Sun Blade 6048 Modular System

Site Planning Guide

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Using this Documentation

The *Sun Blade 6048 Modular System Site Planning Guide* provides the data center site requirements for the installation of Oracle's Sun Blade 6048 modular system.

It includes detailed physical, electrical, power, and cooling specifications, as well as recommendations for compatible cabinets. This document is written for data center administrators who have advanced experience maintaining a data center environment and for experienced system installers.

Product Updates

For product updates navigate to your product from the following web site:

`http://www.oracle.com/us/products/servers-storage/servers/blades/index.html`

This site contains updates for firmware and drivers, as well as CD-ROM `.iso` images.

Related Documentation

For a description of the document set for the Sun Blade 6048 or Sun Blade 6000 modular system, see the *Where To Find Documentation* sheet that is packed with your system and also posted at the product's documentation site. See the following web site, then navigate to your product.

`http://docs.oracle.com`

Translated versions of some of these documents are available at the documentation web site in French, Simplified Chinese, Traditional Chinese, Korean, and Japanese. English documentation is revised more frequently and might be more up-to-date than the translated documentation.

It is important that you review the safety guidelines in the following document:

Sun Blade 6000 and Sun Blade 6048 Modular System Safety and Compliance Guide (E26034).

CHAPTER

Site Planning for the Sun Blade 6048 Modular System

This guide provides system specifications and site requirements you must meet when planning to install the Sun Blade 6048 modular system in your data center.

For safety and compliance information, refer to the *Sun Blade 6000 and Sun Blade 6048 Modular System Safety and Compliance Guide* (E26034) and the *Important Safety Information for Sun Hardware Systems* (816-7190).

This site planning guide is organized as follows:

- "Customer Obligations" on page viii
- "System Configuration" on page viii
- "Preparing the Site Before the System Arrives" on page viii
  - "Load-Bearing and Handling Precautions" on page ix
  - "Power and Electrical Requirements" on page ix
  - "Power Budgeting" on page x
  - "Cooling Requirements" on page xi
  - "Temperature and Humidity Requirements" on page xi
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- "Route to the Data Center" on page xiii
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  - "Secure Installation Requirements" on page xiv
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- "System Specifications" on page xiv
- "Regulatory Compliance" on page xviii
- "Site Planning Checklist" on page xx

Customer Obligations

The customer is obliged to inform Oracle, Inc. of any and all ordinances and regulations that affect the installation. The customer is responsible for meeting all local, national, and international government codes and regulations concerning facilities, such as safety, building, and electrical codes.

System Configuration

The Sun Blade 6048 modular system consists of four shelves, with the following maximum configuration for each shelf:

- 12 server modules
- 1 chassis management module (CMM)
- 24 PCI ExpressModules (PCI EM)
- 2 network express modules (NEMs)
- 2 power supplies
- 8 rear fan modules

Preparing the Site Before the System Arrives

Install the Sun Blade 6048 modular system in accordance with the local safety codes and regulations at the facility site. You must be familiar with and adhere to the safety precautions in the *Sun Blade 6000 and Sun Blade 6048 Modular System Safety and Compliance Guide* (E26034).

Do not make mechanical or electrical modifications to the equipment. Oracle, Inc. is not responsible for regulatory compliance of a modified Oracle product.

Load-Bearing and Handling Precautions

A fully configured Sun Blade 6048 modular system can weigh in excess of 2500 pounds (1134 kg) while in its shipping container, and 2300 pounds (1044 kg) when unpacked. Any floor that this system will cross, or surface on which the system is placed, must be able to support these loads.

The system is shipped on a pallet. You must maintain the system in a vertical, upright position while it is in its shipping container. Be sure you use enough personnel when moving the system, especially on sloping loading docks and ramps, to gain access to a raised computer room floor. Move the system slowly and deliberately, and ensure that the floor is free of foreign objects, cables, or other obstructions.

Power and Electrical Requirements

The Sun Blade 6048 modular system uses two 200-240V, 8400W power supply modules per shelf. The amount of power that the system consumes is dependent on its configuration, that is, the number of active modular components installed. To determine the power redundancy requirements, you need to know:

- Source power available
- Power consumption (depends on component configuration)
- Redundancy level required

The system requires a minimum of two AC inputs per shelf. To provide 2N power redundancy at a 8400 W consumption level, and to ensure that the system can tolerate a loss of one power supply, the system should never exceed 9375 W per shelf of power consumption at any given time.

The power requirements for different components in the Sun Blade 6048 System are provided via the power calculator:

http://www.oracle.com/us/products/servers-storage/sun-power-calculators/calc/6048chassis-power-calculator-161608.html

The AC power requirements for the Sun Blade 6048 modular system are summarized in TABLE -4.

