



# Liebert® Piggyback Condenser and Drycooler

**Installer/User Guide**

60 Hz

Product Discontinued as of August 19, 2023

The information contained in this document is subject to change without notice and may not be suitable for all applications. While every precaution has been taken to ensure the accuracy and completeness of this document, Vertiv assumes no responsibility and disclaims all liability for damages resulting from use of this information or for any errors or omissions.

Vertiv recommends installing a monitored fluid detection system that is wired to activate the automatic closure of field-installed coolant fluid supply and return shut off valves, where applicable, to reduce the amount of coolant fluid leakage and consequential equipment and building damage. Refer to local regulations and building codes relating to the application, installation, and operation of this product. The consulting engineer, installer, and/or end user is responsible for compliance with all applicable laws and regulations relating to the application, installation, and operation of this product.

The products covered by this instruction manual are manufactured and/or sold by Vertiv. This document is the property of Vertiv and contains confidential and proprietary information owned by Vertiv. Any copying, use, or disclosure of it without the written permission of Vertiv is strictly prohibited.

Names of companies and products are trademarks or registered trademarks of the respective companies. Any questions regarding usage of trademark names should be directed to the original manufacturer.

### **Technical Support Site**

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit <https://www.vertiv.com/en-us/support/> for additional assistance.

## TABLE OF CONTENTS

<b>1 Important Safety Instructions</b> .....	<b>1</b>
<b>2 Nomenclature and Components</b> .....	<b>5</b>
2.1 Vertiv™ Liebert® Piggyback Condenser Nomenclature .....	5
2.2 Vertiv™ Liebert® Piggyback Drycooler Nomenclature .....	6
2.3 Vertiv™ Liebert® Piggyback Component Location .....	7
<b>3 Vertiv™ Liebert® Piggyback Overview, Location Guidelines and Electrical Connections</b> .....	<b>9</b>
3.1 Vertiv™ Liebert® Piggyback Condenser and Vertiv™ Liebert® Drycooler Planning Dimensions .....	9
3.2 General Location Guidelines .....	9
3.3 Line Voltage Considerations .....	10
3.4 Shipping Weights and Unit Dimensions .....	10
<b>4 Equipment Inspection and Handling</b> .....	<b>13</b>
4.1 Handling the Unit while Packaged .....	14
4.2 Unpacking the Unit .....	15
4.3 Removing the Unit from the Skid with a Forklift .....	15
4.4 Moving the Unit with Piano Jacks .....	16
4.5 Placing the Unit on a Floor Stand .....	18
<b>5 Vertiv™ Liebert® Piggyback Condensers</b> .....	<b>19</b>
5.1 Condenser Performance Data .....	19
5.2 Standard and Optional Features for Vertiv™ Liebert® Piggyback Condensers .....	20
5.3 Condenser Piping and Refrigerant Requirements .....	21
5.3.1 Condenser Refrigerant Piping Line Sizes and Equivalent Lengths .....	21
5.3.2 Condenser Refrigerant Charge Requirements .....	23
5.3.3 Charging the System with Refrigerant .....	23
5.4 Condenser Electrical Field Connections .....	24
5.4.1 Condenser Line-voltage Wiring .....	24
5.4.2 Condenser Low Voltage Electrical Connections .....	26
<b>6 Vertiv™ Liebert® Piggyback Drycoolers</b> .....	<b>27</b>
6.1 Vertiv™ Liebert® Drycooler Performance Data .....	28
6.2 Standard and Optional Features for Drycoolers .....	29
6.2.1 Optional Device Considerations .....	30
6.2.2 Vertiv™ Liebert® Drycooler Fluid Piping Requirements .....	31
6.3 Vertiv™ Liebert® Drycooler Electrical Field Connections .....	36
6.3.1 Vertiv™ Liebert® Drycooler Line Voltage Wiring .....	37
6.3.2 Vertiv™ Liebert® Drycooler Low Voltage Electrical Wiring .....	41
<b>7 Maintenance Guidelines</b> .....	<b>43</b>
<b>8 Checklist for Completed Installation</b> .....	<b>45</b>
8.1 Moving and Placing Equipment .....	45
8.2 Electrical Installation Checks .....	45

8.3 Piping Installation Checks .....	45
8.4 Other Installation Checks .....	45
<b>9 Initial Start-up Checks and Commissioning Procedure for Warranty Inspection .....</b>	<b>47</b>
<b>Appendices .....</b>	<b>49</b>
Appendix A: Technical Support and Contacts .....	49
Appendix B: Submittal Drawings .....	51

Product Discontinued as of August 19, 2023

# 1 Important Safety Instructions

## SAVE THESE INSTRUCTIONS

This manual contains important safety instructions that should be followed during the installation and maintenance of the Vertiv™ Liebert® Piggyback. Read this manual thoroughly before attempting to install or operate this unit.

Only qualified personnel should move, install or service this equipment.

Adhere to all warnings, cautions, notices and installation, operating and safety instructions on the unit and in this manual. Follow all installation, operation and maintenance instructions and all applicable national and local building, electrical and plumbing codes.

**NOTE:** Refrigerant safety-alert messages apply to Liebert® Piggyback condensers only.



**WARNING!** Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC, and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components require and receive power even during the “Unit Off” mode of the Liebert® iCOM™ controller. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic. Follow all local codes.



**WARNING!** Risk of electric shock. Can cause equipment damage, injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. Service and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers’ specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.



**WARNING!** Risk of electric shock and short circuits. Can cause equipment damage, injury or death. Insert CSA certified or UL listed bushings into holes and or knockouts used to route wiring through to protect the wire insulation from contact with sheet metal edges.



**WARNING!** Risk of over-pressurization of the refrigeration system. Can cause explosive discharge of high-pressure refrigerant, loss of refrigerant, environmental pollution, equipment damage, injury, or death. This unit contains fluids and gases under high pressure. Use extreme caution when charging the refrigerant system. Do not pressurize the system higher than the design pressure marked on the unit’s nameplate. For systems requiring EU CE compliance (50 Hz), the system installer must provide and install a pressure relief valve in the high side refrigerant circuit that is rated same as the refrigerant high side “Max Allowable Pressure” rating that is marked on the unit serial tag. Do not install a shutoff valve between the compressor and the field installed relief valve. The pressure relief valve must be CE-certified to the EU Pressure Equipment Directive by an EU “Notified Body.”





**WARNING!** Risk of top-heavy unit falling over. Improper handling can cause equipment damage, injury or death. Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from or prepare the unit for installation. Unit weights are specified in **3.4** on page 10 .



**WARNING!** Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, serious injury or death. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.



**WARNING!** Risk of electrical fire, smoke, and short circuit. Can cause activation of fire-suppression system, building and equipment damage, injury or death. Select and install the line side electrical supply wire and overcurrent protection device(s) according to the specifications on the unit nameplate(s), per the instructions in this manual and according to the applicable national, state, and local code requirements. Use copper conductors only. Make sure all electrical connections are tight. Unit-specific wiring diagrams are provided on each unit.



**WARNING!** Risk of improper moving. Can cause equipment damage, injury or death. Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. The center of gravity varies depending on the unit size and selected options. The slings must be equally spaced on either side of the center of gravity indicator. Use the center of gravity indicators on the unit to determine the position of the slings. Unit weights are specified in **3.4** on page 10 .



**WARNING!** Risk of improper moving. Unit can tip over and cause building and equipment damage, injury or death. The forklift's tines must be equally spaced on either side of the center of gravity indicator. Ensure that the tines are level—not angled up or down. The tines must be at a height that will allow proper clearance under the unit. Ensure that the tines extend beyond the opposite side of the unit.



**WARNING!** Risk of contact with high-speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure. Do not operate the unit with any or all cabinet panels removed. Do not operate unit with any or all cabinet panels removed. Do not operate units without installing a plenum, duct work or guard over the blower opening(s) on the rear or top of the unit cabinet.



**WARNING!** Risk of contact with high-speed moving parts. Can cause injury or death. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off and verify that all moving parts have completely stopped before working within unit cabinet.



**CAUTION:** Risk of contact with sharp edges, splinters, and exposed fasteners. Can cause injury. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to move, lift, remove packaging from or prepare the unit for installation.



**CAUTION:** Risk of contact with hot surfaces. Can cause injury. The compressor, refrigerant discharge lines, fan motor, and some electrical components are extremely hot during unit operation. Allow sufficient time for them to cool to a touch-safe temperature before working within the unit cabinet. Use extreme caution and wear appropriate, OSHA-approved PPE when working on or near hot components.



**CAUTION:** Risk of improper handling of cabinet panels. Can cause personal injury and equipment damage. Cabinet panels can exceed 5 ft. (1.5 m) in length and weigh more than 35 lb. (15.9 kg). Follow relevant OSHA lifting recommendations and consider using a two-person lift for safe and comfortable removal and installation of cabinet panels. Only properly trained and qualified personnel wearing appropriate OSHA-approved PPE should attempt to remove or install cabinet panels.

**NOTE:** The Liebert indoor cooling unit has a factory-installed high-pressure safety switch in the high side refrigerant circuit. A pressure relief valve is provided on each circuit of the Vertiv™ Liebert® Piggyback condenser.

#### NOTICE

Risk of clogged or leaking drain lines and leaking water-supply lines. Can cause equipment and building damage.

This unit requires a water drain connection. Drain lines must be inspected at start-up and periodically, and maintenance must be performed to ensure that drain water runs freely through the drain system and that lines are clear and free of obstructions and in good condition with no visible sign of damage or leaks.

Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in catastrophic and expensive building and equipment damage and loss of critical data center equipment.

Do not locate unit directly above any equipment that could sustain water damage.

We recommend installing a monitored fluid-detection system to immediately discover and report coolant-fluid system and condensate drain-line leaks.

Product Discontinued as of August 19, 2023

**NOTICE**

Risk of piping-system corrosion and freezing fluids. Can cause leaks resulting in equipment and expensive building damage. Cooling coils, heat exchangers and piping systems are at high risk of freezing and premature corrosion. Fluids in these systems must contain an inhibitor to prevent premature corrosion.

The system coolant fluid must be analyzed by a competent fluid-treatment specialist before start up to establish the inhibitor level and evaluated at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion. The fluid complexity and variations of required treatment programs make it extremely important to obtain the advice of a competent and experienced fluid-treatment specialist and follow a regularly scheduled coolant-fluid system-maintenance program.

Fluid chemistry varies greatly as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components.

The chemistry of the coolant fluid used must be considered, because some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The coolant fluid must be treated and circulating through the system continuously to prevent the buildup of deposits and/or growth of bacteria. Proper inhibitor maintenance must be performed to prevent corrosion of the system.

Consult fluid manufacturer for testing and maintenance of inhibitors.

Commercial-grade coolant fluid is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the coolant fluid from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

Vertiv recommends installing a monitored fluid-detection system that is wired to activate the automatic-closure of field-installed coolant-fluid supply and return shut-off valves to reduce the amount of coolant-fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close-off against the maximum coolant-fluid system pressure in case of a catastrophic fluid leak.

**NOTICE**

Risk of a catastrophic water circuit rupture. Can cause expensive building and equipment damage.

Install shutoff valves in the supply and return water lines that automatically close if water is detected by the leak detection system. The shutoff valves should be spring return and must be rated for a close-off pressure that is the same as or higher than the supply water pressure. A monitored leak detection system should be installed in the base of the unit or under the unit to actuate the shutoff valves immediately on a leak detection signal.

**NOTICE**

Risk of no-flow condition. Can cause equipment damage.

Do not leave the water/coolant fluid-supply circuit in a no-flow condition. Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of tubes. Keep unit switched On and water/coolant fluid-supply circuit system operating continuously.

Product Discontinued as of August 19, 2023



## 2 Nomenclature and Components

This section describes the model configuration numbers for Vertiv™ Liebert® Piggyback units and components.

### 2.1 Vertiv™ Liebert® Piggyback Condenser Nomenclature

Table 2.2 below describes each digit of the condenser model number.

**Table 2.1 Liebert® Piggyback Condenser Model Number**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
P	B	0	3	5	0	A	-	A	2	L	#	#	#	#

**Table 2.2 Condenser Model Number Digit Definitions**

Digit	Description
Digits 1 and 2 = Unit Type	PB = Liebert® Piggyback condenser (31-in. frame units are single-circuit only. 72-in. and 97-in. frame units are dual-circuit only)
Digits 3 to 6 = Model Size	
Digit 7 = Cooling Type	A = Air-cooled
Digit 8 = Placeholder	
Digit 9 = Voltage	A = 460 V - 3 ph - 60 Hz B = 575 V - 3 ph - 60 Hz C = 208 V - 3 ph - 60 Hz D = 230 V - 3 ph - 60 Hz
Digit 10 = ESP	1 = 0.25 in. 2 = 0.50 in. 3 = 0.75 in. 4 = 1.0 in.
Digit 11 = Disconnect	L = Locking S = Non-locking N = None
Digits 12 to 15 = Factory Order Digits	

## 2.2 Vertiv™ Liebert® Piggyback Drycooler Nomenclature

Table 2.4 below describes each digit of the drycooler model number.

**Table 2.3 Liebert® Piggyback Drycooler Model Number**

1	2	3	4	5	6	7	8	9	10	11	12	13	14
P	D	D	3	3	3	-	A	2	L	#	#	#	#

**Table 2.4 Liebert® Drycooler Model Number Digit Definitions**

Digit	Description
Digits 1 and 2 = Unit Type	PD = Liebert® Piggyback drycooler
Digit 3 = Internal Pumps	D = Dual S = Single N = None
Digits 4 to 6 = Model Size	
Digit 7 = Placeholder	
Digit 8 = Voltage	A = 460 V - 3 ph - 60 Hz B = 575 V - 3 ph - 60 Hz C = 208 V - 3 ph - 60 Hz D = 230 V - 3 ph - 60 Hz
Digit 9 = ESP	1 = 0.25 in. 2 = 0.50 in. 3 = 0.75 in. 4 = 1.0 in.
Digit 10 = Disconnect	L = Locking S = Non-locking N = None
Digit 11 to 14 = Factory Order Digits	

## 2.3 Vertiv™ Liebert® Piggyback Component Location

The unit component locations are described in the submittal documents included in the [Submittal Drawings](#).

The following table lists the relevant documents by number and title.

**Table 2.5 Component Location Drawings**

Document Number	Title
DPN004186	Liebert® Piggyback Condenser Component Location Diagram
DPN004185	Liebert® Piggyback Drycooler Component Location Diagram

Product Discontinued as of August 19, 2023

This page intentionally left blank

Product Discontinued as of August 19, 2023

## 3 Vertiv™ Liebert® Piggyback Overview, Location Guidelines and Electrical Connections

The Liebert® Piggyback condensers and Liebert® drycoolers are designed for applications where outdoor heat-rejection equipment location is not practical, typically high-rise buildings. A standard location for the Liebert® Piggyback is adjacent to the Liebert® indoor unit but may be in remote, indoor locations, such as mechanical rooms. Outdoor heat-rejection supply and return air is connected through the exterior-wall duct work.

The heat-rejection configurations available for Liebert® Piggyback units are air-cooled condenser or air-cooled Liebert® drycooler.

### 3.1 Vertiv™ Liebert® Piggyback Condenser and Vertiv™ Liebert® Drycooler Planning Dimensions

The unit and floor stand dimensions are described in the submittal documents included in the [Submittal Drawings](#).

The following table lists the relevant documents by number and title.

**Table 3.1 Dimensional Planning Drawings**

Document Number	Title
<b>Piggyback Condensers</b>	
DPN000675	Dimensional and Weight Data, 61-in. frame models
DPN000695	Dimensional and Weight Data, 72-in. and 97-in. frame models
<b>Piggyback Drycoolers</b>	
DPN000710	Dimensional and Weight Data, 72-in. and 97-in. frame models
<b>Floor Stands</b>	
DPN000727	Floorstand Dimensional Data Condenser & Drycooler

### 3.2 General Location Guidelines

- The heat rejection unit should be located for maximum security and maintenance accessibility.
- Use Vertiv™ Liebert® Piggyback units whenever interior building locations must be used for heat rejection.
- To assure adequate air supply, we recommended that the heat-rejection unit be located in a clean-air area, away from loose dirt and foreign matter that may clog the coil.
- The Liebert® Piggyback unit should not be located in the vicinity of steam, hot air or fume exhausts.
- The Liebert® Piggyback unit should be located no closer than 3 ft (1 m) from a wall, obstruction, or adjacent unit.
- Install the heat-rejection unit in a level position to assure proper refrigerant/glycol flow.
- All piping and wiring methods shall be in accordance with national and local electrical and plumbing codes.

### 3.3 Line Voltage Considerations

For all air-cooled heat-rejection units, line-voltage electrical service is required at their location. This power supply need not be the same voltage as the cooling unit. The separate power source may be ordered as 208, 230, 460 or 575 Volt, 3-phase, 60 Hz. The Vertiv™ Liebert® Piggyback units can be configured with a factory disconnect. Condensers require a separate, single-phase power supply (120-V or 208/230-V) to assure Vertiv™ Liebert® Lee-Temp heater pads are continuously energized.

### 3.4 Shipping Weights and Unit Dimensions

Table 3.2 Condenser Shipping Weights and Dimensions by Unit Model

Model #	Frame Width, in. (cm)	Domestic Packed				Export Packed			
		Weight	Dimensions		Volume	Weight	Dimensions		Volume
		lb (kg)	in. (cm)		ft <sup>3</sup> (m <sup>3</sup> )	lb (kg)	in. (cm)		ft <sup>3</sup> (m <sup>3</sup> )
224	31 (79)	575 (261)	40x40x76	(102x102x203)	74.1 (2.1)	675 (307)	40x40x76	(102x102x203)	74.1 (2.1)
280	31 (79)	575 (261)	40x40x76	(102x102x203)	74.1 (2.1)	675 (307)	40x40x76	(102x102x203)	74.1 (2.1)
332	31 (79)	575 (261)	40x40x76	(102x102x203)	74.1 (2.1)	675 (307)	40x40x76	(102x102x203)	74.1 (2.1)
378	31 (79)	575 (261)	40x40x76	(102x102x203)	74.1 (2.1)	675 (307)	40x40x76	(102x102x203)	74.1 (2.1)
350	72 (183)	1180 (353)	97x45x85	(246x114x216)	214.7 (6.1)	1330 (603)	97x45x85	(246x114x216)	214.7 (6.1)
550	72 (183)	1180 (353)	97x45x85	(246x114x216)	214.7 (6.1)	1330 (603)	97x45x85	(246x114x216)	214.7 (6.1)
675	72 (183)	1180 (353)	97x45x85	(246x114x216)	214.7 (6.1)	1330 (603)	97x45x85	(246x114x216)	214.7 (6.1)
925	97 (246)	1630 (739)	120x45x85	(305x114x216)	265.6 (7.5)	1780 (807)	120x45x85	(305x114x216)	265.6 (7.5)
1100	97 (246)	1630 (739)	120x45x85	(305x114x216)	265.6 (7.5)	1780 (807)	120x45x85	(305x114x216)	265.6 (7.5)
1350	97 (246)	1630 (739)	120x45x85	(305x114x216)	265.6 (7.5)	1780 (807)	120x45x85	(305x114x216)	265.6 (7.5)

Table 3.3 Vertiv™ Liebert® Drycooler Shipping Weights and Dimensions by Unit Model

Model #	Frame Width, in. (cm)	Domestic Packed				Export Packed			
		Weight	Dimensions		Volume	Weight	Dimensions		Volume
		lb (kg)	in. (cm)		ft <sup>3</sup> (m <sup>3</sup> )	lb (kg)	in. (cm)		ft <sup>3</sup> (m <sup>3</sup> )
102	72 (183)	1230 (558)	97x45x85	246x114x216	214.7 (6.1)	1380 (626)	97x45x85	246x114x216	214.7 (6.1)
133	72 (183)	1230 (558)	97x45x85	246x114x216	214.7 (6.1)	1380 (626)	97x45x85	246x114x216	214.7 (6.1)
150	72 (183)	1230 (558)	97x45x85	246x114x216	214.7 (6.1)	1380 (626)	97x45x85	246x114x216	214.7 (6.1)
223	97 (246)	1680 (726)	120x45x85	305x114x216	265.6 (7.5)	1830 (830)	120x45x85	305x114x216	265.6 (7.5)
290	97 (246)	1680 (726)	120x45x85	305x114x216	265.6 (7.5)	1830 (830)	120x45x85	305x114x216	265.6 (7.5)
333	97 (246)	1680 (726)	120x45x85	305x114x216	265.6 (7.5)	1830 (830)	120x45x85	305x114x216	265.6 (7.5)



**Table 3.4 Floor Stand Shipping Weights and Dimensions**

Frame Width	Domestic Packed				Domestic Packed			
	Weight		Dimensions		Weight		Dimensions	
	lb (kg)		in. (mm)		lb (kg)		in. (mm)	
31 in.	40	(18)	33 x 33 x *	838 x 838 x *	60	(27)	36 x 36 x *	914 x 914 x *
72 in.	90	(41)	77 x 37 x *	1956 x 940 x *	140	(64)	81 x 39 x *	2057 x 991 x *
97 in.	121	(55)	102 x 37 x *	2591 x 940 x *	183	(83)	106 x 39 x *	2692 x 991 x *
*Floor stand height + 3 in. (8 cm).								

