Rear Door Heat eXchanger V2
Type 1756

Installation and Maintenance Guide

Rear Door Heat eXchanger V2
Type 1756

Installation and Maintenance Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, “Notices,” on page 81, the *Rack Safety Information* and *Environmental Notices and User Guide* documents on the IBM *Documentation* CD, and the *Important Notices* and *Warranty Information* documents that comes with the product.

Fourth Edition (September 2013)

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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.

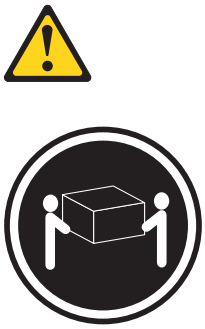
Läs säkerhetsinformationen innan du installerar den här produkten.

Important: Each caution and danger statement in this document is labeled with a number. This number is used to cross reference an English-language caution or danger statement with translated versions of the caution or danger statement in the *IBM Rack Safety Information* document.

For example, if a caution statement is labeled “Statement 1,” translations for that caution statement are in the *IBM Rack Safety Information* document under “Statement 1.”

Be sure to read all caution and danger statements in this document before you perform the procedures. Read any additional safety information that comes with the server or optional device before you install the device.

Statement 5:



≥ 18 kg (39.7 lb)

≥ 32 kg (70.5 lb)

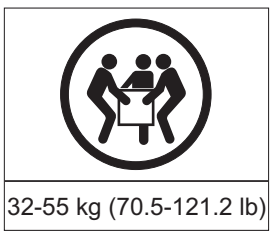
≥ 55 kg (121.2 lb)

CAUTION:
Use safe practices when lifting.

CAUTION:

or

or



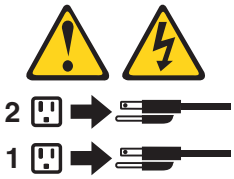
The weight of this part or unit is between 32 and 55 kg (70.5 and 121.2 lb). It takes three persons to safely lift this part or unit. (C010)

Statement 6:

CAUTION:
Do not place any object on top of a rack-mounted device unless that rack-mounted device is intended for use as a shelf.

Statement 7:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Statement 8:

DANGER

- **Plug power cords from devices in the rack cabinet into electrical outlets that are located 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 servicing 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 installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.**

Statement 12:

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

Statement 14:

CAUTION:
Goggles are needed for the procedure.

(L011)

Chapter 1. Introduction

This *Installation and Maintenance Guide* contains instructions for installing, setting up, and maintaining the IBM® Rear Door Heat eXchanger V2 Type 1756.

Note: Installation of the IBM Rear Door Heat eXchanger V2 Type 1756 is your responsibility and is not provided as part of the product purchase.

The heat exchanger is a water-cooled door that is mounted on the rear of an IBM 42U 1100 mm Deep Dynamic Rack Type 9363 to cool the air that is heated and exhausted by devices inside the rack. A supply hose delivers chilled, conditioned water to the heat exchanger. A return hose delivers warmed water back to the water pump or chiller. In this document, this is referred to as a secondary cooling loop. The primary cooling loop supplies the building chilled water to secondary cooling loops and air conditioning units. The hoses for the secondary cooling loop are not included with this product. The rack on which you install the heat exchanger can be on a raised floor or a non-raised floor. Each heat exchanger can remove 100,000 Btu per hour (or approximately 30,000 watts) of heat from your data center.

See “Secondary cooling loop parts and services” on page 10 for information about hoses, water treatment, and coolant distribution units for supplying conditioned water.

If you would like to procure IBM installation planning services regarding what is needed to plan for supplying conditioned water and installing the heat exchanger, see “Installation and support from IBM Integrated Technology Services” on page 22.

If documentation updates are available, you can download them from the IBM website. The heat exchanger might have features that are not described in the documentation that comes with the product, and the documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the heat exchanger documentation. To check for updates, go to http://www.ibm.com/supportportal/.

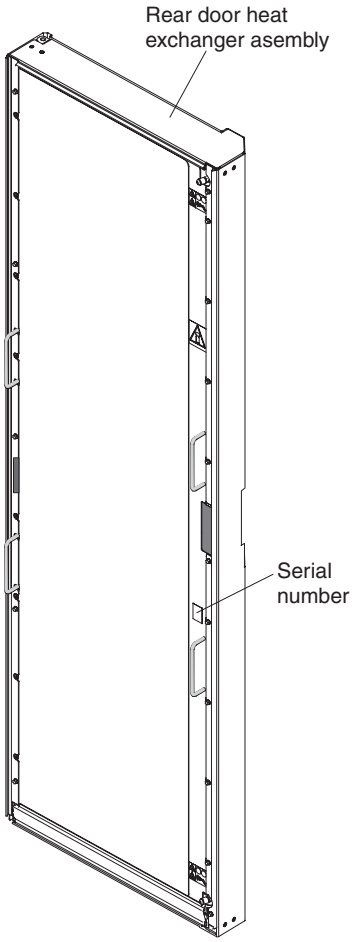


Figure 1. Serial number location on the IBM Rear Door Heat eXchanger V2 Type 1756

Record information about the IBM Rear Door Heat eXchanger V2 Type 1756 in the following table. You will need this information if you need to call for service.

The serial number is on the side rail of the heat exchanger, between the two lift handles.

Product name	IBM Rear Door Heat eXchanger V2 Type 1756
Serial number	_____

The IBM Documentation CD

The IBM *Documentation* CD contains documentation for your rack product in Portable Document Format (PDF) and includes the IBM Documentation Browser to help you find information quickly.

Hardware and software requirements

The IBM *Documentation* CD requires the following minimum hardware and software:

- Microsoft Windows XP, Windows 2000, or Red Hat Linux

- 100 MHz microprocessor
- 32 MB of RAM
- Adobe Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems

Using the Documentation Browser

Use the Documentation Browser to browse the contents of the CD, read brief descriptions of the documents, and view documents, using Adobe Acrobat Reader or xpdf. The Documentation Browser automatically detects the regional settings in your computer and displays the documents in the language for that region (if available). If a document is not available in the language for that region, the English-language version is displayed.

Use one of the following procedures to start the Documentation Browser:

- If Autostart is enabled, insert the CD into the CD or DVD drive. The Documentation Browser starts automatically.
- If Autostart is disabled or is not enabled for all users, use one of the following procedures:
  - If you are using a Windows operating system, insert the CD into the CD or DVD drive and click **Start --> Run**. In the **Open** field, type

    ```
    e:\win32.bat
    ```

    where *e* is the drive letter of the CD or DVD drive, and click **OK**.
  - If you are using Red Hat Linux, insert the CD into the CD or DVD drive; then, run the following command from the /mnt/cdrom directory:

    ```
    sh runlinux.sh
    ```

Select your rack product from the **Product** menu. The **Available Topics** list displays all the documents for your rack product. Some documents might be in folders. A plus sign (+) indicates each folder or document that has additional documents under it. Click the plus sign to display the additional documents.

When you select a document, a description of the document is displayed under **Topic Description**. To select more than one document, press and hold the Ctrl key while you select the documents. Click **View Book** to view the selected document or documents in Acrobat Reader or xpdf. If you selected more than one document, all the selected documents are opened in Acrobat Reader or xpdf.

To search all the documents, type a word or word string in the **Search** field and click **Search**. The documents in which the word or word string appears are listed in order of the most occurrences. Click a document to view it, and press Crtl+F to use the Acrobat search function, or press Alt+F to use the xpdf search function within the document.

Click **Help** for detailed information about using the Documentation Browser.

Notices and statements in this document

The caution and danger statements in this document are also in the multilingual *Rack Safety Information* document, which is on the IBM *Documentation* CD. Each statement is numbered for reference to the corresponding statement in the *Rack Safety Information* document.

The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice
- **Important**: These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage might occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Chapter 2. Heat exchanger planning, specifications, and requirements

This chapter provides information about planning the installation, and heat exchanger specifications, parts, tools, and suppliers.

Planning considerations

As you plan the installation of the heat exchanger, include the following considerations.

- Providing chilled, conditioned water that meets the specifications that are outlined in “Control and conditioning of the secondary cooling loop” on page 12.
- Procuring and installing the water supply system that is suitable for your data center. Details are provided in “Water delivery specifications for secondary loops” on page 14.
- Providing a redundant secondary cooling loop water supply or enough room air conditioning to handle a tolerable heat load if the function of one or more of the heat exchangers is compromised. For example, if the rear door is opened for rack maintenance or conditioned water supply to the door is stopped, the rack heat load is sent out into the room and must be handled by room air conditioning until the conditioned water supply is restored.
- Providing floor or ceiling tile cutouts or protective coverings to avoid tripping hazards on non-raised floors as part of hose management.

CAUTION:

or ***or***

The weight of this part or unit is between 32 and 55 kg (70.5 and 121.2 lb). It takes three persons to safely lift this part or unit. (C010)

Attention:

1. Because of the size and weight of the heat exchanger, three trained persons are required to install or remove the heat exchanger.
2. You must remove the power from the rack and all components before you connect or disconnect the water supply lines and drain or fill the heat exchanger.

Heat exchanger specifications

The following information is a summary of the specifications of the IBM Rear Door Heat eXchanger V2, Type 1756.

Table 1. Heat exchanger specifications

Door size: • Depth: 129 mm (5.0 in.) • Height: 1950 mm (76.8 in.) • Width: 600 mm (23.6 in.) **Door assembly weight:** • Empty: 39 kg (85 lb) • Filled: 48 kg (105 lb) **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

Expected performance of the heat exchanger is illustrated in Figure 2 on page 7 for a typical inlet air temperature of 27°C (80.6°F), with a fully populated rack, near uniform power dissipation, and a 30 kW heat load. By selecting the correct water inlet temperature and water flow rate, you can achieve the necessary heat removal.

A heat removal of 100% 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 (27°C [80.6°F] in this example). Heat removal in excess of 100% indicates that the heat exchanger not only removed all of the heat generated by the devices but further cooled the air so that the average air temperature leaving the rack is actually lower than that entering the rack.

Attention: To help maintain optimum performance of the Rear Door Heat eXchanger and provide proper cooling for all rack components, you must 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.
- Bundle signal cables together in a rectangle so that the upper and lower air-baffle sliders are closed as far as possible. Do not bundle signal cables together in a circular formation. For more information, see “Routing cables through the upper and lower air baffles” on page 42.

The following illustration shows the typical performance of the heat exchanger, 30 kW heat load.

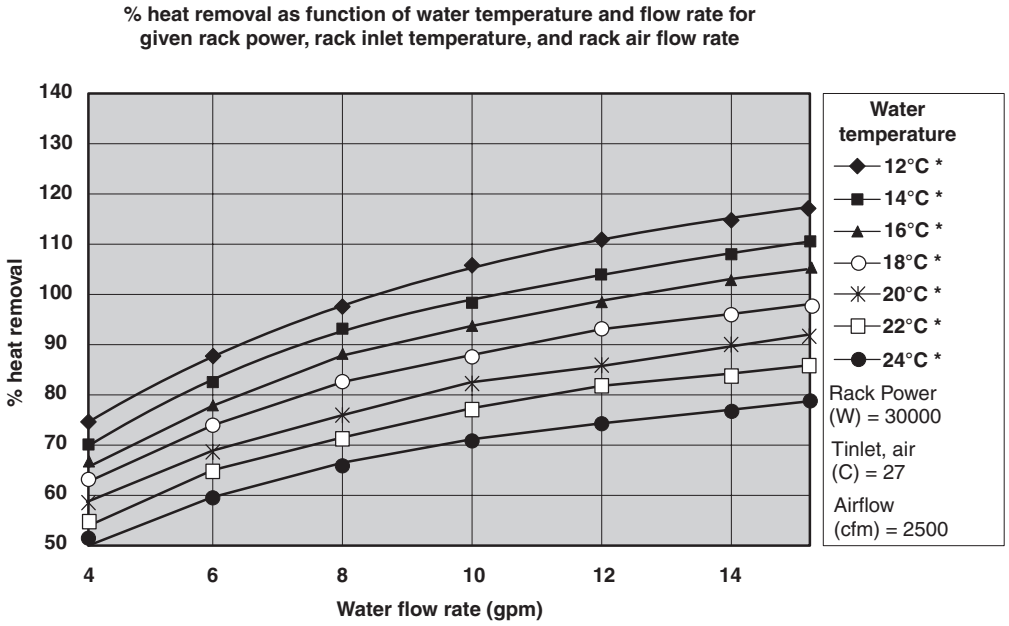


Figure 2. Typical performance of the heat exchanger, 30 kW heat load

* As described in “Water-supply requirements for secondary loops” on page 13, a given water temperature may be used only if the system that is supplying the water is 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 that is allowed at that data center installation.

Performance data is shown in Figure 3 for a 20 kW heat load. Because of the lower heat load, a specific level of cooling can be achieved with warmer water, a lower flow rate, or both.

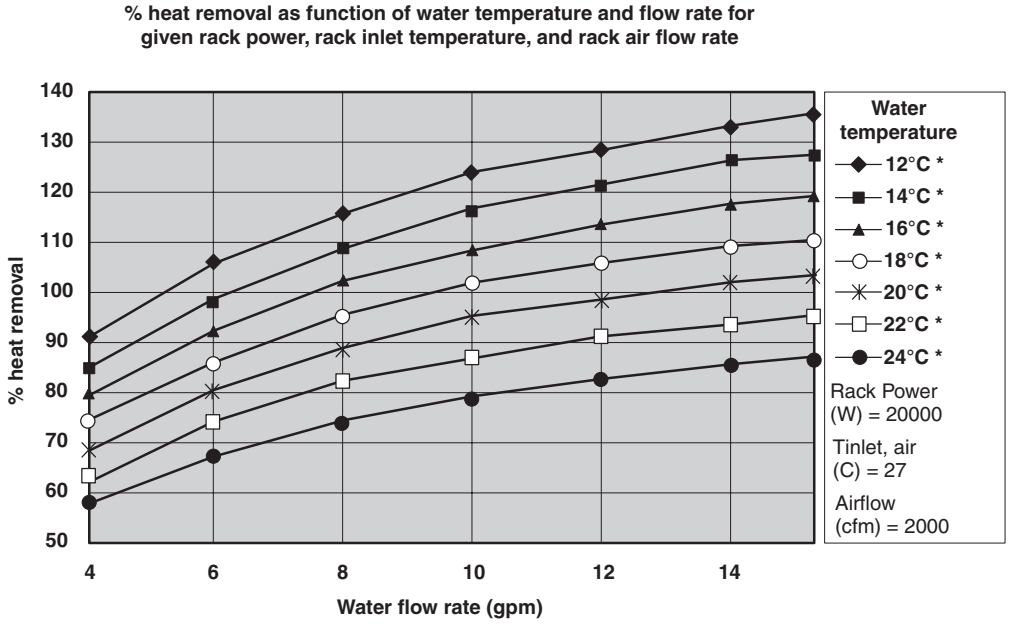


Figure 3. Typical performance of the heat exchanger, 20 kW heat load

* As described in “Water-supply requirements for secondary loops” on page 13, a given water temperature may be used only if the system that is supplying the water is 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 allowed at that datacenter installation.

Heat exchanger parts and tools

The following illustration shows the heat exchanger and the parts that come with it.

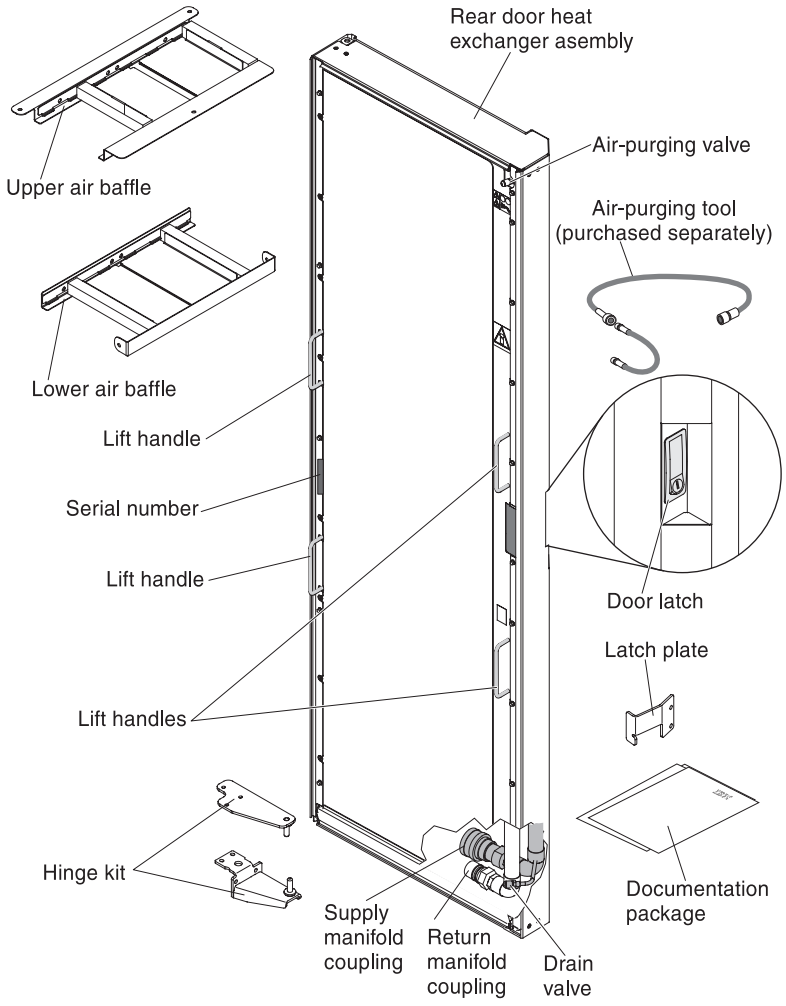


Figure 4. The IBM Rear Door Heat eXchanger V2 Type 1756

Use the tools in the following table to install or remove a part or to attach the rear door heat exchanger.

Table 2. Installation and removal tools

Tool	Part to install or remove	FRU part number
Phillips screwdriver	Hinge bracket; air baffle	73G5363
8 mm socket	Air baffle	73G1458
10 mm socket	Hinge bracket	73G1463
Ratchet-head wrench	Hinge brackets; air baffle	1650840
Platform ladder	Hinge bracket (top)	45E0998

Secondary cooling loop parts and services

This section provides lists of suppliers that can provide coolant distribution unit solutions, flexible hose assemblies, and water treatment that meets the suggested water quality requirements.

Miscellaneous parts and services supplier

Coolcentric supplies the following secondary loop parts and services to customers in North America, Europe, Middle East, Africa, and Asia Pacific:

- Parts
  - Rear door heat exchangers (designed for non-IBM Enterprise racks)
  - Coolant distribution units
  - 3/4-inch inside diameter hose kits
  - Water treatment
  - Chillers
  - Raised-floor grommets
- Services
  - Installation of door and secondary loop items
  - Preventive maintenance

You can contact Coolcentric for all or some of the listed items, depending on your needs.

