control panel (FCP)
2	VESDA sampling tube	**6**	Battery power switch
3	LED display panel	**7**	Batteries (2)
4	VESDA panel		

FIGURE 7-4 shows the locations of the components that are inside the Sigma fire control box.

FIGURE 7-4 Components Inside the Sigma Fire Control Box

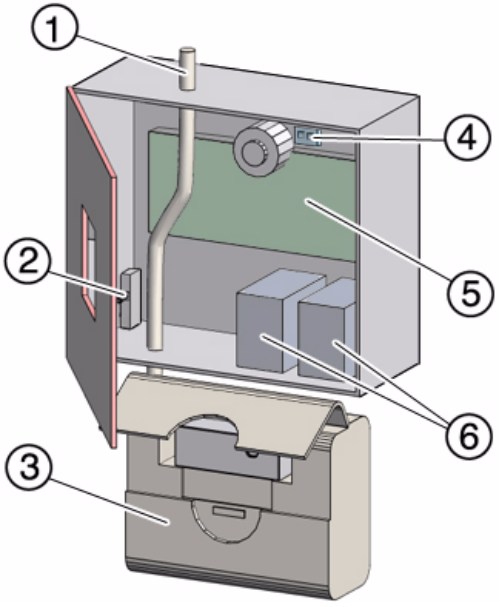


Figure Legend

1	VESDA sampling tube	**4**	RJ-45 to connect to the data panel
2	Battery power switch	**5**	Fire control panel (FCP)
3	VESDA panel	**6**	Batteries (2)

FIGURE 7-5 shows the components for the Nohmi NF227 fire control box.

