Lenovo

Rear Door Heat Exchanger for 48U Rack User Guide

Fourth Edition (February 2025)

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安装本产品之前，请仔细阅读 Safety Information （安全信息）。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας (safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

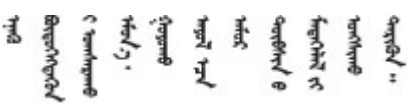
A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.



Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

ཐོན་རྫས་འདི་བདེ་སྐྱོང་མ་བྱས་གོང་། ·སྐྲ་ཐྱི་ཡིད་གཟབ· བྱ་འདྲ་མིན་ཡོད་པའི་འོད་སྣེར་བལྟ་དགོས།

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

ھەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

Youq mwngz yungh canjbinj neix gaxgonq, itdingh aeu doeg aen canjbinj soengq cungj vahgangj ancien siusik.

Safety inspection checklist

Use the information in this section to identify potentially unsafe conditions with your server. As each machine was designed and built, required safety items were installed to protect users and service technicians from injury.

Note: The product is not suitable for use at visual display workplaces according to §2 of the Workplace Regulations.

Note: The set-up of the server is made in the server room only.

CAUTION:
This equipment must be installed or serviced by trained personnel, as defined by the IEC 62368-1, the standard for Safety of Electronic Equipment within the Field of Audio/Video, Information Technology and Communication Technology. Lenovo assumes you are qualified in the servicing of equipment and trained in recognizing hazards energy levels in products. Access to the equipment is by the use of a tool, lock and key, or other means of security, and is controlled by the authority responsible for the location.

Important: Electrical grounding of the server is required for operator safety and correct system function. Proper grounding of the electrical outlet can be verified by a certified electrician.

Use the following checklist to verify that there are no potentially unsafe conditions:

1. Make sure that the power is off and the power cord is disconnected.
2. Check the power cord.
   - Make sure that the third-wire ground connector is in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and the frame ground.
   - Make sure that the power cord is the correct type.

     To view the power cords that are available for the server:

     a. Go to:

http://dcsc.lenovo.com/#/

b. Click **Preconfigured Model** or **Configure to order**.

c. Enter the machine type and model for your server to display the configurator page.

d. Click **Power → Power Cables** to see all line cords.

- Make sure that the insulation is not frayed or worn.

3. Check for any obvious non-Lenovo alterations. Use good judgment as to the safety of any non-Lenovo alterations.
4. Check inside the server for any obvious unsafe conditions, such as metal filings, contamination, water or other liquid, or signs of fire or smoke damage.
5. Check for worn, frayed, or pinched cables.
6. Make sure that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Chapter 1. Rear Door Heat eXchanger for 48U Rack

See this topic to learn about parts of ThinkSystem Rear Door Heat eXchanger for 48U Rack.

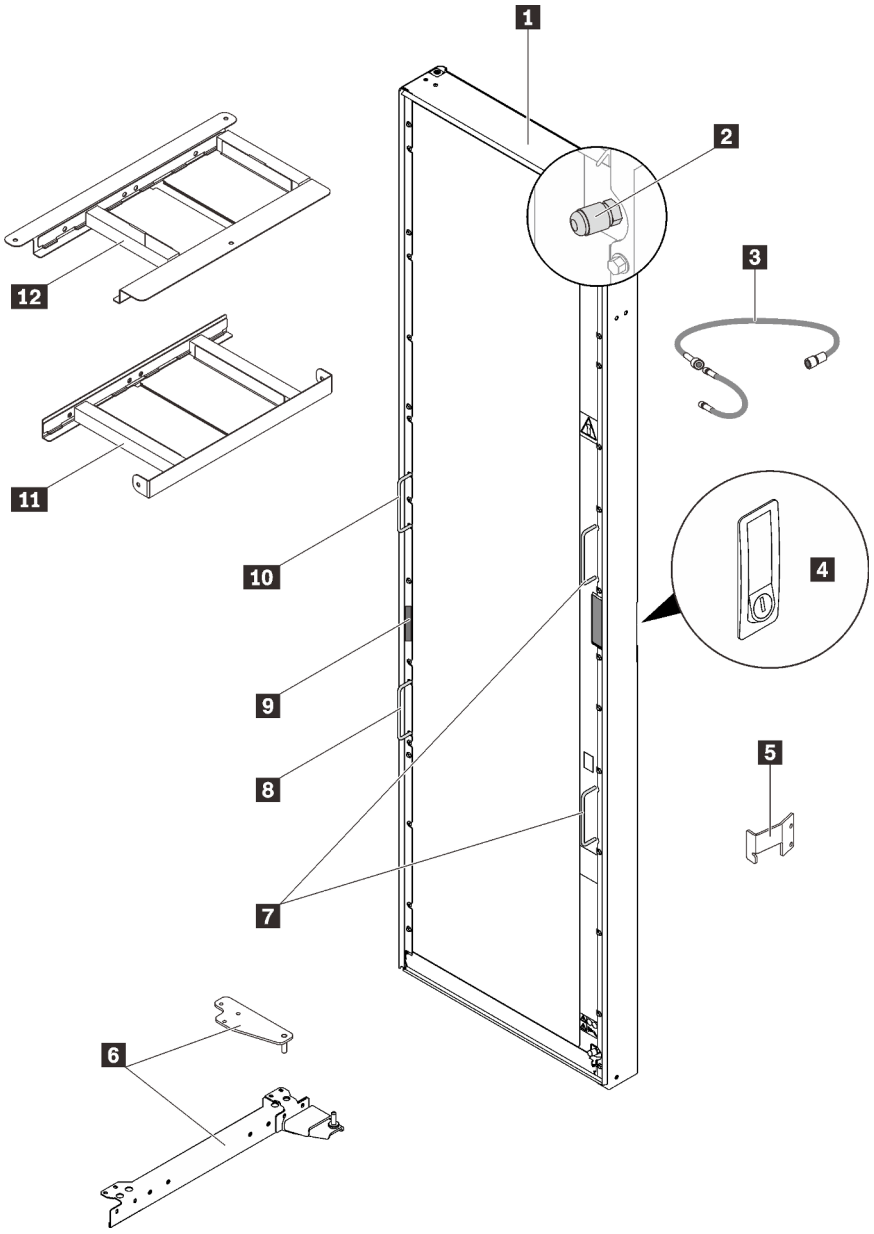


Figure 1. ThinkSystem Rear Door Heat eXchanger for 48U Rack components

Table 1. Rear Door Heat eXchanger components

1 Rear Door Heat eXchanger assembly	7 Lift handles
2 Air-purging valve	8 Lift handle
3 Air-purging tool	9 Serial number

Table 1. Rear Door Heat eXchanger components (continued)

4 Door latch	10 Lift handle
5 Latch plate	11 Lower air baffle
6 Hinge kit	12 Upper air baffle

For setup and installation, see Chapter 2 “Set up Rear Door Heat eXchanger for 48U Rack” on page 5.

Specifications

Dimension	• Depth: 121.5 mm / 4.8 inches • Height: 2179 mm / 85.8 inches • Width: 592 mm / 23.3 inches
Weight	Empty: 49 kg / 103.6 lbs
Air movement	Provided by servers and other devices in the rack
Air temperature drop	With high-heat-load devices, up to 25°C (45°F) between the air exiting the rack devices and the air exiting the heat exchanger.
Water	• **Source** User-supplied, compliant with specifications in this document • **Pressure** – Normal operation: <137.93 kPa (20 psi) – Maximum: 689.66 kPa (100 psi) • **Volume** Approximately 9 liters (2.4 gallons) • **Temperature** – Above dew point – 18°C ±1°C (64.4°F ±1.8°F) for ASHRAE Class 1 Environment – 22°C ±1°C (71.6°F ±1.8°F) for ASHRAE Class 2 Environment **Note:** See “Heat exchanger performance” for more information. • **Required water flow rate** (as measured at the supply entrance to the heat exchanger) – Minimum: 22.7 liters (6 gallons) per minute – Maximum: 56.8 liters (15 gallons) per minute

Heat exchanger performance

The following figure illustrates the diagram of rack air flow and heat exchanger water flow.

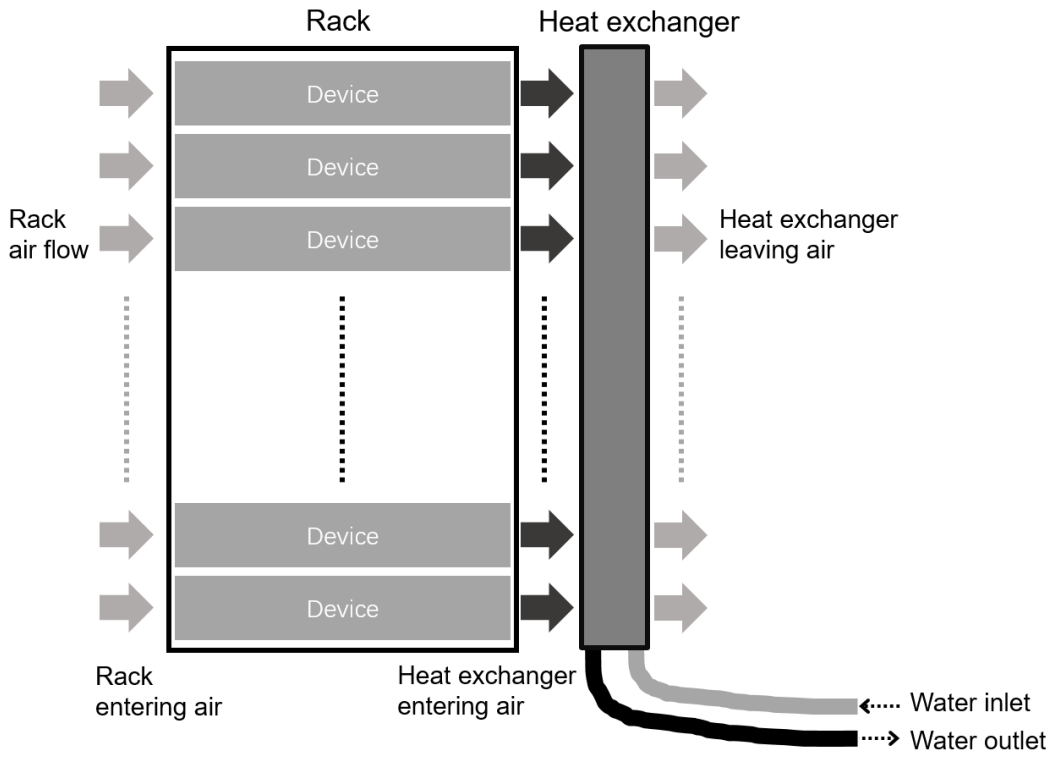


Figure 2. Diagram of rack air flow and heat exchanger water flow

Expected performance of the heat exchanger is illustrated in the following figures for 25°C (77°F) rack entering air temperature and typical rack air flow of 3840SCFM and 4800SCFM. By selecting the correct rack power, water inlet temperature, you can achieve the water flow rate (lpm) for 100% heat removal. Water flow rate (lpm) for 100% heat removal indicates that an amount of heat equivalent to that generated by the devices has been removed by the heat exchanger and the average air temperature leaving the heat exchanger is identical to that entering the rack (25°C /77°F in this example).

Heat removal as function of water inlet temperature and water flow rate for the given rack entering air temperature and air flow rate.

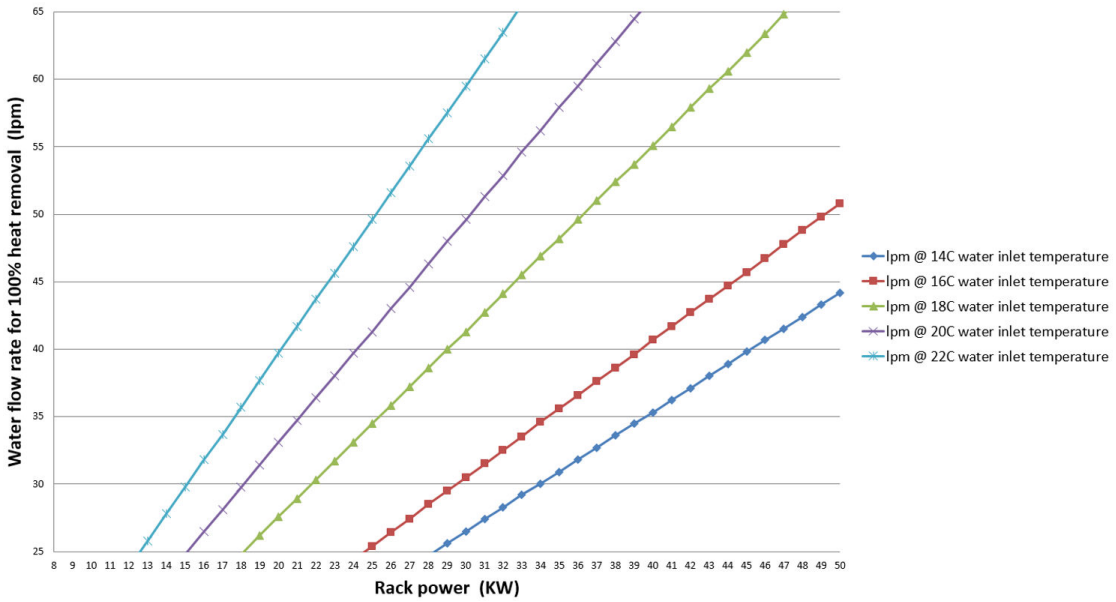


Figure 3. Typical performance of the heat exchanger, 3840SCFM Rack air flow, 25°C Rack entering temperature

Heat removal as function of water inlet temperature and water flow rate for the given rack entering air temperature and air flow rate.

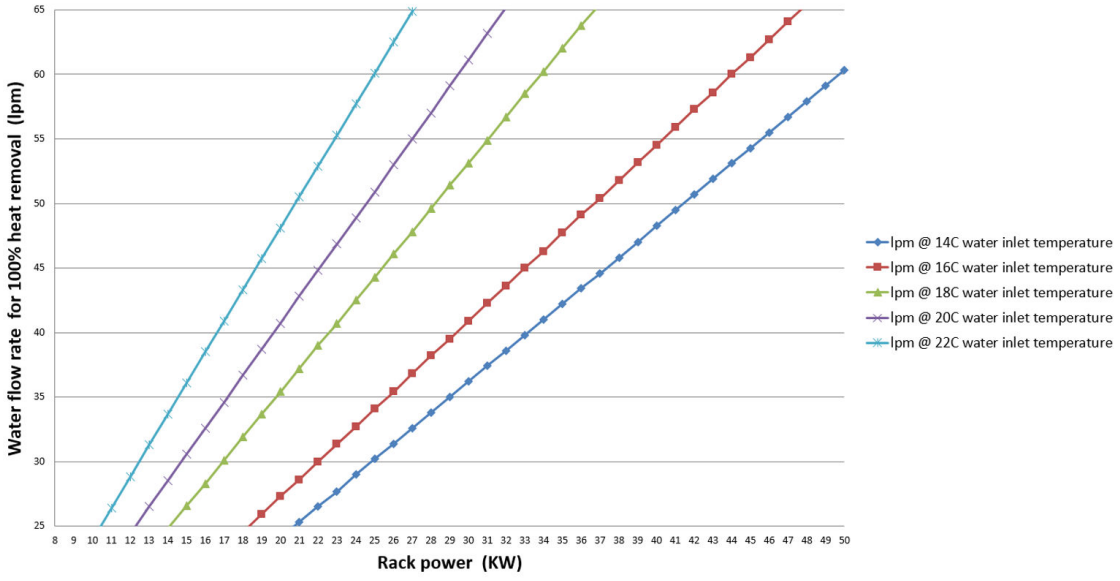


Figure 4. Typical performance of the heat exchanger, 4800SCFM Rack air flow, 25°C Rack entering temperature

Chapter 2. Set up Rear Door Heat eXchanger for 48U Rack

See this topic to learn how to install and set up ThinkSystem Rear Door Heat eXchanger for 48U Rack.

About this task

Follow the instructions in the section corresponding to the installation scenario:

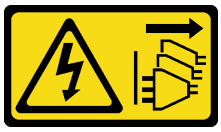
- If Rear Door Heat eXchanger for 48U Rack comes when installed to the rack, see “Complete setup of Rear Door Heat eXchanger 48U that comes with the rack” on page 6 to complete the setup procedure.
- To replace a regular rear door with Rear Door Heat eXchanger for 48U Rack, see “Replace a regular door with Rear Door Heat eXchanger for 48U” on page 10.

Important: Make sure to plan the cooling system with consideration of “Water specifications for the secondary cooling loop” on page 22.

S010

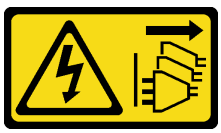
CAUTION:
Do not place any object weighing more than 82 kg (180 lb) on top of rack-mounted devices.

S019



CAUTION:
The power-control button on the device does not turn off the electrical current supplied to the device. The device also might have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals.

R007



DANGER

- **Connect power cords from devices in the rack cabinet to electrical outlets that are near the rack cabinet and are easily accessible.**
- **Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet before you service any device in the rack cabinet.**
- **Install an emergency-power-off switch if more than one power device (power distribution unit or uninterruptible power supply) is installed in the same rack cabinet.**
- **Connect all devices that are installed in a rack cabinet to power devices that are installed in the same rack cabinet. Do not connect a power cord from a device that is installed in one rack cabinet to a power device that is installed in a different rack cabinet.**

R004

CAUTION:
See the instructions in the rack documentation before you install devices, remove devices, or relocate the rack.

S038

CAUTION:
Eye protection should be worn for this procedure.

Complete setup of Rear Door Heat eXchanger 48U that comes with the rack

See this topic to learn how to complete setup of ThinkSystem Rear Door Heat eXchanger for 48U Rack when it comes already installed to the rack.

Procedure

Step 1. Remove the brackets that support the rear door heat exchanger.

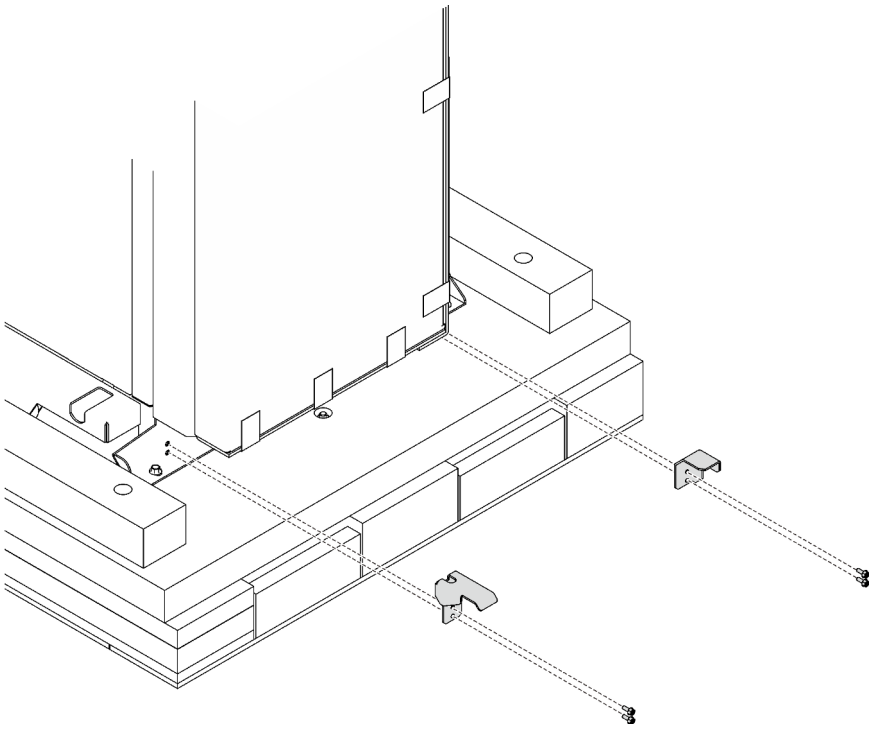


Figure 5. Removing the supporting brackets

Step 2. Make sure that one specially trained person holds onto the rear door heat exchanger and guides the rack down the ramp. The other specially trained persons must guide the rack down the ramp by holding onto the rack frame. Slowly roll the rack down the ramp until the casters are on the floor. Move the rack to the final location.

