CRU

QX448 Receiving Frame

User Manual

A9-6310-000 Rev. 1.1

Product Warranty

CDSG warrants this product to be free of significant defects in material and workmanship for a period of three (3) years from the original date of purchase. CDSG's warranty is nontransferable and is limited to the original purchaser.

Limitation of Liability

The warranties set forth in this agreement replace all other warranties. CDSG expressly disclaims all other warranties, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose and non-infringement of third-party rights with respect to the documentation and hardware. No CDSG dealer, agent, or employee is authorized to make any modification, extension, or addition to this warranty. In no event will CDSG or its suppliers be liable for any costs of procurement of substitute products or services, lost profits, loss of information or data, computer malfunction, or any other special, indirect, consequential, or incidental damages arising in any way out of the sale of, use of, or inability to use any CDSG product or service, even if CDSG has been advised of the possibility of such damages. In no case shall CDSG's liability exceed the actual money paid for the products at issue. CDSG reserves the right to make modifications and additions to this product without notice or taking on additional liability.

FCC Compliance Statement: This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

In the event that you experience Radio Frequency Interference, you should take the following steps to resolve the problem:

1. Ensure that the case of your attached drive is grounded.
2. Use a data cable with RFI reducing ferrites on each end.
3. Use a power supply with an RFI reducing ferrite approximately 5 inches from the DC plug.
4. Reorient or relocate the receiving antenna.

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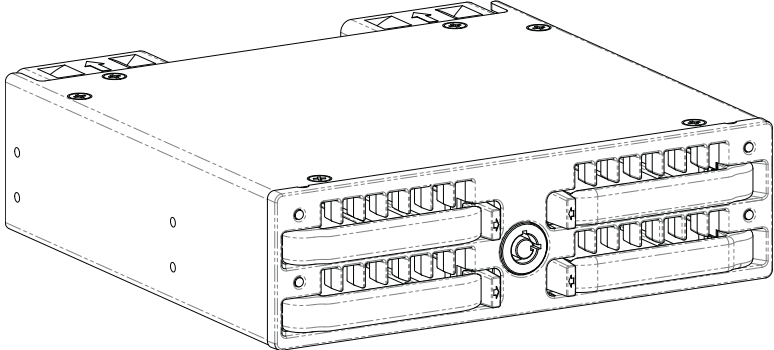This page is intentionally left blank.
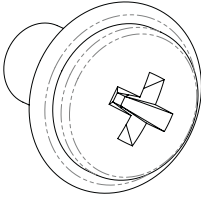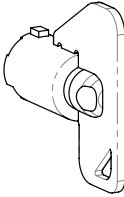
1. General Information

1.1. Introduction

Congratulations on the purchase of your QX448 receiving frame! The QX448 allows you to transfer mas-sive amounts of data quickly via four SHIPS Modules or SHIPS Rugged Modules at one time, each of which contains an M.2 NVMe SSD. Each host connection to a SHIPS module provides four PCIe 4.0 lanes over an OCuLink interface, taking full advantage of the roughly 32 Gbps data transfer speeds available within these technologies. The QX448 receiving frame fits into a single 5.25-inch drive bay, and a single barrel keylock controls physical access to all four SHIPS modules.

This User Manual will show you how to install and properly set up the QX448 receiving frame, how to in-stall and remove SHIPS modules, and provide other operational information you will need to get the most out of your product.

1.2. Package Contents

Check the package contents to verify that you have received the items below. Please contact CRU if any items are missing or damaged.

QX448 Receiving Frame	Qty. 1

M3x5 Screws	Qty. 4

Short Key	Qty. 1

Long Key	Qty. 2
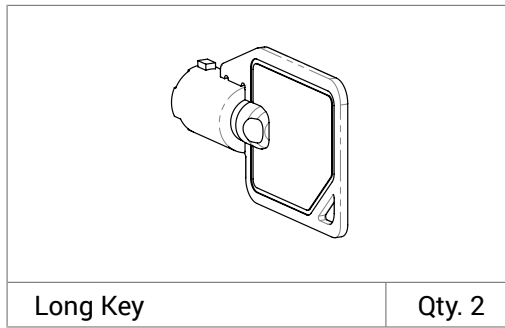
1.3. Safety Information

Please read the following before handling this product.

1. Do not drop the product, submit it to impact, or pierce it.

2. The circuit boards within this product are susceptible to static electricity. Proper grounding is strongly recommended to prevent electrical damage to the product or other connected devices, including the computer host.

3. Avoid placing this product close to magnetic devices, high voltage devices, or in an area exposed to heat, flame, direct sunlight, dampness, moisture, or rain.

4. To avoid overheating, this product should be operated in a well-ventilated area.

5. Before starting any type of hardware installation, please ensure that all power switches have been turned off and all power cords have been disconnected to prevent personal injury and damage to the hardware.

