Precision Cooling
For *Business-Critical Continuity™*

Liebert® DS™

User Manual—28-105kW, 8-30 Tons, Upflow and Downflow, 50/60Hz

EMERSON
Network Power

TABLE OF CONTENTS

FIGURES

TABLES

SAVE THESE INSTRUCTIONS

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

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

Adhere to all warnings, cautions and installation, operating and safety instructions on the unit and in this manual. Follow all operating and user instructions.

⚠ WARNING

Risk of electric shock. Can cause injury or death.

Disconnect local and remote power supplies before working within.

Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable.

Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power.

The Liebert iCOM microprocessor does not isolate power from the unit, even in the "unit off" mode. Some internal components require and receive power even during the "unit off" mode of Liebert iCOM control.

The factory-supplied optional disconnect switch is inside the unit. The line side of this switch contains live high-voltage.

The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic.

Follow all local codes.

⚠ WARNING

Risk of explosive discharge from high-pressure refrigerant. Can cause injury or death.

This unit contains fluids and gases under high pressure. Relieve pressure before working with piping.

⚠ WARNING

Risk of refrigerant system rupture or explosion from overpressurization. Can cause equipment damage, injury or death.

For systems requiring EU CE compliance (50Hz), the system installer must provide and install a discharge pressure relief valve rated for a maximum of 500 psig (34bar) in the high side refrigerant circuit. 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 contact with high-speed moving parts. Can cause injury or death.

Disconnect all local and remote electric power supplies before working in the unit.

Do not operate unit with any or all cabinet panels removed. Do not operate upflow units without installing a plenum, ductwork or guard over the blower opening(s) on the top surface of the unit cabinet.

Ductwork must be connected to the blower(s), or a plenum must be installed on the blower deck for protection from rotating blower wheel(s) on upflow units.

CAUTION

Risk of contact with hot surfaces. Can cause injury.

The compressors, refrigerant discharge lines, humidifiers and reheats are extremely hot during unit operation. Allow sufficient time for them to cool before working within the unit cabinet. Use extreme caution and wear protective gloves and arm protection when working on or near hot compressors, discharge lines, humidifiers and reheats.

CAUTION

Risk of handling heavy and lengthy parts. Can cause personal injury and equipment damage.

Cabinet panels can exceed 5ft. (1.5m) in length and weigh more than 35lb. (15.9kg). Follow relevant OSHA lifting recommendations and consider using a two-person lift for safe and comfortable removal and installation of cabinet panels. Only properly trained and qualified personnel wearing appropriate safety headgear, gloves and shoes should attempt to remove or install cabinet panels.

NOTE

The Liebert indoor cooling unit has a factory-installed high-pressure safety switch in the high side refrigerant circuit. A pressure relief valve is provided with Liebert Lee-Temp™ condensers. Consult local building codes to determine whether the Liebert Fan Speed Control and VFD condensers will require field provided pressure relief devices.

NOTICE

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

This unit requires a water drain connection. Drain lines must be inspected regularly and maintenance must be performed to ensure that drain water runs freely through the drain system and that lines are clear and free of obstructions and in good condition with no visible sign of damage or leaks. This unit may also require an external water supply to operate.

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

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

Emerson recommends installing leak detection equipment for unit and supply lines.

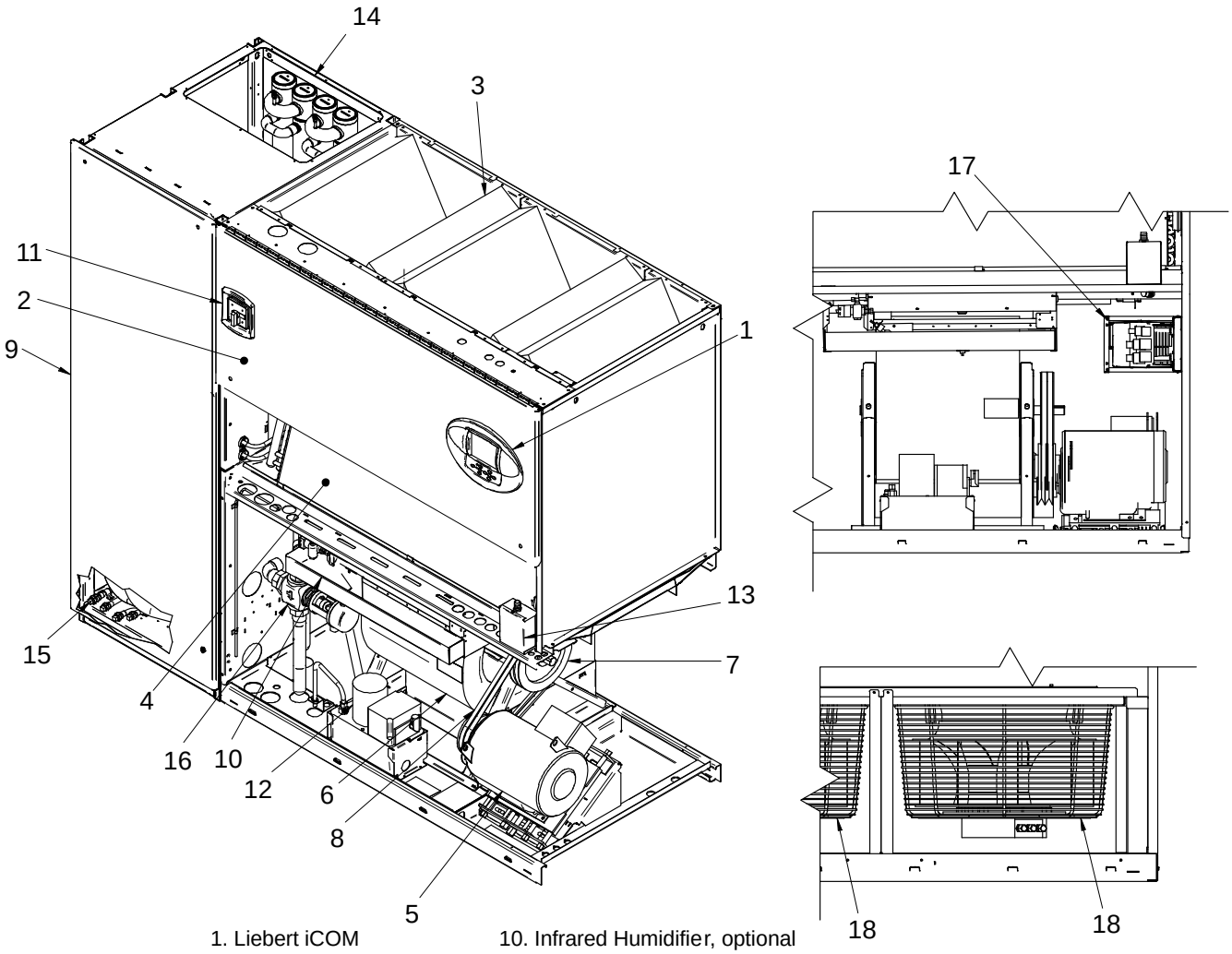
NOTICE

Risk of a leaking coil due to freezing and/or corrosion. Can cause equipment and serious building damage.

Cooling and heat rejection coils, heat exchangers and piping systems that are connected to open cooling towers or other open water/glycol systems are at high risk for freezing and premature corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature coil corrosion. The water or water/glycol solution must be analyzed by a competent water treatment specialist before startup to establish the inhibitor requirement. The water or water/glycol solution must be analyzed every six months to determine the pattern of inhibitor depletion. The complexity of water-caused problems and their correction makes it important to obtain the advice of a water treatment specialist and follow a regularly scheduled maintenance program.

1.0 LIEBERT DS COMPONENTS AND NOMENCLATURE

Figure 1 Downflow model component locations



1. Liebert iCOM
2. Electric Box
3. Filters
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 Cleanout 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

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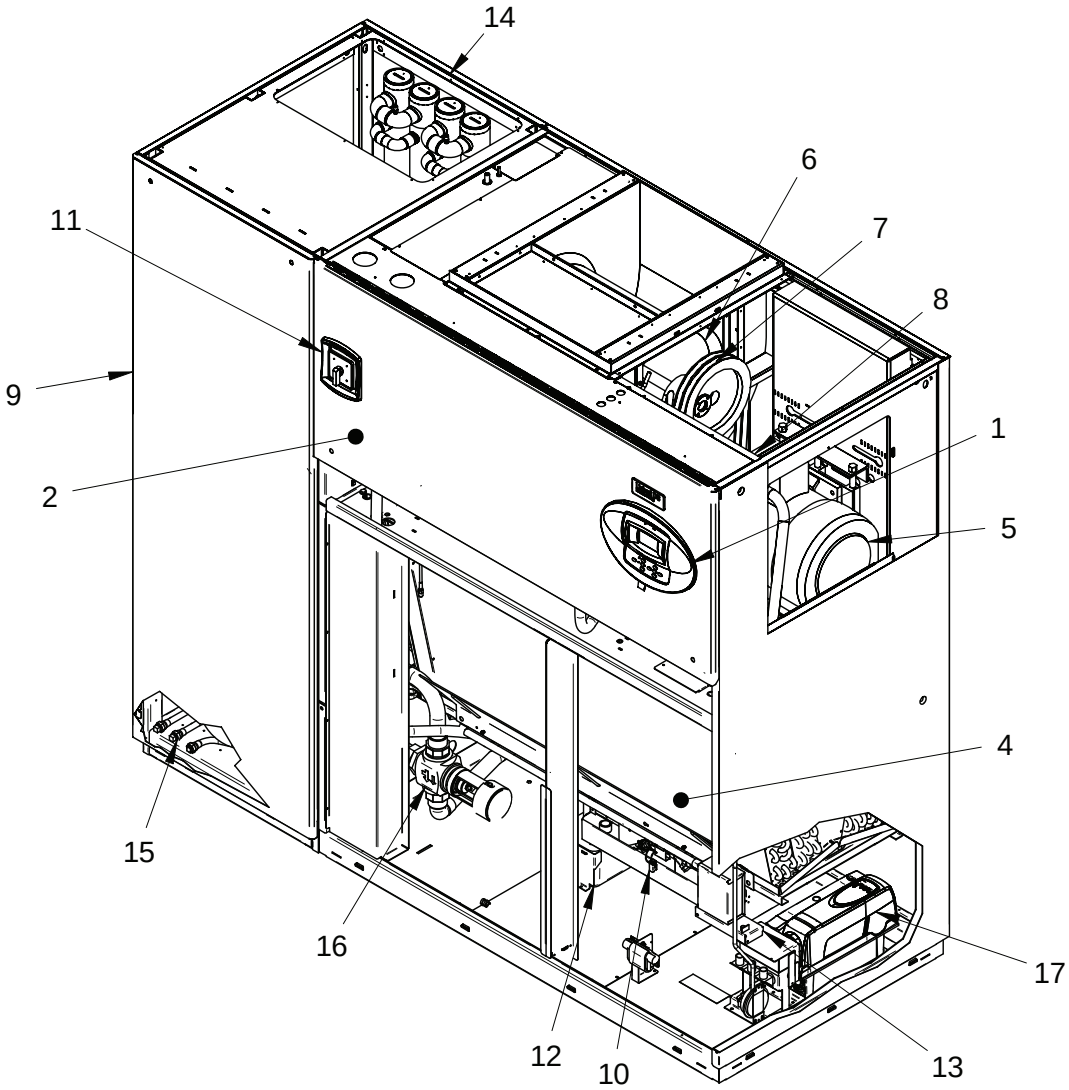
Rev. 3

Figure 2 Upflow model component locations



1. Liebert iCom Control Display
2. Electric Box
3. Filters
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 Cleanout 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)

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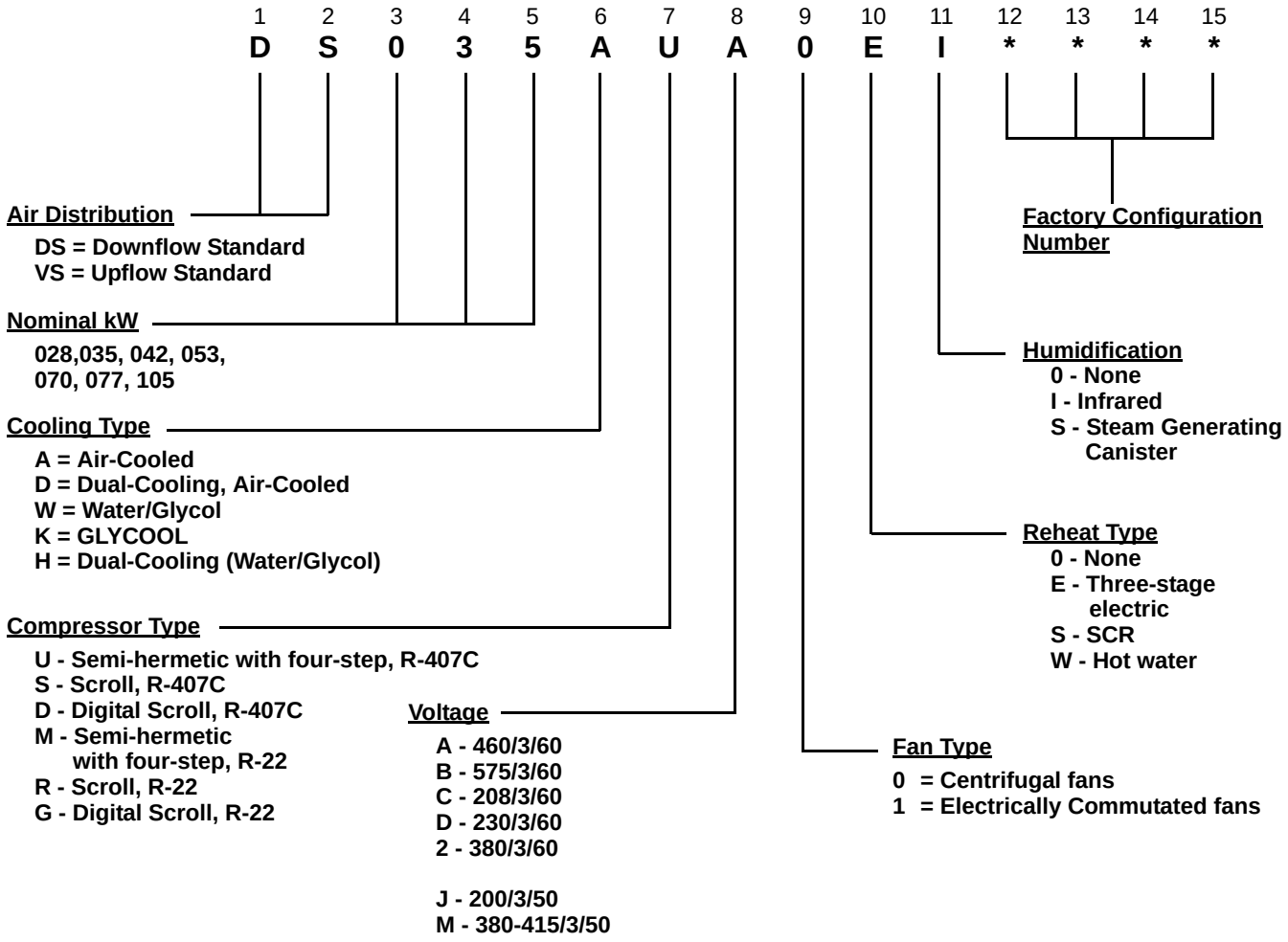
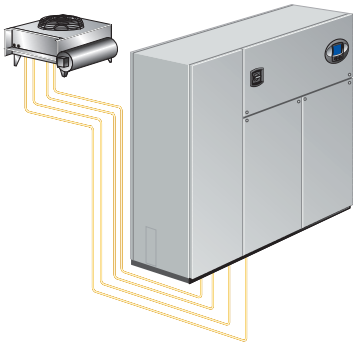
Rev. 1

Figure 3 Liebert DS model number nomenclature



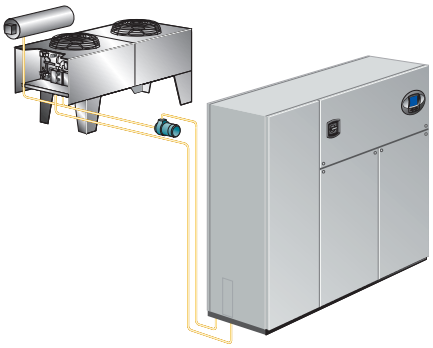
2.0 COOLING CONFIGURATIONS

NOTE
All field-installed piping must comply with applicable local, state and federal codes.



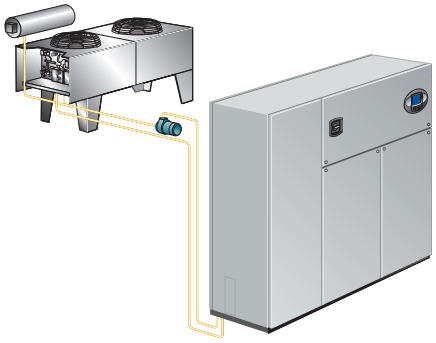
Air-Cooled

Air-cooled unit piping is spun closed from the factory and contain a nitrogen holding charge. Each installation requires refrigerant piping to a condenser.



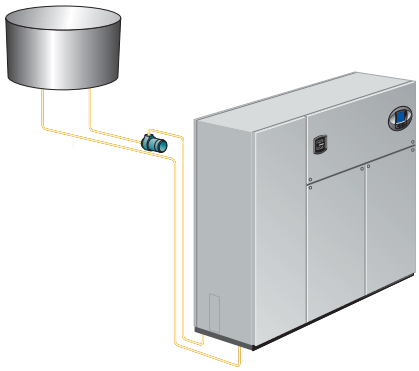
Glycol-Cooled

Glycol-cooled units are factory-charged and tested. Field-installed piping is required from the unit to the drycooler and pump package.



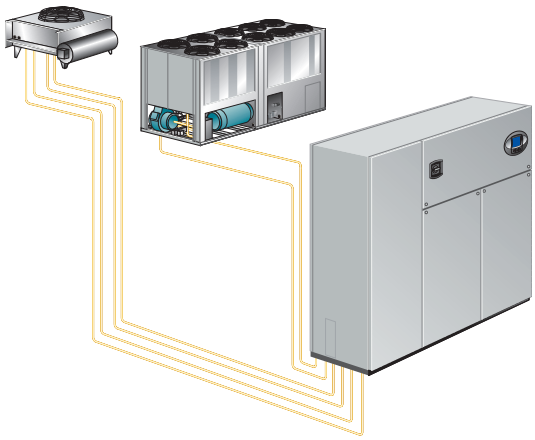
GLYCOOL

GLYCOOL units are factory-charged and tested. Field-installed piping is required from the unit to the drycooler and pump package. An additional coil is included for use when fluid temperatures are sufficiently low (below room temperature). Cooling is provided by circulating cold glycol through this second coil, reducing compressor operation.



Water-Cooled

Water-cooled units are factory-charged and tested. Field-installed water piping is required from the unit to the cooling tower.



Dual-Cool

This 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 water through this second coil and reducing compressor operation.

3.0 PRE-INSTALLATION GUIDELINES

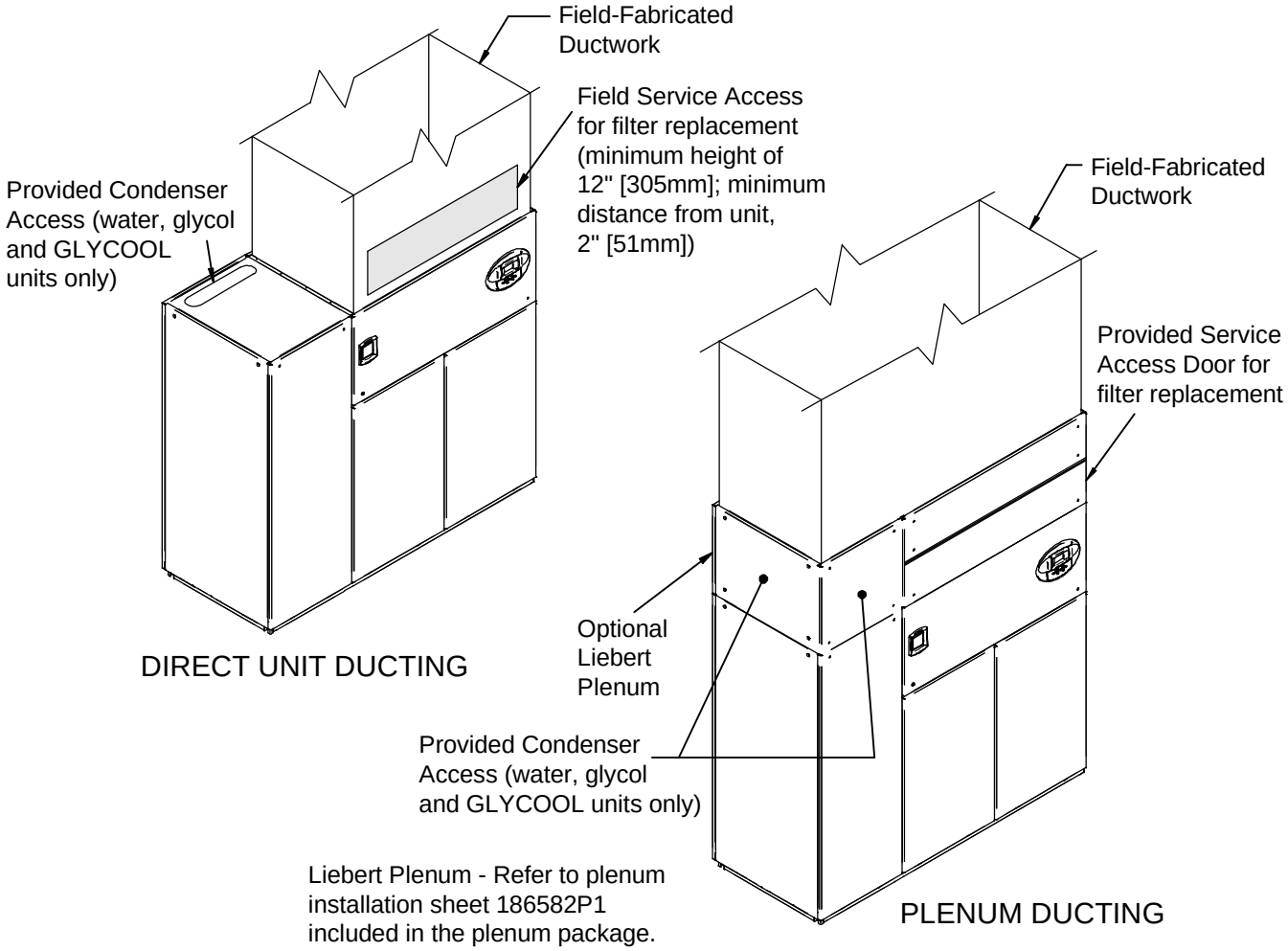
3.1 Room Preparation

- Verify that the floor is level, solid and sufficient to support the unit. See **Table 2** for unit weights.
- Confirm that the room is properly insulated and has a sealed vapor barrier.
- For proper humidity control, keep outside or fresh air to an absolute minimum (less than 5% of total air circulated in the room).
- Do not install Liebert DS units in an alcove or at the end of a long, narrow room.
- Install the units as close as possible to the largest heat load.
- Allow at least the minimum recommended clearances for maintenance and service. See **Figures 6** through **21** for dimensions.
- Emerson recommends installing an under-floor water detection system. Contact your local Emerson representative for information.

3.2 Air Distribution—Downflow Units

- Verify that the raised floor has been properly sized for the unit's airflow and the room is free of airflow restrictions.
- Perforated floor tiles in the raised floor should ensure minimal pressure loss.
- The raised floor must provide 7-1/2" (191mm) of clearance.
- Ensure that there is adequate clearance above the unit for service, such as replacing filters.
- Optional plenums are available for downflow unit ducting.

Figure 4 Downflow unit ducting and plenum ducting



3.3 Air Distribution—Upflow Units

Various configurations are available:

- Front return
- Rear return
- Top-front supply
- Top-rear supply

For in-room applications with supply and return grilles, several feet of clearance must be maintained at the intake and discharge of the unit.

Upflow rear-return configurations use a filter box attached to the back of the Liebert DS. Allow 25" (635 mm) on one side of the unit for access to the rear return filter box. Refer to the rear return installation sheet, 187230P1, inside the rear return filter box package.

WARNING

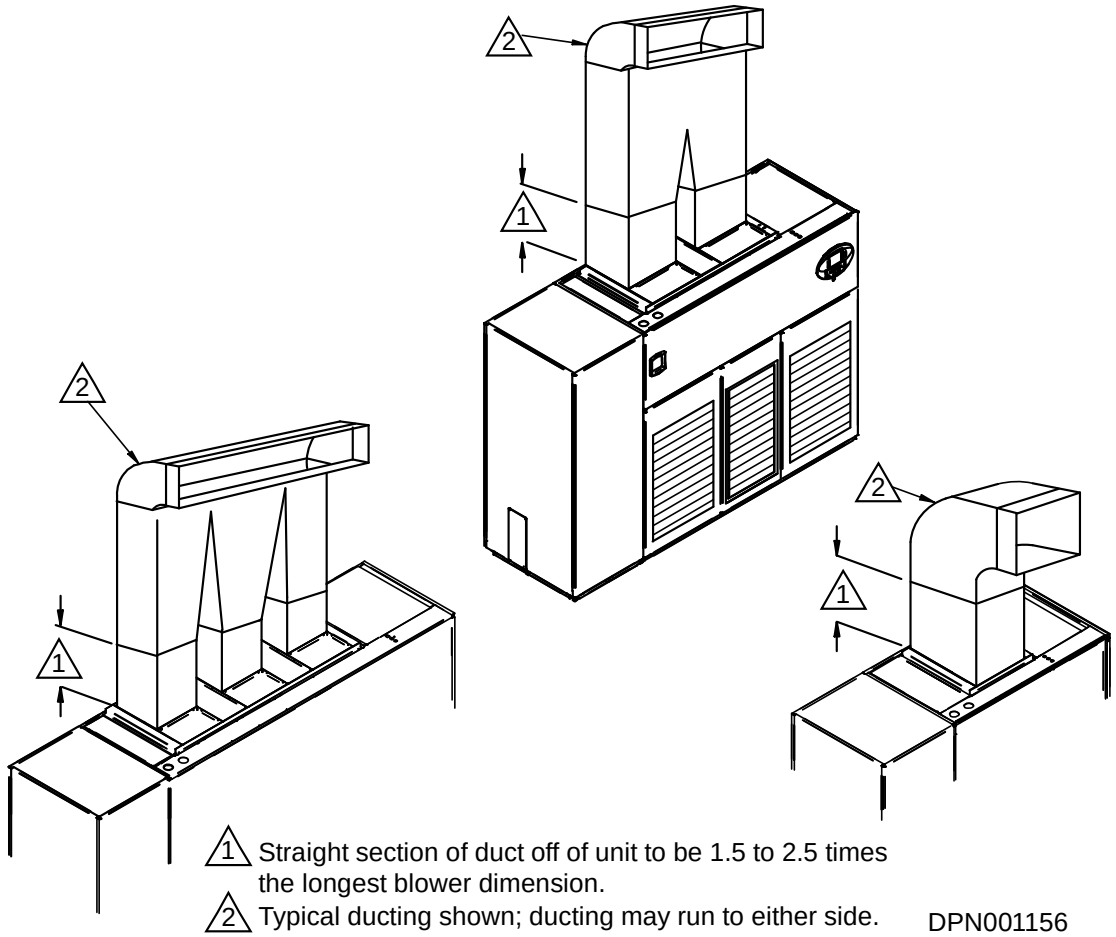
Risk of high-speed moving parts. Can cause injury or death.

