Liebert®

DS™ Thermal Management System

System Design Catalog

35 to 105 kW (10 to 30 ton) Capacity, Upflow and Downflow, 50 and 60 Hz, Air-cooled,
Water/Glycol-cooled, GLYCOOL™ Economizer Coil,
Dual-Cool DX with Secondary Chilled-water Coil

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Technical Support Site

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

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1 NOMENCLATURE AND COMPONENTS

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

1.1 Liebert DS Model Number Nomenclature

Table 1.2 below describes each digit of the model number.

Table 1.1 DS Model Number Example

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
D	S	0	3	5	A	D	A	1	E	I	*	*	*	*

Table 1.2 DS Model-number Digit Definitions

Digit	Description
Digits 1 and 2 =	Airflow Distribution DS = Downflow standard VS = Upflow standard
Digit 3, 4, 5 =	Nominal Cooling Capacity, kW 035 = 35 kW, 10 ton 042 = 42 kW, 12 ton 053 = 53 kW, 15 ton 070 = 70 kW, 20 ton 077 = 77 kW, 22 ton 105 = 105 kW, 30 ton
Digit 6 =	Cooling Type A = Air-cooled D = Dual-cool, air-cooled H = Dual-cool, water-cooled K = GLYCOOL™ (Liebert® Economizer Coil) W = Water/Glycol-cooled
Digit 7 =	Compressor Type D = Digital scroll, R-407C S = Scroll, R-407C U = Semi-hermetic with 4-step, R-407C V = Semi-hermetic with 4-step, R-407C (DS105 water/glycol/GLYCOOL-only)

Table 1.2 DS Model-number Digit Definitions (continued)

Digit	Description
Digit 8 = Voltage A = 460 V - 3 ph - 60 Hz B = 575 V - 3 ph - 60 Hz C = 208 V - 3 ph - 60 Hz D = 230 V - 3 ph - 60 Hz 2 = 380 V - 3 ph - 60 Hz	
Digit 9 = Fan Type 0 = Forward-curved blowers 1 = Electronically-commutated (EC) fans	
Digit 10 = Reheat Type 0 = None E = 3-stage electric	
Digit 11 = Humidifier 0 = No humidifier I = Infrared Humidifier	
Digit 12-15 = Factory Configuration Number	

Not all combinations of options are available on all units:

- Digital Scroll Compressors
  - Not available on VS042A with forward-curved blower
  - Not available on 077 and 105 models
  - 575-V available only on 035, 053 and 070 models
- Scroll Compressors
  - Available on air cooled models 035 – 105
  - Available on water/glycol models 035 – 070
  - Scroll compressors not available on 77- and 105-kW models for water/glycol/GLYCOOL/Dual Cool units
- GLYCOOL Liebert® Econ-O-Coil™ Models
  - Available with digital-scroll compressors on 035 to 070 models, and with semi-hermetic compressors on 077 to 105 models
- High Pressure Water Regulating Valve
  - Not available on 042, 053, 070 and 077 models with semi-hermetic and scroll compressors

1.2 Component Location

The unit component locations are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 1.3 Component-location Drawings

Document Number	Title
DPN003706	Component Location, Downflow Models
DPN003707	Component Location, Upflow Models

1.3 Cooling Configurations

Figure 1.1 Cooling configurations for the Liebert® DS

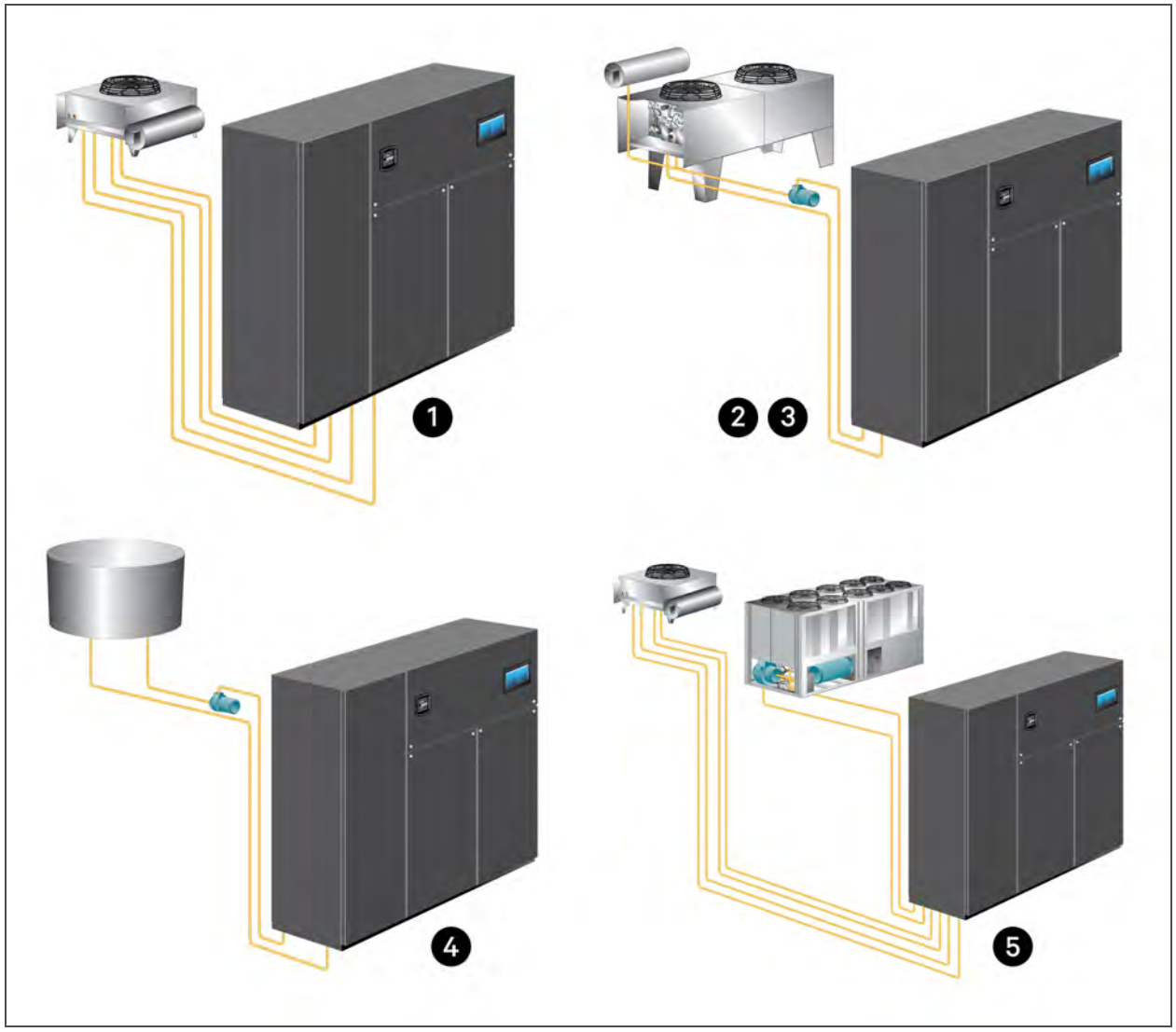


Table 1.4 DS Cooling Descriptions

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

1.4 Blower Configurations

Figure 1.2 Downflow blower configurations, front and rear supply with EC fans

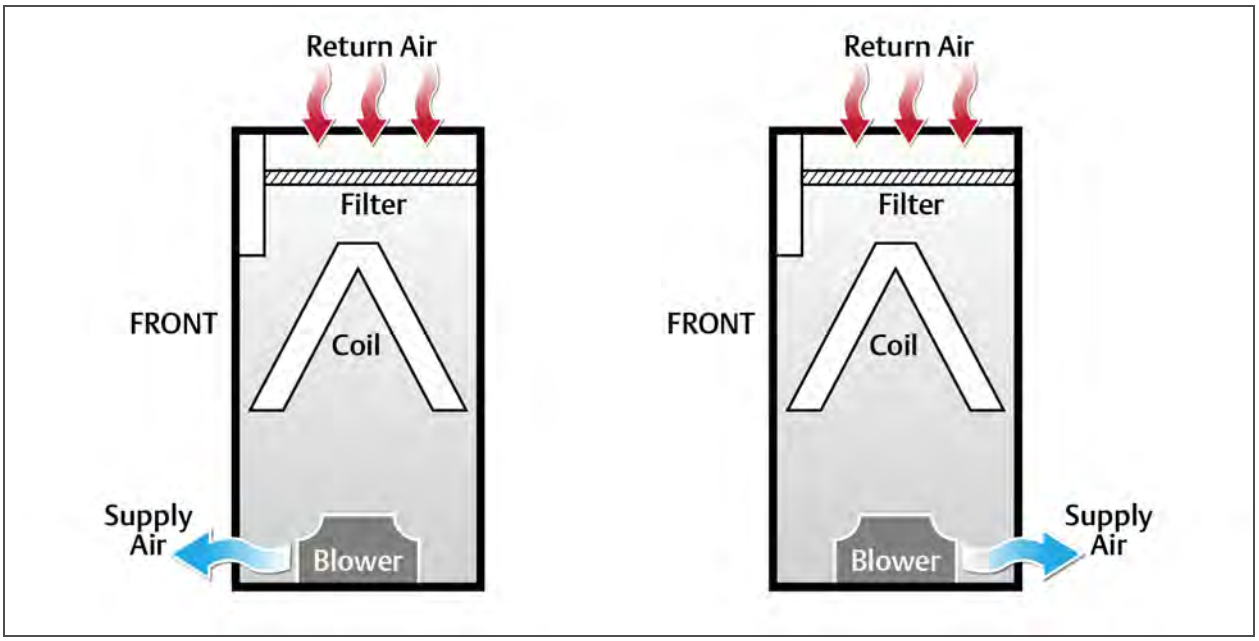
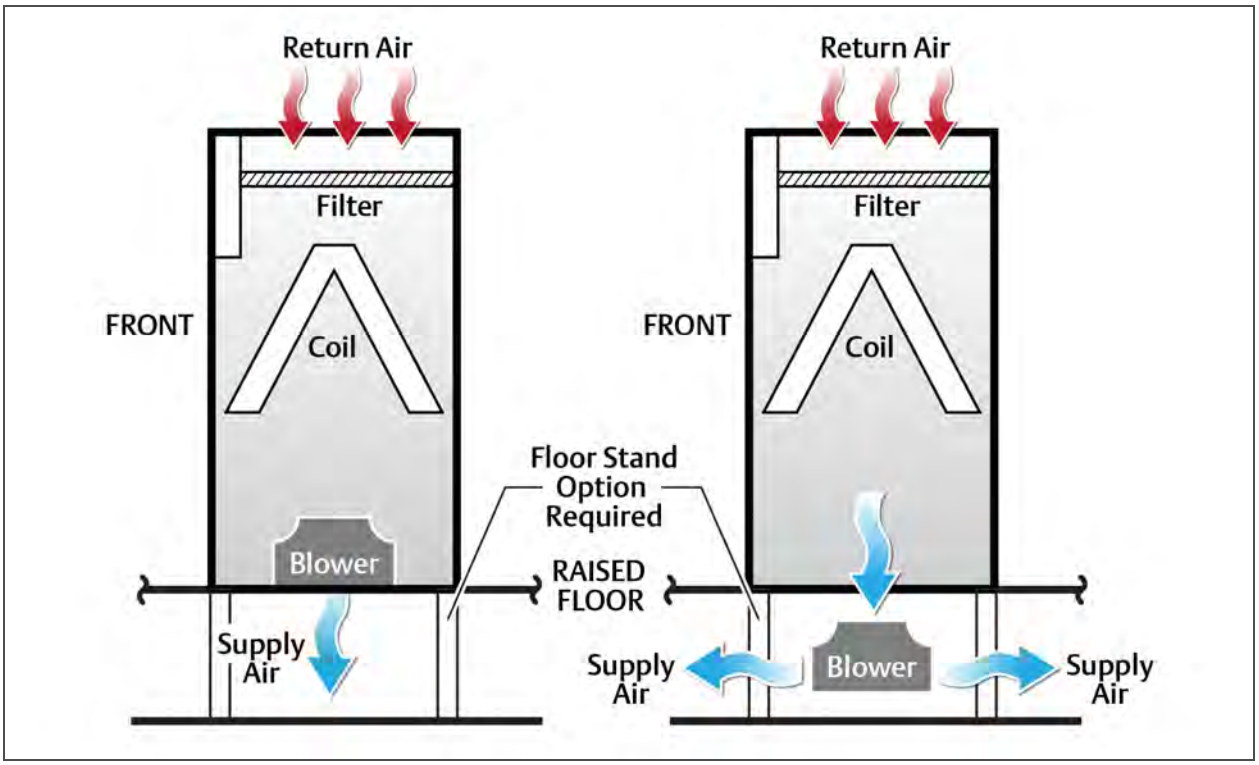
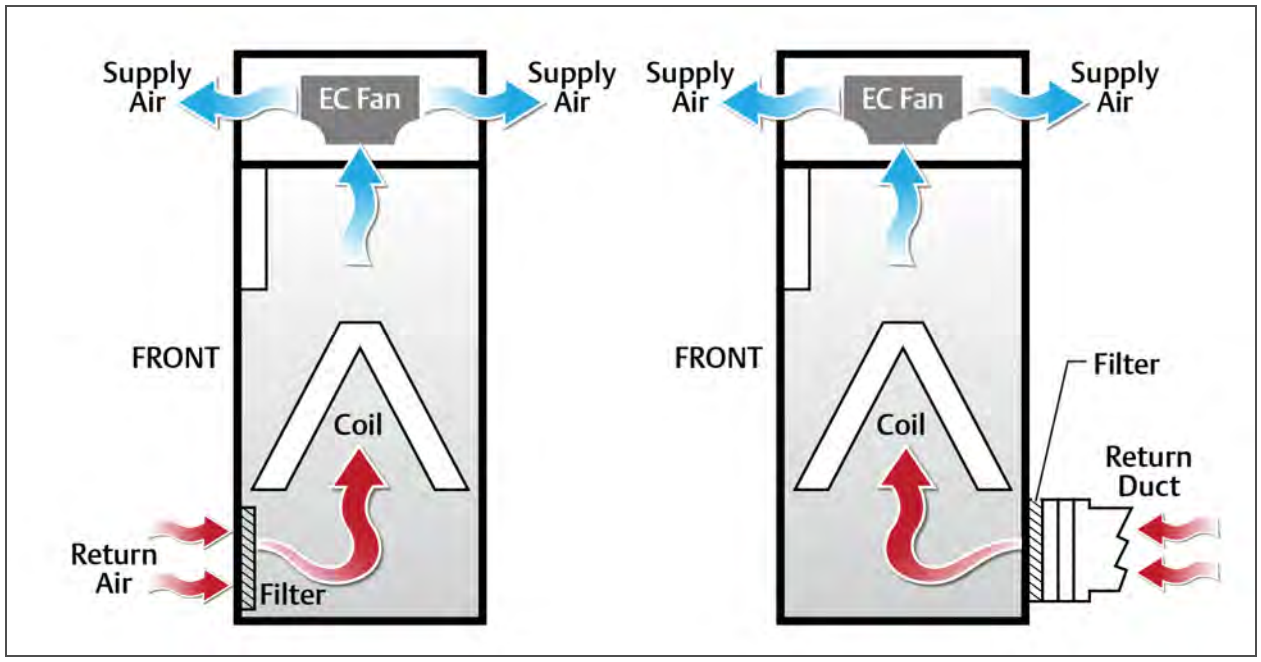


Figure 1.3 Downflow blower configurations, bottom and under-floor supply with EC fans



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

Figure 1.4 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 1.4** above represents the possible options.

Figure 1.5 Upflow blower configurations, front-return with forward-curved blowers

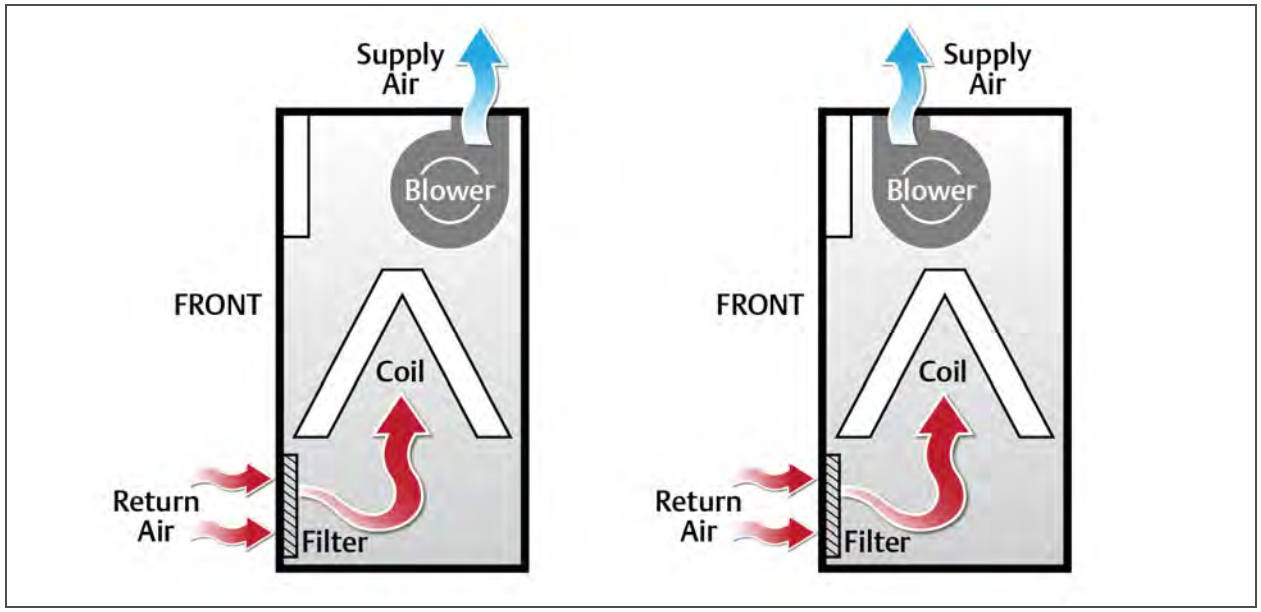
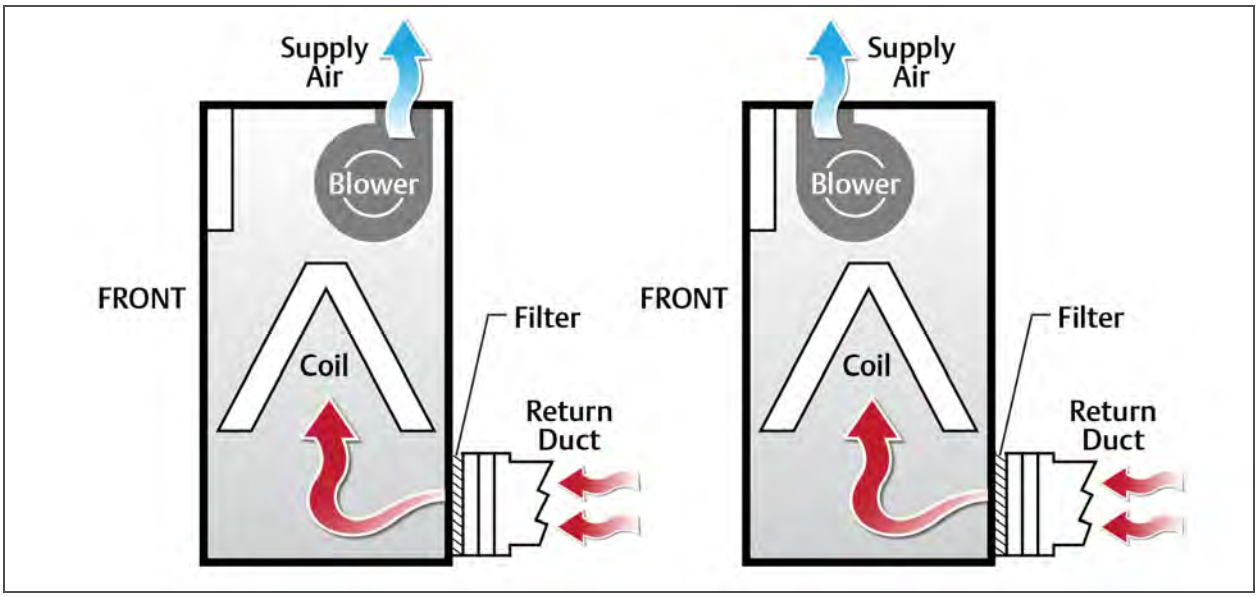


Figure 1.6 Upflow blower configurations, rear-return with forward-curved blowers



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2 SYSTEM DATA

2.1 Air Cooled Capacity and Performance Data

Table 2.1 Air-Cooled Data for Downflow with EC Fan(s), 60-Hz Models

Model Size - Downflow Configuration		DS035	DS042	DS053	DS070	DS077	DS105
DX Evaporator - Net Capacity Data at 95°F (35°C) Outdoor Ambient							
Compressor Type		**Digital Scroll**				**Semi-Hermetic (Four-Step Cooling)**	
MicroChannel Liebert MC™ Matchup at 95°F (35°C) Outdoor Ambient		MCS056	MCS056	MCS056	MCM080	MCM080	MCL110
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	39.3 (134,000)	43.1 (147,000)	59.8 (204,000)	74.1 (252,000)	79.2 (270,000)	105.6 (360,000)
	Sensible, kW (BTUH)	39.3 (134,000)	43.1 (147,000)	59.8 (204,000)	73.2 (249,000)	78.7 (268,000)	101.1 (344,000)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	37.4 (127,000)	40.9 (139,000)	56.9 (194,000)	70.9 (241,000)	75.4 (257,000)	101.3 (345,000)
	Sensible, kW (BTUH)	36.2 (123,000)	40.1 (136,000)	55.4 (189,000)	67.3 (229,000)	72.4 (247,000)	92.2 (314,000)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	35.9 (122,000)	39.2 (133,000)	54.3 (185,000)	68.1 (232,000)	72.2 (246,000)	97.4 (332,000)
	Sensible, kW (BTUH)	32.3 (110,000)	35.9 (122,000)	49.8 (169,000)	60.2 (205,000)	64.7 (220,000)	82.2 (280,000)
Compressor Type		**Scroll (Two-Step Cooling)**					
MicroChannel Liebert MC™ Matchup at 95°F (35°C) Outdoor Ambient		MCS056	MCS056	MCS056	MCM080	MCM080	MCL110
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	39.6 (135,000)	43.4 (148,000)	60.6 (206,000)	75.7 (258,000)	81.3 (277,000)	105.9 (361,000)
	Sensible, kW (BTUH)	39.5 (134,000)	43.4 (148,000)	60.5 (206,000)	74.5 (254,000)	80.4 (274,000)	101.3 (345,000)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	37.8 (128,000)	41.3 (140,000)	57.8 (197,000)	72.6 (247,000)	77.8 (265,000)	101.9 (347,000)
	Sensible, kW (BTUH)	36.4 (124,000)	40.3 (137,000)	56.1 (191,000)	68.3 (233,000)	73.9 (252,000)	92.5 (315,000)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	36.3 (123,000)	39.6 (135,000)	55.4 (189,000)	69.9 (238,000)	75.0 (255,000)[2a]	98.2 (335,000)
	Sensible, kW (BTUH)	32.5 (110,000)	36.1 (123,000)	50.4 (171,000)	61.1 (208,000)	64.2 (219,000)[2a]	82.5 (281,000)
FAN SECTION - EC Down							
Return Air Volume, ACFM (ACMH)		5,200 (8,835)	6,200 (10,534)	8,000 (13,592)	9,600 (16,310)	11,000 (18,689)	13,700 (23,276)
Standard Fan Motor, hp (kW)		3.75 (2.8)	3.75 (2.8)	4.15 (3.1)	4.15 (3.1)	4.15 (3.1)	3.6 (2.7)
Number of Fans		1	1	2	2	2	3
External Static Pressure, in.w.g. (Pa)		0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]

1. Certified in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 (I-P) Standard Rating Conditions. Certified units may be found in the AHRI Directory at www.ahridirectory.org.
2. Certified in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.
2a. Performance data derived from Return ACFM required to be listed in Compliance Certification Database. (DS077 = 10,000)
3. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
4. Net capacity data has fan motor heat factored in for all ratings.
5. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.
6. See Table 2.13 for Optional DualCool Performance.

Table 2.2 Air-Cooled Data for Upflow with EC Fan(s), 60-Hz Models

Model Size - Upflow		VS035	VS042	VS053	VS070	VS077	VS105
DX Evaporator - Net Capacity Data at 95°F (35°C) Outdoor Ambient							
Compressor Type		**Digital Scroll**				**Semi-Hermetic (Four-Step Cooling)**	
MicroChannel Liebert MC™ Matchup at 95°F (35°C) Outdoor Ambient		MCS056	MCM080	MCS056	MCM080	MCM080	MCL110
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	37.6 (128,000)	43.3 (148,000)	60.9 (208,000)	75.7 (258,000)	81.2 (277,000)	106.0 (362,000)
	Sensible, kW (BTUH)	37.4 (128,000)	43.0 (147,000)	60.9 (208,000)	75.0 (256,000)	81.0 (276,000)	102.0 (348,000)
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)	0.4[1] (100)	0.4[1] (100)	0.5[1] (125)	0.5[1] (125)	0.5[1] (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	35.8 (122,000)	41.3 (141,000)	57.7 (197,000)	72.3 (247,000)	77.3 (264,000)	102.2 (349,000)
	Sensible, kW (BTUH)	34.2 (117,000)	39.2 (134,000)	56.4 (192,000)	69.0 (235,000)	74.7 (255,000)	93.3 (318,000)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	33.8 (115,000)	39.1 (133,000)	54.2 (185,000)	68.4 (233,000)	72.9 (249,000)[2a]	96.8 (330,000)[2a]
	Sensible, kW (BTUH)	29.9 (102,000)	34.3 (117,000)	49.9 (170,000)	60.8 (207,000)	64.6 (220,000)[2a]	80.9 (276,000)[2a]
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)
Compressor Type		**Scroll (Two-Step Cooling)**					
MicroChannel Liebert MC™ Matchup at 95°F (35°C) Outdoor Ambient		MCS056	MCS056	MCS056	MCM080	MCM080	MCL110
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	37.8 (129,000)	41.6 (142,000)	62.0 (212,000)	77.3 (264,000)	83.2 (284,000)	107.0 (365,000)
	Sensible, kW (BTUH)	37.5 (128,000)	41.5 (142,000)	62.0 (212,000)	76.3 (260,000)	82.7 (282,000)	102.0 (348,000)
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)	0.4[1] (100)	0.4[1] (100)	0.5[1] (125)	0.5[1] (125)	0.5[1] (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	36.1 (123,000)	39.6 (135,000)	58.9 (201,000)	74.1 (253,000)	79.7 (272,000)	102.7 (350,000)
	Sensible, kW (BTUH)	34.2 (117,000)	38.2 (130,000)	57.4 (196,000)	70.1 (239,000)	76.2 (260,000)	93.6 (319,000)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	34.2 (117,000)	37.4 (128,000)	55.6 (190,000)	70.3 (240,000)	75.5 (258,000)[2a]	97.6 (333,000)[2a]
	Sensible, kW (BTUH)	30.0 (102,000)	33.4 (114,000)	50.9 (174,000)	61.7 (211,000)	65.9 (225,000)[2a]	81.3 (277,000)[2a]
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)
FAN SECTION - EC Up							
Return Air Volume, ACFM (ACMH)		5,200 (8,835)	6,200 (10,534)	8,000 (13,592)	9,600 (16,310)	11,000 (18,689)	13,700 (23,276)
Standard Fan Motor, hp (kW)		3.75 (2.8)	3.75 (2.8)	4.15 (3.1)	4.15 (3.1)	4.15 (3.1)	3.6 (2.7)
Number of Fans		1	1	2	2	2	3

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2. Certified in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.
2a. Performance data derived from Return ACFM required to be listed in Compliance Certification Database. (VS077=10,400; VS105=13,200)
3. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
4. Net capacity data has fan motor heat factored in for all ratings.
5. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.
6. See Table 2.14 for Optional DualCool Performance.

Table 2.3 Air-Cooled Data for Upflow with Centrifugal (Forward-curved) Fan(s), 60-Hz Models

Model Size - Upflow Configuration		VS035	VS042	VS053	VS070	VS077	VS105
DX Evaporator - Net Capacity Data at 95°F (35°C) Outdoor Ambient							
Compressor Type		**Digital Scroll**				**Semi-Hermetic (Four-Step Cooling)**	
MicroChannel Liebert MC™ Matchup at 95°F (35°C) Outdoor Ambient		MCS056		MCS056	MCM080	MCM080	MCL110
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	37.1 (127,000)		60.8 (207,000)	75.4 (257,000)	80.8 (276,000)	106.0 (362,000)
	Sensible, kW (BTUH)	37.1 (127,000)		60.8 (207,000)	74.8 (255,000)	80.6 (275,000)	103.0 (351,000)
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)		0.4[1] (100)	0.5[1] (125)	0.5[1] (125)	0.5[1] (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	35.2 (120,000)		57.6 (197,000)	72.1 (246,000)	76.8 (262,000)	101.8 (347,000)
	Sensible, kW (BTUH)	34.0 (116,000)		56.2 (192,000)	68.7 (234,000)	74.2 (253,000)	94.6 (323,000)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)		0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	33.3 (114,000)[2a]		54.1 (185,000)	68.1 (232,000)	72.3 (247,000)	96.3 (329,000)
	Sensible, kW (BTUH)	29.2 (100,000)[2a]		49.7 (170,000)	60.5 (206,000)	65.3 (223,000)	82.8 (283,000)
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)		1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)
Compressor Type		**Scroll (Two-Step Cooling)**					
MicroChannel Liebert MC™ Matchup at 95°F (35°C) Outdoor Ambient		MCS056	MCM080	MCS056	MCM080	MCM080	MCL110
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	37.3 (127,000)	41.8 (143,000)	61.9 (211,000)	77.1 (263,000)	82.8 (283,000)	106.0 (362,000)
	Sensible, kW (BTUH)	37.3 (127,000)	41.8 (143,000)	61.9 (211,000)	76.0 (259,000)	82.2 (280,000)	103.0 (351,000)
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)	0.4[1] (100)	0.4[1] (100)	0.5[1] (125)	0.5[1] (125)	0.5[1] (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	35.5 (121,000)	39.6 (135,000)	58.8 (201,000)	73.8 (252,000)	79.2 (270,000)	102.2 (349,000)
	Sensible, kW (BTUH)	34.1 (116,000)	38.3 (131,000)	57.3 (196,000)	69.8 (238,000)	75.7 (258,000)	94.8 (323,000)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	33.5 (114,000)	37.8 (129,000)[2a]	55.4 (189,000)	70.0 (239,000)	75.2 (257,000)[2a]	96.9 (331,000)
	Sensible, kW (BTUH)	29.8 (102,000)	32.8 (112,000)[2a]	50.7 (173,000)	61.5 (210,000)	65.2 (222,000)[2a]	83.1 (284,000)
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)
FAN SECTION - Centrifugal (Forward-Curved)							
Return Air Volume, ACFM (ACMH)		5,500 (9,345)	6,600 (11,213)	8,000 (13,592)	9,600 (16,310)	11,000 (18,689)	14,600 (24,805)
Standard Fan Motor, hp (kW)		3.0 (2.2)	5.0 (3.7)	3.0 (2.2)	5.0 (3.7)	7.5 (5.6)	10.0 (7.5)
Optional Fan Motor, hp (kW)		5.0 (3.7)	7.5 (5.6)	5.0 (3.7)	7.5 (5.6)	10.0 (7.5)	15.0 (11.2)
Number of Fans		1	1	2	2	2	3

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2. Certified in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.
2a. Performance data derived from Return ACFM required to be listed in Compliance Certification Database. (VS035=5,100; VS042=6,000; VS077=10,200)
3. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
4. Net capacity data has fan motor heat factored in for all ratings.
5. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.
6. See Table 2.15 for Optional DualCool Performance.

2.2 Water Cooled Capacity and Performance Data

Table 2.4 Water-Cooled Data for Downflow with EC Fan(s), 60-Hz Models

Model Size - Downflow		DS035	DS042	DS053	DS070	DS077	DS105
DX Evaporator - Net Capacity Data with 83°F Entering and 95°F Leaving Fresh Water Temperatures[1]							
	Compressor Type	**Digital Scroll**				**Semi-Hermetic (Four-Step Cooling)**	
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	42.5 (145,000)	47.6 (162,000)	66.5 (227,000)	80.7 (275,000)	86.9 (297,000)	106.5 (363,000)
	Sensible, kW (BTUH)	42.4 (145,000)	47.5 (162,000)	64.9 (221,000)	77.7 (265,000)	84.3 (288,000)	102.6 (350,000)
	Flow Rate, GPM (lps)	31.1 (2.0)	35.0 (2.2)	46.8 (2.9)	58.3 (3.7)	64.3 (4.1)	78.9 (5.0)
	Unit Pressure Drop, ft of Water (kPa)	10.9 (32.6)	13.6 (40.7)	13.1 (39.2)	19.9 (59.5)	23.9 (71.5)	31.2 (93.3)
	Heat Rejection, kW (BTUH)	54.5 (186,000)	61.2 (209,000)	81.9 (279,000)	102.2 (349,000)	112.8 (385,000)	138.2 (472,000)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	40.3 (138,000)	45.1 (154,000)	63.3 (216,000)	77.3 (264,000)	83.0 (283,000)	101.8 (347,000)
	Sensible, kW (BTUH)	38.7 (132,000)	43.7 (149,000)	59.3 (202,000)	70.7 (241,000)	76.7 (262,000)	93.9 (320,000)
	Flow Rate, GPM (lps)	29.8 (1.9)	33.5 (2.1)	45 (2.8)	56.3 (3.5)	62.1 (3.9)	76.1 (4.8)
	Unit Pressure Drop, ft of Water (kPa)	10.0 (29.9)	12.5 (37.4)	12.2 (36.5)	18.6 (55.6)	22.3 (66.7)	29.2 (87.3)
	Heat Rejection, kW (BTUH)	52.2 (178,000)	58.6 (200,000)	78.8 (269,000)	98.6 (336,000)	108.7 (371,000)	133.4 (455,000)
75°F DB, 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	38.4 (131,000)	43.0 (147,000)	60.3 (206,000)	74.1 (253,000)	79.4 (271,000)	97.5 (333,000)
	Sensible, kW (BTUH)	34.5 (118,000)	38.9 (133,000)	52.9 (181,000)	63.0 (215,000)	68.2 (233,000)	84.1 (287,000)
	Flow Rate, GPM (lps)	28.6 (1.8)	32.2 (2.0)	43.3 (2.7)	54.4 (3.4)	59.9 (3.8)	73.5 (4.6)
	Unit Pressure Drop, ft of Water (kPa)	9.3 (27.8)	11.6 (34.7)	11.3 (33.8)	17.4 (52)	20.9 (62.5)	27.3 (81.6)
	Heat Rejection, kW (BTUH)	50.1 (171,000)	56.4 (192,000)	75.8 (259,000)	95.3 (325,000)	105.0 (358,000)	128.7 (439,000)
	Compressor Type	**Scroll (Two-Step Cooling)**					
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	41.1 (140,000)	47.8 (163,000)	66.5 (227,000)	81.3 (277,000)		
	Sensible, kW (BTUH)	41.1 (140,000)	47.7 (163,000)	65.0 (222,000)	78.0 (266,000)		
	Flow Rate, GPM (lps)	29.6 (1.9)	34.4 (2.2)	46.8 (2.9)	58.7 (3.7)		
	Unit Pressure Drop, ft of Water (kPa)	9.9 (29.6)	13.1 (39.2)	13.1 (39.2)	20.2 (60.4)		
	Heat Rejection, kW (BTUH)	51.8 (177,000)	60.2 (205,000)	82.0 (280,000)	102.8 (351,000)		
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	39.0 (133,000)	45.4 (155,000)	63.6 (217,000)	78.0 (266,000)		
	Sensible, kW (BTUH)	37.9 (129,000)	43.9 (150,000)	59.5 (203,000)	71.1 (243,000)		
	Flow Rate, GPM (lps)	28.3 (1.8)	33.0 (2.1)	45.2 (2.8)	56.8 (3.6)		
	Unit Pressure Drop, ft of Water (kPa)	9.1 (27.2)	12.1 (36.2)	12.3 (36.8)	18.9 (56.5)		
	Heat Rejection, kW (BTUH)	49.6 169,000)	57.8 (197,000)	79.2 (270,000)	99.5 (340,000)		
75°F DB, 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	37.2 (127,000)	43.4 (148,000)	60.9 (208,000)	75.0 (256,000)		
	Sensible, kW (BTUH)	33.8 (115,000)	39.1 (133,000)	53.1 (181,000)	63.5 (217,000)		
	Flow Rate, GPM (lps)	27.3 (1.7)	31.8 (2.0)	43.7 (2.8)	55.0 (3.5)		
	Unit Pressure Drop, ft of Water (kPa)	8.5 (25.4)	11.3 (33.8)	11.5 (34.4)	17.8 (53.2)		
	Heat Rejection, kW (BTUH)	47.8 (163,000)	55.8 (190,000)	76.5 (261,000)	96.4 (329,000)		
FAN SECTION - EC Down							
	Return Air Volume, ACFM (ACMH)	5,200 (8,835)	6,200 (10,534)	8,000 (13,592)	9,600 (16,310)	11,000 (18,689)	13,700 (23,276)
	Standard Fan Motor, hp (kW)	3.75 (2.8)	3.75 (2.8)	4.15 (3.1)	4.15 (3.1)	4.15 (3.1)	3.6 (2.7)
	Number of Fans	1	1	2	2	2	3
	External Static Pressure, in.w.g. (Pa)	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]

1. Certified in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 (I-P) Standard Rating Conditions. Certified units may be found in the AHRI Directory at www.ahridirectory.org.
2. Certified in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.
3. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
4. Net capacity data has fan motor heat factored in for all ratings.
5. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.
6. See Table 2.13 for Optional DualCool Performance.

Table 2.5 Water-Cooled Data for Downflow with EC Fan(s), 60-Hz Models

Model Size - Downflow		DS035	DS042	DS053	DS070	DS077	DS105
DX Evaporator - Net Capacity Data with 86°F Entering and 95°F Leaving Fresh Water Temperatures[2]							
	Compressor Type	**Digital Scroll**				**Semi-Hermetic (Four-Step Cooling)**	
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	42.2 (144,000)	47.2 (161,000)	66.0 (225,000)	80.0 (273,000)	82.2 (280,000)	100.8 (344,000)
	Sensible, kW (BTUH)	42.1 (144,000)	47.2 (161,000)	64.6 (220,000)	77.3 (264,000)	76.2 (260,000)	93.3 (318,000)
	Flow Rate, GPM (lps)	41.4 (2.6)	46.5 (2.9)	62.2 (3.9)	77.7 (4.9)	82.5 (5.2)	101.3 (6.4)
	Unit Pressure Drop, ft of Water (kPa)	18.8 (56.2)	23.4 (70.0)	22.6 (67.6)	34.5 (103.2)	38.4 (114.8)	50.1 (149.8)
	Heat Rejection, kW (BTUH)	54.3 (185,000)	61.1 (208,000)	81.7 (279,000)	101.9 (348,000)	108.2 (369,000)	132.8 (453,000)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	40.0 (136,000)	44.7 (153,000)	62.8 (214,000)	76.6 (261,000)	86.1 (294,000)	105.5 (360,000)
	Sensible, kW (BTUH)	38.5 (131,000)	43.4 (148,000)	59.0 (201,000)	70.3 (240,000)	83.8 (286,000)	101.9 (348,000)
	Flow Rate, GPM (lps)	39.6 (2.5)	44.5 (2.8)	59.8 (3.8)	74.9 (4.7)	85.6 (5.4)	104.9 (6.6)
	Unit Pressure Drop, ft of Water (kPa)	17.3 (51.7)	21.5 (64.3)	20.9 (62.5)	32.1 (96.0)	41.2 (123.2)	53.6 (160.3)
	Heat Rejection, kW (BTUH)	52.0 (177,000)	58.4 (199,000)	78.5 (268,000)	98.4 (336,000)	112.3 (383,000)	137.7 (470,000)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	38.1 (130,000)	42.6 (145,000)	59.8 (204,000)	73.4 (250,000)	78.6 (268,000)	96.4 (329,000)
	Sensible, kW (BTUH)	34.3 (117,000)	38.7 (132,000)	52.6 (179,000)	62.7 (214,000)	67.8 (231,000)	83.6 (285,000)
	Flow Rate, GPM (lps)	38.1 (2.4)	42.8 (2.7)	57.6 (3.6)	72.4 (4.6)	79.6 (5.0)	97.7 (6.2)
	Unit Pressure Drop, ft of Water (kPa)	16.0 (47.8)	19.9 (59.5)	19.5 (58.3)	30.1 (90.0)	35.8 (107.0)	46.7 (139.6)
	Heat Rejection, kW (BTUH)	50.0 (171,000)	56.2 (192,000)	75.6 (258,000)	95.1 (324,000)	104.5 (357,000)	128.2 (437,000)
	Compressor Type	**Scroll (Two-Step Cooling)**					
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	40.9 (140,000)	47.4 (162,000)	66.0 (225,000)	80.6 (275,000)		
	Sensible, kW (BTUH)	40.9 (140,000)	47.4 (162,000)	64.6 (220,000)	77.6 (265,000)		
	Flow Rate, GPM (lps)	39.4 (2.5)	45.7 (2.9)	62.3 (3.9)	78.1 (4.9)		
	Unit Pressure Drop, ft of Water (kPa)	17.1 (51.1)	22.6 (67.6)	22.7 (67.9)	34.9 (104.4)		
	Heat Rejection, kW (BTUH)	51.7 (176,000)	60.0 (205,000)	81.8 (279,000)	102.5 (350,000)		
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	38.8 (132,000)	45.0 (154,000)	63.1 (215,000)	77.4 (264,000)		
	Sensible, kW (BTUH)	37.8 (129,000)	43.6 (149,000)	59.2 (202,000)	70.7 (241,000)		
	Flow Rate, GPM (lps)	37.7 (2.4)	43.9 (2.8)	60.1 (3.8)	75.6 (4.8)		
	Unit Pressure Drop, ft of Water (kPa)	15.7 (46.9)	20.9 (62.5)	21.2 (63.4)	32.7 (97.8)		
	Heat Rejection, kW (BTUH)	49.5 (169,000)	57.6 (197,000)	79.0 (270,000)	99.2 (338,000)		
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	36.9 (126,000)	43.0 (147,000)	60.4 (206,000)	74.4 (254,000)		
	Sensible, kW (BTUH)	33.7 (115,000)	38.9 (133,000)	52.9 (181,000)	63.2 (216,000)		
	Flow Rate, GPM (lps)	36.3 (2.3)	42.4 (2.7)	58.1 (3.7)	73.2 (4.6)		
	Unit Pressure Drop, ft of Water (kPa)	14.6 (43.7)	19.5 (58.3)	19.8 (59.2)	30.7 (91.8)		
	Heat Rejection, kW (BTUH)	47.7 (163,000)	55.6 (190,000)	76.3 (260,000)	96.1 (328,000)		
FAN SECTION - EC Down							
	Return Air Volume, ACFM (ACMH)	5,200 (8,835)	6,200 (10,534)	8,000 (13,592)	9,600 (16,310)	11,000 (18,689)	13,700 (23,276)
	Standard Fan Motor, hp (kW)	3.75 (2.8)	3.75 (2.8)	4.15 (3.1)	4.15 (3.1)	4.15 (3.1)	3.6 (2.7)
	Number of Fans	1	1	2	2	2	3
	External Static Pressure, in.w.g. (Pa)	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]

1. Certified in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 (I-P) Standard Rating Conditions. Certified units may be found in the AHRI Directory at www.ahridirectory.org.
2. Certified in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.
3. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
4. Net capacity data has fan motor heat factored in for all ratings.
5. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.
6. See Table 2.13 for Optional DualCool Performance.

Table 2.6 Water-Cooled Data for Upflow with EC Fan(s), 60-Hz Models

Model Size - Upflow		VS035	VS042	VS053	VS070	VS077	VS105
DX Evaporator - Net Capacity Data with 83°F Entering and 95°F Leaving Fresh Water Temperatures[1]							
Compressor Type		**Digital Scroll**				**Semi-Hermetic (Four-Step Cooling)**	
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	43.0 (147,000)	48.3 (165,000)	66.2 (226,000)	80.3 (274,000)	86.6 (295,000)	104.9 (358,000)
	Sensible, kW (BTUH)	**43.0 (147,000)**	**48.3 (165,000)**	**64.6 (220,000)**	**77.2 (263,000)**	**83.9 (286,000)**	**100.9 (344,000)**
	Flow Rate, GPM (lps)	31.6 (2.0)	35.5 (2.2)	46.7 (2.9)	58.3 (3.7)	64.3 (4.1)	78.1 (4.9)
	Unit Pressure Drop, ft of Water (kPa)	**11.2 (33.5)**	**14.0 (41.9)**	**13.1 (39.2)**	**19.9 (59.5)**	**23.9 (71.5)**	**30.7 (91.8)**
	Heat Rejection, kW (BTUH)	55.3 (189,000)	62.2 (212,000)	81.9 (279,000)	102.1 (348,000)	112.7 (385,000)	136.9 (467,000)
	External Static Pressure, in.w.g. (Pa)	**0.4[1] (100)**	**0.4[1] (100)**	**0.4[1] (100)**	**0.5[1] (125)**	**0.5[1] (125)**	**0.5[1] (125)**
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	40.7 (139,000)	45.6 (156,000)	62.8 (214,000)	76.9 (262,000)	82.7 (282,000)	100.3 (342,000)
	Sensible, kW (BTUH)	**39.1 (133,000)**	**44.3 (151,000)**	**58.8 (201,000)**	**70.2 (240,000)**	**76.2 (260,000)**	**92.3 (315,000)**
	Flow Rate, GPM (lps)	30.2 (1.9)	34.0 (2.1)	44.9 (2.8)	56.3 (3.5)	62.0 (3.9)	75.4 (4.8)
	Unit Pressure Drop, ft of Water (kPa)	**10.3 (30.8)**	**12.8 (38.3)**	**12.1 (36.2)**	**18.6 (55.6)**	**22.3 (66.7)**	**28.6 (85.5)**
	Heat Rejection, kW (BTUH)	52.8 (180,000)	59.5 (203,000)	78.7 (269,000)	98.6 (336,000)	108.6 (371,000)	132.1 (451,000)
	External Static Pressure, in.w.g. (Pa)	**0.5 (125)**	**0.5 (125)**	**0.5 (125)**	**0.5 (125)**	**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)	38.2 (130,000)	42.9 (146,000)	59.1 (202,000)	72.7 (248,000)	78.0 (266,000)[2a]	94.6 (323,000)[2a]
	Sensible, kW (BTUH)	**34.2 (117,000)**	**38.8 (132,000)**	**51.6 (176,000)**	**61.6 (210,000)**	**65.6 (224,000)[2a]**	**80.3 (274,000)[2a]**
	Flow Rate, GPM (lps)	29.0 (1.8)	32.6 (2.1)	43.3 (2.7)	54.4 (3.4)	59.4 (3.7)[2a]	72.4 (4.6)[2a]
	Unit Pressure Drop, ft of Water (kPa)	**9.5 (28.4)**	**11.9 (35.6)**	**11.3 (33.8)**	**17.4 (52.0)**	**21.0 (62.8)[2a]**	**27.0 (80.7)[2a]**
	Heat Rejection, kW (BTUH)	50.8 (173,000)	57.2 (195,000)	75.8 (259,000)	95.3 (325,000)	104.1 (355,000)[2a]	126.8 (433,000)[2a]
	External Static Pressure, in.w.g. (Pa)	**1.0 (250)**	**1.0 (250)**	**1.0 (250)**	**1.0 (250)**	**1.0 (250)**	**1.0 (250)**
Compressor Type		**Scroll (Two-Step Cooling)**					
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	**Total, kW (BTUH)**	**41.6 (142,000)**	**48.5 (165,000)**	**66.3 (226,000)**	**80.9 (276,000)**		
	Sensible, kW (BTUH)	41.6 (142,000)	48.5 (165,000)	64.7 (221,000)	77.5 (264,000)		
	Flow Rate, GPM (lps)	**30.0 (1.9)**	**34.9 (2.2)**	**46.8 (2.9)**	**58.7 (3.7)**		
	Unit Pressure Drop, ft of Water (kPa)	10.1 (30.2)	13.5 (40.4)	13.1 (39.2)	20.1 (60.1)		
	Heat Rejection, kW (BTUH)	**52.5 (179,000)**	**61.1 (208,000)**	**82.0 (280,000)**	**102.8 (351,000)**		
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)	0.4[1] (100)	0.4[1] (100)	0.5[1] (125)		
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	**Total, kW (BTUH)**	**39.3 (134,000)**	**45.9 (157,000)**	**63.2 (216,000)**	**77.6 (265,000)**		
	Sensible, kW (BTUH)	38.3 (131,000)	44.5 (152,000)	59.0 (201,000)	70.6 (241,000)		
	Flow Rate, GPM (lps)	**28.7 (1.8)**	**33.4 (2.1)**	**45.2 (2.8)**	**56.8 (3.6)**		
	Unit Pressure Drop, ft of Water (kPa)	9.3 (27.8)	12.4 (37.1)	12.3 (36.8)	18.9 (56.5)		
	Heat Rejection, kW (BTUH)	**50.2 (171,000)**	**58.6 (200,000)**	**79.1 (270,000)**	**99.5 (340,000)**		
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	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)**	**36.9 (126,000)**	**43.2 (147,000)**	**59.7 (204,000)**	**73.7 (251,000)**		
	Sensible, kW (BTUH)	33.6 (115,000)	39.0 (133,000)	51.9 (177,000)	62.0 (212,000)		
	Flow Rate, GPM (lps)	**27.6 (1.7)**	**32.2 (2.0)**	**43.7 (2.8)**	**55.0 (3.5)**		
	Unit Pressure Drop, ft of Water (kPa)	8.6 (25.7)	11.6 (34.7)	11.5 (34.4)	17.8 (53.2)		
	Heat Rejection, kW (BTUH)	**48.3 (165,000)**	**56.5 (193,000)**	**76.5 (261,000)**	**96.4 (329,000)**		
	External Static Pressure, in.w.g. (Pa)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)		
FAN SECTION - EC Up							
Return Air Volume, ACFM (ACMH)		5,200 (8,835)	6,200 (10,534)	8,000 (13,592)	9,600 (16,310)	11,000 (18,689)	13,700 (23,276)
Standard Fan Motor, hp (kW)		**3.75 (2.8)**	**3.75 (2.8)**	**4.15 (3.1)**	**4.15 (3.1)**	**4.15 (3.1)**	**3.6 (2.7)**
Number of Fans		1	1	2	2	2	3

1. Certified in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 (I-P) Standard Rating Conditions. Certified units may be found in the AHRI Directory at www.ahridirectory.org.
2. Certified in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.
2a. Performance data derived from Return ACFM required to be listed in Compliance Certification Database. (VS077=10,400; VS105=13,200)
3. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
4. Net capacity data has fan motor heat factored in for all ratings.
5. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.
6. See Table 2.14 for Optional DualCool Performance.

Table 2.7 Water-Cooled Data for Upflow with EC Fan(s), 60-Hz Models

Model Size - Upflow		VS035	VS042	VS053	VS070	VS077	VS105
DX Evaporator - Net Capacity Data with 86°F Entering and 95°F Leaving Fresh Water Temperatures[2]							
Compressor Type		Digital Scroll				Semi-Hermetic (Four-Step Cooling)	
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	42.7 (146,000)	48.0 (164,000)	65.7 (224,000)	79.6 (272,000)	85.8 (293,000)	103.9 (355,000)
	Sensible, kW (BTUH)	42.7 (146,000)	48.0 (164,000)	64.3 (219,000)	76.8 (262,000)	83.4 (285,000)	100.3 (342,000)
	Flow Rate, GPM (lps)	42.0 (2.6)	47.3 (3.0)	62.2 (3.9)	77.6 (4.9)	85.5 (5.4)	103.9 (6.5)
	Unit Pressure Drop, ft of Water (kPa)	19.3 (57.7)	24.2 (72.4)	22.6 (67.6)	34.4 (102.9)	41.2 (123.2)	52.6 (157.3)
	Heat Rejection, kW (BTUH)	55.1 (188,000)	62.0 (212,000)	81.6 (278,000)	101.8 (347,000)	112.3 (383,000)	136.4 (465,000)
	External Static Pressure, in.w.g. (Pa)	0.4 (100)	0.4 (100)	0.4 (100)	0.5 (125)	0.5 (125)	0.5 (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	40.4 (138,000)	45.2 (154,000)	62.3 (213,000)	76.2 (260,000)	81.8 (279,000)	99.3 (339,000)
	Sensible, kW (BTUH)	38.9 (133,000)	44.1 (150,000)	58.5 (200,000)	69.8 (238,000)	75.8 (259,000)	91.7 (313,000)
	Flow Rate, GPM (lps)	40.1 (2.5)	45.1 (2.8)	59.7 (3.8)	74.9 (4.7)	82.4 (5.2)	100.2 (6.3)
	Unit Pressure Drop, ft of Water (kPa)	17.7 (52.9)	22.1 (66.1)	20.9 (62.5)	32.1 (96.0)	38.3 (114.5)	49.1 (146.8)
	Heat Rejection, kW (BTUH)	52.7 (180,000)	59.3 (202,000)	78.5 (268,000)	98.3 (335,000)	108.2 (369,000)	131.5 (449,000)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	37.9 (129,000)	42.5 (145,000)	58.6 (200,000)	72.0 (246,000)	77.2 (263,000)[2a]	93.6 (319,000)[2a]
	Sensible, kW (BTUH)	34.1 (116,000)	38.6 (132,000)	51.3 (175,000)	61.3 (209,000)	65.2 (222,000)[2a]	79.8 (272,000)[2a]
	Flow Rate, GPM (lps)	38.5 (2.4)	43.4 (2.7)	57.6 (3.6)	72.4 (4.6)	78.9 (5.0)[2a]	96.2 (6.1)[2a]
	Unit Pressure Drop, ft of Water (kPa)	16.4 (49.0)	20.5 (61.3)	19.5 (58.3)	30.1 (90.0)	35.0 (104.7)[2a]	45.0 (134.6)[2a]
	Heat Rejection, kW (BTUH)	50.6 (173,000)	57.0 (194,000)	75.6 (258,000)	95.0 (324,000)	103.5 (353,000)[2a]	126.2 (431,000)[2a]
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)
Compressor Type		**Scroll (Two-Step Cooling)**					
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	41.4 (141,000)	48.2 (164,000)	65.8 (225,000)	80.2 (274,000)		
	Sensible, kW (BTUH)	41.4 (141,000)	48.2 (164,000)	64.3 (219,000)	77.2 (263,000)		
	Flow Rate, GPM (lps)	39.9 (2.5)	46.4 (2.9)	62.3 (3.9)	78.1 (4.9)		
	Unit Pressure Drop, ft of Water (kPa)	17.5 (52.3)	23.3 (69.7)	22.7 (67.9)	34.9 (104.4)		
	Heat Rejection, kW (BTUH)	52.4 (179,000)	61.0 (208,000)	81.8 (279,000)	102.5 (350,000)		
	External Static Pressure, in.w.g. (Pa)	0.4 (100)	0.4 (100)	0.4 (100)	0.5 (125)		
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	39.1 (133,000)	45.5 (155,000)	62.7 (214,000)	77.0 (263,000)		
	Sensible, kW (BTUH)	38.1 (130,000)	44.3 (151,000)	58.7 (200,000)	70.3 (240,000)		
	Flow Rate, GPM (lps)	38.2 (2.4)	44.5 (2.8)	60.1 (3.8)	75.5 (4.8)		
	Unit Pressure Drop, ft of Water (kPa)	16.1 (48.1)	21.5 (64.3)	21.1 (63.1)	32.7 (97.8)		
	Heat Rejection, kW (BTUH)	50.1 (171,000)	58.4 (199,000)	78.9 (269,000)	99.2 (338,000)		
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)		
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	36.7 (125,000)	42.8 (146,000)	59.2 (202,000)	73.0 (249,000)		
	Sensible, kW (BTUH)	33.5 (114,000)	38.8 (132,000)	51.6 (176,000)	61.7 (211,000)		
	Flow Rate, GPM (lps)	36.7 (2.3)	42.9 (2.7)	58.1 (3.7)	73.2 (4.6)		
	Unit Pressure Drop, ft of Water (kPa)	14.9 (44.6)	20.0 (59.8)	19.8 (59.2)	30.7 (91.8)		
	Heat Rejection, kW (BTUH)	48.2 (164,000)	56.3 (192,000)	76.2 (260,000)	96.1 (328,000)		
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)		
FAN SECTION - EC Up							
	Return Air Volume, ACFM (ACMH)	5,200 (8,835)	6,200 (10,534)	8,000 (13,592)	9,600 (16,310)	11,000 (18,689)	13,700 (23,276)
	Standard Fan Motor, hp (kW)	3.75 (2.8)	3.75 (2.8)	4.15 (3.1)	4.15 (3.1)	4.15 (3.1)	3.6 (2.7)
	Number of Fans	1	1	2	2	2	3

1. Certified in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 (I-P) Standard Rating Conditions. Certified units may be found in the AHRI Directory at www.ahridirectory.org.
2. Certified in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.
2a. Performance data derived from Return ACFM required to be listed in Compliance Certification Database. (VS077=10,400; VS105=13,200)
3. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
4. Net capacity data has fan motor heat factored in for all ratings.
5. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.
6. See Table 2.14 for Optional DualCool Performance.

Table 2.8 Water-Cooled Data for Upflow (Forward-Curved) Fan(s), 60-Hz Models

Model Size - Upflow		VS035	VS042	VS053	VS070	VS077	VS105
DX Evaporator - Net Capacity Data with 83°F Entering and 95°F Leaving Fresh Water Temperatures							
	Compressor Type	Digital Scroll				Semi-Hermetic (Four-Step Cooling)	
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	42.8 (146,000)	47.5 (162,000)	66.0 (225,000)	80.0 (273,000)	86.2 (294,000)	104.9 (358,000)
	Sensible, kW (BTUH)	42.8 (146,000)	47.5 (162,000)	64.5 (220,000)	76.9 (262,000)	83.5 (285,000)	102.1 (348,000)
	Flow Rate, GPM (lps)	32.0 (2.0)	36.1 (2.3)	46.7 (2.9)	58.3 (3.7)	64.3 (4.1)	79.1 (5.0)
	Unit Pressure Drop, ft of Water (kPa)	11.5 (34.4)	14.4 (43.1)	13.1 (39.2)	19.9 (59.5)	23.9 (71.5)	31.4 (93.9)
	Heat Rejection, kW (BTUH)	56.1 (191,000)	63.2 (216,000)	81.9 (279,000)	102.1 (348,000)	112.7 (385,000)	138.6 (473,000)
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)	0.4[1] (100)	0.4[1] (100)	0.5[1] (125)	0.5[1] (125)	0.5[1] (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	40.2 (137,000)	44.6 (152,000)	62.7 (214,000)	76.6 (261,000)	82.2 (280,000)	100.1 (342,000)
	Sensible, kW (BTUH)	39.2 (134,000)	43.9 (150,000)	58.6 (200,000)	69.9 (239,000)	75.8 (259,000)	93.5 (319,000)
	Flow Rate, GPM (lps)	30.5 (1.9)	34.3 (2.2)	44.9 (2.8)	56.3 (3.5)	62.0 (3.9)	76.2 (4.8)
	Unit Pressure Drop, ft of Water (kPa)	10.5 (31.4)	13.1 (39.2)	12.1 (36.2)	18.6 (55.6)	22.3 (66.7)	29.3 (87.6)
	Heat Rejection, kW (BTUH)	53.4 (182,000)	60.2 (205,000)	78.7 (269,000)	98.6 (336,000)	108.6 (371,000)	133.5 (456,000)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	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)	37.6 (128,000)	41.8 (143,000)[2a]	59.0 (201,000)	72.4 (247,000)	77.6 (265,000)[2a]	94.3 (322,000)[2a]
	Sensible, kW (BTUH)	34.3 (117,000)	38.1 (130,000)[2a]	51.4 (175,000)	61.3 (209,000)	65.9 (225,000)[2a]	81.9 (279,000)[2a]
	Flow Rate, GPM (lps)	29.2 (1.8)	32.8 (2.1)[2a]	43.3 (2.7)	54.4 (3.4)	59.7 (3.8)[2a]	73.4 (4.6)[2a]
	Unit Pressure Drop, ft of Water (kPa)	9.7 (29.0)	12.0 (35.9)[2a]	11.3 (33.8)	17.4 (52.0)	21.0 (62.8)[2a]	27.0 (80.7)[2a]
	Heat Rejection, kW (BTUH)	51.2 (175,000)	57.5 (196,000)[2a]	75.8 (259,000)	95.3 (325,000)	104.6 (357,000)[2a]	128.5 (438,000)[2a]
	External Static Pressure, in.w.g. (Pa)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)
	Compressor Type	Scroll (Two-Step Cooling)					
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	41.3 (141,000)	47.7 (163,000)	66.1 (226,000)	80.6 (275,000)		
	Sensible, kW (BTUH)	41.3 (141,000)	47.7 (163,000)	64.5 (220,000)	77.3 (264,000)		
	Flow Rate, GPM (lps)	30.4 (1.9)	35.4 (2.2)	46.8 (2.9)	58.7 (3.7)		
	Unit Pressure Drop, ft of Water (kPa)	10.4 (31.1)	13.9 (41.6)	13.1 (39.2)	20.1 (60.1)		
	Heat Rejection, kW (BTUH)	53.2 (182,000)	62.0 (212,000)	82.0 (280,000)	102.8 (351,000)		
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)	0.4[1] (100)	0.4[1] (100)	0.5[1] (125)		
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	38.8 (132,000)	44.8 (153,000)	63.0 (215,000)	77.4 (264,000)		
	Sensible, kW (BTUH)	38.3 (131,000)	44.1 (150,000)	58.8 (201,000)	70.3 (240,000)		
	Flow Rate, GPM (lps)	29.0 (1.8)	33.8 (2.1)	45.2 (2.8)	56.8 (3.6)		
	Unit Pressure Drop, ft of Water (kPa)	9.5 (28.4)	12.7 (38.0)	12.3 (36.8)	18.9 (56.5)		
	Heat Rejection, kW (BTUH)	50.7 (173,000)	59.2 (202,000)	79.1 (270,000)	99.5 (340,000)		
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	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)	36.3 (124,000)	42.0 (143,000)	59.5 (203,000)	73.4 (250,000)		
	Sensible, kW (BTUH)	33.6 (115,000)	38.6 (132,000)	51.7 (176,000)	61.8 (211,000)		
	Flow Rate, GPM (lps)	27.8 (1.8)	32.5 (2.0)	43.7 (2.8)	55.0 (3.5)		
	Unit Pressure Drop, ft of Water (kPa)	8.8 (26.3)	12.0 (35.9)	11.5 (34.4)	17.8 (53.2)		
	Heat Rejection, kW (BTUH)	48.7 (166,000)	57.0 (194,000)	76.5 (261,000)	96.4 (329,000)		
	External Static Pressure, in.w.g. (Pa)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)		
FAN SECTION - Centrifugal (Forward-Curved)							
	Return Air Volume, ACFM (ACMH)	5,500 (9,345)	6,600 (11,213)	8,000 (13,592)	9,600 (16,310)	11,000 (18,689)	14,600 (24,805)
	Standard Fan Motor, hp (kW)	3.0 (2.2)	5.0 (3.7)	3.0 (2.2)	5.0 (3.7)	7.5 (5.6)	10.0 (7.5)
	Optional Fan Motor, hp (kW)	5.0 (3.7)	7.5 (5.6)	5.0 (3.7)	7.5 (5.6)	10.0 (7.5)	15.0 (11.2)
	Number of Fans	1	1	2	2	2	3

1. Certified in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 (I-P) Standard Rating Conditions. Certified units may be found in the AHRI Directory at www.ahridirectory.org.
2. Certified in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.
2a. Performance data derived from Return ACFM required to be listed in Compliance Certification Database. (VS042=6,400 ; VS077=10,800; VS105=14,400)
3. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
4. Net capacity data has fan motor heat factored in for all ratings.
5. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.
6. See Table 2.15 for Optional DualCool Performance.

Table 2.9 Water-Cooled Data for Upflow with Centrifugal (Forward-Curved) Fan(s), 60-Hz Models

Model Size - Upflow		VS035	VS042	VS053	VS070	VS077	VS105
DX Evaporator - Net Capacity Data with 86°F Entering and 95°F Leaving Fresh Water Temperatures[2]							
	Compressor Type	Digital Scroll				Semi-Hermetic (Four-Step Cooling)	
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	42.5 (145,000)	47.1 (161,000)	65.6 (224,000)	79.4 (271,000)	85.3 (291,000)	103.9 (355,000)
	Sensible, kW (BTUH)	42.5 (145,000)	47.1 (161,000)	64.2 (219,000)	76.5 (261,000)	82.9 (283,000)	101.3 (346,000)
	Flow Rate, GPM (lps)	42.6 (2.7)	48.0 (3.0)	62.2 (3.9)	77.6 (4.9)	85.5 (5.4)	105.2 (6.6)
	Unit Pressure Drop, ft of Water (kPa)	19.9 (59.5)	24.8 (74.2)	22.6 (67.6)	34.4 (102.9)	41.2 (123.2)	53.9 (161.2)
	Heat Rejection, kW (BTUH)	55.9 (191,000)	63.0 (215,000)	81.6 (278,000)	101.8 (347,000)	112.3 (383,000)	138.1 (471,000)
	External Static Pressure, in.w.g. (Pa)	0.4 (100)	0.4 (100)	0.4 (100)	0.5 (125)	0.5 (125)	0.5 (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	39.9 (136,000)	44.2 (151,000)	62.2 (212,000)	75.9 (259,000)	81.4 (278,000)	99.0 (338,000)
	Sensible, kW (BTUH)	39.0 (133,000)	43.6 (149,000)	58.4 (199,000)	69.6 (237,000)	75.4 (257,000)	92.8 (317,000)
	Flow Rate, GPM (lps)	40.6 (2.6)	45.7 (2.9)	59.7 (3.8)	74.9 (4.7)	82.4 (5.2)	101.3 (6.4)
	Unit Pressure Drop, ft of Water (kPa)	18.1 (54.1)	22.6 (67.6)	20.9 (62.5)	32.1 (96)	38.3 (114.5)	50.1 (149.8)
	Heat Rejection, kW (BTUH)	53.2 (182,000)	59.9 (204,000)	78.5 (268,000)	98.3 (335,000)	108.2 (369,000)	133.0 (454,000)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	37.3 (127,000)	41.3 (141,000)[2a]	58.4 (199,000)	71.7 (245,000)	76.8 (262,000)[2a]	93.3 (318,000)[2a]
	Sensible, kW (BTUH)	34.1 (116,000)	37.9 (129,000)[2a]	51.1 (174,000)	61.0 (208,000)	65.5 (223,000)[2a]	81.4 (278,000)[2a]
	Flow Rate, GPM (lps)	38.9 (2.5)	43.6 (2.7)[2a]	57.6 (3.6)	72.4 (4.6)	79.3 (5.0)[2a]	97.5 (6.1)[2a]
	Unit Pressure Drop, ft of Water (kPa)	16.7 (49.9)	21.0 (62.8)[2a]	19.5 (58.3)	30.1 (90.0)	36.0 (107.6)[2a]	47.0 (140.5)[2a]
	Heat Rejection, kW (BTUH)	51.0 (174,000)	57.2 (195,000)[2a]	75.6 (258,000)	95.0 (324,000)	104.1 (355,000)[2a]	127.9 (436,000)[2a]
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)
	Compressor Type	Scroll (Two-Step Cooling)					
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	41.1 (140,000)	47.3 (161,000)	65.6 (224,000)	80.0 (273,000)		
	Sensible, kW (BTUH)	41.1 (140,000)	47.3 (161,000)	64.2 (219,000)	76.9 (262,000)		
	Flow Rate, GPM (lps)	40.5 (2.6)	47.1 (3.0)	62.3 (3.9)	78.1 (4.9)		
	Unit Pressure Drop, ft of Water (kPa)	18.0 (53.8)	24.0 (71.8)	22.7 (67.9)	34.9 (104.4)		
	Heat Rejection, kW (BTUH)	53.1 (181,000)	61.8 (211,000)	81.8 (279,000)	102.5 (350,000)		
	External Static Pressure, in.w.g. (Pa)	0.4 (100)	0.4 (100)	0.4 (100)	0.5 (125)		
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	38.5 (131,000)	44.4 (151,000)	62.5 (213,000)	76.7 (262,000)		
	Sensible, kW (BTUH)	38.1 (130,000)	43.8 (149,000)	58.6 (200,000)	70.0 (239,000)		
	Flow Rate, GPM (lps)	38.5 (2.4)	45.0 (2.8)	60.1 (3.8)	75.5 (4.8)		
	Unit Pressure Drop, ft of Water (kPa)	16.4 (49.0)	21.9 (65.5)	21.1 (63.1)	32.7 (97.8)		
	Heat Rejection, kW (BTUH)	50.6 (173,000)	59.0 (201,000)	78.9 (269,000)	99.2 (338,000)		
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)		
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	36.1 (123,000)	41.6 (142,000)	59.0 (201,000)	72.7 (248,000)		
	Sensible, kW (BTUH)	33.5 (114,000)	38.4 (131,000)	51.4 (175,000)	61.5 (210,000)		
	Flow Rate, GPM (lps)	37 (2.3)	43.2 (2.7)	58.1 (3.7)	73.2 (4.6)		
	Unit Pressure Drop, ft of Water (kPa)	15.1 (45.1)	20.0 (59.8)	19.8 (59.2)	30.7 (91.8)		
	Heat Rejection, kW (BTUH)	48.6 (166,000)	56.8 (194,000)	76.2 (260,000)	96.1 (328,000)		
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)		
FAN SECTION - Centrifugal (Forward-Curved)							
	Return Air Volume, ACFM (ACMH)	5,500 (9,345)	6,600 (11,213)	8,000 (13,592)	9,600 (16,310)	11,000 (18,689)	14,600 (24,805)
	Standard Fan Motor, hp (kW)	3.0 (2.2)	5.0 (3.7)	3.0 (2.2)	5.0 (3.7)	7.5 (5.6)	10.0 (7.5)
	Optional Fan Motor, hp (kW)	5.0 (3.7)	7.5 (5.6)	5.0 (3.7)	7.5 (5.6)	10.0 (7.5)	15.0 (11.2)
	Number of Fans	1	1	2	2	2	3

1. Certified in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 (I-P) Standard Rating Conditions. Certified units may be found in the AHRI Directory at www.ahridirectory.org.
2. Certified in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.
2a. Performance data derived from Return ACFM required to be listed in Compliance Certification Database. (VS042=6,400 ; VS077=10,800; VS105=14,400)
3. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
4. Net capacity data has fan motor heat factored in for all ratings.
5. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.
6. See Table 2.15 for Optional DualCool Performance.

2.3 Glycol Cooled Capacity and Performance Data

Table 2.10 Glycol-Cooled Data for Downflow with EC Fan(s), 60-Hz Models

Model Size - Downflow Configuration		DS035	DS042	DS053	DS070	DS077	DS105
DX Evaporator - Net Capacity Data with 104°F Entering and 115°F Leaving 40% Propylene Glycol Temperatures							
	Compressor Type	**Digital Scroll**				**Semi-Hermetic (Four-Step Cooling)**	
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	37.5 (128,000)	42.5 (145,000)	59.9 (204,000)	71.8 (245,000)	77.7 (265,000)	96.5 (329,000)
	Sensible, kW (BTUH)	37.5 (128,000)	42.5 (145,000)	59.9 (204,000)	71.4 (244,000)	77.5 (264,000)	95.2 (325,000)
	Flow Rate, GPM (lps)	35.2 (2.2)	39.8 (2.5)	52.8 (3.3)	65.6 (4.1)	72.2 (4.5)	89.3 (5.6)
	Unit Pressure Drop, ft of Water (kPa)	15.8 (47.2)	19.7 (58.9)	18.9 (56.5)	28.5 (85.2)	34.0 (101.7)	45.0 (134.6)
	Heat Rejection, kW (BTUH)	52.6 (179,000)	59.3 (202,000)	78.9 (269,000)	97.9 (334,000)	107.7 (367,000)	133.2 (454,000)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	35.1 (120,000)	39.9 (136,000)	56.4 (192,000)	68.1 (232,000)	73.3 (250,000)	91.3 (312,000)
	Sensible, kW (BTUH)	35.1 (120,000)	39.8 (136,000)	55.1 (188,000)	65.6 (224,000)	71.1 (243,000)	87.6 (299,000)
	Flow Rate, GPM (lps)	33.5 (2.1)	37.8 (2.4)	50.6 (3.2)	63.2 (4.0)	69.1 (4.4)	85.6 (5.4)
	Unit Pressure Drop, ft of Water (kPa)	14.3 (42.8)	18.0 (53.8)	17.3 (51.7)	26.5 (79.2)	31.2 (93.3)	41.5 (124.1)
	Heat Rejection, kW (BTUH)	49.9 (170,000)	56.4 (192,000)	75.5 (258,000)	94.3 (322,000)	103.1 (352,000)	127.6 (435,000)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	33.1 (113,000)	37.6 (128,000)	53.5 (183,000)	64.9 (221,000)	69.7 (238,000)	86.8 (296,000)
	Sensible, kW (BTUH)	31.7 (108,000)	36.1 (123,000)	49.4 (169,000)	58.6 (200,000)	63.5 (217,000)	78.5 (268,000)
	Flow Rate, GPM (lps)	32.0 (2.0)	36.2 (2.3)	48.7 (3.1)	61.0 (3.8)	66.4 (4.2)	82.2 (5.2)
	Unit Pressure Drop, ft of Water (kPa)	13.1 (39.2)	16.5 (49.3)	16.1 (48.1)	24.8 (74.2)	28.9 (86.4)	38.4 (114.8)
	Heat Rejection, kW (BTUH)	47.8 (163,000)	54.1 (185,000)	72.6 (248,000)	91.1 (311,000)	99.2 (338,000)	122.7 (419,000)
	Compressor Type	**Scroll (Two-Step Cooling)**					
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	36.5 (125,000)	42.7 (146,000)	60.5 (206,000)	73.5 (251,000)		
	Sensible, kW (BTUH)	36.5 (125,000)	42.7 (146,000)	60.4 (206,000)	72.8 (248,000)		
	Flow Rate, GPM (lps)	33.6 (2.1)	39.1 (2.5)	53.3 (3.4)	66.7 (4.2)		
	Unit Pressure Drop, ft of Water (kPa)	14.4 (43.1)	19.1 (57.1)	19.2 (57.4)	29.4 (87.9)		
	Heat Rejection, kW (BTUH)	50.1 (171,000)	58.4 (199,000)	79.5 (271,000)	99.6 (340,000)		
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	34.1 (116,000)	40.0 (136,000)	57.3 (196,000)	70.1 (239,000)		
	Sensible, kW (BTUH)	34.1 (116,000)	40.0 (136,000)	55.7 (190,000)	66.8 (228,000)		
	Flow Rate, GPM (lps)	32.0 (2.0)	37.3 (2.3)	51.2 (3.2)	64.4 (4.1)		
	Unit Pressure Drop, ft of Water (kPa)	13.1 (39.2)	17.5 (52.3)	17.8 (53.2)	27.5 (82.2)		
	Heat Rejection, kW (BTUH)	47.7 (163,000)	55.7 (190,000)	76.5 (261,000)	96.2 (328,000)		
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	32.1 (110,000)	37.9 (129,000)	54.5 (186,000)	67.1 (229,000)		
	Sensible, kW (BTUH)	31.1 (106,000)	36.2 (124,000)	49.9 (170,000)	59.7 (204,000)		
	Flow Rate, GPM (lps)	30.6 (1.9)	35.8 (2.3)	49.4 (3.1)	62.4 (3.9)		
	Unit Pressure Drop, ft of Water (kPa)	12.0 (35.9)	16.2 (48.4)	16.6 (49.6)	25.8 (77.1)		
	Heat Rejection, kW (BTUH)	45.6 (156,000)	53.4 (182,000)	73.7 (251,000)	93.1 (318,000)		
FAN SECTION - EC Down							
	Return Air Volume, ACFM (ACMH)	5,200 (8,835)	6,200 (10,534)	8,000 (13,592)	9,600 (16,310)	11,000 (18,689)	13,700 (23,276)
	Standard Fan Motor, hp (kW)	3.75 (2.8)	3.75 (2.8)	4.15 (3.1)	4.15 (3.1)	4.15 (3.1)	3.6 (2.7)
	Number of Fans	1	1	2	2	2	3
	External Static Pressure, in.w.g. (Pa)	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]

1. Rated in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 (I-P) Standard Rating Conditions.
2. Certified in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.
3. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
4. Net capacity data has fan motor heat factored in for all ratings.
5. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.
6. See Table 2.13 for Optional DualCool Performance.

Table 2.11 Glycol-Cooled Data for Upflow with EC Fan(s), 60-Hz Models

Model Size - Upflow		VS035	VS042	VS053	VS070	VS077	VS105
DX Evaporator - Net Capacity Data with 104°F Entering and 115°F Leaving 40% Propylene Glycol Temperatures							
	Compressor Type	**Digital Scroll**				**Semi-Hermetic (Four-Step Cooling)**	
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	38.0 (130,000)	43.1 (147,000)	59.6 (203,000)	71.4 (244,000)	77.3 (264,000)	95.0 (324,000)
	Sensible, kW (BTUH)	38.0 (130,000)	43.1 (147,000)	59.6 (203,000)	71.0 (242,000)	77.1 (263,000)	93.6 (319,000)
	Flow Rate, GPM (lps)	35.7 (2.2)	40.3 (2.5)	52.8 (3.3)	65.6 (4.1)	72.2 (4.5)	88.4 (5.6)
	Unit Pressure Drop, ft of Water (kPa)	16.2 (48.4)	20.3 (60.7)	18.8 (56.2)	28.4 (84.9)	33.9 (101.4)	44.1 (131.9)
	Heat Rejection, kW (BTUH)	53.2 (182,000)	60.2 (205,000)	78.8 (269,000)	97.9 (334,000)	107.6 (367,000)	131.9 (450,000)
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)	0.4[1] (100)	0.4[1] (100)	0.5[1] (125)	0.5[1] (125)	0.5[1] (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	35.4 (121,000)	40.3 (138,000)	56.0 (191,000)	67.7 (231,000)	73.0 (249,000)	89.9 (307,000)
	Sensible, kW (BTUH)	35.4 (121,000)	40.3 (138,000)	54.7 (187,000)	65.2 (222,000)	70.7 (241,000)	86.0 (293,000)
	Flow Rate, GPM (lps)	33.9 (2.1)	38.3 (2.4)	50.6 (3.2)	63.1 (4.0)	69.1 (4.4)	84.8 (5.3)
	Unit Pressure Drop, ft of Water (kPa)	14.6 (43.7)	18.4 (55.0)	17.3 (51.7)	26.4 (78.9)	31.2 (93.3)	40.8 (122.0)
	Heat Rejection, kW (BTUH)	50.5 (172,000)	57.2 (195,000)	75.5 (258,000)	94.2 (321,000)	103.1 (352,000)	126.4 (431,000)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	32.8 (112,000)	37.3 (127,000)	52.3 (178,000)	63.6 (217,000)	74.5 (254,000)[2a]	84.2 (287,000)[2a]
	Sensible, kW (BTUH)	31.4 (107,000)	35.9 (122,000)	48.1 (164,000)	57.2 (195,000)	67.4 (230,000)[2a]	75.0 (256,000)[2a]
	Flow Rate, GPM (lps)	32.4 (2.0)	36.7 (2.3)	48.6 (3.1)	61.0 (3.8)	65.9 (4.2)[2a]	81.0 (5.1)[2a]
	Unit Pressure Drop, ft of Water (kPa)	13.4 (40.1)	16.9 (50.5)	16.1 (48.1)	24.7 (73.9)	28.0 (83.7)[2a]	37.0 (110.6)[2a]
	Heat Rejection, kW (BTUH)	48.3 (165,000)	54.7 (187,000)	72.6 (248,000)	91.0 (311,000)	98.3 (335,000)[2a]	120.8 (412,000)[2a]
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)
	Compressor Type	**Scroll (Two-Step Cooling)**					
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	36.9 (126,000)	43.3 (148,000)	60.2 (205,000)	73.1 (249,000)		
	Sensible, kW (BTUH)	36.9 (126,000)	43.3 (148,000)	60.1 (205,000)	72.4 (247,000)		
	Flow Rate, GPM (lps)	34.0 (2.1)	39.6 (2.5)	53.2 (3.4)	66.7 (4.2)		
	Unit Pressure Drop, ft of Water (kPa)	14.7 (44.0)	19.6 (58.6)	19.1 (57.1)	29.4 (87.9)		
	Heat Rejection, kW (BTUH)	50.7 (173,000)	59.2 (202,000)	79.5 (271,000)	99.5 (340,000)		
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)	0.4[1] (100)	0.4[1] (100)	0.5[1] (125)		
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	34.4 (117,000)	40.5 (138,000)	56.9 (194,000)	69.7 (238,000)		
	Sensible, kW (BTUH)	34.4 (117,000)	40.5 (138,000)	55.3 (189,000)	66.4 (227,000)		
	Flow Rate, GPM (lps)	32.3 (2.0)	37.8 (2.4)	51.2 (3.2)	64.4 (4.1)		
	Unit Pressure Drop, ft of Water (kPa)	13.4 (40.1)	17.9 (53.5)	17.7 (52.9)	27.4 (81.9)		
	Heat Rejection, kW (BTUH)	48.2 (164,000)	56.4 (192,000)	76.4 (261,000)	96.1 (328,000)		
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)		
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	31.7 (108,000)	37.5 (128,000)	53.3 (182,000)	65.7 (224,000)		
	Sensible, kW (BTUH)	30.8 (105,000)	36.0 (123,000)	48.6 (166,000)	58.3 (199,000)		
	Flow Rate, GPM (lps)	30.9 (1.9)	36.2 (2.3)	49.4 (3.1)	62.4 (3.9)		
	Unit Pressure Drop, ft of Water (kPa)	12.2 (36.5)	16.5 (49.3)	16.6 (49.6)	25.8 (77.1)		
	Heat Rejection, kW (BTUH)	46.1 (157,000)	54.0 (184,000)	73.7 (251,000)	93.0 (317,000)		
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)		
FAN SECTION - EC Up							
	Return Air Volume, ACFM (ACMH)	5,200 (8,835)	6,200 (10,534)	8,000 (13,592)	9,600 (16,310)	11,000 (18,689)	13,700 (23,276)
	Standard Fan Motor, hp (kW)	3.75 (2.8)	3.75 (2.8)	4.15 (3.1)	4.15 (3.1)	4.15 (3.1)	3.6 (2.7)
	Number of Fans	1	1	2	2	2	3

1. Rated in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 (I-P) Standard Rating Conditions.
2. Certified in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.

2a. Performance data derived from Return ACFM required to be listed in Compliance Certification Database. (VS077=10,400; VS105=13,200)

3. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
4. Net capacity data has fan motor heat factored in for all ratings.
5. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.
6. See Table 2.14 for Optional DualCool Performance.

Table 2.12 Glycol-Cooled Data for Upflow with Centifugal (Foward-Curved) Fan(s), 60-HzModels

Model Size - Upflow Configuration		VS035	VS042	VS053	VS070	VS077	VS105
DX Evaporator - Net Capacity Data with 104°F Entering and 115°F Leaving 40% Propylene Glycol Temperatures							
	Compressor Type	Digital Scroll				Semi-Hermetic (Four-Step Cooling)	
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	37.6 (128,000)	42.2 (144,000)	59.5 (203,000)	71.1 (243,000)	76.9 (262,000)	95.1 (324,000)
	Sensible, kW (BTUH)	37.6 (128,000)	42.2 (144,000)	59.5 (203,000)	70.7 (241,000)	76.7 (262,000)	94.3 (322,000)
	Flow Rate, GPM (lps)	36.1 (2.3)	40.8 (2.6)	52.8 (3.3)	65.6 (4.1)	72.2 (4.5)	89.6 (5.6)
	Unit Pressure Drop, ft of Water (kPa)	16.6 (49.6)	20.8 (62.2)	18.8 (56.2)	28.4 (84.9)	33.9 (101.4)	45.3 (135.4)
	Heat Rejection, kW (BTUH)	53.9 (184,000)	61.0 (208,000)	78.8 (269,000)	97.9 (334,000)	107.6 (367,000)	133.7 (456,000)
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)	0.4[1] (100)	0.4[1] (100)	0.5[1] (125)	0.5[1] (125)	0.5[1] (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	35.0 (119,000)	39.2 (134,000)	55.9 (191,000)	67.4 (230,000)	72.5 (247,000)	89.6 (306,000)
	Sensible, kW (BTUH)	35.0 (119,000)	39.2 (134,000)	54.5 (186,000)	64.9 (221,000)	70.3 (240,000)	86.8 (296,000)
	Flow Rate, GPM (lps)	34.3 (2.2)	38.8 (2.4)	50.6 (3.2)	63.1 (4.0)	69.1 (4.4)	85.7 (5.4)
	Unit Pressure Drop, ft of Water (kPa)	14.9 (44.6)	18.9 (56.5)	17.3 (51.7)	26.4 (78.9)	31.2 (93.3)	41.6 (124.4)
	Heat Rejection, kW (BTUH)	51.1 (174,000)	57.9 (198,000)	75.5 (258,000)	94.2 (321,000)	103.1 (352,000)	127.8 (436,000)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	32.6 (111,000)	36.1 (123,000)	52.1 (178,000)	63.3 (216,000)	68.0 (232,000)[2a]	84.0 (287,000)[2a]
	Sensible, kW (BTUH)	31.3 (107,000)	35.3 (120,000)	47.9 (163,000)	56.9 (194,000)	59.0 (201,000)[2a]	75.1 (256,000)[2a]
	Flow Rate, GPM (lps)	32.6 (2.1)	37.0 (2.3)	48.6 (3.1)	61.0 (3.8)	65.0 (4.1)[2a]	81.2 (5.1)[2a]
	Unit Pressure Drop, ft of Water (kPa)	13.6 (40.7)	17.2 (51.4)	16.1 (48.1)	24.7 (73.9)	28.0 (83.7)[2a]	38.0 (113.6)[2a]
	Heat Rejection, kW (BTUH)	48.7 (166,000)	55.2 (188,000)	72.6 (248,000)	91.0 (311,000)	97.0 (331,000)[2a]	121.1 (413,000)[2a]
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)
	Compressor Type	Scroll (Two-Step Cooling)					
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	36.5 (125,000)	42.4 (145,000)	60.1 (205,000)	72.9 (249,000)		
	Sensible, kW (BTUH)	36.5 (125,000)	42.4 (145,000)	60.0 (205,000)	72.1 (246,000)		
	Flow Rate, GPM (lps)	34.4 (2.2)	40.1 (2.5)	53.2 (3.4)	66.7 (4.2)		
	Unit Pressure Drop, ft of Water (kPa)	15.0 (44.9)	20.1 (60.1)	19.1 (57.1)	29.4 (87.9)		
	Heat Rejection, kW (BTUH)	51.3 (175,000)	59.9 (204,000)	79.5 (271,000)	99.5 (340,000)		
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)	0.4[1] (100)	0.4[1] (100)	0.5[1] (125)		
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	33.9 (116,000)	39.4 (134,000)	56.7 (193,000)	69.4 (237,000)		
	Sensible, kW (BTUH)	33.9 (116,000)	39.4 (134,000)	55.1 (188,000)	66.1 (226,000)		
	Flow Rate, GPM (lps)	32.7 (2.1)	38.2 (2.4)	51.2 (3.2)	64.4 (4.1)		
	Unit Pressure Drop, ft of Water (kPa)	13.6 (40.7)	18.3 (54.7)	17.7 (52.9)	27.4 (81.9)		
	Heat Rejection, kW (BTUH)	48.8 (167,000)	57.1 (195,000)	76.4 (261,000)	96.1 (328,000)		
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)		
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	31.1 (106,000)	36.7 (125,000)[2a]	53.1 (181,000)	65.5 (223,000)		
	Sensible, kW (BTUH)	30.6 (104,000)	34.4 (117,000)[2a]	48.5 (165,000)	58.0 (198,000)		
	Flow Rate, GPM (lps)	31.1 (2.0)	35.9 (2.3)[2a]	49.4 (3.1)	62.4 (3.9)		
	Unit Pressure Drop, ft of Water (kPa)	12.4 (37.1)	16.0 (47.8)[2a]	16.6 (49.6)	25.8 (77.1)		
	Heat Rejection, kW (BTUH)	46.4 (158,000)	53.6 (183,000)[2a]	73.7 (251,000)	93.0 (317,000)		
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)		
FAN SECTION - Centrifugal (Forward-Curved)							
	Return Air Volume - ACFM (ACMH)	5,500 (9,345)	6,600 (11,213)	8,000 (13,592)	9,600 (16,310)	11,000 (18,689)	14,600 (24,805)
	Standard Fan Motor, hp (kW)	3.0 (2.2)	5.0 (3.7)	3.0 (2.2)	5.0 (3.7)	7.5 (5.6)	10.0 (7.5)
	Optional Fan Motor, hp (kW)	5.0 (3.7)	7.5 (5.6)	5.0 (3.7)	7.5 (5.6)	10.0 (7.5)	15.0 (11.2)
	Number of Fans	1	1	2	2	2	3

1. Rated in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 (I-P) Standard Rating Conditions.
2. Certified in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.
2a. Performance data derived from Return ACFM required to be listed in Compliance Certification Database. (VS042=5,800; VS077=9,500; VS105=13,400)
3. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
4. Net capacity data has fan motor heat factored in for all ratings.
5. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.
6. See Table 2.15 for Optional DualCool Performance.

