VERTIV.

Liebert®

DSE™ Thermal Management System

System Design Catalog

Downflow 50 to 165 kW (14 to 47 ton) Capacity; Upflow 80 to 85 kW (23 to 24 ton) Capacity, 50 and 60 Hz

AHRI CERTIFIED®
www.ahridirectory.org
Datacom Cooling
AHRI Standard 1360

The information contained in this document is subject to change without notice and may not be suitable for all applications. While every precaution has been taken to ensure the accuracy and completeness of this document, Vertiv assumes no responsibility and disclaims all liability for damages resulting from use of this information or for any errors or omissions. Refer to other local practices or building codes as applicable for the correct methods, tools, and materials to be used in performing procedures not specifically described in this document.

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

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

Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures. Visit https://www.Vertiv.com/en-us/support/ for additional assistance.

TABLE OF CONTENTS

1 NOMENCLATURE AND COMPONENTS

This section describes the model number for Liebert® DSE units and components.

1.1 Liebert DSE Model-number Nomenclature

Table 1.2 below describes each digit of the model number.

Table 1.1 DSE Model Number Example

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
D	A	1	2	5	D	P	1	A	T	H	2	0	8	1	1	D	0	B	S	P	1	2	3	S

Table 1.2 DSE Model-number Digit Definitions

Digit	Description
Digits 1 and 2 = Product Family	DA = Liebert® DSE
Digit 3, 4, 5 = Nominal Cooling Capacity, kW	050 = 50 kW 080 = 80 kW 085 = 85 kW 125 = 125 kW 150 = 150 kW 165 = 165 kW
Digit 6 = Air Discharge	D = Downflow U = Upflow
Digit 7 = System Type	A = Air-cooled P = Air-cooled, Econ-O-Phase ready
Digit 8 = Air-flow (Fan Type)	1 = EC plug fans
Digit 9 = Voltage	A = 460 V - 3 ph - 60 Hz B = 575 V - 3 ph - 60 Hz C = 208 V - 3 ph - 60 Hz D = 230 V - 3 ph - 60 Hz 2 = 380 V - 3 ph - 60 Hz M = 380-415 V - 3 ph - 50 Hz

Table 1.2 DSE Model-number Digit Definitions (continued)

Digit	Description
Digit 10 = Cooling System	
	D = Digital scroll, R-410A
	T = Tandem with digital scroll, R-410A
Digit 11 = Humidifier	
	0 = No humidifier
	H = Infrared Humidifier
Digit 12 = Display	
	2 = iCOM (High Definition)
Digit 13 = Reheat	
	0 = None
	1 = Electric reheat, standard capacity
	R = Electric reheat, reduced capacity
Digit 14 = Air Filter	
	8 = MERV 8, 4-in.
	9 = MERV 11, 4-in.
	A = MERV 13, 4-in.
	6 = MERV 11, 2-in. plus MERV 8 pre-filter, 2-in.
	C = MERV 13, 2-in. plus MERV 8 pre-filter, 2-in.
Digit 15 = Coil Option	
	1 = Non-coated coil, indoor unit
Digit 16 = Enclosure Option	
	1 = Color standard
	2 = Color optional
	3 = Color standard and IBC/OSHPD bracing
	4 = Color optional and IBC/OSHPD bracing
Digit 17 = High-voltage option	
	L = Locking disconnect
	5 = Locking disconnect, with condensate pump
Digit 18 = Option packages	
	0 = None
	L = Option package #1 - low-voltage terminal package
	H = Reheat and Humidifier lockout
	R = Remote humidity contact
	D = Option package #1 plus remote humidifier lockout
	E = Option package #1 plus reheat/humidifier lockout plus remote contact

Table 1.2 DSE Model-number Digit Definitions (continued)

Digit	Description
Digit 19 = Monitoring B = Base comms and connectivity	
Digit 20 = Sensors 0 = None S = Smoke sensor H = High-temperature sensor F = Smoke and High-temperature sensors C = Compressor-overload sensors D = Compressor, smoke sensors K = Compressor, high-temperature, smoke sensors	
Digit 21 = Packaging P = Domestic C = Export	
Digit 22-24 = Factory Configuration Number	
Digit 25 = Configuration Code A = 1 S = SFA	

1.2 Component Location

The unit component locations are described in the submittal documents included in the Submittal Drawings on page 61.

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

Table 1.3 Component-location Drawings

Document Number	Title
DPN003452	Component Location, Typical, Downflow Models, DA050 – DA165
DPN003451	Component Location, Typical, Upflow Models, DA080 – DA085

1.3 Cooling Configurations

Figure 1.1 DSE with Liebert® MC Condenser

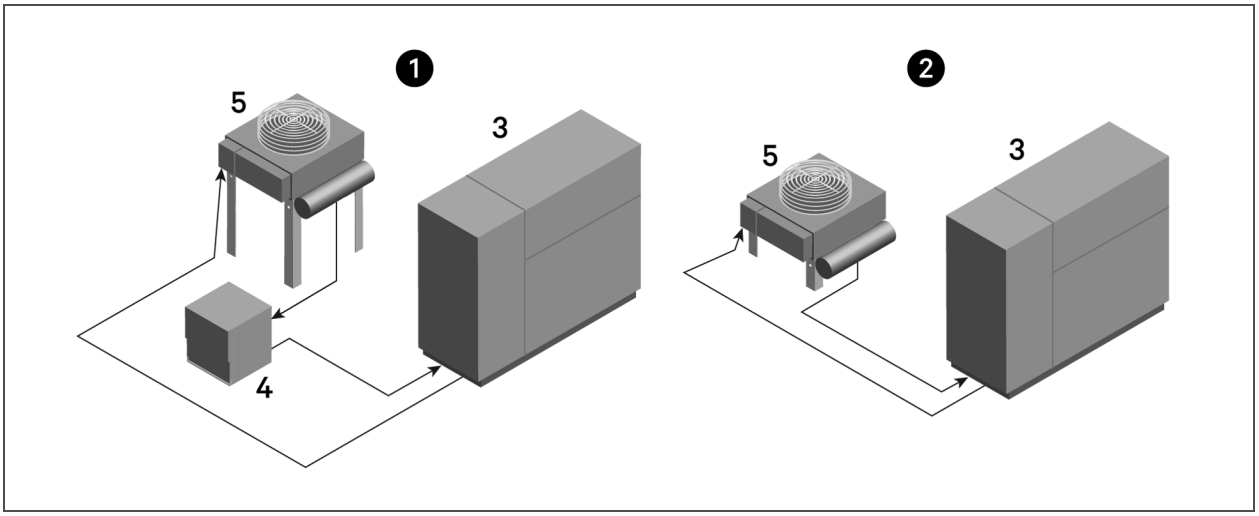


Table 1.4 DSE with MC Condenser Cooling Descriptions

Item	Description
1	Air-Cooled with EconoPhase Pumping Unit—All the features of a standard air-cooled system, with the added benefit of an economizer mode that can be used when the outdoor temperature is cold enough to cool the refrigerant enough to suspend use of the compressors.
2	Air-cooled— configured as a DX-only system (no economization).
3	Liebert® DSE™ Thermal Management System
4	Liebert® EconoPhase™ Pumped-refrigerant Economizer
5	Liebert® MC™ Condenser with DSE receivers.

Figure 1.2 DSE with Liebert® MCV Condenser and EconoPhase Pumping Unit

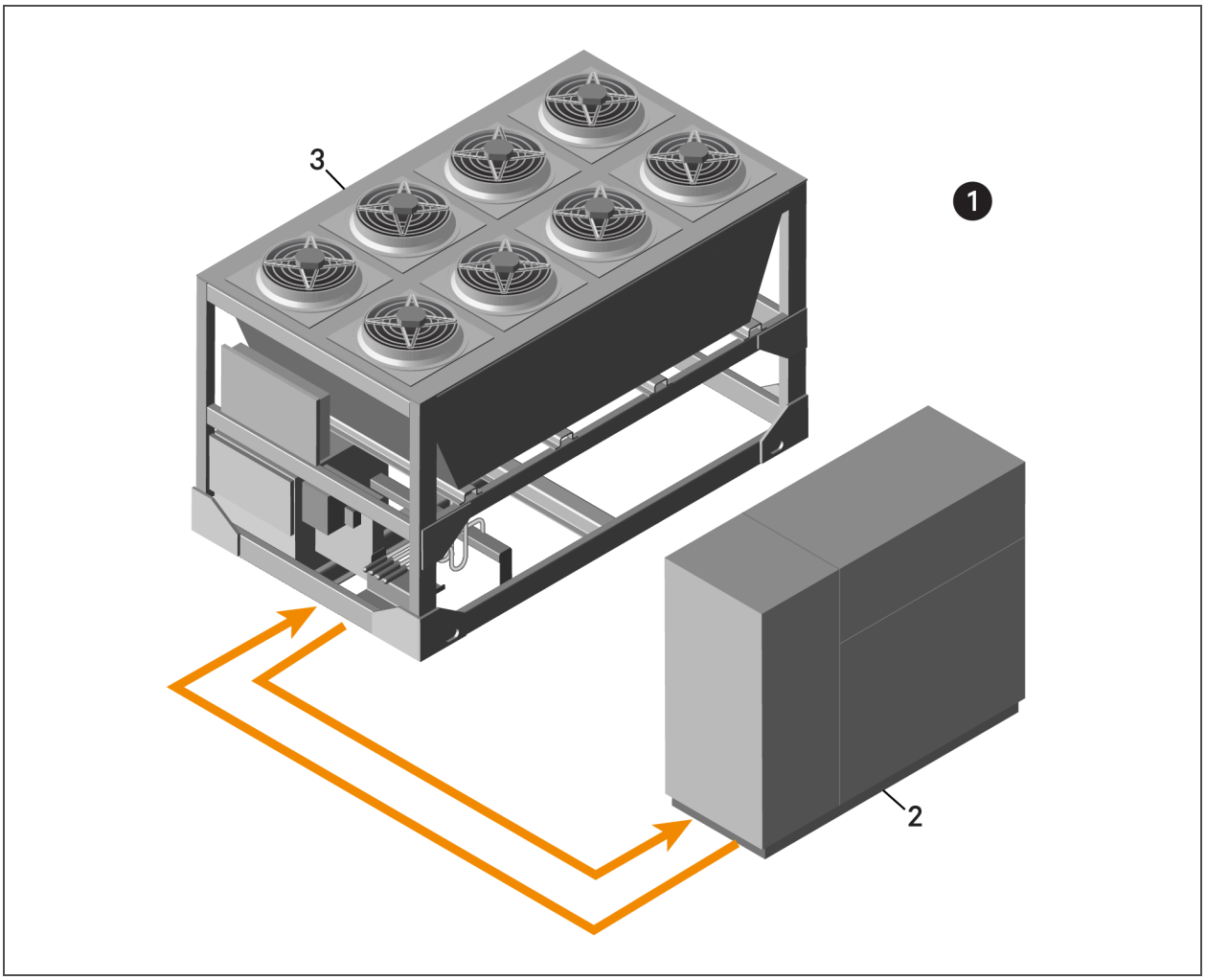


Table 1.5 DSE Air-cooled with MCV Condenser and EconoPhase Pump Cooling Descriptions

Item	Description
1	Air-cooled with Liebert® MCV™ Condenser with Econo-Phase™ Pumping Unit—All the features of a standard air-cooled system, with the added benefit of an economizer mode that can be used when the outdoor temperature is cold enough to cool the refrigerant enough to suspend use of the compressors.
2	Liebert® DSE™ Thermal Management System
3	Liebert® MCV™ Condenser with EconoPhase Pumping unit and DSE receivers mounted, wired, and piped on a common heat-rejection skid for ease of job-site deployment.

1.4 Blower Configurations

Figure 1.3 Downflow blower configurations, front and rear supply with EC fans

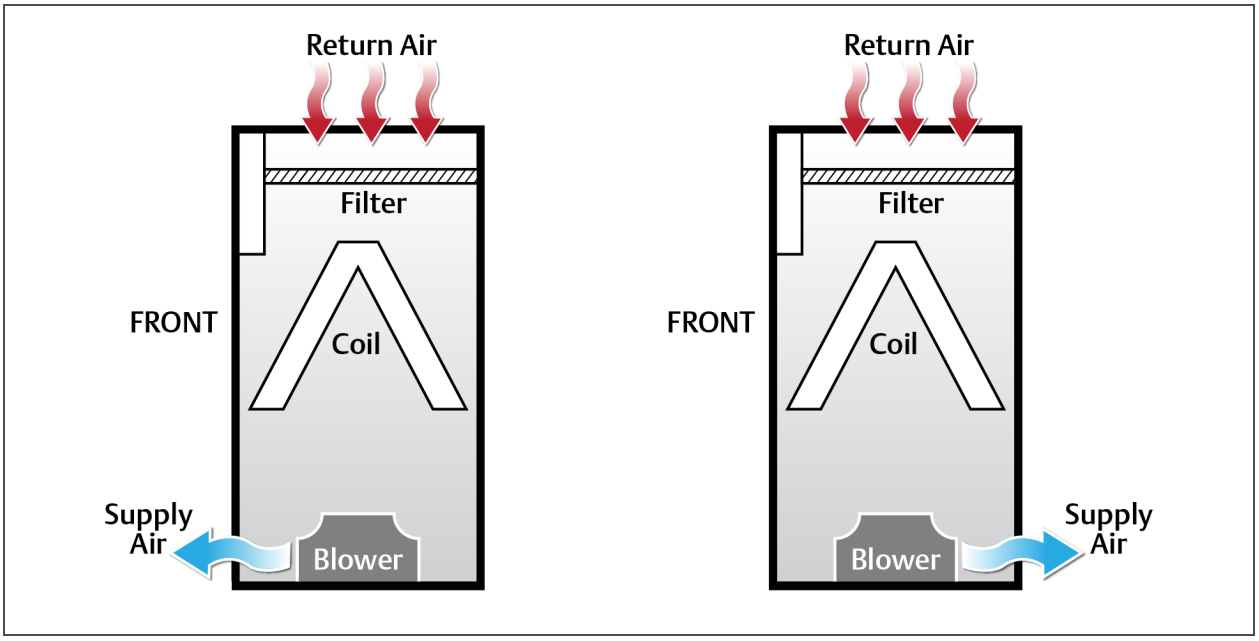
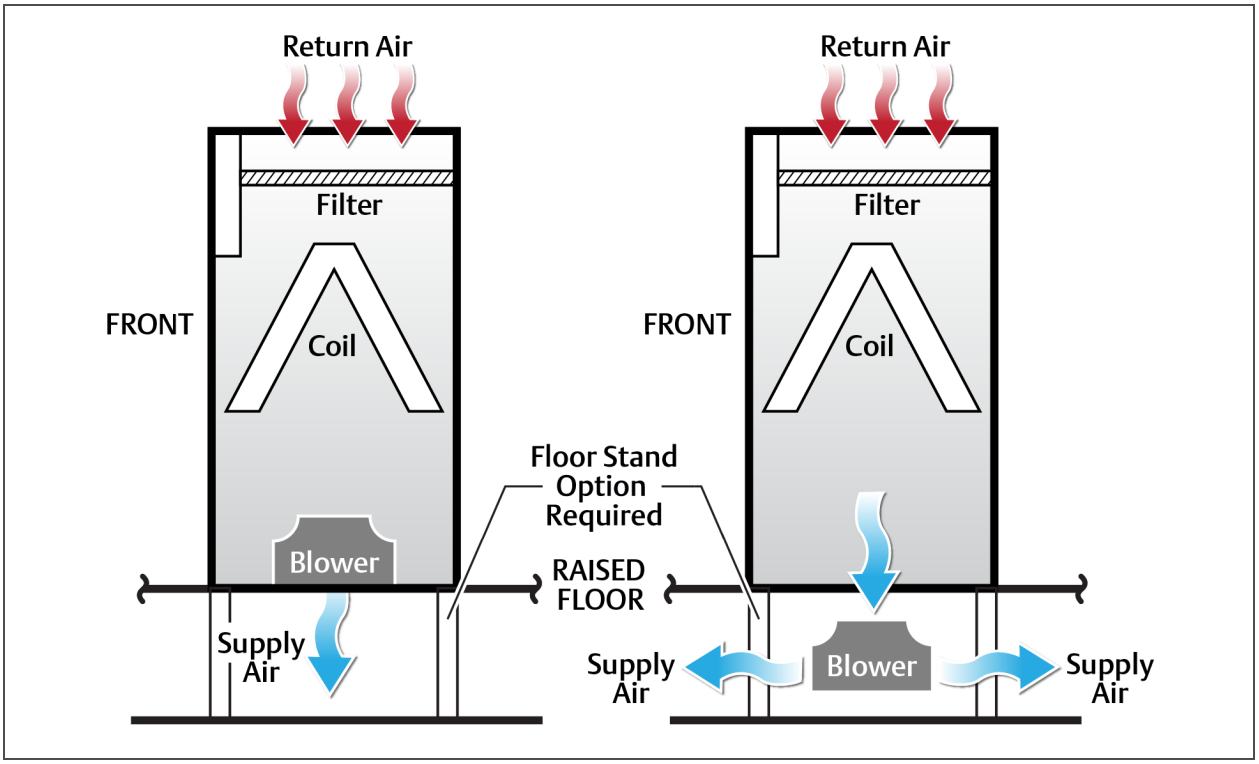
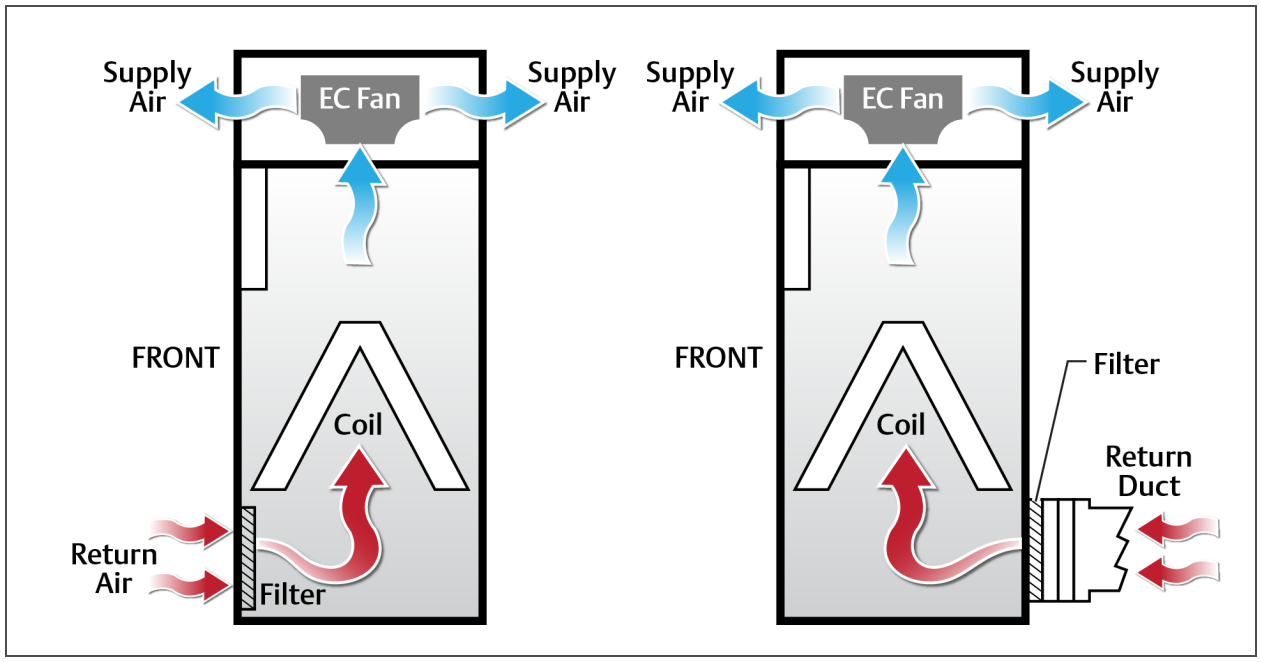


Figure 1.4 Downflow blower configurations, bottom and under-floor supply with EC fans



NOTE: Under-floor supply-air EC fans requires a minimum height of 24-in.

Figure 1.5 Upflow blower configurations with EC fans in a plenum



NOTE: In upflow units with EC fans in the plenum, supply air exits the front or rear only. **Figure 1.5** above represents the possible options.

This page intentionally left blank

2 SYSTEM DATA

2.1 Capacity and Performance Data

Table 2.1 Data for Downflow 60-Hz Models

Model Size - Downflow Configuration	DA050D	DA080D	DA085D	DA125D	DA150D	DA165D
MicroChannel Liebert MCTM Matchup	MCM080E1	MCM160E2	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL165E1 (x2)
DX Evaporator - Net Capacity Data at 95°F (35°C) Outdoor Ambient						
95°F DB, 67.7°F WB, 52°F DP, 23% RH (35°C DB, 19.8.°C WB)						
Total, kW (BTUH)	54 (186,000)	92 (315,000)	99 (338,000)	146 (498,000)	181 (618,000)	193 (659,000)
Sensible, kW (BTUH)	54 (186,000)	92 (315,000)	99 (338,000)	146 (498,000)	181 (618,000)	192 (655,000)
100% Compressor Mode - Net Full-Load SCOP, kW/kW	2.9	3.7	3.3	3.6	3.4	3.2
100% Pump Mode at 35°F (1.7°C) Outdoor Ambient - Net Full-Load SCOP, kW/kW	8.5	12.0	11.0	10.0	8.6	8.6
85°F DB2, 64.4°F WB, 52°F DP, 32% RH(29.4°C DB, 18°C WB)						
Total, kW (BTUH)	49 (166,000)	84 (285,000)	90 (307,000)	130 (444,000)	165 (563,000)	177 (604,000)
Sensible, kW (BTUH)	49 (166,000)	81 (277,000)	87 (297,000)	130 (444,000)	159 (543,000)	166 (566,000)
100% Compressor Mode - Net Full-Load SCOP, kW/kW	2.7	3.3	2.9	3.2	3.0	2.8
100% Pump Mode at 35°F (1.7°C) Outdoor Ambient - Net Full-Load SCOP, kW/kW	7.0	10.4	9.6	9.2	7.7	7.75
75°F DB3, 61°F WB, 52°F DP, 44% RH(23.9°C DB, 16.1°C WB)						
Total, kW (BTUH)	44 (150,000)	76 (260,000)	82 (280,000)	116 (396,000)	150 (512,000)	161 (549,000)
Sensible, kW (BTUH)	42 (142,000)	66 (224,000)	70 (241,000)	112 (382,000)	130 (444,000)	136 (464,000)
100% Compressor Mode - Net Full-Load SCOP, kW/kW	2.4	2.7	2.4	2.8	2.5	2.3
100% Pump Mode at 35°F (1.7°C) Outdoor Ambient - Net Full-Load SCOP, kW/kW	5.4	7.9	7.3	7.6	6.1	6.15

Table 2.1 Data for Downflow 60-Hz Models (continued)

Model Size - Downflow Configuration	DA050D	DA080D	DA085D	DA125D	DA150D	DA165D
MicroChannel Liebert MCTM Matchup	MCM080E1	MCM160E2	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL165E1 (x2)
FAN SECTION - EC Down Fans						
Standard Air Volume - CFM (CMH)	7,200 (12,232)	9,600 (16,310)	10,400 (17,670)	18,000 (30,582)	20,0004 (33,980)	20,0004 (33,980)
External Static Pressure, in.w.g. (Pa)	0.22,3 (50)	0.22,3 (50)	0.22,3 (50)	0.22,3 (50)	0.22,3 (50)	0.22,3 (50)

1. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
2. Certified in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 Standard Rating Conditions. Certified units may be found in the AHRI Directory at www.ahridirectory.org.
3. Certified in accordance with ASHRAE 127-2007. Units with compliance and certification information submitted to DOE may be found in the U.S. Department of Energy's Compliance Certification Database at www.regulations.doe.gov/certification-data.
4. Option for 24,000 CFM fans is available for DA150 and DA165. Consult factory for details.
5. DA165 will achieve full capacity at lower ambient temperatures than DA125 or DA150 units.

Table 2.2 Data for Upflow 60-Hz Models

Model Size - Upflow Configuration	DA080U	DA085U
MicroChannel Liebert MCTM Matchup	MCM160E2	MCM160E2
DX Evaporator - Net Capacity Data at 95°F (35°C) Outdoor Ambient		
95°F DB, 67.7°F WB, 52°F DP, 23% RH (35°C DB, 19.8.°C WB)		
Total, kW (BTUH)	87 (298,000)	94 (321,000)
Sensible, kW (BTUH)	87 (298,000)	94 (321,000)
100% Compressor Mode - Net Full-Load SCOP, kW/kW	3.5	3.2
100% Pump Mode at 35°F (1.7°C) Outdoor Ambient - Net Full-Load SCOP, kW/kW	10.8	10.2
External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)
85°F DB2, 64.4°F WB, 52°F DP, 32% RH(29.4°C DB, 18°C WB)		
Total, kW (BTUH)	80 (273,000)	86 (294,000)
Sensible, kW (BTUH)	75 (259,000)	81 (278,000)
100% Compressor Mode - Net Full-Load SCOP, kW/kW	3.1	2.8
100% Pump Mode at 35°F (1.7°C) Outdoor Ambient - Net Full-Load SCOP, kW/kW	9.0	8.5
External Static Pressure, in.w.g. (Pa)	0.52 (125)	0.52 (125)
75°F DB3, 61°F WB, 52°F DP, 44% RH(23.9°C DB, 16.1°C WB)		
Total, kW (BTUH)	72 (246,000)	78 (266,000)
Sensible, kW (BTUH)	61 (208,000)	65 (224,000)
100% Compressor Mode - Net Full-Load SCOP, kW/kW	2.4	2.2
100% Pump Mode at 35°F (1.7°C)Outdoor Ambient - Net Full-Load SCOP, kW/kW	6.1	5.8
External Static Pressure, in.w.g. (Pa)	1.03 (250)	1.03 (250)
FAN SECTION - EC Plenum Fans		
Standard Air Volume - CFM (CMH)	9,600 (16,310)	10,400 (17,670)

1. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
2. Certified in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 Standard Rating Conditions. Certified units may be found in the AHRI Directory at www.ahridirectory.org.
3. Certified in accordance with ASHRAE 127-2007. Units with compliance and certification information submitted to DOE may be found in the U.S. Department of Energy's Compliance Certification Database at www.regulations.doe.gov/certification-data.

Table 2.3 Data for Downflow 50-Hz Models

Model Size - Downflow Configuration	DA080D	DA085D	DA125D	DA150D
MicroChannel Liebert MCTM Matchup	MCM160E2	MCM160E2	MCV330E2	MCV330E2
DX Evaporator - Net Capacity Data at 95°F (35°C) Outdoor Ambient				
95°F DB, 67.7°F WB, 52°F DP, 23% RH (35°C DB, 19.8.°C WB)				
Total, kW (BTUH)	88 (301,000)	95 (325,000)	169 (577,000)	177 (604,000)
Sensible, kW (BTUH)	88 (301,000)	95 (325,000)	169 (577,000)	177 (604,000)
100% Compressor Mode - Net Full-Load SCOP, kW/kW	3.8	3.5	3.8	3.6
100% Pump Mode at 35°F (1.7°C) Outdoor Ambient - Net Full-Load SCOP, kW/kW	11.3	10.7	N/A	9.6
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)				
Total, kW (BTUH)	79 (271,000)	85 (293,000)	152 (519,000)	160 (546,000)
Sensible, kW (BTUH)	78 (268,000)	84 (288,000)	151 (515,000)	157 (536,000)
100% Compressor Mode - Net Full-Load SCOP, kW/kW	3.4	3.2	3.5	3.2
100% Pump Mode at 35°F (1.7°C) Outdoor Ambient - Net Full-Load SCOP, kW/kW	9.3	8.8	N/A	8.4
75°F DB, 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)				
Total, kW (BTUH)	72 (246,000)	78 (266,000)	138 (471,000)	145 (495,000)
Sensible, kW (BTUH)	63 (217,000)	68 (233,000)	124 (423,000)	129 (440,000)
100% Compressor Mode - Net Full-Load SCOP, kW/kW	2.8	2.6	2.9	2.6
100% Pump Mode at 35°F (1.7°C) Outdoor Ambient - Net Full-Load SCOP, kW/kW	7.1	6.7	N/A	6.8
FAN SECTION - EC Down Fans				
Standard Air Volume - CFM (CMH)	9,600 (16,310)	10,400 (17,670)	18,000 (30,582)	20,0002 (33,980)
External Static Pressure, in.w.g. (Pa)	0.2 (50)	0.2 (50)	0.2 (50)	0.2 (50)

1. Some options or combinations of options may result in reduced air flow.
2. Consult factory for recommendations. . 2.Option for 24,000 CFM fans is available for DA150. Consult factory for details.

Table 2.4 Data for Upflow 50-Hz Models

Model Size - Upflow Configuration	DA080U	DA085U
MicroChannel Liebert MCTM Matchup	MCM160E2	MCM160E2
DX Evaporator - Net Capacity Data at 95°F (35°C) Outdoor Ambient		
95°F DB, 67.7°F WB, 52°F DP, 23% RH (35°C DB, 19.8.°C WB)		
Total, kW (BTUH)	88 (301,000)	90 (308,000)
Sensible, kW (BTUH)	88 (301,000)	90 (308,000)
100% Compressor Mode - Net Full-Load SCOP, kW/kW	3.8	3.4
100% Pump Mode at 35°F (1.7°C) Outdoor Ambient - Net Full-Load SCOP, kW/kW	11.3	10.2
External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)		
Total, kW (BTUH)	79 (271,000)	82 (281,000)
Sensible, kW (BTUH)	78 (268,000)	79 (270,000)
100% Compressor Mode - Net Full-Load SCOP, kW/kW	3.4	3
100% Pump Mode at 35°F (1.7°C) Outdoor Ambient - Net Full-Load SCOP, kW/kW	9.3	8.5
External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)
75°F DB, 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)		
Total, kW (BTUH)	72 (246,000)	74 (253,000)
Sensible, kW (BTUH)	63 (217,000)	63 (217,000)
100% Compressor Mode - Net Full-Load SCOP, kW/kW	2.8	2.4
100% Pump Mode at 35°F (1.7°C) Outdoor Ambient - Net Full-Load SCOP, kW/kW	7.1	5.8
External Static Pressure, in.w.g. (Pa)	1.0 (250)	1.0 (250)
FAN SECTION - EC Plenum Fans		
Standard Air Volume - CFM (CMH)	9,600 (16,310)	10,400 (17,670)
1. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.		

2.2 Physical Data

Table 2.5 Physical data for 60-Hz models

Model Size	50		80	85	125	150	165
EVAPORATOR COIL- Copper Tube/Aluminum Fin							
Face Area, sq. ft. (sq. m)	17.1 (1.58)		24.65 (2.3)	24.65 (2.3)	56.2 (5.2)	56.2 (5.2)	56.2 (5.2)
Rows of Coil	6		6	6	6	6	6
Face Velocity, FPM (m/s), Std. Air Volume	409 (2.08)		389.5 (2.0)	421.9 (2.2)	320.3 (1.6)	320.3 (1.6)	354 (1.8)
REHEAT SECTION							
Electric - Three (3) Stage, Stainless Steel Fin Tubular, capacity does not include fan motor heat							
Capacity,- kW (KBTUH) - Std. Selection	10 (34.13)		15 (51.20)	15 (51.20)	30 (102.4)	30.0 (102.4)	30.0 (102.4)
Capacity, kW (KBTUH) - Opt. Selection	—		10 (34.13)	10 (34.13)	10.0 (34.1)	10.0 (34.1)	10.0 (34.1)
HUMIDIFIER SECTION							
Infrared Humidifier							
Capacity, lb./hr. (kg/h)	11 (5)		22 (10)	22 (10)	22 (10)	22 (10)	22 (10.0)
FILTER SECTION - Disposable Type - Nominal Sizes and Quantities							
Nominal Size, inches	25 x 20	26 x 16	25 x 20	25 x 20	21.5 x 24	21.5 x 24	21.5 x 24
Quantity	2	1	4	4	10	10	10
UNIT PIPING CONNECTION SIZES (not external line sizes)							
Liquid Line, O.D. Cu	5/8", 1 per unit		7/8", 2 per unit	7/8", 2 per unit	7/8", 2 per unit	1-1/8", 2 per unit	1-1/8", 2 per unit
Hot Gas Line, O.D. Cu	1-1/8", 1 per unit		1-1/8", 2 per unit	1-1/8", 2 per unit	1-3/8", 2 per unit	1-3/8", 2 per unit	1-3/8", 2 per unit
Infrared Humidifier, O. D. Cu	1-1/4"		1/4"	1/4"	1/4"	1/4"	1/4"
Condensate Drain, FPT	3/4"		3/4"	3/4"	1-1/8"	1-1/8"	1-1/8"
Condensate Drain w/opt Condensate Pump, O.D. Cu	1/2"		1/2"	1/2"	1/2"	1/2"	1/2"
Refer to **Table 6.3** on page 34, for field-installed refrigerant line-size recommendations and maximum length.							

Table 2.6 Physical data for 50-Hz models

Model Size	80	85	125	150
EVAPORATOR COIL- A-Frame - Copper Tube/Aluminum Fin				
Face Area - sq. ft. (sq. m)	24.65 (2.3)	24.65 (2.3)	56.2 (5.2)	56.2 (5.2)
Rows of Coil	6	6		6
Face Velocity - FPM (m/s) - Std. Air Vol.	389.5 (2.0)	421.9 (2.2)	320.3 (1.6)	320.3 (1.6)

Table 2.6 Physical data for 50-Hz models (continued)

Model Size	80	85	125	150
REHEAT SECTION				
Electric—Three-Stage, Stainless Steel Fin Tubular; capacity does not include fan motor heat				
Capacity - kW (KBTUH) - Std Selection	15 (51.20)	15 (51.20)	30.0 (102.4)	30.0 (102.4)
Capacity - kW (KBTUH) - Opt Selection	10 (34.13)	10 (34.13)	10.0 (34.1)	10.0 (34.1)
HUMIDIFIER SECTION				
Infrared Humidifier				
Capacity, lb./hr. (kg/h)	22.0 (10.0)	22.0 (10.0)	22.0 (10.0)	22.0 (10.0)
FILTER SECTION - Disposable Type - Nominal Sizes and Quantities				
Nominal Size, inches	25 x 20	25 x 20	21.5 x 24	21.5 x 24
Quantity	4	4	10	10
UNIT PIPING CONNECTION SIZES (not external line sizes)				
Liquid Line - O.D. Cu	5/8", 2 per unit	5/8", 2 per unit	7/8", 2 per unit	1-1/8", 2 per unit
Hot Gas Line - O.D. Cu	1-1/8", 2 per unit	1-1/8", 2 per unit	1-1/8", 2 per unit	1-3/8", 2 per unit
Infrared Humidifier - O.D. Cu	1/4"	1/4"	1/4"	1/4"
Condensate Drain - FPT	3/4"	3/4"	1-1/8"	1-1/8"
Condensate Drain w/opt Condensate Pump - OD.. Cu	1/2"	1/2"	1/2"	1/2"
Refer to **Table 6.3** on page 34, for field-installed refrigerant line-size recommendations and maximum length.				

This page intentionally left blank

3 ELECTRICAL POWER REQUIREMENTS

Table 3.1 Electrical Data—DA050, 50/60 Hz

Unit Voltage Rating	Reheat Options:	Standard kW	None	Standard kW	None
	Humidifier Options:	Infrared	Infrared	None	None
208V/60Hz	FLA	94.9	80.4	94.9	67.1
	WSA	116.1	94.7	116.1	81.4
	OPD	150	150	150	125
230V/60Hz	FLA	93.3	78.2	93.3	67.1
	WSA	114.1	92.5	114.1	81.4
	OPD	150	125	150	125
380V/60Hz	FLA	49.7	42.1	49.7	36.0
	WSA	60.6	49.6	60.6	43.5
	OPD	80	70	80	70
460V/60Hz	FLA	43.9	36.5	43.9	30.7
	WSA	53.6	42.9	53.6	37.1
	OPD	70	60	70	60
575V/60Hz	FLA	36.1	33.5	36.1	26.1
	WSA	44.1	39.0	44.1	31.6
	OPD	60	60	60	50
380-415V/50Hz	FLA	48.3	40.3	48.3	33.9
	WSA	58.9	47.3	58.9	40.9
	OPD	80	70	80	60

1. FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device.
2. Full-load amperage values do not reflect operating amperage values.

Source: DPN002863 Rev. 2

Table 3.2 Electrical data—DA080, 50/60 Hz

Unit Voltage Rating	Reheat Options:	Standard kW	None	Standard kW	None
	Humidifier Options:	Infrared	Infrared	None	None
208V/60Hz	FLA	119.2	119.2	97.1	92.6
	WSA	128.5	128.5	116.8	101.9
	OPD	150	150	125	125
230V/60Hz	FLA	114.8	114.8	94.6	92.6
	WSA	124.1	124.1	113.7	101.9
	OPD	150	150	125	125
380V/60Hz	FLA	74.8	74.8	62.6	62.6
	WSA	81.4	81.4	69.2	69.2
	OPD	100	100	90	90
460V/60Hz	FLA	59.6	59.6	48.0	48.0
	WSA	64.6	64.6	57.6	53.0
	OPD	80	80	70	70
575V/60Hz	FLA	46.6	46.6	35.8	35.0
	WSA	50.2	50.2	43.2	38.6
	OPD	60	60	50	50
380-415V/50Hz	FLA	64.0	64.0	52.2	51.2
	WSA	69.2	69.2	62.8	56.4
	OPD	80	80	70	70

1. FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device.
2. Full-load amperage values do not reflect operating amperage values.

Source: DPN002863 Rev. 2

Table 3.3 Electrical data—DA085, 50/60 Hz

Unit Voltage Rating	Reheat Options:	Standard kW	None	Standard kW	None
	Humidifier Options:	Infrared	Infrared	None	None
208V/60Hz	FLA	152.2	152.2	125.6	125.6
	WSA	165.6	165.6	139.0	139.0
	OPD	200	200	175	175
230V/60Hz	FLA	147.8	147.8	125.6	125.6
	WSA	161.2	161.2	139.0	139.0
	OPD	200	200	175	175
380V/60Hz	FLA	74.8	74.8	62.6	62.6
	WSA	81.4	81.4	69.2	69.2
	OPD	100	100	90	90
460V/60Hz	FLA	61.0	61.0	49.4	49.4
	WSA	66.2	66.2	58.5	54.6
	OPD	80	80	70	70
575V/60Hz	FLA	50.8	50.8	39.2	39.2
	WSA	54.9	54.9	45.8	43.3
	OPD	70	70	50	50
380-415V/50Hz	FLA	71.2	71.2	58.4	58.4
	WSA	77.3	77.3	67.3	64.5
	OPD	100	100	80	80

1. FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device.
2. Full-load amperage values do not reflect operating amperage values.

Source: DPN002863 Rev. 2

Table 3.4 Electrical data—DA125, 50/60 Hz

Unit Voltage Rating	Reheat Options:	Standard kW	None	Standard kW	None
	Humidifier Options:	Infrared	Infrared	None	None
208V/60Hz	FLA	174.6	174.6	165.7	148.0
	WSA	193.2	182.3	193.2	155.7
	OPD	200	200	200	175
230V/60Hz	FLA	170.2	170.2	165.2	148.0
	WSA	192.5	177.9	192.5	155.7
	OPD	200	200	200	175
380V/60Hz	FLA	93.6	93.6	88.1	81.4
	WSA	102.7	97.9	102.7	85.7
	OPD	110	110	110	100
460V/60Hz	FLA	79.9	79.9	78.8	68.3
	WSA	92.2	83.5	92.2	71.9
	OPD	100	90	100	80
575V/60Hz	FLA	63.4	63.4	60.5	51.8
	WSA	70.7	66.1	70.7	54.5
	OPD	80	70	80	60
380-415V/50Hz	FLA	108.2	108.2	99.7	95.4
	WSA	113.4	113.4	113.3	100.6
	OPD	125	125	125	110

1. FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device.
2. Full-load amperage values do not reflect operating amperage values.

Source: DPN002863 Rev. 2

Table 3.5 Electrical data—DA150, 50/60 Hz

Unit Voltage Rating	Reheat Options:	Standard kW	None	Standard kW	None
	Humidifier Options:	Infrared	Infrared	None	None
380V/60Hz	FLA	130.4	130.4	118.2	118.2
	WSA	137.0	137.0	127.9	124.8
	OPD	150	150	150	150
460V/60Hz	FLA	102.7	102.7	93.7	91.1
	WSA	107.7	107.7	105.0	96.1
	OPD	125	125	110	110
575V/60Hz	FLA	77.8	77.8	69.3	66.2
	WSA	81.4	81.4	78.8	69.8
	OPD	90	90	80	80
380-415V/50Hz	FLA	108.2	108.2	99.7	95.4
	WSA	113.4	113.4	113.3	100.6
	OPD	125	125	125	110

1. FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device.
2. Full-load amperage values do not reflect operating amperage values.

Source: DPN002863 Rev. 2

Table 3.6 Electrical data—DA165, 60Hz

Unit Voltage Rating	Reheat Options:	Standard kW	None	Standard kW	None
	Humidifier Options:	Infrared	Infrared	None	None
380V/60Hz	FLA	130.4	130.4	118.2	118.2
	WSA	137.0	137.0	127.9	124.8
	OPD	150	150	150	150
460V/60Hz	FLA	105.5	105.5	95.8	93.9
	WSA	110.7	110.7	106.6	99.1
	OPD	125	125	110	110
575V/60Hz	FLA	86.2	86.2	75.6	74.6
	WSA	90.3	90.3	84.1	78.7
	OPD	100	100	90	90

1. FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device.
2. Full-load amperage values do not reflect operating amperage values.

Source: DPN002863 Rev. 2

3.1 EconoPhase Electrical Data

Table 3.7 EconoPhase Electrical Power Requirements

Model	Pump Type	Volts	Phase	Hertz	FLA	Minimum Supply-circuit Ampacity	Max Fuse Size	Single Pump Motor (one pump per circuit)	
								HP	FLA
PR050	Standard	460	3	60	3.5	4.4	15	1.6	3.5
	Standard	208/230	3	60	6.9	8.6	15	1.6	6.9
	Standard	575	3	60	2.8	3.5	15	1.6	3.5
	Standard	380	3	60	4.2	5.3	15	1.6	4.2
	Standard	415	3	50	3.7	4.7	15	1.2	3.7
PR050	High-efficiency	460	3	60	1.3	1.6	15	0.75	1.3
	High-efficiency	208/230	3	60	2.6	3.3	15	0.75	2.6
	High-efficiency	575	3	60	1	1.3	15	0.75	1.3
	High-efficiency	380	3	60	1.6	2	15	0.75	1.6
	High-efficiency	415	3	50	1.2	1.5	15	0.75	1.2
PR085	Standard	460	3	60	7.0	7.9	15	1.6	3.5
	Standard	208/230	3	60	13.8	15.5	20	1.6	6.9
	Standard	575	3	60	5.6	6.3	15	1.6	3.5
	Standard	380	3	60	8.4	9.5	15	1.6	4.2
	Standard	415	3	50	7.4	8.3	15	1.2	3.7
PR085	High-efficiency	460	3	60	2.6	2.9	15	0.75	1.3
	High-efficiency	208/230	3	60	5.2	5.9	15	0.75	2.6
	High-efficiency	575	3	60	2	2.3	15	0.75	1.3
	High-efficiency	380	3	60	3.2	3.6	15	0.75	1.6
	High-efficiency	415	3	50	2.4	2.7	15	0.75	1.2
PR125	Standard	460	3	60	7.0	7.9	15	1.6	3.5
	Standard	208/230	3	60	13.8	15.5	20	1.6	6.9
	Standard	575	3	60	5.6	6.3	15	1.6	3.5
	Standard	380	3	60	8.4	9.5	15	1.6	4.2
	Standard	415	3	50	7.4	8.3	15	1.2	3.7

Table 3.7 EconoPhase Electrical Power Requirements (continued)

Model	Pump Type	Volts	Phase	Hertz	FLA	Minimum Supply-circuit Ampacity	Max Fuse Size	Single Pump Motor (one pump per circuit)	
								HP	FLA
PR250	Standard or High-flow	460	3	60	7.0	7.9	15	1.6	3.5
	Standard or High-flow	208/230	3	60	13.8	15.5	20	1.6	6.9
	Standard or High-flow	575	3	60	5.6	6.3	15	1.6	3.5
	Standard or High-flow	380	3	60	8.4	9.5	15	1.6	4.2
	Standard or High-flow	415	3	50	7.4	8.3	15	1.2	3.7
Source DPN002327 Rev. 12 and DPN004355 Rev. 2									

This page intentionally left blank

3.2 Electrical Field Connections

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

The electrical and unit-to-unit connections are described in the submittal documents included in the Submittal Drawings on page 61.

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

Table 4.1 Electrical Field-connection Drawings

Document Number	Title
DPN004387	Electrical Field Connections, Upflow & Downflow, DA050, DA080, and DA085 Models
DPN004388	Electrical Field Connections, Downflow Models, DA125, DA150, and DA165
DPN003284	CANbus cable connections between indoor unit, 1 Liebert® MC condenser and optional Liebert® EconoPhase pump
DPN002361	CANbus cable connections between indoor unit, 2 Liebert® MC condensers and optional Liebert® EconoPhase pump
Unit-to-Unit Networking	
DPN004351	Liebert® iCOM Unit-to-unit Network Connections

This page intentionally left blank

4 PLANNING GUIDELINES

4.1 Shipping Dimensions and Unit Weights

Table 5.1 Downflow unit domestic and export shipping dimensions and weights

Model #	Domestic Packaging		Export Packaging		Dry Weight, lb (kg)
	Unit Ship Weight, lb (kg)	Shipping Dimensions, in. (mm)	Ship Weight, lb (kg)	Shipping Dimensions, in. (mm)	
DA050*A DA050*P	2012 (913)	97 X45 X 82 (2464 X 1143 X 2083)	2182 (990)	97 X 45 X 82 (2464 X 1143 X 2083)	1590(721)
DA080*A DA080*P	2250 (1021)	120 X 45 X 85 (3048 X1143 X 2159)	2450(1111)	120 X 45 X 85.5 (3048 X 1143 X 2172)	2200 (998)
DA085*A DA085*P	2350 (1066)	120 X 45 X 85 (3048 X 1143 X 2159)	2550 (1157)	120 X 45 X 85.5 (3048 X 1143 X 2172)	2250 (1021)
DA125*A DA125*P	3450 (1565)	153 X 54 X 85 (3886 X 1372 X 2159)	3650 (1656)	153.5 X 54.5 X 85.5 (3899 X 1384 X 2172)	3465 (1572)
DA150*A DA150*P	3570 (1619)	153 X 54 X 85 (3886 X 1372 X 2159)	3770 (1710)	153.5 X 54.5 X 85.5 (3899 X 1384 X 2172)	3574 (1621)
DA165*A DA165*P	3754 (1703)	153 X 54 X 85 (3886 X 1372 X 2159)	3954 (1794)	153.5 X 54.5 X 83.5 (3899 X 1384 X 2121)	3574 (1621)

Table 5.2 Upflow unit domestic and export shipping dimensions and weights

Model #	Domestic Packaging		Export Packaging		Dry Weight, lb (kg)
	Unit Ship Weight, lb (kg)	Shipping dimensions, in. (mm)	Ship Weight, lb (kg)	Shipping dimensions, in. (mm)	
DA080U*A DA080U*P	2270 (1030)	120 X 45 X 85 (3048 X 1143 X 2159)	2470 (1120)	120 X 45 X 85.5 (3048 X 1143 X 2172)	2150 (975)
DA085U*A DA085U*P	2370 (1075)	120 X 45 X 85 (3048 X 1143 X 2159)	2570 (1166)	120 X 45 X 85.5 (3048 X 1143 X 2172)	2150 (975)

4.2 Planning Dimensions

The unit, floor stand, and plenum dimensions are described in the submittal documents included in the Submittal Drawings on page 61.

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

Table 5.3 Dimension Planning Drawings

Document Number	Title
Downflow Units	
DPN003533	Cabinet Dimensional Data, DA050
DPN004083	Cabinet Dimensional Data, DA080 and DA085
DPN003175	Cabinet and Plenum Dimensional Data, DA125, DA150 and DA165
Upflow Units	
DPN002950	Cabinet Dimensional Data, DA080U and DA085U
Floor Stands	
DPN004079	Floorstand Dimensional Data, Downflow, DA050
DPN004073	Floorstand Dimensional Data, Downflow and Upflow, DA080 and DA085
DPN003177	Floorstand Dimensional Data, Downflow, DA125, DA150 and DA165
Plenums	
DPN003514	Plenum Dimensional Data, Downflow, DA050, DA080 and DA085
DPN004081	Plenum Dimensional Data, Upflow, DA080U and DA085U

5 PIPING

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

The following pipe connections are required:

- A drain line from the unit.
- A drain line from the secondary drain pan (if applicable).
- A water-supply line to the optional humidifier (if applicable).
- Refrigerant piping connections between the evaporator unit and the condenser and EconoPhase unit.

The pipe connection locations, piping general arrangement and schematics are described in the submittal documents included in the Submittal Drawings on page 61.

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

Table 6.1 Piping General-arrangment Drawings

Document Number	Title
DPN002615	Piping Schematic, DA050, DA080 and DA085
DPN002340	Piping Schematic, DA125, DA150 and DA165
DPN004476	Piping Schematic, DA125, DA150 and DA165 with MCV Condenser
Liebert® MC Condenser and EconoPhase Pump Locations	
DPN003994	Considerations for mounting MC Condenser/EconoPhase Above or at Same Level as DSE
DPN003552	Typical arrangement for DA050 and single-circuit EconoPhase system
DPN002324	Typical arrangement for DA125, DA150, DA165 and dual-circuit EconoPhase system

Table 6.2 Piping Connection Drawings

Document Number	Title
Downflow Units	
DPN003531	Connection Locations, DA050
DPN004080	Connection Locations, DA080 and DA085
DPN002312	Connection Locations, DA125
DPN004037	Connection Locations, DA150 and DA165
Upflow Units	
DPN002951	Connection Locations, DA080U and DA085U

5.1 Refrigerant Piping

5.1.1 Refrigerant Line Sizes and Equivalent Lengths

Table 6.3 Recommended Refrigerant Line Sizes, OD Copper

Model	DA050		DA080 and DA085		DA125		DA150 and DA165	
Equivalent Length	Hot Gas Line, in.	Liquid Line, in.	Hot Gas Line, in.	Liquid Line, in.	Hot Gas Line, in.	Liquid Line, in.	Hot Gas Line, in.	Liquid Line, in.
50 ft (15 m)	1-1/8	7/8	1-1/8	7/8	1-3/8	7/8	1-3/8	7/8
100 ft (30 m)	1-1/8	7/8	1-1/8	7/8	1-3/8	7/8	1-3/8	1-1/8
150 ft (45 m)	1-1/8	7/8	1-1/8	7/8	1-3/8	7/8	1-3/8	1-1/8
300 ft (91 m)	1-1/8	7/8	1-1/8	7/8	1-3/8	7/8	1-3/8	1-1/8
450 ft (137 m)*	1-1/8	7/8	1-1/8	7/8	1-3/8	7/8	1-3/8	1-1/8

*Consult factory when actual pipe length between condenser/EconoPhase and Liebert DSE unit will exceed 300 ft (91 m).

