Precision Cooling for
Business Critical Continuity

Liebert XDO™

User Manual

14 & 16kW Nominal Capacity, 50 & 60 Hz

Liebert®

EMERSON™
Network Power

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1.0 XDO Component Locations and Model Number Nomenclature

Figure 1 XDO component locations

XDO Components and Nomenclature

1. Hinged, Removable Fan Tray
2. Evaporator Coil
3. Evaporator Fan
4. Serial Tag
5. Internal Mounting Bracket
6. Condensate Detection Option
7. On/Off Switch
8. Circuit Breaker
9. Quarter-Turn Fasteners
10. Knockout High-Voltage Connection
11. Knockout Low-Voltage Connection

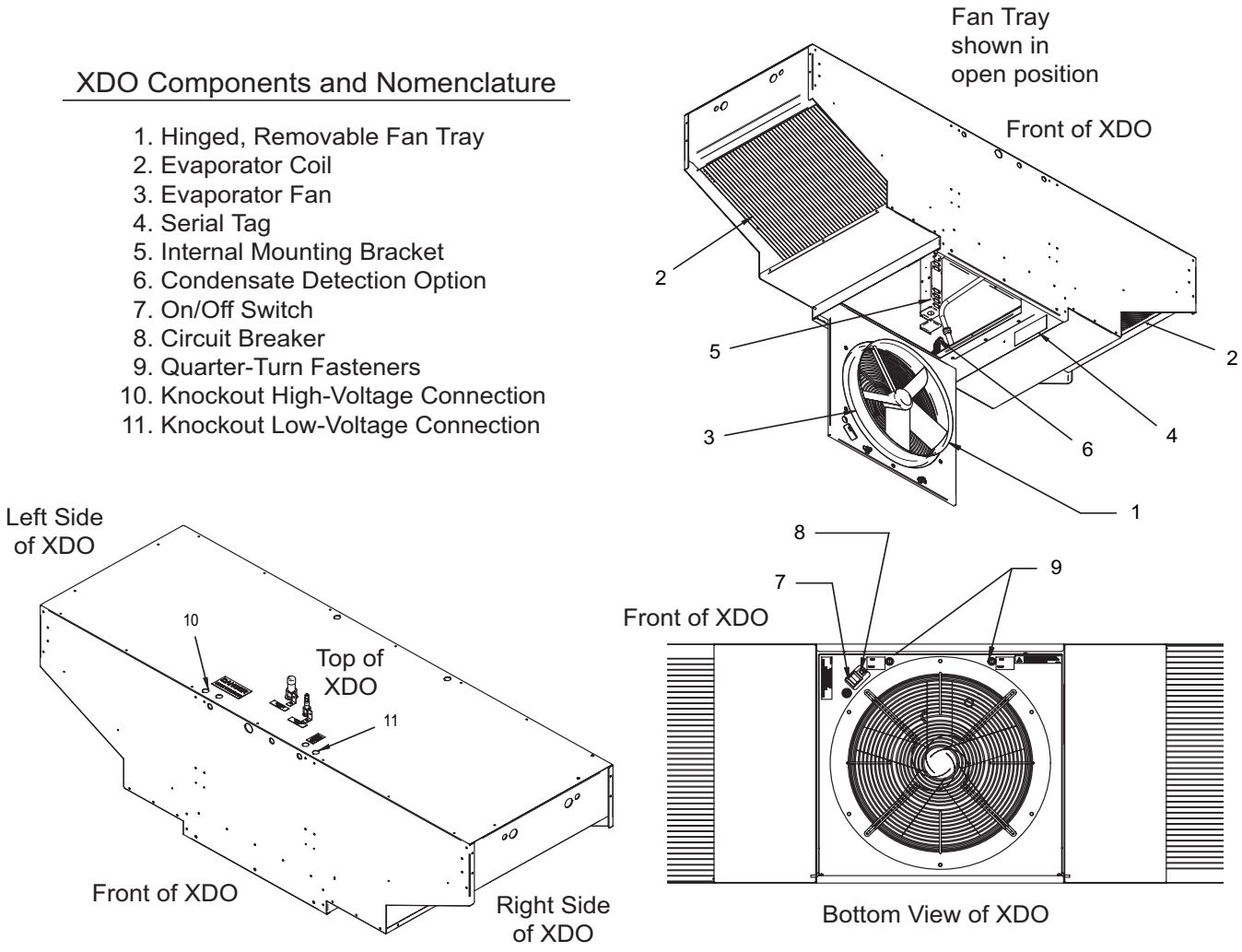


Figure 2 Model number nomenclature

Example: XDO16BK– –0

XD	O	16	B	K	–	–	0
Liebert X-treme heat density system	Overhead cooling module	16 kW nominal capacity	B = Basic unit D = Condensate detection	K = 120V-1ph-60Hz T = 220-240V-1ph-60Hz, 220-240V-1ph- 50Hz S = 230 V- 1 ph-50Hz	Place holder	Place holder	Revision level

2.0 INSTALLATION

2.1 References

This document must be used together with site-specific documentation and documentation for other parts of the system.

2.2 Pre-Installation Checks

1. Verify that the XDO unit voltage matches the available utility power. The nameplate with this information is on the bottom of the cooling module, near the fan.
2. Check the received materials to be sure all required assemblies and parts have been received. If you discover any external damage, report them to the shipping company and your local Liebert representative.
3. When unpacking and handling the XDO module, extra care should be taken to prevent damage to the coils.

2.3 Parts Included With XDO

- Installation manual (this document)
- XDO module
- Mounting kit parts with the following items:

Part	Qty	Qty Required
3/8" hex nuts:	16	8
3/8" small washers:	4	4
rubber bushings:	8	8
metal sleeves:	8	4
3/8" large washers:	4	4
3/8" Nylok nuts:	4	4

2.3.1 Optional Items

- Lighting units
- External mounting kit

Part	Qty
external mounting brackets	2
1/4-20 x 3/4 bolts	6
1/4-20 Nylok nuts:	6

2.4 Installation Considerations

The XDO module is to be securely mounted to the overhead building structure. It is typically hung 18-24" (457-610mm) above the heat-dissipating equipment. A suspended ceiling, if one exists, should be at the same level as the top of the XDO. If the suspended ceiling has open grates, it may be the same level as the bottom of the XDO.

Determine whether the installation will include the optional lighting units. Attaching a lighting unit requires two XDO modules mounted against each other (see **8.0 - Mounting Optional Light Units**). The lights require separate power connections.

Table 1 Application limits

Input Voltage		Range of Return Air Conditions to Unit	
Minimum	**Maximum**	**Dry Bulb Temp.**	**Relative Humidity**
-10%	+5%	60° to 100°F (16° to 38°C)	20% to 80%

2.4.1 Room Preparation

The room should be well insulated and must have a sealed vapor barrier. The vapor barrier in the ceiling and walls can be a polyethylene film. Paint on concrete walls and floors should contain either rubber or plastic.

NOTE

The vapor barrier is the single most important requirement for maintaining environmental control in the conditioned space.

Outside or fresh air should be kept to a minimum when temperature and humidity must be tightly controlled. Outside air adds to the cooling, heating, dehumidifying and humidifying loads of the site. Doors should be properly sealed to minimize leaks and should not contain ventilation grilles.

3.0 GENERAL PRODUCT INFORMATION

3.1 Product/System Description

3.2 Introduction

The Liebert XDO is an overhead cooling system designed for installation above heat-dissipating equipment. A fan draws hot air exhausted from the equipment through two cooling coils and discharges cool air back down to the equipment (see **Figure 3**). The system consists of XDO modules, XDP/XDC coolant distribution units, power and signal cabling and interconnecting piping (see **Figure 4**).

Liebert's XDP/XDC monitors room conditions and prevents coil condensation by maintaining the temperature of the coolant pumped to the XDOs above the room dew point.

Figure 3 Generic air flow schematic

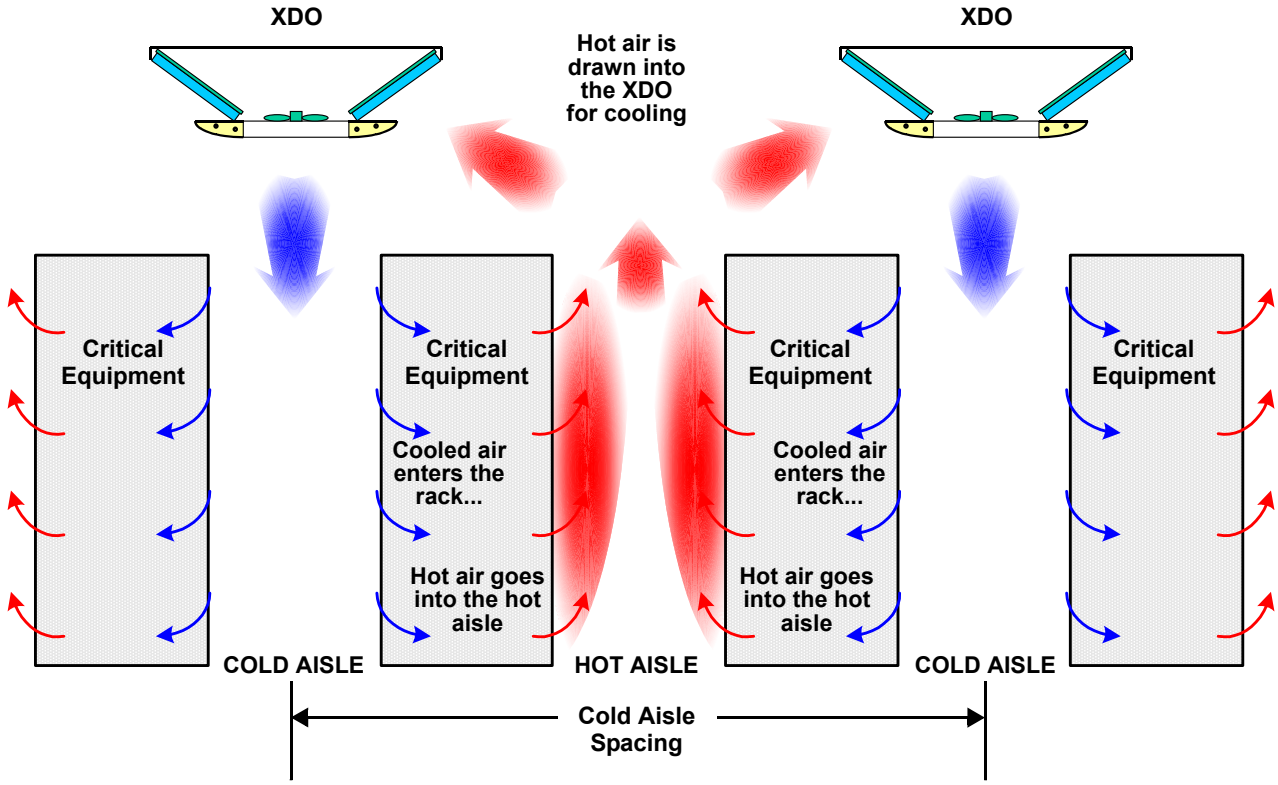
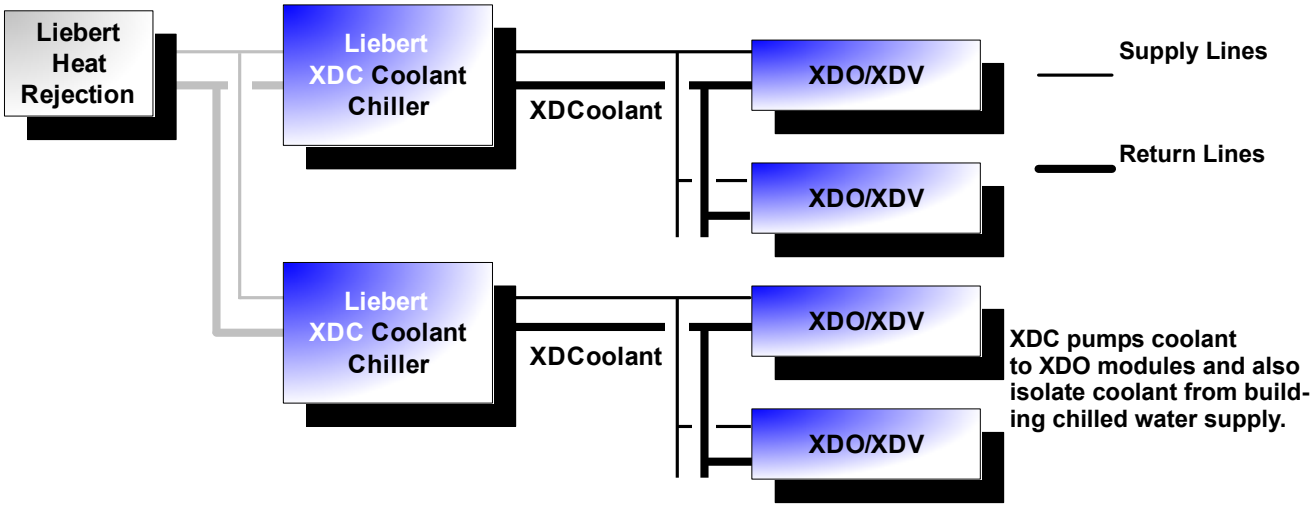


Figure 4 Generic piping schematic



3.3 Equipment Inspection

Upon arrival of the unit, and before unpacking, verify that the labeled equipment matches the Bill of Lading. Carefully inspect all items for either visible or concealed damage. Damage should be immediately reported to the carrier and a damage claim filed with a copy sent to Liebert Corporation or to your sales representative.