2.4 Econ-O-Coil and GLYCOOL Capacity and Performance Data

Table 2.13 Optional Dual-Cool[1] Data for Air or Water/Glycol Cooled Upflow with EC Fans, 60-Hz

Model Size - Upflow Configuration		VS035	VS042	VS053	VS070	VS077	VS105
Optional Econ-O-Coil Chilled Water Coil - Net Capacity Data with 50°F Entering and 62°F Leaving Fresh Water Temperatures							
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	34.3 (117,000)	39.0 (133,000)	56.3 (192,000)	63.6 (217,000)	66.9 (228,000)	83.7 (286,000)
	Sensible, kW (BTUH)	34.3 (117,000)	39.0 (133,000)	56.3 (192,000)	63.6 (217,000)	66.9 (228,000)	83.7 (286,000)
	Flow Rate GPM (lps)	20.5 (1.3)	23.7 (1.5)	33.5 (2.1)	38.7 (2.4)	40.8 (2.6)	51.2 (3.2)
	Unit Pressure Drop ft of Water (kPa)	6.9 (20.6)	9.0 (26.9)	8.8 (26.3)	11.0 (32.9)	12.0 (35.9)	12.0 (35.9)
	External Static Pressure, in.w.g. (Pa)	0.4 (100)	0.4 (100)	0.4 (100)	0.5 (125)	0.5 (125)	0.5 (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	27.1 (92,000)	30.5 (104,000)	45.1 (154,000)	51.0 (174,000)	53.5 (183,000)	66.5 (227,000)
	Sensible, kW (BTUH)	27.1 (92,000)	30.5 (104,000)	45.1 (154,000)	51.0 (174,000)	53.5 (183,000)	66.5 (227,000)
	Flow Rate GPM (lps)	16.5 (1.0)	19.0 (1.2)	27.3 (1.7)	31.5 (2.0)	33.2 (2.1)	41.4 (2.6)
	Unit Pressure Drop ft of Water (kPa)	4.7 (14.1)	6.0 (17.9)	6.1 (18.2)	7.9 (23.6)	8.3 (24.8)	8.2 (24.5)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	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)	19.0 (65,000)	21.1 (72,000)	33.1 (113,000)	36.9 (126,000)	38.5 (131,000)	47.4 (162,000)
	Sensible, kW (BTUH)	19.0 (65,000)	21.1 (72,000)	33.1 (113,000)	36.9 (126,000)	38.5 (131,000)	47.4 (162,000)
	Flow Rate GPM (lps)	12.1 (0.8)	14.0 (0.9)	20.9 (1.3)	24.0 (1.5)	25.3 (1.6)	31.3 (2.0)
	Unit Pressure Drop ft of Water (kPa)	2.7 (8.1)	3.5 (10.5)	3.8 (11.4)	4.9 (14.7)	5.1 (15.2)	4.9 (14.7)
	External Static Pressure, in.w.g. (Pa)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)
Optional Econ-O-Coil Chilled Water Coil - Net Capacity Data with 45°F Entering and 57°F Leaving Fresh Water Temperatures							
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	41.3 (141,000)	46.9 (160,000)	68.6 (234,000)	77.1 (263,000)	79.5 (271,000)	99.9 (341,000)
	Sensible, kW (BTUH)	41.3 (141,000)	46.9 (160,000)	66.5 (227,000)	75.6 (258,000)	79.2 (270,000)	99.4 (339,000)
	Flow Rate GPM (lps)	24.4 (1.5)	28.1 (1.8)	40.4 (2.5)	46.3 (2.9)	47.9 (3.0)	60.3 (3.8)
	Unit Pressure Drop ft of Water (kPa)	9.6 (28.7)	12.0 (35.9)	13.0 (38.9)	16.0 (47.8)	16.0 (47.8)	17.0 (50.8)
	External Static Pressure, in.w.g. (Pa)	0.4 (100)	0.4 (100)	0.4 (100)	0.5 (125)	0.5 (125)	0.5 (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	34.3 (117,000)	38.7 (132,000)	57.4 (196,000)	64.5 (220,000)	66.3 (226,000)	83.0 (283,000)
	Sensible, kW (BTUH)	34.0 (116,000)	38.7 (132,000)	55.7 (190,000)	63.3 (216,000)	66.0 (225,000)	82.6 (282,000)
	Flow Rate GPM (lps)	20.4 (1.3)	23.6 (1.5)	34.2 (2.2)	39.2 (2.5)	40.4 (2.5)	50.8 (3.2)
	Unit Pressure Drop ft of Water (kPa)	7.0 (20.9)	9.0 (26.9)	9.3 (27.8)	12.0 (35.9)	12.0 (35.9)	12.0 (35.9)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	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)	26.3 (90,000)	29.6 (101,000)	45.4 (155,000)	50.7 (173,000)	51.7 (176,000)	64.4 (220,000)
	Sensible, kW (BTUH)	26.3 (90,000)	29.6 (101,000)	43.9 (150,000)	49.5 (169,000)	51.5 (176,000)	64.1 (219,000)
	Flow Rate GPM (lps)	16.3 (1.0)	18.8 (1.2)	27.8 (1.8)	31.8 (2.0)	32.7 (2.1)	40.9 (2.6)
	Unit Pressure Drop ft of Water (kPa)	4.7 (14.1)	6.0 (17.9)	6.4 (19.1)	8.2 (24.5)	8.2 (24.5)	8.2 (24.5)
	External Static Pressure, in.w.g. (Pa)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)
FAN SECTION - EC Up							
	Return Air Volume - ACFM (ACMH)	5,200 (8,835)	6,300 (10,700)	8,000 (13,592)	9,600 (16,310)	10,000 (16,990)	12,800 (21,747)

1. Dual-Cool indicates a 4-pipe connection system.
2. Consult factory for alternate performance outputs.
3. Net capacity data has fan motor heat factored in for all ratings.
4. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.

Table 2.14 Optional Dual-Cool[1] Data for Air or Water/Glycol Cooled Upflow with Centrifugal (Foward-curved) Fans, 60-Hz

Model Size - Upflow Configuration		VS035	VS042	VS053	VS070	VS077	VS105
Optional Econ-O-Coil Chilled Water Coil - Net Capacity Data with 50°F Entering and 62°F Leaving Fresh Water Temperatures							
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	34.9 (119,000)	38.7 (132,000)	56.0 (191,000)	63.3 (216,000)	68.6 (234,000)	88.5 (302,000)
	Sensible, kW (BTUH)	34.9 (119,000)	38.7 (132,000)	56.0 (191,000)	63.3 (216,000)	68.6 (234,000)	88.5 (302,000)
	Flow Rate GPM (lps)	21.4 (1.3)	24.5 (1.5)	33.5 (2.1)	38.7 (2.4)	42.9 (2.7)	55.9 (3.5)
	Unit Pressure Drop ft of Water (kPa)	7.5 (22.4)	9.6 (28.7)	8.8 (26.3)	11 (32.9)	14.0 (41.9)	14.0 (41.9)
	External Static Pressure, in.w.g. (Pa)	0.4 (100)	0.4 (100)	0.4 (100)	0.5 (125)	0.5 (125)	0.5 (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	27.4 (93,000)	29.9 (102,000)	45.1 (154,000)	50.7 (173,000)	54.5 (186,000)	69.4 (237,000)
	Sensible, kW (BTUH)	27.4 (93,000)	29.9 (102,000)	45.1 (154,000)	50.7 (173,000)	54.5 (186,000)	69.4 (237,000)
	Flow Rate GPM (lps)	17.2 (1.1)	19.6 (1.2)	27.3 (1.7)	31.5 (2)	34.9 (2.2)	45.2 (2.9)
	Unit Pressure Drop ft of Water (kPa)	5.0 (15.0)	6.4 (19.1)	6.1 (18.2)	7.9 (23.6)	9.5 (28.4)	9.5 (28.4)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	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)	18.9 (64,000)	20.4 (70,000)	32.5 (111,000)	36.6 (125,000)	39.0 (133,000)	48.6 (166,000)
	Sensible, kW (BTUH)	18.9 (64,000)	20.4 (70,000)	32.5 (111,000)	36.6 (125,000)	39.0 (133,000)	48.6 (166,000)
	Flow Rate GPM (lps)	12.7 (0.8)	14.5 (0.9)	20.9 (1.3)	24.0 (1.5)	26.6 (1.7)	34.1 (2.2)
	Unit Pressure Drop ft of Water (kPa)	2.9 (8.7)	3.7 (11.1)	3.8 (11.4)	4.9 (14.7)	5.8 (17.3)	5.7 (17.0)
	External Static Pressure, in.w.g. (Pa)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)
Optional Econ-O-Coil Chilled Water Coil - Net Capacity Data with 45°F Entering and 57°F Leaving Fresh Water Temperatures							
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	42.2 (144,000)	46.9 (160,000)	68.3 (233,000)	76.8 (262,000)	82.6 (282,000)	107.0 (365,000)
	Sensible, kW (BTUH)	42.2 (144,000)	46.9 (160,000)	66.2 (226,000)	75.3 (257,000)	82.6 (282,000)	107.0 (365,000)
	Flow Rate GPM (lps)	25.4 (1.6)	29.1 (1.8)	40.4 (2.5)	46.3 (2.9)	50.7 (3.2)	66.2 (4.2)
	Unit Pressure Drop ft of Water (kPa)	10.0 (29.9)	13.0 (38.9)	13.0 (38.9)	16.0 (47.8)	19.0 (56.8)	19.0 (56.8)
	External Static Pressure, in.w.g. (Pa)	0.4 (100)	0.4 (100)	0.4 (100)	0.5 (125)	0.5 (125)	0.5 (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	34.6 (118,000)	38.4 (131,000)	57.4 (196,000)	64.5 (220,000)	69.1 (236,000)	88.5 (302,000)
	Sensible, kW (BTUH)	34.6 (118,000)	38.4 (131,000)	55.4 (189,000)	63.0 (215,000)	68.6 (234,000)	88.2 (301,000)
	Flow Rate GPM (lps)	21.3 (1.3)	24.4 (1.5)	34.2 (2.2)	39.2 (2.5)	43.1 (2.7)	55.9 (3.5)
	Unit Pressure Drop ft of Water (kPa)	7.5 (22.4)	9.6 (28.7)	9.3 (27.8)	12.0 (35.9)	14.0 (41.9)	14.0 (41.9)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	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)	26.5 (90,000)	29.1 (99,000)	44.8 (153,000)	50.4 (172,000)	53.6 (183,000)	68.3 (233,000)
	Sensible, kW (BTUH)	26.5 (90,000)	29.1 (99,000)	43.4 (148,000)	49.2 (168,000)	53.3 (182,000)	67.7 (231,000)
	Flow Rate GPM (lps)	17.0 (1.1)	19.4 (1.2)	27.8 (1.8)	31.8 (2.0)	35.0 (2.2)	45.2 (2.9)
	Unit Pressure Drop ft of Water (kPa)	5.0 (15.0)	6.4 (19.1)	6.4 (19.1)	8.2 (24.5)	9.7 (29.0)	9.6 (28.7)
	External Static Pressure, in.w.g. (Pa)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)	1.0 (250)
FAN SECTION - Centrifugal (Forward-Curved)							
	Return Air Volume - ACFM (ACMH)	5,500 (9,345)	6,600 (11,210)	8,000 (13,592)	9,600 (16,310)	11,000 (18,690)	14,600 (24,805)

1. Dual-Cool indicates a 4-pipe connection system.
2. Consult factory for alternate performance outputs.
3. Net capacity data has fan motor heat factored in for all ratings.
4. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.

Table 2.15 GLYCOOL[3] Datra for Downflow with EC Fans, 60-Hz Models

Model Size - Downflow Configuration		DS035	DS042	DS053	DS070	DS077	DS105
DX Evaporator - Net Capacity Data with 104°F Entering and 115°F Leaving 40% Propylene Glycol Temperatures							
Compressor Type		**Digital Scroll**				**Semi-Hermetic (Four-Step Cooling)**	
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	37.3 (127,000)	42.1 (144,000)	59.4 (203,000)	71.0 (242,000)	76.4 (261,000)	95.3 (325,000)
	Sensible, kW (BTUH)	37.3 (127,000)	42.1 (144,000)	59.4 (203,000)	70.7 (241,000)	75.7 (258,000)	93.8 (320,000)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	34.8 (119,000)	39.5 (135,000)	55.9 (191,000)	67.3 (230,000)	72.3 (247,000)	90.2 (308,000)
	Sensible, kW (BTUH)	34.8 (119,000)	39.5 (135,000)	54.6 (186,000)	64.8 (221,000)	69.2 (236,000)	86.1 (294,000)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	32.9 (112,000)	37.2 (127,000)	53.0 (181,000)	64.2 (219,000)	68.8 (235,000)	85.7 (292,000)
	Sensible, kW (BTUH)	31.4 (107,000)	35.8 (122,000)	48.9 (167,000)	57.8 (197,000)	61.6 (210,000)	77.1 (263,000)
Compressor Type		**Scroll (Two-Step Cooling)**					
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	36.2 (124,000)	42.3 (144,000)	60.0 (205,000)	72.8 (248,000)		
	Sensible, kW (BTUH)	36.2 (124,000)	42.3 (144,000)	59.9 (204,000)	72.1 (246,000)		
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	33.9 (116,000)	39.6 (135,000)	56.8 (194,000)	69.3 (236,000)		
	Sensible, kW (BTUH)	33.9 (116,000)	39.6 (135,000)	55.2 (188,000)	66.0 (225,000)		
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	31.8 (109,000)	37.4 (128,000)	54.0 (184,000)	66.3 (226,000)		
	Sensible, kW (BTUH)	30.8 (105,000)	35.9 (122,000)	49.4 (169,000)	58.9 (201,000)		
Condenser Flow Requirements with 104°F Entering Temperature 40% Propylene Glycol							
85°F DB1, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Flow Rate, GPM (lps)	35.2 (2.2)	39.9 (2.5)	53.3 (3.4)	66.7 (4.2)	71.3 (4.5)	89.0 (5.6)
	Unit Pressure Drop, ft of Water (kPa)	15.8 (47.2)	19.9 (59.5)	19.2 (57.4)	29.4 (87.9)	33.2 (99.3)	44.7 (133.7)
	Heat Rejection, kW (BTUH)	52.6 (179,000)	59.5 (203,000)	79.5 (271,000)	99.6 (340,000)	106.5 (363,000)	132.7 (453,000)
Econ-O-Coil GLYCOOL[3] Coil - Net Capacity Data with 45°F Entering Temperature 40% Propylene Glycol							
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	30.0 (102,000)	34.2 (117,000)	52.4 (179,000)	64.7 (221,000)	69.1 (236,000)	94.2 (321,000)
	Sensible, kW (BTUH)	30.0 (102,000)	34.2 (117,000)	52.4 (179,000)	64.7 (221,000)	69.1 (236,000)	94.2 (321,000)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	25.9 (88,000)	29.5 (101,000)	45.4 (155,000)	56.0 (191,000)	59.8 (204,000)	81.7 (279,000)
	Sensible, kW (BTUH)	25.9 (88,000)	29.5 (101,000)	45.4 (155,000)	56.0 (191,000)	59.8 (204,000)	81.7 (279,000)
75°F DB, 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	22.0 (75,000)	24.8 (85,000)	38.5 (131,000)	47.3 (161,000)	50.5 (172,000)	68.4 (233,000)
	Sensible, kW (BTUH)	22.0 (75,000)	24.8 (85,000)	38.5 (131,000)	47.3 (161,000)	50.5 (172,000)	68.4 (233,000)
Econ-O-Coil Flow Requirements with 45°F Entering Temperature 40% Propylene Glycol							
	Flow Rate, GPM (lps)	35.2 (2.2)	39.9 (2.5)	53.3 (3.4)	66.7 (4.2)	71.3 (4.5)	89.0 (5.6)
	Unit Pressure Drop, ft of Water (kPa)	28.0 (83.7)	37.0 (110.6)	45.0 (134.6)	75.0 (224.3)	84.0 (251.2)	84.0 (251.2)
FAN SECTION - EC Down							
	Return Air Volume, ACFM (ACMH)	5,200 (8,835)	6,300 (10,703)	8,000 (13,592)	9,600 (16,310)	10,400 (17,669)	13,500 (22,936)
	Standard Fan Motor, hp (kW)	3.75 (2.8)	3.75 (2.8)	4.15 (3.1)	4.15 (3.1)	4.15 (3.1)	3.6 (2.7)
	Number of Fans	1	1	2	2	2	3
	External Static Pressure, in.w.g. (Pa)	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]	0.2 (50)[1,2]

1. Rated in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 (I-P) Standard Rating Conditions.
2. Rated in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.
3. GLYCOOL indicates a 2-pipe connection system.
4. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
5. Net capacity data has fan motor heat factored in for all ratings.
6. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.

Table 2.16 GLYCOOL[3] Data for Upflow with EC Fans, 60-Hz Models

Model Size - Upflow Configuration		VS035	VS042	VS053	VS070	VS077	VS105
DX Evaporator - Net Capacity Data with 104°F Entering and 115°F Leaving 40% Propylene Glycol Temperatures							
Compressor Type		**Digital Scroll**				**Semi-Hermetic (Four-Step Cooling)**	
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	37.8 (129,000)	43.0 (147,000)	59.4 (203,000)	70.9 (242,000)	76.1 (260,000)	93.7 (320,000)
	Sensible, kW (BTUH)	37.8 (129,000)	43.0 (147,000)	59.3 (202,000)	70.6 (241,000)	75.1 (256,000)	91.7 (313,000)
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)	0.4[1] (100)	0.4[1] (100)	0.5[1] (125)	0.5[1] (125)	0.5[1] (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	35.3 (120,000)	40.1 (137,000)	55.8 (190,000)	67.3 (230,000)	72.2 (246,000)	89.1 (304,000)
	Sensible, kW (BTUH)	35.3 (120,000)	40.1 (137,000)	54.4 (186,000)	64.7 (221,000)	68.4 (233,000)	83.9 (286,000)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	32.6 (111,000)	37.1 (127,000)	52.0 (177,000)	63.2 (216,000)	68.9 (235,000)	83.6 (285,000)
	Sensible, kW (BTUH)	31.3 (107,000)	35.8 (122,000)	47.8 (163,000)	56.8 (194,000)	60.8 (207,000)	73.8 (252,000)
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)
Compressor Type		**Scroll (Two-Step Cooling)**					
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	36.8 (126,000)	43.2 (147,000)	60.0 (205,000)	73.3 (250,000)		
	Sensible, kW (BTUH)	36.8 (126,000)	43.2 (147,000)	59.9 (204,000)	72.6 (248,000)		
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)	0.4[1] (100)	0.4[1] (100)	0.5[1] (125)		
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	34.3 (117,000)	40.3 (138,000)	56.6 (193,000)	69.3 (236,000)		
	Sensible, kW (BTUH)	34.3 (117,000)	40.3 (138,000)	55.0 (188,000)	66.0 (225,000)		
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)		
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	31.6 (108,000)	37.3 (127,000)	53.0 (181,000)	65.3 (223,000)		
	Sensible, kW (BTUH)	30.3 (103,000)	35.9 (122,000)	48.4 (165,000)	57.8 (197,000)		
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)		
Condenser Flow Requirements - with 104°F Entering Temperature 40% Propylene Glycol							
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Flow Rate, GPM (lps)	35.7 (2.2)	40.4 (2.5)	53.2 (3.4)	66.7 (4.2)	70.8 (4.5)	87.1 (5.5)
	Unit Pressure Drop, ft of Water (kPa)	16.1 (48.1)	20.4 (61.0)	19.1 (57.1)	29.0 (86.7)	33.0 (98.7)	43.0 (128.6)
	Heat Rejection, kW (BTUH)	53.2 (182,000)	60.4 (206,000)	79.5 (271,000)	99.5 (340,000)	105.6 (360,000)	129.9 (443,000)
Econ-O-Coil GLYCOOL[3] Coil - Net Capacity Data with 45°F Entering Temperature 40% Propylene Glycol							
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	30.2 (103,000)	34.5 (118,000)	52.4 (179,000)	64.7 (221,000)	68.0 (232,000)	91.9 (314,000)
	Sensible, kW (BTUH)	30.2 (103,000)	34.5 (118,000)	52.4 (179,000)	64.7 (221,000)	68.0 (232,000)	91.9 (314,000)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	26.0 (89,000)	29.7 (101,000)	45.3 (155,000)	56.0 (191,000)	58.9 (201,000)	79.7 (272,000)
	Sensible, kW (BTUH)	26.0 (89,000)	29.7 (101,000)	45.3 (155,000)	56.0 (191,000)	58.9 (201,000)	79.7 (272,000)
75°F DB, 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	21.5 (73,000)	24.3 (83,000)	37.5 (128,000)	46.3 (158,000)	48.8 (167,000)	65.4 (223,000)
	Sensible, kW (BTUH)	21.5 (73,000)	24.3 (83,000)	37.5 (128,000)	46.3 (158,000)	48.8 (167,000)	65.4 (223,000)
Econ-O-Coil Flow Requirements with 45°F Entering Temperature 40% Propylene Glycol							
	Flow Rate, GPM (lps)	35.7 (2.2)	40.4 (2.5)	53.2 (3.4)	66.7 (4.2)	70.8 (4.5)	87.1 (5.5)
	Unit Pressure Drop, ft of Water (kPa)	29.0 (86.7)	38.0 (113.6)	45.0 (134.6)	75.0 (224.3)	83.0 (248.2)	81.0 (242.2)
FAN SECTION - EC Up							
	Return Air Volume, ACFM (ACMH)	5,200 (8,835)	6,300 (10,703)	8,000 (13,592)	9,600 (16,310)	10,000 (16,990)	12,800 (21,747)
	Standard Fan Motor, hp (kW)	3.75 (2.8)	3.75 (2.8)	4.15 (3.1)	4.15 (3.1)	4.15 (3.1)	3.6 (2.7)
	Number of Fans	1	1	2	2	2	3

1. Rated in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 (I-P) Standard Rating Conditions.
2. Rated in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.
3. GLYCOOL indicates a 2-pipe connection system.
4. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
5. Net capacity data has fan motor heat factored in for all ratings.
6. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.

Table 2.17 GLYCOOL[3] Data for Upflow with Centrifugal (Forward-Curved) Fan(s), 60-Hz Models

Model Size - Upflow Configuration		VS035	VS042	VS053	VS070	VS077	VS105
DX Evaporator - Net Capacity Data with 104°F Entering and 115°F Leaving 40% Propylene Glycol Temperatures							
Compressor Type		**Digital Scroll**				**Semi-Hermetic (Four-Step Cooling)**	
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	37.5 (128,000)	41.9 (143,000)	59.2 (202,000)	70.7 (241,000)	76.3 (260,000)	94.4 (322,000)
	Sensible, kW (BTUH)	37.5 (128,000)	41.9 (143,000)	59.2 (202,000)	70.3 (240,000)	76.1 (260,000)	93.5 (319,000)
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)	0.4[1] (100)	0.4[1] (100)	0.5[1] (125)	0.5[1] (125)	0.5[1] (125)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	34.8 (119,000)	39.0 (133,000)	55.6 (190,000)	67.0 (229,000)	72.0 (246,000)	88.9 (303,000)
	Sensible, kW (BTUH)	34.8 (119,000)	39.0 (133,000)	54.3 (185,000)	64.5 (220,000)	69.7 (238,000)	86.0 (293,000)
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	32.0 (109,000)	35.8 (122,000)	51.6 (176,000)	62.9 (215,000)	67.2 (229,000)	82.8 (283,000)
	Sensible, kW (BTUH)	31.1 (106,000)	35.0 (119,000)	47.5 (162,000)	56.5 (193,000)	60.9 (208,000)	75.7 (258,000)
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)
Compressor Type		**Scroll (Two-Step Cooling)**					
85°F DB[1], 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	36.3 (124,000)	42.1 (144,000)	59.8 (204,000)	72.5 (247,000)		
	Sensible, kW (BTUH)	36.3 (124,000)	42.1 (144,000)	59.8 (204,000)	71.7 (245,000)		
	External Static Pressure, in.w.g. (Pa)	0.4[1] (100)	0.4[1] (100)	0.4[1] (100)	0.5[1] (125)		
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	33.8 (115,000)	39.2 (134,000)	56.5 (193,000)	69.0 (235,000)		
	Sensible, kW (BTUH)	33.8 (115,000)	39.2 (134,000)	54.9 (187,000)	65.7 (224,000)		
	External Static Pressure, in.w.g. (Pa)	0.5 (125)	0.5 (125)	0.5 (125)	0.5 (125)		
75°F DB[2], 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	30.9 (105,000)	36.0 (123,000)	52.6 (179,000)	65.0 (222,000)		
	Sensible, kW (BTUH)	30.4 (104,000)	35.1 (120,000)	48.0 (164,000)	57.5 (196,000)		
	External Static Pressure, in.w.g. (Pa)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)	1.0[2] (250)		
Condenser Flow Requirements - with 104°F Entering Temperature 40% Propylene Glycol							
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Flow Rate, GPM (lps)	36.1 (2.3)	40.8 (2.6)	53.2 (3.4)	66.7 (4.2)	72.1 (4.5)	89.7 (5.7)
	Unit Pressure Drop, ft of Water (kPa)	16.5 (49.3)	20.8 (62.2)	19.1 (57.1)	29.0 (86.7)	34.0 (101.7)	45.0 (134.6)
	Heat Rejection, kW (BTUH)	53.9 (184,000)	61.0 (208,000)	79.5 (271,000)	99.5 (340,000)	107.6 (367,000)	133.7 (456,000)
Econ-O-Coil GLYCOOL[3] Coil - Net Capacity Data with 45°F Entering Temperature 40% Propylene Glycol							
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	29.9 (102,000)	33.9 (116,000)	52.2 (178,000)	64.4 (220,000)	69.2 (236,000)	96.7 (330,000)
	Sensible, kW (BTUH)	29.9 (102,000)	33.9 (116,000)	52.2 (178,000)	64.4 (220,000)	69.2 (236,000)	96.7 (330,000)
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	25.7 (88,000)	28.9 (99,000)	45.1 (154,000)	55.7 (190,000)	59.9 (204,000)	83.7 (286,000)
	Sensible, kW (BTUH)	25.7 (88,000)	28.9 (99,000)	45.1 (154,000)	55.7 (190,000)	59.9 (204,000)	83.7 (286,000)
75°F DB, 61°F WB, 52°F DP, 44% RH (23.9°C DB, 16.1°C WB)	Total, kW (BTUH)	21.0 (72,000)	23.4 (80,000)	37.2 (127,000)	46.0 (157,000)	49.5 (169,000)	69.1 (236,000)
	Sensible, kW (BTUH)	21.0 (72,000)	23.4 (80,000)	37.2 (127,000)	46.0 (157,000)	49.5 (169,000)	69.1 (236,000)
Econ-O-Coil Flow Requirements with 45°F Entering Temperature 40% Propylene Glycol							
	Flow Rate, GPM (lps)	36.1 (2.3)	40.8 (2.6)	53.2 (3.4)	66.7 (4.2)	72.1 (4.5)	89.7 (5.7)
	Unit Pressure Drop, ft of Water (kPa)	29.0 (86.7)	38.0 (113.6)	45.0 (134.6)	75.0 (224.3)	86.0 (257.1)	86.0 (257.1)
FAN SECTION - Centrifugal (Forward-Curved)							
	Return Air Volume - ACFM (ACMH)	5,500 (9,345)	6,600 (11,213)	8,000 (13,592)	9,600 (16,310)	10,400 (17,670)	14,600 (24,805)
	Standard Fan Motor, hp (kW)	3.0 (2.2)	5.0 (3.7)	3.0 (2.2)	5.0 (3.7)	7.5 (5.6)	10.0 (7.5)
	Optional Fan Motor, hp (kW)	5.0 (3.7)	7.5 (5.6)	5.0 (3.7)	7.5 (5.6)	10.0 (7.5)	15.0 (11.2)
	Number of Fans	1	1	2	2	2	3

1. Rated in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 (I-P) Standard Rating Conditions.
2. Rated in accordance with the ASHRAE Standard 127-2007 Standard Rating Conditions. Certified units may be found in the Compliance Certification Database at www.regulations.doe.gov.
3. GLYCOOL indicates a 2-pipe connection system.
4. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations.
5. Net capacity data has fan motor heat factored in for all ratings.
6. Consult factory for alternate performance outputs. Performance data generated in LRS Update Version 02-11-2019.

2.5 Physical Data

Table 2.18 Physical Data

Model Size	035	042	053	070	077	105
EVAPORATOR COIL- Copper Tube/Aluminum Fin						
Face Area, sq. ft. (m2)	17.1 (1.6)	17.1 (1.6)	24.7 (2.3)	24.7 (2.3)	24.7 (2.3)	32.3 (3.0)
Rows of Coil	3	3	3	3	3	3
REHEAT SECTION						
Electric Reheat - Three-Stage, Stainless Steel Fin Tubular; capacity does not include fan motor heat						
Capacity - kBTUH (kW) - Standard Selection	51.2 (15.0)	51.2 (15.0)	85.3 (25.0)	85.3 (25.0)	85.3 (25.0)	102.4 (30.0)
Capacity - kBTUH (kW) - Optional Selection	34.1 (10.0)	34.1 (10.0)	51.2 (15.0)	51.2 (15.0)	51.2 (15.0)	68.3 (20.0)
Electric Reheat - SCR Control, Stainless Steel Fin Tubular (optional selection)						
Capacity, kBTUH (kW)	51.2 (15.0)	51.2 (15.0)	85.3 (25.0)	85.3 (25.0)	85.3 (25.0)	102.4 (30.0)
HUMIDIFIER SECTION						
Infrared Humidifier						
Capacity, lb./hr. (kg/h)	11.0 (5.0)	11.0 (5.0)	22.0 (10.0)	22.0 (10.0)	22.0 (10.0)	22.0 (10.0)
FILTER SECTION Disposable Type - Nominal Sizes and Quantities, Standard MERV 8 or Optional MERV 11 (Filter types cannot be mixed, must be all MERV 8 or all MERV 11.)						
Downflow Models						
Quantity	3	3	4	4	4	4
Nominal Size, inches	2 @ 25x20 1 @ 25x16	2 @ 25x20 1 @ 25x16	4 @ 25x20	4 @ 25x20	4 @ 25x20	4 @ 25x20
Upflow Models (Front and Rear return) Filters located in separate filter box on rear return; located on lower unit panel on front return.						
Quantity	4	4	6	6	6	8
Nominal Size, inches	25x20	25x20	25x20	25x20	25x20	25x20
PIPING CONNECTION SIZES - Air-cooled Liebert® DS Indoor Unit (Not External Line Sizes)						
Liquid Line, O.D. Copper (2/unit)	1/2	1/2	5/8	5/8	5/8	5/8
Hot Gas Line, O.D. Copper (2/unit)	5/8	5/8	7/8	7/8	7/8	1-1/8
Infrared Humidifier, O.D. Copper	1/4	1/4	1/4	1/4	1/4	1/4
Condensate Drain, FPT	3/4	3/4	3/4	3/4	3/4	3/4
Condensate Drain w/Optional Condensate Pump, OD	1/2	1/2	1/2	1/2	1/2	1/2

Table 2.18 Physical Data (continued)

Model Size	035	042	053	070	077	105
PIPING CONNECTION SIZES -Water/Glycol/GLYCOOL-cooled Liebert® DS Indoor Unit						
Water/Glycol/GLYCOOL Supply, O.D. Copper	1-5/8"	2-1/8"	2-1/8"	2-1/8"	2-1/8"	2-1/8"
Water/Glycol/GLYCOOL Return, O.D. Copper	1-5/8"	2-1/8"	2-1/8"	2-1/8"	2-1/8"	2-1/8"
Infrared Humidifier, O.D. Copper	1/4	1/4	1/4	1/4	1/4	1/4
Condensate Drain, FPT	3/4	3/4	3/4	3/4	3/4	3/4
Condensate Drain w/Optional Condensate Pump, OD	1/2	1/2	1/2	1/2	1/2	1/2
Hot Water Reheat, O.D. Copper	5/8	5/8	5/8	5/8	5/8	5/8
Fluid Volumes						
Water/Glycol Volume, Without Econ-O-Coil, gal (l)	4 (15.2)	4 (15.2)	7 (26.6)	7 (26.6)	7 (26.6)	8 (30.4)
Econ-O-Coil only Volume, gal (l)	5 (19.0)	5 (19.0)	8 (30.4)	8 (30.4)	8 (30.4)	10 (38.0)
GLYCOOL Unit Volume w/Econ-O-Coil, gal (l)	9 (34.2)	9 (34.2)	14 (53.2)	14 (53.2)	14 (53.2)	17 (64.6)
CAUTION: CuNi coil option must be specified when Econ-O-Coil is applied to open water tower.						
OUTDOOR DRYCOOLERS - STANDARD 95°F AMBIENT SELECTION; SEE Drycooler Match-up Selections on page 65 FOR OTHER SELECTIONS						
Model Number	D-174	D-225	D-260	D-310	D-350	D-466
Number of Fans	2	2	3	3	3	4

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3 ELECTRICAL POWER REQUIREMENTS

The following sections list the electrical data for the units by type.

3.1 Air Cooled Electrical Data

Table 3.1 Electrical Data by Reheat Option with Humidifier—Air Cooled Systems with EC fans

Reheat Options:		Electric Standard, kW				None				Electric, Downsized kW			
Model	Volts	208	230	460	575	208	230	460	575	208	230	460	575
035	FLA	70.7	68.2	33.4	25.5	63.1	60.9	29.5	25.2	63.1	60.9	29.5	25.2
	WSA	86.3	83.2	40.8	31.9	68.3	66.1	32	27.1	69	67	32.7	27.1
	OPD	90	90	45	30	80	80	40	30	80	80	40	30
042	FLA	78.2	75.9	37.7	33	78.1	75.9	37.7	33	78.1	75.9	37.7	33
	WSA	95.7	92.5	46	36	85.2	83	41.2	35.8	85.2	83	41.2	35.8
	OPD	110	110	50	45	110	110	50	45	110	110	50	45
053	FLA	119.9	116	57.1	43.5	109.2	104.8	52.4	42	109.2	104.8	52.4	42
	WSA	145.3	140.4	69.4	53.9	117.2	112.8	56.5	45	117.2	112.8	56.5	45
	OPD	150	150	70	50	125	125	70	50	125	125	70	50
070	FLA	129.2	125.3	59.9	46.4	127.8	123.4	58	46.4	127.8	123.4	58	46.4
	WSA	156.9	152	72.9	55.5	138.2	133.8	62.8	50	138.2	133.8	62.8	50
	OPD	175	175	80	60	175	175	80	60	175	175	80	60
077	FLA	139.2	134.8	61.4	50	139.2	134.8	61	50	139.2	134.8	61	50
	WSA	164	159.2	74.8	57.8	151.	146.6	66.2	54	151	146.6	66.2	54
	OPD	175	175	80	70	175	175	80	70	175	175	80	70
105	FLA	171.5	167.1	83.7	69.1	171.5	167.1	83.7	69.1	171.5	167.1	83.7	69.1
	WSA	198.8	198.2	97.4	76.4	186.5	182.1	91.6	75.4	186.5	182.1	91.6	75.4
	OPD	225	225	110	100	225	225	110	100	225	225	110	100

1. Reduced reheat for 035, and 042 models is 10 kW.
2. Reduced reheat for 053, 070, and 077 models is 15 kW.
3. Consult local representative for SCR reheat values.
4. Reduced reheat for 105 kW models is 20kW.
5. SCCR - Short Circuit Current Rating 65,000 amps rms symmetrical maximum.

Table 3.2 Electrical Data by Reheat Options without Humidifier—Air Cooled Systems with EC Fans

Reheat Options:		Electric Standard kW				None				Electric, Downsized kW			
Model	Volts	208	230	460	575	208	230	460	575	208	230	460	575
035	FLA	70.7	68.2	33.4	25.5	49.8	49.8	23.7	17.8	56.9	55.3	26.9	20.4
	WSA	86.3	83.2	40.8	31.1	55	55	26.2	19.7	69	67	32.7	24.8
	OPD	90	90	45	30	70	70	35	25	80	80	35	25
042	FLA	78.2	75.7	37.5	29.4	64.8	64.8	31.9	25.6	64.8	64.8	31.9	25.6
	WSA	95.7	92.5	46	36	71.9	71.9	35.4	28.4	78.4	76.4	37.8	29.6
	OPD	110	110	50	40	100	100	45	35	100	100	45	35
053	FLA	119.9	116	57.1	43.5	82.6	82.6	40.8	30.4	92.1	89.6	44.1	33.5
	WSA	145.3	140.4	69.4	52.8	90.6	90.62	44.9	33.4	110.52	107.4	53.1	40.3
	OPD	150	150	70	50	110	110	60	45	125	125	60	45
070	FLA	129.2	125.3	59.9	45.7	101.2	101.2	46.4	34.8	101.4	101.2	46.9	35.7
	WSA	156.9	152.0	72.9	55.5	111.6	111.6	51.2	38.4	122.15	119.02	56.6	43
	OPD	175	175	80	60	150	150	70	50	150	150	70	50
077	FLA	134.9	131	61.4	47.5	112.6	112.6	49.4	38.4	112.6	112.6	49.4	38.4
	WSA	164.0	159.2	74.8	57.8	124.37	124.4	54.6	42.4	129.27	126.15	58.5	45.3
	OPD	175	175	80	60	150	150	70	50	150	150	70	50
105	FLA	164	163.5	79.8	62.6	144.9	144.9	72.1	57.5	144.9	144.9	72.1	57.5
	WSA	198.8	198.2	97.4	76.4	159.9	159.9	80	63.8	169.3	165.5	81.3	63.9
	OPD	225	225	110	90	200	200	110	80	200	200	110	80

1. Reduced reheat for 035, and 042 models is 10 kW.
2. Reduced reheat for 053, 070, and 077 models is 15 kW.
3. Consult local representative for SCR reheat values.
4. Reduced reheat for 105 kW models is 20kW.
5. SCCR - Short Circuit Current Rating 65,000 amps rms symmetrical maximum.

Table 3.3 Electrical Data by Reheat Options with Humidifier—Air Cooled Systems with Forward Curved Blowers (Standard Kilowatt Electric Reheat)

Reheat Options:			Electric, Std. kW				None			
Model	Motor hp	Volts	208	230	460	575	208	230	460	575
035	3.0	FLA	72.9	69.4	34.5	26.4	65.3	62.1	30.6	26.1
		WSA	88.5	84.4	41.9	33.0	70.5	67.3	33.1	28.0
		OPD	90	90	45	35	90	80	40	35
035	5.0	FLA	79.0	75.0	37.3	28.6	71.4	67.7	33.4	28.3
		WSA	94.6	90.0	44.7	35.8	76.6	72.9	35.9	30.2
		OPD	100	100	45	35	90	90	45	35
042	5.0	FLA	86.5	82.7	41.6	36.1	86.4	82.7	41.6	36.1
		WSA	104	99.3	49.9	39.1	93.5	89.8	45.1	38.9
		OPD	110	110	50	50	110	110	50	50
042	7.5	FLA	94.0	89.5	45.0	39.0	93.9	89.5	45.0	39.0
		WSA	111.5	106.1	53.3	42.0	101.0	96.6	48.5	41.8
		OPD	125	110	60	50	125	110	60	50
053	3.0	FLA	112.1	107.2	53.9	41	101.4	96	49.2	39.5
		WSA	137.5	131.6	66.2	50.8	109.4	104.0	53.3	42.5
		OPD	150	125	70	50	125	125	60	50
053	5.0	FLA	118.2	112.8	56.7	43.2	107.5	101.6	52.0	41.7
		WSA	143.6	137.2	69.0	53.5	115.5	109.6	56.1	44.7
		OPD	150	150	70	50	125	125	70	50
070	5.0	FLA	127.5	122.1	59.5	46.1	126.1	120.2	57.6	46.1
		WSA	155.2	148.8	72.5	55.2	136.5	130.6	62.4	49.7
		OPD	175	150	80	60	175	150	80	60
070	7.5	FLA	135.0	128.9	62.9	49.0	133.6	127.0	61.0	49.0
		WSA	162.7	155.6	75.9	58.1	144.0	137.4	65.8	52.6
		OPD	175	175	80	60	175	175	80	60
077	7.5	FLA	145	138.4	64.4	52.6	145.0	138.4	64.0	52.6
		WSA	169.8	162.8	77.8	60.4	156.8	150.2	69.2	56.6
		OPD	200	175	90	70	200	175	80	70
077	10.0	FLA	151.6	144.4	67.4	54.6	151.6	144.4	67.0	54.6
		WSA	176.4	168.8	80.8	62.4	163.4	156.2	72.2	58.6
		OPD	200	200	90	70	200	200	90	70

Table 3.3 Electrical Data by Reheat Options with Humidifier—Air Cooled Systems with Forward Curved Blowers (Standard Kilowatt Electric Reheat) (continued)

Reheat Options:			Electric, Std. kW				None			
Model	Motor hp	Volts	208	230	460	575	208	230	460	575
105	10.0	FLA	177.4	170.2	88.4	72.6	177.4	170.2	88.4	72.6
		WSA	204.7	201.3	102.1	79.9	204.7	201.3	102.1	79.9
		OPD	250	225	125	100	250	225	125	100
105	15.0	FLA	192.3	184.2	95.4	78.6	192.3	184.2	95.4	78.6
		WSA	220.1	215.3	109.1	85.9	220.1	215.3	109.1	85.9
		OPD	250	250	125	100	250	250	125	100

Table 3.4 Electrical Data by Reheat Options without Humidifier—Air Cooled systems with Forward Curved blowers (Standard Kilowatt Electric Reheat)

Reheat Options:			Electric, Std. kW				None			
Model	Motor hp	Volts	208	230	460	575	208	230	460	575
035	3.0	FLA	72.9	69.4	34.5	26.4	52.0	51.0	24.8	18.7
		WSA	88.5	84.4	41.9	32.0	57.2	56.2	27.3	20.6
		OPD	90	90	45	35	70	70	35	25
035	5.0	FLA	79.0	75.0	37.3	28.6	58.1	56.6	27.6	20.9
		WSA	94.6	90.0	44.7	34.2	63.3	61.8	30.1	22.8
		OPD	100	100	45	35	80	80	40	30
042	5.0	FLA	86.5	82.5	41.4	32.5	73.1	71.6	35.8	28.7
		WSA	104.0	99.3	49.9	39.1	80.2	78.7	39.3	31.5
		OPD	110	110	50	45	100	100	50	40
042	7.5	FLA	94.0	89.3	44.8	35.4	80.6	78.4	39.2	31.6
		WSA	111.5	106.1	53.3	42.0	87.7	85.5	42.7	34.4
		OPD	125	110	60	45	110	110	50	45
053	3.0	FLA	112.1	107.2	53.9	41	74.8	73.8	37.6	27.9
		WSA	137.5	131.6	66.2	50.3	82.8	81.8	41.7	30.9
		OPD	150	125	70	50	110	110	50	40
053	5.0	FLA	118.2	112.8	56.7	43.2	80.9	79.4	40.4	30.1
		WSA	143.6	137.2	69.0	52.5	88.9	87.4	44.5	33.1
		OPD	150	150	70	50	110	110	60	45

Table 3.4 Electrical Data by Reheat Options without Humidifier—Air Cooled systems with Forward Curved blowers (Standard Kilowatt Electric Reheat) (continued)

Reheat Options:			Electric, Std. kW				None			
Model	Motor hp	Volts	208	230	460	575	208	230	460	575
070	5.0	FLA	127.5	122.1	59.5	45.4	99.5	98	46	34.5
		WSA	155.2	148.8	72.5	55.2	109.9	108.4	50.8	38.1
		OPD	175	150	80	60	150	125	70	50
070	7.5	FLA	135.0	128.9	62.9	48.3	107.0	104.8	49.4	37.4
		WSA	162.7	155.6	75.9	58.1	117.4	115.2	54.2	41.0
		OPD	175	175	80	60	150	150	70	50
077	7.5	FLA	140.7	134.6	64.4	50.1	118.4	116.2	52.4	41.0
		WSA	169.8	162.8	77.8	60.4	130.2	128.0	57.6	45.0
		OPD	175	175	90	70	175	175	70	60
077	10.0	FLA	147.3	140.6	67.4	52.1	125.0	122.2	55.4	43.0
		WSA	176.4	168.8	80.8	62.4	136.8	134.0	60.6	47.0
		OPD	200	175	90	70	175	175	80	60
105	10.0	FLA	169.9	166.6	84.5	66.1	150.8	148	76.8	61.0
		WSA	204.7	201.3	102.1	79.9	165.8	163.0	84.7	67.3
		OPD	225	225	110	90	225	200	110	90
105	15.0	FLA	185.3	180.6	91.5	72.1	166.2	162.0	83.8	67.0
		WSA	220.1	215.3	109.1	85.9	181.2	177.0	91.7	73.3
		OPD	250	250	125	100	225	225	110	90

Table 3.5 Electrical data—Air-cooled systems with forward-curved blowers (Downsized-kilowatt Electric Reheat)

Reheat Options:			Electric, Downsized kW							
Humidifier Options:			Infrared				None			
Model	Motor, hp	Volts	208	230	460	575	208	230	460	575
035	3.0	FLA	65.3	62.1	30.6	26.1	59.1	56.5	28.0	21.3
		WSA	71.2	68.2	33.8	28.0	71.2	68.2	33.8	25.7
		OPD	90	80	40	35	80	80	40	30
035	5.0	FLA	71.4	67.7	33.4	28.3	65.2	62.1	30.8	23.5
		WSA	77.3	73.8	36.6	30.2	77.3	73.8	36.6	27.9
		OPD	90	90	45	35	90	80	40	30

Table 3.5 Electrical data—Air-cooled systems with forward-curved blowers (Downsized-kilowatt Electric Reheat) (continued)

Reheat Options:			Electric, Downsized kW							
Humidifier Options:			Infrared				None			
Model	Motor, hp	Volts	208	230	460	575	208	230	460	575
042	5.0	FLA	86.4	82.7	41.6	36.1	73.1	71.6	35.8	28.7
		WSA	93.5	89.8	45.1	38.9	86.7	83.2	41.7	32.7
		OPD	110	110	50	50	100	100	50	40
042	7.5	FLA	93.9	89.5	45.0	39.0	80.6	78.4	39.2	31.6
		WSA	101.0	96.6	48.5	41.8	94.2	90.0	45.1	35.6
		OPD	125	110	60	50	110	110	50	45
053	3.0	FLA	101.4	96.0	49.2	39.5	84.3	80.8	40.9	31
		WSA	109.4	104.0	53.3	42.5	102.7	98.6	49.9	37.8
		OPD	125	125	60	50	110	110	60	45
053	5.0	FLA	107.5	101.6	52.0	41.7	90.4	86.4	43.7	33.2
		WSA	115.5	109.6	56.1	44.7	108.8	104.2	52.7	40.0
		OPD	125	125	70	50	125	125	60	45
070	5.0	FLA	126.1	120.2	57.6	46.1	99.7	98	46.5	35.4
		WSA	136.5	130.6	62.4	49.7	120.5	115.8	56.2	42.7
		OPD	175	150	80	60	150	125	70	50
070	7.5	FLA	133.6	127.0	61.0	49.0	107.2	104.8	49.9	38.3
		WSA	144.0	137.4	65.8	52.6	128.0	122.6	59.6	45.6
		OPD	175	175	80	60	150	150	70	50
077	7.5	FLA	145	138.4	64.0	52.6	118.4	116.2	52.4	41.0
		WSA	156.8	150.2	69.2	56.6	135.1	129.8	61.5	47.9
		OPD	200	175	80	70	175	175	70	60
077	10.0	FLA	151.6	144.4	67.0	54.6	125.0	122.2	55.4	43.0
		WSA	163.4	156.2	72.2	58.6	141.7	135.8	64.5	49.9
		OPD	200	200	90	70	175	175	80	60
105	10.0	FLA	177.4	170.2	88.4	72.6	150.8	148	76.8	61.0
		WSA	192.4	185.2	96.3	78.9	175.2	168.6	86.0	67.4

Table 3.5 Electrical data—Air-cooled systems with forward-curved blowers (Downsized-kilowatt Electric Reheat) (continued)

Reheat Options:			Electric, Downsized kW							
Humidifier Options:			Infrared				None			
Model	Motor, hp	Volts	208	230	460	575	208	230	460	575
		OPD	250	225	125	100	225	200	110	90
105	15.0	FLA	192.8	184.2	95.4	78.6	166.2	162.0	83.8	67.0
		WSA	207.8	199.2	103.3	84.9	190.6	182.6	93.0	73.4
		OPD	250	250	125	100	225	225	110	90

1. Reduced reheat for 035, and 042 models is 10 kW.
2. Reduced reheat for 053, 070, and 077 models is 15 kW.
3. Consult local representative for SCR reheat values.
4. Reduced reheat for 105 kW models is 20kW.
5. SCCR - Short Circuit Current Rating 65,000 amps rms symmetrical maximum.

3.2 Water/Glycol Cooled Electrical Data

Table 3.6 Electrical Data by Reheat Option with Humidifier—Water/Glycol Cooled Systems with EC Fans

Reheat Options:		Electric Standard, kW				None				Electric, Downsized kW			
Model Number	Volts	208	230	460	575	208	230	460	575	208	230	460	575
035	FLA	70.7	68.2	33.4	25.5	63.1	60.9	29.5	25.2	63.1	60.9	29.5	25.2
	WSA	86.3	83.2	40.8	31.9	68.3	66.1	32	27.1	69	67	32.7	27.1
	OPD	90	90	45	30	80	80	40	30	80	80	40	30
042	FLA	78.2	75.9	37.7	33	78.1	75.9	37.7	33	78.1	75.9	37.7	33
	WSA	95.7	92.5	46	36	85.2	83	41.2	35.8	85.2	83	41.2	35.8
	OPD	110	110	50	45	110	110	50	45	110	110	50	45
053	FLA	119.9	116	57.1	43.5	109.2	104.8	52.4	42	109.2	104.8	52.4	42
	WSA	145.3	140.4	69.4	53.9	117.2	112.8	56.5	45	117.2	112.8	56.5	45
	OPD	150	150	70	50	125	125	70	50	125	125	70	50
070	FLA	129.2	125.3	59.9	46.4	127.8	123.4	58	46.4	127.8	123.4	58	46.4
	WSA	156.9	152	72.9	55.5	138.2	133.8	62.8	50	138.2	133.8	62.8	50
	OPD	175	175	80	60	175	175	80	60	175	175	80	60
077	FLA	139.2	134.8	61.4	50	139.2	134.8	61	50	139.2	134.8	61	50
	WSA	164	159.2	74.8	57.8	151.	146.6	66.2	54	151	146.6	66.2	54
	OPD	175	175	80	70	175	175	80	70	175	175	80	70
105	FLA	164	163.5	82.5	64.7	158.6	154.2	75.7	62.2	158.6	154.2	75.7	62.2
	WSA	198.8	198.2	100.1	78.5	173.6	169.2	83.6	68.5	173.6	169.2	84	68.5
	OPD	225	225	110	90	225	225	110	90	225	225	110	90

1. Reduced reheat for 035, and 042 models is 10kW.
2. Reduced reheat for 053, 070, and 077 models is 15kW.
3. Consult local representative for SCR reheat values.
4. Reduced reheat for 105 kW models is 20kW.
5. SCCR - Short Circuit Current Rating 65,000 amps rms symmetrical maximum.
6. Steam canister humidifiers not available on models with EC fans.

Table 3.7 Electrical Data by Reheat Option without Humidifier—Water/Glycol Cooled Systems with EC Fans

Reheat Options:		Electric Standard kW				None				Electric, Downsized kW			
Model#	Volts	208	230	460	575	208	230	460	575	208	230	460	575
035	FLA	70.7	68.2	33.4	25.5	49.8	49.8	23.7	17.8	56.9	55.3	26.9	20.4
	WSA	86.3	83.2	40.8	31.1	55	55	26.2	19.7	69	67	32.7	24.8
	OPD	90	90	45	30	70	70	35	25	80	80	35	25
042	FLA	78.2	75.7	37.5	29.4	64.8	64.8	31.9	25.6	64.8	64.8	31.9	25.6
	WSA	95.7	92.5	46	36	71.9	71.9	35.4	28.4	78.4	76.4	37.8	29.6
	OPD	110	110	50	40	100	100	45	35	100	100	45	35
053	FLA	119.9	116	57.1	43.5	82.6	82.6	40.8	30.4	92.1	89.6	44.1	33.5
	WSA	145.3	140.4	69.4	52.8	90.6	90.62	44.9	33.4	110.5	107.4	53.1	40.3
	OPD	150	150	70	50	110	110	60	45	125	125	60	45
070	FLA	129.2	125.3	59.9	45.7	101.2	101.2	46.4	34.8	101.4	101.2	46.9	35.7
	WSA	156.9	152.0	72.9	55.5	111.6	111.6	51.2	38.4	122.2	119.02	56.6	43
	OPD	175	175	80	60	150	150	70	50	150	150	70	50
077	FLA	134.9	131	61.4	47.5	112.6	112.6	49.4	38.4	112.6	112.6	49.4	38.4
	WSA	164.0	159.2	74.8	57.8	124.4	124.4	54.6	42.4	129.3	126.15	58.5	45.3
	OPD	175	175	80	60	150	150	70	50	150	150	70	50
105	FLA	164	163.5	82.5	64.7	132	132	64.1	50.6	140.4	137.4	69.6	54.7
	WSA	198.8	198.2	100.1	78.5	147	147	72	56.9	169.3	165.5	84	66
	OPD	225	225	110	90	200	200	100	80	200	200	100	80

1. Reduced reheat for 035, and 042 models is 10kW.
2. Reduced reheat for 053, 070, and 077 models is 15kW.
3. Consult local representative for SCR reheat values.
4. Reduced reheat for 105 kW models is 20kW.
5. SCCR - Short Circuit Current Rating 65,000 amps rms symmetrical maximum.
6. Steam canister humidifiers not available on models with EC fans.

Table 3.8 Electrical Data by Reheat Option with Humidifier— Water/Glycol Cooled systems with Forward Curved Blowers (Standard Kilowatt Electric Reheat)

Reheat Options:			Electric, Std. kW				None			
Model	Motor hp	Volts	208	230	460	575	208	230	460	575
035	3.0	FLA	72.9	69.4	34.5	26.4	65.3	62.1	30.6	26.1
		WSA	88.5	84.4	41.9	33.0	70.5	67.3	33.1	28.0
		OPD	90	90	45	35	90	80	40	35
035	5.0	FLA	79.0	75.0	37.3	28.6	71.4	67.7	33.4	28.3
		WSA	94.6	90.0	44.7	35.8	76.6	72.9	35.9	30.2
		OPD	100	100	45	35	90	90	45	35
042	5.0	FLA	86.5	82.7	41.6	36.1	86.4	82.7	41.6	36.1
		WSA	104	99.3	49.9	39.1	93.5	89.8	45.1	38.9
		OPD	110	110	50	50	110	110	50	50
042	7.5	FLA	94.0	89.5	45.0	39.0	93.9	89.5	45.0	39.0
		WSA	111.5	106.1	53.3	42.0	101.0	96.6	48.5	41.8
		OPD	125	110	60	50	125	110	60	50
053	3.0	FLA	112.1	107.2	53.9	41	101.4	96	49.2	39.5
		WSA	137.5	131.6	66.2	50.8	109.4	104.0	53.3	42.5
		OPD	150	125	70	50	125	125	60	50
053	5.0	FLA	118.2	112.8	56.7	43.2	107.5	101.6	52.0	41.7
		WSA	143.6	137.2	69.0	53.5	115.5	109.6	56.1	44.7
		OPD	150	150	70	50	125	125	70	50
070	5.0	FLA	127.5	122.1	59.5	46.1	126.1	120.2	57.6	46.1
		WSA	155.2	148.8	72.5	55.2	136.5	130.6	62.4	49.7
		OPD	175	150	80	60	175	150	80	60
070	7.5	FLA	135.0	128.9	62.9	49.0	133.6	127.0	61.0	49.0
		WSA	162.7	155.6	75.9	58.1	144.0	137.4	65.8	52.6
		OPD	175	175	80	60	175	175	80	60
077	7.5	FLA	145	138.4	64.4	52.6	145.0	138.4	64.0	52.6
		WSA	169.8	162.8	77.8	60.4	156.8	150.2	69.2	56.6
		OPD	200	175	90	70	200	175	80	70
077	10.0	FLA	151.6	144.4	67.4	54.6	151.6	144.4	67.0	54.6
		WSA	176.4	168.8	80.8	62.4	163.4	156.2	72.2	58.6
		OPD	200	200	90	70	200	200	90	70

Table 3.8 Electrical Data by Reheat Option with Humidifier— Water/Glycol Cooled systems with Forward Curved Blowers (Standard Kilowatt Electric Reheat) (continued)

		Reheat Options:	Electric, Std. kW				None			
Model	Motor hp	Volts	208	230	460	575	208	230	460	575
105	10.0	FLA	169.9	166.6	84.5	66.1	164.5	157.3	77.7	63.6
		WSA	204.7	201.3	102.1	79.9	179.9	172.3	85.6	69.9
		OPD	225	225	110	90	225	225	110	90
105	15.0	FLA	185.3	180.6	91.5	72.1	179.9	171.3	84.7	69.6
		WSA	220.1	215.3	109.1	85.9	194.9	186.3	92.6	79.5
		OPD	250	250	125	100	250	225	110	100

1. Reduced reheat for 035, and 042 models is 10kW.
2. Reduced reheat for 053, 070, and 077 models is 15kW.
3. Consult local representative for SCR reheat values.
4. Reduced reheat for 105 kW models is 20kW.
5. SCCR - Short Circuit Current Rating 65,000 amps rms symmetrical maximum.

Table 3.9 Electrical Data by Reheat Option without Humidifier—Water/Glycol Cooled Systems with Forward Curved blowers (Standard Kilowatt Electric Reheat)

		Reheat Options:	Electric, Std. kW				None			
Model	Motor hp	Volts	208	230	460	575	208	230	460	575
035	3.0	FLA	72.9	69.4	34.5	26.4	52.0	51.0	24.8	18.7
		WSA	88.5	84.4	41.9	32.0	57.2	56.2	27.3	20.6
		OPD	90	90	45	35	70	70	35	25
035	5.0	FLA	79.0	75.0	37.3	28.6	58.1	56.6	27.6	20.9
		WSA	94.6	90.0	44.7	34.2	63.3	61.8	30.1	22.8
		OPD	100	100	45	35	80	80	40	30
042	5.0	FLA	86.5	82.5	41.4	32.5	73.1	71.6	35.8	28.7
		WSA	104.0	99.3	49.9	39.1	80.2	78.7	39.3	31.5
		OPD	110	110	50	45	100	100	50	40
042	7.5	FLA	94.0	89.3	44.8	35.4	80.6	78.4	39.2	31.6
		WSA	111.5	106.1	53.3	42.0	87.7	85.5	42.7	34.4
		OPD	125	110	60	45	110	110	50	45
053	3.0	FLA	112.1	107.2	53.9	41	74.8	73.8	37.6	27.9
		WSA	137.5	131.6	66.2	50.3	82.8	81.8	41.7	30.9
		OPD	150	125	70	50	110	110	50	40

Table 3.9 Electrical Data by Reheat Option without Humidifier—Water/Glycol Cooled Systems with Forward Curved blowers (Standard Kilowatt Electric Reheat) (continued)

Reheat Options:			Electric, Std. kW				None			
Model	Motor hp	Volts	208	230	460	575	208	230	460	575
053	5.0	FLA	118.2	112.8	56.7	43.2	80.9	79.4	40.4	30.1
		WSA	143.6	137.2	69.0	52.5	88.9	87.4	44.5	33.1
		OPD	150	150	70	50	110	110	60	45
070	5.0	FLA	127.5	122.1	59.5	45.4	99.5	98	46	34.5
		WSA	155.2	148.8	72.5	55.2	109.9	108.4	50.8	38.1
		OPD	175	150	80	60	150	125	70	50
070	7.5	FLA	135.0	128.9	62.9	48.3	107.0	104.8	49.4	37.4
		WSA	162.7	155.6	75.9	58.1	117.4	115.2	54.2	41.0
		OPD	175	175	80	60	150	150	70	50
077	7.5	FLA	140.7	134.6	64.4	50.1	118.4	116.2	52.4	41.0
		WSA	169.8	162.8	77.8	60.4	130.2	128.0	57.6	45.0
		OPD	175	175	90	70	175	175	70	60
077	10.0	FLA	147.3	140.6	67.4	52.1	125.0	122.2	55.4	43.0
		WSA	176.4	168.8	80.8	62.4	136.8	134.0	60.6	47.0
		OPD	200	175	90	70	175	175	80	60
105	10.0	FLA	169.9	166.6	84.5	66.1	137.9	135.1	66.1	52
		WSA	204.7	201.3	102.1	79.9	152.9	150.1	74	58.3
		OPD	225	225	110	90	200	200	100	80
105	15.0	FLA	185.3	180.6	91.5	72.1	153.3	149.1	73.1	58
		WSA	220.1	215.3	109.1	85.9	168.3	164.1	81	64.3
		OPD	250	250	125	100	225	200	110	80

1. Reduced reheat for 035, and 042 models is 10kW.
2. Reduced reheat for 053, 070, and 077 models is 15kW.
3. Consult local representative for SCR reheat values.
4. Reduced reheat for 105 kW models is 20kW.
5. SCCR - Short Circuit Current Rating 65,000 amps rms symmetrical maximum.

Table 3.10 Electrical Data—Water/Glycol Cooled Systems with Forward Curved Blowers (Downsized Kilowatt Electric Reheat)

Reheat Options:			Electric, Downsized kW							
Humidifier Options:			Infrared				None			
Model	Motor, hp	Volts	208	230	460	575	208	230	460	575
035	3.0	FLA	65.3	62.1	30.6	26.1	59.1	56.5	28.0	21.3
		WSA	71.2	68.2	33.8	28.0	71.2	68.2	33.8	25.7
		OPD	90	80	40	35	80	80	40	30
035	5.0	FLA	71.4	67.7	33.4	28.3	65.2	62.1	30.8	23.5
		WSA	77.3	73.8	36.6	30.2	77.3	73.8	36.6	27.9
		OPD	90	90	45	35	90	80	40	30
042	5.0	FLA	86.4	82.7	41.6	36.1	73.1	71.6	35.8	28.7
		WSA	93.5	89.8	45.1	38.9	86.7	83.2	41.7	32.7
		OPD	110	110	50	50	100	100	50	40
042	7.5	FLA	93.9	89.5	45.0	39.0	80.6	78.4	39.2	31.6
		WSA	101.0	96.6	48.5	41.8	94.2	90.0	45.1	35.6
		OPD	125	110	60	50	110	110	50	45
053	3.0	FLA	101.4	96.0	49.2	39.5	84.3	80.8	40.9	31
		WSA	109.4	104.0	53.3	42.5	102.7	98.6	49.9	37.8
		OPD	125	125	60	50	110	110	60	45
053	5.0	FLA	107.5	101.6	52.0	41.7	90.4	86.4	43.7	33.2
		WSA	115.5	109.6	56.1	44.7	108.8	104.2	52.7	40.0
		OPD	125	125	70	50	125	125	60	45
070	5.0	FLA	126.1	120.2	57.6	46.1	99.7	98	46.5	35.4
		WSA	136.5	130.6	62.4	49.7	120.5	115.8	56.2	42.7
		OPD	175	150	80	60	150	125	70	50
070	7.5	FLA	133.6	127.0	61.0	49.0	107.2	104.8	49.9	38.3
		WSA	144.0	137.4	65.8	52.6	128.0	122.6	59.6	45.6
		OPD	175	175	80	60	150	150	70	50
077	7.5	FLA	145	138.4	64.0	52.6	118.4	116.2	52.4	41.0
		WSA	156.8	150.2	69.2	56.6	135.1	129.8	61.5	47.9
		OPD	200	175	80	70	175	175	70	60
077	10.0	FLA	151.6	144.4	67.0	54.6	125.0	122.2	55.4	43.0
		WSA	163.4	156.2	72.2	58.6	141.7	135.8	64.5	49.9
		OPD	200	200	90	70	175	175	80	60

Table 3.10 Electrical Data—Water/Glycol Cooled Systems with Forward Curved Blowers (Downsized Kilowatt Electric Reheat) (continued)

Reheat Options:			Electric, Downsized kW							
Humidifier Options:			Infrared				None			
Model	Motor, hp	Volts	208	230	460	575	208	230	460	575
105	10.0	FLA	164.5	157.3	77.7	63.6	146.3	140.5	71.6	56.1
		WSA	179.5	172.3	86	69.9	175.2	168.6	86	67.4
		OPD	225	225	110	90	200	200	110	80
105	15.0	FLA	179.9	171.3	84.7	69.6	161.7	154.5	78.6	62.1
		WSA	194.9	186.3	93	75.9	190.6	182.6	93	73.4
		OPD	250	225	110	100	225	225	110	90

1. Reduced reheat for 035, and 042 models is 10kW.
2. Reduced reheat for 053, 070, and 077 models is 15kW.
3. Consult local representative for SCR reheat values.
4. Reduced reheat for 105 kW models is 20kW.
5. SCCR - Short Circuit Current Rating 65,000 amps rms symmetrical maximum.

3.3 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 91.

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

Table 3.11 Electrical Field-connection Drawings

Document Number	Title
DPN004352	High- and Low-voltage Electrical Field Connections, 35 to 105 kW
DPN003267	CANbus and Interlock Connections between Unit and Condenser
Unit-to-Unit Networking	
DPN004351	Liebert® iCOM Unit-to-unit Network Connections

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4 PLANNING GUIDELINES

4.1 Shipping Dimensions and Unit Weights

Table 4.1 Liebert DS Shipping Dimensions—Domestic and Export

Cooling Type	Compressor Type	035/042	053/070/077	105
		LxWxH, in. (mm)	LxWxH, in. (mm)	LxWxH, in. (mm)
Air, Dual-Cool Air	Scroll or Digital-scroll	90x42x82 (2286x1067x2083)	102x42x82 (2591x1067x2083	136x42x82 (3454x1067x2083)
Air, Dual-Cool Air	Semi-hermetic	—	114x42x82 (2896x1067x2083)	136x42x82 (3454x1067x2083)
Water/Glycol, GLYCOOL/Dual-Cool Water	Scroll or Digital-scroll	90x42x82 (2286x1067x2083)	114x42x82 (2896x1067x2083)	—
Water/Glycol, GLYCOOL/Dual-Cool Water	Semi-hermetic	—	114x42x82 (2896x1067x2083)	136x42x82 (3454x1067x2083)

Table 4.2 Liebert DS Downflow Unit Weights and Shipping Weights—Approximate

			Downflow	Downflow Shipping Weights, lb (kg)	
Model Number	Compressor Type	Cooling Type	EC Fan Unit Weight, lb (kg)	Domestic, lb (kg)	Export, lb (kg)
DS035-042	Scroll or Digital Scroll	Air Cooled	1470 (668)	1608 (730)	1778 (807)
		Dual Cool Air	1620 (736)	1758 (798)	1928 (875)
		Water/Glycol	1780 (809)	1918 (870)	2088 (948)
		GLYCOOL/Dual Cool Water	1930 (877)	2068 (939)	2238 (1016)
DS053	Scroll or Digital Scroll	Air Cooled	1920 (871)	2070 (939)	2260 (1026)
		Dual Cool Air	2100 (953)	2250 (1021)	2440 (1107)
		Water/Glycol	2220 (1010)	2382 (1081)	2582 (1172)
		GLYCOOL/Dual Cool Water	2400 (1091)	2562 (1163)	2762 (1253)
DS070	Scroll or Digital-scroll	Air Cooled	1970 (894)	2120 (962)	2310 (1048)
		Dual Cool Air	2150 (975)	2300 (1044)	2490 (1130)
		Water/Glycol	2270 (1032)	2432 (1104)	2632 (1194)
		GLYCOOL/Dual Cool Water	2450 (1114)	2612 (1185)	2812 (1276)
DS077	Standard Scroll (Digital Scroll is not available)	Air Cooled	2020 (916)	2170(985)	2360 (1071)
		Dual Cool Air	2200 (998)	2350 (1066)	2540 (1153)
	Semi-hermetic	Air Cooled	2450 (1114)	2612 (1185)	2812 (1276)
		Dual Cool Air	2630 (1196)	2792 (1267)	2992 (1358)
		Water/Glycol	2750 (1250)	2912 (1321)	3112 (1412)
		GLYCOOL/Dual Cool Water	2930 (1332)	3092 (1403)	3292 (1494)

Table 4.2 Liebert DS Downflow Unit Weights and Shipping Weights—Approximate (continued)

			Downflow	Downflow Shipping Weights, lb (kg)	
Model Number	Compressor Type	Cooling Type	EC Fan Unit Weight, lb (kg)	Domestic, lb (kg)	Export, lb (kg)
DS105	Standard Scroll (Digital Scroll is not available)	Air Cooled	2660 (1207)	3103 (1408)	3323 (1508)
		Dual Cool Air	3015 (1368)	3463 (1571)	3683 (1671)
	Semi-hermetic	Air Cooled	2780 (1261)	3223 (1462)	3443 (1562)
		Dual Cool Air	3135 (1422)	3583 (1626)	3803 (1726)
		Water/Glycol	3150 (1429)	3593 (1630)	3813 (1730)
		GLYCOOL/Dual Cool Water	3505 (1590)	3953 (1794)	4173 (1893)

Table 4.3 Liebert DS Upflow Unit Weights and Shipping Weights—Approximate

			Upflow		Upflow Shipping Weights, lb (kg) w/Forward-curved Blowers	
Model Number	Compressor Type	Cooling Type	EC Fan Unit Weight, lb (kg)	Forward-Curved Unit Weight, lb (kg)	Domestic, lb (kg)	Export, lb (kg)
VS035-042	Scroll or Digital Scroll	Air Cooled	1370 (621)	1520 (689)	1658 (753)	1828 (830)
		Dual Cool Air	1520 (689)	1670 (758)	1808 (821)	1978 (898)
		Water/Glycol	1680 (762)	1830 (830)	1968 (893)	2138 (970)
		GLYCOOL/Dual Cool Water	1830 (830)	1980 (898)	2118 (961)	2288 (1038)
VS053	Scroll or Digital Scroll	Air Cooled	1900 (862)	2070 (939)	2220 (1007)	2410 (1094)
		Dual Cool Air	2080 (943)	2250 (1021)	2400 (1089)	2590 (1175)
		Water/Glycol	2200 (998)	2370 (1075)	2532 (1149)	2732 (1240)
		GLYCOOL/Dual Cool Water	2380 (1080)	2550 (1157)	2712 (1231)	2912 (1321)
VS070	Scroll or Digital-scroll	Air Cooled	1900 (862)	2070 (939)	2220 (1007)	2410(1094)
		Dual Cool Air	2080 (943)	2250 (1021)	2400 (1089)	2590 (1175)
		Water/Glycol	2200 (998)	2370 (1075)	2532 (1149)	2732 (1240)
		GLYCOOL/Dual Cool Water	2380 (1080)	2550 (1157)	2712 (1231)	2912 (1321)

Table 4.3 Liebert DS Upflow Unit Weights and Shipping Weights—Approximate (continued)

			Upflow		Upflow Shipping Weights, lb (kg) w/Forward-curved Blowers	
Model Number	Compressor Type	Cooling Type	EC Fan Unit Weight, lb (kg)	Forward-Curved Unit Weight, lb (kg)	Domestic, lb (kg)	Export, lb (kg)
VS077	Standard Scroll (Digital Scroll is not available.)	Air Cooled	1900 (862)	2070 (939)	2220 (1007)	2410 (1094)
	Semi-hermetic	Air Cooled	2330 (1057)	2500 (1134)	2662 (1208)	2862 (1299)
		Dual Cool Air	2510 (1139)	2680 (1216)	2842 (1290)	3042 (1380)
		Water/Glycol	2630 (1193)	2800 (1270)	2962 (1344)	3162 (1435)
		GLYCOOL/Dual Cool Water	2810 (1275)	2980 (1352)	3142 (1426)	3342 (1516)
VS105	Standard Scroll (Digital Scroll is not available.)	Air Cooled	2640 (1197)	2880 (1306)	3063 (1390)	3283 (1490)
	Semi-hermetic	Air Cooled	2760 (1252)	3000 (1361)	3183 (1444)	3403 (1544)
		Dual Cool Air	3090 (1402)	3330 (1510)	3513 (1594)	3733 (1694)
		Water/Glycol	3130 (1420)	3370 (1529)	3553 (1612)	3773 (1712)
		GLYCOOL/Dual Cool Water	3460 (1569)	3700 (1678)	3883 (1762)	4103 (1862)

4.2 Planning Dimensions

The unit, floor stand, and plenum dimensions are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 4.4 Dimension Planning Drawings

Document Number	Title
Downflow Units	
DPN003643	Cabinet Dimensional Data, 35 to 105 kW (10 to 30 ton), all blower types
Upflow Units	
DPN003681	Cabinet Dimensional Data, 35 to 105 kW (10 to 30 ton), EC fans
DPN003646	Cabinet Dimensional Data, 35 to 105 kW (10 to 30 ton), Forward-curved blowers
Floor Stands	
DPN003240	Floorstand Dimensional Data, Downflow Models, 35 to 42 kW (10 to 12 ton), EC fans
DPN003173	Floorstand Dimensional Data, Downflow Models, 53 to 77 kW (15 to 22 ton), EC fans
DPN003174	Floorstand Dimensional Data, Downflow Models, 105 kW (30 ton), EC fans, Standard-scroll and Semi-hermetic compressors
DPN003134	Floorstand Dimensional Data, Downflow and Upflow Models, 35 to 42 kW (10 to 12 ton), Forward-curved Blowers
DPN003141	Floorstand Dimensional Data, Downflow and Upflow Models, 53 to 77 kW (15 to 22 ton), Forward-curved Blowers
DPN003149	Floorstand Dimensional Data, Downflow and Upflow Models, 105 kW (30 ton), Forward-curved Blowers
Blower Outlet, Deck and Filter Box	
DPN001120	Blower outlet and Deck Dimensions, Upflow Models, 35 to 42 kW (10 to 12 ton), Forward-curved blowers
DPN001191	Blower outlet and Deck Dimensions, Upflow Models, 53 to 77 kW (15 to 22 ton), Forward-curved blowers
DPN001192	Blower outlet and Deck Dimensions, Upflow Models, 105 kW (30 ton), Forward-curved blowers
DPN001196	Rear-return Filter Box Dimensions, Upflow Models, 35 to 105 kW (10 to 30 ton), All compressor types, Forward-curved blowers.
DPN003974	Rear-return Filter Box Dimensions, Upflow Models, 35 to 105 kW (10 to 30 ton), All compressor types, EC fans.
Plenums	
DPN003164	Plenum Dimensional Data, Upflow Models, 35 to 105 kW (10 to 30 ton), Forward-curved blowers
DPN003458	Plenum Dimensional Data, Upflow Models, 35 to 42 kW (10 to 12 ton), EC fans
DPN003453	Plenum Dimensional Data, Upflow Models, 53 to 77 kW (15 to 22 ton), EC fans
DPN003459	Plenum Dimensional Data, Upflow Models, 105 kW (30 ton), EC fans

5 PIPING

The pipe connection locations, piping general arrangement and schematics are described in the submittal documents included in the Submittal Drawings on page 91.

NOTE: The Recommended refrigerant line sizes and equivalent lengths and refrigerant-charge requirements are included in Refrigerant Piping on page 51.

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

Table 5.1 Piping General-arrangment Drawings

Document Number	Title
Air-cooled Units	
DPN003954	Liebert® MC Condenser Positioning Above/Same Level/Below Indoor Unit
DPN003730	Air Cooled Models with Liebert® MC Condenser with and without Lee-Temp
Water/Glycol-cooled Units	
DPN000896	Water/Glycol Models with scroll compressors
DPN001430	Water/Glycol Models with digital-scroll compressors
DPN000895	Water/Glycol 77-kW to 105-kW models with semi-hermetic compressors
GLYCOOL™ Units	
DPN000897	GLYCOOL Models with semi-hermetic compressors
DPN000898	GLYCOOL Models with scroll compressors
DPN001432	GLYCOOL Models with digital-scroll compressors
Econ-O-Coil™ Option	
DPN000805	Optional Piping for Econ-O-Coil

Table 5.2 Piping Connection Drawings

Document Number	Title
Downflow, Air-cooled Models with EC Fans	
DPN003239	35 to 42 kW (10 to 12 ton) Units with scroll or digital-scroll compressors
DPN002182	53 to 77 kW (15 to 22 ton) Units with scroll compressors
DPN002179	77 kW (22 ton) Units with semi-hermetic compressors
DPN002154	105 kW (30 ton) Units with all compressor types
Downflow, Water/Glycol/GLYCOOL Models with EC Fans	
DPN003530	35 to 42 kW (10 to 12 ton) Units with all compressor types
DPN002183	53 to 77 kW (15 to 22 ton) Units with all compressor types
DPN002153	105 kW (30 ton) Units with all compressor types

Table 5.2 Piping Connection Drawings (continued)

Document Number	Title
Upflow, Air-cooled Models with EC Fans	
DPN002740	35 to 42 kW (10 to 12 ton) Units with scroll compressors
DPN002742	77 kW (22 ton) Units with semi-hermetic compressors
DPN002743	53 to 77 kW (15 to 22 ton) Units with scroll or digital-scroll compressors
DPN002745	105 kW (30 ton) Units with all compressor types
Upflow, Water/Glycol/GLYCOOL Models with EC Fans	
DPN002741	35 to 42 kW (10 to 12 ton) Units with all compressor types
DPN002744	53 to 77 kW (15 to 22 ton) Units with all compressor types
DPN002746	105 kW (30 ton) Units with all compressor types
Upflow, Air-cooled Models with Forward-curved Blowers	
DPN001119	35 to 42 kW (10 to 12 ton) Units with scroll or digital-scroll compressors
DPN001212	77 kW (22 ton) Units with semi-hermetic compressors
DPN001213	53 to 77 kW (15 to 22 ton) Units with scroll or digital-scroll compressors
DPN001257	105 kW (30 ton) Units with all compressor types
Upflow, Water/Glycol/GLYCOOL Models with Forward-curved Blowers	
DPN001179	35 to 42 kW (10 to 12 ton) Units with all compressor types
DPN001214	53 to 77 kW (15 to 22 ton) Units with all compressor types
DPN001258	105 kW (30 ton) Units with all compressor types

5.1 Refrigerant Piping

5.1.1 Refrigerant Line Sizes and Equivalent Lengths

Table 5.3 Recommended Refrigerant Line Sizes for Standard Scroll Models (Non-Digital Scroll) - OD Copper (Inches)

Model:	035		042		053		070		077		105	
Equivalent Length	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line
50 ft (15 m)	7/8	1/2	7/8	1/2	7/8	5/8	1-1/8	7/8	1-1/8	7/8	1-3/8	7/8
100 ft (30 m)	7/8	5/8	7/8	5/8	1-1/8	7/8	1-1/8	7/8	1-1/8	7/8	1-3/8	7/8
150 ft (45 m)	7/8	5/8	7/8	5/8	1-1/8	7/8	1-1/8	7/8	1-1/8	7/8	1-3/8	1-1/8

Consult factory for proper line sizing for runs longer than maximum equivalent length shown.

1. Downsize vertical riser one trade size (1-1/8" to 7/8")

Source: DPN000788, Rev 13

Table 5.4 Recommended Refrigerant Line Sizes for 4-Step Semi-Hermetic and Digital Scroll Models - OD Copper (Inches)

Model:	035		042		053		070		077[2]		105[2]	
Equivalent Length	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line
50 ft (15 m)	3/4	1/2	7/8	5/8	7/8	5/8	1-1/8[1]	7/8	1-1/8	7/8	1-3/8	7/8
100 ft (30 m)	7/8	5/8	7/8	5/8	1-1/8[1]	7/8	1-1/8[1]	7/8	1-1/8	7/8	1-3/8	7/8
150 ft (45 m)	7/8	5/8	1-1/8[1]	5/8	1-1/8[1]	7/8	1-1/8[1]	7/8	1-1/8	7/8	1-3/8	1-1/8

Consult factory for proper line sizing for runs longer than maximum equivalent length shown.

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

Source: DPN000788, Rev 13

5.1.2 Refrigerant Charge Requirements for Air Cooled Systems

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

Table 5.5 Approximate R-407C Refrigerant Charge for Air Cooled Liebert DS

System Type	Model	Charge per Circuit, lb (kg)
Air-cooled	035, 042	5.5 (2.5)
	053, 070, 077	8.0 (3.6)
	105	9.5 (4.3)

Table 5.6 Interconnecting Piping Refrigerant Charge for R-407C, lb per 100 ft (kg per 30 m)

Line Size, O.D., in.	Liquid Line	Hot Gas Line
1/2	6.7 (3.0)	0.5 (0.2)
5/8	10.8 (4.8)	0.8 (0.4)
3/4	16.1 (7.2)	1.2 (0.5)
7/8	22.3 (10.0)	1.7 (0.8)
1-1/8	38.0 (17.0)	2.9 (1.3)
1-3/8	57.9 (25.9)	4.4 (2.0)
Source: DPN003099, Rev. 1		

Table 5.7 Approximate R-407C Refrigerant Required per Circuit for Liebert MC Condenser

Condenser Model	Per circuit without Liebert Lee-Temp, lb (kg)	Per circuit with Liebert Lee-Temp, lb (kg)
MCS056	2.2 (1.0)	21.0 (9.5)
MCM080	3.0 (1.4)	23.9 (10.8)
MCM160	7.5 (3.4)	44.5 (20.2)
MCL110	5.1 (2.3)	26.0 (11.8)
MCL220	12.2 (5.6)	53.8 (24.4)
Source: DPN002411, Rev. 8		

6 HEAT REJECTION—LIEBERT MC™ CONDENSERS

6.1 Liebert MC Match-up Selections

Table 6.1 Standard Sound Matchups♦

Indoor Model	Outdoor Design Ambient Temperature					
	95F (35C)	100F (38C)	105F (41C)	110F (43C)	115F (46C)	120F (49C)
Liebert DS						
DS035A	MCS056E8	MCM080E8	MCM080E8	MCL110E8	MCL110E8	MCL110E8
DS042A	MCS056E8	MCM080E8	MCL110E8	MCL110E8	MCL110E8	MCL110E8
VS035AD*0	MCS056E8	MCM080E8	MCM080E8	MCM080E8	**	**
VS035AD*1	MCS056E8	MCM080E8	MCM080E8	MCM080E8	MCM160E8	MCM160E8
VS035AS*0	MCS056E8	MCM080E8	MCM080E8	MCL110E8	MCL110E8	MCL110E8
VS035AS*1	MCS056E8	MCM080E8	MCM080E8	MCL110E8	MCL110E8	MCL110E8
VS042AD*0	**	**	**	**	**	**
VS042AD*1	MCM080E8	MCM080E8	MCM080E8	MCM160E8	MCM160E8	MCM160E8
VS042AS*0	MCM080E8	MCM080E8	MCM080E8	MCM160E8	MCM160E8	MCM160E8
VS042AS*1	MCS056E8	MCM080E8	MCM080E8	MCL110E8	MCL110E8	MCL110E8
DS/VS053A	MCS056E8	MCM080E8	MCL110E8	MCM160E8	MCM160E8	MCL220E8
DS/VS070A	MCM080E8	MCL110E8	MCL110E8	MCM160E8	MCM160E8	MCL220E8
DS/VS077A	MCM080E8	MCL110E8	MCL110E8	MCM160E8	MCM160E8	MCL220E8
DS/VS105A	MCL110E8	MCM160E8	MCM160E8	MCL220E8	MCL220E8	MCL220E8
♦Return-air conditions Tdb = 75°F, Tdp = 52°F						
** Not available/Consult Factory						

Table 6.2 Quiet Line (Low Noise) Matchup♦

Indoor Model	Outdoor Design Ambient Temperature				
	95F (35C)	100F (38C)	105F (41C)	110F (43C)	115F (46C)
Liebert DS					
DS035A	MCM080E8	MCL110E8	MCL110E8	MCM160E8	MCM160E8
DS042A	MCM080E8	MCL110E8	MCL110E8	MCM160E8	MCM160E8
VS035AD*0	MCM080E8	MCM080E8	**	**	**
VS035AD*1	MCM080E8	MCM080E8	MCM160E8	MCM160E8	MCM160E8
VS035AS*0	MCM080E8	MCL110E8	MCL110E8	MCM160E8	MCM160E8
VS035AS*1	MCM080E8	MCL110E8	MCL110E8	MCM160E8	MCM160E8
VS042AD*0	**	**	**	**	**
VS042AD*1	MCM080E8	MCM080E8	MCM160E8	MCM160E8	MCM160E8
VS042AS*0	MCM080E8	MCM080E8	MCM160E8	MCM160E8	MCM160E8
VS042AS*1	MCM080E8	MCL110E8	MCL110E8	MCM160E8	MCM160E8
DS/VS053A	MCL110E8	MCL110E8	MCM160E8	MCL220E8	MCL220E8
DS/VS070A	MCL110E8	MCM160E8	MCL220E8	MCL220E8	MCL220E8
DS/VS077A	MCL110E8	MCM160E8	MCL220E8	MCL220E8	MCL220E8
DS/VS105A	MCM160E8	MCL220E8	**	**	**
♦Return air conditions = Tdb = 75°F, Tdp=52°F					
** Not available/Consult Factory					

6.2 Liebert® MC Sound Data

Table 6.3 Liebert MC—Sound Power Data

Maximum Sound Power		100% Speed - A-Weighted Sound Power, dBA								
		Frequency - Hz								
		63	125	250	500	1000	2000	4000	8000	Total
MCS	56	53	73	69	73	76	74	67	61	81
MCM	80	52	70	76	79	81	79	72	65	85
	160	55	73	79	82	84	82	75	68	89
MCL	110	65	74	78	83	85	83	76	69	89
	220	68	77	81	86	88	86	79	72	92
Maximum sound power at 100% fan speed and provided to calculate maximum sound pressure values in the specific application. Consult factory for low noise (Quiet Line) sound power values.										

