

IBM Cloud Object Storage System™  
Version 3.13.4

*Slicestor® 2584 Appliance Manual*  
*3409-S03/3401-S03/3403-S03*



**Note**

Before using this information and the product it supports, read the following information:

- The general information in *Notices*
- The information in *Safety and environmental notices*
- The information in the *IBM Environmental Notices and User Guide* (provided on a DVD)

This edition applies to IBM Cloud Object Storage System™ Slicestor® 2584 and is valid until replaced by new editions.

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## Safety and environmental notices

Review the safety notices, environmental notices, and electronic emission notices for IBM® Cloud Object Storage System before you install and use the product.

Suitability for telecommunication environment - This product is not intended to connect directly or indirectly by any means whatsoever to interfaces of public telecommunications networks.

Examples of a caution and a danger notice. Numbers in parentheses refer to message numbers in the *IBM Safety Notices* publication G229-9054, which is included with your product.

### CAUTION:

**A caution notice indicates the presence of a hazard that has the potential of causing moderate or minor personal injury. (C001)**

### DANGER

<b>A danger notice indicates the presence of a hazard that has the potential of causing death or serious personal injury. (D002)</b>
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## Safety notices

Safety notices for this product.

Familiarize yourself with the *IBM Safety Notices* publication G229-9054, which is included with your product.

**DANGER:** When working on or around the system, observe the following precautions:

Electrical voltage and current from power, telephone, and communication cables are hazardous. To avoid a shock hazard:

- If IBM supplied a power cord(s), connect power to this unit only with the IBM provided power cord. Do not use the IBM provided power cord for any other product.
- Do not open or service any power supply assembly.
- Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.
- The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords.
- Connect all power cords to a properly wired and grounded electrical outlet. Ensure that the outlet supplies proper voltage and phase rotation according to the system rating plate.
- Connect any equipment that will be attached to this product to properly wired outlets.
- When possible, use one hand only to connect or disconnect signal cables.
- Never turn on any equipment when there is evidence of fire, water, or structural damage.
- Do not attempt to switch on power to the machine until all possible unsafe conditions are corrected.
- Assume that an electrical safety hazard is present. Perform all continuity, grounding, and power checks specified during the subsystem installation procedures to ensure that the machine meets safety requirements.
- Do not continue with the inspection if any unsafe conditions are present.
- Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.
- Connect and disconnect cables as described in the following procedures when installing, moving, or opening covers on this product or attached devices.

To disconnect:

1. Turn off everything (unless instructed otherwise).
2. Remove the power cords from the outlets.
3. Remove the signal cables from the connectors.
4. Remove all cables from the devices.

To connect:

1. Turn off everything (unless instructed otherwise).
  2. Attach all cables to the devices.
  3. Attach the signal cables to the connectors.
  4. Attach the power cords to the outlets.
  5. Turn on the devices.
- Sharp edges, corners and joints may be present in and around the system. Use care when handling equipment to avoid cuts, scrapes and pinching. (D005)

**DANGER:** Heavy equipment — personal injury or equipment damage might result if mishandled. (D006)

**DANGER:** Professional movers are to be used for all relocation activities. Serious injury or death may occur if systems are handled and moved incorrectly. (D008)

**DANGER:** Serious injury or death can occur if loaded lift tool falls over or if a heavy load falls off the lift tool. Always completely lower the lift tool load plate and properly secure the load on the lift tool before moving or using the lift tool to lift or move an object. (D010)

**CAUTION:** The battery contains lithium. To avoid possible explosion, do not burn or charge the battery.

**Do not:** Throw or immerse into water, heat to more than 100°C (212°F), repair or disassemble. (C003)

Use the following general safety information for all rack mounted devices:

**DANGER:** Observe the following precautions when working on or around your IT rack system:

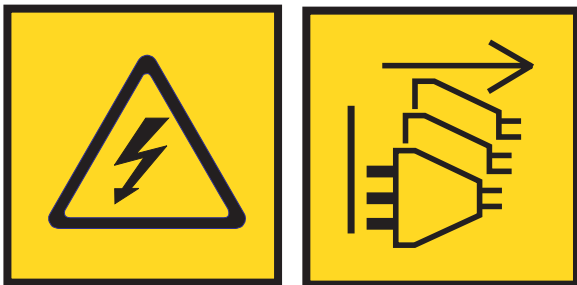
- Heavy equipment—personal injury or equipment damage might result if mishandled.
- Always lower the leveling pads on the rack cabinet.
- Always install stabilizer brackets on the rack cabinet.
- To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.
- Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices.



- Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.
- Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.
- An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.  
(R001 part 1 of 2)

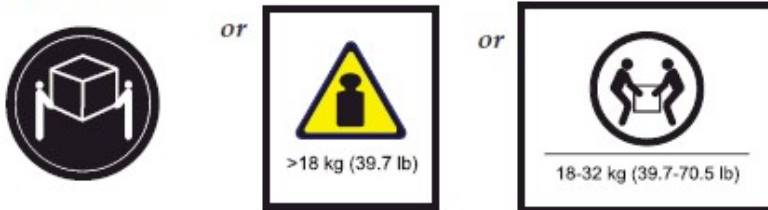
**CAUTION:**

- Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.
- Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front or back of a unit used for air flow through the unit.
- Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.
- (For sliding drawers): Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.
- (For fixed drawers): This drawer is a fixed drawer and must not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack.  
(R001 part 2 of 2)



**DANGER:** Multiple power cords. The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords. (L003)

**CAUTION:**



The weight of this part or unit is between 18 and 32 kg (39.7 and 70.5 lb). It takes two persons to safely lift this part or unit. (C009)

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## Environmental notices

This information contains all of the environmental notices for IBM Systems products in English and other languages.

The IBM Systems Environmental Notices (<http://ibm.co/1fBgWFI>) information includes statements on limitations, product information, product recycling and disposal, battery information, flat panel display, refrigeration and water-cooling systems, external power supplies, and safety data sheets.

## Declared noise emissions

### Declared noise emissions in accordance with ISO 9296<sup>(1, 2, 3)</sup>

Table 1. Declared noise emissions in accordance with ISO 9296<sup>(1,2,3)</sup>

Product description	Declared A-Weighted Sound Power Level, $L_{WAAd}$ (B)		Declared A-Weighted Sound Pressure Level, $L_{pAm}$ (dB)	
	Operating	Idling	Operating	Idling
Model S03 @ 25 deg. C room ambient	8.0	8.0	61	61
Model S03 @ 35 deg. C room ambient	9.3	9.3	75	75
Model S03 @ 25 deg. C room ambient w/Acoustical doors Feature codes FC EC07 = back FC EC08 = front	7.4	7.4	55	55
Model S03 @ 35 deg. C room ambient w/Acoustical doors Feature codes FC EC07 = back FC EC08 = front	8.7	8.7	69	69

Notes:

1. Declared level  $L_{WAAd}$  is the upper-limit A-weighted sound power level; Declared level  $L_{pAm}$  is the mean A-weighted sound pressure level measured at the 1-meter bystander positions.
2. All measurements made in conformance with ISO 7779 and declared in conformance with ISO 9296.
3. B, dB, abbreviations for bels and decibels, respectively. 1 B = 10 dB.



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## Support information

For more information on the product or help with troubleshooting, contact IBM Support at [IBMCloudStorageSupport@us.ibm.com](mailto:IBMCloudStorageSupport@us.ibm.com) or visit the Directory of worldwide contacts.





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## Chapter 1. Appliance safety precautions

Observe physical, electrical, and electronic component safety precautions.



**DANGER:** An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (D004)

**DANGER:** Hazardous voltage present. Voltages present constitute a shock hazard, which can cause severe injury or death. (L004)

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### Introduction

**CAUTION:**

This equipment must be used in the manner that is specified in this document and any related documentation. Failure to do so can bypass the protection that is provided by the equipment.

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### Damage

If you think the equipment is damaged in any way, remove all external cords and cables and contact your equipment supplier.

---

### Handling

**CAUTION:**

A fully configured Slicestor<sup>®</sup> SP-2584 enclosure weighs up to 131 kg (288 lb). An unpopulated enclosure weighs 46 kg (101 lb). Use appropriate lifting methods.



Figure 1. Lifting hazard

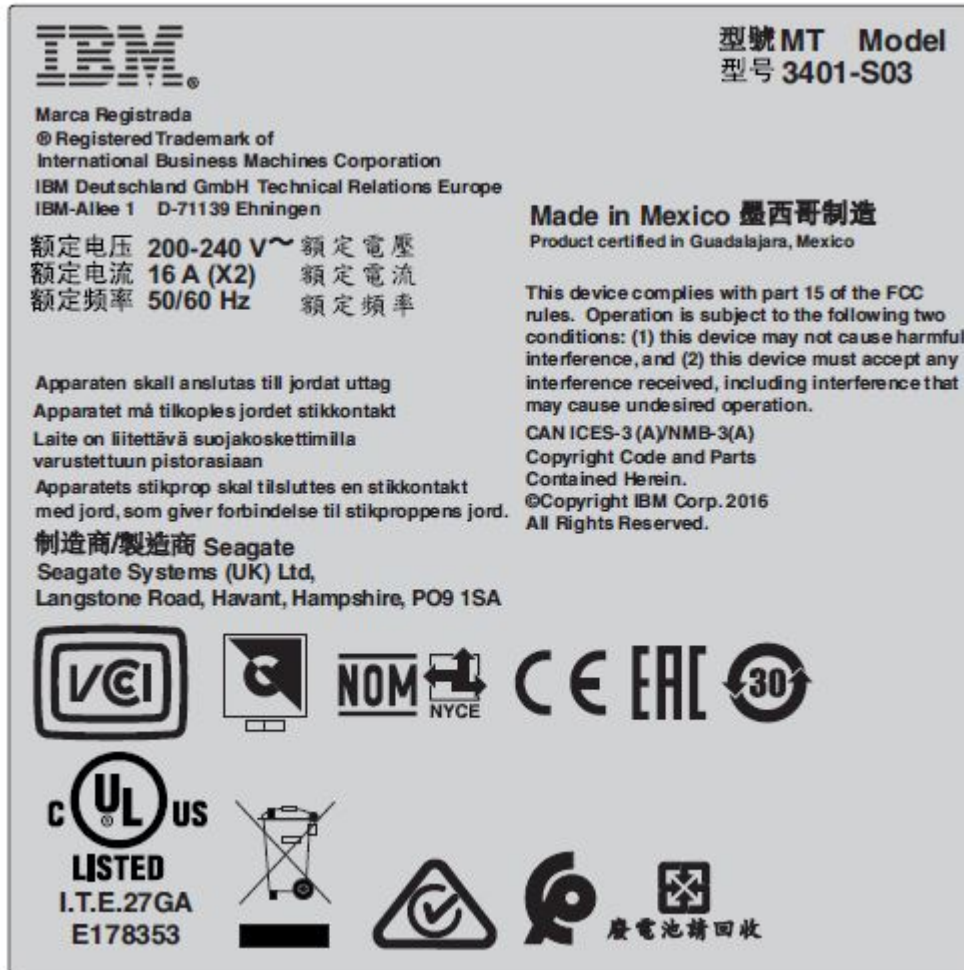


Figure 2. Chassis label (FCC compliance)

Before lifting the enclosure, complete the following tasks:

- Unplug all cords and cables from the enclosure.
- Remove all DDIC modules from both drawers and make sure that the drawers are closed firmly and locked shut. See "Locking drawers."

Use a minimum of three people to lift the enclosure.

Use the lifting straps that are supplied with the enclosure. Do not lift the enclosure by the handles on the power supply units, cooling modules, or I/O modules. They are not designed to take the weight.

Do not lift the enclosure higher than 20U (35 in.). Use mechanical assistance to lift above this height.

## Operation

**Important:** All rear modules are part of the fire enclosure and must be removed when a replacement can be immediately inserted.

**Important:** The enclosure does not receive sufficient airflow or cooling if it is operated with any missing rear modules. Every module bay must be filled either with a module or a blank module.



*Figure 3. Module bay caution label*

Replace any defective modules with fully operational units as soon as possible. Do not remove cooling modules, PSUs, or compute modules unless you have a replacement model of the correct type ready for insertion.

**CAUTION:**

**To prevent overturning, drawer interlocks stop users from opening both drawers at the same time. Do not attempt to force open a drawer when the other drawer in the enclosure is already open. In a rack with more than one enclosure, do not open more than one drawer per rack at a time.**

**CAUTION:**

**Operating temperatures inside the enclosure drawers can reach up to 60°C. Take care opening drawers and removing drive carriers.**



*Figure 4. Hot surface warning label*

**CAUTION:**

**Due to product acoustics, wear ear protection for any prolonged exposure.**



Figure 5. PSU warning label

Before removing a module, disconnect all power cords and cables.

Do not use open drawers to support any other equipment.

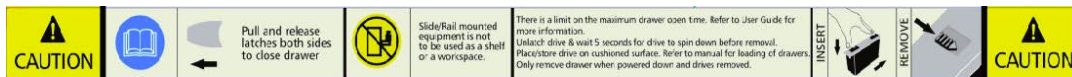


Figure 6. Drawer caution label

## Electrical safety

Operate the enclosure from a power supply input voltage range of 200 to 240 VAC, 50 - 60 Hz only.

A suitable power source with electrical overload protection must be provided to meet the requirements in the technical specification.

All power supply cords must have a safe electrical ground connection. Check the connection to ground of the enclosure before you turn on the power supply.

**Important:** The enclosure must be grounded before applying power.

The plug on the power supply cord is used as the main disconnect device. Ensure that the socket outlets are located near the equipment and are easily accessible.

### CAUTION:

When powered by multiple AC sources, disconnect all supplied power for complete isolation.

## DANGER

Do not remove covers from the enclosure or any of the modules. There is a danger of electric shock inside. Do not attempt to disassemble the rear subchassis from the enclosure. Return any damaged components to your supplier for repair.



**DANGER:** Hazardous voltage, current, or energy levels are present inside any component that has this label attached. Do not open any cover or barrier that contains this label. (L001)

## CAUTION:

The PSUs contain double pole/neutral fusing. Ensure that your electrical installation can support this type of fusing.

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## Rack system safety precautions

The enclosure must be mounted in a rack before use.

The rack must support the total weight of the installed enclosures. A fully populated enclosure weighs up to 135 kg (298 lb). The design should incorporate stabilizing features suitable to prevent the rack from tipping or being pushed over during installation or in normal use.

When loading a rack with enclosures, fill the rack from the bottom up. When removing enclosures, empty from the top down.

## CAUTION:

**The enclosure must be mounted into a rack by using the supplied rail kit only. Due to its weight and length, the enclosure must not be flange mounted.**

Before mounting the enclosure, remove all DDIC modules from both drawers and make sure that the drawers are closed firmly and locked shut. Do not try to lift the enclosure by yourself (see "Handling").

## CAUTION:

**Never move more than one enclosure out of the rack at any one time. There is a danger of the rack falling over.**

The system must be operated with low-pressure rear exhaust installation. The back pressure that is created by the rack doors and obstacles is not to exceed 5 pascals (0.5 mm water gauge).

The minimum open area for the rack doors is 70%.

The rack design should consider the maximum operating ambient temperature for the enclosure, which is 35°C.