Coolcentric
a Division of Wakefield-Vette
33 Bridge Street
Pelham, NH 03076

Telephone: 1-603-635-5199
http://www.coolcentric.com
Sales: sales@coolcentric.com
Post service and support: support@coolcentric.com
General inquiry: info@coolcentric.com

Coolant distribution unit supplier

Eaton-Williams Group Ltd supplies the following coolant distribution unit models that are designed specifically for the IBM Rear Door Heat eXchanger to customers in Europe:

Floor Standing	CD6-3	80-120 kW (400 V, 480 V or 208 Vv)
Floor Standing	CD6-4	150-200 kW (400 V, 480 V or 208 V)
Floor Standing	CD6-5	260-305 kW (400 V, 480 V or 208 V)

Customers in locations other than Europe can contact Eaton-Williams Group or Coolcentric (see “Miscellaneous parts and services supplier” on page 10).

http://www.eaton-williams.com
Email contact: ServerCool@eaton-williams.com

Eaton-Williams Group Ltd
Fircroft Way
Edenbridge
Kent
TN8 6EZ

Telephone:
National: (01732) 866055
International: +44 1732 866055

Fax:
National: (01732) 867937
International: +44 1732 865658

Water specifications for the secondary cooling loop

It is very important that the water that is being supplied to the heat exchanger meet the requirements that are described in this section. Otherwise, system failures might occur over time, 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 these 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

You can 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 at your location:

- Copper
- Brass with less than 30% zinc content
- Stainless steel 303 or 316
- Peroxidecured 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 your 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 describes 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 http://www.ashrae.org/publications/page/1279. Search on `Thermal Guidelines for Data Processing Environments`.

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 describes 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.

Procurement and installation of the components that are needed to create the secondary cooling loop system are required for this design and are your responsibility. See “Secondary cooling loop parts and services” on page 10 for information about suppliers of hoses and coolant distribution units. The main purpose of this section 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 http://webstore.ansi.org/default.aspx. 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

Figure 5 on page 16 through Figure 8 on page 19 show typical cooling solutions with the most flexibility possible. Read the following guidelines before you design the installation:

- 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 Parker 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.

Figure 5 shows a typical cooling solution and identifies the components of the primary cooling loop and the secondary cooling loop.

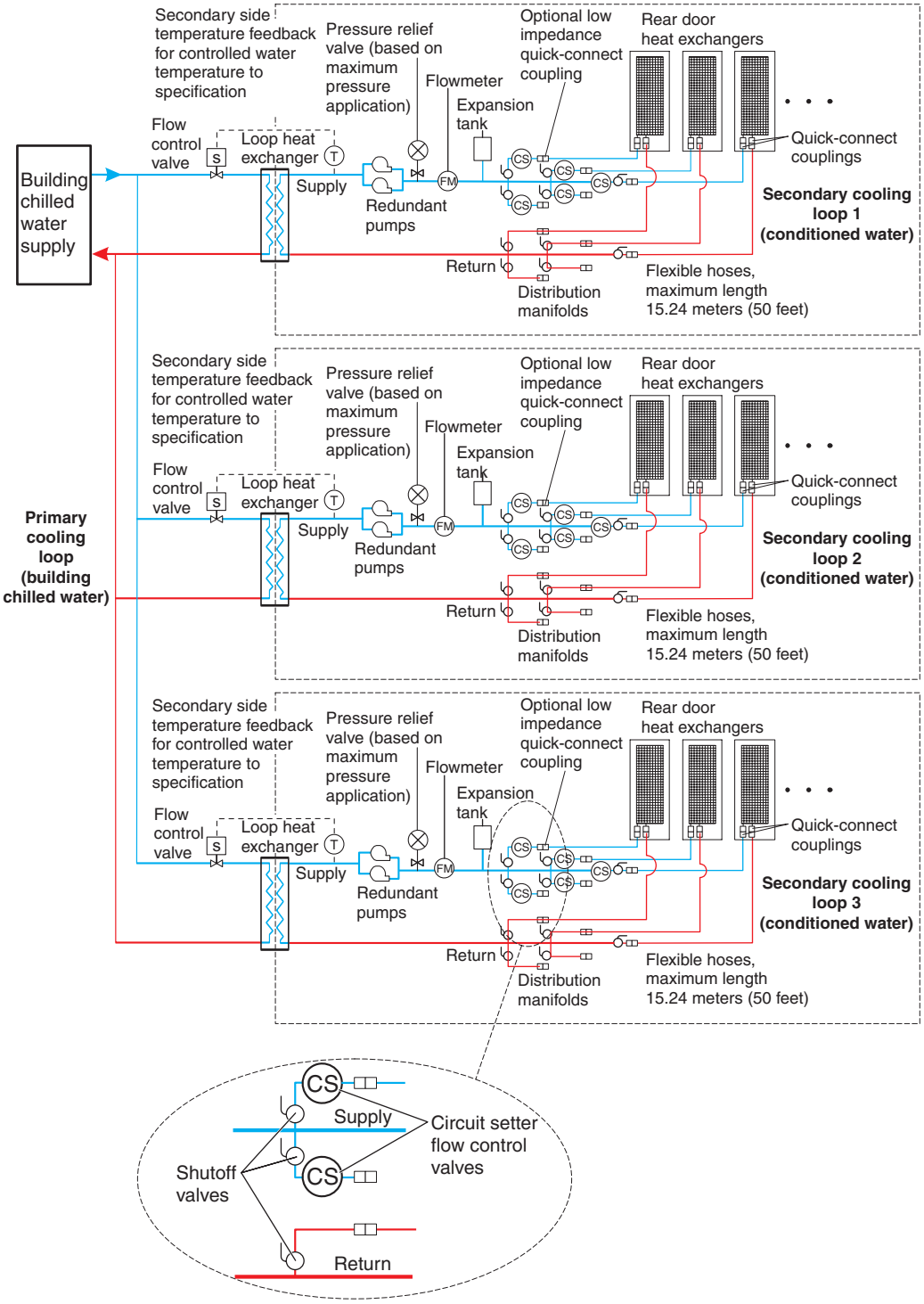


Figure 5. Primary and secondary cooling loops

Figure 6 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.

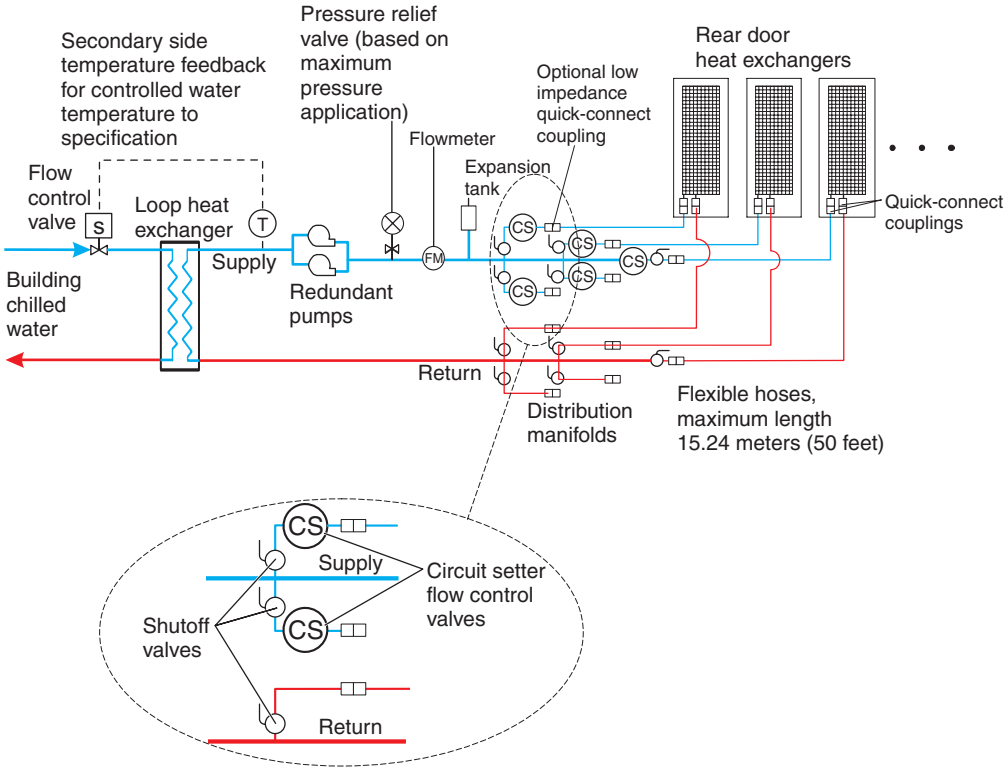


Figure 6. Coolant distribution unit that uses a fabricated facilities solution

Figure 7 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.

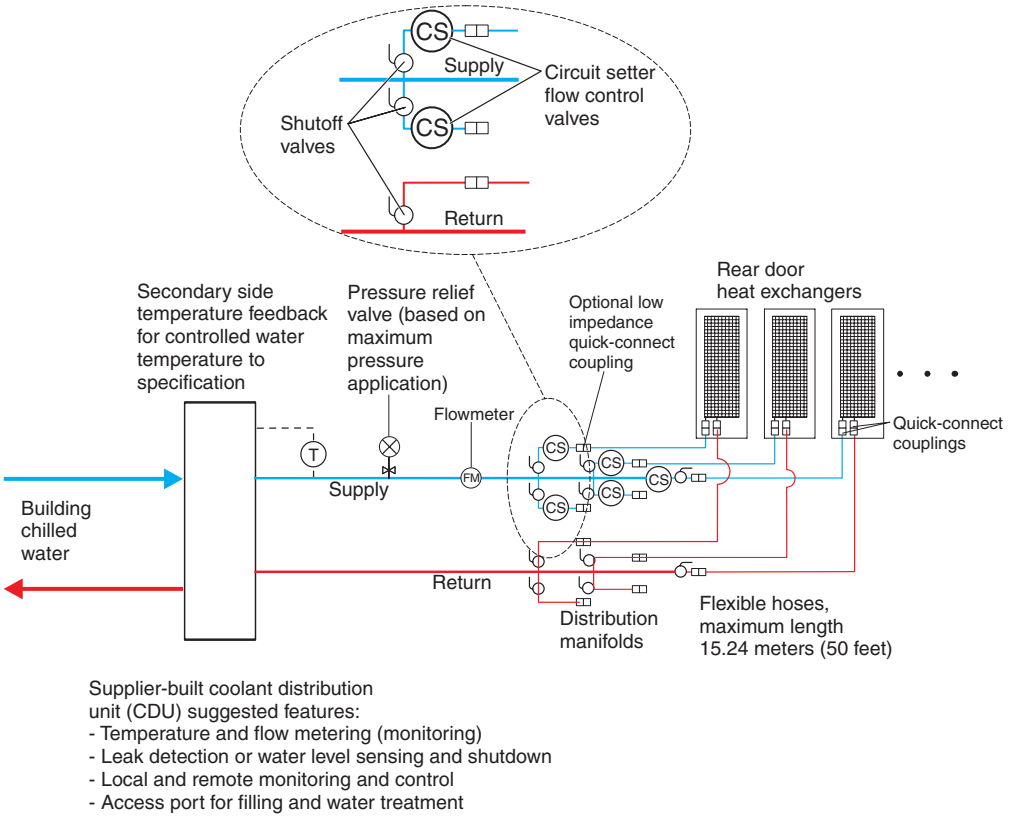
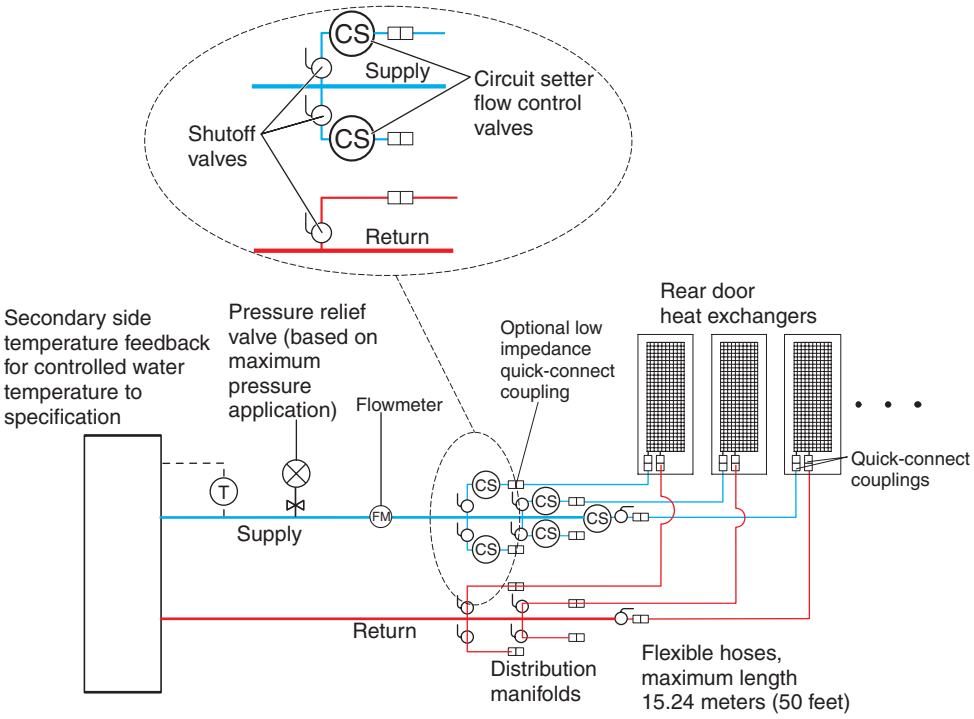


Figure 7. Coolant distribution unit that uses off-the-shelf supplier solutions

Figure 8 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 IBM Rear Door Heat eXchanger.



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

Figure 8. Coolant distribution unit that uses a water chiller unit to provide conditioned water

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. See “Materials to use in secondary loops” on page 12. 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 9 shows another layout for multiple water circuits.

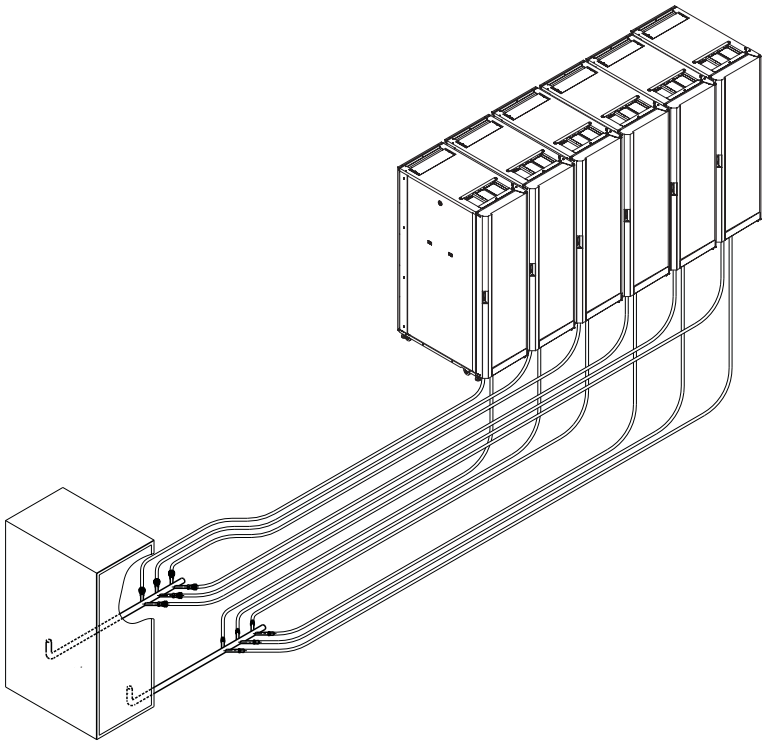


Figure 9. Typical central manifold (at a central location for multiple water circuits)

Figure 10 shows an extended manifold layout.

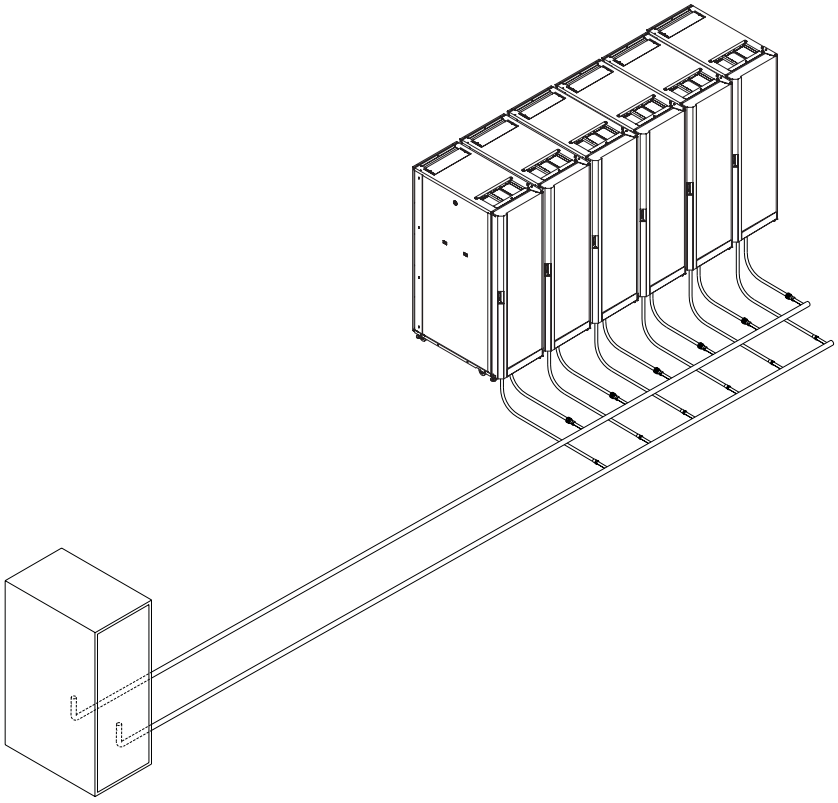


Figure 10. Typical extended manifold (along aisles between racks)

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 Parker Fluid Connectors quick-connect couplings 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 Parker couplings are described in this section and 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. .

For information about a supplier of these hoses, see “Secondary cooling loop parts and services” on page 10. Use solid piping or tubing that has a minimum inner diameter of 19 mm (0.75 in.) and the fewest possible joints between a manifold and a heat exchanger in each secondary loop.

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 passivated 300-L series stainless steel or brass with less than 30% zinc content. The coupling size is 19 mm (0.75 in.).
- The supply hose must have a Parker (male) quick-coupling nipple, part number SH6-63-W, or equivalent. The return hose must have a Parker (female) quick-connect coupling, part number SH6-62-W, 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.