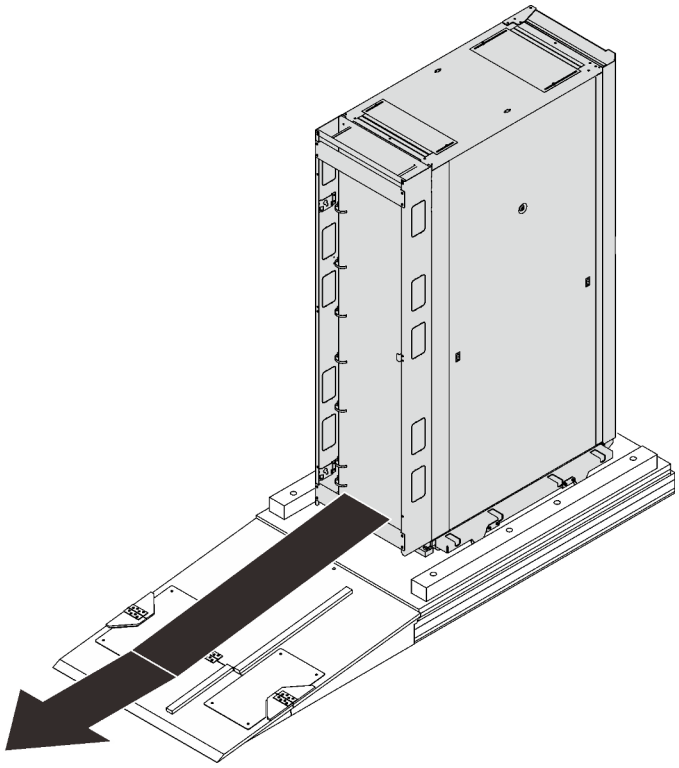
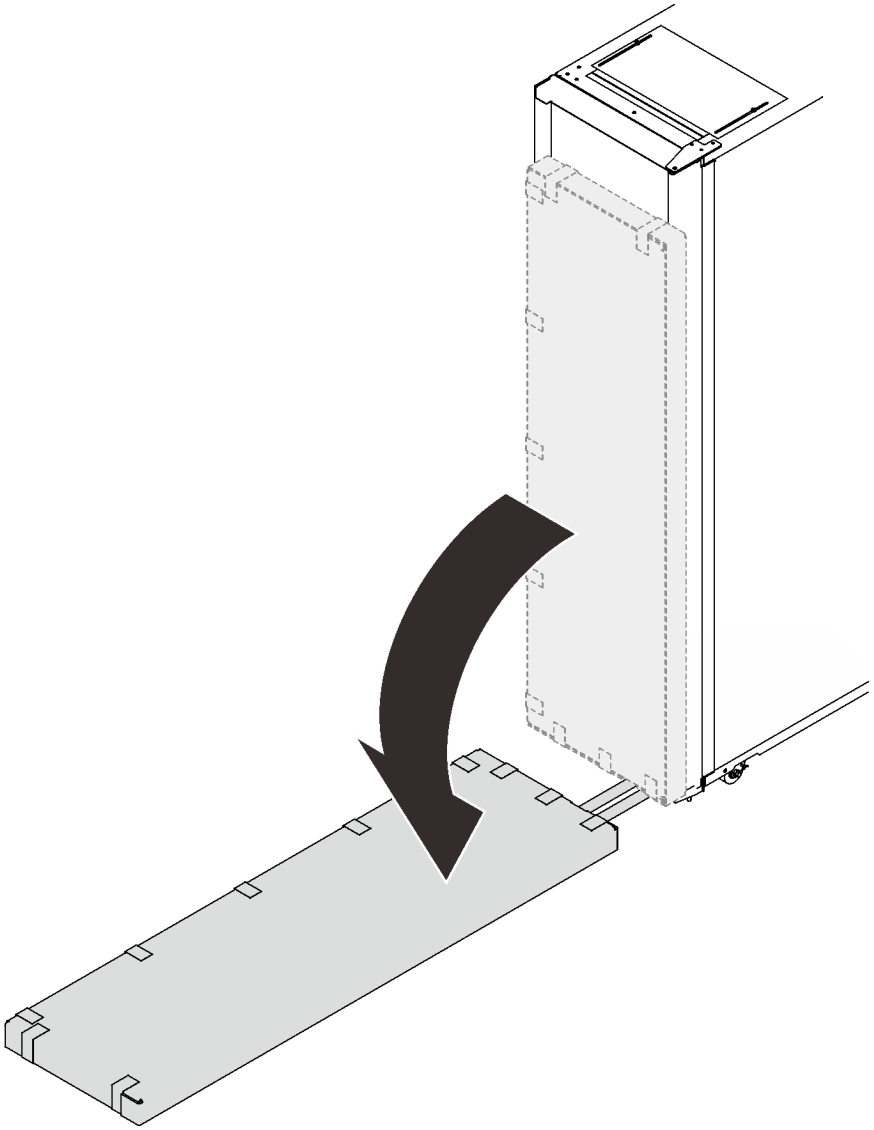


Figure 6. Moving the rack cabinet from the pallet

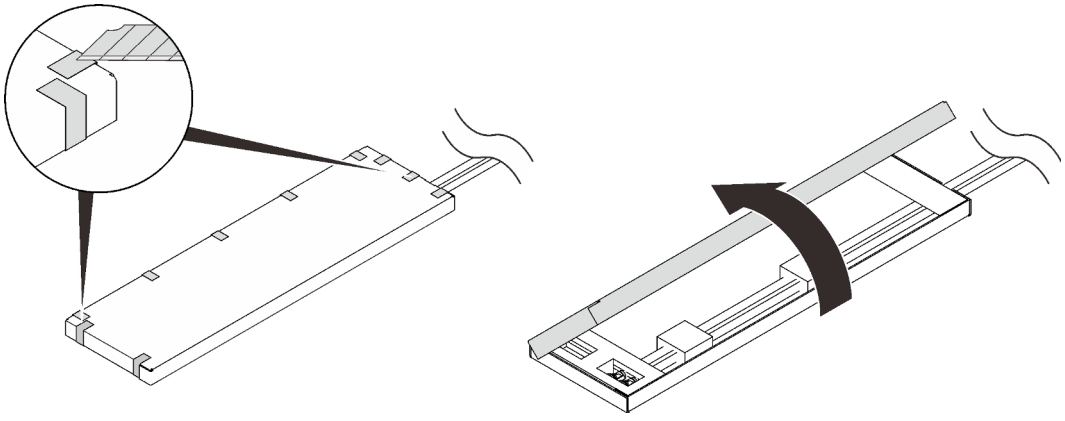
Step 3. Lower the carton that contains the manifolds.

Figure 7. Lowering the manifold carton



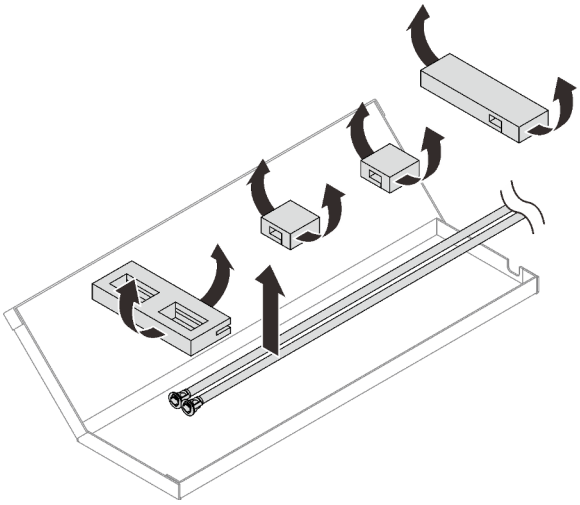
Step 4. Cut the edge of the carton with a sharp tool, and open the carton.

Figure 8. Unpacking the manifolds



Step 5. Remove the materials that secure the manifolds to the carton, and remove the carton from the manifolds.

Figure 9. Unpacking the manifolds



After this task is completed

Proceed to “Fill the heat exchanger with water” on page 32.

Replace a regular door with Rear Door Heat eXchanger for 48U

See this topic to learn how to replace a regular rear door with ThinkSystem Rear Door Heat eXchanger for 48U Rack.

Procedure

Step 1. Extend each of the four leveling pads in turns until they firmly contact the floor and support the rack cabinet. Make sure the cabinet is balanced by gently pushing the cabinet. If it tilts, adjust the length of the leveling pads until the cabinet is well balanced.

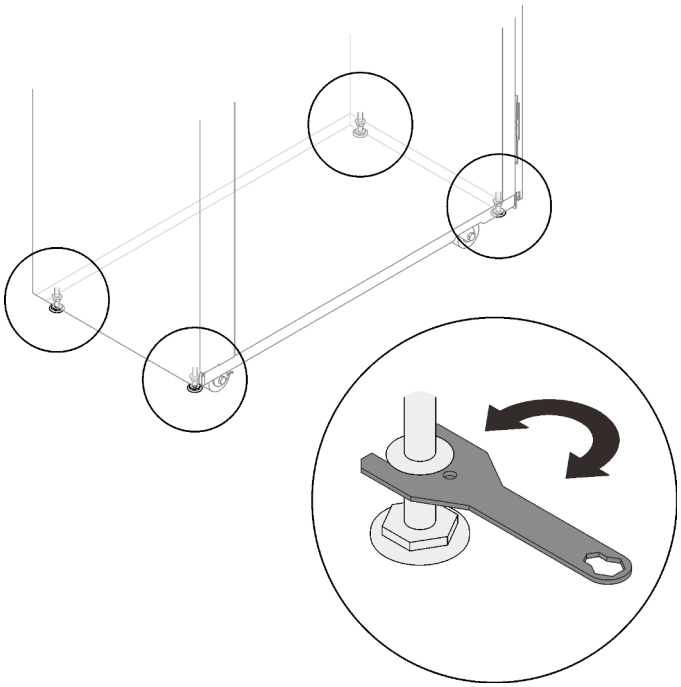


Figure 10. Lowering the leveling pads

Step 2. Remove the rear door from the rack cabinet.

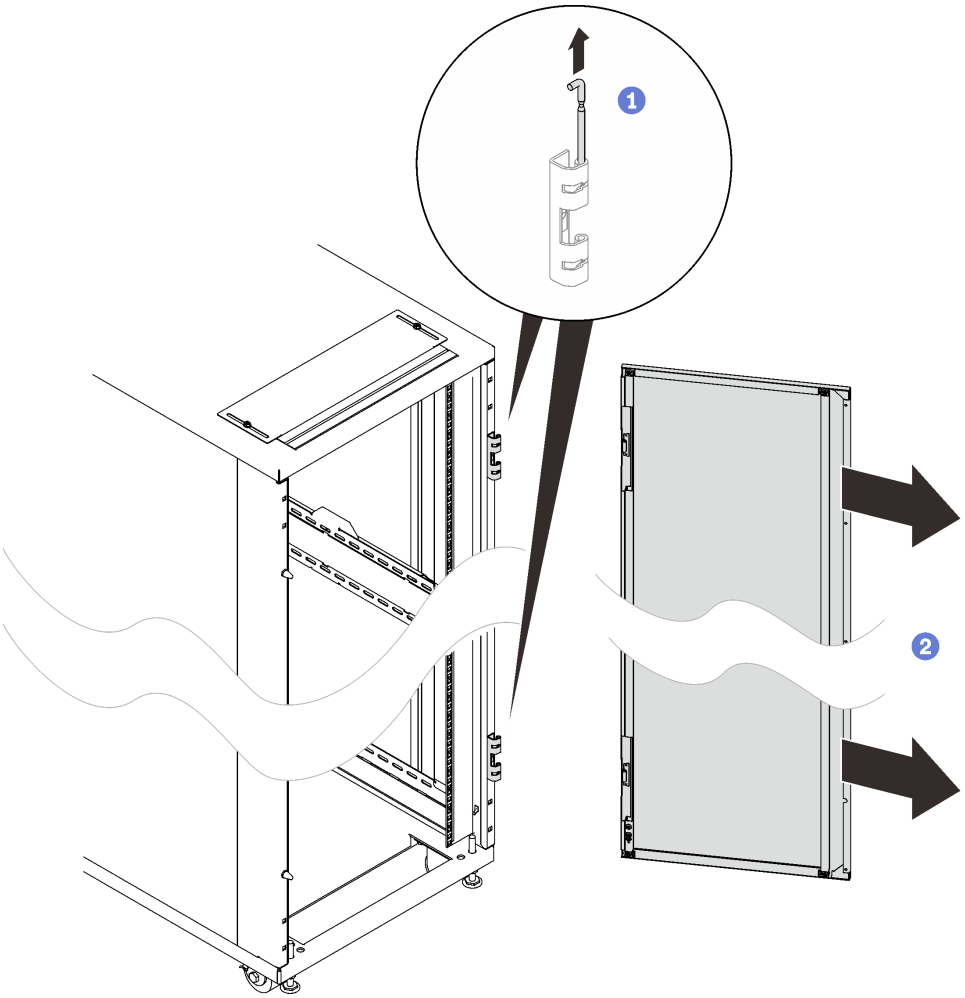


Figure 11. Removing a door

Step 3. Remove the two door hinges and the two doorstops.

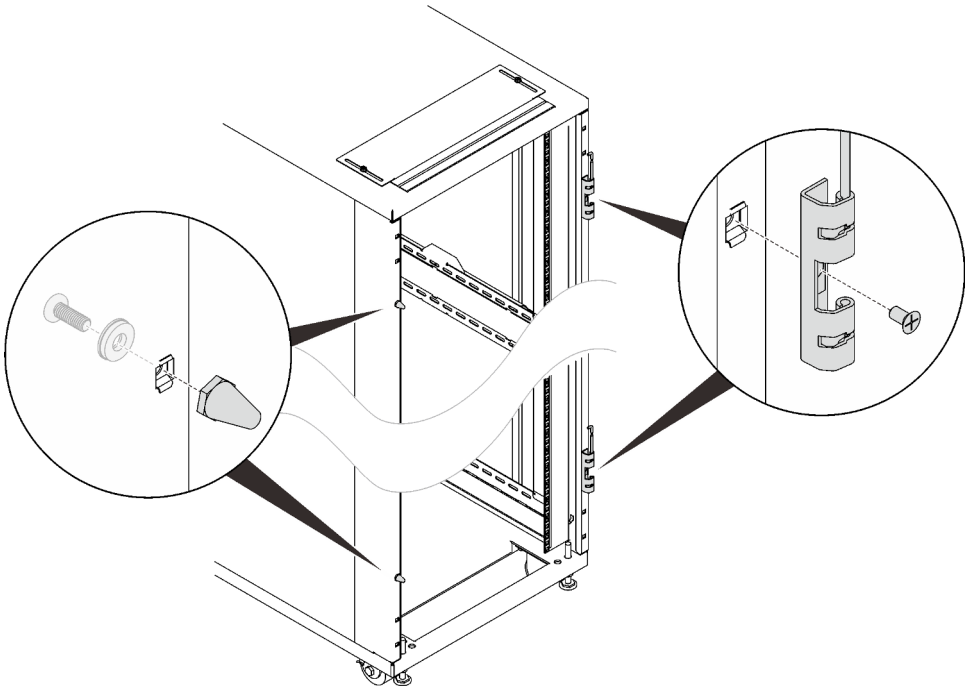


Figure 12. Removing the door hinges and doorstops

Step 4. Remove the door latch.

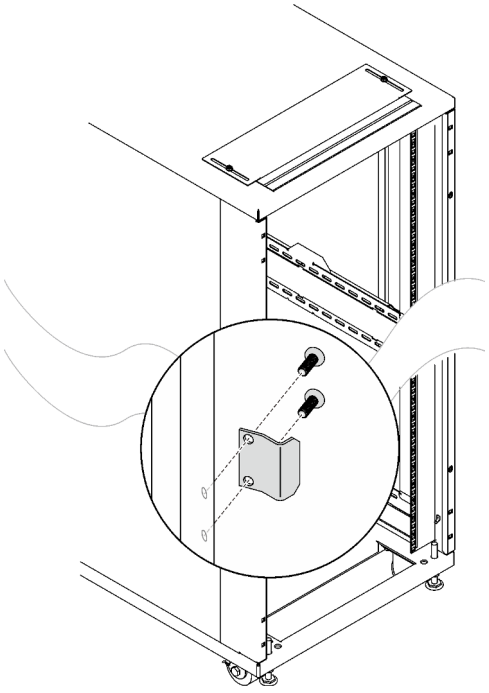


Figure 13. Removing the door latch

Step 5. Install the upper air baffle.

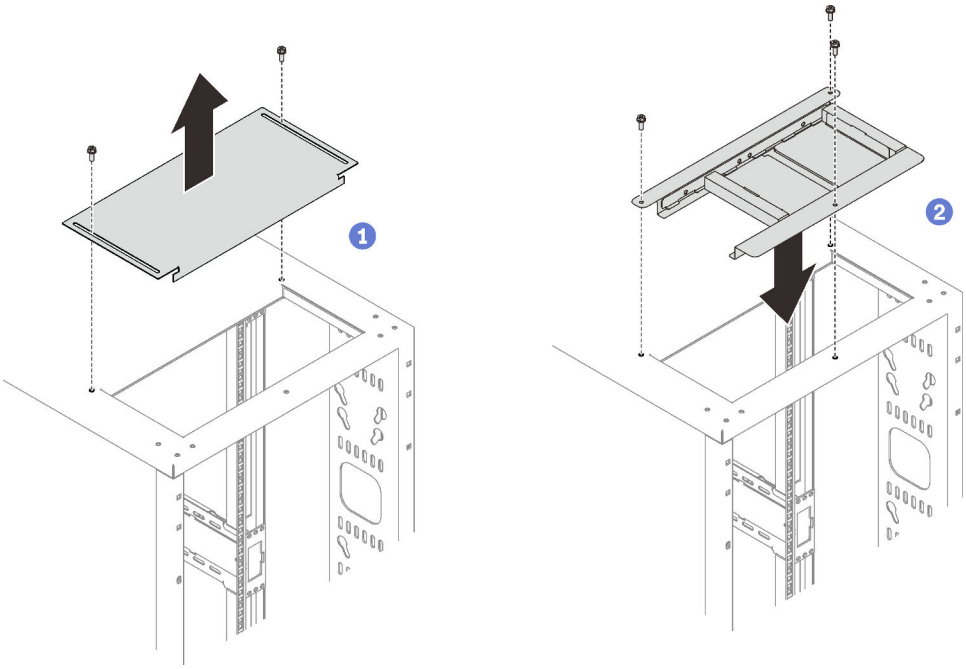


Figure 14. Installing the upper air baffle

1 Remove the two screws that secure the rear cable access cover, and remove the cover.

2 Align the upper air baffle with the slot, and secure it with three screws.

Step 6. Remove the four screws that secure the cable access bar, and remove the bar.

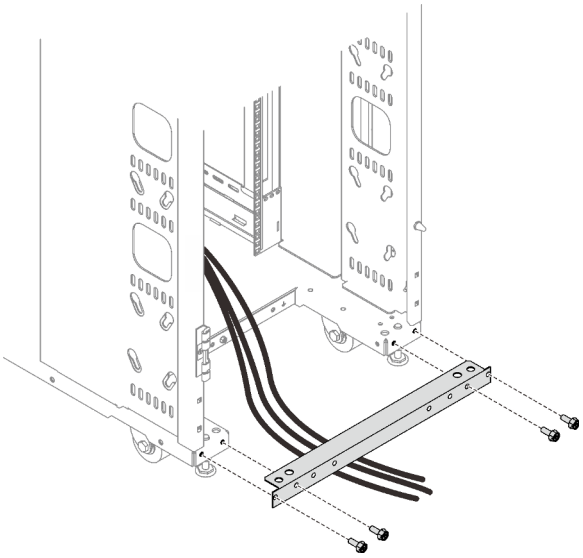


Figure 15. Removing the cable access bar

Step 7. Align the lower air baffle to the bottom cable slot, and secure it with four screws as illustrated.

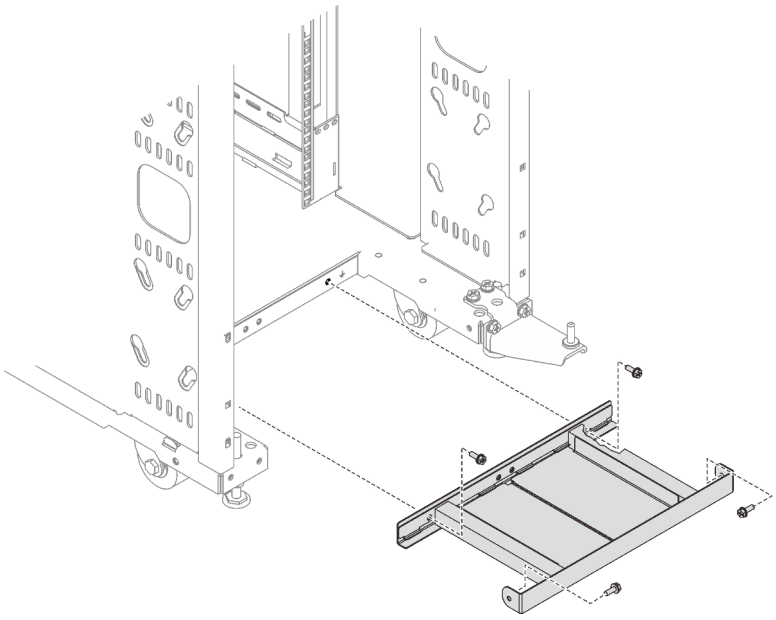


Figure 16. Installing the lower air baffle

Step 8. Secure the bottom hinge assembly to the rack cabinet with eight screws.

