IBM Rear Door Heat eXchanger for the iDataPlex Racks

IBM

Installation and Maintenance Guide

IBM Rear Door Heat eXchanger for the iDataPlex Racks

Installation and Maintenance Guide

Note

Before using this information and the product it supports, read the information in Appendix B, "Notices," on page 61, and the *IBM Safety Information*, *IBM Systems Environmental Notices and User Guide*, and the *IBM Warranty and Support Information* documents on the IBM *Documentation* CD.

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.

v

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.

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 13:

CAUTION:
The weight of this part or unit is more than 55 kg (121.2 lb). It takes specially trained persons, a lifting device, or both to safely lift this part or unit. (C011)

>55 kg (121.2 lb)

≥55 kg (≥121.2 lb)
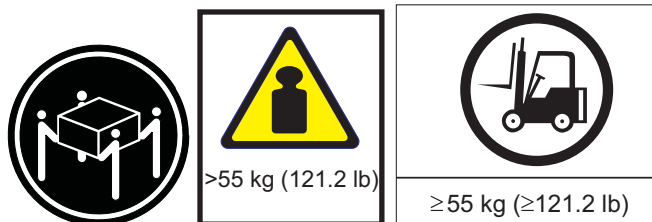
Statement 14:

CAUTION:
Goggles are needed for the procedure.

(L011)

Chapter 1. Introduction

This *Installation and Maintenance Guide* contains instructions and additional information for installing, setting up, and maintaining the IBM® Rear Door Heat eXchanger for the iDataPlex™ Rack.

Attention: Only professional movers, installers, or trained personnel may move, install, replace, remove, or transport the heat exchanger.

The heat exchanger is a water-cooled door that is mounted on the rear of an IBM iDataPlex Rack Type 7825 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, air conditioning units, and so on. 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 up to 100 000 Btu per hour (or approximately 30 000 watts) of heat from your data center.

See "Secondary cooling loop parts and services information" on page 13 for information about hoses, water treatment, and cooling 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 exchangers, see "Installation and support from IBM Integrated Technology Services" on page 24.

This documentation might be updated occasionally to include information about new features, a translated version of the documentation might be available in your language, or technical updates might be available to provide additional information that is not included in this documentation. These updates are available from the IBM Systems Information Center. To check for updated iDataPlex information and technical updates, go to http://publib.boulder.ibm.com/infocenter/systems/scope/idataplex/index.jsp

The updated iDataPlex documentation also is available from the IBM Support Web site. To check for updated documentation and technical updates, complete the following steps.

Note: Changes are made periodically to the IBM Web site. The actual procedure might vary slightly from what is described in this document.

1. Go to http://www.ibm.com/systems/support/.
2. Under **Product support**, click **System x**.
3. Under **Popular links**, click **Publications lookup**.
4. From the **Product family** menu, select **iDataPlex Rack** and click **Go**.

Statement 13:

CAUTION:
The weight of this part or unit is more than 55 kg (121.2 lb). It takes specially trained persons, a lifting device, or both to safely lift this part or unit. (C011)

>55 kg (121.2 lb)

≥55 kg (≥121.2 lb)

Attention:
1. Because of the size and weight of the heat exchanger, a lift tool and a minimum of two or more trained service technicians or a lift tool and professional movers are required to remove or install the heat exchanger.
2. You must remove the power from the rack cabinet and all components before you connect or disconnect the water supply lines and drain or fill the heat exchanger.

Rear door heat
exchanger asembly

Lift handle

Rear door
support bracket

Serial
number

Door catch

Lift handle

Lift handle

Air-purging tool
(option which can be
purchased from IBM)

Or

Reverse   As shown

Documentation package

Upper air baffle

Hinge kit

Lower air baffle
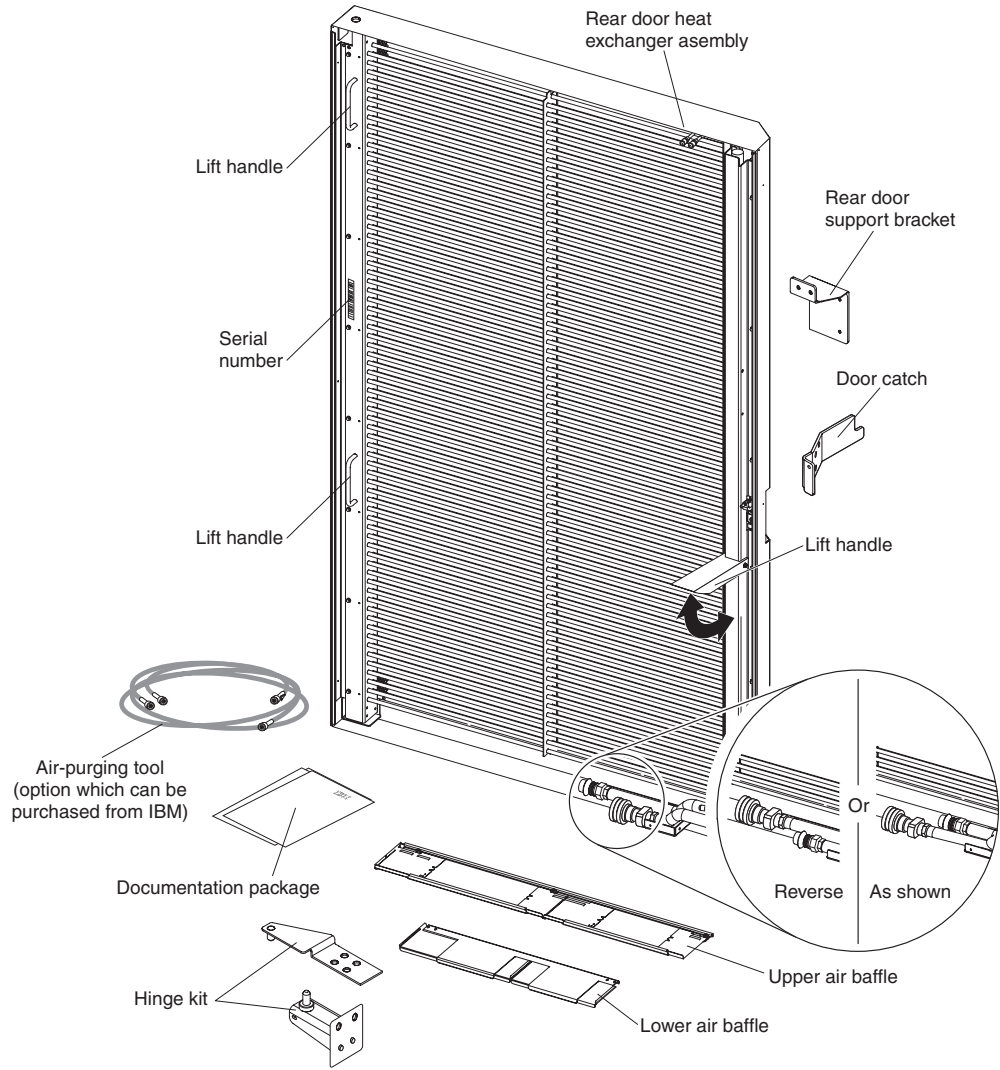
Figure 1. The IBM Rear Door Heat eXchanger for the iDataPlex Rack

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

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

Product name	IBM Rear Door Heat eXchanger for the iDataPlex Rack
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.

Related documentation

Depending on the hardware configuration, additional documentation might be included on the IBM *Documentation* CD.

The iDataPlex documentation might be updated occasionally, or technical updates might be available to provide additional information that is not included in the documentation. These updates are available from the IBM Systems Information Center. To check for updated iDataPlex information and technical updates, go to http://publib.boulder.ibm.com/infocenter/systems/scope/idataplex/index.jsp .

The updated iDataPlex documentation also is available from the IBM Support Web site. To check for updated documentation and technical updates, complete the following steps.

Note: Changes are made periodically to the IBM Web site. The actual procedure might vary slightly from what is described in this document.

1. Go to http://www.ibm.com/systems/support/.
2. Under **Product support**, click **System x**.
3. Under **Popular links**, click **Publications lookup**.
4. From the **Product family** menu, select **iDataPlex Rack** and click **Go**.

Notices and statements in this document

The caution and danger statements that appear in this document are also in the multilingual *IBM Rack Safety Information* document, which is on the IBM *Documentation* CD. Each statement is numbered for reference to the corresponding statement in the *IBM 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.
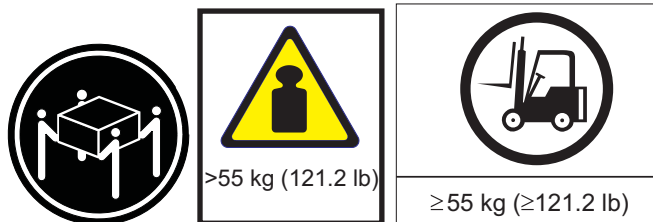
- Providing chilled, conditioned water that meets the specifications that are outlined in "Control and conditioning of the secondary cooling loop" on page 14.
- Procuring and installing the water supply system that is suitable for your data center. Details are provided in "Water delivery specifications for secondary loops" on page 16.
- Providing 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. 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, for example, 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.

Statement 13:

CAUTION:
The weight of this part or unit is more than 55 kg (121.2 lb). It takes specially trained persons, a lifting device, or both to safely lift this part or unit. (C011)

Attention:

1. Because of the size and weight of the heat exchanger, a lift tool and a minimum of two or more trained service technicians or a lift tool and professional movers are required to remove or install the heat exchanger.

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

Planning for the flexible cooling hoses

The following information will help you plan for routing of the flexible cooling hoses and cutting floor or ceiling tiles. As part of hose management, you must consider whether the cooling hoses will be routed under the floor or in the ceiling.

Heat exchanger specifications

The following information is a summary of the specifications of the IBM Rear Door Heat eXchanger for the iDataPlex Rack.
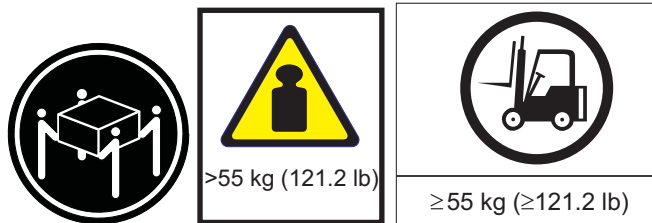
Table 1. Heat exchanger specifications

Door size:
• Depth: 120 mm (4.72 in.)
• Height: 2000 mm (78.7 in.)
• Width: 1200 mm (47.24 in.)
 	
Door assembly weight:
• Empty: 82 kg (180 lb)
• Filled: 90 kg (200 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 11 liters (3 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" on page 9 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

Statement 13:

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The weight of this part or unit is more than 55 kg (121.2 lb). It takes specially trained persons, a lifting device, or both to safely lift this part or unit. (C011)

>55 kg (121.2 lb)

≥55 kg (≥121.2 lb)

Attention:

1. Because of the size and weight of the heat exchanger, a lift tool and a minimum of two or more trained service technicians or a lift tool and professional movers are required to remove or install the heat exchanger.

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

Obtaining service

IBM has selected Coolcentric to provide service and support for the IBM Rear Door Heat eXchanger for the iDataPlex Rack. For service in the United States, call 1-877-248-3883. For service outside the United States, call 1-508-804-5500.

Heat exchanger performance

Expected performance of the heat exchanger is illustrated in Figure 2 for a typical inlet air temperature of 24°C (75.2°F), with a fully populated rack with near uniform power dissipation, a 32 kW heat load, and the node fans running near minimum fan speed. 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 (24°C [75.2°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.

Important: To help maintain optimum performance of the Rear Door Heat eXchanger and provide proper cooling for all rack components, you must always:

- Install filler panels over all unoccupied bays.
- Route signal cables at the rear of the rack cabinet 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 38.

% heat removal as function of water temperature and flow rate for 24°C rack inlet air, 32kW load, min fan speed

Figure 2. Typical performance of the heat exchanger, 32 kW heat load

* As described in "Water-supply requirements for secondary loops" on page 15, 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.

Performance data is shown in Figure 3 for identical conditions as in Figure 2, except 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.

