Storage System Site Preparation Guide

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Revision History

Version and Date	Description of Changes
51323-00, Rev. A, May 2011	Initial release of the document.

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Chapter 1: Site Preparation

This guide defines the hardware, power, and environmental requirements that must be met prior to the installation of the following products:

- The Model 3040 40U cabinet
- The 6580/6780 controller module
- The 6780 controller module
- The 6540 controller module
- The ST2500 M2 array module
- The 6180 array module
- The 6140 array module
- The ST2530 array module
- The ST2510 array module
- The ST2540 array module
- The ST2501 M2 drive module
- The CSM200 drive module
- The CSM100 drive module (SATA)
- The CSM100 drive module (Fibre Channel)
- The FLA200 drive module
- The ST2501 drive module

About This Guide

This guide contains site preparation information that defines the hardware, power, and environmental requirements.

Use this guide prior to delivery and installation to make sure that the appropriate and required preparation tasks are completed. This guide does not explain procedures for installing the hardware trays or for installing and configuring the software.

This guide helps you make decisions about ventilation, electrical power, floor loading, and network configuration. Conduct a power survey to make sure that the storage array's input power is free of noise, spikes, and fluctuations.

Refer to the Product Release Notes for SANtricity ES Storage Manager® for any updated information regarding hardware, software, or firmware products that might not be covered in this guide.

Intended Readers

This guide is intended for system operators, system administrators, and technical support personnel who are responsible for installation and setup of the storage array. They must have the following skills:

- Familiarity with computer system operations
- Understanding of disk storage technology, Redundant Array of Independent Disks (RAID) concepts, networking, and Fibre Channel, Infiniband, and iSCSI technologies
- Basic knowledge of storage area network (SAN) hardware functionality (controllers, drives, and hosts) and SAN cabling

Related Publications

The following guides have information that is related to the site preparation process. You can obtain any of these documents by contacting a Customer and Technical Support representative or your storage representative.

- Model 3040 40U Cabinet Hardware Installation Guide
- 6580/6780 Controller Module Initial Setup Guide
- 6780 Controller Module Initial Setup Guide
- 6540 Controller Module Initial Setup Guide

- ST2500 M2 Array Module Initial Setup Guide
- 6180 Array Module Initial Setup Guide
- 6140 Array Module Initial Setup Guide
- ST2530 Array Modules Initial Setup Guide
- ST2510 Array Module Initial Setup Guide
- ST2540 Array Module Initial Setup Guide
- ST2501 M2 Drive Module Initial Setup Guide
- CSM200 Drive Module Initial Setup Guide
- CSM100 Drive Module Initial Setup Guide
- CSM100 Drive Module Initial Setup Guide
- FLA200 Drive Module Initial Setup Guide
- ST2501 Drive Module Initial Setup Guide
- Product Release Notes for SANtricity ES Storage Manager

Web Address

For information related to the products mentioned in this document, go to the following website:

http://www.lsi.com/storage_home/products_home/external_raid/index.html

Additional Information

From the LSI Technical Support website, you can find contact information, query the knowledge base, submit a service request, download patches, or search for documentation. Visit the LSI Technical Support website at: http://www.lsi.com/support/index.html.

Chapter 2: Specifications of the Model 3040 40U Cabinet

The Model 3040 40U cabinet has these standard features:

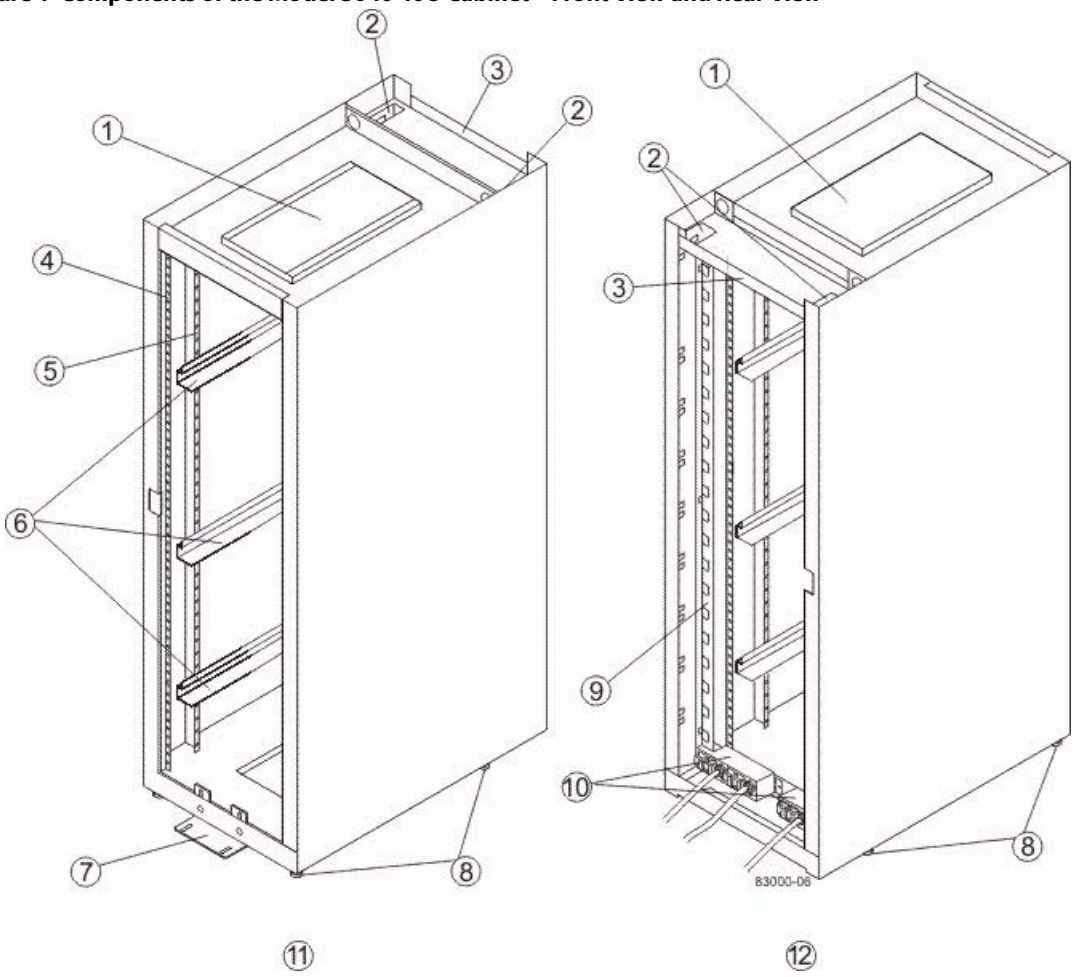
- A detachable rear door
- Standard Electronic Industry Association (EIA) support rails that provide mounting holes for installing devices into a standard 48.3-cm (19-in.) wide cabinet
- Four roller casters and four adjustable leveling feet that are located beneath the cabinet for moving the cabinet and then leveling the cabinet in its final location
- A stability foot that stabilizes the cabinet after it is installed in its permanent location
- Access openings for interface cables
- Two AC power distribution units (PDUs) that allow integrated power connection and power handling capacity for controller modules, array modules, and drive modules

WARNING (W05) **Risk of bodily injury** – If the bottom half of the cabinet is empty, do not install components in the top half of the cabinet. If the top half of the cabinet is too heavy for the bottom half, the cabinet might fall and cause bodily injury. Always install a component in the lowest available position in the cabinet.

WARNING (W07) **Risk of bodily injury** – Only move a populated cabinet with a forklift or adequate help from other persons. Always push the cabinet from the front to prevent it from falling over.

ATTENTION Risk of equipment damage – A fully populated cabinet can weigh more than 909 kg (2000 lb). The cabinet is difficult to move, even on a flat surface. If you must move the cabinet along an inclined surface, remove the components from the top half of the cabinet, and make sure that you have adequate help.

Figure 1 Components of the Model 3040 40U Cabinet – Front View and Rear View



1. Ventilation Cover
2. Interface Cable Access Openings
3. Rear Plate
4. EIA Support Rails
5. Vertical Support Rails
6. Cabinet Mounting Rails
7. Stability Foot
8. Adjustable Leveling Feet
9. Power Strip
10. AC Power Distribution Units
11. Front of the Cabinet
12. Rear of the Cabinet

You can configure the cabinet to meet your data storage needs. Standard cabinet configurations consist of a combination of these types of modules:

- **Controller module** – Contains one or two controllers, one interconnect-battery CRU, and two power-fan CRUs.
- **Array module** – Contains drives, redundant cooling fans and power supplies, and, depending on the model, one or two controllers.
- **Drive module** – Contains drives, redundant cooling fans and power supplies, and one or two environmental services monitors (ESMs).

Model 3040 40U Cabinet Configurations

The following table displays the maximum combination of CSM200 drive modules allowed in one cabinet.

Table 1 CSM200 Drive Modules That Can Be Installed in the Cabinet

Number of Controller Modules or Array Modules and the Specific Types		Maximum Number of CSM200 Drive Modules
0	No controller modules or array modules	13
1	6580/6780 controller module, 6780 controller module, or 6540 controller module	12
	6180 array module or 6140 array module	6
2	6580/6780 controller modules, 6780 controller modules, 6540 controller modules, or 6180 array modules	10
	6180 array module or 6140 array module	11
3	6580/6780 controller modules, 6780 controller modules, 6540 controller modules, or 6180 array modules	9
	6180 array module or 6140 array module	10
4	6580/6780 controller modules, 6780 controller modules, 6540 controller modules, or 6180 array modules	8
	6180 array module or 6140 array module	9
5	6180 array module or 6140 array module	8

The following table displays the maximum combination of ST2501 drive modules allowed in one cabinet.

Table 2 ST2501 Drive Modules That Can Be Installed in the Cabinet

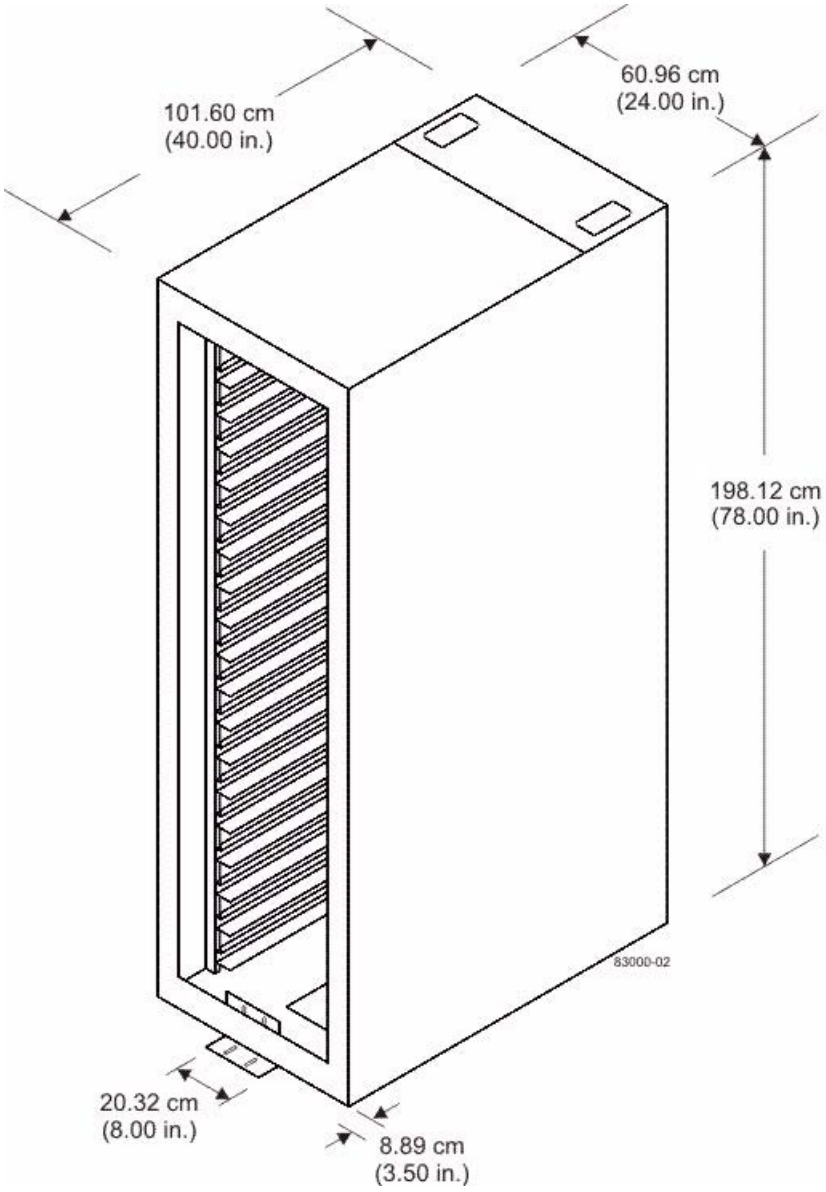
Number of Array Modules	Array Module	Maximum Number of ST2501 Drive Modules
1	ST2530 array module or ST2510 array module or ST2540 array module	3
2	ST2530 array modules or ST2510 array module or ST2540 array modules	6
3	ST2530 array modules or ST2510 array module or ST2540 array modules	9
4	ST2530 array modules or ST2510 array module or ST2540 array modules	12
5	ST2530 array modules or ST2510 array module or ST2540 array modules	15

NOTE These configurations are based on the standard storage array configurations that are shipped from the factory. The number of controller modules, array modules, and drive modules in a cabinet can be modified at the customer site.

Model 3040 40U Cabinet Dimensions

Make sure that the area where you will place the cabinet has sufficient space to install and service the cabinet and the storage array components.

Figure 2 Dimensions of the Model 3040 40U Cabinet – Front View



Model 3040 40U Cabinet Weights

ATTENTION Risk of damage to flooring – The weight of the cabinet might exceed the flooring load specifications. A fully-loaded 3040 40U cabinet weighs up to 1090 kg (2400 lb). Before you install your components, make sure that your flooring is strong enough to support the weight of the cabinet and its components.

Record the total weight of your cabinet and its components. Keep this information in a place where you can refer to it when you check for flooring load restrictions or elevator weight restrictions.

Table 3 Weights of the Model 3040 40U Cabinet, Modules, and Crate

Component	Weight	Notes
Cabinet	138.80 kg (306.0 lb)	Empty with the rear door installed
Power distribution unit (PDUs [pair])	19.96 kg (44.0 lb)	
Mounting rails (pair)	1.59 kg (3.50 lb)	
6580/6780 controller module	36.79 kg (81.1 lb)	Maximum configuration
6780 controller module	36.79 kg (81.1 lb)	Maximum configuration
6540 controller module	36.79 kg (81.1 lb)	Maximum configuration
ST2500 M2 array module	27 kg (59.52 lb)	Maximum configuration
6180 array module	38.15 kg (84.1 lb)	Maximum configuration
6140 array module	38.60 kg (85.1 lb)	Maximum configuration
ST2530 array module	25.58 kg (63.0 lb)	Maximum configuration
ST2540 array module	25.58 kg (63.0 lb)	Maximum configuration
CSM200 drive module	42.18 kg (93.0 lb)	Maximum configuration
CSM100 drive module	40.0 kg (88.0 lb)	Maximum configuration
CSM100 drive module	40.0 kg (88.0 lb)	Maximum configuration
FLA200 drive module	40.4 kg (89.0 lb)	Maximum configuration
ST2501 drive module	25.86 kg (57.0 lb)	Maximum configuration
Shipping crate (worldwide shipments only)	136.08 kg (300.0 lb)	Empty

Model 3040 40U Cabinet Temperature and Humidity

An air-conditioned cooling environment helps to make sure that the ambient temperatures surrounding the cabinet are maintained. This type of environment helps your storage array components to run at operating temperatures that will enhance the overall reliability of your storage.

Table 4 Temperature Requirements and Humidity Requirements for the Model 3040 40U Cabinet

Environment	Temperature Range	Temperature Change	Relative Humidity
Operating*	10°C to 35° C (50°F to 95°F)	10°C per hour (18°F per hour)	20% to 80%
Storage	–10°C to 45°C (14°F to 113°F)	15°C per hour (27°F per hour)	10% to 90%
Transit	–40°C to 65°C (–40°F to 149°F)	20°C per hour (36°F per hour)	5% to 95%
*If you plan to operate a storage array at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.			

The maximum allowed dew point is 28°C (82°F), with a maximum humidity gradient of 10 percent per hour.

Model 3040 40U Cabinet Altitude Ranges

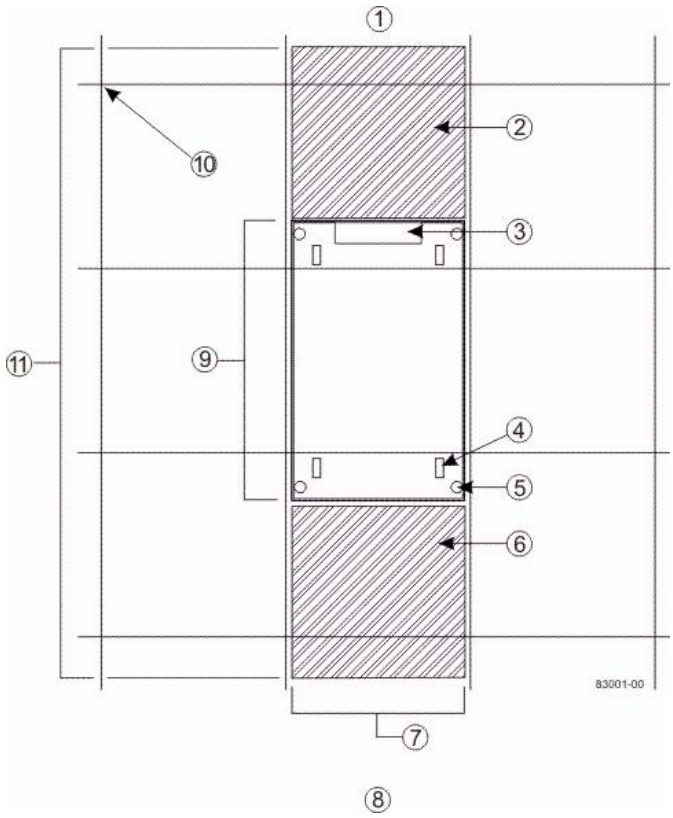
Table 5 Altitude Ranges for the Model 3040 40U Cabinet

Environment	Altitude
Operating	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Storage	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Transit	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level

Model 3040 40U Cabinet Airflow, Heat Dissipation, and Service Clearances

Air flows through the cabinet from the front to the rear. Allow at least 76 cm (30 in.) of clearance in front of the cabinet, and at least 61 cm (24 in.) of clearance behind the cabinet for service clearance, ventilation, and heat dissipation. The total depth required for the cabinet plus clearance is 240 cm (94 in.). The cabinet does not require side clearances.

Figure 3 Area Requirements for the Model 3040 40U Cabinet – Top View



1. Rear of the Cabinet
2. Required Rear Service Area – 61 cm (24 in.)
3. Cable Access
4. Roller Caster
5. Adjustable Leveling Foot
6. Required Front Service Area – 76 cm (30 in.)
7. Width of the Cabinet – 61 cm (24 in.)
8. Front of the Cabinet
9. Depth of the Cabinet – 102 cm (40 in.)
10. Computer Floor Grid – 61 cm x 61 cm (24 in. x 24 in.)
11. Total Clearance Depth – 240 cm (94 in.)

Do not place anything in front of the cabinet or behind the cabinet that would interfere with air flow. The cabinet's ventilation is essential to make sure that ambient air is available to correctly cool your storage array.

Total heat dissipation is a function of the number and type of modules that are installed in the cabinet. Use the table in Model 3040 40U Cabinet Power Requirements to calculate the total heat dissipation for your configuration. For the total Btu/Hr for the cabinet, add the value for each of the individual modules together.

Model 3040 40U Cabinet Site Wiring and Power

The AC power distribution units in the cabinet use common industrial wiring.

- **AC power source** – The AC power source must provide the correct voltage, current, and frequency that are specified on the module and the serial number label.
- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

NOTE *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide enough power and overload protection. An external, independent AC power source that is isolated from large switching loads is recommended to run your storage array. The power going to the AC power distribution boxes and other components in the cabinet should not have air-conditioning motors, elevator motors, or factory loads on the same circuit.
- **Module power distribution** – All units attached to the two individual power strip outlets inside the cabinet must be wide-ranging between 180 VAC and 264 VAC, 50–60 Hz.
- **Power interruptions** – The cabinet and modules can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Maximum frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the modules in the cabinet automatically perform a power-on recovery sequence without operator intervention.

Model 3040 40U Cabinet Power Requirements

Table 6 AC Power Requirements for the Model 3040 40U Cabinet

Parameter	Requirement
Nominal voltage	200 VAC to 240 VAC
Frequency	50 Hz to 60 Hz
Nominal current (typical) Varies depending upon the number and type of modules that are installed in the cabinet.	10.0 A to 24.0 A

The Model 3040 40U cabinet contains power strips that provide either 48A or 72A of usable power.

The 48A power strips provide up to 48A of usable power through four 12A banks of power. This power is provided to 21 power outlets that are located in the rear of the cabinet.

The 72A power strips provide up to 72A of usable power through six 12A banks of power. This power is provided by 24 ICE320 power outlets on each power distribution unit (PDU). The 72A power strips are only used with the DE6900 drive module.

ATTENTION Risk of exceeding maximum amperage – You must calculate the load of the devices in the cabinet to make sure that you do not exceed the 24.0 A maximum. As an example, one controller module (2.2 A) and four drive modules (1.8 A each) would draw approximately 9.4 A (2.2 + 1.8 + 1.8 + 1.8 + 1.8).

Table 7 Power Calculations and Heat Calculations for the Model 3040 40U Cabinet

Component	KVA	Watts	Btu/Hr	Amps (240 VAC)
Cabinet PDU (for 48A PDUs)	9.60*	9600*	32,784*	
Cabinet PDU (for 72A PDUs)	14.4	14400	49,176	
Cabinet PDU/12A bank (for both 48A and 72A PDUs)	2.40*	2400*	8196*	
6580/6780 controller module	0.562	540	1842	2.25
6780 controller module	0.562	540	1842	2.25
6540 controller module	0.546	525	1811	2.19
6180 array module	0.624	600	2047	2.50
6140 array module	0.624	600	2047	2.50
ST2530 array module	0.398	394	1346	2.30
ST2540 array module	0.458	453	1548	2.30
CSM200 drive module	0.462	444	1517	1.85
CSM100 drive module	0.329	316	1078	1.65
CSM100 drive module	0.384	369	1526	1.65
FLA200 drive module	0.375	366	1229	1.65
ST2501 drive module	0.362	358	1224	2.30

*The maximum ratings at 200 VAC. The Btu/Hr calculation is based on the maximum current rating that the power distribution unit can provide.

Model 3040 40U Cabinet Grounding

To prevent personal injury or electrostatic discharge (ESD), make sure that the cabinet is correctly grounded. The ground must have the correct low impedance so that there is no build-up of voltage on any equipment or on any exposed surfaces. Grounding is especially important to eliminate shock hazards, and to facilitate the operation of circuit-protective devices.

Use good metal-to-metal bonding techniques, such as bared metal washers and internal star washers or external star washers. It is not enough to provide ground paths through anodized material or hinges. Never use sheet metal screws to attach a ground. Refer to the Underwriters Laboratory (UL) safety agency for more information about the correct grounding techniques to use.

Consider a low impedance grounding and lightning protection when you plan for and install an electrical system. Your electrical contractor must meet local code requirements and national code requirements when installing an electrical system.

NOTE Local codes and local standards might have more stringent requirements. Always comply with local codes.

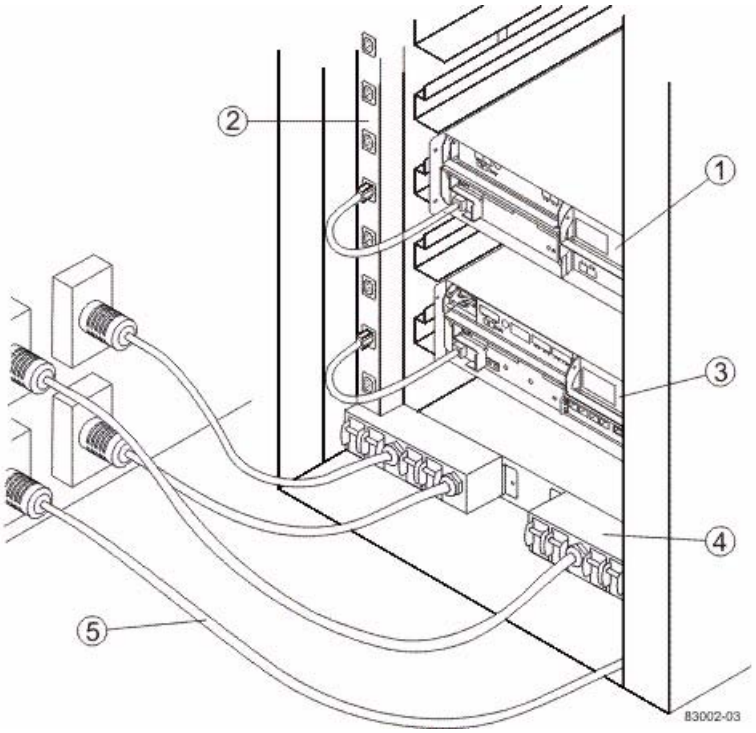
Model 3040 40U Cabinet Power Distribution

The Model 3040 40U cabinet has two identical AC power distribution units, each of which has a separate power cord. Depending on your configuration, each AC power distribution unit supports either North American (USA and Canada) components or worldwide (excluding USA and Canada) components. Each AC power distribution unit includes these parts:

- Two cords per side, NEMA L6-30P or IEC 309
- Four circuit breakers per side, 15 A each, for 48A PDUs
- Six circuit breakers per side, 15 A each, for 72A PDUs
- Twenty IEC 320 power outlets per side, plus an additional outlet for the optional fan module

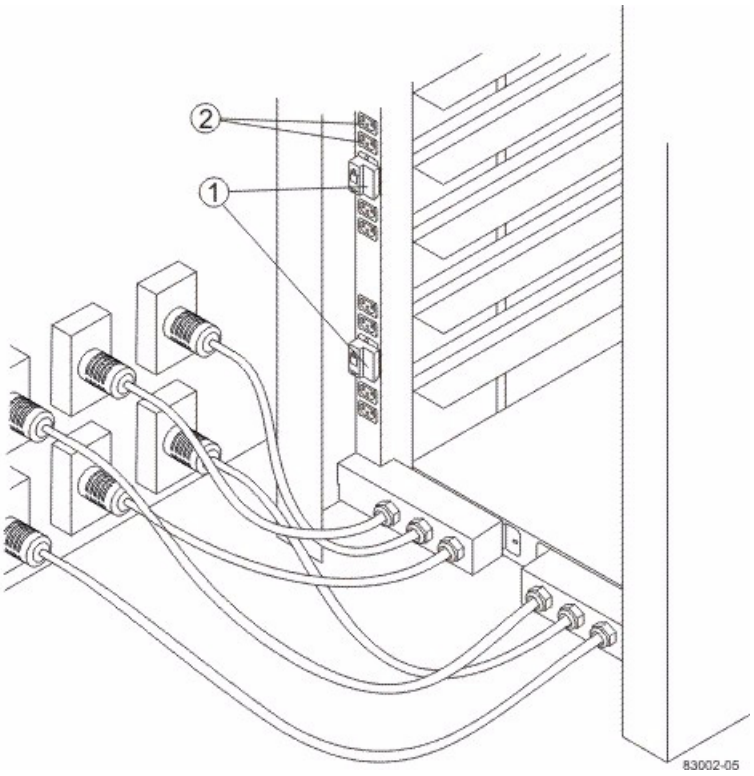
NOTE For pluggable equipment, the electrical outlet must be installed near the equipment and must be easily accessible.