The data center must meet the following electrical requirements for installation of a Sun Blade 6048 System:

- Four 200–240 VAC, 16A/20A branch circuits, one for each of the AC inlets on the system, are required.

- The connection to the Sun Blade 6048 Chassis AC inlet requires the following types of power cords, dependent on site location. Each AC inlet requires a separate power cord; therefore, four power cords are required. The power cord must be rated at 16A or 20A, depending on the site location.

  If you are connecting the system directly to an external power source (for example, power is not obtained through a modular power system), use these types of power cords:

  - Americas Domestic – NEMA L6-20P to IEC320-C19 (4 meter, Oracle part number X5044A-Z)
  - International – IEC309 to IEC320-C19 (4 meter, Oracle part number X5045A-Z)

  If you are connecting the system to a (rack internal) modular power system, use this type of power cord:

  - IEC320-C19 to IEC320-C20 (1.5 meter, Oracle part number X5046A-Z; 2.0 meter, Oracle part number X5047A-Z)
- If you are using an Oracle modular power system (MPS) in the cabinet, refer to the documentation supplied with the cabinet for the MPS power requirements.
- If you are not using an MPS, you must supply a branch circuit with a connector that meets the requirements of your system.

You can configure the Sun Blade 6048 modular system for grid redundancy by using two AC line feeds and the appropriate modular power system. *Grid redundancy* refers to the performance of the chassis power subsystem in the intended AC configuration. For grid redundancy, the AC configuration is supplied AC power from two independent feeds, which can be called Line A and Line B. By connecting one power supply to the Line A feed and one power supply to the Line B feed, the system can tolerate the failure of one power supply or the complete loss of either AC feed.

Power Budgeting

Use the power calculator for estimating the power consumption of your system:

http://www.oracle.com/us/products/servers-storage/sun-power-calculators/calc/6048chassis-power-calculator-161608.html

The intent of the power calculator is to provide guidance for estimating the electrical and heat loads for typical operating conditions. The "Max power" results shown in the calculator (at 100% workload) represent server module power consumption measurements with CPUs at 100% utilization running SPECjbb2005. The "Idle power" results shown in the calculator represent power consumption measurements taken from server modules with operating systems booted and stabilized, yet running at minimal utilization.

Results shown are representative of measurements taken with room temperatures below 25 o C. Actual power consumption will vary with application type, application utilization and ambient temperature. Whenever possible, actual measurements are recommended.

Use these specifications for planning purposes only. The system's actual power requirements are dependent on which components are included in your configuration.

Cooling Requirements

Every watt of power used by the system is dissipated into the air as heat. The thermal power dissipation of the shelf in a 9375W 2N configuration is 32,000 BTU/h. This requires that the data center heating, ventilation, and air conditioning (HVAC) system must accommodate the maximum heat release of a fully configured system, as well as any other systems in the data center.

The amount of heat output per Sun Blade 6048 System varies, depending on the system configuration. The systems are equipped with fans that route cool air throughout the chassis from front to rear. The fans are speed-controlled based on system temperature sensors. Typical airflow (for room temperatures below 23 oC) is about 844 CFM per shelf. Maximum possible airflow is about 1460 CFM per shelf.

As long as the necessary air conditioning is provided in the data center to dissipate the heat load, and sufficient space and properly vented door openings are provided at the front and back of rackmounted systems (see TABLE -1), the system fans will enable the system to work within the temperature specifications for systems in operation (see TABLE -5). Thermal characteristics of the Sun Blade 6048 Chassis system are provided in TABLE -6.

Temperature and Humidity Requirements

Avoid temperature and humidity extremes. The operating and nonoperating temperature specifications listed in TABLE -5 reflect the system's hardware limits, in order to meet all functional requirements. Note that the operating temperatures apply to the air entering the system and not necessarily the temperature of the air in the aisles.

The optimum operating ambient temperature and humidity ranges are the recommended operating environment. Operating the system within the ambient temperature range is optimal for system reliability. At 23 oC (73.4 oF) it is easy to maintain safe relative humidity ranges and to provide a buffer if the environmental support system fails.

Ambient relative humidity levels between 45% and 50% are the most suitable for system operations to:

- Prevent corrosion.
- Provide an operating time buffer in the event of an environmental control system failure.
- Help avoid failures due to intermittent interference from static discharges that can occur when relative humidity is too low. Electrostatic discharge (ESD) is easily generated and less easily dissipated in areas where the relative humidity is below 35%, and becomes critical when levels drop below 30%.