Installation and support from IBM Integrated Technology Services

If you would like to procure assistance with coordinating and managing the installation and support of the IBM Rear Door Heat eXchanger V2 Type 1756, IBM can supply a focal point.

Before you call, have the following information available:

- Serial numbers of the racks
- Serial numbers of the heat exchangers
- Phone number where the racks are located
- Contact name and phone number, building location, and location of the racks within the building

To access the correct contact area in OSC Dispatch, dial the toll-free number and when prompted, enter your 4-digit rack machine type.

- **North America, Europe, Middle East, Africa**

  800-426-7378 (OSC Dispatch)
  Request contact with an IBM installation planning representative in the service branch office closest to your location.
- **Asia Pacific**

  Glen Yuan (Site Services Executive, AP Network and Site Integration Services)
  886-910-007690
  glenyuan@tw.ibm.com

Chapter 3. Special instructions if the heat exchanger comes installed on a rack

To unpack a rack with a rear door heat exchanger, see the *IBM 42U 1100 mm Enterprise V2 Dynamic Rack and Expansion Rack and IBM PureFlex System 42U Rack and Expansion Rack Unpacking Instructions* document that comes with the rack or to download the document from the IBM website, go to http://www-947.ibm.com/support/entry/portal/docdisplay?lndocid=migr-5091922.

If the rack was unpacked without using the instructions in the *Rack Unpacking Instructions* document, you might have to perform the following steps:

1. Make sure that the foam block that is under the left side of the rear door heat exchanger is removed.

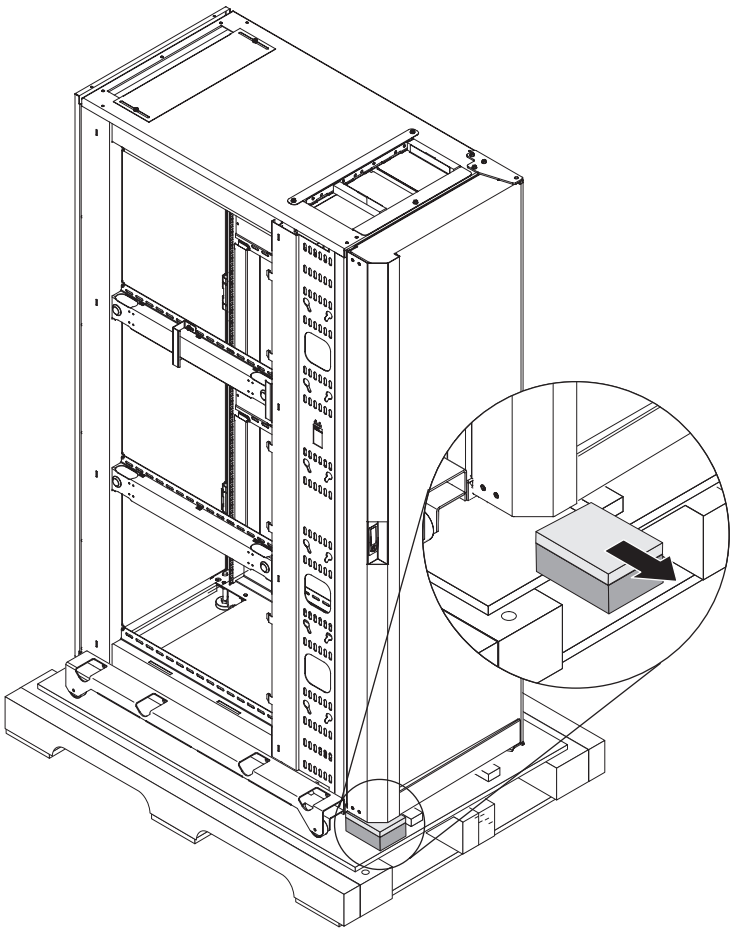
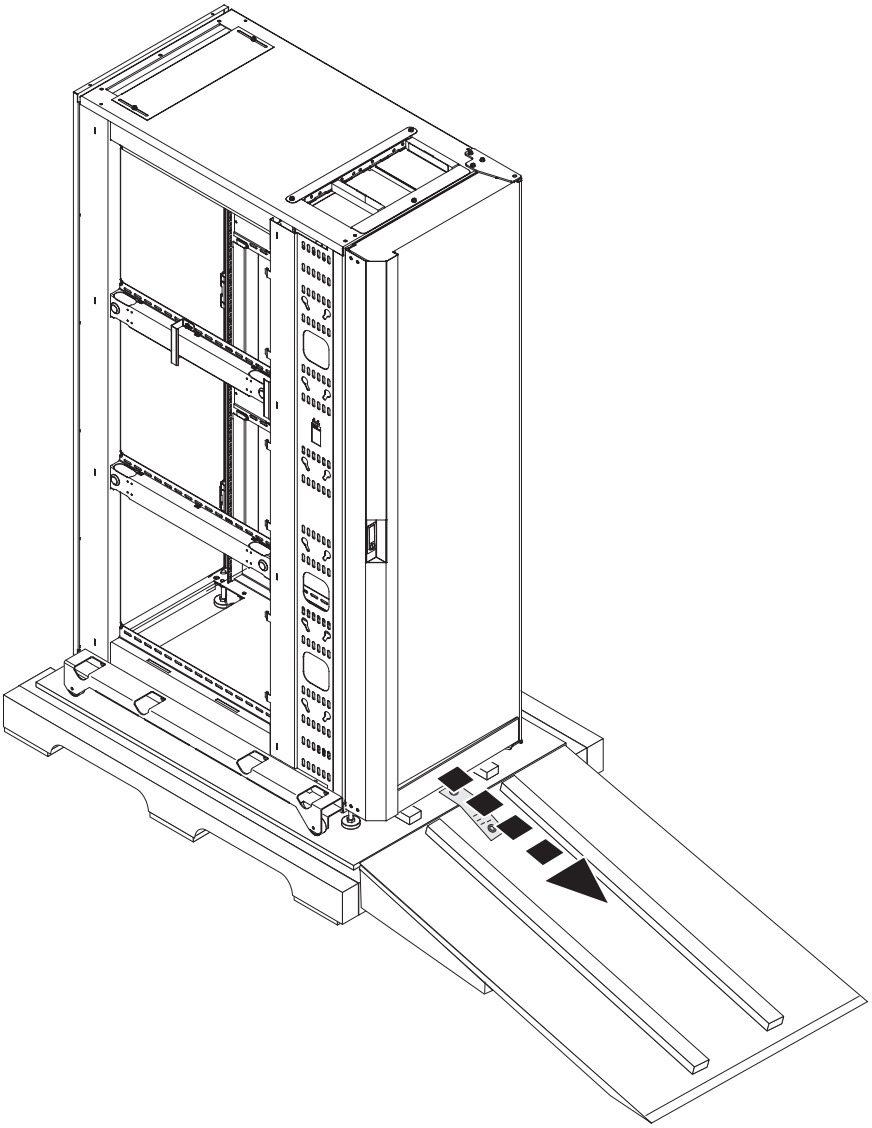


Figure 11. Removing the foam block

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.



3. Move the heat exchanger latch plate to its correct position. Remove the two screws from the latch plate, orient the latch plate as shown in the illustration, and align the holes in the latch plate with the holes on the rack flange. Secure the latch plate to the rack frame with the two screws. Close the door and make sure that it latches securely.

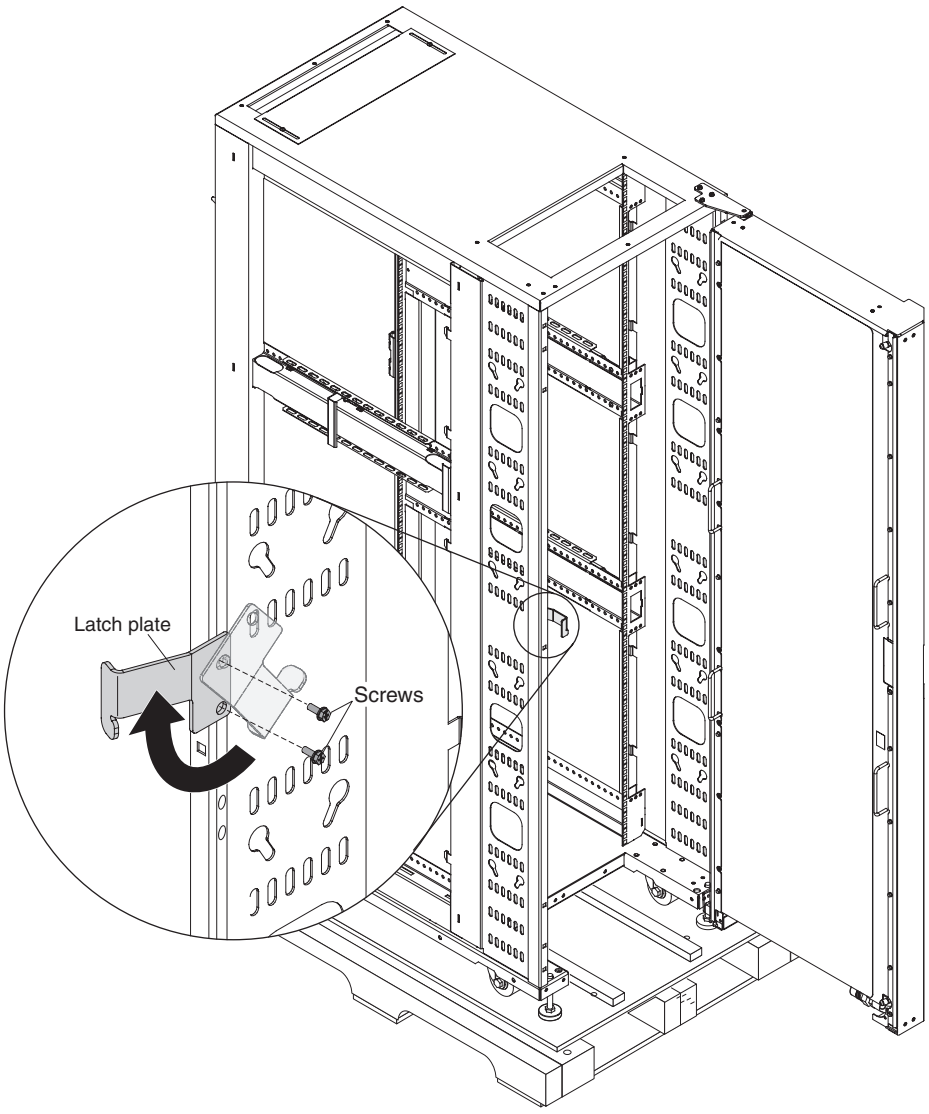


Figure 12. Moving the heat exchanger latch plate to the correct position

4. After you attach the hoses and fill the heat exchanger with water, complete the following steps:
   a. Install the inner hose access panel on the inside bottom of the heat exchanger.

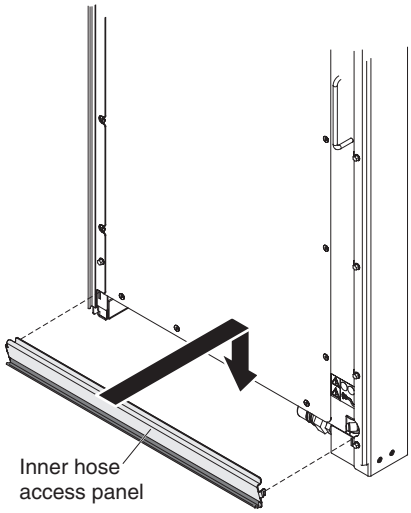


Figure 13. Installing the inner hose access panel

   b. Install the outer hose access panel on the outside bottom of the heat exchanger.

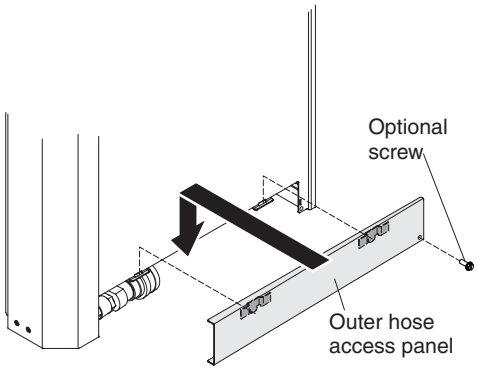


Figure 14. Installing the outer hose access panel

   c. (Optional) Secure the outer hose access panel to the heat exchanger with an M4 screw (see Figure 14).
   d. Reconnect power to the rack and all components; then, close and latch the heat exchanger.

5. Unscrew the shipping bracket, rotate it 180°, and screw the bracket to the rear door heat exchanger.

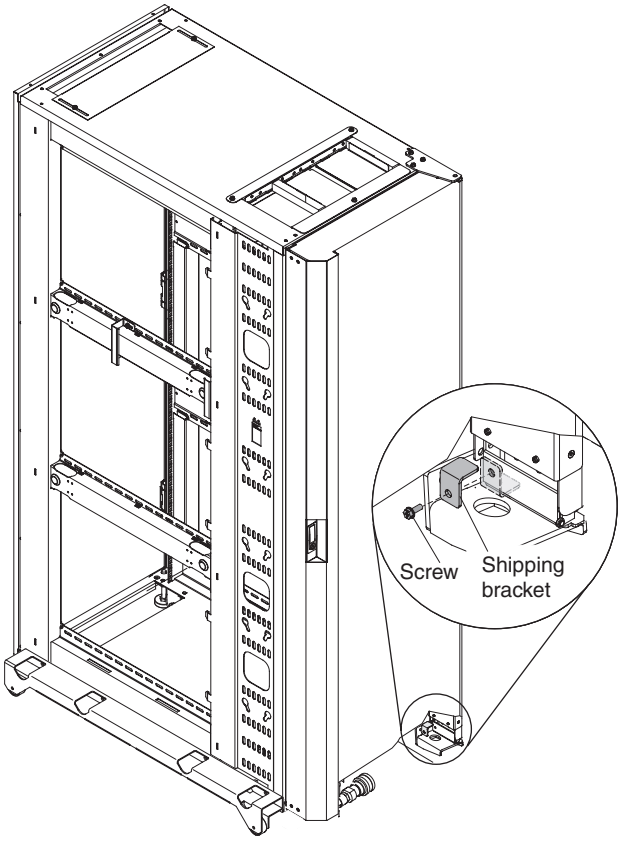


Figure 15. Reversing the shipping bracket

Chapter 4. Installing the heat exchanger

Attention: Because of the size and weight of the heat exchanger, three trained persons are required to move, install, replace, remove, or transport the heat exchanger.

This chapter provides instructions for installing and removing the heat exchanger.

Installation guidelines

Follow these guidelines when you install the heat exchanger:

- Read the safety information that begins on page v. This information will help you work safely.
- Because of the size and weight of the heat exchanger, three trained persons are required to install or remove the heat exchanger.
- Observe good housekeeping in the area where you are working. Place removed packing materials, tools, and other parts in a safe place.
- Do not overtighten plumbing fittings or connections. This will cause leaks and might damage the plumbing fittings.
- Use pipe dope on all threaded plumbing connections to ensure against leaks.
- Do not try to bend or reposition copper tubing. Excessive movement or bending of copper tubing might damage the tubing and create leaks. If you find leaks, check all plumbing connections and fittings for leaks before you connect power to the rack or any of the installed components.
- Repair all leaks before you connect power to the rack or any of the installed components.
- After the heat exchanger is filled, be sure to remove any excess water that might be left over from the filling process.
- Plumbing components expand and contract with changing conditions and might fail or loosen after installation. Place paper towels under the heat exchanger for a period of time; then, examine them for signs of a leak. If it appears that there might be a leak, carefully inspect the entire heat exchanger to determine whether there is a leak or whether it is water that is from the filling process.
- If the heat exchanger core or copper tubing is leaking or is damaged, remove it from the rack and see Appendix A, “Getting help and technical assistance,” on page 77 for information.
- New heat exchangers can be filled with pressurized nitrogen after assembly. Before you install the heat exchanger, the nitrogen must be purged from the heat exchanger in a well-ventilated area. To purge the nitrogen, remove the caps from the air-purging valves and press in on the valve stems to release the nitrogen.
- When you install heat exchangers on a suite of racks, secure the racks together first; then, install the heat exchangers.

Installing the heat exchanger

Attention:

1. Because of the size and weight of the heat exchanger, three trained persons are required to install or remove the heat exchanger.
2. You must remove the power from the rack and all components before you connect or disconnect the water supply lines and drain or fill the heat exchanger.

To install the heat exchanger on a Type 9363 rack, complete the following steps:

1. Read the safety information that begins on page iii and “Installation guidelines” on page 29.
2. Use the wrench that comes with the rack to lower the front and rear leveling pads. Make sure that the rack is level to the floor.

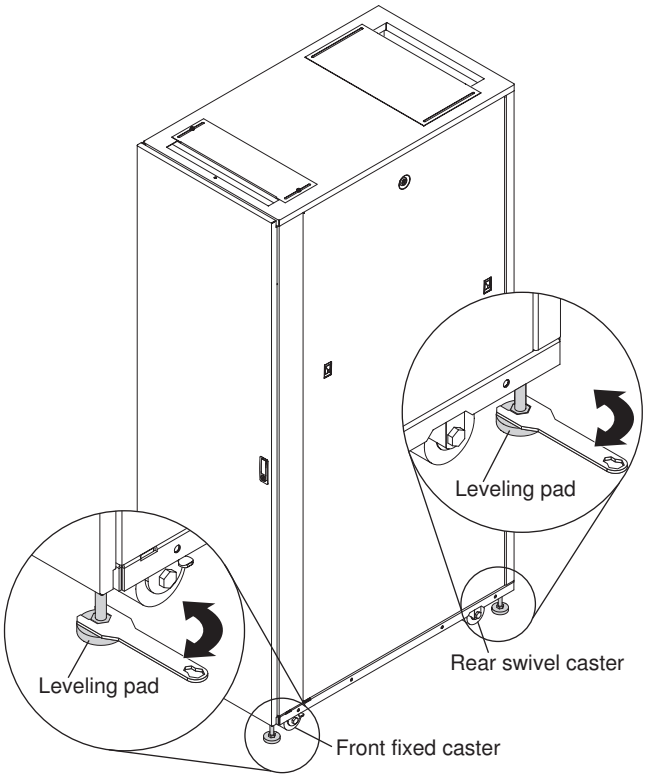


Figure 16. Lowering the leveling pads

3. Remove the rack rear door. For more information, see the *IBM 42U 1100 mm Deep Dynamic Rack and Deep Dynamic Expansion Rack, Type 9363 Installation Guide* on the IBM *Documentation* CD that comes with the rack.
4. Remove power from the rack and all installed components.