6.3 Electrical Power Requirements

Table 6.4 below lists the power requirements by model number. Table 6.5 on the next page lists the additional electrical requirements if your system includes a Liebert® Lee-Temp™ Receiver.

Table 6.4 Electrical Data, Three Phase, 60Hz Condenser, Premium EC Fan Control

Model	Voltage	FLA	WSA	OPD
MCS056	208/230V	6.0	6.8	15
	380V	2.8	3.2	15
	460V	2.8	3.2	15
	575V	2.4	2.7	15
MCM080	208/230V	4.6	5.2	15
	380V	2.8	3.2	15
	460V	2.8	3.2	15
	575V	2.4	2.7	15
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
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.

Source: DPN005027 Rev. 0

Table 6.5 Electrical Data, Lee-Temp™ Receiver, 60Hz

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

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

6.4 Liebert MC Shipping Dimensions and Weights

For Liebert® MC condenser shipping dimensions and weights, please consult the "Liebert® MC Condenser Installer/User Guide," available at https://www.Vertiv.com/en-us/support/.

6.4.1 Condenser and Options Net Weights

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

Table 6.6 Condenser and Option Net Weights—Small Condensers

Condenser Model		MCS056
Condenser Dry Weight, lb (kg)	18" Leg	270 (122)
	36" Leg	419 (190)
	48" Leg	451 (205)
	60" Leg	482 (219)
Additional Weight for Options, lb (kg)		
Liebert® Lee-Temp Receiver		110 (50)
575V Transformer		65 (29)
Coated Coil		8 (4)
Seismic/Wind Bracing, 18-in. legs		40 (18)
Condenser + Liebert Lee-Temp + Coated Coil + 575V Transformer + Seismic/Wind Bracing = Total Weight		
Source: DPN003034, Rev. 4		

Table 6.7 Condenser and Option Net Weights—Medium Condensers

	Condenser Model	MCM080	MCM160
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® Lee-Temp Receiver		110 (50)	220 (100)
575V Transformer		70 (32)	80 (36)
Coated Coil		10 (5)	20 (9)
Seismic/Wind Bracing, 18-in. legs		40 (18)	57 (26)
Condenser + Liebert Lee-Temp or+ Coated Coil + 575V Transformer + Seismic/Wind Bracing = Total Weight			
Source: DPN003034, Rev. 4			

Table 6.8 Condenser and Option Net Weights—Large Condensers

	Condenser Model	MCL110	MCL220
Condenser Dry Weight, lb (kg)	18" Leg	602 (273)	1186 (538)
	36" Leg	766 (347)	1453 (659)
	48" Leg	798 (362)	1501 (681)
	60" Leg	829 (376)	1547 (702)
Additional Weight for Options, lb (kg)			
Liebert® Lee-Temp Receiver		120 (54)	240 (109)
575V Transformer		77 (35)	118 (54)
Coated Coil		16 (7)	32 (15)
Seismic/Wind Bracing, 18-in. legs		41 (19)	57 (26)
Condenser + Liebert Lee-Temp or+ Coated Coil + 575V Transformer + Seismic/Wind Bracing = Total Weight			
Source: DPN003034, Rev. 4			

6.5 Liebert MC Planning Dimensions

The condenser dimensions are described in the submittal documents included in the Submittal Drawings on page 91. Condensers mounted above and below the relative elevation of the indoor unit must follow the guidelines found in the submittal drawings listed in the table.

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

Table 6.9 Dimension Planning Drawings

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

6.6 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 91.

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

Table 6.10 Piping Connection Drawings

Document Number	Title
DPN002425	Dual-circuit piping, 2-fan and 4-fan units without Liebert® Lee-Temp™
DPN002426	Dual-circuit condensers with Liebert® Lee-Temp

6.7 Liebert MC Electrical Field Connections

Condenser-rated voltage should be verified with available power supply before installation. Refer to the unit's electrical schematic and serial tag for specific electrical requirements. Line voltage electrical service is required for all condensers at the location of the condenser. The voltage supply to the condenser may not be the same voltage supply as required by the indoor unit. Consider using UPS equipment on both data center cooling units and Liebert MC condensers to maintain uninterrupted cooling capability. Refer to the unit's serial tag for specific condenser electrical requirements. A unit disconnect is standard. However, a site disconnect may be required per local code to isolate the unit for maintenance. Route the supply power to the site disconnect switch and then to the unit. Route the conduit to the knockout provided in the bottom right end of the electrical control enclosure. Connect the earth ground wire lead to the marked earth ground connection terminal provided near the factory-installed disconnect switch..

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

See Air Cooled Electrical Data on page 29, for power requirements.

The electrical connections are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 6.11 Electrical Field Connection Drawings

Document Number	Title
Power-supply wiring	
DPN002169	Electrical Field Connections, without Liebert® Lee-Temp™
DPN002374	Electrical Field Connections, with Liebert® Lee-Temp™
DPN003047	Electrical Field Connections, 575-V option
Low-voltage wiring	
DPN003267	CANbus and Interlock Connections between Liebert® DS and Liebert® MC

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7 HEAT REJECTION—LIEBERT PIGGYBACK CONDENSERS

7.1 Piggyback Condenser Match-up Selections

Table 7.1 Piggyback Condenser Matchup Selections, Lee-Temp Head Pressure Control

DS Model	95°F (35°C) Ambient Standard Selection	100°F (38°C) Ambient	105°F (41°C) Ambient
DS/VS035A	PB0925A	PB1100A	PB1350A
DS/VS042A	PB1100A	PB1350A	N/A
DS/VS053A	PB1350A	N/A	N/A
DS/VS070A	N/A	N/A	N/A
DS/VS077A	N/A	N/A	N/A
DS/VS105A	N/A	N/A	N/A

Table 7.2 Piggyback Condenser Physical Data, 60Hz

Model	No. of Circuits	Connection Size, OD, In.		Condenser Charge per Circuit R-407C, lb (kg)	Unit Domestic Shipping Weights, lb (kg)	Unit Export Shipping Weights, lb (kg)
		Hot Gas	Liquid			
PB-925	2	7/8	1/2	22 (9.9)	1630 (739)	1780 (807)
PB-1100	2	1-1/8	5/8	34 (15.5)		
PB-1350	2	1-1/8	5/8	34 (15.5)		
Source for unit weights: DPN000695, Rev.5						

Table 7.3 Piggyback Condenser Airflow and Static Pressure Data

Model	No. of Fans	CFM / m^3 / hr	HP/RPM			
			Ext. Static Pressure, in. (Pa)			
			0.25 (62.3)	0.50 (125)	0.75 (187)	1.0 (249)
PB-925A	2	12,500/21,250	7.5/760	7.5/810	7.5/870	7.5/920
PB-1100A	2	12,300/20,910	7.5/780	7.5/830	7.5/890	7.5/940
PB-1350A	2	16,500/28,050	10/640	10/695	10/740	15/790
Values are without filter box. External Static Pressure = filter pressure drop + other static drops. PB-1350A models with filter section will be factory supplied with 15HP motor. ESP higher than 0.50" (125Pa) will reduce airflow. Source: DPN004123, Rev. 1						

7.2 Piggyback Condenser Electrical Power Requirements

Table 7.4 Piggyback Condenser Electrical Data, 60 Hz, 3 Phase[1]

Model	Blower hp	Unit Voltage	Total Unit		
			FLA	WSA	OPD
PB925A PB1100A	7.5	208	24.2	30.3	50
		230	22.0	27.5	45
		460	11.0	13.8	20
		575	9.0	11.3	20
PB1350A	10.0	208	30.8	38.5	60
		230	28.0	35.0	60
		460	14.0	17.5	30
		575	11.0	13.8	20
	15.0	208	46.2	57.8	100
		230	42.0	52.5	90
		460	21.0	26.3	45
		575	17.0	21.3	35

1. See **Table 7.5** below for separate power feed needed for Lee-Temp receiver heaters.
2. HP = horsepower, FLA= full-load amps, WSA = wire-size amps, OPD = maximum overload-protective device

Source: DPN004123, Rev. 1

Table 7.5 Separate Electrical Supply Requirements for Liebert® Lee-Temp™ Receivers, 60Hz, 1 Phase

Voltage	120	120	208/230	208/230
Watts/Receiver	150	300	150	300
FLA	2.5	5.0	1.4	2.8
WSA	3.1	6.2	1.8	3.6
OPD	15	15	15	15

Only one independent input power supply is needed per piggyback unit; connect to Terminals 90 and 91.

7.3 Piggyback Condenser Planning Dimensions

The unit and floor stand dimensions are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 7.6 Dimensional Planning Drawings

Document Number	Title
Piggyback Condensers	
DPN000695	Dimensional and Weight Data, 72-in. and 97-in. frame models
Floor Stands	
DPN000727	Floorstand Dimensional Data Condenser & Drycooler

7.4 Piggyback Condenser Piping

The pipe connection locations are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 7.7 Piping Connection Drawings

Document Number	Title
DPN000696	Connection Locations and Refrigerant Planning Values, 72-in. and 97-in. frame models
DPN002754	Piping General Arrangement, 72-in. and 97-in. frame models

7.5 Piggyback Condenser Electrical Field Connections

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

The electrical field connections are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 7.8 Condenser Electrical Field Connection Drawings

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

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8 HEAT REJECTION—LIEBERT® DRYCOOLERS AND PUMPS

8.1 Drycooler Match-up Selections

Table 8.1 Drycooler Matchup Selections, 60 Hz

Model	Drycooler Type					
	Outdoor Drycooler			Outdoor Quiet-Line Drycooler		
	95°F (35°C)	100°F (38°C)	105°F (41°C)	95°F (35°C)	100°F (38°C)	105°F (41°C)
035	D-174	D-225-16	D-350-16	D-178-16	D-205-16	D-356-32
042	D-225-16	D-310	D-419	D-205	D-347-32	D-453-32
053	D-260	D-350	D-491-32	DD-248	D-347-32	D-453-32
070	D-310	D-419	D-620-32	D-347-32	D-453-32	D-453-32
077	D-350	D-466	D-650-40	D-347-32	D-453-32	N/A
105	D-466	D-620-32	D-880-52	D-453	N/A	N/A

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

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

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

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

Table 8.2 Drycooler Internal Volume, CFM, Connections Size, Dry Weight and Fluid Volume, 60 Hz

Model number *D**	Total heat rejection, kBtuh (kW) @25F ITD	Glycol flow rate, GPM (lpm)	Pressure drop, ft H2O (kPa)	No. of internal circuits (Std.)	No. of fans	Air flow (CFM)	Dry weight, lb (kg)	Internal fluid volume, gal. (L)	No. of inlets/ outlets	Inlet/Outlet connection size, OD Cu in.
Standard Models										
174	173 (50.8)	40 (152)	10.5 (31)	16	2	13300	540 (245)	6.9 (26.2)	1/1	2-1/8
197	197 (57.7)	40 (152)	13.9 (42)	16	2	12645	580 (263)	9 (34)	1/1	2-1/8
225	231 (67.7)	65 (246)	10.9 (33)	26	2	12200	620 (281)	11.1 (42.1)	1/1	2-1/8
260	260 (76.3)	60 (227)	10.1 (30)	24	3	19900	735 (333)	10.0 (37.8)	1/1	2-1/8
310	311 (91.0)	80 (303)	9.8 (29)	32	3	19000	795 (361)	13.1 (50.0)	1/1	2-1/8
350	353 (103)	80 (303)	14.6 (44)	32	3	17400	855 (388)	19.4 (73.3)	1/1	2-1/8
352	328 (96.2)	60 (227)	12.9 (39)	24	4	24800	940 (426)	13.1 (49.6)	1/1	2-1/8
419	394 (115)	80 (303)	12.7 (38)	32	4	23650	1020 (463)	17.4 (65.9)	1/1	2-1/8
466	441 (129)	100 (379)	12.7 (38)	40	4	22800	1050 (476)	22.0 (83.3)	1/1	2-5/8
491	469 (137)	120 (455)	12.8 (38)	48	4	21700	1100 (499)	26.3 (99.6)	1/1	2-5/8
620	621 (182)	160 (606)	9.8 (29)	64	6	37900	1780 (808)	27.0 (102.2)	2/2	2-1/8
650	652 (191)	130 (493)	15.2 (45)	52	6	36500	1830 (831)	33.0 (124.9)	2/2	2-1/8
700	706 (207)	160 (606)	14.6 (44)	64	6	34800	1880 (854)	40.0 (151.4)	2/2	2-1/8
790	787 (231)	160 (606)	12.7 (38)	64	8	47300	2250 (1022)	35.0 (132.5)	2/2	2-1/8
880	882 (258)	200 (758)	12.7 (38)	80	8	45500	2330 (1058)	44.0 (166.5)	4/4	2-1/8
940	938 (275)	240 (910)	12.5 (37)	96	8	43400	2430 (1103)	52.0 (196.8)	4/4	2-1/8

Table 8.2 Drycooler Internal Volume, CFM, Connections Size, Dry Weight and Fluid Volume, 60 Hz (continued)

Model number *D**	Total heat rejection, kBtuh (kW) @25F ITD	Glycol flow rate, GPM (lpm)	Pressure drop, ft H2O (kPa)	No. of internal circuits (Std.)	No. of fans	Air flow (CFM)	Dry weight, lb (kg)	Internal fluid volume, gal. (L)	No. of inlets/ outlets	Inlet/Outlet connection size, OD Cu in.
Liebert® Quiet-Line™ Models										
173	185 (54.2)	80 (303)	9.7 (29)	32	3	8520	795 (361)	13.1 (50.0)	1/1	2-1/8
178	186 (54.5)	80 (303)	14.5 (4.3)	32	3	7440	855 (388)	19.4 (73.3)	1/1	2-1/8
205	219 (64.2)	60 (227)	12.9 (39)	24	4	11680	940 (426)	13.1 (50.0)	1/1	2-1/8
248	248 (72.8)	80 (303)	12.5 (37)	32	4	11360	1020 (463)	17.4 (65.9)	1/1	2-1/8
347	369 (108)	160 (606)	9.8 (29)	64	6	17040	1780 (808)	27.0 (102.2)	2/2	2-1/8
356	372 (109)	160 (606)	14.6 (44)	64	6	14880	1880 (854)	39.3 (148.8)	2/2	2-1/8
453	496 (145)	160 (606)	12.6 (38)	64	8	22720	2250 (1022)	35.0 (132.5)	2/2	2-1/8
498	505 (148)	240 (910)	12.4 (37)	96	8	19840	2430 (1103)	52.0 (196.8)	4/4	2-1/8

8.2 Drycooler Electrical Power Requirements

Table 8.3 60Hz Electrical Values—Drycoolers without Pump Controls

# of Fans	Model #	Voltage	Phase	FLA	WSA	OPD
Standard Models						
2	174, 197, 225	208/230	3	7.0	7.9	15
		460	3	3.4	3.8	15
		575	3	2.8	3.2	15
3	260, 310, 350	208/230	3	10.5	11.4	15
		460	3	5.1	5.5	15
		575	3	4.2	4.6	15
4	352, 419, 466, 491	208/230	3	14.0	14.9	20
		460	3	6.8	7.2	15
		575	3	5.6	6.0	15
6	620, 650, 700	208/230	3	21.0	21.9	25
		460	3	10.2	10.6	15
		575	3	8.4	8.8	15
8	790, 880, 940	208/230	3	28.0	28.9	35
		460	3	13.6	14.0	20
		575	3	11.2	11.6	15
Values are calculated per UL 1995. OPD values may be adjusted higher than calculations to compensate for maximum anticipated application temperatures.						
Liebert Quiet-Line Models						
3	158, 173, 178	208/230	3	5.4	5.9	15
		460	3	2.7	2.9	15
		575	3	2.1	2.3	15
4	205, 248	208/230	3	7.2	7.7	15
		460	3	3.6	3.8	15
		575	3	2.8	3.0	15
6	356	208/230	3	10.8	11.3	15
		460	3	5.4	5.6	15
		575	3	4.2	4.4	15
8	453, 498	208/230	3	14.4	14.9	20
		460	3	7.2	7.4	15
		575	3	5.6	5.8	15
Values are calculated per UL 1995. OPD values may be adjusted higher than calculations to compensate for maximum anticipated application temperatures.						

Table 8.4 60Hz Electrical Values—Standard Drycoolers with Integral Pump Controls, 2, 3, and 4 Fans

# of Fans:		2			3			4		
Model #:		139, 174, 197, 225			260, 310, 350			352, 419, 466, 491		
Pump hp	Ph	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
208-230/3/60										
0.75	3	10.5	11.4	15	14.0	14.9	20	17.5	18.4	25
1.5	3	13.6	15.3	20	17.1	18.8	25	20.6	22.3	25
2.0	3	14.5	16.4	20	18.0	19.9	25	21.5	23.4	30
3.0	3	17.6	20.3	30	21.1	23.8	30	24.6	27.3	35
5.0	3	23.7	27.9	40	27.2	31.4	45	30.7	34.9	50
7.5 *	3	31.2	37.3	60	34.7	40.8	60	38.2	44.3	60
10.0*	3	37.8	45.5	70	41..3	49.0	70	44.8	52.5	80
15.0*	3	53.2	64.8	110	56.7	68.3	110	60.2	71.8	110
460/3/60										
0.75	3	5.0	5.4	15	6.7	7.1	15	8.4	8.8	15
1.5	3	6.4	7.2	15	8.1	8.9	15	9.8	10.6	15
2.0	3	6.8	7.7	15	8.5	9.4	15	10.2	11.1	15
3.0	3	8.2	9.4	15	9.9	11.1	15	11.6	12.8	15
5.0	3	11.0	12.9	20	12.7	14.6	20	14.4	16.3	20
7.5	3	14.4	17.2	25	16.1	18.9	25	17.8	20.6	30
10.0	3	17.4	20.9	30	19.1	22.6	35	20.8	24.3	35
15.0*	3	24.4	29.7	50	26.1	31.4	50	27.8	33.1	50
575/3/60										
0.75	3	4.1	4.5	15	5.5	5.9	15	6.9	7.3	15
1.5	3	5.2	5.8	15	6.6	7.2	15	8.0	8.6	15
2.0	3	5.5	6.2	15	6.9	7.6	15	8.3	9.0	15
3.0	3	6.7	7.7	15	8.1	9.1	15	9.5	10.5	15
5.0	3	8.9	10.4	15	10.3	11.8	15	11.7	13.2	15
7.5	3	11.8	14.1	20	13.2	15.5	20	14.6	16.9	25
10.0	3	13.8	16.8	25	15.2	18.0	25	16.6	19.4	30
15.0	3	19.8	24.1	40	21.2	25.5	40	22.6	26.9	40

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

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

Table 8.5 60Hz Electrical Values—Standard Drycoolers with Integral Pump Controls, 6 and 8 Fans

# of Fans:		6			8		
Model #:		620, 650, 700			790, 880, 940		
Pump hp	Ph	FLA	WSA	OPD	FLA	WSA	OPD
208-230/3/60							
0.75	3	24.5	25.4	30	31.5	32.4	40
1.5	3	27.6	29.3	35	34.6	36.3	40
2.0	3	28.5	30.4	35	35.5	37.4	45
3.0	3	31.6	34.3	40	38.6	41.3	50
5.0	3	37.7	41.9	50	44.7	48.9	60
7.5 *	3	45.2	51.3	70	52.2	58.3	80
10.0*	3	51.8	59.5	90	58.8	66.5	90
15.0*	3	67.2	78.8	110	74.2	85.8	125
460/3/60							
0.75	3	11.8	12.2	15	15.2	15.6	20
1.5	3	13.2	14.0	20	16.6	17.4	20
2.0	3	13.6	14.5	20	17.0	17.9	20
3.0	3	15.0	16.2	20	18.4	19.6	25
5.0	3	17.8	19.7	25	21.2	23.1	30
7.5	3	21.2	24.0	30	24.6	27.4	35
10.0	3	24.2	27.7	40	27.6	31.1	45
15.0*	3	31.2	36.5	50	34.6	39.9	60
575/3/60							
0.75	3	9.7	10.1	15	12.5	12.9	15
1.5	3	10.8	11.4	15	13.6	14.2	20
2.0	3	11.1	11.8	15	13.9	14.6	20
3.0	3	12.3	13.3	15	15.1	16.1	20
5.0	3	14.5	16.0	20	17.3	18.8	20
7.5	3	17.4	19.7	25	20.2	22.5	30
10.0	3	19..4	22.2	30	22.2	25.0	35
15.0	3	25.4	29.7	45	28.2	32.5	45

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

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

Table 8.6 60 Hz Electrical Values—Quiet-Line Drycoolers with Integral Pump Controls

# of Fans:		3			4			6			8		
Model #:		173, 178			205, 248			347, 356			453, 498		
Pump hp	Ph	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
208-230/3/60													
0.75	3	8.9	9.8	15	10.7	11.6	15	14.3	15.2	20	17.9	18.8	25
1.5	3	12.0	13.7	20	13.8	15.5	20	17.4	19.1	25	21.0	22.7	25
2.0	3	12.9	14.8	20	14.7	16.6	20	18.3	20.2	25	21.9	23.8	30
3.0	3	16.0	18.7	25	17.8	20.5	30	21.4	24.1	30	25.0	27.7	35
5.0	3	22.1	26.3	40	23.9	28.1	40	27.5	31.7	45	31.1	35.3	50
7.5 *	3	29.6	35.7	50	31.4	37.5	60	35.0	41.1	60	38.6	44.7	60
10.0 *	3	36.2	43.9	70	38.0	45.7	70	41.6	49.3	80	45.2	52.9	80
15.0 *	3	51.6	63.2	100	53.4	65.0	110	57.0	68.6	110	60.6	72.2	110
460/3/60													
0.75	3	4.3	4.7	15	5.2	5.6	15	7.0	7.4	15	8.8	9.2	15
1.5	3	5.7	6.5	15	6.6	7.4	15	8.4	9.2	15	10.2	11.0	15
2.0	3	6.1	7.0	15	7.0	7.9	15	8.8	9.7	15	10.6	11.5	15
3.0	3	7.5	8.7	15	8.4	9.6	15	10.2	11.4	15	12.0	13.2	15
5.0	3	10.3	12.2	15	11.2	13.1	20	13.0	14.9	20	14.8	16.7	20
7.5	3	13.7	16.5	25	14.6	17.4	25	16.4	19.2	30	18.2	21.0	30
10.0	3	16.7	20.2	30	17.6	21.1	35	19.4	22.9	35	21.2	24.7	35
15 .0*	3	23.7	29.0	45	24.6	29.9	50	26.4	31.7	50	28.2	33.5	50
575/3/60													
0.75	3	3.4	3.7	15	4.1	4.4	15	5.5	5.8	15	6.9	7.2	15
1.5	3	4.5	5.1	15	5.2	5.8	15	6.6	7.2	15	8.0	8.6	15
2.0	3	4.8	5.5	15	5.5	6.2	15	6.9	7.6	15	8.3	9.0	15
3.0	3	6.0	7.0	15	6.7	7.7	15	8.1	9.1	15	9.5	10.5	15
5.0	3	8.2	9.7	15	8.9	10.4	15	10.3	11.8	15	11.7	13.2	15
7.5	3	11.1	13.4	20	11.8	14.1	20	13.2	15.5	20	14.6	16.9	25
10.0	3	13.1	15.9	25	13.8	16.6	25	15.2	18.0	25	16.6	19.4	30
15.0	3	19.1	23.4	40	19.8	24.1	40	21.2	25.5	40	22.6	26.9	40

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

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

Table 8.7 60-Hz Pump FLA Values

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

8.3 Drycooler Planning Dimensions

The unit dimensions are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 8.8 Dimension Planning Drawings

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

8.4 Drycooler Piping Guidelines

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

The pipe connection locations are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 8.9 Piping Connection Drawings

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

8.5 Drycooler Electrical Field Connections

Electrical service must conform to national and local electrical codes.

The electrical connections are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 8.10 Electrical Field Connection Drawings

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

8.6 Drycooler Pump Packages

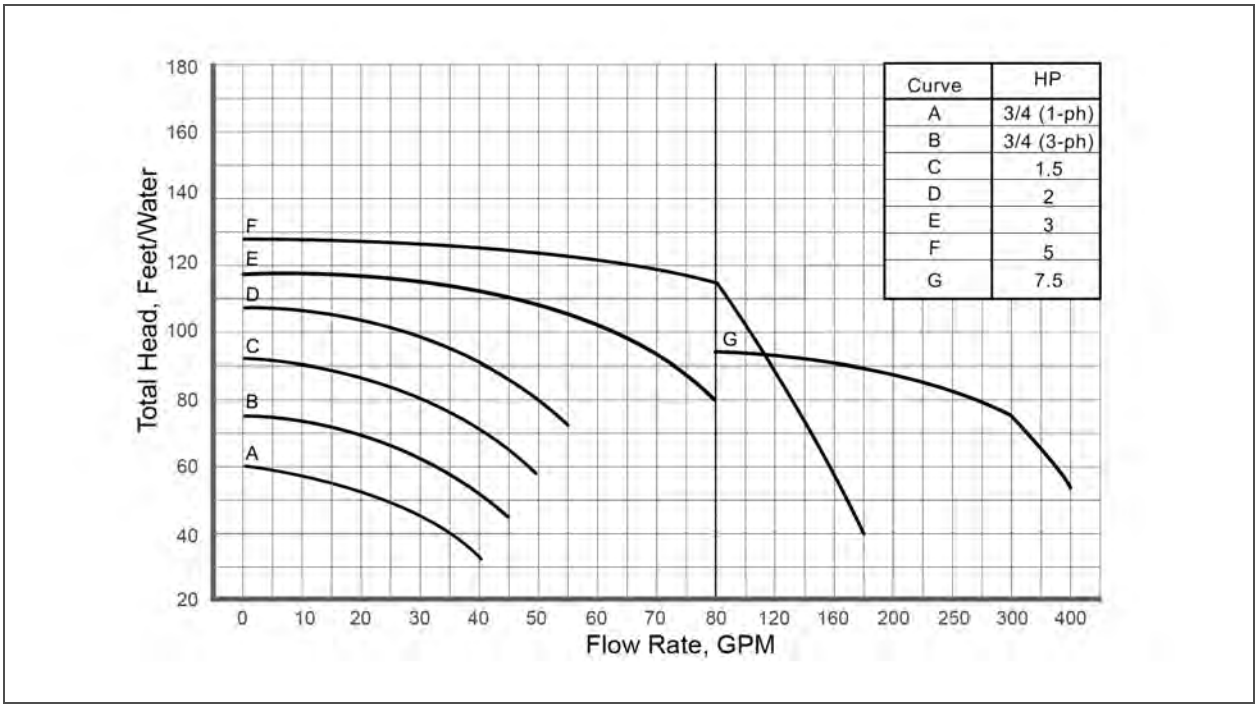
The planning dimensions, electrical power-supply requirements, piping connections, and electrical connections are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 8.11 Drycooler Pump Drawings

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

Figure 8.1 Pump curve, 60 Hz



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

8.6.1 Drycooler Expansion Tank

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

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

The planning dimensions and general arrangement are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 8.12 Drycooler Pump and Tank Drawings

Document Number	Title
DPN004183	Expansion Tank General Arrangement and Dimensional Data

8.6.2 Compression Tank

The compression tank for glycol/GLYCOOL™ systems includes:

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

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

The planning dimensions and general arrangement are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 8.13 Drycooler Pump and Tank Drawings

Document Number	Title
DPN003898	Compression Tank General Arrangement and Dimensional Data

9 HEAT REJECTION—LIEBERT PIGGYBACK DRYCOOLERS

9.1 Piggyback Drycooler Match-ups

Table 9.1 Indoor Piggyback Drycooler Matchup Selections*

DS Model	95°F (35°C) Ambient Standard Selection	100°F (38°C) Ambient	105°F (41°C) Ambient
DS/VS035W	PD_150	PD_223	N/A
DS/VS042W	PD_223	PD_333	N/A
DS/VS053W	PD_290	N/A	N/A
DS/VS070W	PD_333	N/A	N/A
DS/VS077W	PD_333	N/A	N/A
DS/VS105W	N/A	N/A	N/A

* Selections are based on one-indoor-unit-to-one-drycooler system. Consult your sales representative for common glycol-loop solutions with multiple indoor units and for multiple drycoolers with redundancy.

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

For pump capacities, see Figure 8.1 on page 73.

Table 9.2 Indoor Piggyback Airflow and Static Pressure Data

Model	No. of Fans	CFM (m^3/hr)	Horsepower/rpm			
			Ext. Static Pressure - in. (Pa)			
			0.25 (62.3)	0.50 (125)	0.75 (187)	1.0 (249)
PD-150	2	6900 (11,730)	2/605	3/680	3/750	3/820
PD-223	2	12,500 (21,250)	7.5/760	7.5/810	7.5/870	7.5/920
PD-290	2	12,300 (20,910)	7.5/780	7.5/830	7.5/890	7.5/940
PD-333	2	16,500 (28,050)	10/640	10/695	10/740	15/790

1. Values are without filter box. External Static Pressure = filter pressure drop + other static drops.

PD-333 models with filter section will be factory supplied with 15HP motor. ESP higher than 0.50" (125Pa) will reduce airflow.

9.2 Piggyback Drycooler Electrical Power Requirements

Table 9.3 Electrical Data, Piggyback Drycoolers without Pump Package, 60Hz, 3 Phase

Model	Voltage	Blower Motor hp	Drycooler No Pumps		
			Total Unit		
			FLA	WSA	OPD
PD-150	208	2	7.5	9.4	15
	230	2	6.8	8.5	15
	460	2	3.4	4.3	15
	575	2	2.7	3.4	15
	208	3	10.6	13.3	20
	230	3	9.6	12.0	20
	460	3	4.8	6.0	15
	575	3	3.9	4.9	15
PD-223	208	7.5	24.2	30.3	50
	230	7.5	22.0	27.5	45
	460	7.5	11.0	13.8	20
	575	7.5	9.0	11.3	20
PD-290	208	7.5	24.2	30.3	50
	230	7.5	22.0	27.5	45
	460	7.5	11.0	13.8	20
	575	7.5	9.0	11.3	20
PD-333	208	10	30.8	38.5	60
	230	10	28.0	35.0	60
	460	10	14.0	17.5	30
	575	10	11.0	13.8	20
	208	15	46.2	57.8	100
	230	15	42.0	52.5	90
	460	15	21.0	26.3	45
	575	15	17.0	21.3	35

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

Source: DPN004124 Rev. 0

Table 9.4 Electrical Data, Piggyback Drycoolers with Integral Pumps, 60Hz, 3 Phase

Model	Voltage	Blower Motor hp	Drycooler Standard Pump Package				Drycooler - Optional Pump Package			
			Pump hp	Total Unit			Pump hp	Total Unit		
				FLA	WSA	OPD		FLA	WSA	OPD
PD-150	208	2	2	15.0	16.9	20	3	18.1	20.8	30
	230	2	2	13.6	15.3	20	3	16.4	18.8	25
	460	2	2	6.8	7.7	15	3	8.2	9.4	15
	575	2	2	5.4	6.1	15	3	6.6	7.6	15
	208	3	2	18.1	20.8	30	3	21.2	23.9	30
	230	3	2	16.4	18.8	25	3	19.2	21.6	30
	460	3	2	8.2	9.4	15	3	9.6	10.8	15
	575	3	2	6.6	7.6	15	3	7.8	8.8	15
PD-223	208	7.5	3	34.8	40.9	60	5	40.9	47	70
	230	7.5	3	31.6	37.1	50	5	37.2	42.7	60
	460	7.5	3	15.8	18.6	25	5	18.6	21.4	30
	575	7.5	3	12.9	15.2	20	5	15.1	17.4	25
PD-290	208	7.5	5	40.9	47	60	3	34.8	40.9	60
	230	7.5	5	37.2	42.7	30	3	31.6	37.1	50
	460	7.5	5	18.6	21.4	25	3	15.8	18.6	25
	575	7.5	5	15.1	17.4	20	3	12.9	15.2	20
PD-333	208	10	5	47.5	55.2	80	3	41.4	49.1	70
	230	10	5	43.2	50.2	70	3	37.6	44.6	70
	460	10	5	21.6	25.1	35	3	18.8	22.3	35
	575	10	5	17.1	19.9	30	3	14.9	17.7	25
	208	15	5	62.9	74.5	110	3	56.8	68.4	110
	230	15	5	57.2	67.7	100	3	51.6	62.1	100
	460	15	5	28.6	33.9	50	3	25.8	314.1	50
	575	15	5	23.1	27.4	40	3	20.9	25.2	40

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

Source: DPN004124 Rev. 0

9.3 Piggyback Drycooler Planning Dimensions

The unit and floor stand dimensions are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 9.5 Dimensional Planning Drawings

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

9.4 Piggyback Drycooler Piping Guidelines

The piping connections are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 9.6 Piping Connection Drawings

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

9.5 Piggyback Drycooler Electrical Field Connections

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

The electrical field connections are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table 9.7 Drycooler Electrical Field Connection Drawings

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

APPENDICES

Appendix A: Technical Support and Contacts

A.1 Technical Support/Service in the United States

Vertiv™ Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Liebert® Thermal Management Products

1-800-543-2778

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

A.2 Locations

United States

Vertiv Headquarters

1050 Dearborn Drive

Columbus, OH, 43085, USA

Europe

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road

Wanchai, Hong Kong

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Appendix B: Disassembling the DS for Transport

The Liebert® DS 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 on downflow units and for lifting the blower and electric box assembly on upflow units.

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

WARNING! Risk of top-heavy unit falling over. Improper handling can cause equipment damage, injury or death. Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from or prepare the unit for installation. Unit weights are specified in Table 4.2 on page 45.

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

CAUTION: Risk of 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 DS may affect warranty.

The disassembly dimensions and details are described in the submittal documents included in the Submittal Drawings on page 91.

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

Table B.1 Disassembly Dimension Drawings

Document Number	Title
Downflow Units	
DPN003647	Disassembly, 35 to 42 kw (10 to 12 ton)
DPN003648	Disassembly, 53 to 77 kW (15 to 22 ton)
DPN003649	Disassembly, 105 kw (30 ton)
Upflow Units	
DPN003650	Disassembly, 35 to 42 kw (10 to 12 ton)
DPN003657	Disassembly, 53 to 77 kW (15 to 22 ton)
DPN003658	Disassembly, 105 kw (30 ton)

B.1 Required Equipment

- Piano jacks
- Stepladder
- Refrigeration tools

B.2 Disassembly—Downflow Units

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.
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.

NOTICE

Risk of oil loss or displacement. Can cause compressor damage.

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

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

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 unit.
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. GLYCOOL/Dual-Cool—Optional Component
    a. On units with an actuator, unplug the valve actuator harness at the actuator and pull the wire harness into the electric box.
    b. Disconnect the glycol sensor from the control board and pull it into the unit's blower and coil assembly section.
14. Disconnect the air sail switch wires and pull them into the electric box.
15. 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.

NOTE: The wand and tube will remain attached to filter and electric box assembly.

16. Close the electric box cover and the accent panel.
17. 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.

18. Evacuate and recover all refrigerant from the unit.

    Air-cooled units are shipped with an inert-gas holding charge. Water, glycol and GLYCOOL units are factory-charged with refrigerant. Refer to the ASHRAE Refrigeration Handbook for general, good-practice refrigeration piping.

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 inert gas or refrigerant charge in the compressor and prevents moisture from contaminating the compressor oil. This is particularly important with units using R-407C refrigerant.

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

NOTE: We do not recommend unsweating refrigerant connections.

21. Un-sweat or cut all copper water pipes that interconnect unit sections.
22. Immediately cap and seal all piping that has been cut, including the suction and liquid lines, as well as the fluid piping on GLYCOOL and dual-cool units.

B.3 Remove the Compressor Assembly

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 oil loss or displacement. Can cause compressor 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 unit. Do not remove shipping blocks from Semi-hermetic compressors until the unit is fully reassembled and ready for installation.

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

Remove the Filter and Electric Box Assembly

1. Using a stepladder to reach the top of the unit, remove the filter support plate; it is attached to the filter and electric box assembly with two screws, one on each end.
2. Remove tags from the Schrader fittings on top of the coil headers. Retain the tags for replacement during reassembly.
3. 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.
4. Remove coil access plates from the left side of the unit.

5. 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.
6. Separate the unit sections with caution.

NOTICE

Risk of improper handling.

- 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.

7. Move each section of the unit to the installation location.

B.4 Reassembly—Downflow Units

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.
11. On GLYCOOL and dual-cool units, reattach the plug connection at the actuator and reroute the sensor wire back through the electric box and onto the control board.

Reconnecting Piping, Charging and Replacing Panels

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 unit 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.

B.5 Reassembly Checklist

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. Water 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
13. Piping systems pressure-checked for leaks

B.6 Disassembly—Upflow Units

1. Remove the unit from its skid.
2. Remove all panels except top front accent.
3. Remove all filters on front return units. 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 for easy replacement. Cable ties will need to be cut and replaced as necessary. Reference unit wiring schematic on dead-front panel for details.
5. Label the (3) quick connect plugs from the compressor compartment, and disconnect them.
6. Disconnect compressor wire harness, including crankcase heater wires, if applicable, from contactor in electric box. Pull conduit and wires into compressor compartment.
7. **Reheat (optional component):** Disconnect reheat wire harness from bottom of contactor in electric box. Unplug low-voltage quick connect for reheat safety wires. Pull conduit and wires into filter and coil assembly section of unit.

8. Humidifier (optional component):
    a. Disconnect the humidifier wire harness from the bottom of the contactor in the electric box.

       For infrared humidifiers: Remove the quick-connect plugs from these 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).

    b. Disconnect 35-3 and 35-4 from the control board.
    c. Pull the conduit and wires into the unit's filter and coil assembly section.
9. **Condensate pump (optional component):** Disconnect condensate pump high-voltage wire harness. Remove low volt wires from terminal strip #24 and #55. Pull conduit and wires into filter and coil assembly section of unit.
10. **GLYCOOL/Dual-Cool (optional component):** On units with actuator, unplug valve actuator harness at actuator and pull wire harness into electric box. Disconnect glycol sensor from control board and pull into filter and coil assembly section of unit.
11. **Smoke detector (optional component):** For units with smoke detector, remove cover on smoke detector. Remove plug connector from smoke detector and pull into electric box. Remove wires from terminal strip #91, 92, 93 and route the wires to the smoke detector box. Remove the sensing tube from the bottom of the plastic elbow.
12. **Filter Clog Switch:** Disconnect both tubes from the filter clog switch. Pull both of the tubes into the electric box.
13. Close the electric box cover and the accent panel.
14. Remove the pull bar that supports the accent panel from left end of unit, otherwise it will fall out when the compressor section is removed.
15. Evacuate and recover all refrigerant from the unit.
    Air-cooled units contain an inert-gas holding charge. Water, glycol and GLYCOOL units are factory charged with refrigerant. Refer to the ASHRAE Refrigeration Handbook for general, good-practice refrigeration piping.

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 inert gas or refrigerant charge in the compressor and prevents moisture from contaminating the compressor oil. This is particularly important with units using R-407C refrigerant.

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

NOTE: We do not recommend unsweating refrigerant connections.

18. Un-sweat or cut all copper water pipes that interconnect unit sections.
19. Immediately cap off and seal all piping that has been cut, including the suction and liquid lines, the humidifier supply line and the condensate discharge line (if applicable), as well as fluid piping on GLYCOOL and dual-cool units.

B.7 Remove the Compressor Assembly

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 oil loss or displacement. Can cause compressor 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 unit. Do not remove shipping blocks from Semi-hermetic compressors until the unit is fully reassembled and ready for installation.

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

Remove Blower and Electric Box Assembly

1. Remove the motor 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 unit.

- The blower and electric box assembly should be moved forward and set on the floor.
- We recommend using four people to remove this section.
- The motor end will be significantly heavier than the other end.
- 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 means before moving the section.

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

B.8 Reassembly—Upflow Unit

1. Reattach the top section using thread-cutting bolts; there are four on each side.
   Torque the bolts to 225 in-lb. (25 Nm).
2. Reinstall the motor access plate.
   Do not replace the left end coil access plates until brazing is finished.
3. Reattach the compressor section. Insert all compressor thread-cutting bolts before tightening them all down.
4. Reinstall the pull bar to support the accent panel.
5. Reinstall the low-voltage plugs in the compressor section.

6. Rewire the compressor, reheat, humidifier, condensate pump and smoke detector, if applicable.
7. Reattach the sensing tube to the blower inlet.
8. Reattach the plug connection at the actuator and reroute the sensor back through electric box and onto control board, on GLYCOOL and dual-cool units.
9. Piping must be reassembled in accordance with local codes.
10. Move the insulation and plastic bushings away from the brazing area.
11. Wrap the piping with wet cloths. Use copper fittings where required.
12. Refer to the ASHRAE Refrigeration Handbook for general, good-practice refrigeration piping.
13. Open service valves on compressor.
14. Reinsert plastic bushings.
15. Charge the unit with refrigerant; see the unit's nameplate for the proper charge.
16. Replace the galvanized panels on the left side of the coil.
17. Replace the filters.
18. Replace the panels.

B.9 Reassembly Checklist—Upflow Unit

1. Thread-cutting bolts reconnected at a torque specification of 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. actuator
    b. terminal strip
    c. plug connections
    d. smoke detector, if applicable
4. Coil access plates on left side replaced
5. Motor access plate on right side replaced
6. Water lines brazed
7. Suction and liquid refrigerant lines brazed
8. Unit recharged
9. Filters replaced
10. Panels replaced
11. Piping systems pressure-checked for leaks

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Appendix C: Submittal Drawings

Table C.1 Submittal Drawing Contents

Document Number	Title
Component Location	
DPN003706	Component Location, Downflow Models
DPN003707	Component Location, Upflow Models
Planning Dimensions--Downflow Units	
DPN003643	Cabinet Dimensional Data, 35 to 105 kW(10 to 30 ton), all Blower Types
Planning Dimensions--Upflow Units	
DPN003681	Cabinet Dimensional Data, 35 to 105 kW(10 to 30 ton), EC Fans
DPN003646	Cabinet Dimensional Data, 35 to 105 kW(10 to 30 ton), Forward Curved Blowers
Planning Dimensions--Floor Stands	
DPN003240	Floor Floorstand Dimensional Data, Downflow Models, 35 to 42 kW(10 to 12 ton), EC Fans
DPN003173	Floor Floorstand Dimensional Data, Downflow Models, 53 to 77 kW(15 to 22 ton), EC Fans
DPN003174	Floor Floorstand Dimensional Data, Downflow Models, 105 kW(30 ton), EC Fans, Standard Scroll and Semi-Hermetic Compressors
DPN003134	Floorstand Dimensional Data, Downflow Models, 35 to 42 kW(10 to 12 ton), Forward Curved Blowers
DPN003141	Floorstand Dimensional Data, Downflow Models, 53 to 77 kW(15 to 22 ton), Forward Curved Blowers
DPN003149	Floorstand Dimensional Data, Downflow and Upflow Models, 105 kW(30 ton), Forward Curved Blowers
Planning Dimensions--Blower Outlet, Deck and Filter Box	
DPN001120	Blower Outlet and Deck Dimensions, Upflow Models, 35 to 42 kW (10 to 12 ton), Forward Curved Blowers
DPN001191	Blower Outlet and Deck Dimensions, Upflow Models, 53 to 77 kW (15 to 22 ton), Forward Curved Blowers
DPN001192	Blower Outlet and Deck Dimensions, Upflow Models, 105 kW (30 ton), Forward Curved Blowers
DPN001196	Rear Return Filter Box Dimensions, Upflow Models, 35 to 105 kW (10 to 30 ton), All Compressor Types, Forward Curved Blowers.
DPN003974	Rear Return Filter Box Dimensions, Upflow Models, 35 to 105 kW (10 to 30 ton), All Compressor Types, EC Fans.
Planning Dimensions--Plenums	
DPN003164	Plenum Dimensional Data, Upflow Models, 35 to 105 kW (10 to 30 ton), Forward Curved Blowers
DPN003458	Plenum Dimensional Data, Upflow Models, 35 to 42 kW (10 to 12 ton), EC Fans
DPN003453	Plenum Dimensional Data, Upflow Models, 53 to 77 kW (15 to 22 ton), EC Fans
DPN003459	Plenum Dimensional Data, Upflow Models, 105 kW(30 ton), EC Fans
Piping Schematics--Air Cooled Units	
DPN003954	Liebert® MC Condenser Positioning Above/Same Level/Below Indoor Unit
DPN003730	Air Cooled Models with Liebert® MC Condenser

Table C.1 Submittal Drawing Contents (continued)

Document Number	Title
Piping Schematics--Water/Glycol Cooled Units	
DPN000896	Water/Glycol Models with Scroll Compressor
DPN001430	Water/Glycol Models with Digital- Scroll Compressors
DPN000895	Water/Glycol 77-kW to 105-kW Models with Semi-Hermetic Compressors
Piping Schematics GLYCOOL™ Units	
DPN000897	Piping Schematic, Water/Glycol with Semi-Hermetic Compressors, 77 to 105 kW (22 to 30 Ton)
DPN000898	GLYCOOL Models with Scroll Compressors
DPN001432	Piping Schematic, GLYCOOLwith Digital Scroll Compressors, 35 to 70 kW
Piping Schematics Econ-O-Coil™ Option	
DPN000805	Optional Piping for Econ-O-Coil
Piping Connections--Downflow, Air Cooled Models with EC Fans	
DPN003239	35 to 42 kW (10 to 12 Ton) Units with Scroll or Digital Scroll Compressors
DPN002182	53 to 77 kW (15 to 22 Ton) Units with Scroll Compressors
DPN002179	77 kW (22 Ton) Units with Semi-Hermetic Compressors
DPN002154	105 kW (30 Ton) Units with All Compressor Types
Piping Connections--Downflow, Water/Glycol/GLYCOOL Models with EC Fans	
DPN003530	35 to 42 kW (10 to 12 Ton) Units with All Compressor Types
DPN002183	77 kW (22 Ton) Units with All Compressor Types
DPN002153	105 kW (30 Ton) Units with All Compressor Types
Piping Connections--Upflow, Air Cooled Models with EC Fans	
DPN002740	35 to 42 kW (10 to 12 ton) Units with Scroll Compressors
DPN002742	77 kW (22 ton) Units with Semi-Hermetic Compressors
DPN002743	53 to 77 kW (15 to 22 Ton) Units with Scroll or Digital Scroll Compressors
DPN002745	105 kW (30 Ton) Units with All Compressor Types
Piping Connections--Upflow, Water/Glycol/GLYCOOL Models with EC Fans	
DPN002741	35 to 42 kW (10 to 12 ton) Units with All Compressor Types
DPN002744	53 to 77 kW (15 to 22 ton) Units with All Compressor Types
DPN002746	105 kW (30 Ton) Units with All Compressor Types
Piping Connections--Upflow, Air Cooled Models with Forward Curved Blowers	
DPN001119	35 to 42 kW (10 to 12 Ton) Units with Scroll or Digital Scroll Compressors
DPN001212	77 kW (22 Ton) Units with Semi-Hermetic Compressors
DPN001213	53 to 77 kW (15 to 22 Ton) Units with Scroll or Digital Scroll Compressors
DPN001257	105 kW (30 ton) Units with All Compressor Types

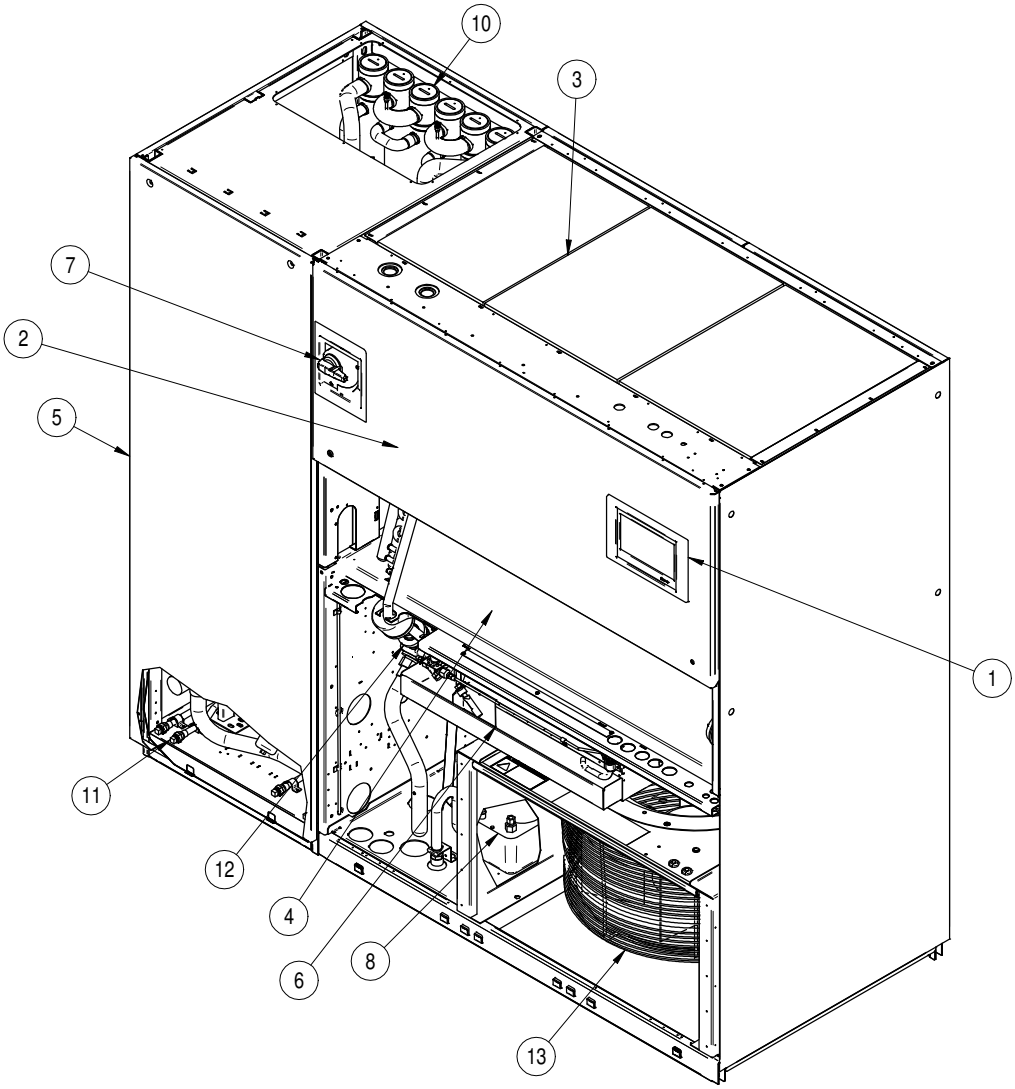
Table C.1 Submittal Drawing Contents (continued)

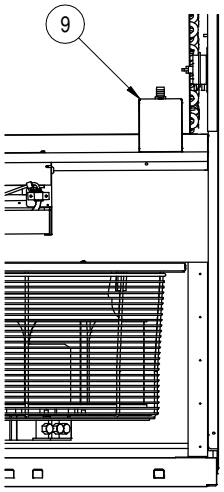
Document Number	Title
Piping Connections--Upflow, Water/Glycol/GLYCOOL, Models with Forward Curved Blowers	
DPN001179	35 to 42 kW (10 to 12 Ton) Units with All Compressor Types
DPN001214	53 to 77 kW (15 to 22 Ton) Units with All Compressor Types
DPN001258	105 kW (30 ton) Units with All Compressor Types
Electrical Connections	
DPN004352	High and Low Voltage Electrical Field Connections, 35 to 105 kW
DPN003267	CANbus and Interlock Connections between Unit and Condenser
Unit to Unit Networking	
DPN004351	Liebert® iCOM Unit to Unit Network Connections
Disassembly Dimensions--Downflow Units	
DPN003647	Disassembly, 35 to 42 kw (10 to 12 Ton)
DPN003648	Disassembly, 53 to 77 kW (15 to 22 Ton)
DPN003649	Disassembly, 105 kw (30 ton)
Disassembly, Dimensions--Upflow Units	
DPN003650	Disassembly, 35 to 42 kw (10 to 12 Ton)
DPN003657	Disassembly, 53 to 77 kW (15 to 22 Ton)
DPN003658	Disassembly, 105 kw (30 Ton)
Planning Dimensions--Piggyback Condensers	
DPN000695	Dimensional and Weight Data, 72-in. and 97-in. Frame Models
Planning Dimensions--Piggyback Drycoolers	
DPN000710	Dimensional and Weight Data, 72-in. and 97-in. Frame Models
Planning Dimensions--Piggyback Floor Stands	
DPN000727	Floorstand Dimensional Data Condenser and Drycooler
DPN002754	General Arrangement Diagram, 72-in. and 97-in. Frame Models
Primary Connections--Piggyback Condenser	
DPN000696	Connection Locations and Refrigerant Planning Values, 72-in. and 97-in. Frame Models
Primary Connections--Piggyback Drycooler	
DPN000711	Primary Connection Locations, 72-in. and 97-in. Frame Models
Electrical Connections--Piggyback Condenser	
DPN000697	Electrical Field Connections, 72-in. and 97-in. Frame Models
Electrical Connections--Piggyback Drycooler	
DPN000712	Electrical Field Connections, 72-in. and 97-in. Frame Models
Liebert®MC Condenser Planning Dimensions	

Table C.1 Submittal Drawing Contents (continued)

Document Number	Title
DPN003437	Condenser Dimensional Data, MCS056, MCM080, MCL110
DPN003439	Condenser Dimensional Data, MCM160 and MCL220
Liebert®MC Condenser Piping	
DPN002425	Dual Circuit Piping, 2-Fan and 4-Fan Units without Liebert® Lee-Temp™
DPN002426	Dual Circuit Condensers with Liebert® Lee-Temp
Liebert® MC Condenser Power Supply Wiring	
DPN002169	Electrical Field Connections, without Liebert® Lee-Temp™
DPN002374	Electrical Field Connections, with Liebert® Lee-Temp™
DPN003047	Electrical Field Connections, 575-V Option
Liebert® MC Condenser Low Voltage Wiring	
DPN003267	CANbus and Interlock Connections between Liebert®DS and Liebert® MC
Liebert® Drycooler Dimensions	
DPN000274	Cabinet and Anchor Dimensions for 1- to 4-Fan Drycoolers
DPN000280	Cabinet and Anchor Dimensions for 1- to 4-Fan Quiet-Line Drycoolers
DPN000721	Cabinet and Anchor Dimensions for 6- to 8-Fan Standard and Quiet-Line Drycoolers
Liebert® Drycooler Piping	
DPN000275	Connection Locations for Standard 1-Fan, 2-Fan, 3-Fan, and 4-Fan Units
DPN000281	Connection Locations for Quiet-Line 1-Fan, 2-Fan, 3-Fan, and 4-Fan Units
DPN002430	Connection Locations for Quiet-Line 6-Fan and 8-Fan Units
DPN003822	Typical Arrangements for Multiple Drycoolers and Multiple Indoor Thermal Management Units
Liebert®Drycooler Electrical Connections	
DPN000276	Electrical Field Connections for Fluid Temperature Control
DPN000329	Pump Electrical Power Data and Piping Connection Sizes
DPN000278	Single Pump Piping Connection Locations and Dimensional Data
DPN000328	Dual Pump Piping Connection Locations and Dimensional Data
Liebert® Drycooler Expansion Tank	
DPN004183	Expansion Tank General Arrangement and Dimensional Data
Liebert® Drycooler Compression Tank	
DPN003898	Compression Tank General Arrangement and Dimensional Data

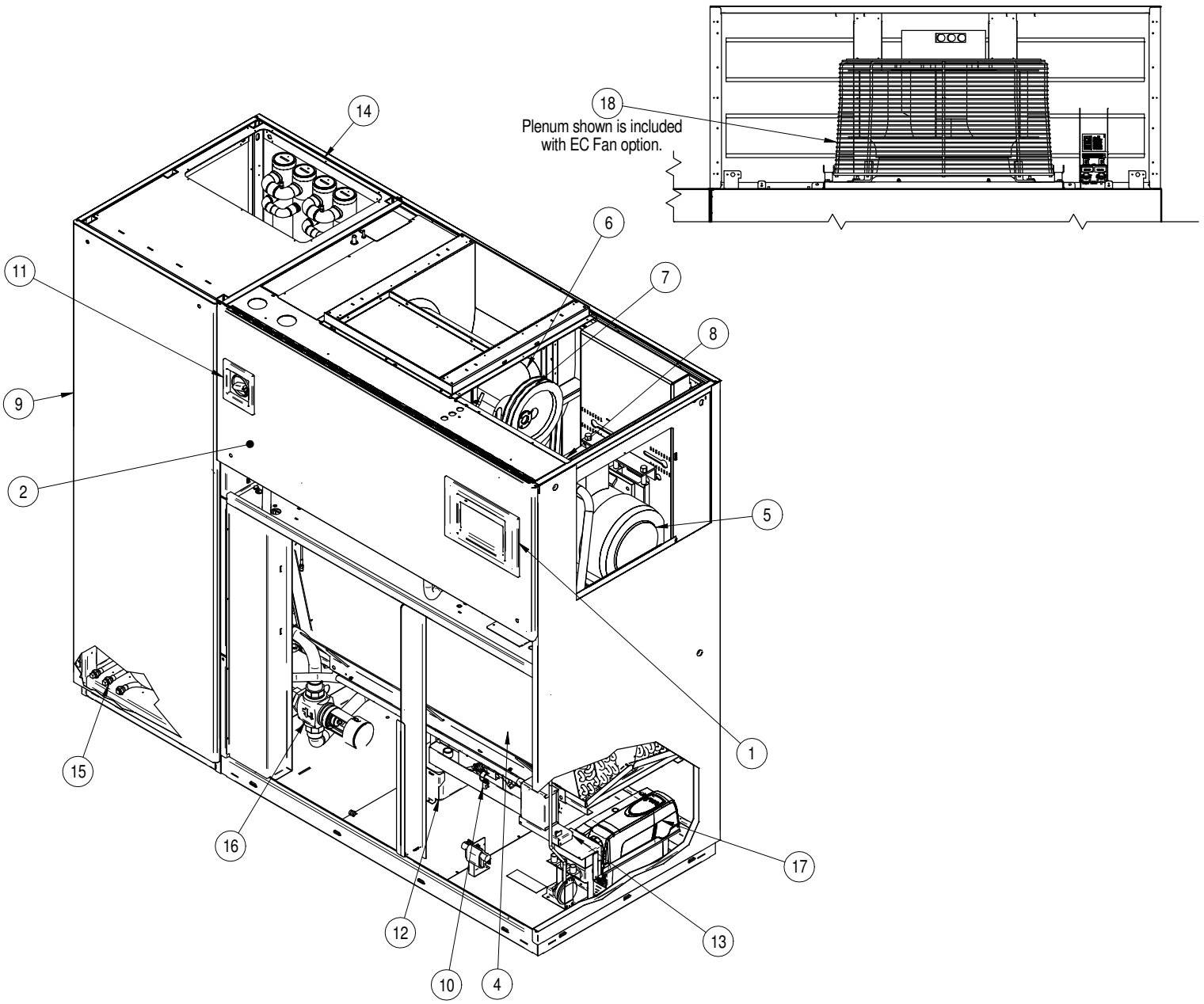
COMPONENT LOCATION
DOWNFLOW MODELS





1.	iCOM Control Display
2.	Electric Box
3.	Filters
4.	Evaporator Coil
5.	Compressor Section
6.	Infrared Humidifier (optional)
7.	Disconnect
8.	Condensate Pump (optional)
9.	Smoke Sensor (optional)
10.	Condenser Clean out Plugs (fluid cooled units only)
11.	Condenser Drain Plugs (fluid cooled units only)
12.	Econ-o-coil Valve (Glycol/Dual cooling)
13.	EC Fans

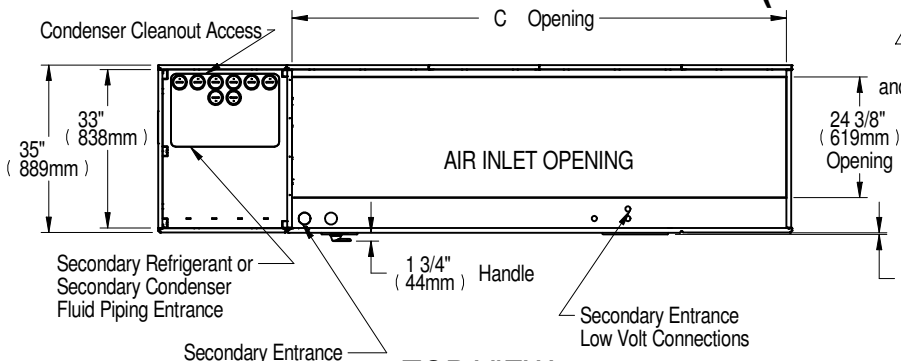
COMPONENT LOCATION
UPFLOW 28-42kW (8-12 TONS) MODELS



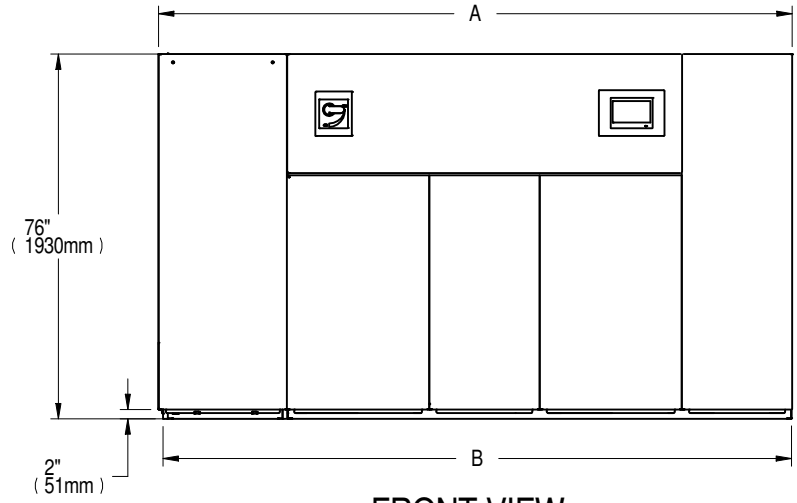
1. iCOM Control Display
2. Electric Box
3. Filters (not shown for clarity)
4. Evaporator Coil
5. Motor
6. Blower
7. Fan Pulley
8. Motor Sheave and Belts
9. Compressor Section
10. Infrared Humidifier (optional)
11. Disconnect (optional)
12. Condensate Pump (optional)
13. Smoke Sensor (optional)
14. Condenser Clean out Plugs (fluid cooled units only)
15. Condenser Drain Plugs (fluid cooled units only)
16. Econ-o-coil Valve (Glycool/Dual Cooling)
17. Variable Frequency Drive (optional on digital scroll units only)
18. EC Fans (optional)

CABINET DIMENSIONAL DATA

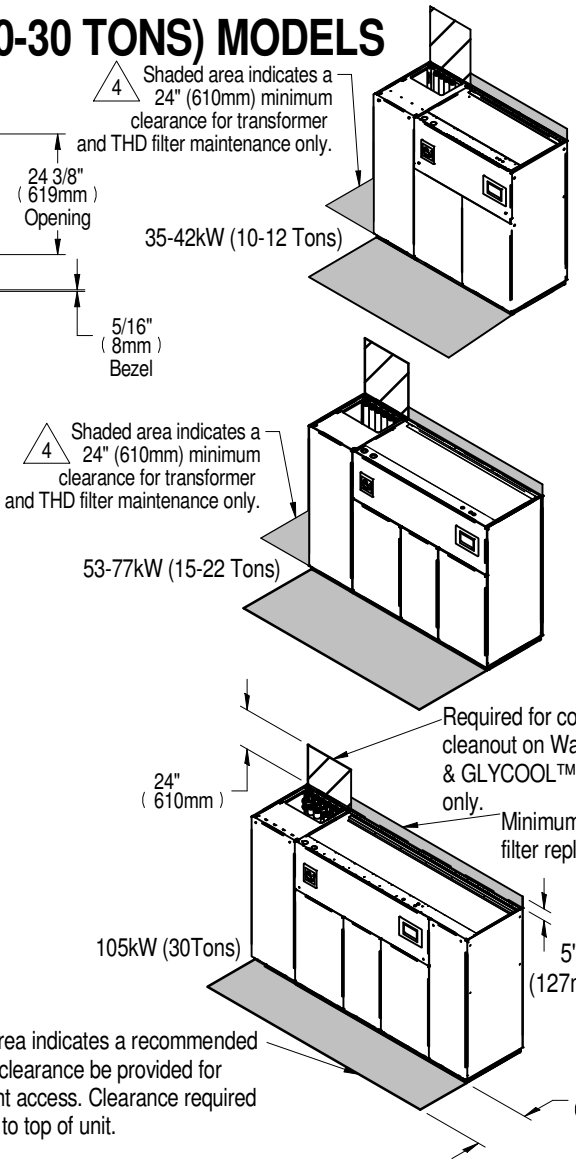
DOWNFLOW 35-105kW (10-30 TONS) MODELS



TOP VIEW



FRONT VIEW



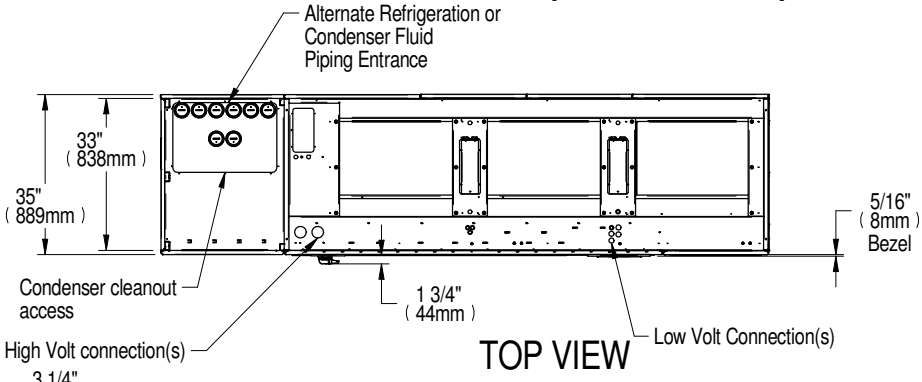
Notes:
1. Filters are accessible through top of unit only.
2. Downflow electrical connections can be made from top or bottom of unit
3. All notes, references, and dimensions not in table are typical for all downflow models.

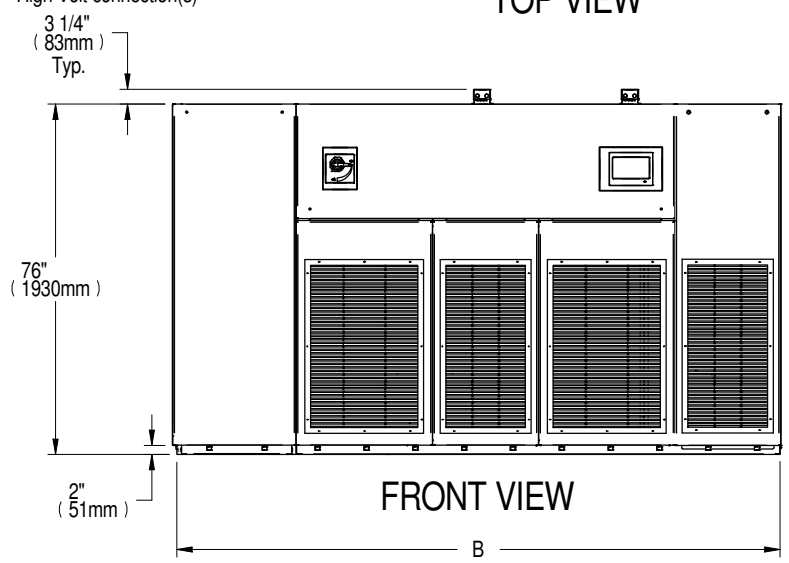
4. Unit power must be off when performing transformer and THD filter maintenance.

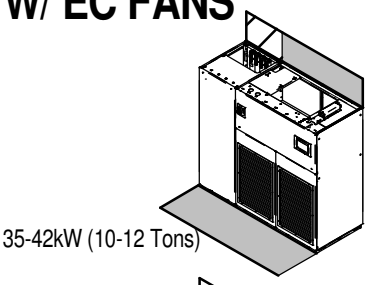
Model Number	Compressor Type	Cooling Type	A in. (mm)	B in. (mm)	C in. (mm)
35kW - 42kW	Scroll or Digital Scroll	Air Cooled & AirCooled w/ Dual Cool	73 (1854)	72 (1854)	56-7/8 (1445)
		Water/Glycol/GLYCOOL™/Dual Cool	86 (2184)	85 (2184)	
53kW - 70kW	Scroll or Digital Scroll	Air Cooled & AirCooled w/ Dual Cool	98 (2489)	97 (2489)	80 (2032)
		Water/Glycol/GLYCOOL™/Dual Cool	109 (2769)	108 (2743)	
77kW	Scroll	Air Cooled & AirCooled w/ Dual Cool	98 (2489)	97 (2489)	
	Semi-Hermetic	Air Cooled & AirCooled w/ Dual Cool	109 (2769)	108 (2743)	
		Water/Glycol/GLYCOOL™/Dual Cool			
105kW	Scroll	Air Cooled & AirCooled w/ Dual Cool	132 (3353)	131 (3327)	102-13/16 (2611)
	Semi-Hermetic	Air Cooled & AirCooled w/ Dual Cool			
		Water/Glycol/GLYCOOL™/Dual Cool			

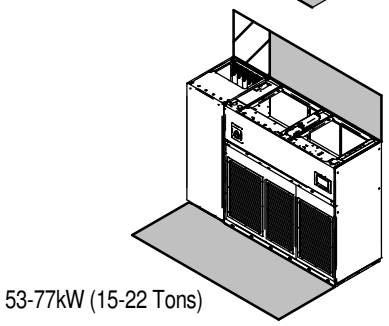
CABINET DIMENSIONAL DATA

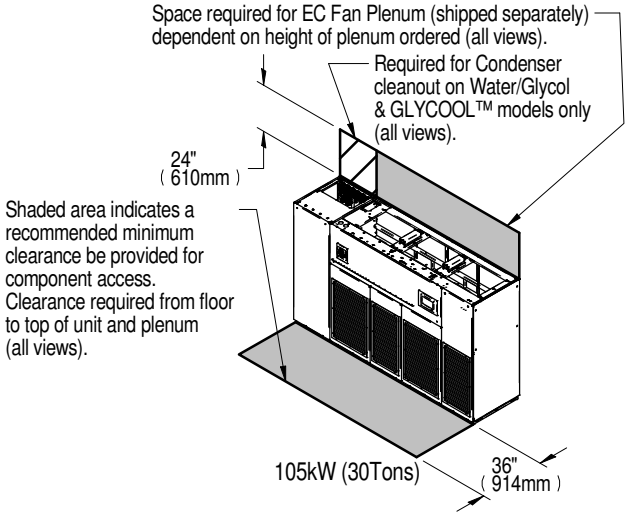
UPFLOW 35-105kW (10-30 TONS) MODELS W/ EC FANS











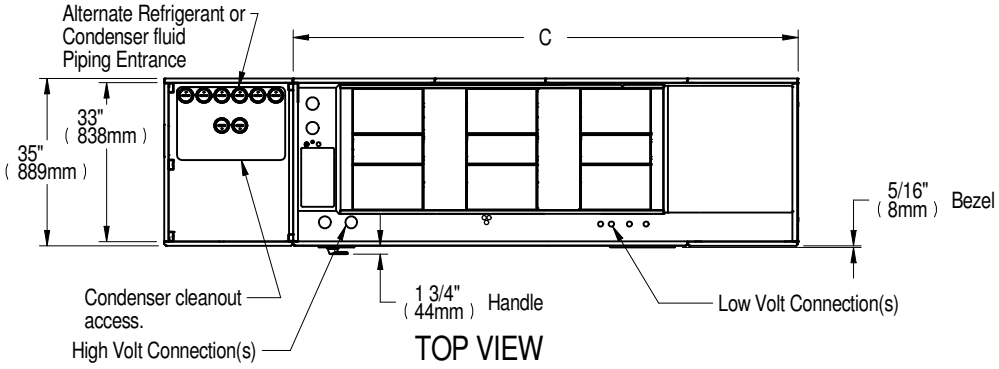
Note:
1. Front air return unit shown. For rear return unit, in addition to front service area shown, also include 25" (635mm) on one side of unit for access to rear return filter box. See DPN003974.
2. EC fans plenum is not shown. EC fans and plenum shipped separately. See DPN003458, DPN003453, & DPN003459 for unit dimensions with EC fans plenum mounted.
3. All notes, references, and dimensions not included in table are typical on all Upflow EC Fan units.

Model Number	Compressor Type	Cooling Type	A in. (mm)	B in. (mm)
35kW - 42kW	Scroll or Digital Scroll	AirCooled/Air Cooled w/Dual Cool	73 (1854)	72 (1829)
		Water/Glycol/GLYCOOL™/Dual Cool	86 (2184)	85 (2159)
53kW - 70kW	Scroll or Digital Scroll	AirCooled/Air Cooled w/Dual Cool	98 (2489)	97 (2464)
		Water/Glycol/GLYCOOL™/Dual Cool	109 (2769)	108 (2743)
77kW	Scroll	AirCooled	98 (2489)	97 (2464)
	Semi-hermetic	AirCooled/Air Cooled w/Dual Cool	109 (2769)	108 (2743)
		Water/Glycol/GLYCOOL™/Dual Cool		
105kW	Scroll	AirCooled	132 (3353)	131 (3327)
	Semi-hermetic	AirCooled/Air Cooled w/Dual Cool		
		Water/Glycol/GLYCOOL™/Dual Cool		

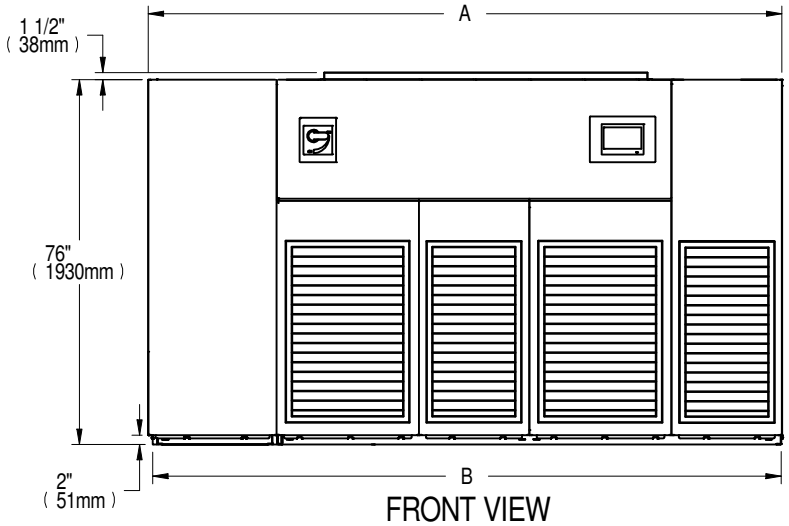
LIEBERT DS

CABINET DIMENSIONAL DATA

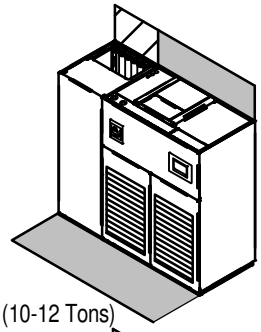
UPFLOW 35-105kW (10-30 TONS) W/ FORWARD CURVED BLOWERS



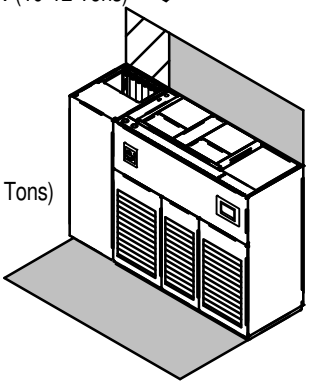
TOP VIEW



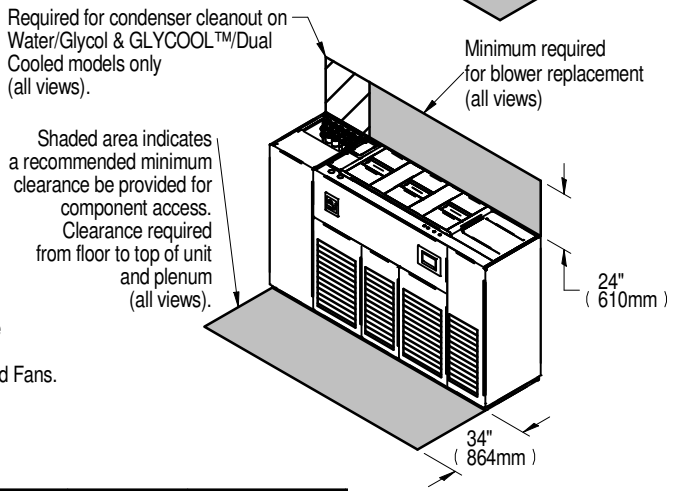
FRONT VIEW



35-42kW (10-12 Tons)



53-77kW (15-22 Tons)



105kW (30 Tons)

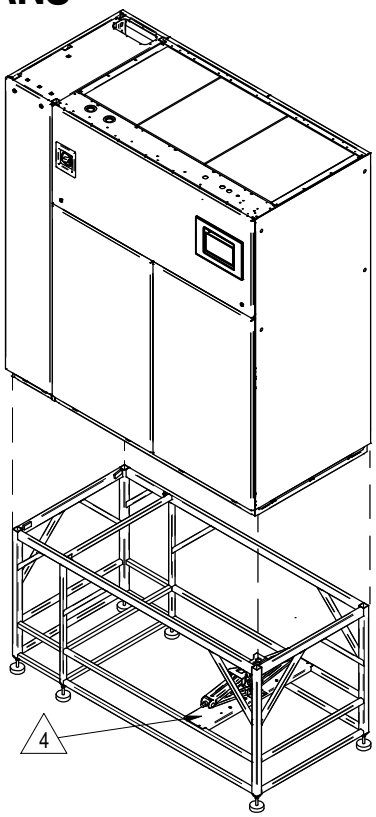
Notes:
1. Front air return unit shown. For rear return unit, in addition to front service area shown, also include 25" (635mm) on one side of unit for access to rear return filter box. See DPN001196.
2. All dimensions, references, and notes not in table are typical to all Upflow units with Forward Curved Fans.
3. Digital Scroll compressors not available on Air Cooled 42kW models.

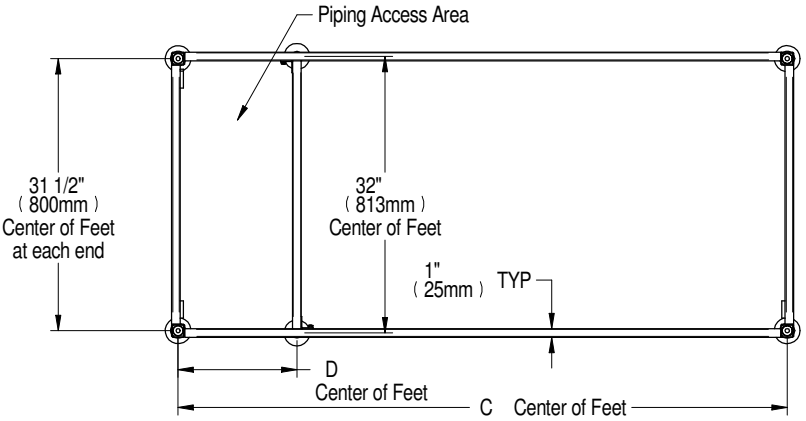
Model Number	Compressor Type	Cooling Type	A in. (mm)	B in. (mm)	C in. (mm)
35kW - 42kW	Scroll or Digital Scroll [3]	AirCooled/Air Cooled w/Dual Cool	73 (1854)	72 (1829)	59-1/4 (1504)
		Water/Glycol/GLYCOOL™/Dual Cool	86 (2184)	85 (2159)	
53kW - 70kW	Scroll or Digital Scroll	AirCooled/Air Cooled w/Dual Cool	98 (2489)	97 (2464)	82-1/8 (2086)
		Water/Glycol/GLYCOOL™/Dual Cool	109 (2769)	108 (2743)	
77kW	Scroll	AirCooled	98 (2489)	97 (2464)	
	Semi-hermetic	AirCooled/Air Cooled w/Dual Cool	109 (2769)	108 (2743)	
		Water/Glycol/GLYCOOL™/Dual Cool			
105kW	Scroll	AirCooled	132 (3353)	131 (3327)	105-1/4 (2673)
	Semi-hermetic	AirCooled/Air Cooled w/Dual Cool			
		Water/Glycol/GLYCOOL™/Dual Cool			

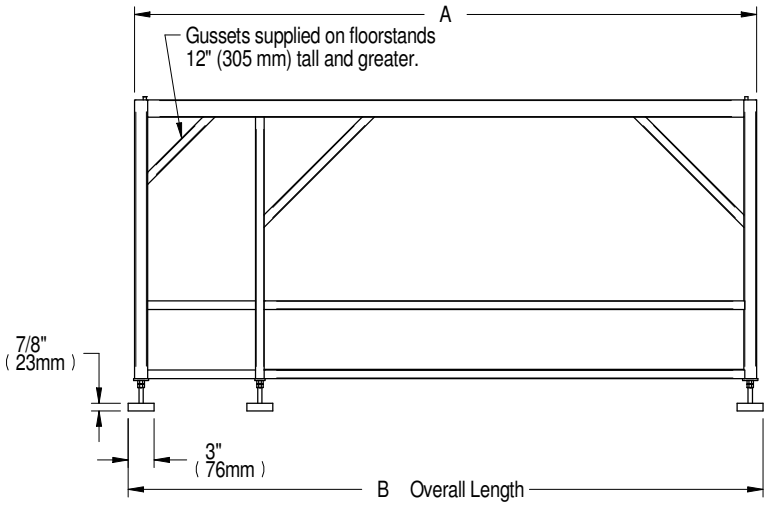
LIEBERT DS

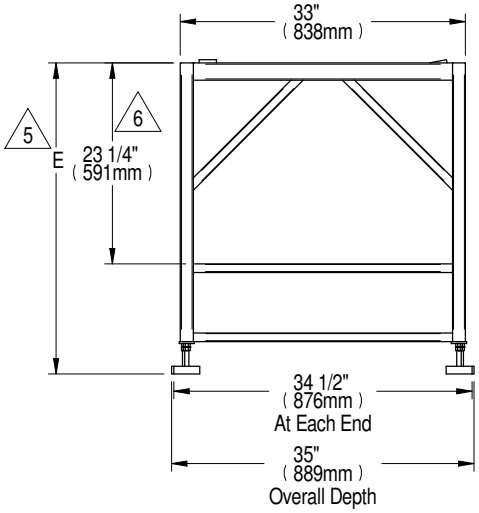
FLOORSTAND DIMENSIONAL DATA
35kW - 42kW (10-12 TONS) W/ EC FANS

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 DS is critical for lowering the EC fans. Unless the floorstand is installed in the correct position, the blowers will not lower into the floor stand.
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 for Downflow units.
5. Leveling feet are provided with ± 1-1/2" (38mm) adjustment from nominal height "E".
6. Applies to 36", 42", & 48" Floorstands.









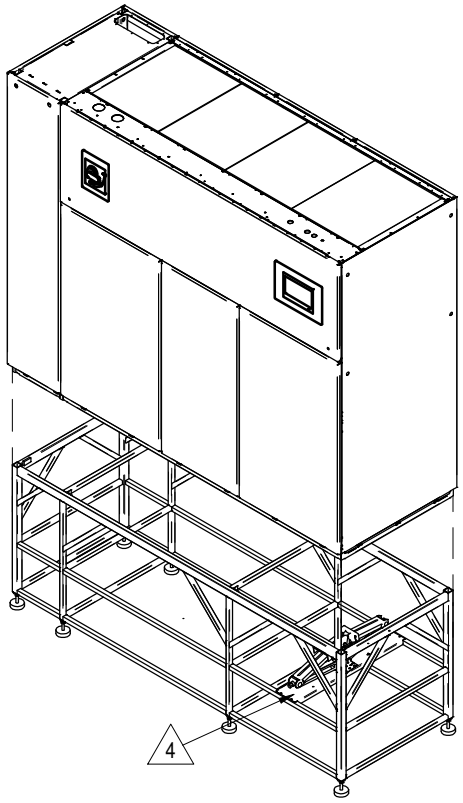
Model	Dimensional Data in. (mm)			
	A	B	C	D
35kW - 42kW Water/Glycol/GLYCOOL™ Scroll & Digital Scroll Models	85 (2159)	86-1/2 (2197)	83-1/2 (2121)	26-3/4 (679)
35kW - 42kW Air-Cooled Scroll and Digital Scroll Models	72 (1829)	73-1/2 (1867)	70-1/2 (1791)	13-3/4 (349)

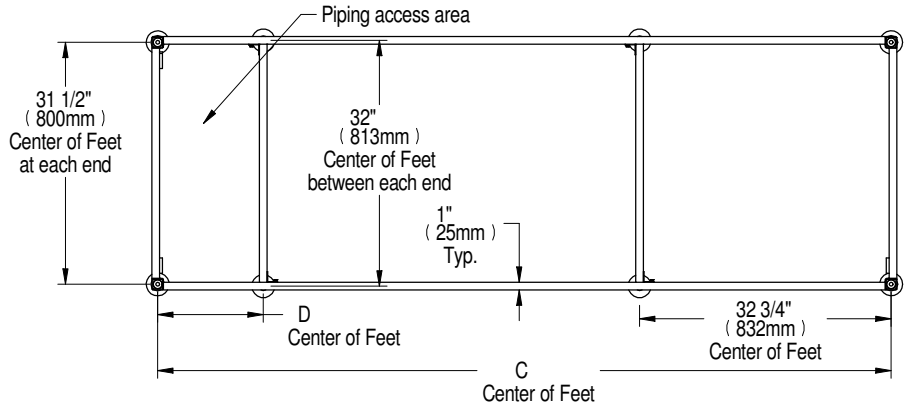
Height in. (mm) 5
E
24 (610)
30 (762)
36 (914)
42 (1069)
48 (1219)

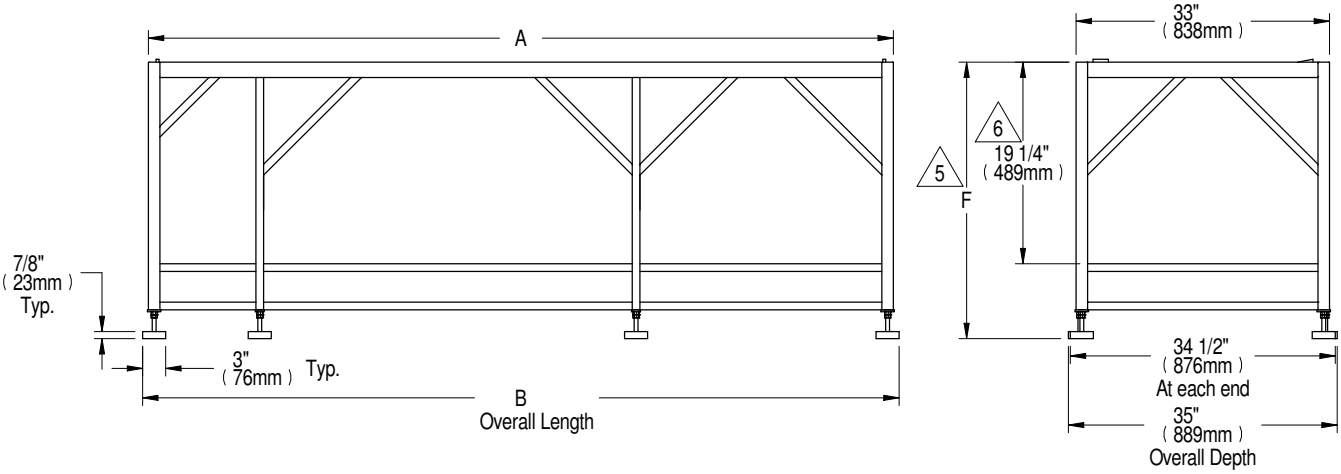
LIEBERT DS

FLOORSTAND DIMENSIONAL DATA
53kW-77kW (15-22 TONS) 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 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 DS is critical for lowering the EC fans. Unless the floorstand is installed in the correct position, the blowers will not lower into the floor stand.
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 for Downflow units.
5. Leveling feet are provided with ± 1-1/2" (38mm) adjustment from nominal height "F".
6. Applies to 36", 42" & 48" Floorstand.





