TrueNAS® ES102 Expansion Shelf Basic Setup Guide

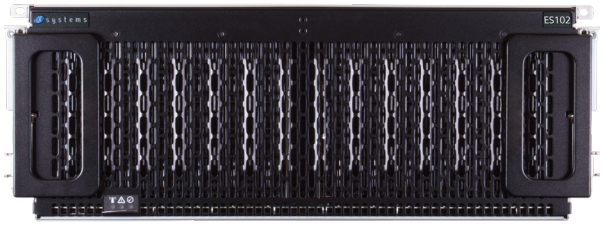
Version 1.04

Contents

1 Unpacking the Unit

TrueNAS units are carefully packed and shipped with trusted carriers to arrive in perfect condition. If there is any shipping damage or any parts are missing, please take photos and contact iXsystems Support immediately at support@ixsystems.com or **1-855-GREP4-iX (1-855-473-7449)** or **1-408-943-4100**.

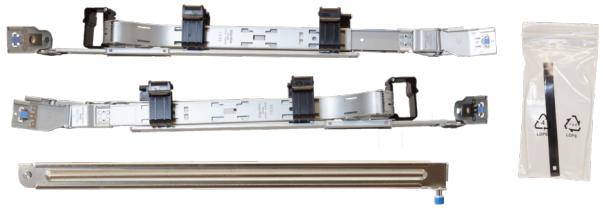
Please locate and record the hardware serial numbers on the back of each chassis for quick reference. Carefully unpack the shipping boxes and locate these components:



ES102 Expansion Shelf

Set of rackmount rails. The rails are stamped with indicators for the left, right, front, and back positions.

102 drive clips with installed hard drives, shipped separately.



Two Cable Management Arms (CMAs), a CMA brace, and bag with cable ties.

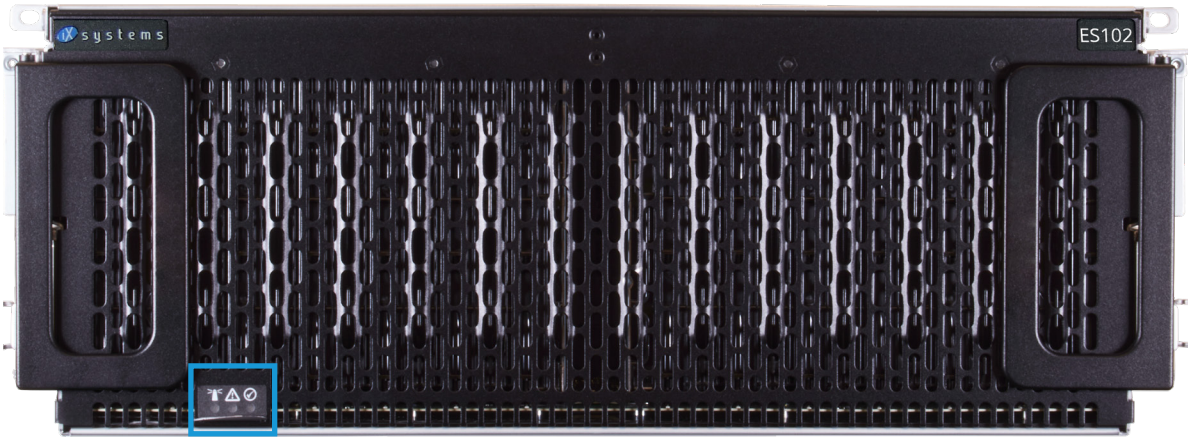
Left and right cover retention brackets.

Two 3-meter Mini SAS HD to Mini SAS HD cables.

Components kit with two IEC C14 to C13 power cords, velcro strips, and rack mounting hardware.

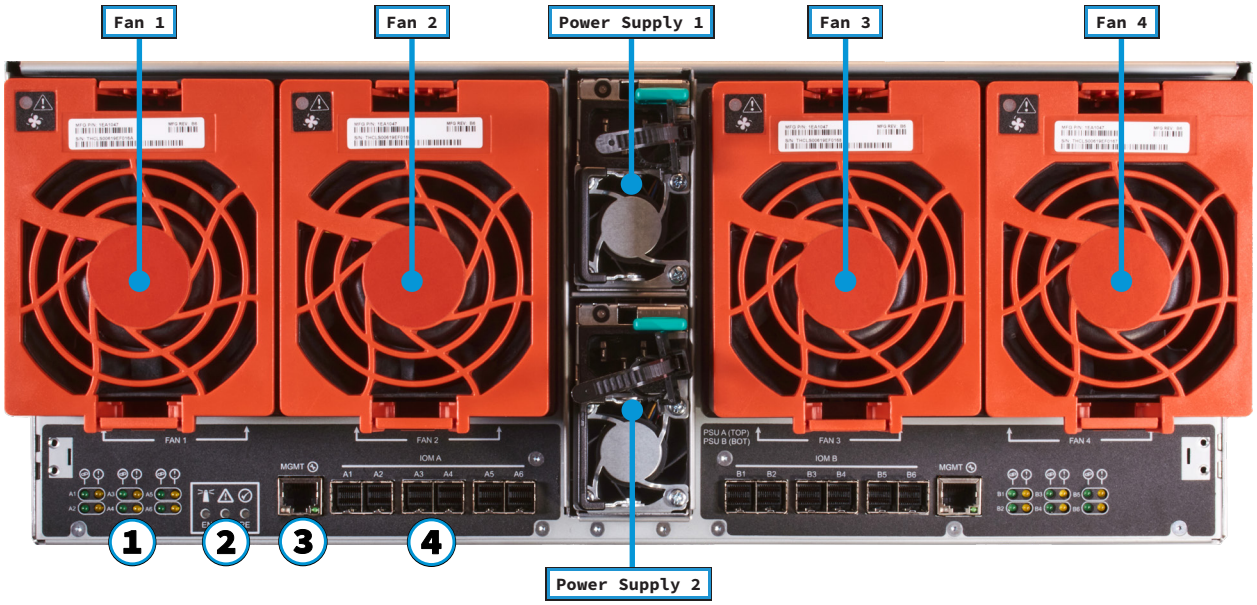
1.2 Become Familiar with the ES102

Indicators on the front panel show identification and status. The fault indicator is on during the initial power-on self-test (POST) or when the TrueNAS software has issued an alert. These indicators are also on the back panel.



LED	Name	Function
	Identify	**Blinks Blue** when identification is active or after identifying **any** component.
	Fault	**Blinks Amber** when Enclosure has a fault. **Off** when Enclosure has no faults.
	Power	**Solid Green** when power is on.

The ES102 has two expansion controllers in a side-by-side configuration.