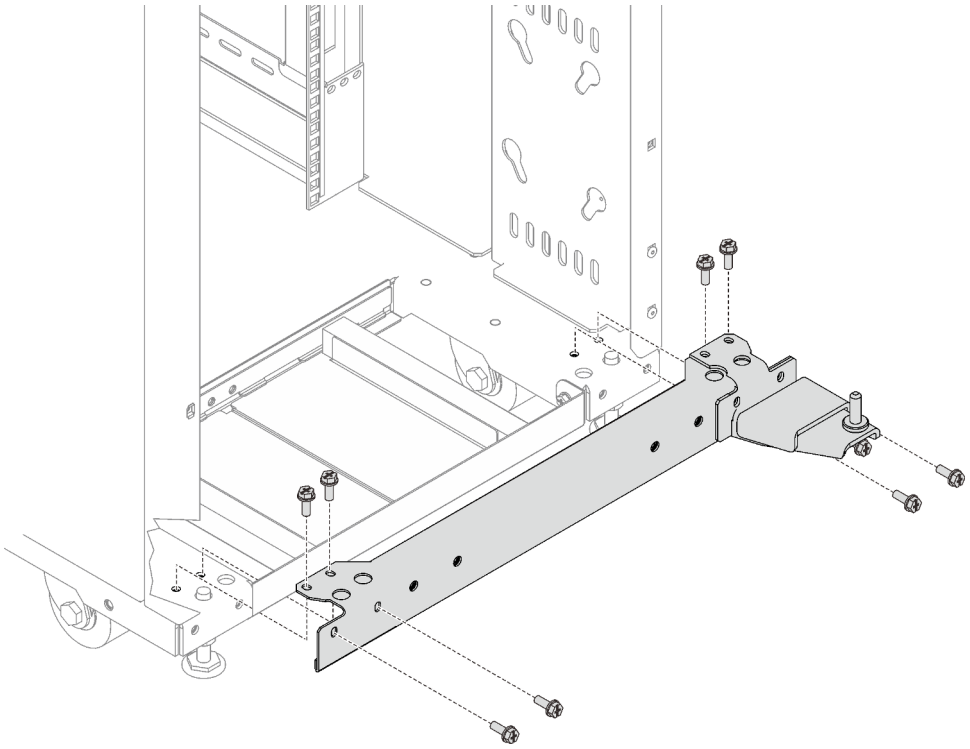


Figure 17. Installing the bottom hinge assembly

Step 9. Secure the latch plate to the heat exchanger with two screws.

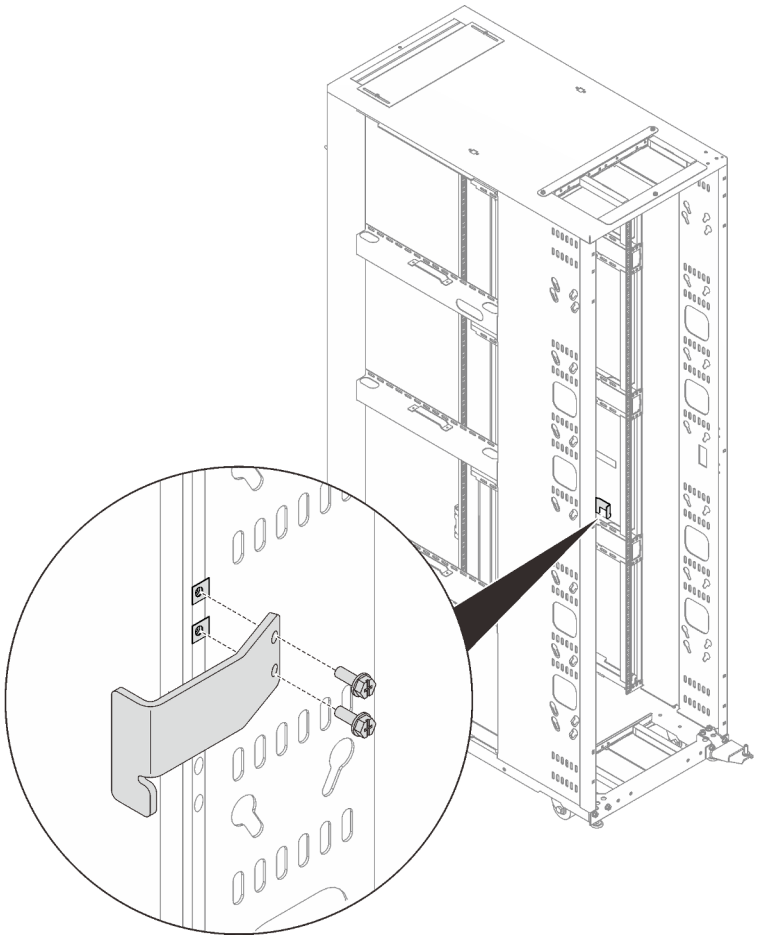


Figure 18. Installing the latch plate

Step 10. Remove the cover of the box that contains the heat exchanger.

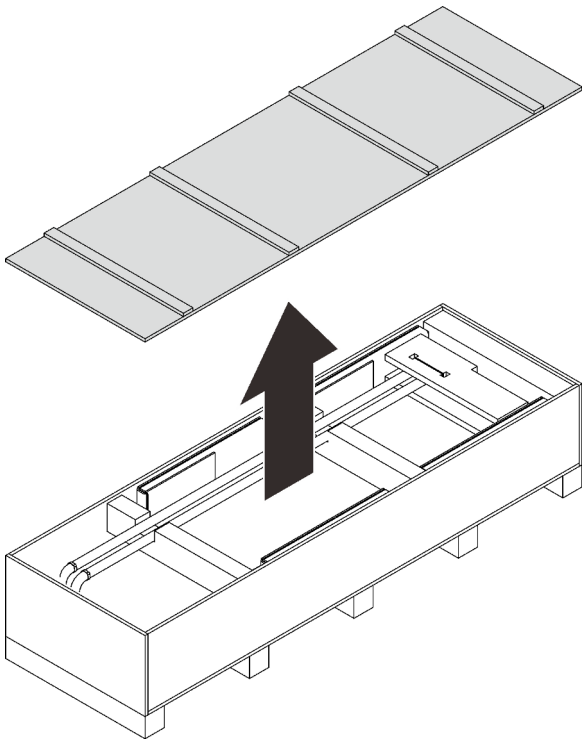


Figure 19. Removing the cover of the box

Step 11. Lift both sides of the heat exchanger with two trained technicians by handles, and remove the heat exchanger from the box.

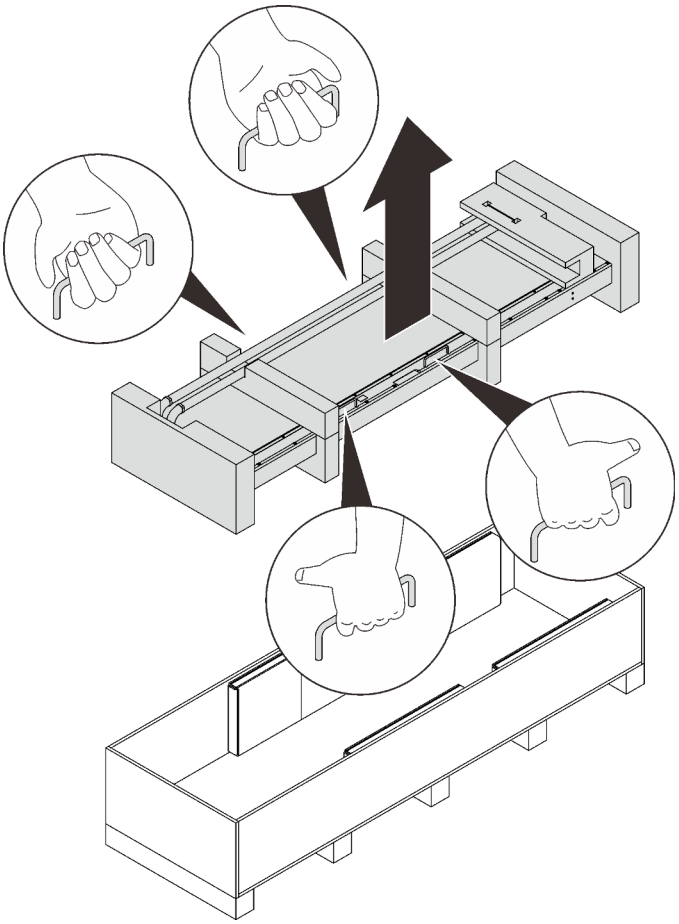


Figure 20. Removing the heat exchanger

Step 12. While the two technicians keep lifting the heat exchanger, have another person remove the top and bottom packing materials.

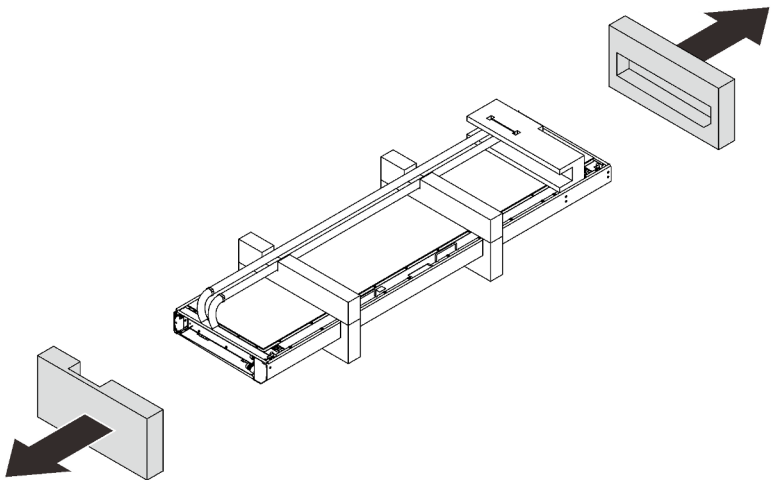


Figure 21. Removing the packing materials

Step 13. Remove the hose retaining material and peel the hoses away.

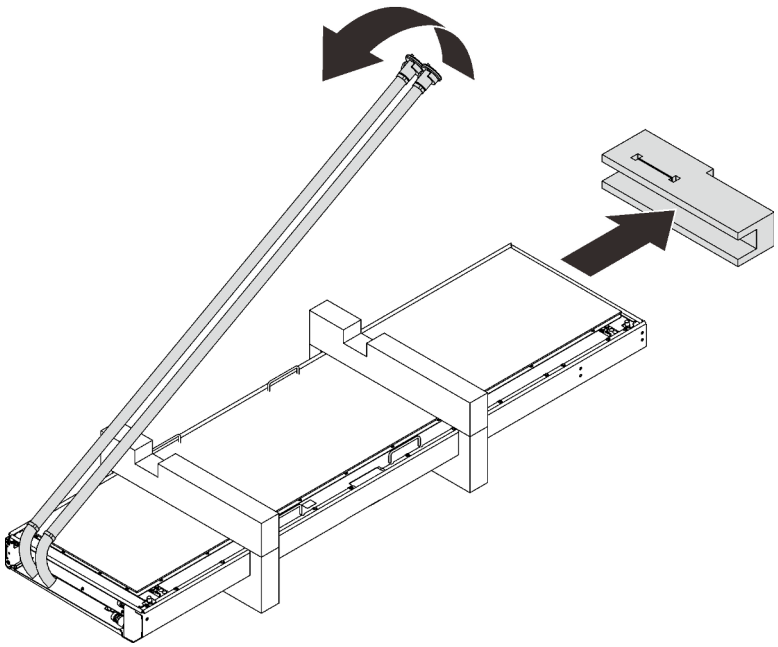


Figure 22. Removing the retaining material

Step 14. Split and remove the rest of the packing materials.

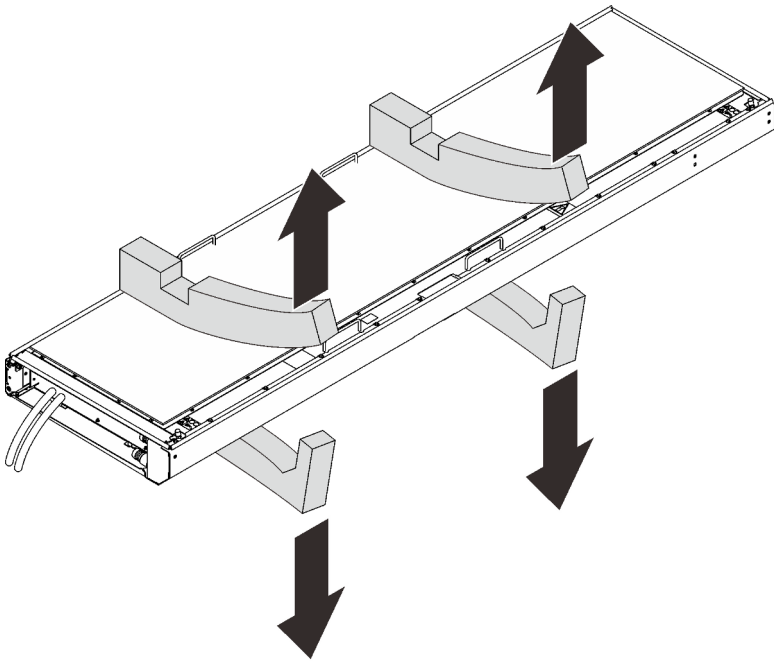


Figure 23. Removing the packing materials

Step 15. While the two technicians who are lifting the heat exchanger rotate it to vertical orientation, the other person hold on to the other handle and the door latch.

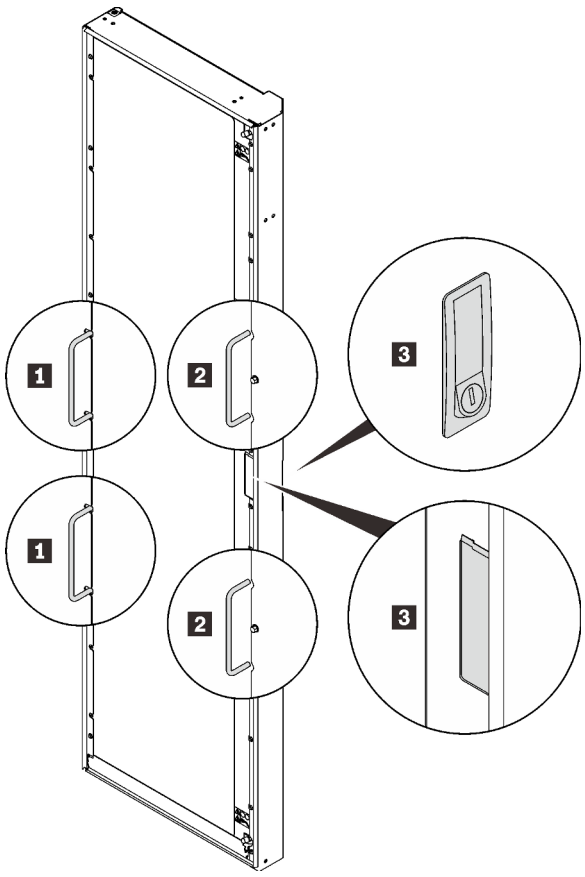


Figure 24. Lifting the heat exchanger with three people

1 Handles that the first person hold on to	3 Spots that the third person hold on to
2 Handles that the second person hold on to	

Step 16. Carry the heat exchanger with three people to the cabinet frame. Align the bottom corner with the bottom hinge pin on the rack cabinet; then, lower the heat exchanger to fit the pin in.

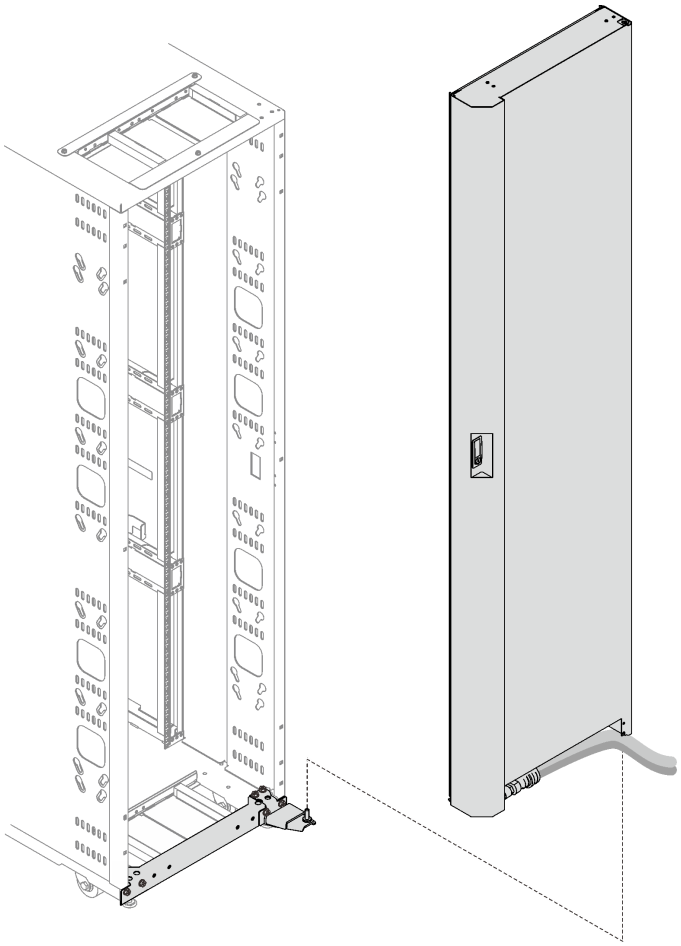


Figure 25. Installing the heat exchanger to the rack cabinet

Step 17. Hold the heat exchanger in place with two people. Insert the top hinge pin to the heat exchanger; then, secure the hinge with three screws.

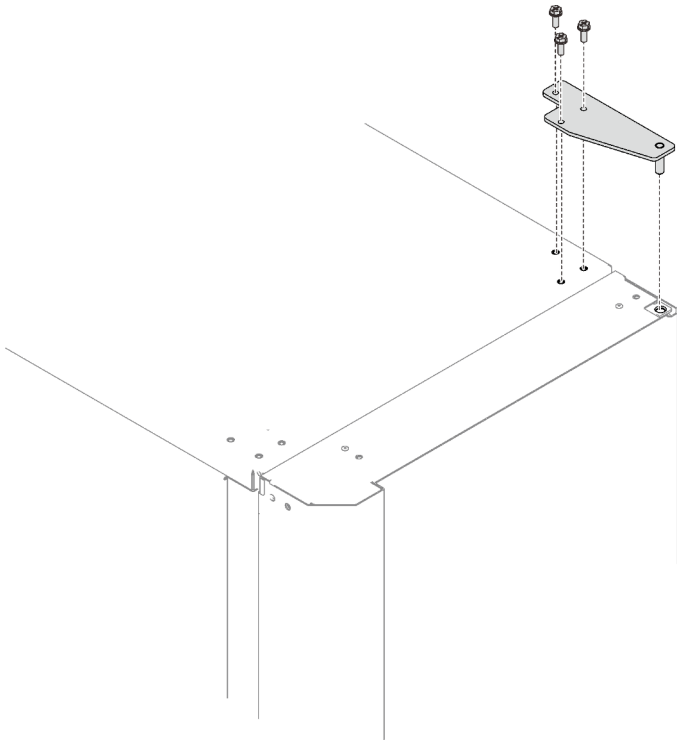


Figure 26. Installing the top hinge

After this task is completed

Proceed to "Fill the heat exchanger with water" on page 32.

Water specifications for the secondary cooling loop

It is of crucial importance that water supplied to the heat exchanger meet the requirements listed in this topic. Make sure to meet the requirements before setting up liquid cooling system.

Important: Without the water that is being supplied to the heat exchanger meeting the requirements that are described in this topic, system failures might occur as a result of any of the following problems:

- Leaks due to corrosion and pitting of the metal components of the heat exchanger or the water-supply system.
- Buildup of scale deposits inside the heat exchanger, which can cause the following problems:
  - A reduction of the ability of the heat exchanger to cool the air that is exhausted from the rack
  - Failure of mechanical hardware, such as a hose quick-connect coupling
- Organic contamination, such as bacteria, fungi, or algae. This contamination can cause the same problems as described for scale deposits.

Control and conditioning of the secondary cooling loop

The water that is used to fill, refill, and supply the heat exchanger must be particle-free deionized water or particle-free distilled water with appropriate controls for avoiding the following issues:

- Metal corrosion
- Bacterial fouling

- Scaling

The water cannot originate from the primary chilled-water system for the building, but must be supplied as part of a secondary closed-loop system.

Important: Do not use glycol solutions, because they can adversely affect the cooling performance of the heat exchanger.

Materials to use in secondary loops

Use any of the following materials in supply lines, connectors, manifolds, pumps and any other hardware that makes up the closed-loop water-supply system:

- Copper
- Brass with less than 30% zinc content
- Stainless steel 303 or 316
- Peroxide-cured ethylene propylene diene monomer (EPDM) rubber, non-metal-oxide material

Materials to avoid in secondary loops

Do not use any of the following materials in any part of the water-supply system:

- Oxidizing biocides, such as chlorine, bromine, and chlorine dioxide
- Aluminum
- Brass with greater than 30% zinc
- Irons (non-stainless steel)

Water-supply requirements for secondary loops

This section includes specific characteristics of the system that supplies the chilled conditioned water to the heat exchanger.

- **Temperature:**

  The heat exchanger and its supply hose and return hoses are not insulated. Avoid any condition that might cause condensation. The temperature of the water inside the supply hose, return hose, and heat exchanger must be kept above the dew point of the location where the heat exchanger is being used.

  Attention: Typical primary chilled water is too cold for use in this application because building chilled water can be as cold as 4°C - 6°C (39°F - 43°F).

  Important: The system that supplies the cooling water must be able to measure the room dew point and automatically adjust the water temperature accordingly. Otherwise, the water temperature must be above the maximum dew point for that data center installation. For example, the following minimum water temperature must be maintained:

  – 18°C ±1°C (64.4°F ±1.8°F). This is applicable within an ASHRAE Class 1 Environmental Specification that requires a maximum dew point of 17°C (62.6°F).

  – 22°C ±1°C (71.6°F ±1.8°F). This is applicable within an ASHRAE Class 2 Environmental Specification that requires a maximum dew point of 21°C (69.8°F).