**% heat removal as function of
water temperature and flow rate for
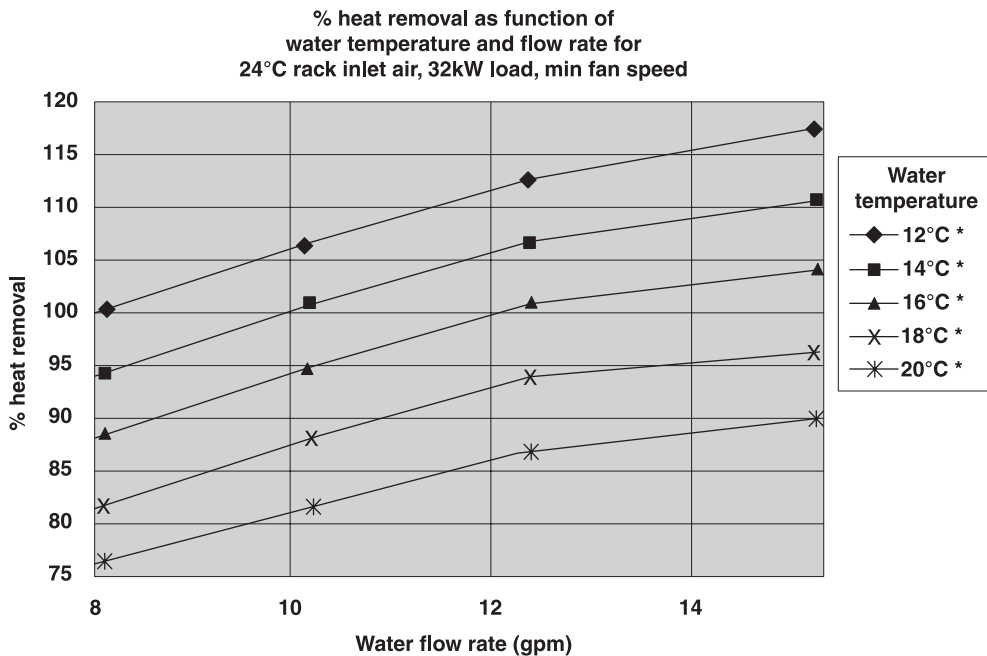24°C rack inlet air, 20kW load, min fan speed**
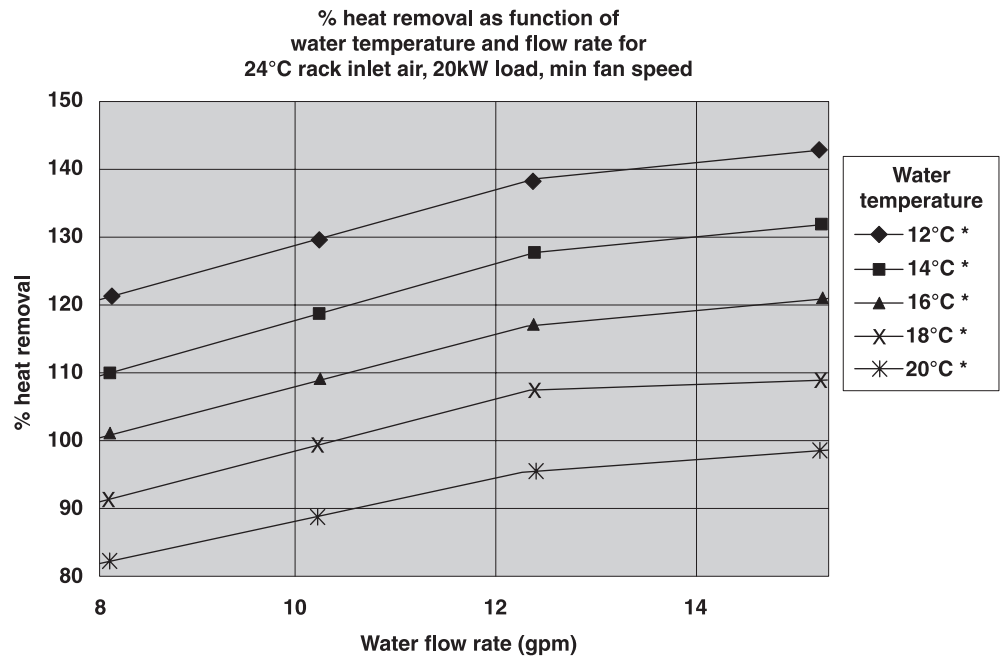
Figure 3. Typical performance of the heat exchanger, 20 kW heat load

* As described in "Water-supply requirements for secondary loops" on page 15, 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.

Parts and tools

This section provides information about the tools and parts that you need to install the heat exchanger and information about secondary cooling loop parts and part suppliers.

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

Figure 4. The IBM Rear Door Heat eXchanger for the iDataPlex Rack

Use the following tools to install or attach the rear door heat exchanger:
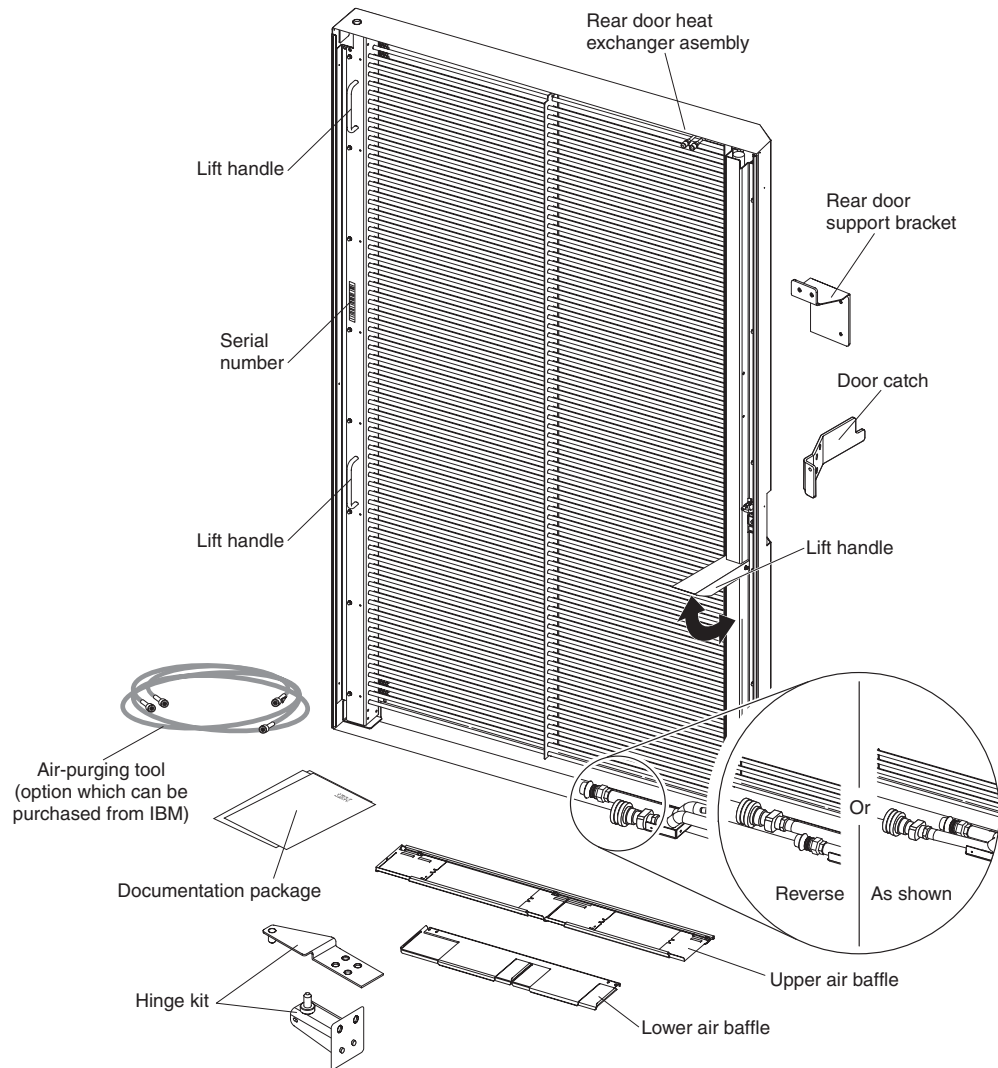- Phillip screwdriver (hinge brackets, and air baffle)
- M7 hex driver (air baffle)
- M10 hex driver (hinge brackets)
- 4 mm hex key (rear door support bracket)
- Air-purging tool (can be purchased as an option from IBM)
- Step stool or ladder

Secondary cooling loop parts and services information

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

Miscellaneous parts suppliers

Table 2 provides supplier and contact information for miscellaneous secondary loop parts. You can contact the supplier listed in the table for all or some of the items listed, depending on your needs.

Table 2. Miscellaneous secondary loop parts supplier information for customers in North America, Europe, Middle East, Africa, Asia Pacific

Supplier	Solution	Contact information
Coolcentric	• Rear door heat exchangers (designed for non-IBM Enterprise racks) • Cooling distribution units • Hose kits • Water treatment • Chillers • Raised-floor grommets	http://www.coolcentric.com/ Coolcentric a Division of Wakefield-Vette 33 Bridge Street Pelham, NH 03076 Sales: sales@coolcentric.com Post service and support: support@coolcentric.com General inquiry: info@coolcentric.com Phone: 1-603-635-5199

Services supplier

Table 3 provides supplier and contact information for services that can be provided for secondary loop parts.

Table 3. Services supplier information for customers in North America, Europe, Middle East, Africa, Asia Pacific

Supplier	Solution	Contact information
Coolcentric	• Installation of door and secondary loop items • Preventive maintenance	http://www.coolcentric.com/ Coolcentric a Division of Wakefield-Vette 33 Bridge Street Pelham, NH 03076 Sales: sales@coolcentric.com Post service and support: support@coolcentric.com General inquiry: info@coolcentric.com Phone: 1-603-635-5199

Cooling distribution unit supplier

Table 4 on page 14 provides supplier and contact information for customers in Europe for a cooling distribution unit that was designed specifically for the IBM Rear Door Heat eXchanger.

Note: Customers in other locations can contact Eaton-Williams Group or Coolcentric (see Table 3 on page 13).

Table 4. Cooling distribution unit supplier information for customers in Europe

Vendor	Solution	Contact information
Eaton-Williams Group, Ltd (UK)	Cooling distribution unit models: • CD6-3 80-120 kW (400 V, 480 V or 208 V) • CD6-4 150-200 kW (400 V, 480 V or 208 V) • CD6-5 260-305 kW (400 V, 480 V or 208 V)	http://www.eaton-williams.com Eaton-Williams Group Ltd Fircroft Way Edenbridge Kent TN8 6EZ Email: ServerCool@eaton-williams.com Phone 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 datacenter installation. For example, the minimum water temperature that must be maintained is:

- 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 689.66 kPa (100 psi). Normal operating pressure at the heat exchanger must be 137.93 kPa (20 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 11.4 liters (3 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 20.9 liters (5.5 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. Air bleed valves are provided at the top of each 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 information" on page 13 for information about suppliers of hoses and cooling 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 18 through Figure 8 on page 21 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 18 through Figure 8 on page 21 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 18 through Figure 8 on page 21) 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.
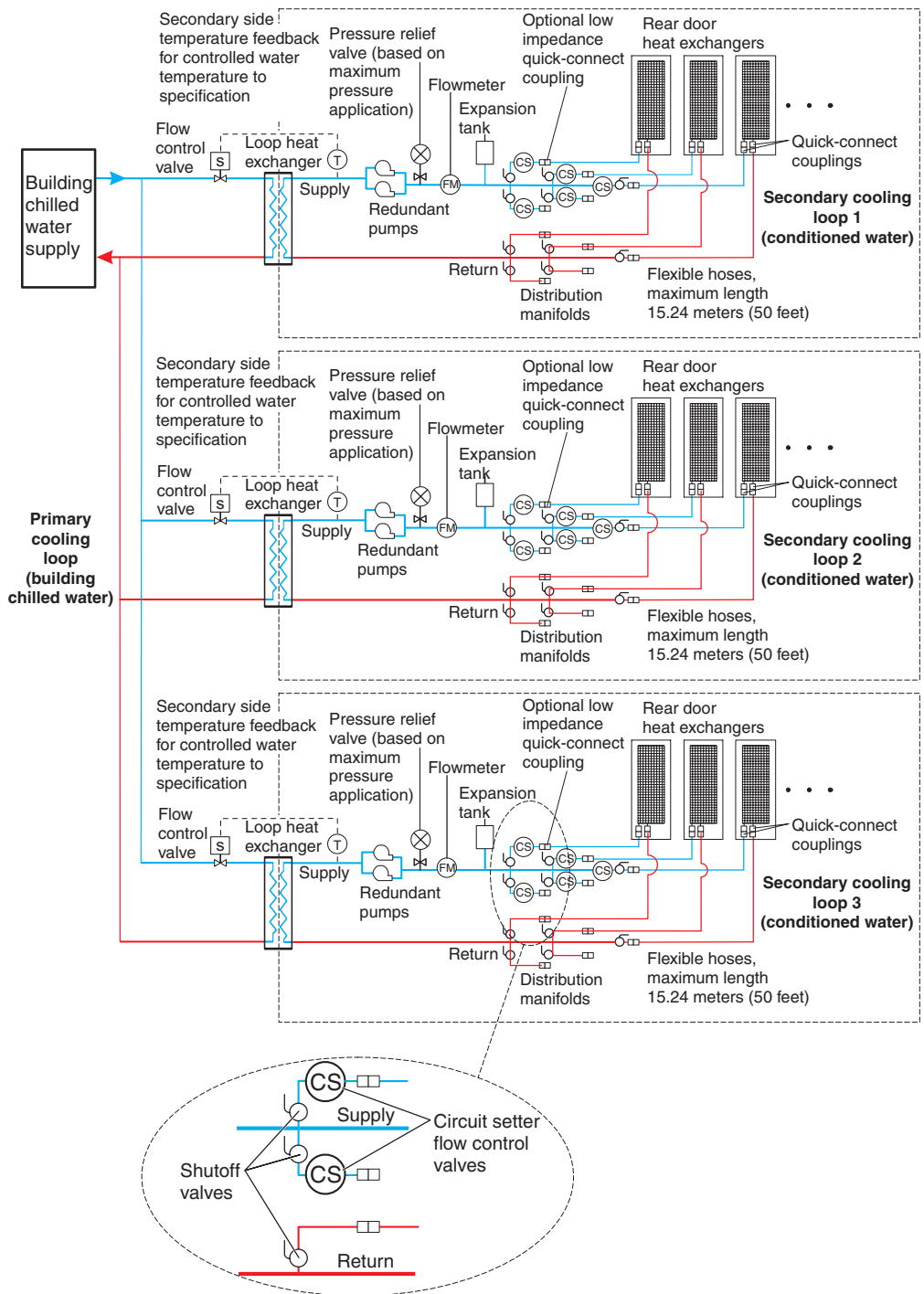

Figure 5. Primary and secondary cooling loops

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 cooling distribution unit that is running the secondary loop.
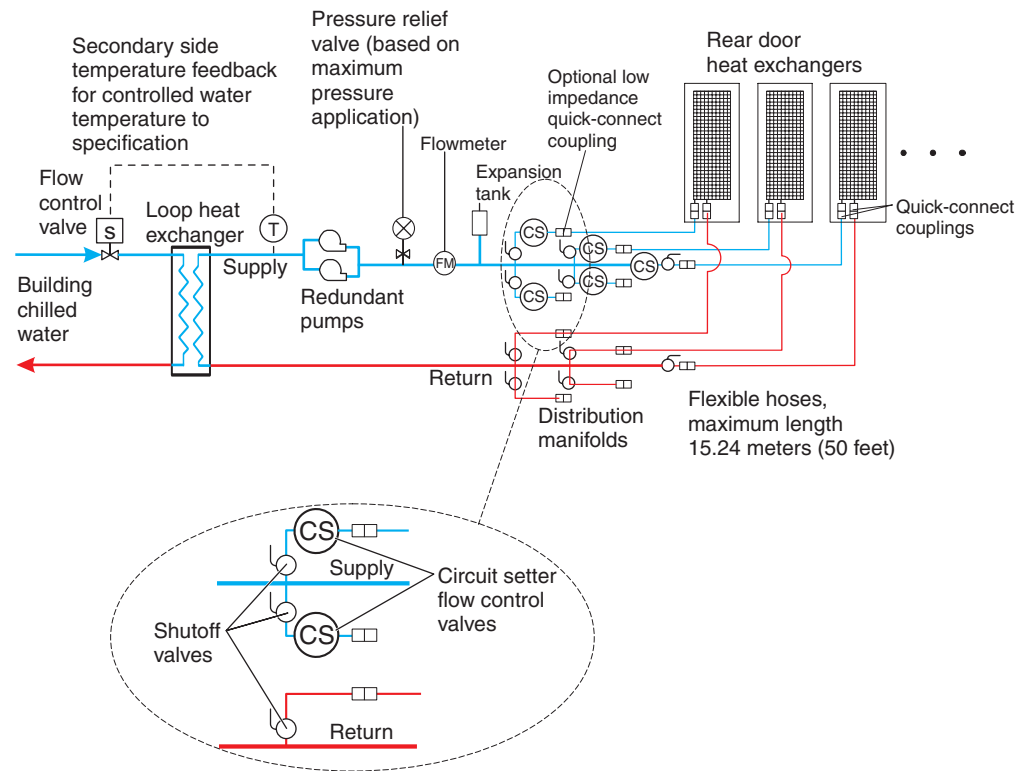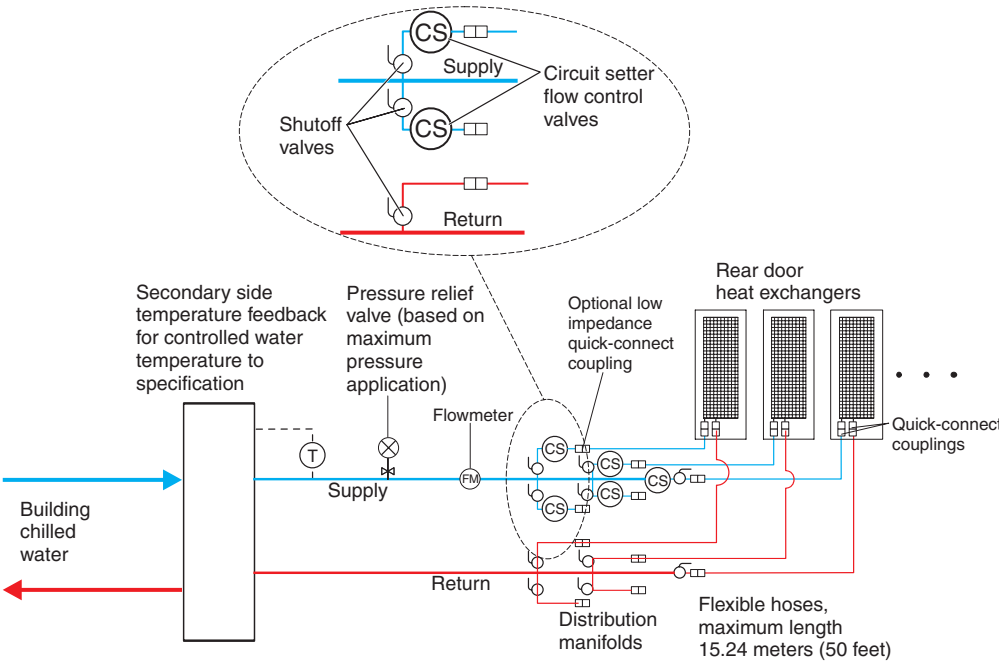

Figure 6. Coolant distribution unit that uses a fabricated facilities solution

Figure 7 shows an example of an off-the-shelf modular cooling distribution unit. The actual number of heat exchangers that are connected to a secondary loop depends on the capacity of the cooling distribution unit that is running the secondary loop

Figure 7. Coolant distribution 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.
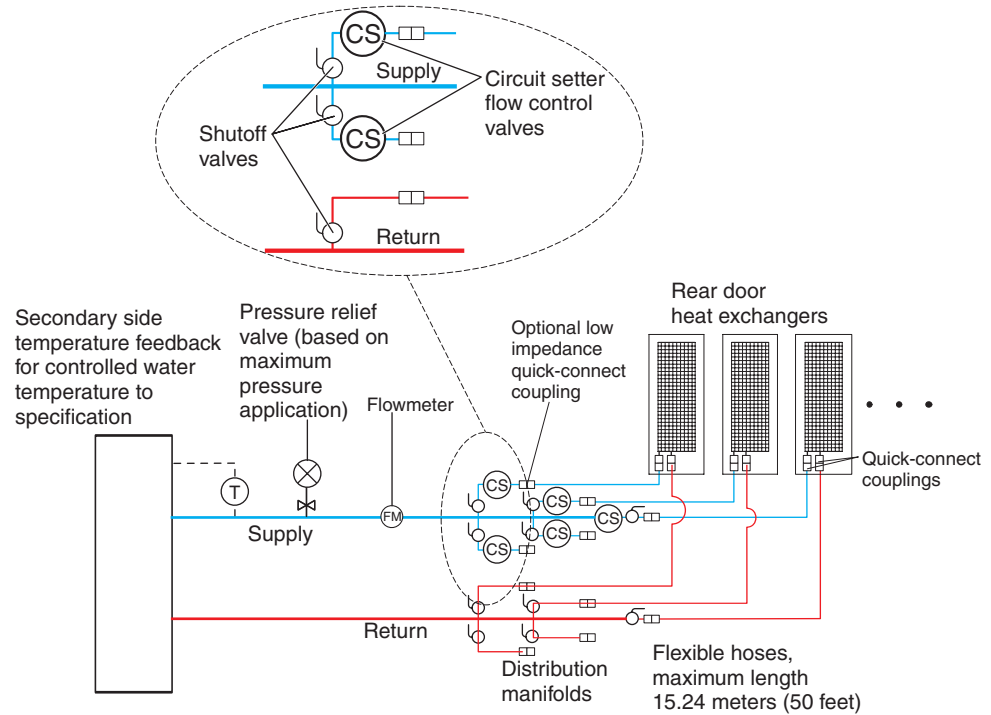
Supplier-built water chiller
unit required features:
- Temperature and flow metering (monitoring)
- Leak detection or water level sensing and shutdown
- Local and remote monitoring and control
- Access port for filling and water treatment

Figure 8. Cooling 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 14. 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 central 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 allow stopping the flow of water in individual legs of multiple circuit loops, install shutoff valves for each supply and return line. This provides a way of servicing or replacing an individual heat exchanger without affecting the operation of other heat exchangers in the loop.

To provide assurance 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.

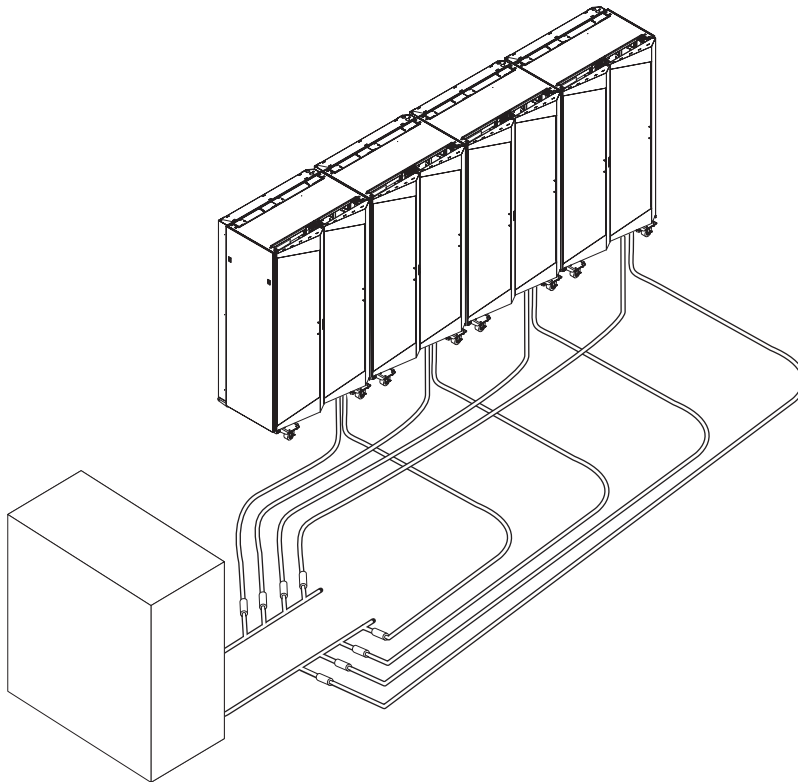Figure 9 shows another layout for multiple water circuits.

