VERTIV.

Liebert®

PDX™ and PCW™
Thermal Management Systems

System Design Catalog

3 to 8 Ton (11 to 29 kW) Nominal Capacity, Upflow and Downflow, 60 Hz,
Air-, Water-, Glycol- and Chilled-water-cooled Models

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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

1 NOMENCLATURE AND COMPONENTS

This section describes the model number for Liebert® PDX/PCW units and components.

Figure 1.1 Liebert PDX/PCW Views

Item	Description
1	Top-discharge, front-return unit
2	Raised-floor discharge unit
3	3-way floor-level discharge unit

1.1 Liebert® PDX Model-number Nomenclature

The tables below describe each digit of the 25-digit configuration number. The 14-digit model number consists of the first 10 digits and last 4 digits of the configuration number.

For the full description of configuration and model number refer to Liebert PDX Model-number Detail on page 71.

Table 1.1 PDX 25-digit Configuration Number

Model Number Digits 1 to 10										Model Details											Model Number Digits 11 to 14			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
P	X	0	2	9	D	A	1	A	D	H	2	2	8	0	1	P	L	B	F	P	A	#	#	#

Table 1.2 PDX Model-number Digit Summary

Digits 1 and 2 = Unit Family	Digit 15 Coil, Valve Type & Pressure Rating[1]
Digit 3, 4, 5 = Nominal Cooling Capacity, kW	Digit 16 = Enclosure Options
Digit 6 = Air Direction and Discharge	Digit 17 = High-voltage Options
Digit 7 = System Type	Digit 18 = Low-voltage Option Packages
Digit 8 = Fan Type	Digit 19 = Monitoring
Digit 9 = Power Supply	Digit 20 = Sensors
Digit 10 = Compressor & Valve (R-410A)	Digit 21 = Packaging
Digit 11 = Humidifier	Digit 22 = Factory Configuration code
Digit 12 = Display	Digit 23-25 = Factory Configuration Number
Digit 13 = Reheat	N/A
Digit 14 = Air filter	N/A
1. High-pressure MBV also results in high-pressure Econ-O-Coil valve.	

1.2 Liebert® PCW Model-number Nomenclature

The tables below describe each digit of the 25-digit configuration number. The 14-digit model number consists of the first 10 digits and last 4 digits of the configuration number.

For the full description of configuration and model number refer to Liebert PCW Model-number Detail on page 75.

Table 1.3 PCW 25-digit Configuration Number

Model Number Digits 1 to 10										Model Details											Model Number Digits 11 to 14			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
P	W	0	2	9	D	C	1	A	D	H	2	2	8	H	1	P	L	B	F	P	A	#	#	#

Table 1.4 PCW Model-number Digit Summary

Digits 1 and 2 = Unit Family	Digit 15 = Coil
Digit 3, 4, 5 = Nominal Cooling Capacity, kW	Digit 16 = Enclosure Options
Digit 6 = Air Discharge	Digit 17 = High-voltage Options
Digit 7 = System Type	Digit 18 = Low-voltage Option Packages
Digit 8 = Fan Type	Digit 19 = Monitoring
Digit 9 = Power Supply	Digit 20 = Sensors
Digit 10 = Chilled Water Valve and Pressure	Digit 21 = Packaging
Digit 11 = Humidifier	Digit 22 = Factory Configuration code
Digit 12 = Display	Digit 23-25 = Factory Configuration Number
Digit 13 = Reheat	N/A
Digit 14 = Air filter	N/A

1.3 Additional Options and Features

The Condensate Pump is factory-installed on upflow units and shipped loose for field installation on downflow units. The condensate pump is powered from the unit.

Cu-Ni Econ-O-Coil is recommended for use on open-tower applications. Please contact your local sales representative for availability.

SCR Reheat is available on PX011 Air & Water/Glycol models only and only with digital scroll compressors.

Table 1.5 Features Available by Access for Downflow Units

Service Item	Freq[1]	Air-Cooled		Air-Cooled with Dual Cool		Water/ Glycol -Cooled		GLYCOOL™		Chilled Water	
		Front Only	Front & Right	Front Only	Front & Right	Front Only	Front & Right	Front Only	Front & Right	Front Only	Front & Right
EP and iCOM	High	x		x		x		x		x	
Air filter	High	x		x		x		x		x	
Humidifier	High	x		x		x		x		x	
DX components	Medium	x		x		x		x			
Chilled-water valve	Medium									x	
Reheats	Medium				x		x		x		x
Filter-clog/ Air-sail switch[2]	Medium		x		x		x		x		x
Smoke sensor	Medium		x		x		x		x		x
Gravity drain/ condensate pump, Piping Connections —Raised Floor	Medium	x		x		x		x		x	
Gravity Drain/ condensate Pump, Piping Connections —Floor-level discharge	Medium		x		x		x		x		x
Water reg valve	Medium						x		x		

Table 1.5 Features Available by Access for Downflow Units (continued)

Service Item	Freq[1]	Air-Cooled		Air-Cooled with Dual Cool		Water/ Glycol -Cooled		GLYCOOL™		Chilled Water	
		Front Only	Front & Right	Front Only	Front & Right	Front Only	Front & Right	Front Only	Front & Right	Front Only	Front & Right
Econ-O-Coil valve	Medium				x				x		
Blower	Low	x		x		x		x		x	
Brazed-plate condenser	Low					x		x			
Evaporator coil	Low		x		x		x		x		x

1. Frequency: High = Once a Month, Medium = Twice a Year, Low = Once in Unit Life.

2. Contact Factory for SFA to move this to Front Access only.

Table 1.6 Features Available by Access for Upflow Units

Service Item	Freq[1]	Air-Cooled		Air-Cooled with Dual Cool		Water/Glycol - Cooled		GLYCOOL™		Chilled Water	
		Front Only	Front & Right	Front Only	Front & Right	Front Only	Front & Right	Front Only	Front & Right	Front Only	Front & Right
EP and iCOM	High	x		x		x		x		x	
Air filter	High	x		x		x		x		x	
Humidifier	High	x		x		x		x		x	
DX components	Medium	x		x		x		x			
Chilled-water valve	Medium									ü	
Reheats	Medium		x		x		x		x		x
Filter-clog/ Air-sail switch[2]	Medium		x		x		x		x		x
Smoke Sensor	Medium	x		x		x		x		x	
Condensate pump	Medium	x		x		x		x		x	
Gravity drain connection	Medium		x		x		x		x		x
Water reg valve	Medium					x		x			

Table 1.6 Features Available by Access for Upflow Units (continued)

Service Item	Freq[1]	Air-Cooled		Air-Cooled with Dual Cool		Water/Glycol - Cooled		GLYCOOL™		Chilled Water	
		Front Only	Front & Right	Front Only	Front & Right	Front Only	Front & Right	Front Only	Front & Right	Front Only	Front & Right
Econ-O-Coil valve	Medium				x				x		
Blower	Low	x		x		x		x		x	
Brazed-plate condenser	Low					x		x			
Evaporator coil	Low		x		x		x		x		x

1. Frequency: High = Once a Month, Medium = Twice a Year, Low = Once in Unit Life.

2. Contact Factory for SFA to move this to Front Access only.

U.S. Department of Energy "Federal Energy Policy Conservation Act"

Thermal Management Computer Room Air Conditioning products manufactured by Vertiv meet minimum Federal efficiency requirements. The Federal Department of Energy (DOE) regulations only apply to Computer Room Air Conditioners that are floor-mounted, direct-expansion, downflow and upflow configuration with sensible capacity less than 760 kBtuh (222 kW). The following units are excluded from DOE regulatory requirements: floor-mount Chilled Water, ceiling-mount, and horizontal air flow (Liebert CRV and Liebert XD) units.

The DOE website [http://www.regulations.doe.gov/certification-data] contains the most-current and detailed product information including the unit indoor model number and the Sensible Coefficient of Performance (SCOP) efficiency. This information is found under "Air Conditioners and Heat Pumps—Computer Room Air Conditioners." If you need more information or assistance, please contact your local sales representative.

1.4 Component Location

The unit component locations are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 1.7 Component-location Drawings

Document Number	Title
DPN003004	PDX Component Location Diagram, Downflow Models
DPN003005	PDX Component Location Diagram, Upflow Models
DPN003020	PCW Component Location Diagram, Downflow Models
DPN003021	PCW Component Location Diagram, Upflow Models

1.5 Cooling Configurations

Figure 1.2 below, shows the configuration options.

Figure 1.2 Cooling configurations for the Liebert PDX and Liebert PCW

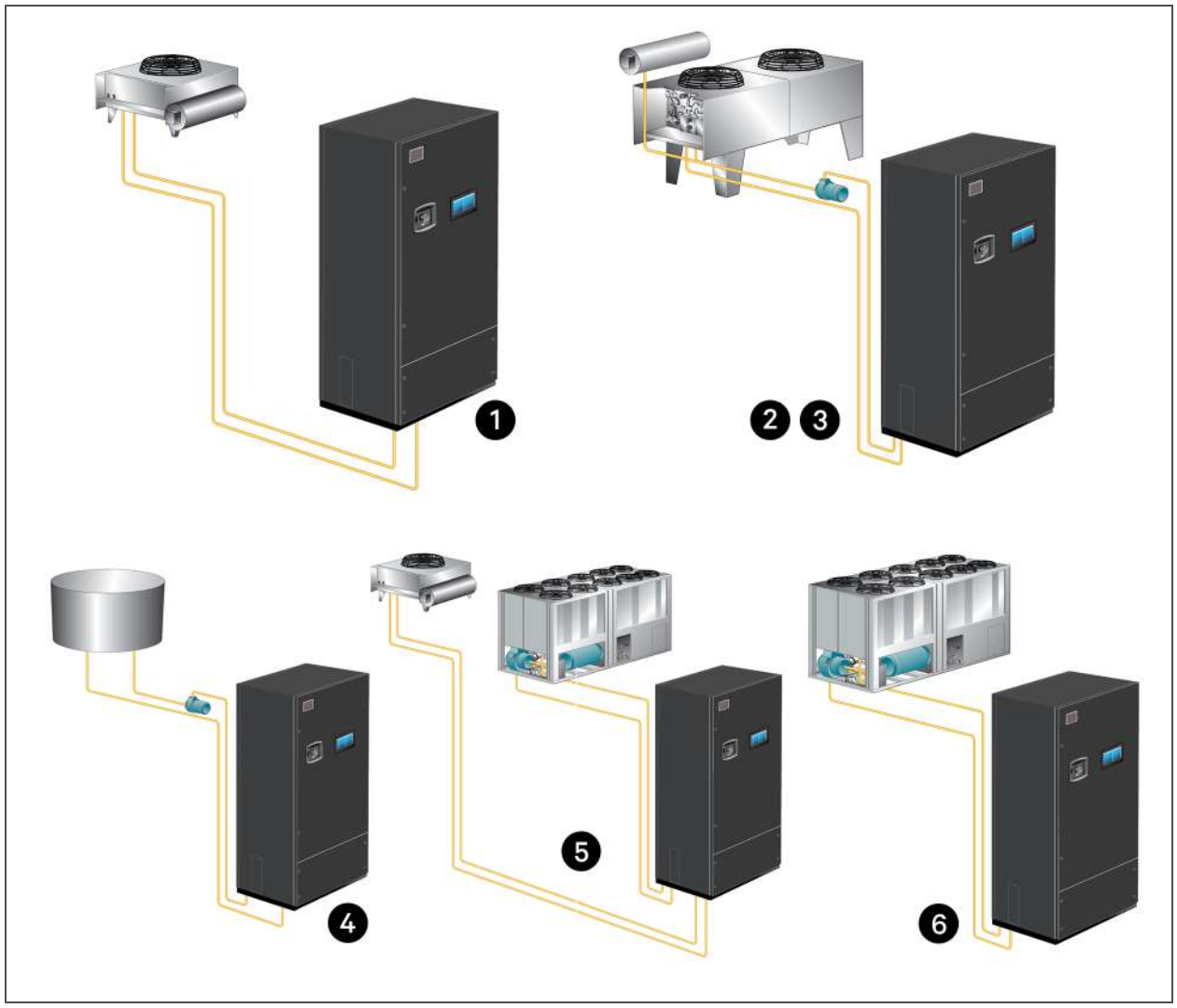


Table 1.8 PDX and PCW Cooling Descriptions

Item	Description
1	Air-cooled—Unit piping is spun closed from the factory and contains a nitrogen holding charge. Each installation requires refrigerant piping to a condenser.
2	Glycol-cooled—Units are factory-charged and tested. Field-supplied and field-installed piping is required from the unit to the drycooler and pump package.
3	GLYCOOL-Integrated Fluid Economizer (Liebert® Econ-O-Coil)—Units are factory-charged and tested. Field-supplied and field-installed piping is required from the unit to the drycooler and pump package. An additional Liebert® Economizer coil is included for use when fluid temperatures are sufficiently low (below room temperature). Economizer cooling is provided by circulating cold glycol through this second coil, reducing or eliminating compressor operation.
4	Water-cooled—Units are factory-charged and tested. Field-supplied and field-installed water piping is required from the unit to the cooling tower.
5	DUAL-COOL—System has all of the features of a compressorized system, but adds a second cooling coil that is connected to a source of chilled water. Cooling is provided by circulating chilled water, when available, through this second coil and reducing compressor operation.
6	Chilled Water—Unit piping is spun closed from the factory and contains a nitrogen charge. Each installation requires a chilled-water source.

1.6 Blower Configurations

Figure 1.3 Downflow blower configuration, discharge into raised floor

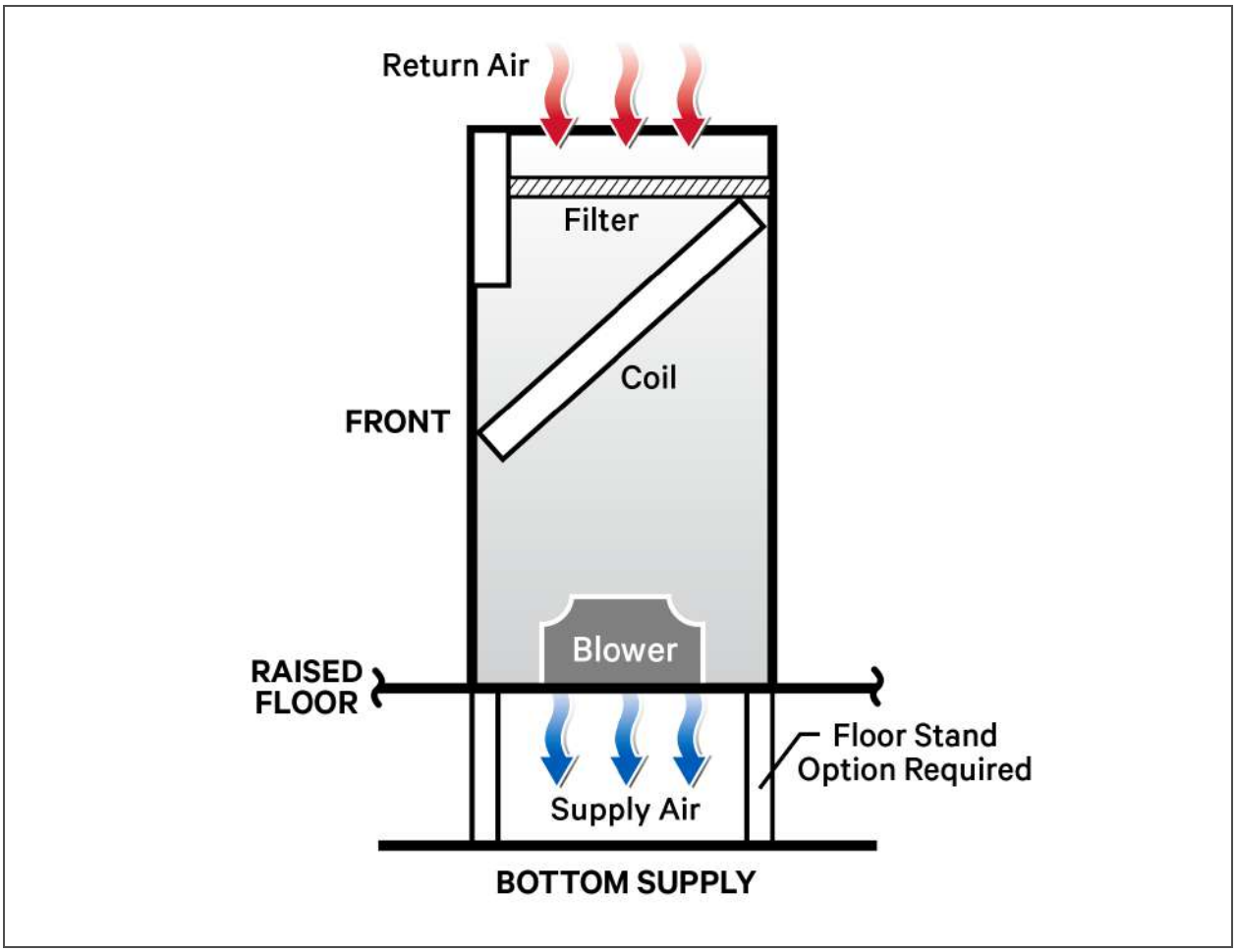
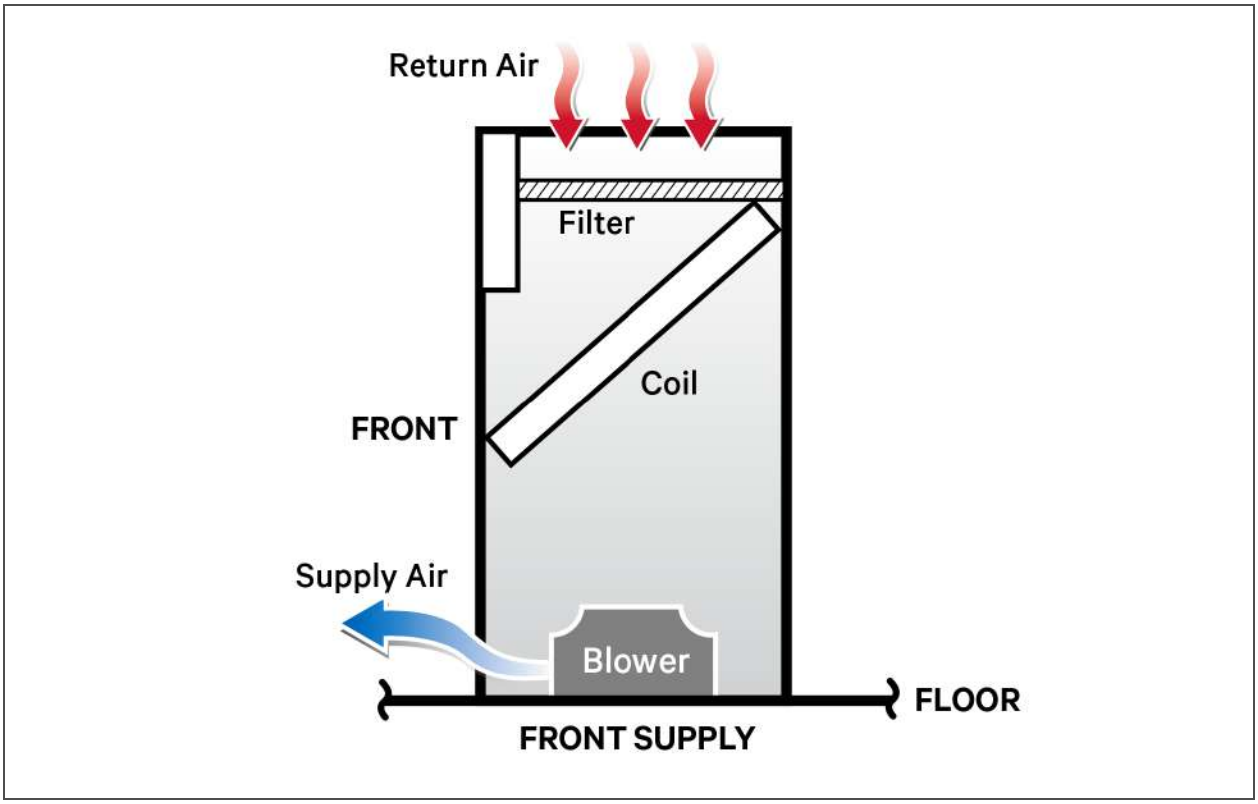


Figure 1.4 Downflow blower configuration, front air discharge (recommended for UPS rooms)



NOTE: Left-side and Right-side discharge are available. Please contact your local sales representative.

Figure 1.5 Upflow blower configuration, front air return

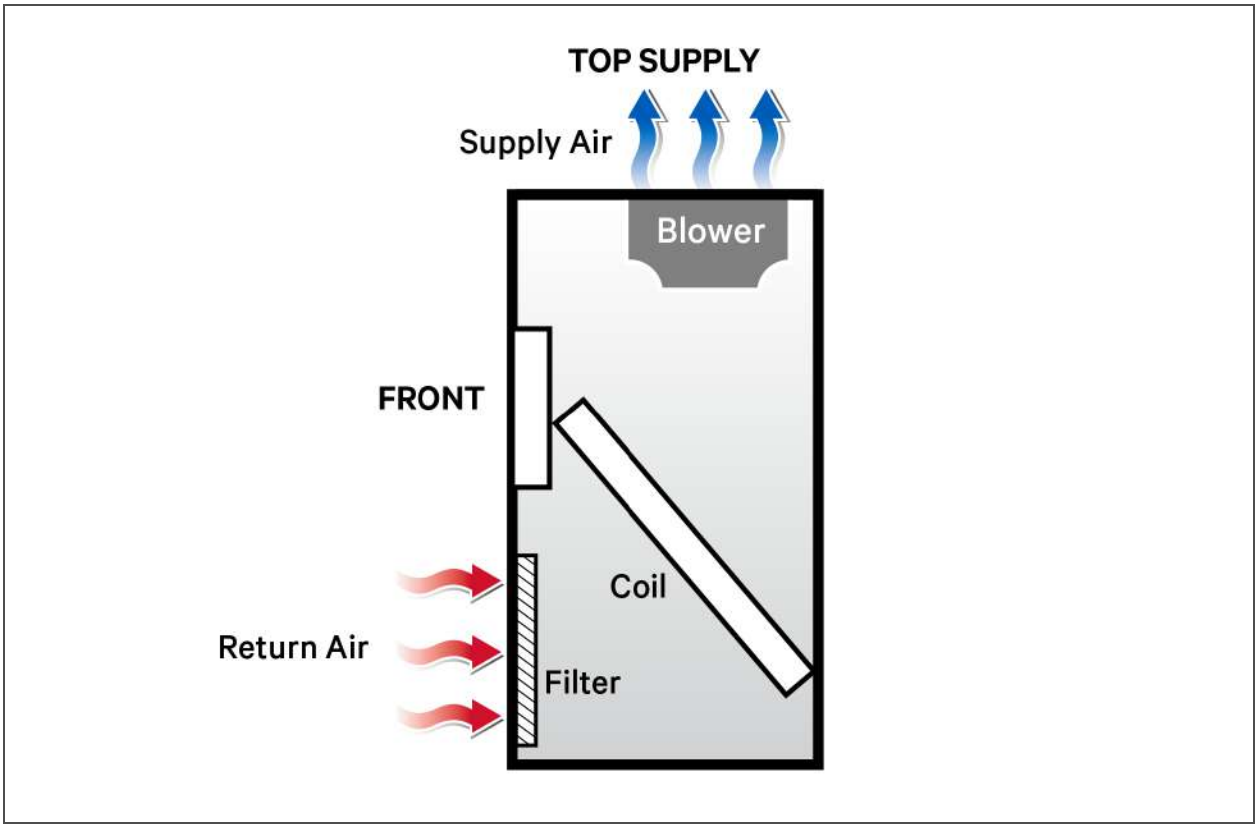
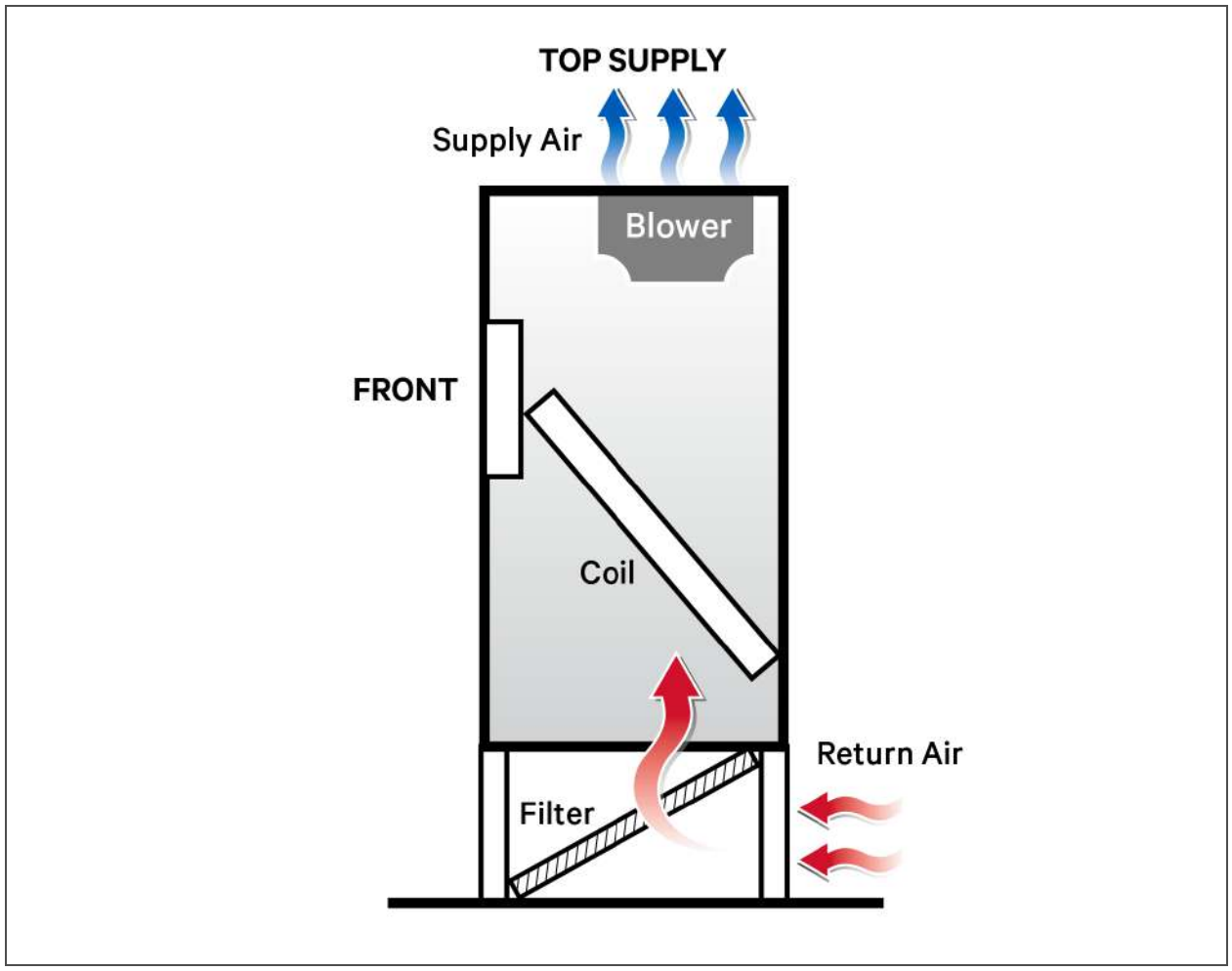


Figure 1.6 Upflow blower configuration, bottom air return with rear-return floor stand



NOTE: The 24-in. return-air floor-stand option is required.

2 SYSTEM DATA

2.1 Air-cooled Capacity and Performance Data

Table 2.1 PDX Downflow, Air-cooled Capacity Data

Model Size	PX011	PX018	PX023	PX029
Net Capacity Data kBTUH (kW), Standard Air Volume and Evaporator Fan Motor, Standard and Digital Compressors				
85°F DB, 64.4°F WB, 52°F DP (29.4°C DB, 18°C WB) 32% RH				
Total kBTUH (kW)	42.3 (12.4)	67.9 (19.9)	85.4 (25)	113.4 (33.2)
Sensible kBTUH (kW)	38.9 (11.4)	67.9 (19.9)	85.4 (25)	113.3 (33.2)
75°F DB, 61°F WB, 52°F DP (23.9°C DB, 16.1°C WB) 44.6% RH				
Total kBTUH (kW)	35.8 (10.5)	62.5 (18.3)	79.5 (23.3)	105.9 (31)
Sensible kBTUH (kW)	32.4 (9.5)	57.1 (16.7)	70.2 (20.6)	91.4 (26.8)
Fan Data				
Standard Airflow, CFM (CMH)	1800 (3058)	2800 (4757)	3500 (5947)	4300 (7306)
Standard Fan Motor, hp (kW)	1.3 (1.0)	4.2 (3.1)	4.2 (3.1)	4.2 (3.1)
External Static Pressure, in. WG (Pa)	0.2 (50)	0.2 (50)	0.2 (50)	0.2 (50)
Evaporator Coil				
DX Coil Rows	3	3	3	4
Maximum Face Velocity, FPM (m/s)	189 (0.96)	295 (1.5)	369 (1.9)	430 (2.2)
Electric Reheat (2 stage)				
Capacity, kBTUH (kW)	20.4 (6)	40.9 (12)	40.9 (12)	40.9 (12)
Infrared Humidifier				
Capacity, lb/hr (kg/hr)	7.7 (3.5)	7.7 (3.5)	7.7 (3.5)	7.7 (3.5)
Steam Generating Humidifier				
Capacity, lb/hr (kg/hr)	10.8 (4.9)	10.8 (4.9)	10.8 (4.9)	10.8 (4.9)

Table 2.1 PDX Downflow, Air-cooled Capacity Data (continued)

Model Size	PX011	PX018	PX023	PX029
Filter Section - MERV rating per ASHRAE 52.2 - 2007 - Deep Pleated Disposable Type				
Standard 2 in. (51 mm) filter rating	MERV 8 Pleated Filter			
Optional 2 in. (51 mm) filter rating	MERV 11 Pleated Filter			
Quantity	1			
Nominal Size, in. (mm)	29.5 x 28.5 (749 x 724)			
Effective Surface Area, ft2 (m2)	25 (2.3)			
Piping Connection Sizes Only[6]				
Hot Gas Line, OD Cu, in.	1/2	5/8		7/8
Liquid Line, OD Cu, in.	3/8	1/2		5/8
Humidifier Supply Line, OD Cu, in.	1/4			
Condensate Drain, in. NPT-Female	3/4			
Unit Weights				
Air-cooled - Dry Weight, lb (kg)	600 (272)	670 (304)	670 (304)	700 (317)
OUTDOOR AIR-COOLED CONDENSER, STANDARD 95°F (35°F) AMBIENT SELECTION				
Condenser Match-Up, Air-Cooled 95°F (35°C) Ambient and 75°F (23.9°C) Return Air				
Model (R-410A) refrigerant	MCS028	MCS028	MCM040	MCL055
Number of Fans	1	1	1	1
Connection size[6] Hot Gas Line, OD Cu, in.	7/8	7/8	7/8	7/8
Connection size[6] Liquid Line, OD Cu, in.	5/8	5/8	5/8	7/8

1 Airflow data rated with 2-in. MERV 8 filter, rated per ASHRAE 52.2-2007.

2 External Static Pressure (ESP) per ASHRAE 127-2007; Higher ESPs are factory available.

3 The net capacity data has fan-motor heat factored-in for all ratings.

4 Capacity data is factory-certified to be within 5% tolerance.

5 Refer to **Table 2.3** on page 16, for information on Dual-cool systems.

6 Refer to **Table 5.5** on page 42, for recommended refrigerant line sizes between evaporator and condenser.

Table 2.2 PDX, Upflow, Air-cooled Capacity Data

Model Size	PX011	PX018	PX023	PX029
Net Capacity Data kBTUH (kW), Standard Air Volume and Evaporator Fan Motor, Standard and Digital Compressors				
85°F DB, 64.4°F WB, 52°F DP (29.4°C DB, 18°C WB) 32% RH				
Total kBTUH (kW)	43.7 (12.8)	69.4 (20.3)	88.4 (25.9)	109.3 (32)
Sensible kBTUH (kW)	40.3 (11.8)	69.4 (20.3)	88.4 (25.9)	109.3 (32)

Table 2.2 PDX, Upflow, Air-cooled Capacity Data (continued)

Model Size	PX011	PX018	PX023	PX029
75°F DB, 61°F WB, 52°F DP (23.9°C DB, 16.1°C WB) 44.6% RH				
Total kBTUH (kW)	37.1 (10.9)	63 (18.5)	81.2 (23.8)	101 (29.6)
Sensible kBTUH (kW)	33.4 (9.8)	59.4 (17.4)	74 (21.7)	89.2 (26.1)
Fan Data				
Standard Airflow, CFM (CMH)	1800 (3058)	2800 (4757)	3500 (5946)	4300 (7306)
Standard Fan Motor, hp (kW)	1.3 (1.0)	4.2 (3.1)	4.2 (3.1)	4.2 (3.1)
External Static Pressure, in. WG (Pa)	0.8 (200)	0.8 (200)	1.0 (250)	1.0 (250)
Evaporator Coil				
DX Coil Rows	3	4	4	4
Maximum Face Velocity without Econ-O-Coil, FPM (m/s)	189 (0.96)	295 (1.5)	369 (1.9)	430 (2.2)
Electric Reheat (2 stage)				
Capacity, kBTUH (kW)	20.4 (6)	40.9 (12)	40.9 (12)	40.9 (12)
Infrared Humidifier				
Capacity, lb/hr (kg/hr)	7.7(3.5)	7.7(3.5)	7.7(3.5)	7.7(3.5)
Steam Generating Humidifier				
Capacity, lb/hr (kg/hr)	10.8 (4.9)	10.8 (4.9)	10.8 (4.9)	10.8 (4.9)
Filter Section - MERV rating per ASHRAE 52.2 - 2007 - Deep Pleated Disposable Type				
Standard 2 in. (51 mm) filter rating	MERV 8 Pleated Filter			
Optional 2 in. (51 mm) filter rating	MERV 11 Pleated Filter			
Quantity	1			
Nominal Size, in. (mm)	34 x 28 (864 x 711)			
Effective Surface Area, ft2 (m2)	21.3 (2.0)			

Table 2.2 PDX, Upflow, Air-cooled Capacity Data (continued)

Model Size	PX011	PX018	PX023	PX029
Piping Connection Sizes Only[6]				
Hot Gas Line, OD Cu, in.	1/2	5/8		7/8
Liquid Line, OD Cu, in.	3/8	1/2		5/8
Humidifier Supply Line, OD Cu, in.	1/4			
Condensate Gravity Drain, in. NPT-Female	3/4			
Condensate Pump Drain Line, OD Cu, in.	1/2			
Unit Weights				
Air Cooled - Dry Weight, lb (kg)	600 (272)	670 (304)	670 (304)	700 (318)
OUTDOOR AIR-COOLED CONDENSER, STANDARD 95°F (35°F) AMBIENT SELECTION				
Condenser Match-Up, Air-Cooled 95°F (35°C) Ambient and 75°F (23.9°C) Return Air				
Model (R-410A) refrigerant	MCS028	MCS028	MCM040	MCL055
Number of Fans	1	1	1	1
Connection size[6] Hot Gas Line, OD Cu, in.	7/8	7/8	7/8	1-1/8
Connection size[6] Liquid Line, OD Cu, in.	5/8	5/8	5/8	7/8

1 Airflow data rated with 2-in. MERV 8 filter, rated per ASHRAE 52.2-2007.

2 External Static Pressure (ESP) per ASHRAE 127-2007; Consult factory for higher ESPs.

3 The net capacity data has fan-motor heat factored-in for all ratings.

4 Capacity data is factory-certified to be within 5% tolerance.

5 Refer to **Table 2.4** on the facing page, for information on Dual-cool systems.

6 Refer to **Table 5.5** on page 42, for recommended refrigerant line sizes between evaporator and condenser.

Table 2.3 PDX, Downflow, Air-cooled Dual-Cool Unit with Econ-O-Coil using Chilled Water (4-pipe connection system) Capacity Data

Model Size	PX011	PX018	PX023	PX029
Net Capacity Data kBTUH (kW), Standard Air Volume and Evaporator Fan Motor, Standard and Digital Compressors				
85°F DB, 64.4°F WB, 52°F DP (29.4°C DB, 18°C WB) 32% RH, 45°F EWT, 55°F LWT (7.2°C EWT, 12.7°C LWT)				
Total kBTUH (kW)	55.3 (16.2)	99.1 (29.1)	112.5 (33)	121.5 (35.6)
Sensible kBTUH (kW)	51.9 (15.2)	88.7 (26.0)	106.2 (31.1)	115 (33.7)
Flow Rate, GPM (l/m)	11.7 (44.3)	20.3 (76.8)	23.4 (88.6)	25.5 (96.5)
Unit Pressure Drop, ft. of Water (kPa)	8.3 (24.7)	10.7 (32.1)	15.6 (46.7)	18.5 (55.4)
75°F DB, 61°F WB, 52°F DP (23.8°C DB, 16.1°C WB) 44.6% RH, 45°F EWT, 55°F LWT (7.2°C EWT, 12.7°C LWT)				
Total kBTUH (kW)	37.5 (10.5)	64.1 (18.8)	77 (22.6)	82.8 (24.3)
Sensible kBTUH (kW)	32.4 (9.5)	59.7 (17.5)	72.2 (21.2)	77.8 (22.8)

Table 2.3 PDX, Downflow, Air-cooled Dual-Cool Unit with Econ-O-Coil using Chilled Water (4-pipe connection system) Capacity Data (continued)

Model Size	PX011	PX018	PX023	PX029
Flow Rate, GPM (l/m)	8.1 (30.7)	13.6 (51.5)	16.4 (62.1)	17.8 (67.4)
Unit Pressure Drop, ft. of water (kPa)	4.3 (12.8)	5.9 (17.7)	8.2 (24.6)	9.7 (29.1)
Fluid Volumes and Piping Connection Sizes				
Econ-O-Coil, gal (l)	2.3 (8.6)	2.7 (10.1)	2.7 (10.1)	2.7 (10.1)
Econ-O-Coil Water Supply and Return, OD Cu, in.	7/8	1-1/8	1-1/8	1-1/8
Fan Data with Econ-O-Coil				
Standard Airflow, CFM (CMH)	1800 (3058)	2800 (4757)	3500 (5946)	3900 (6626)
Standard Fan Motor with Econ-O-Coil, hp (kW)	1.3 (1.0)	4.2 (3.1)	4.2 (3.1)	4.2 (3.1)
External Static Pressure for rating, in. WG (Pa)	0.2 (50)	0.2 (50)	0.2 (50)	0.2 (50)
Evaporator coil and Econ-O-Coil				
DX Coil Rows	3	3	3	4
Econ-O-Coil Rows	2	4	4	4
Maximum Face Velocity, FPM (m/s)	189 (0.96)	295 (1.5)	369 (1.9)	411 (2.1)
Unit Weights				
Air-cooled with Econ-O-Coil Dry Weight, lb (kg)	700 (318)	750 (340)	750 (340)	790 (358)

1. Airflow data rated with 2" MERV 8 filter, rated per ASHRAE 52.2-2007.
2. External Static Pressure (ESP) per ASHRAE 127-2007; Higher ESPs are factory available.
3. The net capacity data has fan motor heat factored in for all ratings.
4. Capacity data is factory-certified to be within 5% tolerance.
5. Refer to **Table 5.5** on page 42 for recommended refrigerant line sizes between evaporator and condenser.

Table 2.4 PDX, Upflow, Air-cooled Dual-Cool Unit with Econ-O-Coil using Chilled Water (4-pipe connection system) Capacity Data

Model Size	PX011	PX018	PX023	PX029
Net Capacity Data kBTUH (kW), Standard Air Volume and Evaporator Fan Motor, Standard and Digital Compressors				
85°F DB, 64.4°F WB, 52°F DP (29.4°C DB, 18°C WB) 32% RH, 45°F EWT, 55°F LWT (7.2°C EWT, 12.7°C LWT)				
Total kBTUH (kW)	57.3 (16.8)	94.1 (27.6)	110.5 (32.4)	119.2 (34.9)
Sensible kBTUH (kW)	53.6 (15.7)	87.9 (25.8)	104.1 (30.5)	112.7 (33.0)
Flow Rate, GPM (l/m)	14 (92.0)	19.6 (74.2)	23.4 (88.6)	25.5 (96.5)

Table 2.4 PDX, Upflow, Air-cooled Dual-Cool Unit with Econ-O-Coil using Chilled Water (4-pipe connection system) Capacity Data (continued)

Model Size	PX011	PX018	PX023	PX029
Unit Pressure Drop, ft. of Water (kPa)	11.5 (34.3)	11.3 (33.9)	15.6 (46.7)	18.5 (55.4)
75°F DB, 61°F WB, 52°F DP (23.9°C DB, 16.1°C WB) 44.6% RH, 45°F EWT, 55°F LWT (7.2°C EWT, 12.7°C LWT)				
TCC kBTUH (kW)	36.9 (10.8)	64.1 (18.8)	74.9 (22)	80.5 (23.6)
SCC kBTUH (kW)	33.4 (9.8)	59.7 (17.5)	70.1 (20.6)	75.5 (22.1)
Flow Rate, GPM (l/m)	8.4 (31.8)	13.6 (51.5)	16.4 (62.1)	17.8 (67.4)
Unit Pressure Drop, ft. of water (kPa)	4.5 (13.4)	5.9 (17.7)	8.2 (24.6)	9.7 (29.1)
Fluid Volumes and Piping Connection Sizes				
Econ-O-Coil, gal (l)	2.3 (8.6)	2.7 (10.1)	2.7 (10.1)	2.7 (10.1)
Econ-O-Coil Water Supply and Return, OD Cu, in.	7/8	1-1/8	1-1/8	1-1/8
Fan Data with Econ-O-Coil				
Standard Airflow, CFM (CMH)	1800 (3058)	2800 (4757)	3500 (5947)	3900 (6626)
Standard Fan Motor with Econ-O-Coil, hp (kW)	1.3 (1.0)	4.2 (3.1)	4.2 (3.1)	4.2 (3.1)
External Static Pressure for rating, in. WG (Pa)	0.8 (200)	0.8 (200)	1.0 (250)	1.0 (250)
Evaporator Coil and Econ-O-Coil				
DX Coil Rows	3	4	4	4
Econ-O-Coil Rows	2	4	4	4
Maximum Face Velocity, FPM (m/s)	189 (0.96)	295 (1.5)	369 (1.9)	411 (2.1)
Unit Weights				
Air-cooled with Econ-O-Coil Dry Weight, lb (kg)	700 (318)	750 (340)	750 (340)	790 (358)

1 Airflow data rated with 2" MERV 8 filter, rated per ASHRAE 52.2-2007.

2 External Static Pressure (ESP) per ASHRAE 127-2007; Consult factory for higher ESPs.

3 The net capacity data has fan motor heat factored in for all ratings.

4 Capacity data is factory-certified to be within 5% tolerance.

2.2 Water-cooled Capacity and Performance Data

Table 2.5 PDX, Downflow, Water-cooled Capacity Data

Model Size	PX011	PX018	PX023	PX029
Net Capacity Data kBTUH (kW), Standard Air Volume and Evaporator Fan Motor, Standard and Digital Compressors				
85°F DB, 64.4°F WB, 52°F DP (29.4°C DB, 18°C WB) 32% RH				
Total kBTUH (kW)	50.7 (14.9)	72.5 (21.3)	90.4 (26.5)	116.7 (34.2)
Sensible kBTUH (kW)	50.7 (14.9)	72.2 (21.2)	89 (26.1)	115 (33.7)
75°F DB, 61°F WB, 52°F DP (23.9°C DB, 16.1°C WB) 44.6% RH				
Total kBTUH (kW)	47.0 (13.8)	68.3 (20)	85.4 (25)	109.8 (32.2)
Sensible kBTUH (kW)	41.4 (12.1)	58.1 (17)	70.7 (20.7)	91.6 (26.8)
Fluid Requirements @ 86°F (30°C) EWT, 95°F (35°C) LWT, RAT @ 75°F DB/52°F DP				
Flow Rate, GPM (l/m)	13.1 (50.0)	18.4 (69.7)	24.8 (93.9)	29.2 (110.5)
Water-cooled Unit Pressure Drop, ft of water (kPA)	13.4 (40.0)	12.3 (36.9)	21.7 (64.8)	21.5 (64.2)
Water-cooled & Econ-O-Coil Unit Pressure Drop, ft of water (kPA)	17.7 (52.9)	18.2 (54.4)	29.9 (89.4)	31.2 (93.3)
Condensing Temperature °F (°C)	104.6 (40.3)	102.3 (39.1)	103.3 (39.6)	102.8 (39)
Total Heat of Rejection kBTUH (kW)	58.6 (17.2)	86.1 (25.2)	110.9 (32.5)	143.6 (42.1)
Fan Data				
Standard Airflow, CFM (CMH)	1800 (3058)	2800 (4757)	3500 (5947)	4300 (7306)[6]
Standard Fan Motor, hp (kW)	1.3 (1.0)	4.2 (3.1)	4.2 (3.1)	4.2 (3.1)
External Static Pressure, in. WG (Pa)	0.2 (50)	0.2 (50)	0.2 (50)	0.2 (50)
Evaporator Coil				
DX Coil Rows	3	3	3	4
Econ-O-Coil Rows	2	4	4	4
Maximum Face Velocity, FPM (m/s)	189 (0.96)	295 (1.5)	369 (1.9)	430 (2.2)
Electric Reheat (2-Stage)				
Capacity, kBTUH (kW)	20.4 (6)	40.9 (12)	40.9 (12)	40.9 (12)
Infrared Humidifier				
Capacity, lb/hr (kg/hr)	7.7 (3.5)	7.7 (3.5)	7.7 (3.5)	7.7 (3.5)
Steam Generating Humidifier				
Capacity, lb/hr (kg/hr)	10.8 (4.9)	10.8 (4.9)	10.8 (4.9)	10.8 (4.9)
Filter Section - MERV rating per ASHRAE 52.2 - 2007 - Deep-Pleated Disposable Type				
Standard 2" (51 mm) Filter Rating	MERV 8 Pleated Filter			

Table 2.5 PDX, Downflow, Water-cooled Capacity Data (continued)

Model Size	PX011	PX018	PX023	PX029
Optional 2" (51 mm) Filter Rating	MERV 11 Pleated Filter			
Quantity	1			
Nominal Size, in. (mm)	29.5 x 28.5 x (749 x 724)			
Effective Surface Area, ft2 (m2)	25 (2.3)			
Piping Connection Sizes				
Condenser Water Supply and Return, OD Cu, in.	7/8	1-1/8	1-1/8	1-1/8
Humidifier Supply Line, OD Cu, in.	1/4			
Condensate Drain, in. NPT-Female	3/4			
Water Control Valve - Motorized Ball Valve				
Water Valve Nominal Size, in.	3/4	1	1	1
Unit Fluid Volumes				
Water-Cooled Unit, gal (L)	1.5 (5.7)	1.7 (6.4)	1.7 (6.4)	1.9 (7.0)
Econ-O-Coil, gal (L)	2.3 (8.6)	2.7 (10.1)	2.7 (10.1)	2.7 (10.1)
Unit Weights				
Water-Cooled - Dry Weight, lb (kg)	620 (281)	690 (313)	690 (313)	720 (327)
Water-Cooled w/Econ-O-Coil Dry Weight, lb (kg)	720 (327)	770 (349)	770 (349)	810 (367)

1. Airflow data rated with 2" MERV filter, rated per ASHRAE 52.2-2007
2. External Status Pressure(ESP) per ASHRAE 127-2007.
3. The net capacity data has fan motor heat factored in for all ratings.
4. Capacity data is factory-certified to be within 5% tolerance.
5. Refer to **Table 2.3** on page 16, for information on dual-cool systems.
6. 3900 cfm (6626 cmh) with Econ-O-Coil.

Table 2.6 PDX, Upflow, Water-cooled Capacity Data

Model Size	PX011	PX018	PX023	PX029
Net Capacity Data kBTUH (kW), Standard Air Volume and Evaporator Fan Motor, Standard and Digital Compressors				
85°F DB, 64.4°F WB, 52°F DP (29.4°C DB, 18°C WB) 32% RH				
Total kBTUH (kW)	50.6 (14.8)	74.5 (21.8)	92.9 (27.2)	114.5 (33.6)
Sensible kBTUH (kW)	50.6 (14.8)	74.5 (21.8)	92.9 (27.2)	113.8 (33.3)
75°F DB, 61°F WB, 52°F DP (23.9°C DB, 16.1°C WB) 44.6% RH				
Total kBTUH (kW)	46.8 (13.7)	68.9 (20.2)	86.4 (25.3)	106.5 (31.2)
Sensible kBTUH (kW)	41.3 (12.1)	62.3 (18.2)	76.3 (22.4)	91.8 (26.9)

Table 2.6 PDX, Upflow, Water-cooled Capacity Data (continued)

Model Size	PX011	PX018	PX023	PX029
Fluid Requirements @ 86°F (30°C) EWT/95°F (35°C) LWT, RAT @ 75°F DB/52°F DP				
Flow Rate, GPM (l/m)	13.1 (49.6)	19.6 (74.2)	25.4 (96.1)	29.2 (110.5)
Water-cooled Unit Pressure Drop, ft of water (kPA)	13.5 (40.3)	13.9 (41.5)	22.7 (67.8)	21.5 (64.2)
Water-cooled & Econ-O-Coil Unit Pressure Drop, ft of water (kPA)	18.0 (53.8)	19.8 (59.2)	30.9 (92.4)	31.2 (93.3)
Condensing Temperature °F (°C)	104.7 (40.4)	102.1 (38.9)	103.5 (39.7)	103.4 (39.7)
Total Heat of Rejection kBTUH (kW)	59.0 (17.3)	87.7 (25.7)	113.7 (33.3)	142.5 (41.8)
Fan Data				
Standard Airflow, CFM (CMH)	1800 (3058)	2800 (4757)	3500 (5947)	4300 (7306)[6]
Standard Fan Motor, hp (kW)	1.3 (1.0)	4.2 (3.1)	4.2 (3.1)	4.2 (3.1)
External Static Pressure, in. WG (Pa)	0.8 (200)	0.8 (200)	1.0 (250)	1.0 (250)
Maximum Face Velocity, FPM (m/s)	189 (0.96)	295 (1.5)	369 (1.9)	430 (2.2)
Evaporator Coil				
DX Coil Rows	3	4	4	4
Econ-O-Coil Rows	2	4	4	4
Electric Reheat (2-Stage)				
Capacity, kBTUH (kW)	20.4 (6)	40.9 (12)	40.9 (12)	40.9 (12)
Infrared Humidifier				
Capacity, lb/hr (kg/hr)	7.7 (3.5)	7.7 (3.5)	7.7 (3.5)	7.7 (3.5)
Steam Generating Humidifier				
Capacity, lb/hr (kg/hr)	10.8 (4.9)	10.8 (4.9)	10.8 (4.9)	10.8 (4.9)
Filter Section - MERV rating per ASHRAE 52.2 - 2007 - Deep-Pleated Disposable Type				
Standard 2" (51 mm) Filter Rating	MERV 8 Pleated Filter			
Optional 2" (51 mm) Filter Rating	MERV11 Pleated Filter			
Quantity	1			
Nominal Size, in. (mm)	34 x 28 (864 x 711)			
Effective Surface Area, ft2 (m2)	21.3 (2.0)			
Piping Connection Sizes				
Condenser Water Supply and Return, OD Cu, in.	7/8	1-1/8	1-1/8	1-1/8
Humidifier Supply Line, OD Cu, in.	1/4			
Condensate Gravity Drain, in. NPT-Female	3/4			

Table 2.6 PDX, Upflow, Water-cooled Capacity Data (continued)

Model Size	PX011	PX018	PX023	PX029
Condensate Pump Drain Line, OD Cu, in.	1/2			
Water Control Valve - Motorized Ball Valve				
Water Valve Nominal Size, in.	3/4	1	1	1
Unit Fluid Volumes				
Water-Cooled Unit, gal (L)	1.5 (5.7)	1.7 (6.4)	1.7 (6.4)	1.9 (7.0)
Econ-O-Coil, gal (L)	2.3 (8.6)	2.7 (10.1)	2.7 (10.1)	2.7 (10.1)
Unit Weights				
Water-Cooled Dry Weight, lb (kg)	620 (281)	690 (313)	690 (313)	720 (327)
Water-Cooled w/Econ-O-Coil Dry Weight, lb (kg)	720 (327)	770 (349)	770 (349)	810 (367)

1. Airflow data rated with 2" MERV 8 filter, rated per ASHRAE 52.2-2007.
2. External Static Pressure (ESP) per ASHRAE 127-2007; Higher ESPs are factory available.
3. The net capacity data has fan motor heat factored in for all ratings.
4. Capacity data is factory-certified to be within 5% tolerance.
5. Refer to **Table 2.4** on page 17, for information on Dual-cool systems.
6. 3900 cfm (6626 cmh) with Econo-O-Coil.

2.3 Glycol/GLYCOOL™-cooled Capacity and Performance Data

Table 2.7 PDX, Downflow, Glycol-cooled and GLYCOOL™ DX Capacity Data

Model Size	PX011	PX018	PX023	PX029
Net Capacity Data kW (BTUH), Standard Air Volume and Evaporator Fan Motor, Standard and Digital Compressors				
85°F DB, 64.4°F WB, 52°F DP (29.4°C DB, 18°C WB) 32% RH				
Total kBTUH (kW)	46.1 (13.5)	66 (19.3)	80.8 (23.7)	102.5 (30.0)
Sensible kBTUH (kW)	46.1 (13.5)	66 (19.3)	80.8 (23.7)	102 (29.9)
75°F DB, 61°F WB, 52°F DP (23.9°C DB, 16.1°C WB) 44.6% RH				
Total kBTUH (kW)	47.1 (12.2)	60.2 (17.6)	74.8 (21.9)	96.2 (28.2)
Sensible kBTUH (kW)	38.9 (11.4)	55.3 (16.2)	66.4 (19.5)	81.9 (24.0)
Fluid Requirements (40% propylene glycol) @ 104°F (40°C) EGT, 115°F (46.1°C) LGT, RAT @ 75°F DB/52°F DP				
Flow Rate, GPM (L/m)	11.0 (41.6)	16.2 (61.3)	20.8 (78.7)	26.4 (99.9)
Glycol-cooled Unit Pressure Drop, ft of water (kPa)	11.1 (33.1)	11.1 (33.3)	17.8 (53.1)	20.4 (60.8)
GLYCOOL with Econ-O-Coil (2-pipe) Unit Pressure Drop, ft of water (kPa)	20.6 (61.6)	24.6 (73.5)	37.9 (113.2)	50.4 (150.7)
Condensing Temperature	124.1 (51.2)	122.6 (50.3)	124.1 (51.1)	122.6 (50.3)
Total Heat of Rejection kBTUH (kw)	56.4 (16.5)	82.5 (24.1)	106.2 (31.1)	134.7 (39.5)
Fan Data				
Standard Airflow, CFM (CMH)	1800 (3058)	2800 (4757)	3500 (5947)	4300 (7306)[6]
Standard Fan Motor, hp (kW)	1.3 (1)	4.2 (3.1)	4.2 (3.1)	4.2 (3.1)
External Static Pressure, in. WG (Pa)	0.2 (50)	0.2 (50)	0.2 (50)	0.2 (50)
Evaporator Coil				
DX Coil Rows	3	3	3	4
Econ-O-Coil Rows	2	4	4	4
Face Velocity, FPM (m/s)	189 (0.96)	295 (1.5)	369 (1.9)	430 (2.2)
Electric Reheat (2-Stage)				
Capacity, kBTUH (kW)	20.4 (6)	40.9 (12)	40.9 (12)	40.9 (12)
Infrared Humidifier				
Capacity, lb/hr (kg/hr)	7.7 (3.5)	7.7 (3.5)	7.7 (3.5)	7.7 (3.5)
Steam Generating Humidifier				
Capacity, lb/hr (kg/hr)	10.8 (4.9)	10.8 (4.9)	10.8 (4.9)	10.8 (4.9)

Table 2.7 PDX, Downflow, Glycol-cooled and GLYCOOL™ DX Capacity Data (continued)

Model Size	PX011	PX018	PX023	PX029
Filter Section - MERV Rating per ASHRAE 52.2 - 2007 - Deep-Pleated Disposable Type				
Standard 2" (51 mm) Filter Rating	MERV 8 Pleated Filter			
Optional 2" (51 mm) Filter Rating	MERV11 Pleated Filter			
Quantity	1			
Nominal Size, in. (mm)	29.5 x 28.5 (749 x 724)			
Effective Surface Area, ft^2 (m^2)	25 (2.3)			
Piping Connection Sizes				
Condenser Glycol Supply and Return, OD Cu, in.	7/8	1-1/8	1-1/8	1-1/8
Humidifier Supply Line, OD Cu, in.	1/4			
Condensate Drain, in. NPT-Female	3/4			
Water Control Valve - Motorized Ball Valve				
Water Valve Nominal Size, in.	3/4	1	1	1
Unit Fluid Volumes				
Glycol-cooled Unit, gal (L)	1.5 (5.7)	1.7 (6.4)	1.7 (6.4)	1.9 (7.0)
Econ-o-Coil. gal (L)	2.3 (8.6)	2.7 (10.1)	2.7 (10.1)	2.7 (10.1)
Unit Weights				
Glycol-cooled - Dry Weight, lb (kg)	620 (281)	690 (313)	690 (313)	720 (327)
GLYCOOL™ w/Econ-O-Coil Dry Weight, lb (kg)	720 (327)	770 (349)	770 (349)	810 (367)

1. Airflow data rated with 2" MERV filter, rated per ASHRAE 52.2-2007
2. External Status Pressure(ESP) per ASHRAE 127-2007.
3. The net capacity data has fan motor heat factoredin for all ratings.
4. Capacity data is factory-certified to be within 5% tolerance.
5. Refer to **Table 2.3** on page 16, for information on dual-cool systems.
6. 3900 cfm (6626 cmh) with Econ-O-Coil.

Table 2.8 PDX, Upflow, Glycol-cooled and GLYCOOL™ (with Econ-O-Coil) DX Capacity Data

Model Size	PX011	PX018	PX023	PX029
Net Capacity Data kW (BTUH), Standard Air Volume and Evaporator Fan Motor, Standard and Digital Compressors				
85°F DB, 64.4°F WB, 52°F DP (29.4°C DB, 18°C WB) 32% RH				
Total kBTUH (kW)	46.0 (13.5)	69.4 (20.3)	86.3 (25.3)	101.7 (29.8)
Sensible kBTUH (kW)	46.0 (13.5)	69.4 (20.3)	86.3 (25.3)	101.7 (29.8)
75°F DB, 61°F WB, 52°F DP (23.9°C DB, 16.1°C WB) 44.6% RH				

Table 2.8 PDX, Upflow, Glycol-cooled and GLYCOOL™ (with Econ-O-Coil) DX Capacity Data (continued)

Model Size	PX011	PX018	PX023	PX029
Total kBTUH (kW)	41.3 (12.1)	62.3 (18.3)	78.2 (22.9)	93.7 (27.5)
Sensible kBTUH (kW)	38.8 (11.4)	60.2 (17.6)	74 (21.7)	83.2 (24.4)
Fluid Requirements (40% propylene glycol) @ 104°F (40°C) EGT, 115°F (46.1°C) LGT, RAT @ 75°F DB/52°F DP				
Flow Rate, GPM (L/m)	11.1 (42.0)	16.5 (62.5)	21.4 (81)	26.5 (100.3)
Glycol-cooled Unit Pressure Drop, ft of water (kPa)	11.3 (33.7)	11.5 (34.4)	18.7 (56)	20.5 (61.3)
GLYCOOL with Econ-O-Coil (2-pipe) Unit Pressure Drop,ft of water (kPa)	22.9 (68.5)	25.4 (75.9)	39.7 (118.7)	50.7 (151.5)
Condensing Temperature	124.1 (51.2)	122.8 (50.4)	124.2 (51.2)	122.6 (50.3)
Total Heat of Rejection kBTUH (kW)	56.3 (16.5)	84.3 (24.7)	109.3 (32.0)	135.1 (39.6)
Fan Data				
Standard Airflow, CFM (CMH)	1800 (3058)	2800 (4757)	3500 (5947)	4300 (7306)[6]
Standard Fan Motor, kW (hp)	1 (1.3)	3.1 (4.2)	3.1 (4.2)	3.1 (4.2)
External Static Pressure, in. WG (Pa)	0.8 (200)	0.8 (200)	1 (250)	1 (250)
Evaporator Coil				
DX Coil Rows	3	4	4	4
Econ-O-Coil Rows	2	4	4	4
Maximum Face Velocity, FPM (m/s)	189 (0.96)	295 (1.5)	369 (1.9)	430 (2.2)
Electric Reheat (2-Stage)				
Capacity, kBTUH (kW)	20.4 (6)	40.9 (12)	40.9 (12)	40.9 (12)
Infrared Humidifier				
Capacity, lb/hr (kg/hr)	7.7 (3.5)	7.7 (3.5)	7.7 (3.5)	7.7 (3.5)
Steam Generating Humidifier				
Capacity, lb/hr (kg/hr)	10.8 (4.9)	10.8 (4.9)	10.8 (4.9)	10.8 (4.9)
Filter Section - MERV Rating per ASHRAE 52.2 - 2007 - Deep-Pleated Disposable Type				
Standard 2" (51 mm) Filter Rating	MERV 8 Pleated Filter			
Optional 2" (51 mm) Filter Rating	MERV 11 Pleated Filter			
Quantity	1			
Nominal Size, in. (mm)	34 x 28 (864 x 711)			
Effective Surface Area, ft2 (m2)	21.3 (2.0)			

Table 2.8 PDX, Upflow, Glycol-cooled and GLYCOOL™ (with Econ-O-Coil) DX Capacity Data (continued)

Model Size	PX011	PX018	PX023	PX029
Piping Connection Sizes				
Condenser Glycol Supply and Return, OD Cu, in.	7/8	1-1/8	1-1/8	1-1/8
Humidifier Supply Line, OD Cu, in.	1/4			
Condensate Gravity Drain Line, in. NPT-Female	3/4			
Condensate Pump Drain Line, OD Cu, IN.	1/2			
Water Control Valve - Motorized Ball Valve				
Water Valve Nominal Size, in.	3/4	1	1	1
Unit Fluid Volumes				
Glycol-cooled Unit, gal (L)	1.5 (5.7)	1.7 (6.4)	1.7 (6.4)	1.9 (7.0)
Econ-O-Coil, gal (L)	2.3 (8.6)	2.7 (10.1)	2.7 (10.1)	2.7 (10.1)
Unit Weights				
Glycol-cooled - Dry Weight, lb (kg)	620 (281)	690 (313)	690 (313)	720 (327)
GLYCOOL™ w/Econ-O-Coil Dry Weight, lb (kg)	720 (327)	770 (349)	770 (349)	810 (367)

1. Airflow data rated with 2" MERV filter, rated per ASHRAE 52.2-2007
2. External Status Pressure(ESP) per ASHRAE 127-2007.
3. The net capacity data has fan motor heat factored in for all ratings.
4. Capacity data is factory-certified to be within 5% tolerance.
5. Refer to **Table 2.3** on page 16, for information on dual-cool systems.
6. 3900 cfm (6626 cmh) with Econ-O-Coil.

2.4 Chilled Water-cooled Capacity and Performance Data

Table 2.9 PCW, Downflow, Chilled-water Capacity Data

Model Size	PW011	PW017	PW029
Net Capacity Data kW (BTUH), Standard Air Volume and Evaporator Fan Motor			
85°F DB, 64.4°F WB, 52°F DP (29.4°C DB, 18°C WB) 32% RH, 45°F EWT, 55°F LWT (7.22°C EWT, 12.78°C LWT)			
Total kBTUH (kW)	57.9 (17)	81.5 (23.9)	141.6 (41.5)
Sensible kBTUH (kW)	55.5 (16.3)	80.9 (23.7)	134.8 (39.5)
Flow Rate, GPM (l/m)	11.7 (44.3)	17.1 (64.7)	30.2 (114.3)
Unit Pressure Drop, ft of Water (kPa)	8.3 (24.7)	16.1 (48)	29.2 (87.2)
75°F DB, 61°F WB, 52°F DP (23.9°C DB, 16.1°C WB) 44.6% RH, 45°F EWT, 55°F LWT (7.22°C EWT, 12.78°C LWT)			
Total kBTUH (kW)	39.6 (11.6)	55.3 (16.2)	95.8 (28.1)
Sensible kBTUH (kW)	38 (11.1)	54.3 (15.9)	90.5 (26.5)
Flow Rate, GPM (l/m)	8.1 (30.7)	11.9 (45)	21.1 (79.9)
Unit Pressure Drop, ft of Water (kPa)	4.3 (12.8)	8.4 (25.1)	15.3 (45.8)
Fan Data			
Standard Airflow, CFM (CMH)	2000 (3401)	3500 (5947)	4800 (8155)
Standard Fan Motor, hp (kW)	1.3 (1.0)	4.2 (3.1)	4.2 (3.1)
External Static Pressure, in. WG (Pa)	0.2 (50)	0.2 (50)	0.2 (50)
Chilled Water Coil			
Rows	2	2	4
Face Velocity, FPM (m/s)	204 (1.05)	357(1.8)	490 (2.5)
Electric Reheat (2-stage)			
Capacity, kBTUH (kW)	20.4 (6)	40.9 (12)	40.9 (12)
Hot Water Reheat 180°F (82.2°C) E.W.T., 75°F (23.9°C) E.A.T, 4 GPM(0.25 l/s)			
Capacity, kBTUH (kW)	44.3 (13.0)	57.1 (16.7)	64.0 (18.7)
Pressure Drop, ft of Water (kPa)	3 (8.9)		
Coil Rows	1		
Infrared Humidifier			
Capacity, lb/hr (kg/hr)	7.7 (3.5)	7.7 (3.5)	7.7 (3.5)
Steam Generating Humidifier			
Capacity, lb/hr (kg/hr)	10.8 (4.9)	10.8 (4.9)	10.8 (4.9)

Table 2.9 PCW, Downflow, Chilled-water Capacity Data (continued)

Model Size	PW011	PW017	PW029
Filter Section—Std. 2 in. (51 mm) MERV rating per ASHRAE 52.2 - 2007—Deep Pleated Disposable Type			
Standard 2 in. (51 mm) Filter Rating	MERV 8 Pleated Filter		
Optional 2 in. (51 mm) Filter Rating	MERV 11 Pleated Filter		
Quantity	1		
Nominal Size, in. (mm)	29.5 x 28.5 (749 x 724)		
Effective Surface Area, ft^2 (m^2)	25 (2.3)		
Piping Connection Sizes			
Chilled Water Supply and Return Connections, OD Cu, in.	1-1/8		
Humidifier Supply Line, OD Cu, in.	1/4		
Condensate Drain Line, in. NPT-Female	3/4		
Optional HWRH Supply and Return Connections, OD Cu, in.	5/8		
Fluid Volumes			
Chilled Water Unit, gal (l)	2.3 (8.6)	2.3 (8.6)	2.7 (10.1)
Optional Hot Water Reheat, gal (l)	0.35 (1.3)		
Water Control Valve - Motorized Ball Valve			
Water Valve Nominal Size, in.	1		
Water Valve Body	2-way or 3-way		
Cv	30		
Valve Close-Off Pressure, PSI (kPa)	200 (1379)		
Unit Weights			
Dry Weight, lb (kg)	575 (261)	600 (272)	650 (294)

1. Airflow data rated with 2" MERV 8 filter, rated per ASHRAE 52.2-2007.
2. External Static Pressure (ESP) per ASHRAE 127-2007; Higher ESPs are factory available.
3. The net capacity data has fan-motor heat factored-in for all ratings.
4. Capacity data is factory-certified to be within 5% tolerance.

Table 2.10 PCW, Upflow, Chilled-water Capacity Data

Model Size	PW011	PW017	PW029
Net Capacity Data kW (BTUH), Standard Air Volume and Evaporator Fan Motor			
85°F DB, 64.4°F WB, 52°F DP (29.4°C DB, 18°C WB) 32% RH, 45°F EWT, 55°F LWT (7.22°C EWT, 12.78°C LWT)			
Total kBTUH (kW)	56.9 (16.7)	80 (23.5)	129.5 (37.9)
Sensible kBTUH (kW)	54.4 (16)	79.4 (23.3)	122.6 (35.9)

Table 2.10 PCW, Upflow, Chilled-water Capacity Data (continued)

Model Size	PW011	PW017	PW029
Flow Rate, GPM (l/m)	11.7 (44.3)	17.1 (64.7)	27.7 (104.9)
Unit Pressure Drop, ft of Water (kPa)	8.3 (24.7)	16.1 (48)	25 (74.9)
75°F DB, 61°F WB, 52°F DP (23.9°C DB, 16.1°C WB) 44.6% RH, 45°F EWT, 55°F LWT (7.22°C EWT, 12.78°C LWT)			
Total kBTUH (kW)	38.6 (11.3)	53.8 (15.8)	87.4 (25.6)
Sensible kBTUH (kW)	36.9 (10.8)	52.8 (15.5)	82.2 (24.1)
Flow Rate, GPM (l/m)	8.1 (30.7)	11.9 (45)	19.4 (73.4)
Unit Pressure Drop, ft of Water (kPa)	4.3 (12.8)	8.4 (25.1)	13.1 (39.3)
Fan Data			
Standard Airflow, CFM (CMH)	2000 (3401)	3500 (5947)	4300 (7306)
Standard Fan Motor, hp (kW)	1.3 (1.0)	4.2 (3.1)	4.2 (3.1)
External Static Pressure, in. WG (Pa)	0.8 (200)	0.8 (200)	1 (250)
Chilled Water Coil			
Rows	2	2	4
Face Velocity, FPM (m/s)	204 (1.05)	357 (1.8)	490 (2.5)
Electric Reheat (2-stage)			
Capacity, kBTUH (kW)	20.4 (6)	40.9 (12)	40.9 (12)
Hot Water Reheat 180°F (82.2°C) E.W.T., 75°F (23.9°C) E.A.T, 4 GPM (0.25 l/s)			
Capacity, kBTUH (kW)	44.3 (13.0)	57.1 (16.7)	64.0 (18.7)
Pressure Drop, ft of Water (kPa)	3 (8.9)		
Coil Rows	1		
Infrared Humidifier			
Capacity, lb/hr (kg/hr)	7.7 (3.5)	7.7 (3.5)	7.7 (3.5)
Steam Generating Humidifier			
Capacity, lb/hr (kg/hr)	10.8 (4.9)	10.8 (4.9)	10.8 (4.9)
Filter Section—Std. 2 in. (51 mm) MERV rating per ASHRAE 52.2 - 2007—Deep Pleated Disposable Type			
Standard 2 in. (51 mm) Filter Rating	MERV 8 Pleated Filter		
Optional 2 in. (51 mm) Filter Rating	MERV11 Pleated Filter		
Quantity	1		
Nominal Size, in. (mm)	34 x 28 (864 x 711)		
Effective Surface Area, ft2 (m2)	21.3 (2.0)		

Table 2.10 PCW, Upflow, Chilled-water Capacity Data (continued)

Model Size	PW011	PW017	PW029
Piping Connection Sizes			
Chilled Water Supply and Return Connections, OD Cu, in.	1-1/8		
Humidifier Supply Line, OD Cu, in.	1/4		
Condensate Gravity Drain Line, in. NPT-Female	3/4		
Condensate Pump Drain Line, OD Cu, in.	1/2		
Optional HWRH Supply and Return Connections, OD Cu, in.	5/8		
Fluid Volumes			
Chilled Water Unit, gal (l)	2.3 (8.6)	2.3 (8.6)	2.7 (10.1)
Optional Hot Water Reheat, gal (l)	0.38 (1.4)		
Water Control Valve - Motorized Ball Valve			
Water Valve Nominal Size, in.	1		
Water Valve Body	2-way or 3-way		
Cv	30		
Valve Close-Off Pressure, PSI (kPa)	200 (1379)		
Unit Weights			
Dry Weight, lb (kg)	575 (261)	600 (272)	650 (294)

1. Airflow data rated with 2" MERV filter, rated per ASHRAE 52.2-2007
2. External Status Pressure(ESP) per ASHRAE 127-2007.
3. The net capacity data has fan motor heat factored in for all ratings.
4. Capacity data is factory-certified to be within 5% tolerance.

