



# **Cabling**

## **E-Series Systems**

NetApp  
November 15, 2022

# Table of Contents

- Cabling ..... 1
  - Cabling overview ..... 1
  - Requirements ..... 1
  - Host cabling ..... 2
  - Drive shelf cabling ..... 3
  - Power cabling ..... 10
  - Hot adding a drive shelf ..... 10
  - Ethernet cabling for a management station ..... 21

# Cabling

## Cabling overview

You can cable a host directly to a controller or use switches to connect a host to a controller.

If your storage system includes one or more drive shelves, you must cable them to your controller shelf. You can add a new drive shelf while power is still applied to other components of the storage system. In addition, you can connect your storage system to a network for out-of-band management.

The cabling information is intended for a hardware installer or system administrator who is installing or expanding a storage system. It is assumed that you have installed the storage system as described in the *Installation and Setup Instructions* for your hardware.

### Applicable hardware model

Cabling information applies to the following hardware models.

Controller Shelf	Drive Shelf
EF300, EF600	DE212C, DE224C, DE460
E5724, EF570, E2812, E2824, EF280	DE212C, DE224C
E2860, E5760	DE460C

### Additional cabling information

If you are cabling for the following configuration, see [Adding IOM Drive Shelves to an Existing E27XX, E56XX, or EF560 Controller Shelf](#).

Controller Shelf	Drive Shelf
E2712, E2724, E5612, E5624, EF560	DE212C, DE224C
E2760, E5660	DE460C

For information about other cabling options, see the [E-Series Hardware Cabling Guide](#) for older systems.

For information about cabling to support mirroring features, see the [Synchronous and Asynchronous Mirroring Feature Descriptions and Deployment Guide](#).

## Requirements

In addition to controller shelves and drive shelves, you might need some or all of the following components when cabling your storage system:

- Cables: SAS, Fibre Channel (FC), Ethernet, InfiniBand
- Small form-factor pluggable (SFP) or Quad SFP (QSFP) transceivers
- Switches
- Host bus adapters (HBAs)
- Host channel adapters (HCAs)
- Network interface cards (NICs)

## Host cabling

You can cable a host directly to a controller (direct-attached topology) or use switches (switch topology) to connect a host to a controller.

### Cabling for a direct-attached topology

A direct-attached topology connects host adapters directly to controllers in your storage system.

The following figure shows an example connection. To help ensure maximum performance, use all available host adapter ports.



**Figure 1. Two hosts and two controllers**

*(1) Connect each host adapter port directly to the host ports on the controllers.*

### Cabling for a switch topology

A switch topology uses switches to connect hosts to the controllers in your storage system. The switch must support the connection type used between the host and the controller.

The following figure shows an example connection. For switches that provide provisioning capability, you should isolate each initiator and target pair.



**Figure 2. Two hosts and two switches**

(1) Connect each host adapter directly to the switch.

(2) Connect each switch directly to the host ports on the controllers. To help ensure maximum performance, use all available host adapter ports.

## Drive shelf cabling

You must connect each controller in the controller shelf to an I/O module (IOM) in a drive shelf.

This procedure applies to IOM12 and IOM12B drive shelves.



IOM12B modules are only supported on SANtricity OS 11.07.2 onward. Ensure your controller's firmware has been updated before installing or upgrading to an IOM12B.



This procedure is for like-for-like shelf IOM hot-swaps or replacements. This means you can only replace an IOM12 module with another IOM12 module or replace an IOM12B module with another IOM12B module. (Your shelf can have two IOM12 modules or have two IOM12B modules.)

If you are cabling an older controller shelf to a DE212C, DE224C, or DE460, see [Adding IOM Drive Shelves to an Existing E27XX, E56XX, or EF560 Controller Shelf](#).

## Cabling E2800 and E5700

The following information applies to cabling an E2800, E2800B, EF280, E5700, EF5700B, or EF570 controller shelf to a DE212C, DE224C, or DE460 drive shelf.

## Cabling a 12-drive or 24-drive shelf

You can cable your controller shelf to one or more 12-drive or 24-drive shelves.

The following image shows a representation of the controller shelf and the drive shelves. To locate the ports on your model, see [Hardware Universe](#).