5. Remove the cardboard top from the heat exchanger carton.

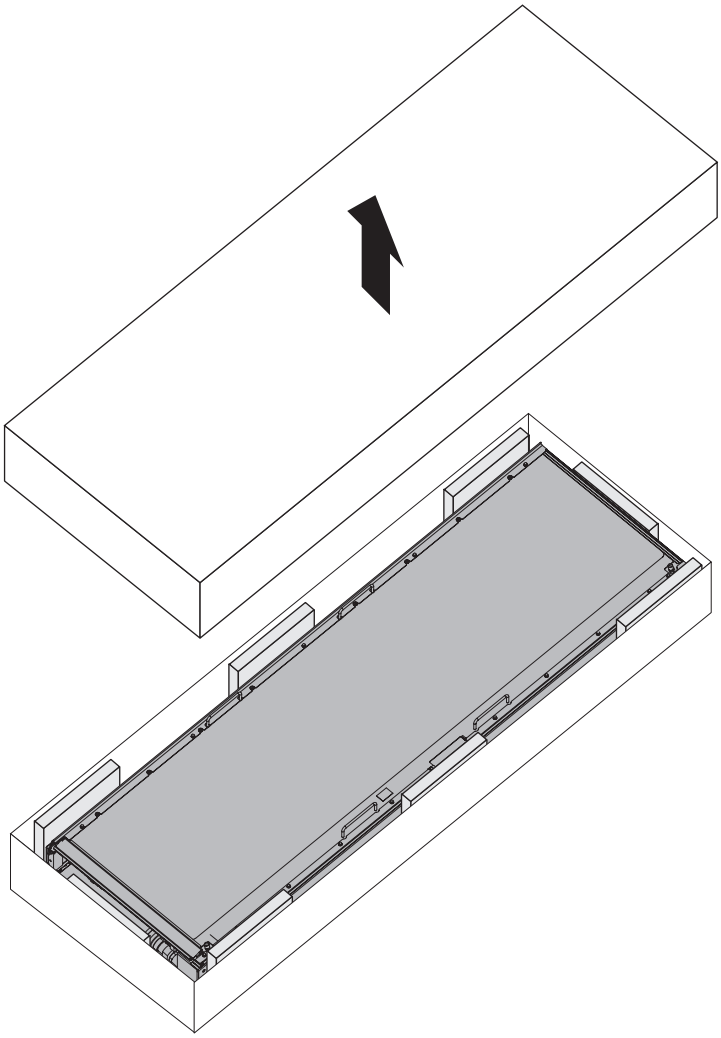


Figure 17. Removing the cardboard top from the heat exchanger carton

6. Remove the parts and tools from the carton and set them near the rack. *Do not* unpack the heat exchanger until later in the procedure.

7. Install the latch plate on the left side of the rack.

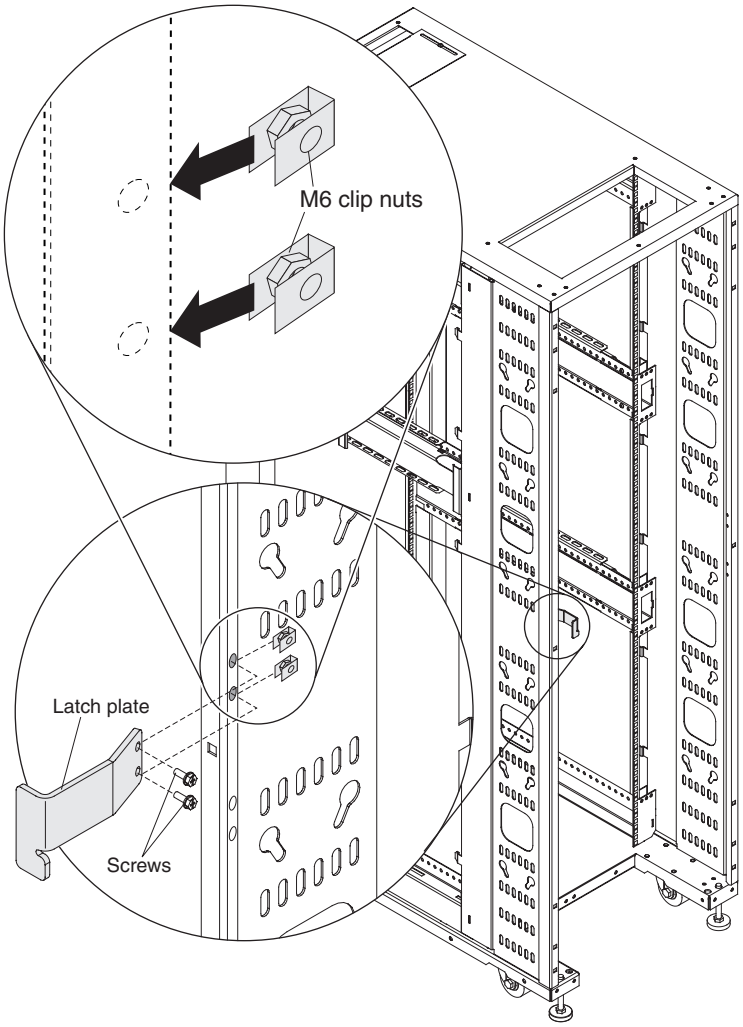


Figure 18. Installing the latch plate

a. Install two M6 clip nuts on the left-side rack-mounting flange of the rack.
b. Align the holes in the latch plate with the holes in the flange and clip nuts; then, secure the latch plate in place with two M6 screws.

8. Remove the cable-access bar from the bottom rear of the rack.

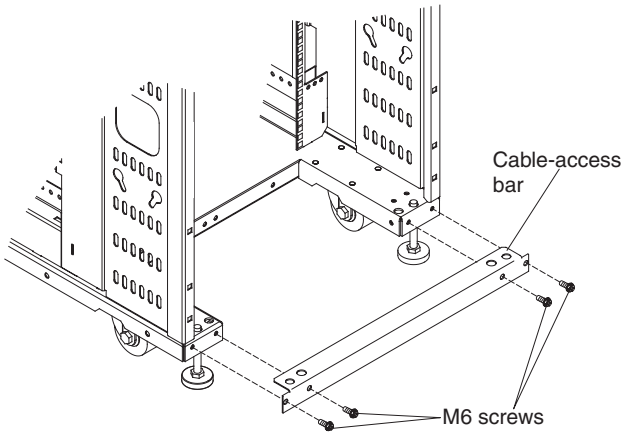


Figure 19. Removing the cable-access bar

9. Install the bottom hinge bracket on the rack:
   a. Locate the bottom hinge bracket.

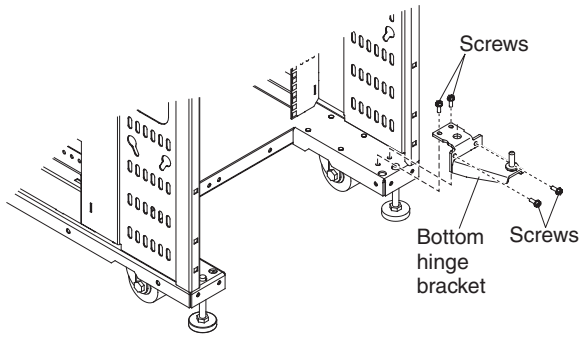


Figure 20. Installing the bottom hinge bracket

   b. Position the bottom hinge bracket so that the hinge pin is facing up.
   c. Place the mounting hole in the bottom hinge bracket over the leveler bolt on the bottom right side of the rack and make sure that the four screw holes in the bracket align with the four screw holes in the rack.
   d. Secure the bottom hinge bracket to the rack with four M6 screws.

      Note: Use a torque screwdriver to tighten the screws to 10±1 Nm.

10. Position a platform ladder near the right side of the rack. One person must climb the ladder to install the top hinge bracket.

11. Partially install the top hinge bracket:
    a. Locate the top hinge bracket.

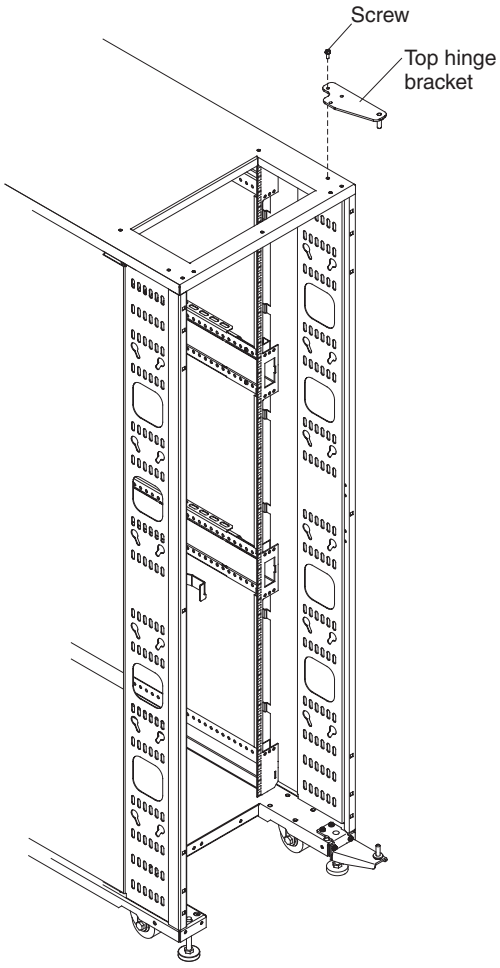


Figure 21. Partially installing the top hinge bracket

    b. Align the top hinge bracket with the three holes in the top right side of the rack.
    c. Use a Phillips screwdriver to partially insert a screw in the hole that is the farthest away from the rear of the rack. See the illustration. Do not fully tighten the screw at this time.
    d. Rotate the hinge bracket to the left or right so that it is temporarily out of the way.

12. Using a utility knife or similar cutting tool, slit the heat exchanger carton vertically on each end of one of the long sides of the carton. See the illustration. Fold down the carton to cover the floor surface.

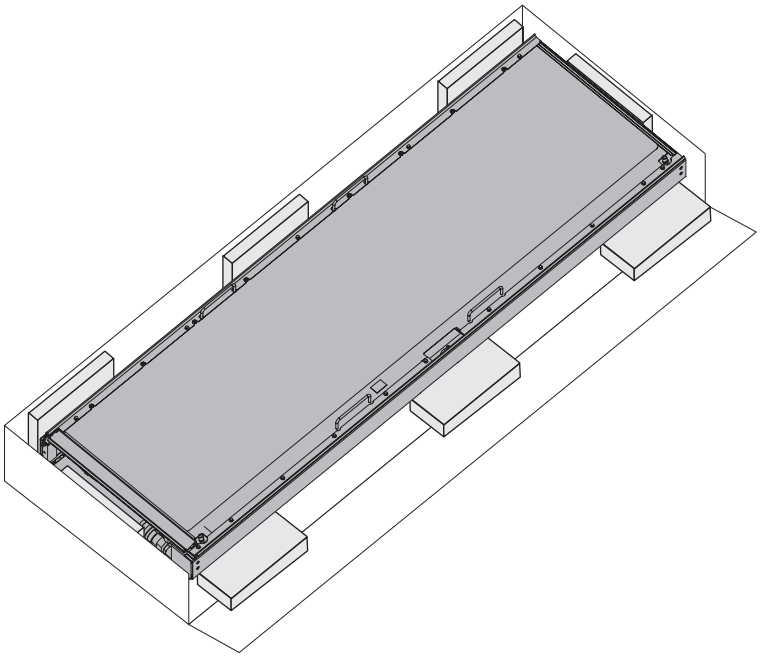


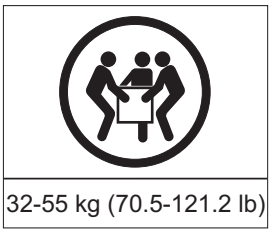
Figure 22. Folding down the carton and placing the packing inserts evenly on the unfolded cardboard

13. Place three of the rectangular cardboard packing inserts evenly on the unfolded cardboard. See Figure 22.

CAUTION:

or

or



The weight of this part or unit is between 32 and 55 kg (70.5 and 121.2 lb). It takes three persons to safely lift this part or unit. (C010)

Attention:

a. Because of the size and weight of the heat exchanger, three trained persons are required to install or remove the heat exchanger.

b. You must remove the power from the rack and all components before you connect or disconnect the water supply lines and drain or fill the heat exchanger.

14. With the three required people (one person on each end and one person in the middle), rotate the heat exchanger 90° and up onto the three rectangular packing inserts.

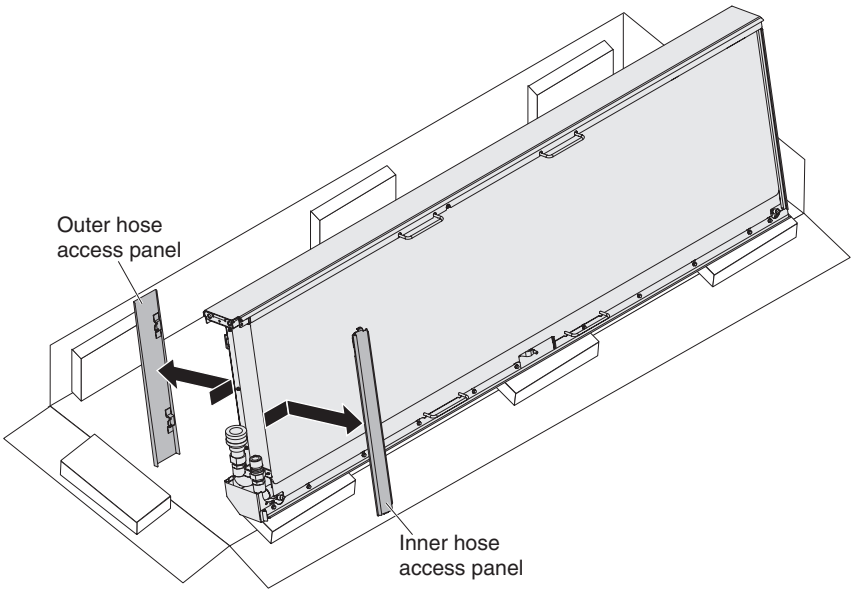


Figure 23. Rotating the heat exchanger 90° and removing the hose access panels

15. With one person holding the heat exchanger steady on the package inserts, have another person remove the inner and outer hose access panels. Push the panels up and out to remove them. See 14. Set the hose access panels aside.
16. Position one person on each end of the heat exchanger. Have each person grasp and hold the under side of the heat exchanger with one hand and hold the top of the heat exchanger with the other hand. Position the third person in the middle of the heat exchanger and grasp the heat exchanger by the handles. Have all three people carefully lift the heat exchanger and carry it to the rear of the rack.

17. When the heat exchanger is in position at the rear of the rack, carefully rest one corner of the heat exchanger on the floor, and then, stand the heat exchanger in an upright position. See the illustration for the correct placement of hands for the three people who are required to lift and move the heat exchanger in an upright position.

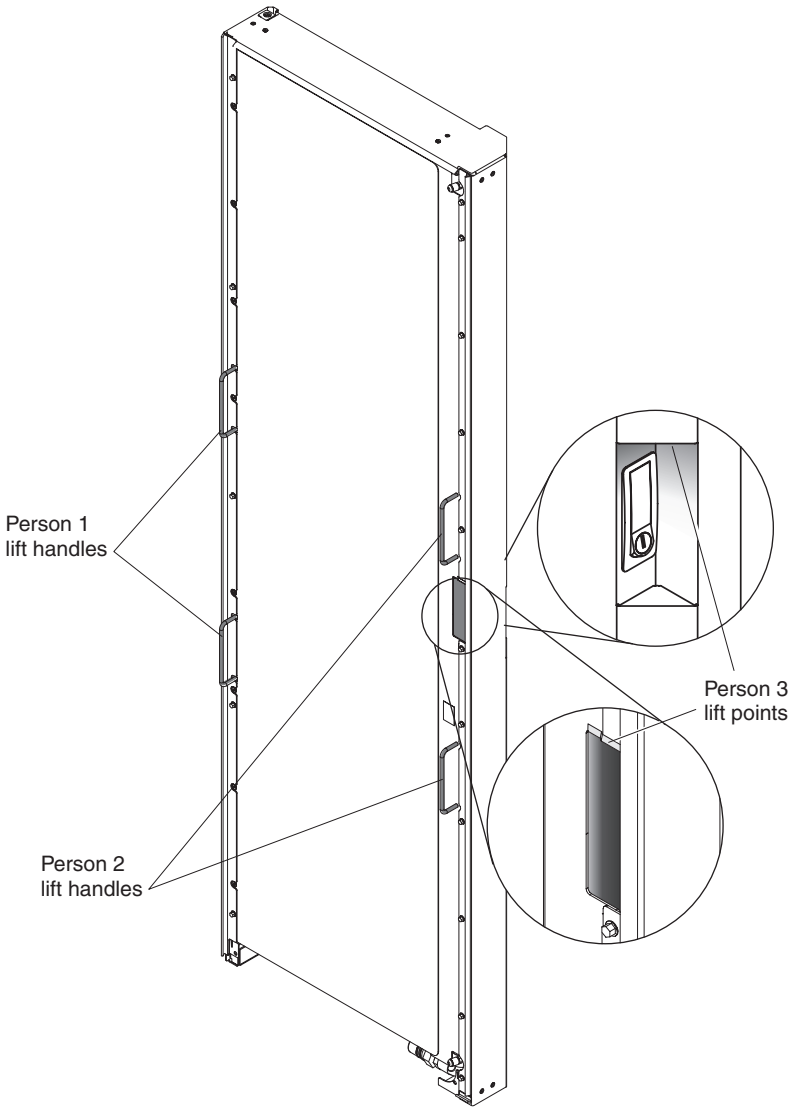


Figure 24. Correct placement of hands to lift and move the heat exchanger

18. Using the lift handles and the required three people, tilt and hold the heat exchanger close to the rear door opening and align the hole in the bottom of the heat exchanger with the hinge pin on the bottom hinge bracket. You might have to move the heat exchanger around until the pin slides into the hole in the bottom of the heat exchanger.

    Note: There are two holes on the bottom hinge side of the heat exchanger. Make sure that the hinge pin goes into the hole that is closest to the rear of the heat exchanger.