Product Discontinued as of August 19, 2023

This page intentionally left blank

Product Discontinued as of August 19, 2023

## 4 Equipment Inspection and Handling



**WARNING!** Risk of top-heavy unit falling over. Improper handling can cause equipment damage, injury or death. Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from or prepare the unit for installation.



**WARNING!** Risk of contact with sharp edges, splinters, and exposed fasteners. Can cause injury. Only properly trained and qualified personnel wearing appropriate, OSHA-approved PPE should attempt to move, lift, remove packaging from or prepare the unit for installation.

### NOTICE

Risk of passageway interference. Can cause unit and/or structure damage. The unit may be too large to fit through a passageway while on or off the skid. Measure the unit and passageway dimensions, and refer to the installation plans prior to moving the unit to verify clearances.

### NOTICE

Risk of damage from forklift. Can cause unit damage. Keep tines of the forklift level and at a height suitable to fit below the skid and/or unit to prevent exterior and/or underside damage.

### NOTICE

Risk of improper storage. Keep the unit upright, indoors and protected from dampness, freezing temperatures and contact damage.

Upon arrival of the unit and before unpacking:

- Verify that the labeled equipment matches the bill of lading.
- Carefully inspect all items for visible or concealed damage.
- Report damage immediately to the carrier and file a damage claim with a copy sent to Vertiv or to your sales representative.
- For initial access use a 7/32-in. Allen wrench for panel removal.

### Equipment Recommended for Handling the Unit:

- Forklift
- Pallet jack
- Plano jacks
- Slings
- Spreader bars

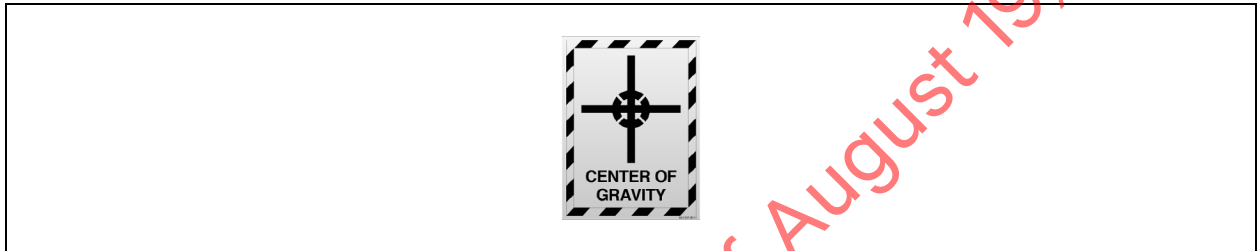
## 4.1 Handling the Unit while Packaged

Transport the unit with a forklift or pallet jack.

When using a forklift or pallet jack:

- When moving the packaged unit, do not lift the unit any higher than 6 in. (152 mm). All personnel except those moving the unit must be kept 12 ft (3.7 m) or more from the unit while it is being moved.
- If the unit must be lifted higher than 6 in. (152 mm), all personnel not directly involved in moving the unit must be 20 ft (5 m) or farther from the unit.
- Always refer to the location of the center-of-gravity indicators when lifting the unit, see **Figure 4.1** below.

**Figure 4.1 Center-of-gravity Indicator**



Product Discontinued as of August 19, 2023

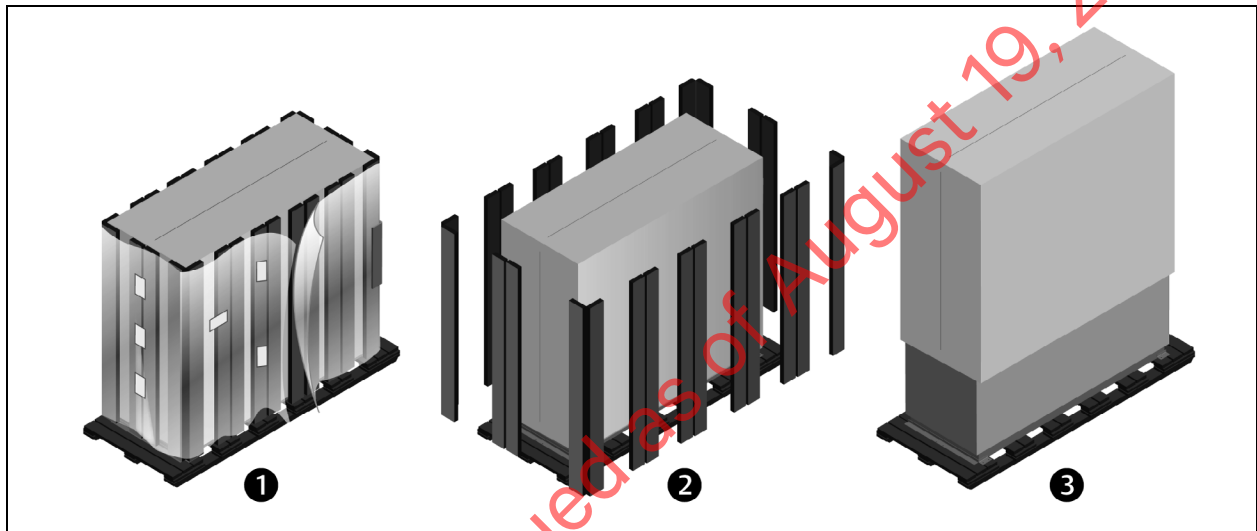
## 4.2 Unpacking the Unit

1. Remove the exterior stretch wrap packaging and external boards from around the unit, as shown in **Figure 4.2** below.
2. Remove the corner and side packaging planks, exposing the bag over the unit.

**NOTE:** The bag may remain in place to protect from dust and to protect the unit panels, or it may be removed for immediate installation.

3. Remove the bag from the unit when ready to remove the skid and install the unit.

**Figure 4.2 Unpacking the Unit**



Item	Description
1	Remove exterior wrap from unit.
2	Remove corner and side packaging planks.
3	Leave the bag on the unit until ready to install.

## 4.3 Removing the Unit from the Skid with a Forklift



**WARNING!** Risk of improper moving. Unit can tip over and cause building and equipment damage, injury or death. The forklift's tines must be equally spaced on either side of the center of gravity indicator. Ensure that the tines are level—not angled up or down. The tines must be at a height that will allow proper clearance under the unit. Ensure that the tines extend beyond the opposite side of the unit.

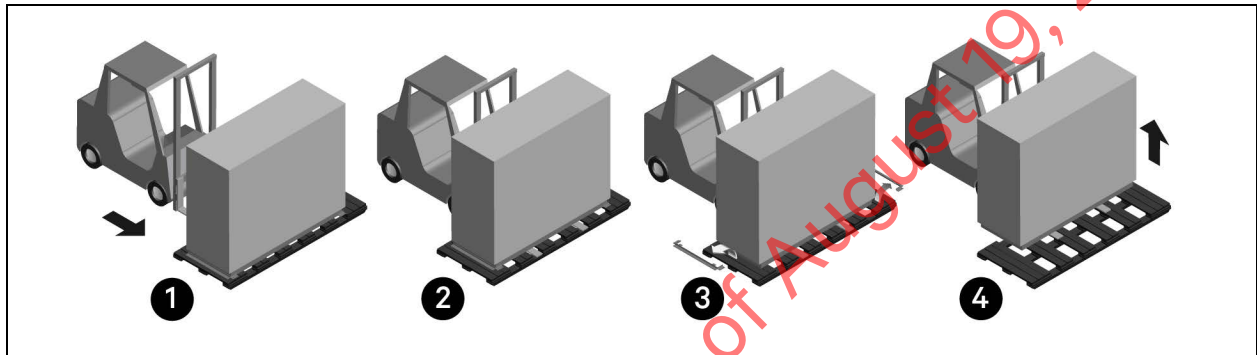
1. Referring to **Figure 4.3** on the next page, align a forklift with either the front or rear side of the unit.
  - Ensure that the tines of the fork lift are locked to the widest location.
  - Use the center-of-gravity indicators on the unit panels when determining the entry points for the tines. Center of gravity varies per unit size and selected options.
  - The tines shall be equally spaced on either side of the center-of-gravity indicator.

2. Insert the tines of the forklift completely under the base of the unit.
  - Ensure that the tines are level, not angled in an upward direction.
  - The tines are to be at a height that will allow proper clearance under the unit.
  - Ensure that the tines extend beyond the opposite side of the unit.

**NOTE: If these steps are not followed, damage may occur to the panels and/or base of the unit.**

3. Remove the bolts that attach the unit tie-down brackets to the unit and skid. Recycle the brackets.
4. Lift the unit off the skid to an elevation point where the skid is not supporting the weight of the unit and remove the skid from under the unit.

**Figure 4.3 Removing from Skid with a Forklift**



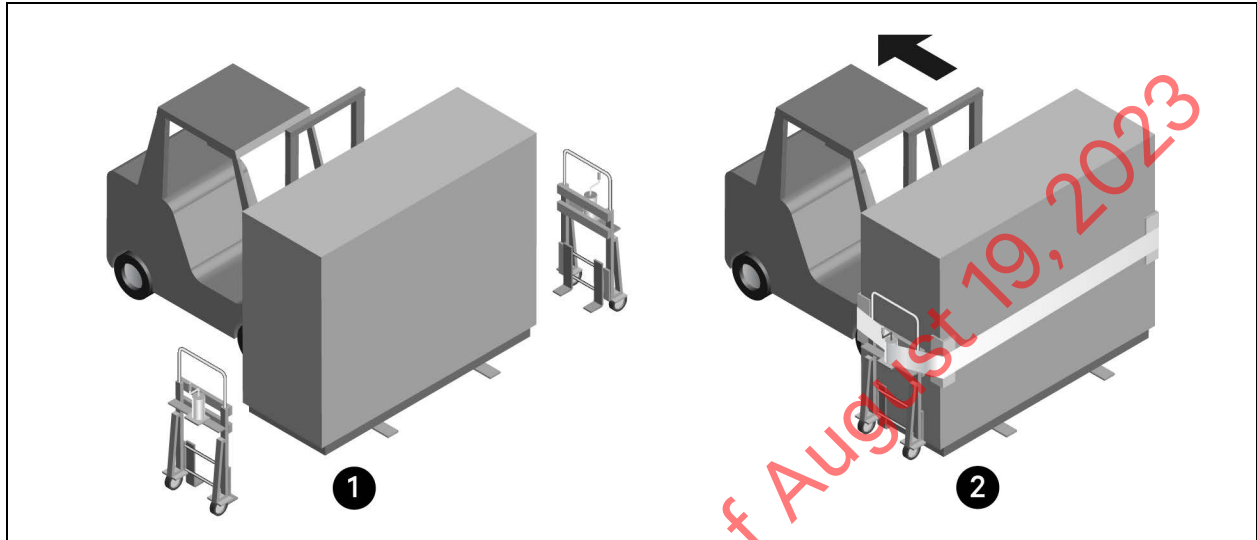
#### 4.4 Moving the Unit with Piano Jacks

1. Raise the unit with a forklift or pallet jack according to the instructions in [Removing the Unit from the Skid with a Forklift](#) on the previous page.
2. With the unit elevated, position piano jacks at each end of the unit.
3. Lower the unit to a height suitable for the piano jacks, place protective material between the unit and the piano jacks and straps.



4. With the unit secured to the piano jacks, move the forklift away from the unit.
5. Using the piano jacks, at least two trained personnel can move the unit to the site for installation.
  - For location considerations, refer to [General Location Guidelines](#) on page 9.

**Figure 4.4 Moving Unit with Piano Jacks**



6. Once the unit is in the installation location, lower the unit as much as the piano jacks will allow.
7. Undo all strapping holding the piano jacks to the unit.
8. Using a pry bar or similar device at one end of the unit with a piano jack, lift the unit just enough for removal of the piano jack.
9. Repeat Step 8 to remove the piano jack at the opposite end.
10. Remove all material used to protect the unit from the piano jacks and strapping.

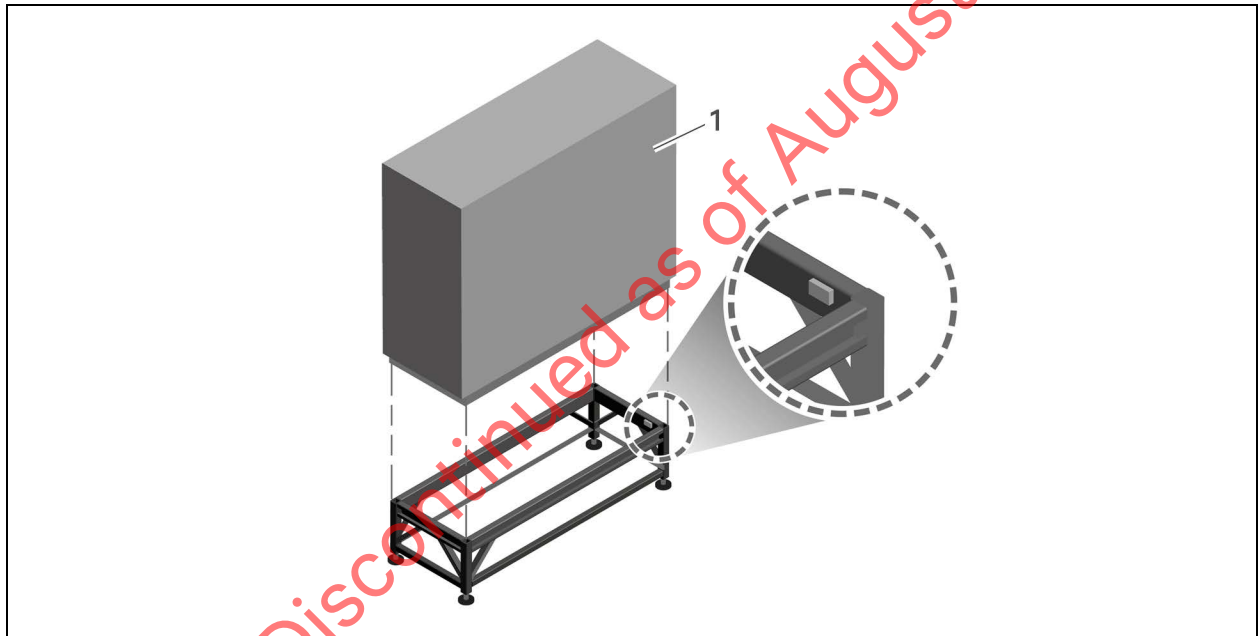
## 4.5 Placing the Unit on a Floor Stand



**CAUTION:** Risk of heavy unit falling into defective raised floor. Can cause injury and equipment damage. Prior to installation, all floor tiles immediately around floor stand are to be removed and inspected. Make sure tiles are not cracked, and ribs have not been cut. If free from defects, re-install. Replace with new tiles if defects are found.

Refer to the floor stand installation sheet, located inside the floor stand package. Unit to be placed onto floor stand using process that will provide safest method based on site layout. Professional installers to be used when placing unit. Unit may require lift onto a floor stand if elevated flooring has not been installed. If flooring is installed, unit will be placed over floor opening containing floor stand. Refer to **Figure 4.5** below. Be sure to align the welded tabs on top of the floor stand with the inside of the unit frame base.

**Figure 4.5** Welded Tabs on Floor Stand



Item	Description
1	Front of unit

## 5 Vertiv™ Liebert® Piggyback Condensers

Liebert® Piggyback condensers are air-cooled heat-rejection units.

### 5.1 Condenser Performance Data

Table 5.1 Vertiv™ Liebert® Piggyback Air-cooled Condenser Capacity Data

Model Size	224A	280A	332A	378A	350A	550A	675A	925A	1100A	1350A	
Frame Size	31 in.				72 in.			97 in.			
Fan Section											
Standard Air Volume - CFM (m <sup>3</sup> /h)	2,650 (4,505)	4,250 (7,225)	3,250 (5,525)	4,100 (6,970)	7,600 (12,920)	6,600 (11,200)	6,900 (11,730)	12,500 (21,250)	12,300 (20,910)	16,500 (28,050)	
external static pressure <sup>1</sup> - inches of water (Pa)	0.5 (125)										
RPM	875	1185	1065	1230	650	650	680	810	780	695	
Fan Motor HP - standard	1	3	2	3	3			7.5		10	
Quantity of fans	1				2						
Size	12 x 12				15 x 15					18 x 18	
Quantity of Belts	1	2	1	2	2						
Condenser Coil											
Face Area, sq. ft. (m <sup>2</sup> )	9.2 (85)				14.6 (135)			19.4 (180)	20.7 (192)		
Tubes	Copper										
Fins	Aluminum										
Rows of Coil	3	3	6	6	2	4	6	4	6	6	
Optional Filters											
Quantity	4				2/4			6/2			
Nominal Size, inches	16x25x2				18x24x2/ 18x18x2			18x24x2/ 18x18x2			
Efficiency	MERV 8				MERV 8			MERV 8			
Piping Connection Sizes <sup>2</sup>	1/unit				2/unit						

**Table 5.1 Vertiv™ Liebert® Piggyback Air-cooled Condenser Capacity Data (continued)**

Model Size	224A	280A	332A	378A	350A	550A	675A	925A	1100A	1350A
Frame Size	31 in.				72 in.			97 in.		
Liquid Line, O.D. Cu	5/8"				1/2"			1/2"		
Hot Gas Line, O.D. Cu	5/8"		7/8"		5/8"	7/8"		7/8"		1-1/8"
Condensate Drain, NPT-Female	1-1/4"				1-1/4"			1-1/4"		
1 With standard blower HP and without filter section										
2 Unit connection sizes are not necessarily field line sizes. See line size chart in piping section of this manual.										

**Table 5.2 Liebert® Piggyback Condenser Selections**

Indoor Model #	Outdoor Design Ambient Temperature, °F (°C)		
	95 (35)	100 (38)	105 (41)
BU/BF042A	PB0224A	PB0280A	PB0332A
BU/BF067A	PB0332A	PB0378A	N/A
DS/VS028A	PB0925A	PB1100A	PB1100A
DS/VS035A	PB0925A	PB1100A	PB1350A
DS/VS042A	PB1100A	PB1350A	N/A
DS/VS053A	PB1350A	N/A	N/A
DS/VS070A	N/A	N/A	N/A
DS/VS077A	N/A	N/A	N/A
DS/VS105A	N/A	N/A	N/A

Note: Liebert® Piggyback condensers are available for replacement only for Liebert® Challenger units.

## 5.2 Standard and Optional Features for Vertiv™ Liebert® Piggyback Condensers

The features are described in the submittal documents included in the [Submittal Drawings](#).

The following table lists the relevant documents by number and title.

**Table 5.3 Feature Lists**

Document Number	Title
DPN000698	Standard and Optional features for 31-in. frame models
DPN000691	Standard and Optional features for 72-in. and 97-in. frame models

## 5.3 Condenser Piping and Refrigerant Requirements

Install all refrigeration piping with high-temperature brazed joints.

Use prevailing good refrigeration practices for piping supports, leak testing, dehydration and charging of the refrigeration circuits.

Isolate the refrigeration piping from the building using vibration-isolating supports.

The pipe connection locations, piping general arrangement and schematics are described in the submittal documents included in the [Submittal Drawings](#).

The following tables list the relevant documents by number and title.

**Table 5.4 Piping General Arrangement Drawings**

Document Number	Title
DPN000673	General Arrangement Diagram, 31-in. frame models
DPN002754	General Arrangement Diagram, 72-in. and 97-in. frame models

**Table 5.5 Piping Connection Drawings**

Document Number	Title
DPN000676	Connection Locations and Refrigerant Planning Values, 31-in. frame models
DPN000696	Connection Locations and Refrigerant Planning Values, 72-in. and 97-in. frame models

### 5.3.1 Condenser Refrigerant Piping Line Sizes and Equivalent Lengths

Install traps in the hot gas lines on vertical risers over 5 ft (1.5 m) in elevation and install additional traps for every 25 ft (7.6 m) in elevation. The traps collect condensed refrigerant and refrigerant oil during the off-cycle of the unit and ensure flow of refrigerant oil during operation.

Factory approval is required for a refrigerant piping run that exceeds 150 ft (45 m) equivalent length or when condensers must be located below the level of the cooling coil. Contact a Vertiv representative for assistance.