FIGURE 7-5 Components Inside the Nohmi NF227 Fire Control Box

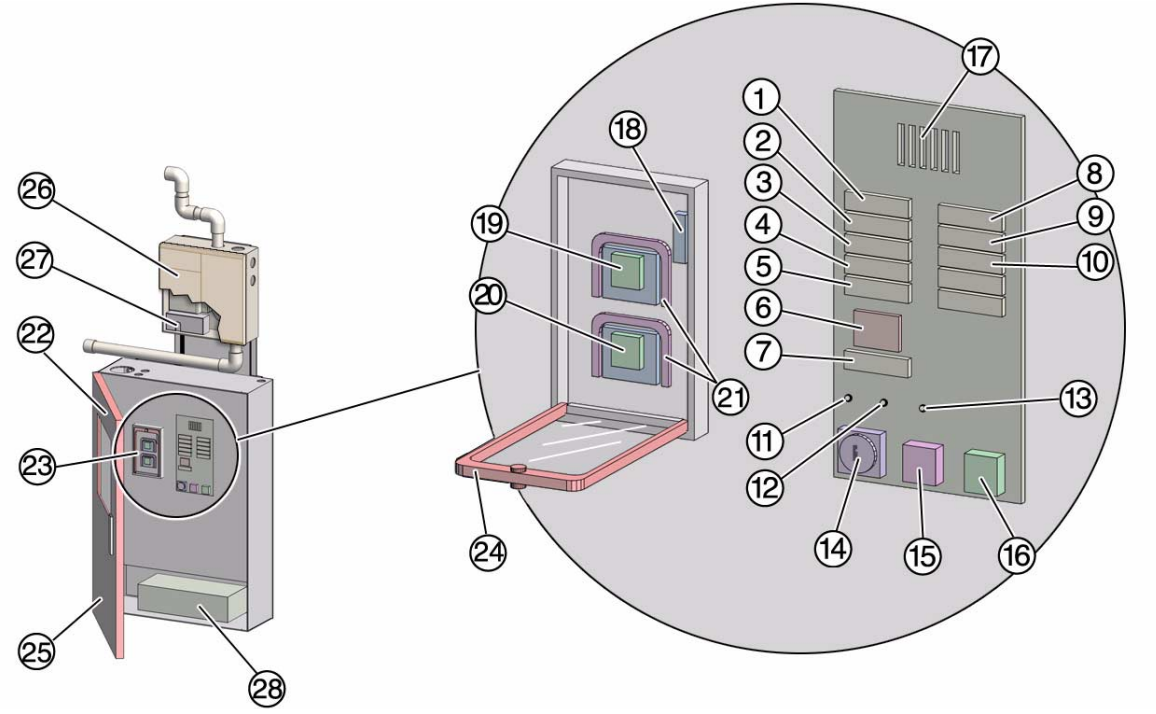


Figure Legend

1	Pilot lamp (green)	**15**	Buzzer stop switch (orange)
2	Fire indicator (red)	**16**	Reset switch (green)
3	Fire indicator (red)	**17**	Buzzer
4	Alarm articularot indicator (red)	**18**	Alarm switch (door switch)
5	Actuation indicator (red)	**19**	Discharge stop switch (green)
6	Count down to discharge indicator	**20**	Discharge switch (red)
7	Discharge indicator (red)	**21**	Discharge stop and start switches
8	Power failure indicator (orange)	**22**	Name plate
9	Trouble actuation circuit indicator (orange)	**23**	Operation panel
10	Ground fault indicator (orange)	**24**	Protection cover
11	Manual indicator (green)	**25**	Instruction plate
12	Automatic indicator (orange)	**26**	VESDA cover
13	Buzzer stop indicator (orange)	**27**	VESDA system
14	Automanual changeover switch (with key)	**28**	Battery unit

Accessing Additional Information

The Sun MD product documentation does not provide detailed information about the various FCPs that can be installed in the Sun MD. Detailed information is also not provided for the VESDA system.

Fire Control Panel Documentation

There are several FCPs that can be installed in the fire control box. Work closely with the local Authority Having Jurisdiction (AHJ) when selecting the type of FCP to install in your Sun MD. Refer to the detailed user guides on the Sun MD secured web site for information about FCPs.

VESDA Documentation

The VESDA system used in the Sun MD is the Xtralis VLF-250. To access the detailed user guide on the VLF-250, refer to the secured Sun MD web site or go to `http://www.xtralis.com`

Glossary

A

AHJ Authority Having Jurisdiction. The agency that regulates fire codes, building codes, and electrical codes within a specific physical locality, such as a city, state, or country.

air plenum A separate space that is provided for air circulation in heating, ventilation, and air conditioning (HVAC).

aisle 1 The aisle on the left side of the Sun MD that contains racks 1 through 4 and associated heat exchangers. Air flows from the front to the rear of the Sun MD by traveling through aisle 1.

aisle 2 The aisle on the right side of the Sun MD that contains racks 5 through 8 and associated heat exchangers. Air flows from the rear to the front of the Sun MD by traveling through the heat exchangers located in aisle 2.

aisle door The doors at each end of the Sun MD service aisle: the front aisle door and rear aisle door.

alarm module The alarm module monitors the Sun MD temperature, emergency power off (EPO) events, inputs from security sensors, data panels, and data box tamper signals. The alarm module directly controls the EPO actuation circuitry. This module is mounted in the infrastructure rack.

A or amp ampere. A measurement of electrical current in a circuit.

ATS automatic transfer switch. An ATS allows switching from a primary power source to a secondary or tertiary power source.

availability The percentage of a specified period of time for which a service, system, or system component satisfactorily performs its intended function.

B

back See *rear*.

back door See *rear door*.

baseline A measurement, calculation, or location that is used as a basis for comparison; a measurable characterization that is used as a basis to establish the current state.

C

cable tray A ladder-type tray that is located over the service aisle and that holds the overhead cabling.

CDF cumulative distribution function. In reliability engineering, the area under the PDF curve representing the probability that a randomly selected unit from a population will fail by some time.

CDU Cabinet power distribution unit. The power strips in the Sun MD racks. See also *PDU*.

chiller A cooling system that removes heat from one element and deposits it into another.

CLI command-line interface. A textual input communication to a computer by way of a command prompt.

conduit A protective tube or duct for enclosing electrical wiring or cabling.

container vents See *vents*.

continuous availability The ability of a service, system, or system component to satisfactorily perform its intended function without planned or unplanned interruption during a specified period of time.

corner blocks The external blocks on all eight corners of the Sun MD container that are used for attaching, lifting, or securing devices.

D

daisy chain A wiring scheme in which device A is wired to device B, device B is wired to device C, and so on. The last device is normally wired to a resistor or terminator. All devices can receive identical signals, or each device in the chain can modify one or more signals before passing them on. For example, the fan control boxes can be daisy-chained together in the Sun MD.

data box The data box houses the data panels. There are two data boxes on the Sun MD; one on the left and one on the right side of the unit.

data panel The panels inside the data box where private network and alarm system cabling is brought into the unit.