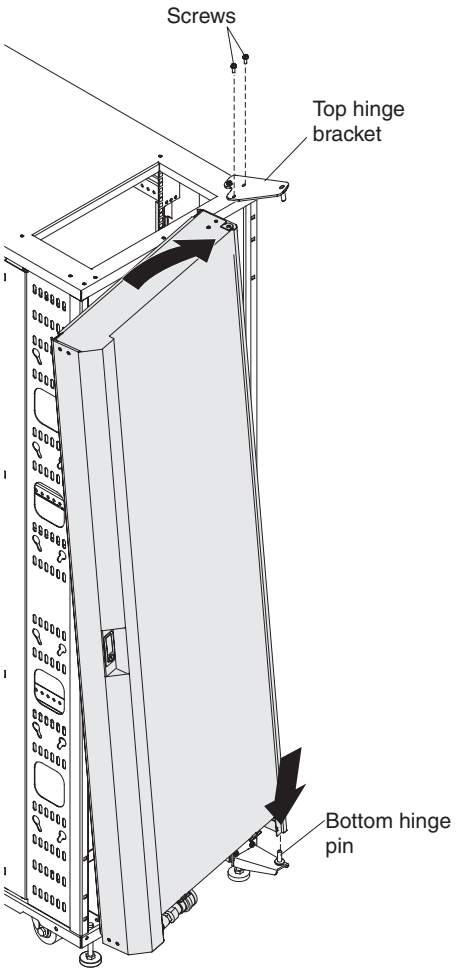


Figure 25. Installing the heat exchanger door

19. While two people hold the heat exchanger steady, have a third person climb the platform ladder, rotate the top hinge bracket, and position the top hinge bracket pin in the hole on the top of the heat exchanger.
20. Align the two open holes in the top of the rack with the threaded holes in the top hinge bracket and square up the heat exchanger with the rack.
21. Secure the top hinge bracket to the rack with two screws. Do not fully tighten the screws.
22. Open and close the door one or two times to be sure that it aligns correctly, adjusting the bracket as needed. Then, tighten all three screws.

    Note: Use a torque screwdriver to tighten the screws to 10±1 Nm.

23. When the heat exchanger is latched, make sure that there is a tight fit between the heat exchanger and the rack frame. Loosen or tighten the latch adjustment screw as required.
24. Install the upper air baffle on the rack:
    a. Climb the platform ladder and loosen the two screws that secure the rear cable-access cover and remove the cover.

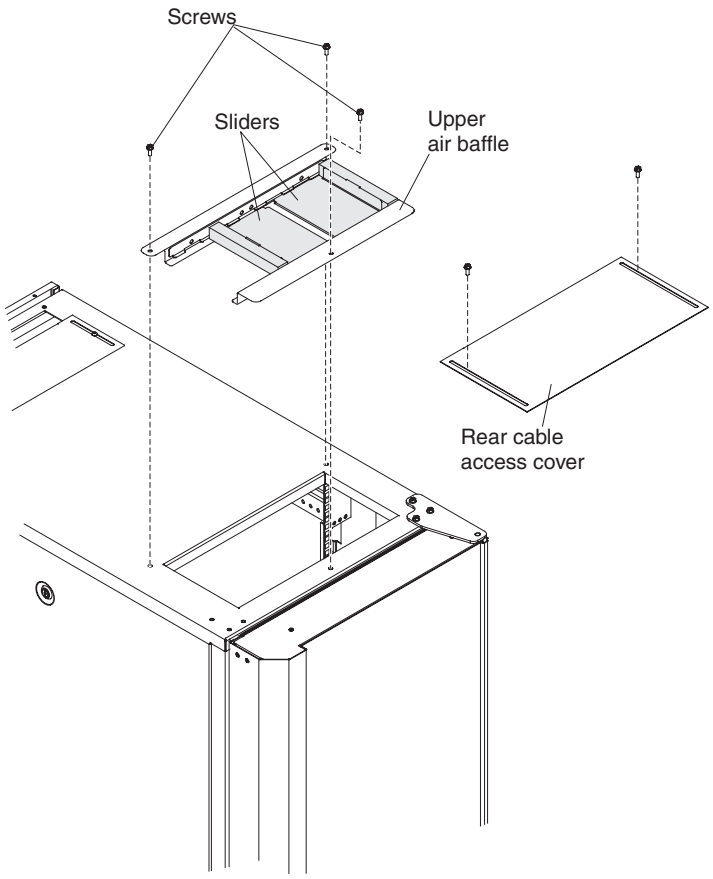


Figure 26. Removing the rear cable-access cover and installing the upper air baffle

    b. Secure the air baffle to the rack with three M6 screws.

25. Install the lower air baffle in the rear of the rack. Secure the air baffle to the rack with four M6 screws.

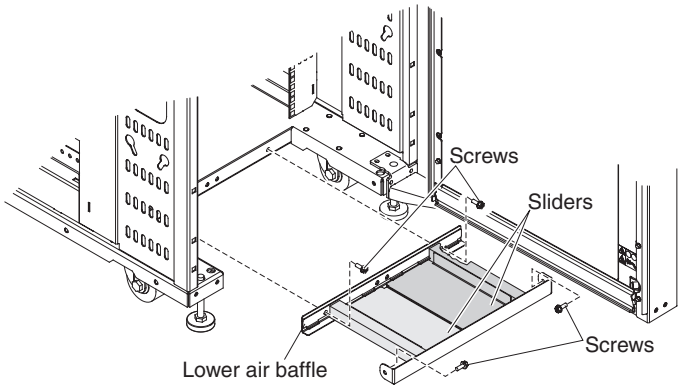


Figure 27. Installing the lower air baffle

26. With the rear door closed and latched, move to the front of the rack. Use a leveler wrench to raise the right front leveler approximately 3 mm (0.12 in.) or until the rear door opens and closes freely. Periodically check that the rear door swings freely. If necessary, adjust the height of the right-front leveler until the rear door does swing freely.
27. Attach the hoses and fill the heat exchanger with water. See “Routing and securing the hoses” on page 44 and “Filling the heat exchanger with water” on page 48 for information about routing and attaching the hoses and filling the heat exchanger.
28. After you attach the hoses and fill the heat exchanger with water, complete the following steps:
    a. Install the inner hose access panel on the inside bottom of the heat exchanger.

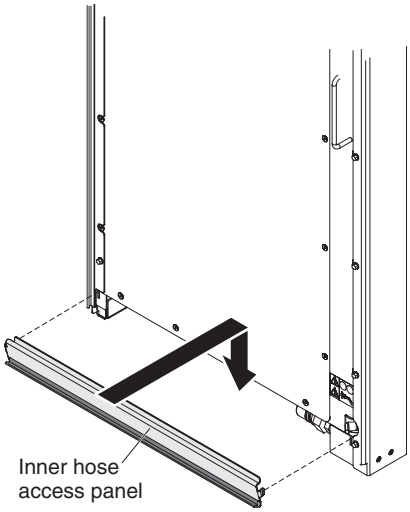


Figure 28. Installing the inner hose access panel

b. Install the outer hose access panel on the outside bottom of the heat exchanger.

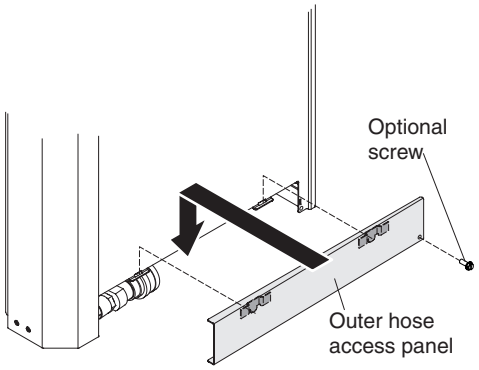


Figure 29. Installing the outer hose access panel

c. (Optional) Secure the outer hose access panel to the heat exchanger with an M4 screw (see Figure 29).

d. Reconnect power to the rack and all components; then, close and latch the heat exchanger.

Routing cables through the upper and lower air baffles

For correct air flow in the rack when routing the cables through the upper and lower air baffles, group the cables in small bundles and spread the cables evenly across the air baffle opening so there are no air gaps. If the cables are tied in a single round bundle, hot air will escape from the open space in the air baffle.

The following illustration shows the correct way to bundle and route cables through the upper air baffle.

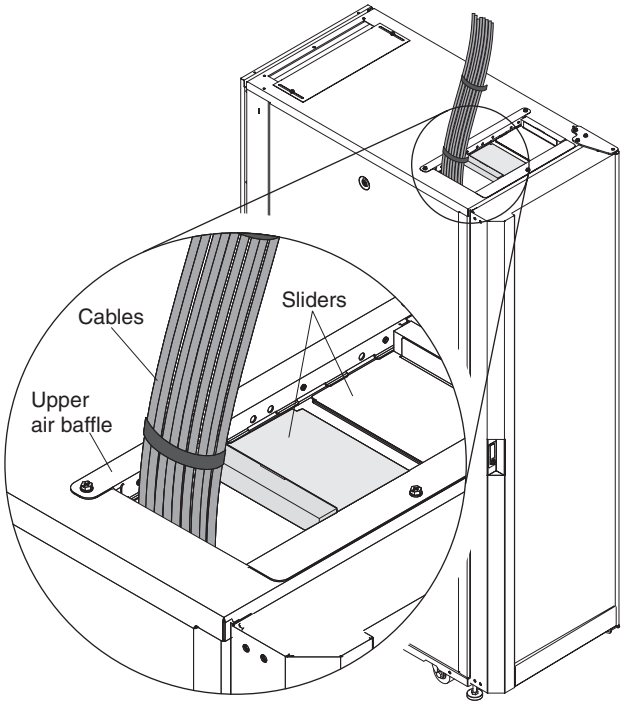


Figure 30. Bundling and routing cables through the upper air baffle

The following illustration shows the correct way to bundle and route cables through the lower air baffle.

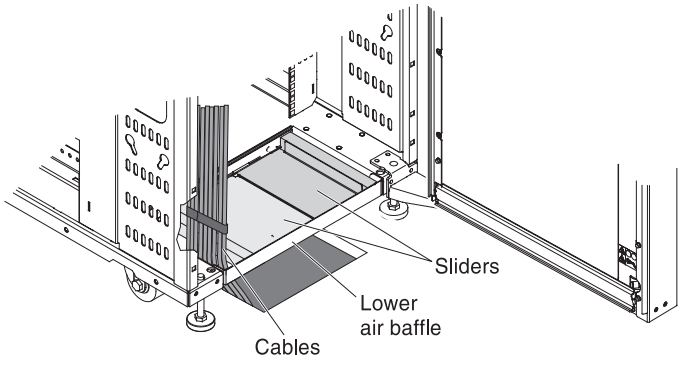


Figure 31. Bundling and routing cables through the lower air baffle

Front-to-rear cable channels and caps

You can route cables from the front of the rack to the rear by using the cable channels on the sides of the rack. There are two cable channels on each side of the rack.

The front end of the cable channel has a cap that slides up and down so you can route cables from front to rear through the channel opening without removing the cap. After you route the cables through a channel, slide the cap down so that it rests lightly on the cables. This helps prevent hot air recirculation from the rear of the rack to the front of the rack.

If a cable channel is not used, make sure that the cap is completely covering the channel opening.

Note: Some cable channel caps do not slide up and down and must be removed before you route cables through the channel. Use a flat-blade screwdriver or a similar tool to pry the cap off the end of the channel.

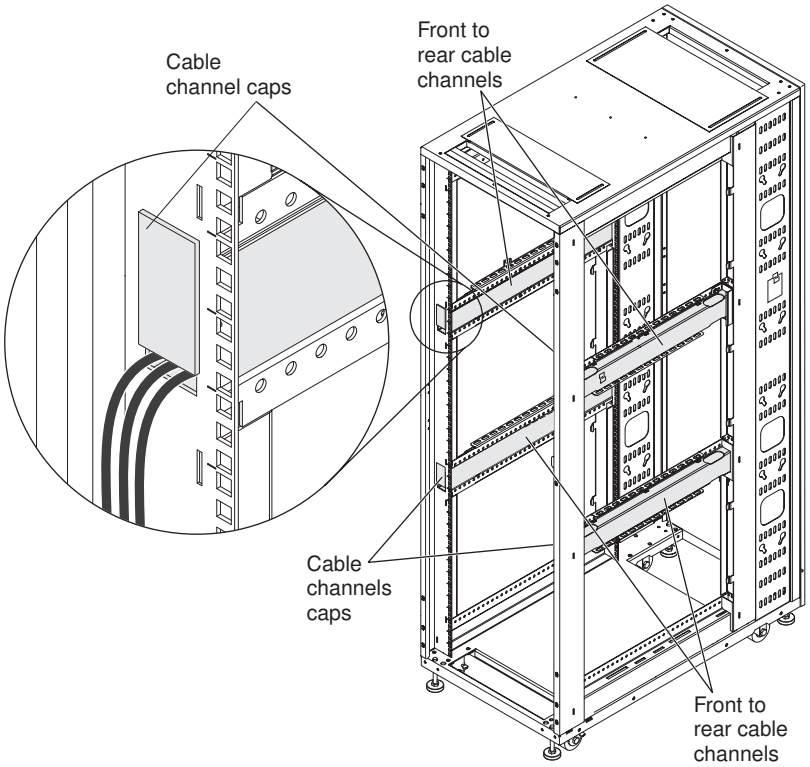


Figure 32. Cable channels and caps

Routing and securing the hoses

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

Important: To help maintain optimum performance of the Rear Door Heat eXchanger and provide proper cooling for all rack components, you must 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.
- 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. For more information, see “Routing cables through the upper and lower air baffles” on page 42.

Raised-floor environment

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

Note: Both illustrations show the view of the rack from the top, looking down.

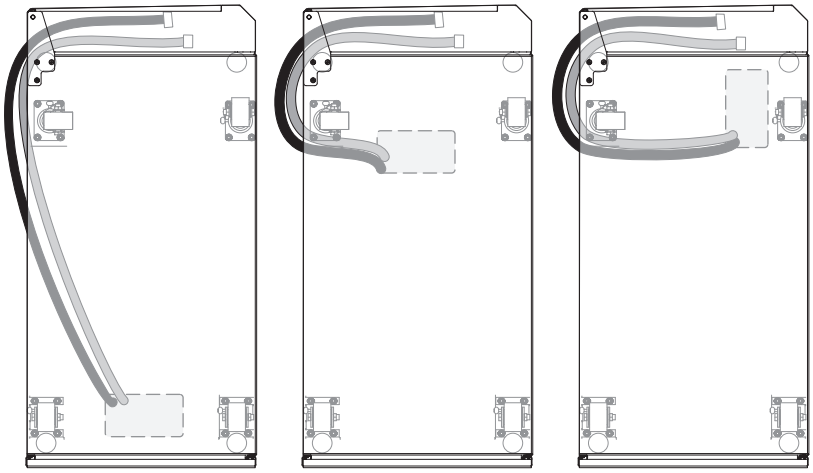


Figure 33. Routing and securing the hoses in a raised-floor environment for individual racks

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.

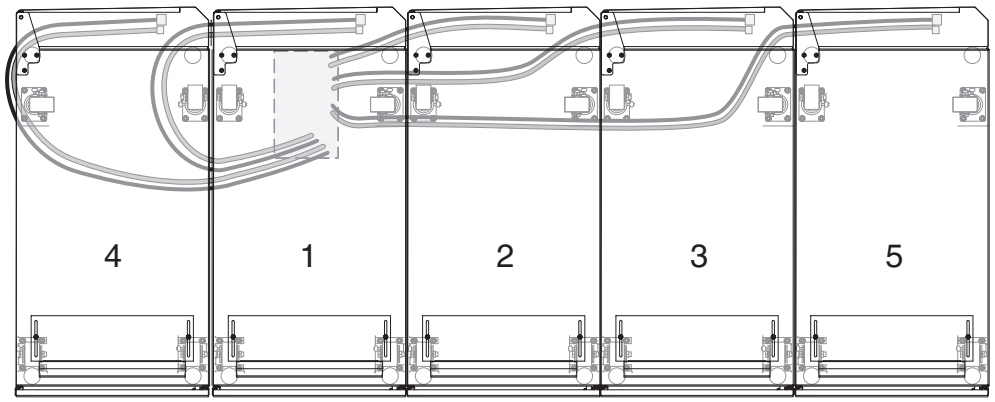


Figure 34. Option for hoses in adjacent racks to share a single hole in the floor

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

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

   a. 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.

   b. 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.

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.

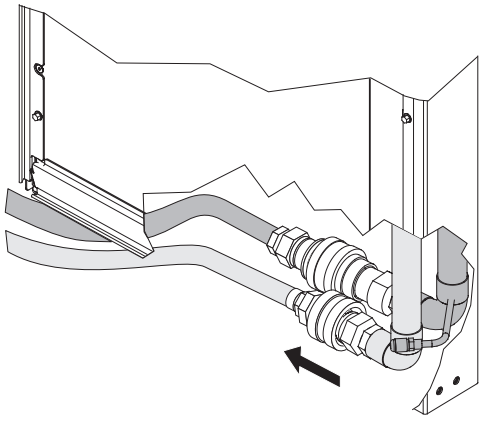


Figure 35. Flexible hoses secured to the bottom of the rear door heat exchanger

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.

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

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 9363 rack has sufficient clearance underneath the rack to enable the quick connects 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.

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.

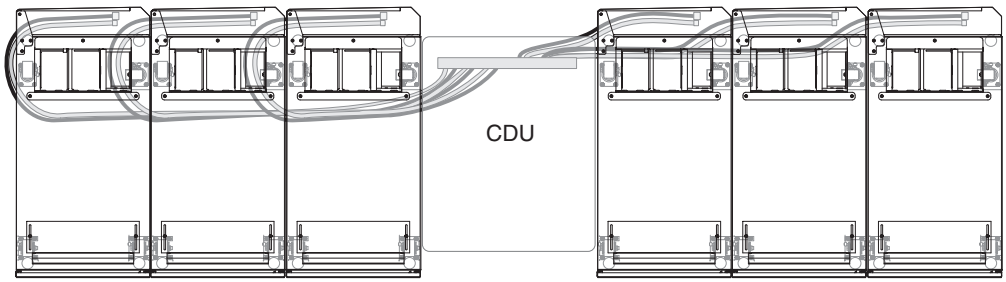


Figure 36. Routing and securing the hoses in raised-floor and non-raised-floor environments

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.

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

Filling the heat exchanger with water

To fill the heat exchanger with water, complete the following steps.

Statement 14:

CAUTION:
Goggles are needed for the procedure.

(L011)

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

1. Remove the inner hose access panel from the inside of the heat exchanger.

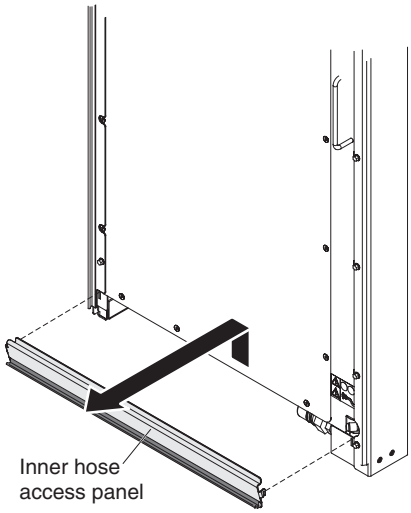


Figure 37. Removing the inner hose access panel

2. Remove the outer hose access panel from the outside of the heat exchanger. If the optional screw is installed, remove it. (See the following illustration).