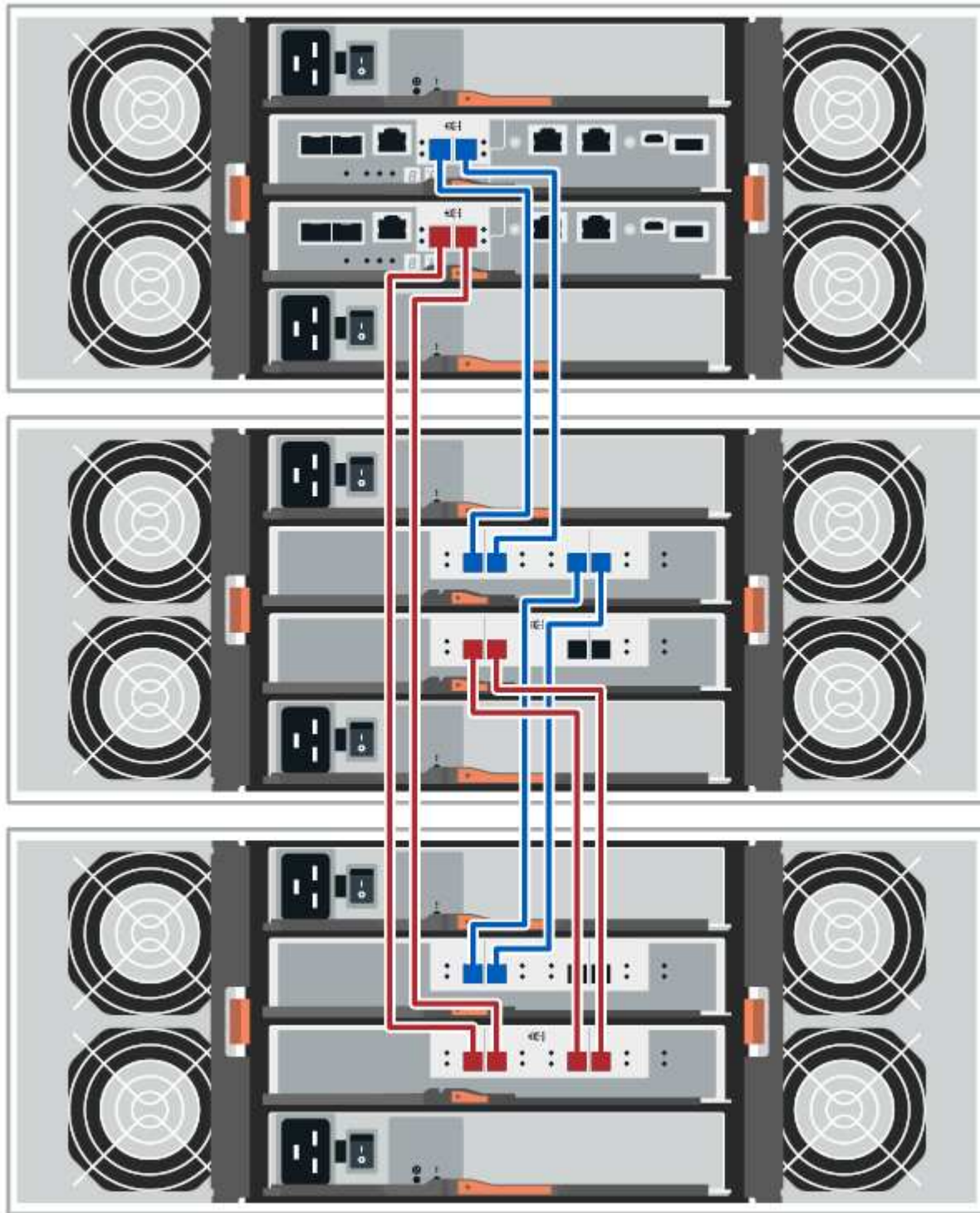
**A controller shelf and 12-drive or 24-drive shelves**



## Cabling a 60-drive shelf

You can cable your controller shelf to one or more 60-drive shelves.

The following image shows a representation of the controller shelf and the drive shelves. To locate the ports on your model, see [Hardware Universe](#).



## Cabling EF300 and EF600

The following information applies to cabling an EF300 or EF600 controller shelf to a DE212C, DE224C, or DE460 drive shelf.