**Table 5.6 Recommended Refrigerant Line Sizes, CU, O.D.**

System Fluid: R-407C		Standard Scroll Models (Non-Digital Scroll)			4-Step Semi-Hermetic or Digital-Scroll Models		
Model	Equivalent Length	50 ft (15 m)	100 ft (30 m)	150 ft (45 m)	50 ft (15 m)	100 ft (30 m)	150 ft (45 m)
DS/VS035	Hot Gas Line, in.	7/8	7/8	7/8	3/4	7/8	7/8
	Liquid Line, in.	1/2	5/8	5/8	1/2	5/8	5/8
DS/VS042	Hot Gas Line, in.	7/8	7/8	7/8	7/8	7/8	1-1/8 <sup>1</sup>
	Liquid Line, in.	1/2	5/8	5/8	5/8	5/8	5/8
DS/VS053	Hot Gas Line, in.	7/8	1-1/8	1-1/8	7/8	1-1/8 <sup>1</sup>	1-1/8 <sup>1</sup>
	Liquid Line, in.	5/8	7/8	7/8	5/8	7/8	7/8

**Table 5.6 Recommended Refrigerant Line Sizes, CU, O.D. (continued)**

System Fluid : R-407C		Standard Scroll Models (Non-Digital Scroll)			4-Step Semi-Hermetic or Digital-Scroll Models		
Model	Equivalent Length	50 ft (15 m)	100 ft (30 m)	150 ft (45 m)	50 ft (15 m)	100 ft (30 m)	150 ft (45 m)
DS/VS070	Hot Gas Line, in.	1-1/8	1-1/8	1-1/8	1-1/8 <sup>1</sup>	1-1/8 <sup>1</sup>	1-1/8 <sup>1</sup>
	Liquid Line, in.	7/8	7/8	7/8	7/8	7/8	7/8
DS/VS077 <sup>2</sup>	Hot Gas Line, in.	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8
	Liquid Line, in.	7/8	7/8	7/8	7/8	7/8	7/8
DS/VS105 <sup>2</sup>	Hot Gas Line, in.	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8
	Liquid Line, in.	7/8	7/8	1-1/8	7/8	7/8	1-1/8

For runs longer than 150 ft (45.7 m) equivalent length, consult the factory.

- Downsize vertical riser one trade size (1-1/8" to 7/8")
- Digital scroll not available on 077 and 105 models.

Source: DPN000788 Rev 13

Product Discontinued as of August 19, 2023



### 5.3.2 Condenser Refrigerant Charge Requirements

The following table provides the refrigerant charge requirements for the Vertiv™ Liebert® Piggyback condenser.

**Table 5.7 Approximate R-407C Refrigerant Charge per Circuit**

Model	Per Circuit, lb (kg)
PB0224A	35 (15.9)
PB0280A	35 (15.9)
PB0332A	69 (31.3)
PB0378A	69 (31.3)
PB0350A	24 (10.9)
PB0550A	30 (13.6)
PB0675A	35 (15.9)
PB0925A	33 (15.0)
PB1100A	69 (31.3)
PB1350A	69 (31.3)

Source: DPN000696 Rev. 4 and DPN000676 Rev. 3

**Table 5.8 Interconnecting Piping Refrigerant Charge by Line Size, lb/100 ft (kg/30 m)**

Line Size, O.D., in.	R-407C, lb/100 ft (kg/30 m)	
	Hot gas	Liquid
3/8	-	3.6 (1.6)
1/2	0.5 (0.2)	6.7 (3.0)
5/8	0.8 (0.4)	10.8 (4.8)
3/4	1.2 (0.5)	16.1 (7.2)
7/8	1.7 (0.8)	22.3 (10.0)
1-1/8	2.9 (1.3)	38.0 (17.0)
1-3/8	4.4 (2.0)	57.9 (25.9)
1-5/8	6.2 (2.8)	-

Note: Data based on 50°F Evap 15°F superheat 125°F SCT 10°F subcooling  
Source: DPN003099 Rev 1

### 5.3.3 Charging the System with Refrigerant

Consult the Installer/User Guide for the indoor unit, and use the procedure for charging a condenser with Vertiv™ Liebert® Lee-Temp Receivers.

## 5.4 Condenser Electrical Field Connections

Line voltage electrical service is required for all models at the location of the unit. Refer to equipment nameplate for wire size and circuit-protection requirements. Electrical service must conform to national and local electrical codes. Refer to electrical schematic when making connections.

A manual, electrical-disconnect switch must be installed in accordance with local codes. Consult local codes for external disconnect requirements. All internal wiring is completed at the factory.



**WARNING! Risk of electric shock. Can cause equipment damage, injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. Service and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.**



**WARNING! Risk of contact with high-speed moving parts. Can cause injury or death. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off and verify that all moving parts have completely stopped before working within unit cabinet.**

**NOTE: Installation and service of this equipment should be done only by properly trained and qualified personnel who have been specially trained in the installation of air conditioning equipment.**

**NOTE: Use copper wiring only. Make sure that all connections are tightened to the proper torque mentioned on the component.**

The electrical field connections are described in the submittal documents included in [Submittal Drawings](#).

The following table lists the relevant documents by number and title.

**Table 5.9 Condenser Electrical Field Connection Drawings**

Document Number	Title
DPN000677	Electrical Field Connections, 31-in. frame models
DPN000697	Electrical Field Connections, 72-in. and 97-in. frame models

### 5.4.1 Condenser Line-voltage Wiring



**WARNING! Risk of electric shock and short circuits. Can cause equipment damage, injury or death. Insert CSA certified or UL listed bushings into holes and or knockouts used to route wiring through to protect the wire insulation from contact with sheet metal edges.**

The voltage supply to the condenser may not be the same voltage supply as required by the indoor unit. Consider using UPS equipment on both data-center cooling units and Vertiv™ Liebert® Piggyback Condenser to maintain uninterrupted cooling capability. Refer to the unit's serial tag for specific condenser electrical requirements.

1. Route the supply power to the site disconnect switch and then to the unit.

2. Route the conduit to the knockout provided in the bottom right end of the electrical control enclosure.
3. Connect the earth-ground wire lead to the marked earth-ground connection terminal provided near the factory-installed disconnect switch.

**Table 5.10 Electrical Data—60-Hz, 3 ph, 31-in. Frame Models**

Model	Unit Voltage	Blower HP	Total Unit		
			FLA	WSA	OPD
PB224A	208	1	4.6	5.8	15
	230	1	4.2	5.3	15
	460	1	2.1	2.6	15
	575	1	1.7	2.1	15
PB280A PB378A	208	3	10.6	13.3	20
	230	3	9.6	12.0	20
	460	3	4.8	6.0	15
	575	3	3.9	4.9	15
PB332A	208	2	7.5	9.4	15
	230	2	6.8	8.5	15
	460	2	3.4	4.3	15
	575	2	2.7	3.4	15

HP = Horsepower, FLA = Full load Amps, WSA = Wire size Amps, OPD = Maximum overload protective device  
Source: DPN004123 Rev. 1

**Table 5.11 Electrical Data—60-Hz, 3 ph, 72-in. and 97-in. Frame Models**

Model	Unit Voltage	Blower HP	Total Unit		
			FLA	WSA	OPD
PB350A PB550A PB675A	208	2	7.5	9.4	15
	230	2	6.8	8.5	15
	460	2	3.4	4.3	15
	575	2	2.7	3.4	15
PB675A	208	3	10.6	13.3	20
	230	3	9.6	12.0	20
	460	3	4.8	6.0	15
	575	3	3.9	4.9	15

**Table 5.11 Electrical Data—60-Hz, 3 ph, 72-in. and 97-in. Frame Models (continued)**

Model	Unit Voltage	Blower HP	Total Unit		
			FLA	WSA	OPD
PB925A PB1100A	208	7.5	24.2	30.3	50
	230	7.5	22.0	27.5	45
	460	7.5	11.0	13.8	20
	575	7.5	9.0	11.3	20
PB1350A	208	10	30.8	38.5	60
	230	10	28.0	35.0	60
	460	10	14.0	17.5	30
	575	10	11.0	13.8	20
	208	15	46.2	57.8	100
	230	15	42.0	52.5	90
	460	15	21.0	26.3	45
	575	15	17.0	21.3	35

HP = Horsepower, FLA = Full load Amps, WSA = Wire size Amps, OPD = Maximum overload protective device  
 Source: DPN004123 Rev. 1

**Table 5.12 Liebert® Lee-Temp Electrical Data, 60 Hz**

Frame size, in.	Voltage	Watts	FLA	WSA	OPD
31	120	150	1.4	1.8	15
	120	300	2.8	3.5	15
	208/230	150	0.7	0.9	15
	208/230	300	1.4	1.8	15
72 and 97	120	150	2.8	3.5	15
	120	300	5.6	7.0	15
	208/230	150	1.4	1.8	15
	208/230	300	2.8	3.5	15

The Liebert® Lee-Temp receiver requires a separate power feed for heaters. The condenser is not designed to supply power to the receiver's heater pads. One supply power feed per unit and is wired to Terminals 90 & 91 and ground wire to ground terminal.

### 5.4.2 Condenser Low Voltage Electrical Connections

A control interlock between the Vertiv™ Liebert® Piggyback unit and the indoor unit is required. This interlock is connected between 70 and 71 in the low-voltage section of the indoor unit and terminals 70 and 71 of the electric panel of the Liebert® Piggyback unit. On dual-compressor indoor units, run wires from 70, 71, and 230, and connect 70 to terminal 70 of Liebert® Piggyback, and 71 and 230 to terminal 71 of Piggyback.

## 6 Vertiv™ Liebert® Piggyback Drycoolers

Liebert® Piggyback drycoolers are air-cooled heat-rejection units that control glycol fluid temperature by modulating a three-way valve, controlling glycol flow rates through the coil.

- Pump and Expansion tank—The Liebert® Piggyback drycooler includes factory installation of pumps and a standard 8.8-gallon expansion tank.
- 3-way bypass—a modulating, 3-way bypass valve controls the leaving fluid temperature. The fluid-temperature setpoint is field-adjustable from 0° to 100°F (–18 to 38°C).
- Operation overview—In the Liebert® Piggyback drycooler system, the fan operates continuously and a proportioning thermostat senses the fluid-leaving temperature. As the fluid reaches the setpoint temperature, the 3-way valve modulates the bypass port to maintain the temperature of the leaving fluid.
- Pump controls—available on all Liebert® drycoolers that contain pumps. The pump controls, including fuses, contactor, and overloads for pump motor(s), are built-in to the same panel as the Liebert® drycooler controls.
- Dual-pump controls—for a primary and a stand-by pump, employ a flow switch and timing circuit to provide continuous operation in the event of a loss-of-flow condition. The lead pump can be manually selected from the electrical-panel switch.

Product Discontinued as of August 19, 2023

## 6.1 Vertiv™ Liebert® Drycooler Performance Data

Table 6.1 Liebert® Piggyback Air-cooled Drycooler Capacity Data

Model Size	PD-102	PD-133	PD-150	PD-223	PD-290	PD-333
<b>Fan Section</b>						
Standard Air Volume - CFM (m <sup>3</sup> /h)	6,600 (11,200)	6,900 (11,730)	6,900 (11,730)	12,500 (21,250)	12,300 (20,910)	16,500 (28,050)
external static* - inches of water (Pa)	0.5 (125)					
RPM	650	680	680	810	780	695
Fan Motor HP	3	3	3	7.5	7.5	10
Quantity of fans	2	2	2	2	2	2
Size	15x15	15x15	15x15	15x15	15x15	18x18
Quantity of Belts	2	2	2	2	2	2
<b>Pumps</b>						
Standard Pump Size HP	1.5		2	3	5	
Optional Pump Size HP	2		3	5	3	
<b>Drycooler Coil</b>						
Face Area, sq. ft. (m <sup>2</sup> )	14.6	14.6	14.6	19.4	20.7	20.7
Tubes	Copper					
Fins	Aluminum					
Rows of Coil	4	6	6	6	6	6
<b>Optional Filters</b>						
Quantity	2/4			6/2		
Nominal Size, inches	18x24x2/18x18x2	18x24x2/18x18x2	18x24x2/18x18x2	18x24x2/18x18x2	18x24x2/18x18x2	18x24x2/18x18x2
Efficiency	MERV 8					
<b>Piping Connection Sizes**</b>						
Glycol Supply, ODS Cu, in.	1-5/8		2-1/8		2-1/8	
Glycol Return, ODS Cu, in.	1-5/8		2-1/8		2-1/8	
Condensate Drain, NPT - Female	1-1/4"		1-1/4"		1-1/4"	
* With standard blower HP and without filter section.						
** Unit connection sizes are not necessarily field line sizes.						

**Table 6.2 Liebert® Piggyback Drycooler Selections for Liebert® PDX, Liebert® DS and Liebert® CRV Units<sup>1</sup>**

System Model	95°F Ambient (35°C) Std Selection	100°F Ambient (38°C)	105°F Ambient (41°C)
<b>Liebert® PDX<sup>2</sup></b>			
PX011_W/G/H/3	PD_102	PD_102	Consult Factory
PX018_W/G/H/3	PD_102	PD_102	PD_102
PX023_W/G/H/3	PD_102	PD_223	PD_223
PX029_W/G/H/3	PD_133	PD_223	PD_223
<b>Liebert® DS</b>			
DS/VS028W	PD_133	PD_223	PD_333
DS/VS035W	PD_150	PD_223	N/A
DS/VS042W	PD_223	PD_333	N/A
DS/VS053W	PD_290	N/A	N/A
DS/VS070W	PD_333	N/A	N/A
DS/VS077W	PD_333	N/A	N/A
DS/VS105W	N/A	N/A	N/A
<b>Liebert® CRV</b>			
CR019/CR020	PD_102	PD_133	PD_233
CR035	PD_223	PD_223	PD_333
<ol style="list-style-type: none"> <li>1. Selections are based on one indoor unit to one Liebert® drycooler system. Consult factory for Liebert® drycooler selections for common glycol loop solutions with multiple indoor units and multiple drycoolers with redundancy considerations.</li> <li>2. All Liebert® piggyback drycooler selections are either 72-in. or 97-in. frame width, whereas the Vertiv™ Liebert® PDX is only 34.5 in. wide.</li> </ol>			

## 6.2 Standard and Optional Features for Drycoolers

The features are described in the submittal documents included in the [Submittal Drawings](#).

The following table lists the relevant documents by number and title.

**Table 6.3 Feature Lists**

Document Number	Title
DPN000705	Standard and Optional features

### 6.2.1 Optional Device Considerations

Depending on the complexity of the system, various other devices may be specified—refer to site-specific drawings. Some of the devices that may be required are:

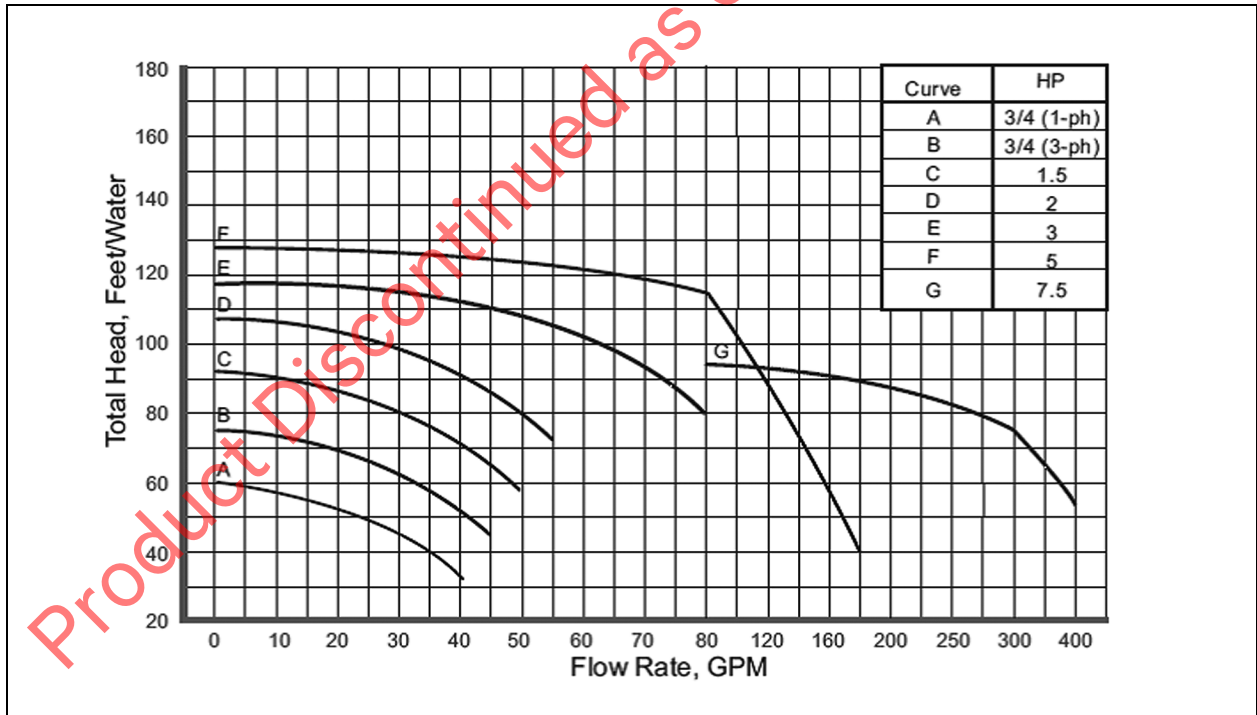
- Pressure gauges
- Flow switches
- Automatic air separator
- Tempering valves
- Standby pumps
- Sensors for electrical controls.

**NOTICE**

Risk of frozen pipes and corrosion from improper coolant mixture. Can cause water leaks resulting in equipment and building damage.

When the Vertiv™ Liebert® drycooler, the cooling unit or piping may be exposed to freezing temperatures, charge the system with the proper percentage of glycol and water for the coldest design ambient temperature. Automotive antifreeze is unacceptable and must NOT be used in any glycol fluid system. Use only HVAC glycol solution that meets the requirements of recommended industry practices. Do not use galvanized pipe.

Figure 6.1 Liebert® Drycooler Pump Curve, 60 Hz





## 6.2.2 Vertiv™ Liebert® Drycooler Fluid Piping Requirements

### NOTICE

Risk of piping-system corrosion and freezing fluids. Can cause leaks resulting in equipment and expensive building damage. Cooling coils, heat exchangers and piping systems are at high risk of freezing and premature corrosion. Fluids in these systems must contain an inhibitor to prevent premature corrosion.

The system coolant fluid must be analyzed by a competent fluid-treatment specialist before start up to establish the inhibitor level and evaluated at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion. The fluid complexity and variations of required treatment programs make it extremely important to obtain the advice of a competent and experienced fluid-treatment specialist and follow a regularly scheduled coolant-fluid system-maintenance program.

Fluid chemistry varies greatly as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components.

The chemistry of the coolant fluid used must be considered, because some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The coolant fluid must be treated and circulating through the system continuously to prevent the buildup of deposits and/or growth of bacteria. Proper inhibitor maintenance must be performed to prevent corrosion of the system.

Consult fluid manufacturer for testing and maintenance of inhibitors.

Commercial-grade coolant fluid is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the coolant fluid from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

Vertiv recommends installing a monitored fluid-detection system that is wired to activate the automatic-closure of field-installed coolant-fluid supply and return shut-off valves to reduce the amount of coolant-fluid leakage and consequential equipment and building damage. The shut-off valves must be sized to close-off against the maximum coolant-fluid system pressure in case of a catastrophic fluid leak.

### NOTICE

Risk of a catastrophic water circuit rupture. Can cause expensive building and equipment damage.

Install shutoff valves in the supply and return water lines that automatically close if water is detected by the leak detection system. The shutoff valves should be spring return and must be rated for a close-off pressure that is the same as or higher than the supply water pressure. A monitored leak detection system should be installed in the base of the unit or under the unit to actuate the shutoff valves immediately on a leak detection signal.

### NOTICE

Risk of no-flow condition. Can cause equipment damage.

Do not leave the water/coolant fluid-supply circuit in a no-flow condition. Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of tubes. Keep unit switched On and water/coolant fluid-supply circuit system operating continuously.

Piping between the Liebert® drycooler, any external pump and the cooling unit is required to complete the system.

Properly-sized pipes will help reduce pumping power and operating costs. Pipe material choices are typically copper, plastic or steel/black iron. Consult glycol and pipe manufacturing literature for compatibility and sizing assistance. Galvanized piping should not be used. Any copper piping installed should be “L” or “K” refrigerant-grade copper.

Liebert® drycooler supply and return connections vary in size and number. See **Table 6.6** on the next page.

Consider the following guidelines when planning and performing the piping installation:

- Equipment damage and personal injury can result from improper piping installation, leak checking, fluid chemistry and fluid maintenance.
- Follow local piping codes, safety codes.
- Qualified personnel must install and inspect system piping.
- On multiple-pump packages install a check valve at the discharge of each pump to prevent back-flow through the standby pump(s).
- To extend the service life of the Liebert® drycooler and pumps, install 16-20 mesh-screen filters/strainers in the supply line to the pumps. The filter/strainer(s) should be easily replaced or cleaned.
- Consider installing hose bibs at the lowest point of the system to facilitate filling.
- Keep piping runs as straight as possible, avoid unnecessary bends, and minimize additional fittings.
- Isolate piping from the building with vibration-isolating supports. Use soft, flexible material to seal between pipes and wall openings to prevent pipe damage.
- Use welded or high-temperature soldered joints where possible. Threaded pipe joints, if needed, can be made with tightly drawn Teflon tape.
- Clean and prepare all pipe connections before joining. Be careful not to allow solder/joining debris to get inside the lines during the connection process.