6. A damaged cable or device may malfunction and/or overheat and become a fire hazard.
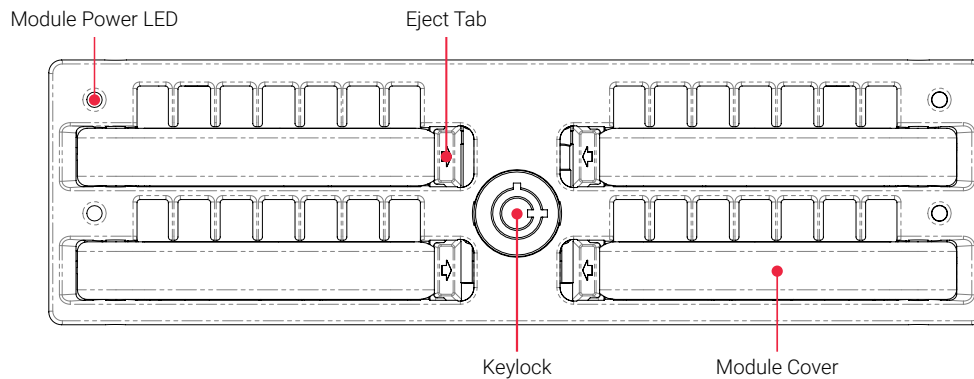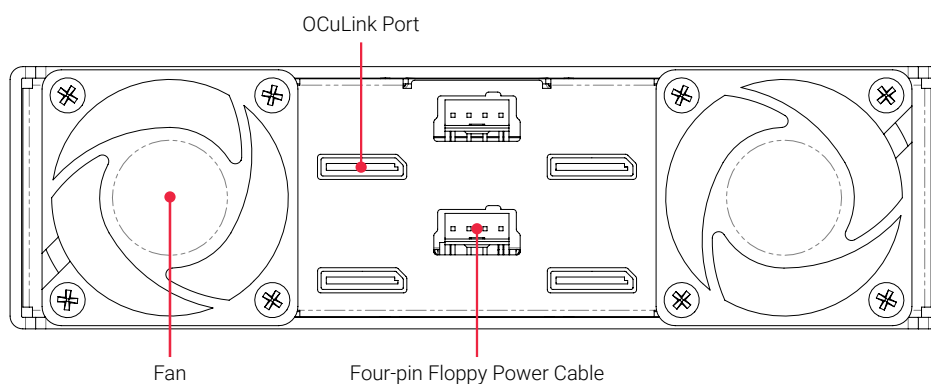
1.4. Identifying Parts

Figure 1. Front

Figure 2. Rear

Figure 2. Rear diagram showing OCuLink Port, Fan, and Four-pin Floppy Power Cable.

1.5. LED Behavior

| LED Name	Color	State	Description
Module Power (all slots)	Green	Solid	The SHIPS module inside the slot is powered on.
		Flicker-ing	The module inside the slot is being accessed by your computer.
	Amber	Solid	The SHIPS module inside the slot is powered on, but the module is at risk of data throttling due to high temperatures.
		Flicker-ing	The module inside the slot is being accessed by your computer, but the module is at risk of data throttling due to high temperatures.
Module Power (left side)	Red	Solid	The left-side fan on the rear of the QX448 has failed. Contact Technical Support for a replacement.
		Flicker-ing	The module inside the slot is being accessed by your computer, but the left-side fan on the QX448 has failed. Contact Technical Support for a replacement.
Module Power (right side)	Red	Solid	The right-side fan on the rear of the QX448 has failed. Contact Technical Support for a replacement.
		Flicker-ing	The module inside the slot is being accessed by your computer, but the right-side fan on the QX448 has failed. Contact Technical Support for a replacement.