Conditions should not be allowed to fluctuate by more than 5.5 oC (10 oF) or 10% relative humidity during a 60-minute period.

Airflow Requirements

The system uses forced air to draw in ambient air for cooling from the front of the chassis, while heated air exits the rear of the chassis. The design of the system provides two primary regions of airflow: The lower airstream cools the Server Modules, and the upper airstream cools the power supplies, Chassis Monitoring Modules, Sun Blade 6048 Network Express Modules, and PCI Express Modules.

The rear fan cage includes eight rear fan modules, each module having two fans, for a total of 16 fans. The fans draw cool air through the front of the Server Modules and exhaust heated air through the back of the chassis. This results in typical measurements of approximately 844 CFM (cubic feet per minute) of total airflow through a shelf.

The upper airstream provides forced air by using a combination of internal fans within each power supply.

Follow these airflow guidelines:

- Do not block the ventilation areas of the system.
- Ensure that all cabling at the rear of the system does not block any exhaust air.

Clearance for Service and Aisle Requirements

To enable installation and servicing of the system, including access to system cables, follow these space restrictions.

TABLE -1 Service and Aisle Clearance Requirements

Location	Service Access Requirement
Front cold aisle	4 feet (1.22 m); required for inserting server modules
Back hot aisle	3 feet (0.9 m); required for cable access

Arrange cabinets in a hot aisle/cold aisle layout. This layout enables cool air to flow through the aisles to the system's front air intake and enables heated air to flow from the system's back exhaust. A hot aisle/cold aisle layout eliminates the direct transfer of hot exhaust air from one system into the intake air of another system.

Route to the Data Center

Ideally, the data center and loading dock should be located in close proximity to one another. The access allowances for the path from the loading dock to the data center must include:

- A minimum 87-inch (221-cm) height
- A minimum 37-inch (94-cm) width (greater is recommended)

The system chassis and factory-installed components ship in a single container on a pallet. The system must be kept in a vertical, upright position at all times while in its shipping container. Ensure that the equipment and personnel unloading the chassis shipping container can accommodate the shipping dimensions and weight of the container. See TABLE -2 for shipping container and weight specifications.

If there is a significant temperature or humidity difference between the system and the data center environment, keep the system in its shipping container in a location that has a similar temperature and humidity environment to the data center. Wait at least 24 hours before removing the system from its shipping container to prevent thermal shock and condensation.

Provide a room that is separate from the data center in which to open equipment cartons and to repack hardware when you install and remove parts. Avoid unpacking the cartons in the data center. Dirt and dust from the packing materials can contaminate the data center.

Facility Safety

Observe the following guidelines and precautions when installing the Sun Blade 6048 modular system.

Secure Installation Requirements

To minimize personal injury in the event of a seismic occurrence, you must securely fasten the cabinet in which the system is installed to a rigid structure extending from the floor to the ceiling, or from the walls, of the room in which the cabinet is located.

Install the cabinet on a level surface. At the base of the cabinet is an anti-tilt bar. This bar must be extended before you install the Sun Blade 6048 modular system to prevent the cabinet from moving.

Placement of an Oracle Product

Caution – Failure to follow the following guidelines can cause overheating and affect the reliability of your system.

Do not block or cover the openings of the Sun Blade 6048 modular system. Never place a Oracle product near a radiator or heat register. Air cools the Sun Blade 6048 modular system from front to back. The front and rear cabinet door clearances must provide sufficient space for cooling. See "Airflow Requirements" on page xii for specific clearance specifications.

Hazardous Conditions Precaution

Because of the inherent nature of the system's modular design, care must be taken to ensure that operators are not exposed to moving parts and sharp edges.

System Specifications

This section describes the following system specifications:

- "Shipping Crate Physical Specifications" on page xv
- "Chassis and Components Dimensions and Weights" on page xvi
- "AC Power Requirements" on page xvi
- "Environmental Specifications" on page xvii
- "Thermal Design Specifications" on page xviii
- "Acoustic Noise Emissions" on page xviii

Shipping Crate Physical Specifications

The standard Sun Blade 6048 modular system is shipped with the following components installed:

- 1 Sun Blade 6048 chassis
- 8 8400 W power supply modules with integrated fans
- 32 redundant rear fan modules
- 4 chassis monitoring modules (CMMs)
- 2 dongles with DB-9 to RJ-45 adapters
- Filler panels for the following modules
  - 47 server modules
  - 96 PCI ExpressModules (PCI EMs)
  - 8 network express modules (NEMs)

The chassis shipping crate physical specifications are as follows.