3 ELECTRICAL POWER REQUIREMENTS

3.1 PDX—Compressorized Units Electrical Data

Table 3.1 Electrical data by Reheat Option for PDX with Humidifier without Condensate Pump

Model	Voltage (60 Hz)	Electric Reheat Infrared or Steam Gen Humidifier			No Reheat Infrared or Steam Gen Humidifier			SCR Reheat Infrared or Steam Gen Humidifier		
		FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
PX011	208	37.6	46.3	50	34.2	38.7	50	50.9	59.6	70
	230	35.3	43.4	50	32.0	36.5	50	46.4	54.5	60
	380	—	—	—	—	—	—	—	—	—
	460	17.6	21.5	25	16.2	18.3	25	23.4	27.3	30
	575	14.8	18.5	20	14.4	15.8	20	20.4	23.3	25
PX018	208	65.2	79.2	90	45.2	50.9	70	—	—	—
	230	60.8	73.7	80	43.0	48.7	70	—	—	—
	380	32.2	39.0	45	23.1	26.1	35	—	—	—
	460	29.3	35.6	40	20.7	23.4	30	—	—	—
	575	23.5	28.6	30	18.9	21.0	25	—	—	—
PX023	208	70.4	85.7	100	50.4	57.4	80	—	—	—
	230	66.0	80.2	100	48.2	55.2	80	—	—	—
	380	36.0	43.8	50	26.9	30.9	45	—	—	—
	460	32.5	39.6	50	23.9	27.4	40	—	—	—
	575	26.2	32.0	35	21.6	24.4	35	—	—	—
PX029	208	73.9	90.1	100	53.9	61.8	90	—	—	—
	230	69.5	84.6	100	51.7	59.6	90	—	—	—
	380	38.0	46.3	60	28.9	33.4	50	—	—	—
	460	34.8	42.5	50	26.2	30.3	45	—	—	—
	575	27.8	34.0	40	23.2	26.4	35	—	—	—

FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device

Table 3.2 Electrical data by Reheat Option for PDX with Humidifier with Condensate Pump

Model	Voltage (60 Hz)	Electric Reheat Infrared or Steam Gen Humidifier			No Reheat Infrared or Steam Gen Humidifier			SCR Reheat Infrared or Steam Gen Humidifier		
		FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
PX011	208	39.9	48.6	60	36.5	41.0	50	53.2	61.9	70
	230	37.6	45.7	50	34.3	38.8	50	48.7	56.8	70
	380	—	—	—	—	—	—	—	—	—
	460	18.8	22.7	25	17.4	19.5	25	24.6	28.5	35
	575	15.7	19.7	20	15.3	16.7	20	21.3	24.2	25
PX018	208	67.5	81.5	90	47.5	53.2	70	—	—	—
	230	63.1	76.0	90	45.3	51.0	70	—	—	—
	380	33.4	40.2	45	24.3	27.3	35	—	—	—
	460	30.5	36.8	40	21.9	24.6	35	—	—	—
	575	24.4	29.5	30	19.8	21.9	30	—	—	—
PX023	208	72.7	88.0	100	52.7	59.7	80	—	—	—
	230	68.3	82.5	100	50.5	57.5	80	—	—	—
	380	37.2	45.0	50	28.1	32.1	45	—	—	—
	460	33.7	40.8	50	25.1	28.6	40	—	—	—
	575	27.1	32.9	40	22.5	25.3	35	—	—	—
PX029	208	76.2	92.4	100	56.2	64.1	90	—	—	—
	230	71.8	86.9	100	54.0	61.9	90	—	—	—
	380	39.2	47.5	60	30.1	34.6	50	—	—	—
	460	36.0	43.7	50	27.4	31.5	45	—	—	—
	575	28.7	34.9	40	24.1	27.3	35	—	—	—

FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device

Table 3.3 Electrical data by Reheat Option for PDX without Humidifier without Condensate Pump

Model	Voltage (60 Hz)	No Reheat			Electric Reheat		
		FLA	WSA	OPD	FLA	WSA	OPD
PX011	208	20.9	25.4	40	37.6	46.3	50
	230	20.9	25.4	40	35.3	43.4	50
	380	—	—	—	—	—	—
	460	10.4	12.5	20	17.6	21.5	25
	575	7.0	8.4	15	13.0	15.9	20
PX018	208	31.9	37.6	60	65.2	79.2	90
	230	31.9	37.6	60	60.8	73.7	80
	380	17.0	20.0	30	32.2	39.0	45
	460	14.9	17.6	25	29.3	35.6	40
	575	11.5	13.6	20	23.5	28.6	30
PX023	208	37.1	44.1	70	70.4	85.7	100
	230	37.1	44.1	70	66.0	80.2	100
	380	20.8	24.8	40	36.0	43.8	50
	460	18.1	21.6	35	32.5	39.6	50
	575	14.2	17.0	25	26.2	32.0	35
PX029	208	40.6	48.5	70	73.9	90.1	100
	230	40.6	48.5	70	69.5	84.6	100
	380	22.8	27.3	45	38.0	46.3	60
	460	20.4	24.5	40	34.8	42.5	50
	575	15.8	19.0	30	27.8	34.0	40

FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device

Table 3.4 Electrical data by Reheat Option for PDX without Humidifier with Condensate Pump

Model	Voltage (60 Hz)	No Reheat			Electric Reheat		
		FLA	WSA	OPD	FLA	WSA	OPD
PX011	208	23.2	27.7	45	39.9	48.6	60
	230	23.2	27.7	45	37.6	45.7	50
	380	—	—	—	—	—	—
	460	11.6	13.7	20	18.8	22.7	25
	575	7.9	9.3	15	13.9	16.8	20
PX018	208	34.2	39.9	60	67.5	81.5	90
	230	34.2	39.9	60	63.1	76.0	90
	380	18.2	21.2	30	33.4	40.2	45
	460	16.1	18.8	25	30.5	36.8	40
	575	12.4	14.5	20	24.4	29.5	30
PX023	208	39.4	46.4	70	72.7	88.0	100
	230	39.4	46.4	70	68.3	82.5	100
	380	22.0	26.0	40	37.2	45.0	50
	460	19.3	22.8	35	33.7	40.8	50
	575	15.1	17.9	25	27.1	32.9	40
PX029	208	42.9	50.8	80	76.2	92.4	100
	230	42.9	50.8	80	71.8	86.9	100
	380	24.0	28.5	45	39.2	47.5	60
	460	21.6	25.7	40	36.0	43.7	50
	575	16.7	19.9	30	28.7	34.9	40

FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device

3.2 PCW—Chilled-water Units Electrical Data

Table 3.5 Electrical data for PCW without Condensate Pump

Model	Voltage (60 Hz)	Electric Reheat Infrared or Steam Gen Humidifier			No Reheat No Humidifier			No Reheat Infrared or Steam Gen Humidifier			Electric Reheat No Humidifier		
		FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
PW011	208	33.0	41.3	45	3.0	3.8	15	16.3	20.4	25	19.7	24.6	25
	230	28.5	35.6	40	3.0	3.8	15	14.1	17.6	20	17.4	21.8	25
	380	15.5	19.3	20	1.8	2.2	15	7.9	9.8	15	9.4	11.7	15
	460	14.8	18.4	20	1.8	2.2	15	7.6	9.4	15	9.0	11.2	15
	575	14.8	18.4	20	1.4	1.8	15	8.8	11.0	15	7.4	9.3	15
PW017	208	55.8	69.8	70	9.2	11.5	20	22.5	28.1	30	42.5	53.1	50
	230	49.2	61.5	70	9.2	11.5	20	20.3	25.4	30	38.1	47.6	45
	380	26.2	32.8	35	4.9	6.1	15	11.0	13.8	15	20.1	25.1	25
	460	24.2	30.3	35	4.0	5.0	15	9.8	12.3	15	18.4	23.0	25
	575	22.6	28.3	30	3.2	4.0	15	10.6	13.3	15	15.2	19.0	20
PW029	208	55.8	69.8	70	9.2	11.5	20	22.5	28.1	30	42.5	53.1	50
	230	49.2	61.5	70	9.2	11.5	20	20.3	25.4	30	38.1	47.6	45
	380	26.2	32.8	35	4.9	6.1	15	11.0	13.8	15	20.1	25.1	25
	460	24.2	30.3	35	4.0	5.0	15	9.8	12.3	15	18.4	23.0	25
	575	22.6	28.3	30	3.2	4.0	15	10.6	13.3	15	15.2	19.0	20

FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device

Table 3.6 Electrical data for PCW with Condensate Pump

Model	Voltage (60 Hz)	Electric Reheat Infrared or Steam Gen Humidifier			No Reheat No Humidifier			No Reheat Infrared or Steam Gen Humidifier			Electric Reheat No Humidifier		
		FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
PW011	208	35.3	44.1	45	5.3	6.1	15	18.6	23.3	25	22.0	27.5	30
	230	30.8	38.5	40	5.3	6.1	15	16.4	20.5	25	19.7	24.6	25
	380	16.7	20.8	25	3.0	3.4	15	9.1	11.3	15	10.6	13.2	15
	460	16.0	19.9	20	3.0	3.4	15	8.8	10.9	15	10.2	12.7	15
	575	15.7	19.7	20	2.3	2.7	15	9.7	12.2	15	8.3	10.4	15
PW017	208	58.1	72.6	80	11.5	13.8	20	24.8	31.0	35	44.8	56.0	50
	230	51.5	64.4	70	11.5	13.8	20	22.6	28.3	30	40.4	50.5	50
	380	27.4	34.3	35	6.1	7.3	15	12.2	15.3	15	21.3	26.6	25
	460	25.4	31.8	35	5.2	6.2	15	11.0	13.8	15	19.6	24.5	25
	575	23.5	29.4	30	4.1	4.9	15	11.5	14.4	15	16.1	20.2	25
PW029	208	58.1	72.6	80	11.5	13.8	20	24.8	31.0	35	44.8	56.0	50
	230	51.5	64.4	70	11.5	13.8	20	22.6	28.3	30	40.4	50.5	50
	380	27.4	34.3	35	6.1	7.3	15	12.2	15.3	15	21.3	26.6	25
	460	25.4	31.8	35	5.2	6.2	15	11.0	13.8	15	19.6	24.5	25
	575	23.5	29.4	30	4.1	4.9	15	11.5	14.4	15	16.1	20.2	25

FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device

3.3 Wye- and Delta-connected Power Supply for PDX and PCW

Table 3.7 on the facing page shows the acceptable and un-acceptable power supplies by model number for 208-V to 575-V nominal units. See Table 3.8 on page 38, for the electrical-connection locations on the units.

Figure 3.1 Wye- and Delta-connected power-suppy connection diagram

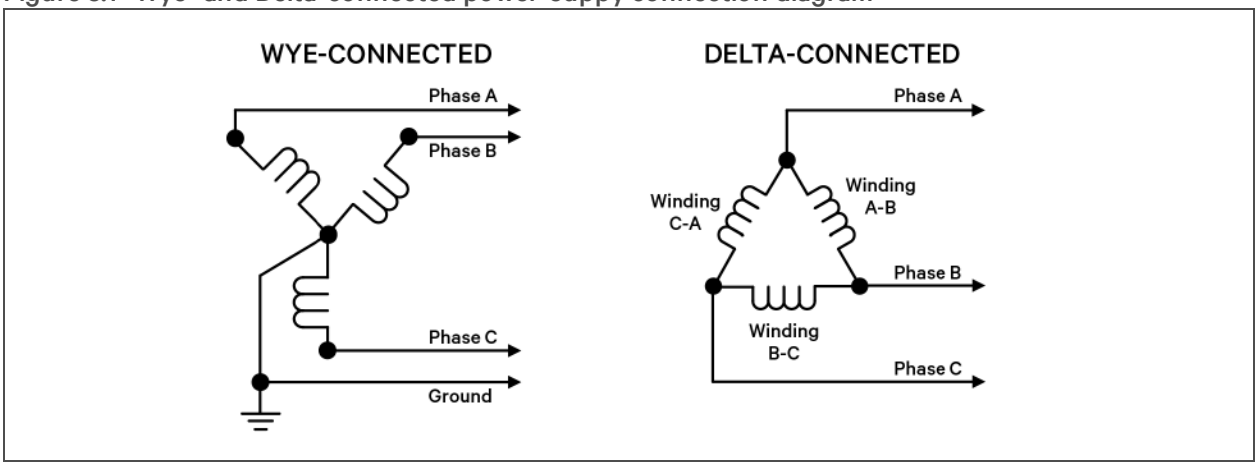


Table 3.7 Acceptable power supplies by nominal voltage and model

	208V to 230V nominal	380V to 575V nominal	208V to 575V nominal			
	PX011 PW011	PX011 PW011	PX018	PW017	PX023	PX029 PW029
Wye with solidly-grounded neutral:						
208V Wye, 120V line-to-ground	Yes	Yes	Yes	Yes	Yes	Yes
230V Wye, 133V line-to-ground	Yes	Yes	Yes	Yes	Yes	Yes
380V Wye, 220V line-to-ground	Yes	Yes	Yes	Yes	Yes	Yes
480 V Wye, 277V line-to-ground	Yes	Yes	Yes	Yes	Yes	Yes
575V Wye, 332V line-to-ground (uses step transformers)	Yes	Yes	Yes	Yes	Yes	Yes
Wye with high-resistance (impedance) ground:	Yes	No	Yes	Yes	Yes	Yes
Delta:						
without ground or floating ground	No	No	No	No	No	No
with corner ground	Yes	No	Yes	Yes	Yes	Yes
with grounded center tap	No	No	No	No	No	No

NOTE: A 3-Phase, Wye-connected system consists of 3 hot lines or phases (commonly referred to as X, Y, Z,) and a ground wire, for a total of 4 wires in a power-distribution cable. The lower voltage in each case is the country's standard utilization voltage and is measured Line-to-Neutral, while the higher voltage is measured Line-to-Line. The Line-to-Line voltage is always 1.732 times higher than the Line-to-Neutral voltage in a Wye-configured 3-Phase system.

A 3-Phase, Delta-connected system consists of 3 hot lines (commonly referred to as phase A, phase B, phase C,) and a ground wire for a total of 4 wires in a power-distribution cable. These phase voltages are measured Line-to-Line and are typically the country's standard utilization voltage. Because there is no neutral line in a Delta-connected system, there is no Line-to-Neutral voltage! However, the line current in a Delta-connected system is 1.732 times the phase current supplied to the load(s).

3.4 Electrical Field Connections

Three-phase electrical service is required for all models. Electrical service must conform to national and local electrical codes.

NOTE: **Unit Input Power Requirements: For three-phase units, only three power wires and an earth ground are required. A neutral is not required at the unit input connections. See Wye- and Delta-connected Power Supply for PDX and PCW on the previous page, for detailed information.**

The electrical connections are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 3.8 Electrical Field-connection Drawings

Document Number	Title
DPN004594	Electrical Field Connections, Upflow & Downflow Models
DPN004595	Electrical Field Connections, Downflow Models
DPN004596	Electrical Field Connections, Upflow Models
DPN003266	PDX CANbus & Interlock Connections between PDX Unit & Liebert® MC Condenser
DPN002169	Liebert® MC Condenser Electrical Field Connections without Liebert® Lee-Temp™
DPN002374	Liebert® MC Condenser Electrical Field Connections with Liebert® Lee-Temp™
DPN003507	Liebert® iCOM Remote Temperature/Humidity Sensor
DPN004351	Liebert® iCOM Unit-to-unit Network Connections
DPN003269	2T Rack-temperature-sensor Connections

4 PLANNING GUIDELINES

4.1 Shipping Dimensions and Unit Weights

Table 4.1 Shipping dimensions for Liebert PDX/PCW

Model Number	L x W x H, in. (mm)	
	Domestic	Export
PX011, PX018 PX023, PX029 PW011, PW017, PW029	44 x 60 x 85.5 (1118 x1524 x 2172)	45 x 60 x 86 (1143 x1524 x 2184)

Table 4.2 Unit Weights—approximate

Model #	Cooling Type	Dry Unit Weight, lb (kg)	Shipping Weight Domestic, lb (kg)	Shipping Weight Export, lb (kg)
PX011	Air	600 (272)	750 (340)	885 (401)
	Air with Econ-O-Coil	700 (318)	850 (386)	985 (447)
	Water/Glycol	620 (281)	770 (349)	905 (410)
	Water/Glycol with Econ-O-Coil	720 (327)	870 (395)	1005 (456)
	GLYCOOL™			
PX018 PX023	Air	670 (304)	820 (372)	955 (433)
	Air with Econ-O-Coil	750 (340)	900 (408)	1035 (469)
	Water/Glycol	690 (313)	840 (381)	975 (442)
	Water/Glycol with Econ-O-Coil	770 (349)	920 (417)	1055 (478)
	GLYCOOL			
PX029	Air	700 (317)	850 (385)	985 (446)
	Air with Econ-O-Coil	790 (358)	940 (426)	1075 (487)
	Water/Glycol	720 (327)	870 (395)	1005 (456)
	Water/Glycol with Econ-O-Coil	810 (367)	960 (435)	1095 (496)
	GLYCOOL			
PW011	Chilled Water	575 (261)	725 (379)	860 (390)
PW017		600 (272)	750 (340)	885 (401)
PW029		650 (294)	800 (362)	935 (423)

NOTE: See capacity tables for unit liquid volume. Consult your factory sales rep for additional component weight information.

4.2 Planning Dimensions

The unit, floor stand, and plenum dimensions are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 4.3 Dimension Planning Drawings

Document Number	Title
Downflow Units	
DPN002936	Cabinet Dimensional Data, Downflow Models
DPN002944	Cabinet Dimensional Data, Downflow Floor Level Discharge Models
Upflow Units	
DPN002937	Cabinet Dimensional Data, Upflow Models
DPN002971, pg. 1	Cabinet Dimensional Data, Upflow Rear Return Models
Floor Stands	
DPN002970	Floorstand & Floor Planning Dimensional Data, Downflow Models
DPN002971, pg. 2	Floorstand Dimensional Data, Upflow Rear Return Models
Plenums	
DPN002981	Plenum Dimensional Data, Upflow Discharge Grille
DPN003697	Plenum Dimensional Data, Upflow Discharge w/ Duct Collar
DPN003447	Plenum Dimensional Data, Top Discharge Upflow Units
DPN003610	Downflow Plenum Dimensional Data
DPN003757	Duct-flange Dimensions, Downflow models, Field-supplied duct work

5 PIPING

The pipe connection locations, piping general arrangement and schematics are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 5.1 Piping General-arrangement Drawings

Document Number	Title
Liebert® PDX Piping Schematics	
DPN002929	Air Cooled Models with TXV
DPN003843	Air Cooled Models with EEV
DPN002931	Water/Glycol Models
DPN002932	GLYCOOL™ Models
DPN002972	Econ-O-Coil Models
Liebert® PCW Piping Schematics	
DPN002930	Chilled Water Models
DPN003737	Hot Water Reheat

Table 5.2 Piping Connection Drawings

Document Number	Title
Downflow Model Primary Connection Locations	
DPN002938	Air Cooled, Raised Floor Models
DPN002945	Air Cooled, Front Discharge Models
DPN002942	Water/Glycol, Raised Floor Models
DPN002947	Water/Glycol, Front Discharge Models
DPN003520	GLYCOOL™ Raised Floor Models
DPN003522	GLYCOOL™ Front Discharge Models
DPN002940	Chilled Water, Raised Floor Models
DPN002946	Chilled Water, Front Discharge Models
Upflow Model Primary Connection Locations	
DPN002939	Air Cooled Models
DPN002943	Water/Glycol Models
DPN003521	GLYCOOL™ Models
DPN002941	Chilled Water Models

5.1 Condenser Positioning Guidelines

Table 5.3 Maximum equivalent refrigerant piping—Indoor unit to Liebert MC Condenser with or without Receivers

Parameter	Maximum Distances, ft. (m)	
From cooling unit to condenser	300 (91.4) equivalent length	
Condenser without receiver relative to indoor unit	Above: 60 (18.3)	Below: 15 (4.5)
Condenser with receiver relative to indoor unit	Above: 60 (18.3)	Below: 0 (0)

The condenser positions above, below, and at the same level as the indoor unit are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 5.4 Air-cooled Models Condenser-connection Drawings

Document Number	Title
DPN003954	Condenser positioning relative to PDX unit with TXV
DPN003993	Condenser positioning relative to PDX unit with EEV

5.1.1 Refrigerant Line Sizes and Equivalent Lengths

Table 5.5 below lists requirements for field-installed refrigerant piping for the system.

Table 5.5 Recommended refrigerant line sizes for standard- and digital-scroll models, OD Copper (inches)

Model	PX011		PX018		PX023		PX029	
Equivalent Length	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line
50 ft. (15 m)	1/2	3/8	5/8	1/2	3/4	5/8	7/8	5/8
100 ft. (30 m)	5/8[2]	1/2	5/8	1/2	3/4	5/8	7/8	5/8
150 ft. (45 m)	5/8[2]	1/2	5/8	1/2	3/4	5/8	7/8	5/8
300 ft. (91 m)	5/8[2]	1/2	3/4[2]	5/8	7/8[2]	5/8	1-1/8[2]	3/4

1. Contact your Vertiv representative for line sizing for runs longer than maximum equivalent length shown in the table.
2. Must down-size vertical riser one trade size (1-1/8" to 7/8", 7/8" to 3/4", 3/4" to 5/8", or 5/8" to 1/2").

Source: DPN000788, Rev. 13

5.1.2 Refrigerant Charge Requirements for Air-cooled Systems

The following tables provide the refrigerant charge requirements for the Liebert® PDX, connected piping, and condenser options.

Table 5.6 Approximate R-410A refrigerant charge for air-cooled Liebert PDX

Model	Downflow, lb (kg)	Upflow, lb (kg)
PX011	4.6 (2.1)	5.1 (2.3)
PX018	5.0 (2.3)	7.1 (3.2)
PX023	5.0 (2.3)	7.1 (3.2)
PX029	6.6 (3.0)	7.4 (3.4)

Table 5.7 Interconnecting piping refrigerant charge for R-410A, lb per 100 ft (kg per 30 m)

Line Size, O.D., in.	Liquid Line	Hot Gas Line
3/8	3.2 (1.4)	—
1/2	5.9 (2.7)	0.7 (0.3)
5/8	9.6 (4.3)	1.1 (0.5)
3/4	14.3 (6.4)	1.6 (0.7)
7/8	19.8 (8.8)	2.3 (1.0)
1-1/8	33.8 (15.1)	3.9 (1.7)
1-3/8	51.5 (23.0)	5.9 (2.6)
1-5/8	—	8.4 (3.7)

Source: DPN003099, Rev. 1

Table 5.8 Condenser refrigerant charge approximate R-410A per circuit including receiver

Condenser Model	Condensers without receivers, lb (kg)	Condensers with Liebert® Lee-Temp receiver[1], lb (kg)	Condensers with PDX-EEV un-heated receiver[1], lb (kg)
MCS028	2.5 (1.2)	21.7 (9.8)	11.0 (5.0)
MCM040	3.5 (1.6)	22.7 (10.3)	12.0 (5.4)
MCL055	5.0 (2.3)	24.2 (11.0)	13.5 (6.1)
MCM080	8.5 (3.8)	39.8 (18.1)	17.0 (7.7)
MCL110	10.7 (4.9)	49.1 (22.3)	19.5 (8.8)

1. Condenser charge includes receiver.

Source: DPN002411 Rev. 8

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6 HEAT REJECTION—LIEBERT MC™ CONDENSERS

6.1 Liebert MC Match-up Selections

Table 6.1 Liebert® MC Condenser selections for Liebert® PDX units—Traditional open room (75°F/45% RH return air conditions)

Model #	Outdoor Design Ambient Temperature, °F (°C)					
	95 (35)	100 (38)	105 (41)	110 (43)	115 (46)	120 (49)
Traditional open room (75°F/45% RH Return Air Conditions)						
PX011_A	MCS028E1	MCS028E1	MCS028E1	MCM040E1	MCM040E1	MCL055E1
PX018_A	MCS028E1	MCS028E1	MCM040E1	MCM040E1	MCL055E1	MCL055E1
PX023_A	MCM040E1	MCM040E1	MCM040E1	MCL055E1	MCL055E1	MCM080E1
PX029_A	MCM040E1 MCL055E1*	MCL055E1	MCL055E1	MCL055E1	MCM080E1	MCM080E1
Ducted return (85°F/32% RH Return Air Conditions)						
PX011_A	MCS028E1	MCS028E1	MCS028E1	MCM040E1	MCM040E1	MCL055E1
PX018_A	MCS028E1	MCS028E1	MCM040E1	MCM040E1	MCL055E1	MCL055E1
PX023_A	MCM040E1	MCM040E1	MCL055E1	MCL055E1	MCM080E1	MCM080E1
PX029_A	MCL055E1	MCL055E1	MCL055E1	MCM080E1	MCM080E1	MCM080E1

* MCM040 yields higher energy efficiency and MCL055 yields higher system capacity.

Table 6.2 Liebert® MC Quiet-Line selections for Liebert® PDX units—Traditional open room (75°F/45% RH return air conditions)

Model #	Outdoor Design Ambient Temperature, °F (°C)				
	95 (35)	100 (38)	105 (41)	110 (43)	115 (46)
PX011_A	MCS028E1	MCS028E1	MCS028E1	MCM040E1	MCM040E1
PX018_A	MCS028E1	MCM040E1	MCM040E1	MCL055E1	MCL055E1
PX023_A	MCM040E1	MCM040E1	MCL055E1	MCM080E1	Consult Factory
PX029_A	MCL055E1	MCL055E1	MCL055E1	MCM080E1	Consult Factory

The following conditions apply to Table 6.2 above:

- Liebert® Quiet-Line match-ups were at 80% maximum condenser fan speed and condensing temperatures ≤126°F (52°C).
- Liebert® Quiet-Line sound feature of the Liebert® MC requires CANbus communication between the indoor unit's Liebert® iCOM™ and the condenser (field-supplied wiring) and field adjustment of the Liebert® iCOM settings to enable reduced fan rpm.
- Liebert® Lee-Temp™ receivers are required for Liebert® Quiet-Line condenser match-ups.

6.2 Liebert MC Electrical Power Requirements

Table 6.3 below lists the power requirements by model number. Table 6.4 below lists the additional electrical requirements if your system includes a Liebert® Lee-Temp™ Receiver.

Table 6.3 Electrical data, three-phase, 60Hz condenser, Premium EC-fan Control

Model	Voltage	FLA	WSA	OPD
MCS028	208/230V	3.0	3.8	15
	380V	1.4	1.8	15
	460V	1.4	1.8	15
	575V	1.2	1.5	15
MCM040	208/230V	2.3	2.9	15
	380V	1.4	1.8	15
	460V	1.4	1.8	15
	575V	1.2	1.5	15
MCM080	208/230V	4.6	5.2	15
	380V	2.8	3.2	15
	460V	2.8	3.2	15
	575V	2.4	2.7	15
MCL055	208/230V	5.7	7.1	15
	380V	2.8	3.5	15
	460V	2.8	3.5	15
	575V	2.3	2.9	15

1. FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device.

Table 6.4 Electrical data, Lee-Temp™ receiver, 60Hz

Rated Voltage - Single-Phase:	120	208/230
Watts/Receiver	150	150
Amps	1.4	0.7
Wire Size Amps	1.8	0.9
Maximum Overcurrent Protection Device, Amps	15	15

1. The Liebert® Lee-Temp receiver requires a separate power feed for heaters.
2. The condenser is not designed to supply power to the receiver heater pads.
3. The Liebert Lee-Temp system allows system start-up and positive head pressure control in outdoor temperature as low as -30°F (-34°C).

6.3 Liebert MC Shipping Dimensions and Weights

Table 6.5 Condenser shipping weights, dimensions and volume, approximate

Model Number	Number of Fans	Domestic Packaging			Export Packaging		
		Weight, lb (kg)	Dimensions L x W x H, in. (cm)	Volume, ft^3 (m^3)	Weight, lb (kg)	Dimensions L x W x H, in. (cm)	Volume, ft^3 (m^3)
MCS028	1	359 (163)	76 x 36 x 63 (193 x 91 x 160)	100 (2.8)	476 (216)	77 x 37 x 64 (196 x 94 x 163)	106 (3.0)
MCM040	1	439 (199)	76 x 36 x 63 (193 x 91 x 160)	100 (2.8)	556 (252)	77 x 37 x 64 (196 x 94 x 163)	106 (3.0)
MCM080	2	769 (349)	122 x 36 x 63 (310 x 91 x 160)	160 (4.5)	941 (427)	123 x 37 x 64 (312 x 94 x 163)	169 (4.8)
MCL055	1	552 (250)	76 x 36 x 63 (193 x 91 x 160)	100 (2.8)	669 (303)	77 x 37 x 64 (196 x 94 x 163)	106 (3.0)

Packaged weights will increase with factory options, such as legs taller than 18" (457mm), coated coils, 575V and seismic/wind options. See **Table 6.6** on the next page, **Table 6.7** on the next page and **Table 6.8** on page 49 for option weights to add to the packaged weights above. Consult factory for additional information.

Receivers and 60-in. legs are shipped separately from the condenser.

6.3.1 Condenser and Options Net Weights

Total unit weight is the sum of the condenser weight with the selected legs plus the weight of any option.

Table 6.6 Condenser and option net weights—Small condensers

Condenser Model		MCS028
Refrigeration Circuits		1
Condenser Dry Weight, lb (kg)	18" Leg	154 (70)
	36" Leg	286 (130)
	48" Leg	318 (144)
	60" Leg	349 (158)
Additional Weight for Options, lb (kg)		
PDX-EEV Receiver		45 (20)
Liebert® Lee-Temp Receiver		55 (25)
575V Transformer		55 (25)
Coated Coil		4 (2)
Seismic/Wind Bracing, 18-in. legs		40 (18)
Condenser + PDX-EEV Receiver or Liebert Lee-Temp + Coated Coil + 575V Transformer + Seismic/Wind Bracing = Total Weight		
Source: DPN003034, Rev. 4		

Table 6.7 Condenser and option net weights—Medium condensers

Condenser Model		MCM040	MCM080
Refrigeration Circuits		1	1
Condenser Dry Weight, lb (kg)	18" Leg	231 (105)	441 (200)
	36" Leg	363 (165)	590 (268)
	48" Leg	395 (179)	622 (282)
	60" Leg	426 (193)	653 (296)
Additional Weight for Options, lb (kg)			
PDX-EEV Receiver		45 (20)	45 (20)
Liebert® Lee-Temp Receiver		55 (25)	100 (45)
575V Transformer		60 (27)	70 (32)
Coated Coil		5 (2)	10 (5)
Seismic/Wind Bracing, 18-in. legs		40 (18)	40 (18)
Condenser + PDX-EEV Receiver or Liebert Lee-Temp or+ Coated Coil + 575V Transformer + Seismic/Wind Bracing = Total Weight			
Source: DPN003034, Rev. 4			

Table 6.8 Condenser and option net weights—Large condensers

Condenser Model		MCL055
Condenser Dry Weight, lb (kg)	18" Leg	344 (156)
	36" Leg	486 (220)
	48" Leg	518 (235)
	60" Leg	549 (249)
Additional Weight for Options, lb (kg)		
PDX-EEV Receiver		45 (20)
Liebert® Lee-Temp Receiver		60 (27)
575V Transformer		67 (30)
Coated Coil		8 (4)
Seismic/Wind Bracing, 18-in. legs		40 (18)
Condenser + PDX-EEV Receiver or Liebert Lee-Temp or+ Coated Coil + 575V Transformer + Seismic/Wind Bracing = Total Weight		
Source: DPN003034, Rev. 4		

6.4 Liebert MC Planning Dimensions

The condenser dimensions are described in the submittal documents included in the Submittal Drawings on page 79. Condensers mounted above and below the relative elevation of the indoor unit must follow the guidelines found in the submittal drawings listed in the table.

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

Table 6.9 Dimension Planning Drawings

Document Number	Title
DPN003436	Condenser Dimensional Data, MCS028, MCM040, MCL055
DPN003756	Condenser Dimensional Data, MCM080, MCL110, single-circuit

6.5 Liebert MC Piping

Field-installed piping must be installed in accordance with local codes.

The pipe connection locations are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 6.10 Piping Connection Drawings

Document Number	Title
DPN002166	Single-circuit piping without Liebert® Lee-Temp™
DPN002167	Single-circuit piping with Liebert® Lee-Temp™
Receiver Mounting	
DPN002554	Receiver mounting for single-circuit MCL055, MCL110, MCL165, and MCL220 and for dual-circuit MCL110 and MCL220
DPN003839	PDX-EEV receiver mounting for MCS/MCM condenser left-side option and right-side option

6.6 Liebert MC Electrical Field Connections

Condenser-rated voltage should be verified with available power supply before installation. Refer to the unit's electrical schematic and serial tag for specific electrical requirements. Line voltage electrical service is required for all condensers at the location of the condenser. 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 Liebert MC condensers to maintain uninterrupted cooling capability. Refer to the unit's serial tag for specific condenser electrical requirements. A unit disconnect is standard. However, a site disconnect may be required per local code to isolate the unit for maintenance. Route the supply power to the site disconnect switch and then to the unit. Route the conduit to the knockout provided in the bottom right end of the electrical control enclosure. Connect the earth ground wire lead to the marked earth ground connection terminal provided near the factory-installed disconnect switch..

NOTE: Liebert Lee-Temp™ kits require a separate line voltage electrical supply for the heated receivers.

See Electrical Power Requirements on page 31, for power requirements.

The electrical connections are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 6.11 Electrical Field-connection Drawings

Document Number	Title
Power-supply wiring	
DPN002169	Electrical Field Connections, without Liebert® Lee-Temp™
DPN002374	Electrical Field Connections, with Liebert® Lee-Temp™
Low-voltage wiring	
DPN003266	Field-communication connections between Liebert® PDX and Liebert® MC

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7 HEAT REJECTION—LIEBERT® DRYCOOLERS AND PUMPS

7.1 Drycooler Match-up Selections

Table 7.1 Drycooler match-ups (1-indoor unit to 1-drycooler unit for PDX water, glycol and GLYCOOL)

Indoor Model	Outdoor Design Ambient Temperature	Number of Fans	Models
Traditional (Approximately 120°F (49°C) EGT and 110°F (43°C) LGT at drycooler)			
PX011	95°F (35°C)	1	DSF092_6
PX018		1	DSF109_8
PX023		2	DSO139_8
PX029		2	DSO174
PX011	100°F (38°C)	2	DSF109_8
PX018		2	DSO197
PX023		3	DSO197
PX029		2	DSO225
PX011	105°F (41°C)	2	DSO139_8
PX018		2	DSO225_16
PX023		3	DSO260_16
PX029		3	DSO310-_16
DOE Standard (Approximately 115°F (46°C) EGT and 104°F (40°C) LGT at drycooler)			
PX011	95°F (35°C)	1	DSF092_6
PX018		2	DSO174
PX023		2	DSO174
PX029		2	DSO225_16
PX011	100°F (38°C)	2	DSF109_8
PX018		3	DSO260_16
PX023		3	DSO260_16
PX029		3	DSO350_16
PX011	105°F (41°C)	2	DSO139_8
PX018		3	DSO260_16
PX023		3	DSO260_16
PX029		3	DSO350_16

Table 7.1 Drycooler match-ups (1-indoor unit to 1-drycooler unit for PDX water, glycol and GLYCOOL) (continued)

Indoor Model	Outdoor Design Ambient Temperature	Number of Fans	Models
Quiet-Line (Approximately 120°F (49°C) EGT and 110°F (43°C) LGT at drycooler)			
PX011	95°F (35°C)	2	DSO111
PX018		2	DSO121
PX023		3	DSO158_16
PX029		4	DSO248_16
PX011	100°F (38°C)	3	DSO158_16
PX018		4	DSO205_16
PX023		4	DSO205_16
PX029		4	DSO248_16
PX011	105°F (41°C)	3	DSO173_16
PX018		4	DSO248_16
PX023		4	DSO248_16
PX029		6	DSO356_32

NOTE: Drycooler recommendations based on one drycooler per indoor unit, 40% propylene glycol, 75°F/45% RH unit return air conditions. Consult factory for match-up needs using multiple indoor units, different return-air conditions or alternate glycol temperatures.

DSF (Fan Speed Control) - Fan speed control provides an infinite number of speed variations on specially designed, single-phase, permanent split capacitor motor, by monitoring leaving fluid temperature. Fan speed control provides air delivery in direct proportion to heat rejection requirements of the system.

DSO (Fan Cycling Control) - A thermostatic control cycles the fan on a single-fan drycooler in response to leaving fluid temperatures. Two or more thermostats are employed on drycoolers with two or more fans to cycle fans or groups of fans in response to leaving fluid temperatures.

Pump Controls - Available on all Fan Speed and Fan Cycling Control drycoolers. Controls for pump(s) up to 7.5 hp are built into the same integral electric panel as the drycooler fan controls. Pump fuses, overload heaters and flow switch (dual pump control models) are included with the Liebert® pump packages or must be field-supplied for field-supplied pumps.

Remote Pump-control Panel option - Consult your local sales representative. Provides controls for primary and standby pump for multiple-drycooler systems.

Table 7.2 Drycooler internal volume, CFM, connections size, dry weight and fluid volume, 60 Hz

Model number *D**	Total heat rejection, kBtuh (kW) @25F ITD	Glycol flow rate, GPM (lpm)	Pressure drop, ft H2O (kPa)	No. of internal circuits (Std.)	No. of fans	Air flow (CFM)	Dry weight, lb (kg)	Internal fluid volume, gal. (L)	No. of inlets/ outlets	Inlet/Outlet connection size, OD Cu in.
Standard Models										
092	92 (27.1)	30 (114)	8.6 (26)	12	1	6600	395 (179)	3.7 (13.9)	1/1	1-5/8
109	109 (31.9)	40 (152)	8.1 (24)	16	1	6300	415 (188)	4.9 (18.6)	1/1	1-3/8
139	134 (39.3)	40 (152)	7.1 (21)	16	2	13700	500 (227)	4.8 (18.2)	1/1	2-1/8
174	173 (50.8)	40 (152)	10.5 (31)	16	2	13300	540 (245)	6.9 (26.2)	1/1	2-1/8
197	197 (57.7)	40 (152)	13.9 (42)	16	2	12645	580 (263)	9 (34)	1/1	2-1/8
225	231 (67.7)	65 (246)	10.9 (33)	26	2	12200	620 (281)	11.1 (42.1)	1/1	2-1/8
260	260 (76.3)	60 (227)	10.1 (30)	24	3	19900	735 (333)	10.0 (37.8)	1/1	2-1/8
310	311 (91.0)	80 (303)	9.8 (29)	32	3	19000	795 (361)	13.1 (50.0)	1/1	2-1/8
350	353 (103)	80 (303)	14.6 (44)	32	3	17400	855 (388)	19.4 (73.3)	1/1	2-1/8
Liebert® Quiet-Line™ Models										
111	111 (32.5)	40 (152)	10.4 (31)	16	2	5980	540 (245)	6.9 (26.2)	1/1	2-1/8
121	121 (35.4)	40 (152)	13.7 (41)	16	2	5680	580 (263)	9.0 (34.0)	1/1	2-1/8
158	166 (48.7)	60 (227)	10.0 (30)	24	3	8970	735 (333)	10.0 (37.9)	1/1	2-1/8
173	185 (54.2)	80 (303)	9.7 (29)	32	3	8520	795 (361)	13.1 (50.0)	1/1	2-1/8
178	186 (54.5)	80 (303)	14.5 (4.3)	32	3	7440	855 (388)	19.4 (73.3)	1/1	2-1/8
205	219 (64.2)	60 (227)	12.9 (39)	24	4	11680	940 (426)	13.1 (50.0)	1/1	2-1/8
248	248 (72.8)	80 (303)	12.5 (37)	32	4	11360	1020 (463)	17.4 (65.9)	1/1	2-1/8
356	372 (109)	160 (606)	14.6 (44)	64	6	14880	1880 (854)	39.3 (148.8)	2/2	2-1/8

7.2 Drycooler Electrical Power Requirements

Table 7.3 60Hz electrical values—Drycoolers without pump controls

# of Fans	Model #	Voltage	Phase	FLA	WSA	OPD
Standard Models						
1	092, 109, 112	208/230	1	4.8	6	15
			3	3.5	4.4	15
		460	3	1.7	2.1	15
		575	3	1.4	1.8	15
2	139, 174, 197, 225	208/230	3	7.0	7.9	15
		460	3	3.4	3.8	15
		575	3	2.8	3.2	15
3	260, 310, 350	208/230	3	10.5	11.4	15
		460	3	5.1	5.5	15
		575	3	4.2	4.6	15
4	352, 419, 466, 491	208/230	3	14.0	14.9	20
		460	3	6.8	7.2	15
		575	3	5.6	6.0	15
6	620, 650, 700	208/230	3	21.0	21.9	25
		460	3	10.2	10.6	15
		575	3	8.4	8.8	15

Table 7.3 60Hz electrical values—Drycoolers without pump controls (continued)

# of Fans	Model #	Voltage	Phase	FLA	WSA	OPD
Liebert® Quiet-Line Models						
2	111, 121	208/230	3	3.6	4.1	15
		460	3	1.8	2.0	15
		575	3	1.4	1.6	15
3	158, 173	208/230	3	5.4	5.9	15
		460	3	2.7	2.9	15
		575	3	2.1	2.3	15
4	205, 248	208/230	3	7.2	7.7	15
		460	3	3.6	3.8	15
		575	3	2.8	3.0	15
6	356	208/230	3	10.8	11.3	15
		460	3	5.4	5.6	15
		575	3	4.2	4.4	15

Values are calculated per UL 1995. OPD values may be adjusted higher than calculations to compensate for maximum anticipated application temperatures.

Table 7.4 60Hz electrical values—Standard drycoolers with integral pump controls

# of Fans:		1			2			3		
Model #:		092, 109			139, 174, 197, 225			260, 310, 350		
Pump hp	Ph	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
208/230/60										
0.75	1	12.4	14.3	20	—	—	—	—	—	—
0.75	3	7	7.9	15	10.5	11.4	15	14.0	14.9	20
1.5	3	10.1	11.8	15	13.6	15.3	20	17.1	18.8	25
2.0	3	11.0	12.9	20	14.5	16.4	20	18.0	19.9	25
3.0	3	14.1	16.8	25	17.6	20.3	30	21.1	23.8	30
5.0	3	20.2	24.4	40	23.7	27.9	40	27.2	31.4	45
7.5 *	3	27.7	33.8	50	31.2	37.3	60	34.7	40.8	60
460/60										
0.75	3	3.3	3.7	15	5.0	5.4	15	6.7	7.1	15
1.5	3	4.7	5.5	15	6.4	7.2	15	8.1	8.9	15
2.0	3	5.1	6.0	15	6.8	7.7	15	8.5	9.4	15
3.0	3	6.5	7.7	15	8.2	9.4	15	9.9	11.1	15
5.0	3	9.3	11.2	15	11.0	12.9	20	12.7	14.6	20
7.5	3	12.7	15.5	25	14.4	17.2	25	16.1	18.9	25
575/60										
0.75	3	2.7	3.1	15	4.1	4.5	15	5.5	5.9	15
1.5	3	3.8	4.4	15	5.2	5.8	15	6.6	7.2	15
2.0	3	4.1	4.8	15	5.5	6.2	15	6.9	7.6	15
3.0	3	5.3	6.3	15	6.7	7.7	15	8.1	9.1	15
5.0	3	7.5	9.0	15	8.9	10.4	15	10.3	11.8	15
7.5	3	10.4	12.7	20	11.8	14.1	20	13.2	15.5	20

Values are calculated per UL 1995. Pump FLA values used are based on NEC tables for motor horsepower. OPD values may be adjusted higher than calculations to compensate for maximum anticipated application temperatures.

* May require electrical component(s) with higher capacity in the drycooler. Consult factory representatives for assistance before ordering.

Table 7.5 60 Hz electrical values—Quiet-Line drycoolers with integral pump controls

# of Fans:		2			3			4			6		
Model #:		111, 121			158, 173			205, 248			356		
Pump hp	Ph	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
208/230/3/60													
0.75	3	7.1	8.0	15	8.9	9.8	15	10.7	11.6	15	14.3	15.2	20
1.5	3	10.2	11.9	15	12.0	13.7	20	13.8	15.5	20	17.4	19.1	25
2.0	3	11.1	13.0	20	12.9	14.8	20	14.7	16.6	20	18.3	20.2	25
3.0	3	14.2	16.9	25	16.0	18.7	25	17.8	20.5	30	21.4	24.1	30
5.0	3	20.3	24.5	40	22.1	26.3	40	23.9	28.1	40	27.5	31.7	45
7.5 *	3	27.8	33.9	50	29.6	35.7	50	31.4	37.5	60	35.0	41.1	60
460/3/60													
0.75	3	3.4	3.8	15	4.3	4.7	15	5.2	5.6	15	7.0	7.4	15
1.5	3	4.8	5.6	15	5.7	6.5	15	6.6	7.4	15	8.4	9.2	15
2.0	3	5.2	6.1	15	6.1	7.0	15	7.0	7.9	15	8.8	9.7	15
3.0	3	6.6	7.8	15	7.5	8.7	15	8.4	9.6	15	10.2	11.4	15
5.0	3	9.4	11.3	15	10.3	12.2	15	11.2	13.1	20	13.0	14.9	20
7.5	3	12.8	15.6	25	13.7	16.5	25	14.6	17.4	25	16.4	19.2	30
575/3/60													
0.75	3	2.7	3.0	15	3.4	3.7	15	4.1	4.4	15	5.5	5.8	15
1.5	3	3.8	4.4	15	4.5	5.1	15	5.2	5.8	15	6.6	7.2	15
2.0	3	4.1	4.8	15	4.8	5.5	15	5.5	6.2	15	6.9	7.6	15
3.0	3	5.3	6.3	15	6.0	7.0	15	6.7	7.7	15	8.1	9.1	15
5.0	3	7.5	9.0	15	8.2	9.7	15	8.9	10.4	15	10.3	11.8	15
7.5	3	10.4	12.7	20	11.1	13.4	20	11.8	14.1	20	13.2	15.5	20

Values are calculated per UL 1995. Pump FLA values used are based on NEC tables for motor horsepower. OPD values may be adjusted higher than calculations to compensate for maximum anticipated application temperatures.

* May require electrical component(s) with higher capacity in the drycooler. Consult factory representatives for assistance before ordering.

Table 7.6 60-Hz pump FLA values

Pump hp	Phase	Input Power, Volts			
		208	230	460	575
3/4	1	7.6	6.9	7.0	N/A
3/4	3	3.5	3.2	1.6	1.3
1.5	3	6.6	6.0	3.0	2.4
2	3	7.5	6.8	3.4	2.7
3	3	10.6	9.6	4.8	3.9
5	3	16.7	15.2	7.6	6.1
7.5	3	24.2	22.0	11.0	9.0
Values based on NEC handbook values for three-phase motors. For larger pump horsepower, please consult you local sales representative.					

7.3 Drycooler Planning Dimensions

The unit dimensions are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 7.7 Dimension Planning Drawings

Document Number	Title
DPN000274	Cabinet and Anchor dimensions for 1- to 4-fan drycoolers
DPN000280	Cabinet and Anchor dimensions for 1- to 4-fan Quiet-Line drycoolers
DPN000721	Cabinet and Anchor dimensions for 6- to 8-fan standard and Quiet-Line drycoolers

7.4 Drycooler Piping Guidelines

Field-installed piping must be installed in accordance with local codes.

The pipe connection locations are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 7.8 Piping Connection Drawings

Document Number	Title
DPN000275	Connection locations for standard 1-fan, 2-fan, 3-fan, and 4-fan units
DPN000281	Connection locations for Quiet-Line 1-fan, 2-fan, 3-fan, and 4-fan units
DPN002430	Connection locations for Quiet-Line 6-fan and 8-fan units
DPN003822	Typical arrangement for multiple drycoolers and multiple indoor thermal-management units

7.5 Drycooler Electrical Field Connections

Electrical service must conform to national and local electrical codes.

The electrical connections are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 7.9 Electrical Field-connection Drawings

Document Number	Title
DPN000276	Electrical Field Connections for fluid-temperature control
DPN000277	Electrical Field Connections for fan-speed control

7.6 Drycooler Pump Packages

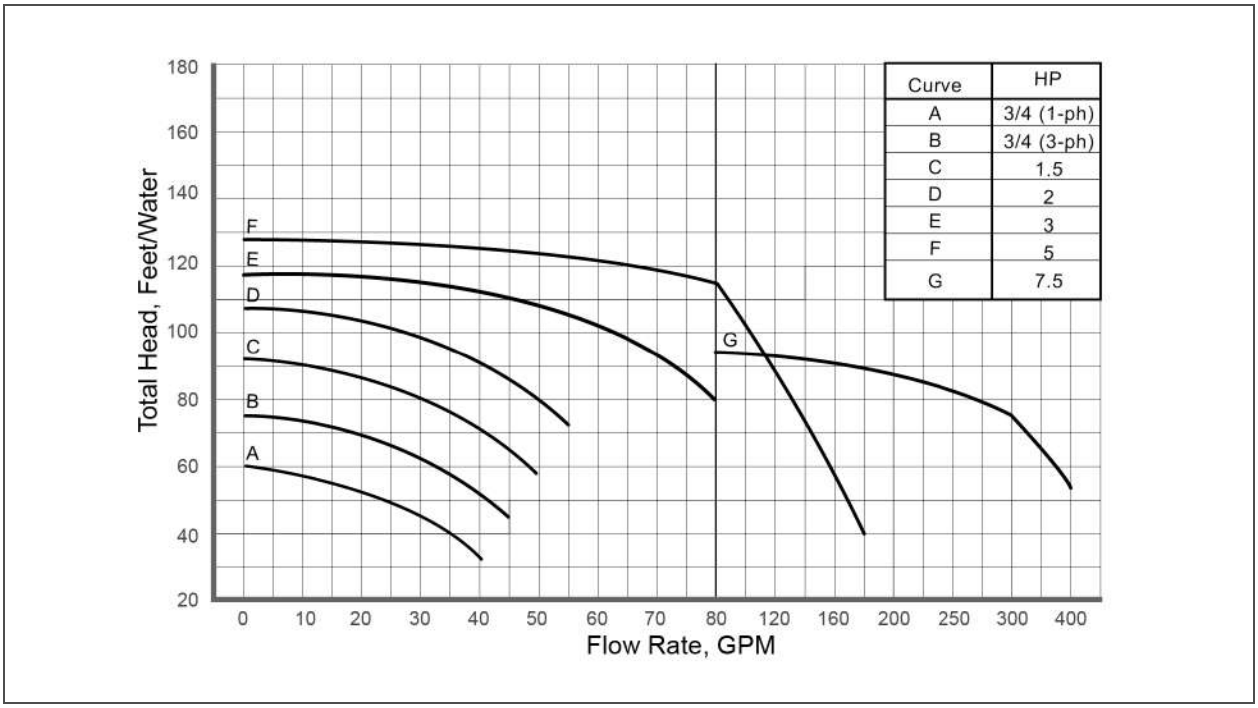
The planning dimensions, electrical power-supply requirements, piping connections, and electrical connections are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 7.10 Drycooler Pump Drawings

Document Number	Title
DPN000329	Pump Electrical Power Data and Piping-connection sizes.
DPN000278	Single-pump Piping connection locations and dimensional data
DPN000328	Dual-pump Piping connection locations and dimensional data

Figure 7.1 Pump curve, 60 Hz



NOTE: Higher-capacity pumps are available. Please contact your local sales rep for more information.

7.6.1 Drycooler Expansion Tank

The expansion tank, included in a standard pump package, has an internal volume of 8.8 gal. (33 l) and a maximum pressure of 100 psi (690 kPa).

The tank is sized for a typical "open" system with a fluid volume of less than 75 gal. (280 l). When used in a "closed" system, volumes of up to 140 gal. (530 l) can be accommodated. We recommend use of a field-supplied safety-relief valve for systems "closed" to atmospheric venting. Other piping accessories for filling, venting, or adjusting the fluid in the system, are recommended, but not included.

The planning dimensions and general arrangement are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 7.11 Drycooler Pump and Tank Drawings

Document Number	Title
DPN004183	Expansion Tank General Arrangement and Dimensional Data

7.6.2 Compression Tank

The compression tank for glycol/GLYCOOL™ systems includes:

- Tank
- Airtrol fitting
- Sight glass with shut-off valves
- 50-psi relief valve
- Drain valve

Mounting brackets are not included. Maximum design pressure 125 psig.

The planning dimensions and general arrangement are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 7.12 Drycooler Pump and Tank Drawings

Document Number	Title
DPN003898	Compression Tank General Arrangement and Dimensional Data

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8 HEAT REJECTION—LIEBERT PIGGYBACK DRYCOOLERS

8.1 Piggyback Drycooler Match-ups

Table 8.1 Piggyback Drycooler and PDX indoor unit match-ups

Traditional open-room (75°F/45% RH return-air conditions)			
PDX indoor unit	Outdoor design ambient temperature		
	95°F (35°C)	100°F (38°C)	105°F (41°C)
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

NOTE: Drycooler recommendations based on one drycooler per indoor unit and are sized using approximately 120°F (49°C) EGT and 110°F (43°C) LGT. Consult your sales rep for match-up needs using multiple indoor or alternative glycol temperatures.

For pump capacities, see Figure 7.1 on page 62.

Table 8.2 Indoor piggyback airflow and static pressure data

Model	No. of Fans	CFM (m^3/hr)	Horsepower/rpm			
			Ext. Static Pressure - in. (Pa)			
			0.25 (62.3)	0.50 (125)	0.75 (187)	1.0 (249)
PD-102	2	6900 (11,730)	2/605	3/680	3/750	3/820
PD-133	2	6900 (11,730)	2/605	3/680	3/750	3/820
PD-223	2	12,500 (21,250)	7.5/760	7.5/810	7.5/870	7.5/920
1. Values are without filter box. External Static Pressure = filter pressure drop + other static drops.						

8.2 Piggyback Drycooler Electrical Power Requirements

Table 8.3 Electrical data, piggyback drycoolers without pump package, 60Hz, 3 phase

Model	Voltage	Blower Motor hp	Drycooler No Pumps		
			Total Unit		
			FLA	WSA	OPD
PD-102 PD-133	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-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

FLA = Full Load Amps; WSA = Wire Size Amp; OPD = Maximum Overcurrent Protection Device

Source: DPN004124 Rev. 0

Table 8.4 Electrical data, piggyback drycoolers with integral pumps, 60Hz, 3 phase

Model	Voltage	Blower Motor hp	Drycooler Standard Pump Package				Drycooler - Optional Pump Package			
			Pump hp	Total Unit			Pump hp	Total Unit		
				FLA	WSA	OPD		FLA	WSA	OPD
PD-102 PD-133	208	3	1.5	17.2	19.9	30	2	18.1	20.8	30
	230	3	1.5	15.6	18	25	2	16.4	18.8	25
	460	3	1.5	7.8	9	15	2	8.2	9.4	15
	575	3	1.5	6.3	7.3	15	2	6.6	7.6	15
PD-223	208	7.5	3	34.8	40.9	60	5	40.9	47	70
	230	7.5	3	31.6	37.1	50	5	37.2	42.7	60
	460	7.5	3	15.8	18.6	25	5	18.6	21.4	30
	575	7.5	3	12.9	15.2	20	5	15.1	17.4	25

FLA = Full Load Amps; WSA = Wire Size Amp; OPD = Maximum Overcurrent Protection Device

Source: DPN004124 Rev. 0

8.3 Piggyback Drycooler Planning Dimensions

The unit and floor stand dimensions are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 8.5 Dimensional Planning Drawings

Document Number	Title
Piggyback Drycoolers	
DPN000710	Dimensional and Weight Data, 72-in. and 97-in. frame models
Floor Stands	
DPN000727	Floorstand Dimensional Data Condenser & Drycooler

8.4 Piggyback Drycooler Piping Guidelines

The piping connections are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 8.6 Piping Connection Drawings

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

8.5 Piggyback Drycooler Electrical Field Connections

Line voltage electrical service is required for all models at the location of the unit. Electrical service must conform to national and local electrical codes.

The electrical field connections are described in the submittal documents included in the Submittal Drawings on page 79.

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

Table 8.7 Drycooler Electrical Field-connection Drawings

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

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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

1-800-543-2778

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

A.2 Locations

United States

Vertiv Headquarters

1050 Dearborn Drive

Columbus, OH, 43085, 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

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Appendix B: Liebert PDX Model-number Detail

Table B.2 below, describes each digit of the 25-digit configuration number. The 14-digit model number consists of the first 10 digits and last 4 digits of the configuration number.

Table B.1 PDX 25-digit Configuration Number

Model Number Digits 1 to 10										Model Details											Model Number Digits 11 to 14			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
P	X	0	2	9	D	A	1	A	D	H	2	2	8	0	1	P	L	B	F	P	A	#	#	#

Table B.2 PDX Model-number Digit Definitions

Digit	Description
Digits 1 and 2 = Unit Family	PX = Liebert® PDX (DX)
Digit 3, 4, 5 = Nominal Cooling Capacity, kW	011 018 023 029
Digit 6 = Air Direction and Discharge	D = Downflow for raised floor H = Downflow for solid floor - front 1 = Downflow for solid floor - front + right side 2 = Downflow for solid floor - front + left + right side 3 = Downflow for solid floor - front + left side U = Upflow w/ Front Air Return C = Upflow w/ Bottom Air Return
Digit 7 = System Type	A = Air-Cooled W = Water/Glycol-Cooled G = GLYCOOL™ D = Dual Cool (Air-Cooled + Econ-O-Coil w/3-way MBV) H = Dual Cool (Water/Glycol-Cooled + Econ-O-Coil w/3-way MBV) 2 = Dual Cool (Air-Cooled + Econ-O-Coil w/2-way MBV) 3 = Dual Cool (Water/Glycol-Cooled + Econ-O-Coil w/2-way MBV)
Digit 8 = Fan Type	1 = EC plug fans (Variable speed)

Table B.2 PDX Model-number Digit Definitions (continued)

Digit	Description
Digit 9 = Power Supply	
	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
	2 = 380 V - 3 ph - 60 Hz
Digit 10 = Compressor & Valve (R-410A)	
	D = Digital Scroll w/TXV
	8 = Digital Scroll w/ Sound Jacket & TXV
	P = Digital Scroll w/ EEV
	9 = Digital Scroll w/ Sound Jacket & EEV
	S = Scroll w/TXV
Digit 11 = Humidifier	
	0 = No humidifier
	H = Infrared Humidifier
	S = Steam Gen Canister Humidifier
Digit 12 = Display	
	2 = iCOM™ (high-definition)
Digit 13 = Reheat	
	0 = No reheat
	2 = Electric reheat (2-Stage)
	5 = SCR reheat (PX011 w/ digital scroll and System Type A or W only)
Digit 14 = Air filter	
	8 = MERV 8, 2-in. Pleated
	9 = MERV 11, 2-in. Pleated
Digit 15 Coil, Valve Type & Pressure Rating[1]	
	0 = Air-Cooled only
	B = Dual Cool/Air-Cooled, 150 PSIG CW MBV
	E = Dual Cool/Air-Cooled, 400 PSIG CW MBV
	1 = W/G, 2-way 150 PSIG Condenser MBV
	2 = W/G, 2-way 400 PSIG Condenser MBV
	7 = W/G, 3-way 150 PSIG Condenser MBV
	8 = W/G, 3-way 400 PSIG Condenser MBV
Digit 16 = Enclosure Options	
	1 = Standard Enclosure
	C = Double-skin panels

Table B.2 PDX Model-number Digit Definitions (continued)

Digit	Description
Digit 17 = High-voltage Options M = Locking Disconnect P = Locking Disconnect with condensate pump	
Digit 18 = Low-voltage Option Packages 0 = None L = Low Voltage Terminal Package (LVTP) H = Reheat and Humidifier (R/H) Lockout D = LVTP and Remote humidifier contact (RHC) E = LVTP and R/H Lockout and RHC	
Digit 19 = Monitoring B = Base Comms and Connectivity	
Digit 20 = Sensors 0 = None S = Smoke Sensor H = High-temperature Sensor C = Compressor Overload Sensor F = Smoke and High-temperature Sensors A = Smoke and Compressor Overload Sensors K = Smoke, High-temperature and Compressor Overload Sensors	
Digit 21 = Packaging P = Domestic C = Wood Crate Export	
Digit 22 = Factory Configuration code A = No SFA's (Any Alpha letter except S) S = SFA	
Digit 23-25 = Factory Configuration Number	
1. High-pressure MBV also results in high-pressure Econ-O-Coil valve.	

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Appendix C: Liebert PCW Model-number Detail

Table C.2 below, describes each digit of the 25-digit configuration number. The 14-digit model number consists of the first 10 digits and last 4 digits of the configuration number.

Table C.1 PCW 25-digit Configuration Number

Model Number Digits 1 to 10										Model Details											Model Number Digits 11 to 14			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
P	W	0	2	9	D	C	1	A	D	H	2	2	8	H	1	P	L	B	F	P	A	#	#	#

Table C.2 PCW Model-number Digit Definitions

Digit	Description
Digits 1 and 2 = Unit Family	PW = Liebert® PCW (Chilled-water system)
Digit 3, 4, 5 = Nominal Cooling Capacity, kW	011 017 029
Digit 6 = Air Discharge	D = Downflow for raised floor H = Downflow for solid floor - front 1 = Downflow for solid floor - front + right side 2 = Downflow for solid floor - front + left + right side 3 = Downflow for solid floor - front + left side U = Upflow w/ Front Air Return (Future) C = Upflow w/ Bottom Air Return (Future)
Digit 7 = System Type	C = Chilled Water
Digit 8 = Fan Type	1 = EC plug Fan (Variable Speed)
Digit 9 = Power Supply	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 2 = 380 V- 3 ph - 60 Hz

Table C.2 PCW Model-number Digit Definitions (continued)

Digit	Description
Digit 10 = Chilled Water Valve and Pressure	
	2 = 2-Way 150 PSIG Chilled Water Motorized Ball Valve
	3 = 3-Way 150 PSIG Chilled Water Motorized Ball Valve
	1 = 2-Way 400 PSIG Chilled Water Motorized Ball Valve
	T = 3-Way 400 PSIG Chilled Water Motorized Ball Valve
Digit 11 = Humidifier	
	0 = No humidifier
	H = Infrared Humidifier
	S = Steam Gen Canister Humidifier
Digit 12 = Display	
	2 = iCOM™ (high-definition)
Digit 13 = Reheat	
	0 = No reheat
	2 = Electric reheat (2-Stage)
	4 = Hot Water Reheat (CW only)
Digit 14 = Air filter	
	8 = MERV 8, 2-in. Pleated
	9 = MERV 11, 2-in. Pleated
Digit 15 = Coil	
	H = Chilled Water Unit
Digit 16 = Enclosure Options	
	1 = Standard Enclosure
	C = Double-skin panels
Digit 17 = High-voltage Options	
	M = Locking Disconnect
	P = Locking Disconnect with condensate pump
Digit 18 = Low-voltage Option Packages	
	0 = None
	L = Low Voltage Terminal Package (LVTP)
	H = Reheat and Humidifier (R/H) Lockout
	D = LVTP and Remote humidifier contact (RHC)
	E = LVTP and R/H Lockout and RHC
Digit 19 = Monitoring	
	B = Base Comms and Connectivity

Table C.2 PCW Model-number Digit Definitions (continued)

Digit	Description
Digit 20 = Sensors 0 = None S = Smoke Sensor H = High-temperature Sensor F = Smoke and High-temperature Sensors	
Digit 21 = Packaging P = Domestic C = Wood Crate Export	
Digit 22 = Factory Configuration code A = No SFA's (Any Alpha letter except S) S = SFA	
Digit 23-25 = Factory Configuration Number	

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Appendix D: Submittal Drawings

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

Table D.1 Submittal-drawings Contents

Document Number	Title
Component Locations	
DPN003004	PDX Component Location Diagram, Downflow Models
DPN003005	PDX Component Location Diagram, Upflow Models
DPN003020	PCW Component Location Diagram, Downflow Models
DPN003021	PCW Component Location Diagram, Upflow Models
Planning Dimensions - Downflow Units	
DPN002936	Cabinet Dimensional Data, Downflow Models
DPN002944	Cabinet Dimensional Data, Downflow Floor Level Discharge Models
Planning Dimensions - Upflow Units	
DPN002937	Cabinet Dimensional Data, Upflow Models
DPN002971, pg 1	Cabinet Dimensional Data, Upflow Rear Return Models
Planning Dimensions - Floor Stands	
DPN002970	Floorstand & Floor Planning Dimensional Data
DPN002971, pg 2	Floorstand Dimensional Data, Upflow Rear Return Models
Planning Dimensions - Plenums	
DPN002981	Plenum Dimensional Data, Upflow Discharge Grille
DPN003697	Plenum Dimensional Data, Upflow Discharge w/ Duct Collar
DPN003447	Plenum Dimensional Data, Top Discharge Upflow Units
DPN003610	Downflow Plenum Dimensional Data
DPN003757	Duct-flange Dimensions, Downflow models, Field-supplied duck work
Liebert® PDX Piping Schematics	
DPN002929	Air Cooled Models with TXV
DPN003843	Air Cooled Models with EEV
DPN002931	Water/Glycol Models
DPN002932	GLYCOOL™ Models
DPN002972	Econ-O-Coil Models
Liebert® PCW Piping Schematics	
DPN002930	Chilled Water Models
DPN003737	Hot Water Reheat

Table D.1 Submittal-drawings Contents (continued)

Document Number	Title
Downflow Model Primary Connection Locations	
DPN002938	Air Cooled, Raised Floor Models
DPN002945	Air Cooled, Front Discharge Models
DPN002942	Water/Glycol, Raised Floor Models
DPN002947	Water/Glycol, Front Discharge Models
DPN003520	GLYCOOL™ Raised Floor Models
DPN003522	GLYCOOL™ Front Discharge Models
DPN002940	Chilled Water, Raised Floor Models
DPN002946	Chilled Water, Front Discharge Models
Upflow Model Primary Connection Locations	
DPN002939	Air Cooled Models
DPN002943	Water/Glycol Models
DPN003521	GLYCOOL™ Models
DPN002941	Chilled Water Models
Condenser Positioning for PDX, Air-cooled Models	
DPN003954	Condenser positioning relative to PDX unit with TXV
DPN003993	Condenser positioning relative to PDX unit with EEV
Electrical Field Connections	
DPN004594	Electrical Field Connections, Upflow & Downflow Models
DPN004595	Electrical Field Connections, Downflow Models
DPN004596	Electrical Field Connections, Upflow Models
DPN003266	PDX CANbus & Interlock Connections between PDX Unit & Liebert® MC Condenser
DPN002169	Liebert® MC Condenser Electrical Field Connections without Liebert® Lee-Temp™
DPN002374	Liebert® MC Condenser Electrical Field Connections with Liebert® Lee-Temp™
DPN003507	Liebert® iCOM Remote Temperature/Humidity Sensor
DPN004351	Liebert® iCOM Unit-to-unit Network Connections
DPN003269	2T Rack-temperature-sensor Connections
Planning Dimensions - Piggyback Drycoolers	
DPN000710	Dimensional and Weight Data, 72-in. and 97-in. frame models
Planning Dimensions - Piggyback Floor Stands	
DPN000727	Floorstand Dimensional Data Condenser & Drycooler

Table D.1 Submittal-drawings Contents (continued)

Document Number	Title
Primary Connections - Piggyback Drycooler	
DPN000711	Primary connection locations, 72-in. and 97-in. frame models
Electrical Connections - Piggyback Drycooler	
DPN000712	Electrical Field Connections, 72-in. and 97-in. frame models
Liebert® MC Condenser Planning Dimensions	
DPN003436	Condenser Dimensional Data, MCS028, MCM040, MCL055
DPN003756	Condenser Dimensional Data, MCM080
Liebert® MC Condenser Piping	
DPN002166	Single-circuit piping without Liebert® Lee-Temp™
DPN002167	Single-circuit piping with Liebert® Lee-Temp™
Liebert® MC Condenser Receiver Mounting	
DPN002554	Receiver mounting for single-circuit MCL055, MCL110, MCL165, and MCL220 and for dual-circuit MCL110 and MCL220
DPN003839	PDX-EEV receiver mounting for MCS/MCM condenser left-side option and right-side option
Liebert® MC Condenser Power-supply wiring	
DPN002169	Electrical Field Connections, without Liebert® Lee-Temp™
DPN002374	Electrical Field Connections, with Liebert® Lee-Temp™
Liebert® MC Condenser Low-voltage wiring	
DPN003266	Field-communication connections between Liebert® PDX and Liebert® MC
Liebert® Drycooler Dimensions	
DPN000274	Cabinet and Anchor dimensions for 1- to 4-fan drycoolers
DPN000280	Cabinet and Anchor dimensions for 1- to 4-fan Quiet-Line drycoolers
DPN000721	Cabinet and Anchor dimensions for 6- to 8-fan standard and Quiet-Line drycoolers
Liebert® Drycooler Piping	
DPN000275	Connection locations for standard 1-fan, 2-fan, 3-fan, and 4-fan units
DPN000281	Connection locations for Quiet-Line 1-fan, 2-fan, 3-fan, and 4-fan units
DPN002430	Connection locations for Quiet-Line 6-fan and 8-fan units
DPN003822	Typical arrangement for multiple drycoolers and multiple indoor thermal-management units
Liebert® Drycooler Electrical Connections	
DPN000276	Electrical Field Connections for fluid-temperature control
DPN000277	Electrical Field Connections for fan-speed control

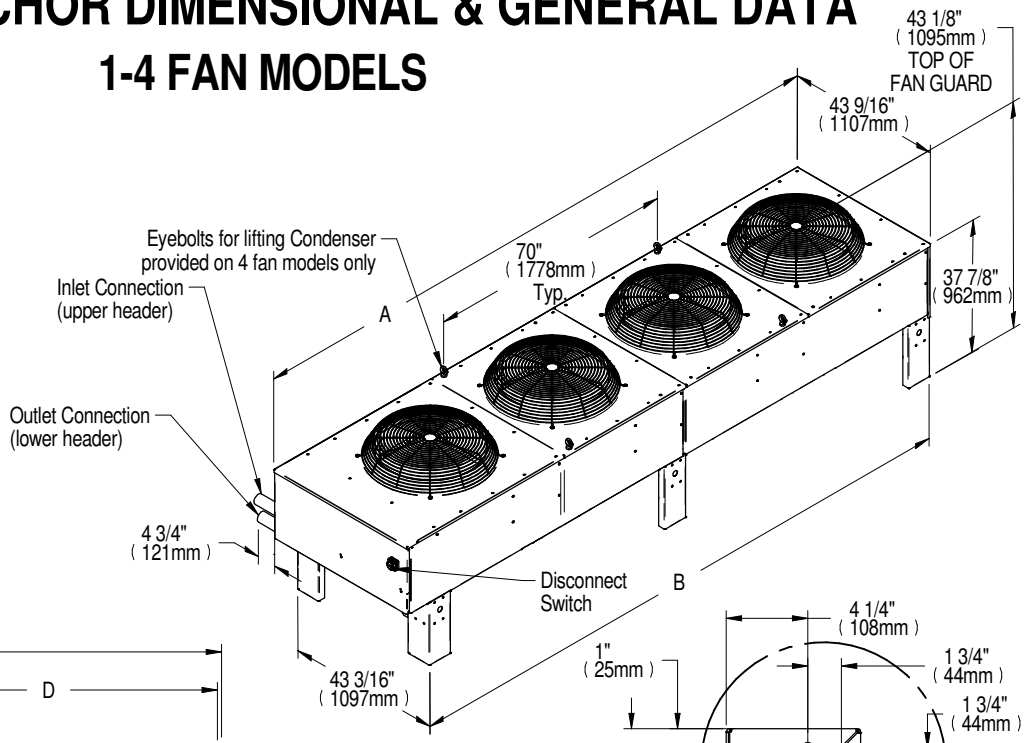
Table D.1 Submittal-drawings Contents (continued)

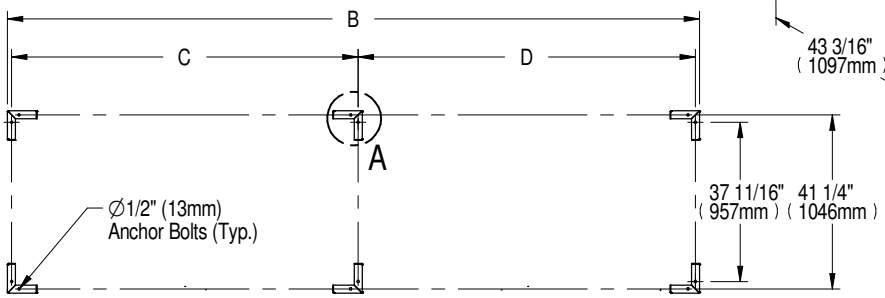
Document Number	Title
Liebert® Drycooler Pump Packages	
DPN000329	Pump Electrical Power Data and Piping-connection sizes.
DPN000278	Single-pump Piping connection locations and dimensional data
DPN000328	Dual-pump Piping connection locations and dimensional data
Liebert® Drycooler Expansion Tank	
DPN004183	Expansion Tank General Arrangement and Dimensional Data
Liebert® Drycooler Compression Tank	
DPN003898	Compression Tank General Arrangement and Dimensional Data

LIEBERT DRYCOOLER

CABINET ANCHOR DIMENSIONAL & GENERAL DATA

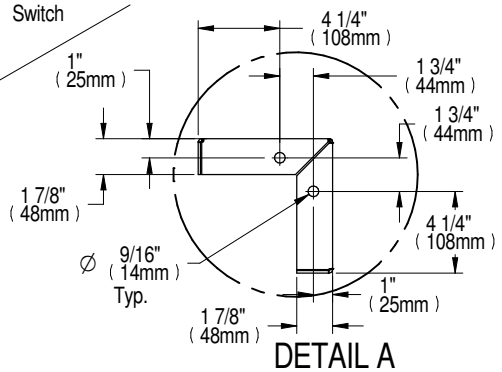
1-4 FAN MODELS





4 legs furnished for 1, 2, 3, & 4 fan models
6 legs furnished for 4 fan models

Unit Anchor Plan



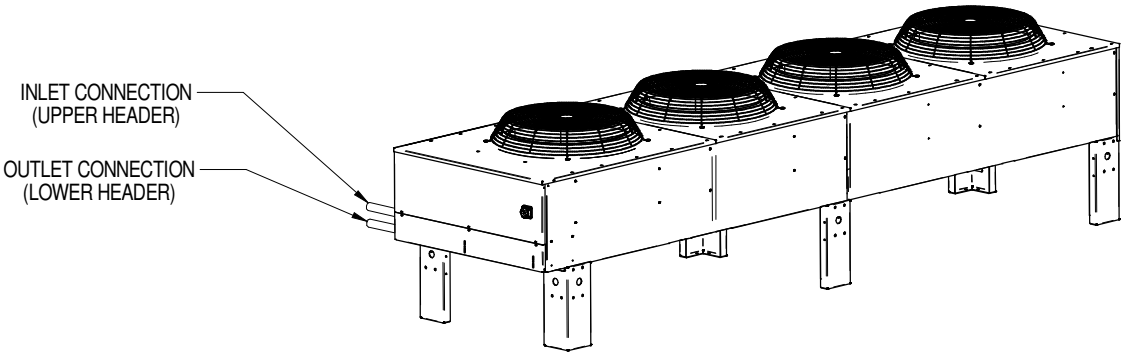
DETAIL A

Liebert Model	No. of fans	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	CFM (l/s) 60Hz (See note 1)	CFM (l/s) 50Hz (See note 1)	Internal Volume Gal. (Liters)	Dry Wt. Lbs. (kg)
*D**033	1	51-1/2 (1308)	44 (1118)	42 (1067	N/A	7200 (3398)	6000 (2932)	1.2 (4.6)	355 (161)
*D**069						6866 (3240)	5722 (2700)	2.4 (9.2)	375 (170)
*D**092						6633 (3130)	5527 (2609)	3.7 (13.9)	395 (179)
*D**109						6322 (2984)	5268 (2486)	4.9 (18.6)	415 (188)
*D**112						6088 (2873)	5074 (2394)	5.8 (22)	435 (197)
*D**139	2	91-1/2 (2324)	84 (2134)	82 (2083)		13732 (6481)	11443 (5401)	4.8 (18.2)	500 (227)
*D**174						13265 (6261)	11054 (5217)	6.9 (26.2)	540 (245)
*D**197						12645 (5968)	10535 (4973)	9 (34)	580 (263)
*D**225						12177 (5748)	10147 (4789)	11.1 (42.1)	620 (281)
*D**260	3	131-1/2 (3340)	124 (3150)	122 (3099)		19898 (9392)	16582 (7827)	10 (37.8)	735 (333)
*D**310						18965 (8951)	15804 (7459)	13.1 (49.6)	795 (361)
*D**350						17398 (8212)	14499 (6843)	19.4 (73.3)	855 (388)
*D**352	4	171-1/2 (4356)	164 (4166)	82 (2083)	80 (2032)	24800 (11705)	20667 (9755)	13.1 (49.6)	940 (426)
*D**419						23650 (11163)	19708 (9302)	17.4 (65.9)	1020 (463)
*D**466						22770 (10747)	18975 (8956)	22 (83.3)	1050 (476)
*D**491						21700 (10242)	18083 (8535)	26.3 (99.6)	1100 (499)

Notes:
1. All Drycooler fan motors are 3/4H.P.
2. A miniimum clearance of 36" (914mm) is recommended on all sides for proper operation and component access.

LIEBERT DRYCOOLER

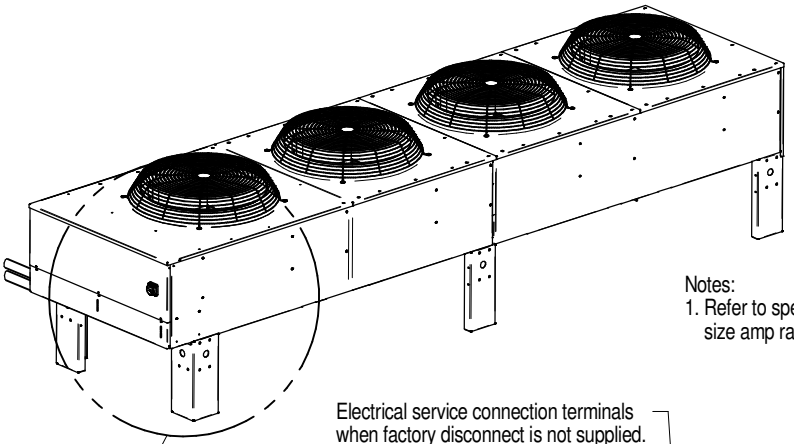
PIPING CONNECTIONS



DRYCOOLER PIPING CONNECTION SIZES (O.D. Cu)		
DRYCOOLER MODEL NUMBER	NUMBER OF COIL CIRCUITS	INLET & OUTLET PIPE DIAMETER (INCHES)
-033	4*	1 3/8
-069	4, 8*	1 3/8
-092	6, 12*, 16	1 5/8
-109	8	1 3/8
-109	16*	2 1/8
-112	8	1 3/8
-112	16*, 26	2 1/8
-139	8, 16*	2 1/8
-174	8, 16*, 24	2 1/8
-197	8	1 3/8
-197	16*, 32	2 1/8
-225	16, 26*	2 1/8
-260	16, 24*	2 1/8
-310	16, 32*	2 1/8
-350	16, 32*	2 1/8
-350	48	2 5/8
-352	16, 24*	2 1/8
-419	16, 32*	2 1/8
-466	26	2 1/8
-466	40*	2 5/8
-491	16, 32	2 1/8
-491	48*	2 5/8
* = Standard Circuiting		

LIEBERT DRYCOOLER

ELECTRICAL FIELD CONNECTIONS
FLUID TEMPERATURE CONTROL



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

Electrical service connection terminals when factory disconnect is not supplied. Fuse block supplied on DNT drycoolers.

Factory wired to 24V Class 2 control circuit

Factory wired to components on electric panel

Electrical service connection terminals when factory disconnect is supplied.