Disconnect all local and remote electric power supplies before working in the unit.

Do not operate upflow units without installing a plenum, ductwork or guard over the blower opening(s) on the top surface of the unit cabinet.

Ductwork must be connected to the blower(s), or a plenum must be installed on the blower deck for protection from rotating blower wheel(s) on upflow units.

Figure 5 Upflow ducting configurations



1 Straight section of duct off of unit to be 1.5 to 2.5 times the longest blower dimension.

2 Typical ducting shown; ducting may run to either side.

* Follow standard practices on all duct work.

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Rev. 0

NOTE

Drain traps are qualified to a return duct static of negative 1.5 i.w.g. (-1.5 i.w.g).

3.4 Connections and System Setup

- Plan the routing of wiring, piping and ductwork to the unit. See **Figure 61** and **Figures 76** through **96** for unit connection locations.
- Water/glycol and GLYCOOL units utilizing a drycooler may require an optional aquastat setting. See **Tables 66** through **69** for aquastat setting guidelines. Applications with the optional stat setting require field piping to be insulated to prevent condensation.
- The unit requires a drain, which must comply with all applicable codes. This drain line may contain boiling water. See **9.1.1 - Condensate Piping—Field-Installed** for details.
- Three-phase electrical service is required for all models. Electrical service must conform to national and local electrical codes. See equipment nameplate for details.
- If seismic requirements apply, consult your local Emerson representative for information about a seismic-rated floor stand.

NOTE

Seal openings around piping and electrical connection to prevent air leakage. Failure to do so could reduce the unit's cooling performance.

3.5 Operating Conditions

- The Liebert DS must be operated in a conditioned space within the operating envelope ASHRAE recommends for data centers: Maximum temperature of 77°F (25°C) DB and 55% RH or maximum WB of 65.5°F (18.6°C).

  Operating outside this envelope can decrease equipment reliability.
- Return air to the unit must be no cooler than the ASHRAE recommendation of 68°F (20°C) DB and 40% RH or minimum WB of 54°F (12.2°C) for proper unit operation.

  Operating below this can decrease equipment reliability.

Refer to ASHRAE's publication, "Thermal Guidelines for Data Processing Environments."

4.0 LIEBERT DS DIMENSIONS AND WEIGHTS

Table 1 Shipping dimensions—domestic and export, inches (mm)

Model Number	028/035/042 LxWxH, in (mm)	053/070/077 LxWxH, in (mm)	105 LxWxH, in (mm)
DS/VSAS, DS/VSAD, DS/VSAR, DS/VSAG, DS/VSDS, DS/VSDD, DS/VSDR, DS/VSDG	90x42x82 (2286x1067x2083)	102x42x82 (2591x1067x2083	136x42x82 (3454x1067x2083)
DS/VSAU, DS/VSAM, DS/VSDU, DS/VSDM			
DS/VSWS, DS/VSWD, DS/VSWR, DS/VSWG DS/VSHS, DS/VSHD, DS/VSHR, DS/VSHG		114x42x82 (2896x1067x2083)	
DS/VSWU, DS/VSWM, DS/VSHU, DS/VSHM			

Table 2 Shipping weights—approximate, kg

Size	Cooling Type	Compressor Type	Downflow Unit Weight, lb		Upflow Unit Weight, lb	
			Domestic	Export	Domestic	Export
8-12 Ton	Air	Semi	1918	2088	1968	2138
		Scroll	1608	1778	1658	1828
	Air D/C	Semi	2068	2238	2118	2288
		Scroll	1758	1928	1808	1978
	W/G	Semi	2068	2238	2118	2288
		Scroll	1918	2088	1968	2138
	G/C	Semi	2218	2388	2268	2438
		Scroll	2068	2238	2118	2288
15 Ton	Air	Semi	2512	2712	2512	2712
		Scroll	2070	2260	2220	2410
	Air D/C	Semi	2692	2892	2692	2892
		Scroll	2250	2440	2400	2590
	W/G	Semi	2812	3012	2812	3012
		Scroll	2382	2582	2532	2732
	G/C	Semi	2992	3192	2992	3192
		Scroll	2562	2762	2712	2912
20 Ton	Air	Semi	2562	2762	2662	2862
		Scroll	2120	2310	2220	2410
	Air D/C	Semi	2742	942	2842	3042
		Scroll	2300	2490	2400	2590
	W/G	Semi	2862	3062	2962	3162
		Scroll	2432	2632	2532	2732
	G/C	Semi	3042	3242	3142	3342
		Scroll	2612	2812	2712	2912
22 Ton	Air	Semi	2612	2812	2662	2862
		Scroll	2170	2360	2220	2410
	Air D/C	Semi	2792	2992	2842	3042
		Scroll	2350	2540	2400	2590
	W/G	Semi	2912	3112	2962	3162
		Scroll	2470	2660	2532	2732
	G/C	Semi	3092	3292	3142	3342
		Scroll	2650	2840	2712	2912
30 Ton	Air	Semi	3223	3443	3183	3403
		Scroll	3103	3323	3063	3283
	Air D/C	Semi	3583	3803	3513	3733
		Scroll	3463	3683	3393	3613
	W/G	Semi	3593	3813	3553	3773
		Scroll	3473	3693	3433	3653
	G/C	Semi	3953	4173	3883	4103
		Scroll	3833	4053	3763	3983

Figure 6 Cabinet and floor planning dimensions—downflow, air-cooled, 28-42kW (8-12 ton), semi-hermetic compressor models

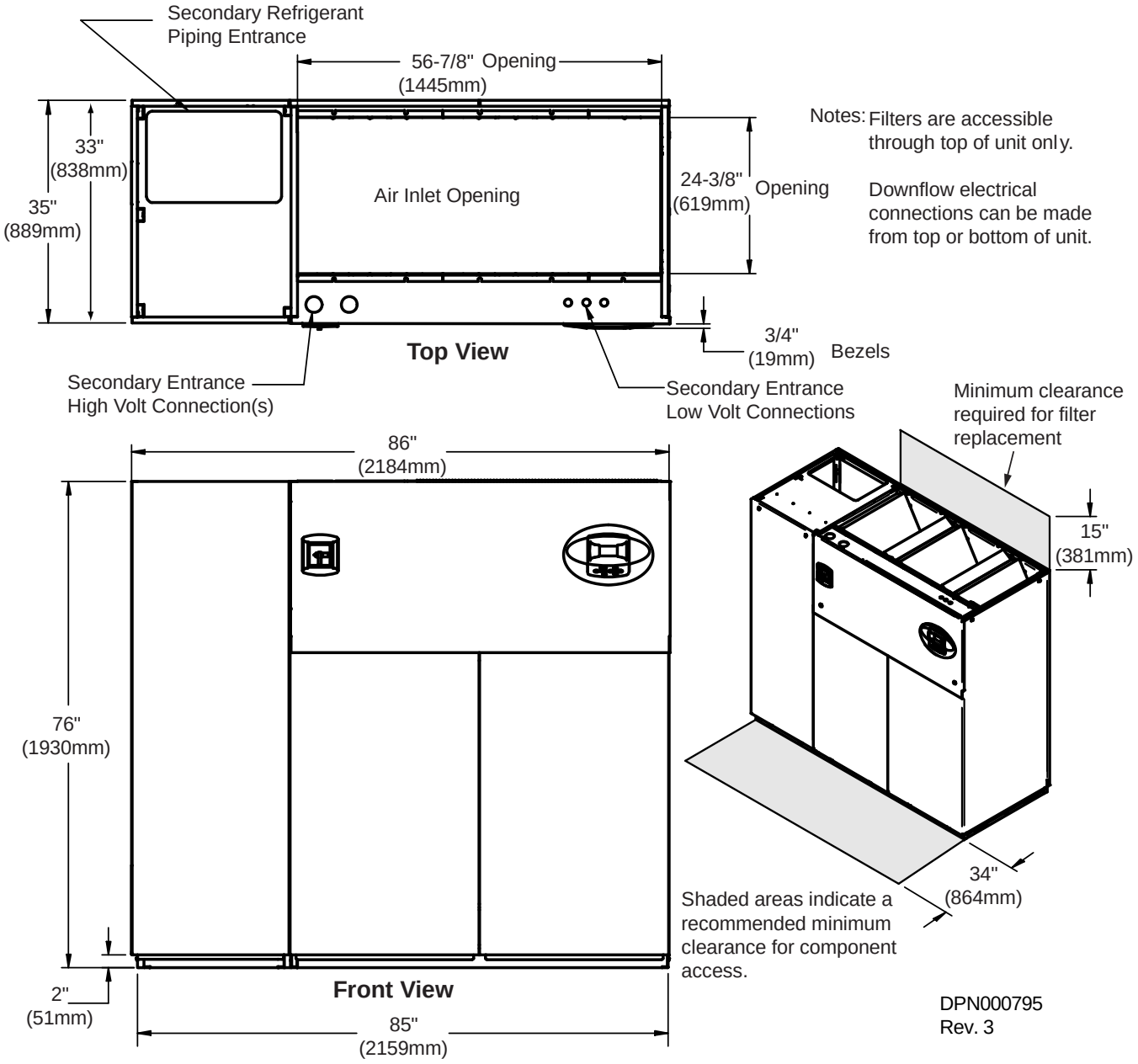


Table 3 Weights for downflow, air-cooled, 28-42kW (8-12 ton), semi-hermetic compressor models

	Dry Weight - lb. (kg), Approximate
Model No.	**028, 035, 042**
Air-Cooled	1780 (809)
Dual-Cool	1930 (877)

Figure 7 Cabinet and floor planning dimensions—downflow, air-cooled, 28-42kW (8-12 ton), scroll compressor models

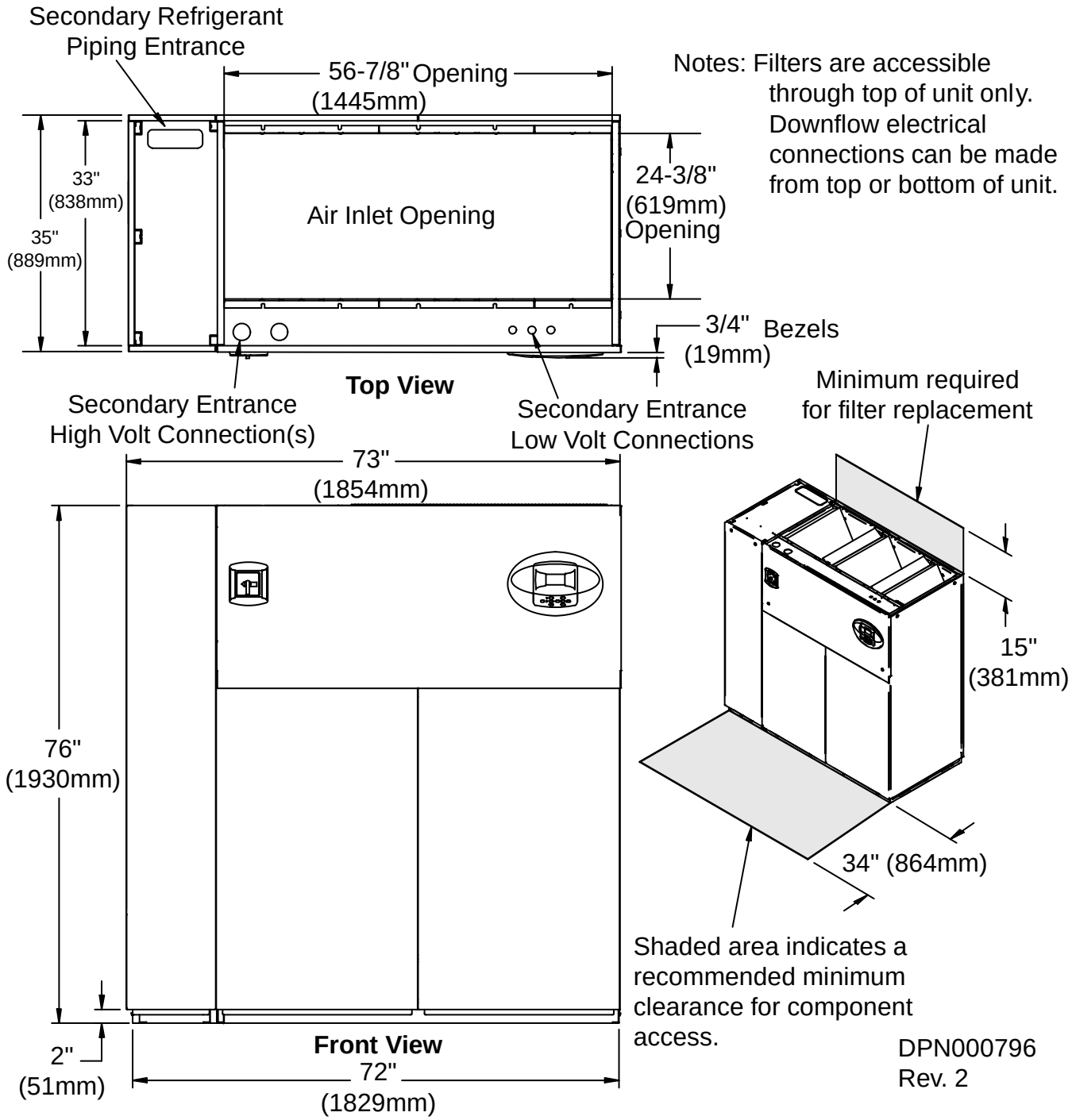


Table 4 Weights for downflow, air-cooled, 28-42kW (8-12 ton), scroll compressor models

Dry Weight, lb (kg), Approximate	
Model No.	**028, 035, 042**
Air-Cooled	1470 (668)
Dual-Cool	1620 (736)

Figure 8 Cabinet and floor planning dimensions—downflow, water/glycol/GLYCOOL, 28-42kW (8-12 ton), all compressor models

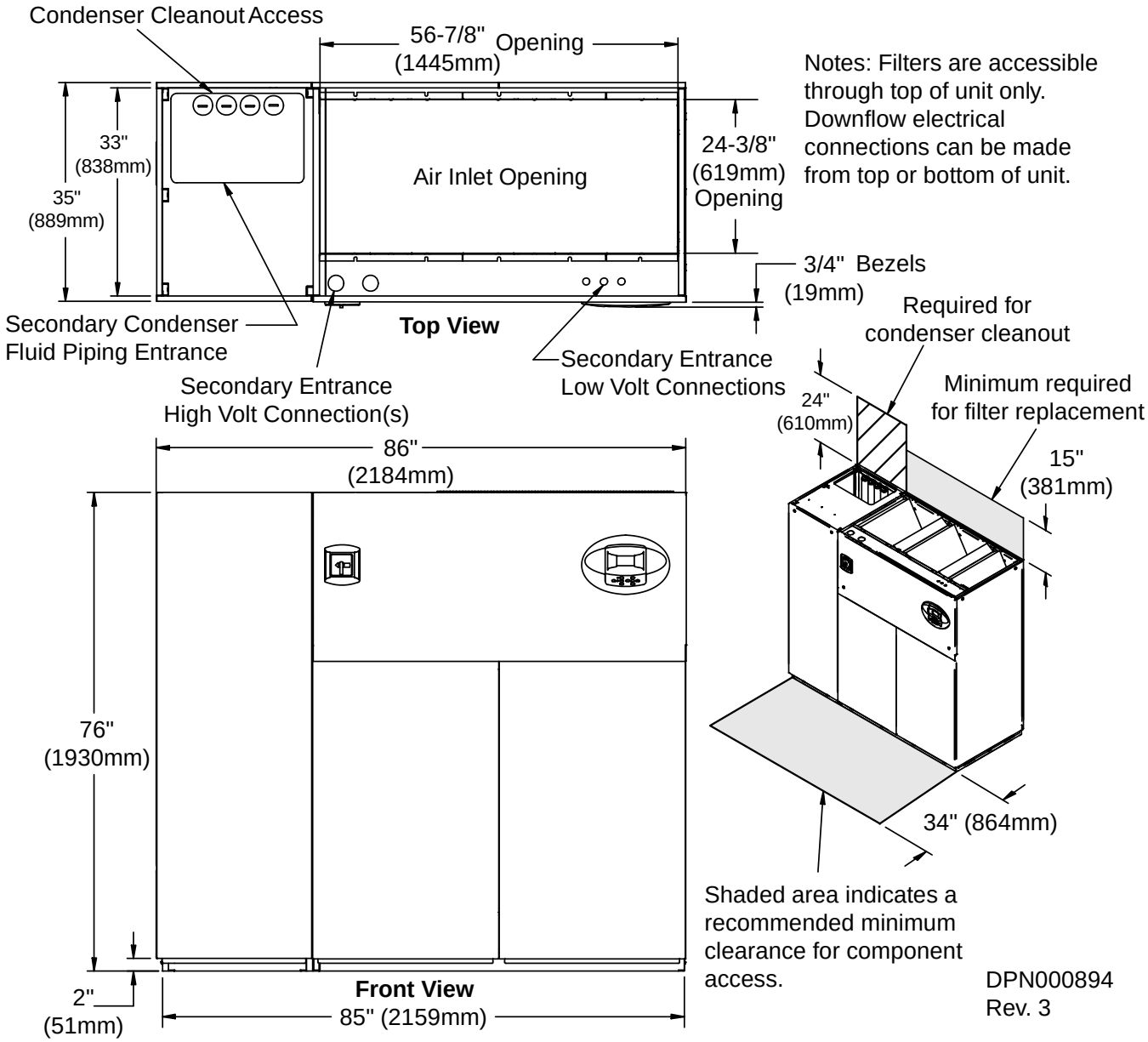


Table 5 Weights for downflow, water/glycol/GLYCOOL, 28-42kW (8-12 ton), all compressor models

Compressor Type	Dry Weight - lb. (kg), Approximate	
	Model	028, 035, 042
Semi-Hermetic Compressor	Water/Glycol	1930 (877)
	GLYCOOL/Dual-Cool	2080 (945)
Scroll or Digital Scroll Compressor	Water/Glycol	1780 (809)
	GLYCOOL/Dual-Cool	1930 (877)

Figure 9 Cabinet and floor planning dimensions—downflow, air-cooled, 53-77kW (15-22 ton), semi-hermetic compressor models

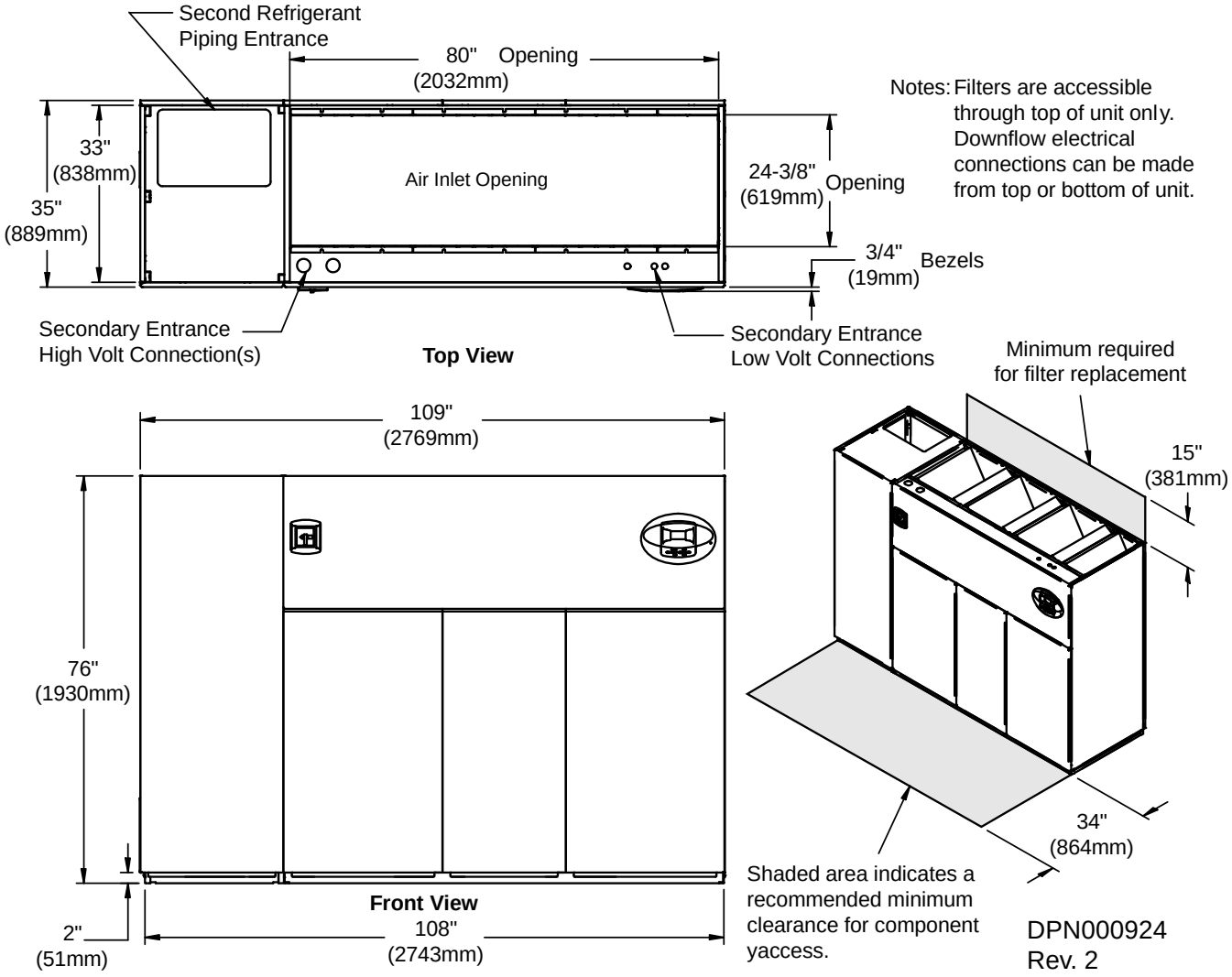


Table 6 Weights for downflow, air-cooled, 53-77kW (15-22 ton), semi-hermetic compressor models

Model	Dry Weight, lb (kg) Approximate		
	053	070	077
Air-Cooled	2350 (1069)	2400 (1091)	2450 (1114)
Dual-Cool	2530 (1150)	2580 (1173)	2630 (1196)

Figure 10 Cabinet and floor planning dimensions—downflow, air-cooled, 53-77kW (15-22 ton), scroll compressor models

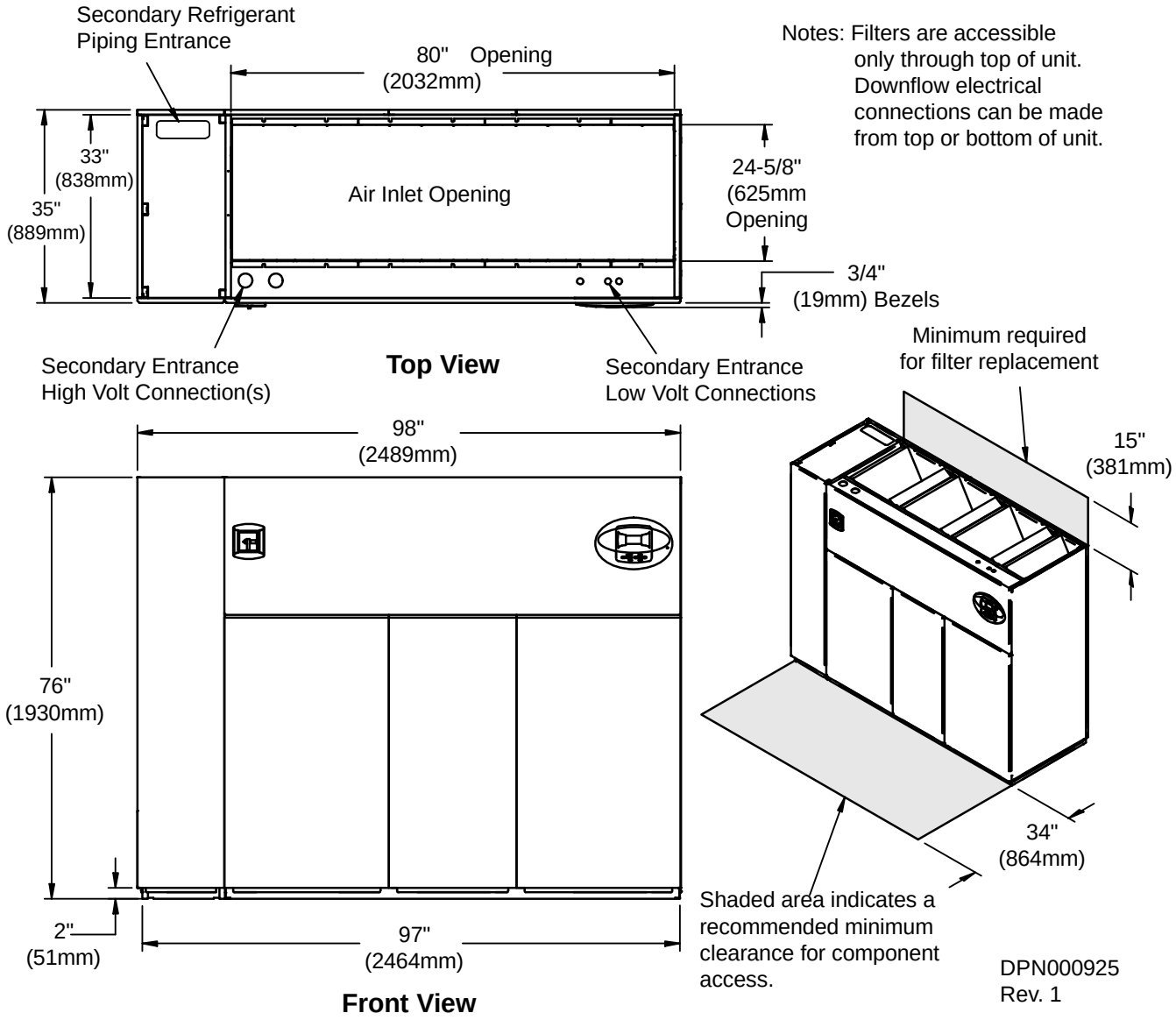


Table 7 Weights for downflow, air-cooled, 53-77kW (15-22 ton), scroll compressor models