The piping general arrangement and schematics are described in the submittal documents included in the [Submittal Drawings](#).

The following tables list the relevant documents by number and title.

**Table 6.4 Piping General Arrangement Drawings**

Document Number	Title
DPN000706	General Arrangement Diagram, Glycol system
DPN000707	General Arrangement Diagram, GLYCOOL system

**Table 6.5 Piping Connection Drawings**

Document Number	Title
DPN000711	Primary connection locations, 72-in. and 97-in. frame models

**Table 6.6 Standard Liebert® Drycooler Piping Connection Sizes and Internal Volume**

Model	No. of Fans	Internal Volume, gal. (L)	Inlet & Outlet Connection Size, ODS Copper, in.	No. of Inlets/Outlets
PD_102	2	6 (23)	1-5/8	1/1
PD_133	2	9 (35)	1-5/8	1/1
PD_150	2	9 (35)	2-1/8	1/1
PD_223	2	12 (46)	2-1/8	1/1
PD_290	2	13 (50)	2-1/8	1/1
PD_333	2	13 (50)	2-1/8	1/1

## Preparing to Fill the System

### NOTICE

Risk of improper handling of glycol products. Can cause environmental damage.

Before using any glycol products, review the latest manufacturer's Material Safety Data Sheets and ensure that you can use the product safely. The installer must read, understand and comply with the information on the product packaging and in the current Material Safety Data Sheets. Make this information available to anyone responsible for operation, maintenance and repair of the Vertiv™ Liebert® drycooler and related equipment.

Because government regulations and use conditions are subject to change, it is the user's responsibility to determine that this information is appropriate and suitable under current, applicable laws and regulations.

### NOTICE

Risk of using the wrong type of glycol. Can cause piping damage, coolant fluid leaks, and catastrophic and expensive building and equipment damage.

Do not use automotive antifreeze as it contains chemicals that can damage the piping system.

Typical inhibited formula ethylene glycol and propylene glycol are supplied with corrosion inhibitors and do not contain a silicone anti-leak formula. Commercial ethylene glycol and propylene glycol, when pure, are generally less corrosive to the common metals of construction than water itself. Aqueous solutions of these glycols, however, assume the corrosivity of the water from which they are prepared and may become increasingly corrosive with use when not properly inhibited.

Read and follow the water-system maintenance [NOTICE](#) on page 4 .

Remove any dirt, oil, or metal filings that may contaminate the cooling system piping to prevent contamination of the fresh glycol solution and fouling of the Liebert® drycooler piping. Flush the system thoroughly using a mild cleaning solution or high-quality water and then completely drain before charging with glycol.

Cleaning a new system is just as important as cleaning an old one. New systems can be coated with oil or a protective film. Dirt and scale are also common. Any residual contaminants could adversely affect the heat-transfer stability and performance of your system. In most cases, special cleaners are needed to remove scale, rust, and hydrocarbon foulants from pipes, manifolds, and passages. For more information on cleaners and degreasers, contact your Vertiv representative. Follow the manufacturer's instructions when using these products.

Calculate the internal volume of the system as closely as possible. The Liebert® drycooler volumes are shown in [Table 6.6](#) on the previous page . Use [Table 6.7](#) below , for field-installed piping volumes. Indoor unit volumes are found in their respective user manuals.

**Table 6.7 Glycol Volume in Standard type "L" Copper Piping**

Diameter, in.		Volume	
Outside	Inside	gal/ft	l/m
1-3/8	1.265	0.065	0.81
1-5/8	1.505	0.092	1.15
2-1/8	1.985	0.161	2.00
2-5/8	2.465	0.248	3.08

**Table 6.7 Glycol Volume in Standard type "L" Copper Piping (continued)**

Diameter, in.		Volume	
Outside	Inside	gal/ft	l/m
3-1/8	2.945	0.354	4.40
3-5/8	3.425	0.479	5.95
4-1/8	3.905	0.622	7.73

When considering the use of any glycol products in a particular application, review the latest Material Safety Data Sheets and ensure that the intended use can be accomplished safely. For Material Safety Data Sheets and other product safety information, contact the supplier nearest you. Before handling any other products mentioned in the text, you should obtain available product safety information and take necessary steps to ensure safety of use.

**Table 6.8 Glycol Concentrations for Freeze Protection by Ambient Temperature**

Coolant	Minimum Outdoor Ambient Temperature, °F (°C)							
	20 (-7)	10 (-12)	0 (-18)	-10 (-23)	-20 (-29)	-30 (-34)	-40 (-40)	-50 (-46)
Propylene Glycol, % by volume	18*	29*	36	42	46	50	54	57
Ethylene Glycol, % by volume	17*	26*	35	41	46	50	55	59

Based on Dowfrost (PG) and Dowtherm (EG) product literature.  
 \*Inhibitor levels should be adjusted to properly protect the system if solution concentrations are less than 30%.

There are two basic types of additives:

- Corrosion inhibitors
- Environmental stabilizers

The corrosion inhibitors function by forming a surface barrier that protects the metals from attack. Environmental stabilizers, while not corrosion inhibitors in the strictest sense, decrease corrosion by stabilizing or favorably altering the overall environment. An alkaline buffer, such as borax, is a simple example of an environmental stabilizer, because its prime purpose is to maintain an alkaline condition (pH above 7).

The percentage of glycol to water must be determined by using the lowest design outdoor temperature in which the system is operating. **Table 6.8** above, indicates the solution volume of inhibited glycol required to provide freeze protection at various ambient temperatures

## Filling the Vertiv™ Liebert® Drycooler System

We recommend installing hose bibs at the lowest point of the system.

When filling a glycol system, keep air to a minimum. Air in glycol turns to foam and is difficult and time-consuming to remove. (Consider anti-foam additives.)

### To fill the system:

1. Open all operating systems to the loop.
2. With the top vent(s) open, fill the system from the bottom of the loop.  
The glycol will push the air out of the top of the system, minimizing trapped air.
3. Fill to approximately 80% of calculated capacity, then continue to fill slowly from this point, checking fluid levels until full.

**NOTE:** For glycol solution preparation and periodic testing, follow manufacturer's recommendations. Do not mix products of different manufacturers.

Product Discontinued as of August 19, 2023

### 6.3 Vertiv™ Liebert® Drycooler Electrical Field Connections

Line voltage electrical service is required for all models at the location of the unit. Refer to equipment nameplate for wire size and circuit-protection requirements. Electrical service must conform to national and local electrical codes. Refer to electrical schematic when making connections.

A manual, electrical-disconnect switch must be installed in accordance with local codes. Consult local codes for external disconnect requirements. All internal wiring is completed at the factory



**WARNING! Risk of electric shock. Can cause equipment damage, injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. Service and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.**



**WARNING! Risk of contact with high-speed moving parts. Can cause injury or death. Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is Off and verify that all moving parts have completely stopped before working within unit cabinet.**

**NOTE: Installation and service of this equipment should be done only by properly trained and qualified personnel who have been specially trained in the installation of air conditioning equipment.**

**NOTE: Use copper wiring only. Make sure that all connections are tightened to the proper torque mentioned on the component.**

The electrical field connections are described in the submittal documents included in [Submittal Drawings](#).

The following table lists the relevant documents by number and title.

**Table 6.9 Liebert® Drycooler Electrical Field Connection Drawings**

Document Number	Title
DPN000712	Electrical Field Connections, 72-in. and 97-in. frame models

Product Discontinued as of August 19, 2023

### 6.3.1 Vertiv™ Liebert® Drycooler Line Voltage Wiring



**WARNING! Risk of electrical fire, smoke, and short circuit. Can cause activation of fire-suppression system, building and equipment damage, injury or death. Select and install the line side electrical supply wire and overcurrent protection device(s) according to the specifications on the unit nameplate(s), per the instructions in this manual and according to the applicable national, state, and local code requirements. Use copper conductors only. Make sure all electrical connections are tight. Unit-specific wiring diagrams are provided on each unit.**

Line voltage electrical service is required for all Liebert® drycoolers at the location of the drycooler. The voltage supply to the Liebert® drycooler may not be the same voltage supply as required by the indoor unit. Consider using UPS equipment on both data-center cooling units and Liebert® Piggyback Drycooler to maintain uninterrupted cooling capability. Refer to the unit's serial tag for specific, Liebert® drycooler electrical requirements. A unit disconnect is standard. However, a site disconnect may be required per local code to isolate the unit for maintenance.

1. Route the supply power to the site disconnect switch and then to the unit.
2. Route the conduit to the knockout provided in the bottom right end of the electrical control enclosure.
3. Connect the earth-ground wire lead to the marked earth-ground connection terminal provided near the factory-installed disconnect switch.

**Table 6.10 Liebert® Drycooler without Pump Electrical Data, 60 Hz, 3-phase**

Model	Unit Voltage	Blower HP	Total Unit		
			FLA	WSA	OPD
PD-102 PD-133	208	2	7.5	9.4	15
	230	2	6.8	8.5	15
	460	2	3.4	4.3	15
	575	2	2.7	3.4	15
	208	3	10.6	13.3	20
	230	3	9.6	12.0	20
	460	3	4.8	6.0	15
	575	3	3.9	4.9	15
PD-150	208	2	7.5	9.4	15
	230	2	6.8	8.5	15
	460	2	3.4	4.3	15
	575	2	2.7	3.4	15
	208	3	10.6	13.3	20
	230	3	9.6	12.0	20
	460	3	4.8	6.0	15
	575	3	3.9	4.9	15

**Table 6.10 Liebert® Drycooler without Pump Electrical Data, 60 Hz, 3-phase (continued)**

Model	Unit Voltage	Blower HP	Total Unit		
			FLA	WSA	OPD
PD-223	208	7.5	24.2	30.3	50
	230	7.5	22.0	27.5	45
	460	7.5	11.0	13.8	20
	575	7.5	9.0	11.3	20
PD-290	208	7.5	24.2	30.3	50
	230	7.5	22.0	27.5	45
	460	7.5	11.0	13.8	20
	575	7.5	9.0	11.3	20
PD-333	208	10	30.8	38.5	60
	230	10	28.0	35.0	60
	460	10	14.0	17.5	30
	575	10	11.0	13.8	20
	208	15	46.2	57.8	100
	230	15	42.0	52.5	90
	460	15	21.0	26.3	45
	575	15	17.0	21.3	35

HP = Horsepower FLA=Full Load Amps WSA=Wire Size Amps OPD = Maximum Overload Protective Device  
 Source: DPN004124 Rev. 0

**Table 6.11 Liebert® Drycooler with Standard Pump (Single or Dual ) Electrical Data, 60 Hz, 3-phase**

Model	Unit Voltage	Blower HP	Pump HP	Total Unit		
				FLA	WSA	OPD
PD-102 PD-133	208	2	1.5	14.1	16.0	20
	230	2	1.5	12.8	14.5	20
	460	2	1.5	6.4	7.3	15
	575	2	1.5	5.1	5.8	15
	208	3	1.5	17.2	19.9	30
	230	3	1.5	15.6	18.0	25
	460	3	1.5	7.8	9.0	15
	575	3	1.5	6.3	7.3	15



Table 6.11 Liebert® Drycooler with Standard Pump (Single or Dual ) Electrical Data, 60 Hz, 3-phase (continued)

Model	Unit Voltage	Blower HP	Pump HP	Total Unit		
				FLA	WSA	OPD
PD-150	208	2	2	15.0	16.9	20
	230	2	2	13.6	15.3	20
	460	2	2	6.8	7.7	15
	575	2	2	5.4	6.1	15
	208	3	2	18.1	20.8	30
	230	3	2	16.4	18.8	25
	460	3	2	8.2	9.4	15
	575	3	2	6.6	7.6	15
PD-223	208	7.5	3	34.8	40.9	60
	230	7.5	3	31.6	37.1	50
	460	7.5	3	15.8	18.6	25
	575	7.5	3	12.9	15.2	20
PD-290	208	7.5	5	40.9	47.0	70
	230	7.5	5	37.2	42.7	60
	460	7.5	5	18.6	21.4	30
	575	7.5	5	15.1	17.4	25
PD-333	208	10	5	47.5	55.2	80
	230	10	5	43.2	50.2	70
	460	10	5	21.6	25.1	35
	575	10	5	17.1	19.9	30
	208	15	5	62.9	74.5	110
	230	15	5	57.2	67.7	100
	460	15	5	28.6	33.9	50
575	15	5	23.1	27.4	40	

HP = Horsepower FLA=Full Load Amps WSA=Wire Size Amps OPD = Maximum Overload Protective Device  
Source: DPN004124 Rev. 0

**Table 6.12 Liebert® Drycooler with Optional Pump (Single or Dual ) Electrical Data, 60 Hz, 3-phase**

Model	Unit Voltage	Blower HP	Pump HP	Total Unit		
				FLA	WSA	OPD
PD-102 PD-133	208	2	2	15.0	16.9	20
	230	2	2	13.6	15.3	20
	460	2	2	6.8	7.7	15
	575	2	2	5.4	6.1	15
	208	3	2	18.1	20.8	30
	230	3	2	16.4	18.8	25
	460	3	2	8.2	9.4	15
	575	3	2	6.6	7.6	15
PD-150	208	2	3	18.1	20.8	30
	230	2	3	16.4	18.8	25
	460	2	3	8.2	9.4	15
	575	2	3	6.6	7.6	15
	208	3	3	21.2	23.9	30
	230	3	3	19.2	21.6	30
	460	3	3	9.6	10.8	15
	575	3	3	7.8	8.8	15
PD-223	208	7.5	5	40.9	47.0	70
	230	7.5	5	37.2	42.7	60
	460	7.5	5	18.6	21.4	30
	575	7.5	5	15.1	17.4	25
PD-290	208	7.5	3	34.8	40.9	60
	230	7.5	3	31.6	37.1	50
	460	7.5	3	15.8	18.6	25
	575	7.5	3	12.9	15.2	20

Product Discontinued as of August 19, 2023

**Table 6.12 Liebert® Drycooler with Optional Pump (Single or Dual ) Electrical Data, 60 Hz, 3-phase (continued)**

Model	Unit Voltage	Blower HP	Pump HP	Total Unit		
				FLA	WSA	OPD
PD-333	208	10	3	41.4	49.1	70
	230	10	3	37.6	44.6	70
	460	10	3	18.8	22.3	35
	575	10	3	14.9	17.7	25
	208	15	3	56.8	68.4	110
	230	15	3	51.6	62.1	100
	460	15	3	25.8	31.1	50
	575	15	3	20.9	25.2	40

HP = Horsepower FLA=Full Load Amps WSA=Wire Size Amps OPD = Maximum Overload Protective Device  
Source: DPN004124 Rev. 0

### 6.3.2 Vertiv™ Liebert® Drycooler Low Voltage Electrical Wiring

A control interlock between the Liebert® Piggyback drycooler and the indoor unit is required. This Class 1, field-supplied interlock wire is field-wired between 70 and 71 on the wire raceway in the indoor unit low-voltage section and the Liebert® Piggyback drycooler terminals marked 70 and 71. These may be inside the electrical panel or in a separate, factory-wired junction box.

Liebert® Piggyback drycooler with dual-pump option is wired to provide an alarm signal to the cooling unit when a stand-by pump is initiated by the drycooler pump flow switch. A Class 1 field-supplied wire is field-wired between the Liebert® Piggyback drycooler terminals 24 and 50 and one set of cooling-unit remote alarm device terminals. Loss of flow from the primary pump will initiate a time-delayed closure of the alarm signal relay contacts. Upon contact closure, a “Standby Glycol Pump” alarm is indicated on the Vertiv™ Liebert® iCOM™ display and through BMS monitoring systems, allowing pump maintenance to be scheduled while the system continues to operate.

This page intentionally left blank

Product Discontinued as of August 19, 2023

## 7 Maintenance Guidelines

Restricted airflow through the heat-rejection coil will reduce the operating efficiency of the unit and can result in high temperatures and loss of cooling.

### To clean the coil:

1. Clean the coil of all debris that will inhibit air flow using compressed air or commercial coil cleaner.
2. Thoroughly rinse the coil to remove any cleaner residue.

Additional maintenance guidelines:

- Check for bent or damaged fins and repair as necessary.
- Check all piping and control capillaries for vibration isolation. Support as necessary.
- Check air filters after initial run period and monthly thereafter, replacing as necessary. Replace with the same size and type as originally furnished.
- Periodic checks of the blower package include: belts, motor mounts, fan bearings, and impellers.
- Belts should be checked monthly for signs of wear and adjustment. Most motor and fan bearings are permanently lubricated, however if lubricating fittings are installed, grease in accordance with the recommended grease posted at the fitting.

**IMPORTANT! When ordering replacement parts for heat rejection equipment, you must specify the model number, serial number, and voltage. Fill in this information below for future use.**

Model No.	_____
Serial No.	_____
Voltage	_____

Product Discontinued as of August 19, 2023

This page intentionally left blank

Product Discontinued as of August 19, 2023

## 8 Checklist for Completed Installation

### 8.1 Moving and Placing Equipment

1. Unpack and check received material.
2. Proper clearance for service access has been maintained around the equipment.
3. Equipment is level and mounting fasteners are tight.

### 8.2 Electrical Installation Checks

1. Supply voltage and phase matches equipment nameplate.
2. Power wiring connections completed to the disconnect switch.
3. Power line circuit breakers or fuses have proper ratings for equipment installed.
4. Control wiring connections completed between indoor evaporator and heat-rejection equipment.
5. All internal and external high- and low-voltage wiring connections are tight.
6. Confirm that unit is properly grounded to an earth ground.
7. Control transformer setting matches incoming power.
8. Electrical service conforms to national and local codes.
9. Verify that Terminals 70, 71, and 230 (when applicable) are used, and that they are properly-wired, particularly on systems that use two condensers for one indoor unit.

### 8.3 Piping Installation Checks

1. Piping completed to corresponding indoor cooling-unit refrigeration circuit/water-glycol loop.
2. Piping is leak-checked, evacuated and charged with specified refrigerant/appropriate glycol/water mixture.
3. Piping is properly sized, sloped, and trapped for proper oil return.
4. Check piping inside and outside of equipment for proper support and adequate spacing to prevent rub-through or chafing.
5. Hot-gas line on Vertiv™ Liebert® Lee-Temp receiver is fastened to the side of the cabinet and isolated for vibration reduction, if applicable.

### 8.4 Other Installation Checks

1. Field duct work completed to air inlet and discharge flanges.
2. Seal openings around piping and electrical connections.
3. Installation materials and tools have been removed from equipment (literature, shipping materials, construction materials, tools, etc.).
4. Locate blank start-up sheet, ready for completion by installer or start-up technician.

This page intentionally left blank

Product Discontinued as of August 19, 2023



## 9 Initial Start-up Checks and Commissioning Procedure for Warranty Inspection



**WARNING!** Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious injury or death. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable. Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components require and receive power even during the “Unit Off” mode of the Liebert® iCOM™ controller. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic. Follow all local codes.



**WARNING!** Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, serious injury or death. Installation and service of this equipment should be done only by qualified personnel who have been specially-trained in the installation of air-conditioning equipment and who are wearing appropriate, OSHA-approved PPE.

### NOTICE

Risk of improper electrical connection of three-phase input power. Can cause backward fan rotation and unit damage. Service technicians should observe fan rotation during the initial start-up to verify that 3-phase power is connected properly. We recommend checking the unit’s phasing with proper instrumentation to ensure that power connections were made correctly.

- Confirm that all items on [Checklist for Completed Installation](#) on page 45, have been done.
- Locate “Liebert® Piggyback Warranty Inspection Check Sheet” in the unit’s electric panel:
  - PSWI-8542-423CO for the Piggyback Condenser
  - PSWI-8542-424CO for the Piggyback Drycooler.
- Complete “Liebert® Piggyback Warranty Inspection Check Sheet” during start-up.
- Forward the completed “Liebert® Piggyback Warranty Inspection Check Sheet” to your local sales office. **This information must be completed and forwarded to validate warranty.**
- Contact your local sales representative or technical support if you have any questions or problems during unit start-up and commissioning. Visit <https://www.Vertiv.com/en-us/support/> or call 1-800-543-2778 for contacts.

This page intentionally left blank

Product Discontinued as of August 19, 2023

# Appendices

## Appendix A: Technical Support and Contacts

### A.1 Technical Support/Service in the United States

Vertiv Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Liebert® Thermal Management Products

1-800-543-2378

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

### A.2 Locations

#### United States

Vertiv Headquarters

505 N. Cleveland Ave.

Westerville, OH 43082, USA

#### Europe

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

#### Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road

Wanchai, Hong Kong

Product Discontinued as of August 19, 2023

This page intentionally left blank

Product Discontinued as of August 19, 2023

## Appendix B: Submittal Drawings

The submittal drawings are in the order of document part number (DPN). **Table B.1** below, groups the drawings by topic/application.