Factory installed disconnect switch (optional)

Unit Alarm Connection Field supplied 24V Class 2 wiring to terminals 24 & 50 to indicate "Standby Glycol Pump On". (Supplied with dual pump controls only).

Control interlock. Field supplied Class 2 wiring to interlock drycooler 24V controls to Liebert room unit. 7/8" (22mm) diameter hole provided in bottom of electric box.

Flow switch connection (Dual pump controls only). Field supplied 24V Class 2 wiring from terminals 74 & 77 to field mounted flow switch.

Electric service connection terminals for power supply to pumps when pump controls are factory supplied. Dual pump connection shown. 7/8" (22mm) diameter knockouts provided in bottom of electric box.

PUMP FUSES & OVERLOAD HEATERS (SHIPPED WITH STANDARD PUMP PACKAGES) ARE TO BE FIELD INSTALLED IN PUMP FUSE BLOCK(S) AND STARTER(S).

Earth ground bar (50Hz). Connection terminals with factory ground from each high voltage component for field supplied earth ground wire.

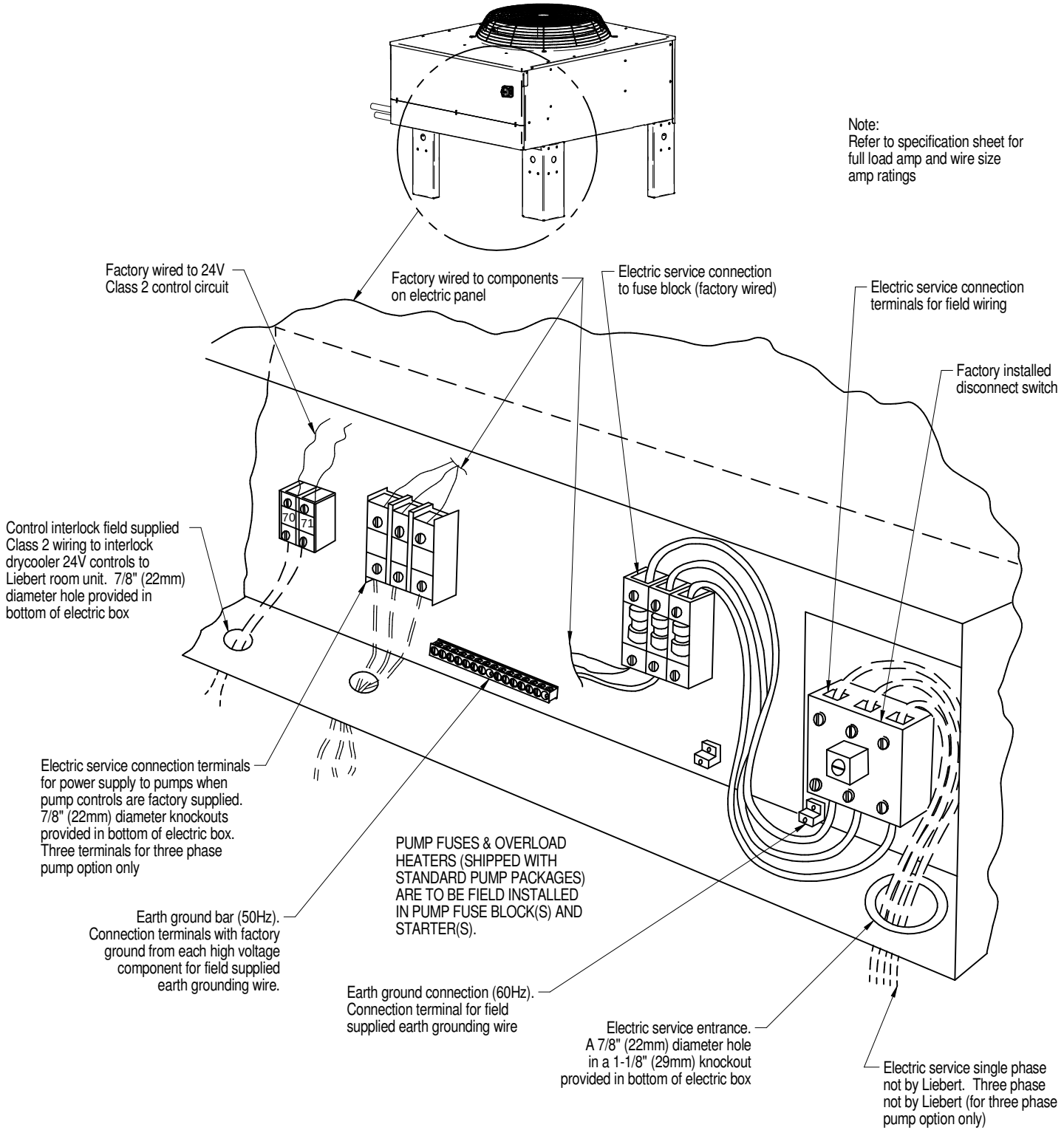
Earth ground connection (60Hz). Connection terminal for field supplied earth ground wire.

Electric service entrance. A 7/8" (22mm) diameter hole in a 1-1/8" (29mm) knockout provided in bottom of electric box.

Electric service not provided by Liebert.

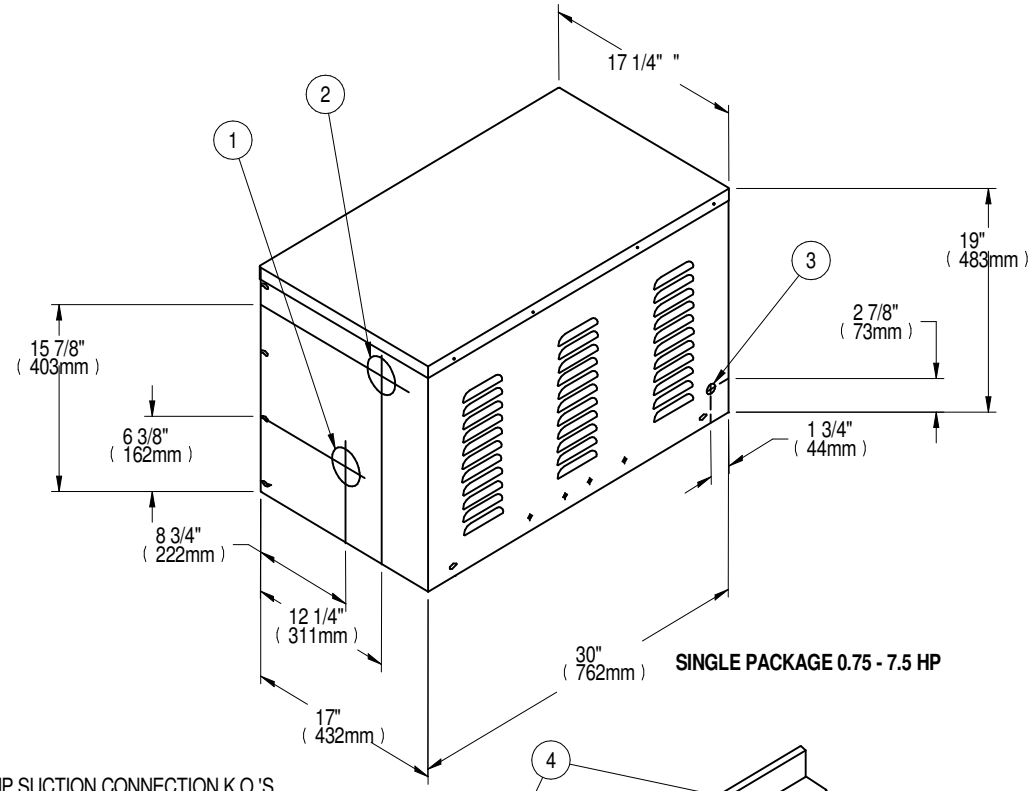
LIEBERT DRYCOOLER

ELECTRICAL FIELD CONNECTIONS
FAN SPEED CONTROL



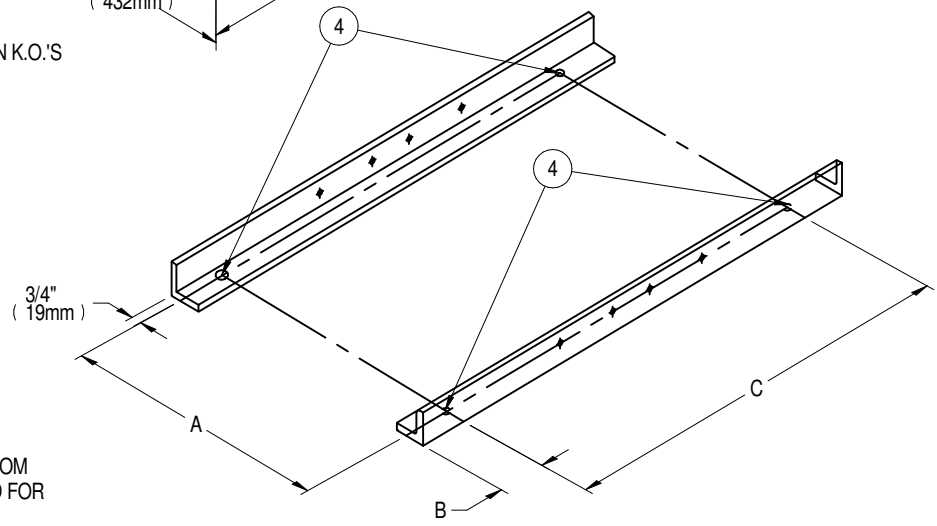
LIEBERT DRYCOOLER

PIPING LOCATIONS & DIMENSIONAL DATA
SINGLE PUMP PACKAGE



SINGLE PACKAGE 0.75 - 7.5 HP

1. 3" (76.2mm) DIA. PUMP SUCTION CONNECTION K.O.'S
2. 3" (76.2mm) DIA. PUMP DISCHARGE CONNECTION K.O.'S
3. 7/8" (22.2mm) DIA. ELECTRICAL K.O.'S
4. 1/2" (12.7mm) DIA. HOLES FOR MOUNTING



NOTE:
ANGLES LOCATED INSIDE, BOTTOM OF PUMP PACKAGE. VIEW USED FOR MOUNTING REFERENCE.

PUMP PACKAGE MOUNTING ANGLES

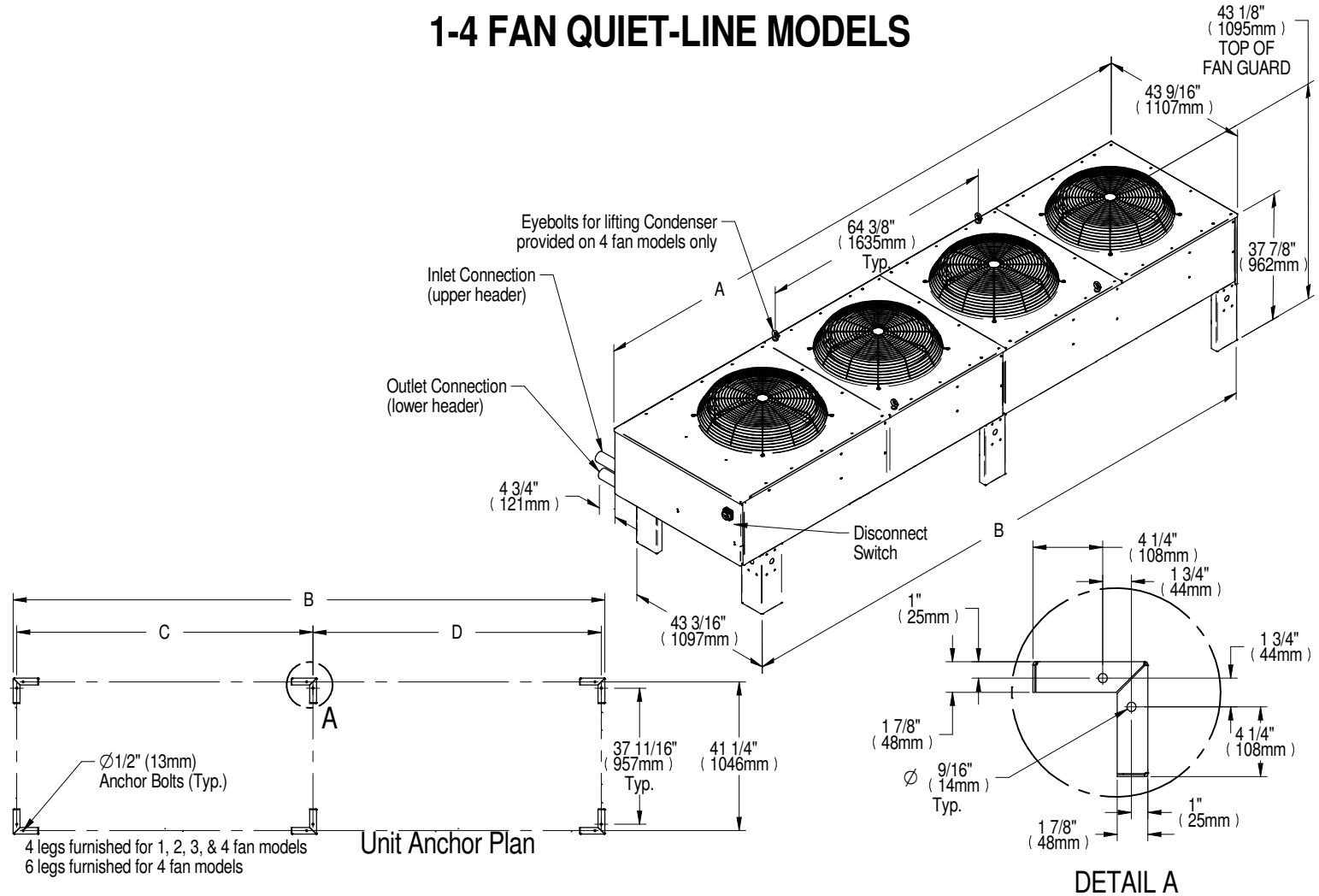
MOUNTING HOLE DIMENSIONAL DATA in. (mm)			
Pump Package	A	B	C
Single (0.75 - 7.5HP)	15-1/4 (387)	2-1/2 (64)	22-1/2 (572)

SINGLE PUMP PACKAGE WEIGHT, lb (kg)	
Model	Weight
S.75	64 (29)
S1.5	66 (30)
S2	
S3	90 (41)
S5	121 (55)
S7.5	152 (69)

LIEBERT DRYCOOLER

CABINET ANCHOR DIMENSIONAL & GENERAL DATA

1-4 FAN QUIET-LINE MODELS



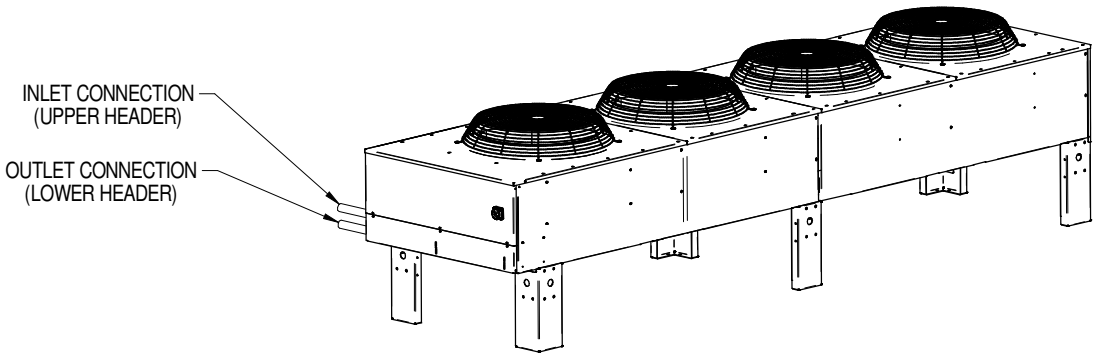
Quiet-Line Model	No. of fans	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	CFM (l/s) 60Hz (See note 1)	CFM (l/s) 50Hz (See note 1)	Internal Volume Gal. (Liters)	Dry Wt. Lbs. (kg)
*D**040	1	51-1/2 (1308)	44 (1118)	42 (1067	N/A	3110 (5285)	2592 (4404)	2.4 (9.1)	375 (170)
*D**057						2990 (5081)	2492 (4234)	3.7 (14)	395 (179)
*D**060						2840 (4826	2367 (4021)	4.9 (18.5)	415 (188)
*D**080	2	91-1/2 (2324)	84 (2134)	82 (2083)		6220 (10569)	5183 (8808)	4.8 (18.2)	500 (227)
*D**111						5980 (10161)	4983 (8468)	6.9 (26.1)	540 (245)
*D**121						5680 (9651)	4733 (8043)	9 (34.1)	580 (263)
*D**158	3	131-1/2 (3340)	124 (3150)	122 (3099)		8970 (15242)	7475 (12702)	10 (37.9)	735 (333)
*D**173						8520 (14477)	7100 (12064)	13.1 (49.6)	795 (361)
*D**178						7440 (12462)	6200 (10535)	19.4 (73.4)	855 (388)
*D**205	4	171-1/2 (4356)	164 (4166)	82 (2083)	80 (2032)	11680 (19847)	9733 (16539)	13.1 (49.6)	940 (426)
*D**248						11360 (19303)	9467 (16086)	17.4 (65.9)	1020 (463)

Notes:
1. All Drycooler fan motors are 1/4H.P.
2. A miniimum clearance of 36" (914mm) is recommended on all sides for proper operation and component access.

LIEBERT DRYCOOLER

PIPING CONNECTIONS

QUIET-LINE MODELS

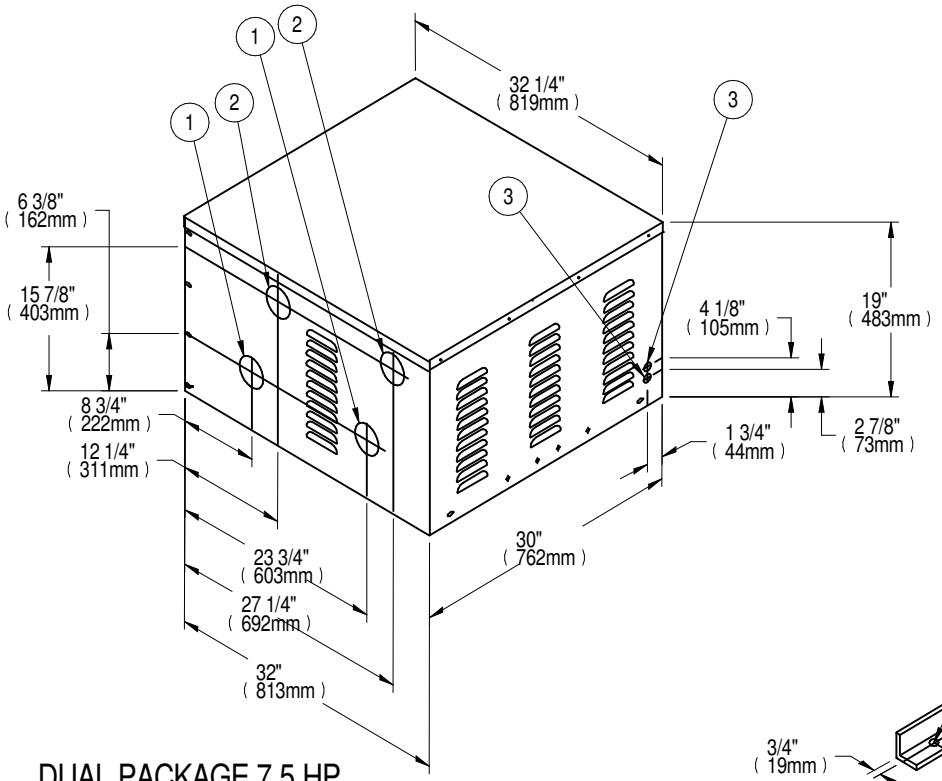


DRYCOOLER PIPING CONNECTION SIZES (O.D. Cu)		
DRYCOOLER MODEL NUMBER	NUMBER OF COIL CIRCUITS	INLET & OUTLET PIPE DIAMETER (INCHES)
-040	4, 8*	1 3/8
-057	12*	1 5/8
-057	16	2 1/8
-060	8	1 3/8
-060	16*	2 1/8
-080	8, 16*	2 1/8
-111	16*, 24	2 1/8
-121	16*, 32	2 1/8
-158	16, 24*	2 1/8
-173	16, 32*	2 1/8
-178	16, 32*	2 1/8
-178	48	2 5/8
-205	16, 24*	2 1/8
-248	16, 32*	2 1/8
* = Standard Circuiting		

LIEBERT DRYCOOLER

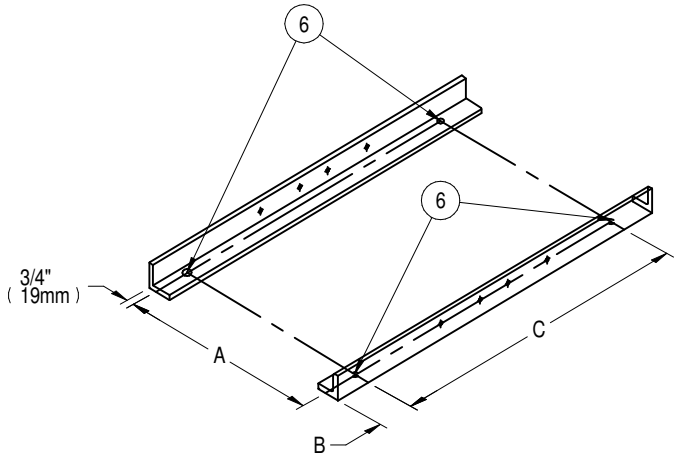
PIPING CONNECTIONS & DIMENSIONAL DATA
DUAL PUMP PACKAGE

DUAL PACKAGE 0.75 - 5 HP



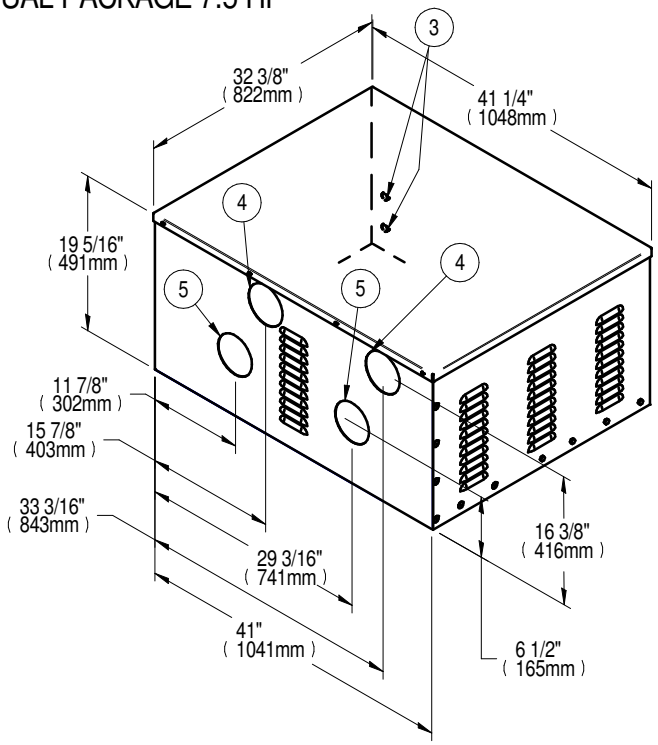
1. 3" (76.2mm) DIA. PUMP SUCTION CONNECTION K.O.'S
2. 3" (76.2mm) DIA. PUMP DISCHARGE CONNECTION K.O.'S
3. 7/8" (22.2mm) DIA. ELECTRICAL K.O.'S
4. 5" (127mm) DIA. PUMP DISCHARGE CONNECTION HOLE
5. 5" (127mm) DIA. PUMP SUCTION CONNECTION HOLE
6. 1/2" (12.7mm) DIA. HOLES FOR MOUNTING

PUMP PACKAGE MOUNTING ANGLES



NOTE:
ANGLES LOCATED INSIDE, BOTTOM OF PUMP PACKAGE. VIEW USED FOR MOUNTING REFERENCE.

DUAL PACKAGE 7.5 HP



Dual Pump Package Weights	
Model	Weight lb (kg)
D.75	138 (63)
D1.5	140 (64)
D2	
D3	164 (74)
D5	220 (100)
D7.5	276 (125)

Mounting Hole Dimensional Data in. (mm)			
Pump Package	A	B	C
Dual (0.75-5HP)	30-1/4 (768)	2-1/2 (64)	22-1/2 (572)
Dual (7.5HP)	39-5/16 (999)	1-3/4 (45)	26-7/8 (683)

LIEBERT DRYCOOLER

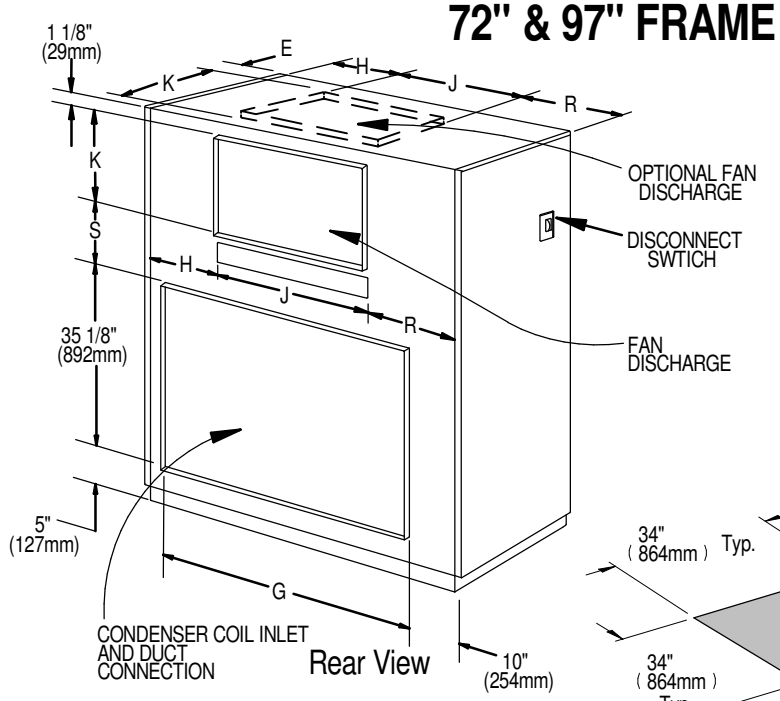
ELECTRICAL & PIPING CONNECTION DATA
PUMP PACKAGE

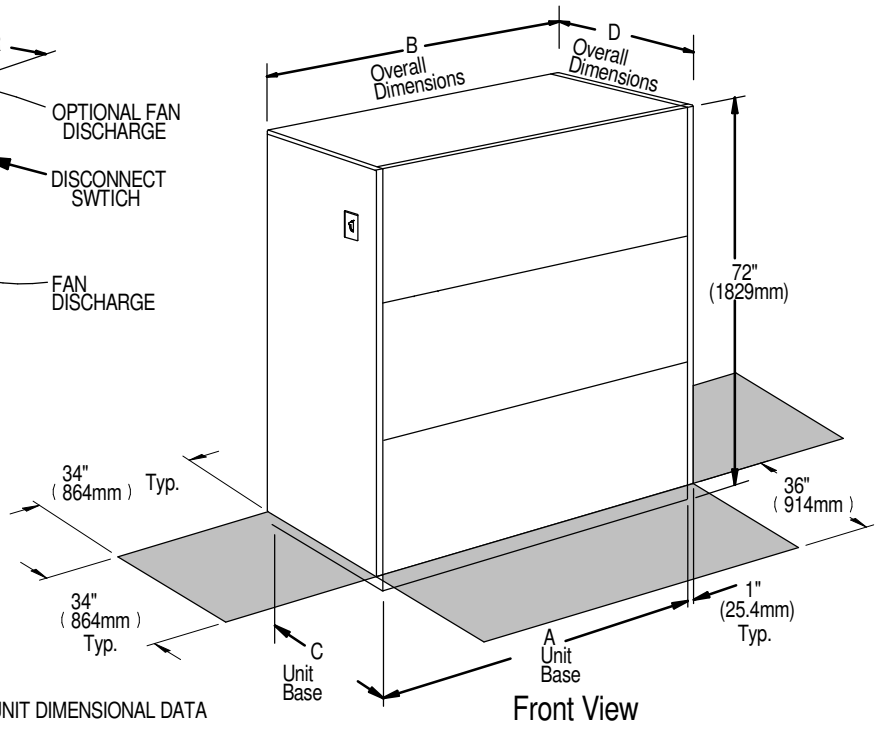
GLYCOL PUMP DATA							
HP	ELECTRICAL DATA 60Hz					PIPING CONNECTIONS NPT FEMALE IN.	
	PHASE	FLA (FULL LOAD AMPS)				SUCTION	DISCHARGE
		208V	230V	460V	575V		
3/4	1	7.6	6.9	N/A	N/A	1-1/4	3/4
	3	3.5	3.2	1.6	1.3		
1-1/2		6.6	6.0	3.0	2.4		
2		7.5	6.8	3.4	2.7		
3		10.6	9.6	4.8	3.9	1-1/2	1
5		16.7	15.2	7.6	6.1		1-1/4
7.5		24.2	22	11	9	3	3
HP	ELECTRICAL DATA 50Hz					PIPING CONNECTIONS NPT FEMALE IN.	
	PHASE	FLA (FULL LOAD AMPS)				SUCTION	DISCHARGE
		380V / 415V					
1	3	1.64 / 1.63				1-1/4	3/4
1-1/2		2.4 / 2.25					
2		3.00 / 2.88					
3		4.7 / 4.38				1-1/2	1-1/4
5		7.9 / 7.47					1

LIEBERT PIGGYBACK DRYCOOLER

DIMENSIONAL DATA

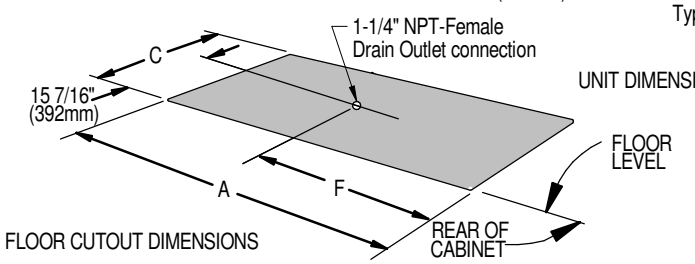
72" & 97" FRAME MODELS





UNIT DIMENSIONAL DATA

Shaded areas indicate recommended clearance for component access



FLOOR CUTOUT DIMENSIONS

Unit Shipping Weight lbs. (kg)		
Liebert Model No.	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

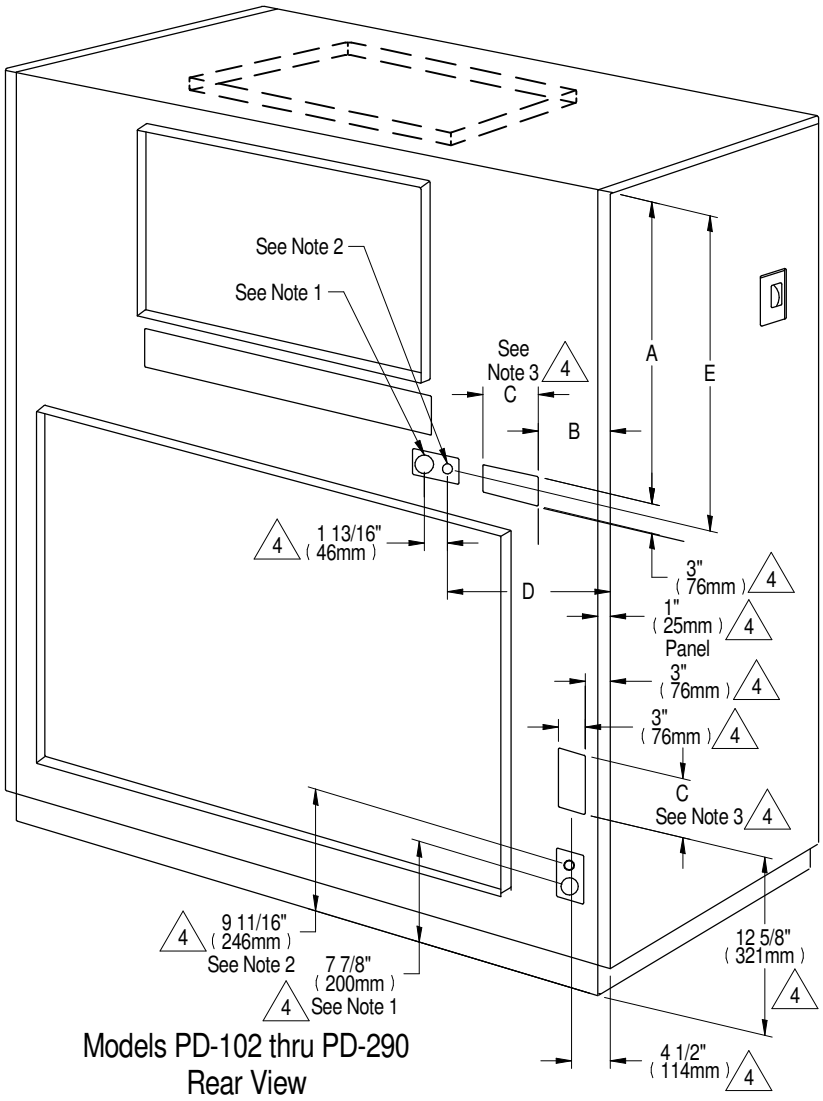
PUMP PACKAGE SELECTION
☐ SINGLE PUMP PACKAGE
☐ DUAL PUMP PACKAGE

Liebert Model No.	Dimensional Data in. (mm)											
	A	B	C	D	E	F	G	H	J	K	R	S
PD-102	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-133												
PD-150												
PD-223	97 (2464)	99 (2515)	33 (838)	34 (864)	3-1/8 (79)	46-1/2 (1181)	85 (2159)	23-5/16 (592			23-1/2 (597	
PD-290												
PD-333								16-5/16 (421	63-7/8 (1622)	19-1/8 (486)	16-13/16 (427)	11-5/8 (295)

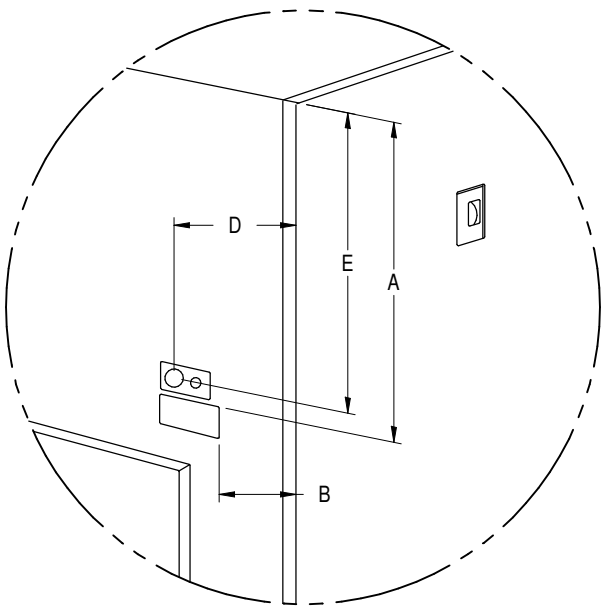
Note:
1. A 1" (25.4mm) flange is provided oncoil inlet opening and fan discharge opening for duct connections.

LIEBERT PIGGYBACK DRYCOOLER

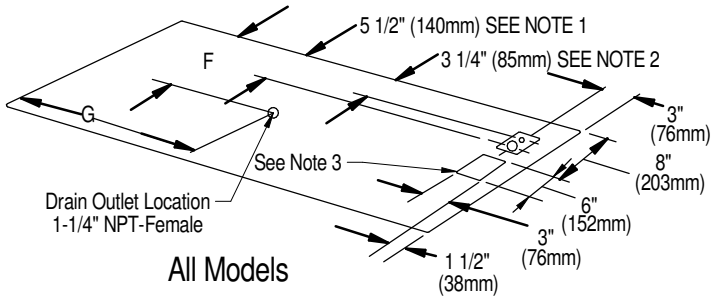
PRIMARY CONNECTION LOCATIONS
72" & 97" FRAME MODELS



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	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-133							
PD-150							
PD-223							
PD-290							
PD-333	26-1/2 (673)	7 (178)		11-1/4 (286)	24 (610)	16-1/2 (419)	48-1/2 (1232)

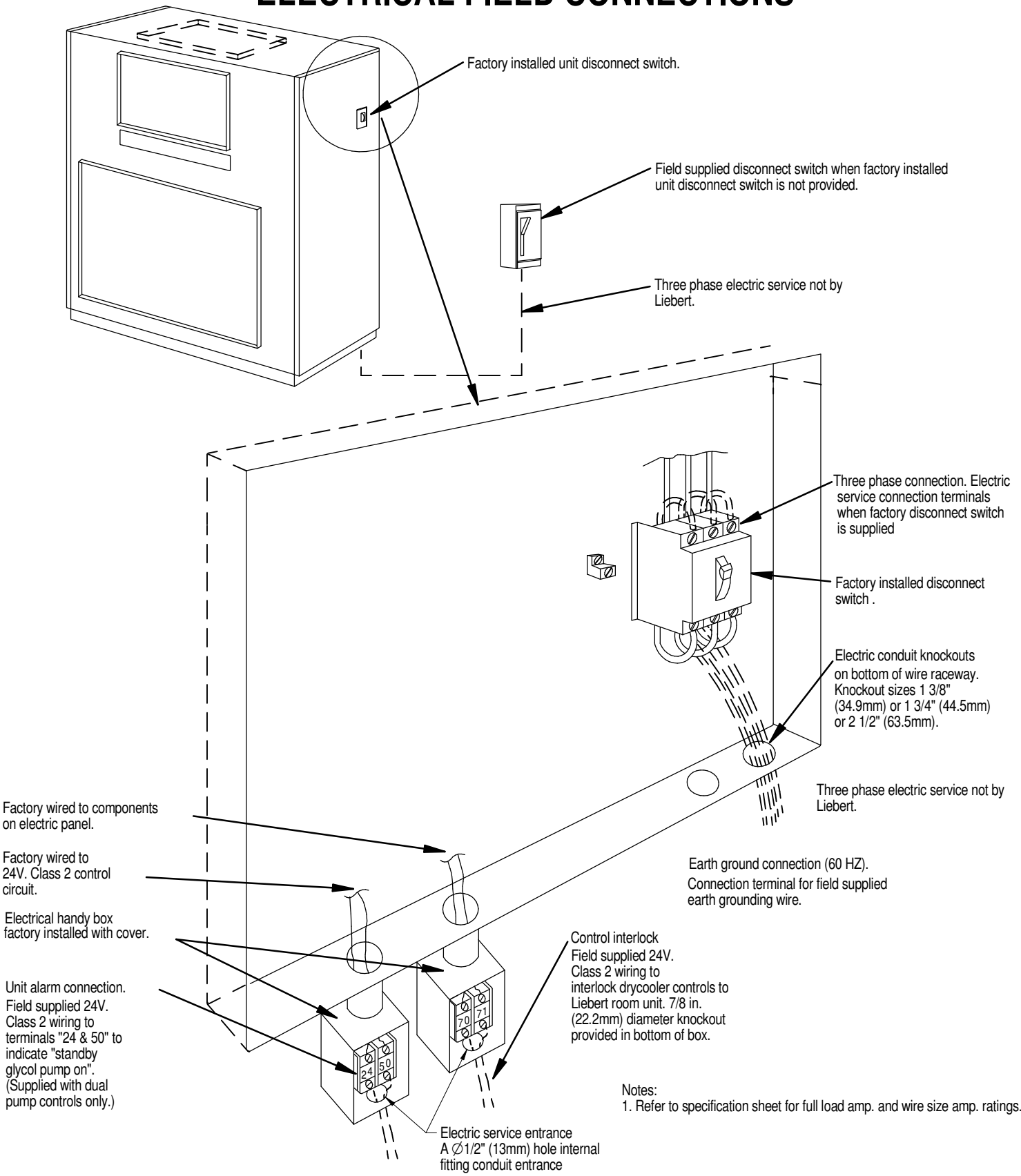
Libert Model No.	Piping Sizes (in. (mm)	
	Connection Sizes O.D.S.	
	Glycol Supply	Glycol Return
PD-102	1-5/8 (41)	1-5/8 (41)
PD-133		
PD-150	2-1/8 (54)	2-1/8 (54)
PD-223		
PD-290		
PD-333		

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

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

LIEBERT PIGGYBACK DRYCOOLER

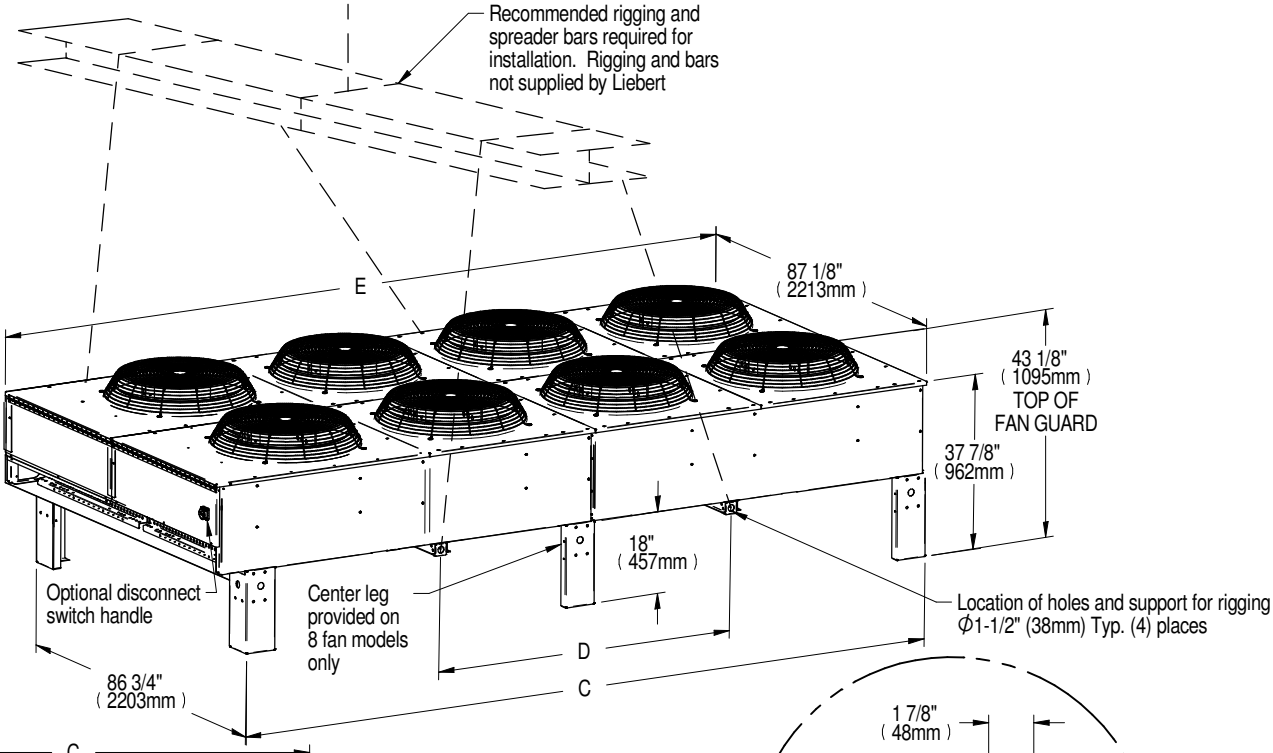
ELECTRICAL FIELD CONNECTIONS

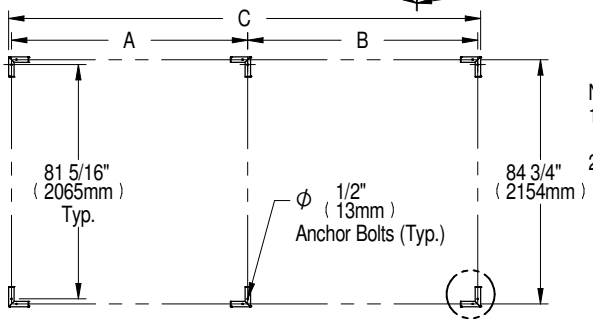


Notes:
1. Refer to specification sheet for full load amp. and wire size amp. ratings.

LIEBERT DRYCOOLER

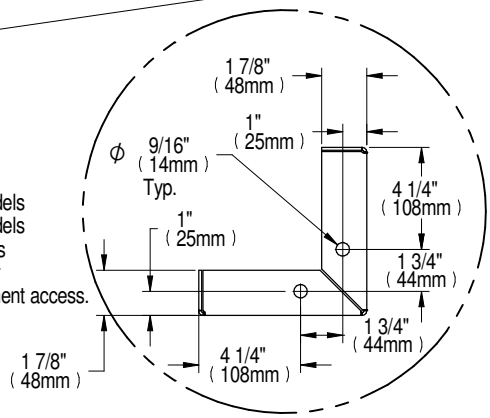
CABINET & ANCHOR DIMENSIONAL DATA
6 & 8 FAN HEAT REJECTION QUIET-LINE MODELS





Unit Anchor Plan

Notes:
1. 4 legs furnished for 6 fan models
   6 legs furnished for 8 fan models
2. A clearance of 36" (914mm) is recommended on all sides for proper operation and component access.



A

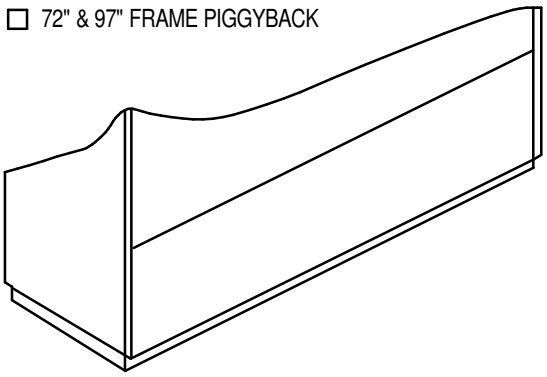
DETAIL A

Drycooler Physical Data									
Liebert Model No.	Drycooler Type	Qty. of Fans	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	E in. (mm)	Coil Internal Vol. Gal (L)	Dry Wt. lbs. (kg)
-620	Standard	6	122 (3099)	N/A	124 (3150)	59 (1499)	131-1/2 (3340)	27 (102.2)	1780 (808)
-650								33(124.9)	1830 (831)
-700								40 (151.4)	1880 (854)
-347	Quiet-Line							27 (102)	1780 (808)
-356								39.3 (149)	1880 (854)
-790	Standard	8	82 (2083)	80 (2032)	164 (4166)	70 (1778)	171-1/2 (4356)	35 (132.5)	2250 (1022)
-880								44 (166.5)	2330 (1058)
-940								52 (196.8)	2430 (1103)
-453	Quiet-Line							35 (132)	2250 (1022)
-498								52.6 (199)	2430 (1103)

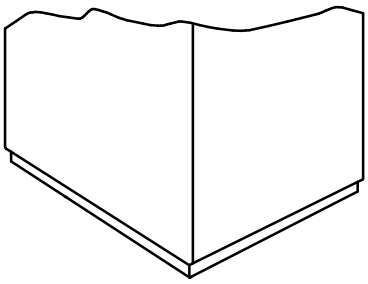
LIEBERT PIGGYBACK

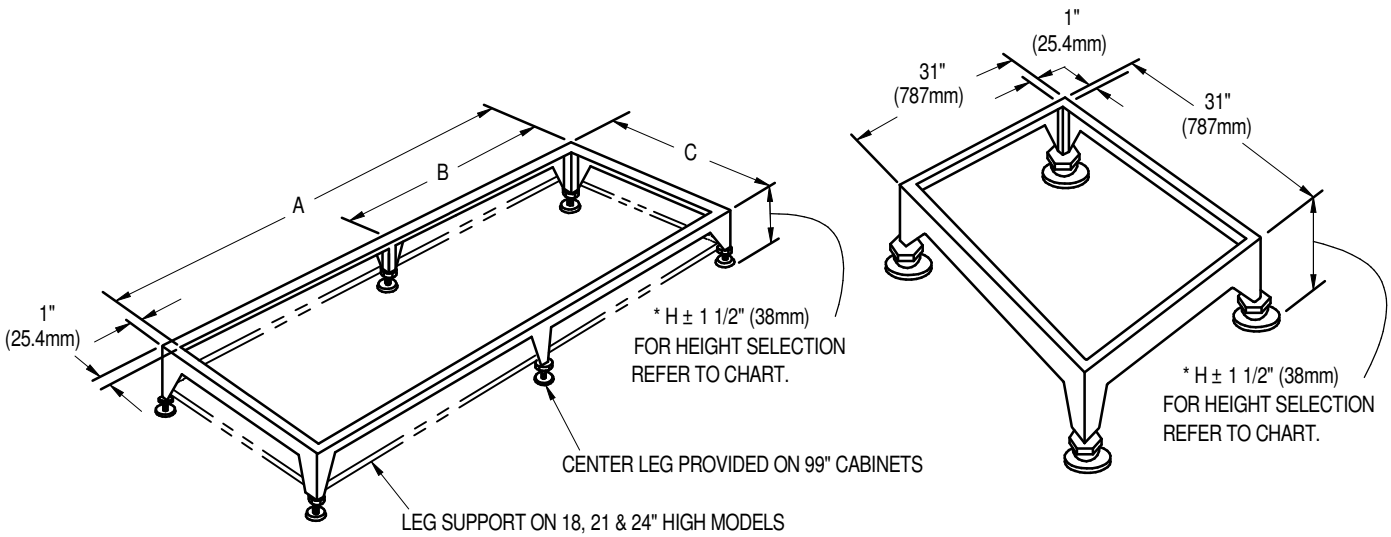
FLOORSTAND DIMENSIONAL DATA
CONDENSER & DRYCOOLER

☐ 72" & 97" FRAME PIGGYBACK



☐ 31" FRAME 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) ⚠1
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)

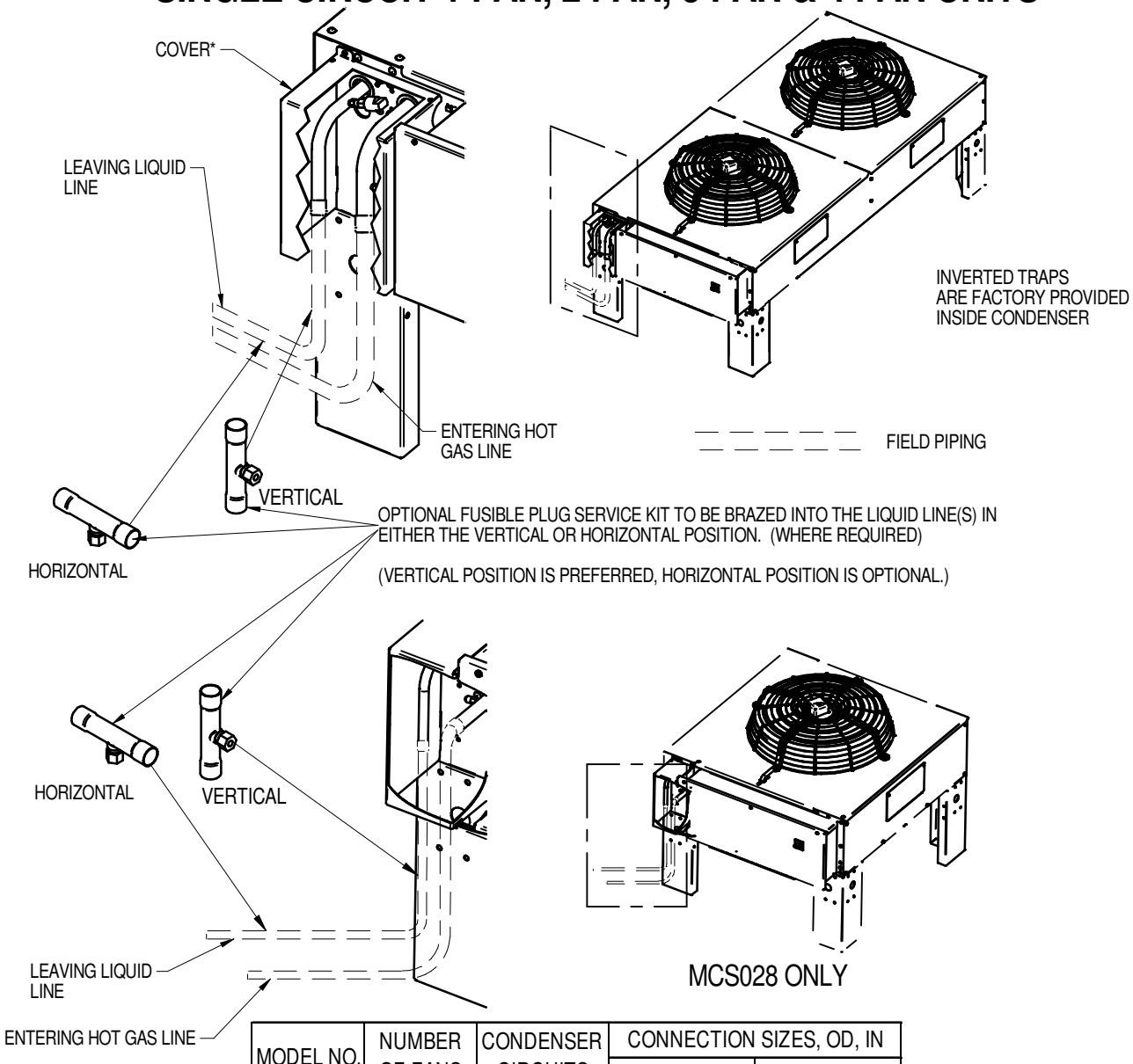
Notes:

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

LIEBERT MC CONDENSER

PIPING DIMENSIONAL DATA

SINGLE CIRCUIT 1 FAN, 2 FAN, 3 FAN & 4 FAN UNITS

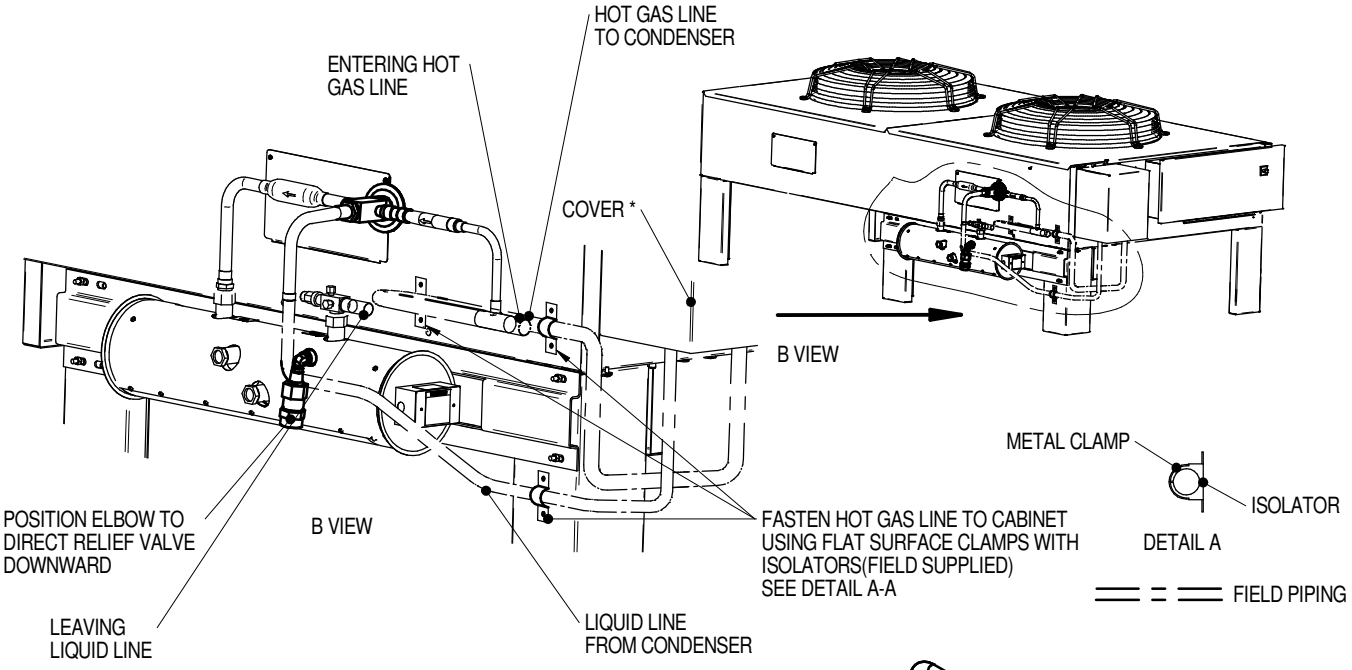


MODEL NO.	NUMBER OF FANS	CONDENSER CIRCUITS	CONNECTION SIZES, OD, IN	
			HOT GAS LINE	LIQUID LINE
MCS 028	1	1	7/8	5/8
MCM 040	1	1	7/8	5/8
MCM 080	2	1	1-1/8	7/8
MCL 055	1	1	1-1/8	7/8
MCL 110	2	1	1-3/8	1-1/8
MCL 165	3	1	1-3/8	1-1/8
MCL 220	4	1	1-5/8	1-3/8

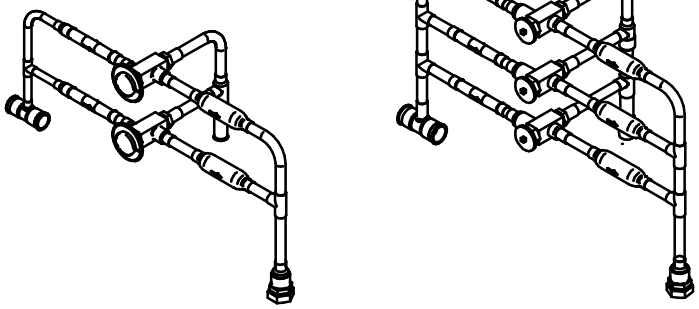
* SHIPPING COVER IS NOT NECESSARY FOR PROPER CONDENSER OPERATION AND MAY BE RECYCLED IF FIELD PIPING INTERFERES WITH PROPER REATTACHMENT.

LIEBERT MC CONDENSER

PIPING LOCATIONS
SINGLE CIRCUIT WITH LEE-TEMP



GENERAL ARRANGEMENT



LIEBERT SUPPLIED PIPING ASSEMBLY WILL INCLUDE 1 TO 3 HEAD PRESSURE VALVES AND CHECK VALVES DEPENDENT ON CONDENSER CAPACITY AND REFRIGERANT.

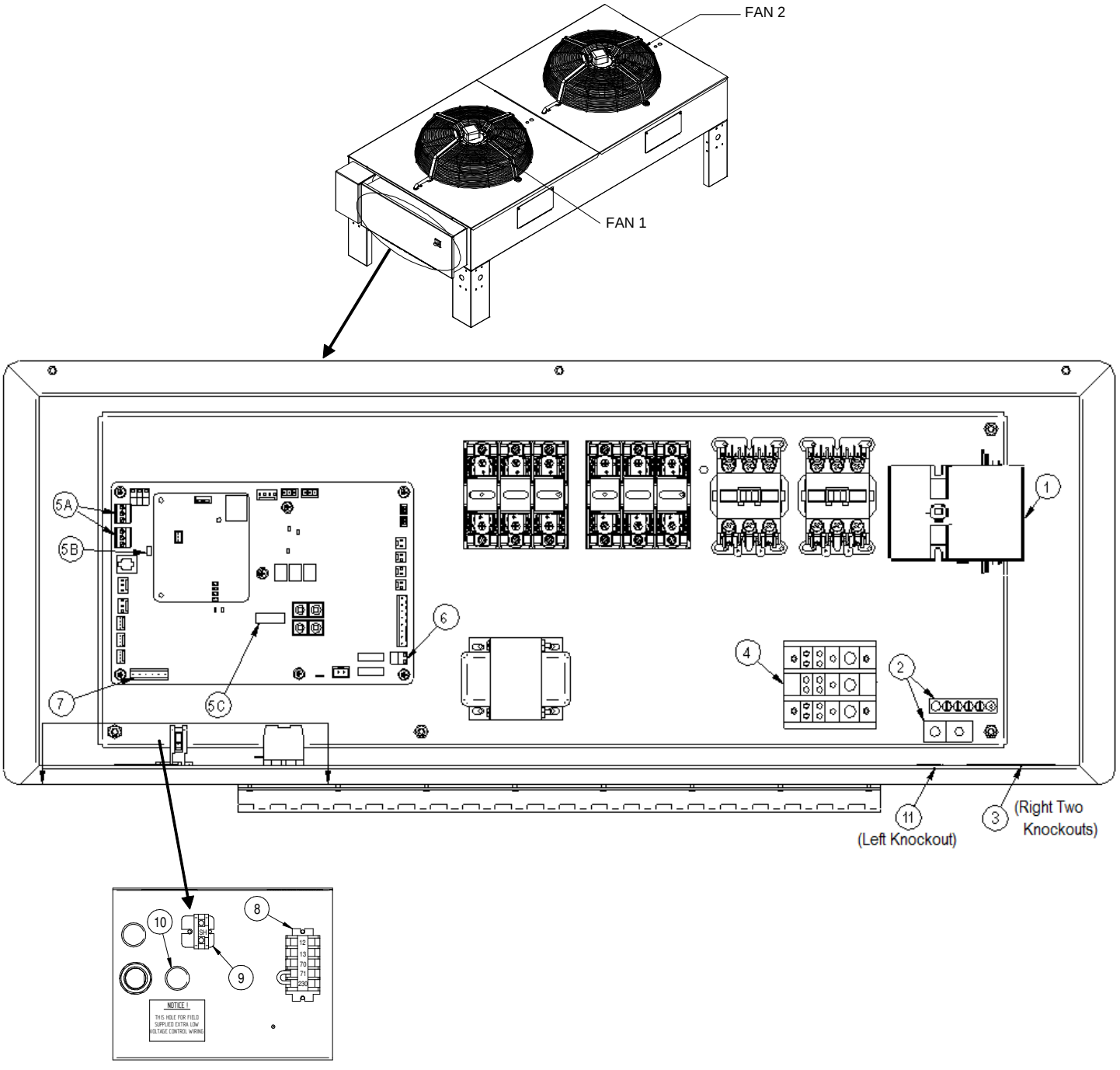
NOTE:

1. THE FOLLOWING MATERIALS ARE SUPPLIED BY LIEBERT,SHIPPED LOOSE FOR EACH CIRCUIT AND FOR FIELD INSTALLATION: INSULATED LEE-TEMP RECEIVER TANK WITH ELECTRIC HEATER PADS AND SIGHT GLASSES, PIPING ASSEMBLY WITH HEAD PRESSURE CONTROL VALVE AND CHECK VALVE, ROTO-LOCK VALVE AND PRESSURE RELIEF VALVE. ALL OTHER PIPING AND ELECTRICAL WIRING TO BE SUPPLIED AND INSTALLED BY OTHERS. ADDITIONAL CONDENSER LEG PER CIRCUIT WHEN REQUIRED, SHIPS WITH THE CONDENSER.

CONDENSER PIPING CONNECTION SIZES						
CONDENSER CONNECTIONS (ODS-INCHES)				LEE-TEMP CONNECTIONS		
MODEL NO.	CONDENSER CIRCUITS	HOT GAS	LIQUID	HOT GAS TEE (IDS-INCHES)	LIQ TO L-T VALVE (ODS-INCHES)	RECEIVER OUT ROTO LOCK (IDS-INCHES)
MCS028	1	7/8	5/8	7/8	5/8	5/8
MCM040						
MCM080		1-1/8	7/8	1-1/8	7/8	1-1/8
MCL055						7/8
MCL110		1-3/8	1-1/8	1-3/8	1-1/8	1-1/8
MCL165						
MCL220		1-5/8	1-3/8	1-5/8	1-3/8	1-3/8

* SHIPPING COVER IS NOT NECESSARY FOR PROPER CONDENSER OPERATION AND MAY BE RECYCLED IF FIELD PIPING INTERFERES WITH PROPER REATTACHMENT.

ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL



KEY ELECTRICAL DETAILS:

1) **Three phase electrical service –** Terminals are on top of disconnect switch for one and two fan units. Terminals are on bottom of disconnect switch for three and four fan units. Three phase service not by Liebert. See note 5.
2) **Earth ground –** Field lug terminal for earth ground connection. Ground terminal strip for fan motor ground connection.
3) **Primary high voltage entrance –** Two 7/8" (22.2mm) diameter knockouts located at the bottom of the enclosure.
4) **SPD field connection terminals –** High voltage surge protective device (SPD) terminals. SPD is an optional device.

ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL

5) **CANbus terminal connections –** Field terminals for CANbus cable connection.
- 5A is the CANbus connectors.
  - o TB49-1 is the input terminal for CANbus high.
  - o TB49-3 is the input terminal for CANbus low.
  - o TB50-1 is output terminal for CANbus high.
  - o TB50-3 is the output terminal for CANbus low.
  - o Each CANbus cable shield is connected to terminal "SH", item 9.
- 5B is the "END OF LINE" jumper.
- 5C is the CANbus "DEVICE ADDRESS DIP SWITCH". CANbus cable not by Liebert. See Note 2. (below)

6) **Remote unit shutdown –** Replace existing jumper between terminals TB38-1 and TB38-2 with field supplied normally closed switch having a minimum 75VA 24VAC rating. Use field supplied Class 1 wiring. (This is an optional feature that may be owner specified.)

7) **Alarm terminal connections –**
   - **a.** Common Alarm Relay indicates when any type of alarm occurs. TB74-1 is common, TB74-2 is normally open, and TB74-3 is normally closed. 1 Amp 24VAC is the maximum load. Use Class 1 field supplied wiring.
   - **b.** Shutdown Alarm Relay indicates when condenser loses power, or when a critical alarm has occurred that shuts down the condenser unit. TB74-4 is common, TB74-5 is normally open, and TB74-6 is normally closed. 1 Amp 24VAC is the maximum load. Use Class 1 field supplied wiring.

8) **Indoor unit interlock and SPD alarm terminals –**
   - **a.** On any call for compressor operation, normally open contact is closed across terminals 70 and 71 for Circuit 1, and normally open contact is closed across terminals 70 and 230 for Circuit 2 from indoor room unit.
   - **b.** During SPD alarm, normally open contact is closed across terminals 12 & 13. SPD is an optional device.

9) **CANbus shield terminal –** Terminal for field shield connection of the CANbus field supplied cables. The shield of CANbus field supplied cables must not be connected to ground at the condenser.

10) **Primary low voltage entrance –** One 7/8" (22.2mm) diameter knockout that is free for customer low voltage wiring.

11) **SPD entrance –** One 7/8" (22.2mm) diameter knockout hole located at the bottom of the enclosure. High voltage surge protective device (SPD) is optional.

NOTES:

1. Refer to specification sheet for unit voltage rating, full load amp, and wire size amp ratings.
2. The CANbus wiring is field supplied and must be:
   - Braided shield or foil shield with drain wire
   - Shield must be wired to ground at indoor unit
   - 22-18AWG stranded tinned copper
   - Twisted pair (minimum 4 twists per foot)
   - Low Capacitance (15pF/FT or less)
   - Must be rated to meet local codes and conditions
   - EXAMPLES BELDEN 89207 (PLENUM RATED), OR ALPHA WIRE 6454 CATEGORY 5, 5E, OR HIGHER
3. Do not run in same conduit, raceway, or chase as high voltage wiring.
4. For CANbus network lengths greater than 450FT (137M) call Factory.

ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL

5. All wiring must be sized and selected for insulation case per NEC and other local codes.
6. Do not bend cables to less than four times the diameter of the cable.
7. Do not deform cables when securing in bundles or when hanging them.
8. Avoid running the cables by devices that may introduce noise, such as machines, fluorescent lights, and electronics.
9. Avoid stretching cables.
10. The electrically commutated (EC) motors included in the Liebert MC Condenser are suitable for connection to power supplies with a solidly grounded neutral or high resistance to ground or corner ground.
    a. Acceptable power supplies for 208 to 575V nominal units:
        - 208V wye with solidly grounded neutral and 120V line to ground;
        - 380V wye with solidly grounded neutral and 220V line to ground;
        - 480V wye with solidly grounded neutral and 277V line to ground;
        - 575V wye with solidly grounded neutral and 332V line to ground (uses step-down transformer);
        - Wye with high resistance (or impedance) ground;
        - Delta with corner ground

    b. Unacceptable power supplies for 208V to 575V nominal units:
        - Delta without ground or with floating ground;
        - Delta with grounded center tap.

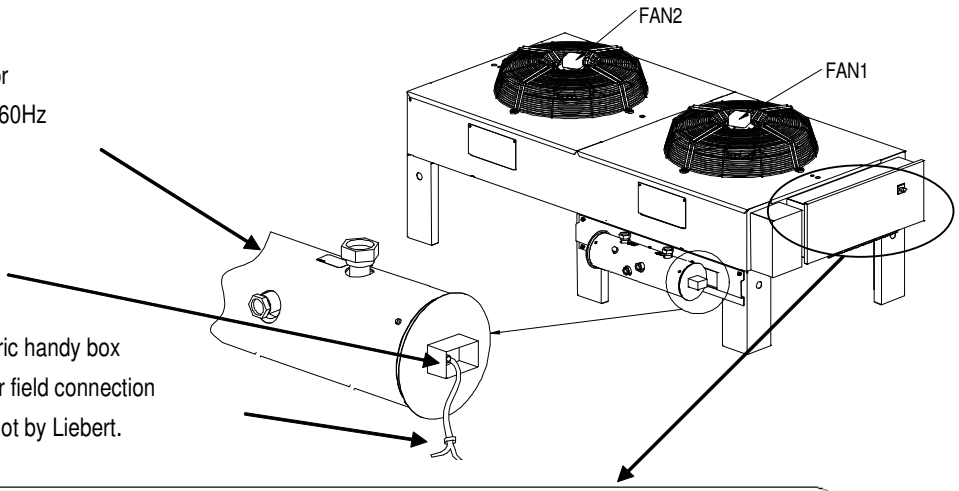
ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL WITH LEE-TEMP

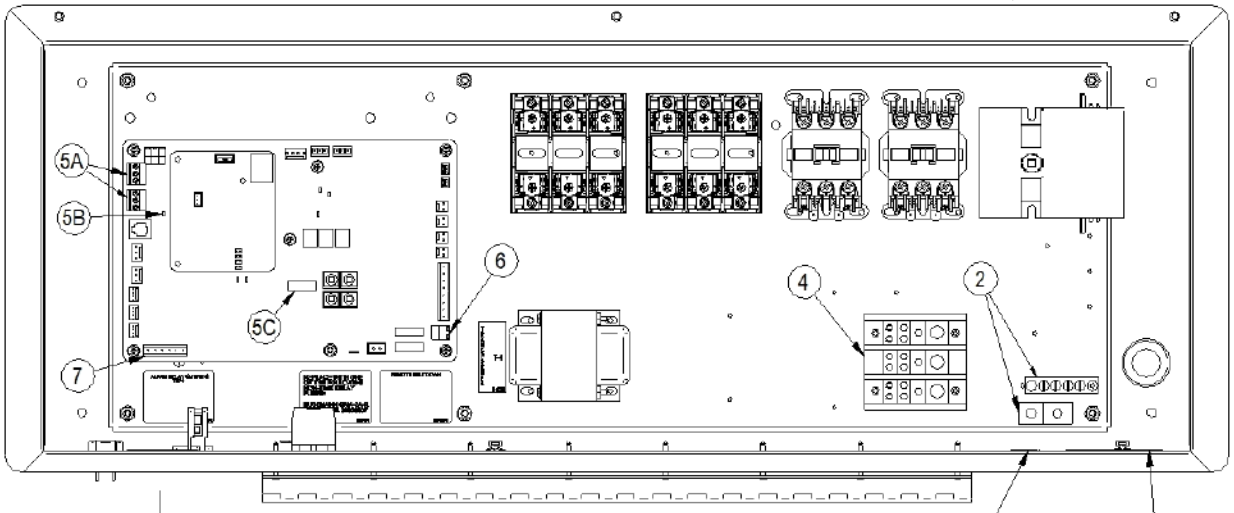
Electrical Connections for Lee-Temp Receiver

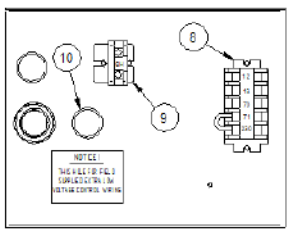
Lee-Temp receiver tank (1 per circuit).
NOTE: Heater pad voltage available for
120V/1 phase/60 Hz or 230V/1 phase/60Hz
150 or 300 Watt, varies by condenser.

Electrical connection box with cover.
(Cover removed for clarity.)

Electrical service connection. Pigtails in electric handy box are factory wired to Lee-Temp heater pads for field connection of separate continuous electric source, wire not by Liebert.







KEY ELECTRICAL DETAILS:

1) **Three phase electrical service –** Terminals are on top of disconnect switch for one and two fan units. Terminals are on bottom of disconnect switch for three and four fan units. Three phase service not by Liebert. See Note 5 (below).
2) **Earth ground –** Field lug terminal for earth ground connection. Ground terminal strip for fan motor ground connection.
3) **Primary high voltage entrance –** Two 7/8" (22.2mm) diameter knockouts located at the bottom of the enclosure.
4) **SPD field connection terminals –** High voltage surge protective device (SPD) terminals. SPD is an optional device.

ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL WITH LEE-TEMP

5) **CANbus terminal connections –** Field terminals for CANbus cable connection.
   - 5A is the CANbus connectors.
     - TB49-1 is the input terminal for CANbus high.
     - TB49-3 is the input terminal for CANbus low.
     - TB50-1 is output terminal for CANbus high.
     - TB50-3 is the output terminal for CANbus low.
     - Each CANbus cable shield is connected to terminal "SH", item 9.
   - 5B is the "END OF LINE" jumper.
   - 5C is the CANbus "DEVICE ADDRESS DIP SWITCH". CANbus cable not by Liebert. See Note 2 (below).

6) **Remote unit shutdown –** Replace exiting jumper between terminals TB38-1 and TB38-2 with field supplied normally closed switch having a minimum 75VA 24VAC rating. Use field supplied Class 1 wiring. (This is an optional feature that may be owner specified.)

7) **Alarm terminal connections –**
   - **a.** Common Alarm Relay indicates when any type of alarm occurs. TB74-1 is common, TB74-2 is normally open, and TB74-3 is normally closed. 1 Amp 24VAC is the maximum load. Use Class 1 field supplied wiring.
   - **b.** Shutdown Alarm Relay indicates when condenser loses power, or when a critical alarm has occurred that shuts down the condenser unit. TB74-4 is common, TB74-5 is normally open, and TB74-6 is normally closed. 1 Amp 24VAC is the maximum load. Use Class 1 field supplied wiring.

8) **Indoor unit interlock and SPD alarm terminals –**
   - **a.** On any call for compressor operation, normally open contact is closed across terminals 70 & 71 for Circuit 1, and normally open contact is closed across terminals 70 & 230 for Circuit 2 from indoor room unit.
   - **b.** During SPD alarm, normally open contact is closed across terminals 12 & 13. SPD is an optional device.

9) **CANbus shield terminal –** Terminal for field connection of the CANbus field supplied cables. Shield of CANbus field supplied cables must not be connected to ground.

10) **Primary low voltage entrance –** One 7/8" (22.2mm) diameter knockout that is free for customer low voltage wiring.

11) **SPD entrance –** One 7/8" (22.2mm) diameter knockout hole located at the bottom of the enclosure. High voltage surge protective device (SPD) is optional.

NOTES:

1. Refer to specification sheet for unit voltage rating, full load amp, and wire size amp ratings.
2. The CANbus wiring is field supplied and must be:
   - Braided shield or foil shield with drain wire
   - Shield must be wired to ground at indoor unit
   - 22-18AWG stranded tinned copper
   - Twisted pair (minimum 4 twists per foot)
   - Low Capacitance (15pF/FT or less)
   - Must be rated to meet local codes and conditions
   - EXAMPLES BELDEN 89207 (PLENUM RATED), OR ALPHA WIRE 6454 CATEGORY 5, 5E, OR HIGHER
3. Do not run in same conduit, raceway, or chase as high voltage wiring.
4. For CANbus network lengths greater than 450FT (137M) call Factory.