2. Setup

2.1. Receiving Frame Installation

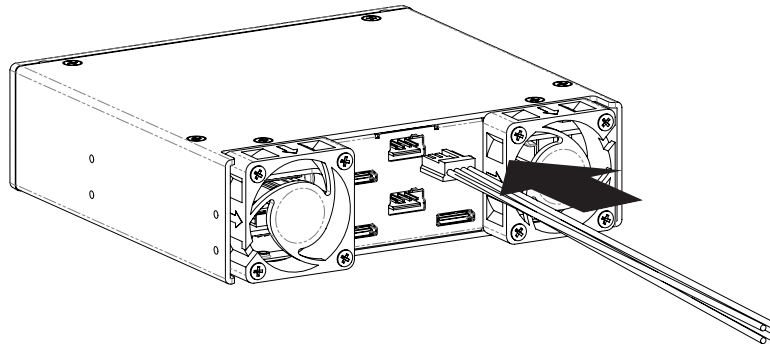1. Turn off your computer. Disconnect the power cord, and remove the computer cover.
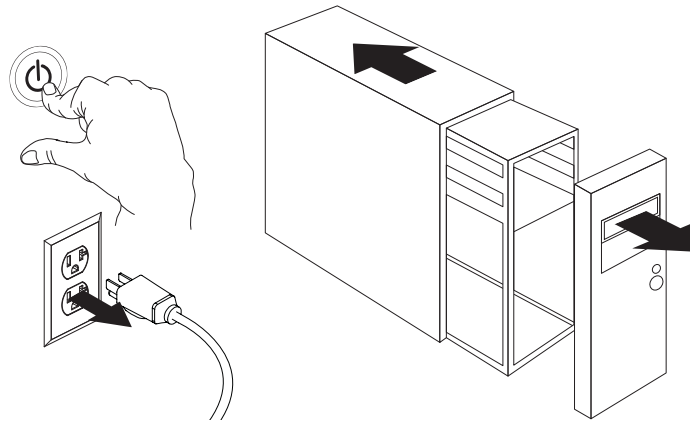
2. Remove a vacant 5.25-inch drive bay panel and slide the QX448 receiving frame in.
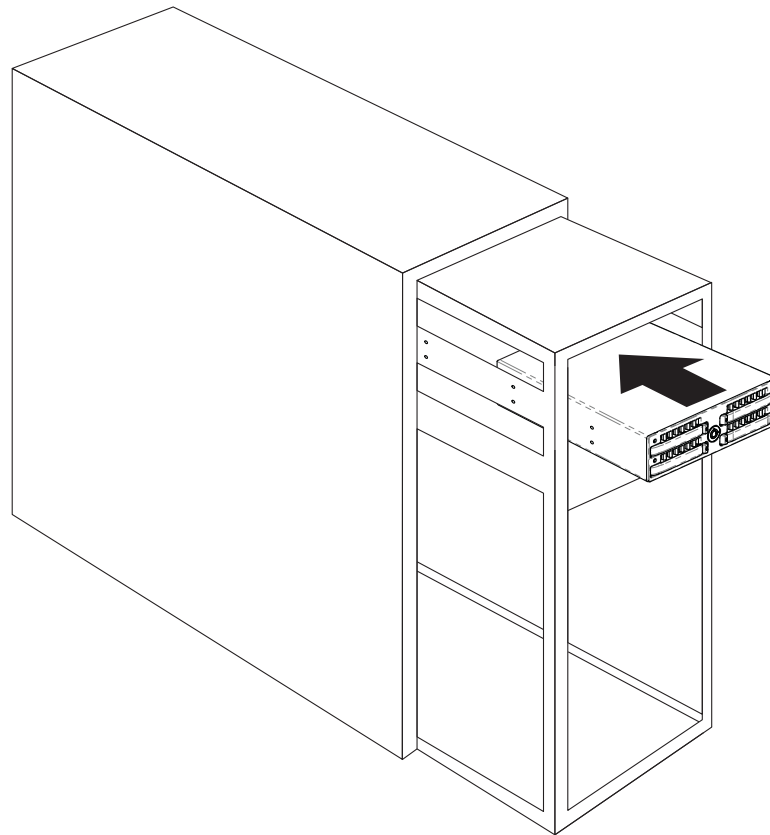
3. Secure the QX448 to the drive bay with the supplied screws.
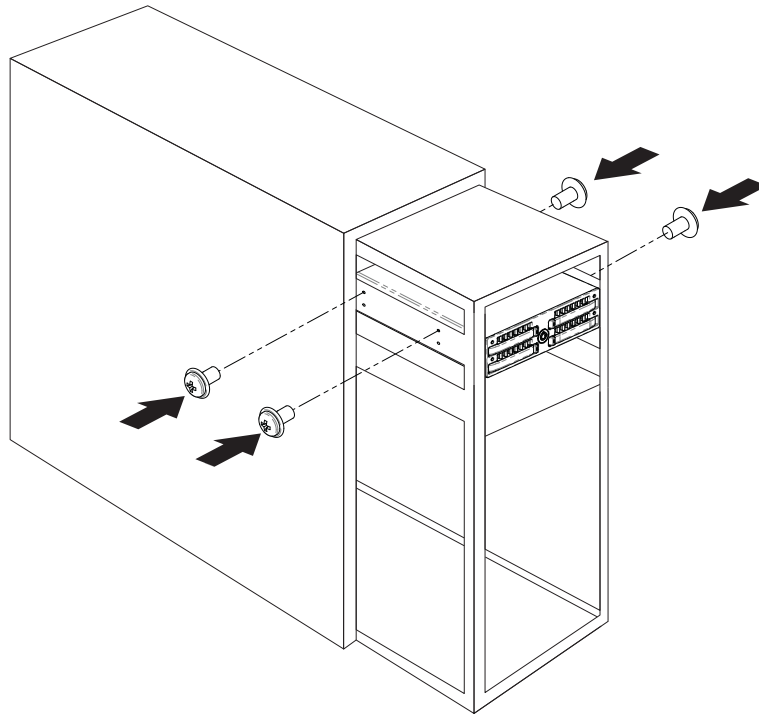
4. Connect two (2) four-pin floppy power cables from your computer to the rear of the QX448.