Figure 4 Circuit Breakers and Electrical Outlets for 48A PDUs



1. Controller Module
2. Power Strip
3. Drive Module
4. AC Power Distribution Unit
5. AC Power Cords

Figure 5 Circuit Breakers and Electrical Outlets for 72A PDUs

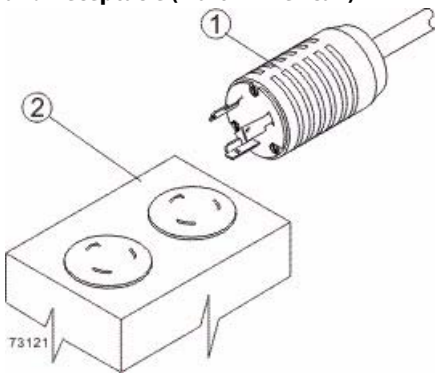


1. Circuit Breakers
2. Electrical Outlets

Model 3040 40U Cabinet Power Cords and Receptacles

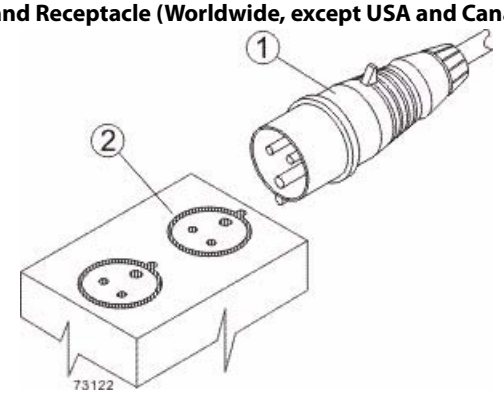
The cabinet is equipped with two AC power distribution units. Each AC power distribution unit contains four 15-A circuit breakers on each side. Depending on your installation, the AC power distribution units in your cabinet have either North American (USA and Canada) power cords or worldwide (except USA and Canada) power cords. Connect each AC power distribution unit power cord to an independent power source outside of the cabinet.

Figure 6 NEMA L6-30 Power Cord and Receptacle (North American)



1. 250-VAC, 30-A Plug (North American)
2. Receptacle

Figure 7 IEC 309 Power Cord and Receptacle (Worldwide, except USA and Canada)



1. 230-VAC, 32-A Plug (Worldwide, except USA and Canada)
2. Receptacle

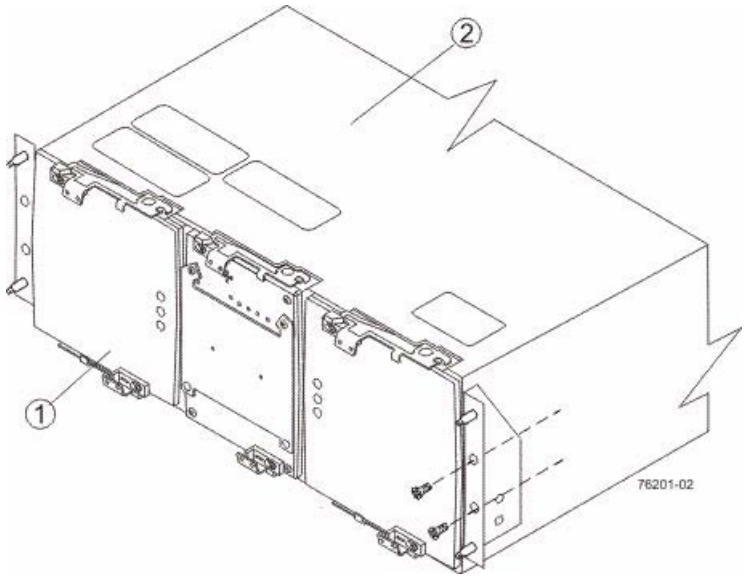
Chapter 3: Specifications of the 6580/6780 Controller Module

The 6580/6780 controller module is a compact, rackmounted unit that provides high-capacity disk storage for Fibre Channel, Infiniband, and iSCSI environments, depending on the choice of the host interface card.

The 6580/6780 controller module contains two power-fan CRUs that include the power supplies and fans. One power-fan CRU can provide electrical power and cooling to the controller module if the other power-fan CRU is turned off or malfunctions.

In the front, behind the bezel, are two power-fan CRUs and one interconnect-battery CRU.

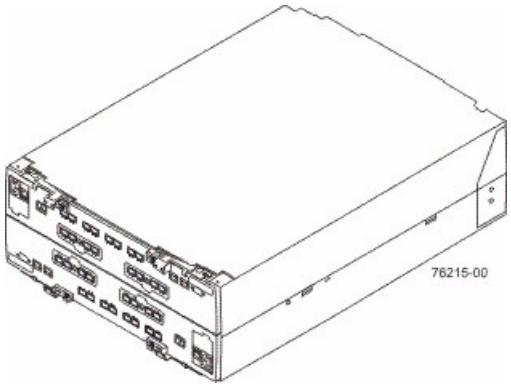
Figure 8 6580/6780 Controller Module – Front View



1. Power-Fan CRUs (Left and Right) and the Interconnect-Battery CRU (Center)
2. Top of the 6580/6780 Controller Module

In the rear are two controller CRUs with controller A on the top and controller B on the bottom. Controller A is upside down, and controller B is right-side up.

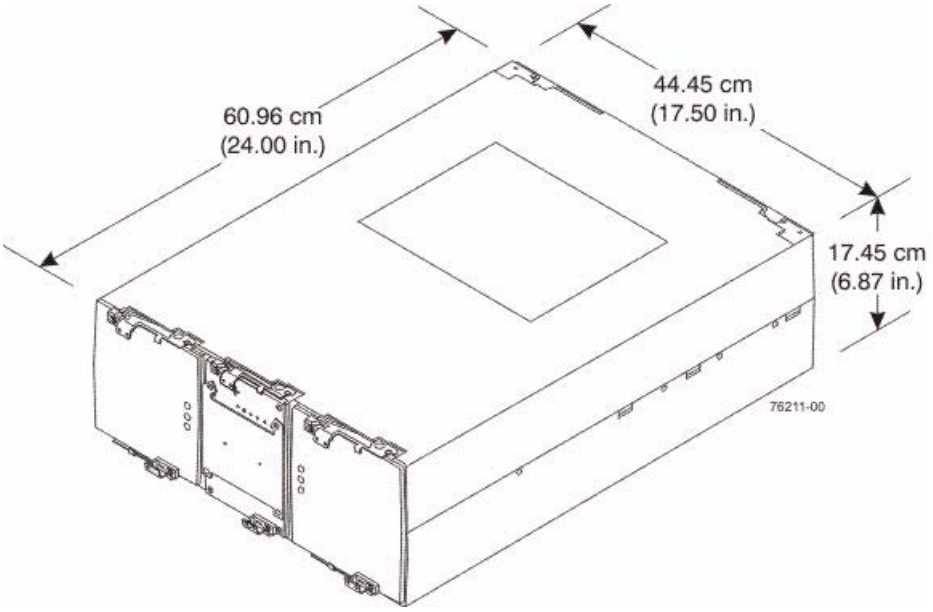
Figure 9 6580/6780 Controller Module – Rear View



6580/6780 Controller Module Dimensions

The 6580/6780 controller module conforms to the 48.3-cm (19-in.) rack standard.

Figure 10 Dimensions of the 6580/6780 Controller Module – Front View



6580/6780 Controller Module Weight

Table 8 Weights of the 6580/6780 Controller Module

Unit	Weight		
	Maximum*	Empty**	Shipping***
6580/6780 controller module	36.79 kg (81.1 lb)	13.15 kg (29.0 lb)	49.44 kg (109.0 lb)

*Maximum weight indicates a controller module with all of its components installed.

**Empty weight indicates a controller module with the controller CRUs, the power-fan CRUs, and the interconnect-battery CRU removed.

***Shipping weight indicates the maximum weight of a controller module and all shipping material.

Table 9 Component Weights of the 6580/6780 Controller Module

Component	Weight
Controller CRU	6.24 kg (13.8 lb)
Power-fan CRU	3.719 kg (8.20 lb)
Interconnect-battery CRU (with two batteries installed)	4.082 kg (9.00 lb)
Battery CRU	1.134 kg (2.50 lb)

6580/6780 Controller Module Shipping Dimensions

Table 10 Shipping Carton Dimensions for the 6580/6780 Controller Module

Height	Width	Depth
44.45 cm (17.50 in.) – Includes the height of the pallet.	62.23 cm (24.50 in.)	78.74 cm (31.00 in.)

6580/6780 Controller Module Temperature and Humidity

Table 11 Temperature Requirements and Humidity Requirements for the 6580/6780 Controller Module

Condition	Parameter	Requirement
Temperature*	Operating range	10°C to 40°C (32°F to 104°F)
	Maximum rate of change	10°C (18°F) per hour
	Storage range	–10°C to 65°C (14°F to 149°F)
	Maximum rate of change	15°C (27°F) per hour
	Transit range	–40°C to 65°C (–40°F to 149°F)
	Maximum rate of change	20°C (36°F) per hour
Relative humidity (no condensation)	Operating range	20% to 80%
	Storage range	10% to 93%
	Transit range	5% to 95%
	Maximum dew point	26°C (79°F)
	Maximum gradient	10% per hour
*If you plan to operate a system at an altitude between 1000 m to 3048 m (3280 ft to 10,000 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.		

6580/6780 Controller Module Altitude Ranges

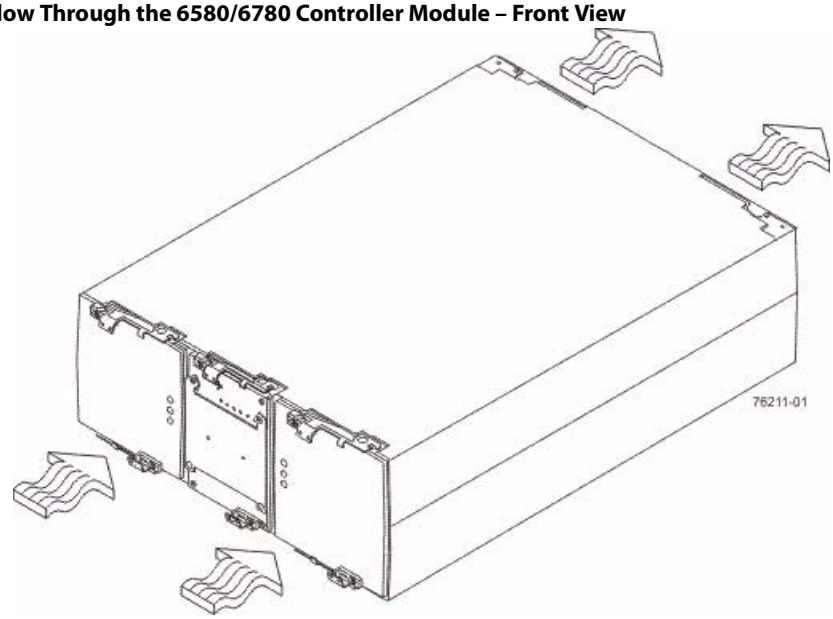
Table 12 Altitude Ranges for the 6580/6780 Controller Module

Environment	Altitude
Operating	30.5 m (100 ft) below sea level to 3048 m (10,000 ft) above sea level
Storage	30.5 m (100 ft) below sea level to 3048 m (10,000 ft) above sea level
Transit	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level

6580/6780 Controller Module Airflow and Heat Dissipation

Airflow goes from the front of the controller module to the rear of the controller module. Allow at least 76 cm (30 in.) of clearance in front of the controller module and at least 61 cm (24 in.) of clearance behind the controller module for service clearance, ventilation, and heat dissipation.

Figure 11 Airflow Through the 6580/6780 Controller Module – Front View



The tabulated power and heat dissipation values in the following table are the maximum measured operating power. Maximum configuration units are typically operated at higher data rates or have larger random access memory (RAM) capabilities.

Table 13 Power Ratings and Heat Dissipation for the 6580/6780 Controller Module

Component	KVA	Watts (AC)	Btu/Hr	Amps (240 VAC)
6580/6780 controller module	0.562	540	1842	2.25

6580/6780 Controller Module Acoustic Noise

Table 14 Sound Levels for the 6580/6780 Controller Module

Measurement	Level
Sound power	6.0 bels
Sound pressure	60 dBA

6580/6780 Controller Module Site Wiring and Power

The agency ratings for the 6580/6780 controller module are 5.40 A at 100 VAC and 2.25 A at 240 VAC. These ratings are the overall maximum currents for this system.

The 6580/6780 controller module uses wide-ranging redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies operate within the range of 90 VAC to 264 VAC, at a minimum frequency of 50 Hz and a maximum frequency of 60 Hz. Voltage levels can fluctuate within the specified range. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

Keep this information in mind when you prepare the installation site for the controller module:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

NOTE *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide enough power and overload protection. To prevent damage to the controller module, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The controller module can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Maximum frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the controller module automatically performs a power-on recovery sequence without operator intervention after the power is restored.

NOTE When a power failure occurs, the controller module uses battery power to back up the data that is in cache.

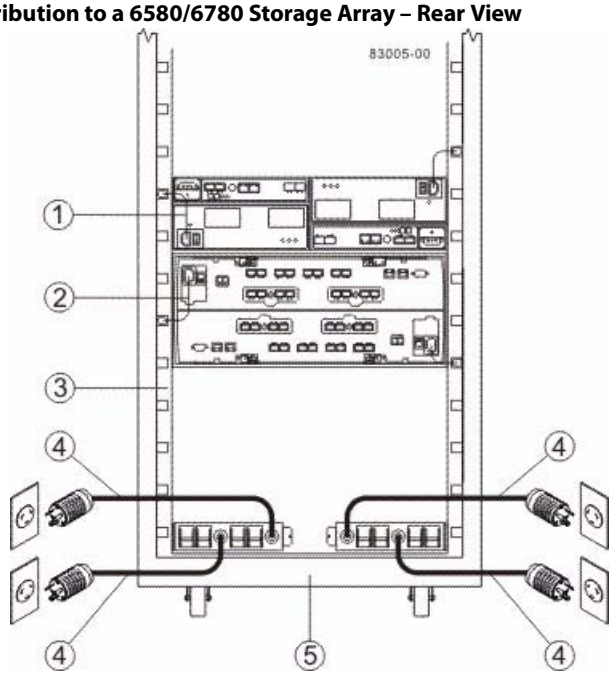
If you are installing a large storage array configuration, you must make sure that you are supplying the correct AC source voltages and not creating an over-current situation.

When calculating the cabinet's total power requirements, take the controller module's 540 W and divide it by the cabinet's input voltage. If you are using 240 VAC, you obtain a maximum current of 2.25 A. Then add the amperage of each drive module. If each drive module uses 1.85 A, then 10 drive modules would use 18.5 A. In this example, your total storage array would use a rated maximum of 20.75 A.

6580/6780 Controller Module Power Cords and Receptacles

Each 6580/6780 controller module is shipped with two AC power cords. Each AC power cord connects one of the power-fan CRUs in the controller module to an independent, external AC power source, such as a wall receptacle, or to any acceptable uninterruptible power supply (UPS).

Figure 12 AC Power Distribution to a 6580/6780 Storage Array – Rear View



1. AC Power Cord to the Drive Module
2. AC Power Cord to the 6580/6780 Controller Module
3. Power Strip Portion of the Power Distribution Unit
4. AC Power Cord to the External Power Source
5. Rear of the Cabinet

The optional UPS equipment is either placed external from the cabinet, or it is placed at the bottom of the cabinet. UPS devices provide a continuous supply of electrical power when utility power is unavailable. Some UPS equipment can also provide power conditioning to protect your storage array from voltage spikes, line noise, and undesirable power fluctuations, such as brownout. Contact an electrician to help you select and install the correct UPS equipment.

The switched-rack power distribution unit (PDU) is also available for some customer-supplied cabinets. These new PDUs are stand-alone, network-manageable devices that allow programmable control of the power outlets. This capability enables you to control each outlet independently, manage power sequencing, and monitor the aggregate current draw through the switched-rack PDU. Additional equipment may be used to support temperature monitoring as well.

Preparing the Network for the Controllers

If you plan to use Ethernet connections from the storage management station to the controllers, you will use the out-of-band management method. For this configuration, meet with your network administrator before you order and install the equipment so that you can prepare for the setup and management of the devices on the IP network. Each controller uses its Ethernet management ports to connect to the IP network and communicate with the other devices on the IP network (often requiring a special application to set up the protocol).

Your network administrator can pre-assign the addresses that you need to manage the communication between the devices on the IP network. Depending on your storage configuration, you will need the following addresses:

- Up to two network IP addresses for each controller
- Up to two subnet mask addresses for each controller
- Either two IPv4 addresses (one static and one dynamic) or one IPv6 address for each controller
- A Dynamic Host Configuration Protocol (DHCP) address for each controller

If switches are used in your storage environment, you must know if zoning will be used, and how it will be configured.

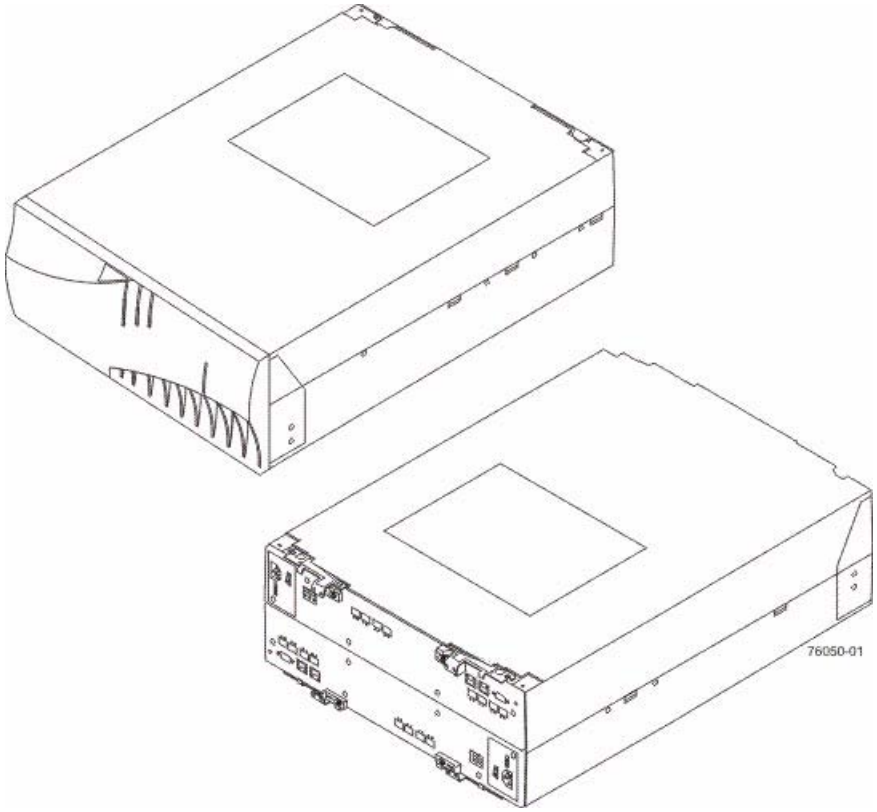
Chapter 4: Specifications of the 6540 Controller Module

The 6540 controller module is a compact, rackmounted unit that provides high-capacity disk storage for Fibre Channel environments.

The 6540 controller module contains two power-fan CRUs that include the power supplies and fans. One power-fan CRU can provide electrical power and cooling to the controller module if the other power-fan CRU is turned off or malfunctions.

In the front, behind the bezel, are two power-fan CRUs and one interconnect-battery CRU. In the rear are two controller CRUs, with controller A on the top and controller B on the bottom. Controller A is upside down, and controller B is right-side up.

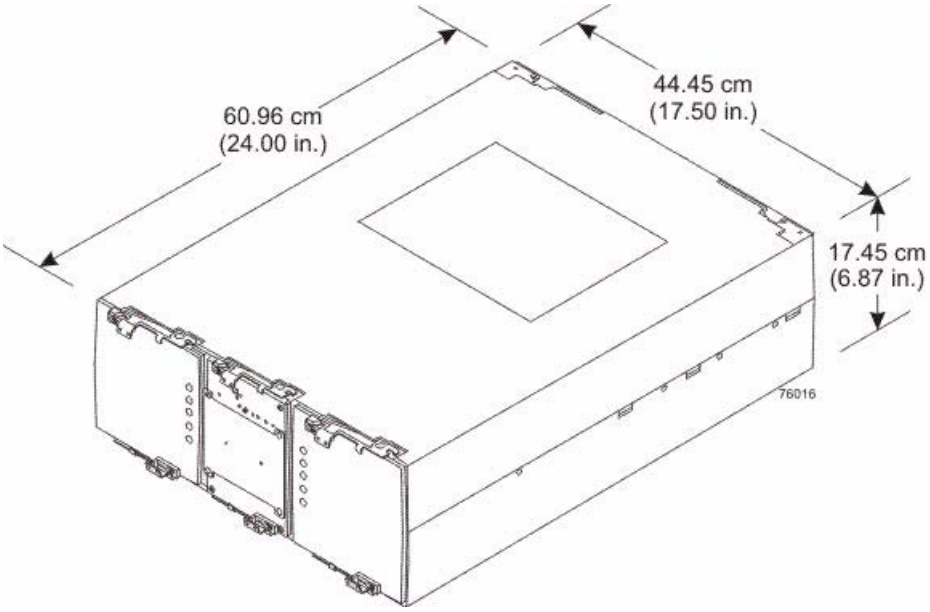
Figure 13 6540 Controller Module – Front View and Rear View



6540 Controller Module Dimensions

The 6540 controller module conforms to the 48.3-cm (19-in.) rack standard.

Figure 14 Dimensions of the 6540 Controller Module – Front View



6540 Controller Module Weight

Table 15 Weights of the 6540 Controller Module

Unit	Weight		
	Maximum*	Empty**	Shipping***
6540 controller module	36.79 kg (81.1 lb)	13.15 kg (29.0 lb)	49.44 kg (109.0 lb)

*Maximum weight indicates a controller module with all of its components installed.

**Empty weight indicates a controller module with the controller CRUs, the power-fan CRUs, and the interconnect-battery CRU removed.

***Shipping weight indicates the maximum weight of the controller module and all shipping material.

Table 16 Component Weights of the 6540 Controller Module

Component	Weight
Controller CRU	6.24 kg (13.8 lb)
Power-fan CRU	3.719 kg (8.20 lb)
Interconnect-battery CRU (with two batteries installed)	4.082 kg (9.00 lb)
Battery CRU	1.134 kg (2.50 lb)

6540 Controller Module Shipping Dimensions

Table 17 Shipping Carton Dimensions for the 6540 Controller Module

Height	Width	Depth
44.45 cm (17.50 in.) – Includes the height of the pallet.	62.23 cm (24.50 in.)	78.74 cm (31.00 in.)

6540 Controller Module Temperature and Humidity

Table 18 Temperature Requirements and Humidity Requirements for the 6540 Controller Module

Condition	Parameter	Requirement
Temperature*	Operating range	0°C to 40°C (32°F to 104°F)
	Maximum rate of change	10°C (18°F) per hour
	Storage range	–10°C to 65°C (14°F to 149°F)
	Maximum rate of change	15°C (27°F) per hour
	Transit range	–40°C to 65°C (–40°F to 149°F)
	Maximum rate of change	20°C (36°F) per hour
Relative humidity (no condensation)	Operating range	20% to 80%
	Storage range	10% to 93%
	Transit range	5% to 95%
	Maximum dew point	26°C (79°F)
	Maximum gradient	10% per hour
*If you plan to operate a system at an altitude between 1000 m to 3048 m (3280 ft to 10,000 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.		

6540 Controller Module Altitude Ranges

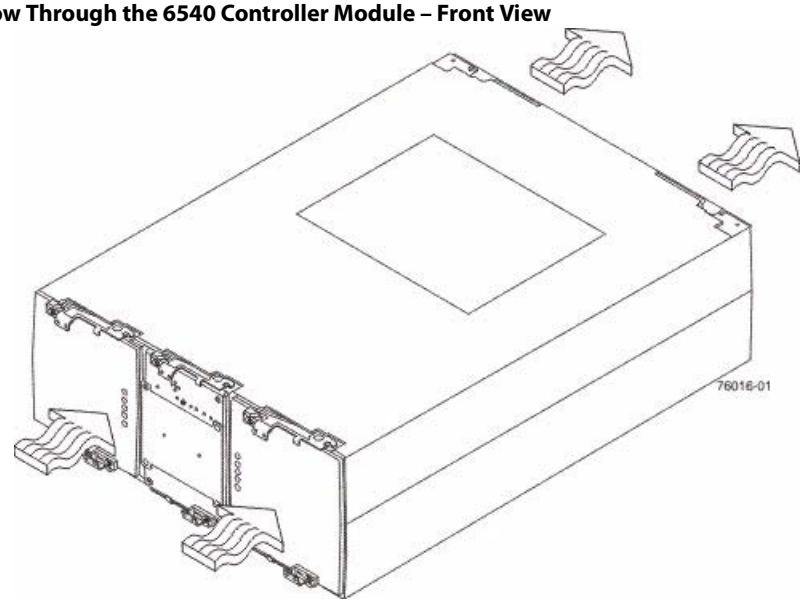
Table 19 Altitude Ranges for the 6540 Controller Module

Environment	Altitude
Operating	30.5 m (100 ft) below sea level to 3048 m (10,000 ft) above sea level
Storage	30.5 m (100 ft) below sea level to 3048 m (10,000 ft) above sea level
Transit	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level

6540 Controller Module Airflow and Heat Dissipation

Airflow goes from the front of the controller module to the rear of the controller module. Allow at least 76 cm (30 in.) of clearance in front of the controller module and at least 61 cm (24 in.) of clearance behind the controller module for service clearance, ventilation, and heat dissipation.

Figure 15 Airflow Through the 6540 Controller Module – Front View



The tabulated power and heat dissipation values in the following table are the maximum measured operating power. Maximum configuration units are typically operated at higher data rates or have larger random access memory (RAM) capabilities.

Table 20 Power Ratings and Heat Dissipation for the 6540 Controller Module

Component	KVA	Watts (AC)	Btu/Hr	Amps (240 VAC)
6540 controller module	0.546	525	1791	2.19

6540 Controller Module Acoustic Noise

Table 21 Sound Levels for the 6540 Controller Module

Measurement	Level
Sound power	6.0 bels
Sound pressure	60 dBA

6540 Controller Module Site Wiring and Power

The agency ratings for the 6540 controller module are 5.25 A at 100 VAC and 2.19 A at 240 VAC. These ratings are the overall maximum currents for this system.

The 6540 controller module uses wide-ranging redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies operate within the range of 90 VAC to 264 VAC, at a minimum frequency of 50 Hz and a maximum frequency of 60 Hz. Voltage levels can fluctuate within the specified range. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

Keep this information in mind when you prepare the installation site for the controller module:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

NOTE *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide enough power and overload protection. To prevent damage to the controller module, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The controller module can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Maximum frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the controller module automatically performs a power-on recovery sequence without operator intervention after the power is restored.

NOTE When a power failure occurs, the controller module uses battery power to back up the data that is in cache.

If you are installing a large storage array configuration, you must make sure that you are supplying the correct AC source voltages, and not creating an over-current situation.

When calculating the cabinet's total power requirements, take the controller module's 525 W, and divide it by the cabinet's input voltage. If you are using 240 VAC, you obtain a maximum current of 2.19 A. Then add the amperage of each drive module. If each drive module uses 1.85 A, then 10 drive modules would use 18.5 A. In this example, your total storage array would use a rated maximum of 20.69 A.

6540 Controller Module Power Cords and Receptacles

Each 6540 controller module is shipped with two AC power cords. Each AC power cord connects one of the power-fan CRUs in the controller module to an independent, external AC power source, such as a wall receptacle, or to any uninterruptible power supply (UPS).

The optional UPS equipment is either placed external from the cabinet, or it is placed at the bottom of the cabinet. UPS devices provide a continuous supply of electrical power when utility power is unavailable. Some UPS equipment can also provide power conditioning to protect your storage array from voltage spikes, line noise, and undesirable power fluctuations, such as brownout. Contact an electrician to help you select and install the correct UPS equipment.

Switched-rack PDUs are also available for some customer-supplied cabinets. These new PDUs are stand-alone, network-manageable devices that allow programmable control of the power outlets. This capability enables you to control each outlet independently, manage power sequencing, and monitor the aggregate current draw through the switched-rack PDU. Additional equipment may be used to support temperature monitoring as well.

Preparing the Network for the Controllers

If you plan to use Ethernet connections from the storage management station to the controllers, you will use the out-of-band management method. For this configuration, meet with your network administrator before you order and install the equipment so that you can prepare for the setup and management of the devices on the IP network. Each controller uses its Ethernet management ports to connect to the IP network and communicate with the other devices on the IP network (often requiring a special application to set up the protocol).

