

E-Series

Site Preparation Guide

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doccomments@netapp.com

NetApp®

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Deciding whether to use this guide

This guide includes information and key specification for the currently supported E-Series and EF-Series controller shelves, flash arrays, and drive shelves. Use this guide to prepare your site for the installation of controller shelves, flash arrays, and drive shelves into an industry-standard cabinet.

The following table defines some of the most commonly used hardware terms:

Term used for E2700 and E5600 storage arrays, and EF560 flash arrays	Term used for E2800 storage arrays	Definition
tray	shelf	An enclosure you can install in a cabinet or rack. E-Series and EF-Series enclosures might include controller canisters and drives, or they might contain drives only.
controller-drive tray	controller shelf	An enclosure that includes one or two controller canisters and drives.
drive tray (or "expansion drive tray")	drive shelf (or "expansion drive shelf")	An enclosure that includes drives and either two environmental service modules (ESMs) or two I/O modules (IOMs).
slot	bay	One of the locations in an enclosure for a drive, controller canister, or ESM or IOM.
controller canister	controller canister	The component in a controller-drive tray or controller shelf that includes a controller card, a battery, and–optionally–a host interface card.
ESM (environmental service module)	IOM (I/O module)	The component in a drive tray or drive shelf that manages the activities performed by the enclosure.
power-fan canister	power-fan canister	The component in a 12-drive or 24-drive enclosure that includes the power supply (or PSU) and integrated fans.

Note: Different terms might apply to different hardware models. The terms used for E2700 and E5600 storage arrays, and EF560 flash arrays are also used for E2600 and E5500 storage arrays, and EF550 flash arrays.

For additional documentation and instructions for E-Series products, including SANtricity software, go to the *NetApp E-Series and EF-Series Systems Documentation Center*.

Related information

NetApp E-Series and EF-Series Systems Documentation Center

E-Series and EF-Series 3040 40U Cabinet Installation Guide

Specifications of the model 3040 40U cabinet

The model 3040 40U cabinet has these standard features:

- A rear door that can be latched and locked
- 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 provide integrated power connection and power handling capacity

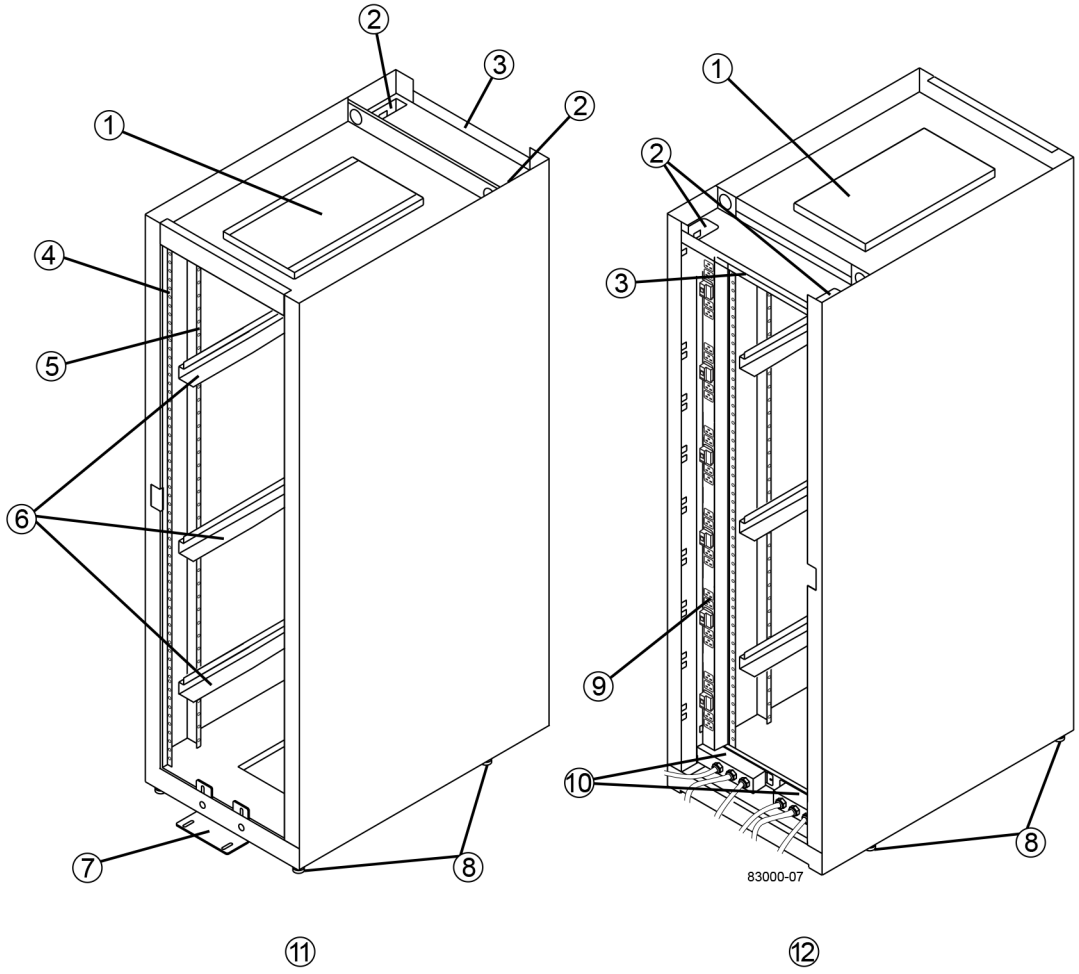
Warning: Risk of bodily injury – If the bottom half of the cabinet is empty, do not install components in the top half of the cabinet. If the top half of the cabinet is too heavy for the bottom half, the cabinet might fall and cause bodily injury. Always install a component in the lowest available position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

Warning: 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. A fully populated cabinet can weigh more than 2000 lb (909 kg). 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.

Note: You cannot install an E2860 controller shelf or a DE460C drive shelf into a 3040 40U cabinet.

Note: If a 3040 cabinet is fully populated with DE6600 trays, it weighs more than 2756 lb (1250.1 kg).

The following figures show a front view (left) and a rear view (right) of the cabinet.



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 distribution unit (one of two)
10.	AC power entry boxes
11.	Front of the cabinet
12.	Rear of the cabinet

Model 3040 40U cabinet: Configurations

The following table lists the total number of trays that you can install in a 3040 40U cabinet. If you install the total number of trays, keep in mind that no more than half of the trays can be controller-drive trays.

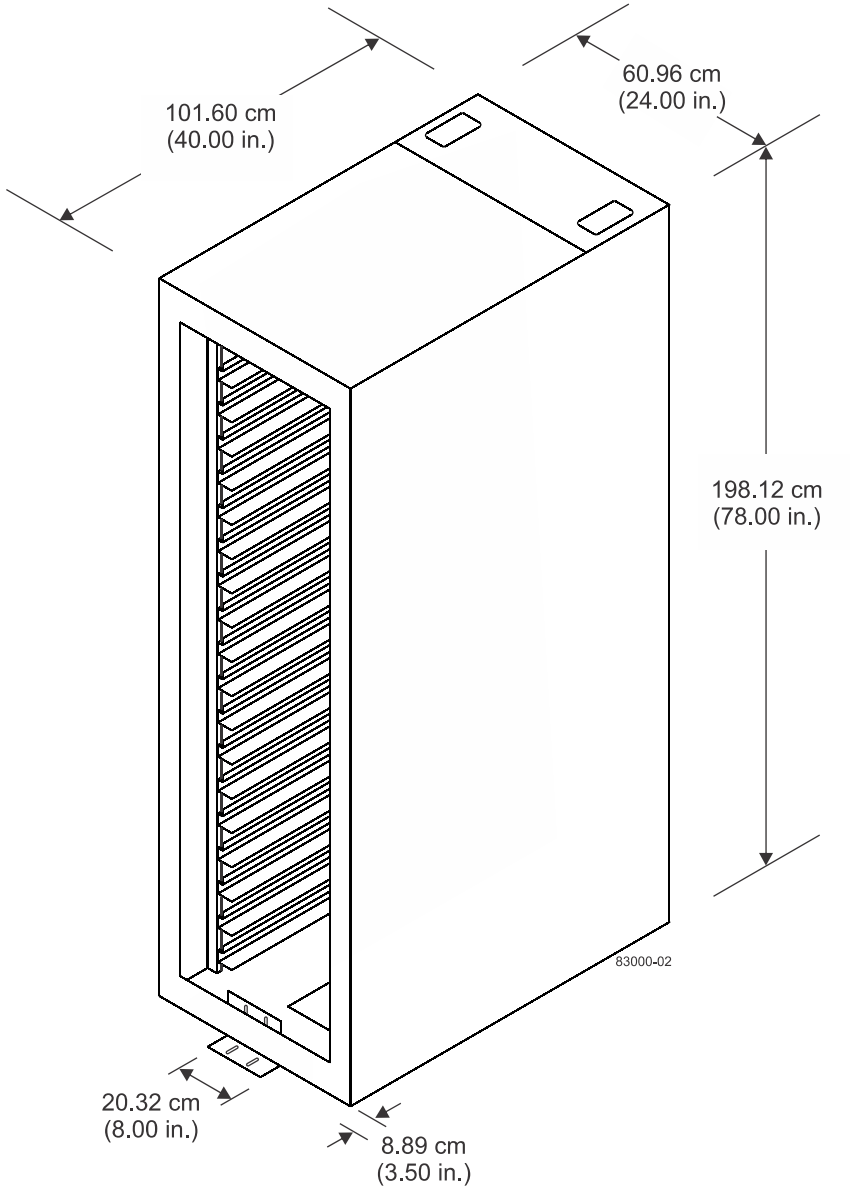
Tray size	Total number of trays	Maximum number of controller-drive trays
12-drive tray (2U)	20	10
24-drive tray (2U)	20	10
60-drive tray (4U)	10	5

For information about how to install the 3040 40U cabinet, see *E-Series and EF-Series 3040 40U Cabinet Installation Guide*.

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. For additional information, see *Model 3040 40U cabinet: Airflow, heat dissipation, and service clearances* on page 17.

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 2705 lb (1226.66 kg). 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 1: Weights of the model 3040 40U cabinet, trays, and crate

Component	Weight	Notes
Cabinet	306.0 lb (138.80 kg)	Empty with the rear door installed
Power distribution unit (PDUs)–pair	44.0 lb (19.96 kg)	
Mounting rails (pair)	3.50 lb (1.59 kg)	
E2600 controller-drive tray	61.50 lb (27.90 kg)	Maximum configuration
E2660 controller-drive tray	236.93 lb (107.47 kg)	Maximum configuration
E2712 controller-drive tray	61.24 lb (27.78 kg)	Maximum configuration
E2724 controller-drive tray	59.25 lb (26.88 kg)	
E2760 controller-drive tray	237.02 lb (107.51 kg)	
E2812 controller shelf	63.9 lb (29 kg)	Maximum configuration
E2824 controller shelf	60.5 lb (27.4 kg)	Maximum configuration
E5412 controller-drive tray	64.04 lb (29.50 kg)	
E5424 controller-drive tray	66.03 lb (28.59 kg)	
E5460 controller-drive tray	241.19 lb (109.40 kg)	
E5512 controller-drive tray	65.37 lb (29.65 kg)	
E5524 controller-drive tray	63.23 lb (28.68 kg)	
E5560 controller-drive tray	240.92 lb (109.28 kg)	
E5612 controller-drive tray	65.37 lb (29.65 kg)	
E5624 controller-drive tray	63.23 lb (28.68 kg)	
E5660 controller-drive tray	240.92 lb (109.28 kg)	
EF540 flash array	62.67 lb (27.15 kg)	
EF550 flash array	60.1 lb (27.29 kg)	
EF560 flash array	60.1 lb (27.29 kg)	
DE1600 drive tray	59.61 lb (27.07 kg)	
DE212C drive shelf	59.78 lb (27.12 kg)	
DE224C drive shelf	60.5 lb (27.44 kg)	
DE5600 drive tray	52.42 lb (23.78 kg)	
DE6600 drive tray	235.32 lb (106.74 kg)	Maximum configuration
Shipping crate (worldwide shipments only)	300.0 lb (136.08 kg)	Empty

Model 3040 40U cabinet: Temperature and humidity

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

Table 2: 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 60°C (–40°F to 140°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

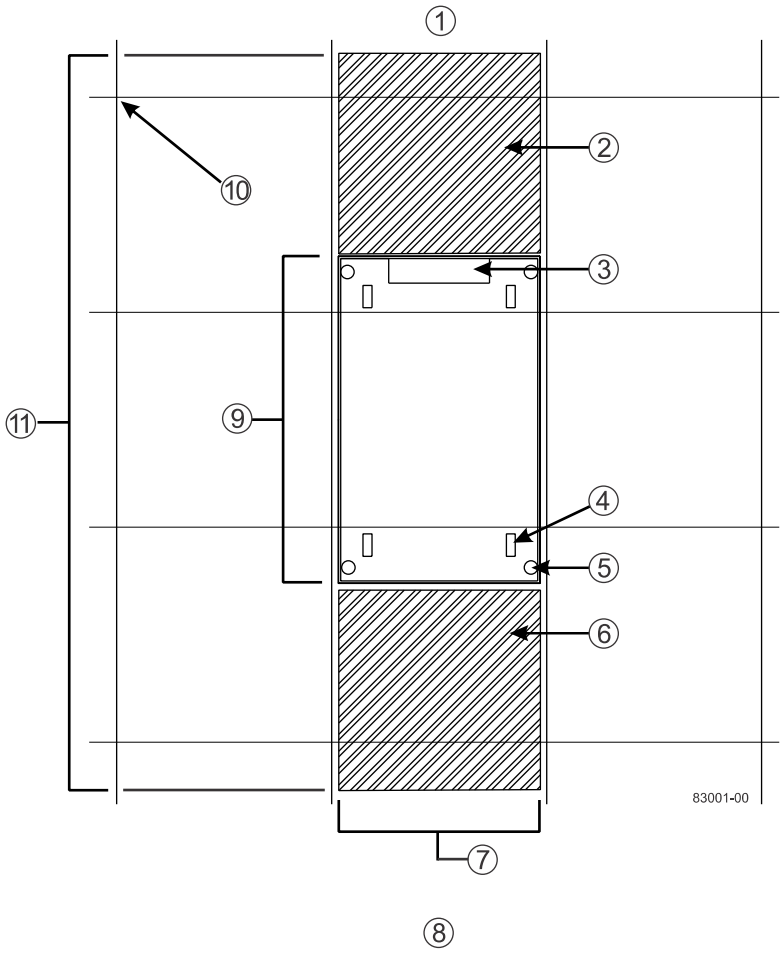
Table 3: Altitude ranges for the Model 3040 40U cabinet

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.

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 × 61 cm (24 in. × 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 trays that are installed in the cabinet. Use the table in *Model 3040 40U cabinet: Power requirements* on page 19 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 trays 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 tray 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.
- **Tray 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 trays 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 trays in the cabinet automatically perform a power-on recovery sequence without operator intervention.

Model 3040 40U cabinet: Power requirements

Table 4: 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 trays that are installed in the cabinet.	10.0 A to 55.0 A

Attention: Risk of exceeding maximum amperage – You must calculate the load of the devices in the cabinet to ensure that you do not exceed the maximum amperage.

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.

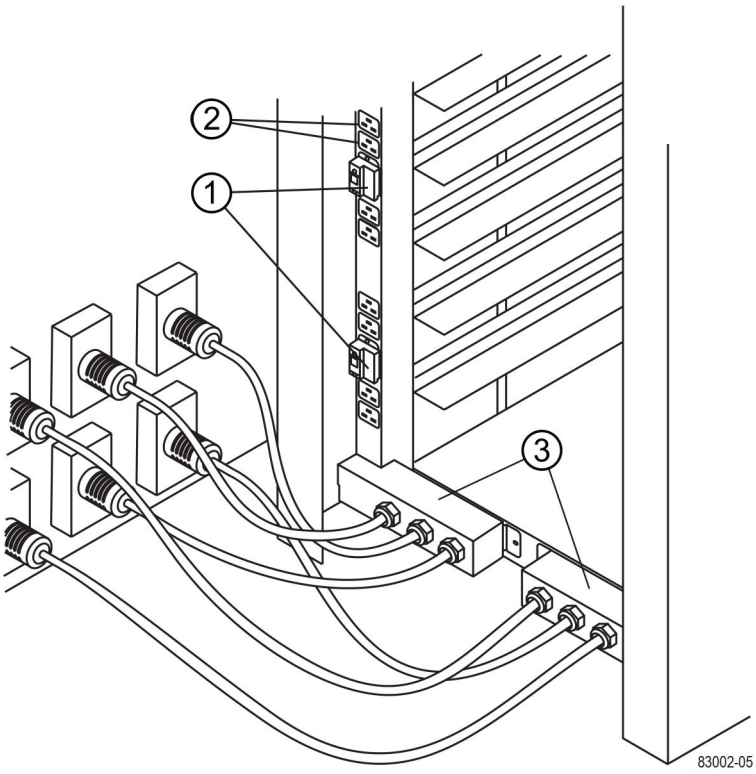
Model 3040 40U cabinet: Power distribution

The Model 3040 40U cabinet uses two identical AC power distribution units (PDUs). Each PDU provides up to 72A of usable power and consists of the following:

- A power strip mounted vertically at the back of the cabinet that includes six 12A power banks. Each power bank contains four IEC 60320-C19 power outlets and a 15A circuit breaker. Each power strip has a total of 24 outlets and 6 circuit breakers.
- Three power entry boxes at the bottom of the cabinet, with each power entry box providing power to eight of the 24 outlets.

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

Circuit breakers and electrical outlets for 72A PDUs

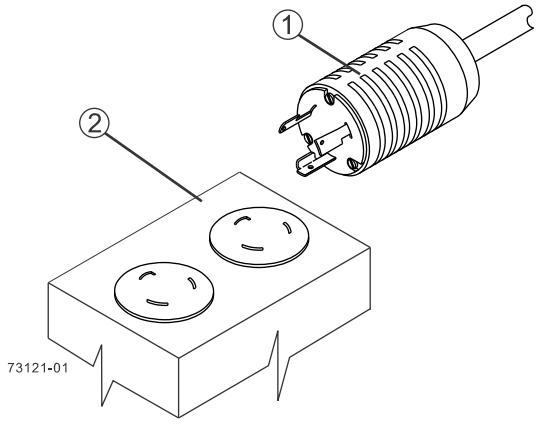


1.	Circuit breakers
2.	Electrical outlets
3.	Power entry boxes

Model 3040 40U cabinet: Power cords and receptacles

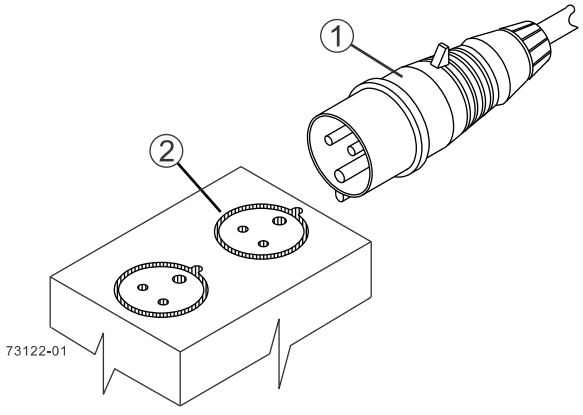
Depending on your installation, each of the two AC power distribution units includes three NEMA L6-30 power cords for use in North America (USA and Canada) or three IEC 60309 power cords for use internationally (except in the USA and Canada). You must connect each AC power distribution unit to an independent power source outside of the cabinet.

NEMA L6-30 power cord and receptacle (North America)



1.	250-VAC, 30-A plug (North America)
2.	Receptacle

IEC 60309 power cord and receptacle (worldwide, except USA and Canada)

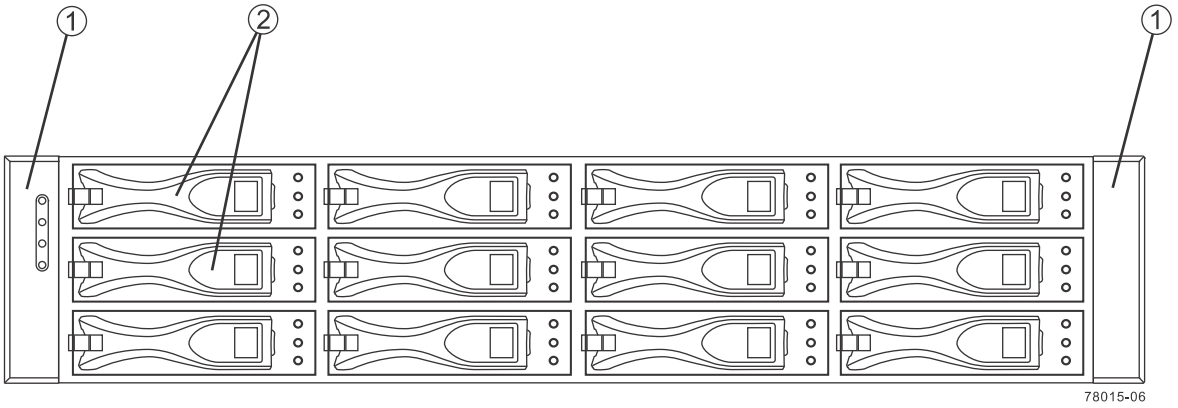


1.	230-VAC, 32-A plug (worldwide, except USA and Canada)
2.	Receptacle

Specifications of the E2612 and E2624 controller-drive trays

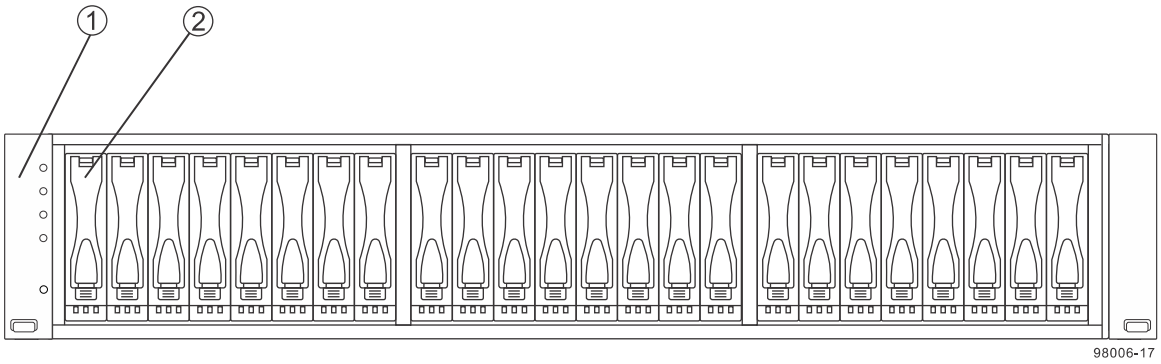
The E2612 and E2624 controller-drive trays are high-density SAS 2.0 (6-Gb/s) drive enclosures available in a rack-mount model, with a capacity of either twelve 3.5-in. SAS drives or twenty-four 2.5-in. SAS drives.

E2612 controller-drive tray with 12 drives – front view



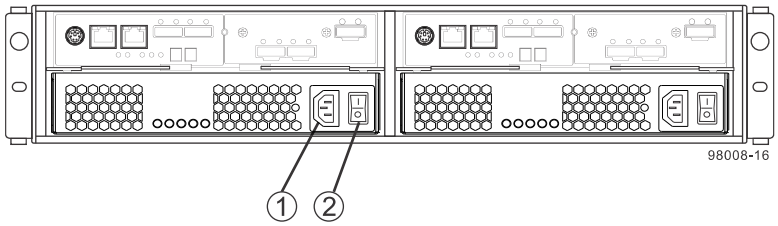
1.	End caps (the left end cap has the controller-drive tray summary LEDs)
2.	Drive canisters

E2624 controller-drive tray with 24 drives – front view



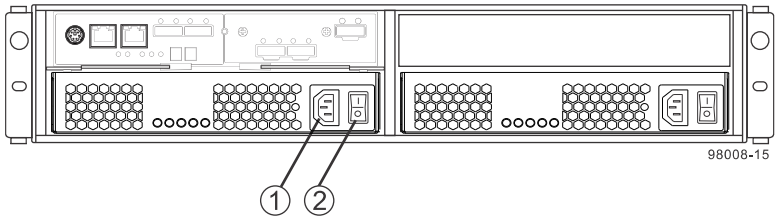
1.	End caps (the left end cap has the controller-drive tray summary LEDs)
2.	Drive canisters

E2612 and E2624 controller-drive trays – rear view



1.	AC power connector
2.	AC power switch

E2612 and E2624 controller-drive trays simplex configuration – rear view

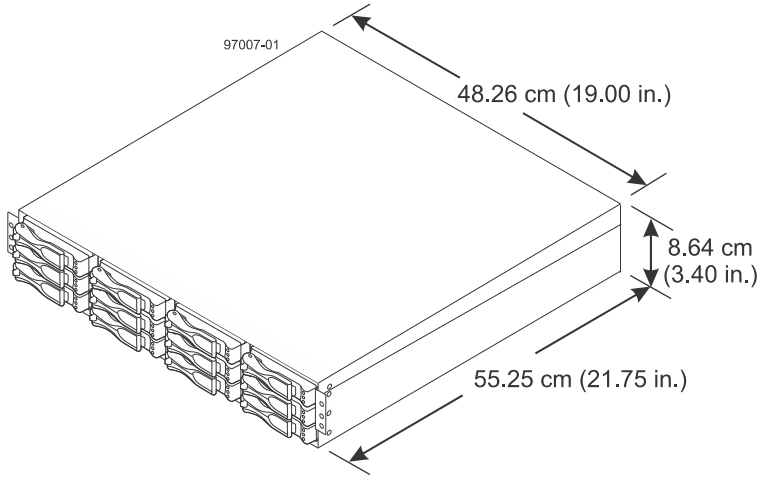


1.	AC power connector
2.	AC power switch

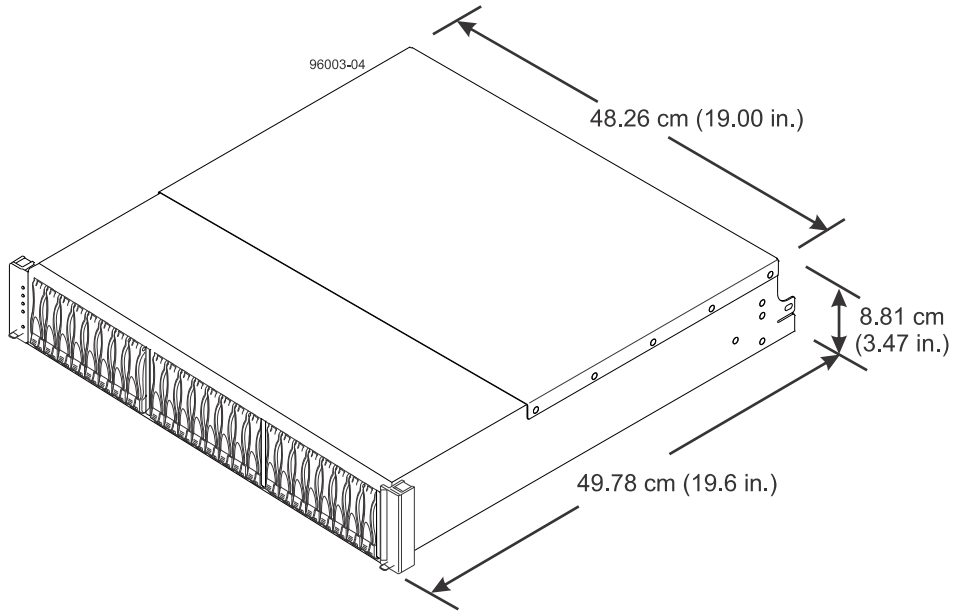
E2612 and E2624 controller-drive trays: Dimensions

The E2612 and E2624 controller-drive trays conform to the 48.3-cm (19.0-in.) rack standard.

Dimensions of the E2612 controller-drive tray with 12 drives – front view



Dimensions of the E2624 controller-drive tray with 24 drives – front view



E2612 and E2624 controller-drive trays: Weights

Table 5: Weights of the E2612 and E2624 controller-drive trays

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
E2612 controller-drive tray, with twelve 8.89-cm (3.5-in.) drives	61.50 lb (27.90 kg)	18.52 lb (8.4 kg)	70.0 lb (31.75 kg)
E2624 controller-drive tray, with twenty-four 6.35-cm (2.5-in.) drives	58.59 lb (26.58 kg)	23.59 lb (10.7 kg)	70.0 lb (31.75 kg)
*Maximum weight indicates a controller-drive tray, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type. **Empty weight indicates a controller-drive tray with the controller canisters, the power-fan canisters, and the drives removed. ***Shipping weight indicates the maximum weight of the controller-drive tray and all shipping material.			

Table 6: Component weights

Component	Weight
Controller canister	4.70 lb (2.131 kg)
Power-fan canister	5.51 lb (2.500 kg)
2.5-in. SAS drive	0.41 lb (0.19 kg) to 0.51 lb (0.23 kg)

Component	Weight
3.5-in. SAS drive	1.43 lb (0.65 kg) to 1.72 lb (0.78 kg)
2.5-in. SSD	0.15 lb (0.07 kg) to 0.37 lb (0.17 kg)

E2612 and E2624 controller-drive trays: Shipping dimensions

Table 7: Shipping carton dimensions for the E2612 and E2624 controller-drive trays

Controller-drive tray model	Height	Width	Depth
E2612	27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)
E2624	27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)

E2612 and E2624 controller-drive trays: Temperature and humidity requirements

Note: Converting *maximum rate of change* requires converting between Fahrenheit and Celsius first, and then subtracting the difference.

Table 8: Temperature requirements and humidity requirements for the E2600 controller-drive tray

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 per hour (18°F per hour)
	Storage range	–10°C to 50°C (14°F to 122°F)
	Maximum rate of change	15°C per hour (27°F per hour)
	Transit range	–40°C to 60°C (–40°F to 140°F)
	Maximum rate of change	20°C per hour (36°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

Condition	Parameter	Requirement
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 (3.1°F) for every 1000 m (3280 ft) above sea level.		