  See the ASHRAE document *Thermal Guidelines for Data Processing Environments*. Information about obtaining this document is at https://www.techstreet.com/ashrae/products/1909403.

- **Pressure**

  The water pressure in the secondary loop must be less than 690 kPa (100 psi). Normal operating pressure at the heat exchanger must be 414 kPa (60 psi) or less.

- **Flow rate**

  The flow rate of the water in the system must be in the range of 23 - 57 liters (6 - 15 gallons) per minute. Pressure drop versus flow rate for heat exchangers (including quick-connect couplings) is defined as approximately 103 kPa (15 psi) at 57 liters (15 gallons) per minute.

- **Water volume limits**

  The heat exchanger holds approximately 9 liters (2.4 gallons). Fifteen meters (50 ft) of 19 mm (0.75 in.) supply and return hoses hold approximately 9.4 liters (2.5 gallons). To minimize exposure to flooding in the event of leaks, the entire product cooling system (heat exchanger, supply hose, and return hose), excluding any reservoir tank, must have a maximum 18.4 liters (4.8 gallons) of water. This is a cautionary statement, not a functional requirement. Also consider using leak detection methods on the secondary loop that supplies water to the heat exchanger.

- **Air exposure**

  The secondary cooling loop is a closed loop, with no continuous exposure to room air. After you fill the loop, remove all air from the loop. An air bleed valve is provided at the top of a heat exchanger manifold for purging all air from the system.

Water delivery specifications for secondary loops

This section includes the various hardware components that make up the delivery system secondary loop that provides the chilled, conditioned water to the heat exchanger. The delivery system includes pipes, hoses, and the required connection hardware to connect the hoses to the heat exchanger. Hose management in raised-floor and non-raised-floor environments is also described.

The heat exchanger can remove 100% or more of the heat load from an individual rack when it is running under optimum conditions.

The primary cooling loop is considered to be the building chilled-water supply or a modular chiller unit. The primary loop must not be used as a direct source of coolant for the heat exchanger.

The main purpose of this topic is to provide examples of typical methods of secondary loop setup and operating characteristics that are needed to provide an adequate, safe supply of water to the heat exchanger.

Attention: The overpressure safety device must meet the following requirements:

- Comply with ISO 4126-1 (Information about obtaining this document is at https://webstore.ansi.org/Standards/ISO/ISO41262013. Search on document number iso 4126-1.)
- Be installed so that it is easily accessed for inspection, maintenance, and repair.
- Be connected as close as possible to the device that it is intended to protect.
- Be adjustable only with the use of a tool.
- Have a discharge opening that is directed so that discharged water or fluid will not create a hazard or be directed toward any person.
- Be of adequate discharge capacity to ensure that the maximum working pressure is not exceeded.
- Be installed without a shutoff valve between the overpressure safety device and the protected device.

The following figures show typical cooling solutions with the most flexibility possible. Consider the following guidelines before planning your solution.

- A method for monitoring and setting the total flow rate delivered to all of the heat exchangers is required. This can be a discrete flowmeter that is built into the flow loop or a flowmeter within the secondary loop of the coolant distribution unit (CDU).

- After you set the total flow rate for all of the heat exchangers by using a flowmeter as previously described, it is important to design the plumbing so that it provides the flow rate that you want for each heat exchanger and provides a way to verify the flow rate. Figure 5 on page 16 through Figure 8 on page 19 illustrate the use of circuit setters to adjust the flow rate to each heat exchanger. Other methods, such as inline or external flowmeters, can provide a more accurate method for setting the flow rate through the individual shutoff valves.
- Design the flow loop to minimize the total pressure drop within the flow loop. The Optional Low Impedance Quick Connect feature (shown in Figure 5 on page 16 through Figure 8 on page 19) cannot be the Eaton quick-connect couplings that are used on the heat exchanger because of the excessive pressure drop associated with flowing through four quick-connect pairs in series. These must be very low, near 0, flow impedance quick connects. Alternatively, these quick connects can be eliminated and replaced with a hose barb connection.

Following are some examples of the most common solutions.

- **Primary and secondary cooling loops**

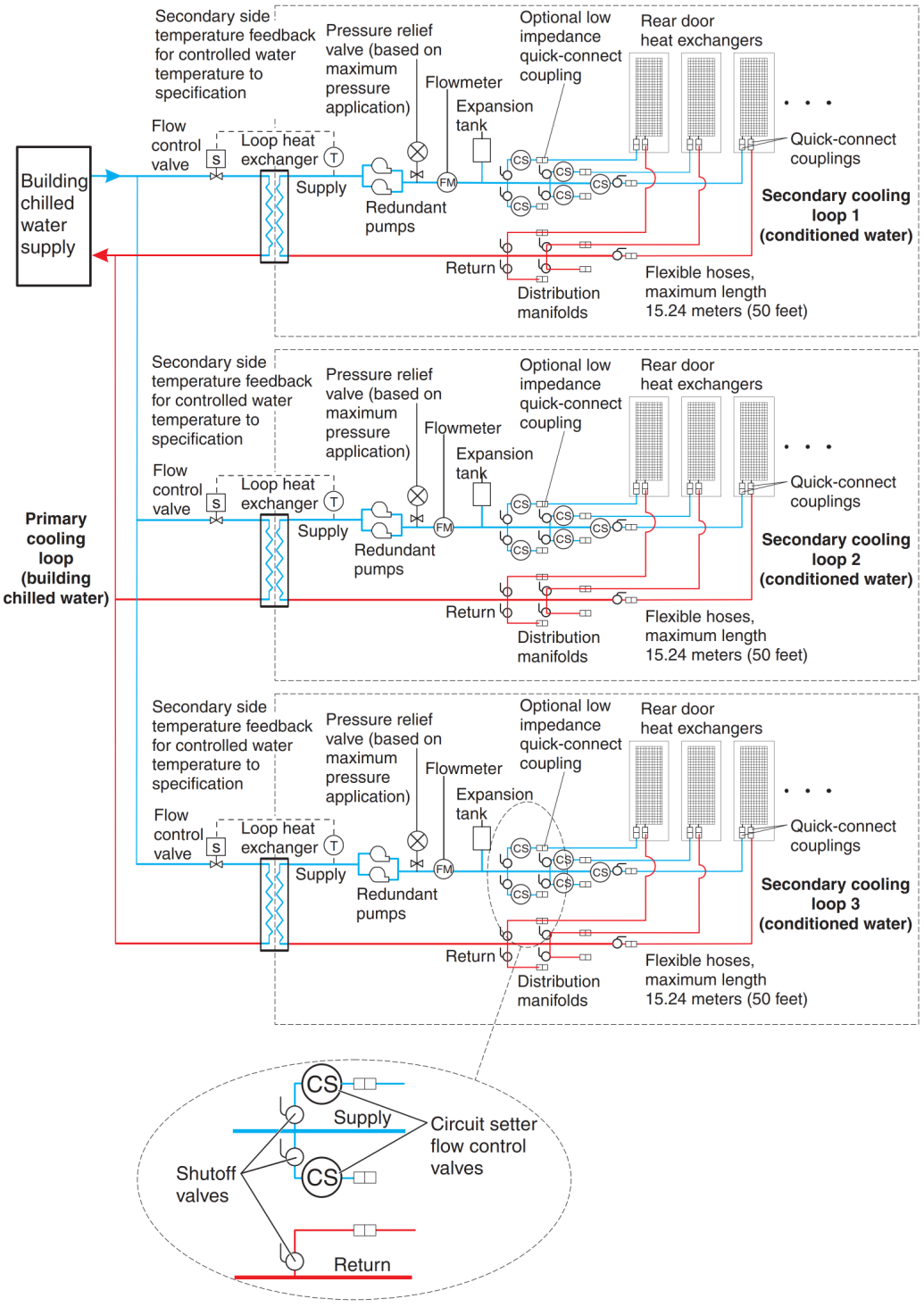


Figure 27. Primary and secondary cooling loops

This figure shows a typical cooling solution and identifies the components of the primary cooling loop and the secondary cooling loop.

- **Coolant distribution unit with a fabricated facilities solution**

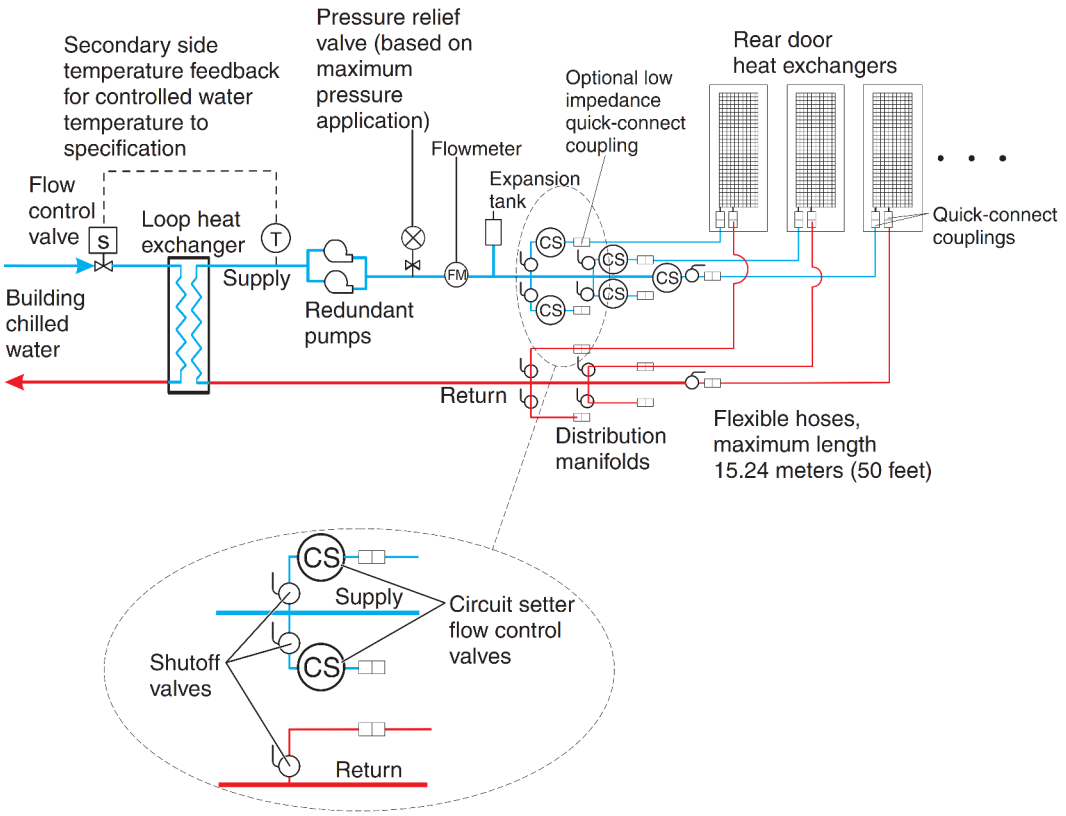


Figure 28. Coolant distribution unit with a fabricated facilities solution

This figure shows an example of a facilities fabricated solution. The actual number of heat exchangers that are connected to a secondary loop depends on the capacity of the coolant distribution unit that is running the secondary loop.

- **Coolant distribution unit with off-the-shelf supplier solutions**

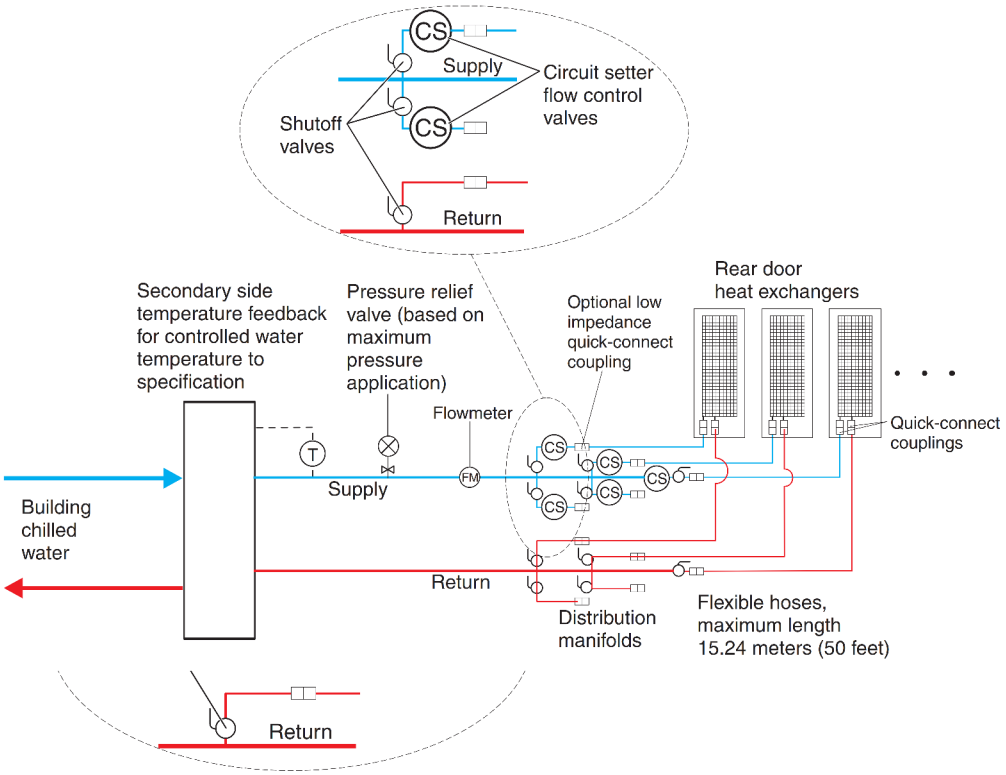


Figure 29. Coolant distribution unit that uses off-the-shelf supplier solutions

Notes: Supplier-built coolant distribution unit (CDU) suggested features:

- Temperature and flow metering (monitoring)
- Leak detection or water level sensing and shutdown
- Local and remote monitoring and control
- Access port for filling and water treatment

This figure shows an example of an off-the-shelf modular coolant distribution unit. The actual number of heat exchangers that are connected to a secondary loop depends on the capacity of the coolant distribution unit that is running the secondary loop

- **Coolant distribution unit with a water chiller unit to provide conditioned water**

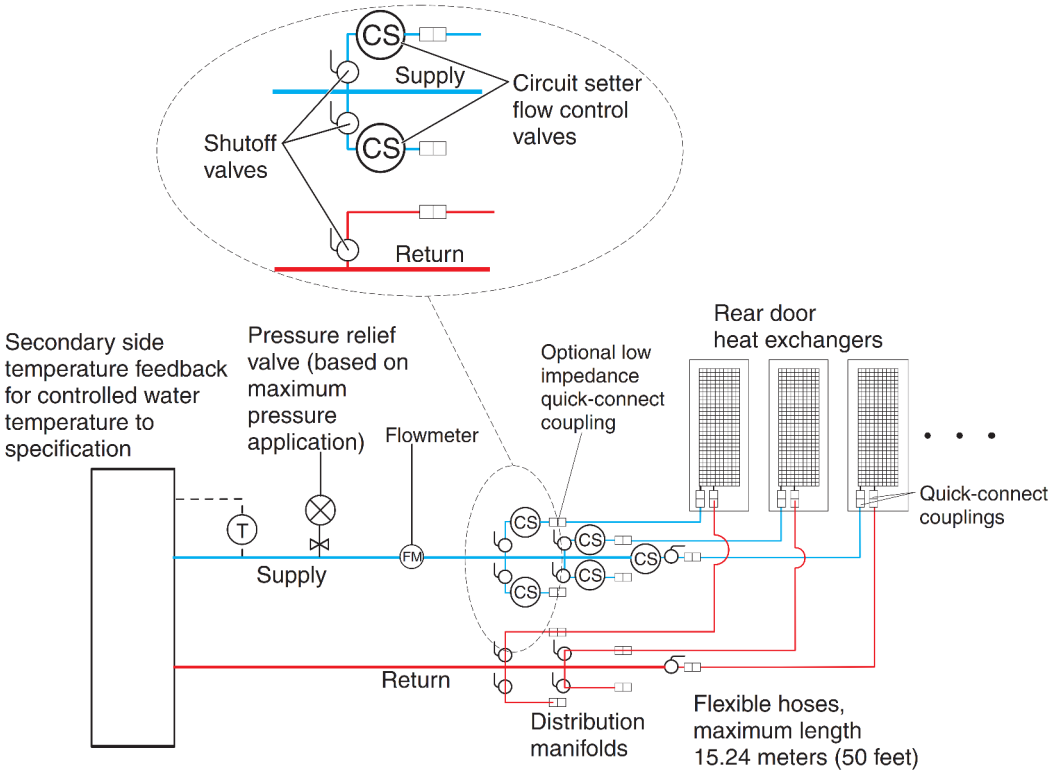


Figure 30. Coolant distribution unit that uses off-the-shelf supplier solutions

Notes: Supplier-built water chiller unit required features:

- Temperature and flow metering (monitoring)
- Leak detection or water level sensing and shutdown
- Local and remote monitoring and control
- Access port for filling and water treatment

This figure shows an example of a water chiller unit that supplies conditioned water to one or more heat exchangers. This must be a closed system (no exposure of the water to air) and meet all materials, water quality, water treatment, and temperature and flow specifications that are defined in this document. A water chiller unit is considered an acceptable alternative to use as a building chilled water source for removing heat from an Rear Door Heat eXchanger.

Manifolds and piping

Manifolds that accept large-diameter feed pipes from a pump unit are the preferred method for splitting the flow of water to smaller-diameter pipes or hoses that are routed to individual heat exchangers. Manifolds must be constructed of materials that are compatible with the pump unit and related piping. The manifolds must provide enough connection points to allow a matching number of supply and return lines to be attached, and the manifolds must match the capacity rating of the pumps and the loop heat exchanger (between the secondary cooling loop and the building chilled-water source). Anchor or restrain all manifolds to provide the required support to avoid movement when quick-connect couplings are connected to the manifolds.

Example manifold supply pipe sizes

- Use a 50.8 mm (2 in.) or larger supply pipe to provide the correct flow to three 19 mm (0.75 in.) supply hoses, with a 100 kW coolant distribution unit (CDU).

- Use a 63.5 mm (2.50 in.) or larger supply pipe to provide the correct flow to four 19 mm (0.75 in.) supply hoses, with a 120 kW CDU.
- Use an 88.9 mm (3.50 in.) or larger supply pipe to provide the correct flow to nine 19 mm (0.75 in.) supply hoses, with a 300 kW CDU.

To stop the flow of water in individual legs of multiple circuit loops, install shutoff valves for each supply and return line. This provides a way to service or replace an individual heat exchanger without affecting the operation of other heat exchangers in the loop.

To ensure that water specifications are being met and that the optimum heat removal is taking place, use temperature and flow metering (monitoring) in secondary loops.

Anchor or restrain all manifolds and pipes to provide the required support and to avoid movement when quick-connect couplings are being attached to the manifolds.

Figure 31 “The following figure” on page 30 shows another layout for multiple water circuits.

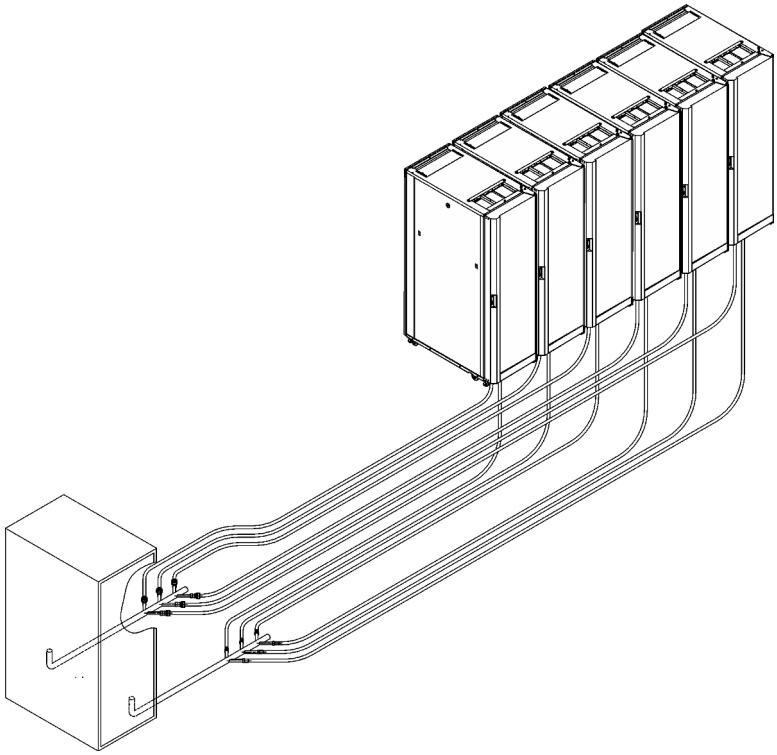


Figure 31. Typical central manifold (at a central location for multiple water circuits)

Figure 32 “The following figure” on page 31 shows an extended manifold layout.