Your network administrator can pre-assign the addresses that you need to manage the communication between the devices on the IP network. Depending on your storage configuration, you will need the following addresses:

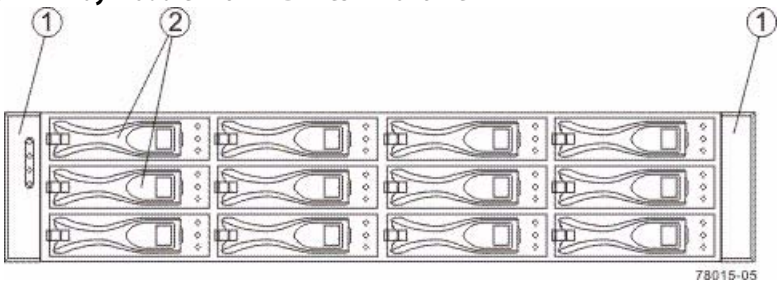
- Up to two network IP addresses for each controller
- Up to two subnet mask addresses for each controller
- Either two IPv4 addresses (one static and one dynamic) or one IPv6 address for each controller
- A Dynamic Host Configuration Protocol (DHCP) address for each controller

If switches are used in your storage environment, you must know if zoning will be used, and how it will be configured.

Chapter 5: Specifications of the ST2500 M2 Array Module

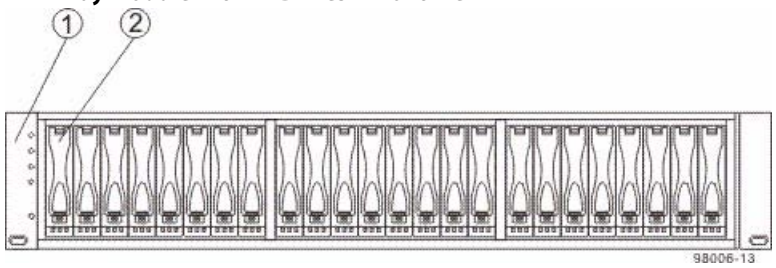
The ST2500 M2 array module is available in a rackmount model, with a capacity of either 12 drives or 24 drives.

Figure 16 ST2500 M2 Array Module with 12 Drives – Front View



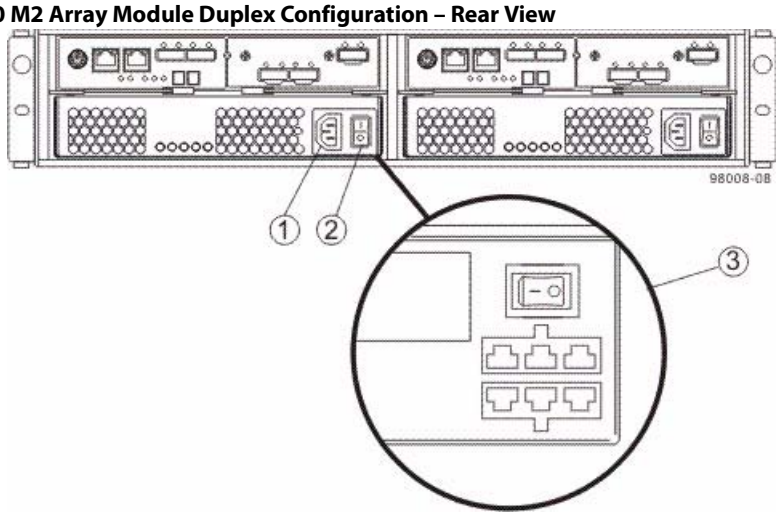
1. End Caps (the Left End Cap Has the Array Module Summary LEDs)
2. Drive CRUs

Figure 17 ST2500 M2 Array Module with 24 Drives – Front View



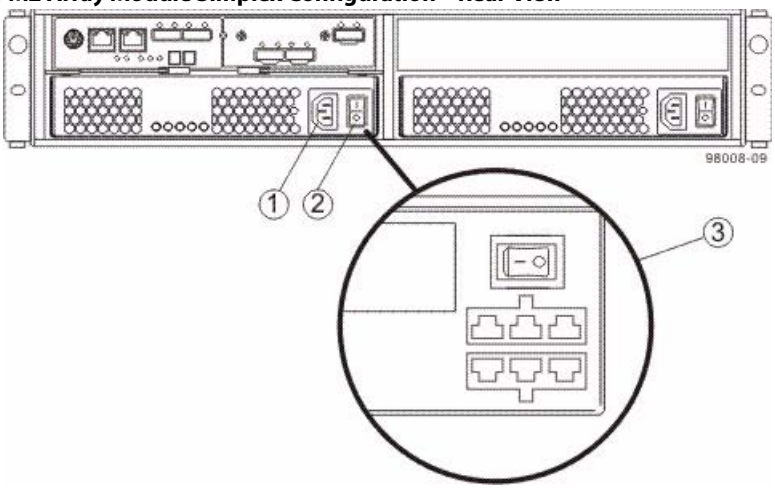
1. End Caps (the Left End Cap Has the Array Module Summary LEDs)
2. Drive CRUs

Figure 18 ST2500 M2 Array Module Duplex Configuration – Rear View



1. AC Power Connector on the AC Power-Fan CRU
2. AC Power Switch
3. DC Power Connector and DC Power Switch on the Optional DC Power-Fan CRU

Figure 19 ST2500 M2 Array Module Simplex Configuration – Rear View



1. AC Power Connector
2. AC Power Switch
3. Optional DC Power Connector and DC Power Switch

ST2500 M2 Array Module Dimensions

The ST2500 M2 array module conforms to the 48.3-cm (19.0-in.) rack standard.

Figure 20 Dimensions of the ST2500 M2 Array Module (12-Drive Model) – Front View

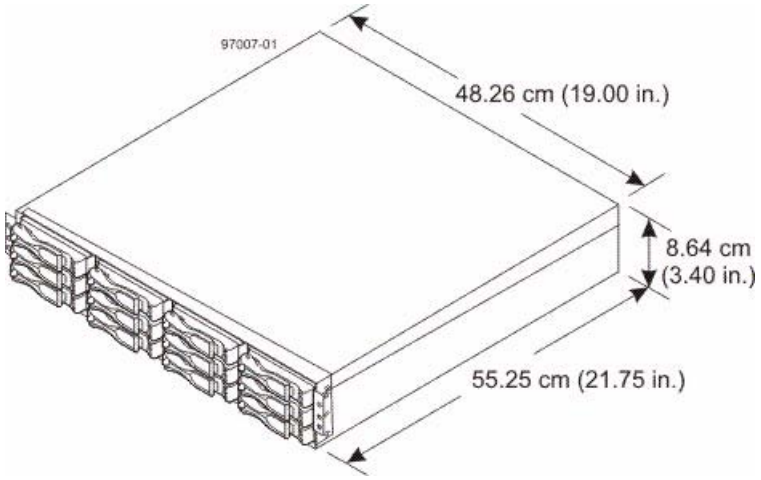
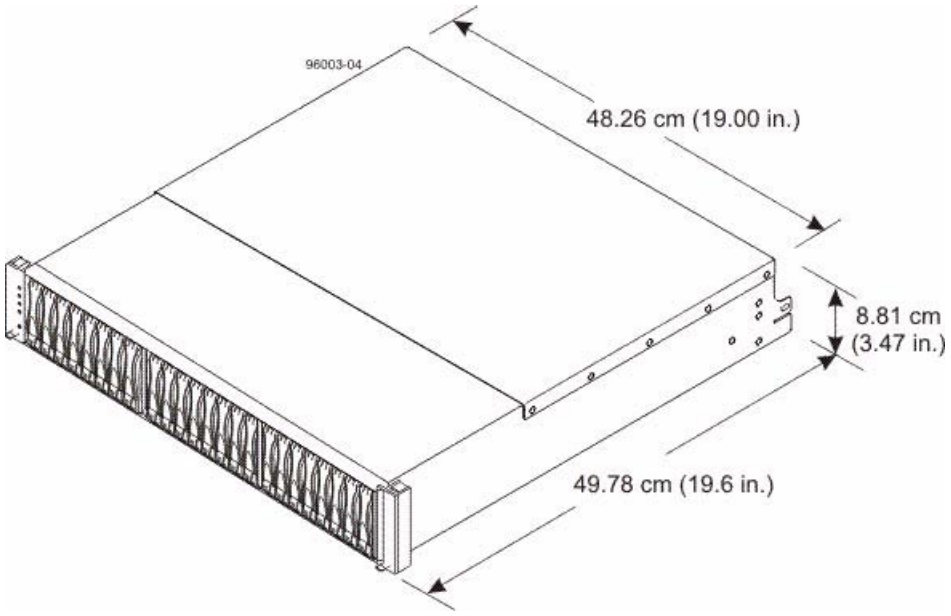


Figure 21 Dimensions of the ST2500 M2 Array Module (24-Drive Model) – Front View



ST2500 M2 Array Module Weight

Table 22 Weights of the ST2500 M2 Array Module

Unit	Weight		
	Maximum*	Empty**	Shipping***
Array Module, with twelve 8.89-cm (3.5-in.) drives	27 kg (59.52 lb)	18.60 kg (41.01 lb)	31.75 kg (70.0 lb)
Array Module, with twenty-four 6.35-cm (2.5-in.) drives	26 kg (57.32 lb)	21.70 kg (47.84 lb)	31.75 kg (70.0 lb)

*Maximum weight indicates a array module with all of its drives and other components installed. Because drive weights can vary greatly, this value can vary from the value specified as much as either 0.3 kg (0.66 lb) times the maximum number of drives per array module for 3.5-in. SATA drives or 0.08 kg (0.18 lb) times the maximum number of drives per array module for 2.5-in. SATA drives.

**Empty weight indicates a array module with the controller CRUs, the power-fan CRUs, and the drives removed.

***Shipping weight indicates the maximum weight of the array module and allshipping material.

Table 23 Weights of the Individual Components

Component	Weight
Controller CRU	2.131 kg (4.70 lb)
Power-fan CRU	2.500 kg (5.51 lb)
2.5-in. SATA drive	0.3 kg (0.66 lb)
3.5-in. SATA drive	1.0 kg (2.2 lb)

ST2500 M2 Array Module Shipping Dimensions

Table 24 Shipping Carton Dimensions for the ST2500 M2 Array Module

Height	Width	Depth
24.13 cm (9.5 in.)*	63.50 cm (25 in.)	58.42 cm (23 in.)
24.13 cm (9.5 in.)**	68.58 cm (27 in.)	58.42 cm (23 in.)

*Array Module with twelve 3.5-in. drives.

**Array Module with twenty-four 2.5-in. drives.

ST2500 M2 Array Module Temperature and Humidity

Table 25 Temperature Requirements and Humidity Requirements for the ST2500 M2 Array Module

Condition	Parameter	Requirement
Temperature	Operating range (both cabinet and subsystem)	10°C to 35°C (50°F to 104°F)
	Maximum rate of change	10°C (50°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F)
	Maximum rate of change	15°C (59°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140°F)
	Maximum rate of change	20°C (68°F) per hour
Relative humidity (no condensation)	Operating range (both cabinet and subsystem)	20% to 80%
	Storage range	10% to 90%
	Transit range	5% to 90%
	Operating gradient	10°C (50°F) per hour maximum
	Storage gradient	15°C (59°F) per hour maximum
	Transit gradient	20°C (68°F) per hour maximum
	Maximum dew point	26°C (79°F)
	Maximum gradient	10% per hour

*If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.

ST2500 M2 Array Module Altitude Ranges

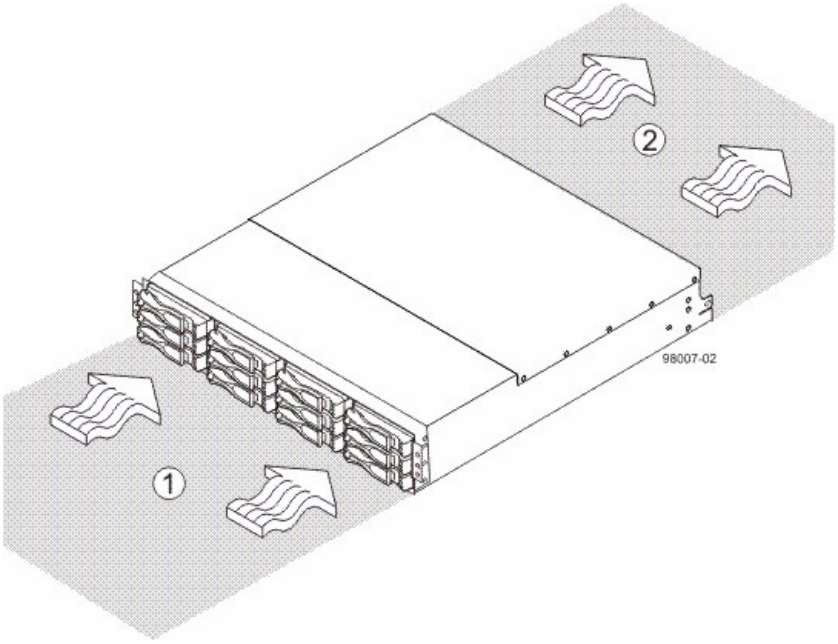
Table 26 Altitude Ranges for the ST2500 M2 Array Module

Environment	Altitude
Operating	30.5 m (100 ft) below sea level to 3000 m (9840 ft) above sea level
Storage	30.5 m (100 ft) below sea level to 3000 m (9840 ft) above sea level
Transit	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level

ST2500 M2 Array Module Airflow and Heat Dissipation

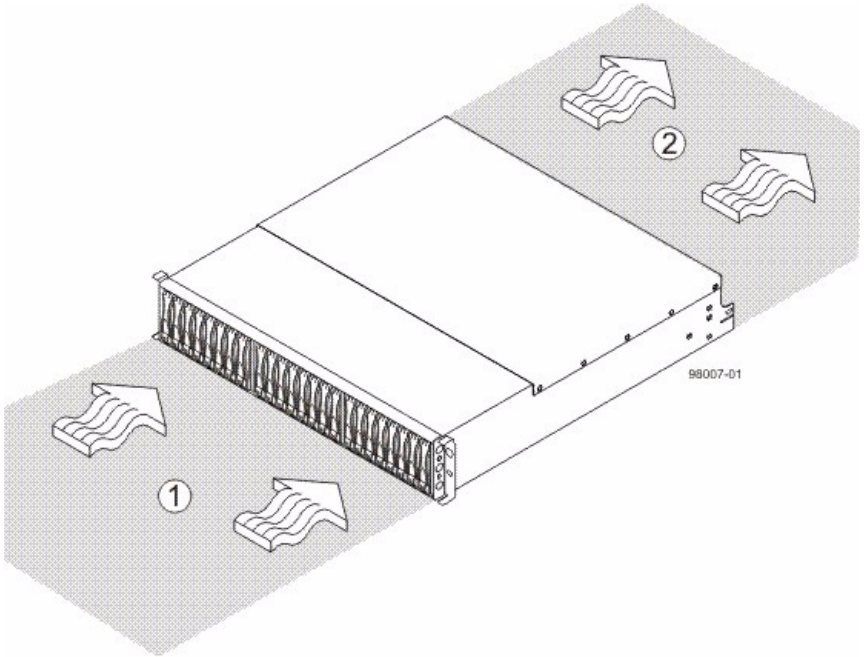
Allow at least 76 cm (30 in.) of clearance in front of the array module and 61 cm (24 in.) behind the array module for service clearance, ventilation, and heat dissipation.

Figure 22 Airflow Through the Array Module with 12 Drives – Front View



1. 76 cm (30 in.) clearance in front of the cabinet
2. 61 cm (24 in.) clearance behind the cabinet

Figure 23 Airflow Through the Array Module with 24 Drives – Front View



1. 76 cm (30 in.) clearance in front of the cabinet
2. 61 cm (24 in.) clearance behind the cabinet

Table 27 Power and Heat Dissipation for theST2500 M2 Array Module

Component	KVA	Watts (AC)	Btu/Hr
Controller CRUs with two power-fan CRUs and 12 drives	0.400	399	1366
Controller CRUs with two power-fan CRUs and 24 drives	0.331	330	1127

ST2500 M2 Array Module Acoustic Noise

Table 28 Acoustic Noise at 25°C for the ST2500 M2 Array Module

Measurement	Level
Sound power (standby operation)	6.5 bels maximum
Sound pressure (normal operation)	65 dBA maximum

ST2500 M2 Array Module Site Wiring and Power

The ST2500 M2 array module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source or the optional –48-VDC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

NOTE Power for the optional –48-VDC power configuration is supplied by a centralized DC power plant instead of the AC power source in the cabinet. Refer to the associated manufacturer's documentation for specific DC power source requirements.

Keep this information in mind when you prepare the installation site for the array module:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source or the optional –48-VDC power source.

NOTE *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide enough power and overload protection. To prevent damage to the array module, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The array module can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the array module automatically performs a power-on recovery sequence without operator intervention.

ST2500 M2 Array Module Power Input

AC Power Input

Each power supply contains one 10-A slow-blow fuse.

Table 29 AC Power Requirements for the ST2500 M2 Array Module

Parameter	Low Range	High Range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Idle current	3.97 A*	1.63 A**
Maximum operating current	4.25 A*	1.68 A**
Sequential Drive Group Spin Up	4.27 A	1.76 A
Simultaneous Drive Spin Up	6.13 A	2.71 A
System Rating Plate Label	7.0 A	2.9 A

* Typical current: 100 VAC, 60 Hz at 0.87 power supply efficiency and 0.99 power factor. These numbers can vary significantly, depending upon the drives tested in the particular configuration.

**Typical current: 240 VAC, 60 Hz at 0.87 power supply efficiency and 0.99 power factor. These numbers can vary significantly, depending upon the drives tested in the particular configuration.

DC Power Input

Nominal input voltages for the DC power source are as follows:

- Low range: –42 VDC
- High range: –60 VDC

The maximum operating current is 21.7 A.

ST2500 M2 Array Module Power Factor Correction

Power factor correction is applied within the power supply, which maintains the power factor of the array module at greater than 0.95 with nominal input voltage.

ST2500 M2 Array Module AC Power Cords and Receptacles

Each ST2500 M2 array module is shipped with two AC power cords. Each AC power cord connects one of the power supplies in an array module to an independent, external AC power source, such as a wall receptacle or a UPS.

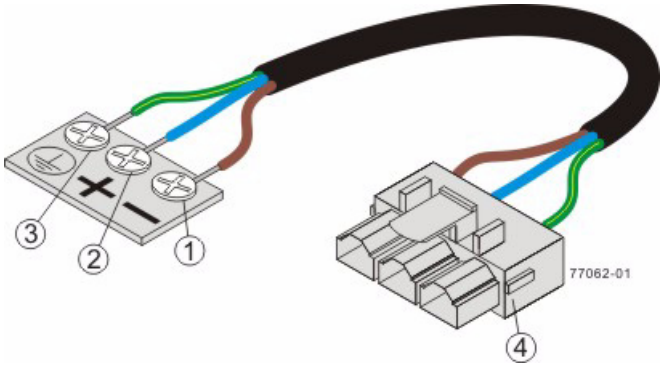
If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the AC power cords that are shipped with the array module.

DC power is an option that is available for use with youran array module and drive modules. For more information, see ST2500 M2 Array Module Optional DC Power Connector Cables and Source Wires.

ST2500 M2 Array Module Optional DC Power Connector Cables and Source Wires

The ST2500 M2 array module is shipped with –48-VDC power connector cables if the DC power option is ordered. The –48-VDC power connector cable plugs into the DC power connector on the rear of the array module. The three source wires on the other end of the power connector cable connect the array module to centralized DC power plant equipment, typically through a bus bar above the cabinet.

WARNING (W12) **Risk of electrical shock** – This unit has more than one power source. To remove all power from the unit, all DC MAINS must be disconnected by removing all power connectors (item 4 below) from the power supplies.



1. Supply (Negative), Brown Wire, –48 VDC
2. Return (Positive), Blue Wire
3. Ground, Green and Yellow Wire
4. DC Power Connector

WARNING (W14) **Risk of bodily injury** – A qualified service person is required to make the DC power connection according to NEC and CEC guidelines.

Two (or, optionally, four) DC power connector cables are provided with each array module. Two DC power connectors are on the two DC power supplies on the rear of each array module if additional redundancy is required.

NOTE It is not mandatory that you connect the second DC power connection on the DC power supplies of the array module. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

Preparing the Network for the Controllers

If you plan to use Ethernet connections from the storage management station to the controllers, you will use the out-of-band management method. For this configuration, meet with your network administrator before you order and install the equipment so that you can prepare for the setup and management of the devices on the IP network. Each controller uses its Ethernet management ports to connect to the IP network and communicate with the other devices on the IP network (often requiring a special application to set up the protocol).

Your network administrator can pre-assign the addresses that you need to manage the communication between the devices on the IP network. Depending on your storage configuration, you will need the following addresses:

- Up to two network IP addresses for each controller

- Up to two subnet mask addresses for each controller
- Either two IPv4 addresses (one static and one dynamic) or one IPv6 address for each controller
- A Dynamic Host Configuration Protocol (DHCP) address for each controller

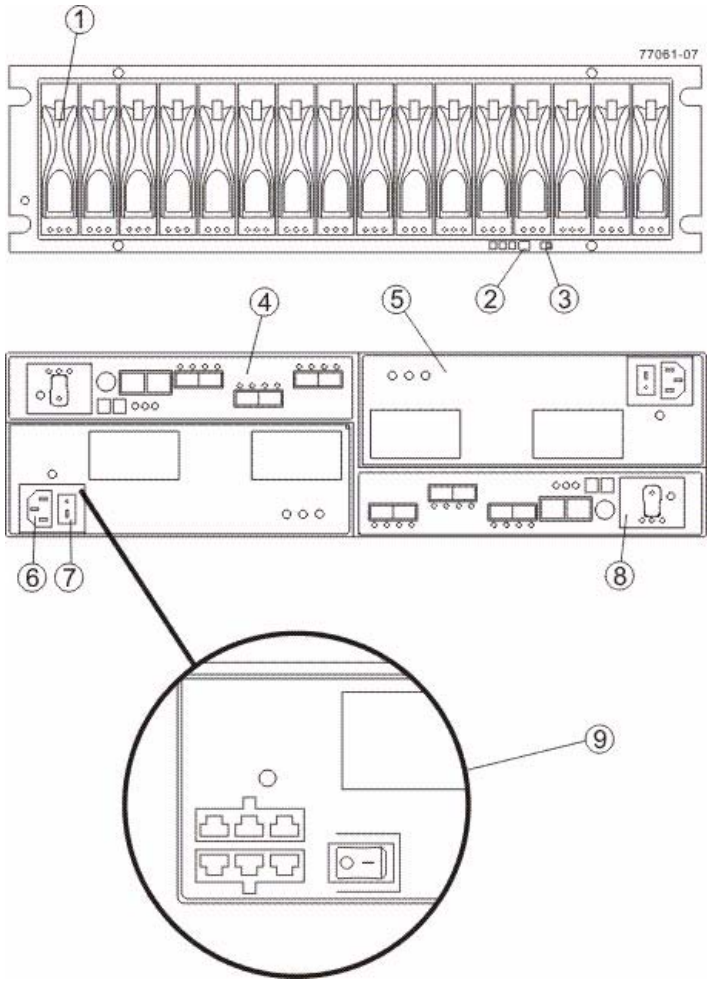
If switches are used in your storage environment, you must know if zoning will be used, and how it will be configured.

Chapter 6: Specifications of the 6180 Array Module

The 6180 array module is available as a rackmount model that provides high-capacity disk storage for Fibre Channel or iSCSI environments.

The 6180 array module contains the components shown in the following figure.

Figure 24 6180 Array Module – Front View and Rear View

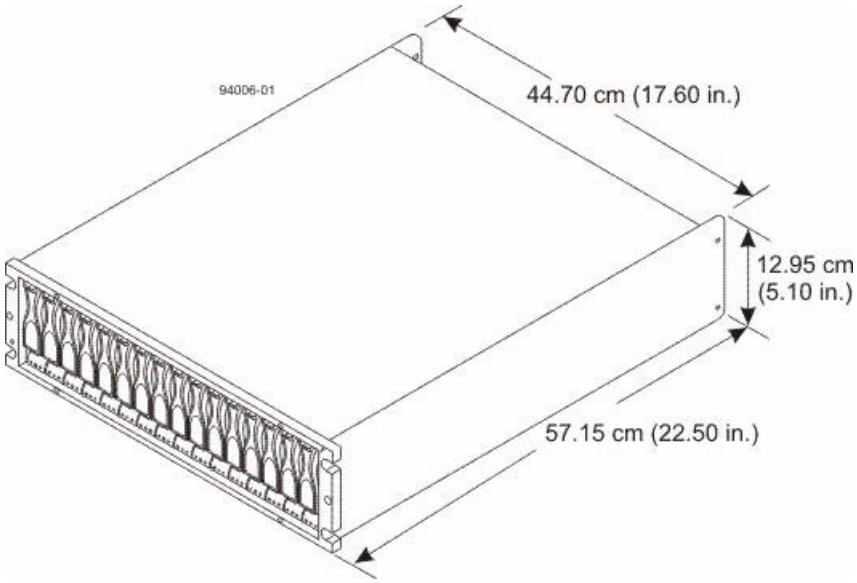


1. (Front View) Drive CRU
2. Alarm Mute Switch
3. (Rear View) Link Rate Switch
4. Controller A (Inverted)
5. Power-Fan CRU
6. AC Power Connector
7. AC Power Switch
8. Battery CRU
9. Optional DC Power Connector and DC Power Switch

6180 Array Module Dimensions

The 6180 array module conforms to the 48.3-cm (19.0-in.) rack standard.

Figure 25 Dimensions of the 6180 Array Module – Front View



6180 Array Module Weight

Table 30 Weights of the 6180 Array Module

Unit	Weight		
	Maximum*	Empty**	Shipping***
6180 array module	38.15 kg (84.1 lb)	22.67 kg (50.0 lb)	51.70 kg (114.0 lb)

*Maximum weight indicates an array module with all of its drives and other components installed. Because drive weights can vary greatly, this value can vary from the value specified as much as 0.3 kg (0.6 lb) times the maximum number of drives per array module for drives weighing 1.0 kg (2.2 lb).

**Empty weight indicates an array module with the controller CRUs, the power-fan CRUs, and the drives removed.

***Shipping weight indicates the maximum weight of an array module and all shipping material.

Table 31 Component Weights of the Array Module

Component	Weight
Controller CRU	1.995 kg (4.40 lb)
Power-fan CRU	3.629 kg (8.00 lb)
ESM CRU	1.814 kg (4.00 lb)
Battery	0.544 kg (1.20 lb)
Drive	Approximately 1.0 kg (2.2 lb)

6180 Array Module Shipping Dimensions

Table 32 Shipping Carton Dimensions for the 6180 Array Module

Height	Width	Depth
45.72 cm (18.00 in.) – Includes the height of the pallet.	60.96 cm (24.00 in.)	81.28 cm (32.00 in.)

6180 Array Module Temperature and Humidity

Table 33 Temperature Requirements and Humidity Requirements for the 6180 Array Module

Condition	Parameter	Requirement
Temperature*	Operating range	10°C to 40°C (50°F to 104°F) without the battery 10°C to 35°C (50°F to 95°F) with the battery
	Maximum rate of change	10°C (18°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F) without the battery –10°C to 45°C (14°F to 113°F) with the battery (three-month maximum in storage)
	Maximum rate of change	15°C (27°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140° F) without the battery –20°C to 60°C (–4°F to 140°F) with the battery (one-week maximum in transit)
	Maximum rate of change	20°C (36°F) per hour
Relative humidity (no condensation)	Operating range	20% to 80%
	Storage range	10% to 90%
	Transit range	5% to 95%
	Maximum dew point	26°C (79°F)
	Maximum gradient	10% per hour

*If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.