E2612 and E2624 controller-drive trays: Altitude ranges

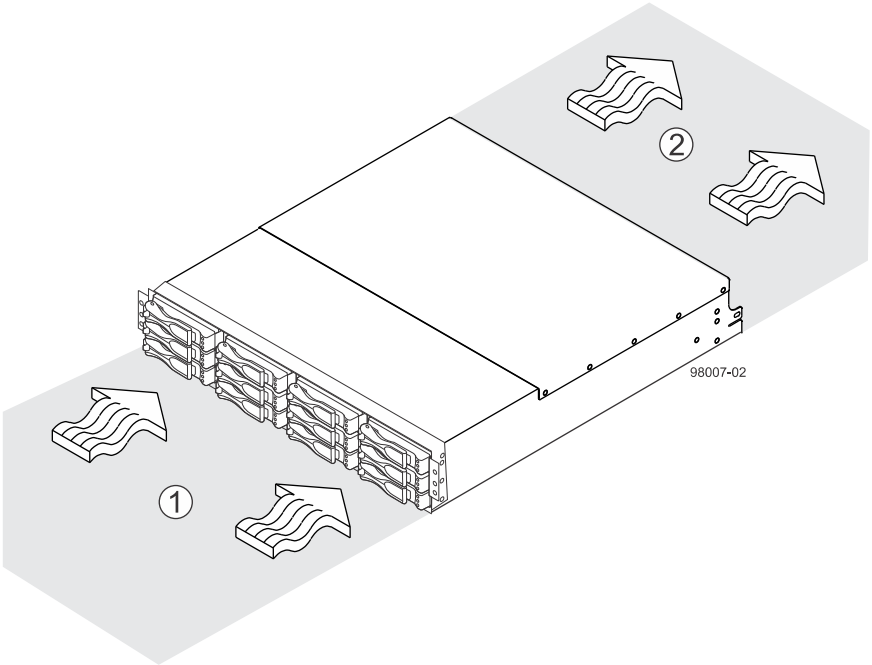
Table 9: Altitude ranges for the E2612 and E2624 controller-drive trays

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

E2612 and E2624 controller-drive trays: Airflow and heat dissipation

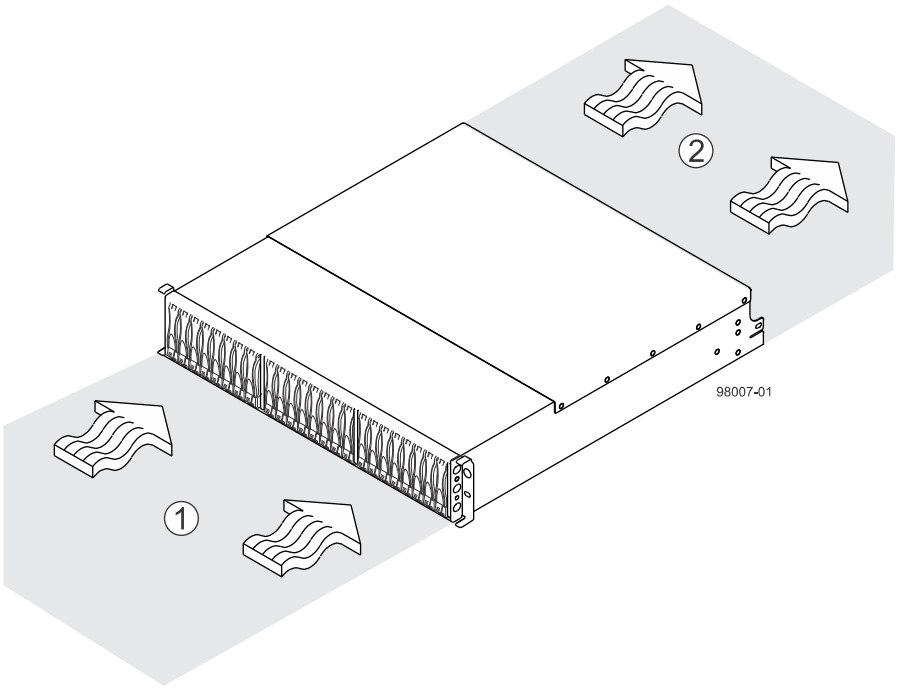
Allow at least 76 cm (30 in.) of clearance in front of the controller-drive tray and 61 cm (24 in.) behind the controller-drive tray for service clearance, ventilation, and heat dissipation.

Airflow through the E2612 controller-drive tray – front view



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

Airflow through the E2624 controller-drive tray – front view



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

Table 10: Power and heat dissipation for the E2612 and E2624 controller-drive trays

Component	Typical operating power	Rated power requirement
E2612 controller-drive tray: Controller canisters with two power-fan canisters and 12 NL-SAS drives each with 6-TB capacity	**KVA:** 0.287	**KVA:** 0.908
	Watts: 284	**Watts:** 900
	Btu/Hr: 970	**Btu/Hr:** 3071
E2624 controller-drive tray: Controller canisters with two power-fan canisters and 24 10K SAS drives each with 1.2-TB capacity	**KVA:** 0.337	**KVA:** 0.908
	Watts: 333	**Watts:** 900
	Btu/Hr: 1138	**Btu/Hr:** 3071

E2612 and E2624 controller-drive trays: Acoustic noise

Table 11: Acoustic noise at 25°C for the E2612 and E2624 controller-drive trays

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

E2612 and E2624 controller-drive trays: Site wiring and power

The E2612 and E2624 controller-drive trays use 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 controller-drive trays:

- **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 controller-drive tray, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The controller-drive trays 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 controller-drive trays automatically perform a power-on recovery sequence without operator intervention.

E2612 and E2624 controller-drive trays: Power input

AC power input

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

Table 12: AC power requirements for the E2612 and E2624 controller-drive trays

Parameter	Low range	High range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Typical operating current for 12 drives	2.87 A*	1.20 A**
Typical operating current for 24 drives	3.37 A*	1.40 A**
Maximum operating current for 12 drives	4.37 A*	1.82 A**

Parameter	Low range	High range
Maximum operating current for 24 drives	4.87 A*	2.02 A**
System rating plate label	9.0 A	3.6 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.

E2612 and E2624 controller-drive trays: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the controller-drive trays at greater than 0.95 with nominal input voltage.

E2612 and E2624 controller-drive trays: AC power cords and receptacles

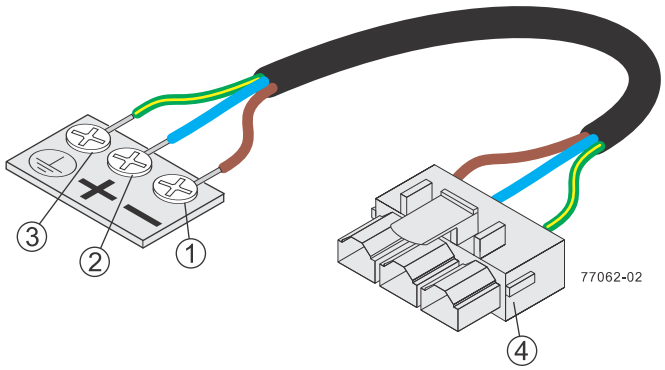
The E2612 and E2624 controller-drive trays are each shipped with two AC power cords. Each AC power cord connects one of the power supplies in a controller-drive tray to an independent, external AC power source, such as a wall receptacle or a UPS.

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 controller-drive tray.

E2612 and E2624 controller-drive trays: Optional DC power connector cables and source wires

The E2612 and E2624 controller-drive trays are 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 controller-drive tray. The three source wires on the other end of the power connector cable connect the controller-drive tray 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.

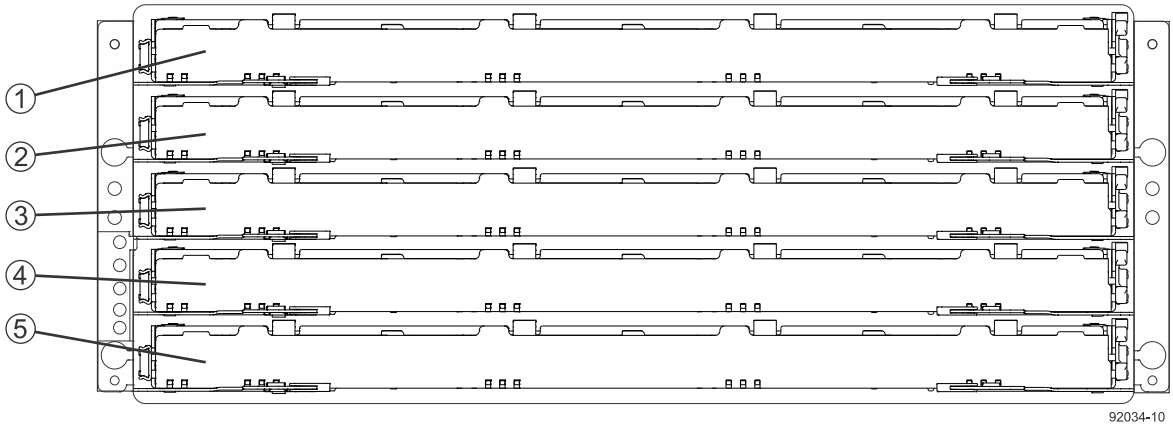
Two (or, optionally, four) DC power connector cables are provided with each controller-drive tray. Two DC power connectors are on the two DC power supplies on the rear of each controller-drive tray if additional redundancy is required.

Note: You do not need to connect the second DC power connection on the DC power supplies of the controller-drive tray. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

Specifications of the E2660 controller-drive tray

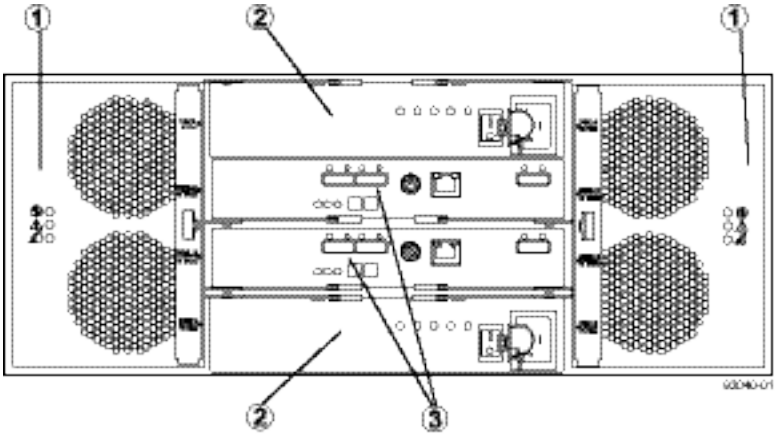
The E2660 controller-drive tray is a high-density SAS 2.0 (6-Gb/s) drive enclosure available in a rack-mount model, with either high-capacity 3.5-in. SAS drives, high-performance 2.5-in. 10K hard disk drive (HDD) SAS drives, or 2.5-in. solid state drive (SSD) SAS drives.

E2660 controller-drive tray – front view with bezel removed



1.	Drive drawer 1
2.	Drive drawer 2
3.	Drive drawer 3
4.	Drive drawer 4
5.	Drive drawer 5

E2660 controller-drive tray – rear view

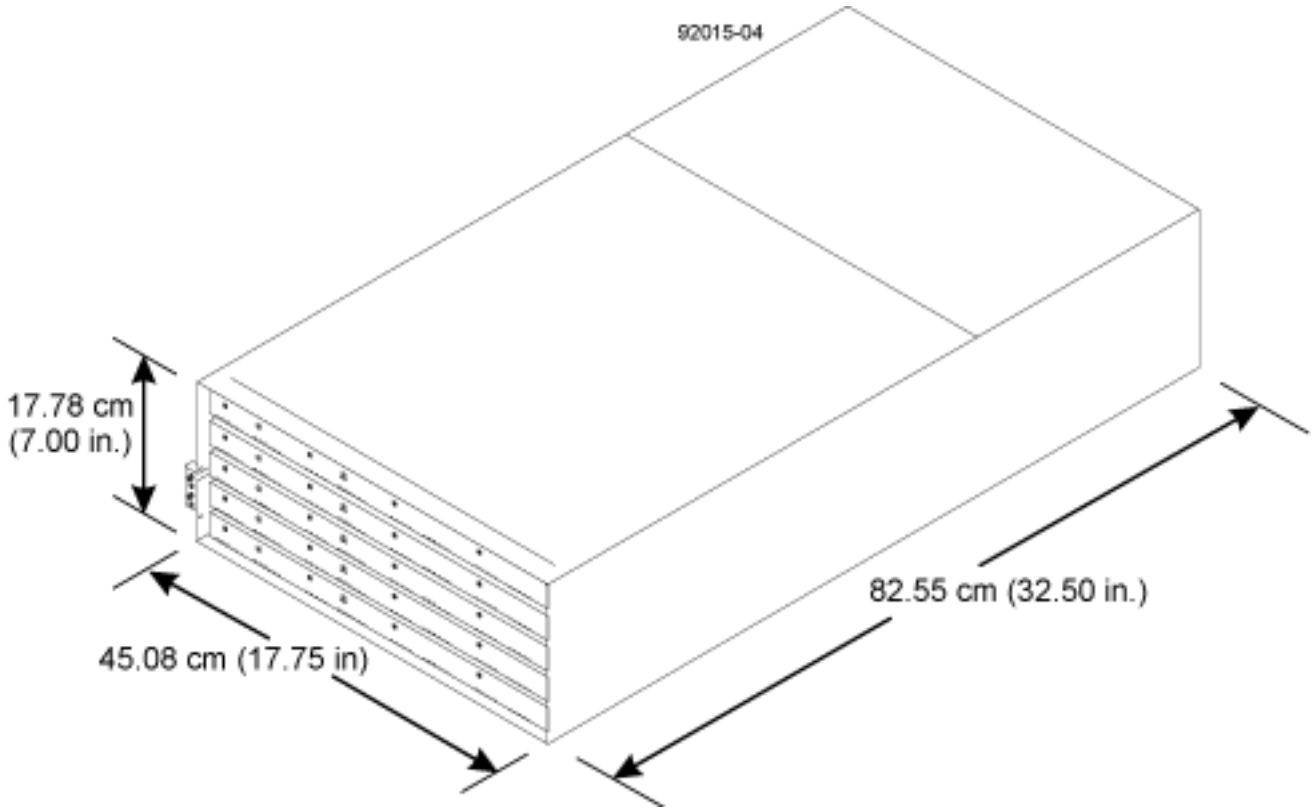


1.	Fan canisters
2.	Power canisters
3.	Controller canisters

E2660 controller-drive tray: Dimensions

The E2660 controller-drive tray conforms to the 48.3-cm (19.0-in.) rack standard.

Dimensions of the E2660 controller-drive tray – front view



E2660 controller-drive tray: Weights

Table 13: Weights of the E2660 controller-drive tray

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
E2660 controller-drive tray	236.93 lb (107.47 kg)	132 lb (59.8 kg)	278 lb (126.1 kg)
*Maximum weight indicates a controller-drive tray, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type. **Empty weight indicates a drive tray without the controller canisters, the power canisters, the fan canisters, and the drives. ***Shipping weight indicates the empty weight of a drive tray and all shipping material, as well as the weight of the 60 drives that are shipped separately in multipack cartons.			

Table 14: Component weights of the E2660 controller-drive tray

Component	Weight
Controller canister	6.60 lb (2.99 kg)
Power canister	5.5 lb (2.5 kg)
Fan canister	Approximately 2.16 lb (1 kg)
2.5-in. SAS drive	0.41 lb (0.19 kg) to 0.51 lb (0.23 kb)
3.5-in. SAS drive	1.43 lb (0.65 kg) to 1.72 lb (0.78 kg)
2.5-in. SSD	0.15 lb (0.07 kg) to 0.37 lb (0.17 kg)

E2660 controller-drive tray: Shipping dimensions

Table 15: Shipping carton dimensions for the E2660 controller-drive tray

Height	Width	Depth
73.66 cm (29 in.)	60.96 cm (24 in.)	101.60 cm (40 in.)

E2660 controller-drive tray: Temperature and humidity requirements

Note: Converting *maximum rate of change* requires converting between Fahrenheit and Celsius first, and then subtracting the difference.

Table 16: Temperature requirements and humidity requirements for the E2660 controller-drive tray

Condition	Parameter	Requirement
Temperature	Operating range (both cabinet and subsystem)	10°C to 35°C (50°F to 95°F)
	Maximum rate of change	10°C per hour (18°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F)
	Maximum rate of change	15°C per hour (27°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140°F)
	Maximum rate of change	20°C per hour (36°F) per hour

Condition	Parameter	Requirement
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 (3.1°F) for every 1000 m (3280 ft) above sea level.		

E2660 controller-drive tray: Altitude ranges

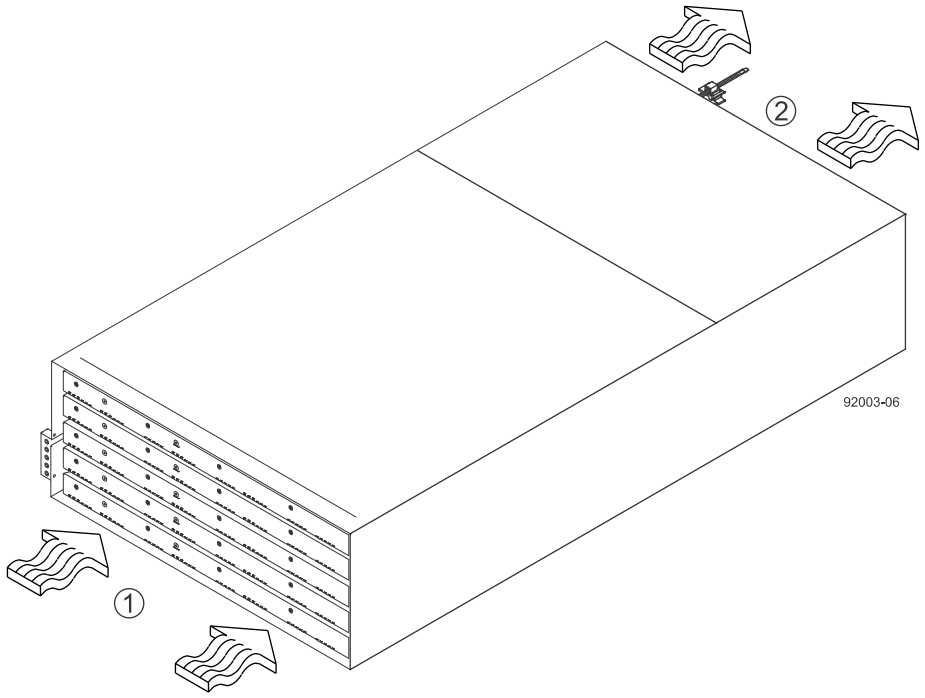
Table 17: Altitude ranges for the E2660 controller-drive tray

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

E2660 controller-drive tray: Airflow and heat dissipation

Airflow goes from the front of the E2660 controller-drive tray to the rear of the controller-drive tray. Allow at least 81 cm (32 in.) of clearance in front of the E2660 controller-drive tray and at least 61 cm (24 in.) of clearance behind the controller-drive tray for service clearance, ventilation, and heat dissipation.

Airflow through the E2660 controller-drive tray – front view



1.	81 cm (32 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 18: Power ratings and heat dissipation for the E2660 controller-drive tray

Component	Typical operating power	Rated power requirement
E2660 controller-drive tray with two power supplies, two controller trays, 60 drives (6-TB SAS drives and controllers), and two fan canisters, full speed	**KVA:** 0.918	**KVA:** 1.526
	Watts: 909	**Watts:** 1512
	Btu/Hr: 3102	**Btu/Hr:** 5159

E2660 controller-drive tray: Acoustic noise

Table 19: Acoustic noise at 25° C for the E2660 controller-drive tray

Measurement	Level
Sound power (standby operation)	7.2 bels
Sound power (normal operation)	7.2 bels
Sound pressure	72 dBA

E2660 controller-drive tray: Site wiring and power

The E2660 controller-drive tray 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 power connections or line-to-line power connections.

Keep this information in mind when you prepare the installation site for the controller-drive tray:

- **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 tray, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The controller-drive tray 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 tray automatically performs a power-on recovery sequence without operator intervention after the power is restored.

E2660 controller-drive tray: Power input

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

Table 20: AC power requirements for the E2660 controller-drive tray

Parameter	High range
Nominal voltage	240 VAC
Frequency	50-60 Hz
Idle current	4.14 A
Typical operating current	3.82 A *
Maximum operating current	4.7 A *
Maximum surge current	7.09 A
* This number could be higher during a failure due to higher speed fans operation.	

E2660 controller-drive tray: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the E2660 controller-drive tray at greater than 0.95 with nominal input voltage.

E2660 controller-drive tray: AC power cords and receptacles

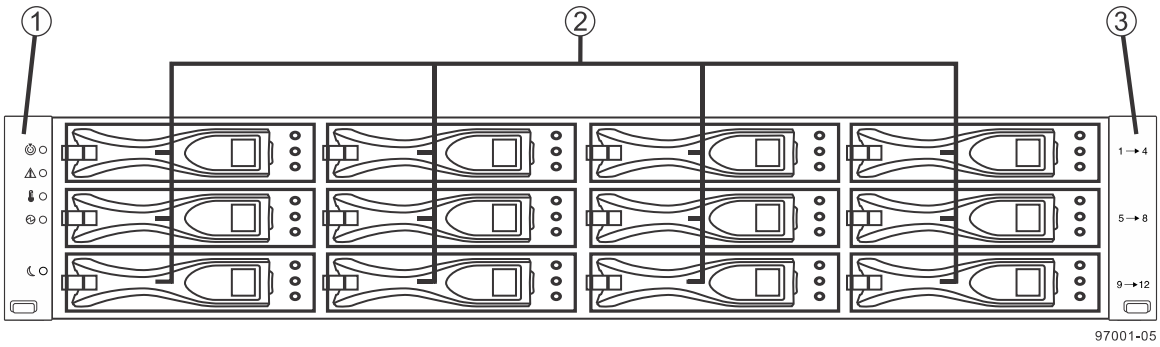
Each E2660 controller-drive tray is shipped with two AC power cords, which fit the standard AC outlets in the destination country. Each AC power cord connects one of the power canisters in the drive tray to an independent, external AC power source, such as a wall receptacle, or to any uninterruptible power supply (UPS).

Specifications of the E2712 and E2724 controller-drive trays

The E2712 and E2724 controller-drive trays are high-density SAS 2.0 (6-Gb/s) drive enclosures available in a rack-mount model, with either high-capacity 3.5-in. SAS drives or high-performance 2.5-in. SAS drives.

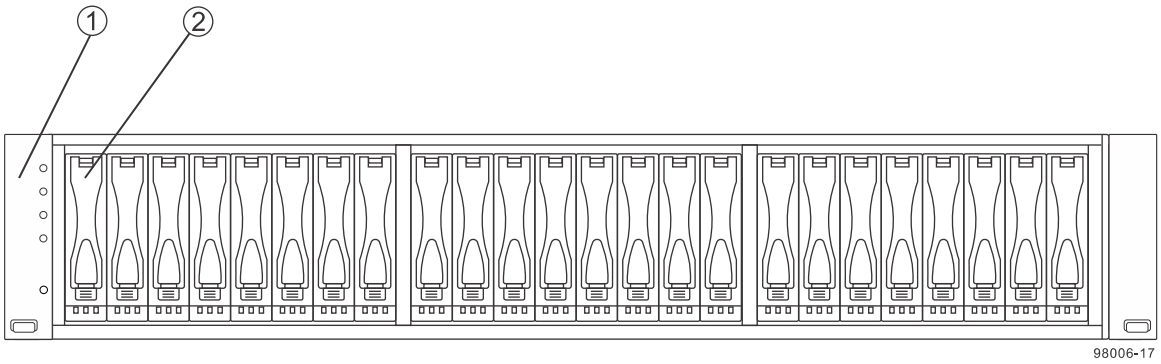
The E2712 and E2724 controller-drive trays provides high-capacity disk storage for Fibre Channel, SAS, and iSCSI environments, depending on the choice of the host interface card.

E2712 controller-drive tray with 12 drives – front view



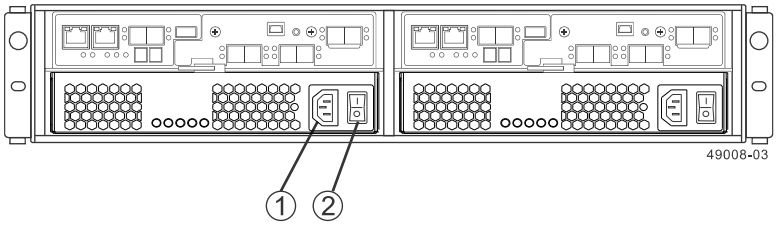
1.	Left end cap (has the controller-drive tray summary LEDs)
2.	Drive canisters
3.	Right end cap

E2724 controller-drive tray with 24 drives – front view



1.	End caps (the left end cap has the controller-drive tray summary LEDs)
2.	Drive canisters

E2712 and E2724 controller-drive trays – rear view

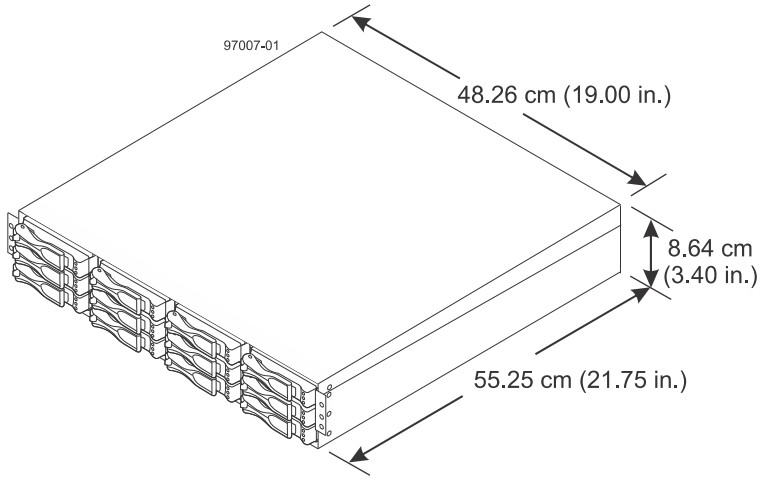


1.	AC power connector
2.	AC power switch

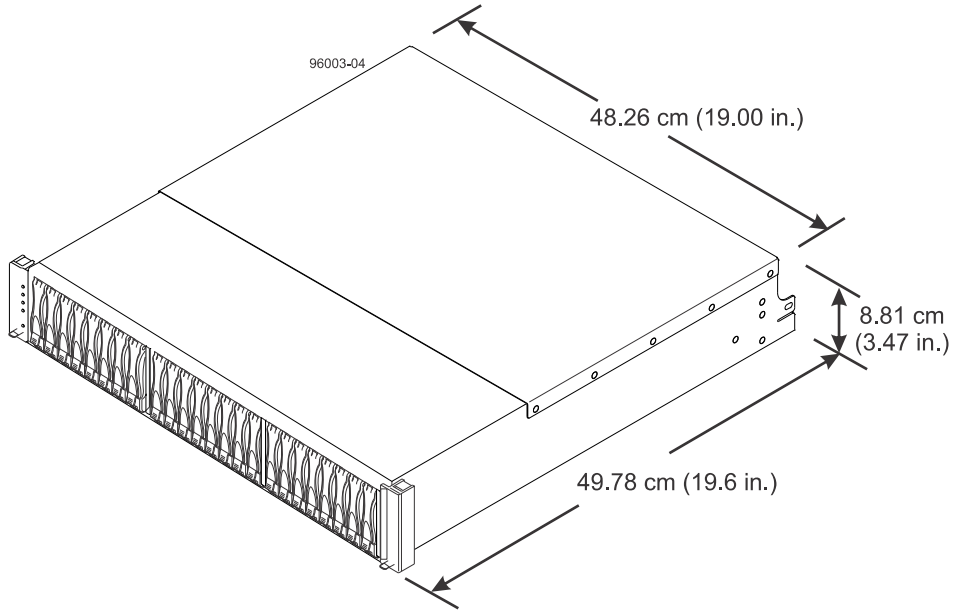
E2712 and E2724 controller-drive trays: Dimensions

The E2712 and E2724 controller-drive trays conform to the 48.3-cm (19.0-in.) rack standard.

Dimensions of the E2712 controller-drive tray – front view



Dimensions of the E2724 controller-drive tray – front view



E2712 and E2724 controller-drive trays: Weights

Table 21: Weights of the E2712 and E2724 controller-drive trays

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
E2712 controller-drive tray, with twelve 8.89-cm (3.5-in.) NL-SAS drives each with 4-TB capacity	61.24 lb (27.78 kg)	18.52 lb (8.4 kg)	70.0 lb (31.75 kg)
E2724 controller-drive tray, with twenty-four 6.35-cm (2.5-in.)10k SAS drives each with 900-GB capacity	59.25 lb (26.88 kg)	23.59 lb (10.7 kg)	70.0 lb (31.75 kg)
*Maximum weight indicates a controller-drive tray, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type. **Empty weight indicates a controller-drive tray with the controller canisters, the power-fan canisters, and the drives removed. ***Shipping weight indicates the maximum weight of the controller-drive tray and all shipping material.			

Component	Weight
Controller canister	4.70 lb (2.131 kg)
Power-fan canister	5.51 lb (2.500 kg)
2.5-in. SAS drive	0.41 lb (0.19 kg) to 0.51 lb (0.23 kg)
3.5-in. SAS drive	1.43 lb (0.65 kg) to 1.72 lb (0.78 kg)

Component	Weight
2.5-in. SSD	0.15 lb (0.07 kg) to 0.37 lb (0.17 kg)

E2712 and E2724 controller-drive trays: Shipping dimensions

Table 22: Shipping carton dimensions for the E2712 and E2724 controller-drive trays

Controller-drive tray model	Height	Width	Depth
E2712	27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)
E2724	27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)

E2712 and E2724 controller-drive trays: Temperature and humidity requirements

Note: Converting *maximum rate of change* requires converting between Fahrenheit and Celsius first, and then subtracting the difference.

Table 23: Temperature requirements and humidity requirements for the E2712 and E2724 controller-drive trays

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 per hour (18°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F)
	Maximum rate of change	15°C per hour (27°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140°F)
	Maximum rate of change	20°C per hour (36°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 (3.1°F) for every 1000 m (3280 ft) above sea level.		

E2712 and E2724 controller-drive trays: Altitude ranges

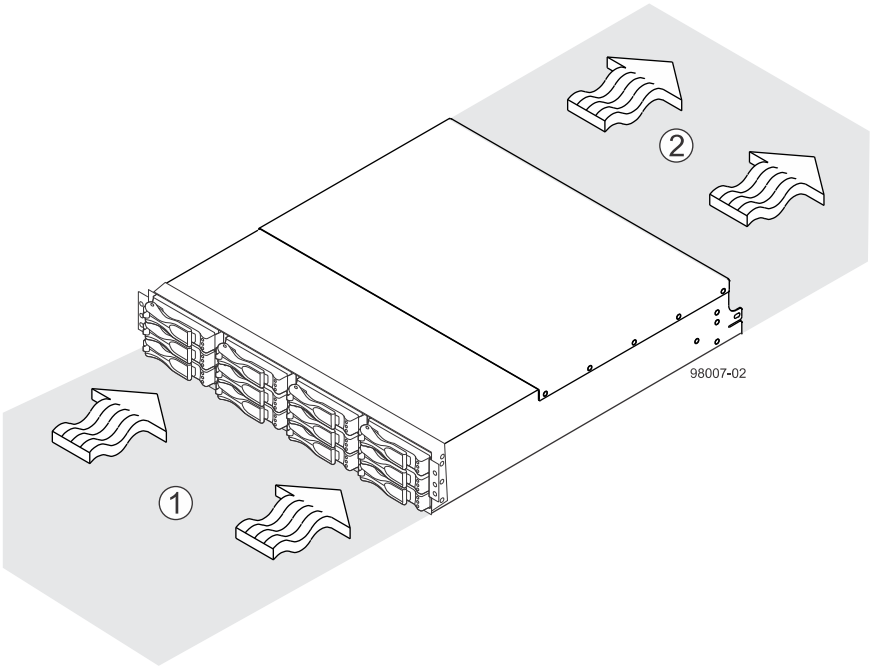
Table 24: Altitude ranges for the E2712 and E2724 controller-drive trays

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

E2712 and E2724 controller-drive trays: Airflow and heat dissipation

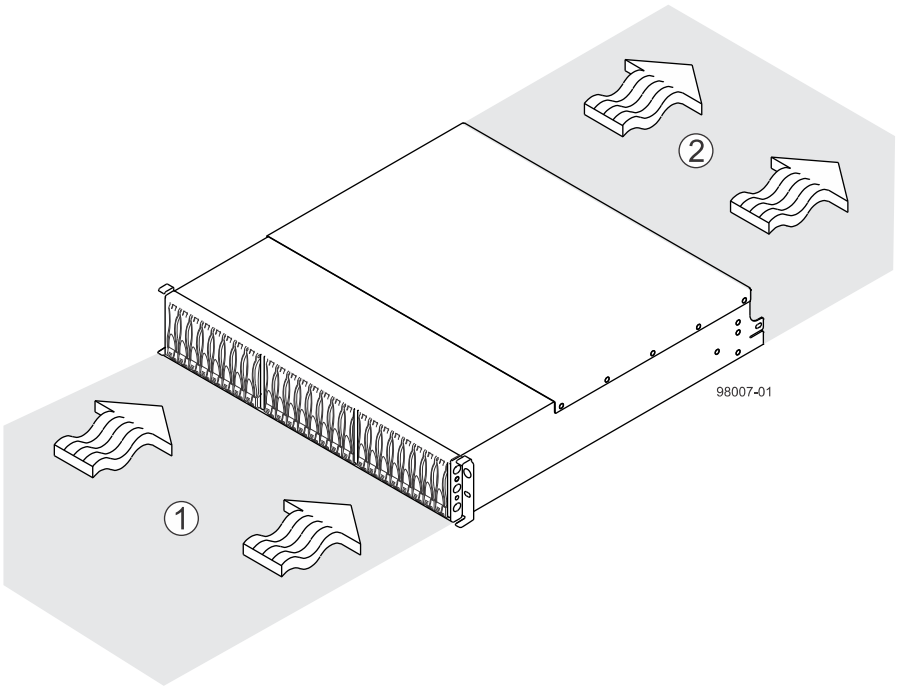
Allow at least 76 cm (30 in.) of clearance in front of the controller-drive tray and 61 cm (24 in.) behind the controller-drive tray for service clearance, ventilation, and heat dissipation.