The rack must have a safe electrical distribution system. It must provide overcurrent protection for the enclosure and must not be overloaded by the total number of enclosures that are installed in the rack. When addressing these concerns, consideration should be given to the electrical power consumption rating shown on the nameplate.

The electrical distribution system must provide a reliable ground for each enclosure, and for the rack.

Each PSU in each enclosure has a ground leakage current of 1.6 mA. The design of the electrical distribution system must consider the total ground leakage current from all the PSUs in all the enclosures. The rack must be labeled with the words: "HIGH LEAKAGE CURRENT. Ground connection essential before connecting supply."

The rack must meet the safety requirements of UL 60950-1 and IEC 60950-1.

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## **Electrostatic discharge (ESD) precautions**

Fit and check a suitable anti-static wrist or ankle strap and observe all conventional ESD precautions when handling plug-in modules and components. Avoid contact with backplane components and module connectors.

---

## **Regional safety**

For North American use, the branch circuit must be rated for 20A.

This equipment is suitable for connection to an IT power system (Norway).





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## Chapter 2. System overview

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### Chassis

The system is housed in a 5U chassis that contains two drawers of 42 drives each (84 drives in total).

The system is shown in the following figures.



*Figure 7. Enclosure front view*

The system uses 3.5" SATA drives. Each drive is hot pluggable and can be replaced on site.

---

### The enclosure core product

The Slicestor<sup>®</sup> design concept is based on an enclosure subsystem together with a set of plug-in modules.

A typical enclosure system for direct dock SATA (as supplied) comprises:

- The enclosure chassis has the following parts.
  - Two sliding drawers containing Disk Drive In Carrier (DDIC) modules
  - An operator's (ops) panel
  - A front bezel
  - A midplane PCB into which other components connect
- Two Power Supply Units (PSUs). The system can be operated on a single PSU.
- One PSU module blank.
- Five cooling modules.

- One compute module. Must be inserted in slot B (RHS).
- One compute module blank.
- Up to 84 Disk Drive In Carrier (DDIC) modules with SATA drives installed.
- A rail kit for rack mounting.

**Important:** To ensure correct airflow and cooling, all PSU bays and cooling module bays must contain a functioning unit.

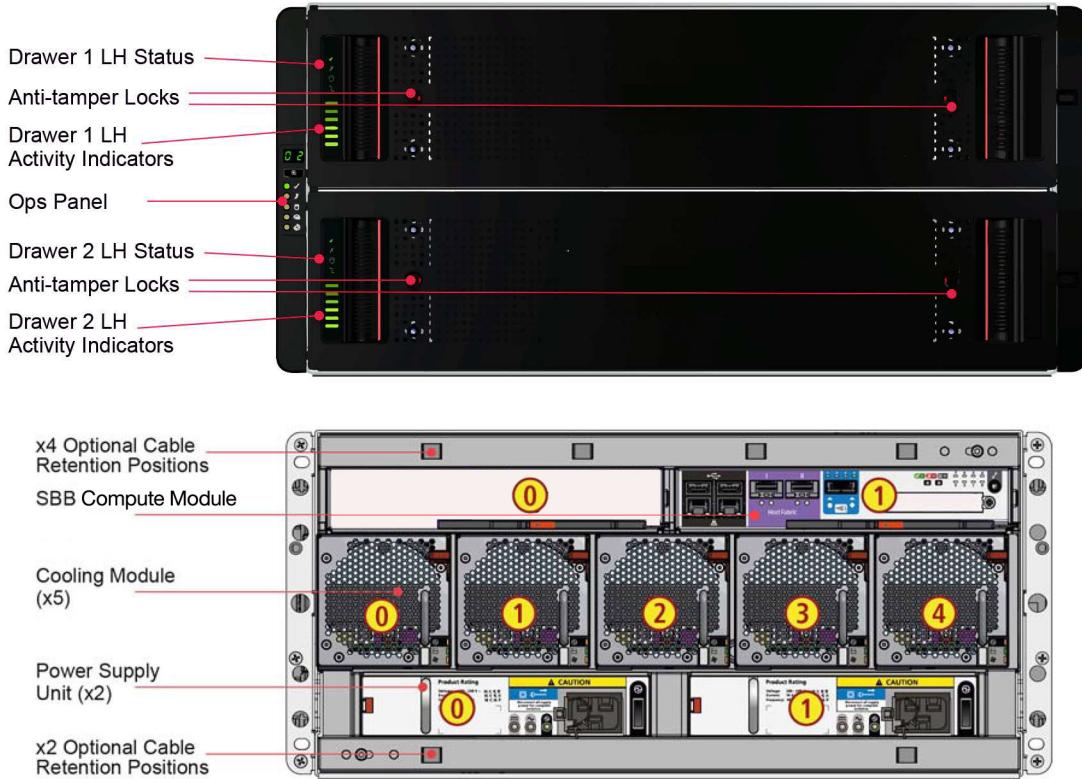


Figure 8. AP-TL-1 module locations

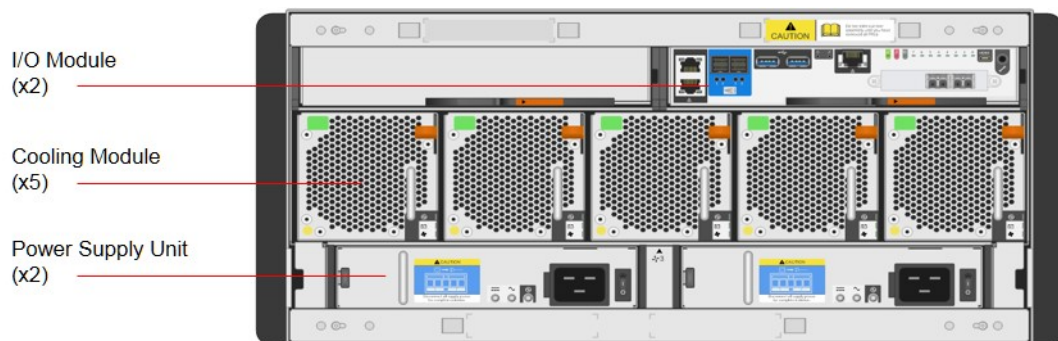


Figure 9. AP-LS-1 module locations

## Components

The chassis consists of a sheet metal enclosure assembly with an integrated midplane PCB, module runner system, and two drawers for drive modules.

The chassis has a 19-inch rack mounting that enables it to be installed on to standard 19-inch racks and uses 5 EIA units of rack space (8.75 inches (222 mm)).

Each drawer contains 42 bays for Disk Drives in Carriers (DDICs). DDICs are top-mounted into the drawers.

At the rear, the chassis assembly can accept two PSUs (or one PSU + one PSU blank), one SBB compute module and SBB module blank, and five cooling modules.

## **Drawers**

Each drawer contains 42 slots, each of which accepts a single DDIC containing a 3.5" drive.

Opening a drawer does not interrupt the functioning of the system, and DDICs can be hotswapped while the enclosure continues to operate. However, drawers must not be left open for longer than 2 minutes, otherwise airflow and cooling are compromised.

The drawer is designed to support its own weight, plus the weight of any drives, when fully open.

The following safety features are included:

- To reduce the possibility of toppling, only one drawer can be open at any one time.
- The drawer locks into place when opened all the way. To reduce pinching hazards, two latches must be released before the drawer can be pushed back in.

Data is sent via three baseplanes and a single sideplane that is mounted on the left side of the drawer, with no redundant path available. Power is sent via three baseplanes and two sideplanes, the sideplanes ensures a redundant power path to each drive. The right sideplane provides power to the drives and does not provide a data path.

Each drawer is locked shut by turning both anti-tamper locks clockwise. Use a screwdriver with a Torx T20 bit (see Figure 8 on page 10). Each side of each drawer has a series of status LEDs, shown in the following figure.

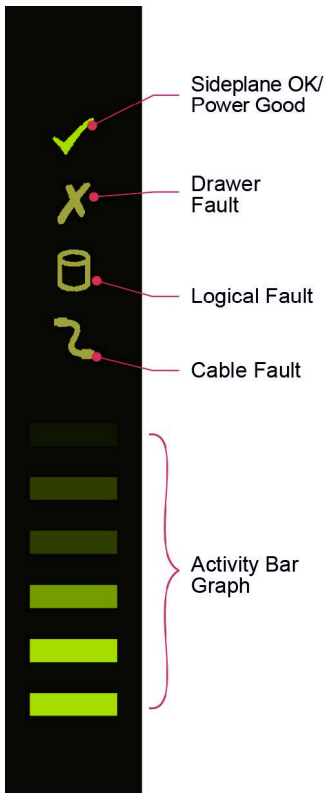


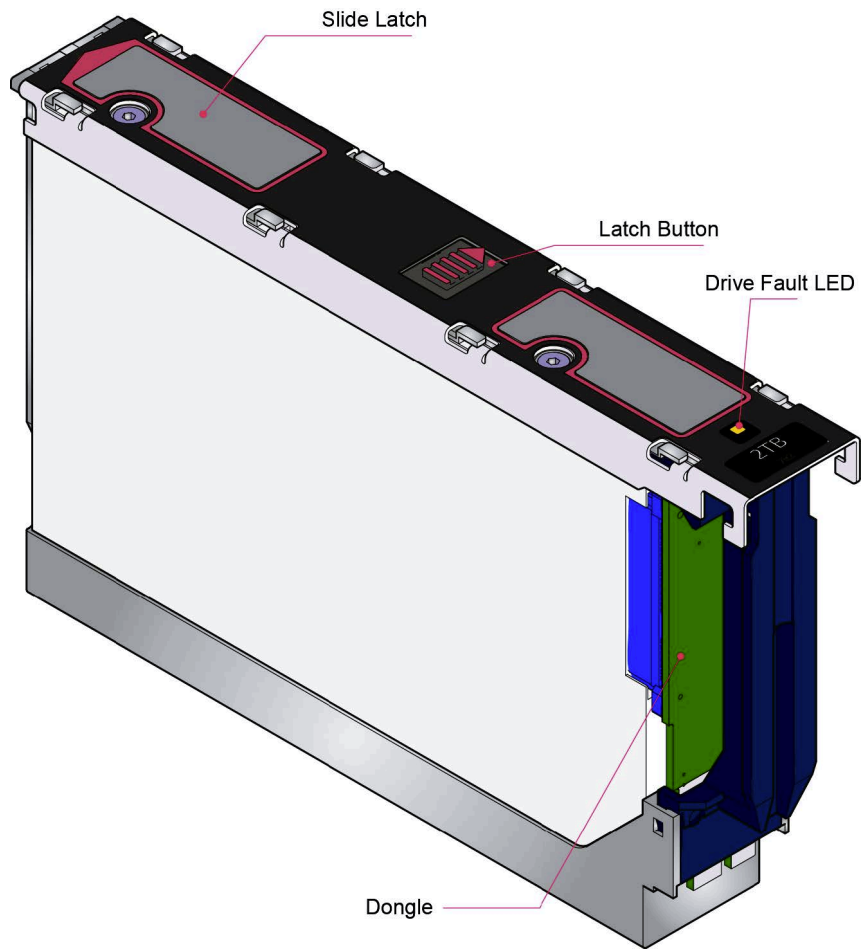
Figure 10. Drawer LEDs (left side only)

**Important:** During normal operation, drawers must be kept shut to ensure correct airflow and cooling.

### Disk drives in carriers (DDICs)

Each drive is housed in a carrier that enables secure insertion of the drive into the drawer and contains a SAS carrier transition card (used with direct dock SATA).

Figure 11. A disk drive in carrier (DDIC)



The following hard disk drives are supported:

- 3.5" 7200 rpm SATA drive

The drive carrier has a single amber LED that is lit when the drive has a fault.

## Operator's panel

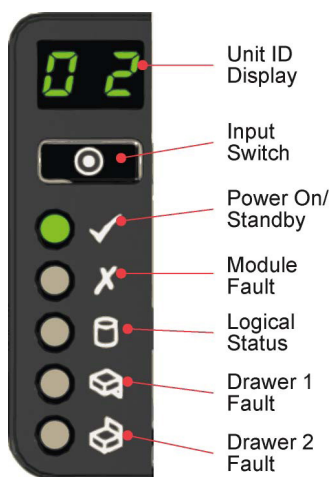


Figure 12. Enclosure operator's panel

The left front of the enclosure features an operator's (ops) panel (shown in previous figure). The panel contains the following indicators:

### Unit Identification Display

A numerical display whose primary function is to display the enclosure unit identification number. It can be helpful when setting up and maintaining multiple enclosure systems.

However, a VPD (Vital Product Data) option allows the unit identification display to be configured for other purposes. The display is on by default and displays a value of 0. See "Unit Identification Number".

### Mute/Input button

Used to set the unit identification display. See "How To Set the Unit Identification Number".

### Power On/Standby LED (green/amber)

Shows amber when the system is in standby (not operational). Shows green when the system is on (operational).

### Module Fault LED (amber)

Shows amber when a system hardware fault exists. Additionally, an LED might be lit on a PSU, drawer, DDIC, cooling module, or compute module that helps you identify which component is at fault.

### Logical Status LED (amber)

Indicates a change of status or fault from something other than the Enclosure Management (EM) system. It is usually associated with a disk drive and LEDs at each disk drive position help you identify the drive that is affected.

### Drawer 1 Fault LED (amber)

Indicates a drive, cable, or sideplane fault in drawer 1.

### Drawer 2 Fault LED (amber)

Indicates a drive, cable, or sideplane fault in drawer 2.

The ops panel is a part of the chassis, and is not replaceable on site.

---

## Power supply unit (2200 kW PSU)

Power is provided by two 2200 W PSUs. These units require an input of 200 to 240 VAC at 50 to 60 Hz.

The following figure shows the PSU.

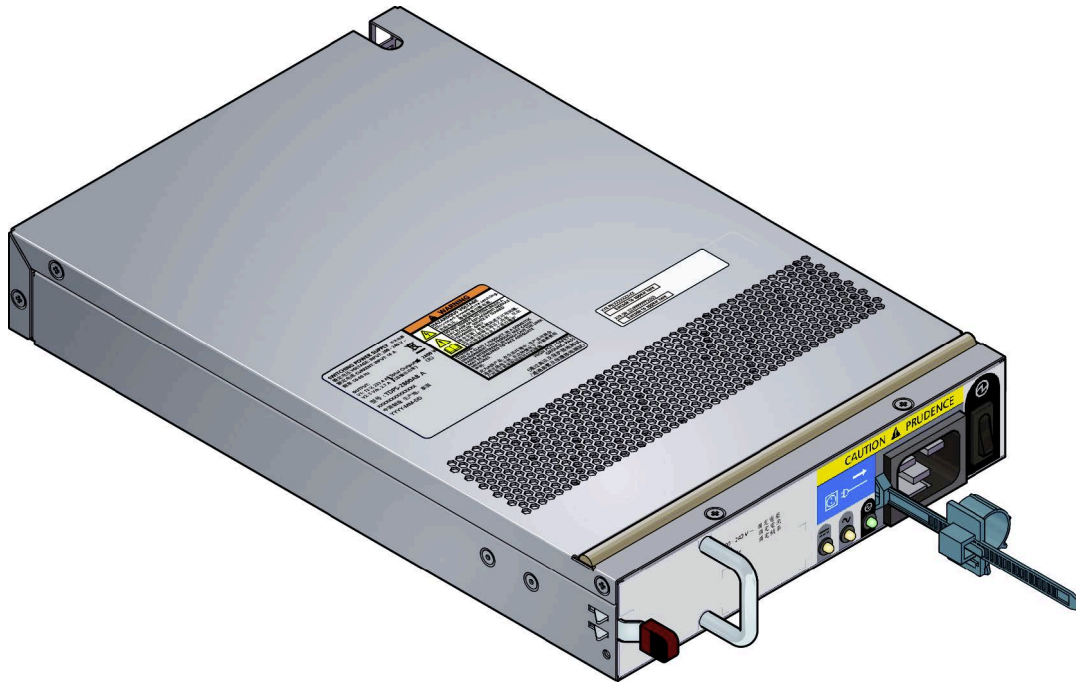


Figure 13. 2200 W PSU

Dual PSUs provide redundant power for the system. If one PSU fails, the other keeps the system running while you replace the faulty module. The PSUs are hot-swappable. Replacement of a PSU can be performed while the enclosure is running, but the procedure must be completed within 2 minutes of the removal of the defective PSU. Ensure that you have a replacement PSU before you remove the defective PSU.