6180 Array Module Altitude Ranges

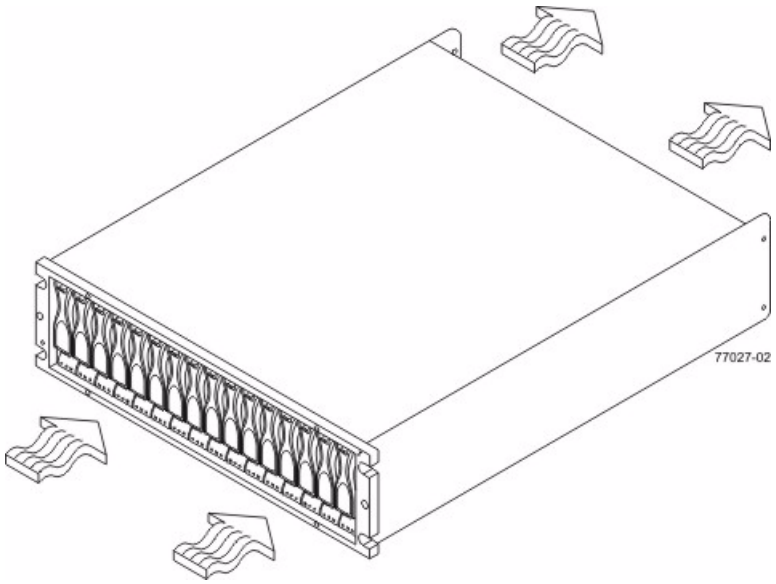
Table 34 Altitude Ranges for the 6180 Array Module

Environment	Altitude
Operating	30.5 m (100 ft) below to 3,000 m (9840 ft) above sea level
Storage	30.5 m (100 ft) below to 3,000 m (9840 ft) above sea level
Transit	30.5 m (100 ft) below to 12,000 m (40,000 ft) above sea level

6180 Array Module Airflow and Heat Dissipation

Airflow goes from the front of the array module to the rear of the array module. Allow at least 76 cm (30 in.) of clearance in front of the array module and at least 61 cm (24 in.) of clearance behind the array module for service clearance, ventilation, and heat dissipation.

Figure 26 Airflow Through the 6180 Array Module – Front View



The tabulated power and heat dissipation values in the following table are the maximum measured operating power. Maximum configuration units are typically operated at high data rates or have larger random access memory (RAM) capabilities.

Table 35 Power Ratings and Heat Dissipation for the 6180 Array Module

Component	KVA	Watts (AC)	Btu/Hr	Amps (240 VAC)
6180 array module	0.624	600	2047	2.50

6180 Array Module Acoustic Noise

Table 36 Sound Levels for the 6180 Array Module

Measurement	Level
Sound power	6.5 bels
Sound pressure	65 dBA

6180 Array Module Site Wiring and Power

The agency ratings for the 6180 array module are 6.00 A at 100 VAC and 2.50 A at 240 VAC. These ratings are the overall maximum AC currents for this system.

The 6180 array module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source or the optional –48-VDC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

NOTE Power for the optional –48-VDC power configuration is supplied by a centralized DC power plant instead of the AC power source in the cabinet. Refer to the associated manufacturer's documentation for specific DC power source requirements.

Keep this information in mind when you prepare the installation site for the array module:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source or the optional –48-VDC power source.

NOTE *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide enough power and overload protection. To prevent damage to the array module, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The array module can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Maximum frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the array module automatically performs a power-on recovery sequence without operator intervention after the power is restored.

NOTE When a power failure occurs, the array module uses battery power to back up the data that is in cache.

If you are installing a large storage system configuration, you must make sure that you are supplying the correct AC source voltages, and not creating an over-current situation.

6180 Array Module Power Input

AC Power Input

Each power supply contains one 15-A slow-blow fuse.

Table 37 AC Power Requirements for the 6180 Array Module

Parameter	Low Range	High Range
Nominal voltage	115 VAC	230 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Idle current	3.81 A*	1.98 A**
Maximum operating current	3.96 A*	2.06 A**
Maximum surge current	5.52 A*	2.72 A**

*Typical current: 115 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor.

**Typical current: 230 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor.

DC Power Input

Nominal input voltages for the DC power source are as follows:

- Low range: –36 VDC
- High range: –72 VDC

The maximum operating current is 17 A.

6180 Array Module Power Factor Correction

Power factor correction is applied within the power-fan CRU of each 6180 array module, which maintains the power factor of the array module at greater than 0.96 with nominal input voltage.

6180 Array Module AC Power Cords and Receptacles

Each 6180 array module is shipped with two AC power cords, which fit the standard AC outlets in the destination country. Each AC power cord connects one of the power-fan CRUs in the array module to an independent, external AC power source, such as a wall receptacle or an uninterruptible power supply (UPS).

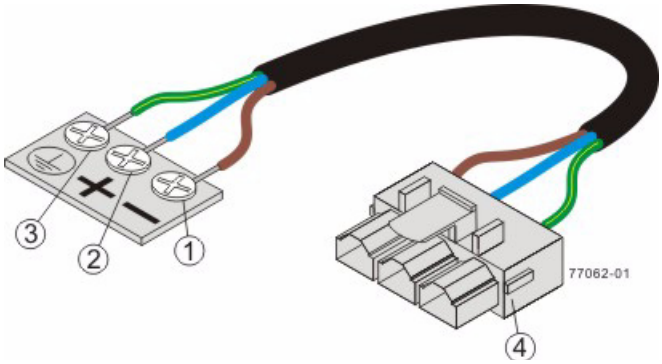
DC power is an option that is available for use with your array module and drive module. For more information, see 6180 Array Module Optional DC Power Connector Cables and Source Wires.

If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the AC power cords that are shipped with the array module.

6180 Array Module Optional DC Power Connector Cables and Source Wires

The 6180 array module is shipped with –48-VDC power connector cables if the DC power option is ordered. The –48-VDC power connector cable plugs into the DC power connector on the rear of the array module. The three source wires on the other end of the power connector cable connect the array module to centralized DC power plant equipment, typically through a bus bar above the cabinet.

WARNING (W12) **Risk of electrical shock** – This unit has more than one power source. To remove all power from the unit, all DC MAINS must be disconnected by removing all power connectors (item 4 below) from the power supplies.



1. Supply (Negative), Brown Wire, –48 VDC
2. Return (Positive), Blue Wire
3. Ground, Green and Yellow Wire
4. DC Power Connector

WARNING (W14) **Risk of bodily injury** – A qualified service person is required to make the DC power connection according to NEC and CEC guidelines.

Two (or, optionally, four) DC power connector cables are provided with each array module. Two DC power connectors are on the two DC power supplies on the rear of each array module if additional redundancy is required.

NOTE It is not mandatory that you connect the second DC power connection on the DC power supplies of the array module. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

Preparing the Network for the Controllers

If you plan to use Ethernet connections from the storage management station to the controllers, you will use the out-of-band management method. For this configuration, meet with your network administrator before you order and install the equipment so that you can prepare for the setup and management of the devices on the IP network. Each controller uses its Ethernet management ports to connect to the IP network and communicate with the other devices on the IP network (often requiring a special application to set up the protocol).

Your network administrator can pre-assign the addresses that you need to manage the communication between the devices on the IP network. Depending on your storage configuration, you will need the following addresses:

- Up to two network IP addresses for each controller
- Up to two subnet mask addresses for each controller
- Either two IPv4 addresses (one static and one dynamic) or one IPv6 address for each controller
- A Dynamic Host Configuration Protocol (DHCP) address for each controller

If switches are used in your storage environment, you must know if zoning will be used, and how it will be configured.

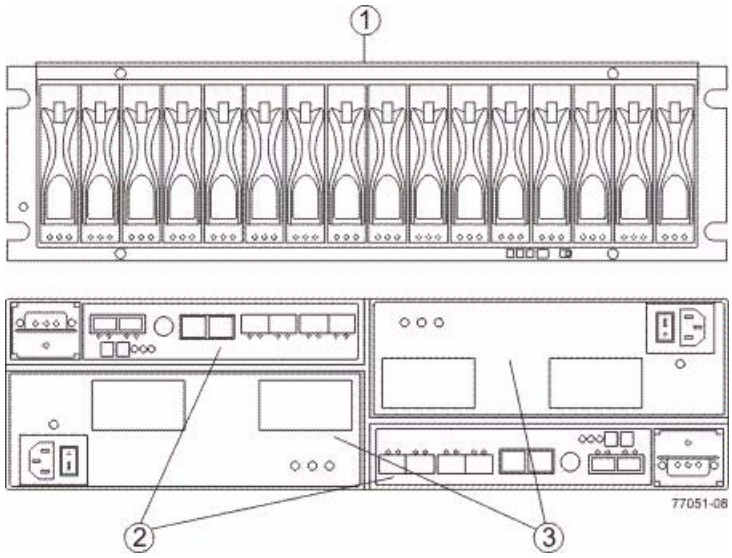
Chapter 7: Specifications of the 6140 Array Module

The 6140 array module is available as a rackmount model or a deskside model that provides high-capacity disk storage for Fibre Channel environments.

The 6140 array module contains these components:

- A maximum of 16 Fibre Channel or SATA drives
- Two power-fan CRUs
- One or two controllers

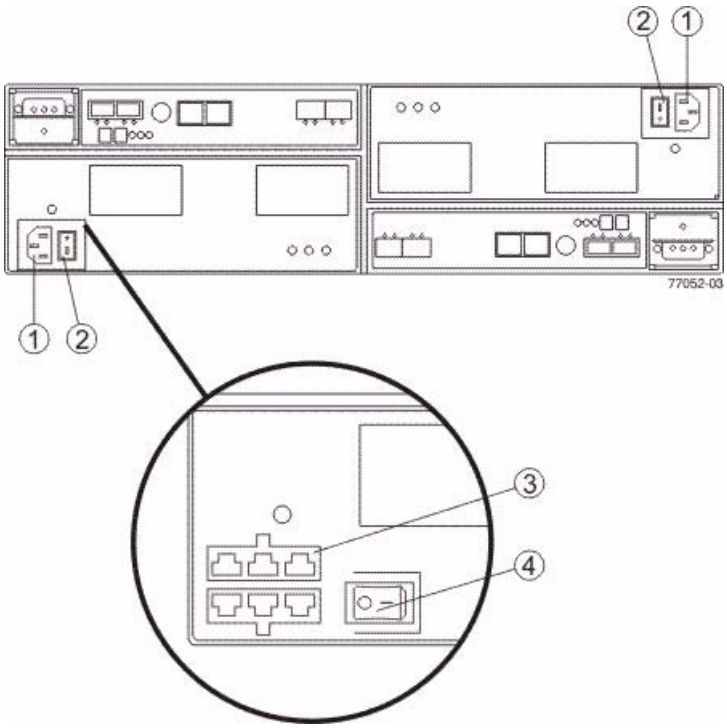
Figure 27 6140 Array Module (Rackmount Model) – Front View and Rear View



1. Drive CRUs
2. Controller CRUs
3. Power-Fan CRUs

Usually an AC power source is used to supply power to the power-fan CRU. A DC power option is also available.

Figure 28 Power Source Options for the 6140 Array Module – Rear View

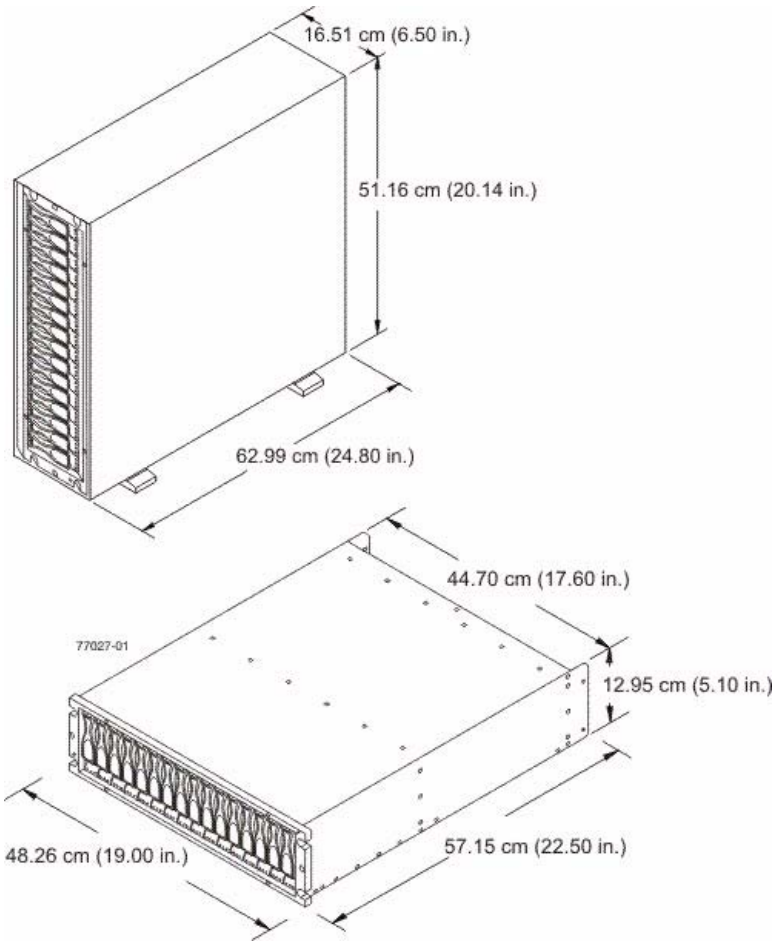


1. AC Power Connectors
2. AC Power Switches
3. (Optional) Two DC Power Connectors
4. (Optional) DC Power Switch

6140 Array Module Dimensions

The 6140 array module conforms to the 48.3-cm (19.0-in.) rack standard.

Figure 29 Dimensions of the 6140 Array Module (Deskside Model and Rackmount Model) – Front View



6140 Array Module Weight

Table 38 Weights of the 6140 Array Module

Unit	Weight		
	Maximum*	Empty**	Shipping***
6140 array module	41 kg (91 lb)	15.88 kg (35.0 lb)	52.16 kg (115.0 lb)

*Maximum weight indicates an array module with all of its drives and other components installed. Because drive weights can vary greatly, this value can vary from the value specified as much as 0.3 kg (0.6 lb) times the maximum number of drives per array module for drives weighing 1.0 kg (2.2 lb).

**Empty weight indicates an array module with the controller CRUs, the power-fan CRUs, and the drives removed.

***Shipping weight indicates the maximum weight of an array module and all shipping material.

6140 Array Module Shipping Dimensions

Table 39 Shipping Carton Dimensions for the 6140 Array Module

Height	Width	Depth
45.72 cm (18.00 in.) – Includes the height of the pallet.	62.23 cm (24.50 in.)	80.65 cm (31.75 in.)

6140 Array Module Temperature and Humidity

Table 40 Temperature Requirements and Humidity Requirements for the 6140 Array Module

Condition	Parameter	Requirement
Temperature*	Operating range	10°C to 40°C (50°F to 104°F) without the battery 10°C to 35°C (50°F to 95°F) with the battery
	Maximum rate of change	10°C (18°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F) without the battery –10°C to 45°C (14°F to 113°F) with the battery (three-month maximum in storage)
	Maximum rate of change	15°C (27°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140° F) without the battery –20°C to 60°C (–4°F to 140°F) with the battery (one-week maximum in transit)
	Maximum rate of change	20°C (36°F) per hour
Relative humidity (no condensation)	Operating range	20% to 80%
	Storage range	10% to 90%
	Transit range	5% to 95%
	Maximum dew point	26°C (79°F)
	Maximum gradient	10% per hour

*If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.

6140 Array Module Altitude Ranges

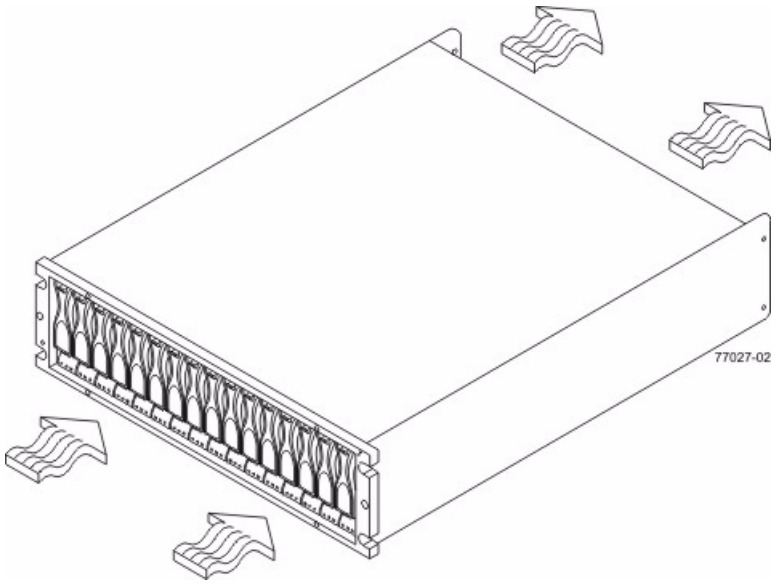
Table 41 Altitude Ranges for the 6140 Array Module

Environment	Altitude
Operating	30.5 m (100 ft) below to 3,000 m (9840 ft) above sea level
Storage	30.5 m (100 ft) below to 3,000 m (9840 ft) above sea level
Transit	30.5 m (100 ft) below to 12,000 m (40,000 ft) above sea level

6140 Array Module Airflow and Heat Dissipation

Airflow goes from the front of the array module to the rear of the array module. Allow at least 76 cm (30 in.) of clearance in front of the array module and at least 61 cm (24 in.) of clearance behind the array module for service clearance, ventilation, and heat dissipation.

Figure 30 Airflow Through the 6140 Array Module – Front View



The tabulated power and heat dissipation values inthe following table are the maximum measured operating power. Maximum configuration units are typically operated at high data rates or have larger random access memory (RAM) capabilities.

Table 42 Power Ratings and Heat Dissipation for the 6140 Array Module

Component	KVA	Watts (AC)	Btu/Hr	Amps (240 VAC)
6140 array module	0.624	600	2047	2.50

6140 Array Module Acoustic Noise

Table 43 Sound Levels for the 6140 Array Module

Measurement	Level
Sound power	6.5 bels
Sound pressure	65 dBA

6140 Array Module Site Wiring and Power

The agency ratings for the 6140 array module are 6.00 A at 100 VAC and 2.50 A at 240 VAC. These ratings are the overall maximum AC currents for this system.

The 6140 array module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source or the optional –48-VDC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

NOTE Power for the optional –48-VDC power configuration is supplied by a centralized DC power plant instead of the AC power source in the cabinet. Refer to the associated manufacturer's documentation for specific DC power source requirements.

Keep this information in mind when you prepare the installation site for the array module:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source or the optional –48-VDC power source.

NOTE *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide enough power and overload protection. To prevent damage to the array module, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The array module can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Maximum frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the array module automatically performs a power-on recovery sequence without operator intervention after the power is restored.

NOTE When a power failure occurs, the array module uses battery power to back up the data that is in cache.

If you are installing a large storage system configuration, you must make sure that you are supplying the correct AC source voltages, and not creating an over-current situation.

6140 Array Module Power Input

AC Power Input

Each power supply contains one 15-A slow-blow fuse.

Table 44 AC Power Requirements for the 6140 Array Module

Parameter	Low Range	High Range
Nominal voltage	115 VAC	230 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Idle current	3.81 A*	1.98 A**

Parameter	Low Range	High Range
Maximum operating current	3.96 A*	2.06 A**
Maximum surge current	5.52 A*	2.72 A**

*Typical current: 115 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor.

**Typical current: 230 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor.

DC Power Input

Nominal input voltages for the DC power source are as follows:

- Low range: –36 VDC
- High range: –72 VDC

The maximum operating current is 17 A.

6140 Array Module Power Factor Correction

Power factor correction is applied within the power-fan CRU of each 6140 array module, which maintains the power factor of the array module at greater than 0.96 with nominal input voltage.

6140 Array Module AC Power Cords and Receptacles

Each 6140 array module is shipped with two AC power cords, which fit the standard AC outlets in the destination country. Each AC power cord connects one of the power-fan CRUs in the array module to an independent, external AC power source, such as a wall receptacle or an uninterruptible power supply (UPS).

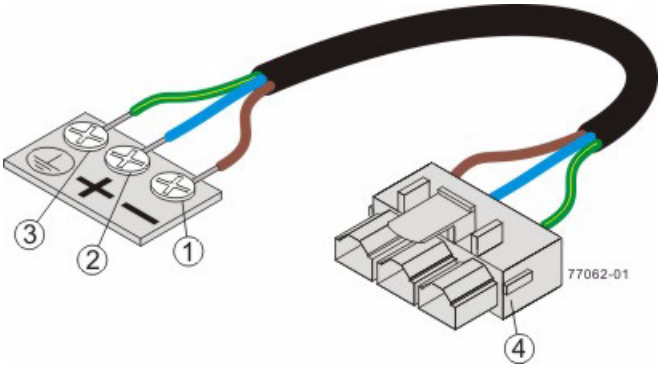
DC power is an option that is available for use with your array module and drive module. For more information, refer to 6140 Array Module Optional DC Power Connector Cables and Source Wires.

If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the AC power cords that are shipped with the array module.

6140 Array Module Optional DC Power Connector Cables and Source Wires

The 6140 array module is shipped with –48-VDC power connector cables if the DC power option is ordered. The –48-VDC power connector cable plugs into the DC power connector on the rear of the array module. The three source wires on the other end of the power connector cable connect the array module to centralized DC power plant equipment, typically through a bus bar above the cabinet.

WARNING (W12) **Risk of electrical shock** – This unit has more than one power source. To remove all power from the unit, all DC MAINS must be disconnected by removing all power connectors (item 4 below) from the power supplies.



1. Supply (Negative), Brown Wire, –48 VDC
2. Return (Positive), Blue Wire
3. Ground, Green and Yellow Wire
4. DC Power Connector

WARNING (W14) **Risk of bodily injury** – A qualified service person is required to make the DC power connection according to NEC and CEC guidelines.

Two (or, optionally, four) DC power connector cables are provided with each array module. Two DC power connectors are on the two DC power supplies on the rear of each array module if additional redundancy is required.

NOTE It is not mandatory that you connect the second DC power connection on the DC power supplies of the array module. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

Preparing the Network for the Controllers

If you plan to use Ethernet connections from the storage management station to the controllers, you will use the out-of-band management method. For this configuration, meet with your network administrator before you order and install the equipment so that you can prepare for the setup and management of the devices on the IP network. Each controller uses its Ethernet management ports to connect to the IP network and communicate with the other devices on the IP network (often requiring a special application to set up the protocol).

Your network administrator can pre-assign the addresses that you need to manage the communication between the devices on the IP network. Depending on your storage configuration, you will need the following addresses:

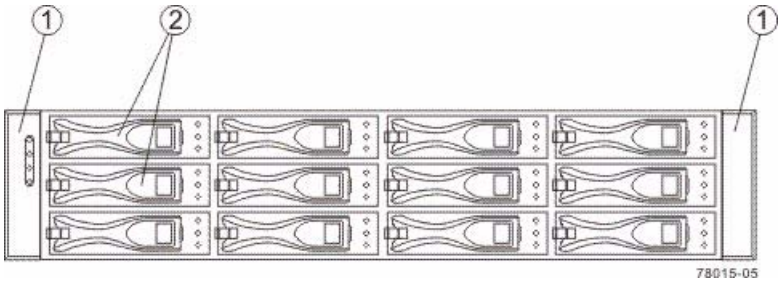
- Up to two network IP addresses for each controller
- Up to two subnet mask addresses for each controller
- Either two IPv4 addresses (one static and one dynamic) or one IPv6 address for each controller
- A Dynamic Host Configuration Protocol (DHCP) address for each controller

If switches are used in your storage environment, you must know if zoning will be used, and how it will be configured.

Chapter 8: Specifications of the ST2530 Array Module

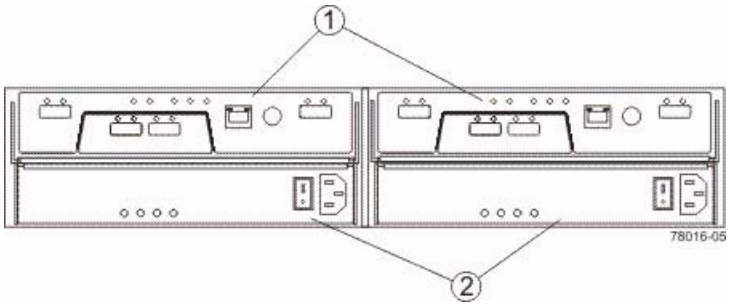
The ST2530 array module is available in rackmount models.

Figure 31 ST2530 Array Module – Front View



1. End Caps (the Left End Cap Has the Array Module Summary LEDs)
2. Drives

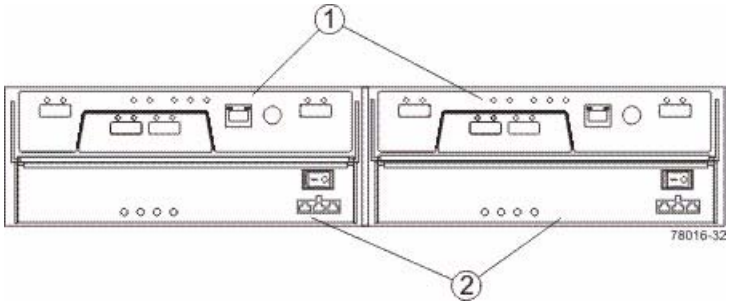
Figure 32 ST2530 Array Module – Rear View



1. Controller CRUs
2. Power-Fan CRUs

Usually, an AC power source supplies power to the power-fan CRU. A DC poweroption is also available.

Figure 33 ST2530 Array Module – Power Source Options Rear View

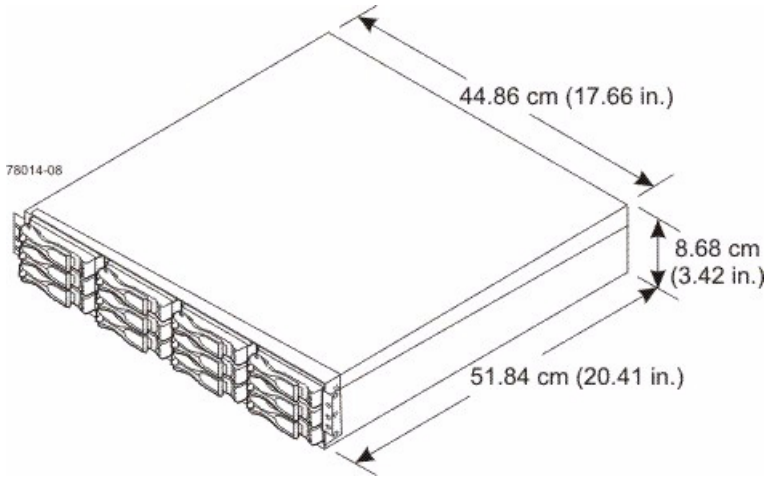


1. Controller CRUs
2. DC Power Switch on an Optional Power-Fan CRU

ST2530 Array Module Dimensions

The ST2530 array module conforms to the 48.3-cm (19.0-in.) rack standard.

Figure 34 Dimensions of the ST2530 Array Module – Front View



ST2530 Array Module Weight

Table 45 Weights of the ST2530 Array Module

Unit	Weight		
	Maximum*	Empty**	Shipping***
ST2530 array module	25.86 kg (57 lb)	6.80 kg (15 lb)	25.00 kg (55.0 lb)

*Maximum weight indicates a array module with all of its drives and other components installed. Because drive weights can vary greatly, this value can vary from the value specified as much as 0.3 kg (0.6 lb) times the maximum number of drives per array module for drives weighing 1.0 kg (2.2 lb).

**Empty weight indicates an array module with the controller CRUs, the power-fan CRUs, and the drives removed.

***Shipping weight indicates the maximum weight of the array module and all shipping material.

Table 46 Component Weights of the ST2530 Array Module

Component	Weight
ESM CRU	0.907 kg (2.00 lb)
Power-fan CRU	2.267 kg (5.00 lb)
Drive	1.0 kg (2.2 lb)

ST2530 Array Module Shipping Dimensions

Table 47 Shipping Carton Dimensions for the ST2530 Array Module

Height	Width	Depth
8.68 cm (3.42 in.)	51.84 cm (20.41 in.)	44.86 cm (17.66 in.)

ST2530 Array Module Temperature and Humidity

Table 48 Temperature Requirements and Humidity Requirements for the ST2530 Array Module

Condition	Parameter	Requirement
Temperature*	Operating range	10°C to 35°C (50°F to 95°F)
	Maximum rate of change	10°C (18°F) per hour
	Storage range	–10°C to 45°C (14°F to 113°F)
	Maximum rate of change	15°C (27°F) per hour
	Transit range	–20°C to 60°C (–40°F to 149°F) for one week
	Maximum rate of change	20°C (36°F) per hour
Relative humidity (no condensation)	Operating range	20% to 80%
	Storage range	10% to 90%
	Transit range	5% to 95%
	Maximum dew point	26°C (79°F)
	Maximum gradient	10% per hour
*If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.		