### Before you begin

Before cabling an EF300 or EF600, make sure the firmware is updated to the latest version. To update the firmware, follow the instructions in [Upgrading SANtricity OS](#).

### **Cabling a 12-drive or 24-drive shelf**

You can cable your controller shelf to one or more 12-drive or 24-drive shelves.

The following image shows a representation of the controller shelf and the drive shelves. To locate the ports on your model, see [Hardware Universe](#).

#### **A controller shelf and 12-drive or 24-drive shelves**





### Cabling a 60-drive shelf

You can cable your controller shelf to one or more 60-drive shelves.

The following image shows a representation of the controller shelf and the drive shelves. To locate the ports on your model, see [Hardware Universe](#).

**A controller shelf and 60-drive shelves**



# Power cabling

You must connect each component's power supplies to separate power circuits.

## Before you begin

- You have confirmed that your location provides the necessary power.
- The two power switches on the two shelf power supplies must be turned off.

## About this task

The power source for your storage system must be able to accommodate the power requirements of the new drive shelf. For information about the power consumption for your storage system, see the [Hardware Universe](#).

## Step

1. Connect the two power cables for each shelf to different power distribution units (PDUs) in the cabinet or rack.

# Hot adding a drive shelf

You can add a new drive shelf while power is still applied to the other components of the storage system. You can configure, reconfigure, add, or relocate storage system capacity without interrupting user access to data.

## Before you begin

Due to the complexity of this procedure, the following is recommended:

- Read all steps before beginning the procedure.
- Ensure hot adding a drive shelf is the procedure you need.

## About this task

This procedure applies to hot adding a DE212C, DE224C, or DE460C drive shelf to an E2800, E2800B, EF280, E5700, E5700B, EF570, or EF300 controller shelf.

This procedure applies to IOM12 and IOM12B drive shelves.



IOM12B modules are only supported on SANtricity OS 11.07.2 onward. Ensure your controller's firmware has been updated before installing or upgrading to an IOM12B.



This procedure is for like-for-like shelf IOM hot-swaps or replacements. This means you can only replace an IOM12 module with another IOM12 module or replace an IOM12B module with another IOM12B module. (Your shelf can have two IOM12 modules or have two IOM12B modules.)

If you are cabling an older controller shelf to a DE212C, DE224C, or DE460, see [Adding IOM Drive Shelves to an Existing E27XX, E56XX, or EF560 Controller Shelf](#).



To maintain system integrity, you must follow the procedure exactly in the order presented.

## Step 1: Prepare to add the drive shelf

To prepare to hot add a drive shelf, you must check for critical events and check the status of the IOMs.

### Before you begin

- The power source for your storage system must be able to accommodate the power requirements of the new drive shelf. For the power specification for your drive shelf, see the [Hardware Universe](#).
- The cabling pattern for the existing storage system must match one of the applicable schemes shown in this procedure.

### Steps

1. In SANtricity System Manager, select **Support > Support Center > Diagnostics**.
2. Select **Collect Support Data**.

The Collect Support Data dialog box appears.

3. Click **Collect**.

The file is saved in the Downloads folder for your browser with the name support-data.7z. The data is not automatically sent to technical support.

4. Select **Support > Event Log**.

The Event Log page displays the event data.

5. Select the heading of the **Priority** column to sort critical events to the top of the list.
6. Review the system critical events for events that have occurred in the last two to three weeks, and verify that any recent critical events have been resolved or otherwise addressed.



If unresolved critical events have occurred within the previous two to three weeks, stop the procedure and contact technical support. Continue the procedure only when the issue is resolved.

7. Select **Hardware**.
8. Select the **IOMs (ESMs)** icon.



The Shelf Component Settings dialog box appears with the **IOMs (ESMs)** tab selected.

9. Make sure that the status shown for each IOM/ESM is *Optimal*.
10. Click **Show more settings**.
11. Confirm that the following conditions exist:
  - The number of ESMs/IOMs detected matches the number of ESMs/IOMs installed in the system and that for each drive shelf.
  - Both of the ESMs/IOMs show that communication is OK.
  - The data rate is 12Gb/s for DE212C, DE224C, and DE460C drive shelves or 6 Gb/s for other drive trays.

## Step 2: Install the drive shelf and apply power

You install a new drive shelf or a previously installed drive shelf, turn on the power, and check for any LEDs that require attention.