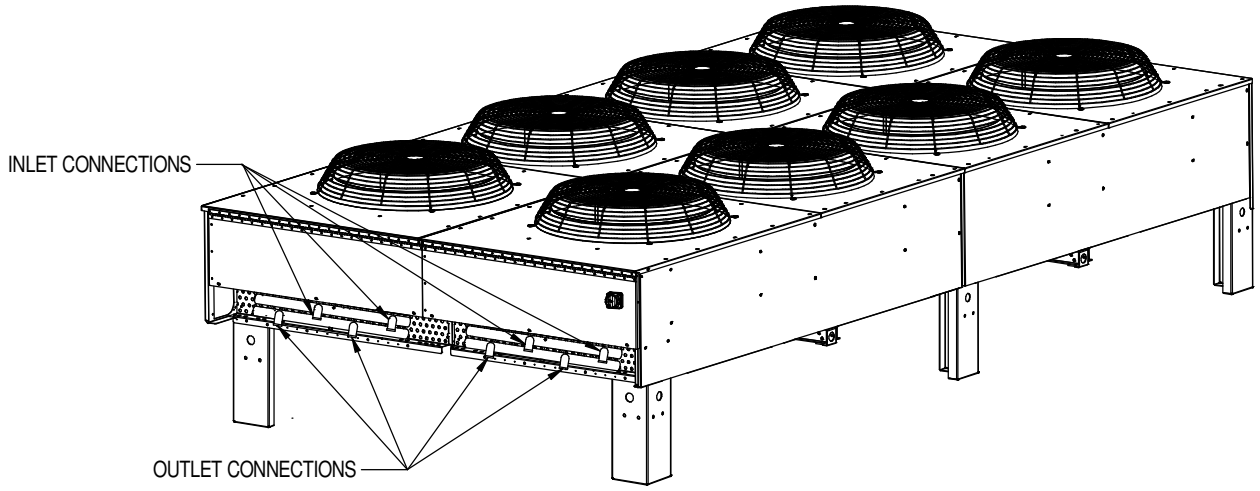
ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL WITH LEE-TEMP

5. All wiring must be sized and selected for insulation case per NEC and other local codes.
6. Do not bend cables to less than four times the diameter of the cable.
7. Do not deform cables when securing in bundles or when hanging them.
8. Avoid running the cables by devices that may introduce noise, such as machines, fluorescent lights, and electronics.
9. Avoid stretching cables.
10. The electrically commutated (EC) motors included in the Liebert MC Condenser are suitable for connection to power supplies with a solidly grounded neutral or high resistance to ground or corner ground.
    A. Acceptable power supplies for 208 to 575V nominal units:
        - 208V wye with solidly grounded neutral and 120V line to ground;
        - 380V wye with solidly grounded neutral and 220V line to ground;
        - 480V wye with solidly grounded neutral and 277V line to ground;
        - 575V wye with solidly grounded neutral and 332V line to ground (uses step-down transformer);
        - Wye with high resistance (or impedance) ground;
        - Delta with corner ground

    B. Unacceptable power supplies for 208V to 575V nominal units:
        - Delta without ground or with floating ground;
        - Delta with grounded center tap.

LIEBERT DRYCOOLER

PIPING CONNECTIONS
6 & 8 FAN QUIET-LINE MODELS



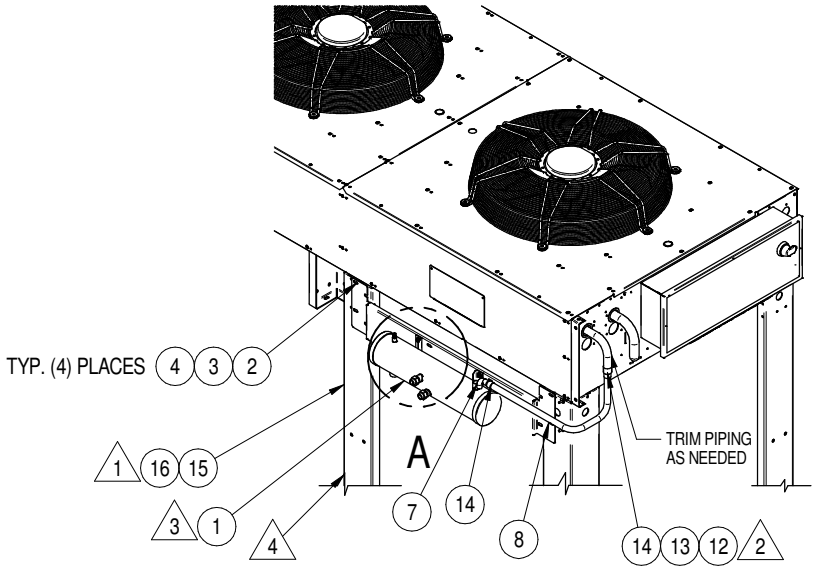
4 INLET, 4 OUTLET CONNECTIONS SHOWN SEE TABLE FOR ACTUAL NUMBER PROVIDED.

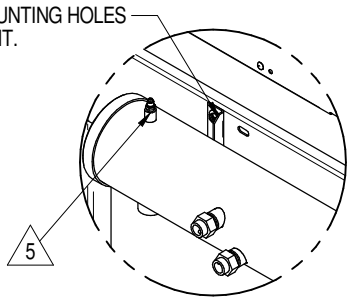
Liebert Model No.	Fan Qty.	No. of Internal Circuits	No. of Inlets & Outlets	Inlet & Outlet Connection Size (IDS, Cu)
-347	6	32	2	2-1/8"
		64*		
-356		32		
		64*		
		96	4	
-453	8	32	2	
		64*		
-498		32		
		64		
		96*	4	

* STANDARD CIRCUITING

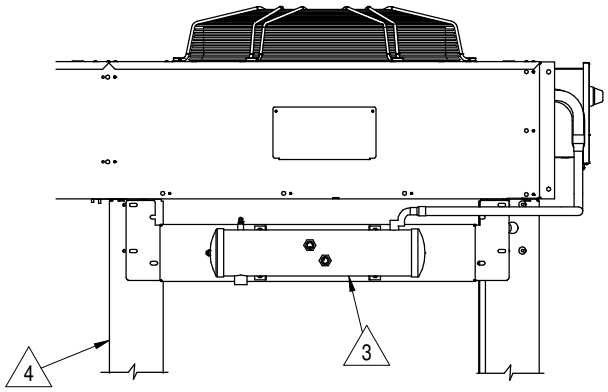
LIEBERT MC CONDENSER

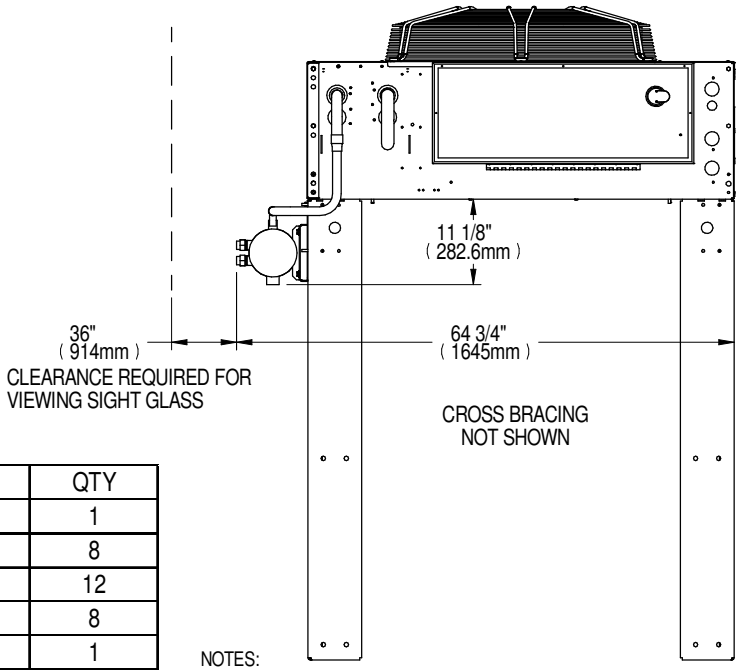
LEFT SIDE DSE & PDX-EEV RECEIVER MOUNTING KIT
MCL055, MCL110, MCL165 & MCL220 SINGLE CIRCUIT CONDENSER





DETAIL A





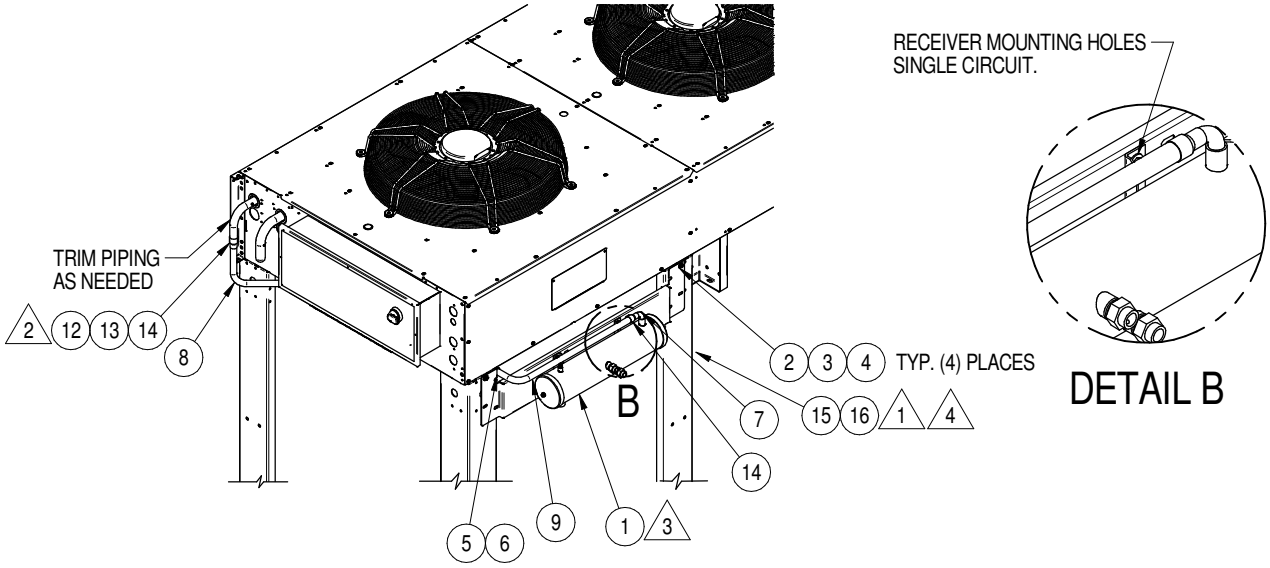
ITEM NO.	DESCRIPTION	QTY
1	RECEIVER AND BRACKET ASSEMBLY	1
2	CAP SCREW HXDIN933M8-1.25X25A2	8
3	FENDER WASHER DIN9021 M8X24 A2	12
4	LOCK NUT HEX NYL INSR M8	8
7	90° ELBOW FTGXFTG 7/8" CU	1
8	COPPER FORMED TUBE 1-1/8"	1
12	COUPLING CU 1-1/8"	1
13	REDUCER CU CXC 1-3/8"X1-1/8"	1
14	REDUCER CU CXC 1-1/8"X7/8"	2
15	SUPPORT LEG	1
16	FASTENER ASSEMBLY: CAP SCREW, LOCK WASHER, FENDER WASHER	4

NOTES:

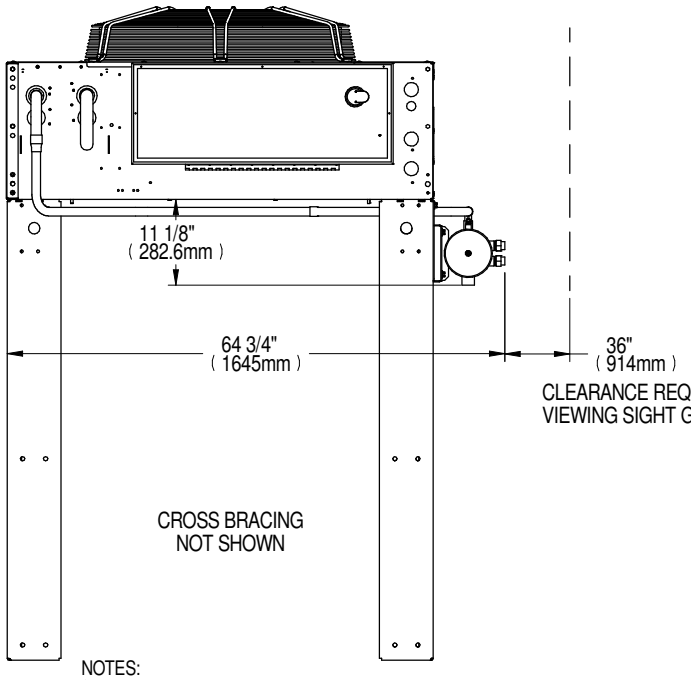
1. USE ITEMS 15 AND 16 AS NEEDED FOR MOUNTING OF ITEM 1.
2. ITEM 12 TO BE USED ON MCL110 & MCL165 UNITS.
   ITEM 13 TO BE USED ON MCL220 UNITS.
   ITEM 14 TO BE USED ON MCL055 UNITS.
3. SMALL RECEIVER SHOWN. ACTUAL RECEIVER SIZE MAY VARY.
4. RECEIVER LEG IS SAME HEIGHT AS OTHER LEGS AND NEEDS TO BE ANCHORED WITH THEM.
5. SCHRADER PORT FOR PROOF PRESSURE RELIEF ONLY & ACCESS NOT REQUIRED AFTER PIPING.

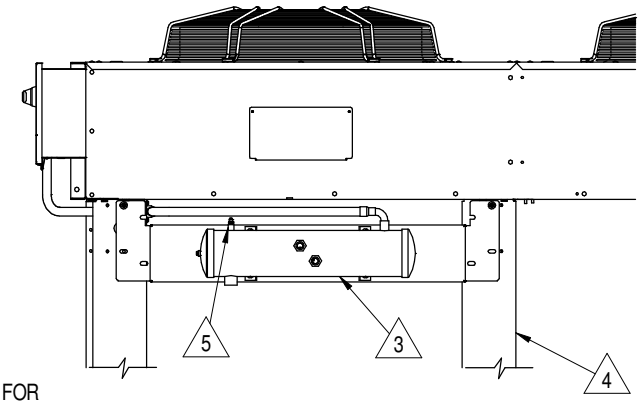
LIEBERT MC CONDENSER

RIGHT SIDE DSE & PDX-EEV RECEIVER MOUNTING KIT
MCL055, MCL110, MCL165 & MCL220 SINGLE CIRCUIT CONDENSER



DETAIL B





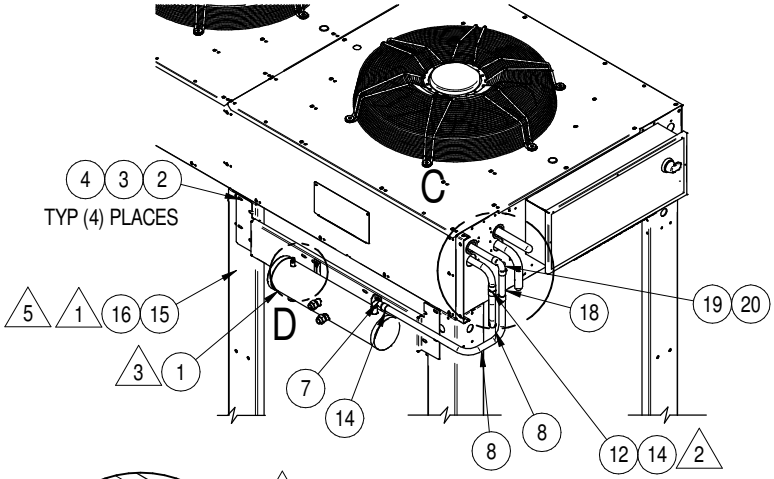
ITEM NO.	DESCRIPTION	QTY
1	RECEIVER AND BRACKET ASSEMBLY	1
2	CAP SCREW HXDIN933M8-1.25X25A2	8
3	FENDER WASHER DIN9021 M8X24 A2	12
4	LOCK NUT HEX NYL INSR M8	8
5	CLAMP OMEGA 7/8"	7
6	SCREW SD HWH YZ 10-16 X 5/8	2
7	90° ELBOW FTGXFTG 7/8" CU	1
8	COPPER FORMED TUBE 1-1/8"	1
9	COPPER FORMED TUBE 1-1/8"	2
12	COUPLING CU 1-1/8"	1
13	REDUCER CU CXC 1-3/8"X1-1/8"	1
14	REDUCER CU CXC 1-1/8"X7/8"	2
15	SUPPORT LEG	1
16	FASTENER ASSEMBLY: CAP SCREW, LOCK WASHER, FENDER WASHER	4

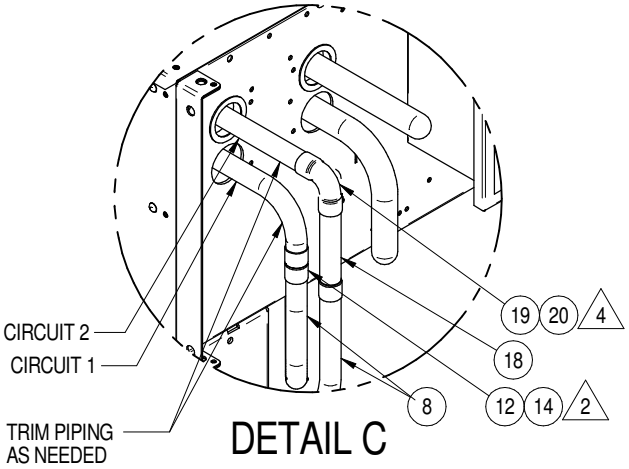
NOTES:

1. USE ITEMS 15 AND 16 AS NEEDED FOR MOUNTING OF ITEM 1.
2. ITEM 12 TO BE USED ON MCL110 & MCL165 UNITS.
   ITEM 13 TO BE USED ON MCL220 UNITS.
   ITEM 14 TO BE USED ON MCL055 UNITS.
3. SMALL RECEIVER SHOWN. ACTUAL RECEIVER SIZE MAY VARY.
4. RECEIVER LEG IS SAME HEIGHT AS OTHER LEGS AND NEEDS TO BE ANCHORED WITH THEM.
5. SCHRADER PORT FOR PROOF PRESSURE RELIEF ONLY & ACCESS NOT REQUIRED AFTER PIPING.

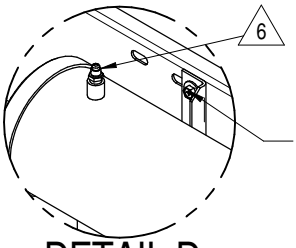
LIEBERT MC CONDENSER

DSE RECEIVER MOUNTING KITS
MCL110 & MCL220 DUAL CIRCUIT CONDENSER

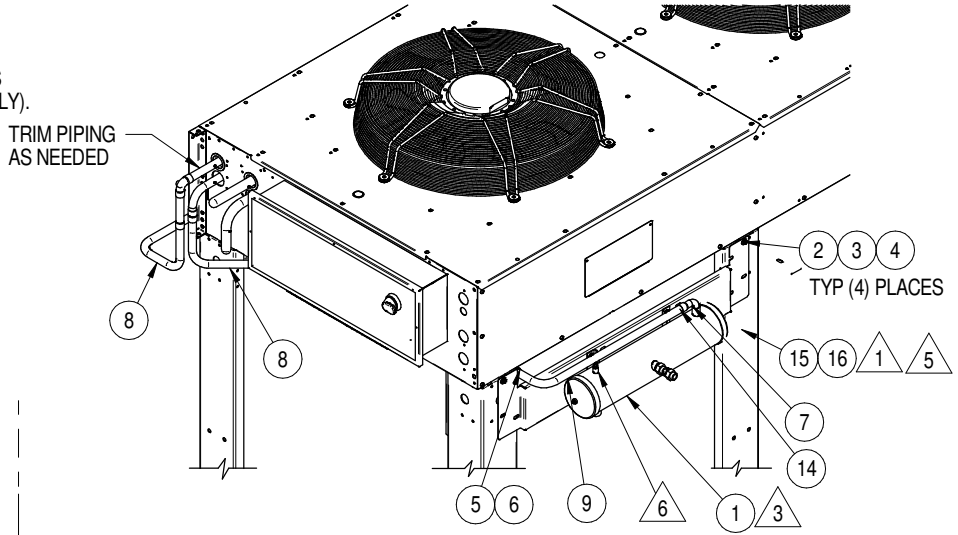


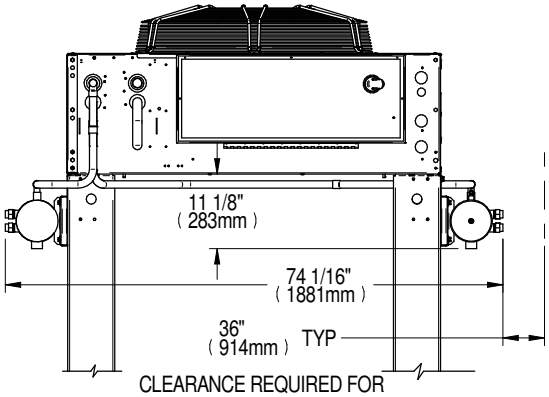


DETAIL C



DETAIL D





CLEARANCE REQUIRED FOR
VIEWING SIGHT GLASS

CROSS BRACING
NOT SHOWN

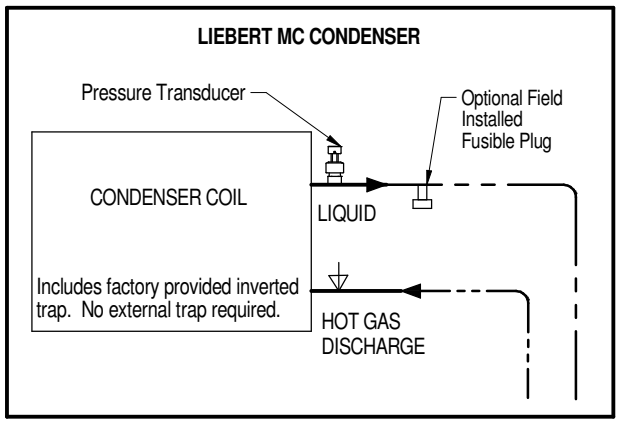
NOTES:

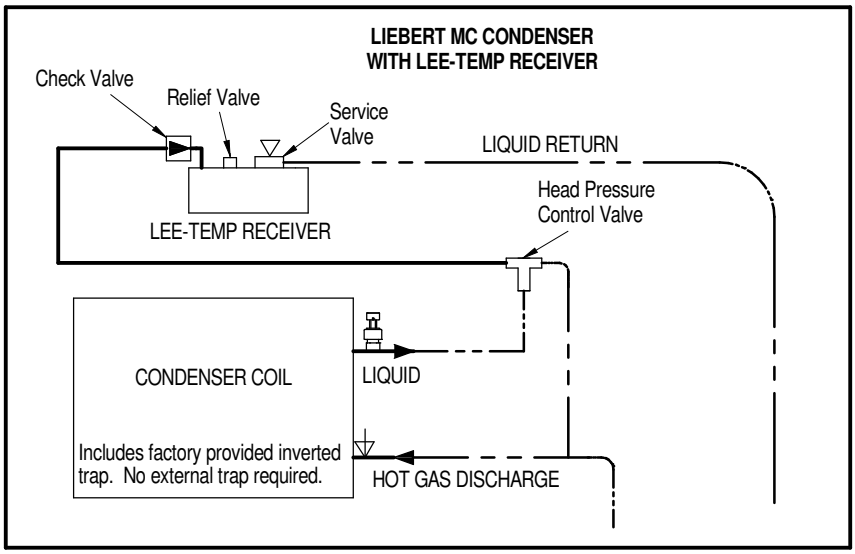
1. USE ITEMS 15 AND 16 AS NEEDED FOR MOUNTING OF ITEM 1.
2. ITEM 14 TO BE USED ON MCL110 UNITS.
   ITEM 12 TO BE USED ON MCL220 UNITS.
3. SMALL RECEIVER SHOWN. ACTUAL RECEIVER SIZE MAY VARY.
4. ITEM 20 TO BE USED ON MCL110 UNITS.
   ITEM 19 TO BE USED ON MCL220 UNITS.
5. RECEIVER LEG IS SAME HEIGHT AS OTHER LEGS AND NEEDS TO BE ANCHORED WITH THEM.
6. SCHRADER PORT FOR PROOF PRESSURE RELIEF ONLY & ACCESS NOT REQUIRED AFTER PIPING.

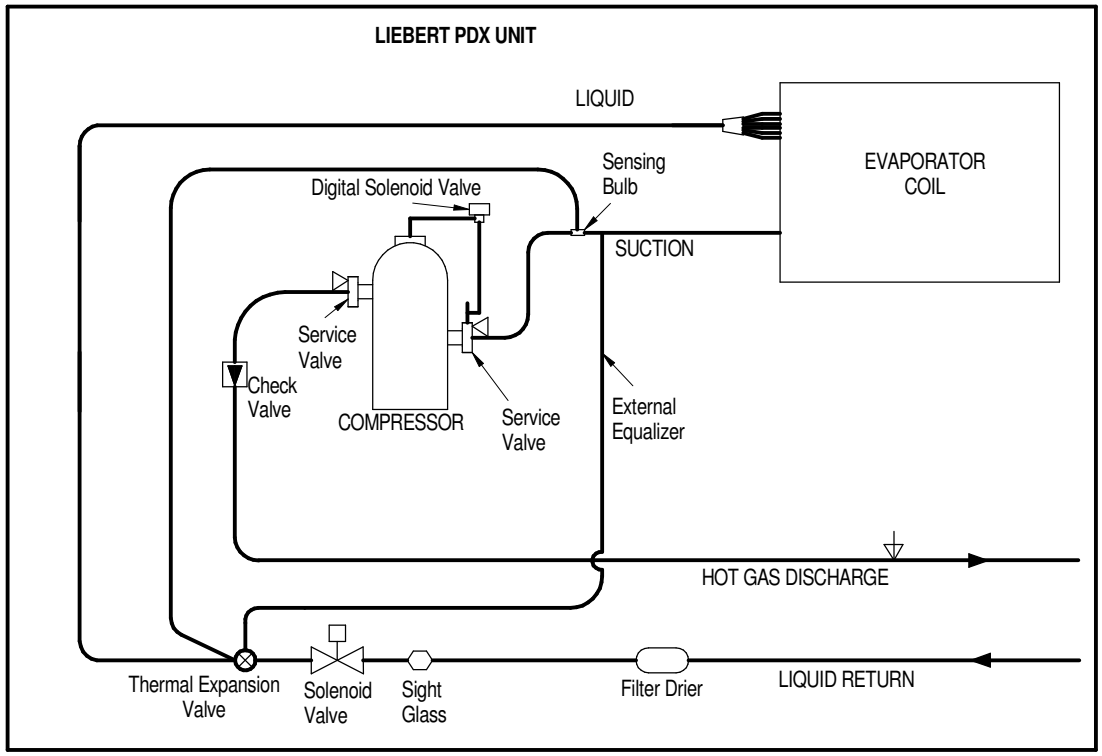
ITEM NO.	DESCRIPTION	QTY
1	RECEIVER AND BRACKET ASSEMBLY	2
2	CAP SCREW HXDIN933M8-1.25X25A2	12
3	FENDER WASHER DIN9021 M8X24 A2	20
4	LOCK NUT HEX NYL INSR M8	12
5	CLAMP OMEGA 7/8"	1
6	SCREW SD HWH YZ 10-16 X 5/8	2
7	90° ELBOW FTGXFTG 7/8" CU	2
8	COPPER FORMED TUBE 1-1/8"	2
9	COPPER FORMED TUBE 1-1/8"	1
12	COUPLING CU 1-1/8"	1
14	REDUCER CU CXC 1-1/8"X7/8"	4
15	SUPPORT LEG	2
16	FASTENER ASSEMBLY: CAP SCREW, LOCK WASHER, FENDER WASHER	8
18	COPPER TUBE 1-1/8" SWAGED	1
19	90° ELBOW CXC 1-1/8" CU	1
20	90° ELBOW CXC 1-1/8"X7/8" CU	1

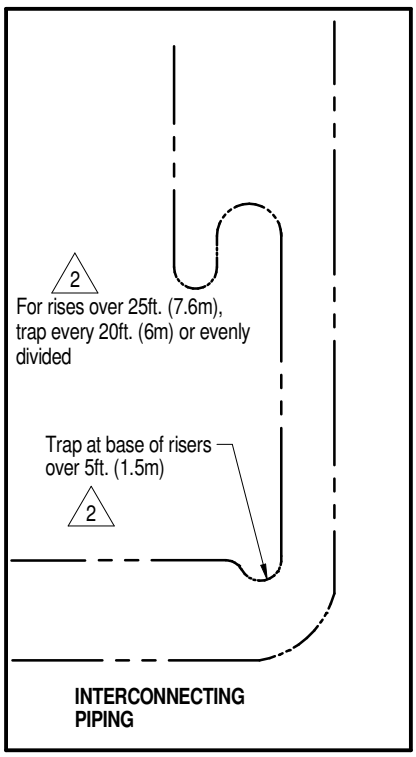
LIEBERT PDX

PIPING SCHEMATIC
AIR COOLED MODELS WITH TXV







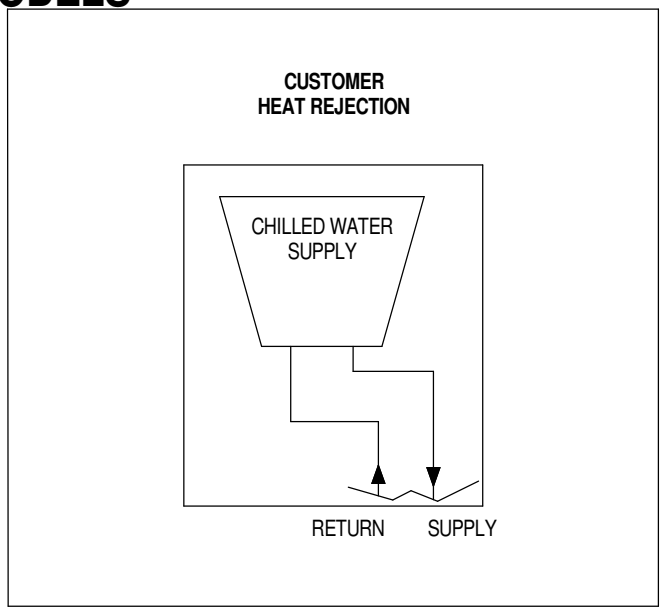


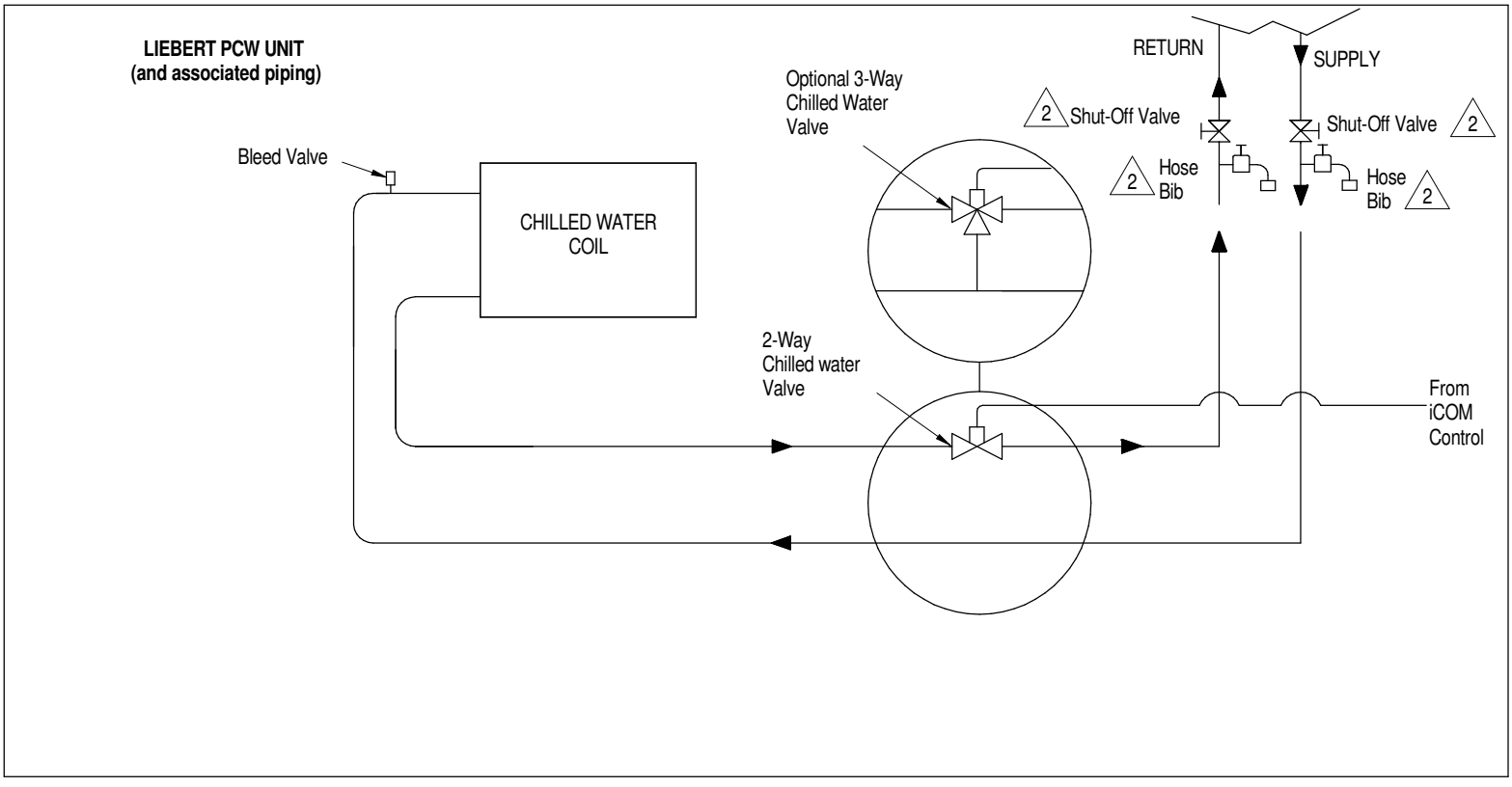
FACTORY REFRIGERANT PIPING
FIELD PIPING
SERVICE / SCHRADER (ACCESS) CONNECTION NO VALVE CORE
SERVICE / SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

Notes:
1. Schematic representation shown. Do not use for specific connection locations.
2. Components are not supplied by Liebert but are required for proper circuit operation and maintenance.
3. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid floodback to compressor. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
4. Do not isolate any refrigerant circuits from over pressurization protection.

LIEBERT PCW

PIPING SCHEMATIC
CHILLED WATER MODELS





FACTORY PIPING

FIELD PIPING

OPTIONAL FACTORY PIPING

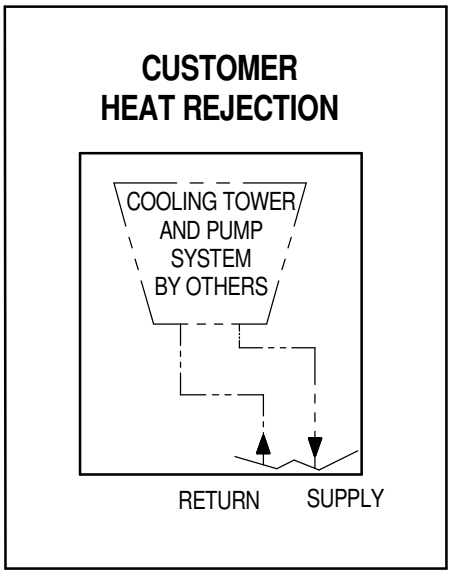
Notes:

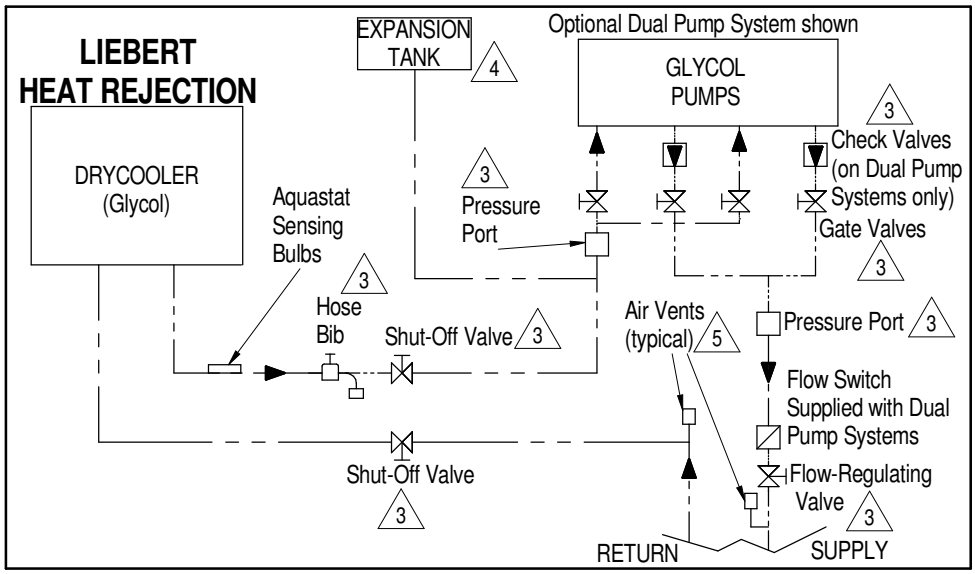
1. Schematic representation shown. This schematic does not imply or define elevations and component location, unless specifically noted.

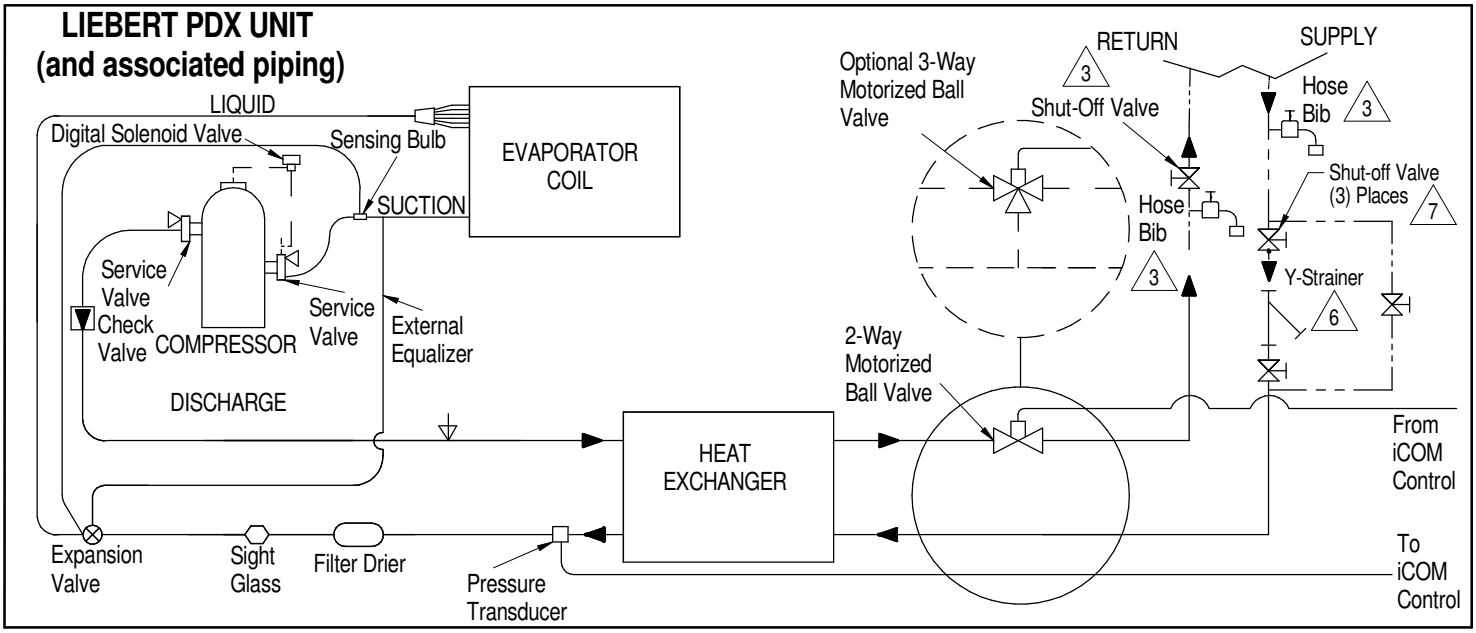
2. Components are not supplied by Liebert but are required for proper circuit operation and maintenance.

LIEBERT PDX

PIPING SCHEMATIC
WATER/GLYCOL MODELS







FACTORY PIPING

FIELD PIPING

OPTIONAL FACTORY PIPING

SERVICE / SCHRADER (ACCESS) CONNECTION NO VALVE CORE

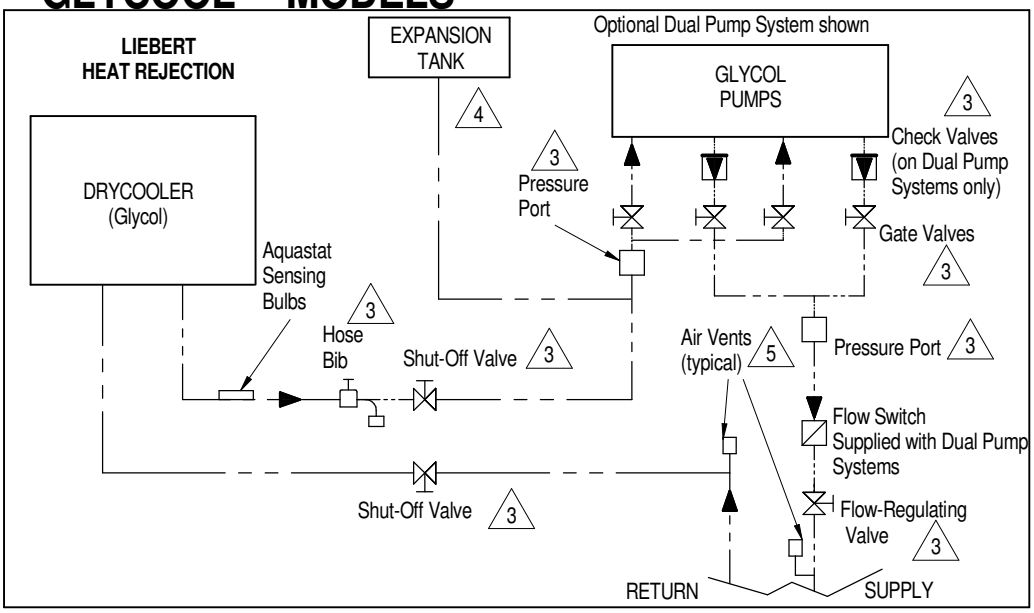
SERVICE / SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

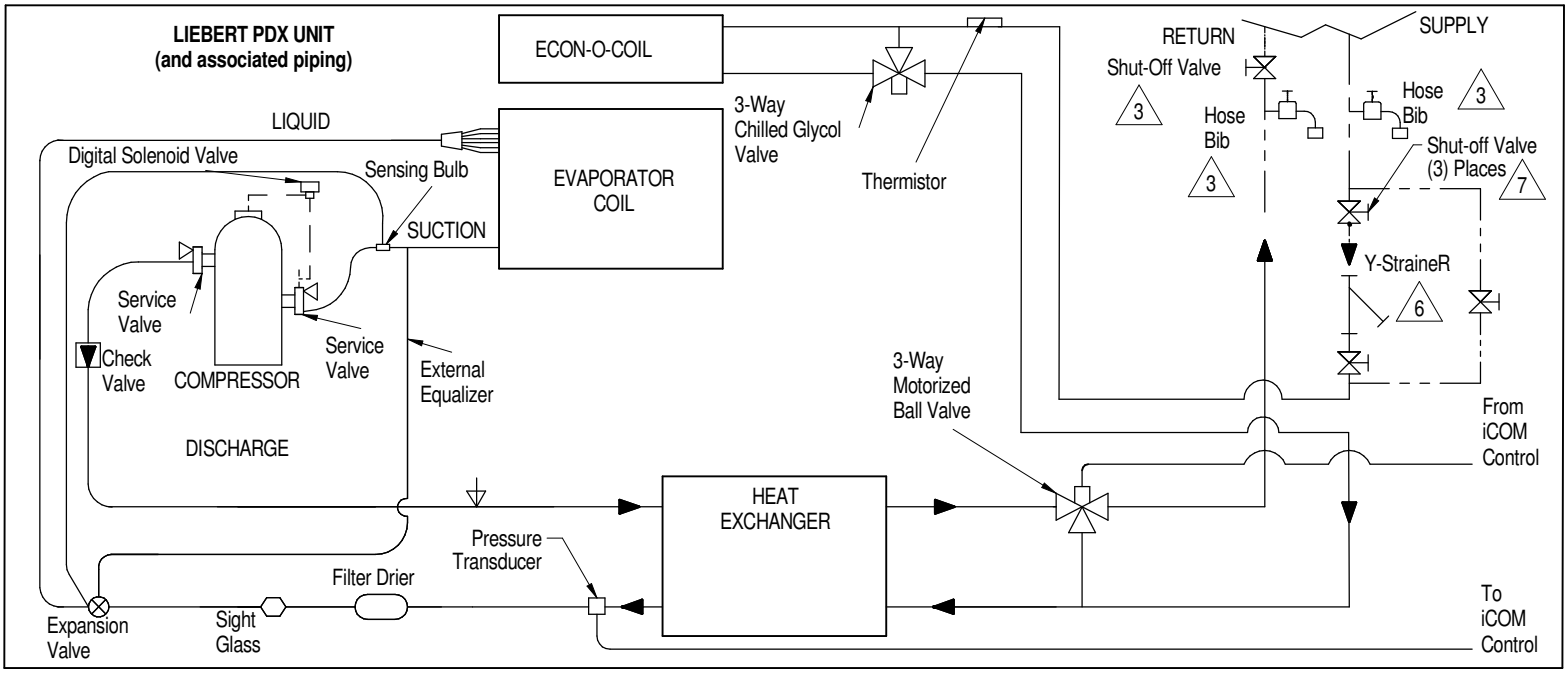
Notes:

1. Schematic representation shown. Do not use for specific connection locations.
2. Install a 20 mesh strainer, in an easily accessible location, on the water/glycol supply to prevent particles from entering the heat exchanger. Strainer bypass valves are recommended to allow the strainer to be cleaned while maintaing flow to the cooling unit.
3. Components are not supplied by Liebert.
4. Field installed at highest point in system on return line to pumps.
5. Locate at tops of all risers and any intermediate system high points.
6. Components are Liebert supplied and field installed, and are required for proper circuit operation and maintenance.
7. Component are not supplied by Liebert but are recommended for proper circuit operation and maintenance.

LIEBERT PDX

PIPING SCHEMATIC
GLYCOOL™ MODELS





FACTORY PIPING
FIELD PIPING

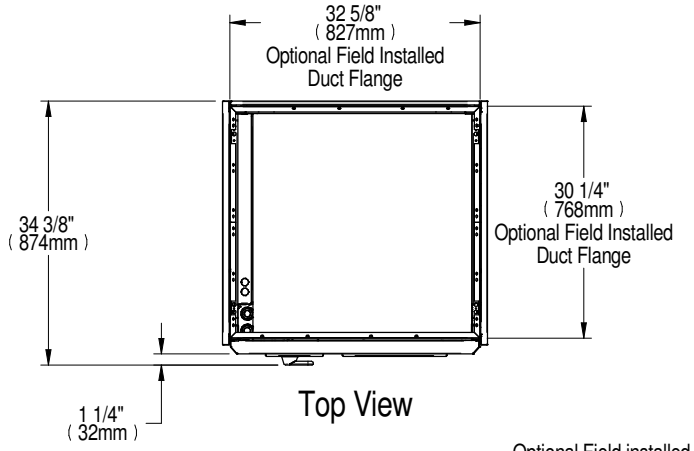
SERVICE / SCHRADER (ACCESS) CONNECTION NO VALVE CORE
SERVICE / SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

Notes:

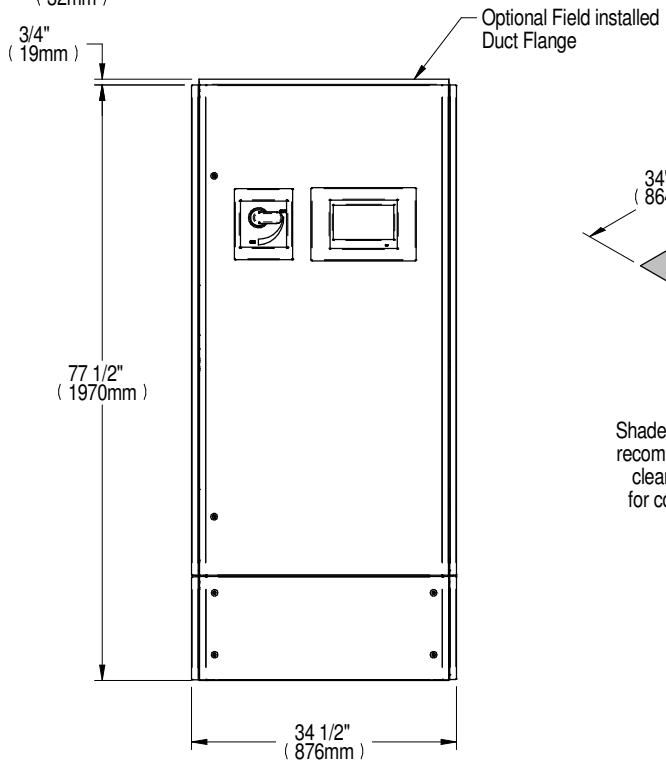
1. Schematic representation shown. Do not use for specific connection locations.
2. Install a 20 mesh strainer, in an easily accessible location, on the water/glycol supply to prevent particles from entering the heat exchanger. Strainer bypass valves are recommended to allow the strainer to be cleaned while maintaing flow to the cooling unit.
3. Components are not supplied by Liebert.
4. Field installed at highest point in system on return line to pumps.
5. Locate at tops of all risers and any intermediate system high points.
6. Components are Liebert supplied and field installed, and are required for proper circuit operation and maintenance.
7. Component are not supplied by Liebert but are recommended for proper circuit operation and maintenance.

CABINET DIMENSIONAL DATA

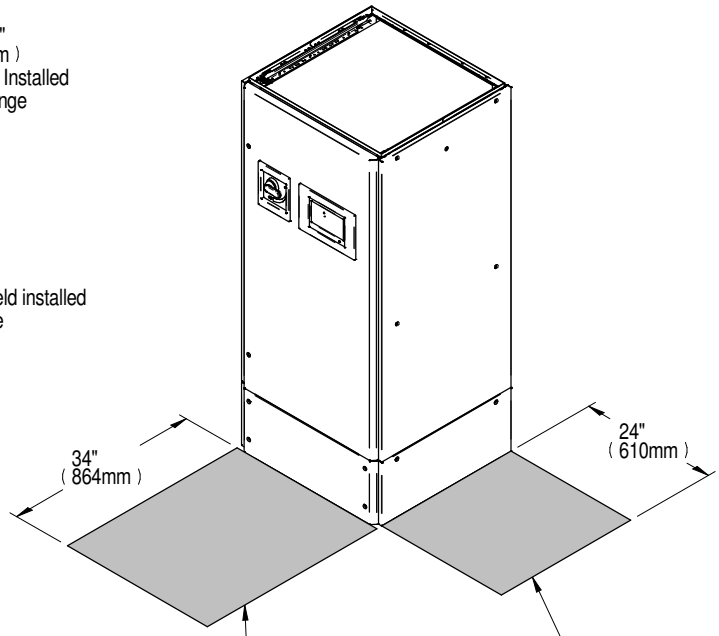
DOWNFLOW MODELS



Top View



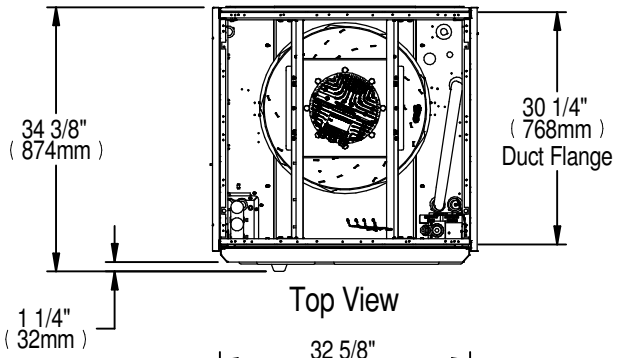
Front View



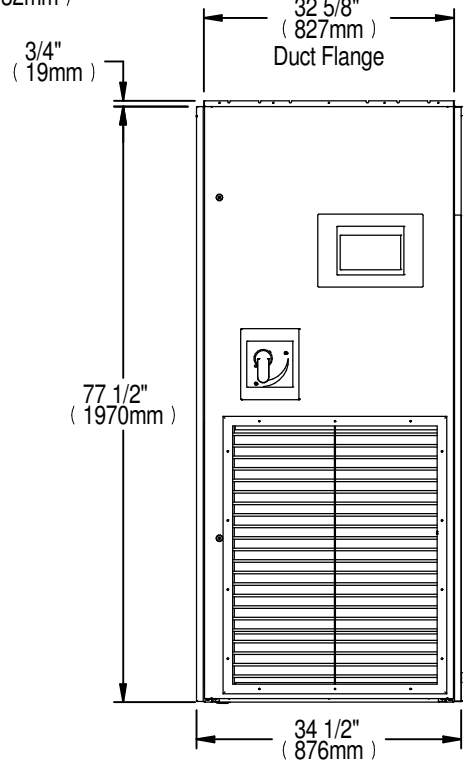
DRY WEIGHT lb (kg) APPROXIMATE			
Liebert PDX Model No.	**PX011**	**PX018-023**	**PX029**
Air Cooled	600 (272)	670 (304)	700 (317)
Air Cooled w/dual cool	700 (317)	750 (340)	790 (358)
Water/Glycol	620 (281)	690 (313)	720 (327)
GLYCOOL™ or Water/Glycol w/dual cool	720 (327)	770 (349)	810 (367)
Liebert PCW Model No.	**PW011**	**PW017**	**PW029**
Chilled Water	575 (260)	600 (272)	650 (294)

LIEBERT PDX & PCW

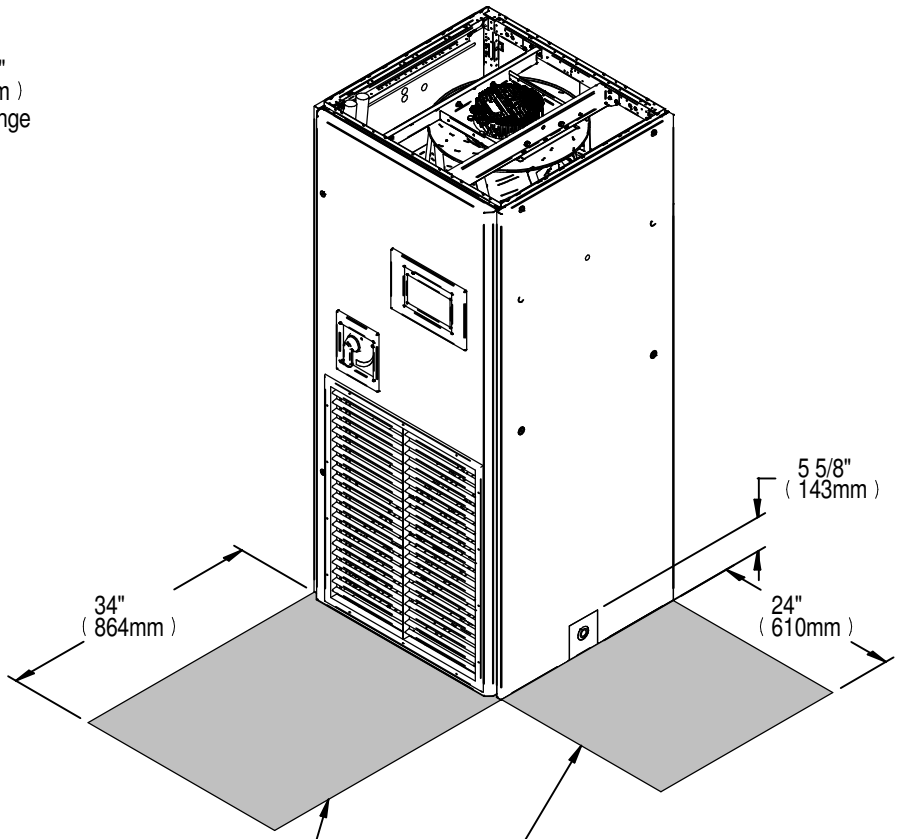
CABINET DIMENSIONAL DATA
UPFLOW MODELS



Top View



Front View



Shaded area indicates a recommended minimum clearance be provided for component access.

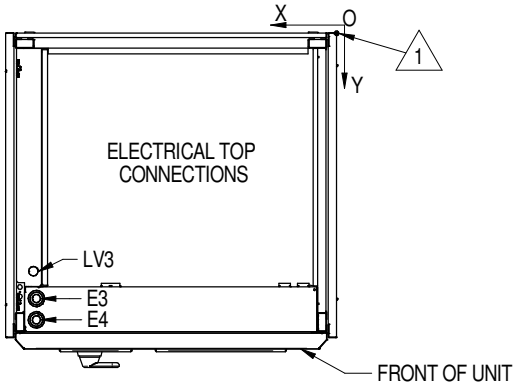
Recommended Clearance for unit installation and for servicing these components if equipped: Reheat, Filter Clog Switch, Econ-O-Coil Valve, or Gravity Drain Connections.

DRY WEIGHT lb (kg) APPROXIMATE			
Liebert PDX Model No.	**PX011**	**PX018-023**	**PX029**
Air Cooled	600 (272)	670 (304)	700 (317)
Air Cooled w/dual cool	700 (317)	750 (340)	790 (358)
Water/Glycol	620 (281)	690 (313)	720 (327)
GLYCOOL™ or Water/Glycol w/dual cool	720 (327)	770 (349)	810 (367)
Liebert PCW Model No.	**PW011**	**PW017**	**PW029**
Chilled Water	575 (260)	600 (272)	650 (294)

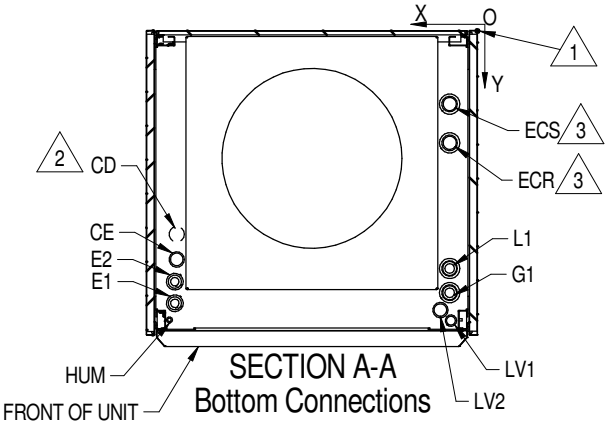
Note: Unit with front return shown. Bottom return with rear return floorstand is also available (24" height rear return floorstand is required for use with bottom return unit).

LIEBERT PDX

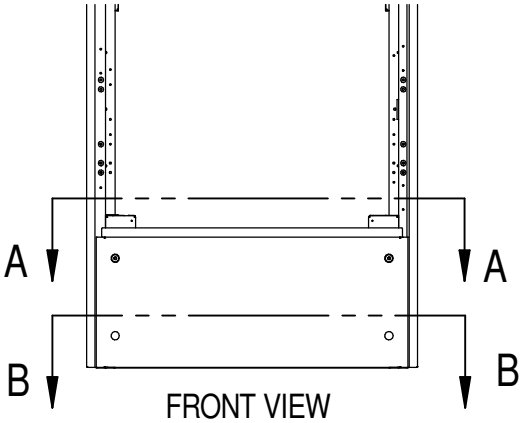
PRIMARY CONNECTION LOCATIONS
DOWNFLOW AIR COOLED MODELS



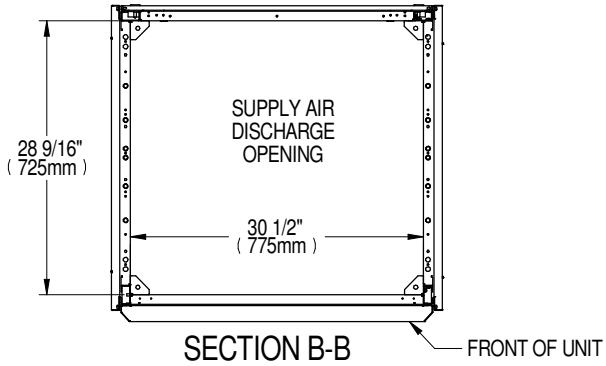
TOP VIEW



SECTION A-A
Bottom Connections



FRONT VIEW



SECTION B-B

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING		
				PX011	PX018, PX023	PX029
L1	LIQUID LINE SYSTEM	2-7/8 (73)	24-3/4 (629)	3/8"	1/2"	5/8"
G1	HOT GAS DISCHARGE		27-3/8 (695)	1/2"	5/8"	7/8"
CD △2	CONDENSATE DRAIN	31-1/2 (800)	21-1/4 (540)	3/4" NPT FEMALE		
CE	CONDENSATE ELECTRICAL		24 (610)	1-1/2"		
HUM	HUMIDIFIER SUPPLY LINE	32 (813)	30-1/8 (765)	1/4"		
ECS △3	ECON-O-COIL SUPPLY	2-7/8 (73)	7-5/8 (194)	7/8"	1-1/8"	
ECR △3	ECON-O-COIL RETURN		11-3/4 (298)			
E1	ELECTRICAL CONN. (HIGH VOLT) BOTTOM	31-1/2 (800)	28-3/8 (721)	7/8", 1-3/8", 1-3/4"		
E2	ELECTRICAL CONN. (HIGH VOLT) BOTTOM		26-1/8 (664)			
E3	ELECTRICAL CONN. (HIGH VOLT) TOP	31-1/4 (793)	27-5/8 (701)			
E4	ELECTRICAL CONN. (HIGH VOLT) TOP		29-7/8 (758)			
LV1	ELECTRICAL CONN. (LOW VOLT) BOTTOM	2-3/4 (70)	30-1/8 (765)	1-1/8"		
LV2	ELECTRICAL CONN. (LOW VOLT) BOTTOM	3-1/2 (89)	29 (737)	1-1/2"		
LV3	ELECTRICAL CONN. (LOW VOLT) TOP	31-5/8 (803)	24-7/8 (632)	1"		

Notes:

△1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).

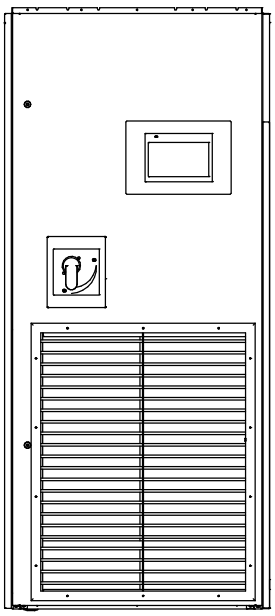
△2. Field pitch Condensate drain line a minimum of 1/8" (3mm) per 12" (305mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with local codes.

△3. Supplied on Dual Cooling Systems only (4 pipe system).

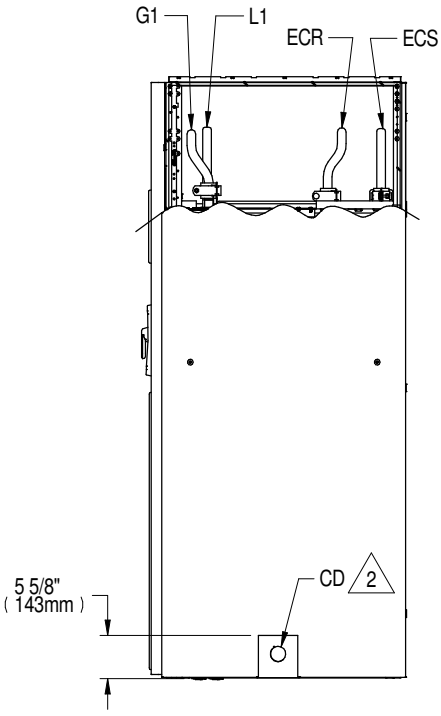
4. All refrigerant & water piping connections are O.D. Copper except as noted.

LIEBERT PDX

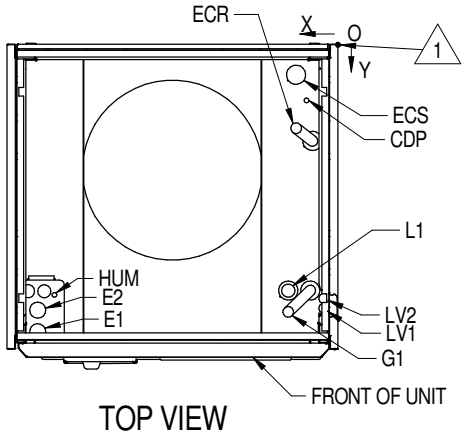
PRIMARY CONNECTION LOCATIONS
UPFLOW AIR COOLED MODELS



FRONT VIEW



RIGHT SIDE VIEW



TOP VIEW

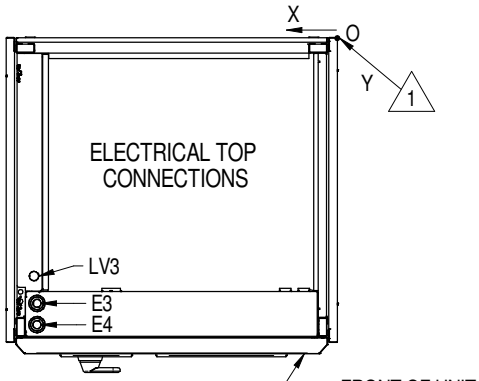
POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	Z in. (mm)	CONNECTION SIZE in.		
					PX011	PX018, PX023	PX029
L1	LIQUID LINE SYSTEM	5-1/8 (130)	25-5/8 (651)	N/A	3/8	1/2	5/8
G1	HOT GAS DISCHARGE		27-7/8 (708)		1/2	5/8	7/8
CD	CONDENSATE DRAIN 2	N/A	16-5/8 (422)	3-1/8 (89)	3/4 NPT FEMALE		
CDP	CONDENSATE DRAIN WITH PUMP	3-1/4 (83)	5-7/8 (149)	N/A	1/2		
HUM	HUMIDIFIER SUPPLY LINE	29-1/2 (749)	26 (660)		1/4		
ECS	ECON-O-COIL SUPPLY 3	4-1/4 (108)	3-1/4 (83)		7/8	1-1/8	
ECR	ECON-O-COIL RETURN 3		8-1/4(210)				
E1	ELECTRICAL CONN. (HIGH VOLT)	31-1/4 (794)	30 (762)		7/8, 1-3/8, 1-3/4 6		
E2	ELECTRICAL CONN. (HIGH VOLT)		27-3/4 (705)				
LV1	ELECTRICAL CONN. (LOW VOLT)	1-1/2 (38)	27-1/2 (699)		1		
LV2	ELECTRICAL CONN. (LOW VOLT)		26-1/2 (673)				

Notes:

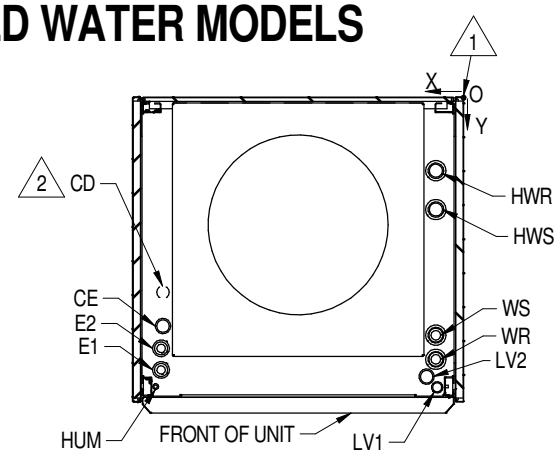
1. Drawing not to scale. All dimensions from rear corner of unit including panels and have a tolerance of ± 1/2" (13mm).
2. Field pitch Condensate drain line a minimum of 1/8" (3mm) per 12" (305mm) All units contain a factory installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials The drain line must comply with local codes.
3. Supplied on Dual Cooling Systems only.
4. Unit with front return shown. Bottom return with rear return floorstand also available.
5. All refrigerant & water piping connections are O.D. Copper except as noted.
6. Concentric knockouts to be used based on field supplied conduit diameter.

LIEBERT PCW

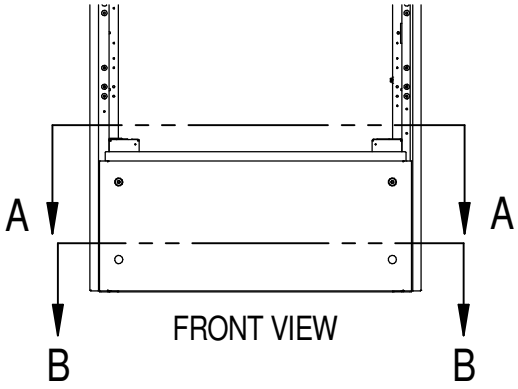
PRIMARY CONNECTION LOCATIONS
DOWNFLOW CHILLED WATER MODELS



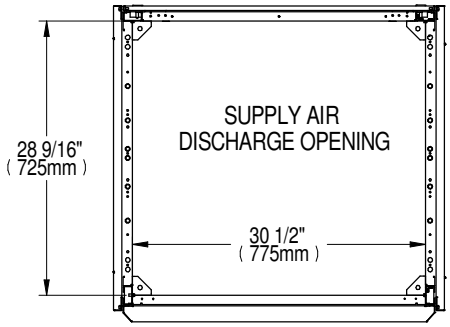
TOP VIEW



SECTION A-A
BOTTOM CONNECTIONS



FRONT VIEW



SECTION B-B

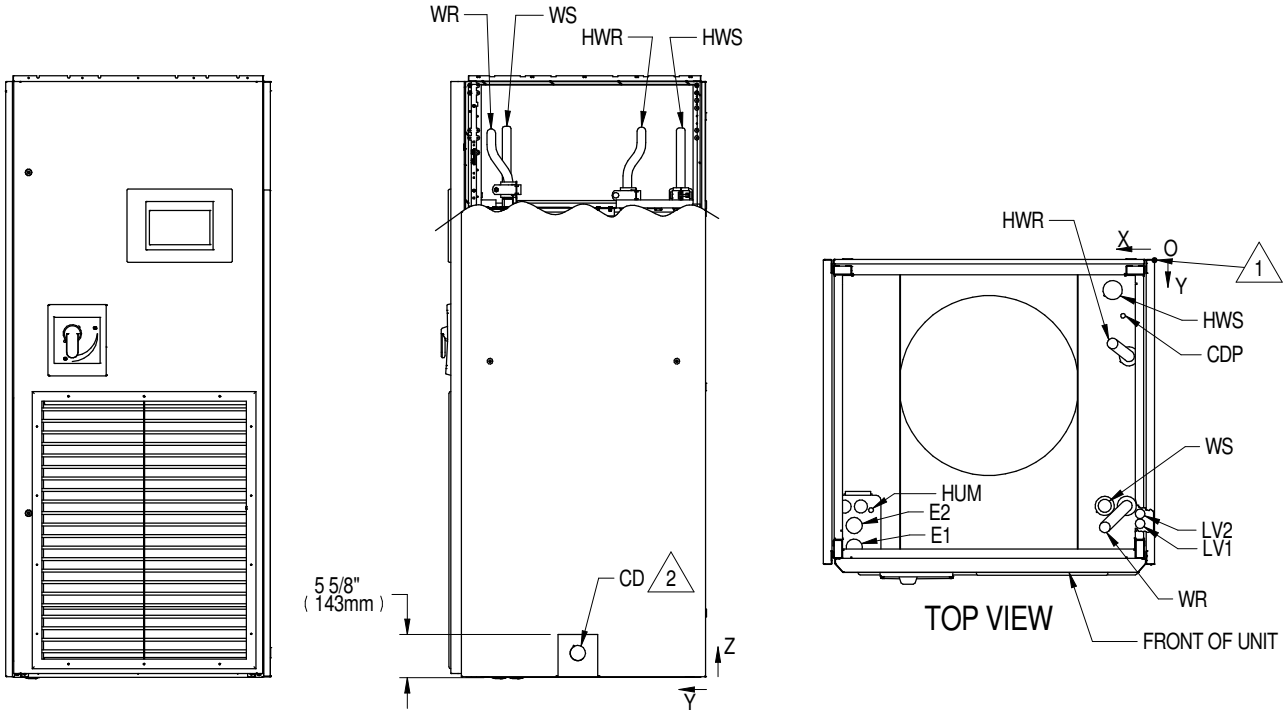
POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
HWR	HOT WATER REHEAT RETURN (OPTIONAL)	2-7/8 (73)	7-5/8 (194)	5/8"
HWS	HOT WATER REHEAT SUPPLY (OPTIONAL)		11-3/4 (298)	
WS	WATER SUPPLY		24-3/4 (629)	1-1/8"
WR	WATER RETURN		27-3/8 (695)	
CD 2	CONDENSATE DRAIN	31-1/2 (800)	21-1/4 (540)	3/4" NPT FEMALE
CE	CONDENSATE ELECTRICAL		24 (610)	1-1/2"
HUM	HUMIDIFIER SUPPLY LINE	32 (813)	30-1/8 (765)	1/4"
E1	ELECTRICAL CONN. (HIGH VOLT) BOTTOM	31-1/2 (800)	28-3/8 (721)	7/8", 1-3/8", 1-3/4"
E2	ELECTRICAL CONN. (HIGH VOLT) BOTTOM		26-1/8 (664)	
E3	ELECTRICAL CONN. (HIGH VOLT) TOP	31-1/4 (793)	27-5/8 (701)	
E4	ELECTRICAL CONN. (HIGH VOLT) TOP		29-7/8 (758)	
LV1	ELECTRICAL CONN. (LOW VOLT) BOTTOM	2-3/4 (70)	30-1/8 (765)	1-1/8"
LV2	ELECTRICAL CONN. (LOW VOLT) BOTTOM	3-1/2 (89)	29 (737)	1-1/2"
LV3	ELECTRICAL CONN. (LOW VOLT) TOP	31-5/8 (803)	24-7/8 (632)	1"

Note:

1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field pitch Condensate drain line a minimum of 1/8" (3mm) per 12" (305mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with local codes.
3. All water piping is O.D. Copper except as noted.