The data panel also contains the status LEDs, chiller port, chiller alarm, temperature and humidity sensors, and data box door sensor.

data redundancy The duplication of data objects as a failure mode mitigation and recovery strategy.

dehumidifier An appliance that reduces the amount of water vapor in the air. The dehumidifier in the Sun MD is located in the infrastructure rack.

drain Four drains, one in each corner of the container, are provided to remove moisture from the floor of the Sun MD. Drain outlets are located in the sides of the container's base frame. The front left drain allows water from the dehumidifier to exit the unit.

E

EMI electromagnetic interference. The disruption of operation of an electronic device when it is in the vicinity of an electromagnetic field in the radio frequency spectrum that is caused by another electronic device.

EMS Environmental Management System. The system that monitors environmental conditions and events that occur in the Sun MD. The EMS includes the sensor module, fan control module, alarm module, and all of the associated components that provide control of the system.

EPO emergency power off. The capability to immediately remove power from a system all at once. In the Sun MD, an emergency power off can be triggered by the EMS or the alarm module based on condition sensed within the Sun MD. The Sun MD EPO can also be triggered manually. The manually operated EPO buttons are located to the front-left and rear-right of the service aisle.

event An occurrence that happens somewhere in an overall system. Events carry meaning and definition.

Events are a particular type of message that can be passed between systems.

While events are descriptive, they do not directly produce an action. The EMS is responsible for assigning actions that occur as the result of an event in the Sun MD.

F

fan control module The mechanism that is mounted above each heat exchanger to power and control the fans on the heat exchanger assembly. The fan control module receives input from the temperature sensors that are located on the heat exchangers. The Sun MD contains a total of eight fan control modules.

fire control panel A circuit board that monitors signals from the VESDA sampling points and smoke detectors to determine when to change the status LEDs, trigger audible and visual alarms, and release the clean agent gas. The FCP also monitors the signal sent by the EMS to prevent the release of the clean agent gas.

The FCP is located just inside the rear door on the left side (to the right when entering through the rear door) of the Sun MD.

front The end of the Sun MD that contains the infrastructure rack.

front door The front, outermost doors to the Sun MD.

front plenum The space between the front doors and the front service aisle door where environmentally controlled air flows from aisle 2 to aisle 1.

front service aisle door The door located inside the front door that provides access to the service aisle.

FRU field-replaceable unit. A hardware component that can replaced or repaired at the point of deployment.

G

generator A machine that changes mechanical energy into electricity.

grid Any interconnected set of nodes such as the electric power network or a communications network.

H

heat exchanger A component hat cools or heats air as it circulates through the Sun MD. Heat exchangers are provided between each rack of equipment. Each heat exchanger includes five pairs of fans, five temperature sensors, and five cooling cores. A Sun MD has a total of eight heat exchangers: three in aisle 1 and five in aisle 2.

home position The position of a rack when it is located between the heat exchangers and is bolted to the floor with the securing pin in place.

I

IMS Integrated Management Server. The server that ships installed in rack 1 of the Sun MD and is preloaded with system monitoring and management software. The IMS is the repository of all data collected by the EMS (including power consumption and environmental status) and provides external access to that data through a web server.

infrastructure cable tray Vertical trays on the front, right, and left sides of the infrastructure rack that maintain the cabling to the infrastructure rack.

infrastructure rack Rack 1 in the Sun MD, which contains customer-supplied networking equipment, a dehumidifier, the sensor module, and the alarm module. Rack 1 is located on the left and in the front of the Sun MD, and is the first rack in aisle 1.

inherent availability The percentage of a specified period of time for which a system or service is satisfactorily performing its intended function under ideal conditions.

inherent reliability The probability that a system or system component will remain failure-free during a specified time interval under ideal conditions.

ISO International Standards Organization.

L

latency The time delay experienced when performing a specified unit of work.

left The left side of the Sun MD when faced from the front of the unit; this is where racks 1–4 are located.

leveling legs Commercially available container leveling legs that are used to level all four corners of the Sun MD.

leveling shims Metal plates or stock shims of varying thickness that can be used to level all four corners of the Sun MD.

light timer Two timer mechanisms, one located at the front left side and one at the rear-right side of the Sun MD, that control how long the lights remain turned on inside the unit. The timer can be set for a maximum of two hours.