The enclosure chassis is keyed to prevent PSUs from being inserted upside down.

The back of the PSU has a power switch, three status LEDs, and a socket for the power cord, as shown in the following figure.

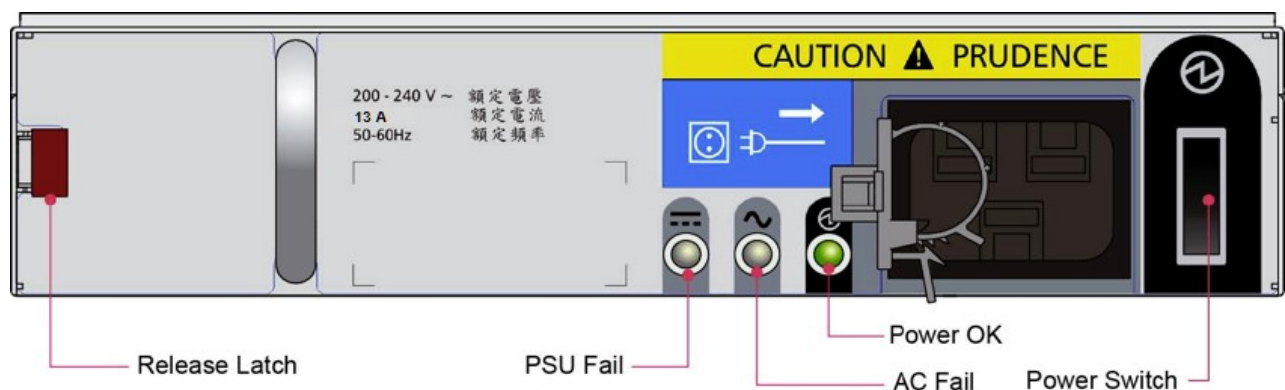


Figure 14. PSU LEDs

## Power supply unit (2800 kW PSU)

Power is provided by two 2800 W PSUs. These units require an input of 200 to 240 VAC at 50 to 60 Hz.



The following figure shows the PSU.

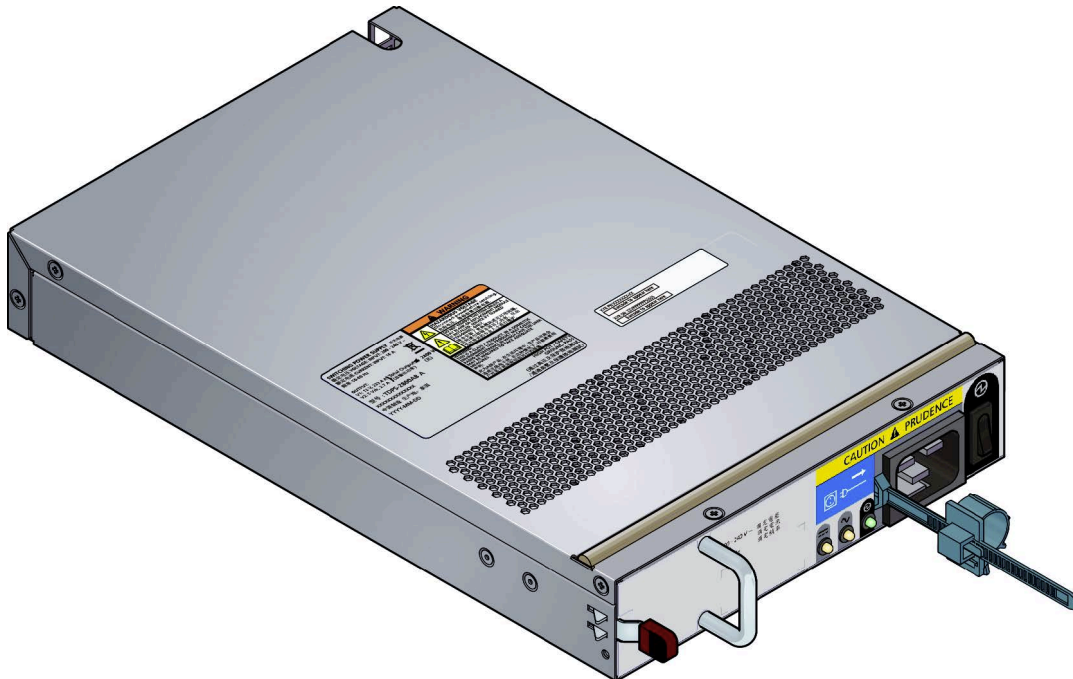


Figure 15. 2800 W PSU

Dual PSUs provide redundant power for the system. If one PSU fails, the other keeps the system running while you replace the faulty module. The PSUs are hot-swappable. Replacement of a PSU can be performed while the enclosure is running, but the procedure must be completed within 2 minutes of the removal of the defective PSU. Ensure that you have a replacement PSU before you remove the defective PSU.

The enclosure chassis is keyed to prevent PSUs from being inserted upside down.

The back of the PSU has a power switch, three status LEDs, and a socket for the power cord, as shown in the following figure.

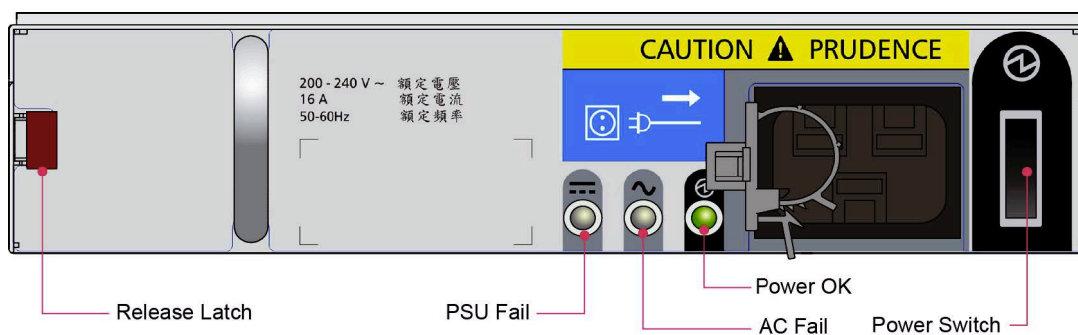


Figure 16. PSU LEDs

## Cooling module

The five cooling modules at the rear of the enclosure maintain all system components below their maximum temperature, assuming the ambient temperature is below 95° F (35°C).



The speed of the fans in the cooling modules is controlled by the SSB compute modules. For more information about the system airflow, see “System airflow.”

Cooling modules can be hot-swapped while the enclosure is still running, assuming that only one module is removed at a time and the swap takes no longer than 2 minutes. Ensure that you have a replacement cooling module before you remove the defective cooling module.

The following figure shows a cooling module.

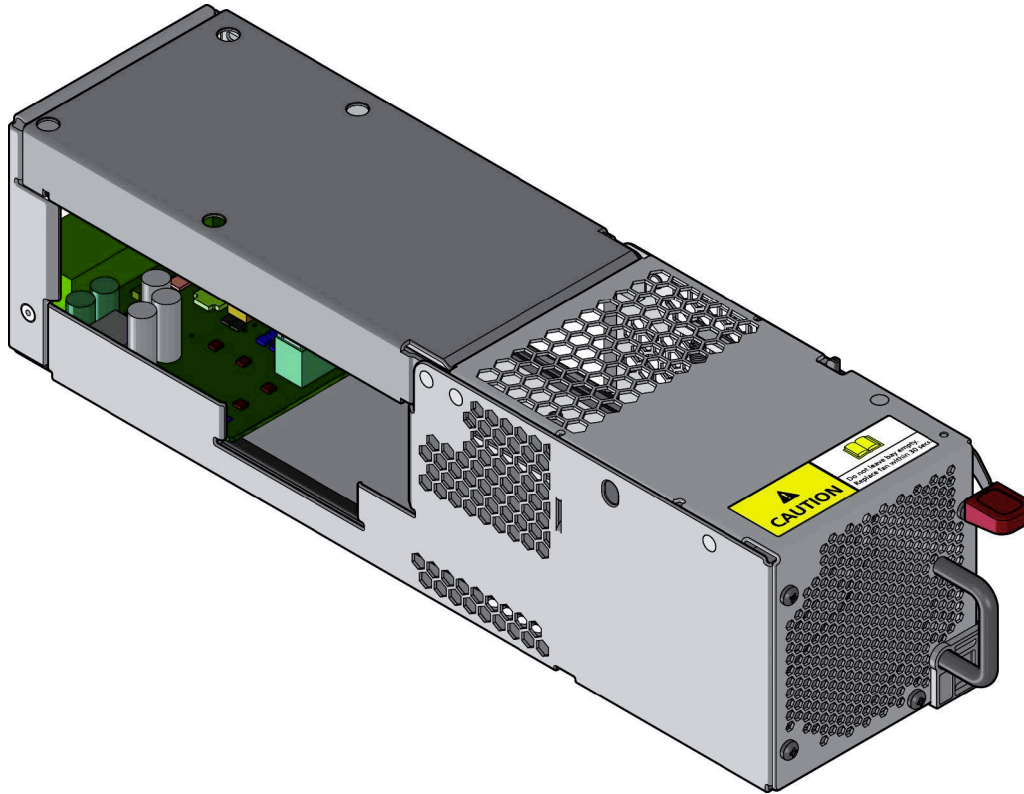


Figure 17. Cooling module

## System airflow

The system must be operated with low-pressure rear exhaust installation. Back pressure that is created by the rack doors and obstacles is not to exceed 5 pascals (0.5 mm water gauge). The cooling system provides sufficient capacity to ensure that maximum temperatures are not exceeded.

The minimum open area for the rack doors is 70%.

## Cooling module LEDs

Cooling modules have LEDs for the module status and fan faults.

The following figure shows the LEDs for a cooling module.

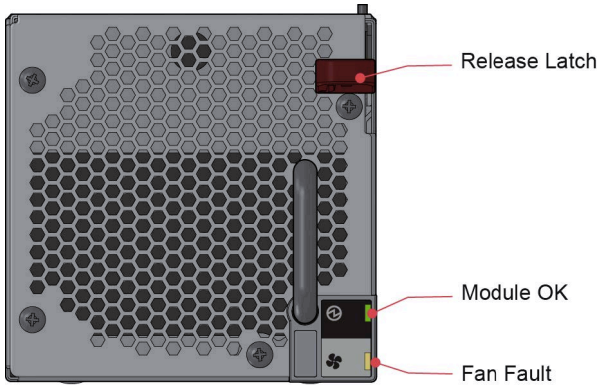


Figure 18. Cooling module LEDs

Table 2. Cooling module LED states

Module OK (green)	Fan fault (amber)	Status
X	Off	Fan OK
X	On	Communication lost with fan module controller
X	On	Reported fan speed is out of tolerance
On	X	Module good (battery and fan)
X = disregard		

## Compute modules

The platform has various compute module options. Refer to the specific compute module documentation for details.

All compute modules are mechanically and electrically compliant to the SSB V2 specification.

The following figures show the AP-TL-1 and AP-LS-1 compute modules.

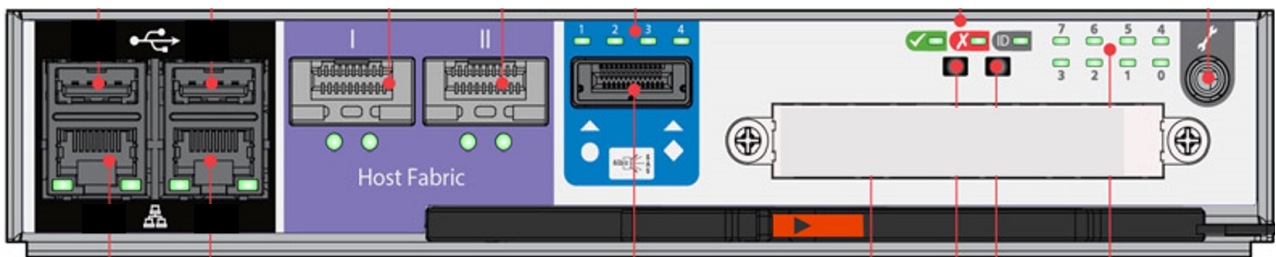


Figure 19. AP-TL-1 module

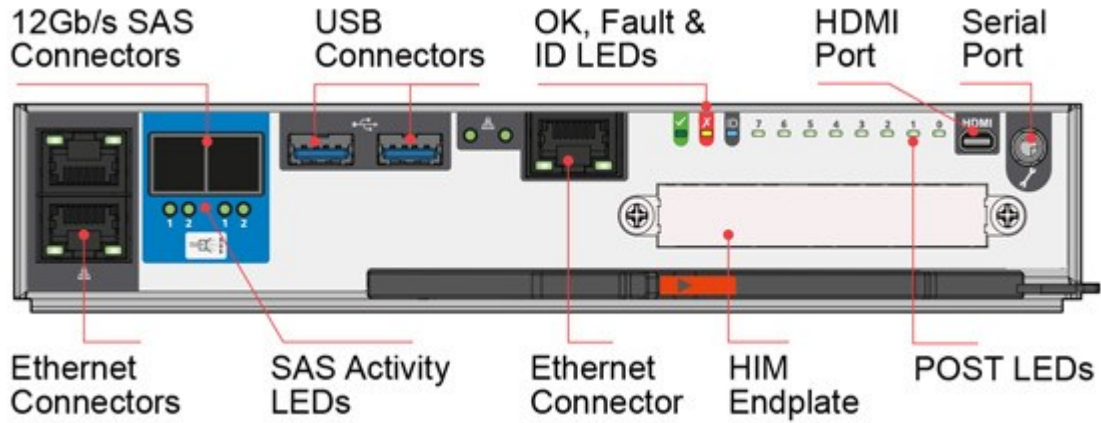


Figure 20. AP-LS-1 module

Configured for direct dock SATA, the system operates with one module. The other compute module bay must be filled with a blank module. The presence of compute modules is checked when the power is turned on. The enclosure does not turn on if the compute module is not present. An alarm occurs when incompatible configurations are detected.

The enclosure chassis is keyed to prevent compute modules from being inserted upside down.



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## Chapter 3. Installation

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### Preparation

Before you start, familiarize yourself with the safety precautions.

**Important:** Before you attempt to install the system, read the "Safety and environmental notices" section and Chapter 1 of this guide.