Model No.	Dry Weight, lb (kg) Approximate		
	053	070	077
Air-Cooled	1920 (873)	1970 (896)	2020 (919)
Dual-Cool	2100 (955)	2150 (978)	2200 (1000)

Figure 11 Cabinet and floor planning dimensions—downflow, water/glycol/GLYCOOL, 53-77kW (15-22 ton), all compressor models

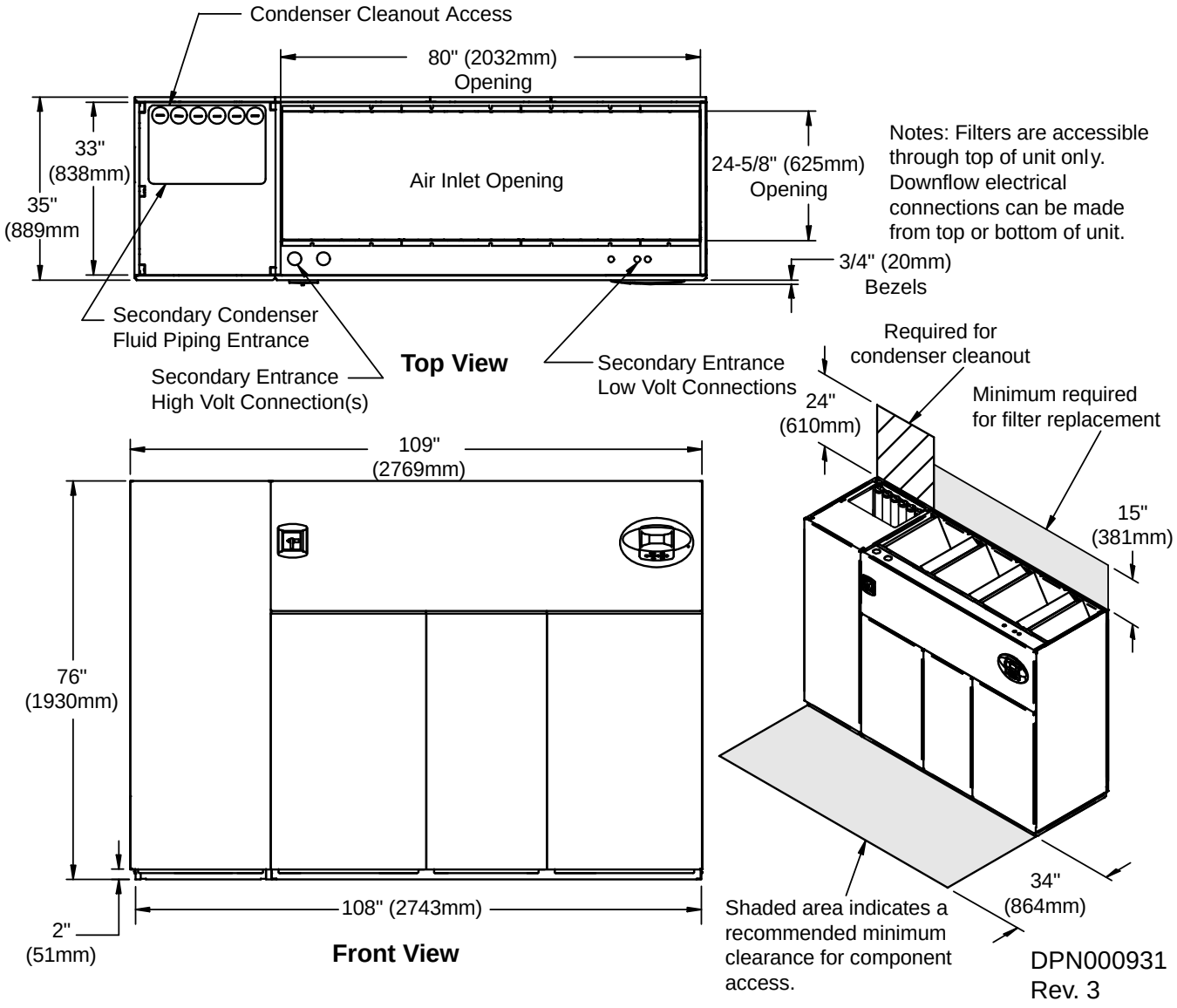


Table 8 Weights for downflow, water/glycol/GLYCOOL, 53-77kW (15-22 ton), all compressor models

Compressor Type	Model	Dry Weight, lb (kg), Approximate		
		053	070	077
Semi-Hermetic Compressor	Water/Glycol	2650 (1205)	2700 (1228)	2750 (1250)
	GLYCOOL/Dual-Cool	2830 (1287)	2880 (1310)	2930 (1332)
Scroll or Digital Scroll Compressor	Water/Glycol	2220 (1010)	2270 (1032)	2320 (1055)
	GLYCOOL/Dual-Cool	2400 (1091)	2450 (1114)	2500 (1137)

Figure 12 Cabinet and floor planning dimensions—downflow, air-cooled, 105kW (30 ton), all compressor models

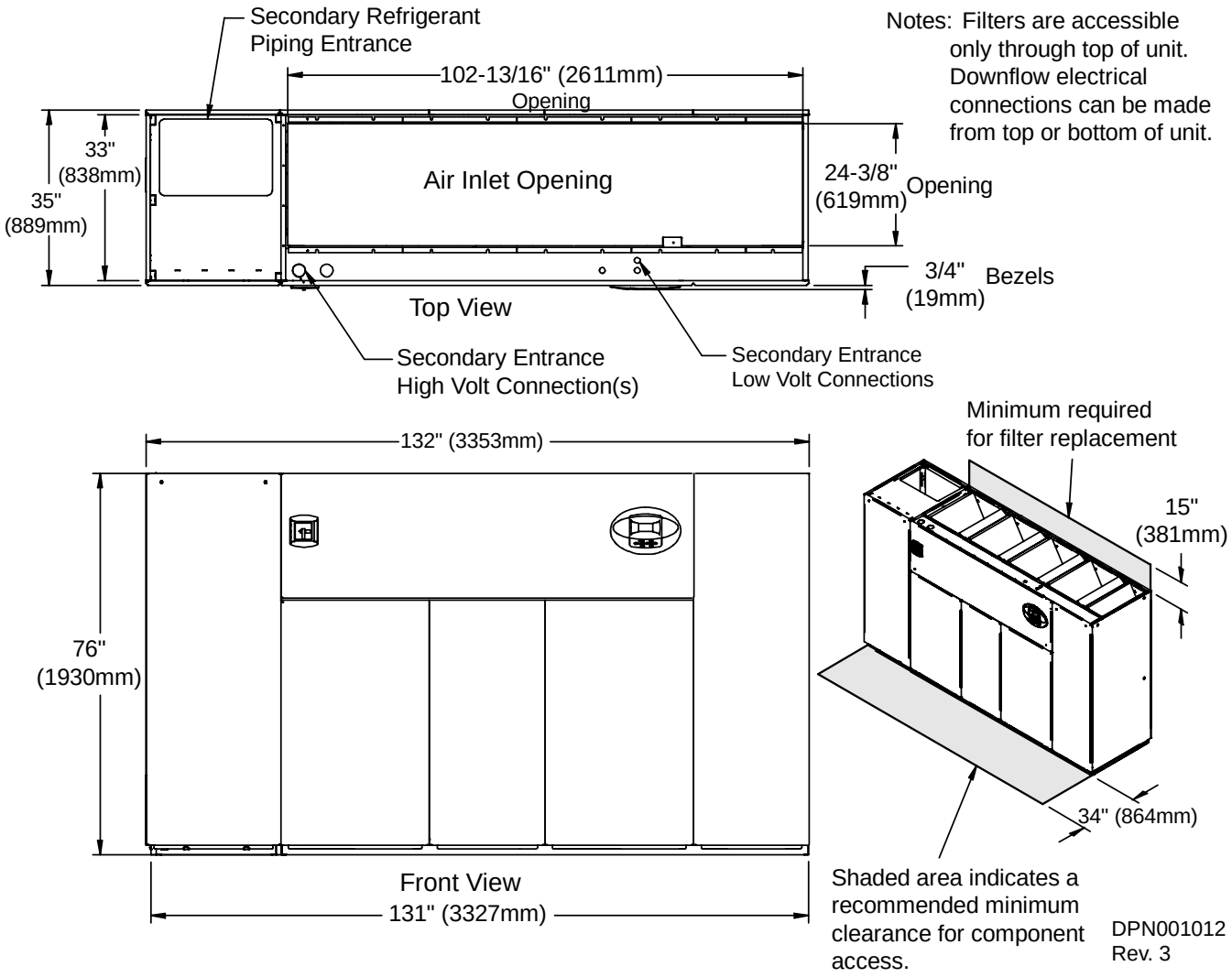


Table 9 Weights for downflow, air-Cooled, 105kW (30 ton), all compressor models

Compressor Type	Dry Weight, lb (kg) approximate		
	Model	105	
	Fan Type	Forward-Curved Fans	EC Fans
Semi-Hermetic Compressor	Air-Cooled	3040 (1382)	2774 (1258)
	Dual-Cool	3400 (1545)	3134 (1422)
Scroll Compressor	Air-Cooled	2920 (1327)	2654 (1204)
	Dual-Cool	3280 (1491)	3014 (1367)

Figure 13 Cabinet and floor planning dimensions—downflow, water/glycol/GLYCOOL, 105kW (30 ton), all compressor models

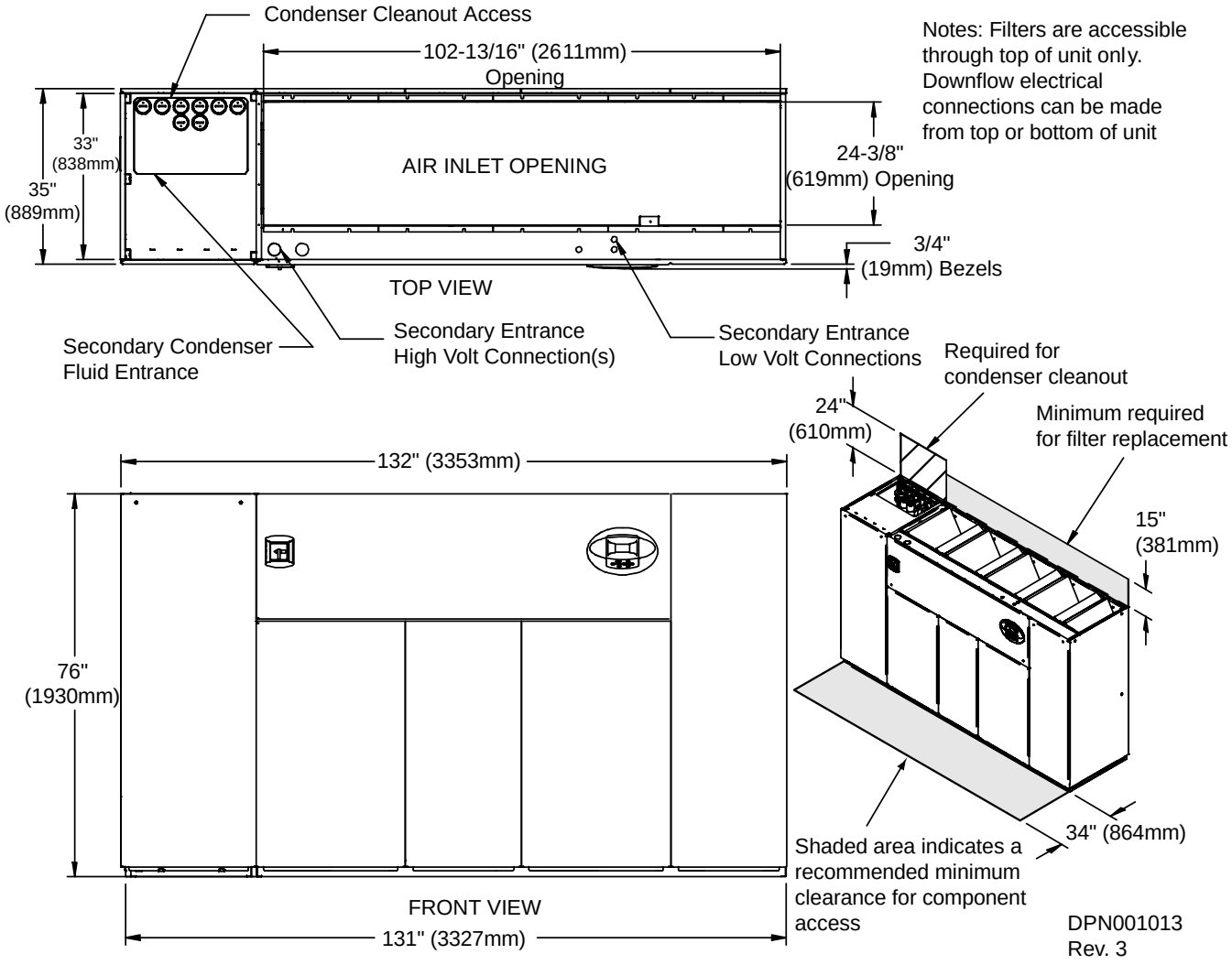


Table 10 Weights for downflow, water/glycol/GLYCOOL, 105kW (30 ton), all compressor models

Compressor Type	Dry Weight, lb (kg) approximate	
	Model	**105**
Semi-Hermetic Compressor	Water/Glycol	3410 (1550)
	GLYCOOL/Dual-Cool	3770 (1714)
Scroll Compressor	Water/Glycol	3290 (1495)
	GLYCOOL/Dual-Cool	3650 (1659)

Figure 14 Cabinet and floor planning dimensions—upflow, air-cooled 28-42kW (8-12 ton), semi-hermetic compressor models

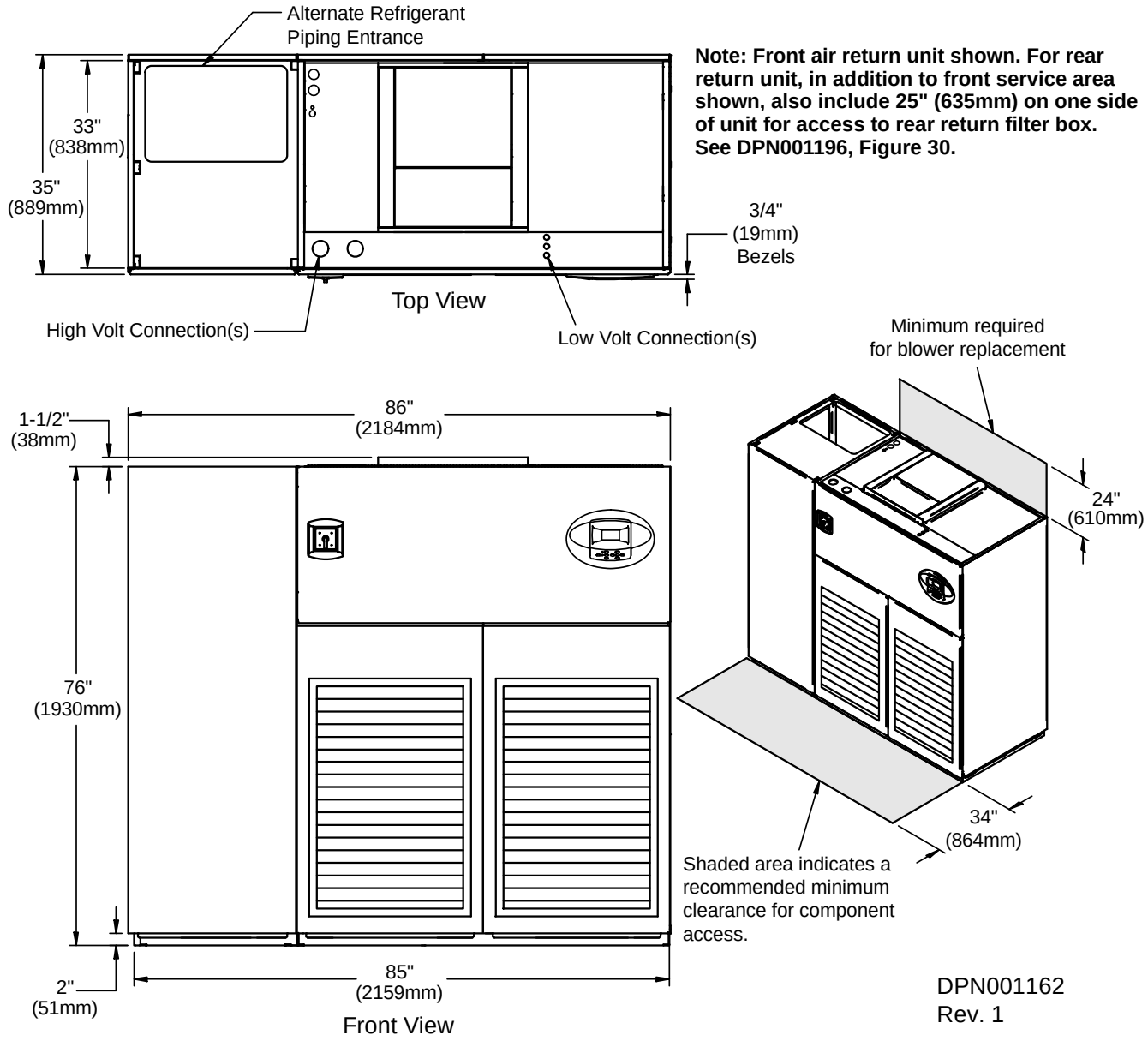
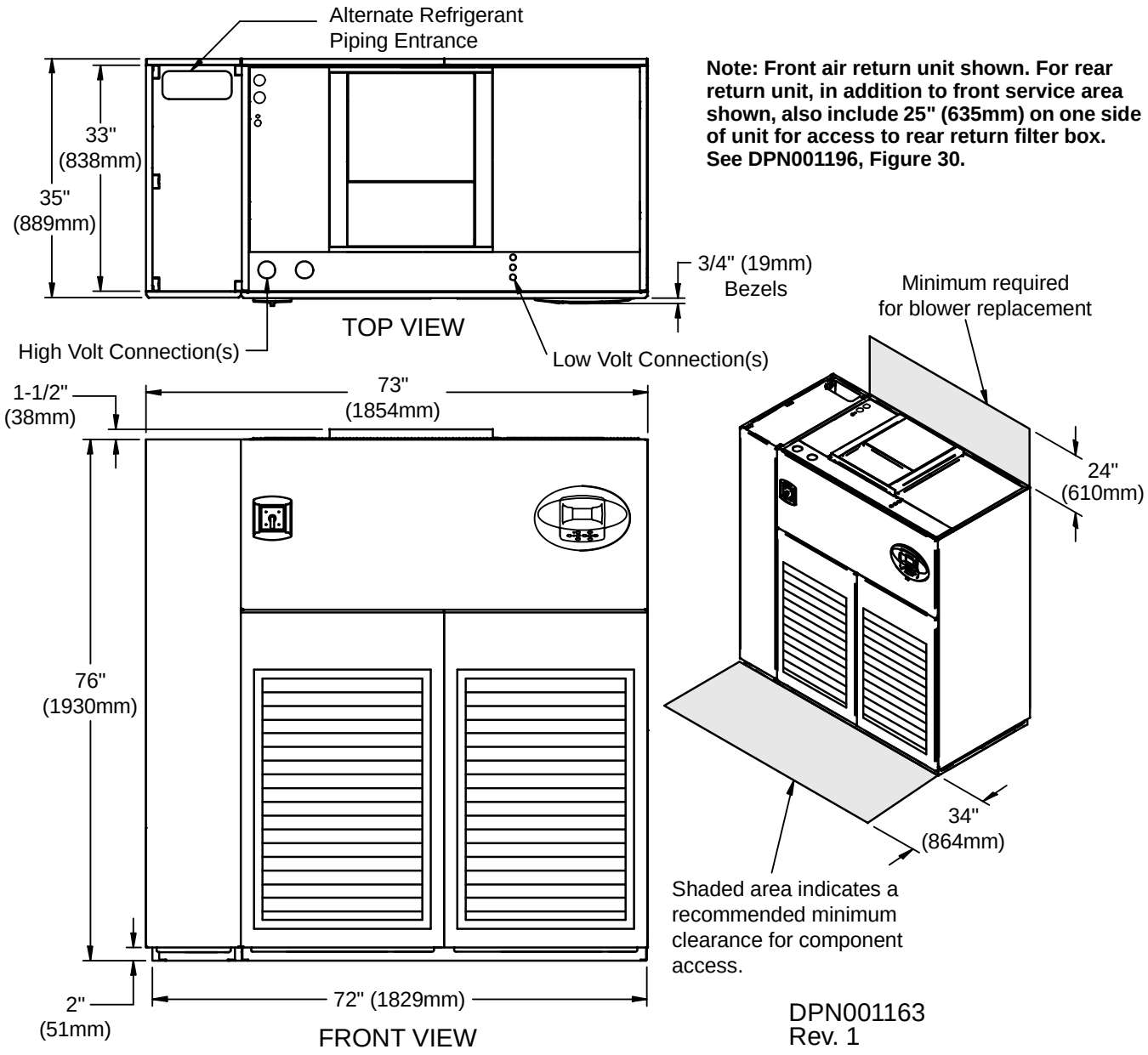


Table 11 Weight for upflow, air-cooled, 28-42kW (8-12 ton), semi-hermetic compressor models

	Dry Weight, lb (kg) approximate
Model No.	**028-042**
Air-Cooled	1830 (830)
Dual-Cool	1980 (898)

Figure 15 Cabinet and floor planning dimensions—upflow, air-cooled 28-42kW (8-12 ton), scroll or digital scroll compressor models



Note: 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, Figure 30.

Table 12 Weight for upflow, air-cooled, 28-42kW (8-12 ton), scroll or digital scroll compressor models

	Dry Weight, lb (kg) approximate
Model No.	**028-042**
Air-Cooled	1520 (689)
Dual-Cool	1670 (758)

Figure 16 Cabinet and floor planning dimensions—upflow, water/glycol/GLYCOOL, 28-42kW (8-12 ton), all compressor models

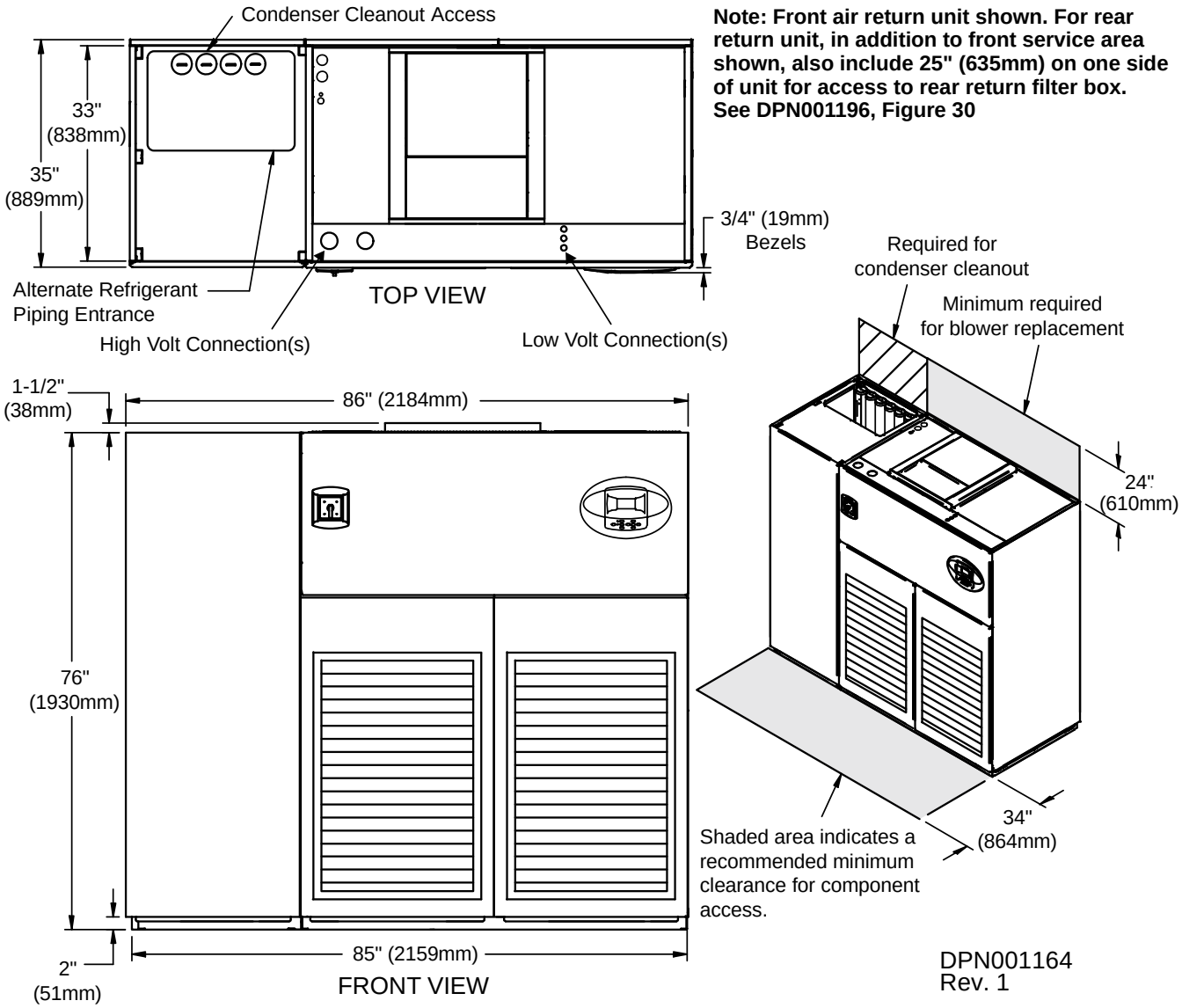
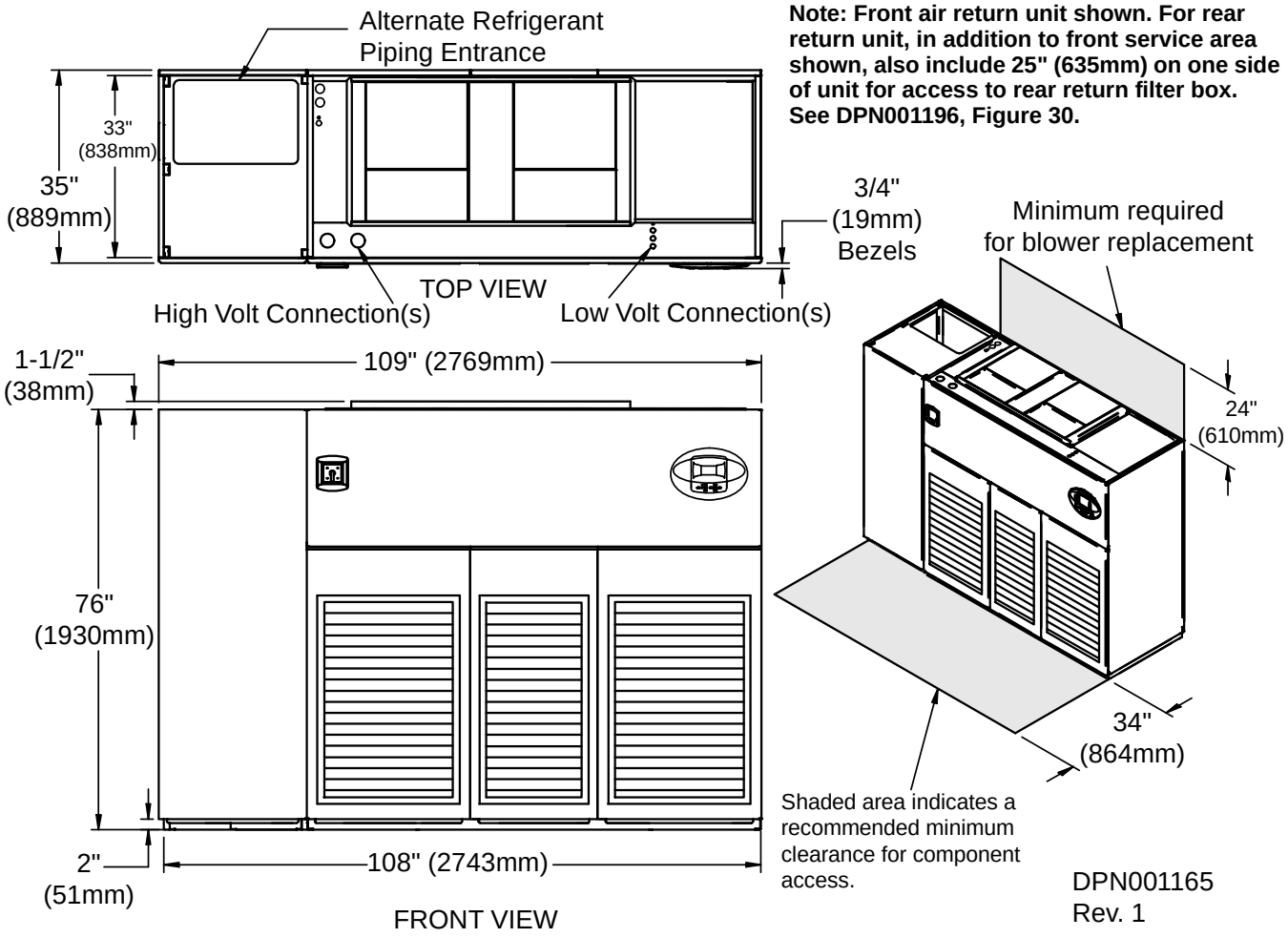