3.3.1 Recyclable Packaging

All material used to package this unit is recyclable. Please save for future use or dispose of the material appropriately.

WARNING

Improper handling can cause equipment damage, injury or death! Read all of the following instructions before attempting to move, lift, remove packaging from, or preparing unit for installation.

CAUTION

Risk of sharp edges, splinters and exposed fasteners can cause personal injury!

Only properly trained personnel wearing appropriate safety headgear, gloves, shoes and glasses should attempt to move, lift, remove packaging from, or prepare unit for installation.

CAUTION

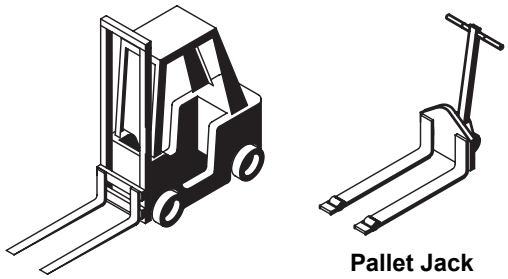
Risk of damage from fork lift!

Improper handling with the fork lift can cause exterior and/or underside damage! Keep tines of the fork lift level and at a height suitable to fit below the skid.

CAUTION

Risk of unit damage if improperly stored! Keep the unit indoors and protected from dampness, freezing temperatures and contact damage.

Figure 5 Recommended unit handling equipment



3.4 Unit Handling

If possible, transport the unit using a fork lift or pallet jack.

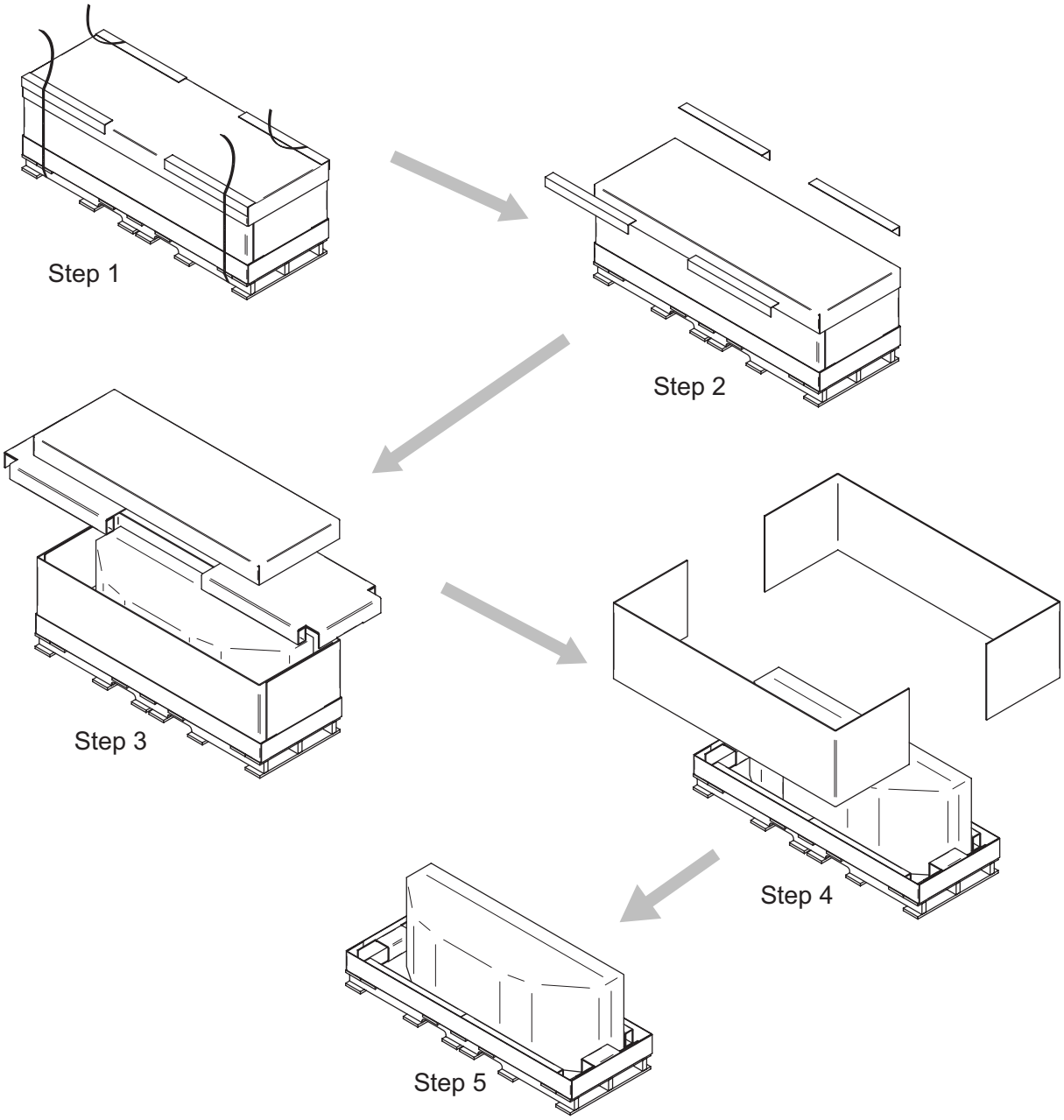
- If using a fork lift or pallet jack, ensure that the fork tine length is suitable to safely move the packaged unit.
- It is recommended by Liebert Corporation that the unit remain in the protective packaging until located at the installation site.
- When handling and unpacking the unit, exercise great care to prevent damage to the coil fins (see **Figures 6**, **7** and **8**).

3.5 Unpacking the Unit

3.5.1 Domestic Packaging

- Remove outer packaging when ready to install the XDO.
- Keep the XDO covered by the unit bag until removal from pallet.

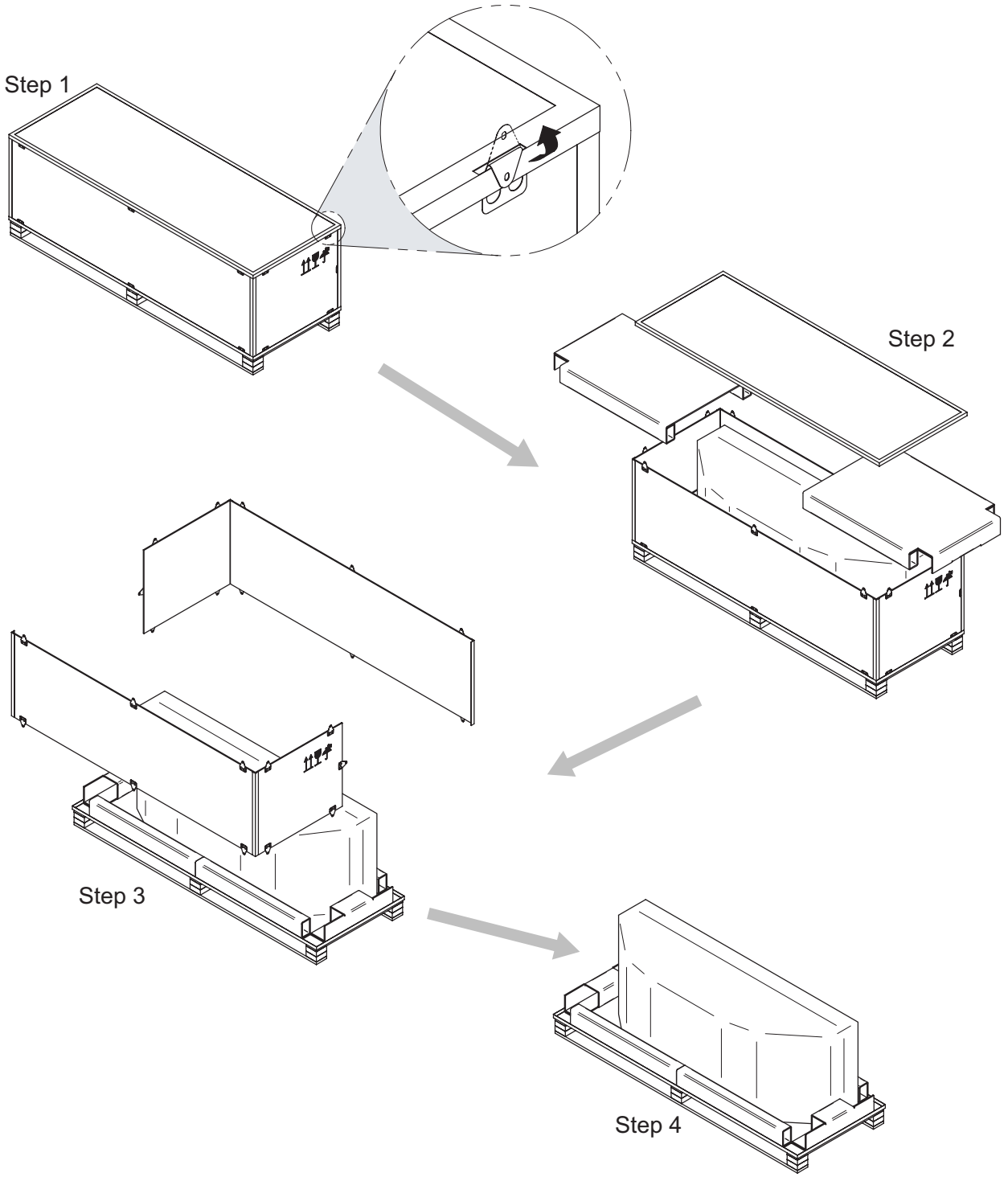
Figure 6 Removing domestic shipping package



3.5.2 Export Packaging

- Unbend all metal tabs as indicated in Step 1 in **Figure 7** below.
- Remove outer packaging when ready to install the XDO.
- Keep the XDO covered by the unit bag until removal from pallet.

Figure 7 Removing export shipping package



3.5.3 Removing the XDO from the Pallet

1. Unfold the unit bag to expose the XDO.
2. Verify the nameplate information found on the XDO against the bill of lading information. If the information does not match the product specified, contact your local sales representative.
3. At least two properly trained personnel may lift the XDO off of the pallet and onto a flat surface, as shown in **Figure 8**.
4. To protect the painted surface of the XDO, lay a piece of protective material, the length of the unit, on the flat surface before moving the XDO.

Figure 8 Removing XDO from shipping pallet

Removing the XDO from its shipping pallet requires two people.