Source: DPN000788 Rev. 13

NOTE: Install a 1-3/8-in. liquid line between the condenser and the Liebert EconoPhase™ unit, regardless of line sizes indicated in Table 6.3 above. See the piping schematics for your system in Submittal Drawings on page 61. For installations using pre-fabricated heat-rejection skids, included piping must be factored into total equivalent length calculation. Please consult factory for details.

6 HEAT REJECTION—LIEBERT MC™ CONDENSERS

6.1 Liebert MC Match-up Selections

Table 7.1 High-efficiency Condenser Match-ups

Outdoor Design Ambient Temp., °F (°C)	Maximum Return Air Temp., °F (°C)	DSE Models					
		DA050	DA080	DA085	DA125	DA150	DA165
95 (35)	85 (29)	MCM080E1	MCM160E2	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL165E1 (x2)
	90 (32)	MCM080E1	MCM160E2	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL165E1 (x2)
	95 (35)	MCM080E1	MCM160E2	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL165E1 (x2)
	100 (38)	MCM080E1	MCM160E2	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL165E1 (x2)
	105 (41)	MCM080E1	MCM160E2	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL165E1 (x2)
100 (38)	85 (29)	MCL110E1	MCM160E2	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL165E1 (x2)
	90 (32)	MCL110E1	MCM160E2	MCM160E2	MCL165E1 (x2)	MCL165E1 (x2)	MCL165E1 (x2)
	95 (35)	MCL110E1	MCM160E2	MCM160E2	MCL165E1 (x2)	MCL165E1 (x2)	MCL165E1 (x2)
	100 (38)	MCL110E1	MCM160E2	MCM160E2	MCL165E1 (x2)	MCL165E1 (x2)	MCL220E1 (x2)
	105 (41)	MCL110E1	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL165E1 (x2)	MCL220E1 (x2)
105 (41)	85 (29)	MCL165E1	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL220E1 (x2)	MCL220E1 (x2)
	90 (32)	MCL165E1	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL220E1 (x2)	MCL220E1 (x2)
	95 (35)	MCL165E1	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL220E1 (x2)	MCL220E1 (x2)
	100 (38)	MCL165E1	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL220E1 (x2)	MCL220E1 (x2)
	105 (41)	MCL165E1	MCM160E2	MCL220E2	MCL220E1 (x2)	MCL220E1 (x2)	MCL220E1 (x2)

Table 7.2 Small-footprint Condenser Match-ups

Outdoor Design Ambient Temp., °F (°C)	Maximum Return Air Temp., °F (°C)	DSE Models					
		DA050	DA080	DA085	DA125	DA150	DA165
95 (35)	85 (29)	MCM080E1	MCL110E2	MCL110E2	MCM160E2	MCL220E2	MCL165E1 (x2)
	90 (32)	MCM080E1	MCL110E2	MCL110E2	MCM160E2	MCL220E2	MCL165E1 (x2)
	95 (35)	MCM080E1	MCL110E2	MCL110E2	MCM160E2	MCL220E2	MCL165E1 (x2)
	100 (38)	MCM080E1	MCL110E2	MCL110E2	MCM160E2	MCL220E2	MCL165E1 (x2)
	105 (41)	MCM080E1	MCL110E2	MCL110E2	MCM160E2	MCL220E2	MCL165E1 (x2)
100 (38)	85 (29)	MCM080E1	MCL110E2	MCL110E2	MCM160E2	MCL220E2	MCL165E1 (x2)
	90 (32)	MCM080E1	MCL110E2	MCM160E2	MCL220E2	MCL220E2	MCL165E1 (x2)
	95 (35)	MCM080E1	MCL110E2	MCM160E2	MCL220E2	MCL220E2	MCL165E1 (x2)
	100 (38)	MCM080E1	MCM160E2	MCM160E2	MCL220E2	MCL220E2	MCL165E1 (x2)
	105 (41)	MCM080E1	MCM160E2	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL165E1 (x2)
105 (41)	85 (29)	MCL110E1	MCM160E2	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL220E1 (x2)
	90 (32)	MCL110E1	MCM160E2	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL220E1 (x2)
	95 (35)	MCL110E1	MCM160E2	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL220E1 (x2)
	100 (38)	MCL110E1	MCM160E2	MCM160E2	MCL220E2	MCL165E1 (x2)	MCL220E1 (x2)
	105 (41)	MCL110E1	MCM160E2	MCM160E2	MCL165E1 (x2)	MCL165E1 (x2)	MCL220E1 (x2)

6.2 Liebert MC Electrical Power Requirements

Table 7.3 below lists the power requirements by model number.

Table 7.3 Electrical data, three-phase, 60Hz condenser, Premium EC-fan Control

Model	Voltage	FLA	WSA	OPD
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
MCM160	208/230V	9.2	9.8	15
	380V	5.6	6.0	15
	460V	5.6	6.0	15
	575V	4.8	5.1	15
MCL110	208/230V	11.4	12.8	15
	380V	5.6	6.3	15
	460V	5.6	6.3	15
	575V	4.7	5.3	15
MCL165	208/230V	17.1	18.5	20
	380V	8.4	9.1	15
	460V	8.4	9.1	15
	575V	7.0	7.6	15
MCL220	208/230V	22.8	24.2	25
	380V	11.2	11.9	15
	460V	11.2	11.9	15
	575V	9.4	9.9	15

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

6.3 Liebert MC Shipping Dimensions and Weights

Table 7.4 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)
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)
MCM160	4	1509 (684)	256 x 36 x 63 (650 x 91 x 160)	336 (9.5)	1834 (832)	257 x 37 x 64 (653 x 94 x 163)	352 (10)
MCL110	2	962 (436)	136 x 36 x 63 (345 x 91 x 160)	179 (5.0)	1134 (514)	137 x 37 x 64 (348 x 94 x 163)	188 (5.3)
MCL165	3	1364 (619)	196 x 36 x 63 (498 x 91 x 160)	257 (7.3)	1619 (734)	197 x 37 x 64 (500 x 94 x 163)	270 (7.7)
MCL220	4	1835 (832)	256 x 36 x 63 (650 x 91 x 160)	336 (9.5)	2160 (980)	257 x 37 x 64 (653 x 94 x 163)	352 (10)

Packaged weights will increase with factory options, such as legs taller than 18" (457mm), coated coils, 575V and seismic/wind options. See **Table 7.5** on the facing page and **Table 7.6** on the facing page 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 7.5 Condenser and option net weights—Medium condensers

Condenser Model		MCM080	MCM160
Refrigeration Circuits		1	2
Condenser Dry Weight, lb (kg)	18" Leg	441 (200)	860 (390)
	36" Leg	590 (268)	1066 (484)
	48" Leg	622 (282)	1114 (505)
	60" Leg	653 (296)	1160 (526)
Additional Weight for Options, lb (kg)			
Liebert® DSE Receiver DA050/080/085		45 (20)	90 (41)
Liebert® DSE Receiver DA125/150/165		92 (42)	184 (83)
575V Transformer		70 (32)	80 (36)
Coated Coil		10 (5)	20 (9)
Seismic/Wind Bracing, 18-in. legs		40 (18)	57 (26)
Condenser + DSE Receiver + Coated Coil + 575V Transformer + Seismic/Wind Bracing = Total Weight			
Source: DPN003034, Rev. 4			

Table 7.6 Condenser and option net weights—Large condensers

Condenser Model		MCL110	MCL110	MCL165	MCL220	MCL220
Refrigeration Circuits		1	2	1	1	2
Condenser Dry Weight, lb (kg)	18" Leg	602 (273)	602 (273)	891 (404)	1186 (538)	1186 (538)
	36" Leg	766 (347)	766 (347)	1136 (515)	1453 (659)	1453 (659)
	48" Leg	798 (362)	798 (362)	1184 (537)	1501 (681)	1501 (681)
	60" Leg	829 (376)	829 (376)	1230 (558)	1547 (702)	1547 (702)
Additional Weight for Options, lb (kg)						
Liebert® DSE Receiver DA050/080/085		45 (20)	90 (41)	45 (20)	45 (20)	90 (41)
Liebert® DSE Receiver DA125/150/165		94 (43)	—	94 (43)	94 (43)	188 (85)
575V Transformer		77 (35)	77 (35)	118 (54)	118 (54)	118 (54)
Coated Coil		16 (7)	16 (7)	24 (11)	32 (15)	32 (15)
Seismic/Wind Bracing, 18-in. legs		40 (18)	41 (19)	57 (26)	57 (26)	57 (26)
Condenser + DSE Receiver + 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 61. 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.

NOTE: DSE systems require DSE receivers. Lee-Temp™ receivers are not an option for DSE systems.

Table 7.7 Dimension Planning Drawings

Document Number	Title
DPN003437	Condenser Dimensional Data, MCS056, MCM080, MCL110, dual-circuit
DPN003438	Condenser Dimensional Data, MCL165
DPN003439	Condenser Dimensional Data, MCM160 and MCL220

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 61.

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

Table 7.8 Piping Connection Drawings

Document Number	Title
DPN002166	Single-circuit piping
DPN002425	Dual-circuit piping
Receiver Mounting	
DPN002554	Receiver mounting for single-circuit MCL055, MCL110, MCL165, and MCL220 and for dual-circuit MCL110 and MCL220
DPN002383	Receiver mounting for dual-circuit MCM160

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..

See Electrical Power Requirements on page 21, for power requirements.

The electrical connections are described in the submittal documents included in the Submittal Drawings on page 61.

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

Table 7.9 Electrical Field-connection Drawings

Document Number	Title
Power-supply wiring	
DPN002169	Electrical Field Connections, without Liebert® Lee-Temp™
Low-voltage wiring	
DPN003284	CANbus cabling between indoor unit and one condenser
DPN002361	CANbus cabling between indoor unit and two condensers

This page intentionally left blank

7 HEAT REJECTION—LIEBERT MCV™ CONDENSERS

7.1 Liebert MCV Match-up Selections

Table 8.1 High-efficiency Condenser Match-ups

Outdoor Design Ambient Temp., °F (°C)	Maximum Return Air Temp., °F (°C)	DSE Models
		DA125 to DA165
95 (35)	85 (29) to 105 (41)	MCV330
100 (38)	85 (29) to 105 (41)	MCV330
105 (41)	85 (29) to 105 (41)	MCV330

7.2 Liebert MCV Electrical Power Requirements

Table 8.2 below lists the power requirements by model number.

Table 8.2 Electrical Data—MCV Condenser, 50/60-Hz

Unit Voltage Rating		MCV330 + PRE
380 V, 60 Hz	FLA	29.4
	WSA	30.5
	OPD	35
460 V, 60 Hz	FLA	23.8
	WSA	24.7
	OPD	25
575 V, 60 Hz	FLA	19
	WSA	19.7
	OPD	30
415 V, 50 Hz	FLA	28.4
	WSA	29.3
	OPD	30
Source: DPN005045 Rev. 0		

7.3 Liebert MCV Unit Weights

Table 8.3 MCV Heat-rejection Skid with EconoPhase Approximate Weights

Model	Number of Fans on Heat-rejection Skid	Number of MCV/PRE pairs on Heat-rejection Skid	Weight, lb (kg)
MCV330 + PRE	6	1	5000 (2268)
MCV330 + PRE	12	2	10,000 (4,535)

7.4 Liebert MCV Planning Dimensions

The condenser dimensional data, piping and electrical locations are described in the submittal documents included in the Submittal Drawings on page 61.

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

Table 8.4 Dimensional Planning and Connection Drawings

Document Number	Title
Dimensional Data	
DPN003889	Cabinet Dimensional Data, MCV330, Single skid
DPN003875	Cabinet Dimensional Data, MCV330, Dual skid
Piping and Electrical Connections	
DPN003887	Connection Data, MCV330, Single skid
DPN003878	Connection Data, MCV330, Dual skid
DPN003886	MCV CANbus and Signal connections to the DSE
DPN003965	DSE - EEV Reciever Mounting
DPN004476	Piping Schematic, DA125 to DA165 with MCV

7.5 Piping Planning

For the piping, see Piping General-arrangment Drawings on page 33.

8 LIEBERT® ECONOPHASE™ PUMP

8.1 EconoPhase Match-up Selections

Table 9.1 EconoPhase to DSE match-ups

PRE model	DSE model
PR050A	DA050
PR085A	DA080 and DA085
PR125A	DA125, DA150, and DA165

8.2 Electrical Data and Field Connections

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

The electrical data and connections are described in the submittal documents included in the Submittal Drawings on page 61.

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

Table 9.2 Electrical Field-connection Drawings

Document Number	Title
High-voltage Electrical Connections	
DPN002327	Electrical Field Connections, PR085 - PR125 Models
DPN004355	Electrical Field Connections, PR050 Models
Low-voltage Communication Connections	
DPN003284	CANbus cabling between indoor unit and one condenser
DPN002361	CANbus cabling between indoor unit and two condensers

8.3 EconoPhase Unit Weights

Table 9.3 Typical EconoPhase unit weights

Model	Circuits	Unit Voltage, Hz	Approximate Unit Weight, lb (kg)
PR050	1	208/230 V, 460 V, 60 Hz	217 (98)
		380 V, 575 V, 60 Hz	242 (110)
		415 V, 50 Hz	217 (98)
PR085 - PR250	2	208/230 V, 460 V, 60 Hz	340 (154)
		380 V, 575 V, 60 Hz	390 (177)
		415 V, 50 Hz	347 (157)
Source DPN002326 Rev. 9			

8.4 EconoPhase Planning Dimensions

The unit is described in the submittal documents included in the Submittal Drawings on page 61.

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

Table 9.4 Dimension Planning Drawings

Document Number	Title
DPN002326	Cabinet Dimensional Data, PR050 - PR250

8.5 EconoPhase Location and Arrangement with Condenser

IMPORTANT! The condenser must not be installed below the level of the DSE. The condenser may be installed on the same level as the DSE or as much as 60 ft (18.3 m) above the DSE. (For guidelines, refer to the appropriate drawing for your system in the Submittal Drawings on page 61.

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

Table 9.5 Liebert® MC Condenser and EconoPhase Pump Location Drawings

Document Number	Description
DPN003994	Considerations for mounting MC Condenser/EconoPhase Above or at Same Level as DSE
DPN003552	Typical arrangement for DA050 and single-circuit EconoPhase system
DPN002324	Typical arrangement for DA125, DA150, DA165, and dual-circuit EconoPhase system

8.6 EconoPhase Piping Planning

For the piping, refer to Piping General-arrangment Drawings on page 33

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

This page intentionally left blank

Appendix B: Disassembling the DSE for Transport

The Liebert® DSE has a modular frame construction that allows separating the unit into three sections. Each of these sections is more easily maneuvered through tight spaces or placed in small elevators.

A qualified service technician with the required tools and recommended assistance can disassemble an air-cooled unit in about four hours, assuming refrigerant evacuation is not required.

This procedure requires four or more people for lifting the filter and electric-box assembly.

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

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

CAUTION: Risk of contact with sharp edges and exposed fasteners. Can cause injury. Wear appropriate, OSHA-approved personal protective equipment (PPE) when installing the component.

CAUTION: Risk of handling heavy unit and component parts. Can cause injury and equipment damage. Use OSHA-recommended safe lifting techniques and/or lifting equipment rated for the weight of the unit.

NOTICE

Risk of improper disassembly. Can cause equipment damage.

Disassembling this unit requires substantial work, including reclaiming refrigerant and charging the unit, cutting and brazing refrigerant lines, cutting and brazing water lines, disconnecting and reconnecting electrical lines and moving heavy, bulky equipment. One member of the crew disassembling the unit must be qualified in wiring, brazing and refrigeration.

Improperly disassembling or reassembling the DSE may affect warranty.

The disassembly dimensions and details are described in the submittal documents included in the Submittal Drawings on page 61.

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

Table B.1 Disassembly Dimension Drawings

Document Number	Title
Downflow Units	
DPN003532	Disassembly, DA050
DPN003140	Disassembly, DA080 and DA085
DPN003178	Disassembly, DA125, DA150 and DA165
Upflow Units	
DPN003166	Disassembly, DA080U and DA085U

B.1 Required Equipment

- Piano jacks
- Stepladder
- Refrigeration tools

B.2 Downflow DA050, DA080 and DA085 Disassembly

1. Remove the unit from its shipping skid before beginning.
2. Remove all panels except the top front accent.
3. Remove all filters. This allows access to the screws for metal plate blocking off the top coil and removal of the filter plate.
   All wires are hot-stamped and all circuit board connectors are lettered to ease connection. Some cable ties must be cut and replaced. Refer to the unit's wiring schematic on the unit's dead-front panel for details.

NOTICE

Risk of improper handling and storage. Can cause equipment damage.

Do not lay the compressor section on its side. It must remain upright. The coil section also must remain upright.

4. Label the three quick-connect plugs from the compressor compartment and disconnect them.

5. Disconnect the two CAN connections and cut the wire ties going to the EEV boxes in the bottom of the compressor section.
6. Disconnect the compressor wire harness, including the crankcase heater wires, if present, from the contactor in the electric box.
7. Pull the conduit and wires into the compressor compartment.
8. Disconnect the fan motor wire harness from the bottom of the contactor in the electric box.
9. Pull the conduit and wires into the bottom section of the DSE.
10. Reheat—Optional Component
    a. Disconnect the reheat wire harness from the bottom of the contactor in the electric box.
    b. Unplug the low-voltage quick connect for the reheat safety wires.
    c. Pull the conduit and wires into the unit's blower and coil assembly section.
11. Humidifier—Optional Component
    a. Disconnect the humidifier wire harness from the bottom of the contactor in the electric box.
    b. For infrared humidifiers: Remove the quick-connect plugs from the following low-voltage connections: 35-5 and 35-6 (safety under pan), 35-3 and 35-4 (humidifier make-up valve), and 8-5 and 8-7 (high water alarm).
    c. Disconnect 35-3 and 35-4 from the control board.
    d. Pull the conduit and wires into the unit's blower and coil assembly section.
12. Condensate Pump—Optional Component
    a. Disconnect the condensate pump's high-voltage wiring harness.
    b. Remove the low-volt wires from terminal strips #24 and #55.
    c. Pull the conduit and wires into the unit's blower and coil assembly section.
13. Disconnect the air sail switch wires and pull them into the electric box.
14. Smoke Detector—Optional Component
    a. Remove the smoke detector cover.
    b. Remove the plug connector from the smoke detector and pull it into electric box.
    c. Remove the wires from terminal strips #91, 92, 93 and route them into the smoke detector box.
    d. Remove the sensing tube from top of the smoke detector.
    The wand and tube will remain attached to filter and electric-box assembly.
15. Close the electric-box cover and the accent panel.
16. Remove the pull bar that supports the accent panel from the left end of unit, otherwise it will fall out when the compressor section is removed.
17. Evacuate and recover all refrigerant from the DSE.

    Air-cooled units are shipped with a nitrogen holding charge.

NOTICE

Risk of compressor oil contamination with moisture. Can cause equipment damage.

We recommend front-seating the compressor service valves. Front-seating the valves keeps the nitrogen or refrigerant charge in the compressor and prevents moisture from contaminating the compressor oil.

18. Cut the insulation and pull it back from the piping.
19. Cut the refrigerant piping with a tubing cutter; if there is no Schrader fitting, let the nitrogen bleed out before cutting all the way through the pipe.

NOTE: We do not recommend un-sweating refrigerant connections.

20. Immediately cap and seal all piping that has been cut, including the suction and liquid lines.

Removing Compressor Assembly for Downflow DA050, DA080 and DA085

1. Secure the compressor wire harness to the compressor assembly.
2. Remove the 10 thread-cutting bolts holding the compressor section assembly to the filter and electric-box assembly and the blower and coil assembly.
   There are five bolts in the front, four in the back and one on the top at the middle of the unit.
   a. Begin removing bolts at the bottom of the unit and progress toward the top. Use this method for the front and back bolts.
   b. Stabilize the compressor section before removing the top, middle bolt.

NOTICE

Risk of improper handling. Can cause compressor and/or piping damage.

The compressor section is top-heavy and has a small base. It must remain upright. Do not lay the compressor section on its side during or after removing it from the DSE. Do not remove shipping blocks from semi-hermetic compressors until the DSE is fully reassembled and ready for installation.

NOTE: We recommend using piano jacks when moving this section.

Removing Filter and Electric-box for Downflow DA050, DA080 and DA085

1. Using a stepladder to reach the top of the DSE, remove the filter support plate; it is attached to the filter and electric-box assembly with two screws, one on each end.
    c. Remove tags from the Schrader fittings on top of the coil headers. Retain the tags for replacement during reassembly.
    d. Remove 16 screws, (8) on each side, from the evaporator top cover plate to coil assembly. Coil top blocker will remain with top section for rigidity.
    e. Remove coil access plates from the left side of the DSE.
    f. Remove the four thread-cutting bolts securing the filter and electric-box assembly to the blower and coil assembly. There are two on the left and two on the right.
    g. Separate the unit sections with caution.

Notice

Risk of improper handling. Can cause equipment damage.

- The filter and electric-box section should be moved forward and set on the floor.
- Make sure to lift the coil plate over the Schrader fittings on the headers. We recommend using four people to remove this section. Special care is required when moving this section because the legs are not designed to withstand strong shocks.
- The blower and coil assembly must remain upright. The coil is not secured to the blower and coil assembly.
- Secure the coil to the bottom section with straps or a similar method before moving the section.

2. Move each section of the DSE to the installation location.

B.3 Reassembling Downflow DA050, DA080 and DA085

1. Replace the top section.
   Make sure to clear the Schrader valves on the coil header.
2. Reconnect the filter and electric-box assembly to the blower and coil assembly using thread-cutting bolts.
   Torque the bolts to 225 in-lb. (25 Nm)
3. Reattach the evaporator top cover plate; there are eight screws on each side.
4. Reattach the filter support plate to the filter and electric-box assembly; there is one screw on each side.
5. Reattach the tags to the Schrader fittings on top of the coil headers.
6. Replace the compressor section.
   Insert all compressor thread-cutting bolts before tightening any of the bolts.
7. Reinstall the pull bar to support the accent panel.
8. Reattach the low-voltage plugs in the compressor section.
9. Reconnect the wiring for the compressor, fan motor, reheat, humidifier, condensate pump, smoke detector and air sail switch.
10. Reattach the sensing tube to the top of the smoke detector.

Reconnecting Piping, Charging and Replacing Panels for Downflow DA050, DA080 and DA085

1. Piping must be reassembled in accordance with local codes.
2. Move insulation and plastic bushings away from the brazing area.
3. Wrap piping with wet cloths. Use copper fittings where required.
4. Refer to the ASHRAE Refrigeration Handbook for general, good-practice refrigeration piping.
5. Open the service valves on the compressor.
6. Reinsert the plastic bushings.
7. Charge the DSE with refrigerant; see the unit's nameplate for the proper charge.
8. Reinstall the galvanized panels on the left side of the coil.
9. Replace the filters.
10. Replace the panels.

Re-assembly Checklist for Downflow DA050, DA080 and DA085

1. Thread-cutting bolts reconnected and torqued to 225 in-lb. (25 Nm)
2. Top cover plate attached to coil
3. Filter plate attached
4. High-voltage wires connected to proper contactors:
    a. Compressor
    b. Fan motor
    c. Reheat, if applicable
    d. Humidifier, if applicable
    e. Condensate pump, if applicable
5. Low-voltage wires connected
    a. Actuator
    b. Terminal strip
    c. Plug connections
    d. Smoke detector, if applicable
6. Coil access plates on right and left replaced
7. Humidifier lines brazed
8. Suction and liquid refrigerant lines brazed
9. Vacuum pulled and unit checked for leaks
10. Unit recharged
11. Filters replaced
12. Panels replaced

B.4 Downflow DA125, DA150 and DA165 Disassembly

1. Remove the unit from its shipping skid before beginning.
2. Remove all panels except the top front accent.

3. All wires are hot-stamped and all circuit board connectors are lettered to ease connection. Some cable ties must be cut and replaced. Refer to the unit's wiring schematic on the unit's dead-front panel for details.

NOTICE

Risk of improper handling. Can cause compressor and/or piping damage.

Do not lay the compressor section on its side. It must remain upright. The coil section also must remain upright.

4. Label the three quick-connect plugs from the compressor compartment and disconnect them.
5. Disconnect the CAN connections going to the EEV boxes in front of each compressor.
6. Disconnect the compressor wire harness, including the crankcase heater wires, from the contactor in the electric box.
7. Pull the conduit and wires into the compressor compartment.
8. Close the electric-box cover and the accent panel.
9. Evacuate and recover all refrigerant from the DSE.

Air-cooled units are shipped with a nitrogen holding charge.

NOTICE

Risk of compressor oil contamination with moisture. Can cause equipment damage.

We recommend front-seating the compressor service valves. Front-seating the valves keeps the nitrogen or refrigerant charge in the compressor and prevents moisture from contaminating the compressor oil.

10. Cut the insulation and pull it back from the piping.
11. Cut the refrigerant piping with a tubing cutter; if there is no Schrader fitting, let the nitrogen bleed out before cutting all the way through the pipe.

NOTE: We do not recommend un-sweating refrigerant connections.

12. Immediately cap and seal all piping that has been cut, including the suction and liquid lines.

Removing Compressor Assembly for Downflow DA125, DA150 and DA165

1. Secure the compressor wire harness to the compressor assembly.
2. Remove the 20 thread-cutting bolts holding the compressor section assembly to the filter and electric-box assembly and the blower and coil assembly.
   There are eight bolts in the front, eight in the back and four in the bottom of the unit.
   a. Begin removing bolts at the bottom of the unit and progress toward the top. Use this method for the front and back bolts.
   b. Stabilize the compressor section before removing the bolts.

NOTICE

Risk of improper handling. Can cause compressor and/or piping damage.

The compressor section is top-heavy and has a small base. It must remain upright. Do not lay the compressor section on its side during or after removing it from the DSE.

NOTE: We recommend using piano jacks when moving this section.

Notice

Risk of improper handling. Can cause equipment damage.

- The blower and coil assembly must remain upright. The coil is not secured to the blower and coil assembly.
- Secure the coil to the bottom section with straps or a similar method before moving the section.

3. Move each section of the DSE to the installation location.

B.5 Reassembling Downflow DA125, DA150 and DA165

1. Replace the compressor section.
   Insert all thread-cutting compressor bolts before tightening any of the bolts.
2. Reattach the low-voltage plugs in the compressor section.
3. Reconnect the wiring for the compressor.

Reconnecting Piping, Charging and Replacing Panels for Downflow DA125, DA150 and DA165

1. Piping must be reassembled in accordance with local codes.
2. Move insulation and plastic bushings away from the brazing area.
3. Wrap piping with wet cloths. Use copper fittings where required.
4. Referd to the ASHRAE Refrigeration Handbook for general, good-practice refrigeration piping.
5. Open the service valves on the compressor.
6. Reinsert the plastic bushings.
7. Charge the DSE with refrigerant; see the unit's nameplate for the proper charge.
8. Reinstall the galvanized panels on the left side of the coil.
9. Replace the panels.
10. Install the filter plenum as instructed in the instructions included with the plenum.

Re-assembly Checklist for Downflow DA125, DA150 and DA165

1. Thread-cutting bolts reconnected and torqued to 225 in-lb. (25 Nm)
2. Top cover plate attached to coil
3. Filter plate attached
4. High-voltage wires connected to proper contactors on compressor
5. Low-voltage wires connected
    a. Actuator
    b. Terminal strip
    c. Plug connections
6. Suction and liquid refrigerant lines brazed
7. Vacuum pulled and unit checked for leaks
8. Unit recharged
9. Panels replaced
10. Filter plenum installed.

B.6 Upflow DA080 and DA085 Disassembly

1. Remove the unit from its shipping skid before beginning.
2. Remove all panels except the top front accent.
3. Remove all filters. This allows easier access to items located in the filter and coil assembly.
4. All wires are hot-stamped and all circuit board connectors are lettered to ease connection. Some cable ties must be cut and replaced. Refer to the unit's wiring schematic on the unit's dead-front panel for details.
5. Label the three quick-connect plugs from the compressor compartment and disconnect them.
6. Disconnect the two CAN connections and cut the wire ties going to the EEV boxes in the bottom of the compressor section.
7. Disconnect the compressor wire harness, including the crankcase heater wires, if present, from the contactor in the electric box.
8. Pull the conduit and wires into the compressor compartment.
9. Reheat-Optional Component
    a. Disconnect the reheat wire harness from the bottom of the contactor in the electric box.
    b. Unplug the low-voltage quick connect for the reheat safety wires.
    c. Pull the conduit and wires into the unit's filter and coil assembly section.
10. Humidifier-Optional Component
    a. Disconnect the humidifier wire harness from the bottom of the contactor in the electric box.
    b. For infrared humidifiers: Remove the quick-connect plugs from the following low-voltage connections: 35-5 and 35-6 (safety under pan), 35-3 and 35-4 (humidifier makeup valve), and 8-5 and 8-7 (high water alarm).
    c. Disconnect 35-3 and 35-4 from the control board.
    d. Pull the conduit and wires into the unit's filter and coil assembly section.

11. Condensate Pump-Optional Component
    a. Disconnect the condensate pump's high-voltage wiring harness.
    b. Remove the low-volt wires from terminal strips #24 and #55.
    c. Pull the conduit and wires into the unit's filter and coil assembly section.
12. Smoke Detector-Optional Component
    a. Remove the smoke detector cover.
    b. Remove the plug connector from the smoke detector and pull it into the electric box.
    c. Remove the wires from terminal strips #91, 92, 93 and route them into the smoke detector box.
    d. Remove the sensing tube from the bottom of the plastic elbow.
13. Close the electric-box cover and the accent panel.
14. Remove the pull bar that supports the accent panel from the left end of the unit, otherwise it will fall out when the compressor section is removed.
15. Evacuate and recover all refrigerant from the DSE. Air-cooled units are shipped with a nitrogen holding charge.

NOTICE

Risk of compressor oil contamination with moisture. Can cause equipment damage.

We recommend front-seating the compressor service valves. Front-seating the valves keeps the nitrogen or refrigerant charge in the compressor and prevents moisture from contaminating the compressor oil.

16. Cut the insulation and pull it back from the piping.
17. Cut the refrigerant piping with a tubing cutter; if there is no Schrader fitting, let the nitrogen bleed out before cutting all the way through the pipe.

NOTE: We do not recommend un-sweating refrigerant connections.

18. Immediately cap and seal all piping that has been cut, including the suction and liquid lines.

Removing Compressor Assembly for Upflow DA080 and DA085

1. Secure the compressor wire harness to the compressor assembly.
2. Remove the 10 thread-cutting bolts holding the compressor section assembly to the filter, the electric-box assembly and the blower and coil assembly. There are five bolts in the front, four in the back and one on the top at the middle of the unit.
    a. Begin removing bolts at the bottom of the unit and progress toward the top. Use this method for the front and back bolts.
    b. Stabilize the compressor section before removing the top, middle bolt.

NOTICE

Risk of improper handling. Can cause compressor and/or piping damage.

The compressor section is top-heavy and has a small base. It must remain upright. Do not lay the compressor section on its side during or after removing it from the DSE.

NOTE: We recommend using piano jacks when moving this section.

Removing Blower and Electric-box for Upflow DA080 and DA085

1. Remove the access plate from right end of unit. This will provide a place to grasp the blower and electric-box assembly and move it. Remove the coil access plates on the left side of the unit for clearance when brazing the suction and discharge lines.
2. Remove the thread-cutting bolts holding the unit sections together; there are four on the left and four on the right.
3. Separate the unit sections with caution.

NOTICE

Risk of improper handling. Can cause damage to the DSE.

- The blower and electric-box section should be moved forward and set on the floor. We recommend using four people to remove this section.
- The filter and coil assembly must remain upright. The coil is not secured to the filter and coil assembly.
- Secure the coil to the bottom section with straps or a similar method before moving the section.

4. Move each section of the DSE to the installation location.

B.7 Reassembling Upflow DA080 and DA085

1. Replace the top section. Make sure to clear the Schrader valves on the coil header.
2. Reattach the top section using thread-cutting bolts; there are four on each side. Torque the bolts to 225 in-lb. (25 Nm)
3. Reinstall the motor access plate. Do not replace the left end coil access plates until brazing is finished.
4. Reattach compressor section. Insert all compressor thread-cutting bolts before tightening them all down.
5. Reinstall the pull bar to support the accent panel, if applicable.
6. Reattach the low-voltage plugs in the compressor section.
7. Reconnect the wiring for the compressor, reheat, humidifier, condensate pump and smoke detector if applicable.
8. Reattach the sensing tube.
9. Piping must be reassembled in accordance with local codes.
10. Move insulation and plastic bushings away from the brazing area.
11. Wrap piping with wet cloths. Use copper fittings where required.
12. Refer to the ASHRAE Refrigeration Handbook for general, good-practice refrigeration piping.
13. Open the service valves on the compressor.
14. Reinsert the plastic bushings.
15. Pull vacuum, check for leaks, and charge the DSE with refrigerant. See the unit's nameplate for the proper charge.
16. Reinstall the galvanized panels on the left side of the coil.
17. Replace the filters.
18. Replace the panels.

Reassembly Checklist for Upflow DA080 and DA085

1. Thread-cutting bolts reconnected and torqued to 225 in-lb. (25 Nm)
2. High-voltage wires connected to proper contactors:
    a. Compressor
    b. Reheat, if applicable
    c. Humidifier, if applicable
    d. Condensate pump, if applicable
3. Low-voltage wires connected
    a. Terminal strip
    b. Plug connections
    c. Smoke detector, if applicable
4. Coil access plates on left replaced
5. Motor access plate on right side replaced
6. Suction and liquid refrigerant lines brazed
7. Vacuum pulled and unit checked for leaks
8. Unit recharged
9. Filters replaced
10. Panels replaced

Appendix C: Submittal Drawings

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

Table C.1 Submittal-drawings Contents

Document Number	Title
Component Location	
DPN003452	Component Location, Typical, Downflow Models
DPN003451	Component Location, Typical, Upflow Models
Planning Dimensions - Downflow Units	
DPN003533	Cabinet Dimensional Data, DA050
DPN004083	Cabinet Dimensional Data, DA080 and DA085
DPN003175	Cabinet Dimensional Data, DA125, DA150 and DA165
Planning Dimensions - Upflow Units	
DPN002950	Cabinet Dimensional Data, DA080U and DA085U
Planning Dimensions - Floor Stands	
DPN004079	Floorstand Dimensional Data, Downflow, DA050
DPN004073	Floorstand Dimensional Data, Downflow and Upflow, DA080 and DA085
DPN003177	Floorstand Dimensional Data, Downflow, DA125, DA150 and DA165
Planning Dimensions - Plenums	
DPN003514	Plenum Dimensional Data, Downflow, DA050, DA080 and DA085
DPN004081	Plenum Dimensional Data, Upflow, DA080U and DA085U
Piping Schematics	
DPN002615	Piping Schematic, DA050, DA080 and DA085
DPN002340	Piping Schematic, DA125, DA150 and DA165
Piping Arrangement - Liebert® MC Condenser and EconoPhase Pump Locations	
DPN003994	Considerations for mounting MC Condenser/EconoPhase Above or at Same Level as DSE
DPN003552	Typical arrangement for single-circuit system
DPN002324	Typical arrangement for dual-circuit system
Piping Connections - Downflow Units	
DPN003531	Connection Locations, DA050
DPN004080	Connection Locations, DA080 and DA085
DPN002312	Connection Locations, DA125
DPN004037	Connection Locations, DA150 and DA165

Table C.1 Submittal-drawings Contents (continued)

Document Number	Title
Piping Connections - Upflow Units	
DPN002951	Connection Locations, DA080U and DA085U
Electrical Connections	
DPN004387	Electrical Field Connections, Upflow & Downflow, DA050, DA080, and DA085 Models
DPN004388	Electrical Field Connections, Downflow Models, DA125, DA150, and DA165
DPN003284	CANbus cable connections between indoor unit, 1 Liebert® MC condenser and optional Liebert® EconoPhase pump
DPN002361	CANbus cable connections between indoor unit, 2 Liebert® MC condensers and optional Liebert® EconoPhase pump
Unit-to-Unit Networking	
DPN004351	Liebert® iCOM Unit-to-unit Network Connections
Disassembly Dimensions - Downflow Units	
DPN003532	Disassembly, DA050
DPN003140	Disassembly, DA080 and DA085
DPN003178	Disassembly, DA125, DA150 and DA165
Disassembly Dimensions - Upflow Units	
DPN003166	Disassembly, DA080U and DA085U
Liebert® MC Condenser Planning Dimensions	
DPN003437	Condenser Dimensional Data, MCS056, MCM080, MCL110
DPN003438	Condenser Dimensional Data, MCL165
DPN003439	Condenser Dimensional Data, MCM160 and MCL220
Liebert® MC Condenser Piping	
DPN002166	Single-circuit piping
DPN002425	Dual-circuit piping
Liebert® MC Condenser Receiver Mounting	
DPN002554	Receiver mounting for single-circuit MCL055, MCL110, MCL165, and MCL220 and for dual-circuit MCL110 and MCL220
DPN002383	Receiver mounting for dual-circuit MCM160
Liebert® MC Condenser Power-supply wiring	
DPN002169	Electrical Field Connections, without Liebert® Lee-Temp™
Liebert® MC Condenser Low-voltage wiring	
DPN003284	CANbus cabling between indoor unit and one condenser
DPN002361	CANbus cabling between indoor unit and two condensers

Table C.1 Submittal-drawings Contents (continued)

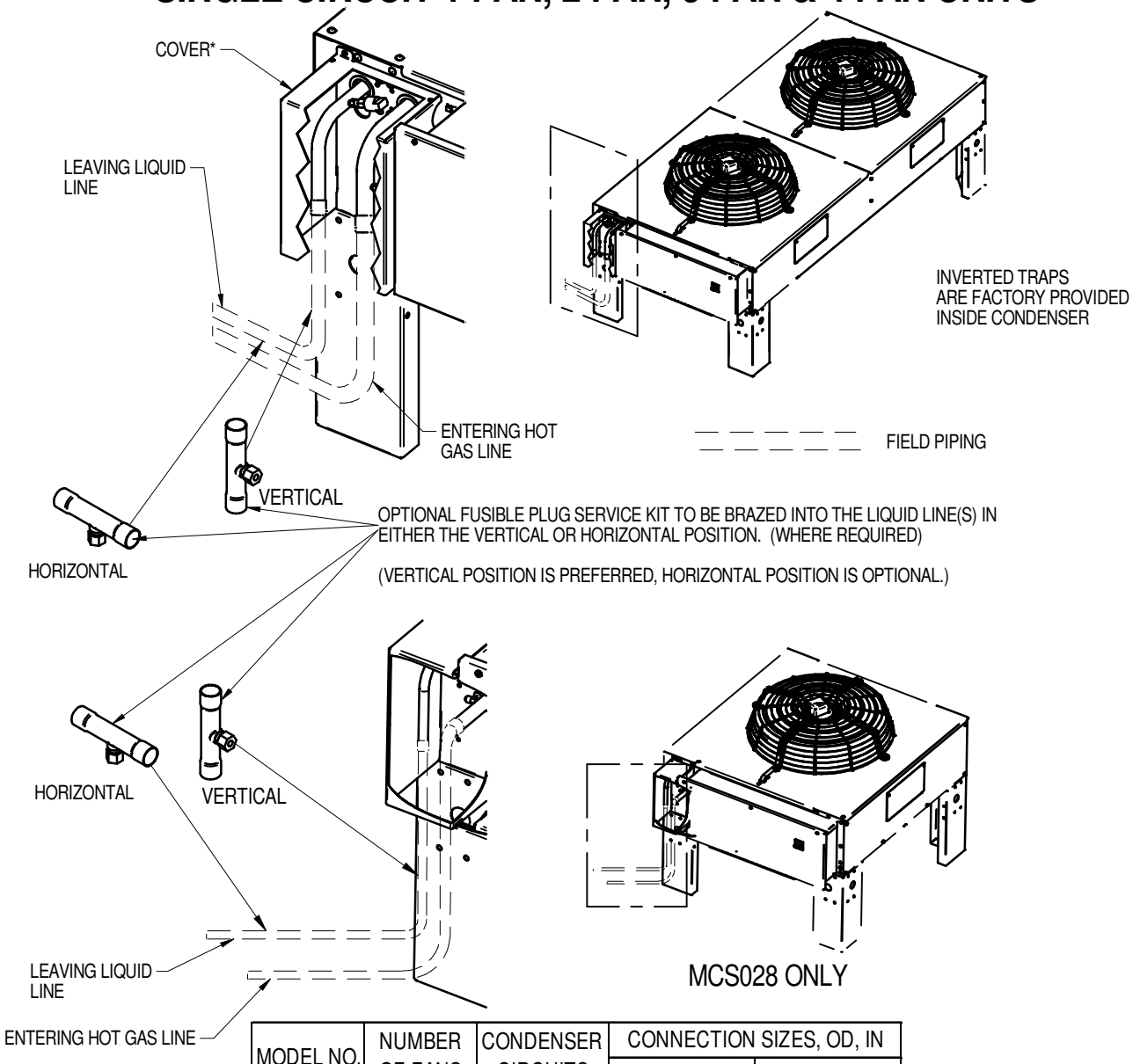
Document Number	Title
Liebert® EconoPhase Planning Dimensions	
DPN002326	Cabinet Dimensional Data, PR050 - PR125
Liebert® MC Condenser and Liebert® EconoPhase Pump Location Arrangement	
DPN003994	Considerations for mounting MC Condenser/EconoPhase Above or at Same Level as DSE
DPN003552	Typical arrangement for single-circuit system
DPN002324	Typical arrangement for dual-circuit system
EconoPhase High-voltage Electrical Connections	
DPN002327	Electrical Field Connections, PR085 - PR125 Models
DPN004355	Electrical Field Connections, PR050 Models
EconoPhase Low-voltage Electrical Connections	
DPN003284	CANbus cabling between indoor unit and one condenser
DPN002361	CANbus cabling between indoor unit and two condensers
Liebert MCV Heat-rejection Skid Planning Dimensions	
DPN003889	Cabinet Dimensional Data, MCV330, Single skid
DPN003875	Cabinet Dimensional Data, MCV330, Dual skid
Liebert MCV Heat-rejection Skid Piping and Electrical Connections	
DPN003887	Connection Data, MCV330, Single skid
DPN003878	Connection Data, MCV330, Dual skid
DPN003886	MCV CANbus and Signal connections to the DSE
DPN003965	DSE - EEV Receiver Mounting
DPN004476	Piping Schematic, DA125 to DA165 with MCV

This page intentionally left blank

LIEBERT MC CONDENSER

PIPING DIMENSIONAL DATA

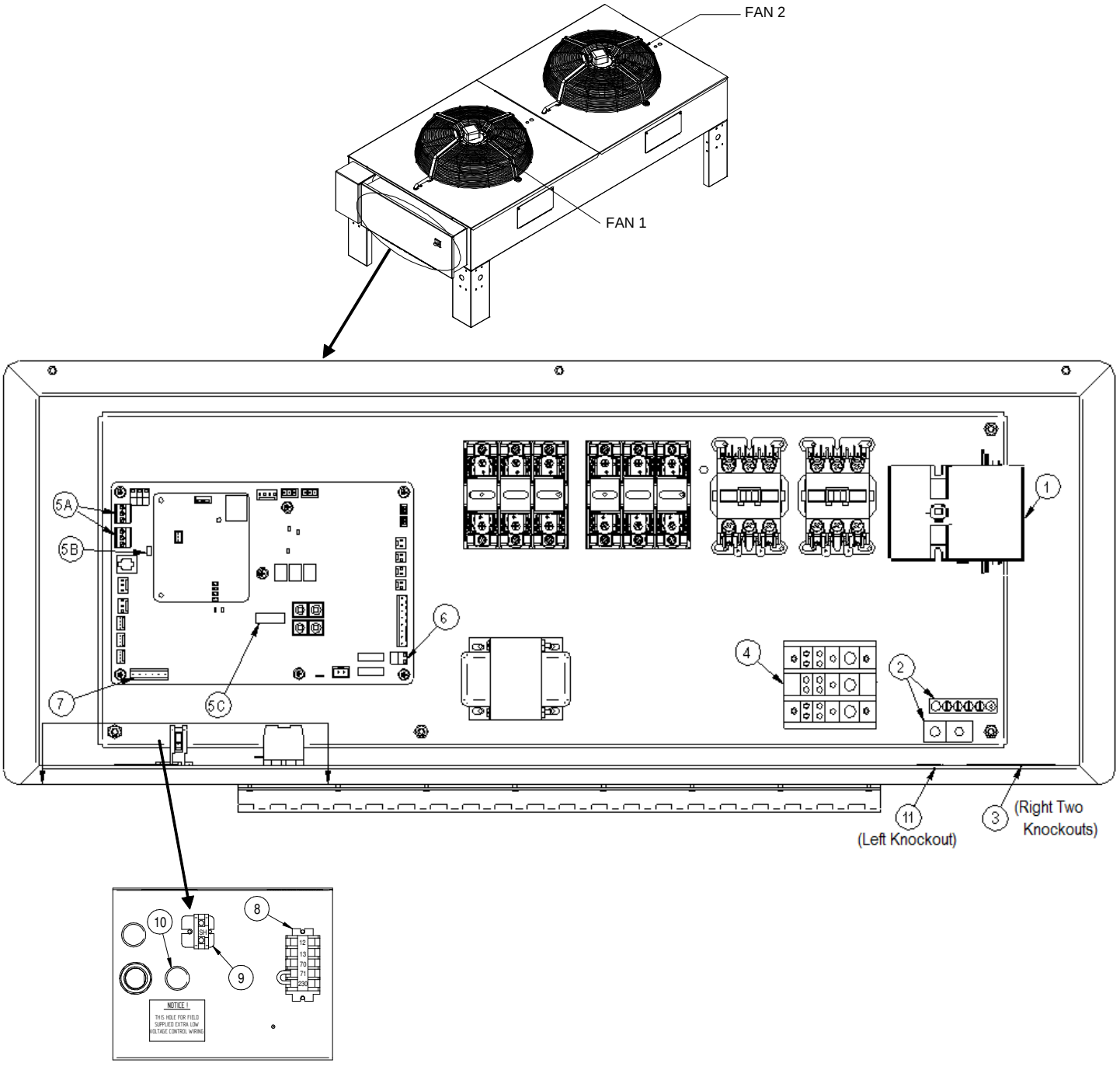
SINGLE CIRCUIT 1 FAN, 2 FAN, 3 FAN & 4 FAN UNITS



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.

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.

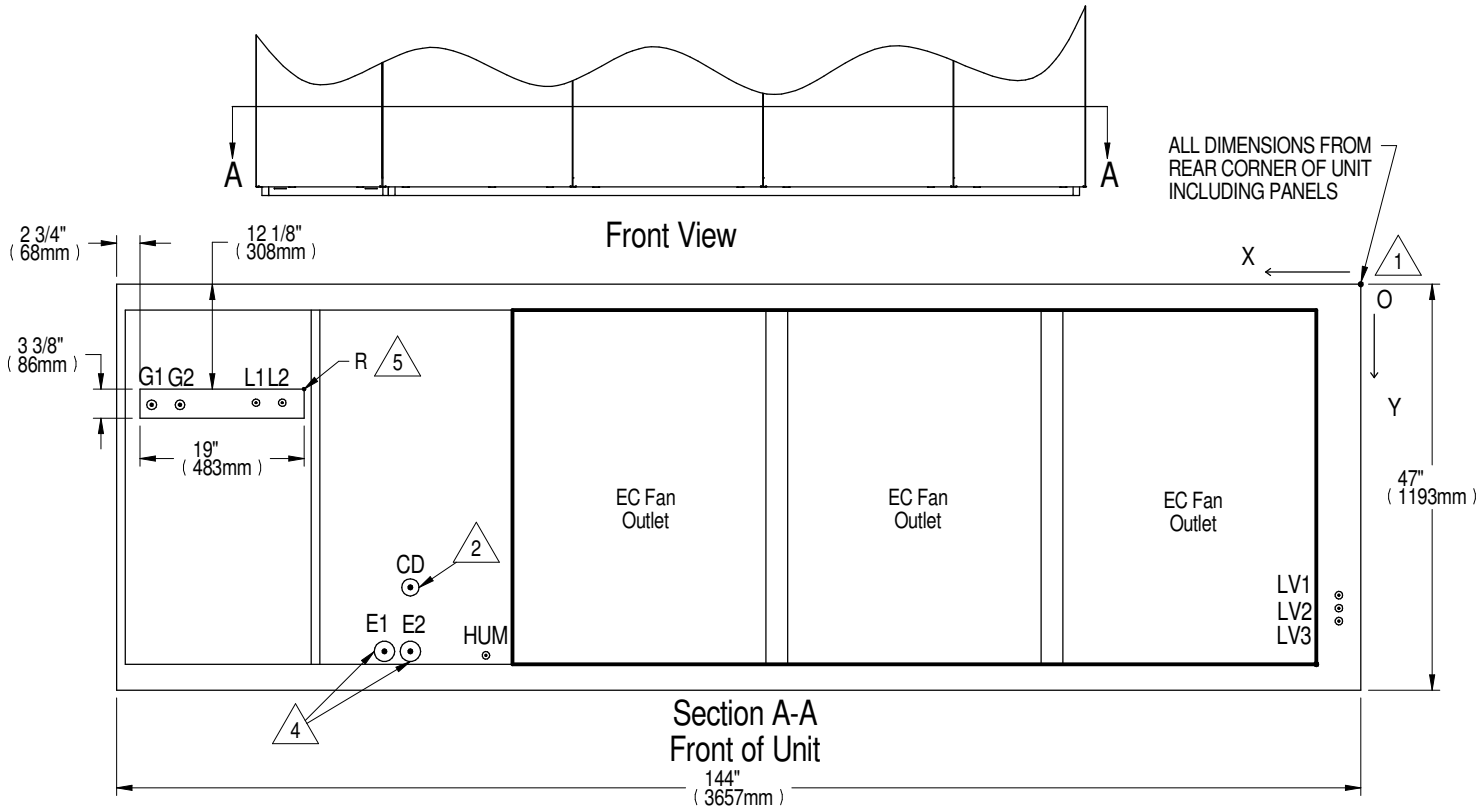
ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL

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.