ST2530 Array Module Altitude Ranges

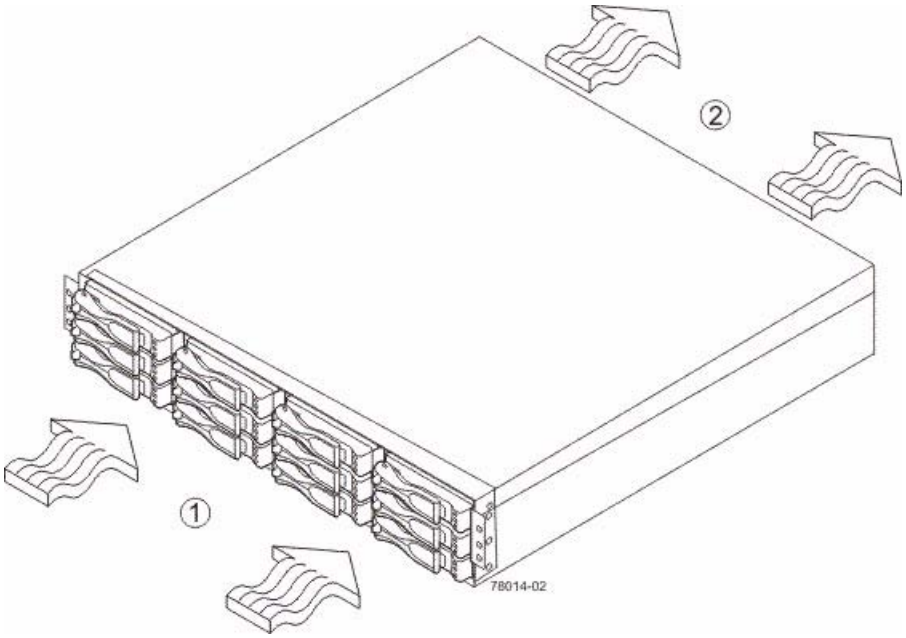
Table 49 Altitude Ranges for the ST2530 Array Module

Environment	Altitude
Operating	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Storage	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Transit	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level

ST2530 Array Module Airflow and Heat Dissipation

Allow at least 76 cm (30 in.) of clearance in front of the array module and 61 cm (24 in.) behind the array module for service clearance, ventilation, and heat dissipation.

Figure 35 Airflow Through the ST2530 Array Module – Front View



1. 76 cm (30 in.) clearance in front of the cabinet
2. 61 cm (24 in.) clearance behind the cabinet

Table 50 Power and Heat Dissipation for the ST2530 Array Module

Component	KVA	Watts (AC)	Btu/Hr
Controller CRU	0.398	394	1346

ST2530 Array Module Acoustic Noise

Table 51 Sound Levels for the ST2530 Array Module

Measurement	Level
ES 2-10-02 Standard Level 2	0.5 bels margin
Sound power (standby operation	6.5 bels
Sound power (normal operation)	6.8 bels

ST2530 Array Module Site Wiring and Power

The ST2530 array modules use wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

Keep this information in mind when you prepare the installation site for the array module:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

NOTE *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide enough power and overload protection. To prevent damage to the array module, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The array module can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the array module automatically performs a power-on recovery sequence without operator intervention.

ST2530 Array Module Power Input

AC Power Input

Each power supply contains one 10-A slow-blow fuse.

Table 52 AC Power Requirements for the ST2530 Array Module

Parameter	Low Range	High Range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Idle current	3.140 A–3.750 A*	1.34 A–1.58 A**
Maximum operating current	4.01 A–4.08 A*	1.69 A–1.70 A**

*Typical voltage: 100 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor. The range provided shows that these numbers can vary significantly, depending upon the drives tested in the particular configuration.

**Typical voltage: 240 VAC, 50 Hz at 0.77 power supply efficiency and 0.96 power factor. The range provided shows that these numbers can vary significantly, depending upon the drives tested in the particular configuration.

DC Power Input

Nominal input voltages for the DC power source are as follows:

- Low range: –36 VDC
- High range: –72 VDC

The maximum operating current is 17 A.

ST2530 Array Module Power Factor Correction

Power factor correction is applied within the power supply, which maintains the power factor of the array module at greater than 0.95 with nominal input voltage.

ST2530 Array Module AC Power Cords and Receptacles

Each ST2530 array module is shipped with two AC power cords. Each AC power cord connects one of the power supplies in an array module to an independent, external AC power source, such as a wall receptacle or a UPS.

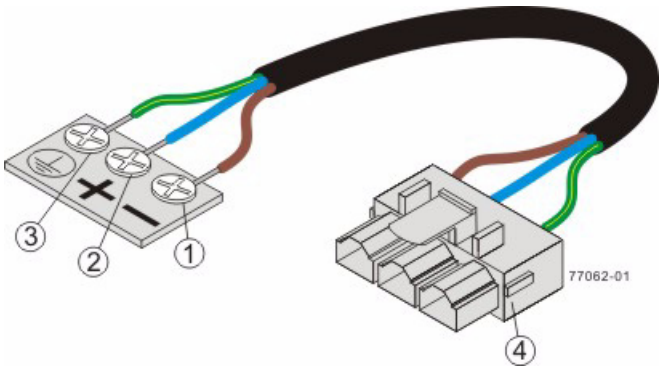
DC power is an option that is available for use with your array module and drive module. For more information, see ST2530 Array Module Optional DC Power Connector Cables and Source Wires

If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the AC power cords that are shipped with the array module.

ST2530 Array Module Optional DC Power Connector Cables and Source Wires

The ST2530 array module is shipped with –48-VDC power connector cables if the DC power option is ordered. The –48-VDC power connector cable plugs into the DC power connector on the rear of the array module. The three source wires on the other end of the power connector cable connect the array module to centralized DC power plant equipment, typically through a bus bar above the cabinet.

WARNING (W12) **Risk of electrical shock** – This unit has more than one power source. To remove all power from the unit, all DC MAINS must be disconnected by removing all power connectors (item 4 below) from the power supplies.



1. Supply (Negative), Brown Wire, –48 VDC
2. Return (Positive), Blue Wire
3. Ground, Green and Yellow Wire
4. DC Power Connector

WARNING (W14) **Risk of bodily injury** – A qualified service person is required to make the DC power connection according to NEC and CEC guidelines.

Two DC power connector cables are provided with each array module. Two DC power connectors are on the two DC power supplies on the rear of each array module if additional redundancy is required.

NOTE It is not mandatory that you connect the second DC power connection on the DC power supplies of the array module. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

Preparing the Network for the Controllers

If you plan to use Ethernet connections from the storage management station to the controllers, you will use the out-of-band management method. For this configuration, meet with your network administrator before you order and install the equipment so that you can prepare for the setup and management of the devices on the IP network. Each controller uses its Ethernet management ports to connect to the IP network and communicate with the other devices on the IP network (often requiring a special application to set up the protocol).

Your network administrator can pre-assign the addresses that you need to manage the communication between the devices on the IP network. Depending on your storage configuration, you will need the following addresses:

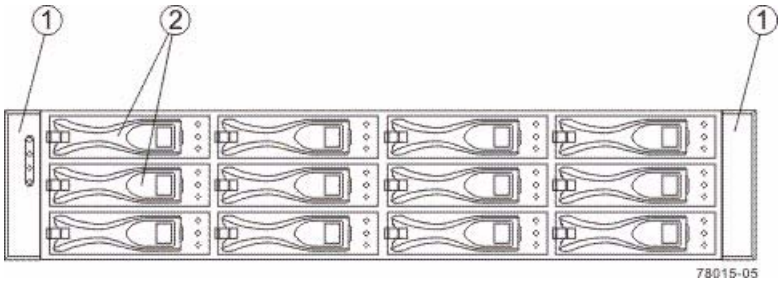
- Up to two network IP addresses for each controller
- Up to two subnet mask addresses for each controller
- Either two IPv4 addresses (one static and one dynamic) or one IPv6 address for each controller
- A Dynamic Host Configuration Protocol (DHCP) address for each controller

If switches are used in your storage environment, you must know if zoning will be used, and how it will be configured.

Chapter 9: Specifications of the ST2510 Array Module

The ST2510 array module is available in a rackmount model.

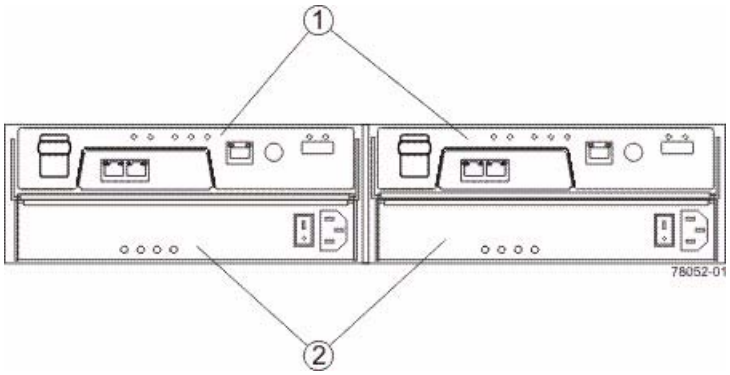
Figure 36 ST2510 Array Module – Front View



1. End Caps (the Left End Cap Has the Array Module Summary LEDs)
2. Drives

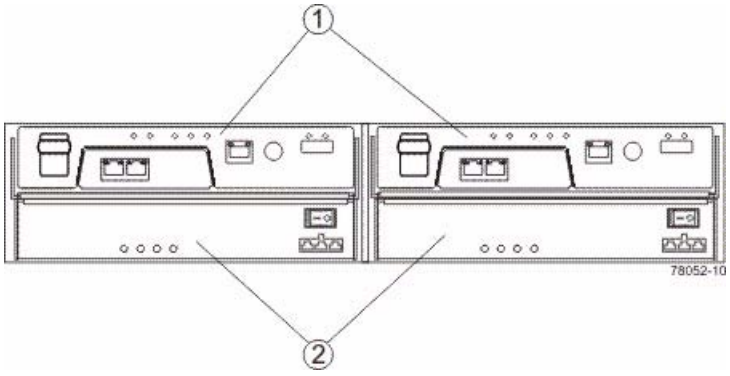
Usually, an AC power source supplies power to the power-fan CRU. A DC poweroption is also available.

Figure 37 ST2510 Array Module – Rear View



1. Controller CRUs
2. Power-Fan CRUs

Figure 38 ST2510 Array Module – Power Source Options Rear View

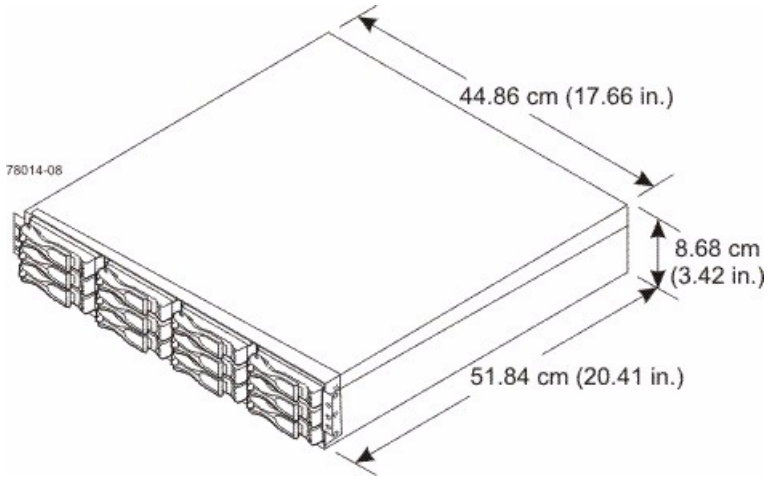


1. Controller CRUs
2. DC Power Switch on an Optional Power-Fan CRU

ST2510 Array Module Dimensions

The ST2510 array module conforms to the 48.3-cm (19.0-in.) rack standard.

Figure 39 Dimensions of the ST2510 Array Module – Front View



ST2510 Array Module Weight

Table 53 Weights of the ST2510 Array Module

Unit	Weight		
	Maximum*	Empty**	Shipping***
ST2510 array module	25.86 kg (57 lb)	6.80 kg (15 lb)	25.00 kg (55.0 lb)

*Maximum weight indicates a array module with all of its drives and other components installed. Because drive weights can vary greatly, this value can vary from the value specified as much as 0.3 kg (0.6 lb) times the maximum number of drives per array module for drives weighing 1.0 kg (2.2 lb).

**Empty weight indicates an array module with the controller CRUs, the power-fan CRUs, and the drives removed.

***Shipping weight indicates the maximum weight of the array module and all shipping material.

Table 54 Component Weights of the ST2510 Array Module

Component	Weight
ESM CRU	0.907 kg (2.00 lb)
Power-fan CRU	2.267 kg (5.00 lb)
Drive	1.0 kg (2.2 lb)

ST2510 Array Module Shipping Dimensions

Table 55 Shipping Carton Dimensions for the ST2510 Array Module

Height	Width	Depth
8.68 cm (3.42 in.)	51.84 cm (20.41 in.)	44.86 cm (17.66 in.)

ST2510 Array Module Temperature and Humidity

Table 56 Temperature Requirements and Humidity Requirements for the ST2510 Array Module

Condition	Parameter	Requirement
Temperature	Operating range	10°C to 35°C (50°F to 95°F)
	Maximum rate of change	10°C (18°F) per hour
	Storage range	–10°C to 45°C (14°F to 113°F)
	Maximum rate of change	15°C (27°F) per hour
	Transit range	–20°C to 60°C (–40°F to 140°F) for one week
	Maximum rate of change	20°C (36°F) per hour
Relative humidity (no condensation)	Operating range	20% to 80%
	Storage range	10% to 90%
	Transit range	5% to 95%
	Maximum dew point	26°C (79°F)
	Maximum gradient	10% per hour
*If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.		

ST2510 Array Module Altitude Ranges

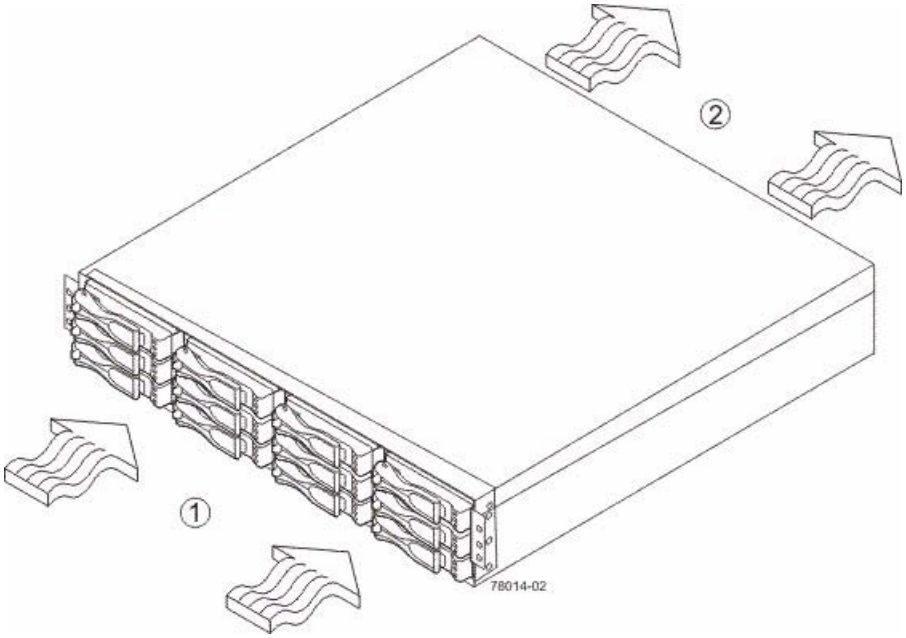
Table 57 Altitude Ranges for the ST2510 Array Module

Environment	Altitude
Operating	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Storage	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Transit	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level

ST2510 Array Module Airflow and Heat Dissipation

Allow at least 76 cm (30 in.) of clearance in front of the array module and 61 cm (24 in.) behind the array module for service clearance, ventilation, and heat dissipation.

Figure 40 Airflow Through the ST2510 Array Module – Front View



1. 76 cm (30 in.) clearance in front of the cabinet
2. 61 cm (24 in.) clearance behind the cabinet

Table 58 Power and Heat Dissipation for the ST2510 Array Module

Component	KVA	Watts (AC)	Btu/Hr
Controller CRU	0.458	453	1548

ST2510 Array Module Acoustic Noise

Table 59 Sound Levels for the ST2510 Array Module

Measurement	Level
ES 2-10-02 Standard Level 2	0.5 bels margin
Sound power (standby operation)	6.5 bels
Sound power (normal operation)	6.8 bels

ST2510 Array Module Site Wiring and Power

The ST2510 array module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

Keep this information in mind when you prepare the installation site for the array module:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

NOTE *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide enough power and overload protection. To prevent damage to the array module, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The array module can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the array module automatically performs a power-on recovery sequence without operator intervention.

ST2510 Array Module Power Input

AC Power Input

Each power supply contains one 10-A slow-blow fuse.

Table 60 AC Power Requirements for the ST2510 Array Module

Parameter	Low Range	High Range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Idle current	3.96 A*	1.74 A**
Maximum operating current	4.08 A*	1.70 A**

*Typical current: 100 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor. These numbers can vary significantly, depending upon the drives tested in the particular configuration.

**Typical current: 240 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor. These numbers can vary significantly, depending upon the drives tested in the particular configuration.

DC Power Input

Nominal input voltages for the DC power source are as follows:

- Low range: –36 VDC
- High range: –72 VDC

The maximum operating current is 17 A.

ST2510 Array Module Power Factor Correction

Power factor correction is applied within the power supply, which maintains the power factor of the array module at greater than 0.95 with nominal input voltage.

ST2510 Array Module AC Power Cords and Receptacles

Each ST2510 array module is shipped with two AC power cords. Each AC power cord connects one of the power supplies in an array module to an independent, external AC power source, such as a wall receptacle or a UPS.

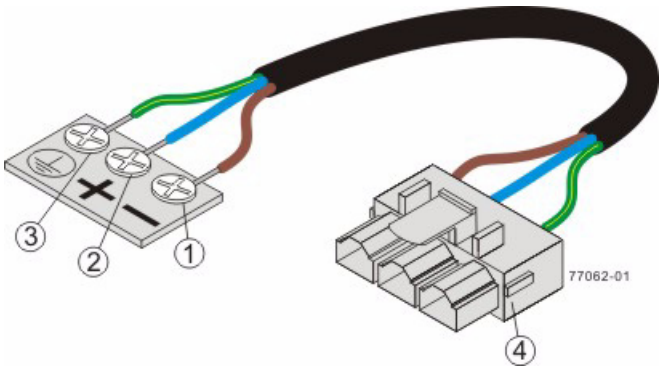
DC power is an option that is available for use with your array module and drive module. For more information, see ST2510 Array Module Optional DC Power Connector Cables and Source Wires.

If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the AC power cords that are shipped with the array module.

ST2510 Array Module Optional DC Power Connector Cables and Source Wires

The ST2510 array module is shipped with –48-VDC power connector cables if the DC power option is ordered. The –48-VDC power connector cable plugs into the DC power connector on the rear of the array module. The three source wires on the other end of the power connector cable connect the array module to centralized DC power plant equipment, typically through a bus bar above the cabinet.

WARNING (W12) **Risk of electrical shock** – This unit has more than one power source. To remove all power from the unit, all DC MAINS must be disconnected by removing all power connectors (item 4 below) from the power supplies.



1. Supply (Negative), Brown Wire, –48 VDC
2. Return (Positive), Blue Wire
3. Ground, Green and Yellow Wire
4. DC Power Connector

WARNING (W14) **Risk of bodily injury** – A qualified service person is required to make the DC power connection according to NEC and CEC guidelines.

Two DC power connector cables are provided with each array module. Two DC power connectors are on the two DC power supplies on the rear of each array module if additional redundancy is required.

NOTE It is not mandatory that you connect the second DC power connection on the DC power supplies of the array module. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

Preparing the Network for the Controllers

If you plan to use Ethernet connections from the storage management station to the controllers, you will use the out-of-band management method. For this configuration, meet with your network administrator before you order and install the equipment so that you can prepare for the setup and management of the devices on the IP network. Each controller uses its Ethernet management ports to connect to the IP network and communicate with the other devices on the IP network (often requiring a special application to set up the protocol).

Your network administrator can pre-assign the addresses that you need to manage the communication between the devices on the IP network. Depending on your storage configuration, you will need the following addresses:

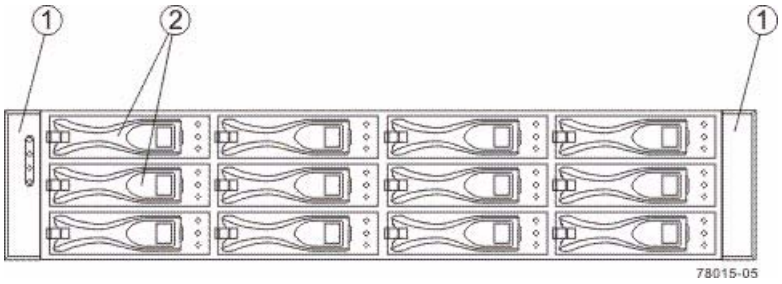
- Up to two network IP addresses for each controller
- Up to two subnet mask addresses for each controller
- Either two IPv4 addresses (one static and one dynamic) or one IPv6 address for each controller
- A Dynamic Host Configuration Protocol (DHCP) address for each controller

If switches are used in your storage environment, you must know if zoning will be used, and how it will be configured.

Chapter 10: Specifications of the ST2540 Array Module

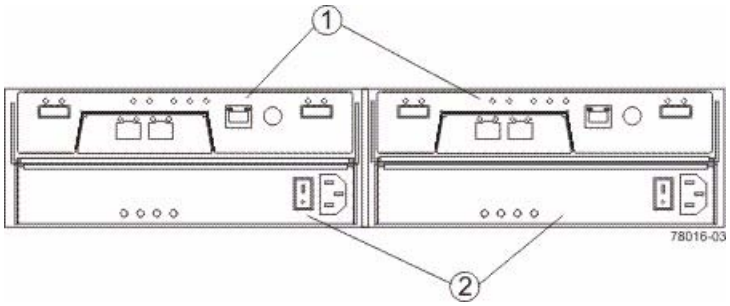
The ST2540 array module is available in a rackmount model.

Figure 41 ST2540 Array Module – Front View



1. End Caps (the Left End Cap Has the Array Module Summary LEDs)
2. Drives

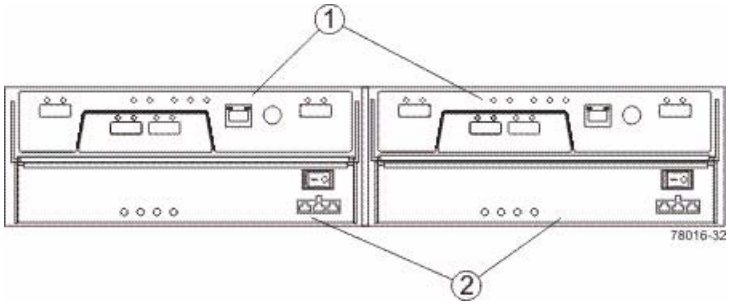
Figure 42 ST2540 Array Module – Rear View



1. Controller CRUs
2. Power-Fan CRUs

Usually, an AC power source supplies power to the power-fan CRU. A DC poweroption is also available.

Figure 43 ST2540 Array Module – Power Source Options Rear View

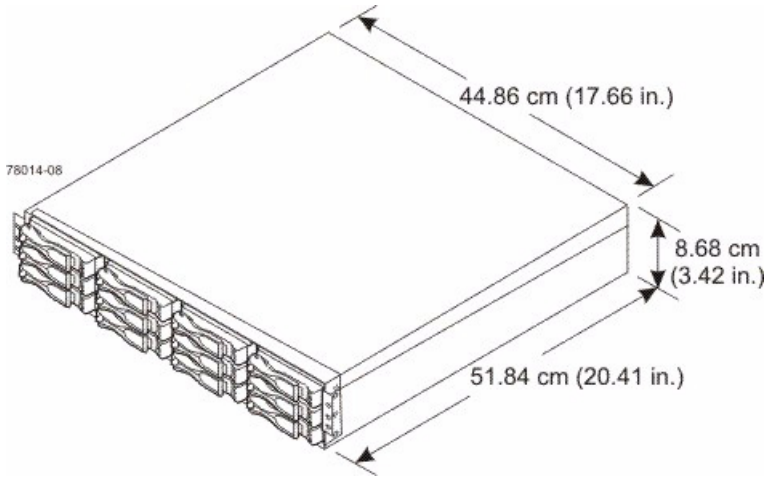


1. Controller CRUs
2. DC Power Switch on an Optional Power-Fan CRU

ST2540 Array Module Dimensions

The ST2540 array module conforms to the 48.3-cm (19.0-in.) rack standard.

Figure 44 Dimensions of the ST2540 Array Module – Front View



ST2540 Array Module Weight

Table 61 Weights of the ST2540 Array Module

Unit	Weight		
	Maximum*	Empty**	Shipping***
ST2540 array module	25.86 kg (57 lb)	6.80 kg (15 lb)	25.00 kg (55.0 lb)

*Maximum weight indicates a array module with all of its drives and other components installed. Because drive weights can vary greatly, this value can vary from the value specified as much as 0.3 kg (0.6 lb) times the maximum number of drives per array module for drives weighing 1.0 kg (2.2 lb).

**Empty weight indicates an array module with the controller CRUs, the power-fan CRUs, and the drives removed.

***Shipping weight indicates the empty weight of an array module and all shipping material.

Table 62 Component Weights of the ST2540 Array Module

Component	Weight
ESM CRU	0.907 kg (2.00 lb)
Power-fan CRU	2.267 kg (5.00 lb)
Drive	1.0 kg (2.2 lb)

ST2540 Array Module Shipping Dimensions

Table 63 Shipping Carton Dimensions for the ST2540 Array Module

Height	Width	Depth
8.68 cm (3.42 in.)	51.84 cm (20.41 in.)	44.86 cm (17.66 in.)

ST2540 Array Module Temperature and Humidity

Table 64 Temperature Requirements and Humidity Requirements for the ST2540 Array Module

Condition	Parameter	Requirement
Temperature*	Operating range	10°C to 35°C (50°F to 95F)
	Maximum rate of change	10°C (18°F) per hour
	Storage range	–10°C to 45°C (14°F to 113°F)
	Maximum rate of change	15°C (27°F) per hour
	Transit range	–20°C to 60°C (–40°F to 140°F)
	Maximum rate of change	20°C (36°F) per hour
Relative humidity (no condensation)	Operating range	20% to 80%
	Storage range	10% to 90%
	Transit range	5% to 95%
	Maximum dew point	26°C (79°F)
	Maximum gradient	10% per hour

*If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.

ST2540 Array Module Altitude Ranges

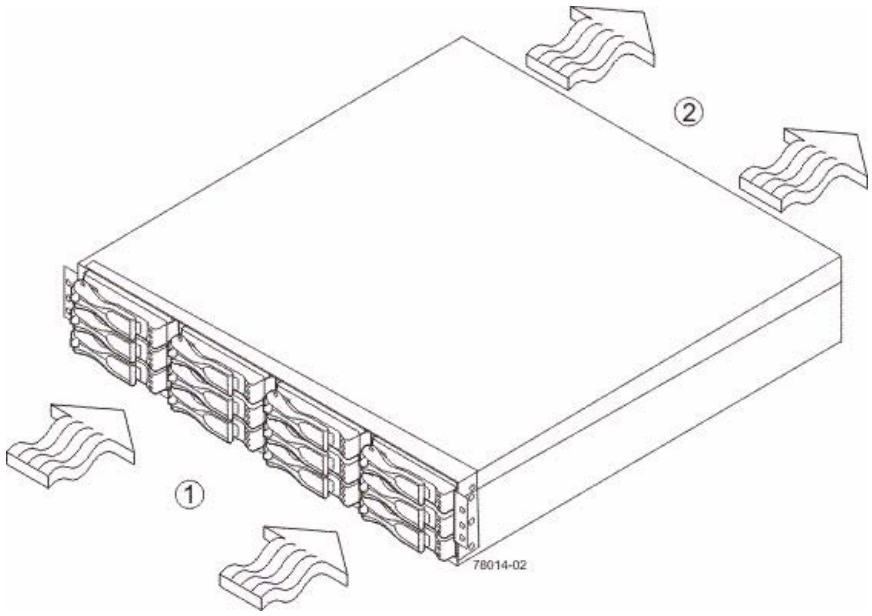
Table 65 Altitude Ranges for the ST2540 Array Module

Environment	Altitude
Operating	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Storage	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Transit	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level

ST2540 Array Module Airflow and Heat Dissipation

Allow at least 76 cm (30 in.) of clearance in front of the array module and 61 cm (24 in.) behind the array module for service clearance, ventilation, and heat dissipation.