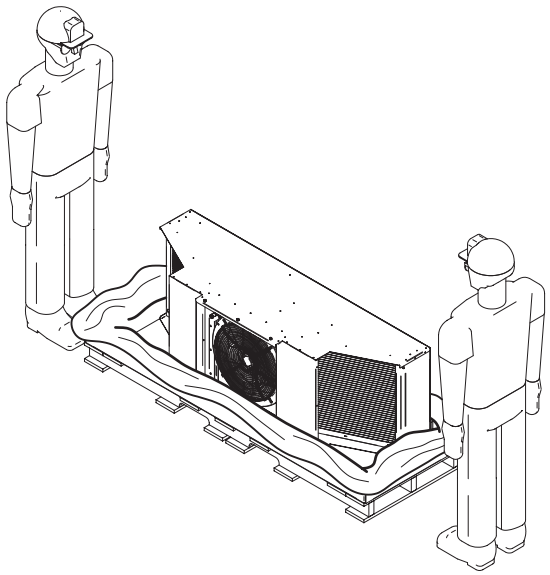
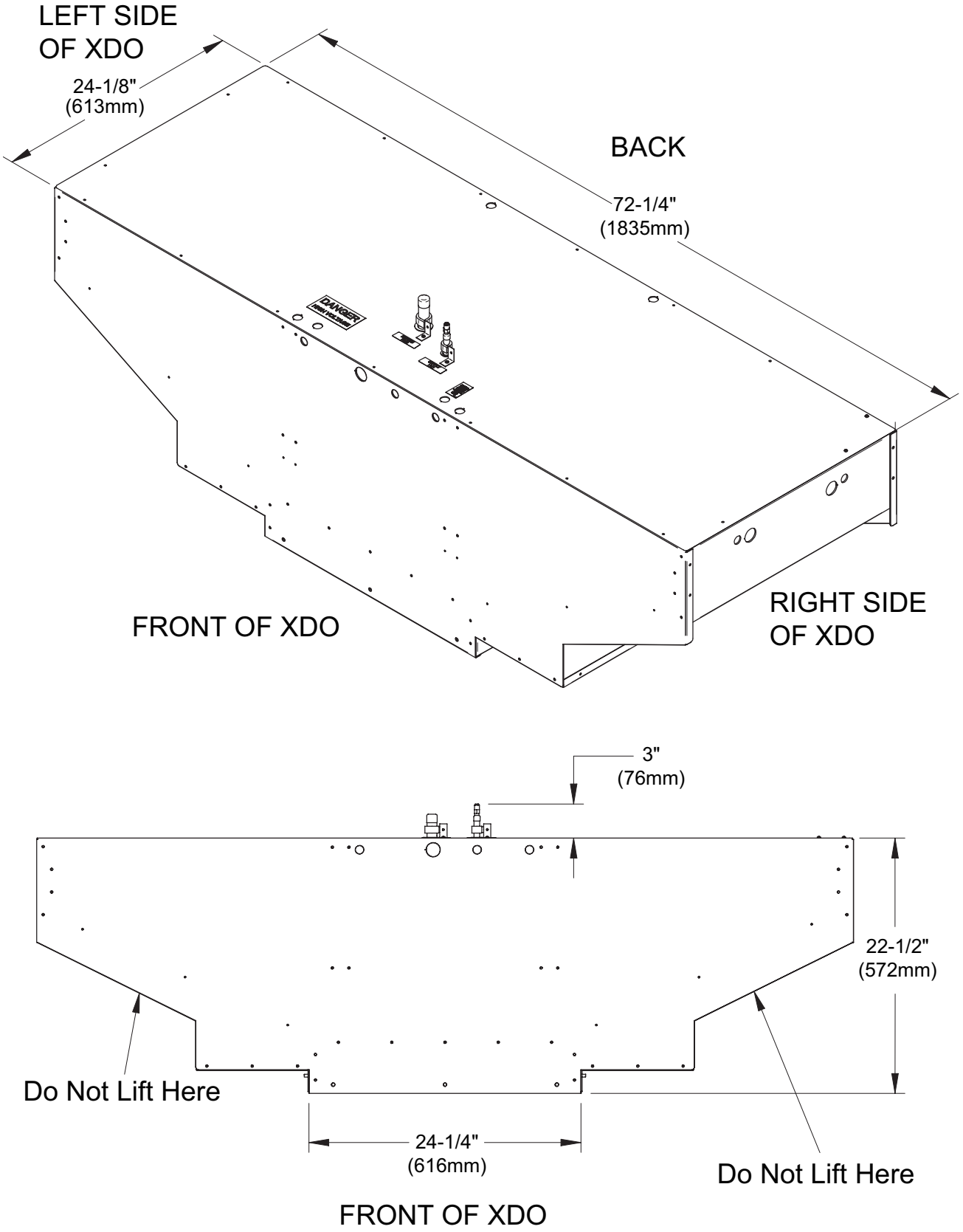


Figure 9 General arrangement and overall dimensions



4.0 MECHANICAL CONSIDERATIONS

WARNING

Be sure to securely anchor the top ends of the suspension rods. Make sure all nuts are tight.

4.1 Locating in Ceiling, Spacing

The distances between the XDO modules are determined by the heat density to be cooled. Refer to site-specific drawings for exact spacing.

The optional lighting units require a pair of XDO units installed either front-to-back or back-to-back (determined by electrical and coolant access locations).

4.1.1 Weight Distribution

The weight is evenly distributed within the XDO unit.

4.2 Leveling

The XDO modules must be mounted so that they are level within 1/2" (13mm) end-to-end.

4.3 Ceiling Preparation

The XDO module must be securely mounted to the overhead building structure. This may require reinforcing the overhead building structure and supports of existing buildings.

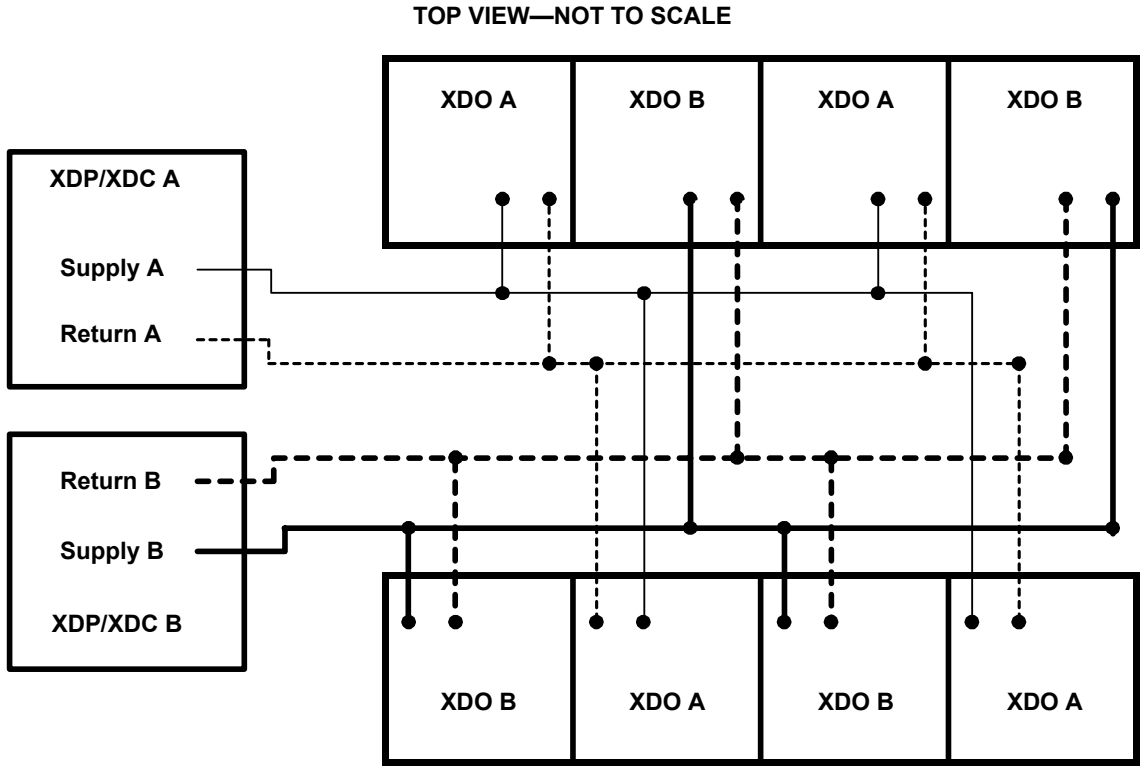
Be sure to follow all applicable codes.

4.4 System Connection Configuration

If possible, connect the XDO modules to XDPs or XDCs in an interlaced configuration (see **Figure 10**). Interlacing the connection piping will keep half the XDP/XDC units operating and maintain even cooling in the conditioned space should one of the XDP or XDC units fail.

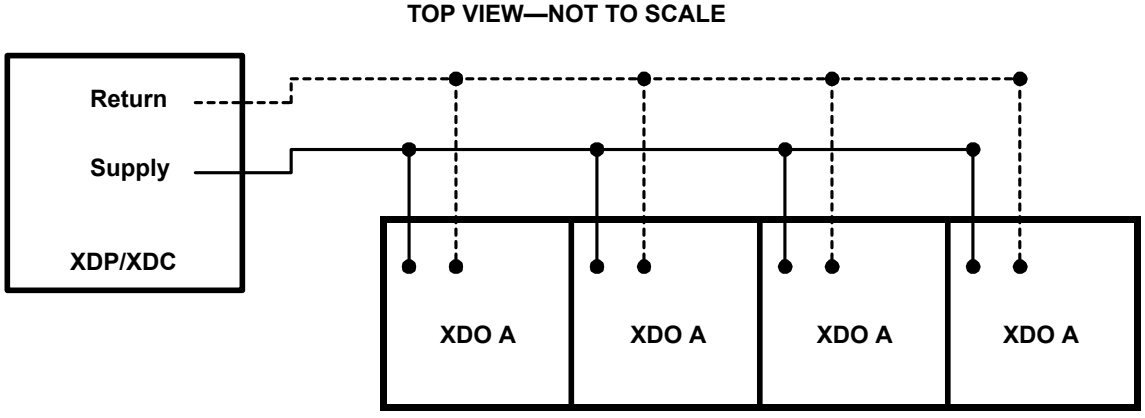
However, in a system with just one XDP or XDC, connect XDO modules in a non-interlaced configuration (see **Figure 11**).

Figure 10 Typical XDO piping—interlaced connections



NOTE: Line size does NOT indicate pipe size difference.

Figure 11 Typical XDO piping—non-interlaced connection



5.0 ATTACHING SUSPENSION HARDWARE AND MOUNTING THE UNIT

The XDO may be suspended from the overhead building structure in either of two ways, using field-supplied threaded suspension rods.

- Inserting the rods through internal mounting brackets
- Attaching the rods to external brackets and attaching those to the XDO's front and rear panels

5.1 Opening Hinged, Removable Fan Tray

Internal mounting brackets and some wiring connections are accessible only when the XDO's fan tray is open. To open the fan tray:

1. Shut off power to the XDO unit to be opened by flipping power switch to the Off position before working on unit (see **Figure 12**).
2. Slowly unthread electrical connector from its mating half before opening the fan tray.
3. Turn the quarter-turn fastener to open the fan tray.
4. To service the interior of the XDO or to install threaded rods for installation, back out two M6 screws on the removable fan tray.
   The fan tray may now be removed.