Airflow through the E2712 controller-drive tray – front view



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

Airflow through the E2724 controller-drive tray – front view



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

Table 25: Power and heat dissipation for the E2712 and E2724 controller-drive trays

Component	Typical operating power	Rated power requirement
E2712 controller-drive tray: Controller canisters with two power-fan canisters and 12 drives with HIC (6-TB drives fully populated)	**KVA:** 0.361	**KVA:** 0.908
	Watts: 358	**Watts:** 900
	Btu/Hr: 1220	**Btu/Hr:** 3071
E2724 controller-drive tray: Controller canisters with two power-fan canisters and 24 drives with HIC (1.2-TB 10k drives fully populated)	**KVA:** 0.411	**KVA:** 0.908
	Watts: 407	**Watts:** 900
	Btu/Hr: 1388	**Btu/Hr:** 3071

E2712 and E2724 controller-drive trays: Acoustic noise

Table 26: Acoustic noise at 25° C for the E2712 and E2724 controller-drive trays

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

E2712 and E2724 controller-drive trays: Site wiring and power

The E2712 and E2724 controller-drive trays use 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 controller-drive tray:

- **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 controller-drive tray, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The controller-drive tray 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 controller-drive tray automatically performs a power-on recovery sequence without operator intervention.

E2712 and E2724 controller-drive trays: Power input

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

Table 27: AC power requirements for the E2712 and E2724 controller-drive trays

Parameter	Low range	High range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Typical operating current for 12 drives	3.61 A *	1.50 A **
Typical operating current for 24 drives	4.11 A *	1.71 A **
Maximum operating current for 12 drives	5.16 A *	2.15 A **
Maximum operating current for 24 drives	5.61 A *	2.34 A **
Sequential drive group spin up	4.27 A	1.76 A

Parameter	Low range	High range
Simultaneous drive spin up	6.81 A	2.71 A
System rating plate label	9.0 A	3.6 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.		

E2712 and E2724 controller-drive trays: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the E2712 and E2724 controller-drive trays at greater than 0.95 with nominal input voltage.

E2712 and E2724 controller-drive trays: AC power cords and receptacles

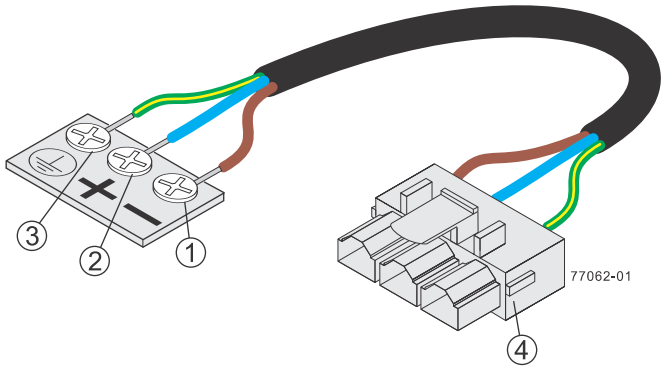
The E2712 and E2724 controller-drive trays are each shipped with two AC power cords, which use the standard AC outlets in the destination country. Each AC power cord connects one of the power supplies in the drive tray to an independent, external AC power source, such as a wall receptacle, or to any uninterrupted power supply (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 controller-drive tray.

E2712 and E2724 controller-drive trays: Optional DC power connector cables and source wires

The E2712 and E2724 controller-drive trays are 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 controller-drive tray. The three source wires on the other end of the power connector cable connect the controller-drive tray 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.

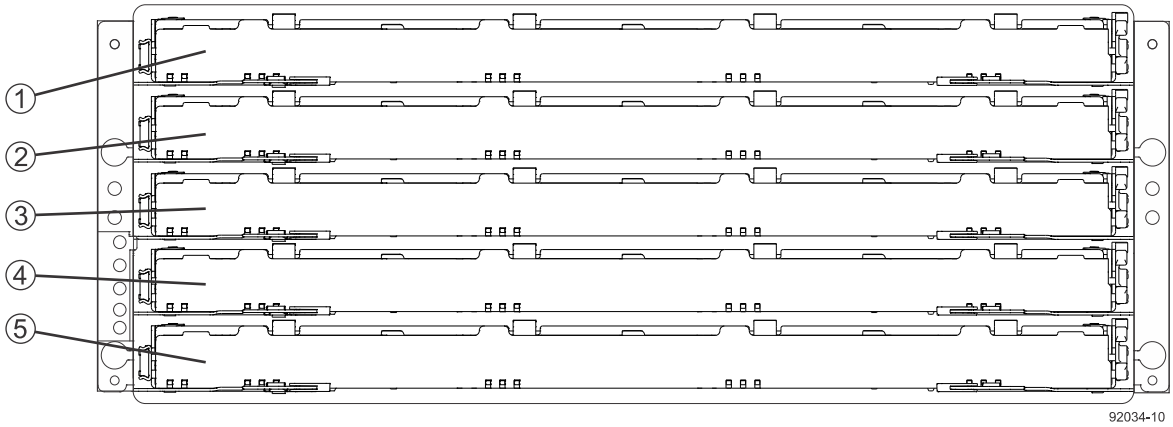
Two (or, optionally, four) DC power connector cables are provided with each controller-drive tray. Two DC power connectors are on the two DC power supplies on the rear of each controller-drive tray if additional redundancy is required.

Note: You do not need to connect the second DC power connection on the DC power supplies of the controller-drive tray. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

Specifications of the E2760 controller-drive tray

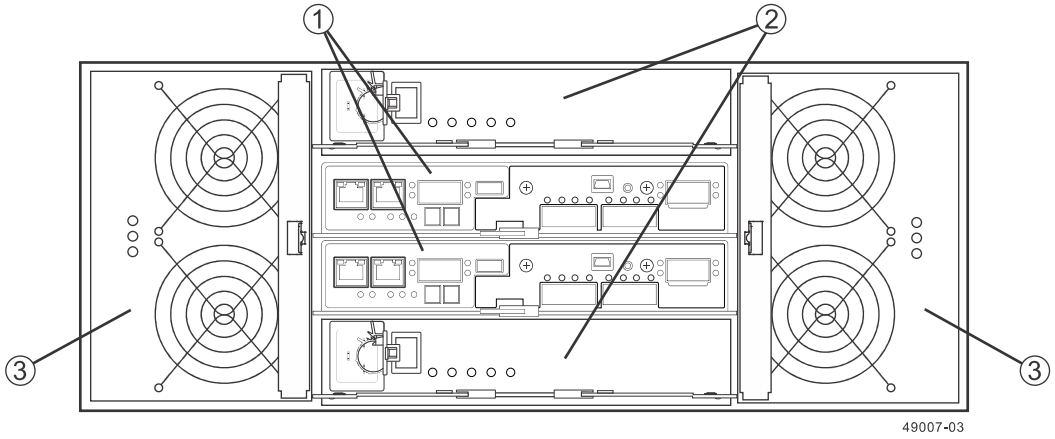
The E2760 controller-drive tray is a high-density SAS 2.0 (6-Gb/s) 60-drive enclosure, which can include high-performance 2.5-in. SAS drives, near-line 3.5-in. SAS drives, or SSDs, housed in five drawers with 12 drives each.

E2760 controller-drive tray – front view with bezel removed



1.	Drive drawer 1
2.	Drive drawer 2
3.	Drive drawer 3
4.	Drive drawer 4
5.	Drive drawer 5

E2760 controller-drive tray – rear view

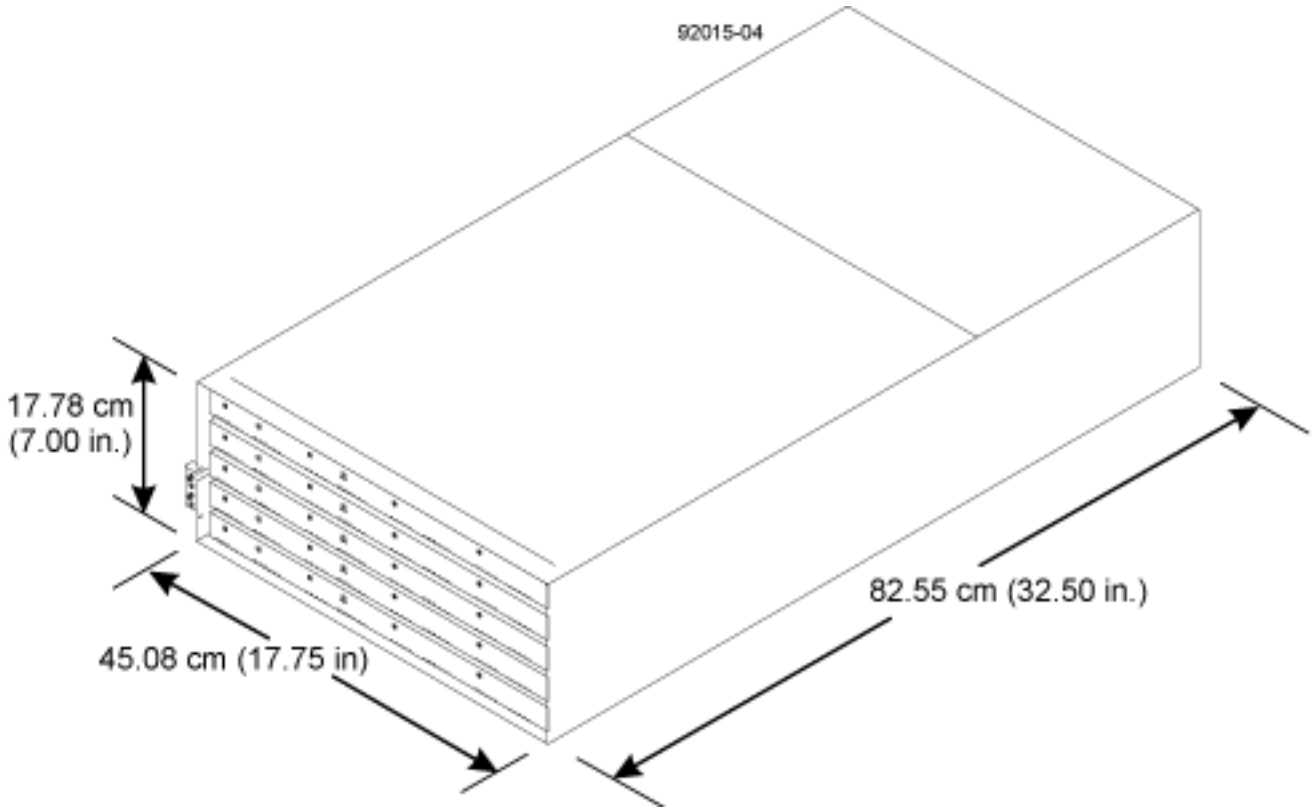


1.	Controller canisters
2.	Power canisters
3.	Fan canisters

E2760 controller-drive tray: Dimensions

The E2760 controller-drive tray conforms to the 48.3-cm (19.0-in.) rack standard.

Dimensions of the E2760 controller-drive tray – front view



E2760 controller-drive tray: Weights

Table 28: Weights of the E2760 controller-drive tray

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
E2760 controller-drive tray	237.02 lb (107.51 kg)	132 lb (59.8 kg)	278 lb (126.1 kg)
*Maximum weight indicates a controller-drive tray, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type. **Empty weight indicates a drive tray without the controller canisters, the power canisters, the fan canisters, and the drives. ***Shipping weight indicates the empty weight of a drive tray and all shipping material, as well as the weight of the 60 drives that are shipped separately in multipack cartons.			

Table 29: Component weights of the E2760 controller-drive tray

Component	Weight
Controller canister	6.60 lb (2.99 kg)
Power canister	5.5 lb (2.5 kg)
Fan canister	Approximately 2.16 lb (1 kg)
2.5-in. SAS drive	0.41 lb (0.19 kg) to 0.51 lb (0.23 kg)
3.5-in. SAS drive	1.43 lb (0.65 kg) to 1.72 lb (0.78 kg)
2.5-in. SSD	0.15 lb (0.07 kg) to 0.37 lb (0.17 kg)

E2760 controller-drive tray: Shipping dimensions

Table 30: Shipping carton dimensions for the E2760 controller-drive tray

Height	Width	Depth
73.66 cm (29 in.)	60.96 cm (24 in.)	101.60 cm (40 in.)

E2760 controller-drive tray: Temperature and humidity requirements

Note: Converting *maximum rate of change* requires converting between Fahrenheit and Celsius first, and then subtracting the difference.

Table 31: Temperature requirements and humidity requirements for the E2760 controller-drive tray

Condition	Parameter	Requirement
Temperature	Operating range (both cabinet and subsystem)	10°C to 35°C (50°F to 95°F)
	Maximum rate of change	10°C per hour (18°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F)
	Maximum rate of change	15°C per hour (27°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140°F)
	Maximum rate of change	20°C per hour (36°F) per hour

Condition	Parameter	Requirement
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 (3.1°F) for every 1000 m (3280 ft) above sea level.		

E2760 controller-drive tray: Altitude ranges

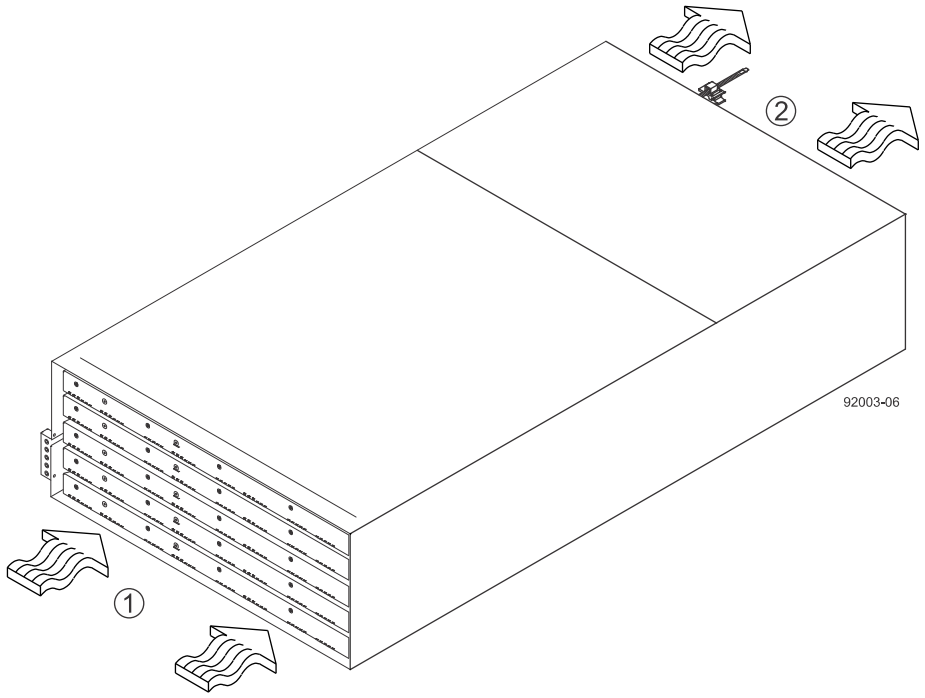
Table 32: Altitude ranges for the E2760 controller-drive tray

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

E2760 controller-drive tray: Airflow and heat dissipation

Airflow goes from the front of the E2760 controller-drive tray to the rear of the controller-drive tray. Allow at least 81 cm (32 in.) of clearance in front of the E2760 controller-drive tray and at least 61 cm (24 in.) of clearance behind the controller-drive tray for service clearance, ventilation, and heat dissipation.

Airflow through the E2760 controller-drive tray – front view



1.	81 cm (32 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 33: Power ratings and heat dissipation for the E2760 controller-drive tray

Component	Typical operating power	Rated power requirement
E2760 controller-drive tray with HIC (6-TB drives fully populated)	**KVA:** 0.996	**KVA:** 1.526
	Watts: 986	**Watts:** 1512
	Btu/Hr: 3364	**Btu/Hr:** 5159

E2760 controller-drive tray: Acoustic noise

Table 34: Acoustic noise at 25°C for the E2760 controller-drive tray

Measurement	Level
Sound power (standby operation)	7.2 bels
Sound power (normal operation)	7.2 bels
Sound pressure	72 dBA

E2760 controller-drive tray: Site wiring and power

The E2760 controller-drive tray uses 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 power connections or line-to-line power connections.

Keep this information in mind when you prepare the installation site for the controller-drive tray:

- **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 tray, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The controller-drive tray 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 tray automatically performs a power-on recovery sequence without operator intervention after the power is restored.

E2760 controller-drive tray: Power input

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

Table 35: E2760 controller-drive tray power input

Parameter	Low range	High range
Nominal voltage	200 VAC	240 VAC
Frequency	50 Hz	60 Hz
Typical operating current	4.98 A	4.15 A
Maximum operating current	6.02 A	5.02 A
System nameplate rating	7.56 A	6.3 A

E2760 controller-drive tray: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the E2760 controller-drive tray at greater than 0.95 with nominal input voltage.

E2760 controller-drive tray: AC power cords and receptacles

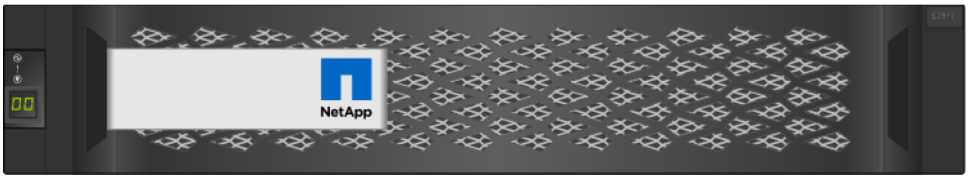
Each E2760 controller-drive tray is shipped with two AC power cords, which fit the standard AC outlets in the destination country. Each AC power cord connects one of the power canisters in the drive tray to an independent, external AC power source, such as a wall receptacle, or to any uninterruptible power supply (UPS).

Attention: Possible risk of equipment failure – To ensure proper cooling, the E2760 controller-drive tray always uses two power supplies.

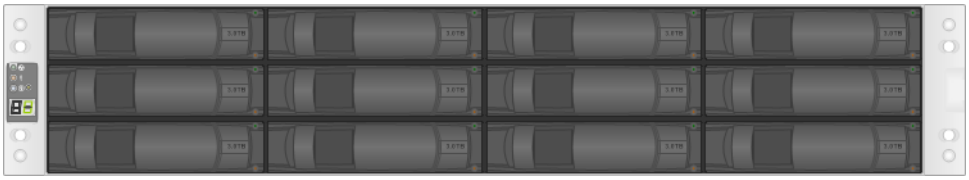
Specifications of the E2812 and E2824 controller shelves

The E2812 and E2824 controller shelves are high-density SAS-3 (12 Gb/s) enclosures, with one or two E2800 controllers and either high-capacity 3.5-inch SAS drives or high-performance 2.5-inch SAS drives. The E2812 and E2824 controller shelves provide high-capacity disk storage for Fibre Channel, SAS, and iSCSI environments.

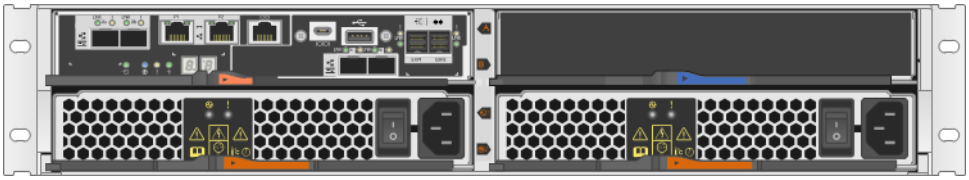
The following figure shows the front of an E2812 controller shelf with the bezel:



The following figure shows the front of an E2812 controller shelf without the bezel:

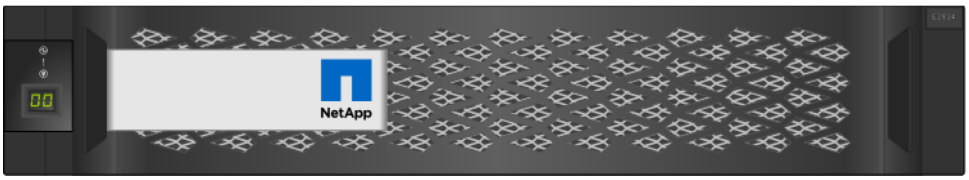


The following figure shows the back of an E2812 controller shelf with one controller (simplex).

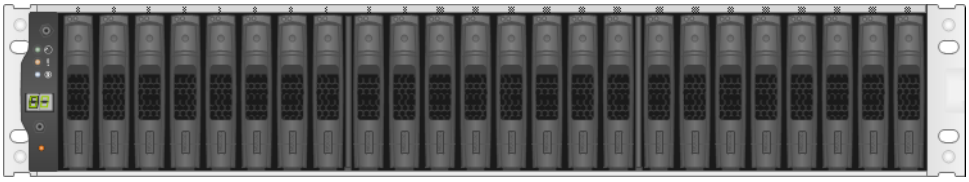


An E2812 controller shelf can also be configured with two controllers (duplex). The figure is not shown here.

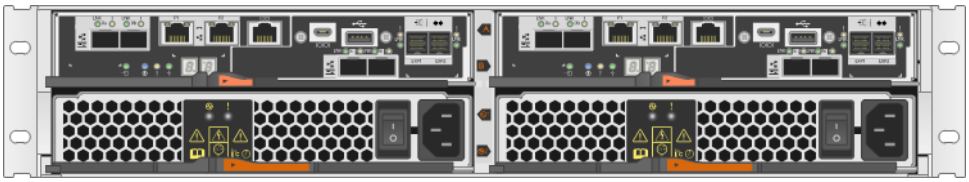
The following figure shows the front of an E2824 controller shelf with the bezel:



The following figure shows the front of an E2824 controller shelf without the bezel:



The following figure shows the back of a duplex E2824 controller shelf:



An E2824 controller shelf can also be configured as simplex. The figure is not shown here.

E2812 and E2824 controller shelves: Dimensions

The E2812 and E2824 controller shelves conform to the 19.0-inch (48.3 cm) rack standard.

Controller shelf	Height	Width	Depth
E2812	3.41 in. (8.68 cm)	17.6 in. (44.7 cm)	21.1 in. (53.6 cm)
E2824	3.34 in. (8.48 cm)	17.6 in. (44.7 cm)	19.0 in. (48.3 cm)

E2812 and E2824 controller shelves: Weight

Unit	Weight		
	Maximum*	Empty**	Shipping***
E2812 controller shelf, with twelve 3.5 in. (8.89 cm) SAS-3 drives each with 6 TB capacity	63.9 lb (29.0 kg)	17.08 (7.75 kg)	80 lb (36.2 kg)
E2824 controller shelf, with twenty-four 2.5 in. (6.35 cm) SAS-3 drives each with 900 GB capacity	60.5 lb (27.4 Kg)	17.4 lb (7.89 kg)	91 lb (41.2 kg)
*Maximum weight indicates a controller shelf, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type. **Empty weight indicates a controller shelf with the controller canister, the power fan-canister, and the drives removed. ***Shipping weight indicates the maximum weight of the controller shelf and all shipping material.			

Component	Weight
Controller canister	5.47 lb (2.48 kg)
Power-fan canister	5.2 lb (2.35 kg)

Component	Weight
2.5 in. SAS drive	0.6 lb (0.27 kg)
3.5 in. SAS drive	2.09 lb (0.95 kg)
2.5 in. SSD (solid-state disk)	1.33 lb (0.6 kg)

E2812 and E2824 controller shelves: Shipping dimensions

Height	Width	Depth
19.5 in. (49.53 cm)	31.5 in. (80.01 cm)	28 in. (71.12 cm)

E2812 and E2824 controller shelves: Temperature and humidity requirements

Condition	Parameter	Requirement
Temperature	Operating range (both cabinet and subsystem)	50°F to 104°F (10°C to 40°C)
	Storage range	32°F to 158°F (0°C to 70°C)
	Transit range	–40°F to 158°F (–40°C to 70°C)
Relative humidity (no condensation)	Operating range (both cabinet and subsystem)	20% to 80%
	Storage range	5% to 95%
	Transit range	10% to 95%
If you plan to operate a system at an altitude between 3280 ft to 9842 ft (1000 m to 3000 m) above sea level, lower the environmental temperature 3.1°F (1.7°C) for every 3280 ft (1000 m) above sea level.		

E2812 and E2824 controller shelves: Altitude ranges

Environment	Altitude
Operating	Sea level to 10,000 ft (3048 m) above sea level
Storage	1000 ft (304.8 m) below sea level to 40,000 ft (12,192 m) above sea level

E2812 and E2824 controller shelves: Airflow and heat dissipation

Allow at least 32 inches (81.2 cm) in front of the controller shelf and 24 inches (60.96 cm) behind the controller shelf for service clearance, ventilation, and heat dissipation.

The power and heat dissipation values for the E2812 and E2824 controller shelves are as follows:

Component	Typical operating power
E2812 controller shelf: Two controller canisters with HICs (host interface cards) two power-fan canisters, and 12 drives	**KVA:** 0.451
	Watts: 451.3
	BTU/Hr: 1543.4
E2824 controller shelf: Two controller canisters with HICs, two power-fan canisters, and 24 drives	**KVA:** 0.503
	Watts: 501.4
	BTU/Hr: 1715

Note: These values can vary depending on your configuration.

E2812 and E2824 controller shelves: Acoustic noise

Controller shelf	Measurement	Level
E2812	Sound power (standby operation)	6.6 bels maximum
	Sound pressure (normal operation)	56 dBA maximum
E2824	Sound power (standby operation)	6.8 bels maximum

E2812 and E2824 controller shelves: Site wiring and power

The E2812 and E2824 controller shelves 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 controller shelf:

- **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 shelf, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The controller shelf 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 controller shelf automatically performs a power-on recovery sequence without operator intervention.

E2812 and E2824 controller shelves: Power input

Each power supply contains two 16A slow-blow fuses.

Parameter	Low range	High range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Typical operating current for 12 drives	4.51A*	1.92A**
Typical operating current for 24 drives	5.04A*	2.16A**
Maximum operating current for 12 drives	7.2A*	2.9A**
Maximum operating current for 24 drives	9.3A*	3.7A**
System rating plate label	12A	6.3A
*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.		

E2812 and E2824 controller shelves: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the E2812 and E2824 controller shelves at greater than 0.95 with nominal input voltage.

E2812 and E2824 controller shelves: AC power cords and receptacles

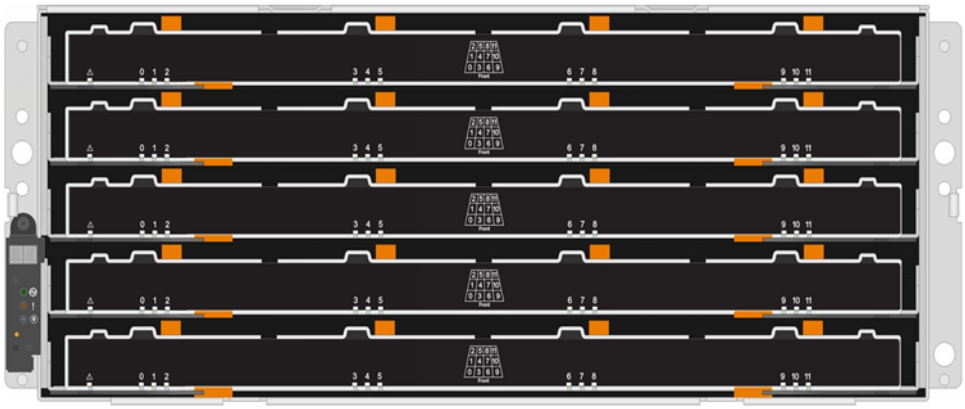
The E2812 and E2824 controller shelves are each shipped with two AC power cords, which use the standard AC outlets in the destination country. Each AC power cord connects one of the power supplies in the controller shelf to an independent, external AC power source, such as a wall receptacle, or to any uninterrupted power supply (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 controller shelf.

Specifications of the E2860 controller shelf

The E2860 controller shelf is a four-rack-unit-high (4U) high-density SAS-3 (12 Gb/s) enclosure. It includes two E2800 controllers and can hold up to 60 drives in five horizontal drawers. The E2860 controller shelf supports either high-capacity 3.5-inch SAS drives or high-performance 2.5-inch SAS drives. You need a minimum of 20 drives for proper airflow and heat dissipation.

The following figure shows the front of an E2860 controller shelf without the bezel:



The following figure shows the back of an E2860 controller shelf:



E2860 controller shelf: Dimensions

You must ensure that you have an industry-standard rack with sufficient depth, weight, and power handling capability.

Height	Width	Depth
6.87 in. (17.44 cm)	17.66 in. (44.85 cm)	38.25 in. (97.15 cm)

E2860 controller shelf: Weight

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
E2860 controller shelf with 60 hard disk drives (HDDs), two power canisters, two controllers, two fan canisters, and the bezel	249.12 lb (113 kg)	107.6 lb (48.8 kg)	324.3 lb (147.1 kg)

*Maximum weight indicates a controller shelf, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type.

**Empty weight indicates a controller shelf with the controller canisters, power canisters, fan canisters, and drives removed.

***Shipping weight indicates the weight of the controller shelf and all shipping material, as well as the weight of the 60 drives that are shipped separately in multipack cartons.