LOM Lights Out Manager. Software that enables system administrators to remotely monitor and manage systems and other network equipment, regardless of whether the primary machine is powered on.

N

NEMA National Electrical Manufacturers Association. An organization that has established environmental ratings for electrical equipment enclosures.

NPT National Pipe Thread. A United States standard for tapered threads used to join pipe and fittings.

O

operational availability The percentage of a specified period of time for which a service, system, or system component is satisfactorily performing its intended function under stated conditions.

operational redundancy A system or subsystem architecture in which multiple components that are operating in parallel manage specific failure modes as part of the normal operation of the system (for example, failure-mode recovery time at, or approaching, zero).

operational reliability The probability that a system or system component will remain failure-free during a specified time interval under stated conditions.

P

payload Any electronic equipment including, but not limited to, compute nodes, servers, storage devices, routers, switches, communications, and other computer-type equipment that is located in the racks inside a Sun MD.

PDF probability density function. In reliability engineering, a frequency distribution denoting the fraction of failures for a given population within some interval of time (a lifetime distribution model).

PDU power distribution unit. The stand-alone devices that control the distribution of power to CDUs. There are two power options available for the racks: two PDUs (low-power option) or four PDUs (high-power option). The infrastructure rack always has two PDUs. See also *CDU*.

platform The hardware and hardware-specific software components of a system.

power strip A device that has a strip of sockets that protects the devices plugged into it from surges in power.

pressure release valve A device that controls or limits the amount of pressure allowed to accumulate within a closed system.

PSI pounds per square inch. The unit of measure for pressure.

public networks Commercially available network infrastructure (the Internet).

R

rack A metal frame that is used to hold hardware equipment in a shelf-like configuration by stacking the components vertically. The Sun MD has eight racks.

rack dolly A tool that is used to remove a rack and position it for service inside a Sun MD.

rack wrench A bent-handle service wrench with an alignment point on one end and a ratcheting socket wrench on the other end. The point is typically used to assist in aligning the rack prior to bolting it down. The socket/ratchet is used for loosening and tightening the bolts that secure the rack to the container while it's in the home position.

rear The end of the Sun MD where the two electrical panels and the fire suppression system are located.

rear door The first set of doors on the rear side of the Sun MD.

rear plenum The space between the rear service aisle door and the rear plenum door where environmentally controlled air flows from aisle 1 to aisle 2.

rear plenum door The door behind the two external doors in the rear of the Sun MD. This door and its surrounding wall form an air plenum through which environmentally controlled air flows from aisle 1 on the left side of the Sun MD to aisle 2 on the right side of the Sun MD.

rear service aisle door The door that is located inside the rear plenum door and provides access to the service aisle.

reliability The probability that a service, a system, or a system component will continue to satisfactorily perform its intended function at a specified point in time. The concept of reliability is classically derived from life distribution models described by the probability density function (PDF) and cumulative distribution function (CDF).

response time A measure of latency relative to the expected rate of execution.

right The right side of the Sun MD when faced from the front of the unit; this is where racks 5–8 are located.

RJ-45 Registered Jack-45. An eight-wire connector commonly used to connect computers to local area networks (LANs), especially Ethernets.

RTU remote terminal unit. An embedded microprocessor system located inside the sensor module that is receives input from sensors throughout the Sun MD. The RTU sends control information throughout the Sun MD in response to sensor stimuli.

RS-232 Recommended Standard 232. A standard interface for connecting serial devices. This port should be used only by trained service personnel.

RS-485 Recommended Standard 485. An OSI model physical layer electrical specification of a two-wire, half-duplex, multipoint serial connection. This port should be used only by trained service personnel.

RU rack unit. A measurement inside the equipment rack. Each RU is 1.75 inches (44.45 mm). Rack units in the Sun MD are numbered from the bottom of the rack to the top of the rack.