Figure 12 Opening or removing hinged fan tray

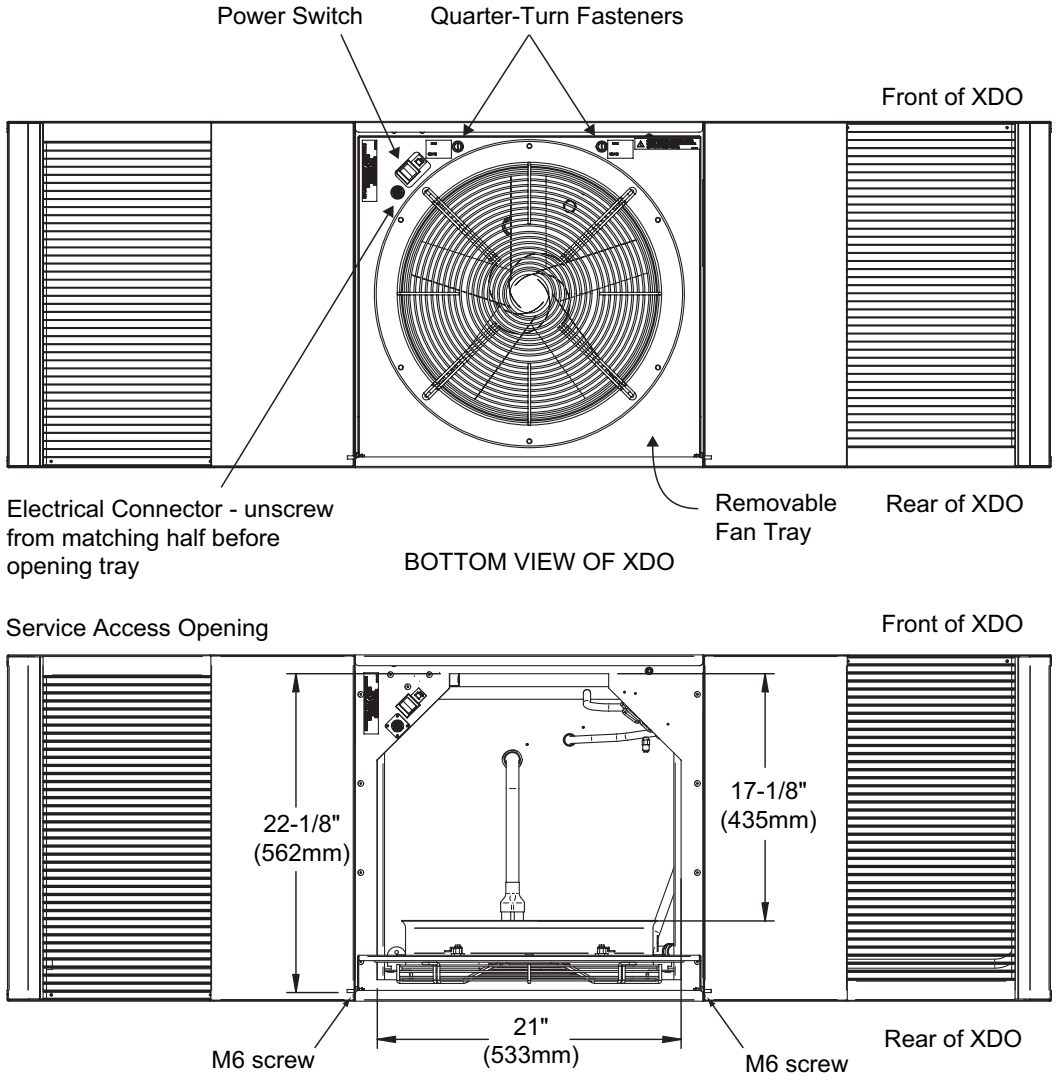
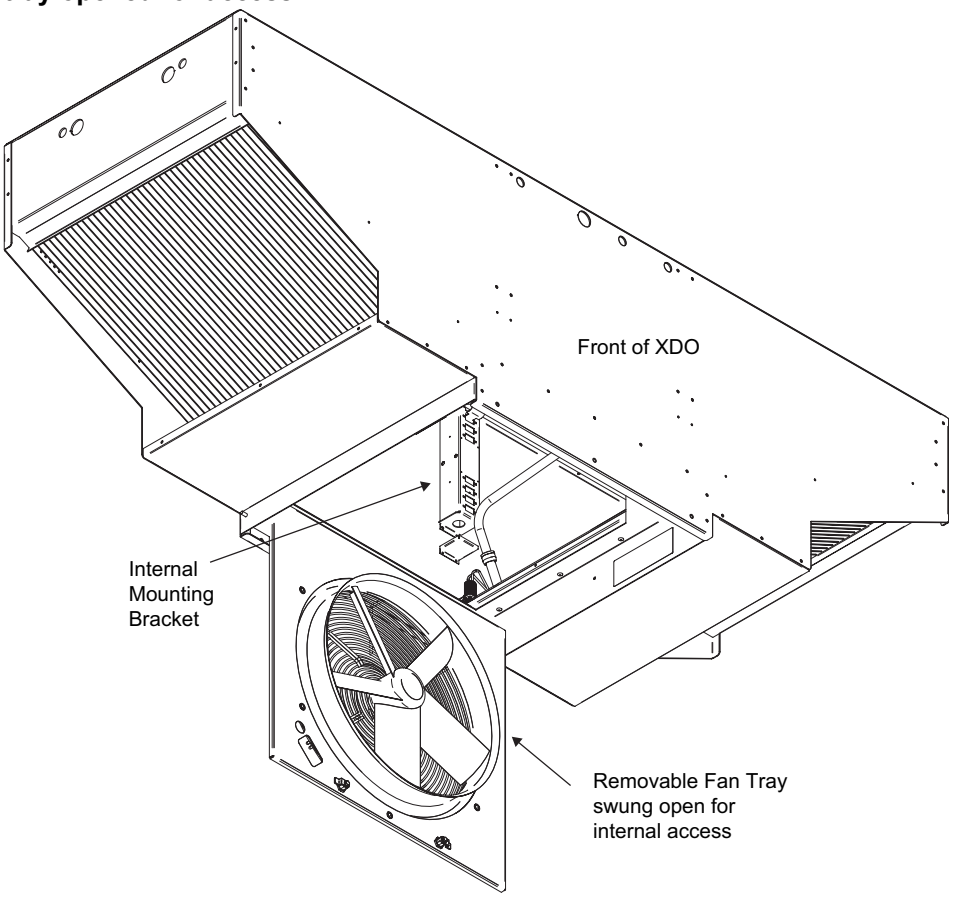


Figure 13 Fan tray opened for access



5.2 Installation With Internal Mounting Brackets

Before beginning, take precautions to ensure that the equipment below the XDO will not be damaged if the XDO, a piece of hardware or installation tool is dropped.

1. Insert a 3/8" threaded rod into one of the internal mounting brackets.
   Two mounting brackets and their associated access holes are near the front of the XDO and two are near the back of the unit. Locate the holes by referring to **Figure 14**.
2. Hardware to secure the rod to the XDO must be installed as shown in **Figure 15** (above the bracket, arrange the components from top to bottom: Nylok nut, 3/8" small washer and a bushing; below the bracket, from bottom to top: Nylok nut, 3/8" large washer, a bushing and a sleeve).
3. Tighten the Nylok nuts firmly.
   Repeat for each of the four rods, checking to ensure that the XDO will be level when suspended for operation.
4. Using either lifting equipment or adequate personnel, raise the XDO to mounting connections in the overhead building structure and secure the unit using field-supplied hardware.
5. Adjust the Nylok nuts so that the weight of the unit is supported evenly by the four (4) rods and the unit is level within 1/2" (13mm) end-to-end.

Figure 14 Mounting hole locations

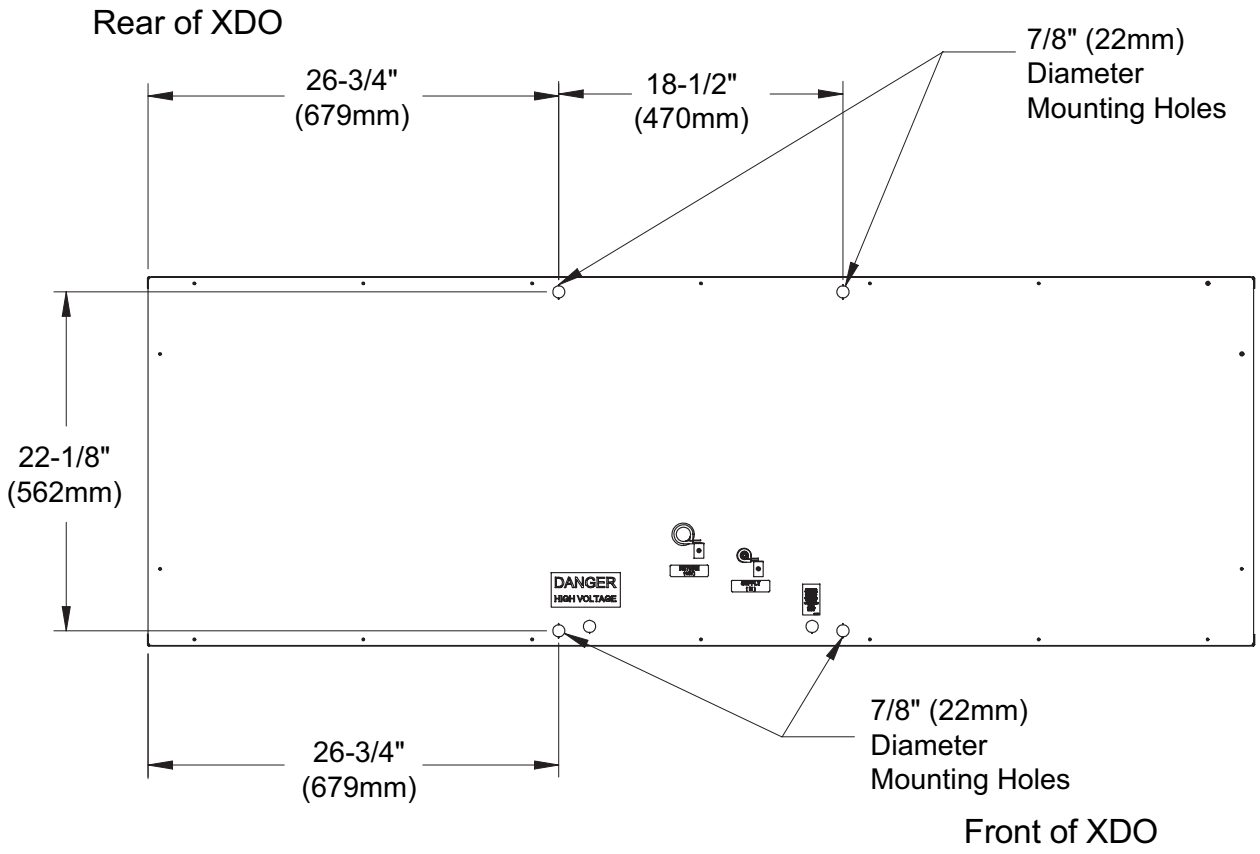
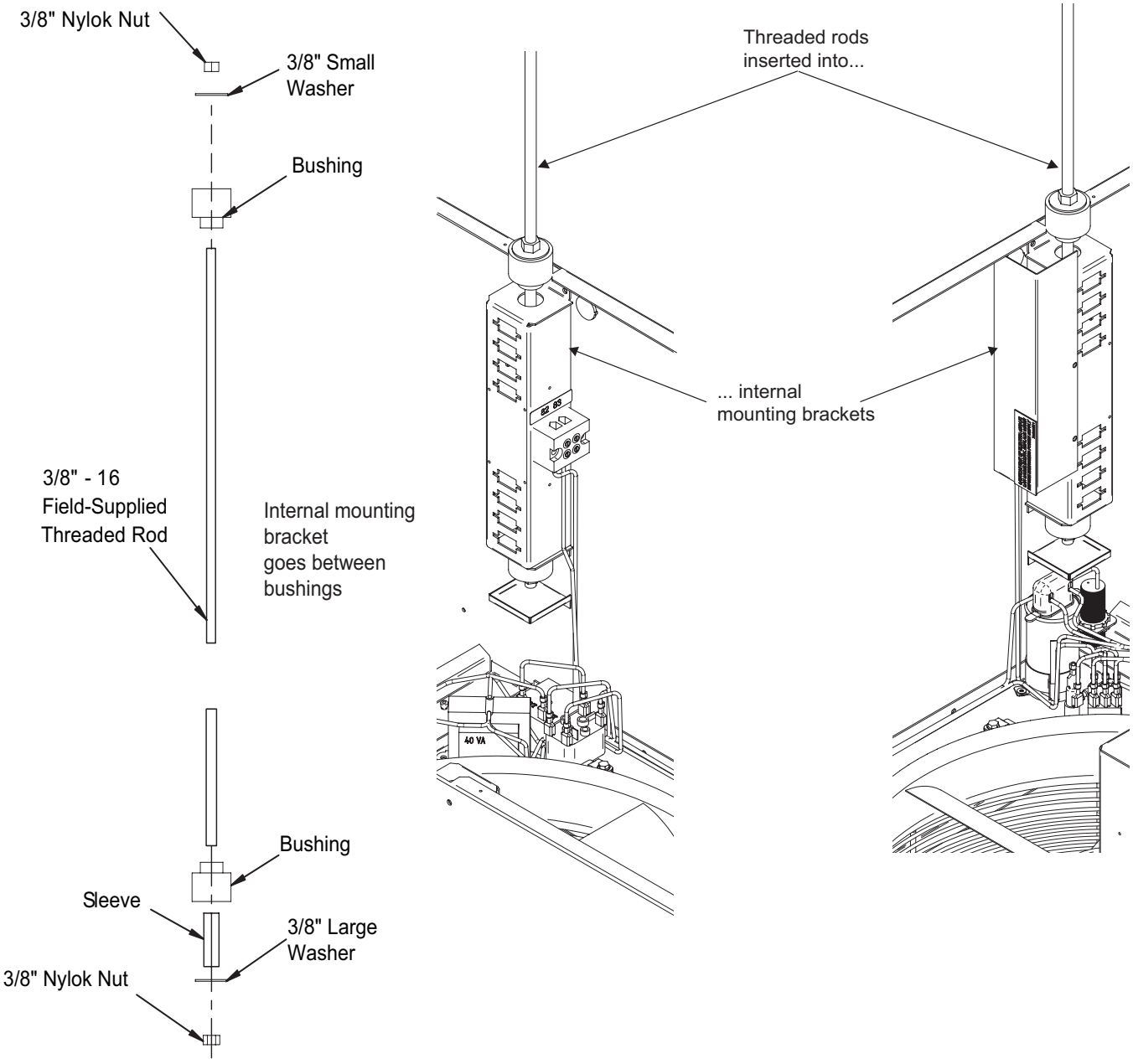