LIEBERT PCW

PRIMARY CONNECTION LOCATIONS
UPFLOW CHILLED WATER MODELS



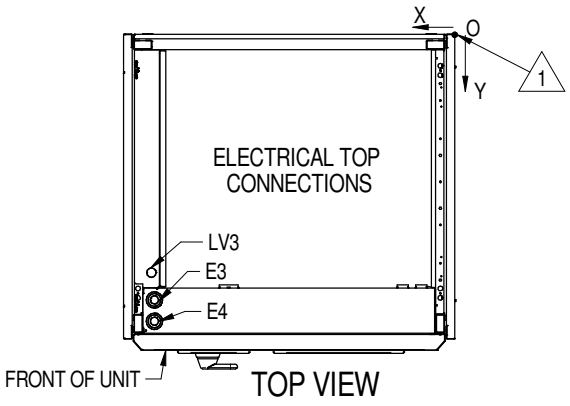
RIGHT SIDE VIEW

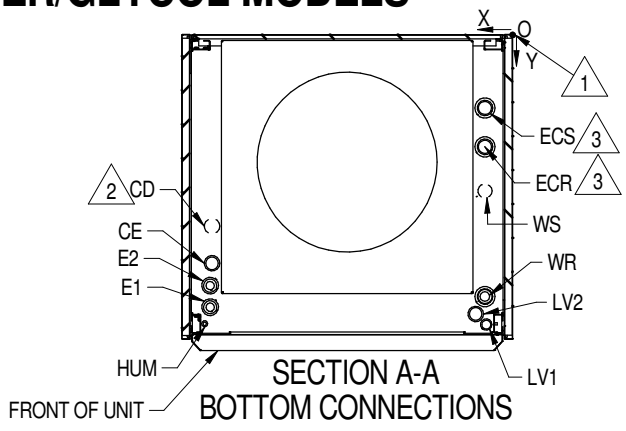
POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	Z in. (mm)	CONNECTION SIZE in.
WS	WATER SUPPLY	5-1/8 (130)	25-5/8 (651)	N/A	1-1/8
WR	WATER RETURN		27-7/8(708)		
HWR	HOT WATER REHEAT RETURN (OPTIONAL)	4-1/4 (108)	8-1/4 (210)		5/8
HWS	HOT WATER REHEAT SUPPLY (OPTIONAL)		3-1/4 (83)		
CD	CONDENSATE DRAIN 2	N/A	16-5/8 (422)	3-1/8 (89)	3/4 NPT FEMALE
CDP	CONDENSATE DRAIN WITH PUMP	3-1/4 (83)	5-7/8 (149)	N/A	1/2
HUM	HUMIDIFIER SUPPLY LINE	29-1/2 (749)	26 (660)		1/4
E1	ELECTRICAL CONN. (HIGH VOLT)	31-1/4 (794)	30 (762)		7/8, 1-3/8, 1-3/4 5
E2	ELECTRICAL CONN. (HIGH VOLT)		27-3/4 (705)		
LV1	ELECTRICAL CONN. (LOW VOLT)	1-1/2 (38)	27-1/2 (699)		1
LV2	ELECTRICAL CONN. (LOW VOLT)		26-1/2 (673)		

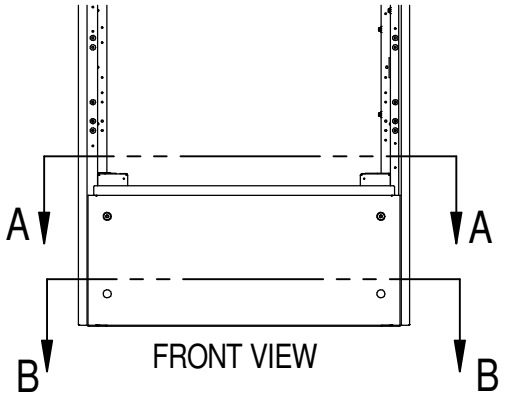
Notes:

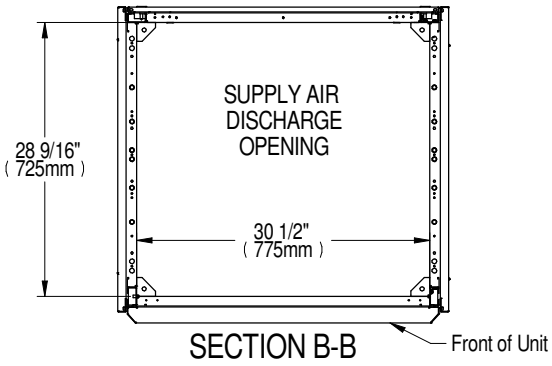
1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field pitch Condensate drain line a minimum of 1/8" (3mm) per 12" (305mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with local codes.
3. Unit with front return shown. Bottom return with rear return floorstand also available.
4. All water piping is O.D. Copper except as noted.
5. Concentric knockouts to be used based on field supplied conduit diameter.

PRIMARY CONNECTION LOCATIONS
DOWNFLOW WATER/GLYCOL MODELS









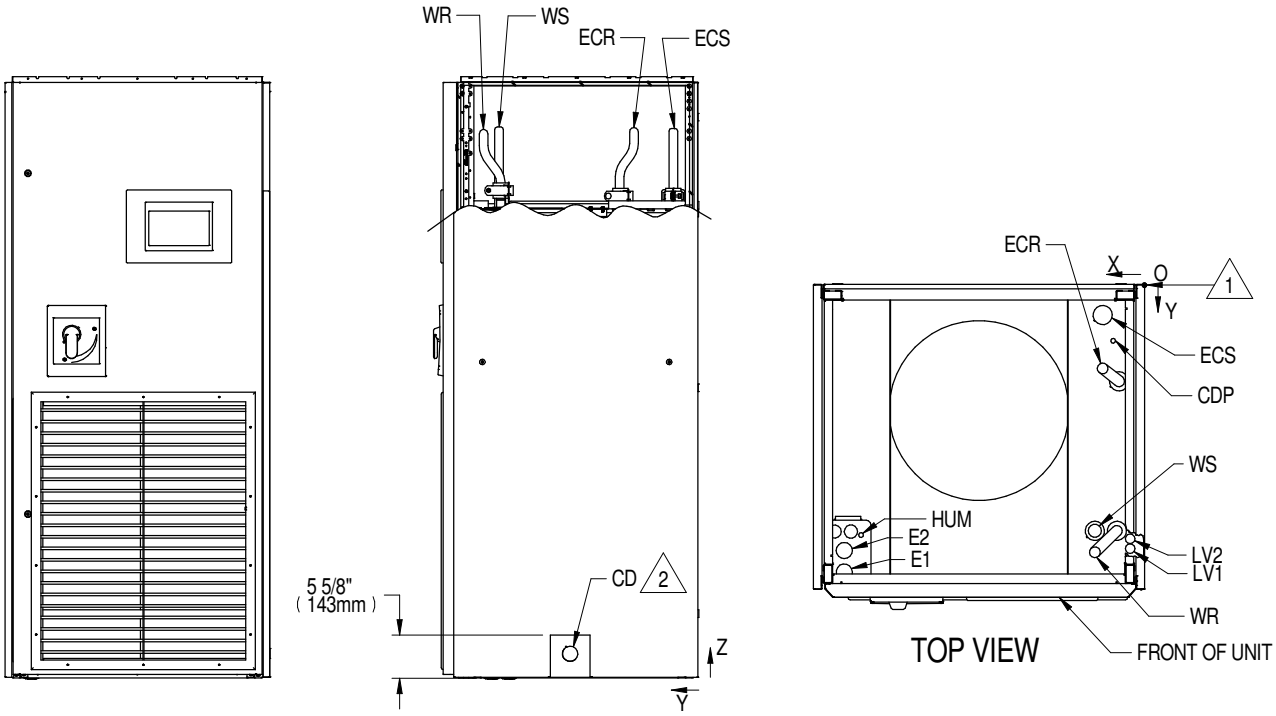
POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING	
				PX011	PX018-PX029
WS	WATER/GLYCOL SUPPLY	2-7/8 (73)	16-1/4 (413)	7/8"	1-1/8"
WR	WATER/GLYCOL RETURN		27-3/8 (695)		
CD 2	CONDENSATE DRAIN	31-1/2 (800)	21-1/4 (540)	3/4" NPT FEMALE	
CE	CONDENSATE ELECTRICAL		24 (610)	1-1/2"	
HUM	HUMIDIFIER SUPPLY LINE	32 (813)	30-1/8 (765)	1/4"	
ECS 3	ECON-O-COIL SUPPLY	2-7/8 (73)	7-5/8 (194)	7/8"	1-1/8"
ECR 3	ECON-O-COIL RETURN		11-3/4 (298)		
E1	ELECTRICAL CONN. (HIGH VOLT) BOTTOM	31-1/2 (800)	28-3/8 (721)	7/8", 1-3/8", 1-3/4"	
E2	ELECTRICAL CONN. (HIGH VOLT) BOTTOM		26-1/8 (664)		
E3	ELECTRICAL CONN. (HIGH VOLT) TOP	31-1/4 (793)	27-5/8 (701)		
E4	ELECTRICAL CONN. (HIGH VOLT) TOP		29-7/8 (758)		
LV1	ELECTRICAL CONN. (LOW VOLT) BOTTOM	2-3/4 (70)	30-1/8 (765)	1-1/8"	
LV2	ELECTRICAL CONN. (LOW VOLT) BOTTOM	3-1/2 (89)	29 (737)	1-1/2"	
LV3	ELECTRICAL CONN. (LOW VOLT) TOP	31-5/8 (803)	24-7/8 (632)	1"	

Notes:

1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field pitch Condensate drain line a minimum of 1/8" (3mm) per 12" (305mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with local codes.
3. Supplied on Dual Cooling Systems only (4 pipe system).
4. All water piping is O.D. Copper except as noted.

LIEBERT PDX

PRIMARY CONNECTION LOCATIONS
UPFLOW WATER/GLYCOL MODELS



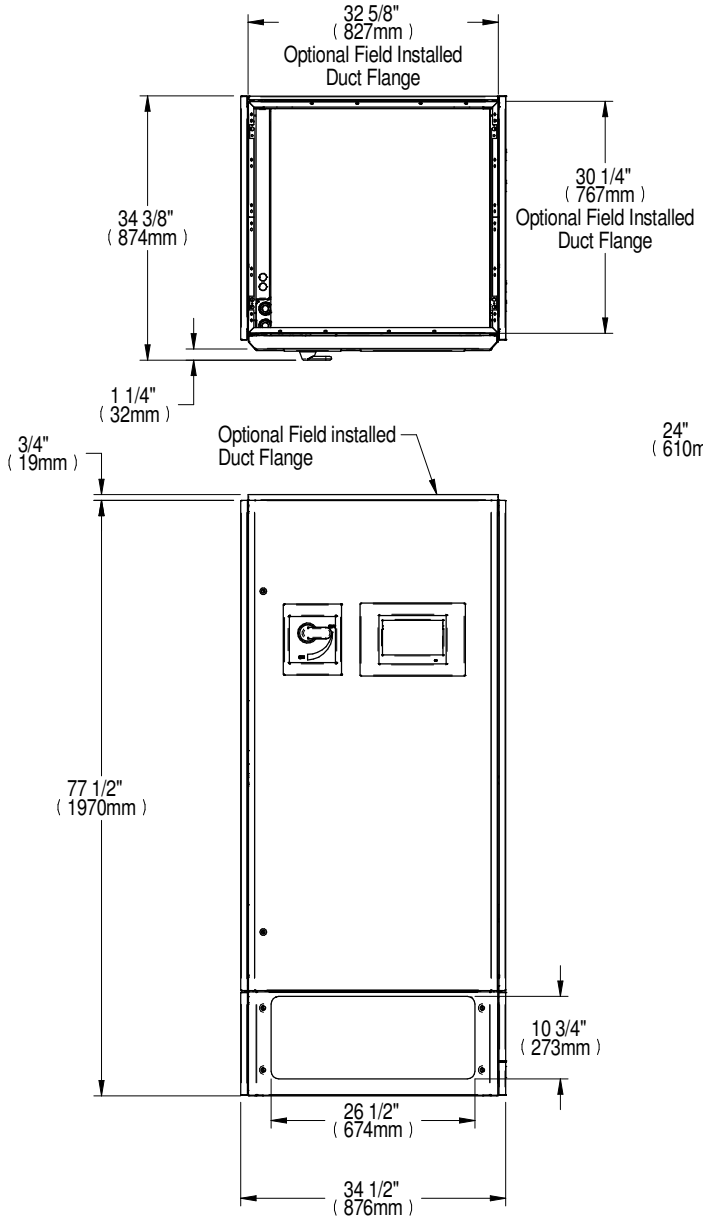
POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	Z in. (mm)	CONNECTION SIZE in.	
					PX011	PX018-PX029
WS	WATER/GLYCOL SUPPLY	5-1/8 (130)	25-5/8 (651)	N/A	7/8	1-1/8
WR	WATER/GLYCOL RETURN		27-7/8 (708)			
CD	CONDENSATE DRAIN 2	N/A	16-5/8 (422)	3-1/8 (89)	3/4 NPT FEMALE	
CDP	CONDENSATE DRAIN WITH PUMP	3-1/4 (83)	5-7/8 (149)	N/A	1/2	
HUM	HUMIDIFIER SUPPLY LINE	29-1/2 (749)	26 (660)		1/4	
ECS	ECON-O-COIL SUPPLY 3	4-1/4 (108)	3-1/4 (83)		7/8	1-1/8
ECR	ECON-O-COIL RETURN 3		8-1/4(210)			
E1	ELECTRICAL CONN. (HIGH VOLT)	31-1/4 (794)	30 (762)		7/8, 1-3/8, 1-3/4 6	
E2	ELECTRICAL CONN. (HIGH VOLT)		27-3/4 (705)			
LV1	ELECTRICAL CONN. (LOW VOLT)	1-1/2 (38)	27-1/2 (699)		1	
LV2	ELECTRICAL CONN. (LOW VOLT)		26-1/2 (673)			

Notes:

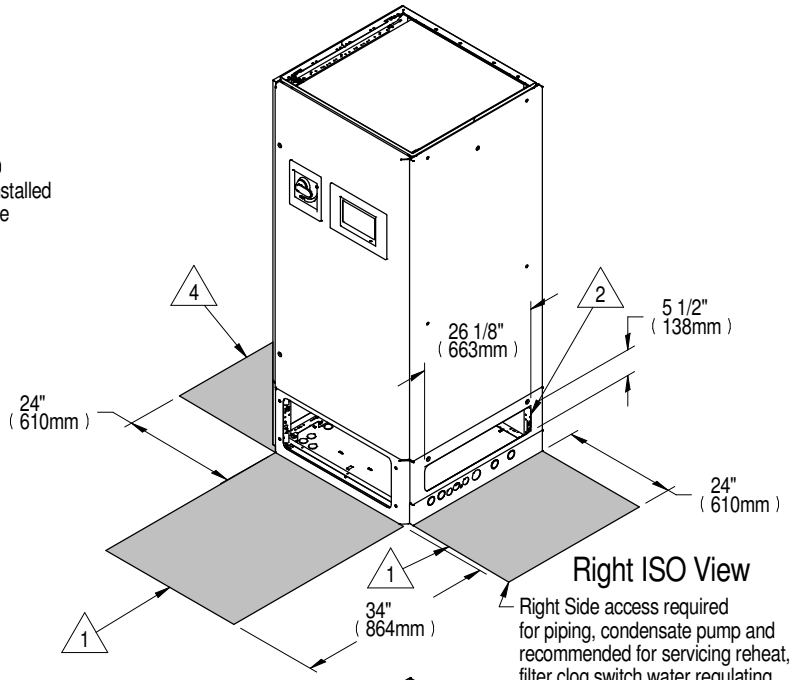
1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field pitch Condensate drain line a minimum of 1/8" (3mm) per 12" (305mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with local codes.
3. Supplied on Dual Cooling Systems only (4 pipe system)
4. Unit with front return shown. Bottom return with rear return floorstand also available.
5. All water piping is O.D. Copper except as noted.
6. Concentric knockouts to be used based on field supplied conduit diameter.

LIEBERT PDX/PCW

CABINET DIMENSIONAL DATA
DOWNFLOW FLOOR LEVEL DISCHARGE MODELS

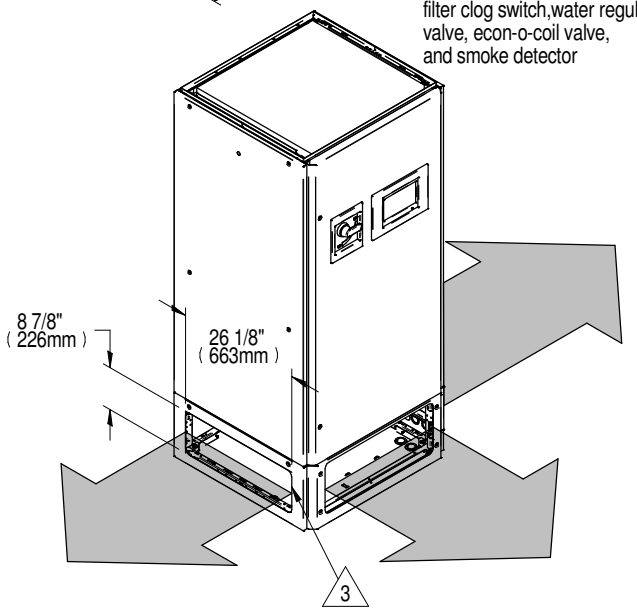


Front View



Right ISO View

Right Side access required for piping, condensate pump and recommended for servicing reheat, filter clog switch,water regulating valve, econ-o-coil valve, and smoke detector



Left ISO View

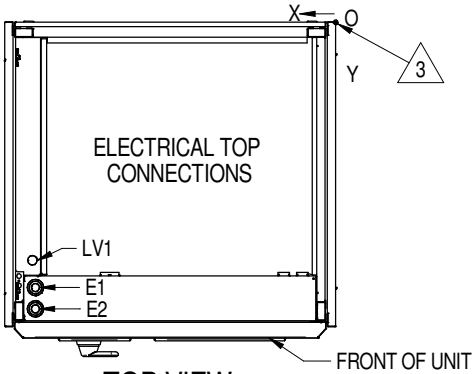
DRY WEIGHT lb (kg) APPROXIMATE			
Liebert PDX Model No.	**PX011**	**PX018-023**	**PX029**
Air Cooled	600 (272)	670 (304)	700 (317)
Air Cooled w/dual cool	700 (317)	750 (340)	790 (358)
Water/Glycol	620 (281)	690 (313)	720 (327)
GLYCOOL™ or Water/Glycol w/dual cool	720 (326)	770 (349)	810 (367)
Liebert PCW Model No.	**PW011**	**PW017**	**PW029**
Chilled Water	575 (260)	600 (272)	650 (294)

Notes:

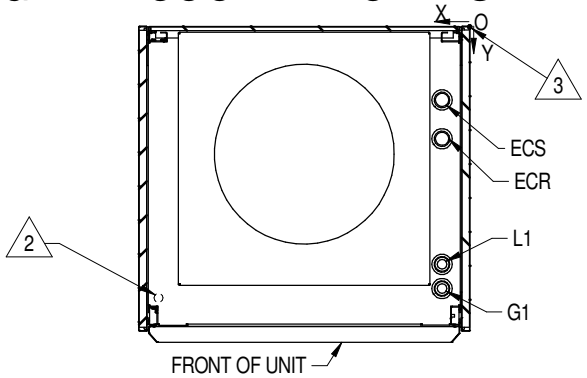
1. Shaded area indicates a recommended minimum clearance be provided for component access and air discharge.
2. Optional opening for units with right side discharge or right and left side discharge.
3. Optional opening for units with left side discharge or right and left side discharge.
4. Shaded area indicates recommended clearance for air discharge.

LIEBERT PDX

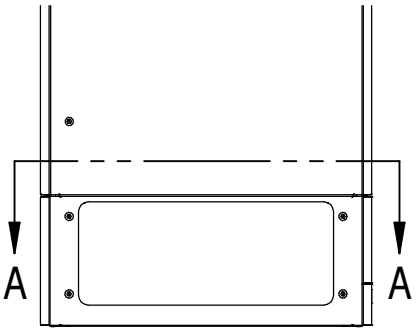
PRIMARY CONNECTION LOCATIONS
DOWNFLOW FRONT DISCHARGE AIR COOLED MODELS



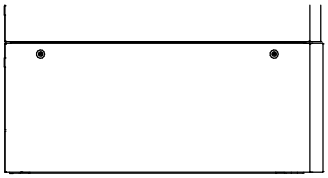
TOP VIEW



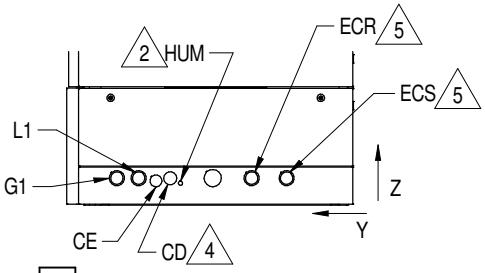
SECTION A-A



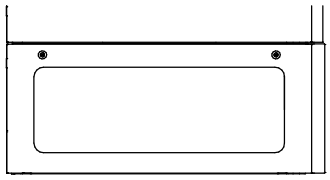
FRONT VIEW



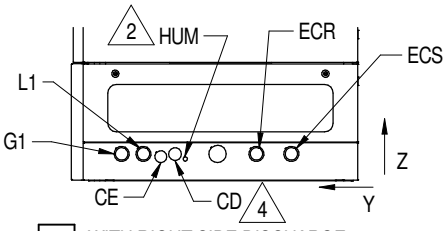
WITHOUT LEFT SIDE DISCHARGE



WITHOUT RIGHT SIDE DISCHARGE



WITH LEFT SIDE DISCHARGE



WITH RIGHT SIDE DISCHARGE

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	Z in. (mm)	CONNECTION SIZE / OPENING		
					PX011	PX018, PX023	PX029
L1	LIQUID LINE SYSTEM	2-7/8 (73)	24-3/4 (629)	3 (76)	3/8"	1/2"	5/8"
G1	HOT GAS DISCHARGE		27-3/8 (695)		1/2"	5/8"	7/8"
CD 4	CONDENSATE DRAIN	N/A	21-1/8 (537)		3/4" NPT FEMALE		
CE	CONDENSATE ELECTRICAL		22-3/4 (578)	2-3/4 (70)	1-3/8"		
HUM 2	HUMIDIFIER SUPPLY LINE		20 (508)	2-1/2 (64)	1/4"		
ECS 5	ECON-O-COIL SUPPLY	2-7/8 (73)	7-5/8 (194)	3 (76)	7/8"	1-1/8"	
ECR 5	ECON-O-COIL RETURN		11-3/4 (298)				
E1	ELECTRICAL CONN. (HIGH VOLT) TOP	31-1/4 (793)	27-5/8 (701)	N/A	7/8", 1-3/8", 1-3/4"		
E2	ELECTRICAL CONN. (HIGH VOLT) TOP		29-7/8 (758)				
LV1	ELECTRICAL CONN. (LOW VOLT) TOP	31-5/8 (803)	24-7/8 (632)		1"		

Notes:

1. Pipes at various heights to allow for tube cutter to be used. Will require stub tubes and elbows for connection at all tube locations.

2. Humidifier supply line will need to be routed through this opening to the connection at the left hand side of the unit.

3. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).

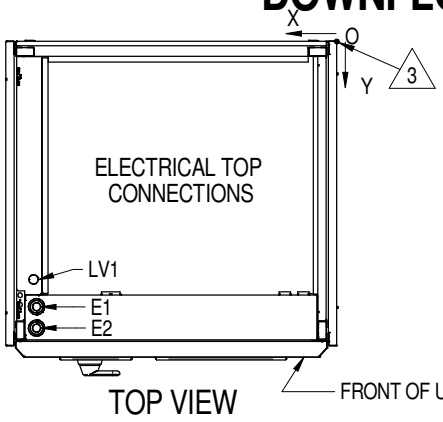
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with all local codes.

5. Supplied on Dual Cooling Systems only (4 pipe system).

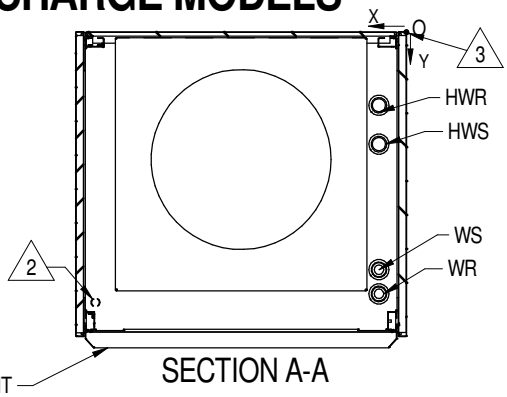
6. All refrigerant & water piping connections are O.D. Copper except as noted.

LIEBERT PCW

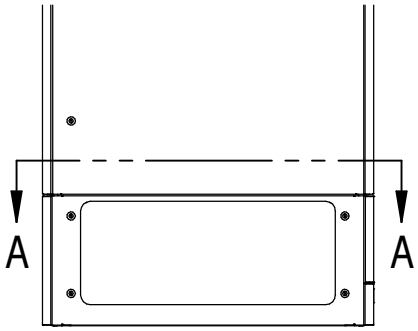
PRIMARY CONNECTION LOCATIONS
DOWNFLOW FRONT DISCHARGE MODELS



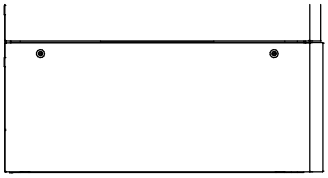
TOP VIEW

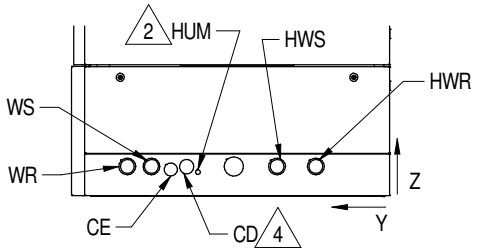


SECTION A-A

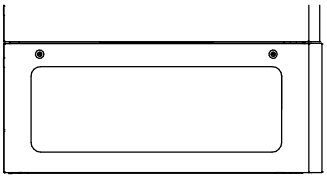


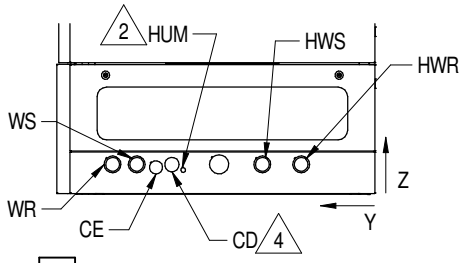
FRONT VIEW


WITHOUT LEFT SIDE DISCHARGE



WITHOUT RIGHT SIDE DISCHARGE


WITH LEFT SIDE DISCHARGE



WITH RIGHT SIDE DISCHARGE

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	Z in. (mm)	CONNECTION SIZE / OPENING
					PW011-PW029
HWR	HOT WATER REHEAT RETURN (OPTIONAL)	2-7/8 (73)	7-5/8 (194)	3 (76)	5/8"
HWS	HOT WATER REHEAT SUPPLY (OPTIONAL)		11-3/4 (298)		
WS	WATER SUPPLY		24-3/4 (629)		1-1/8"
WR	WATER RETURN		27-3/8 (695)		
CD 4	CONDENSATE DRAIN	N/A	21-1/8 (537)		3/4" NPT FEMALE
CE	CONDENSATE ELECTRICAL		22-3/4 (578)	2-3/4 (70)	1-1/2"
HUM 2	HUMIDIFIER SUPPLY LINE		20 (508)	2-1/2 (64)	1/4"
E1	ELECTRICAL CONN. (HIGH VOLT) TOP	31-1/4 (793)	27-5/8 (701)	N/A	7/8", 1-3/8", 1-3/4"
E2	ELECTRICAL CONN. (HIGH VOLT) TOP		29-7/8 (758)		
LV1	ELECTRICAL CONN. (LOW VOLT) TOP	31-5/8 (803)	24-7/8 (632)		1"

Notes:

1. Pipes at various heights to allow for tube cutter to be used. Will require stub tubes and elbows for connection at all tube locations.

2. Humidifier supply line will need to be routed through this opening to the connection at the left hand side of the unit.

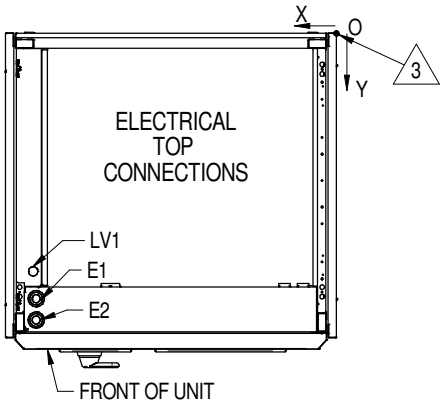
3. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).

4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with all local codes.

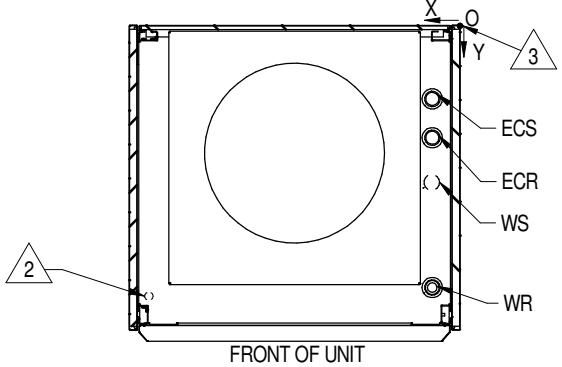
5. All water piping is O.D. Copper except as noted.

LIEBERT PDX

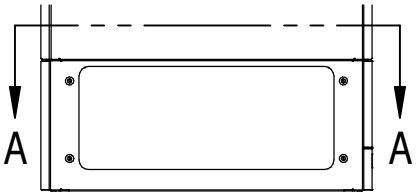
PRIMARY CONNECTION LOCATIONS
DOWNFLOW FRONT DISCHARGE WATER/GLYCOL MODELS



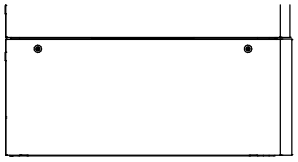
TOP VIEW



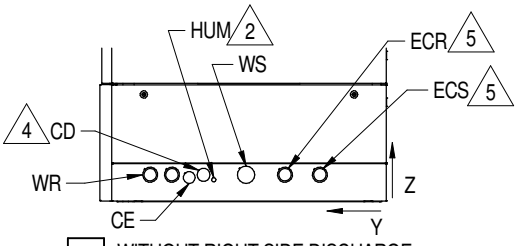
SECTION A-A



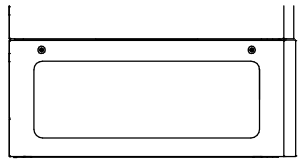
FRONT VIEW



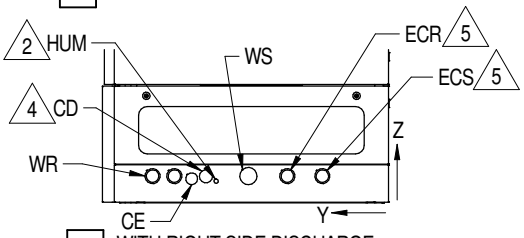
WITHOUT LEFT SIDE DISCHARGE



WITHOUT RIGHT SIDE DISCHARGE



WITH LEFT SIDE DISCHARGE



WITH RIGHT SIDE DISCHARGE

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	Z in. (mm)	CONNECTION SIZE / OPENING	
					PX011	PX018-PX029
WS	WATER/GLYCOL SUPPLY	2-7/8 (73)	16-1/4 (413)	3 (76)	7/8"	1-1/8"
WR	WATER/GLYCOL RETURN		27-3/8 (695)			
CD 4	CONDENSATE DRAIN	N/A	21-1/8 (537)		3/4" NPT FEMALE	
CE	CONDENSATE ELECTRICAL		22-3/4 (578)	2-3/4 (70)	1-3/8"	
HUM 2	HUMIDIFIER SUPPLY LINE		20 (508)	2-1/2 (64)	1/4"	
ECS 5	ECON-O-COIL SUPPLY	2-7/8 (73)	7-5/8 (194)	3 (76)	7/8"	1-1/8"
ECR 5	ECON-O-COIL RETURN		11-3/4 (298)			
E1	ELECTRICAL CONN. (HIGH VOLT) TOP	31-1/4 (793)	27-5/8 (701)	N/A	7/8", 1-3/8", 1-3/4"	
E2	ELECTRICAL CONN. (HIGH VOLT) TOP		29-7/8 (758)			
LV1	ELECTRICAL CONN. (LOW VOLT) TOP	31-5/8 (803)	24-7/8 (632)		1-1/8"	

Notes:

1. Pipes at various heights to allow for tube cutter to be used. Will require stub tubes and elbows for connection at all tube locations.

2. Humidifier supply line will need to be routed through this opening to the connection at the left hand side of the unit.

3. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).

4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with all local codes.

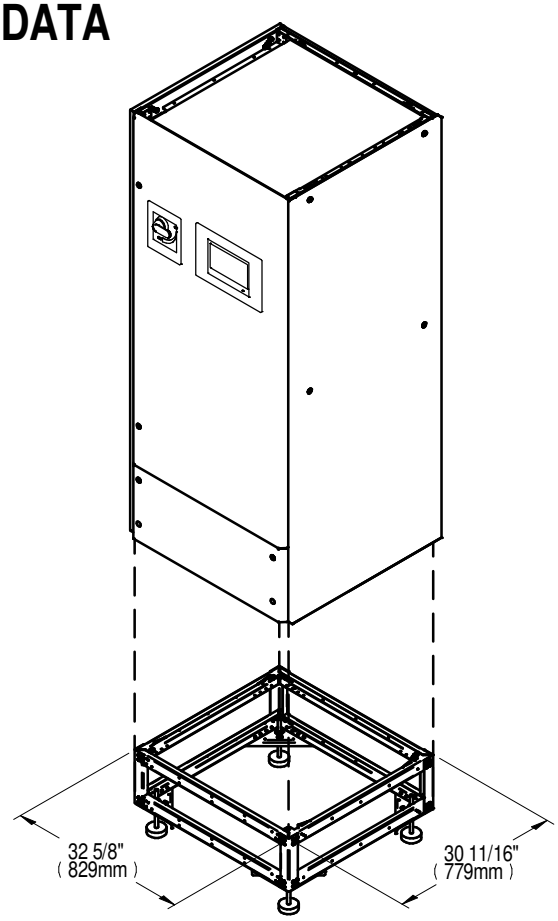
5. Supplied on Dual Cooling Systems only (4 pipe system).

6. All water piping is O.D. Copper except as noted.

LIEBERT PDX & PCW

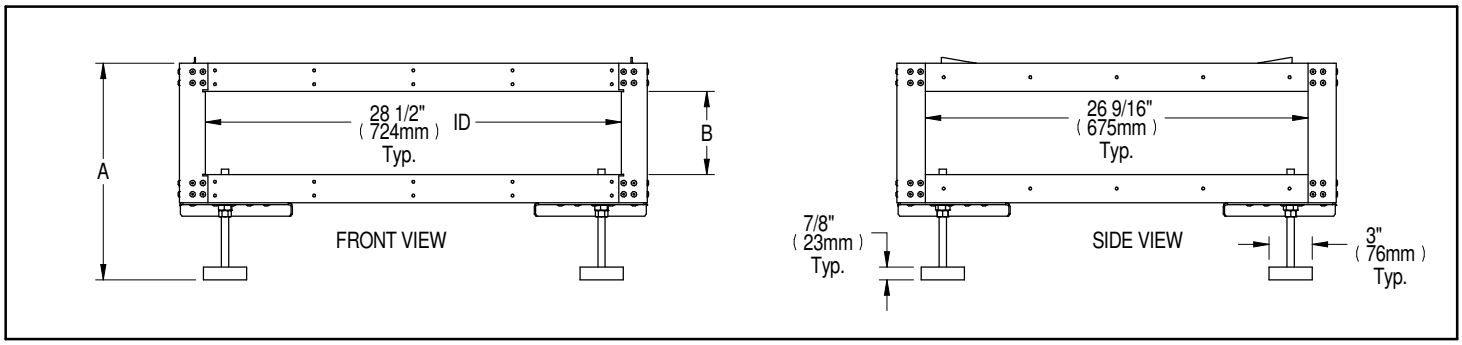
FLOORSTAND & FLOOR PLANNING

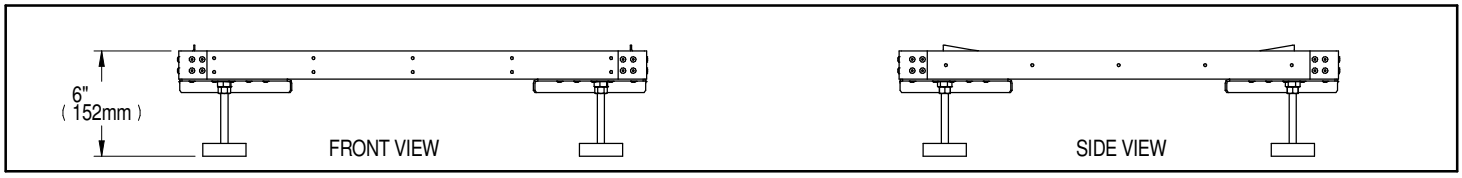
DIMENSIONAL DATA

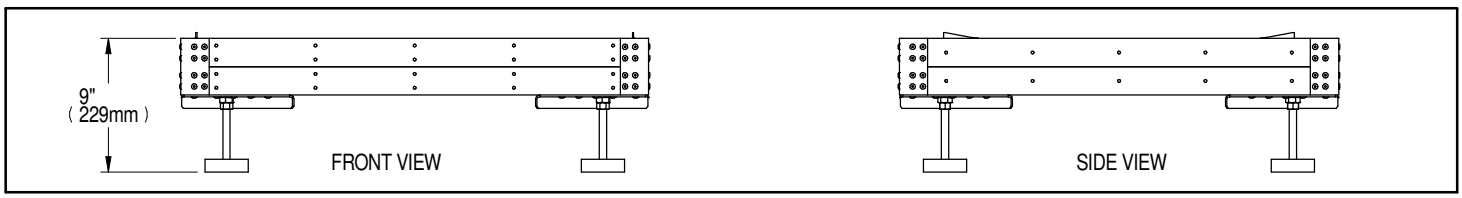


Height in. (mm)	
A	B
12 (305)	2-3/4 (70)
15 (381)	5-3/4 (146)
18 (457)	8-3/4 (223)
21 (533)	11-3/4 (299)
24 (610)	14-3/4 (375)

NOTES:
1. Leveling feet are provided with ±1-1/2" (38mm) adjustment for all floorstands.
2. Using the table above and the boxes to the left of the floorstand views select one floorstand size. If you have any difficulty please contact your Liebert Sales Representative for assistance.

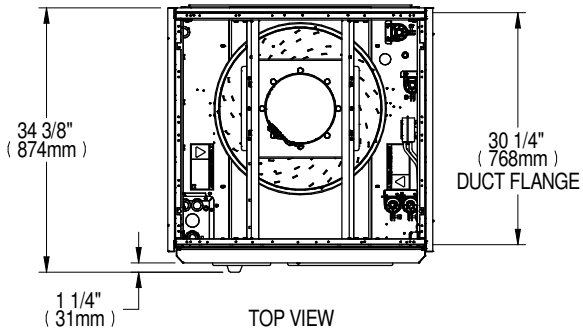




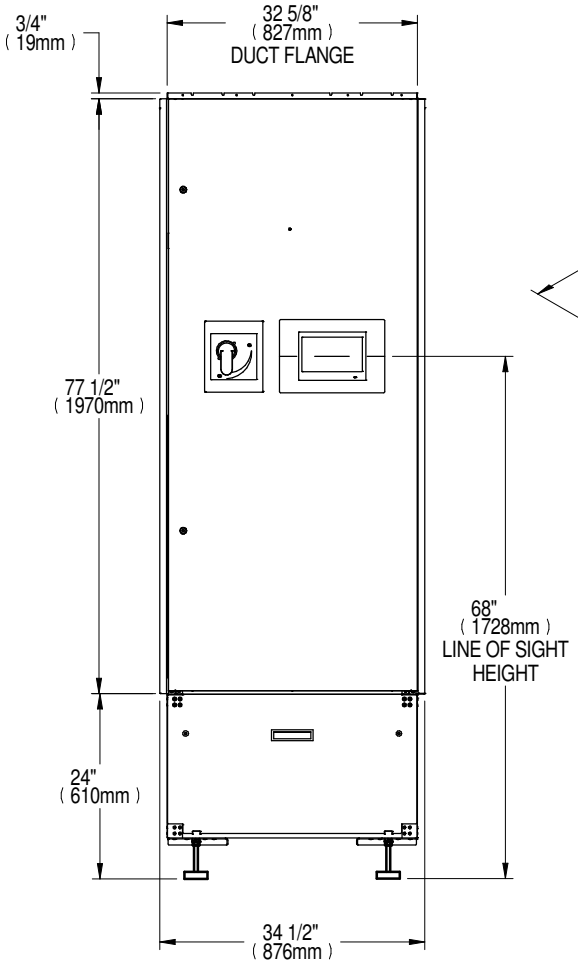


CABINET DIMENSIONAL DATA

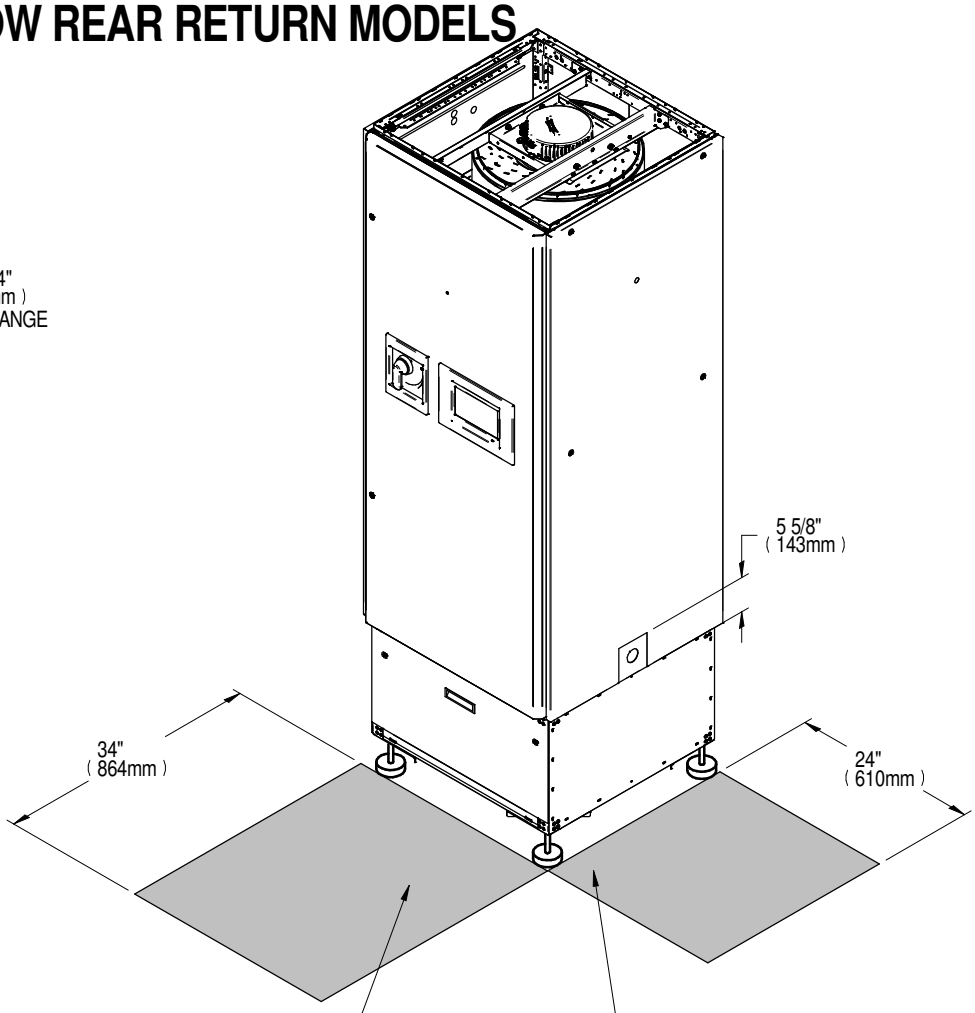
UPFLOW REAR RETURN MODELS



TOP VIEW



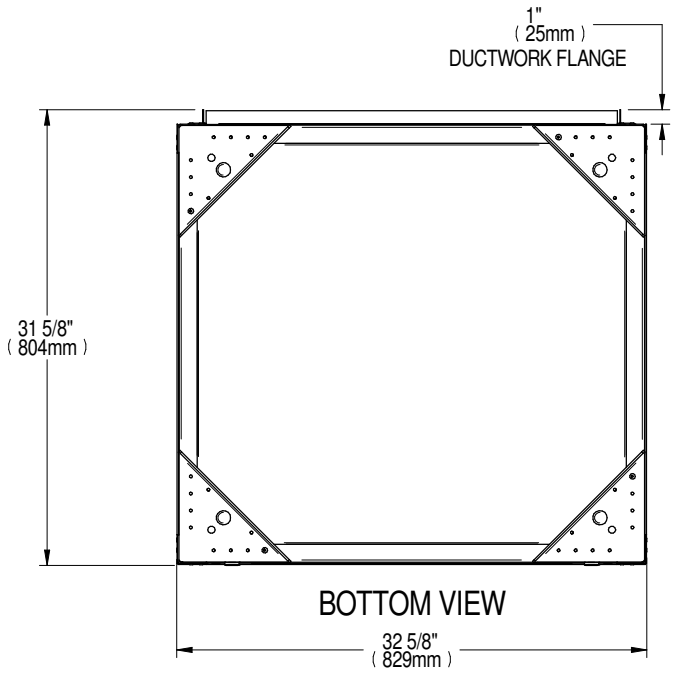
FRONT VIEW

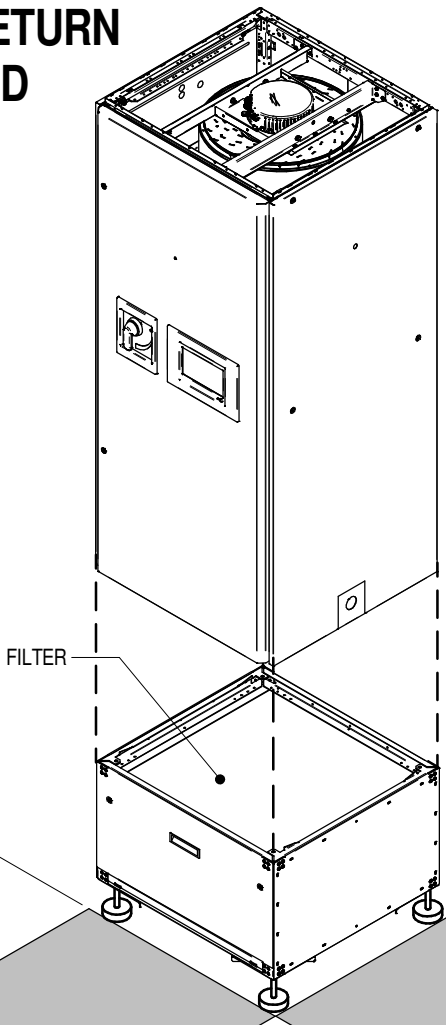


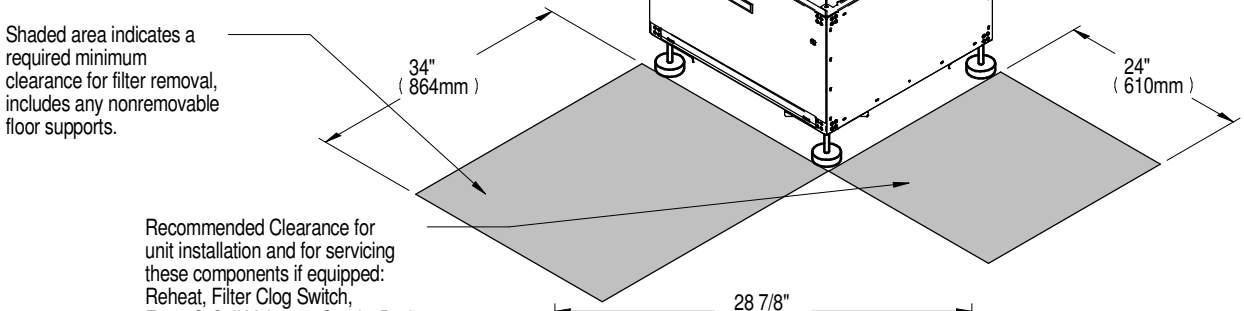
DRY WEIGHT lb (kg) APPROXIMATE			
Liebert PDX Model No.	**PX011**	**PX018-023**	**PX029**
Air Cooled	700 (318)	770 (349)	800 (317)
Air Cooled w/dual cool	800 (363)	850 (386)	890 (358)
Water/Glycol	720 (327)	790 (358)	820 (327)
GLYCOOL™ or Water/Glycol w/dual cool	820 (372)	870 (395)	910 (367)
Liebert PCW Model No.	**PW011**	**PW017**	**PW029**
Chilled Water	675 (306)	700 (318)	750 (340)

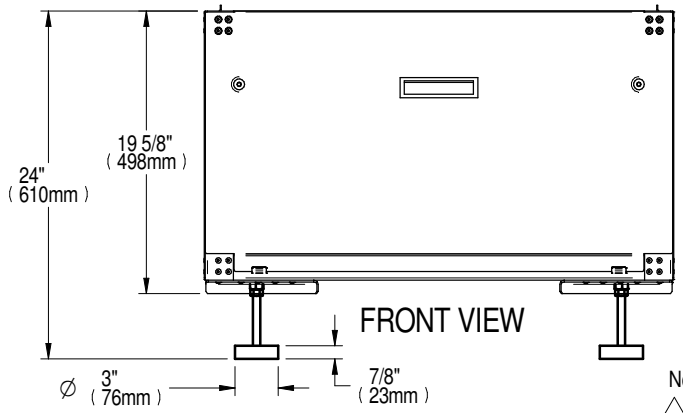
DIMENSIONAL DATA

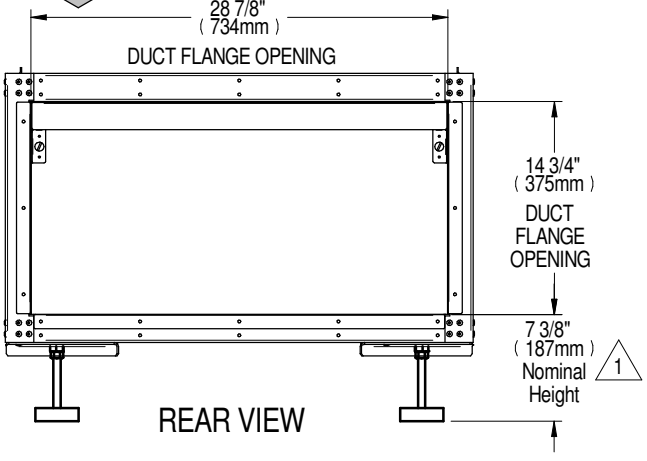
UPFLOW REAR RETURN FLOORSTAND







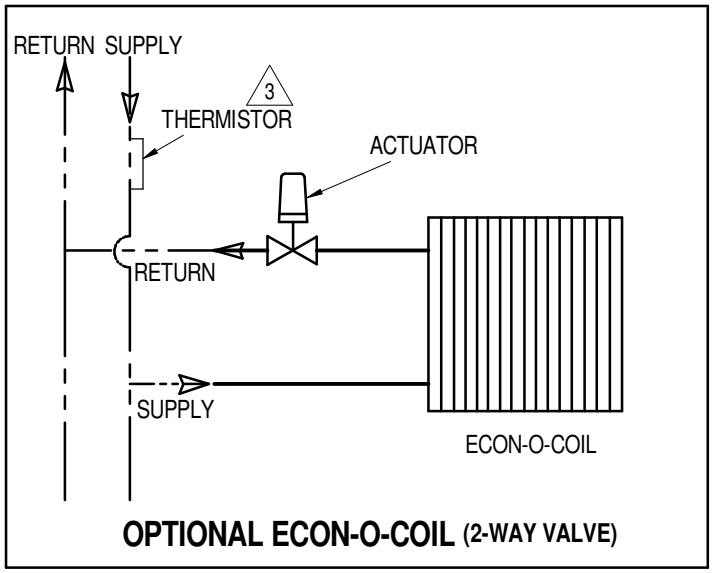




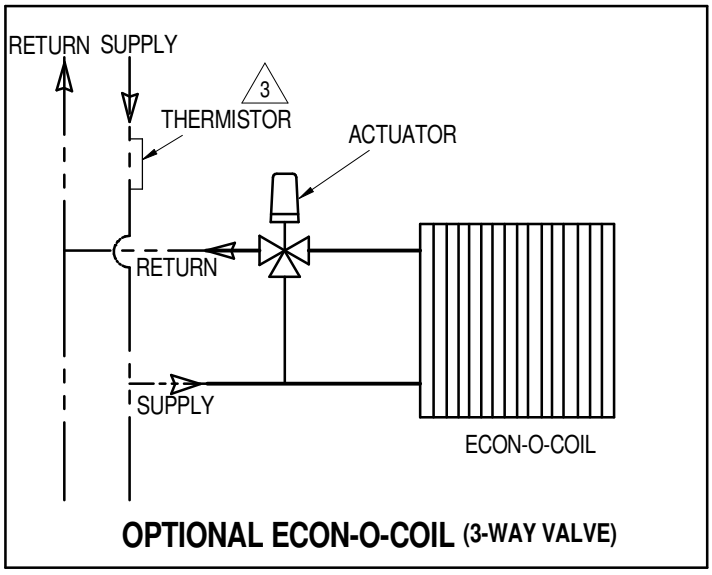
Note:

1. Leveling feet are provided with +/- 1-1/2" (38mm) adjustment from nominal height.
2. Rear Duct Flange connection is 1" (25mm) deep.

OPTIONAL PIPING SCHEMATICS
ECON-O-COIL MODELS



OPTIONAL ECON-O-COIL (2-WAY VALVE)



OPTIONAL ECON-O-COIL (3-WAY VALVE)

FACTORY PIPING
FIELD PIPING

Notes:
1, Place thermistor in location where flow is always present.
2. Thermistor must be located out of the Supply air stream.

3. Supplied with 10 feet extra thermistor wire for installation on Field Supply line.

LIEBERT PDX & PCW

PLENUM DIMENSIONAL DATA
UPFLOW DISCHARGE GRILLE

FRONT VIEWS - CHECK ONE (1):

☐ WITH GRILLE

☐ WITHOUT GRILLE

REAR VIEWS - CHECK ONE (1):

☐ WITH GRILLE

☐ WITHOUT GRILLE

LEFT SIDE VIEWS - CHECK ONE (1):

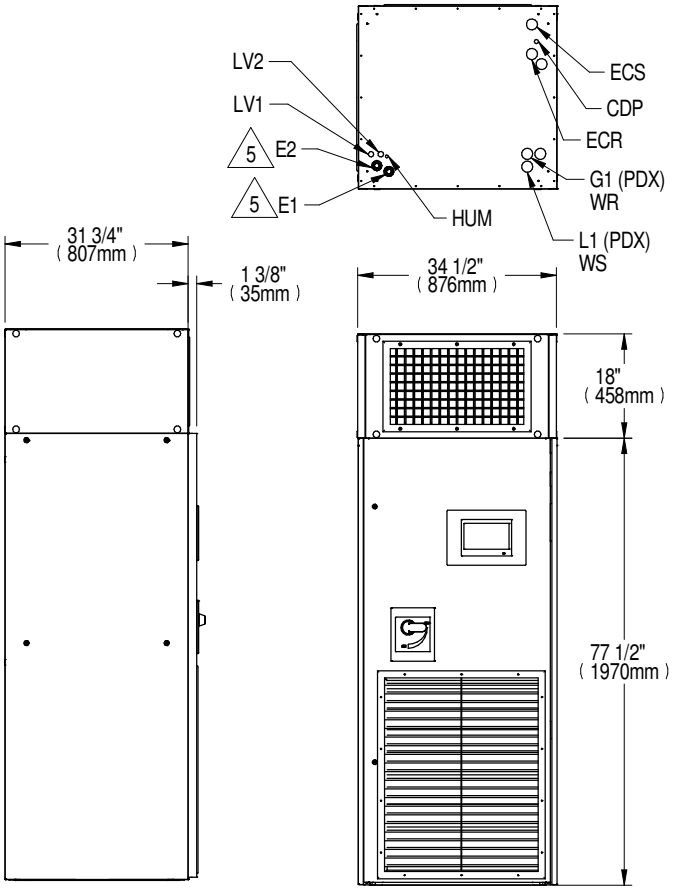
☐ WITH GRILLE

☐ WITHOUT GRILLE

RIGHT SIDE VIEWS - CHECK ONE (1):

☐ WITH GRILLE

☐ WITHOUT GRILLE



SIDE VIEW - UNIT WITH PLENUM FRONT VIEW - UNIT WITH PLENUM

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	KNOCKOUT SIZE, in. (mm)
L1	LIQUID LINE SYSTEM 1	5-1/8 (130)	25-5/8 (651)	2 (51)
G1	HOT GAS DISCHARGE 1			
CDP	CONDENSATE DRAIN WITH PUMP	3-1/2 (89)	6-1/8 (155)	3/4 (19)
HUM	HUMIDIFIER SUPPLY LINE	29-1/2 (748)	26 (662)	1/2 (13)
WS	SUPPLY-CW/WATER/GLYCOL	5-1/8 (130)	25-5/8 (651)	2 (51)
WR	RETURN-CW/WATER/GLYCOL/GLYCOOL™			
ECS	ECON-O-COIL SUPPLY 4 / GLYCOOL™ SUPPLY	4-1/4 (109)	3-1/8 (80)	
ECR	ECON-O-COIL RETURN 4		8-1/4 (210)	
E1	ELECTRICAL CONN. (HIGH VOLT)	29-1/8 (739)	28-5/8 (728)	7/8 (23), 1-3/8 (35), 1-3/4 (44) 5
E2	ELECTRICAL CONN. (HIGH VOLT)	31-1/4 (793)	27-5/8 (702)	
LV1	ELECTRICAL CONN. (LOW VOLT)	32-1/4 (818)	25-5/8 (652)	1 (25)
LV2	ELECTRICAL CONN. (LOW VOLT)	30-1/2 (775)		

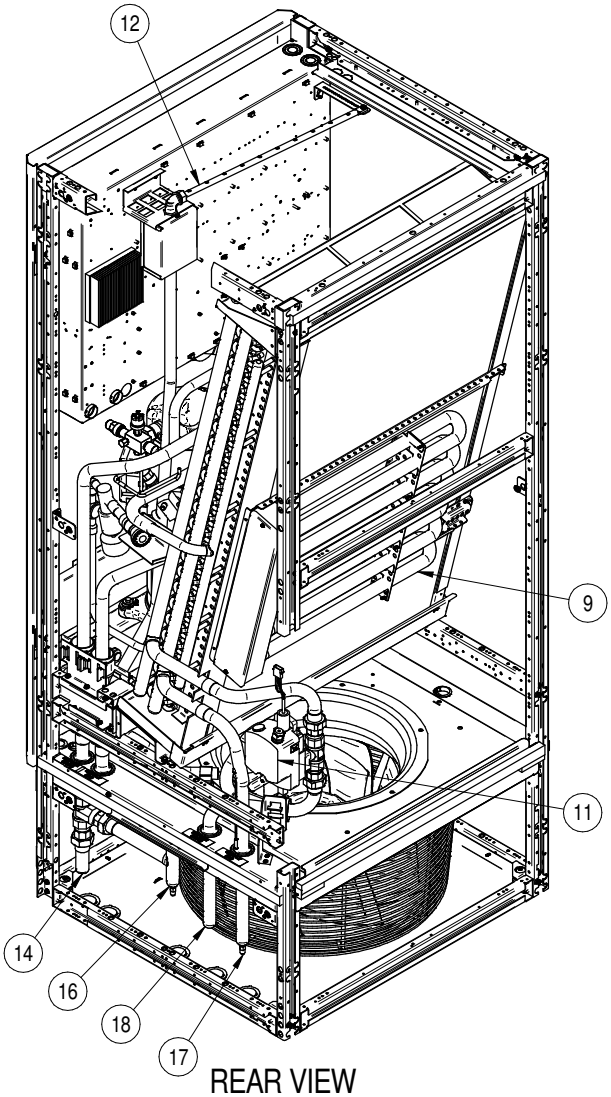
Notes:
1. Two grilles minimum per plenum required.
   The nominal grille size is 24" (609mm) x 14" (355mm).
2. All Plenums are shipped flat (non-assembled) and must be assembled on site.
3. Upflow bottom return units are available with required rear return floorstand with filter.

4. Units supplied with Dual Cooling systems only (4 pipe system).

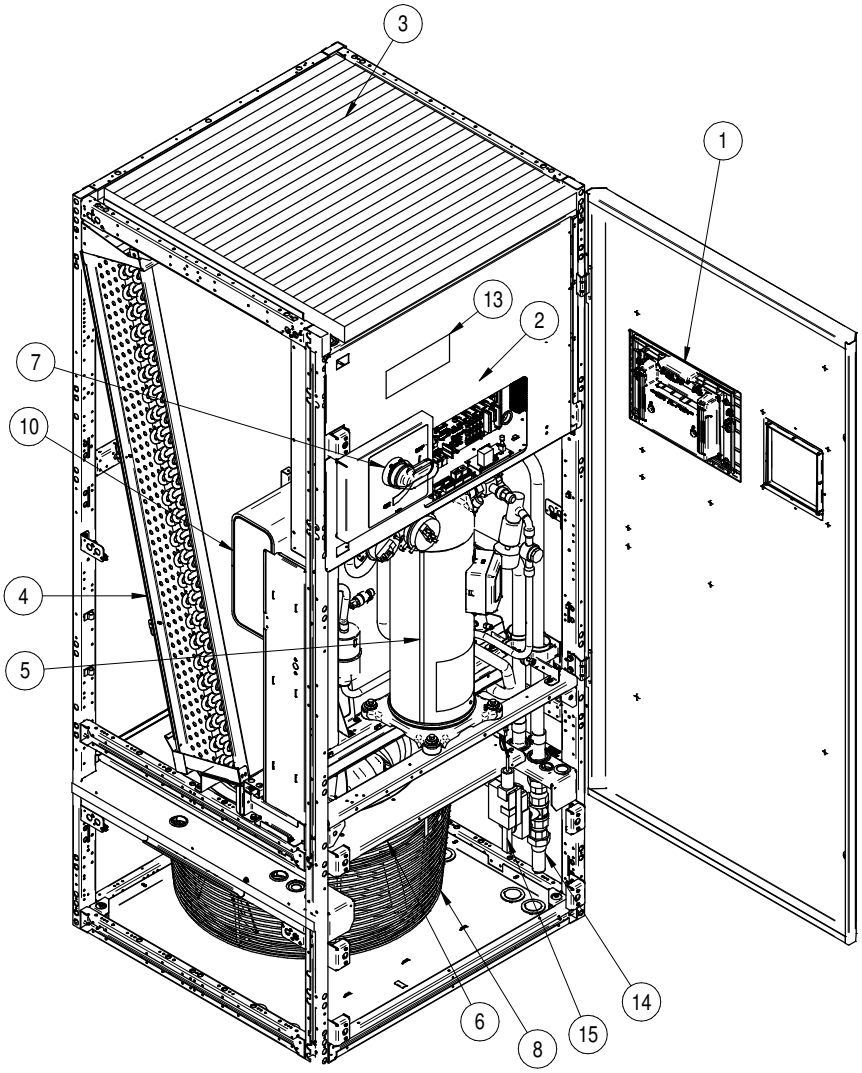
5. Concentric knockouts to be used based on field supplied conduit diameter.

LIEBERT PDX

COMPONENT LOCATION DIAGRAM
DOWNFLOW MODELS



REAR VIEW

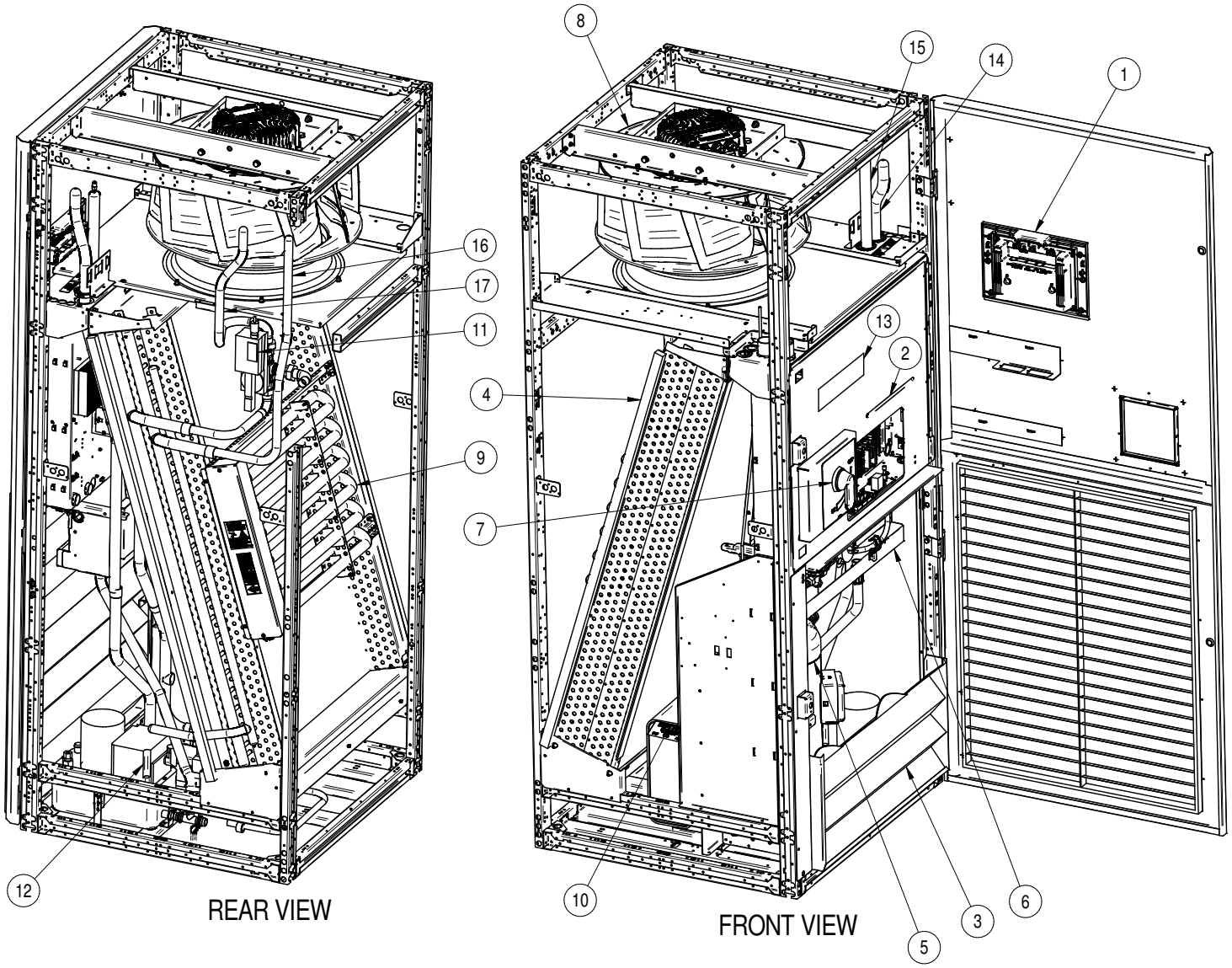


FRONT VIEW

1. Liebert iCOM Control Display
2. Electric Box
3. Filter
4. Evaporator Coil
5 Compressor
6. Infrared Humidifier (optional)
7. Disconnect
8. EC Fan
9. Electric Reheat (optional)
10. Plate Condenser (optional)
11. Econ-O-Coil Valve - GLYCOOL™/Dual Cooling (optional)
12. Smoke Detector (optional)
13. Serial Tag
14. Hot Gas Line (Air-Cooled) or Return Connection (Water/Glycol/GLYCOOL™)
15. Liquid Line Connection (Air-Cooled)
16. Supply Connection (Water/Glycol)
17. Supply Connection (GLYCOOL™/Econ-O-Coil)
18. Return Connection (Econ-O-Coil)
19. Steam Gen Humidifier (option not shown, located to the left hand side of the Compressor)

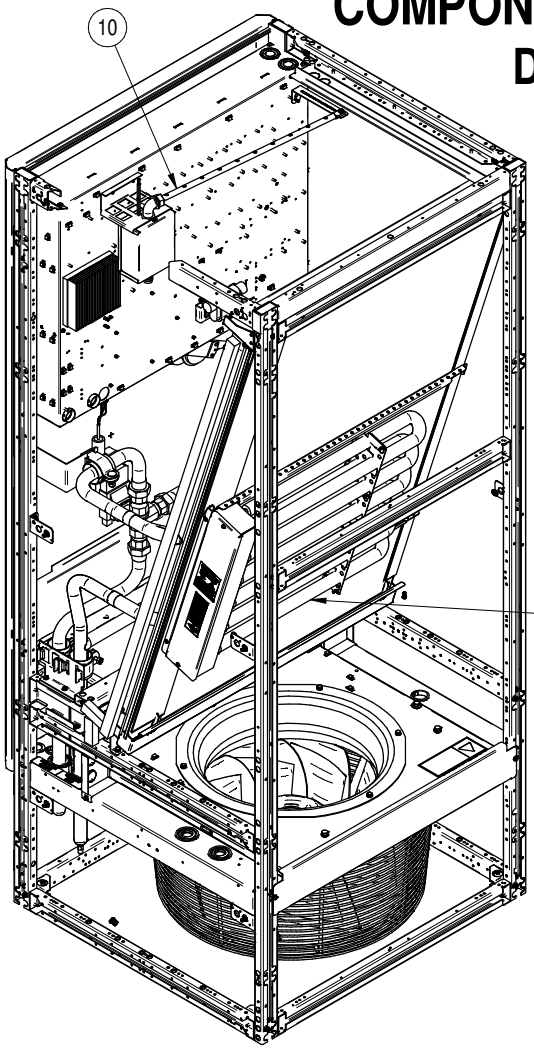
LIEBERT PDX

COMPONENT LOCATION DIAGRAM
UPFLOW MODELS

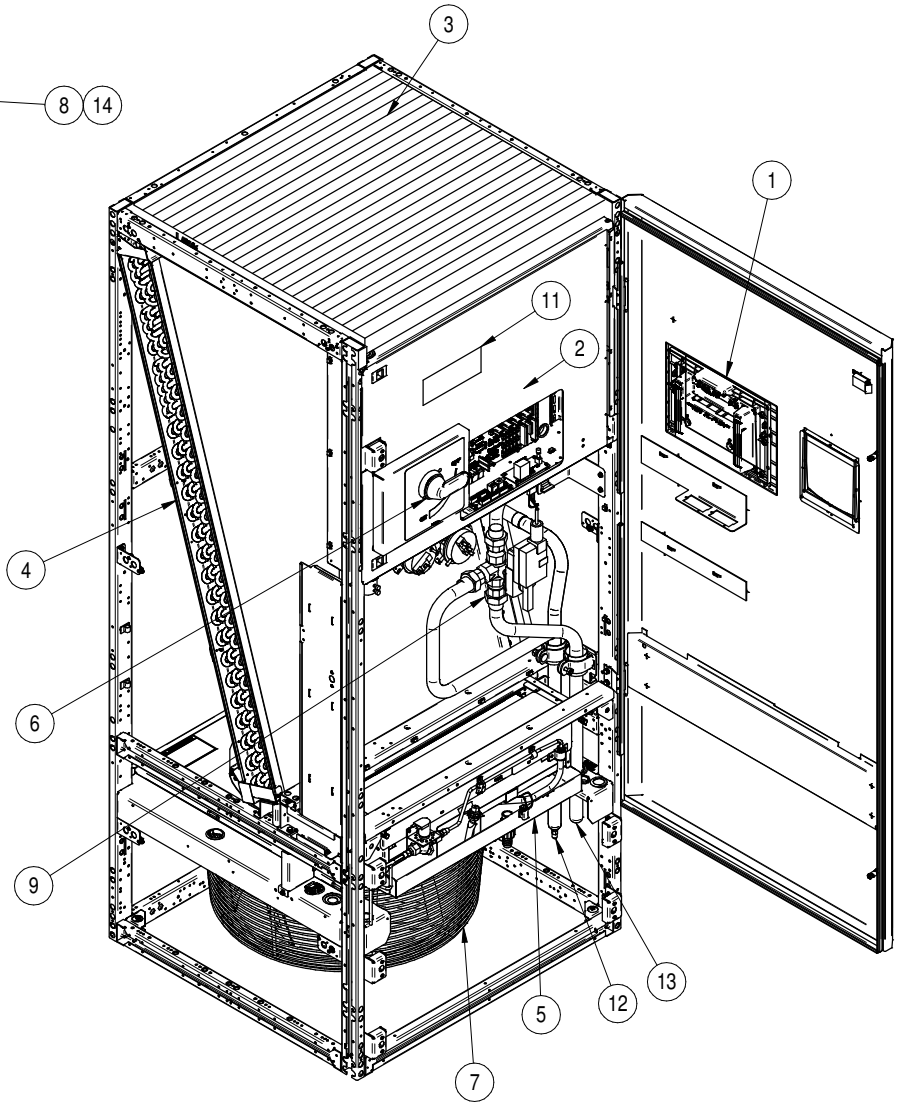


1 Liebert iCOM Control Display
2 Electric Box
3 Filter (partial filter shown for clarity)
4 Evaporator Coil
5 Compressor
6 Infrared Humidifier (optional)
7 Disconnect
8 EC Fan
9 Electric Reheat (optional)
10 Plate Condenser (optional)
11 Econ-O-Coil Valve - GLYCOOL/Dual Cooling (optional)
12 Condensate Pump (optional)
13 Serial Tag
14 Hot Gas Line (Air-cooled) or Return Connection (Water/Glycol/GLYCOOL™)
15 Liquid Line (Air-Cooled) or Return Connection (Water/Glycol)
16 Supply Connection (GLYCOOL™ / Econ-O-coil)
17 Return Connection (Econ-O-Coil)
18 Steam Gen Humidifier (option not shown, located above Condensate Pump)

COMPONENT LOCATION DIAGRAM
DOWNFLOW MODELS



REAR VIEW

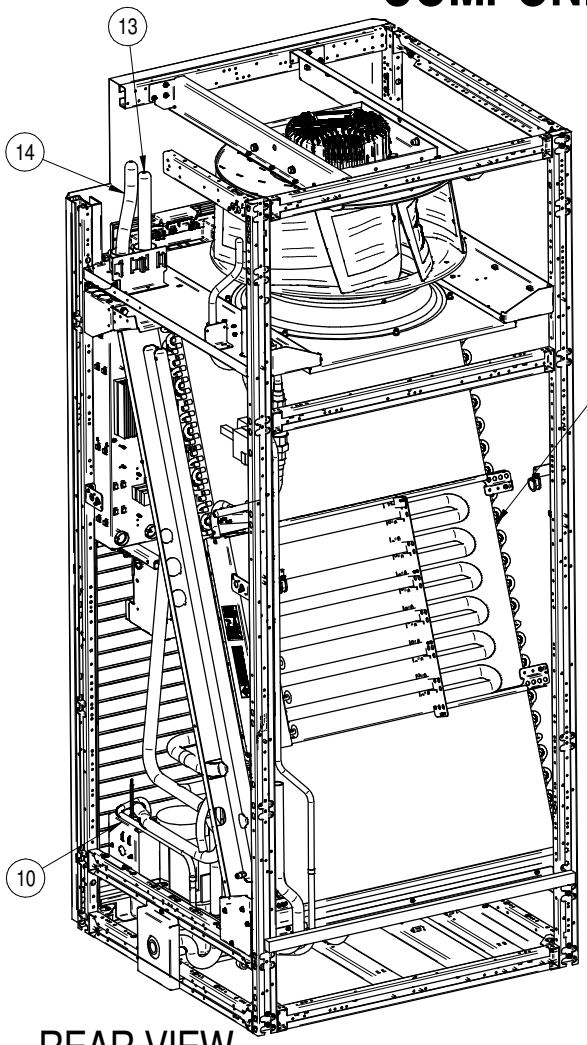


FRONT VIEW

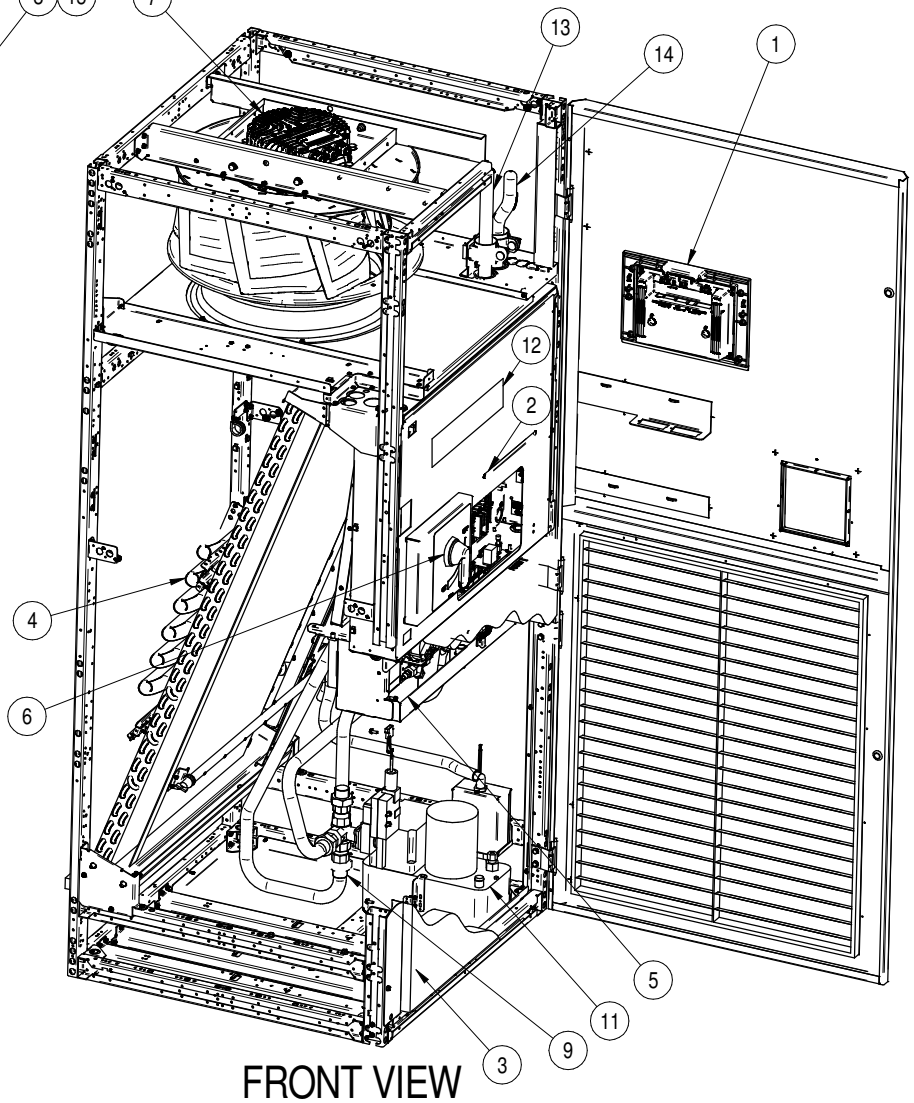
1. Liebert iCOM Control Display
2. Electric Box
3. Filter
4. Chilled Water Coil
5. Infrared Humidifier (optional)
6. Disconnect
7. EC Fan
8. Electric Reheat (optional)
9. Chilled Water Valve
10. Smoke Detector (optional)
11. Serial Tag
12. Supply Connection - Chilled Water
13. Return Connection - Chilled Water
14. Hot Water Reheat Coil (option not shown, located in place of Electric Reheat)
15. Steam Gen Humidifier (option not shown, located to the left of the Chilled Water Valve)

LIEBERT PCW

COMPONENT LOCATION DIAGRAM
UPFLOW MODELS



REAR VIEW

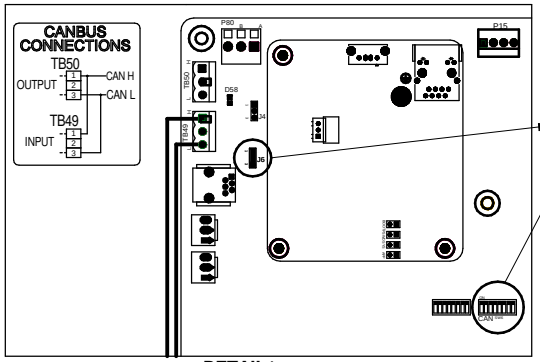


FRONT VIEW

1. Liebert iCOM Control Display
2. Electric Box
3 Filter (partial filter shown for clarity)
4. Chilled Water Coil
5. Infrared Humidifier (optional)
6. Disconnect
7. EC Fan
8. Electric Reheat (optional)
9. Chilled Water Valve
10. Smoke Detector (optional)
11. Condensate Pump (optional)
12. Serial Tag
13. Supply Connection - Chilled Water
14. Return Connection - Chilled Water
15. Hot Water Reheat Coil
    (option not shown, located in place of Electric Reheat)
16. Steam Gen Humidifier
    (option not shown, located above Condensate Pump

LIEBERT PDX

CANbus & INTERLOCK CONNECTIONS
BETWEEN PDX UNIT & LIEBERT MC CONDENSER (PREMIUM)

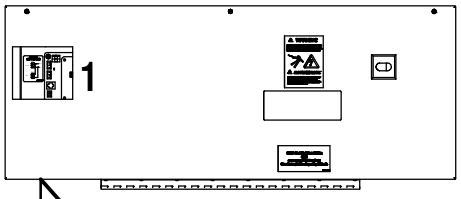


J6 TERMINATION JUMPER MUST BE SET TO PINS 1 AND 2.