Figure 9. Typical central manifold (located at a central location for multiple water circuits)
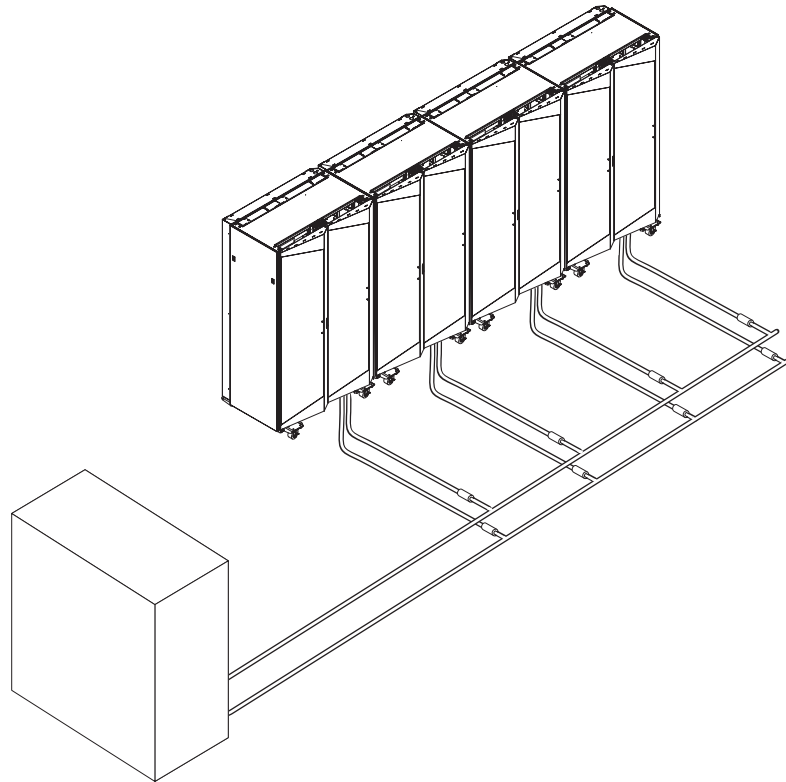
Figure 10 shows an extended manifold layout.

Figure 10. Typical extended manifold (located 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 cooling 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 attaches to the heat exchanger and must either have a low impedance quick connect 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 Table 2 on page 13. 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 exchanger. 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 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 assistance with coordinating and managing the installation and support of heat exchangers, IBM can supply a focal point.

Before you call, have the following information available:

- Serial numbers of the racks
- 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.

Table 5. IBM Integrated Technology Services contact information

North America, Europe, Middle East, Africa	1-800-426-7378 (OSC Dispatch) Request contact with an IBM Installation Planning Representative in the service branch office closest to your location.
Asia Pacific	Glen Yuan E-mail: glenyuan@cn.ibm.com DC Services Executive, GCG Site Services Cell Phone: +86-15601-73772

Chapter 3. Installing and removing the heat exchanger

Attention: Only professional movers, installers, or trained personnel may move, install, replace, remove, or transport the heat exchanger.

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

Installation guidelines

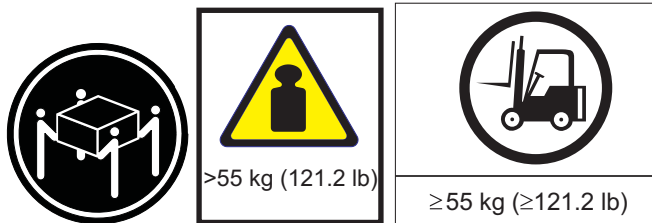Follow these guidelines when you install the heat exchanger.

- Read the safety information that begins on page v. This information will help you work safely.
- A lift tool and a minimum of two or more trained service technicians or a lift tool and professional movers are required to remove or install 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.
- If you ordered a rear door heat exchanger and it was shipped separate from the rack, locate the rack with the label that says HX ON RACK on the left rail; then, install the heat exchanger on the rack.
- Do not overtighten plumbing fittings or connections. This will cause leaks and might damage the plumbing fittings.
- Use Teflon tape or 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 cabinet or any of the installed components.
- Repair all leaks before you connect power to the rack cabinet 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 cabinet and see Appendix A, "Getting help and technical assistance," on page 57 for information.
- New heat exchangers are filled with pressurized helium after assembly. Before installing the heat exchanger, the helium must be purged from the heat exchanger in a well ventilated area. To purge the helium, remove the caps from the air-purging valves and press in on the valve stems to release the helium.
- When you install heat exchangers on a suite of rack cabinets, secure the rack cabinets together first; then, install the heat exchangers.

Statement 13:

CAUTION:
The weight of this part or unit is more than 55 kg (121.2 lb). It takes specially trained persons, a lifting device, or both to safely lift this part or unit. (C011)

Attention:

1. Because of the size and weight of the heat exchanger, a lift tool and a minimum of two or more trained service technicians or a lift tool and professional movers are required to remove or install the heat exchanger.

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

Installing the heat exchanger

Attention:

1. Only professional movers, installers, or trained personnel may move, install, replace, remove, or transport the heat exchanger.

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

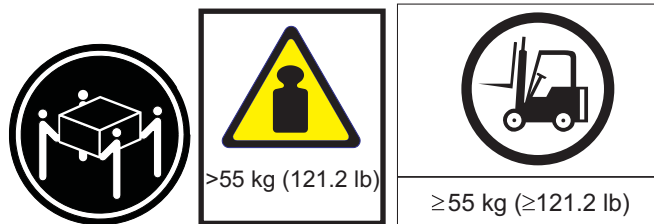To install the heat exchanger, complete the following steps:

1. Read the safety information that begins on page iii and "Installation guidelines" on page 25.

2. If you ordered a rear door heat exchanger and it was shipped separate from the rack, identify which rack the heat exchanger is to be installed on by locating label that says HX ON RACK; then, install the heat exchanger on the rack.

3. Unpack the heat exchanger and save all packing materials.

   Statement 13:

   CAUTION:
   The weight of this part or unit is more than 55 kg (121.2 lb). It takes specially trained persons, a lifting device, or both to safely lift this part or unit. (C011)

   >55 kg (121.2 lb)   ≥55 kg (≥121.2 lb)

   Attention:

   a. Because of the size and weight of the heat exchanger, a lift tool and a minimum of two or more trained service technicians or a lift tool and professional movers are required to remove or install the heat exchanger.

   b. You must remove the power from the rack cabinet and all components before you connect or disconnect the water supply lines and drain or fill the heat exchanger.
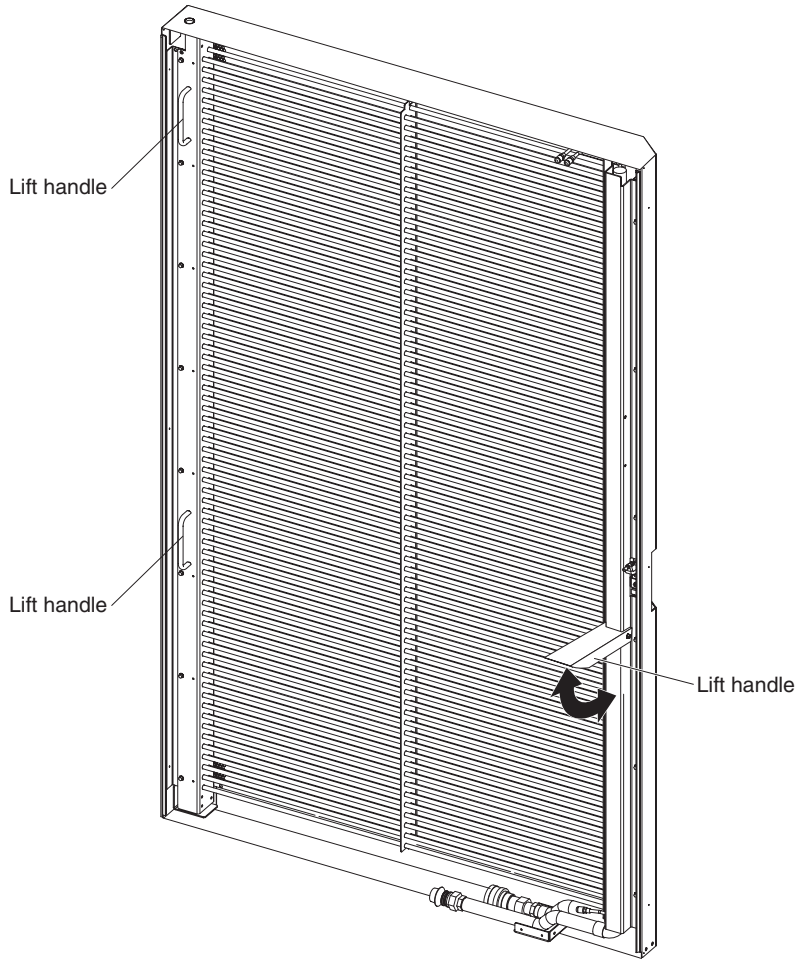
Figure 11. Lift handles on the heat exchanger.

4. If necessary, install the latch bracket on the left side of the rack cabinet.
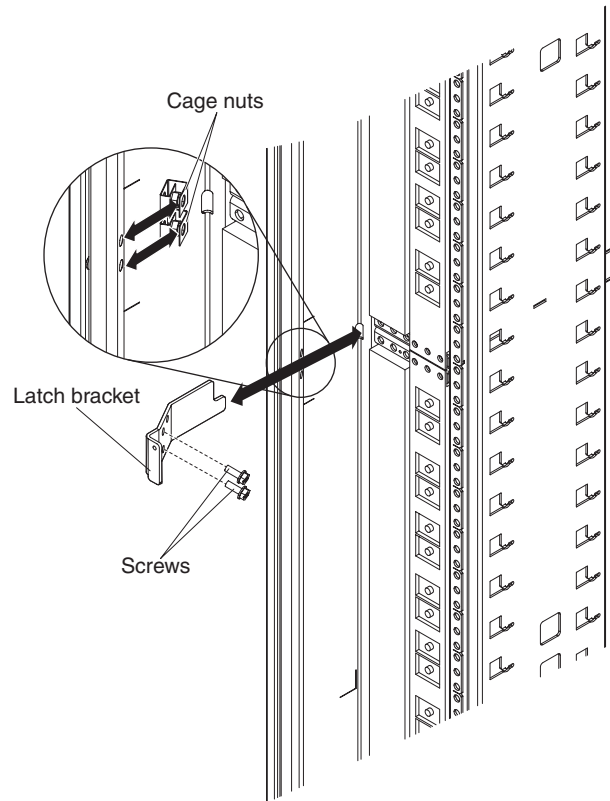

Cage nuts

Latch bracket

Screws

Figure 12. Install the latch bracket

    a. Install the two cage nuts on the right-side rail of the rack cabinet.

    b. Align the holes in the latch bracket with the holes in the rail and nut clips; then, secure the latch bracket in place with two M6 screws.

5. Install the rear door support bracket on the bottom-left corner of the rack cabinet. This bracket is attached with one M6 screw to the rack cabinet. The support bracket has a slotted hole. Install the bracket as far as possible to the left of the rack cabinet.
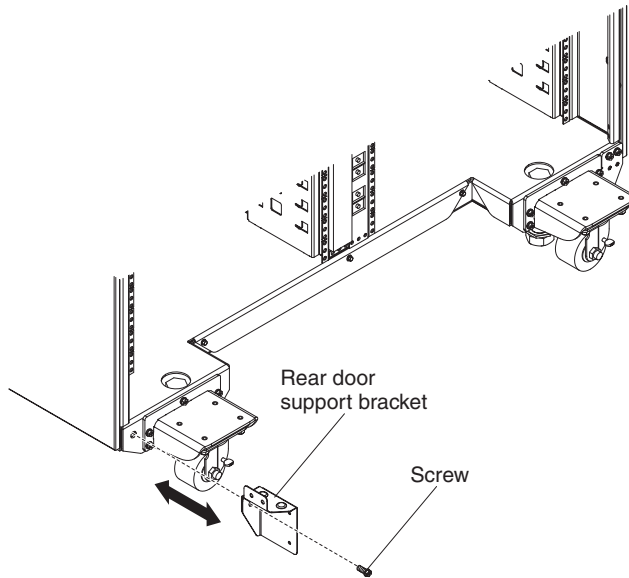