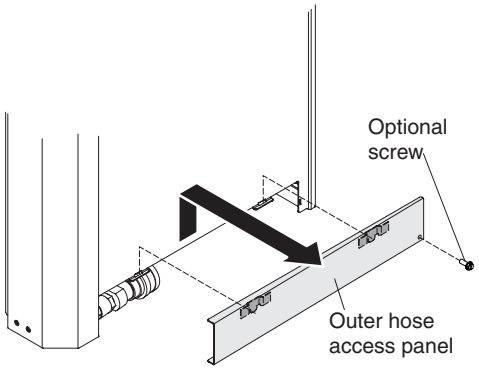


Figure 38. Removing the outer hose access panel

3. Unscrew and retain the cap from the air-purging valve.

   Note: The valve is similar to the valve on a bicycle or automobile tire.

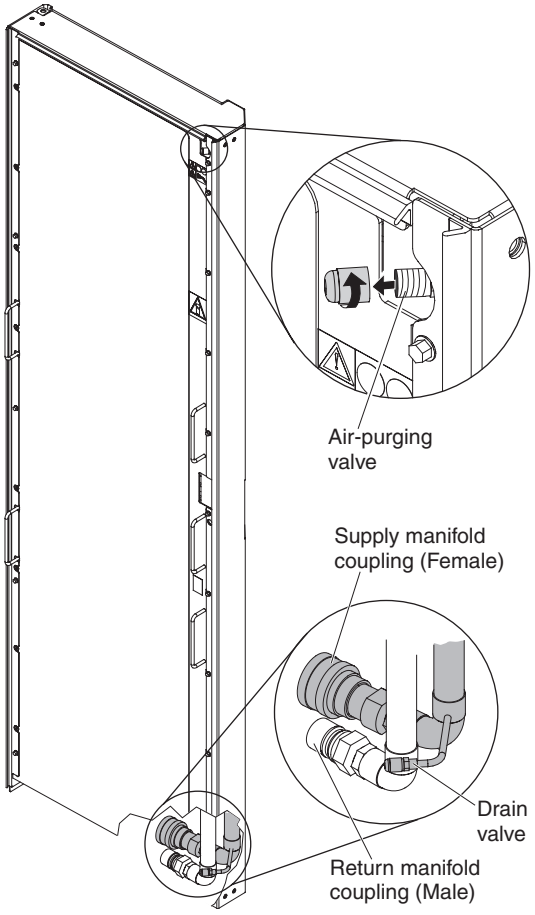


Figure 39. Removing the cap from the air-purging valve

4. 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.
5. Connect the return and supply hoses.

   Note: To avoid damage to cooling system tubing, do not apply excessive force to the couplings.

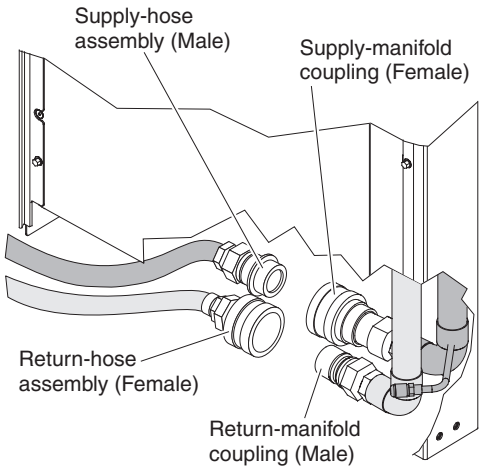


Figure 40. Attaching the hoses to the manifold couplings

- To connect the return hose, complete the following steps:
  a. Align the female hose quick-connect coupling with the male return-manifold coupling.

     Note: If you misalign the couplings or if the pressure has not been bled from the manifold, it is difficult to connect the hose. Make sure that the pressure has been bled, and then attempt to connect the couplings again.
  b. Pull the female collar back and move the couplings toward each other.
  c. Exert pressure until the female collar locks in place with an audible click.

     Note: After the couplings are engaged but before the collar has locked into place, you can let go of the collar and use both hands to push the hose to lock the couplings.
- To connect the supply hose, complete the following steps:
  a. Align the male hose quick-connect coupling with the female supply-manifold coupling.

     Note: If you misalign the couplings or if the pressure has not been bled from the manifold, it is difficult to connect the hose. Make sure that the pressure has been bled, and then attempt to connect the couplings again.
  b. Pull the female collar back and move the couplings toward each other.
  c. Exert pressure until the female collar locks in place with an audible click.

     Note: After the couplings are engaged but before the collar has locked into place, you can let go of the collar and use both hands to push the hose to lock the couplings.

6. Turn on the flow of water to the heat exchanger.

   Note: Depending on your facility, this might mean turning on the pump unit, opening a valve at the pump unit, or a similar action.

7. Place the drain end of the air-purging tool into a 2-liter (or larger) container to catch the water and air bubbles that escape during the filling procedure.

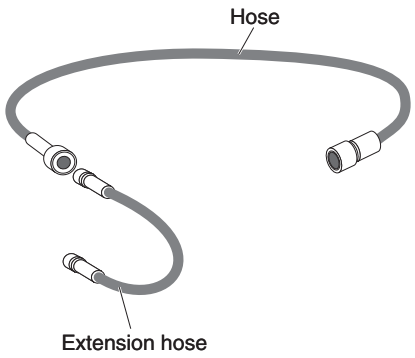


Figure 41. Air-purging tool

Note: The 6-inch extension hose for the air-purging tool is not required for this procedure. You can attach the extension hose to the tool, or you can set the extension hose aside.

8. After the water is flowing through the heat exchanger for several minutes, attach the air-purging tool to the air-purging valve at the top of the heat exchanger. Make sure that you attach the end of the hose with a valve stem in the center of the connector to the heat exchanger air-purging valve. If you connect the wrong end of the hose, no water will flow.
9. When there is a steady stream of water 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 exercise and reseat the seal.
10. Screw the valve cap onto the air-purging valve and hand-tighten it to provide a secondary seal.
11. Install the inner hose access panel on the inside bottom of the heat exchanger.

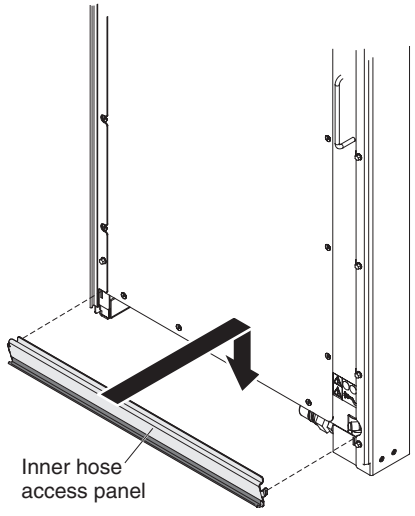


Figure 42. Installing the inner hose access panel

12. Install the outer hose access panel on the outside bottom of the heat exchanger.

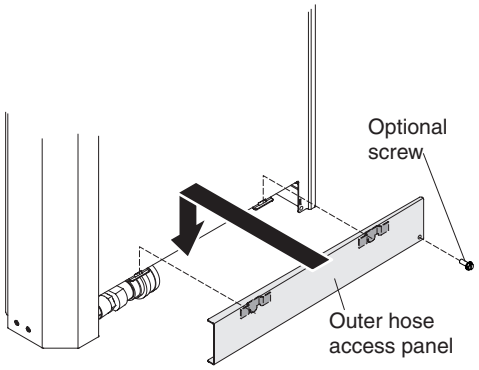


Figure 43. Installing the outer hose access panel

13. (Optional) Secure the outer hose access panel to the heat exchanger with an M4 screw (see Figure 43).

Chapter 5. Maintaining the heat exchanger

This chapter provides instructions for maintaining the heat exchanger.

Attention:

1. Because of the size and weight of the heat exchanger, three trained persons are required to install or remove the heat exchanger.
2. You must remove the power from the rack and all components before you connect or disconnect the water supply lines and drain or fill the heat exchanger.

The following illustration shows the locations of components on the heat exchanger.

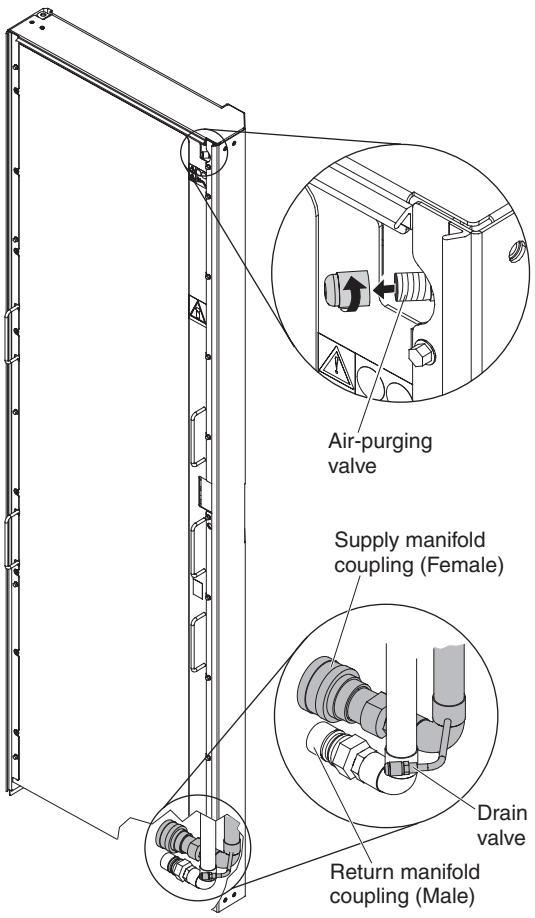


Figure 44. Components of the heat exchanger

Note: When you perform procedures on the heat exchanger, you might want to place some water-absorbent material beneath the door assembly.

Draining the heat exchanger

Perform this procedure before you have the heat exchanger removed from the rack or when you are directed to do so by an IBM service representative. The drain valve is at the bottom of the heat exchanger, near the supply and return couplings.

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

To drain water from the heat exchanger, complete the following steps:

1. Shut off the flow of water at the source. Depending on your facility, this might mean turning off the pump unit, closing a valve at the pump unit, or a similar action.

   Note: Although the likelihood of water exposure is small, you might prefer to place some water-absorbent material beneath the door assembly as a general practice when you drain the heat exchanger.
2. Remove the inner hose access panel from the inside of the heat exchanger.

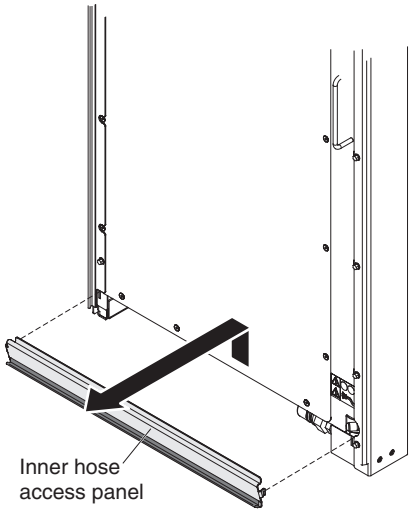


Figure 45. Removing the inner hose access panel

3. Remove the outer hose access panel from the outside of the heat exchanger. If the optional screw is installed, remove it. (See the following illustration).

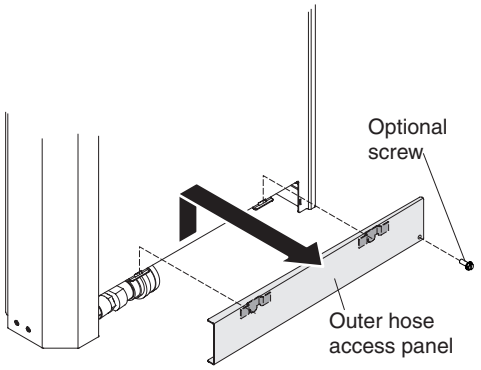


Figure 46. Removing the outer hose access panel

4. Disconnect the return hose and supply hose from the heat exchanger and move them out of the way.

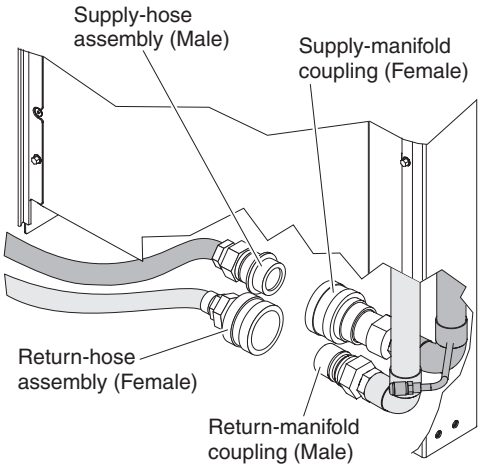


Figure 47. Disconnecting the return hose and supply hose

5. Unscrew and retain the valve caps from the air-purging valve and from the drain valve.

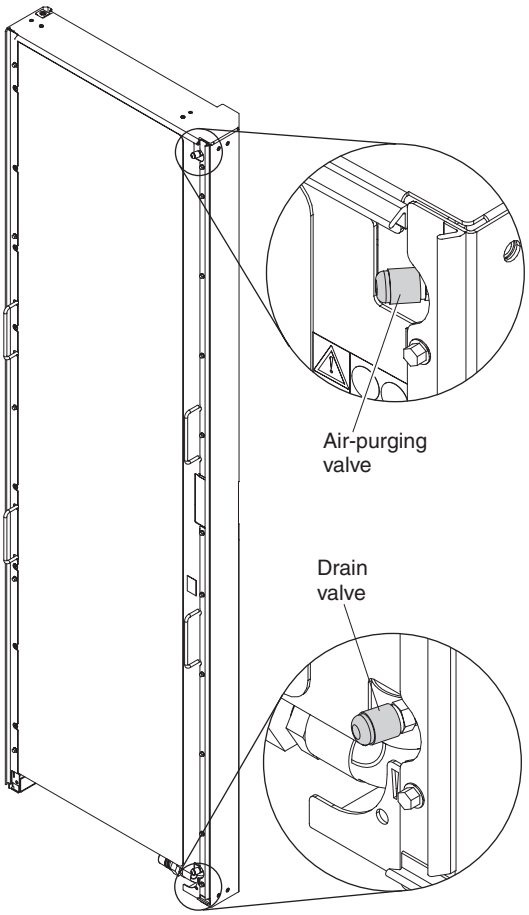


Figure 48. Removing the cap from the air-purging valve and drain valve

6. Remove the extension hose from the air-purging tool, if it is connected.

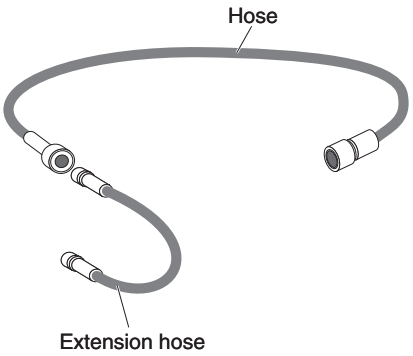


Figure 49. Air-purging tool

7. Place the drain end of the air-purging tool into a container that can hold at least 11.4 liters (3 gallons) of water.

8. Attach the air-purging tool to the drain valve at the bottom of the heat exchanger. Make sure you attach the end of the hose with a valve stem in the center of the connector to the heat exchanger drain valve. If you connect the wrong end of the hose, no water will flow.
9. Attach the end of the extension hose with a valve stem in the center of the connector to the air-purging valve at the top of the heat exchanger to allow air to enter the manifolds.

   Note: Instead of using the extension hose, if filtered and oil-free compressed air is available, you can attach the compressed-air hose to the air-purging valve to force water out of the exchanger. Keep the air pressure at 50 pounds per square inch gage (psig) or less to avoid excessive spray at the drain valve.
10. When the water has drained completely from the manifolds, complete the following steps:
    a. Remove the air-purging-tool extension hose or compressed-air hose from the air-purging valve.
    b. Remove the air-purging tool from the drain valve on the hear exchanger.
    c. Screw the valve caps onto the air-purging valve and drain valve and hand-tighten them to provide a secondary seal.

Refilling after a leak in the system

The action that you take depends on where the leak occurs.

Leak in the water-supply circuit

If the leak occurs in the user-supplied secondary loop of the water-circulation system, other than in the heat exchanger, repair the leak; then, complete the following steps:

1. Reconnect the return and supply hoses, if they are disconnected:
   - To connect the supply hose, complete the following steps:
     a. Align the male hose quick-connect coupling with the female supply-manifold coupling.

        Note: If you misalign the couplings, it is difficult to connect the hose.
     b. Pull the female collar back and move the couplings toward each other.
     c. Exert pressure until the female collar locks in place with an audible click.

        Note: After the couplings are engaged but before the collar has locked into place, you can let go of the collar and use both hands to push the hose upward to lock the couplings.
   - To connect the return hose, complete the following steps:
     a. Align the female hose quick-connect coupling with the male return-manifold coupling.

        Note: If you misalign the couplings, it is difficult to connect the hose.
     b. Pull the female collar back and move the couplings toward each other.
     c. Exert pressure until the female collar locks in place with an audible click.

        Note: After the couplings are engaged but before the collar has locked into place, you can let go of the collar and use both hands to push the hose upward to lock the couplings.
2. Turn on the flow of water from the pump unit to the heat exchanger.
3. Perform the air-purging procedure to remove any air that enters the heat exchanger from the hoses. (See“Filling the heat exchanger with water” on page 48 for instructions.)

Leak in the heat exchanger

Although a leak in the heat exchanger is unlikely, if it does occur, you must replace the door assembly. To replace the door assembly, complete the following steps.

Note: Call for service to obtain a replacement heat exchanger. For service or assistance information, see Appendix A, “Getting help and technical assistance,” on page 77.

1. Drain the water from the heat exchanger. (See “Draining the heat exchanger” on page 56 for instructions.)
2. Have trained service personnel replace the door assembly.
3. Fill the replacement heat exchanger with water. (See “Filling the heat exchanger with water” on page 48 for instructions.)

Maintenance schedule

Perform the following maintenance tasks at the indicated time intervals.

Table 3. Maintenance schedule

Task	When to perform
Inspect the heat-exchanger fins for air blockage at the fins (from dust, dirt, and debris).	Annually
Perform the air-bleed process	• After a few minutes of water flowing through the heat exchanger • One month after installation • Whenever warm air is exiting the top of the heat exchanger while cooler air is exiting below that
Inspect the entire length of the supply hose and return hose for damage, age cracks, and kinks. Be sure to inspect at the door and outside of the rack.	Annually

Replaceable components

Field replaceable units (FRUs) must be replaced only by a trained service technician, unless they are classified as customer replaceable units (CRUs).