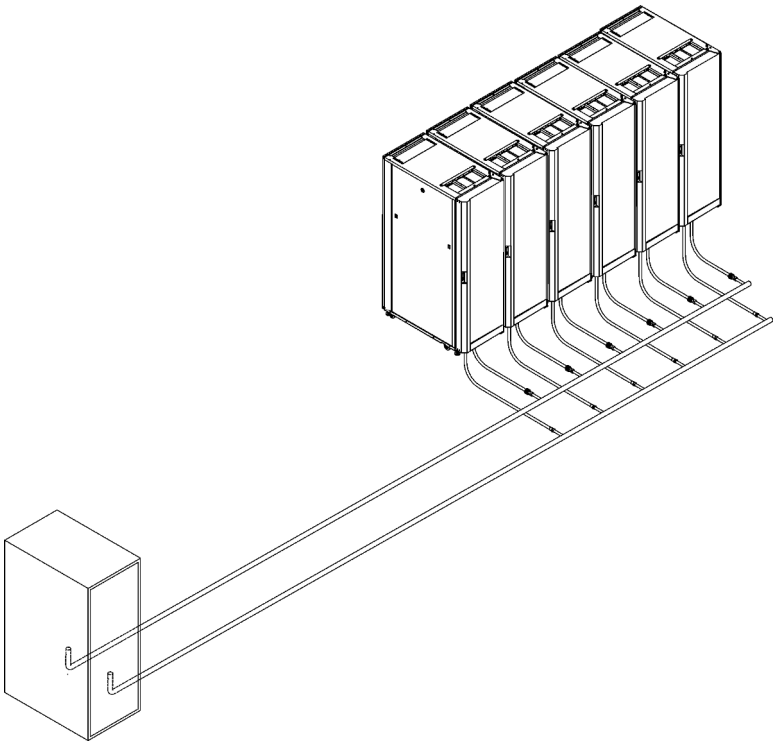


Figure 32. Typical extended manifold (along aisles between racks)

Flexible hoses and connections to manifolds and heat exchangers

Pipe and hose configurations can vary. You can determine the best configuration for your installation by analyzing the needs of your facilities, or a site preparation representative can provide this analysis.

Flexible hoses are needed to supply and return water between your hard plumbing (manifolds and coolant distribution units) and the heat exchanger (allowing needed movement for opening and closing the rack rear door).

Hoses are available that provide water with acceptable pressure-drop characteristics and that help prevent depletion of some corrosion inhibitors. These hoses must be made of peroxide-cured ethylene propylene diene monomer (EPDM) rubber, non-metal oxide material and must have Eaton self-coupling type quick connector ball valve at one end which are attached to the heat exchanger, and must either have a low impedance quick connect coupling or nothing so as to attach to a barb at the other end. The Eaton ball valves that are described in this topic are compatible with the heat exchanger couplings. Hose lengths from 3 to 15 meters (10 to 50 ft), in increments of 3 meters (10 ft), are available. Hoses that are longer than 15 meters (50 ft) might create unacceptable pressure loss in the secondary circuit and reduce the water flow, reducing the heat removal capabilities of the heat exchanger.

Use quick-connect couplings to attach the hoses to the heat exchangers. Hose couplings that connect to the heat exchanger must have the following characteristics:

- The couplings must be constructed of 303 stainless steel, and the size is 25 mm (1 in.).
- The hoses must have Eaton part number FD83-2046-16-16, or equivalent.
- If a low impedance quick-connect coupling is used at the opposite (manifold) end of the hose, use positive locking mechanisms to prevent loss of water when the hoses are disconnected. The connections must minimize water spill and air inclusion into the system when they are disconnected.

Fill the heat exchanger with water

See this topic to learn how to fill ThinkSystem Rear Door Heat eXchanger for 48U Rack with water.

About this task

S038

CAUTION:
Eye protection should be worn for this procedure.

Attention: Wear safety goggles or other eye protection whenever you fill, drain, or purge air or nitrogen from the heat exchanger.

Procedure

Step 1. Purge the nitrogen that has been filled in the hose from the hose.

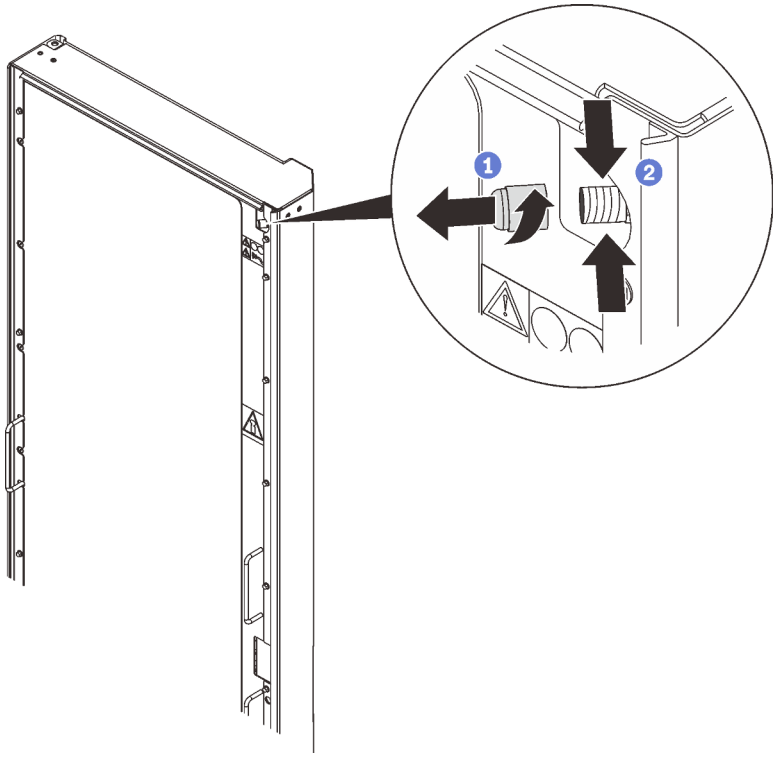


Figure 33. Purging nitrogen

1 Loosen and remove the cap from the air-purging valve.

2 Press in on the valve stem of the air-purging valve to purge the nitrogen from the heat exchanger. Continue holding in the valve stem until the pressure is released.

Step 2. Attach the air-purging tool to the air-purging valve at the top of the heat exchanger, and place the drain end into a 2-liter (or larger) container to catch the water and air bubbles that escape during the filling procedure.

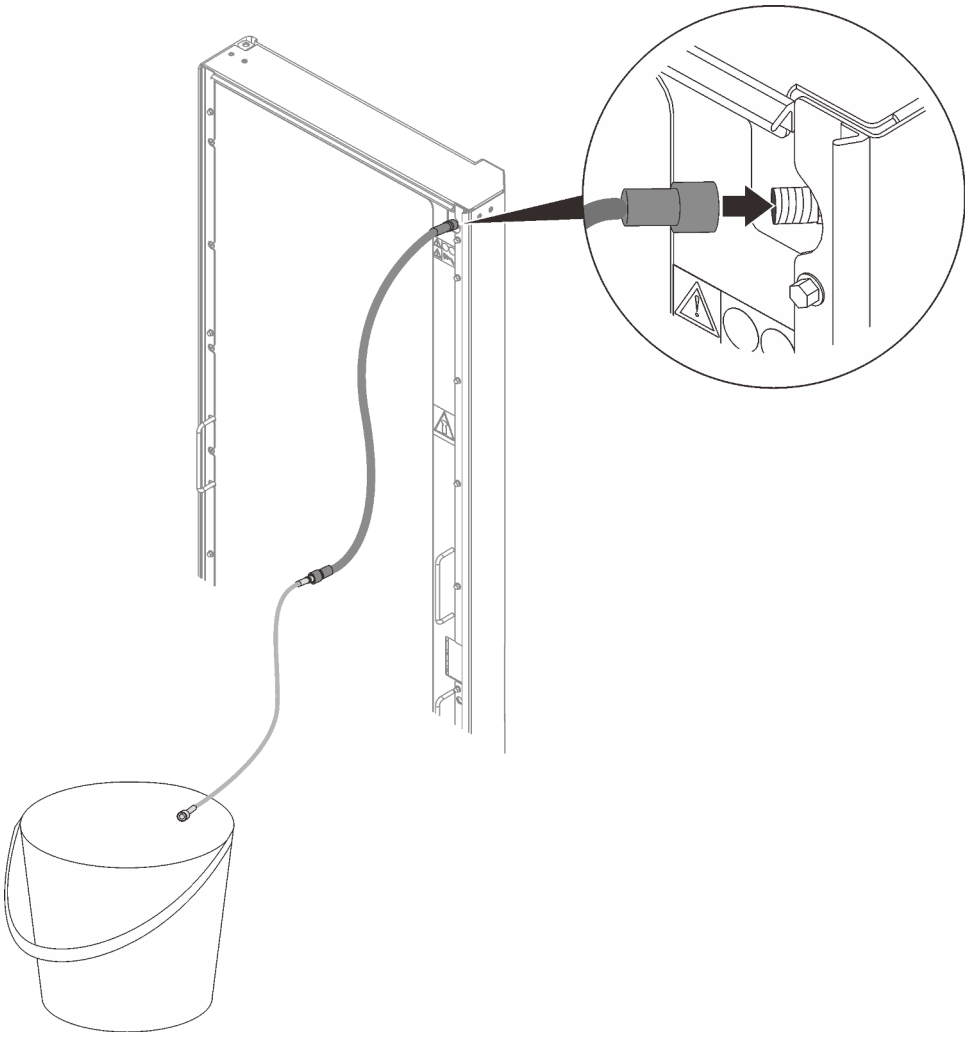


Figure 34. Installing the air-purging tool

Step 3. Connect the supply and return hose couplings with the manifolds.

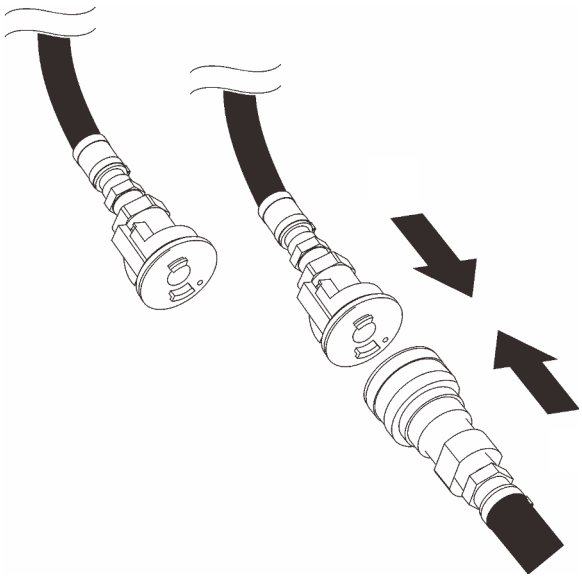


Figure 35. Connecting manifolds

Step 4. Turn on the flow of water to the heat exchanger, and let it run for several minutes.

Step 5. When there is a steady stream of liquid into the container from the air-purging tool, disconnect the tool from the heat exchanger.

Attention: If water drips from the air-purging valve after you remove the air-purging tool, reattach the tool and disconnect it again to seal the valve.

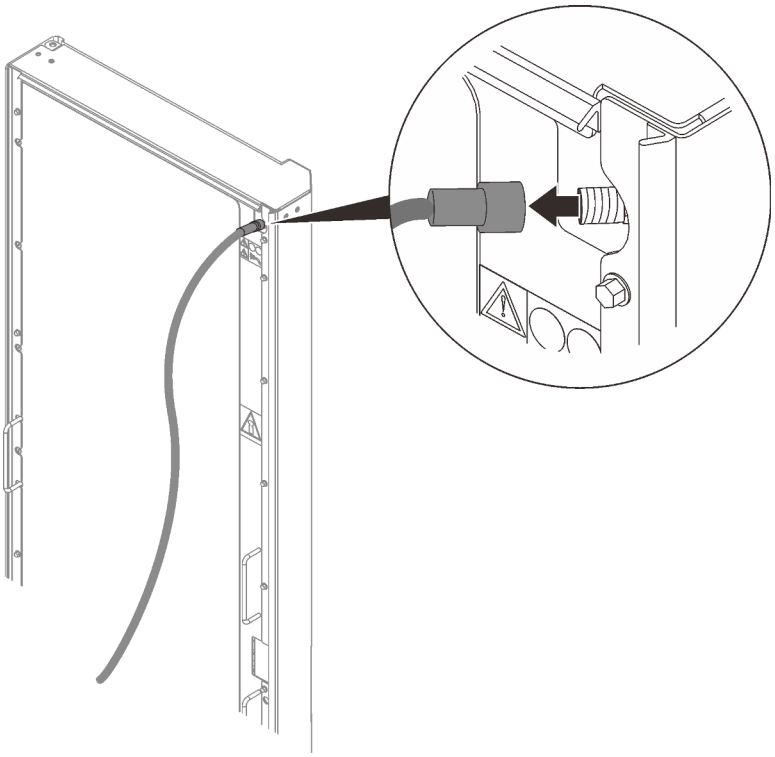


Figure 36. Removing the air-purging tool

Step 6. Install the valve cap back to the air-purging valve.

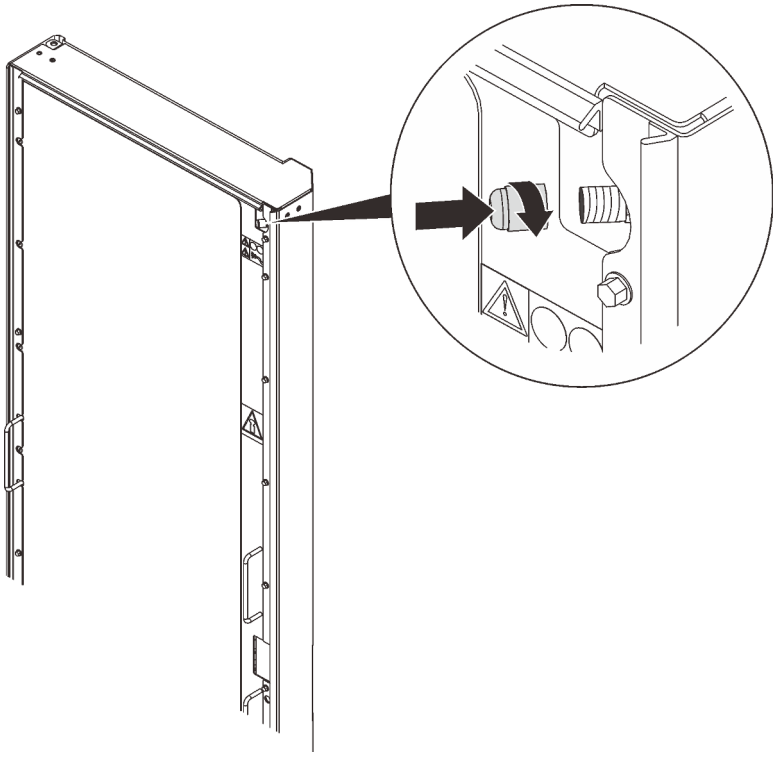


Figure 37. Installing the valve cap

Chapter 3. Routing cables/hoses for water-cooled system

Adopt one of the following procedures, depending on whether the rack is in a raised-floor environment.

Important: To help maintain optimal performance and provide proper cooling for all rack components, always take the following precautions:

- Install filler panels over all unoccupied bays.
- Route signal cables at the rear of the rack so that they enter or exit the cabinet through the top and bottom air baffles.

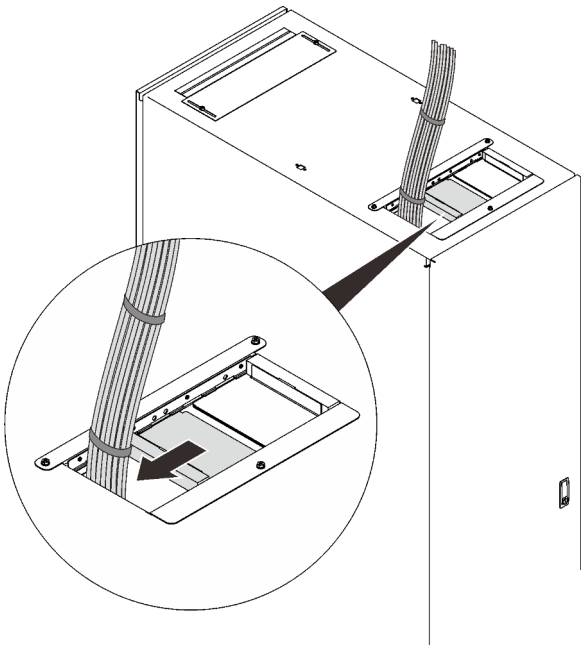


Figure 38. Managing cables with the upper air baffle

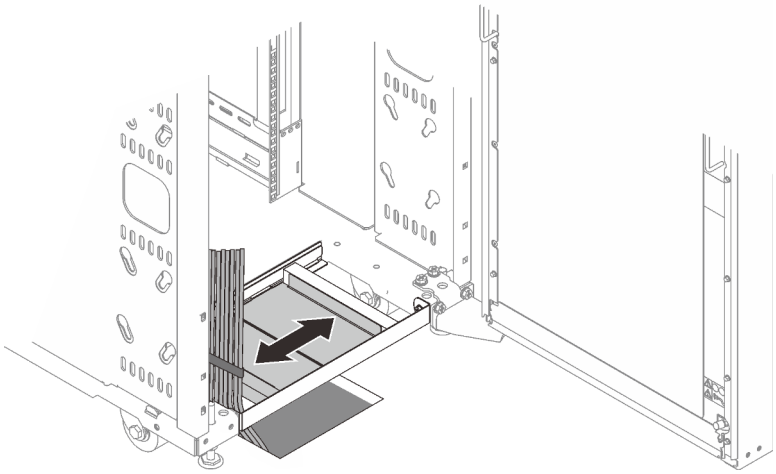


Figure 39. Managing cables with the lower air baffle

- Bundle signal cables together in a rectangle so that the air-baffle sliders are closed as far as possible. Do not bundle signal cables together in a circular formation.

Raised-floor environment

The following illustrations show routing and securing the hoses in a raised-floor environment for individual racks and adjacent racks.

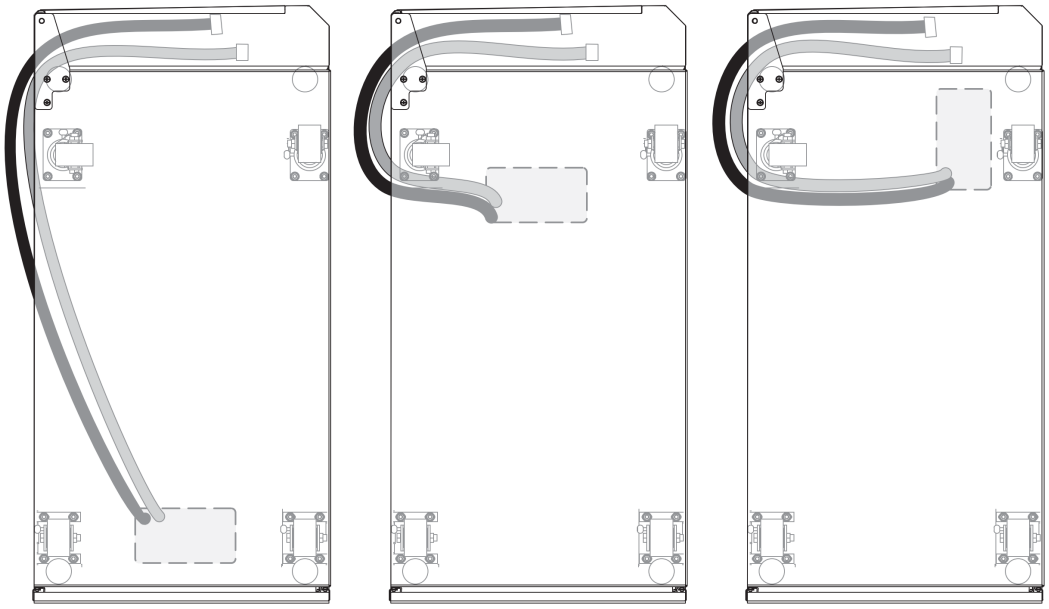
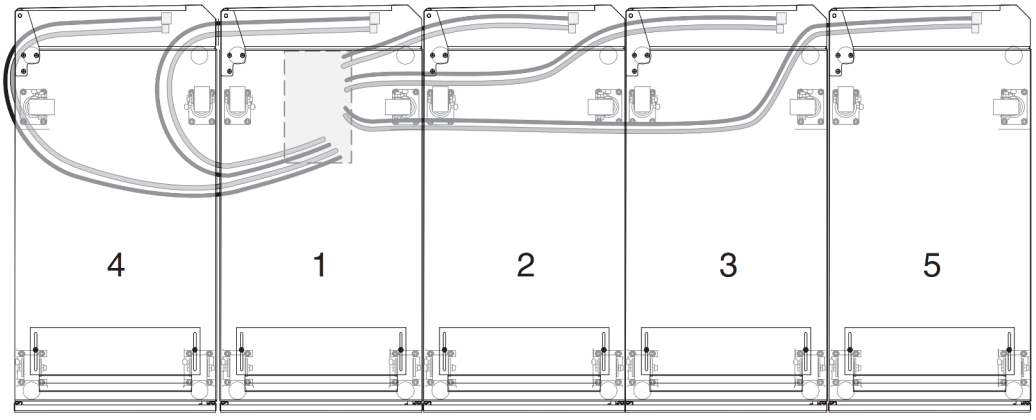


Figure 40. Routing and securing the hoses in a raised-floor environment for individual racks (from the top, looking down)

In the following illustration, the numbers represent the suggested placement of racks that share one hole in the floor. For example, if three racks will share one hole in the floor, place the racks as shown by the numbers 1, 2, and 3. If you want to add a fourth rack that will share the same hole in the floor, place it next to rack number 1.