LIEBERT DSE

PRIMARY CONNECTION LOCATIONS
DOWNFLOW AIR COOLED DA125 MODELS
WITH AND WITHOUT ECONOPHASE



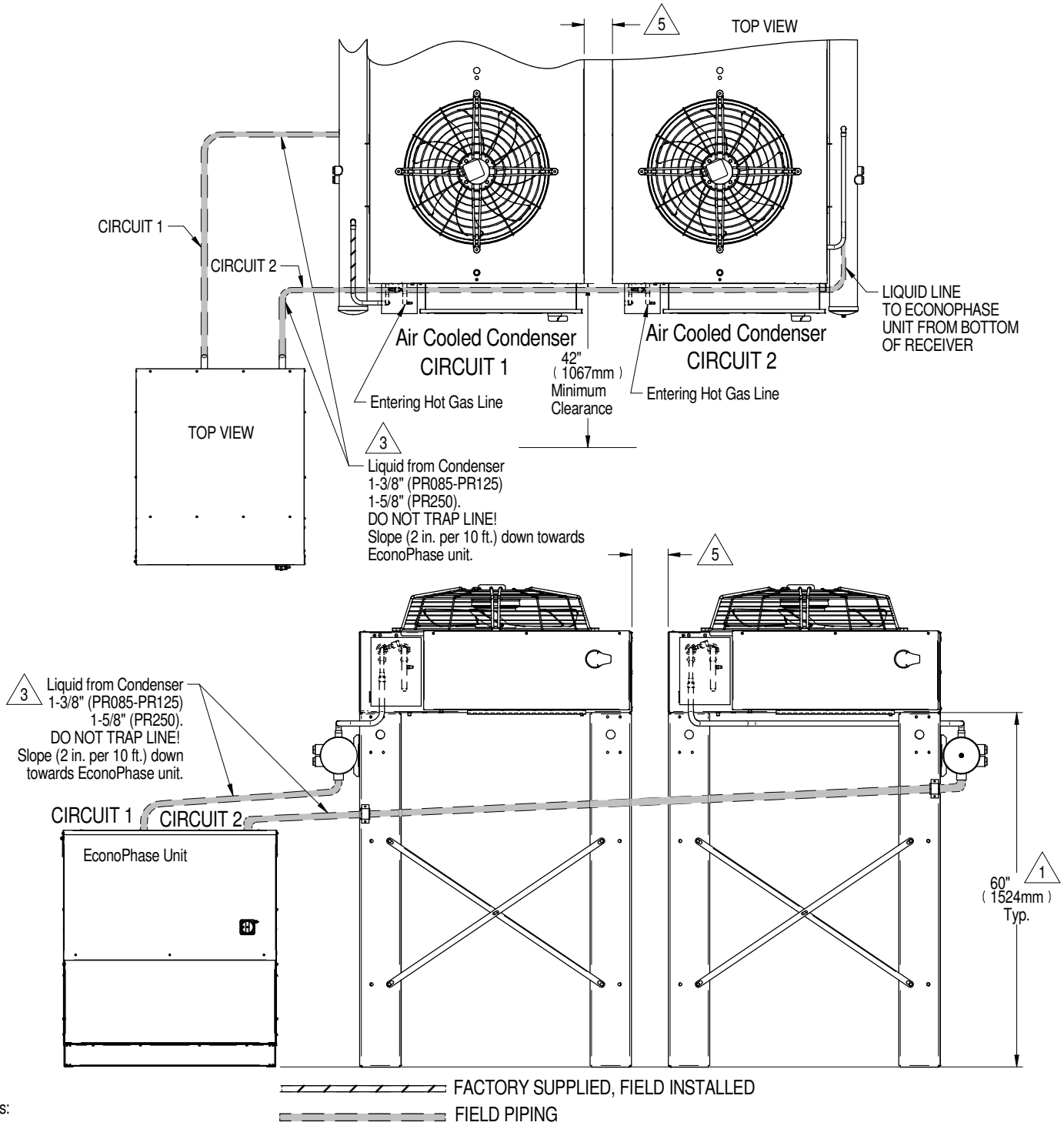
POINT	DESCRIPTION	X	Y	DX ONLY CONNECTION SIZE / OPENING	DX W/ ECONOPHASE
R	REFRIGERANT ACCESS 5	122-5/16" (3106mm)	12-1/8" (333mm)	19" (483mm) X 3-3/8" (86mm)	19" (483mm) X 3-3/8" (86mm)
L1	LIQUID LINE SYSTEM 1	127-7/8" (3248mm)	13-3/4" (348mm)	7/8" O.D. Cu	7/8" O.D. Cu
L2	LIQUID LINE SYSTEM 2	124-13/16" (3170mm)	13-3/4" (348mm)	7/8" O.D. Cu	7/8" O.D. Cu
G1	HOT GAS DISCHARGE 1 3	140" (3554mm)	14" (355mm)	1-1/8" O.D. Cu	1-3/8" O.D. Cu
G2	HOT GAS DISCHARGE 2 3	136-11/16" (3471mm)	14" (355mm)	1-1/8" O.D. Cu	1-3/8" O.D. Cu
CD	CONDENSATE DRAIN (infrared humidifier or no humidifier) 2	110" (2794mm)	35-1/16" (891mm)	1-1/8" NPT Female	1-1/8" NPT Female
	W/ OPTIONAL PUMP	110" (2794mm)	35-1/16" (891mm)	1/2" O.D. Cu	1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	101-1/4" (2572mm)	43" (1091mm)	1/4" O.D. Cu	1/4" O.D. Cu
E1	ELECTRICAL CONN. (HIGH VOLT)	113" (2870mm)	42-1/2" (1080mm)	2-1/2"	2-1/2"
E2	ELECTRICAL CONN. (HIGH VOLT)	110" (2794mm)	42-1/2" (1080mm)	2-1/2"	2-1/2"
LV1	ELECTRICAL CONN. (LOW VOLT)	2-1/2" (64mm)	36" (914mm)	7/8"	7/8"
LV2	ELECTRICAL CONN. (LOW VOLT)	2-1/2" (64mm)	37-1/2" (952mm)	7/8"	7/8"
LV3	ELECTRICAL CONN. (LOW VOLT)	2-1/2" (64mm)	39" (991mm)	7/8"	7/8"

Notes:

1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance on all piping dimensions is ± 1/2" (13mm).
2. 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.
3. When piping out the top of the unit, install traps in the discharge lines in the bottom of the unit before running lines to the top.
4. Opening for conduit chase, E1 and E2 are openings for conduit for connections to 2-1/2", 1-3/4" and 1-3/8" knockouts at electric panel.
5. See DPN003175 for alternate piping from top of unit.

LIEBERT ECONOPHASE

UNIT ARRANGEMENT DIAGRAM
CONDENSER AND DUAL CIRCUIT ECONOPHASE UNIT



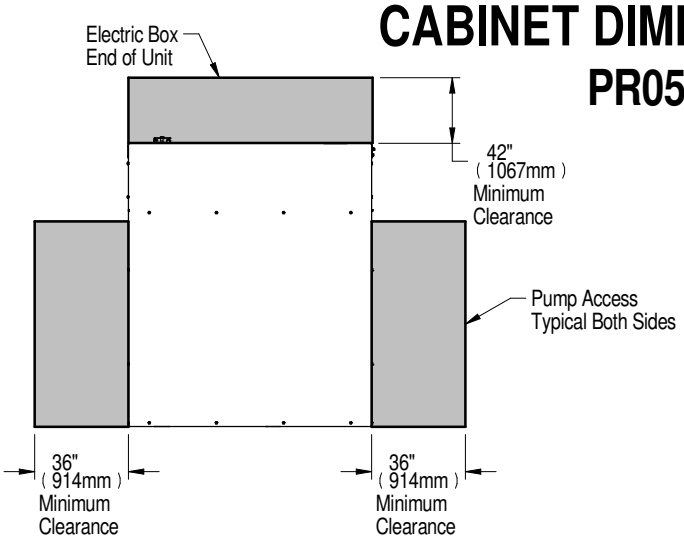
Notes:

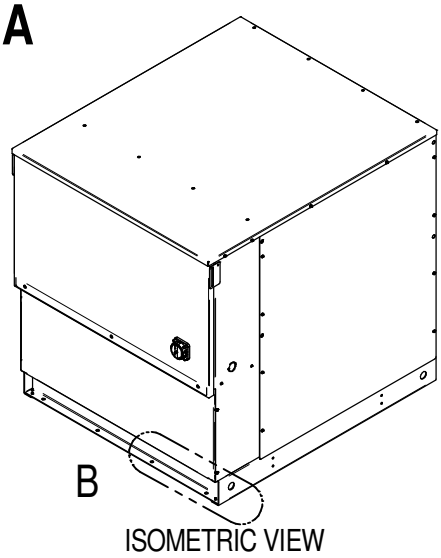
1. For proper pump function, a minimum elevation difference of 60" (1524 mm) must be maintained between the bottom of condenser box to the bottom of EconoPhase unit.
2. All indoor and outdoor field refrigerant piping must be insulated, 1/2" minimum. All outdoor insulation must be UV and ozone resistant.
3. Components are not supplied by Liebert but are required for proper circuit operation and maintenance.
4. For Piping Elevation refer to DPN003994.
5. Liebert MC Condenser with legs taller than 18" (457mm) require a minimum spacing of 6" (152mm) for leg bracing.

LIEBERT ECONOPHASE

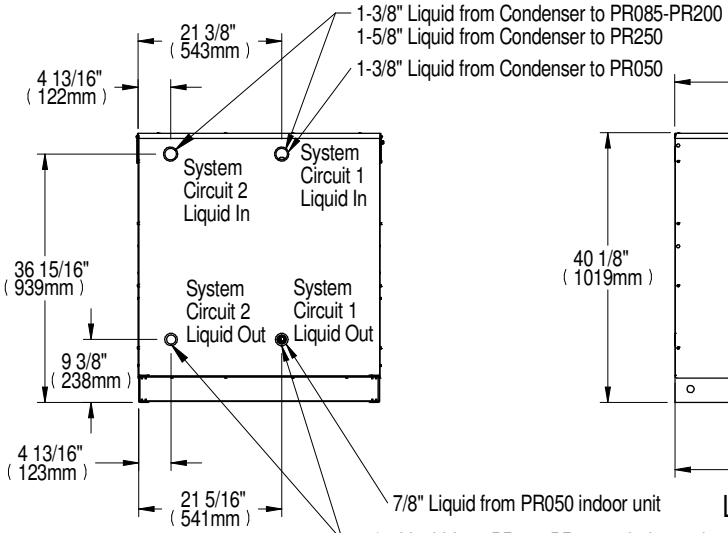
CABINET DIMENSIONAL DATA

PR050 - PR250

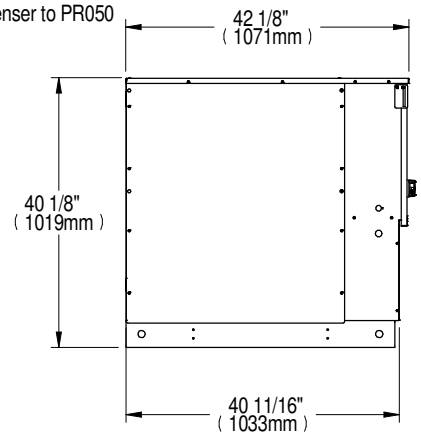




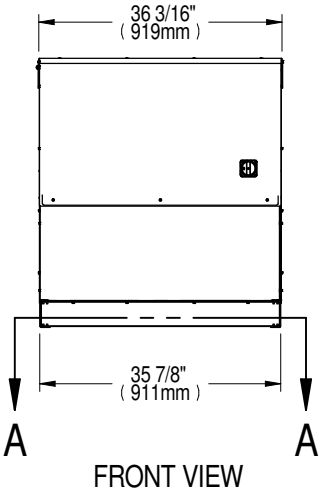
ISOMETRIC VIEW



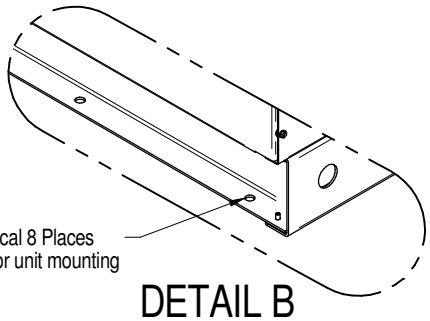
REAR VIEW
(PIPING END)



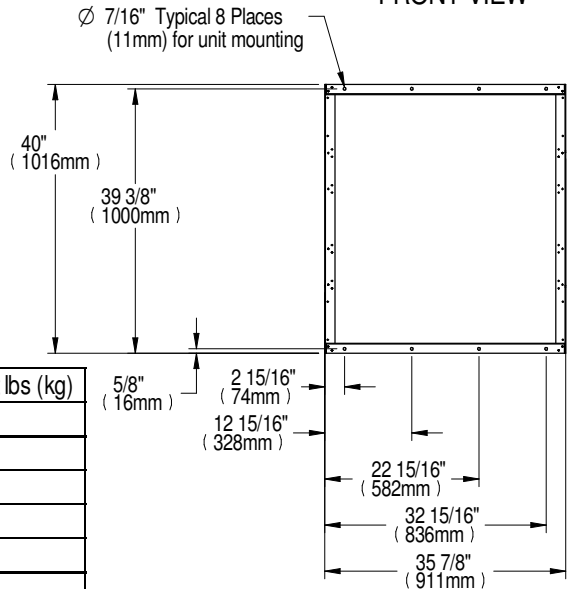
LEFT SIDE VIEW



FRONT VIEW



DETAIL B

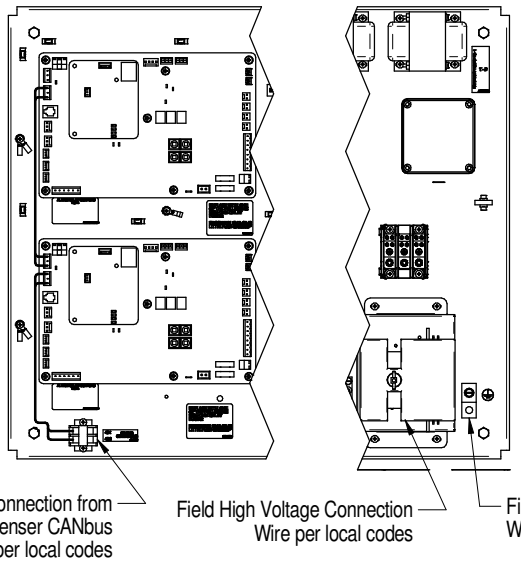


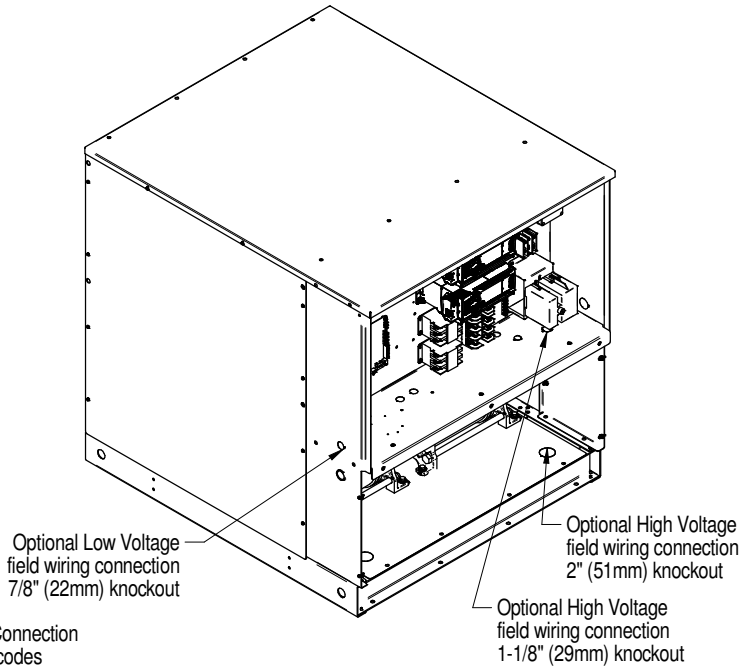
SECTION A-A

Model	Circuits	Unit Voltage, Hz	Approximate Dry Weight lbs (kg)
PR050	1	208/230V, 460V 60Hz	217 (98)
		380V, 575V 60Hz	242 (110)
		415V 50Hz	217 (98)
PR085-125 and PR250	2	208/230V, 460V 60Hz	340 (154)
		380V, 575V 60Hz	390 (177)
		415V 50Hz	347 (157)
PR200	2	460V 60Hz	350 (159)

ELECTRICAL FIELD CONNECTIONS

PR085 - PR250 DUAL CIRCUIT MODELS

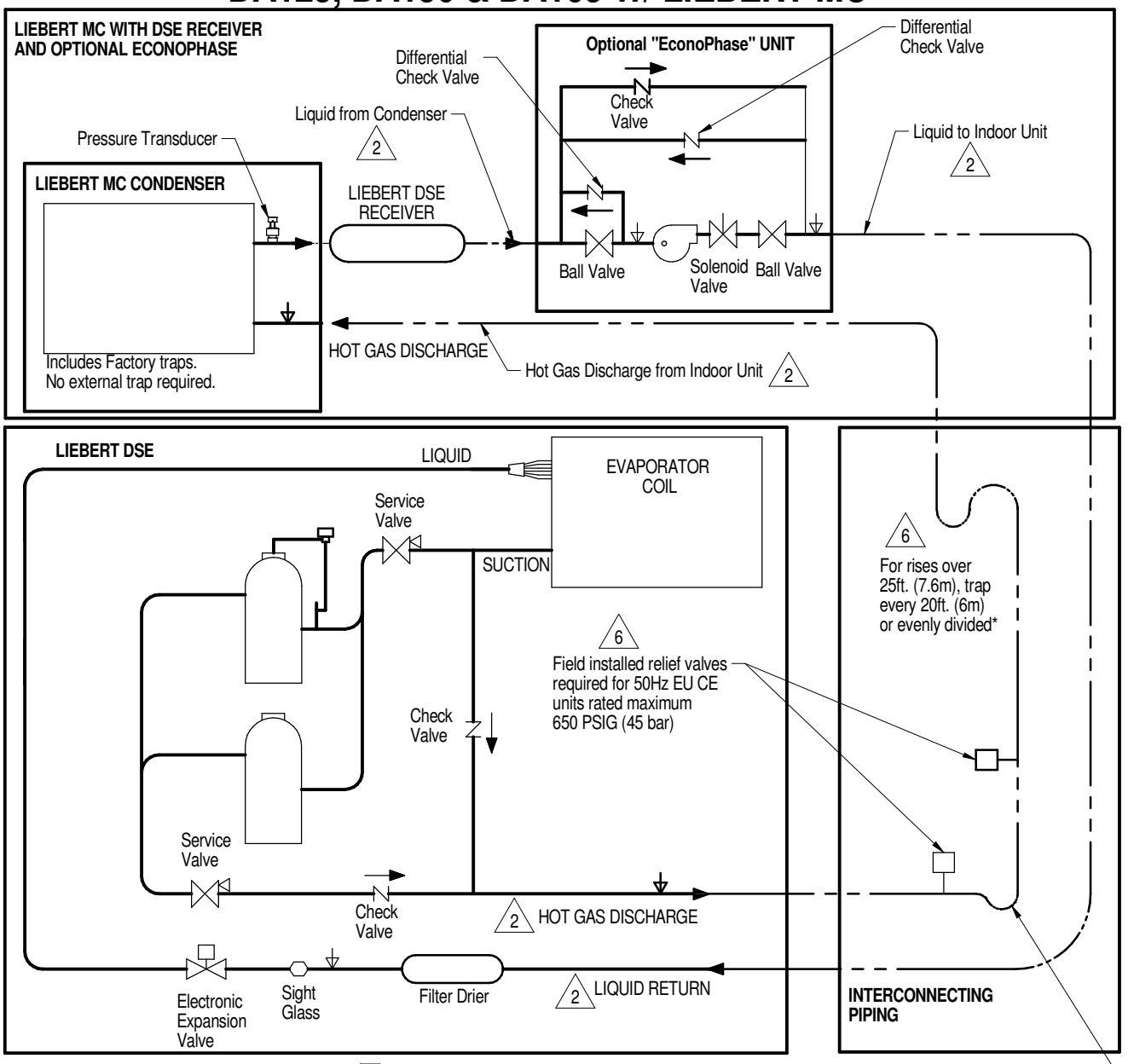




Model	Unit Electrical Specifications						Single Pump Motor (one pump per circuit)	
	Voltage	Phase	Hz	FLA	Minimum Supply Circuit Ampacity	Maximum Fuse Size	HP	FLA
PR085AA***- PR125AA***- PR250AA***2	460	3	60	7.0	7.9	15	1.6	3.5
PR085AY***- PR125AY***- PR250AY***2	208/230			13.8	15.5	20		6.9
PR085AB***- PR125AB***- PR250AB***2	575			5.6	6.3	15		3.5
PR085A2***- PR125A2***- PR250A2***2	380			8.4	9.5			4.2
PR085AG***- PR125AG***- PR250AG***2	415		50	7.4	8.3		1.2	3.7
PR085AA***H	460		60	2.6	2.9		0.75	1.3
PR085AY***H	208/230			5.2	5.9			2.6
PR085AB***H	575			2	2.3			1.3
PR085A2***H	380			3.2	3.6			1.6
PR085AG***H	415		50	2.4	2.7			1.2
PR200AA***3	460		60	4.6	5.2		1.5	2.3

LIEBERT DSE

PIPING SCHEMATIC
DA125, DA150 & DA165 W/ LIEBERT MC

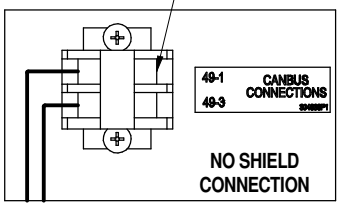


FACTORY REFRIGERANT PIPING
FIELD PIPING
SERVICE/SCHRADER (ACCESS) CONNECTION, NO VALVE CORE.
SERVICE/SCHRADER (ACCESS) CONNECTION, WITH VALVE CORE.
6 Trap at base of risers over 5ft. (1.5m)*

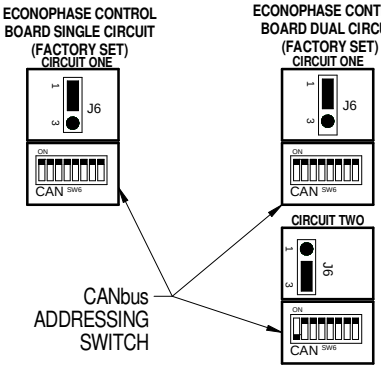
Notes:

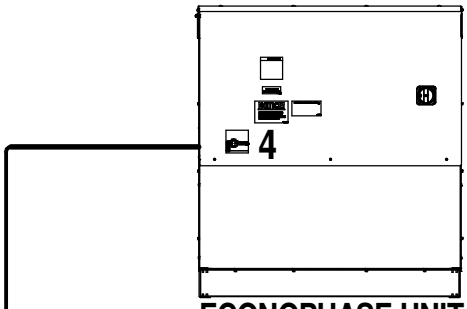
1. Two refrigeration circuits provided. Single refrigeration circuit shown for clarity.
2. Circuit 1 must be maintained between indoor unit, condenser and EconoPhase unit. Circuit 2 must be maintained between indoor unit, condenser and EconoPhase unit.
3. Schematic representation shown. Do not use for specific connection locations.
4. 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). Liebert DSE Receiver required for systems with or without EconoPhase.
5. All indoor and outdoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor insulation must be UV and ozone resistant.
6. Components are not supplied by Liebert but are required for proper circuit operation and maintenance.
7. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid flood back to compressor. Pitch horizontal 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.
8. Do not isolate any refrigerant circuits from over pressurization protection.

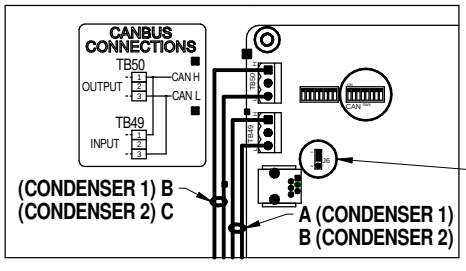
CANbus & INTERLOCK CONNECTIONS
USING 2 LIEBERT MC CONDENSERS & OPTIONAL ECONOPHASE UNIT



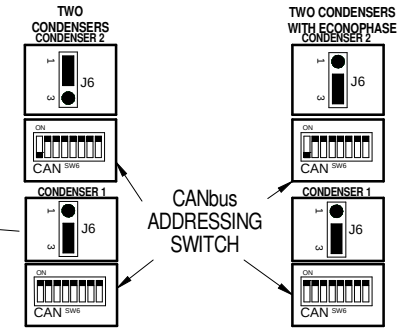
DETAIL 4
CAN CABLE CONNECTION (C)

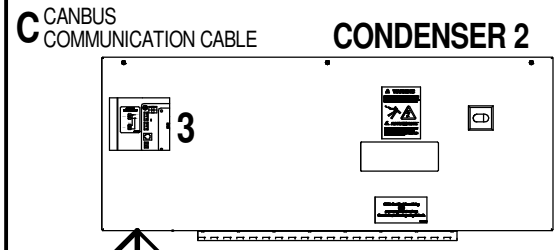


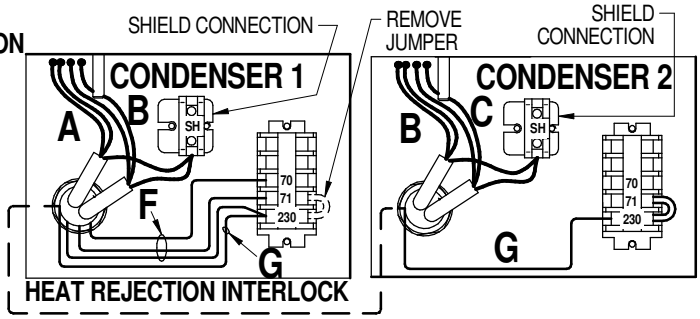


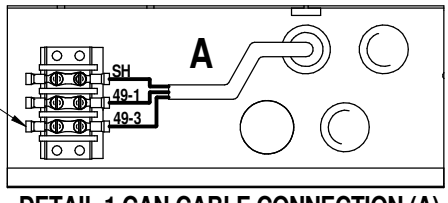


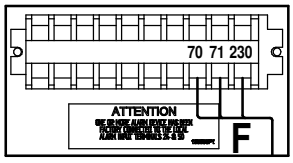
DETAIL 3
CAN CABLE CONNECTION
CONDENSER 1 (B) (A)
CONDENSER 2 (C) (B)

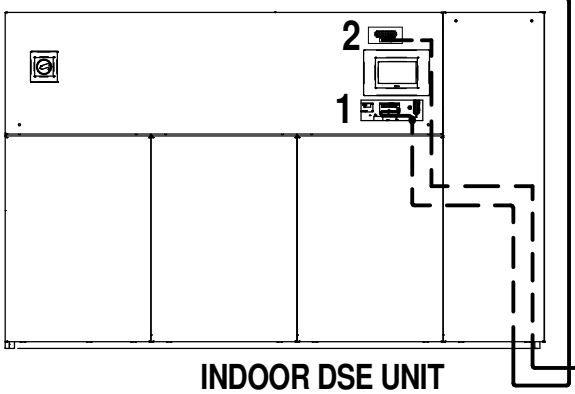












See sheet 2 for Component notes, Cable notes, & Wire notes.

CANbus & INTERLOCK CONNECTIONS
USING 2 LIEBERT MC CONDENSERS & OPTIONAL ECONOPHASE UNIT

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

CAN & CABLE NOTES (A, B, C):
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 LIEBERT FACTORY.

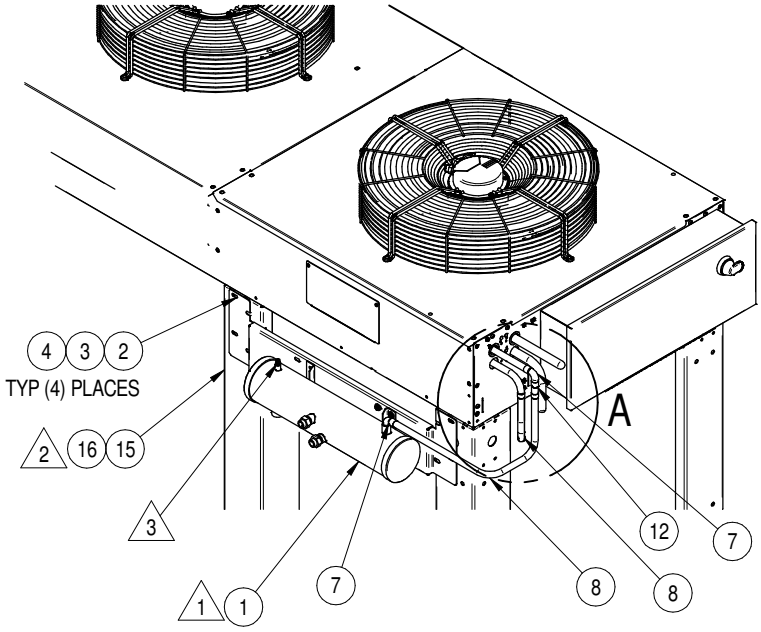
INTERLOCK WIRE NOTES (F):
1. FIELD SUPPLIED WIRE
   - 3 CONDUCTOR 18AWG OR GREATER
   - RATED 600V
2. RUN FIELD SUPPLIED WIRES BETWEEN THE INDOOR UNIT AND CONDENSER 1.

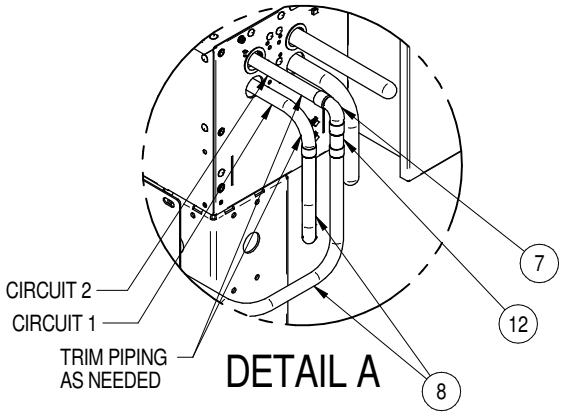
INTERLOCK WIRE NOTES (G):
1. FIELD SUPPLIED WIRE
   - MINIMUM 1 CONDUCTOR 18AWG OR GREATER
   - RATED 600V
2. RUN FIELD SUPPLIED WIRES BETWEEN CONDENSER 1 AND CONDENSER 2.

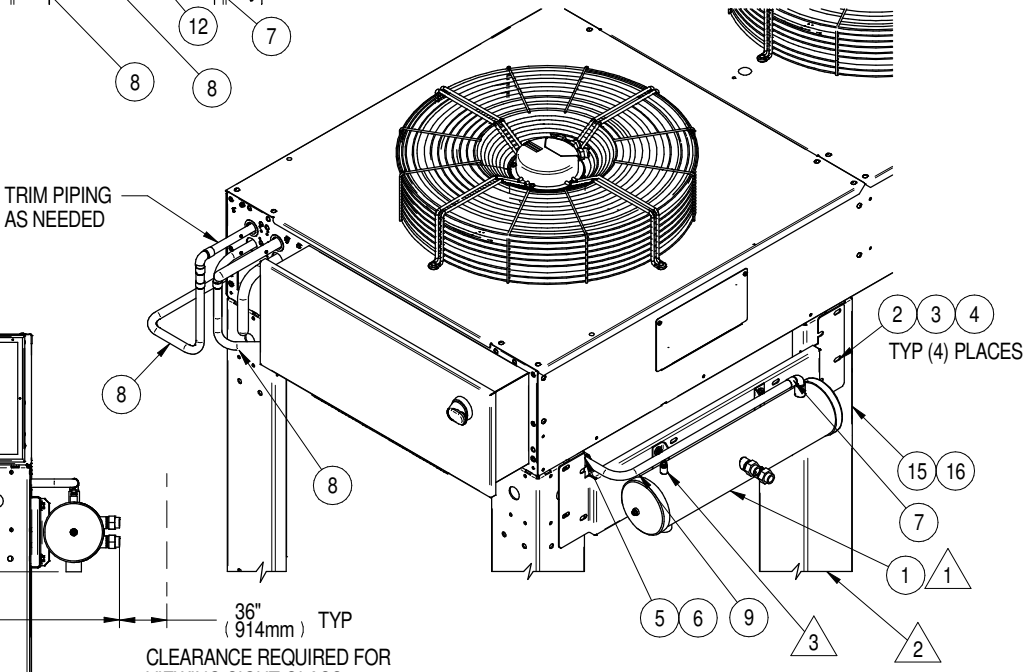
LIEBERT MC CONDENSER

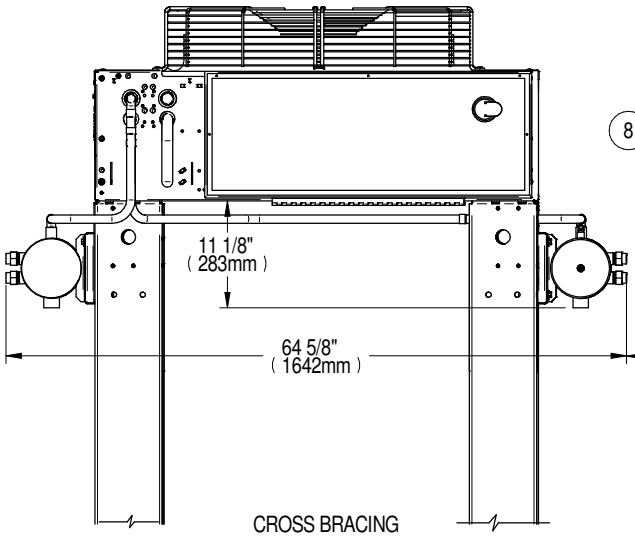
DSE RECEIVER MOUNTING

MCM160 DUAL CIRCUIT DUAL CONDENSER OUTLET RECEIVERS









36" (914mm) TYP

CLEARANCE REQUIRED FOR VIEWING SIGHT GLASS.

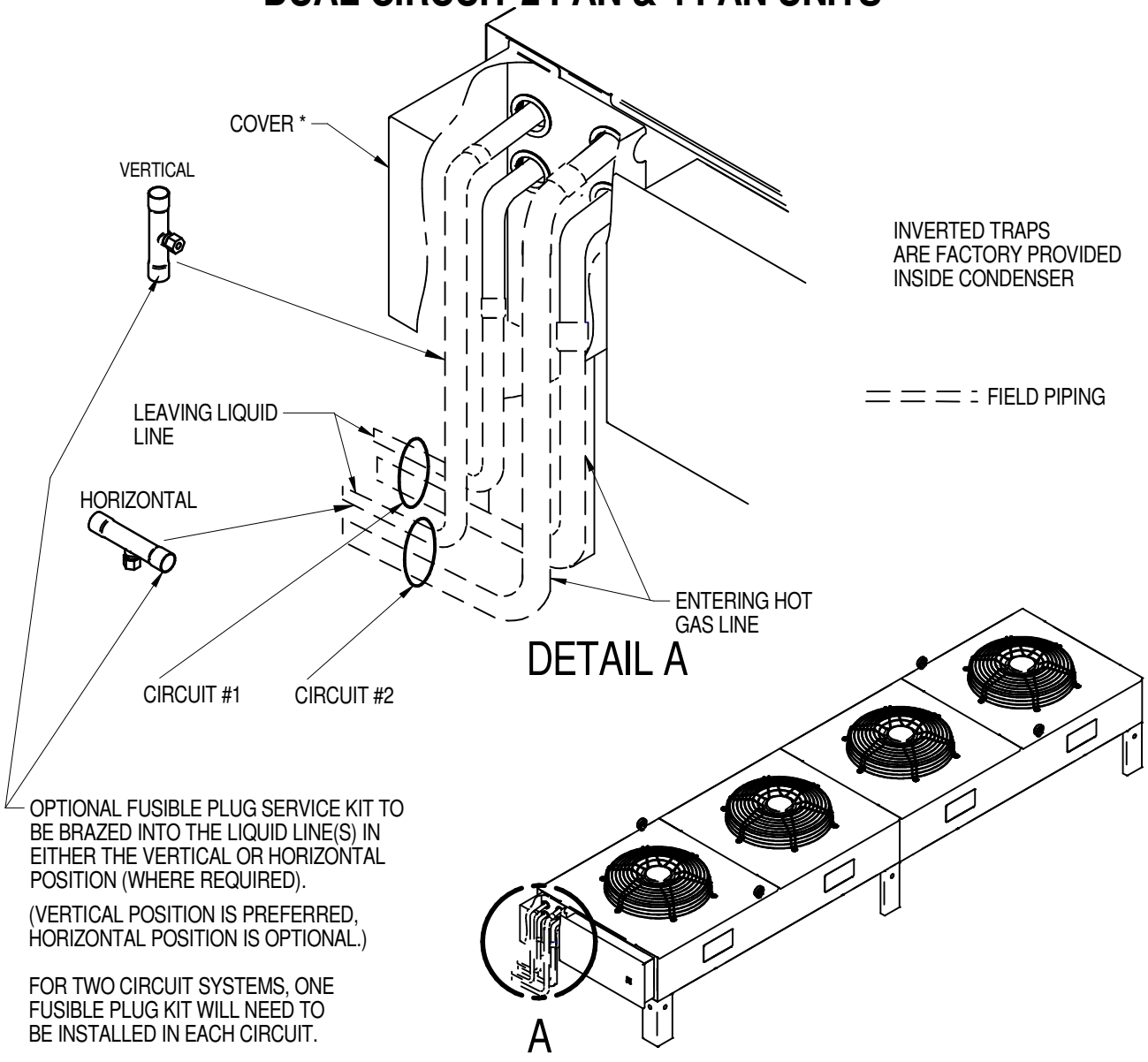
ITEM NO.	DESCRIPTION	QTY
1	RECEIVER AND BRACKET ASSEMBLY	2
2	CAP SCREW HXDIN933M8-1.25X25A2	12
3	FENDER WASHER DIN9021 M8X24 A2	20
4	LOCK NUT HEX NYL INSR M8	12
5	CLAMP OMEGA 7/8"	1
6	SCREW SD HWH YZ 10-16 X 5/8	2
7	90° ELBOW FTGXC 7/8" CU	3
8	COPPER FORMED TUBE 7/8"	2
9	COPPER FORMED TUBE 7/8"	1
12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

NOTES

1. SMALL RECEIVER SHOWN. ACTUAL RECEIVER SIZE MAY VARY.
2. RECEIVER LEG IS SAME HEIGHT AS OTHER LEGS AND NEEDS TO BE ANCHORED WITH THEM.
3. SCHRADER PORT FOR PROOF PRESSURE RELIEF ONLY & ACCESS NOT REQUIRED AFTER PIPING.

LIEBERT MC CONDENSER

PIPING DIMENSIONAL DATA
DUAL CIRCUIT 2 FAN & 4 FAN UNITS

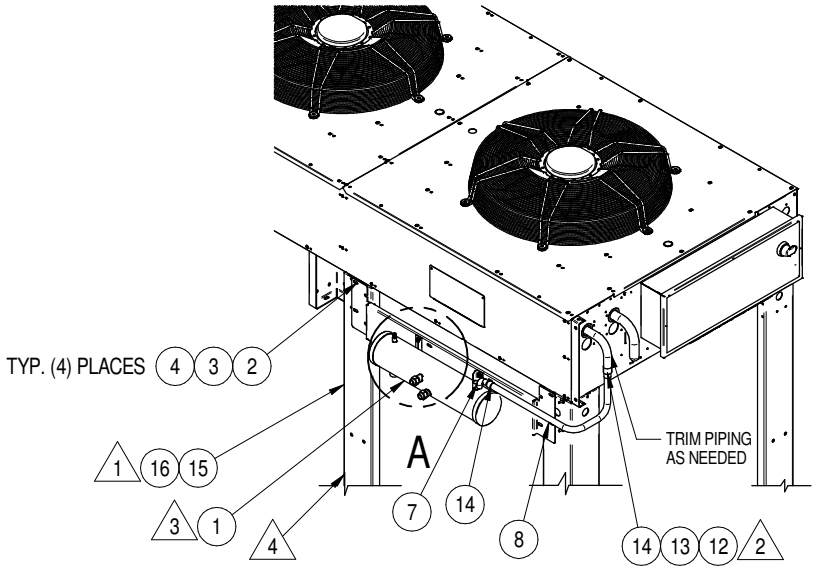


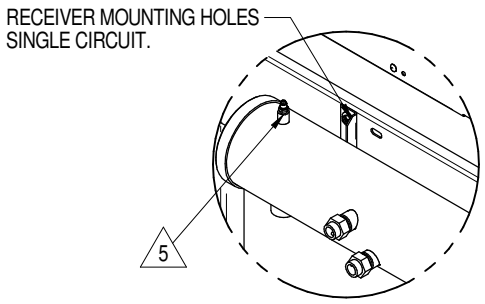
MODEL NO.	NUMBER OF FANS	CONDENSER CIRCUITS	CONNECTION SIZES ,OD,IN	
			HOT GAS LINE	LIQUID LINE
MCS 056	2	2	7/8	5/8
MCM 080	2	2	7/8	5/8
MCL 110	2	2	1-1/8	7/8
MCM 160	4	2	1-1/8	7/8
MCL 220	4	2	1-3/8	1-1/8

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

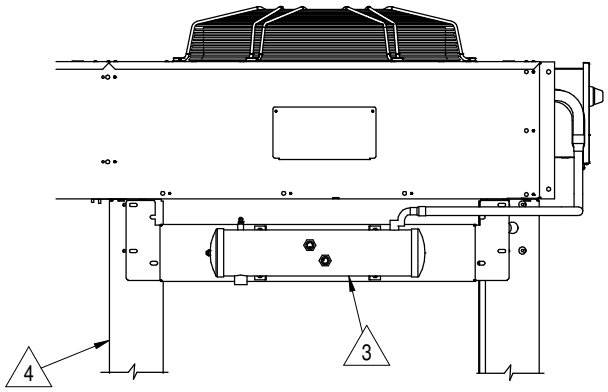
LIEBERT MC CONDENSER

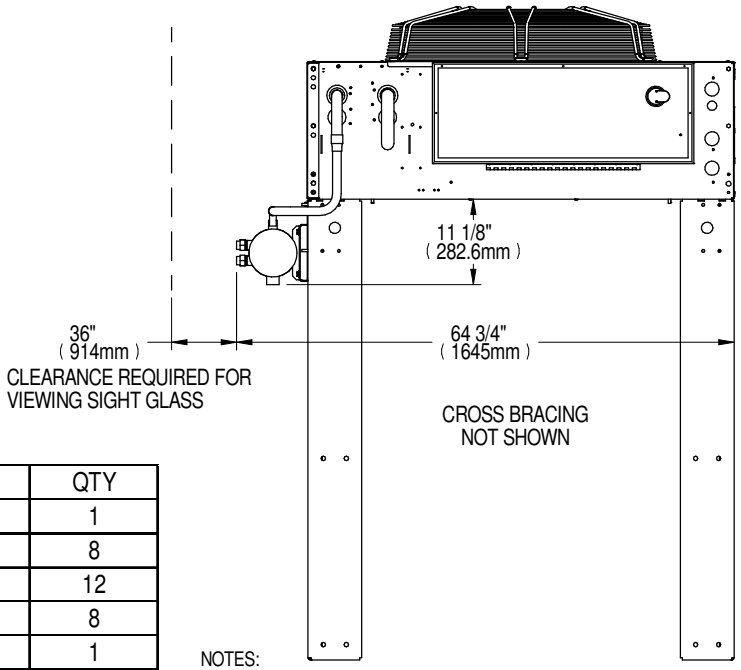
LEFT SIDE DSE & PDX-EEV RECEIVER MOUNTING KIT
MCL055, MCL110, MCL165 & MCL220 SINGLE CIRCUIT CONDENSER





DETAIL A





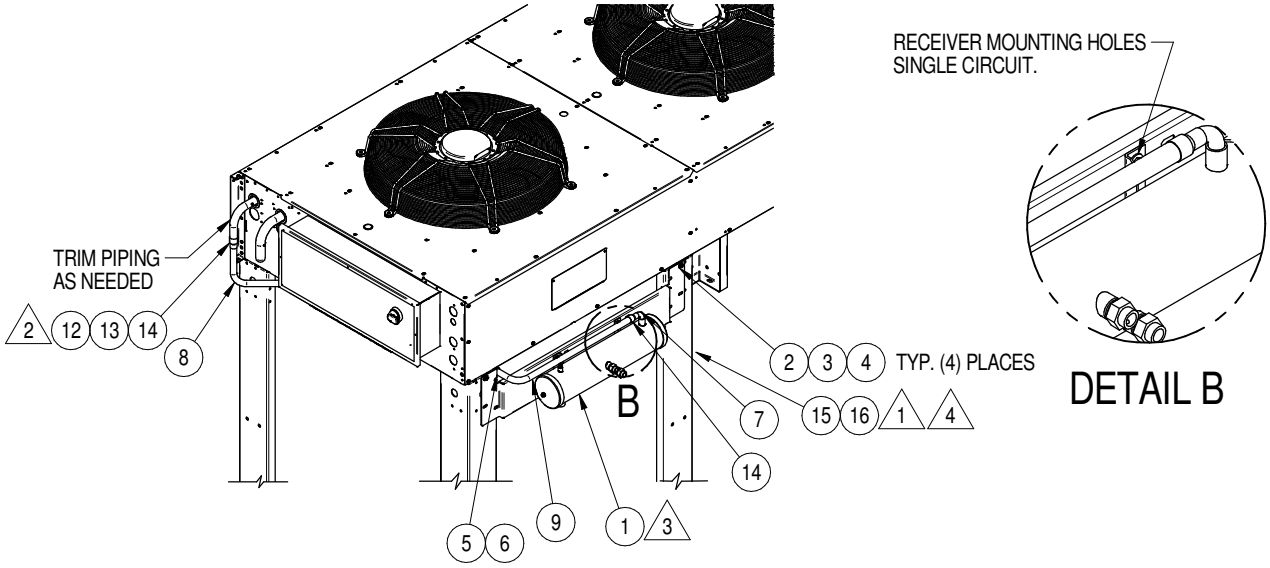
ITEM NO.	DESCRIPTION	QTY
1	RECEIVER AND BRACKET ASSEMBLY	1
2	CAP SCREW HXDIN933M8-1.25X25A2	8
3	FENDER WASHER DIN9021 M8X24 A2	12
4	LOCK NUT HEX NYL INSR M8	8
7	90° ELBOW FTGXFTG 7/8" CU	1
8	COPPER FORMED TUBE 1-1/8"	1
12	COUPLING CU 1-1/8"	1
13	REDUCER CU CXC 1-3/8"X1-1/8"	1
14	REDUCER CU CXC 1-1/8"X7/8"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

NOTES:

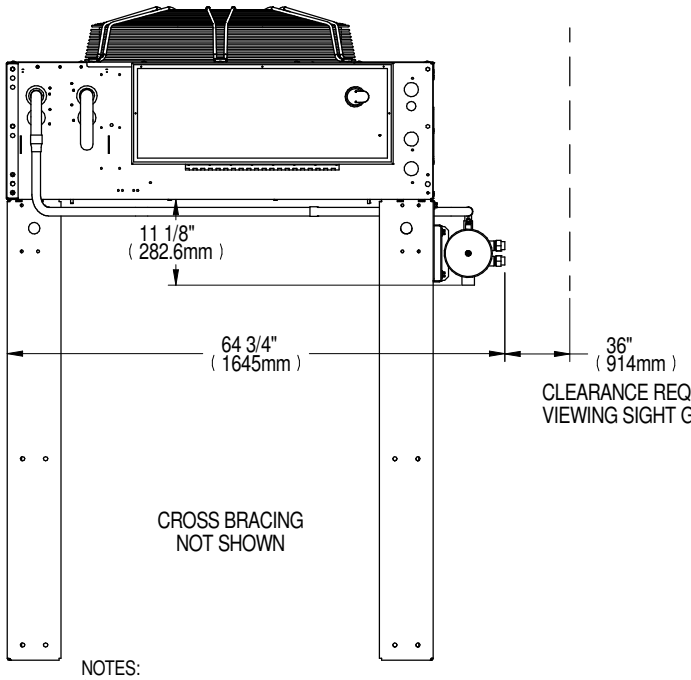
1. USE ITEMS 15 AND 16 AS NEEDED FOR MOUNTING OF ITEM 1.
2. ITEM 12 TO BE USED ON MCL110 & MCL165 UNITS.
   ITEM 13 TO BE USED ON MCL220 UNITS.
   ITEM 14 TO BE USED ON MCL055 UNITS.
3. SMALL RECEIVER SHOWN. ACTUAL RECEIVER SIZE MAY VARY.
4. RECEIVER LEG IS SAME HEIGHT AS OTHER LEGS AND NEEDS TO BE ANCHORED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

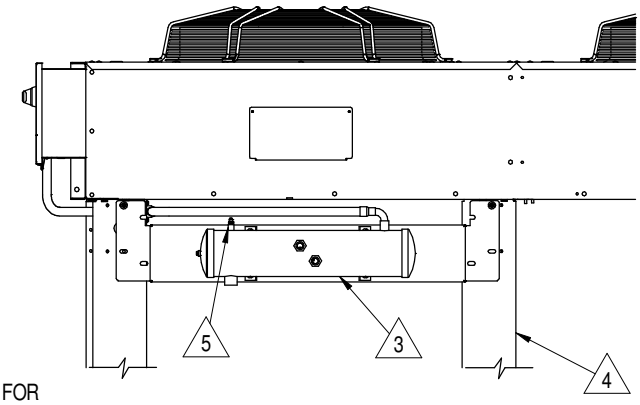
LIEBERT MC CONDENSER

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



DETAIL B





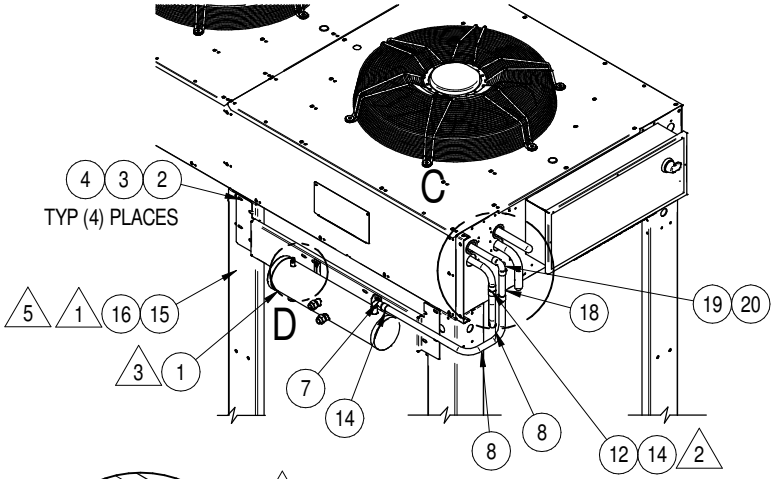
ITEM NO.	DESCRIPTION	QTY
1	RECEIVER AND BRACKET ASSEMBLY	1
2	CAP SCREW HXDIN933M8-1.25X25A2	8
3	FENDER WASHER DIN9021 M8X24 A2	12
4	LOCK NUT HEX NYL INSR M8	8
5	CLAMP OMEGA 7/8"	7
6	SCREW SD HWH YZ 10-16 X 5/8	2
7	90° ELBOW FTGXFTG 7/8" CU	1
8	COPPER FORMED TUBE 1-1/8"	1
9	COPPER FORMED TUBE 1-1/8"	2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

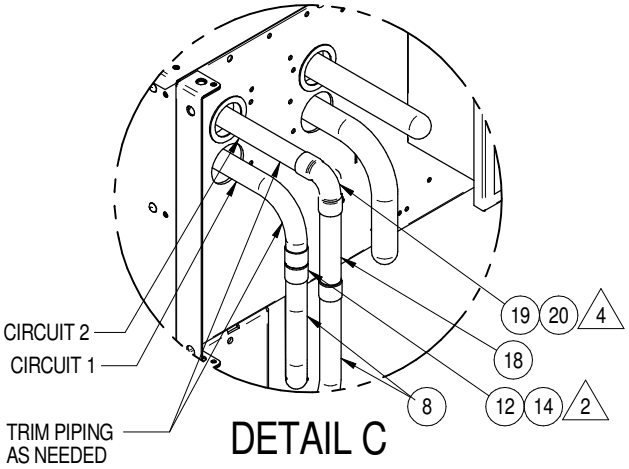
NOTES:

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.