The enclosure must be mounted in a rack before use.

Only service personnel should install the system.

### ESD precautions

Fit and check a suitable anti-static wrist or ankle strap and observe all conventional ESD precautions when handling plug-in modules and components. Avoid contact with backplane components and module connectors.

### Site requirements

Before you begin, make sure the site where you intend to set up and use your storage system has the following utilities provided and the necessary equipment for a proper installation:

- Standard power from an independent source or a rack power distribution unit with a UPS.
- Qty 2: C19 to C20 Power Cords
- Rack kit
- Torx T20 Screwdriver
- 3.5mm to DE-9 Serial cable
- Qty 2: Mellanox SFP+s
- Qty 2: Mellanox QSAs (AP-TL-1 only)

**Note:** Refer to your supplier for a list of qualified accessories for use with the enclosure.

The accessory box contains the power cords and other ordered accessories.

### Unpacking the system

1. Position the case within 2 m (6 ft) of the site where you intend to use your storage system.
2. Inspect the packaging for crushes, cuts, water damage, or any other evidence of mishandling during transit. If any damage is seen, photograph the packaging for future reference before opening.
3. Remove the packaging, as shown in the following figure.

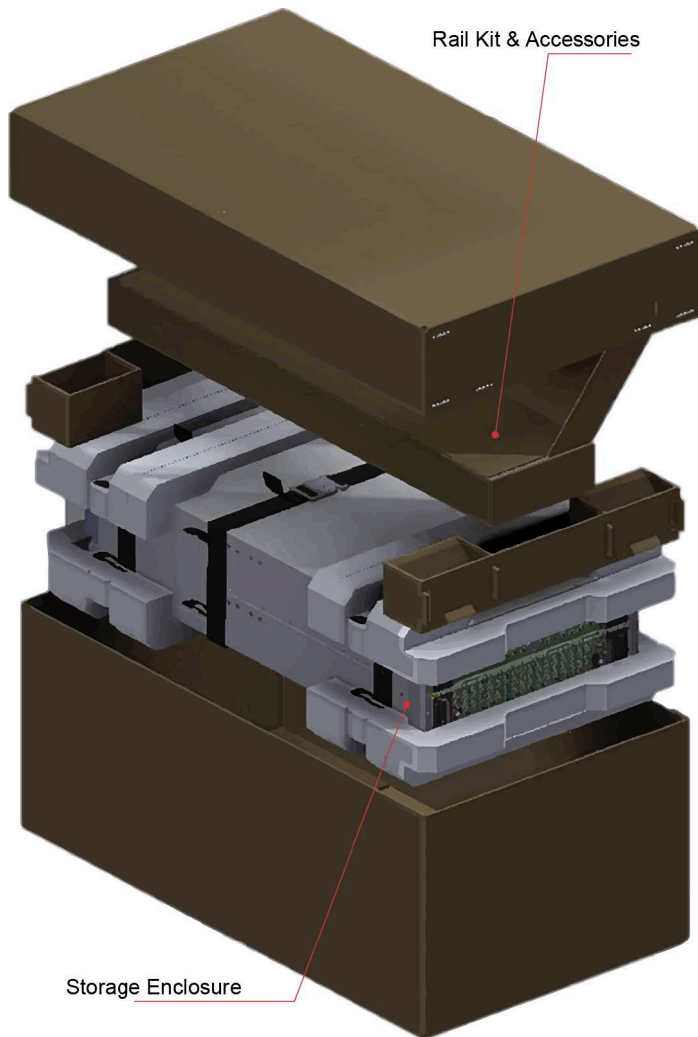


Figure 21. Unpacking the system

---

## Installation

First, install the rail kit, then install the modules.

### Installing the rail kit

#### CAUTION:

**An unpopulated enclosure can weigh up to 46 kg (101 lb). Do not try to lift it by yourself.**

Due to the weight of the enclosure, install it without the drive carriers.

The adjustment range of the rail kit, from the inside of the front post to the inside of the rear post is 660 mm - 840 mm. It suits a 1-meter deep rack within Rack Specification IEC 60297.

1. To facilitate access, remove the door from the rack.
2. Ensure that the pre-assembled rails are at their shortest length.
3. Locate the rail location pins inside the front of the rack and extend the length of the rail assembly to enable the rear location pins to locate. Ensure that the pins are fully located in the square or round

holes in the rack posts, as shown in the following figure.

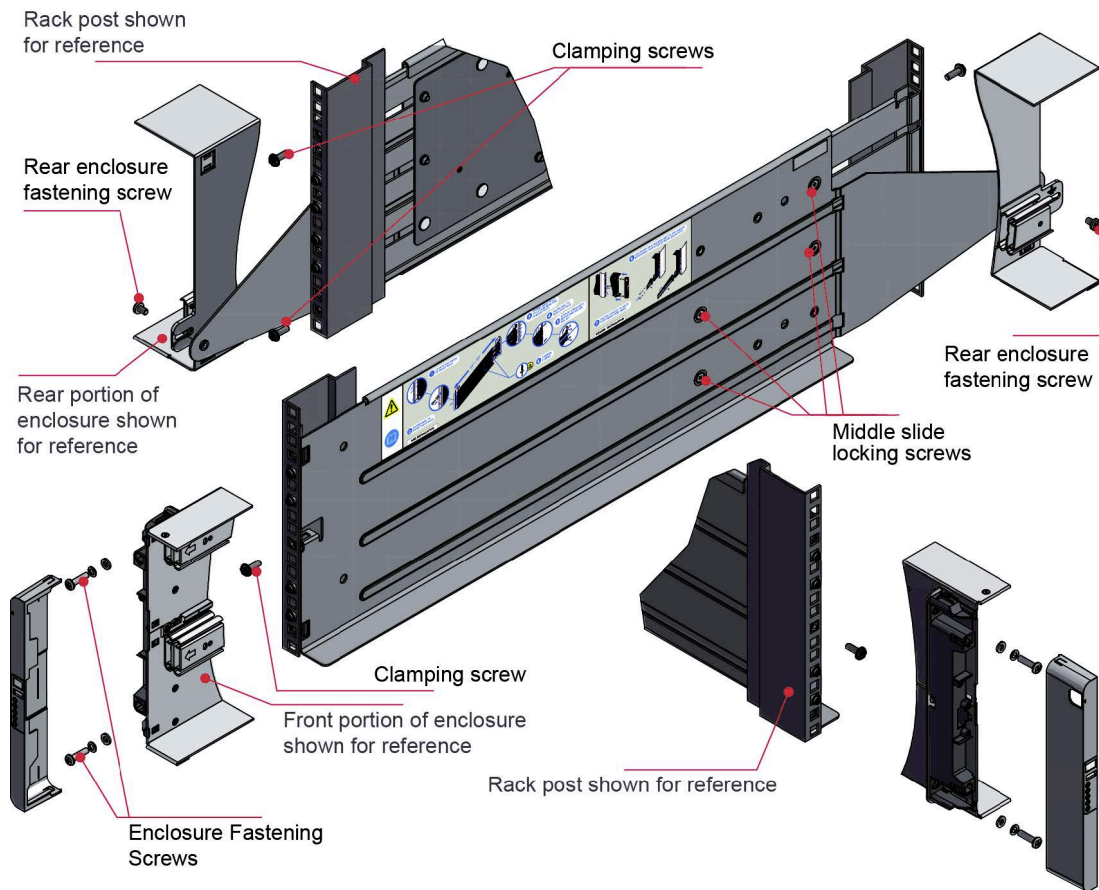


Figure 22. Mounting the system into a rack (left rail only)

4. Fully tighten all clamping screws and middle slide locking screws.
5. Ensure the rear spacer clips (x4) are fitted tight to the edge of the rack post.
6. Slide the enclosure fully home on its rails.
7. Fasten the front of the enclosure by using the enclosure fastening screws (x4).
8. Fix the rear of the enclosure to the hold-down bracket with the rear enclosure fixing screws (x2).

**Note:** Use the long or short hold-down bracket depending on the distance from the rack post to the enclosure hold-down slot. Ensure that the sliding nut is at the rear of the slot before fitting the bracket to the post. Then, slide the nut along the slot to enable the rear enclosure fastening screw to be fitted.

**Note:** For rack depths where the rack posts are behind the enclosure hold-down slots:

1. Swap the left and right hold-down brackets.
2. Insert the long flange between the rack post and chassis side, as shown in the following figure.

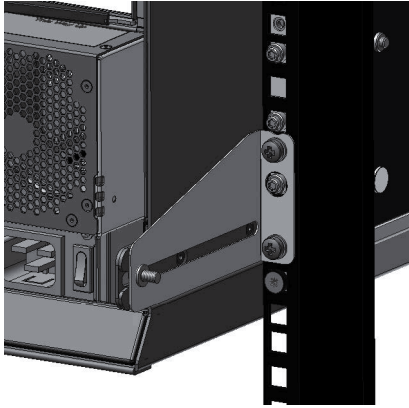


Figure 23. Rear enclosure mounting

3. The sliding nut head must always face away from the enclosure, whichever configuration is used.

**CAUTION:**

Use only the power cords that are supplied or cords that match the specification in Appendix B, "AC power cords".

**CAUTION:**

After the enclosure is installed in the rack, dispose of the lifting straps. Due to the difficulty in attaching the straps after the enclosure is installed in the rack, the straps are not suitable for removing the enclosure from the rack.

## Inserting modules

See the "Module replacement" chapter for the following instructions:

- "Inserting a cooling module"
- "Inserting a PSU"
- "Inserting an SBB compute module"
- "Inserting a DDIC"

---

## Power cord connection

Observe all warnings that are related to power cords.

**Important:** When more than one PSU is fitted, connect each PSU to separate and independent supplies to assure redundancy.

**CAUTION:**

Always remove the power connections before you remove the PSU from the enclosure.

---

## Grounding checks

The product must be connected to a power source that has a safety electrical ground connection.

**CAUTION:**

If one or more 5U enclosures go into a rack, the importance of the ground connection to the rack increases because the rack has a larger "EARTH LEAKAGE CURRENT" ("TOUCH CURRENT").

Examine the ground connection to the rack before turning it on. An electrical engineer who is qualified for the appropriate local and national standards must do the examination.



For more information, see "Electrical safety".

---

## **Data security**

Precautions can help preserve data security.

- Power down your host computer and all attached peripheral devices before beginning installation.
- Each enclosure contains up to 84 removable disk drive modules. Disk drives are fragile. Handle them with care, and keep them away from strong magnetic fields.
- All the supplied plug-in modules must be in place for the air to flow correctly around the enclosure and also to complete the internal circuitry.
- If the enclosure system is used with missing modules for more than a few minutes, the enclosure can overheat, causing power failure and data loss. Such use can also invalidate the warranty.
- If you remove a drive module, replace it immediately. If it is faulty, replace it with a drive module of the same type and capacity.
- Ensure that all disk drives are removed from the enclosure before attempting to manhandle or move the rack installation.
- Do not abandon your backup routines.



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## Chapter 4. Operation

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### Before you begin

Before you power on the enclosure, make sure that all the modules are firmly seated in their correct bays.

---

### Power on

Instructions for applying power to the enclosure.

#### CAUTION:

**Do not operate the enclosure system until the ambient temperature is within the specified operating range. If the drives were recently installed, make sure that they have time to adjust to the environmental conditions.**

1. Connect the power cables to the PSUs.
2. Move all PSU power switches to the on position, as shown in the following figure.

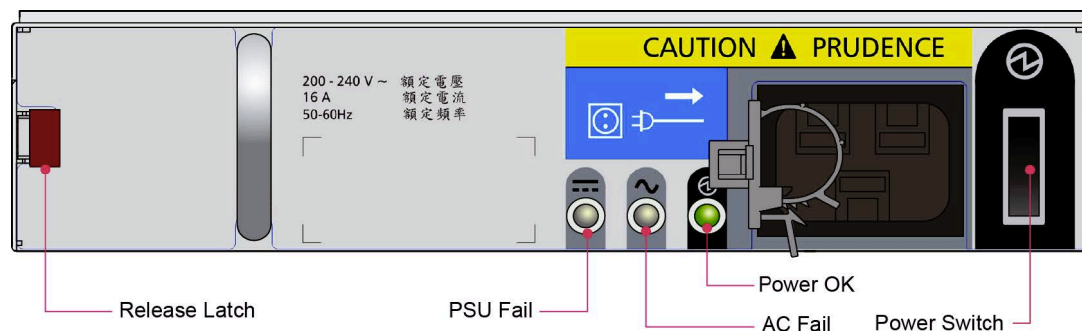


Figure 24. PSU Power Switch and LEDs

3. The system power LED on the ops panel is lit green and the disk drive motors start.

**Important:** If main power is lost for any reason, the system restarts automatically when power is restored.

**Note:** For more information about the ops panel LEDs and related fault conditions, see “Ops panel LEDs” on page 28.

Consider the following points when turning PSUs on or off:

- Remove the AC cord before inserting or removing a PSU.
- Turn off the PSU switch before inserting or removing the AC cord.
- Allow 15 seconds between turning the PSU off and back on again.
- Allow 15 seconds between turning one PSU in the system on and the other PSU off.
- Never turn off a PSU while any amber LED is lit on the partner PSU.
- The enclosure must be left in a powered state for 30 seconds following resumption from standby before the enclosure can be placed into standby again.

## Ops panel LEDs

Ops panel LEDs indicate fault and status conditions.

The following table shows the possible conditions for the LEDs.

The following figure shows the location of the LEDs.

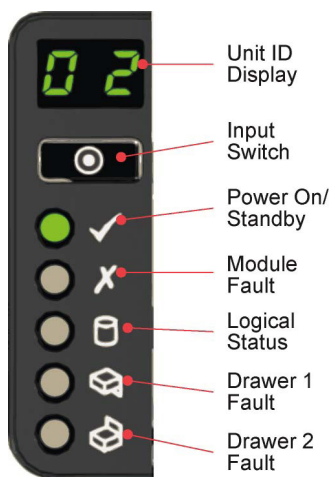


Figure 25. Ops panel LEDs

Table 3. Ops panel LED states

Unit ID display	Power (green/amber)	Module fault (amber)	Logical status (amber)	Drawer 1 fault	Drawer 2 fault	Associated LEDs or alarms	Status
X	On	Off	Off	Off	Off		Aux present, overall power failed or off
X	On	On	X	X	X	Single beep, then double	Ops panel power on (5s) test state
X	On	Off	Off	Off	Off		Power on, all functions good
X	On	On	X	Off	Off	PSU fault LEDs, fan fault LEDs	Any PSU fault, fan fault, over or under temperature
X	On	On	X	Off	Off	Compute module LEDs	Any compute module fault
X	On	Flashing	X	Off	Off		Enclosure logical fault such as VPD configuration error
X	On	Flashing	X	Off	Off	Module status LED on compute module	Unknown compute module type installed, I2C Bus failure, or VPD configuration error
X	On	Flashing	X	Off	Off	PSU fault LEDs, fan fault LEDs	Unknown (invalid or mixed) PSU module type installed, or I2C Bus failure (PSU comms)

Table 3. Ops panel LED states (continued)

Unit ID display	Power (green/amber)	Module fault (amber)	Logical status (amber)	Drawer 1 fault	Drawer 2 fault	Associated LEDs or alarms	Status
X	On	On	X	Off	Off	DDIC fault LED, drawer fault LED	Drive failure has occurred causing loss of availability or redundancy
X	On	X	Flashing	Off	Off	Arrays in impacted state	Arrays operating background function
X	On	Flashing	Flashing	Off	Off	S1	Unit ID number different from "Start Of Day"
X	On	X	X	On	Off	Fault LED on Drawer 1	Fault present on drawer 1 (drive, cable or fanout card fault)
X	On	X	X	Off	On	Fault LED on Drawer 2	Fault present on drawer 2 (drive, cable or fanout card fault)
Flashing	X	X	X	X	X		SES controlled enclosure identify

X = disregard

## Unit identification number

After a unit identification number is set, it is stored in the midplane VPD by the Enclosure Management software and appears when the enclosure is next powered on.