5. If necessary, install a host bus adapter card (HBA) or cards with a combined total of four (4) OCuLink ports into your computer. Refer to the HBA's user manual for installation instructions.
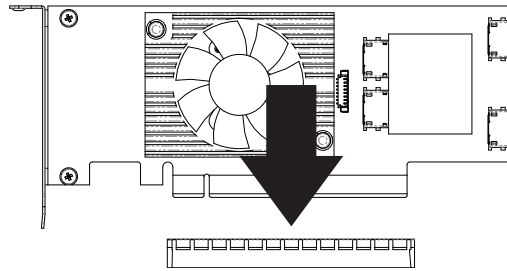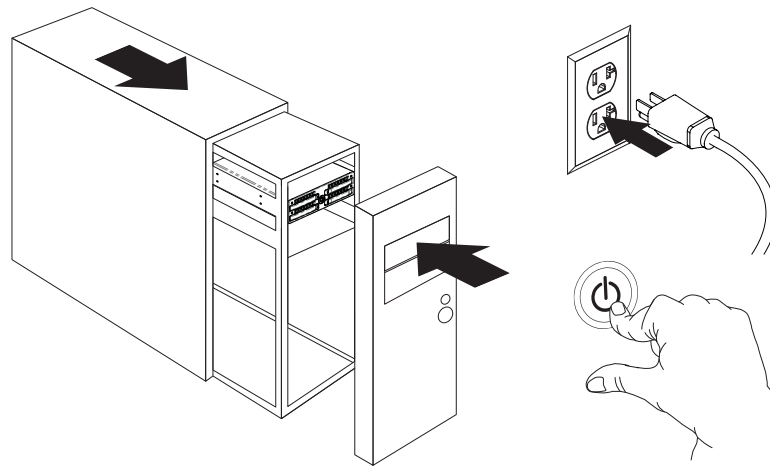

6. Connect the appropriate OCuLink cable to your HBA.
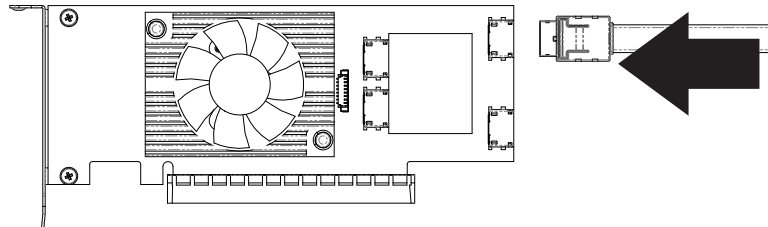
7. Connect the other end of the cable to an OCuLink port on the rear of the QX448. Repeat Steps 6 and 7 three (3) more times for each of the remaining ports on the rear of the QX448.
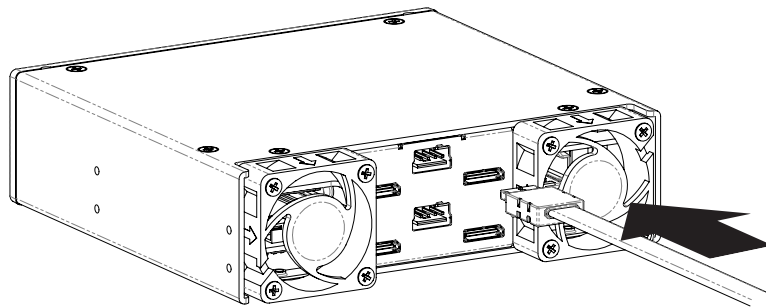
8. Replace the computer cover, reconnect the power cord, and turn on your computer.


> **NOTE**
> Compatible adapter cards and cables are available for purchase on the QX448 product page at cru-inc.com.
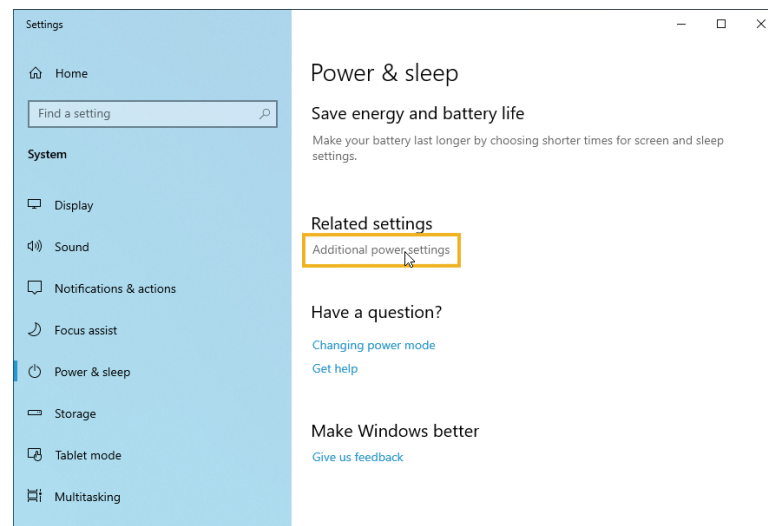
2.2. Disable Windows Fast Startup