1. SAS Connection Indicators **(4)**
2. Enclosure Indicators (see table above) **(5)**
3. Controller Management Port (not used) **(6)**
4. HD Mini SAS3 connectors **(7)**

2 Prerequisites

There are additional considerations and some preparation required before installing the ES102 into a rack.

2.1 Safety

The ES102 is much larger than other Expansion Shelves sold by iXsystems. Be sure to take full safety precautions when installing or servicing the enclosure.

2.1.1 Static Discharge

Static electricity can build up in your body and discharge when touching conductive materials. Electrostatic Discharge (ESD) is harmful to sensitive electronic devices and components. Keep these safety recommendations in mind before opening the system case or handling non-hot-swappable system components:

1. Turn off the system and remove power cables before opening the case or touching internal components.
2. Place the system on a clean, hard work surface like a wooden tabletop. Using an ESD dissipative mat can also help protect the internal components.
3. Touch the metal chassis with your bare hand to dissipate static electricity in your body before touching any internal components, including components not yet installed in the system. Using an anti-static wristband and grounding cable is another option.
4. Store all system components in anti-static bags.

You can find more preventative tips and details about ESD at https://www.wikihow.com/Ground-Yourself-to-Avoid-Destroying-a-Computer-with-Electrostatic-Discharge.

2.1.2 Enclosure Size

The ES102 weighs 70 lbs unloaded and requires a minimum of **two** people to lift.

Do not attempt to lift the ES102 when it is fully populated with drives! The total weight of a fully-populated system is over 260 lbs. When removing a fully-populated system from a rack, remove the drives before de-racking the enclosure.

You will need at least 37.5" (952.5mm) empty space in front of a racked ES102 to fully extend the enclosure to access all drive bays. Due to the weight of the enclosure, this can be a tipping hazard for the rack. Be sure to follow all tipping prevention instructions recommended by your rack provider before installing the ES102.

2.2 Tools

You will need these tools to properly install the ES102 in a compatible rack:
Long T15 screwdriver and a #2 Philips head screwdriver.

You don't need these items, but they can be useful when installing the ES102:
Tape measure, level, flat head screwdriver, and cable ties.

2.3 Rack Requirements

At minimum, the ES102 requires 4U of space in a EIA-310 compliant rack that is 47.24" (1200mm) deep, from frame to frame. The vertical rack rails need to be spaced between 31.5" - 36.2" (800mm - 920mm) apart to properly install the ES102 rails.

We recommend adjusting the front vertical rack rails to be as close to the front of the rack as possible to prevent the cable management arms (CMAs) from protruding from the back of the rack.

The system with CMAs attached is 47.1 (1197mm) deep.

The rack must be a standard 17.72" - 18.31" (450mm - 465mm) wide, although a minimum 29.5" (750mm) cabinet width allows for using a zeroU PDU with the enclosure. Narrower cabinets could require a rack-mounted PDU to properly allow the enclosure to be fully installed into the rack and properly cabled with the included Cable Management Arms.

For 52U racks, iXsystems recommends the AR3357X674. For a 42U rack, we recommend the AR3350 APC.

We recommend using the bottom-most available 4U space in the rack to better balance the system's weight with other equipment installed in that rack.

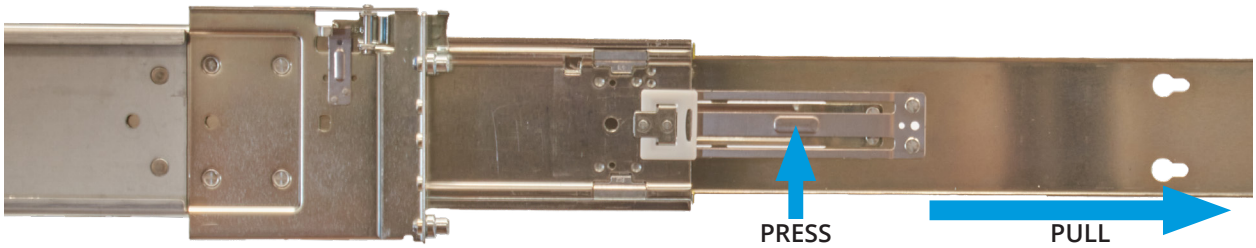
For both the AR3357X674 and AR3350 APC rack, we recommend using the STV-4501, STV-4502, or STV-4503 PDU.

3 ES102 Rail Installation Procedures

ES102 rail installation has several steps. First, separate the chassis rails from the rack rails and install them on the ES102. Then, fit the rack rails inside the rack. Next, install the additional components to secure the ES102 drive cover and latch the unit in the rack. Finally, you can reattach the ES102 to the rack rails and install it in the rack.

3.1 Enclosure Rails

Each rack rail includes an inner chassis rail that must be removed. Extend the innermost rail as shown below until it clicks into place and the metal safety catch is fully exposed. Push the safety catch in and continue to pull out the innermost rail until it is completely free from the rack rail. Repeat the process for the second rail.



The chassis rails attach to each side of the ES102. Align the chassis rail keyholes with the ES102's side posts. Slide the rail towards the rear of the system until the metal tab clicks and locks the rail in place. Use **three** of the included low-profile M4 Philips screws to secure the rail to the ES102. Repeat this process on the other side. The Cable Management Arm attach point will be at the *back* of the system.

3.2 Rack Rails

The ES102 occupies 4U of rack space. The *front* rail pins mount to the 4U's bottom-most attach points, and the *back* rail pins mount to one space above the 4U's bottom-most attach points. The rails are stamped for left side (L) and right side (R) of the rack, according to your perspective when facing the rack.

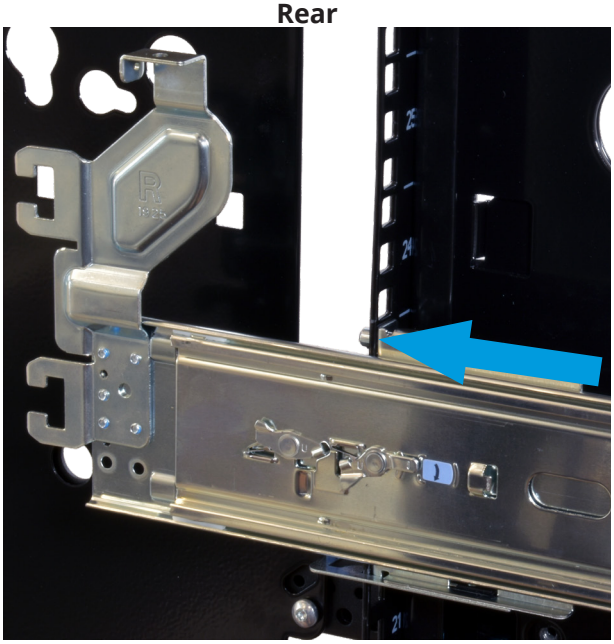
Install the front of the rail first. Align the rail pins with the mounting holes in the rack and push forward until the front latch clicks into place on the rack. Make sure an additional 2U of rack space is available above the rail.