Figure 13. Installing the rear door support bracket

6. Install the upper and lower air baffles on the rack cabinet. These brackets are attached with three M5 screws to the rack cabinet.
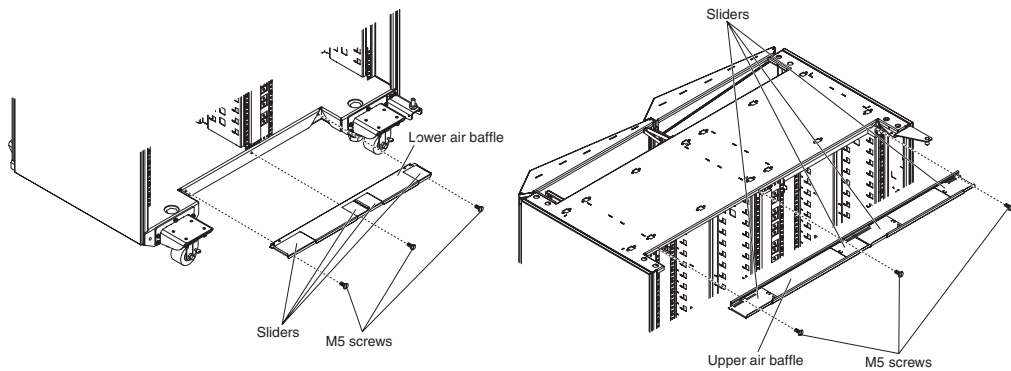
Figure 14. Installing the upper and lower air baffles

7. Install the bottom hinge bracket on the rack cabinet:

   Note: If you removed the standard rear door, you must also remove the bottom hinge bracket before continuing. The hinge bracket for the heat exchanger is larger than the one used for the standard rear door.

   a. Locate the bottom hinge bracket.
   b. Position the bottom hinge bracket so that the pin is facing up; then, align the two mounting holes with the holes in the rack cabinet on the right side of the cabinet.

c. Using two M6 screws and a screwdriver, secure the bottom hinge bracket to the cabinet.
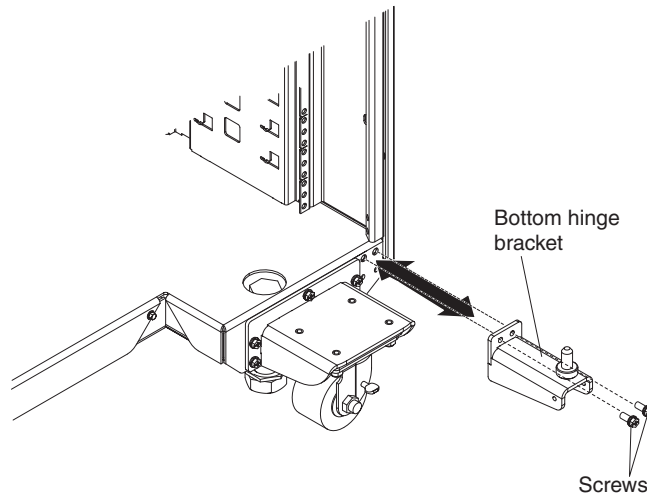

Bottom hinge bracket

Screws

Figure 15. Installing the bottom hinge bracket

8. Locate the lift handle on the left, or latch, side of the heat exchanger and extend it. When you use this lift handle, use an overhand grip.

Statement 13:

CAUTION:
The weight of this part or unit is more than 55 kg (121.2 lb). It takes specially trained persons, a lifting device, or both to safely lift this part or unit. (C011)

>55 kg (121.2 lb)

≥55 kg (≥121.2 lb)

Attention:

a. Because of the size and weight of the heat exchanger, a lift tool and a minimum of two or more trained service technicians or a lift tool and professional movers are required to remove or install the heat exchanger.

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

Lift handle

Lift handle

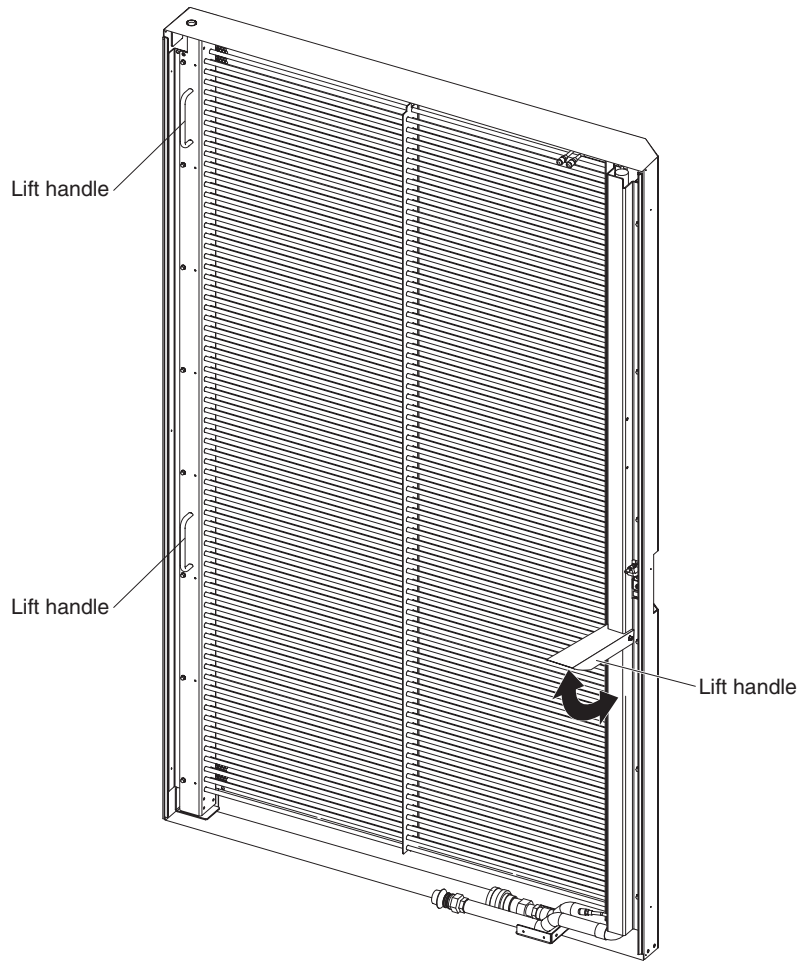Lift handle

Figure 16. Lift handles on the heat exchanger

9. Using the lift handles, lift the heat exchanger and align the hole in the bottom of the door 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 door.
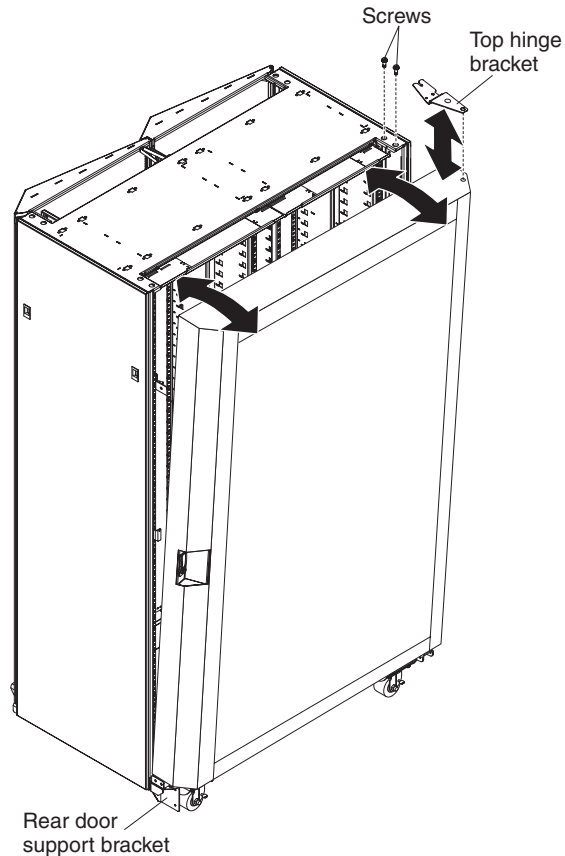
Screws

Top hinge
bracket

Rear door
support bracket

Figure 17. Installing the top hinge on the top of the door

10. Position a ladder near the right side of the rack cabinet. One person must climb the ladder to install the top hinge bracket and screws that secure the top hinge bracket.

11. Before you continue, make sure that the door latch is open.

12. While you support the heat exchanger, partially close the door and let the bottom rest on the support bracket. The lift handle on the latch side must be closed before you continue.

13. While the person on the latch side steadies the heat exchanger, install the top hinge in the hole on the top of the heat exchanger.

14. Rotate the top edge of the heat exchanger toward the rack cabinet and align the holes in the top of the rack cabinet with the threaded holes in the hinge bracket.

15. Secure the top hinge bracket to the rack cabinet.

   a. Reach over the top of the door and into the opening to hold the top hinge bracket in place.

   b. Align the threaded holes in the hinge bracket with the holes in the top of the rack cabinet.

   c. Install the screw furthest away from the heat exchanger. Do not tighten the screw, you might have to adjust the hinge location to line up the remaining holes.

   d. Install the remaining screw and tighten both screws.

16. Close and latch the door. The rear door might drop a couple of millimeters and prevent the door from closing. If this happens, grasp the lifting handle on the latch side and lift the door while closing it.

17. With the rear door closed and latched, move to the front of the rack cabinet. Use a leveler wrench to raise the right front leveler approximately 3 mm (.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.

18. If necessary, loosen the M6 screw under the rear door support bracket and slide the rear door support bracket against the heat exchanger; then, using two M6 screws, secure the support bracket to the heat exchanger.

19. If necessary, remove the M6 screw that secures the bracket to the rack cabinet.

20. Attach the hoses and fill the heat exchanger. See "Completing the installation" on page 42 and "Filling the heat exchanger with water" on page 39 for information about routing and attaching the hoses and filling the heat exchanger.

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

Removing the heat exchanger

Attention:

1. Because of the size and weight of the heat exchanger, a lift tool and a minimum of two or more trained service technicians or a lift tool and professional movers are required to remove or install the heat exchanger.

2. You must remove the power from the rack cabinet and all components before you connect or disconnect the water supply lines and drain or fill 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 25.

2. Turn off the power to the rack cabinet and all installed components.
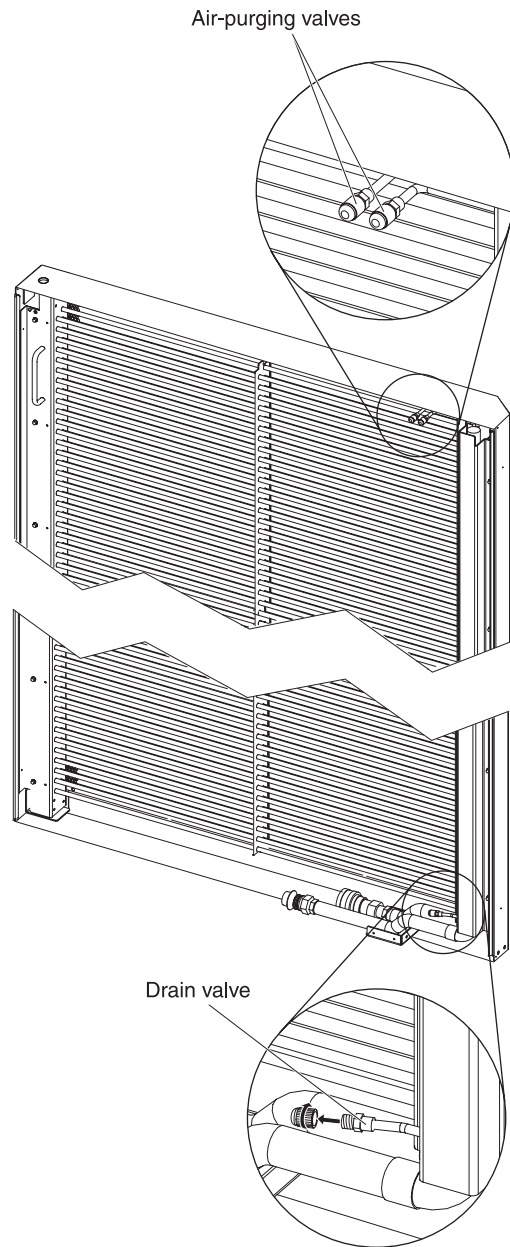
Air-purging valves

Drain valve

Figure 18. Locations of air-purging valves and drain valve

Statement 14:

CAUTION:
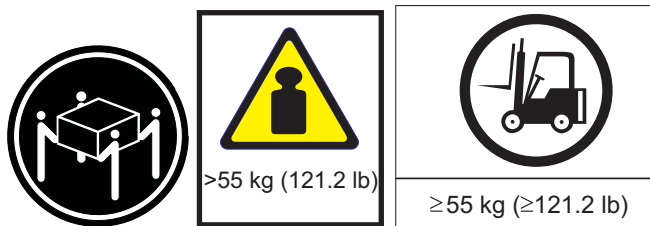**Goggles are needed for the procedure.**

(L011)

3. Drain the heat exchanger (see "Draining the heat exchanger" on page 52).

Statement 13:

CAUTION:
The weight of this part or unit is more than 55 kg (121.2 lb). It takes specially trained persons, a lifting device, or both to safely lift this part or unit. (C011)

>55 kg (121.2 lb)   ≥55 kg (≥121.2 lb)

Attention:

a. Because of the size and weight of the heat exchanger, a lift tool and a minimum of two or more trained service technicians or a lift tool and professional movers are required to remove or install the heat exchanger.