### Steps

1. If you are installing a drive shelf that has previously been installed in a storage system, remove the drives. The drives must be installed one at a time later in this procedure.

If the installation history of the drive shelf that you are installing is unknown, you should assume that it has been previously installed in a storage system.

2. Install the drive shelf in the rack that holds the storage system components.



See the installation instructions for your model for the full procedure for physical installation and power cabling. The installation instructions for your model includes notes and warnings that you must take into account to safely install a drive shelf.

3. Power on the new drive shelf, and confirm that no amber attention LEDs are illuminated on the drive shelf. If possible, resolve any fault conditions before you continue with this procedure.

## Step 3: Cable your system

Select one of the following options, depending on whether you are cabling an E2800 and E5700 storage system or an EF300 storage system.

- [Option 1: Connect the drive shelf for E2800 and E5700](#)
- [Option 2: Connect the drive shelf for EF300](#)

If you are cabling an older controller shelf to a DE212C, DE224C, or DE460, see [Adding IOM Drive Shelves to an Existing E27XX, E56XX, or EF560 Controller Shelf](#).

### Option 1: Connect the drive shelf for E2800 and E5700

You connect the drive shelf to controller A, confirm IOM status, and then connect the drive shelf to controller B.

### Steps

1. Connect the drive shelf to controller A.

The following figure shows an example connection between an additional drive shelf and controller A. To locate the ports on your model, see the [Hardware Universe](#).







2. In SANtricity System Manager, click **Hardware**.



At this point in the procedure, you have only one active path to the controller shelf.

3. Scroll down, as necessary, to see all the drive shelves in the new storage system. If the new drive shelf is not displayed, resolve the connection issue.
4. Select the **ESMs/IOMs** icon for the new drive shelf.



The **Shelf Component Settings** dialog box appears.

5. Select the **ESMs/IOMs** tab in the **Shelf Component Settings** dialog box.
6. Select **Show more options**, and verify the following:
  - IOM/ESM A is listed.
  - Current data rate is 12 Gbps for a SAS-3 drive shelf.
  - Card communications is OK.
7. Disconnect all expansion cables from controller B.
8. Connect the drive shelf to controller B.

The following figure shows an example connection between an additional drive shelf and controller B. To locate the ports on your model, see the [Hardware Universe](#).





9. If it is not already selected, select the **ESMs/IOMs** tab in the **Shelf Component Settings** dialog box, and then select **Show more options**. Verify that Card communications is **YES**.



Optimal status indicates that the loss of redundancy error associated with the new drive shelf has been resolved and the storage system is stabilized.

## Option 2: Connect the drive shelf for EF300

You connect the drive shelf to controller A, confirm IOM status, and then connect the drive shelf to controller B.

### Before you begin

- You have updated your firmware to the latest version. To update your firmware, follow the instructions in the [Upgrading SANtricity OS](#).

### Steps

1. Disconnect both of the A-side controller cables from IOM12 ports one and two from previous last shelf in the stack and then connect them to the new shelf IOM12 ports one and two.



2. Connect the cables to A-side IOM12 ports three and four from the new shelf to previous last shelf IOM12 ports one and two.

The following figure shows an example connection for A side between an additional drive shelf and the previous last shelf. To locate the ports on your model, see the [Hardware Universe](#).





3. In SANtricity System Manager, click **Hardware**.



At this point in the procedure, you have only one active path to the controller shelf.

4. Scroll down, as necessary, to see all the drive shelves in the new storage system. If the new drive shelf is not displayed, resolve the connection issue.
5. Select the **ESMs/IOMs** icon for the new drive shelf.



The **Shelf Component Settings** dialog box appears.

6. Select the **ESMs/IOMs** tab in the **Shelf Component Settings** dialog box.
7. Select **Show more options**, and verify the following:
  - IOM/ESM A is listed.
  - Current data rate is 12 Gbps for a SAS-3 drive shelf.
  - Card communications is OK.
8. Disconnect both the B-side controller cables from IOM12 ports one and two from the previous last shelf in the stack then connect them to the new shelf IOM12 ports one and two.
9. Connect the cables to B-side IOM12 ports three and four from the new shelf to the previous last shelf IOM12 ports one and two.