To route and secure the hoses in a raised-floor environment, complete the following steps:

Figure 41. Option for hoses in adjacent racks to share a single hole in the floor (from the top, looking down)

Step 1. Remove the floor tile under the rack that will have an access hole cut into it.

Step 2. Cut an access hole in the floor tile; then, reinstall the floor tile. The access hole for the supply and return hoses must be a minimum of 200 mm (8 in.) long x 100 mm (4 in.) wide.

Notes:

- Each hose must be routed through the access hole lengthwise so that the hose has the entire 200 mm (8 in.) to pass through the floor. If adjacent racks share a hole in the floor, increase the size of the hole according to the number of hoses, 50 mm (2 in.) in length for every rack. For example, the hole for one rack is 100 x 200 mm (4 x 8 in.), the hole for two racks is 150 x 200 mm (6 x 8 in.), and so on. Smaller hole sizes might also work, depending on the hose routing underneath the raised floor.
- Each hose must be routed with a minimum bend radius of 200 mm (8 in.). A bend radius less than 200 mm (8 in.) will cause the hose to kink, will restrict the flow of water to and from the heat exchanger, and will void the heat exchanger warranty.

Step 3. Route the hoses through the access hole lengthwise, under the rack and around the rear caster on the pivot side of the heat exchanger. See “Filling the heat exchanger with water” on page 48 for information about how to connect the hoses.

Step 4. Check the heat exchanger for air in the manifolds again after one month of operation, to ensure that the heat exchanger is filled correctly.

Raised-floor and non-raised-floor environments

If the coolant distribution unit (CDU) that is providing water to the heat exchanger is in a row of racks with heat exchangers, all hoses can be routed on the floor, irrespective of if it is a raised floor or slab installation. The Type 7D6E rack has sufficient clearance underneath the rack to enable the ball valves to be run underneath the rack. This provides a very clean hose-routing solution with hoses of minimum length.

Note: Each hose must be routed with a minimum bend radius of 200 mm (8 in.). A bend radius less than 200 mm (8 in.) will cause the hose to kink, will restrict the flow of water to and from the heat exchanger, and will void the heat exchanger warranty.

Step 1. If the hoses must be run overhead, either route the hoses through the rack vertically, or route them vertically down the hinge (pivot) side of the heat exchanger, leaving enough slack in the hoses to reach the couplings.

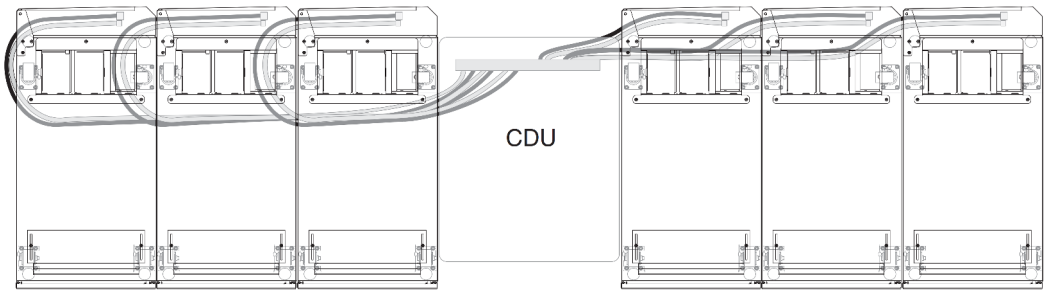


Figure 42. Routing and securing the hoses in raised-floor and non-raised-floor environments (from the top, looking down)

Step 2. After several hours of operation, repeat the air-purging procedure on the valve (trapped air from the hoses might have migrated to the heat exchanger). To perform the air-purging procedure, complete step 7 on page 52 through step 10 on page 52 in Filling the heat exchanger with water.

Step 3. Check the heat exchanger for air in the manifolds again after one month of operation, to ensure that the heat exchanger is filled correctly.

Chapter 4. Rear Door Heat eXchanger for 48U Rack replacement

See this topic to learn how to remove and install Rear Door Heat eXchanger for 48U Rack and subsidiary components.

Drain the heat exchanger of water

See this topic to learn how to drain the heat exchanger of water.

About this task

S038

CAUTION:
Eye protection should be worn for this procedure.

Attention: Wear safety goggles or other eye protection whenever you fill, drain, or purge air or nitrogen from the heat exchanger.

Procedure

Step 1. Lift and remove the inner hose access panel from the heat exchanger.

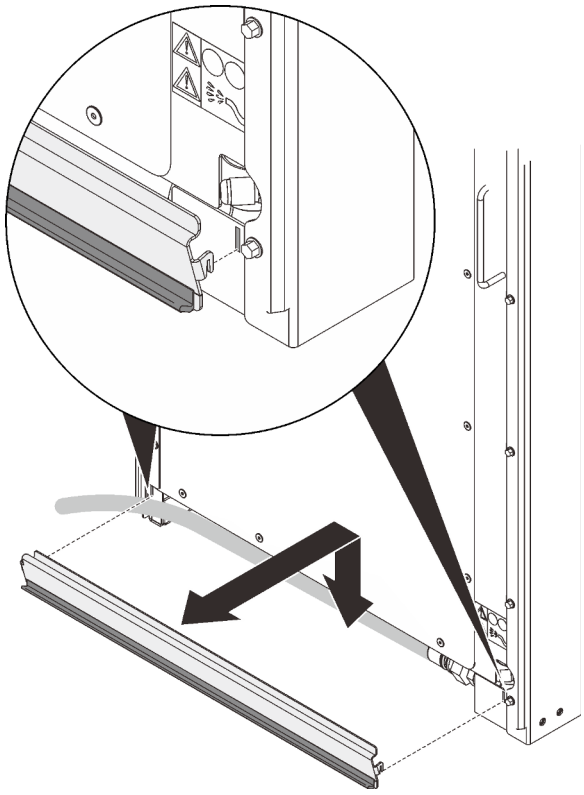


Figure 43. Removing the inner hose access panel

Step 2. Remove the screw that secures the panel if applicable, then lift and remove the panel from the heat exchanger.

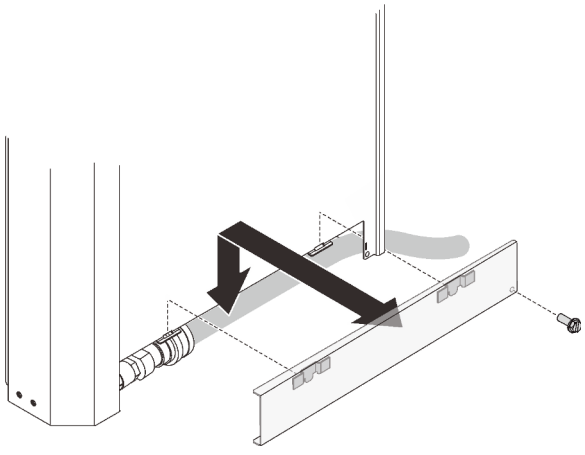


Figure 44. Removing the outer hose access pane

Step 3. Open the four Eaton ball valves, and disconnect the supply and return couplings from the manifolds.

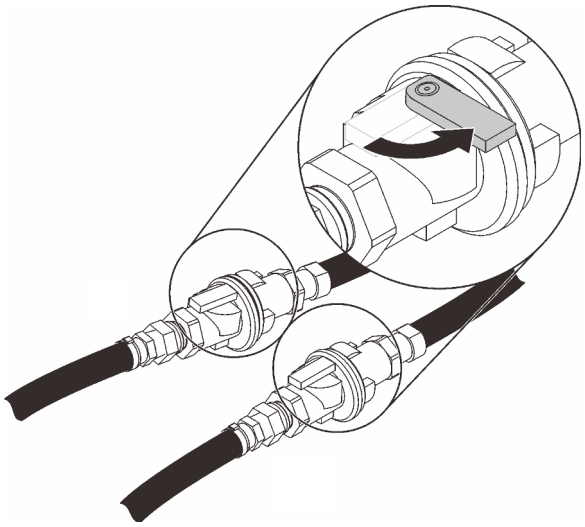


Figure 45. Opening Eaton ball valves

Step 4. Remove the caps from the air-purging and drain valve.

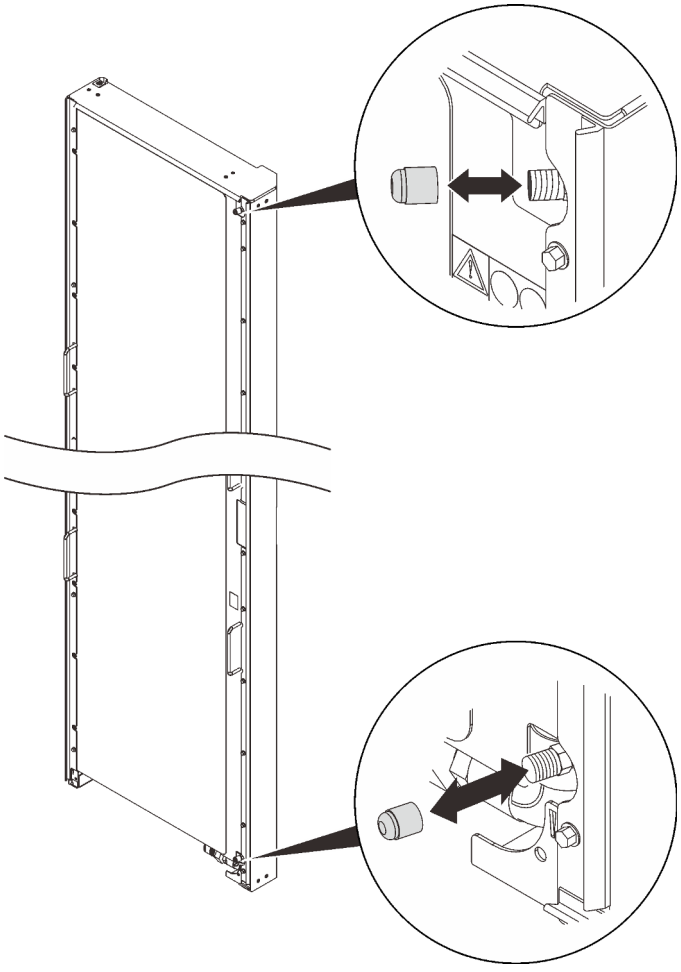


Figure 46. Removing valve caps

Step 5. Remove the extension hose from the air-purging tool.

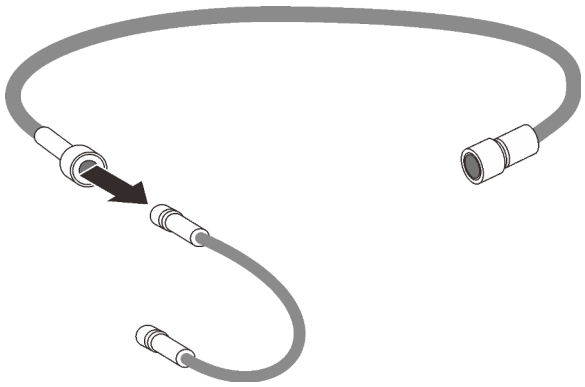


Figure 47. Removing the extension hose

Step 6. Insert one end of the air-purging tool extension hose into the center of air-purging valve stem at the top of the heat exchanger to allow air to enter the manifolds.

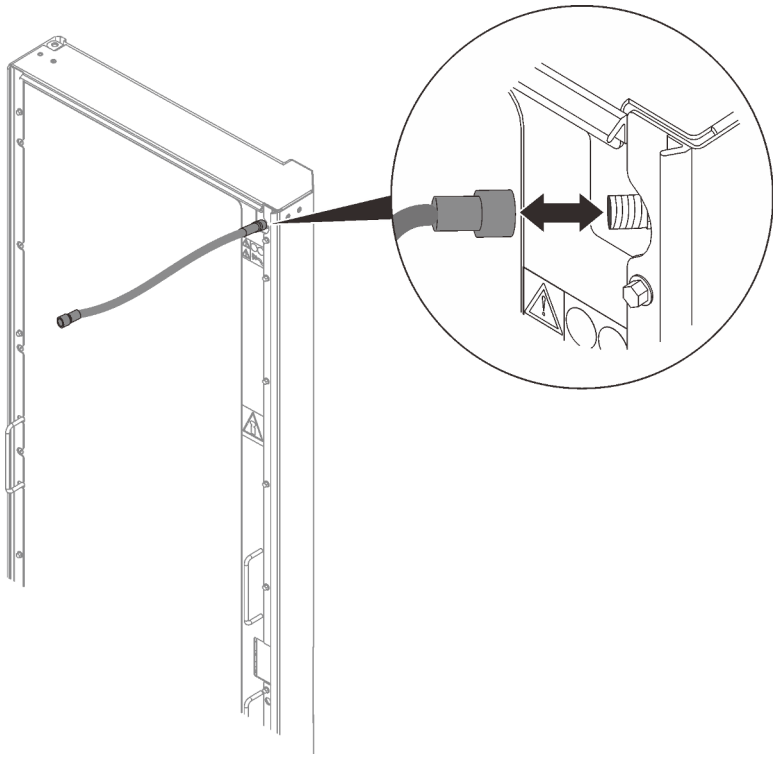


Figure 48. Inserting the air-purging tool extension hose

Step 7. Attach the air-purging tool to the drain valve at the bottom of the heat exchanger, and place the drain end into a 2-liter (or larger) container to catch the water.

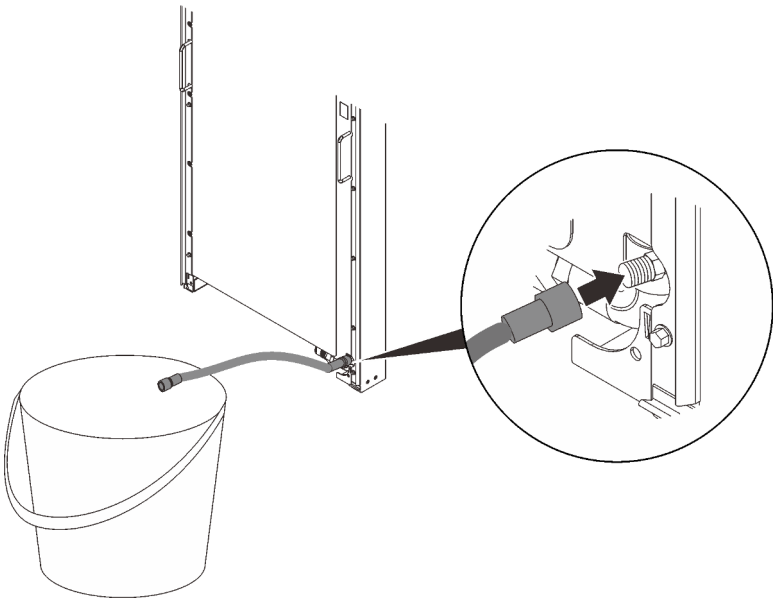


Figure 49. Draining water

Step 8. When the water is drained completely, remove the air-purging-tool extension hose from the valve.

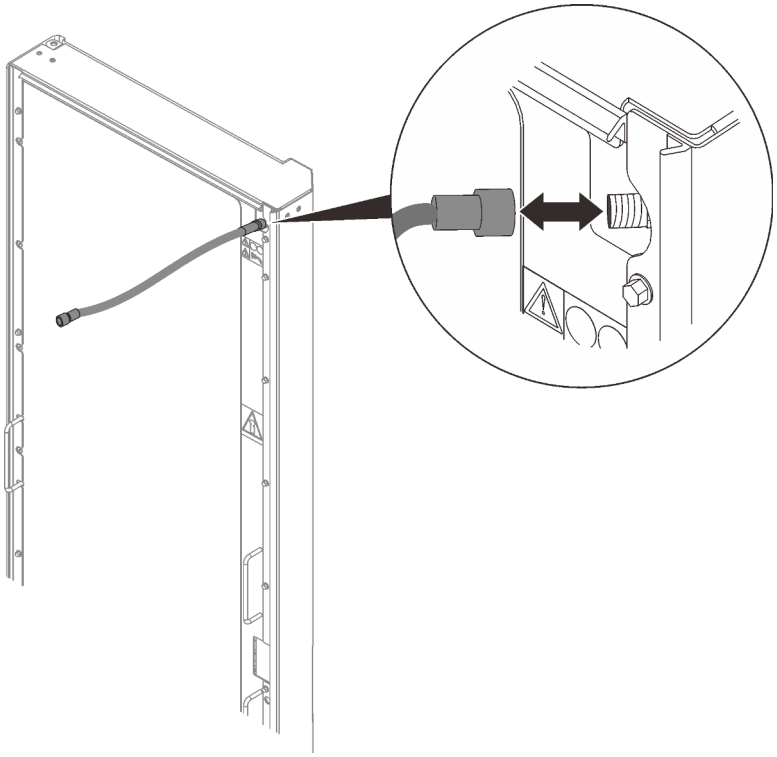


Figure 50. Removing the air-purging tool extension hose

Step 9. Remove the air-purging tool from the drain valve.

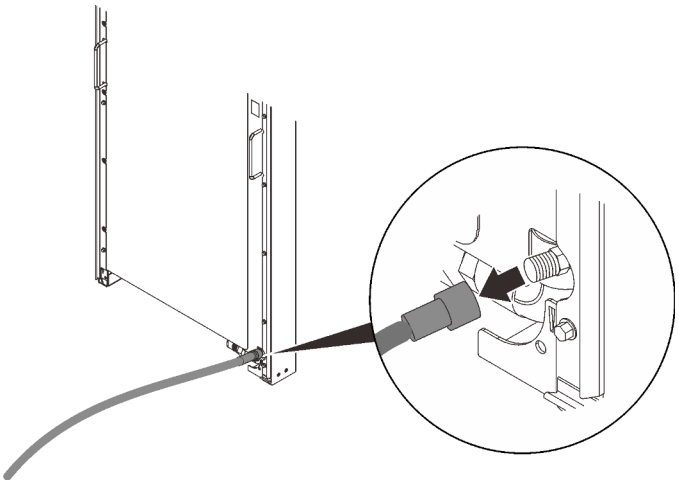


Figure 51. Removing the air-purging tool

Step 10. Install the two caps back to the air-purging and drain valve.

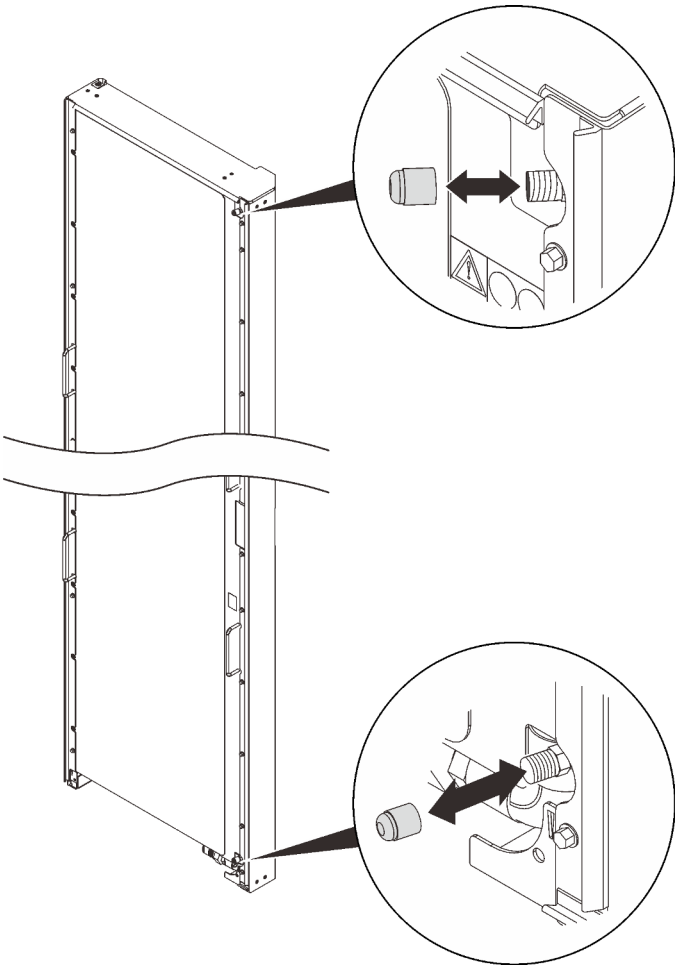


Figure 52. Installing the valve caps

Step 11.

Remove Rear Door Heat eXchanger for 48U Rack

See the section to learn how to remove Rear Door Heat eXchanger for 48U Rack.

About this task

S036

18 - 32 kg (39 - 70 lb)

32 - 55 kg (70 - 121 lb)

CAUTION:
Use safe practices when lifting.

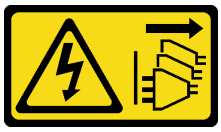
S010

CAUTION:
Do not place any object weighing more than 82 kg (180 lb) on top of rack-mounted devices.

S019

CAUTION:
The power-control button on the device does not turn off the electrical current supplied to the device. The device also might have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals.

R007



DANGER

- **Connect power cords from devices in the rack cabinet to electrical outlets that are near the rack cabinet and are easily accessible.**
- **Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet before you service any device in the rack cabinet.**
- **Install an emergency-power-off switch if more than one power device (power distribution unit or uninterruptible power supply) is installed in the same rack cabinet.**
- **Connect all devices that are installed in a rack cabinet to power devices that are installed in the same rack cabinet. Do not connect a power cord from a device that is installed in one rack cabinet to a power device that is installed in a different rack cabinet.**

R004

CAUTION:
See the instructions in the rack documentation before you install devices, remove devices, or relocate the rack.