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

4. Remove the heat exchanger:

a. Remove one of the M6 screws from the rear door support bracket and relocate it to the slotted hole in the bottom half of the bracket; then, remove the remaining M6 screw. You might have to lift the latch side of the door to align the slotted hole in the rear door support bracket with the hole in the rack cabinet.

b. Push the support bracket as far as possible to the left and tighten the M6 screw to secure it in place. Open the latch and let the door open slightly, resting on the support bracket.

c. Position a step stool or small ladder on the hinge side of the heat exchanger; then, use a screwdriver to remove the two screws that secure the top hinge bracket to the rack cabinet. Be sure to support the top hinge bracket with one hand while you remove the screws. Supporting the bracket will make it easier to remove both screws.
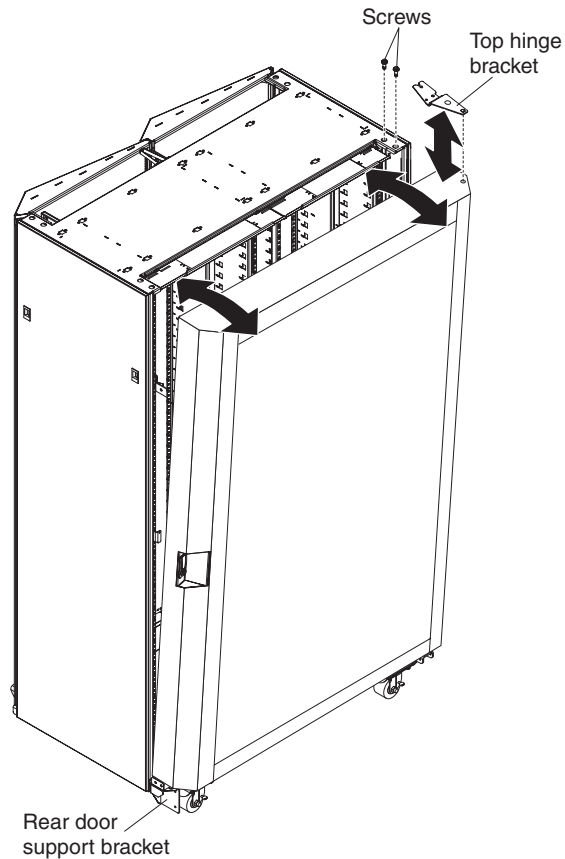
Figure 19. Removing the heat exchanger from the rack cabinet.

d. With the help of another person, let the top of the heat exchanger rotate away from the rack cabinet; then, lift the top hinge bracket up and off the heat exchanger.

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

f. Place the heat exchanger on the floor. The heat exchanger is now ready to be moved.

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.
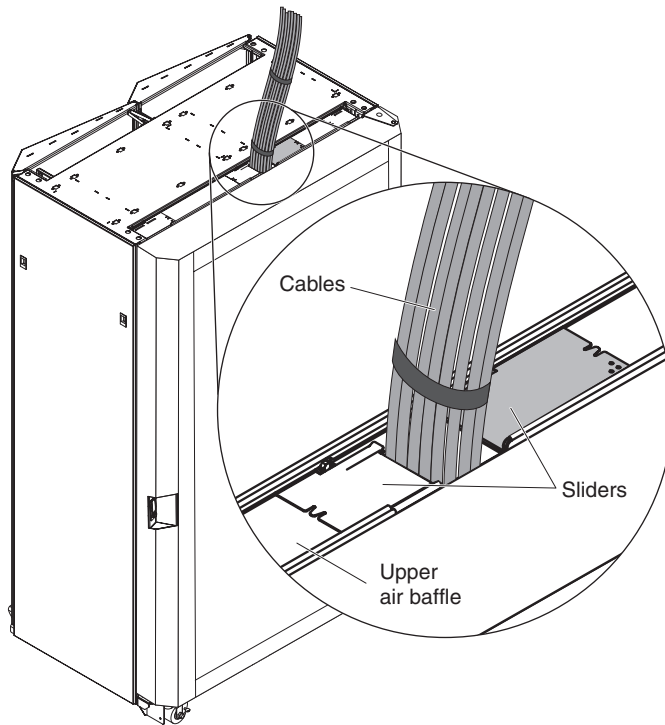
Figure 20. Bundling and routing cables through the upper air baffle

The following illustration shows the correct way to bundle and route cables through the lower air baffle.
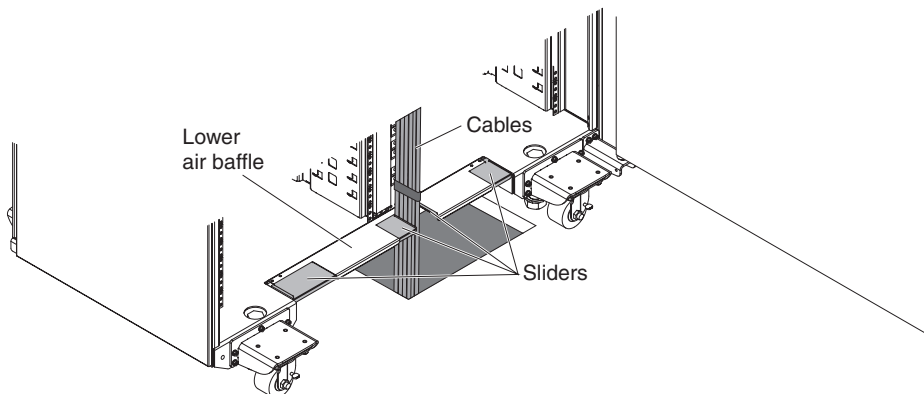
Figure 21. Bundling and routing cables through the lower air baffle

Filling the heat exchanger with water

To fill the heat exchanger with water for the first time, 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 helium from the heat exchanger.
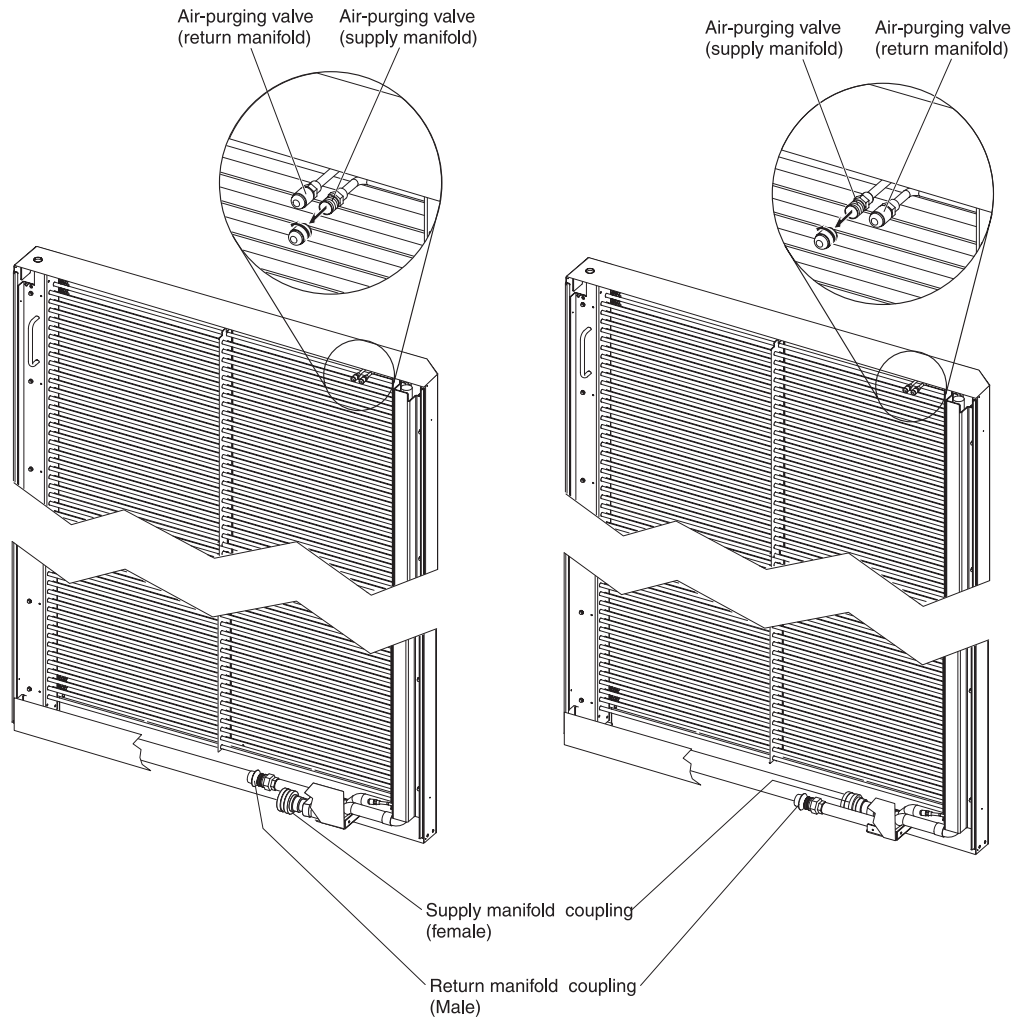
Figure 22. Remove the cap from the air-purging valve

1. Unscrew and retain the caps from both air-purging valves.

   Note: The valves are similar to the valves on bicycle or automobile tires.

2. Press in on the valve stems of the air-purging valves to purge the helium from the heat exchanger. Keep holding the valve stems in until the pressure is released.

3. Connect the return and supply hoses.

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

   - To attach 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 will be difficult to connect the hose. Ensure the pressure has been bled and 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 attach 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 will be difficult to connect the hose. Ensure the pressure has been bled and 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.

4. 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.

Hose

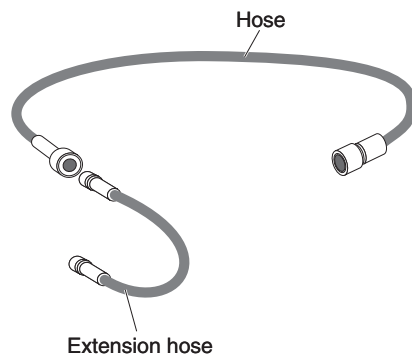Extension hose

Figure 23. Air-purging tool

5. 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.

   Note: The six-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.
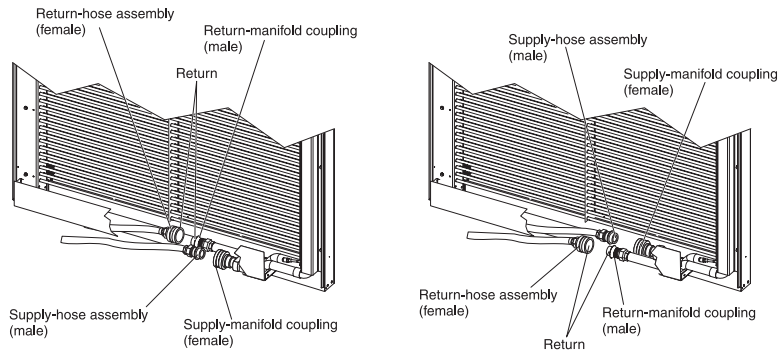
Figure 24. Attach the hoses to the manifold couplings

6. After the water is flowing through the heat exchanger for several minutes, attach the air-purging tool to the supply manifold air-purging valve. Make sure 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.

7. When there is a steady stream of water from the air-purging tool into the container, disconnect the tool from the heat exchanger supply air-purging valve and connect to the heat exchanger return air-purging valve, all the while keeping the drain end of the hose in the container.

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

8. When there is a steady stream of water from the air-purging tool disconnect the tool from the heat exchanger.

    Notes:

    a. Water will spray or spit into the container immediately at this point.

    b. Air in a manifold may cause a splashing or gurgling sound. Repeat the air-purging procedure on both valves if this sound is present.

9. Feel the tops and bottoms of the manifolds (the vertical copper supply and return pipes on the heat exchanger). If they are cool to the touch, the chilled water is flowing correctly through the heat exchanger.