### How to set the unit identification number

The unit identification number is not set before the first system power-on. The display is set to "00" (flashing). The enclosure continues to power on even if the unit identification number is not set.

To set the unit identification number, do the following steps.

1. Press and hold the Input switch on the ops panel for 5 seconds. The left digit flashes.
2. Press and release the Input switch to increment the number until the wanted digit is reached.
3. Press and hold the Input switch for 5 seconds. The right digit flashes.
4. Press and release the Input switch to increment the number until the wanted digit is reached.
5. Press and hold the Input switch for 5 seconds to finish setting the number. Values of "01" to "99" are valid.

In a situation where the VPD cannot be read, or where there is no enclosure management (compute module management failure) the enclosure displays "00".

### Other uses

The unit identification number can also have the following uses:

- Error codes.
- Unit location identifier. This function sets the display to flash (3 seconds on, 1 second off) until it is stopped, either through SES or by pressing the Input switch.

The unit identification number can be set via other methods. Contact your storage vendor for details. As previously stated, the new setting is applied only after a power cycle. All other functions remain the same as described.

---

## Power down

Shut down the system from within the operating system and then turn off all installed PSUs by moving the power switches to the “Off” position.

---

## Lock the drawers

A drawer can be locked shut by using a screwdriver with a Torx T20 bit to rotate both anti-tamper locks until the red arrows point away from the center of the enclosure.

The following figure shows the locations of the locks.



Figure 26. Anti-tamper locks

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## Chapter 5. Troubleshooting

The system includes monitoring and control logic so that it can diagnose problems with power, cooling, PSUs, and drive systems.

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### Initial start-up problems

When starting the appliance, a number of issues can occur.

#### Power fault

Ensure that you wired up the enclosure system correctly and that main power is present. Call your supplier for replacements if any of the following situations occur.

- Cords are missing or damaged.
- Plugs are incorrect.
- Cords are too short.

#### LEDs

LED colors are used consistently throughout the enclosure and its components to indicate status.

**Green** Good or positive indication.

#### Flashing green or amber

Non-critical condition.

#### Amber

Fault.

**Note:** When the enclosure is powered on, all LEDs light up for a short period to ensure that they are working. This condition does not indicate a fault unless the LEDs remain lit after a few seconds.

#### PSU LEDs

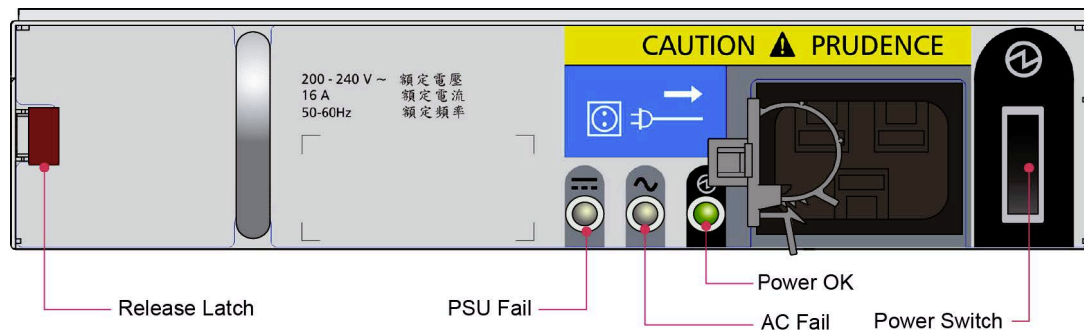


Figure 27. PSU LEDs

Table 4. PSU LED states

PSU Fail (Amber)	AC Missing (Amber)	Power (Green)	Status
Off	Off	Off	No AC power to either PSU.

Table 4. PSU LED states (continued)

PSU Fail (Amber)	AC Missing (Amber)	Power (Green)	Status
On	On	Off	PSU present, but not supplying power or PSU alert state (usually due to critical temperature).
Off	Off	On	Main AC present, switch is on. This PSU is providing power.
Off	Off	Flashing	AC power present, PSU in standby (other PSU is providing power).
Flashing	Flashing	Off	PSU firmware download
Off	On	Off	AC power unavailable, PSU in standby (other PSU is providing power).
On	On	On	GEM software lost communication with the PSU.
On	-	Off	PSU failed. Follow the procedure in "Replacing a Power Supply Unit (PSU)".

## Cooling module LEDs

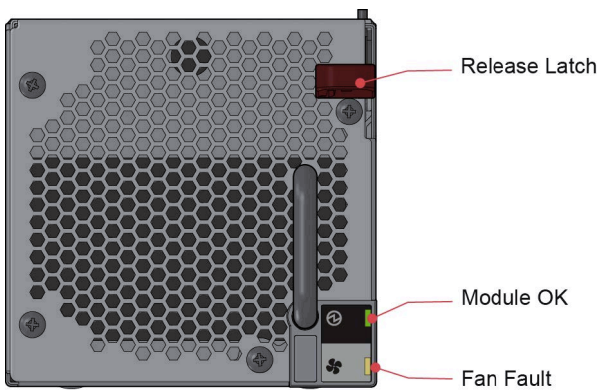


Figure 28. Cooling module LEDs

Table 5. Cooling module LED descriptions

LED	Description
Module OK	Constant green indicates that the fan is working correctly. Off means that the fan failed. Follow the procedure in "Replace a cooling module" on page 45.
Fan Fault	Amber indicates that a fan failed. Follow the procedure in "Replace a cooling module" on page 45.

## Operator's panel LEDs

The operator's (ops) panel displays the aggregated status of all the modules, as shown in the following figure.



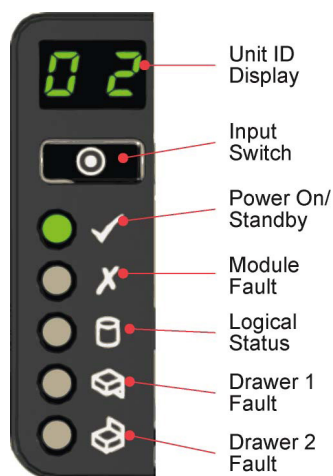


Figure 29. Operator's panel LEDs

Table 6. Ops panel LED descriptions

Display/LED	Description
Unit Identification Display	Usually shows the identification number for the enclosure, but can be used for other purposes.
Power On/Standby LED	Amber if the system is in standby. Green if the system has full power.
Module Fault LED	Amber indicates a fault in a PSU, cooling module or compute module. Check the drawer LEDs to see whether a drive fault is indicated (see Drawer LEDs)
Logical Status LED	Amber indicates a fault from something other than GEM (usually a disk drive fault, or a compute module that is failed). Check the drawer LEDs to see whether a drive fault is indicated (see Drawer LEDs).
Drawer 1 Fault LED	Amber indicates a drive, cable, or sideplane fault in drawer 1. Open the drawer and check the disk drive LEDs for faults.
Drawer 2 Fault LED	Amber indicates a drive, cable, or sideplane fault in drawer 2. Open the drawer and check the disk drive LEDs for faults.

Table 7. Ops panel LED states

Unit ID display	Power (green/amber)	Module fault (amber)	Logical status (amber)	Drawer 1 fault	Drawer 2 fault	Associated LEDs or alarms	Status
X	On	Off	Off	Off	Off		Aux present, overall power failed or off
X	On	On	X	X	X	Single beep, then double	Ops panel power on (5s) test state
X	On	Off	Off	Off	Off		Power on, all functions good
X	On	On	X	Off	Off	PSU fault LEDs, fan fault LEDs	Any PSU fault, fan fault, over or under temperature

Table 7. Ops panel LED states (continued)

Unit ID display	Power (green/amber)	Module fault (amber)	Logical status (amber)	Drawer 1 fault	Drawer 2 fault	Associated LEDs or alarms	Status
X	On	On	X	Off	Off	Compute module LEDs	Any compute module fault
X	On	Flashing	X	Off	Off		Enclosure logical fault such as VPD configuration error
X	On	Flashing	X	Off	Off	Module status LED on compute module	Unknown compute module type installed, I2C Bus failure, or VPD configuration error
X	On	Flashing	X	Off	Off	PSU fault LEDs, fan fault LEDs	Unknown (invalid or mixed) PSU module type installed, or I2C Bus failure (PSU comms)
X	On	On	X	Off	Off	DDIC fault LED, drawer fault LED	Drive failure has occurred causing loss of availability or redundancy
X	On	X	Flashing	Off	Off	Arrays in impacted state	Arrays operating background function
X	On	Flashing	Flashing	Off	Off	S1	Unit ID number different from "Start Of Day"
X	On	X	X	On	Off	Fault LED on Drawer 1	Fault present on drawer 1 (drive, cable or fanout card fault)
X	On	X	X	Off	On	Fault LED on Drawer 2	Fault present on drawer 2 (drive, cable or fanout card fault)
Flashing	X	X	X	X	X		SES controlled enclosure identify
X = disregard							

## Drawer LEDs

The following figure shows the names and locations of the disk drawer LEDs.

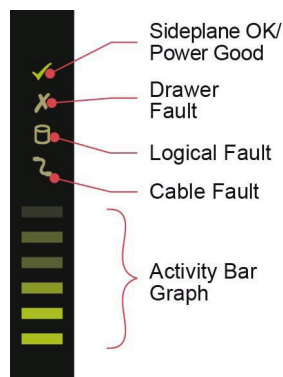


Figure 30. Drawer LEDs (left sideplane only)

Table 8. Drawer LED descriptions

LED	Description
Sideplane OK/Power Good	Green if the sideplane card is working and no power problems exist.
Drawer Fault	Amber if a drawer component failed. If it is a drive that failed, an amber LED lights up on the failed drive; follow the procedure in “Replace a disk drive in carrier (DDIC)” on page 43. If the drives are functioning correctly, contact your storage vendor to identify the failure.
Logical Fault	Amber for a drive fault. Flashes amber if one or more arrays are in an impacted state.
Cable Fault	Amber if the cabling between the drawer and the back of the enclosure failed. Contact your storage vendor to resolve the problem.
Activity Bar Graph	Shows the amount of data I/O from zero segments lit (no I/O) to all six segments lit (maximum I/O).

## Disk drive in carrier (DDIC) LED

Each disk drive has a single amber drive fault LED as shown in the following figure. When lit, it indicates a drive failure. The drive should be replaced as soon as possible using the procedure described in “Replace a disk drive in carrier (DDIC)” on page 43.

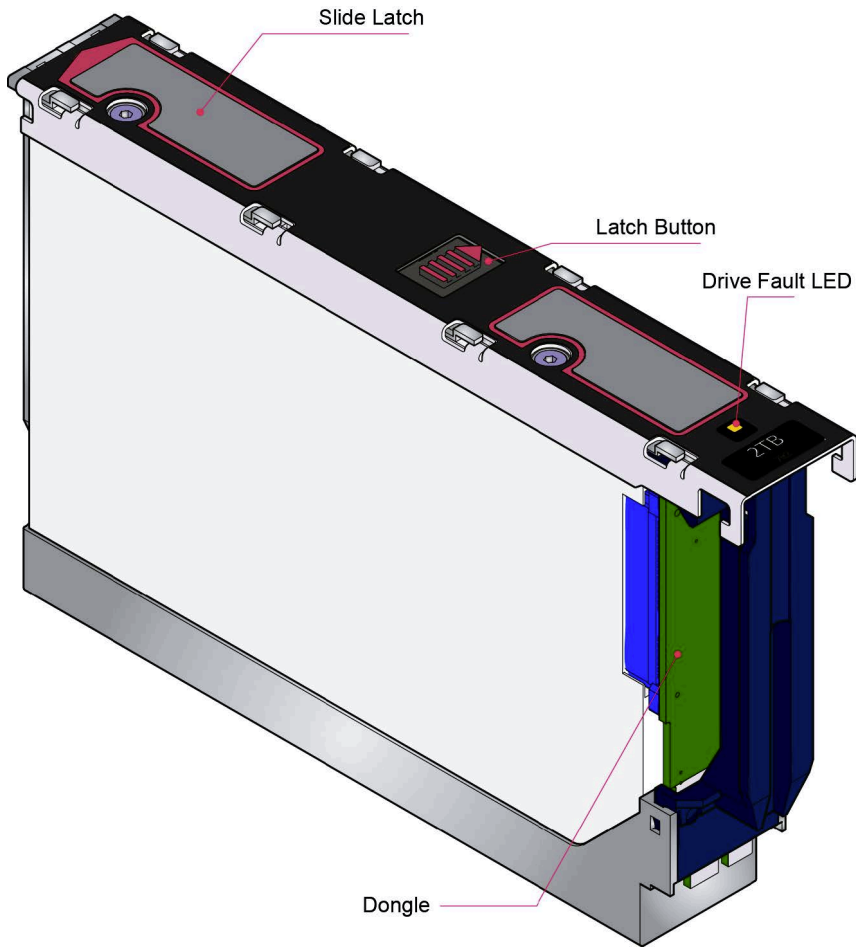


Figure 31. Drive Fault LED

## Compute Module LEDs

The LEDs on the compute module depend on the type of module in use. The following figure shows the LEDs for a common I/O module, the 6 Gb/s SAS EBOD.

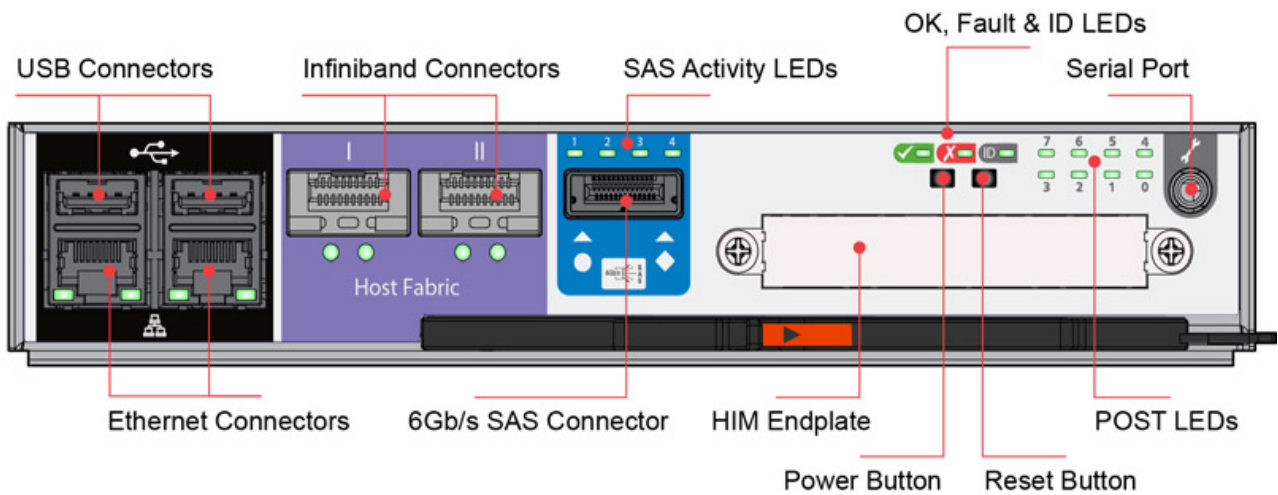


Figure 32. Compute module LEDs

**Note:** SAS ports are not supported for any external SAS connections.

The following table shows the possible values for the LEDs.