Component	Weight
Controller	4.4 lb (2 kg)
Single drawer (no drives, no cable chain)	11.9 lb (5.4 kg)
Power canister	5.7 lb (2.6 kg)
Fan canister	3.5 lb (1.6 kg)
2.5 in. SAS drive carrier	0.48 lb (0.22 kg)
3.5 in. SAS drive carrier	0.14 lb (0.06 kg)
Bezel	1.86 lb (0.84 kg)

E2860 controller shelf: Shipping dimensions

Height	Width	Depth
27.1 in. (68.8 cm)	26.9 in. (68.3 cm)	46.3 in. (117.6 cm)

E2860 controller shelf: Temperature and humidity requirements

Condition	Parameter	Requirement
Temperature	Operating range (both cabinet and subsystem)	50°F to 104°F (10°C to 40°C)
	Storage range	32°F to 158°F (0°C to 70°C)
	Transit range	–40°F to 158°F (–40°C to 70°C)

Condition	Parameter	Requirement
Relative humidity (no condensation)	Operating range (both cabinet and subsystem)	20% to 80%
	Storage range	5% to 95%
	Transit range	10% to 95%
If you plan to operate a system at an altitude between 3280 ft to 9842 ft (1000 m to 3000 m) above sea level, lower the environmental temperature 3.1°F (1.7°C) for every 3280 ft (1000 m) above sea level.		

E2860 controller shelf: Altitude ranges

Environment	Altitude
Operating	100 ft (30.5 m) below sea level to 9842 ft (3000 m) above sea level
Transit	100 ft (30.5 m) below sea level to 40,000 ft (12,192 m) above sea level
Storage	100 ft (30.5 m) below sea level to 40,000 ft (12,192 m) above sea level

E2860 controller shelf: Airflow and heat dissipation

The clearance needed for proper ventilation and heat dissipation is as follows:

Clearance in front of the cabinet	32 in. (81.2 cm)
Clearance behind the cabinet	24 in. (60.9 cm)

The power and heat dissipation values are as follows:

Typical operating power in KVA	1.05
Typical operating power in Watts	1022
Typical operating power in BTU/Hr	3495

E2860 controller shelf: Acoustic noise

Measurement	Level
Sound power (standby operation)	7.2 bels
Sound power (normal operation)	7.2 bels
Sound pressure	72 dBA

E2860 controller shelf: Site wiring and power

The power supplies in the E2860 controller shelf support voltages in the 200V to 240V range. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide operation. The power supplies use standard industrial wiring with line-to-neutral power connections or line-to-line power connections.

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

- **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 tray, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The controller shelf 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 controller shelf automatically performs a power-on recovery sequence without operator intervention after the power is restored.

E2860 controller shelf: Power input

Each power supply contains two 16A slow-blow fuses.

Parameter	Low range	High range
Nominal voltage	200 VAC	240 VAC
Frequency	50 Hz	60 Hz
Typical operating current	6.0A	5.0A
Maximum operating current	7.0A	5.8A
System nameplate rating	9.98A	9.98A

These numbers can vary significantly, depending upon the drives tested in the particular configuration.

E2860 controller shelf: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the E2860 controller shelf at greater than 0.95 with nominal input voltage.

E2860 controller shelf: AC power cords and receptacles

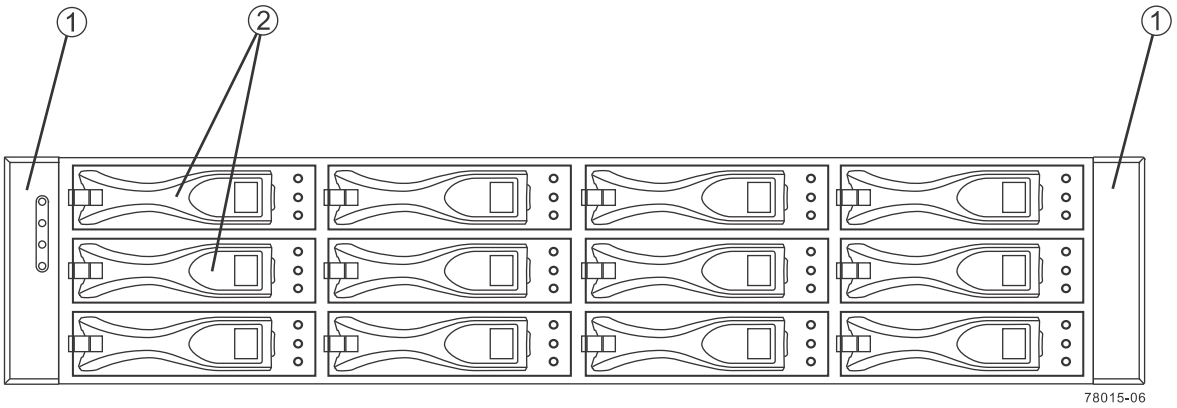
Each E2860 controller shelf is shipped with two AC power cords, which fit the standard AC outlets in the destination country. Each AC power cord connects one of the power canisters in the controller shelf to an independent, external AC power source, such as a wall receptacle, or to any uninterruptible power supply (UPS).

Specifications of the E5412 and E5424 controller-drive trays and EF540 flash array

The E5412 and E5424 controller-drive trays and the EF540 flash array are high-density SAS 2.0 (6-Gb/s) drive enclosures. The E5412 controller-drive tray supports twelve 3.5-in. SAS drives. The E5424 controller-drive tray and the EF540 flash array support twenty-four 2.5-in. SAS drives. The E5424 supports both solid state drives (SSDs) and hard disk drives (HDDs), while the EF540 only supports SSDs.

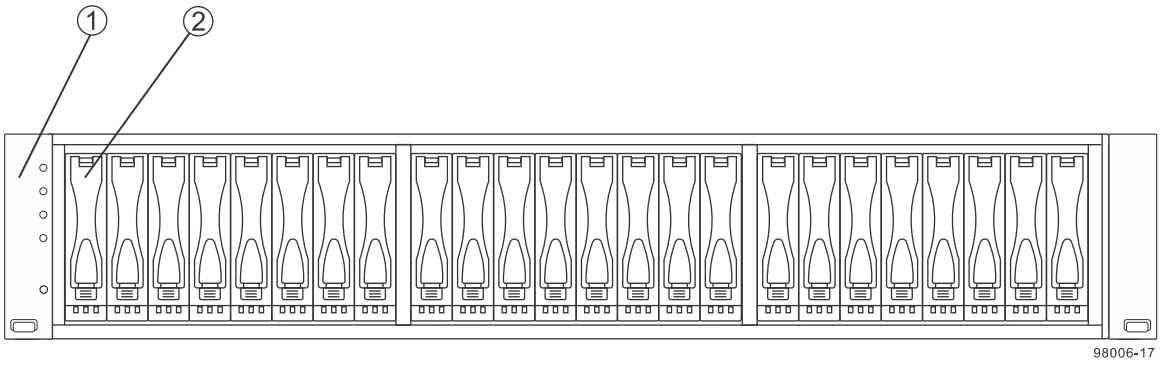
The rack-mounted E5412 and E5424 controller-drive trays and the EF540 flash array provide high-capacity disk storage for Fibre Channel, Infiniband, SAS, and iSCSI environments, depending on the choice of the host interface card.

E5412 controller-drive tray with 12 drives – front view



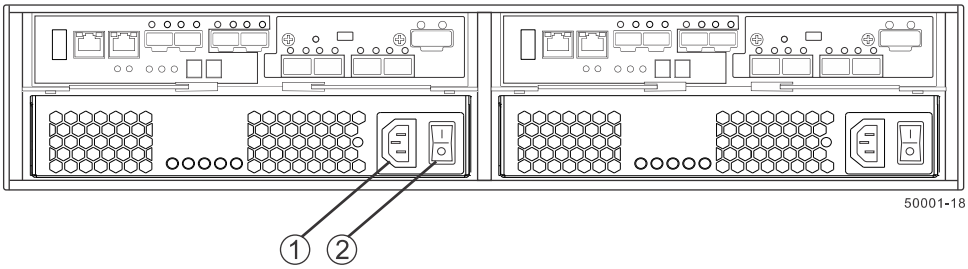
1.	End caps (the left end cap includes the controller-drive tray summary LEDs)
2.	Drive canisters

E5412 controller-drive tray or EF540 flash array with 24 drives – front view



1.	End caps (the left end cap has the controller-drive tray summary LEDs)
2.	Drive canisters

E5412 and E5424 controller-drive trays and EF540 flash array – rear view

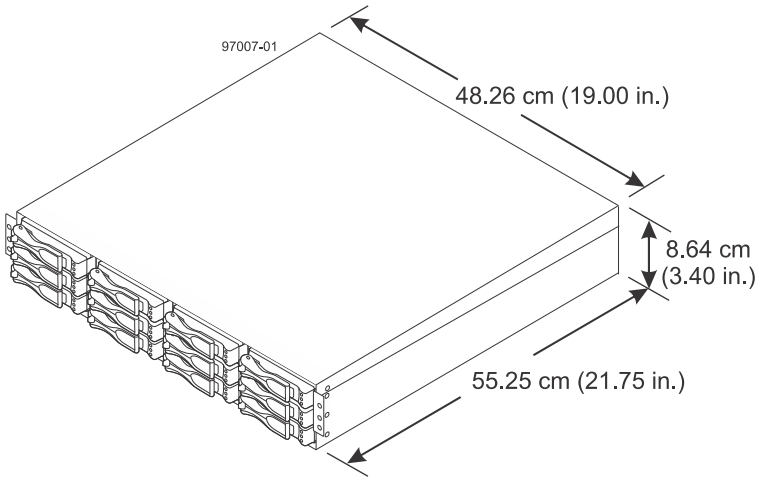


1.	AC power connector
2.	AC power switch

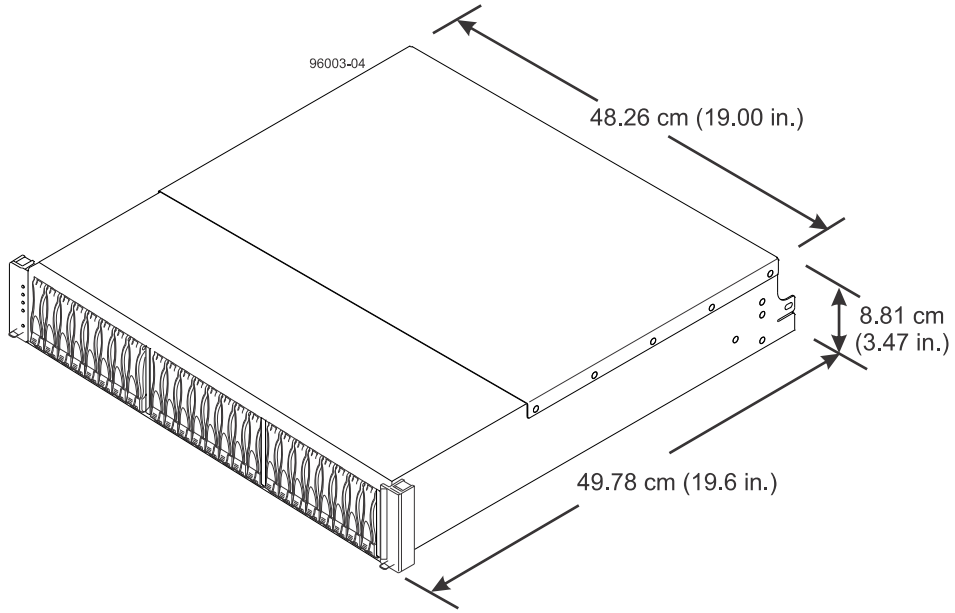
E5412 and E5424 controller-drive trays and EF540 flash array: Dimensions

The E5412 and E5424 controller-drive trays and EF540 flash array conform to the 48.3-cm (19.0-in.) rack standard.

Dimensions of the E5412 controller-drive tray with 12 drives – front view



Dimensions of the E5424 controller-drive tray or the EF540 flash array with 24 drives – front view



E5412 and E5424 controller-drive trays and EF540 flash array: Weight

Table 36: Weights of the E5412 and E5424 controller-drive trays and the EF540 flash array

Unit	Weight		
	Maximum*	Empty**	Shipping***
E5412 controller-drive tray, with twelve 8.89-cm (3.5-in.) SAS HDD drives	64.04 lb (29.50 kg)	18.52 lb (8.4 kg)	70.0 lb (31.75 kg)
E5424 controller-drive tray, with twenty-four 6.35-cm (2.5-in.) SAS HDD drives	66.03 lb (28.59 kg)	23.59 lb (10.7 kg)	70.0 lb (31.75 kg)
EF540 flash array with twenty-four 6.35-cm (2.5-in.) SAS SSD drive	62.67 lb (30.24 kg)	23.59 lb (10.7 kg)	70.0 lb (31.75 kg)

*Maximum weight indicates a controller-drive tray, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type.

**Empty weight indicates a controller-drive tray or flash array with the controller canisters, the power-fan canisters, and the drives removed.

***Shipping weight indicates the maximum weight of the controller-drive tray and all shipping material.

Component	Weight
Controller canister	2.131 kg (4.70 lb)
Power-fan canister	2.500 kg (5.51 lb)
2.5-in. SAS drive	0.41 lb (0.19 kg) to 0.51 lb (0.23 kg)
3.5-in. SAS drive	1.43 lb (0.65 kg) to 1.72 lb (0.78 kg)
2.5-in. SSD	0.15 lb (0.07 kg) to 0.37 lb (0.17 kg)

E5412 and E5424 controller-drive trays and EF540 flash array: Shipping dimensions

Table 37: Shipping dimensions for the E5412 and E5424 controller-drive trays and the EF540 flash array

Controller-Drive Tray	Height	Width	Depth
E5412 controller-drive tray with twelve 3.5-in. SAS HDD drives	27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)
E5424 controller-drive tray with twenty-four 2.5-in. SAS HDD drives	27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)
EF540 flash array with twenty-four 2.5 in. SAS SSD drives	27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)

E5412 and E5424 controller-drive trays and EF540 flash array: Temperature and humidity requirements

Note: Converting *maximum rate of change* requires converting between Fahrenheit and Celsius first, and then subtracting the difference.

Table 38: Temperature requirements and humidity requirements for the E5412 and E5424 controller-drive trays and the EF540 flash array

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 per hour (18°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F)
	Maximum rate of change	15°C per hour (27°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140°F)
	Maximum rate of change	20°C per hour (36°F) per hour

Condition	Parameter	Requirement
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 (3.1°F) for every 1000 m (3280 ft) above sea level.		

E5412 and E5424 controller-drive trays and EF540 flash array: Altitude ranges

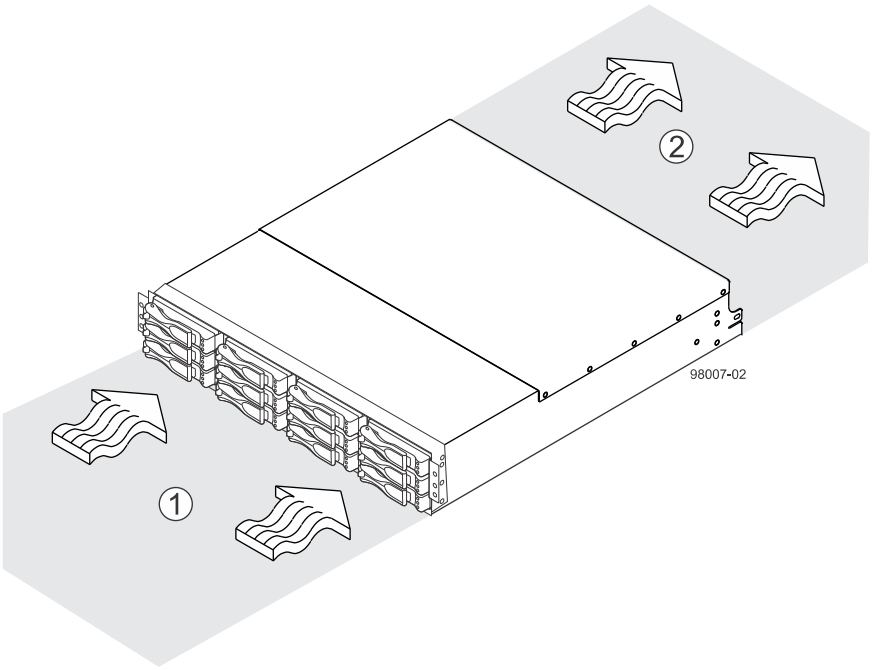
Table 39: Altitude ranges for the E5412 and E5424 controller-drive trays and EF540 flash array

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

E5412 and E5424 controller-drive trays and EF540 flash array: Airflow and heat dissipation

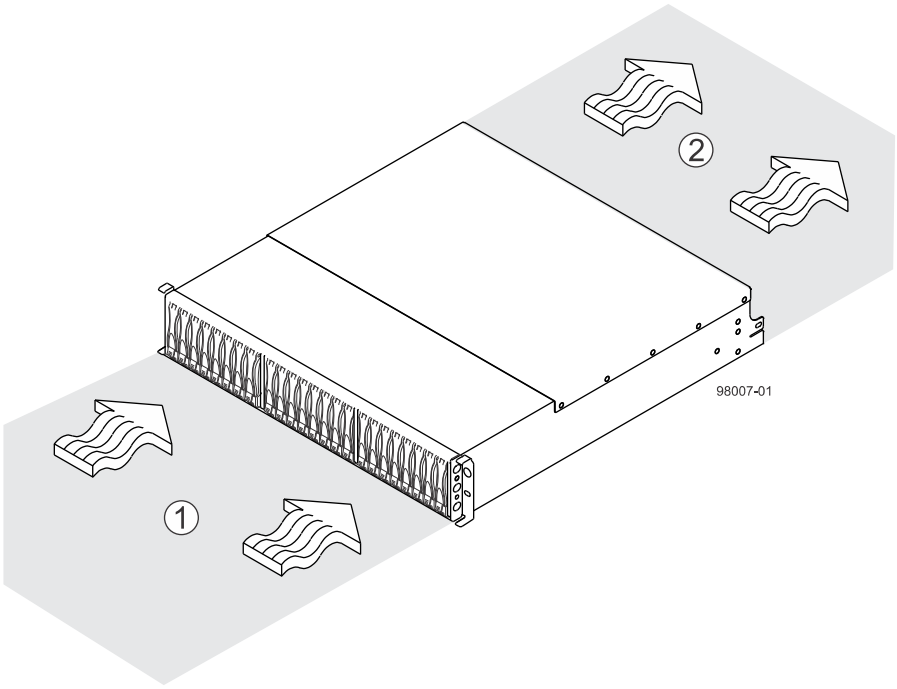
Allow at least 76 cm (30 in.) of clearance in front of the controller-drive tray or flash array and 61 cm (24 in.) behind the controller-drive tray or flash array for service clearance, ventilation, and heat dissipation.

Airflow through the E5412 controller-drive tray – front view



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

Airflow through the E5424 controller-drive tray and the EF540 flash array 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 40: Power and heat dissipation for the E5412 and E5424 controller drive trays and EF540 flash array

Component	Typical operating power	Rated power requirement
E5412 controller-drive tray: Controller canisters with two power-fan canisters and 12 SAS HDD drives, each with 6-TB capacity	**KVA:** 0.408	**KVA:** 0.908
	Watts: 404	**Watts:** 900
	Btu/Hr: 1377	**Btu/Hr:** 3071
E5424 controller-drive tray: Controller canisters with two power-fan canisters and 24 SAS HDD drives, each with 1.2-TB capacity	**KVA:** 0.457	**KVA:** 0.908
	Watts: 453	**Watts:** 900
	Btu/Hr: 1545	**Btu/Hr:** 3071
EF540 flash array: Controller canisters with two power-fan canisters and 24 SAS SSDs, each with 1.6-TB capacity	**KVA:** 0.409	**KVA:** 0.908
	Watts: 405	**Watts:** 900
	Btu/Hr: 1382	**Btu/Hr:** 3071

E5412 and E5424 controller-drive trays and EF540 flash array: Acoustic noise

Table 41: Acoustic noise at 25°C for the E5412 and E5424 controller-drive trays and EF540 flash array

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

E5412 and E5424 controller-drive trays and EF540 flash array: Site wiring and power

The E5412 and E5424 controller-drive trays and EF540 flash array use 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 controller-drive tray:

- **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 controller-drive tray or flash array, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The controller-drive tray or flash array 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 controller-drive tray or flash array automatically performs a power-on recovery sequence without operator intervention.

E5412 and E5424 controller-drive trays and EF540 flash array: Power input

Table 42: AC power requirements for the E5412 and E5424 controller-drive trays and EF540 flash arrays

Each power supply contains one 10-A slow-blow fuse. **Parameter**	**Low range**	**High range**
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Typical operating current for 12 drives	4.08 A *	1.70 A **
Typical operating current for 24 drives	4.57 A *	1.90 A **
Maximum operating current for 12 drives	5.58 A *	2.33 A **
Maximum operating current for 24 drives	6.07A *	2.53 A **
Sequential drive group spin up	4.27 A	1.76 A
Simultaneous drive spin up	6.81 A	2.71 A
System rating plate label	9.0 A	3.6 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.		

E5412 and E5424 controller-drive trays and EF540 flash array: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the E5412 and E5424 controller-drive trays at greater than 0.95 with nominal input voltage.

E5412 and E5424 controller-drive trays and EF540 flash array: AC power cords and receptacles

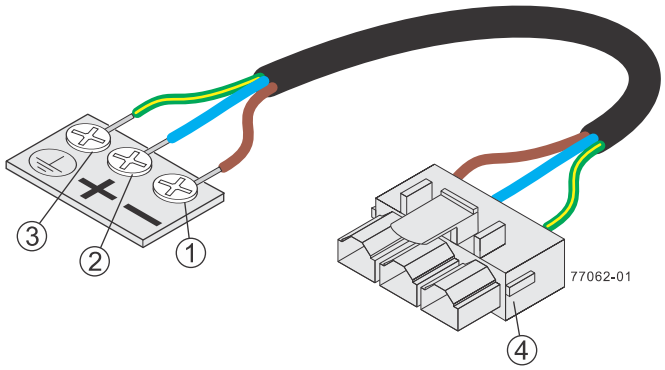
Each E5412 controller-drive tray, E5424 controller-drive tray, or EF540 flash array is shipped with two AC power cords, which use the standard AC outlets in the destination country. Each AC power cord connects one of the power supplies in the drive tray to an independent, external AC power source, such as a wall receptacle, or to any uninterruptible power supply (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 controller-drive tray or flash array.

E5412 and E5424 controller-drive trays and EF540 flash array: Optional DC power connector cables and source wires

The E5412 controller-drive tray, the E5424 controller-drive tray, and the EF540 flash array are 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 controller-drive tray or flash array. The three source wires on the other end of the power connector cable connect the controller-drive tray or flash array 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.

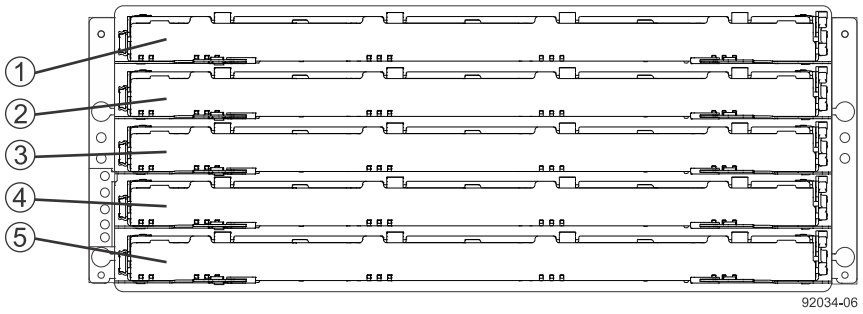
Two (or, optionally, four) DC power connector cables are provided with each controller-drive tray or flash array. Two DC power connectors are on the two DC power supplies on the rear of each controller-drive tray or flash array if additional redundancy is required.

Note: You do not need to connect the second DC power connection on the DC power supplies of the controller-drive tray. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

Specifications of the E5460 controller-drive tray

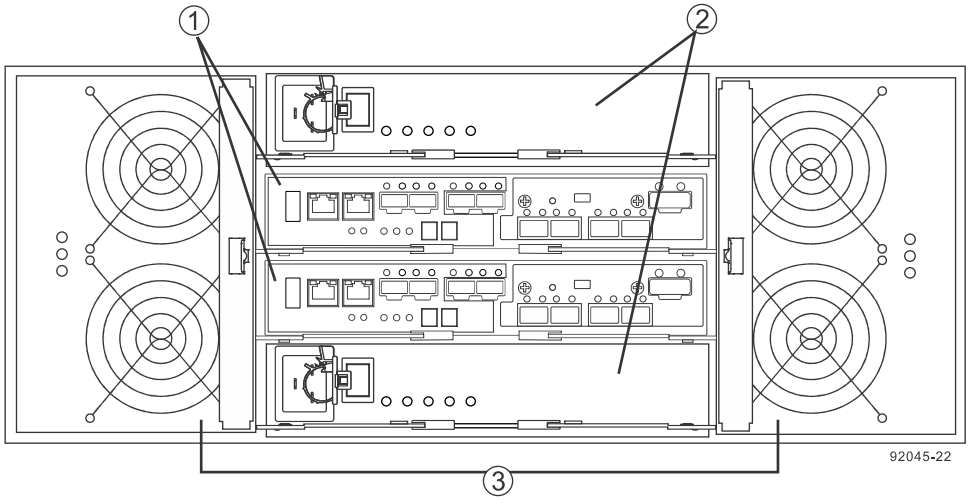
The E5460 controller-drive tray is a high-density SAS 2.0 (6-Gb/s) drive enclosure available in a rack-mount model, with either high-capacity 3.5-in. SAS drives, high-performance 2.5-in. 10K hard disk drive (HDD) SAS drives, or 2.5-in. solid state drive (SSD) SAS drives.

E5460 controller-drive tray – front view with bezel removed



1.	Drive drawer 1
2.	Drive drawer 2
3.	Drive drawer 3
4.	Drive drawer 4
5.	Drive drawer 5

E5460 controller-drive tray – rear view

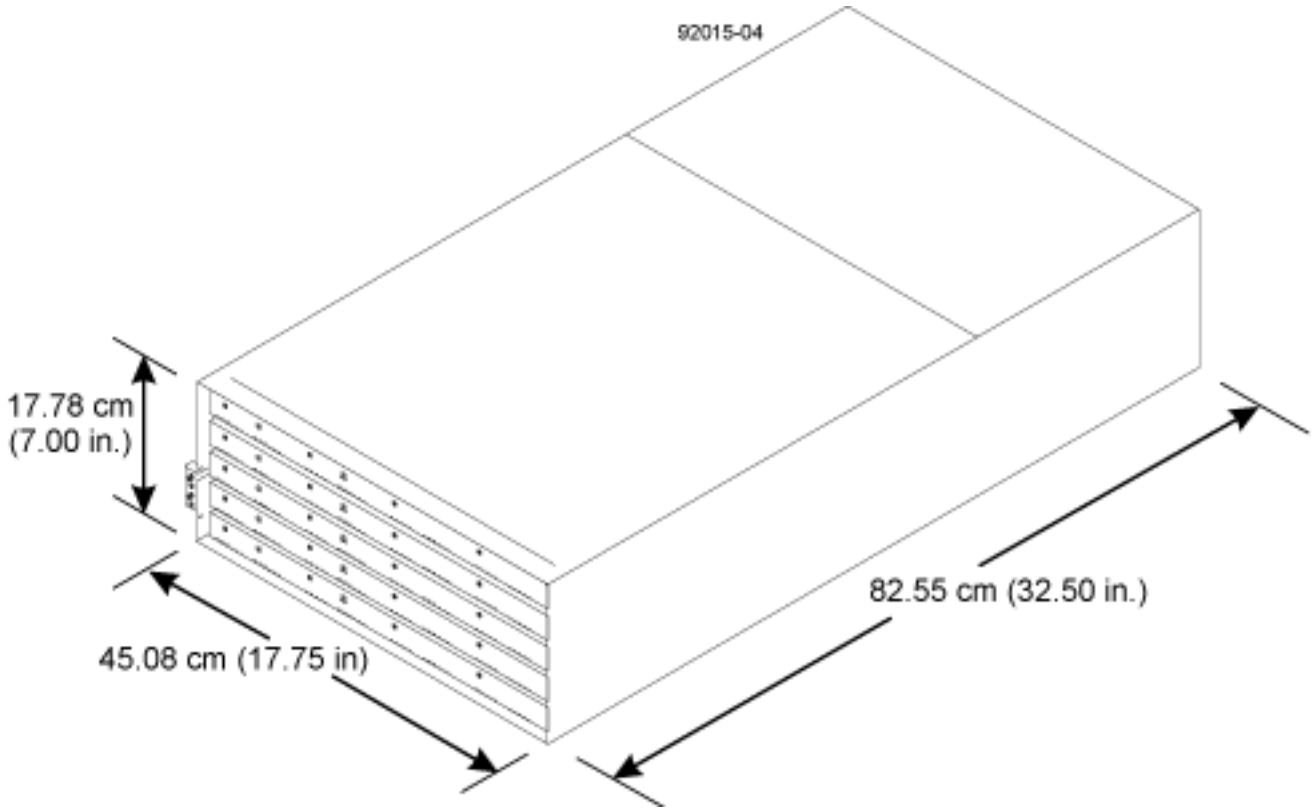


1.	Controller canisters
2.	Power canisters
3.	Fan canisters

E5460 controller-drive tray: Dimensions

The E5460 controller-drive tray conforms to the 48.3-cm (19.0-in.) rack standard.

Dimensions of the E5460 controller-drive tray – front view



E5460 controller-drive tray: Weights

Table 43: Weights of the E5460 controller-drive tray

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
E5460 controller-drive tray	241.19 lb (109.40 kg)	132 lb (59.80 kg)	278 lb (126.10 kg)
*Maximum weight indicates a controller-drive tray, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type. **Empty weight indicates a drive tray without the controller canisters, the power canisters, the fan canisters, and the drives. ***Shipping weight indicates the empty weight of a drive tray and all shipping material, as well as the weight of the 60 drives that are shipped separately in multipack cartons.			

Table 44: Component weights of the E5460 controller-drive tray

Component	Weight
Controller canister	6.60 lb (2.99 kg)
Power canister	5.5 lb (2.5 kg)
Fan canister	Approximately 2.16 lb (1 kg)
2.5-in. SAS drive	0.41 lb (0.19 kg) to 0.51 lb (0.23 kg)
3.5-in. SAS drive	1.43 lb (0.65 kg) to 1.72 lb (0.78 kg)
2.5-in. SSD	0.15 lb (0.07 kg) to 0.37 lb (0.17 kg)

E5460 controller-drive tray: Shipping dimensions

Table 45: Shipping carton dimensions for the E5460 controller-drive tray

Height	Width	Depth
73.66 cm (29 in.)	60.96 cm (24 in.)	101.60cm (40 in.)

E5460 controller-drive tray: Temperature and humidity

Note: Converting *maximum rate of change* requires converting between Fahrenheit and Celsius first, and then subtracting the difference.

Table 46: Temperature requirements and humidity requirements for the E5460 controller-drive tray

Condition	Parameter	Requirement
Temperature	Operating range (both cabinet and subsystem)	10°C to 35°C (50°F to 95°F)
	Maximum rate of change	10°C per hour (18°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F)
	Maximum rate of change	15°C per hour (27°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140°F)
	Maximum rate of change	20°C per hour (36°F) per hour

Condition	Parameter	Requirement
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 (3.1°F) for every 1000 m (3280 ft) above sea level.		