Figure 45 Airflow Through the ST2540 Array Module – Front View



1. 76 cm (30 in.) clearance in front of the cabinet
2. 61 cm (24 in.) clearance behind the cabinet

Table 66 Power and Heat Dissipation for the ST2540 Array Module

Component	KVA	Watts (AC)	Btu/Hr
Controller CRU	0.458	453	1548

ST2540 Array Module Acoustic Noise

Table 67 Sound Levels for the ST2540 Array Module

Measurement	Level
ES 2-10-02 Standard Level 2	0.5 bels margin
Sound power (standby operation)	6.5 bels
Sound power (normal operation)	6.8 bels

ST2540 Array Module Site Wiring and Power

The ST2540 array module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

Keep this information in mind when you prepare the installation site for the array module:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

NOTE *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide enough power and overload protection. To prevent damage to the array module, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The array module can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the array module automatically performs a power-on recovery sequence without operator intervention.

ST2540 Array Module Power Input

AC Power Input

Each power supply contains one 10-A slow-blow fuse.

Table 68 AC Power Requirements for the ST2540 Array Module

Parameter	Low Range	High Range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Idle current	2.90 A–3.96 A*	1.25 A–1.74A**
Maximum operating current	3.14 A–4.01 A*	1.35 A–1.70 A**

*Typical voltage: 100 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor. The range provided shows that these numbers can vary significantly, depending upon the drives tested in the particular configuration.

**Typical voltage: 240 VAC, 50 Hz at 0.77 power supply efficiency and 0.96 power factor. The range provided shows that these numbers can vary significantly, depending upon the drives tested in the particular configuration.

DC Power Input

Nominal input voltages for the DC power source are as follows:

- Low range: –36 VDC
- High range: –72 VDC

The maximum operating current is 17 A.

ST2540 Array Module Power Factor Correction

Power factor correction is applied within the power supply, which maintains the power factor of the array module at greater than 0.95 with nominal input voltage.

ST2540 Array Module AC Power Cords and Receptacles

Each ST2540 array module is shipped with two AC power cords. Each AC power cord connects one of the power supplies in an array module to an independent, external AC power source, such as a wall receptacle or a UPS.

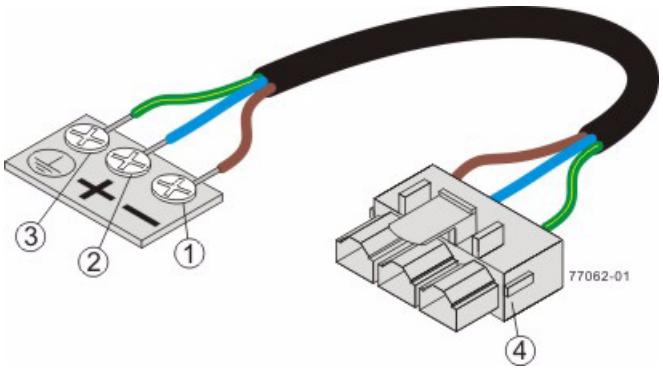
DC power is an option that is available for use with your array module and drive module. For more information, see ST2540 Array Module Optional DC Power Connector Cables and Source Wires.

If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the AC power cords that are shipped with the array module.

ST2540 Array Module Optional DC Power Connector Cables and Source Wires

The ST2540 array module is shipped with –48-VDC power connector cables if the DC power option is ordered. The –48-VDC power connector cable plugs into the DC power connector on the rear of the array module. The three source wires on the other end of the power connector cable connect the array module to centralized DC power plant equipment, typically through a bus bar above the cabinet.

WARNING (W12) **Risk of electrical shock** – This unit has more than one power source. To remove all power from the unit, all DC MAINS must be disconnected by removing all power connectors (item 4 below) from the power supplies.



1. Supply (Negative), Brown Wire, –48 VDC
2. Return (Positive), Blue Wire
3. Ground, Green and Yellow Wire
4. DC Power Connector

WARNING (W14) **Risk of bodily injury** – A qualified service person is required to make the DC power connection according to NEC and CEC guidelines.

Two DC power connector cables are provided with each array module. Two DC power connectors are on the two DC power supplies on the rear of each array module if additional redundancy is required.

NOTE It is not mandatory that you connect the second DC power connection on the DC power supplies of the array module. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

Preparing the Network for the Controllers

If you plan to use Ethernet connections from the storage management station to the controllers, you will use the out-of-band management method. For this configuration, meet with your network administrator before you order and install the equipment so that you can prepare for the setup and management of the devices on the IP network. Each controller uses its Ethernet management ports to connect to the IP network and communicate with the other devices on the IP network (often requiring a special application to set up the protocol).

Your network administrator can pre-assign the addresses that you need to manage the communication between the devices on the IP network. Depending on your storage configuration, you will need the following addresses:

- Up to two network IP addresses for each controller
- Up to two subnet mask addresses for each controller
- Either two IPv4 addresses (one static and one dynamic) or one IPv6 address for each controller
- A Dynamic Host Configuration Protocol (DHCP) address for each controller

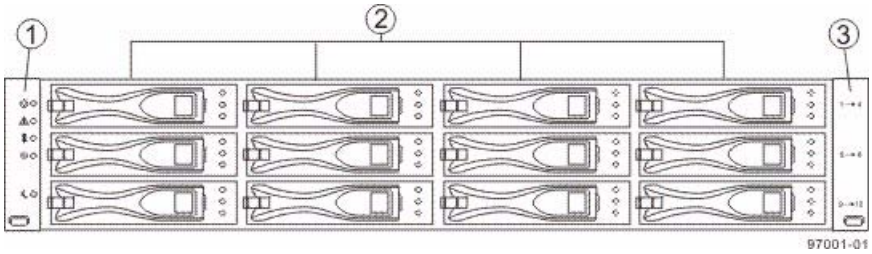
If switches are used in your storage environment, you must know if zoning will be used, and how it will be configured.

Chapter 11: Specifications of the ST2501 M2 Drive Module

The ST2501 M2 drive module contains Serial Attached SCSI (SAS) drives. Each ST2501 M2 drive module contains these components:

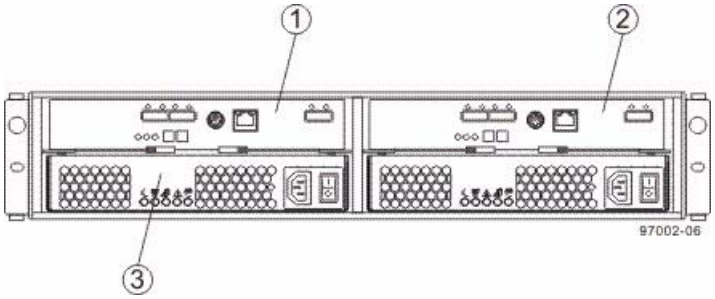
- A maximum of 12 drives
- One or two power-supply fan CRUs
- One or two environmental services monitor (ESM) CRUs

Figure 46 ST2501 M2 Drive Module – Front View



1. End Caps (the Left End Cap Has the Drive Module LEDs)
2. Drives
3. Right End Cap

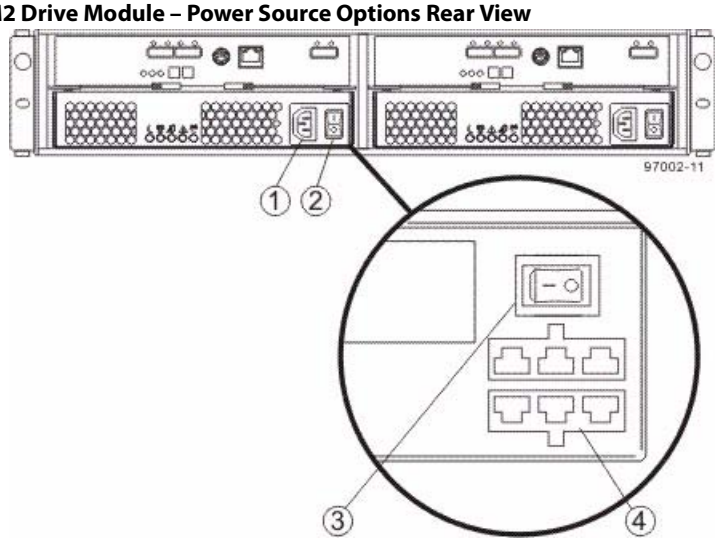
Figure 47 ST2501 M2 Drive Module – Rear View



1. ESM A CRU
2. ESM B CRU
3. Power-Fan A CRU

Usually, an AC power source supplies power to the power-fan CRU. A DC poweroption is also available.

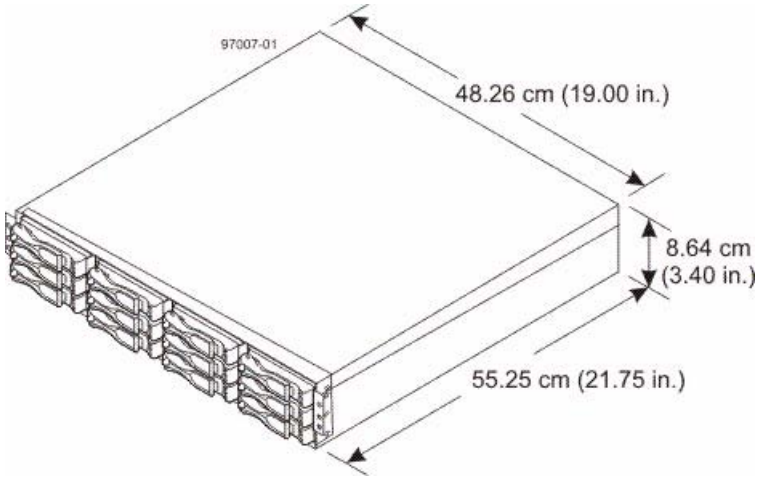
Figure 48 ST2501 M2 Drive Module – Power Source Options Rear View



1. AC Power Connector on the AC Power-Fan CRU
2. AC Power Switch
3. DC Power Switch on an Optional DC Power-Fan CRU
4. Optional DC Power Connector and DC Power Switch

ST2501 M2 Drive Module Dimensions

Figure 49 Dimensions of the ST2501 M2 Drive Module – Front View



ST2501 M2 Drive Module Weight

Table 69 Weights of the ST2501 M2 Drive Module

Unit	Weight		
	Maximum*	Empty**	Shipping***
ST2501 M2 drive module	27 kg (59.52 lb)	18.60 kg (41.01 lb)	31.75 kg (70.0 lb)

*Maximum weight indicates adrive module with all of its drives and other components installed. Because drive weights can vary greatly, this value can vary from the value specified as much as 0.3 kg (0.6 lb) times the maximum number of drives per drive module for 3.5-in. SAS drives.

**Empty weight indicates a drive module with the ESM CRUs, the power-fan CRUs, and the drives removed.

***Shipping weight indicates the maximum weight of a fully-populated drive module and all shipping material.

Table 70 Component Weights of the ST2501 M2 Drive Module

Component	Weight
ESM CRU	1.75 kg (3.86 lb)
Power-fan CRU	2.5 kg (5.51 lb)
3.5-in. SAS drive	1.00 kg (2.20 lb)

ST2501 M2 Drive Module Shipping Dimensions

Table 71 Drive Module and Shipping Carton Dimensions for the ST2501 M2 Drive Module

Height	Width	Depth
24.13 cm (9.5 in.)	58.42 cm (23.00 in.)	68.58 cm (27 in.)

ST2501 M2 Drive Module Temperature and Humidity

Table 72 Temperature Requirements and Humidity Requirements for the ST2501 M2 Drive Module

Condition	Parameter	Requirement
Temperature	Operating range (both cabinet and subsystem)	10°C to 40°C (50°F to 104°F)
	Maximum rate of change	10°C (50°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F)
	Maximum rate of change	15°C (59°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140°F)
	Maximum rate of change	20°C (68°F) per hour
Relative humidity (no condensation)	Operating range (both cabinet and subsystem)	20% to 80%
	Storage range	10% to 90%
	Transit range	5% to 90%
	Operating gradient	10°C (50°F) per hour
	Storage gradient	15°C (59°F) per hour
	Transit gradient	20°C (68°F) per hour
	Maximum dew point	26°C (79°F)
	Maximum gradient	10% per hour
*If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.		

ST2501 M2 Drive Module Altitude Ranges

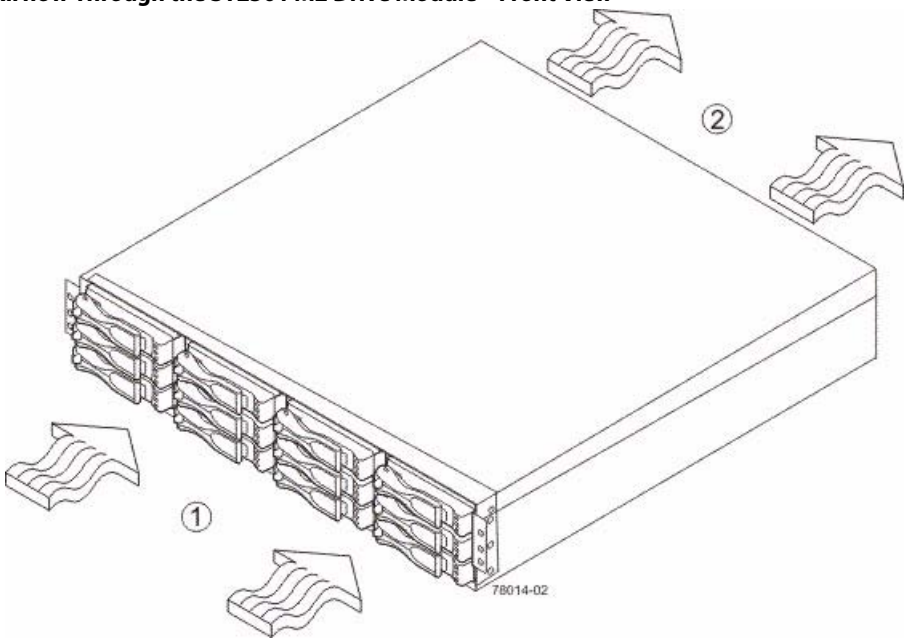
Table 73 Altitude Ranges for the ST2501 M2 Drive Module

Environment	Altitude
Operating	30.5 m (100 ft) below sea level to 3000 m (9840 ft) above sea level
Storage	30.5 m (100 ft) below sea level to 3000 m (9840 ft) above sea level
Transit	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level

ST2501 M2 Drive Module Airflow and Heat Dissipation

Airflow goes from the front of the drive module to the rear of the drive module. Allow at least 76 cm (30 in.) of clearance in front of the drive module and at least 61 cm (24 in.) of clearance behind the drive module for service clearance, ventilation, and heat dissipation.

Figure 50 Airflow Through the ST2501 M2 Drive Module – Front View



1. 76 cm (30 in.) clearance in front of the cabinet
2. 61 cm (24 in.) clearance behind the cabinet

The tabulated power and heat dissipation values in the following table are the maximum measured operating power.

Table 74 Power Ratings and Heat Dissipation for the ST2501 M2 Drive Module

Unit	KVA	AC Watts	Btu/Hr
ST2501 M2 drive module	0.276	276	945

ST2501 M2 Drive Module Acoustic Noise

Table 75 Acoustic Noise at 25°C for the ST2501 M2 Drive Module

Measurement	Level
Sound power (standby operation)	6.5 bels maximum
Sound power (normal operation)	6.8 bels maximum

ST2501 M2 Drive Module Site Wiring and Power

The ST2501 M2 drive module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source or the optional –48-VDC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

NOTE Power for the optional –48-VDC power configuration is supplied by a centralized DC power plant instead of the AC power source in the cabinet. Refer to the associated manufacturer's documentation for specific DC power source requirements.

Keep this information in mind when preparing the installation site for the drive module:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source or the optional –48-VDC power source.

NOTE *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide enough power and overload protection. To prevent damage to the drive module, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The drive module can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Maximum frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the drive module automatically performs a power-on recovery sequence without operator intervention after the power is restored.

ST2501 M2 Drive Module Power Input

AC Power Input

The AC power sources must provide the correct voltage, current, and frequency specified on the module and serial number label.

Table 76 AC Power Requirements for the ST2501 M2 Drive Module

Parameter	Low Range	High Range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Idle current	2.96 A*	1.23 A**
Maximum operating current	3.03 A*	1.26 A**
Sequential Drive Group Spin Up	4.23 A	1.76 A
Simultaneous Drive Spin Up	4.43 A	1.83 A
System Rating Plate Label	7.0 A	2.9 A

* Typical current: 100 VAC, 60 Hz at 0.87 power supply efficiency and 0.99 power factor. These numbers can vary significantly, depending upon the drives tested in the particular configuration.

**Typical current: 240 VAC, 60 Hz at 0.87 power supply efficiency and 0.99 power factor. These numbers can vary significantly, depending upon the drives tested in the particular configuration.

DC Power Input

Nominal input voltages for the DC power source are as follows:

- Low range: –42VDC
- High range: –60 VDC

The maximum operating current is 21.7 A.

ST2501 M2 Drive Module Power Factor Correction

Power factor correction is applied within the power supply of each ST2501 M2 drive module, which maintains the power factor of the drive module at greater than 0.95 with nominal input voltage.

ST2501 M2 Drive Module AC Power Cords and Receptacles

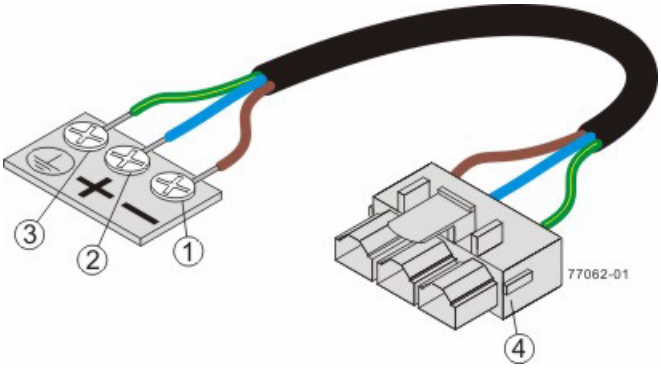
Each ST2501 M2 drive module is shipped with two AC power cords, which use standard AC outlets in the destination country. Each AC power cord connects one of the power supplies in the drive module to an independent, external AC power source, such as a wall receptacle, or to any uninterruptible power supply (UPS).

DC power is an option that is available for use with your ST2501 M2 drive module. For more information, see ST2501 M2 Drive Module Optional DC Power Connector Cables and Source Wires.

ST2501 M2 Drive Module Optional DC Power Connector Cables and Source Wires

The ST2501 M2 drive module is shipped with –48-VDC power connector cables if the DC power option is ordered. The –48-VDC power connector cable plugs into the DC power connector on the rear of the drive module. The three source wires on the other end of the power connector cable connect the drive module to centralized DC power plant equipment, typically through a bus bar above the cabinet.

WARNING (W12) **Risk of electrical shock** – This unit has more than one power source. To remove all power from the unit, all DC MAINS must be disconnected by removing all power connectors (item 4 below) from the power supplies.



1. Supply (Negative), Brown Wire, –48 VDC
2. Return (Positive), Blue Wire
3. Ground, Green and Yellow Wire
4. DC Power Connector

WARNING (W14) **Risk of bodily injury** – A qualified service person is required to make the DC power connection according to NEC and CEC guidelines.

Two (or, optionally, four) DC power connector cables are provided with each drive module. Two DC power connectors are on the two power-fan CRUs on the rear of each drive module if additional redundancy is required.

NOTE It is not mandatory that you connect the second DC power connection on the power-fan CRU of the drive module. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

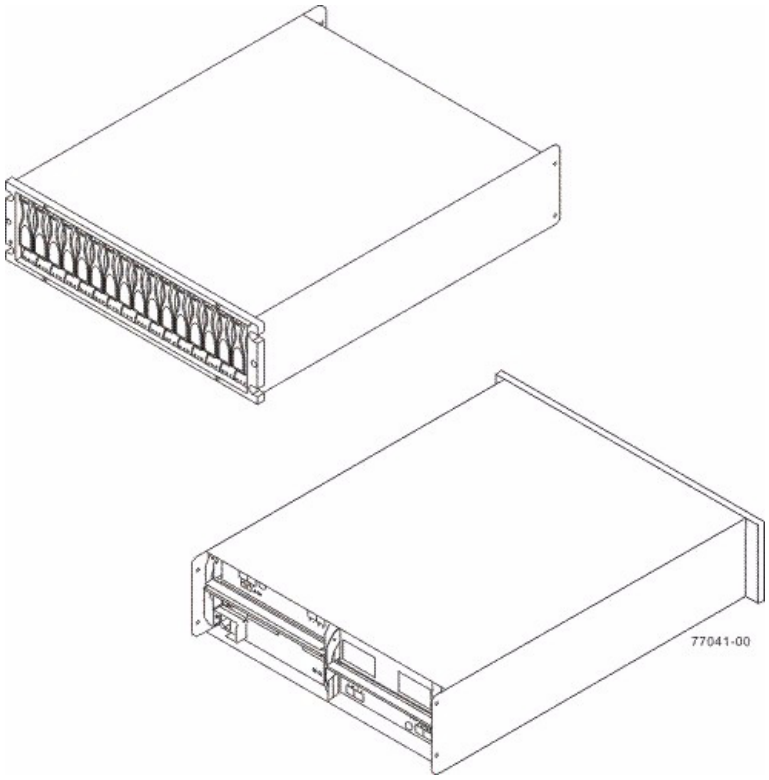
Chapter 12: Specifications of the CSM200 Drive Module

The CSM200 drive module is a 16-slot drive module capable of handling 4-Gb Fibre Channel speeds. The drive module is designed to be used by disk storage customers who desire top-of-the-line storage arrays. It comes in a deskside model and a rackmount model.

The CSM200 drive module contains these components:

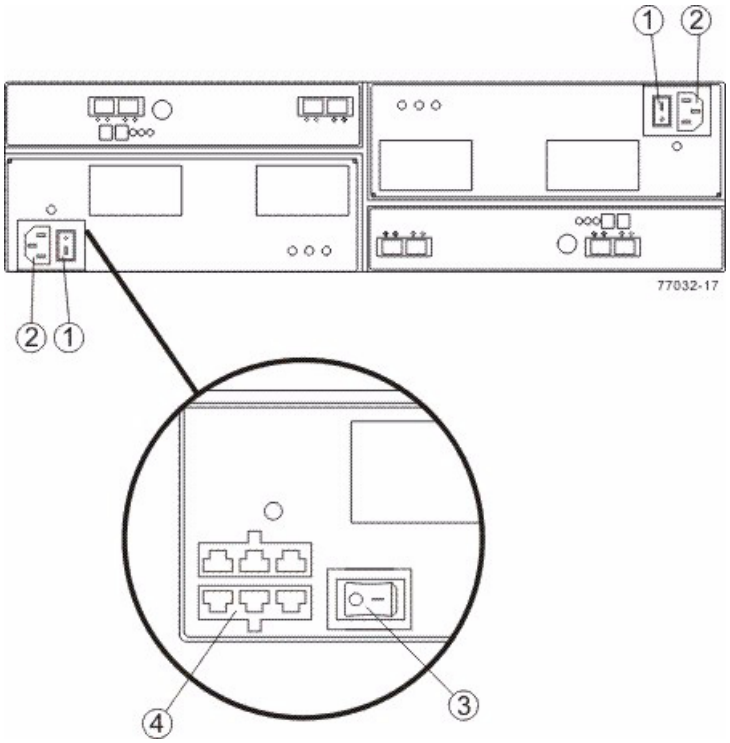
- Up to 16 Fibre Channel drives
- Two power-fan CRUs
- Two environmental services monitor (ESM) CRUs

Figure 51 CSM200 Drive Module – Front View and Rear View



Usually, an AC power source supplies power to the power-fan CRU. A DC power option is also available.

Figure 52 Power Source Options for the CSM200 Drive Module – Rear View



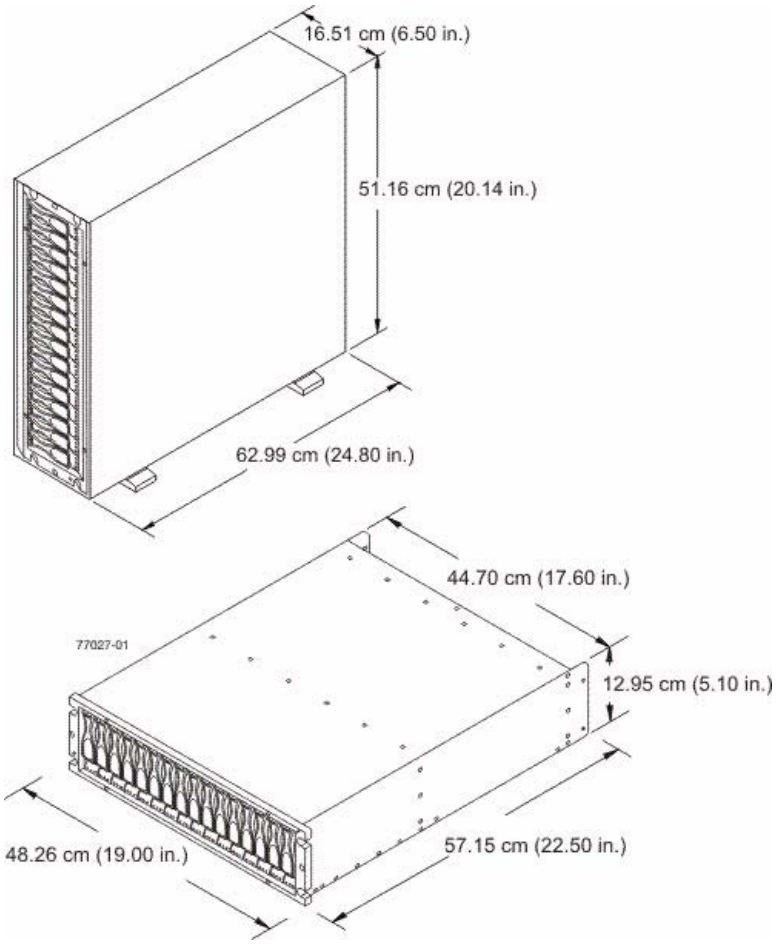
1. AC Power Switch on the AC Power-Fan CRU
2. AC Power Connector
3. DC Power Switch on an Optional Power-Fan CRU
4. Two DC Power Connectors

The drive modules come with drive interface ports that enable you to establish up to eight drive channels when using the 6580/6780 controller module for your disk storage solution.

CSM200 Drive Module Dimensions

The CSM200 drive module conforms to the 48.3-cm (19.0-in.) rack standard.

Figure 53 Dimensions of the CSM200 Drive Module (Deskside Model and Rackmount Model) – Front View



CSM200 Drive Module Weight

Table 77 Weights of the CSM200 Drive Module

Unit	Weight		
	Maximum*	Empty**	Shipping***
CSM200 drive module, deskside model	54.88 kg (121.0 lb)	28.58 kg (63.0 lb)	66.68 kg (147.0 lb)
CSM200 drive module, rackmount model	42.18 kg (93.0 lb)	15.88 kg (35.0 lb)	53.98 kg (119.0 lb)

*Maximum weight indicates a drive module with all of its drives and other components installed. Because drive weights can vary greatly, this value can vary from the value specified as much as 0.3 kg (0.6 lb) times the maximum number of drives per drive module for drives weighing 1.0 kg (2.2 lb).

**Empty weight indicates a drive module with the ESM CRUs, the power-fan CRUs, and the drives removed.

***Shipping weight indicates the maximum weight of a drive module and all shipping material.

Table 78 Component Weights of the CSM200 Drive Module

Component	Weight
ESM CRU	2.313 kg (5.10 lb)
Power-fan CRU	2.449 kg (5.40 lb)
Drive	Approximately 1.0 kg (2.2 lb)

CSM200 Drive Module Shipping Dimensions

Table 79 Shipping Carton Dimensions for the CSM200 Drive Module

Height	Width	Depth
45.72 cm (18.00 in.) – Includes the height of the pallet.	62.23 cm (24.50 in.)	80.65 cm (31.75 in.)