**Table B.1 Submittal Drawing Contents**

Document Number	Title
<b>Component Location - Piggyback Condensers and Drycoolers</b>	
DPN004186	Liebert® Piggyback Condenser Component Location Diagram
DPN004185	Liebert® Piggyback Drycooler Component Location Diagram
<b>Planning Dimensions - Piggyback Condensers</b>	
DPN000675	Dimensional and Weight Data, 31-in. Frame Models
DPN000695	Dimensional and Weight Data, 72-in. and 97-in. Frame Models
<b>Planning Dimensions - Piggyback Drycoolers</b>	
DPN000710	Dimensional and Weight Data, 72-in. and 97-in. Frame Models
<b>Planning Dimensions - Piggyback Floor Stands</b>	
DPN000727	Floorstand Dimensional Data Condenser and Drycooler
<b>Feature Lists - Piggyback Condenser</b>	
DPN000698	Standard and Optional Features for 31-in. Frame Models
DPN000691	Standard and Optional Features for 72-in. and 97-in. Frame Models
<b>Piping Schematics - Piggyback Condenser</b>	
DPN000673	General Arrangement Diagram, 31-in. Frame Models
DPN002754	General Arrangement Diagram, 72-in. and 97-in. Frame Models
<b>Primary Connections - Piggyback Condenser</b>	
DPN000676	Connection Locations and Refrigerant Planning Values, 31-in. Frame Models
DPN000696	Connection Locations and Refrigerant Planning Values, 72-in. and 97-in. Frame Models
<b>Electrical Field Connections - Piggyback Condenser</b>	
DPN000677	Electrical Field Connections, 31-in. Frame Models
DPN000697	Electrical Field Connections, 72-in. and 97-in. Frame Models
<b>Feature Lists - Piggyback Drycooler</b>	
DPN000705	Standard and Optional Features
<b>Piping Schematics - Piggyback Drycooler</b>	
DPN000706	General Arrangement Diagram, Glycol System
DPN000707	General Arrangement Diagram, GLYCOOL System

**Table B.1 Submittal Drawing Contents (continued)**

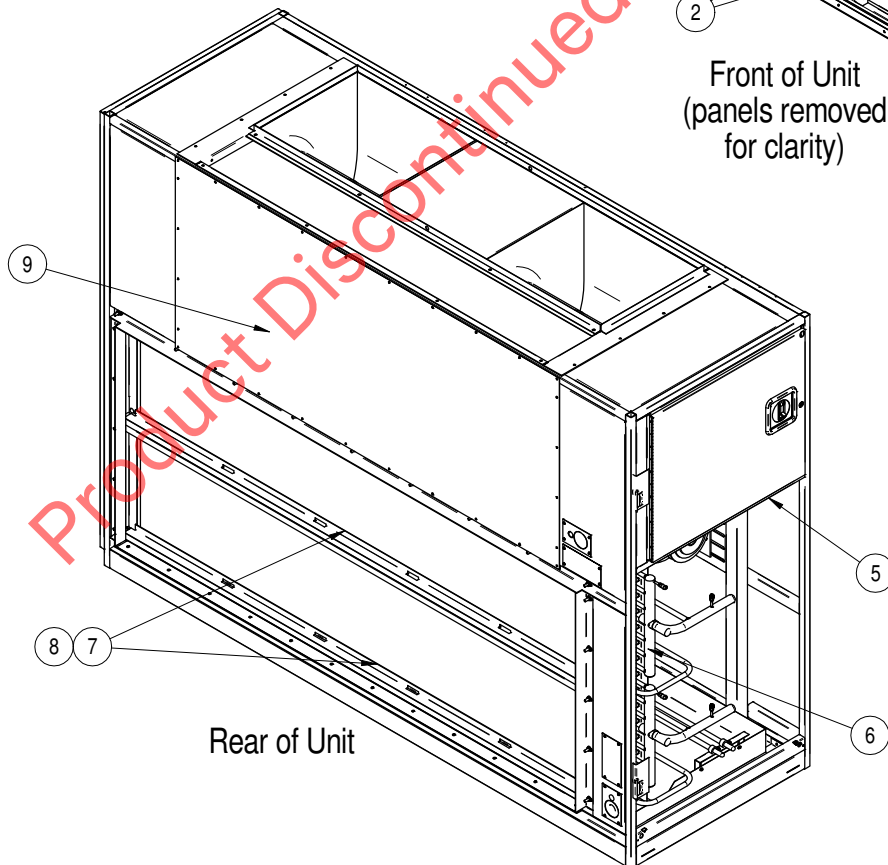
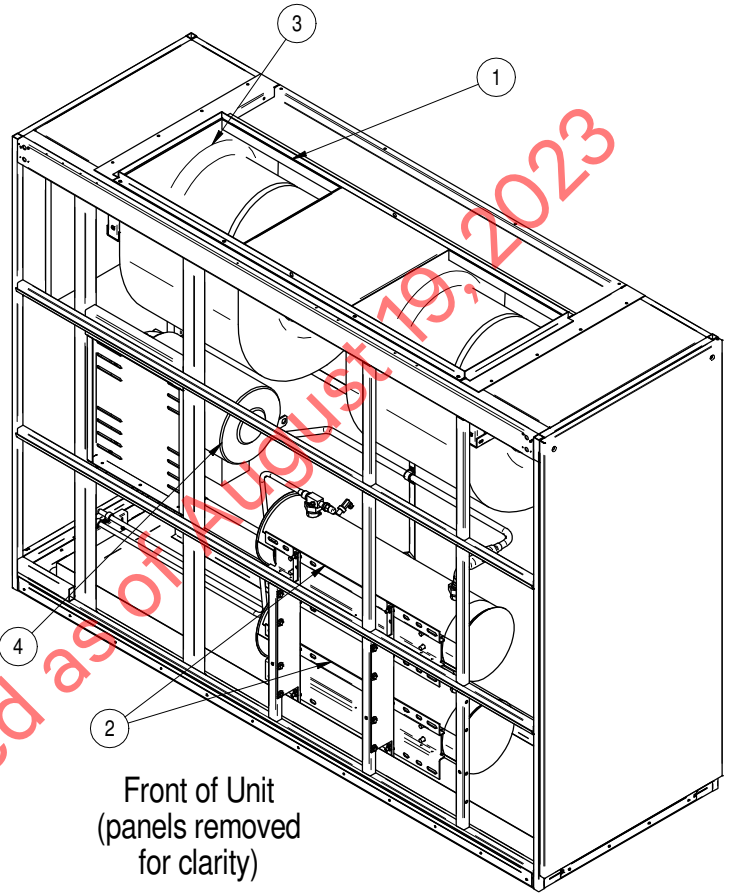
Document Number	Title
<b>Primary Connections - Piggyback Drycooler</b>	
DPN000711	Primary Connection Locations, 72-in. and 97-in. Frame Models
<b>Electrical Field Connections - Piggyback Drycooler</b>	
DPN000712	Electrical Field Connections, 72-in. and 97-in. Frame Models

Product Discontinued as of August 19, 2023

# LIEBERT PIGGYBACK CONDENSER

## COMPONENT LOCATION DIAGRAM

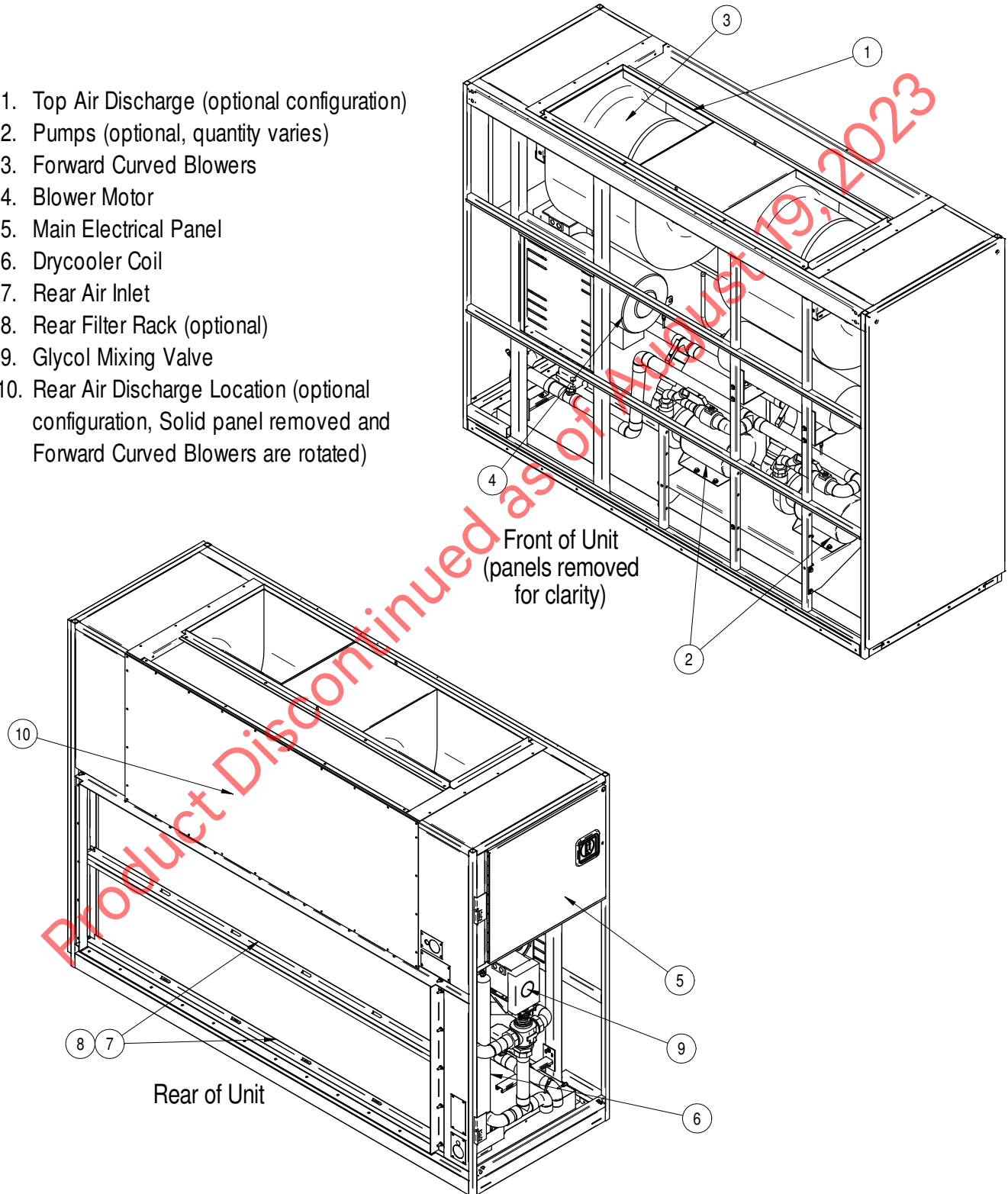
1. Top Air Discharge (optional configuration)
2. Lee-Temp Receivers
3. Forward Curved Blowers
4. Blower Motor
5. Main Electrical Panel
6. Condenser Coil
7. Rear Air Inlet
8. Rear Filter Rack (optional)
9. Rear Air Discharge Location (optional configuration, Solid panel removed and Forward Curved Blowers rotated)



# LIEBERT PIGGYBACK DRYCOOLER

## COMPONENT LOCATION DIAGRAM

1. Top Air Discharge (optional configuration)
2. Pumps (optional, quantity varies)
3. Forward Curved Blowers
4. Blower Motor
5. Main Electrical Panel
6. Drycooler Coil
7. Rear Air Inlet
8. Rear Filter Rack (optional)
9. Glycol Mixing Valve
10. Rear Air Discharge Location (optional configuration, Solid panel removed and Forward Curved Blowers are rotated)

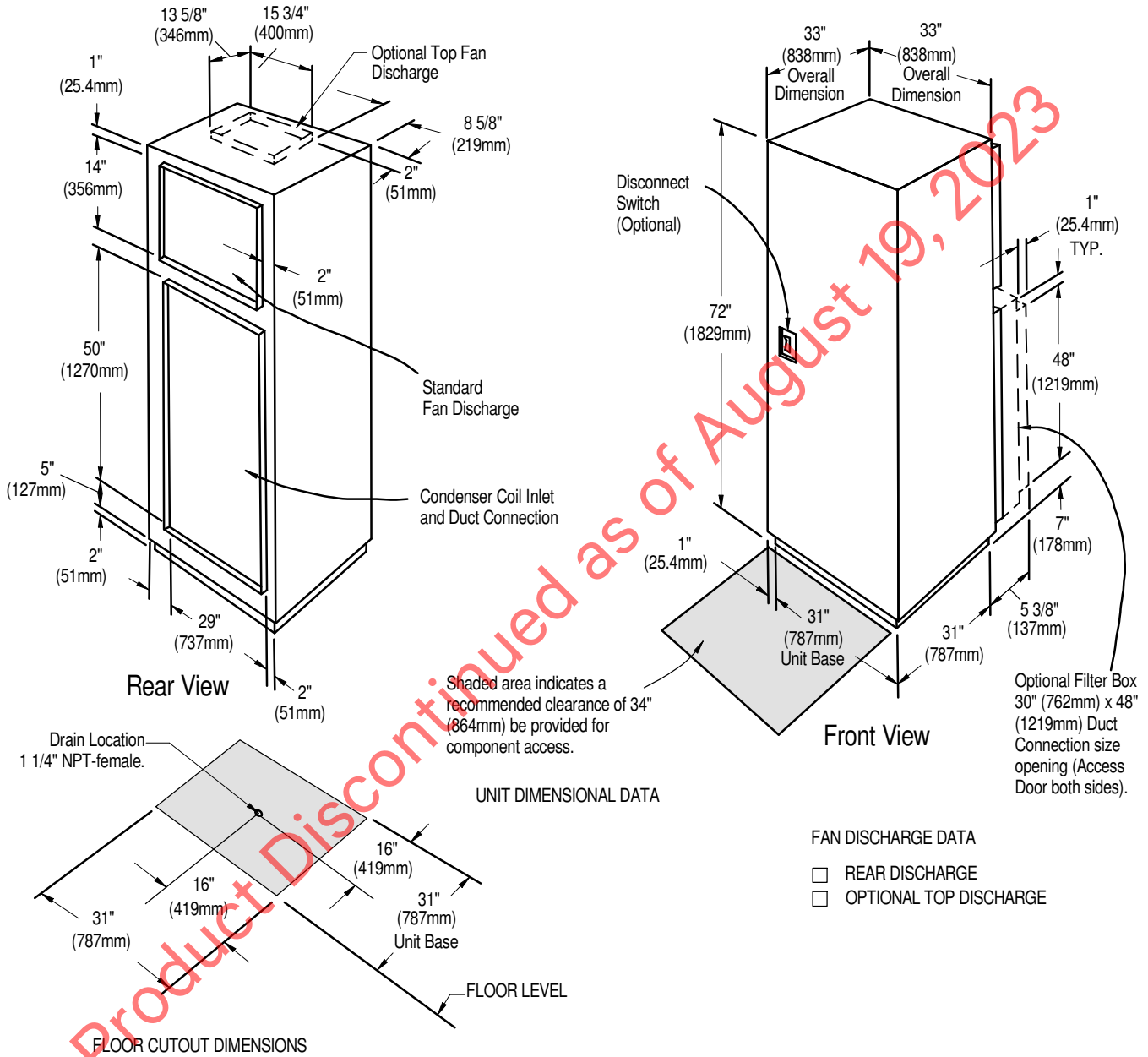






# LIEBERT® PIGGYBACK CONDENSER

## DIMENSIONAL DATA 31" FRAME MODELS



UNIT SHIPPING WEIGHT lbs. (kg)		
MODEL	DOMESTIC PACKAGE	EXPORT PACKAGE
PB-224A	575 (261)	675 (307)
PB-280A	575 (261)	675 (307)
PB-332A	575 (261)	675 (307)
PB-378A	575 (261)	675 (307)

