



# Sun™ Datacenter Switch 3456 Site Planning Guide

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Sun Microsystems, Inc.  
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# Preface

This site planning guide provides information about the Sun Datacenter Switch 3456 switch and the facilities to accommodate the switch.

This document is written for persons responsible for organizing the installation of the Sun Datacenter Switch 3456, and configuring its working environment. Topics include cautions, specifications, location, utilities, and personnel.

## Related Documentation

The documents listed as online are available at:

<http://docs.sun.com/app/docs/prod/switch.3456>

Application	Title	Part Number	Format	Location
Product Notes	<i>Sun Datacenter Switch 3456 Product Notes</i>	820-4727-10	PDF	Online
Unpacking	<i>Sun Datacenter Switch 3456 Unpacking Guide</i>	820-4736-10	PDF	Shipping crate
			Printed	Online
Site Planning	<i>Sun Datacenter Switch 3456 Site Planning Guide</i>	820-4728-10	PDF	Online
Installation	<i>Sun Datacenter Switch 3456 Installation Guide</i>	820-4730-10	PDF	Shipping kit
			Printed	Online
Administration	<i>Sun Datacenter Switch 3456 Administration Guide</i>	820-4731-10	PDF	Online
Service	<i>Sun Datacenter Switch 3456 Service Manual</i>	820-4733-10	PDF	Online
Reference	<i>Sun Datacenter Switch 3456 Reference Manual</i>	820-4734-10	PDF	Online
Regulatory	<i>Sun Datacenter Switch 3456 Safety and Compliance Guide</i>	820-4735-10	PDF	Online

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*Sun Datacenter Switch 3456 Site Planning Guide*, part number 820-4728-10.



## Cautions and Considerations

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This chapter describes the challenges in preparing the site and installing the Sun Datacenter Switch 3456. This chapter contains the following topics:

- “Chassis Weight” on page 1
- “Chassis Activity Dimensions” on page 3
- “Heat Considerations” on page 3
- “Electrical Considerations” on page 4

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**Note** – A hard copy version of the *Sun Datacenter Switch 3456 Installation Guide* is shipped inside the switch shipping crate. You can also access the guide at this URL: <http://docs.sun.com/app/docs/prod/switch.3456>

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## Chassis Weight

As shipped, the Sun Datacenter Switch 3456 switch chassis and crate weighs approximately 1800 pounds (820 kg). This section describes the effects and behavior of that much mass.

## Moving the Chassis

When moving the chassis from the truck to the unpacking area and to the final location, consider the implications of the chassis weight:

- Traversing any grade requires additional force and personnel to safely move the Sun Datacenter Switch 3456.

- The Sun Datacenter Switch 3456 casters all swivel freely. The chassis responds to the greater of applied forces. This means that a person pushing on one corner to move the chassis also causes the chassis to rotate. So at least two people should push equally on adjacent corners to move the Sun Datacenter Switch 3456.
- When rolling the Sun Datacenter Switch 3456 off of the shipping pallet and down the shipping ramp, the chassis catches at the junction of the pallet and ramp, and has a tendency to rotate. Expect and prepare for this behavior.
- To accelerate the Sun Datacenter Switch 3456 to a walking speed requires effort, time, and distance. To stop the Sun Datacenter Switch 3456 from moving requires the same or more. To accelerate, transport, or stop a Sun Datacenter Switch 3456 requires slow methodical movement, a clear and safe path, and sufficient personnel aware of their actions.



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**Caution** – The Sun Datacenter Switch 3456 chassis cannot be safely moved by one person alone. Never allow any person near the direct path of the Sun Datacenter Switch 3456. Personnel moving the Sun Datacenter Switch 3456 should consciously keep their feet away from the bottom edge of the Sun Datacenter Switch 3456, because this is a pinch point and can cause injury. Personnel moving the Sun Datacenter Switch 3456 should stand to either side of the chassis or behind its direction of motion.

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## Loading by the Chassis

The Sun Datacenter Switch 3456 can only be located on surfaces that can accommodate its weight. The four casters on the Sun Datacenter Switch 3456 chassis have a total contact area of 2 square inches or a loading of 726 psi. This load should not be of concern, if the surfaces or foundations are concrete or reinforced. Unreinforced wood surfaces cannot support the weight of the Sun Datacenter Switch 3456, and even if only temporary during movement, might flex enough to cause bottoming out.

Carpeted surfaces might not be able to survive the stress of the Sun Datacenter Switch 3456 casters, especially when turning. Additionally, movement over carpet is difficult.

# Chassis Activity Dimensions

The following table provides Sun Datacenter Switch 3456 chassis dimensions, and the minimum dimensions needed for unpacking, moving, and the final location.

**TABLE 1-1** Approximate Minimum Chassis Activity Dimensions

Item	Length	Width	Height	Comment
Sun Datacenter Switch 3456 chassis	6 ft (1.8 m)	4 ft (1.2 m)	5 ft (1.5 m)	Dimensions of chassis.
Unpacking space	35 ft (10.7 m)	10 ft (3 m)	9 ft (2.7 m)	To accommodate rollout and crate shell movement
Moving perimeter	15 ft (4.6 m)	10 ft (3 m)	6 ft (1.8 m)	For stopping distance and safety margin.
Installation at final location	12 ft (3.7 m)	12 ft (3.7 m)	6 ft (1.8 m)	To accommodate line card and fabric card installation.
Final location	8 ft (2.4 m)	10 ft (3 m)	6 ft (1.8 m)	Dimensions outside of cable guides, access space only.

## Heat Considerations

This section describes the heat output of the Sun Datacenter Switch 3456 and its potential safety hazard for personnel. This section also describes keeping an open area at the exhaust side, and considerations for other systems and equipment in the area.

### Air Temperature

The calculated approximate air temperature output of the Sun Datacenter Switch 3456 is 36°F (20°C) hotter than the air going in. While this output temperature is not hot enough to burn, this temperature is sufficient to dehydrate and render useless any cooling device in the vicinity.

## Surface Temperature

During operations, the exhaust surfaces, such as the fans mounted to the fabric cards, are at a higher temperature than the exhaust air. Bear this situation in mind when replacing a failed fan, because its temperature can be even greater.