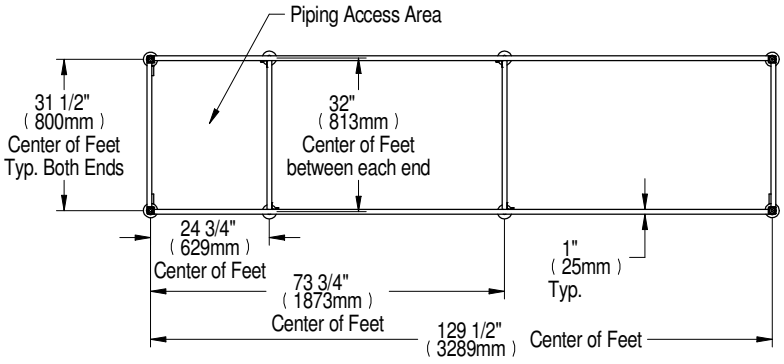


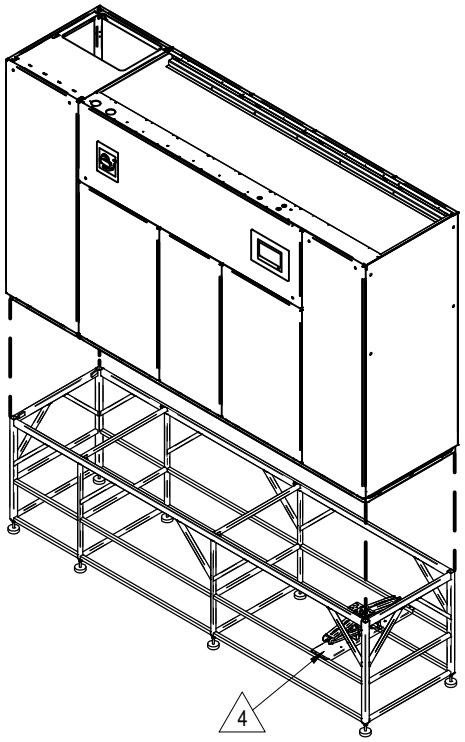
	Dimensional Data in (mm)			
	A	B	C	D
53kW - 70kW, Water/Glycol/GLYCOOL™ Scroll Models	108 (2743)	109-1/2 (2781)	106-1/2 (2705)	24-3/4 (629)
53kW - 70kW, Air-Cooled Scroll and Air-Cooled Digital Scroll Models	97 (2464)	98-1/2 (2502)	95-1/2 (2426)	13-3/4 (349)
77kW, All Semi-hermetic Models	108 (2743)	109-1/2 (2781)	106-1/2 (2705)	24-3/4 (629)
77kW, Air-Cooled Scroll Models	97 (2464)	98-1/2 (2502)	95-1/2 (2426)	13-3/4 (349

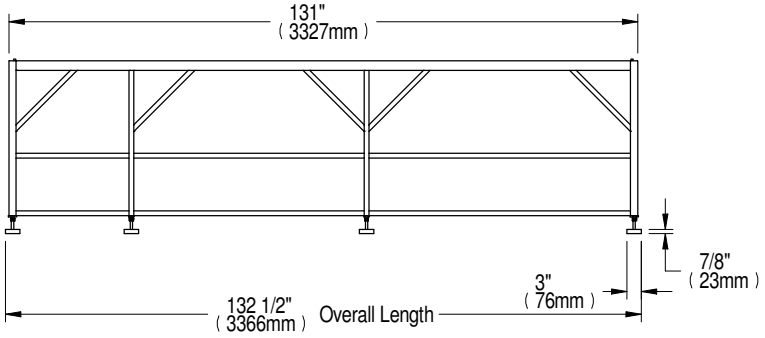
Height in (mm)
F 5
24 (610)
30 (762)
36 (914)
42 (1067)
48 (1219)

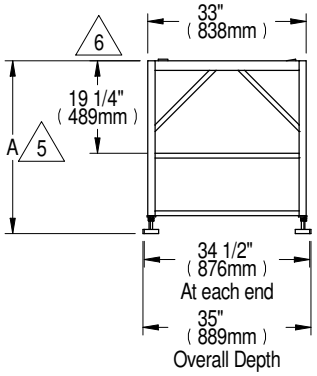
LIEBERT DS

FLOORSTAND DIMENSIONAL DATA
105kW (30 TONS) MODELS W/ EC FANS









Notes:

1. This floorstand should be used when EC fans are intended to be lowered under a 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 DS 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 for Downflow units.

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

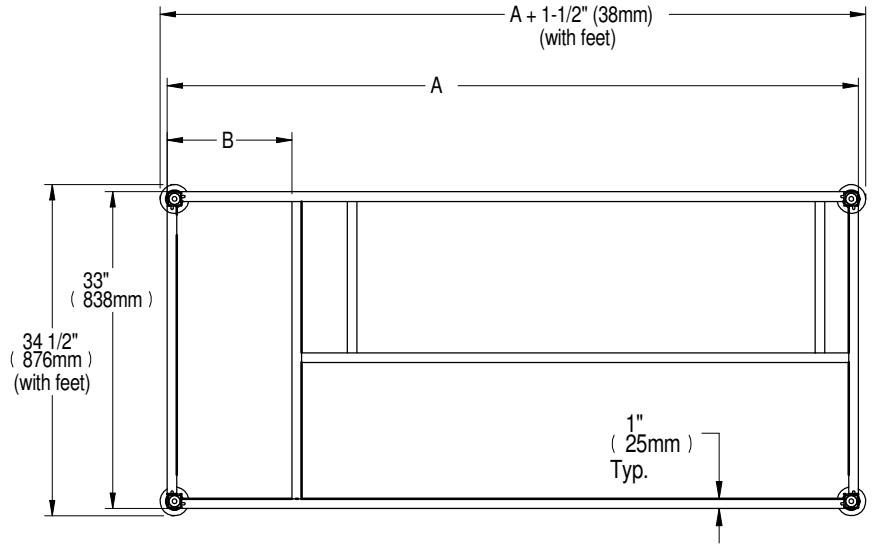
6. Applies to 36", 42", & 48" Floorstands.

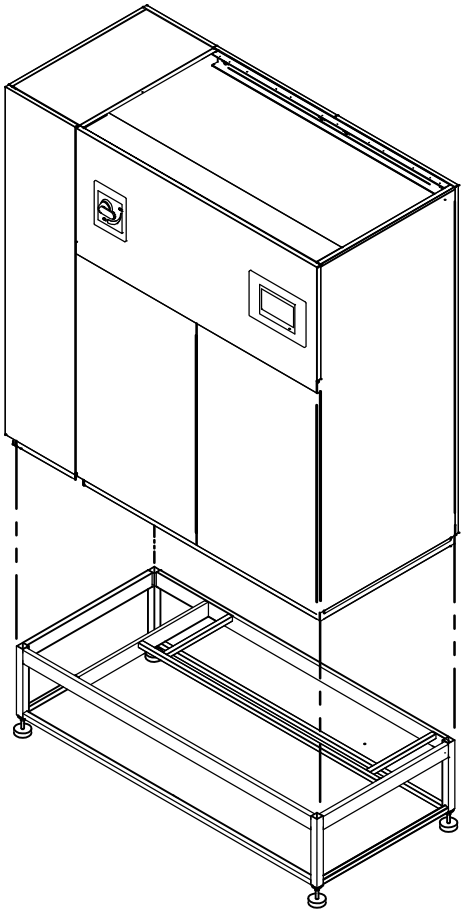
Height in (mm)
A 5
24 (610)
30 (762)
36 (914)
42 (1067)
48 (1219)

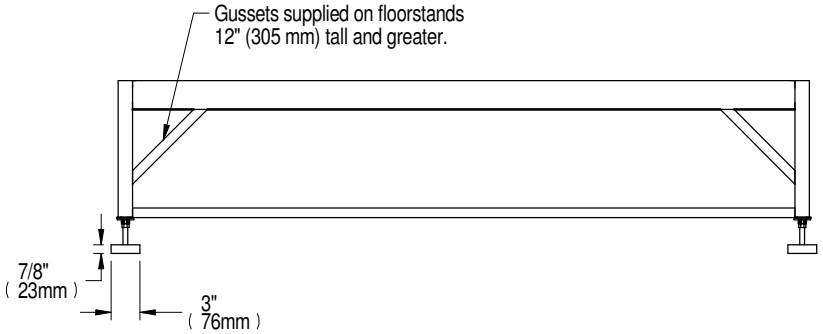
LIEBERT DS

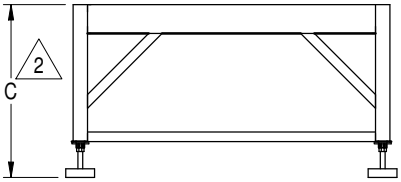
FLOORSTAND & FLOOR PLANNING DIMENSIONAL DATA

UPFLOW 35-42kW (10-12 TONS) MODELS W/ FORWARD CURVED BLOWERS









Dimensional Data in (mm)		
	A	B
Water/Glycol/GLYCOOL™ cooled Scroll & Digital Scroll Models	85 (2159)	26 (660)
Air-Cooled Scroll and Digital Scroll Models △3	72 (1829)	13 (330)

Height in (mm)
C △2
9 (229)
12 (305)
15 (381)
18 (457)
21 (533)
24 (610)

Notes:

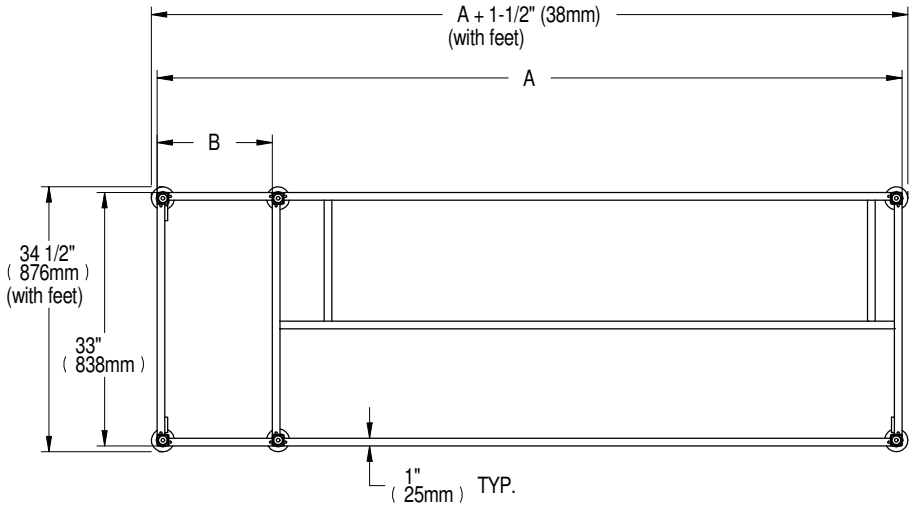
1. Right side of paneled unit is flush with right side of floorstand. All other paneled sides overhang floorstand 1" (25mm).

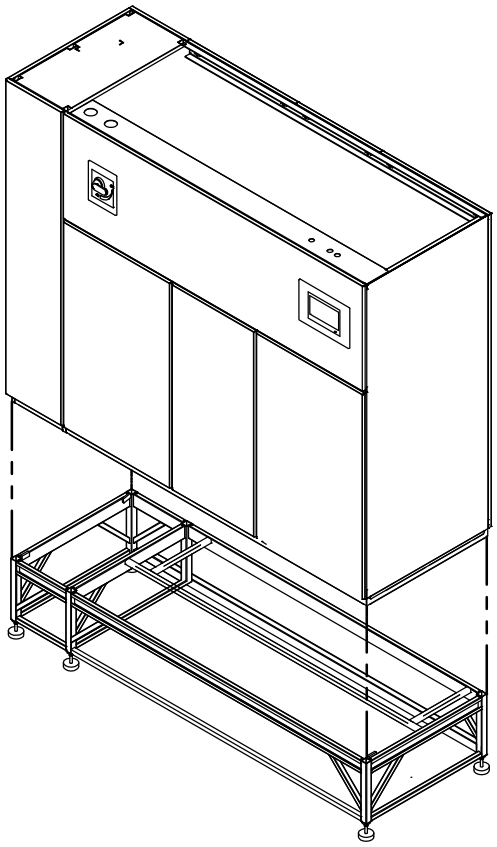
△2. Leveling feet are provided with ± 1-1/2" (38mm) adjustment from nominal height C.

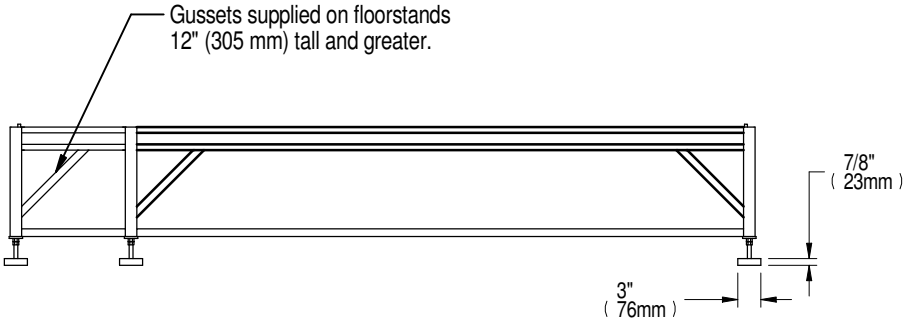
△3. Digital Scroll compressors not available on Air Cooled 42kW models.

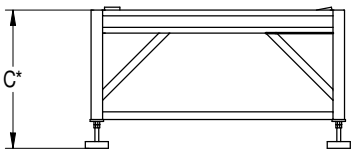
LIEBERT DS

FLOORSTAND & FLOOR PLANNING DIMENSIONAL DATA
UPFLOW 53-77kW (15-22 TONS) MODELS W/ FORWARD CURVED BLOWERS









Dimensional Data in. (mm)		
	A	B
Air-Cooled Semi-Hermetic and all Water/Glycol/GLYCOOL™ Models △3	108 (2743)	26 (660)
Air-Cooled Scroll and Air-Cooled Digital Scroll Models	97 (2464)	15 (381)

Height in (mm)
C △2
9 (229)
12 (305)
15 (381)
18 (457)
21 (533)
24 (610)

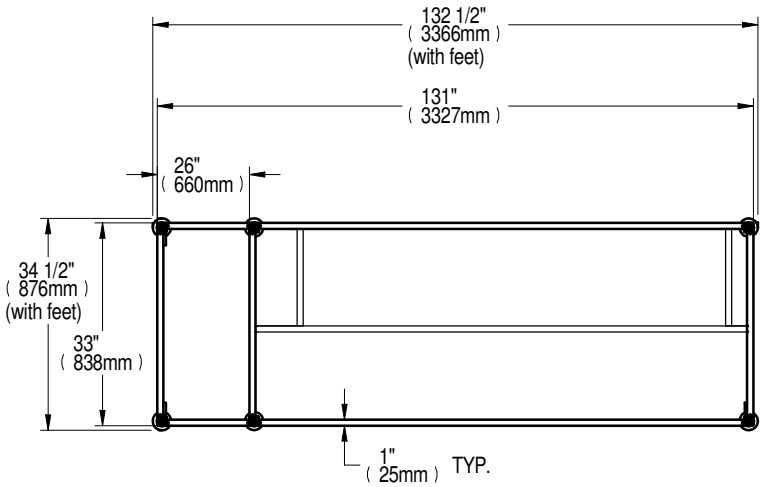
Notes:
1. Right side of paneled unit is flush with right side of floorstand. All other paneled sides overhang floorstand 1" (25mm).

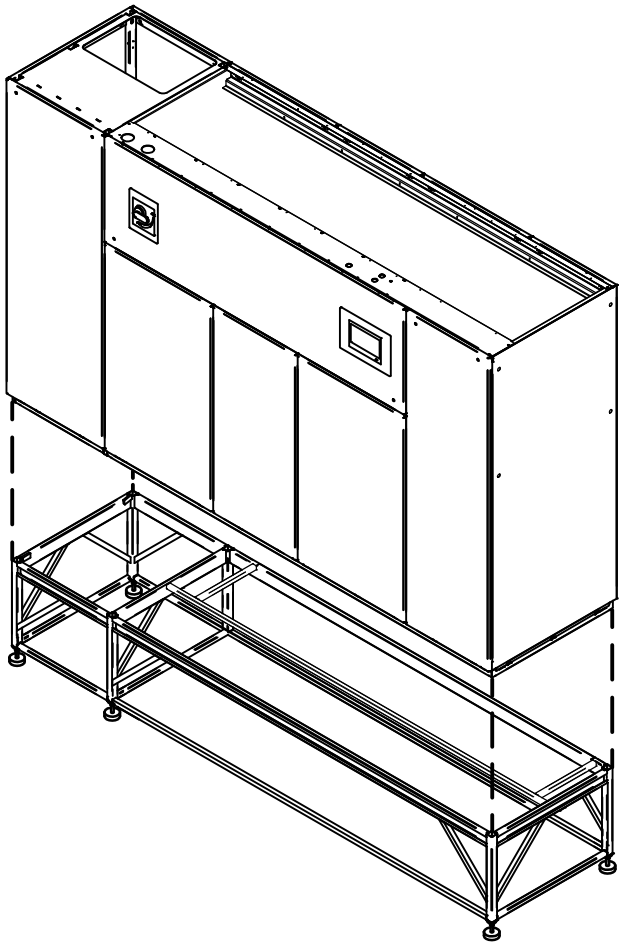
△2. Leveling feet are provided with ± 1-1/2" (38mm) adjustment from nominal height C.

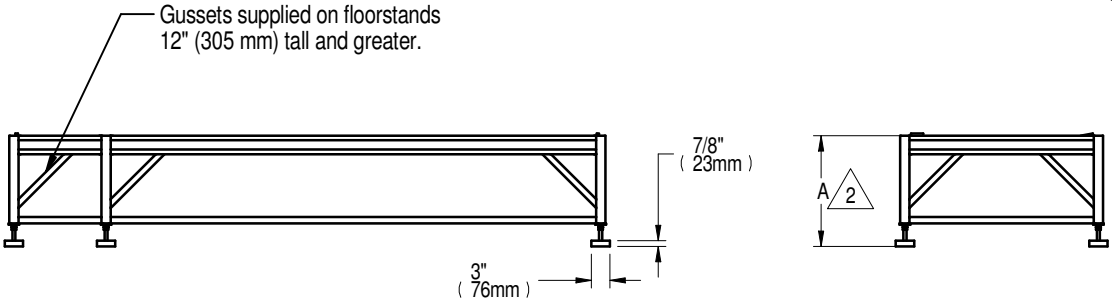
△3. Semi-Hermetic Compressor only available on 77kW models.

LIEBERT DS

FLOORSTAND & FLOOR PLANNING DIMENSIONAL DATA
UPFLOW 105kW (30 TONS) MODELS W/ FORWARD CURVED BLOWERS



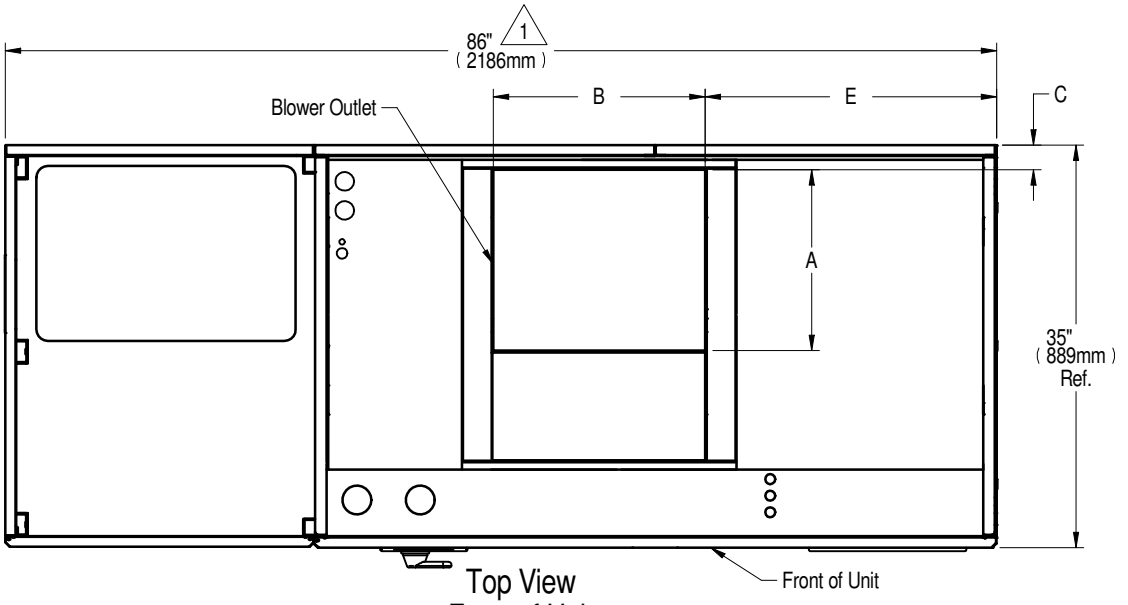




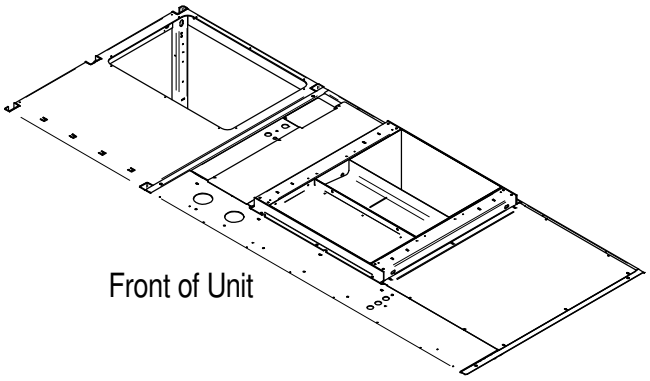
Height in. (mm)
A 2
9 (229)
12 (305)
15 (381)
18 (457)
21 (533)
24 (610)

Notes:
1. Right side of paneled unit is flush with right side of floorstand. All other paneled sides overhang floorstand 1" (25mm).
2. Leveling feet are provided with ± 1-1/2" (38mm) adjustment from nominal height A.

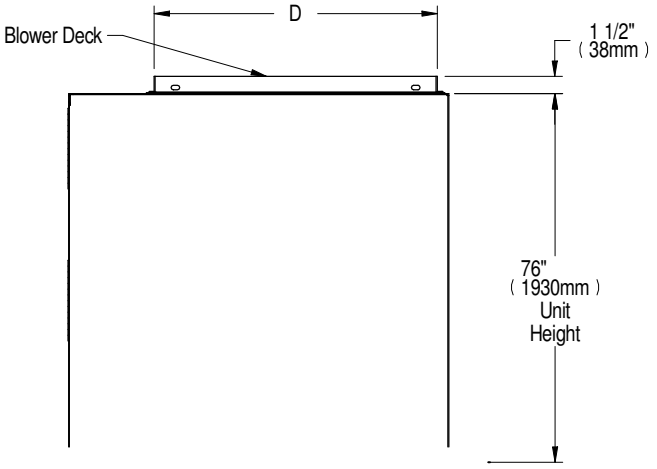
BLOWER OUTLET & DECK DIMENSIONAL DATA
UPFLOW 35-42kW (10-12 TONS) W/ FORWARD CURVED BLOWERS



Top View
Front of Unit



Front of Unit



Right Side View

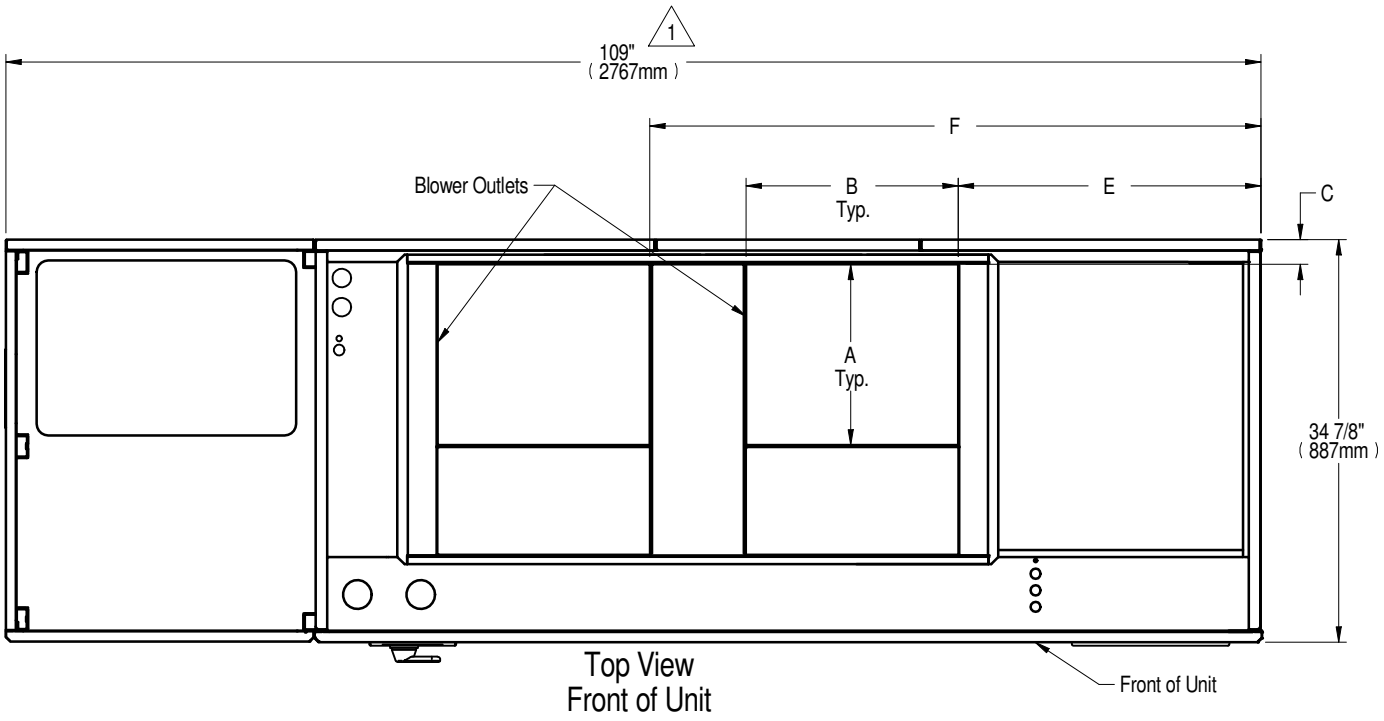
Notes:

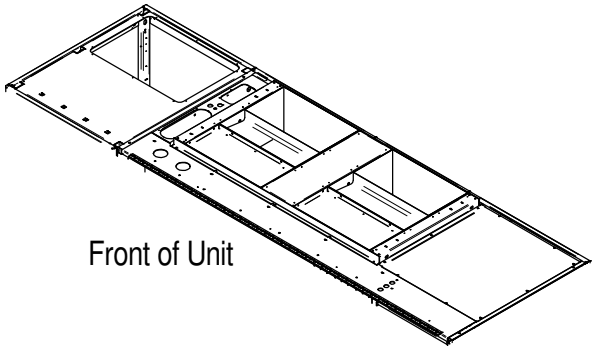
1. Applies to units with Semi-Hermetic compressor section.
   Dimension for units with Scroll type compressor section is 73" (1854mm).
2. Digital Scroll compressors not available on Air Cooled 42kW models.

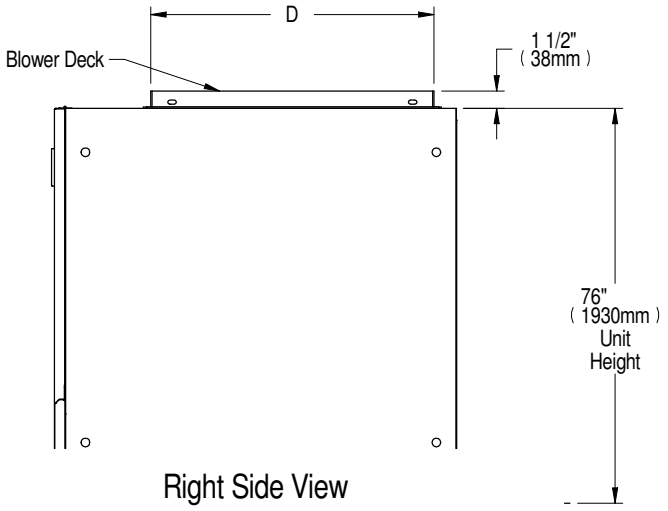
BLOWER	SUPPLY	DIMENSIONAL DATA inches (mm)				
		A	B	C	D	E
15 x 15	FRONT THROW	15-7/8 (404)	18-5/8 (472)	2-1/8 (54)	24-5/8 (625)	25-1/4 (641)
	REAR THROW			11-5/8 (295)		
15 x 11	FRONT THROW		14-3/4 (375)	2-1/8 (54)		
	REAR THROW			11-5/8 (295)		

LIEBERT DS

BLOWER OUTLET & DECK DIMENSIONAL DATA
UPFLOW 53-77kW (15-22 TONS) W/ FORWARD CURVED BLOWERS







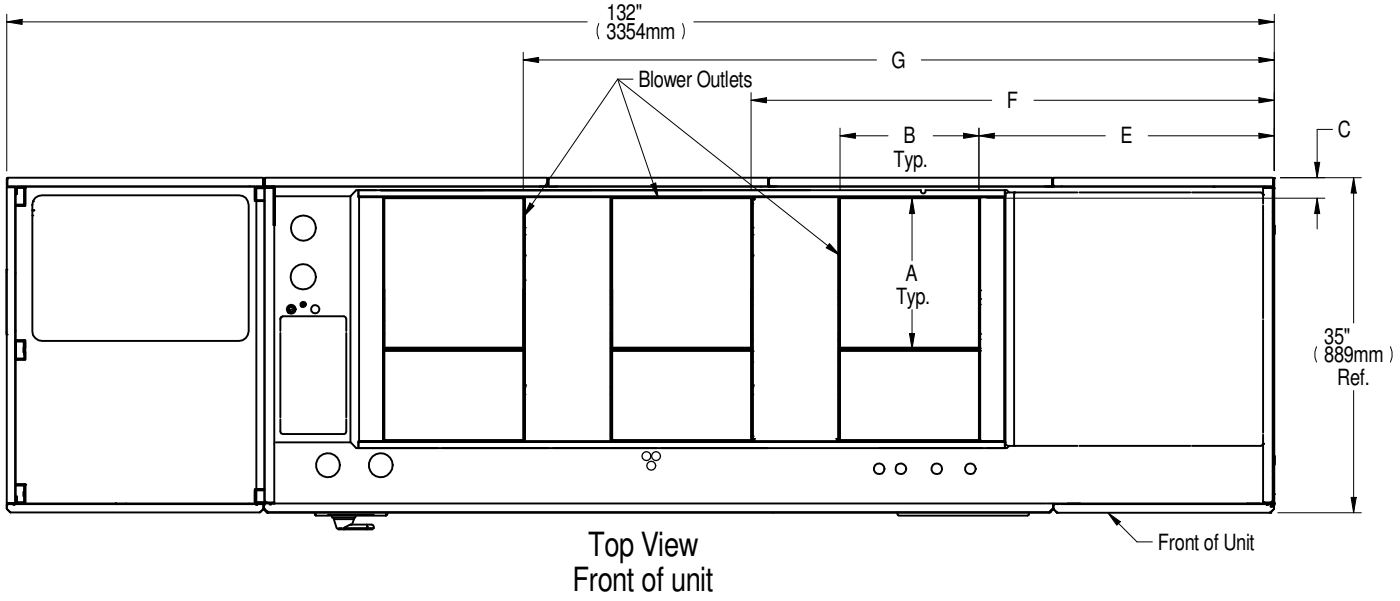
Notes:

1. Applies to units with Semi-Hermetic compressor section.
Dimension for units with Scroll type compressor section is 98" (2489mm).

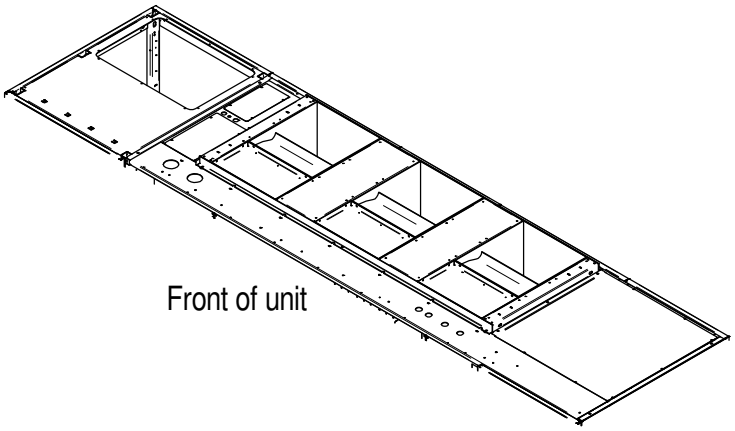
MODELS	BLOWER	SUPPLY	DIMENSIONAL DATA inches (mm)					
			A	B	C	D	E	F
53-77kW (15-22 Tons)	15 x 15	FRONT THROW	15-7/8 (404)	18-5/8 (472)	2-1/8 (54)	24-5/8 (625)	27-7/8 (708)	54-1/2 (1384)
		REAR THROW			11-5/8 (295)			
	15 x 11	FRONT THROW		14-3/4 (375)	2-1/8 (54)		31-3/8 (797)	58-1/2 (1486)
		REAR THROW			11-5/8 (295)			

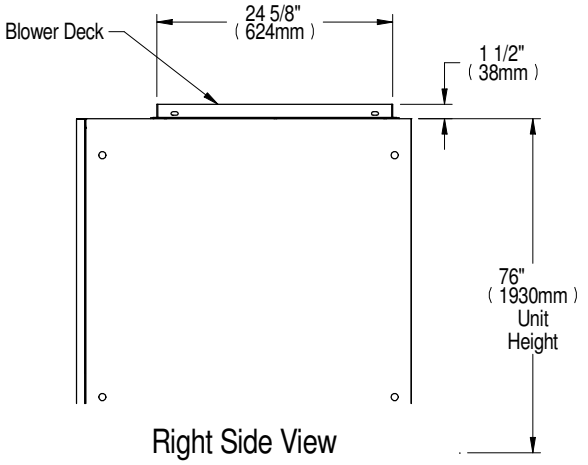
BLOWER OUTLET & DECK DIMENSIONAL DATA

UPFLOW 105kW (30 TONS) W/ FORWARD CURVED BLOWERS



Top View
Front of unit

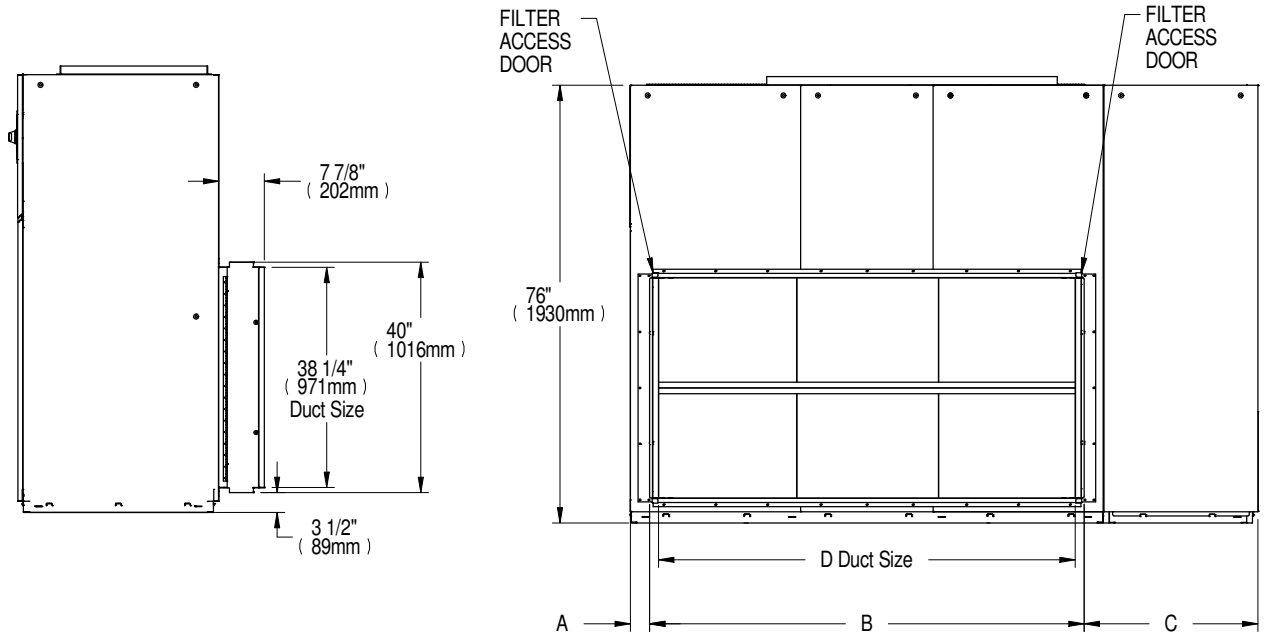




Right Side View

BLOWER	SUPPLY	DIMENSIONAL DATA inches (mm)						
		A	B	C	D	E	F	G
15 x 11	FRONT THROW	15-7/8 (404)	14-3/4 (375)	2-1/8 (54)	24-5/8 (625)	30-3/4 (781)	54-1/2 (1384)	78-1/4 (1988)
	REAR THROW			11-5/8 (295)				

REAR RETURN FILTER BOX DIMENSIONAL DATA
UPFLOW 35-105kW (10-30 TONS) ALL COMPRESSOR MODELS W/ FORWARD CURVED BLOWERS



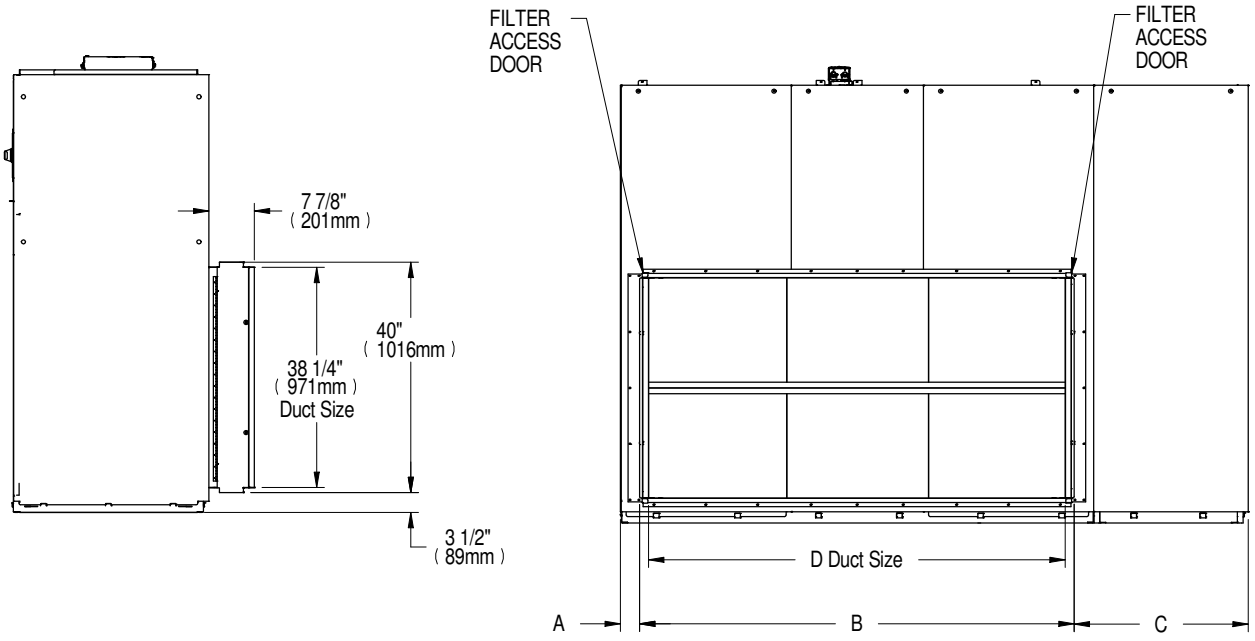
Notes:
1. Filters can be accessed from either side.
2. 25" (635mm) minimum clearance provided on one side for filter access.
3. Filter boxes are shipped flat and must be field assembled.

4. Digital Scroll compressors not available on Air Cooled 42kW models.

Rear Return Filter Box Dimensional Data in (mm)					
	A	B	C	D	# Filters
35-42kW, Air-Cooled Scroll and Air-Cooled Digital Scroll Models 4	4-1/4 (108)	50-3/4 (1289)	18 (457)	47-5/8 (1210)	4
35-42kW all Water/Glycol/GLYCOOL™ Models			31 (787)		
53-70kW, Air-Cooled Scroll and Air-Cooled Digital Scroll Models	3-1/4 (83)	75-1/2 (1918)	19-1/4 (489)	72-3/8 (1838)	6
53-70kW all Water/Glycol/GLYCOOL™ Models			30-1/4 (768)		
77kW, Air Cooled Scroll Models			19-1/4 (489)		
77kW, All Semi-hermetic Models and all Water/Glycol/GLYCOOL™ Models			30-1/4 (768)		
105kW, All Models	2-1/4 (57)	100-1/4 (2546)	29-1/2 (749)	97-1/8 (2467)	8

LIEBERT DS

REAR RETURN FILTER BOX DIMENSIONAL DATA
UPFLOW 35-105kW (10-30 TONS) W/ EC FANS ALL COMPRESSOR MODELS



Notes:
1. Filters can be accessed from either side.
2. 25" (635mm) minimum clearance provided on one side for filter access.
3. Filter boxes are shipped flat and must be field assembled.

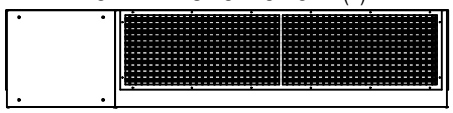
Rear Return Filter Box Dimensional Data in (mm)					
	A	B	C	D	# Filters
35-42kW, Air-Cooled Scroll and Air-Cooled Digital Scroll Models	4-1/4 (108)	50-3/4 (1289)	18 (457)	47-5/8 (1210)	4
35-42kW all Water/Glycol/GLYCOOL™ Models			31 (787)		
53-70kW, Air-Cooled Scroll and Air-Cooled Digital Scroll Models	3-1/4 (83)	75-1/2 (1918)	19-1/4 (489)	72-3/8 (1838)	6
53-70kW all Water/Glycol/GLYCOOL™ Models			30-1/4 (768)		
77kW, Air Cooled Scroll Models			19-1/4 (489)		
77kW, All Semi-hermetic Models and all Water/Glycol/GLYCOOL™ Models			30-1/4 (768)		
105kW, All Models	2-1/4 (57)	100-1/4 (2546)	29-1/2 (749)	97-1/8 (2467)	8

LIEBERT DS

UPFLOW PLENUM DIMENSIONAL DATA

35kW-105kW (10-30 TONS) MODELS W/ FORWARD CURVED BLOWERS

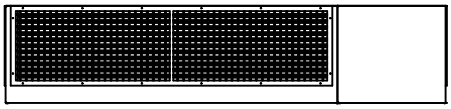
FRONT VIEWS - CHECK ONE (1):



☐ WITH FRONT GRILLE

☐ WITHOUT GRILLE

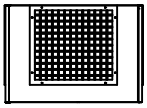
REAR VIEWS - CHECK ONE (1):



☐ WITH REAR GRILLE

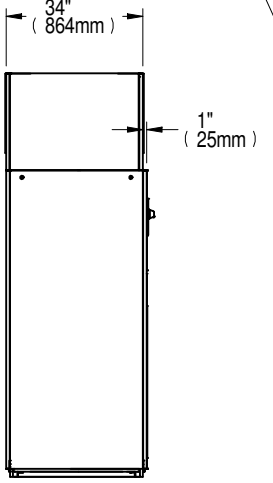
☐ WITHOUT GRILLE

LEFT SIDE VIEWS - CHECK ONE (1):

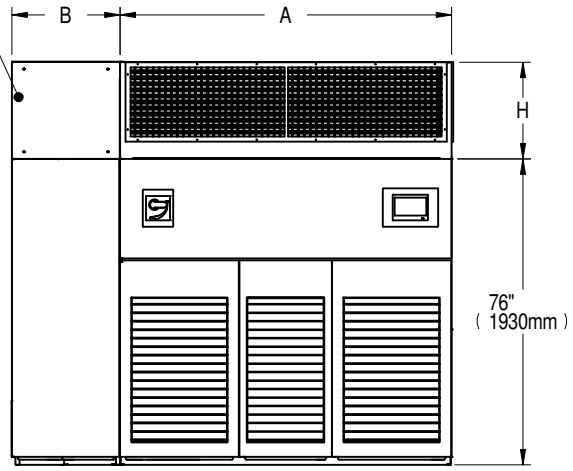


☐ WITH GRILLE

☐ WITHOUT GRILLE

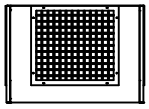


SIDE VIEW - UNIT WITH PLENUM

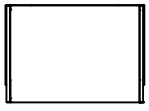


FRONT VIEW - UNIT WITH PLENUM

RIGHT SIDE VIEWS - CHECK ONE (1):



☐ WITH GRILLE



☐ WITHOUT GRILLE

Plenum Dimensional Data in (mm)			Grille Size in (mm) - Nominal	
	A	B	Front/Rear Grilles	Side Grille
35kW-42kW, Air-Cooled Scroll ⚠5 and Air-Cooled Digital Scroll Models	59-1/4 (1505)	13-3/4 (349)	18 (457) X 55 (1397)	18 (457) X 20 (508)
35kW-42kW Water/Glycol/GLYCOOL™ Models		26-3/4 (679)		
53kW-70kW, Air-Cooled Scroll and Air-Cooled Digital Scroll Models	82-1/4 (2089)	15-3/4 (400)	18 (457) X 78 (1981)	
53kW-70kW Water/Glycol/GLYCOOL™ Models		26-3/4 (679)		
77kW, Air-Cooled Scroll Models		15-3/4 (400)		
77kW, All Semi-Hermetic Models and all Water/Glycol/GLYCOOL™ Models		26-3/4 (679)		
105kW, All Models	105-1/4 (2673)		(1) 18 (457) X 20 (508) (1) 18 (457) X 78 (1981)	

Height H in (mm)	PLENUM CONFIGURATION
20 (508)	NON GRILLED
24 (610)	NON-GRILLED, FRONT DISCHARGE OR REAR DISCHARGE
36 (914)	NON-GRILLED

Notes:
1. Typical 53kW-77kW (15-22 Tons) unit orientation shown with grille Plenum. View varies by unit size and Plenum selection.
2. Optional grille Plenum kits must include front or rear grille.
3. Non-grille Plenums are open on the top and not designed with duct flange.
4. All Plenums are shipped flat and must be field assembled.

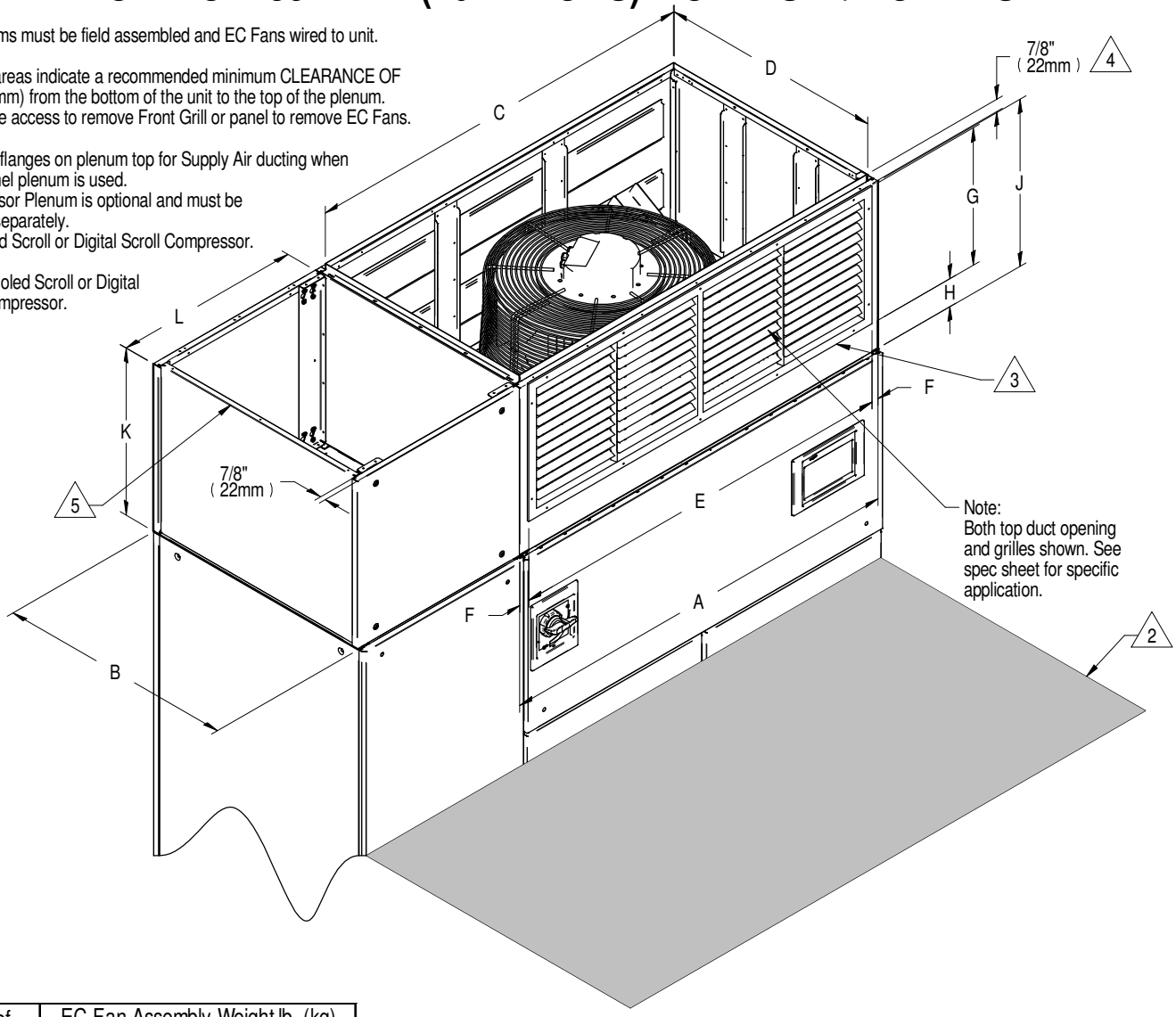
⚠5. Digital Scroll compressors not available on Air Cooled 42kW models.

LIEBERT DS

PLENUM DIMENSIONAL DATA

UPFLOW 35-42kW (10-12 TONS) MODELS W/ EC FANS

Notes:
1. All Plenums must 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. Compressor Plenum is optional and must be ordered separately.
6. Air Cooled Scroll or Digital Scroll Compressor.
7. Water Cooled Scroll or Digital Scroll Compressor.



No. of Fans/Unit	EC Fan Assembly Weight lb. (kg)	
	VS028-VS035	VS042
1	119 (54)	141 (64)

Main unit Plenum Height J in. (mm)	Main Unit Plenum Weight lb. (kg)		
	Non-grilled Plenum	Front Discharge	Rear Discharge
24 (610)	85 (39)	126 (57)	129 (59)
30 (762)	105 (48)	N/A	
36 (914)	123 (56)		

Compressor Plenum		
Width L in. (mm)	Height K in. (mm)	Weight lb. (kg)
13 (330) 6	24 (610)	24 (11)
	30 (762)	26 (12)
	36 (914)	29 (13)
26 (660) 7	24 (610)	33 (15)
	30 (762)	37 (17)
	36 (914)	42 (19)

Plenum Dimensional Data in. (mm)							
A	B	C	D	E	F	G	H
59-1/4 (1505)	33-3/4 (857)	57-9/16 (1463)	32-1/16 (815)	56-11/16 (1440)	1-5/16 (33)	19-11/16 (500)	4-5/16 (109)

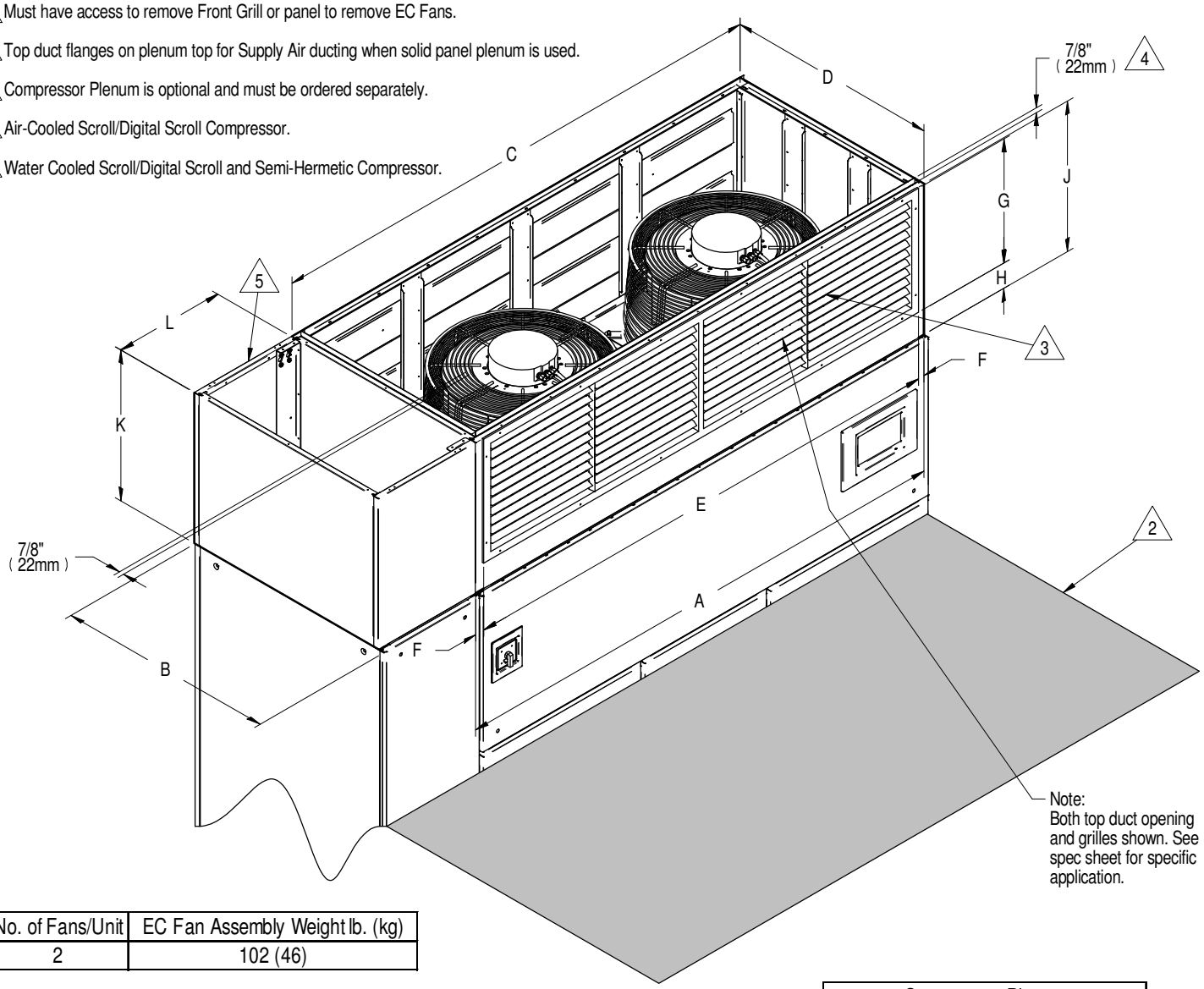
LIEBERT DS

PLENUM DIMENSIONAL DATA

UPFLOW 53-77kW (15-22 TONS) W/ EC FANS

Notes:

1. All Plenums must be field assembled and 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. Compressor Plenum is optional and must be ordered separately.
6. Air-Cooled Scroll/Digital Scroll Compressor.
7. Water Cooled Scroll/Digital Scroll and Semi-Hermetic Compressor.



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

Plenum Dimensional Data in. (mm)							
A	B	C	D	E	F	G	H
82 (2083)	34 (864)	81 (2057)	32 (813)	80 (2032)	1 (25)	20 (508)	4 (102)

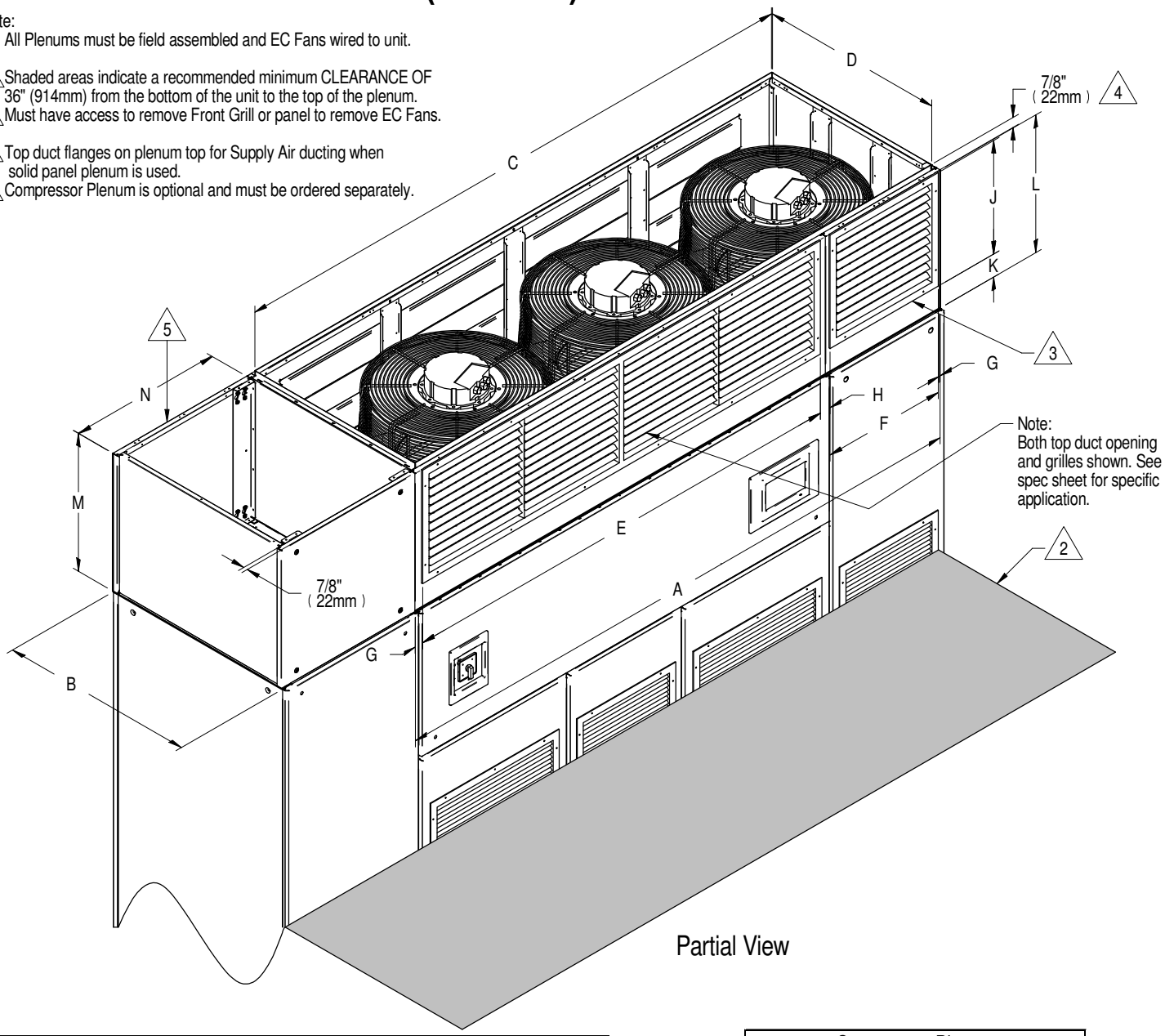
Main unit Plenum Height J in. (mm)	Main unit Plenum weight lb. (kg)		
	Non-grilled plenum	Front discharge	Rear discharge
24 (610)	112 (51)	160 (73)	173 (79)
30 (762)	136 (62)	N/A	
36 (914)	156 (71)		

Compressor Plenum		
Width L in. (mm)	Height K in. (mm)	Weight lb. (kg)
15 (381) △6	24 (610)	26 (12)
	30 (762)	29 (13)
	36 (914)	31 (14)
26 (660) △7	24 (610)	33 (15)
	30 (762)	37 (17)
	36 (914)	42 (19)

LIEBERT DS

PLENUM DIMENSIONAL DATA
UPFLOW 105kW (30 TONS) MODELS W/ EC FANS

Note:
1. All Plenums must 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. Compressor Plenum is optional and must be ordered separately.



Main unit Plenum Height L in. (mm)	Main unit Plenum weight lb. (kg)		
	Non-grilled plenum	Front discharge	Rear discharge
24 (610)	131 (59)	206 (93 kg)	220 (100)
30 (762)	162 (74)	N/A	
36 (914)	188 (85)		

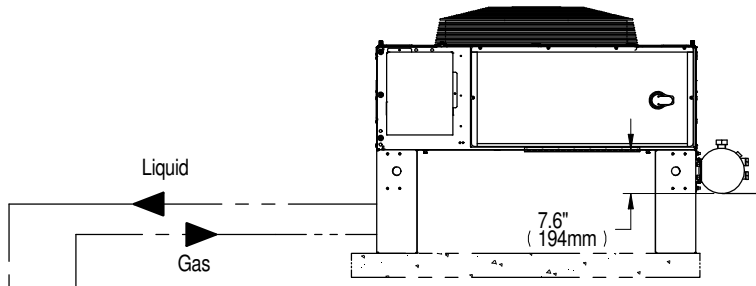
Compressor Plenum		
Width N in. (mm)	Height M in. (mm)	Weight lb. (kg)
26	24 (610)	33 (15)
	30 (762)	37 (17)
	36 (914)	42 (19)

Plenum Dimensional Data in. (mm)									
A	B	C	D	E	F	G	H	J	K
105 (2673)	34 (864)	104 (2641)	32 (813)	80 (2032)	22 (559)	1 (25)	2 (51)	20 (508)	4 (102)

No. of Fans/Unit	EC Fan Assembly Weight lb. (kg)
3	93 (42)

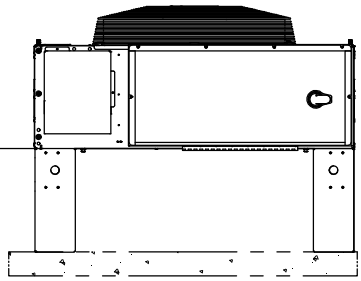
LIEBERT MC CONDENSER

AIR COOLED PIPING SCHEMATIC
CONDENSER ABOVE INDOOR UNIT



MC Condenser with Receiver

(Piping to Condenser & Receiver not shown for clarity)

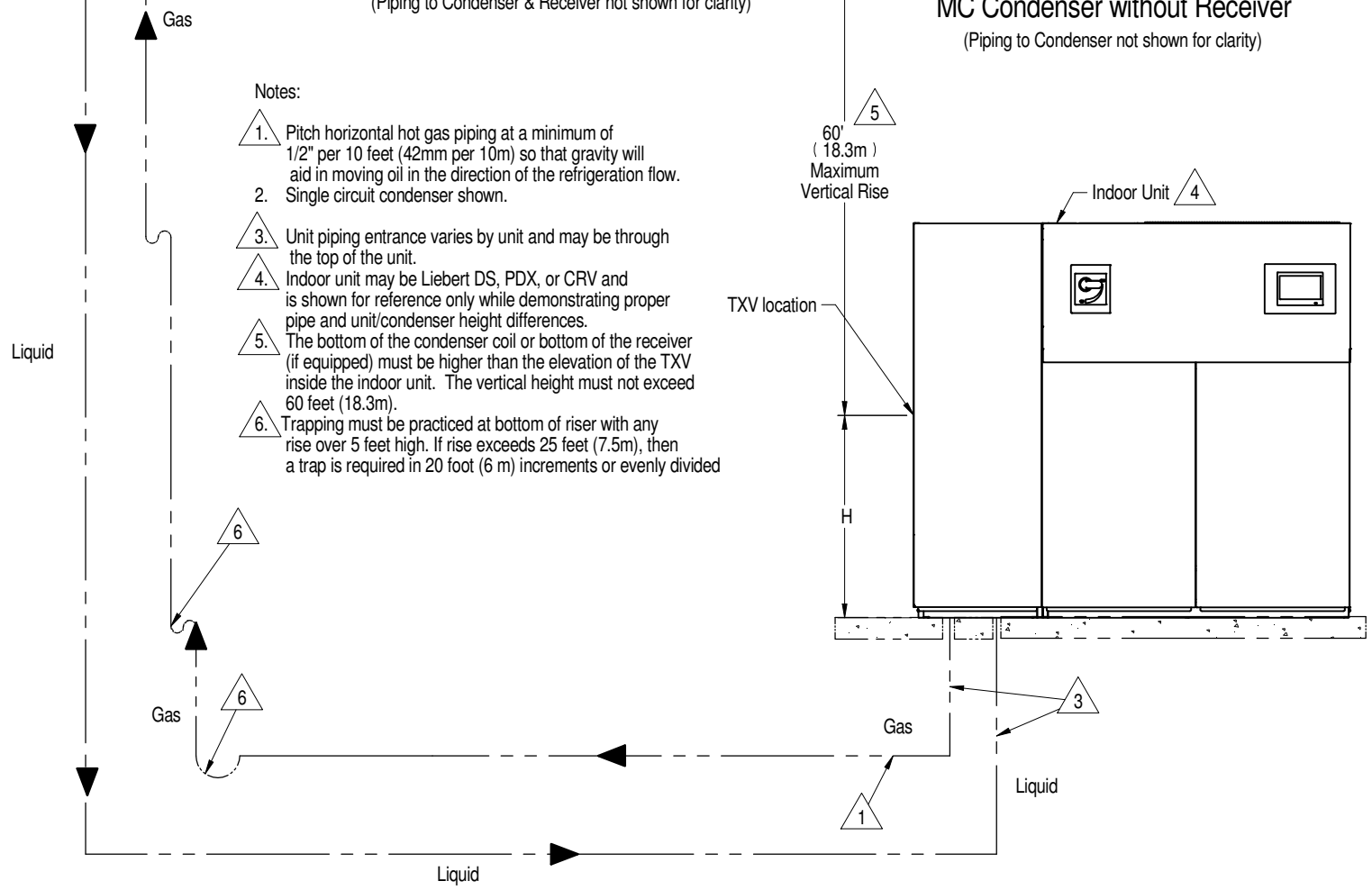


MC Condenser without Receiver

(Piping to Condenser not shown for clarity)

Notes:

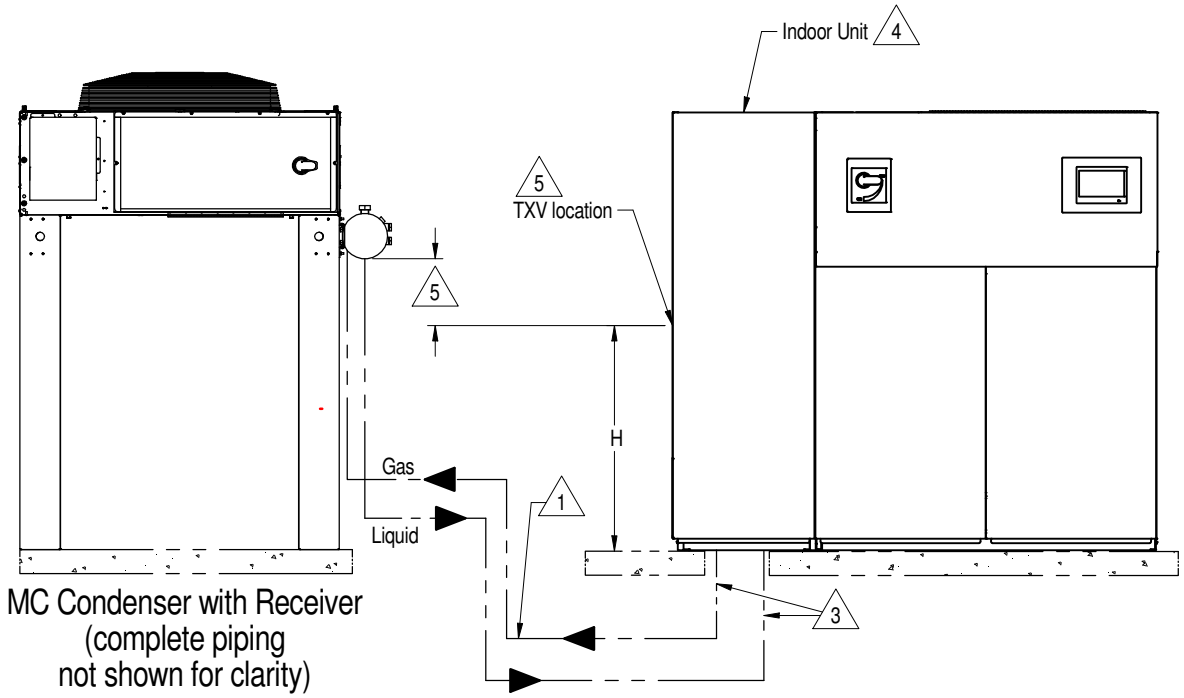
1. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
2. Single circuit condenser shown.
3. Unit piping entrance varies by unit and may be through the top of the unit.
4. Indoor unit may be Liebert DS, PDX, or CRV and is shown for reference only while demonstrating proper pipe and unit/condenser height differences.
5. The bottom of the condenser coil or bottom of the receiver (if equipped) must be higher than the elevation of the TXV inside the indoor unit. The vertical height must not exceed 60 feet (18.3m).
6. Trapping must be practiced at bottom of riser with any rise over 5 feet high. If rise exceeds 25 feet (7.5m), then a trap is required in 20 foot (6 m) increments or evenly divided



Internal TXV Height	H in. (mm)
PDX Downflow	44 (1118)
PDX Upflow	20 (508)
DS035-105 Downflow/Upflow	43 (1092)
CRV - CR019	45 (1143)
CRV - CR020/CR035	27 (686)

——— Field piping

AIR COOLED PIPING SCHEMATIC
CONDENSER AND INDOOR UNIT AT SAME LEVEL

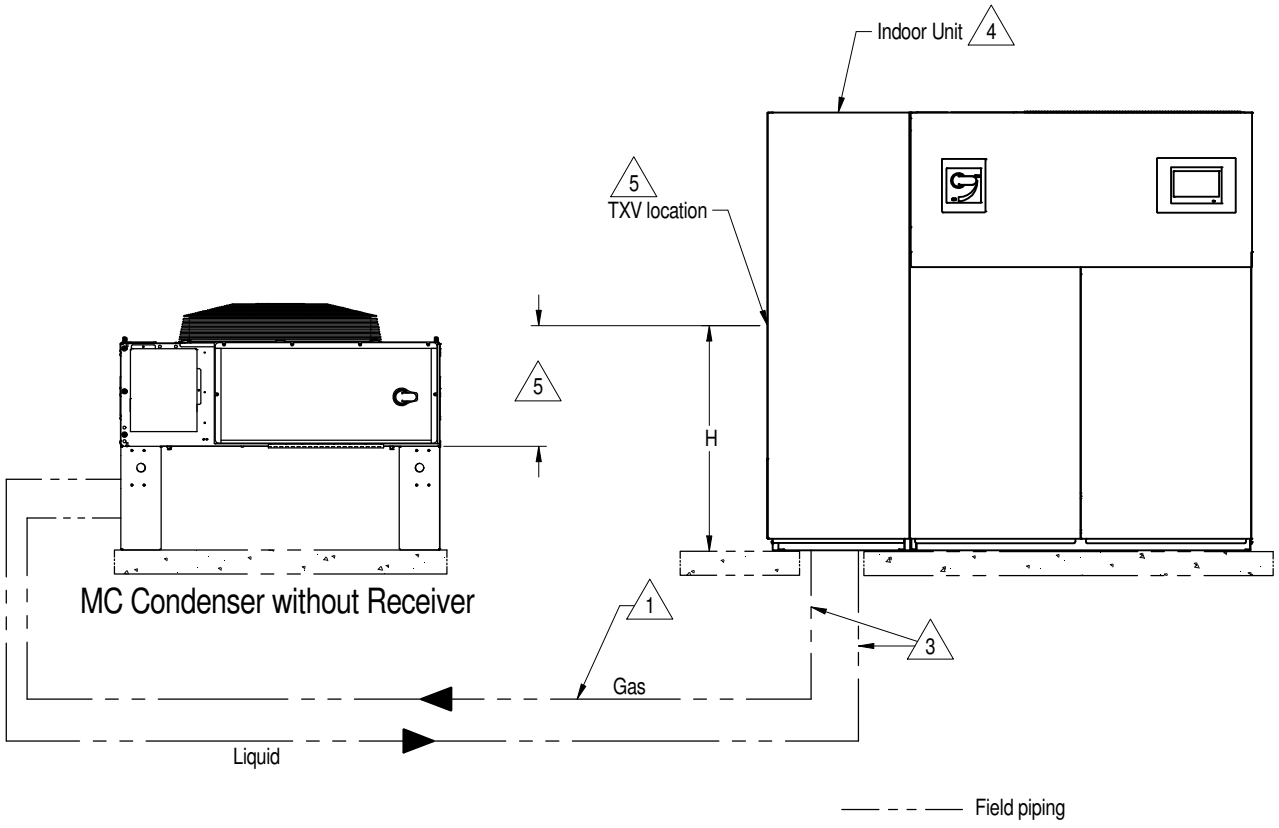


Internal TXV Height	H in. (mm)
PDX Downflow	44 (1118)
PDX Upflow	20 (508)
DS035-105 Downflow/Upflow	43 (1092)
CRV - CR019	45 (1143)
CRV - CR020/CR035	27 (686)

Notes:

1. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
2. Single circuit condenser shown.
3. Unit piping entrance varies by unit and may be through the top of the unit.
4. Indoor unit may be Liebert DS, PDX, or CRV and is shown for reference only.
5. The bottom of the receiver must be higher than the elevation of the TXV inside the indoor unit, otherwise extended legs or a field piped subcooler needs to be utilized. Contact your Vertiv sales representative for additional information.

AIR COOLED PIPING SCHEMATIC
CONDENSER AND INDOOR UNIT AT SAME LEVEL

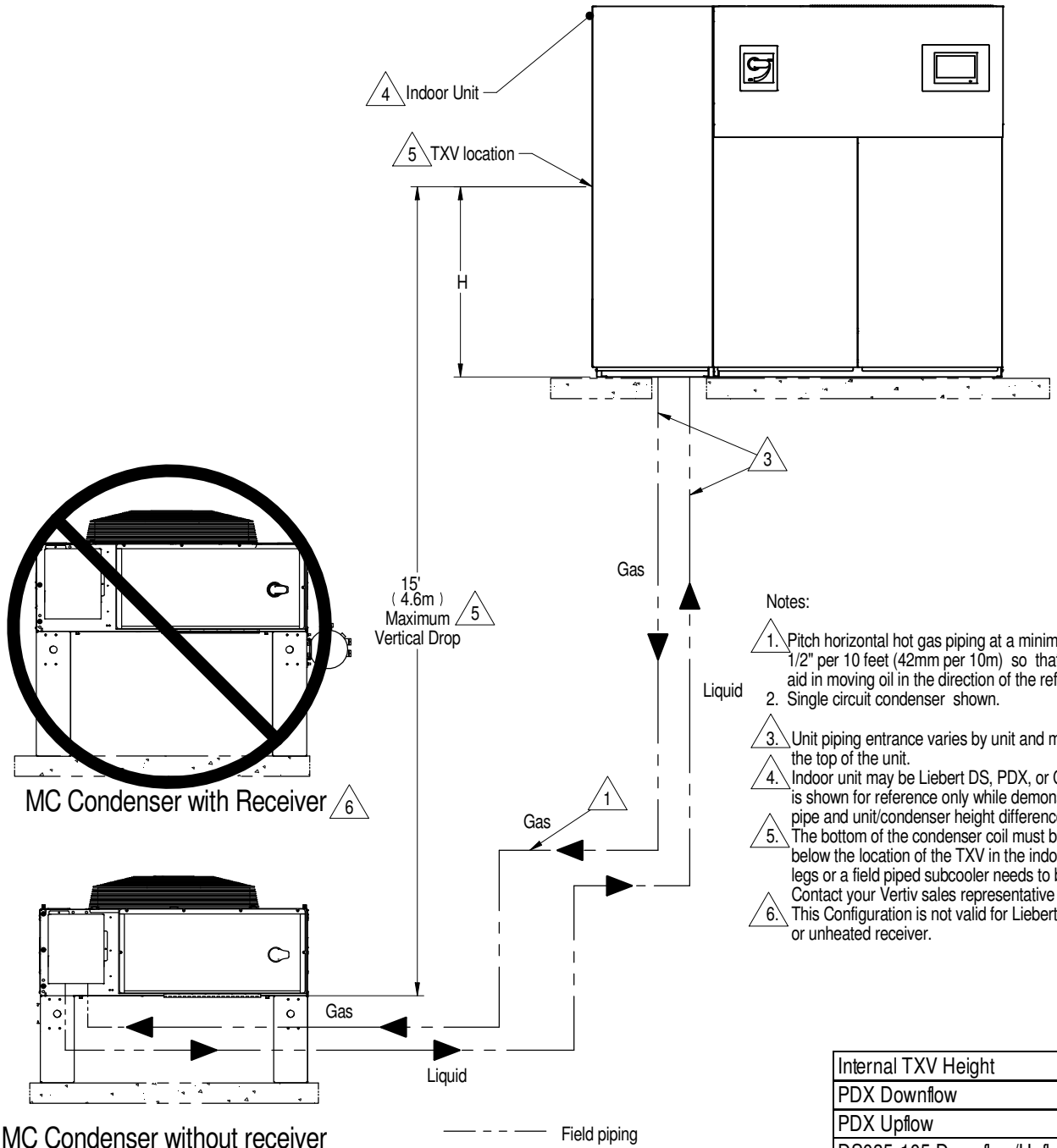


Internal TXV Height	H in. (mm)
PDX Downflow	44 (1118)
PDX Upflow	20 (508)
DS035-105 Downflow/Upflow	43 (1092)
CRV - CR019	45 (1143)
CRV - CR020/CR035	27 (686)

Notes:

1. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
2. Single circuit condenser shown.
3. Unit piping entrance varies by unit and may be through the top of the unit.
4. Indoor unit may be Liebert DS, PDX, or CRV and is shown for reference only.
5. The bottom of the coil must be less than 15' (4.6m) below the elevation of the TXV inside the indoor unit. Contact your Vertiv sales representative for additional information.

AIR COOLED PIPING SCHEMATIC
CONDENSER BELOW INDOOR UNIT



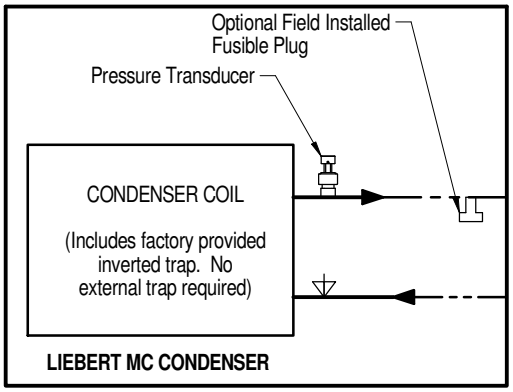
Notes:

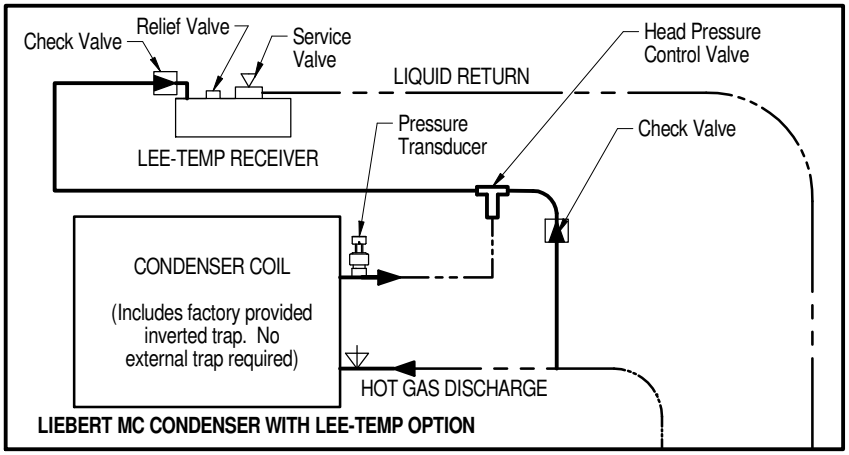
1. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
2. Single circuit condenser shown.
3. Unit piping entrance varies by unit and may be through the top of the unit.
4. Indoor unit may be Liebert DS, PDX, or CRV and is shown for reference only while demonstrating proper pipe and unit/condenser height differences.
5. The bottom of the condenser coil must be less than 15 feet (4.6m) below the location of the TXV in the indoor unit, otherwise extended legs or a field piped subcooler needs to be utilized. Contact your Vertiv sales representative for additional information.
6. This Configuration is not valid for Liebert MC with Lee-Temp or unheated receiver.