Figure 15 Threaded rod and internal mounting kit installation



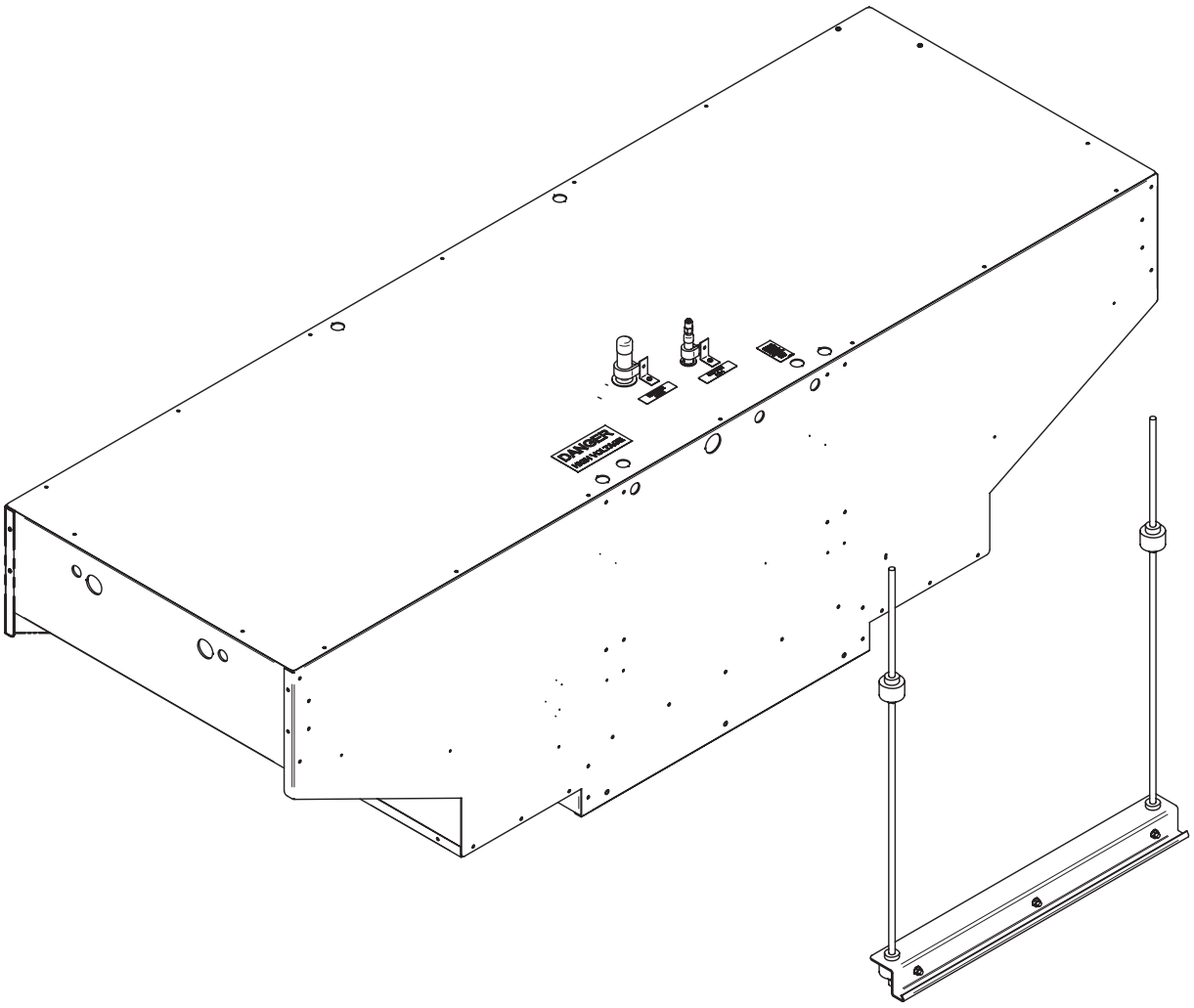
5.3 Installation With External Mounting Brackets

An optional external mounting bracket kit may be used to hang XDO units. This kit attaches to the front and rear of the XDO and are used to secure the unit to the overhead building structure.

To use the external mounting brackets:

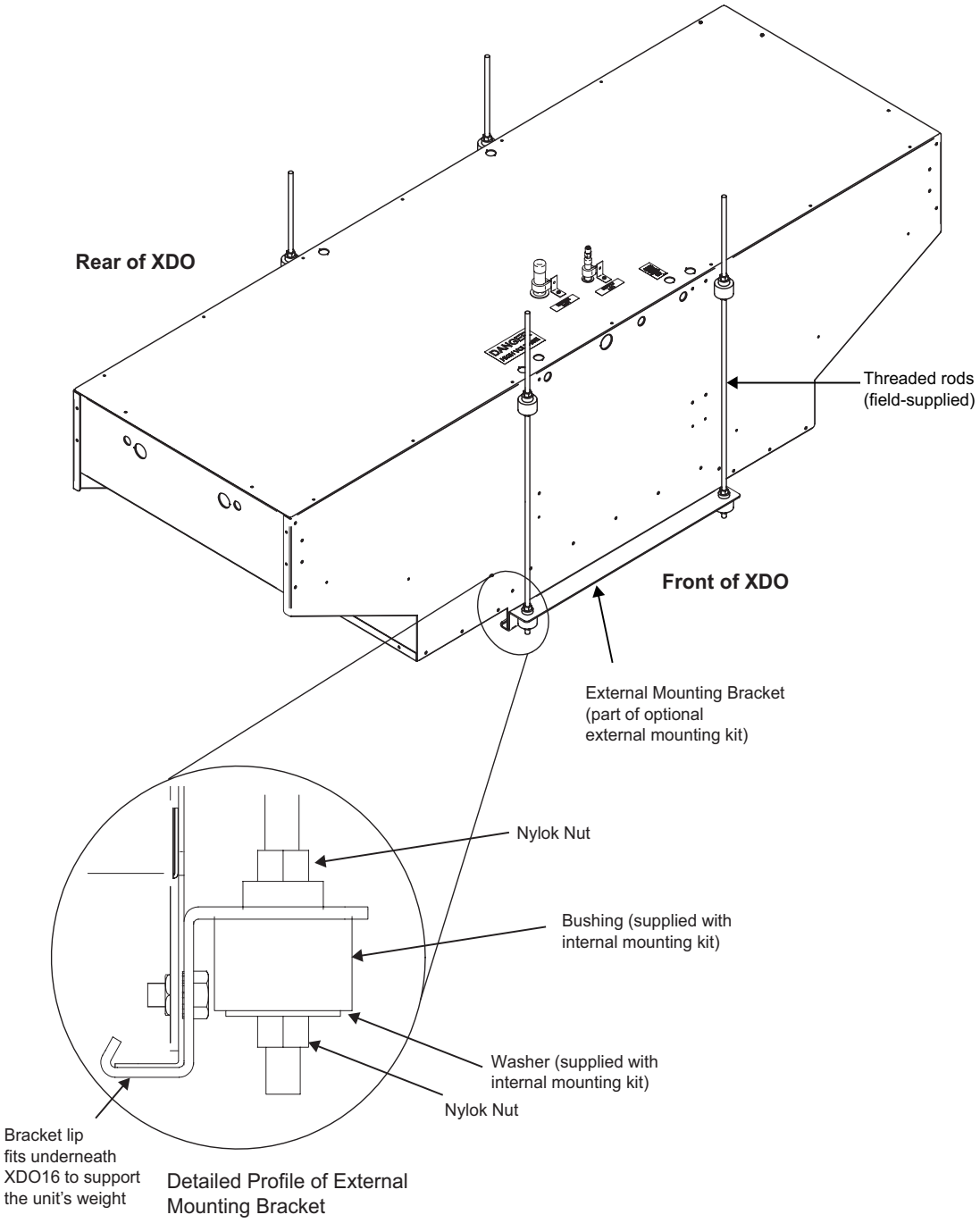
1. Attach two field-supplied threaded rods to a mounting bracket, using two nuts, two washers and a bushing, as shown in **Figure 17**.

Figure 16 External mounting kit for XDO



2. Place the bracket against either the front or rear panel of the XDO, making sure that the lip along the bottom of the bracket fits under the bottom of the panel.
3. Secure the bracket to the XDO using three nuts and bolts supplied with the mounting kit as shown in **Figure 17**.
4. Using either lifting equipment or adequate personnel, raise the XDO to mounting connections installed in the overhead building structure and secure the unit using field-supplied hardware.

Figure 17 Detailed view of mounting kit attached to front panel



6.0 ELECTRICAL CONNECTIONS

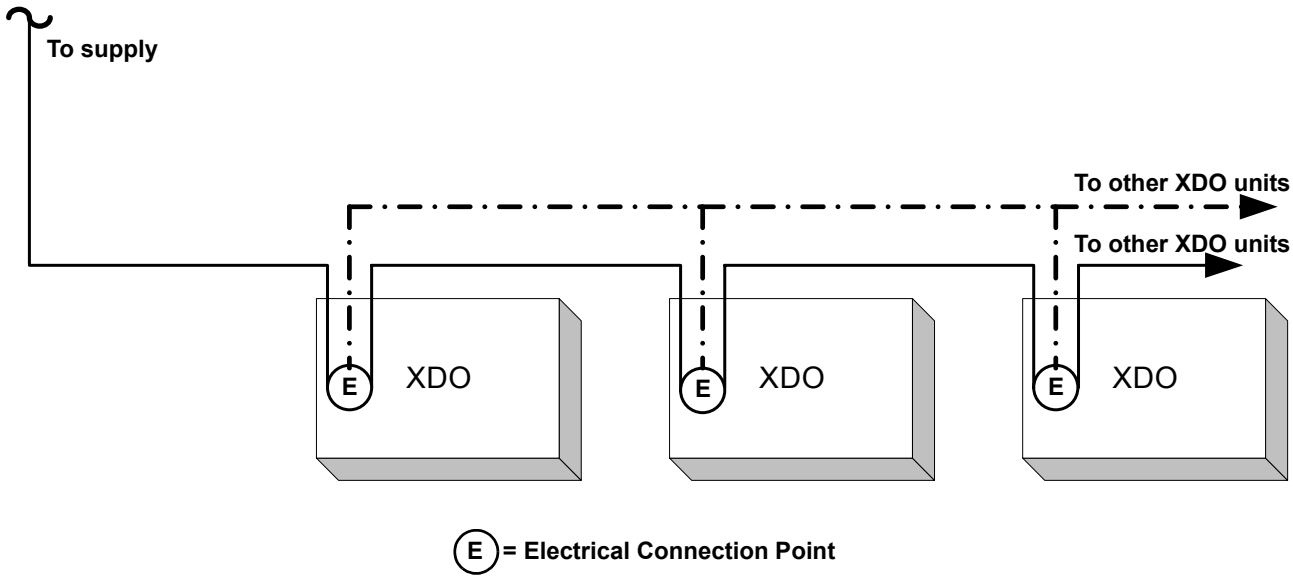
The appliance must be installed in accordance with national wiring regulations Refer to the unit's serial tag for electrical requirements.

CAUTION
Use copper wiring only. Make sure that all connections are tight.

The voltage supplied must agree with the voltage specified on the unit serial tag.