S038

CAUTION:
Eye protection should be worn for this procedure.

Procedure

Step 1. Drain the water from the heat exchanger completely (see “Drain the heat exchanger of water” on page 41).

Step 2. Hold the heat exchanger in place with two people, and remove the top hinge.Depending on the configuration, select the corresponding removal procedures:

- **Without rack extension kit installed**

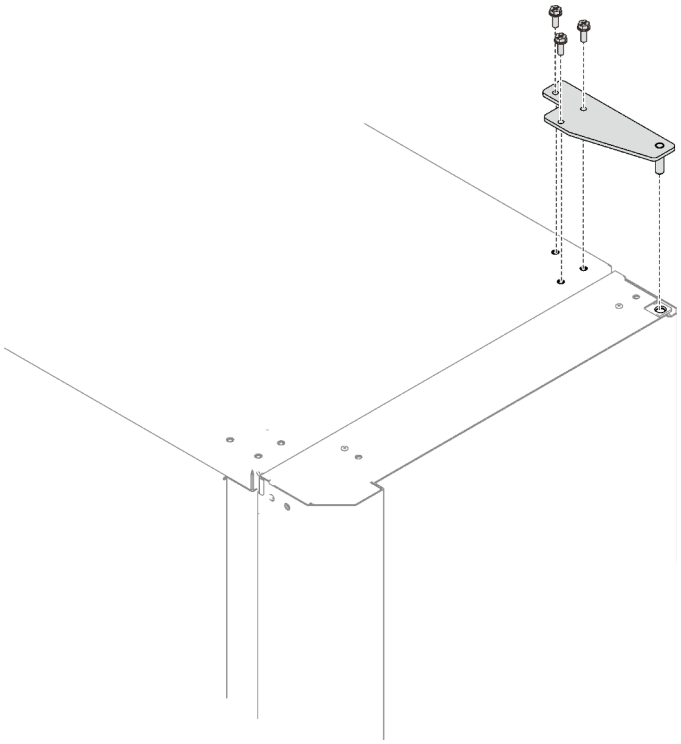


Figure 53. Removing the top hinge

Unfasten the three screws to remove the top hinge.

- **With** 48U Advanced Rack Extension Kit **installed**

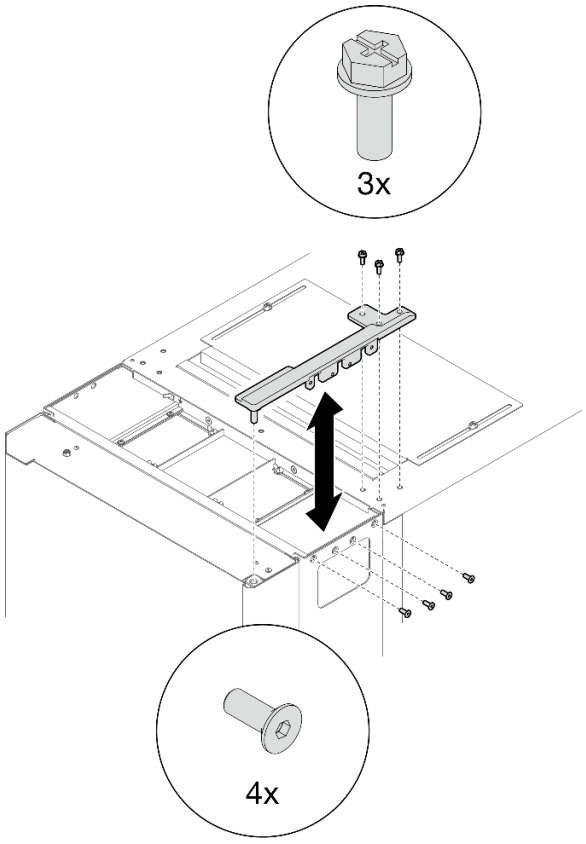


Figure 54. Removing the top hinge

Unfasten the seven screws to remove the top hinge.

Step 3. Hold the heat exchanger with three people on the handles/spots as illustrated.

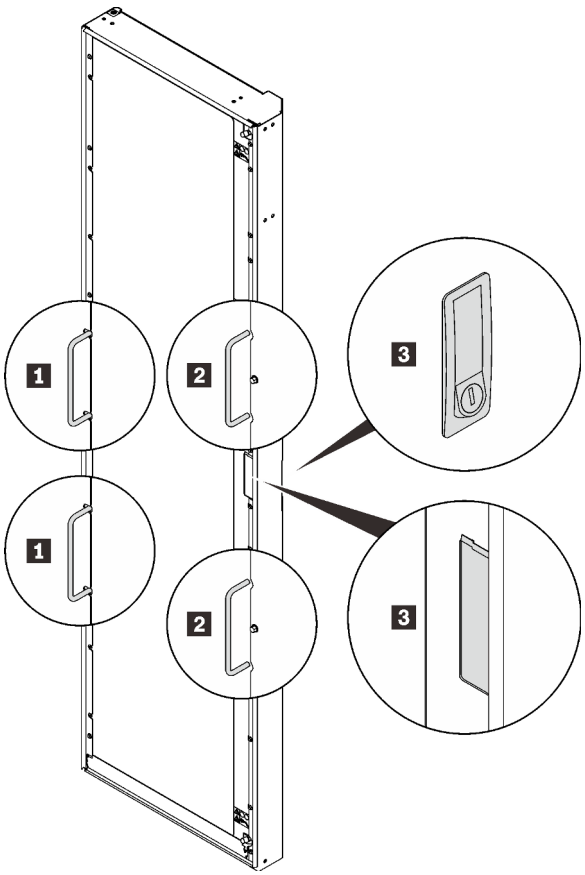


Figure 55. Lifting the heat exchanger with three people

1 Handles that the first person hold on to	3 Spots that the third person hold on to
2 Handles that the second person hold on to	

Step 4. Lift the heat exchanger with three people as described in the previous step, and remove it from the rack cabinet.

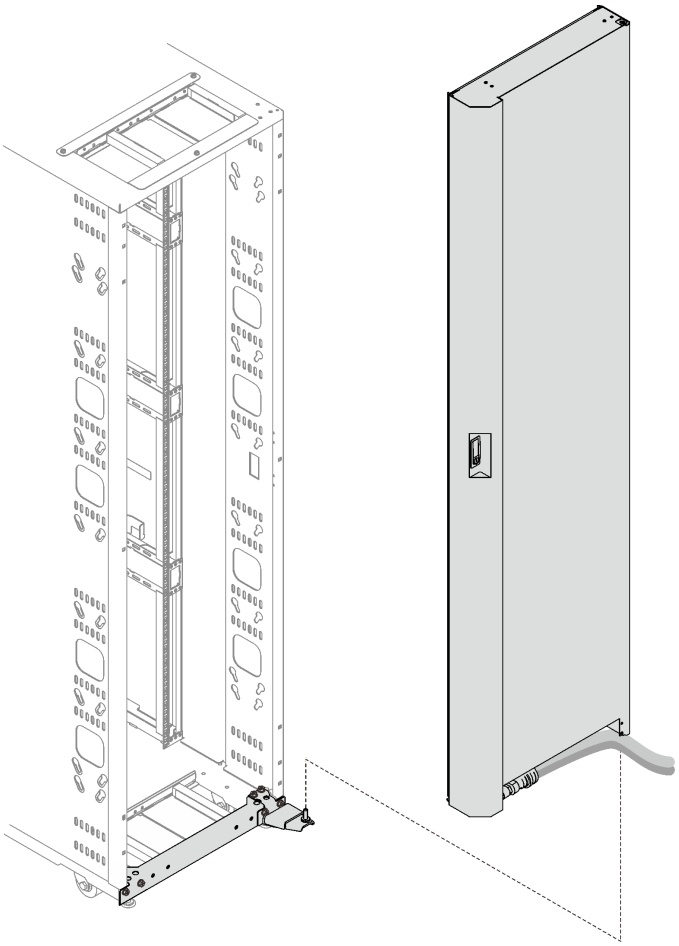


Figure 56. Removing the heat exchanger from the rack cabinet

Install Rear Door Heat eXchanger for 48U Rack

See this topic to learn how to install ThinkSystem Rear Door Heat eXchanger for 48U Rack.

About this task

S036

18 - 32 kg (39 - 70 lb)

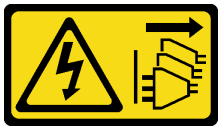
32 - 55 kg (70 - 121 lb)

CAUTION:
Use safe practices when lifting.

S010

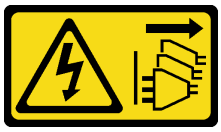
CAUTION:
Do not place any object weighing more than 82 kg (180 lb) on top of rack-mounted devices.

S019



CAUTION:
The power-control button on the device does not turn off the electrical current supplied to the device. The device also might have more than one connection to dc power. To remove all electrical current from the device, ensure that all connections to dc power are disconnected at the dc power input terminals.

R007



DANGER

- **Connect power cords from devices in the rack cabinet to electrical outlets that are near the rack cabinet and are easily accessible.**
- **Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet before you service any device in the rack cabinet.**
- **Install an emergency-power-off switch if more than one power device (power distribution unit or uninterruptible power supply) is installed in the same rack cabinet.**
- **Connect all devices that are installed in a rack cabinet to power devices that are installed in the same rack cabinet. Do not connect a power cord from a device that is installed in one rack cabinet to a power device that is installed in a different rack cabinet.**

R004

CAUTION:
See the instructions in the rack documentation before you install devices, remove devices, or relocate the rack.

S038

CAUTION:
Eye protection should be worn for this procedure.

Procedure

Step 1. (**With** 48U Advanced Rack Extension Kit **installed only**) Make sure the three support brackets are removed from the extension panels.

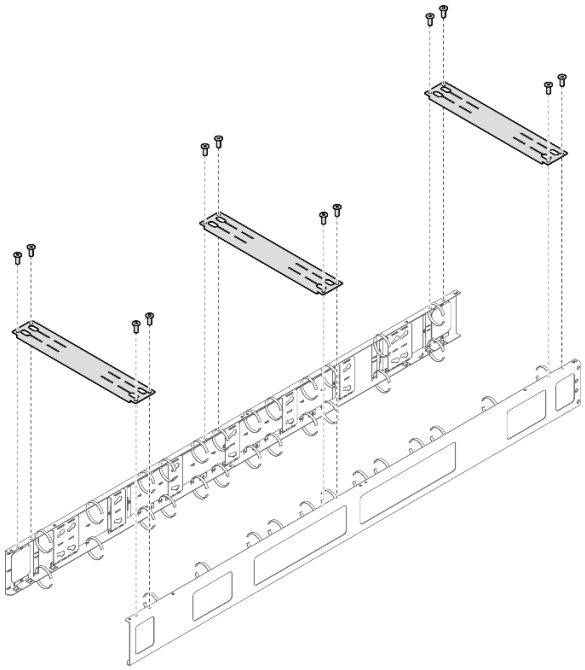


Figure 57. Removing the support brackets

Step 2. Remove the cover of the box that contains the heat exchanger.

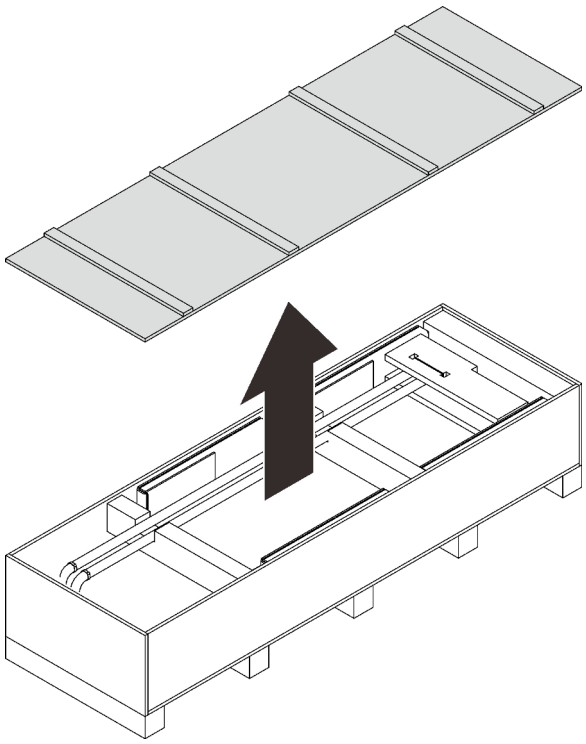


Figure 58. Removing the cover of the box

Step 3. Lift both sides of the heat exchanger with two trained technicians by handles, and remove the heat exchanger from the box.

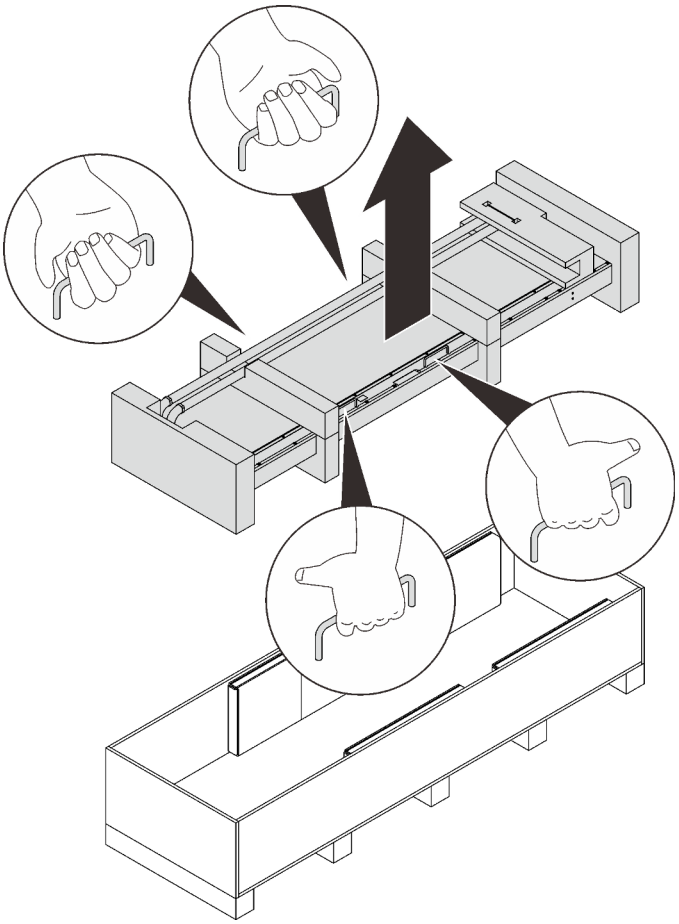


Figure 59. Removing the heat exchanger

Step 4. While the two technicians keep lifting the heat exchanger, have another person remove the top and bottom packing materials.

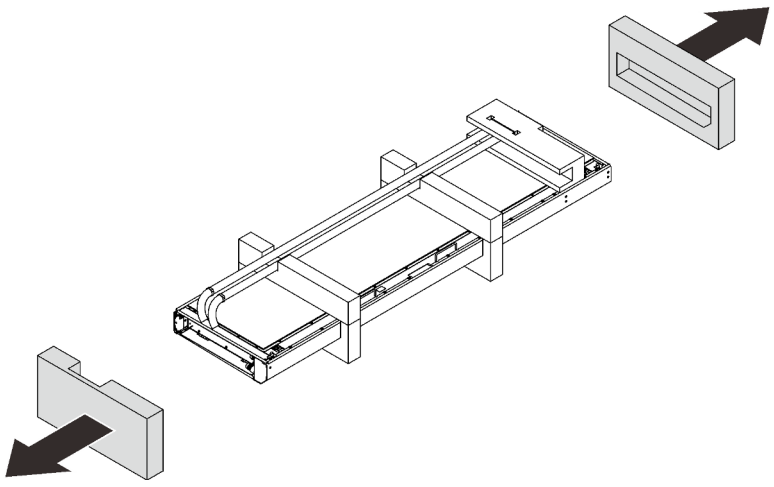


Figure 60. Removing the packing materials

Step 5. Remove the hose retaining material and peel the hoses away.

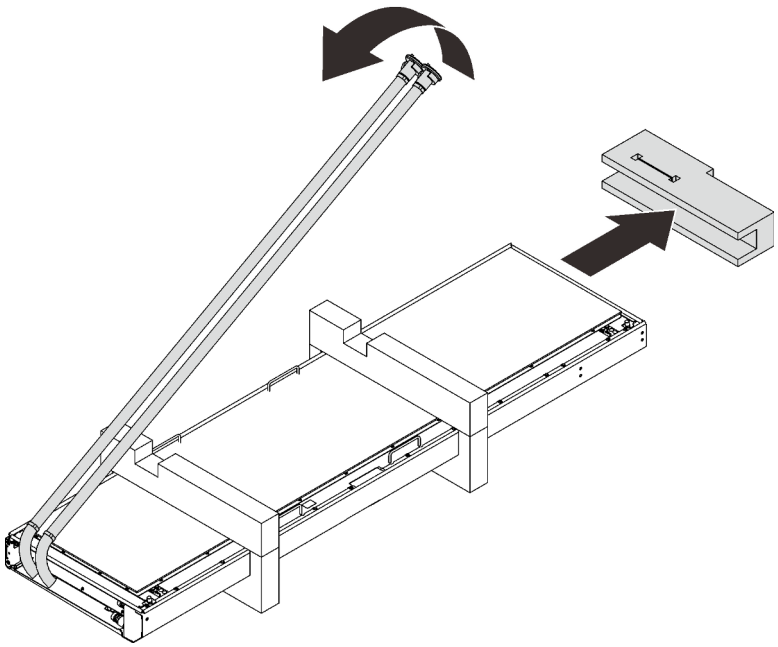


Figure 61. Removing the retaining material

Step 6. Split and remove the rest of the packing materials.

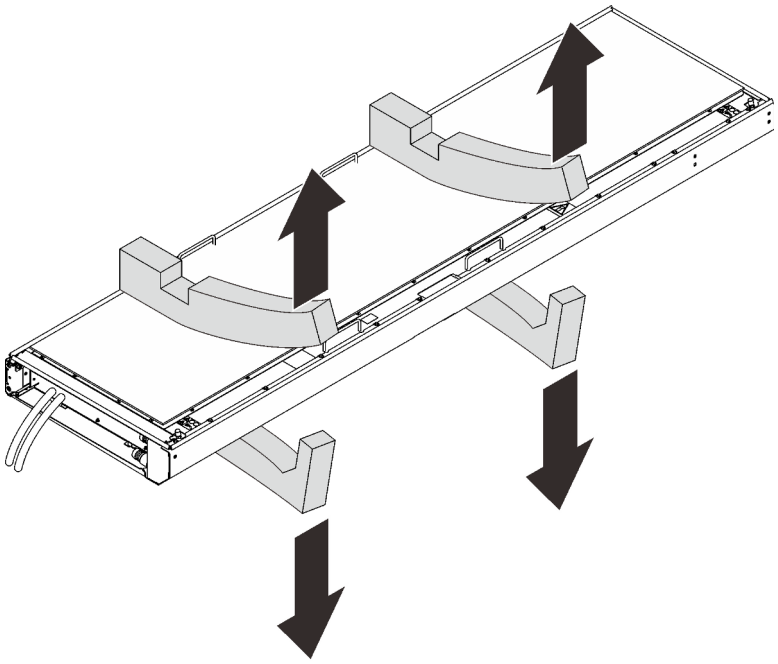


Figure 62. Removing the packing materials

Step 7. While the two technicians who are lifting the heat exchanger rotate it to vertical orientation, the other person hold on to the other handle and the door latch.

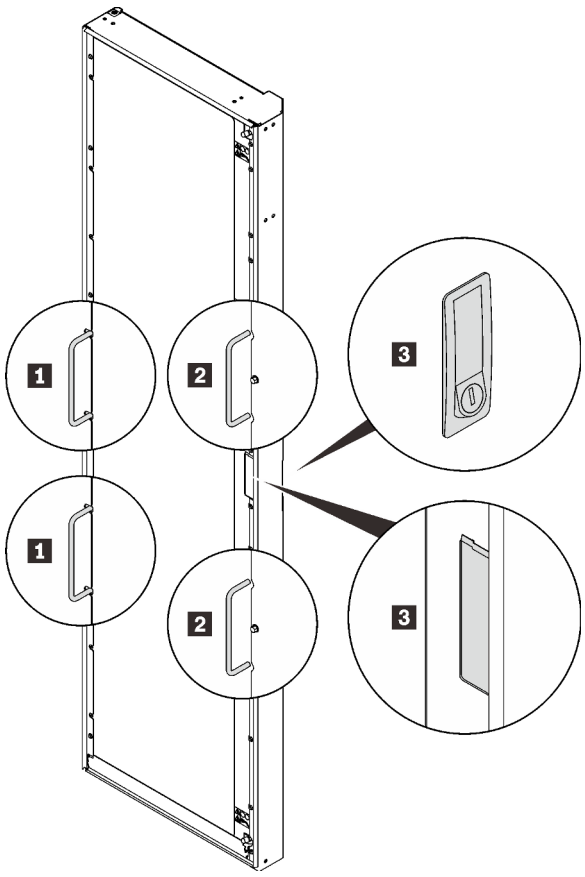


Figure 63. Lifting the heat exchanger with three people

1 Handles that the first person hold on to	3 Spots that the third person hold on to
2 Handles that the second person hold on to	

Step 8. Carry the heat exchanger with three people to the cabinet frame. Align the bottom corner with the bottom hinge pin on the rack cabinet; then, lower the heat exchanger to fit the pin in.