E5460 controller-drive tray: Altitude ranges

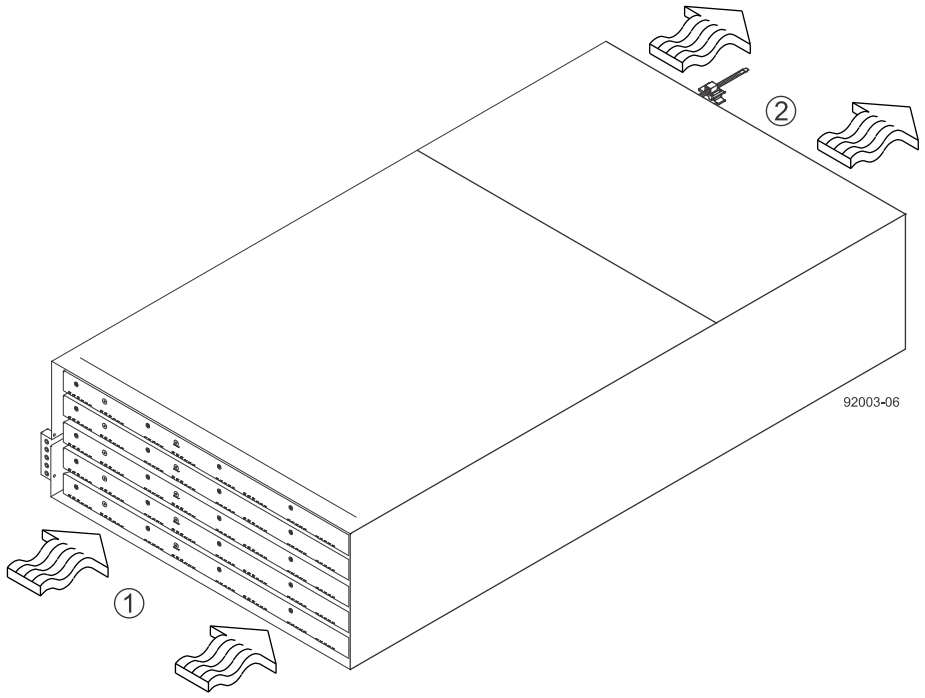
Table 47: Altitude ranges for the E5460 controller-drive tray

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

E5460 controller-drive tray: Airflow and heat dissipation

Airflow goes from the front of the E5460 controller-drive tray to the rear of the controller-drive tray. Allow at least 81 cm (32 in.) of clearance in front of the E5460 controller-drive tray and at least 61 cm (24 in.) of clearance behind the controller-drive tray for service clearance, ventilation, and heat dissipation.

Airflow through the E5460 controller-drive tray – front view



1.	81 cm (32 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 48: Power ratings and heat dissipation for the E5460 controller-drive tray

Component	Typical operating power	Rated power requirements
E5460 controller-drive tray with HIC (6-TB drives fully populated)	**KVA:** 1.044	**KVA:** 1.526
	Watts: 1034	**Watts:** 1512
	Btu/Hr: 3528	**Btu/Hr:** 5159

E5460 controller-drive tray: Acoustic noise

Table 49: Acoustic noise at 25°C for the E5460 controller-drive tray

Measurement	Level
Sound power (standby operation)	7.2 bels
Sound power (normal operation)	7.2 bels
Sound pressure	72 dBA

E5460 controller-drive tray: Site wiring and power

The E5460 controller-drive tray 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 power connections or line-to-line power connections.

Keep this information in mind when you prepare the installation site for the controller-drive tray:

- **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 tray, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The controller-drive tray 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 tray automatically performs a power-on recovery sequence without operator intervention after the power is restored.

E5460 controller-drive tray: Power input

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

Table 50: AC power requirements for the E5460 controller-drive tray

Parameter	Low range	High range
Nominal voltage	200 VAC	240 VAC
Frequency	50 Hz	60 Hz
Typical operating current	5.22 A	4.35A
Maximum operating current	6.27 A	5.23 A
System name plate rating	7.56 A	6.3 A

E5460 controller-drive tray: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the E5460 controller-drive tray at greater than 0.95 with nominal input voltage.

E5460 controller-drive tray: AC power cords and receptacles

Each E5460 controller-drive tray 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 canisters in the drive tray to an independent, external AC power source, such as a wall receptacle, or to any uninterruptible power supply (UPS).

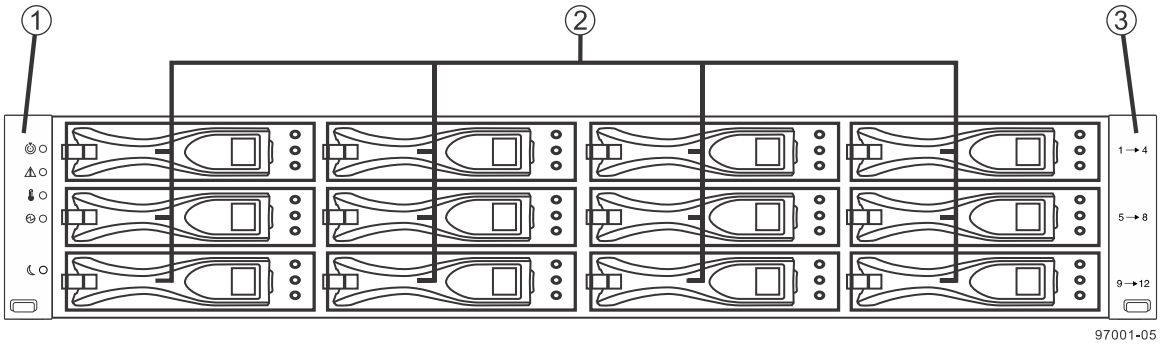
Attention: Possible risk of equipment failure – To ensure proper cooling, the E5460 controller-drive tray always uses two power supplies.

Specifications of the E5512 and E5524 controller-drive trays and EF550 flash array

The E5512 and E5524 controller-drive trays and the EF550 flash array are high-density SAS 2.0 (6-Gb/s) drive enclosures. The E5512 controller-drive tray supports twelve 3.5-in. SAS drives. The E5524 controller-drive tray and the EF550 flash array support twenty-four 2.5-in. SAS drives. The E5524 supports both hard disk drives (HDDs) and solid state disks (SSDs). The EF550 flash array only supports SSDs.

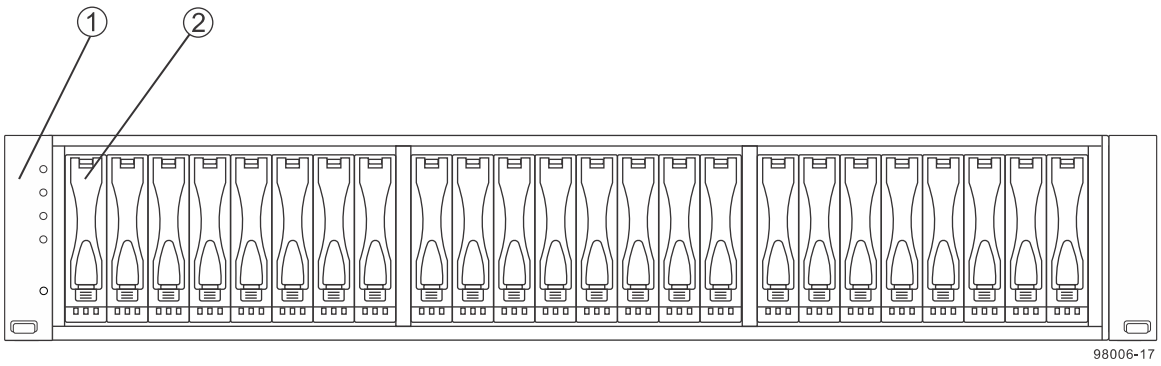
The rack-mounted E5512 and E5524 controller-drive trays and the EF550 flash array provide high-capacity disk storage for Fibre Channel, Infiniband, SAS, and iSCSI environments, depending on the choice of the host interface card.

E5512 controller-drive tray with 12 drives – front view



1.	Left end cap (has the controller-drive tray summary LEDs)
2.	Drive canisters
3.	Right end cap

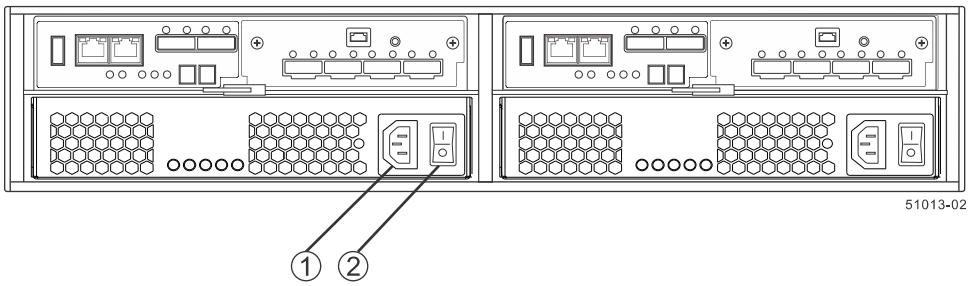
E5524 controller-drive tray or EF550 flash array with 24 drives – front view



1.	End caps (the left end cap has the controller-drive tray summary LEDs)

2.	Drive canisters

E5512 and E5524 controller-drive trays or EF550 flash array – rear view

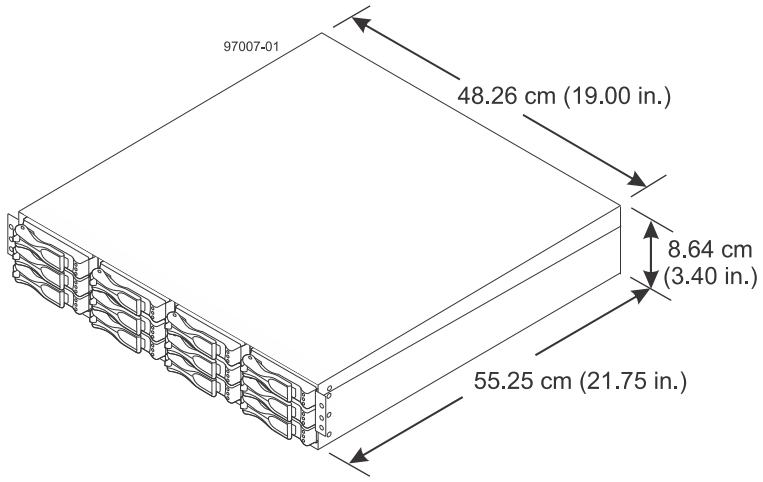


1.	AC power connector
2.	AC power switch

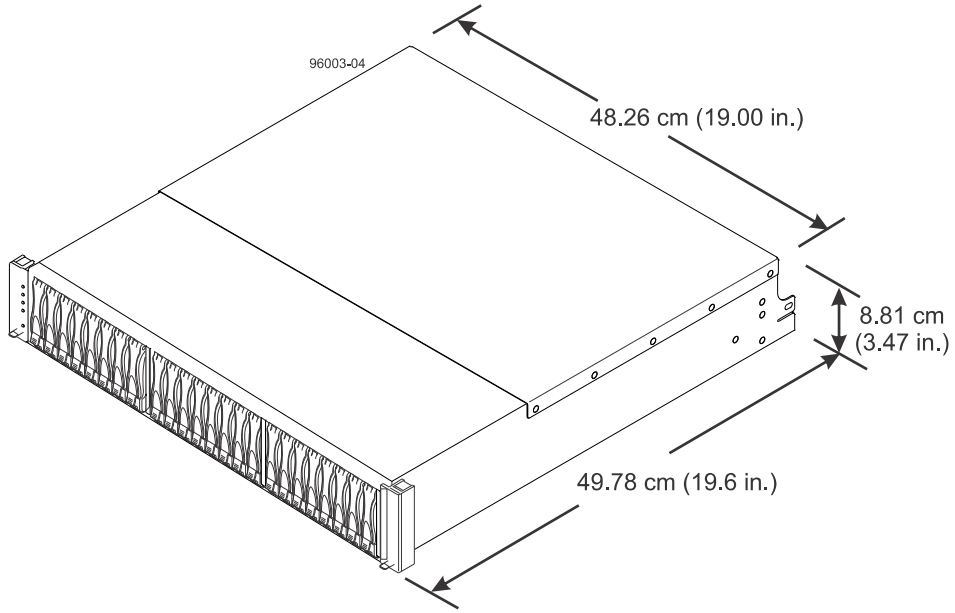
E5512 and E5524 controller-drive trays and EF550 flash array: Dimensions

The E5512 and E5524 controller-drive trays and the EF550 flash array conform to the 48.3-cm (19.0-in.) rack standard.

Dimensions of the E5512 controller-drive tray with 12 drives – front view



Dimensions of the E5524 controller-drive tray and EF550 flash array with 24 drives – front view



E5512 and E5524 controller-drive trays and EF550 flash array: Weight

Table 51: Weights of the E5512 and E5524 controller-drive trays and the EF550 flash array

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
E5512 controller-drive tray, with twelve 8.89cm (3.5in.) SAS HDD drives	65.37 lb (29.65 kg)	18.52 lb (8.4 kg)	70.0 lb (31.75 kg)
E5524 controller-drive tray, with twenty-four 6.35cm (2.5in.) SAS HDD drives	63.23 lb (28.68 kg)	23.59 lb (10.7 kg)	70.0 lb (31.75 kg)
EF550 flash array with twenty-four 6.35cm (2.5in.) SAS SSD drives	60.1 lb (27.29 kg)	23.59 lb (10.7 kg)	70.0 lb (31.75 kg)

*Maximum weight indicates a controller-drive tray, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type.

**Empty weight indicates a controller-drive tray or flash array with the controller canisters, the power-fan canisters, and the drives removed.

***Shipping weight indicates the maximum weight of the controller-drive tray or flash array and all shipping material.

Component	Weight
Controller canister	4.70 lb (2.131 kg)
Power-fan canister	5.51 lb (2.500 kg)
2.5in. SAS drive	0.41 lb (0.19 kg) to 0.51 lb (0.23 kg)
3.5in. SAS drive	1.43 lb (0.65 kg) to 1.72 lb (0.78 kg)
2.5in. SSD	0.15 lb (0.07 kg) to 0.37 lb (0.17 kg)

E5512 and E5524 controller-drive trays and EF550 flash array: Shipping dimensions

Table 52: Shipping carton dimensions

Controller-drive tray/flash array model	Height	Width	Depth
E5512 controller-drive tray with twelve 3.5-in. SAS HDD drives	27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)
E5524 controller-drive tray with twenty-four 2.5-in. SAS HDD drives	27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)
EF550 flash array with twenty-four 2.5-in. SAS SSDs	27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)

E5512 and E5524 controller-drive trays and EF550 flash array: Temperature and humidity requirements

Note: Converting *maximum rate of change* requires converting between Fahrenheit and Celsius first, and then subtracting the difference.

Table 53: Temperature requirements and humidity requirements

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 per hour (18°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F)
	Maximum rate of change	15°C per hour (27°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140°F)
	Maximum rate of change	20°C per hour (36°F) per hour

Condition	Parameter	Requirement
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 (3.1°F) for every 1000 m (3280 ft) above sea level.		

E5512 and E5524 controller-drive trays and EF550 flash array: Altitude ranges

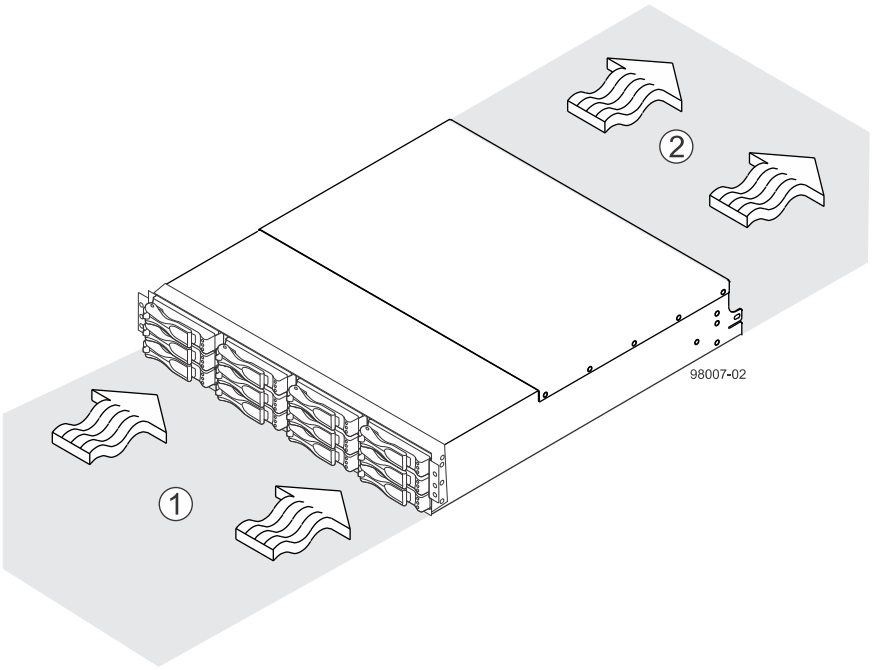
Table 54: Altitude ranges

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

E5512 and E5524 controller-drive trays and EF550 flash array: Airflow and heat dissipation

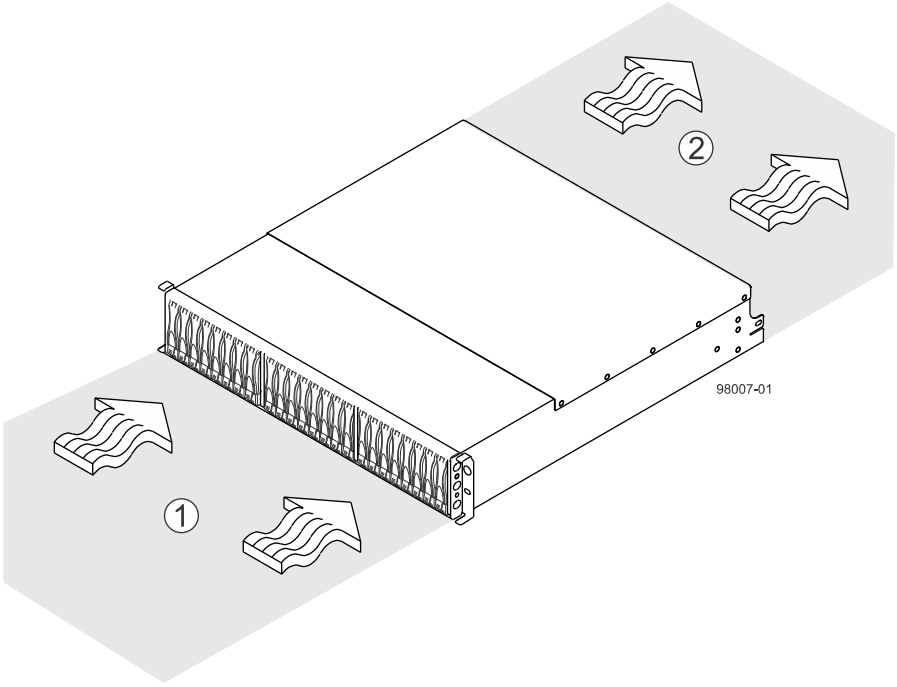
Allow at least 76 cm (30 in.) of clearance in front of the controller-drive tray or flash array and 61 cm (24 in.) behind the controller-drive tray or flash array for service clearance, ventilation, and heat dissipation.

Airflow through the E5512 controller-drive tray 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

Airflow through the E5524 controller-drive tray or EF550 flash array 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 55: Power and heat dissipation for the E5512 and E5524 controller-drive trays and the EF550 flash array

Component	Typical operating power	Rated power requirement
E5512 controller drive-tray: Controller canisters with two power-fan canisters and 12 SAS HDD drives, each with 6-TB capacity	**KVA:** 0.437	**KVA:** 0.908
	Watts: 433	**Watts:** 900
	Btu/Hr: 1476	**Btu/Hr:** 3071
E5524 controller drive-tray: Controller canisters with two power-fan canisters and 24 SAS HDD drives, each with 1.2-TB capacity	**KVA:** 0.487	**KVA:** 0.908
	Watts: 482	**Watts:** 900
	Btu/Hr: 1644	**Btu/Hr:** 3071
EF550 flash array: Controller canisters with two power-fan canisters and 24 SAS SSD drives, each with 1.6-TB capacity	**KVA:** 0.438	**KVA:** 0.908
	Watts: 434	**Watts:** 900
	Btu/Hr: 1481	**Btu/Hr:** 3071

E5512 and E5524 controller-drive trays and EF550 flash array: Acoustic noise

Table 56: Acoustic noise at 25°C for the E5512 and E5524 controller-drive trays and the EF550 flash array

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

E5512 and E5524 controller-drive trays and EF550 flash array: Site wiring and power

The E5512 and E5524 controller-drive trays and the EF550 flash array use 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 controller-drive tray or flash array:

- **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 controller-drive tray, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The controller-drive trays 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 controller-drive trays automatically perform a power-on recovery sequence without operator intervention.

E5512 and E5524 controller-drive trays and EF550 flash array: Power input

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

Table 57: AC power requirements

Parameter	Low range	High range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Typical operating current	4.87 A *	2.03 A **
Maximum operating current	6.37 A *	2.65 A **
Sequential drive group spin up	4.27 A	1.76 A
Simultaneous drive spin up	6.81 A	2.71 A
System rating plate label	9.0 A	3.6 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.		

E5512 and E5524 controller-drive trays and EF550 flash array: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the E5512 and E5524 controller-drive trays and the EF550 flash array at greater than 0.95 with nominal input voltage.

E5512 and E5524 controller-drive trays and EF550 flash array: AC power cords and receptacles

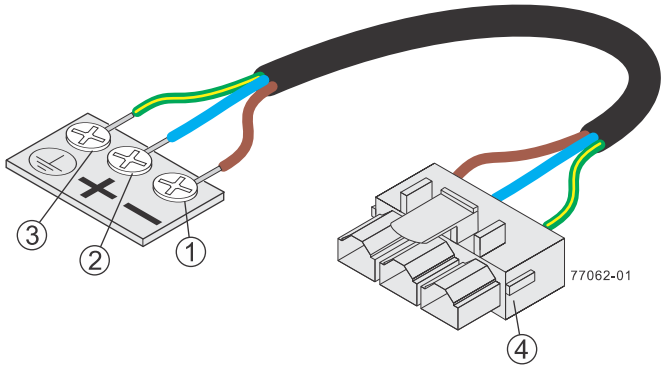
Each E5512 controller-drive tray, E5524 controller-drive tray, or EF550 flash array is shipped with two AC power cords, which use the standard AC outlets in the destination country. Each AC power cord connects one of the power supplies in the drive tray to an independent, external AC power source, such as a wall receptacle, or to any uninterrupted power supply (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 controller-drive tray or flash array.

E5512 and E5524 controller-drive trays and EF550 flash array: Optional DC power connector cables and source wires

The E5512 controller-drive tray, E5524 controller-drive tray, and EF550 flash array are 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 controller-drive tray or flash array. The three source wires on the other end of the power connector cable connect the controller-drive tray or flash array 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.

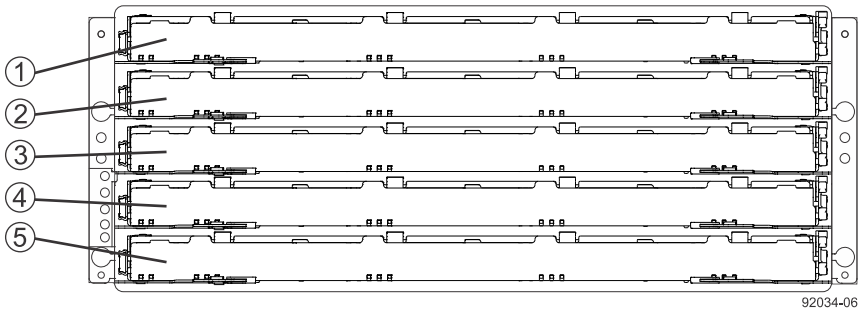
Two (or, optionally, four) DC power connector cables are provided with each controller-drive tray. Two DC power connectors are on the two DC power supplies on the rear of each controller-drive tray or flash array if additional redundancy is required.

Note: You do not need to connect the second DC power connection on the DC power supplies of the controller-drive tray. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

Specifications of the E5560 controller-drive tray

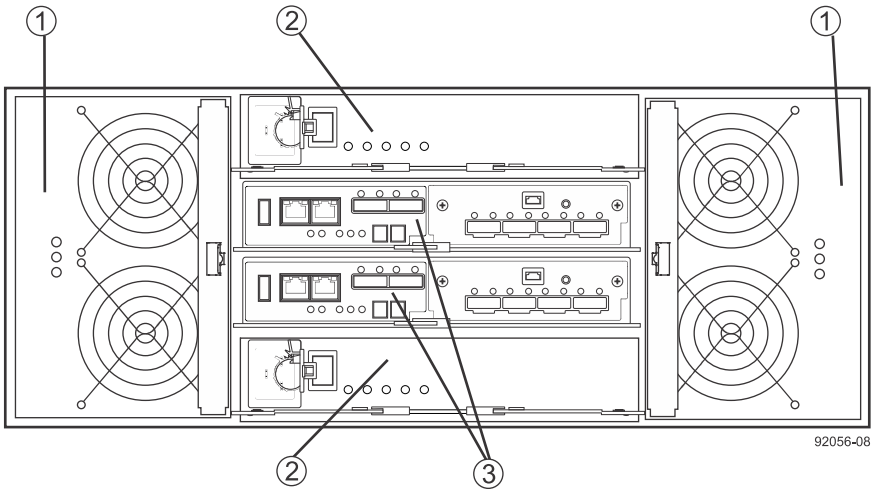
The E5560 controller-drive tray is a high-density SAS 2.0 (6-Gb/s) drive enclosure available in a rack-mount model, with either high-capacity 3.5-in. SAS drives, high-performance 2.5-in. 10K hard disk drive (HDD) SAS drives, or 2.5-in. solid state drive (SSD) SAS drives.

E5560 controller-drive tray – front view with bezel removed



1.	Drive drawer 1
2.	Drive drawer 2
3.	Drive drawer 3
4.	Drive drawer 4
5.	Drive drawer 5

E5560 controller-drive tray – rear view

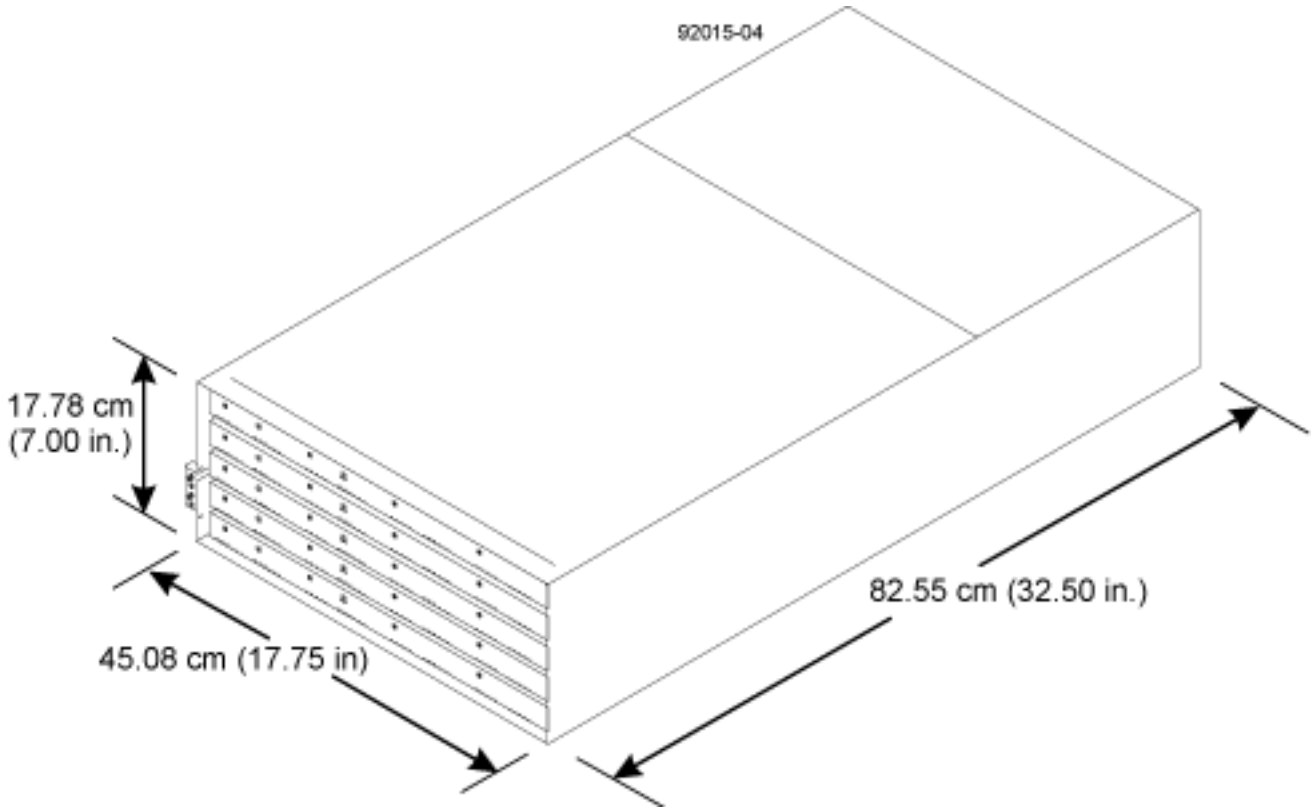


1.	Fan canisters
2.	Power canisters
3.	Controller canisters

E5560 controller-drive tray: Dimensions

The E5560 controller-drive tray conforms to the 48.3-cm (19.0-in.) rack standard.

Dimensions of the E5560 controller-drive tray – front view



E5560 controller-drive tray: Weight

Table 58: Weights of the E5560 controller-drive tray

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
E5560 controller-drive tray	240.7 lb (109.2 kg)	132 lb (59.8 kg)	282 lb (127.9 kg)
*Maximum weight indicates a controller-drive tray, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type. **Empty weight indicates a drive tray without the controller canisters, the power canisters, the fan canisters, and the drives. ***Shipping weight indicates the empty weight of a drive tray and all shipping material, as well as the weight of the 60 drives that are shipped separately in multipack cartons.			

Table 59: Component weights of the E5560 controller-drive tray

Component	Weight
Controller canister	6.60 lb (2.99 kg)
Power canister	5.5 lb (2.5 kg)
Fan canister	Approximately 2.16 lb (1 kg)
2.5-in. SAS drive	0.41 lb (0.19 kg) to 0.51 lb (0.23 kg)
3.5-in. SAS drive	1.43 lb (0.65 kg) to 1.72 lb (0.78 kg)
2.5-in. SSD	0.15 lb (0.07 kg) to 0.37 lb (0.17 kg)

E5560 controller-drive tray: Shipping dimensions

Table 60: Shipping carton dimensions for the E5560 controller-drive tray

Height	Width	Depth
73.66 cm (29 in.)	60.96 cm (24 in.)	101.60 cm (40 in.)

E5560 controller-drive tray: Temperature and humidity requirements

Note: Converting *maximum rate of change* requires converting between Fahrenheit and Celsius first, and then subtracting the difference.