## Other Objects' Temperatures

No object should be in direct contact with the exhaust air. However, occasional hanging cables or drop lamps might happen to be in the stream. Any objects in the exhaust air stream is at an elevated temperature because of this exposure.

## Hot and Cold Aisles

The heat output of a fully configured Sun Datacenter Switch 3456 is approximately 40 KW. The Sun Datacenter Switch 3456s's air mass flow is calculated to approximately 3400 cfm (1.6 m<sup>3</sup>/s), which means that the air exhausted from the switch is 36°F (20°C) degrees hotter than the air going in. As such, the hot aisle for the Sun Datacenter Switch 3456 should be configured to accommodate this heat output and in no way compromise the cooling of other equipment. Do not store any objects in the switch hot aisle. Such objects would interfere with proper air circulation, and might become a safety hazard.

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## Electrical Considerations

This section describes the voltages present and the exposure to active lines during component installation.

### Main Power



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**Caution** – The 16 Sun Datacenter Switch 3456 power supplies require 200 -240 VAC. Take all precautions normally associated with these voltages.

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## Bus Power



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**Caution** – When servicing the Sun Datacenter Switch 3456, bus power is active. Bus power is a low voltage, but very high current. Even the smallest form of short circuit can cause physical injury and severe damage to the Sun Datacenter Switch 3456.

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## Pin Power



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**Caution** – When servicing the Sun Datacenter Switch 3456, pin power and signals are active. While not a shock or burn threat, there is the possibility of damage to the pin, midplane, fabric card, and line card, should a short or grounding take place. Use all precautions associated with working with active signal conductors when servicing the Sun Datacenter Switch 3456.

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# Sun Datacenter Switch 3456 Specifications

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This chapter describes specifications of the Sun Datacenter Switch 3456 chassis, components, and shipping containers. Topics include:

- [“Weight” on page 7](#)
- [“External Dimensions” on page 8](#)
- [“Environmental Specifications” on page 10](#)
- [“Power Consumption” on page 11](#)



## Weight

This section describes minimum and maximum weights of the Sun Datacenter Switch 3456 chassis, components, and the shipping containers.

### Chassis Weight

[TABLE 2-1](#) lists the minimum and maximum chassis weights.

**TABLE 2-1** Chassis Weight According to Configuration

Component	Weight
Bare chassis	992 lb (450 kg)
Chassis as shipped	1433 lb (650 kg)

**TABLE 2-1** Chassis Weight According to Configuration *(Continued) (Continued)*

Component	Weight
Chassis with 18 fabric cards and 1 line card	2128 lb (965 kg)
Chassis fully configured	3043 lb (1380 kg)
Chassis fully configured with cabling and hardware	4325 lb (1966 kg) approximated

## Component Weights

[TABLE 2-2](#) provides the weight of line cards, fabric cards, Chassis Management Controllers (CMC)s, and power supplies.

**TABLE 2-2** Weight of Chassis Components

Component	Weight
Fan module	< 1 lb (0.5 kg)
CMC	< 1 lb (0.5 kg)
Power supply	4.4 lb (2 kg)
Fabric card	36.4 lb (16.5 kg)
Line card	39.7 lb (18 kg)
Splitter cable	0.104 lb/ft (0.155 kg/ m)
Cable tree	66.9 lb(30.4 kg)
Cable tray	7.3 lb (3.3 kg)
Cable plate	3.3 lb (1.5 kg)

## External Dimensions

This section describes external dimensions.



## Chassis External Dimensions

TABLE 2-3 lists the dimensions of the configured chassis, and of the working space around the chassis.

**TABLE 2-3** Chassis Dimensions and Working Space

Dimension	Chassis	Working Space	Total
Length (left right)	71.8 in (1.823 m)	22 in (0.56 m)(left) 22 in (0.56 m)(right)	115.8 in (2.94 m)
Width (front rear)	43.8 in (1.113 m)	44 in (1.12 m)(front) 44 in (1.12 m)(rear)	131.8 in (3.35 m)
Height	62.4 in (1.585 m)	12 in (0.3 m)	74.4 in (1.89 m)

## Component External Dimensions

TABLE 2-4 provides the approximate dimensions of the chassis components.

**TABLE 2-4** Approximate Component Dimensions

Component	Length	Width	Height
Fan module	5.3 in (135 mm)	1.6 in (42 mm)	4.3 in (110 mm)
CMC	14 in (357 mm)	13.9 in (355 mm)	1.2 in (30 mm)
Power supply	10 in (256 mm)	4.2 in (106 mm)	2.8 in (71 mm)
Fabric card	45.5 in (1156 mm)	14.8 in (375 mm)	1.8 in (47 mm)
Line card	42.8 in (1088 mm)	13.3 in (337 mm)	1.6 in (41 mm)
Cable tree	18.9 in (480 mm)	13.3 in (337 mm)	41.3 in (1050 mm)
Cable tray	12.6 in (320 mm)	48.5 in (1233 mm)	0.6 in (15 mm)
Cable plate	8.3 in (211 mm)	9.7 in (246 mm)	2 in (52 mm)

# Shipping Container Dimensions

TABLE 2-5 lists dimensions of the shipping containers and notes regarding storing the containers.

**TABLE 2-5** Shipping Container Dimensions and Notes

Shipping Container Component	Dimensions of Container	Notes for Storage
Chassis	90 in x 40 in x 60 in (2.3 m x 1 m x 1.5 m)	Store as a closed container. Internal space can accommodate many fabric card and line card boxes.
Fabric card and line card	53.7 in x 23.4 in x 5.1 in (1365 mm x 595 mm x 130 mm)	Empty fabric card and line card boxes can be stacked inside of the chassis shipping crate.

## Environmental Specifications

TABLE 2-6 lists environmental specifications for operation and nonoperation of the Sun Datacenter Switch 3456.

**TABLE 2-6** Environmental Specifications

Parameter	Operating Value	Nonoperating Value
Temperature	5 – 35 °C	-40 – 65°C
Humidity	10% RH @ 27°C wet bulb	90% RH @ 27°C
Altitude	3000 m @ 35°C	12,000 m
Shock	3 G, 11 msec, 1/2 sine	1 in roll-off, 20 mm @ 0.75 m/s

# Power Consumption

The Sun Datacenter Switch 3456 has 16 power supplies. [TABLE 2-7](#) provides power supply requirements for supplied power:

**TABLE 2-7** Individual Power Supply Power Requirements

Aspect	Value
Voltage	200 – 240 VAC
Frequency	50 – 60 Hz
Current	13 Amps @ 200 VAC nominal, 14.8 Amps @ 200 VAC maximum

[TABLE 2-8](#) provides a breakdown of the power requirements for the Sun Datacenter Switch 3456 chassis components.