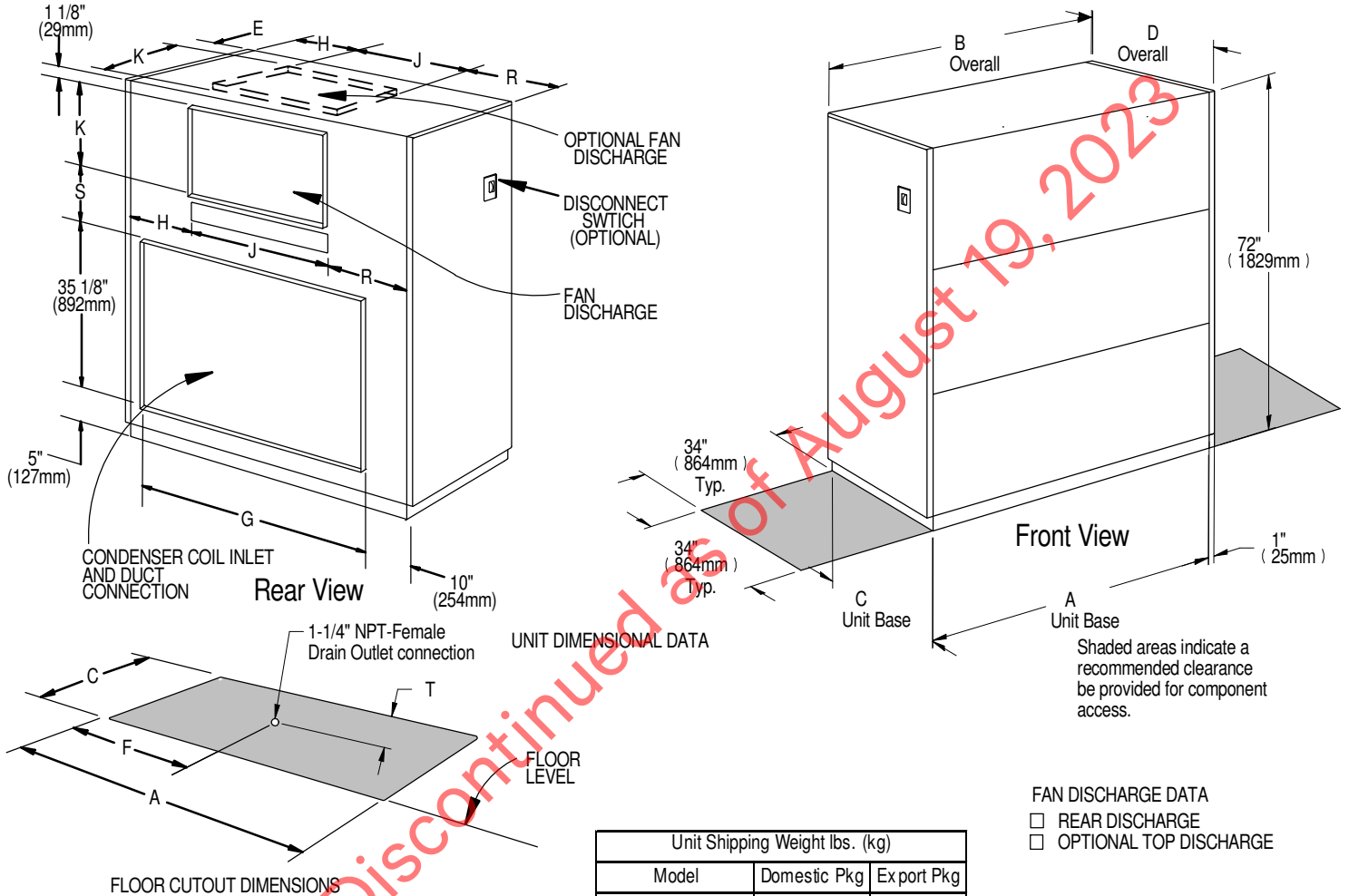
**Note:**

1. A 1" (25mm) flange is provided on coil inlet opening and fan discharge opening for duct connections.



# LIEBERT® PIGGYBACK CONDENSER

## DIMENSIONAL DATA 72" & 97" FRAME MODELS



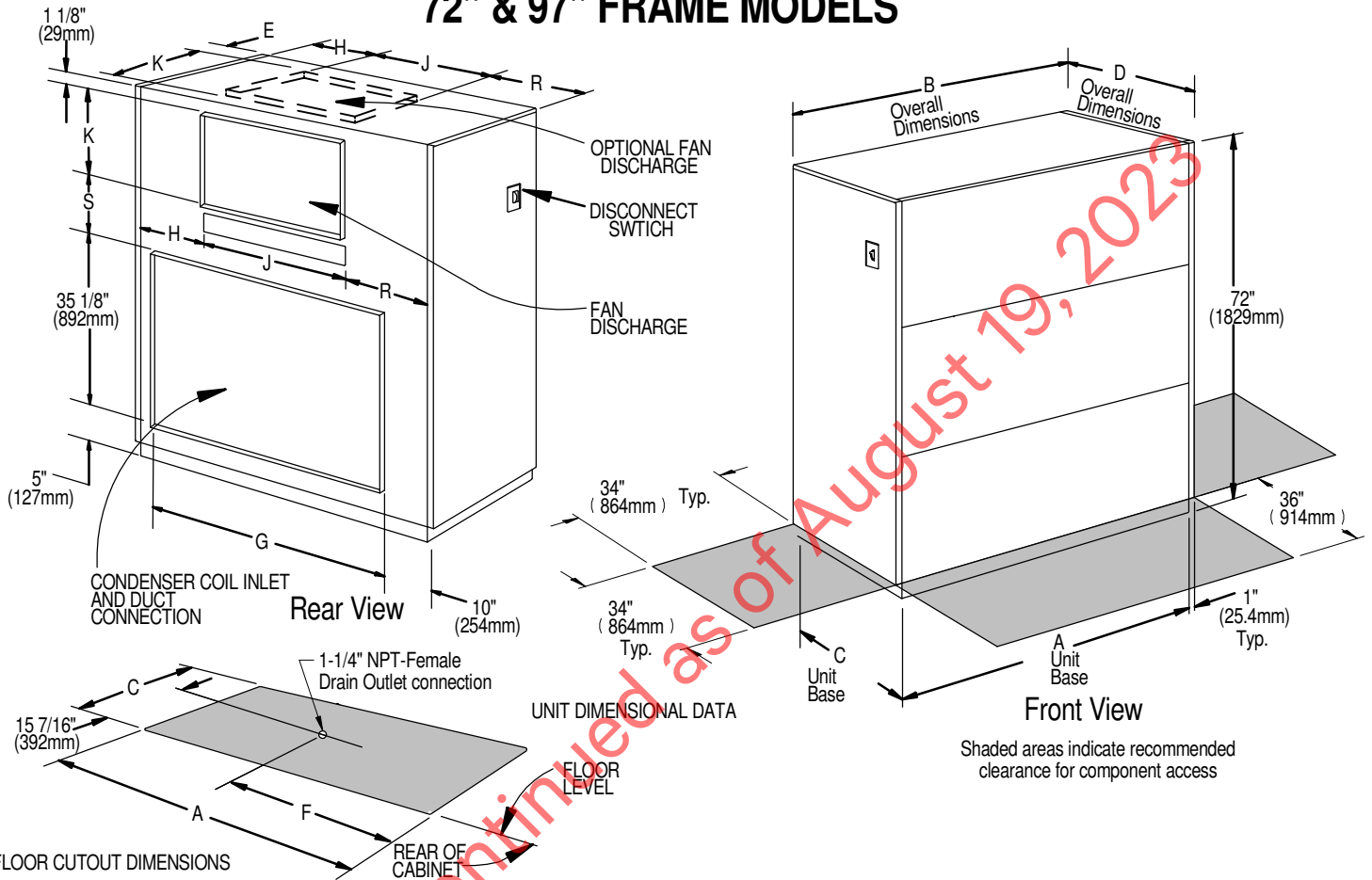
Unit Shipping Weight lbs. (kg)		
Model	Domestic Pkg	Export Pkg
PB-350A	1180 (535)	1330 (603)
PB-550A		
PB-675A		
PB-925A	1630 (739)	1780 (807)
PB-1100A		
PB-1350A		

Model	Dimensional Data in. (mm)												
	A	B	C	D	E	F	G	H	J	K	R	S	T
PB-350A													
PB-550A	72 (1829)	74 (1880)	31 (787)	32 (813)	1-1/8 (29)	33 (838)	60 (1524)	8-5/8 (219)	50-3/16 (1275)	16-1/16 (408)	13-3/16 (335)	14-11/16 (373)	15-1/2 (394)
PB-675A													
PB-925A								23-5/16 (592)			23-1/2 (597)		
PB-1100A	97 (2464)	99 (2515)	33 (838)	34 (864)	3-1/8 (79)	45-1/2 (1156)	85 (2159)		63-7/8 (1622)	19-1/8 (486)	16-13/16 (427)	11-5/8 (295)	16-1/2 (419)
PB-1350A								16-5/16 (414)					

Note:  
1. A 1" (25mm) flange is provided on coil inlet opening and fan discharge opening for duct connections.

Form No.: DPN001040\_REV14

## DIMENSIONAL DATA 72" & 97" FRAME MODELS



Unit Shipping Weight lbs. (kg)		
Model	Domestic Pkg	Export Pkg
PD-102	1230 (558)	1380 (626)
PD-133		
PD-150		
PD-223	1680 (726)	1830 (830)
PD-290		
PD-333		

- FAN DISCHARGE DATA**
- REAR DISCHARGE
- OPTIONAL TOP DISCHARGE
- PUMP PACKAGE SELECTION**
- SINGLE PUMP PACKAGE
- DUAL PUMP PACKAGE

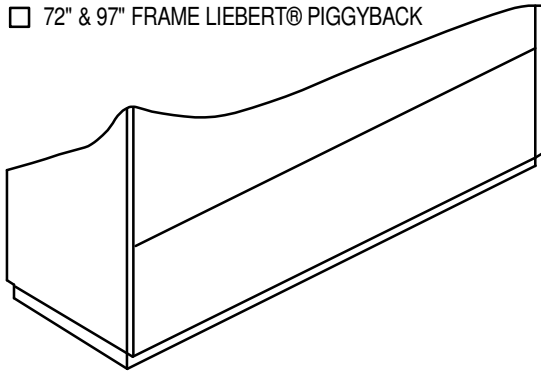
Model	Dimensional Data in. (mm)											
	A	B	C	D	E	F	G	H	J	K	R	S
PD-102												
PD-133	72 (829)	74 (1880)	31 (787)	32 (813)	1-1/8 (29)	33 (838)	60 (1524)	8-5/8 (219)	50-3/16 (1275)	16-1/16 (408)	13-3/16 (335)	14-11/16 (373)
PD-150											23-1/2 (597)	
PD-223												
PD-290	97 (2464)	99 (2515)	33 (838)	34 (864)	3-1/8 (79)	46-1/2 (1181)	85 (2159)	23-5/16 (592)	63-7/8 (1622)	19-1/8 (486)	16-13/16 (427)	11-5/8 (295)
PD-333								16-5/16 (421)				

Note:  
1. A 1" (25.4mm) flange is provided on coil inlet opening and fan discharge opening for duct connections.

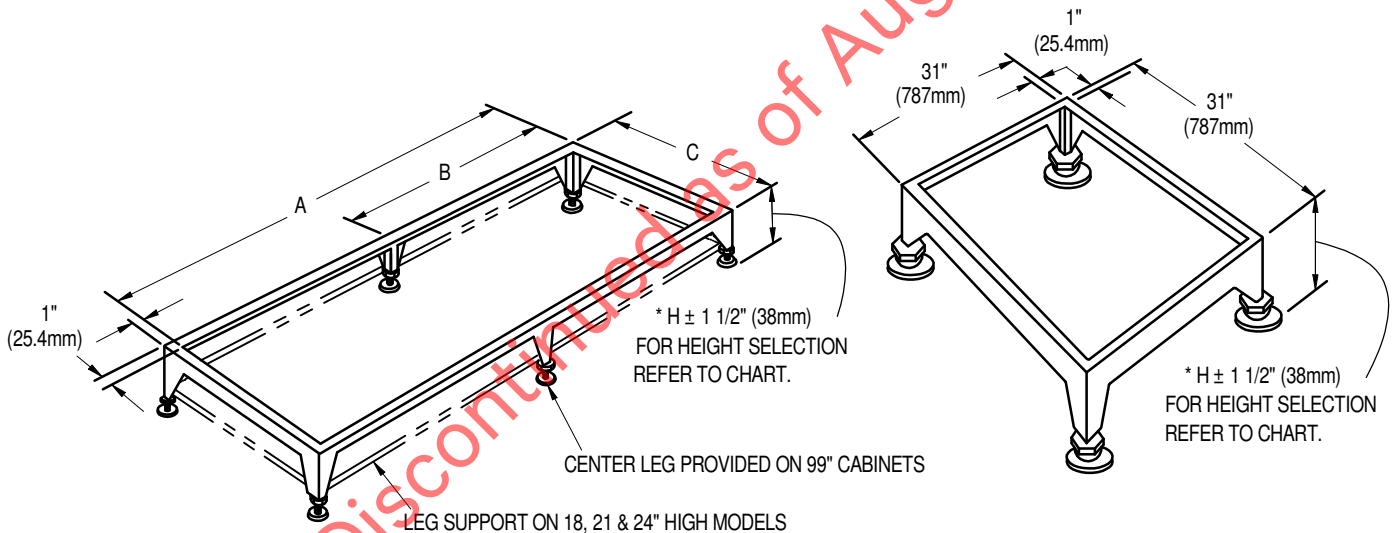
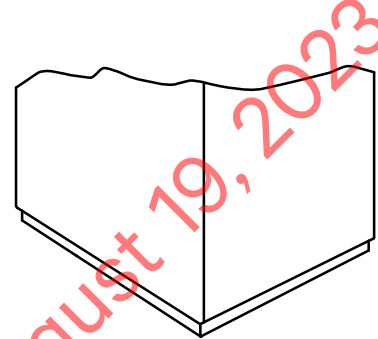
# LIEBERT® PIGGYBACK

## FLOORSTAND DIMENSIONAL DATA LIEBERT® PIGGYBACK CONDENSER & LIEBERT® PIGGYBACK DRYCOOLER

□ 72" & 97" FRAME LIEBERT® PIGGYBACK



□ 31" FRAME LIEBERT® PIGGYBACK



FLOORSTAND DIMENSIONAL DATA in. (mm)			
FRAME SIZES	A	B	C
72 (1829)	72 (1829)	36 (914)	31 (787)
97 (2464)	97 (2464)	48-1/2 (1232)	33 (838)

HEIGHT SELECTION IN. (mm)	
NOMINAL	RANGE (NOMINAL ± 1 1/2" $\Delta$ )
9 (229)	7-1/2 (191) TO 10-1/2 (267)
12 (305)	10-1/2 (267) TO 13-1/2 (343)
15 (381)	13-1/2 (343) TO 16-1/2 (419)
18 (458)	16-1/2 (419) TO 19-1/2 (495)
21 (553)	19-1/2 (495) TO 22-1/2 (572)
24 (610)	22-1/2 (572) TO 25-1/2 (648)

Notes:

1. Leveling feet are provided with ±1-1/2" (38mm) adjustment from nominal height.



# LIEBERT® PIGGYBACK CONDENSER

## STANDARD & OPTIONAL FEATURES 31" FRAME MODELS

### STANDARD FEATURES

- COIL** Is constructed of copper tubes in a staggered tube pattern. Tubes are expanded into aluminum plate type fins. The fins have full depth fin collars that bond to the seamless copper tubes. Coils are installed to provide horizontal air flow.
- FANS** Quiet, low speed centrifugal type, double width, double inlet, dynamically balanced to a vibration tolerance of two mils in any plane with lifetime lubricated self-aligning ball bearings rated at a minimum life of 100,000 hours. The fan motor operates at 1750 RPM for 60 HZ and is mounted on an adjustable slide base. A rear (standard) or top (optional) discharge location enables the draw-through design to provide even air distribution across the coil.
- DRIVES** Consist of one fixed pitch sheave keyed to the fan shaft and a variable pitch sheave keyed to the motor shaft. The sheaves are machined cast iron, single or double grooved and are statically balanced.
- CABINET AND FRAME** Custom painted steel panels with 1"(25.4), 1 1/2 lb.(.68kg) insulation. A hinged rear access panel opens to a second dead front panel which is a protection enclosure for all high voltage components. Frame is constructed of 14 gauge MIG welded tubular steel.
- HEAD PRESSURE CONTROL** A Liebert® Lee-Temp control system consists of an insulated, heated receiver tank with sight glasses, pressure relief valve, service valves, and head pressure operated 3-way valve.
- ELECTRICAL PANEL** Is housed within the high voltage compartment and contains the contactors, fuses and overloads. All high voltage components are protected by a separate dual fuse element and the panel is protected by a safety lock dead front panel. The rear access panel can be opened while the high voltage electric panel remains enclosed for operator safety.
- DRAIN PAN** The equipment is supplied with a full drain pan in the bottom of the unit for the removal of moisture accumulation.

### OPTIONAL FEATURES

- UNIT DISCONNECT SWITCH** Two types of switches are available. The "Non-Locking Type" consists of a non-automatic molded case circuit breaker operational from the outside of the unit. Access to the high voltage electric panel compartment can be obtained with the breaker in either the "on" or "off" position. The "Locking Type" is identical except access to the high voltage electric panel compartment can be obtained only with the breaker in the "off" position.
- FLOORSTAND** Is constructed of MIG welded tubular steel and available in heights from 9" to 24" with vibration isolation pads provided on the adjustable legs.
- BLOWER DISCHARGE** Available in one alternate location: top discharge.
- FILTER CHAMBER** Is an external filter chamber with access doors on both sides, supplied with a 1"(25.4mm) flange for duct connection. Four (4) 2" x 16" x 25" (50 x 406 x 635mm) filters are supplied with the chamber. The filters are deep pleated with a minimum efficiency of MERV8 (based on ASHRAE 52.2-2007).



# LIEBERT® PIGGYBACK CONDENSER

## STANDARD & OPTIONAL FEATURES 72" & 97" FRAME MODELS

### STANDARD FEATURES

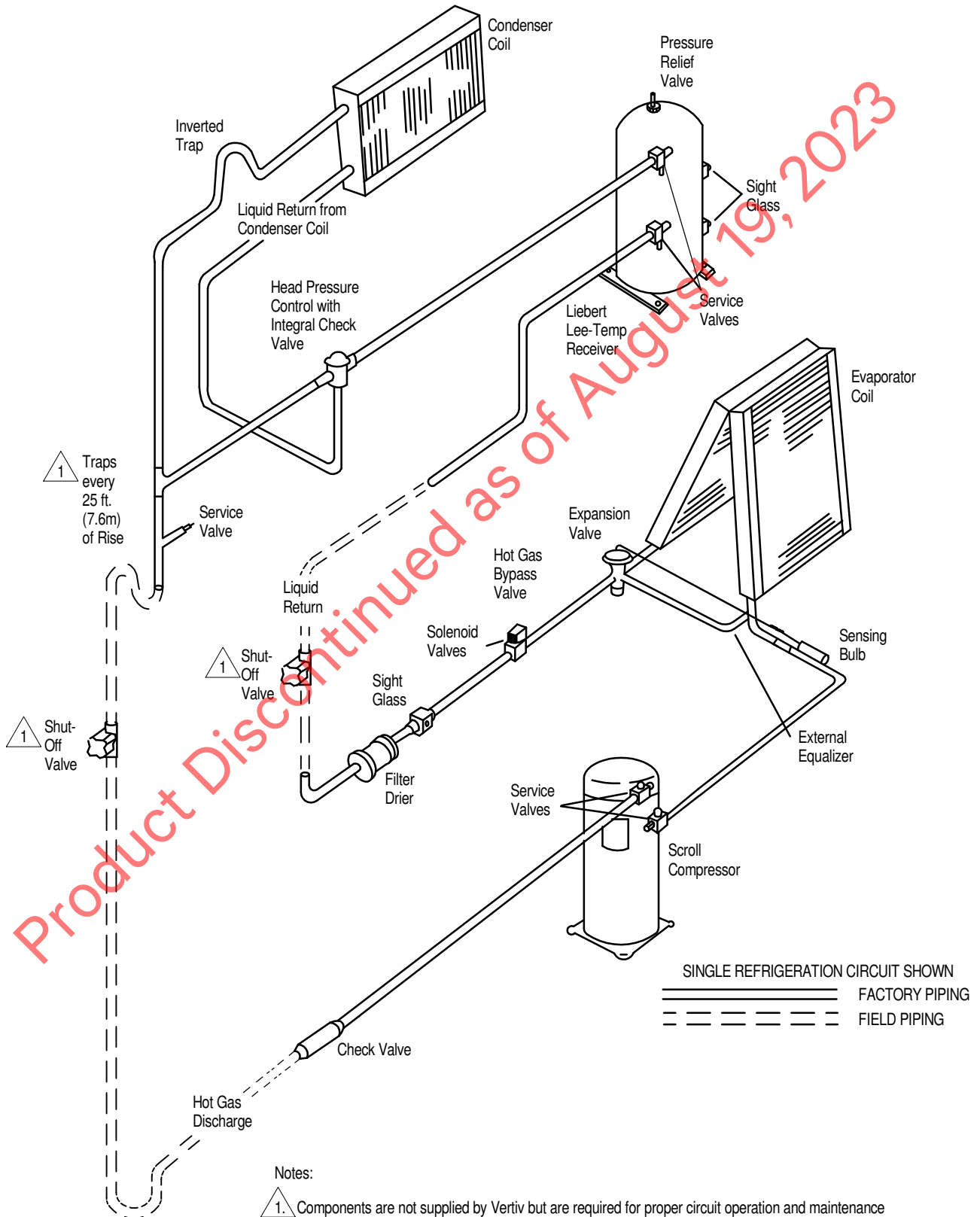
- COIL** Is constructed of copper tubes in a staggered tube pattern. Tubes are expanded into aluminum plate type fins. The fins have full depth fin collars that bond to the seamless copper tubes. Coils are installed to provide horizontal air flow.
- FANS** Quiet, low speed centrifugal type, double width, double inlet, dynamically balanced to a vibration tolerance of two miles in any plane with lifetime lubricated self-aligning ball bearings rated at a minimum life of 100,000 hours. The fan motor operates at 1750 RPM for 60 HZ and is mounted on an adjustable slide base. A rear (standard) or top (optional) discharge location enables the exclusive draw-through design to provide even air distribution across the coil.
- DRIVES** Consist of one fixed pitch sheave keyed to the fan shaft and a variable pitch sheave keyed to the motor shaft. The sheaves are machined cast iron, single or double grooved and are statically balanced.
- CABINET AND FRAME** Custom painted steel panels with 1" (25.4mm), 1 1/2 lb. (.68 kg) insulation. A hinged left end access panel opens to a second dead front panel which is a protection enclosure for all high voltage components. Frame is constructed of 14 gauge heliarc welded tubular steel.
- HEAD PRESSURE-CONTROL** A Liebert® Lee-Temp control system is furnished for each circuit and consists of an insulated, heated receiver tank with sight glasses, pressure relief valve, roto lock valve, and head pressure operated 3-way valve.
- ELECTRICAL PANEL** Is housed within the high voltage compartment and contains the contactors, fuses and overloads. All high voltage components are protected by a separate dual fuse element and the panel is protected by a safety lock dead front panel. The left end access panel can be opened while the high voltage electric panel remains enclosed for operator safety.
- DRAIN PAN** The equipment is supplied with a full drain pan in the bottom of the unit for the removal of moisture accumulation.

### OPTIONAL FEATURES

- FILTER CHAMBER** Deep pleated with a minimum efficiency rating of MERV8 (based on ASHRAE 52.2-2007) located within the cabinet inside the optional filter chamber positioned in front of the condenser coil, and serviceable from either end of the unit.
- UNIT DISCONNECT SWITCH** Two types of switches are available. The "Non-Locking-Type" consists of a non-automatic molded case circuit breaker operational from the outside of the unit. Access to the high voltage electric panel compartment can be obtained with the breaker in either the "on" or "off" position. The "Locking Type" is identical except access to the high voltage electric panel compartment can be obtained only with the breaker in the "off" position.
- FLOORSTAND** Is constructed of heliarc welded tubular steel and available in heights from 9" to 24" with vibration isolation pads provided on the adjustable legs.
- BLOWER DISCHARGE** Available in an alternate location: top discharge.