CANbus ADDRESSING SWITCH

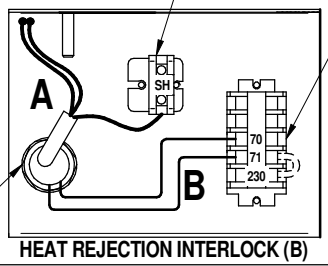
DETAIL1
CAN CABLE CONNECTION (A)

CONDENSER



SHIELD CONNECTION

FACTORY WIRING BETWEEN MC CONTROL BOARD AND TERMINAL STRIP.



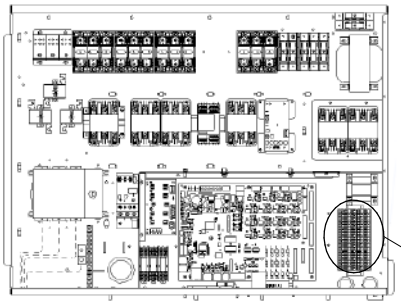
LOW VOLTAGE FIELD ENTRANCE LOCATED ON BOTTOM LEFT OF CONDENSER ENCLOSURE.

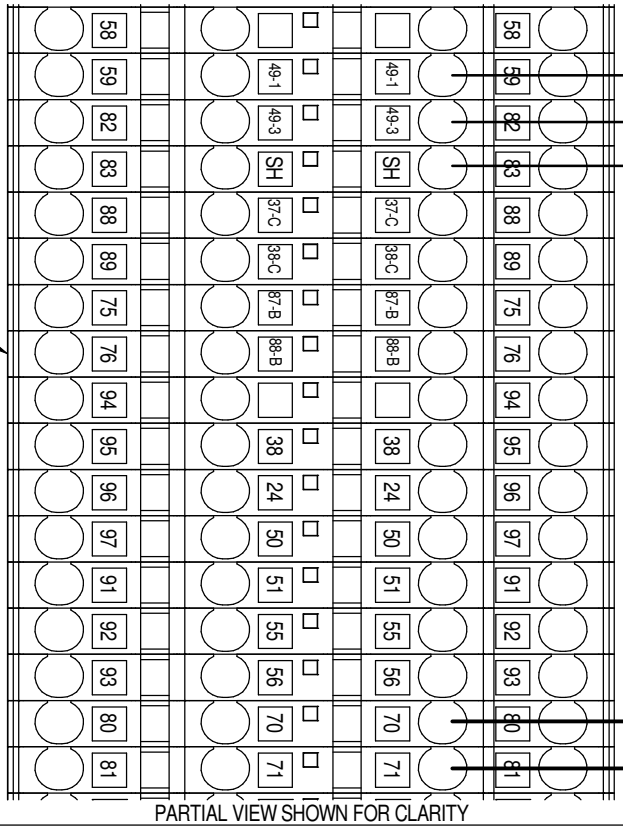
HEAT REJECTION INTERLOCK (B)

A
CANbus CABLE CONNECTION

B
HEAT REJECTION INTERLOCK WIRE

INDOOR UNIT





PARTIAL VIEW SHOWN FOR CLARITY

CANbus & INTERLOCK CONNECTIONS
BETWEEN PDX UNIT & LIEBERT MC CONDENSER (PREMIUM)

COMPONENT NOTES:
1. COMPONENT APPEARANCE, ORIENTATION AND POSITIONINGMAY VARY TERMINAL NAMES AND CALLOUTS REMAIN CONSTANT.
2. ALL CIRCUITS TO THESE CONNECTION POINTS ARE CLASS 2.

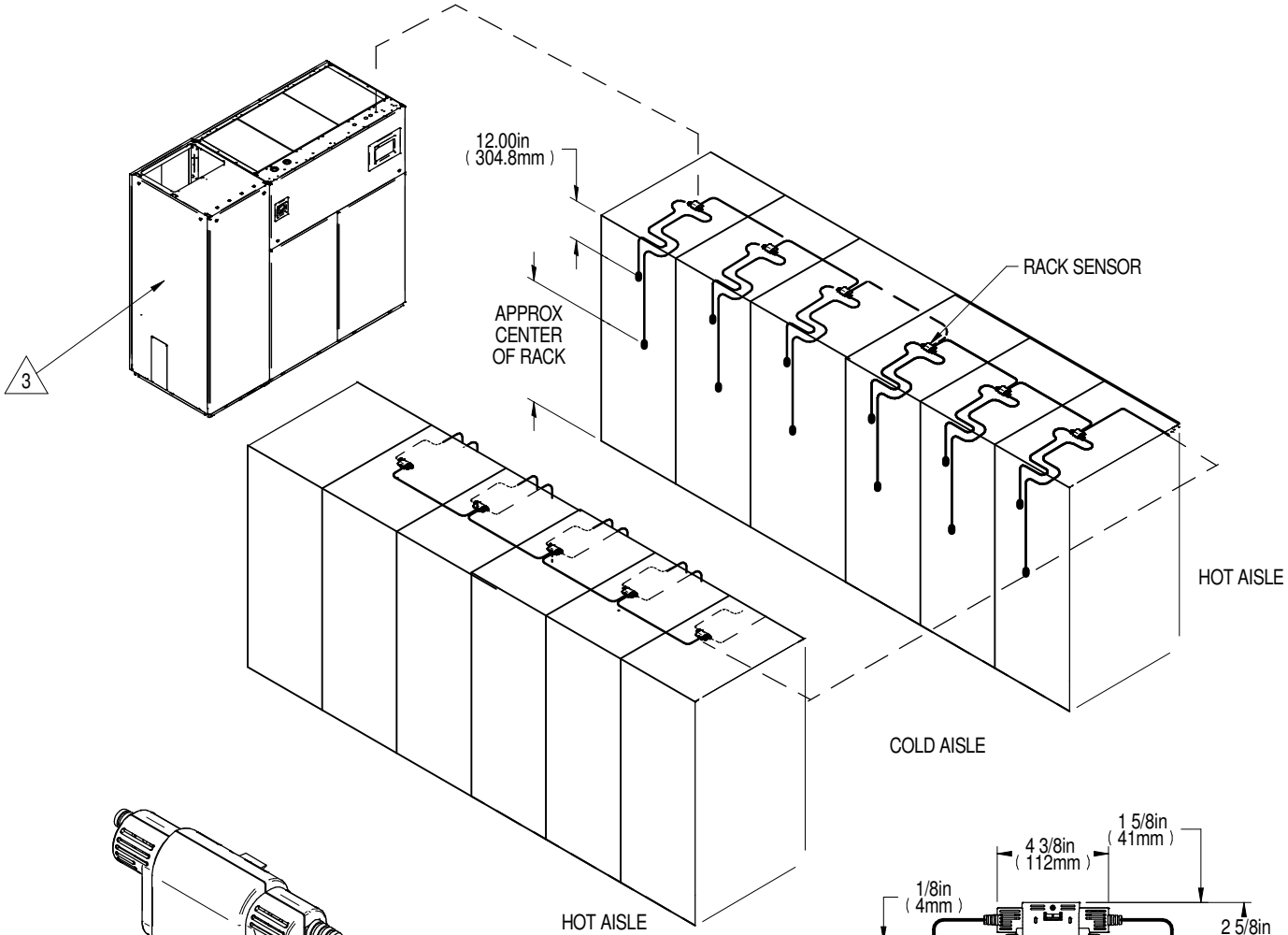
CAN & CABLE NOTES (A):
1. CABLE MUSTHAVE THE FOLLOWING SPECIFICATIONS:
   - BRAIDED SHIELD OR FOIL SHIELD WITH DRAIN WIRE
   - SHIELD MUST BE WIRED TO GROUND AT INDOOR UNIT
   - 22-18AWG STRANDED TINNED COPPER
   - TWISTED PAIR (MINIMUM 4 TWISTS PER FOOT)
   - LOW CAPACITANCE (15pF/FT OR LESS)
   - MUST BE RATED TO MEET LOCAL CODES AND CONDITIONS.
   - EXAMPLES BELDEN 89207 (PLENUM RATED), OR ALPHA WIRE 6454 CATEGORY 5, 5E, OR HIGHER.
2. DO NOT RUN IN SAME CONDUIT, RACEWAY, OR CHASE AS HIGH VOLTAGE WIRING.
3. FOR CANBUS NETWORK LENGTHS GREATER THAN 450FT(137M), CONTACT FACTORY.

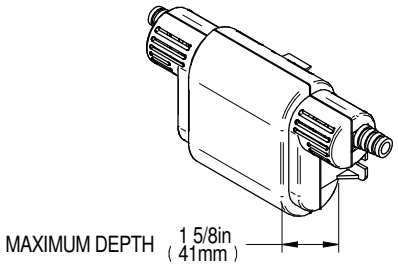
INTERLOCK WIRE NOTES (B):
1. FIELD SUPPLIED WIRE
   - 2 CONDUCTOR 18AWG OR GREATER
   - RATED 600V

2. RUN FIELD SUPPLIED WIRES BETWEEN THE INDOOR UNIT AND THE CONDENSER.

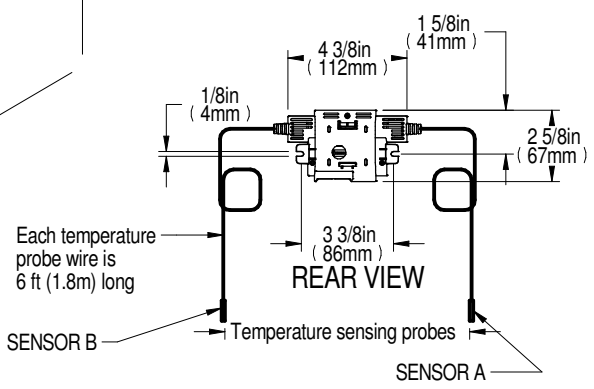
LIEBERT iCOM™

2T RACK TEMPERATURE SENSOR CONNECTIONS
LIEBERT CW,DS,DSE, & PDX UNITS





ISO VIEW



NOTE:
1. Rack sensor provided by the factory and installed by others.
2. Install temperature sensors on the perforated portion of the rack door using the supplied wire ties. Ensure door can swing open freely without binding cables.
3. The cooling unit used in this submittal drawing is a reference model, it's only purpose is to show how a 2T sensor system can be laid out.
4. The low voltage electrical knockout locations will vary between CW, DS, DSE and PDX.
5. All the low voltage internal component orientations and positioning will vary.

RECOMMENDED WIRED SENSOR LOCATIONS

1. Racks at end of aisles/rows shall be monitored via wired/wireless temperature sensors.

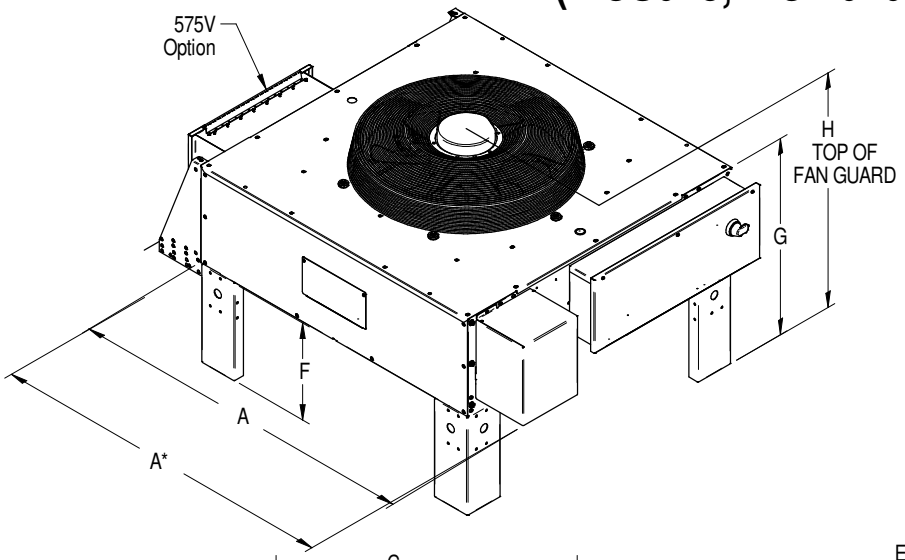
2. At minimum 1 of every 3 racks should be monitored, equally spaced if populated racks exist.

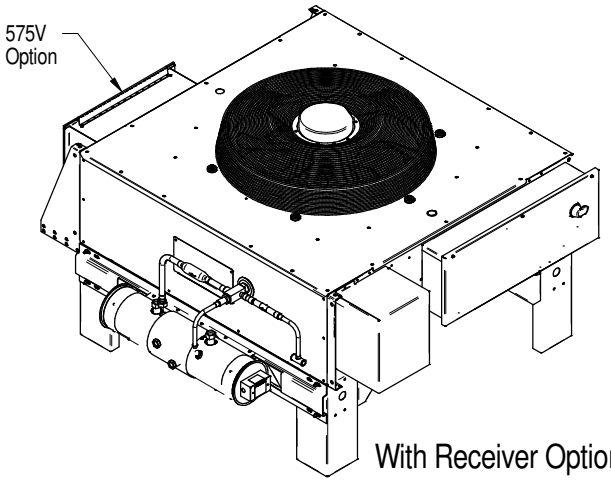
SEE INSTRUCTION SHEET 310301 FOR CANBUS WIRE CONSIDERATIONS AND SENSOR INSTALLATION INSTRUCTIONS.

LIEBERT MC CONDENSER

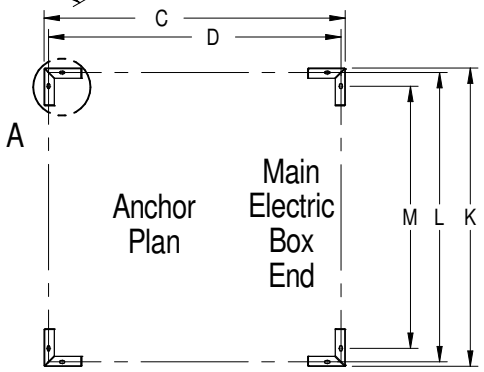
CABINET & ANCHOR DIMENSIONAL DATA

1 FAN (MCS028, MCM040, MCL055)

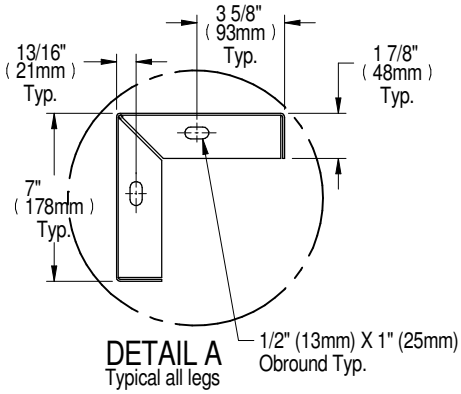




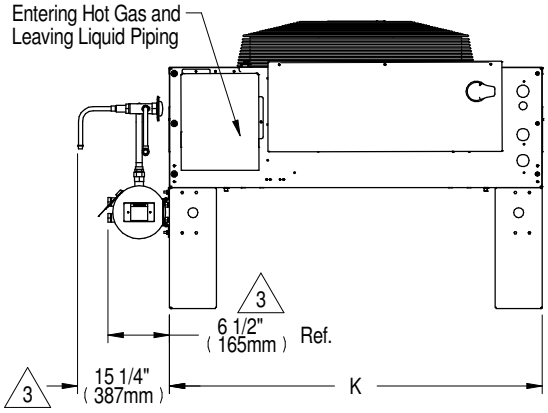
With Receiver Option



Left Side of Unit



DETAIL A
Typical all legs



Front View (Lee-Temp Shown)

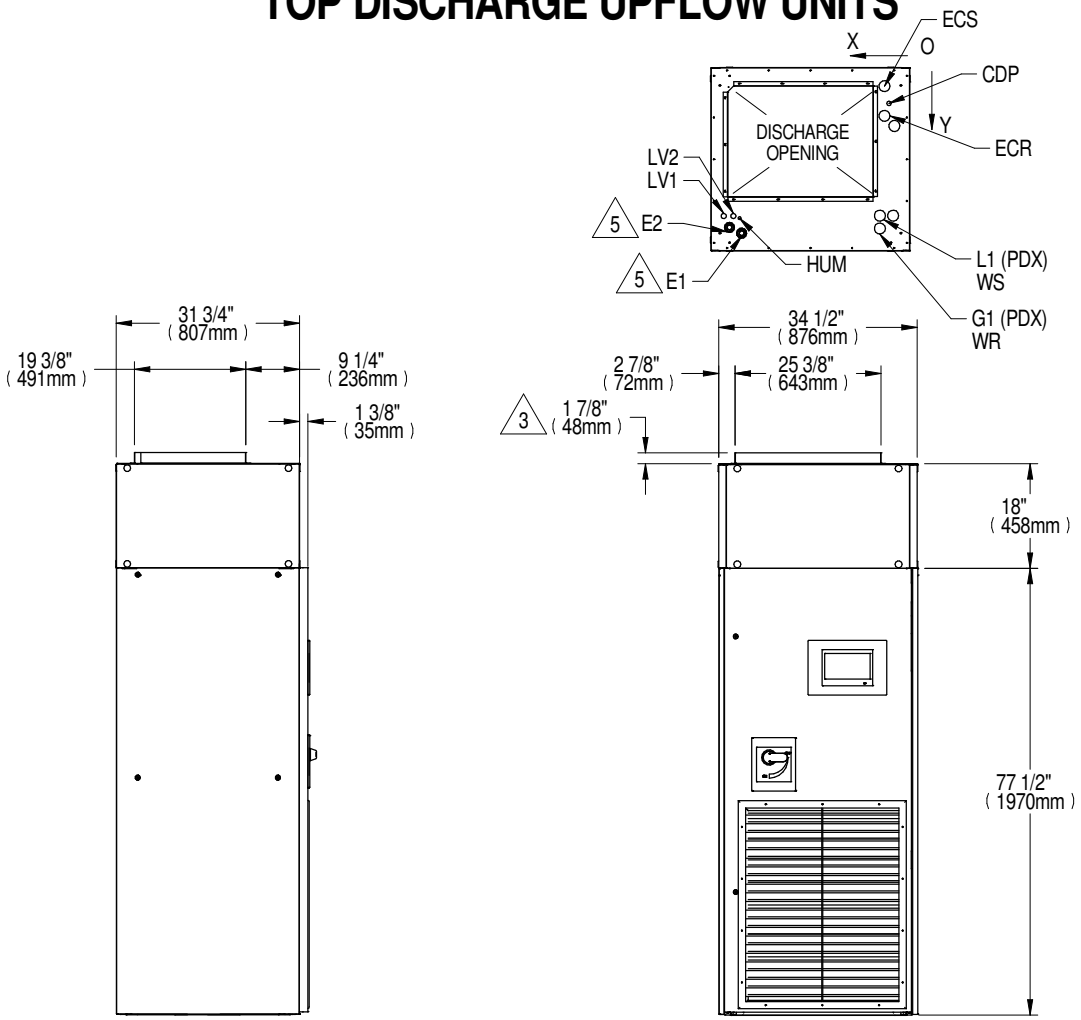
LIEBERT MODEL NUMBER	F in. (mm) (LEG HEIGHT DIMENSIONS) △2			
	18 (457)	36 (914)	48 (1219)	60 (1524)
MCS028 MCM040				
DIM "G"	31-5/8 (803)	49-5/8 (1260)	61-5/8 (1565)	73-5/8 (1870)
DIM "H"	39-5/8 (1006)	57-5/8 (1464)	69-5/8 (1768)	81-5/8 (2073)
MCL055				
DIM "G"	35-7/8 (911)	53-7/8 (1368)	65-7/8 (1673)	77-7/8 (1978)
DIM "H"	43-5/8 (1108)	61-5/8 (1565)	73-5/8 (1870)	85-5/8 (2175)

Note:
1. Liebert recommends a clearance of 36" (915mm) on each side for proper operation and component access.
△2. Cross Bracing required for legs longer than 18" (457.2mm). Quantity varies per model & options selected.
△3. For PDX w/EEV systems & unheated refrigerant receivers, 6-1/2" (165mm) is 9-1/4" (235mm) and 15-1/4" (387) is not applicable.

LIEBERT MODEL NUMBER	A in (mm)	A* in (mm) (575V ONLY)	C in (mm)	D in (mm)	K in (mm)	L in (mm)	M in (mm)
MCS028	50-5/8 (1287)	58-7/8 (1495)	44-1/8 (1120)	42-1/2 (1080)	42-1/2 (1080)	40-7/8 (1038)	35-7/8 (910)
MCM040	57-3/16 (1453)	65-3/8 (1661)	48 (1219)	46-5/16 (1177)	46 (1168)	44-3/8 (1127)	39-5/16 (999)
MCL055	68 (1727)	77 (1956)	56 (1422)	54-3/8 (1381)	55-1/2 (1410)	53-7/8 (1368)	48-3/4 (1238)

PLENUM DIMENSIONAL DATA

TOP DISCHARGE UPFLOW UNITS



Left Side View Unit with Plenum

Front View Unit with Plenum

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	KNOCKOUT SIZE, in. (mm)
L1	LIQUID LINE SYSTEM 1	5-1/8 (130)	25-5/8 (651)	2 (51)
G1	HOT GAS DISCHARGE 1		27-7/8 (708)	
CDP	CONDENSATE DRAIN WITH PUMP	3-1/2 (89)	6-1/8 (155)	3/4 (19)
HUM	HUMIDIFIER SUPPLY LINE	29-1/2 (748)	26 (662)	1/2 (13)
WS	SUPPLY-CW/WATER/GLYCOL	5-1/8 (130)	25-5/8 (651)	2 (51)
WR	RETURN-CW/WATER/GLYCOL/GLYCOOL™			
ECS	ECON-O-COIL SUPPLY 4 / GLYCOOL™ SUPPLY	4-1/4 (109)	3-1/8 (80)	
ECR	ECON-O-COIL RETURN 4		8-1/4 (210)	
E1	ELECTRICAL CONN. (HIGH VOLT)	29-1/8 (739)	28-5/8 (728)	7/8 (23), 1-3/8 (35), 1-3/4 (44) 5
E2	ELECTRICAL CONN. (HIGH VOLT)	31-1/4 (793)	27-5/8 (702)	
LV1	ELECTRICAL CONN. (LOW VOLT)	32-1/4 (818)	25-5/8 (652)	1 (25)
LV2	ELECTRICAL CONN. (LOW VOLT)	30-1/2 (775)		

Notes:

1. Plenums are shipped flat (non-assembled) and must be assembled on site.
2. Unit with front return shown. Upflow unit with bottom return are available, but requires a rear return floorstand with filter.

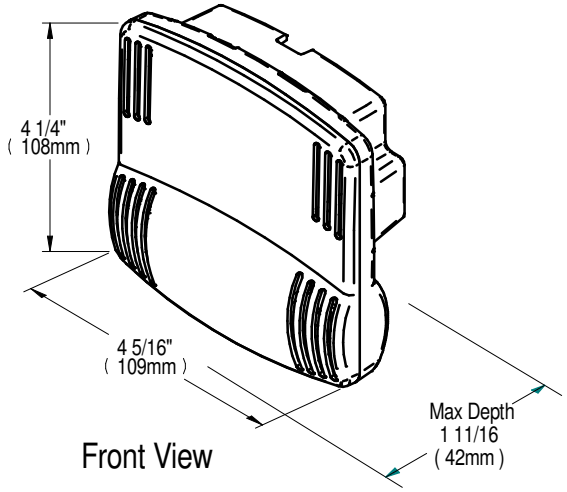
3. Plenums with inner liners the duct flange measures 1" (25mm).

4. Units supplied with Dual Cooling systems only (4 pipe system).

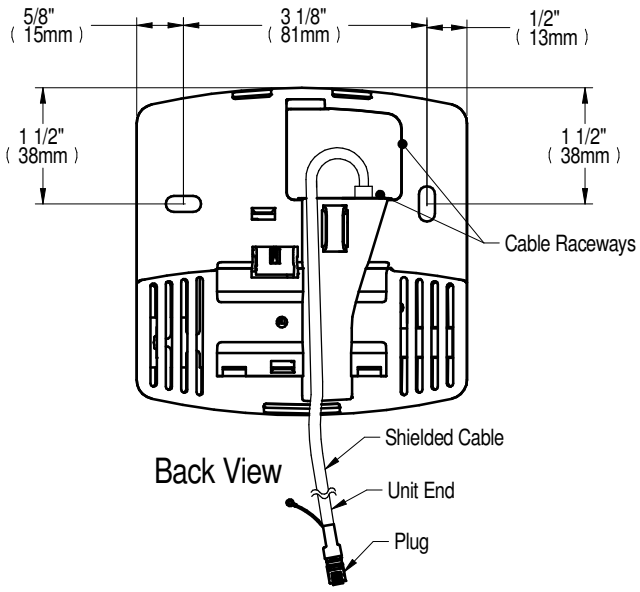
5. Concentric knockouts to be used based on field supplied conduit diameter.

LIEBERT iCOM™

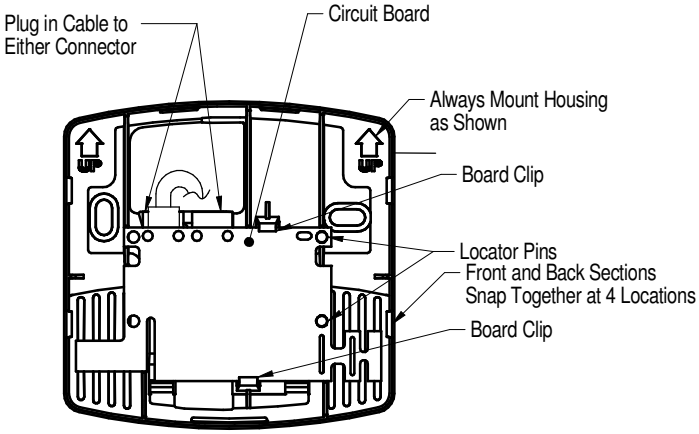
REMOTE TEMPERATURE & HUMIDITY SENSOR



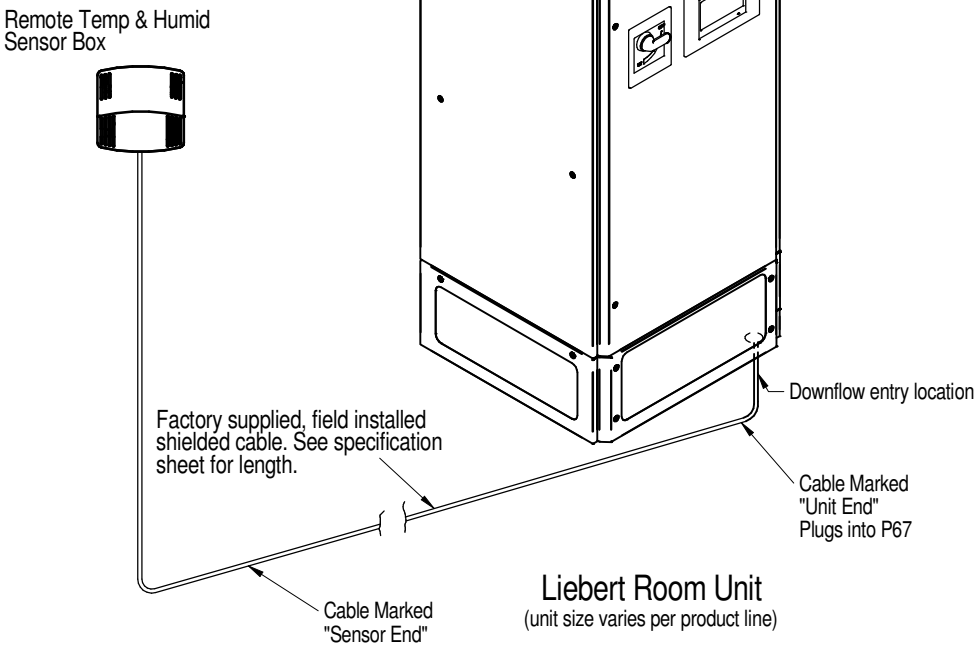
Front View



Back View



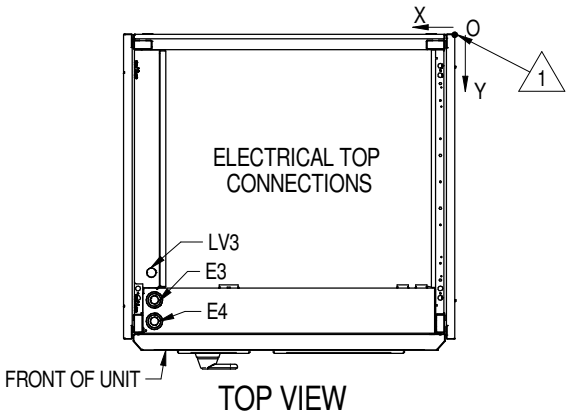
Inside View of Back



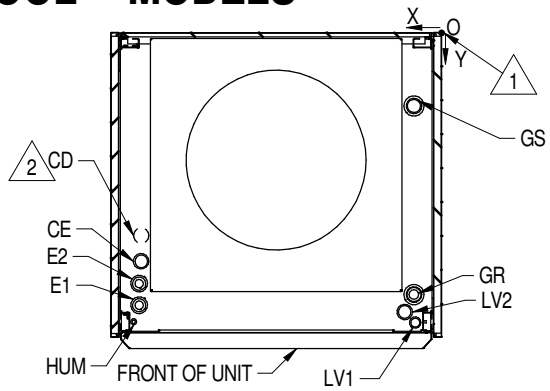
Liebert Room Unit
(unit size varies per product line)

LIEBERT PDX

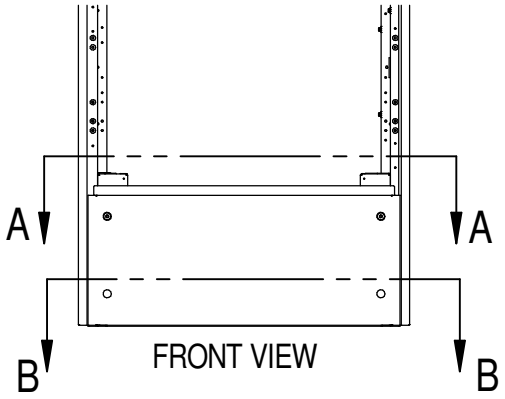
PRIMARY CONNECTION LOCATIONS
DOWNFLOW GLYCOOL™ MODELS

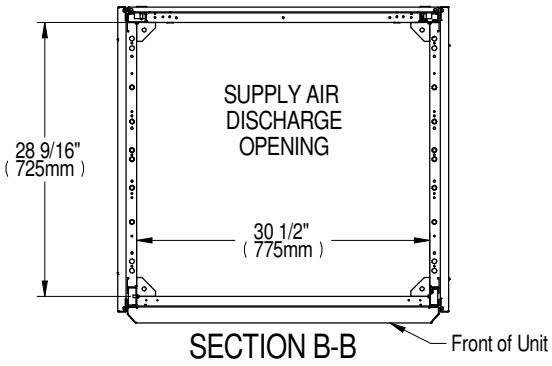


TOP VIEW



SECTION A-A
BOTTOM CONNECTIONS





SECTION B-B

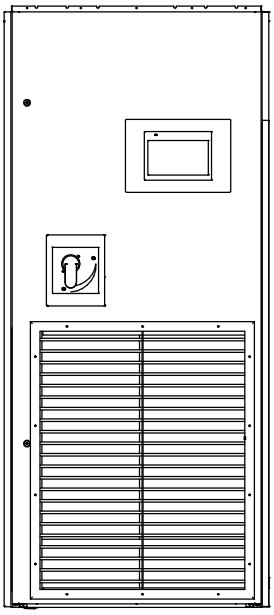
POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING	
				PX011	PX018-PX029
GS	GLYCOOL SUPPLY	2-7/8 (73)	7-5/8 (194)	7/8"	1-1/8"
GR	GLYCOOL RETURN		27-3/8 (695)		
CD 2	CONDENSATE DRAIN	31-1/2 (800)	21-1/4 (540)	3/4" NPT FEMALE	
CE	CONDENSATE ELECTRICAL		24 (610)	1-1/2"	
HUM	HUMIDIFIER SUPPLY LINE	32 (813)	30-1/8 (765)	1/4"	
E1	ELECTRICAL CONN. (HIGH VOLT) BOTTOM	31-1/2 (800)	28-3/8 (721)	7/8", 1-3/8", 1-3/4"	
E2	ELECTRICAL CONN. (HIGH VOLT) BOTTOM		26-1/8 (664)		
E3	ELECTRICAL CONN. (HIGH VOLT) TOP	31-1/4 (793)	27-5/8 (701)		
E4	ELECTRICAL CONN. (HIGH VOLT) TOP		29-7/8 (758)		
LV1	ELECTRICAL CONN. (LOW VOLT) BOTTOM	2-3/4 (70)	30-1/8 (765)	1-1/8"	
LV2	ELECTRICAL CONN. (LOW VOLT) BOTTOM	3-1/2 (89)	29 (737)	1-1/2"	
LV3	ELECTRICAL CONN. (LOW VOLT) TOP	31-5/8 (803)	24-7/8 (632)	1"	

Notes:

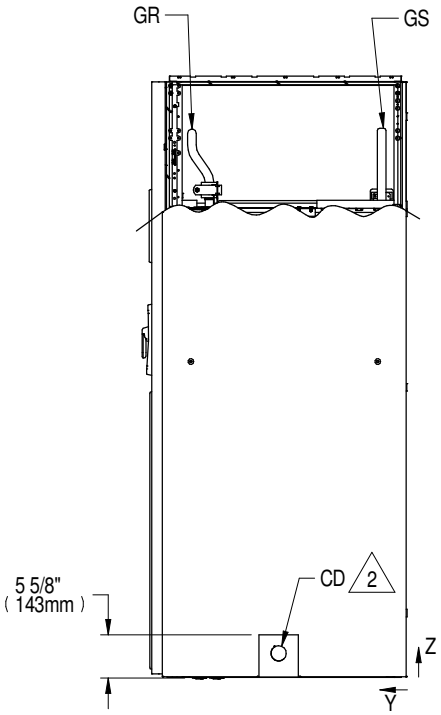
1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field pitch Condensate drain line a minimum of 1/8" (3mm) per 12" (305mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with local codes.
3. All water piping is O.D. Copper except as noted.

LIEBERT PDX

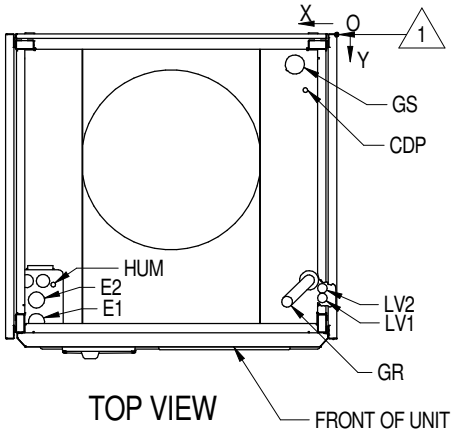
PRIMARY CONNECTION LOCATIONS
UPFLOW GLYCOOL™ MODELS



FRONT VIEW



RIGHT SIDE VIEW



TOP VIEW

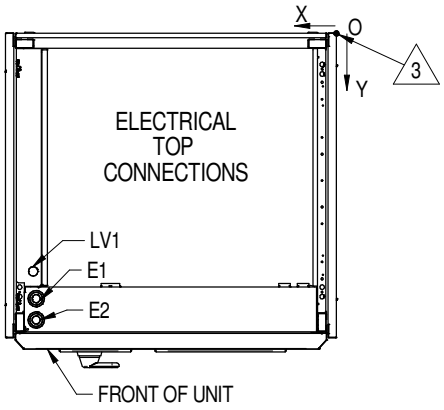
POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	Z in. (mm)	CONNECTION SIZE in.	
					PX011	PX018-PX029
GS	GLYCOOL SUPPLY	4-1/4 (108)	3-1/4 (83)	N/A	7/8	1-1/8
GR	GLYCOOL RETURN	5-1/8 (130)	27-7/8 (708)			
CD	CONDENSATE DRAIN 2	N/A	16-5/8 (422)	3-1/8(79)	3/4 NPT FEMALE	
CDP	CONDENSATE DRAIN WITH PUMP	3-1/4 (83)	5-7/8 (149)	N/A	1/2	
HUM	HUMIDIFIER SUPPLY LINE	29-1/2 (749)	26 (660)		1/4	
E1	ELECTRICAL CONN. (HIGH VOLT)	31-1/4 (794)	30 (762)		7/8, 1-3/8, 1-3/4 5	
E2	ELECTRICAL CONN. (HIGH VOLT)		27-3/4 (705)			
LV1	ELECTRICAL CONN. (LOW VOLT)	1-1/2 (38)	27-1/2 (699)		1	
LV2	ELECTRICAL CONN. (LOW VOLT)		26-1/2 (673)			

Notes:

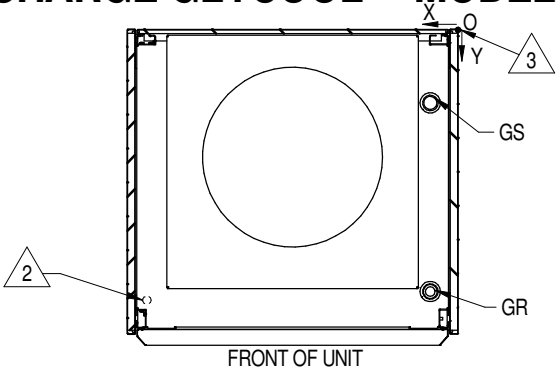
1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field pitch Condensate drain line a minimum of 1/8" (3mm) per 12" (305mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with local codes.
3. Unit with front return shown. Bottom return with rear return floorstand also available.
4. All water piping is O.D. Copper except as noted.
5. Concentric knockouts to be used based on field supplied conduit diameter.

LIEBERT PDX

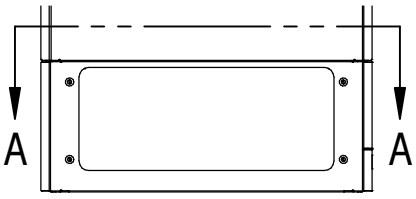
PRIMARY CONNECTION LOCATIONS
DOWNFLOW FRONT DISCHARGE GLYCOOL™ MODELS



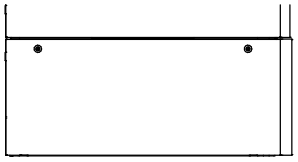
TOP VIEW

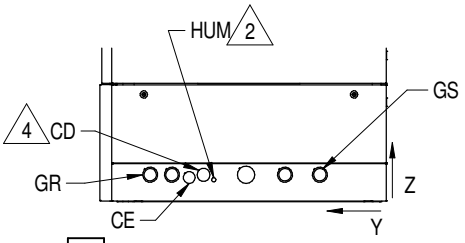


SECTION A-A

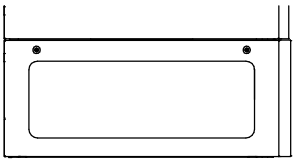


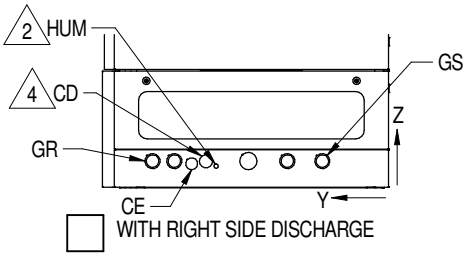
FRONT VIEW


WITHOUT LEFT SIDE DISCHARGE



WITHOUT RIGHT SIDE DISCHARGE


WITH LEFT SIDE DISCHARGE



WITH RIGHT SIDE DISCHARGE

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	Z in. (mm)	CONNECTION SIZE / OPENING	
					PX011	PX018-PX029
GS	GLYCOOL SUPPLY	2-7/8 (73)	7-5/8 (194)	3 (76)	7/8"	1-1/8"
GR	GLYCOOL RETURN		27-3/8 (695)			
CD 4	CONDENSATE DRAIN	N/A	21-1/8 (537)		3/4" NPT FEMALE	
CE	CONDENSATE ELECTRICAL		22-3/4 (578)	2-3/4 (70)	1-3/8"	
HUM 2	HUMIDIFIER SUPPLY LINE		20 (508)	2-1/2 (64)	1/4"	
E1	ELECTRICAL CONN. (HIGH VOLT) TOP	31-1/4 (793)	27-5/8(701)	N/A	7/8", 1-3/8", 1-3/4"	
E2	ELECTRICAL CONN. (HIGH VOLT) TOP		29-7/8(758)			
LV1	ELECTRICAL CONN. (LOW VOLT) TOP	31-5/8 (803)	24-7/8 (632)		1-1/8"	

Notes:
1. Pipes at various heights to allow for tube cutter to be used. Will require stub tubes and elbows for connection at all tube locations.

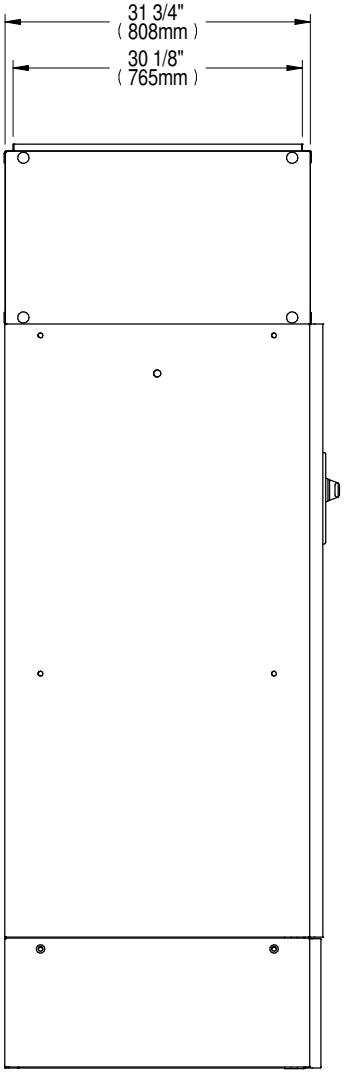
2. Humidifier supply line will need to be routed through this opening to the connection at the left hand side of the unit.

3. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).

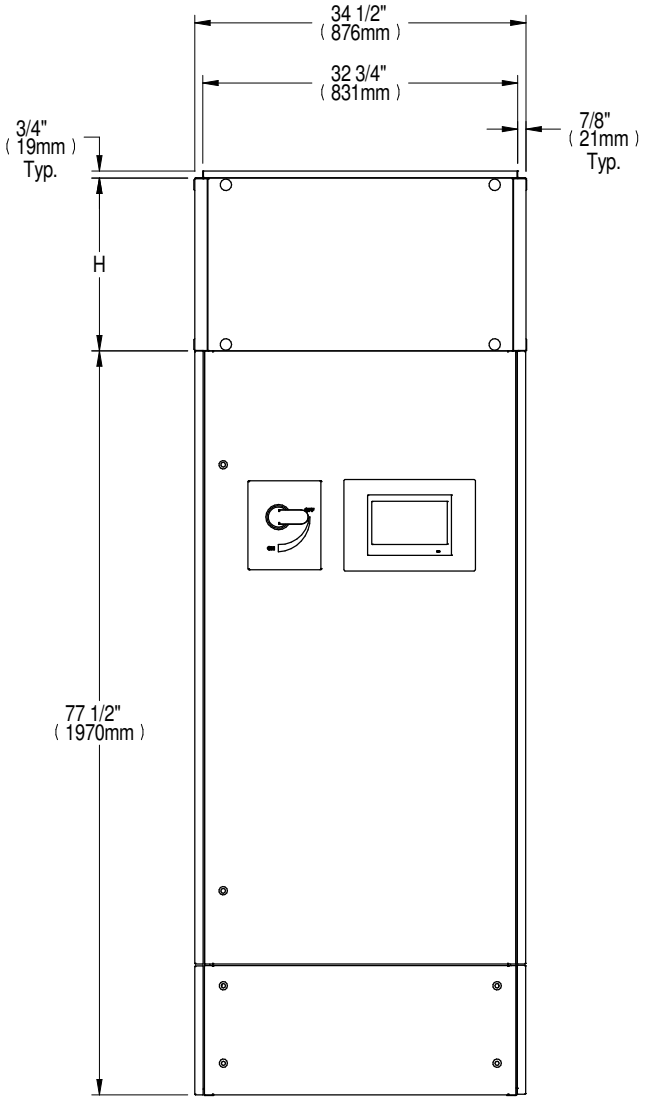
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with all local codes.
5. All water piping is O.D. Copper except as noted.

LIEBERT PDX & PCW

PLENUM DIMENSIONAL DATA
DOWNFLOW RETURN W/ DUCT COLLAR



LEFT SIDE VIEW - WITH PLENUM



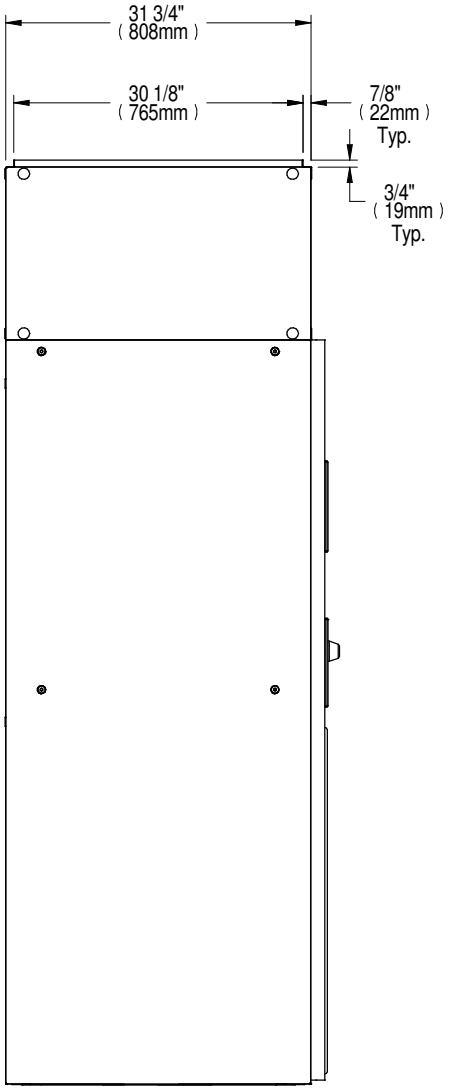
FRONT VIEW - UNIT WITH PLENUM

	Height H in (mm)
☐	18 (457)
☐	24 (609)
☐	30 (762)
☐	36 (914)
☐	42 (1066)
☐	48 (1219)

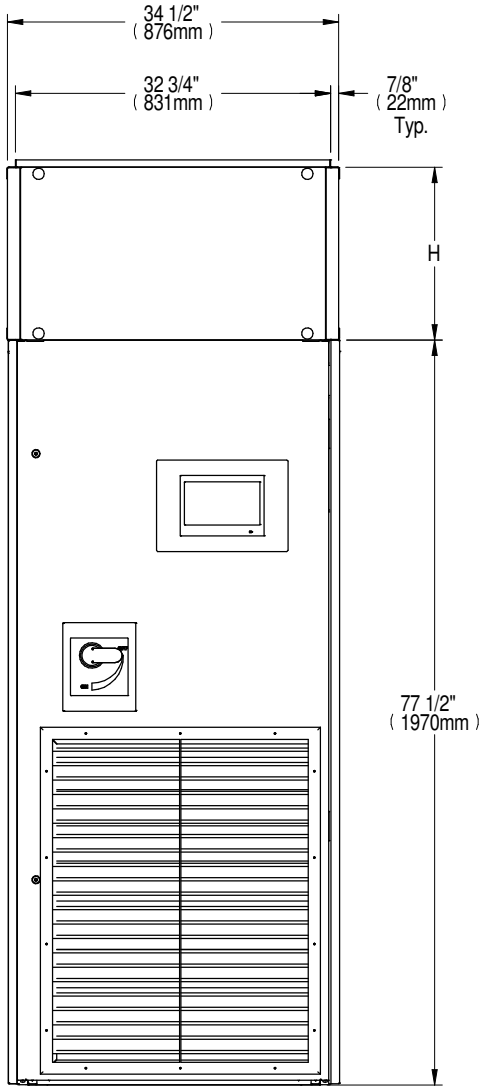
Notes:
1. All Plenums are shipped flat (non-assembled) and must be assembled on site.

LIEBERT PDX & PCW

PLENUM DIMENSIONAL DATA
UPFLOW DISCHARGE W/ DUCT COLLAR



SIDE VIEW - UNIT WITH PLENUM

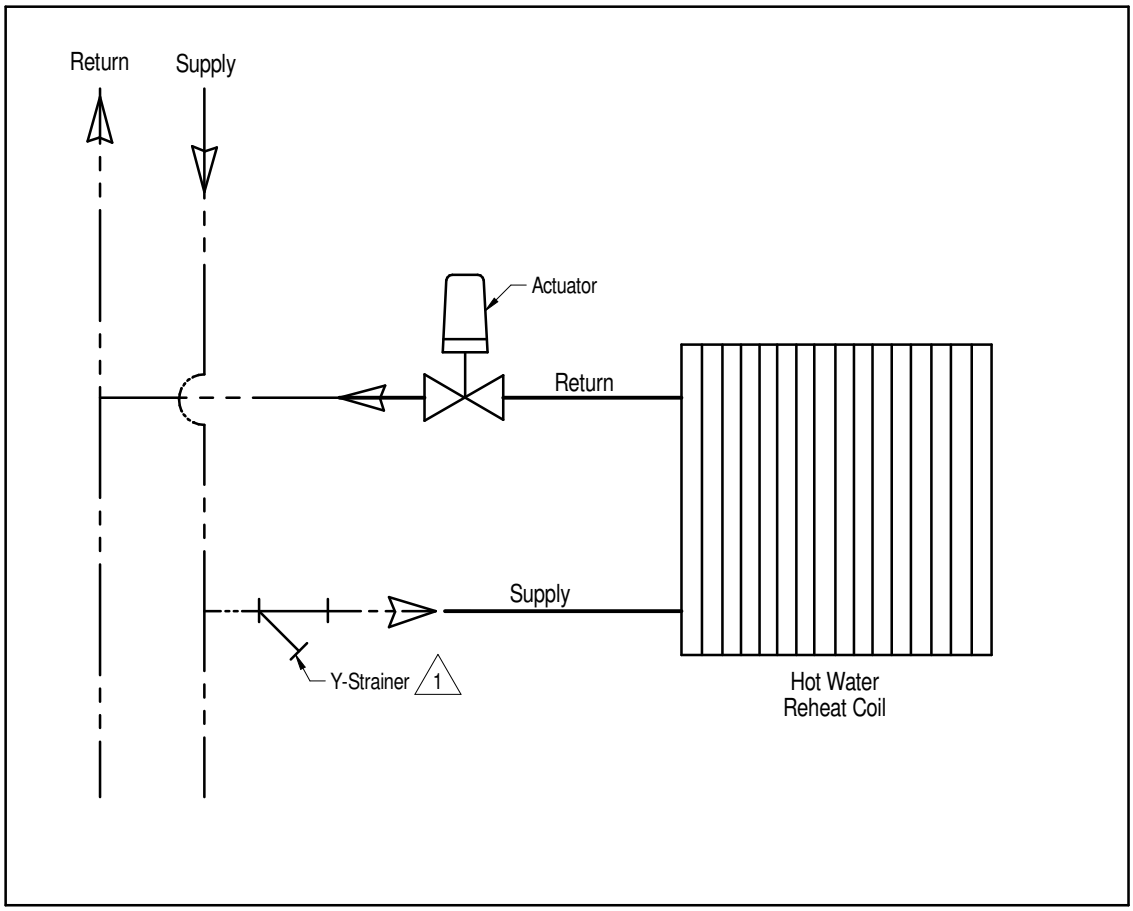


FRONT VIEW - UNIT WITH PLENUM

	Height H in (mm)
☐	18 (457)
☐	24 (609)
☐	30 (762)
☐	36 (914)
☐	42 (1066)
☐	48 (1219)

Notes:
1. Upflow unit shown with top discharge Plenum with duct collar.
2. All Plenums are shipped flat (non-assembled) and must be assembled on site.
3. Unit with front return shown. Upflow bottom return units are available with required rear return floorstand with filter.

OPTIONAL PIPING SCHEMATIC
HOT WATER REHEAT



Optional Hot Water Reheat (2-way valve)

FACTORY PIPING
FIELD PIPING

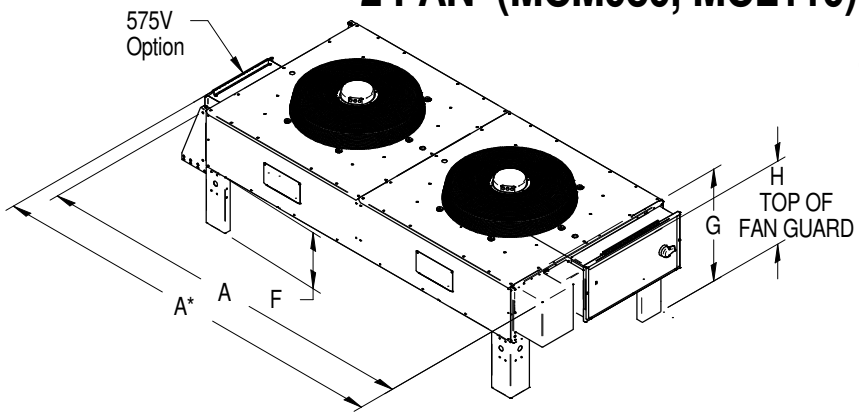
Note:

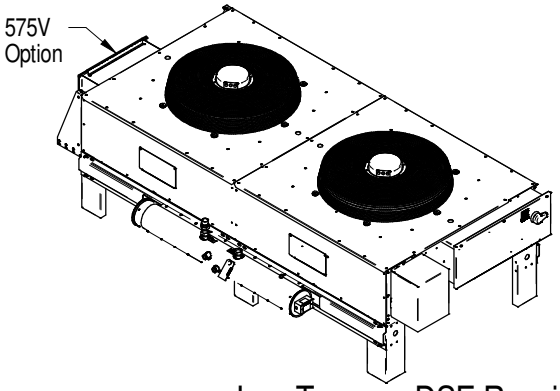
1. Components are not supplied by Liebert, but are required for proper circuit operation and maintenance.

LIEBERT MC CONDENSER

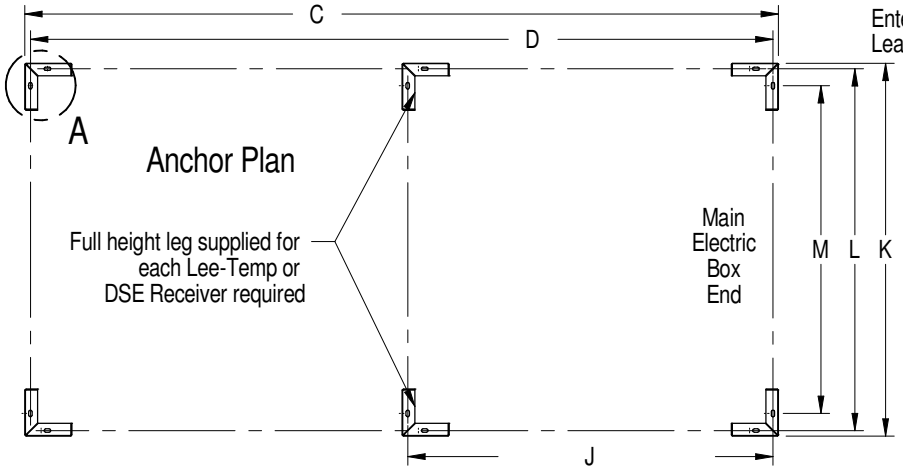
CABINET & ANCHOR DIMENSIONAL DATA

2 FAN (MCM080, MCL110) SINGLE CIRCUIT

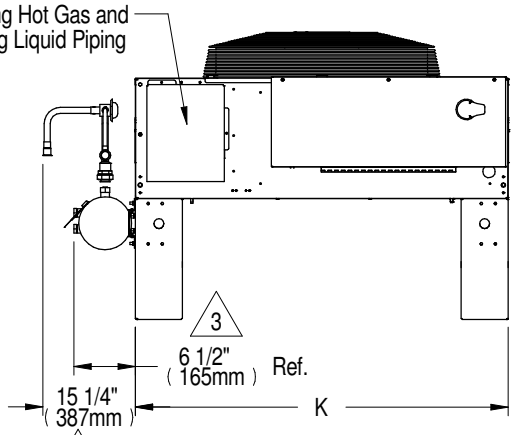




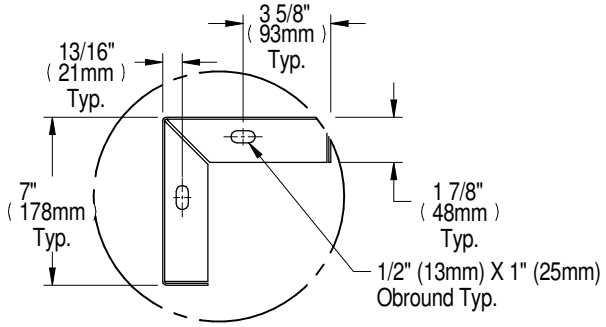
Lee-Temp or DSE Receiver



Left Side of Unit



Front View (Lee-Temp Shown)



DETAIL A
Typical All Legs

LIEBERT MODEL NUMBER	F 2 LEG HEIGHT DIMENSIONS in. (mm)			
MCM080	18 (457)	36 (914)	48 (1219)	60 (1524)
DIM "G"	31-5/8 (803)	49-5/8 (1260)	61-5/8 (1565)	73-5/8 (1870)
DIM "H"	39-5/8 (1006)	57-5/8 (1464)	69-5/8 (1768)	81-5/8 (2073)
MCL110				
DIM "G"	35-7/8 (911)	53-7/8 (1368)	65-7/8 (1673)	77-7/8 (1978)
DIM "H"	43-5/8 (1108)	61-5/8 (1565)	73-5/8 (1870)	85-5/8 (2175)

Note:
1. Liebert recommends a clearance of 36" (915mm) on each side for proper operation and component access.

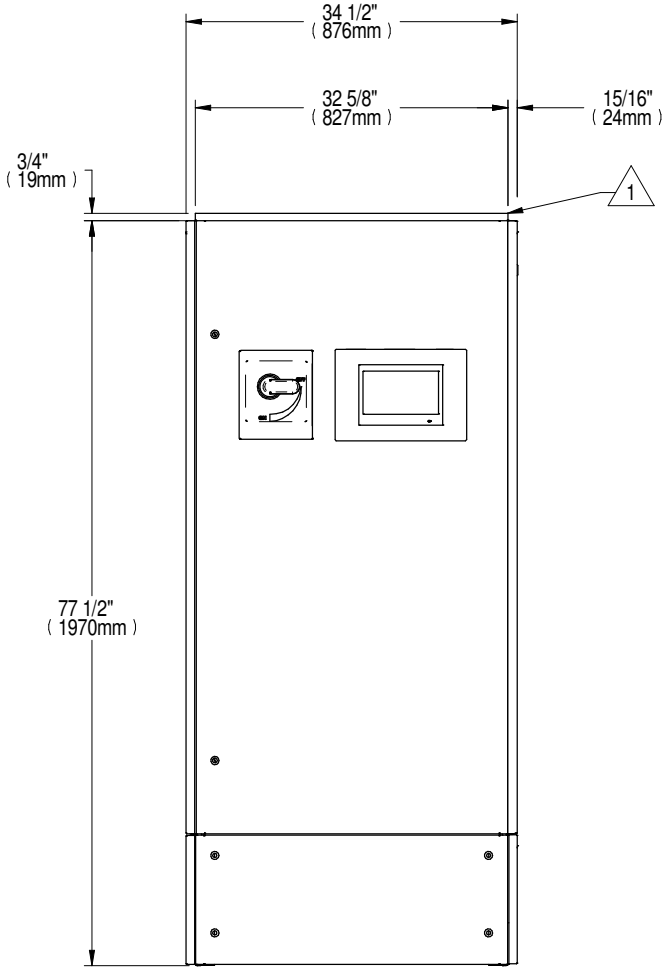
2 Cross bracing required for legs longer than 18" (457mm). Quantity varies per model & options selected.

3 For DSE models only, 6-1/2" (165mm) dimension is 9-1/4" (235mm) and 15-1/4 (387mm) dimension is not applicable.

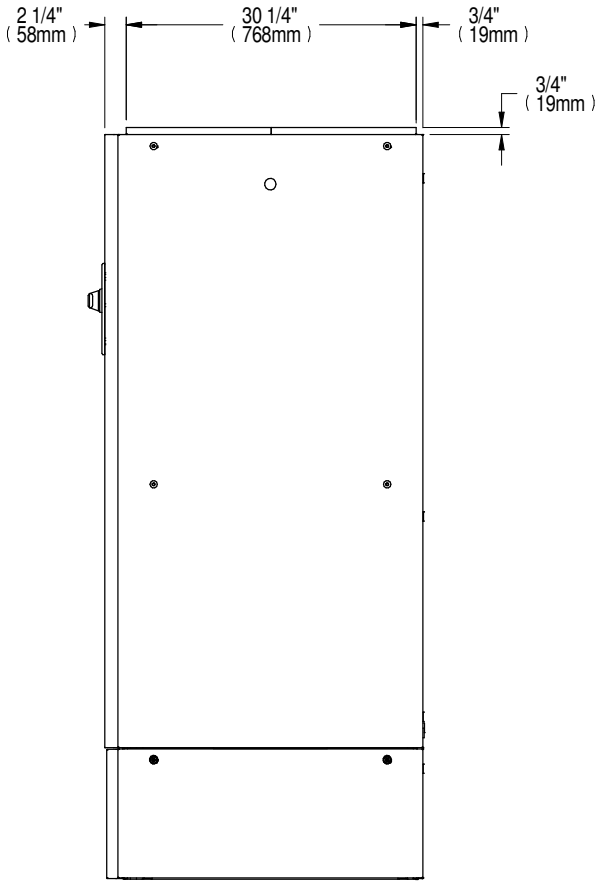
Dimensions in. (mm)								
LIEBERT MODEL NUMBER	A	A* (575V ONLY)	C	D	J Lee-Temp or DSE Receivers Only	K	L	M
MCM080	105-1/4 (2674)	113-7/16 (2882)	96-1/16 (2440)	94-7/16 (2398)	46-5/16 (1177)	46 (1168)	44-3/8 (1127)	39-5/16 (999)
MCL110	124-1/8 (3152)	133-1/8 (3381)	112-1/8 (2848)	110-1/2 (2806)	54-3/8 (1381)	55-1/2 (1410)	53-7/8 (1368)	48-3/4 (1238)

LIEBERT PDX/PCW

DOWNFLOW UNIT WITH FIELD DUCT CONNECTION



Front



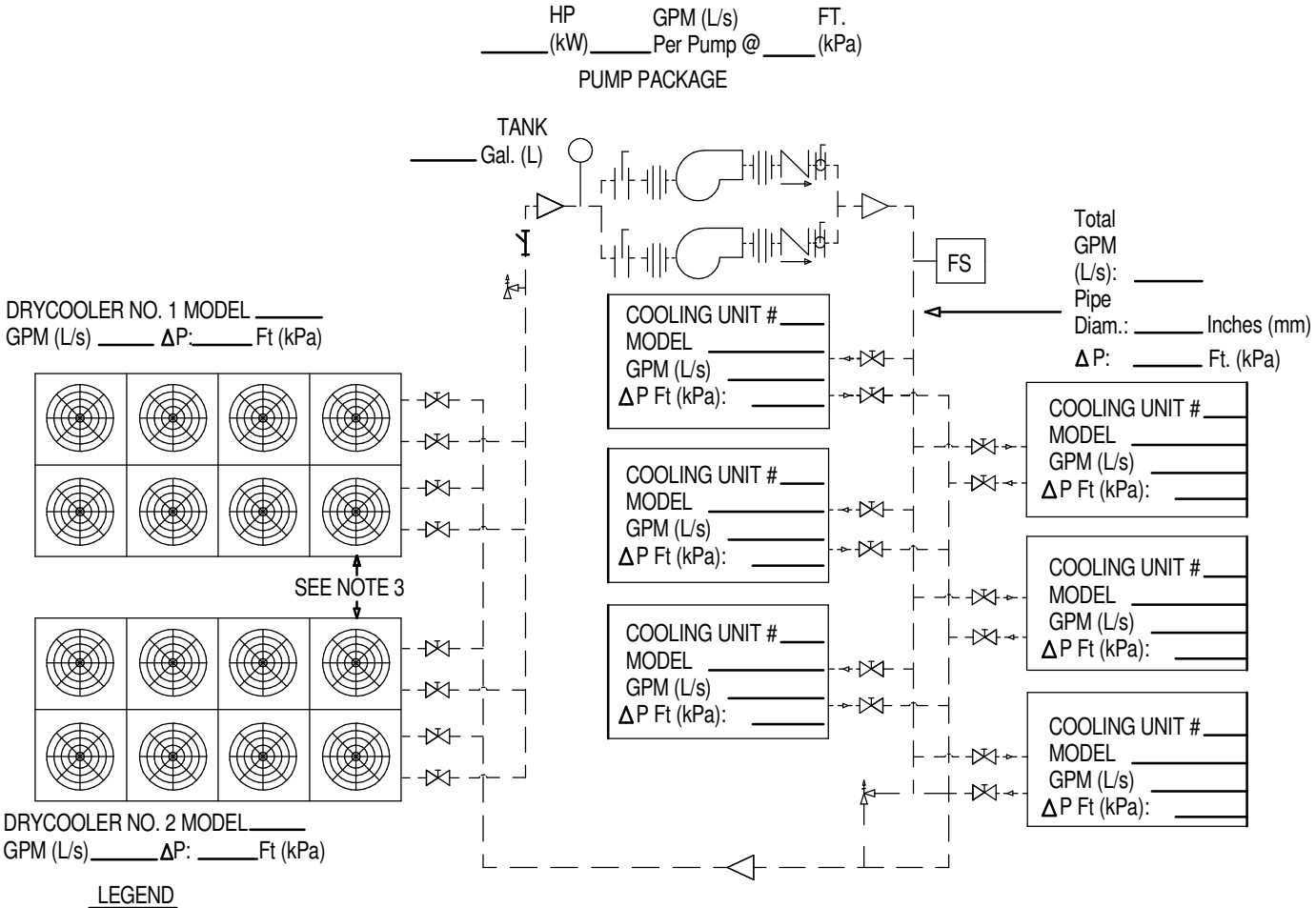
Right Side

Notes:

1. Duct collar kit is shipped loose and is field assembled.

LIEBERT DRYCOOLER

PIPING SCHEMATIC
MULTIPLE DRYCOOLERS & COOLING UNITS ON COMMON GLYCOL LOOP



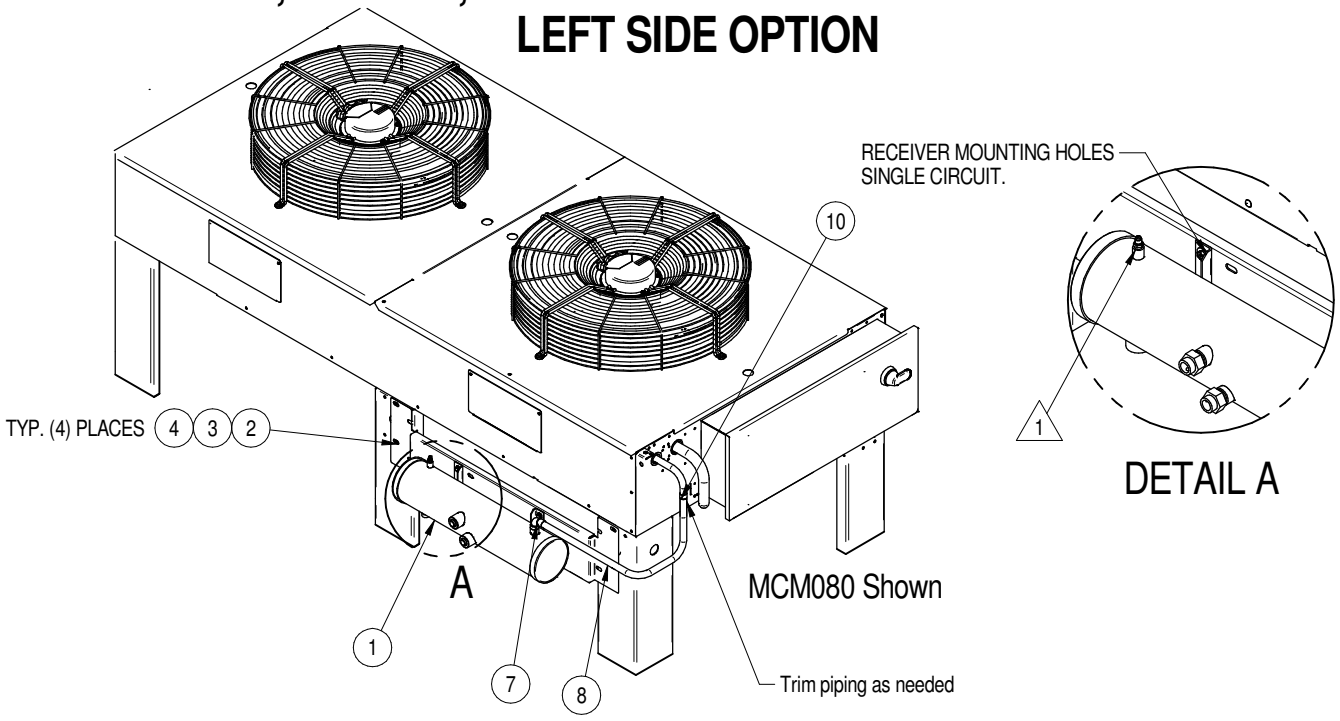
LEGEND

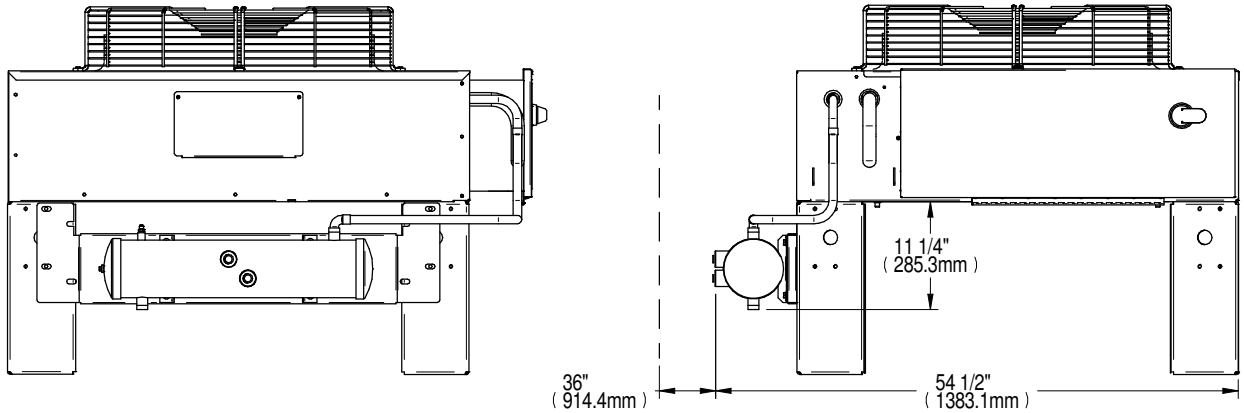
- GATE VALVE
- CHECK VALVE
- BUTTERFLY VALVE
- RELIEF VALVE
- UNION
- BALL OR FLOW CONTROL VALVE
- FS FLOW SWITCH
- ΔP: PRESSURE DROP
- STRAINER/FILTER

NOTES:
1. PRESSURE AND TEMPERATURE GAUGES (OR PORTS FOR SAME) ARE RECOMMENDED TO MONITOR COMPONENT PRESSURE DROPS AND PERFORMANCE.
2. FLOW MEASURING DEVICES, DRAIN AND BALANCING VALVES TO BE SUPPLIED BY OTHERS AND LOCATED AS REQUIRED.
3. SEE PRODUCT LITERATURE FOR INSTALLATION GUIDELINES AND CLEARANCE DIMENSIONS.
4. DRAWING SHOWS DUAL PUMP PACKAGE. ALTERNATE PUMP PACKAGES WITH MORE PUMPS MAY BE CONSIDERED, CONSULT SUPPLIER.
5. DEPENDING ON THE DRYCOOLER COIL CIRCUITING IT MAY HAVE 2 IN/OUT OR 4 IN/OUT CONNECTION POINTS.
6. INSTALL EXPANSION OR COMPRESSION TANK AT THE HIGHEST POINT OF THE SYSTEM.