NOTE
All electrical data maybe found in ***Table 3 - Liebert XDO specifications****.*

Figure 18 XDO electrical connection diagram



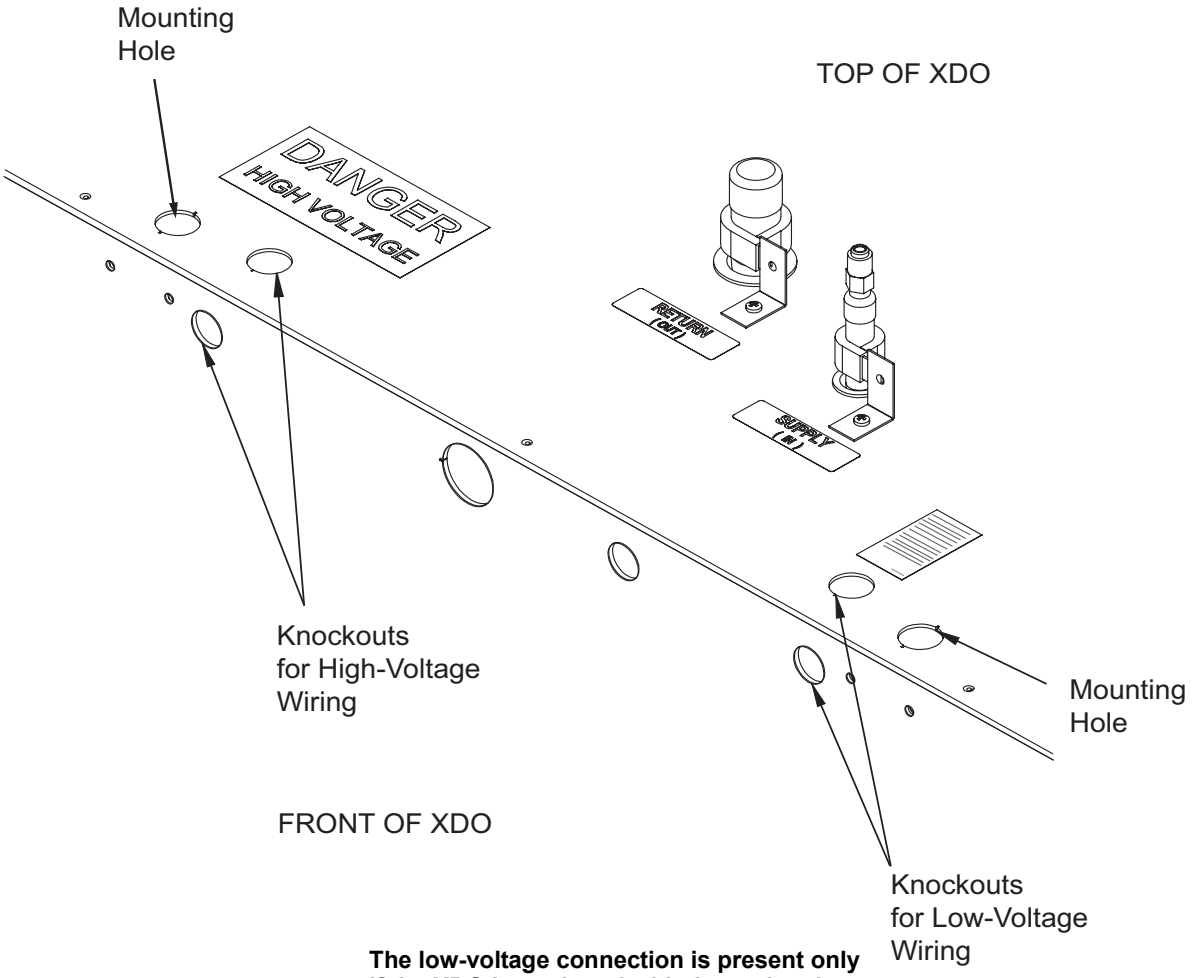
6.1 Connecting High Voltage Cables

WARNING
Risk of electric shock. Can cause injury or death.
Disconnect all local and remote electric power before working within the unit.

CAUTION
Sharp edges and heavy parts may cause personal injury.
Wear gloves to prevent injury to hands.
Damage to wiring or components may make unit unsafe to operate.
Use caution when installing wiring to prevent damage to factory wiring.
Install protective bushings in wiring knockouts as required
Do not disturb factory wiring or route field-installed wiring over electrical terminals.
Use NEC Class 1 wiring for all hazardous voltage electrical power supplies.
Check and retighten all wiring connections before starting.

The XDO is designed for electrical access through the top or front (see **Figure 19**).

Figure 19 Top and front electrical access points

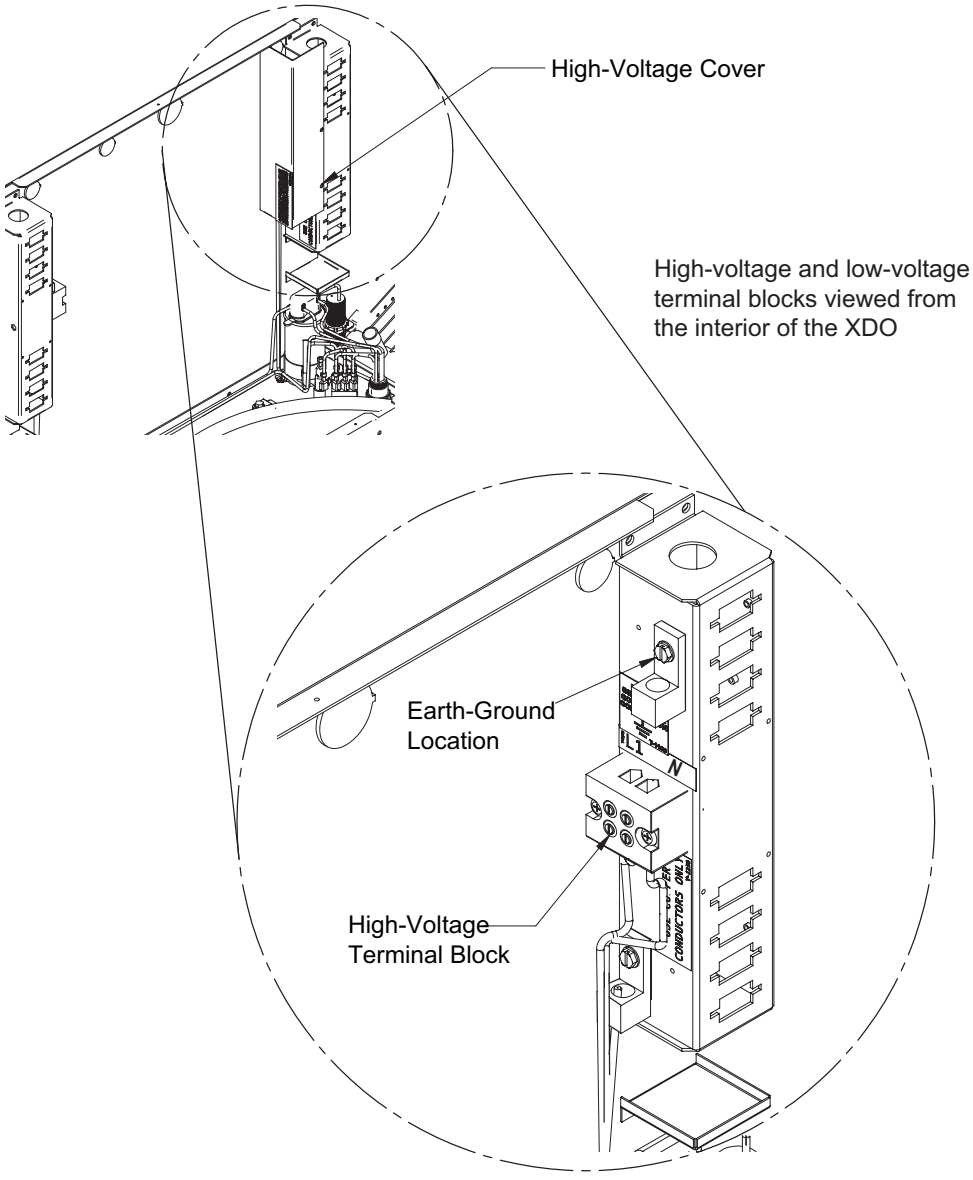


The low-voltage connection is present only if the XDO is equipped with the optional condensation detection system.

1. Route the electrical service conduit through the hole provided in the top or front of the XDO. The electrical connections are on the front of the inside compartment of the XDO on the internal mounting brackets, which, in addition to serving as electrical terminal blocks, also are used to secure internal piping.

   Looking at the XDO from the front, the knockout for the high-voltage wiring and the high-voltage terminal block will be on the left (see **Figure 19**); the low-voltage locations will be on the right. (The low-voltage connection is present only if the XDO is equipped with the optional condensation detection system.)
2. Open the hinged, removable fan tray (see **5.1 - Opening Hinged, Removable Fan Tray**).
3. Remove two screws to remove the protective cover from the high-voltage terminal block (see **Figure 20**.
4. Connect the high-voltage power supply wires and the earth ground wire to the XDO as shown in **Figure 20**.The black wire in the power supply line connects to L1 on the terminal block and the white wire connects to N on the terminal block. The earth (ground) wire connects to the earth (ground) location above the L1 and N connectors.
5. Reinstall the cover over the high-voltage terminal block.

Figure 20 High-voltage terminal block location and connection locations

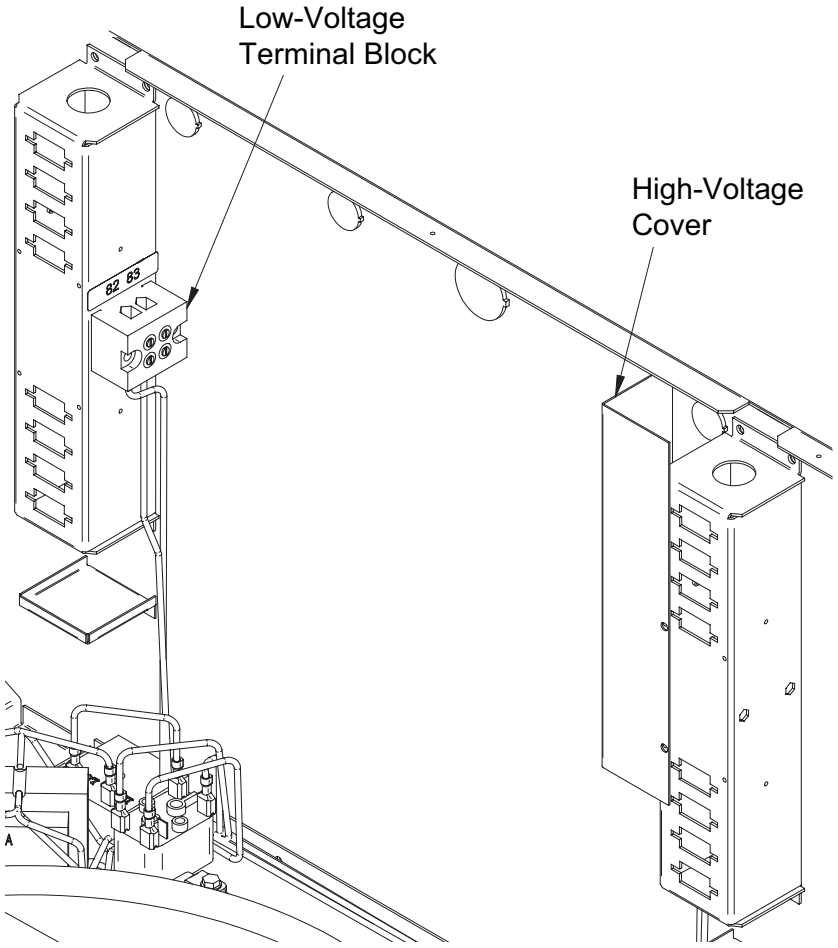


6.2 Connecting Low Voltage Wiring—Optional

Low voltage connections to the XDP/XDC are required only for units with the optional condensation detection feature. Viewing the XDO from the front or from above, the low voltage terminal block is on the right side of the unit (see **Figure 19** for knockout locations; see **Figure 21** for low voltage terminal block location).

For units equipped with the condensation detection package, make low voltage connections according to site-specific drawings. The unit must be installed in accordance with national wiring regulations.

Figure 21 Low voltage wiring connections



7.0 PIPING CONNECTIONS AND PIPING ACCESS POINTS

Refer to site specific drawings for general locations of the piping connections. These drawings should specify where the piping connects to the XDO (top, front and side).

7.1 Connection Methods and Points

The assembly and connection means used for piping in the XD system are the same as those used in conventional refrigeration systems. Observe all standard practices during installation and startup to prevent damage and contamination. Pipe used should be copper type ACR or clean Type L.

Supply piping connection is 1/2" OD copper pipe, and return piping connection is 7/8" OD copper.