CSM200 Drive Module Temperature and Humidity

Table 80 Temperature Requirements and Humidity Requirements for the CSM200 Drive Module

Condition	Parameter	Requirement
Temperature*	Operating range	10°C to 40°C (50°F to 104°F)
	Maximum rate of change	10°C (18°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F)
	Maximum rate of change	15°C (27°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140° F)
	Maximum rate of change	20°C (36°F) per hour
Relative humidity (no condensation)	Operating range	20% to 80%
	Storage range	10% to 90%
	Transit range	5% to 95%
	Maximum dew point	26°C (79°F)
	Maximum gradient	10% per hour
*If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.		

CSM200 Drive Module Altitude Ranges

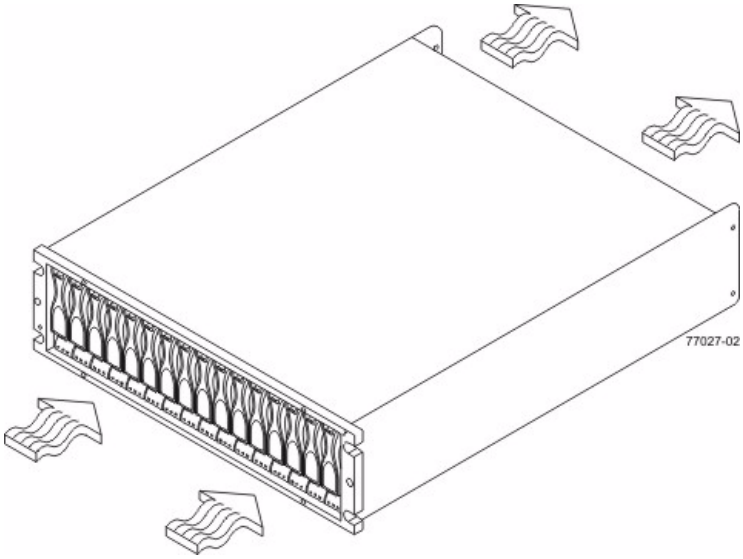
Table 81 Altitude Ranges for the CSM200 Drive Module

Environment	Altitude
Operating	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Storage	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Transit	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level

CSM200 Drive Module Airflow and Heat Dissipation

Airflow goes from the front of the drive module to the rear of the drive module. Allow at least 76 cm (30 in.) of clearance in front of the drive module and at least 61 cm (24 in.) of clearance behind the drive module for service clearance, ventilation, and heat dissipation.

Figure 54 Airflow Through the CSM200 Drive Module – Front View



The tabulated power and heat dissipation values in the following table are the maximum measured operating power.

Table 82 Power Ratings and Heat Dissipation for the CSM200 Drive Module

Unit	KVA	Watts (AC)	Btu/hr	Amps (240 VAC)
CSM200 drive module	0.462	444	1517	1.85

CSM200 Drive Module Acoustic Noise

Table 83 Sound Levels for the CSM200 Drive Module

Measurement	Level
Sound power	6.5 bels
Sound pressure	65 dBA

CSM200 Drive Module Site Wiring and Power

The agency ratings for the CSM200 drive module are 4.44 A at 100 VAC and 1.85 A at 240 VAC. These ratings are the overall maximum AC currents for this system.

The CSM200 drive module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source or the optional –48-VDC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

NOTE Power for the optional –48-VDC power configuration is supplied by a centralized DC power plant instead of the AC power source in the cabinet. Refer to the associated manufacturer's documentation for specific DC power source requirements.

Keep this information in mind when you prepare the installation site for the drive module:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source or the optional –48-VDC power source.

NOTE *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide enough power and overload protection. To prevent damage to the drive module, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The drive module can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Maximum frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the drive module automatically performs a power-on recovery sequence without operator intervention after the power is restored.

CSM200 Drive Module Power Input

AC Power Input

Each power supply contains one 15-A slow-blow fuse.

Table 84 AC Power Requirements for the CSM200 Drive Module

Parameter	Low Range	High Range
Nominal voltage	90 to 136 VAC	180 to 264 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Idle current	3.78 A*	1.98 A**
Maximum operating current	3.90 A*	2.06 A**
Maximum surge current (16-drive spin up)	5.25 A*	2.67 A**

*Typical current: 115 VAC, 60 Hz at 0.73 power supply efficiency and 0.96 power factor.

**Typical current: 230 VAC, 60 Hz at 0.73 power supply efficiency and 0.96 power factor.

DC Power Input

Nominal input voltages for the DC power source are as follows:

- Low range: –36 VDC
- High range: –72 VDC

The maximum operating current is 17 A.

CSM200 Drive Module Power Factor Correction

Power factor correction is applied within the power-fan CRU of each CSM200 drive module, which maintains the power factor of the drive module at greater than 0.99 with nominal input voltage.

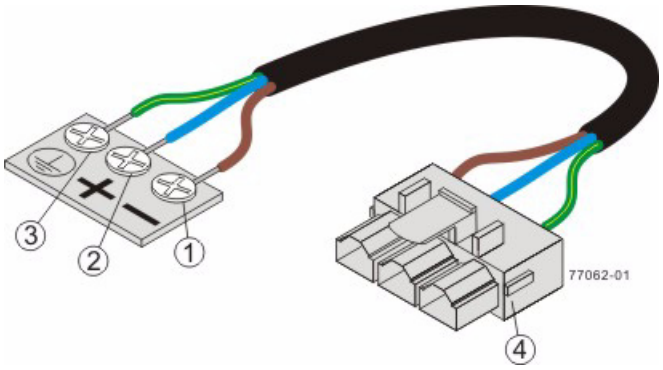
CSM200 Drive Module AC Power Cords and Receptacles

Each CSM200 drive module is shipped with two AC power cords, which fit the standard AC outlets in the destination country. Each AC power cord connects one of the power-fan CRUs in the drive module to an independent, external AC power source, such as a wall receptacle, or to any uninterruptible power supply (UPS).

CSM200 Drive Module Optional DC Power Connector Cables and Source Wires

The CSM200 drive module is shipped with –48-VDC power connector cables if the DC power option is ordered. The –48-VDC power connector cable plugs into the DC power connector on the rear of the drive module. The three source wires on the other end of the power connector cable connect the drive module to centralized DC power plant equipment, typically through a bus bar above the cabinet.

WARNING (W12) **Risk of electrical shock** – This unit has more than one power source. To remove all power from the unit, all DC MAINS must be disconnected by removing all power connectors (item 4 below) from the power supplies.



1. Supply (Negative), Brown Wire, –48 VDC
2. Return (Positive), Blue Wire
3. Ground, Green and Yellow Wire
4. DC Power Connector

WARNING (W14) **Risk of bodily injury** – A qualified service person is required to make the DC power connection according to NEC and CEC guidelines.

Two (or, optionally, four) DC power connector cables are provided with each drive module. Two DC power connectors are on the two power-fan CRUs on the rear of each drive module if additional redundancy is required.

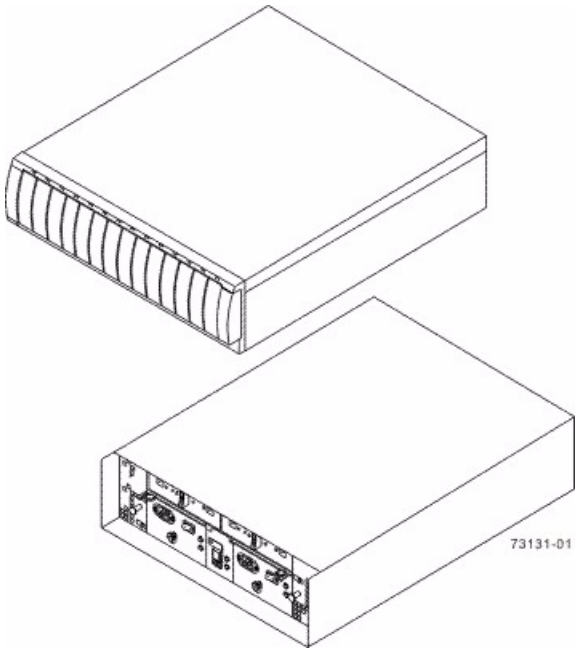
NOTE It is not mandatory that you connect the second DC power connection on the power-fan CRU of the drive module. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

Chapter 13: Specifications of the CSM100 Drive Module (SATA)

The CSM100 drive module contains Serial Advanced Technology Attachment (SATA) drives that provide storage in a Fibre Channel environment. Each CSM100 drive module contains these components:

- Two to fourteen drives
- One or two environmental services monitor (ESM) CRUs
- Two power supplies
- Two fans

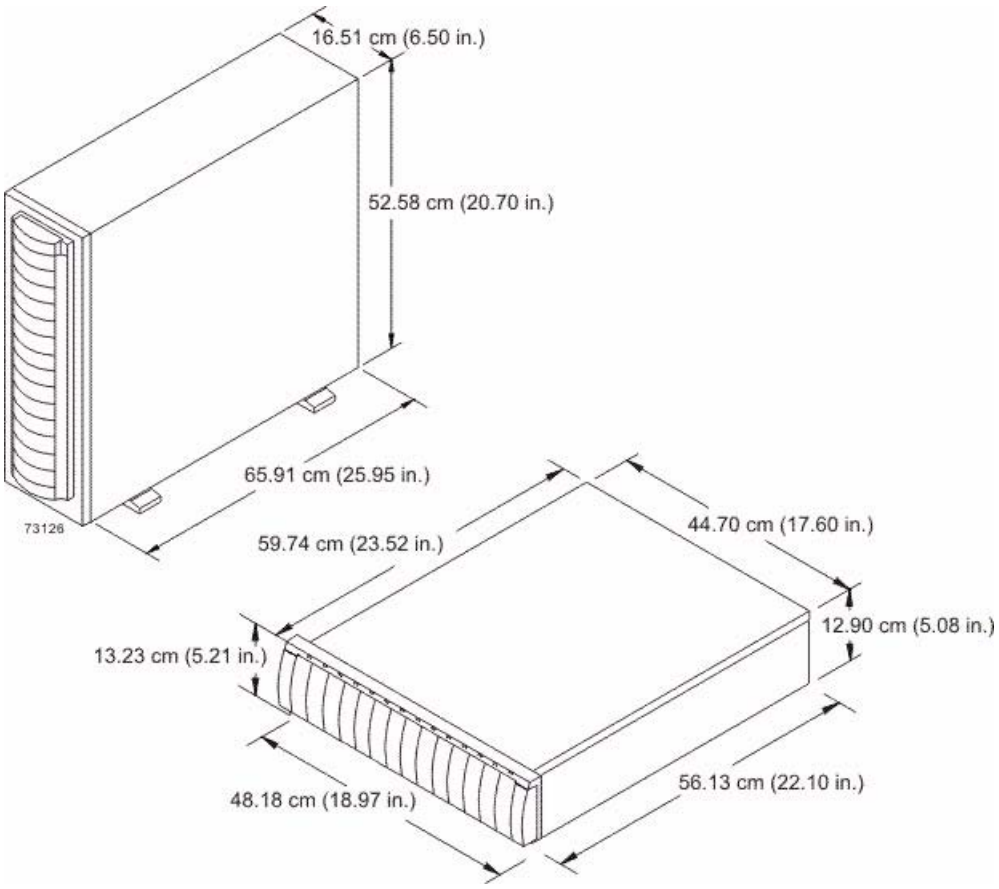
Figure 55 CSM100 Drive Module – Front View and Rear View



CSM100 Drive Module Dimensions

A deskside model and a rackmount model of the CSM100 drive module are available. The rackmount model conforms to the 48.3-cm (19.0-in.) rack standard.

Figure 56 Dimensions of the CSM100 Drive Module (Deskside Model and Rackmount Model) – Front View



CSM100 Drive Module Weight

Table 85 Weights of the CSM100 Drive Module

Unit	Weight		
	Maximum*	Empty**	Shipping***
CSM100 drive module, deskside model	52.62 kg (116.0 lb)	28.58 kg (63.0 lb)	64.41 kg (142.0 lb)
CSM100 drive module, rackmount model	39.92 kg (88.0 lb)	15.88 kg (35.0 lb)	51.71 kg (114.0 lb)

*Maximum weight indicates a drive module with all of its drives and other components installed. Because drive weights can vary greatly, this value can vary from the value specified as much as 0.3 kg (0.6 lb) times the maximum number of drives per drive module for drives weighing 1.0 kg (2.2 lb).

**Empty weight indicates a drive module with the ESM CRUs, the power supply CRUs, the fan CRUs, and the drives removed.

***Shipping weight indicates the maximum weight of a drive module and all shipping material.

Table 86 Component Weights of the CSM100 Drive Module

Component	Weight
ESM CRU	1.678 kg (3.70 lb)
Power supply CRU	2.449 kg (5.40 lb)
Fan CRU	0.998 kg (2.20 lb)
Drive	Approximately 1.0 kg (2.2 lb)

CSM100 Drive Module Shipping Dimensions

Table 87 Shipping Carton Dimensions for the CSM100 Drive Module

Height	Width	Depth
44.45 cm (17.50 in.) – Includes the height of the pallet.	62.23 cm (24.50 in.)	74.93 cm (29.50 in.)

CSM100 Drive Module Temperature and Humidity

Table 88 Temperature Requirements and Humidity Requirements for the CSM100 Drive Module

Condition	Parameter	Requirement
Temperature*	Operating range	10°C to 40°C (50°F to 104°F)
	Maximum rate of change	10°C (18°F) per hour
	Storage range	–10°C to 65°C (14°F to 149°F)
	Maximum rate of change	15°C (27°F) per hour
	Transit range	–40°C to 65°C (–40°F to 149°F)
	Maximum rate of change	20°C (36°F) per hour
Relative humidity (no condensation)	Operating range	20% to 80%
	Storage range	10% to 90%
	Transit range	5% to 95%
	Maximum dew point	26°C (79°F)
	Maximum gradient	10% per hour
*If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.		

CSM100 Drive Module Altitude Ranges

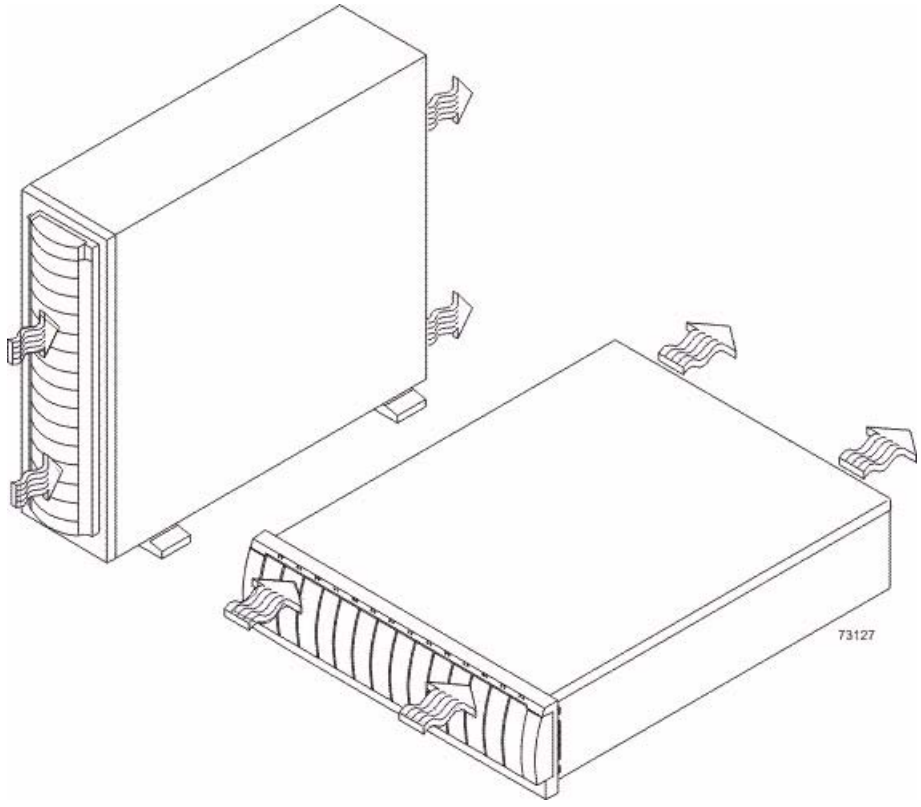
Table 89 Altitude Ranges for the CSM100 Drive Module

Environment	Altitude
Operating	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Storage	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Transit	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level

CSM100 Drive Module Airflow and Heat Dissipation

Airflow goes from the front of the drive module to the rear of the drive module. Allow at least 76 cm (30 in.) of clearance in front of the drive module and at least 61 cm (24 in.) of clearance behind the drive module for service clearance, ventilation, and heat dissipation.

Figure 57 Airflow Through the CSM100 Drive Module – Front View



The tabulated power and heat dissipation values in the following table are the maximum measured operating power.

Table 90 Power Ratings and Heat Dissipation for the CSM100 Drive Module

Unit	KVA	Watts (AC)	Btu/hr	Amps (240 VAC)
CSM100 drive module	0.329	316	1078	1.32

CSM100 Drive Module Acoustic Noise

Table 91 Sound Levels for the CSM100 Drive Module

Measurement	Level
Sound power	6.0 bels
Sound pressure	60 dBA

CSM100 Drive Module Site Wiring and Power

The CSM100 drive module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

Keep this information in mind when you prepare the installation site for the drive module:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

NOTE *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide enough power and overload protection. To prevent damage to the drive module, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The drive module can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Maximum frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the drive module automatically performs a power-on recovery sequence without operator intervention after the power is restored.

CSM100 Drive Module Power Input

Each power supply contains one 10-A slow-blow fuse.

Table 92 AC Power Requirements for the CSM100 Drive Module

Parameter	Low Range	High Range
Nominal voltage	90 to 136 VAC	180 to 264 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Idle current	2.65 A*	1.31 A**
Maximum operating current	2.78 A*	1.43 A**
Maximum surge current	4.00 A*	2.03 A**

*Typical current: 115 VAC, 60 Hz at 0.73 power supply efficiency and 0.96 power factor.

**Typical current: 230 VAC, 60 Hz at 0.73 power supply efficiency and 0.96 power factor.

CSM100 Drive Module Power Factor Correction

Power factor correction is applied within the power supply of each CSM100 drive module, which maintains the power factor of the drive module at greater than 0.99 with nominal input voltage.

CSM100 Drive Module Power Cords and Receptacles

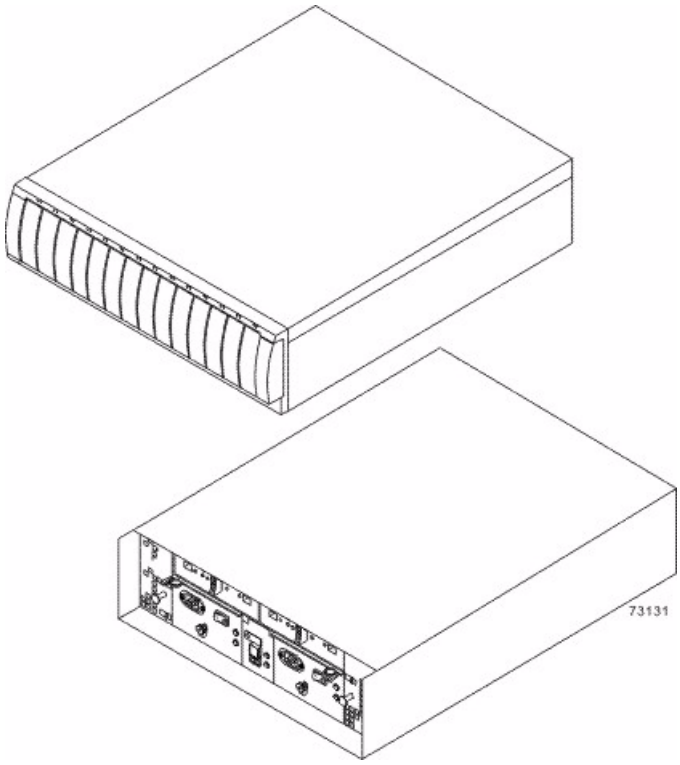
Each CSM100 drive module is shipped with two AC power cords, which use the standard AC outlets in the destination country. Each AC power cord connects one of the power supplies in the drive module to an independent, external AC power source, such as a wall receptacle, or to any uninterruptible power supply (UPS).

Chapter 14: Specifications of the CSM100 Drive Module (Fibre Channel)

The CSM100 drive module contains Fibre Channel drives that provide storage in a Fibre Channel environment. Each CSM100 drive module contains these components:

- A maximum of 14 drives
- Two fan CRUs
- Two power supply CRUs
- One or two environmental services monitor (ESM) CRUs

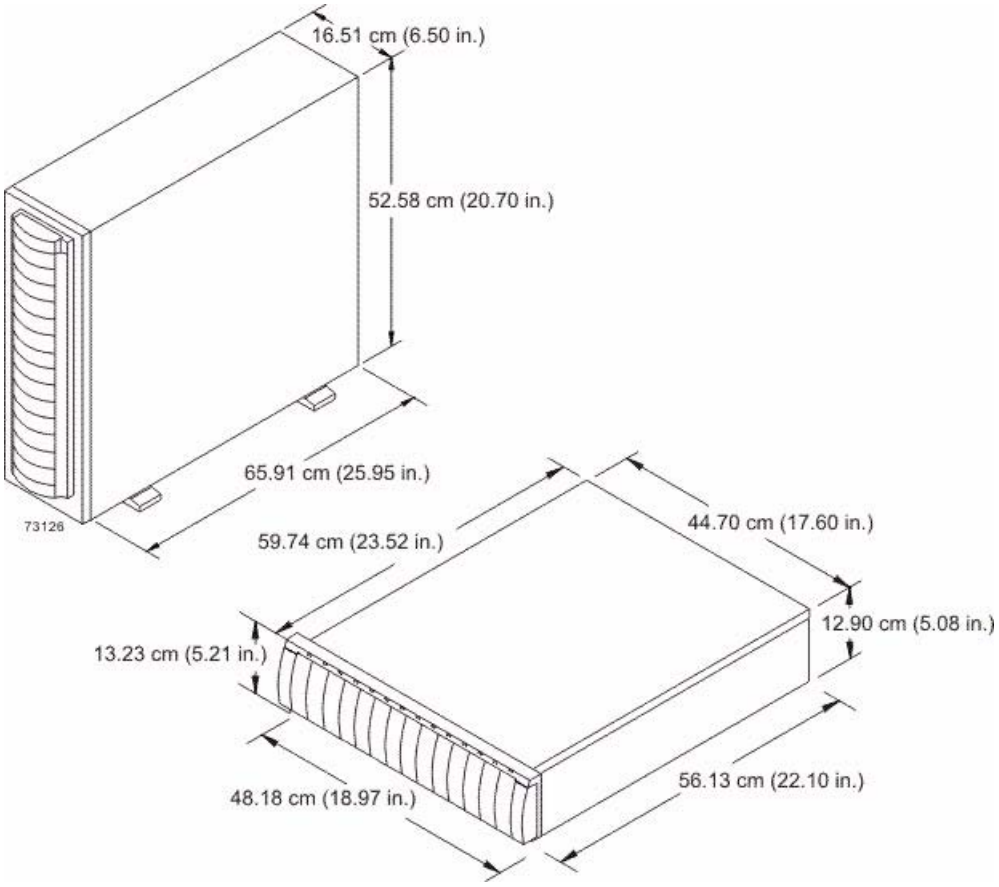
Figure 58 CSM100 Drive Module – Front View and Rear View



CSM100 Drive Module Dimensions

A deskside model and a rackmount model of the CSM100 drive module are available. The rackmount model conforms to the 48.3-cm (19.0-in.) rack standard.

Figure 59 Dimensions of the CSM100 Drive Module(Deskside Model and Rackmount Model) – Front View



CSM100 Drive Module Weight

Table 93 Weights of the CSM100 Drive Module

Unit	Weight		
	Maximum*	Empty**	Shipping***
CSM100 drive module, deskside model	52.62 kg (116.0 lb)	28.58 kg (63.0 lb)	64.41 kg (142.0 lb)
CSM100 drive module, rackmount model	39.92 kg (88.0 lb)	15.88 kg (35.0 lb)	51.71 kg (114.0 lb)

*Maximum weight indicates a drive module with all of its drives and other components installed. Because drive weights can vary greatly, this value can vary from the value specified as much as 0.3 kg (0.6 lb) times the maximum number of drives per drive module for drives weighing 1.0 kg (2.2 lb).

**Empty weight indicates a drive module with the ESM CRUs, the power-supply CRUs, the fan CRUs, and the drives removed.

***Shipping weight indicates the maximum weight of a drive module and all shipping material.

Table 94 Component Weights of the CSM100 Drive Module

Component	Weight
ESM CRU	1.678 kg (3.70 lb)
Power supply CRU	2.449 kg (5.40 lb)
Fan CRU	0.998 kg (2.20 lb)
Drive	Approximately 1.0 kg (2.2 lb)

CSM100 Drive Module Shipping Dimensions

Table 95 Shipping Carton Dimensions for the CSM100 Drive Module

Height	Width	Depth
44.45 cm (17.50 in.) – Includes the height of the pallet.	62.23 cm (24.50 in.)	74.93 cm (29.50 in.)

CSM100 Drive Module Temperature and Humidity

Table 96 Temperature Requirements and Humidity Requirements for the CSM100 Drive Module

Condition	Parameter	Requirement
Temperature*	Operating range	10°C to 40°C (50°F to 104°F)
	Maximum rate of change	10°C (18°F) per hour
	Storage range	–10°C to 65°C (14°F to 149°F)
	Maximum rate of change	15°C (27°F) per hour
	Transit range	–40°C to 65°C (–40°F to 149°F)
	Maximum rate of change	20°C (36°F) per hour
Relative humidity (no condensation)	Operating range	20% to 80%
	Storage range	10% to 90%
	Transit range	5% to 95%
	Maximum dew point	26°C (79°F)
	Maximum gradient	10% per hour
*If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.		

CSM100 Drive Module Altitude Ranges

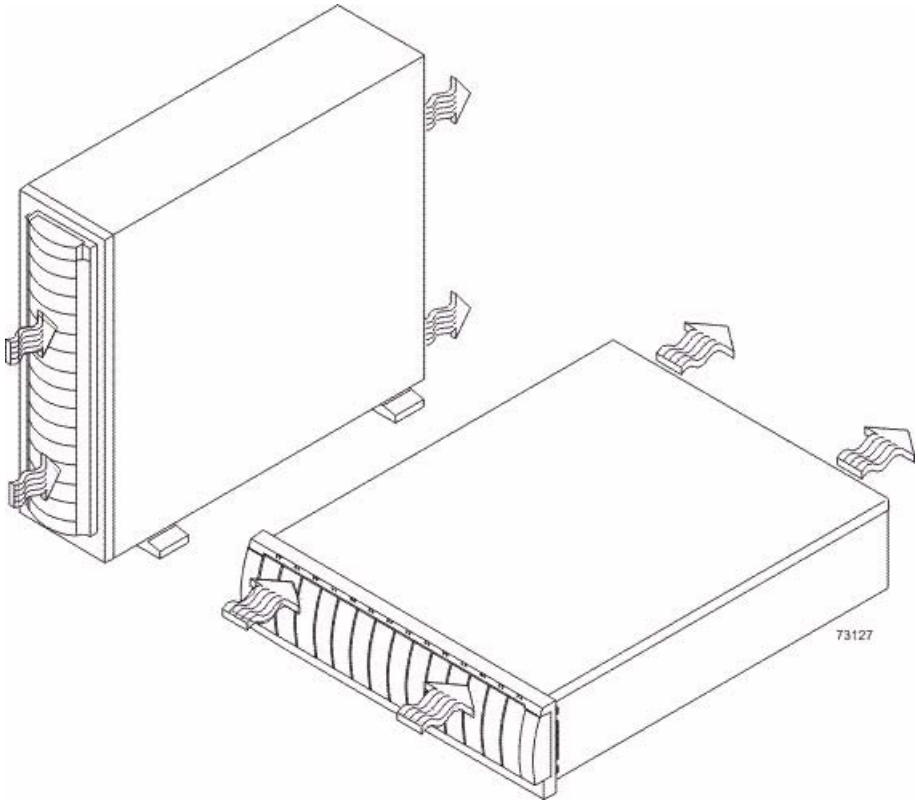
Table 97 Altitude Ranges for the CSM100 Drive Module

Environment	Altitude
Operating	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Storage	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Transit	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level

CSM100 Drive Module Airflow and Heat Dissipation

Airflow goes from the front of the drive module to the rear of the drive module. Allow at least 76 cm (30 in.) of clearance in front of the drive module and at least 61 cm (24 in.) of clearance behind the drive module for service clearance, ventilation, and heat dissipation.