"Fast startup" must be disabled in Windows 10 and Windows 8.1 to ensure that data from the QX448 is read properly. Here are the instructions for how to do so with Windows 10.
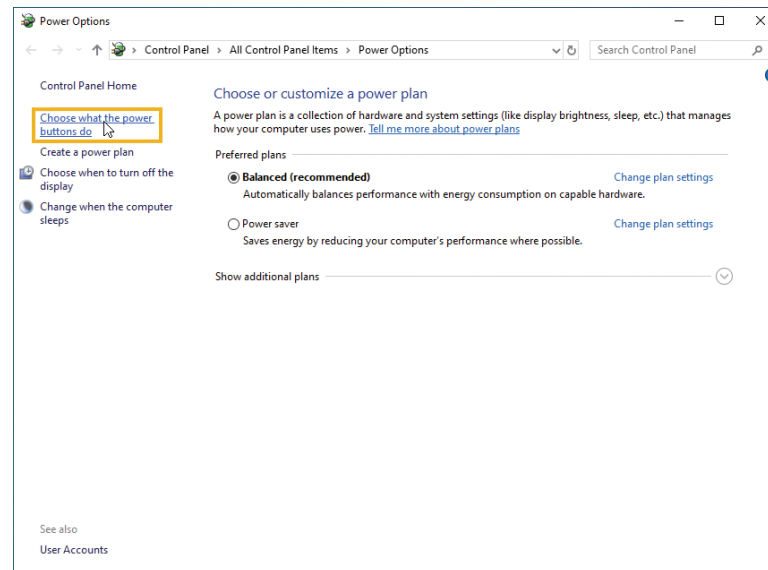
1. Right click on the **Start Button** and select **Power Options**.
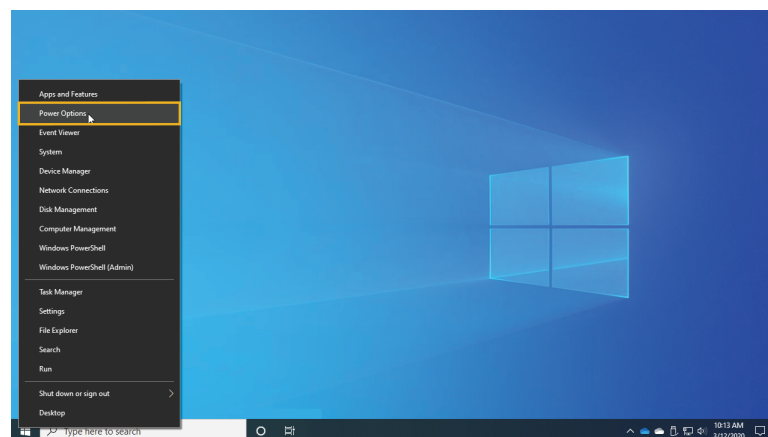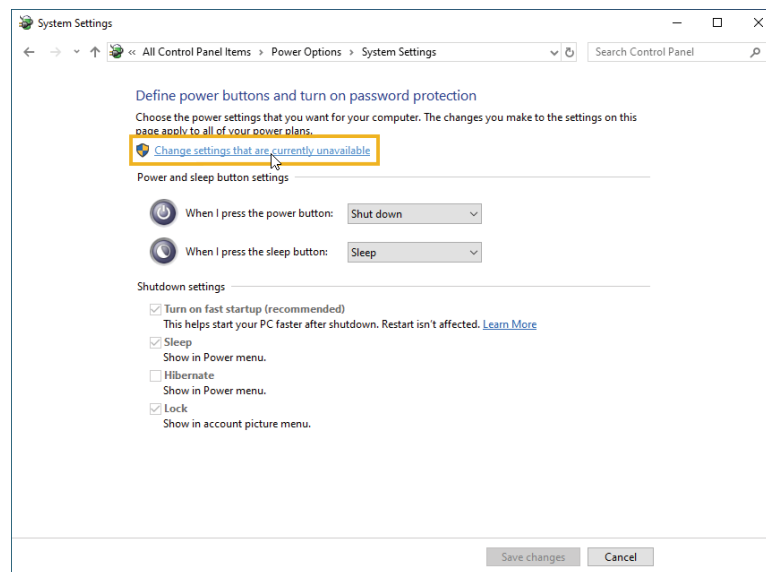
2.   Under Related Power Settings in the right column, select **Additional power settings**.
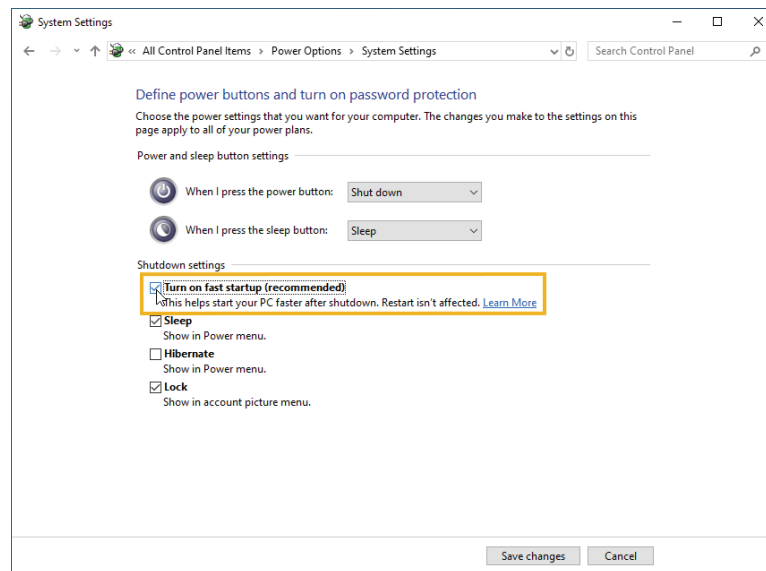