**TABLE 2-8** Chassis Component Power Requirements

Component	Quantity	Standby (3.3 V) Power (each)	Operational (12V) Power (each)	Total for Components
CMC	2	6.27	0	13.54
Fans	144	0	20.04	2885.76
Fabric card	18	2.97	370.44	6721.38
Line card	24	2.97	1235.16	29715.12
Total		138.28	39197.52	39335.80

The total power consumed is also the heat load on the environmental control systems by the Sun Datacenter Switch 3456.



## Partial Configuration

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This chapter describes configuring the Sun Datacenter Switch 3456 with less than a complete configuration. Topics include:

- [“Complete and Base Configurations” on page 13](#)
- [“Configuration Considerations” on page 14](#)
- [“Component Distribution” on page 15](#)

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## Complete and Base Configurations

For maximum functionality, the Sun Datacenter Switch 3456 is designed to be operated in a fully configured state:

- 24 line cards
- 18 fabric cards
- 16 power supplies
- 2 CMCs

If necessary, fewer components can be installed. For example, the base configuration of the switch is:

- 1 line card
- 18 fabric cards
- 6 power supplies
- 2 CMCs

For the base configuration or a partial configuration, filler panels must be installed where there are empty line card and power supply slots.



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**Caution** – Do not configure the Sun Datacenter Switch 3456 with fewer than 18 fabric cards installed. Thermal requirements will not be satisfied.

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## Configuration Considerations

### Filler Panels

To maintain proper airflow for adequate cooling, filler panels must be installed in vacant line card and power supply slots. Besides directing airflow, the filler panels close openings to the Sun Datacenter Switch 3456 chassis, preventing intrusion of objects and contaminants to the chassis interior.

### Line Card Distribution

Line cards are installed from the center out, across the available slots. The vacant slots must have filler panels installed. For example, if only 12 line cards are to be installed, they would occupy slots 6 through 17. Filler panels are installed in the vacant slots (0 through 5 and 18 through 23).

### Power Supplies

Power supplies are configured in a need+1 redundancy. A fully configured Sun Datacenter Switch 3456 with 24 line cards and 18 fabric cards needs 14 power supplies. Two power supplies act as redundant, one for each power bus. The power supply slots are hard-wired to two power buses. Power supplies installed in the lower row (PS0, PS1, and so on to PS7), provide power to line card slots 0 to 11 and fabric card slots 9 to 17. Power supplies installed in the upper row (PS8, PS9, and so on to PS15), provide power to line card slots 12 to 23 and fabric card slots 0 to 8.

TABLE 3-1 lists the maximum number of line cards that are supported for a given number of power supplies.

TABLE 3-1 Maximum Quantity of Line Cards for Quantity of Power Supplies

Quantity of Power Supplies	Maximum Supported Line Cards
6	2
8	6
10	10
12	16
14	20
16	24

## Component Distribution

If you are configuring less than a complete Sun Datacenter Switch 3456, you can incrementally add and distribute line cards and power supplies to the empty slots in the left-to-right order described by TABLE 3-2:

TABLE 3-2 Incremental Configuration

Quantity of Line Cards																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Line Card Slot	11	12	10	13	9	14	8	15	7	16	6	17	5	18	4	19	3	20	2	21	1	22	0	23
Power Supply Slots	2, 4, 6, 9, 11, 13		0, 15				7, 8				3, 12					1, 14				5, 10				

For example, if you were to configure the switch with only one line card, you would install the line card into slot 11. You would also install power supplies into slots 2, 4, 6, 9, 11, and 13, in that order.

If you were to configure the switch with ten line cards, you would install the line cards into slots 11, 12, 10, 13, 9, 14, 8, 15, 7, and 16, in that order. You would also install power supplies into slots 2, 4, 6, 9, 11, 13, 0, 15, 7, and 8, in that order.

[TABLE 3-3](#) provides suggested configurations, based upon a fraction of the complete configuration.

**TABLE 3-3** Suggested Configurations

Configuration	Quantity of Line Cards	Line Card Slots	Power Supply Slots
Base	1	11	2, 4, 6, 9, 11, 13
1/8	3	11, 12, 10	2, 4, 6, 9, 11, 13, 0, 15
1/4	6	11, 12, 10, 13, 9, 14	2, 4, 6, 9, 11, 13, 0, 15
3/8	9	11, 12, 10, 13, 9, 14, 8, 15, 7	2, 4, 6, 9, 11, 13, 0, 15, 7, 8
1/2	12	11, 12, 10, 13, 9, 14, 8, 15, 7, 16, 6, 17	2, 4, 6, 9, 11, 13, 0, 15, 7, 8, 3, 12
5/8	15	11, 12, 10, 13, 9, 14, 8, 15, 7, 16, 6, 17, 5, 18, 4	2, 4, 6, 9, 11, 13, 0, 15, 7, 8, 3, 12
3/4	18	11, 12, 10, 13, 9, 14, 8, 15, 7, 16, 6, 17, 5, 18, 4, 19, 3, 20	2, 4, 6, 9, 11, 13, 0, 15, 7, 8, 3, 12, 1, 14
7/8	21	11, 12, 10, 13, 9, 14, 8, 15, 7, 16, 6, 17, 5, 18, 4, 19, 3, 20, 2, 21, 1	2, 4, 6, 9, 11, 13, 0, 15, 7, 8, 3, 12, 1, 14, 5, 10

Because the line cards are equally distributed across the available slots, cabling rules and lengths still apply. See [Chapter 6](#).



## Location Requirements

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This chapter discusses the location equipment, spatial, and loading requirements and other requirements. Topics include:

- [“Equipment to Unload and Move” on page 17](#)
- [“Path to Final Location” on page 18](#)
- [“Final Location” on page 21](#)
- [“Administration” on page 22](#)
- [“Pin Repair Kit” on page 23](#)

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## Equipment to Unload and Move

This section describes the tools to unload the Sun Datacenter Switch 3456 from the truck, and move it to the final location. Ratings of the forklifts, pallet jacks, and other equipment.