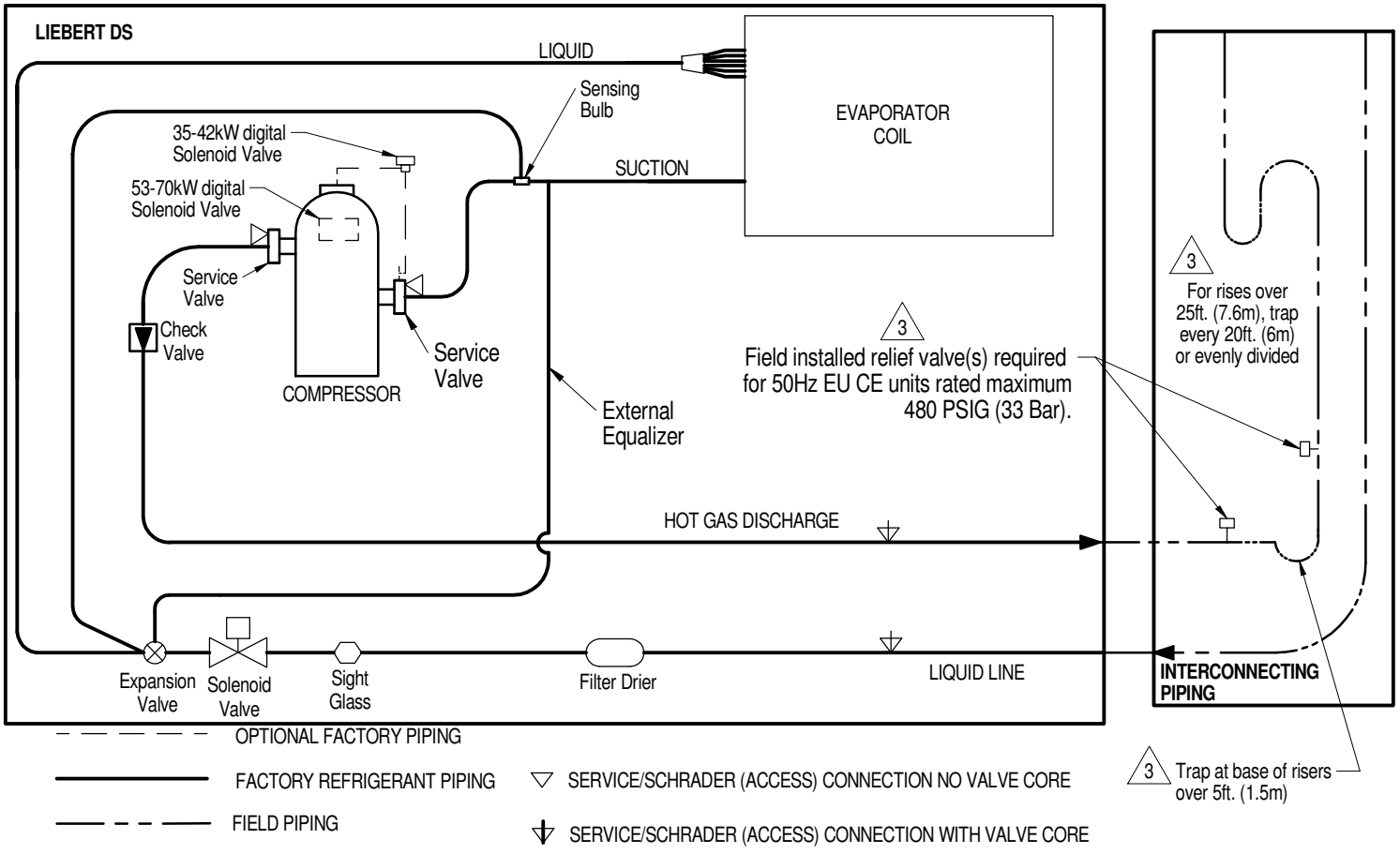
Internal TXV Height	H in. (mm)
PDX Downflow	44 (1118)
PDX Upflow	20 (508)
DS035-105 Downflow/Upflow	43 (1092)
CRV - CR019	45 (1143)
CRV - CR020/CR035	27 (686)

LIEBERT DS

PIPING SCHEMATIC W/ LIEBERT MC CONDENSER
AIR COOLED SCROLL OR DIGITAL SCROLL COMPRESSOR MODELS



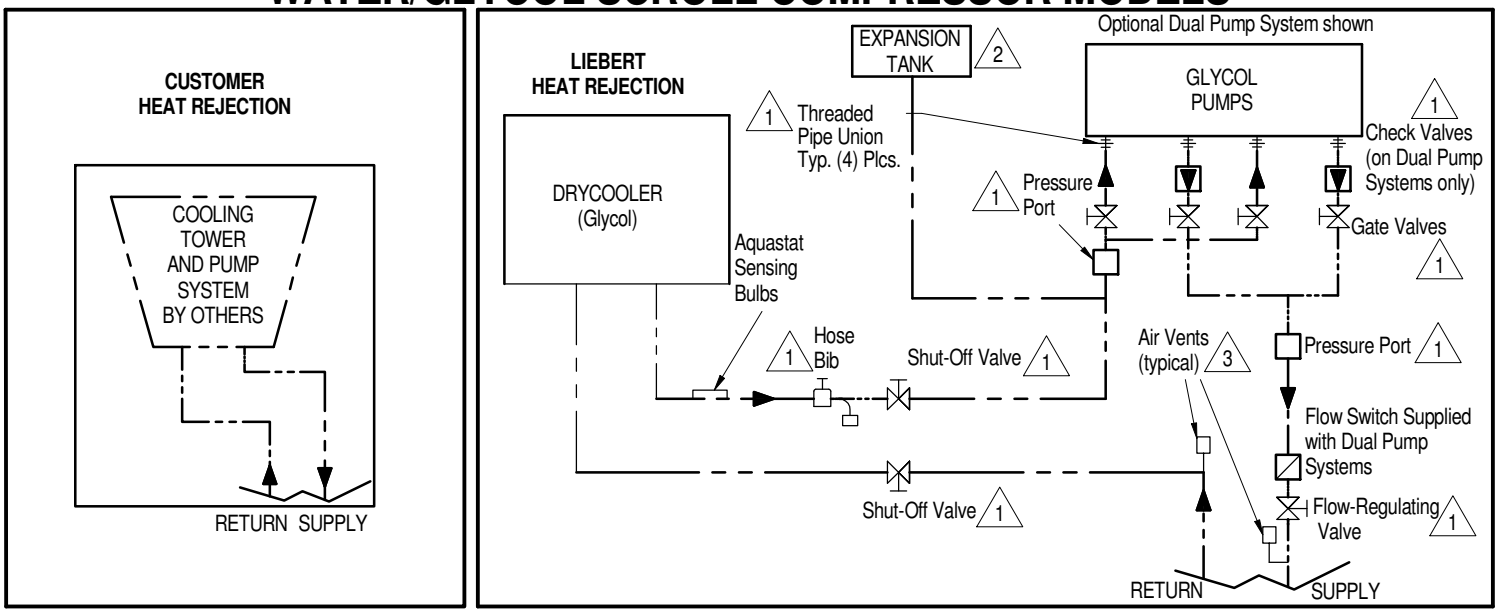


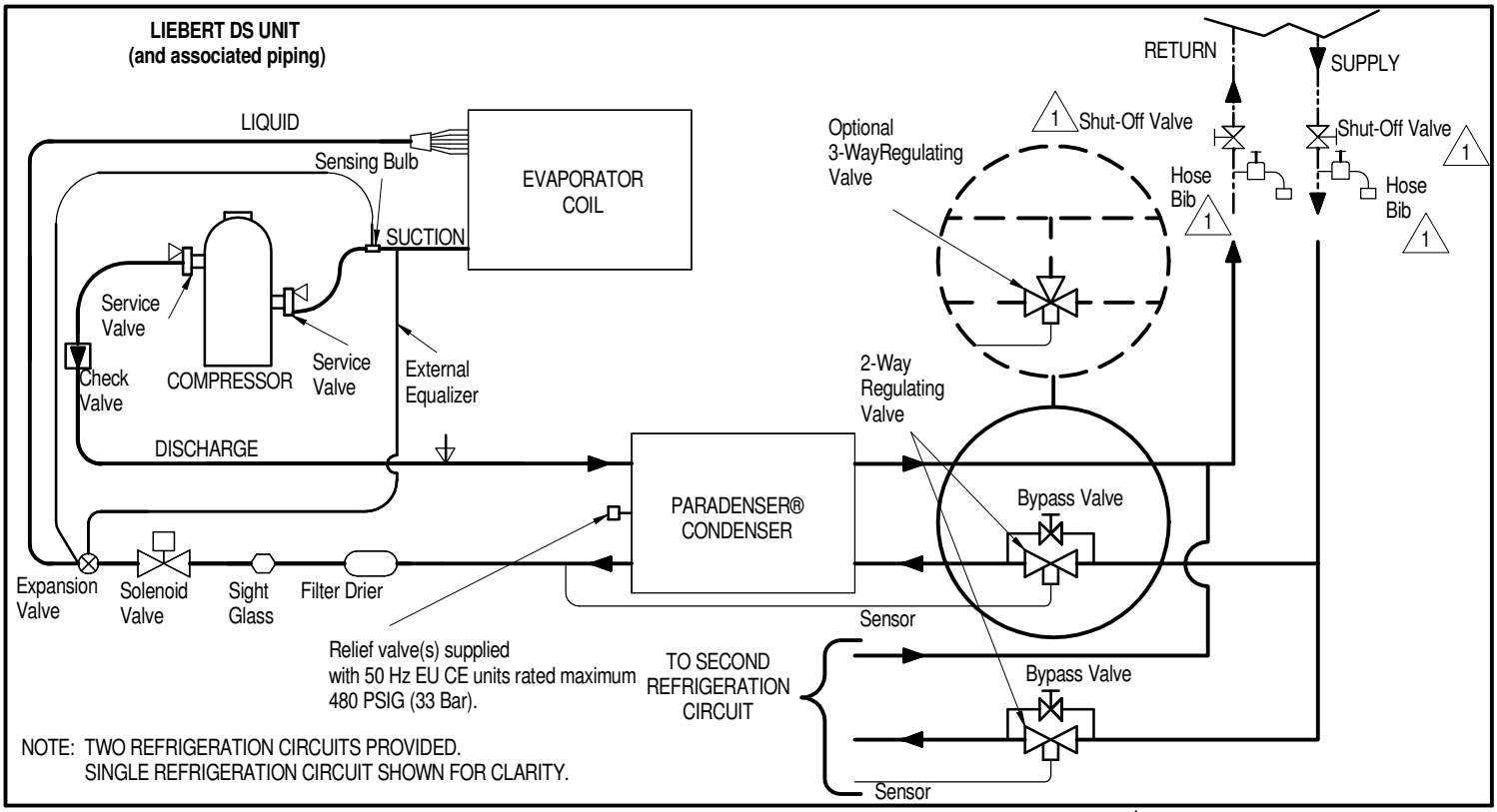


Notes:
1. Single refirigeration circuit shown for clarity.
2. Schematic representation shown. Do not use for specific connection locations.
3. Components are not supplied by Liebert, but are required for proper operation and maintenance.
4. Traps must be installed and horizontal lines pitched to ensure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

LIEBERT DS

PIPING SCHEMATIC
WATER/GLYCOL SCROLL COMPRESSOR MODELS





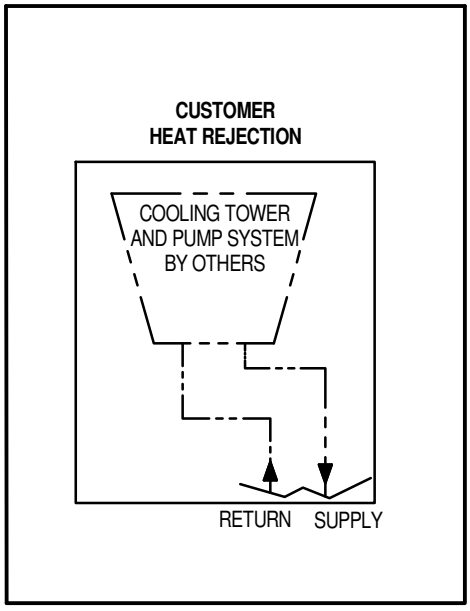
FACTORY PIPING
FIELD PIPING
OPTIONAL FACTORY PIPING
SERVICE / SCHRADER (ACCESS) CONNECTION NO VALVE CORE
SERVICE / SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

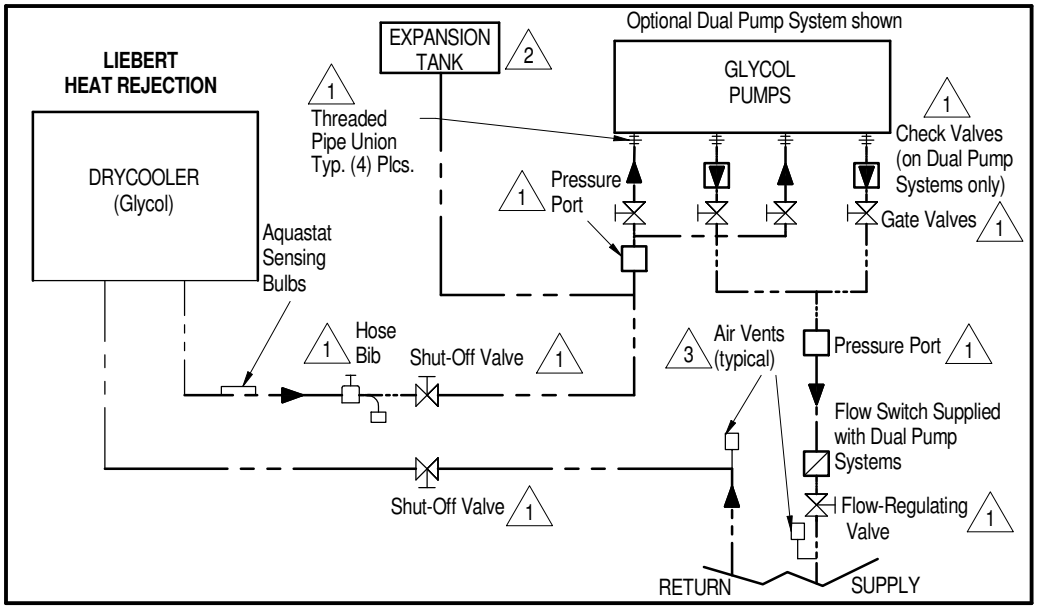
NOTE: SCHEMATIC REPRESENTATION SHOWN. THIS SCHEMATIC DOES NOT IMPLY OR DEFINE ELEVATIONS AND COMPONENT LOCATION, UNLESS SPECIFICALLY NOTED.

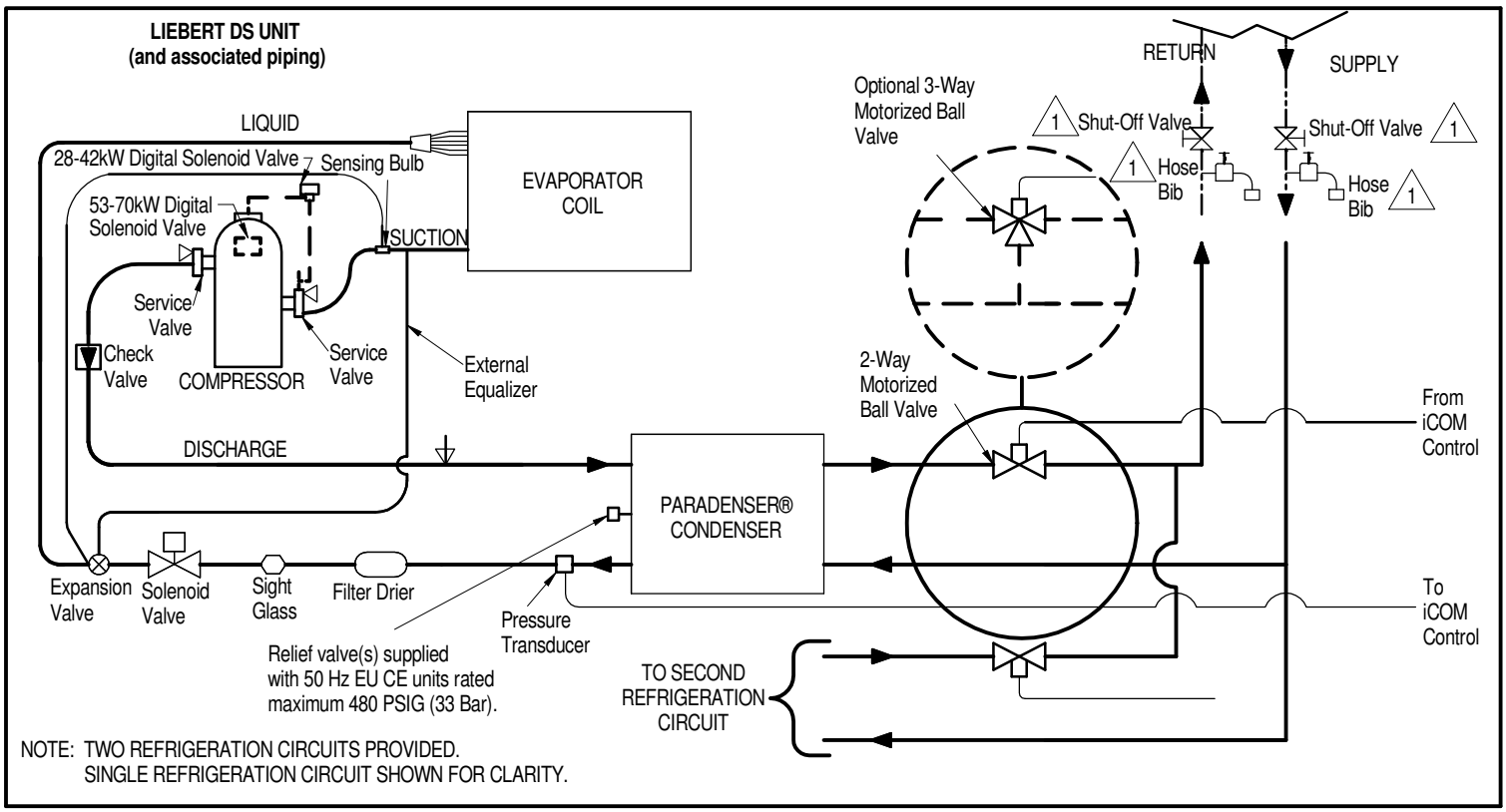
1 Components are not supplied by Liebert but are required for proper operation and maintenance
2 Field installed at highest point in system on return line to pumps
3 Locate at tops of all risers and any intermediate system high points

LIEBERT DS

PIPING SCHEMATIC
WATER/GLYCOL DIGITAL SCROLL COMPRESSOR MODELS







NOTE: TWO REFRIGERATION CIRCUITS PROVIDED.
SINGLE REFRIGERATION CIRCUIT SHOWN FOR CLARITY.

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

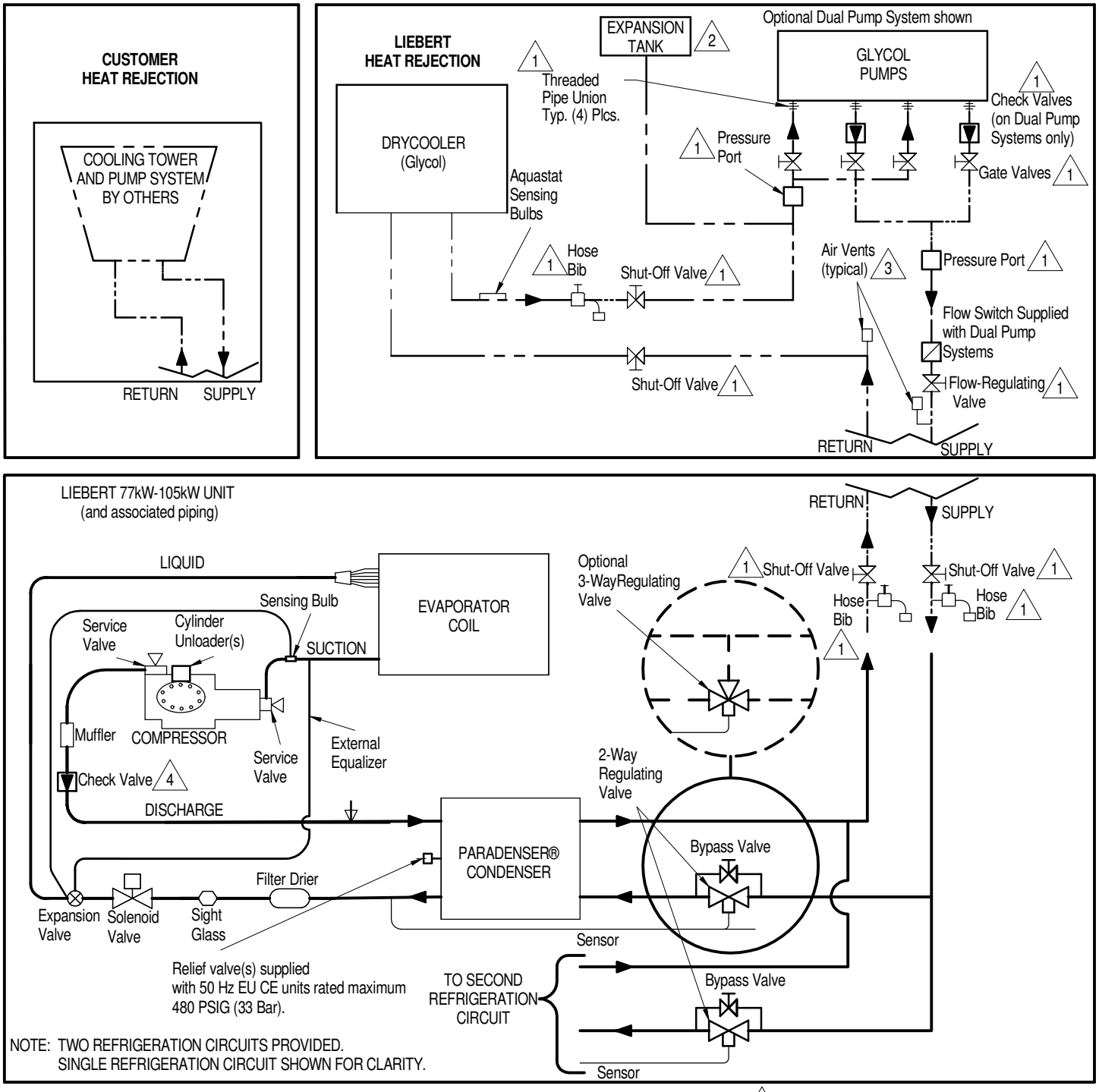
NOTE: SCHEMATIC REPRESENTATION SHOWN. THIS SCHEMATIC DOES NOT IMPLY OR DEFINE ELEVATIONS AND COMPONENT LOCATION, UNLESS SPECIFICALLY NOTED.

1. Components are not supplied by Liebert but are required for proper operation and maintenance
2. Field installed at highest point in system on return line to pumps
3. Locate at tops of all risers and any intermediate system high points

LIEBERT DS

PIPING SCHEMATIC

WATER/GLYCOL 77kW - 105kW SEMI-HERMETIC COMPRESSOR MODELS



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

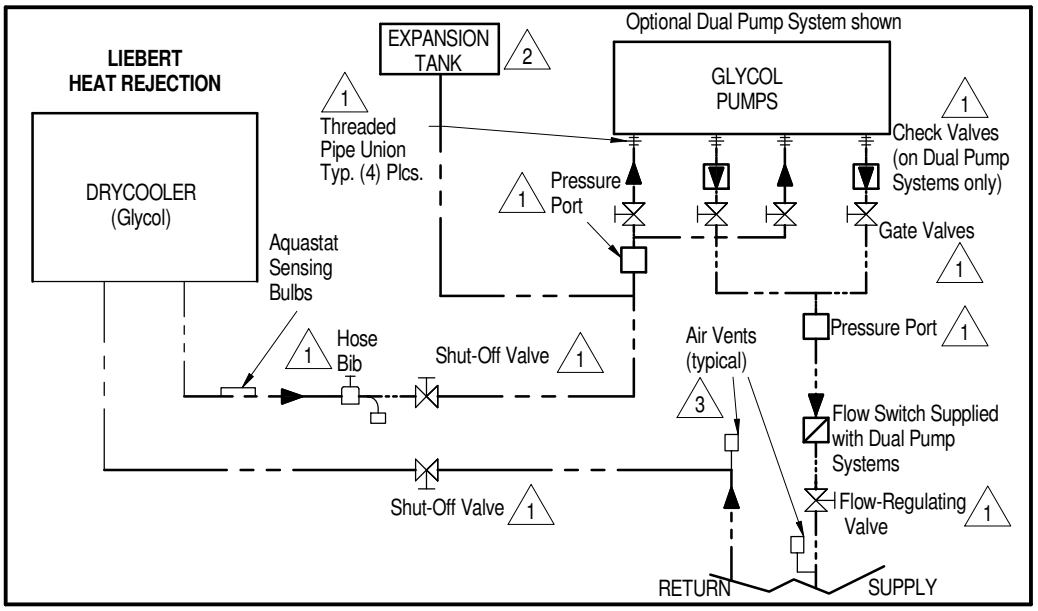
NOTE: SCHEMATIC REPRESENTATION SHOWN. THIS SCHEMATIC DOES NOT IMPLY OR DEFINE ELEVATIONS AND COMPONENT LOCATION, UNLESS SPECIFICALLY NOTED.

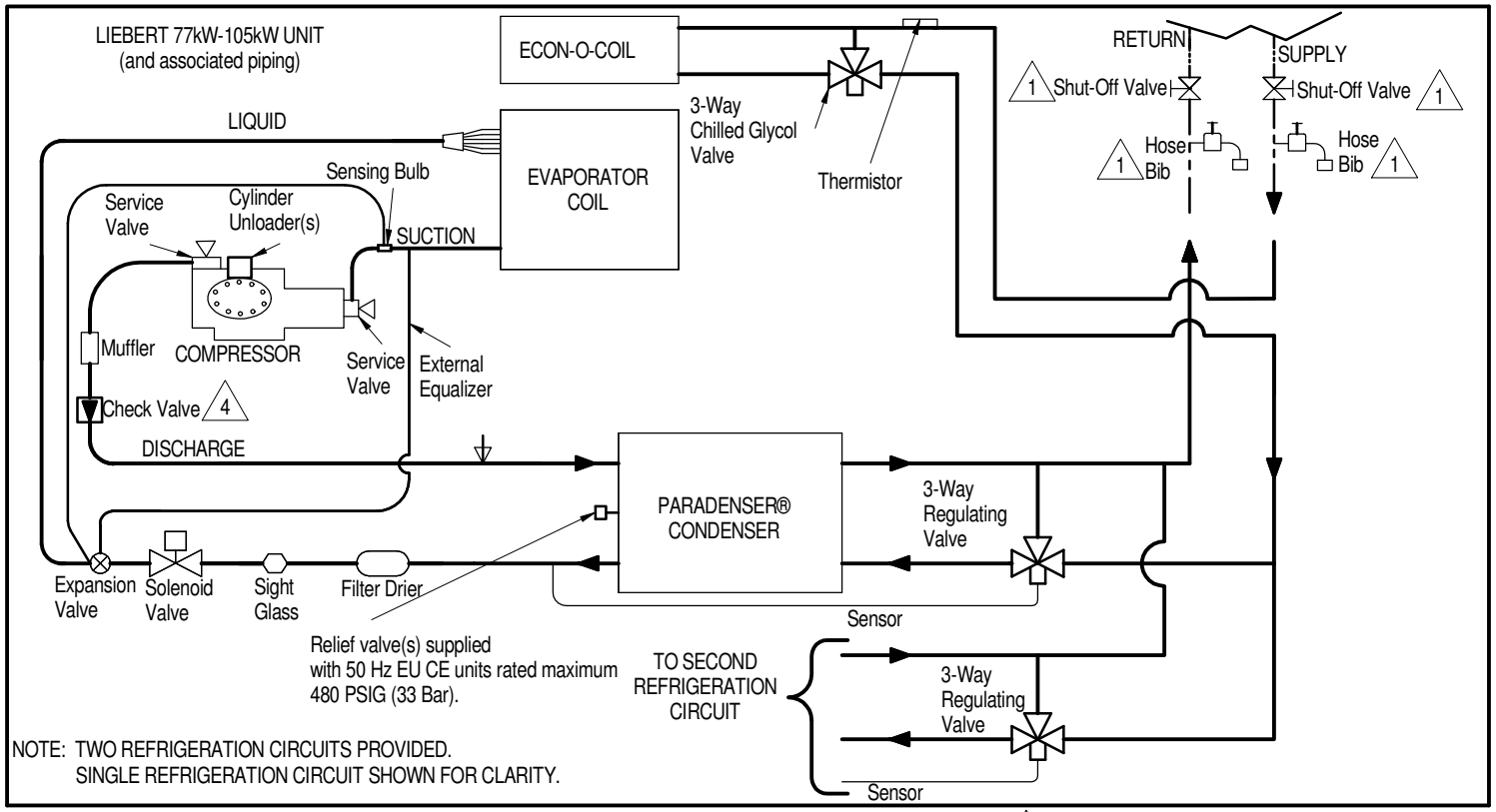
1. Components are not supplied by Liebert but are required for proper operation and maintenance
2. Field installed at highest point in system on return line to pumps
3. Locate at tops of all risers and any intermediate system high points
4. This check valve is present on 77kW models only.

LIEBERT DS

PIPING SCHEMATIC

GLYCOOL™ 77kW - 105kW SEMI-HERMETIC COMPRESSOR MODELS





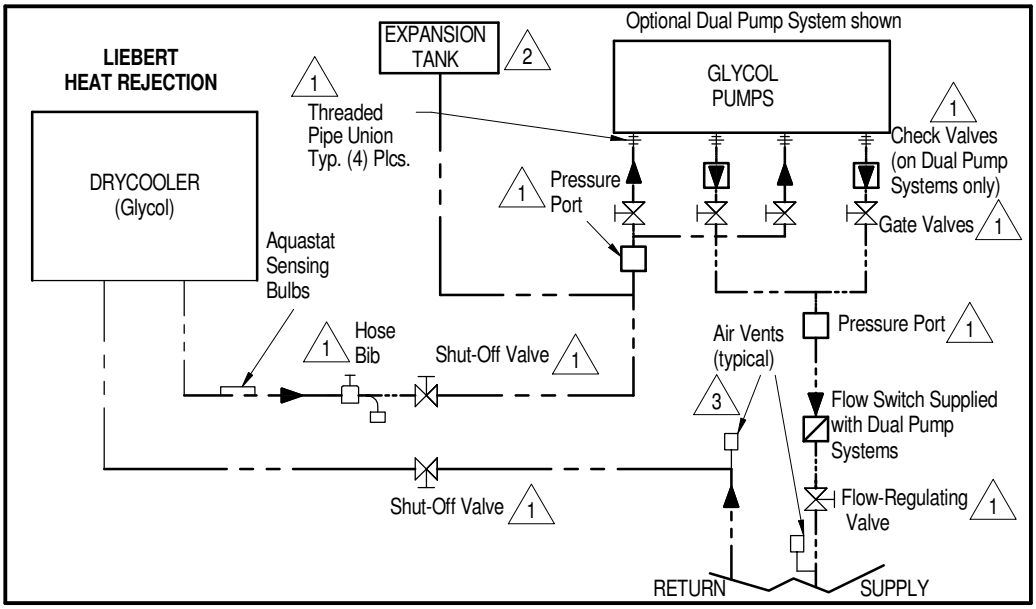
FACTORY PIPING
FIELD PIPING
SERVICE / SCHRADER (ACCESS) CONNECTION NO VALVE CORE
SERVICE / SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

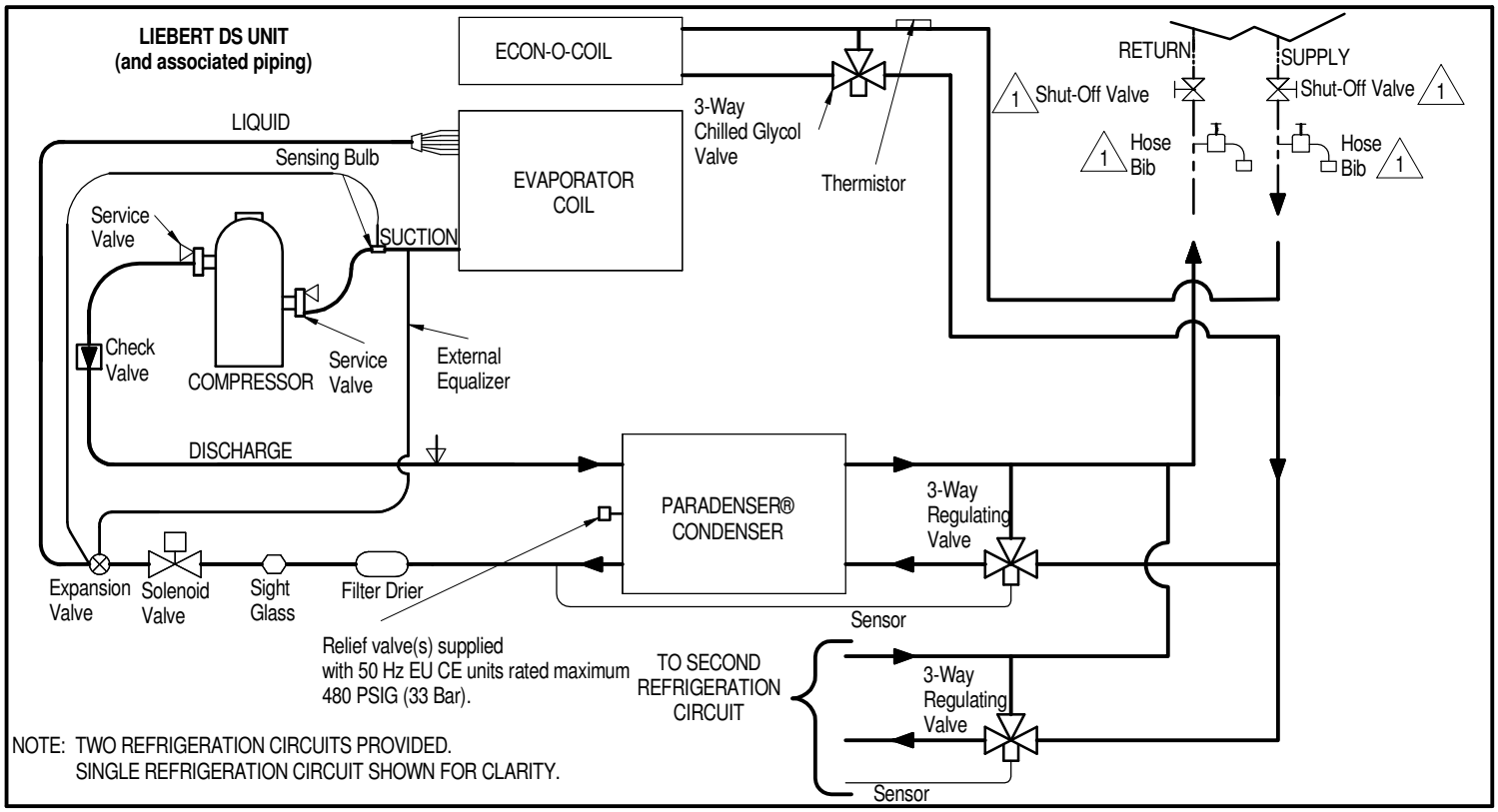
NOTE: SCHEMATIC REPRESENTATION SHOWN. THIS SCHEMATIC DOES NOT IMPLY OR DEFINE ELEVATIONS AND COMPONENT LOCATION, UNLESS SPECIFICALLY NOTED.

1. Components are not supplied by Liebert but are required for proper operation and maintenance
2. Field installed at highest point in system on return line to pumps
3. Locate at tops of all risers and any intermediate system high points
4. This check valve is present on 77kW models only.

LIEBERT DS

PIPING SCHEMATIC
GLYCOOL™ SCROLL COMPRESSOR MODELS





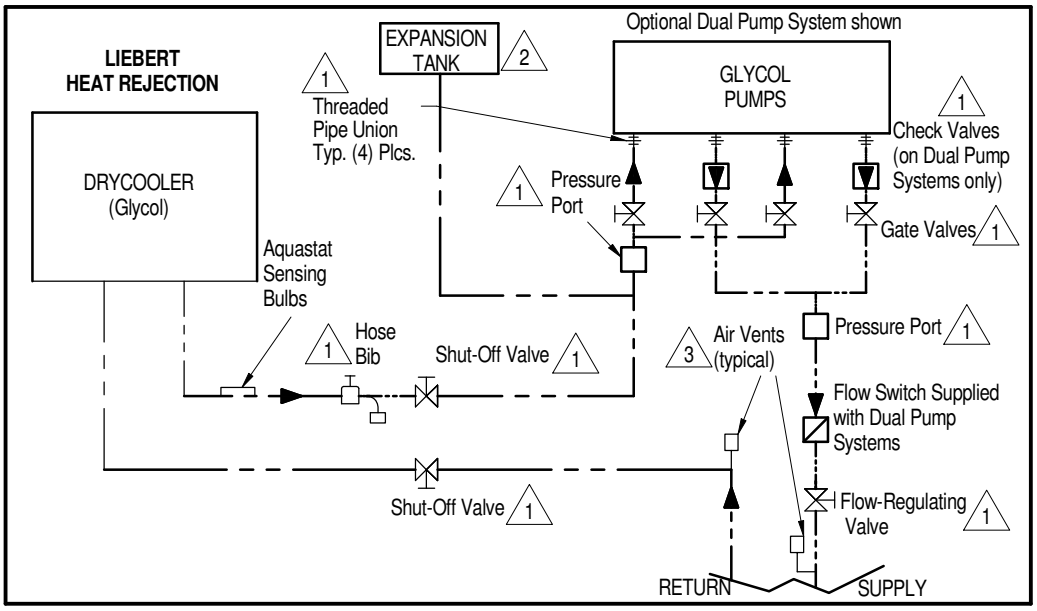
FACTORY PIPING
FIELD PIPING
SERVICE / SCHRADER (ACCESS) CONNECTION NO VALVE CORE
SERVICE / SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

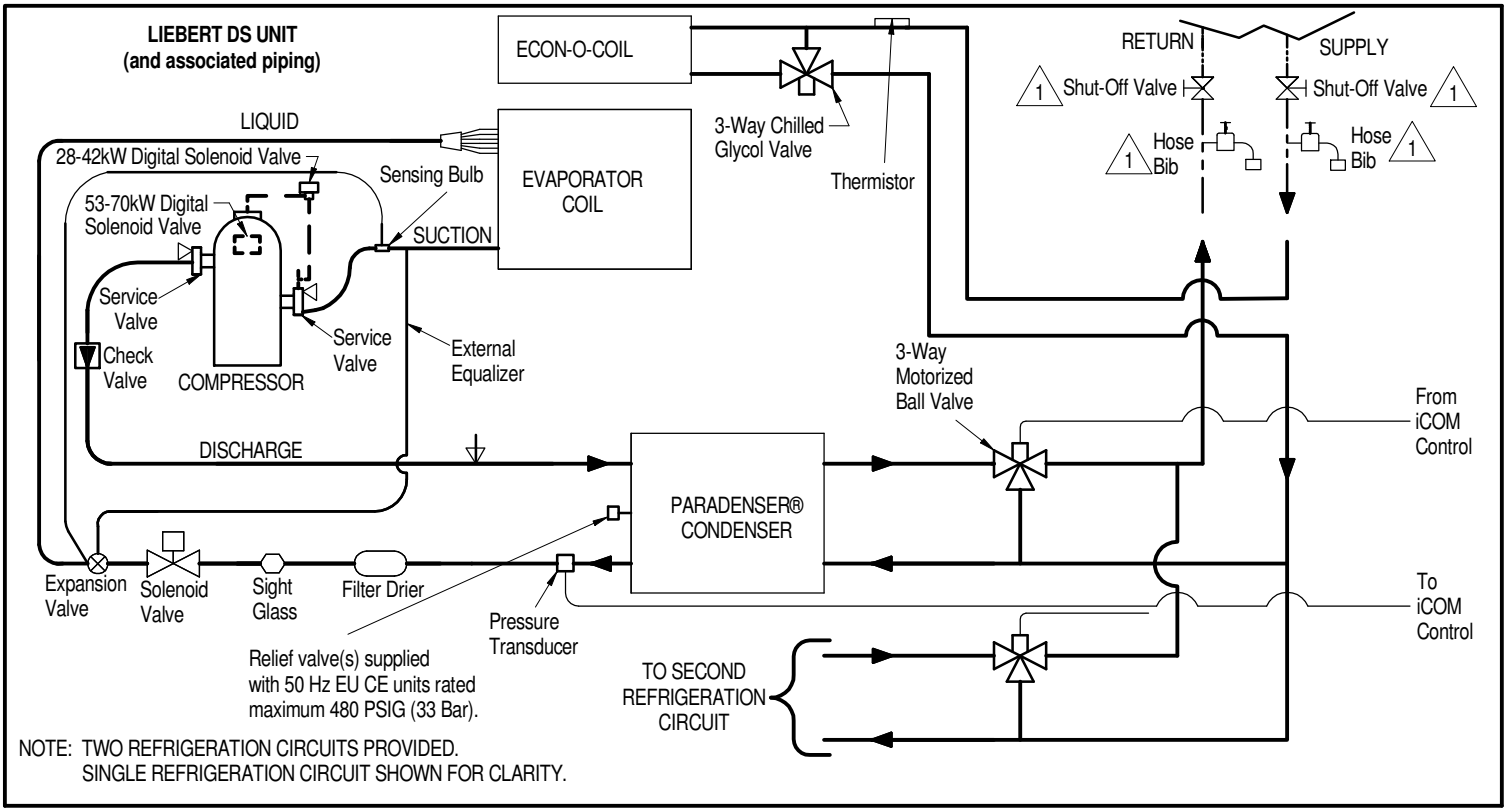
NOTE: SCHEMATIC REPRESENTATION SHOWN. THIS SCHEMATIC DOES NOT IMPLY OR DEFINE ELEVATIONS AND COMPONENT LOCATION, UNLESS SPECIFICALLY NOTED.

1. Components are not supplied by Liebert but are required for proper operation and maintenance
2. Field installed at highest point in system on return line to pumps
3. Locate at tops of all risers and any intermediate system high points

LIEBERT DS

PIPING SCHEMATIC
GLYCOOL™ DIGITAL SCROLL COMPRESSOR MODELS





NOTE: TWO REFRIGERATION CIRCUITS PROVIDED.
SINGLE REFRIGERATION CIRCUIT SHOWN FOR CLARITY.

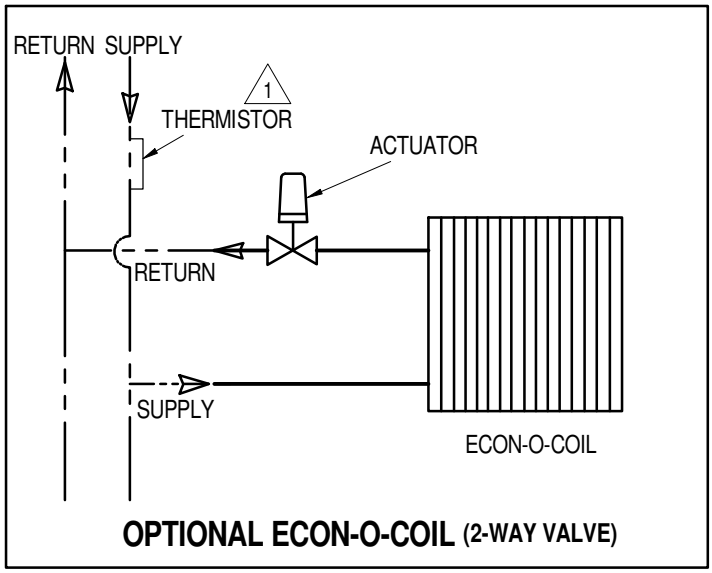
- OPTIONAL FACTORY PIPING
- FACTORY PIPING
- FIELD PIPING
- SERVICE / SCHRADER (ACCESS) CONNECTION NO VALVE CORE
- SERVICE / SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

1. Components are not supplied by Liebert but are required for proper operation and maintenance
2. Field installed at highest point in system on return line to pumps
3. Locate at tops of all risers and any intermediate system high points

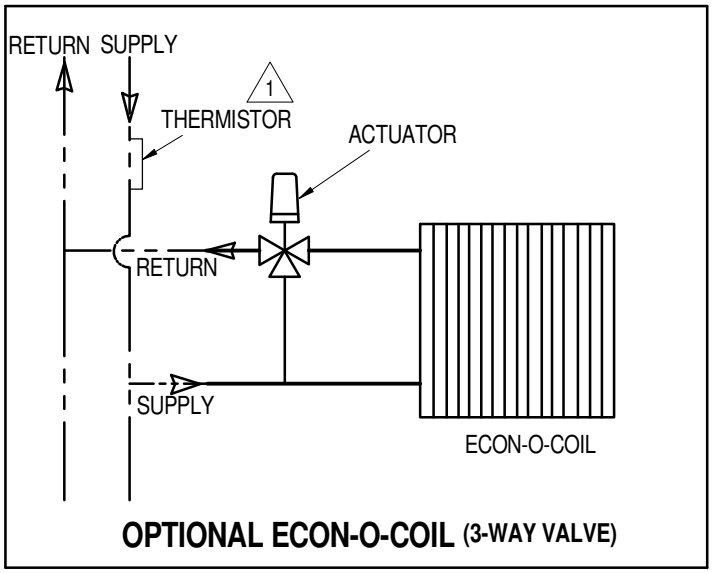
NOTE: SCHEMATIC REPRESENTATION SHOWN. THIS SCHEMATIC DOES NOT IMPLY OR DEFINE ELEVATIONS AND COMPONENT LOCATION, UNLESS SPECIFICALLY NOTED.

LIEBERT DS

OPTIONAL PIPING SCHEMATIC
ECON-O-COIL MODELS



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



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

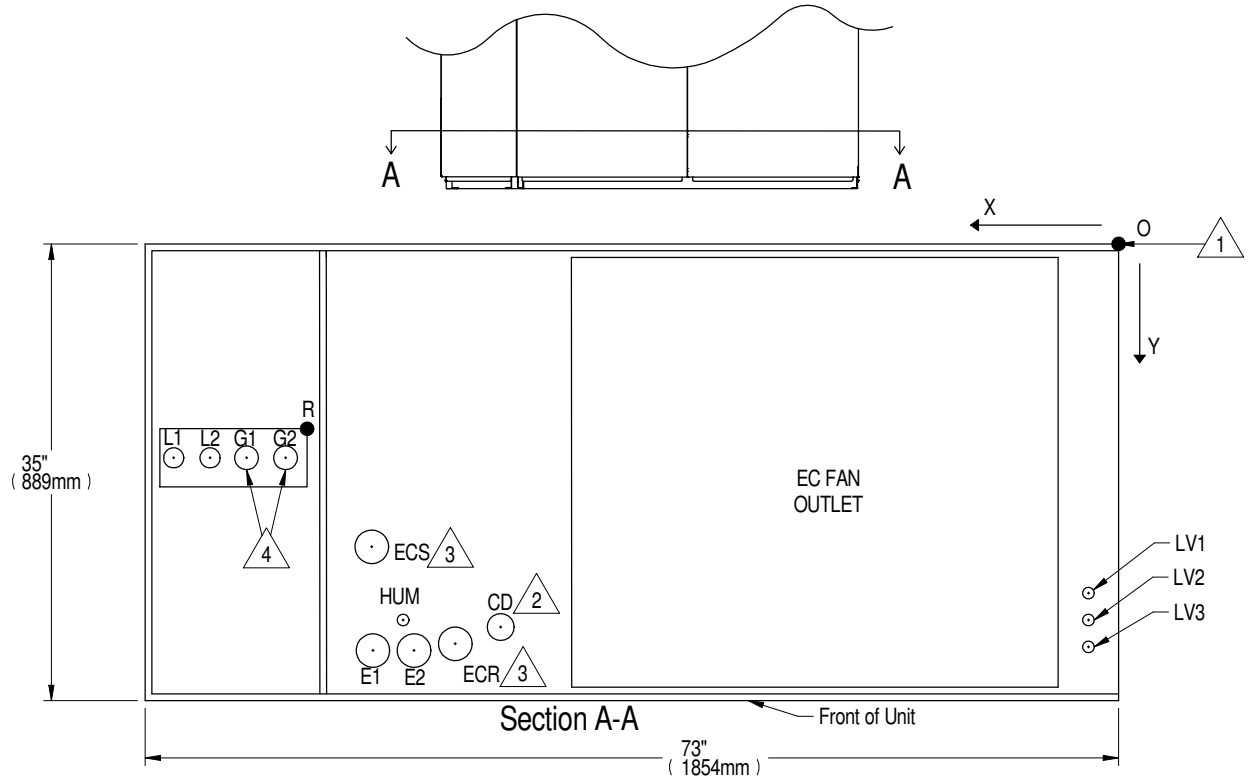
FACTORY PIPING
FIELD PIPING

1 SUPPLIED WITH 10 FEET EXTRA THERMISTOR WIRE FOR INSTALLATION ON FIELD SUPPLY LINE.

NOTE: 1) PLACE THERMISTOR IN LOCATION WHERE FLOW IS ALWAYS PRESENT.
2) THERMISTOR MUST BE LOCATED OUT OF THE SUPPLY AIR STREAM.

LIEBERT DS

PRIMARY CONNECTION LOCATIONS
DOWNFLOW AIR COOLED 35-42kW (10-12 TONS)
SCROLL OR DIGITAL SCROLL COMPRESSOR MODELS



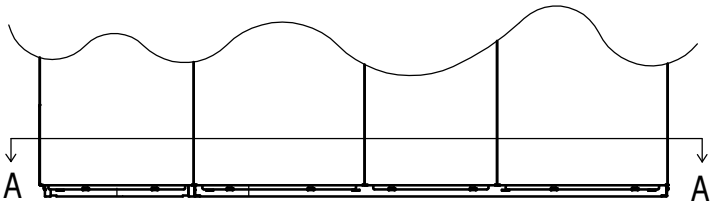
Notes:

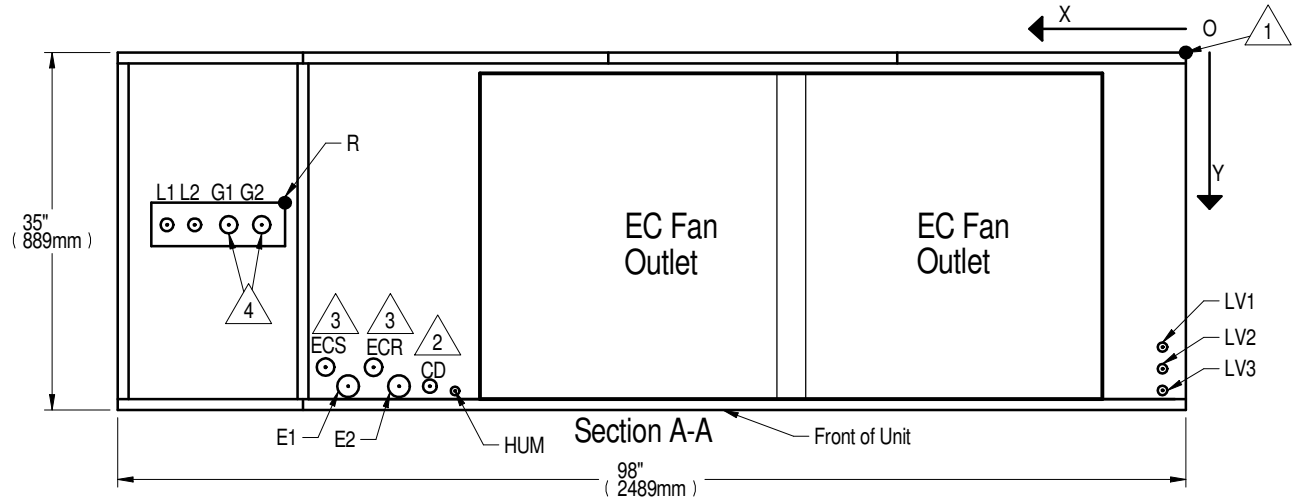
1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
3. Supplied on Dual Cooling systems only.
4. 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.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
R	REFRIGERANT ACCESS	59-5/16 (1507)	14-3/4 (375)	11-3/16" (284mm) X 4" (102mm)
L1	LIQUID LINE SYSTEM 1	69-15/16 (1776)	16-13/16 (427)	1/2" O.D. Cu
L2	LIQUID LINE SYSTEM 2	67-5/8 (1718)		
G1 4	HOT GAS DISCHARGE 1	65-1/2 (1664)		5/8" O.D. Cu
G2 4	HOT GAS DISCHARGE 2	62-7/16 (1586)		
CD 2	CONDENSATE DRAIN (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
ECS 3	ECON-O-COIL SUPPLY	54-7/8 (1394)	22-9/16 (573)	1-5/8" O.D. Cu
ECR 3	ECON-O-COIL RETURN	49-3/8 (1254)	30-3/4 (781)	
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)	

LIEBERT DS

PRIMARY CONNECTION LOCATIONS
DOWNFLOW AIR COOLED 53-77kW
SCROLL OR DIGITAL SCROLL COMPRESSOR MODELS W/ EC FANS





POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING	
R	DS REFRIGERANT ACCESS	81-3/4 (2076)	14-3/4 (375)	12-3/16" (310mm) X 4" (102mm)	
				53kW (15 TONS)	70 & 77kW (20 & 22 TONS)
L1	LIQUID LINE SYSTEM 1	94-11/16 (2405)	16-3/4 (425)	1/2" O.D. Cu	5/8" O.D. Cu
L2	LIQUID LINE SYSTEM 2	91-7/8 (2334)			
G1	HOT GAS DISCHARGE 1 △4	88-3/4 (2254)	16-3/8 (416)	7/8" O.D. Cu	1-1/8" O.D. Cu
G2	HOT GAS DISCHARGE 2 △4	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	
ECS	ECON-O-COIL SUPPLY △3	78-5/8 (1997)	22-1/4 (565)	2-1/8" O.D. Cu	
ECR	ECON-O-COIL RETURN △3	73-15/16 (1878)	26-9/16 (675)		
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)	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. Select appropriate drain system materials. The drain line must comply with all local codes.

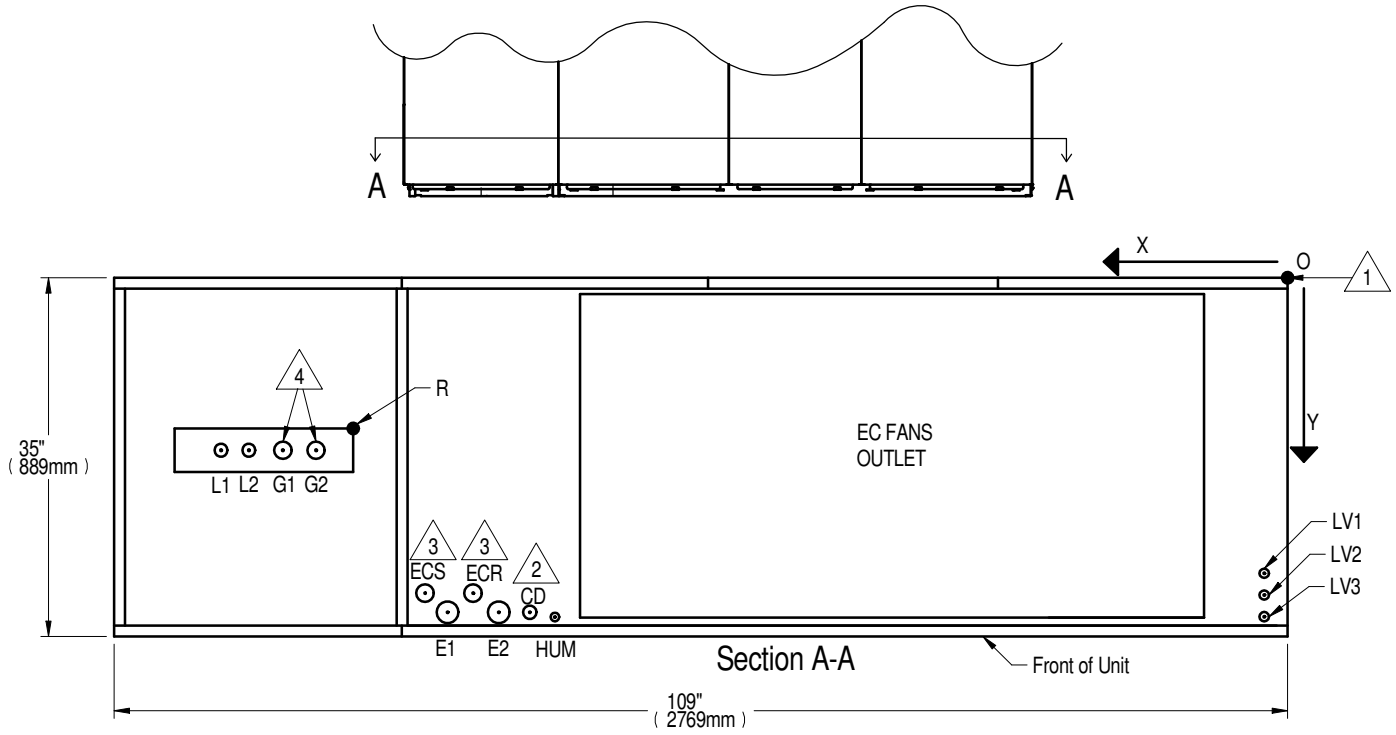
△3. Supplied on Dual Cooling systems only.

△4. 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.

5. Digital Scroll compressor not available on DS077 models.

LIEBERT DS

PRIMARY CONNECTION LOCATIONS
DOWNFLOW AIR COOLED 77kW (22 TONS)
SEMI-HERMETIC COMPRESSOR MODELS



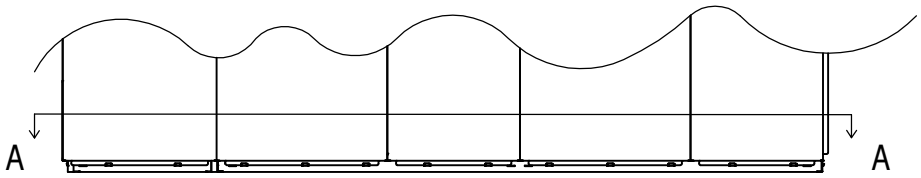
Notes:

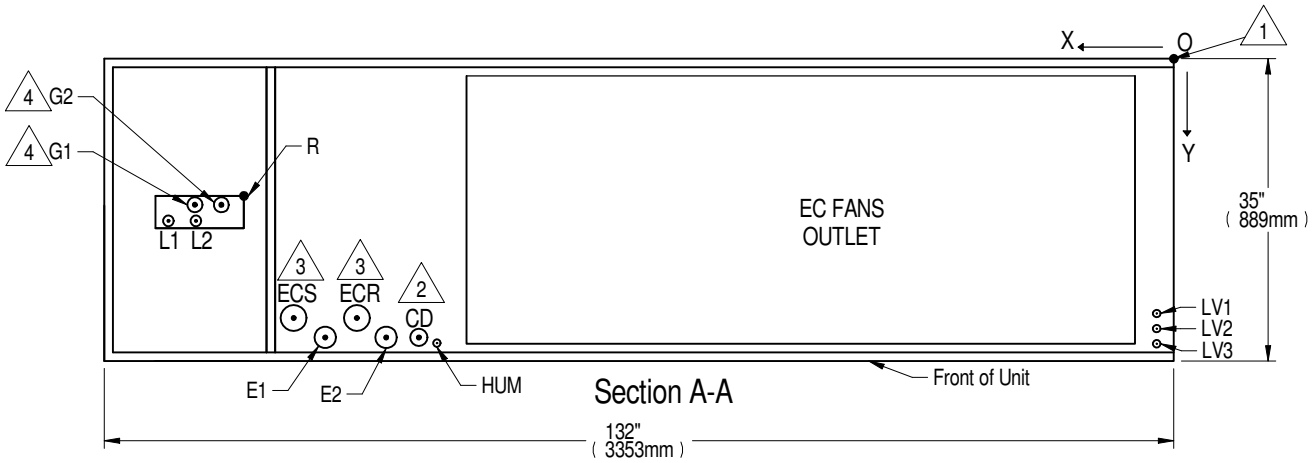
1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
3. Supplied on Dual Cooling systems only.
4. 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.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
R	REFRIGERANT ACCESS	82-3/4 (2102)	13-7/8 (352)	16-7/16" (4181mm) X 4" (102mm)
L1	LIQUID LINE SYSTEM 1	97 (2464)	16-7/8 (429)	5/8" O.D. Cu
L2	LIQUID LINE SYSTEM 2	93-5/16 (2370)		
G1	HOT GAS DISCHARGE 1 4	90-5/8 (2302)	16-5/8 (422)	1-1/8" O.D. Cu
G2	HOT GAS DISCHARGE 2 4	88 (2235)		
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
ECS	ECON-O-COIL SUPPLY 3	78-5/8 (1997)	22-1/4 (565)	2-1/8" O.D. Cu
ECR	ECON-O-COIL RETURN 3	73-15/16 (1862)	26-9/16 (675)	
E1	ELECTRICAL CONN. (HIGH VOLT)	78-1/2 (1994)	31-1/8 (791)	2-1/2"
E2	ELECTRICAL CONN. (HIGH VOLT)	75-3/8 (1915)		
LV1	ELECTRICAL CONN. (LOW VOLT)	2 (51)	29 (737)	7/8"
LV2	ELECTRICAL CONN. (LOW VOLT)		30-7/8 (784)	
LV3	ELECTRICAL CONN. (LOW VOLT)		32 (813)	

LIEBERT DS

PRIMARY CONNECTION LOCATIONS
DOWNFLOW AIR COOLED 105kW (30 TONS) ALL COMPRESSOR MODELS





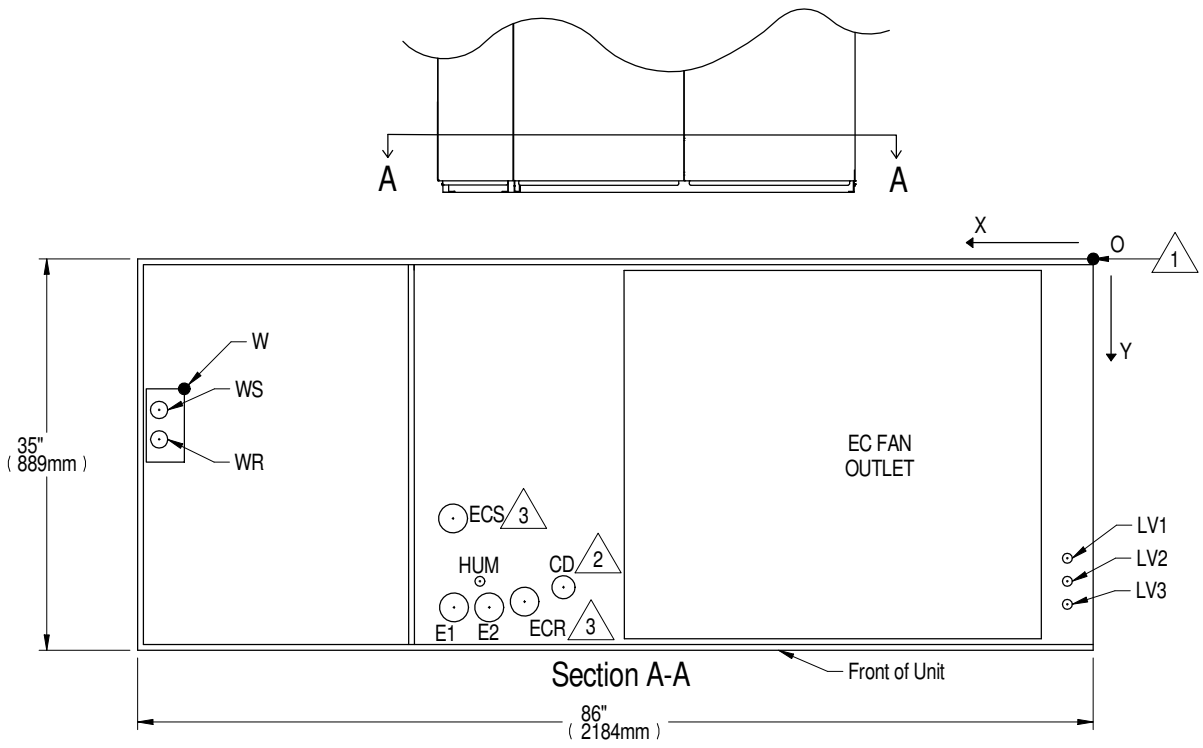
Notes:

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 Select appropriate drain system materials. The drain line must comply with all local codes.
3. Supplied on Dual Cooling systems only.
4. 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.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
R	REFRIGERANT ACCESS	109 (2769)	15-3/4 (400)	16-7/16" (418mm) X 4" (102mm)
L1	LIQUID LINE SYSTEM 1	121-3/4 (3092)	16-3/4 (425)	5/8" O.D. Cu
L2	LIQUID LINE SYSTEM 2	118-1/8 (3000)		
G1 4	HOT GAS DISCHARGE 1	118-1/4 (3004)	14-1/4 (362)	1-1/8" O.D. Cu
G2 4	HOT GAS DISCHARGE 2	115-5/8 (2937)		
CD 2	CONDENSATE DRAIN (infrared humidifier or no humidifier)	87-3/8 (2219)	31 (787)	3/4" NPT FEMALE
	W/ OPTIONAL PUMP	83-13/16 (2129)	30 (762)	1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	85-5/16 (2167)	32-1/2 (826)	1/4" O.D. Cu
ECS 3	ECON-O-COIL SUPPLY	101-7/8 (2588)	29 (737)	2-5/8" O.D. Cu
ECR 3	ECON-O-COIL RETURN	94-9/16 (2402)		
E1	ELECTRICAL CONN. (HIGH VOLT)	98-1/8 (2492)	31 (787)	2-1/2"
E2	ELECTRICAL CONN. (HIGH VOLT)	91 (2311)		
LV1	ELECTRICAL CONN. (LOW VOLT)	2 (51)	29 (737)	7/8"
LV2	ELECTRICAL CONN. (LOW VOLT)		30-7/8 (784)	
LV3	ELECTRICAL CONN. (LOW VOLT)		32 (813)	

LIEBERT DS

PRIMARY CONNECTION LOCATIONS
DOWNFLOW WATER/GLYCOL/GLYCOOL™ 35-42kW (10-12 TONS)
ALL COMPRESSOR MODELS

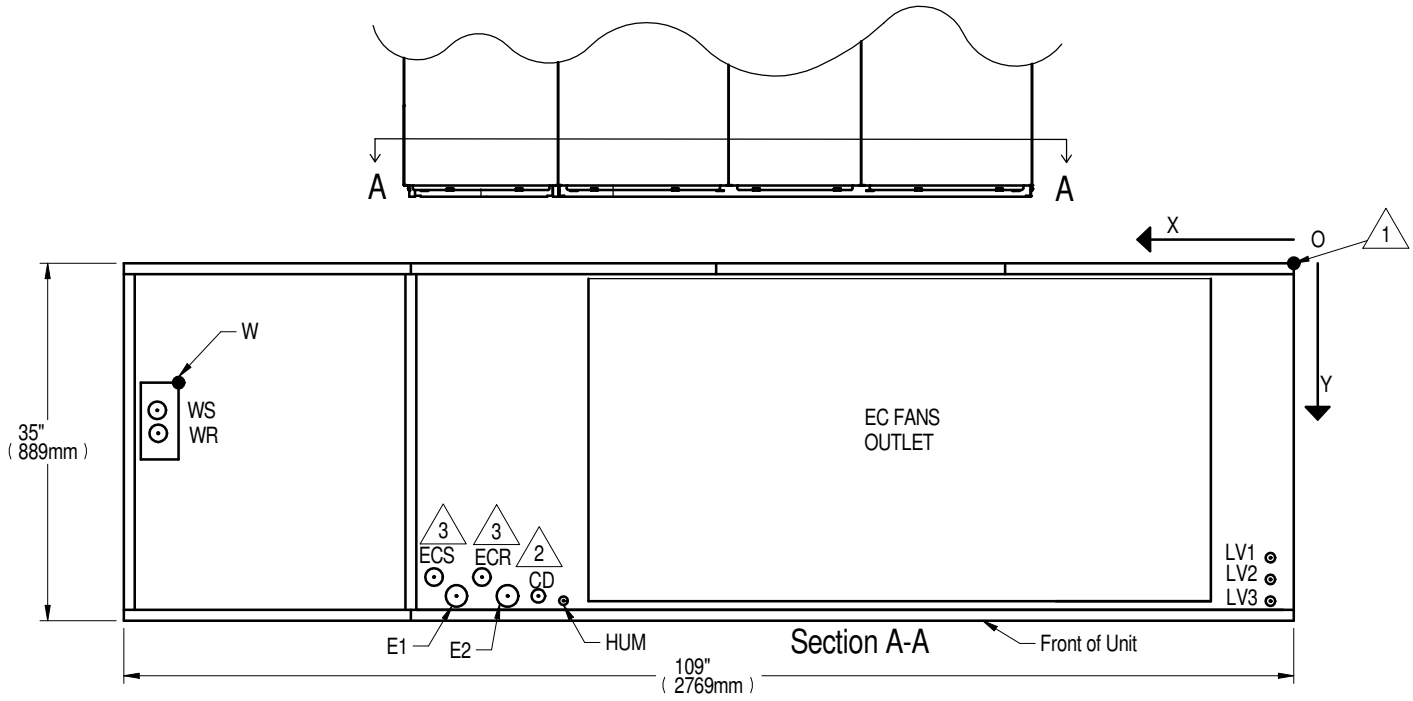


Notes:

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. Select appropriate drain system materials. The drain line must comply with all local codes.
3. Supplied on Dual Cooling systems only (four-pipe system).
4. Semi-Hermetic Compressor not available on 35kW - 42kW models.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING	
				35kW (10 TONS)	42kW (12 TONS)
W	WATER/GLYCOL/GLYCOOL™ ACCESS	79-15/16 (2030)	9-1/16 (230)	3-1/2" (89mm) X 8" (203mm)	
WS	WATER/GLYCOL/GLYCOOL™ SUPPLY	82-15/16 (2107)	10-15/16 (278)	1-5/8" O.D. CU	2-1/8" O.D. CU
WR	WATER/GLYCOL/GLYCOOL™ RETURN		14-1/16 (357)		
ECS	ECON-O-COIL SUPPLY 3	54-7/8 (1394)	22-9/16 (573)		
ECR	ECON-O-COIL RETURN 3	49-13/16 (1265)	28-1/2 (724)		
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)		

PRIMARY CONNECTION LOCATIONS
DOWNFLOW WATER/GLYCOL/GLYCOOL™ 53-77kW (15-22 TONS)
ALL COMPRESSOR MODELS



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. Select appropriate drain system materials. The drain line must comply with all local codes.
3. Supplied on Dual Cooling systems only (four-pipe system).
4. Scroll and Digital Scroll compressors not available on 77kW models.
5. Semi-Hermetic Compressor available only on 77kW models.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
W	WATER/GLYCOL/GLYCOOL™ ACCESS	103 (2616)	9 (229)	3-1/2" (89mm) X 8 (203mm)
WS	WATER/GLYCOL/GLYCOOL™ SUPPLY	104-3/4 (2661)	11 (279)	2-1/8" O.D. Cu
WR	WATER/GLYCOL/GLYCOOL™ RETURN		15 (381)	
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
ECS	ECON-O-COIL SUPPLY 3	78-5/8 (1997)	22-1/4 (565)	2-1/8" O.D. Cu
ECR	ECON-O-COIL RETURN 3	73-15/16 (1878)	26-9/16 (675)	
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)	2 (51)	29 (737)	7/8"
LV2			30-7/8 (784)	
LV3			32 (813)	

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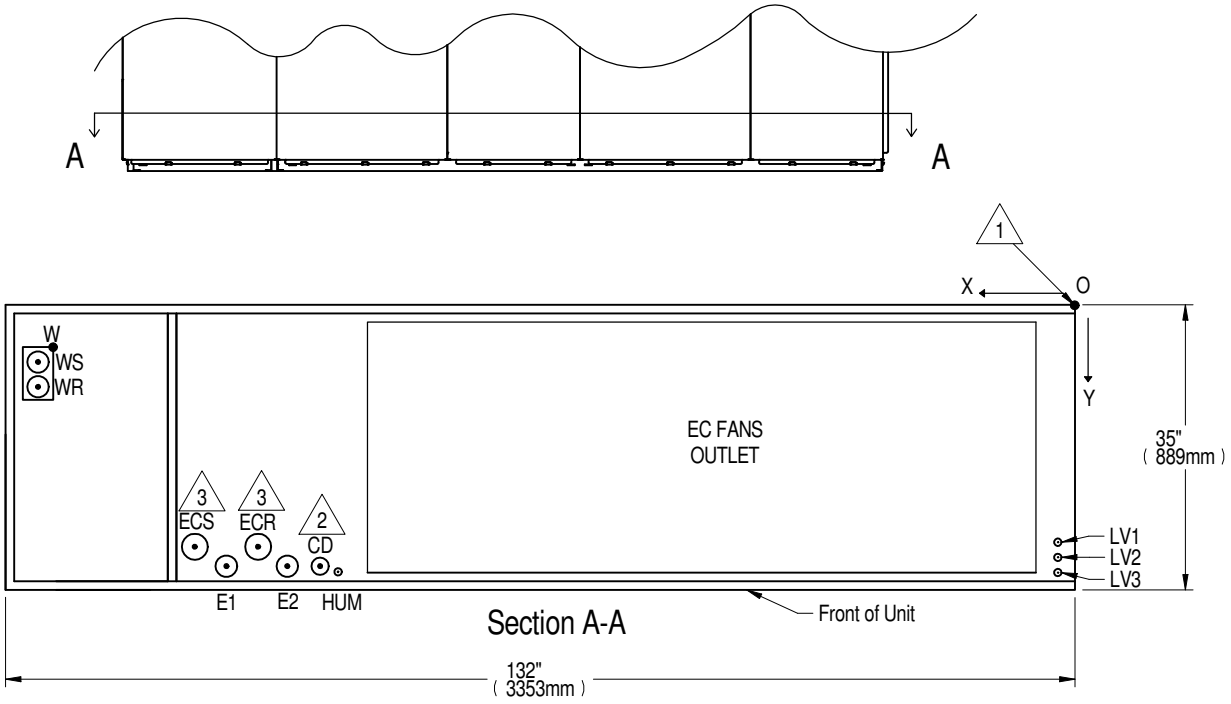
PRIMARY CONNECTION LOCATIONS
DOWNFLOW WATER/GLYCOL/GLYCOOL™ 105kW (30 TONS)
ALL COMPRESSOR MODELS



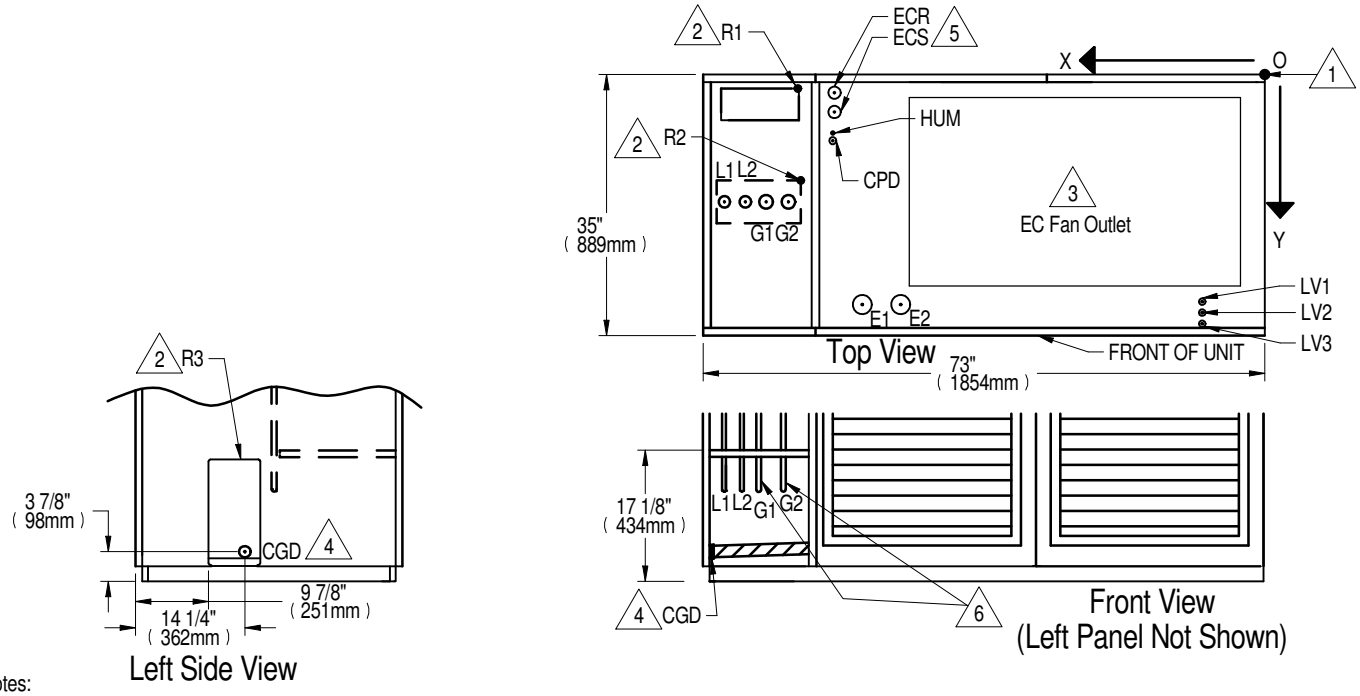
Notes:

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. Select appropriate drain system materials. The drain line must comply with all local codes.
3. Supplied on Dual Cooling systems only (four-pipe system).
4. Scroll and Digital Scroll compressors not available on105kW models.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
W	WATER/GLYCOL/GLYCOOL™ ACCESS	125-15/16 (3199)	9 (229)	3-1/2" (89mm) X 8" (203mm)
WS	WATER/GLYCOL/GLYCOOL™ SUPPLY	127-7/8 (3248)	10-1/16 (256)	2-1/8" O.D. Cu
WR	WATER/GLYCOL/GLYCOOL™ RETURN		13-1/4 (337)	
CD 2	CONDENSATE DRAIN (infrared humidifier or no humidifier)	87-3/8 (2219)	31 (787)	3/4" NPT FEMALE
	W/ OPTIONAL PUMP	83-13/16 (2129)	30 (762)	1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	85-5/16 (2167)	32-1/2 (826)	1/4" O.D. Cu
ECS 3	ECON-O-COIL SUPPLY	101-7/8 (2588)	29 (737)	2-5/8" O.D. Cu
ECR 3	ECON-O-COIL RETURN	94-9/16 (2402)		
E1	ELECTRICAL CONN. (HIGH VOLT)	98-1/8 (2492)	31 (787)	2-1/2"
E2	ELECTRICAL CONN. (HIGH VOLT)	91 (2311)		
LV1	ELECTRICAL CONN. (LOW VOLT)	2 (51)	29 (737)	7/8"
LV2	ELECTRICAL CONN. (LOW VOLT)		30-7/8 (784)	
LV3	ELECTRICAL CONN. (LOW VOLT)		32 (813)	

LIEBERT DS

PRIMARY CONNECTION LOCATIONS
UPFLOW AIR COOLED 35-42kW (10-12 TONS)
SCROLL OR DIGITAL SCROLL COMPRESSOR MODELS W/ EC FANS



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 routed alternatives for refrigerant gas & liquid line connection points.
3. EC fan shown. See submittal page DPN003458 for EC fan outlet & plenum dimensional data.
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
5. Supplied on Dual Cooling Systems only.
6. 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.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
R1	REFRIGERANT ACCESS (TOP) 2	60-5/8 (1540)	2-13/16 (71)	10-1/8" (257mm) X 4-1/8" (105mm)
R2	REFRIGERANT ACCESS (BOTTOM) 2	59-5/16 (1507)	14-3/4 (375)	11-3/16" (284mm) X 4" (102mm)
R3	REFRIGERANT ACCESS (SIDE) 2	N/A	N/A	6" (152mm) X 17-3/16" (437mm)
L1	LIQUID LINE SYSTEM 1	69-15/16 (1776)	16-3/4 (425)	1/2" O.D. Cu
L2	LIQUID LINE SYSTEM 2	67-5/8 (1718)		
G1	HOT GAS DISCHARGE 1 6	65-1/2 (1664)	16-5/8 (422)	5/8" O.D. Cu
G2	HOT GAS DISCHARGE 2 6	62-7/16 (1586)		
CGD	CONDENSATE GRAVITY DRAIN 4	N/A	N/A	3/4" NPT FEMALE
CPD	CONDENSATE PUMP DISCHARGE (OPT)	56-1/4 (1429)	11-1/8 (283)	1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE		9-1/8 (232)	1/4" O.D. Cu
ECS	ECON-O-COIL SUPPLY 5	56 (1422)	7-5/16 (186)	1-5/8" O.D. Cu
ECR	ECON-O-COIL RETURN 5		4-1/2 (114)	
E1	ELECTRICAL CONN. (HIGH VOLT)	52-3/8 (1330)	29-15/16 (760)	2-1/2"
E2		47-3/8 (1203)		
LV1	ELECTRICAL CONN. (LOW VOLT)	8-1/8 (206)	29-9/16 (751)	7/8"
LV2			31 (787)	
LV3			32-7/16 (824)	

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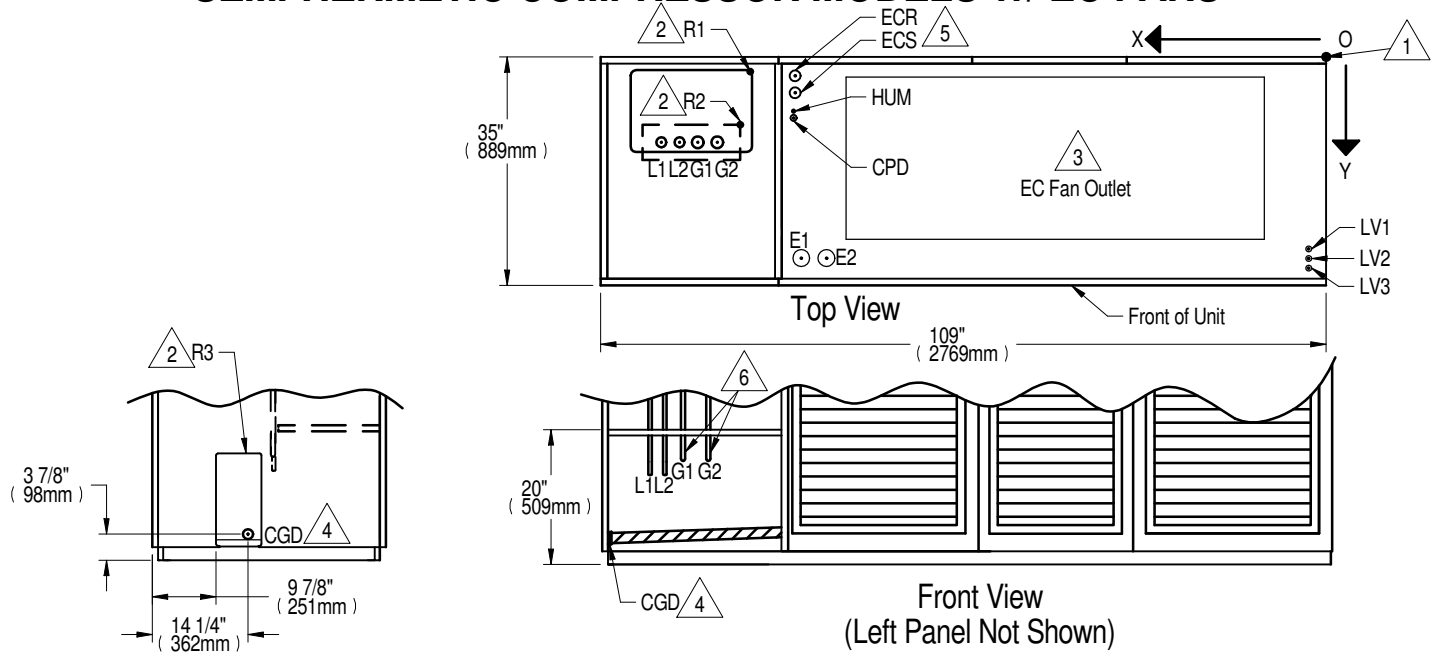
PRIMARY CONNECTION LOCATIONS
UPFLOW AIR COOLED 77kW (22 TONS)
SEMI-HERMETIC COMPRESSOR MODELS W/ EC FANS



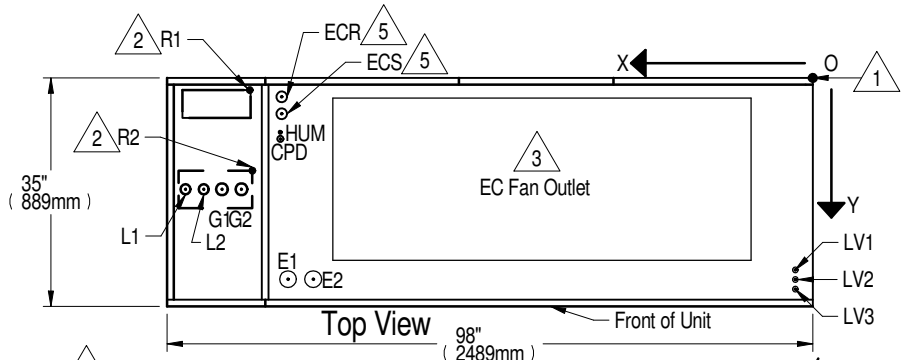
Notes:

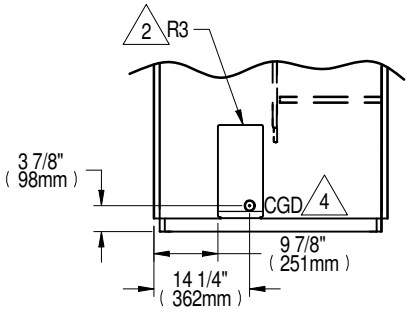
1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ±1/2" (13mm).
2. Field routed alternatives for refrigerant gas & liquid line connection points.
3. EC fans shown. See submittal page DPN003453 for EC fan outlet and plenum dimensional data.
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
5. Supplied on Dual Cooling Systems only.
6. 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.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
R1	REFRIGERANT ACCESS (TOP) 2	83-3/4 (2127)	1-7/8 (48)	22-1/2"(572mm) X 15-3/16" (386mm)
R2	REFRIGERANT ACCESS (BOTTOM) 2	86 (2184)	13-7/8 (352)	16-7/16" (418mm) X 4" (102mm)
R3	REFRIGERANT ACCESS (SIDE) 2	N/A	N/A	6" (152mm) X 17-3/16" (437mm)
L1	LIQUID LINE SYSTEM 1	97 (2464)	16-3/4 (425)	5/8" O.D. Cu
L2	LIQUID LINE SYSTEM 2	93-5/16 (2370)		
G1	HOT GAS DISCHARGE 1 6	90-5/8 (2302)	16-5/8 (422)	1-1/8" O.D. Cu
G2	HOT GAS DISCHARGE 2 6	88 (2235)		
CGD	CONDENSATE GRAVITY DRAIN 4	N/A	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
ECS	ECON-O-COIL SUPPLY 5	78-5/8 (1997)	7-7/8 (200)	2-1/8" O.D. Cu
ECR	ECON-O-COIL RETURN 5		4-5/8 (117)	
E1	ELECTRICAL CONN. (HIGH VOLT)	78-1/8 (1984)	30 (762)	2-1/2"
E2	ELECTRICAL CONN. (HIGH VOLT)	74-3/8 (1889)		
LV1	ELECTRICAL CONN. (LOW VOLT)	2-5/8 (67)	28-9/16 (725)	7/8"
LV2	ELECTRICAL CONN. (LOW VOLT)		30 (762)	
LV3	ELECTRICAL CONN. (LOW VOLT)		31-7/16 (799)	

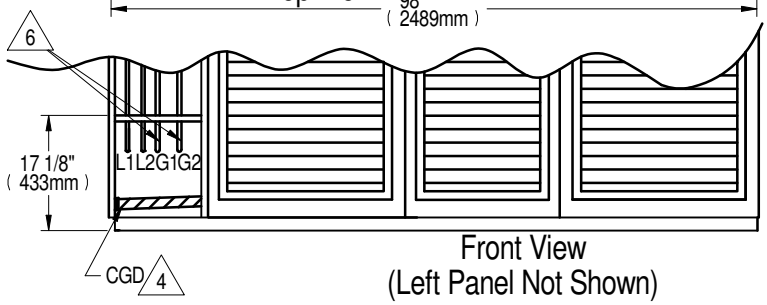
LIEBERT DS

PRIMARY CONNECTION LOCATIONS
UPFLOW AIR COOLED 53-77kW (15-22 TONS)
SCROLL OR DIGITAL SCROLL COMPRESSOR MODELS





Left Side View



Front View
(Left Panel Not Shown)

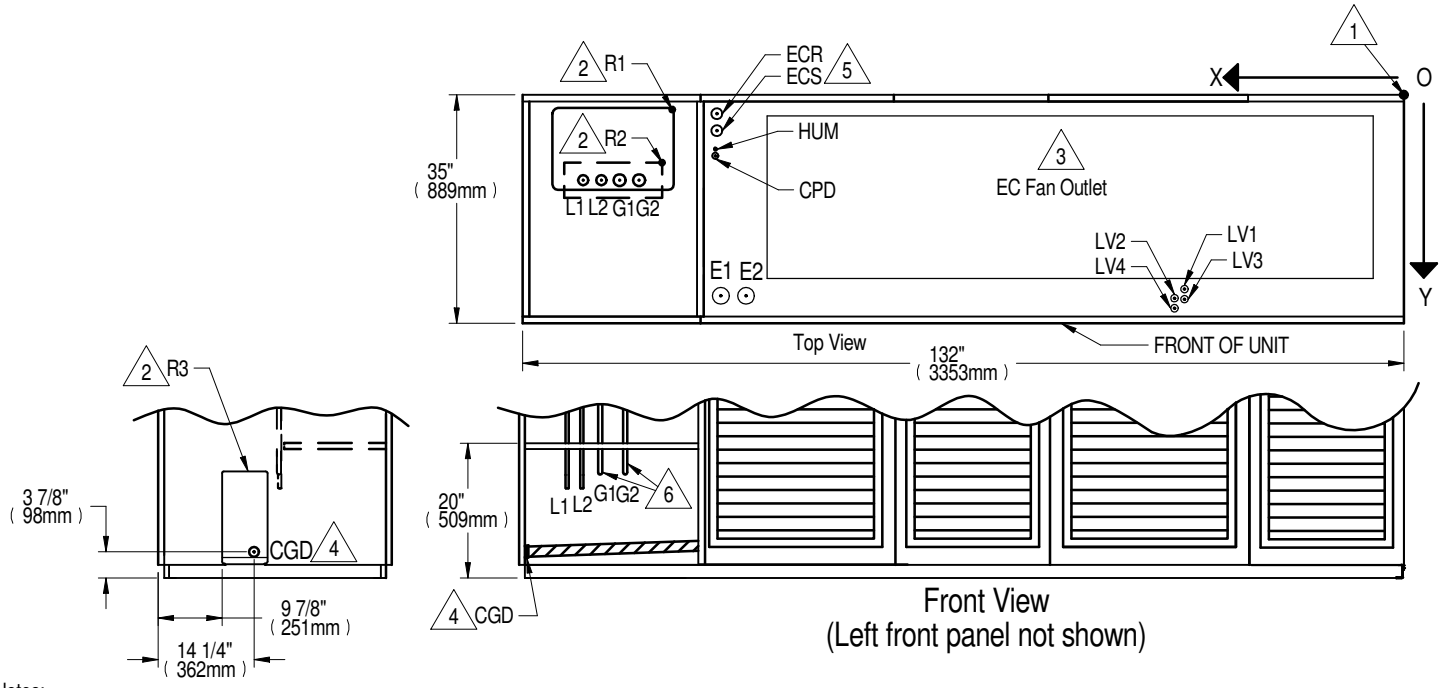
Notes:

1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field routed alternatives for refrigerant gas and liquid line connection points.
3. EC fans shown. See submittal page DPN003453 for EC fan outlet and plenum dimensional data.
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
5. Supplied on Dual Cooling Systems only.
6. 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.
7. Digital Scroll compressor not available on DS077 models.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING	
R1 2	REFRIGERANT ACCESS (TOP)	83-5/8 (2124)	2 (51)	12"(305mm) X 4" (102mm)	
R2 2	REFRIGERANT ACCESS (BOTTOM)	82-3/4 (2102)	14-3/4 (375)	12-3/16" (310mm) X 4" (102mm)	
R3 2	REFRIGERANT ACCESS (SIDE)	N/A	N/A	6" (152mm) X 17-3/16" (437mm)	
				53kW (15TONS)	70 & 77kW (20 & 22TONS)
L1	LIQUID LINE SYSTEM 1	94-11/16 (2405)	16-3/4 (425)	1/2" O.D. Cu	5/8" O.D. Cu
L2	LIQUID LINE SYSTEM 2	91-7/8 (2334)			
G1 6	HOT GAS DISCHARGE 1	88-3/4 (2254)	16-3/8 (416)	7/8" O.D. Cu	1-1/8" O.D. Cu
G2 6	HOT GAS DISCHARGE 2	85-9/16 (2173)			
CGD 4	CONDENSATE GRAVITY DRAIN	N/A	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	
ECS 5	ECON-O-COIL SUPPLY	78-5/8 (1997)	7-7/8 (200)	2-1/8" O.D. Cu	
ECR 5	ECON-O-COIL RETURN		4-5/8 (117)		
E1	ELECTRICAL CONN. (HIGH VOLT)	78-1/8 (1984)	30 (762)	2-1/2"	
E2	ELECTRICAL CONN. (HIGH VOLT)	74-3/8 (1889)			
LV1	ELECTRICAL CONN. (LOW VOLT)	2-5/8 (67)	28-9/16 (725)	7/8"	
LV2	ELECTRICAL CONN. (LOW VOLT)		30 (762)		
LV3	ELECTRICAL CONN. (LOW VOLT)		31-7/16 (799)		

LIEBERT DS

PRIMARY CONNECTION LOCATIONS
UPFLOW AIR COOLED 105kW (30 TONS) ALL COMPRESSOR MODELS



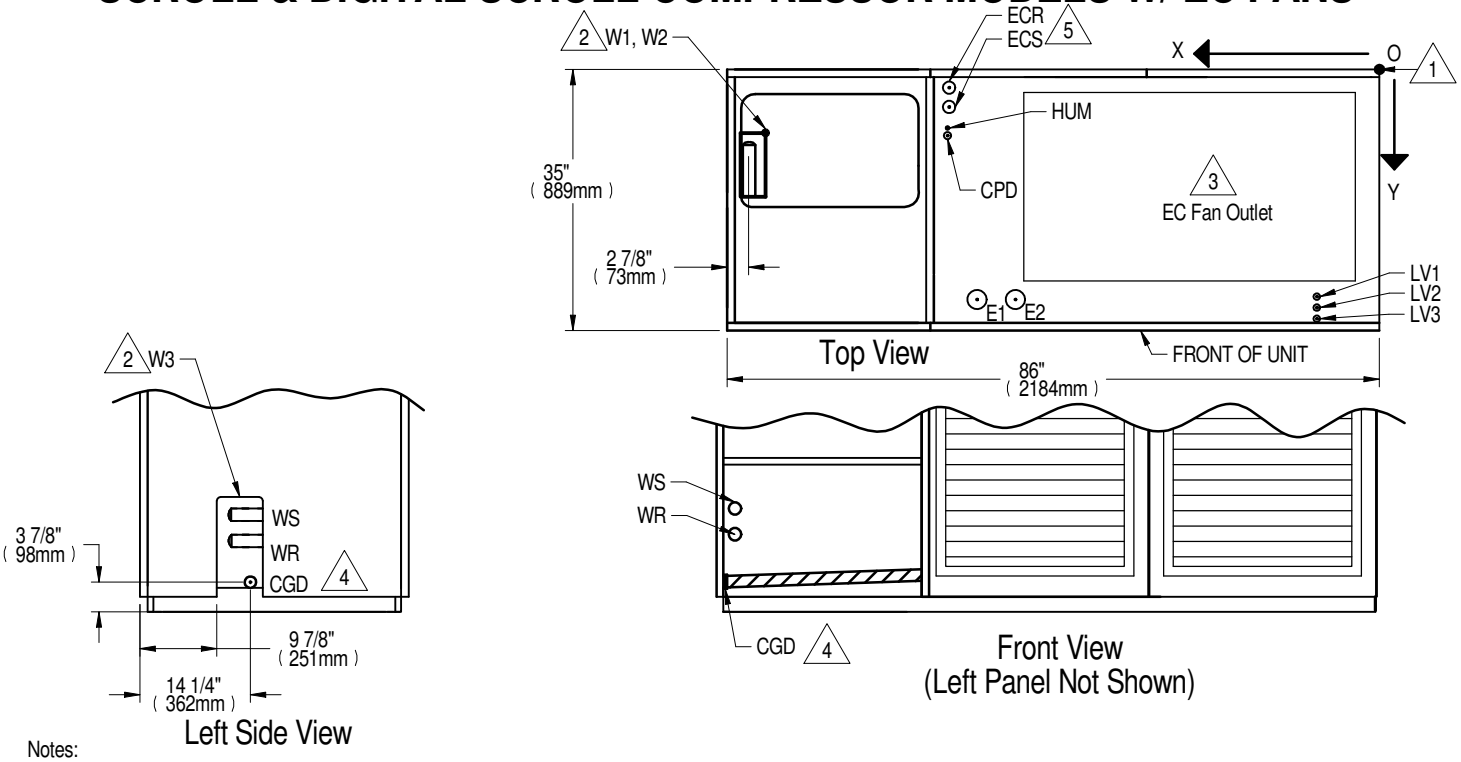
Notes:

1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field routed alternatives for refrigerant gas and liquid line connection points.
3. EC fans shown. See submittal page DPN003459 for EC fan outlet and plenum dimensional data.
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
5. Supplied on Dual Cooling Systems only.
6. 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.
7. Digital Scroll Compressor not available on DS105.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
R1	REFRIGERANT ACCESS (TOP) 2	106-7/8 (2715)	1-7/8 (48)	22-1/2"(572mm) X 15-3/16" (386mm)
R2	REFRIGERANT ACCESS (BOTTOM) 2	109-1/8 (2772)	13-7/8 (352)	16-7/16" (418mm) X 4" (102mm)
R3	REFRIGERANT ACCESS (SIDE) 2	N/A	N/A	6" (152mm) X 17-3/16" (437mm)
L1	LIQUID LINE SYSTEM 1	121-3/4 (3092)	16-3/4 (425)	5/8" O.D. Cu
L2	LIQUID LINE SYSTEM 2	118-1/8 (3000)		
G1	HOT GAS DISCHARGE 1 6	118-1/4 (3004)	14-1/4 (362)	1-1/8" O.D. Cu
G2	HOT GAS DISCHARGE 2 6	115-5/8 (2937)		
CGD	CONDENSATE GRAVITY DRAIN 4	N/A	N/A	3/4" NPT FEMALE
CPD	CONDENSATE PUMP DISCHARGE (OPT)	102-3/8 (2600)	13-5/8 (346)	1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	101-1/8 (2569)	13-1/8 (333)	1/4" O.D. Cu
ECS	ECON-O-COIL SUPPLY 5		10-1/4 (260)	2-5/8" O.D. Cu
ECR	ECON-O-COIL RETURN 5		5-1/4 (133)	
E1	ELECTRICAL CONN. (HIGH VOLT)		30 (762)	2-1/2"
E2		97-7/8 (2486)		
LV1	ELECTRICAL CONN. (LOW VOLT)	34-1/8 (867)	30-1/4 (768)	7/8"
LV2			31-3/4 (806)	
LV3		32-5/8 (829)	28-15/16 (735)	
LV4			30-7/16 (773)	

LIEBERT DS

PRIMARY CONNECTION LOCATIONS
UPFLOW WATER/GLYCOL/GLYCOOL™ 35-42kW (10-12 TONS)
SCROLL & DIGITAL SCROLL COMPRESSOR MODELS W/ EC FANS



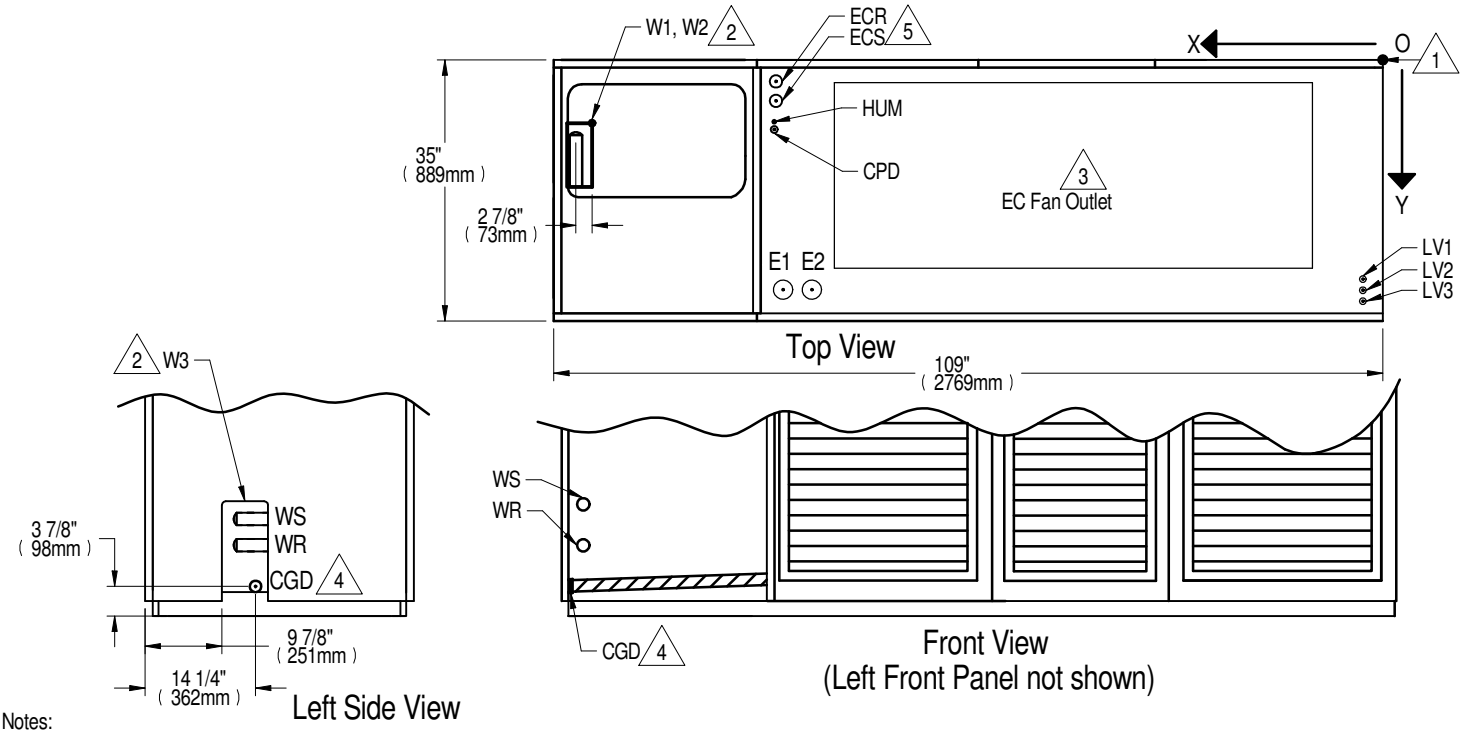
Notes:

1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ±1/2" (13mm).
2. Field routed alternatives for water/glycol connections.
3. EC fan shown. See submittal page DPN003458 for EC fan outlet and plenum dimensional data.
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
5. Supplied on Dual Cooling Systems only (four-pipe systems).