3.   On the left column of the new window, select **Choose what the power buttons do**.
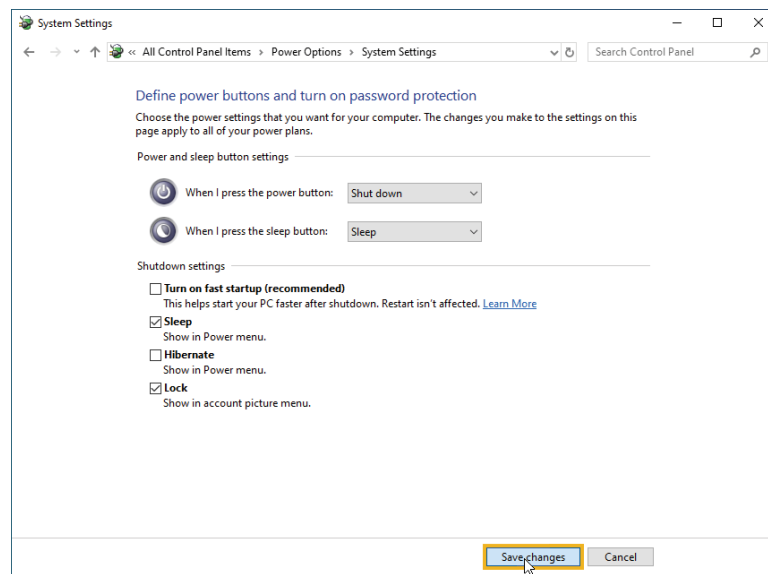
4.   Select **Change settings that are currently unavailable**.

5.   Uncheck **Turn on fast startup (recommended)**.

6. Click the **Save changes** button.

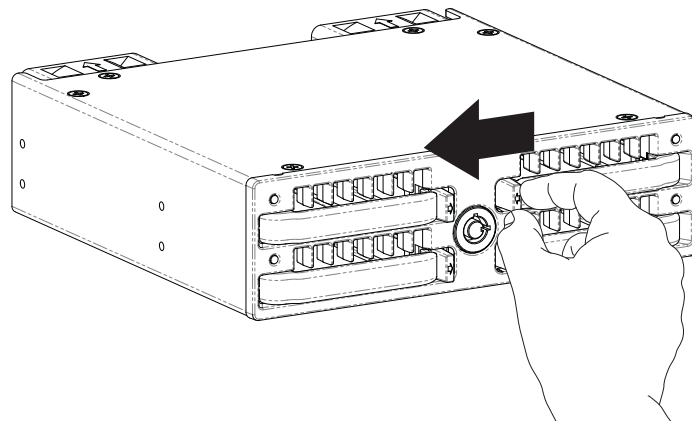# 3. Operation

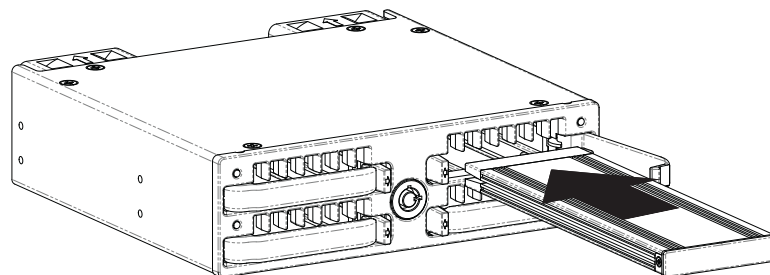## 3.1. SHIPS Module Installation

> ⚠️ **CAUTION**
> If hot swapping is not available, then failure to turn off your computer before removing or installing a SHIPS module may result in data loss.
>
> CRU has designed the QX448 to support hot swapping. However, your entire system must support hot swapping, including your motherboard, BIOS/UEFI, CPU, operating system, and host bus adapter. CRU sells hot-swap-capable HBAs and cables to help simplify your installation needs. They are available on the QX448 product page at cru-inc.com.