### Forklift

If a forklift is used for moving the shipping crates, it must be rated for at least 2000 lbs. (910 kg) lift. The forks must extend at least 4 ft (1.3 m), the width of the chassis shipping crate.

Follow these guidelines when using a forklift for moving the shipping crates:

- Stack fabric card or line card shipping crates no more than four high for movement.
- When moving a crate, raise it only high enough to enable movement or clear any floor obstructions (thresholds).



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**Caution** – Do not use a forklift for moving the Sun Datacenter Switch 3456 chassis. There is not enough clearance for the forks under the chassis. Lifting from any location on the chassis is not possible and can damage the chassis.

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## Pallet Jack

If a pallet jack is used for moving the shipping crates it must be rated for at least 2000 lbs. (910 kg) lift. Stack fabric card or line card shipping crates no more than four high for movement.

## Other Equipment

Do not use the following for moving crates:

- Server lift
- Hand truck
- Hand cart

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**Note** – These devices can be used for moving cardboard shipping boxes, however.

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## Path to Final Location

This section address obstructions or hindrances along the route from the unpacking site to the final location.

## Security Systems

The path to the final location might need the Sun Datacenter Switch 3456 to move through a secure area. Sensors for intrusion, movement, doors opening, and so on, must be disabled, or else a false alarm might sound.

Consider the impact of the path to the final location on the security of the building. Are the personnel entering or passing through an area that they are not authorized to do so?

Consult with the security services before moving the Sun Datacenter Switch 3456. This way, security is not surprised if intrusion and door alarms are activated. Additionally, security might be able to provide an alternative route that has less impact to building security.

## Signage

If the path to the final location has high foot traffic, consider posting signs and providing email informing personnel of the move. This action alerts uninvolved personnel to avoid the path, which eases the movement of the Sun Datacenter Switch 3456 and reduces the possibility of complications or injuries.

## Carpets

The Sun Datacenter Switch 3456 chassis cannot roll on carpet without great effort. Plan a path to the final location that avoids carpeted areas. If carpeting cannot be avoided, place sheet metal or masonite panels over the carpeting to make the chassis roll more easily.

You do not need to place panels on the entire carpeted path. Use enough to support the chassis and provide the chassis a surface to roll on. For example, if you use 3 ft x 5 ft (0.91 m x 1.52 m) masonite panels, three panels support the chassis, while a fourth panel can be laid in front of the chassis in the direction of travel. Once the chassis has rolled off the rear-most panel, lift that panel and move it to the front. Repeat this process down the path over carpeting.

## Grades

The Sun Datacenter Switch 3456 chassis weighs 1433 pounds (650 kg) as shipped. Any grade along the path requires additional effort to move the chassis, or prevent the chassis from moving. Do not attempt to move the chassis up or down a grade greater than 3%.

Additionally, the Sun Datacenter Switch 3456 chassis is equipped with antitilt bars that are mounted at the centerline. The presence of the bars limits the clearance movement to 0.5 inch (12 mm). When a chassis peaks a grade of 3% or greater, the antitilt bars bottom out.

## Elevators

If the path to the final location requires use of an elevator, ensure that the elevator can safely accommodate the weight of the Sun Datacenter Switch 3456 chassis and the personnel moving it.

The elevator doors must be wide enough to allow the Sun Datacenter Switch 3456 to pass, ideally with personnel alongside. The doors might need to be held open, either physically, or by pressing the door open button within the elevator.

Verify that the threshold at the elevator doors permits the chassis to enter and exit the elevator. The gap between the floor and elevator should not be too large, nor should there be any height difference. Check this gap at both the entering and exiting floors. If there are any minor discrepancies, a metal sheet or masonite panel can be used to compensate.

## Doors

Doors must open wide enough to accommodate the Sun Datacenter Switch 3456 chassis and personnel alongside. Additional personnel can hold doors open, or the doors can be securely propped open using wedges or catches. Do not hold doors open with chairs or other easily available objects. Such objects do not guarantee a secure door and can diminish the space for moving the chassis.

## Thresholds and Gaps

The path to the final location might have building expansion joint gaps, carpet runners, door thresholds, or other inconsistencies in an otherwise smooth surface. When these obstructions cannot be avoided, use metal plates or masonite panels to compensate for the irregularities. Should a gap be too great, or a threshold too high, the panel might break. In this situation, an alternative path to the final location must be found.

## Path

### Surface

The path, regardless of surface, should be clean and free of any obstructions. Obstructions include trash, cables, fasteners (screws, nuts, paper clips, thumbtacks, tie wraps, and so on), any scrap (pencils, pens, papers, and so on), or small object

that might hinder movement. A quick sweeping of the path to the final location before moving the Sun Datacenter Switch 3456 can remove most objects that might later prove troublesome.

## Turns

Ensure that any turns in the path to the final location allow unhindered movement of the chassis. Avoid narrow hallways and tight turns, because they create opportunities for injury.

Check the path before moving the Sun Datacenter Switch 3456. If you are in doubt of the chassis' ability to navigate a certain section of a building, a make-shift framework, constructed of duct-taped sticks for example, can give an idea of the path's viability. Walk the framework through the path to the final location. If there is any situation where the framework binds, then the chassis will also.

If a tight turn cannot be avoided, consider adding protection to the walls of the inside corners of the turn. Additionally, consider adding protection to the corners of the Sun Datacenter Switch 3456 chassis.

---

## Final Location

This section describes the design and capabilities of the final installation location. Can the floor take the load, what re-enforcements are needed, and so on.

## Floor Design and Loading

A fully configured and cabled Sun Datacenter Switch 3456 weighs in excess of 4325 pounds (1966 kgs). The loading is over an area of 3 x 6 feet (0.9 x 1.8 meters). Yet, the true stress of the weight is over the four casters and four leveling feet. The casters have a combined contact area of 2 square inches (13 cm<sup>2</sup>), as does each of the leveling feet. The 4325 pound weight is distributed over 10 square inches (65 cm<sup>2</sup>), or approximately 432 psi (30.2 kg/cm<sup>2</sup>). Since the leveling feet are adjacent to the casters, each corner of the chassis bears 1081 pounds (491 kg). Initially, these two values seem trivial, but consider that the loading is not equally distributed. If a caster and leveling foot are located in the center of a raised floor tile, that tile bears the 1081 pounds (491 kg) load. The floor tile and underlying supports must be able to accommodate this load.