For ease of connection, the XDO offers supply and return piping access on the top or through the front or either side (see **Figure 22**). Piping connections extend through the XDO's top, the most frequently used access point. Should access from another direction be required, the factory-installed pipes can be shortened and elbows installed inside the unit to accommodate the alternate entrances. To locate the side and front entrances, see **Figures 23** and **24**.

Figure 22 Top piping access points

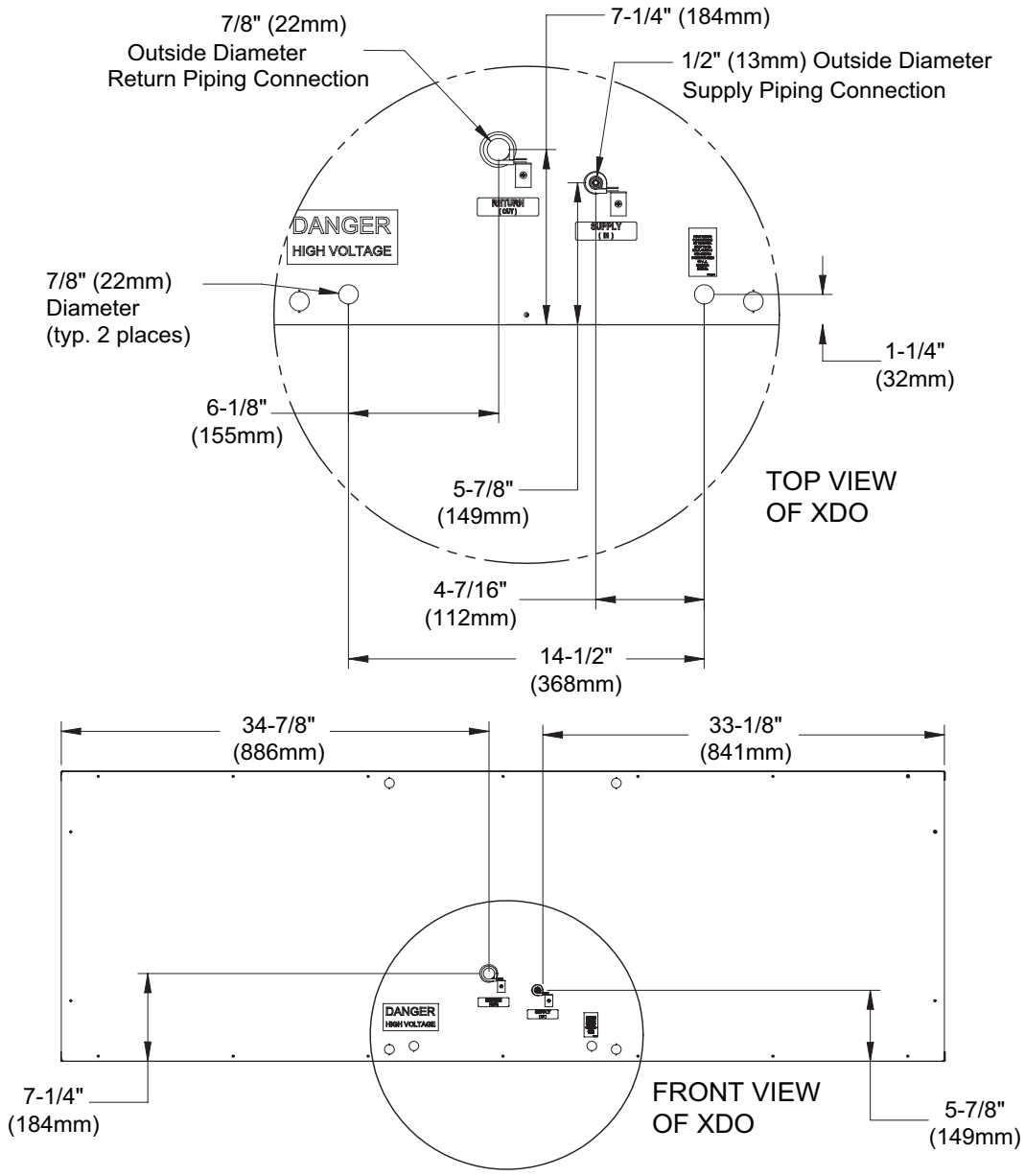


Figure 23 Front piping access points

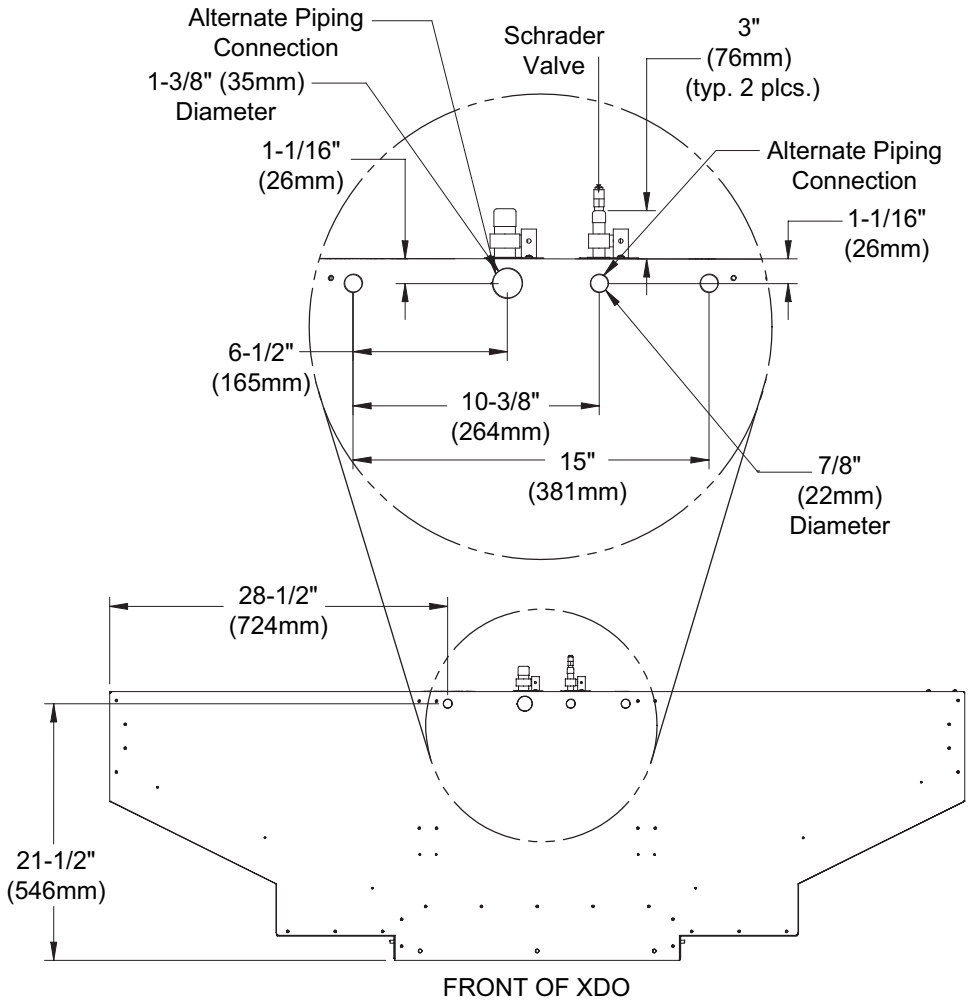
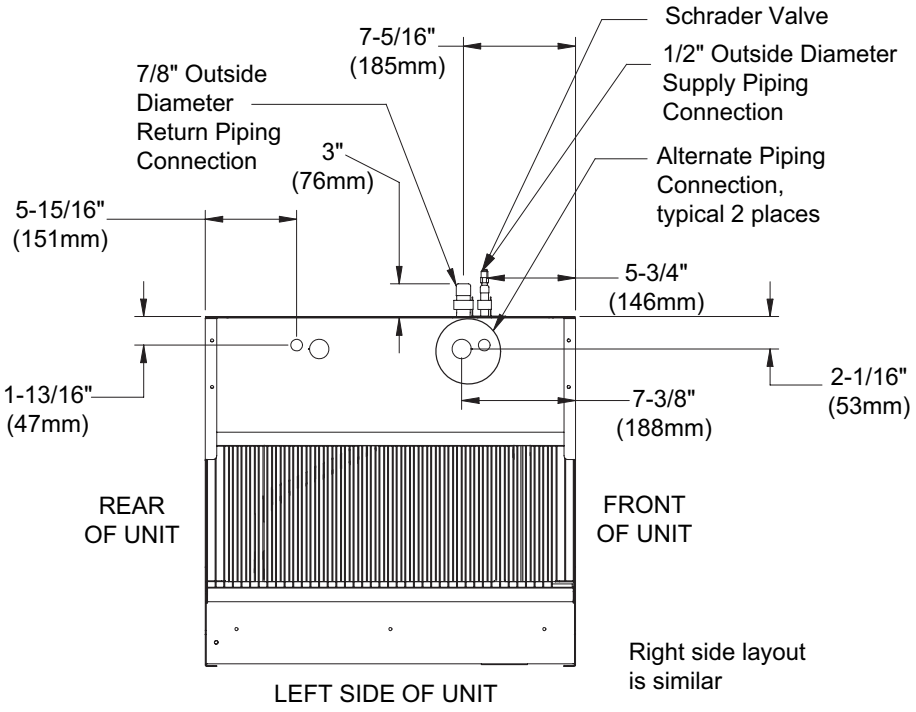


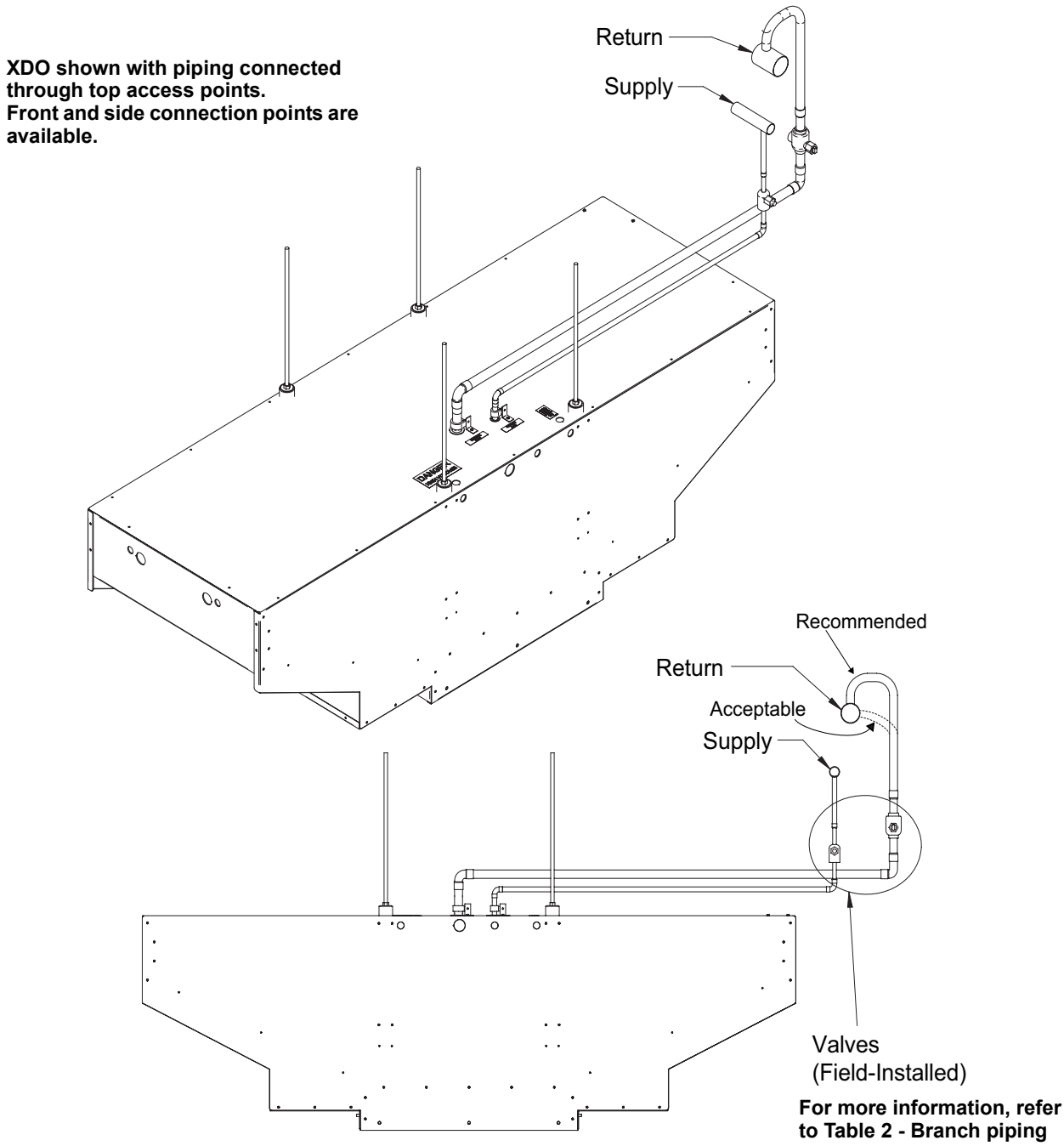
Figure 24 Side piping access points



7.2 Piping Details - Shutoff/Isolation Valves

To allow for fluid isolation of each XDO module, install a full port isolation valve (field-supplied) on each branch circuit, see **Figure 25** below, site specific documentation, Liebert's XD System Design and Configuration Document and documentation for other parts of the system.