The following figure shows an example connection for B side between an additional drive shelf and the previous last shelf. To locate the ports on your model, see the [Hardware Universe](#).





10. If it is not already selected, select the **ESMs/IOMs** tab in the **Shelf Component Settings** dialog box, and then select **Show more options**. Verify that Card communications is **YES**.



Optimal status indicates that the loss of redundancy error associated with the new drive shelf has been resolved and the storage system is stabilized.

## Step 4: Complete hot add

You complete the hot add by checking for any errors and confirming that the newly added drive shelf uses the latest firmware.

### Steps

1. In SANtricity System Manager, click **Home**.
2. If the link labeled **Recover from problems** appears at the center top of the page, click the link, and resolve any issues indicated in the Recovery Guru.
3. In SANtricity System Manager, click **Hardware**, and scroll down, as necessary, to see the newly added drive shelf.
4. For drives that were previously installed in a different storage system, add one drive at time to the newly installed drive shelf. Wait for each drive to be recognized before you insert the next drive.

When a drive is recognized by the storage system, the representation of the drive slot in the **Hardware** page displays as a blue rectangle.

5. Select **Support > Support Center > Support Resources** tab.
6. Click the **Software and Firmware Inventory** link, and check which versions of the IOM/ESM firmware and the drive firmware are installed on the new drive shelf.



You might need to scroll down the page to locate this link.

7. If necessary, upgrade the drive firmware.

IOM/ESM firmware automatically upgrades to the latest version unless you have disabled the upgrade feature.

The hot add procedure is complete. You can resume normal operations.

## Ethernet cabling for a management station

You can connect your storage system to an Ethernet network for out-of-band storage array management. You must use Ethernet cables for all storage array management connections.

### Direct topology

A direct topology connects your controller directly to an Ethernet network.

You must connect management port 1 on each controller for out-of-band management and leave port 2 available for access to the storage array by technical support.



**Figure 3. Direct storage management connections**

## Fabric topology

A fabric topology uses a switch to connect your controller to an Ethernet network.

You must connect management port 1 on each controller for out-of-band management and leave port 2 available for access to the storage array by technical support.



**Figure 4. Fabric storage management connections**



## Copyright information

Copyright © 2022 NetApp, Inc. All Rights Reserved. Printed in the U.S. No part of this document covered by copyright may be reproduced in any form or by any means—graphic, electronic, or mechanical, including photocopying, recording, taping, or storage in an electronic retrieval system—without prior written permission of the copyright owner.

Software derived from copyrighted NetApp material is subject to the following license and disclaimer:

THIS SOFTWARE IS PROVIDED BY NETAPP “AS IS” AND WITHOUT ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY DISCLAIMED. IN NO EVENT SHALL NETAPP BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

NetApp reserves the right to change any products described herein at any time, and without notice. NetApp assumes no responsibility or liability arising from the use of products described herein, except as expressly agreed to in writing by NetApp. The use or purchase of this product does not convey a license under any patent rights, trademark rights, or any other intellectual property rights of NetApp.

The product described in this manual may be protected by one or more U.S. patents, foreign patents, or pending applications.

LIMITED RIGHTS LEGEND: Use, duplication, or disclosure by the government is subject to restrictions as set forth in subparagraph (b)(3) of the Rights in Technical Data -Noncommercial Items at DFARS 252.227-7013 (FEB 2014) and FAR 52.227-19 (DEC 2007).

Data contained herein pertains to a commercial product and/or commercial service (as defined in FAR 2.101) and is proprietary to NetApp, Inc. All NetApp technical data and computer software provided under this Agreement is commercial in nature and developed solely at private expense. The U.S. Government has a non-exclusive, non-transferrable, nonsublicensable, worldwide, limited irrevocable license to use the Data only in connection with and in support of the U.S. Government contract under which the Data was delivered. Except as provided herein, the Data may not be used, disclosed, reproduced, modified, performed, or displayed without the prior written approval of NetApp, Inc. United States Government license rights for the Department of Defense are limited to those rights identified in DFARS clause 252.227-7015(b) (FEB 2014).

## Trademark information

NETAPP, the NETAPP logo, and the marks listed at <http://www.netapp.com/TM> are trademarks of NetApp, Inc. Other company and product names may be trademarks of their respective owners.