## Working Space

Once in its final location, the Sun Datacenter Switch 3456 requires a certain amount of working space for the installation of fabric cards, line cards, power cables, and IB cables.

When installing or servicing the Sun Datacenter Switch 3456, consider these conditions to working space:

- Front – Allow at least 4 feet to enable pin inspection, line card installation, cable tree and cable tray installation, and IB cable installation.
  - Rear – Allow at least 3 feet to enable pin inspection, fabric card installation, and power supply cable installation.
  - Sides – Allow at least 3 feet for cable tree and cable plate installation, and for movement around the chassis.
- 

## Administration

This section describes what computing or system resources are allocated to the administration and management of the Sun Datacenter Switch 3456.

### Dedicated Servers

The Sun Datacenter Switch 3456's design is to network many high performance computing machines. To communicate with the Sun Datacenter Switch 3456, servers to interface with the switch are needed.

The Sun Datacenter Switch 3456 uses a mini computer in each CMC to monitor and administrate components on the IPMB bus. The mini computer is called the shelf manager, and it has a command interface to send commands to and receive information from components on the IPMB bus. Communicating with the shelf manager and issuing commands is done through either the serial management port or network management port of the CMC. Typically, a terminal server or networked server is used for this task.

The administration of the routing achieved by the Sun Datacenter Switch 3456 is done using a subnet manager. This software is run on a server external to the switch.

# Interfaces

## Switch-Specific Interface

There are switch-specific commands available at the shelf manager prompt. These commands utilize scripts and CLIA interface commands to simplify some switch administration activities.

## CLIA Interface

The CLIA interface is invoked with the `clia` command at the shelf manager prompt.

```
# clia  
cli>
```

Alternatively, commands for the CLIA interface can be run with the `clia` command:

```
# clia subcommand
```

Switch-specific commands and subcommands for the CLIA interface are discussed in the *Sun Datacenter Switch 3456 Administration Guide* and *Sun Datacenter Switch 3456 Reference Manual*.

## Linux Interface

The shelf manager also has a Linux command-line interface and minimal file system.

---

## Pin Repair Kit

In the event that a midplane connector pin is damaged, severely bent, or broken, it must be replaced. Replacement is accomplished using a pin repair kit, available from Molex.





# Environmental Requirements

---

This chapter describes the environmental requirements of the Sun Datacenter Switch 3456. Topics include:

- [“Heat and Airflow” on page 25](#)
- [“Electric Power” on page 28](#)

---

## Heat and Airflow

This section describes the cooling requirements of the Sun Datacenter Switch 3456, and its airflow.

### Heat Generated That Has to Be Replaced

In the maximum configuration, the Sun Datacenter Switch 3456 switch consumes 40 KW. This is the additional heat load to the environmental systems of the room where the Sun Datacenter Switch 3456 is installed.

Though the airflow through the chassis is great, the resulting thermal output creates a larger heat density in the locality of the Sun Datacenter Switch 3456. As such, the air conditioning system must accommodate a more localized heat source and therefore, might require additional ducting or chillers in the vicinity of the Sun Datacenter Switch 3456.

If cabling to the Sun Datacenter Switch 3456 is routed overhead, this might complicate the cooling solution.

## Air Flow and Thermal Channels

In a fully configured Sun Datacenter Switch 3456, the total air flow through the line cards and fabric cards is calculated as approximately 3400 cfm (1.6 m<sup>3</sup>/s) and the temperature change of intake air in the cool aisle to the exhaust air in the hot aisle is 36°F (20°C). When contrasted with the output temperature of other systems, if the hot aisle is too narrow, or the airflow from the opposing systems too low, the Sun Datacenter Switch 3456 has the ability to heat the opposing systems. It is important to consider this possibility when determining the location of the Sun Datacenter Switch 3456 with respect to other systems.

Also consider that the air flow rate through the Sun Datacenter Switch 3456 can cause a low pressure region in the cool aisle immediately in front of the Sun Datacenter Switch 3456. If this aisle is narrow in regard to the opposing systems, the Sun Datacenter Switch 3456's air flow might reduce the air flow in the opposing systems, affecting their cooling.

Because the Sun Datacenter Switch 3456 is a central component of a Sun Blade™ 6048 Modular System cluster, it follows that its physical location within the cluster is also central. Use this fact when planning the location and routing of cooling and return air.

## Near Stationary Objects

Basic thermal planning guidelines suggests a hot aisle width of 2 feet for two opposed systems. The guidelines also state that this situation is identical to a stationary object, such as a wall, being half that distance. It is not advised to have such a narrow hot aisle with the Sun Datacenter Switch 3456 switch. Allow at least 3 feet from the exhaust (fan surface) of the Sun Datacenter Switch 3456 to any wall.

Even with this distance to the wall, consider the following:

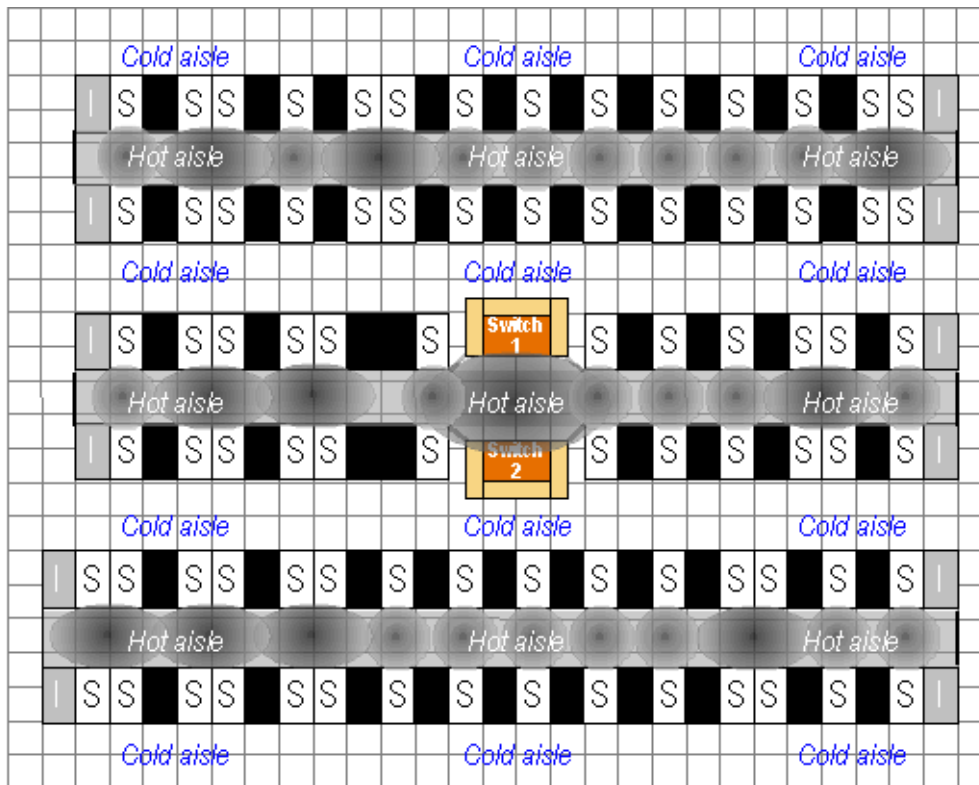
- The wall will become warm to the touch, possibly as hot as the exhaust surface of the Sun Datacenter Switch 3456.
- Any object in the exhaust area, including the wall, experiences accelerated aging and oxidation.
- Any personnel entering the exhaust area will feel uncomfortably warm. Prolonged exposure might cause dehydration.

## Near Other Heat Sources

Most likely, the Sun Datacenter Switch 3456 is the hottest object in the data center. As discussed previously, it has a large heat density. Consider the heat density of other systems and objects in the vicinity of the Sun Datacenter Switch 3456 when determining the cooling configuration.

FIGURE 5-1 describes a simplified thermal mapping of the Sun Datacenter Switch 3456 in the datacenter.

**FIGURE 5-1** Simplified Thermal Map



The floorplan shown in FIGURE 5-1 has two switches and 82 racks of servers, denoted by the letter 'S'. The black rectangles are rackmounted power backup, conditioning, and distribution units. The grey rectangles denoted with the letter 'I' are rackmounted I/O controllers and interfaces. To improve thermal characteristics, the hot aisles are closed so that hot aisle/cold aisle mixing is not possible.

# Example Situation

When configuring the hot aisle for the switch and other systems, consider the to wall dimensions as your separation distance. For example, the Sun Datacenter Switch 3456 requires at least 3 feet spacing between the exhaust fan surface and a wall. If the opposing system has a similar to wall requirement, such as 1 foot, then the separation between the switch and the system should be  $3 + 1 = 4$  feet.

## Electric Power

This section describes the power requirements for the Sun Datacenter Switch 3456.

### Power Delivery

Each Sun Datacenter Switch 3456 power supply should be shunted through a circuit breaker for facility power. The cabling from the circuit breaker, through the conduit to the power receptacles should be capable of providing the following power, and conform to local codes.

- 200 to 240 VAC
- 15 Amps @ 200 VAC

TABLE 5-1 lists cables available from Sun for the power supplies.

TABLE 5-1 Power Delivery Requirements

Part Number	Cable Description	Comment
180-2005-xx	4 m cable with NEMA L6-20P plug	20 A cable has a twist-lock connector.
180-2004-xx	4 m cable with 16A IEC60309 plug	16 A cable is for European standards.
180-2060-xx	4 m cable with Hubbell C320P6W plug	20 A cable and connector is water-resistant.
180-2061-xx	4 m cable with Hubbell C320P6W plug	16 A cable and connector is water-resistant.

### Power Backup

For the Sun Datacenter Switch 3456 to remain operational during a blackout, a back-up power source must be made available. The power draw of 40 KW means that battery backup is not possible, and a generator is required.

The current backup power solution of the data center might be able to accommodate the additional 40 KW draw. If not or you are uncertain, consult with your facilities or building manager and seek additional assistance to install more or larger generators or reconfigure the loads on the existing generators.

## Power Cables

### Cable Conduit

The Sun Datacenter Switch 3456 has 16 power supplies at its lower backside, Each power supply has a 200 - 240 volt power connector. The routing of power to the Sun Datacenter Switch 3456 can be either from above or from below. In either situation, the power cables from the power supplies must not interfere with access to the back of the Sun Datacenter Switch 3456 for installation, maintenance, or service. The cables are best routed to either side of the Sun Datacenter Switch 3456, immediately exiting the power supply.

Additionally, if power for the Sun Datacenter Switch 3456 is to be delivered from overhead, such conduits must not restrict or interfere with the airflow out the back of the Sun Datacenter Switch 3456.

### Circuit Breakers

For ease of operation, power to the Sun Datacenter Switch 3456 should be distributed through independent circuit breakers, one for each power supply. In this manner, better safety is achieved and minimal impact is received should a power supply over load or fail.

### Local Codes

All power cabling, conduits, and supporting equipment must be installed and energized according to local code.



## InfiniBand Cabling Requirements

---

This chapter describes requirements for the InfiniBand cabling to the Sun Datacenter Switch 3456. Topics include:

- “IB Cable Cautions” on page 31
- “IB Cable Routing” on page 32
- “IB Cable Length” on page 33
- “Cable Connection” on page 36

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### IB Cable Cautions



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**Caution** – Do not allow any IB cable to bend through a less than 5 inch (127 mm) radius. Tight bends can break the cable internally.

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**Caution** – Do not use zip ties to bundle or support IB cables. The sharp edges of the ties can break the cables internally

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**Caution** – Do not allow any IB cable to experience extreme tension. Do not pull on an IB cable or allow it to drag. Unroll an IB cable for its length. Pulling on an IB cable can break the cables internally.

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**Caution** – Do not twist an IB cable more than 1 revolution for its entire length. Twisting an IB cable can break the cable internally.

---



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**Caution** – Do not route IB cables where they might be stepped upon or experience rolling loads. Such a crushing effect can break the cable internally.