Figure 25 Piping details



7.3 Connecting Pipes to the Top of the XDO

To connect the pipes:

1. Vent the nitrogen holding charge as specified in **7.5 - Holding Charge**.
2. Remove the caps from the supply and return pipes—the caps are soldered in place and can be removed with a small torch.
3. Connect the supply and return pipes, soldering or brazing them in place. Before brazing the pipes, refer to **7.6 - Brazing Preparations**.

7.4 Connecting Pipes Through the Side or Front of the XDO

To connect the pipes:

1. Vent the nitrogen holding charge as specified in **7.5 - Holding Charge**.
2. Remove the caps from the supply and return pipes—the caps are soldered in place and can be removed with a small torch. Be careful to not damage internal components when making internal piping connections.
3. Remove the top panel; it is held in place with screws.
4. Cut the supply and return pipes to the proper length, permitting pipe connections with the panel replaced.
5. Remove the knockouts on the side or front panel where pipes will enter the XDO.
6. Bring the supply and return pipes into the XDO, soldering or brazing them in place. Before brazing the pipes, refer to **7.6 - Brazing Preparations**.
7. Replace the top panel.

7.5 Holding Charge

The XDO is shipped with a low-pressure holding charge of nitrogen. This must be vented before removing the caps on the ends of the supply and return piping.

To vent the holding charge:

1. Find the Schrader valve on the top exterior of the cabinet, which will allow you to vent the nitrogen holding charge in the XDO unit, as shown in **Figure 23**.
2. Open the valve and vent the holding charge.
3. Replace and secure the cap on the Schrader valve.

7.6 Brazing Preparations

Brazing material or soft solder may be used to connect supply and return pipes. However, if brazing material is used, the lines being brazed **must** be pressurized with flowing dry nitrogen during brazing to prevent oxidation and scale formation inside the piping.

After the holding charge has been vented, a torch can be used to remove the caps over the ends of the supply and return lines.

7.7 Recommended Piping Size

Connect the main pipes between the XDO branch piping and the XDP or XDC according to **Table 2**. Elbows and restrictions must be minimized to get good fluid flow.

Connect the branch pipes between the main piping and the XDO according to **Table 2**.

Table 2 Branch piping

Nominal Pipe Size, in.		Equivalent Length ft. (m)	Pipe Material
Supply	1/2 O.D.	up to 10 (3)	Copper
	7/8 O.D.	longer than 10 but less than 25 (3-7.6)	Copper
Return	7/8 O.D.	up to 10 (3)	Copper
	1-1/8 O.D.	longer than 10 but less than 25 (3-7.6)	Copper

7.8 Insulation

To minimize the possibility of condensation, insulate all piping between the XDO and the XDP or XDC.

7.9 Charging with Refrigerant and Starting the XD System

The Liebert XD System must be completely installed before it is charged with refrigerant. After installation is complete, refer to the Liebert XDP or Liebert XDC user manual for instructions on charging the XDV/XDO with refrigerant and starting the system. The complete XD system includes all XDO and XDV units, an XDC **or** XDP unit and any other connected equipment.

8.0 MOUNTING OPTIONAL LIGHT UNITS

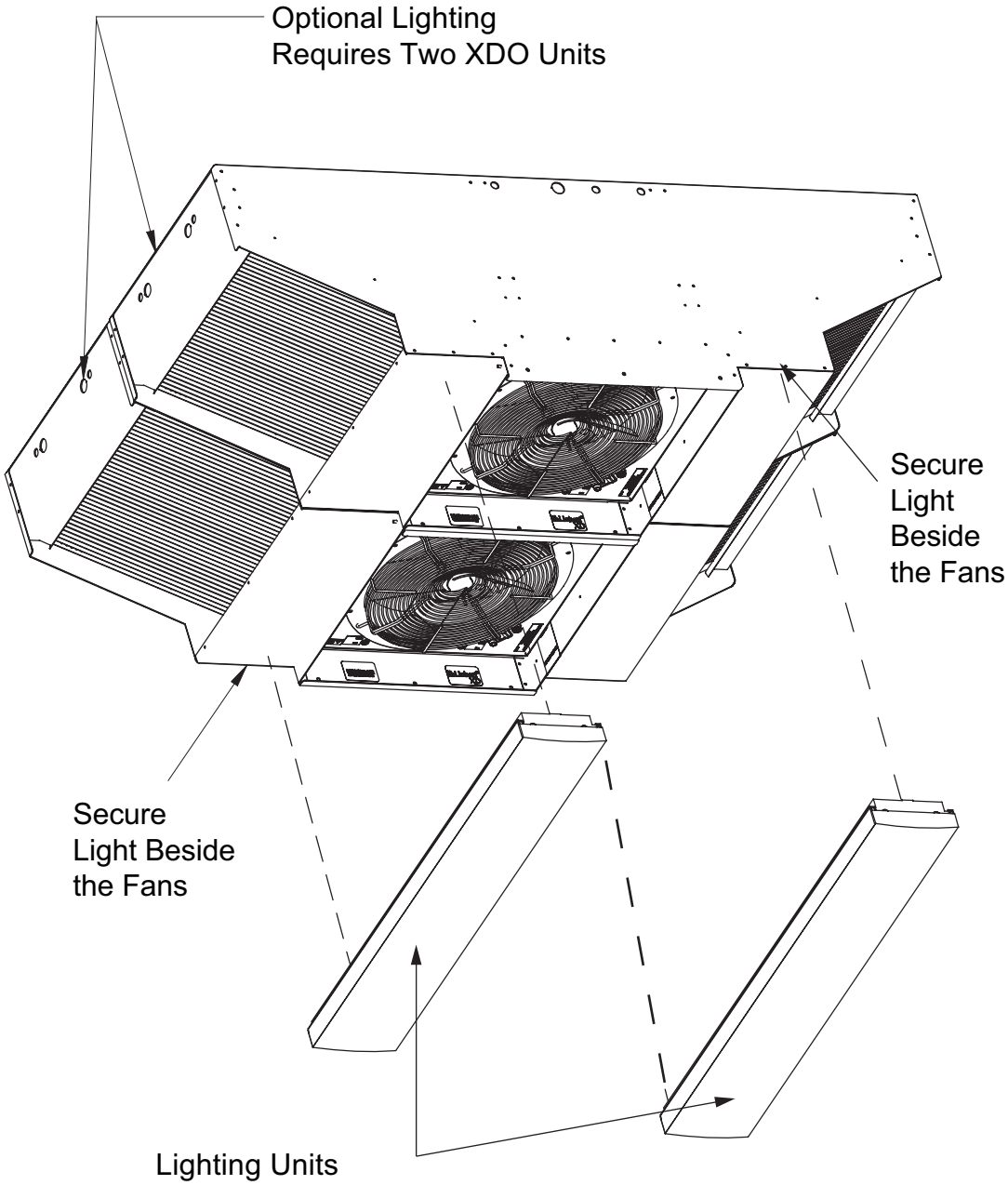
Liebert offers optional lighting units that may be mounted on XDOs to save space and improve illumination in the conditioned space.

The XDO modules serve as a mounting platform for the lights, but do not provide power to the lights. The lights require separate power connections.

Follow all local and national electrical codes when making power and control connections to the lights.

Attach the lights to the bottom of the XDO on either side of the fan trays as shown in **Figure 26**.

Figure 26 Adding optional lighting units



9.0 CHECKLIST FOR PROPER INSTALLATION

___ 1. Threaded rods installed in the overhead building structure.

___ 2. XDO module secured on threaded rod using mounting hardware provided. See **2.3 - Parts Included With XDO** and **2.3.1 - Optional Items**.

___ 3. XDO module level within 1/2".

___ 4. High voltage wiring to XDO module.

___ 5. Low voltage wiring to XDO.

___ 6. Piping from XDP/XDC to XDO, with isolation valves piped to each XDO.

___ 7. Field piping has no leaks.

___ 8. Piping insulated.

___ 9. Fan tray closed and securely latched.

___ 10. Start system to ensure proper operation.

___ 11. Shut down system.

10.0 MAINTENANCE

Minimal maintenance is required to keep the XDO operating at optimal levels. The unit should be cleaned and checked for damage and worn parts. Suggested maintenance includes:

- Cooling fins—Clean any dust and debris from the cooling fins, taking care not to bend them
- Circulating fans—Clean any dust from the fans.

11.0 SPECIFICATIONS

Table 3 Liebert XDO specifications

Models	XDO16BK--0, XDO16DK--0 (60Hz)	XDO16BT--0 XDO16DT--0 (60Hz)	XDO16BT--0 XDO16DT--0 (50Hz)	XDO16BS--0 XDO16DS--0 (50Hz)
Cooling Capacity, nominal	16kW / 4.6 Tons	16kW / 4.6 Tons	14kW / 3.98 Tons	
Conditions	55ºF Entering Coolant Temperature, 85ºF Entering Air Temperature, 50ºF or lower dew point			
Electrical Requirements				
Input Voltage	1ph-60Hz-120V	1ph-60Hz-220-240V	1ph-50 Hz-220-240V	1ph-50 Hz-230V
Input Power Connections	Terminal blocks provided internal to unit			
Full Load Amps	2.7A @ 120V	1.46A @ 230V	1.19 @ 230V	
Wire Size Amps	3.4	2.0	1.28	
Overcurrent Protection Device	15	15	15	15
Power consumption, nominal, watts	350	360	350	350
Dimensions, inches (mm)				
Length	72-1/4 (1835)			
Width	24-1/8 (613)			
Height	22-1/2 (572) not including electrical and piping access			
Weight, lb (kg)				
Unit only	150 (68)			
Shipping weight	238 (108)	296 (134)		
Installed, with coolant, without options	155 (70)			
Number of Fans	1		1	
Airflow, Nominal, ft^3/ min (m^3/ hr)	2700 (4587)		2250 (3822)	
Audible Noise	85 dBa sound power		83 dBa sound power	
Pipe Connections				
XD Coolant Supply from XDP/XDC	1/2" OD, Copper			
XD Coolant Return to XDP/XDC	7/8" OD, Copper			
Serviceable Parts	Fan and electrical components			
Exterior Finish – Bottom, Sides, Front and Rear	Black, matte finish, heat-fused powder coat			
Exterior Finish - Top	Hot-dipped galvanized steel			
Agency				
Approvals	CSA 60 Hz		CSA 50Hz	CE 50Hz

Options		
Lighting Fixtures (ship loose)	2 XDOs per lighting unit; 120V or 277V; 4’ standard fluorescent tubes (not included)	
Power, optional lighting fixture	0.9A per 120V light fixture; 0.4A per 277V light fixture	None
Condensate sensing (factory-installed)	Dry contact 24VAC - 1A maximum	

Table 4 Dimensions—domestic and export

Model	Shipping Dimensions, inches (mm)						Unit Dimension Unpacked, inches (mm)		
	Domestic			Export					
	Length	Width	Height	Length	Width	Height	Length	Width	Height *
All Models	84 (2134)	30 (762)	30 (762)	83 (2108)	30 (762)	30 (762)	72-1/4 (1835)	24-1/8 (613)	25-1/2 (648)

* Includes piping connections

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- Environmental systems—close-control air conditioning from 1 to 60 tons
- Power conditioning and UPS with power ranges from 300 VA to more than 1000 kVA
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While every precaution has been taken to ensure the accuracy and completeness of this literature, Liebert Corporation assumes no responsibility and disclaims all liability for damages resulting from use of this information or for any errors or omissions.

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