Tier 1 CRU: Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request without a service contract, you will be charged for the installation.

Tier 2 CRU: You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service that is designated for your product.

For more information about the terms of the warranty and getting service and assistance, see the *Warranty Information* document that comes with the heat exchanger.

Table 4. Field replaceable units for the IBM Rear Door Heat eXchanger V2 Type 1756

Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number (trained service technician only)
Rear Door Heat eXchanger assembly			95Y2284
Door hinge accessory kit	95Y2281		
Latch, door	90Y3057		
Upper air baffle kit	95Y2283		
Lower air baffle kit	95Y2282		
Purge tool kit	46C6345		
Ladder, platform	45E0998		

Replacing the heat exchanger (trained service technician only)

Attention:

1. Because of the size and weight of the heat exchanger, three trained persons are required to remove and install the heat exchanger.
2. You must remove the power from the rack and all components before you connect or disconnect the water supply lines and drain or fill the heat exchanger.

Removing the heat exchanger

To remove the heat exchanger, complete the following steps:

1. Read the safety information that begins on page iii and “Installation guidelines” on page 29.
2. Turn off the power to the rack and all installed components.
3. Remove the inner hose access panel from the inside of the heat exchanger.

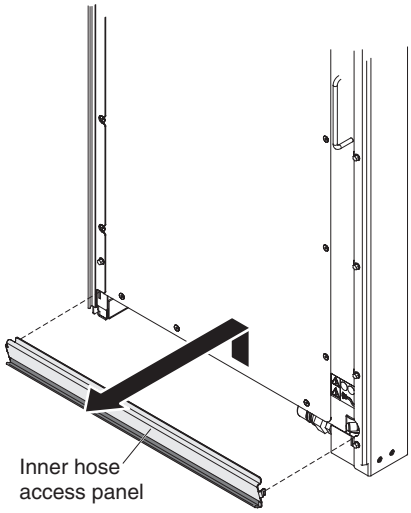


Figure 50. Removing the inner hose access panel

4. Remove the outer hose access panel from the outside of the heat exchanger. If the optional screw is installed, remove it. (See the following illustration).

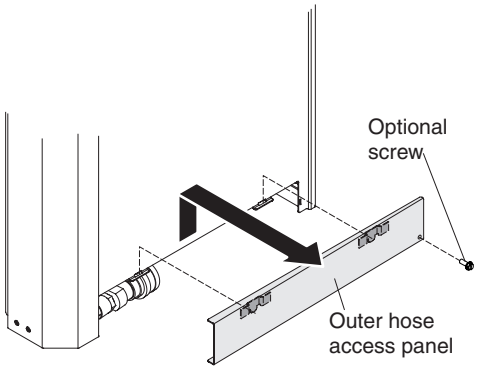


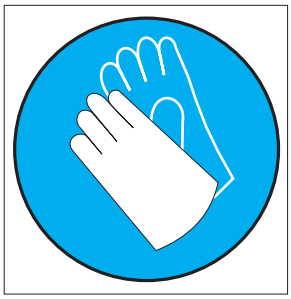
Figure 51. Removing the outer hose access panel

Note to service technician: The customer is responsible for disconnecting the water supply and return hoses and draining the heat exchanger. If the hoses are still connected, have the customer drain the heat exchanger by following the procedure in “Draining the heat exchanger” on page 56. Disengage from the service call until the customer informs you that the door is drained.

Statement 14:

CAUTION:
Goggles are needed for the procedure.

(L011)



Attention: Make sure that proper handling procedures are followed when you work with any chemically treated water that is used in the rack cooling system. Make sure that material safety data sheets (MSDS) and safety information is provided by the water chemical treatment supplier and that proper personal protective equipment (PPE) is available as recommended by the water chemical treatment supplier. Wear safety goggles or other eye protection whenever you drain or purge air from the heat exchanger.

5. Remove and retain the valve caps from the air-purging valve and from the drain valve.

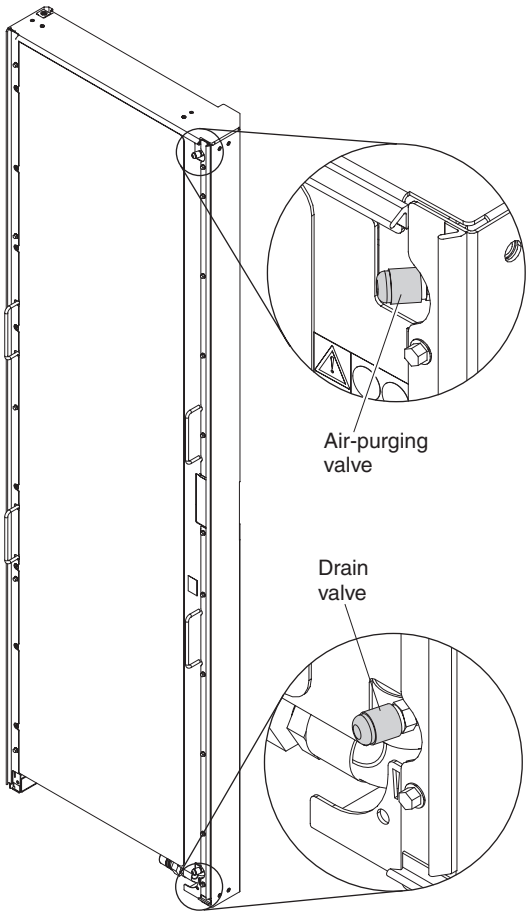


Figure 52. Removing the caps from the air-purging valve and drain valve

6. If the air-purging tool is available (see the illustration), complete the following steps. Otherwise, go to step 7.

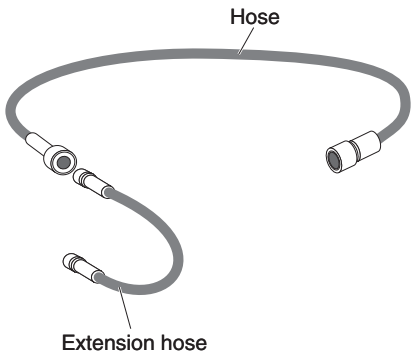


Figure 53. Air-purging tool

   a. Remove the extension hose from the air-purging tool, if it is connected.
   b. Place the drain end of the air-purging tool hose into a 0.47 L (16 oz) or larger container to collect water if any remains within the heat exchanger.
   c. Attach the air-purging tool to the drain valve at the bottom of the heat exchanger. Make sure that you attach the end of the hose with a valve stem in the center of the connector to the heat exchanger drain valve. If you connect the wrong end of the hose, no water will flow.
   d. Attach the extension hose to the air-purging valve at the top of the heat exchanger to allow air to enter the manifolds. Make sure that you attach the end of the extension hose with a valve stem in the center of the connector to the heat exchanger purge valve. If you connect the wrong end of the hose, no water will flow.
   e. Take one of the following actions, depending on the amount of water that comes out of the hose:
      - If only a little or no water comes out of the air-purging tool, the heat exchanger is sufficiently drained. Go to step 8 on page 67.
      - If a significant amount of water comes out of the air-purging tool, the heat exchanger is not drained. *Close the valves immediately and do not continue.*

        Note to service technician: The customer is responsible for draining the heat exchanger. If the heat exchanger is not drained, have the customer drain the heat exchanger by following the procedure in “Draining the heat exchanger” on page 56. Disengage from the service call until the customer informs you the door has been drained.

7. If the air-purging tool is *not* available, complete the following steps:
   a. Place a 0.47 l (16 oz) or larger container under the drain valve at the bottom of the heat exchanger to collect water if any remains within the heat exchanger.
   b. Use a small object such as a screwdriver tip to press in on the valve stem of the drain valve at the bottom of the heat exchanger.

c. Have a second person use a small object such as a screwdriver tip to press and hold the air-purging valve stem at the top of the heat exchanger.

d. Take one of the following actions, depending on the amount of water that comes out of the drain valve:

- If only a little or no water comes out of the drain valve, the heat exchanger is sufficiently drained. Go to step 8.
- If a significant amount of water comes out of the air-purging tool, the heat exchanger is not drained. *Close the valves immediately and do not continue.*

  Note to service technician: The customer is responsible for draining the heat exchanger. If the heat exchanger is not drained, have the customer drain the heat exchanger by following the procedure in “Draining the heat exchanger” on page 56. Disengage from the service call until the customer informs you the door has been drained.

8. After making sure that the heat exchanger is drained, complete the following steps:

   a. Remove the air-purging tools, if used.

   b. Screw the valve caps onto the air-purging valve and the drain valve and hand-tighten them to provide a secondary seal.

   c. Replace the inner and outer hose access panels.

CAUTION:

The weight of this part or unit is between 32 and 55 kg (70.5 and 121.2 lb). It takes three persons to safely lift this part or unit. (C010)

Attention:

a. Because of the size and weight of the heat exchanger, three trained persons are required to install or remove the heat exchanger.

b. You must remove the power from the rack and all components before you connect or disconnect the water supply lines and drain or fill the heat exchanger.

9. Remove the heat exchanger from the rack:

   a. Open the latch and let the heat exchanger door open slightly.

   b. Position a platform ladder on the hinge side of the heat exchanger.

c. Use a screwdriver to loosen the three screws that secure the top hinge bracket to the rack.

d. Support the top hinge bracket with one hand while you remove only the two front screws. Supporting the bracket makes it easier to remove the two screws.

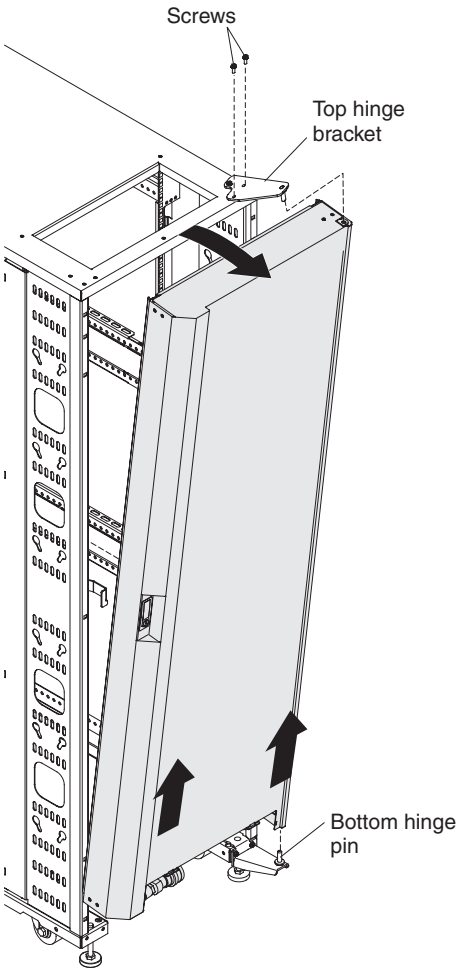


Figure 54. Removing the heat exchanger from the rack.

e. While two people stabilize the heat exchanger, let the top of the heat exchanger rotate away from the rack; then, lift the top hinge bracket up and off the heat exchanger.

f. While you support the top half of the heat exchanger with one hand, let the top of the door rotate out far enough so that you can grasp the lift handles and lift the heat exchanger off the bottom hinge pin.

g. Carefully lower the heat exchanger to the floor so that it rests on one corner.

10. Position one person on each end of the heat exchanger. Have each person grasp and hold the under side of the heat exchanger with one hand and hold the top of the heat exchanger with the other hand. Position the third person in the middle of the heat exchanger and grasp the heat exchanger by the handles. Have all three people carefully lift the heat exchanger and carry it away.

Installing the replacement heat exchanger

Attention: Because of the size and weight of the heat exchanger, three trained persons are required to install or remove the heat exchanger.

To install the replacement heat exchanger, complete the following steps:

1. Read the safety information that begins on page iii and “Installation guidelines” on page 29.
2. Remove the cardboard top from the heat exchanger carton and remove the packing material.

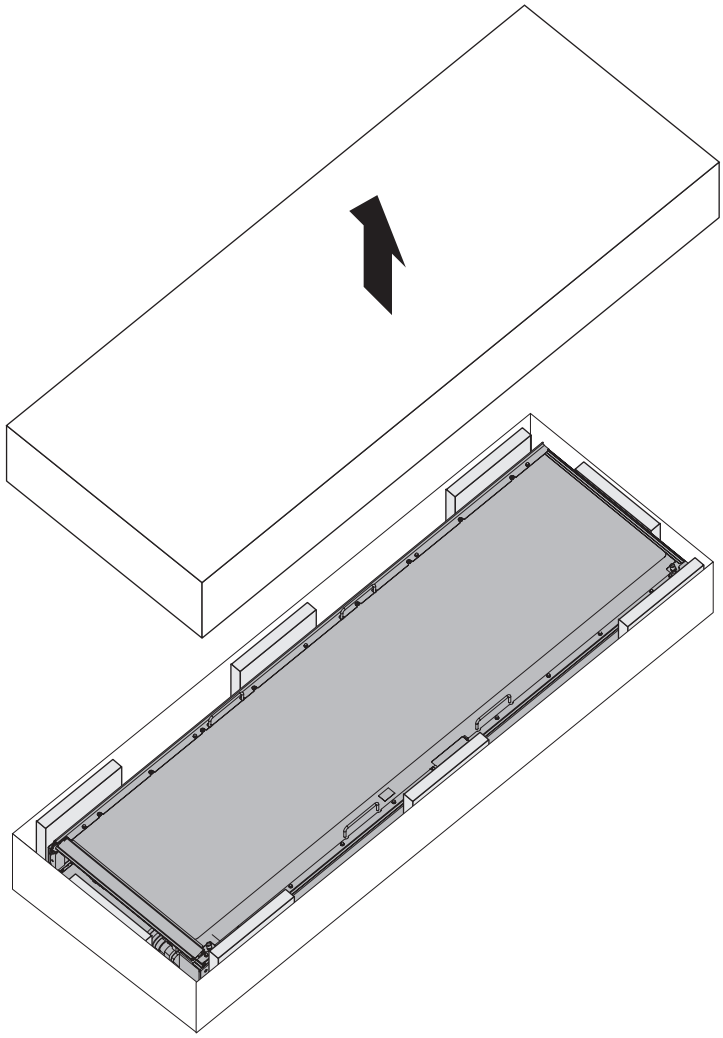


Figure 55. Removing the cardboard top from the heat exchanger carton

3. Using a utility knife or similar cutting tool, slit the carton vertically on each end of one of the long sides of the carton. See the illustration. Fold down the carton side to cover the floor surface.

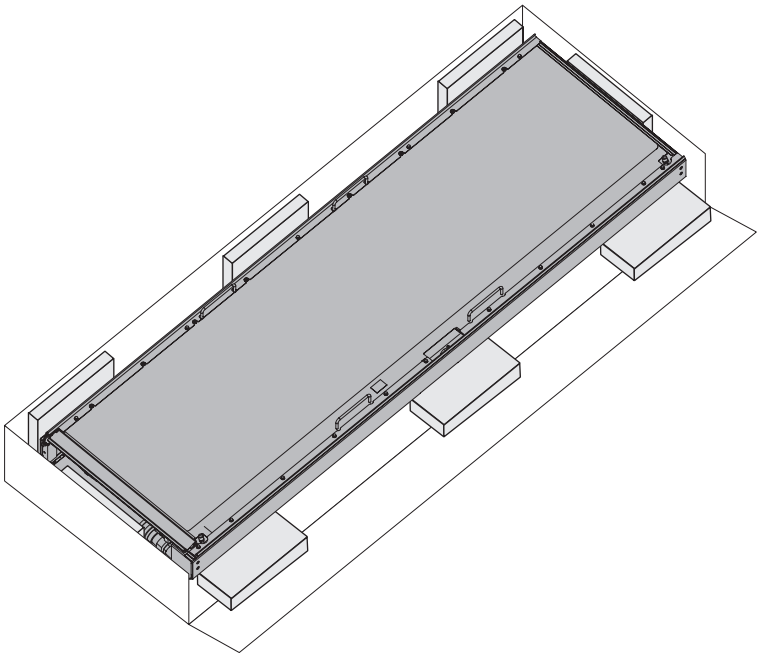


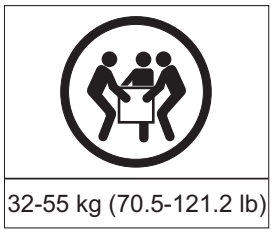
Figure 56. Folding down the carton side and placing the packing inserts evenly on the unfolded cardboard

4. Place three of the rectangular cardboard packing inserts evenly on the unfolded cardboard. See Figure 56.

CAUTION:

or

or



The weight of this part or unit is between 32 and 55 kg (70.5 and 121.2 lb). It takes three persons to safely lift this part or unit. (C010)

Attention:

a. Because of the size and weight of the heat exchanger, three trained persons are required to install or remove the heat exchanger.

b. You must remove the power from the rack and all components before you connect or disconnect the water supply lines and drain or fill the heat exchanger.

5. With the three required people (one person on each end and one person in the middle), rotate the heat exchanger 90° and up onto the three rectangular packing inserts.

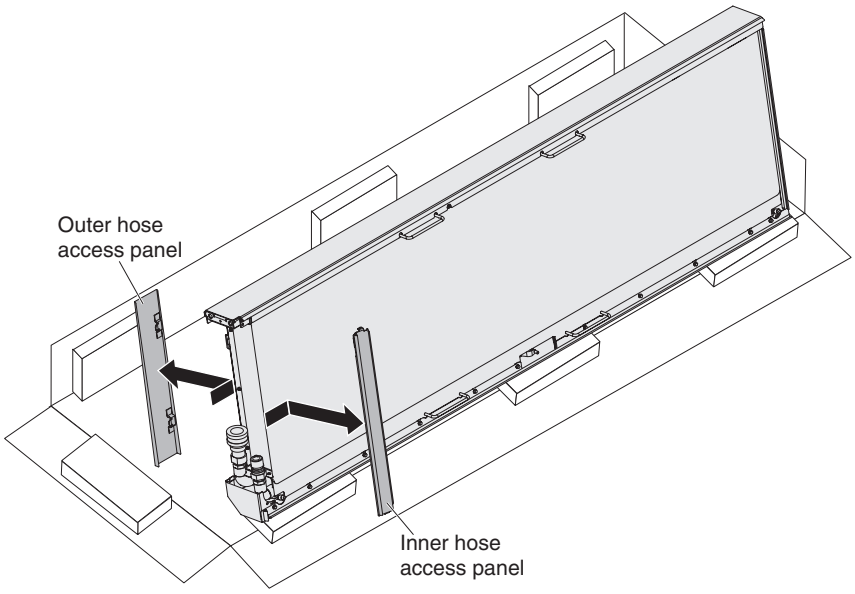


Figure 57. Rotating the heat exchanger 90° and removing the hose access panels

6. With one person holding the heat exchanger steady on the package inserts, have another person remove the inner and outer hose access panels. Push the panels up and out to remove them. See Figure 57. Set the hose access panels aside.
7. Position two people on each end of the heat exchanger. Have each person grasp and hold the under side of the heat exchanger with one hand and hold the top of the heat exchanger with the other hand. Position the third person in the middle of the heat exchanger and grasp the heat exchanger by the handles. Have all three people carefully lift up the heat exchanger and walk it in front of the rear of the rack.