---

## IB Cable Routing

### Bundling IB Cables

When bundling IB cables in groups, use hook and loop straps to keep cables organized. If possible, use color-coordinated straps to help identify cables and their routing. The IB splitter and 4X cables are fairly thick and heavy for their length. Consider the retention strength of the hook and loop straps when supporting cables. Bundle as few cables as reasonably possible. If the IB cables break free of their straps and fall free, the cables might break internally when they strike the floor or are jerked from tension.

### Floor and Underfloor Delivery of IB Cables

The Sun Datacenter Switch 3456 was designed to accept IB cables from floor or underfloor delivery. The cable plates on the sides of the switch support the weight of the IB cables. Each plate supports 96 IB cables in eight rows of 12.

Floor and underfloor delivery limits the tension in the IB cable to the weight of the cable for the height of the Sun Datacenter Switch 3456 switch.

### Overhead Delivery of IB Cables

For overhead delivery, it is suggested that cable trays and lattices be used to support the IB cables. A fully configured Sun Datacenter Switch 3456 has over 1150 IB cables, so it is important to distribute the load of the cables over as many supports as reasonably possible.

The cable plates attached to the sides of the Sun Datacenter Switch 3456 chassis cannot support cable weights from above. However, they can be used for cable organization.



If the overhead delivery has a large drop height, consider using an intermediate support for the IB cables. Use of the support can limit the tension in the IB cable to the weight of the cable for the distance between the supports and the Sun Datacenter Switch 3456.

# IB Cable Length

Ideally, cables should be as short as possible. When the length of a cable has been calculated, select the shortest cable to satisfy the length requirement. When specifying a cable, consider the following:

- Bends in the cable path increases the required length of the cable. Rarely does a cable travel in a straight line from connector to connector. Bends (of a minimum 5 in (127 mm) radius) in the cable are necessary, and with each bend, an increase in the total length.
- Bundling increases the required length of the cables. Bundling causes one or more cables to follow a common path. Yet the bend radius is different in different parts of the bundle. If the bundle is large, unorganized, and there are many bends, one cable might experience only the inner radius of bends, while another cable might experience the outer radius of bends. In this situation, the differences of the required lengths of the cables is quite substantial.
- If you are routing the IB cable under floor, consider the height of the raised floor when calculating cable length.

# Cable Type and Length

TABLE 6-1 lists the cables available for the Sun Datacenter Switch 3456, their length, and data rate.

TABLE 6-1 IB Cables for the Sun Datacenter Switch 3456

Cable Type	Length	Data Rate
Standard Sun IB 12x to 12x	3 m	Passive DDR
Standard Sun IB 12x to 12x	5 m	Passive DDR
Standard Sun IB 12x to 12x	7 m	Active DDR
Standard Sun IB 12x to 12x	11 m	Active DDR
Standard Sun IB 12x to 12x	15 m	Active DDR

**TABLE 6-1** IB Cables for the Sun Datacenter Switch 3456 *(Continued) (Continued)*

Cable Type	Length	Data Rate
Splitter Sun IB 12x to 3 by 4x	8 m	Active DDR
Splitter Sun IB 12x to 3 by 4x	12 m	Active DDR
Splitter Sun IB 12x to 3 by 4x	16 m	Active DDR

## Determining IB Cable Path Length at Sun Datacenter Switch 3456

The following tables help you determine the length of cable required to plug into a line card connector, lay on a cable tray, pass through the cable tree, lay over the cable plate, and touch the floor. To find this path length, add the lengths of the route through the cable tree, to and from the cable plates, over the cable plates, and if the connection is at B, add an additional 0.67 in (17 mm).

**Note** – The values provided in the following tables are approximated from calculations of metric measurements taken from an early prototype of the Sun Datacenter Switch 3456 configured with pass-through IB cables. The lengths are not exact. You should round-up the values to the next reasonable length, so as to compensate for changes in path or bundling which are not ideal.

**Note** – The shaded cells of the tables are values used in the example following the tables.

Use [TABLE 6-2](#) to find the length of cable path from a connector group through the cable tree. The values in [TABLE 6-2](#) are the same for all line cards.

**TABLE 6-2** Cable Lengths From Connector Group Through Cable Tree

Connector	0, 23	1, 22	2, 21	3, 20	4, 19	5, 18	6, 17	7, 16	8, 15	9, 14	10, 13	11, 12
Length in (mm)	22.05 (560)	24.17 (614)	26.38 (670)	28.66 (728)	30.98 (787)	33.35 (847)	35.71 (907)	38.11 (968)	40.55 (1030)	42.99 (1092)	45.39 (1153)	47.87 (1216)

Use [TABLE 6-3](#) to find the length of the cable path from the cable tree to the cable plate and from the cable plate to the floor.

**TABLE 6-3** Cable Lengths From Cable Tree to Cable Plate and Cable Plate to floor

Line cards	0, 1, 2, 3	4, 5, 6, 7	8, 9, 10, 11	12, 13, 14, 15	16, 17, 18, 19	20, 21, 22, 23
Length in (mm)	23.94 (608)	33.7 (856)	44.25 (1124)	53.86 (1368)	64.29 (1633)	74.37 (1889)

Use [TABLE 6-4](#) to find the length of the cable path over the cable plate.

**TABLE 6-4** Cable Lengths Over the Cable Plate

Line cards	0, 4, 8, 12, 16, 20	1, 5, 9, 13, 17, 21	2, 6, 10, 14, 18, 22	3, 7, 11, 15, 19, 23
Length in (mm)	9.33 (237)	10.71 (272)	12.05 (306)	13.43 (341)

For example, how long is the cable path from connector 1B on line card 17 to the floor?

24.17 ([TABLE 6-2](#)) + 64.29 ([TABLE 6-3](#)) + 10.71 ([TABLE 6-4](#)) + 0.67 (connector B) = 99.84 in (2536 mm)

The range of cable path lengths vary from:

- Shortest, 55.32 in (1405 mm) – Connector 0A or 23A in line card 0
- Longest, 136.34 in (3463 mm) – Connector 11B or 12B in line card 23

As seen in [TABLE 6-1](#), the shortest cable length is 3 m, yet cable paths can be longer than 3 m. [TABLE 6-5](#) lists the cable paths greater than 3 m.