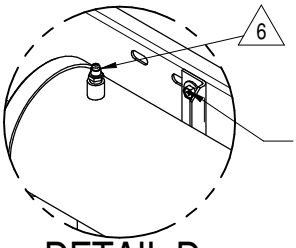
LIEBERT MC CONDENSER

DSE RECEIVER MOUNTING KITS
MCL110 & MCL220 DUAL CIRCUIT CONDENSER



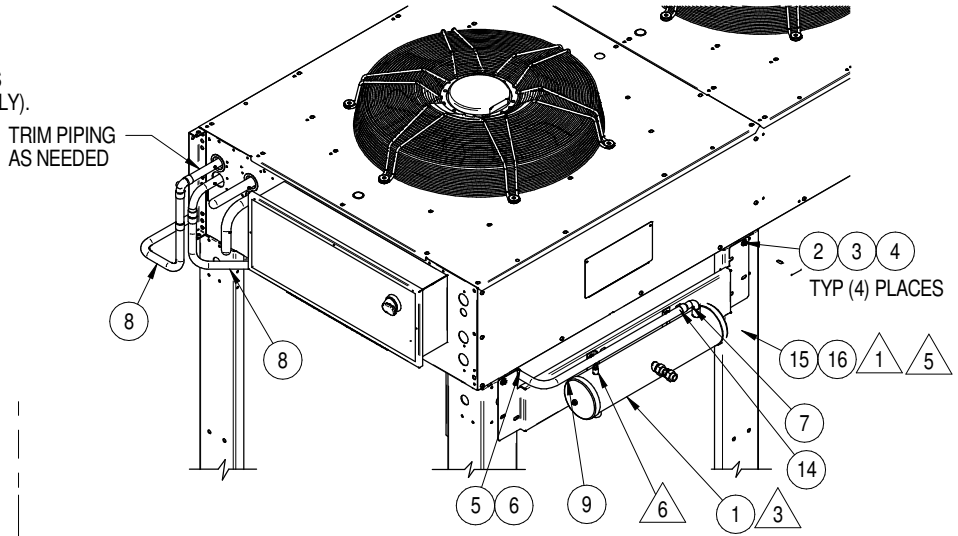


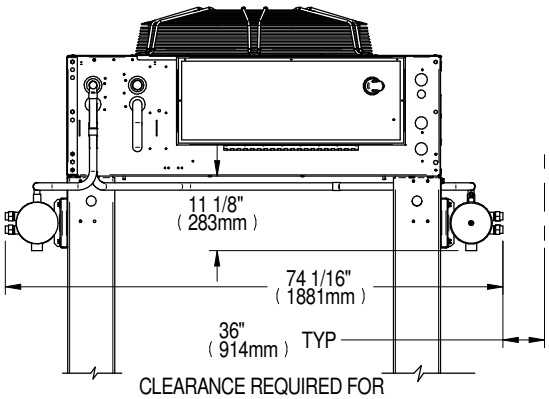
DETAIL C



RECEIVER MOUNTING HOLES
DUAL CIRCUIT (CIRCUIT 2 ONLY).

DETAIL D





CLEARANCE REQUIRED FOR
VIEWING SIGHT GLASS

CROSS BRACING
NOT SHOWN

NOTES:

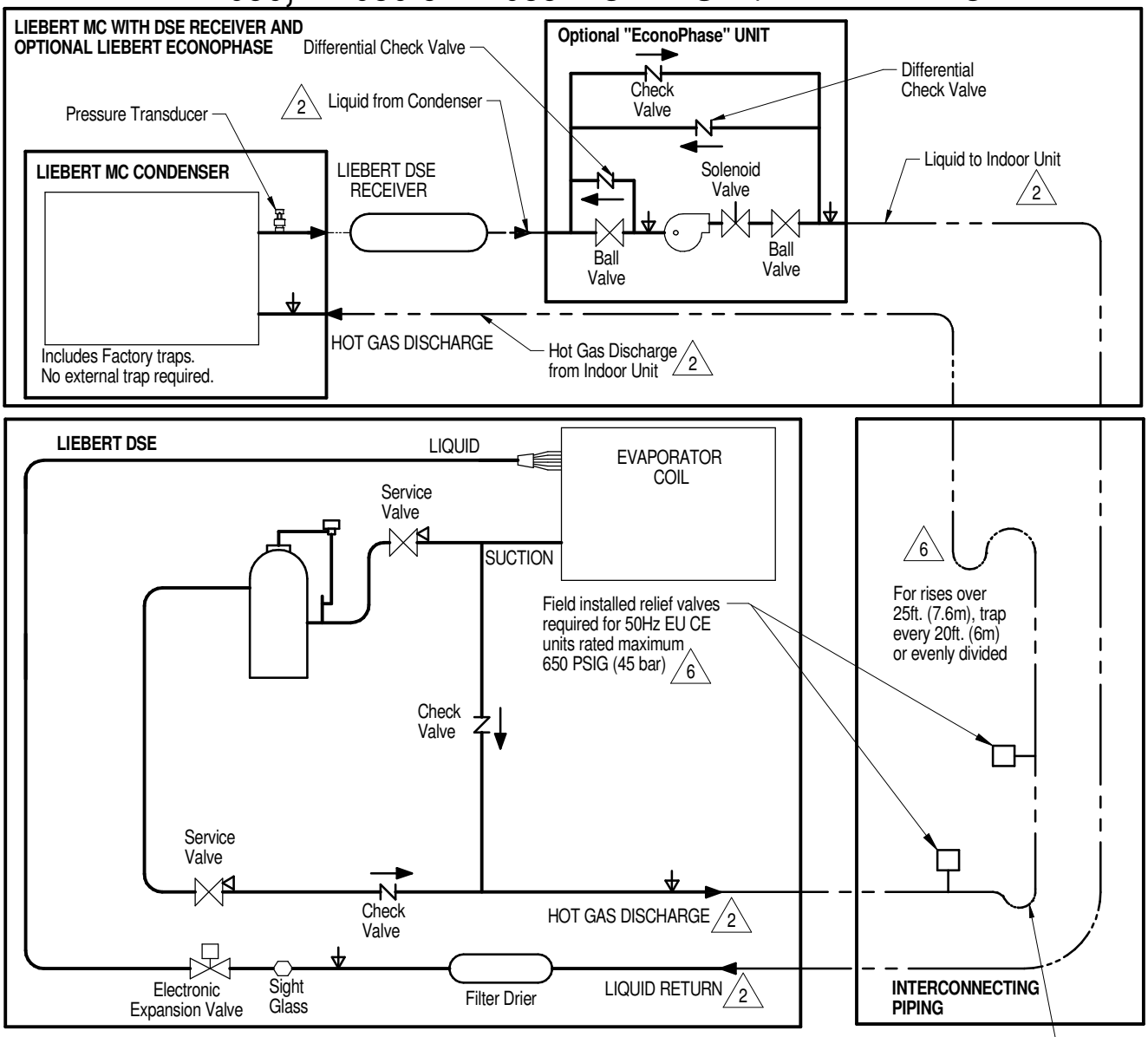
1. USE ITEMS 15 AND 16 AS NEEDED FOR MOUNTING OF ITEM 1.
2. ITEM 14 TO BE USED ON MCL110 UNITS.
   ITEM 12 TO BE USED ON MCL220 UNITS.
3. SMALL RECEIVER SHOWN. ACTUAL RECEIVER SIZE MAY VARY.
4. ITEM 20 TO BE USED ON MCL110 UNITS.
   ITEM 19 TO BE USED ON MCL220 UNITS.
5. RECEIVER LEG IS SAME HEIGHT AS 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 DSE

PIPING SCHEMATIC

DA050, DA080 & DA085 MODELS W/ LIEBERT MC

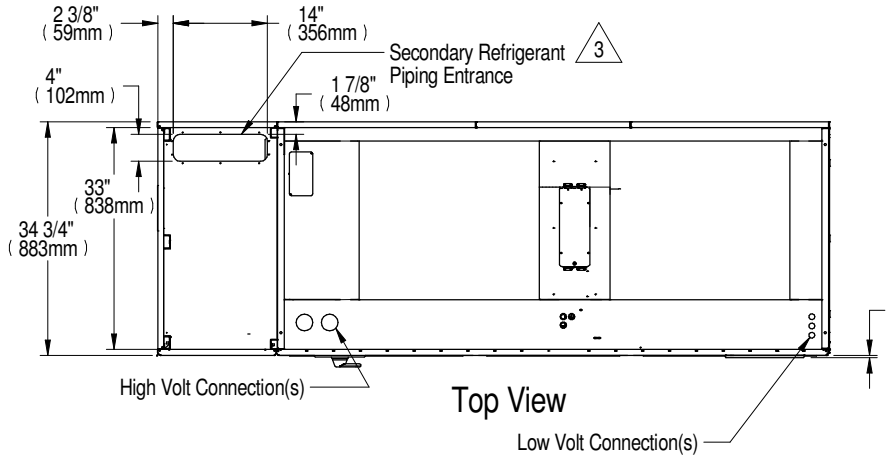


Notes:

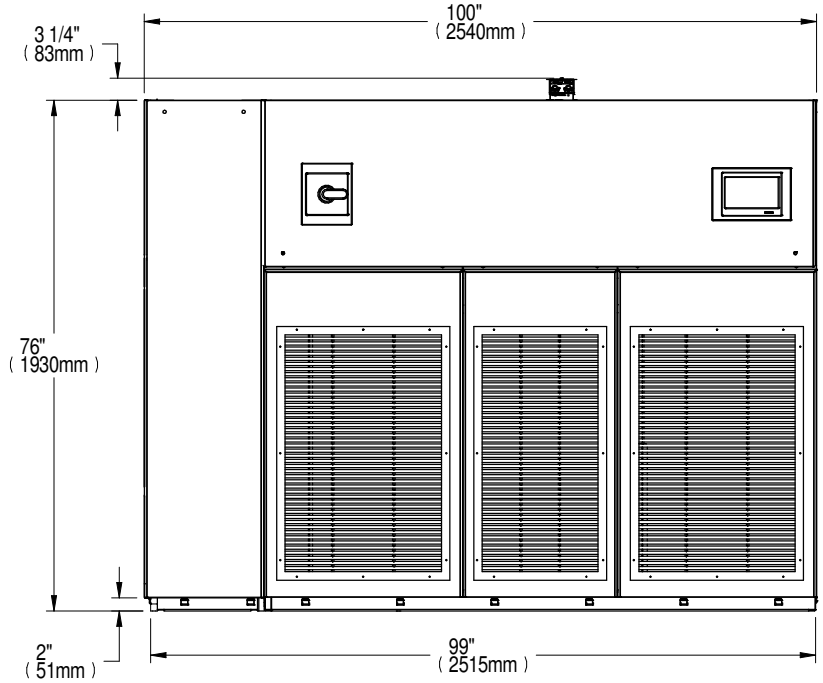
1. Two refrigeration circuits provided on DA080 & DA085. Single refrigeration circuit provided on DA050. Single refrigeration circuit shown for clarity.
2. Circuit 1 must be maintained between indoor unit, condenser and EconoPhase unit. Circuit 2 must be maintained between indoor unit, condenser and EconoPhase unit.
3. Schematic representation shown. Do not use for specific connection locations.
4. 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). Liebert DSE Receiver required for systems with or without EconoPhase unit.
5. All indoor and outdoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor insulation must be UV and ozone resistant.
6. Components are not supplied by Liebert but are required for proper circuit operation and maintenance.
7. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid flood back 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 refrigeration flow.
8. Do not isolate any refrigeration circuits from over pressurization protection.

LIEBERT DSE

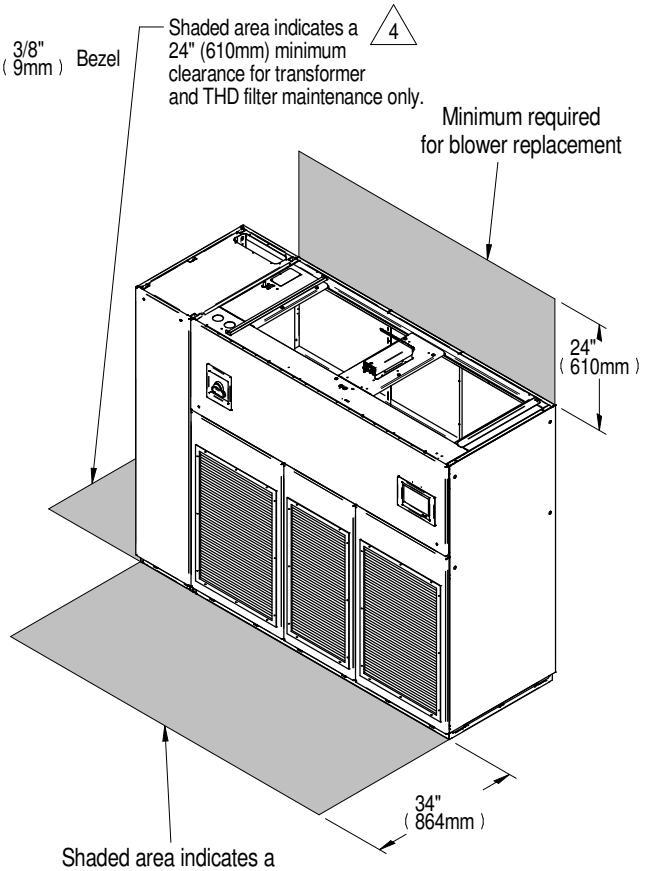
CABINET DIMENSIONAL DATA
UPFLOW DA080-DA085



Top View



Front View



Approximate Dry Weight lbs. (kg)
2150 (977) 2

Notes:
1. Front air return unit shown.

2. Fan weight not included in this unit weight. Fan is installed in Plenum. Add 120lbs. (54kg) for 575V Transformer.

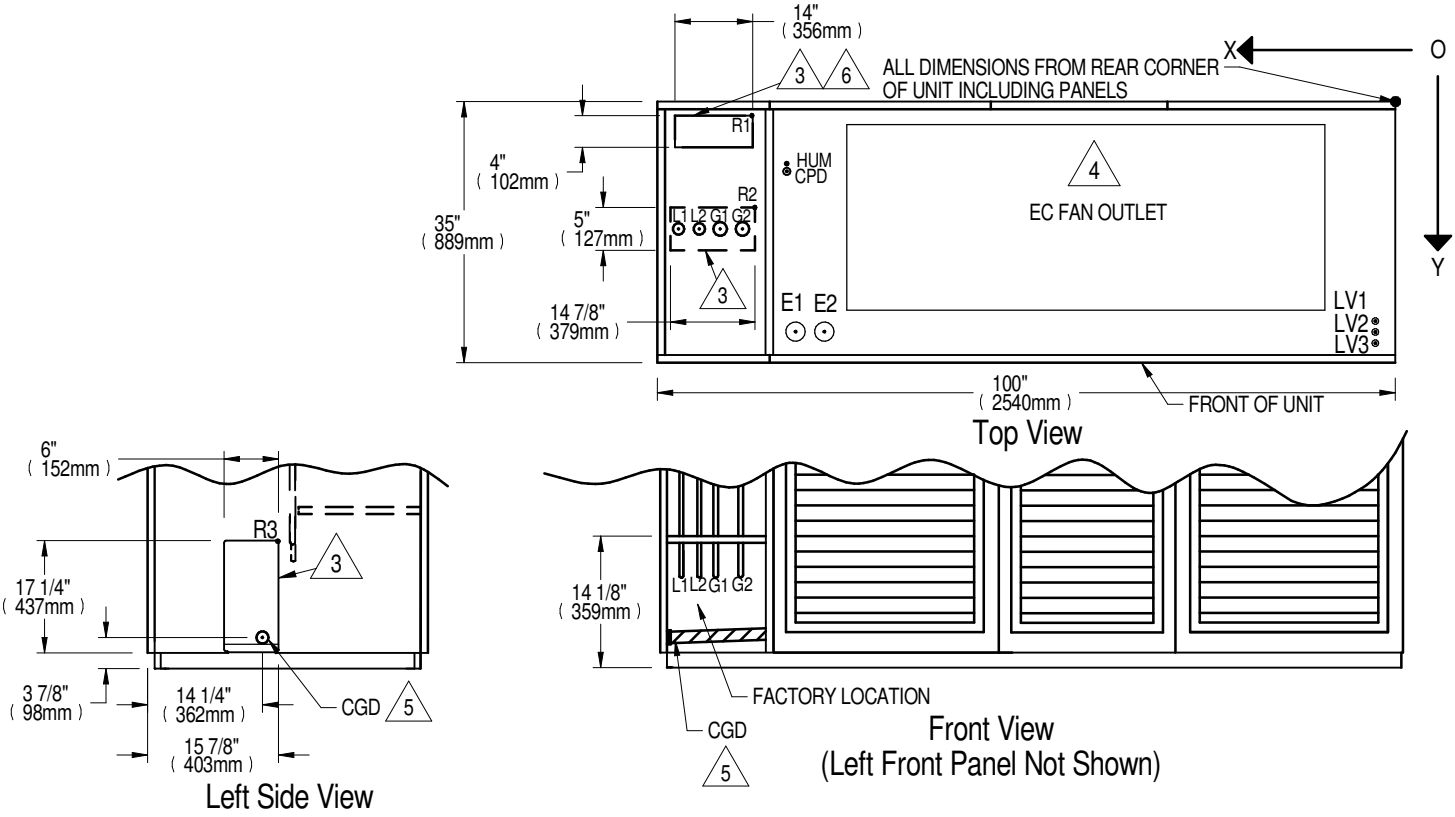
3. Secondary Refrigerant Piping Entrance not available with 575V.

4. Unit power must be off when performing transformer and THD filter maintenance.

LIEBERT DSE

PRIMARY CONNECTION LOCATIONS

UPFLOW DA08-DA085



POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
R1	SECONDARY REFRIGERANT ACCESS (TOP) 3	83-5/8 (2124)	1-7/8 (48)	15-7/16"(392mm) X 4" (102mm)
R2	REFRIGERANT ACCESS (BOTTOM) 3	82-15/16 (2106)	13-5/8 (346)	14-15/16" (379mm) X 5" (127mm)
R3	REFRIGERANT ACCESS (SIDE) 3	N/A		6" (152mm) X 17-3/16" (437mm)
L1	LIQUID LINE SYSTEM 1	94-9/16 (2402)	16-3/4 (425)	5/8" O.D. Cu
L2	LIQUID LINE SYSTEM 2	91-7/8 (2334)		
G1	HOT GAS DISCHARGE 1	88-7/8 (2257)	16-7/16 (418)	1-1/8" O.D. Cu
G2	HOT GAS DISCHARGE 2	85-5/8 (2175)		
CGD	CONDENSATE GRAVITY DRAIN 5	N/A		3/4" NPT Female
CPD	CONDENSATE PUMP DISCHARGE (OPT)	79-5/16 (2015)	11-7/8 (302)	1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE		9-7/8 (251)	1/4" O.D. Cu
E1	ELECTRICAL CONN. (HIGH VOLT)	78-1/8 (1984)	30 (762)	2-1/2"
E2		74-3/8 (1889)		
LV1	ELECTRICAL CONN. (LOW VOLT)	2-5/8 (66)	29-1/16 (738)	7/8"
LV2			30-7/16 (773)	
LV3			31-13/16 (808)	

Notes:
1. Drawing not to scale.
2. Tolerance on all piping dimensions is ± 1/2" (13mm).

3. Field routed alternatives for refrigerant gas and liquid line connection points.

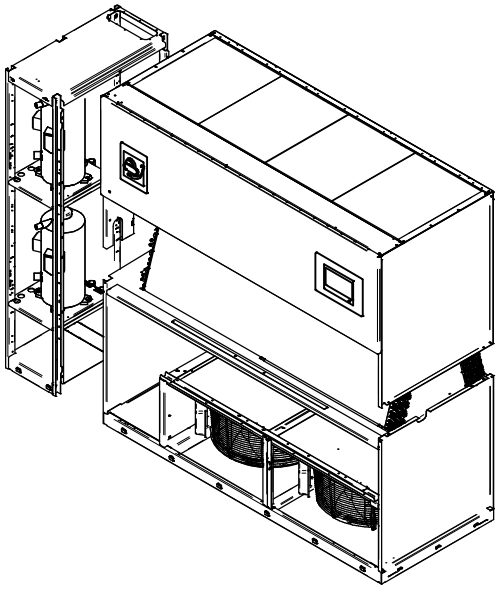
4. See submittal page DPN004084 for plenum dimensional data.

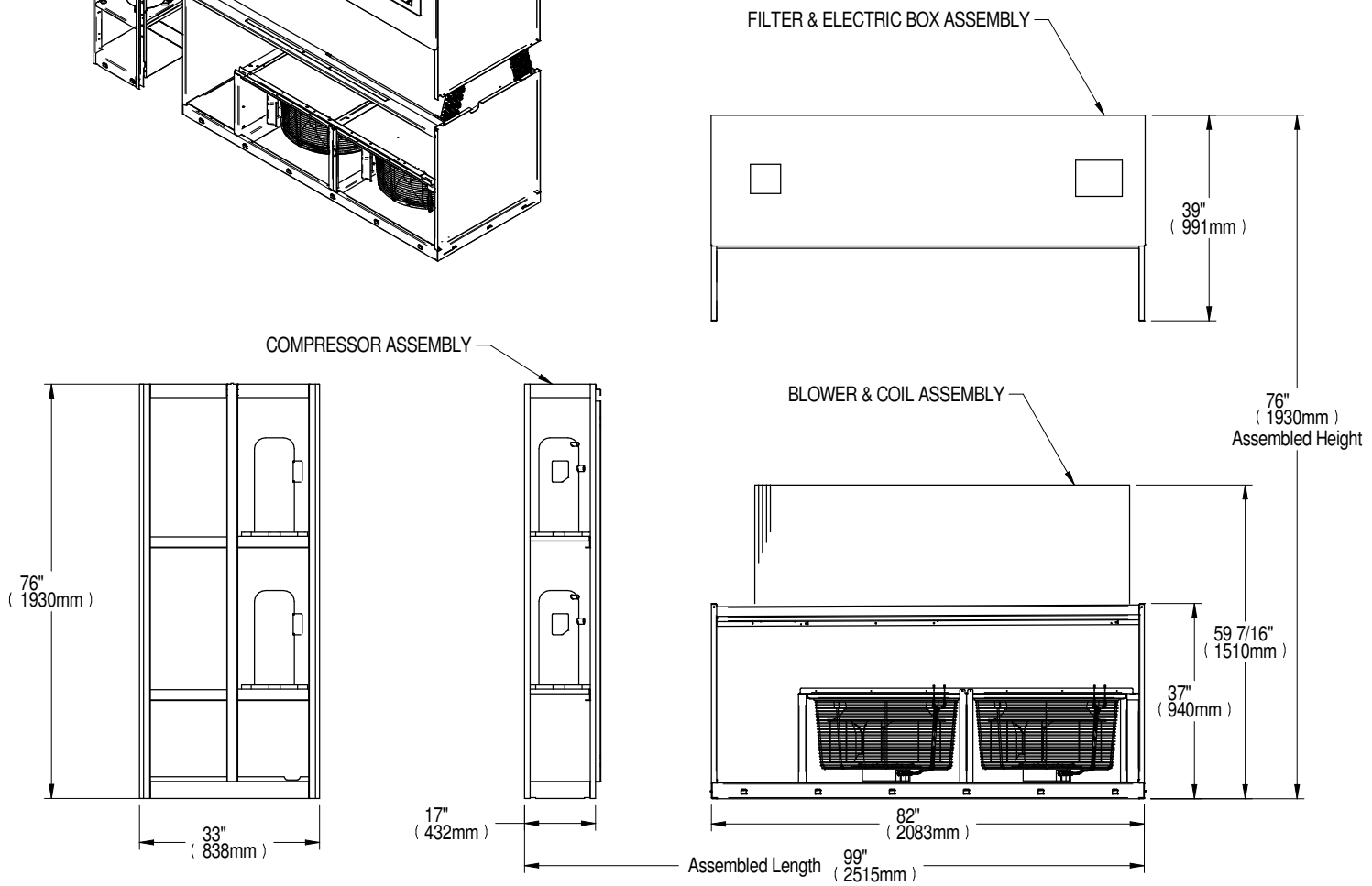
5. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with all local codes

6. Secondary Refrigerant Access (R1). Not available with 575V.

LIEBERT DSE

DISASSEMBLY DIMENSIONAL DATA
DOWNFLOW DA080-DA085





APPROXIMATE DRY WEIGHT lb (kg) (Includes Panels)	
COMPRESSOR ASSEMBLY	590 (269) 3
FILTER & ELECTRIC BOX ASSEMBL	250 (114)
BLOWER & COIL ASSEMBLY	1410 (641)

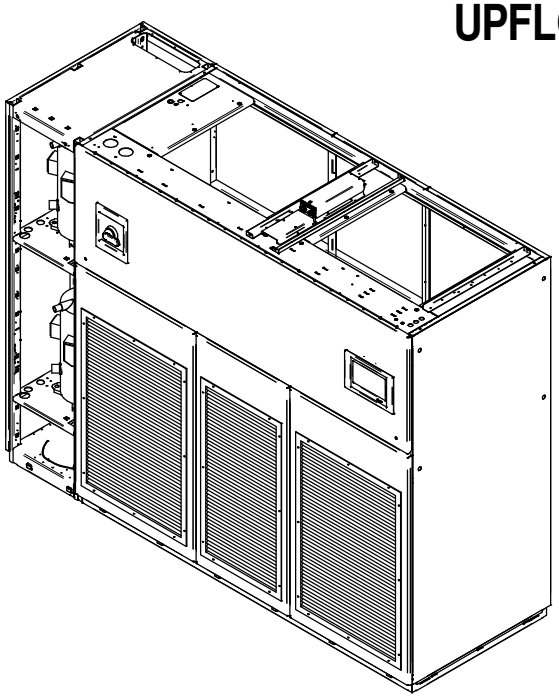
Notes:
1. Drawing views are simplified with panels removed to show over all dimensions.
2. See disassembly and handling instructions in installation manual.

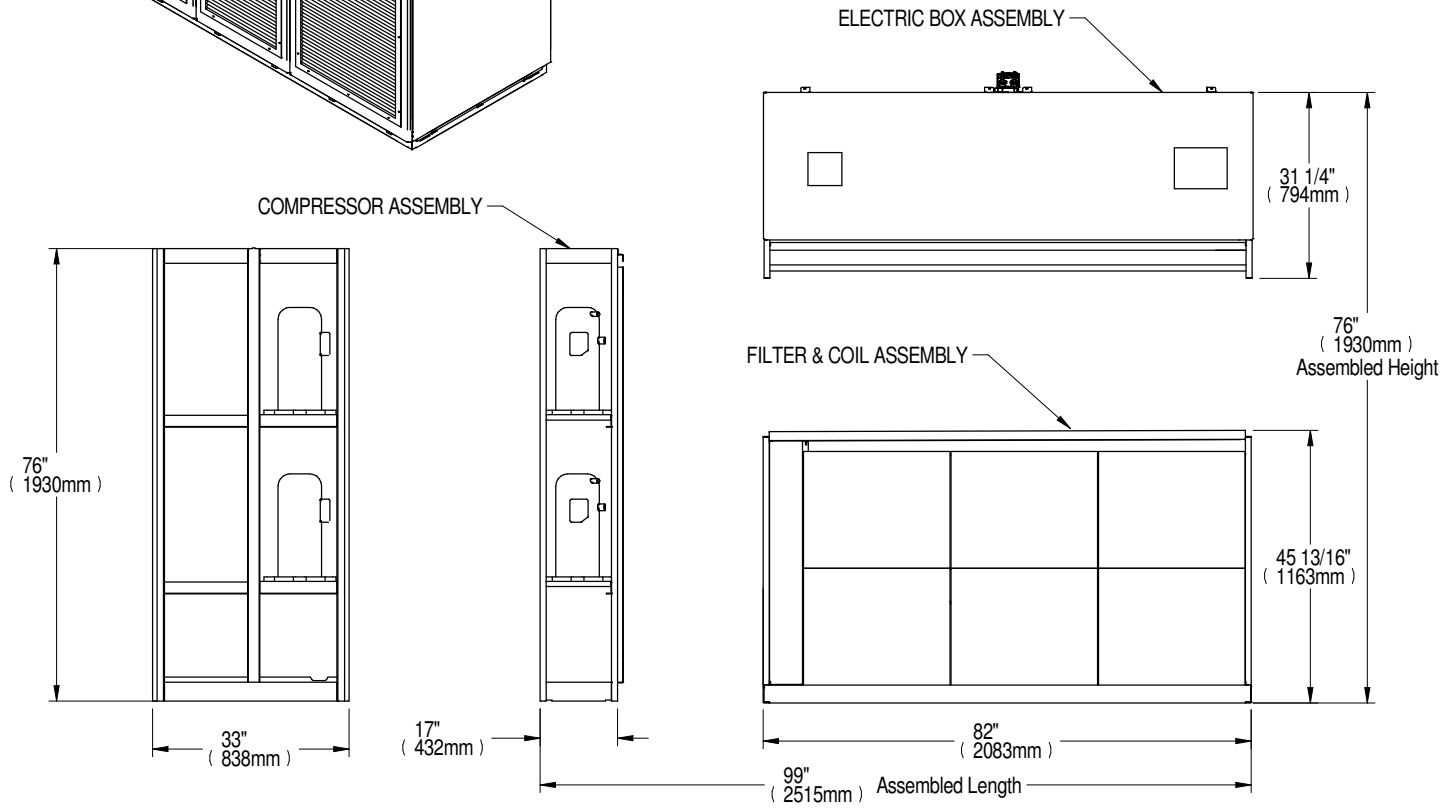
3. Add 120lbs. (54kg) for 575V Transformer.

LIEBERT DSE

DISASSEMBLY DIMENSIONAL DATA

UPFLOW DA080-DA085





APPROXIMATE DRY WEIGHT lb (kg) (Includes Panels) 3	
COMPRESSOR ASSEMBLY	590 (269) 4
ELECTRIC BOX ASSEMBLY	600 (272)
FILTER & COIL ASSEMBLY	960 (436)

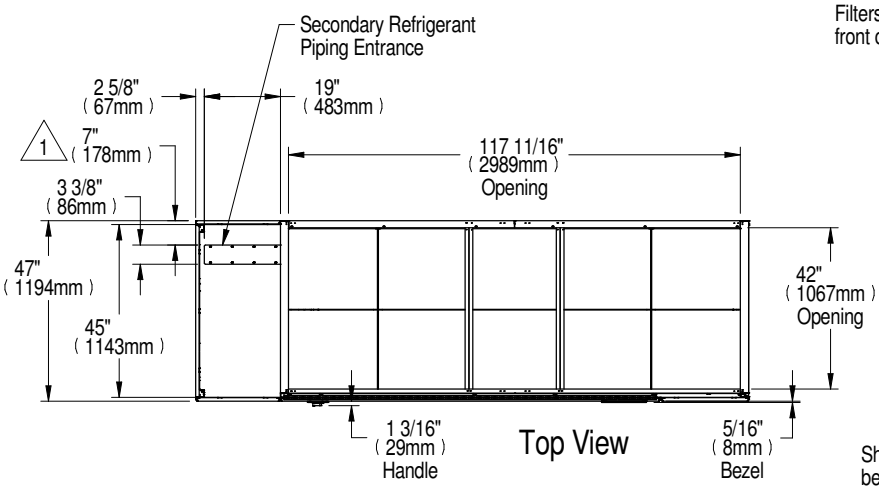
Notes:
1. Drawing views are simplified with panels removed to show overall dimensions.
2. See disassembly and handling instructions in installation manual.

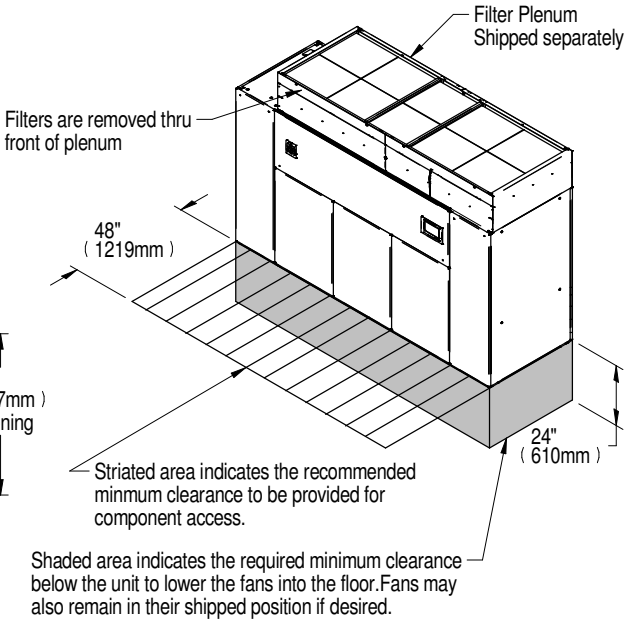
3. Fan weight not included in this unit weight. Fan is installed in plenum.

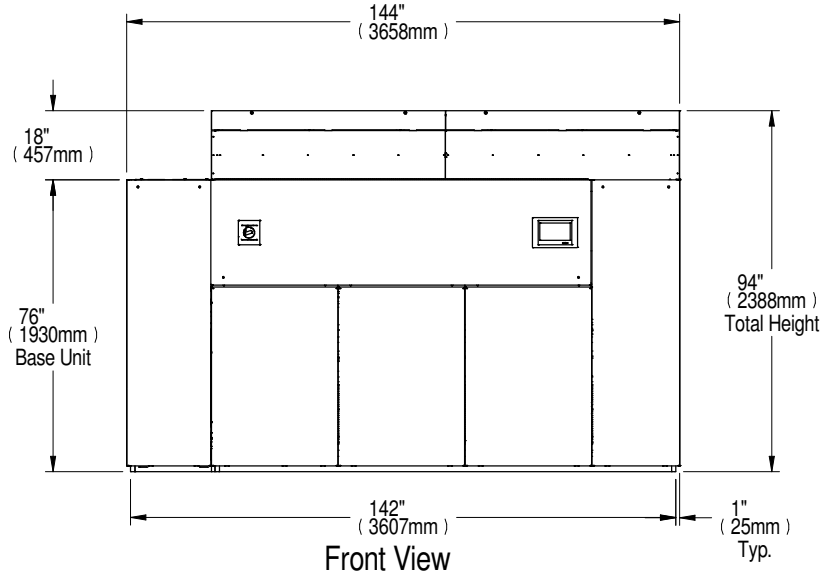
4. Add 120lbs. (54kg) for 575V Transformer.

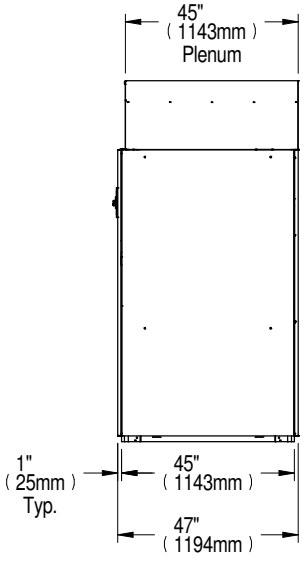
LIEBERT DSE

CABINET DIMENSIONAL DATA
DOWNFLOW AIR COOLED DA125, DA150 & DA165 MODELS









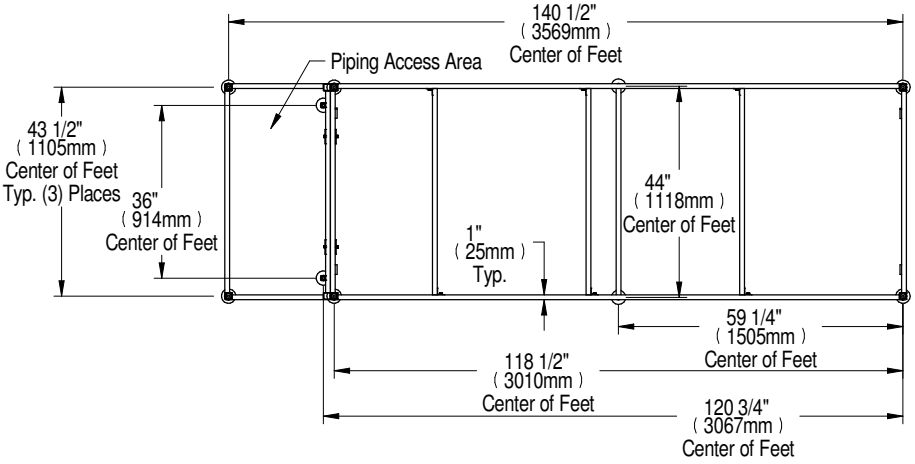
Model No.	Approximate Dry Weight lb(kg)
DA125	3465 (1572)
DA150/DA165	3574 (1621)

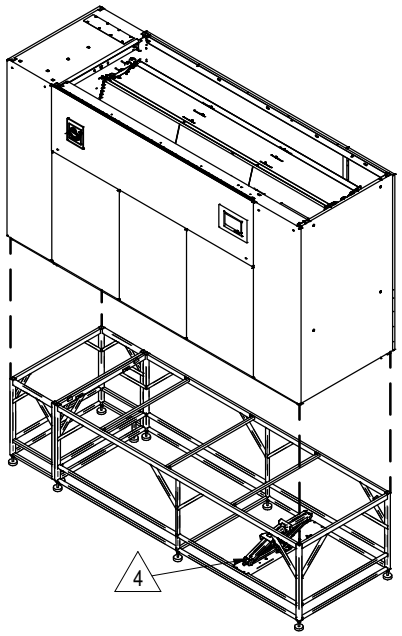
Notes:

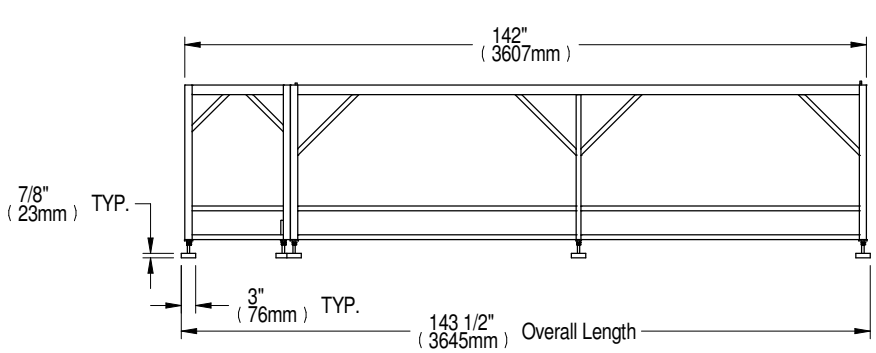
1. 7" for DA125, 4" for DA150 & DA165.

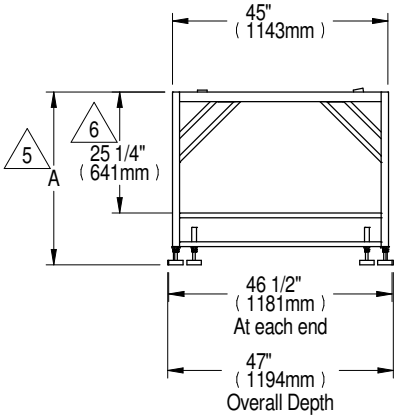
LIEBERT DSE

FLOORSTAND DIMENSIONAL DATA
DOWNFLOW AIR COOLED DA125, DA150 & DA165 MODELS









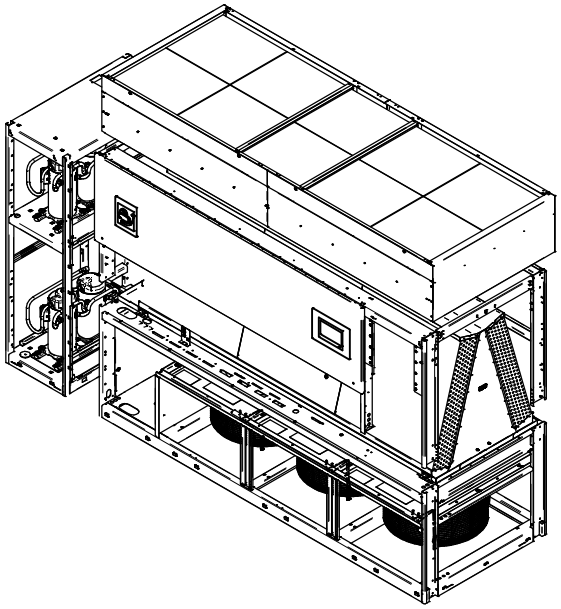
Notes:

1. This floorstand should be used when EC fans are intended to be lowered under a raised floor. 24-48" floorstands allow fan to be lowered under the raised floor.
2. All paneled sides of unit overhang floorstand 1" (25mm).
3. The floorstand used with EC units is not symmetrical and proper orientation required for lowering the blowers. Unless the floor stand is installed in the correct position, the blowers will not lower into the floorstand.
4. Jack and jack support are shipped loose and are intended to be placed into position under each fan and utilized to lower or raise that fan as needed individually.
5. Leveling feet are provided with ±1-1/2" (38mm) adjustment from nominal height "A".
6. Applies to 36", 42", & 48" Floorstands.
7. 7" Floorstands can only be used with downflow units with front or rear discharge.
8. Fans may be lowered into 18" floor, however this application does not allow for the use of a factory provided floor jack. Other methods of raising/lowering fans must be employed for raised floors less than 24".

Height in. (mm)
A 5
7 (178) 7
18 (457) 8
24 (610)
30 (762)
36 (914)
42 (1067)
48 (1219)

LIEBERT DSE

DISASSEMBLY DIMENSIONAL DATA
DOWNFLOW AIR COOLED DA125, DA150 & DA165

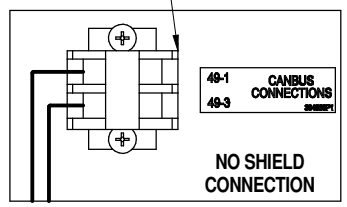


DRY WEIGHT lb(kg) APPROXIMATE (Includes Panels)		
	DA125	DA150/DA165
COMPRESSOR ASSEMBLY	630 (286)	739 (335)
ELECTRIC BOX ASSEMBLY	417 (189)	417 (189)
BLOWER & COIL ASSEMBLY	2218 (1006)	2218 (1006)
FILTER ASSEMBLY	200 (91)	200 (91)

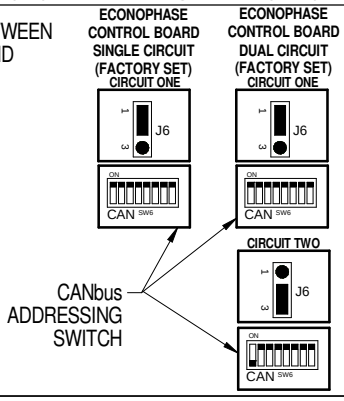
NOTE: Drawing views are simplified with panels removed to show over all dimensions.
See disassembly and handling instructions in installation manual.

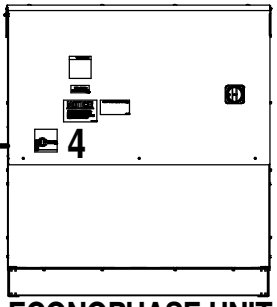
LIEBERT DSE

CANbus & INTERLOCK COMMUNICATIONS
USING 1 LIEBERT MC CONDENSER & OPTIONAL ECONOPHASE UNIT

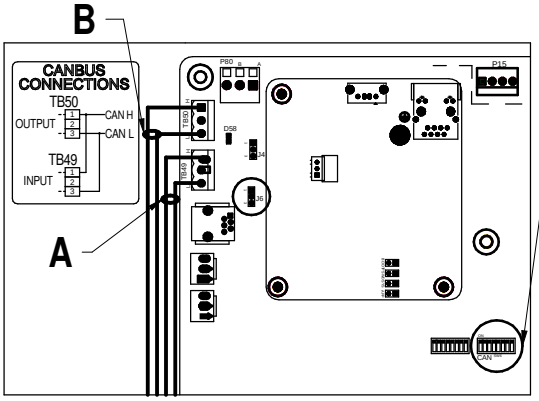


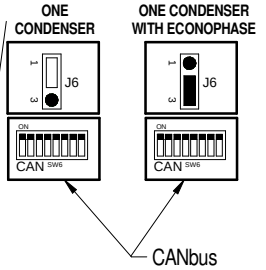
DETAIL 4
CAN CABLE CONNECTION (B)





ECONOPHASE UNIT
LAST DEVICE ON CANBUS (IF PRESENT)

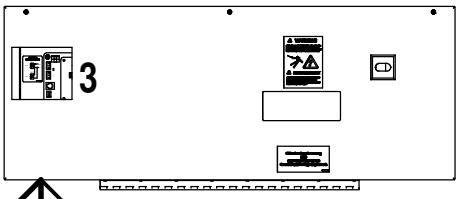


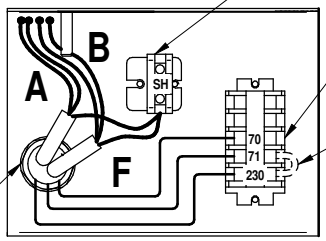


DETAIL 3
CAN CABLE CONNECTION (A) (B)

B CANBUS COMMUNICATION CABLE

CONDENSER



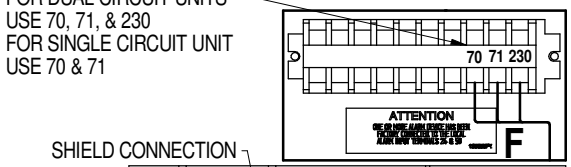


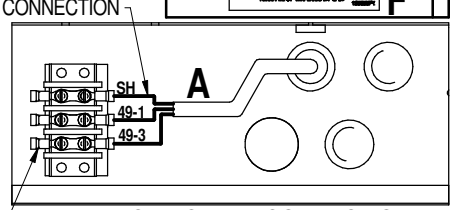
HEAT REJECTION INTERLOCK (F)

F HEAT REJECTION INTERLOCK WIRE

DETAIL 2
HEAT REJECTION INTERLOCK (F)

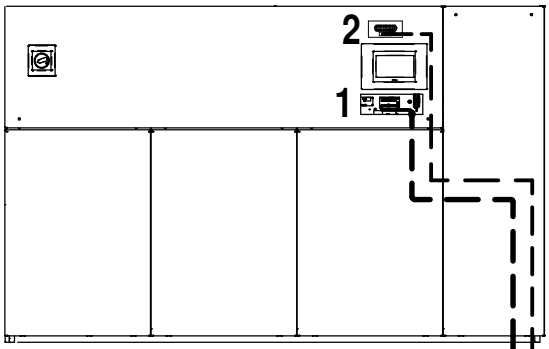
A CANBUS COMMUNICATION CABLE





DETAIL 1 CAN CABLE CONNECTION (A)

FACTORY WIRING BETWEEN ICOM AND TERMINAL STRIP.