8. When the heat exchanger is in position at the rear of the rack, carefully rest one corner of the heat exchanger on the floor, and then, stand the heat exchanger in an upright position. See the illustration for the correct placement of hands for the three people who are required to lift and move the heat exchanger in an upright position.

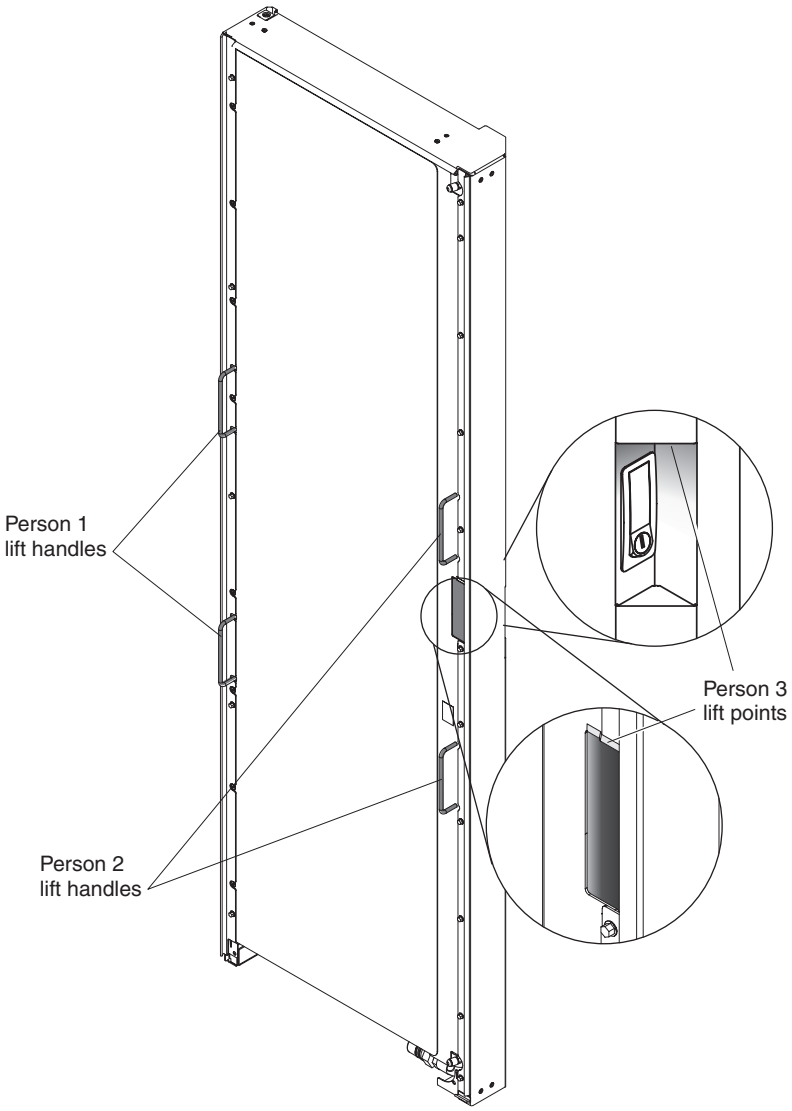


Figure 58. Correct placement of hands to lift and move the heat exchanger

9. Using the lift handles and the required three people, tilt and hold the heat exchanger close to the rear door opening and align the hole in the bottom of the heat exchanger with the hinge pin on the bottom hinge bracket. You might have to move the heat exchanger around until the pin slides into the hole in the bottom of the heat exchanger.

   Note: There are two holes on the bottom hinge side of the heat exchanger. Make sure that the hinge pin goes into the hole that is closest to the outside of the heat exchanger.

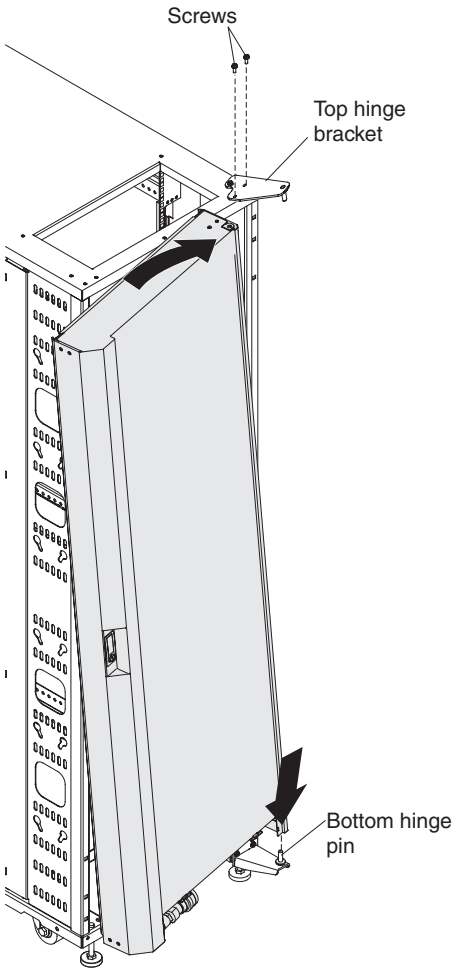


Figure 59. Installing the heat exchanger door

10. While two people hold the heat exchanger steady, have a third person climb the platform ladder, rotate the top hinge bracket, and position the top hinge bracket pin in the hole on the top of the heat exchanger.
11. Align the two open holes in the top of the rack with the threaded holes in the top hinge bracket and square up the heat exchanger with the rack.
12. Secure the top hinge bracket to the rack with two screws. Do not fully tighten the screws.
13. Open and close the door one or two times to be sure that it aligns correctly, adjusting the bracket as needed. Then, tighten all three screws.

14. When the heat exchanger is latched, make sure that there is a tight fit between the heat exchanger and the rack frame. Loosen or tighten the latch adjustment screw as required.
15. With the rear door closed and latched, move to the front of the rack. Use a leveler wrench to raise the right front leveler approximately 3 mm (0.12 in.) or until the rear door opens and closes freely. Periodically check that the rear door swings freely. If necessary, adjust the height of the right-front leveler until the rear door does swing freely.
16. Attach the hoses and fill the heat exchanger with water. See “Filling the heat exchanger with water” on page 48.
17. After you attach the hoses and fill the heat exchanger with water, complete the following steps:
    a. Install the inner hose access panel on the inside bottom of the heat exchanger.

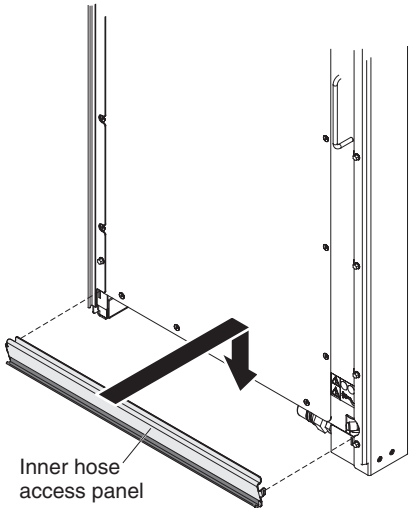


Figure 60. Installing the inner hose access panel

b. Install the outer hose access panel on the outside bottom of the heat exchanger.

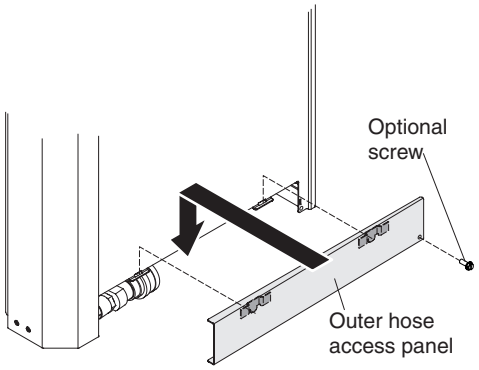


Figure 61. Installing the outer hose access panel

c. (Optional) Secure the outer hose access panel to the heat exchanger with an M4 screw (see Figure 61).

d. Reconnect power to the rack and all components; then, close and latch the heat exchanger.

Replacing the latch on the heat exchanger

To replace the latch on the heat exchanger, complete the following steps:

1. Unlock and open the heat exchanger.
2. On the inside of the heat exchanger, use a Phillips screwdriver to loosen the latch mounting bracket and remove the bracket and the latch.
3. Align the replacement latch with the hole on the outside of the door and from the inside, secure the mounting bracket and the latch to the heat exchanger with the screw.

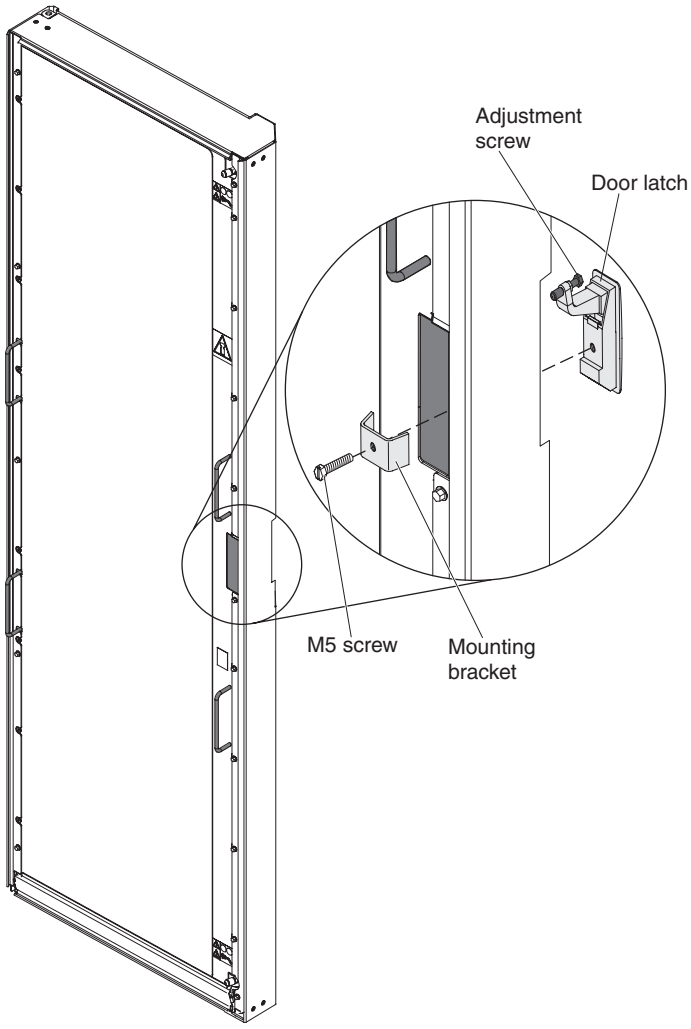


Figure 62. Removing and installing the heat exchanger latch

4. When the heat exchanger is closed and latched, make sure that there is a tight fit between the heat exchanger and the rack frame. Loosen or tighten the latch adjustment screw as required.

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. Use this information to obtain additional information about IBM and IBM products, determine what to do if you experience a problem with your IBM system or optional device, and determine whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Check for updated firmware and operating-system device drivers for your IBM product. The IBM Warranty terms and conditions state that you, the owner of the IBM product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your IBM service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
- If you have installed new hardware or software in your environment, check http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/ to make sure that the hardware and software is supported by your IBM product.
- Go to http://www.ibm.com/supportportal/ to check for information to help you solve the problem.
- Gather the following information to provide to IBM Support. This data will help IBM Support 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 (IBM 4-digit machine identifier)
  - Model number
  - Serial number
  - Current system UEFI and firmware levels
  - Other pertinent information such as error messages and logs
- Go to http://www.ibm.com/support/entry/portal/Open_service_request/ 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 IBM Support quickly and efficiently. IBM service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documentation that is provided with your IBM product. The documentation that comes with IBM systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that

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.

Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/supportportal/. Also, some documents are available through the IBM Publications Center at http://www.ibm.com/shop/publications/order/.

Getting help and information from the World Wide Web

On the World Wide Web, up-to-date information about IBM systems, optional devices, services, and support is available at http://www.ibm.com/supportportal/. The address for IBM System x® information is http://www.ibm.com/systems/x/. The address for IBM BladeCenter® information is http://www.ibm.com/systems/bladecenter/. The address for IBM IntelliStation® information is http://www.ibm.com/systems/intellistation/.

How to send Dynamic System Analysis data to IBM

Use the IBM Enhanced Customer Data Repository to send diagnostic data to IBM. Before you send diagnostic data to IBM, read the terms of use at http://www.ibm.com/de/support/ecurep/terms.html.

You can use any of the following methods to send diagnostic data to IBM:

- **Standard upload:** http://www.ibm.com/de/support/ecurep/send_http.html
- **Standard upload with the system serial number:** http://www.ecurep.ibm.com/app/upload_hw
- **Secure upload:** http://www.ibm.com/de/support/ecurep/send_http.html#secure
- **Secure upload with the system serial number:** https://www.ecurep.ibm.com/app/upload_hw

Creating a personalized support web page

At http://www.ibm.com/support/mynotifications/, you can create a personalized support web page by identifying IBM products that are of interest to you. From this personalized page, you can subscribe to weekly email notifications about new technical documents, search for information and downloads, and access various administrative services.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with your IBM products. For information about which products are supported by Support Line in your country or region, see http://www.ibm.com/services/supline/products/.

For more information about Support Line and other IBM services, see http://www.ibm.com/services/, or see http://www.ibm.com/planetwide/ for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through your IBM reseller or IBM Services. To locate a reseller authorized by IBM to provide warranty service, go to http://www.ibm.com/partnerworld/ and click **Find Business Partners** on the right side of the page. For IBM support telephone numbers, see http://www.ibm.com/planetwide/. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

IBM Taiwan product service

台灣 IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路 7 號 3 樓
電話：0800-016-888

IBM Taiwan product service contact information:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd.
Taipei, Taiwan
Telephone: 0800-016-888

Appendix B. Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION “AS IS” WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM websites are provided for convenience only and do not in any manner serve as an endorsement of those websites. The materials at those websites are not part of the materials for this IBM product, and use of those websites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Trademarks

IBM, the IBM logo, and ibm.com are trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the web at “Copyright and trademark information” at http://www.ibm.com/legal/copytrade.shtml.

Adobe and PostScript are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States and/or other countries.

Cell Broadband Engine is a trademark of Sony Computer Entertainment, Inc., in the United States, other countries, or both and is used under license therefrom.

Intel, Intel Xeon, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft, Windows, and Windows NT are trademarks of Microsoft Corporation in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Important notes

Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1024 bytes, MB stands for 1,048,576 bytes, and GB stands for 1,073,741,824 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1,000,000 bytes, and GB stands for 1,000,000,000 bytes. Total user-accessible capacity can vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives that are available from IBM.

Maximum memory might require replacement of the standard memory with an optional memory module.

IBM makes no representation or warranties regarding non-IBM products and services that are ServerProven®, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. These products are offered and warranted solely by third parties.

IBM makes no representations or warranties with respect to non-IBM products. Support (if any) for the non-IBM products is provided by the third party, not IBM.

Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the device that is described in this document. Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the device to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If IBM determines that the levels of particulates or gases in your environment have caused damage to the device, IBM may condition provision of repair or replacement of devices or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 5. Limits for particulates and gases

Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2[1]. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%[2]. • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985[3] • Silver: Corrosion rate of less than 300 Å in 30 days

[1] ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

[2] The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.

[3] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.

Documentation format

The publications for this product are in Adobe Portable Document Format (PDF) and should be compliant with accessibility standards. If you experience difficulties when you use the PDF files and want to request a web-based format or accessible PDF document for a publication, direct your mail to the following address:

Information Development
IBM Corporation
205/A015
3039 E. Cornwallis Road
P.O. Box 12195
Research Triangle Park, North Carolina 27709-2195

U.S.A.

In the request, be sure to include the publication part number and title.

When you send information to IBM, you grant IBM a nonexclusive right to use or distribute the information in any way it believes appropriate without incurring any obligation to you.

Telecommunication regulatory statement

This product may not be certified in your country for connection by any means whatsoever to interfaces of public telecommunications networks. Further certification may be required by law prior to making any such connection. Contact an IBM representative or reseller for any questions.

Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. 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. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

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.

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Australia and New Zealand Class A statement

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

Attention: This is an EN 55022 Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Responsible manufacturer:
International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
914-499-1900

European Community contact:
IBM Technical Regulations, Department M456
IBM-Allee 1, 71137 Ehningen, Germany
Telephone: +49 7032 15-2937
Email: tjahn@de.ibm.com

Germany Class A statement

Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

Um dieses sicherzustellen, sind die Geräte wie in den Handbüchern beschrieben zu installieren und zu betreiben. Des Weiteren dürfen auch nur von der IBM empfohlene Kabel angeschlossen werden. IBM übernimmt keine Verantwortung für die Einhaltung der Schutzanforderungen, wenn das Produkt ohne Zustimmung der IBM verändert bzw. wenn Erweiterungskomponenten von Fremdherstellern ohne Empfehlung der IBM gesteckt/eingebaut werden.

EN 55022 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden: “Warnung: Dieses ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funk-Störungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen zu ergreifen und dafür aufzukommen.”

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem “Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)”. Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC EG Richtlinie 2004/108/EG) für Geräte der Klasse A

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Einhaltung der EMV Vorschriften ist der Hersteller:

International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
914-499-1900

Der verantwortliche Ansprechpartner des Herstellers in der EU ist:

IBM Deutschland
Technical Regulations, Department M456
IBM-Allee 1, 71137 Ehningen, Germany
Telephone: +49 7032 15-2937
Email: tjahn@de.ibm.com

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

VCCI Class A statement

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

Korea Communications Commission (KCC) statement

이 기기는 업무용(A급)으로 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

This is electromagnetic wave compatibility equipment for business (Type A). Sellers and users need to pay attention to it. This is for any areas other than home.

Russia Electromagnetic Interference (EMI) Class A statement

ВНИМАНИЕ! Настоящее изделие относится к классу А.
В жилых помещениях оно может создавать радиопомехи, для снижения которых необходимы дополнительные меры

People's Republic of China Class A electronic emission statement

中华人民共和国“A类”警告声明

声 明

此为A级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取切实可行的措施。

Taiwan Class A compliance statement

警告使用者:
這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Index

L

M

N

O

P

R

S

T

U

W

Part Number: 00D2434

Printed in USA

(1P) P/N: 00D2434