Table 13 Weights for upflow, water/glycol/GLYCOOL, 28-42kW (8-12 ton), all compressor models

Compressor Type	Dry Weight, lb (kg) approximate	
	Model	028-042
Semi-Hermetic	Water/Glycol	1980 (898)
	GLYCOOL/Dual-Cool	2130 (966)
Scroll or Digital Scroll	Water/Glycol	1830 (830)
	GLYCOOL/Dual-Cool	1980 (898)

Figure 17 Cabinet and floor planning dimensions—upflow, air-cooled, 53-77kW (15-22 ton), semi-hermetic compressor models



Note: 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, Figure 30.

Table 14 Weights for upflow, air-cooled, 53-77kW (15-22 ton), semi-hermetic compressor models

Model	Dry Weight, lb (kg) approximate	
	053	070, 077
Air-Cooled	2350 (1069)	2500 (1134)
Dual-Cool	2530 (1150)	2680 (1216)

Figure 18 Cabinet and floor planning dimensions—upflow, air-cooled, 53-77kW (15-22 ton), scroll or digital scroll compressor models

Note: 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, Figure 30.

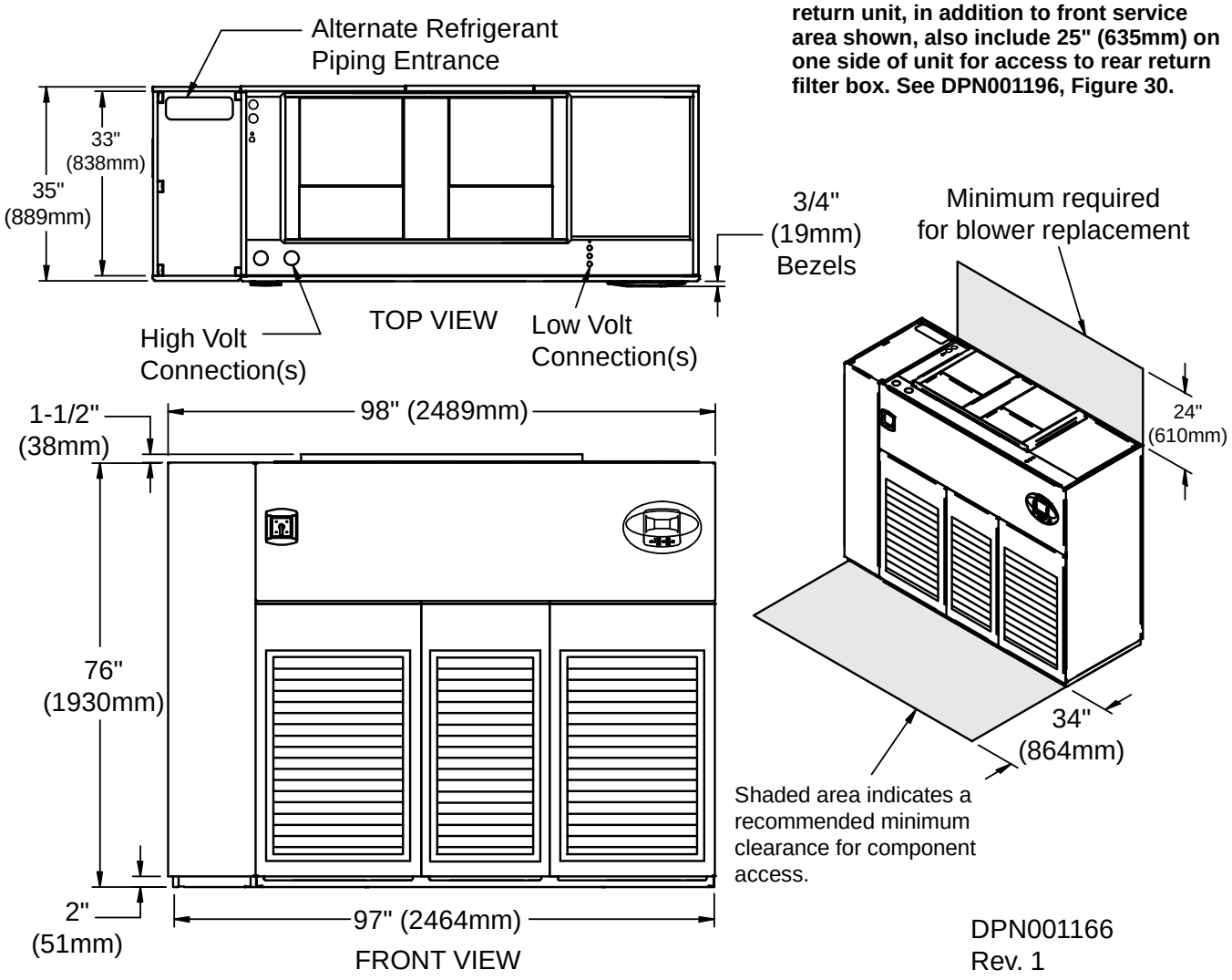


Table 15 Weight for upflow, air-cooled, 53-77kW (15-22 ton), scroll or digital scroll compressor models

Model No.	Dry Weight, lb (kg) approximate
	053, 070, 077
Air-Cooled	2070 (939)
Dual-Cool	2250 (1021)

Figure 19 Cabinet and floor planning dimensions—upflow, water/glycol/GLYCOOL, 53-77kW (15-22 ton), all compressor models

Note: 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, Figure 30.

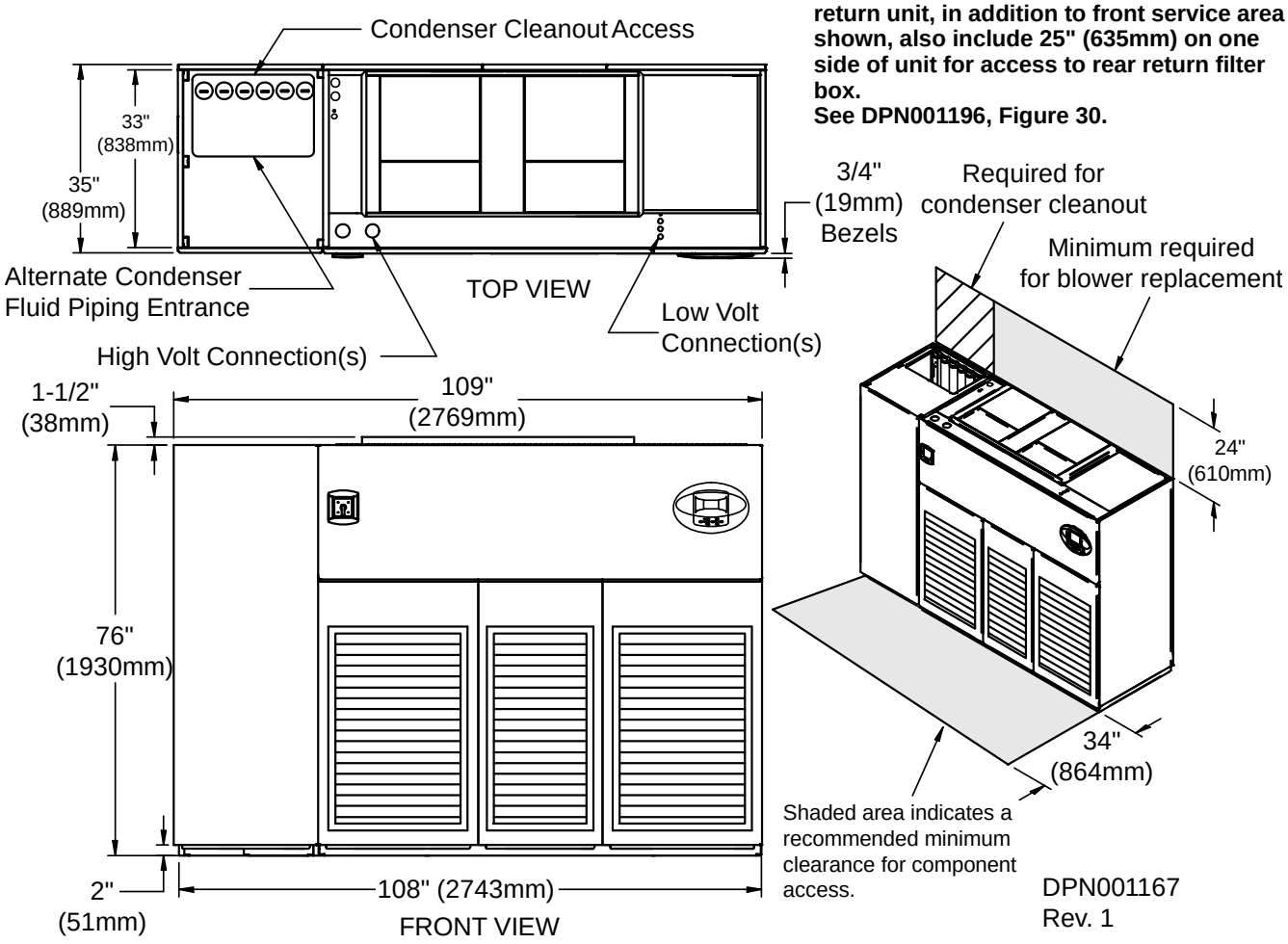
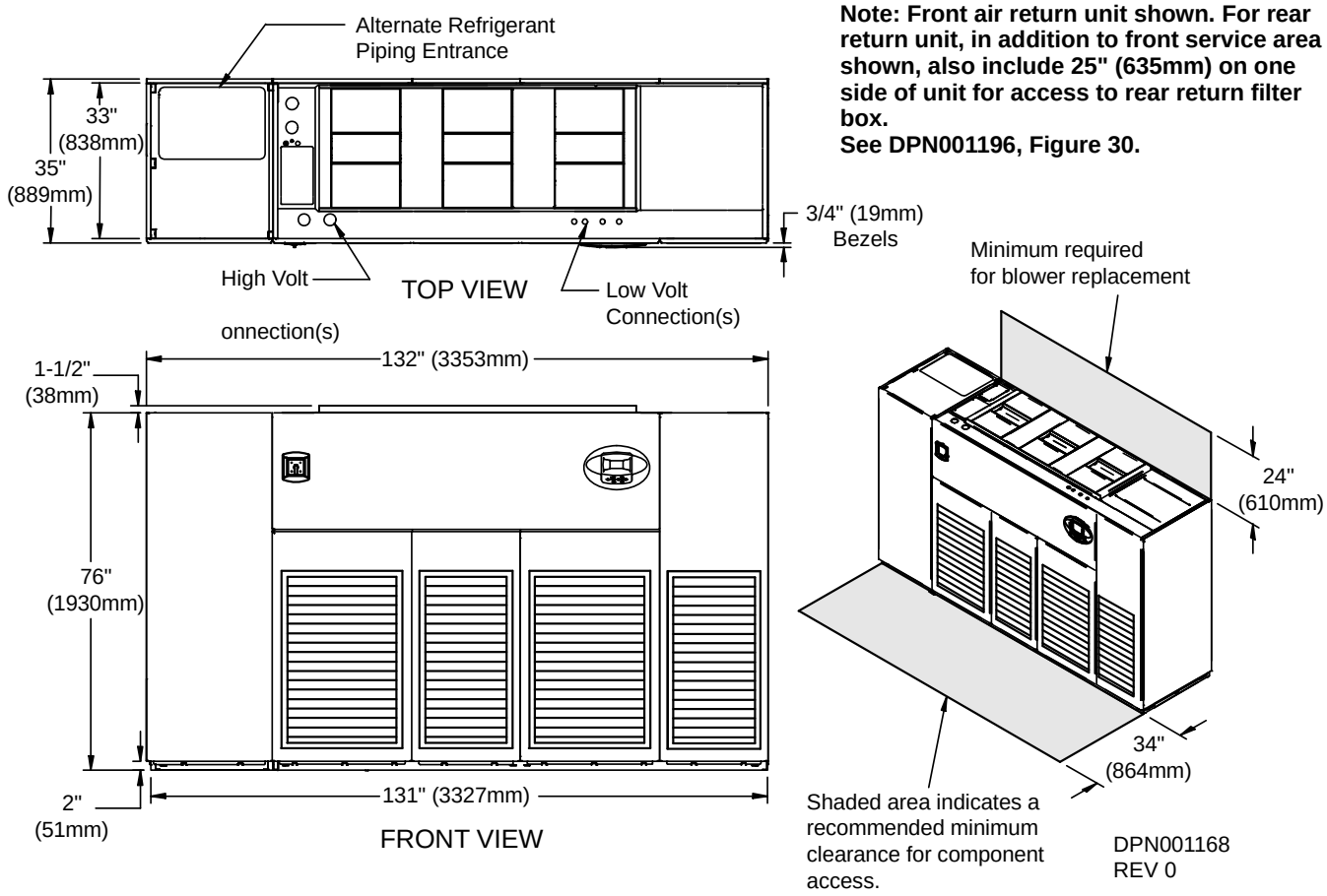


Table 16 Weights for upflow, water/glycol/GLYCOOL, 53-77kW (15-22 ton), all compressor models

Compressor Type	Dry Weight, lb (kg) approximate		
	Model	053	070, 077
Semi-Hermetic Compressor	Water/Glycol	2650 (1205)	2800 (1270)
	GLYCOOL/Dual-Cool	2830 (1287)	2980 (1352)
Scroll or Digital Scroll Compressor	Water/Glycol	2370 (1075)	
	GLYCOOL/Dual-Cool	2550 (1157)	

Figure 20 Cabinet and floor planning dimensions—upflow, air-cooled, 105kW (30 ton), all



Note: 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, Figure 30.

Table 17 Weights—upflow, air-cooled, 105kW (30 ton), all

Dry Weight, Approximate, lb (kg)	
Model	**105**
Semi- Hermetic, Air-Cooled	3000 (1361)
Semi-Hermetic, Dual-Cool	3330 (1510)
Scroll or Digital Scroll, Air-Cooled	2880 (1306)
Scroll or Digital Scroll, Dual-Cool	3210 (1456)

Figure 21 Cabinet and floor planning dimensions—upflow water/glycol/GLYCOOL 105kW (30 ton), all compressors

Note: 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, Figure 30.

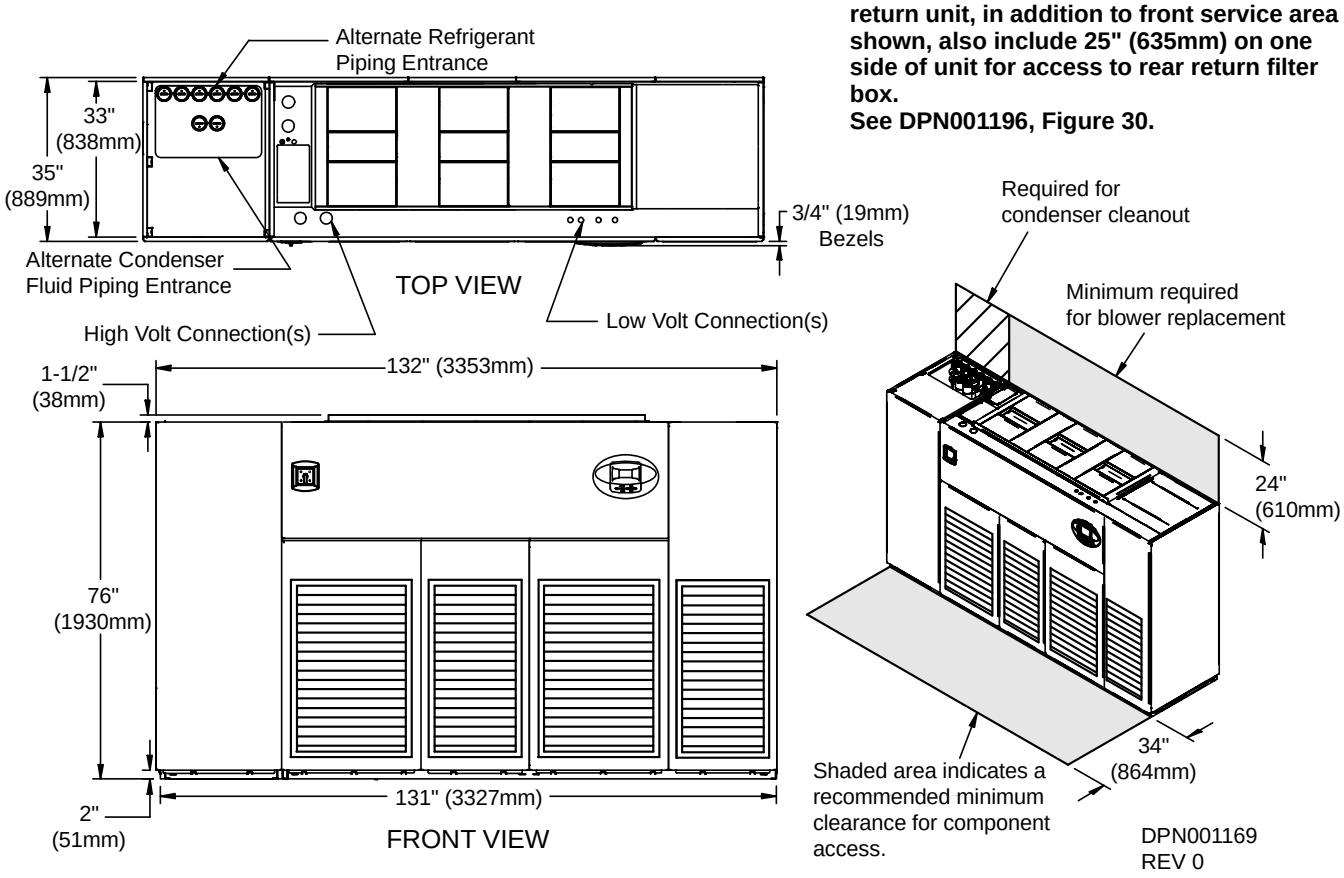


Table 18 Weights—upflow water/glycol/GLYCOOL 105kW (30 ton), all compressors

	Model	105
Semi-Hermetic Compressor	Water/Glycol	3370 (1529)
	GLYCOOL/Dual-Cool	3700 (1678)
Scroll or Digital Scroll Compressor	Water/Glycol	3250 (1474)
	GLYCOOL/Dual-Cool	3580 (1624)

Figure 22 Floor stand dimensions—downflow, 28-42kW (8-12 ton) models

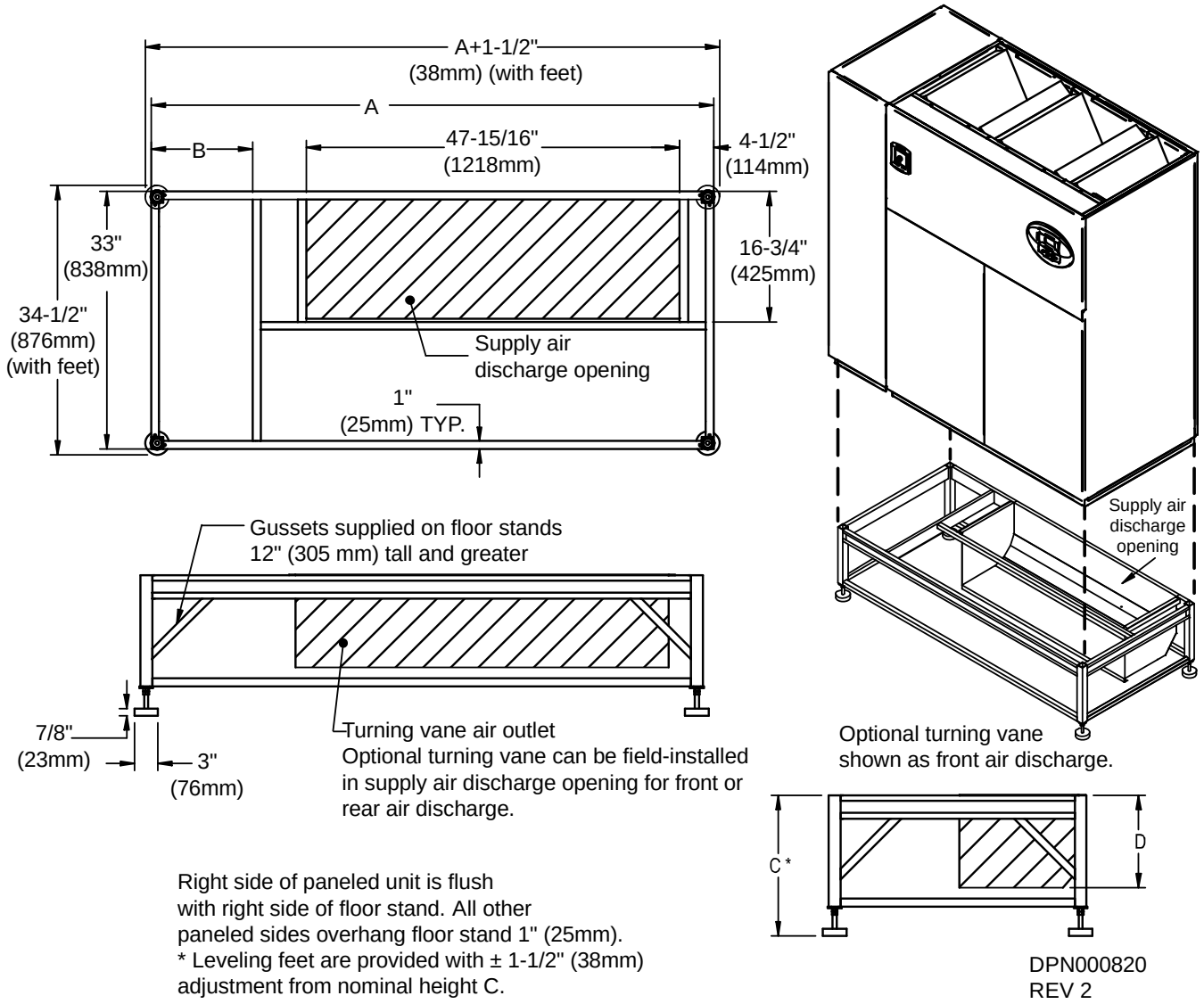


Table 19 Floor stand and floor planning dimensions—downflow, 28-42kW (8-12 ton) models

Dimensions, in. (mm)		
Model	**A**	**B**
Air-Cooled Semi-Hermetic Models and All Water/Glycol/GLYCOOL Models	85 (2159)	26 (660)
Air-Cooled Scroll Models and Air-Cooled Digital Scroll Models	72 (1829)	13 (330)

Height, in. (mm)	
C*	**D Turning Vane**
9 (229)	4 (111)
12 (305)	7 (187)
15 (381)	10 (264)
18 (457)	13 (340)
21 (533)	16 (416)
24 (610)	19 (492)