INDOOR DSE UNIT

CANbus & INTERLOCK COMMUNICATIONS
USING 1 LIEBERT MC CONDENSER & OPTIONAL ECONOPHASE UNIT

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

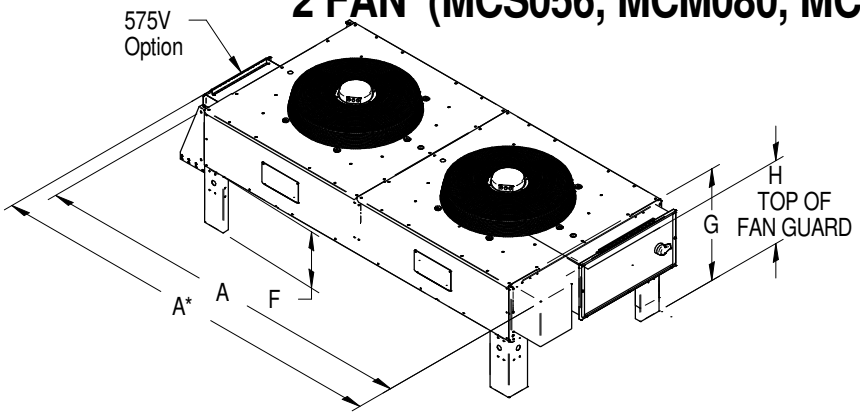
CAN & CABLE NOTES (A, B):
1. CABLE MUSTHAVE THE FOLLOWING SPECIFICATIONS:
   - BRAIDED SHIELD OR FOIL SHIELD WITH DRAIN WIRE
   - SHIELD MUST BE WIRED TO GROUND AT INDOOR UNIT
   - 22-18AWG STRANDED TINNED COPPER
   - TWISTED PAIR (MINIMUM 4 TWISTS PER FOOT)
   - LOW CAPACITANCE (15pF/FT OR LESS)
   - 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 LIEBERT FACTORY.

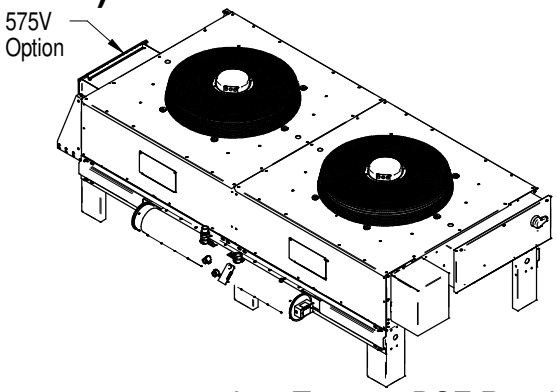
INTERLOCK WIRE NOTES (F):
1. FIELD SUPPLIED WIRE
   - 2 CONDUCTOR 18AWG OR GREATER FOR SINGLE REFRIGERANT CIRCUIT DSE UNITS.
   - 3 CONDUCTOR 18AWG OR GREATER FOR DUAL REFRIGERANT CIRCUIT DSE UNITS.
   - RATED 600V
2. RUN FIELD SUPPLIED WIRES BETWEEN THE INDOOR UNIT AND THE CONDENSER.

LIEBERT MC CONDENSER

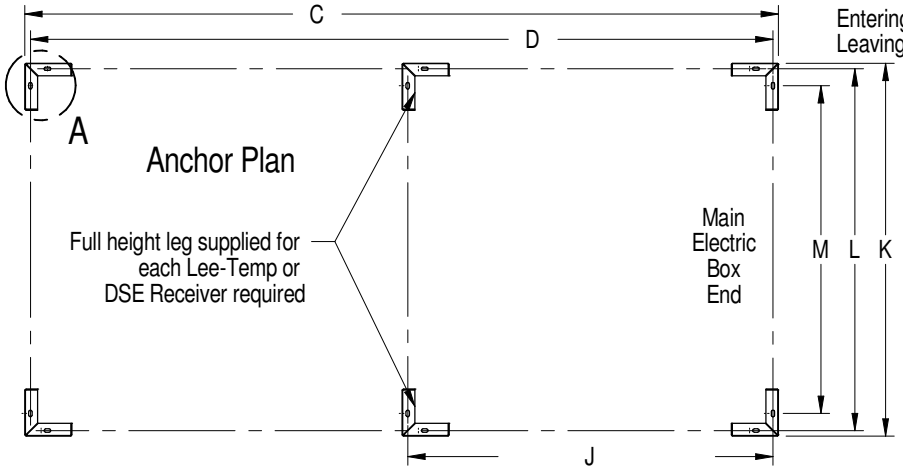
CABINET & ANCHOR DIMENSIONAL DATA

2 FAN (MCS056, MCM080, MCL110) DUAL CIRCUIT

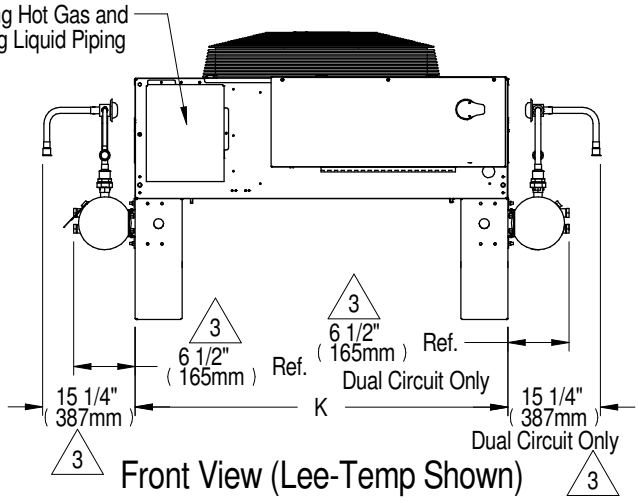




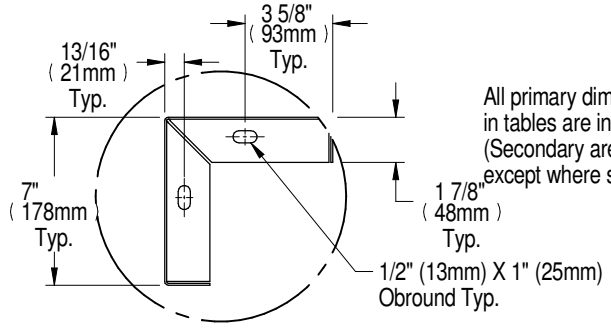
Lee-Temp or DSE Receiver



Left Side of Unit



Front View (Lee-Temp Shown)



DETAIL A
Typical All Legs

All primary dimensions in tables are in inches (Secondary are in mm) except where specified

LIEBERT MODEL NUMBER	F 2 (LEG HEIGHT DIMENSIONS)			
MCS056 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)

LIEBERT MODEL NUMBER	A	A* (575V ONLY)	C	D	J Lee-Temp or DSE Receivers Only	K	L	M
MCS056	94-7/8 (2411)	103-1/8 (2619)	88-3/8 (2245)	86-3/4 (2203)	42-1/2 (1079)	42-1/2 (1080)	40-7/8 (1038)	35-7/8 (910)
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)

Note:

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

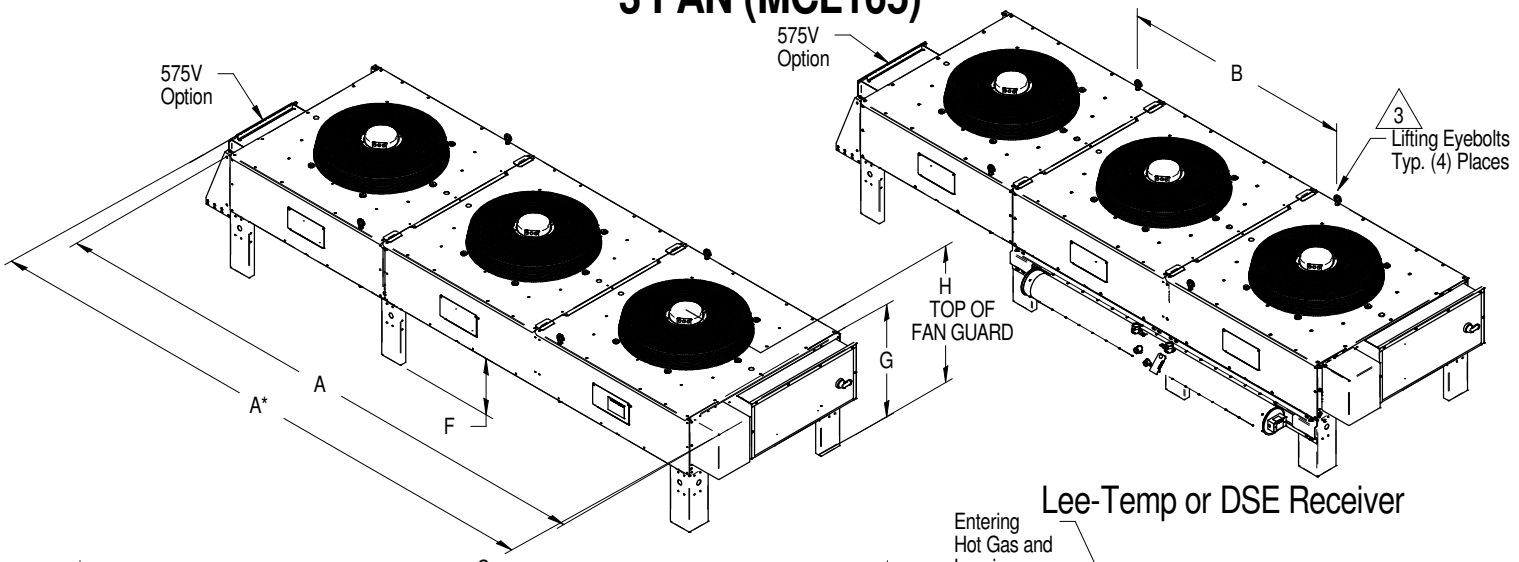
2 **Cross bracing required for legs longer than 18" (457mm). Quantity varies per model & options selected.**

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

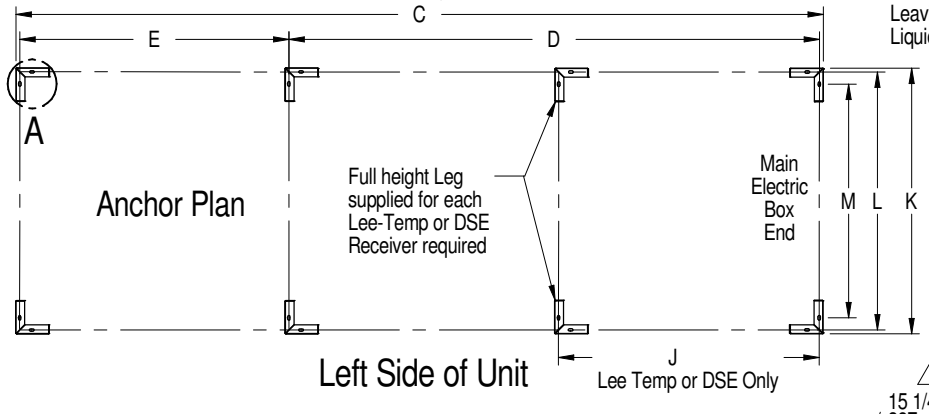
LIEBERT MC CONDENSER

CABINET & ANCHOR DIMENSIONAL DATA

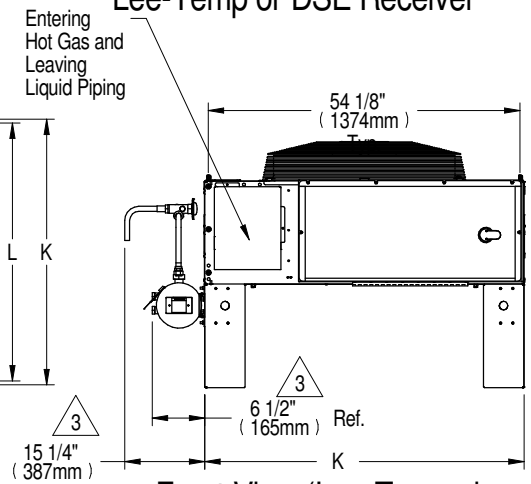
3 FAN (MCL165)



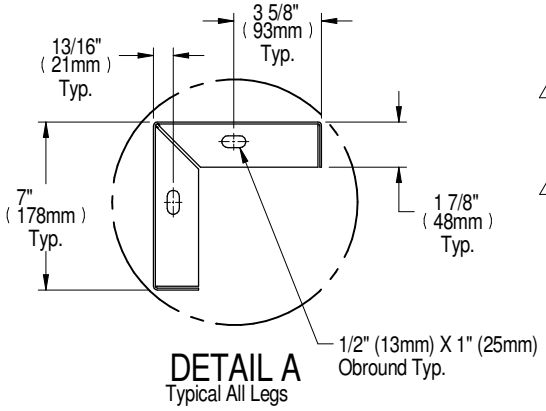
Lee-Temp or DSE Receiver



Left Side of Unit



Front View (Lee-Temp shown)



DETAIL A
Typical All Legs

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

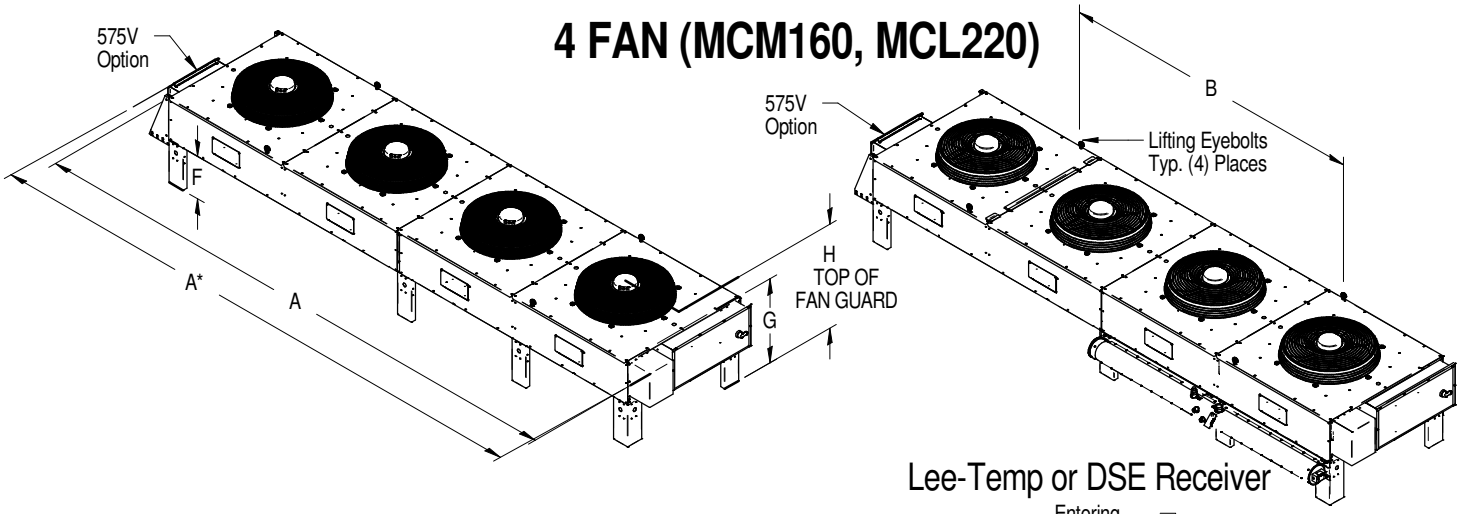
LIEBERT MODEL NUMBER	F 2 LEG HEIGHT DIMENSIONS in. (mm)			
MCL165	18 (457)	36 (914)	48 (1219)	60 (1524)
DIM "G"	35-7/8 (911)	53-7/8 (1368)	65-7/8 (1673)	77-7/8 (1978)
DIM "H"	43-5/8 (1108)	61-5/8 (1565)	73-5/8 (1870)	85-5/8 (2175)

Dimensions in. (mm)										
LIEBERT MODEL NUMBER	A	A* (575V ONLY)	B	C	D	E	J Lee-Temp or DSE Reciever	K	L	M
MCL165	180-1/4 (4578)	189-1/4 (4807)	73-7/16 (1866)	168-1/4 (4274)	110-1/2 (2806)	56-1/8 (1425)	54-3/8 (1381)	55-1/2 (1410)	53-7/8 (1368)	48-3/4 (1238)

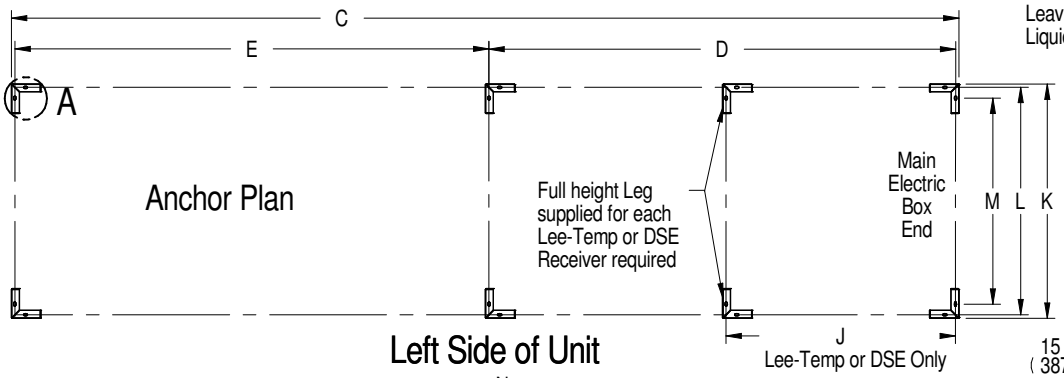
LIEBERT MC CONDENSER

CABINET & ANCHOR DIMENSIONAL DATA

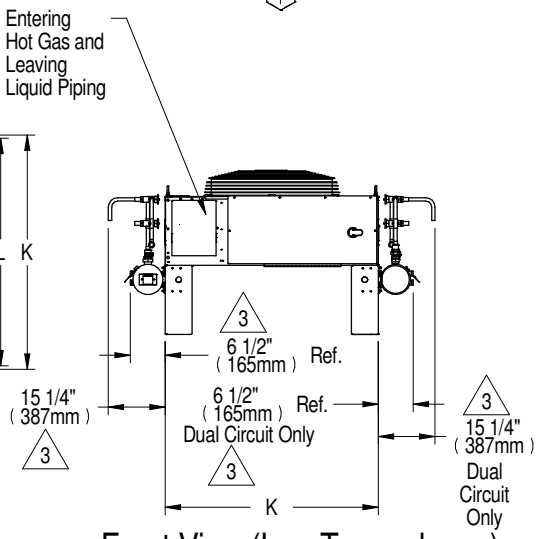
4 FAN (MCM160, MCL220)



Lee-Temp or DSE Receiver



Left Side of Unit

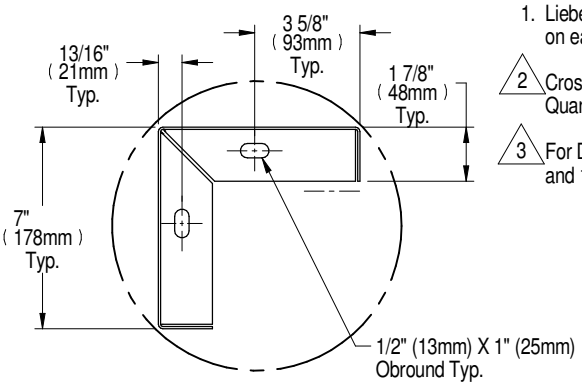


Front View (Lee-Temp shown)

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



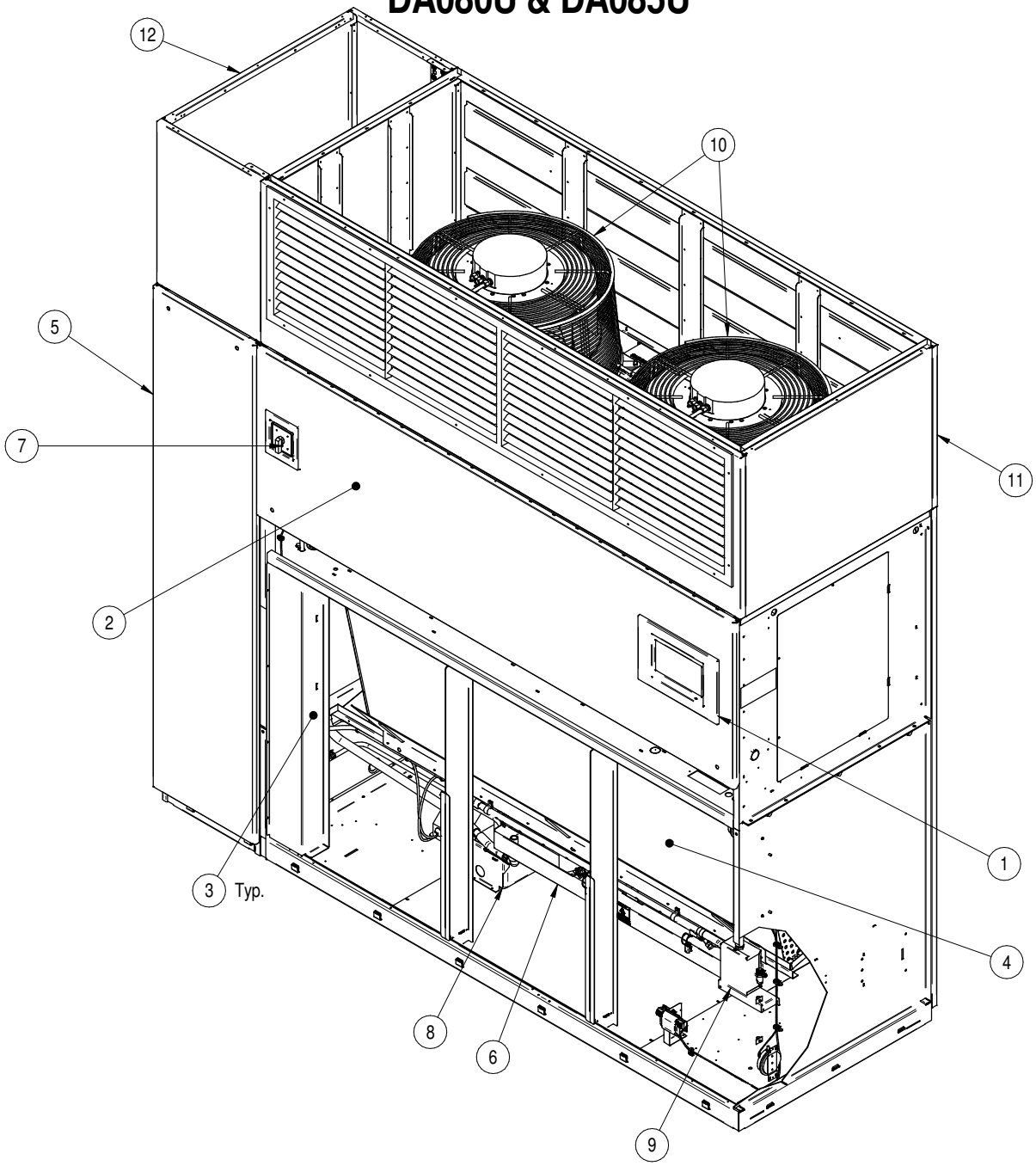
DETAIL A
Typical all legs

LIEBERT MODEL NUMBER	F △2 LEG HEIGHT DIMENSIONS in. (mm)			
	18 (457)	36 (914)	48 (1219)	60 (1524)
MCM160				
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)
MCL220				
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)

Dimensions in. (mm)										
LIEBERT MODEL NUMBER	A	A* (575V ONLY)	B	C	D	E	J Lee-Temp or DSE Receiver Only	K	L	M
MCM160	202-7/16 (5142)	210-5/8 (5350)	113-1/2 (2883)	192-1/4 (4883)	94-7/16 (2398)	96-3/16 (2444)	46-5/16 (1177)	46 (1168)	44-3/8 (1127)	39-5/16 (999)
MCL220	236-5/16 (6003)	245-5/16 (6231)	129-9/16 (3291)	224-3/8 (5699)	110-1/2 (2806)	112-1/4 (2851)	54-3/8 (1381)	55-1/2 (1410)	53-7/8 (1368)	48-3/4 (1238)

COMPONENT LOCATION DIAGRAM

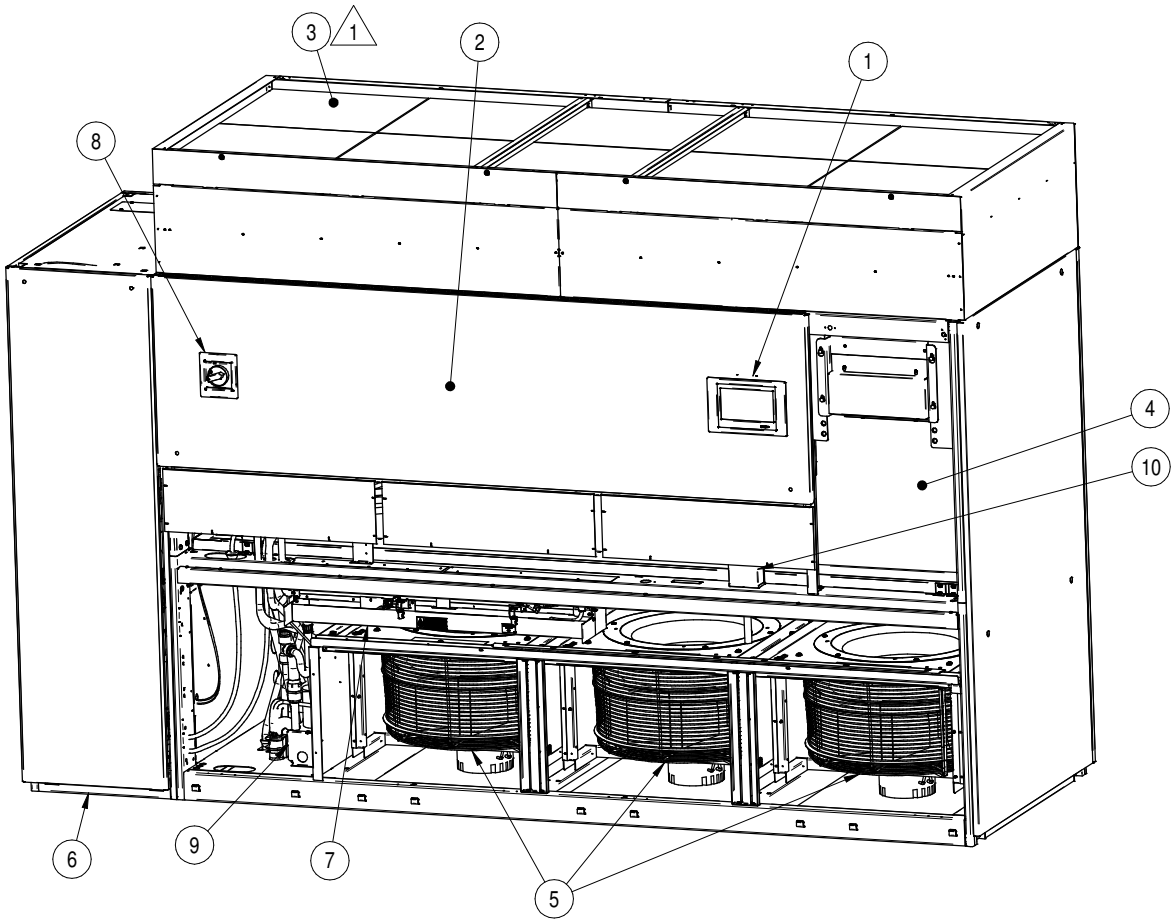
DA080U & DA085U



1. iCOM Control Display
2. Electric Box
3. Filters (not shown for clarity)
4. Evaporator Coil
5. Compressor Section
6. Infrared Humidifier (optional)
7. Disconnect
8. Condensate Pump (optional)
9. Smoke Sensor (optional)
10. EC Fans
11. Plenum (Front Discharge shown)
12. Compressor Section Plenum (optional, ordered separately)

LIEBERT DSE

COMPONENT LOCATION DIAGRAM
DA050 - DA165



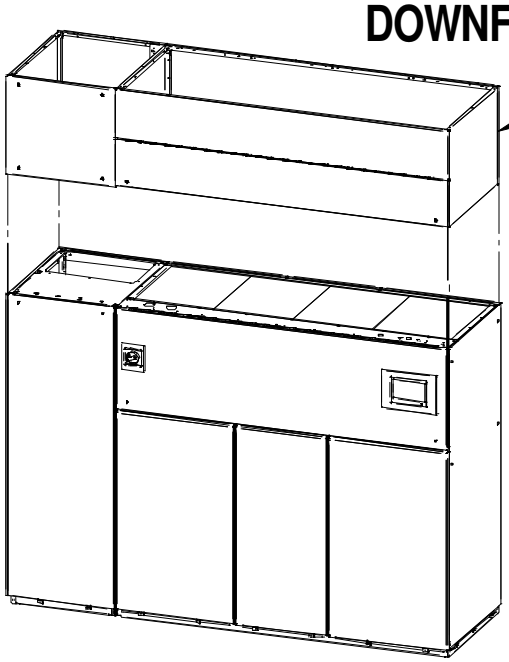
1. iCOM Control Display
2. Electric Box
1 3. Filter Plenum (not shipped with unit)
4. Evaporator Coil
5. Fan Modules
6. Compressor Section
7. Infrared Humidifier (optional)
8. Disconnect (optional)
9. Condensate Pump (optional)
10. Smoke Sensor (optional)

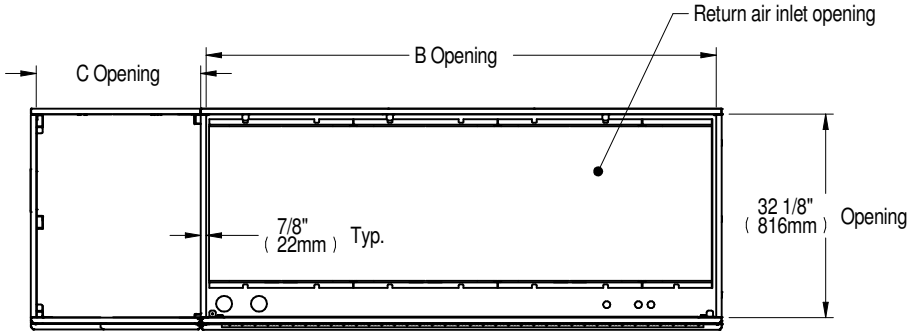
Notes:

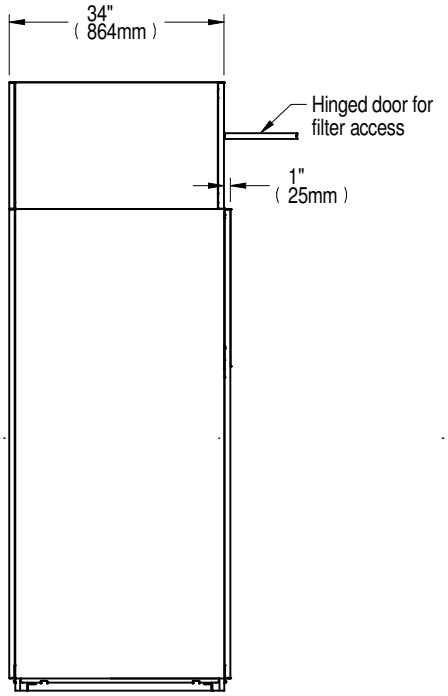
1. Filter Plenum not available on DA050/080/085 units.
2. DA050/080/085 filters are located above the Electric Panel and can be accessed from the front of the unit.

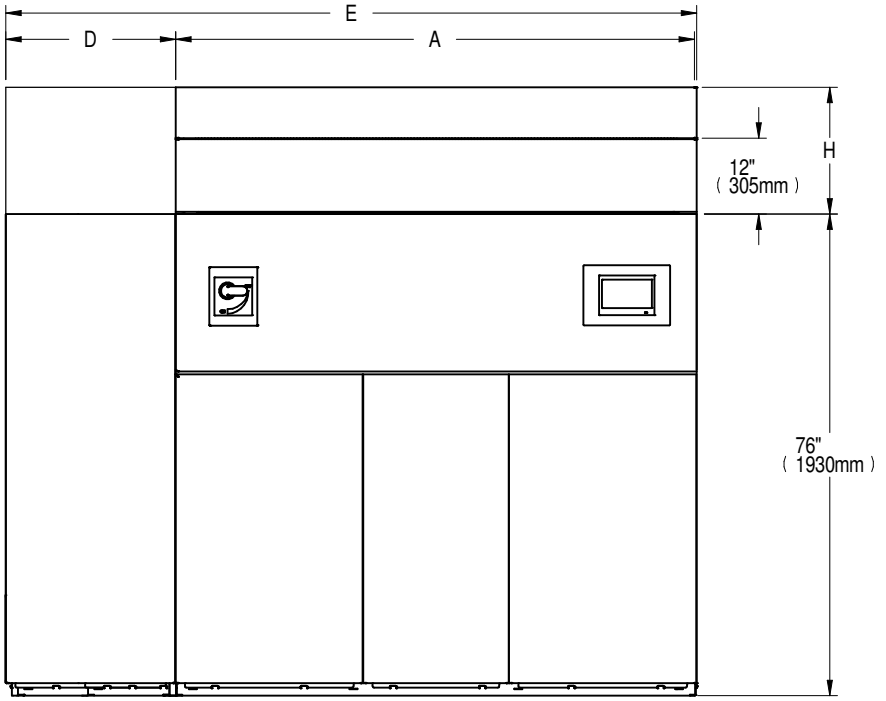
LIEBERT DSE

PLENUM DIMENSIONAL DATA
DOWNFLOW DA050-DA085 MODELS









Plenum Dimensional Data in (mm)					
	A	B	C	D	E
DA080-DA085 Digital Scroll Models	82-1/4 (2089)	80-1/2 (2045)	16-15/16 (430)	17-13/16 (452)	100-1/16 (2542)
DA050 Digital Scroll Models	59-1/4 (1505)	57-1/2 (1461)			77-1/16 (1957)

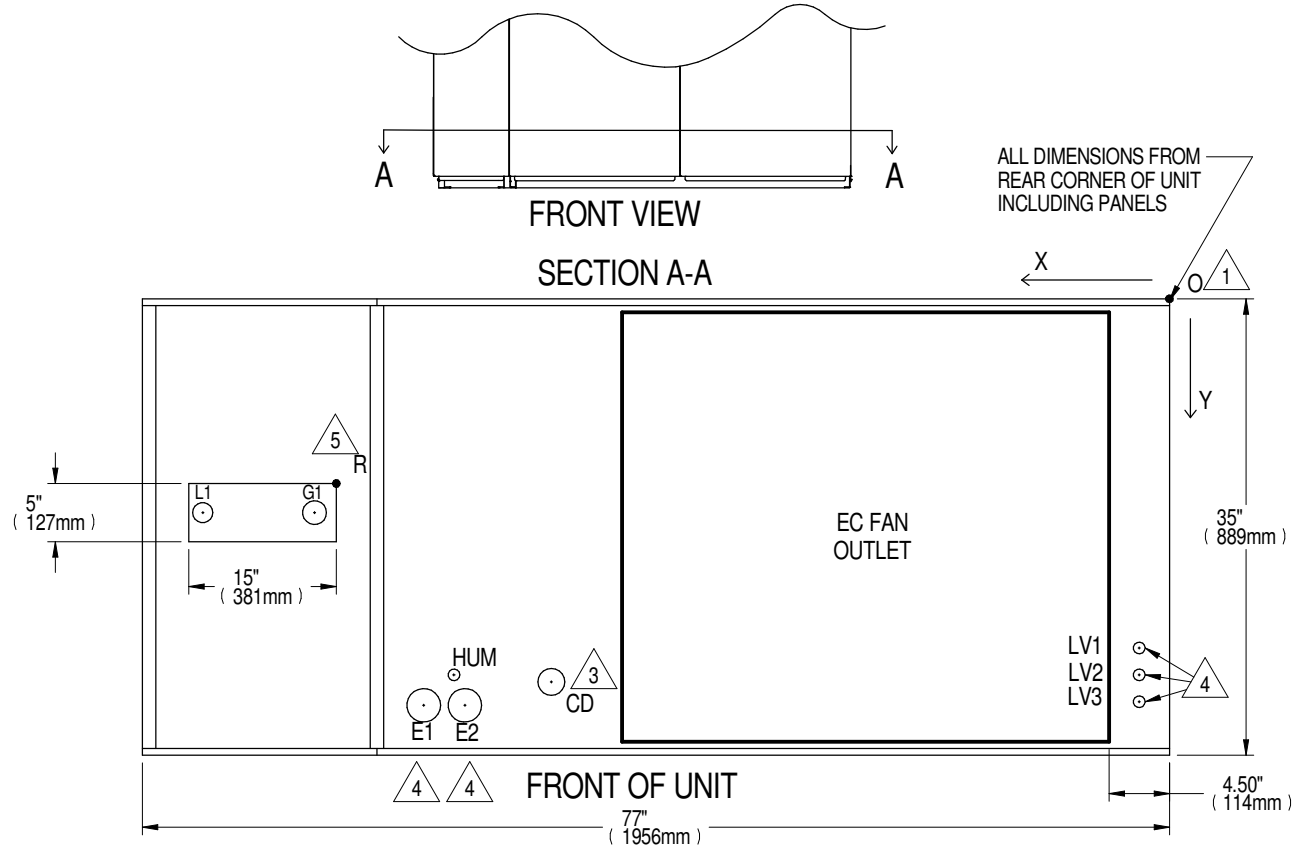
Height in (mm)
H
20 (508)
24 (610)
30 (762) ⚠1
36 (914)

Notes:

⚠1. Only available on DA080-DA085 model.

LIEBERT DSE

PRIMARY CONNECTION LOCATIONS
DOWNFLOW DA050



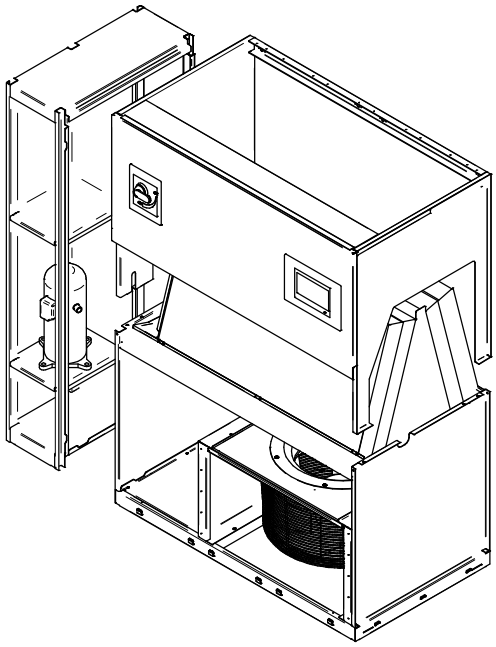
POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
R	REFRIGERANT ACCESS 5	59-7/8 (1521)	13-11/16 (348)	15" (381mm) X 5" (127mm)
L1	LIQUID LINE SYSTEM 1	71-11/16 (1821)	16-3/4 (425)	5/8" O.D. Cu
G1	HOT GAS DISCHARGE 1 3	62-9/16 (1589)	16-3/8 (416)	1-1/8" O.D. Cu
CD	CONDENSATE DRAIN 2 (infrared humidifier or no humidifier)	46 (1168)	29-1/2 (749)	3/4" NPT Female
	W/ OPTIONAL PUMP			1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	53-1/2 (1359)	29 (737)	1/4" O.D. Cu
E1	ELECTRICAL CONN. (HIGH VOLT)	55-1/2 (1410)	31-1/4 (794)	2-1/2"
E2	ELECTRICAL CONN. (HIGH VOLT)	52-7/16 (1332)		
LV1	ELECTRICAL CONN. (LOW VOLT)	2-1/4 (57)	27 (686)	7/8"
LV2	ELECTRICAL CONN. (LOW VOLT)		29 (737)	
LV3	ELECTRICAL CONN. (LOW VOLT)		31 (787)	

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" (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.
3. When piping out of the top of the unit, install traps in the discharge lines in the bottom of the unit before running lines to the top.
4. Opening for conduit chase, E1 and E2 are openings for conduit connections to 2-1/2", 1-3/4" and 1-3/8" knockouts at electric panel.
5. See DPN003533 for alternate piping from the top of the unit.

LIEBERT DSE

DISASSEMBLY DIMENSIONAL DATA
DOWNFLOW DA050

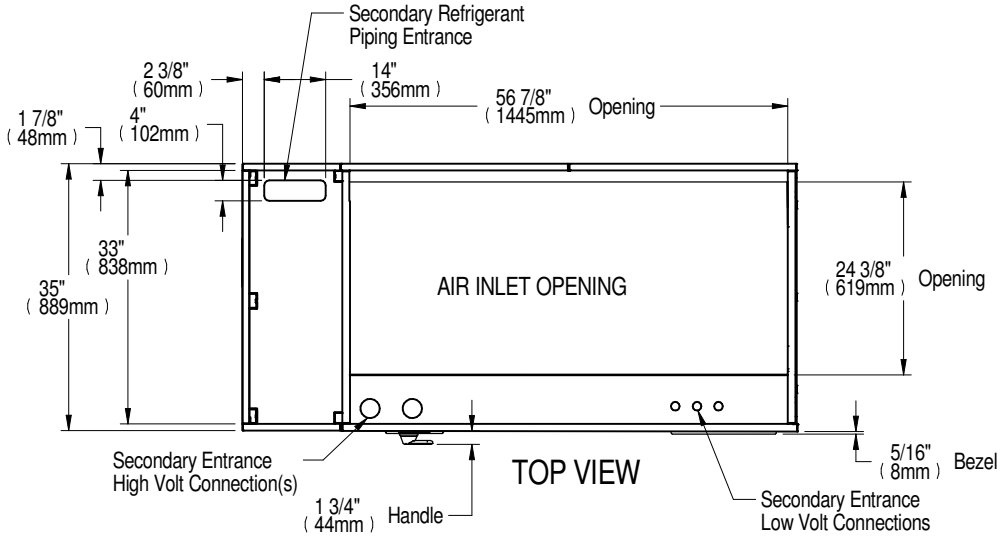


APPROXIMATE DRY WEIGHT lb (kg) (Includes Panels)	
COMPRESSOR ASSEMBLY	460 (209)
FILTER & ELECTRIC BOX ASSEMBLY	210 (96)
BLOWER & COIL ASSEMBLY	920 (417)

Notes:
1. Drawing views are simplified with panels removed to show overall dimensions.
2. See disassembly and handling instructions in installation manual.

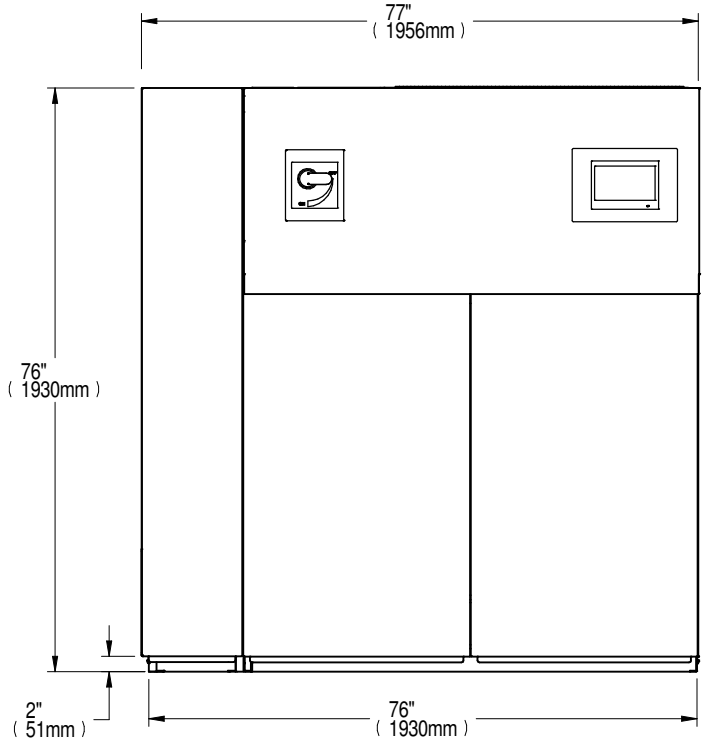
LIEBERT DSE

CABINET DIMENSIONAL DATA
DOWNFLOW DA050 AIR COOLED

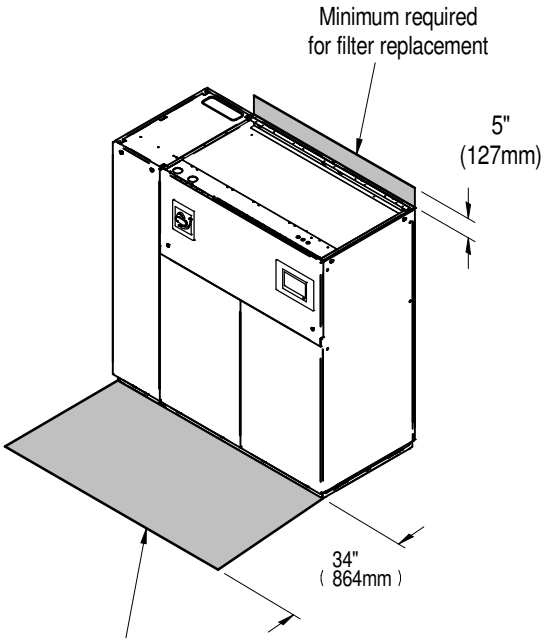


TOP VIEW

Note:
1. Filters are accessible through top of unit only.
2. Downflow electrical connections can be made from top or bottom of unit.



FRONT VIEW

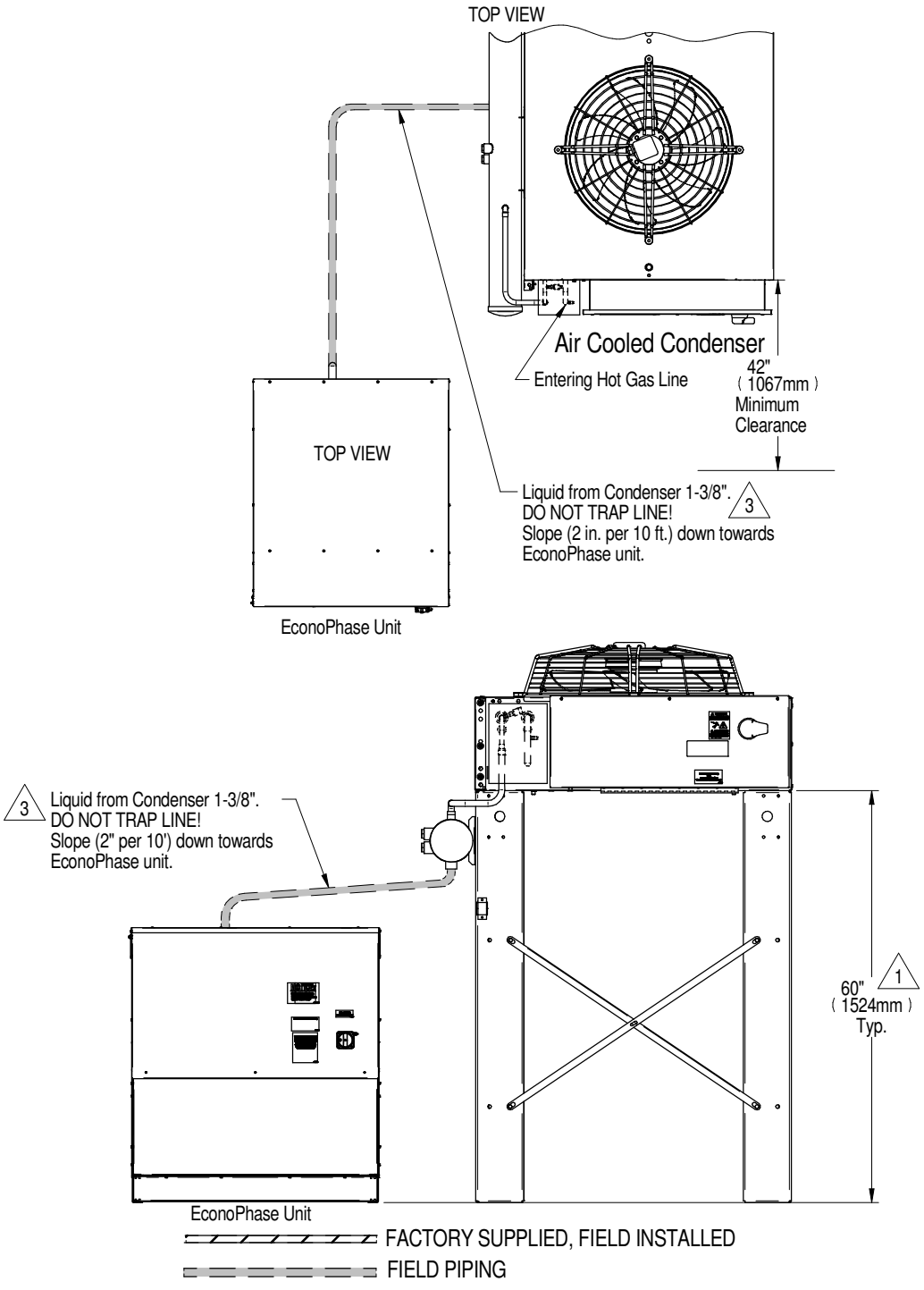


Shaded area indicates a recommended minimum clearance be provided for component access.