LIEBERT MC CONDENSER

PDX-EEV RECEIVER MOUNTING
MCS028, MCM040, MCM080 SINGLE CIRCUIT CONDENSER
LEFT SIDE OPTION





ITEM NO.	DESCRIPTION	QTY
1	RECEIVER AND BRACKET ASSEMBLY	1
2	CAP SCREW HXDIN933M8-1.25X25A2	8
3	FENDER WASHER DIN9021 M8X24 A2	12
4	LOCK NUT HEX NYL INSR M8	8
7	90° ELBOW FTGXC 7/8" CU	1
8	COPPER FORMED TUBE 7/8"	1
10	REDUCER CU CXC 7/8"X5/8"	1

NOTES:

1. SCHRADER PORT FOR PROOF PRESSURE RELIEF ONLY & ACCESS NOT REQUIRED AFTER PIPING.

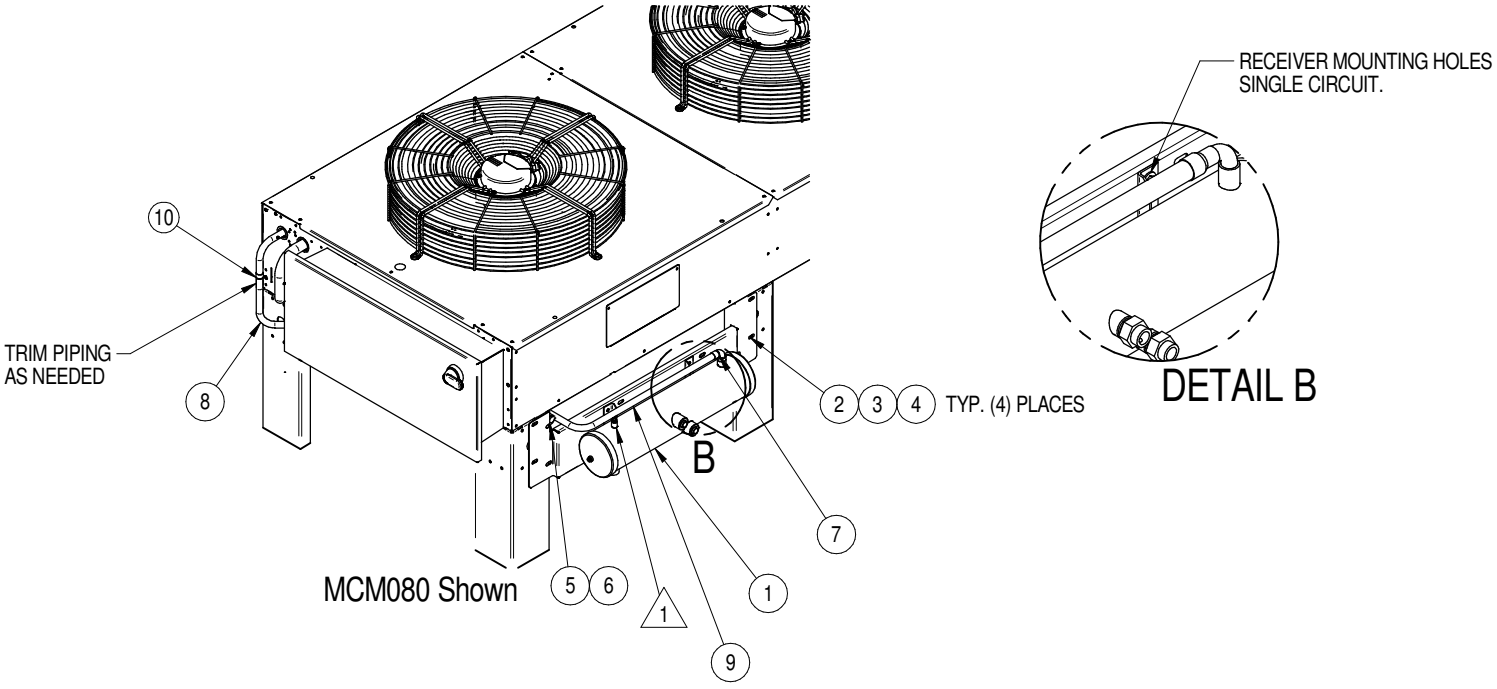
Liebert MC Condenser Hot Gas/Receiver Outlet Connection Sizes*

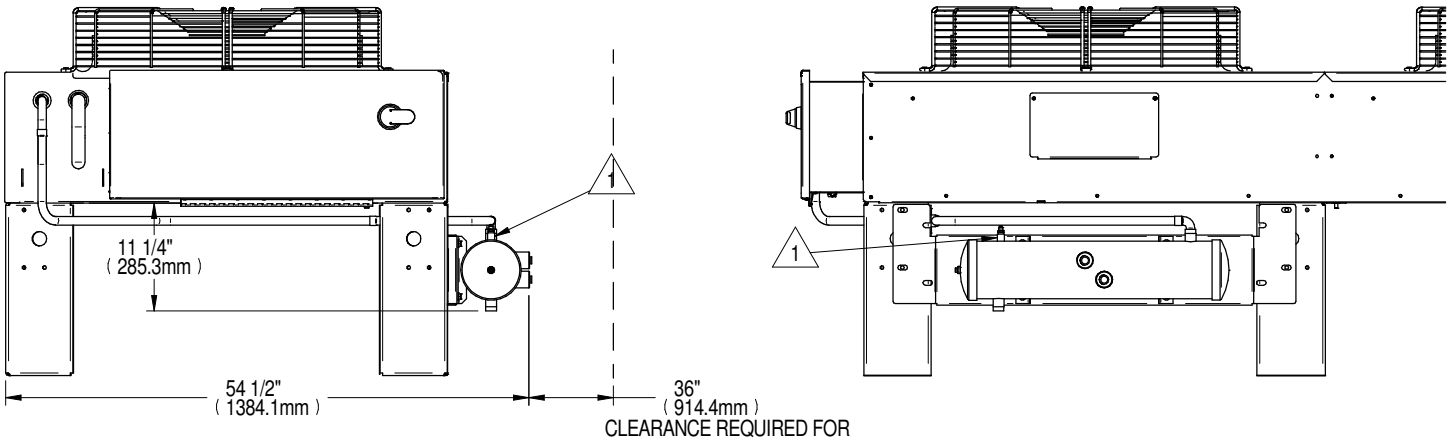
MODEL NO.	CONNECTION SIZES, OD, IN	
	HOT GAS LINE	RECEIVER OUTLET (LIQUID LINE)
MCS 028	7/8	1-3/8
MCM 040	7/8	1-3/8
MCM 080	1-1/8	1-3/8

*Consult DPN000788 for Hot Gas & Liquid Line sizes required between indoor and outdoor units.

LIEBERT MC CONDENSER

PDX-EEV RECEIVER MOUNTING
MCS028, MCM040, MCM080 SINGLE CIRCUIT CONDENSER
RIGHT SIDE OPTION





ITEM NO.	DESCRIPTION	QTY
1	RECEIVER AND BRACKET ASSEMBLY	1
2	CAP SCREW HXDIN933M8-1.25X25A2	8
3	FENDER WASHER DIN9021 M8X24 A2	12
4	LOCK NUT HEX NYL INSR M8	8
5	CLAMP OMEGA 7/8"	1
6	SCREW SD HWH YZ 10-16 X 5/8	2
7	90° ELBOW FTGXC 7/8" CU	1
8	COPPER FORMED TUBE 7/8"	1
9	COPPER FORMED TUBE 7/8"	1
10	REDUCER CU CXC 7/8"X5/8"	1

NOTES:

1. SCHRADER PORT FOR PROOF PRESSURE RELIEF ONLY & ACCESS NOT REQUIRED AFTER PIPING.

Liebert MC Condenser Hot Gas/Receiver Outlet Connection Sizes*

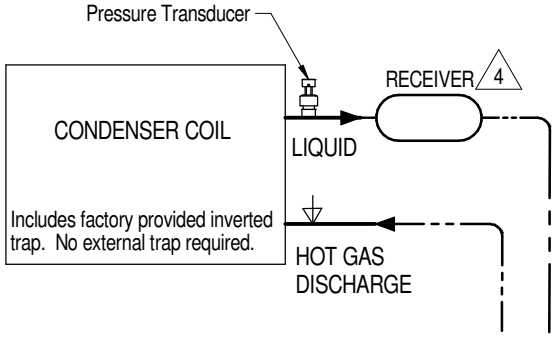
MODEL NO.	CONNECTION SIZES, OD, IN	
	HOT GAS LINE	RECEIVER OUTLET (LIQUID LINE)
MCS 028	7/8	1-3/8
MCM 040	7/8	1-3/8
MCM 080	1-1/8	1-3/8

*Consult DPN000788 for Hot Gas & Liquid Line sizes required between indoor and outdoor units.

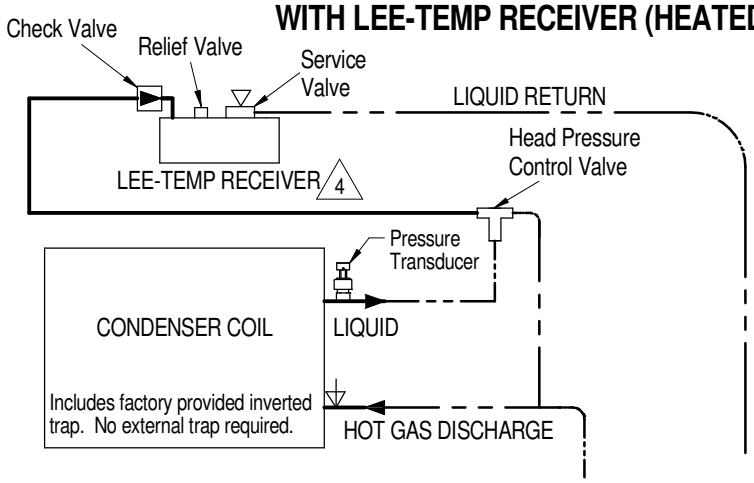
LIEBERT PDX

PIPING SCHEMATIC
AIR COOLED MODELS WITH EEV

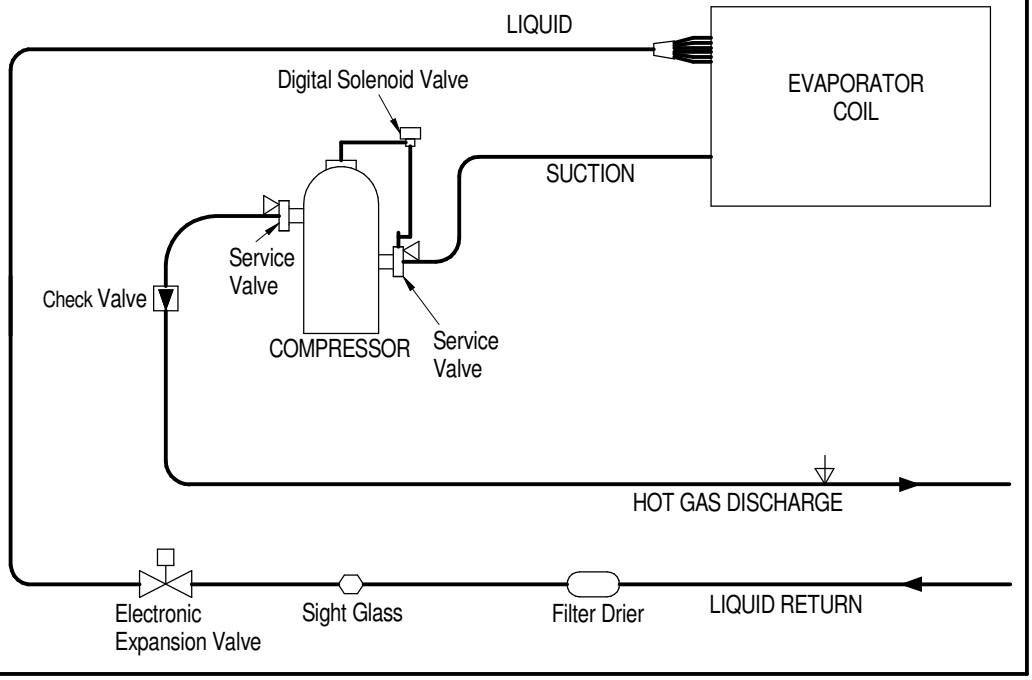
LIEBERT MC CONDENSER WITH REFRIGERANT RECEIVER (UNHEATED)

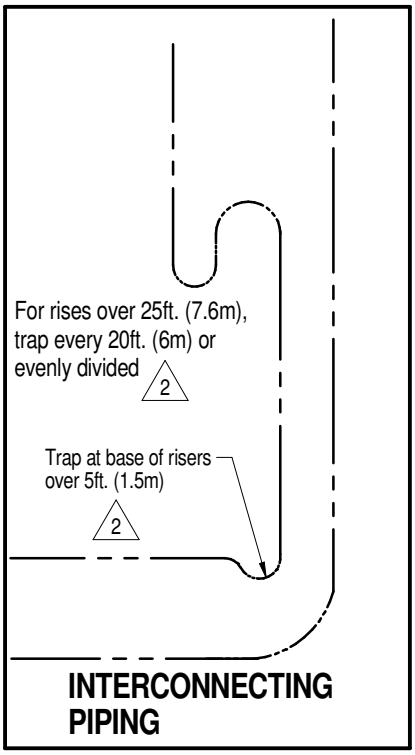


LIEBERT MC CONDENSER WITH LEE-TEMP RECEIVER (HEATED)



LIEBERT PDX UNIT





INTERCONNECTING PIPING

FACTORY REFRIGERANT PIPING
FIELD PIPING

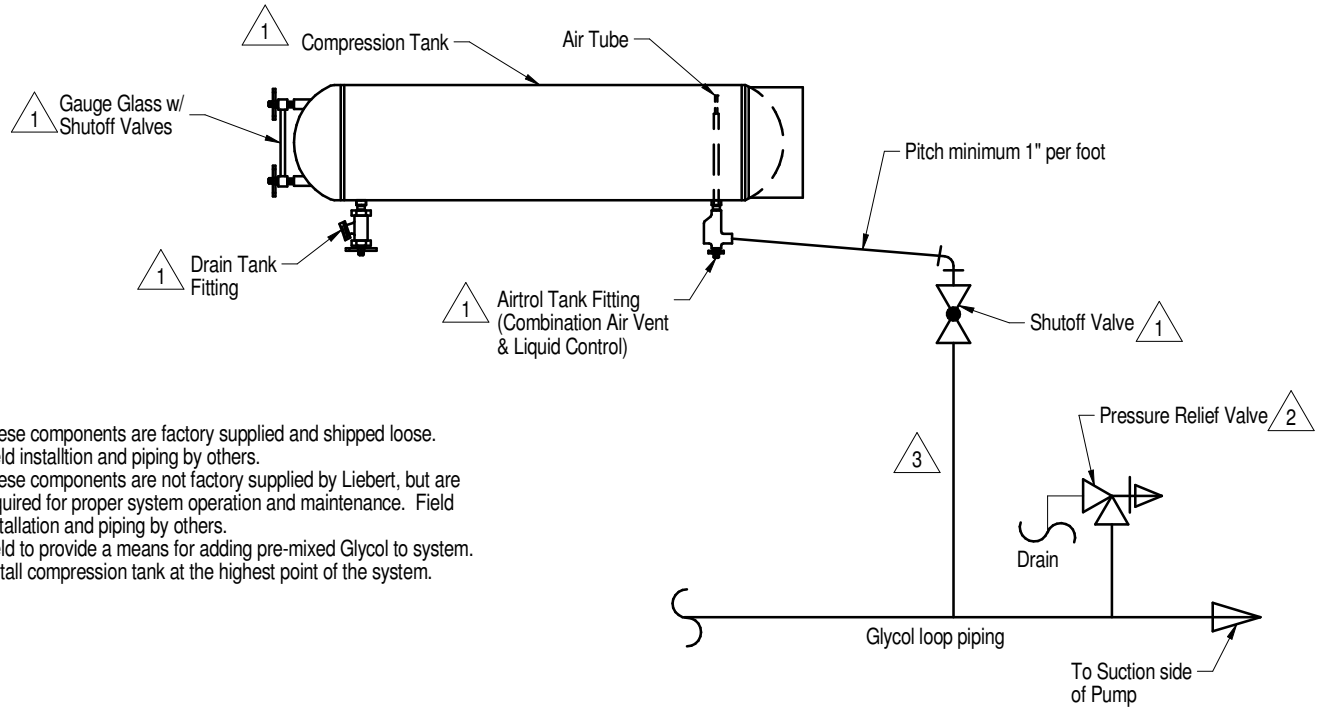
SERVICE/SCHRADER (ACCESS) CONNECTION, NO VALVE CORE.
SERVICE/SCHRADER (ACCESS) CONNECTION, WITH VALVE CORE.

Notes:

1. Schematic representation shown. Do not use for specific connection locations.
2. Components are not supplied by Liebert but are required for proper circuit operation and maintenance.
3. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid floodback to compressor. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
4. Refrigerant receiver or Lee-temp receiver required with PDX unit with EEV option. The outlet of the receiver must be higher than the elevation of the EEV inside the indoor unit. This vertical height must not exceed 60ft. (18.3m).
5. Do not isolate any refrigerant circuits from over pressurization protection.

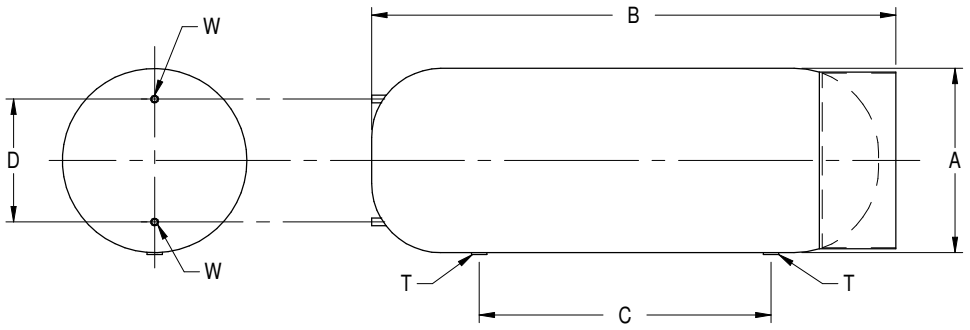
LIEBERT DRYCOOLER

GENERAL ARRANGEMENT DIAGRAM & DIMENSIONAL DATA
ASME COMPRESSION TANK KITS GLYCOL/GLYCOOL™ SYSTEMS



Notes:

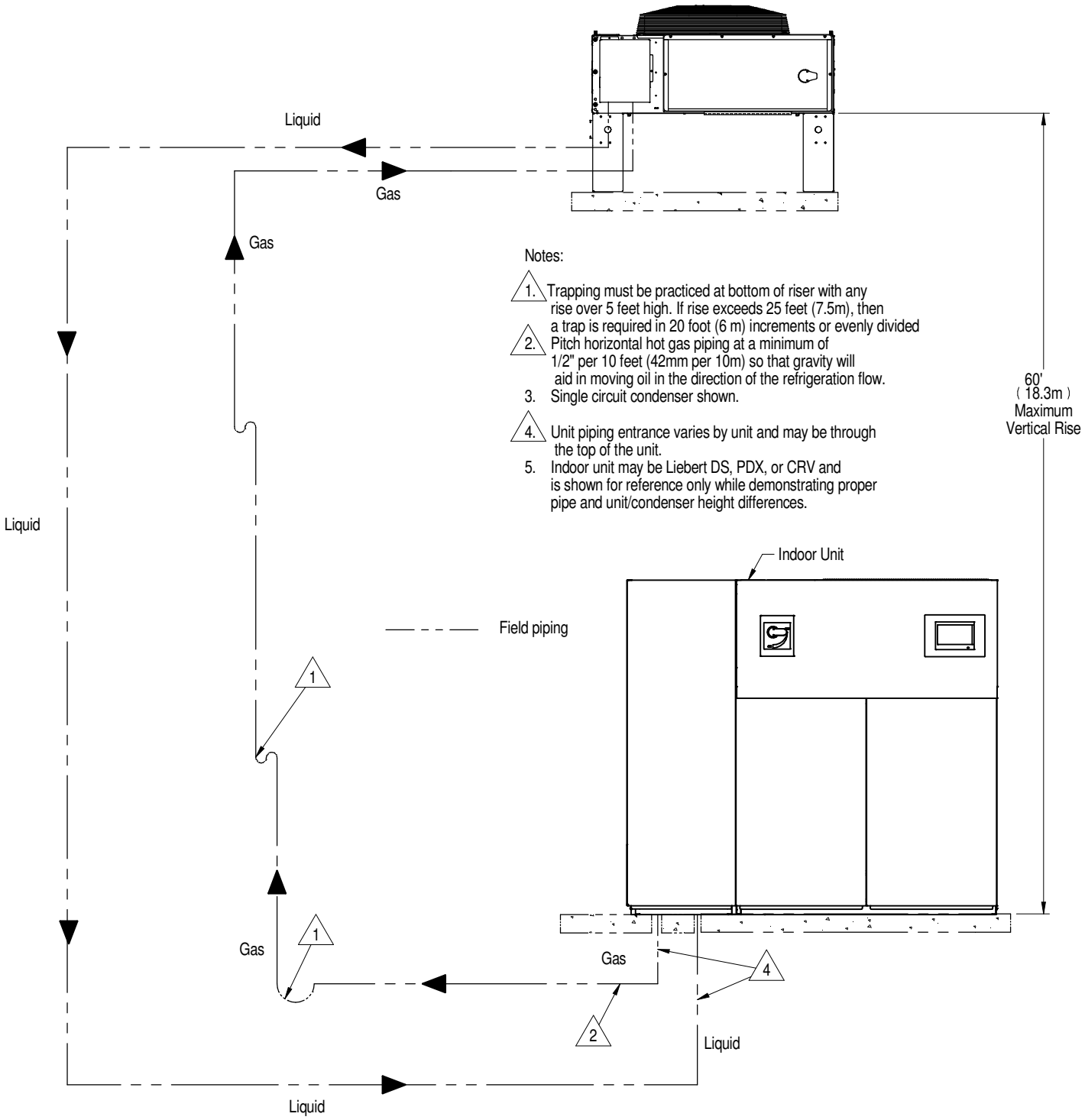
1. These components are factory supplied and shipped loose. Field installtion and piping by others.
2. These components are not factory supplied by Liebert, but are required for proper system operation and maintenance. Field installation and piping by others.
3. Field to provide a means for adding pre-mixed Glycol to system.
4. Install compression tank at the highest point of the system.



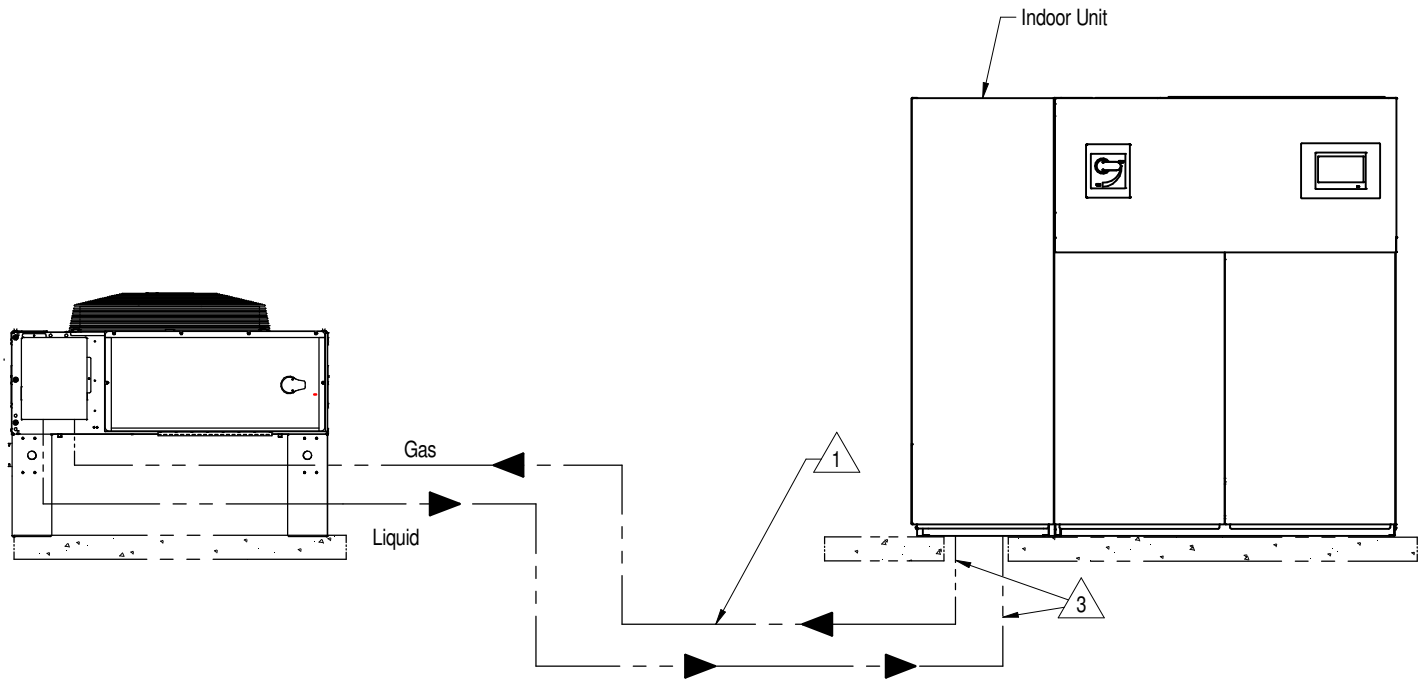
MAXIMUM SYSTEM	TANK CAPACITY	DIMENSIONS in. (mm)						APPROX. KIT WT.
(GAL)	(GAL)	A	B	C	D	T (NPT Female)	W (NPT Female)	Lbs. (kg)
250	15	12 (305)	34-1/8 (867)	19 (483)	8 (203)	1"	1/2"	60 (27.2)
400	24		52-1/8 (1324)	37 (940)				75 (34.0)
500	30	14 (356)	49-3/8 (1254)	31-1/4 (794)	10 (254)			82 (37.2)
650	40		64-3/8 (1635)	46-1/4 (1175)				105 (47.6)
1000	60	16 (406)	73 (1854)	53-1/2 (1359)	12 (305)			140 (63.5)
1650	100	20 (508)	80-5/16 (2040)	58 (1473)	16 (406)			200 (90.7)

LIEBERT MC CONDENSER

AIR COOLED PIPING SCHEMATIC
CONDENSER ABOVE INDOOR UNIT



AIR COOLED PIPING SCHEMATIC
CONDENSER AND INDOOR UNIT AT SAME LEVEL

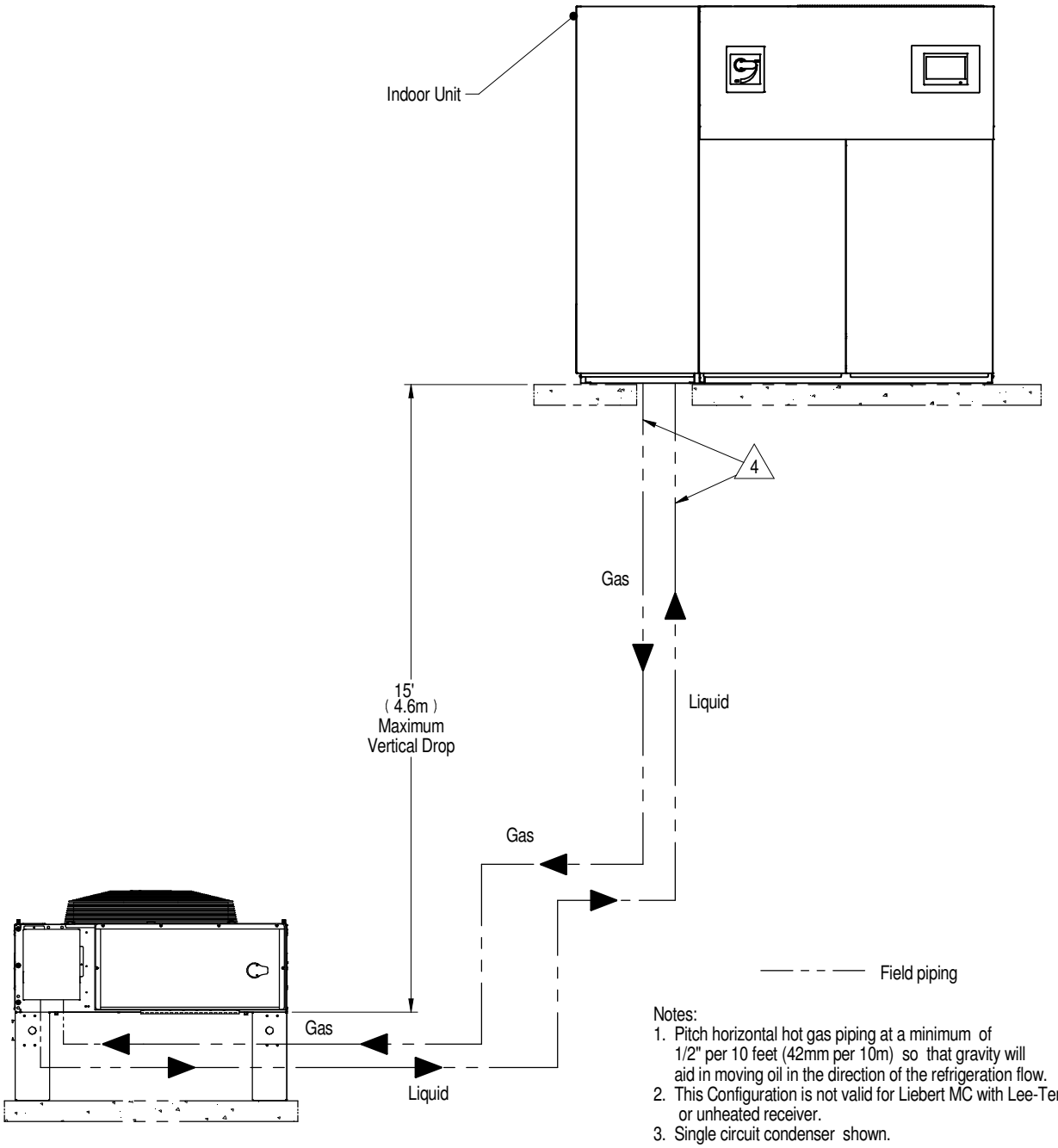


—— – – —— Field piping

Notes:

1. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
2. Single circuit condenser shown.
3. Unit piping entrance varies by unit and may be through the top of the unit.
4. Indoor unit may be Liebert DS, PDX, or CRV and is shown for reference only.

AIR COOLED PIPING SCHEMATIC
CONDENSER BELOW INDOOR UNIT



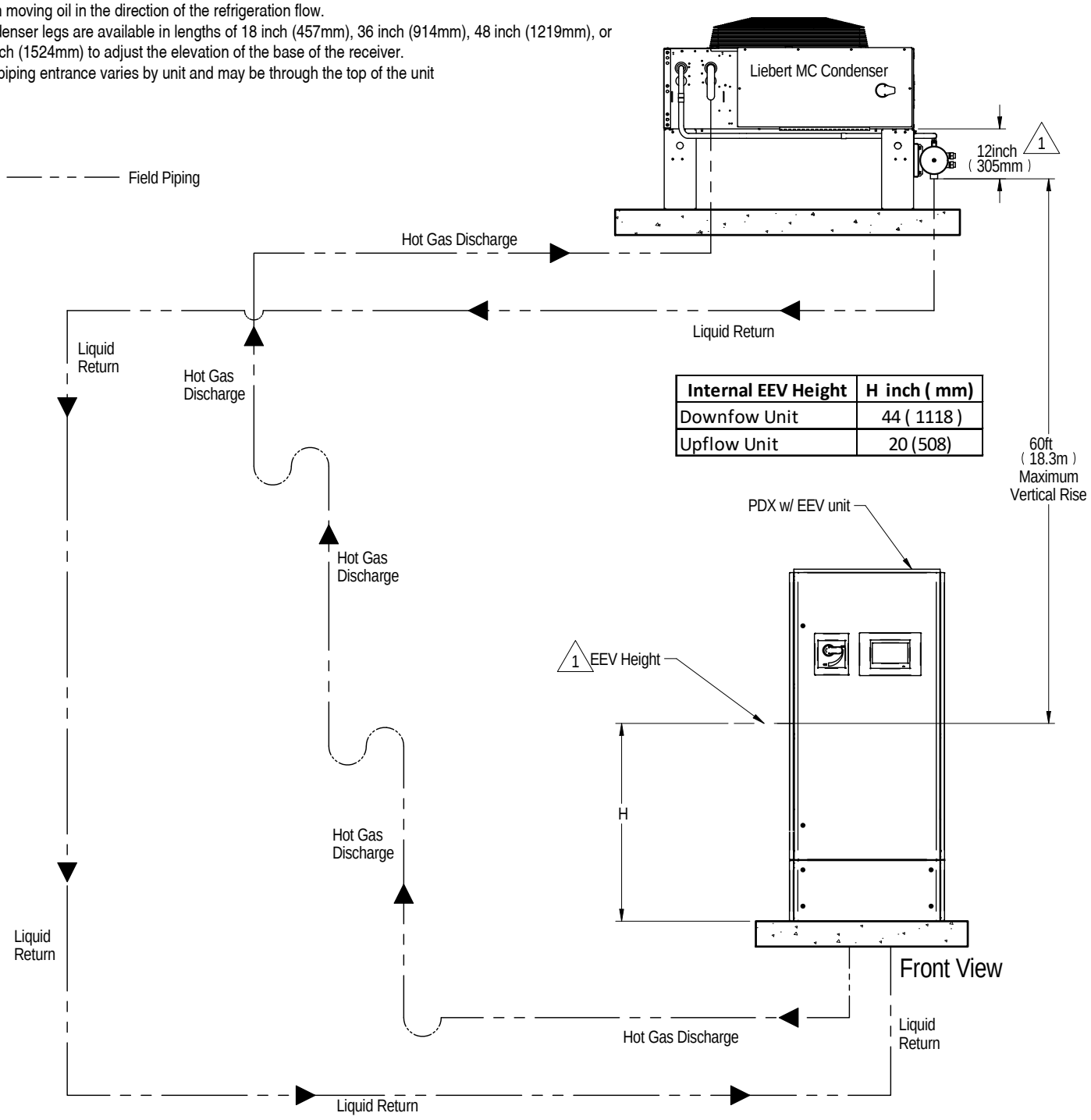
Notes:
1. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
2. This Configuration is not valid for Liebert MC with Lee-Temp or unheated receiver.
3. Single circuit condenser shown.
4. Unit piping entrance varies by unit and may be through the top of the unit.
5. Indoor unit may be Liebert DS, PDX, or CRV and is shown for reference only while demonstrating proper pipe and unit/condenser height differences.

LIEBERT PDX w/EEV

AIR COOLED PIPING SCHEMATIC
LIEBERT MC WITH RECEIVER ABOVE UNIT

Notes:

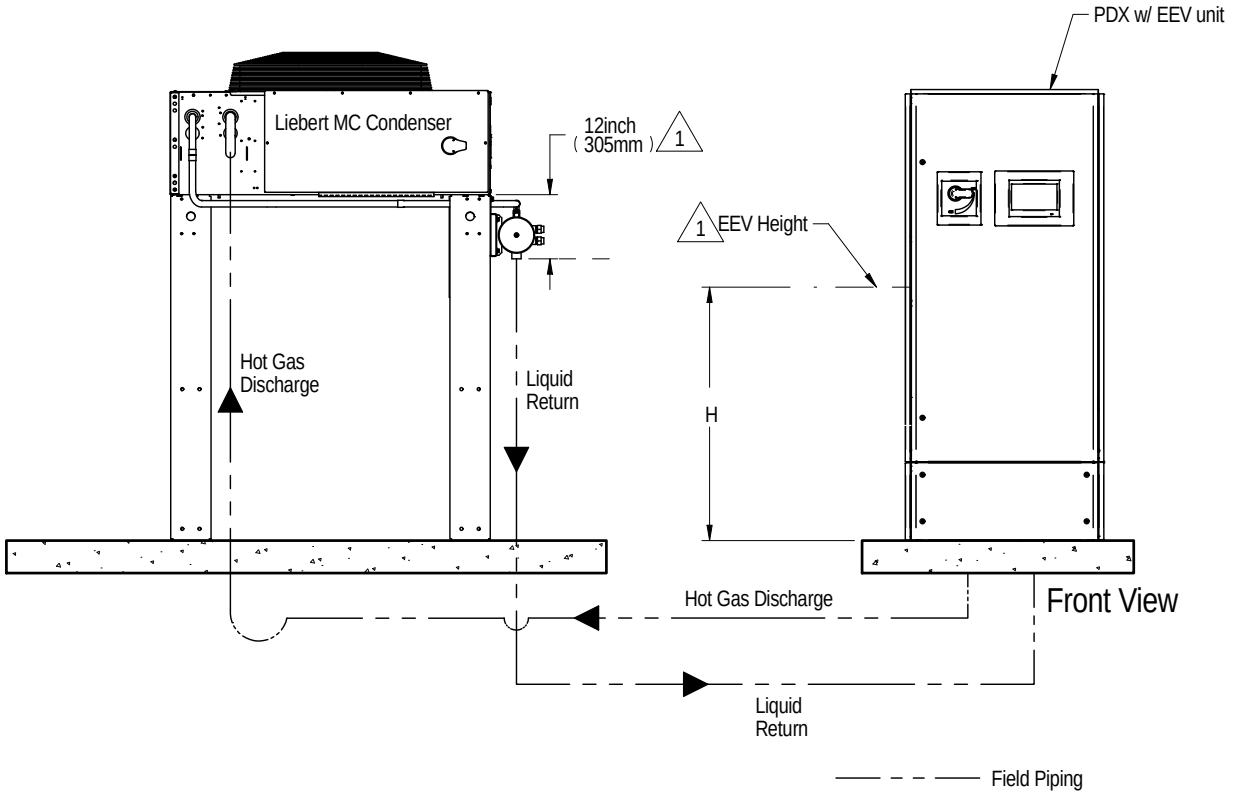
1. The outlet of the required receiver must be higher than the elevation of the EEV inside the indoor unit.
2. Unit must be trapped at bottom of riser with any rise over 5 feet (1.5m) high. If rise exceeds 25 feet (7.5m), then a trap is required in 20 foot (6.1m) increments or evenly divided.
3. Pitch horizontal hot gas piping at a minimum of ½ inch per 10 feet (42 mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
4. Condenser legs are available in lengths of 18 inch (457mm), 36 inch (914mm), 48 inch (1219mm), or 60 inch (1524mm) to adjust the elevation of the base of the receiver.
5. Unit piping entrance varies by unit and may be through the top of the unit



Internal EEV Height	H inch (mm)
Downfow Unit	44 (1118)
Upflow Unit	20 (508)

AIR COOLED PIPING SCHEMATIC

LIEBERT MC WITH RECEIVER MOUNTED AND UNIT AT SIMILIAR LEVEL



Internal EEV Height	H inch (mm)
Downfow Unit	44 (1118)
Upflow Unit	20 (508)

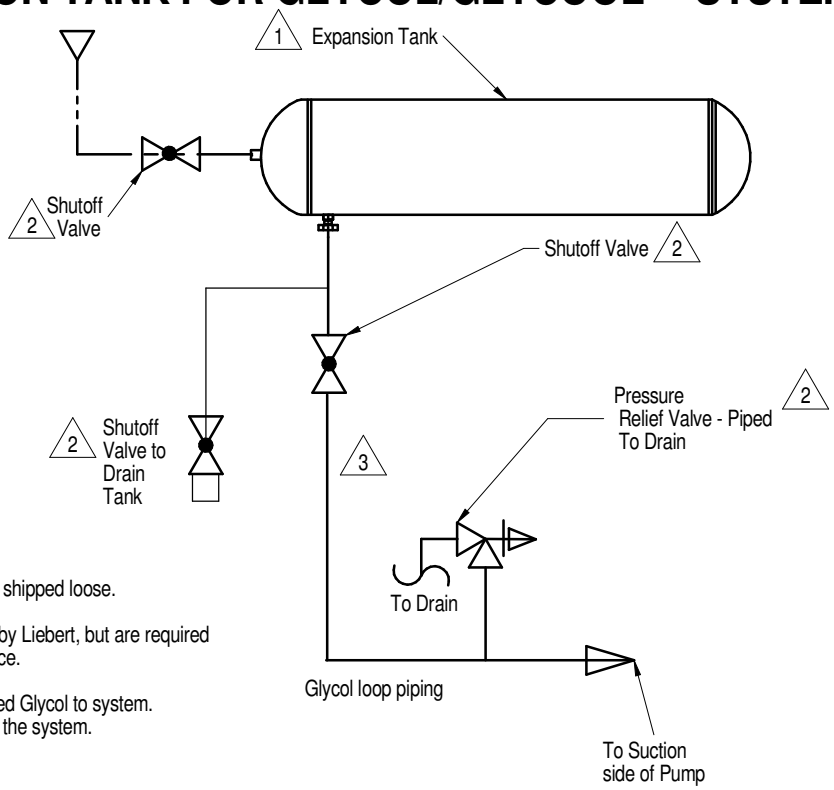
Notes:

1. The outlet of the required receiver must be higher than the elevation of the EEV inside the indoor unit.
2. Unit must be trapped at bottom of riser with any rise over 5 feet (1.5m) high. If rise exceeds 25 feet (7.5m), then a trap is required in 20 foot (6.1m) increments or evenly divided.
3. Pitch horizontal hot gas piping at a minimum of ½ inch per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
4. Condenser legs are available in lengths of 18 inch (457mm), 36 inch (914mm), 48 inch (1219mm), or 60 inch (1524mm) to adjust the elevation of the base of the receiver.
5. Unit piping entrance varies by unit and may be through the top of the unit

LIEBERT DRYCOOLER

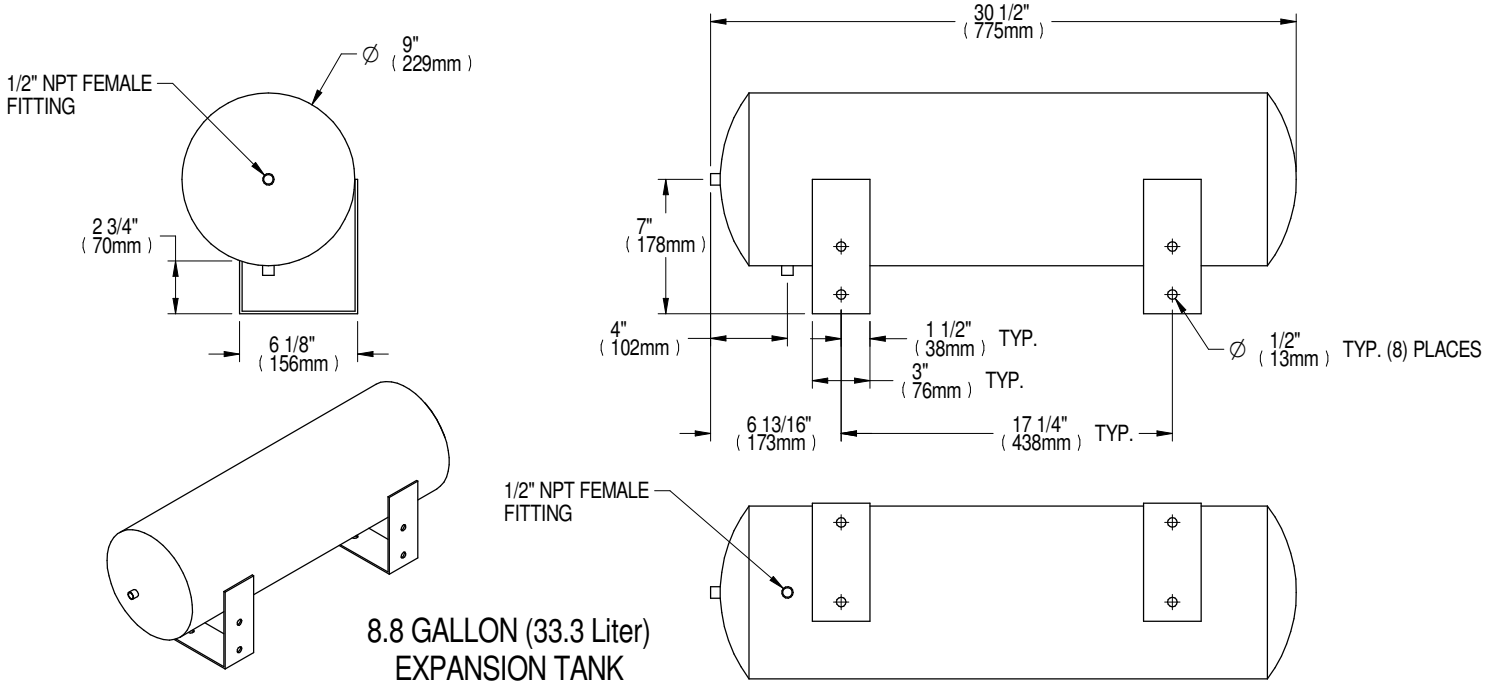
GENERAL ARRANGEMENT DIAGRAM & DIMENSIONAL DATA

EXPANSION TANK FOR GLYCOL/GLYCOOL™ SYSTEMS



Notes:

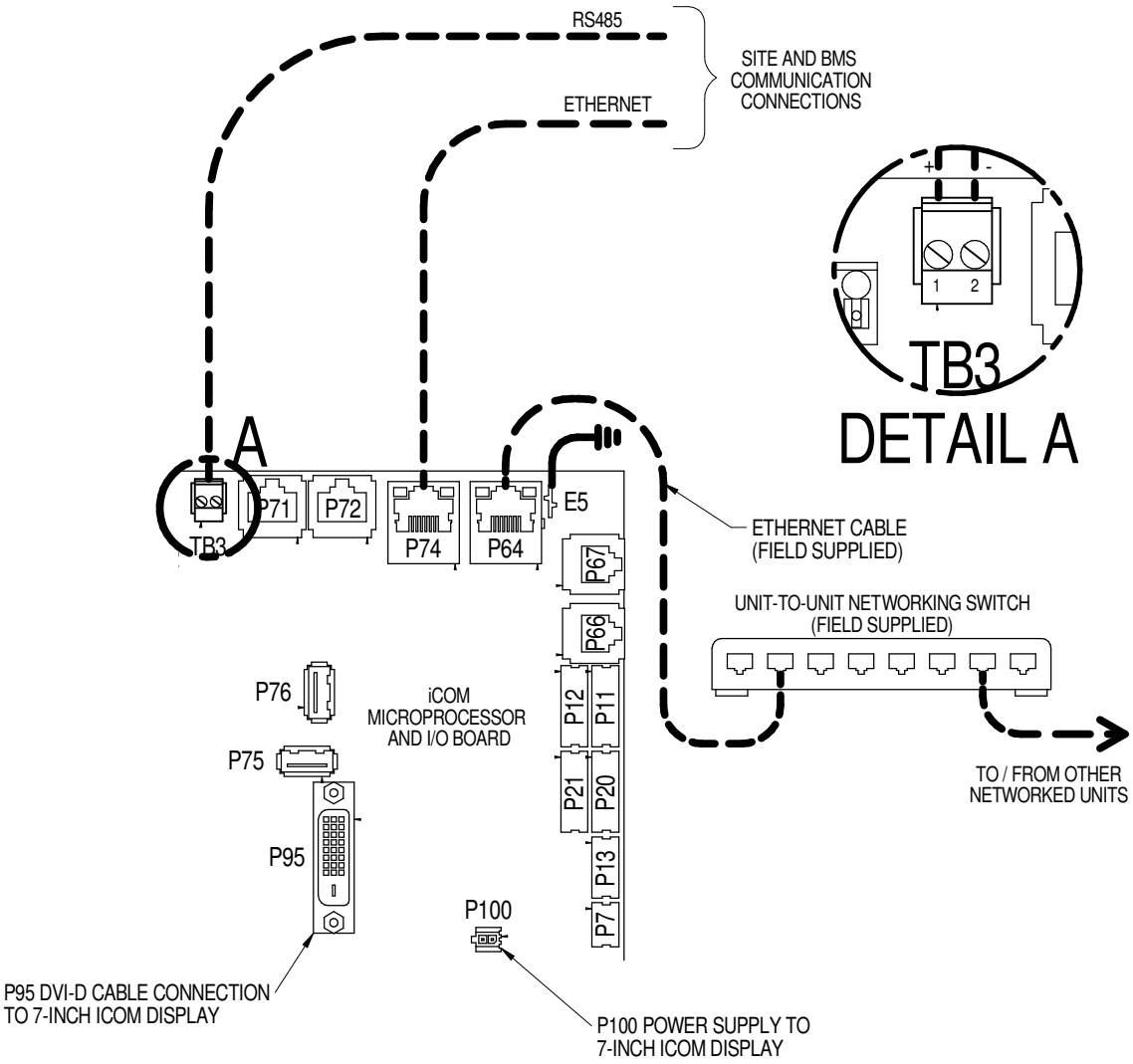
1. These components are factory supplied and shipped loose. Field installation and piping by others.
2. These components are not factory supplied by Liebert, but are required for proper system operation and maintenance. Field installation and piping by others.
3. Field to provide a means for adding pre-mixed Glycol to system.
4. Install expansion tank at the highest point of the system.



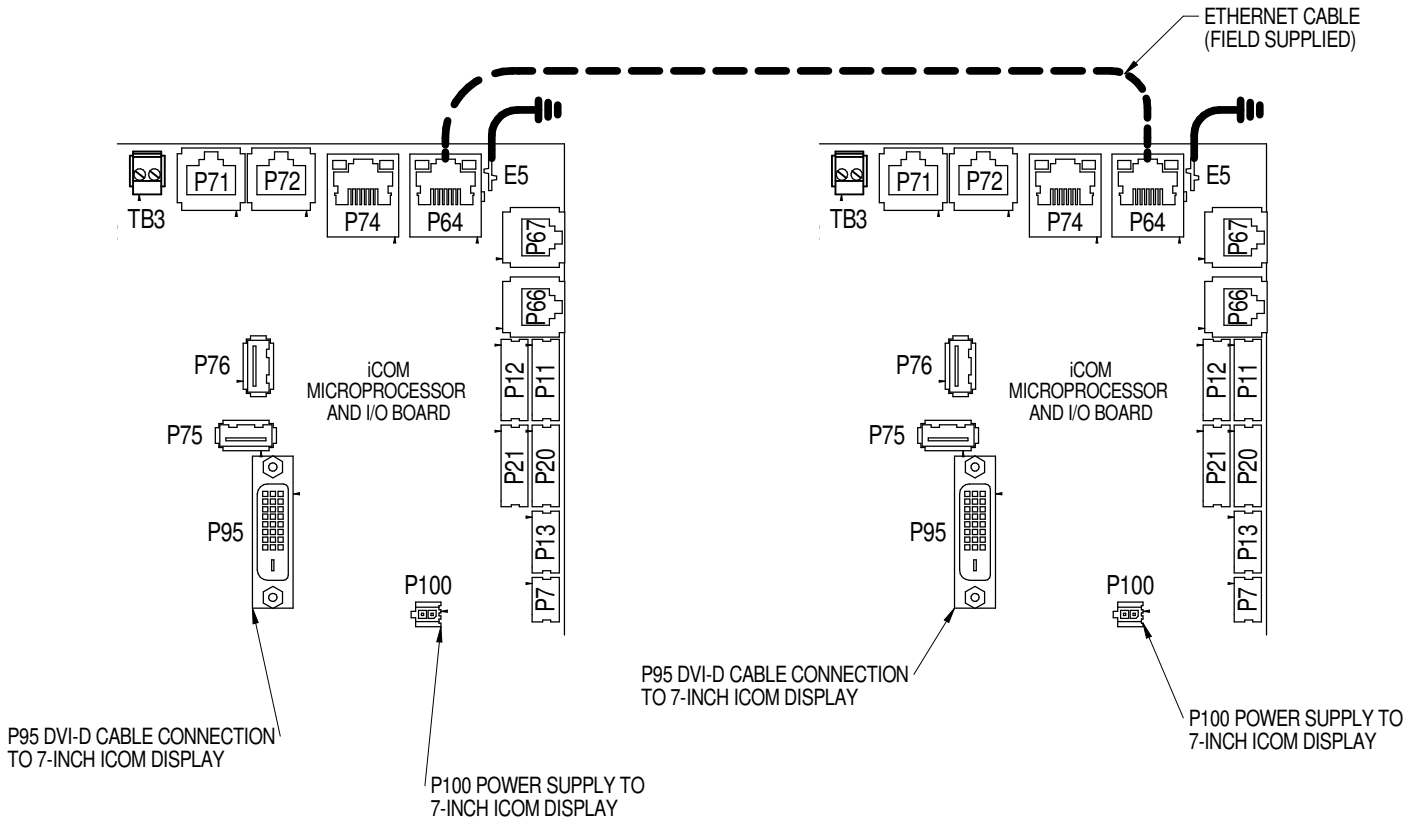
8.8 GALLON (33.3 Liter) EXPANSION TANK

LIEBERT DS, DSE, CW, PDX & PCW

UNIT TO UNIT NETWORK CONNECTIONS



UNIT TO UNIT NETWORK CONNECTIONS



NOTE* For dual-unit network configurations only

ELECTRICAL FIELD CONNECTIONS
UPFLOW & DOWNFLOW MODELS

1. **High Voltage Entrance.** Supplied on top and bottom of electric box. Knockout size Ø1.75in (44.5mm).
2. **Low Voltage Entrance.** Ø1.375 in. (34.9mm) hole located on bottom of Electric Box.
3. **Three phase Electric Service and earth ground.** Field supplied.
4. **Three phase connection.** Electric service connection terminals on disconnect.
5. **Factory installed disconnect switch.** Fused disconnect switch provided on units.
6. **Earth ground connection.** Connection terminals for field supplied earth grounding wire.
7. **Earth ground bar.** Connection terminals with factory ground from each high voltage component for field supplied earth grounding wire.
8. **Control and monitoring section** of electric box.
9. **Remote unit shutdown.** Replace existing jumper between terminals 37 & 38 with normally closed switch having a minimum 75VA, 24VAC rating. Use field supplied Class 1 wiring. Two additional contact pairs available as an option (labeled as 37B & 38B, 37C & 38C). Replace existing jumper for appropriate pair as done for 37 & 38.
10. **Remote Alarm Device (RAD) Connections.** Alarm connections may be factory wired or field wired. See schematic, RAD1-4, for factory wired alarms. For field wired alarms, use Class 1 wiring to connect normally open contacts between terminals 24 & 50, 24 & 51, 24 & 55, or 24 & 56. Suitable for 24VAC.
11. **Smoke detector alarm connections.** Field supplied Class 1 wiring to 1 Amp, 24VAC maximum remote alarm circuits. Factory wired contacts from optional smoke detector are #91-Common, #92-NO, and #93-NC. Optional smoke detector trouble (SDT) connections #80 & # 81.
12. **Common alarm connection.** Field supplied Class 1 wiring to common alarm terminals 75 & 76 (and optional 94 & 95, and 96 & 97), which are factory connected to normally open contacts, 1 Amp, 24VAC maximum on common alarm relay (R3).
13. **Heat rejection connection.** Field supplied Class 1 wiring to heat rejection interlock terminals 70 & 71 which are factory connected to normally open compressor side switch (self contained units only) or to GLYCOOL relay K11 (GLYCOOL units only). On Dual Cool units only, connect auxilliary cooling source terminals 72 & 73 to relay K11. See indoor and outdoor electric schematic for more information.
14. **Reheat and Humidifier Lockout.** Optional emergency power lockout of reheat and/or humidifier: Connections #82 & #83 are provided for remote 24VAC source and Class 1 wiring by others.
15. **Main Fan Auxiliary Switch.** Optional main fan auxiliary side switch. Terminals located on customer connection terminal block for remote indication that the evaporator fan motor/unit is on. Field to connect 24V maximum, Class 1 wiring to connections #84 & #85.
16. **Optional Condensate Alarm (Dual Float Condensate Pump only).** Relay terminals located on customer connection terminal block for remote indication. Field supplied Class 1 wiring to connections #88 & #89.
17. **Optional Remote Liquitect Indicator.** Optional remote liquitect indicator for unit shutdown. Terminals located on customer connection terminal block. Field to connect 24V maximum, Class 1 wiring to connections #58 & #59.
18. **Optional Analog Inputs #3 & #4.** Customer connection to terminals 41, 42, 43, 44 for analog inputs.
19. **Spare Terminals for Optional Devices**. Customer connection when optional device is supplied. See unit schematic.

ELECTRICAL FIELD CONNECTIONS
UPFLOW & DOWNFLOW MODELS

20. CANbus Connector. Terminal block with terminals 49-1 (CAN-H) and 49-3 (CAN-L) + SH (shield connection). The terminals are used to connect the CANbus communication cable (provided by others) from the indoor unit to the Liebert MC Condenser.

21. CANbus Cable. CANbus cable provided by others to connect to the outdoor condenser and optional PRE unit. No special considerations are required when the total external cable connection between the indoor unit and outdoor unit(s) is less than 450FT (137M). For total external cable connections greater than 450FT (137M). For external cable connections greater than 450FT (137M), but less than 800FT (243M) a CANbus isolator is required (Contact Factory). Cable must have the following specifications:

- Braided shield or foil shield with drain wire
- Shield must be wired to ground at indoor unit
- 22-18AWG stranded tinned copper
- Twisted pair (minimum 4 twists per foot)
- Low Capacitance (15pF/FT or less)
- Must be rated to meet local codes and conditions
- EXAMPLES BELDEN 89207 (PLENUM RATED), OR ALPHA WIRE 6454 CATEGORY 5, 5E, OR HIGHER

22. Do not run in same conduit, raceway, or chase as high voltage wiring.

23. For CANbus network lengths greater than 450FT (137M) call Factory.

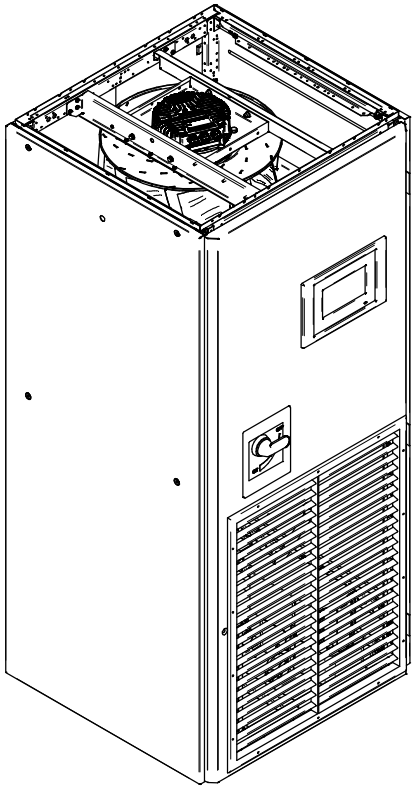
OPTIONAL COMMUNICATION CONNECTIONS

24. Unit-To-Unit – Plug 64 is reserved for U2U communication.

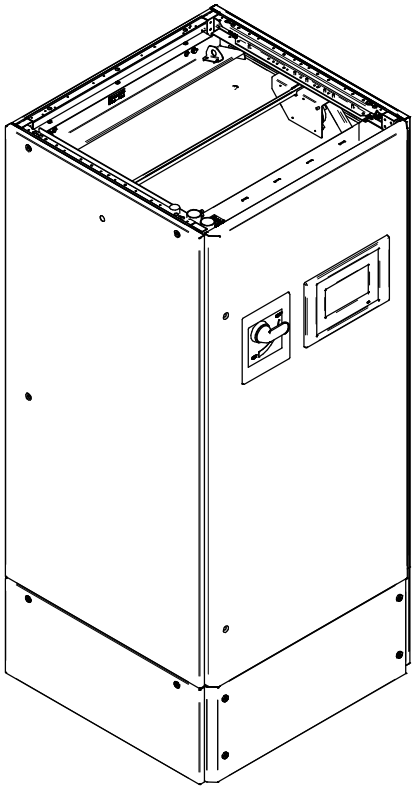
25. Site and BMS – Plug 74 and terminal block 3 are reserved for Site and BMS connections. Plug 74 is an eight pin RJ45 for a Cat 5 cable. Terminal block 3 is a two position screw terminal block for use with twisted pair wires. Only one of these connections can be used at a time.

NOTE: Refer to specification sheet for total unit full load amps, wire size amps, and max overcurrent protective device size.

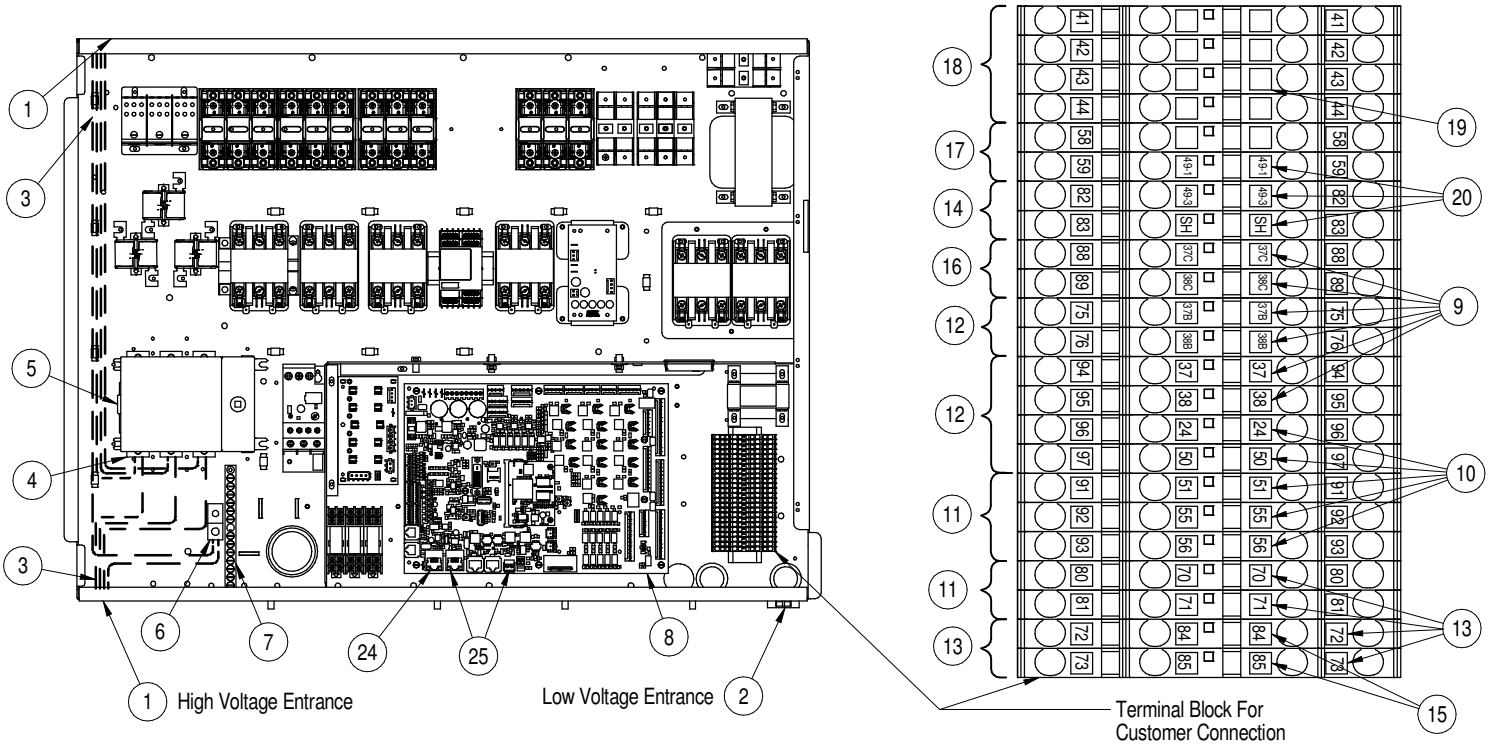
ELECTRICAL FIELD CONNECTIONS
UPFLOW & DOWNFLOW MODELS



UPFLOW UNIT

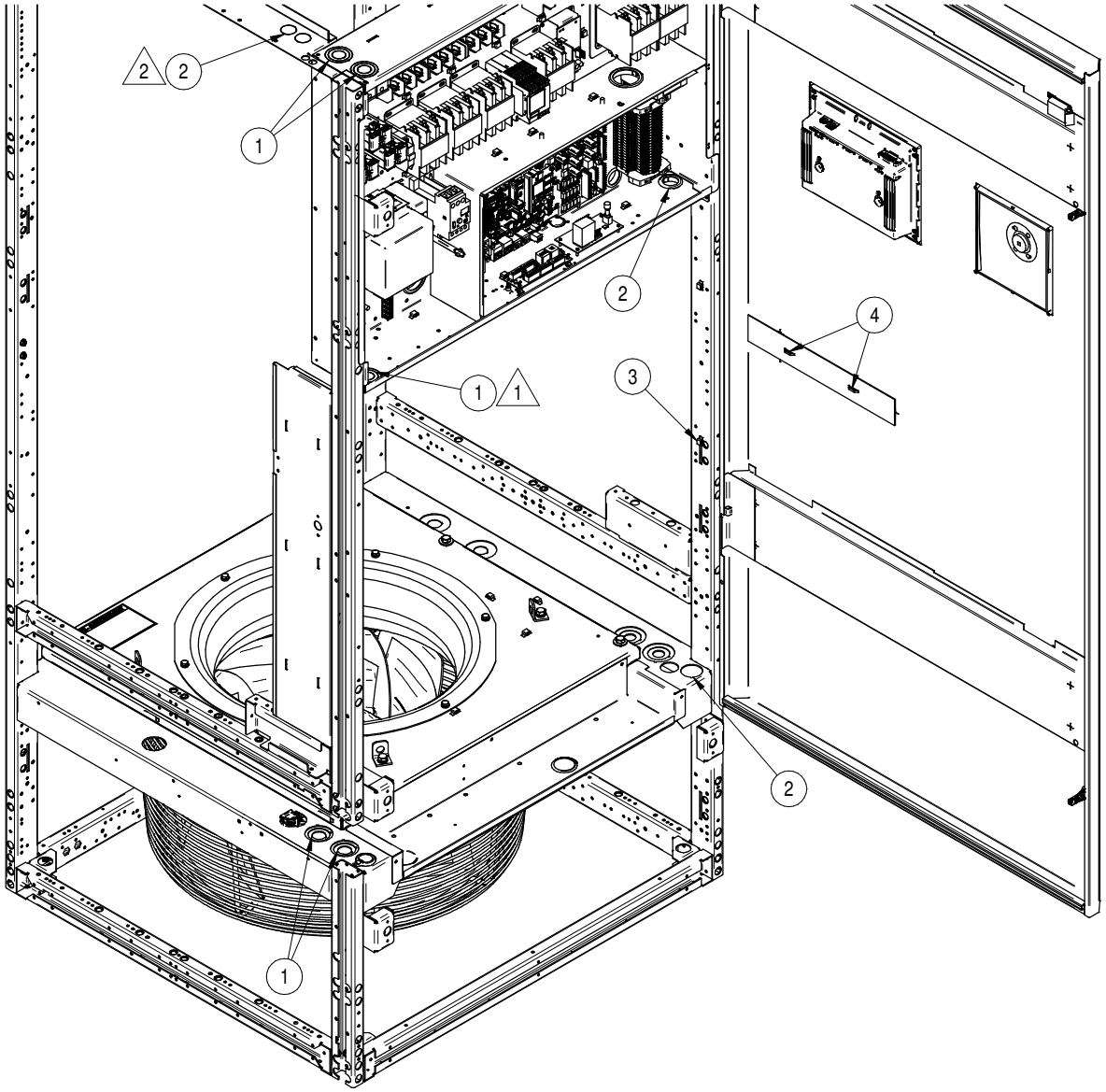


DOWNFLOW UNIT



LIEBERT PDX & PCW

ELECTRICAL FIELD CONNECTIONS
DOWNFLOW MODELS



1. Opening for field wiring. Suggested entry point for HV field wiring to unit.
2. Opening for field wiring. Suggested entry point for LV field wiring to unit.
3. Wire tie anchors. Use to secure customer Ethernet wiring to control board.
4. Wire tie anchors. Use to secure customer wiring.

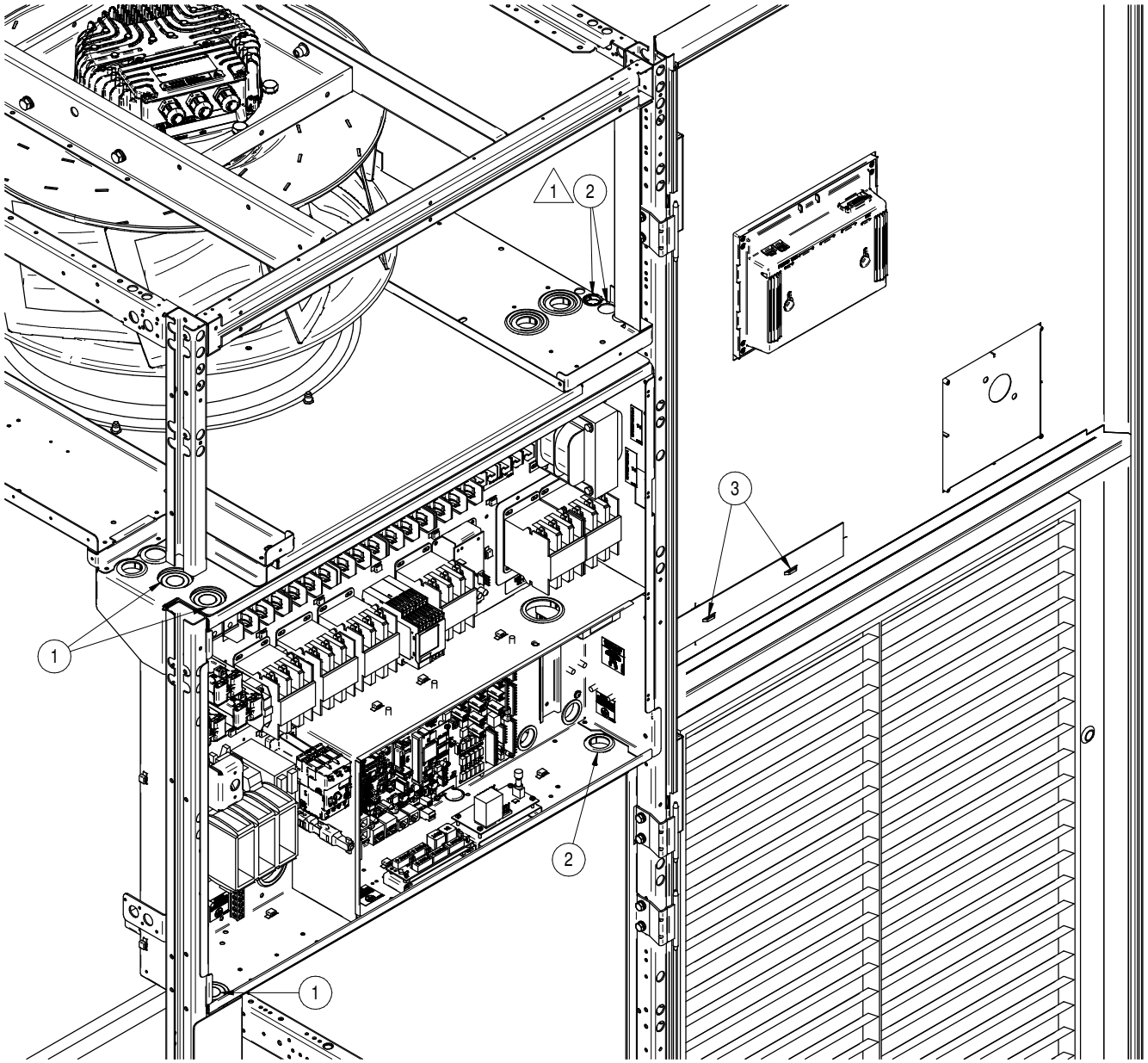
NOTES:

1. Requires bushing if conduit is terminated below.
2. Wire needs to be routed behind electric box to Low Voltage entrance on bottom of Electric Box.

LIEBERT PDX & PCW

ELECTRICAL FIELD CONNECTIONS

UPFLOW MODELS



(1) Opening for field wiring. Suggested entry point for HV field wiring to unit.

(2) Opening for field wiring. Suggested entry point for LV field wiring to unit.

(3.) Wire tie anchors. Use to secure customer wiring.

Notes:

1. Wire needs to be routed outside Electric Box to Low Voltage knockout on bottom of Electric Box.

Appendix E: Guide Specifications

The following are the guide specifications for the Liebert® PDX/PCW.

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Liebert® PDX™ and PCW™

Nominal 11, 17, 18, 23 or 29 kW Thermal Management System Guide Specifications

1.0 GENERAL

1.1 SUMMARY

These specifications describe requirements for a mission critical Thermal Management system. The system shall be designed to control temperature and humidity conditions in rooms containing electronic equipment, with good insulation and vapor barrier. The manufacturer shall design and furnish all equipment to be fully compatible with the heat dissipation requirements of the room.

1.2 DESIGN REQUIREMENTS

The precision Thermal Management system shall be a Liebert PDX or Liebert PCW factory-assembled unit. Standard 60Hz units shall be CSA-certified to the harmonized U.S. and Canadian product safety standard, "CSA C22.2 No 236/UL 1995 for Heating and Cooling Equipment" and are marked with the CSA c-us logo. It shall be specifically designed for service from the front and right side of the unit. The system shall be designed for draw-through air arrangement to insure even air distribution to the entire face area of the coil.

The system shall be AHRI Certified™, the trusted mark of performance assurance for heating, ventilation, air conditioning and commercial refrigeration equipment, using AHRI Standard 1360.

1.3 SUBMITTALS

Submittals shall be provided with the proposal and shall include single-line diagrams; dimensional, electrical, and capacity data; piping and electrical connection drawings.

1.4 SERVICEABILITY/ACCESS

The cabinet shall be designed so all components are easily accessible for service and maintenance through the front and right sides of the unit.

1.5 ACCEPTABLE ALTERNATIVES

Acceptable alternatives shall be permitted with engineer's prior approval only. Contractor to submit a detailed summary form listing all variations to include size deviations, electrical load differences, functional and component changes and savings to end user.

1.6 QUALITY ASSURANCE

The specified system shall be factory-tested before shipment. Testing shall include, but shall not be limited to: Quality Control Checks, "Hi-Pot." The system shall be designed and manufactured according to world-class quality standards. The manufacturer shall be ISO 9001 certified.

2.0 PRODUCT

2.1 COOLING SYSTEM

2.1.1 Air-Cooled Refrigeration System (Model 011, 018, 023 and 029)

2.1.1.1 System Description

Single refrigeration circuit shall include a liquid line filter drier, a refrigerant sight glass with moisture indicator, an expansion valve, pressure safety switches, and a liquid line solenoid valve. The indoor evaporator refrigerant piping shall be filled with a nitrogen holding charge and spun shut. Field relief of the Schrader valve shall indicate a leak-free system.

2.1.1.2 Hydrophilic-Coated Evaporator Coil

Liebert PDX

The direct-expansion, tilted-slab cooling coil shall be constructed of copper tubes and hydrophilic-coated aluminum fins. The hydrophilic coating shall significantly improve the speed of condensate drainage from the fins and shall provide superior water carryover resistance. One stainless steel condensate drain pan shall be provided.

2.1.1.3 R-410A Refrigerant

The system shall be designed for use with R-410A refrigerant, which meets the U.S. Clean Air Act for phase out of HCFC refrigerants.

2.1.1.4 Compressor

Digital Scroll Compressor

The compressor shall be an R-410A scroll-type with variable capacity operation from 20-100%, commonly known as a digital scroll. The compressor solenoid valve shall unload the digital scroll compressor to provide variable capacity operation. The compressor shall have a suction gas cooled motor, EPDM Rubber vibration isolators, internal thermal overloads, automatic reset high pressure switch with lockout after three failure occurrences, rota-lock service valves, low pressure transducer, and crankcase heater. The compressor shall be removable and serviceable from the front of the unit. The crankcase heater and a discharge check valve shall be provided for additional system protection from refrigerant migration during Off cycles.