Figure 23 Floor stand dimensions—downflow, 53-77kW (15-22 ton) models

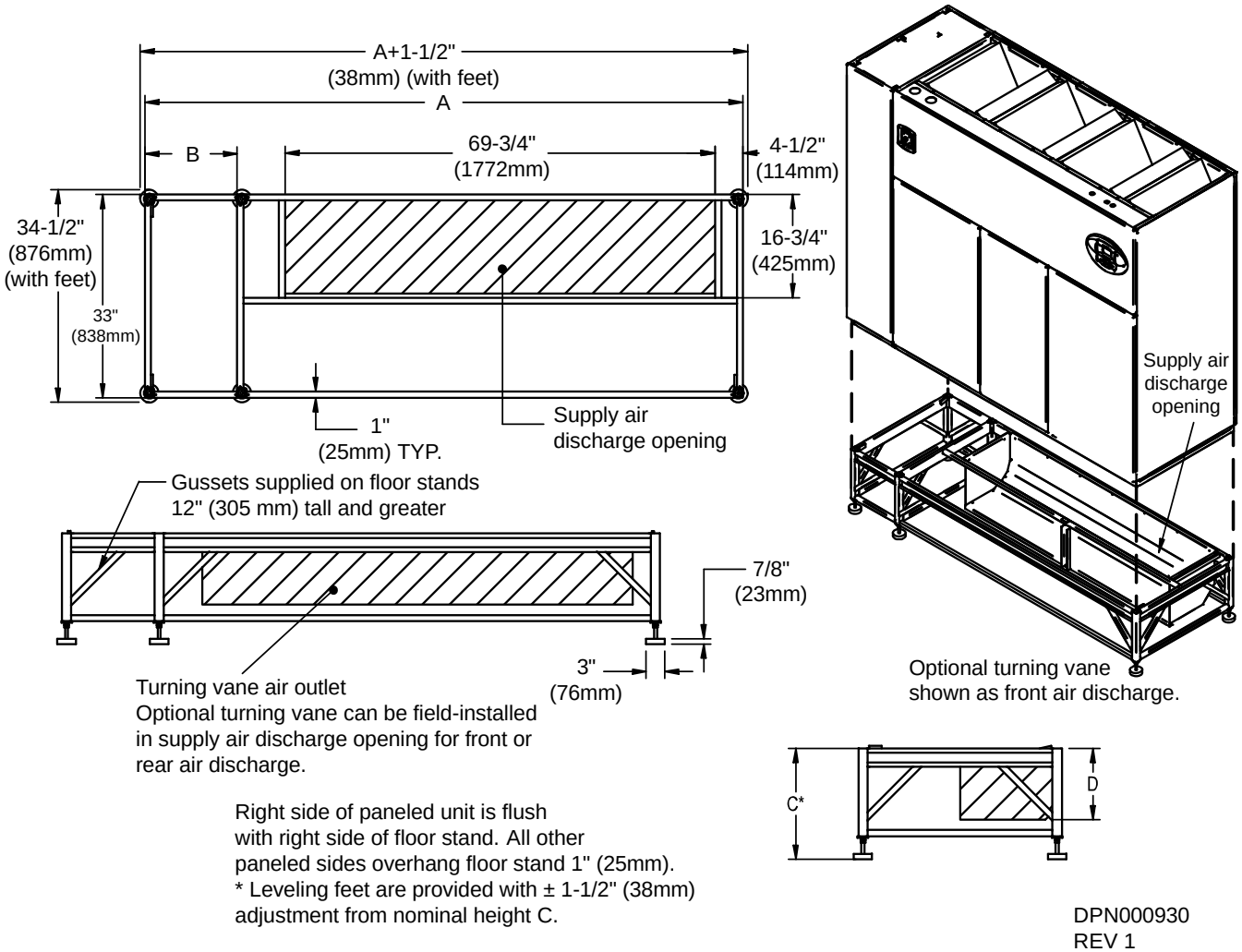
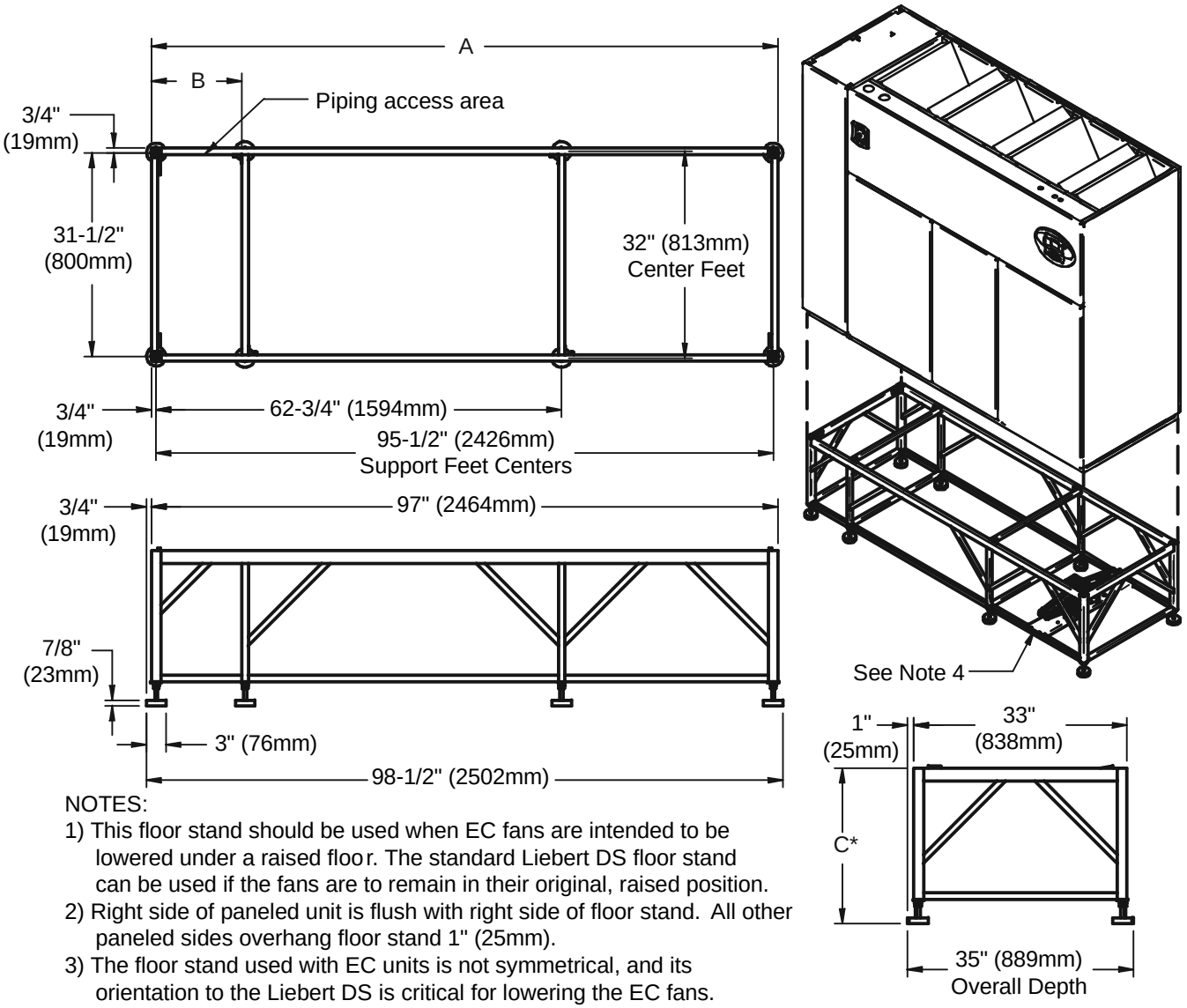


Table 20 Floor stand and floor planning dimensions—downflow, 53-77kW (15-22 ton) models

Dimensions, in. (mm)		
Model	**A**	**B**
Air-Cooled Semi-Hermetic Models and All Water/Glycol/GLYCOOL Models	108 (2743)	26 (660)
Air-Cooled Scroll Models and Air-Cooled Digital Scroll Models	97 (2464)	15 (381)

Height, in. (mm)	
C*	**D Turning Vane**
9 (229)	4 (111)
12 (305)	7 (187)
15 (381)	10 (264)
18 (457)	13 (340)
21 (533)	16 (416)
24 (610)	19 (492)

Figure 24 Floor stand and floor planning dimension, downflow 53-77kW (15-22 tons) models with EC fans



NOTES:

1) This floor stand should be used when EC fans are intended to be lowered under a raised floor. The standard Liebert DS floor stand can be used if the fans are to remain in their original, raised position.
2) Right side of paneled unit is flush with right side of floor stand. All other paneled sides overhang floor stand 1" (25mm).
3) The floor stand used with EC units is not symmetrical, and its orientation to the Liebert DS is critical for lowering the EC fans. Unless the floor stand 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 used to lower or raise that fan as needed.

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

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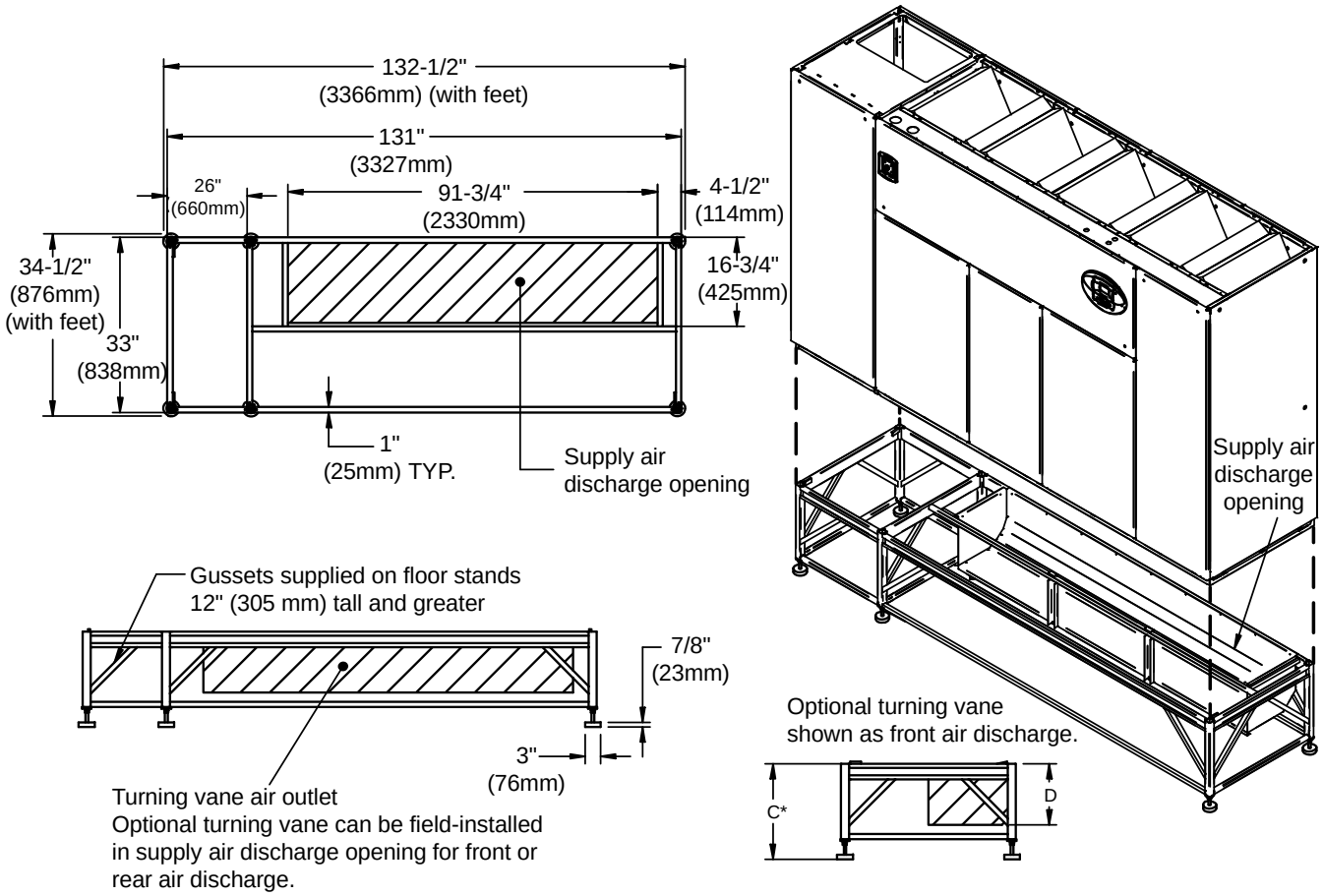
REV 0

Table 21 Floor stand and floor planning dimensions—downflow, 53-77kW (15-22 ton) models with EC fans

Height, Dimension C in. (mm)
24 (610)
30 (762)
36 (914)
42 (1067)
48 (1219)

Figure 25 Floor stand dimensions—downflow, 105kW (30 ton) models



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

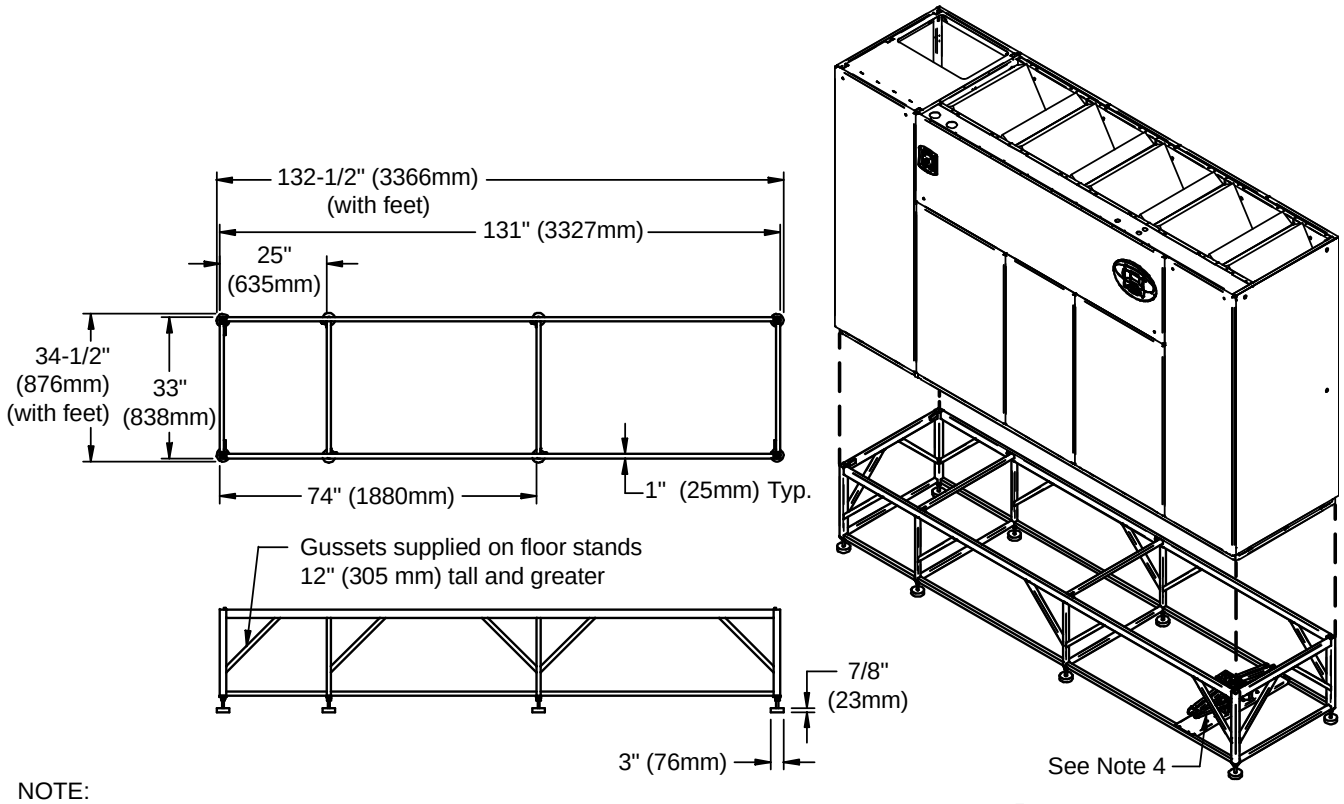
* Leveling feet are provided with ± 1-1/2" (38mm) adjustment from nominal height C.

DPN001059
REV 1

Table 22 Floor stand and floor planning dimensions—downflow, 105kW (30 ton) models

Height, in. (mm)	
C*	**D turning vane**
9 (229)	4 (111)
12 (305)	7 (187)
15 (381)	10 (264)
18 (457)	13 (340)
21 (533)	16 (416)
24 (610)	19 (492)

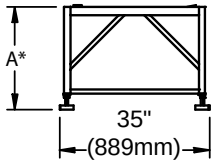
Figure 26 Floor stand and floor planning dimension, downflow 105kW (30 tons) models with EC fans



NOTE:

1) This floor stand should be used when EC fans are intended to be lowered under a raised floor. The standard Liebert DS floor stand can be used if the fans are to remain in their original raised position.
2) Right side of paneled unit is flush with right side of floor stand. All other paneled sides overhang floor stand 1" (25mm).
3) The floor stand used with EC units is not symmetrical and its orientation to the Liebert DS is critical for lowering the EC fans. Unless the floor stand 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.

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

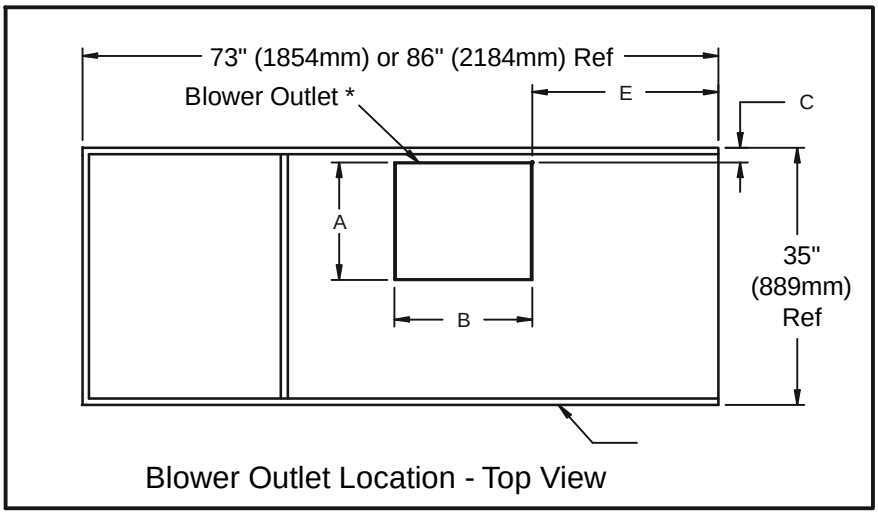


DPN002152
Rev. 0

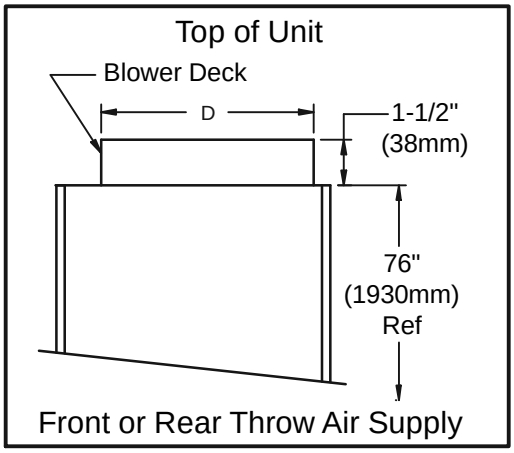
Table 23 Floor stand and floor planning dimensions—downflow, 105kW (30 ton) models with EC fans

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

Figure 27 Blower outlet and deck dimensions—upflow, 28-42kW (8-12 ton)



* Duct flange not provided



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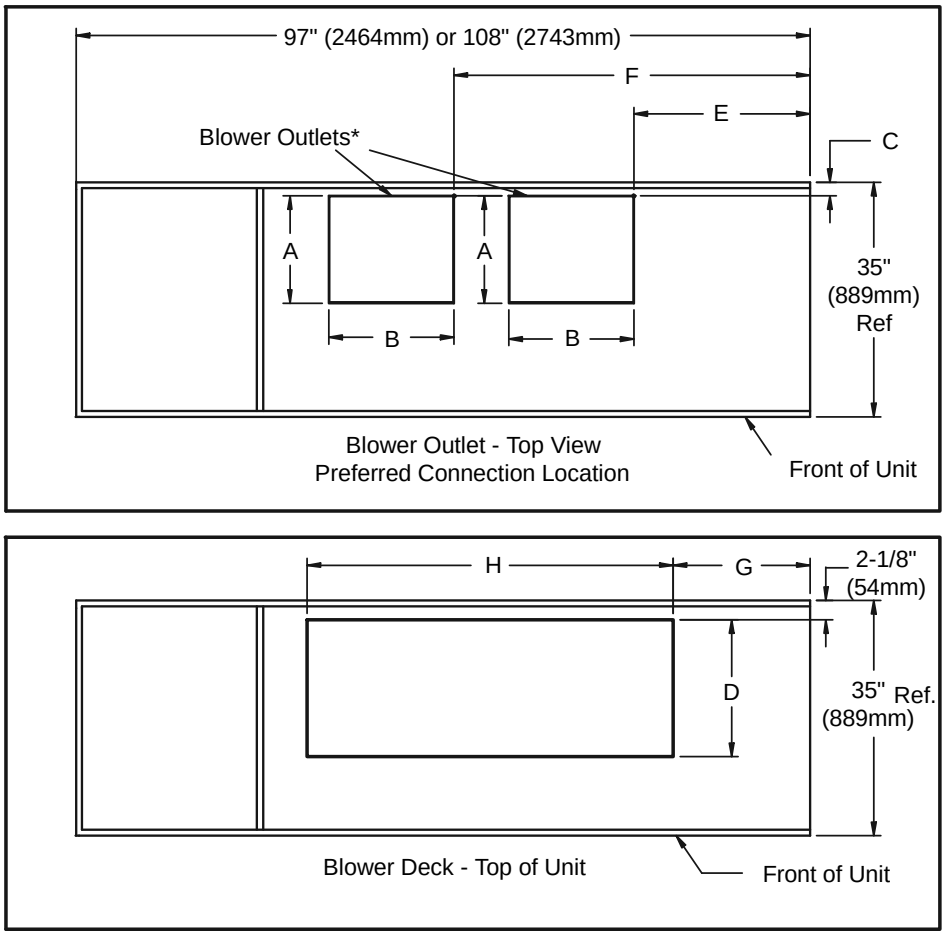
Rev. 2

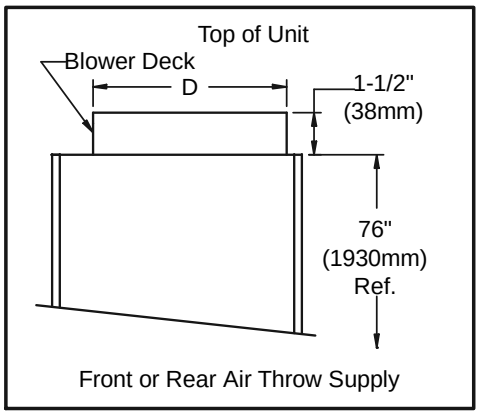
Table 24 Blower outlet and deck dimensional data for upflow, 28-42kW (8-12 ton)

Dimensional data, in. (mm)							
Model	**Blower**	**Supply**	**A**	**B**	**C**	**D**	**E**
28-42kW (8-12ton)	15 x 15	Front Throw	15-7/8 (404)	18-5/8 (472)	2-1/8 (54)	25-5/8 (651)	25 (635)
		Rear Throw	15-7/8 (404)	18-5/8 (472)	11-5/8 (295)	25-5/8 (651)	25 (635)
	15 x 11	Front Throw	15-7/8 (404)	14-1/2 (368)	2-1/8 (54)	25-5/8 (651)	25 (635)
		Rear Throw	15-7/8 (404)	14-1/2 (368)	11-5/8 (295)	25-5/8 (651)	25 (635)

Figure 28 Blower outlet and deck dimensions—upflow, 53-77kW (15-22 ton)



* Duct flanges not provided.