The rear of the rail can adjust to racks that have 32 -36 inches of space between the front and rear rack posts.

Align the rear rail pins with the rack's mounting holes and push forward until the blue release catch clicks into place over the rack. Note that the rear rail pins install *one mounting hole higher* than the front rail pins. You can use a level to ensure the front and back of the rail are even.

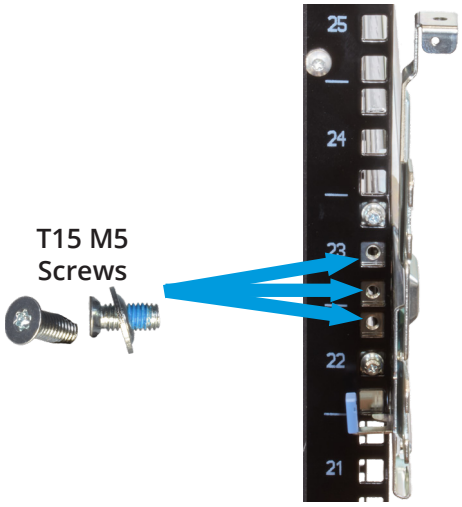
Front

Rear



Use **three** of the included **washers** and **T15 M5** screws to secure the rear of the rail to the rack post.

Rear



When installed correctly, the front and rear of the rail is level and the inner part of the rail with the gray bearing sleeve is facing the *inside* of the rack. Use the same procedure to install the other rail, being sure to install both left and right rails at the same height in each rack post.

4 Cover Retention

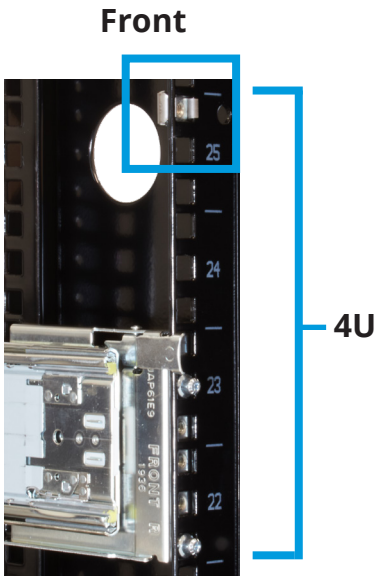
The cover retention components hold the cover in place when the unit slides forward out of the rack, simplifying drive bay access. If you want cover retention, install alignment brackets over the rear of the rack rails. Then install cage nuts at the system's front for the cover retention screws.

4.1 Attach Cage Nuts

You will need **two** of the included square cage nuts.

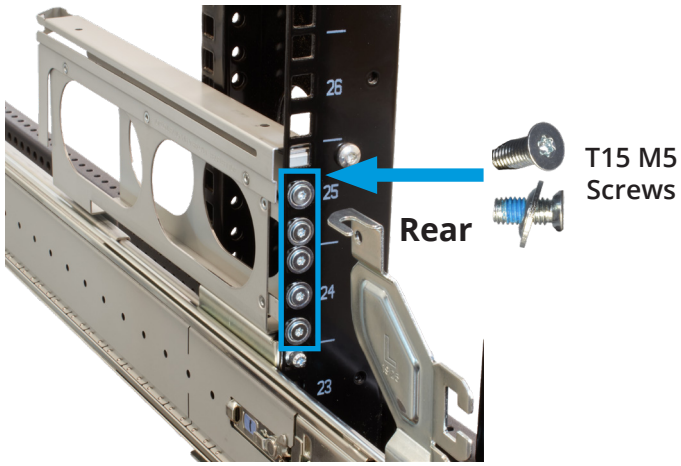
Take a cage nut and add it the topmost rack mounting hole of the required 4U of space. A flat head screwdriver can be helpful to push the cage nut "wings" into the rack mounting hole.

The nut should be ***inside*** the rack, with the attach "wings" touching ***the left and right sides of the hole (horizontal)***. Repeat this process for the other rack post and make sure both cage nuts are installed parallel rack mounting holes.



4.2 Install Alignment Brackets

Place the included Cover Alignment Bracket over the rail and align it with the mounting holes on the *rear* of the rack rail. The groove in the bracket must be pointed toward the *inside* of the rack. Use five washers and T15 M5 screws to secure the bracket to the *rear* of the rack rail.

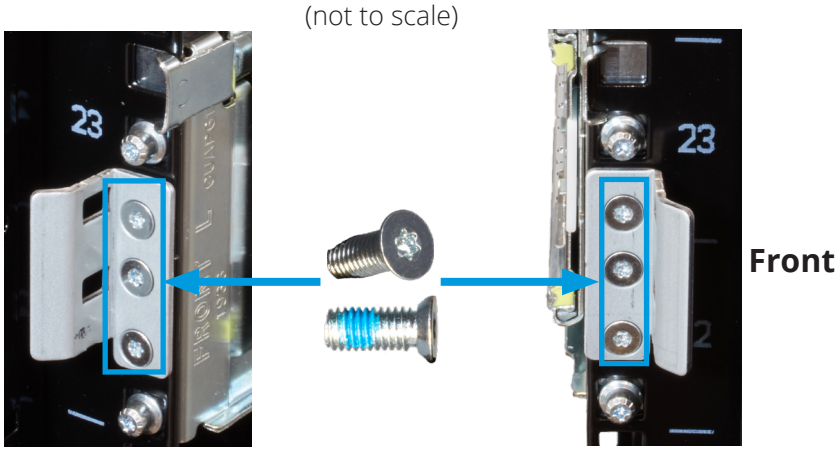


Use the same method to install the second alignment bracket to the other rail. Make sure the grooves on top of both brackets point inside the rack. The ES102 cover slides into the grooves when it is pushed into the rack.

5 Latch Plates

The latch plates attach to the front of the rack rails. They secure the rails to the rack and hold the enclosure in place when fully inserted in the rack. Align the plate over the three holds between the rack rail front mounting pins. The flange must point to the outside of the rack. Use three T15 M5 screws to secure the latch plate, rack post, and rack rails together.

T15 M5 Screws
(not to scale)

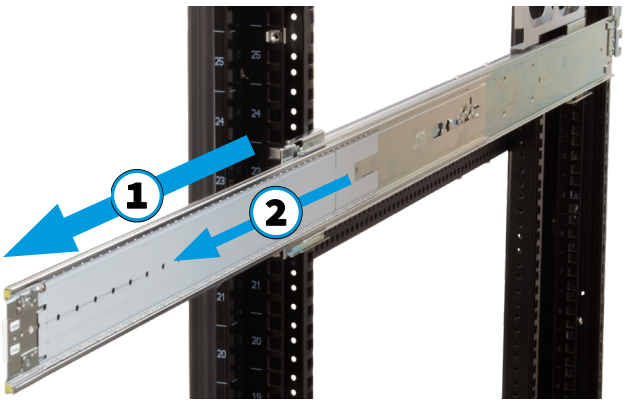


Use the same procedure to install the second plate on the front of the other rail. Make sure that both flanges on the latch plates point to the *outside* of the rack.