**TABLE 6-5** Cable Paths Greater than 3 m

Line Card	Connector Groups
LC23	4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19
LC22	5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18
LC21	5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18
LC20	6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17
LC19	8, 9, 10, 11, 12, 13, 14, 15
LC18	9, 10, 11, 12, 13, 14
LC17	9, 10, 11, 12, 13, 14
LC16	10, 11, 12, 13

---

**Note** – Considering the number and range of cable lengths supported by the cable management hardware, if the cable weighs 0.104 lb/ft (0.155 kg/m), then a fully configured Sun Datacenter Switch 3456 has an approximate additional weight of 942.7 lbs (428.5 kgs) from just the cables.

---

## Cable Connection

When the Sun Datacenter Switch 3456 is initially installed, cables are attached starting at the lowest line card and working up to the top line card. This method keeps an open area above the immediate connection. Once the Sun Datacenter Switch 3456 is fully configured, removing and attaching cables becomes more difficult. The free space surrounding an attached cable is fairly tight. Likewise, connecting a cable in such tight quarters is difficult.

## Personnel Requirements

---

This section describes the people who work with the Sun Datacenter Switch 3456. Topics include:

- [“Installation Personnel” on page 37](#)
- [“Administration Personnel” on page 38](#)
- [“Maintenance and Service Personnel” on page 39](#)

---

## Installation Personnel

This section describes the personnel who installs the Sun Datacenter Switch 3456. Installation is a hands-on role.

## Installation Responsibilities

The personnel who installs the Sun Datacenter Switch 3456 must be fully capable of the following tasks:

- Use of basic hand tools
- Operation of forklift or pallet jack
- Strong enough to move a somewhat heavy object
- Competent to level a heavy object
- Meticulous inspection of thousands of very small objects
- Perform electrical testing
- Work in synchronization with others
- Connect cables
- Use computers

- Perform software tasks of an administrative nature

## Installer Education and Experience

The following list describes education and experience that is beneficial when installing a Sun Datacenter Switch 3456:

- Basic hand tool use
  - Basic mathematics
  - Basic physics
  - Basic electricity
  - Basic networking
  - Basic system administration
  - High school diploma
  - Degree in engineering (preferred)
- 

## Administration Personnel

This section describes the personnel who administers or manages the Sun Datacenter Switch 3456. This is a remote role.

## Administration Responsibilities

The person who administers the Sun Datacenter Switch 3456 must be fully capable of the following tasks:

- Use of computers and networking equipment
- Troubleshoot problems and implement solutions
- Perform administrative tasks
- Authorized to enable, disable, and change hardware operating parameters
- Responsible for mission-critical and highly available systems
- Competent to make decisions which impact others and operations

## Administrator Education and Experience

The following list describes education and experience that is beneficial when administering a Sun Datacenter Switch 3456:

- Advanced computing topics
  - Advanced networking topics
  - UNIX shell and other command line interfaces
  - Advanced system administration
  - BS degree in computer science (preferred)
- 

## Maintenance and Service Personnel

This section describes the personnel who services the Sun Datacenter Switch 3456. Servicing the switch is a hands-on role.

## Maintenance and Service Responsibilities

The person who services the Sun Datacenter Switch 3456 must be fully capable of the following tasks:

- Use of basic hand tools
- Strong enough to lift and align a heavy object
- Meticulous inspection of thousands of very small objects
- Perform electrical testing
- Connect cables
- Interpret indicators
- Use computers
- Perform system administration tasks
- Recognize problems and deduce solutions

## Maintenance and Service Education and Experience

The following list describes education and experience that is beneficial when maintaining or servicing a Sun Datacenter Switch 3456:

- Basic hand tool use
- Basic mathematics
- Basic physics
- Basic electricity
- Basic networking
- Basic system administration
- College degree (engineering preferred)



## Site Planning Checklist

---

This section provides a checklist of items to be completed before installation of the Sun Datacenter Switch 3456 switch. Topics include:

- “Thermal Checklist” on page 41
- “Power Checklist” on page 41
- “Network Checklist” on page 42
- “Location Checklist” on page 42
- “Personnel Checklist” on page 43

---

### Thermal Checklist

- \_\_\_\_ Are the environmental systems capable of supporting the Sun Datacenter Switch 3456’s 40KW heat load requirement?
- \_\_\_\_ Has additional cooling capacity been installed, if necessary?
- \_\_\_\_ Have ducting and other delivery devices been installed to provide cooled air to the Sun Datacenter Switch 3456?
- \_\_\_\_ Has the effect of the heat output from the Sun Datacenter Switch 3456 on other systems been considered?

---

### Power Checklist

- \_\_\_\_ Is there enough available power to support the Sun Datacenter Switch 3456?
- \_\_\_\_ Has the power been properly routed and conditioned to the final location?

- \_\_\_\_ Has the cabling, conduit, and supporting hardware been installed and is the hardware up to local code?
- 

## Network Checklist

- \_\_\_\_ Has the network topology been determined?
  - \_\_\_\_ Has the hardware to support the IB cables been specified and installed?
  - \_\_\_\_ Has the length of each IB cable been determined?
  - \_\_\_\_ Have the IB cables been properly routed and bundled?
- 

## Location Checklist

- \_\_\_\_ Is there a forklift or pallet jack available for moving the shipping crates?
- \_\_\_\_ Are the proper tools available for installation?
- \_\_\_\_ Is there enough space to unpack the Sun Datacenter Switch 3456 from the shipping crate?
- \_\_\_\_ Have you considered the weight of the Sun Datacenter Switch 3456 and its loading on the floor at the final location?
- \_\_\_\_ Was reinforcement of the floor at the final location done, if necessary?
- \_\_\_\_ Have you determined a path to the final location that can accommodate the Sun Datacenter Switch 3456's size and weight, along with the personnel moving the switch?
- \_\_\_\_ Has the path to the final location been prepared for the Sun Datacenter Switch 3456 transport?
- \_\_\_\_ Is there enough working space at the final location?
- \_\_\_\_ Have the administration servers been determined?
- \_\_\_\_ Have the administration servers been configured?
- \_\_\_\_ Has a pin repair kit been acquired?
- \_\_\_\_ Have the cable connection tools been acquired?

---

## Personnel Checklist

- \_\_\_\_ Have the installation personnel been determined?
- \_\_\_\_ Has the Sun Datacenter Switch 3456 administrator been determined?
- \_\_\_\_ Have the Sun Datacenter Switch 3456 service personnel been determined?



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