S

scalability A measure of the ability to comply with stated service policies relative to changes in workload for a service, system, or system component.

securing pin The top mounting system for each rack consists of a pin used to help secure racks in place. The pin secures the top of the rack to a bracket mounted on the Unistrut that is above the racks.

sensor and control array The network of sensors and their controls that are in the Sun MD.

sensor module A control box mounted in the infrastructure rack that contains the Linux-based RTU. See also *RTU*.

service aisle The center walkway inside the Sun MD that is used as a service area.

service apron The space outside the Sun MD that is used to access the system and to transport hardware into and out of it.

service position The position of the payload rack when it is located in the service aisle.

shock mounts Helical springs that are mounted on skids, to which the equipment racks are mounted to absorb the shock when the Sun MD is moved.

skids The mounting plates for the shock mounts, which are located under the racks.

SLA Service Level Agreement. A contract between parties that includes both technical and legal components defining the specific service level objectives to be maintained, how they will be measured, and the penalties to the service provider for failing to maintain those levels.

slice The airflow through the racks is divided into five horizontal planes. Each plane is separated into five segments that correspond to each slice. Each segment includes two fans and a cooling core. The fans blow air through the cooling core to cool the air before it is consumed by the next rack. The slices are numbered from 1–5 starting near the floor.

SLO Service Level Objective. A measurable statement of need that expresses the desired performance and behavior for an application or service.

SLS Service Level Specification. A detailed technical description of the operational design parameters for an application or service.

smoke alarm A device that provides sensor input to the EMS and sounds an audible alarm when it senses the presence of smoke. The smoke alarm in the Sun MD is completely independent of the fire suppression system.

smoke detector Two smoke detectors are provided to report the presence of smoke in the Sun MD directly to the FCP.

SNMP Simple Network Management Protocol. A standard for gathering statistical data about network traffic and the behavior of network components. SNMP uses management information bases (MIBs), which define what information is available from any manageable network device.

SOP standard operating procedure. A set of instructions that define a standardized procedure.

SPOF single point of failure. The failure of an entire system that occurs when a single part of any system fails.

SSH Secure Shell. A client/server-based service and protocol designed to replace `rlogin`, TELNET, and `rsh` unencrypted communications with encrypted communications and protocol tunneling between two untrusted hosts over an insecure network (for example, the Internet).

SSL Secure Sockets Layer. A cryptographic protocol that provides secure communications over the Internet.

standby redundancy A system, subsystem, or component with one or more identical backups that remain in an "off" state until needed (for example, when the system is not experiencing mechanical, thermal, or electrical stress), but becomes active after some switchover time during failure mode recovery.

system A collection of hardware, software, people, or processes that are organized and operated to fulfill a business or mission objective.

system component A specific hardware, software, people, or process element of a system.

T

TEU twenty-foot equivalent unit. The size of the ISO shipping container used to build a Sun MD.

TLS Transport Layer Security. A cryptographic protocol that provides secure communications over the Internet and is intended as a replacement for SSL.

transformer A device that transfers electric energy from one alternating-current circuit to one or more other circuits, either increasing (stepping up) or reducing (stepping down) the voltage.

TVSS transient voltage surge suppression. A lightning protection box that can be added in line with the power feed to the Sun MD. A separate TVSS is needed for each power input to the Sun MD.

U

UPS uninterruptible power supply. A device that maintains a continuous supply of electric power to connected equipment by supplying power from a separate source when utility power is unavailable.

utility A company that generates, transmits, or distributes communication services, electricity, water, or gas from facilities that it owns or operates.

V

VAC volts of alternating current. A measure of force or pressure behind an electrical current.

vents The Sun MD container has four vents; both of the vents on the right side of the container, and the rear vent on the left side of the container, are sealed. The front vent on the left side is left open to aid in atmospheric pressure equalization. The open vent has a HEPA filter.

VESDA Very Early Smoke Detection Apparatus. A system that samples the air inside the Sun MD on a continuous basis and can detect fire at the precombustion stage. This type of system aspirates the smoke from various locations into a tube where the smoke is analyzed electro-optically by a line of sight transmitter-receiver set.

VLAN virtual local area network. A collection of devices that can communicate on the same broadcast domain. VLANs can be based on a physical port, layer-2 mac-address, or layer-3 protocol.

W

water connectors The supply and return fittings for bringing water into and out of the Sun MD. There are two sets of connectors; one on the left side and one on the right side of the container. These pairs of connectors are not redundant, they are strictly for hookup convenience.

water I/O boxes The boxes located on the left side and right side of the Sun MD that contain the water connectors. These boxes are referred to as the left water I/O box and the right water I/O box.

watts Multiplying amps times volts equals the total measurement of power or watts.