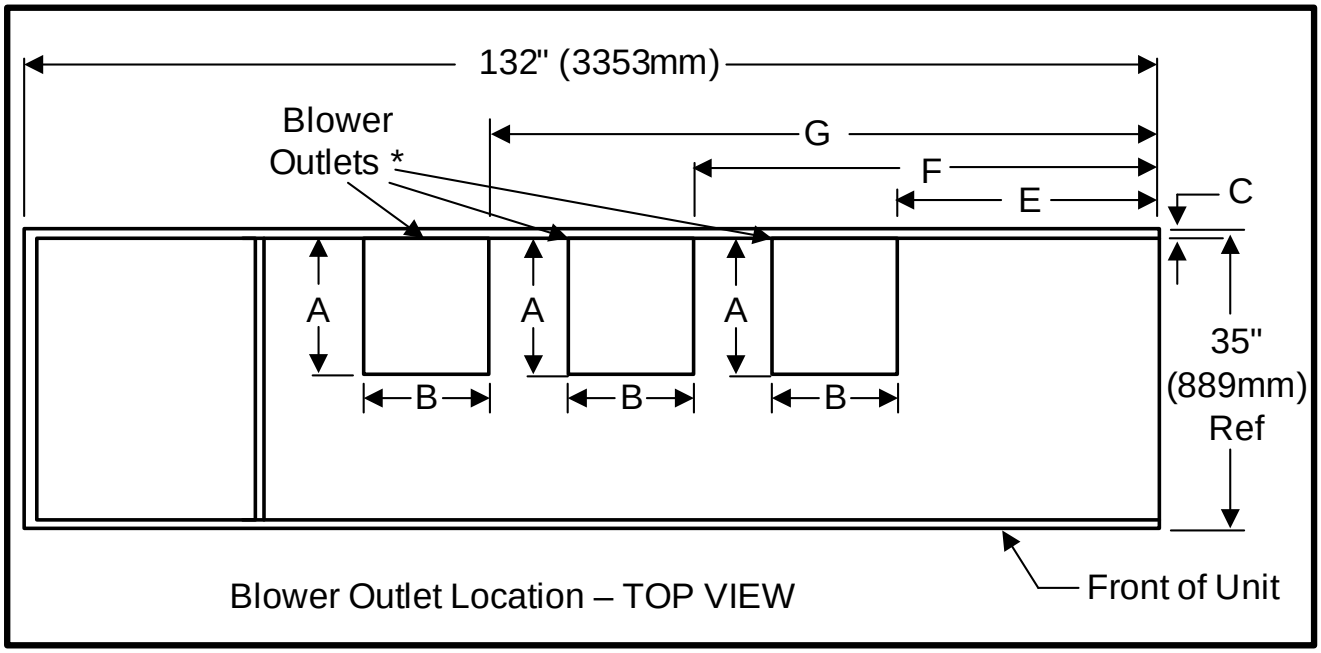


DPN001191
Rev. 4

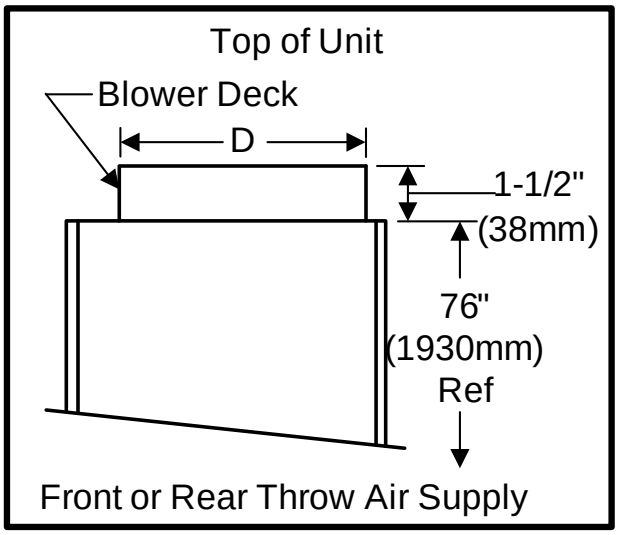
Table 25 Blower outlet and deck dimensional data upflow, 53-77kW (15-22 tons)

Models	Blower	Supply	Dimensional Data, inches (mm)							
			A	B	C	D	E	F	G	H
53-77kW (15-22 Tons)	15 x 15	Front Throw	15-7/8 (404)	18-5/8 (472)	2-1/8 (54)	25-5/8 (651)	27-3/4 (705)	55-1/2 (1410)	25-1/8" (638mm)	50-1/2" (1283mm)
		Rear Throw	15-7/8 (404)	18-5/8 (472)	11-5/8 (295)	25-5/8 (651)	27-3/4 (705)	55-1/2 (1410)	25-1/8" (638mm)	50-1/2" (1283mm)
	15 x 11	Front Throw	15-7/8 (404)	14-11/16 (373)	2-1/8 (54)	25-5/8 (651)	31-3/8 (797)	58-7/16 (1484)	27-3/4" (705mm)	47" (1194mm)
		Rear Throw	15-7/8 (404)	14-11/16 (373)	11-5/8 (295)	25-5/8 (651)	31-3/8 (797)	58-7/16 (1484)	27-3/4" (705mm)	47" (1194mm)

Figure 29 Blower outlet and deck dimensions—upflow 105kW (30ton)



* Duct Flanges Not Provided



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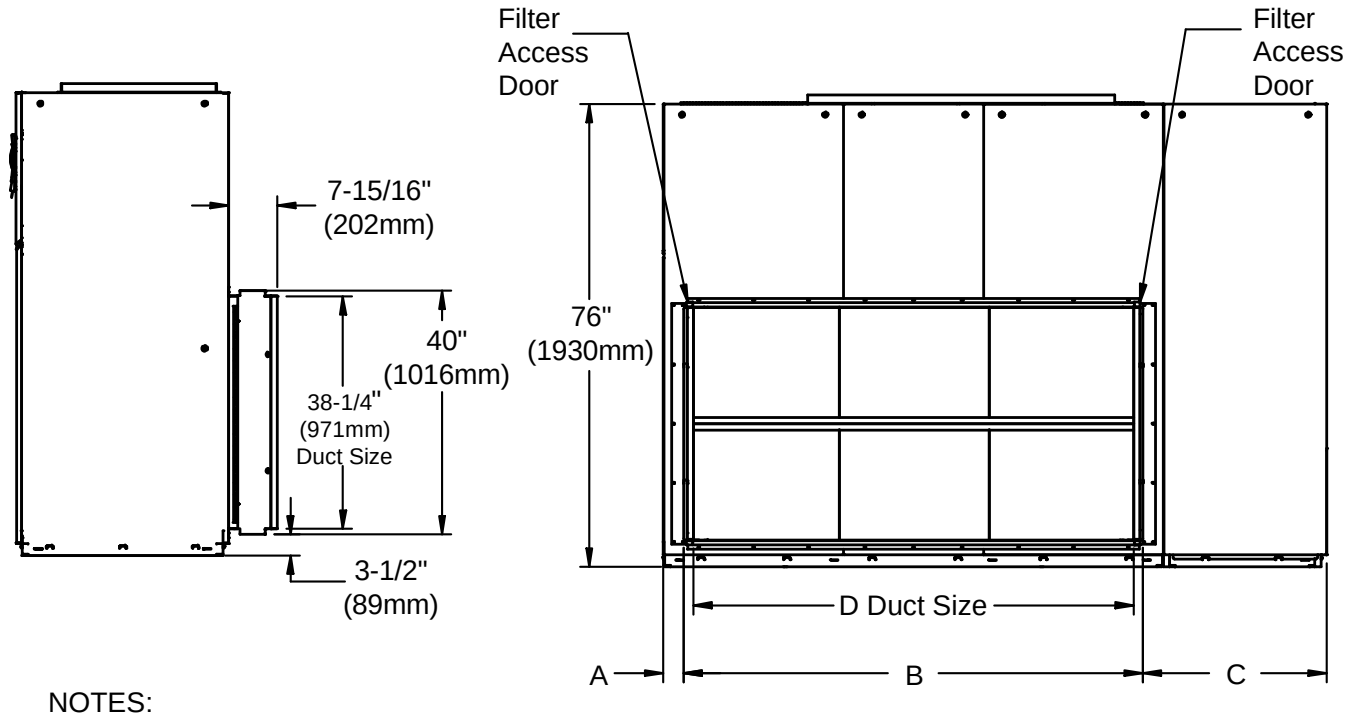
Rev. 0

Table 26 Blower outlet and deck dimensions—upflow 105kW (30ton)

Models	Blower	Supply	Dimensions, in. (mm)						
			A	B	C	D	E	F	G
105kW (30 ton)	15 x 11	Front Throw	15-7/8 (404)	14-11/16 (373)	2-1/8 (54)	25-5/8 (651)	30-3/4 (781)	54-1/2 (1384)	78-1/8 (1984)
		Rear Throw	15-7/8 (404)	14-11/16 (373)	11-5/8 (295)	25-5/8 (651)	30-3/4 (781)	54-1/2 (1384)	78-1/8 (1984)

Figure 30 Rear return filter box dimensions



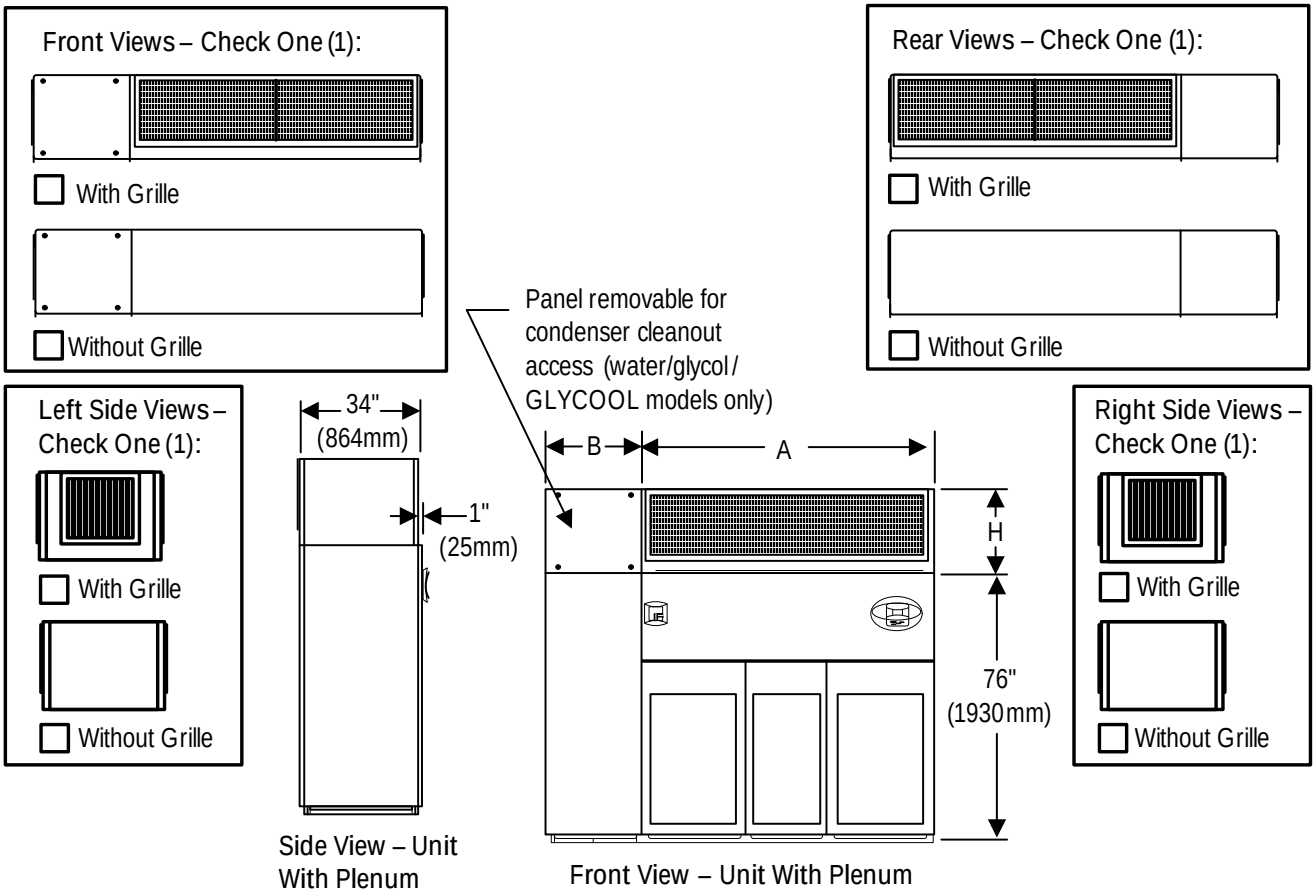
NOTES:
1. Filters can be accessed from either side.
2. 25" (635mm) minimum clearance provided on one side for filter access.
3. Filter boxes are shipped flat and must be field assembled.

DPN001196
Rev. 0

Table 27 Rear return filter box dimensions

Compressor Type	Dimensions, in (mm)				
	A	B	C	D	# Filters
28-42kW (8-12 ton) Air-Cooled Scroll and Air-Cooled Digital Scroll Models	4-1/4 (108)	50-3/4 (1289)	18 (457)	47-5/8 (1210)	4
28-42kW (8-12 ton) Semi-Hermetic and all Water/Glycol/GLYCOOL Models	4-1/4 (108)	50-3/4 (1289)	31 (787)	47-5/8 (1210)	4
53-77kW (15-22 ton) 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
53-77kW (15-22 ton) Semi-Hermetic and all Water/Glycol/GLYCOOL Models	3-1/4 (83)	75-1/2 (1918)	30-1/4 (768)	72-3/8 (1838)	6
105kW (30 ton) All Models	2-1/4 (57)	100-1/4 (2546)	29-1/2 (749)	97-1/8 (2467)	8

Figure 31 Upflow unit plenum dimensions



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

DPN001187
Rev. 0

Table 28 Upflow unit plenum dimensions

Plenum Dimensions, in (mm)				Grille Size, in (mm) - Nominal	
	A	B	H	Front/Rear Grilles	Side Grille
28-42kW (8-12 ton) Air-Cooled Scroll and Air-Cooled Digital Scroll Models	59-1/4 (1505)	13-3/4 (349)	20 (508)	18 x 55 (457 x 1397)	18 x 20 (457 x 508)
28-42kW (8-12 ton) Semi-Hermetic and all Water/Glycol/GLYCOOL Models	59-1/4 (1505)	26-3/4 (679)		18 x 55 (457 x 1397)	18 x 20 (457 x 508)
53-77kW (15-22 ton) Air-Cooled Scroll and Air-Cooled Digital Scroll Models	82-1/4 (2089)	15-3/4 (400)	24 (610)	18 x 78 (457 x 1981)	18 x 20 (457 x 508)
53-77kW (15-22 ton) Semi-Hermetic and all Water/Glycol/GLYCOOL Models	82-1/4 (2089)	26-3/4 (679)		18 x 78 (457 x 1981)	18 x 20 (457 x 508)
105kW (30 ton) All Models	105-1/4 (2673)	26-3/4 (679)	36 (914)	(1) 18 x 20 (457 x 508) (1) 18 x 78 (457 x 1981)	18 x 20 (457 x 508)

5.0 EQUIPMENT INSPECTION AND HANDLING

Upon arrival of the unit and before unpacking it, verify that the labeled equipment matches the bill of lading. Carefully inspect all items for damage, either visible or concealed. For initial access use a 7/32" Allen wrench for panel removal. Damage should be immediately reported to the carrier and a damage claim filed with a copy sent to Emerson Network Power or to your sales representative.

5.1 Packaging Material

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

SAFETY INFORMATION

WARNING

Risk of top-heavy unit falling over. Can cause equipment damage, injury or death.

Read all of the following instructions before attempting to move the unit, lift it, remove packaging or prepare the unit for installation.

CAUTION

Risk of sharp edges, splinters and exposed fasteners. Can cause personal injury.

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

NOTICE

Risk of overhead interference. The unit may be too tall to fit through a doorway while on the skid. Measure the unit and doorway heights and refer to the installation plans to verify clearances prior to moving the unit. If the Liebert DS is too large to fit through doors, halls or other tight spaces, the unit can be partly dismantled as detailed in **7.0 - Disassembling the Liebert DS for Transport**.

NOTICE

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

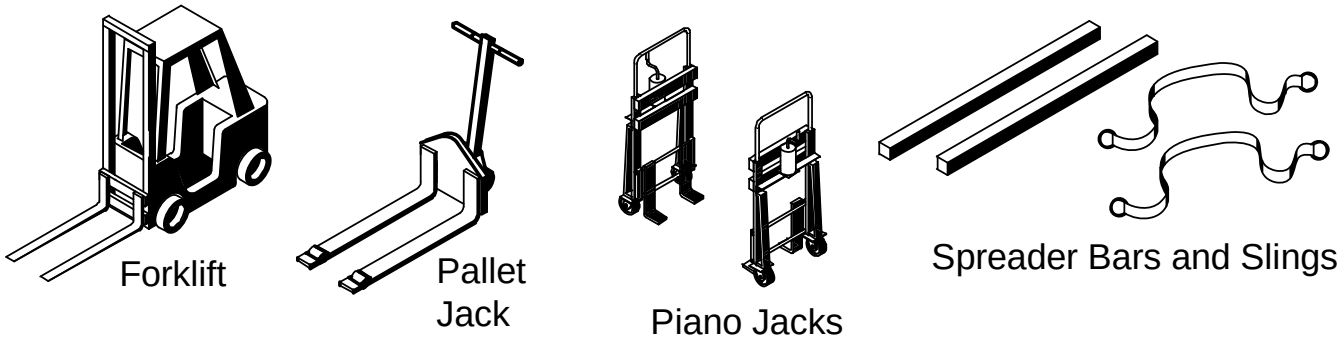
NOTICE

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

NOTICE

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

Figure 32 Equipment recommended for handling Liebert DS



If possible, transport the Liebert DS with a forklift or pallet jacks. If that is not possible, use a crane with belts or cables, slings and spreader bars.

- If using a forklift or pallet jack, make sure that the forks (if adjustable) are spread to the widest allowable distance that will fit under the skid.

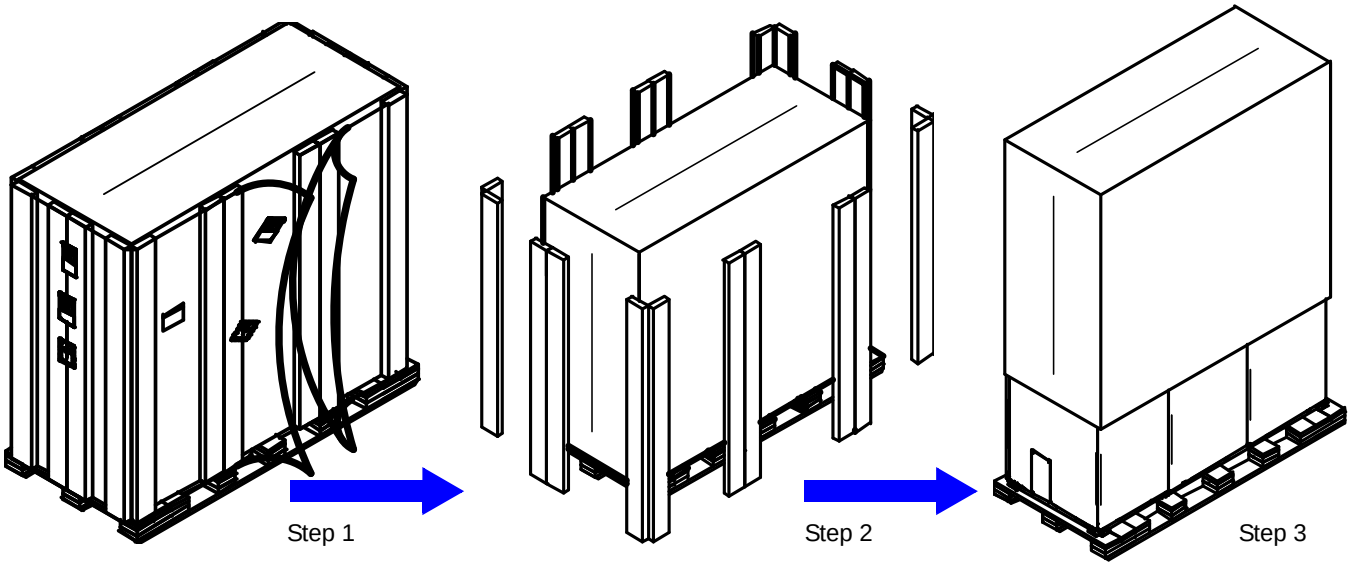
  Ensure the fork length is suitable for the unit length.
- When moving the packaged Liebert DS with a forklift, lift the unit from the designated "heavy side" of the unit no higher than 6" (152mm) off the ground. Ensure that the opposite end still touches the ground.
- The unit is to be pulled by the forklift—If the unit must be lifted higher than 6" (152mm) great care must be exercised: Personnel who are not directly involved in moving the unit must be kept 20' (5m) or farther from the lift point of the unit.
- Always refer to the location of the center of gravity indicators when lifting the Liebert DS (see **Figure 36**).

5.2 Unpacking the Unit

Remove outer packaging when ready to install the unit.

- Remove the exterior stretch wrap packaging material from around the unit, exposing the protective corner and side packaging planks.
- Remove the corner and side packaging planks from the unit, exposing the bag over the unit.
- Remove the bag from the unit when ready to remove the skid and install the unit.

Figure 33 Removing packaging



181659P1
Rev. 5

5.2.1 Removing the Unit from the Skid With a Forklift

1. Align a forklift with either the front or rear side of the unit.

WARNING

Risk of improper moving. Can cause equipment damage, injury or death.

Use the center of gravity indicators on the unit to determine the entry points for the tines (see **Figure 36**). The center of gravity varies depending on the unit size and selected options.

The forklift's tines must be equally spaced on either side of the center of gravity indicator.

2. Insert the tines of the forklift completely under the base of the Liebert DS.

WARNING

Risk of improper moving. Can cause equipment damage, injury or death.

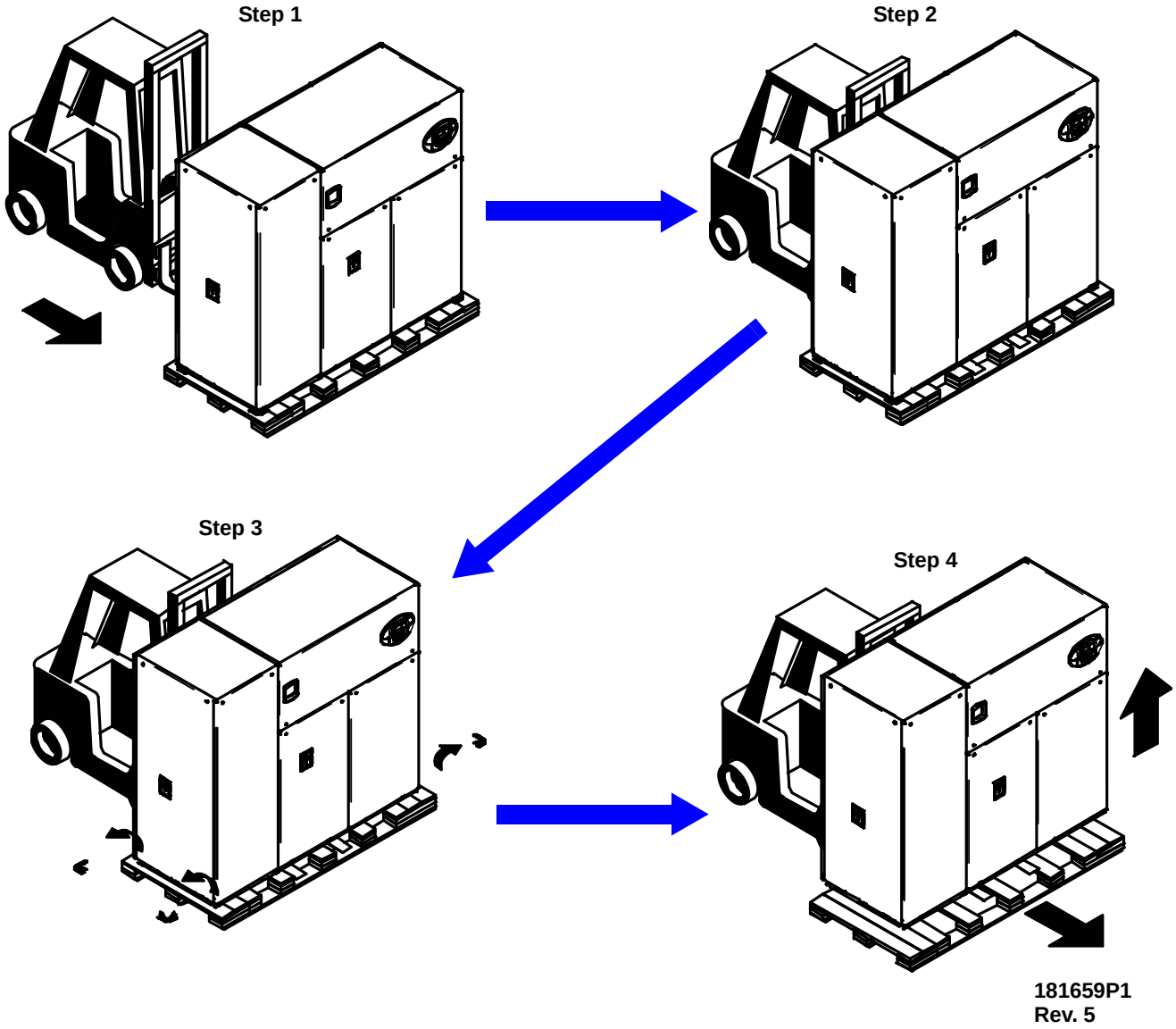
Ensure that the tines are level, not angled up or down.

The tines must be at a height that will allow proper clearance under the unit.

Ensure the tines extend beyond the opposite side of the unit.

3. Remove the lag bolts from each bracket holding the Liebert DS to the skid.
4. Lift the unit off the skid—no more than 6" (152mm)—and remove the skid.

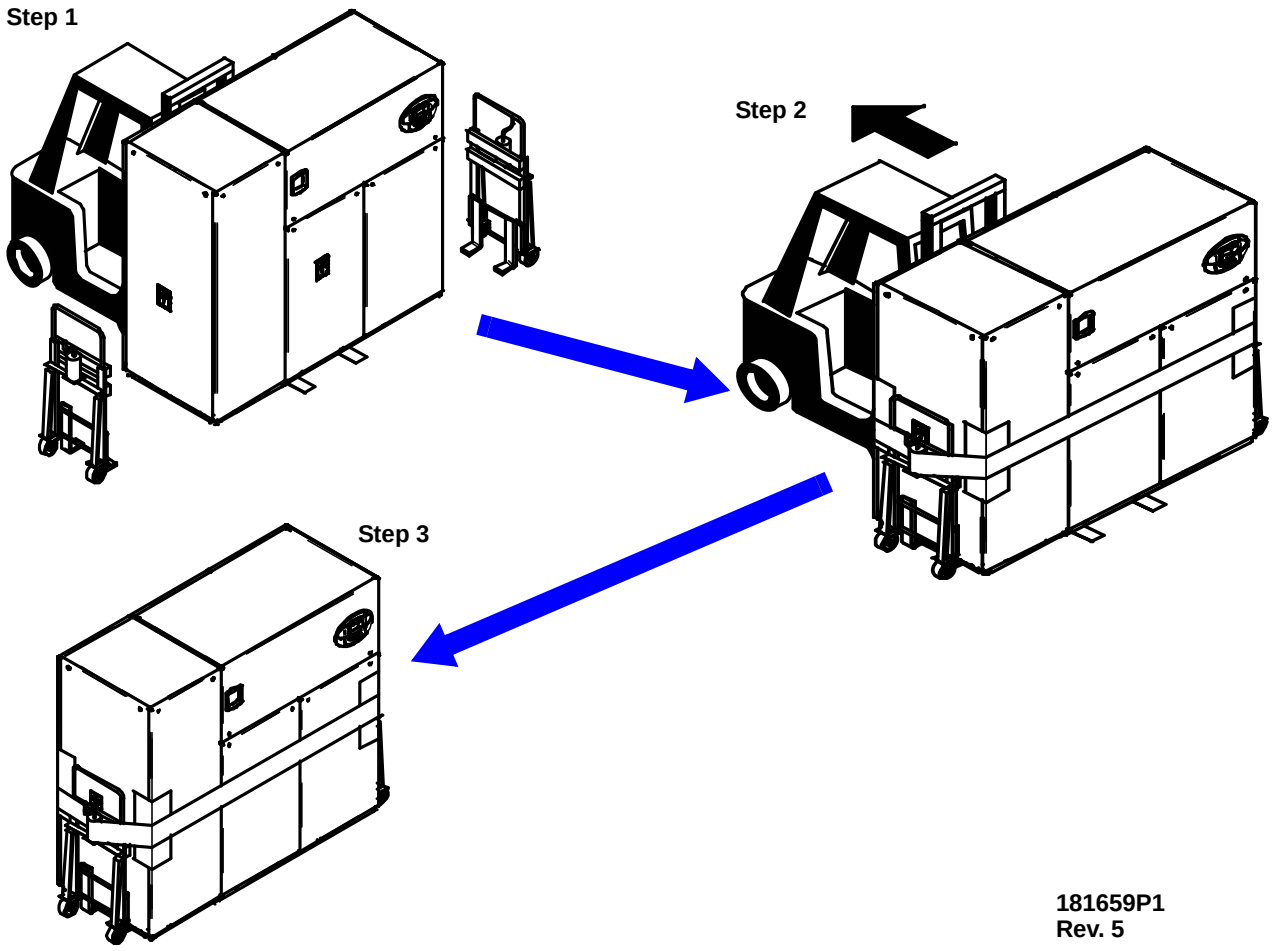
Figure 34 Remove the unit from the skid



5.2.2 Moving the Unit to the Installation Location with Piano Jacks

1. With the Liebert DS elevated, place two piano jacks into position—one at either end of the unit.
2. Lower the unit to a height suitable for the piano jacks and place protective material between the Liebert DS and the piano jacks.
3. Secure the unit to the piano jacks and remove the forklift.
4. Use the piano jacks to move the unit for installation.