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING	
				35kW (10 TONS)	42kW (12 TONS)
W1	WATER/GLYCOL/GLYCOOL™ ACCESS (BOTTOM) 2	79-15/16 (2030)	9 (229)	3-1/2" (89mm) X 8" (203mm)	
W2	WATER/GLYCOL/GLYCOOL™ ACCESS (TOP) 2				
W3	WATER/GLYCOL/GLYCOOL™ ACCESS (SIDE) 2	N/A	N/A	6" (152mm) x 17-3/16" (437mm)	
WS	WATER/GLYCOL/GLYCOOL™ SUPPLY			1-5/8" O.D. Cu	2-1/8" O.D. Cu
WR	WATER/GLYCOL/GLYCOOL™ RETURN				
ECS	ECON-O-COIL SUPPLY 5	56 (1422)	7-5/16 (186)		
ECR	ECON-O-COIL RETURN 5		4-1/2 (114)		
CGD	CONDENSATE GRAVITY DRAIN 4	N/A	N/A	3/4" NPT FEMALE	
CPD	CONDENSATE PUMP DISCHARGE (OPT)	56-1/4 (1429)	11-1/8 (283)	1/2" O.D. Cu	
HUM	HUMIDIFIER SUPPLY LINE		9-1/8 (232)	1/4" O.D. Cu	
E1	ELECTRICAL CONN. (HIGH VOLT)	52-3/8 (1330)	29-15/16 (760)	2-1/2"	
E2		47-3/8 (1203)			
LV1	ELECTRICAL CONN. (LOW VOLT)	8-1/8 (206)	29-9/16 (751)	7/8"	
LV2			31 (787)		
LV3			32-7/16 (824)		

LIEBERT DS

PRIMARY CONNECTION LOCATIONS
UPFLOW WATER/GLYCOL/GLYCOOL™ 53-77kW (15-22 TONS)
ALL COMPRESSOR MODELS W/ EC FANS



Notes:

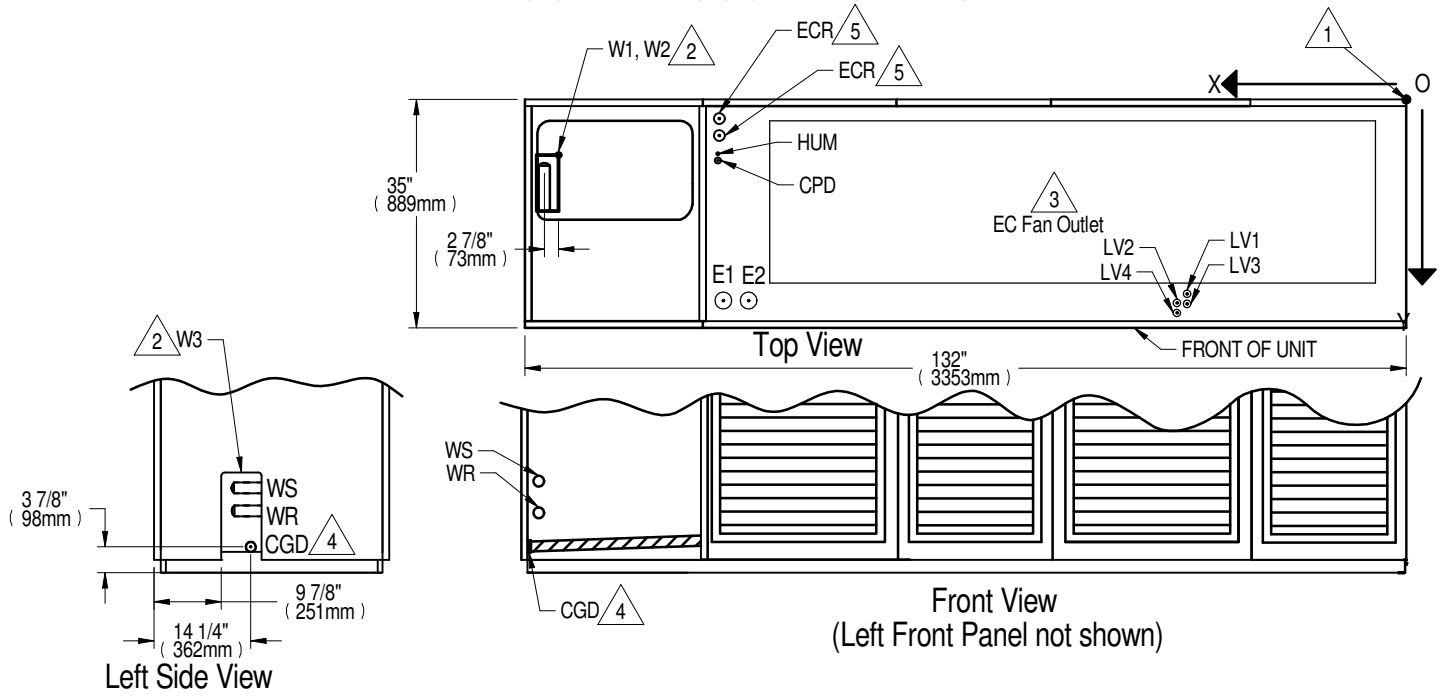
1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field routed alternatives for water/glycol connections.
3. EC fan shown. See submittal DPN003453 for EC fan outlet & plenum dimensional data.
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
5. Supplied on Dual Cooling Systems only (four-pipe system).

6. Scroll and Digital Scroll compressor not available on 77kW models.
7. Semi-Hermetic Compressor only available on 77kW models.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
W1	WATER/GLYCOL/GLYCOOL™ ACCESS (BOTTOM) 2	102-15/16 (2615)	9 (229)	3-1/2" (89mm) X 8" (203mm)
W2	WATER/GLYCOL/GLYCOOL™ ACCESS (TOP) 2			3-1/2" (89mm) X 8" (203mm)
W3	WATER/GLYCOL/GLYCOOL™ ACCESS (SIDE) 2	N/A	N/A	6" (152mm) x 17-3/16" (437mm)
WS	WATER/GLYCOL/GLYCOOL™ SUPPLY			2-1/8" O.D. Cu
WR	WATER/GLYCOL/GLYCOOL™ RETURN			
CGD	CONDENSATE GRAVITY DRAIN 4			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
ECS	ECON-O-COIL SUPPLY 5	78-5/8 (1998)	7-7/8 (200)	2-1/8" O.D. Cu
ECR	ECON-O-COIL RETURN 5		4-5/8 (117)	
E1	ELECTRICAL CONN. (HIGH VOLT)	78-1/8 (1984)	30 (762)	2-1/2"
E2	ELECTRICAL CONN. (HIGH VOLT)	74-3/8 (1889)		
LV1	ELECTRICAL CONN. (LOW VOLT)	2-5/8 (66)	28-9/16 (726)	7/8"
LV2	ELECTRICAL CONN. (LOW VOLT)		30 (762)	
LV3	ELECTRICAL CONN. (LOW VOLT)		31-7/16 (799)	

LIEBERT DS

PRIMARY CONNECTION LOCATIONS
UPFLOW WATER/GLYCOL/GLYCOOL™ 105kW (30 TONS)
ALL COMPRESSOR MODELS



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 routed alternatives for water/glycol connections.
3. EC fans shown. See submittal DPN003459 for EC fan outlet & plenum dimensional data.
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
5. Supplied on Dual Cooling Systems only (four-pipe system).

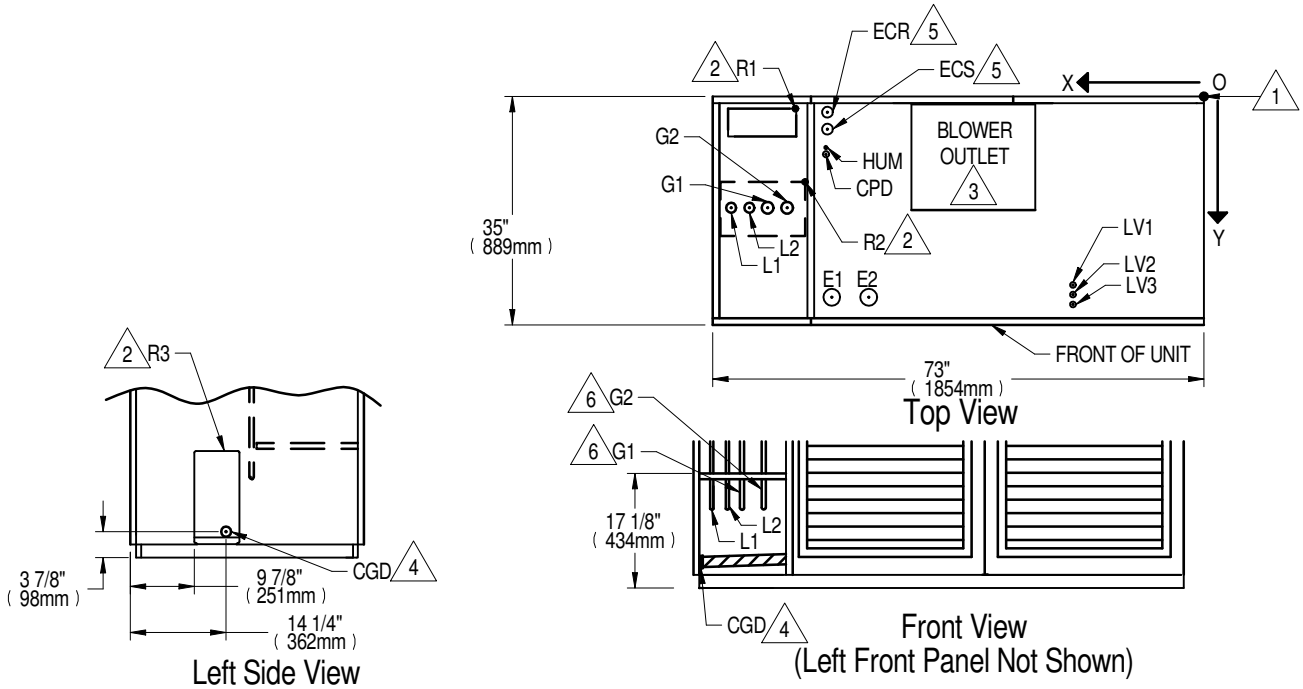
6. Scroll and Digital Scroll compressor not available on 105kW models.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
W1	WATER/GLYCOL/GLYCOOL ACCESS (BOTTOM) 2	126-1/8 (3204)	9 (229)	3-1/2" (89mm) X 8" (203mm)
W2	WATER/GLYCOL/GLYCOOL ACCESS (TOP) 2			3-1/2" (89mm) X 8" (203mm)
W3	WATER/GLYCOL/GLYCOOL ACCESS (SIDE) 2	N/A	N/A	6" (152mm) x 17-3/16" (437mm)
WS	WATER/GLYCOL/GLYCOOL SUPPLY			2-1/8" O.D. Cu
WR	WATER/GLYCOL/GLYCOOL RETURN			
CGD	CONDENSATE GRAVITY DRAIN 4			3/4" NPT FEMALE
CPD	CONDENSATE PUMP DISCHARGE (OPT)	102-3/8 (2600)	13-5/8 (346)	1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	101-1/8 (2569)	13-1/8 (333)	1/4" O.D. Cu
ECS	ECON-O-COIL SUPPLY 5		10-1/4 (260)	2-5/8" O.D. Cu
ECR	ECON-O-COIL RETURN 5		5-1/4 (133)	
E1	ELECTRICAL CONN. (HIGH VOLT)	101-5/8 (2581)	30 (762)	2-1/2"
E2		97-7/8 (2486)		
LV1	ELECTRICAL CONN. (LOW VOLT)	34-1/8 (867)	30-1/4 (768)	7/8"
LV2			31-3/4 (806)	
LV3		32-5/8 (829)	28-15/16 (735)	
LV4			30-7/16 (773)	

LIEBERT DS

PRIMARY CONNECTION LOCATIONS

UPFLOW AIR COOLED 35-42kW (10-12 TONS) SCROLL OR DIGITAL SCROLL COMPRESSOR MODELS W/ FORWARD CURVED BLOWERS



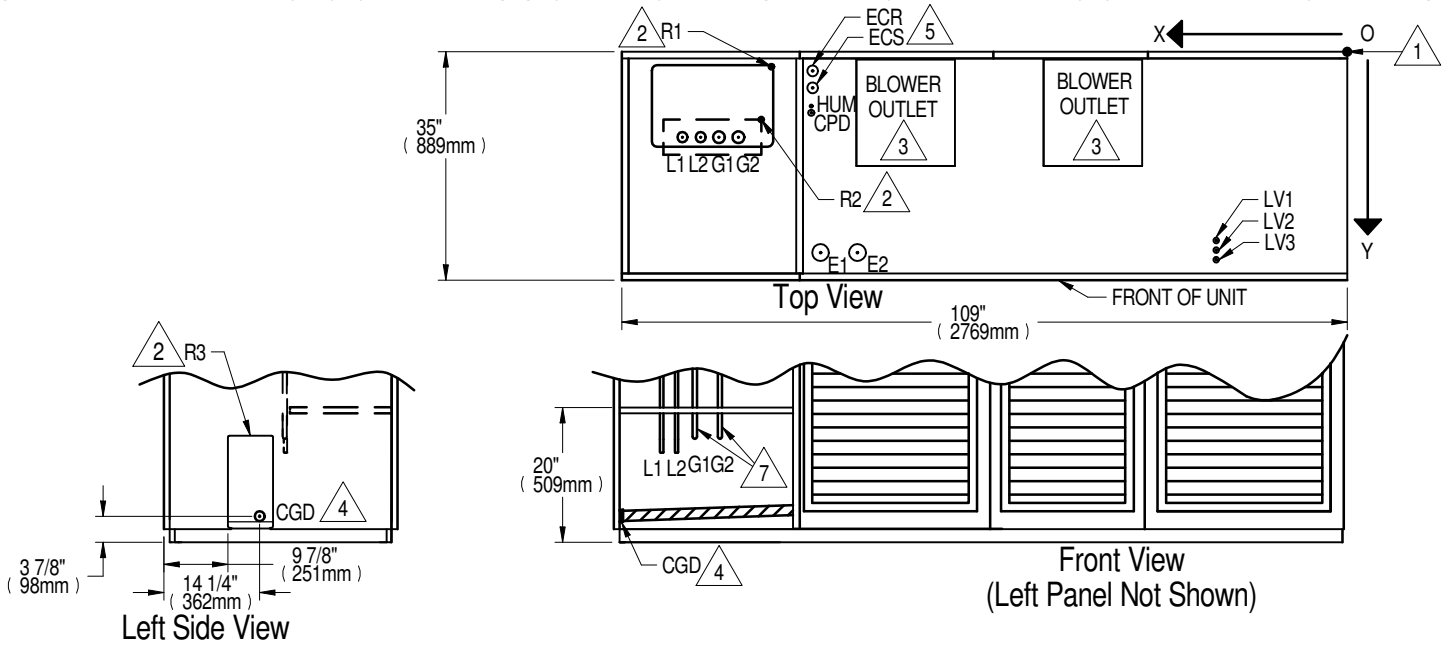
Notes:

1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field routed alternatives for refrigerant gas & liquid line connection points.
3. Forward Curved Blower Shown. See submittal page DPN001120 for blower outlet and deck dimensional data.
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
5. Supplied on Dual Cooling Systems only.
6. 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.
7. Digital Scroll compressors not available on Air Cooled 42kW models.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
R1	REFRIGERANT ACCESS (TOP) 2	60-5/8 (1540)	2-13/16 (71)	10-1/8" (257mm) X 4-1/8" (105mm)
R2	REFRIGERANT ACCESS (BOTTOM) 2	59-5/16 (1507)	14-3/4 (375)	11-3/16" (284mm) X 4" (102mm)
R3	REFRIGERANT ACCESS (SIDE) 2	N/A	N/A	6" (152mm) X 17-3/16" (437mm)
L1	LIQUID LINE SYSTEM 1	69-15/16 (1776)	16-3/4 (425)	1/2" O.D. Cu
L2	LIQUID LINE SYSTEM 2	67-5/8 (1718)		
G1	HOT GAS DISCHARGE 1 6	65-1/2 (1664)	16-5/8 (422)	5/8" O.D. Cu
G2	HOT GAS DISCHARGE 2 6	62-7/16 (1586)		
CGD	CONDENSATE GRAVITY DRAIN 4	N/A	N/A	3/4" NPT FEMALE
CPD	CONDENSATE PUMP DISCHARGE (OPT)	56-1/4 (1429)	11-1/8 (283)	1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE		9-1/8 (232)	1/4" O.D. Cu
ECS	ECON-O-COIL SUPPLY 5	56 (1422)	7-5/16 (186)	1-5/8" O.D. Cu
ECR	ECON-O-COIL RETURN 5		4-1/2 (114)	
E1	ELECTRICAL CONN. (HIGH VOLT)	52-3/8 (1330)	30 (762)	2-1/2"
E2	ELECTRICAL CONN. (HIGH VOLT)	46-7/8 (1191)		
LV1	ELECTRICAL CONN. (LOW VOLT)	19-1/2 (495)	29-1/16 (738)	7/8"
LV2	ELECTRICAL CONN. (LOW VOLT)		30-1/2 (775)	
LV3	ELECTRICAL CONN. (LOW VOLT)		31-15/16 (811)	

LIEBERT DS

PRIMARY CONNECTION LOCATIONS
UPFLOW AIR COOLED 77kW (22 TONS)
SEMI-HERMETIC COMPRESSOR MODELS W/ FORWARD CURVED BLOWERS



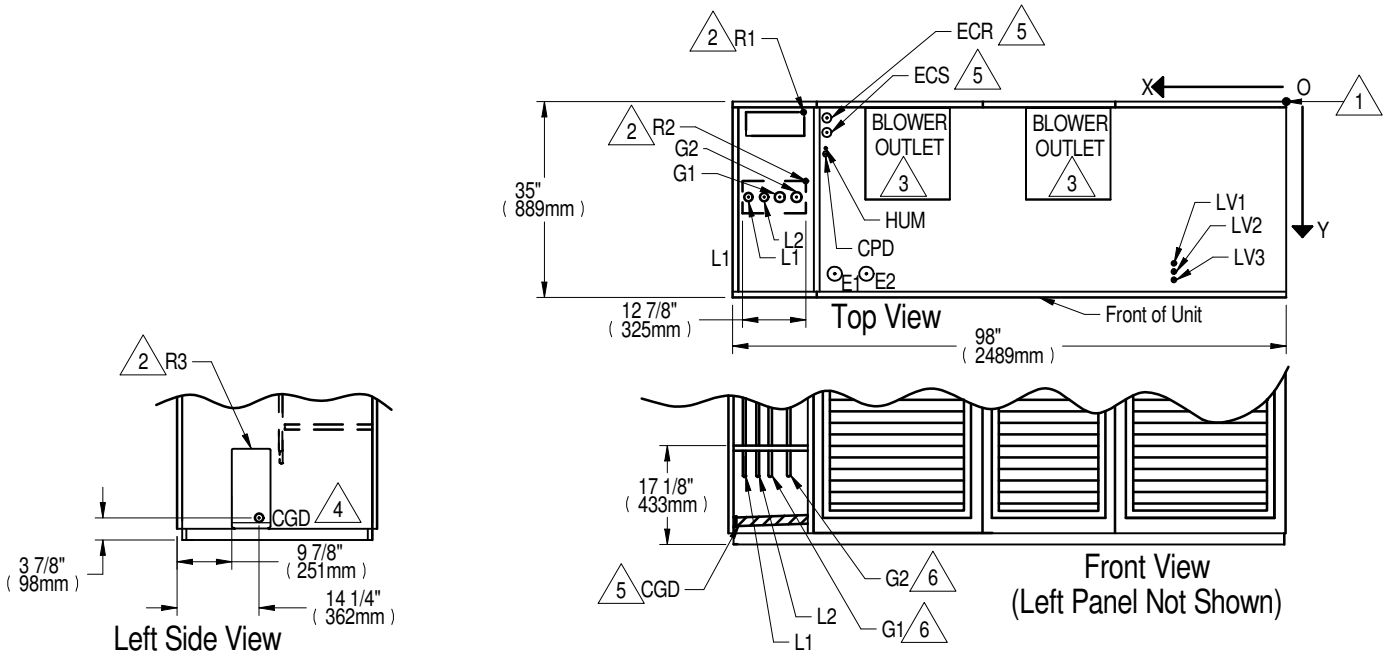
Notes:

1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field routed alternatives for refrigerant gas & liquid line connection points.
3. Forward Curved Blowers shown. See submittal page DPN001191 for blower outlet and deck dimensional data.
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
5. Supplied on Dual Cooling Systems only.
6. 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.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
R1	REFRIGERANT ACCESS (TOP) 2	83-3/4 (2127)	1-7/8 (48)	22-1/2"(572mm) X 15-3/16" (386mm)
R2	REFRIGERANT ACCESS (BOTTOM) 2	86 (2184)	13-7/8 (352)	16-7/16" (418mm) X 4" (102mm)
R3	REFRIGERANT ACCESS (SIDE) 2	N/A	N/A	6" (152mm) X 17-3/16" (437mm)
L1	LIQUID LINE SYSTEM 1	97 (2464)	16-3/4 (425)	5/8" O.D. Cu
L2	LIQUID LINE SYSTEM 2	93-5/16 (2370)		
G1	HOT GAS DISCHARGE 1 6	90-5/8 (2302)	16-5/8 (422)	1-1/8" O.D. Cu
G2	HOT GAS DISCHARGE 2 6	88 (2235)		
CGD	CONDENSATE GRAVITY DRAIN 4	N/A	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
ECS	ECON-O-COIL SUPPLY 5	78-5/8 (1997)	7-7/8 (200)	2-1/8" O.D. Cu
ECR	ECON-O-COIL RETURN 5		4-5/8 (117)	
E1	ELECTRICAL CONN. (HIGH VOLT)	75-3/8 (1915)	30 (762)	2-1/2"
E2		69-7/8 (1775)		
LV1	ELECTRICAL CONN. (LOW VOLT)	19-1/2 (495)	29-1/16 (738)	7/8"
LV2			30-1/2 (775)	
LV3			31-15/16 (811)	

LIEBERT DS

PRIMARY CONNECTION LOCATIONS
UPFLOW AIR COOLED 53-77kW 15-22 TONS
SCROLL OR DIGITAL SCROLL COMPRESSORS



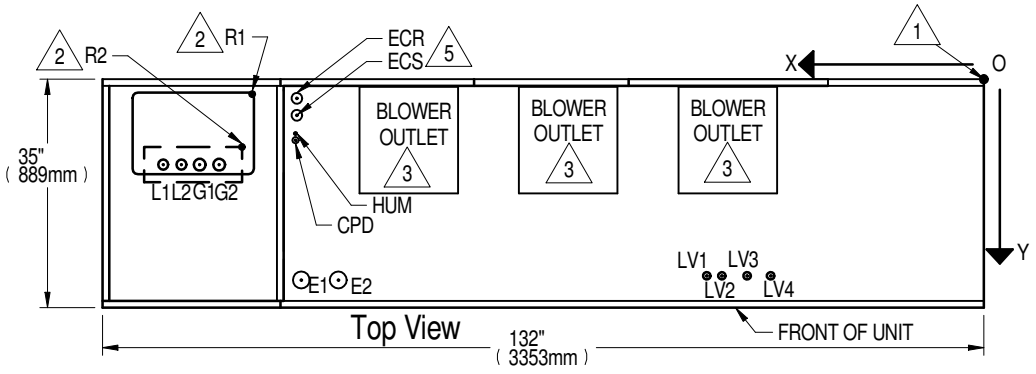
Notes:

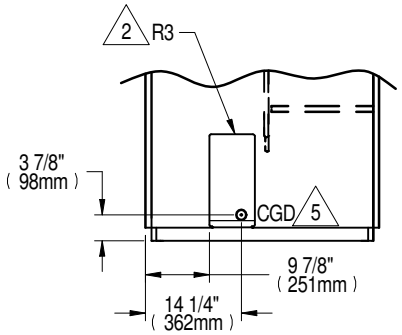
1. Drawing not to scale. All dimensions from rear corner of unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field routed alternatives for refrigerant gas and liquid line connection points.
3. Forward Curved Blowers shown. See submittal page DPN001191 for blower outlet and deck dimensional data.
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
5. Supplied on Dual Cooling Systems only.
6. When piping out the top of the unit, install traps in the discharge lines in the bottom of the unit before running the lines to the top.
7. Digital Scroll Compressor not available on DS077 models.

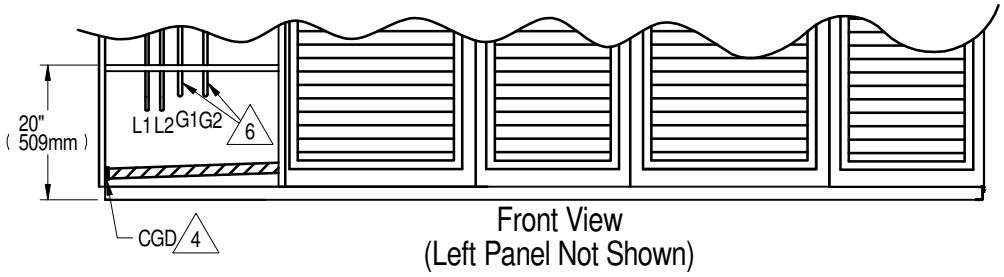
POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING	
R1	REFRIGERANT ACCESS (TOP) 2	83-5/8 (2124)	2 (51)	12"(305mm) X 4" (102mm)	
R2	REFRIGERANT ACCESS (BOTTOM) 2	82-3/4 (2102)	14-3/4 (375)	12-3/16" (310mm) X 4" (102mm)	
R3	REFRIGERANT ACCESS (SIDE) 2	N/A	N/A	6" (152mm) X 17-3/16" (437mm)	
				53kW (15TONS) /	70 & 77kW (20 & 22TONS)
L1	LIQUID LINE SYSTEM 1	94-11/16 (2405)	16-3/4 (425)	1/2" O.D. Cu	5/8" O.D. Cu
L2	LIQUID LINE SYSTEM 2	91-7/8 (2334)			
G1	HOT GAS DISCHARGE 1 6	88-3/4 (2254)	16-3/8 (416)	7/8" O.D. Cu	1-1/8" O.D. Cu
G2	HOT GAS DISCHARGE 2 6	85-9/16"(2173)			
CGD	CONDENSATE GRAVITY DRAIN 4	N/A	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	
ECS	ECON-O-COIL SUPPLY 5	78-5/8 (1997)	7-7/8 (200)	2-1/8" O.D. Cu	
ECR	ECON-O-COIL RETURN 5		4-5/8 (117)		
E1	ELECTRICAL CONN. (HIGH VOLT)	75-3/8 (1915)	30 (762)	2-1/2"	
E2		69-7/8 (1775)			
LV1	ELECTRICAL CONN. (LOW VOLT)	19-1/2 (495)	29-1/16 (738)	7/8"	
LV2			30-1/2 (775)		
LV3			31-15/16 (811)		

LIEBERT DS

PRIMARY CONNECTION LOCATIONS
UPFLOW AIR COOLED 105kW (30 TONS) ALL COMPRESSOR MODELS







Notes:

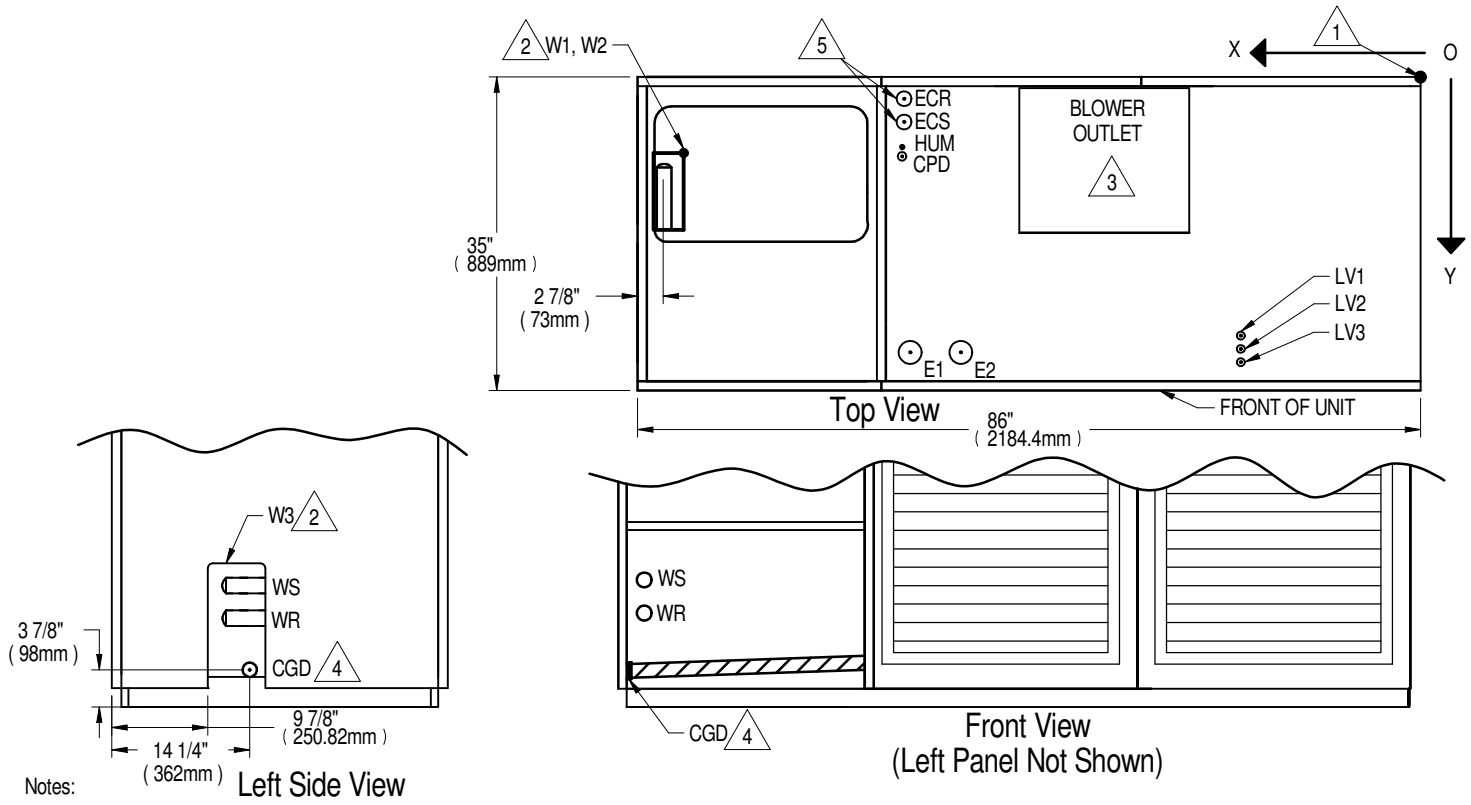
1. Drawing not to scale. All dimensions from rear corner of unit including panel, and have a tolerance of ± 1/2" (13mm).
2. Field routed alternatives for refrigerant gas and liquid line connection points.
3. Forward Curved Blowers shown. See submittal page DPN001192 for blower outlet and deck dimensional data.
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
5. Supplied on Dual Cooling Systems only.
6. 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.
7. Digital Scroll compressors not available on 105kW models.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
R1	REFRIGERANT ACCESS (TOP) 2	106-7/8 (2715)	1-7/8 (48)	22-1/2"(572mm) X 15-3/16" (386mm)
R2	REFRIGERANT ACCESS (BOTTOM) 2	109-1/8 (2772)	13-7/8 (352)	16-7/16" (418mm) X 4" (102mm)
R3	REFRIGERANT ACCESS (SIDE) 2	N/A	N/A	6" (152mm) X 17-3/16" (437mm)
L1	LIQUID LINE SYSTEM 1	121-3/4 (3092)	16-3/4 (425)	5/8" O.D. Cu
L2	LIQUID LINE SYSTEM 2	118-1/8 (3000)		
G1	HOT GAS DISCHARGE 1 6	118-1/4 (3004)	14-1/4 (362)	1-1/8" O.D. Cu
G2	HOT GAS DISCHARGE 2 6	115-5/8 (2937)		
CGD	CONDENSATE GRAVITY DRAIN 4	N/A	N/A	3/4" NPT FEMALE
CPD	CONDENSATE PUMP DISCHARGE (OPT)	102-3/8 (2600)	13-5/8 (346)	1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	101-1/8 (2569)	13-1/8 (333)	1/4" O.D. Cu
ECS	ECON-O-COIL SUPPLY 5		10-1/4 (260)	2-5/8" O.D. Cu
ECR	ECON-O-COIL RETURN 5		5-1/4 (133)	
E1	ELECTRICAL CONN. (HIGH VOLT)	98-1/2 (2502)	30 (762)	2-1/2"
E2		93 (2362)		
LV1	ELECTRICAL CONN. (LOW VOLT)	41-1/8 (1045)	30-3/8 (772)	7/8"
LV2		38-7/8 (987)		
LV3		35-1/8 (892)		
LV4		31-5/8 (803)		

LIEBERT DS

PRIMARY CONNECTION LOCATIONS

UPFLOW WATER/GLYCOL/GLYCOOL™ 35-42kW (10-12 TONS) SCROLL & DIGITAL SCROLL COMPRESSOR MODELS W/ FORWARD CURVED BLOWER



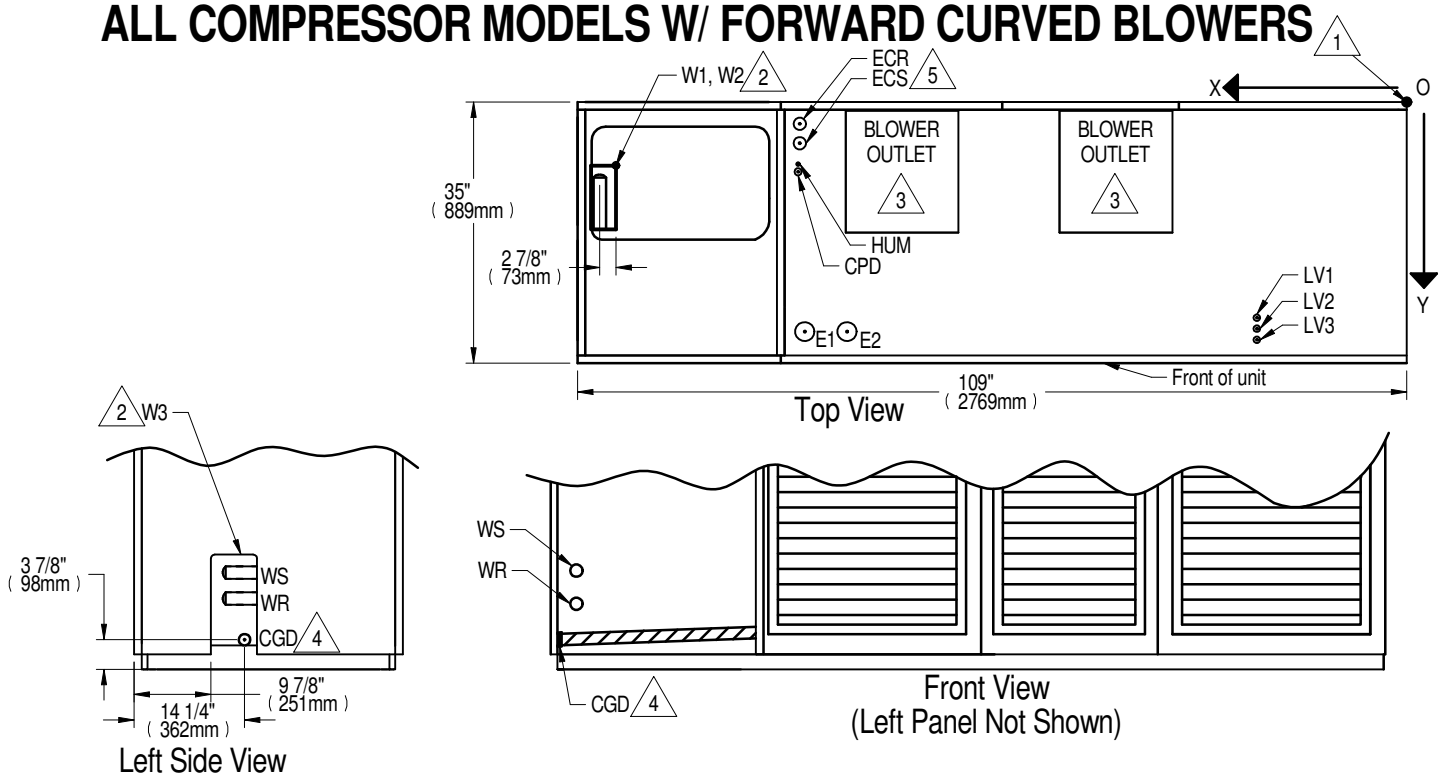
Notes:

1. Drawing not to scale. All dimensions from rear corner of unit including panels and have a tolerance of ± 1/2" (13mm).
2. Field routed alternatives for water/glycol connections.
3. Forward Curved Blower shown. See submittal page DPN001120 for blower outlet and deck dimensional data.
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
5. Supplied on Dual Cooling Systems only (four-pipe system).

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING	
				35kW (10 TON)	42kW (12 TON)
W1	WATER/GLYCOL/GLYCOOL™ ACCESS (BOTTOM) 2	79-15/16 (2030)	9 (229)	3-1/2" (89mm) X 8" (203mm)	
W2	WATER/GLYCOL/GLYCOOL™ ACCESS (TOP) 2				
W3	WATER/GLYCOL/GLYCOOL™ ACCESS (SIDE) 2	N/A	N/A	6" (152mm) x 17-3/16" (437mm)	
WS	WATER/GLYCOL/GLYCOOL™ SUPPLY			1-5/8" O.D. Cu	2-1/8" O.D. Cu
WR	WATER/GLYCOL/GLYCOOL™ RETURN				
ECS	ECON-O-COIL SUPPLY 5	56 (1422)	7-5/16 (186)		
ECR	ECON-O-COIL RETURN 5		4-1/2 (114)		
CGD	CONDENSATE GRAVITY DRAIN 4	N/A	N/A	3/4" NPT FEMALE	
CPD	CONDENSATE PUMP DISCHARGE (OPT)	56-1/4 (1429)	11-1/8 (283)	1/2" O.D. Cu	
HUM	HUMIDIFIER SUPPLY LINE		9-1/8 (232)	1/4" O.D. Cu	
E1	ELECTRICAL CONN. (HIGH VOLT)	52-3/8 (1330)	30 (762)	2-1/2"	
E2		46-7/8 (1191)			
LV1	ELECTRICAL CONN. (LOW VOLT)	19-1/2 (495)	29-1/16 (738)	7/8"	
LV2			30-1/2 (775)		
LV3			31-15/16 (811)		

PRIMARY CONNECTION LOCATIONS

UPFLOW WATER/GLYCOL/GLYCOOL™ 53-77kW (15-22 TONS)
ALL COMPRESSOR MODELS W/ FORWARD CURVED BLOWERS

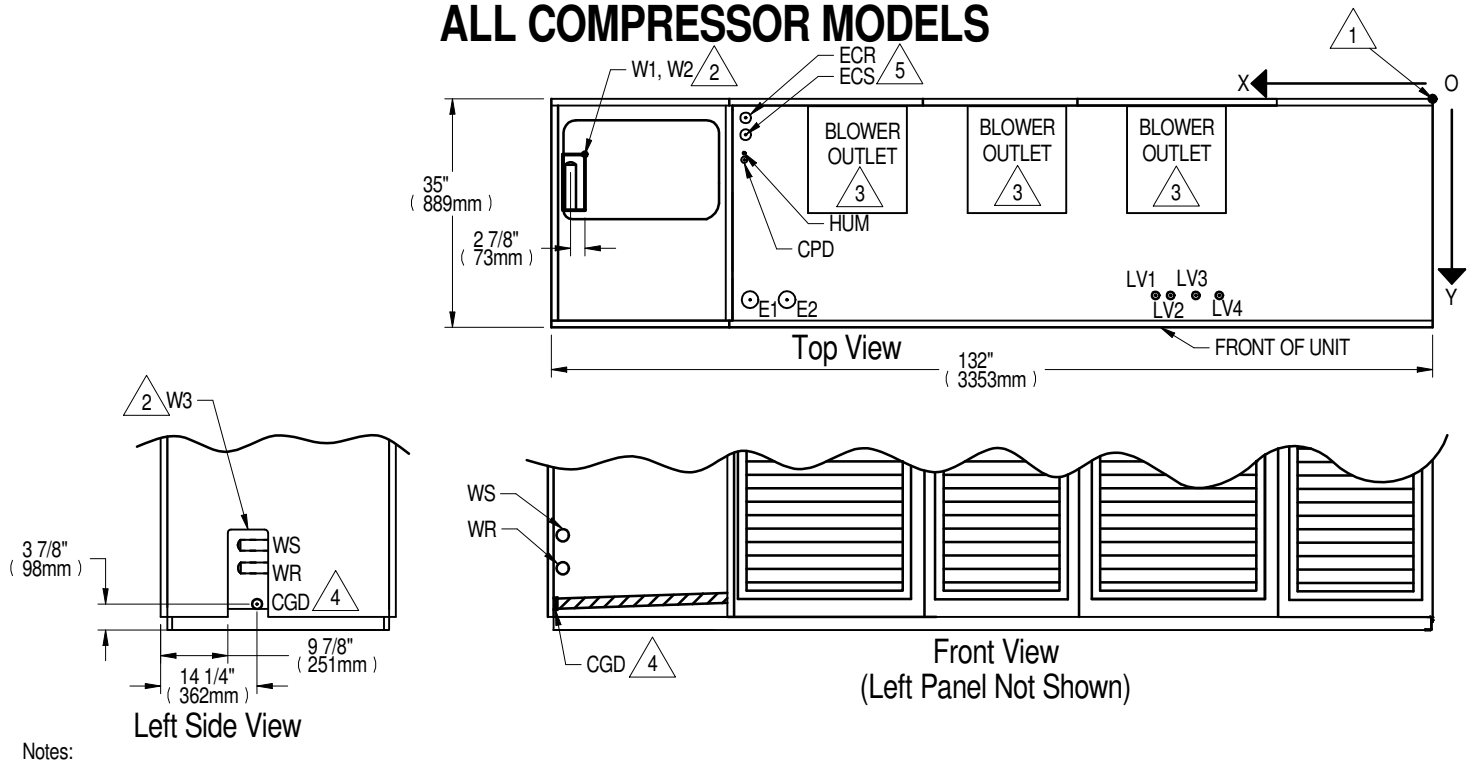


Notes:

1. Drawing not to scale. All dimensions are from rear corner if unit including panels, and have a tolerance of ± 1/2" (13mm).
2. Field routed alternatives for water/glycol connections.
3. Forward Curved Blowers shown. See submittal page DPN001191 for blower outlet and deck dimensional data.
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
5. Supplied on Dual Cooling Systems only (four-pipe system).
6. Scroll and Digital Scroll compressors not available on 77kW models.
7. Semi-Hermetic Compressor only available on 77kW models.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
W1	WATER/GLYCOL/GLYCOOL™ ACCESS (BOTTOM) 2	102-15/16 (2615)	9 (229)	3-1/2" (89mm) X 8" (203mm)
W2	WATER/GLYCOL/GLYCOOL™ ACCESS (TOP) 2			
W3	WATER/GLYCOL/GLYCOOL™ ACCESS (SIDE) 2	N/A	N/A	6" (152mm) x 17-3/16" (437mm)
WS	WATER/GLYCOL/GLYCOOL™ SUPPLY			2-1/8" O.D. Cu
WR	WATER/GLYCOL/GLYCOOL™ RETURN			
CGD	CONDENSATE GRAVITY DRAIN 4			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
ECS	ECON-O-COIL SUPPLY 5	78-5/8 (1997)	7-7/8 (200)	2-1/8" O.D. Cu
ECR	ECON-O-COIL RETURN 5		4-5/8 (117)	
E1	ELECTRICAL CONN. (HIGH VOLT)	75-3/8 (1915)	30 (762)	2-1/2"
E2	ELECTRICAL CONN. (HIGH VOLT)	69-7/8 (1775)		
LV1	ELECTRICAL CONN. (LOW VOLT)	19-1/2 (495)	29-1/16 (738)	7/8"
LV2	ELECTRICAL CONN. (LOW VOLT)		30-1/2 (775)	
LV3	ELECTRICAL CONN. (LOW VOLT)		31-15/16 (811)	

PRIMARY CONNECTION LOCATIONS
UPFLOW WATER/GLYCOL/GLYCOOL™ 105kW (30 TONS)
ALL COMPRESSOR MODELS



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 routed alternatives for water/glycol connections.
3. Forward Curved Blowers shown. See submittal page DPN001192 for blower outlet and deck dimensional data.
4. Field pitch Condensate Drain line a minimum of 1/8" (3.2 mm) per foot (305 mm). All units contain a factory installed condensate trap. Do not trap external to the unit. Select appropriate drain system materials. The drain line must comply with all local codes.
5. Supplied on Dual Cooling Systems only (four-pipe systems).

6. Scroll and Digital Scroll compressors are not available on 105kW models.

POINT	DESCRIPTION	X in. (mm)	Y in. (mm)	CONNECTION SIZE / OPENING
W1 2	WATER/GLYCOL/GLYCOOL™ ACCESS (BOTTOM)	126-1/8 (3204)	9 (229)	3-1/2" (89mm) X 8" (203mm)
W2 2	WATER/GLYCOL/GLYCOOL™ ACCESS (TOP)			
W3 2	WATER/GLYCOL/GLYCOOL™ ACCESS (SIDE)	N/A	N/A	6" (152mm) x 17-3/16" (437mm)
WS	WATER/GLYCOL/GLYCOOL™ SUPPLY			2-1/8" O.D. Cu
WR	WATER/GLYCOL/GLYCOOL™ RETURN			
CGD 4	CONDENSATE GRAVITY DRAIN			3/4" NPT FEMALE
CPD	CONDENSATE PUMP DISCHARGE (OPT)	102-3/8 (2600)	13-5/8 (346)	1/2" O.D. Cu
HUM	HUMIDIFIER SUPPLY LINE	101-1/8 (2569)	13-1/8 (333)	1/4" O.D. Cu
ECS 5	ECON-O-COIL SUPPLY		10-1/4 (260)	2-5/8" O.D. Cu
ECR 5	ECON-O-COIL RETURN		5-1/4 (133)	
E1	ELECTRICAL CONN. (HIGH VOLT)	98-1/2 (2502)	30 (762)	2-1/2"
E2	ELECTRICAL CONN. (HIGH VOLT)	93 (2362)		
LV1	ELECTRICAL CONN. (LOW VOLT)	41-1/8 (1045)	30-3/8 (772)	7/8"
LV2	ELECTRICAL CONN. (LOW VOLT)	38-7/8 (987)		
LV3	ELECTRICAL CONN. (LOW VOLT)	35-1/8 (892)		
LV4	ELECTRICAL CONN. (LOW VOLT)	31-5/8 (803)		

LIEBERT DS

ELECTRICAL FIELD CONNECTION DESCRIPTION
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. When DS unit is paired with a Liebert MC series condenser, remove jumper between terminal 71 and terminal 230. 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
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) **Auxiliary cool contact -** On any call for econ-o-coil operation, normally open dry contact is closed across terminals 72 & 73 on dual cool units only. 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.
21) **Analog Inputs-** Terminals 41, 42, 43, 44 are user configurable for 0-10V, 0-5V, or 4-20MA.

OPTIONAL LOW VOLTAGE TERMINAL PACKAGE CONNECTIONS

22) **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.
23) **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.
24) **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.
25) **Liqui-Tect shutdown and dry contact -** On Liqui-Tect activation, normally open dry contact is closed across terminals 58 & 59 for remote indication (Liqui-Tect sensor ordered separately). 1 AMP, 24VAC max load. Use Class 1 field supplied wiring.

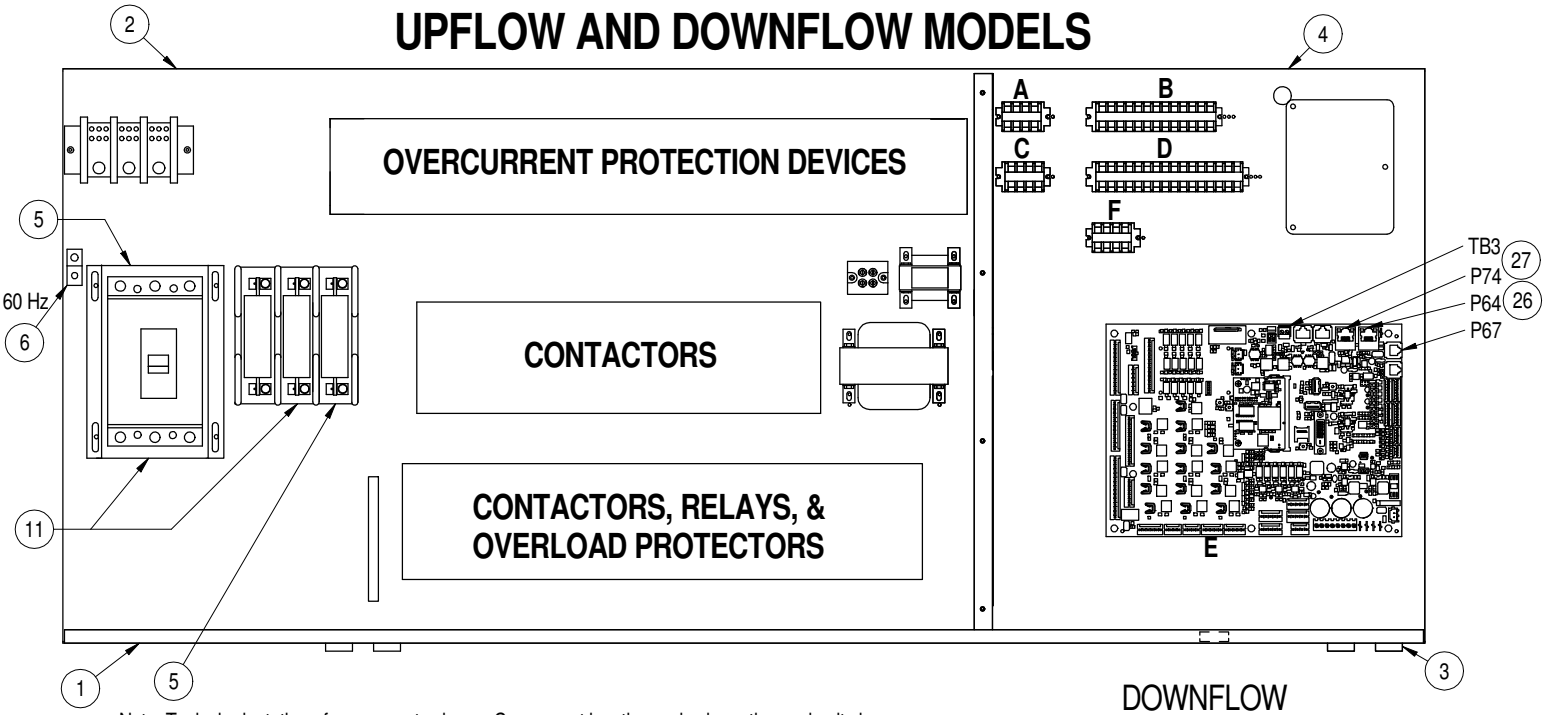
OPTIONAL COMMUNICATION CONNECTIONS

26) **Unit-To-Unit –** Plug 64 is reserved for U2U communication
27) **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.

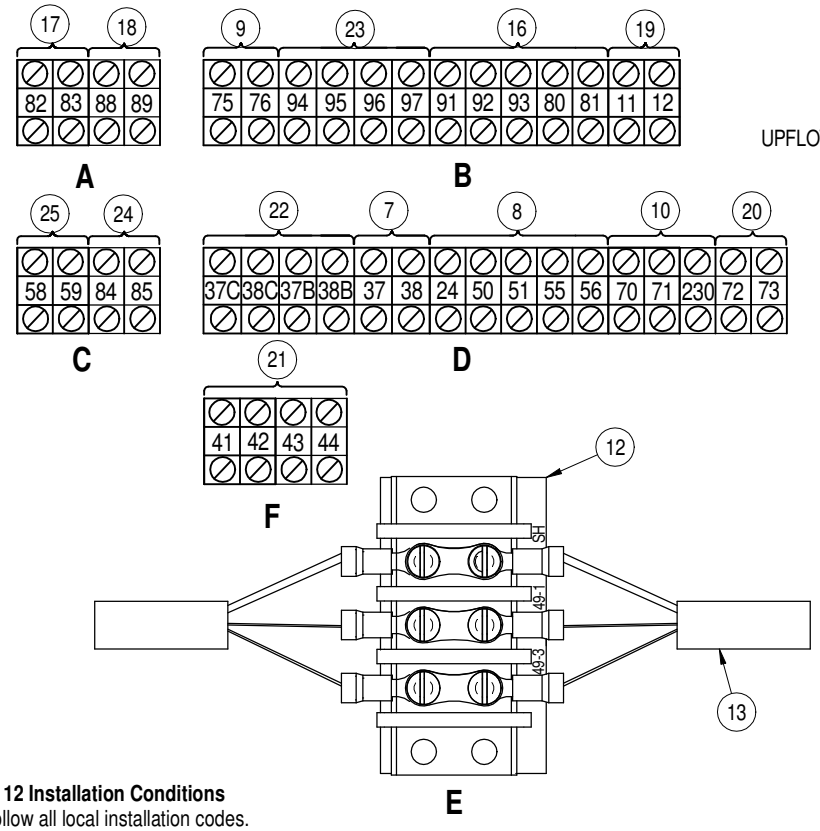
ELECTRICAL FIELD CONNECTION DESCRIPTION

UPFLOW AND DOWNFLOW MODELS



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

DOWNFLOW
LOW VOLT SECTION

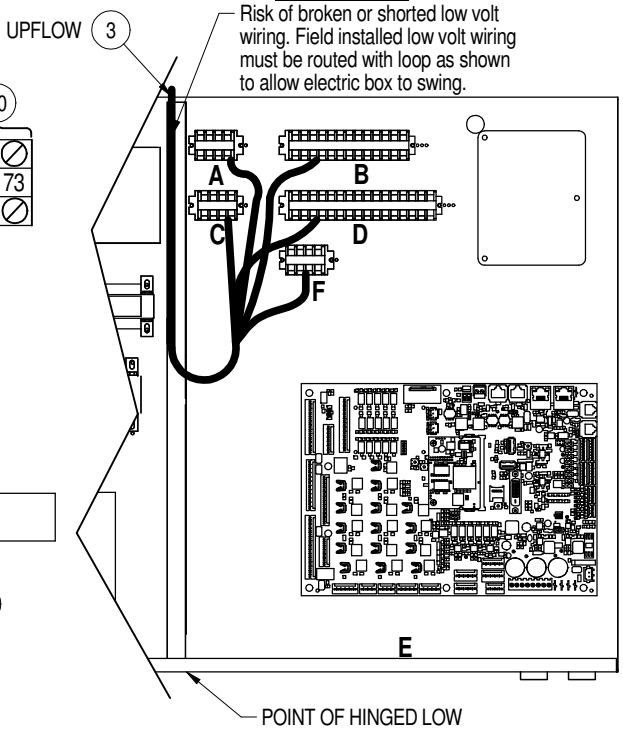


Item 12 Installation Conditions

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.

CAUTION:

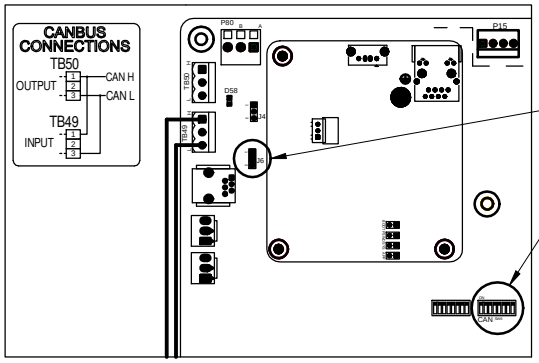
Risk of broken or shorted low volt wiring. Field installed low volt wiring must be routed with loop as shown to allow electric box to swing.



UPFLOW LOW VOLT SECTION

LIEBERT DS

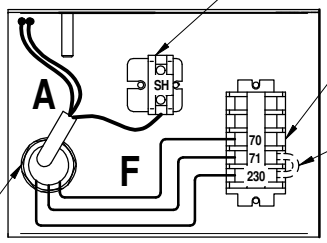
CANbus & INTERLOCK CONNECTIONS
BETWEEN LIEBERT DS & LIEBERT MC CONDENSER (PREMIUM)



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

CANbus ADDRESSING SWITCH

DETAIL 3
CAN CABLE CONNECTION (A)



SHIELD CONNECTION

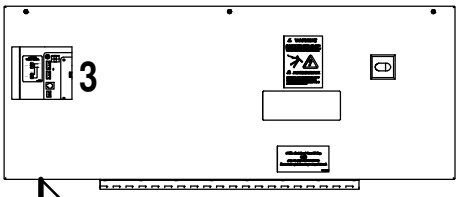
FACTORY WIRING BETWEEN
MC CONTROL BOARD AND
TERMINAL STRIP.

REMOVE JUMPER
FOR DUAL CIRCUIT

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

HEAT REJECTION INTERLOCK (F)

CONDENSER



F HEAT REJECTION INTERLOCK

A CANbus CONNECTION

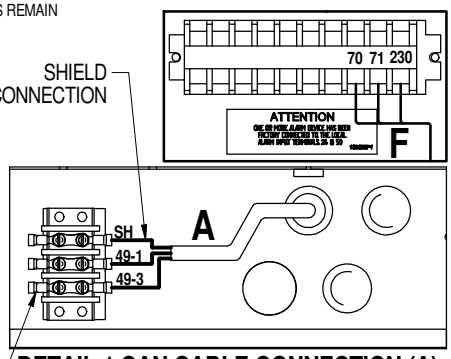
COMPONENT NOTES:
1. COMPONENT APPEARANCE, ORIENTATION , AND POSITION MAY VARY BETWEEN PRODUCT LINES. TERMINAL NAMES AND CALLOUTS REMAIN CONSTANT.
2. ALL CIRCUITS TO THESE CONNECTION POINTS ARE CLASS 2.

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.

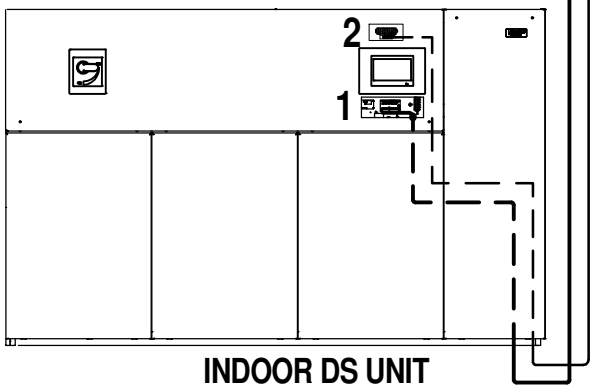
WIRE NOTES (F):
1. FIELD SUPPLIED WIRE
   - 3 CONDUCTOR 18AWG OR GREATER
   - RATED 600V
2. RUN FIELD SUPPLIED WIRES BETWEEN THE INDOOR UNIT AND THE CONDENSER.

DETAIL 2
HEAT REJECTION INTERLOCK (F)

SHIELD CONNECTION



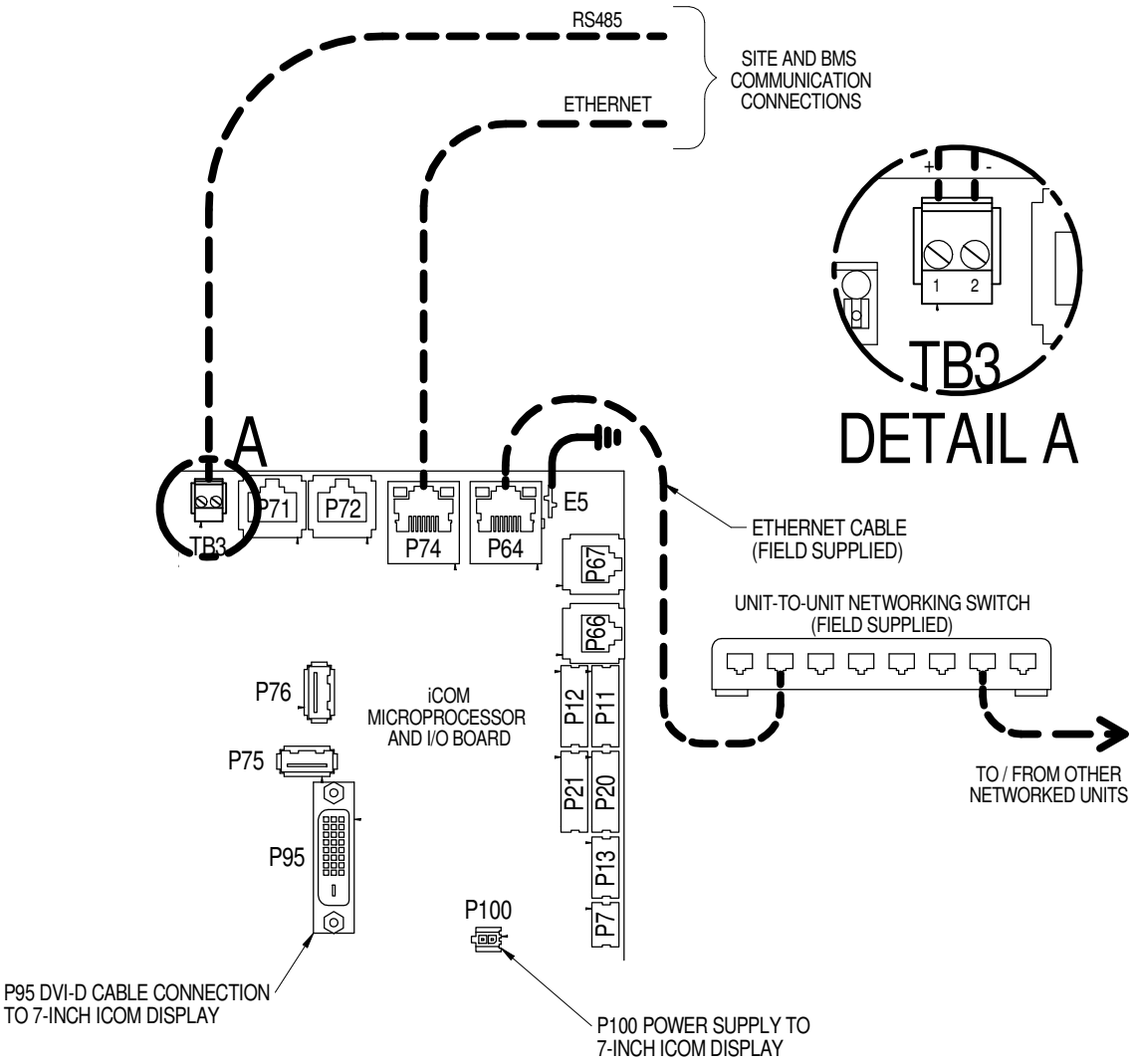
DETAIL 1 CAN CABLE CONNECTION (A)
FACTORY WIRING BETWEEN ICOM AND TERMINAL STRIP.



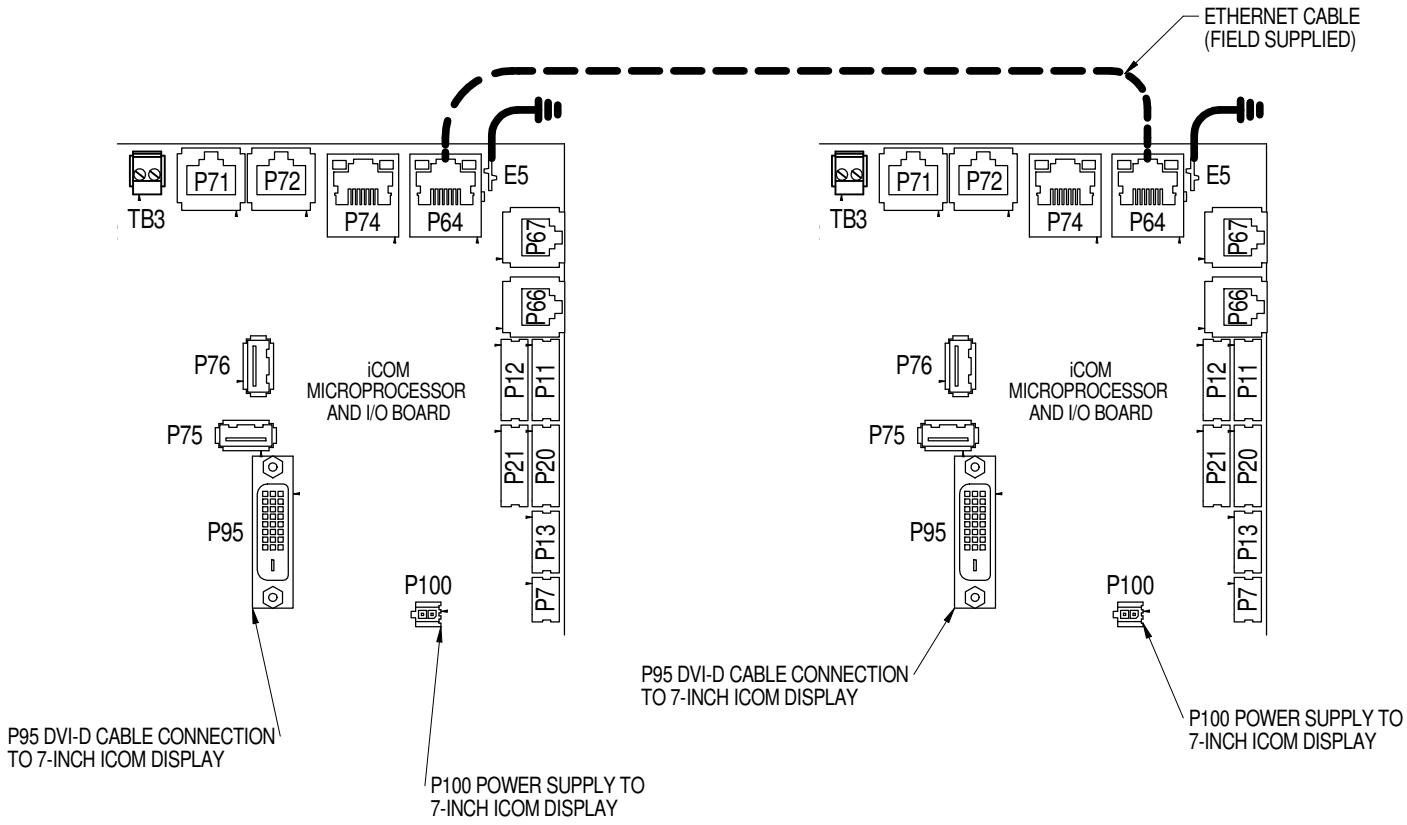
INDOOR DS UNIT

LIEBERT DS, DSE, CW, PDX & PCW

UNIT TO UNIT NETWORK CONNECTIONS



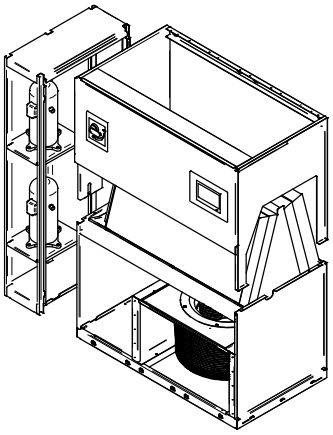
UNIT TO UNIT NETWORK CONNECTIONS



NOTE* For dual-unit network configurations only

LIEBERT DS

DISASSEMBLY DIMENSIONAL DATA
DOWNFLOW 35-42kW (10-12 TONS) MODELS
W/ SCROLL & DIGITAL SCROLL COMPRESSORS



Unit w/ Scroll/Digital Scroll Compressor Section

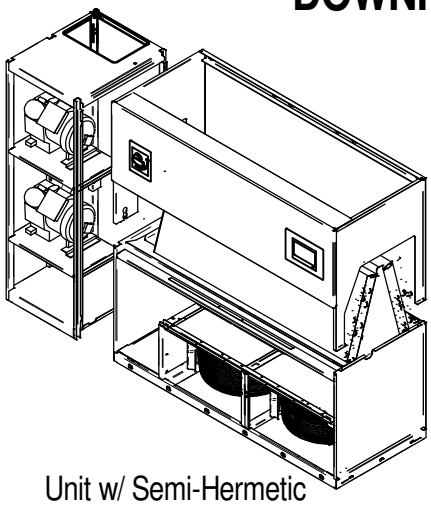
Cooling Type	A in. (mm)	B in. (mm)
Air Cooled	13 (330)	72 (1829)
Air Cooled w/Dual Cool		
Water/Glycol	26 (660)	85 (2159)
GLYCOOL™/Dual Cool		

Assembly	APPROXIMATE DRY WEIGHT lb (kg) (Includes Panels)			
	Air Cooled	A/C w/ Dual Cool	Water/Glycol	GLYCOOL™/Dual Cool
Compressor Assembly	490 (223)	490 (223)	800 (364)	800 (364)
Filter & Electric Box Assembly	210 (96)	210 (96)	210 (96)	210 (96)
Blower & Coil Assembly	770 (350)	920 (418)	770 (350)	920 (418)

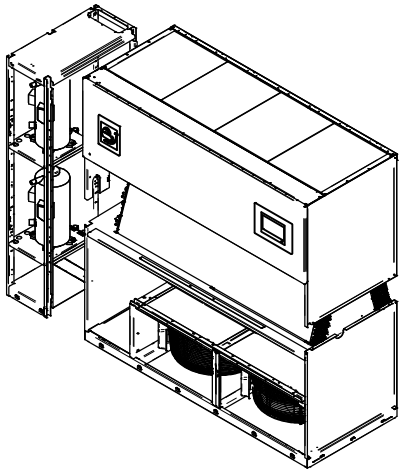
Notes:
1. Drawing Views are simplified with panels removed to show overall dimensions. See disassembly and handling instructions in installation manual.

LIEBERT DS

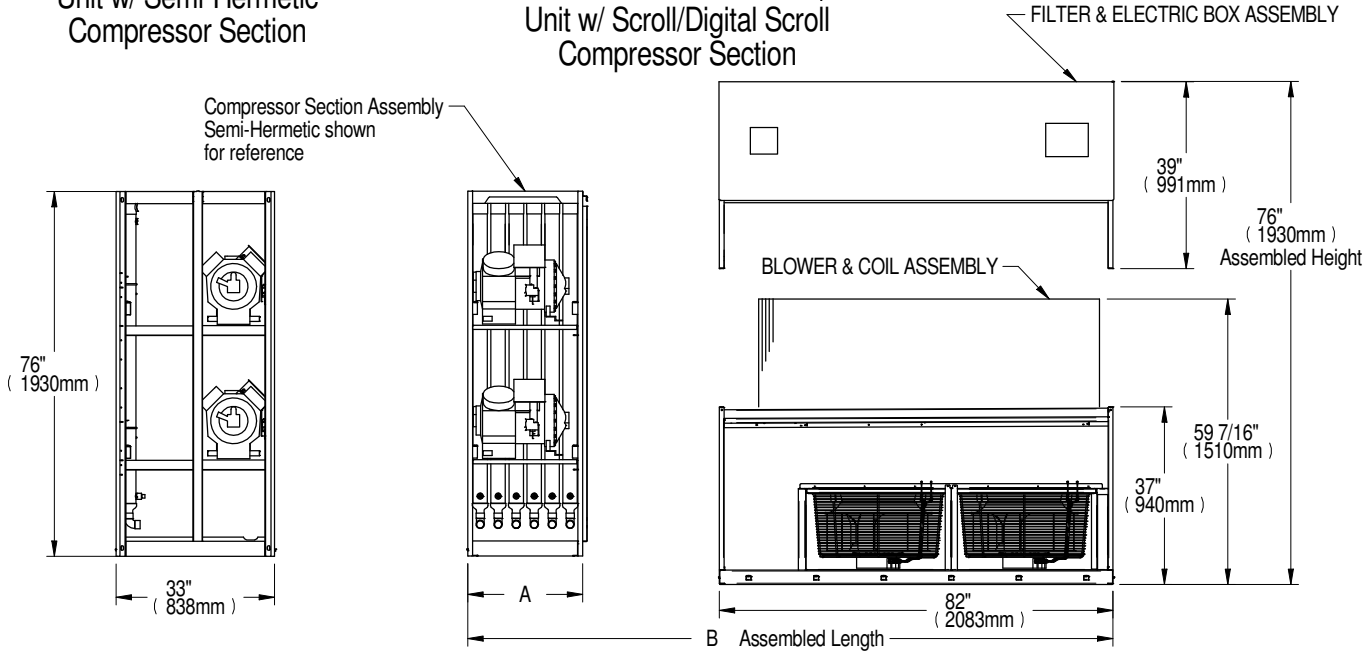
DISASSEMBLY DIMENSIONAL DATA
DOWNFLOW 53-77kW (15-22 TONS) MODELS



Unit w/ Semi-Hermetic Compressor Section



Unit w/ Scroll/Digital Scroll Compressor Section



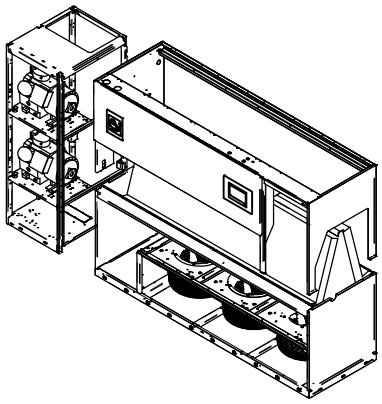
Compressor Type	Cooling Type	A in. (mm)	B in. (mm)
Scroll or Digital Scroll	Air Cooled	15 (381)	97 (2464)
	Air Cooled w/ Dual Cool		
	Water/Glycol	26 (660)	108 (2743)
	GLYCOOL™/Dual Cool		
Semi-Hermetic △2	Air Cooled		
	Air Cooled w/ Dual Cool		
	Water/Glycol		
	GLYCOOL™/Dual Cool		

Notes:
1. Drawing Views are simplified with panels removed to show overall dimensions. See disassembly and handling instructions in installation manual.
△2. Semi-Hermetic Compressor options only available on 77kW models.