*Table 9. Compute module LED descriptions*

LED	Description
ID LED	Blue when the module is being identified.
Fault LED	Amber when a fault in the controller exists. For the replacement procedure, see Replacing an SBB Compute Module.
OK LED	Green when the controller is operating correctly. Flashing green when a controller VPD error exists.
SAS Activity LEDs	Steady green indicates a connection but no activity. Flashing green indicates both connection and activity. <b>Note:</b> SAS ports are not supported for any external SAS connections.
Ethernet status LEDs	Left side: <ul style="list-style-type: none"> <li>• Off when there is no connection.</li> <li>• Steady green when the network link is active.</li> <li>• Flashing green when there is network activity.</li> </ul> Right side – network speed: <ul style="list-style-type: none"> <li>• LS controller management port and E12EBD: <ul style="list-style-type: none"> <li>– Off: 10/100Mb/s.</li> <li>– Green: 1Gb/s.</li> </ul> </li> <li>• LS controller twin Ethernet ports: <ul style="list-style-type: none"> <li>– Off: No link.</li> <li>– Amber: 100Mb/s.</li> <li>– Green: 1Gb/s or 10Gb/s.</li> </ul> </li> </ul>
POST LEDs	Power On Self Test LEDs are used to show the boot progress of the x86 subsystem. If it fails to boot, the LEDs show what stage of the process was being performed when the problem occurred.

---

## Thermal sensors

Thermal sensors throughout the enclosure and its components monitor the thermal health of the storage system. Exceeding the limits of critical values causes the Over-temperature alarm to occur.

---

## Troubleshooting

The module fault LED on the ops panel displays a solid amber color to indicate a fault. All alarms are also reported by using SES.

*Table 10. Alarm Conditions*

Status	Severity
PSU alert – loss of DC power from a single PSU	Fault - loss of redundancy
Cooling module fan failure	Fault - loss of redundancy
PSU removed	Configuration error
Enclosure configuration error (VPD)	Fault - critical
Low temperature warning	Warning

Table 10. Alarm Conditions (continued)

Status	Severity
High temperature warning	Warning
Over-temperature alarm	Fault - critical
Under-temperature alarm	Fault - critical
I2C bus failure	Fault - loss of redundancy
Ops panel communication error (I2C)	Fault - critical
RAID error	Fault - critical
Drive power control fault	Warning; no loss of drive power
Drive power control fault	Fault - critical; loss of drive power
Insufficient power available	Warning

For more information on how to remove and replace a module, see Chapter 6, “Module replacement,” on page 41.

## Thermal monitoring and control

The system uses extensive thermal monitoring and takes a number of actions to ensure that component temperatures are kept low and also to minimize acoustic noise. Air flows from the front to the rear of the enclosure.

### Symptom

If the ambient air is below 77 °F (25 °C) and the fans are observed to increase in speed, then some restriction on airflow might be causing internal temperature rise.

**Note:** It is not a fault condition.

**Cause** The first stage in the thermal control process is for the fans to automatically increase in speed when a thermal threshold is reached. It can be caused by higher ambient temperatures in the local environment and can be perfectly normal.

**Note:** This threshold changes according to the number of drives and power supplies fitted.

### Action

1. Check the installation for any airflow restrictions at either the front or rear of the enclosure. A minimum gap of 25 mm at the front and 50 mm at the rear is needed.
2. Check for restrictions due to dust buildup. Clean.
3. Check for excessive recirculation of heated air from rear to the front. Use of the enclosure in a fully enclosed rack is not ideal.
4. Check that all blank modules are in place.
5. Reduce the ambient temperature.

## Thermal alarm

### Symptom

Ops panel module fault LED is amber.

**Cause** The internal temperature exceeded a preset threshold.

### Action

1. Check that the local ambient environment temperature is below the specification (see “Temperature and humidity” on page 51).

2. Check the installation for any airflow restrictions at either the front or rear of the enclosure. A minimum gap of 1 in. (25 mm) at the front and 2 in. (50 mm) at the rear is recommended.
3. Check for restrictions due to dust buildup. Clean.
4. Check for excessive recirculation of heated air from rear to the front. Use of the enclosure in a fully enclosed rack is not recommended.
5. If possible, shut down the enclosure and investigate the problem.

---

## Hardware faults

Ensure that you obtained a replacement module of the same type before removing any faulty module.

**Important:** If the enclosure is powered on and you remove a module, replace it immediately. If the system is used with any modules that are missing for more than a few seconds, the enclosure can overheat, causing power failure and data loss. Such action invalidates the warranty.

**Important:** Observe all conventional ESD precautions when handling modules and components. Avoid contact with midplane components and module connectors.





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## Chapter 6. Module replacement

---

### Overview

Observe all precautions when replacing modules.

**Important:** Always have available a replacement or blank module before removing the old module. When you replace a module, you must never leave an empty bay in the rear of the enclosure.

### ESD Precautions

**Important:** Fit and check a suitable anti-static wrist or ankle strap and observe all conventional ESD precautions when handling plug-in modules and components. Avoid contact with midplane and sideplane components, and with module connectors.

### Continuous operation during replacement

Your hardware or software enclosure management application determines the capability of replacing a failed disk without loss of access to any file system on the enclosure. Enclosure access and use during this period is uninterrupted. If an enclosure contains two PSUs, one of them can maintain power to the system while the other is replaced.

### Field replaceable units (FRUs)

Please refer to the IBM Field Replaceable Units Reference Guide for more information.

The IBM Cloud Object Storage System™ SliceStor® 2584 does not feature hot swap sideplanes.

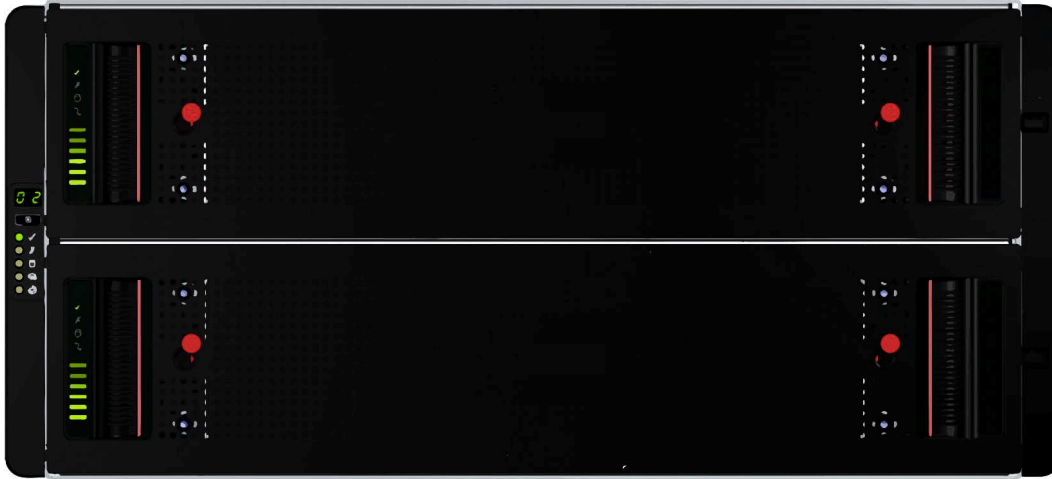
---

### General procedures

General procedures include opening and closing drive drawers.

#### Opening a drawer

1. Make sure the anti-tamper locks are not engaged. The red arrows on the locks point inwards if the locks are disengaged (see the following figure). Unlock them if necessary by rotating them counterclockwise using a screwdriver with a Torx T20 bit.



● Anti-tamper Locks

Figure 33. Anti-tamper locks (shown disengaged)

2. Push the drawer latches inward and hold them (see the following figure).



Figure 34. Opening the bottom drawer

3. Pull out the drawer all the way until it locks open.

**Important:** The drawer must not be left open for more than 2 minutes while the enclosure is powered.

## Closing a drawer

1. Press and hold both of the black latches on the sides of the drawer (see the following figure).

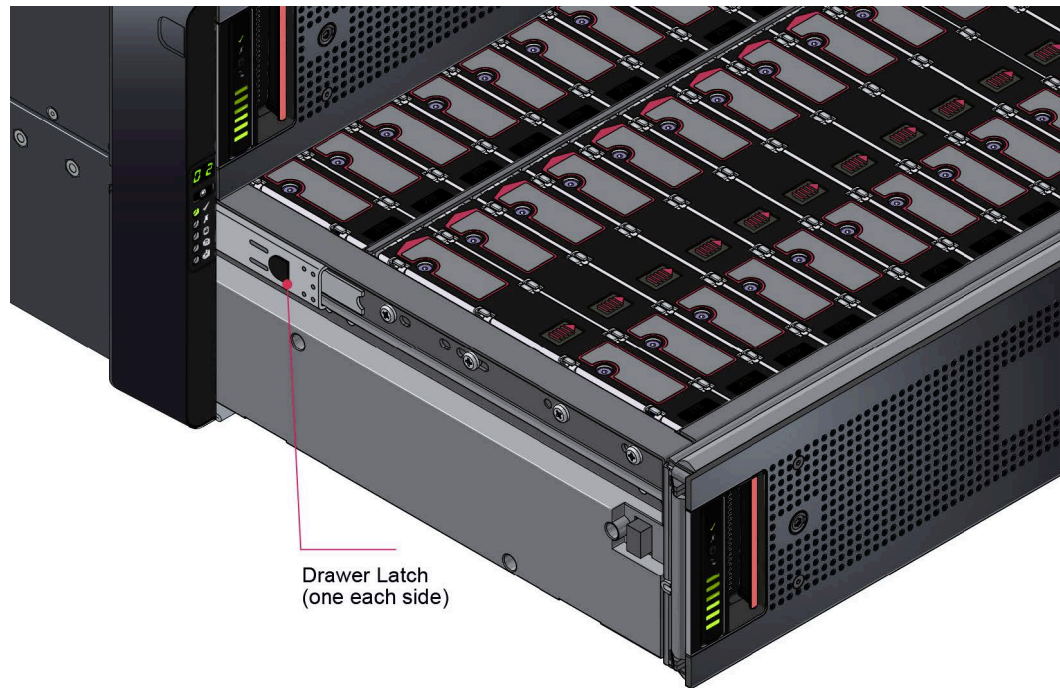


Figure 35. Drawer latch

2. Push the drawer in slightly.
3. Release the black latches.
4. Push the drawer all the way back into the enclosure, making sure it clicks home.

---

## Replace a disk drive in carrier (DDIC)

Two steps are needed; removing the existing drive, and replacing it with a new one.

### Removing a DDIC

1. Identify which drawer contains the drive to be replaced. If the drive number is known, you can use the plan in the following figure. If the drive failed, the drive fault LED is lit amber on the relevant drawer.

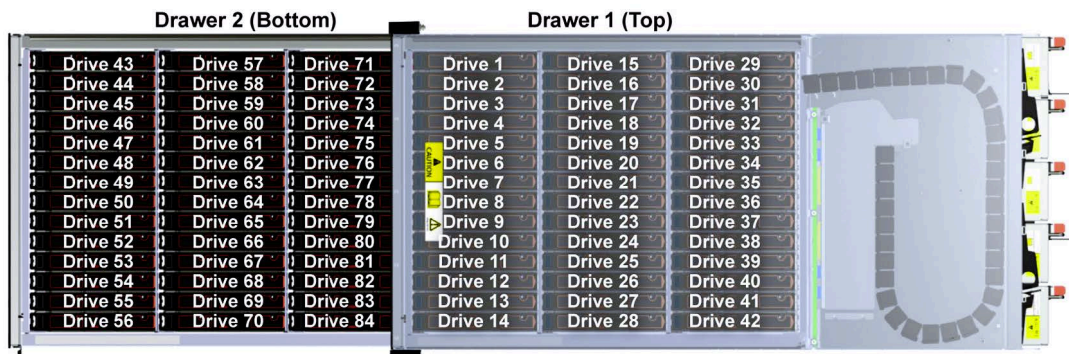


Figure 36. Drive location plan

2. Open the relevant drawer by using the instructions in "Opening a Drawer".
3. Locate the drive to be replaced, either by using the drive plan in the previous figure or by looking for the amber LED on the drive that indicates a fault.
4. Push the drive carrier latch in the direction that is shown in the following figure to unlock the drive.

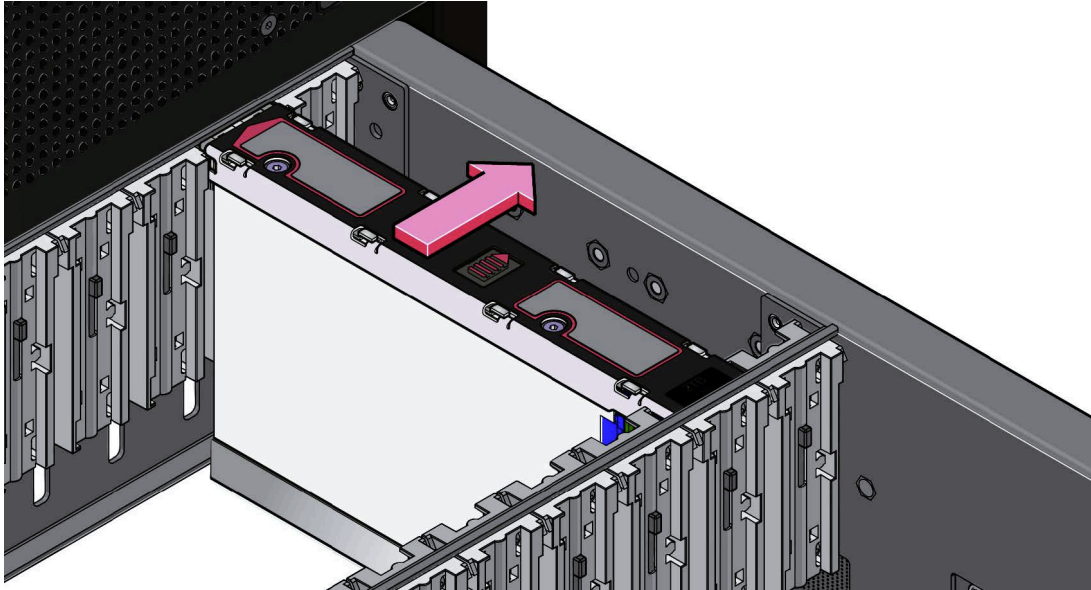


Figure 37. Removing a DDIC

5. Pull the drive upward and out of the drawer.

**Important:** If you are not going to replace the drive immediately, close the drawer (see "Closing a Drawer") so that correct airflow and cooling are maintained in the enclosure.