Figure 35 Moving the unit to its installation location



5.2.3 Removing Piano Jacks

1. Lower the unit as much as the piano jacks will allow.
2. Undo all strapping holding the piano jacks to the unit.
3. Use a pry bar or similar device to lift one end of the unit just enough to allow removal of the piano jack from that end.
4. Repeat **Step 3** to remove the piano jack on the opposite end.
5. Remove all material that might have been used to protect the unit from the piano jacks and strapping.

5.2.4 Removing Liebert DS from Skid Using Rigging

WARNING

Risk of improper moving. Can cause equipment damage, injury or death.

Use the center of gravity indicators (see **Figure 36**) on the unit to determine the position of the slings. The center of gravity varies depending on the unit size and selected options.

The forklift's tines must be equally spaced on either side of the center of gravity indicator.

1. Space the slings equidistant on either side of the center of gravity indicator (see **Figure 36**).

Figure 36 Locate center of gravity marker and place slings

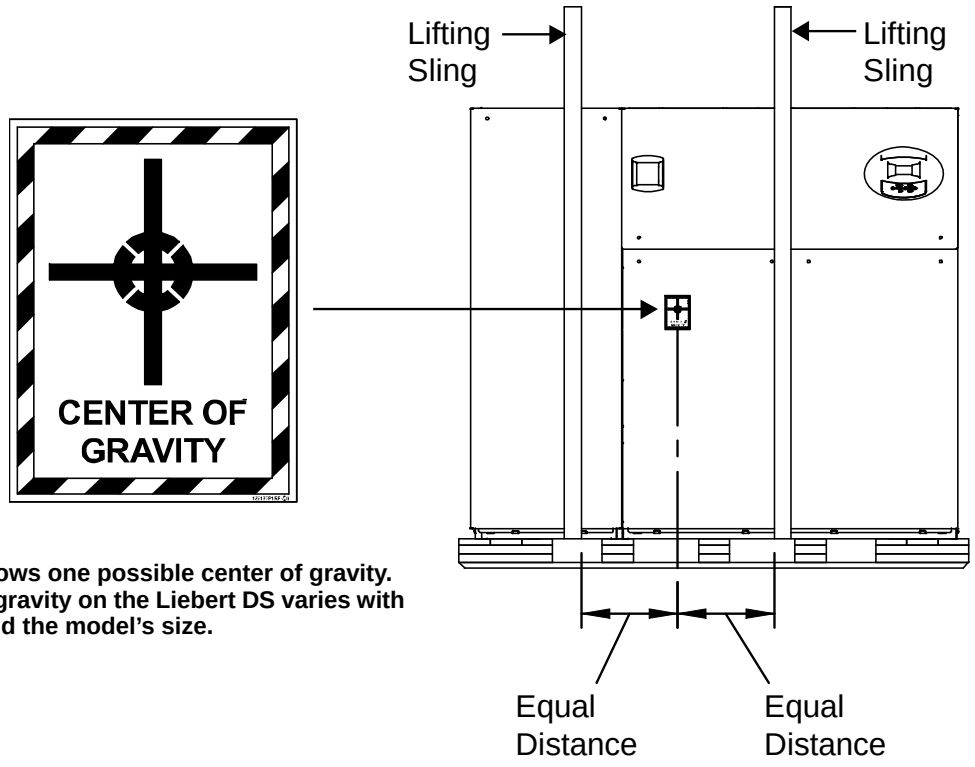


Illustration shows one possible center of gravity. The center of gravity on the Liebert DS varies with the options and the model's size.

181659P1 Rev. 5

2. Place the slings between the bottom rails of the Liebert DS and the top of the skid.

NOTE

Unit is shown without packaging. These instructions may be applied with the outer packaging in place.

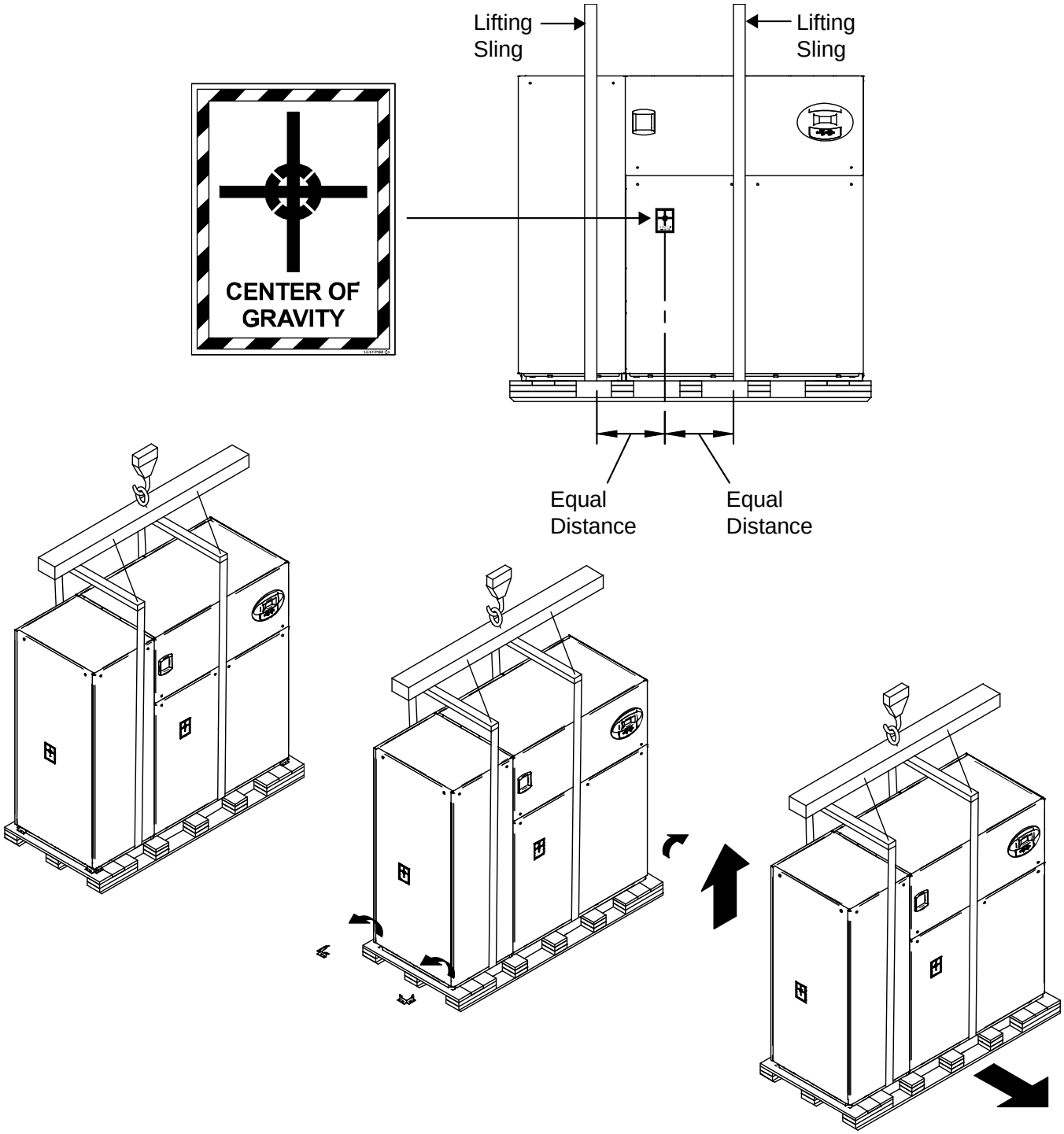
3. Use spreader bars or a similar device and padding to ensure the Liebert DS will not be damaged when the unit is lifted. Lifting will force the slings toward the Liebert DS and the slings may damage the unit unless it is properly protected.
4. Remove the lag bolts from the bracket securing the Liebert DS to the shipping skid.
5. Remove the brackets.

NOTE

Depending on final installation location, the skid may need to remain under the unit. Therefore, the lag bolts and brackets would not yet be removed.

6. Lift the Liebert DS off the skid.
7. Move the skid from under the unit.

Figure 37 Using rigging to lift Liebert DS off skid



5.3 Semi-Hermetic Compressor Spring Isolation System

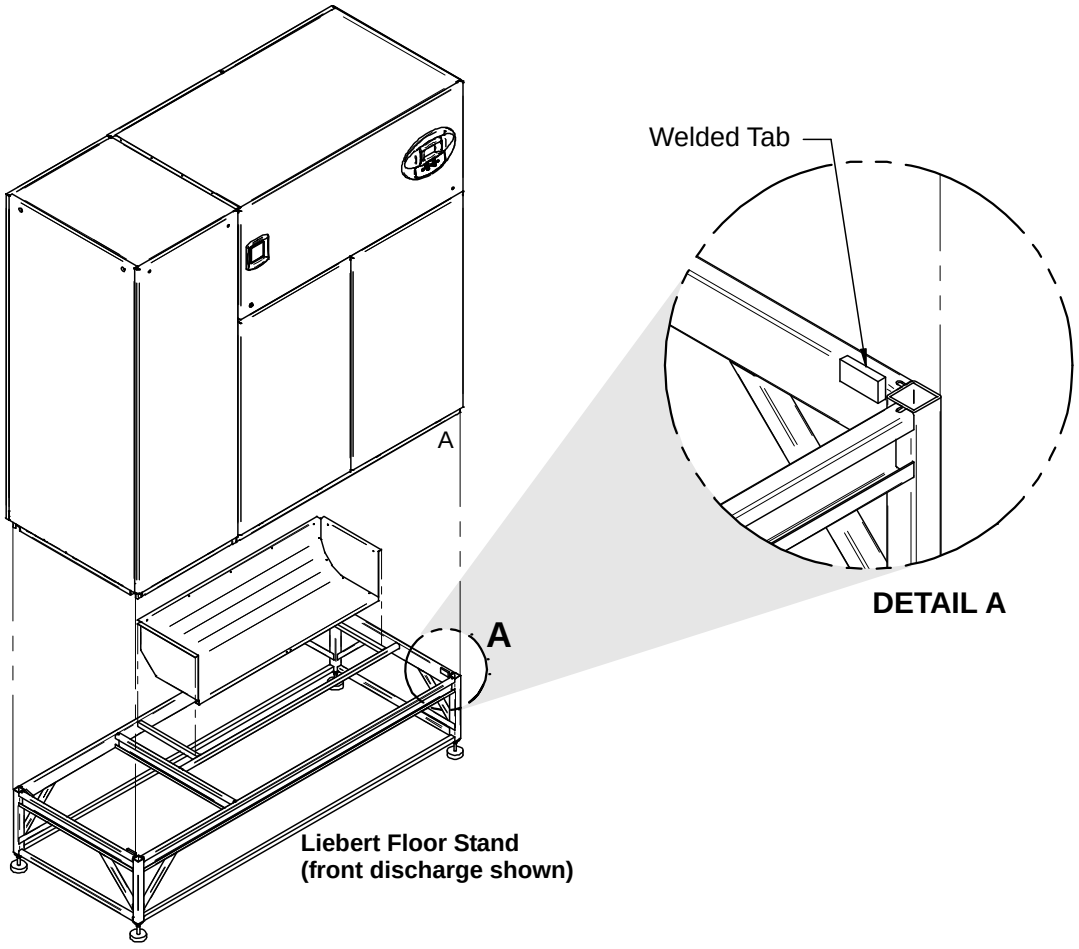
Shipping blocks under all semi-hermetic compressors must be removed and the springs must be adjusted before startup.

1. Loosen nuts at each of the four compressor feet and remove the two shipping blocks.
2. Beginning with one compressor foot, retighten nut until the washer under the nut can no longer be rotated by finger.
3. Loosen the nut half a turn. The washer will be slightly loose.
4. Repeat for remaining feet and recheck all when done

5.4 Placing the Unit on a Floor Stand

Liebert Floor Stand—Ensure that the optional turning vane is installed in the floor stand (if included) prior to placing the unit. Refer to the floor stand installation sheet, 182278P1, located inside the floor stand package. Lower the unit onto the floor stand. Refer to Detail A in **Figure 38**. Be sure to align the welded tabs on top of the floor stand with the inside of the unit frame base.

Figure 38 Setting the unit on a floor stand



NOTE

*The floor stand for Liebert DS units equipped with EC fans is not symmetrical. Its orientation to the Liebert DS unit is critical for lowering the EC fans. Unless the floor stand is installed in the correct position, shown in **Figures 24** and **26**, the fans will not lower into the floor stand.*

6.0 EC FANS—LOWERING AND REMOVING

Liebert DS downflow models DS053, DS070, DS077 and DS105 can be equipped with EC fans that can be operated either in their fully raised position or lowered into the floor stand for increased efficiency from reduced air resistance.

The fans are also removable, easing maintenance and replacement.

WARNING

Risk of electric shock and high speed rotating fan blades. Can cause injury or death.

Disconnect all local and remote electric power supplies and verify that fan blades have stopped rotating before working within.

WARNING

Risk of very heavy fan modules dropping downward suddenly. Can cause injury or death.

Support fan modules before removing mounting hardware.

Use caution to keep body parts out of the fan modules pathway during repositioning.

Only properly trained and qualified personnel should work on this equipment.

Fan modules weigh in excess of 100 lbs (45.4kg) each.

NOTE

The Liebert DS unit should be used with the fans either in their original raised position or with the fans in their fully lowered position. Suspension of fans in an intermediate position will directly affect product performance and is not recommended.

6.1 Lowering the EC Fans into the Floor Stand

Tools Needed

- 1/2" hex socket & wrench
- Factory-supplied jack, crank and jack support
- cable tie cutter

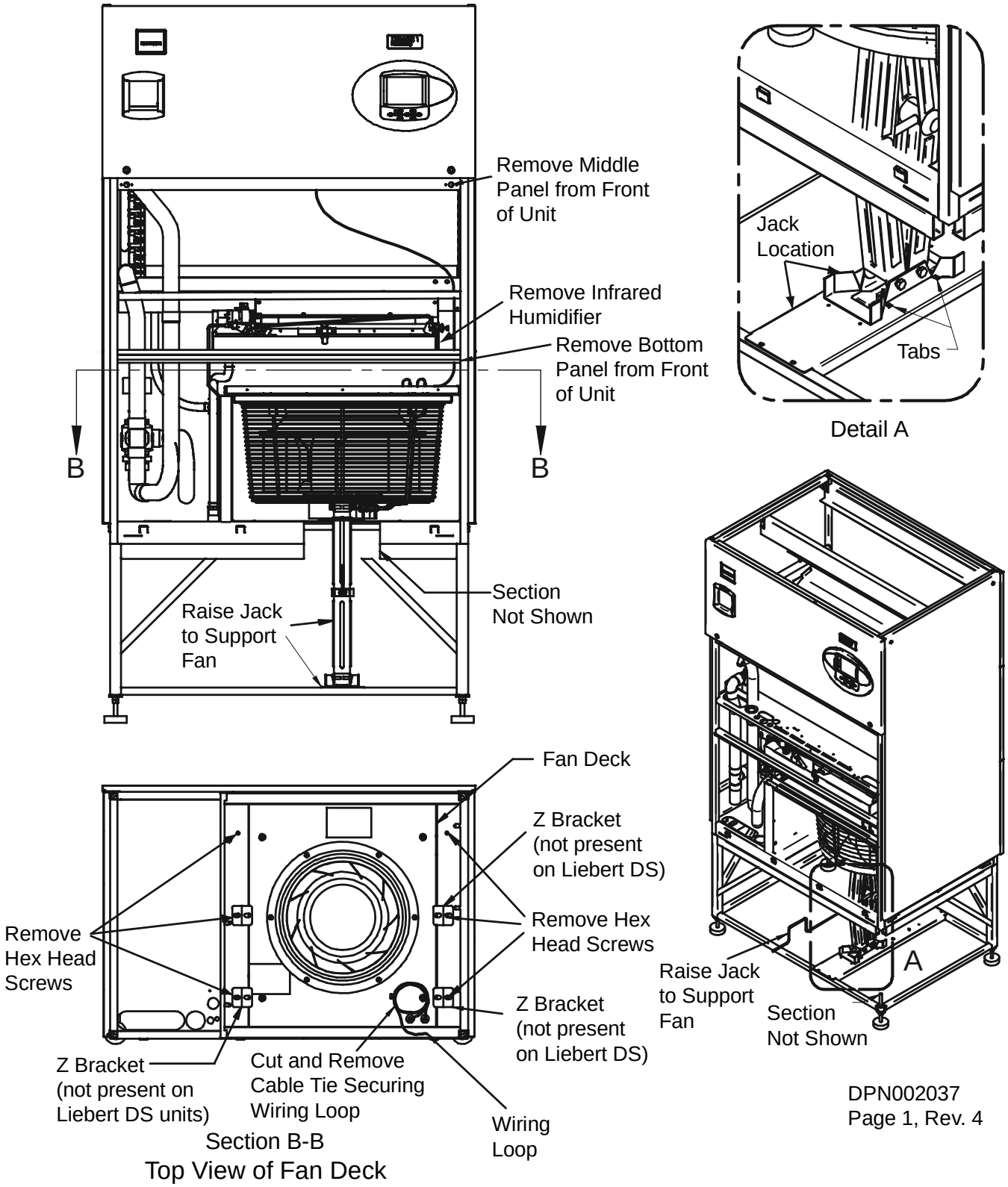
1. Remove the middle and bottom panels from the front of the unit.
2. For ease of fan lowering, Emerson recommends removing the infrared humidifier using the approved infrared humidifier removal procedure.
3. Position the factory-supplied jack and jack support under the fan to be lowered.
4. Raise the jack to safely support the fan before removing any hardware.

NOTE

A properly positioned jack will be centered between the first and second set of tabs on the jack support. The jack will be biased towards the front of the unit.

5. Cut and remove the cable tie that retains the wiring loop to the blower mounting plate. All other cable ties that route the fan wiring should remain intact.
6. Remove the six 1/2" hex head screws. Retain the hardware for later use.

Figure 39 Lowering EC fans into floor stand, Steps 1 through 6



7. Using the jack, lower the fan module slowly until it rests on the frame of the unit.

NOTICE

Risk of equipment snagging cables and wiring. Can damage the Liebert DS components.

Monitor the position of the fan harnesses and other parts while lowering the fan to be sure that they are not caught or pinched.

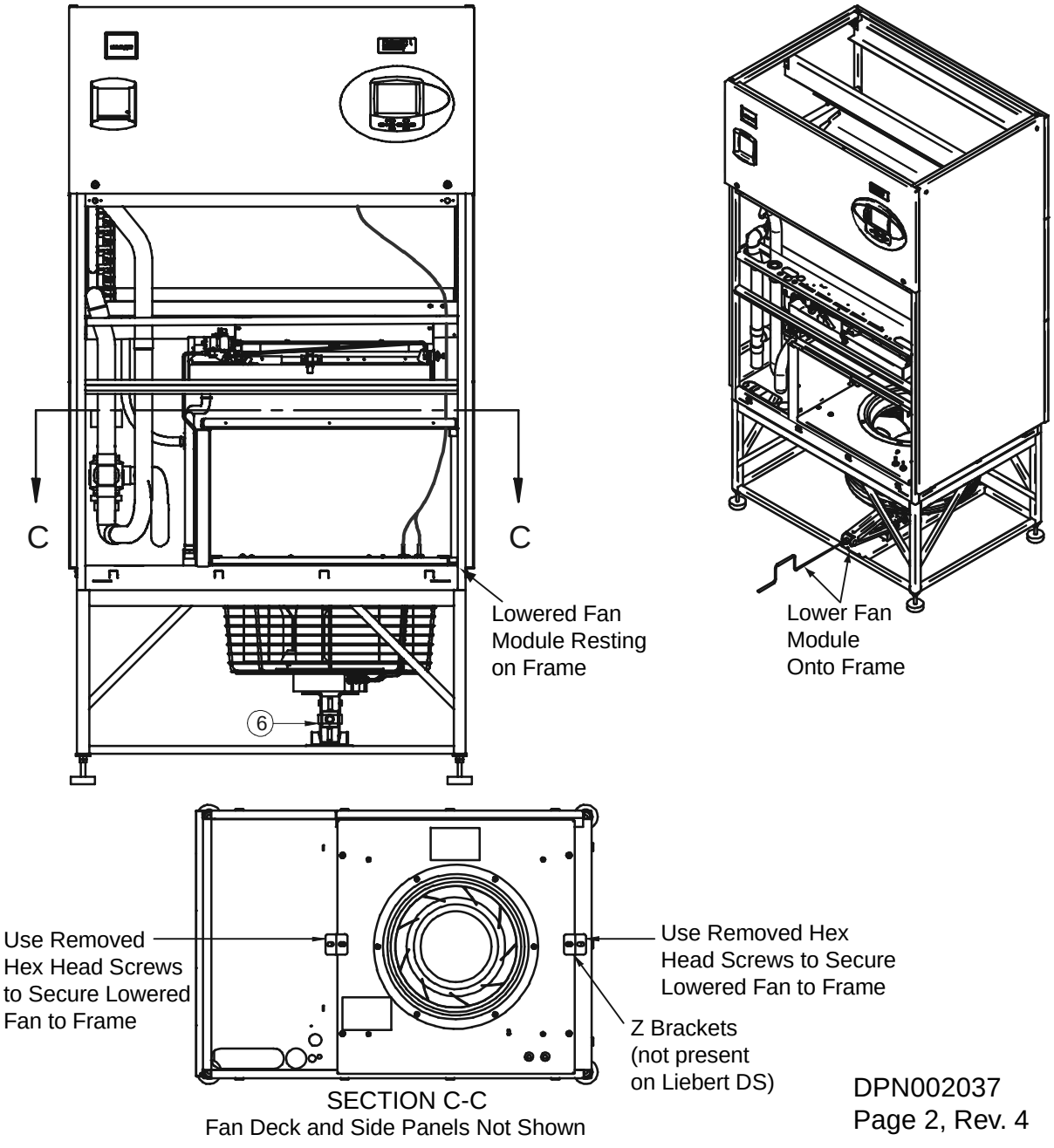
8. Secure the fan module in the fully lowered position by re-installing the hex head screws directly to the frame. Screw clearance holes are provided in the fan module.

NOTE

Not all hardware retained will be used to secure the fans in the lowered positioned.

9. Repeat **Steps 3** through **8** to lower remaining fan modules.

Figure 40 Lowering EC fans into floor stand, Steps 7 through 9



6.2 Removing the EC Fans

The EC fans in Liebert DS units can be removed for easier maintenance or for replacement.

WARNING

Risk of electric shock and high speed rotating fan blades. Can cause injury or death.

Disconnect all local and remote electric power supplies and verify that fan blades have stopped rotating before working within.

WARNING

Risk of very heavy fan modules dropping downward suddenly. Can cause injury or death.

Support fan modules before removing mounting hardware.

Use caution to keep body parts out of the fan modules pathway during repositioning.

Only properly trained and qualified personnel should work on this equipment.

Fan modules weigh in excess of 100 lbs (45.4kg) each.

NOTE

The Liebert DS unit should be used with the fans either in their original raised position or with the fans in their fully lowered position. Suspension of fans in an intermediate position will directly affect product performance and is not recommended.

1. Remove the middle and bottom panels from the front of the unit.
2. For ease of fan removal, Emerson recommends removing the infrared humidifier using the approved infrared humidifier removal procedure.
3. If the fan to be removed has been lowered into the floor stand, position the factory supplied jack and jack support under the fan module so it is safely supported before removing any hardware.

NOTE

A properly positioned jack will be centered between the first and second set of tabs on the jack support. The jack will be biased toward the front of the unit. If the fan module is fully raised, proceed to ***Step 6****.*

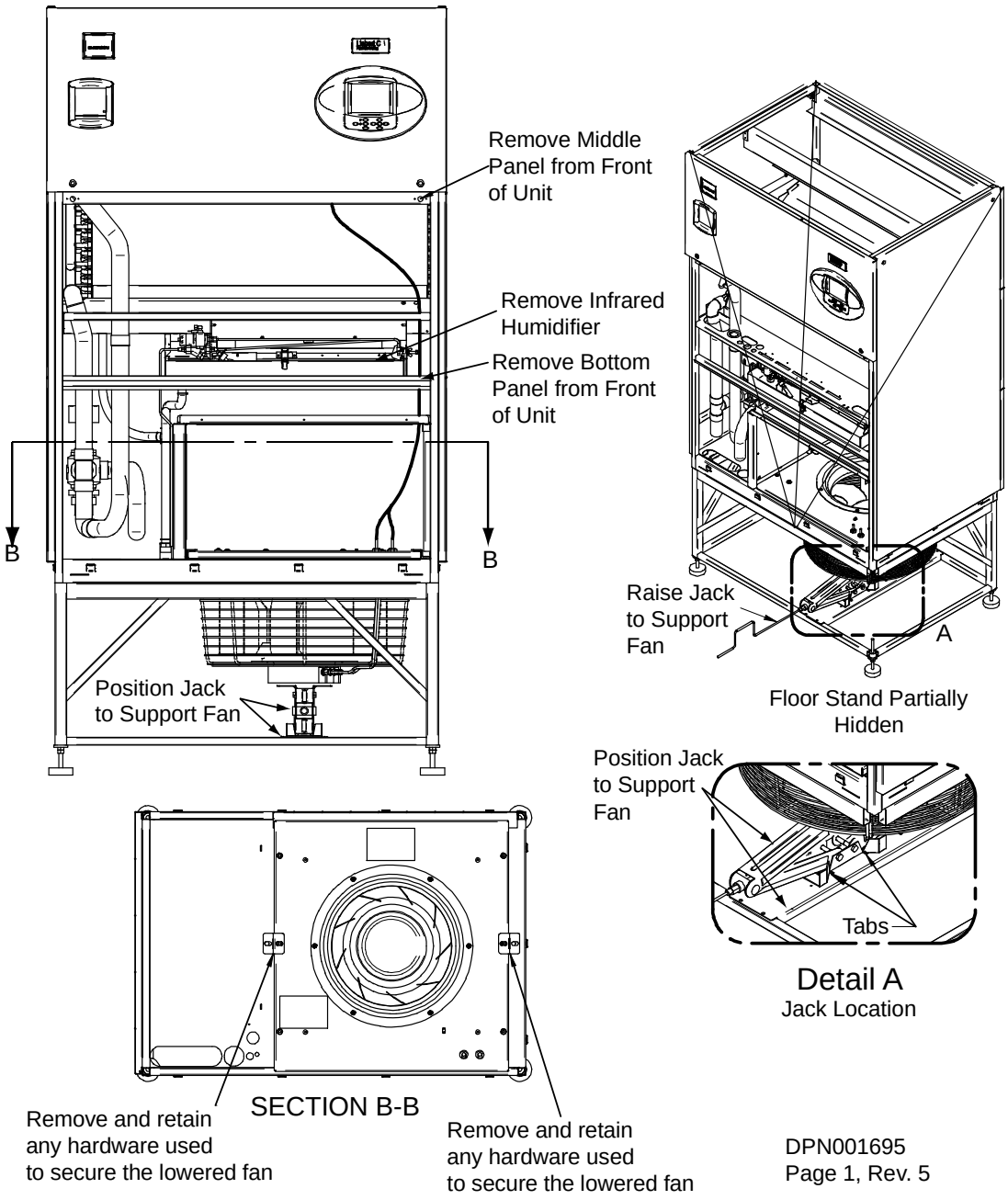
4. Remove any securing hardware used to retain the fan in the lowered position. Retain hardware for fan module reinstallation.
5. Use the jack to raise the fan module slowly out of the floor stand and into the unit, ensuring that the fan motor clears the front frame channel.