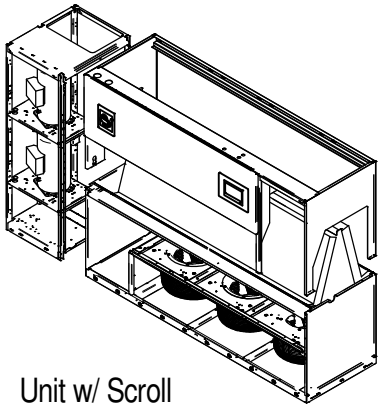
Assembly	APPROXIMATE DRY WEIGHT lb (kg) (Includes Panels)							
	Semi-Hermetic Compressor △2		Scroll or Digital Scroll Compressor		Semi-Hermetic Compressor △2		Scroll or Digital Scroll Compressor	
	Air Cooled	A/C w/ Dual Cool	Air Cooled	A/C w/ Dual Cool	Water/Glycol	GLYCOOL™/Dual Cool	Water/Glycol	GLYCOOL™/Dual Cool
Compressor Assembly	970 (441)	970 (441)	540 (246)	540 (246)	1270 (578)	1270 (578)	840 (382)	840 (382)
Filter & Electric Box Assembly	250 (114)	250 (114)	250 (114)	250 (114)	250 (114)	250 (114)	250 (114)	250 (114)
Blower & Coil Assembly	1230 (560)	1410 (641)	1230 (560)	1410 (641)	1230 (560)	1410 (641)	1230 (560)	1410 (641)

LIEBERT DS

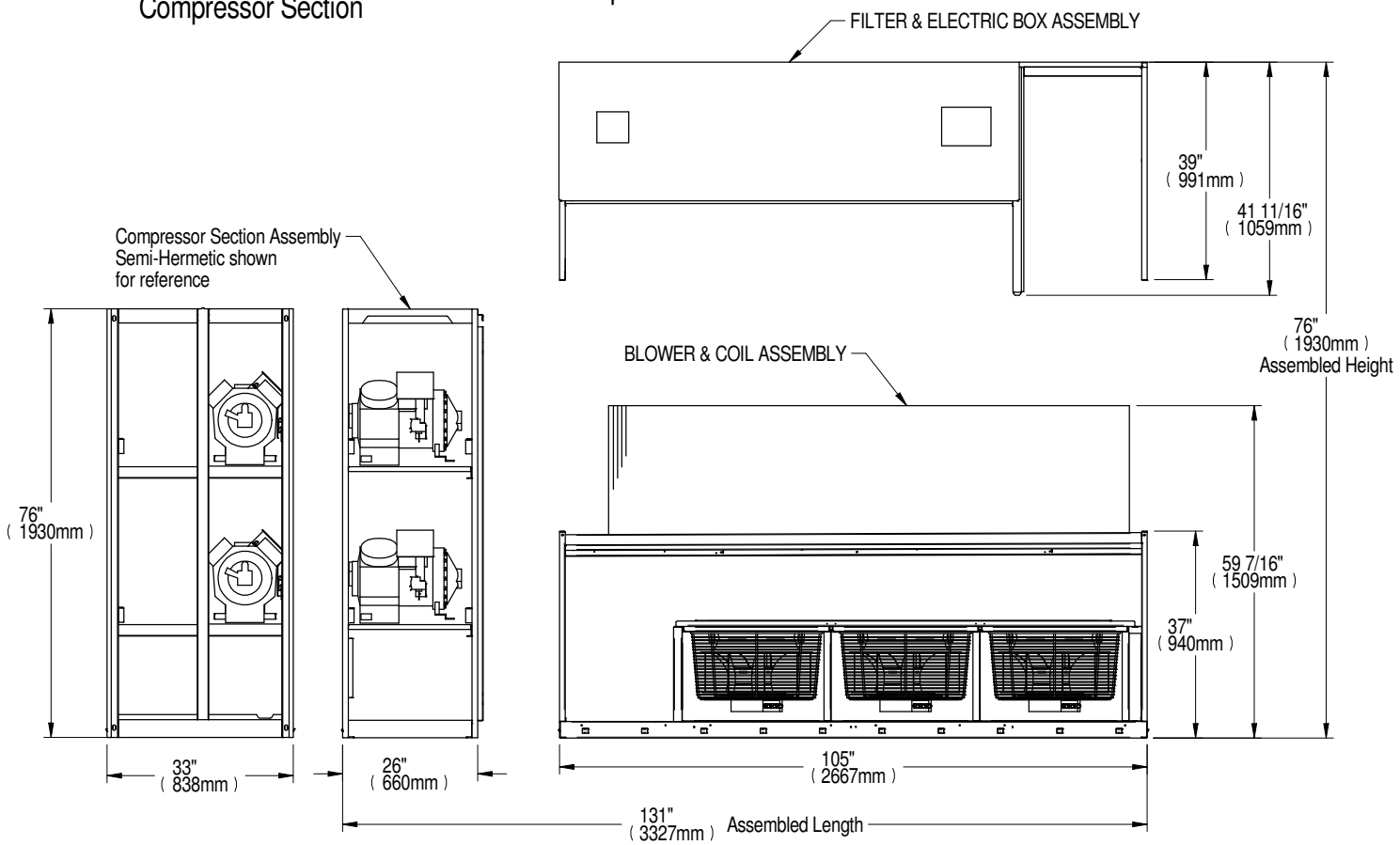
DISASSEMBLY DIMENSIONAL DATA
DOWNFLOW 105kW (30 TONS) MODELS



Unit w/ Semi-Hermetic Compressor Section



Unit w/ Scroll Compressor Section

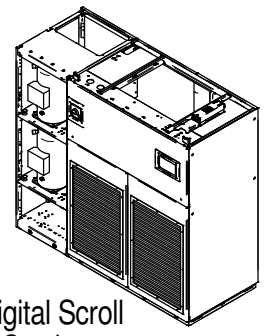


Note: Drawing Views are simplified with panels removed to show overall dimensions. See disassembly and handling instructions in installation manual.

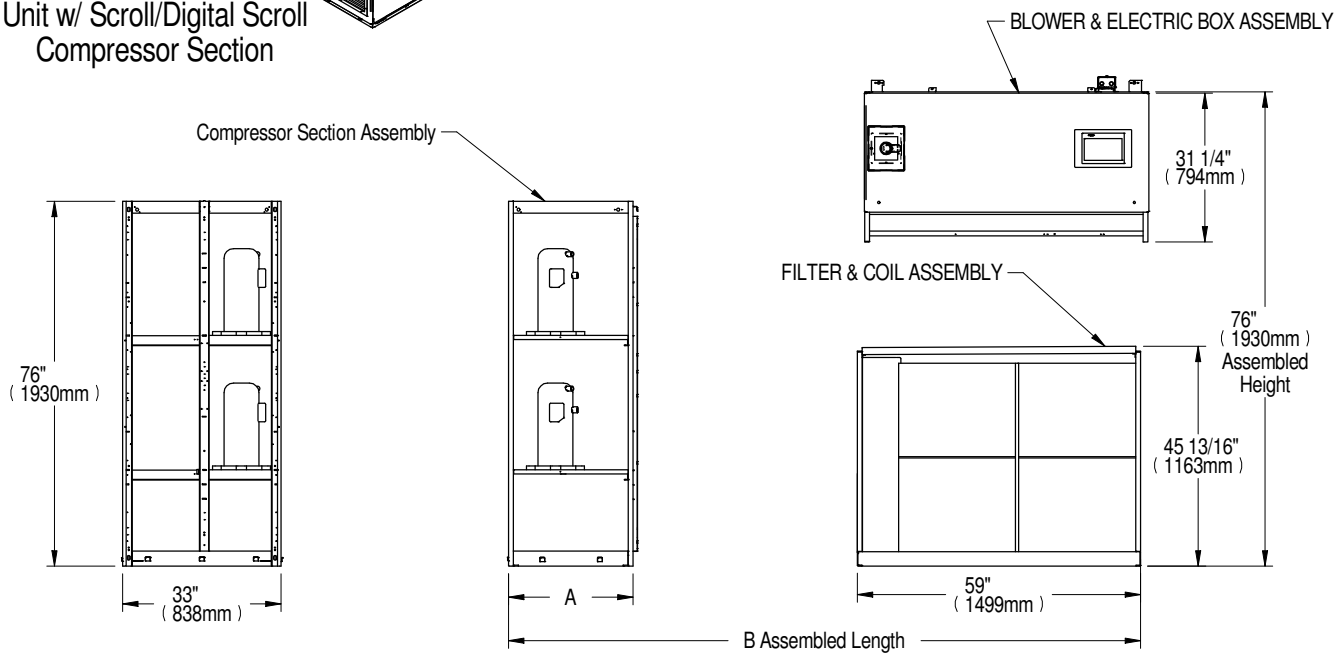
Assembly	DRY WEIGHT lb(kg) APPROXIMATE (Includes Panels)				
	Semi-Hermetic Compressor		Scroll Compressor	Semi-Hermetic Compressor	
	Air cooled	A/C w/dual cool	Air cooled	Water/Glycol	GLYCOOL™/Dual Cool
Compressor Assembly	950 (432)	950 (432)	830 (377)	1320 (600)	1320 (600)
Filter & Electric Box Assembly	270 (123)	270 (123)	270 (123)	270 (123)	270 (123)
Blower & Coil Assembly	1560 (708)	1915 (870)	1560 (708)	1560 (708)	1915 (870)

LIEBERT DS

DISASSEMBLY DIMENSIONAL DATA
UPFLOW 35-42kW (10-12 TONS) MODELS
W/ SCROLL & DIGITAL SCROLL COMPRESSORS



Unit w/ Scroll/Digital Scroll Compressor Section



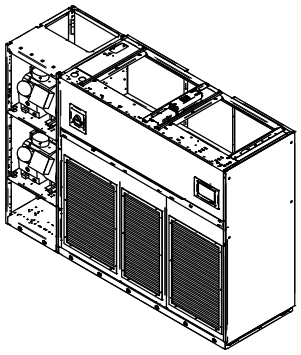
Cooling Type	A in (mm)	B in. (mm)
Air Cooled	13 (330)	72 (1829)
Air Cooled w/ Dual Cool		
Water/Glycol	26 (660)	85 (2159)
GLYCOOL™/Dual Cool		

Assembly	APPROXIMATE DRY WEIGHT lb (kg) (Includes Panels)			
	Air Cooled	A/C w/ Dual Cool	Water/Glycol	GLYCOOL™/Dual Cool
Compressor Assembly	490 (223)	490 (223)	800 (364)	800 (364)
Forward Curved Blower & Electric Box Assembly	510 (231)	510 (231)	510 (231)	510 (231)
EC Fan & △2 Electric Box Assembly	360 (163)	360 (163)	360 (163)	360 (163)
Filter & Coil Assembly	520 (236)	670 (304)	520 (236)	670 (304)

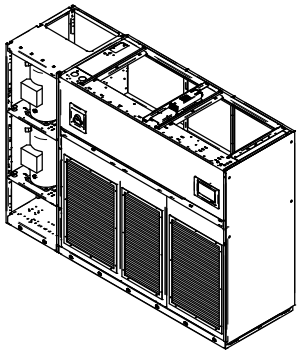
Notes:
1. Drawing Views are simplified with panels removed to show overall dimensions.
2. See disassembly and handling instructions in installation manual. EC Fan unit shown. EC Fan wieght not included in this unit weight. Fan is installed in plenum. See DPN003458.
3. Digital Scroll compressors not avaiable on Air Cooled 42kW models.

LIEBERT DS

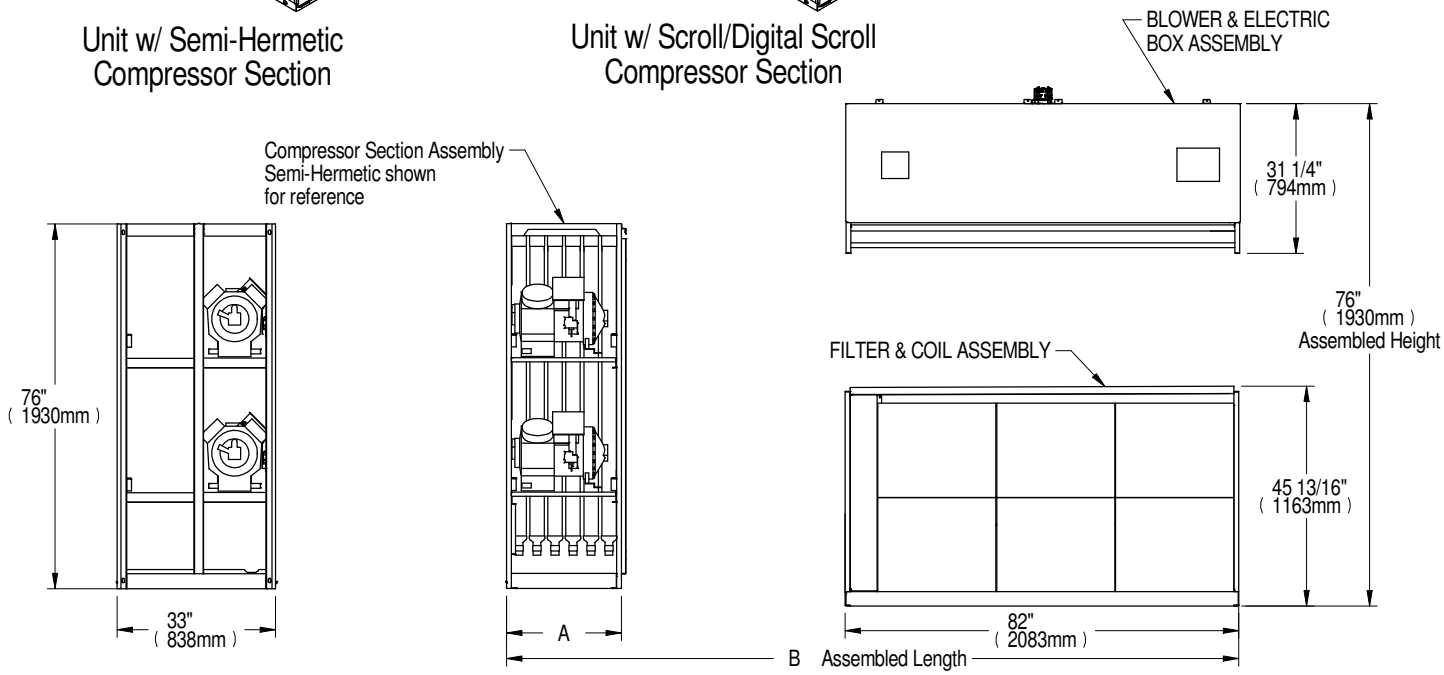
DISASSEMBLY DIMENSIONAL DATA
UPFLOW 53-77kW (15-22 TONS) MODELS



Unit w/ Semi-Hermetic Compressor Section



Unit w/ Scroll/Digital Scroll Compressor Section



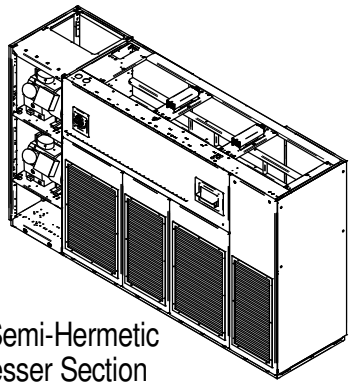
Compressor Type	Cooling Type	A in. (mm)	B in. (mm)
Scroll or Digital Scroll	Air Cooled	15 (381)	97 (2464)
	Air Cooled w/ Dual Cool		
	Water/Glycol	26 (660)	108 (2743)
	GLYCOOL™/Dual Cool		
Semi-hermetic △3	Air Cooled		
	Air Cooled w/ Dual Cool		
	Water/Glycol		
	GLYCOOL™/Dual Cool		

Notes:
1. Drawing Views are simplified with panels removed to show overall dimensions. See disassembly and handling instructions in installation manual. EC Fan unit shown.
△2. EC Fan weight not included in this unit weight. Fan is installed in plenum. See DPN003453.
△3. Semi-Hermetic Compressor options only available on 77kW models.

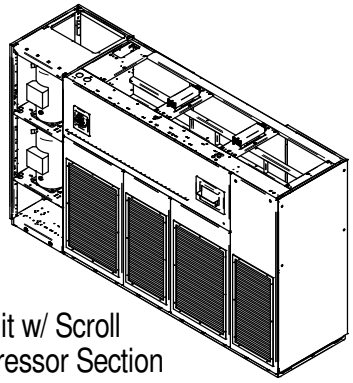
Assembly	APPROXIMATE DRY WEIGHT lb (kg) (Includes Panels)							
	Semi-Hermetic Compressor △3		Scroll or Digital Scroll Compressor		Semi-Hermetic Compressor △3		Scroll or Digital Scroll Compressor	
	Air cooled	A/C w/ Dual Cool	Air Cooled	A/C w/ Dual Cool	Water/Glycol	GLYCOOL™/Dual Cool	Water/Glycol	GLYCOOL™/Dual Cool
Compressor Assembly	970 (441)	970 (441)	540 (246)	540 (246)	1270 (578)	1270 (578)	840 (382)	840 (382)
Blower & Electric Box Assembly	770 (349)	770 (349)	770 (349)	770 (349)	770 (349)	770 (349)	770 (349)	770 (349)
Blower & Electric Box Assembly △2	600 (272)	600 (272)	600 (272)	600 (272)	600 (272)	600 (272)	600 (272)	600 (272)
Filter & Coil Assembly	760 (345)	940 (426)	760 (345)	940 (426)	760 (345)	940 (426)	760 (345)	940 (426)

LIEBERT DS

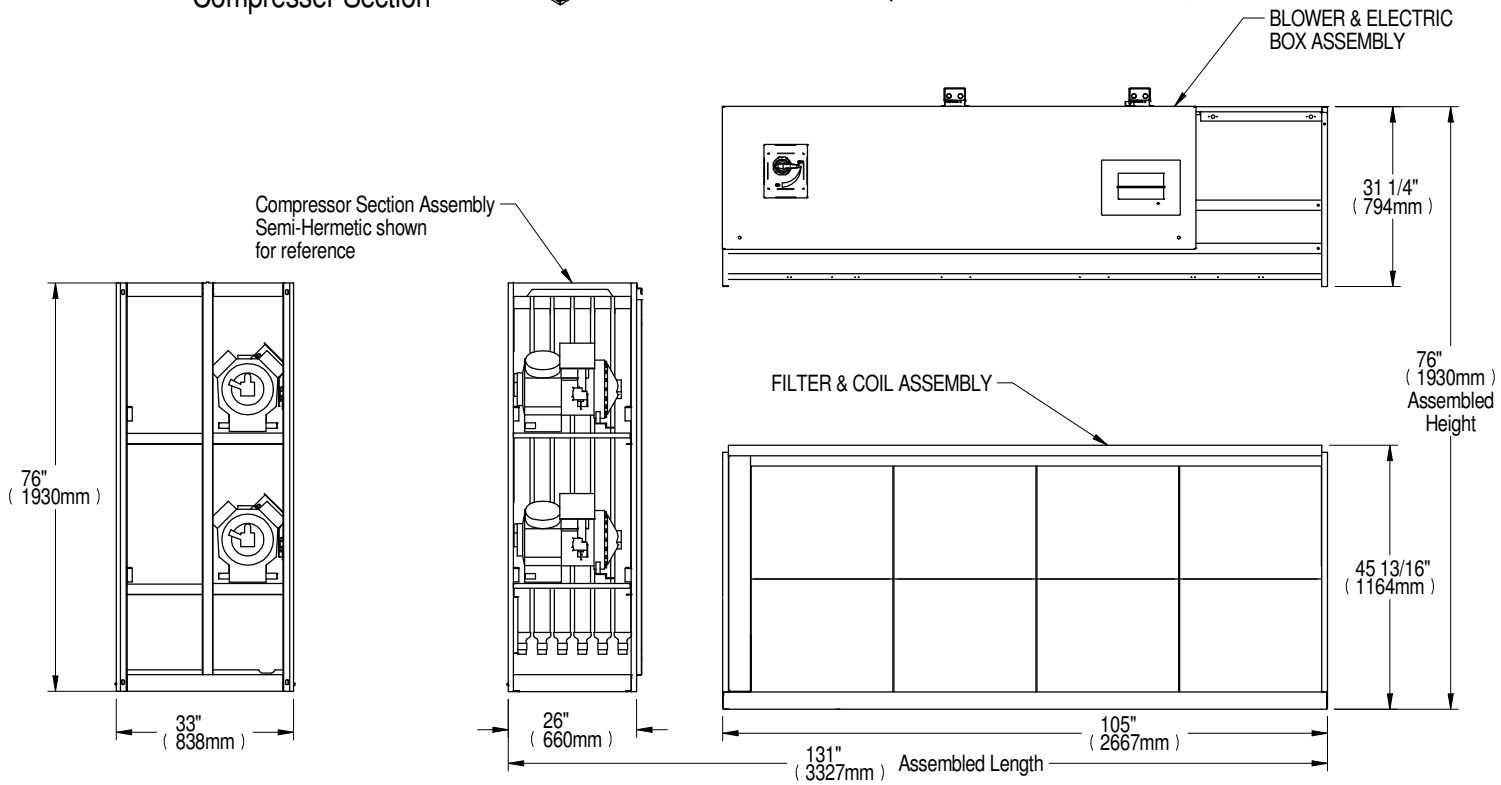
DISASSEMBLY DIMENSIONAL DATA
UPFLOW 105kW (30 TONS) MODELS



Unit w/ Semi-Hermetic Compresser Section



Unit w/ Scroll Compressor Section



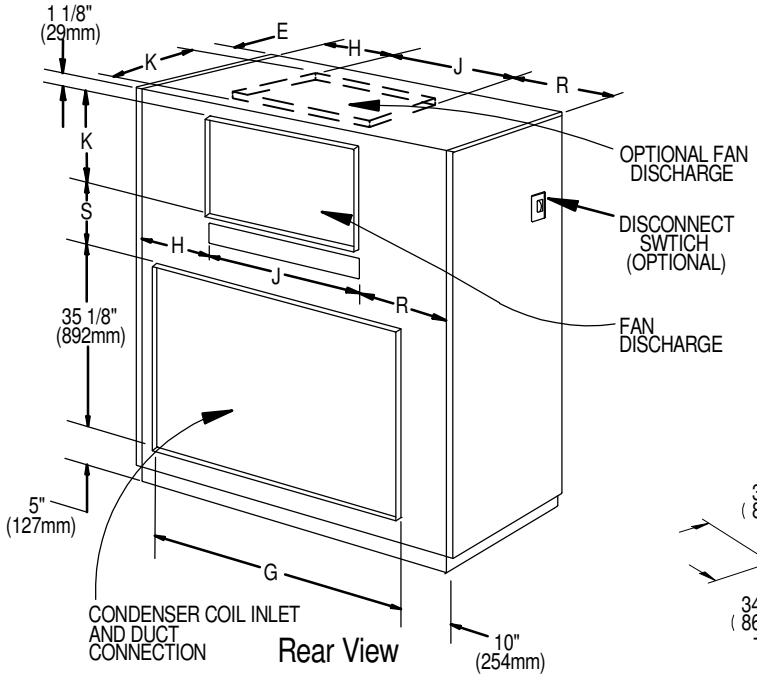
Assembly	APPROXIMATE DRY WEIGHT lb (kg) (Includes Panels)				
	Semi-Hermetic Compressor		Scroll Compressor	Semi-Hermetic Compressor	
	Air Cooled	A/C w/ Dual Cool	Air Cooled	Water/Glycol	GLYCOOL™/Dual Cool
Compressor Assembly	950 (431)		830 (376)	1320 (599)	
Forward Curved Blower & Electric Box Assembly	1080 (490)		1080 (490)	1080 (490)	
EC Fans & Electric Box Assembly △2	840 (381)		840 (381)	840 (381)	
Filter & Coil Assembly	970 (440)	1300 (590)	970 (440)	970 (440)	1300 (590)

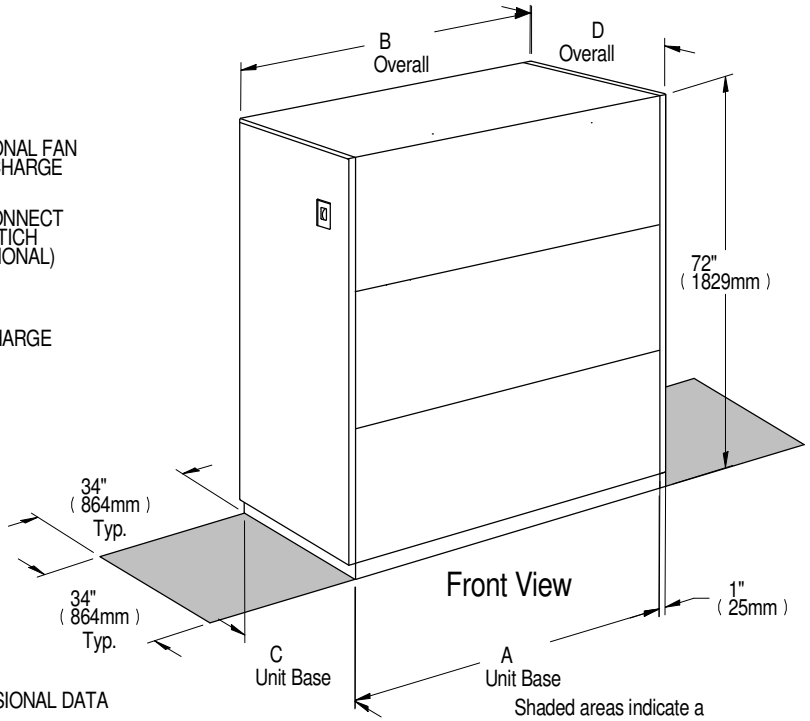
Notes:
1. Drawing Views are simplified with panels removed to show overall dimensions. See disassembly and handling instructions in installation manual. EC Fan unit shown.

△2. EC Fan weight not included in this unit weight. Fan is installed in plenum. See DPN003459.

LIEBERT PIGGYBACK CONDENSER

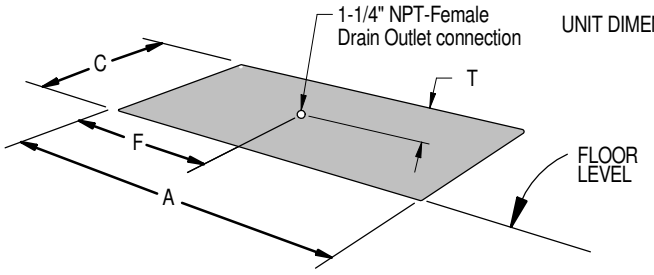
DIMENSIONAL DATA
72" & 97" FRAME MODELS





UNIT DIMENSIONAL DATA

Shaded areas indicate a recommended clearance be provided for component access.



FLOOR CUTOUT DIMENSIONS

FAN DISCHARGE DATA

☐ REAR DISCHARGE
☐ OPTIONAL TOP DISCHARGE

Unit Shipping Weight lbs. (kg)		
Liebert Model No.	Domestic Pkg	Export Pkg
PB-350A	1180 (535)	1330 (603)
PB-550A		
PB-675A		
PB-925A	1630 (739)	1780 (807)
PB-1100A		
PB-1350A		

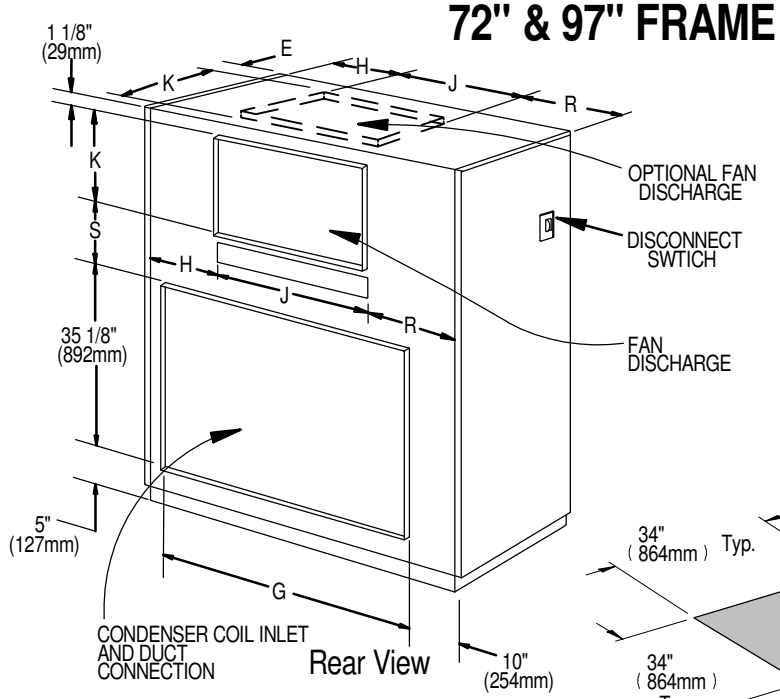
Liebert Model	Dimensional Data in. (mm)												
	A	B	C	D	E	F	G	H	J	K	R	S	T
PB-350A	72 (1829)	74 (1880)	31 (787)	32 (813)	1-1/8 (29)	33 (838)	60 (1524)	8-5/8 (219)	50-3/16 (1275)	16-1/16 (408)	13-3/16 (335)	14-11/16 (373)	15-1/2 (394)
PB-550A													
PB-675A													
PB-925A	97 (2464)	99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

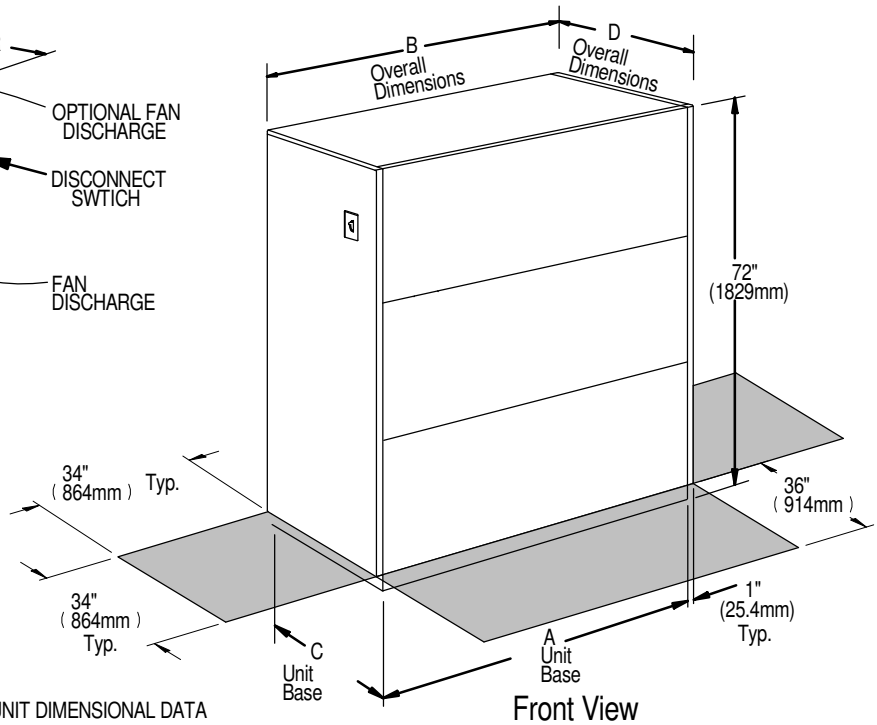
Note:
1. A 1" (25mm) flange is provided on coil inlet opening and fan discharge opening for duct connections.

LIEBERT PIGGYBACK DRYCOOLER

DIMENSIONAL DATA

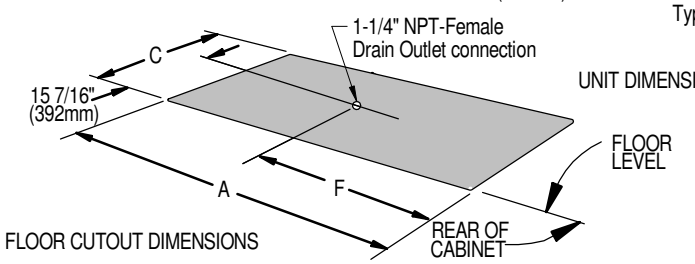
72" & 97" FRAME MODELS





UNIT DIMENSIONAL DATA

Shaded areas indicate recommended clearance for component access



FLOOR CUTOUT DIMENSIONS

Unit Shipping Weight lbs. (kg)		
Liebert Model No.	Domestic Pkg	Export Pkg
PD-102	1230 (558)	1380 (626)
PD-133		
PD-150		
PD-223	1680 (726)	1830 (830)
PD-290		
PD-333		

FAN DISCHARGE DATA
☐ REAR DISCHARGE
☐ OPTIONAL TOP DISCHARGE

PUMP PACKAGE SELECTION
☐ SINGLE PUMP PACKAGE
☐ DUAL PUMP PACKAGE

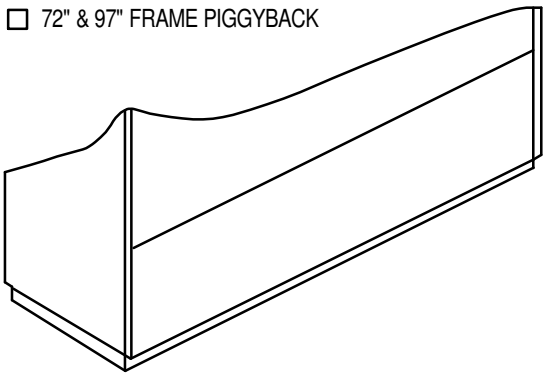
Liebert Model No.	Dimensional Data in. (mm)											
	A	B	C	D	E	F	G	H	J	K	R	S
PD-102	72 (829)	74 (1880	31 (787	32 (813)	1-1/8 (29)	33 (838)	60 (1524)	8-5/8 (219)	50-3/16 (1275)	16-1/16 (408)	13-3/16 (335)	14-11/16 (373)
PD-133												
PD-150												
PD-223	97 (2464)	99 (2515)	33 (838)	34 (864)	3-1/8 (79)	46-1/2 (1181)	85 (2159)	23-5/16 (592			23-1/2 (597	
PD-290												
PD-333								16-5/16 (421	63-7/8 (1622)	19-1/8 (486)	16-13/16 (427)	11-5/8 (295)

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

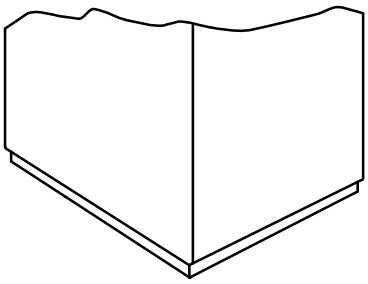
LIEBERT PIGGYBACK

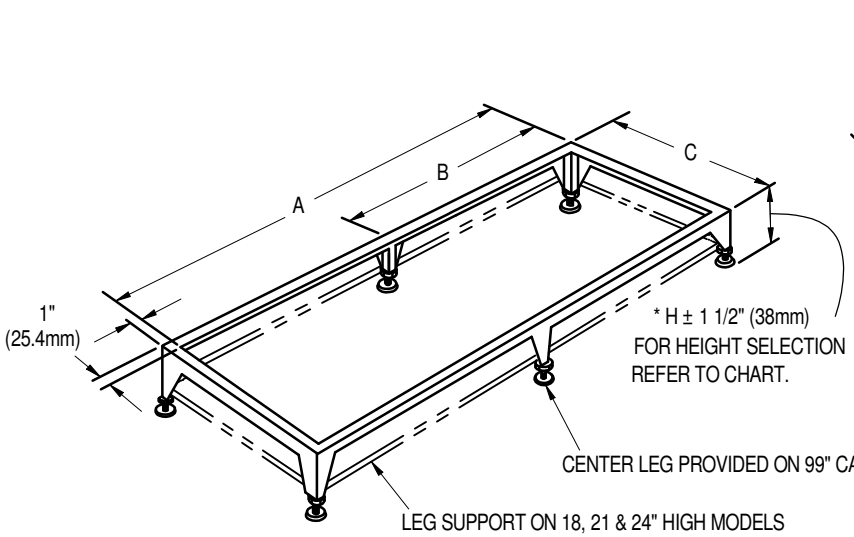
FLOORSTAND DIMENSIONAL DATA
CONDENSER & DRYCOOLER

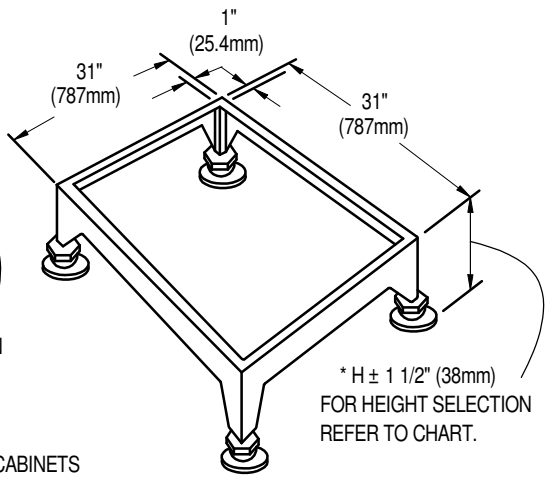
☐ 72" & 97" FRAME PIGGYBACK



☐ 31" FRAME PIGGYBACK







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

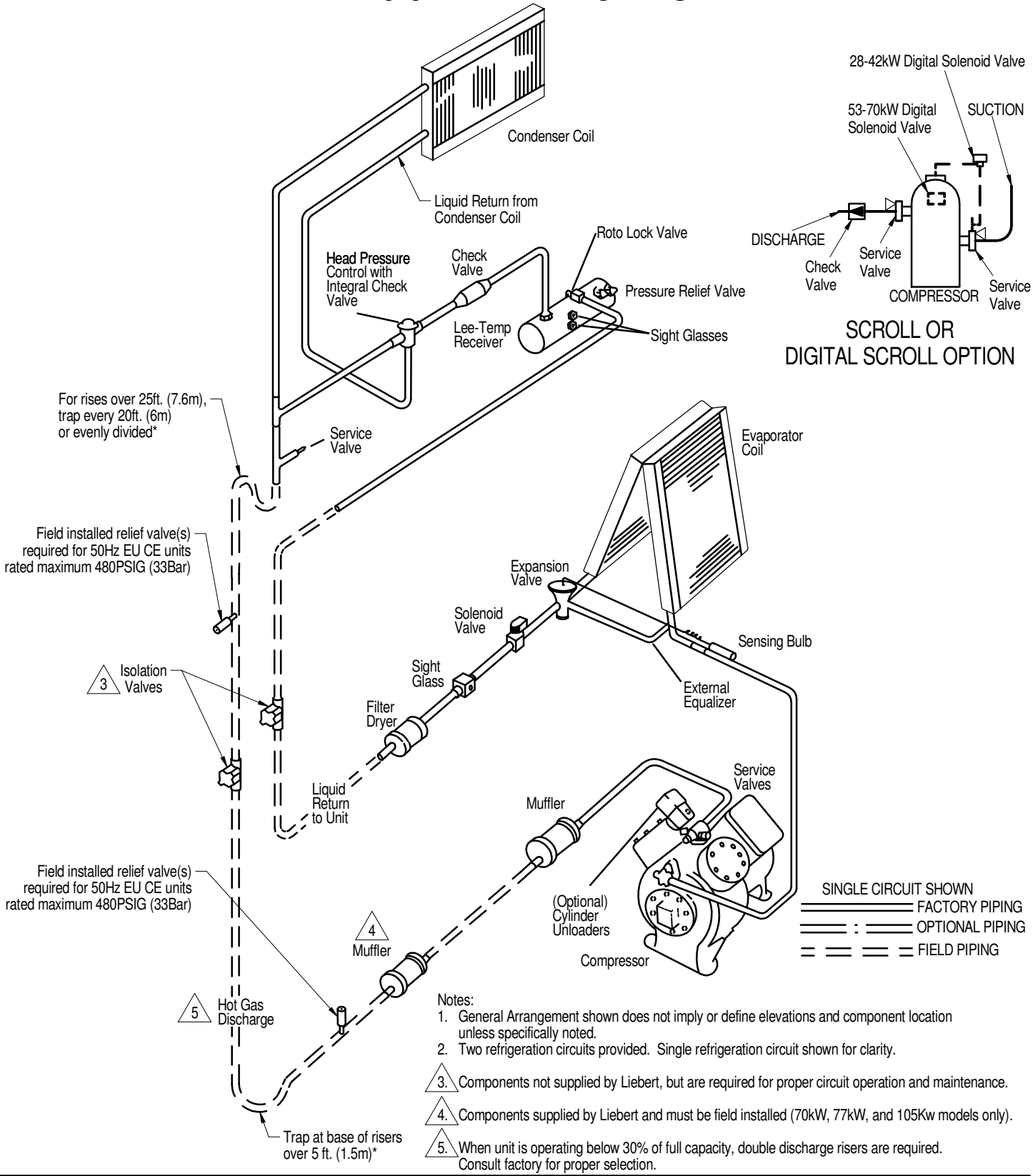
HEIGHT SELECTION IN. (mm)	
NOMINAL	RANGE (NOMINAL ± 1 1/2) ⚠1
9 (229)	7-1/2 (191) TO 10-1/2 (267)
12 (305)	10-1/2 (267) TO 13-1/2 (343)
15 (381)	13-1/2 (343) TO 16-1/2 (419)
18 (458)	16-1/2 (419) TO 19-1/2 (495)
21 (553)	19-1/2 (495) TO 22-1/2 (572)
24 (610)	22-1/2 (572) TO 25-1/2 (648)

Notes:

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

LIEBERT PIGGYBACK CONDENSER

GENERAL ARRANGEMENT DIAGRAM
72" & 97" FRAME MODELS



Notes:
1. General Arrangement shown does not imply or define elevations and component location unless specifically noted.
2. Two refrigeration circuits provided. Single refrigeration circuit shown for clarity.

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

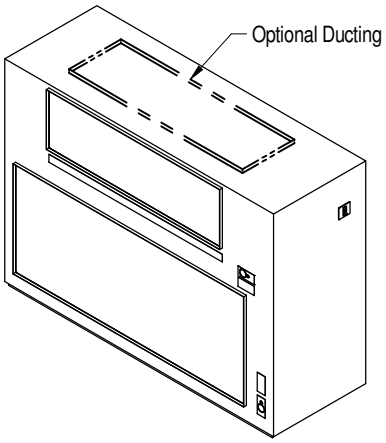
4. Components supplied by Liebert and must be field installed (70kW, 77kW, and 105Kw models only).

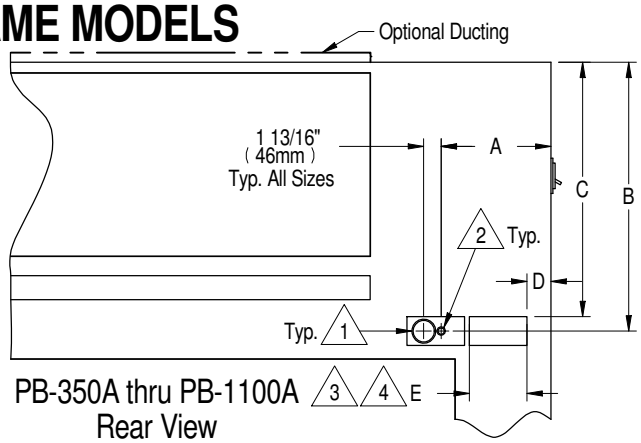
5. When unit is operating below 30% of full capacity, double discharge risers are required. Consult factory for proper selection.

LIEBERT PIGGYBACK CONDENSER

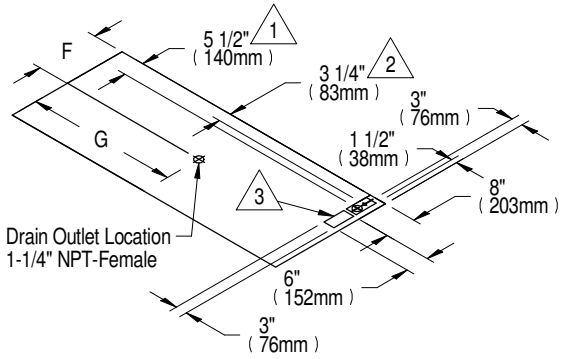
PRIMARY CONNECTION LOCATIONS & REFRIGERANT PLANNING VALUES

72" & 97" FRAME MODELS

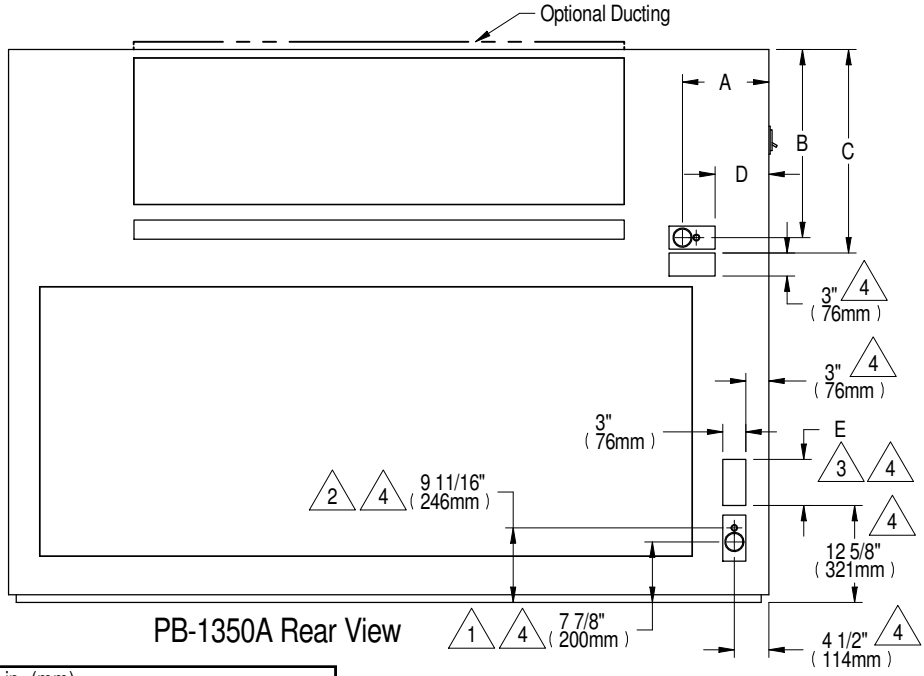




PB-350A thru PB-1100A
Rear View



All Models



PB-1350A Rear View

Liebert Model No.	Dimensional Data in. (mm)						
	A	B	C	D	E	F	G
PB-350A	10-1/8 (267)	28-3/4 (730)	27-1/4 (692)	2-1/2 (64)	6 (152)	15-1/2 (394)	36 (914)
PB-550A							
PB-675A							
PB-925A							
PB-1100A							
PB-1350A	11-1/4 (286)	24 (610)	26-1/2 (673)	7 (178)		16-1/2 (419)	48-1/2 (1232)

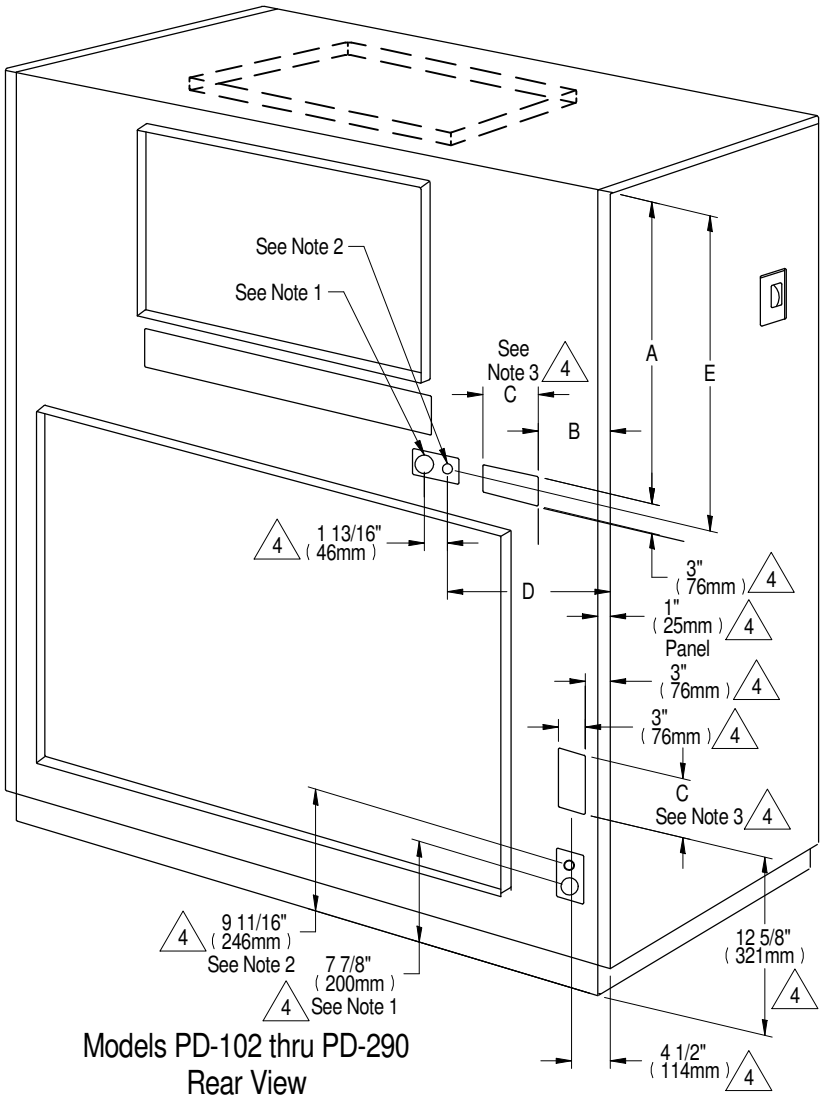
Liebert Model No.	Connection Sizes O.D. Cu 2 per unit		Approximate Refrigeration Charge per ciruit
	Liquid Line	Hot Gas Line	R-407C lbs.
PB-350A	1/2"	5/8"	24
PB-550A			30
PB-675A		7/8"	35
PB-925A			33
PB-1100A	5/8"	1-1/8"	69
PB-1350A			

Notes:

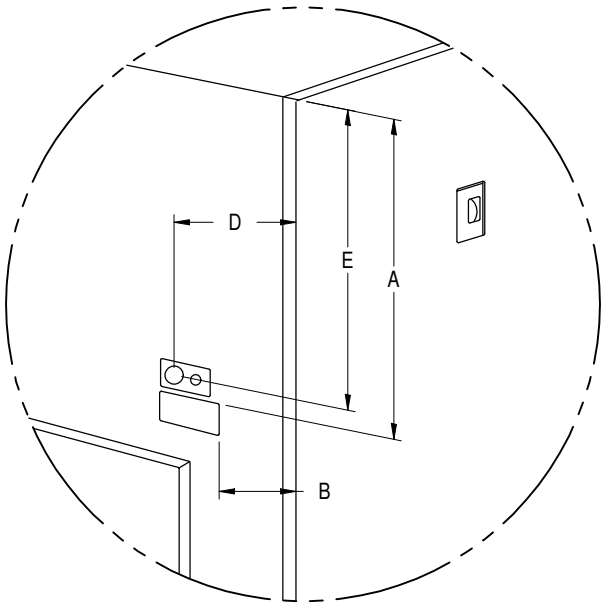
1. Multiple K.O. of ∅1-3/8" (35mm), ∅1-3/4" (45mm), and ∅2-1/2" (64mm) for Main Power Supply (Typ.)
2. 7/8" (22mm) K.O. for Lee-Temp Power Supply (Typ.)
3. Cover Plate for access of Liquid Line and Hot Gas Line.
4. Dimensions typical to PB-350A thru PB-1350A units.

LIEBERT PIGGYBACK DRYCOOLER

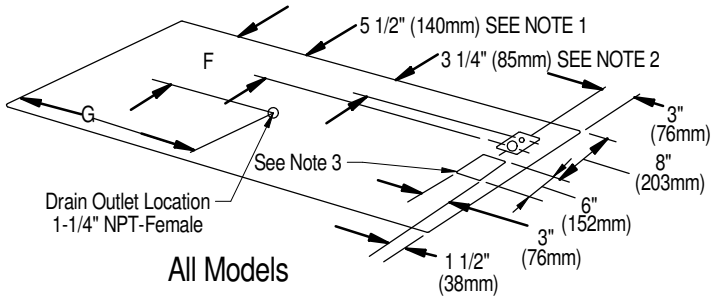
PRIMARY CONNECTION LOCATIONS
72" & 97" FRAME MODELS



Models PD-102 thru PD-290
Rear View



Model PD-333
Rear View



All Models

Liebert Model No.	Dimensional Data in. (mm)						
	A	B	C	D	E	F	G
PD-102	27-1/4 (692)	2-1/2 (64)	6 (152)	9-1/8 (232)	28-3/4 (730)	15-1/2 (394)	36 (914)
PD-133							
PD-150							
PD-223							
PD-290							
PD-333	26-1/2 (673)	7 (178)		11-1/4 (286)	24 (610)	16-1/2 (419)	48-1/2 (1232)

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

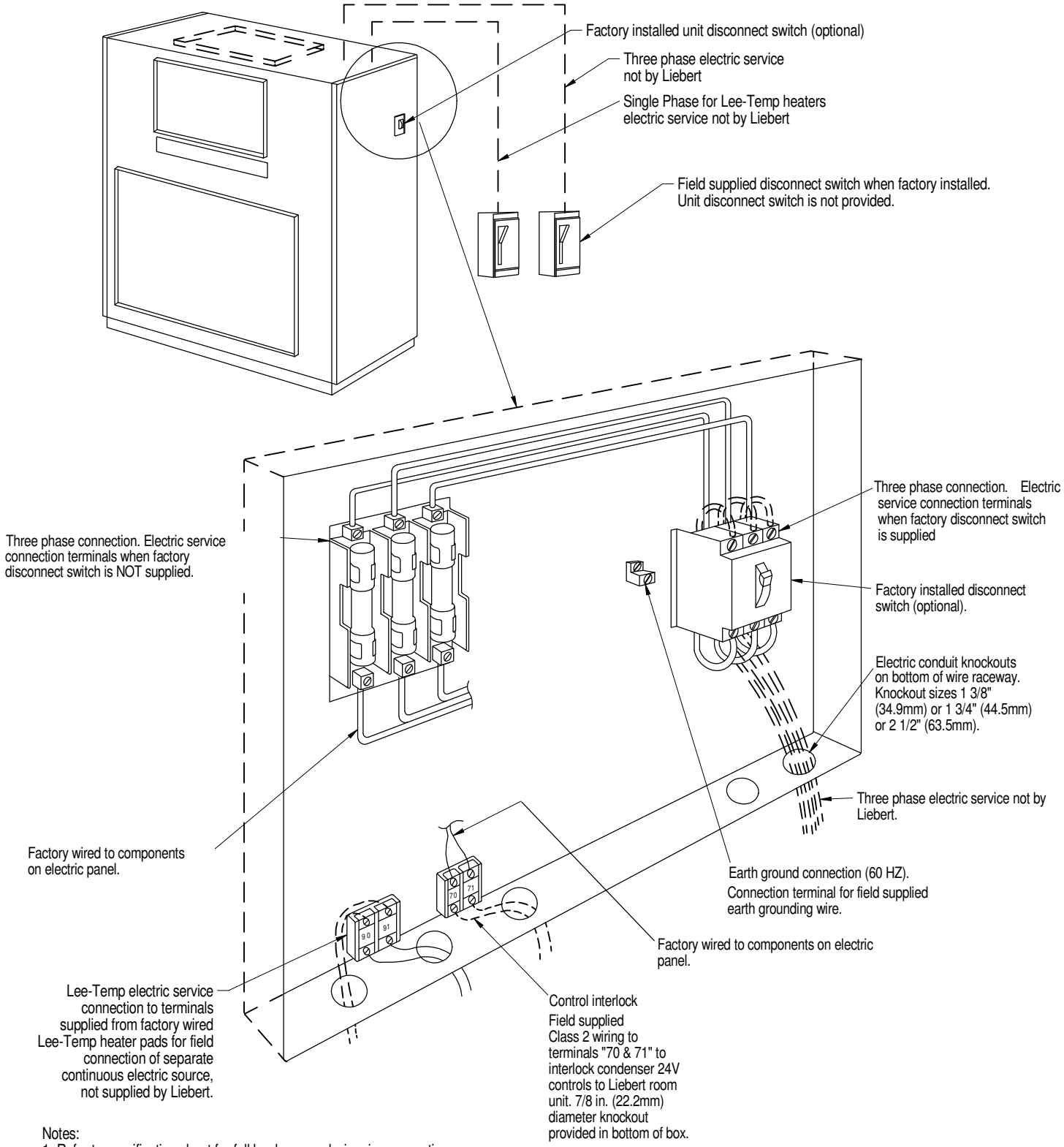
Notes:
1. Multiple K.O. of ∅1-3/8" (35mm), ∅1-3/4" (45mm), and ∅2-1/2" (64mm) for Main Power Supply (Typ.)
2. 7/8" (22mm) K.O. providsed
3. Cover Plate for access of Glycol piping inlet & outlet.

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

LIEBERT PIGGYBACK CONDENSER

ELECTRICAL FIELD CONNECTIONS

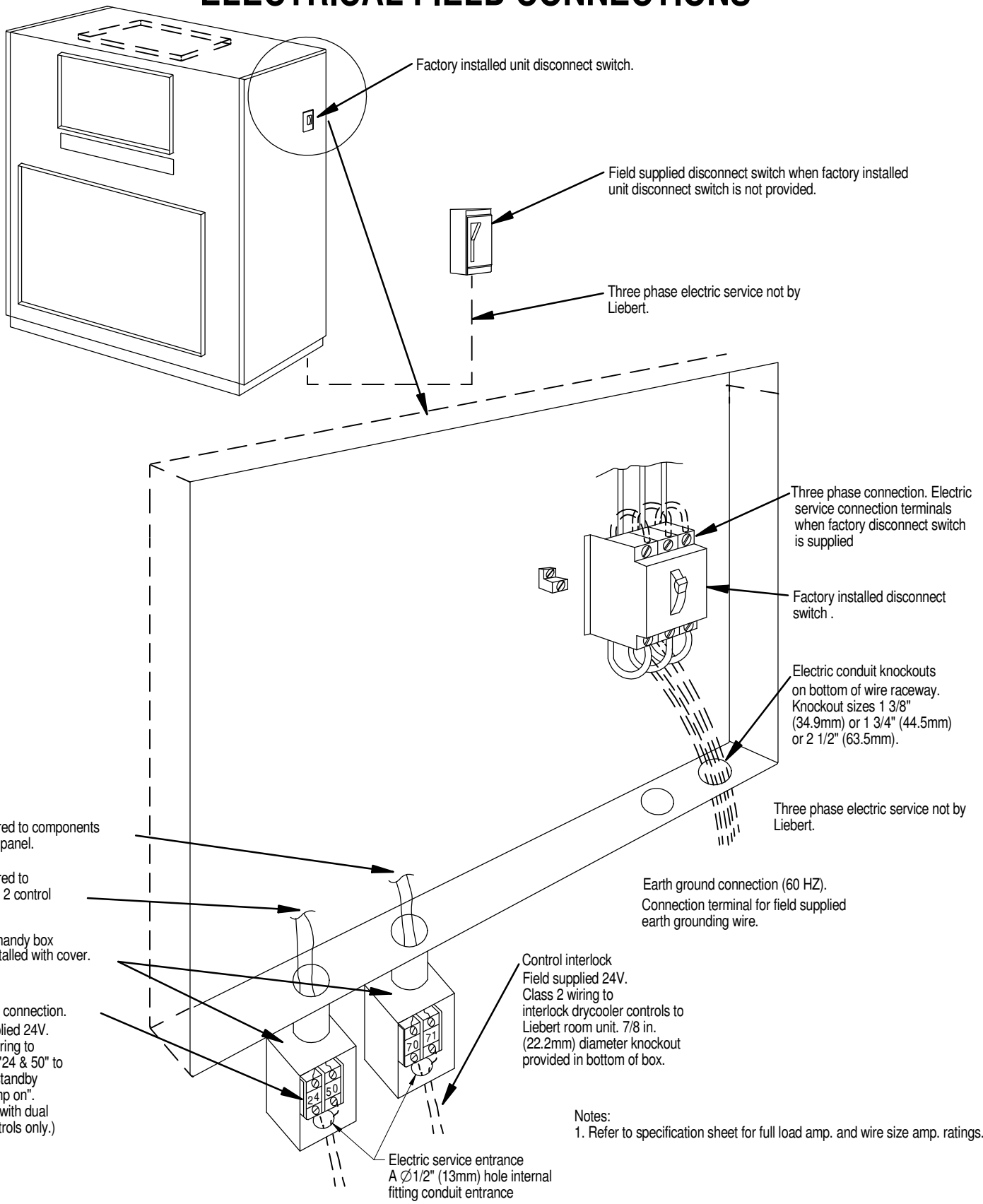
72" & 97" FRAME MODELS



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

LIEBERT PIGGYBACK DRYCOOLER

ELECTRICAL FIELD CONNECTIONS

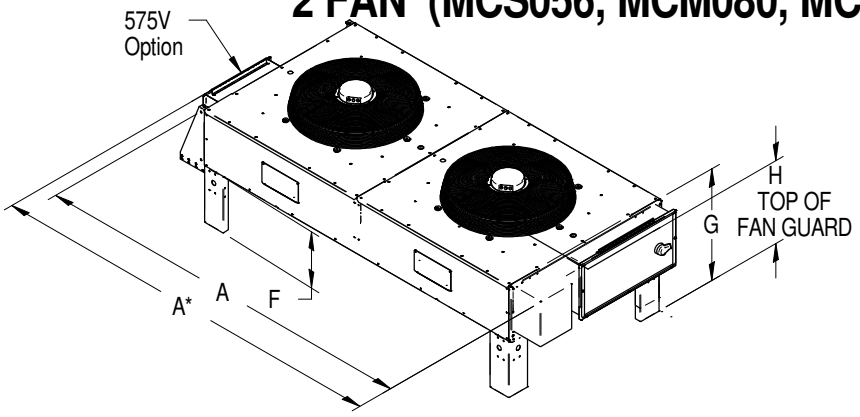


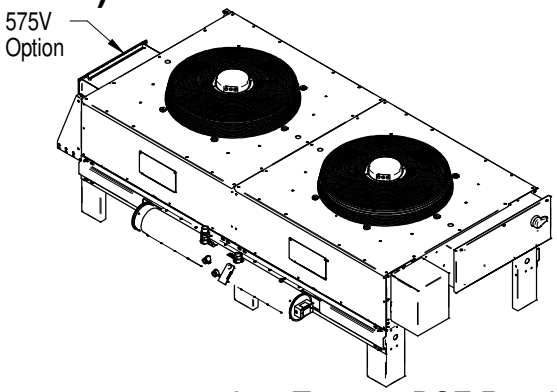
Notes:
1. Refer to specification sheet for full load amp. and wire size amp. ratings.

LIEBERT MC CONDENSER

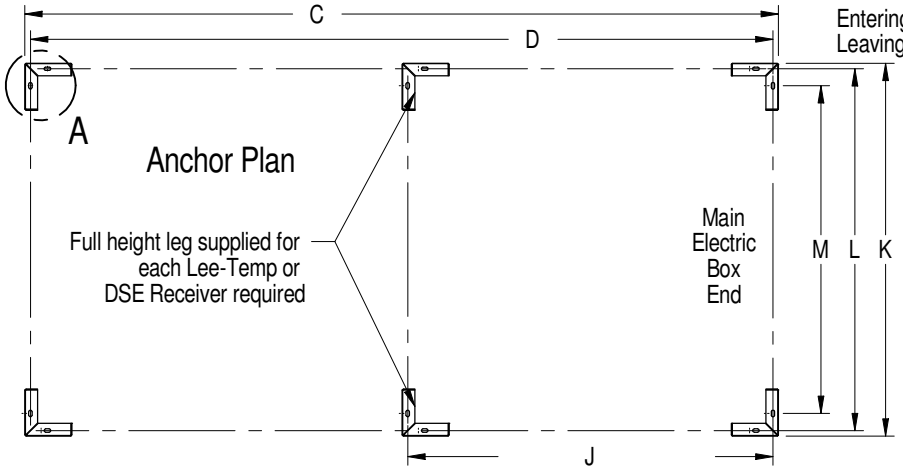
CABINET & ANCHOR DIMENSIONAL DATA

2 FAN (MCS056, MCM080, MCL110) DUAL CIRCUIT

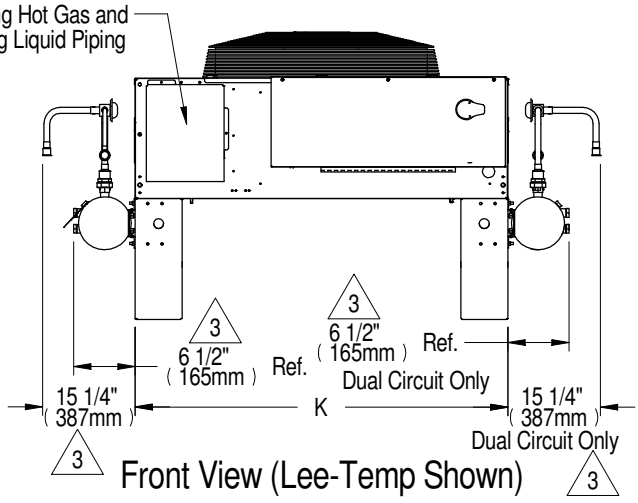




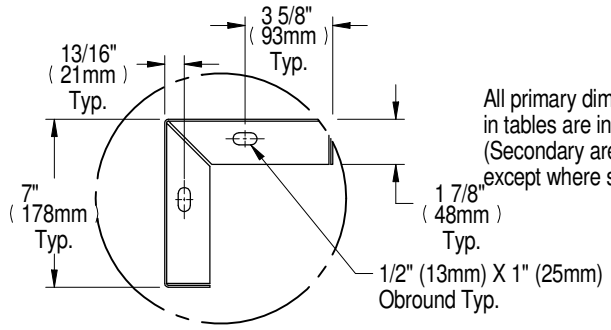
Lee-Temp or DSE Receiver



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.**

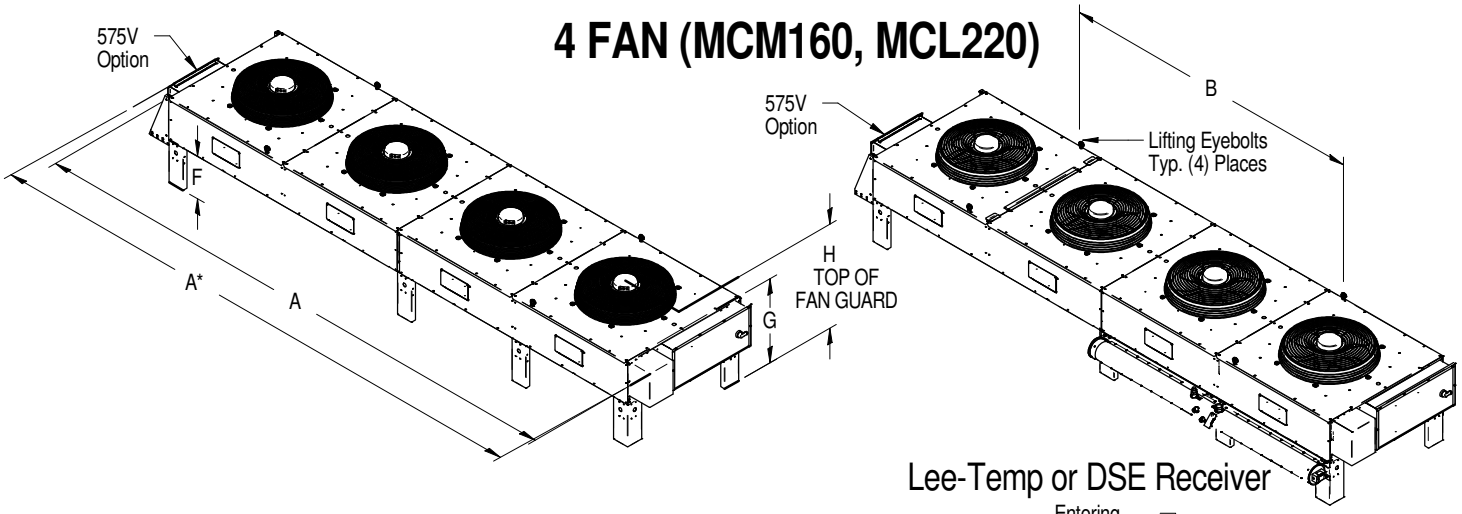
2 **Cross bracing required for legs longer than 18" (457mm). Quantity varies per model & options selected.**

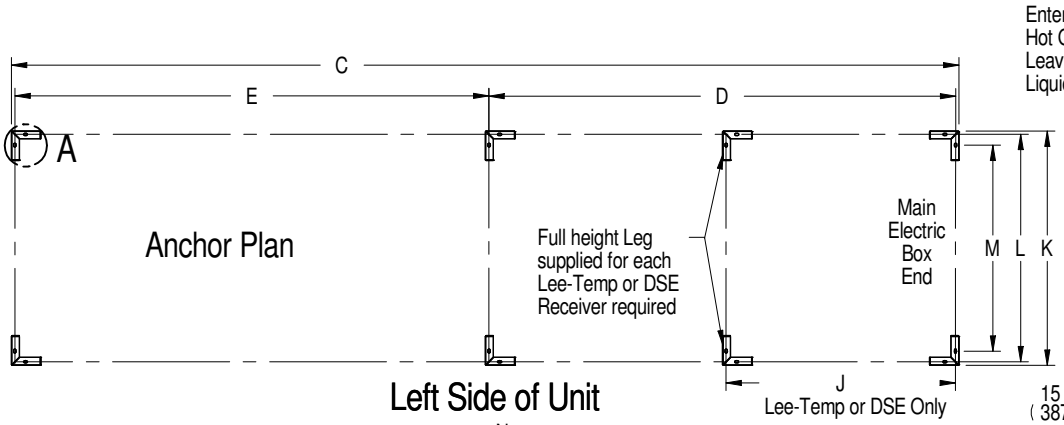
3 **For DSE models only, 6-1/2" (165mm) dimension is 9-1/4" (235mm) and 15-1/4 (387mm) dimension is not applicable.**

LIEBERT MC CONDENSER

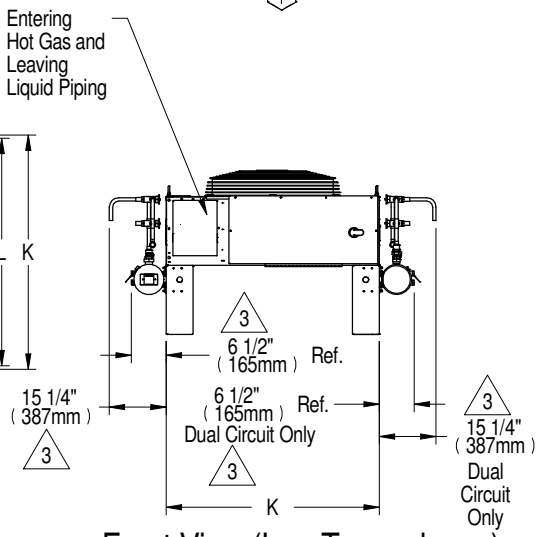
CABINET & ANCHOR DIMENSIONAL DATA

4 FAN (MCM160, MCL220)





Left Side of Unit

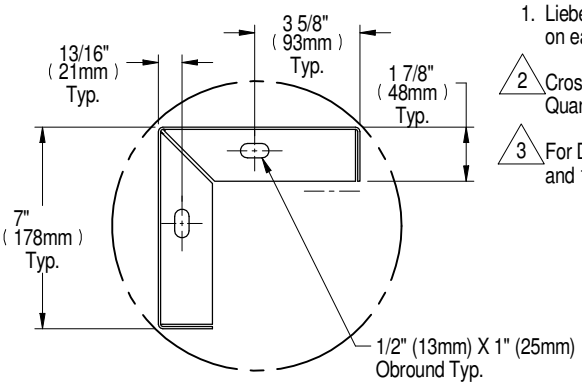


Front View (Lee-Temp shown)

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.



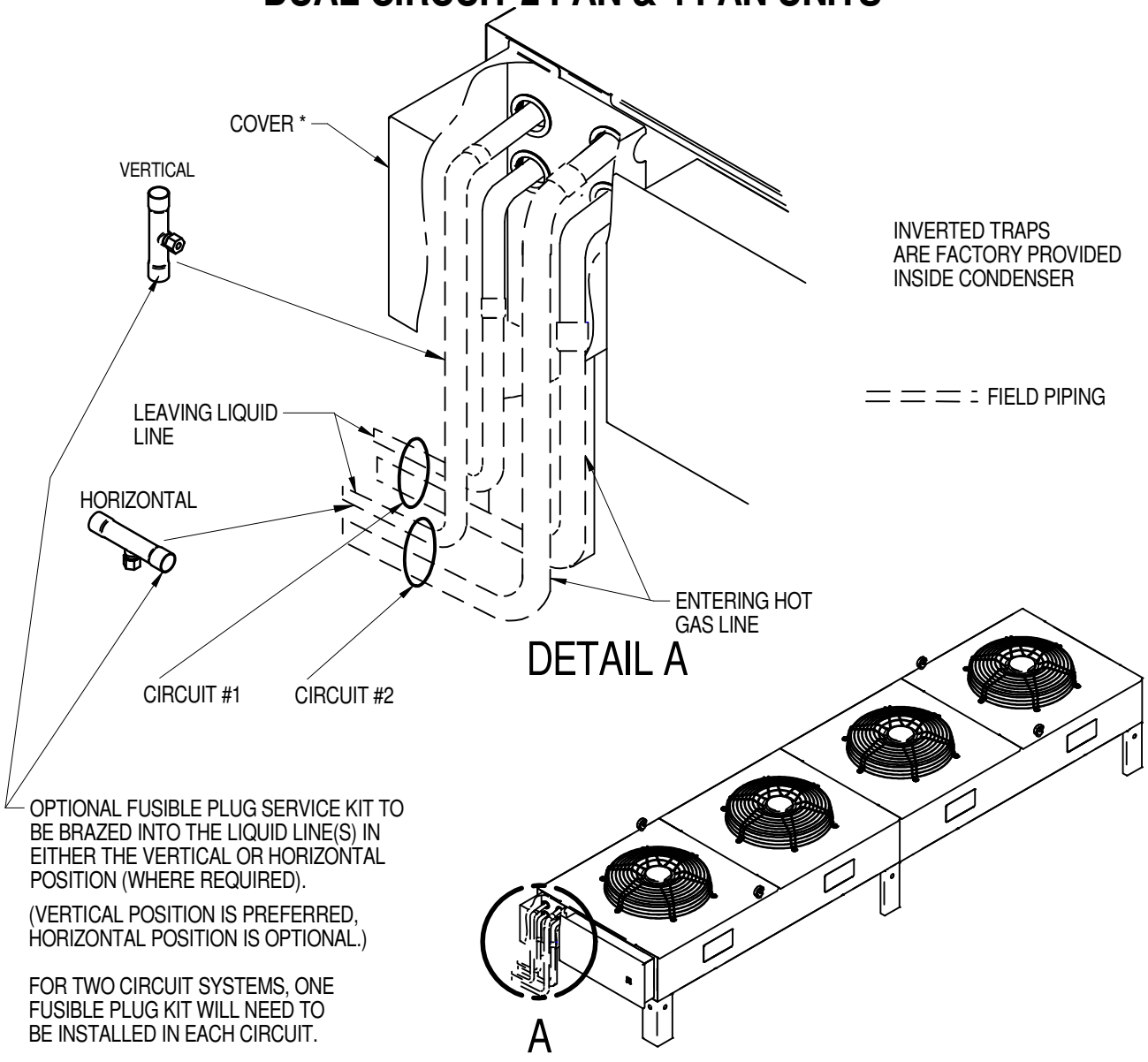
DETAIL A
Typical all legs

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)

LIEBERT MC CONDENSER

PIPING DIMENSIONAL DATA
DUAL CIRCUIT 2 FAN & 4 FAN UNITS

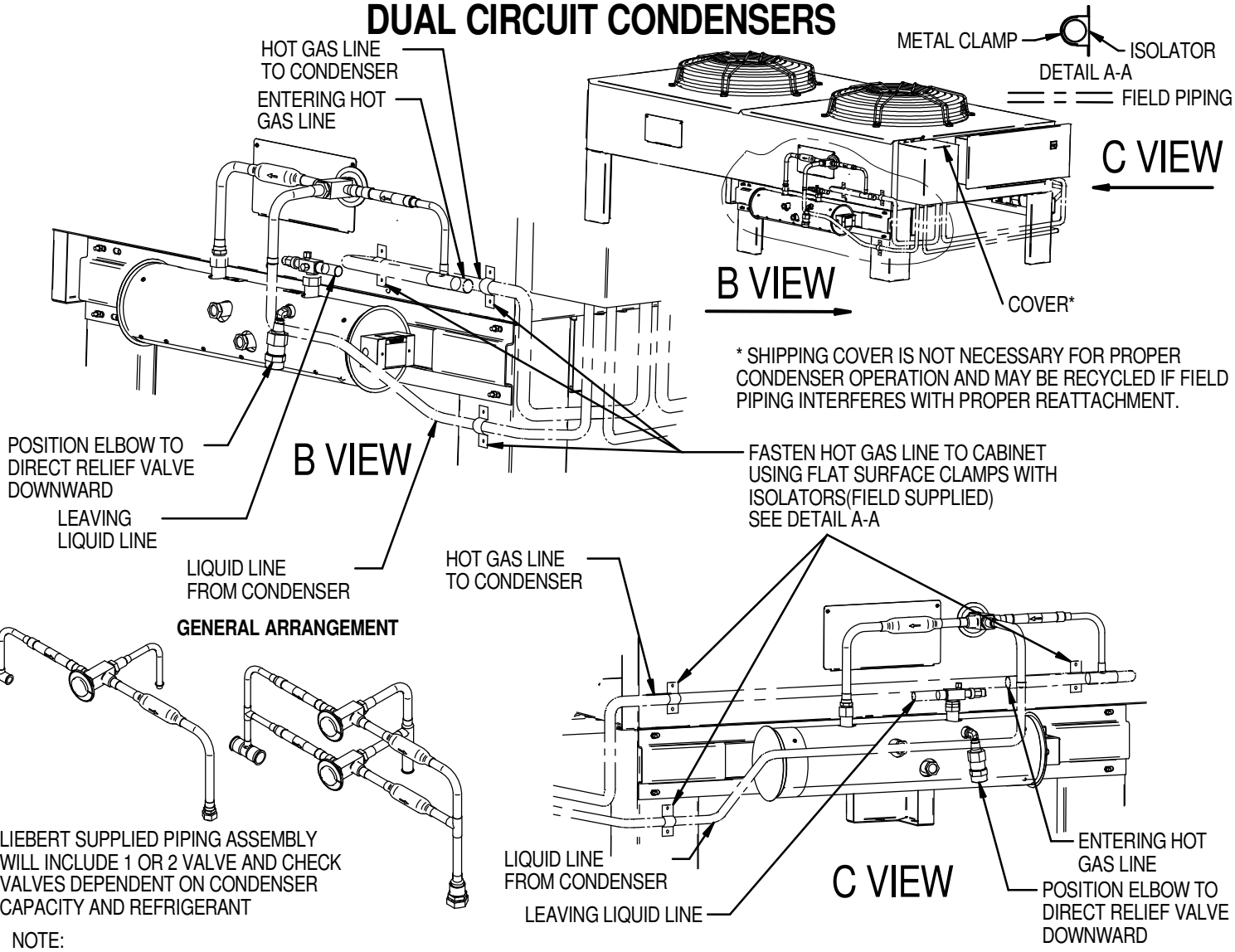


MODEL NO.	NUMBER OF FANS	CONDENSER CIRCUITS	CONNECTION SIZES ,OD,IN	
			HOT GAS LINE	LIQUID LINE
MCS 056	2	2	7/8	5/8
MCM 080	2	2	7/8	5/8
MCL 110	2	2	1-1/8	7/8
MCM 160	4	2	1-1/8	7/8
MCL 220	4	2	1-3/8	1-1/8

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

LIEBERT MC CONDENSER

PIPING: DIMENSIONAL DATA WITH LEE-TEMP
DUAL CIRCUIT CONDENSERS

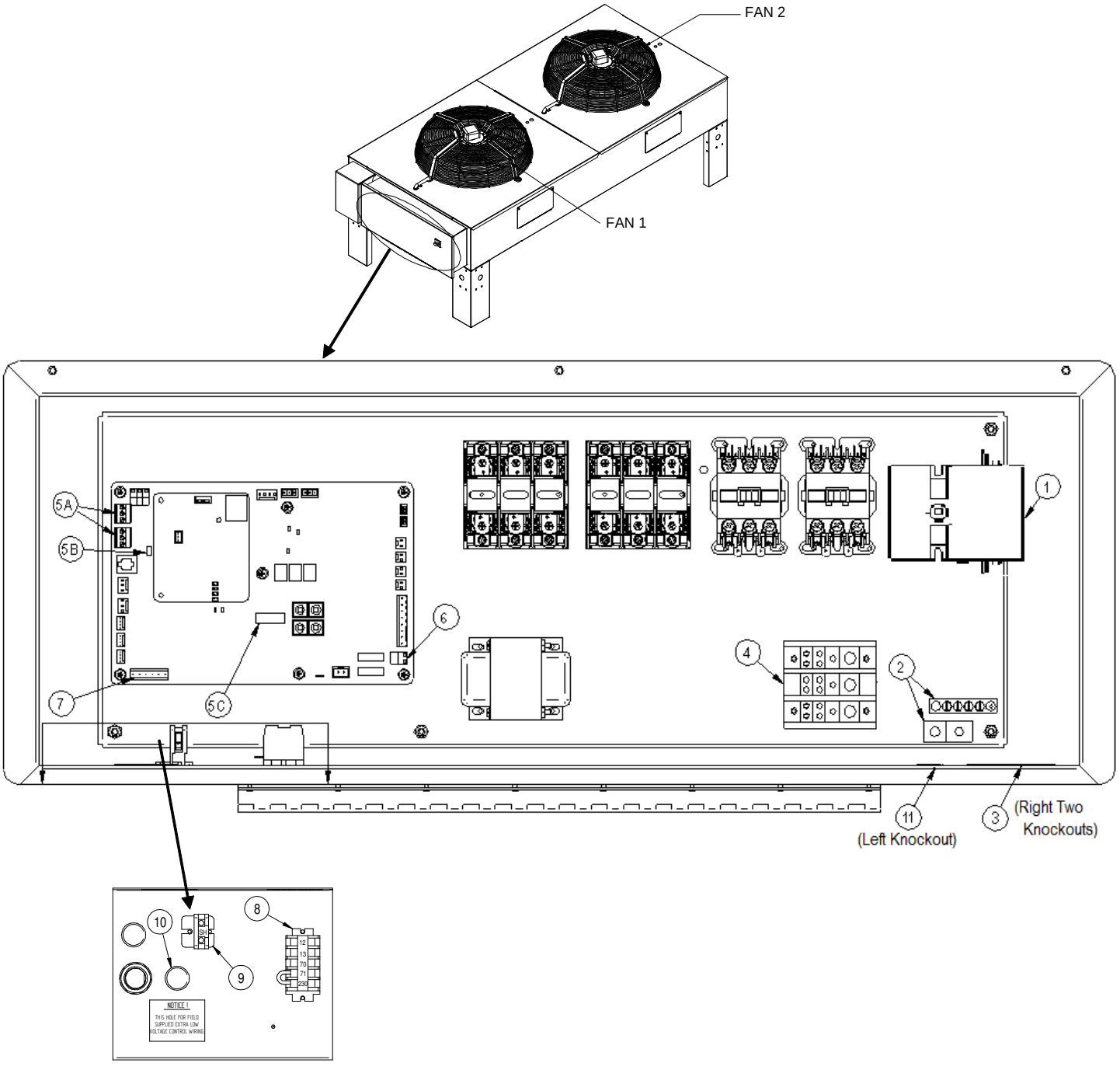


NOTE:

1. THE FOLLOWING MATERIALS ARE SUPPLIED BY LIEBERT, SHIPPED LOOSE FOR EACH CIRCUIT, AND FOR FIELD INSTALLATION:
   INSULATED LIEBERT LEE-TEMP RECEIVER TANK WITH ELECTRIC HEATER PADS AND SIGHT GLASSES, PIPING ASSEMBLY WITH HEAD PRESSURE CONTROL VALVE AND CHECK VALVE, ROTO-LOCK VALVE AND PRESSURE RELIEF VALVE.
   ALL OTHER PIPING AND ELECTRICAL WIRING TO BE SUPPLIED AND INSTALLED BY OTHERS. AN ADDITIONAL CONDENSER LEG PER CIRCUIT TO BE SHIPPED WITH THE CONDENSER.
2. FOR RUNS LONGER THAN 150FT.(45.7M)EQUIV. LENGTH, CONSULT FACTORY FOR PROPER LINE SIZING.