APPROXIMATE DRY WEIGHT lb (kg)
1590 (721)

LIEBERT ECONOPHASE

UNIT ARRANGEMENT DIAGRAM
CONDENSER & SINGLE CIRCUIT ECONOPHASE UNIT

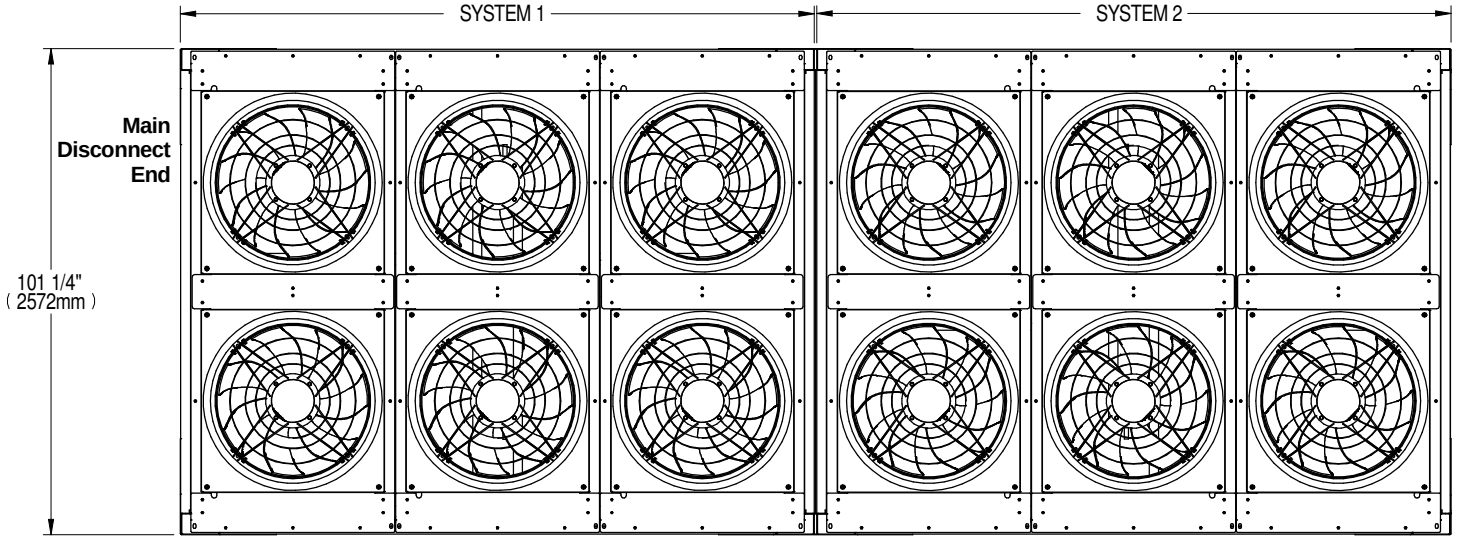


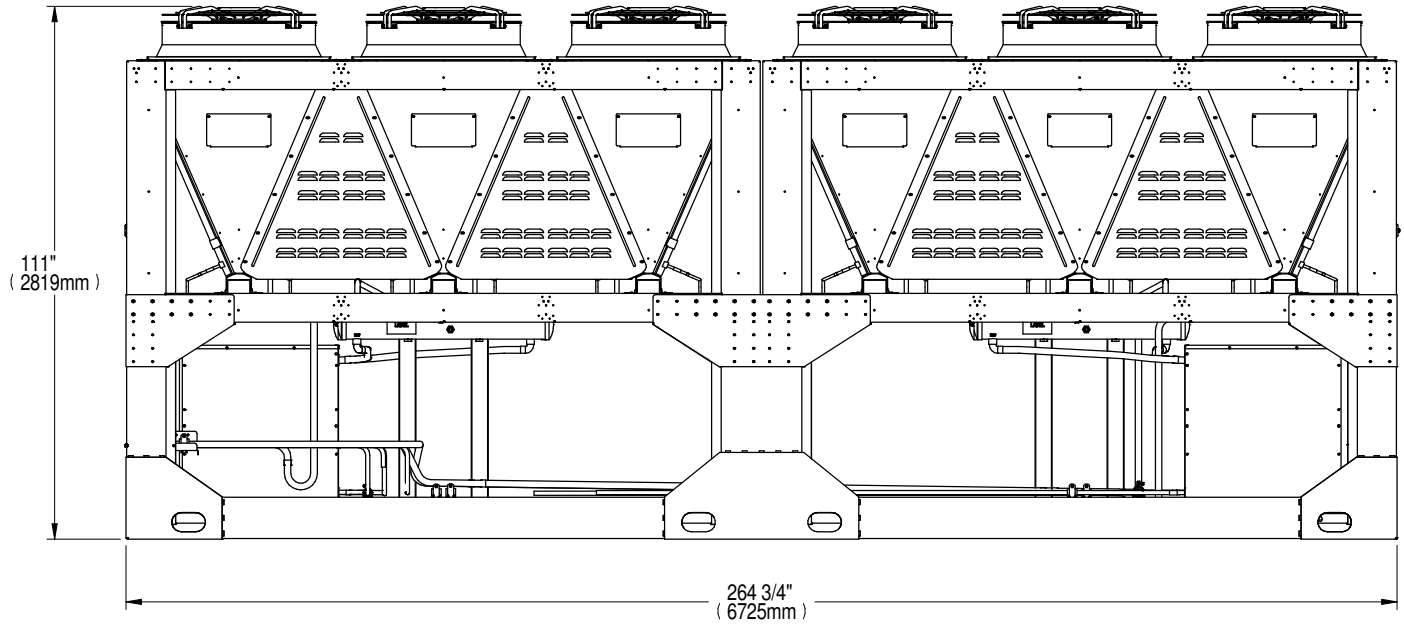
Notes:

1. For proper pump function, a minimum elevation difference of 60" (1524 mm) must be maintained between the bottom of condenser box to the bottom of EconoPhase unit.
2. All indoor and outdoor field refrigerant piping must be insulated, 1/2" minimum. All outdoor insulation must be UV and ozone resistant.
3. Components are not supplied by Liebert but are required for proper circuit operation and maintenance.
4. See DPN003994 for piping elevations.

LIEBERT HEAT REJECTION SKID

CABINET & ANCHOR DIMENSIONAL DATA
MCV330 (2) + ECONOPHASE(2) + BASE ASSEMBLY

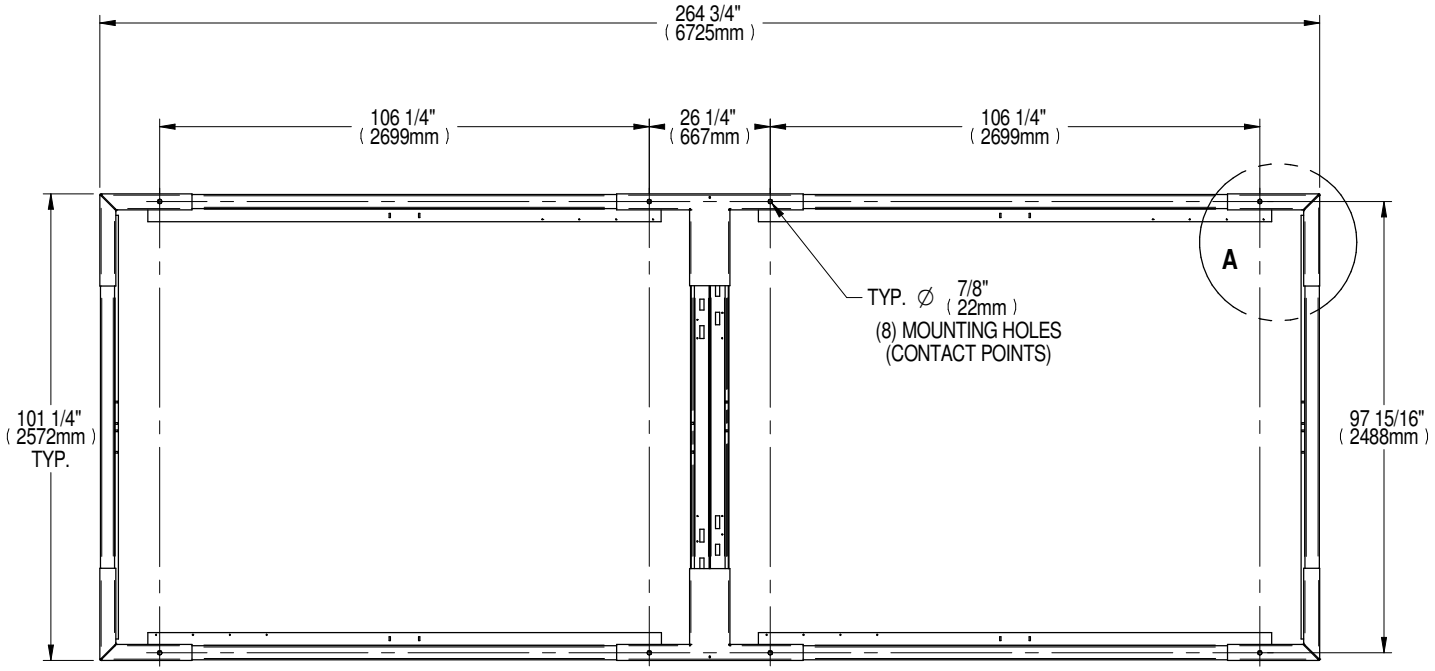




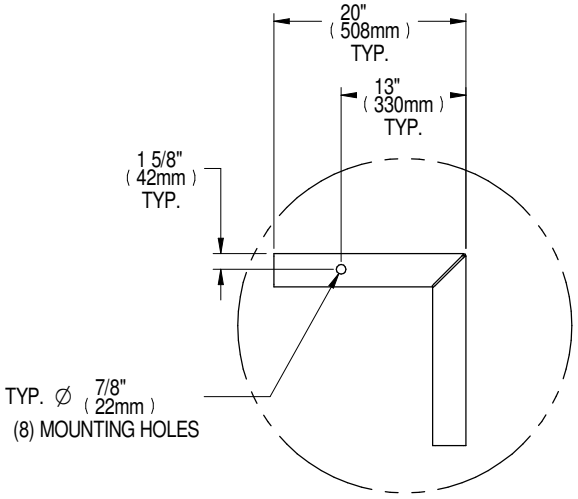
Notes:
1. Minimum clearance of the Main Unit Disconnect Enclosure shall be 48" (1219mm) or per local electrical code.
2. Recommended minimum 48" (1219mm) clearance when multiple skids are mounted side by side to ensure proper airflow. Contact the factory for other spacing requirments.
3. Preliminary assembly weight 10,000 lbs (4,536 kg).

LIEBERT HEAT REJECTION SKID

CABINET & ANCHOR DIMENSIONAL DATA
MCV330 (2) + ECONOPHASE(2) + BASE ASSEMBLY



Underside of unit, coil and fan removed for clarity.

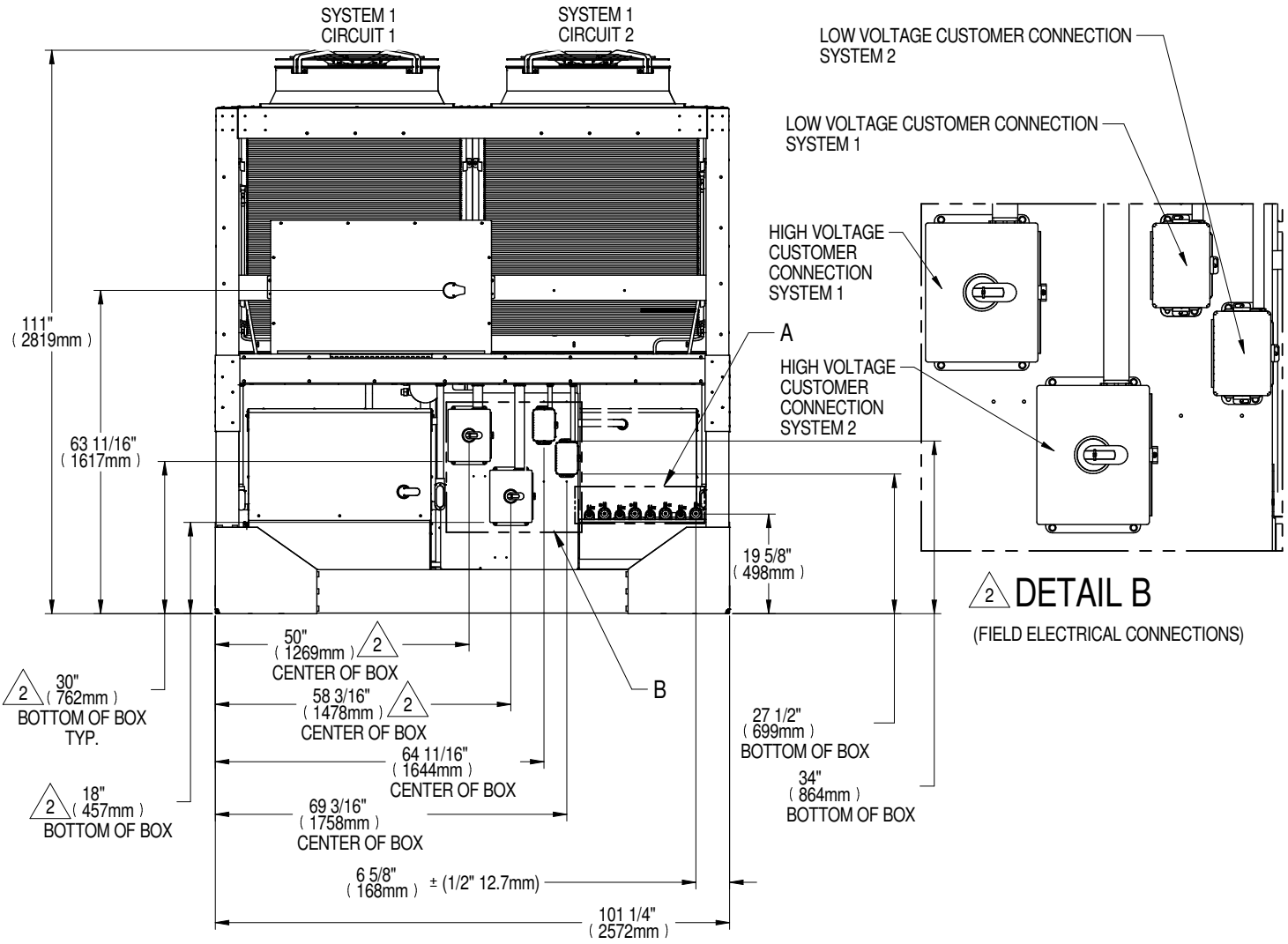


DETAIL A

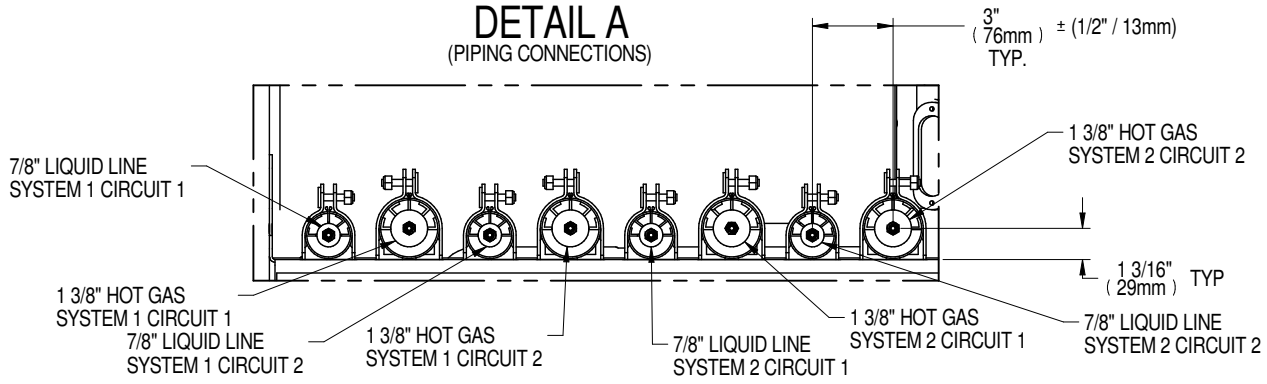
Notes:
1. Eight mounting holes and eight 3/4" field supplied bolts required to secure skid base assembly to customer support structure. Bolt grade to be specified by local requirements.

LIEBERT HEAT REJECTION SKID

PRIMARY CONNECTION LOCATIONS
MCV330 (2) + ECONOPHASE (2) + BASE ASSY 460V & 575V



ALL CONNECTIONS MADE FROM SYSTEM 1 END (SHOWN)



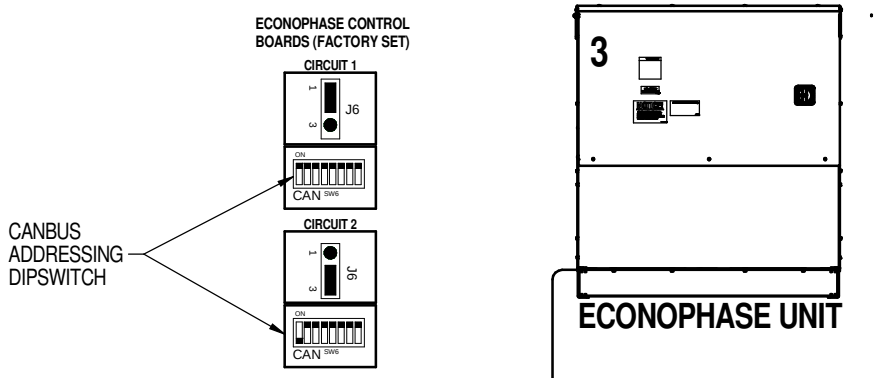
Notes:

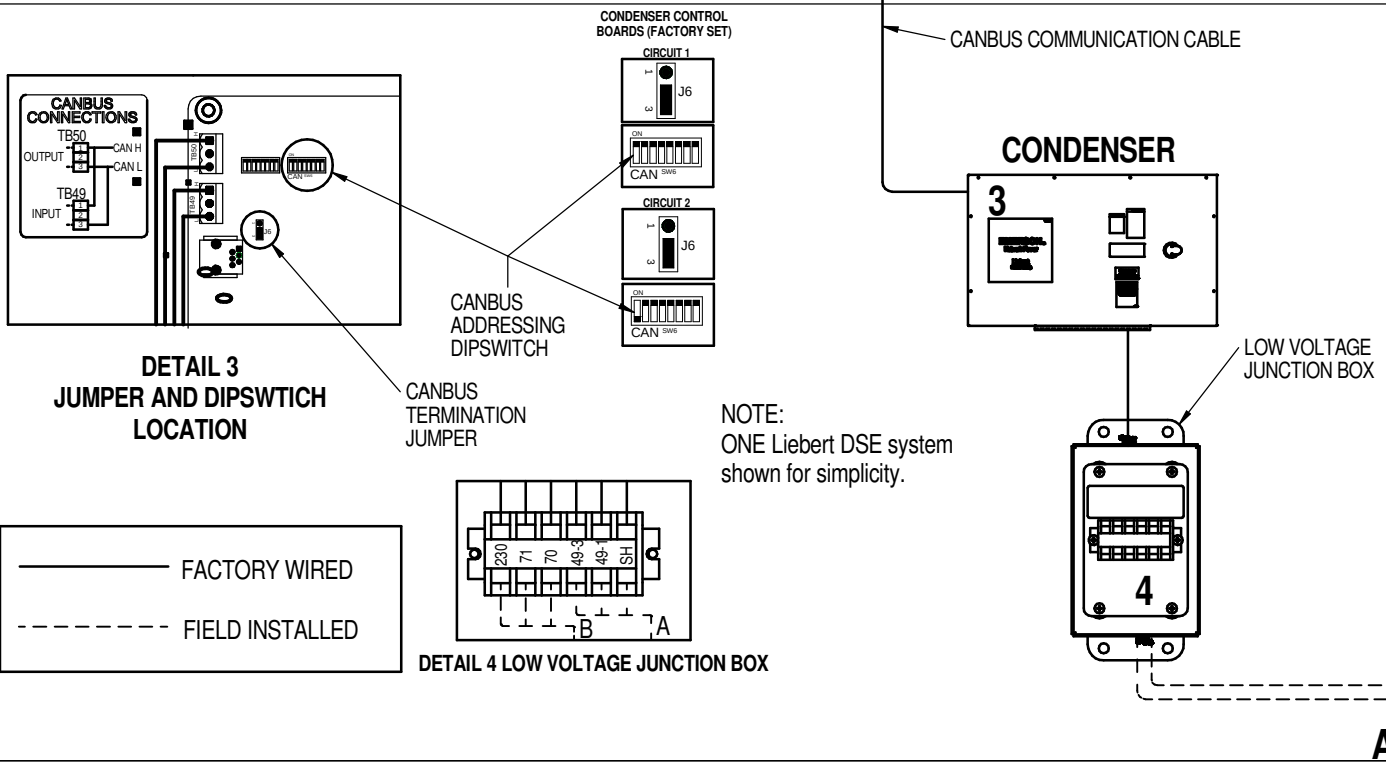
1. Field to provide hole for conduit for high voltage disconnect box and low voltage distribution panel.

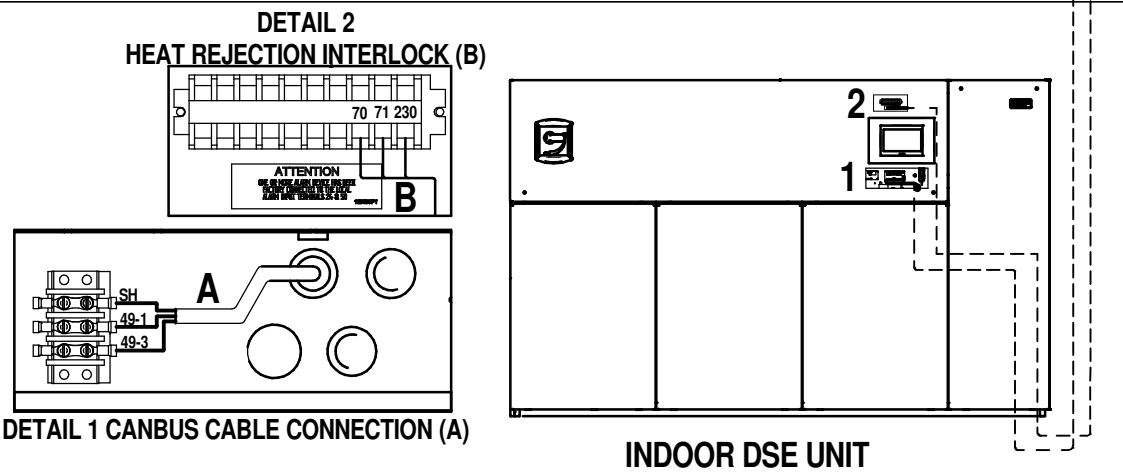
2. High Voltage Customer Connection for:
Voltage Codes: A=(460V/3 Phase/60Hz); B=(575V/3 Phase/60Hz)

LIEBERT HEAT REJECTION SKID

CANbus & INTERLOCK CONNECTIONS
MCV + ECONOPHASE + BASE ASSEMBLY







SEE SHEET 2 FOR COMPONENT NOTES, CABLE NOTES, & WIRE NOTES

LIEBERT HEAT REJECTION SKID

CANbus & INTERLOCK CONNECTIONS
MCV + ECONOPHASE + BASE ASSEMBLY

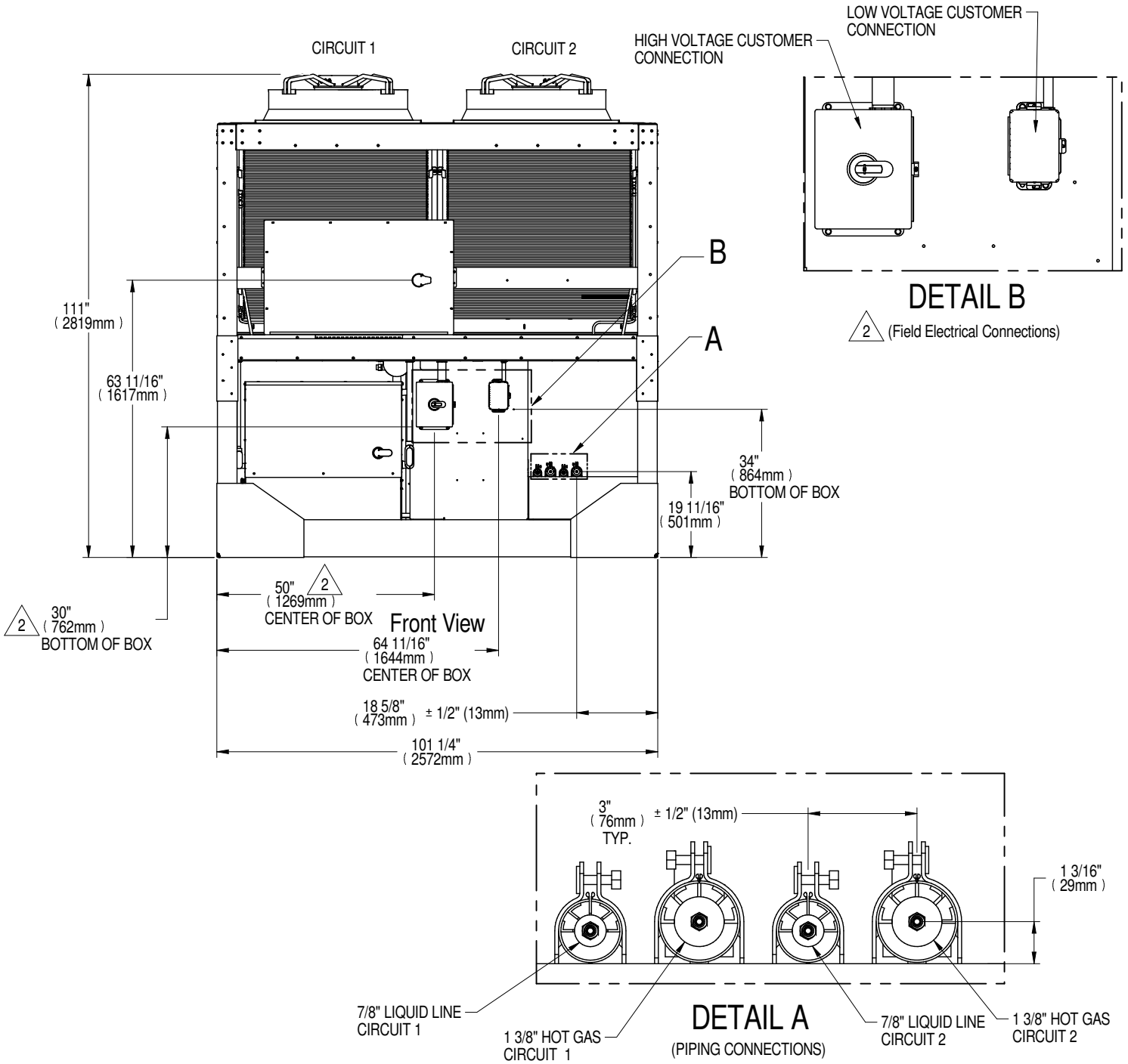
COMPONENT NOTES:
1. COMPONENT APPEARANCE, ORIENTATION, AND POSITION MAY VARY BETWEEN PRODUCT LINES. TERMINAL NAMES REMAIN CONSTANT.
2. ALL CIRCUITS TO THESE CONNECTION POINTS REMAIN CONSTANT.

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 LIEBERT FACTORY.

INTERLOCK WIRE NOTES (B):
1. FIELD SUPPLIED WIRE
   - 3 CONDUCTOR18AWG OR GREATER
   - RATED 600V
2. RUN FIELD SUPPLIED WIRES BETWEEN THE INDOOR UNIT AND THE LOW VOLTAGE JUNCTION BOX.

LIEBERT HEAT REJECTION SKID

PRIMARY CONNECTION LOCATIONS
MCV330 + ECONOPHASE + BASE ASSY 460V & 575V

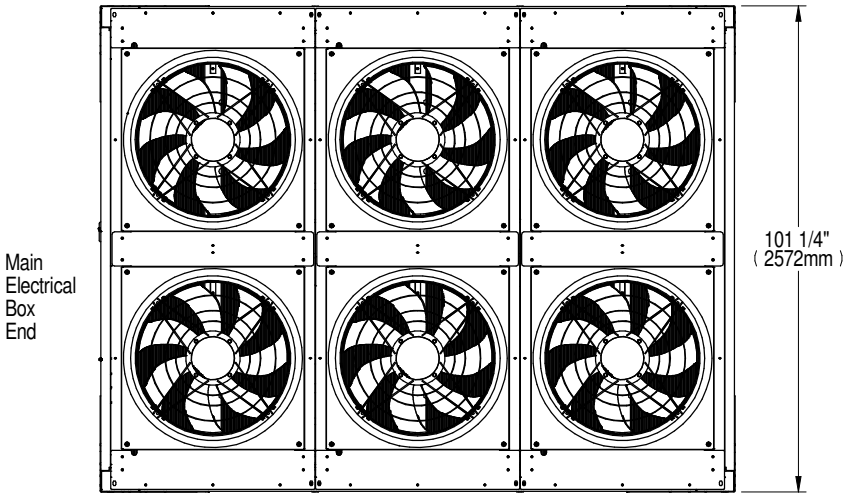


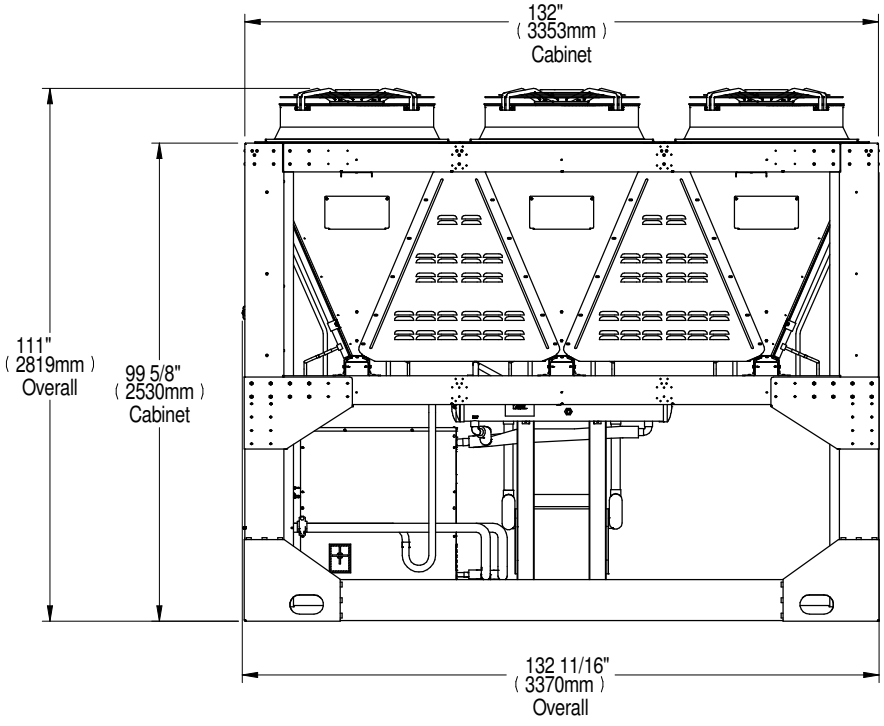
Notes:
1. Field to provide hole for conduit for high voltage disconnect box and low voltage distribution panel.

2. High Voltage Customer Connection for:
Voltage Codes: A=(460V/3 Phase/60Hz); B=(575V/3 Phase/60Hz)

LIEBERT HEAT REJECTION SKID

CABINET & ANCHOR DIMENSIONAL DATA
MCV330 + ECONOPHASE + BASE ASSEMBLY

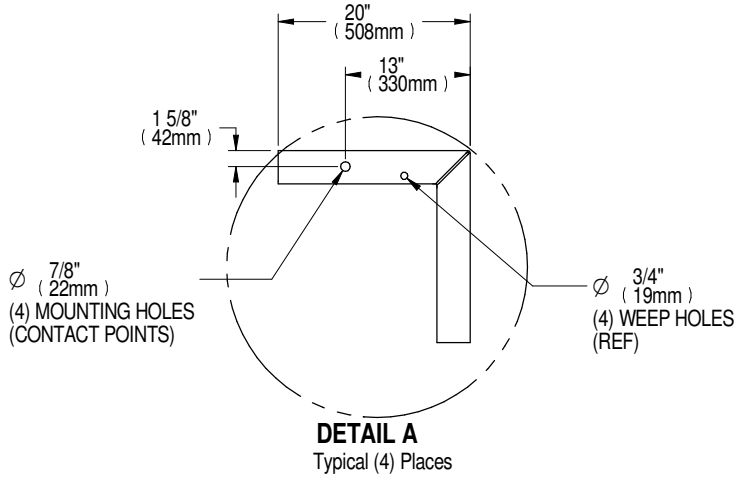




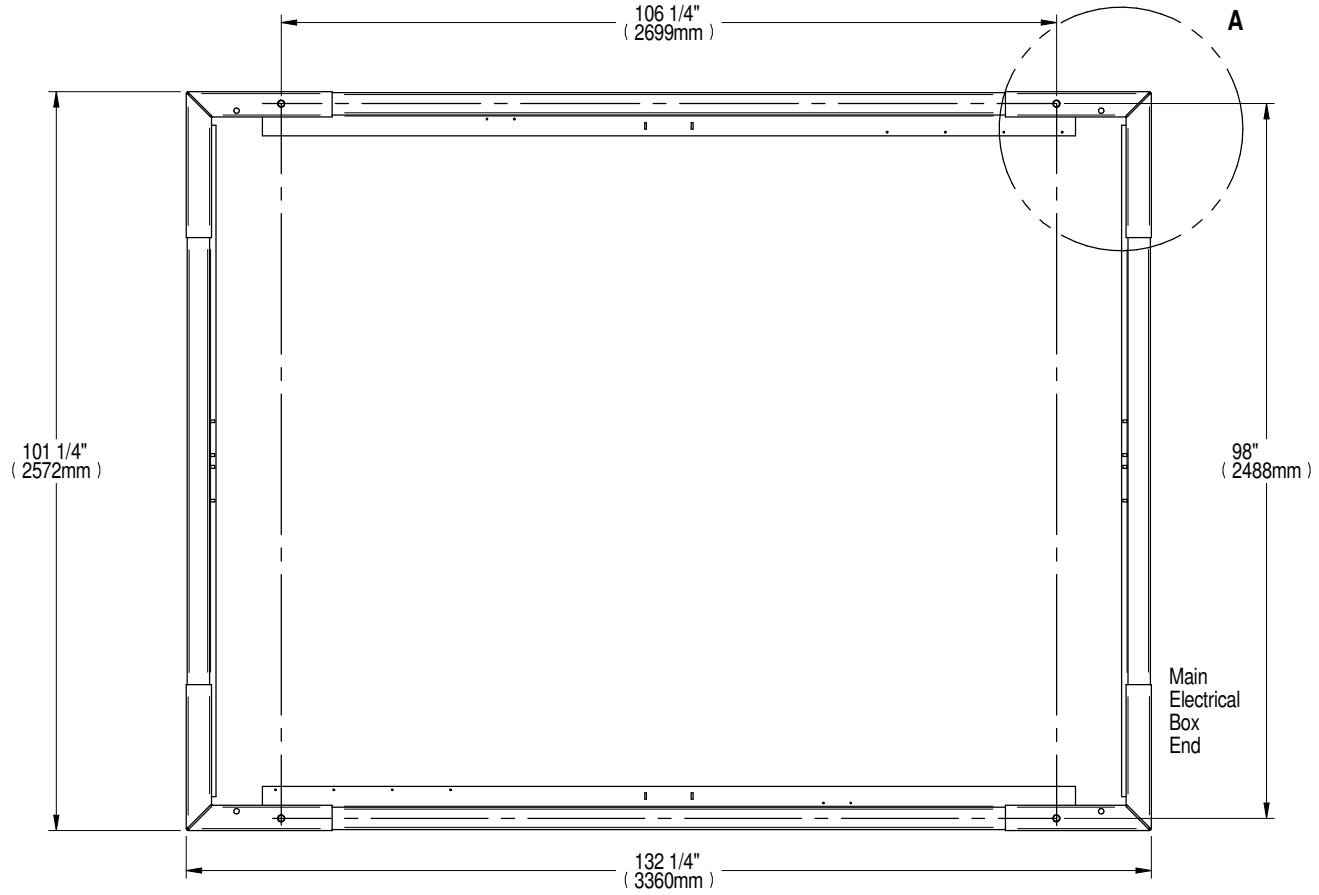
NOTES:
1) Minimum clearance on the Main Unit Disconnect Enclosure shall be 48" (1219mm) or per local code.
2) Recommended minimum 48" (1219mm) clearance when multiple skids are mounted side by side to ensure proper airflow. Contact the factory for other spacing requirements.
3) Preliminary assembly weight 4,800 lbs (2,177 kg).

LIEBERT HEAT REJECTION SKID

CABINET & ANCHOR DIMENSIONAL DATA
MCV330 + ECONOPHASE + BASE ASSEMBLY



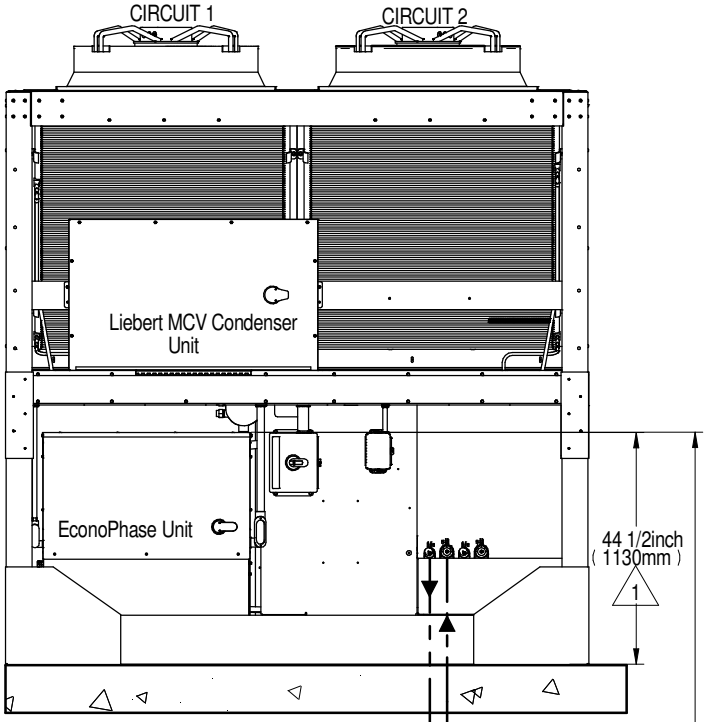
DETAIL A
Typical (4) Places

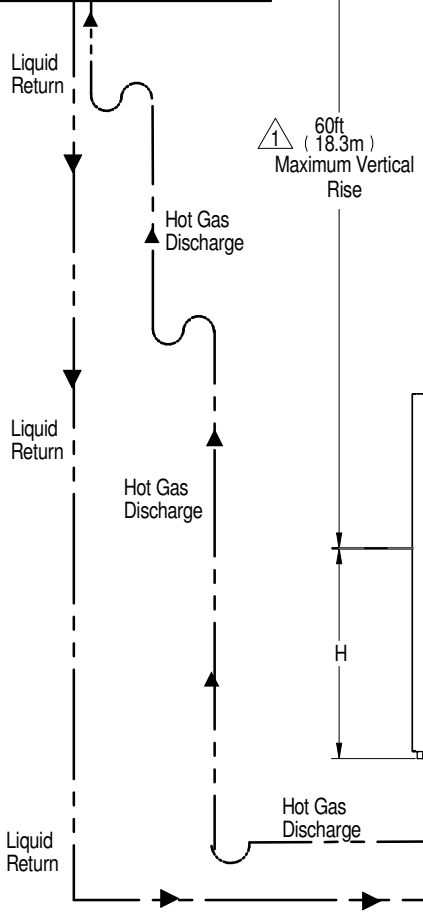


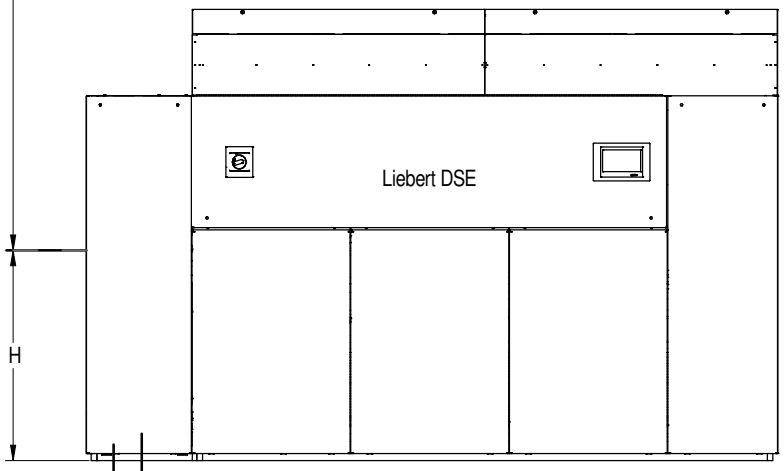
NOTES:
1) Underside of unit, coil and fan removed for clarity.
2) Four mounting holes and four 3/4" field supplied bolts required to secure skid base assembly to customer support structure. Bolt grade to be specified by local requirements.

LIEBERT DSE

AIR COOLED PIPING SCHEMATIC
LIEBERT MCV MOUNTED ABOVE LIEBERT DA125-250







Notes:

1. The outlet of the receiver must be higher than the elevation of the EEV inside the indoor unit. The vertical height must not be greater than 60 ft (18.3 m).
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. DA250 with horizontal discharge has internally installed traps on the hot gas discharge line.
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. Unit piping entrance varies by unit and may be through the top of the unit.
5. All indoor and outdoor field refrigerant piping must be insulated, ½ inch minimum. All outdoor insulation must be UV and ozone resistant.
6. Consult factory for any exceptions to the above guidelines.

Internal EEV Height	H inch (mm)
DA125-DA165	43 (1092)
DA250	56 (1422)

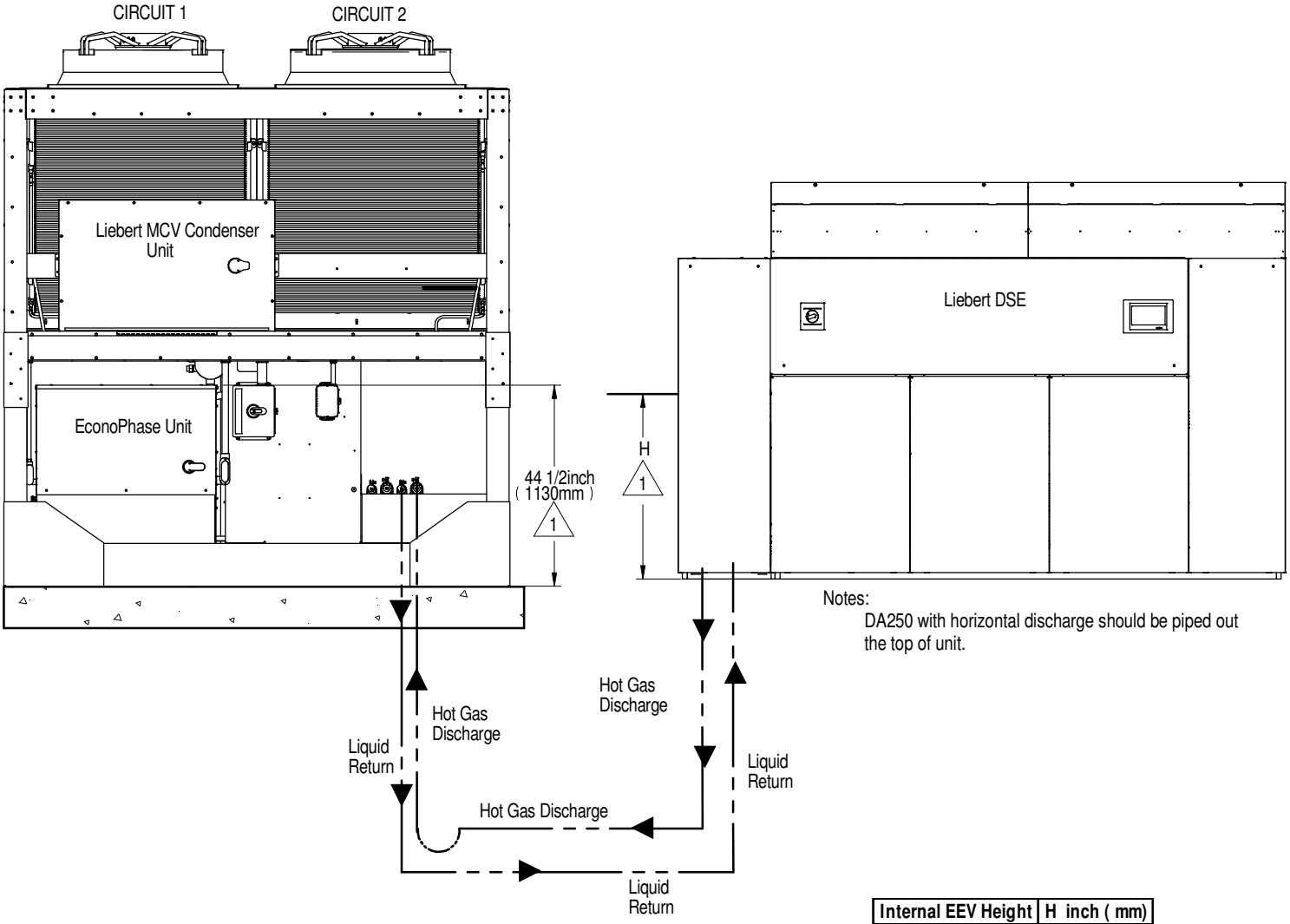
Field Piping

Notes:

DA250 with horizontal discharge should be piped out the top of unit.

LIEBERT DSE

AIR COOLED PIPING SCHEMATIC
LIEBERT MCV AND LIEBERT DA125-250 AT SIMILAR LEVEL



Notes:
DA250 with horizontal discharge should be piped out the top of unit.

Internal EEV Height	H inch (mm)
DA125-DA165	43 (1092)
DA250	56 (1422)

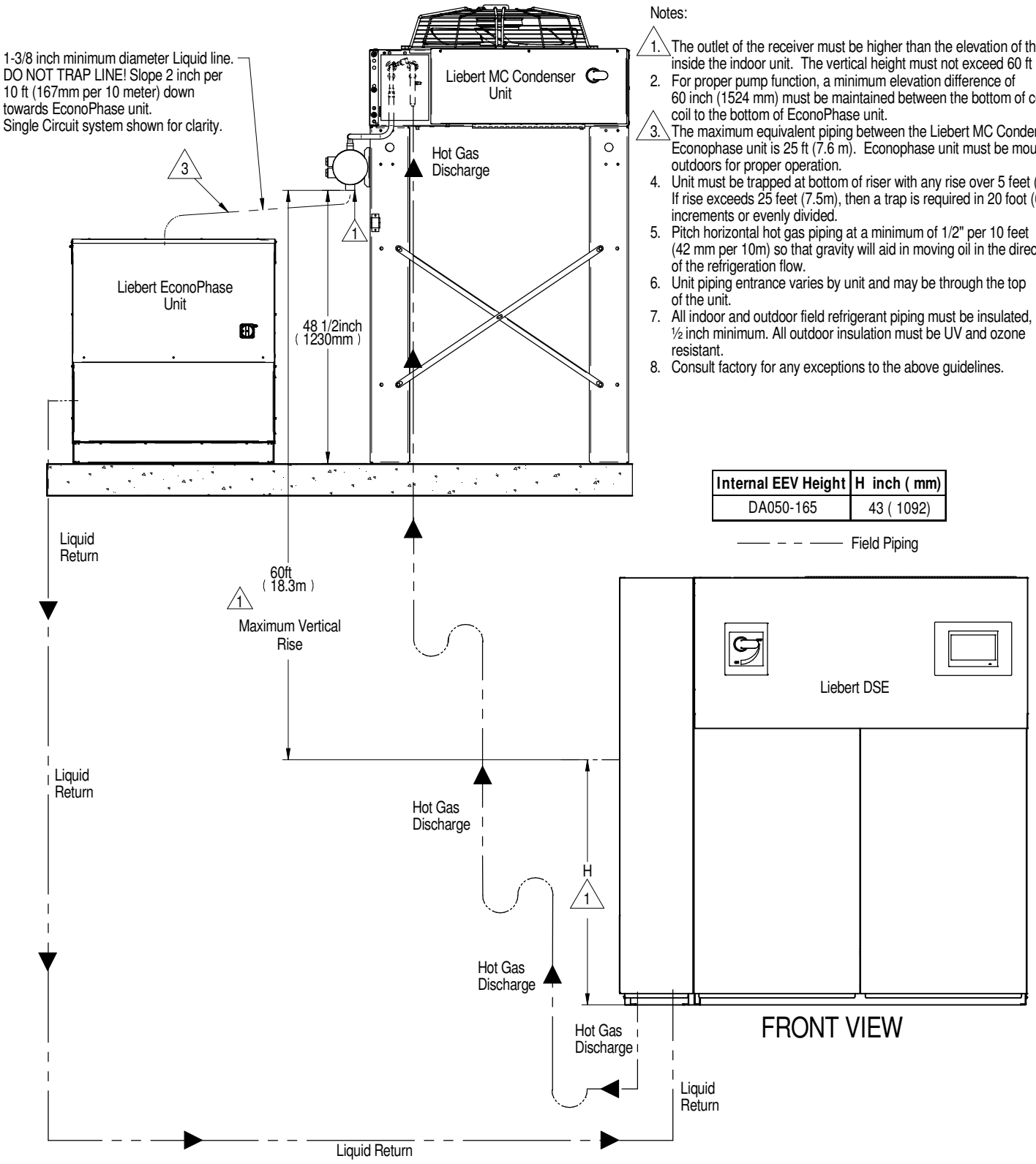
—— – – – —— Field Piping

Notes:

1. The outlet of the 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. DA250 with horizontal discharge has internally installed traps on the hot gas discharge line.
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. Unit piping entrance varies by unit and may be through the top of the unit.
5. All indoor and outdoor field refrigerant piping must be insulated, ½ inch minimum. All outdoor insulation must be UV and ozone resistant.
6. Consult factory for any exceptions to the above guidelines.