# LIEBERT® PIGGYBACK CONDENSER

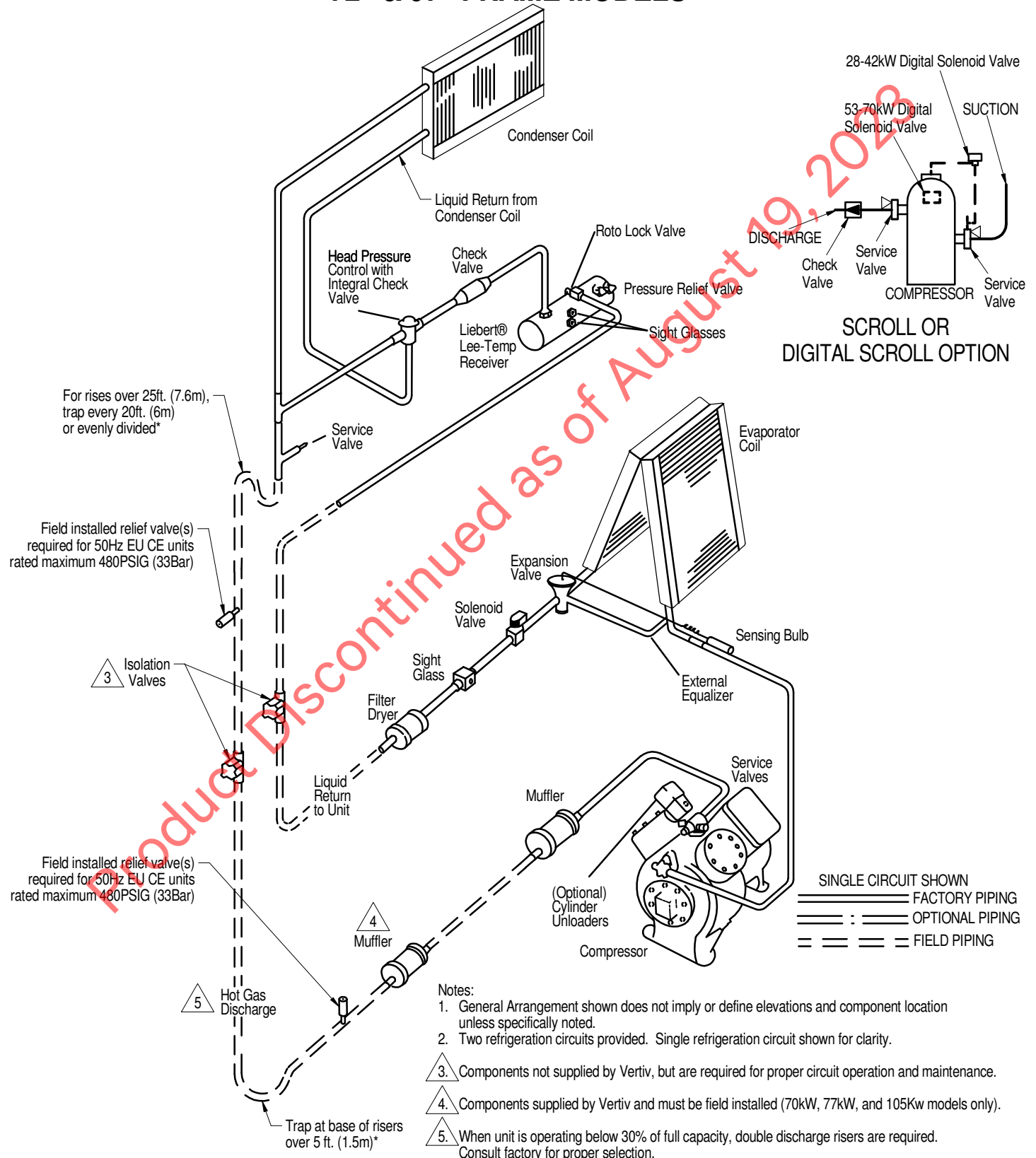
## GENERAL ARRANGEMENT DIAGRAM 31" FRAME MODELS





# LIEBERT® PIGGYBACK CONDENSER

## GENERAL ARRANGEMENT DIAGRAM 72" & 97" FRAME MODELS







# LIEBERT® PIGGYBACK CONDENSER

## PRIMARY CONNECTION LOCATIONS & REFRIGERANT PLANNING VALUES 31" FRAME MODELS

24V, 2-wire control interlock from Liebert unit. Conduit entrance.

Liebert® Lee-Temp heater pads electrical supply conduit entrance.

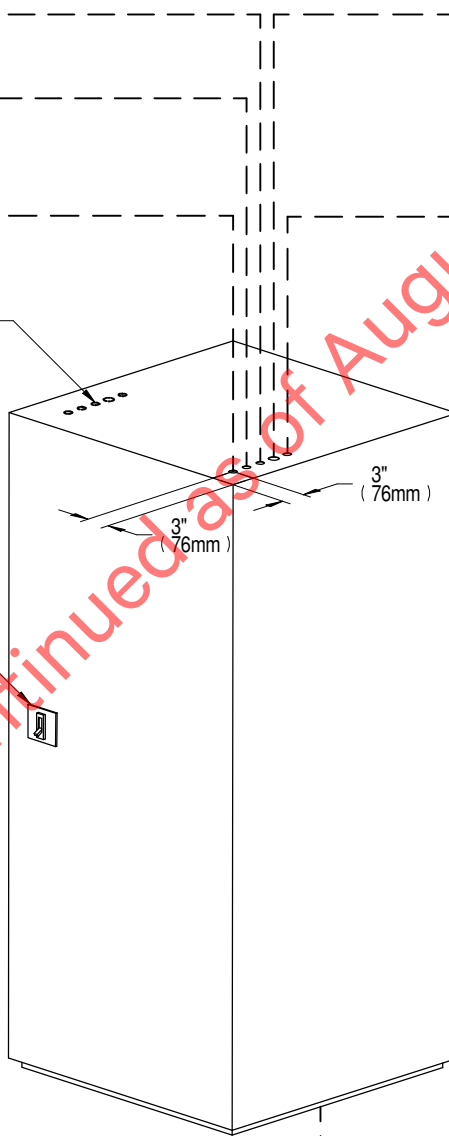
Main power electrical supply conduit entrance.

Hot Gas Connection Piping stubbed out inside unit. 1 1/8" (29mm) this K.O. only (typical both sides). 1

Liquid Line Connection

Optional Connection Outlet Locations

Disconnect Switch (Optional)



Drain Connection 1 1/4" NPT Female

Model	Connection Sizes		Approximate Refrigerant Charge R-407C lbs.
	Liquid Line	Hot Gas Line	
PB0224A	5/8" O.D. Cu	5/8" O.D. Cu	35
PB0280A		5/8" O.D. Cu	
PB0332A		7/8" O.D. Cu	69
PB0378A			

Notes:

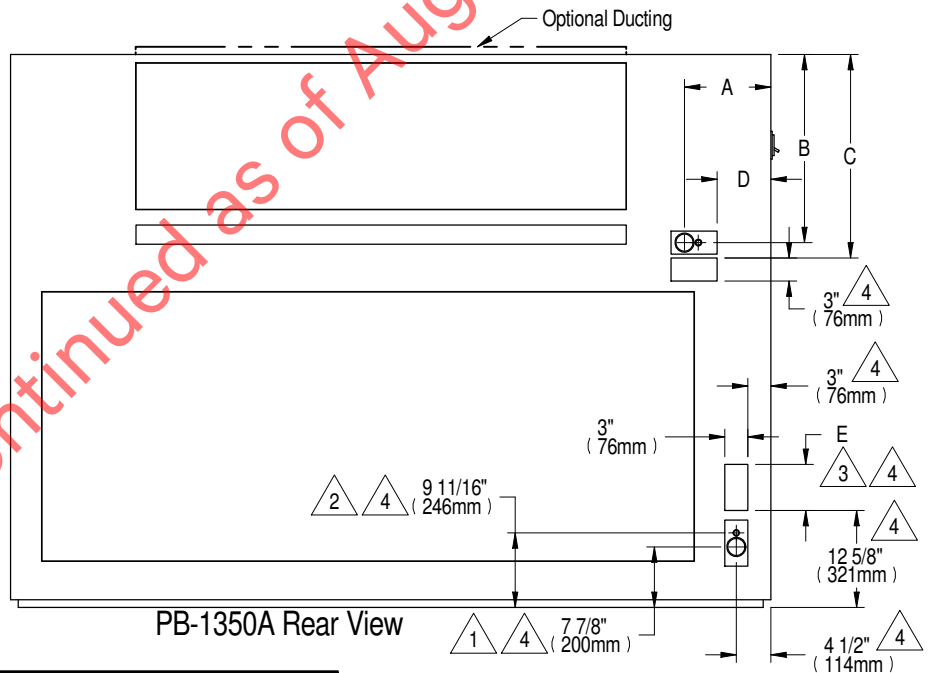
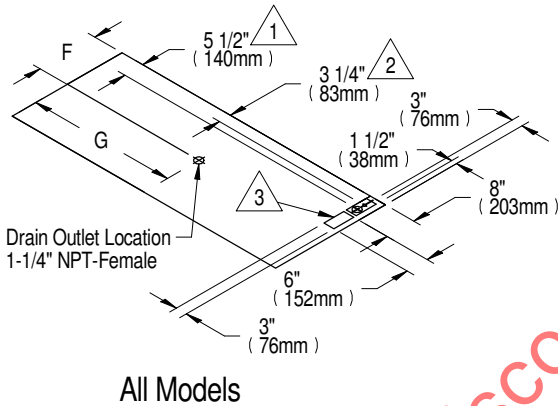
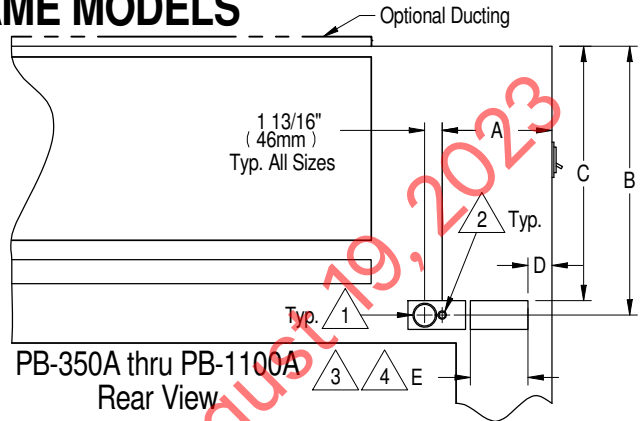
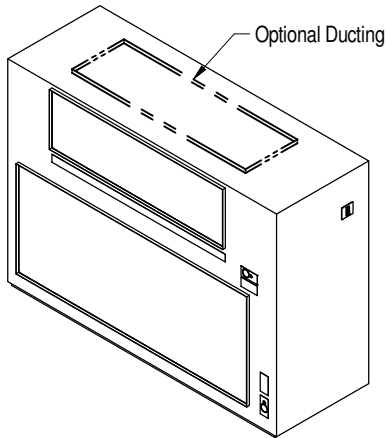
1. Except where noted, all knockouts are  $\varnothing 7/8"$  (22mm) and spaced 2" (51mm).

Product Discontinued as of August 19, 2023



# LIEBERT® PIGGYBACK CONDENSER

## PRIMARY CONNECTION LOCATIONS & REFRIGERANT PLANNING VALUES 72" & 97" FRAME MODELS



Model	Dimensional Data in. (mm)						
	A	B	C	D	E	F	G
PB-350A							
PB-550A							
PB-675A	10-1/8 (267)	28-3/4 (730)	27-1/4 (692)	2-1/2 (64)	6 (152)	15-1/2 (394)	36 (914)
PB-925A							
PB-1100A							
PB-1350A	11-1/4 (286)	24 (610)	26-1/2 (673)	7 (178)			

Model	Connection Sizes O.D. Cu 2 per unit		Approximate Refrigeration Charge per circuit R-407C lbs.
	Liquid Line	Hot Gas Line	
PB-350A	1/2"	5/8"	24
PB-550A		30	
PB-675A		7/8"	35
PB-925A		33	
PB-1100A	5/8"	1-1/8"	69
PB-1350A			

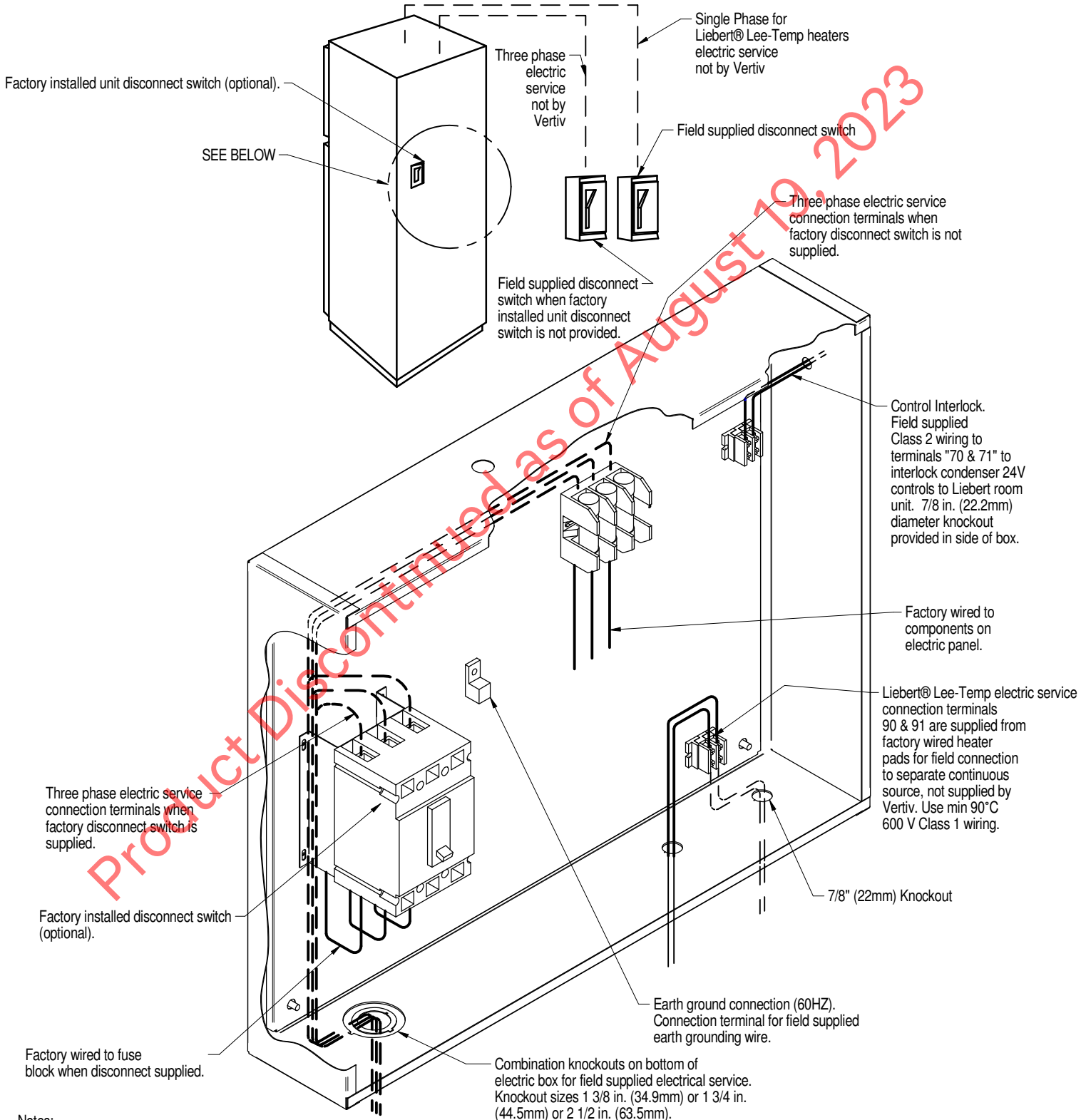
Notes:

1. Multiple K.O. of  $\varnothing$ 1-3/8" (35mm),  $\varnothing$ 1-3/4" (45mm), and  $\varnothing$ 2-1/2" (64mm) for Main Power Supply (Typ.)
2. 7/8" (22mm) K.O. for Liebert® Lee-Temp Power Supply (Typ.)
3. Cover Plate for access of Liquid Line and Hot Gas Line.
4. Dimensions typical to PB-350A thru PB-1350A units.



# LIEBERT® PIGGYBACK CONDENSER

## ELECTRICAL FIELD CONNECTIONS 31" FRAME MODELS



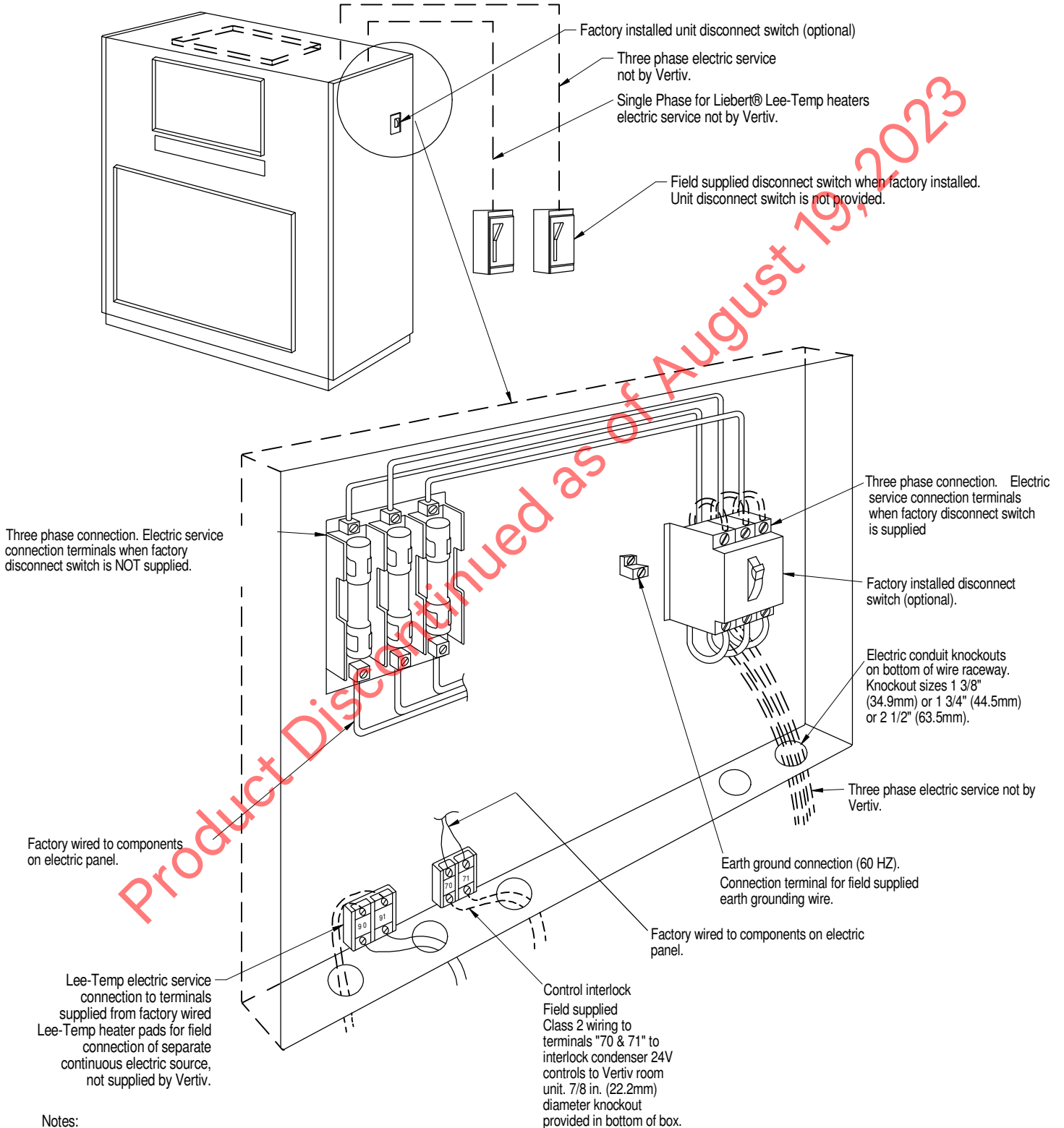
Notes:  
1. Refer to specification sheet for full load amp and wire size amp ratings.

Form No.: DPN001040\_REV14



# LIEBERT® PIGGYBACK CONDENSER

## ELECTRICAL FIELD CONNECTIONS 72" & 97" FRAME MODELS



**Notes:**

1. Refer to specification sheet for full load amp and wire size amp ratings.



# LIEBERT® PIGGYBACK DRYCOOLER

## STANDARD & OPTIONAL FEATURES

### STANDARD FEATURES

- COIL** Is constructed of copper tubes in a staggered tube pattern. Tubes are expanded into aluminum plate type fins. The fins have full depth fin collars that bond to the seamless copper tubes. Coils are installed to provide horizontal air inlet.
- FANS** Quiet, low speed centrifugal type, double width, double inlet, dynamically balanced to a vibration tolerance of two mils in any plane with lifetime lubricated self-aligning ball bearings rated at 100,000 hours. The open drip-proof fan motor operates at 1750 RPM for 60 HZ and is mounted on an adjustable slide base. A top or rear discharge location enables the draw-through design to provide even air distribution across the coil.
- DRIVES** Consist of one fixed pitch sheave keyed to the fan shaft and a variable pitch sheave keyed to the motor shaft. The sheaves are machined cast iron, double grooved and are statically balanced. Dual V-belts, standard for extra protection, are super-grip or grip-notched type.
- CABINET AND FRAME** Custom painted steel panels with 1" (25.4mm), 1 1/2 lb. (.68 kg) insulation. A hinged left end access panel opens to a second dead front panel which is a protection enclosure for all high voltage components. Frame is constructed of 14 gauge heliarc welded tubular steel.
- SINGLE GLYCOL PUMP** Is a single staged, end suction, close coupled, with ball bearing motors, bronze fitted construction, stainless steel pump shaft, high efficiency impellers, and designed for continuous service.
- ELECTRICAL PANEL** Is housed within the high voltage compartment and contains the motor starters, fuses and overloads. All high voltage components are protected by a separate dual fuse element and the panel is protected by a safety lock dead front panel. The left end access panel can be opened while the high voltage electric panel remains closed for operator safety.
- DRAIN PAN** The equipment is supplied with a full drain pan in the bottom of the unit for the removal of moisture (rain, snow, condensation) accumulation.
- MODULATING GLYCOL CONTROL VALVE** with aquastat control. Factory installed and maintains constant fluid temperature.
- SYSTEM GLYCOL CIRCUIT** Consists of drycooler modulating valve and piping. Designed for a maximum working pressure of 75 PSIG (517 kPa).
- EXPANSION TANK** mounted and piped within the cabinet, provides volume for thermal expansion and contraction of the system fluid.