TABLE -2 Standard Shipping Crate Physical Specifications

Dimension or Weight	Specification
Shipping crate height	87.5 inches (222.3 cm)
Shipping crate width	48 inches (121.9 cm)
Shipping crate length	62 inches (157.5 cm)
Chassis, packaging, and pallet weight	Approximately 2500 lb (1134 kg)

Chassis and Components Dimensions and Weights

The unpacked chassis and component dimensions and weights are as follows.

TABLE -3 Chassis and Component Physical Specifications

Dimension or Weight	Specification
Chassis height	81.7 inches (2075 mm)
Chassis depth	40.35 inches (1025 mm)
Chassis width	23.78 inches (604 mm)
Chassis weight	Fully configured system: 2300 lb (1045 kg) Empty chassis: 1300 lb (590 kg) Subassembly weights: • I/O chassis with midplane: 26 lb (11.79 kg) • Power supply module: 30 lb (13.6 kg) • Server Module: 23 lb (10.43 kg) • Front fan module: 1.95 lb (0.88 kg) • Rear fan module: 2.31 lb (1.04 kg) • Network Express Module: 3.85 lb (1.75 kg) • PCI Express Module: 0.78 lb (0.35 kg) • Chassis Monitoring Module: 1.25 lb (0.57 kg) • Front Indicator Module: 0.75 lb (0.34 kg)

AC Power Requirements

The AC power requirements of the system are as follows.

TABLE -4 AC Power Requirements

Function	Specification
Voltage	200 to 240 VAC
Frequency	50/60 Hz
Current	16A per input, total six AC inputs (three per power supply module).
Number of AC inputs	6 per shelf; 24 total for the whole system
AC input connection	• Americas Domestic – NEMA L6-20P to IEC320-C19M (4m, Oracle PN X5044A-Z) • International – IEC309 to IEC320-C19 (4m, Oracle PN X5045A-Z) • Installed in rack with modular power system – IEC320-C319 to IEC320-C20 (1.5m, Oracle PN X5046A-Z; 2.0m, X5047A-Z)

Environmental Specifications

The environmental specifications of the system are as follows.

TABLE -5 Environmental Specifications

Specification	Operating	Nonoperating
Temperature	5 to 32 oC (41 to 90 oF) noncondensing	-40 to 65 oC (-40 to 149 oF) noncondensing
Optimum ambient temperature	23 oC (73.4 oF)	
Relative humidity	10 to 90% RH, noncondensing, 27 oC max wet bulb	5 to 93% RH, noncondensing, 38 oC max wet bulb
Optimum ambient relative humidity	45 to 50% RH, noncondensing	
Altitude	0 to 10,000 feet (3048 m) maximum ambient temperature is derated by 1 oC per 300 m (984 ft) above 900 m (2953 ft)	0 to 39,370 feet (12,000 m)

Thermal Design Specifications

The thermal design specifications of the system are as follows.

TABLE -6 Thermal Design Specifications

Parameter	Specification
Per shelf volumetric airflow	844 CFM typical, 1460 CFM maximum possible
Maximum possible per shelf heat dissipation/HVAC load	32,000 BTU/h
Maximum possible temperature rise through chassis	19.6 oC (35 oF)

Acoustic Noise Emissions

Declared noise emissions are in accordance with ISO 9295/9296 standards.

Data center personnel should take necessary precautions to reduce exposure to the high noise levels. Acoustic noise emission levels are as follows:

TABLE -7 Acoustic Noise Emission Specifications Per Rack

Function	Specification
Operating/idling acoustic noise (LwAd, 1B=10 dB)	9.2 B at or below 23 ˚C, 10.1 B at max ambient

Regulatory Compliance

The system complies with the following Oracle Microsystems and regulatory agency standards.

TABLE -8 Regulatory Compliance

Category	Standard
Product safety	• UL approved to UL 60950 and C22.2 No. 60950 • UL Demko approval to EN60950-1 and CB Report IEC 60950-1; including all amendments and full worldwide deviations • GOST Certification for Russia • Korean MIC Certification • China CCC Mark for power supply (system is exempt since it is rated greater than 1300W) • CE Declaration of Conformity (SMI self declaration) to The Electromagnetic Compatibility Directive and Low Voltage Directive 2006/95/EC • IRAM S-Mark for power supply (system is exempt due to class of equipment) • CNS 14336 (Taiwan)
Laser product and optical I/O	• FCC Registration to Code of Federal regulations 21 CFR 1040-Lasers • TUV approval to IEC 60825-1 Safety of Laser Products • Canadian Radiation Emitting Devices Act REDR C1370
Electromagnetic interference	• CFR 47 Part 15 (Code of Federal Regulations, Part 15, Subpart B) Class A • EN55022:2006 Class A per EMC Directive 2004/108/EEC (CE Mark) • VCCI Class A • Industry Canada ICES-003 • AS/NZ 3548 (Australia/New Zealand) • CNS 13438 (Taiwan)