6 Mount the Unit in the Rack

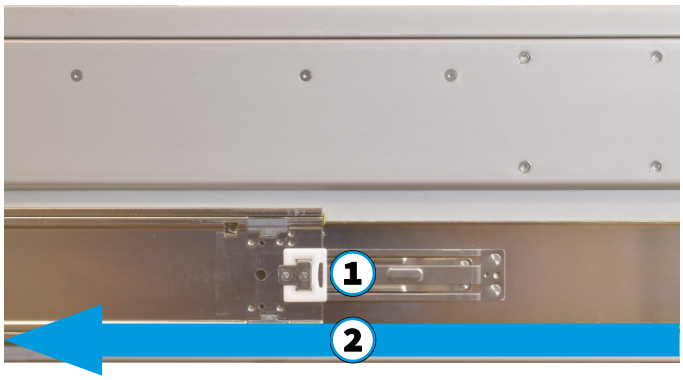
Caution: When using a lift, you need **two people and 7ft** of clearance between the system front and the rack. When lifting unaided, you need **three people and 5ft** of clearance to safely lift and install the chassis. Do not install drives until the chassis is installed in the rack. Remove all drives before removing the chassis from the rack.

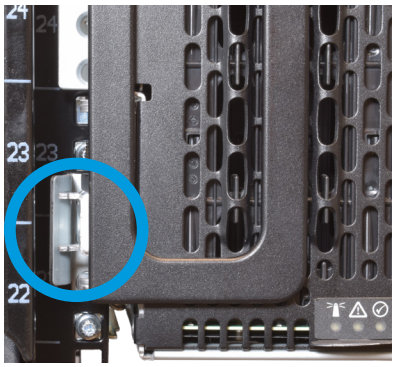
Slide the middle part of the rack rails out of the rack until they click into place (**1**). Make sure the inner bearing sleeve is also slid as far forward as possible (**2**).



Caution: Do not use the front handles to lift the ES102! The handles are only for unlatching and sliding the enclosure after attaching it to the rack rails. They cannot support the system's weight. Lift the ES102, align the attached cabinet rails with the middle rack rails, and push the ES102 into the rack rails until it stops.

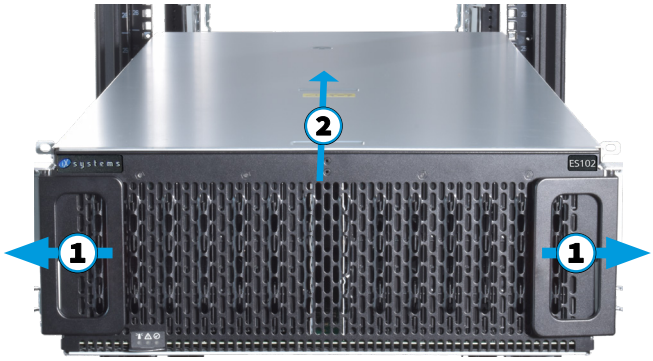
Locate the metal safety catches on each chassis rail and squeeze them into the chassis **(1)**. Hold the safety catches in place and push the chassis into the rack **(2)** until the chassis latches touch the rail latch plates.





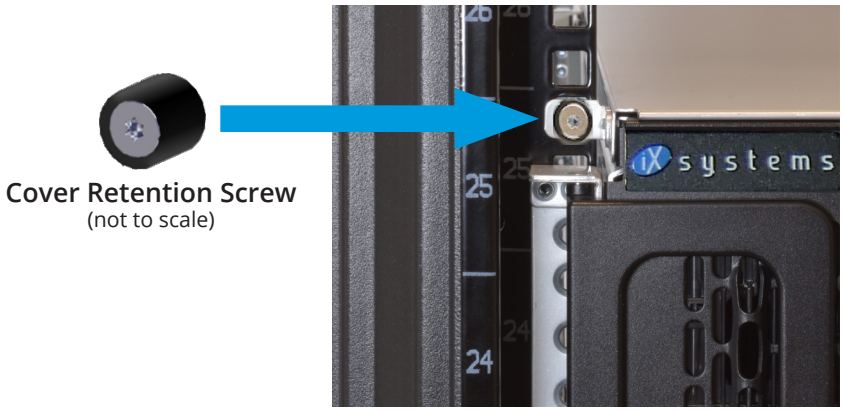
Make sure the enclosure cover slides into the Alignment Bracket grooves at the rear of the rack.

To minimize any jarring motions, softly secure the enclosure in place by swinging the front handles out (**1**) and gently pushing the enclosure forward until it is fully in the rack (**2**). After releasing the handles, the enclosure latches catch behind the latch plates and hold the system in the rack (**3**).