1. Power off your computer. If you have hot swapping capability, then you may ignore this step.

2. On the QX448, pull an empty receiving slot's eject tab toward the center of the QX448 to release the module cover. Then move the module cover out of the way.

3. Orient a SHIPS Module or SHIPS Rugged Module so that its pins are downward and facing the QX448. Insert it into an open slot on the QX448 receiving frame.

4.   Close the module cover until it snaps into place. The module will automatically power on when the computer is turned on.
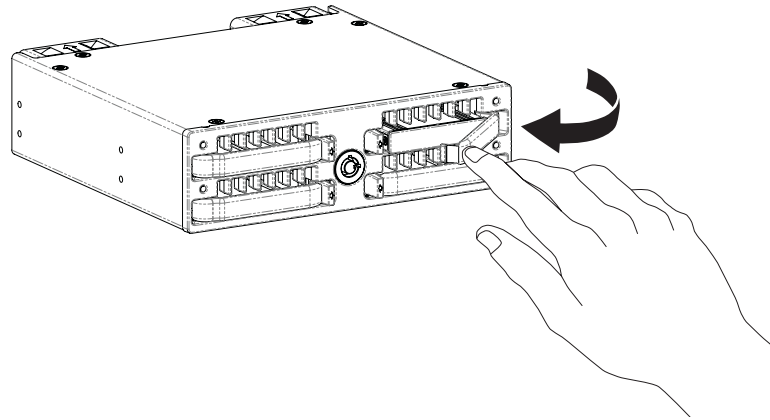
5.   You may optionally lock all receiving slots at once by inserting the provided key and rotating it 90 degrees clockwise.
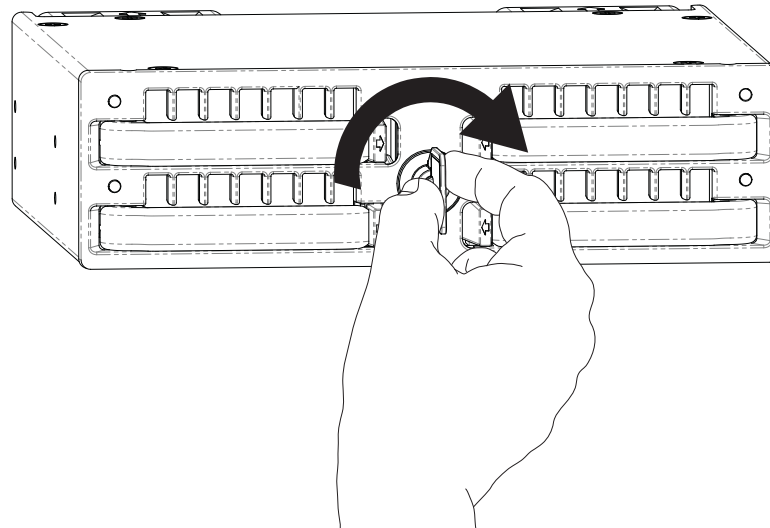
6.   Power on the computer if it is powered off.

3.2. Safe SHIPS Module Removal

> ⚠ **CAUTION**
> If hot swapping is not available, then failure to turn off your computer before removing or installing a SHIPS module may result in data loss.
>
> CRU has designed the QX448 to support hot swapping. However, your entire system must support hot swapping, including your motherboard, BIOS/UEFI, CPU, operating system, and host bus adapter. CRU sells hot-swap-capable HBAs and cables to help simplify your installation needs. They are available on the QX448 product page at cru-inc.com.

1. Power off your computer. If you have hot swapping capability, then you do not need to turn the computer off, but you must make sure that data on the module you wish to remove is not being accessed by your computer.

2. If the module is locked into the receiving frame, insert the included key into the lock and turn it 90 degrees counterclockwise.