CONDENSER PIPING CONNECTION SIZES						
CONDENSER CONNECTIONS				LEE-TEMP CONNECTIONS		
MODEL NO.	CIRCUIT NO.	HOT GAS	LIQUID	HOT GAS TEE (IDS-INCHES)	LIQ TO L-T VALVE (ODS-INCHES)	RECEIVER OUT ROTO-LOCK (IDS-INCHES)
MCS056	2	7/8	5/8	7/8	5/8	5/8
MCM080	2	7/8	5/8	7/8	5/8	5/8
MCL110	2	1-1/8	7/8	1-1/8	7/8	7/8
MCM160	2	1-1/8	7/8	1-1/8	7/8	1-1/8
MCL220	2	1-3/8	1-1/8	1-3/8	1-1/8	1-1/8

ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL



KEY ELECTRICAL DETAILS:

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

ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL

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

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

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

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

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

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

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

NOTES:

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

ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL

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

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

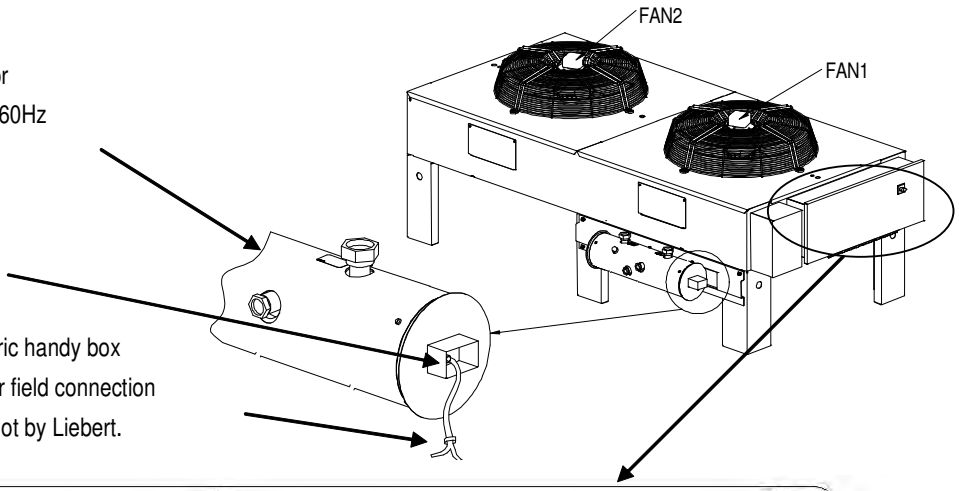
ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL WITH LEE-TEMP

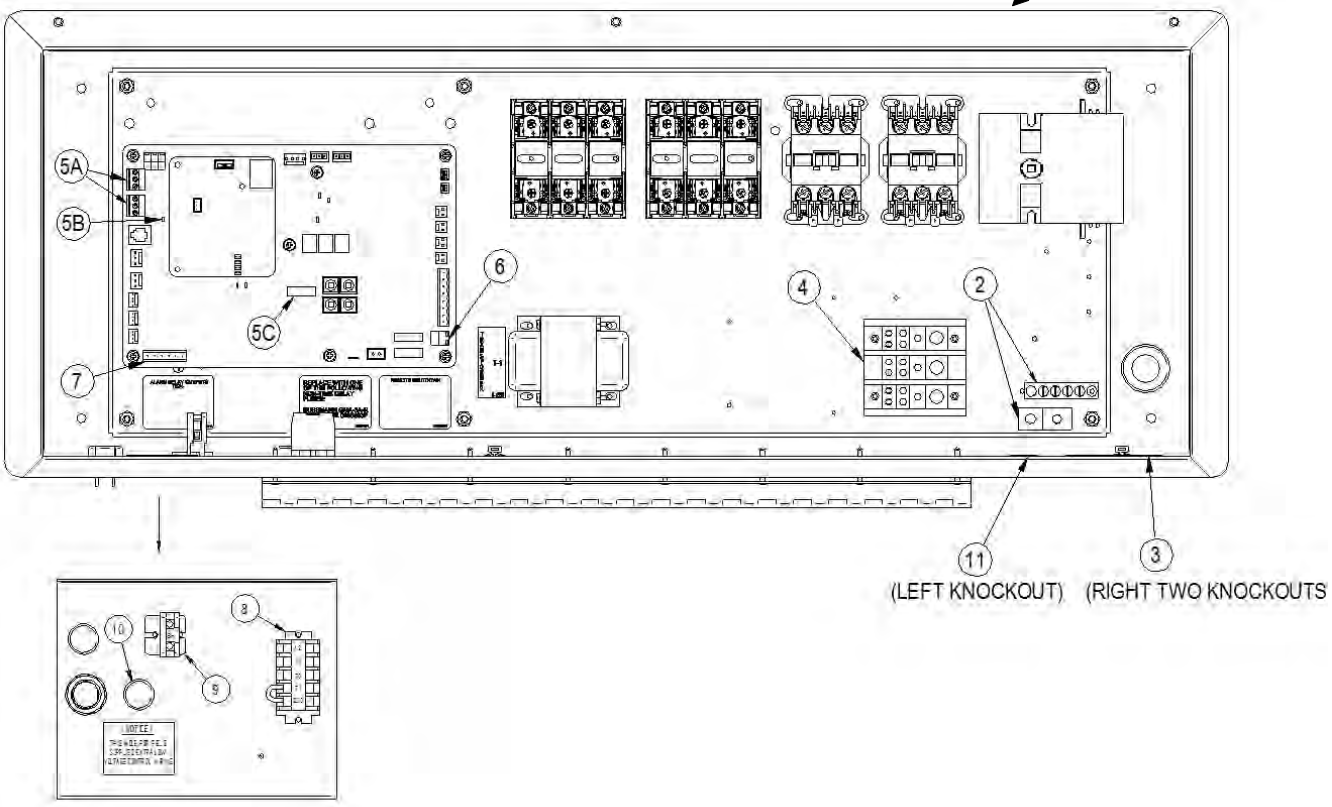
Electrical Connections for Lee-Temp Receiver

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

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

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





KEY ELECTRICAL DETAILS:

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2) **Earth ground –** Field lug terminal for earth ground connection. Ground terminal strip for fan motor ground connection.
3) **Primary high voltage entrance –** Two 7/8" (22.2mm) diameter knockouts located at the bottom of the enclosure.
4) **SPD field connection terminals –** High voltage surge protective device (SPD) terminals. SPD is an optional device.

ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL WITH LEE-TEMP

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- 5C is the CANbus "DEVICE ADDRESS DIP SWITCH". CANbus cable not by Liebert. See Note 2 (below).

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NOTES:

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

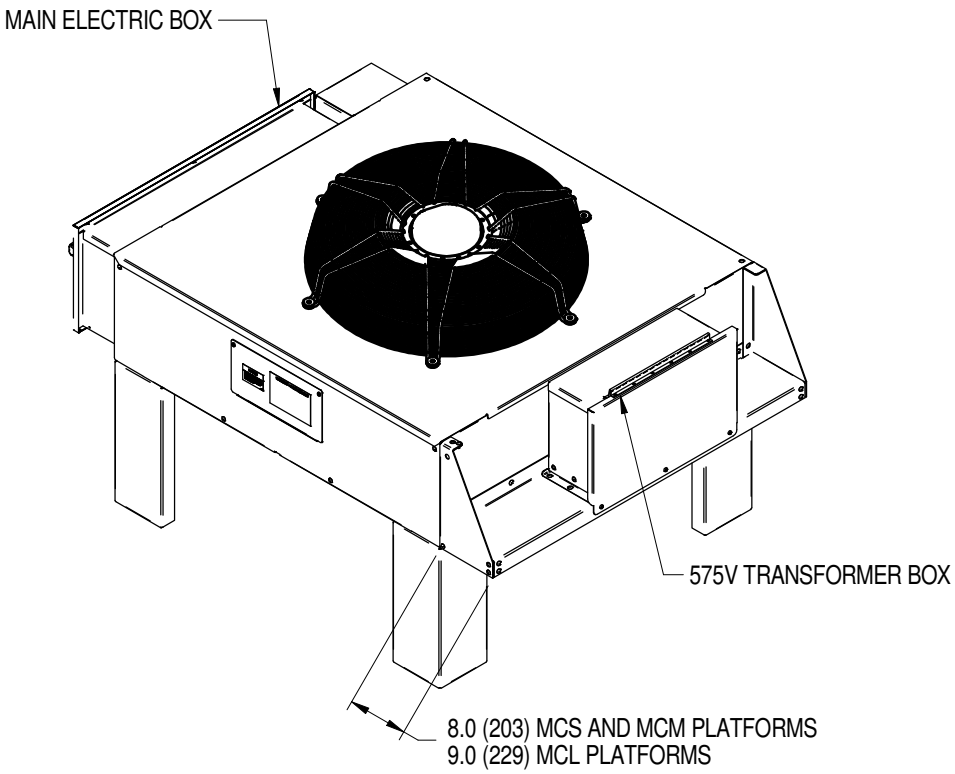
ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL WITH LEE-TEMP

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

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

LIEBERT MC CONDENSER

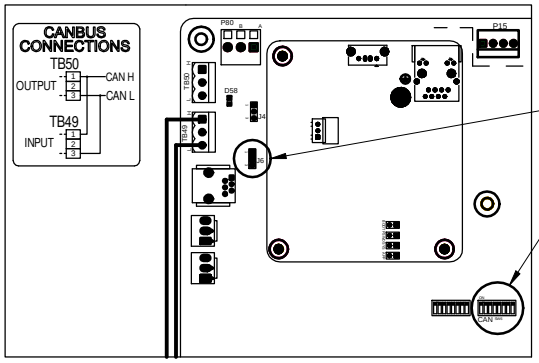
ELECTRICAL: 575V OPTION



-CUSTOMER FIELD CONNECTIONS MADE IN MAIN ELECTRIC BOX.
-POWER DISCONNECT LOCATED IN MAIN ELECTRIC BOX.
-TRANSFORMER BOX IS FACTORY WIRED TO MAIN ELECTRIC BOX.
-575V TRANSFORMER BOX INCLUDES TRANSFORMER AND PROTECTIVE FUSES FOR TRANSFORMER SECONDARY.

LIEBERT DS

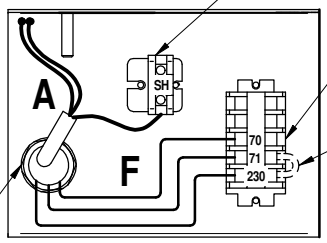
CANbus & INTERLOCK CONNECTIONS
BETWEEN LIEBERT DS & LIEBERT MC CONDENSER (PREMIUM)



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

CANbus ADDRESSING SWITCH

DETAIL 3
CAN CABLE CONNECTION (A)



SHIELD CONNECTION

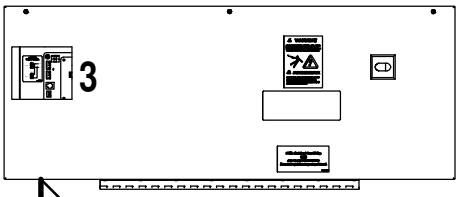
FACTORY WIRING BETWEEN
MC CONTROL BOARD AND
TERMINAL STRIP.

REMOVE JUMPER
FOR DUAL CIRCUIT

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

HEAT REJECTION INTERLOCK (F)

CONDENSER



F HEAT REJECTION INTERLOCK

A CANbus CONNECTION

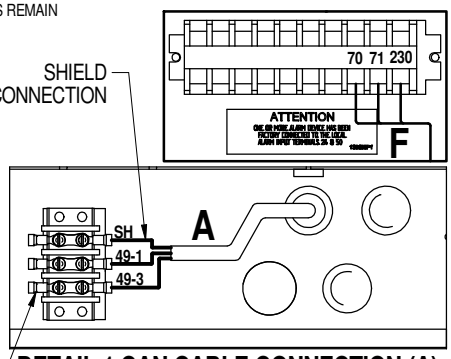
COMPONENT NOTES:
1. COMPONENT APPEARANCE, ORIENTATION , AND POSITION MAY VARY BETWEEN PRODUCT LINES. TERMINAL NAMES AND CALLOUTS REMAIN CONSTANT.
2. ALL CIRCUITS TO THESE CONNECTION POINTS ARE CLASS 2.

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.

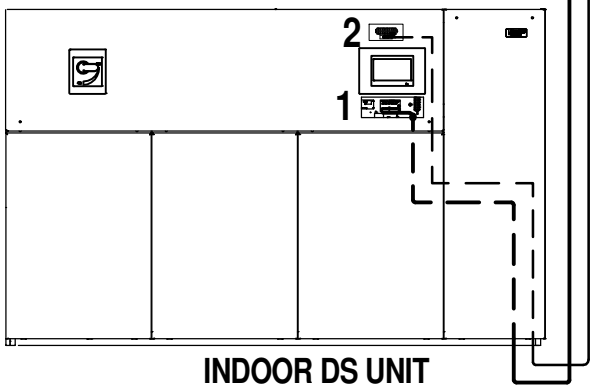
WIRE NOTES (F):
1. FIELD SUPPLIED WIRE
   - 3 CONDUCTOR 18AWG OR GREATER
   - RATED 600V
2. RUN FIELD SUPPLIED WIRES BETWEEN THE INDOOR UNIT AND THE CONDENSER.

DETAIL 2
HEAT REJECTION INTERLOCK (F)

SHIELD CONNECTION



DETAIL 1 CAN CABLE CONNECTION (A)
FACTORY WIRING BETWEEN ICOM AND TERMINAL STRIP.

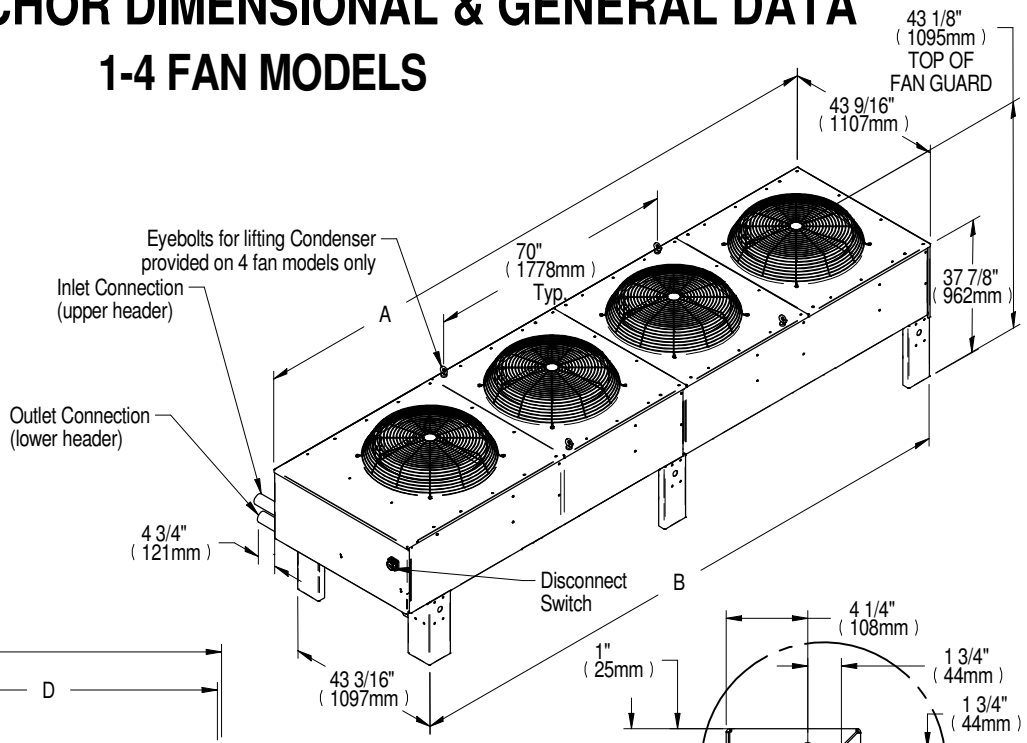


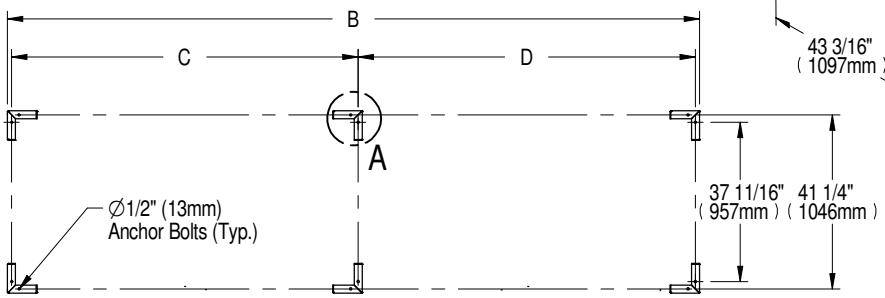
INDOOR DS UNIT

LIEBERT DRYCOOLER

CABINET ANCHOR DIMENSIONAL & GENERAL DATA

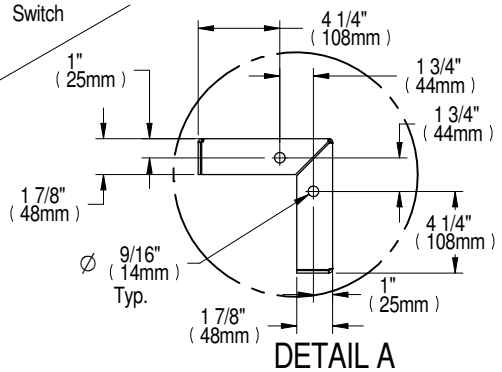
1-4 FAN MODELS





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

Unit Anchor Plan



DETAIL A

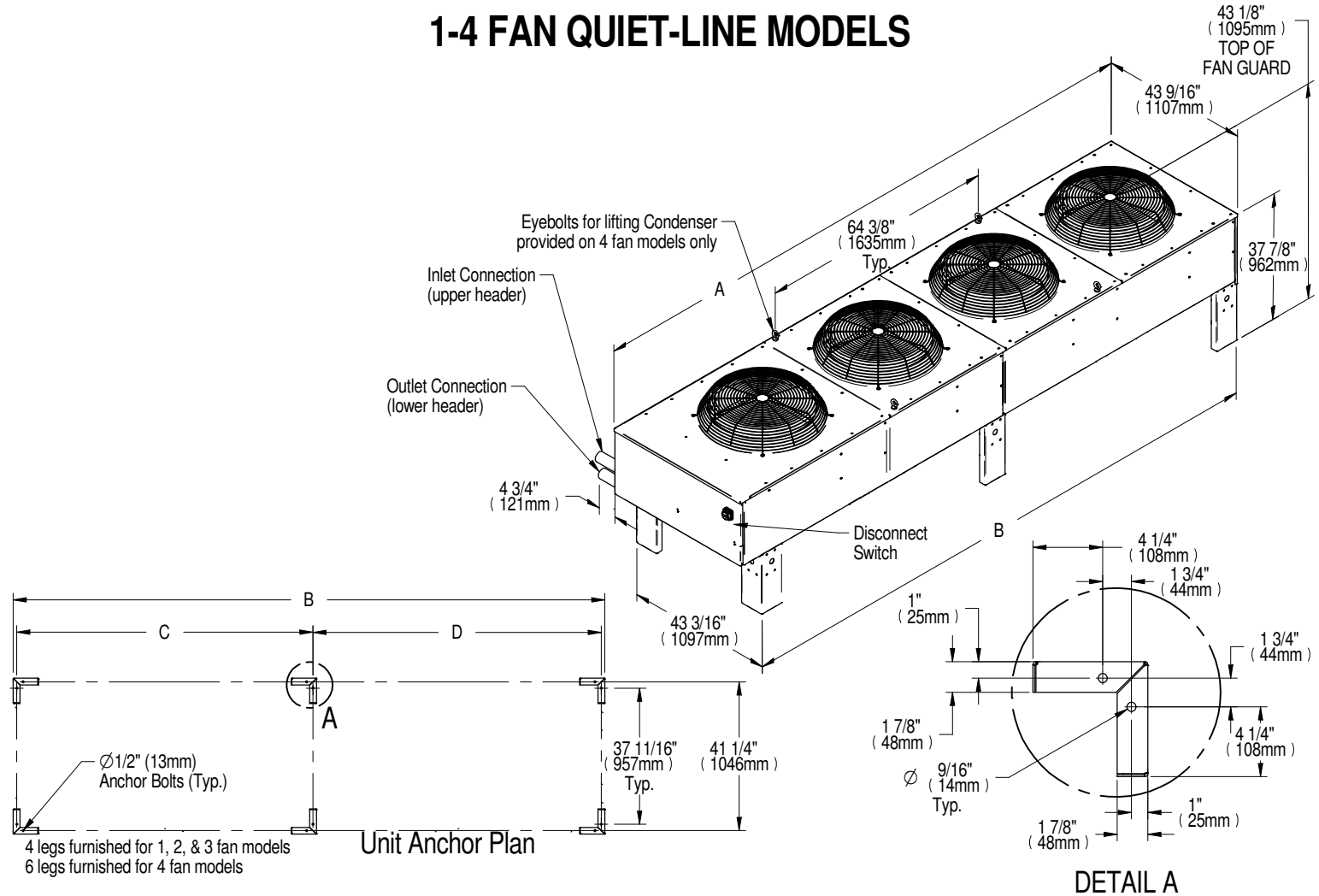
Liebert Model	No. of fans	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	CFM (l/s) 60Hz (See note 1)	CFM (l/s) 50Hz (See note 1)	Internal Volume Gal. (Liters)	Dry Wt. Lbs. (kg)
*D**033	1	51-1/2 (1308)	44 (1118)	42 (1067	N/A	7200 (3398)	6000 (2932)	1.2 (4.6)	355 (161)
*D**069						6866 (3240)	5722 (2700)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

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

LIEBERT DRYCOOLER

CABINET ANCHOR DIMENSIONAL & GENERAL DATA

1-4 FAN QUIET-LINE MODELS

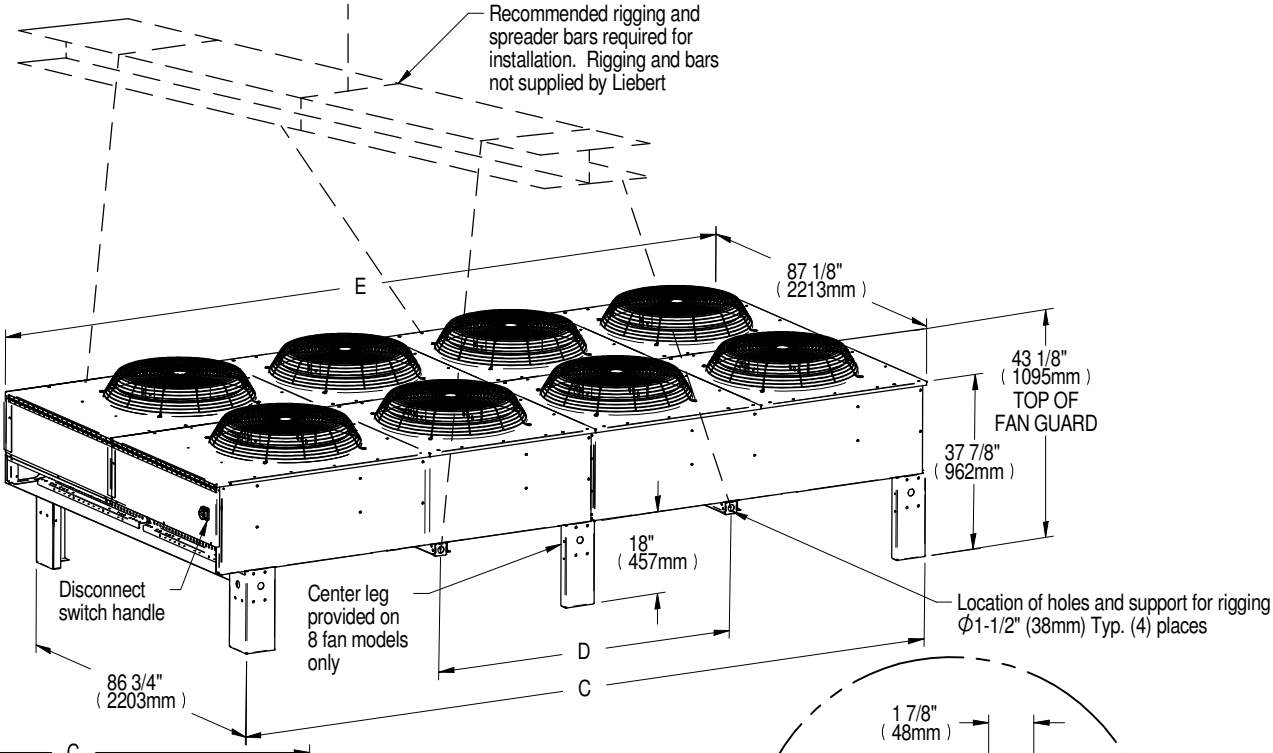


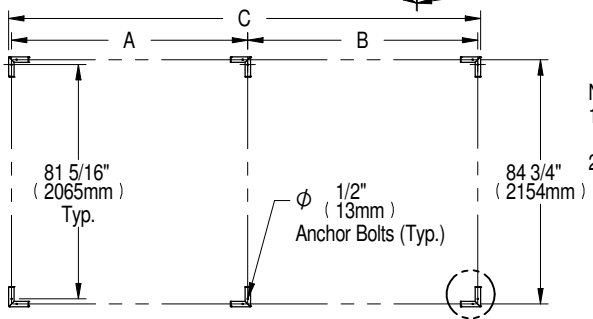
Quiet-Line Model	No. of fans	A in. (mm)	B in. (mm)	C in. (mm)	D in. (mm)	CFM (l/s) 60Hz (See note 1)	CFM (l/s) 50Hz (See note 1)	Internal Volume Gal. (Liters)	Dry Wt. Lbs. (kg)
*D**040	1	51-1/2 (1308)	44 (1118)	42 (1067	N/A	3110 (5285)	2592 (4404)	2.4 (9.1)	375 (170)
*D**057						2990 (5081)	2492 (4234)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

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

LIEBERT DRYCOOLER

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

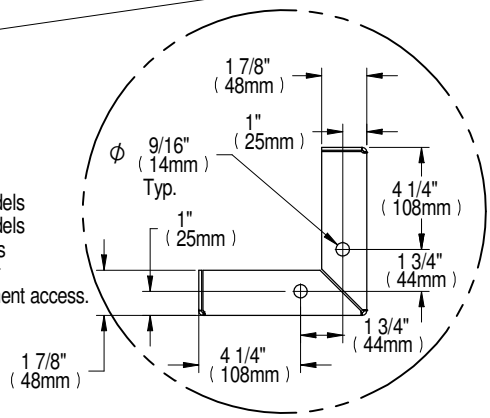




Unit Anchor Plan

A

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

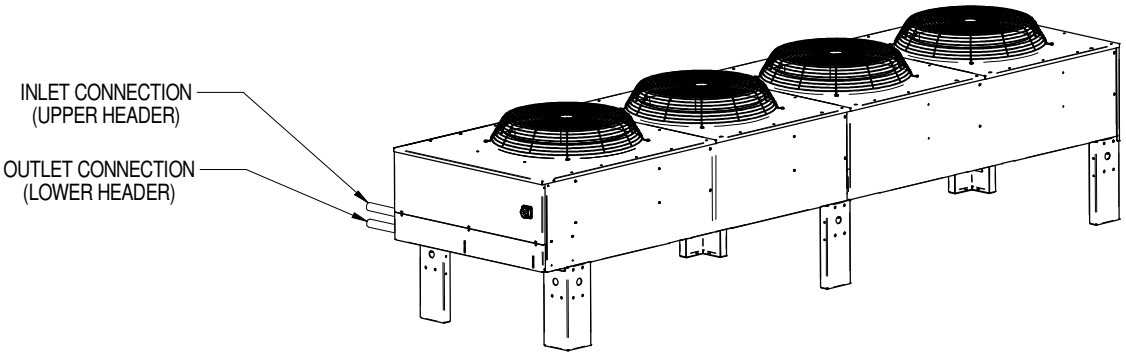


DETAIL A

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

LIEBERT DRYCOOLER

PIPING CONNECTIONS

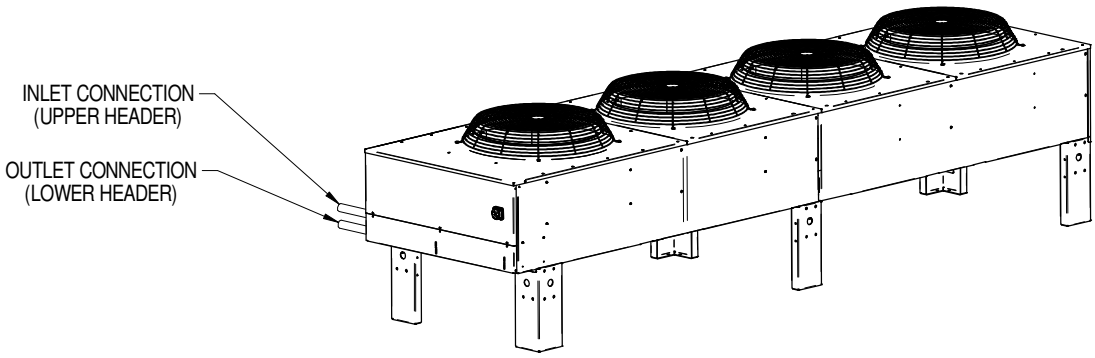


DRYCOOLER PIPING CONNECTION SIZES (O.D. Cu)		
DRYCOOLER MODEL NUMBER	NUMBER OF COIL CIRCUITS	INLET & OUTLET PIPE DIAMETER (INCHES)
-033	4*	1 3/8
-069	4, 8*	1 3/8
-092	6, 12*, 16	1 5/8
-109	8	1 3/8
-109	16*	2 1/8
-112	8	1 3/8
-112	16*, 26	2 1/8
-139	8, 16*	2 1/8
-174	8, 16*, 24	2 1/8
-197	8	1 3/8
-197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

LIEBERT DRYCOOLER

PIPING CONNECTIONS

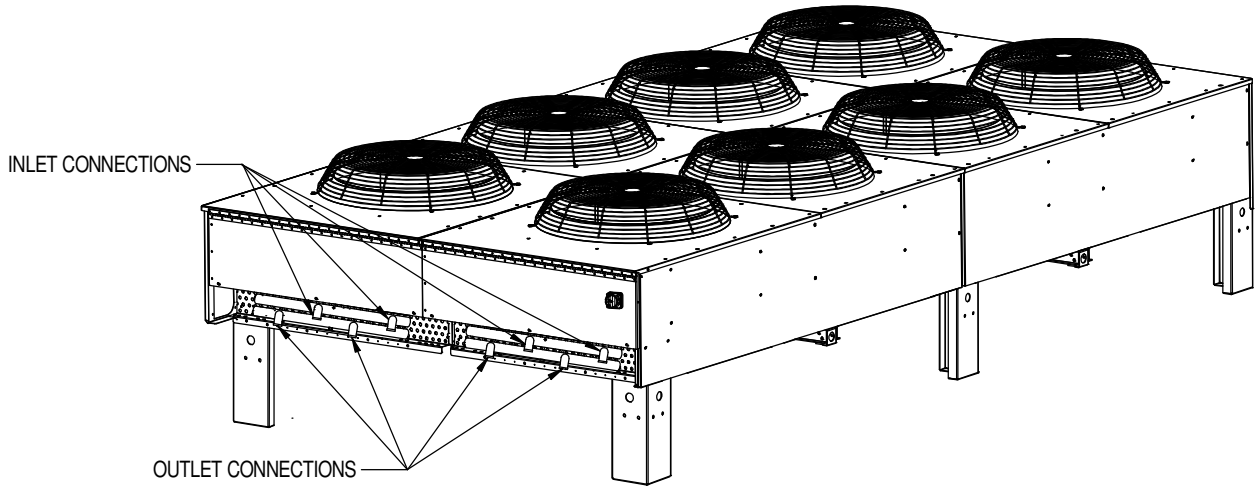
QUIET-LINE MODELS



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

LIEBERT DRYCOOLER

PIPING CONNECTIONS
6 & 8 FAN QUIET-LINE MODELS



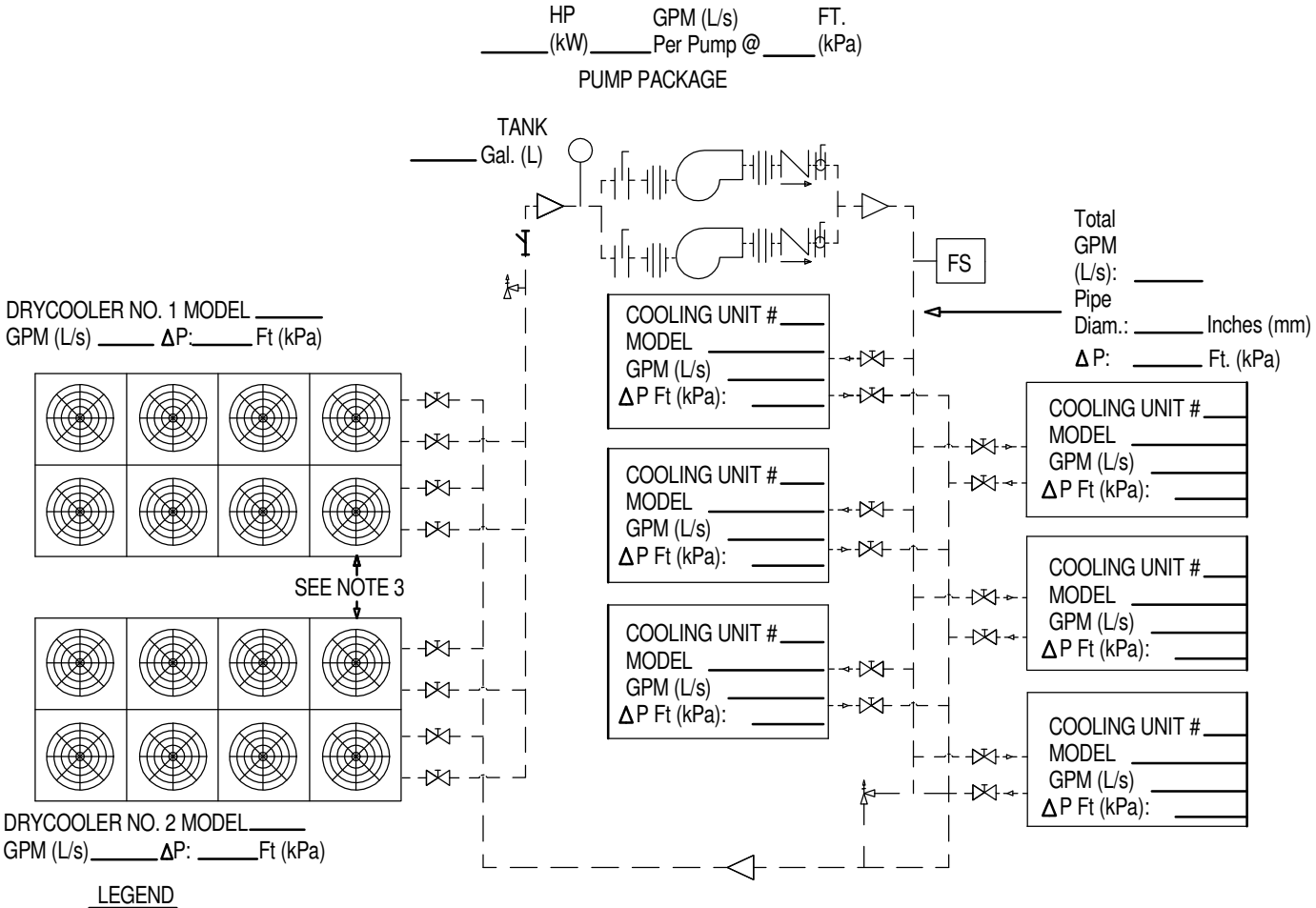
4 INLET, 4 OUTLET CONNECTIONS SHOWN SEE TABLE FOR ACTUAL NUMBER PROVIDED.

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

* STANDARD CIRCUITING

LIEBERT DRYCOOLER

PIPING SCHEMATIC
MULTIPLE DRYCOOLERS & COOLING UNITS ON COMMON GLYCOL LOOP



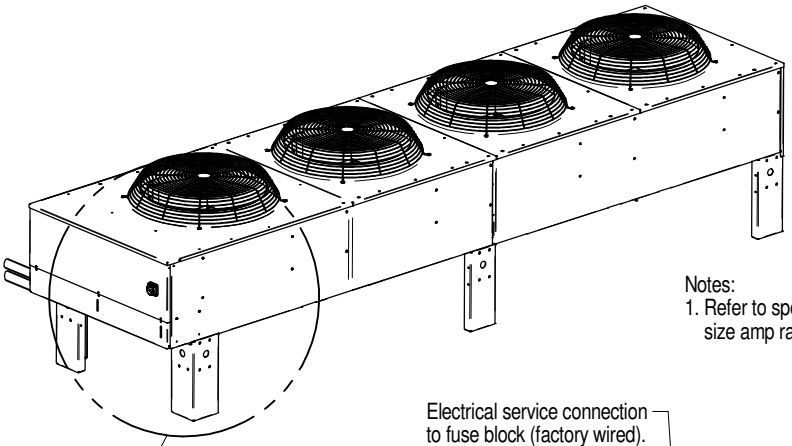
LEGEND

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

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

LIEBERT DRYCOOLER

ELECTRICAL FIELD CONNECTIONS
FLUID TEMPERATURE CONTROL



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

Electrical service connection to fuse block (factory wired).

Factory wired to 24V Class 2 control circuit

Factory wired to components on electric panel

Electrical service connection terminals for field wiring.

Factory installed disconnect switch

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

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

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

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

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

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

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

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

Electric service not provided by Liebert.

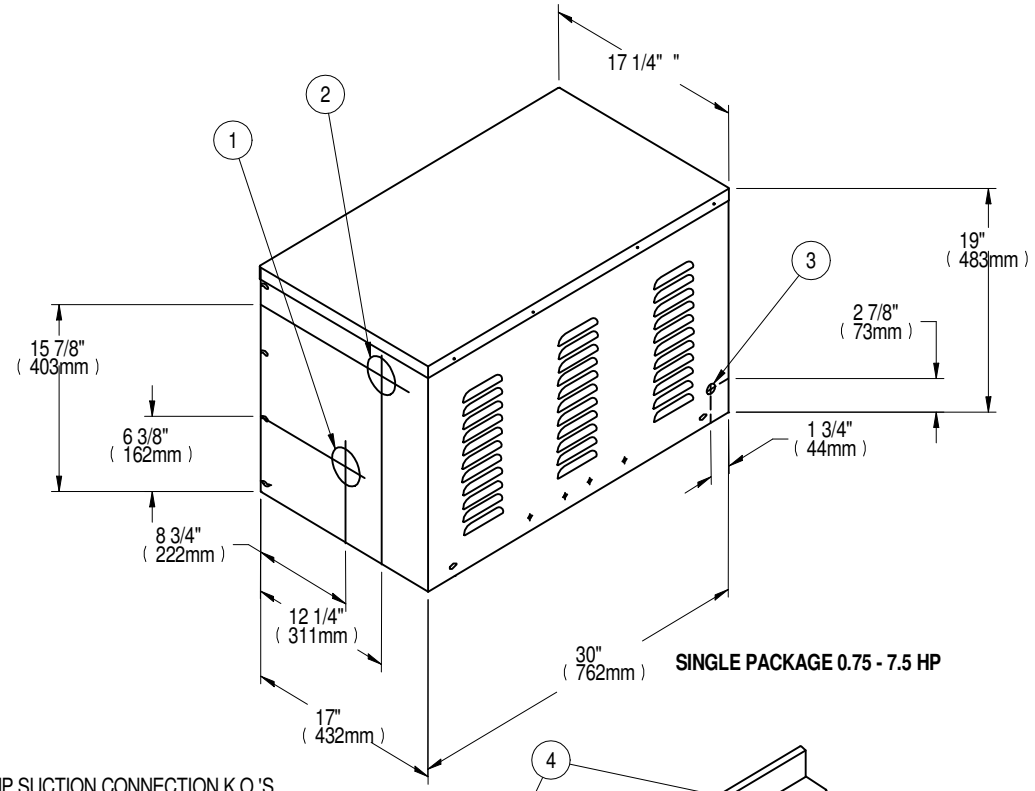
LIEBERT DRYCOOLER

ELECTRICAL & PIPING CONNECTION DATA
PUMP PACKAGE

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

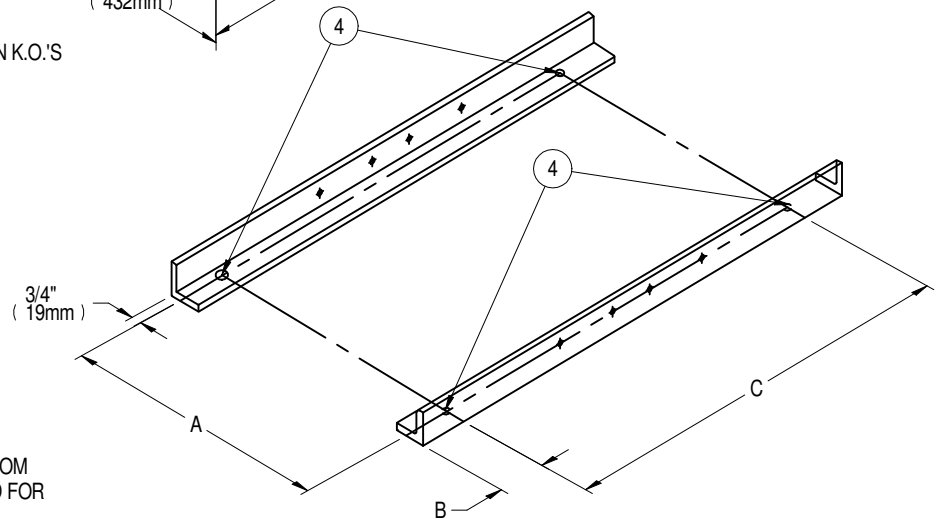
LIEBERT DRYCOOLER

PIPING LOCATIONS & DIMENSIONAL DATA
SINGLE PUMP PACKAGE



SINGLE PACKAGE 0.75 - 7.5 HP

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



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

PUMP PACKAGE MOUNTING ANGLES

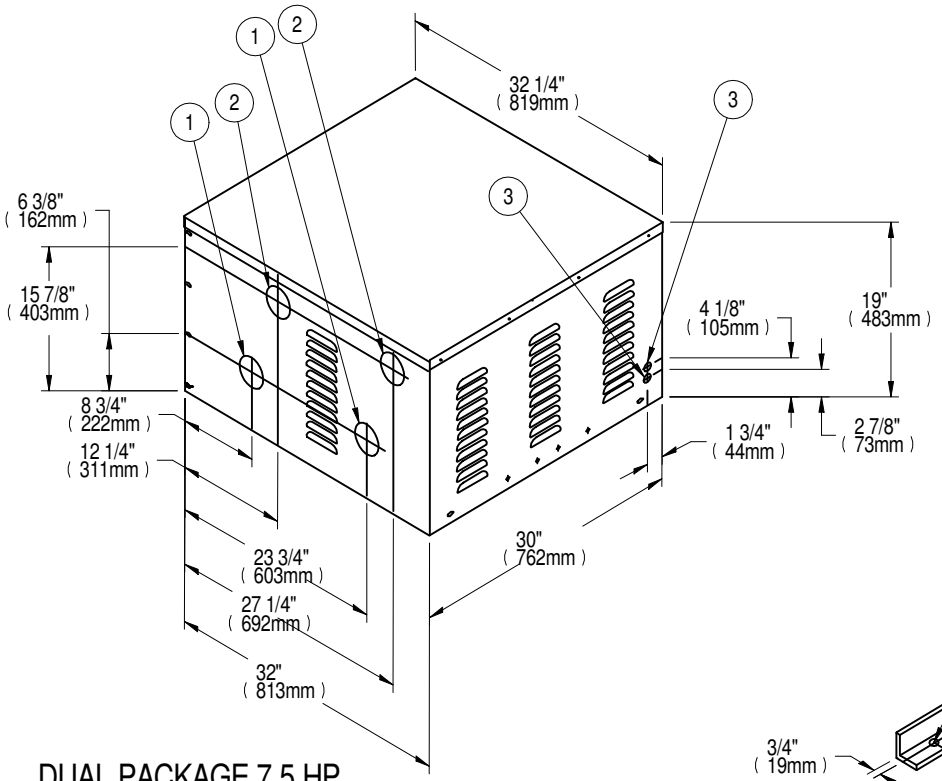
MOUNTING HOLE DIMENSIONAL DATA in. (mm)			
Pump Package	A	B	C
Single (0.75 - 7.5HP)	15-1/4 (387)	2-1/2 (64)	22-1/2 (572)

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

LIEBERT DRYCOOLER

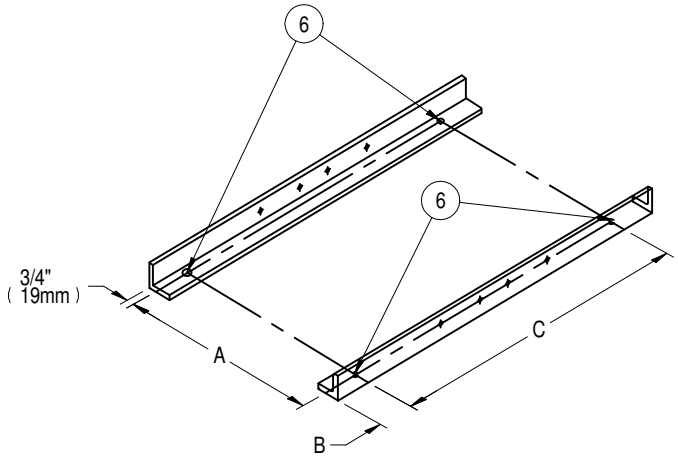
PIPING CONNECTIONS & DIMENSIONAL DATA
DUAL PUMP PACKAGE

DUAL PACKAGE 0.75 - 5 HP



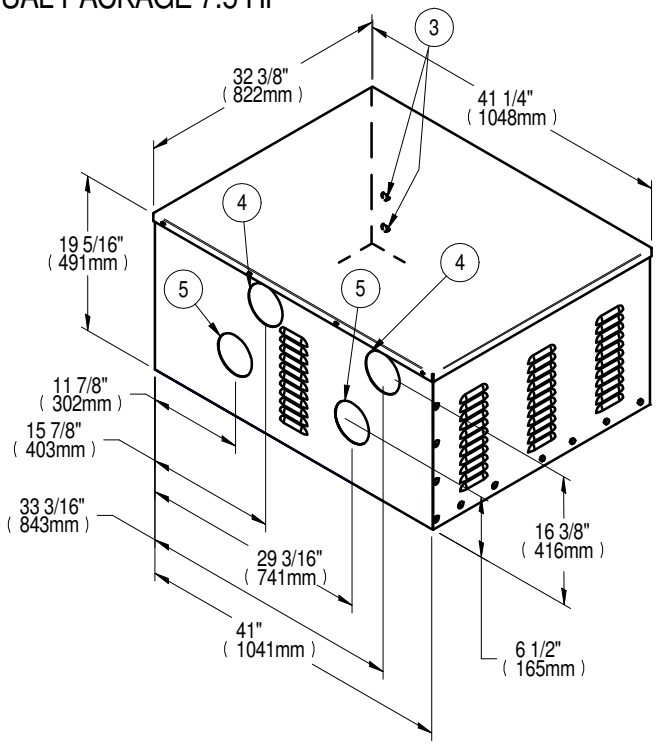
1. 3" (76.2mm) DIA. PUMP SUCTION CONNECTION K.O.'S
2. 3" (76.2mm) DIA. PUMP DISCHARGE CONNECTION K.O.'S
3. 7/8" (22.2mm) DIA. ELECTRICAL K.O.'S
4. 5" (127mm) DIA. PUMP DISCHARGE CONNECTION HOLE
5. 5" (127mm) DIA. PUMP SUCTION CONNECTION HOLE
6. 1/2" (12.7mm) DIA. HOLES FOR MOUNTING

PUMP PACKAGE MOUNTING ANGLES



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

DUAL PACKAGE 7.5 HP



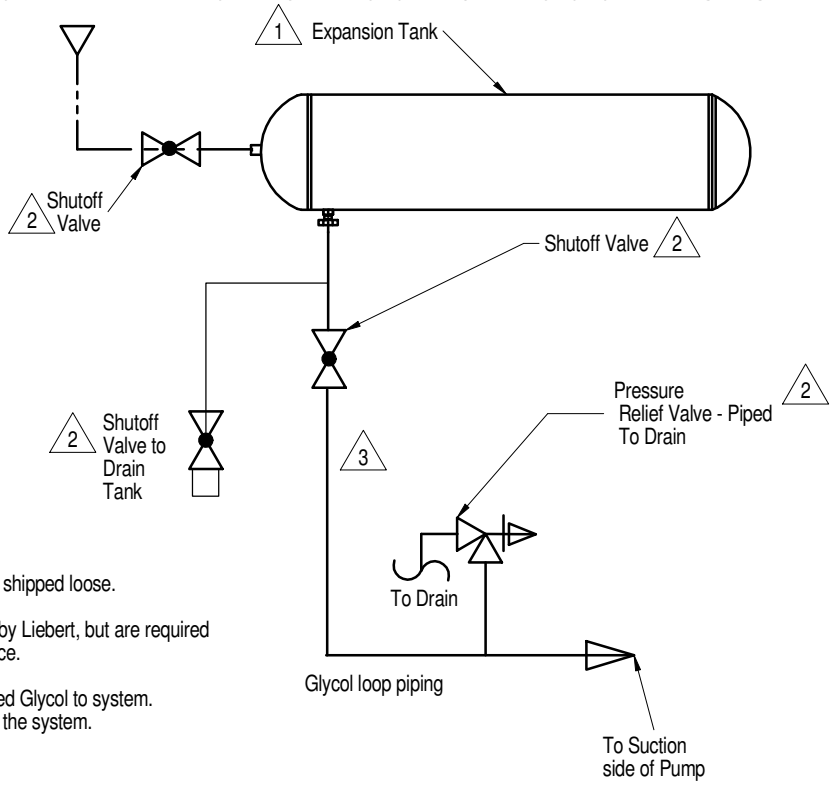
Dual Pump Package Weights	
Model	Weight lb (kg)
D.75	138 (63)
D1.5	140 (64)
D2	
D3	164 (74)
D5	220 (100)
D7.5	276 (125)

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

LIEBERT DRYCOOLER

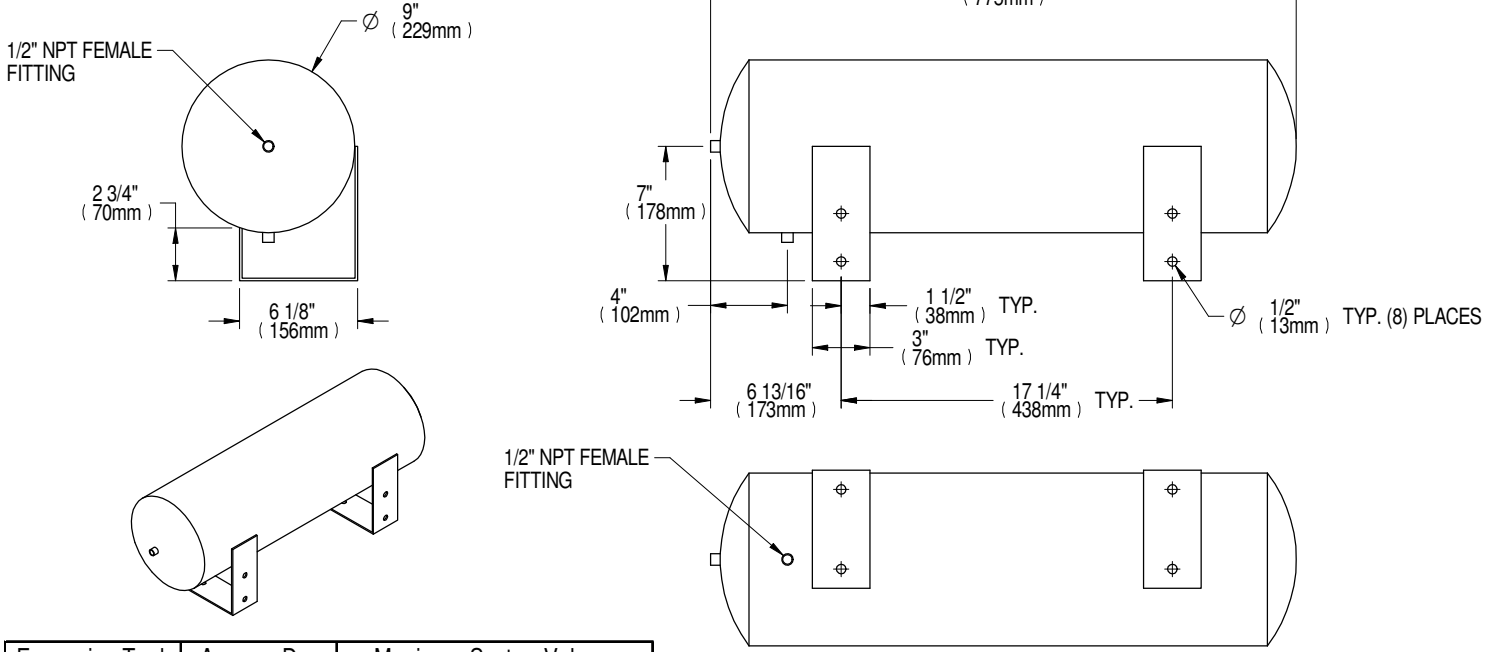
GENERAL ARRANGEMENT DIAGRAM & DIMENSIONAL DATA

EXPANSION TANK FOR GLYCOL/GLYCOOL™ SYSTEMS



Notes:

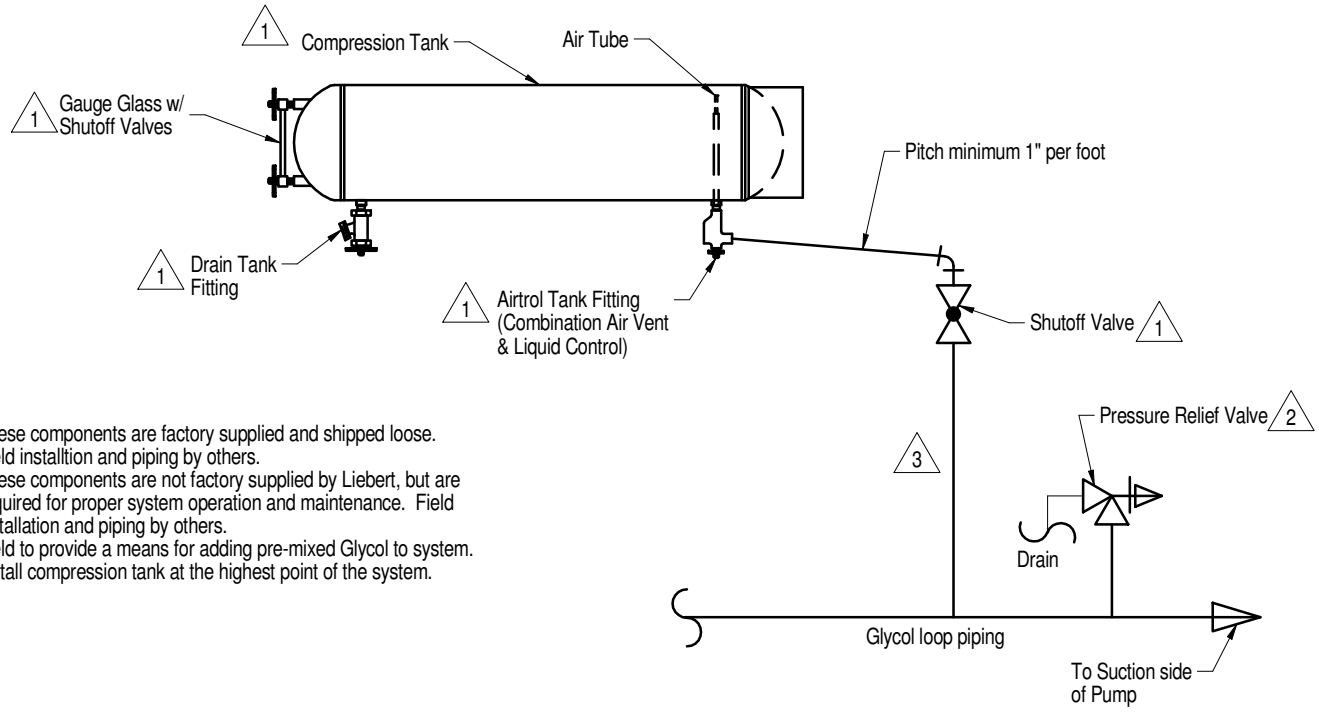
1. These components are factory supplied and shipped loose. Field installation and piping by others.
2. These components are not factory supplied by Liebert, but are required for proper system operation and maintenance. Field installation and piping by others.
3. Field to provide a means for adding pre-mixed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



Expansion Tank Volume Gal (L)	Approx, Dry Weight lbs. (kg)	Maximum System Volume Gal (L)	
Tank Only		Open System	Closed System
8.8 (33.3)	26 (11.8)	75 (280)	140 (530)

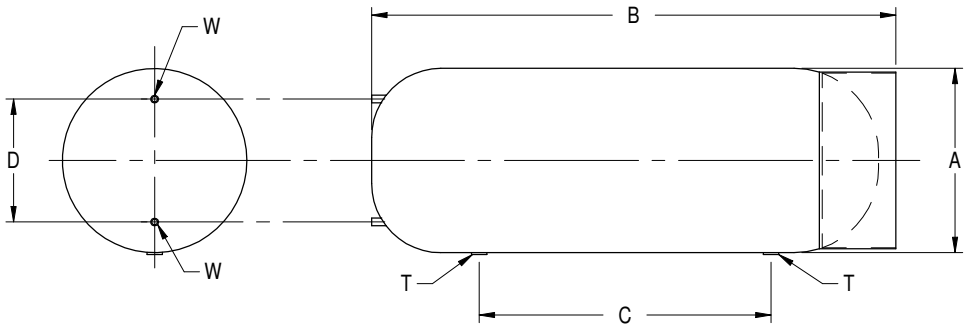
LIEBERT DRYCOOLER

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



Notes:

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



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

Appendix D: Guide Specifications

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

Liebert® DS™

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.

1.3 SUBMITTALS

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-flow Configurations

2.1.1.1 Downflow Air Supply

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

2.1.1.2 Downflow Air, Under-Floor Discharge

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

2.1.1.3 Downflow Air, EC Fans Lowered into Floor Stand

The supply air shall exit from all sides of the floor stand.

2.1.1.4 Downflow Air Return

The return air shall enter the unit from the top.

2.1.2 Upflow Air-flow Configurations

2.1.2.1 Upflow Air Supply

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

2.1.2.2 Upflow Top Air Supply, Front Throw

The supply air shall exit from the top of the cabinet (or plenum) with the air throw toward the front.

2.1.2.3 Upflow Top Air Supply, Rear Throw

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

2.1.2.4 Upflow Top Air Supply, Front Throw

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

2.1.2.5 Upflow Air Return, Rear

The return air shall enter the unit from the back of the cabinet.

2.1.3 Exterior Panels

The exterior panels shall be insulated with a minimum 1 in. (25 mm), 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 . The accent color shall be _____.

2.2 FILTERS

For Downflow units, the filter chamber shall be located within the cabinet, and filters shall be removable from the top of the unit. Filters shall be arranged in a flat bank configuration.

For Upflow units with front return, the filters shall be located within the cabinet and removed from the front of the unit. On Upflow units with rear return, the filters are removed from the side of the unit and are located in the rear-return filter box.

2.2.1 Filters, 4-in. MERV8 or MERV11

Filters shall be deep pleated 4-in. filters with an ASHRAE 52.2-2007 MERV8 or ASHRAE 52.2-2007 MERV11.

2.2.2 Filters, 2-in. MERV8 Pre-Filter With 2-in. Filter MERV11

Filters shall be 2-in. ASHRAE 52.2-2007 MERV8 pre-filter, with 2-in. ASHRAE 52.2-2007 MERV11 efficiency filter.

2.2.3 Extra Filter Set

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

2.3 LOCKING DISCONNECT SWITCH

The electrical panel shall provide at least 65,000A SCCR (60hz) or 5000A SCCR (50 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.

2.4 SHORT-CIRCUIT CURRENT RATING (SCCR)

The electrical panel shall provide at least 65,000A SCCR (60hz) or 5000A SCCR (50 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) Fan

The blower section shall be designed for _____ CFM (CMH) at an external static pressure of _____ in. wg. (Pa).

The fans shall be plug/plenum type, single inlet and shall be 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 available on downflow (fans may be lowered into a raised floor with a minimum height of 24 in. (610 mm)) or upflow models. EC fans may operate within the Liebert DS cabinet, instead of under the floor.
- 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).
- DS/VS035 fan motor(s) shall be nominal 3.75 hp (2.8 kW) each with a maximum operating speed of 1230 rpm; quantity, 1.
- DS/VS042 air or water cooled unit fan motor(s) shall be nominal 3.75 hp (2.8 kW) each with a maximum operating speed of 1230 rpm; quantity, 1.
- DS042 Dual Cool Air, Dual Cool Water and GLYCOOL unit fan motor(s) shall be nominal 5.36 hp (4.0 kW) fan for 380-480V (maximum 1370 rpm).
- VS042 Dual Cool Air, Dual Cool Water and GLYCOOL unit fan motor(s) shall be nominal 3.75 hp (2.8 kW) each with a maximum operating speed of 1230 rpm; quantity, 1.

- DS/VS053, DS/VS070 and DS/VS077 fan motors shall be nominal 4.15 hp (3.1 kW) each with a maximum operating speed of 1520 rpm; quantity, 2.
- DS/VS105 fan motors shall be nominal 3.6 hp (2.7 kW) each, with a maximum operating speed of 1700 rpm; quantity, 3.

2.5.2 Forward Curved Blower—Optional

The blower section shall be designed for___CFM (CMH) at an external static pressure of____in. wg. (Pa).

The fans shall be the centrifugal type, double-width and double-inlet, and shall be dynamically balanced as a completed assembly. The shaft shall be heavy-duty steel with self-aligning, permanently-sealed, pillow-block bearings with a minimum L3 life of 200,000 hours.

The fans shall be located to draw air over the coil to ensure even air distribution and maximum coil performance.

The fan motor shall be an open drip-proof, premium efficiency__hp (kW) at 1750 rpm @ 60 Hz (1450 rpm @50 Hz), mounted to an automatic, spring tensioning base. The motor shall be removable from the front of the cabinet. The drive package shall be two-belt, variable speed, sized for 200% of the fan-motor horsepower. [Forward Curved Blower only available on upflow units]

2.6 INFRARED HUMIDIFIER—OPTIONAL

A humidifier shall be factory-installed inside the unit. The humidifier shall be of the infrared type, 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 1 in. (24 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.

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 three stages. The reheat elements shall be removable from the front of the cabinet.

2.8 REFRIGERATION SYSTEM

2.8.1 Evaporator Coil

The evaporator coil shall be A-frame design for downflow units and V-frame design for upflow units and have _____sq. ft. (m2) face area, _____ rows deep.

It shall be constructed of rifled copper tubes and aluminum fins and shall have a maximum face velocity of _____ ft. per minute (m/s) at CFM (m3). A stainless-steel condensate drain pan shall be provided.

2.8.2 Compressorized Systems

2.8.2.1 Dual Refrigeration System

Each unit shall include two (2) independent refrigeration circuits and shall include hot gas mufflers (semi-hermetic compressor units only), liquid line filter driers, and refrigerant sight glasses with moisture indicator,

externally equalized expansion valves, and liquid line solenoid valves. Compressors shall be located outside the air stream and shall be removable and serviceable from the front of the unit

2.8.2.1 Scroll Compressors

The compressors shall be scroll-type. The compressors shall include a suction gas cooled motor, vibration isolators, thermal overloads, automatic reset high pressure switch with lockout after three failures, rotalock service valves, pump-down low-pressure transducer, suction-line strainer and a maximum operating speed of 3500 RPM.

2.8.2.2 Digital Scroll Compressors

The compressor shall be scroll-type with a variable capacity operation capability. The compressor solenoid valve shall unload the compressor and allow for variable capacity operation. The compressor shall be suction gas cooled motor, vibration isolators, thermal overloads, automatic reset high-pressure switch with lockout after three failures, rotalock service valves, pump-down low-pressure transducer, suction-line strainer and a maximum operating speed of 3500 rpm. Consult factory for 575V availability. Not available on DS077 and DS105 units.

2.8.2.2 Semi-Hermetic Compressors with Four-Step Unloaders Control

The compressor shall be semi-hermetic with a suction gas cooled motor, vibration isolators, thermal overloads, oil sight glass, automatic reset high pressure switch with control lockout after three failures, pump-down low-pressure transducer, suction-line strainer, service valves, reversible oil pumps for forced feed lubrication, a maximum operating speed of 1750 rpm. The system shall include cylinder unloaders on the semi-hermetic compressors. The unloaders shall be activated by solenoid valves which are controlled from the microprocessor control. In response to the return air temperature, the microprocessor control shall activate the unloader solenoids and the liquid line solenoids such that four stages of refrigeration cooling are obtained. The stages shall be: 1) one compressor, partially loaded, 2) two compressors partially loaded, 3) one compressor partially loaded, one compressor fully loaded, 4) two compressors fully loaded. On a call for dehumidification, the microprocessor control shall ensure that at least one compressor is on full for proper humidity control. Only available on DS077 and DS105 units.

2.8.3 Expansion Valve

2.8.3.1 Thermostatic Expansion Valve (TXV)

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

2.8.4 Crankcase Heaters

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

2.8.5 R-407C Refrigerant

The system shall be designed for use with R-407C refrigerant, which meets the EPA clean air act for phase- out of HCFC refrigerants.

2.9 COOLING SYSTEM

2.9.1 Air-Cooled System

2.9.1.1 System Description

The indoor evaporator refrigerant piping shall be filled with an inert gas holding charge and spun shut. Field relief of the Schrader valve shall indicate a leak-free system. Evaporator unit shall be matched with a Liebert

MC condenser.

2.9.2 Dual Cool: Chilled Water + Air-Cooled Refrigeration

2.9.2.1 System Description

The dual cooling source system shall consist of an air cooled compressorized system with the addition of a chilled water coil, a modulating control valve, and a comparative temperature sensor. The system shall be able to function either as a modulating chilled water system or as a compressorized system, or a combination of both. The primary mode of cooling shall be chilled water. Switchover between the two cooling modes shall be performed automatically by the microprocessor control.

2.9.2.2 Dual-Cooling Source

The dual-cooling source coil shall be constructed with copper tubes and aluminum fins. It shall be located in the return air, before the evaporator coil. The dual cooling source coil shall be rated at ___ BTU/HR (kW) sensible cooling capacity with 45°F (7.2°C) entering water temperature. The dual cooling source coil shall require _____ GPM (l/s) of chilled water and the pressure drop shall not exceed _____ psi (kPa). A Cu-Ni coil must be specified whenever a GLYCOOL or Dual Cooling Source system is applied to a cooling tower loop or other open water system.

2.9.2.3 Dual-Cool: Free-Cooling Control Valve

2.9.2.3.1 Three-Way Modulating Valve

The water circuit shall include a 3-way modulating valve. The Liebert iCOM™ Control positions the valve in response to room conditions. Cooling capacity will be controlled by bypassing chilled water around the coil. The modulating valve travel for dehumidification shall be proportional.

2.9.2.3.2 Two-Way Modulating Valve—Optional

The water circuit shall include a pre-piped two-way modulating valve. The Liebert iCOM™ Control shall manage valve movement to maintain desired room conditions. The modulating valve travel for dehumidification shall be proportional.

2.9.2.4 Chilled Water System Design Pressure

2.9.2.4.1 Standard Pressure

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

2.9.2.4.2 High Pressure Rating—Optional

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

2.9.2.5 Comparator Sensor

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

2.9.2.6 Cu-Ni Econ-O-Coil—Optional

A 70/30 Cu-Ni Econ-O-Coil shall be provided when the Liebert Econ-O-Coil is applied to a cooling-tower loop or other open water system.

2.9.3 Water/Glycol-Cooled System

2.9.3.1 System Description

The system includes a Paradenser™ and water regulating valve. The refrigeration system is factory charged with refrigerant. The water piping shall be filled with an inert gas holding charge and spun shut. Field relief of the Schrader valve on the water piping shall indicate a leak-free system.

2.9.3.2 Paradenser™ Condenser

The Paradenser water-cooled condensers for each circuit shall be cleanable, shell-and-tube, counter-flow type. The heads shall be removable to allow for cleaning of the water tubes. Condensers shall be rated for a maximum refrigerant pressure of 400 psi at 200°F (2758 kPa at 93.3°C). The condenser shall be capable of operating with R-407C refrigerant. The unit shall require____GPM (l/m) of____°F (°C) water and have a maximum pressure drop of____psi (kPa).

2.9.3.3 Water/Glycol Regulating Valve

The condenser shall be pre-piped with a 2-way regulating valve.

2.9.3.4 Water/Glycol Regulating Valve, 3-Way

The condenser shall be pre-piped with a 3-way regulating valve.

2.9.3.5 Water/Glycol System Design Pressure

2.9.3.5.1 Standard Pressure

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

2.9.3.5.2 High Pressure Rating—Optional

The condenser water circuit shall be designed for a pressure of 350 psi (2413 kPa).

2.9.4 Dual Cooling Source System: Water/ Glycol Cooled + Econ-O-Coil

2.9.4.1 Dual-Cooling Source

The dual-cooling source system shall consist of an water-cooled compressorized system with the addition of a chilled water coil (Liebert Econ-O-Coil™), a modulating control valve and a comparative temperature sensor. The system shall be able to function either as a modulating chilled water system or as a compressorized system, or a combination of both. The primary cooling mode shall be chilled water. Switchover between the two cooling modes shall be performed automatically by the microprocessor control. Four (4) pipes shall be included on water/glycol systems: Liebert Econ-O-Coil supply, Liebert Econ-O-Coil return, condenser supply and condenser return.

2.9.4.2 Dual-Cooling Econ-O-Coil Control Valve

2.9.4.2.1 Three-Way Modulating Valve

The water circuit shall include a three-way modulating valve. The Liebert iCOM™ Control shall manage valve movement to maintain desired room conditions. Cooling capacity will be controlled by bypassing chilled water around the coil. The modulating valve travel for dehumidification shall be proportional.

2.9.4.2.2 Two-Way Modulating Valve—Optional

The water circuit shall include a pre-piped two-way modulating valve. The Liebert iCOM™ Control shall manage valve movement to maintain desired room conditions. The modulating valve travel for dehumidification shall be proportional.

2.9.4.3 Econ-O-Coil System Design Pressure

2.9.4.3.1 Standard Pressure

The Econ-O-coil (chilled water) circuit shall be designed for a pressure of 150 psi (1034kPa).

2.9.4.3.2 High Pressure Rating—Optional

The Econ-O-coil (chilled water) circuit shall be designed for a pressure of 400 psi (2758 kPa).

2.9.4.4 COMPARATOR SENSOR

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

2.9.4.5 Cu-Ni Econ-O-Coil—Optional

A 70/30 Cu-Ni Econ-O-Coil shall be provided for when the Liebert Econ-O-Coil is cooling tower loop or other open water system.

2.9.4.6 Paradenser™ Condenser

The water-cooled condensers for each circuit shall be cleanable, shell-and-tube, counter-flow type. The heads shall be removable to allow for cleaning of the water tubes. Condensers shall be rated for a maximum refrigerant pressure of 400 psi at 200°F (2758 kPa at 93.3°C). The condenser shall be capable of operating with R-22 or R 407C refrigerant. The unit shall require_____GPM (l/m) of_____°F (°C) water and have a maximum pressure drop of_____psi (kPa).

2.9.4.7 Water/Glycol Regulating Valve

The condenser shall be pre-piped with a 2-way regulating valve.

2.9.4.8 Water/Glycol Regulating Valve, 3-Way

The condenser shall be pre-piped with a 3-way regulating valve.

2.9.4.9 Water/Glycol System Design Pressure

2.9.4.9.1 Standard Unit Pressure

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

2.9.4.9.2 Standard Unit High Pressure Rating—Optional

The condenser water circuit shall be designed for a pressure of 350 psi (2413 kPa).

2.9.5 GLYCOOL™: Fluid-Cooled Economizer and DX Refrigeration System

2.9.5.1 System Description

GLYCOOL™ - The GLYCOOL unit shall have two independent cooling coils. The first cooling coil shall be a part of a chilled glycol circuit and shall be strategically located in the return-air stream to either pre-cool or totally cool the air before entering the refrigeration coil. The second cooling coil shall be part of a direct-expansion refrigeration circuit and shall include a compressor, Paradenser™, pressure safety switches, and a factory refrigerant charge. Liebert iCOM shall control the activation/deactivation and modulation of the two cooling circuits allowing the system to function either as a modulating glycol economizer, a glycol refrigeration system, or a combination of both. This shall be a two-pipe system and shall require closed-loop

water/glycol heat rejection, such as drycooler/pump or customer water tower using properly treated glycol solutions. Field relief of the Schrader valve shall indicate a leak-free system.

2.9.5.2 GLYCOOL Coil

The GLYCOOL (Liebert Econ-O-Coil™) shall be constructed of copper tubes and aluminum fins. The coil shall be A-frame or V-frame to minimize air-pressure drop and shall be nested with the DX coil. The Liebert Econ-O-Coil shall be upstream of the DX coil to enable pre-cooling of the air.

The Liebert Econ-O-Coil shall have a net sensible cooling capacity of____BTUH (kW) with 45°F (7.2°C) entering glycol solution temperature. The system shall require____GPM (l/s) and the total unit pressure drop shall not exceed____feet of water (kPa), when in the Liebert Econ-O-Coil mode of operation.

2.9.5.3 GLYCOOL 3-Way Control Valve

The GLYCOOL coil shall be equipped with a fully proportional 3-way control valve. This motorized control valve shall control the amount of flow to the GLYCOOL (Econ-O-Coil) coil to control room temperature and relative humidity.

2.9.5.4 Paradenser™ Condenser

The water-cooled condensers for each circuit shall be cleanable, shell-and-tube, counter-flow type. The heads shall be removable to allow for cleaning of the water tubes. Condensers shall be rated for a maximum refrigerant pressure of 400 psi at 200°F (2758 kPa at 93.3°C). The condenser shall be capable of operating with R-22 or R 407C refrigerant. The unit shall require____GPM (l/m) of____°F (°C) water and have a maximum pressure drop of____psi (kPa).

2.9.5.5 Water/Glycol Regulating Valve, 3-Way

The condenser shall be pre-piped with a 3-way regulating valve.

2.9.5.6 GLYCOOL System Design Pressure

2.9.5.6.1 Standard Pressure

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

2.9.5.6.2 High Pressure Rating—Optional

The GLYCOOL system shall be designed for a pressure of 350 psi (2413 kPa).

2.9.5.7 Cu-Ni Econ-O-Coil—Optional

A 70/30 Cu-Ni Econ-O-Coil shall be provided for when the Liebert Econ-O-Coil is cooling tower loop or other open water system.

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 shall allow the user to see applicable information based on the login used.
- Unit Backup/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 be able to configure the display information based on the specific user's preference. Language, units of measure, screen contrast, home screen layout, back-light timer and the hide/show of certain readouts shall be configurable through the display.
- Additional Readouts - The display shall enable the user to configure custom widgets on the main screen. Widget options will include items such as fan speed, call for cooling, call for free-cooling, maintenance status, call for hot water reheat, call for electric reheat, call for dehumidification, call for humidification, airflow, static pressure, fluid flow rate and cooling capacity.
- Status LED's - The Liebert iCOM shall show the unit's operating status using an integral LED. The LED shall indicate if the unit has an active alarm; if the unit has an active alarm that has been acknowledged; or if the unit is On, Off or in standby status.
- Event Log - The Liebert iCOM shall automatically store the last 400 unit-only events (messages, warnings, and alarms).
- Service Contact Information - The Liebert iCOM shall be able to store the local service or sales contact information.
- Upgradeable - Liebert iCOM firmware upgrades shall be performed through a USB connection.
- Timers/Sleep Mode – The menus shall allow various customer settings for turning the unit On or Off.

- Menu Layout - The menus shall be divided into two main menus: User and Service. The User screen shall contain the menus to access parameters required for basic unit control and setup. The Service screen shall be 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 from 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 one network and one 485 protocol simultaneously.

3.2 ALARMS

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

- High Temperature
- Low Temperature
- High Humidity
- Low Humidity
- EC Fan Fault
- Change Filters
- Loss of Air Flow
- Loss of Power
- Compressor Overload (Optional)

- Humidifier Problem
- High Head Pressure
- Low Suction Pressure
- Custom Alarms

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

- Leak Under Floor
- Smoke Detected
- Standby Unit On

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

3.3 LIEBERT ICOM™ CONTROL METHODS AND OPTIONS

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

3.3.1 Controlling Sensor Options

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

3.3.1.1 Cooling Capacity

- Supply
- Remote
- Return

3.3.1.2 Fan Speed

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

3.3.2 Temperature Compensation

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

3.3.3 Humidity Control

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

3.4 MULTI-UNIT COORDINATION

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

- Teamwork Mode 1 (Parallel): Is best in small rooms with balanced heat loads. The controlling temperature and humidity sensor readings of all units in operation (fan On) are collected to be used for an average or worst-case sensor reading (user-selectable). The master unit shall send the operating requirements to all operating units in the group. The control band (temperature, fan and humidity) is divided and shared among the units in the group. Each unit will receive instructions on how to operate from the Master unit based on how far the system deviates from the setpoints. Evaporator fans and cooling capacity are ramped in parallel.
- Teamwork Mode 2 (Independent): The Liebert iCOM calculates the worse-case demand for heating, cooling humidification and dehumidification. Based on the greatest demand within the group, each unit operates independently, meaning that the unit may respond to the thermal load and humidity conditions based on the unit's controlling sensors.

  All sensor readings are shared.
- Teamwork Mode 3 (Optimized Aisle): May be employed in large and small rooms with varying heat loads. Optimized Aisle is the most efficient teamwork mode that allows the unit to match cooling capacity with heat load. In the Optimized Aisle mode, the fans operate in parallel. Fans can be controlled exclusively by remote temperature or using static pressure with a secondary remote temperature sensor(s) as an override to ensure that the inlet rack temperature is being met. Cooling (Compressors or Economizer) is controlled through unit supply air conditions. Liebert iCOM calculates the average or worst-case sensor reading (user-selectable) for heating, cooling humidification and dehumidification. Based on the demand within the group, units will be allowed to operate within that mode until room conditions are satisfied. This is the best form of control for a room with an unbalanced load.

3.5 STANDBY LEAD-LAG

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

3.6 STANDBY UNIT CASCADING

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

3.7 WIRED SUPPLY SENSOR

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

3.8 VIRTUAL MASTER

As part of the robust architecture of the Liebert iCOM control, it shall allow for a virtual master that

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

3.9 VIRTUAL BACK-DRAFT DAMPER

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

3.10 COMPRESSOR SHORT CYCLE CONTROL

To help maximize the life of the compressor(s), there shall be start-to-next start delay for each single compressor. The control shall monitor the number of compressor starts in an hour. If the compressor starts more than 10 times in 60 minutes, the local display and remote monitoring shall notify the user through a Compressor 1 or 2 Short Cycle event.

3.11 LIEBERT MC™ CONDENSER COMMUNICATION

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

3.12 SYSTEM AUTO RESTART

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

3.13 SEQUENTIAL LOAD ACTIVATION

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

3.14 LOW-PRESSURE MONITORING

Units shall ship standard with low-pressure transducers for monitoring 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—AIR-COOLED MODELS

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

3.16 ADVANCED FREEZE PROTECTION

Units shall ship standard with advanced freeze protection enabled. The advanced freeze protection shall monitor the pressure of each circuit using a transducer. The control shall interact with the fan and compressor to prevent the unit coil from freezing if circuit suction pressure drops. Applying fan speed to direct expansion systems requires limitations to avoid freezing condensate on the coil when the unit operates below 100% fan speed. Liebert iCOM's advanced freeze protection provides the ability to predict freeze conditions and correct

this condition automatically by adjusting fan speed and compressor capacity. If a freeze condition is detected, the user shall be notified through the local display and remote monitoring systems.

3.17 ADVANCED HIGH-PRESSURE PROTECTION—WATER/GLYCOL-COOLED MODELS WITH VARIABLE CAPACITY COMPRESSORS

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

- 4-Step
- Digital Scroll

3.18 REFRIGERANT PRESSURE TRANSDUCER FAILURE

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

3.19 OIL RETURN PROTECTION

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

3.20 DIGITAL SCROLL HIGH-TEMPERATURE PROTECTION

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

3.21 DIGITAL SCROLL SENSOR FAILURE

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

3.22 COMPRESSOR SEQUENCING

A user-selectable compressor sequencing parameter shall be provided and shall be accessible through the local display. This sequencing parameter shall present the user with three choices:

- Always use Compressor 1 as the lead compressor.
- Always use Compressor 2 as the lead compressor.
- Auto: The unit shall automatically stage compressors to keep each unit’s run time within 8 hours of the other’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, then it is the next to be started/stopped.
- Second priority: If both compressors are Off: The compressor with fewer working hours is the next to start.
- Third priority: If both compressors are in operation: the compressor that has been operating longer since the last start is 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(s) 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.

3.27 FLOODED START PROTECTION

The control shall isolate each compressor through a dedicated circuit liquid line solenoid valve and/or

electronic expansion valve. These devices, combined with a spring-closed discharge check valve and compressor crankcase heater (air-cooled models), shall help ensure refrigerant does not migrate/carry oil out of the compressor case during the off cycle.

3.28 COMPRESSOR DEHUMIDIFICATION

The control shall permit the user to specify which compressor is used for dehumidification. The choices shall be 1st compressor, 2nd compressor, 1 or 2, or BOTH.

4.0 MISCELLANEOUS OPTION

4.1 HIGH TEMPERATURE SENSOR—OPTIONAL

The high-temperature sensor shall immediately shut down the environmental control system when activated. The high-temperature sensor shall be mounted in the electrical panel with the sensing element in the return air.

4.2 SMOKE SENSOR—OPTIONAL

The smoke sensor shall immediately shut-down the environmental control 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 condensate pump shall have a minimum capacity of GPH (__l/h) at__ft. (____kPa) head. 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 shall 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 - Two additional pairs of terminals provide the customer with additional locations to remotely shut down the unit by field-installed devices or controls.
- Extra Common Alarm Contacts - Two additional pairs of terminals provide the customer with normally open contacts for remote indication of unit alarms.
- Main Fan Auxiliary Switch - One set of normally open contacts wired to the EC fan motor contactor will close when EC fan operation is required. This set of dry contacts could also be used to initiate air economizer operation. Air economizer and associated devices by others.
- Liqui-tect Shutdown - One pair of dry contacts for the Liqui-tect sensor signal will provide unit shut down. (Liqui-tect sensor is not included)

4.5 REMOTE HUMIDIFIER CONTACT—OPTIONAL

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

4.6 MAIN FAN OVERLOAD—OPTIONAL

A pair of normally open contacts shall be factory-installed and wired to indicate Main Fan Overload.

4.7 COMPRESSOR OVERLOAD—OPTIONAL

A pair of normally open contacts shall be factory-installed and factory-wired to each compressor to indicate Compressor Overload.

4.8 WIRED REMOTE SENSOR(S)—OPTIONAL

Each Liebert iCOM shall 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 units and provide greater flexibility, visibility, and control using that to respond to changes in the data center. When the sensors are used for control, the user may set the control to be based off a maximum or average of a select highest temperature reading.

4.9 LIEBERT LIQUI-TECT™ SENSORS

Provide____(quantity) solid state water sensors under the raised floor.

4.10 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.

4.11 SEISMIC RATED FLOOR STAND—OPTIONAL

The floor stand shall be seismic rated and shall be bolted to the unit frame.

4.12 RETURN AIR PLENUM FOR DOWNFLOW UNITS—OPTIONAL

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.

4.13 DISCHARGE AIR PLENUM FOR UPFLOW UNITS, WITH DISCHARGE GRILLE(S)—OPTIONAL

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.

4.14 DISCHARGE AIR PLENUM FOR UPFLOW UNITS, WITHOUT DISCHARGE GRILLE(S)—OPTIONAL

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.

4.15 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.

5.0 HEAT REJECTION

5.1 OPTIONS—AIR-COOLED LIEBERT MC CONDENSER

5.1.1 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.

5.1.2 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.

5.1.3 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. Various methods shall be available to match indoor unit type, maximum outdoor design ambient and maximum sound requirements.

5.1.4 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.

5.1.4.1 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.

5.1.5 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.

5.1.5.1.1 Liebert MC Condenser EC Fan Motor

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

5.1.6 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.

5.1.6.1.1 EC Fan Speed and Premium Control

The EC fan/Premium Control System shall include an electronic control board, EC-fan motor(s) with internal overload protection, refrigerant and ambient temperature thermistors and refrigerant pressure transducers. The Premium Control Board shall communicate directly with the indoor unit's Liebert iCOM control via field-supplied CANbus communication wires and via field-supplied low-voltage interlock wires. The control board shall use sensor and communication inputs to maintain refrigerant pressure by controlling each EC fan on the same refrigerant circuit to the same speed. The Premium control board shall be rated to a temperature of –30°F to 125°F (–34.4°C to 51.7°C). The premium control shall be factory-set for (fan speed) (fan speed with Liebert Lee-Temp™) control.

5.1.6.1.2 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.

5.1.6.1.3 Short Circuit Current Rating

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

5.1.7 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.

5.1.8 Liebert MC Mounting Legs Standard Aluminum Legs

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

5.1.8.1 Optional Galvanized-Steel Legs With Bracing

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

5.1.9 Liebert MC Condenser Accessories

5.1.9.1 Liebert Lee-Temp™ System—Optional

Liebert Lee-Temp Receiver Kit shall contain an insulated, heated receiver tank with sight glasses, mounting plate, mounting hardware, pressure-relief valve, rota-lock valve for refrigerant charge isolation and piping assembly with head-pressure operated 3-way valve and check valve. Components shall be field-assembled to the condenser. The 3-way valve shall sense refrigerant head pressure and adjust the flooding charge in the condenser coil to adjust the condenser heat-rejection capacity. The Liebert Lee-Temp heater shall be 150 W, shall include an integral thermostat to maintain refrigerant temperature at a minimum of 85°F (29°C) and shall require a separate power supply of (208/230V - 1 ph - 60 Hz) (120V - 1 ph - 60 Hz).

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

5.1.9.2 Liebert Mc 575-Volt—Optional

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

5.1.10 Fusible Plug Kit—Optional

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

5.1.11 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.

5.2 OPTIONS—LIEBERT DRYCOOLER

5.2.1 Liebert Drycooler Summary

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

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

Standard 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.

5.2.2 Liebert Design Requirements

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

5.2.3 Liebert Drycooler Standard Features—All Drycoolers

The drycooler shall consist of drycooler coil(s), housing, propeller fan(s) direct-driven by individual fan motor(s), electrical controls, and mounting legs. The Liebert air-cooled drycooler shall provide glycol

temperature control to the indoor cooling unit by adjusting heat-rejection capacity. Various methods shall be available to match indoor unit type, minimum outdoor design ambient and maximum sound requirements.

5.2.4 Liebert Drycooler Coil

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

5.2.5 Housing

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

5.2.6 Propeller Fan

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

5.2.7 Fan Motor

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

5.2.8 Electrical Controls

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

5.2.9 Specific Features by Drycooler Type

5.2.9.1 Fan Cycling Control (DSO, DDO) DRYCOOLER (All Fan Quantities) With Integral Pump Control

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

5.2.9.2 Fan Cycling Control (DDNT/DNT) DRYCOOLER (All Fan Quantities)

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

5.2.9.3 Main Fan Control (DDNL/DNL) DRYCOOLERS (All Fan Quantities)

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

5.2.9.4 No Fan Control (DDNC/DNC) DRYCOOLERS (All Fan Quantities)

The [D]DNC/DNC drycooler shall activate all fixed-speed fans when supply power is applied to the drycooler. The fixed-speed motors shall be 3-phase and have individual, internal overload protection. Fixed-speed motors shall have a TEAO enclosure. The air-cooled drycooler shall have a _____volt, 3 ph,_____ Hz power supply.

5.2.9.5 Liebert Quiet-Line™ DRYCOOLERS (All Fan Quantities)

Liebert Quiet-Line drycoolers shall be available for DSO, DDO, DDNT, DDNL and DDNC control types. The fan motor(s) shall have a TEAO enclosure and provide individual overload protection for quiet operation.

5.2.10 Pump Controls Within DRYCOOLER

5.2.10.1 Single Pump Option

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

5.2.10.2 Dual Pump Option

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

5.2.11 Pump Package

5.2.11.1.1 Single Pump Package

This system shall be provided with a centrifugal pump mounted in a weatherproof and vented enclosure. The pump shall be rated for___GPM (___l/m) at____ft. (___kPa) of head and operate on____volt, 3-phase, ____ Hz and operate on____volt, 3-phase,____Hz.

5.2.11.1.2 Dual Pump Package

The dual pump package shall include pumps, enclosure, and field-mounted flow switch. The standby pump shall automatically start up on failure of the lead pump by drycooler pump controls or by a separate, factory- wired control box and shall include a lead/ lag switch for the pumps. Each pump shall be rated for _ GPM (___l/s) at____ft. (___kPa) of head and operate on____volt, 3-phase,____Hz.

5.2.12 ANCILLARY ITEMS

5.2.12.1 EXPANSION TANKS, FLUID RELIEF VALVES, AIR MANAGEMENT AND OTHER DEVICES

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

6.0 EXECUTION

6.1 INSTALLATION OF THERMAL MANAGEMENT UNITS

6.1.1 General

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

6.1.2 Electrical Wiring

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

6.1.3 Piping Connections

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

6.1.3.1 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.

6.2 FIELD QUALITY CONTROL

Start the system in accordance with manufacturer's start-up 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.

6.3 WARRANTY START-UP AND CONTROL PROGRAMMING

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

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