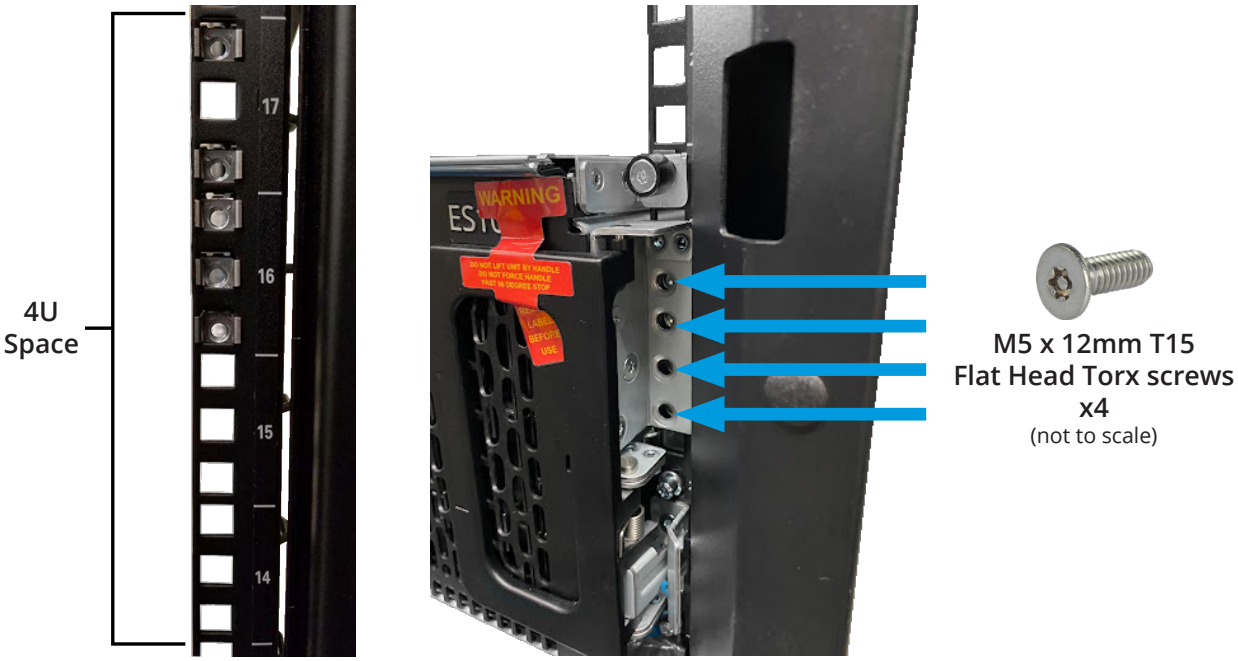
6.1 Attach Cover Retention Screws

To hold the ES102 cover in place when the system is slid out of the rack, attach the **two** included Philips head retention screws through the *left* and *right* cover retention holes and into the installed cage nuts. Make sure both screws are tight enough to securely hold the cover in place.



6.2 Shipping Screws

If you will be installing the ES102 in a rack for shipping purposes, install four more M5 cage nuts in holes 3-6 of the 4U space. These will receive the M5 x 12mm T15 Flat Head Torx screws that secure the enclosure to the rack with the shipping bracket.



7 ES102 Cable Management Arms

You need the included Cable Management Arms (CMA) to ensure the ES102 remains properly cabled while sliding out of the rack. There are two CMAs included with the ES102 that attach to the rear of the enclosure in an Upper (U) Lower (L) configuration. The CMAs include a brace that stabilizes the CMAs and rails together.

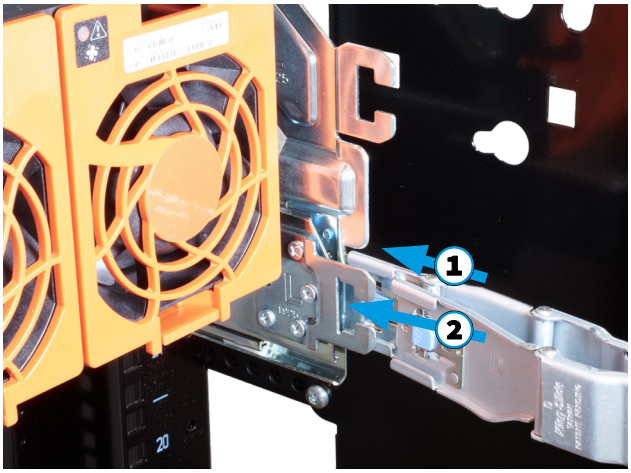
7.1 Attach Cable Management Brace

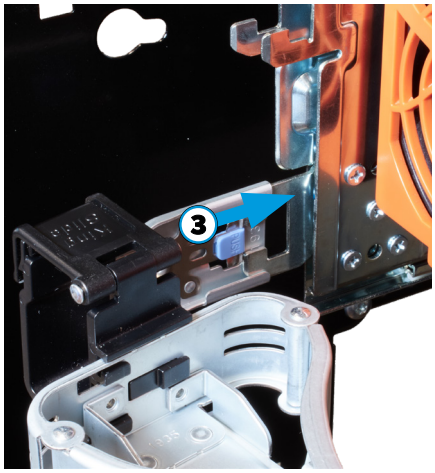
At the back of the system, insert the brace pivot pin into the top bracket on the *right* rail (**1**). Align the brace with the top bracket on the left rail (**2**) and tighten the thumbscrew until the brace is firmly in place (**3**).

7.2 Install Lower Cable Management Arm

You will need the CMA stamped Lower (L) for this procedure.

There are three attach points for the lower CMA, two on the *right* rail and one on the *left*. Beginning with the *right* side, insert the outermost connection post into the outer bracket until it clicks into place (**1**). Now, align and insert the inner post into the innermost bracket (**2**). Swing the back of the CMA to the *left* rail and insert the post into the *left* bracket until it clicks into place (**3**).