Table 61: Temperature requirements and humidity requirements for the E5560 controller-drive tray

Condition	Parameter	Requirement
Temperature	Operating range (both cabinet and subsystem)	10°C to 35°C (50°F to 95°F)
	Maximum rate of change	10°C per hour (18°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F)
	Maximum rate of change	15°C per hour (27°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140°F)
	Maximum rate of change	20°C per hour (36°F) per hour

Condition	Parameter	Requirement
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 (3.1°F) for every 1000 m (3280 ft) above sea level.		

E5560 controller-drive tray: Altitude ranges

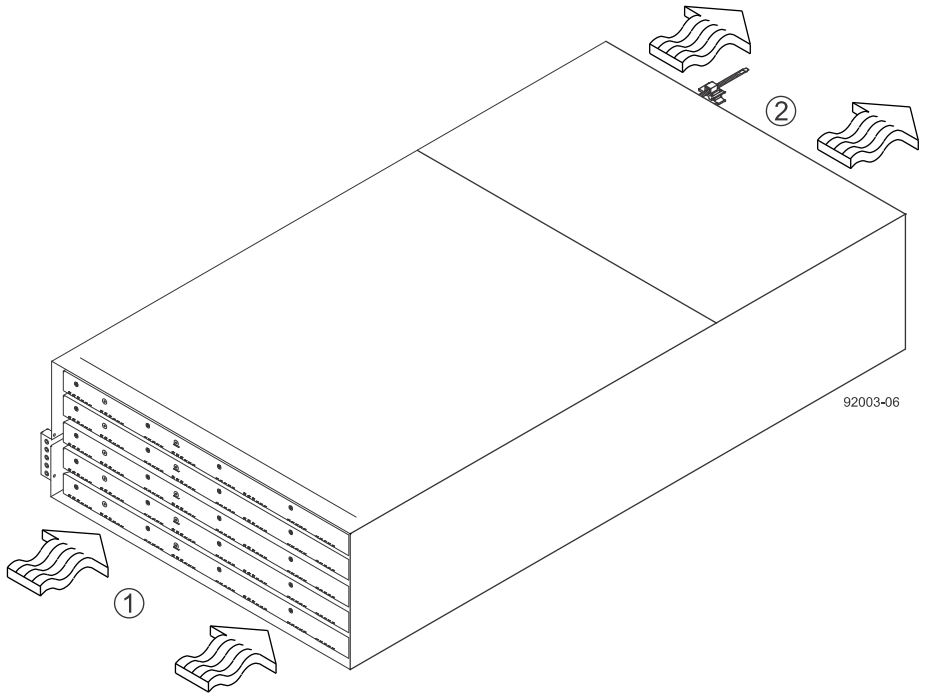
Table 62: Altitude ranges for the E5560 controller-drive tray

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

E5560 controller-drive tray: Airflow and heat dissipation

Airflow goes from the front of the E5560 controller-drive tray to the rear of the controller-drive tray. Allow at least 81 cm (32 in.) of clearance in front of the E5560 controller-drive tray and at least 61 cm (24 in.) of clearance behind the controller-drive tray for service clearance, ventilation, and heat dissipation.

Airflow through the E5560 controller-drive tray – front view



1.	81 cm (32 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 63: Power ratings and heat dissipation for the E5560 controller-drive tray

Component	Typical operating power	Rated power requirement
E5560 controller-drive tray with HIC (6-TB drives fully populated)	**KVA:** 1.075	**KVA:** 1.526
	Watts: 1064	**Watts:** 1512
	Btu/Hr: 3632	**Btu/Hr:** 5159

E5560 controller-drive tray: Acoustic noise

Table 64: Acoustic noise at 25°C for the E5560 controller-drive tray

Measurement	Level
Sound power (standby operation)	7.2 bels
Sound power (normal operation)	7.2 bels
Sound pressure	72 dBA

E5560 controller-drive tray: Site wiring and power

The E5560 controller-drive tray 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 power connections or line-to-line power connections.

Keep this information in mind when you prepare the installation site for the controller-drive tray:

- **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 tray, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The controller-drive tray 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 tray automatically performs a power-on recovery sequence without operator intervention after the power is restored.

E5560 controller-drive tray: Power input

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

Table 65: AC requirements for the E5560 controller-drive tray

Parameter	Low range	High range
Nominal voltage	200 VAC	240 VAC
Frequency	50 Hz	60 Hz
Typical operating current	5.38 A	4.48 A
Maximum operating current	6.43 A	5.35 A
System nameplate rating	7.56 A	6.3 A

E5560 controller-drive tray: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the E5560 controller-drive tray at greater than 0.95 with nominal input voltage.

E5560 controller-drive tray: AC power cords and receptacles

Each E5560 controller-drive tray 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 canisters in the drive tray to an independent, external AC power source, such as a wall receptacle, or to any uninterruptible power supply (UPS).

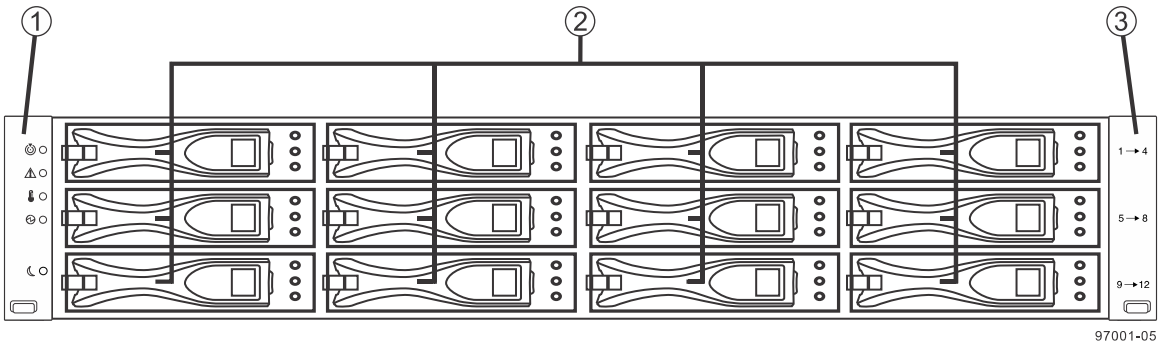
Attention: Possible risk of equipment failure – To ensure proper cooling, the E5560 controller-drive tray always uses two power supplies.

Specifications of the E5612 and E5624 controller-drive trays and EF560 flash array

The E5612 and E5624 controller-drive trays and the EF560 flash array are high-density SAS 2.0 (6-Gb/s) drive enclosures available in a rack-mount model, with either high-capacity 3.5-in. SAS drives or high-performance 2.5-in. SAS drives.

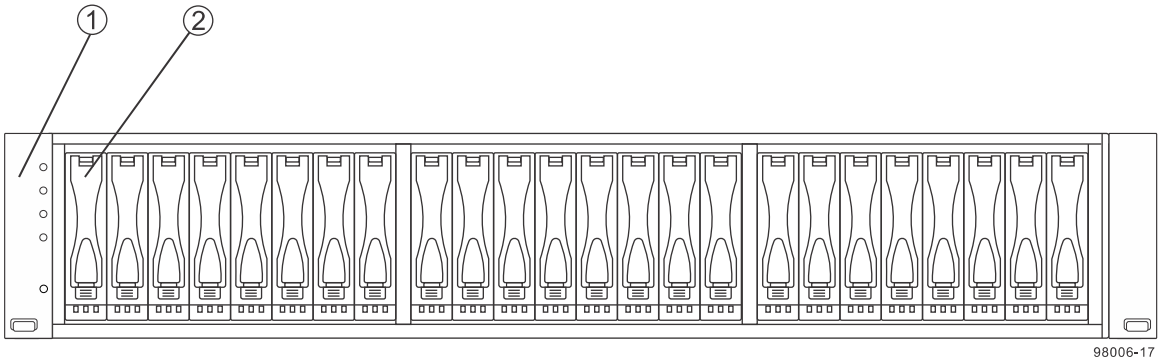
The E5612 and E5624 controller-drive trays and the EF560 flash array provide high-capacity disk storage for Fibre Channel, InfiniBand, SAS and iSCSI environments, depending on the choice of the host interface card.

E5612 controller-drive tray – front view



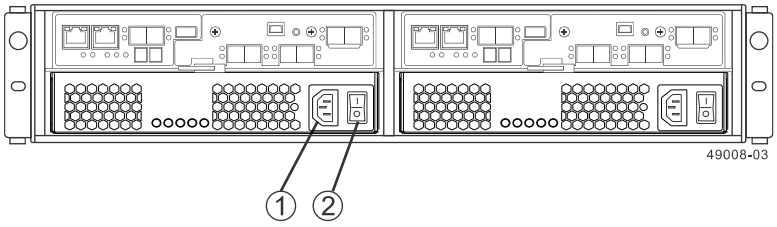
1.	Left end cap (has the controller-drive tray summary LEDs)
2.	Drive canisters
3.	Right end cap

E5624 controller-drive tray – front view



1.	End caps (the left end cap has the controller-drive tray summary LEDs)
2.	Drive canisters

E5612 and E5624 controller-drive trays and EF560 flash array – rear view

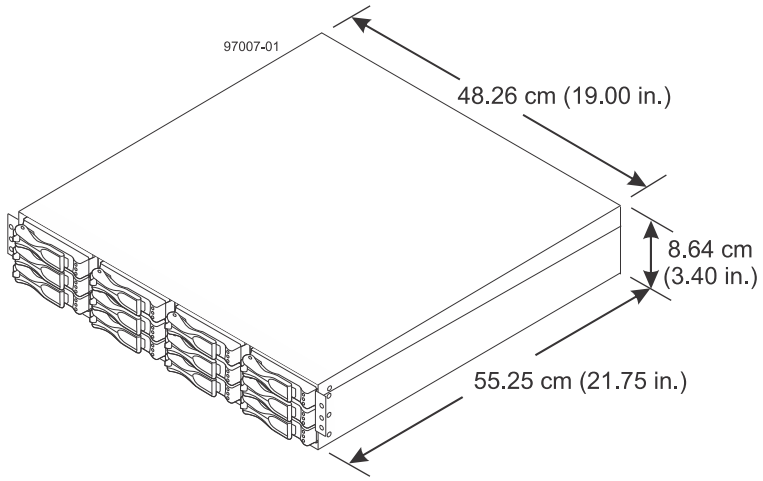


1.	AC power connector
2.	AC power switch

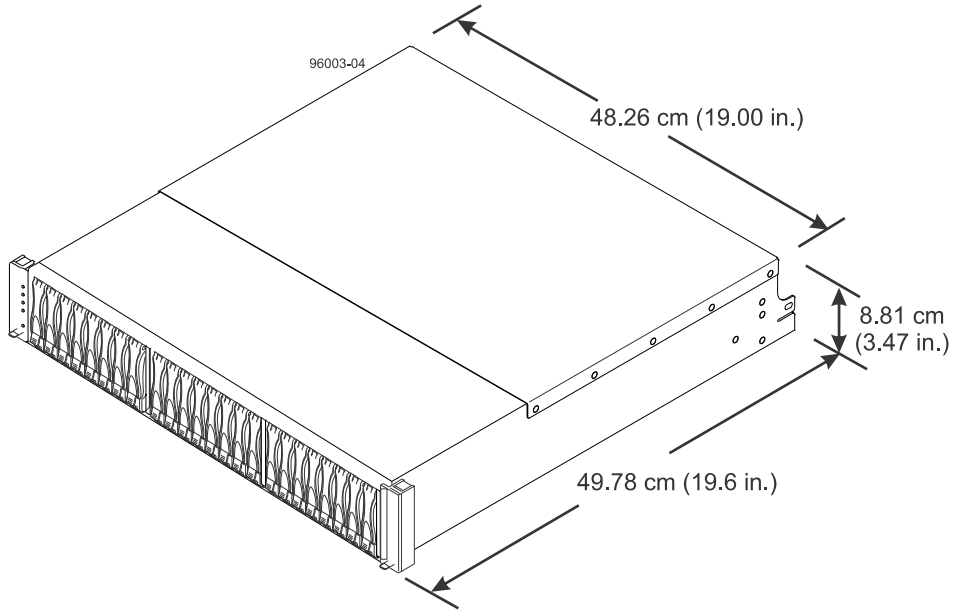
E5612 and E5624 controller-drive trays and EF560 flash array: Dimensions

The E5612 and E5624 controller-drive trays and the EF560 flash array conform to the 48.3-cm (19.0-in.) rack standard.

Dimensions of the E5612 controller drive tray – front view



Dimensions of the E5624 controller drive tray and the EF560 flash array – front view



E5612 and E5624 controller-drive trays and EF560 flash array: Weight

Table 66: Weights of the E5612 and E5624 controller-drive trays and EF560 flash array

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
E5612 controller-drive tray, with twelve 8.89cm (3.5in.) SAS HDD drives	65.37 lb (29.65 kg)	18.52 lb (8.4 kg)	70.0 lb (31.75 kg)
E5624 controller-drive tray, with twenty-four 6.35cm (2.5in.) SAS HDD drives	63.23 lb (28.68 kg)	23.59 lb (10.7 kg)	70.0 lb (31.75 kg)
EF560 flash array with twenty-four 6.35cm (2.5in.) SAS SSD drives	60.1 lb (27.29 kg)	23.59 lb (10.7 kg)	70.0 lb (31.75 kg)

*Maximum weight indicates a controller-drive tray, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type.

**Empty weight indicates a controller-drive tray or flash array with the controller canisters, the power-fan canisters, and the drives removed.

***Shipping weight indicates the maximum weight of the controller-drive tray or flash array and all shipping material.

Component	Weight
Controller canister	4.70 lb (2.131 kg)

Component	Weight
Power-fan canister	5.51 lb (2.500 kg)
2.5 in. SAS drive	0.41 lb (0.19 kg) to 0.51 lb (0.23 kg)
3.5 in. SAS drive	1.43 lb (0.65 kg) to 1.72 lb (0.78 kg)
2.5 in. SSD	0.15 lb (0.07 kg) to 0.37 lb (0.17 kg)

E5612 and E5624 controller-drive trays and EF560 flash array: Shipping dimensions

Table 67: Shipping carton dimensions for the E5612 and E5624 controller-drive trays and EF560 flash array

Controller-drive tray/flash array model	Height	Width	Depth
E5612 controller-drive tray with twelve 3.5-in. SAS HDD drives	27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)
E5624 controller-drive tray with twenty-four 2.5-in. SAS HDD drives	27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)
EF560 flash array with twenty-four 2.5-in. SAS SSD drives	27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)

E5612 and E5624 controller-drive trays and EF560 flash array: Temperature and humidity requirements

Note: Converting *maximum rate of change* requires converting between Fahrenheit and Celsius first, and then subtracting the difference.

Table 68: Temperature requirements and humidity requirements for the E5612 and E5624 controller-drive trays and the EF560 flash array

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 per hour (18°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F)
	Maximum rate of change	15°C per hour (27°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140°F)
	Maximum rate of change	20°C per hour (36°F) per hour

Condition	Parameter	Requirement
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 (3.1°F) for every 1000 m (3280 ft) above sea level.		

E5612 and E5624 controller-drive trays and EF560 flash array: Altitude ranges

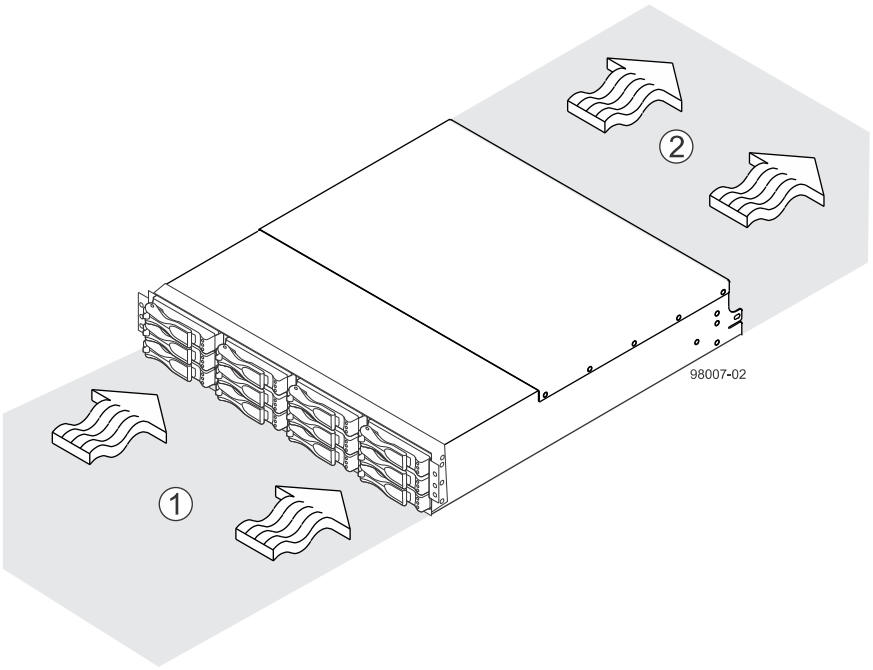
Table 69: Altitude ranges for the E5612 and E5624 controller-drive trays and EF560 flash array

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

E5612 and E5624 controller-drive trays and EF560 flash array: Airflow and heat dissipation

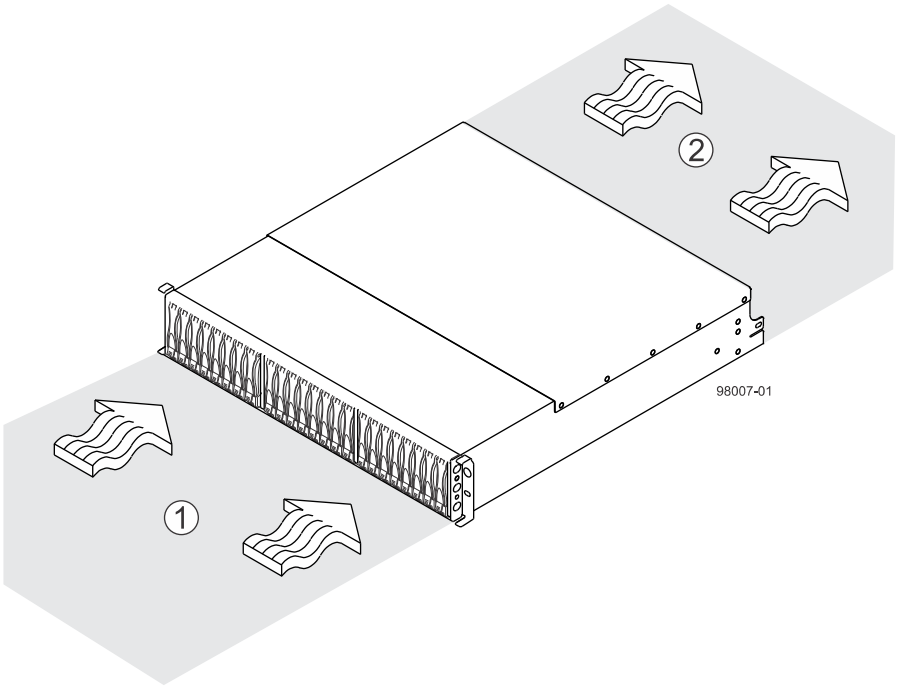
Allow at least 76 cm (30 in.) of clearance in front of the controller-drive tray or flash array and 61 cm (24 in.) behind the controller-drive tray or flash array for service clearance, ventilation, and heat dissipation.

Airflow through the E5612 controller-drive tray – front view



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

Airflow through the E5624 controller-drive tray and the EF560 flash array – front view



1.	76 cm (30 in.) clearance in front of the cabinet

2.	61 cm (24 in.) clearance behind the cabinet

Table 70: Power and heat dissipation for the E5612 and E5624 controller-drive trays and the EF560 flash array

Component	Typical operating power	Rated power requirement
E5612 controller-drive tray: Controller canisters with two power-fan canisters and 12 SAS HDD drives, each with 6-TB capacity	**KVA:** 0.475	**KVA:** 0.908
	Watts: 470	**Watts:** 900
	Btu/Hr: 1605	**Btu/Hr:** 3071
E5624 controller-drive tray: Controller canisters with two power-fan canisters and 24 SAS HDD drives, each with 1.2-TB capacity	**KVA:** 0.525	**KVA:** 0.908
	Watts: 520	**Watts:** 900
	Btu/Hr: 1774	**Btu/Hr:** 3071
EF560 flash array: Controller canisters with two power-fan canisters and 24 SAS SSDs, each with 1.6-TB capacity	**KVA:** 0.477	**KVA:** 0.908
	Watts: 472	**Watts:** 900
	Btu/Hr: 1610	**Btu/Hr:** 3071

E5612 and E5624 controller-drive trays and EF560 flash array: Acoustic noise

Table 71: Acoustic noise at 25°C for the E5612 and E5624 controller-drive trays and EF560 flash array

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

E5612 and E5624 controller-drive trays and EF560 flash array: Site wiring and power

The E5612 and E5624 controller-drive trays and the EF560 flash array use 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 controller-drive tray or flash array:

- **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 controller-drive tray or flash array, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The controller-drive tray or flash array 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 controller-drive tray of flash array automatically performs a power-on recovery sequence without operator intervention.

E5612 and E5624 controller-drive trays and EF560 flash array: Power input

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

Table 72: AC power requirements for the E5612 and E5624 controller-drive trays and the EF560 flash arrays

Parameter	Low range	High range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Typical operating current for 12 drives	4.75 A *	1.98 A **
Typical operating current for 24 drives	5.25 A *	2.19 A **
Maximum operating current for 12 drives	6.25 A *	2.60 A **
Maximum operating current for 24 drives	2.81 A *	2.46 A **
Sequential drive group spin up	4.27 A	1.76 A
Simultaneous drive spin pp	6.81 A	2.71 A
System rating plate label	9.0 A	3.6 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.		

E5612 and E5624 controller-drive trays and EF560 flash array: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the E5612 and E5624 controller-drive trays and the EF560 flash arrays at greater than 0.95 with nominal input voltage.

E5612 and E5624 controller-drive trays and EF560 flash array: AC power cords and receptacles

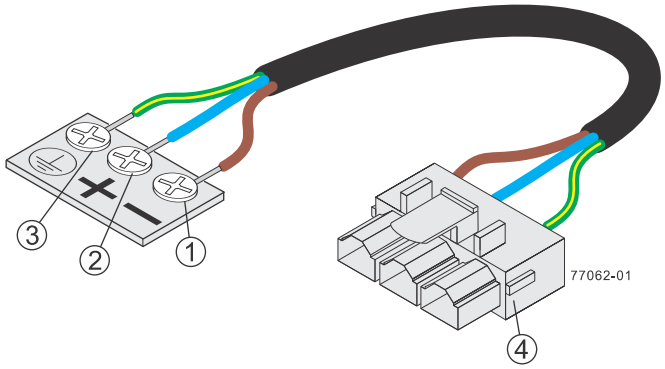
The E5612 and E5624 controller-drive trays and the EF560 flash array are shipped with two AC power cords, which use the standard AC outlets in the destination country. Each AC power cord connects one of the power supplies in the drive tray to an independent, external AC power source, such as a wall receptacle, or to any uninterrupted power supply (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 controller-drive tray or flash array.

E5612 and E5624 controller-drive trays and EF560 flash array: Optional DC power connector cables and source wires

The E5612 and E5624 controller-drive trays and the EF560 flash array are 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 controller-drive tray or flash array. The three source wires on the other end of the power connector cable connect the controller-drive tray 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.

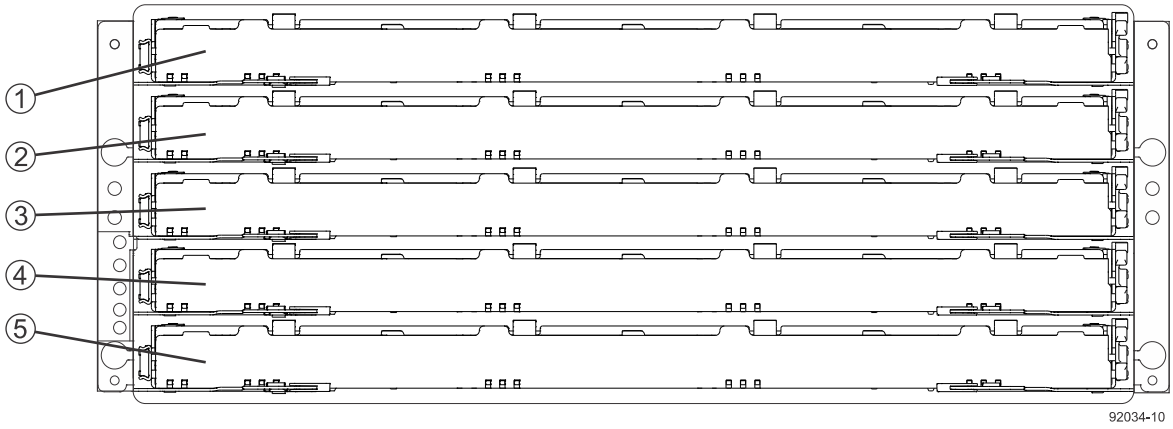
Two (or, optionally, four) DC power connector cables are provided with each controller-drive tray or flash array. Two DC power connectors are on the two DC power supplies on the rear of each controller-drive tray or flash array if additional redundancy is required.

> **Note:** You do not need to connect the second DC power connection on the DC power supplies of the controller-drive tray or flash array. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

Specifications of the E5660 controller-drive tray

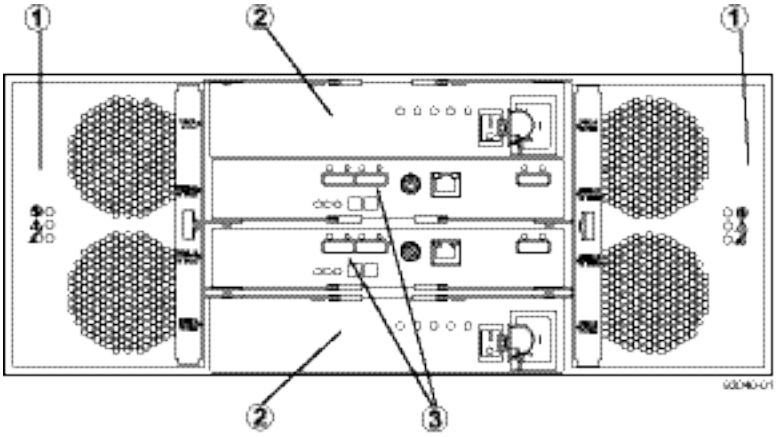
The E5660 controller-drive tray is a high-density SAS 2.0 (6-Gb/s) drive enclosure available in a rack-mount model, with either high-capacity 3.5-in. SAS drives, high-performance 2.5-in. 10K hard disk drive (HDD) SAS drives, or 2.5-in. solid state drive (SSD) SAS drives.

E5660 controller-drive tray – front view with bezel removed



1.	Drive drawer 1
2.	Drive drawer 2
3.	Drive drawer 3
4.	Drive drawer 4
5.	Drive drawer 5

E5660 controller-drive tray – rear view

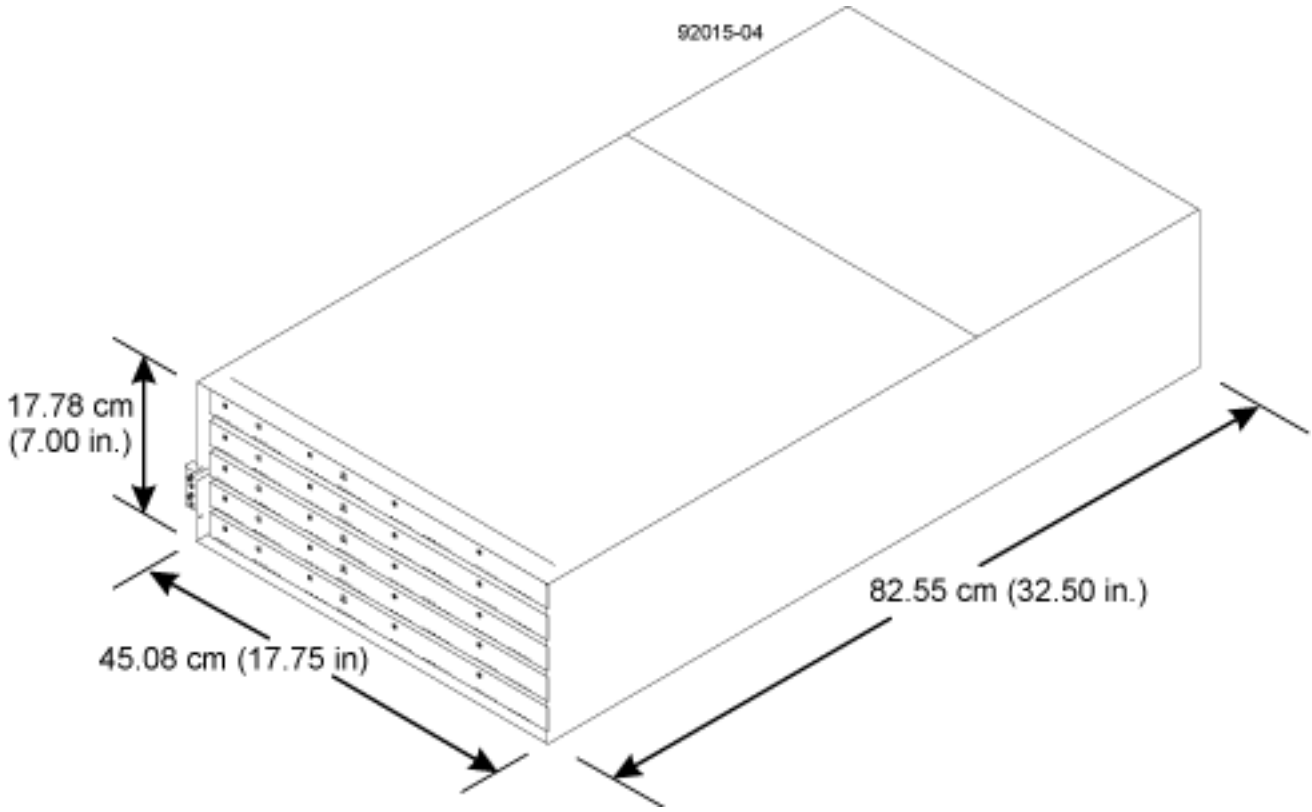


1.	Fan canisters
2.	Power canisters
3.	Controller canisters

E5660 controller-drive tray: Dimensions

The E5660 controller-drive tray conforms to the 48.3-cm (19.0-in.) rack standard.

Dimensions of the E5660 controller-drive tray – front view



E5660 controller-drive tray: Weight

Table 73: Weights of the E5660 controller-drive tray

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
E5660 controller-drive tray	240.7 lb (109.2 kg)	132 lb (59.8 kg)	282 lb (127.9 kg)
*Maximum weight indicates a controller-drive tray, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type. **Empty weight indicates a drive tray without the controller canisters, the power canisters, the fan canisters, and the drives. ***Shipping weight indicates the empty weight of a drive tray and all shipping material, as well as the weight of the 60 drives that are shipped separately in multipack cartons.			

Table 74: Component weights of the E5660 controller-drive tray

Component	Weight
Controller canister	6.60 lb (2.99 kg)
Power canister	5.5 lb (2.5 kg)
Fan canister	Approximately 2.16 lb (1 kg)
2.5-in. SAS drive	0.41 lb (0.19 kg) to 0.51 lb (0.23 kg)
3.5-in. SAS drive	1.43 lb (0.65 kg) to 1.72 lb (0.78 kg)
2.5-in. SSD	0.15 lb (0.07 kg) to 0.37 lb (0.17 kg)

E5660 controller-drive tray: Shipping dimensions

Table 75: Shipping carton dimensions for the E5660 controller-drive tray

Height	Width	Depth
73.66 cm (29 in.)	60.96 cm (24 in.)	101.60 cm (40 in.)