## Inserting a DDIC

**Important:** Failed drives must be replaced with approved drives. Contact your storage vendor for details.

1. If the relevant drawer is not already open, open it using the instructions in "Opening a Drawer".
2. Lower the DDIC into the slot, with the drive capacity label facing towards you, as shown in the following figure.

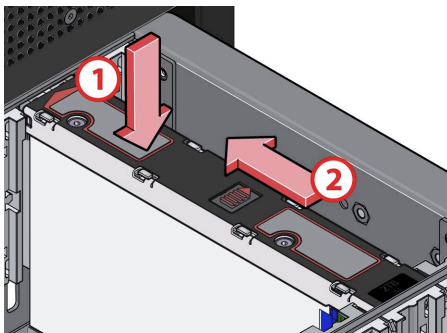


Figure 38. Installing a DDIC

3. Push the DDIC downwards and hold it down while sliding the drive carrier plate in the direction shown in the previous figure. This action locks the drive in place.

4. Check that the release latch has returned to its locked position, as shown in the following figure.

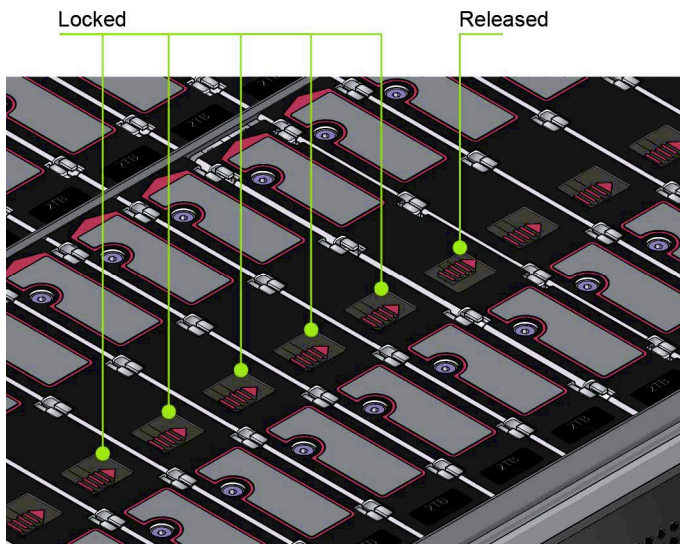


Figure 39. Latch position of a correctly inserted drive

**Note:** The drawers must be populated with drives in whole rows at a time (three rows of 14 drives per drawer). Observe the following rules:

- The minimum number of drives in an enclosure is 14.
- The number of rows must not differ by more than 1 between top and bottom drawers.
- The rows must be populated from the front to the rear of the enclosure.

---

## Replace a cooling module

The process involves removing the existing module and inserting a new one.

### Removing a cooling module

**Important:** Before you remove a module, make sure that you have a replacement module to insert.

1. Identify the cooling module to be removed. If the module failed, the fan fault LED displays an amber color, as shown in the following figure.

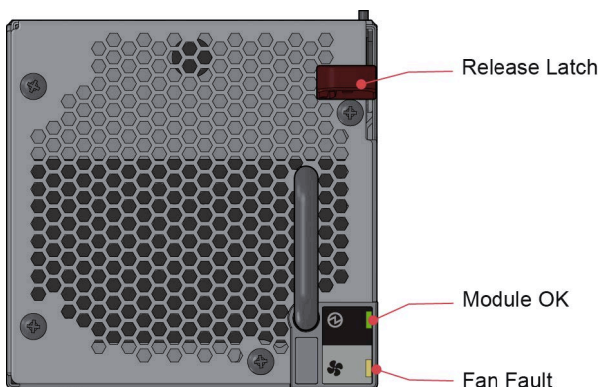


Figure 40. Cooling module LEDs



2. As shown in the following two figures, push down and hold the black release latch (1) and pull out the module by its handle (2).

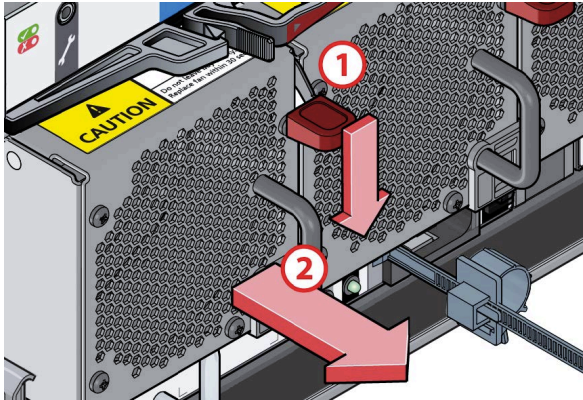


Figure 41. Removing a Cooling Module (1)

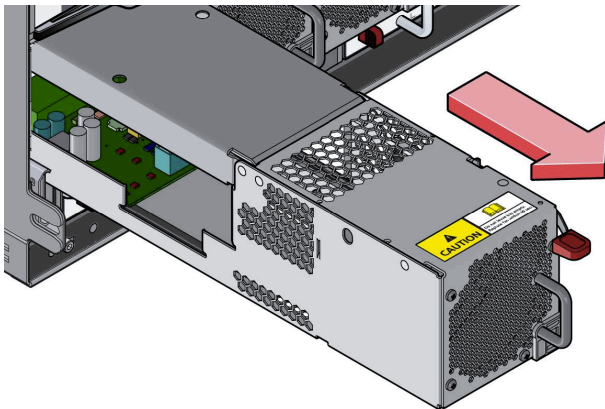


Figure 42. Removing a Cooling Module (2)

**Important:** The cooling module bay must not be empty for more than 2 minutes while the enclosure is powered.

### Inserting a cooling module

1. Rotate the cooling module so that the black release latch and handle are on the right side.
2. Slide the cooling module into its slot until the latch clicks home. The enclosure automatically detects and uses the new unit.

---

## Replace a power supply unit (PSU)

The process involves removing the existing module and inserting a new one.

### Removing a PSU

**Important:** Before you remove a PSU, make sure that you have a replacement module to insert.

1. Identify the PSU to be removed by using appropriate fault reporting software.
2. As shown in the following two figures, push the red release latch to the right and hold it (1), then pull out the module by its handle (2).

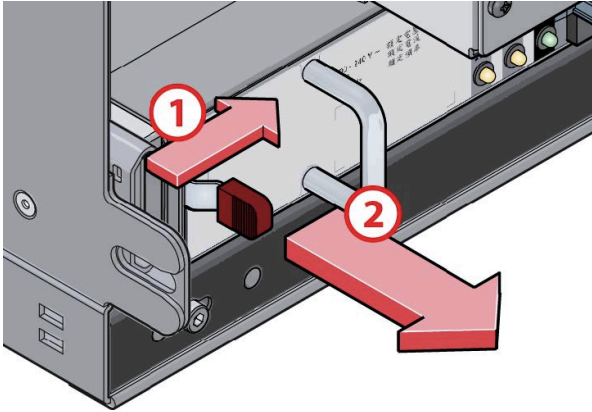


Figure 43. Removing a PSU module (1)

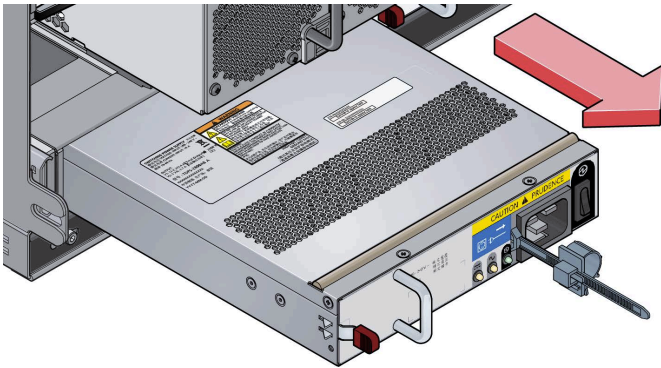


Figure 44. Removing a PSU Module (2)

**Important:** The PSU module bay must not be empty for more than 2 minutes while the enclosure is powered.

### Inserting a PSU

1. Rotate the PSU so that the red release latch and handle are on the left side.
2. Slide the PSU into its slot until the latch clicks home. The enclosure automatically detects the new unit.

---

## Replace a compute module

The process involves removing the existing module and inserting a new one.

**Important:** Before you remove a compute module, make sure that you have a replacement module to insert.

### Removing a compute module

1. Identify the compute module to be removed. If the module failed, the fault LED is lit in an amber color.

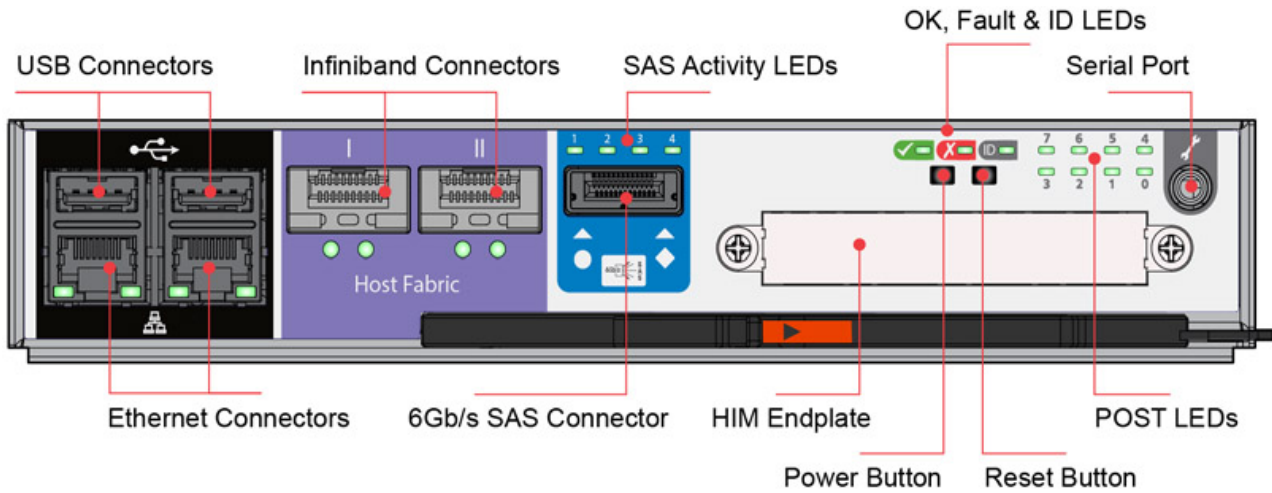


Figure 45. AP-TL-1 compute module LEDs

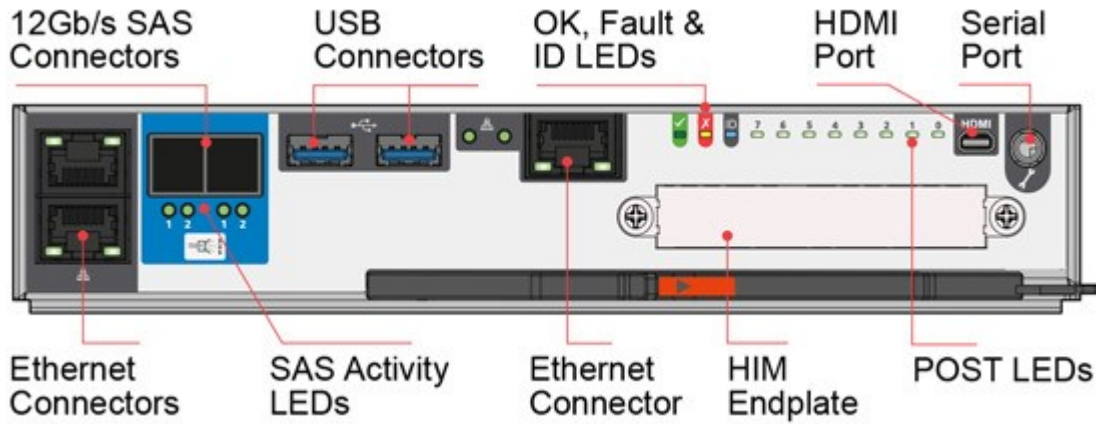


Figure 46. AP-LS-1 module

2. Make a note of the locations of the cables before you remove them from the compute module.
- 3.

**Note:** Various compute modules can be used in the enclosure.

As shown in the following two figures, pinch the latch on the module and pull the handle towards you (1). This action levers the module out of its connector on the midplane.



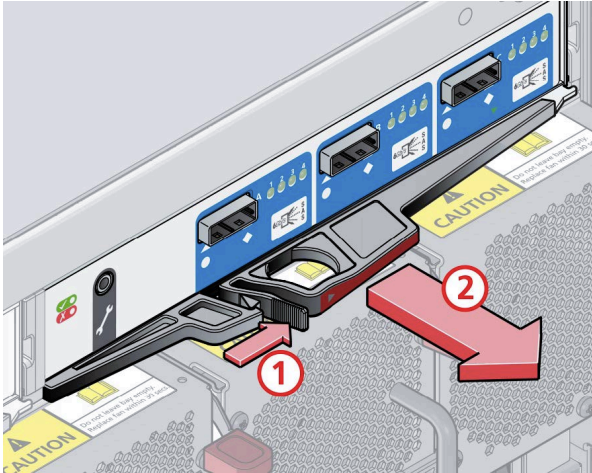


Figure 47. Removing a module (1).

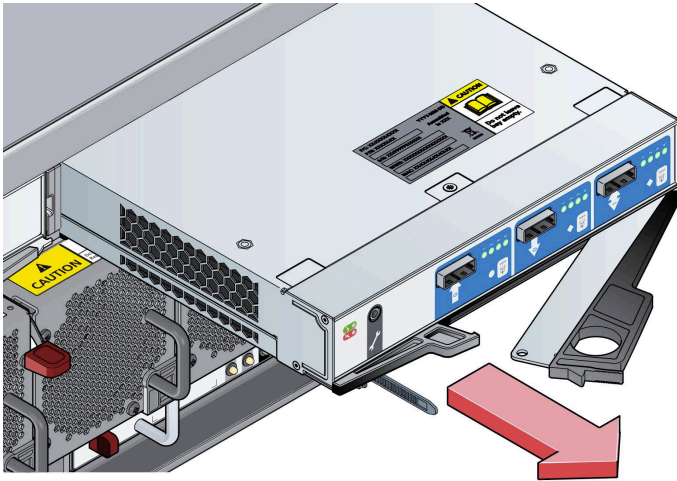


Figure 48. Removing a module (2).

4. Pull the module out of the enclosure (2).

### Inserting a compute module

1. Rotate the compute module so that the release latch is at the bottom.
2. Open the release latch and rotate it to its most open position, as shown in the previous figure.
3. Slide the compute module into its slot until it goes no farther and the handle starts to close.
4. Close the latch until it clicks home. It levers the module home into its connector on the midplane. The enclosure automatically detects the new unit.
5. Connect the cables to the new module. If necessary, refer to the note you made before you removed the cables from the defective compute module.

---

## Battery removal

### Battery removal

To remove the Onboard battery, follow these steps:

1. Power off your system and unplug your power cable.
2. Remove compute module from chassis.
3. Locate the Onboard battery inside of the compute module.
4. Use one finger to tilt the battery horizontally out of its socket, pushing it away from the socket.
5. Use your thumb and index finger to lift the battery from the socket.