LIEBERT DSE

AIR COOLED PIPING SCHEMATIC
LIEBERT MC MOUNTED ABOVE LIEBERT DA050-165



Notes:

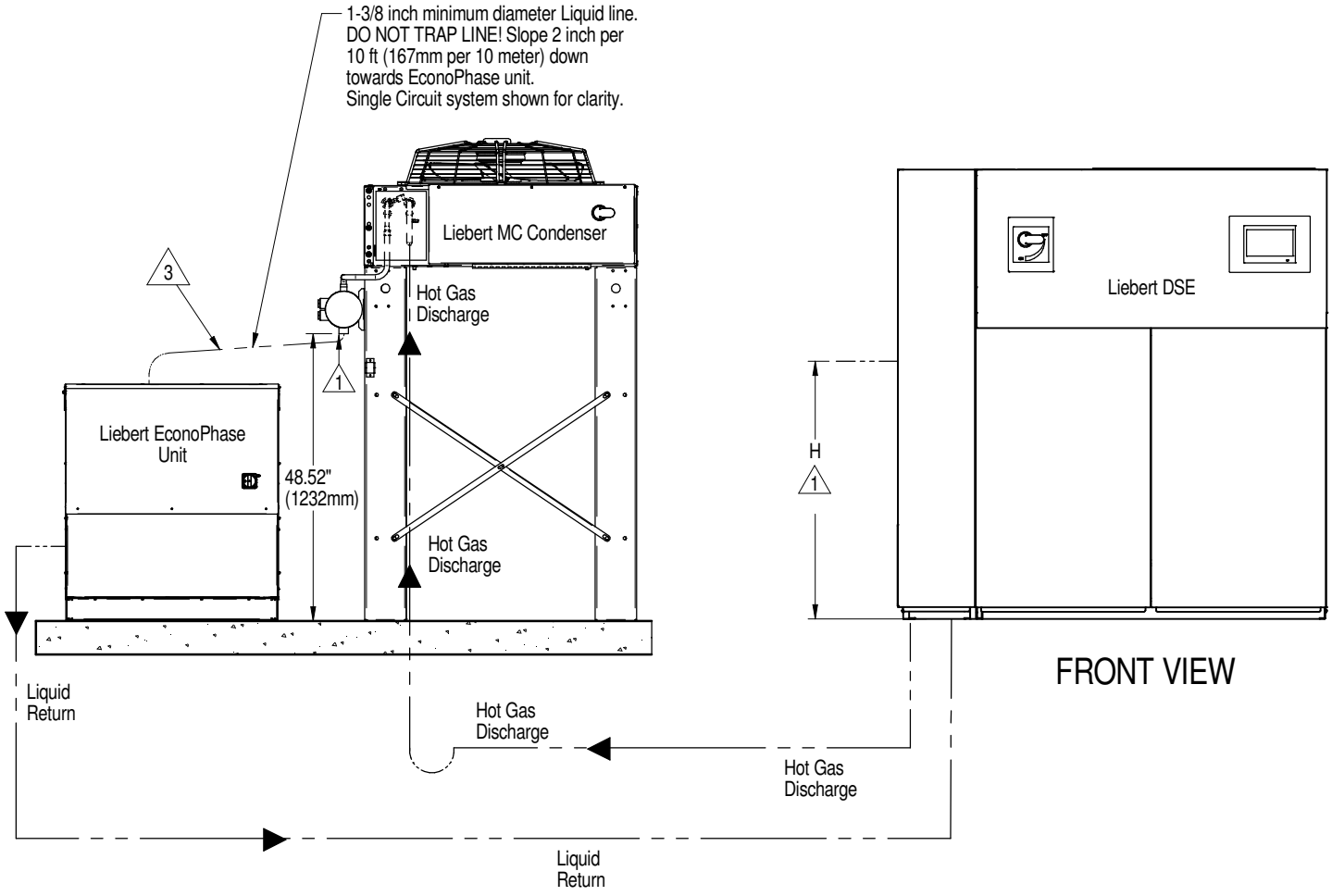
1. The outlet of the receiver must be higher than the elevation of the EEV inside the indoor unit. The vertical height must not exceed 60 ft (18.3m).
2. For proper pump function, a minimum elevation difference of 60 inch (1524 mm) must be maintained between the bottom of condenser coil to the bottom of EconoPhase unit.
3. The maximum equivalent piping between the Liebert MC Condenser and Econophase unit is 25 ft (7.6 m). Econophase unit must be mounted outdoors for proper operation.
4. 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.
5. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42 mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
6. Unit piping entrance varies by unit and may be through the top of the unit.
7. All indoor and outdoor field refrigerant piping must be insulated, ½ inch minimum. All outdoor insulation must be UV and ozone resistant.
8. Consult factory for any exceptions to the above guidelines.

Internal EEV Height	H inch (mm)
DA050-165	43 (1092)

Field Piping

AIR COOLED PIPING SCHEMATIC

LIEBERT MC AND LIEBERT DA050-165 AT SIMILAR LEVELS



Internal EEV Height	H inch (mm)
DA050-165	43 (1092)

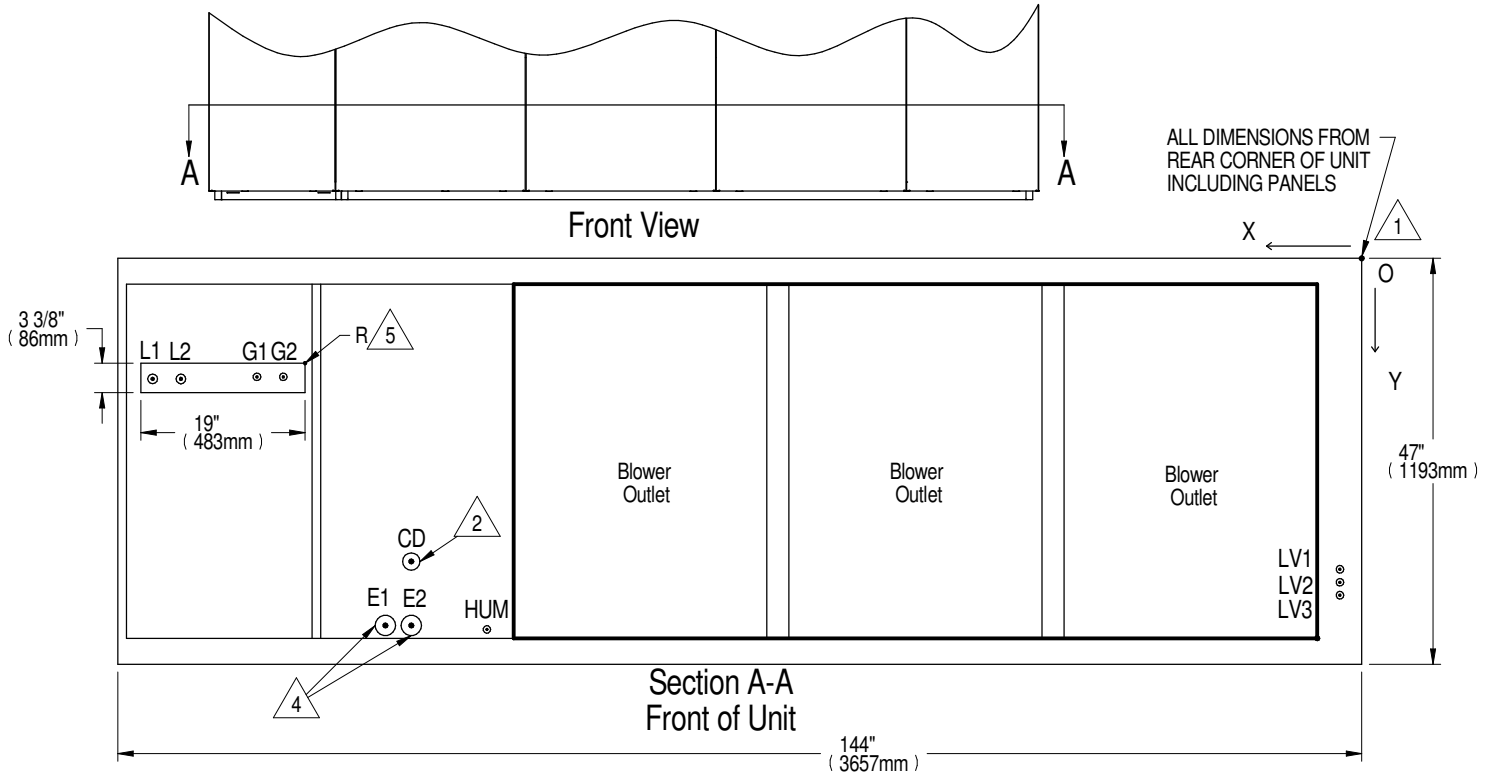
—— – – —— Field Piping

Notes:

1. The outlet of the receiver must be higher than the elevation of the EEV inside the indoor unit.
2. For proper pump function, a minimum elevation difference of 60 inch (1524 mm) must be maintained between the bottom of condenser coil to the bottom of EconoPhase unit.
3. The maximum equivalent piping between the Liebert MC Condenser and Econophase unit is 25 ft (7.6 m). Econophase unit must be mounted outdoors for proper operation.
4. 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.
5. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42 mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
6. Unit piping entrance varies by unit and may be through the top of the unit.
7. All indoor and outdoor field refrigerant piping must be insulated, ½ inch minimum. All outdoor insulation must be UV and ozone resistant.
8. Consult factory for any exceptions to the above guidelines.

LIEBERT DSE

PRIMARY CONNECTION LOCATIONS
DOWNFLOW AIR COOLED DA150 & DA165 MODELS WITH AND WITHOUT ECONOPHASE



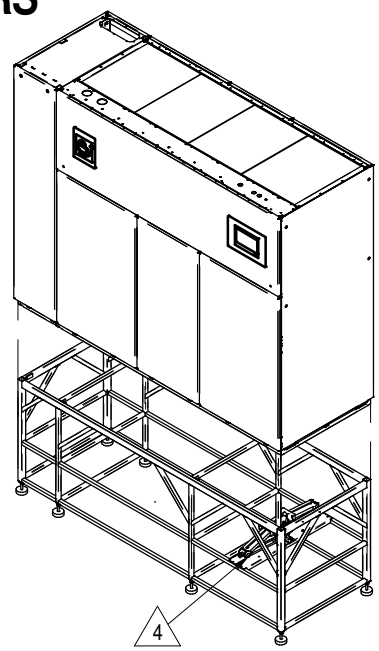
POINT	DESCRIPTION	X	Y	DX ONLY CONNECTION SIZE / OPENING	DX W/ ECONOPHASE
R	REFRIGERANT ACCESS 5	122-5/16" (3106mm)	12-1/8" (333mm)	19" (483mm) x 3-3/8" (86mm)	19" (483mm) X 3-3/8" (86mm)
L1	LIQUID LINE SYSTEM 1	140" (3554mm)	14" (355mm)	1-1/8" O.D. Cu	1-1/8" O.D. Cu
L2	LIQUID LINE SYSTEM 2	136-11/16" (3471mm)	14" (355mm)	1-1/8" O.D. Cu	1-1/8" O.D. Cu
G1	HOT GAS DISCHARGE 1 3	127-7/8" (3248mm)	13-3/4" (348mm)	1-3/8" O.D. Cu	1-3/8" O.D. Cu
G2	HOT GAS DISCHARGE 2 3	124-3/16" (3170mm)	13-3/4" (348mm)	1-3/8" O.D. Cu	1-3/8" O.D. Cu
CD	CONDENSATE DRAIN (infrared humidifier or no humidifier) 2	110" (2794mm)	35-1/16" (891mm)	1-1/8" FPT	1-1/8" FPT
	CONDENSATE DRAIN (steam generating humidifier) 2	CONSULT FACTORY			
	W/ OPTIONAL PUMP	110" (2794mm)	35-1/16" (891mm)	1/2" O.D. Cu	1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	101-1/4" (2572mm)	43" (1091mm)	1/4" O.D. Cu	1/4" O.D. Cu
E1	ELECTRICAL CONN. (HIGH VOLT)	113" (2870mm)	42-1/2" (1080mm)	2-1/2"	2-1/2"
E2	ELECTRICAL CONN. (HIGH VOLT)	110" (2794mm)	42-1/2" (1080mm)	2-1/2"	2-1/2"
LV1	ELECTRICAL CONN. (LOW VOLT)	2-1/2" (64mm)	36" (914mm)	7/8"	7/8"
LV2	ELECTRICAL CONN. (LOW VOLT)	2-1/2" (64mm)	37-1/2" (952mm)	7/8"	7/8"
LV3	ELECTRICAL CONN. (LOW VOLT)	2-1/2" (64mm)	39" (991mm)	7/8"	7/8"

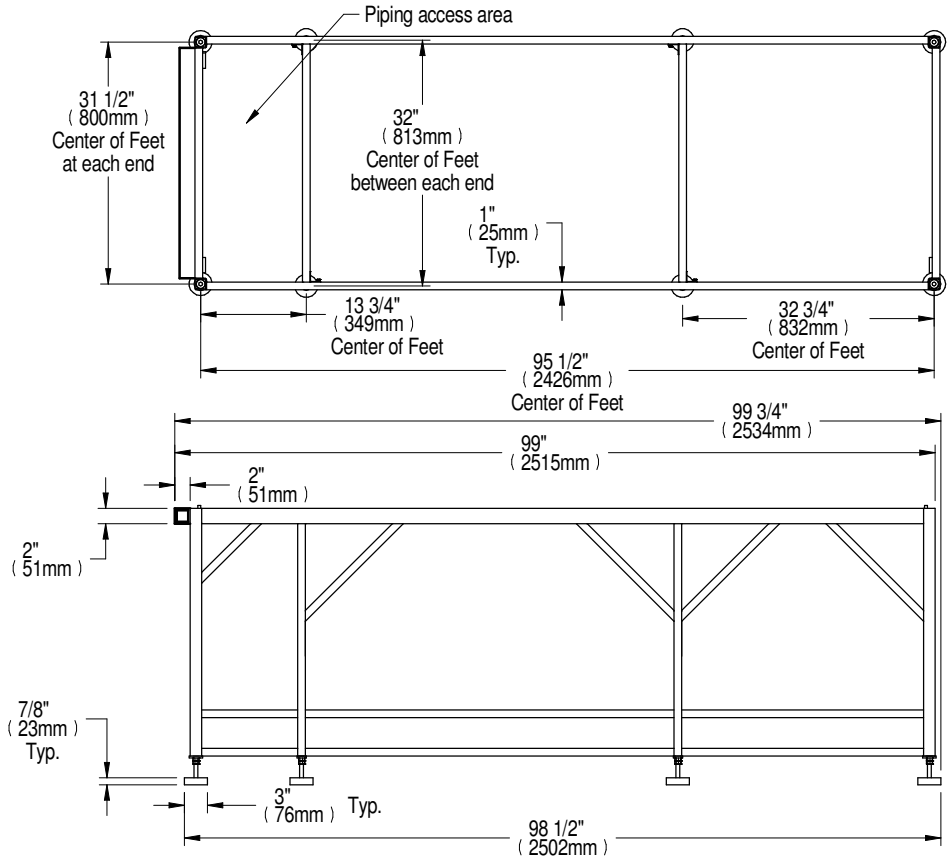
Notes:

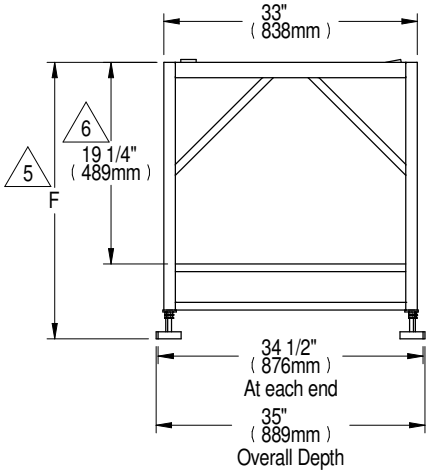
1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of± 1/2" (13mm).
2. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Drain line may contain boiling water. Select appropriate drain system materials. The drain line must comply with all local codes.
3. When piping out the top of the unit, install traps in the discharge lines in the bottom of the unit before running lines to the top.
4. Opening for conduit chase, E1 and E2 are openings for conduit for connections to 2-1/2", 1-3/4" and 1-3/8" knockouts at electric panel.
5. See DPN003175 for alternate piping from the top of the unit.

LIEBERT DSE

FLOORSTAND DIMENSIONAL DATA
DOWNFLOW AIR COOLED DA080-DA085
W/ DIGITAL SCROLL COMPRESSORS







Notes:
1. This floorstand should be used when EC fans are intended to be lowered under a raised floor. 24-48" floorstands allow fan to be lowered under raised floor.
2. Right side of paneled unit is flush with right side of floorstand. All other paneled sides overhang floorstand 1" (25mm).
3. The floorstand used with EC units is not symmetrical and its orientation to the Liebert DSE is critical for lowering the EC fans. Unless the floor stand is installed in the correct position, the blowers will not lower into the floorstand.

△4. Jack and jack support are shipped loose and are intended to be placed into position under each fan and utilized to lower or raise that fan as needed.

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

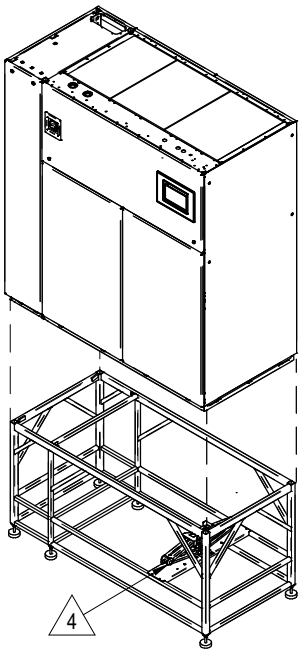
△6. Applies to 36", 42" & 48" Floorstand.

△7. Fans may be lowered into 18" floor, however this application does not allow for the use of a factory provided floor jack. Other methods of raising/lowering fans must be employed for raised floors less than 24".

Height in (mm)
F △5
18 (457) △7
24 (610)
30 (762)
36 (914)
42 (1067)
48 (1219)

LIEBERT DSE

FLOORSTAND DIMENSIONAL DATA
DOWNFLOW DA050 MODELS W/ EC FANS



Notes:
1. This floorstand should be used when EC fans are intended to be lowered under a raised floor. 24-48" floorstands allow fan to be lowered under the raised floor.
2. Right side of paneled unit is flush with right side of floorstand. All other paneled sides overhang floorstand 1" (25mm).
3. The floorstand used with EC units is not symmetrical and its orientation to the Liebert DSE is critical for lowering the EC fans. Unless the floorstand is installed in the correct position, the blowers will not lower into the floorstand.

4. Jack and jack support are shipped loose and are intended to be placed into position under each fan and utilized to lower or raise that fan as needed.

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

6. Applies to 36", 42", & 48" Floorstands.

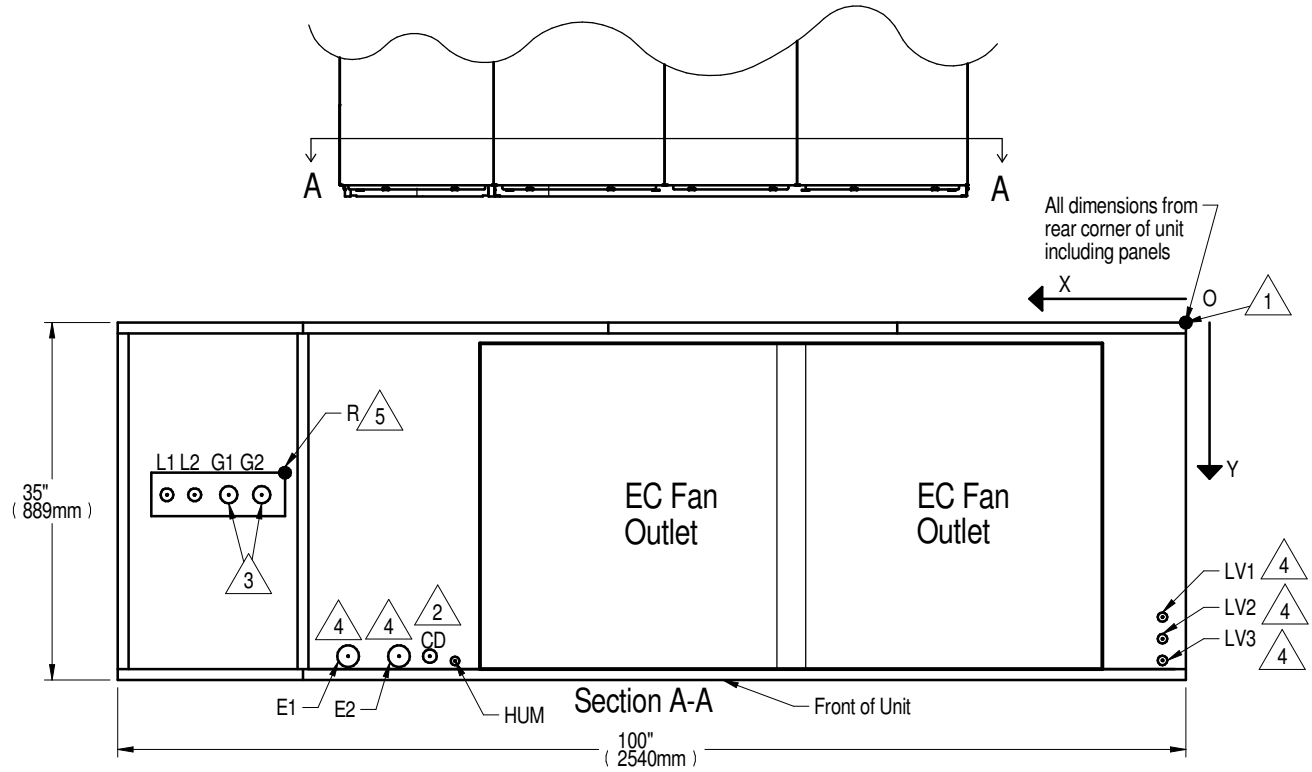
7. 7" Floorstands can only be used with downflow units with front or rear discharge.

8. Fans may be lowered into 18" floor, however this application does not allow for the use of a factory provided floor jack. Other methods of raising/lowering fans must be employed for raised floors less than 24".

Height in. (mm) A 5
7 (178) 7
18 (457) 8
24 (610)
30 (762)
36 (914)
42 (1069)

LIEBERT DSE

PRIMARY CONNECTION LOCATIONS
DOWNFLOW DA080-DA085
SCROLL OR DIGITAL SCROLL COMPRESSOR MODELS



POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
R	REFRIGERANT ACCESS 5	82-7/8 (2105)	13-11/16 (348)	15" (379mm) X 5" (127mm)
L1	LIQUID LINE SYSTEM 1	94-11/16 (2405)	16-3/4 (425)	5/8" O.D. Cu
L2	LIQUID LINE SYSTEM 2	91-7/8 (2334)		
G1	HOT GAS DISCHARGE 1 3	88-3/4 (2254)	16-3/8 (416)	1-1/8" O.D. Cu
G2	HOT GAS DISCHARGE 2 3	85-9/16 (2173)		
CD	CONDENSATE DRAIN 2 (infrared humidifier or no humidifier)	68-3/8 (1737)	31-3/8 (797)	3/4" NPT FEMALE
	W/ OPTIONAL PUMP			1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	76-1/2 (1943)	29 (737)	1/4" O.D. Cu
E1	ELECTRICAL CONN. (HIGH VOLT)	78-1/2 (1994)	31-1/8 (791)	2-1/2"
E2		75-3/8 (1915)		
LV1	ELECTRICAL CONN. (LOW VOLT) 4	2 (51)	29 (737)	7/8"
LV2			30-7/8 (784)	
LV3			32 (813)	

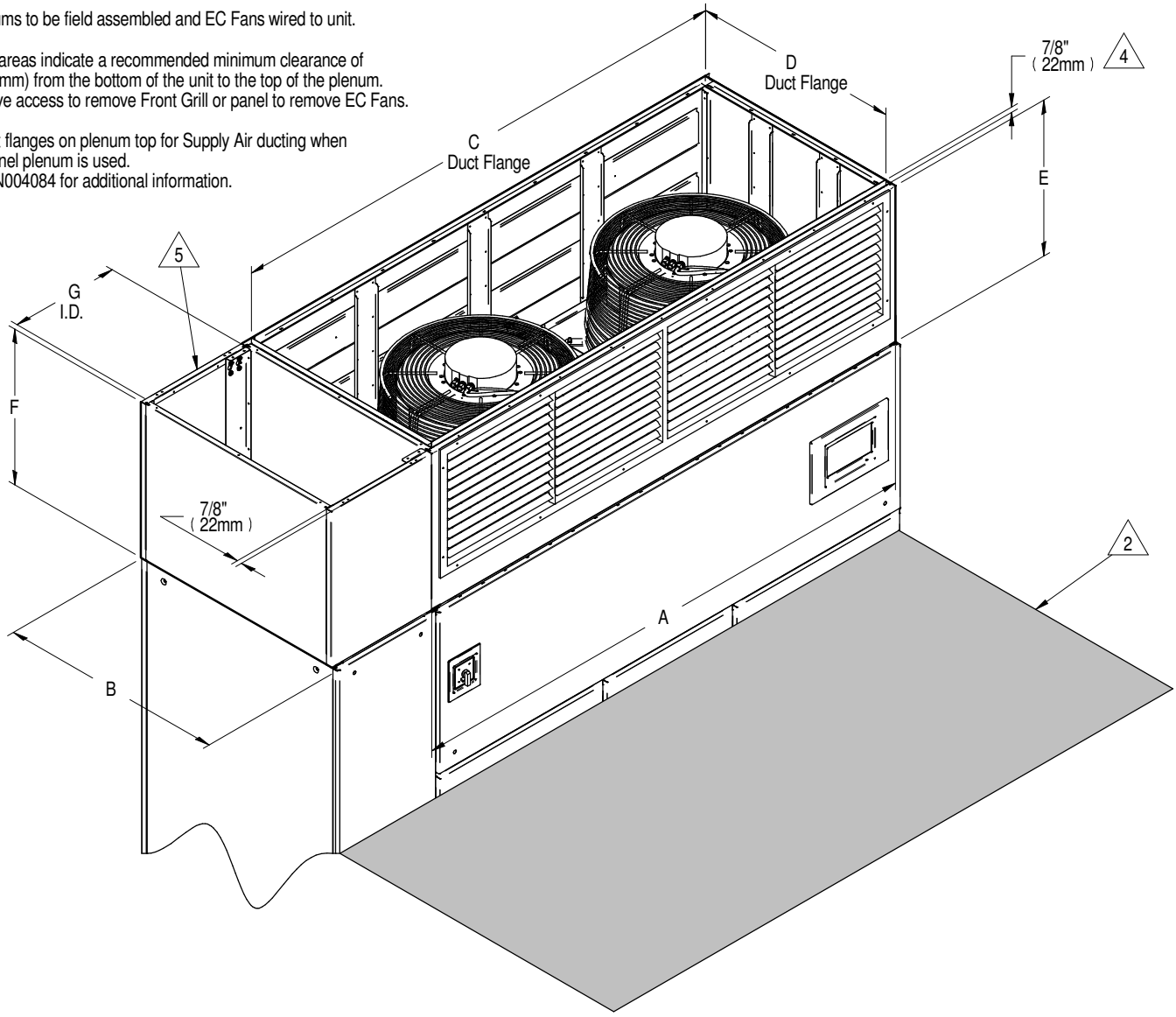
Notes:

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" (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.
3. When piping out the top of the unit, install traps in the discharge lines in the bottom of the unit before running lines to the top.
4. Opening for conduit chase, E1 and E2 are openings for conduit for connections to 2-1/2", 1-3/4", and 1-38" knockouts at electric panel.
5. See DPN004083 for alternate piping from the top of the unit. Alternate access is available on all units except 575V.

LIEBERT DSE

PLENUM DIMENSIONAL DATA
UPFLOW 80kW-85kW W/ EC FANS

Notes:
1. All Plenums to be field assembled and EC Fans wired to unit.
2. Shaded areas indicate a recommended minimum clearance of 36" (914mm) from the bottom of the unit to the top of the plenum.
3. Must have access to remove Front Grill or panel to remove EC Fans.
4. Top duct flanges on plenum top for Supply Air ducting when solid panel plenum is used.
5. See DPN004084 for additional information.



Main unit Plenum Height E in. (mm)	Main unit Plenum weight lb. (kg)		
	Non-grilled plenum	Front discharge	Rear discharge
24 (610)	112 (51)	160 (73)	173 (79)
30 (762)	136 (62)	N/A	
36 (914)	156 (71)		

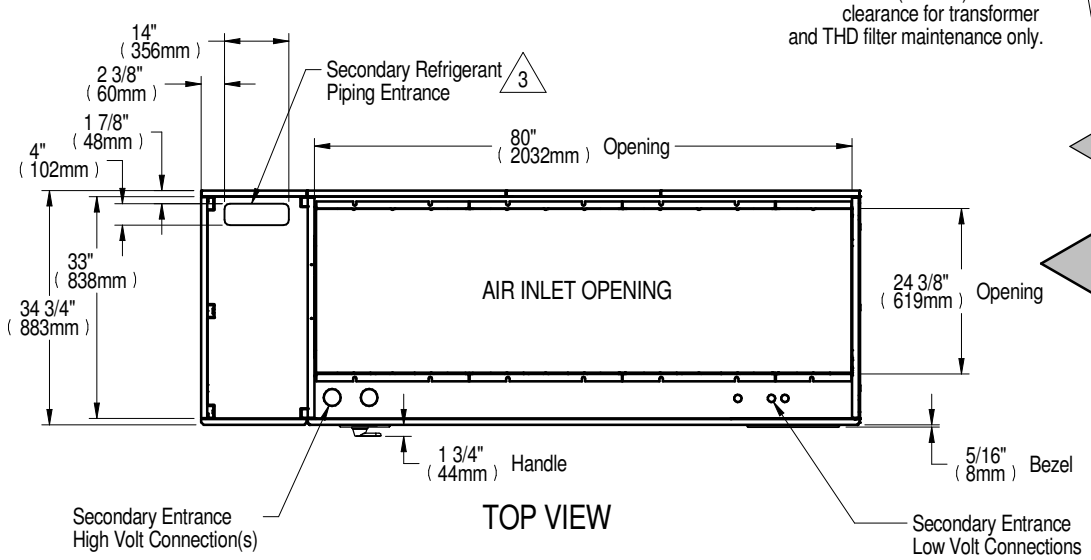
Compressor Plenum		
Width G in. (mm)	Height F in. (mm)	Weight lb (kg)
17 (432)	24 (610)	27 (12)
	30 (762)	30 (14)
	36 (914)	33 (15)

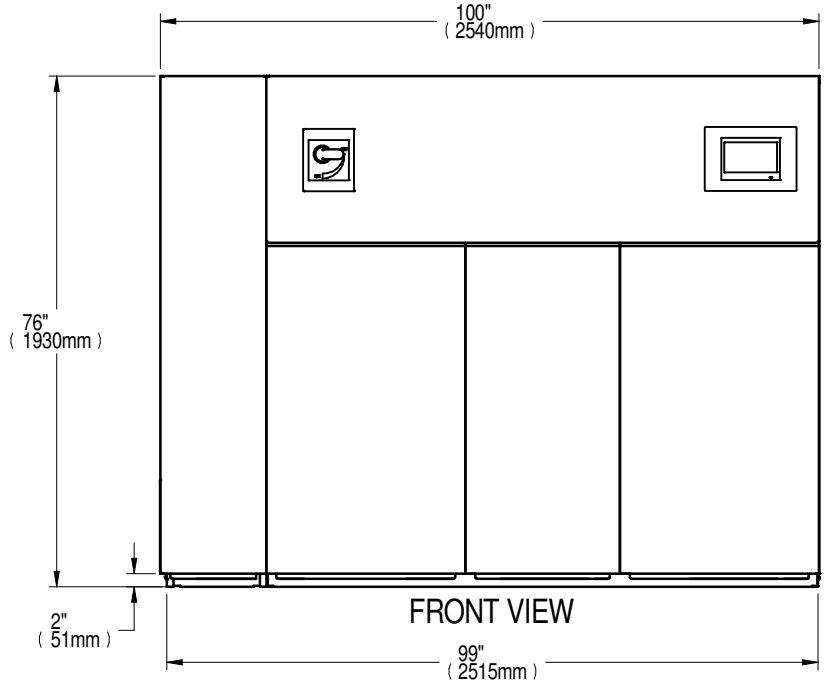
Plenum Dimensional Data in. (mm)			
A	B	C	D
82-1/4 (2089)	34 (864)	81 (2057)	32 (813)

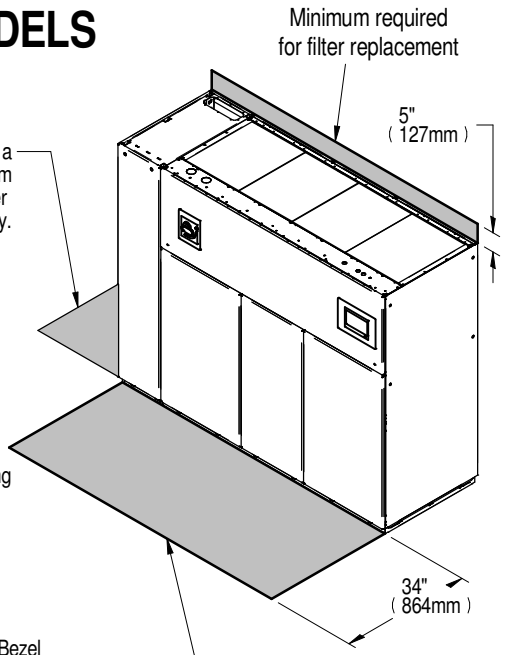
No. of Fans/Unit	EC Fan Assembly Weight lb. (kg)
2	102 (46)

LIEBERT DSE

CABINET DIMENSIONAL DATA
DOWNFLOW DA080-DA085 MODELS







Notes:
1. Filters are accessible through top of unit only.
2. Downflow electrical connections can be made from top or bottom of unit.

3. Secondary Refrigerant piping entrance. Not available with 575V.

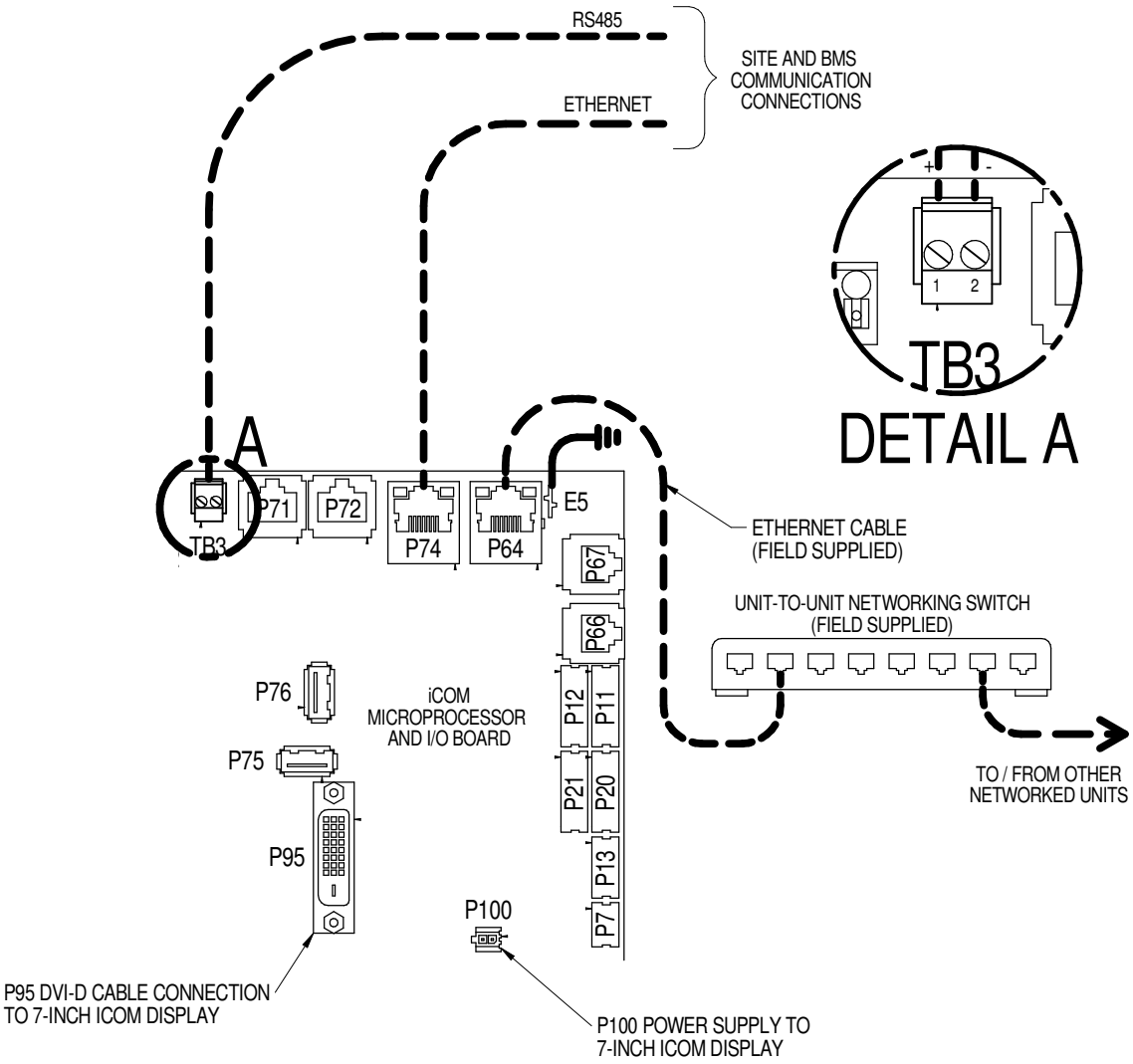
4. Add 120lbs. (54kg) for 575V transformer.

5. Unit power must be off when performing transformer and THD filter maintenance.

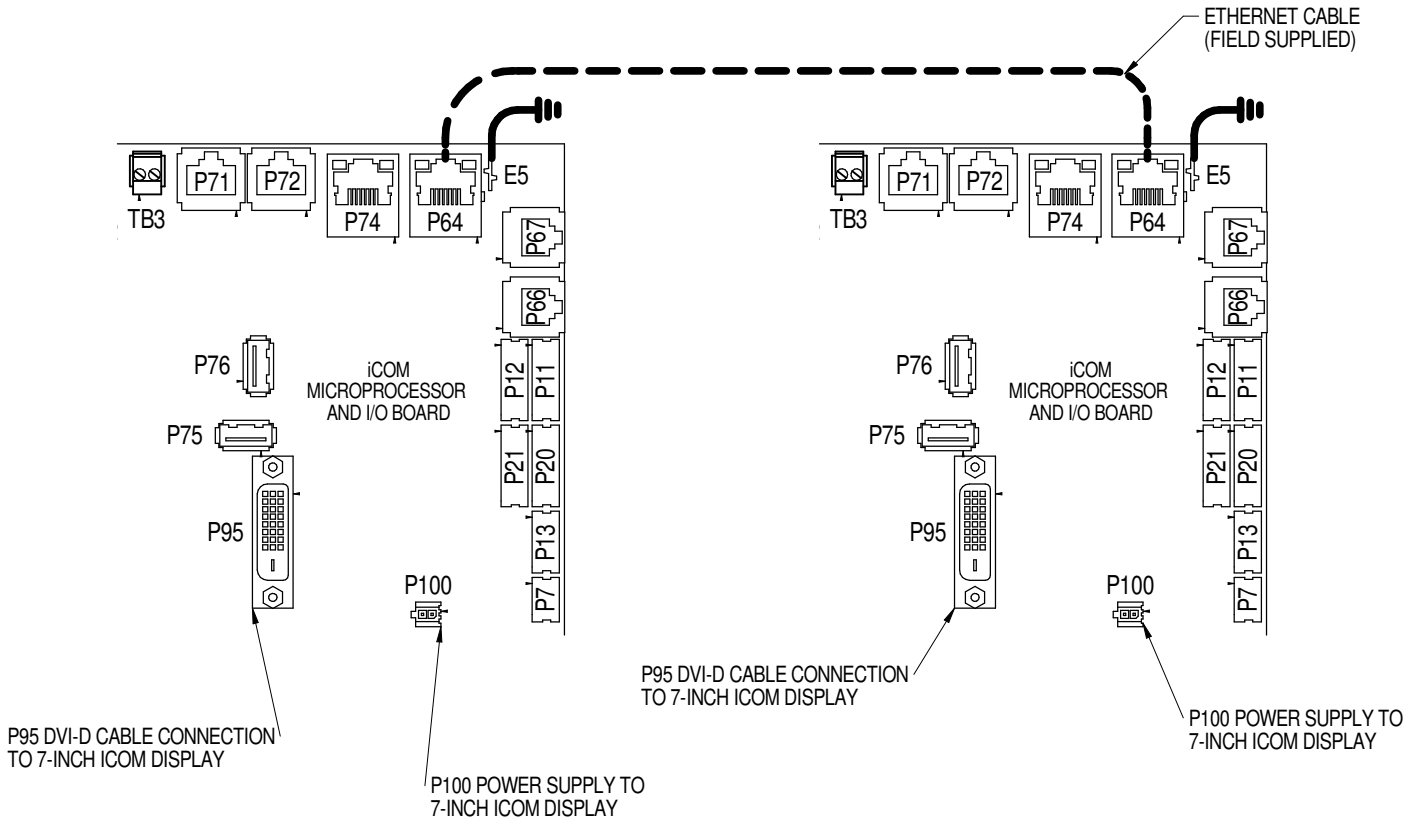
Approximate Dry Weight lb. (kg) 4	
DA080	2200 (998)
DA085	2250 (1021)

LIEBERT DS, DSE, CW, PDX & PCW

UNIT TO UNIT NETWORK CONNECTIONS



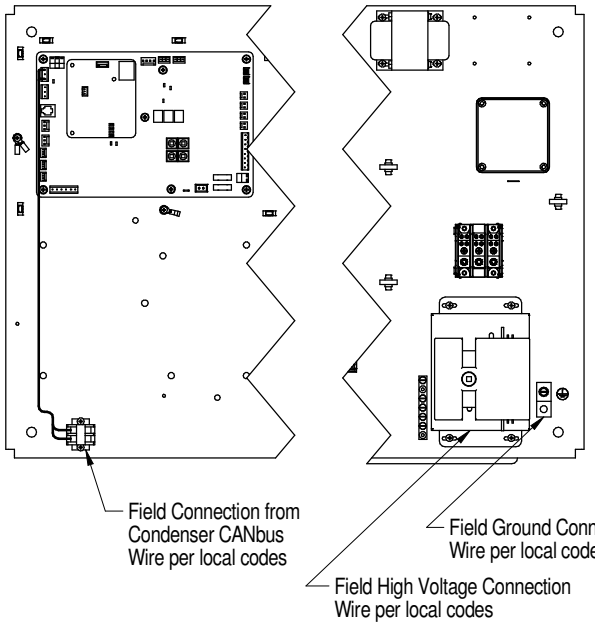
UNIT TO UNIT NETWORK CONNECTIONS

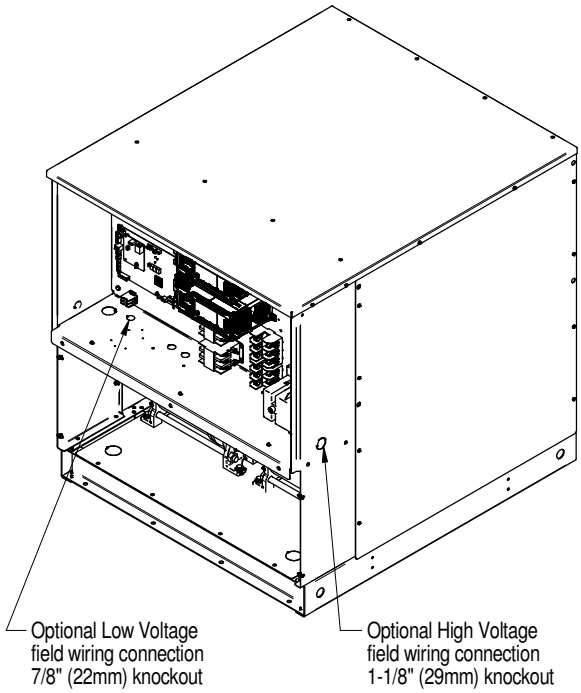


NOTE* For dual-unit network configurations only

ELECTRICAL FIELD CONNECTIONS

PR050 SINGLE CIRCUIT MODELS





Model	Unit Electrical Specifications						Single Pump Motor	
	Voltage	Phase	Hz	FLA	Minimum Supply Circuit Ampacity	Maximum Fuse Size	HP	FLA
PR050AA***_	460	3	60	3.5	4.4	15	1.6	3.5
PR050AY***_	208/230			6.9	8.6			6.9
PR050AB***_	575			2.8	3.5			3.5
PR050A2***_	380			4.2	5.3			4.2
PR050AG***_	415		50	3.7	4.7		1.2	3.7
PR050AA***H	460		60	1.3	1.6		0.75	1.3
PR050AY***H	208/230			2.6	3.3			2.6
PR050AB***H	575			1	1.3			1.3
PR050A2***H	380			1.6	2			1.6
PR050AG***H	415		50	1.2	1.5			1.2

LIEBERT DSE

ELECTRICAL FIELD CONNECTION DESCRIPTION
50kW - 85kW UPFLOW AND DOWNFLOW MODELS

STANDARD ELECTRICAL CONNECTIONS

1) **Primary high voltage entrance -** 2.50" (64mm); 1.75" (44mm); 1.375" (35mm) diameter concentric knockouts located in bottom of box
2) **Secondary high voltage entrance -** 2.50" (64mm); 1.75" (44mm); 1.375" (35mm) diameter concentric knockouts located in top of box
3) **Primary low voltage entrance -** Quantity (3) 1.375" (35mm) diameter knockouts located in bottom of unit
4) **Secondary low voltage entrance -** Quantity (3) 1. 375" (35mm) diameter knockouts located in top of box
5) **Three phase electrical service -** Terminals are on main fuse block (disregard if unit has optional disconnect switch). Three phase service not by Liebert.
6) **Earth ground -** Terminal for field supplied earth grounding wire. Earth grounding required for Liebert units.
7) **Remote unit shutdown -** Replace existing jumper between terminals 37 & 38 with field supplied normally closed switch having a minimum 75VA, 24VAC rating. Use field supplied Class 1 wiring.
8) **Customer alarm inputs -** Terminals for field supplied, normally open contacts, having a minimum 75VA, 24VAC rating, between terminals 24 & 50, 51, 55, 56. Use field supplied Class 1 wiring. Terminal availability varies by unit options.
9) **Common alarm -** On any alarm, normally open dry contact is closed across terminals 75 & 76 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
10) **Heat rejection interlock -** On any call for compressor operation, normally open dry contact is closed across terminals 70 & 71(circuit 1), 230 (circuit 2) to heat rejection equipment. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring. Liebert DSE units must be connected to Liebert MC series condenser with premium control. It is required that the jumper between terminal 71 and terminal 230 be removed. Three wires must connect terminals 70, 71, and 230 of the indoor unit to terminals 70, 71 and 230 of the Liebert MC series condenser.
11) **Unit factory installed disconnect switch, Fuse Block and Main Fuses –** "Locking Type" consists of a non-automatic molded case switch operational from the outside of the unit. Access to the high voltage electric panel compartment can be obtained only with the switch in the "off" position. Units with fused disconnects are provided with a defeater button that allows access to the electrical panel when power is on. The molded case switch disconnect models contain separate main fuses

CANBUS ELECTRICAL CONNECTIONS

12) **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 –Optional Econophase Unit.
13) **CANbus Cable** – CANbus cable provided by others to connect to the outdoor condenser, and optional PRE unit (DA units only). 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) 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
14) Do not run in same conduit, raceway, or chase as high voltage wiring.
15) For CANbus network lengths greater than 450FT (137M) call Factory.

ELECTRICAL FIELD CONNECTION DESCRIPTION
50kW - 85kW UPFLOW AND DOWNFLOW MODELS

OPTIONAL ELECTRICAL CONNECTIONS

16) **Smoke sensor alarm - Factory** wired dry contacts from smoke sensor are 91-common, 92-NO, and 93-NC. Supervised contacts, 80 & 81, open on sensor trouble indication. 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. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
17) **Reheat and humidifier lockout -** Remote 24VAC required at terminals 82 & 83 for lockout of reheat and humidifier.
18) **Condensate alarm** (with condensate pump option) - On pump high water indication, normally open dry contact is closed across terminals 88 & 89 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
19) **Remote humidifier -** On any call for humidification, normally open dry contact is closed across terminals 11 & 12 to signal field supplied remote humidifier. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
20) **Analog Inputs-** Terminals 41, 42, 43, 44 are user configurable for 0-10V, 0-5V, or 4-20MA.

OPTIONAL LOW VOLTAGE TERMINAL PACKAGE CONNECTIONS

21) **Remote unit shutdown -** Two additional contact pairs available for unit shutdown (labeled as 37B & 38B, 37C & 38C). Replace jumpers with field supplied normally closed switch having a minimum 75VA, 24VAC rating. Use field supplied Class 1 wiring.
22) **Common alarm -** On any alarm, two additional normally open dry contacts are closed across terminals 94 & 95 and 96 & 97 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
23) **Main fan auxiliary switch -** On closure of main fan contactor, normally open dry contact is closed across terminals 84 & 85 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
24) **Liqui-Tect shutdown and dry contact -** On Liqui-Tect activation, normally open dry contact is closed across terminals 58 & 59 for remote indication (LiquiTect sensor ordered separately). 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.

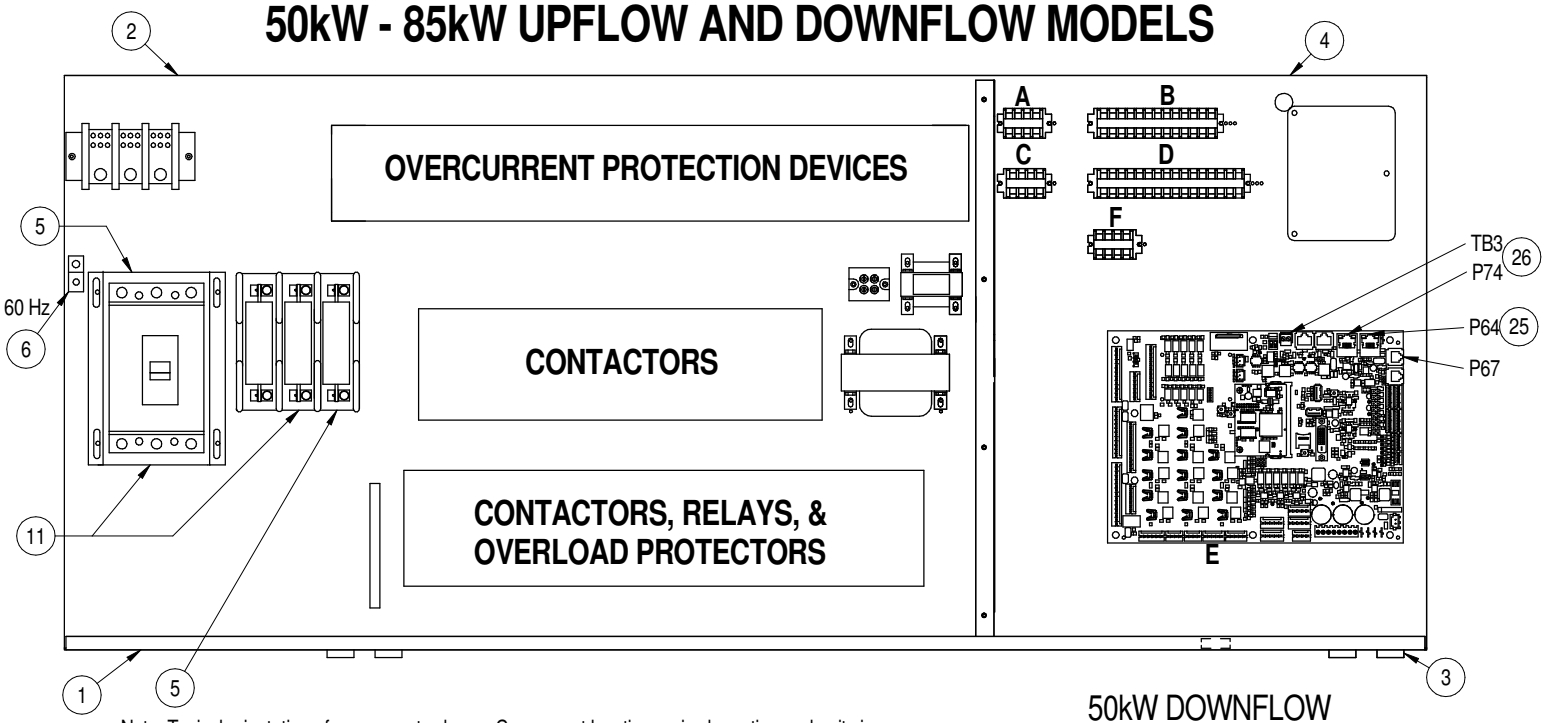
OPTIONAL COMMUNICATION CONNECTIONS.