E5660 controller-drive tray: Temperature and humidity requirements

Note: Converting *maximum rate of change* requires converting between Fahrenheit and Celsius first, and then subtracting the difference.

Table 76: Temperature requirements and humidity requirements for the E5660 controller-drive tray

Condition	Parameter	Requirement
Temperature	Operating range (both cabinet and subsystem)	10°C to 35°C (50°F to 95°F)
	Maximum rate of change	10°C per hour (18°F) per hour
	Storage range	–10°C to 50°C (14°F to 122°F)
	Maximum rate of change	15°C per hour (27°F) per hour
	Transit range	–40°C to 60°C (–40°F to 140°F)
	Maximum rate of change	20°C per hour (36°F) per hour

Condition	Parameter	Requirement
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 (3.1°F) for every 1000 m (3280 ft) above sea level.		

E5660 controller-drive tray: Altitude ranges

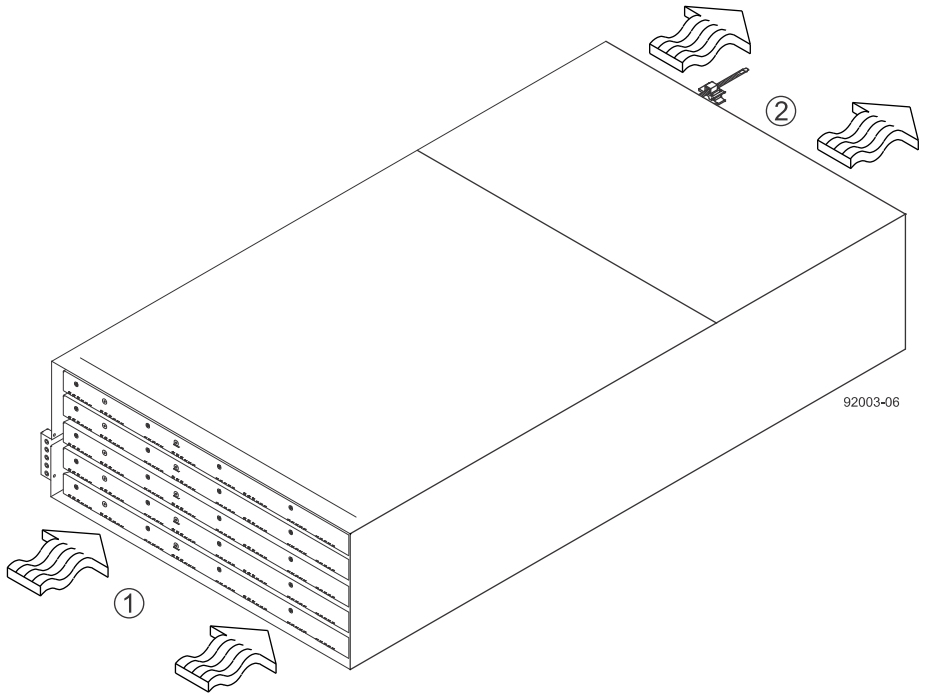
Table 77: Altitude ranges for the E5660 controller-drive tray

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

E5660 controller-drive tray: Airflow and heat dissipation

Airflow goes from the front of the E5660 controller-drive tray to the rear of the controller-drive tray. Allow at least 81 cm (32 in.) of clearance in front of the E5660 controller-drive tray and at least 61 cm (24 in.) of clearance behind the controller-drive tray for service clearance, ventilation, and heat dissipation.

Airflow through the E5660 controller-drive tray – front view



1.	81 cm (32 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 78: Power ratings and heat dissipation for the E5660 controller-drive tray

Component	Typical operating power	Rated power requirement
E5660 controller-drive tray with HIC (6-TB drives fully populated)	**KVA:** 1.115	**KVA:** 1.526
	Watts: 1104	**Watts:** 1512
	Btu/Hr: 3767	**Btu/Hr:** 5159

E5660 controller-drive tray: Acoustic noise

Table 79: Acoustic noise at 25°C for the E5660 controller-drive tray

Measurement	Level
Sound power (standby operation)	7.2 bels
Sound power (normal operation)	7.2 bels
Sound pressure	72 dBA

E5660 controller-drive tray: Site wiring and power

The E5660 controller-drive tray uses 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 power connections or line-to-line power connections.

Keep this information in mind when you prepare the installation site for the controller-drive tray:

- **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 tray, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The controller-drive tray 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 tray automatically performs a power-on recovery sequence without operator intervention after the power is restored.

E5660 controller-drive tray: Power input

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

Table 80: AC power requirements for the E5660 controller-drive tray

Parameter	Low range	High range
Nominal voltage	200 VAC	240 VAC
Frequency	50 Hz	60 Hz
Typical operating current	5.58 A	4.65 A
Maximum operating current	6.63 A	5.47 A
System nameplate rating	7.56 A	6.3 A

E5660 controller-drive tray: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the E5660 controller-drive tray at greater than 0.95 with nominal input voltage.

E5660 controller-drive tray: AC power cords and receptacles

Each E5660 controller-drive tray 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 canisters in the drive tray to an independent, external AC power source, such as a wall receptacle, or to any uninterruptible power supply (UPS).

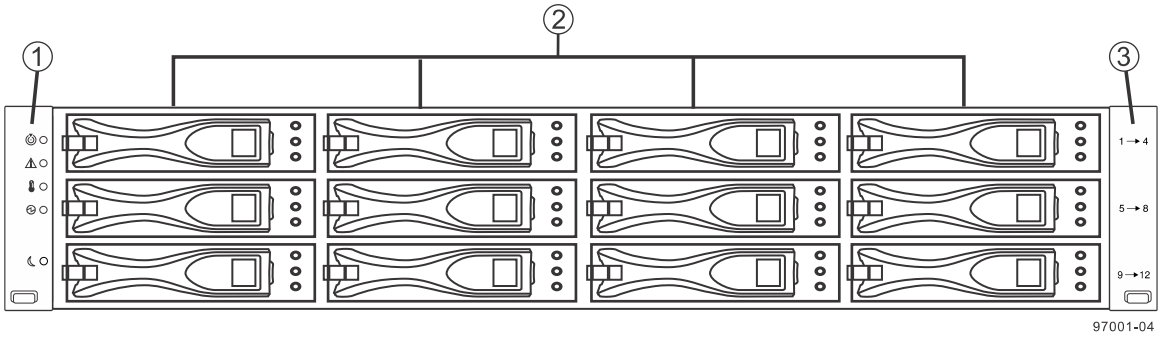
Attention: Possible risk of equipment failure – To ensure proper cooling, the E5660 controller-drive tray always uses two power supplies.

Specifications of the DE1600 drive tray

The DE1600 drive tray contains SAS drives. Each DE1600 drive tray contains these components:

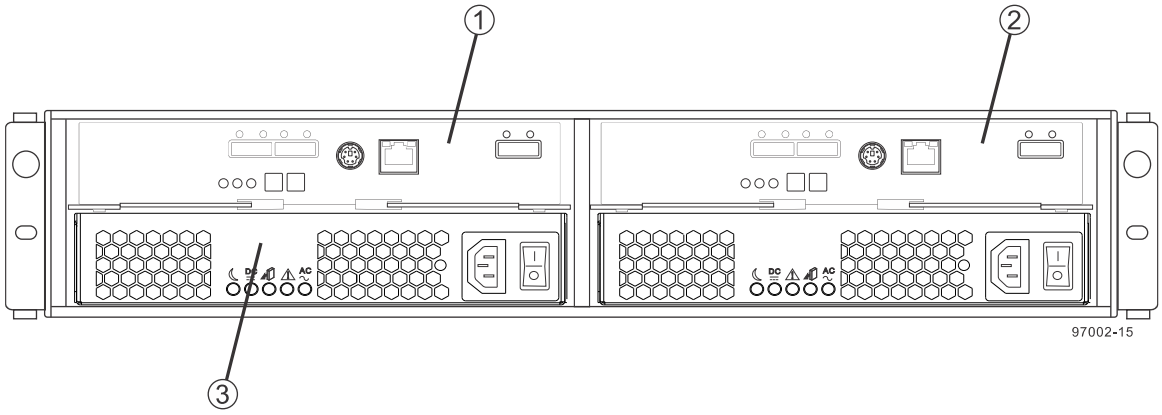
- A maximum of 12 drives
- Two power-supply fan canisters
- One or two environmental services module (ESM) canisters

DE1600 drive tray – front view



1.	Left end cap (has the drive tray LEDs)
2.	Drives
3.	Right end cap

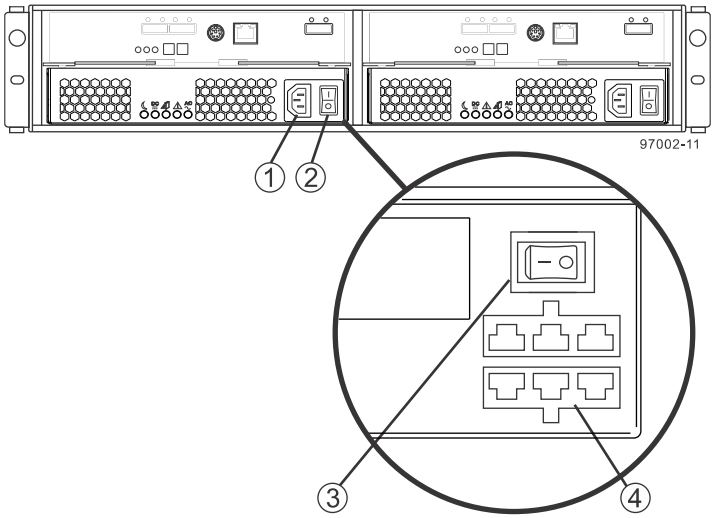
DE1600 drive tray – rear view



1.	ESM A canister
2.	ESM B canister
3.	Power-fan canister

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

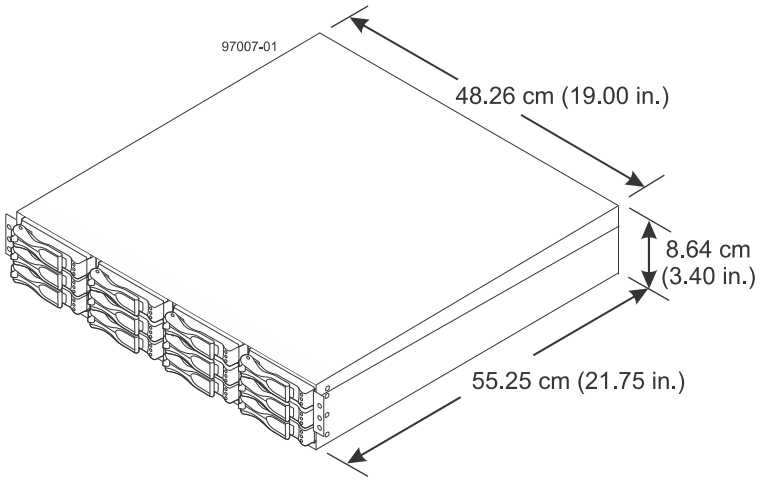
Power source options for DE1600 drive tray – rear view



1.	AC power connector on the AC power-fan canister
2.	AC power switch on the AC power-fan canister
3.	DC power switch on the optional DC power-fan canister
4.	DC power connector on the optional DC power-fan canister

DE1600 drive tray: Dimensions

Dimensions of the DE1600 drive tray – front view



DE1600 drive tray: Weight

Table 81: Weights of the DE1600 drive tray

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
DE1600 drive tray	59.61 lb (27.07 kg)	18.52 lb (8.4 kg)	70.0 lb (31.75 kg)
*Maximum weight indicates a drive tray, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type. **Empty weight indicates a drive tray with the ESM canisters, the power-fan canisters, and the drives removed. ***Shipping weight indicates the maximum weight of a fully-populated drive tray and all shipping material.			

Table 82: Component weights of the DE1600 drive tray

Component	Weight
ESM canister	1.75 kg (3.86 lb)
Power-fan canister	2.5 kg (5.51 lb)
3.5-in. SAS drive	1.43 lb (0.65 kg) to 1.72 lb (0.78 kg)

DE1600 drive tray: Shipping dimensions

Table 83: Drive tray and shipping carton dimensions for the DE1600 drive tray

Height	Width	Depth
27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)

DE1600 drive tray: Temperature and humidity requirements

Note: Converting *maximum rate of change* requires converting between Fahrenheit and Celsius first, and then subtracting the difference.

Table 84: Temperature requirements and humidity requirements for the DE1600 drive tray

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.		

DE1600 drive tray: Altitude ranges

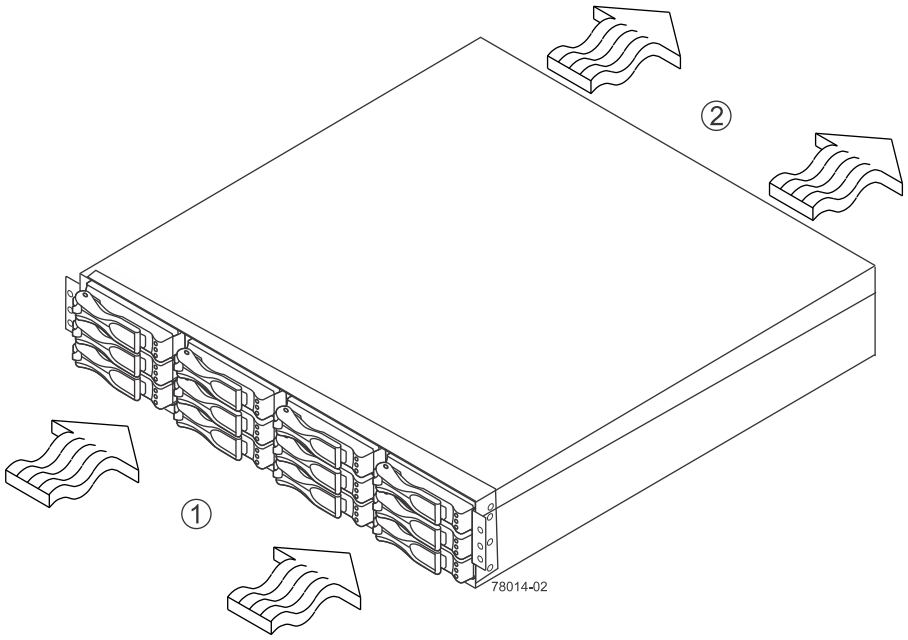
Table 85: Altitude ranges for the DE1600 drive tray

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

DE1600 drive tray: Airflow and heat dissipation

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

Airflow through the DE1600 drive tray – 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 86: Power ratings and heat dissipation for the DE1600 drive tray

Component	Typical operating power	Rated power requirement
DE1600 drive tray (6-TB drives fully populated)	**KVA:** 0.175	**KVA:** 0.908
	Watts: 174	**Watts:** 900
	Btu/Hr: 593	**Btu/Hr:** 3071

DE1600 drive tray: Acoustic noise

Table 87: Acoustic noise at 25°C for the DE1600 drive tray

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

DE1600 drive tray: Site wiring and power

The DE1600 drive tray 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 tray:

- **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 tray, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The drive tray 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 tray automatically performs a power-on recovery sequence without operator intervention after the power is restored.

DE1600 drive tray: Power input

AC power input

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

Table 88: AC power requirements for the DE1600 drive tray

Parameter	Low range	High range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Typical operating current	1.75 A *	0.73 A **
Maximum operating current	3.25 A*	1.35 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	9.0 A	3.6 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.

DE1600 drive tray: Power factor correction

Power factor correction is applied within the power supply of each DE1600 drive tray, which maintains the power factor of the drive tray at greater than 0.95 with nominal input voltage.

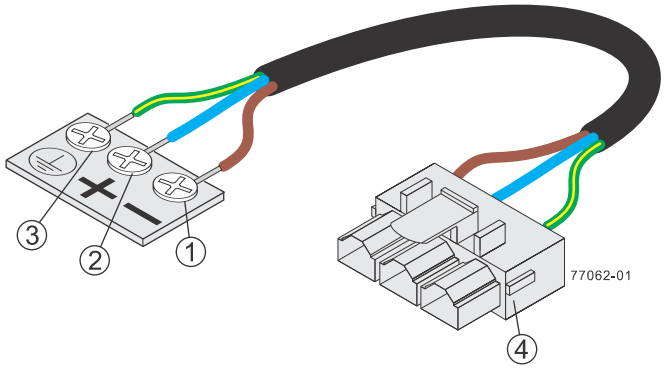
DE1600 drive tray: AC power cords and receptacles

Each DE1600 drive tray 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 tray to an independent, external AC power source, such as a wall receptacle, or to any uninterrupted power supply (UPS).

DE1600 drive tray: Optional DC power connector cables and source wires

The DE1600 drive tray 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 tray. The three source wires on the other end of the power connector cable connect the drive tray 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.

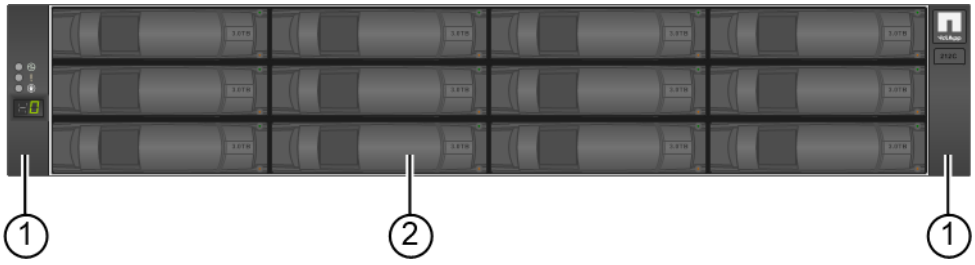
Two (or, optionally, four) DC power connector cables are provided with each drive tray. Two DC power connectors are on the two power-fan canisters on the rear of each drive tray if additional redundancy is required.

Note: You do not need to connect the second DC power connection on the power-fan canister of the drive tray. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

Specifications of the DE212C drive shelf

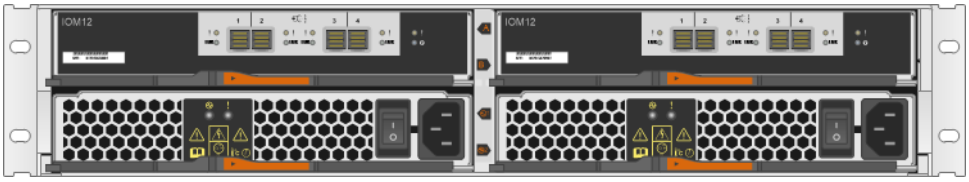
The DE212C drive shelf is a high-density SAS-3 (12-Gb/s) enclosure. It can contain a maximum of 12 high-capacity 3.5-inch SAS drives or high-performance 2.5-inch SAS drives. It is the same as the E2812 controller shelf. Instead of controllers, the DE212C drive shelf has one or two I/O modules (IOMs).

The following figure shows the front of a DE212C drive shelf:



1	End caps
2	Drives

The following figure shows the back of a DE212C drive shelf with two IOMs:



The DE212C drive shelf can also be configured with one IOM. The figure is not shown here.

DE212C drive shelf: Dimensions

The DE212C drive shelf conforms to the 19.0-inch (48.3 cm) rack standard.

Height	Width	Depth
3.41 in. (8.68 cm)	17.6 in. (44.7 cm)	21.1 in. (53.6 cm)

DE212C drive shelf: Weight

Unit	Weight		
	Maximum*	Empty**	Shipping***
DE212C drive shelf, with twelve 3.5 in. (8.89 cm) SAS-3 drives each with 6 TB capacity	59.78 lb (27.12 kg)	17.08 (7.75 kg)	80 lb (36.2 kg)

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
*Maximum weight indicates a drive shelf, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type. **Empty weight indicates a drive shelf with the IOM canister, the power-fan canister, and the drives removed. ***Shipping weight indicates the maximum weight of a fully-loaded drive shelf and all shipping material.			

Component	Weight
IOM canister	3.4 lb (1.54 kg)
Power-fan canister	5.2 lb (2.35 kg)
3.5 in. SAS drive	2.09 lb (.95 kg)

DE212C drive shelf: Shipping dimensions

Height	Width	Depth
19.5 in. (49.53 cm)	31.5 in. (80.01 cm)	28 in. (71.12 cm)

DE212C drive shelf: Temperature and humidity

Condition	Parameter	Requirement
Temperature	Operating range (both cabinet and subsystem)	50°F to 104°F (10°C to 40°C)
	Storage range	32°F to 158°F (0°C to 70°C)
	Transit range	–40°F to 158°F (–40°C to 70°C)
Relative humidity (no condensation)	Operating range (both cabinet and subsystem)	20% to 80%
	Storage range	5% to 95%
	Transit range	10% to 95%
If you plan to operate a system at an altitude between 3280 ft to 9842 ft (1000 m to 3000 m) above sea level, lower the environmental temperature 3.1°F (1.7°C) for every 3280 ft (1000 m) above sea level.		

DE212C drive shelf: Altitude ranges

Environment	Altitude
Operating	Sea level to 10,000 ft (3048 m) above sea level
Storage	1000 ft (304.8 m) below sea level to 40,000 ft (12,192 m) above sea level

DE212C drive shelf: Airflow and heat dissipation

Allow at least 32 inches (81.2 cm) in front of the drive shelf and 24 inches (60.96 cm) behind the drive shelf for service clearance, ventilation, and heat dissipation.

The power and heat dissipation values for the DE212C drive shelf are as follows:

Component	Typical operating power
DE212C drive shelf	**KVA:** 0.25
	Watts: 248.7
	BTU/Hr: 850.55

Note: These values can vary depending on your configuration.

DE212C drive shelf: Acoustic noise

Measurement	Level
Sound power (standby operation)	6.8 bels maximum
Sound pressure (normal operation)	56 dBA maximum

DE212C drive shelf: Site wiring and power

The DE212C drive shelf 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 shelf:

- **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 shelf, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The drive shelf 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 shelf automatically performs a power-on recovery sequence without operator intervention.

DE212C drive shelf: Power input

Each power supply contains two 16A slow-blow fuses.

Parameter	Low range	High range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Typical operating current for 12 drives	2.49A*	1.16A**
Maximum operating current for 12 drives	5.3A*	2.1A**
System rating plate label	12A	6.3A
*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.		

DE212C drive shelf: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the DE212C drive shelf at greater than 0.95 with nominal input voltage.

DE212C drive shelf: AC power cords and receptacles

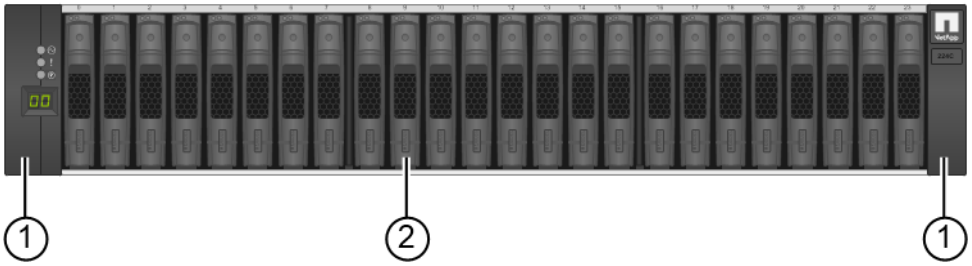
The DE212C drive shelf is shipped with two AC power cords, which use the standard AC outlets in the destination country. Each AC power cord connects one of the power supplies in the drive shelf to an independent, external AC power source, such as a wall receptacle, or to any uninterrupted power supply (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 shelf.

Specifications of the DE224C drive shelf

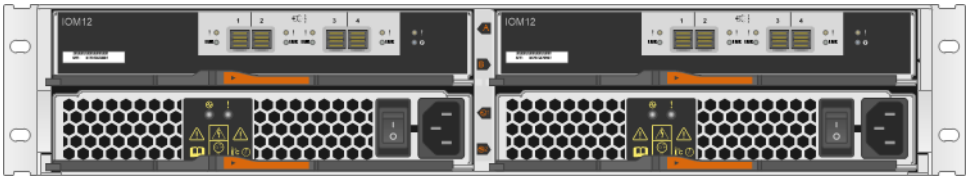
The DE224C drive shelf is a high-density SAS-3 (12 Gb/s) enclosure. It can contain a maximum of 24 high-capacity high-performance 2.5 inch SAS drives. It is the same as the E2824 controller shelf. Instead of controllers, the DE224C drive shelf has one or two I/O modules (IOMs).

The following figure shows the front of a DE224C drive shelf:



1	End caps
2	Drives

The following figure shows the back of a DE224C drive shelf with two IOMs:



The DE224C drive shelf can also be configured with one IOM. The figure is not shown here.

DE224C drive shelf: Dimensions

The DE224C drive shelf conforms to the 19.0-inch (48.3 cm) rack standard.

Height	Width	Depth
3.34 in. (8.48 cm)	17.6 in. (44.7 cm)	19.0 in. (48.3 cm)

DE224C drive shelf: Weight

Unit	Weight		
	Maximum*	Empty**	Shipping***
DE224C drive shelf	60.5 lb (27.44 kg)	17.4 lb (7.89 kg)	91 lb (41.27 kg)

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
*Maximum weight indicates a drive shelf, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type. **Empty weight indicates a drive shelf with the IOM canister, the power-fan canister, and the drives removed. ***Shipping weight indicates the maximum weight of a fully-loaded drive shelf and all shipping material.			

Component	Weight
IOM canister	3.4 lb (1.54 kg)
Power-fan canister	5.2 lb (2.35 kg)
2.5 in. SAS drive	2.09 lb (.95 kg)

DE224C drive shelf: Shipping dimensions

Height	Width	Depth
19.5 in. (49.53 cm)	31.5 in. (80.01 cm)	28 in. (71.12 cm)

DE224C drive shelf: Temperature and humidity

Condition	Parameter	Requirement
Temperature	Operating range (both cabinet and subsystem)	41°F to 113°F (5°C to 45°C)
	Storage range	–40°F to 158°F (–40°C to 70°C)
	Transit range	–40°F to 158°F (–40°C to 70°C)
Relative humidity (no condensation)	Operating range (both cabinet and subsystem)	8% to 90%
	Storage range	10% to 95%
	Transit range	10% to 95%
If you plan to operate a system at an altitude between 3280 ft to 9842 ft (1000 m to 3000 m) above sea level, lower the environmental temperature 3.1°F (1.7°C) for every 3280 ft (1000 m) above sea level.		

DE224C drive shelf: Altitude ranges

Environment	Altitude
Operating	Up to 10,000 ft (3048 m) above sea level
Storage	Up to 40,000 ft (12,192 m) above sea level
Transit	Up to 40,000 ft (12,192 m) above sea level

DE224C drive shelf: Airflow and heat dissipation

Allow at least 32 inches (81.2 cm) in front of the drive shelf and 24 inches (60.96 cm) behind the drive shelf for service clearance, ventilation, and heat dissipation.

The power and heat dissipation values for the DE224C drive shelf are as follows:

Component	Typical operating power
DE224C drive shelf	**KVA:** 0.302
	Watts: 298.8
	BTU/Hr: 1022.15

Note: These values can vary depending on your configuration.

DE224C drive shelf: Acoustic noise

Measurement	Level
Sound power (standby operation)	6.6 bels maximum
Sound pressure (normal operation)	56 dBA maximum

DE224C drive shelf: Site wiring and power

The DE224C drive shelf 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 shelf:

- **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 shelf, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The drive shelf 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 shelf automatically performs a power-on recovery sequence without operator intervention.

DE224C drive shelf: Power input

Each power supply contains two 16A slow-blow fuses.

Parameter	Low range	High range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Typical operating current for 24 drives	1.61A*	0.79A**
Maximum operating current for 24 drives	7.4A*	2.9A**
System rating plate label	12A	6.3A
*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.		

DE224C drive shelf: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the DE224C drive shelf at greater than 0.95 with nominal input voltage.

DE224C drive shelf: AC power cords and receptacles

The DE224C drive shelf 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 shelf to an independent, external AC power source, such as a wall receptacle, or to any uninterrupted power supply (UPS).

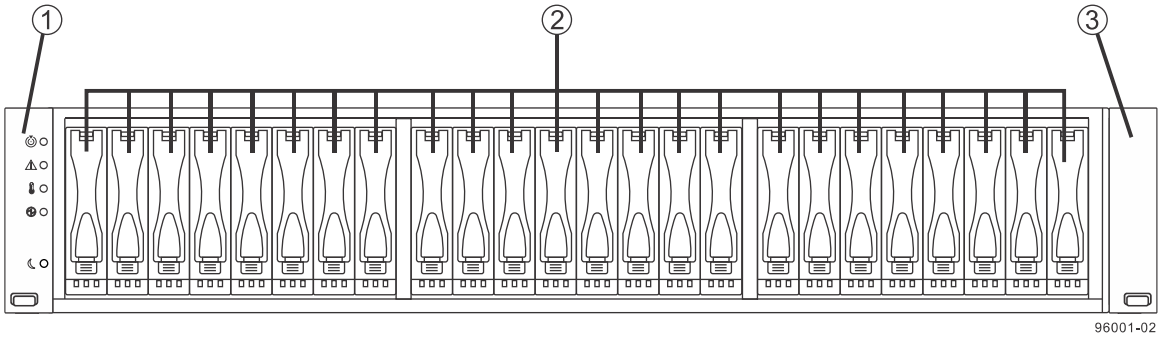
If you have a cabinet with internal power cabling, such as a ladder cord, you do not need the AC power cords that are shipped with the drive shelf.