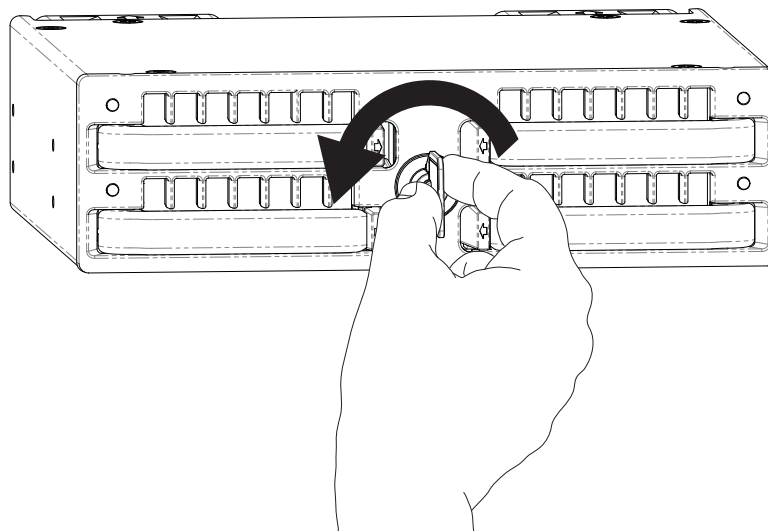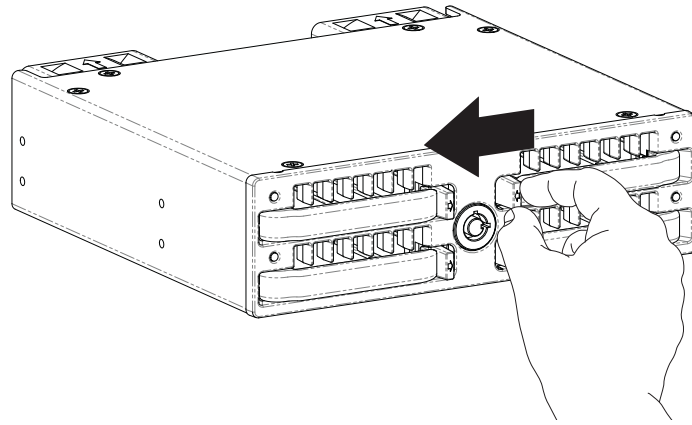3. Pull the eject tab to the center of the QX448 to open the module cover. Then move the module cover out of the way.

4. Pull the module out of the receiving frame.
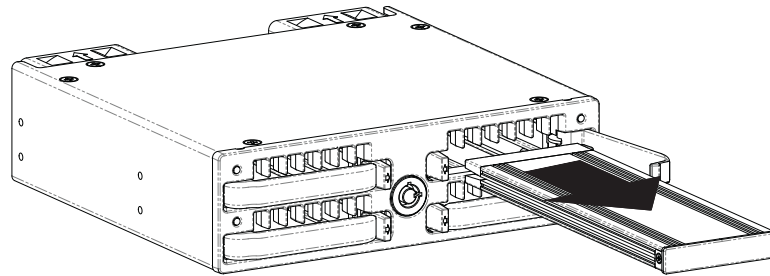
4. Triple-Speed Fan

The QX448 comes equipped with two (2) triple-speed cooling fans located on the rear of the device. The fans spin at a constant rotation and will switch to medium speed when the drives inside begin to heat up, and will switch to high speed when they are hot.

5. Product Support

Your investment in CRU products is backed up by our free technical support for the lifetime of the product. Contact us through our website, cru-inc.com/support or call us at 1-800-260-9800 or +1-360-816-1800.

Appendix A. Table of Specifications

Product Name	DIGISTOR QX448
QX448 Interface Types & Speeds	OCuLink SFF-8612: up to ~32 Gbps (32 GT/s)
Host Bus Interface	PCIe 3.1
Supported Storage Media	Up to four (4) CRU DIGISTOR SHIPS Modules or DIGISTOR SHIPS Rugged Modules[1]
Data Connectors	Four (4) OCuLink SFF-8612 connectors[2]
Power Connectors	Two (2) 4-pin floppy power connectors
Form Factor	5.25-inch drive bay (SFF-8551)
Torque	M3 screws: 4 inch-pounds max
Fans	Two (2) variable speed fans (controlled by drive temp)
Modern Standby Support	No
Supported Operating Systems	• Windows 11, 10, and 8.1 • Windows Server 2022, 2019, 2016, and 2012 product families • Red Hat Enterprise Linux and Ubuntu LTS
Weight	467 g
Dimensions	• Width: 146.40 mm • Length: 142.00 mm • Height: 41.40 mm
Compliance	• EMI Standard: FCC Part 15 Class B • EMC Standard: EN55024, EN55032 • CE, RoHS, RCM • The QX448 with its supporting accessories have been tested to be PCIe Gen3 compliant per the Add in Card criteria of the PCIe Specification 3.1.

[1]Each CRU DIGISTOR SHIPS Module ships with an M.2 NVMe SSD preinstalled. Documentation for the SHIPS module is provided in the SHIPS Documentation, available by request.

[2]OCuLink SFF-8612 connectors require an OCuLink SFF-8611 cable to mate

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