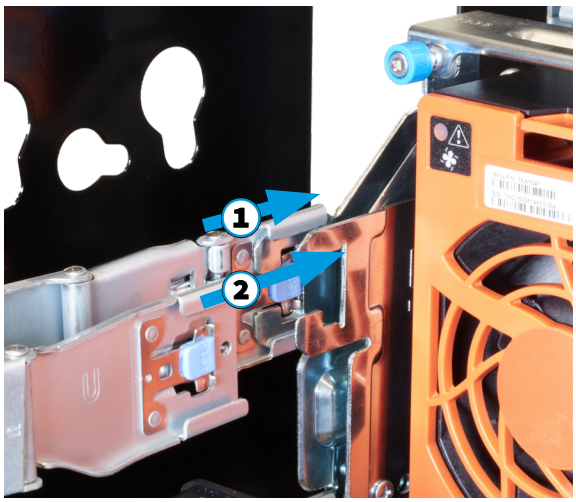


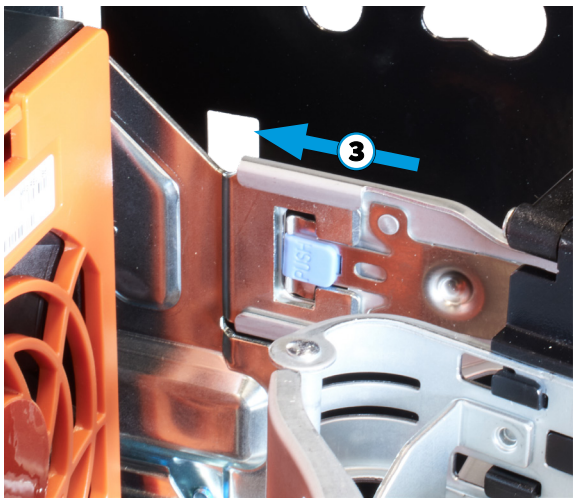


7.3 Install Upper Cable Management Arm

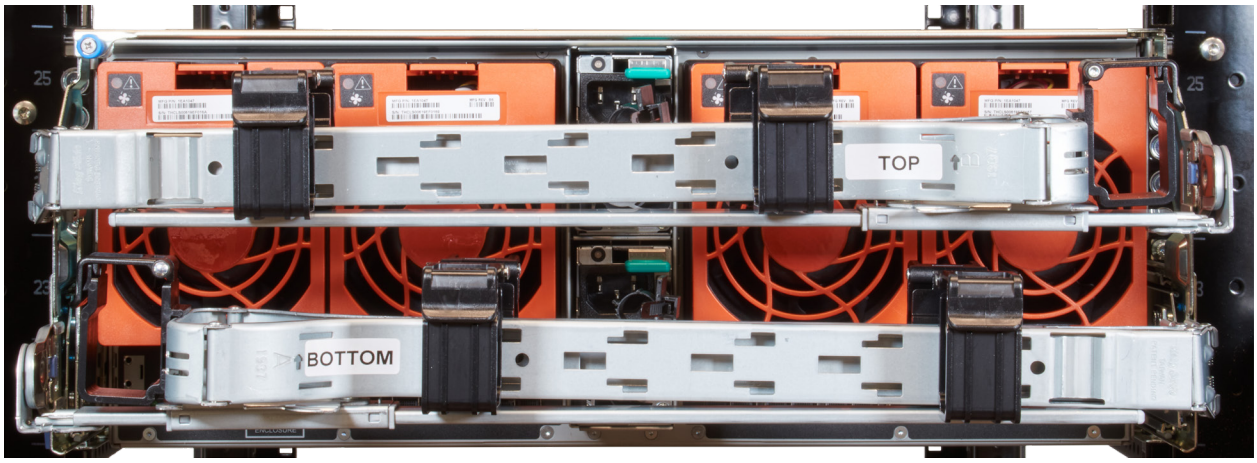
You will need the CMA stamped Upper (U) for this procedure.

There are three attach points for the upper CMA, two on the *left* rail and one on the *right*. Beginning with the *left* side, insert the outermost connection power into the outer bracket until it clicks into place (1). Now align and insert the inner post into the innermost bracket (2). Swing the back of the CMA to the *right* rail and insert the post into the *right* backet until it clicks into place (3).





Here is how the back of the system should appear with both CMAs properly installed:



Before installing any drives in the ES102 or routing any cables through the CMAs, test the installation by unlatching the enclosure and sliding it forward until it clicks into place. The CMAs will fully extend behind the ES102, and the cover will remain in place, exposing the drive and component bay.

If you feel any grinding or the enclosure unexpectedly stops before locking into place, don't force the motion! Carefully press the enclosure rail safety catches and push it back into the rack. Secure it in place, and verify the Cable Management Arms, Latch Plates, Cover Alignment Brackets, and Rails are correctly installed.

8 Drive Installation

Do not install the drives until the enclosure has been installed in the rack. Only approved WD drives are compatible with the ES102.

The ES102 ships with all the drives needed to fully populate the enclosure, packaged separately. Drives ship already attached to the drive clips, but in the event you need to replace a failed drive, the clip attach procedure is below.

8.1 Attach Clip to Drive

ES102 drive clips fit over the front of a drive and have two plastic pegs that pop into the frontmost screw holes on the left and right sides of the drive.
Align the drive and clip so the the bottom of the clip fits over the bottom of the drive and the drive connection ports are on the opposite end from the clip. Push the clip connection peg into place on one side of the drive and then gently flex the clip over the drive until the other connection peg pops into place.

8.2 Insert Drives into the Enclosure

Use drives with attached clips to install drives into the enclosure from back to front.

To install a drive, point the arrow on the clip towards the enclosure's front. Pinch the orange clips and gently push the drive down into the enclosure slot. Release the orange clips to secure the drive in place. Ensure the drive is fully inserted into the enclosure and does not extend above the system. You might need to gently work the clip into the sides of the bay to secure it in place.

For proper airflow, be sure to follow this drive installation order:
Starting with the row at the *back* of the ES102 drive bay, install the drives from *left* to right. When that row is full, move to the next row forward and proceed to fill the enclosure from *left* to right, *back* to *front*.

8.3 Drive LED Indicators

There is a single amber LED on each drive bay. The LED indicates different drive states:

- Drive Insertion: Amber Light - Solid Note: LED stays in this state until the shelf is closed
- Normal Behavior: No light.
- Activity: No light.
- Issue/Fault: Amber Light - On for one second, then off (repeats).
- Identify: Amber Light - On for two seconds, then off (repeats). The front chassis blue identify light also blinks.
- Hot-Spare: No light

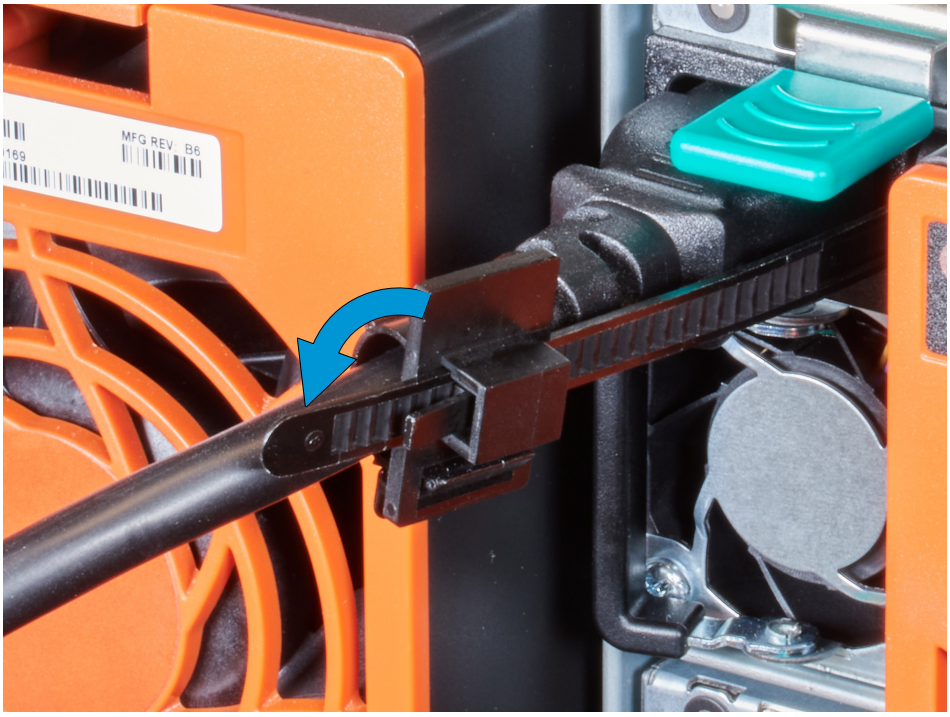
9 Cabling

Do not plug the power cords into a power outlet yet.
Start by connecting cables to the various ports on the back of the ES102 and routing through the cable management arms. Make sure to leave enough flex in the cables so that they don't pull out of place when the enclosure slides out of the rack.

Service and Management ports are not used during normal operation and do not require cabling.