25) **Unit-To-Unit –** Plug 64 is reserved for U2U communication.
26) **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.

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

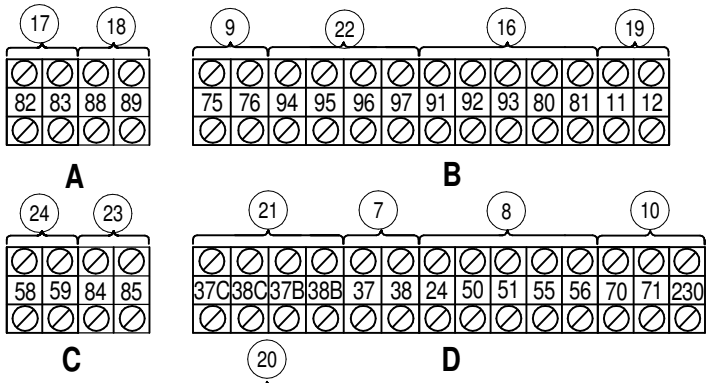
ELECTRICAL FIELD CONNECTION DESCRIPTION

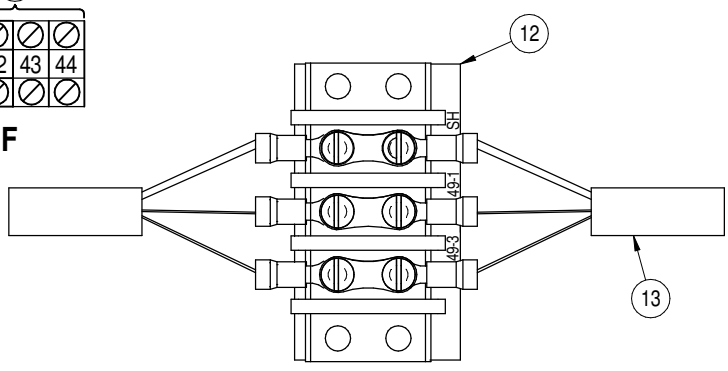
50kW - 85kW UPFLOW AND DOWNFLOW MODELS



Note: Typical orientation of components shown. Component location varies by option and unit size.

50kW DOWNFLOW
80kW - 85kW UPFLOW AND DOWNFLOW
LOW VOLT SECTION





Item 12 Installation Conditions

1. Follow all local installation codes.
2. Do not run CAN cables in same conduit, raceway, or chase as high voltage wires (120-600V).
3. Separate high volt wires from CAN wires by 12 inches.

ELECTRICAL FIELD CONNECTION DESCRIPTIONS
DA125, DA150 & DA165 DOWNFLOW MODELS

STANDARD ELECTRICAL CONNECTIONS

1) Primary high voltage entrance - 2.50" (64mm); 1.75" (44mm); 1.375" (35mm) diameter concentric knockouts located in bottom of box.
2) Primary low voltage entrance - Quantity (3) 1.375" (35mm) diameter knockouts located in bottom of unit.
3) Three phase electrical service - Terminals are on top of disconnect switch. Three phase service not by Liebert.
4) Earth ground - Terminal for field supplied earth grounding wire and component ground terminal strip. Earth grounding required for Liebert units.
5) Remote unit shutdown - Replace existing jumper between terminals 37 & 38 with field supplied normally closed switch having a minimum 75VA, 24VAC rating. Use field supplied Class 1 wiring.
6) Customer alarm inputs - Terminals for field supplied, normally open contacts, having a minimum 75VA, 24VAC rating, between terminals 24 & 50, 51, 55, 56. Use field supplied Class 1 wiring. Terminal availability varies by unit options.
7) Common alarm - On any alarm, normally open dry contact is closed across terminals 75 & 76 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
8) Heat rejection interlock - On any call for compressor operation, normally open dry contact is closed across terminals 70 & 71 (Circuit 1), 230 (Circuit 2) to heat rejection equipment. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
9) Unit factor installed disconnect switch, Fuse Block and Main Fuses – "Locking Type" consists of a non-automatic molded case switch operational from the outside of the unit. Access to the high voltage electrical panel compartment can be obtained only with the switch in the "off" position. Units with fused disconnects are provided with a defeater button that allows access to the electrical panel when power is on. The molded case switch disconnect models contain separate main fuses.

CANbus ELECTRICAL CONNECTIONS

10) 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 –Optional Econophase unit.
11) 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 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
12) Do not run in same conduit, raceway, or chase as high voltage wiring.
13) For CANbus network lengths greater than 450FT (137M) call Factory.

ELECTRICAL FIELD CONNECTION DESCRIPTIONS
DA125, DA150 & DA165 DOWNFLOW MODELS

OPTIONAL ELECTRICAL CONNECTIONS

14) Smoke sensor alarm - Factory wired dry contacts from smoke sensor are 91-common, 92-NO, and 93-NC. Supervised contacts, 80 & 81, open on sensor trouble indication. 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. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
15) Reheat and humidifier lockout - Remote 24VAC required at terminals 82 & 83 for lockout of reheat and humidifier.
16) Condensate alarm (with condensate pump option) - On pump high water indication, normally open dry contact is closed across terminals 88 & 89 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
17) Remote humidifier - On any call for humidification, normally open dry contact is closed across terminals 11 & 12 to signal field supplied remote humidifier. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
18) Analog inputs- Terminals 41, 42, 43, 44 are user configurable for 0-10V, 0-5V, or 4-20MA.

OPTIONAL LOW VOLTAGE TERMINAL PACKAGE CONNECTIONS

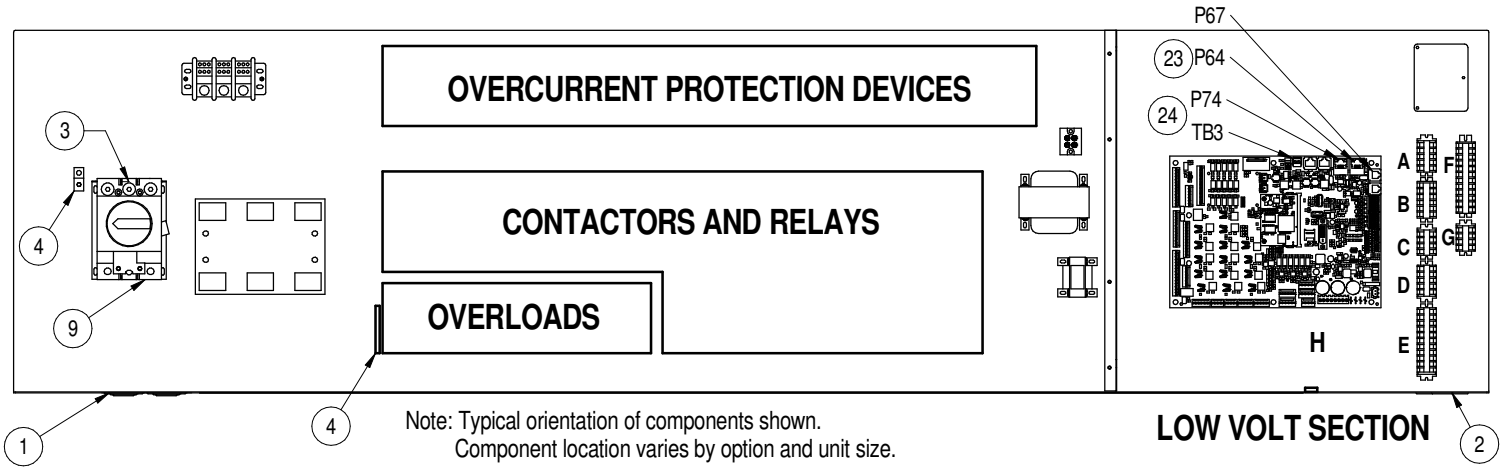
19) Remote unit shutdown - Two additional contact pairs available for unit shutdown (labeled as 37B & 38B, 37C & 38C). Replace jumpers with field supplied normally closed switch having a minimum 75VA, 24VAC rating. Use field supplied Class 1 wiring.
20) Common alarm - On any alarm, two additional normally open dry contacts are closed across terminals 94 & 95 and 96 & 97 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
21) Main fan auxiliary switch - On closure of main fan contactor, normally open dry contact is closed across terminals 84 & 85 for remote indication. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
22) Liqui-Tect shutdown and dry contact - On LiquiTect activation, normally open dry contact is closed across terminals 58 & 59 for remote indication (LiquiTect sensor ordered separately). 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.

OPTIONAL COMMUNICATION CONNECTIONS

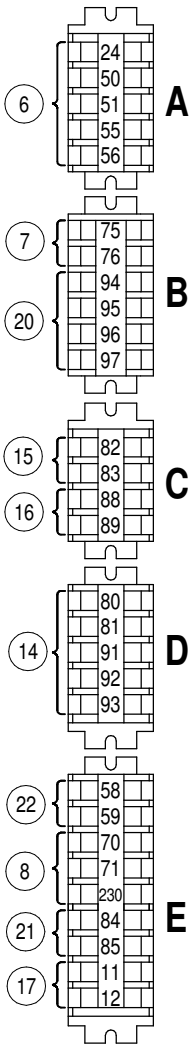
23) Unit-to-Unit – Plug 64 is reserved for U2U communication.
24) Site and BMS – Plug 74 and terminal block 3 are reserved for Site and BMS connections. Plug 74 is an eight pin RJ45 for a Cat 5 cable. Terminal block 3 is a two position screw terminal block for use with twisted pair wires.

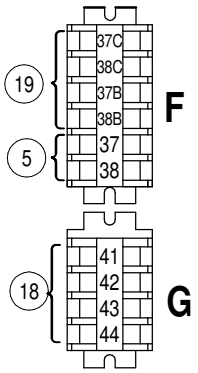
NOTE: Refer to specification sheet for total unit full load amps, wire size amps, and max overcurrent protective device size.

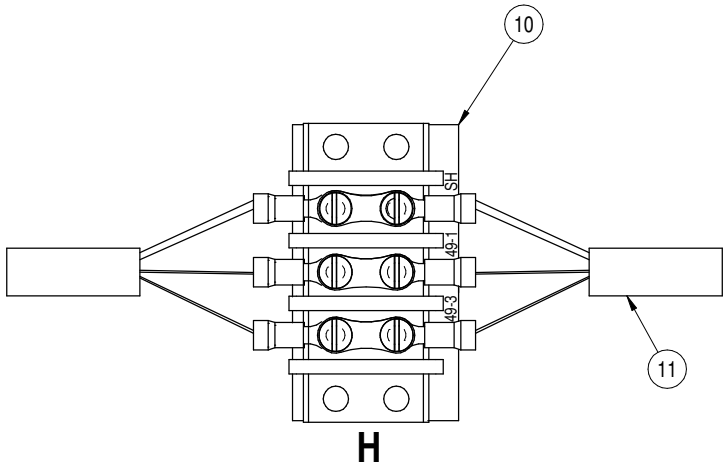
ELECTRICAL FIELD CONNECTIONS
DA125, DA150 & DA165 DOWNFLOW MODELS



Note: Typical orientation of components shown.
Component location varies by option and unit size.

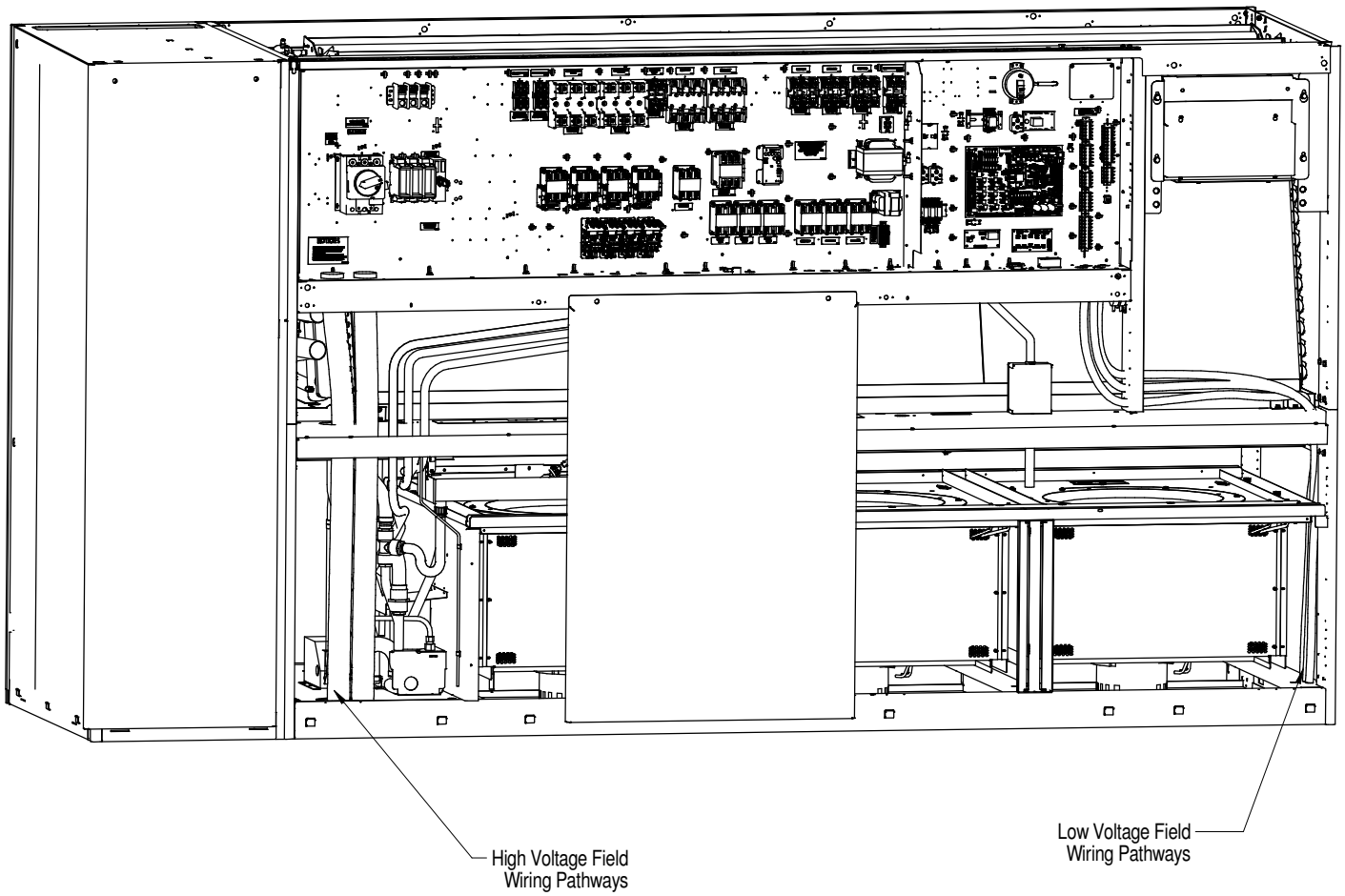






Item 11 Installation Conditions
1. Follow all local installation codes.
2. Do not run CAN cables in same conduit, raceway, or chase as high voltage wires (120-600V).
3.Separate high volt wires from CAN wires by 12 inches.

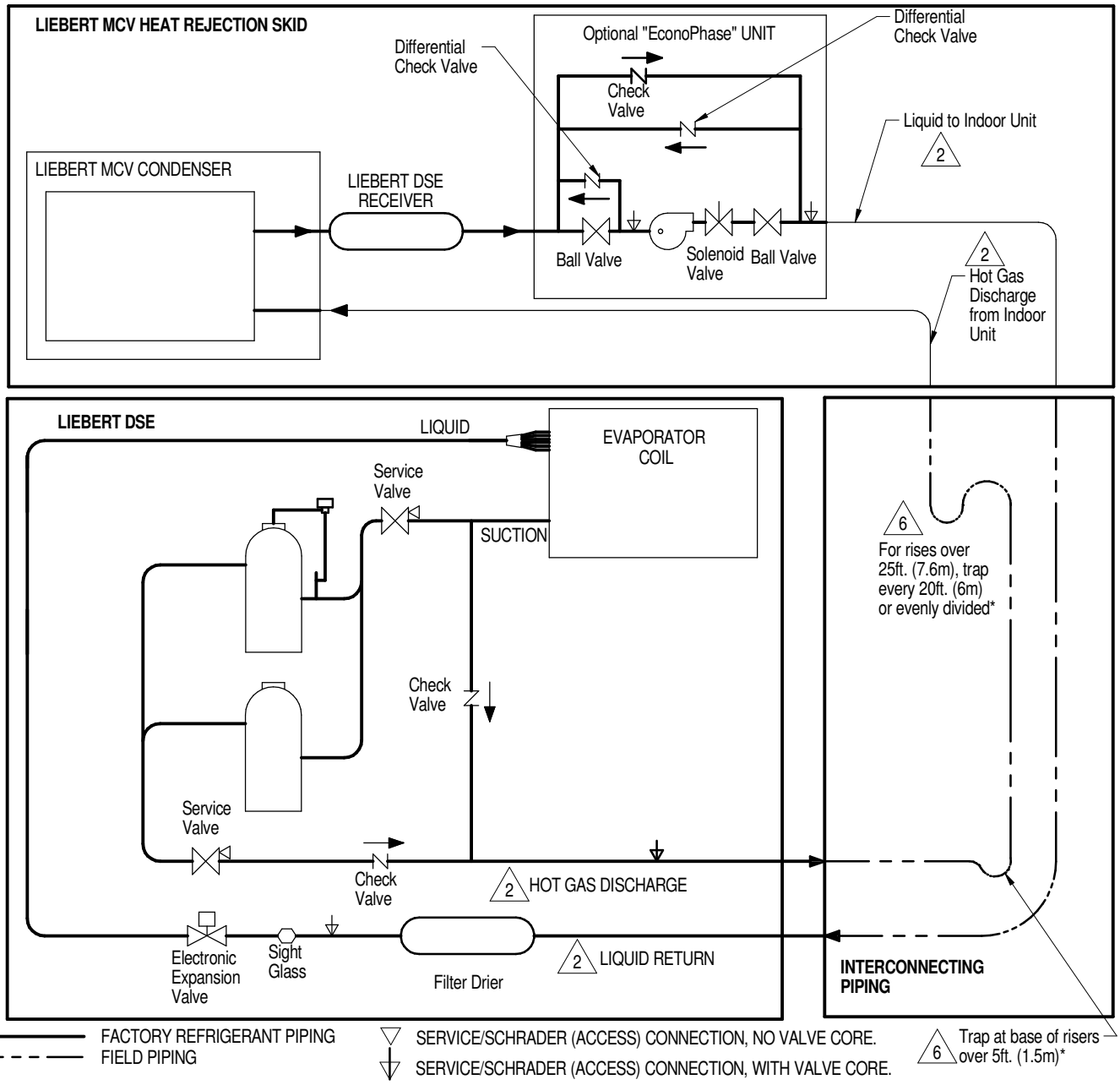
ELECTRICAL FIELD CONNECTIONS
DA125, DA150 & DA165 DOWNFLOW MODELS



LIEBERT DSE

PIPING SCHEMATIC

DA125, DA150, DA165 & DA250 with LIEBERT MCV



Notes:

1. Two refrigeration circuits provided. Single refrigeration circuit shown for clarity.
2. Circuit 1 must be maintained between indoor unit, condenser and EconoPhase unit. Circuit 2 must be maintained between indoor unit, condenser and EconoPhase unit.
3. Schematic representation shown. Do not use for specific connection locations.
4. 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). Liebert DSE Receiver required for systems with or without EconoPhase unit.
5. All indoor and outdoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor insulation must be UV and ozone resistant.
6. Components are not supplied by Liebert but are required for proper circuit operation and maintenance (DA250 with top piping has internally installed traps on the discharge lines).
7. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid flood back to compressor. Pitch horizontal 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.
8. Do not isolate any refrigeration circuits from over pressurization protection.

Appendix D: Guide Specifications

The following are the guide specifications for the Liebert® DSE.

This page intentionally left blank

Liebert® DSE™ Models DA050 – DA165

Guide Specifications

1.0 GENERAL

1.1 SUMMARY

These specifications describe requirements for a 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 heat dissipation requirements of the room.

1.2 DESIGN REQUIREMENTS

The Thermal Management system shall be a Liebert self-contained, factory-assembled unit. Standard 60 Hz 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.

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. The system sensible coefficient of performance (SCOP) shall meet ASHRAE 90.1.

1.3 SUBMITTALS

Submittals shall be provided with the agreement of 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 that all components are easily accessible for service and maintenance through the front 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 FRAME

The frame shall be welded, formed sheet metal. It shall be protected against corrosion using the autophoretic coating process. The frame shall be capable of being separated into three parts in the field to accommodate rigging through small spaces.

2.1.1 Downflow Air-supply Configurations

2.1.1.1 Downflow Air Bottom Discharge

The supply air shall exit from the bottom of the unit.

2.1.1.2 Downflow Air Front Discharge

The supply air shall exit from the front of the unit.

2.1.2 Downflow Air Return

The return air shall enter the unit from the top.

2.1.3 Upflow Air-supply Configuration

The supply air shall exit from the top of the unit.

2.1.4 Upflow Air Return, Front

The return air shall enter the unit from the front of the cabinet through factory-installed grilles. Grilles shall be painted black.

2.1.5 Exterior Panels

The exterior panels shall be insulated with a minimum 1 in. (25mm), 1.5 lb. (0.68 kg) density fiber insulation. The main front panel shall have captive quarter-turn fasteners. The main unit color shall be _____.

2.2 FILTERS—DA050, DA080, DA085

For Downflow units, the filter chamber shall be located within the cabinet, and filters shall be removable from the top of the unit.

For Upflow units, the filter chamber shall be located within the cabinet, and filters shall be removable from the front of the unit.

2.2.1 Filters, 4-in. MERV 8 or MERV11

Filters shall be deep-pleated, 4 in. (102 mm) filters with an ASHRAE 52.2-2007 MERV8 or MERV11 rating.

2.2.1 Filters, 2-in. MERV8 and 2-in. MERV11

Filters shall be deep-pleated, 2 in. (51 mm) filters with an ASHRAE 52.2-2007 MERV8 rating, plus 2-in. (51 mm) MERV11 filters.

2.2.2 Extra Filter Set

____ extra set(s) of filters shall be provided per system.

2.2 FILTERS—DA125, DA150 AND DA165

The filter plenum shall be exterior to the main cooling unit, and shall be field assembled and installed. The filters shall be removable from the front or top of the filter plenum. The filter plenum shall be painted to match the panel colors of the indoor cooling unit.

2.2.1 Filters, 4-in. MERV 8 or MERV11 or MERV13

Filters shall be deep-pleated, 4 in. (102 mm) filters with an ASHRAE 52.2-2007 MERV8 or MERV11 or MERV13 rating.

2.2.1 Filters, 2-in. MERV8 and 2-in. MERV11

Filters shall be deep-pleated, 2 in. (51 mm) filters with an ASHRAE 52.2-2007 MERV8 rating, plus 2-in. (51 mm) MERV11 filters.

2.2.1 Filters, 2-in. MERV8 and 2-in. MERV13

Filters shall be deep-pleated, 2 in. (51 mm) filters with an ASHRAE 52.2-2007 MERV8 rating, plus 2-in. (51 mm) MERV13 filters.

2.2.2 Extra Filter Set

____ extra set(s) of filters shall be provided per system.

2.3 LOCKING DISCONNECT SWITCH

The manual disconnect switch shall be mounted in the high-voltage section of the electrical panel. The switch shall be accessible from the outside of the unit with the door closed and shall prevent access to the high-voltage electrical components until switched to the “OFF” position.

2.4 SHORT-CIRCUIT CURRENT RATING (SCCR)

The electrical panel shall provide at least 65,000A SCCR (60 Hz).

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.

2.5 FAN SECTION

2.5.1 Electronically Commutated (EC) Fans

The fans shall be plug/plenum type, motorized impellers, single inlet and dynamically balanced. The drive package shall be direct drive, electronically commutated and variable speed. The fans shall be located to draw air over the coil to ensure even air distribution and maximum coil performance. EC fans shall be capable of being lowered into a raised floor (during field installation with EC-fan lowering jack) with minimum height of 24 in. (609.6 mm). EC fans shall also be capable of operating within the cooling cabinet, instead of under the floor.

The EC fans shall be available on upflow models and fans shall operate outside the unit in a factory-provided plenum with a minimum height of 24 in (610 mm).

- Downflow DA050 fan motor(s) shall be nominal 4.9 hp (3.7 kW) each with a maximum operating speed of 1400 rpm; quantity, 1.
- Downflow/Upflow DA080, DA085 fan motors shall be nominal 4.15 hp (3.1 kW) each with a maximum operating speed of 1520 rpm; quantity, 2.
- Downflow DA125, DA150 and DA165 fan motors shall be nominal 3.75 hp (2.8 kW) each, with a maximum operating speed of 1210 rpm; quantity, 3.

2.6 INFRARED HUMIDIFIER—OPTIONAL

The humidifier shall be of the infrared type installed inside the unit, consisting of high-intensity quartz lamps mounted above and out-of the water supply. The humidifier pan shall be stainless steel and arranged to be removable without disconnecting high-voltage electrical connections. The complete humidifier section shall be pre-piped, ready for field connection to the water supply. The humidifier shall be equipped with an automatic water supply system and shall have an adjustable water-overfeed to prevent mineral precipitation. A high-water detector shall shut down the humidifier to prevent overflowing. A factory provided 1-in. (25-mm) air-gap in compliance with ASME A112.1.2 section 2.4.2 (backsiphonage testing) shall prevent back-flow of the humidifier supply water. The humidifier capacity shall be ____lb./hr (kg/hr). The humidifier shall be removable from the front of the cabinet. Bypass air slots shall be included to enable moisture to be absorbed into the air stream

2.7 THREE-STAGE REHEAT—OPTIONAL

The Thermal Management unit shall include a factory-installed reheat to control temperature during dehumidification.

The electric reheat coils shall be low watt density, 304/304 stainless steel fin tubular construction, protected by thermal safety switches, shall be ____ kW (____ BTUH) controlled in 3 stages. The reheat elements shall be removable from the front of the cabinet. A ground-current detection device shall disable reheat in the case where a ground-fault is detected in the reheat element.

2.8 REFRIGERATION SYSTEM

2.8.1 Single Circuit - DA050

Each unit shall include one independent refrigeration circuit and shall include a liquid-line filter drier, refrigerant sight glass with moisture indicator and electronic expansion valve. Compressor shall be located outside the air stream and shall be removable and serviceable from the front of the unit.

2.8.2 Dual Circuit - DA080, DA085, DA125-165

Each unit shall include two (2) independent refrigeration circuits and each circuit shall include liquid line filter driers, refrigerant sight glass with moisture indicator and electronic expansion valves. Compressors shall be located outside the air stream and shall be removable and serviceable from the front of the unit. Each compressor circuit shall be connected to the full-face area of the evaporator coil.

2.9 COMPRESSORS

2.9.1 Digital Scroll Compressors—DA050, DA080, DA085

The compressors shall be scroll-type with a variable capacity operation capability. Compressor solenoid valve shall unload the compressor and allow for variable capacity operation. The compressor shall have vibration isolators, thermal overloads, automatic reset high-pressure switch with lockout after three failures, rotalock service valves, suction line strainer and a maximum operating speed of 3500 rpm. The compressor motor shall be suction gas cooled.

2.9.1 Tandem Digital Scroll Compressors—DA125, DA150 and DA165

The compressors shall be tandem, scroll-type with a variable capacity operation capability of one compressor of the pair. Compressor solenoid valve shall unload the compressor and allow for variable capacity operation. The compressor shall have vibration isolators, thermal overloads, automatic reset high-pressure switch with lockout after three failures, rotalock service valves, suction line strainer and a maximum operating speed of 3500 rpm. The compressor motor shall be suction gas cooled.

2.10 CRANK-CASE HEATERS

The compressors shall include crankcase heaters, powered from the indoor unit electric panel.

2.11 EVAPORATOR COIL

The evaporator coil shall be A-frame design for downflow units and V-frame design for upflow units (DA080 and DA085 only) and have _____ sq. ft. (_____ sq. m) face area, ____ rows deep. It shall be constructed of rifled copper tubes and aluminum fins with a maximum face velocity of _____ ft. per minute (_____ m/s) at _____ CFM (_____ CMH). A stainless steel condensate drain pan shall be provided.

2.11.1 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. Refrigerant shall be field supplied and field charged by the installing contractor.

2.12 AIR-COOLED SYSTEMS

The indoor evaporator unit shall include refrigerant piping and shall have a factory holding charge of nitrogen. The hot-gas and liquid lines shall be spun shut and each shall include a factory-installed Schrader valve. Field-relief of the Schrader valve shall indicate a leak-free system from the factory. Installing contractor shall cut the evaporator piping and shall evacuate and charge the system. Refrigerant shall be supplied by the installing contractor.

3.0 CONTROLS

3.1 LIEBERT ICOM™ MICROPROCESSOR CONTROL WITH 7-IN. 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 allows 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 a report 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 have the ability to configure the Liebert iCOM 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 Liebert iCOM shall permit the user to configure custom widgets on the main screen. Widget options shall 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 LED’s—The Liebert iCOM shall provide the user with the unit's operating status using an integrated 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 have the ability to store the local service or sales contact information.
- Upgradeable— Liebert iCOM firmware upgrades shall be performed through a USB connection.
- Timers/Sleep Mode—The menu 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 designed 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 sensors provided by others. 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. When configuring the analog inputs, the selectable items to choose shall include air pressure, fluid pressure, temperature, percentage, general amperage, condenser amps, compressor amps, reheat amps, humidifier amps, unit amps, fan amps factory standard, and not used.
- 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 can support dual IP on a single network and one 485 protocol simultaneously.
- DSE System Optimization Allows for efficiency improvements for the DSE system during Econophase mode. By optimizing liquid refrigerant temperature and pressure setpoints, the result is a reduction in power consumption of the condenser fan during mid and high ambient conditions. DSE System Optimization provides an opportunity for additional energy savings by increasing the utilization of the PRE-pumps and decreasing the utilization of the condenser fans, but always maintaining appropriate heat capacity rejection during mid to high ambient outdoor conditions. Energy savings occurs when utilizing the PRE-pump package; a pump consumes roughly 1/10th of the power consumed by the compressor.

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 customer's Building Management System/Building Automation System. The Liebert iCOM control shall activate an audible and visual alarm in the 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 (Standard on DA050 and Optional DA080 to DA165)
- 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 shall 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

The 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 diagnostics or to receive a signal from the BMS through 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 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 derived 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 units controlling sensors. All sensor readings are shared.
- Teamwork Mode 3 - Optimized Aisle (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, Economizer or EconoPhase) is controlled through unit supply-air conditions. The 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 3–Optimized Aisle mode with remote temperature sensors. In Teamwork Mode 3, Cascade mode will stage units On based on the temperature and humidity readings and their deviation from setpoint. Cascade mode coordinates the fan speed dynamically 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 new 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 back into standby.

3.7 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.

3.8 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 of a stand-by unit to spin slower (15% or less) to act as a damper.

3.9 COMPRESSOR SHORT CYCLE CONTROL

Compressor short cycle control shall be available to prevent compressor short-cycling and needless compressor wear.

3.10 LIEBERT MC™ CONDENSER AND ECONOPHASE COMMUNICATION

The Liebert iCOM shall communicate directly with the Liebert MC condenser and/or Liebert EconoPhase unit via field-supplied CANbus communication wires and via field-supplied, low-voltage interlock wires. This communication shall allow Liebert iCOM to control Liebert MC condenser/EconoPhase modes and operation and to monitor their health and alarm status.

3.11 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.

3.12 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 outage.

3.13 SEQUENTIAL LOAD ACTIVATION

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

3.14 LOW-PRESSURE MONITORING

Units shall ship standard with low-pressure transducers for monitoring individual 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

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 delay after the compressor start has elapsed, the low-pressure input should remain in the normal state. If the low pressure input does not remain in the normal state after the 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

When the compressor is initially activated, the system shall be monitored for a high pressure. When high pressure is detected, the control shall reduce the system discharge pressure by altering the compressor loading and the condenser fan speed, 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 automatically re-enable the compressor when pressure returns to a safe level.

3.18 REFRIGERANT PRESSURE TRANSDUCER FAILURE

The control shall monitor the high-side and low-side refrigerant pressure transducers. If the control senses that the transducer has failed, has been disconnected, shorted or the reading has gone out of range, the user shall be notified through 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 the thermistor becomes disconnected, shorted or the reading goes out of range, the user will be notified through an event on the local display and remote monitoring.

3.22 COMPRESSOR SEQUENCING

A user-selectable compressor sequencing parameter shall be provided and access through the local control. This sequencing parameter presents the user with three choices:

- Always use Compressor 1 as lead compressor.
- Always use Compressor 2 as lead compressor.
- Auto: The unit shall automatically stage compressors to keep each unit's run time within 8 hours of the other unit's run time. NOTE: The Auto setting attempts to maintain equal run times between compressors. However, the control will not turn Off a compressor to equalize run time when it is needed to control the space.
    - First priority: If the safety timings are acceptable for only one compressor, that compressor shall be the next to be started/stopped.
    - Second priority: If both compressors are Off, the one with fewer working hours shall be the next to start.
    - Third priority: If both compressors are in operation, the one that has been operating longer since the last start shall be the next to be stopped.

3.23 COMPRESSOR HIGH- AND LOW-TEMPERATURE LIMIT PROTECTION

The control shall monitor the return air to ensure that the compressor(s) are 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.

3.24 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.

3.25 MANUAL COMPRESSOR DISABLEMENT

The user shall have the ability to disable compressor operation using a set of either normally-open or normally-closed dry contacts tied directly to the control or through remote monitoring. An additional enable/disable feature shall be provided to allow the user to permanently disable an individual compressor circuit for maintenance using the local display.

3.26 MANUAL COMPRESSOR OPERATION

The user shall be able to operate each compressor manually from the local display. The user shall be able to energize refrigeration components including liquid-line solenoid valves, compressor contactors, electronic expansion valves and adjust capacity for troubleshooting or repair. The control shall monitor the compressor during manual operation and shall shut the compressor down if needed to prevent electrical or mechanical damage.

4.0 MISCELLANEOUS OPTIONS

4.1 HIGH-TEMPERATURE SENSOR—OPTIONAL

The high-temperature 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.

4.2 SMOKE SENSOR—OPTIONAL

The smoke sensor shall immediately shut down the Thermal Management system and activate the alarm system when activated. The smoke sensor shall be mounted in the electrical panel with the sensing element in the return air compartment. The smoke sensor is not intended to function as or replace any room smoke detection system that may be required by local or national codes. The smoke sensor shall include a supervision contact closure.

4.3 CONDENSATE PUMP, DUAL FLOAT—OPTIONAL

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

4.4 LOW VOLTAGE TERMINAL PACKAGE—OPTIONAL

Factory-installed and factory-wired terminals shall be provided.

- Remote Shutdown Terminals - 2 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 - 2 additional pairs of terminals provide the customer with normally-open contacts for remote indication of unit alarms.
- Main-Fan Auxiliary Switch - 1 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 - 1 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 allow 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 EC FAN OVERLOAD

The EC fan fault is standard on all models.

4.7 COMPRESSOR OVERLOAD—STANDARD ON DA050, OPTIONAL ON DA080 -DA165

A pair of N/O contacts shall be factory-installed and wired to each compressor to indicate Compressor Overload.

4.8 QUICK START FUNCTION—OPTIONAL

Quick-start feature will only become available in the event the capacitive buffer is no longer able to maintain power to the iCOM controller and iCOM powers down. Upon power restoration to the iCOM controller, the quick-start feature shall activate. Unit restart time for full cooling shall be 40 seconds or less after power to the unit has been restored, with fans starting within 15 seconds. The unit shall be equipped with a UPS or capacitive buffer to provide the Liebert iCOM with a minimum of 3 minutes of ride-through power. The capacitive buffer shall provide power for continuous connectivity to the Building Management System(s) via Liebert iCOM control.

4.9 WIRED REMOTE SENSOR(S)—OPTIONAL

Each Liebert iCOM™ can have up to ten 2T sensors (20 sensor readings total) for control or reference. As part of the U2U network, those sensors shall be shared and used to control the cooling units and provide greater flexibility, visibility and control to respond to changes in the conditioned space. When the sensors are used for control, the user may set the control to be based off a maximum or average of a selected highest temperature reading.

4.10 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.

4.11 LIEBERT LIQUI-TECT™ SENSORS (MAXIMUM OF 2 PER UNIT)—OPTIONAL

____ (quantity) solid state water sensors shall be provided for installation under the raised floor.

4.12 FLOOR STAND—OPTIONAL

The floor stand shall be constructed of a welded steel frame. The floor stand shall have adjustable legs with vibration isolation pads. The floor stand shall be ____ in. (_____mm) high.

4.12.1 Seismic Rated Floor Stand—Optional

The floor stand shall be seismic rated per IBC2015, and shall be attached to the unit frame (field-installed). The floor stand shall also be capable of being anchored to the subfloor.

4.13 RETURN AIR PLENUM FOR DOWNFLOW UNITS

The air plenum shall be constructed of 20-gauge steel, powder coated to match unit color. The plenum shall be _____in. (_____mm) high. A door shall be included in the front of the plenum to enable front filter access. Air shall enter the plenum from the top.

4.14 DISCHARGE AIR PLENUM FOR UPFLOW UNITS, WITH DISCHARGE GRILLE(S)—OPTIONAL DA080 AND DA085 ONLY

The air plenum shall be constructed of 20-gauge steel, powder coated to match unit color. The plenum shall be ___in. (___mm) high. Discharge air grilles shall be painted black and shall be included on the (front), (rear), (left side) or (right side) of the plenum. Compressor plenum is optional.

4.15 DISCHARGE AIR PLENUM FOR UPFLOW UNITS, WITHOUT DISCHARGE GRILLE(S)—OPTIONAL DA080 AND DA085 ONLY

The air plenum shall be constructed of 20-gauge steel, powder coated to match unit color. The plenum shall be ___in. (___mm) high. Air shall discharge from the top of the plenum. Compressor plenum is optional.

5.0 ECONOPHASE CYCLE

5.1 ECONOPHASE CYCLE—OPTIONAL

During cold outdoor temperatures, refrigerant pumps shall circulate refrigerant through the cooling system, in lieu of operating the compressors. The compressors shall ramp down during EconoPhase operation, and, if able to completely offset the load, the control system shall shut the compressors off. Refrigerant pump(s) (PR050 has 1 pump, PR085-125 has 2 pumps) shall be housed in an enclosure, with each pump dedicated to its own refrigerant circuit. The EconoPhase system shall include a variable-speed drive on each refrigerant pump to enable the pumps' speed to adjust in response to the load.

6.0 HEAT REJECTION

6.1 OPTIONS—LIEBERT MC CONDENSER

6.1.1 Liebert MC 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 60-Hz 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.

The condenser model number shall be: _____

6.1.2 Liebert MC 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.

The unit is to be supplied for operation using a _____Volt____phase,_____Hz power supply.

6.1.3 Liebert MC 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 reduce sound levels.

6.1.4 Liebert MC Coil

Liebert MC 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 (2068 kPag). 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.

6.1.5 Liebert MC 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-meshed 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.

6.1.6 Liebert MC 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.

6.1.6.1 EC Fan Speed and Premium Control

The Liebert MC 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 (–34.4°C to 51.7°C) and shall be factory-set for fan speed control with Liebert DSE receivers.

The mode of the Liebert MC shall be controlled by the Liebert DSE iCOM control and shall be in either DX, EconoPhase or Idle Mode by each refrigerant circuit. Dual circuit condensers shall operate fans to meet airflow needs and mode of each circuit independent of the other. Fan(s) on common refrigerant circuit shall operate in synchronous speed when that circuit is active.

6.1.6.2 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.

6.1.6.3 Short Circuit Current Rating

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

6.1.6.4 575-Volt Option

The secondary electrical enclosure shall contain a factory wired transformer and fusing to support 575V input power. All internal wiring shall be provided to connect main and secondary electrical enclosures. High-voltage supply and low voltage indoor unit communication/interlock connections shall be made in the main electrical enclosure.

6.1.7 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. Units with the 575V option shall include a second, factory-mounted, NEMA 3R weatherproof electrical enclosure opposite the main electrical enclosure.

6.1.8 Liebert MC Mounting Legs Standard Aluminum Legs

6.1.8.1 Standard 60-in. Height Galvanized Legs with Bracing

Condenser shall be shipped with 60in. (1524mm) mounting legs with stabilization bracing. Legs, bracing and hardware shall be galvanized steel and shall be field installed and anchored to the mounting surface.

6.1.8.2 Optional Height Galvanized Legs with Bracing

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

6.1.8.3 Optional Height 18-in. Aluminum Legs

Condenser shall be shipped with 18 in. (457 mm) legs to mount unit for vertical air discharge with rigging holes for hoisting the unit into position. Legs shall be aluminum and hardware shall be galvanized steel.

6.1.9 Liebert MC Condenser Accessories

6.1.9.1 Liebert DSE™ Receiver Kit

Liebert DSE 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.

6.1.9.2 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.

6.2 LIEBERT ECONOPHASE

The Liebert EconoPhase has two, variable-speed refrigerant pumps controlled by individual VFDs, factory-wired electrical panel, and factory-piped and tested refrigerant piping all housed within a bright aluminum NEMA 3R enclosure. The Liebert EconoPhase refrigerant pumps are individually activated and speed controlled during cooler outdoor ambient, coordinated with Liebert DSE compressors idled and refrigerant bypassed around them. Cool temperatures, such as mild weather and at night, partial economization, and power savings is provided with one pump activated and one compressor idled. Colder temperatures, such as winter weather, allow both Liebert DSE compressors to be idled and EconoPhase pumps to be controlled independently to provide full economization.

6.3 OPTIONAL—LIEBERT MCV CONDENSER

6.3.1 MCV 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 60 Hz units are 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.

The condenser model number shall be: _____

6.3.2 MCV Condenser Design Requirements

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

The unit is to be supplied for operation using a _____volt/3phase/60Hz power supply.

6.3.3 MCV Standard Features – All Condensers

Condenser shall consist of all-aluminum microchannel condenser coil configured in V-banks, propeller fans direct-driven by individual EC-fan motors, mounting base, and electrical controls, suitable for mounting outdoors. The Liebert air-cooled condenser shall provide the heat rejection of two refrigeration circuits, matching heat-rejection capacity varying with the outdoor ambient temperatures and compressor or EconoPhase pump heat-rejection requirements. 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 provide reduced maximum sound levels.

6.3.4 MCV Condenser Coil

6.3.4.1 Aluminum Microchannel Coil

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.

6.3.5 MCV Fan

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

6.3.5.1 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.

6.3.6 MCV Electrical Controls

Electrical controls and service connection terminals shall be provided and factory wired inside the attached control panel section. A locking disconnect switch shall be factory-mounted and wired to the electrical panel and controlled via an externally mounted locking and lockable door handle. High-voltage supply wiring and low voltage indoor unit communication/interlock wiring shall be factory-wired to customer connection boxes mounted on the base.

6.3.6.1 Premium Efficiency Fan Control

The Liebert MCV 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 control system provides refrigerant head pressure and system starting for outdoor ambient temperature as low as -30°F (-35 °C), provided the total temperature range (from minimum design ambient to maximum design ambient) is 125°F (70°C) or less.

The mode of the Liebert MCV shall be controlled by the Liebert DSE iCOM control and shall be in either DX, EconoPhase or Idle Mode by each refrigerant circuit. Dual circuit condensers shall operate fans to meet airflow needs and mode of each circuit independent of the other. Fan(s) on common refrigerant circuit shall operate in synchronous speed when that circuit is active.

6.3.6.2 High-voltage Supply Connection Box

A high-voltage, customer connection box shall be provided for each Liebert MCV and matching EconoPhase to provide a single, high-voltage connection. The connection box shall be factory-mounted to the condenser base and wired to the electrical panels of the Liebert MCV and the Liebert EconoPhase units. A locking-type disconnect switch shall be accessible from the outside of the unit with the door closed, and shall prevent access to the high-voltage electrical components until switched to the Off position. The locking disconnect shall be lockable in support of lockout/tag-out safety programs.

6.3.6.3 Low-voltage Connection Box

A low-voltage connection box shall be provided for each Liebert MCV and matching EconoPhase unit to provide a single, low-voltage connection from the indoor Liebert DSE unit. The connection box shall be factory-mounted to the condenser base and wired to the electrical panels of the Liebert MCV and the Liebert EconoPhase units.

6.3.6.4 Short Circuit Current Rating

The high-voltage electrical configuration shall provide at least 65,000A SCCR and shall be labeled to speed site approvals by AHJs.

6.3.6.5 575-Volt Option

A secondary electrical enclosure shall be mounted to the condenser base and shall contain a factory-wired transformer and fusing to support 575-V input power to the Liebert MCV and EconoPhase units. Liebert MCV and EconoPhase units shall be 460-V units. All internal wiring shall be provided to connect the connection-box transformer to Liebert MCV and EconoPhase electrical enclosures. High-voltage supply connections from the building shall be made in the high-voltage connection box.

6.3.7 Liebert MCV Condenser Cabinet

The condenser cabinet shall be divided into multiple fan/coil sections by configuring two coils into a V-bank arrangement for each variable-speed EC fan. Fan/coil sections shall be created and protected by galvanized panels on each V-bank end. Internal structural support members, including coil support frame, shall be painted or galvanized steel for strength and corrosion resistance. Panel doors are provided on the outside of each coil/fan section to provide for coil cleaning. An electrical panel shall be contained inside a factory mounted, NEMA 3R weatherproof electrical enclosure.

6.3.8 Liebert DSE™ Receiver

Liebert DSE Receiver shall be painted, un-insulated receiver with integral fusible plug, formed copper pipe for ease of connecting condenser liquid line to receiver and mounting bracket. These receivers are factory installed and piped to the Liebert MCV Skid assembly

6.3.9 Liebert EconoPhase

The Liebert EconoPhase has two variable speed refrigerant pumps controlled by individual VFDs, factory wired electrical panel, factory piped and tested refrigerant piping all housed within a bright aluminum NEMA 3R enclosure. The Liebert EconoPhase is mounted, wired, and piped into the Liebert MCV Condenser Skid to provide significant jobsite installation savings. The Liebert EconoPhase refrigerant pumps are individually activated and speed controlled during cooler outdoor ambient, coordinated with Liebert DSE compressors idled and refrigerant bypassed around them. Cool temperatures, such as mild weather and at night, partial economization and power savings is provided with one pump activated and one compressor idled. Colder temperatures, such as winter weather, allow both Liebert DSE compressors to be idled and EconoPhase pumps to be controlled independently to provide full economization.

6.3.10 Liebert MCV Single Skid Assembly

The Liebert MCV Single Skid Assembly shall consist of a galvanized-steel base with the Liebert MCV condenser, Liebert EconoPhase, and Liebert DSE Receivers mounted to provide a single, high-density heat-rejection unit to support one Liebert DSE unit. All components shall be factory-wired to a centralized connection location for high-voltage connection and low-voltage connection boxes. Refrigeration components shall be factory piped, insulated, secured to a common location on the base, and sealed with an inert gas for shipment. Field relief of the Schrader valve shall indicate a leak-free system. Job-site transportation, rigging, anchorage, and connections shall be simplified for fast deployment.

6.3.11 Liebert MCV Double Skid Assembly—OPTIONAL

The Liebert MCV Double Skid Assembly shall consist of 2 independent Single skid assemblies that are bolted together, creating a common assembly for ease of transportation and job-site rigging. The double skid assembly shall support two Liebert DSE units. All components shall be factory-wired to a centralized connection location on one end of the double skid for high-voltage connection and low-voltage connection boxes.

Refrigeration components shall be factory piped, insulated, and secured to a common location on same end of the double skid as electrical connections. Piping shall be sealed with an inert gas for shipment, and field relief of the Schrader valve shall indicate a leak-free system. Job-site transportation, rigging, anchorage and connections shall be simplified for fast deployment.

7.0 EXECUTION

7.1 INSTALLATION OF THERMAL MANAGEMENT UNITS

The customer or the customer's representative shall be responsible for the following:

7.1.1 General

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

7.1.2 Electrical Wiring

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

7.1.3 Piping Connections

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

7.1.4 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.

7.2 FIELD QUALITY CONTROL

Start cooling units in accordance with the 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.

7.3 WARRANTY START-UP AND CONTROL PROGRAMMING

Install the indoor unit in accordance with manufacturer's installation instructions provided with seismic option. Firmly anchor maintaining manufacturer's recommended clearances. Mounting requirement details such as anchor brand, type, embedment depth, edge spacing, anchor-to-anchor spacing, concrete strength, special inspection and attachment to non-building structures must be outlined and approved by the Engineer of Record for the projection or building. Electrical, pipe and duct connections must permit movement in three dimensions and isolate the unit from field connections. Electrical conduit shall be flexible, having at least one bend between the rigid connection at the unit cabinet and the connection to rigid conduit or foundation. The piping flexible connection or loop must be suitable for the operation pressure and temperature of the system. Furnish copy of manufacturer's piping connection diagram submittal to piping contractor.

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.

Vertiv.com | Vertiv Headquarters, 1050 Dearborn Drive, Columbus, OH, 43085, USA

SL-18934_REV4/590-1424-501E