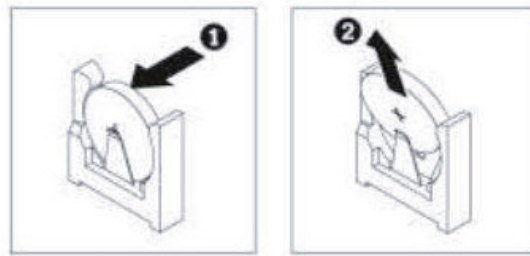


Figure 49. Remove the battery

#### CAUTION:

Handle used batteries carefully. Do not damage the battery in any way; a damaged battery can release hazardous materials into the environment. Do not discard a used battery in the garbage or a public landfill. Refer to the IBM Systems Environmental Notices for battery disposal guidelines.

---

## Appendix A. Technical specifications

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### Dimensions

The table shows the dimensions of the enclosure.

*Table 11. Enclosure dimensions*

Dimension	Inches	Millimeters
Height (enclosure, overall)	8.75	222.3
Width across mounting flange	19	482.6
Depth from rear of front flanges to rear extremity of chassis	36	915

---

### Components (fully populated)

The table shows the components that populate the enclosure.

*Table 12. Components*

Component	Quantity
Drawers	2
Disk Drives In Carriers (DDICs)	84
Compute module	1
PSUs	2
Cooling modules	5

---

### Thermal

The table shows the specifications for the thermal sensors.

*Table 13. Thermal specifications*

Specification	Quantity
Thermal sensors	1 per drawer baseplane (three baseplanes per drawer)
	2 per power supply
Airflow with all fans running	4.24 cubic feet (120 liters) per second maximum

---

### Temperature and humidity

The table shows the temperature and humidity limits for the enclosure.

*Table 14. Temperature and humidity limits*

Factor	Operating	Non-operating
Temperature range	41°F (5°C) to 95°F (35°C)	-40°F (-40°C) to 158°F (70°C)
Relative humidity	20%rh to 80%rh non-condensing	5%rh to 100%rh non-condensing
Maximum wet bulb	82°F (28°C)	84°F (29°C)

## Cooling modules

Each of the five cooling modules contains two stacked fans: 80 mm x 80 mm x 38 mm.

## AP-TL-1 and AP-LS-1 compute modules

The specifications table for the compute modules.

Table 15. Compute canister specifications

	AP-TL-1	AP-LS Family
Module Type	Application platform (AP)	Application platform (AP)
CPU Options	Intel "Sandy Bridge-EP" Xeon <ul style="list-style-type: none"> <li>• E5-2609 4-core 2.4GHz (80W)</li> <li>• E5-2630L 6-core 2.0GHz (60W)</li> <li>• E5-2648L 8-core 1.8GHz (70W)</li> </ul> Intel "Ivy Bridge-EP" Xeon <ul style="list-style-type: none"> <li>• E5-2609 v2 4-core 2.5GHz (80W)</li> <li>• E5-2618L v2 6-core 2.0GHz (50W)</li> <li>• E5-2630 v2 6-core 2.6GHz (80W)</li> <li>• E5-2648L v2 10-core 1.9GHz (70W)</li> </ul>	AP-LS-1 is designed to support the Intel Haswell-EP and Broadwell-EP CPUs.
RAM Options	DDR3 VLP DIMMs	DDR4DIMMs (including support for RDIMMs and ECC RAM) <sup>2</sup>
Boot Drive	SATA SSD	1or 2 x internal NGFF M.2 mSATA SSD
Expansion Cards	1PCIe x8 card (half length, half height, custom bezel)	"LS1": 1 half length, half height PCieslot and a Daughter Card slot (based on PCIe) sized specifically for use in LS.
Battery	None	Metis Redundant Battery solution
Interfaces <sup>1</sup>		
SAS	1x External SAS Ports x 6Gb/s (4 lanes each)	2x Internal SAS ports x 12Gb/s (4 lanes each), 2 x External SAS ports x 12Gb/s (4 lanes each)
Ethernet	2 x 1Gb	3 x 1Gb
Fibre Channel	None	None
USB	2 x USB 2.0	2 x USB 3.0
HDMI	None	1 Type D (Micro)
Serial (3.5mm)	1	1
<sup>1</sup> Other interfaces can be added to LS controllers by using a PCIe expansion card or the Daughter Card Slot – but these are factory options.		

---

## Power supply unit (2200 kW PSU)

The table shows the specifications of the PSU.

Table 16. PSU specifications

Category	Value
Output power	2214 W maximum continuous output power at high line voltage
Voltage	+12 V at 183A (2214 W)
	+5 V standby voltage at 2.7A
Input voltage range	200 - 240 VAC
Input frequency	50 - 60 Hz
Power factor correction	>0.95 @ ≥50% load
Efficiency	82% at 10% load
	90% at 20% load
	94% at 50% load
	91% at 100% load
Holdup time	> 20ms
Main power inlet connector	IEC60320 C20 with cable retention
Weight	3 kg

---

## Power supply unit (2800 kW PSU)

The table shows the specifications of the PSU.

Table 17. PSU specifications

Category	Value
Output power	2814 W maximum continuous output power at high line voltage
Voltage	+12 V at 233.4A (2800 W)
	+5 V standby voltage at 2.7A
Input voltage range	200 - 240 VAC
Input frequency	50 - 60 Hz
Power factor correction	>0.95 @ 100% load
Efficiency	80% at 10% load
	88% at 20% load
	92% at 50% load
	88% at 100% load
Holdup time	5 ms from ACOKn high to rails out of regulation (see v2 specification).
Main power inlet connector	IEC320-C20 with cable retention
Weight	4 kg

---

## Supported drives

The table shows the supported drives for the enclosure.

*Table 18. Supported disk drives*

Type	Description
Hard disk drives (HDD)	3.5" 7200 rpm SATA drive
	Contact your storage vendor for details of other hard disk drives that are available for use in the system.

---

## Shock and vibration tolerance

The table shows the shock tolerance for the enclosure.

*Table 19. Shock and vibration tolerance*

Type	Tolerance
Operational vibration	0.21 g RMS, 5 - 500 Hz random with <10% throughput loss
Operational shock	5 g 10 ms $\frac{1}{2}$ sine
Relocation vibration (non-operational)	0.3 g, 2 - 200 to 2 Hz swept sine
Non-operational vibration	1.04 g RMS, 2 - 200 Hz random
Non-operational shock	20 g 10 ms $\frac{1}{2}$ sine

---

## Appendix B. Standards and regulations

The appliance is designed to comply with the standards and regulations enumerated in sections below. This compliance includes any sample units.

---

### EMC qualification

Slicestor<sup>®</sup> 2584 meets a number of EMC standards.

Slicestor<sup>®</sup> 2584 carries EMC approval for the following territories:

- Australia/New Zealand
- Canada
- European Union
- United States of America
- Taiwan (CNS 13438-2006)

### Conducted emission limit levels

Slicestor<sup>®</sup> 2584 complies with the following EMC conducted emission limit standards to a greater than 6dB margin:

- EN 55022:2006 including A1:2007 / CISPR 22-Class A
- United States CFR47 Part 15: Radio Frequency Devices, Subpart B: Unintentional Radiators, Class A

Class A labeling is used.

### Radiated emissions limit levels

Slicestor<sup>®</sup> 2584 complies with the following EMC radiated emission limit standards to a greater than 6dB margin:

- EN 55022:2006 including A1:2007 / CISPR 22-Class A
- Individual shelves and towers comply with United States CFR47 Part 15: Radio Frequency Devices, Subpart B: Unintentional Radiators, Class A

Class A labeling is used.

### Harmonics

EMC harmonics are in accordance with EN 61000-3-2:2006.

### Flicker

EMC flicker is in accordance with EN 61000-3-3:2008.

### Immunity limit levels

EMC immunity is in accordance with European standard EN 50024:1998 including A1:2001 and A2:2003.

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## Acoustics

Slicestor® 2584 produces an operating sound power of < LWAd 8.2 Bels (re 1pW) at an ambient temperature of 73°F (23°C).

---

## AC power cords

If supplying your own power cord, you must meet a number of specifications.

Table 20. Power cord specifications

Country	Cord type	Plug (AC source)	Socket (PSU socket)	Comments
USA	SJT or SVT, 12 AWG minimum, 3 conductor	IEC 320 C20, 250V, 20A or a suitable plug rated 250V, 20A	IEC 320 C19, 250V, 20A	Must be NRTL LISTED (National Recognized Test Laboratory, such as UL)
Europe & Others	Harmonized, H05-VVF-3G2.5	IEC 320 C20, 250V, 16A or a suitable plug rated 250V, 16A	IEC 320 C19, 250V, 16A	

**Important:** The plug and the complete power cord assembly must meet the standards appropriate to the country, and must have safety approvals acceptable in that country.

---

## SMM Phase

POST Codes – SMM Phase

Table 21. POST Codes – SMM Phase

Description	Value
SMM_IDENTIFY_FLASH_DEVICE	0xA0
SMM_SMM_PLATFORM_INIT	0xA2
SMM_ACPI_ENABLE_START	0xA6
SMM_ACPI_ENABLE_END	0xA7
SMM_S1_SLEEP_CALLBACK	0xA1
SMM_S3_SLEEP_CALLBACK	0xA3
SMM_S4_SLEEP_CALLBACK	0xA4
SMM_S5_SLEEP_CALLBACK	0xA5
SMM_ACPI_DISABLE_START	0xA8
SMM_ACPI_DISABLE_END	0xA9



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## Appendix C. Post Codes

List of POST Codes.

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### SEC Phase

POST Codes – SEC Phase

*Table 22. POST Codes – SEC Phase*

Description	Value
SEC_SYSTEM_POWER_ON	0x01
SEC_BEFORE_MICROCODE_PATCH	0x02
SEC_AFTER_MICROCODE_PATCH	0x03
SEC_ACCESS_CSR	0x04
SEC_GENERIC_MSRRINIT	0x05
SEC_CPU_SPEEDCFG	0x06
SEC_SETUP_CAR_OK	0x07
SEC_FORCE_MAX_RATIO	0x08
SEC_GO_TO_SECSTARTUP	0x09
SEC_GO_TO_PEICORE	0x0A

---

### DXE Phase

POST Codes – DXE Phase

*Table 23. POST Codes – BDS Phase*

Description	Value
DXE_TCGDXE	0x40
DXE_SB_SPL_INIT	0x41
DXE_CF9_RESET	0x42
DXE_SB_SERIAL_GPIO_INIT	0x43
DXE_SMMACCESS	0x44
DXE_NB_INIT	0x45
DXE_SIO_INIT	0x46
DXE_LEGACY_REGION	0x47
DXE_SB_INIT	0x48
DXE_IDENTIFY_FLASH_DEVICE	0x49
DXE_FTW_INIT	0x4A
DXE_VARIABLE_INIT	0x4B
DXE_VARIABLE_INIT_FAIL	0x4C
DXE_MTC_INIT	0x4D
DXE_CPU_INIT	0x4E
DXE_MP_CPU_INIT	0x4F

Table 23. POST Codes – BDS Phase (continued)

DXE_SMBUS_INIT	0x50
DXE_SMART_TIMER_INIT	0x51
DXE_PCRTC_INIT	0x52
DXE_SATA_INIT	0x53
DXE_SMM_CONTROLLER_INIT	0x54
DXE_LEGACY_INTERRUPT	0x55
DXE_RELOCATE_SMBASE	0x56
DXE_FIRST_SMI	0x57
DXE_VTD_INIT	0x58
DXE_BEFORE_CSM16_INIT	0x59
DXE_AFTER_CSM16_INIT	0x5A
DXE_LOAD_ACPL_TABLE	0x5B
DXE_SB_DISPATCH	0x5C
DXE_SB_IOTRAP_INIT	0x5D
DXE_SUBCLASS_DRIVER	0x5E
DXE_PPM_INIT	0x5F
DXE_HECIDRV_INIT	0x60
DXE_VARIABLE_RECLAIM	0x61
DXE_FLASH_PART_NONSUPPORT	0x62

## BDS Phase

POST Codes – BDS Phase

Table 24. POST Codes – BDS Phase

Description	Value
BDS_ENTER_BDS	0x10
BDS_INSTALL_HOTKEY	0x11
BDS_ASF_INIT	0x12
BDS_PCI_ENUMERATION_START	0x13
BDS_BEFORE_PCIIO_INSTALL	0x14
BDS_PCI_ENUMERATION_END	0x15
BDS_CONNECT_CONSOLE_IN	0x16
BDS_CONNECT_CONSOLE_OUT	0x17
BDS_CONNECT_STD_ERR	0x18
BDS_CONNECT_USB_HC	0x19
BDS_CONNECT_USB_BUS	0x1A
BDS_CONNECT_USB_DEVICE	0x1B
BDS_NO_CONSOLE_ACTION	0x1C
BDS_DISPLAY_LOGO_SYSTEM_INFO	0x1D
BDS_START_IDE_CONTROLLER	0x1E
BDS_START_SATA_CONTROLLER	0x1F

Table 24. POST Codes – BDS Phase (continued)

BDS_START_ISA_ACPI_CONTROLLER	0x20
BDS_START_ISA_BUS	0x21
BDS_START_ISA_FDD	0x22
BDS_START_ISA_SEIRAL	0x23
BDS_START_IDE_BUS	0x24
BDS_START_AHCI_BUS	0x25
BDS_CONNECT_LEGACY_ROM	0x26
BDS_ENUMERATE_ALL_BOOT_OPTION	0x27
BDS_END_OF_BOOT_SELECTION	0x28
BDS_ENTER_SETUP	0x29
BDS_ENTER_BOOT_MANAGER	0x2A
BDS_BOOT_DEVICE_SELECT	0x2B
BDS_EFI64_SHADOW_ALL_LEGACY_ROM	0x2C
BDS_ACPI_S3SAVE	0x2D
BDS_READY_TO_BOOT_EVENT	0x2E
BDS_GO_LEGACY_BOOT	0x2F
BDS_GO_UEFI_BOOT	0x30
BDS_LEGACY16_PREPARE_TO_BOOT	0x31
BDS_EXIT_BOOT_SERVICES	0x32
BDS_LEGACY_BOOT_EVENT	0x33
BDS_ENTER_LEGACY_16_BOOT	0x34
BDS_RECOVERY_START_FLASH	0x35
BDS_START_SDHC_BUS	0x36
BDS_CONNECT_ATA_LEGACY	0x37
BDS_CONNECT_SD_LEGACY	0x38
POST_BDS_NO_BOOT_DEVICE	0xF9
POST_BDS_START_IMAGE	0xFB
POST_BDS_ENTER_INT19	0xFD
POST_BDS_JUMP_BOOT_SECTOR	0xFE

---

## SMM Phase

POST Codes – SMM Phase

Table 25. POST Codes – SMM Phase

Description	Value
SMM_IDENTIFY_FLASH_DEVICE	0xA0
SMM_SMM_PLATFORM_INIT	0xA2
SMM_ACPI_ENABLE_START	0xA6
SMM_ACPI_ENABLE_END	0xA7
SMM_S1_SLEEP_CALLBACK	0xA1
SMM_S3_SLEEP_CALLBACK	0xA3

Table 25. POST Codes – SMM Phase (continued)

SMM_S4_SLEEP_CALLBACK	0xA4
SMM_S5_SLEEP_CALLBACK	0xA5
SMM_ACPI_DISABLE_START	0xA8
SMM_ACPI_DISABLE_END	0xA9

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