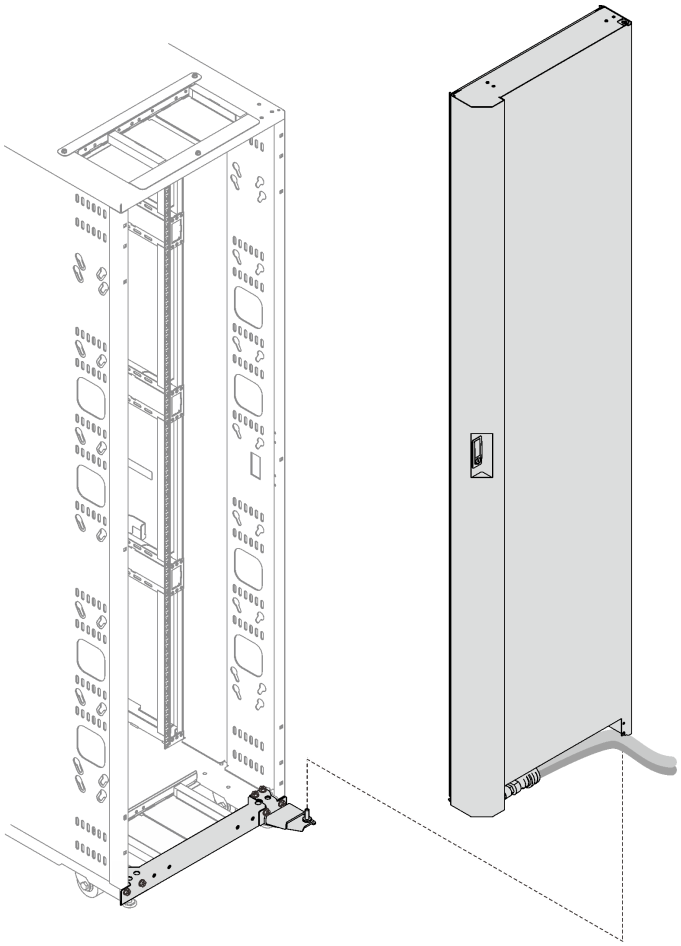


Figure 64. Installing the heat exchanger to the rack cabinet

Step 9. Hold the heat exchanger in place with two people, and install the top hingeDepending on the configuration, select the corresponding installation procedures:

- **Without rack extension kit installed**

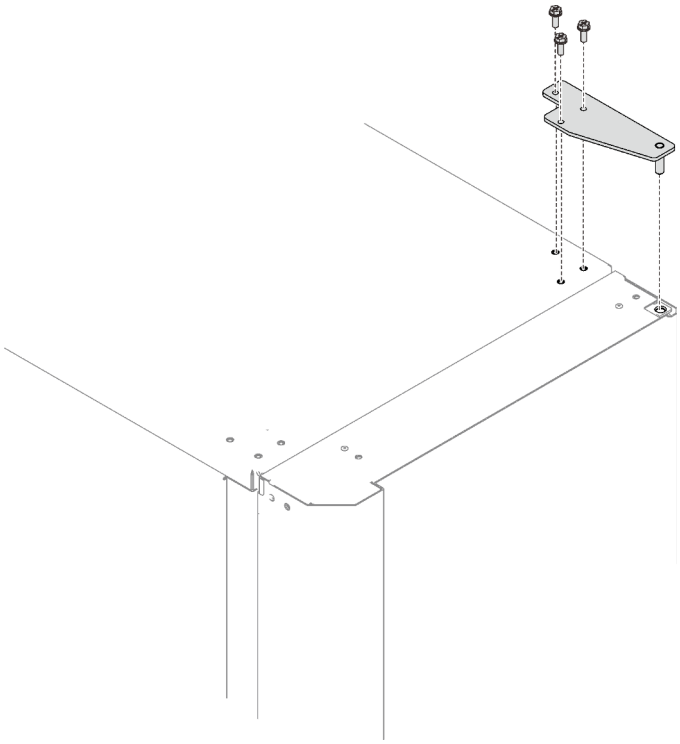


Figure 65. Installing the top hinge

Insert the top hinge pin to the heat exchanger; then, secure the hinge with three screws.

- **With** 48U Advanced Rack Extension Kit **installed**

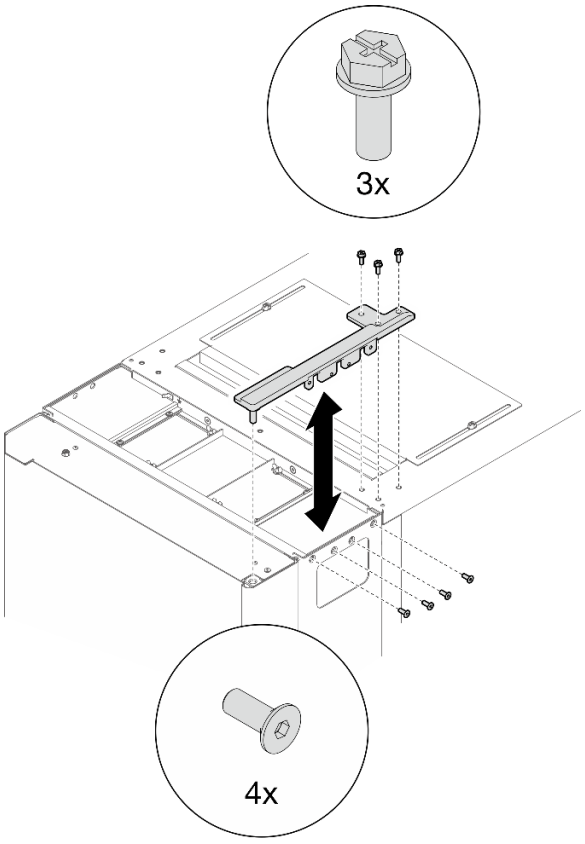


Figure 66. Installing the top hinge

Insert the top hinge pin to the heat exchanger; then, secure the hinge with seven screws.

After this task is completed

Proceed to "Fill the heat exchanger with water" on page 61.

Fill the heat exchanger with water

See this topic to learn how to fill ThinkSystem Rear Door Heat eXchanger for 48U Rack with water.

About this task

S038

CAUTION:
Eye protection should be worn for this procedure.

Attention: Wear safety goggles or other eye protection whenever you fill, drain, or purge air or nitrogen from the heat exchanger.

Procedure

Step 1. Purge the nitrogen that has been filled in the hose from the hose.

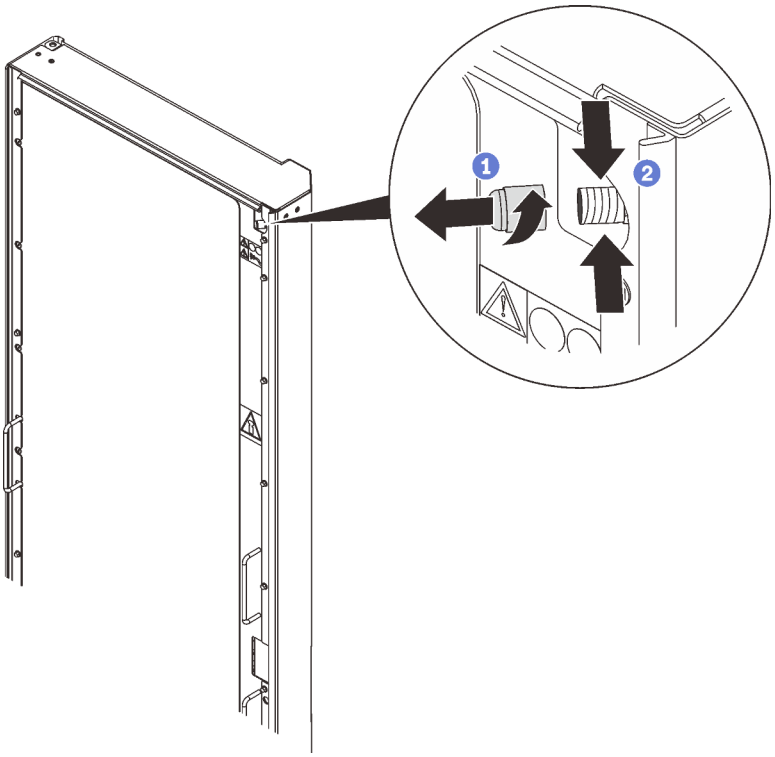


Figure 67. Purging nitrogen

1 Loosen and remove the cap from the air-purging valve.

2 Press in on the valve stem of the air-purging valve to purge the nitrogen from the heat exchanger. Continue holding in the valve stem until the pressure is released.

Step 2. Attach the air-purging tool to the air-purging valve at the top of the heat exchanger, and place the drain end into a 2-liter (or larger) container to catch the water and air bubbles that escape during the filling procedure.

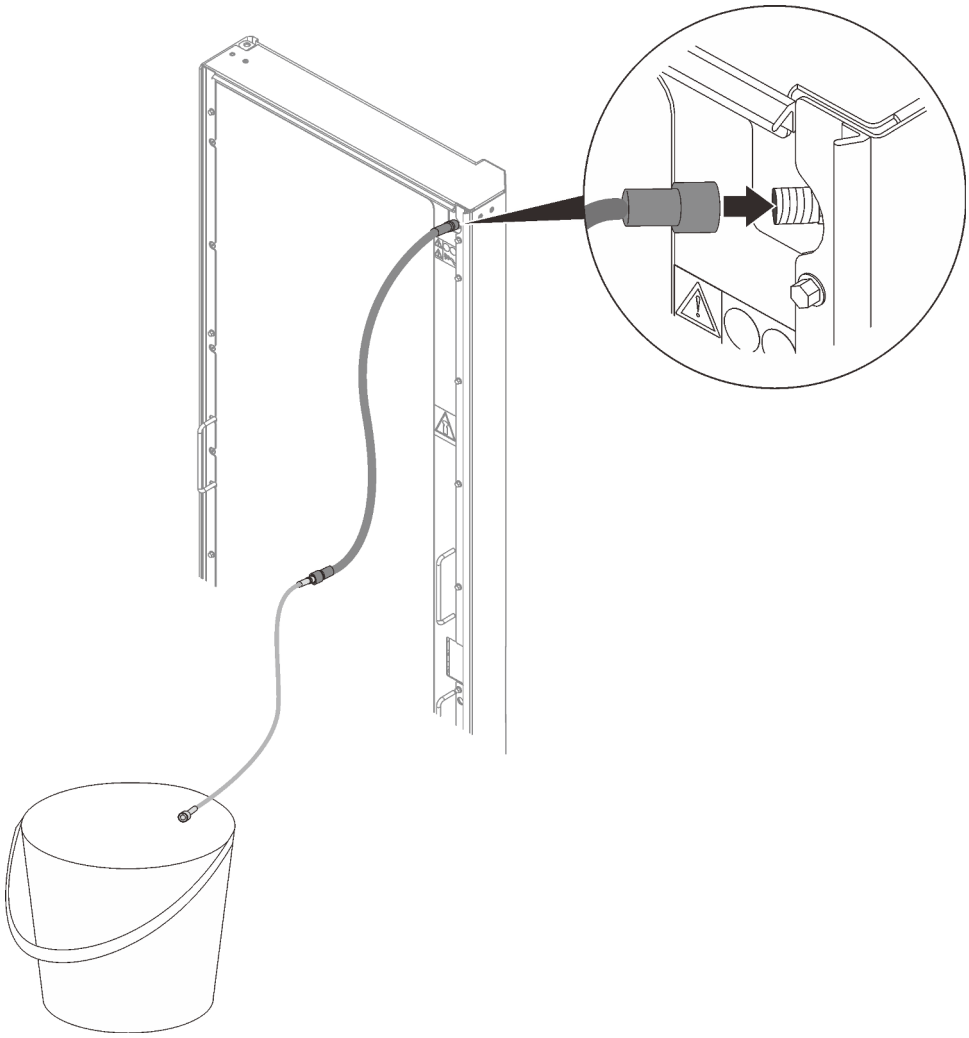


Figure 68. Installing the air-purging tool

Step 3. Connect the supply and return hose couplings with the manifolds.

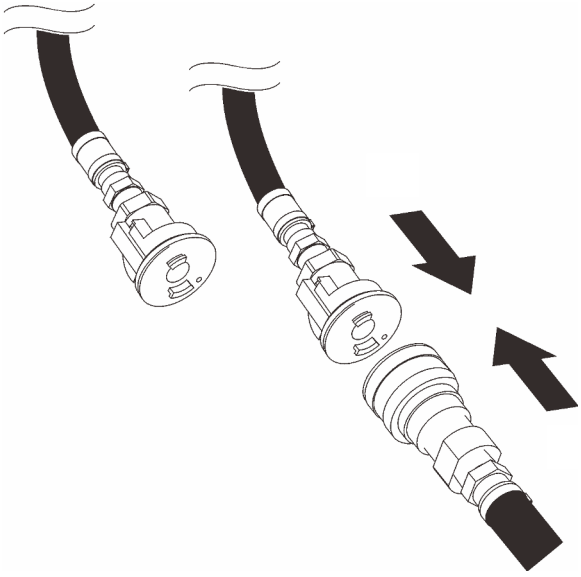


Figure 69. Connecting manifolds

Step 4. Turn on the flow of water to the heat exchanger, and let it run for several minutes.

Step 5. When there is a steady stream of liquid into the container from the air-purging tool, disconnect the tool from the heat exchanger.

Attention: If water drips from the air-purging valve after you remove the air-purging tool, reattach the tool and disconnect it again to seal the valve.

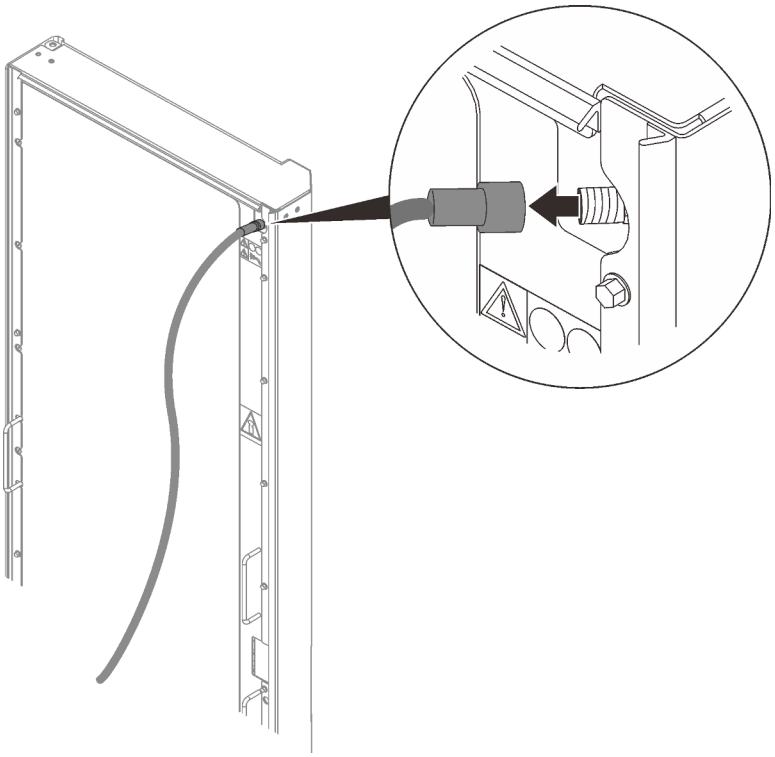


Figure 70. Removing the air-purging tool

Step 6. Install the valve cap back to the air-purging valve.

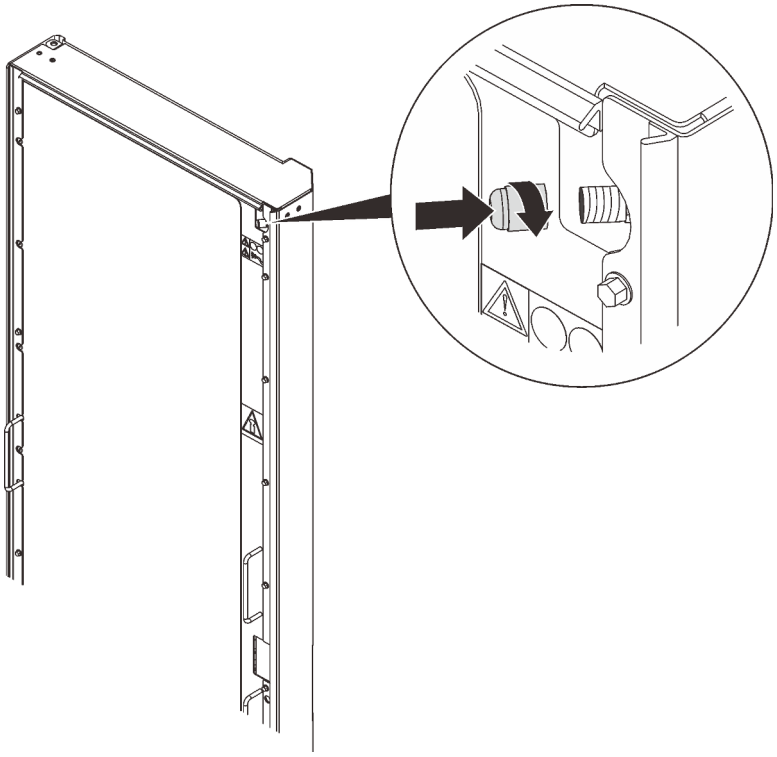


Figure 71. Installing the valve cap

Replace the door latch

See this topic to learn how to replace the door latch of Rear Door Heat eXchanger.

Procedure

Step 1. Remove the screw that secure the latch to the heat exchanger; then, secure the replacement unit with the same screw.

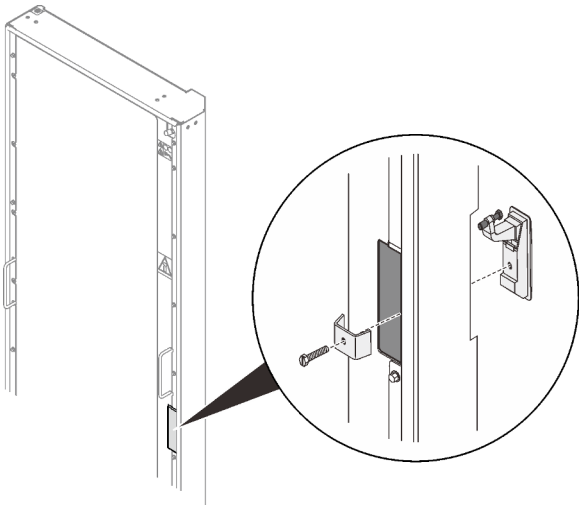


Figure 72. Replacing the door latch

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about Lenovo products, you will find a wide variety of sources available from Lenovo to assist you.

On the World Wide Web, up-to-date information about Lenovo systems, optional devices, services, and support are available at:

http://datacentersupport.lenovo.com

Note: This section includes references to IBM web sites and information about obtaining service. IBM is Lenovo's preferred service provider for ThinkSystem.

Before you call

Before you call, there are several steps that you can take to try and solve the problem yourself. If you decide that you do need to call for assistance, gather the information that will be needed by the service technician to more quickly resolve your problem.

Attempt to resolve the problem yourself

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The Lenovo product documentation also describes the diagnostic tests that you can perform. The documentation for most systems, operating systems, and programs contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

You can find the product documentation for your ThinkSystem products at the following location:

http://thinksystem.lenovofiles.com/help/index.jsp

You can take these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- If you have installed new hardware or software in your environment, check https://static.lenovo.com/us/en/serverproven/index.shtml to make sure that the hardware and software is supported by your product.
- Go to http://datacentersupport.lenovo.com and check for information to help you solve the problem.
  - Check the Lenovo forums at https://forums.lenovo.com/t5/Datacenter-Systems/ct-p/sv_eg to see if someone else has encountered a similar problem.

You can solve many problems without outside assistance by following the troubleshooting procedures that Lenovo provides in the online help or in the Lenovo product documentation. The Lenovo product documentation also describes the diagnostic tests that you can perform. The documentation for most systems, operating systems, and programs contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

Gathering information needed to call Support

If you believe that you require warranty service for your Lenovo product, the service technicians will be able to assist you more efficiently if you prepare before you call. You can also see http://datacentersupport.lenovo.com/warrantylookup for more information about your product warranty.

Gather the following information to provide to the service technician. This data will help the service technician quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.

- Hardware and Software Maintenance agreement contract numbers, if applicable
- Machine type number (Lenovo 4-digit machine identifier)
- Model number
- Serial number
- Current system UEFI and firmware levels
- Other pertinent information such as error messages and logs

As an alternative to calling Lenovo Support, you can go to https://support.lenovo.com/servicerequest to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to the service technicians. The Lenovo service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

Contacting Support

You can contact Support to obtain help for your issue.

You can receive hardware service through a Lenovo Authorized Service Provider. To locate a service provider authorized by Lenovo to provide warranty service, go to https://datacentersupport.lenovo.com/serviceprovider and use filter searching for different countries. For Lenovo support telephone numbers, see https://datacentersupport.lenovo.com/supportphonelist for your region support details.

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Any performance data contained herein was determined in a controlled environment. Therefore, the result obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

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