Specifications of the DE5600 drive tray

The DE5600 drive tray contains SAS drives. Each DE5600 drive tray contains these components:

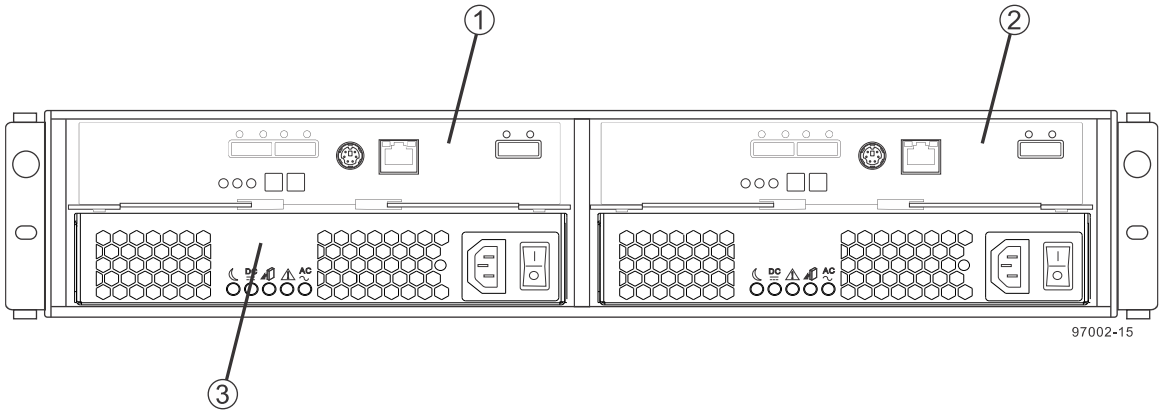
- A maximum of 24 drives
- Two power-supply fan canisters
- One or two environmental services module (ESM) canisters

DE5600 drive tray – front view



1.	Left end cap (has the drive tray LEDs)
2.	Drives
3.	Right end cap

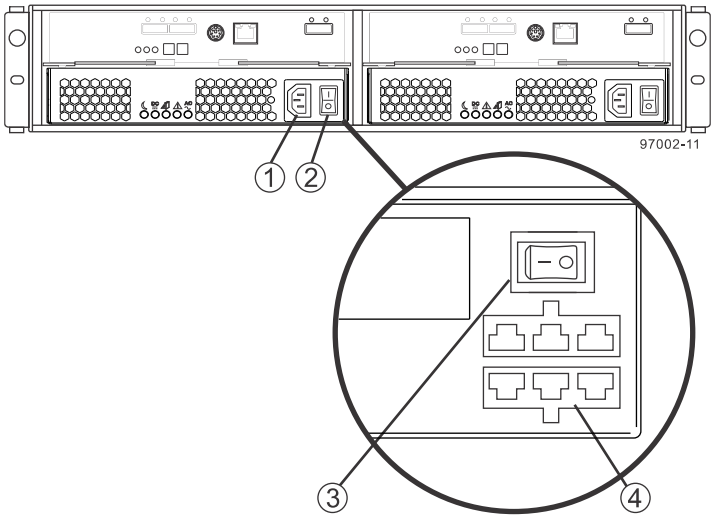
DE5600 drive tray – rear view



1.	ESM A canister
2.	ESM B canister
3.	Power-fan canister

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

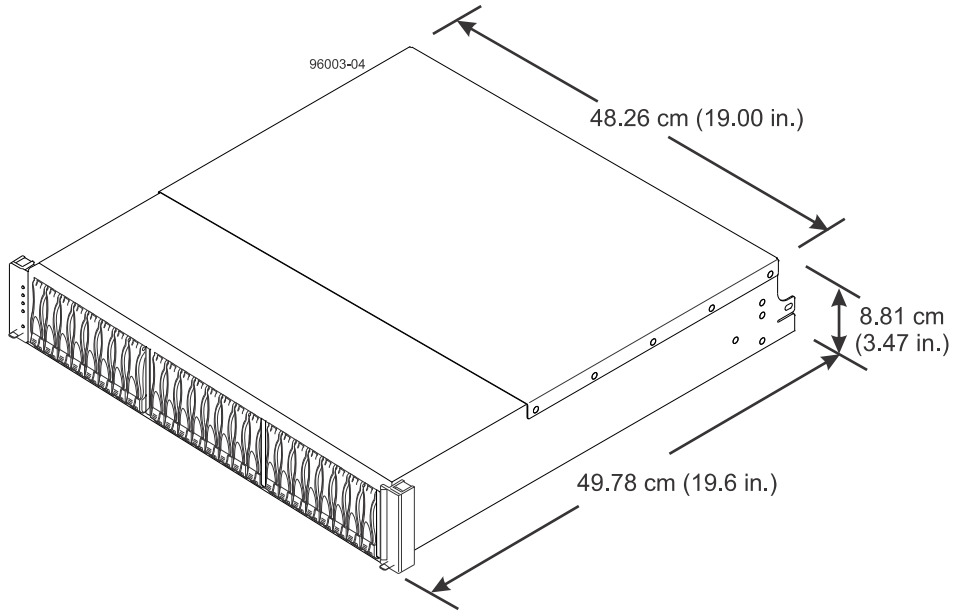
DE5600 drive tray power source options – rear view



1.	AC power switch on the AC power-fan canister
2.	AC power connector on the AC power-fan canister
3.	DC power switch on the optional DC power-fan canister
4.	DC power connector on the optional DC power-fan canister

DE5600 drive tray: Dimensions

Dimensions for the DE5600 drive tray – front view



DE5600 drive tray: Weight

Table 89: Weights of the DE5600 drive tray

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
DE5600 drive tray	54.4 lb (24.7 kg)	23.59 lb (10.7 kg)	70.0 lb (31.75 kg)
*Maximum weight indicates a controller-drive tray, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type. **Empty weight indicates a drive tray with the ESM canisters, the power-fan canisters, and the drives removed. ***Shipping weight indicates the maximum weight of a fully-populated drive tray and all shipping material.			

Table 90: Component weights of the DE5600 drive tray

Component	Weight
ESM canister	2.00 lb (0.907 kg)
Power-fan canister	5.51 lb (2.500 kg)
2.5-in. SAS drive	0.41 lb (0.19 kg) to 0.51 lb (0.23 kg)
2.5-in. SSD	0.15 lb (0.07 kg) to 0.37 lb (0.17 kg)

DE5600 drive tray: Shipping dimensions

Table 91: Drive tray and shipping carton dimensions for the DE5600 drive tray

Height	Width	Depth
27.31 cm (10.75 in.)	59.69 cm (23.50 in.)	79.38 cm (31.25 in.)

DE5600 drive tray: Temperature and humidity requirements

Note: Converting *maximum rate of change* requires converting between Fahrenheit and Celsius first, and then subtracting the difference.

Table 92: Temperature requirements and humidity requirements for the DE5600 drive tray

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 (18°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.		

DE5600 drive tray: Altitude ranges

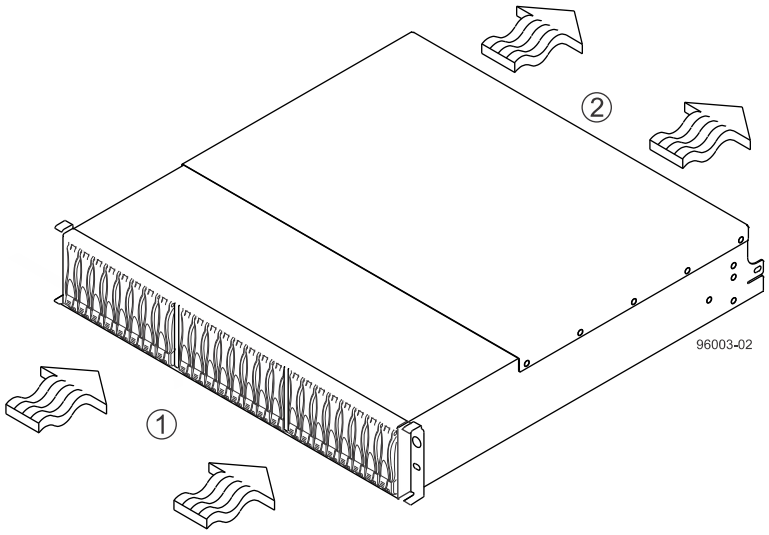
Table 93: Altitude ranges for the DE5600 drive tray

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

DE5600 drive tray: Airflow and heat dissipation

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

Airflow through the DE5600 drive tray – 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 94: Power ratings and heat dissipation for the DE5600 drive tray

Component	Typical operating power	Rated power requirement
DE5600 drive tray (1.2-TB 10k drives fully populated)	**KVA:** 0.225	**KVA:** 0.908
	Watts: 223	**Watts:** 900
	Btu/Hr: 761	**Btu/Hr:** 3071

DE5600 drive tray: Acoustic noise

Table 95: Acoustic noise at 25°C for the DE5600 drive tray

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

DE5600 drive tray: Site wiring and power

The DE5600 drive tray 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 tray:

- **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 tray, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The drive tray 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 tray automatically performs a power-on recovery sequence without operator intervention after the power is restored.

DE5600 drive tray: AC power input

AC power input

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

Table 96: AC power requirements for the DE5600 drive tray

Parameter	Low range	High range
Nominal voltage	100 VAC	240 VAC
Frequency	50 to 60 Hz	50 to 60 Hz
Typical operating current	2.25 A *	0.94 A **
Maximum operating current	3.75 A*	1.56 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	9.0 A	3.6 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.

DE5600 drive tray: Power factor correction

Power factor correction is applied within the power supply of each DE5600 drive tray, which maintains the power factor of the drive tray at greater than 0.95 with nominal input voltage.

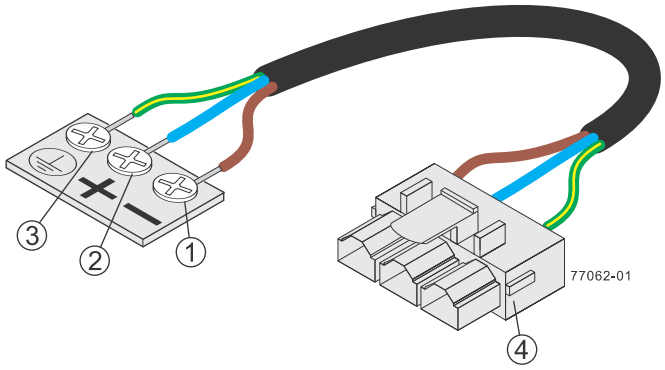
DE5600 drive tray: AC power cords and receptacles

Each DE5600 drive tray 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 tray to an independent, external AC power source, such as a wall receptacle, or to any uninterrupted power supply (UPS).

DE5600 drive tray: Optional DC power connector cables and source wires

The DE5600 drive tray 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 tray. The three source wires on the other end of the power connector cable connect the drive tray 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 tray. Two DC power connectors are on the two power-fan canisters on the rear of each drive tray if additional redundancy is required.

Note: You do not need to connect the second DC power connection on the power-fan canister of the drive tray. The second DC power connection is provided for additional redundancy only and can be connected to a second DC power bus.

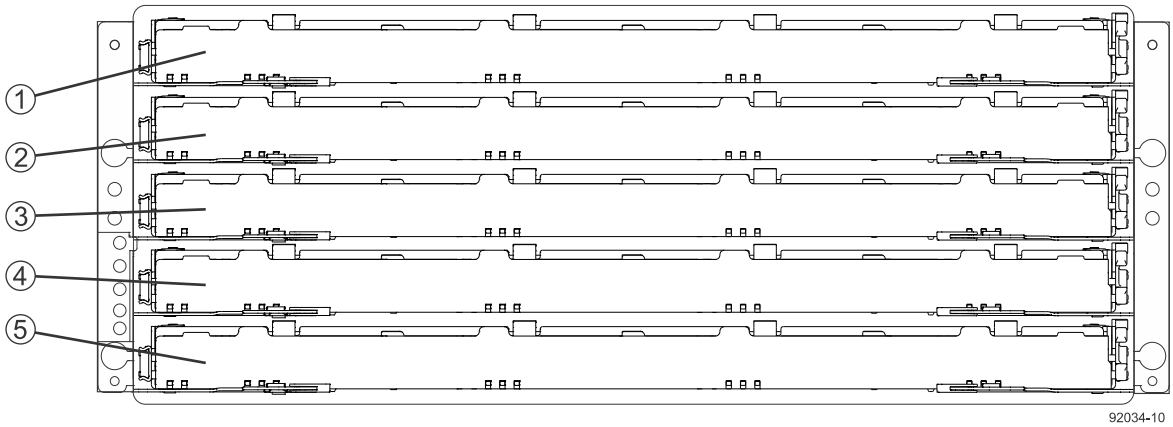
Specifications of the DE6600 drive tray

The DE6600 drive tray is a high-density SAS 2.0 (6-Gb/s) drive enclosure available in a rack-mount model. The DE6600 supports 3.5-in NL-SAS drives, 2.5-in. SAS drives, and 2.5-in. SSD drives with a minimum requirement of 20 drives per DE6600.

The DE6600 drive tray contains these components:

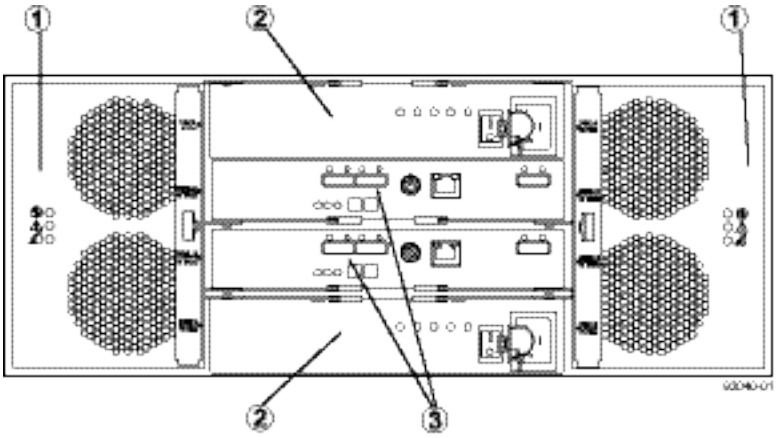
- Up to 60 SAS drives
- Two power canisters
- Two fan canisters
- Two environmental services module (ESM) canisters

DE6600 drive tray – front view with bezel removed



1.	Drive drawer 1
2.	Drive drawer 2
3.	Drive drawer 3
4.	Drive drawer 4
5.	Drive drawer 5

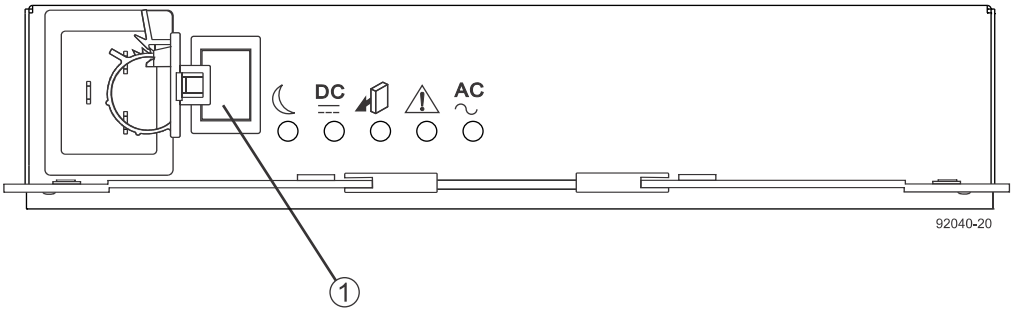
DE6600 drive tray - rear view



1.	Fan canisters
2.	Power canisters
3.	ESM canisters

An AC power source supplies power to the power canister.

DE6600 drive tray power canister – rear view

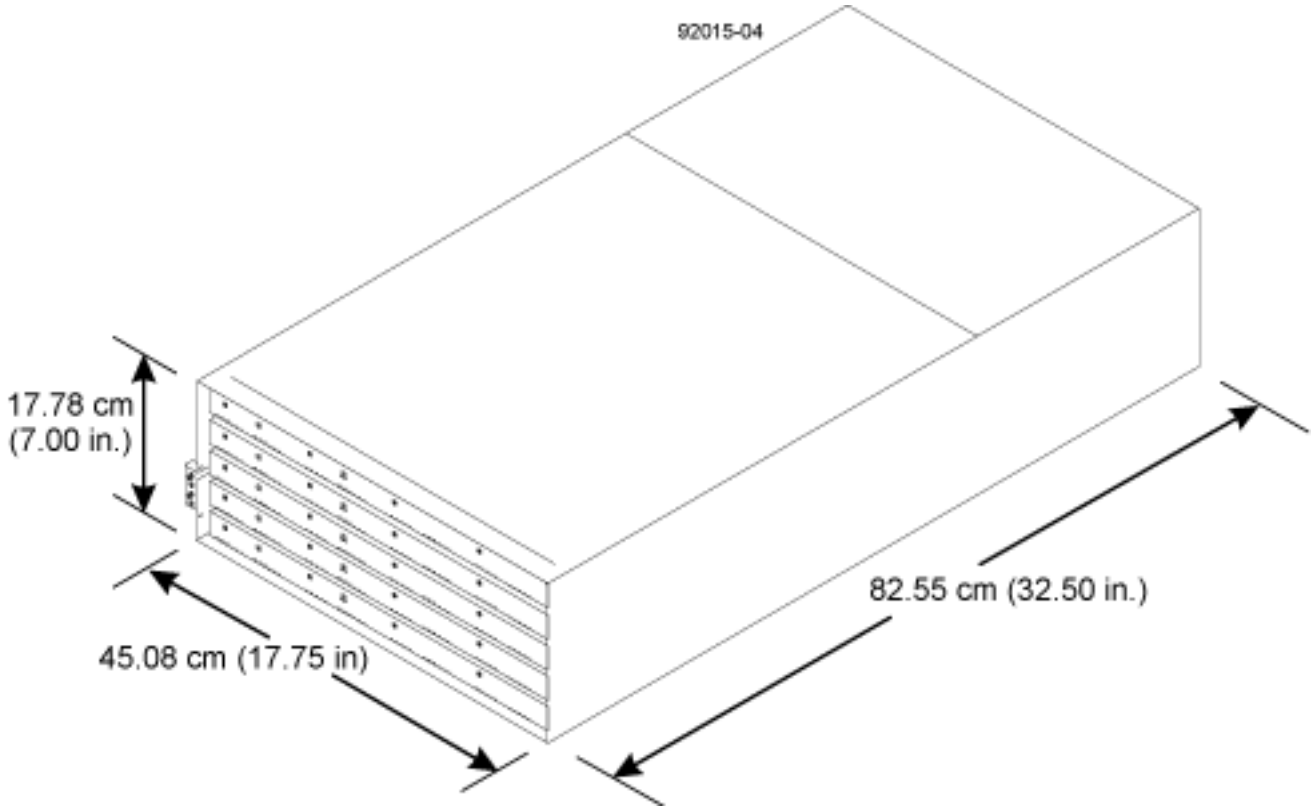


1.	AC power switch

DE6600 drive tray: Dimensions

The DE6600 drive tray is available only as a rack-mount model that conforms to the 100-cm (40.0-in.) rack depth.

Dimensions of the DE6600 drive tray – front view



DE6600 drive tray: Weight

Table 97: Weights of the DE6600 drive tray

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
DE6600 drive tray	235.32 lb (106.74 kg)	132 lb (59.8 kg)	278 lb (126 kg)
*Maximum weight indicates a controller-drive tray, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type. **Empty weight indicates a drive tray with the ESM canisters, the power canisters, the fan canisters, and the drives removed. ***Shipping weight indicates the empty weight of a drive tray and all shipping material, as well as the weight of the 60 drives that are shipped separately in multipack cartons.			

Table 98: Component weights of the DE6600 drive tray

Component	Weight
ESM canister	1.65 kg (3.64 lb)
Power canister	2.5 kg (5.5 lb)

Component	Weight
Fan canister	Approximately 1 kg (2.16 lb)
2.5-in. SAS drive	0.41 lb (0.19 kg) to 0.51 lb (0.23 kg)
3.5-in. SAS drive	1.43 lb (0.65 kg) to 1.72 lb (0.78 kg)
2.5-in. SSD	0.15 lb (0.07 kg) to 0.37 lb (0.17 kg)

DE6600 drive tray: Shipping dimensions

Table 99: Shipping carton dimensions for the DE6600 drive tray

Included drives	Height	Width	Depth
Packaging with drives	73.66 cm (29 in.)	60.96 cm (24.00 in.)	101.60 cm (40 in.)
Packaging without drives	48.26 cm (19 in.)	60.96 cm (24.00 in.)	101.60 cm (40 in.)

Note: The DE6600 can be shipped with or without drives.

DE6600 drive tray: Temperature and humidity requirements

Note: Converting *maximum rate of change* requires converting between Fahrenheit and Celsius first, and then subtracting the difference.

Table 100: Temperature requirements and humidity requirements for the DE6600 drive tray

Condition	Parameter	Requirement
Temperature*	Operating range	0°C to 35°C (32°F to 95°F)
	Maximum rate of change	10°C (95°F) per hour
	Storage range	–10°C to 50°C (95°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) without the battery
	Maximum rate of change	20°C (68°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.		

DE6600 drive tray: Altitude ranges

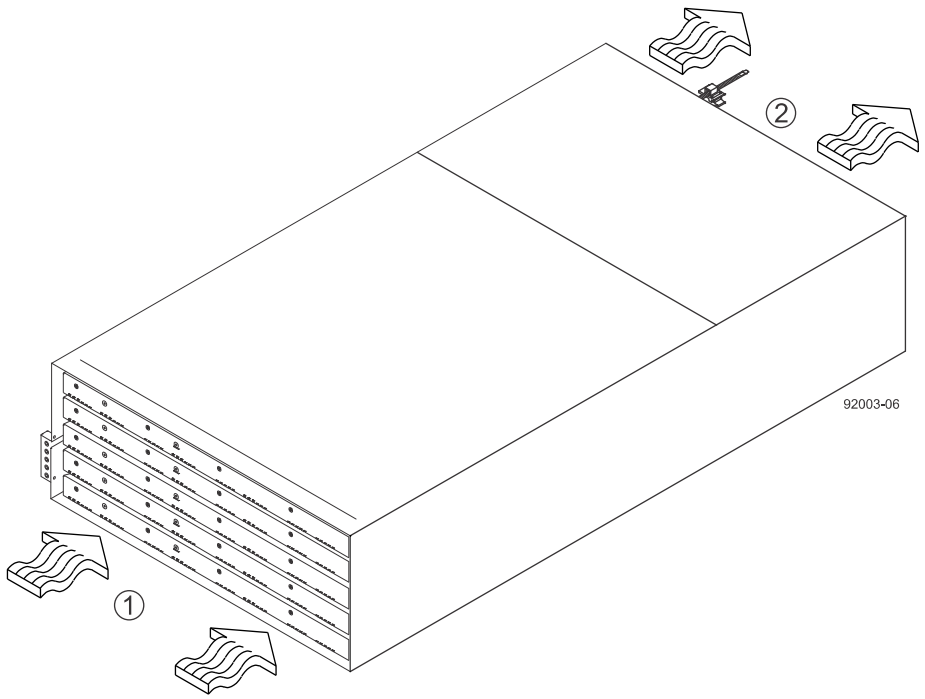
Table 101: Altitude ranges for the DE6600 drive tray

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

DE6600 drive tray: Airflow and heat dissipation

Airflow goes from the front of the drive tray to the rear of the drive tray. Allow at least 81 cm (32 in.) of clearance in front of the drive tray and at least 61 cm (24 in.) of clearance behind the drive tray for service clearance, ventilation, and heat dissipation.

Airflow through the DE6600 drive tray – front view



1.	81 cm (32 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 represent the maximum measured operating power.

Table 102: Power ratings and heat dissipation for the DE6600 drive tray

Component	Typical operating power	Rated power requirement
DE6600 drive tray (6-TB drives fully populated)	**KVA:** 0.801	**KVA:** 1.526
	Watts: 793	**Watts:** 1512
	Btu/Hr: 2707	**Btu/Hr:** 5159

DE6600 drive tray: Acoustic noise

Table 103: Acoustic noise at 25°C for the DE6600 drive tray

Measurement	Level
Sound power (standby operation)	7.2 bels
Sound power (normal operation)	7.2 bels
Sound pressure	72 dBA

DE6600 drive tray: Site wiring and power

The agency ratings for the DE6600 drive tray are 7.56 A at 200 VAC and 6.3 A at 240 VAC. These ratings are the overall maximum AC currents for this system.

The DE6600 drive tray 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 power connections or line-to-line power connections.

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

- **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 tray, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The drive tray 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 tray automatically performs a power-on recovery sequence without operator intervention after the power is restored.

DE6600 drive tray: Power input

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

Table 104: AC power requirements for the DE6600 drive tray

Parameter	High range
Nominal voltage	200 to 240 VAC
Frequency	50 to 60 Hz
Typical operating current	3.34 A
Maximum operating current	4.21 A

DE6600 drive tray: Power factor correction

Power factor correction is applied within the power canister of each DE6600 drive tray, which maintains the power factor of the drive tray at no less than 0.95 with all input voltage levels.

DE6600 drive tray: AC power cords and receptacles

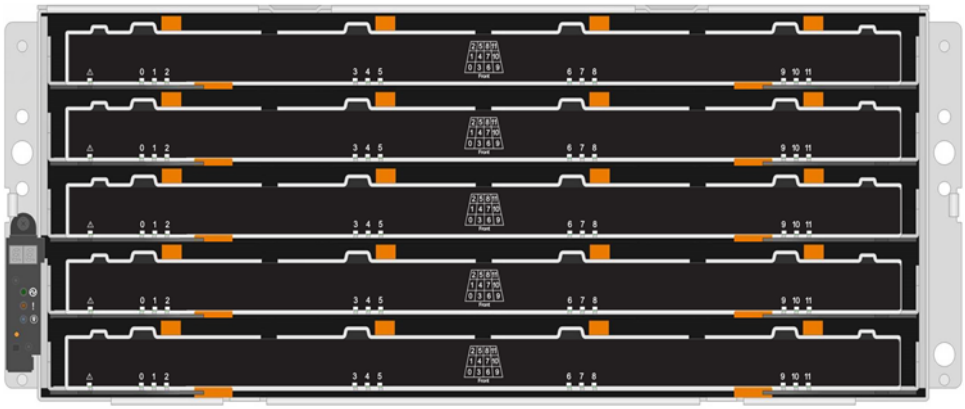
Each DE6600 drive tray is shipped with two AC power cords, which fit the standard AC outlets in the destination country. Each AC power cord connects one of the power canisters in the drive tray to an independent, external AC power source, such as a wall receptacle, or to any uninterruptible power supply (UPS).

Attention: Possible risk of equipment failure – To ensure proper cooling, the DE6600 drive tray always uses two power supplies.

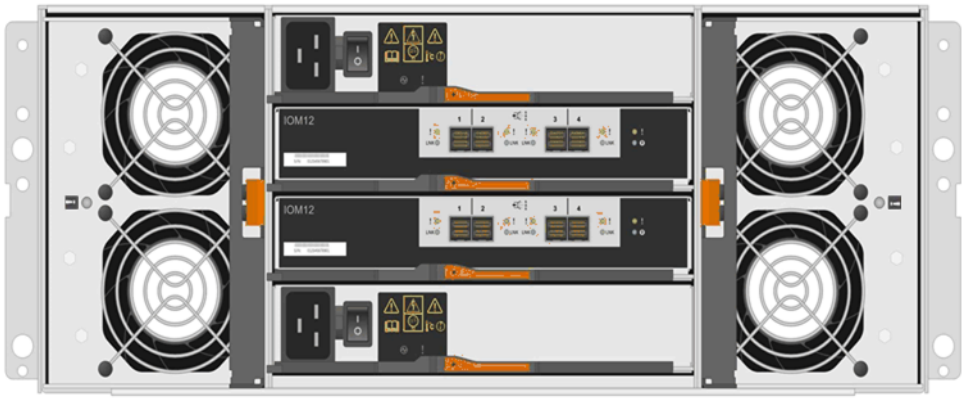
Specifications of the DE460C drive shelf

The DE460C drive shelf is a high-density SAS-3 (12 Gb/s) enclosure. It can contain a maximum of 60 high-capacity 3.5-inch SAS drives or high-performance 2.5-inch SAS drives. It is the same as the E2860 controller shelf. However, instead of controllers, the DE460C drive shelf has two I/O modules (IOMs).

The following figure shows the front of a DE460C drive shelf without the bezel:



The following figure shows the back of a DE460C drive shelf:



DE460C drive shelf: Dimensions

You must ensure that you have an industry-standard rack with sufficient depth, weight, and power handling capability.

Height	Width	Depth
6.87 in. (17.44 cm)	17.66 in. (44.85 cm)	38.25 in. (97.15 cm)

DE460C drive shelf: Weight

Unit	Weight		
	Maximum*	**Empty****	**Shipping*****
DE460C drive shelf, with sixty 60 hard disk drives (HDDs), two power canisters, two I/O modules (IOMs), two fan canisters, and the bezel	247.4 lb (112.2 kg)	107.6 lb (48.8 kg)	324.3 lb (147.1 kg)

*Maximum weight indicates a drive shelf, fully-loaded with the heaviest drives and all other components installed. Because drive weights can vary greatly, this value can vary, depending on the drives installed. Refer to the next table for weight ranges by drive type.

**Empty weight indicates a drive shelf with the IOM canisters, the power canisters, the fan canisters, and the drives removed.

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

Component	Weight
IOM	3.5 lb (1.6 kg)
Single drawer (no drives, no cable chain)	11.9 lb (5.4 kg)
Power canister	5.7 lb (2.6 kg)
Fan canister	3.5 lb (1.6 kg)
2.5-in. SAS drive carrier	0.48 lb (0.22 kg)
3.5-in. SAS drive carrier	0.14 lb (0.06 kg)
Bezel	1.86 lb (0.84 kg)

DE460C drive shelf: Shipping dimensions

Height	Width	Depth
27.1 in. (68.8 cm)	26.9 in. (68.3 cm)	46.3 in. (117.6 cm)

DE460C drive shelf: Temperature and humidity

Condition	Parameter	Requirement
Temperature	Operating range (both cabinet and subsystem)	50°F to 104°F (10°C to 40°C)
	Storage range	32°F to 158°F (0°C to 70°C)
	Transit range	–40°F to 158°F (–40°C to 70°C)

Condition	Parameter	Requirement
Relative humidity (no condensation)	Operating range (both cabinet and subsystem)	20% to 80%
	Storage range	5% to 95%
	Transit range	10% to 95%
If you plan to operate a system at an altitude between 3280 ft to 9842 ft (1000 m to 3000 m) above sea level, lower the environmental temperature 3.1°F (1.7°C) for every 3280 ft (1000 m) above sea level.		

DE460C drive shelf: Altitude ranges

Environment	Altitude
Operating	100 ft (30.5 m) below sea level to 9842 ft (3000 m) above sea level
Transit	100 ft (30.5 m) below sea level to 40,000 ft (12,192 m) above sea level
Storage	100 ft (30.5 m) below sea level to 40,000 ft (12,192 m) above sea level

DE460C drive shelf: Airflow and heat dissipation

The clearance needed for proper ventilation and heat dissipation is as follows:

Clearance in front of the cabinet	32 in. (81.2 cm)
Clearance behind the cabinet	24 in. (60.9 cm)

The power and heat dissipation values are as follows:

Typical operating power in KVA	1.05
Typical operating power in Watts	1022
Typical operating power in BTU/Hr	3495

DE460C drive shelf: Acoustic noise

Measurement	Level
Sound power (standby operation)	7.2 bels
Sound power (normal operation)	7.2 bels
Sound pressure	72 dBA

DE460C drive shelf: Site wiring and power

The power supplies in the DE460C drive shelf support voltages in the 200V to 240V range. The power supplies meet standard voltage requirements for both North American (USA and Canada) operation and worldwide 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 shelf:

- **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 shelf, isolate its power source from large switching loads, such as air-conditioning motors, elevator motors, and factory loads.
- **Power interruptions** – The drive shelf 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 shelf automatically performs a power-on recovery sequence without operator intervention.

DE460C drive shelf: Power input

Each power supply contains two 16A slow-blow fuses.

Parameter	Low range	High range
Nominal voltage	200 VAC	240 VAC
Frequency	50 Hz	60 Hz
Typical operating current	5.2A	4.3A
Maximum operating current	6.0A	5.4A
System nameplate rating	9.98A	8.32A

These numbers can vary significantly, depending upon the drives tested in the particular configuration.

DE460C drive shelf: Power factor correction

Power factor correction is applied within the power supply, which maintains the power factor of the DE460C drive shelf at greater than 0.95 with nominal input voltage.

DE460C drive shelf: AC power cords and receptacles

The DE460C drive shelf 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 shelf to an independent, external AC power source, such as a wall receptacle, or to any uninterrupted power supply (UPS).

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