Compressor Sound Jacket—Optional

The compressor sound jacket shall reduce the level of sound emitted from the digital scroll compressor. It shall consist of a 3/8 inch closed cell polymeric 4.5 - 8.5 lb/ft^3 density jacket that encloses the compressor.

Standard Scroll Compressor

The compressor shall be an R-410A scroll-type with a suction gas-cooled motor; EPDM vibration isolators, internal thermal overloads, and automatic reset high-pressure switch with lockout after three failure occurrences, rota-lock service valves, low-pressure transducer, and crankcase heater. The crankcase heater and a discharge check valve shall be provided for additional system protection from refrigerant migration during Off cycles. The compressor shall be serviceable and removable from the front of the unit.

2.1.1.5 Expansion Valve

Thermostatic Expansion Valve (TXV)

A manually-adjustable, externally-equalized, thermostatic expansion valve (TXV) shall control the flow of liquid refrigerant entering the direct expansion coil. The TXV shall maintain consistent superheat of the refrigerant vapor at the outlet of the evaporator coil over the unit's operating range. The TXV shall prevent liquid refrigerant from returning to the compressor.

Electronic Expansion Valve (Optional for Digital Scroll Compressors)

An electronically-controlled expansion valve (EEV) shall precisely control the flow of liquid refrigerant entering the direct-expansion coil. The EEV shall be of stepper-motor type. The EEV shall maintain consistent superheat of the refrigerant vapor at the outlet of the evaporator coil over the unit's operating range. The valve shall be controlled by a separate electronic controller. Superheat shall be determined through the suction-pressure-temperature method.

2.1.2 Dual Cool: Chilled Water + Air-Cooled Refrigeration (Model 011, 018, 023 and 029)

2.1.2.1 System Description

Two independent circuits shall be included. The dual-cooling source system shall consist of an air cooled system with the addition of a free-cooling chilled water coil or free-cooling chilled glycol coil (Liebert Econ-O-Coil), a modulating control valve, and a comparative temperature sensor. The system shall be able to function as a modulating chilled-water system, as a compressorized system or as a combination of both. The primary cooling mode shall be chilled water. The secondary refrigeration circuit shall include a liquid-line filter drier, a refrigerant sight glass with moisture indicator, an expansion valve, pressure safety switch and a liquid line solenoid valve. The indoor evaporator refrigerant piping shall be filled with a nitrogen holding charge and spun shut. Field relief of the Schrader valve shall indicate a leak-free system. Switchover between the two cooling modes shall be performed automatically by the microprocessor control.

2.1.2.2 Hydrophilic-Coated Evaporator Coil

The direct-expansion, tilted-slab cooling coil and the free-cooling chilled water coil shall be constructed of copper tubes and hydrophilic-coated aluminum fins. The hydrophilic coating shall significantly improve the speed of condensate drainage from the fins and shall provide superior water carryover resistance. One stainless steel condensate drain pan shall be provided.

2.1.2.3 R-410A Refrigerant

The system shall be designed for use with R-410A refrigerant, which meets the U.S. Clean Air Act for phase out of HCFC refrigerants.

2.1.2.4 Compressor

Digital Scroll Compressor

The compressor shall be an R-410A scroll-type with variable capacity operation from 20-100%, commonly known as a digital scroll. The compressor solenoid valve shall unload the digital scroll compressor to provide variable capacity operation. The compressor shall have a suction gas cooled motor, EPDM Rubber vibration isolators, internal thermal overloads, automatic reset high pressure switch with lockout after three failure occurrences, rota-lock service valves, low pressure transducer, and crankcase heater. The compressor shall be removable and serviceable from the front of the unit. The crankcase heater and a discharge check valve shall be provided for additional system protection from refrigerant migration during Off cycles.

Compressor Sound Jacket—Optional

The compressor sound jacket shall reduce the level of sound emitted from the digital scroll compressor. It shall consist of a 3/8 inch closed cell polymeric 4.5 - 8.5 lb/ft^3 density jacket that encloses the compressor.

Standard Scroll Compressor

The compressor shall be an R-410A scroll-type with a suction gas-cooled motor; EPDM vibration isolators, internal thermal overloads, and automatic reset high-pressure switch with lockout after three failure occurrences, rota-lock service valves, low-pressure transducer, and crankcase heater. The crankcase heater and a discharge check valve shall be provided for additional system protection from refrigerant migration during Off cycles. The compressor shall be serviceable and removable from the front of the unit.

2.1.2.5 Expansion Valve

Thermostatic Expansion Valve (TXV)

A manually-adjustable, externally-equalized, thermostatic expansion valve (TXV) shall control the flow of liquid refrigerant entering the direct expansion coil. The TXV shall maintain consistent superheat of the refrigerant vapor at the outlet of the evaporator coil over the unit's operating range. The TXV shall prevent liquid refrigerant from returning to the compressor.

Electronic Expansion Valve (Optional for Digital Scroll Compressors)

An electronically-controlled expansion valve (EEV) shall precisely control the flow of liquid refrigerant entering the direct-expansion coil. The EEV shall be of stepper-motor type. The EEV shall maintain consistent superheat of the refrigerant vapor at the outlet of the evaporator coil over the unit's operating range. The valve shall be controlled by a separate electronic controller. Superheat shall be determined through the suction-pressure-temperature method.

2.1.2.6 Dual-Cool: Free-Cooling Control Valve

Three-Way Motorized Ball Valve

The water circuit shall include a pre-piped three-way motorized ball valve. The Liebert iCOM™ control shall manage the non-spring return valve actuator movement to maintain the desired room conditions for various entering water temperatures. Cooling capacity will be controlled by bypassing chilled water around the coil.

Two-Way Motorized Ball Valve—Optional

The water circuit shall include a pre-piped two-way motorized ball valve. The Liebert iCOM shall manage the non-spring return valve actuator movement to maintain the desired room conditions for various entering water temperatures. The motorized ball valve travel for dehumidification shall be proportional.

2.1.2.7 Comparator Sensor

The system shall be equipped with a Liebert iCOM microprocessor-controlled comparator sensor that permits free-cooling operation whenever entering chilled water temperature is below return-air temperature. The comparator sensor shall be factory-installed on a free-cooling three-way valve and field-installed on a free-cooling two-way valve.

2.1.2.8 System Design Pressure

Standard Pressure

The water circuit shall be designed for a pressure of 150PSI (1034kPa).

High Pressure—Optional

The water circuit shall be designed for a pressure of 400PSI (2758kPa).

2.1.3 Water/Glycol-cooled Refrigeration System (Model 011, 018, 023, and 029)

2.1.3.1 System Description

Single refrigeration circuit shall include a compressor, liquid line filter drier, and a refrigerant sight glass with moisture indicator, an expansion valve, a brazed-plate condenser, pressure safety switches, and a factory refrigerant charge. The water piping shall be filled with a nitrogen holding charge and spun shut. Field relief of the Schrader valve on the water piping shall indicate a leak-free system.

2.1.3.2 Hydrophilic-Coated Evaporator Coil

The direct-expansion, tilted-slab cooling coil shall be constructed of copper tubes and hydrophilic-coated aluminum fins. The hydrophilic coating shall significantly improve the speed of condensate drainage from the fins and shall provide superior water carryover resistance. One stainless steel condensate drain pan shall be provided.

2.1.3.3 R-410A Refrigerant

The system shall be designed for use with R-410A refrigerant, which meets the U.S. Clean Air Act for phase out of HCFC refrigerants.

2.1.3.4 Compressor

Digital Scroll Compressor

The compressor shall be an R-410A scroll-type with variable capacity operation from 20-100%, commonly known as a digital scroll. The compressor solenoid valve shall unload the digital scroll compressor to provide variable capacity operation. The compressor shall have a suction gas cooled motor, EPDM Rubber vibration isolators, internal thermal overloads, automatic reset high pressure switch with lockout after three failure occurrences, rota-lock service valves, low pressure transducer, and crankcase heater. The compressor shall be removable and serviceable from the front of the unit. The crankcase heater and a discharge check valve shall be provided for additional system protection from refrigerant migration during Off cycles.

Compressor Sound Jacket—Optional

The compressor sound jacket shall reduce the level of sound emitted from the digital scroll compressor. It shall consist of a 3/8 inch closed cell polymeric 4.5 - 8.5 lb/ft^3 density jacket that encloses the compressor.

Standard Scroll Compressor

The compressor shall be an R-410A scroll-type with a suction gas-cooled motor; EPDM vibration isolators, internal thermal overloads, and automatic reset high-pressure switch with lockout after three failure occurrences, rota-lock service valves, low-pressure transducer, and crankcase heater. The crankcase heater and a discharge check valve shall be provided for additional system protection from refrigerant migration during Off cycles. The compressor shall be serviceable and removable from the front of the unit.

2.1.3.5 Expansion Valve

Thermostatic Expansion Valve (TXV)

A manual adjustable externally equalized expansion valve thermostatic expansion valve (TXV) shall control the flow of liquid refrigerant entering the direct expansion coil. The TXV shall maintain consistent superheat of the refrigerant vapor at the outlet of the evaporator coil over the unit's operating range. The TXV shall prevent liquid refrigerant from returning to the compressor.

2.1.3.6 Brazed-Plate Condenser

The condenser shall be an insulated, brazed-plate type. The plates are to be stainless steel material. The primary side shall be piped to a condenser water source, and the secondary side shall be connected to the refrigeration system. A factory-supplied strainer is to be field-installed upstream of the Liebert PDX, on the condenser water supply line. Water pressure rating of the condenser shall be 600 psig (4136kPa) design working pressure.

2.1.3.7 Condenser Motorized Ball Valve

Three-Way Valve

A pre-piped three-way motorized ball valve shall control the water/glycol flow passing through the insulated, brazed-plate condenser. The Liebert iCOM™ control shall manage the non-spring return valve actuator movement to maintain the desired condensing temperature for various entering water temperatures.

Two-Way Valve—Optional

A pre-piped two-way motorized ball valve shall control the water/glycol flow passing through the insulated, brazed-plate condenser. The Liebert iCOM control shall manage the non-spring return valve actuator movement to maintain the desired condensing temperature for various entering water temperatures. The maximum differential pressure across the closed valve shall be 200 PSI (1379kPa).

2.1.3.8 System Design Pressure

Standard Pressure

The water/glycol circuit shall be designed for a pressure of 150PSI (1034kPa).

High Pressure—Optional

The water/glycol circuit shall be designed for a pressure of 400PSI (2758kPa).

2.1.4 Dual Cooling Source System: Water/ Glycol Cooled + Econ-O-Coil (Models 011, 018, 023 and 029)

2.1.4.1 System Description

Two independent circuits shall be included. The dual-cooling source system shall consist of a water/glycol-cooled system with the addition of a free-cooling chilled water coil or free-cooling chilled glycol coil (Liebert Econ-O-Coil), a modulating control valve, and a comparative temperature sensor. The system shall be able to function either as a modulating chilled water system or as a compressorized system, or as a combination of the two. The primary cooling mode shall be chilled water. The secondary refrigeration circuit shall include a compressor, liquid line filter drier, a refrigerant sight glass with moisture indicator, an expansion valve, a brazed-plate condenser, pressure safety switches, and a factory refrigerant charge.

The Liebert Econ-O-Coil piping shall be filled with a nitrogen holding charge and spun shut. Field relief of the Schrader valve shall indicate a leak-free system. Switchover between the two cooling modes shall be performed automatically by the microprocessor control. Four (4) pipe connections shall be included on water/glycol systems: Econ-O-Coil supply, Econ-O-Coil return, condenser supply and condenser return.

2.1.4.2 Hydrophilic-Coated Evaporator Coil

The direct-expansion, tilted-slab cooling coil and the Liebert Econ-O-Coil coil be constructed of copper tubes and hydrophilic coated aluminum fins. The hydrophilic coating shall significantly improve the speed of condensate drainage from the fins and shall provide superior water carryover resistance. One stainless steel condensate drain pan shall be provided.

2.1.4.3 R-410A Refrigerant

The system shall be designed for use with R-410A refrigerant, which meets the U.S. Clean Air Act for phase out of HCFC refrigerants.

2.1.4.4 Compressor

Digital Scroll Compressor

The compressor shall be an R-410A scroll-type with variable capacity operation from 20-100%, commonly known as a digital scroll. The compressor solenoid valve shall unload the digital scroll compressor to provide variable capacity operation. The compressor shall have a suction gas cooled motor, EPDM Rubber vibration isolators, internal thermal overloads, automatic reset high pressure switch with lockout after three failure occurrences, rota-lock service valves, low pressure transducer, and crankcase heater. The compressor shall be removable and serviceable from the front of the unit. The crankcase heater and a discharge check valve shall be provided for additional system protection from refrigerant migration during Off cycles.

Compressor Sound Jacket—Optional

The compressor sound jacket shall reduce the level of sound emitted from the digital scroll compressor. It shall consist of a 3/8 inch closed cell polymeric 4.5 - 8.5 lb/ft^3 density jacket that encloses the compressor.

Standard Scroll Compressor

The compressor shall be an R-410A scroll-type with a suction gas-cooled motor; EPDM vibration isolators, internal thermal overloads, and automatic reset high-pressure switch with lockout after three failure occurrences, rota-lock service valves, low-pressure transducer, and crankcase heater. The crankcase heater and a discharge check valve shall be provided for additional system protection from refrigerant migration during Off cycles. The compressor shall be serviceable and removable from the front of the unit.

2.1.4.5 Expansion Valve

Thermostatic Expansion Valve

A manual adjustable externally equalized expansion valve thermostatic expansion valve (TXV) shall control the flow of liquid refrigerant entering the direct expansion coil. The TXV shall maintain consistent superheat of the refrigerant vapor at the outlet of the evaporator coil over the unit's operating range. The TXV shall prevent liquid refrigerant from returning to the compressor.

2.1.4.6 Brazed-Plate Condenser

The condenser shall be an insulated, brazed-plate type. The plates are to be stainless steel material. The primary side shall be piped to a condenser water/glycol source, and the secondary side shall be connected to the refrigeration system. A factory-supplied strainer is to be field-installed upstream of the Liebert PDX, on the condenser water supply line. Water pressure rating of the condenser shall be 600 psig (4136kPa) design working pressure.

2.1.4.7 Condenser Motorized Ball Valve

Three-Way Valve

A pre-piped three-way motorized ball valve shall control the water/glycol flow passing through the insulated, brazed-plate condenser. The Liebert iCOM™ shall manage the non-spring return valve actuator movement to maintain the desired condensing temperature for various entering water temperatures.

Two-Way Valve—Optional

A pre-piped two-way motorized ball valve shall control the water/glycol flow passing through the insulated, brazed-plate condenser. The Liebert iCOM control shall manage the non-spring return valve actuator movement to maintain the desired condensing temperatures for various entering water temperatures. The maximum differential pressure across the closed valve shall be 200 PSI (1379kPa).

2.1.4.8 Dual-Cool: Econ-O-Coil Control Valve

Three-Way Motorized Ball Valve

The water circuit shall include a pre-piped three-way motorized ball valve. The Liebert iCOM shall manage the non-spring return valve actuator movement to maintain the desired room conditions for various entering water temperatures. Cooling capacity shall be controlled by bypassing chilled water around the coil.

Two-Way Motorized Ball Valve—Optional

The water circuit shall include a pre-piped two-way motorized ball valve. The Liebert iCOM shall manage the non-spring return valve actuator movement to maintain the desired room conditions for various entering water temperatures. The motorized ball valve travel for dehumidification shall be proportional.

2.1.4.9 Comparator Sensor

The system shall be equipped with a Liebert iCOM microprocessor-controlled comparator sensor that permits free-cooling operation whenever entering chilled water/glycol temperature is below return-air temperature. The comparator sensor shall be factory-installed on a free-cooling three-way valve unit and field-installed on a continuous flowing pipe for a unit with a free-cooling two-way valve.

2.1.4.10 Design Pressure

Standard Pressure

The water circuit shall be designed for a pressure of 150 PSI (1034 kPa).

High Pressure—Optional

The water circuit shall be designed for a pressure of 400 PSI (2758 kPa).

2.1.5 GLYCOOL™: Fluid-cooled Economizer and DX Refrigeration System (Model 011, 018, 023 and 029)

2.1.5.1 System Description

GLYCOOL™ - The GLYCOOL™ unit shall have two independent cooling coils. The first cooling coil shall be a part of a chilled glycol circuit and shall be strategically located in the return-air stream to either pre-cool or totally cool the air before entering the refrigeration coil. The second cooling coil shall be part of a direct-expansion refrigeration circuit and shall include a compressor, liquid line filter drier, a refrigerant sight glass with moisture indicator, an expansion valve, a brazed-plate condenser, pressure safety switches, and a factory refrigerant charge. Liebert iCOM shall control the activation/deactivation and modulation of the two cooling circuits allowing the system to function either as a modulating glycol economizer, a glycol refrigeration system, or a combination of both. This shall be a two-pipe system and shall require closed-loop water/glycol heat rejection, such as drycooler/pump or customer water tower using properly treated glycol solutions. Field relief of the Schrader valve shall indicate a leak-free system.

2.1.5.2 Hydrophilic-coated Evaporator Coil

The GLYCOOL unit shall have two independent cooling circuits, constructed of copper tubes with hydrophilic-coated aluminum fins. The first cooling circuit shall be a chilled glycol circuit and designed for closed-loop applications using properly treated glycol solutions. The second cooling circuit shall be a direct expansion refrigeration circuit. The coil shall be constructed into the tilted slab. The hydrophilic coating shall significantly improve the speed of condensate drainage from the fins and shall provide superior water carryover resistance. The coil shall be provided with a stainless steel drain pan.

2.1.5.2.1 Cu-Ni Coil—Optional

A 70/30 Cu-Ni Liebert Econ-O-Coil™ shall be provided on dual-cooling units that are connected to a cooling tower loop or other open water system. This option shall be required on open cooling tower applications.

2.1.5.3 R-410A Refrigerant

The system shall be designed for use with R-410A refrigerant, which meets the U.S. Clean Air Act for phase out of HCFC refrigerants.

2.1.5.4 Compressor

Digital Scroll Compressor

The compressor shall be an R-410A scroll-type with variable capacity operation from 20-100%, commonly known as a digital scroll. The compressor solenoid valve shall unload the digital scroll compressor to provide variable capacity operation. The compressor shall have a suction gas cooled motor, EPDM Rubber vibration isolators, internal thermal overloads, automatic reset high pressure switch with lockout after three failure occurrences, rota-lock service valves, low pressure transducer, and crankcase heater. The compressor shall be removable and serviceable from the front of the unit. The crankcase heater and a discharge check valve shall be provided for additional system protection from refrigerant migration during Off cycles.

Compressor Sound Jacket—Optional

The compressor sound jacket shall reduce the level of sound emitted from the digital scroll compressor. It shall consist of a 3/8 inch closed cell polymeric 4.5 - 8.5 lb/ft^3 density jacket that encloses the compressor.

Standard Scroll Compressor

The compressor shall be an R-410A scroll-type with a suction gas-cooled motor; EPDM vibration isolators, internal thermal overloads, and automatic reset high-pressure switch with lockout after three failure occurrences, rota-lock service valves, low-pressure transducer, and crankcase heater. The crankcase heater and a discharge check valve shall be provided for additional system protection from refrigerant migration during Off cycles. The compressor shall be serviceable and removable from the front of the unit.

2.1.5.5 Expansion Valve

Thermostatic Expansion Valve

A manual adjustable externally equalized expansion valve thermostatic expansion valve (TXV) shall control the flow of liquid refrigerant entering the direct expansion coil. The TXV shall maintain consistent superheat of the refrigerant vapor at the outlet of the evaporator coil over the unit's operating range. The TXV shall prevent liquid refrigerant from returning to the compressor.

2.1.5.6 Brazed-Plate Heat Condensers

The condenser shall be an insulated, brazed-plate type. The plates are to be stainless steel material. The primary side shall be piped to a condenser glycol source, and the secondary side shall be connected to the refrigeration system. A factory-supplied strainer shall be field-installed upstream of the Liebert PDX, on the water/glycol supply line. Water pressure rating of the condenser shall be 600 psig (4136kPa) design working pressure.

2.1.5.7 Three-Way GLYCOOL™ Valve

The GLYCOOL coil shall include a pre-piped, three-way motorized ball valve. The Liebert iCOM™ shall manage the non-spring return valve actuator movement to maintain the desired room conditions for various entering water temperatures.

2.1.5.8 Condenser Motorized Ball Valve

Three-Way Valve

A pre-piped three-way motorized ball valve shall control the water/glycol flow passing through the insulated, brazed-plate condenser. The Liebert iCOM shall manage the valve actuator movement to maintain the desired condensing temperature for various entering water temperatures.

2.1.5.9 Comparator Sensor

The system shall be equipped with a factory-installed Liebert iCOM microprocessor-controlled comparator sensor that permits free-cooling operation whenever entering chilled glycol temperature is below return air temperature.

2.1.5.10 System Design Pressure

Standard Pressure

The GLYCOOL circuit shall be designed for a maximum system pressure of 150 PSI (1034 kPa).

High Pressure—Optional

The GLYCOOL circuit shall be designed for a maximum system pressure of 400 PSI (2758 kPa).

2.1.6 Chilled Water System (Models 011, 017 and 029)

2.1.6.1 System Description

The system shall function as a modulating chilled-water system consisting of a modulating chilled-water valve and a coil designed to distribute water into the entire coil-face area.

2.1.6.2 Hydrophilic-Coated Evaporator Coil

The chilled-water tilted-slab cooling coil shall be constructed of copper tubes and hydrophilic-coated aluminum fins. The hydrophilic coating shall significantly improve the speed of condensate drainage from the fins and shall provide superior water carryover resistance. One stainless steel condensate drain pan shall be provided. The water circuit shall be filled with a nitrogen holding charge and spun shut. Field relief of the Schrader valve shall indicate a leak-free system.

2.1.6.3 Control Valve

Three-Way Motorized Ball Valve

A pre-piped three-way motorized ball valve controls the chilled water flow passing through the cooling coil. The Liebert iCOM™ control shall manage the non-spring return valve actuator movement to maintain the desired room conditions for various entering water temperatures. Cooling capacity shall be regulated by varying the chilled water flow.

Two-Way Motorized Ball Valve—Optional

A two-way pre-piped way motorized ball valve shall control the chilled water flow through the cooling coil. The Liebert iCOM control shall manage non-spring return the valve actuator movement to maintain the desired room conditions for various entering water temperatures. Cooling capacity shall be regulated by varying the chilled water flow. The maximum differential pressure across the closed valve shall be 200 PSI (1379kPa).

2.1.6.4 System Design Pressure

Standard Pressure

The chilled water circuit shall be designed for a maximum system pressure of 150 PSI (1034 kPa).

High Pressure—Optional

The chilled water circuit shall be designed for a maximum system pressure of 400 PSI (2758 kPa).

2.2 FAN SECTION

2.2.1 Fan and Motor

The unit shall be equipped with one plug fan: integral direct driven fan with backward-curved blades and electronically commutated DC motor; commonly referred to as EC fan. The fan speed shall be variable and automatically regulated by the Liebert iCOM through all modes of operation. The fan shall have a dedicated motor, fault monitoring circuitry, and speed controller, which shall provide a level of redundancy. The impeller shall be made of aluminum and dynamically balanced. The EC fan shall be located within the unit. The EC fan shall also provide greater energy savings than forward curved centrifugal fan and variable speed drives.

2.2.2 Air Flow Configuration

2.2.2.1 Upflow Supply

Upflow Supply with Front Air Return

The supply air shall exit from the top of the cabinet. The return air shall be through the front factory installed grilles. The EC fan shall be factory mounted in the upper portion of the unit. The fan shall be located to pull air through the filters and cooling coil to ensure even air distribution and maximum coil performance.

Upflow Supply with Rear Air Return

The supply air shall exit from the top of the cabinet. The return air shall be through the rear of the factory-supplied, 24" rear return, skirted floor stand assembly with air filters. The EC fan shall be factory mounted in the upper portion of the unit. The fan shall be located to pull air through the filter and cooling coil to ensure even air distribution and maximum coil performance.

2.2.2.2 Downflow Configurations

Downflow Supply with Front Air Discharge

The supply air shall exit from the front of the cabinet opening. The EC fan shall be mounted in the bottom of the unit. The fan shall be located to draw air through the filters and cooling coil to ensure even air distribution and maximum coil performance.

Downflow Supply with Front and Right Side Air Discharge

The supply air shall exit from the front and right side cabinet openings. The EC fan shall be mounted in the bottom of the unit. The fan shall be located to draw air through the filters and cooling coil to ensure even air distribution and maximum coil performance.

Downflow Supply with Front Air and Left Side Air Discharge

The supply air shall exit from the front and left side cabinet openings. The EC fan shall be mounted in the bottom of the unit. The fan shall be located to draw air through the filters and cooling coil to ensure even air distribution and maximum coil performance.

Downflow Supply with Front, Right and Left Side Air Discharge

The supply air shall exit from the front, right and left side cabinet openings. The EC fan shall be mounted in the bottom of the unit. The fan shall be located to draw air through the filters and cooling coil to ensure even air distribution and maximum coil performance.

Downflow Supply with Discharge into Raised Floor

The supply air shall exit from the bottom of the unit directly into the raised floor. The EC fan shall be mounted in the bottom of the unit. The fan shall be located to draw air through the filter and cooling coil to ensure even air distribution and maximum coil performance.

2.3 CABINET CONSTRUCTION AND ACCESSIBILITY

2.3.1 Cabinet Construction

The exterior panels shall be 20 gauge steel and powder-coated with RAL 7021 black color paint to protect against corrosion. The exterior panels shall be insulated with 1/2” to 1" (12.7 to 25.4mm), 1-1/2 lb. (0.68 kg) insulation. Front and side panels shall have captive, quarter-turn fasteners. The cabinet shall be designed so that all components are serviceable and removable using the front and right sides of the unit.

2.3.2 Double-Skin Panels—Optional

The exterior panels shall be internally lined with 20 gauge galvanized steel, sandwiching the insulation between the panels for easy cleaning.

2.4 LOCKING DISCONNECT SWITCH

A locking-type fused disconnect switch shall be mounted in the electrical panel and shall be capable of disrupting the flow of power to the unit. The locking type shall consist of a main unit switch operational from outside the unit. The electric panel compartment shall be accessible only with the switch in the Off position. The locking disconnect shall be lockable in support of lockout/tagout safety programs.

2.5 SHORT-CIRCUIT CURRENT RATING (SCCR)

The electrical panel shall provide at least 65,000A SCCR.

Short-circuit current rating (SCCR) is the maximum short-circuit current a component or assembly can safely withstand when protected by a specific overcurrent protective device(s) or for a specified time.

2.6 FILTRATION

2.6.1 MERV 8 Filters

The filter shall be an integral part of the system and located within the cabinet. The filter shall be deep-pleated, 2 in. (51mm) thick with a MERV 8 rating efficiency based on ASHRAE 52.2-2007. A filter clog switch shall be included. Mesh type, cleanable filters shall be unacceptable.

2.6.2 MERV 11 Filters

The filter shall be an integral part of the system and located within the cabinet. The filter shall be deep-pleated, 2 in (51mm) thick with a MERV 11 rating efficiency based on ASHRAE 52.2-2007. A filter clog switch shall be included. Mesh type, cleanable filters shall be unacceptable.

2.6.3 Extra Filter Set—Optional

_____ extra set(s) of [(MERV 8) (MERV 11)] filters shall be provided per system.

2.7 ELECTRIC REHEAT—OPTIONAL

The reheat shall be a low-watt density 304/304 stainless steel finned-tubular electric reheat. The reheat section shall include UL/CSA recognized safety switches to protect the system from overheating. The electric reheat shall be controlled in two stages. The reheat elements shall be accessible from the right side of the cabinet.

2.8 SCR REHEAT—OPTIONAL ON PX011 UNITS ONLY

The SCR (Silicon Controlled Rectifier) controller shall proportionally control the stainless steel reheats to maintain the selected room temperature. The SCR controller shall provide precise temperature control, and the lower element temperature shall improve heater life. Available only on air-cooled or water/glycol-cooled PX011 units using digital scroll compressors.

2.9 HOT WATER REHEAT—OPTIONAL ON CHILLED WATER UNITS ONLY

The hot water reheat coil shall have copper tubes and aluminum fins. The control system shall be factory pre-piped with a two-way motorized control valve. A cleanable Y-strainer should be field supplied and installed on the hot water supply line.

2.10 INFRARED HUMIDIFIER

The humidifier shall be of the infrared type, consisting of high intensity quartz lamps mounted above and out of the water supply. The evaporator pan shall be stainless steel and arranged to be serviceable without disconnecting water supply lines, drain lines, or electrical connections. The complete humidifier section shall be pre-piped ready for final connection. The infrared humidification system shall use bypass air to prevent over humidification of the controlled space. The auto flush system shall automatically flush deposits from the humidifier pan. The system shall be field adjustable to change the cycle time to suit local water conditions. A minimum 1 in. (25.4 mm) air gap within the humidifier piping assembly, in compliance with ASME A112.1.2 section 2.4.2 (backsiphonage testing), shall prevent back flow of the humidifier supply water.

2.11 STEAM GENERATING CANISTER HUMIDIFIER—OPTIONAL

A canister-type steam generating humidifier shall be factory-installed in the cooling unit and operated by the Liebert iCOM. It shall be complete with disposable cylinder, all supply and drain valves, steam distributor, and electronic controls. The need to change the canister shall be indicated on the Liebert iCOM display. The humidifier is designed to operate with water conductivity from 330 to 670 microS/cm. System shall automatically fill and drain as well as maintain the required water level based on conductivity. A minimum 1 in. (25.4 mm) air-gap within the humidifier assembly shall prevent back flow of the humidifier supply water.

2.12 CONDENSATE PUMP—OPTIONAL

The pump shall have a capacity of _____ GPM (_____ l/m) at _____ ft head (_____ kPa). The dual-float condensate pump shall be complete with integral primary and secondary float switches, pump, motor assembly and reservoir. The secondary float shall send a signal to the local alarm and shut down the unit upon high water condition. The condensate pump shall be factory-installed on upflow units and field-installed on downflow units.

3.0 CONTROLS

3.1 LIEBERT ICOM™ MICROPROCESSOR CONTROL WITH 7 INCH COLOR TOUCHSCREEN

The Liebert iCOM shall be microprocessor-based with a 7-inch, high definition, capacitive, color touchscreen display and shall be mounted in an ergonomic, aesthetically pleasing housing. The display and housing shall be viewable while the front panel is open or closed. The controls shall be menu-driven. The system shall display user menus for active alarms, event log, graphic data, unit view/status overview (including the monitoring of room conditions, operational status in percentage of each function, date and time), total run hours, various sensors, display setup and service contacts. A password shall be required to make system changes. Service menus shall include setpoints, standby settings (lead/lag), timers/sleep mode, alarm setup, sensor calibration, maintenance/wellness settings, options setup, system/network setup, auxiliary boards and diagnostics/service mode. The Liebert iCOM control shall provide Ethernet/RS-485 ports dedicated for BMS connectivity (i.e. Base-Comms).

- **Password Protection** - The Liebert iCOM shall contain two unique passwords to protect against unauthorized changes. An auto hide/show feature shall allow the user to see applicable information based on the login used.
- **Unit Backup and Restore** - The user shall be able to create safe copies of important control parameters. The Liebert iCOM shall have the capacity for the user to automatically backup unit configuration settings to internal memory or USB storage drive. Configuration settings may be transferred to another unit for a more streamlined unit startup.
- **Parameter Download** - The Liebert iCOM shall enable the user to download an iCOM parameter file that lists parameter names, factory default settings and user-programmed settings in .csv format for remote reference.
- **Parameter Search** - The Liebert iCOM shall have search fields for efficient navigation and parameter lookup.
- **Parameter Directory** - The Liebert iCOM shall provide a directory that lists all parameters in the control. The list shall provide Line ID numbers, parameter labels, and current parameter values.
- **Context-Sensitive Help** - The Liebert iCOM shall have an on-board help database. The database shall provide context-sensitive help to assist with setup and navigation of the menus.
- **Display Setup** - The user shall be able to configure the display information based on the specific user's preference. Language, units of measure, screen contrast, home screen layout, back-light timer, and the hide/show of certain readouts shall be configurable through the display.
- **Additional Readouts** - The display shall enable the user to configure custom widgets on the main screen. Widget options will include items such as fan speed, call for cooling, call for free-cooling, maintenance status, call for hot water reheat, call for electric reheat, call for dehumidification, call for humidification, airflow, static pressure, fluid flow rate and cooling capacity.
- **Status LEDs** - The Liebert iCOM shall show the unit's operating status using an integral LED. The LED shall indicate if the unit has an active alarm; if the unit has an active alarm that has been acknowledged; or if the unit is On, Off or in standby status.
- **Event Log** - The Liebert iCOM shall automatically store the last 400 unit-only events (messages, warnings, and alarms).
- **Service Contact Information** - The Liebert iCOM shall be able to store the local service or sales contact information.
- **Upgradeable** - Liebert iCOM upgrades shall be performed through a USB connection.
- **Timers/Sleep Mode** - The menus shall allow various customer settings for turning the unit On or Off.

- **Menu Layout** - The menus shall be divided into two main menus: User and Service. The User screen shall contain the menus to access parameters required for basic unit control and setup. The Service screen shall be de-signed for service personnel and shall provide access to advanced control setup features and diagnostic information.
- **Sensor Calibration** - The menus shall allow unit sensors to be calibrated with external sensors.
- **Maintenance/Wellness Settings** - The menus shall allow reporting of potential component problems before they occur.
- **Options Setup** - The menus shall provide operation settings for the installed components.
- **Auxiliary Boards** - The menus shall allow setup of optional expansion boards.
- **Various Sensors:** The menus shall allow setup and display of optional custom sensors. The control shall include four customer accessible analog inputs for field-supplied sensors. The analog inputs shall accept a 4 to 20mA signal. The user shall be able to change the input to 0 to 5VDC or 0 to 10VDC. The gains for each analog input shall be programmable from the front display. The analog inputs shall be able to be monitored from the front display.
- **Diagnostics/Service Mode** - The Liebert iCOM™ control shall be provided with self-diagnostics to aid in troubleshooting. The microcontroller board shall be diagnosed and reported as pass/not pass. Control inputs shall be indicated as On or Off at the front display. Control outputs shall be able to be turned On or Off from the front display without using jumpers or a service terminal. Each control output shall be indicated by an LED on a circuit board.
- **Base-Comms for BMS Connectivity** – The Liebert iCOM controller shall provide one Ethernet Port and RS-485 Port dedicated for BMS Connectivity. Provides ground fault isolated RS-485 Modbus, BACnet IP & Modbus IP network connectivity to Building Management Systems for unit monitoring and management. Also, provides ground fault isolated 10/100 baseT Ethernet connectivity for unit monitoring and management. The supported management interfaces include: SNMP for Network Management Systems, HTTP for web page viewing, SMTP for email, and SMS for mobile messaging. The iCOM controller shall support dual IP on a single network and one 485 protocol simultaneously.

3.2 ALARMS

All unit alarms shall be annunciated through both audio and visual cues, clearly displayed on the screen, automatically recorded in the event log and communicated to the customers Building Management System/Building Automation System. The Liebert iCOM control shall activate an audible and visual alarm in event of any of the following conditions:

- High Temperature
- Low Temperature
- High Humidity
- Low Humidity
- EC Fan Fault
- Change Filters
- Loss of Air Flow
- Loss of Power
- Compressor Overload (Optional)
- Humidifier Problem
- High Head Pressure
- Low Suction Pressure
- Custom Alarms

Custom alarm inputs shall be provided to indicate facility-specific events. Custom alarms can be identified with programmable labels. Frequently used alarm inputs include:

- Leak Under Floor
- Smoke Detected
- Standby Unit On

Each alarm (unit and custom) shall be separately enabled or disabled, selected to activate the common alarm and programmed for a time delay of 0 to 255 seconds.

3.3 LIEBERT ICOM™ CONTROL METHODS AND OPTIONS

The Liebert iCOM shall be factory-set to allow precise monitoring and control of the condition of the air entering and leaving the unit. This control shall include predictive methods to control air flow and cooling capacity based control sensors installed. Proportional and Tunable PID shall also be user selectable options.

3.3.1 CONTROLLING SENSOR OPTIONS

Liebert iCOM shall be flexible in the sense that it shall allow for controlling the capacity and fan from multiple different sensor selections. The sensor selections shall be:

3.3.1.1 COOLING CAPACITY

- Supply
- Remote
- Return

3.3.1.2 FAN SPEED

- Supply
- Remote
- Return
- Manual (for diagnostic or to receive a signal from the BMS through the Liebert remote monitoring devices or analog input)
- Static Pressure

3.3.2 TEMPERATURE COMPENSATION

The Liebert iCOM shall be able to adjust the capacity output based on supply and return temperature conditions to meet SLA guidelines while operating at highest efficiency.

3.3.3 HUMIDITY CONTROL

Dew point and relative humidity control methods shall be available (based on user preference) for humidity control within the conditioned space.

3.4 MULTI-UNIT COORDINATION

Liebert iCOM teamwork shall save energy by preventing multiple units in an area from operating in opposing modes. Teamwork allows the control to optimize a group of connected cooling units equipped with Liebert iCOM using the U2U (Unit-to-Unit) network. There shall be three modes of teamwork operation:

- **Teamwork Mode 1 (Parallel):** Is best in small rooms with balanced heat loads. The controlling temperature and humidity sensor readings of all units in operation (fan On) are collected to be used for an average or worst case sensor reading (user selectable). The master unit shall send the operating requirements to all operating units in the group. The control band (temperature, fan and humidity) is divided and shared among the units in the group. Each unit will receive instructions on how to operate from the Master unit based on how far the system deviates from the setpoints. Evaporator fans and cooling capacity are ramped in parallel.
- **Teamwork Mode 2 (Independent):** The Liebert iCOM calculates the worse-case demand for heating, cooling humidification and dehumidification. Based on the greatest demand within the group, each unit operates independently, meaning that the unit may respond to the thermal load and humidity conditions based on the unit's controlling sensors. All sensor readings are shared.
- **Teamwork Mode 3 (Optimized Aisle):** May be employed in large and small rooms with varying heat loads. Optimized Aisle is the most efficient teamwork mode that allows the unit to match cooling capacity with heat load. In the Optimized Aisle mode, the fans operate in parallel. Fans can be controlled exclusively by remote temperature or using static pressure with a secondary remote temperature sensor(s) as an override to ensure that the inlet rack temperature is being met. Cooling (Compressors or Economizer) is controlled through unit supply air conditions. Liebert iCOM calculates the average or worst-case sensor reading (user-selectable) for heating, cooling humidification and dehumidification. Based on the demand within the group, units will be allowed to operate within that mode until room conditions are satisfied. This is the best form of control for a room with an unbalanced load.

3.5 STANDBY LEAD-LAG

The Liebert iCOM shall allow scheduled rotation to keep equal run time on units and provide automated emergency rotation of operating and standby units.

3.6 STANDBY UNIT CASCADING

The Liebert iCOM cascade option shall allow the units to turn On and Off based on heat load when utilizing Teamwork Mode 1, Independent mode or Teamwork Mode 3, Optimized Aisle mode with remote temperature sensors. In Teamwork Mode 1, Cascade mode will stage units On based on the temperature and humidity readings and their deviation from setpoint. In Teamwork 3 Mode, Cascade mode dynamically coordinates the fan speed to save energy and to meet the cooling demands. For instance, with a Liebert iCOM group of six units and only 50% of the heat load, the Liebert iCOM shall operate only four units at 80% fan speed and leave the other two units in standby. As the heat load increases, the Liebert iCOM shall automatically respond to the additional load and bring on another unit, increasing the units in operation to five. As the heat load shifts up or down, the control shall meet the needs by cascading units On or putting them into standby.

3.7 WIRED SUPPLY SENSOR

Each Liebert iCOM shall have one factory-supplied and connected supply air sensor that may be used as a controlling sensor or reference. When multiple sensors are applied for control purposes, the user shall be able to control based on a maximum or average temperature reading.

3.8 VIRTUAL MASTER

As part of the robust architecture of the Liebert iCOM control, it shall allow for a virtual master that coordinates operation. The Virtual Master function shall provide smooth control operation if the group's communication is compromised. When the lead unit, which is in charge of component staging in teamwork, unit staging and standby rotation, becomes disconnected from the network, the Liebert iCOM shall automatically assign a virtual master. The virtual master shall assume the same responsibilities as the master until communication is restored.

3.9 VIRTUAL BACK-DRAFT DAMPER

The Liebert iCOM shall allow the use of a virtual back-draft damper, eliminating the need for a mechanical damper. This shall allow the fans to spin slower (15% or less) to act as a damper.

3.10 COMPRESSOR SHORT CYCLE CONTROL

To help maximize the life of the compressor, there shall be start-to-next start delay for each compressor. The control shall monitor the number of compressor starts in an hour. If the compressor starts more than 10 times in 60 minutes, the local display and remote monitoring shall notify the user through a Compressor Short Cycle event.

3.11 LIEBERT MC™ CONDENSER COMMUNICATION

The Liebert iCOM shall communicate directly with the Liebert MC condenser via field-supplied CANbus communication wires and via field-supplied, low-voltage interlock wires. This shall provide enhanced monitoring, alarming, diagnostics, low-noise mode, and condenser-fan reversal for cleaning mode.

3.12 SYSTEM AUTO RESTART

The auto restart feature shall automatically restart the system after a power failure. Time delay shall be programmable. An optional capacitive buffer may be provided for continuous control operation through a power failure.

3.13 SEQUENTIAL LOAD ACTIVATION

On initial startup or restart after power failure, each operational load shall be sequenced with a minimum delay of one second to minimize total inrush current.

3.14 LOW-PRESSURE MONITORING

Units shall ship standard with low-pressure transducers for monitoring compressor suction pressure. If the pressure falls due to loss of charge or other mechanical cause, the corresponding circuit shall shut down to prevent equipment damage. The user shall be notified of the low-pressure condition through the local display and remote monitoring.

3.15 WINTER START TIME DELAY—AIR-COOLED MODELS

An adjustable software timer shall be provided to assist with compressor starting during cold weather. When the compressor starts, the low-pressure input shall be ignored for the period set in the user-adjustable timer. Once the time period has elapsed after the compressor start, the low-pressure input should remain in the normal state. If the low-pressure input does not remain in the normal state when the time delay has elapsed, the circuit shall lock out on low pressure. The low-pressure alarm shall be announced on the local display and communicated to remote monitoring systems.

3.16 ADVANCED FREEZE PROTECTION

Units shall ship standard with advanced freeze protection enabled. The advanced freeze protection shall monitor the pressure of each circuit using a transducer. The control shall interact with the fan and compressor to prevent the unit coil from freezing if circuit suction pressure drops. Applying fan speed to direct expansion systems requires limitations to avoid freezing condensate on the coil when the unit operates below 100% fan speed. Liebert iCOM's advanced freeze protection provides the ability to predict freeze conditions and correct this condition automatically by adjusting fan speed and compressor capacity. If a freeze condition is detected, the user shall be notified through the local display and remote monitoring systems.

3.17 ADVANCED HIGH-PRESSURE PROTECTION—MODELS WITH DIGITAL SCROLL COMPRESSORS

When the compressor is initially activated, the system shall be monitored for high pressure. When high pressure is detected, the control shall alter the compressor operation and the condenser fan speed to reduce the system discharge pressure, preventing circuit shut down. If the unit is unsuccessful in correcting the problem through this interaction, an alarm shall occur and the affected compressor shall be immediately locked off. The control shall re-enable the compressor when the pressure returns to a safe level. This feature is standard on units equipped with liquid line transducers and digital scroll.

3.18 REFRIGERANT PRESSURE TRANSDUCER FAILURE

The control shall monitor the high-side and low-side refrigerant pressure transducers. If the control senses the transducer has failed, has been disconnected, has shorted or the reading has gone out of range, the user shall be notified through an event on the local display and remote monitoring. The corresponding circuit that the failure has occurred on shall be disabled to prevent unit damage.

3.19 OIL RETURN PROTECTION

The control shall monitor compressor operation and staging to ensure that liquid and hot gas velocity are maintained for proper oil return to the compressor.

3.20 DIGITAL SCROLL HIGH-TEMPERATURE PROTECTION

The control shall monitor digital scroll temperature during unit operation. A compressor temperature limit shall be imposed to help prevent damage to the compressor. If the temperature reaches the maximum temperature limit, the compressor shall be locked out for 30 minutes and an alarm shall be annunciated on the local display and through monitoring. After the initial lockout, the control shall continue to monitor compressor temperature during the off-cycle and re-enable the circuit once a safe operating temperature is reached and the 30 minutes has elapsed. The control shall store the number of high-temperature trips. The number of trips shall be accessible through the local display.

3.21 DIGITAL SCROLL SENSOR FAILURE

The control shall monitor the status of the digital scroll sensor(s). If the control senses that the thermistor is disconnected, shorted or the reading goes out of range, the user shall be notified through an event on the local display and remote monitoring.

3.22 COMPRESSOR HIGH- AND LOW-TEMPERATURE LIMIT PROTECTION

The control shall monitor the return air to ensure that the compressor is operated within the manufacturer's defined window of operation. If the return air temperature deviates from the manufacturer's window of operation, the Liebert iCOM shall automatically adjust to prevent damage to the cooling unit or reduction in its reliability.

3.23 COMPRESSOR RUN TIME MONITORING

The control shall log these compressor statistics:

- Number of compressor starts
- Run hours
- Average run time
- Starts per day
- Starts per day worst
- Number of high-pressure alarms
- Operating phase in which the high-pressure alarm occurred
- Number of low-pressure alarms
- Operating phase in which the low-pressure alarm occurred
- Number of compressor overloads
- Number of high-temperature alarms (scroll compressors)

The user shall have the ability to monitor compressor operating temperature and pressure from the local display to be used as a diagnostic tool.

3.24 FLOODED START PROTECTION

The control shall isolate each compressor through a dedicated circuit liquid line solenoid valve and/or electronic expansion valve. These devices, combined with a spring-closed discharge check valve and compressor crank-case heater (air-cooled models), shall help ensure refrigerant does not migrate/carry oil out of the compressor case during the off cycle.

4.0 MISCELLANEOUS OPTIONS

4.1 HIGH TEMPERATURE SENSOR—OPTIONAL

This sensor shall be factory-installed in the unit and shall be factory-set to 125ºF (52ºC). It shall immediately shut down the environmental control system when activated. The sensor shall be mounted with the sensing element in the return air. This sensor is not meant to replace any fire detection system that may be required by local or national codes.

4.2 SMOKE SENSOR—OPTIONAL

The smoke sensor samples the return air, shuts down the unit upon activation, and sends visual and audible alarms. Dry contacts are available for a remote customer alarm. The smoke sensor includes a “supervision” contact closure. This smoke sensor is not intended to function as or replace any room smoke detection system that may be required by local or national codes.

4.3 REMOTE TEMPERATURE/HUMIDITY SENSOR—OPTIONAL

This sensor shall allow the control of the unit based on temperature/humidity conditions remote to the unit. This sensor shall be field-mounted and wired to the Liebert iCOM control board and the unit shall not have a return-air temperature/humidity sensor mounted inside the unit.

4.4 LOW-VOLTAGE TERMINAL PACKAGE—OPTIONAL

Factory-installed and factory-wired terminals shall be provided for customer connection:

- Remote Shutdown Terminals - Two additional pairs of terminals provide the customer with additional locations to remotely shut down the unit by field-installed devices or controls.
- Extra Common Alarm Contacts - Two additional pairs of terminals provide the customer with normally open contacts for remote indication of unit alarms.
- Main Fan Auxiliary Switch - One set of normally open contacts wired to the EC fan motor contactor will close when EC fan operation is required. This set of dry contacts could also be used to initiate air economizer operation. Air economizer and associated devices by others.
- Liqui-tect Shutdown - One pair of dry contacts for the Liqui-tect sensor signal will provide unit shut down. (Liqui-tect sensor is not included)

4.5 REMOTE HUMIDIFIER CONTACT—OPTIONAL

A pair of N/O contacts provided for connection to a remote humidifier that allows the unit's humidity controller to control a humidifier outside the unit. Power to operate the remote humidifier does not come from the unit.

4.6 COMPRESSOR OVERLOAD—OPTIONAL

A factory-installed sensor designed to detect high compressor currents and provide iCOM input to shut down the compressor as a compressor protection feature.

4.7 FLOOR STAND—OPTIONAL

4.7.1 Supply Air Floor Stand—Optional

Downflow Raised Floor (Upflow, Not Rear Return)

The floor stand shall be constructed of galvanized steel. The floor stand shall have adjustable legs with vibration isolation pads. The floor stand shall be: (6in. [15cm]), (9 in. [23cm]), (12 in. [30cm]), (15 in. [38cm]), (18 in. [46cm]), (21 in. [53cm]), (24 in. [61cm]) high.

4.7.2 Return Air Floor Stand Assembly—Optional

The upflow unit with rear returns air configuration shall be supplied with a skirted-floor stand assembly. The floor stand assembly shall be constructed of galvanized steel with powder-coated panels and supplied with air filter. The floor stand assembly shall be 24-1/8 in. (613mm) high and have adjustable legs with vibration isolation pads. It shall provide a rear return duct flange and removable panel for filter access.

4.8 PLENUM—OPTIONAL

4.8.1 Plenum Construction

The exterior panels shall be 20 gauge steel and powder-coated with black color paint to protect against corrosion. The exterior panels are insulated with 1/2” to 1" (12.7 to 25.4mm), 1-1/2 lb. (0.68 kg) insulation. Front and side panels shall have captive, quarter-turn fasteners.

4.8.2 Air Flow Configuration

Ducted

The unit shall be supplied with a ducted air discharge plenum. The plenum shall be (18 in. [457mm]), (24 in. [609mm]), (30 in. [762mm]), (36 in. [914mm]), (42 in. [1066mm]) or (48 in. [1219]mm) with top duct connection.

Two-way Grille

The unit shall be supplied with a two-way air discharge plenum. The plenum shall be 18 in. (457mm) high.

Three-way Grille

The unit shall be supplied with a three-way air discharge plenum. The plenum shall be 18 in. (457mm) high.

Four-way Grille

The unit shall be supplied with a four-way air discharge plenum. The plenum shall be 18 in. (457mm) high.

4.9 LIEBERT vNSA™ NETWORK SWITCH-OPTIONAL

The Liebert vNSA network switch is designed for networking multiple iCOM unit-level controllers together. There shall be two different styles of the vNSA14 panel available:

- vNSA14 – enclosure with network switches only
- vNSA14-iCOM-H – enclosure with network switches and 9” iCOM color touchscreen display

Each offering shall be housed inside a steel enclosure secured with a key lock and contain two network switches, providing a total of 14 Ethernet ports available for iCOM controller unit-to-unit networking. The Liebert vNSA requires field supplied, hard wiring, 16AWG, 100-240VAC universal (12V, 1.5A) single-phase input power supply for 120V or 230V operation with factory supplied power connector.

4.10 LIEBERT NFORM™ ADVANCED MONITORING—OPTIONAL

The Critical Infrastructure Management software shall centrally monitor and manage distributed equipment using the customer's existing network infrastructure. The system shall provide the Critical Infrastructure Management and Monitoring for air conditioning (CRAC) systems, uninterruptible power supply (UPS) systems, power distribution units (PDUs), static transfer switches (STS), direct current power systems (DC), power distribution strips (PDUs), Alber™ battery monitoring, rack enclosure intrusion monitoring, leak detection systems and other critical infrastructure systems as specified. The system shall have an architecture that allows up to 10,000 managed devices, including Liebert and third-party devices, in a single-server installation.

4.10.1 Liebert NForm System Requirements

All material and equipment used shall be standard components, regularly manufactured and available and not custom-designed especially for this project. All systems and components shall have previously been thoroughly tested and proven in actual use before installation on this project.

The manufacturer will furnish or supply a site-specific Critical Infrastructure Management software system based on customer requirements. The system must be a software-only solution; no substitutions shall be accepted.

The system architecture shall consist of network interface cards that shall be installed in all critical infrastructures that, at a minimum, support HTTP and SNMP simultaneously.

The system shall receive SNMP traps from managed equipment and display the alarm notification in a graphical user interface.

The system shall be based on SNMP open protocols and shall integrate seamlessly with Vertiv, Aperture™ software suite and Network Management Systems.

Open protocol support shall include:

- HTTP(s)
- TCP/IP/v4, TCP/IP/v6
- SNMPv1, SNMPv2

The system shall have the capability of being remotely monitored and managed 24 hours a day, 7 days a week by the manufacturer.

The system shall have the ability to be deployed worldwide.

The system shall operate as a client-to-server application.

The Web interface of each managed device shall integrate directly into the system.

The system shall support enterprise-level databases including Microsoft® SQL™.

The system shall support exporting of all recorded parametric trend data.

The system shall operate on a server determined by the customer. Specific server brand or function is not permissible.

The system shall support virtual server environments by default.

The system shall include, at no additional cost, one (1) year of Software Assurance.

4.10.2 Approved Products

The Critical Infrastructure Monitoring System shall be Liebert Nform™ as manufactured by Vertiv. No substitutions shall be accepted.

4.10.3 Liebert NForm Scope of Work

Owner-Supplied Items

The owner shall furnish the following system components:

- Network (LAN) hardware and software required to provide an Ethernet backbone to be used for transport of IP data packets from network interface cards installed in all equipment to the Critical Infrastructure server and to the Liebert Nform workstations. These components may include hubs, routers, cabling, network operating systems, firewalls, IP addresses, virtual private network (VPN) and other components as required. The owner shall supply network drops for the Critical Infrastructure server, workstation clients and all network-interfaced equipment.
- Dedicated Critical Infrastructure server meeting the following minimum requirements:
  - Microsoft® Windows® 7, Windows® 8/8.1 Enterprise, Windows Server® 2003, Windows Server® 2008 (R2) or Windows Server® 2012 (R2) operating system
  - Pentium™ 3.0GHz single processor or better (1.8GHz dual processor or better recommended)
  - 4 GB of RAM (memory) or better
  - 40 GB hard drive (SCSI recommended)
  - 10/100 BaseT network port or better
  - Monitor / keyboard and mouse port as required for setup
  - Standard USB ports
  - CD or DVD-ROM drive for software installation (CD/DVD-RW suggested for installation and backup)
  - Critical Infrastructure server may be Virtual Environment compatible
- Critical Infrastructure Workstation PCs meeting the following minimum requirements:
  - System should meet the minimum requirements for Microsoft® Windows® 7, XP, 2003, Windows Vista®, Windows® 8/8.1 Enterprise, Windows Server® 2008 (R2) or Windows Server® 2012 (R2) operating system.
  - Microsoft Internet Explorer® v9.0 or better
  - 2 GB RAM (or the minimum operating system requirement)
  - 20 GB hard disk (or the minimum operating system requirement)
  - The owner shall supply the following to facilitate system implementation:
  - IP addresses and subnet masks and other information as required to configure network devices
  - A person as the nominated system owner for administrator purposes
  - Secure location for hardware and server

Critical Infrastructure System Vendor Responsibilities

Provide hardware and software as listed.

- Critical Infrastructure software and licenses for server and workstation installations.
- Software Assurance for the first year at no additional cost.
- 7 x 24 system application and service support through a toll-free telephone number.
- Warranty (parts and labor) per the manufacturer's warranty statement.
- Vendor shall be ISO 9001 listed for design and manufacture of environmental control systems for Critical Monitoring and Control applications.

4.11 LIEBERT LIQUI-TECT™ 410 POINT LEAK DETECTION SENSOR FOR REMOTE MOUNTING—OPTIONAL

A total of _____ (quantity) solid-state water sensor(s) with no moving parts and hermetically sealed to keep out dust and dirt shall be provided. The Liebert Liqui-tect 410 (LT410) shall provide a single-point detection of leaks. The point detection sensor shall have two gold-plated sensing probes to prevent corrosion resistance and to provide accurate readings. The LT410 shall constantly monitor points for leaks, internal faults, and power failures and warn of any abnormal conditions. Mounting brackets shall allow for sensor height adjustment and leveling. The LT410 shall provide two independent outputs to signal both a local alarm panel and a remote building management system or external equipment. The LT410 shall be rated for 24VAC, 50/60Hz and 0.10 amps.

4.12 LIEBERT LIQUI-TECT™ 460 ZONE LEAK DETECTION MODULE WITH CABLE KIT FOR REMOTE MOUNTING—OPTIONAL

A total of _____ (quantity) zone water sensor cables with no moving parts and hermetically sealed to keep out dust and dirt shall be provided. The Liebert Liqui-tect 460 (LT460) shall provide a zone detection of leaks. The LT460 shall constantly monitor points for leaks, internal faults, and power failures and warn of any abnormal conditions. LED's shall provide status indication and also ensure the cable is properly installed and operational under raised floors. The LT460 shall provide two independent outputs provide a signal to a local alarm panel, Liebert environmental unit, remote building management system, or external equipment.

Liebert Liqui-tect 460 Module

The LT460 shall consist of a metal enclosure with a hinged top door providing access to the internal circuit board for wiring termination and configuration of DIP switches. The LT460 shall monitor up to 100 feet (30m) of connected LT500Y leak detection cable. The LT460 shall be rated for 24VAC, 50/60Hz, and 0.12A.

LT500Y Leak Detection Cable

The cable material and construction shall allow the cable to lie flat when used with hold-down clips. The LT500Y shall be plenum-rated and UL-listed for safe operation. Cables shall be available in lengths of 20, 25, 30, 35, and 45 feet (6, 7.6, 9, 10.6, and 13.7m).

5.0 HEAT REJECTION - LIEBERT MC™ CONDENSER

5.1 LIEBERT MC CONDENSER SUMMARY

These specifications describe requirements for a Liebert air-cooled condenser for a Liebert Thermal Management system. The condenser shall be designed to reject waste heat to outdoor air and to control refrigerant head pressure as indoor equipment loading and outdoor ambient conditions change.

The manufacturer shall design and furnish all equipment in the quantities and configurations shown on the project drawings.

Standard 60Hz units shall be CSA-certified to the harmonized U.S. and Canadian product safety standard “CSA C22.2 No 236/UL 1995 for Heating and Cooling Equipment” and shall be marked with the CSA c-us logo.

5.2 LIEBERT MC CONDENSER DESIGN REQUIREMENTS

The air-cooled condenser shall be a factory-assembled unit, complete with integral electrical panel, designed for outdoor installation. The condenser shall be a draw-through design.

5.3 LIEBERT MC CONDENSER STANDARD FEATURES

Condenser shall consist of microchannel condenser coil(s), propeller fan(s) direct-driven by individual fan motor(s), electrical controls, housing, and mounting legs. The Liebert air-cooled condenser shall provide positive refrigerant head pressure control to the indoor cooling unit by adjusting heat rejection capacity. Microchannel coils shall provide superior heat transfer, reduce air-side pressure drop, increase energy efficiency, and significantly reduce the system refrigerant volume required. EC fans and fan operating techniques shall reduced sound levels. Various methods shall be available to match indoor unit type, maximum outdoor design ambient and maximum sound requirements.

5.4 LIEBERT MC CONDENSER COIL

Liebert microchannel coils shall be constructed of aluminum microchannel tubes, fins, and manifolds. Tubes shall be flat and contain multiple, parallel flow microchannels and span between aluminum headers. Full-depth louvered aluminum fins shall fill spaces between the tubes. Tubes, fins, and aluminum headers shall be oven-brazed to form a complete refrigerant-to-air heat exchanger coil. Copper stub pipes shall be electric resistance welded to aluminum coils and joints protected with polyolefin to seal joints from corrosive environmental elements. Coil assemblies shall be factory leak tested at a minimum of 300 psig (2068kPag). Hot gas and liquid lines shall be copper and shall be brazed using nitrogen gas flow to the stub pipes with spun-closed ends for customer piping connections. Complete coil/piping assembly shall be then filled and sealed with an inert gas holding charge for shipment.

Aluminum Microchannel Coil with E-Coat—Optional

Aluminum microchannel coil with E-coat shall provide a flexible epoxy coating to all coil surface areas without material bridging between fins. E-coat shall increase coil corrosion protection and shall reduce heat rejection capacity degradation to less than 10% after a severe 2000 hour 5% neutral salt spray test (ref. ASTM B117). The coating process shall ensure complete coil encapsulation, and the color shall be black. A UV topcoat shall be applied to prevent UV degradation of E-coat.

5.5 LIEBERT MC CONDENSER FAN MOTOR/BLADE ASSEMBLY

The fan motor/blade assembly shall have an external rotor motor, fan blades and fan/finger guard. Fan blades shall be constructed of cast aluminum or glass-reinforced polymeric material. Fan guards shall be heavy gauge, close-mesh steel wire, coated with a black corrosion resistant finish. Fan terminal blocks shall be in an IP54 enclosure on the top of the fan motor. Fan assemblies shall be factory-balanced, tested before shipment and mounted securely to the condenser structure.

Liebert MC Condenser EC Fan Motor

The EC fan motors shall be electronically commutated for variable speed operation and shall have ball bearings. The EC fans shall provide internal overload protection through built-in electronics. Each EC fan motor shall have a built-in controller and communication module, linked via RS485 communication wire to each fan and the Premium Control Board, allowing each fan to receive and respond to precise fan speed inputs from the Premium Control Board.

5.6 LIEBERT MC CONDENSER ELECTRICAL CONTROLS

Electrical controls and service connection terminals shall be provided and factory-wired inside the attached control panel section. Only high-voltage supply wiring and low voltage indoor unit communication/interlock wiring are required at condenser installation.

EC Fan Speed and Premium Control

The EC fan/Premium Control System shall include an electronic control board, EC fan motor(s) with internal overload protection, refrigerant and ambient temperature thermistors, and refrigerant pressure transducers. The Premium Control Board shall communicate directly with the indoor unit's Liebert iCOM control via field-supplied CANbus communication wires and via field-supplied low voltage interlock wires. The control board shall use sensor and communication inputs to maintain refrigerant pressure by controlling each EC fan on the same refrigerant circuit to the same speed. The Premium control board shall be rated to a temperature of -30°F to 125°F. The premium control shall be factory set for (fan speed) (fan speed with Liebert Lee-Temp™) (fan speed with unheated receivers for EEV) control.

Locking Disconnect Switch

A Locking-Type disconnect switch shall be factory-mounted and wired to the electrical panel and be capable of disrupting the flow of power to the unit and controlled via an externally mounted locking and lockable door handle. The locking disconnect shall be lockable in support of lockout/tagout safety programs.

Short Circuit Current Rating

The electrical panel shall provide at least 65,000A SCCR.

Cabinet

The condenser cabinet shall be constructed of bright aluminum sheet and divided into individual fan sections by full width baffles. Internal structural support members, including coil support frame, shall be galvanized steel for strength and corrosion resistance. Panel doors shall be provided on two sides of each coil/fan section to permit coil cleaning. An electrical panel shall be contained inside a factory-mounted NEMA 3R weatherproof electrical enclosure.

5.7 LIEBERT MC CONDENSER MOUNTING LEGS

Standard Aluminum Legs

Aluminum legs shall be provided to mount unit for vertical air discharge with rigging holes for hoisting the unit into position. Standard height is 18 in. (457mm).

Optional Galvanized Steel Legs with Bracing

Condensers shall be shipped with (36in. [914mm]) (48in. [1219mm]) (60in. [1524mm]) mounting legs with stabilization bracing. Legs, bracing, and hardware shall be galvanized steel.

5.8 LIEBERT MC CONDENSER ACCESSORIES

Liebert Lee-Temp™ System—Optional

Liebert Lee-Temp Receiver Kit shall contain an insulated, heated receiver tank with sight glasses, mounting plate, mounting hardware, pressure relief valve, rota-lock valve for refrigerant charge isolation and piping assembly with head pressure operated three-way valve and check valve. Components shall be field-assembled to the condenser. The three-way valve shall sense refrigerant head pressure and adjust the flooding charge in the condenser coil to adjust the condenser heat rejection capacity. The Liebert Lee-Temp heater shall be 150W, shall include an integral thermostat to maintain refrigerant temperature at a minimum of 85°F (29°C) and shall require a separate power supply of (208/230V-1ph-60Hz) (120V-1ph-60Hz).

The Liebert Lee-Temp Kit shall function with Liebert MC variable speed fan motors and electronic controls that lower fan speed in lower outdoor ambient temperatures for maximum energy efficiency. This system shall allow system startup and positive head pressure control with ambient temperatures as low as -30°F (-34.4°C).

Liebert PDX-EEV Receiver Kit—Optional

Liebert PDX-EEV Receiver Kit shall contain a painted, un-insulated receiver with integral fusible plug, formed copper pipe for ease of connecting condenser liquid line to receiver and mounting bracket. Additional full-length leg is shipped with condenser (18 in., 36 in. and 48 in.) or with 60 in. leg kit and should be secured to the mounting surface. One receiver kit shall be field installed per refrigerant circuit.

Liebert MC 575 Volt—Optional

The condenser cabinet shall include a secondary, factory-mounted, NEMA 3R weatherproof electrical enclosure. The secondary enclosure shall contain a 575V transformer and protective fuses. All wiring between main and secondary electrical enclosures shall be factory-provided. All field electrical connections shall be made in the main electrical enclosure.

5.9 FUSIBLE PLUG KIT—OPTIONAL

A fusible plug kit shall be field-installed on the liquid line for compliance with building codes requiring refrigerant relief during high temperature and building fire conditions.

5.10 IBC/OSHPD SEISMIC CERTIFICATION AND IBC WIND/SNOW LOAD COMPLIANT—OPTIONAL

IBC/OSHPD Seismic Certification and IBC Wind/Snow Load Compliant condensers shall be provided with any applicable bracing and field-installation instructions. Condensers shall bear a label certifying compliance with IBC/OSHPD requirements.

6.0 HEAT REJECTION - LIEBERT DRYCOOLERS

6.1 LIEBERT DRYCOOLER SUMMARY

These specifications describe requirements for a Liebert air-cooled drycooler for a Liebert Thermal Management system. The drycooler shall be designed to reject waste heat to outdoor air and to control glycol temperature as pumped glycol rates and outdoor ambient conditions change.

The manufacturer shall design and furnish all equipment in the quantities and configurations shown on the project drawings.

Standard 60Hz units shall be CSA-certified to the harmonized U.S. and Canadian product safety standard CSA C22.2 No 236/UL 1995 for Heating and Cooling Equipment and shall be marked with the CSA c-us logo.

6.2 LIEBERT DRYCOOLER DESIGN REQUIREMENTS

The drycooler shall be a factory-assembled unit, complete with integral electrical panel, designed for outdoor installation and vertical airflow only. The drycooler shall be a draw-through design.

6.3 LIEBERT DRYCOOLER STANDARD FEATURES

The drycooler shall consist of drycooler coil(s), housing, propeller fan(s) direct-driven by individual fan motor(s), electrical controls, and mounting legs. The Liebert air-cooled drycooler shall provide glycol temperature control to the indoor cooling unit by adjusting heat rejection capacity. Various methods shall be available to match indoor unit type, minimum outdoor design ambient and maximum sound requirements.

6.4 LIEBERT DRYCOOLER COIL

The Liebert-manufactured coil shall be constructed of copper tubes in a staggered tube pattern. Tubes shall be expanded into continuous, corrugated aluminum fins. The fins shall have full-depth fin collars completely covering the copper tubes, which shall connected to heavy wall Type “L” headers. Inlet coil connector tubes shall pass through relieved holes in the tube sheet for maximum resistance to piping strain and vibration. Coil shall be split flow into multiple coil circuits, combined to yield a drycooler with _____ internal circuits. The supply and return lines shall be (spun shut [1-4 fan models]), (brazed with a cap [6 or 8-fan models]) and shall include a factory-installed Schrader valve. Coils shall be factory leak-tested at a minimum of 300 psig (2068kPag), dehydrated, then filled and sealed with an inert gas holding charge for shipment. Field relief of the Schrader valve shall indicate a leak-free coil.

6.5 LIEBERT DRYCOOLER HOUSING

The drycooler housing shall be constructed of bright aluminum sheet and divided into individual fan sections by full-width baffles. Structural support members, including coil support frame, motor and drive support, shall be galvanized steel for strength and corrosion resistance. Aluminum legs shall be provided to mount unit for vertical air discharge and shall have rigging holes for hoisting the unit into position. An electrical panel shall be inside an integral NEMA 3R weatherproof section of the housing.

6.6 LIEBERT DRYCOOLER PROPELLER FAN

The propeller fan shall have aluminum blades secured to a corrosion protected steel hub. Fans shall be secured to the fan motor shaft by means of a keyed hub and dual setscrews. Fan diameter shall be 26" (660mm) or less. Fans shall be factory-balanced and run before shipment. Fan guards shall be heavy gauge, close-mesh steel wire with corrosion resistant polyester paint finish that shall be rated to pass a 1000-hour salt spray test.

6.7 LIEBERT DRYCOOLER FAN MOTOR

The fan motor shall be continuous air-over design and shall be equipped with a rain shield and permanently sealed bearing. Motors shall be rigidly mounted on die-formed galvanized steel supports.

6.8 LIEBERT DRYCOOLER ELECTRICAL CONTROLS

Electrical controls, overload protection devices and service connection terminals shall be provided and factory-wired inside the integral electrical panel section of the housing. A locking disconnect switch shall be factory-mounted and wired to the electrical panel and controlled via an externally mounted locking door handle. An indoor unit interlock circuit shall enable drycooler operation whenever indoor unit compressors are active. Only supply wiring, indoor unit interlock wiring, and high voltage wiring to pumps when controlled by the drycooler shall be required at drycooler installation.

6.9 SPECIFIC FEATURES BY DRYCOOLER TYPE

6.9.1 Fan Speed Control (DSF/DDF) Drycooler (1 Fan) with Integral pump control

The DSF/DDF drycooler shall have a fan speed controller that senses the leaving glycol temperature and varying the speed of a FSC duty motor in direct proportion to the heat rejection needs of the system. Fan speed controller shall be factory set to range of 70 to 100°F (21 to 38°C) for glycol-cooled applications. The fan speed control shall be field adjustable to a range of 30 to 60°F (2 to 7°C) for free-cooling applications. The motor shall be single-phase and include built-in overload protection. The motor shall have an ODP enclosure. The DSF/DDF drycooler shall control operation of glycol pumps powered from the electrical panel. The air-cooled drycooler shall have a ____ volt, ____ ph, ____ Hz power supply.

6.9.2 Fan Cycling Control FAN(DSO, DDO) Drycooler (All Fan Quantities) with Integral Pump Control

The DSO/DDO drycooler shall sense the leaving glycol temperature and cycle fixed speed fans to maintain glycol temperatures. Aquastats shall have field-adjustable setpoints. The fixed speed motors shall be three-phase and have individual internal overload protection. Fixed speed motors shall have a TEAO enclosure. The DSO/DDO drycooler shall control operation of glycol pumps powered from the electrical panel. The air-cooled drycooler shall have a ____ volt, 3 ph, ____ Hz power supply.

6.9.3 Fan Cycling Control (DDNT) Drycooler (All Fan Quantities)

The DDNT drycooler shall sense the leaving glycol temperature and cycle fixed-speed fans to maintain glycol temperatures. Aquastats shall have field-adjustable setpoints. The fixed-speed motors shall be three-phase and have individual internal overload protection. Fixed-speed motors shall have a TEAO enclosure. The air-cooled drycooler shall have a ____ volt, 3 ph, ____ Hz power supply.

6.9.4 Main Fan Control (DDNL) Drycooler (All Fan Quantities)

The DDNL drycooler shall control fixed-speed fans when an external contact closure completes the internal 24VAC circuit. The fixed-speed motors shall be three-phase and have individual internal overload protection. Fixed-speed motors shall have a TEAO enclosure. The air-cooled drycooler shall have a ____ volt, 3 ph, ____ Hz power supply.

6.9.5 No Fan Control (DDNC) Drycooler (All Fan Quantities)

The DDNC drycooler shall activate all fixed-speed fans when supply power is applied to the drycooler. The fixed-speed motors shall be three-phase and have individual internal overload protection. Fixed-speed motors shall have a TEAO enclosure. The air-cooled drycooler shall have a ____ volt, 3 ph, ____ Hz power supply.

6.9.6 Liebert QuietLine™ Drycooler (All Fan Quantities)

Liebert QuietLine drycoolers shall be available for DSO, DDO, DDNT, DDNL and DDNC control types. The fan motor(s) shall have a TEAO enclosure and provide individual overload protection and have a full speed of 570rpm @ 60Hz for quiet operation.

6.10 PUMP CONTROLS WITHIN DRYCOOLER

6.10.1 Single Pump Option

Pump controls for a single glycol pump up to 7.5 hp (5.6kW) shall be incorporated into the same integral electrical panel as the drycooler fan controls and may include fuses or circuit breakers as required for the pump motor. Pump voltage, phase, and frequency shall be same as drycooler voltage, phase, and frequency.

6.10.2 Dual Pump Option

Pump controls for a dual glycol pump system up to 7.5 hp (5.6 kW) shall operate one pump as primary and the second pump shall operate as a standby pump. Pump controls shall be incorporated into the same integral electrical panel controlling drycooler fans. A factory-supplied, field-installed flow switch shall sense loss of flow and switch to the standby pump for continuous system operation. An internal switch shall allow manual selection of the primary (lead) pump.

6.11 PUMP PACKAGE

Single Pump Package

This system shall be provided with a centrifugal pump mounted in a weatherproof and vented enclosure. The pump shall be rated for ___ GPM (___ l/m) at ___ ft. (___ kPa) of head and operate on ___ volt, 3-phase, ___ Hz.

Dual Pump Package

The dual pump package shall include pumps, enclosure, and field-mounted flow switch. The standby pump shall automatically start up on failure of the lead pump by drycooler pump controls or by a separate factory-wired control box and shall include a lead/ lag switch for the pumps. Each pump shall be rated for _____ GPM (___ l/s) at ___ ft. (___ kPa) of head.

6.12 ANCILLARY ITEMS

Expansion Tanks, Fluid Relief Valves, Air Management, and Other Devices

An expansion tank shall be provided for expansion and contraction of the glycol fluid due to temperature change in the closed system. The tank and air vents shall be field-installed at the system's highest elevation to allow venting of trapped air. A fluid pressure relief valve shall be provided for system safety. The system shall include (tank-steel [expansion, compression, diaphragm, bladder], air separator, air vent, fluid pressure relief valve, pressure gages, flow switches, tempering valves, [primary, primary and standby] pumps, supply and return piping).

7.0 HEAT REJECTION - LIEBERT PIGGYBACK DRYCOOLERS

7.1 LIEBERT PIGGYBACK COIL

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.

7.2 LIEBERT PIGGYBACK 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.

7.3 LIEBERT PIGGYBACK DRIVES

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.

7.4 LIEBERT PIGGYBACK 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.

7.5 LIEBERT PIGGYBACK SINGLE GLYCOL PUMP

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.

7.6 LIEBERT PIGGYBACK OPTIONS

7.6.1 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.

7.6.2 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.

7.6.3 Floor Stand

Floor stand is constructed of heliarc welded tubular steel and available in heights from 9" to 24" with vibration isolation pads provided on the adjustable legs.

7.6.4 Oversized Blower & Pump Motors

Oversized blower and pump motors are available for higher than normal pressure applications.

7.6.5 Dual Glycol Pumps with Automatic Changeover Control

Dual glycol pumps with automatic changeover control provide 100% redundancy of the glycol pump.

7.6.6 No Glycol Pump

Option is available for field supplied pump applications.

8.0 EXECUTION

8.1 INSTALLATION OF PRECISION COOLING UNITS

8.1.1 General

Install precision cooling units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

8.1.2 Electrical Wiring

Install and connect electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's electrical connection diagram submittal to electrical contractor.

8.1.3 Piping Connections

Install and connect devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's piping connection diagram submittal to piping contractor.

8.1.4 Field Quality Control

Start the system in accordance with manufacturer's startup instructions. Test controls and demonstrate compliance with requirements. These specifications describe requirements for a computer room environmental control system. The system shall be designed to maintain temperature and humidity conditions in the rooms containing electronic equipment.

The manufacturer shall design and furnish all equipment to be fully compatible with heat dissipation requirements.

8.1.5 Supply and Drain Water Piping

Connect water supply and drains to air conditioning unit. Provide pitch and trap as manufacturer's instructions and local codes require.

8.2 WARRANTY START-UP AND CONTROL PROGRAMMING

Engage manufacturer's field service technician to provide warranty start-up supervision and assist in programming of unit(s) controls and ancillary panels supplied by them.


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