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

11. If you are installing and filling the heat exchanger for the first time, return to "Routing and securing the hoses in a raised-floor environment" on page 43 or "Routing and securing the hoses in a non-raised-floor environment" on page 45 for information on securing the hoses.

Completing the installation

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:

- Install filler panels over all unoccupied bays.

- Route signal cables at the rear of the rack cabinet 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 38.

Routing and securing the hoses in a raised-floor environment

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

Figure 25. Routing and securing the hoses in a raised-floor environment.

1. Remove one of the floor tiles that pass under the front door of the rack cabinet.

   Note: The access hole for the supply and return hoses must be a minimum of 200 mm (8 in.) length x 100 mm (4 in.) width.
2. Cut an access hole in the floor tile; then, reinstall the floor tile so that the access hole is under the front doors of the rack cabinet.

Notes:

    a. The hoses must be routed through the access hole length wise so that the hose has the entire 200 mm (8 in.) to pass through the floor.

    b. The hoses must be routed with a minimum bend radius of 200 mm (8 in.).

    c. Hoses with a bend radius less than 200 mm (8 in.) will cause the hoses 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 length wise, under the rack cabinet and around the rear caster on the pivot side of the heat exchanger. See "Filling the heat exchanger with water" on page 39 for information on how to connect the hoses.
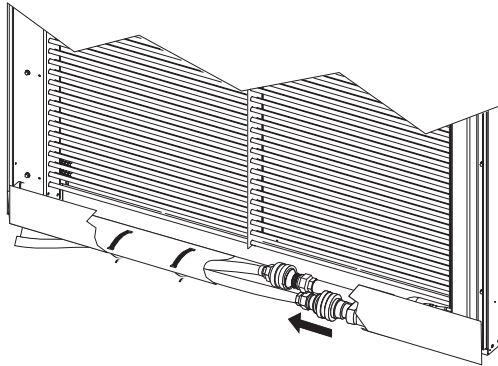
Figure 26. Flexible hoses secured to the bottom of the rear door heat exchanger.

4. Secure the hoses using hook-and-loop straps.

    a. Install a hook-and-loop strap in the slot just above the quick-connect couplings under the heat exchanger and secure the quick-connect couplings to the bottom of the heat exchanger. It might be easier to install the hook-and-loop strap if you bend the end of the strap first. Then, feed the bent end through one slot and then through the parallel slot.

    b. Starting a few inches away from the quick-connect couplings, push the supply hose under the return hose.

    c. Install a hook-and-loop strap in the slots under the heat exchanger and wrap it around both hoses while you pull the hoses up tight against the bottom of the heat exchanger, securing them in place. Continue along the bottom of the door and install a second hook-and-loop strap to secure the hoses closer to the hinge side of the heat exchanger.

    d. While you keep the two hoses stacked, place a hook-and-loop strap around the hoses and secure them together approximately every 12 to 18 inches up to the point where they go under the raised floor.

Check the heat exchanger after several hours of operation and repeat the air-purging process on both valves (trapped air from the hoses might have migrated to the heat exchanger). See "Filling the heat exchanger with water" on page 39 for information on how to connect the hoses.

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

Routing and securing the hoses in a non-raised-floor environment

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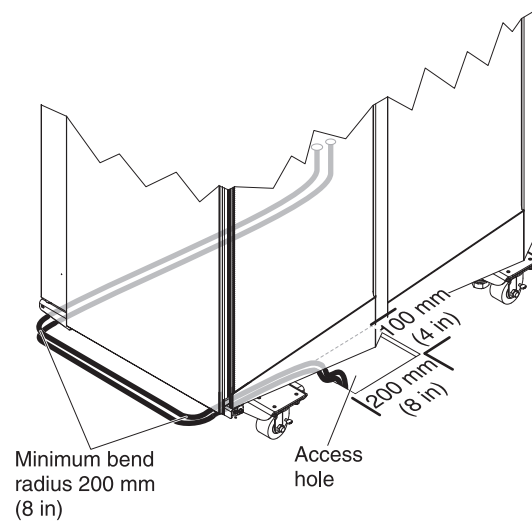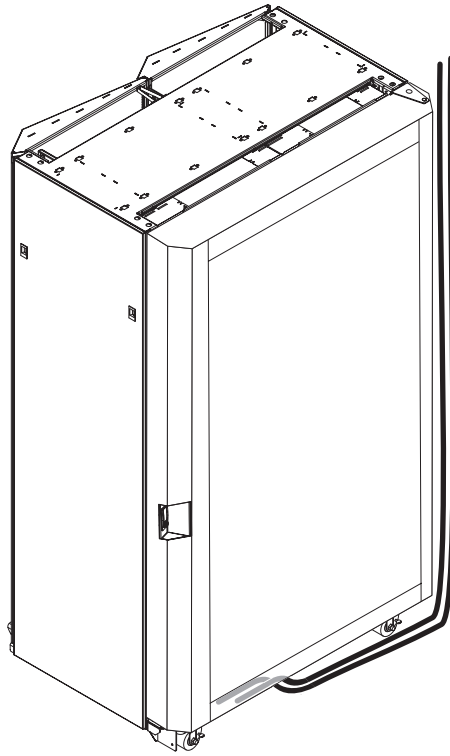

Figure 27. Routing and securing the hoses in a non-raised-floor environment.

1. If necessary, cut a 100 mm (4 in.) length x 100 mm (4 in.) width hole in a ceiling tile above the heat exchanger; then, route the hoses vertically down the hinge or pivot side of the heat exchanger, leaving enough slack in the hoses to reach the couplings. See "Filling the heat exchanger with water" on page 39 for information on how to connect the hoses.

Figure 28. Flexible hoses secured to the bottom of the rear door heat exchanger.

2. Secure the hoses using hook-and-loop straps.

   a. Install a hook-and-loop strap in the slot just above the quick-connect couplings under the heat exchanger and secure the quick-connect couplings to the bottom of the heat exchanger. It might be easier to install the

hook-and-loop strap if you bend the end of the strap first. Then, feed the bent end through one slot and then through the parallel slot.

   b. Starting a few inches away from the quick-connect couplings, push the hose that is farther back under the other hose.

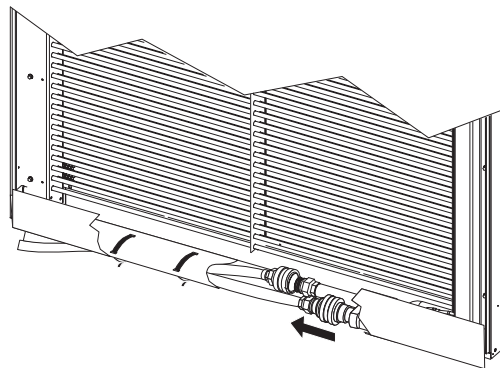   c. Install a hook-and-loop strap in the slots under the heat exchanger and wrap it around both hoses while you pull the hoses up tight against the bottom of the heat exchanger, securing them in place. Continue along the bottom of the door and install a second hook-and-loop strap to secure the hoses closer to the hinge or pivot side of the heat exchanger.

   d. Secure the hoses to the hinge or pivot side of the heat exchanger using approximately four hook-and-loop straps.

Check the heat exchanger after several hours of operation and repeat the air-purging process on both valves (trapped air from the hoses might have migrated to the heat exchanger). See "Filling the heat exchanger with water" on page 39 for information on how to connect the hoses.

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

Shipping a rack with the heat exchanger installed

Follow these guidelines when you ship a rack cabinet with the heat exchanger installed:

- Read the safety information that begins on page v. This information will help you work safely.
- Observe good housekeeping in the area where you are working. Place removed packing materials, tools, and other parts in a safe place.
- Install the two shipping brackets on the rear door heat exchanger.
- Reuse the original rack cabinet packing materials.

Installing the shipping brackets

There are two shipping brackets that you must install prior to shipping an IBM iDataPlex Rack Type 7825 with the rear door heat exchanger installed. One is located inside the rear door heat exchanger and the other is located on the outside bottom left corner.

To install the shipping bracket located inside the heat exchanger, complete the following steps with the rear door heat exchanger installed on the rack cabinet.
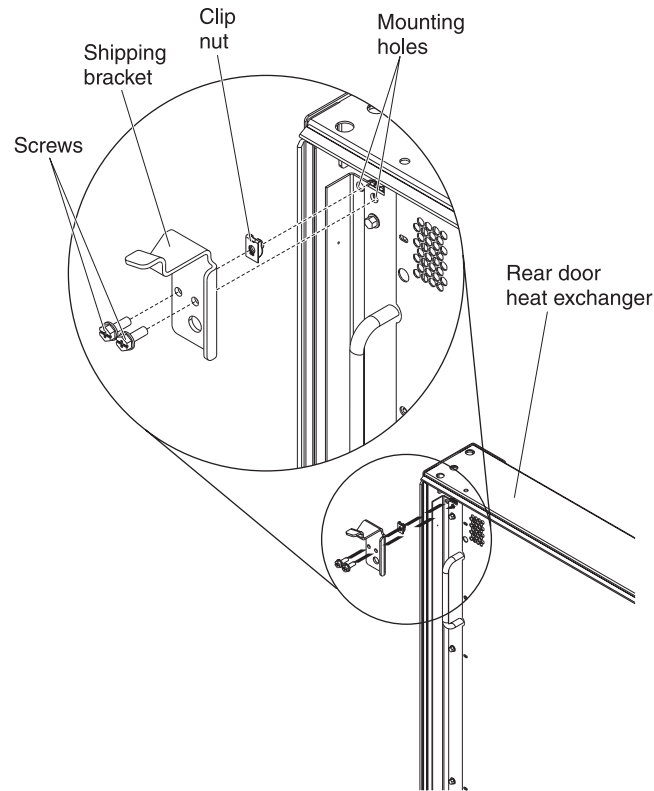
Figure 29. Installing and removing the shipping bracket

1. Open the rear door and locate the two mounting holes in the top-left corner of the rear door heat exchanger; then, install a clip nut on the left mounting hole.

2. Align the two top holes in the shipping bracket with the mounting holes on the rear door heat exchanger.

   Note: The larger hole in the shipping bracket fits over the M6 screw in the rear door heat exchanger.

3. Use two M6 screws to secure the shipping bracket to the heat exchanger; then, close and lock the rear door.

To install the shipping bracket on the lower left corner of the heat exchanger, complete the following steps.

Figure 30. Installing the rear door shipping bracket
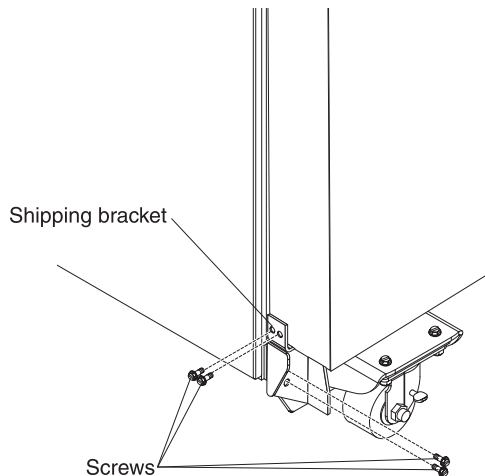
1. Align the slotted mounting hole on the bottom of the shipping bracket with the mounting hole on the bottom left corner of the rack cabinet; then, use two M6 screws to loosely secure the shipping bracket. Do not tighten the screws completely because you might need to further adjust the position of the bracket.
2. Push the shipping bracket against the side of the heat exchanger; then, use two M6 screws to secure the shipping bracket to the heat exchanger.
3. Tighten the two M6 screws under the left corner of the heat exchanger to secure the shipping bracket and heat exchanger to the rack cabinet.

Packaging the rack for shipment

To ship the rack with the heat exchanger installed, you must reuse or obtain new shipping materials. The following is a list of the shipping materials that you will need to ship the rack and heat exchanger:

- Ramp
- Pallet
- Shipping brackets with bolts
- System bag
- Cardboard
- Cardboard box
- Banding (new)

Statement 12:

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

To ship the rack with the heat exchanger installed, complete the following steps:

1. Remove one bolt from each of the shipping brackets and set them aside for future use; then, rotate the shipping brackets toward the center of the pallet.
2. Install the ramp on either side of the pallet.