TABLE -8 Regulatory Compliance *(Continued) (Continued)*

Category	Standard
Immunity	EN55024:1998 +A1:2001 +A2:2003 per EMC Directive 2004/108/EEC, including: • IEC 61000-4-2 Electrostatic discharge immunity test • IEC 61000-4-3 Radiated, radio-frequency, electromagnetic field immunity test • IEC 61000-4-4 Electrical fast transient/burst immunity test • IEC 61000-4-5 Surge immunity test • IEC 61000-4-6 Immunity to conducted disturbances, induced by radio-frequency fields • IEC61000-4-8 Power frequency magnetic field immunity test • IEC 61000-4-11 Voltage dips, short interruptions, and voltage variations immunity tests
Line distortion	• EN 61000-3-2 per EMC Directive 89/336/EEC
Voltage fluctuations and flicker	• EN 61000-3-3 per EMC Directive 89/336/EEC

Site Planning Checklist

TABLE -9 organizes the site planning tasks into a checklist that you can use during the site planning process.

TABLE -9 Site Planning Checklist

Requirement	Completed	Task
Configuration	Yes__ No__	Have you determined the hardware configuration for each system?
	Yes__ No__	Have you determined the type and number of cabinets and racks you need?
	Yes__ No__	Have you determined how you will populate each rack?
	Yes__ No__	Have you determined which external peripherals, such as terminals, monitors, keyboards, SCSI devices, and so forth, the systems require?
Environmental	Yes__ No__	Does the data center environment meet the system specifications for temperature and humidity?
	Yes__ No__	Have you determined the thermal load, heat dissipation, and air conditioning requirements of all equipment in the data center?

TABLE -9 Site Planning Checklist *(Continued) (Continued)*

Requirement	Completed	Task
	Yes__ No__	Can you maintain the data center environment when certain failures occur, such as power failure, air conditioning unit failure, or humidity control unit failure?
	Yes__ No__	Is fire suppression and alarm equipment installed?
Power	Yes__ No__	Have you determined the maximum power requirements of the systems?
	Yes__ No__	Are you using two AC power sources to establish power grid redundancy?
	Yes__ No__	Have you installed a modular power system, if required?
	Yes__ No__	Do you have sufficient power receptacles and circuit breakers for each system and its peripherals?
	Yes__ No__	Are the power receptacles within 13 feet (4m) of the racks?
	Yes__ No__	Have you installed and labeled the circuit breakers?
Physical	Yes__ No__	Does the facility's loading dock meet standard common carrier truck requirements? If not, have you made other arrangements for unloading the racks and systems, such as providing a fork lift?
	Yes__ No__	Are pallet jacks or carts available to move the systems and racks from the loading dock to the computer room?
	Yes__ No__	Will the equipment fit through the access route and into the computer room?
	Yes__ No__	Have you calculated the weight of each rack with all the equipment installed within it?
	Yes__ No__	Is the data center floor able to support the weight of the systems and racks?
	Yes__ No__	Have you established where you will locate each rack on the data center floor?
	Yes__ No__	Are the systems and racks positioned so that the heated exhaust air of one system does not enter the air inlet of another system?
	Yes__ No__	Is there sufficient room around the racks for system access and maintenance?
Miscellaneous	Yes__ No__	Are there sufficient people available to unload, unpack, and install the systems into the racks?

TABLE -9 Site Planning Checklist *(Continued) (Continued)*

Requirement	Completed	Task
	Yes__ No__	Have system administrators and service technicians enrolled in appropriate training courses to upgrade their skills, as necessary?
	Yes__ No__	Have you acquired all the hardware needed to set up the systems and racks?
	Yes__ No__	Do you have the documents required to install the systems into the racks?

APPENDIX **A**

Conversion Information

TABLE A-1 Conversion Factors

Multiply	By	To Obtain
°C	(°C*1.8)+32	°F
°F	(°F-32)/1.8	°C
Btu/hr	0.252	kcal/hr
kcal/hr	3.968	Btu/hr
tons	12,000	Btu/hr
Btu/hr	0.0000833	tons
kW	3412.97	Btu/hr
Btu/hr	0.000293	kW
CFM	0.0283	m^3/min
m^3/min	35.315	CFM
m^2	10.764	ft^2
ft^2	0.0929	m^2
m	3.281	ft
ft	0.3048	m
cm	0.3937	in
in	2.540	cm