Figure 60 Airflow Through the CSM100 Drive Module – Front View



The tabulated power and heat dissipation values in the following table are the maximum measured operating power.

Table 98 Power Ratings and Heat Dissipation for the CSM100 Drive Module

Unit	KVA	Watts (AC)	Btu/Hr	Amps (240 VAC)
CSM100 drive module	0.384	369	1259	1.54

CSM100 Drive Module Acoustic Noise

Table 99 Sound Levels for the CSM100 Drive Module

Measurement	Level
Sound power	6.0 bels
Sound pressure	60 dBA

CSM100 Drive Module Site Wiring and Power

The CSM100 drive module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

Keep this information in mind when preparing the installation site for the drive module:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

NOTE *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide enough power and overload protection. To prevent damage to the drive module, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The drive module can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Maximum frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the drive module automatically performs a power-on recovery sequence without operator intervention after the power is restored.

CSM100 Drive Module Power Input

The AC power sources must provide the correct voltage, current, and frequency specified on the module and serial number label.

Table 100 AC Power Requirements for the CSM100 Drive Module

Parameter	Low Range	High Range
Nominal voltage	115 VAC	230 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Idle current	3.81 A*	1.98 A**
Maximum operating current	3.96 A*	2.06 A**
Maximum surge current	5.52 A*	2.72 A**

*Typical current: 115 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor.

**Typical current: 230 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor.

CSM100 Drive Module Power Factor Correction

Power factor correction is applied within the power supply of each CSM100 drive module, which maintains the power factor of the drive module at greater than 0.99 with nominal input voltage.

CSM100 Drive Module Power Cords and Receptacles

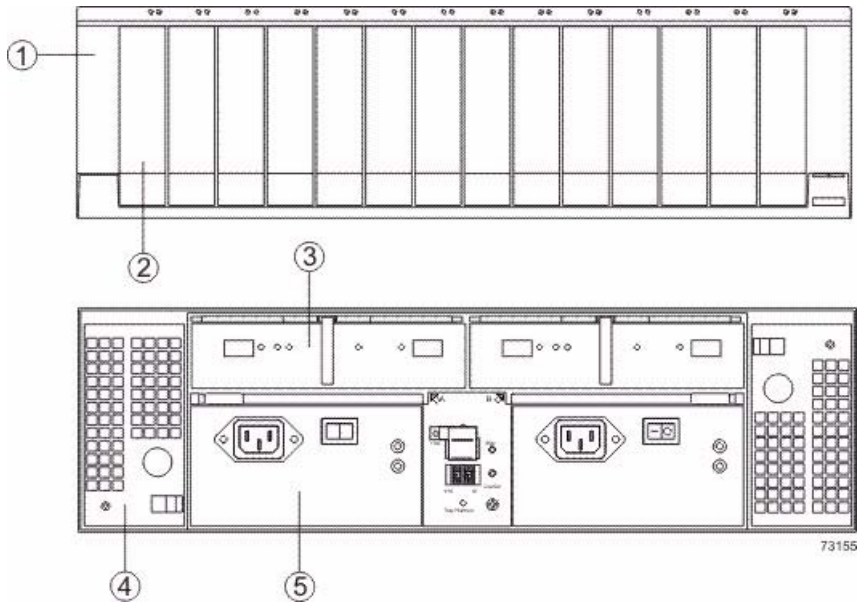
Each CSM100 drive module is shipped with two AC power cords, which use the standard AC outlets in the destination country. Each AC power cord connects one of the power supplies in the drive module to an independent, external AC power source, such as a wall receptacle, or to any uninterruptible power supply (UPS).

Chapter 15: Specifications of the FLA200 Drive Module

The FLA200 drive module is available as a rackmount model or a deskside model that provides high-capacity disk storage for Fibre Channel environments. Each FLA200 drive module contains these components:

- A maximum of 14 drives
- Two fan CRUs
- Two power-supply CRUs
- One or two environmental services monitor (ESM) CRUs

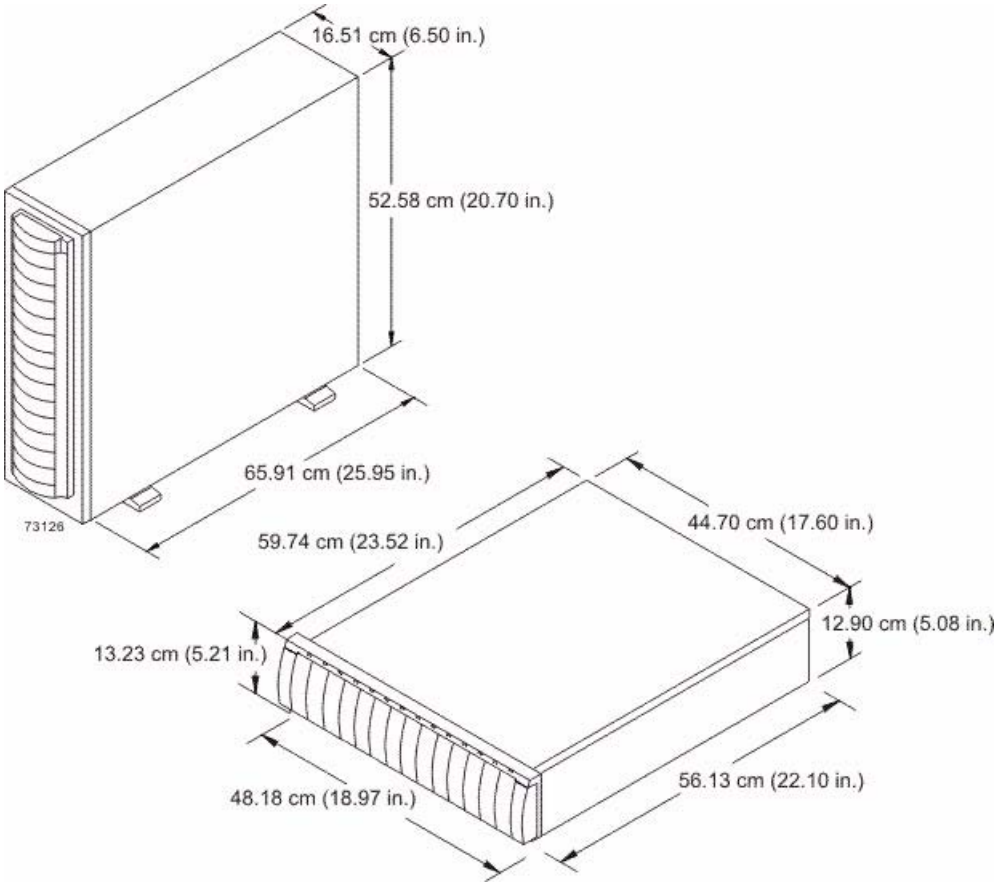
Figure 61 FLA200 Drive Module – Front View and Rear View



1. Bezel
2. Drive
3. ESM CRU
4. Fan CRU
5. Power Supply CRU

FLA200 Drive Module Dimensions

Figure 62 Dimensions of the FLA200 Drive Module (Deskside Model and Rackmount Model) – Front View



FLA200 Drive Module Weight

Table 101 Weights of the FLA200 Drive Module

Unit	Weight		
	Maximum*	Empty**	Shipping***
FLA200 drive module, deskside model	53.1 kg (117.0 lb)	28.0 kg (63.0 lb)	64.9 kg (143.0 lb)
FLA200 drive module, rackmount model	40.40 kg (89.0 lb)	15.9 kg (35.0 lb)	52.2 kg (115.0 lb)

*Maximum weight indicates a drive module with all of its drives and other components installed. Because drive weights can vary greatly, this value can vary from the value specified as much as 0.3 kg (0.6 lb) times the maximum number of drives per drive module for drives weighing 1.0 kg (2.2 lb).

**Empty weight indicates a drive module with the ESM CRUs, the power-supply CRUs, fan CRUs, and drives removed.

***Shipping weight indicates the maximum weight of the drive module and all shipping material.

Table 102 Component Weights of the FLA200 Drive Module

Component	Weight
Drive	1.00 kg (2.2 lb)
ESM	1.59 kg (3.7 lb)
Power supply	2.45 kg (5.39 lb)

FLA200 Drive Module Temperature and Humidity

Table 103 Temperature Requirements and Humidity Requirements for the FLA200 Drive Module

Condition	Parameter	Requirement
Temperature*	Operating range	10°C to 40°C (50°F to 104°F)
	Maximum rate of change	10°C (18°F) per hour
	Storage range	–10°C to 65°C (14°F to 149°F)
	Maximum rate of change	15°C (27°F) per hour
	Transit range	–40°C to 65°C (–40°F to 149°F)
	Maximum rate of change	15°C (27°F) per hour
Relative humidity (no condensation)	Operating range	20% to 80%
	Storage range	10% to 90%
	Transit range	5% to 95%
	Maximum dew point	26°C (79°F)
	Maximum gradient	10% per hour
*If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.		

FLA200 Drive Module Altitude Ranges

Table 104 Altitude Ranges for the FLA200 Drive Module

Environment	Altitude
Operating	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Storage	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Transit	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level

FLA200 Drive Module Airflow and Heat Dissipation

Allow at least 76 cm (30 in.) in front of the drive module and at least 61 cm (24 in.) behind the drive module for service clearance, ventilation, and heat dissipation.

Figure 63 Airflow Through the FLA200 Drive Module

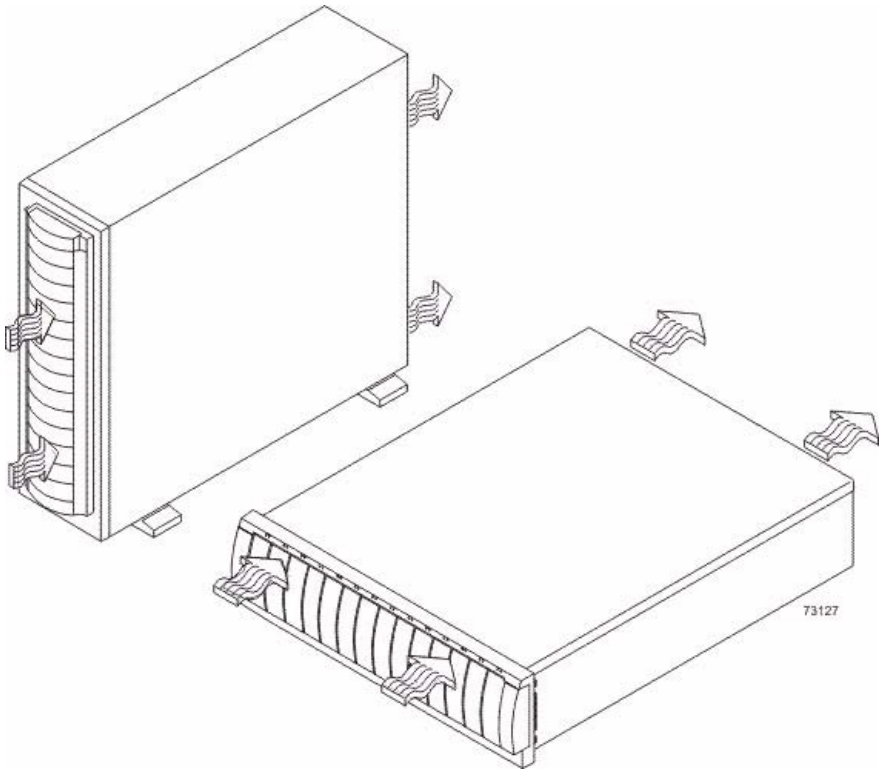


Table 105 Power and Heat Dissipation for the FLA200 Drive Module

Unit	KVA	Watts (AC)	Btu per hour
FLA200 drive module	0.375	366	1229

FLA200 Drive Module Acoustic Noise

Table 106 Sound Levels for the FLA200 Drive Module

Measurement	Level
Sound power	6.0 bels
Sound pressure	60 dBA

FLA200 Drive Module Site Wiring and Power

The FLA200 drive module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

NOTE Protective ground is also known as safety ground or chassis ground.

- **Circuit overloading –** Power circuits and associated circuit breakers must provide enough power and overload protection. To prevent damage to the drive module, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The drive module can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the drive module automatically performs a power-on recovery sequence without operator intervention.

FLA200 Drive Module Power Input

Each power supply contains one 10-A slow-blow fuse.

Table 107 AC Power Requirements for the FLA200 Drive Module

Parameter	Low Range	High Range
Nominal voltage	90 to 136 VAC	180 to 264 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Idle current	2.93 A*	1.27 A**
Maximum operating current	3.18 A	1.37 A
Maximum surge current	5.85 A	2.36 A

*Typical current: 115 VAC, 60 Hz at 0.73 power supply efficiency and 0.96 power factor.

**Typical current: 230 VAC, 60 Hz at 0.73 power supply efficiency and 0.96 power factor.

FLA200 Drive Module Power Correction Factor

Power factor correction is applied within the power supply of each FLA200 drive module, which maintains the power factor of the drive module at greater than 0.99 with nominal input voltage.

FLA200 Drive Module AC Power Cords and Receptacles

Each FLA200 drive module is shipped with two AC power cords that are appropriate for use in a typical outlet in the destination country. Each AC power cord connects one of the power supplies in a drive module to an independent, external AC power source, such as a wall receptacle or a UPS.

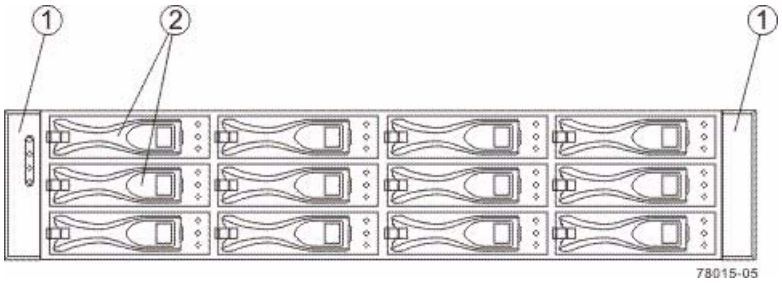
If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the AC power cords that are shipped with the drive module.

Chapter 16: Specifications of the ST2501 Drive Module

The ST2501 drive module contains Serial Attached SCSI (SAS) drives. Each ST2501 drive module contains these components:

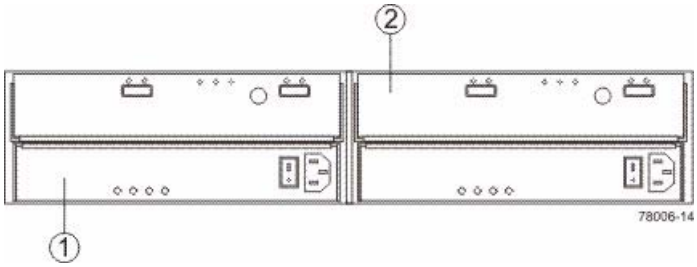
- A maximum of 12 drives
- Two power-supply fan CRUs
- One or two environmental services monitor (ESM) CRUs

Figure 64 ST2501 Drive Module – Front View



1. End Caps (the Left End Cap has the Drive Module LEDs)
2. Drive CRUs

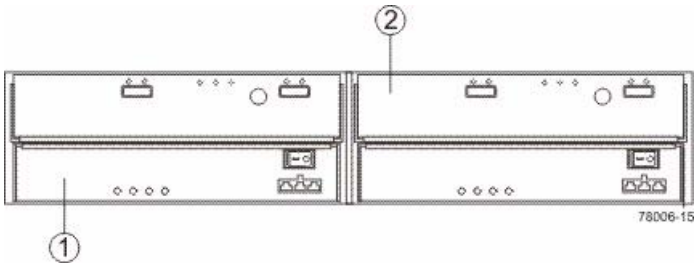
Figure 65 ST2501 Drive Module – Rear View



1. Power-Fan CRU
2. ESM CRU

Usually, an AC power source supplies power to the power-fan CRU. A DC poweroption is also available.

Figure 66 ST2501 Drive Module Power Source Options – Rear View

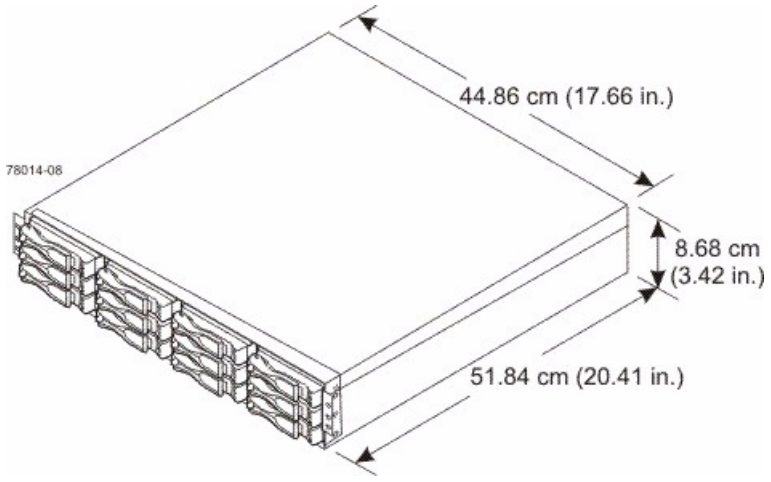


1. Controller CRU
2. DC Power Switch on an Optional Power-Fan CRU

ST2501 Drive Module Dimensions

The ST2501 drive module conforms to the 48.3-cm (19.0-in.) rack standard.

Figure 67 Dimensions of the ST2501 Drive Module – Front View



ST2501 Drive Module Weight

Table 108 Weights of the ST2501 Drive Module

Unit	Weight		
	Maximum*	Empty**	Shipping***
ST2501 drive module	25.86 kg (57.0 lb)	6.80 kg (15.0 lb)	25.00 kg (55.0 lb)

*Maximum weight indicates a drive module with all of its drives and other components installed. Because drive weights can vary greatly, this value can vary from the value specified as much as 0.3 kg (0.6 lb) times the maximum number of drives per drive module for drives weighing 1.0 kg (2.2 lb).

**Empty weight indicates a drive module with the ESM CRUs, the power-fan CRUs, and the drives removed.

***Shipping weight indicates the maximum weight of a fully-populated drive module and all shipping material.

Table 109 Component Weights of the ST2501 Drive Module

Component	Weight
ESM CRU	0.907 kg (2.00 lb)
Power-fan CRU	2.267 kg (5.00 lb)
Drive	Approximately 1.0 kg (2.2 lb)

ST2501 Drive Module Shipping Dimensions

Table 110 Shipping Carton Dimensions for the ST2501 Drive Module

Height	Width	Depth
25.40 cm (10.00 in.)	60.76 cm (24.00 in.)	44.86 cm (78.74 in.)

ST2501 Drive Module Temperature and Humidity

Table 111 Temperature Requirements and Humidity Requirements for the ST2501 Drive Module

Condition	Parameter	Requirement
Temperature*	Operating range	10°C to 40°C (50°F to 104°F)
	Maximum rate of change	10°C (18°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F)
	Maximum rate of change	15°C (27°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140°F)
	Maximum rate of change	20°C (36°F) per hour
Relative humidity (no condensation)	Operating range	20% to 80%
	Storage range	10% to 90%
	Transit range	5% to 95%
	Maximum dew point	26°C (79°F)
	Maximum gradient	10% per hour

*If you plan to operate a system at an altitude between 1000 m to 3000 m (3280 ft to 9842 ft) above sea level, lower the environmental temperature 1.7°C (3.3°F) for every 1000 m (3280 ft) above sea level.

ST2501 Drive Module Altitude Ranges

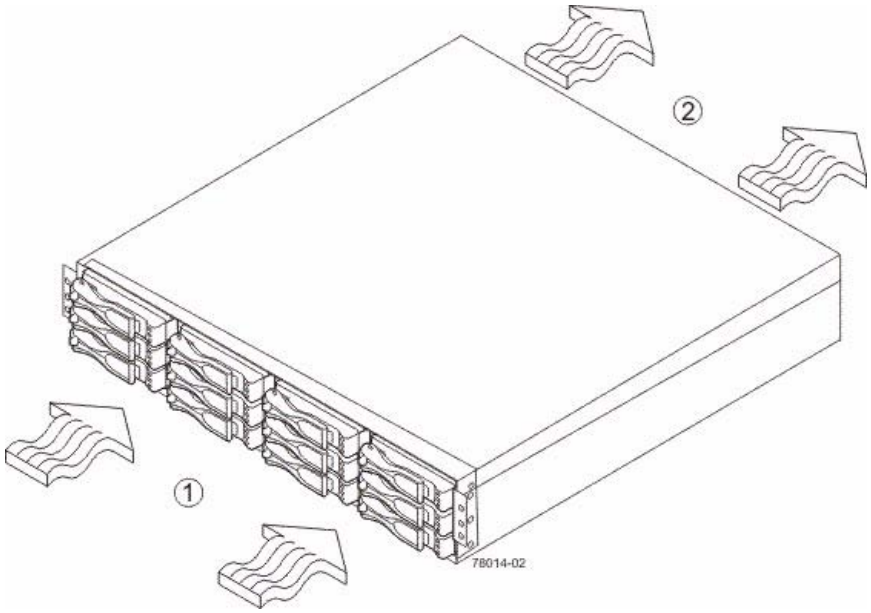
Table 112 Altitude Ranges for the ST2501 Drive Module

Environment	Altitude
Operating	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Storage	30.5 m (100 ft) below sea level to 3000 m (9842 ft) above sea level
Transit	30.5 m (100 ft) below sea level to 12,000 m (40,000 ft) above sea level

ST2501 Drive Module Airflow and Heat Dissipation

Airflow goes from the front of the drive module to the rear of the drive module. Allow at least 76 cm (30 in.) of clearance in front of the drive module and at least 61 cm (24 in.) of clearance behind the drive module for service clearance, ventilation, and heat dissipation.

Figure 68 Airflow Through the ST2501 Drive Module – Front View



1. 76 cm (30 in.) clearance in front of the cabinet
2. 61 cm (24 in.) clearance behind the cabinet

The tabulated power and heat dissipation values in the following table are the maximum measured operating power.

Table 113 Power Ratings and Heat Dissipation for the ST2501 Drive Module

Unit	KVA	Watts (AC)	Btu/Hr	Amps (240 VAC)
ST2501 drive module	0.362	358	1224	1.54

ST2501 Drive Module Acoustic Noise

Table 114 Sound Levels for the ST2501 Drive Module

Measurement	Level
ES 2-10-02 Standard Level 2	0.5 bels margin
Sound power (standby operation)	6.5 bels
Sound power (normal operation)	6.8 bels

ST2501 Drive Module Site Wiring and Power

The ST2501 drive module uses wide-ranging, redundant power supplies that automatically accommodate voltages to the AC power source. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide (except USA and Canada) operation. The power supplies use standard industrial wiring with line-to-neutral or line-to-line power connections.

Keep this information in mind when preparing the installation site for the drive module:

- **Protective ground** – Site wiring must include a protective ground connection to the AC power source.

NOTE *Protective ground* is also known as safety ground or chassis ground.

- **Circuit overloading** – Power circuits and associated circuit breakers must provide enough power and overload protection. To prevent damage to the drive module, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The drive module can withstand these applied voltage interruptions:
  - **Input transient** – 50 percent of the nominal voltage
  - **Duration** – One-half cycle
  - **Maximum frequency** – Once every 10 seconds
- **Power failures** – If a total power failure occurs, the drive module automatically performs a power-on recovery sequence without operator intervention after the power is restored.

ST2501 Drive Module Power Input

AC Power Input

The AC power sources must provide the correct voltage, current, and frequency specified on the module and serial number label.

Table 115 AC Power Requirements for the ST2501 Drive Module

Parameter	Low Range	High Range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Idle current	3.96 A*	1.74 A**
Maximum operating current	4.08 A*	1.70 A**

*Typical current: 100 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor. These numbers can vary significantly, depending upon the drives tested in the particular configuration.

**Typical current: 240 VAC, 60 Hz at 0.77 power supply efficiency and 0.96 power factor. These numbers can vary significantly, depending upon the drives tested in the particular configuration.

DC Power Input

Nominal input voltages for the DC power source are as follows:

- Low range: –36 VDC
- High range: –72 VDC

The maximum operating current is 17 A.

ST2501 Drive Module Power Factor Correction

Power factor correction is applied within the power supply of each ST2501 drive module, which maintains the power factor of the drive module at greater than 0.95 with nominal input voltage.

ST2501 Drive Module AC Power Cords and Receptacles

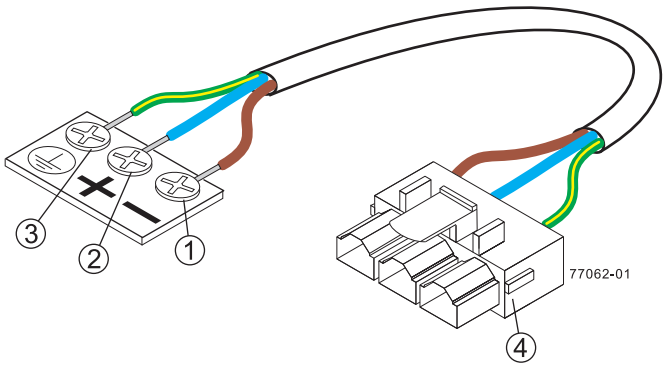
Each ST2501 drive module is shipped with two AC power cords, which use standard AC outlets in the destination country. Each AC power cord connects one of the power supplies in the drive module to an independent, external AC power source, such as a wall receptacle, or to any uninterruptible power supply (UPS).

Usually an AC power source supplies power to the power-fan CRU. A DC power option is also available. For more information about the DC power option, see ST2501 Drive Module Optional DC Power Connector Cables and Source Wires.

ST2501 Drive Module Optional DC Power Connector Cables and Source Wires

The ST2501 drive module is shipped with –48-VDC power connector cables if the DC power option is ordered. The –48-VDC power connector cable plugs into the DC power connector on the rear of the drive module. The three source wires on the other end of the power connector cable connect the drive module to centralized DC power plant equipment, typically through a bus bar above the cabinet.

WARNING (W12) **Risk of electrical shock** – This unit has more than one power source. To remove all power from the unit, all DC MAINS must be disconnected by removing all power connectors (item 4 below) from the power supplies.



1. Supply (Negative), Brown Wire, –48 VDC
2. Return (Positive), Blue Wire
3. Ground, Green and Yellow Wire
4. DC Power Connector

WARNING (W14) **Risk of bodily injury** – A qualified service person is required to make the DC power connection according to NEC and CEC guidelines.

Two DC power connector cables are provided with each drive module. Two DC power connectors are on the two power-fan CRUs on the rear of each drive module if additional redundancy is required.

NOTE It is not mandatory that you connect the second DC power connection on the power-fan CRU of the drive module. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

Appendix A Regulatory Compliance Statements

FCC Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the Federal Communications Commission (FCC) Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

LSI Corporation is not responsible for any radio or television interference caused by unauthorized modification of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by LSI. It is the user's responsibility to correct interference caused by such unauthorized modification, substitution, or attachment.

Laser Products Statement

This equipment uses Small Form-factor Pluggable (SFP) optical transceivers, which are unmodified Class 1 laser products pursuant to 21 CFR, Subchapter J, Section 1040.10. All optical transceivers used with this product are required to be 21 CFR certified Class 1 laser products. For outside the USA, this equipment has been tested and found compliant with Class 1 laser product requirements contained in European Normalization standard EN 60825-1 1994+A11. Class 1 levels of laser radiation are not considered to be hazardous and are considered safe based upon current medical knowledge. This class includes all lasers or laser systems which cannot emit levels of optical radiation above the exposure limits for the eye under any exposure conditions inherent in the design of the laser products.

LSI Corporation is not responsible for any damage or injury caused by unauthorized modification of this equipment or the substitution or attachment of connecting cables and equipment other than those specified by LSI. It is the user's responsibility to correct interference caused by such unauthorized modification, substitution, or attachment.

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classé A respecte toutes les exigences du Règlement sure le matèriel brouilleur du Canada.

この装置は、第一種情報装置（商工業地域において使用されるべき情報装置）で商工業地域での電波障害防止を目的とした情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）基準に適合しております。

従って、住宅地域またはその隣接した地域で使用すると、ラジオ、テレビジョン受信機等に受信障害を与えることがあります。

取扱説明書に従って正しい取り扱いをして下さい。

警告使用者： 這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

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