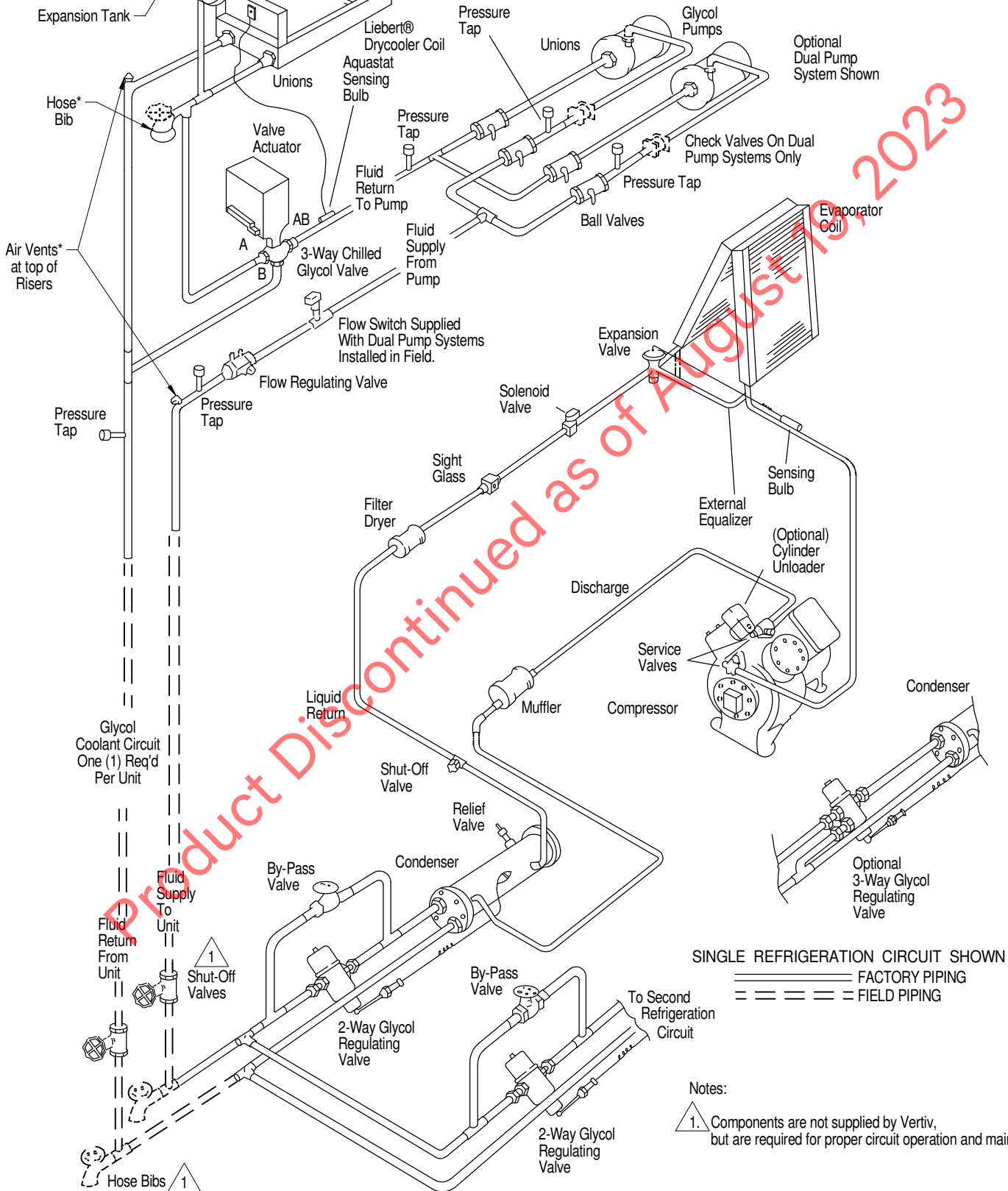
### OPTIONAL FEATURES

- FILTER CHAMBER** Deep pleated with a minimum efficiency rating of MERV8 (based on ASHRAE 52.2-2007) located within the cabinet inside the optional filter chamber positioned in front of the condenser coil, and serviceable from either end of the unit.
- UNIT DISCONNECT SWITCH** Two types of switches are available. The "Non-Locking-Type" consists of a non-automatic molded case circuit breaker operational from the outside of the unit. Access to the high voltage electric panel can be obtained with the breaker in either the "on" or "off" position. The "Locking Type" is identical except access to the high voltage electric panel compartment can be obtained only while the breaker is in the "off" position.
- FLOORSTAND** Is constructed of heliarc welded tubular steel and available in heights from 9" to 24" with vibration isolation pads provided on the adjustable legs.
- OVERSIZED BLOWER & PUMP MOTORS** are available for higher than normal pressure applications.
- DUAL GLYCOL PUMPS WITH AUTOMATIC CHANGEOVER CONTROL** provides 100% redundancy of the glycol pump.
- NO GLYCOL PUMP OPTION** is available for field supplied pump applications.

# LIEBERT® PIGGYBACK DRYCOOLER

Liebert® Drycooler Electric Box

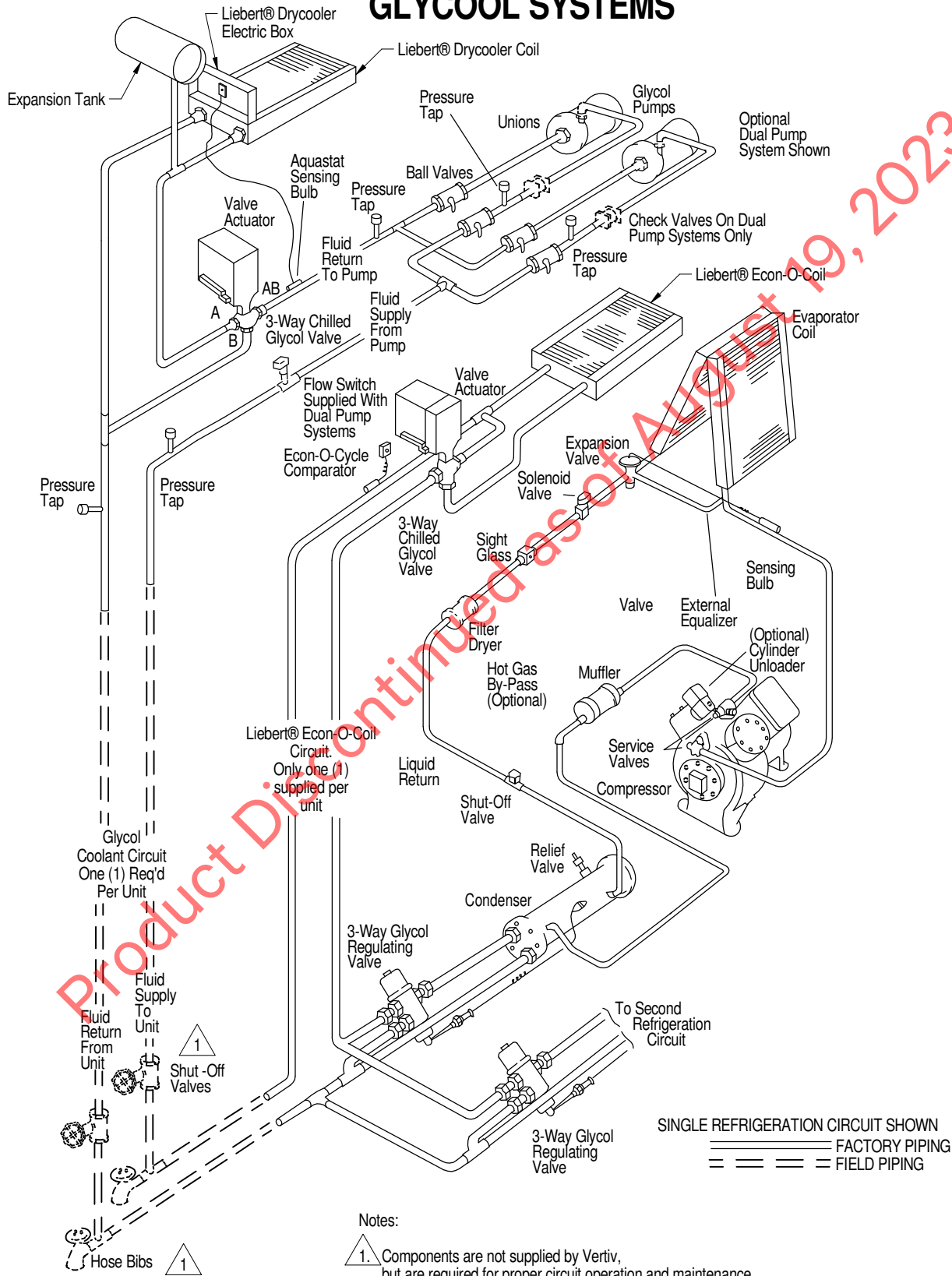
## GENERAL ARRANGEMENT DIAGRAM GLYCOL SYSTEMS





# LIEBERT® PIGGYBACK DRYCOOLER

## GENERAL ARRANGEMENT DIAGRAM GLYCOOL SYSTEMS



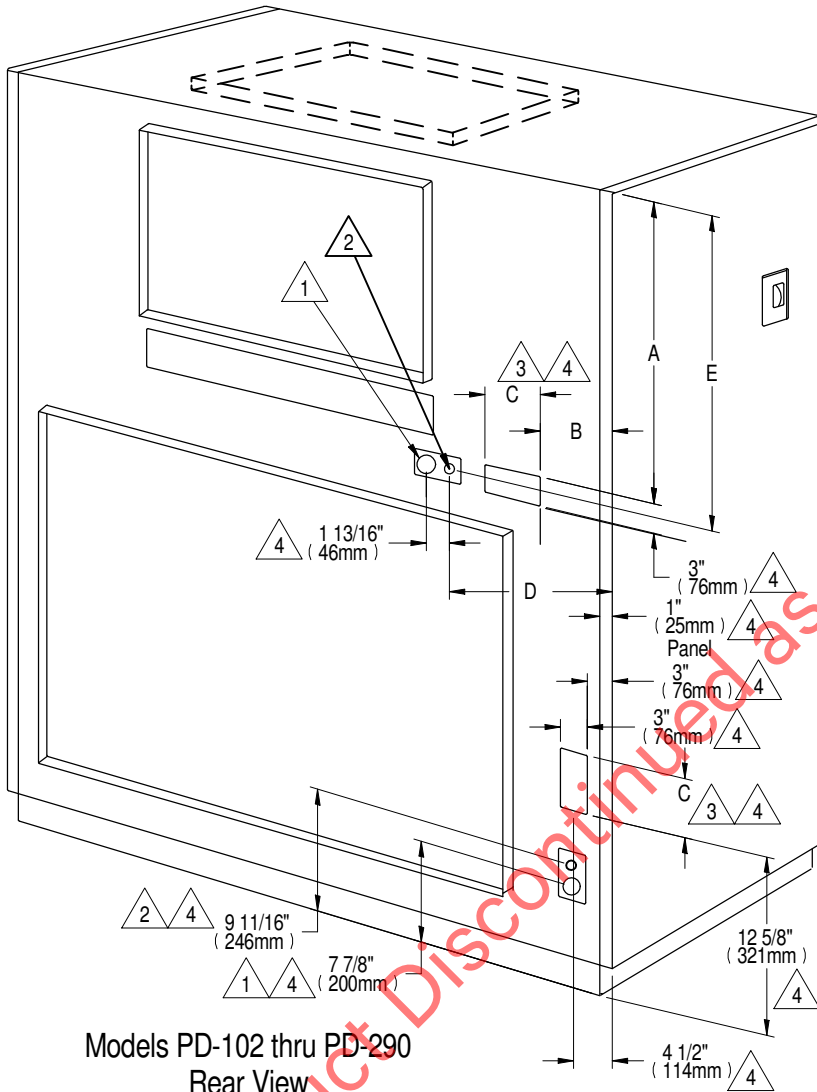
Form No.: DPN001040\_REV14



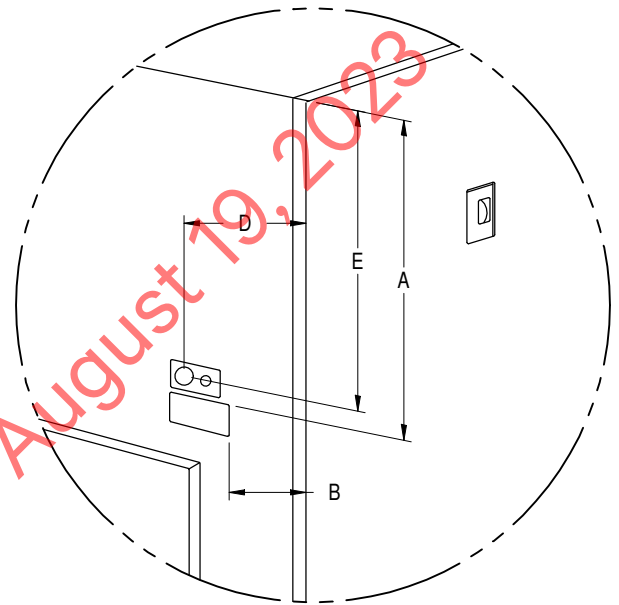


# LIEBERT® PIGGYBACK DRYCOOLER

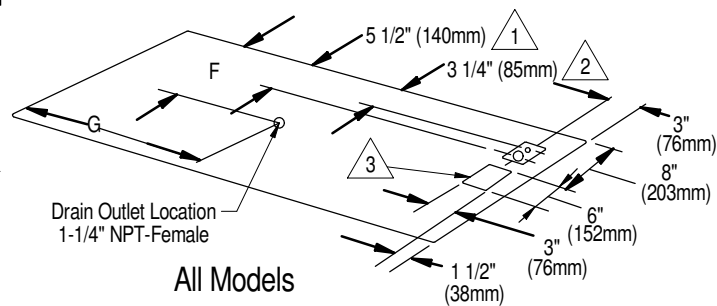
## PRIMARY CONNECTION LOCATIONS 72" & 97" FRAME MODELS



Models PD-102 thru PD-290  
Rear View



Model PD-333  
Rear View



All Models

Liebert® Model No.	Dimensional Data in. (mm)						
	A	B	C	D	E	F	G
PD-102							
PD-133							
PD-150	27-1/4 (692)	2-1/2 (64)	6 (152)	9-1/8 (232)	28-3/4 (730)	15-1/2 (394)	36 (914)
PD-223							
PD-290							
PD-333	26-1/2 (673)	7 (178)			11-1/4 (286)	24 (610)	16-1/2 (419)

Liebert® Model No.	Piping Sizes (in. (mm))	
	Connection Sizes O.D.S.	
	Glycol Supply	Glycol Return
PD-102	1-5/8 (41)	1-5/8 (41)
PD-133	1-5/8 (41)	1-5/8 (41)
PD-150		
PD-223	2-1/8 (54)	2-1/8 (54)
PD-290	2-1/8 (54)	2-1/8 (54)
PD-333		

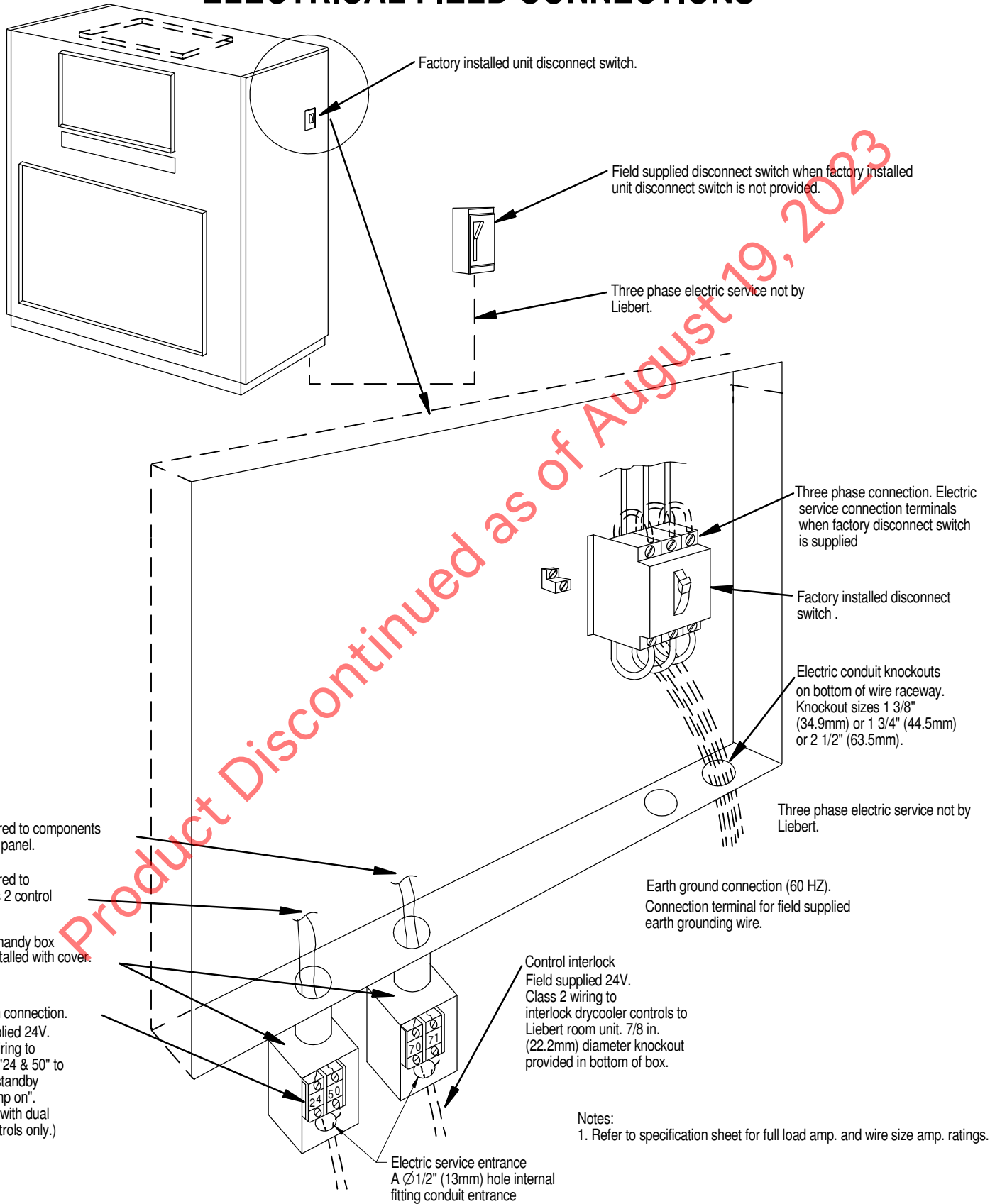
Notes:

- Multiple K.O. of  $\varnothing$ 1-3/8" (35mm),  $\varnothing$ 1-3/4" (45mm), and  $\varnothing$ 2-1/2" (64mm) for Main Power Supply (Typ.)
- 7/8" (22mm) K.O. provided
- Cover Plate for access of Glycol piping inlet & outlet.

4. Dimensions typical to PD-102 thru PD-333 units.



## ELECTRICAL FIELD CONNECTIONS



### Connect with Vertiv on Social Media



<https://www.facebook.com/vertiv/>



<https://www.instagram.com/vertiv/>



<https://www.linkedin.com/company/vertiv/>



<https://www.twitter.com/Vertiv/>

Product Discontinued as of August 19, 2023

Product Discontinued as of August 19, 2023



---

Vertiv.com | Vertiv Headquarters, 505 N. Cleveland Ave, Westerville, OH 43082, USA

© 2023 Vertiv Group Corp. All rights reserved. Vertiv™ and the Vertiv logo are trademarks or registered trademarks of Vertiv Group Corp. All other names and logos referred to are trade names, trademarks or registered trademarks of their respective owners. While every precaution has been taken to ensure accuracy and completeness here, Vertiv Group Corp. assumes no responsibility, and disclaims all liability, for damages resulting from use of this information or for any errors or omissions.

SL-10068\_REV4\_08-23