9.1 Power Cables

The ES102 only accepts 200-240v power input. Connect a power cord to the back of one power supply. Extend the plastic retention clamp, open it, fit it over the power cable, and push it down over the cable to lock it in place. Repeat the process to connect the second power supply and secure the cord.



9.2 SAS Cables

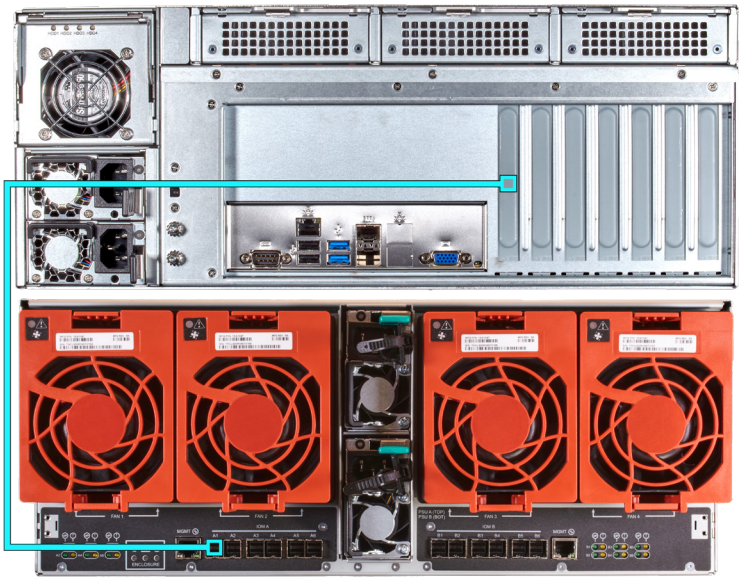
ES102 systems are compatible with the M60 and R50 Unified Storage Arrays. Typical SAS cable connections for two ES102s to either system are shown here.

To set up SAS between your TrueNAS system and Expansion Shelves, cable the first port on the first TrueNAS Controller to the first port on the first Expansion Shelf Controller. High Availability systems require another cable from the first port on the second TrueNAS Controller to the first port on the second Expansion Shelf Controller. We **DO NOT** recommend other cabling configurations. Contact iX Support if you need other cabling methods.

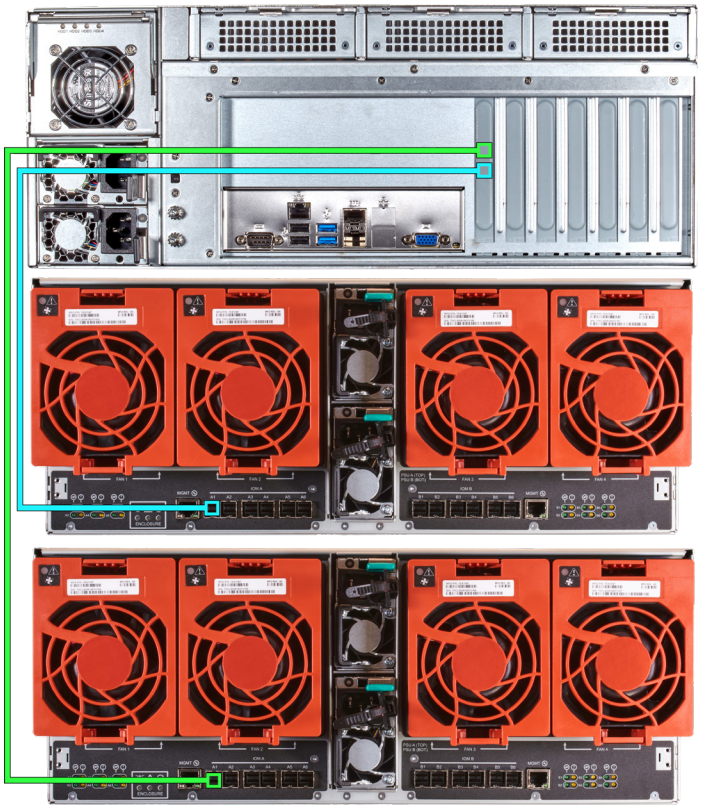
Warning: When setting up your SAS connections, please adhere to the wiring examples in this guide. Connecting expansion shelves incorrectly will cause errors. Never cable a single controller to different expanders on the same expansion shelf.

9.2.1 R50

R50 with a single ES102 Expansion Shelf:

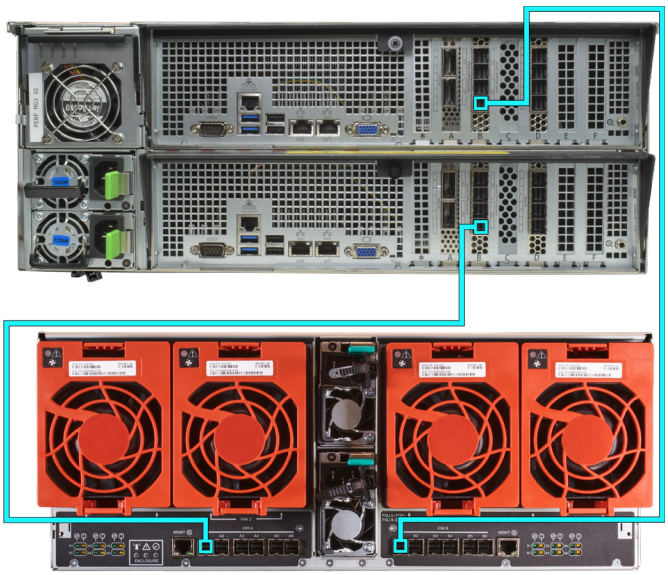


R50 with two ES102 Expansion Shelves:

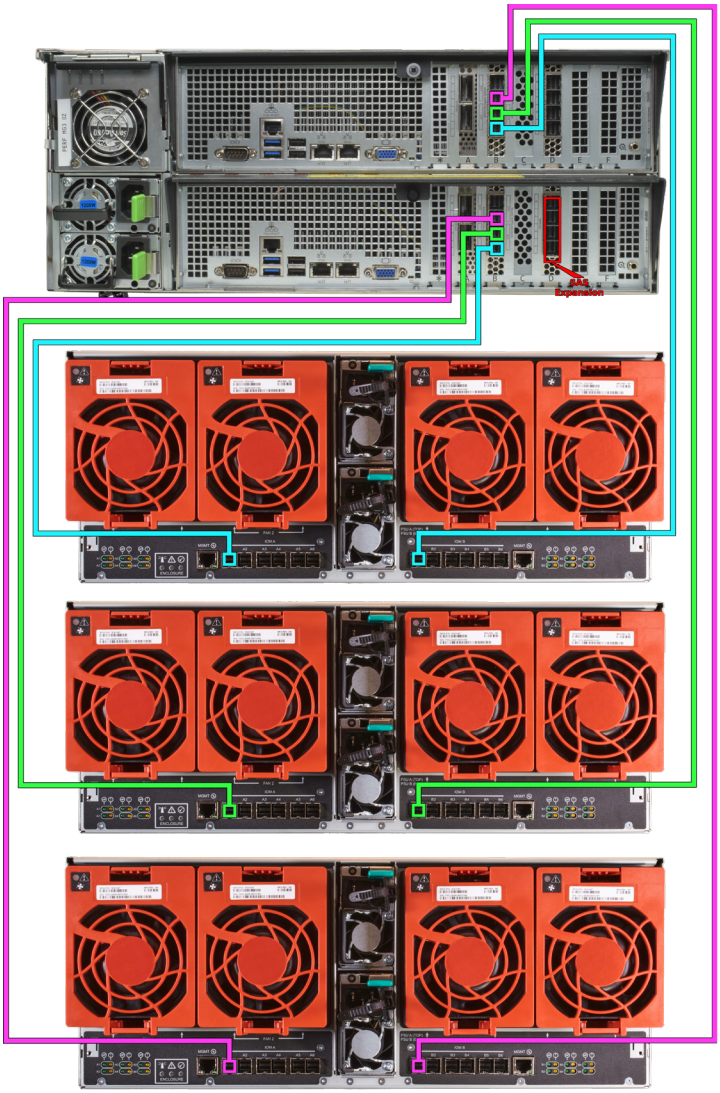


9.2.2 M60

M60 with a single ES102 Expansion Shelf



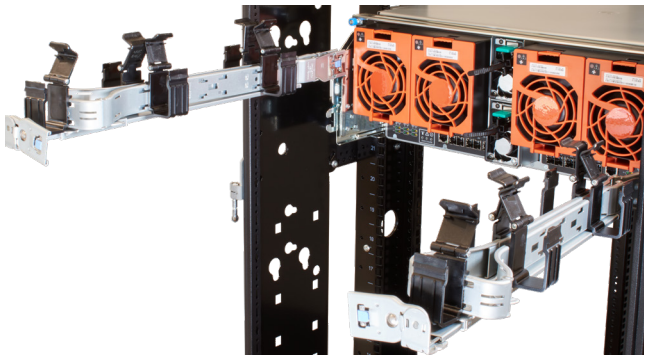
M60 with three ES102 Expansion Shelves. The M60 can support up to 12 total Expansion Shelves with the use of additional SAS cards.



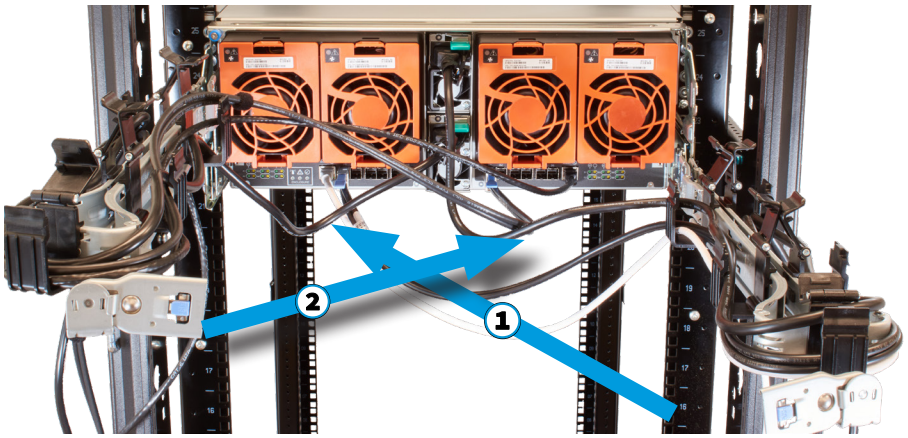
9.3 Cable Routing

To simplify cabling with the Cable Management Arms (CMAs), swing open both arms so that they point directly away from the enclosure. To do this, start with the lower arm and press the blue release catch on the left side connector, then swing the arm to the right. Release the right side connector on the upper arm and swing it to the left.

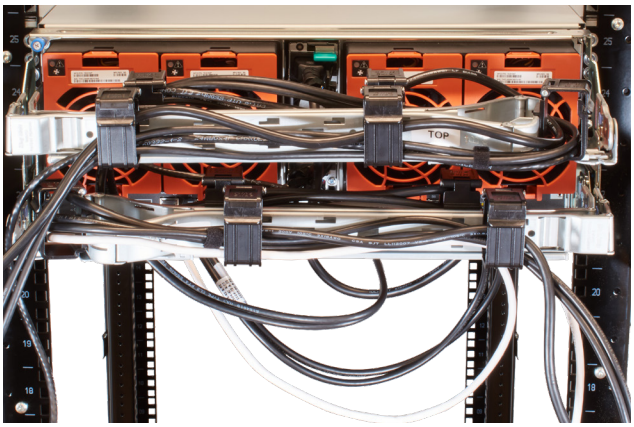
To open the cable retention clips, gently squeeze and lift the top of the clip.



To ensure there is enough flex in the cables to allow sliding the enclosure fully out of the rack, we recommend routing cables for the first Storage Controller (*left* side) through the lower CMA (*right* side) (**1**). Route cables for the second Storage Controller (*right* side) through the upper CMA (*left* side) (**2**). Allow plenty of flex in the cables by not pulling them tightly through the CMAs.



When finished routing cables through the CMAs, close all the cable retention clips and swing the arms closed, reconnecting each side to the enclosure. If you see any cables getting pinched or pulled while closing the arms, do not force the motion! Return to the starting position and adjust the cables to allow more flex or avoid pinching.



If the TrueNAS system is already on, you can turn on the ES102 any time by plugging both power cords into PDU outlets and waiting two minutes for the drives to start.

10 Additional Resources

The TrueNAS Documentation Hub has complete software configuration and usage instructions. Click **Guide** in the TrueNAS web interface or go directly to:

https://www.truenas.com/docs/

Additional hardware guides and articles are in the Documentation Hub's Hardware section:

https://www.truenas.com/docs/hardware/

The TrueNAS Community forums provide opportunities to interact with other TrueNAS users and discuss their configurations:

https://www.truenas.com/community/

10.1 Contacting iXsystems

For assistance, please contact iX Support:

Contact Method	Contact Options
Web	https://support.ixsystems.com
Email	support@iXsystems.com
Telephone	Monday-Friday, 6:00AM to 6:00PM Pacific Standard Time: • US-only toll-free: **1-855-473-7449** option 2 • Local and international: **1-408-943-4100** option 2
Telephone	Telephone After Hours (24x7 Gold Level Support only): • US-only toll-free: **1-855-499-5131** • International: **1-408-878-3140** (International calling rates will apply)

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