Attention: Do not attach the ramp to the front or rear of the pallet. Pushing the rack cabinet onto the front or rear of the pallet will cause the rack cabinet to tip over, causing a safety hazard.
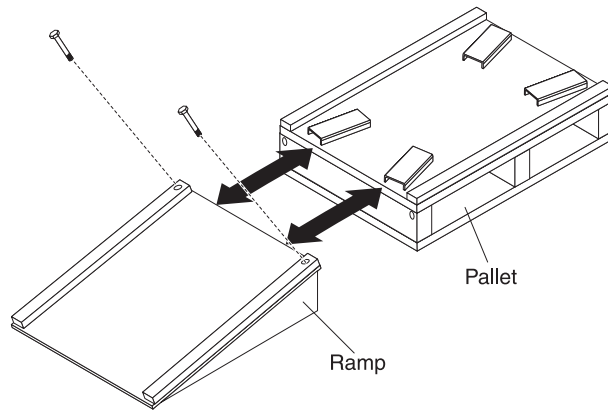
Figure 31. Install the ramp on the side of the pallet

    a. Position the ramp with the angled end of the ramp away from the pallet.

    b. Use the supplied wrench and two of the mounting bolts that were removed from the shipping brackets to secure the ramp to the pallet.

3. Slowly push the rack cabinet up the ramp and onto the pallet; then, remove the two bolts that secure the ramp to the pallet and set them aside.

4. Use the wrench that comes with the rack cabinet to lower each of the four leveling feet.
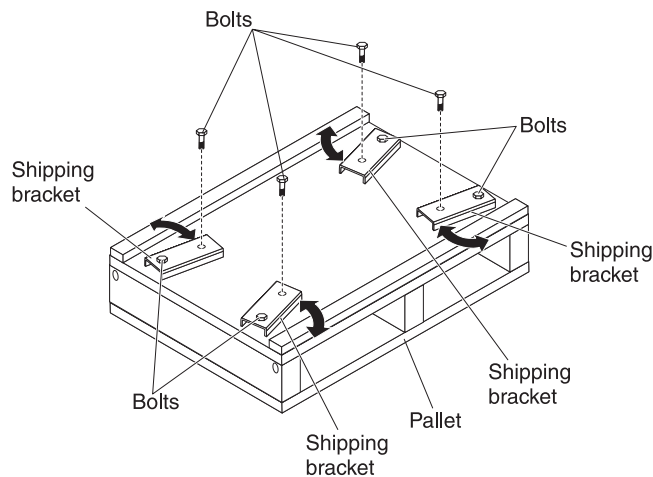
Figure 32. Installing the shipping brackets

5. Install the shipping brackets that secure the rack cabinet to the pallet.
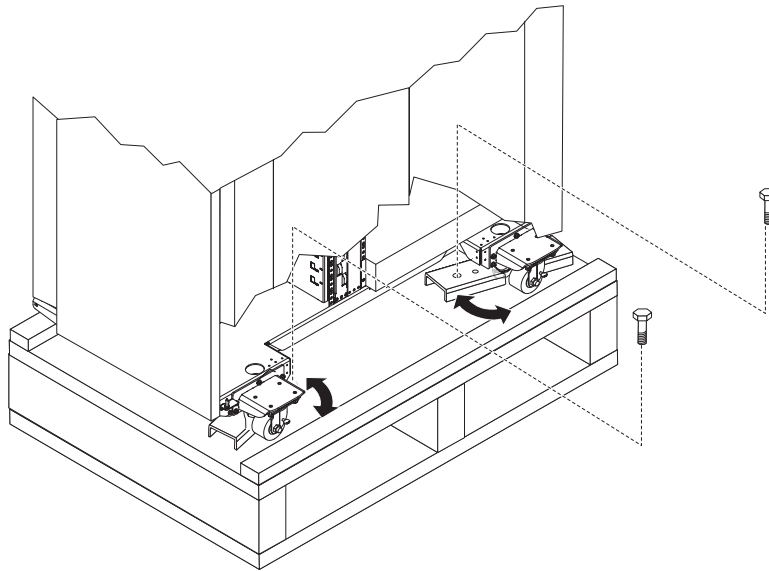
Figure 33. Rotate the shipping brackets

    a. Rotate the shipping bracket over the leveling foot; then, use one of the four bolts removed in step 1 on page 48 to secure the bracket to the pallet.

    b. Tighten the jam nut on the leveler until the jam nut comes in contact with the top of the shipping bracket.

    c. Repeat steps 5a and 5b for each of the brackets; then, continue to step 6.

6. Place the system bag and cardboard on the rack.

7. Place the ramp on the pallet in front of the rack.

8. Use new banding to secure the cardboard and the rack to the pallet.

Chapter 4. Maintaining the heat exchanger

This chapter provides instructions for maintaining your heat exchanger.

Attention:

1. Because of the size and weight of the heat exchanger, a lift tool and a minimum of two or more trained service technicians or a lift tool and professional movers are required to remove or install the heat exchanger.

2. You must remove the power from the rack cabinet 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 34. Components of the heat exchanger

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 perform procedures on the heat exchanger.

Draining the heat exchanger

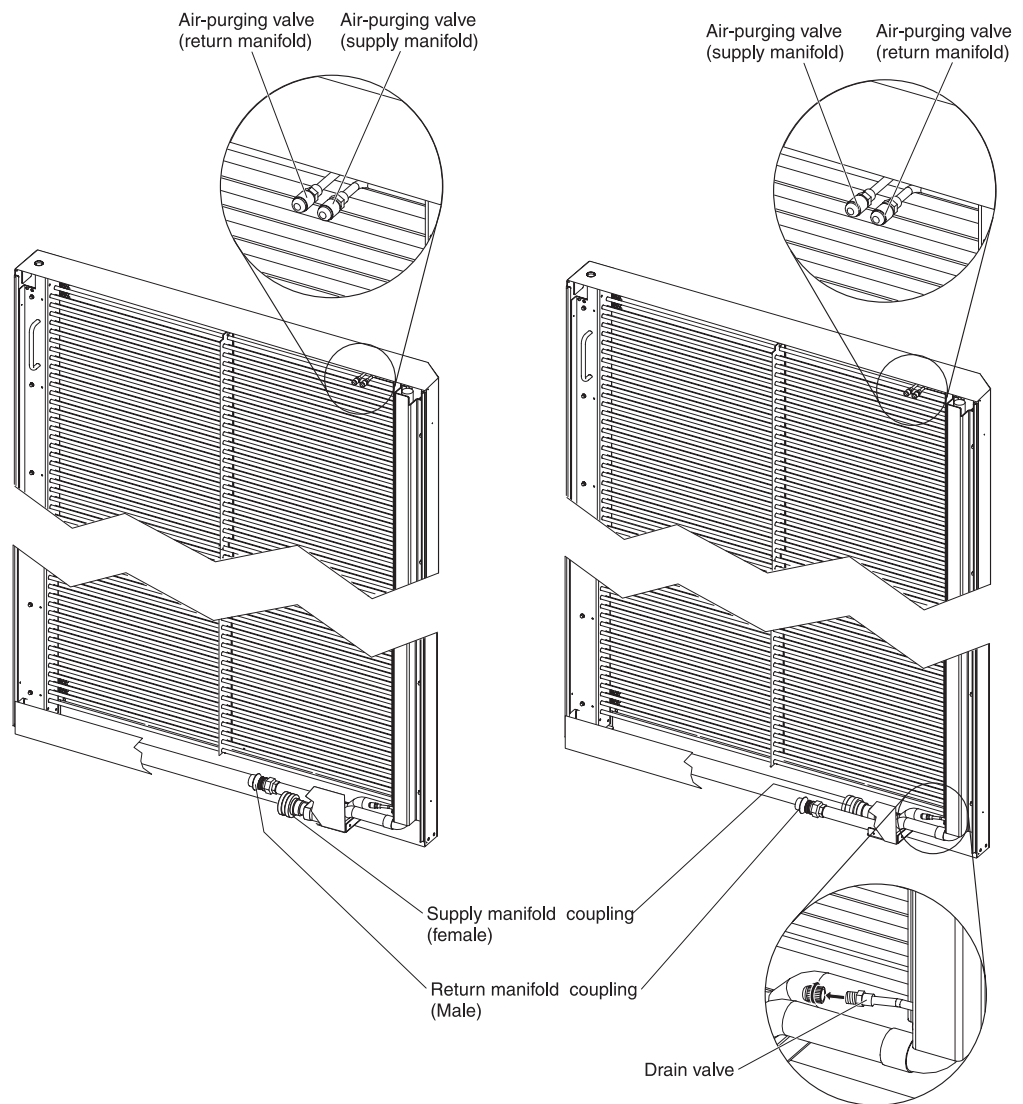Perform this procedure before you have the heat exchanger removed from the rack cabinet or when directed to do so by an IBM service representative. The drain port is at the bottom of the heat exchanger, near the supply and return couplings.

Attention: Wear safety googgles, 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.

   Statement 14:

   CAUTION:
   Goggles are needed for the procedure.

   (L011)

2. Disconnect the return hose and the supply hose from the heat exchanger and move them out of the way.
3. Remove and retain the valve caps from the air-purging valves and from the drain port.
4. Remove the extension hose from the air-purging tool, if it is connected.
5. Place the drain end of the air-purging tool into a 11.4 liter (3 gallon or larger) container.
6. Attach the air-purging tool to the drain valve. 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.
7. Attach the extension hose to one of the air-purging valves at the top of the heat exchanger to allow air to enter the manifolds. Make sure 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.

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 port.

8. When the water flow at the drain port stops, move the extension hose or compressed-air hose to the other air-purging valve and repeat the process.

9. 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 hose from the drain valve.

   c. Screw the valve caps onto the air-purging valves 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 attach 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 will be 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 attach 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 will be 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 39 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. See Appendix A, "Getting help and technical assistance," on page 57 for service or assistance information.

1. Drain the water from the heat exchanger. (See "Draining the heat exchanger" on page 52 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 39 for instructions.)

Maintenance schedule

Perform the following maintenance tasks at the indicated time intervals.

Table 6. Maintenance schedule

Task	When to perform
Inspect the heat-exchanger fins for air blockage at the fins (from dust, dirt, debris, and so on).	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

Replaceable components are of three types:

- **Tier 1 customer replaceable unit (CRU):** Replacement of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation.
- **Tier 2 customer replaceable unit:** 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 server.
- **Field replaceable unit (FRU):** FRUs must be installed only by trained service technicians.

See Table 7 on page 55, to determine whether a component is a Tier 1 CRU, Tier 2 CRU, or FRU.

For more information about the terms of the warranty and getting service and assistance, see the *Warranty and Support Information* document on the IBM *Documentation* CD.

Table 7. CRU/FRU parts for the rear door heat exchanger

Description	CRU part number (Tier 1)	CRU part number (Tier 2)	FRU part number
Rear Door Heat eXchanger assembly			44W4694
Hinge kit		46C6969	
Upper air baffle kit	46C6301		
Lower air baffle kit	46C6300		
Purge tool kit	12R9301		

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. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your system, and whom to call for service, if it is necessary.

Note: IBM has selected Coolcentric to provide service and support for the IBM Rear Door Heat eXchanger for the iDataPlex Rack. For service, call (+1) 603-635-5199.

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.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Problem Determination and Service Guide* on the IBM *Documentation* CD that comes with your system.
- Go to the IBM support Web site at http://www.ibm.com/systems/support/ to check for technical information, hints, tips, and new device drivers or to submit a request for information.

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/systems/support/ and follow the instructions. 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, the IBM Web site has up-to-date information about IBM systems, optional devices, services, and support. The address for IBM System x® and xSeries information is http://www.ibm.com/systems/x/. The address for IBM iDataPlex information is http://www.ibm.com/systems/x/hardware/idataplex/index.html. The address for IBM BladeCenter information is http://www.ibm.com/systems/bladecenter/. The address for IBM IntelliStation® information is http://www.ibm.com/intellistation/.

You can find service information for IBM systems and optional devices at http://www.ibm.com/systems/support/.

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with System x and xSeries servers, BladeCenter products, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, see http://www.ibm.com/services/sl/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 IBM Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. See http://www.ibm.com/planetwide/ for support telephone numbers, or 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

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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.

United Kingdom telecommunications safety requirement

Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

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.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

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 Community contact:
    IBM Technical Regulations
    Pascalstr. 100, Stuttgart, Germany 70569
    Telephone: 0049 (0)711 785 1176
    Fax: 0049 (0)711 785 1283
    E-mail: tjahn@de.ibm.com

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Chinese Class A warning statement

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を講ずるよう要求されることがあります。　　　　　　　　VCCI-A

Korean Class A warning statement

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