NOTICE

Risk of equipment snagging cables and wiring. Can cause unit damage.

Monitor the position of the fan harnesses and other parts while raising the fan to be sure that they are not caught or pinched while the fan is being raised.

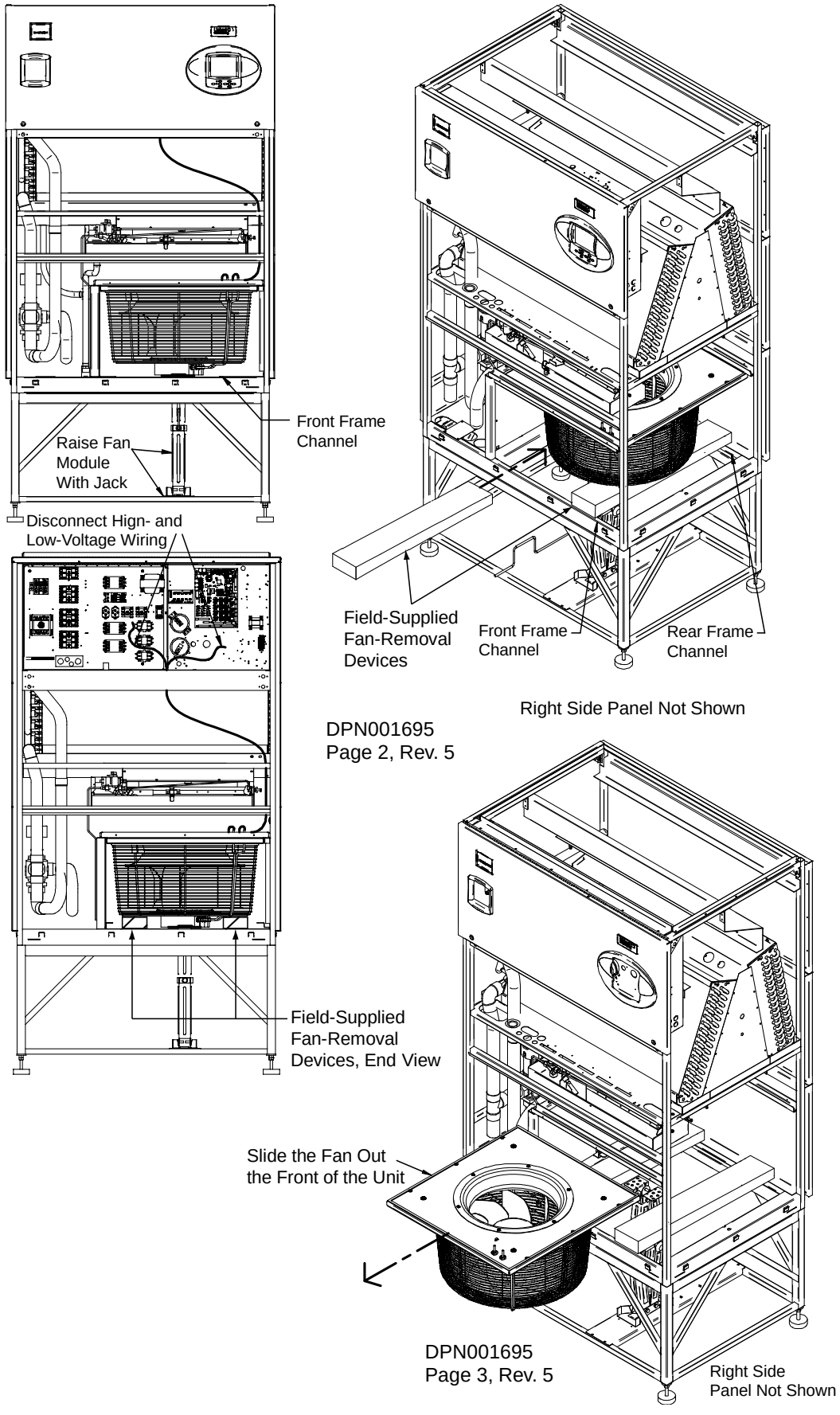
Figure 41 Removing the EC fans, Steps 1 through 5



6. Insert a field-supplied fan removal device under the fan module. The fan removal device should rest securely on the front and rear frame channels.
7. Disconnect high-voltage and low-voltage fan motor wiring from the fan motor electric component inside the electric panel. Carefully cut cable ties as needed.
8. Using the removal device, slide the fan module out through the front of the unit.
9. To reinstall the fan module, reverse the steps above. Remove the field-supplied fan removal device before resuming unit operation.

NOTE
Refer to the unit's electrical schematic for specific wire attachment points.

Figure 42 Removing the EC fans, Steps 6 through 9



7.0 DISASSEMBLING THE LIEBERT 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 explosive discharge from high-pressure refrigerant. Can cause injury or death.

This unit contains fluids and/or gases under high pressure. Relieve pressure before working with piping, compressors or other internal components.

WARNING

Risk of top heavy unit falling over. Improper handling can cause equipment damage, injury, or death.

Read all instructions before attempting to move or lift unit. Installation and service of this equipment should be done only by properly trained and qualified personnel who have been specially trained in the installation of air conditioning equipment.

CAUTION

Risk of sharp edges and heavy parts. Can cause personal injury.

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

CAUTION

Risk of handling heavy and lengthy parts. Can cause personal injury and equipment damage.

Cabinet panels can exceed 5ft. (1.5m) in length and weigh more than 35lb. (15.9kg). Follow relevant OSHA lifting recommendations and consider using a two-person lift for safe and comfortable removal and installation of cabinet panels. Only properly trained and qualified personnel wearing appropriate safety headgear, gloves and shoes should attempt to remove or install cabinet panels.

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 Liebert DS may affect warranty.

7.1 Required Equipment

- Piano jacks
- Stepladder for downflow units
- Refrigeration tools

7.2 Disassembly—Downflow Units

For detailed views of downflow units, see **Figures 43** through **51**.

1. Remove the unit from its shipping skid before beginning (refer to **5.2 - Unpacking the Unit**).
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 deadfront panel for details.

   # NOTICE

   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 Liebert DS.
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).
       For steam generating humidifiers: Remove the quick-connect plugs from the following low-voltage connections: 35-1, H-24H and H-24G, and 35-7 and HAR-24H.
    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.
       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 Liebert DS.

    Air-cooled units are shipped with a nitrogen holding charge. Water, glycol and GLYCOOL units are factory-charged with refrigerant. Refer to **9.0 - Piping** for piping guidelines and to the ASHRAE Refrigeration Handbook for general, good-practice refrigeration piping.

    # NOTICE

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

    Emerson recommends front-seating the compressor service valves. Front-seating the valves keeps the nitrogen or refrigerant charge in the compressor and prevents moisture from contaminating the compressor oil. 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 nitrogen bleed out before cutting all the way through the pipe.

NOTE

Emerson does not recommend unsweating refrigerant connections.

21. Unsweat 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.

7.2.1 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

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 Liebert DS. Do not remove shipping blocks from semi-hermetic compressors until the Liebert DS is fully reassembled and ready for installation.

NOTE

Emerson recommends using piano jacks when moving this section.

7.2.2 Remove the Filter and Electric Box Assembly

1. Using a stepladder to reach the top of the Liebert DS, 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 Liebert DS.
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. Emerson recommends 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 Liebert DS to the installation location.

7.3 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. (25Nm)
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.

7.3.1 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 **9.0 - Piping** for piping guidelines and 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 Liebert DS 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.

7.4 Reassembly Checklist

___ 1. Thread-cutting bolts reconnected and torqued to 225 in-lb. (25Nm)

___ 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. Unit recharged

___ 10. Filters replaced

___ 11. Panels replaced

Figure 43 Component dimensions—downflow, air-cooled, 28-42kW (8-12 ton), semi-hermetic compressor models

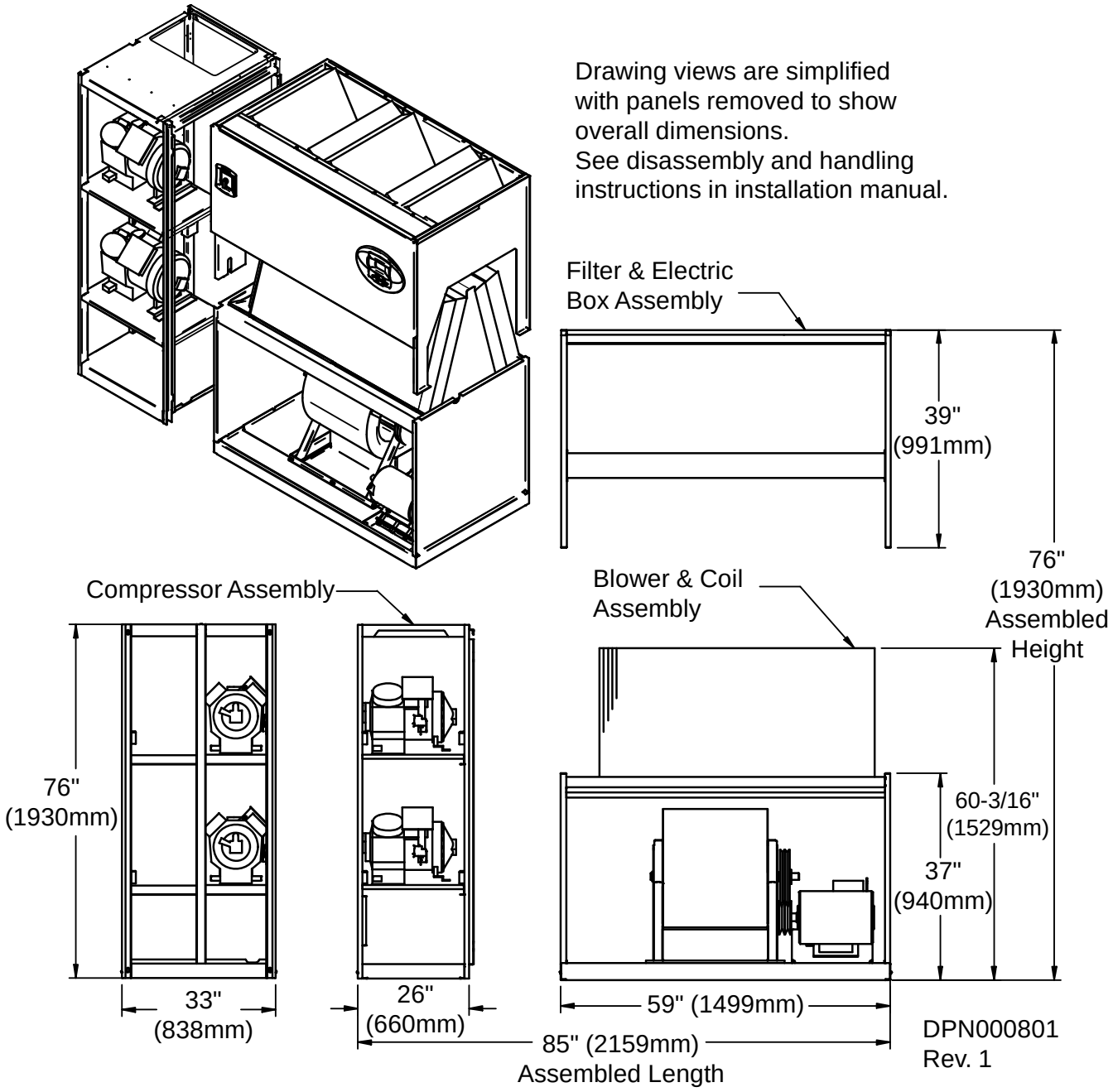


Table 29 Component weights—downflow, air-cooled, 28-42kW (8-12 ton), semi-hermetic

Dry Weight, Approximate, Including Panels, lb (kg)		
Component	**Air-Cooled**	**Dual-Cool**
Compressor Assembly	800 (364)	800 (364)
Filter & Electric Box Assembly	210 (96)	210 (96)
Blower & Coil Assembly	770 (350)	920 (418)

Figure 44 Component dimensions—downflow, air-cooled, 28-42kW (8-12 ton), scroll/digital scroll compressor models

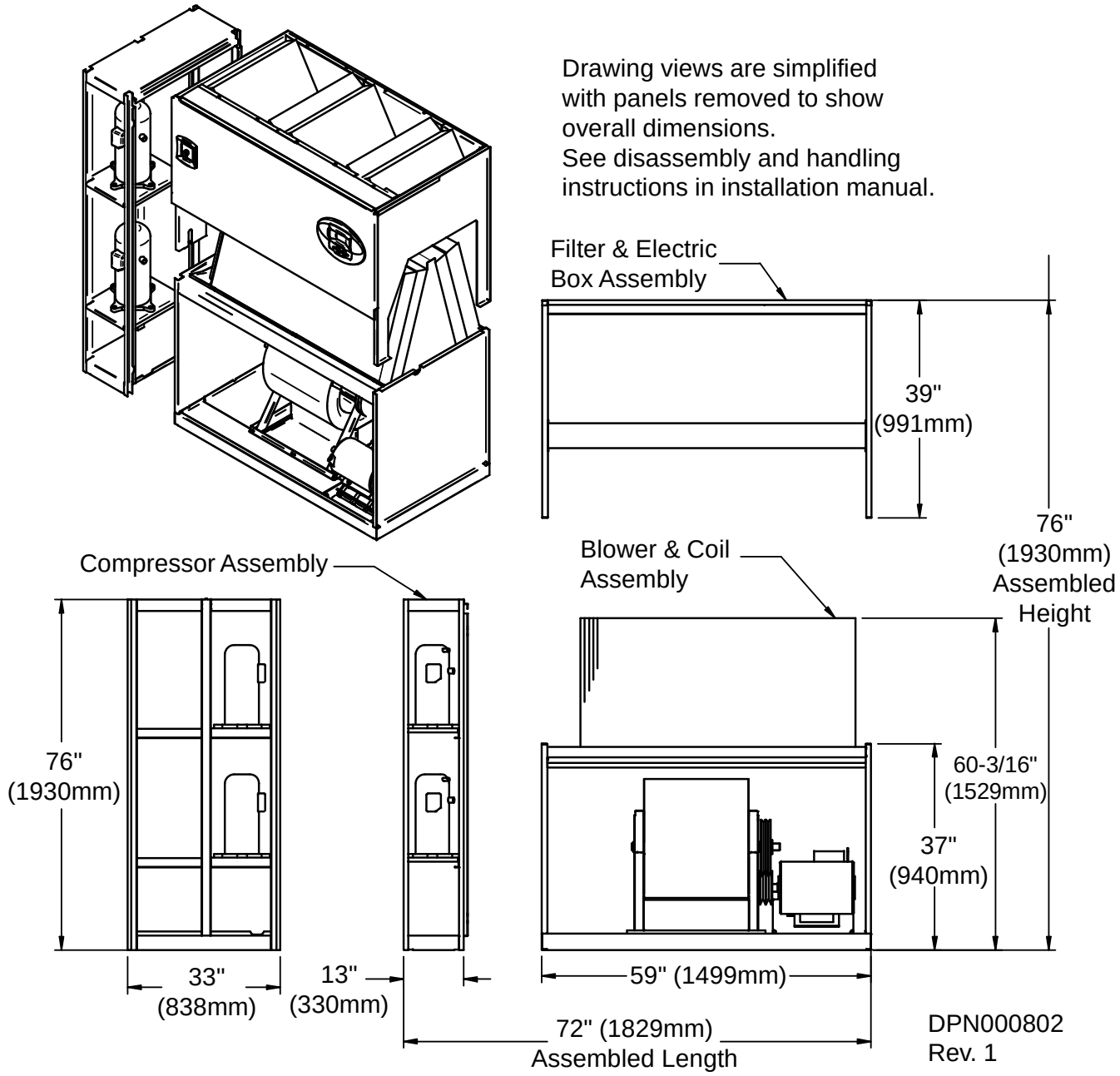


Table 30 Component weights—downflow, air-cooled, 28-42kW (8-12 ton), scroll/digital scroll

Dry Weight, Approximate, lb. (kg)		
Component	**Air-Cooled**	**Dual-Cool**
Compressor Assembly	490 (223)	490 (223)
Filter & Electric Box Assembly	210 (96)	210 (96)
Blower & Coil Assembly	770 (350)	920 (418)

Figure 45 Component dimensions—downflow, water/glycol/GLYCOOL, 28-42kW (8-12 ton), all compressor models

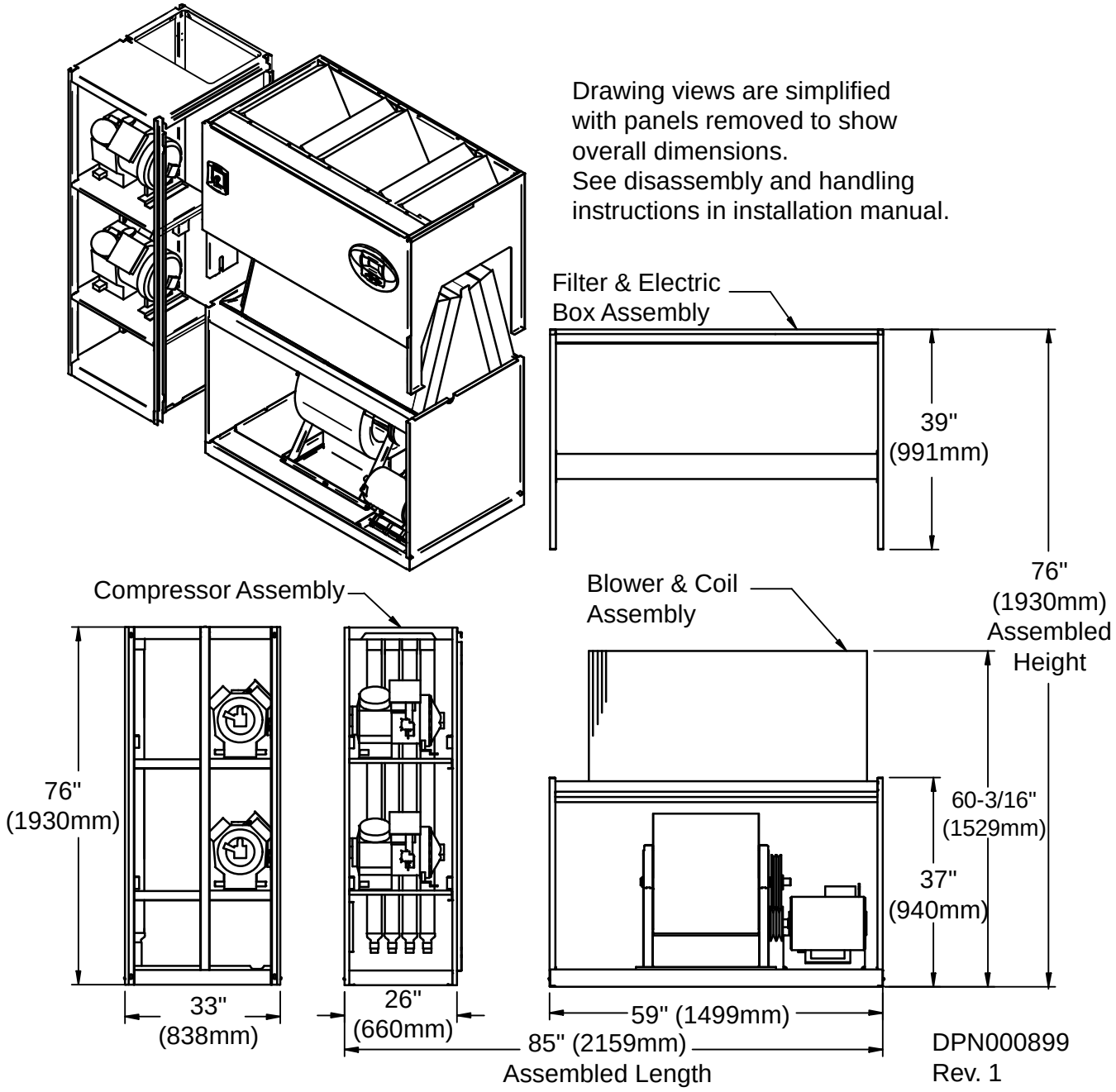


Table 31 Component weights—downflow, water/glycol/GLYCOOL, 28-42kW (8-12 ton), all

Dry Weight, Approximate, Including Panels, lb (kg)				
	Semi-Hermetic Compressor		Scroll or Digital Scroll Compressor	
Component	**Water/Glycol**	**GLYCOOL/Dual-Cool**	**Water/Glycol**	**GLYCOOL/Dual-Cool**
Compressor Assembly	950 (432)	950 (432)	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)

Figure 46 Component dimensions—downflow, air-cooled, 53-77kW (15-22 ton), semi-hermetic compressor models; forward-curved and EC fan

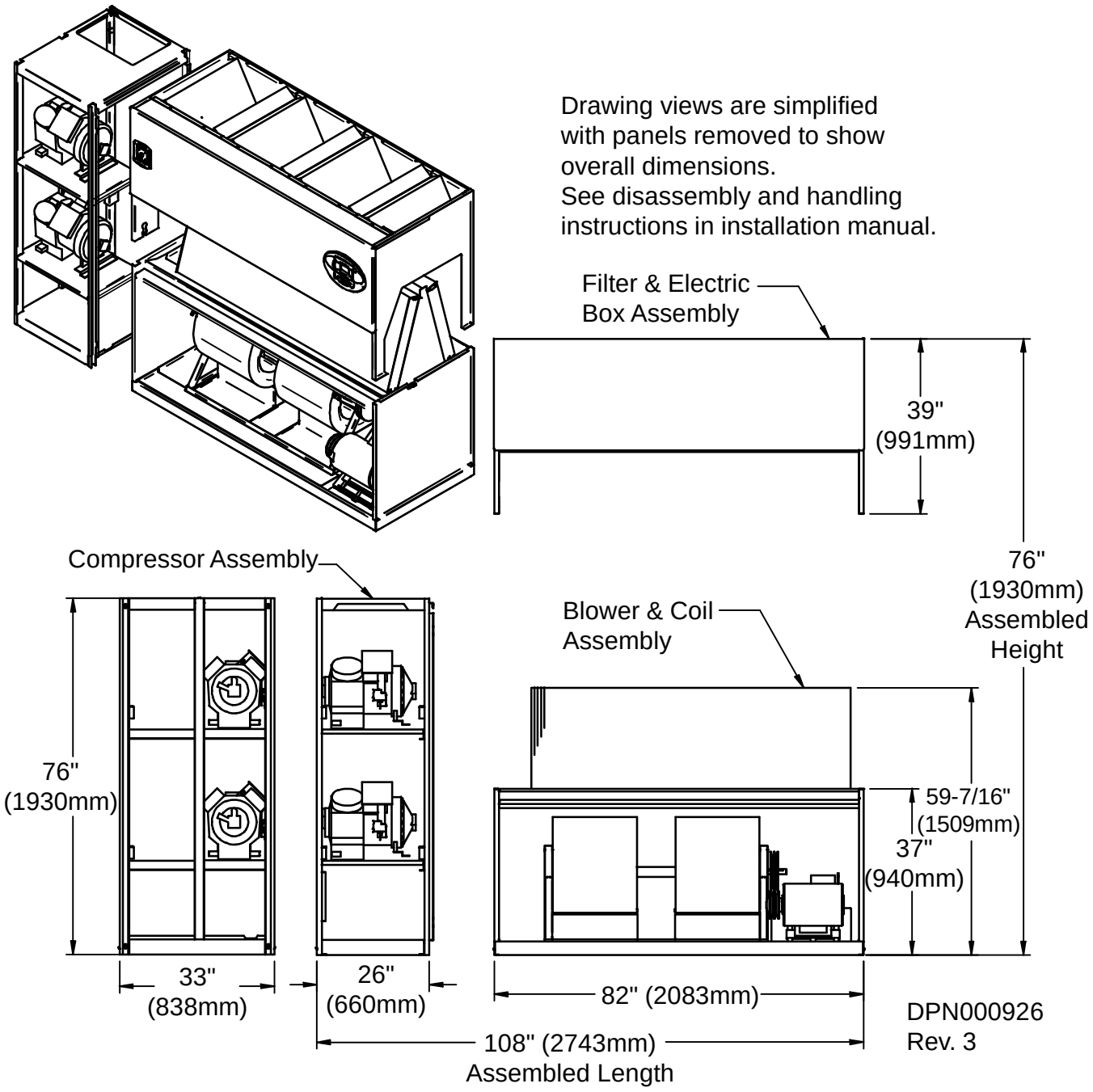


Table 32 Component weights—downflow, air-cooled, 53-77kW (15-22 ton), semi-hermetic; forward-curved and EC fan

Dry Weight, Approximate, Including Panels, lb (kg)		
Component	**Air-Cooled**	**Dual-Cool**
Compressor Assembly	970 (441)	970 (441)
Filter & Electric Box Assembly	250 (114)	250 (114)
Blower & Coil Assembly	1230 (560)	1410 (641)

Figure 47 Component dimensions—downflow air-cooled, 53-77kW (15-22 ton), scroll/digital scroll compressor models; forward-curved and EC fan

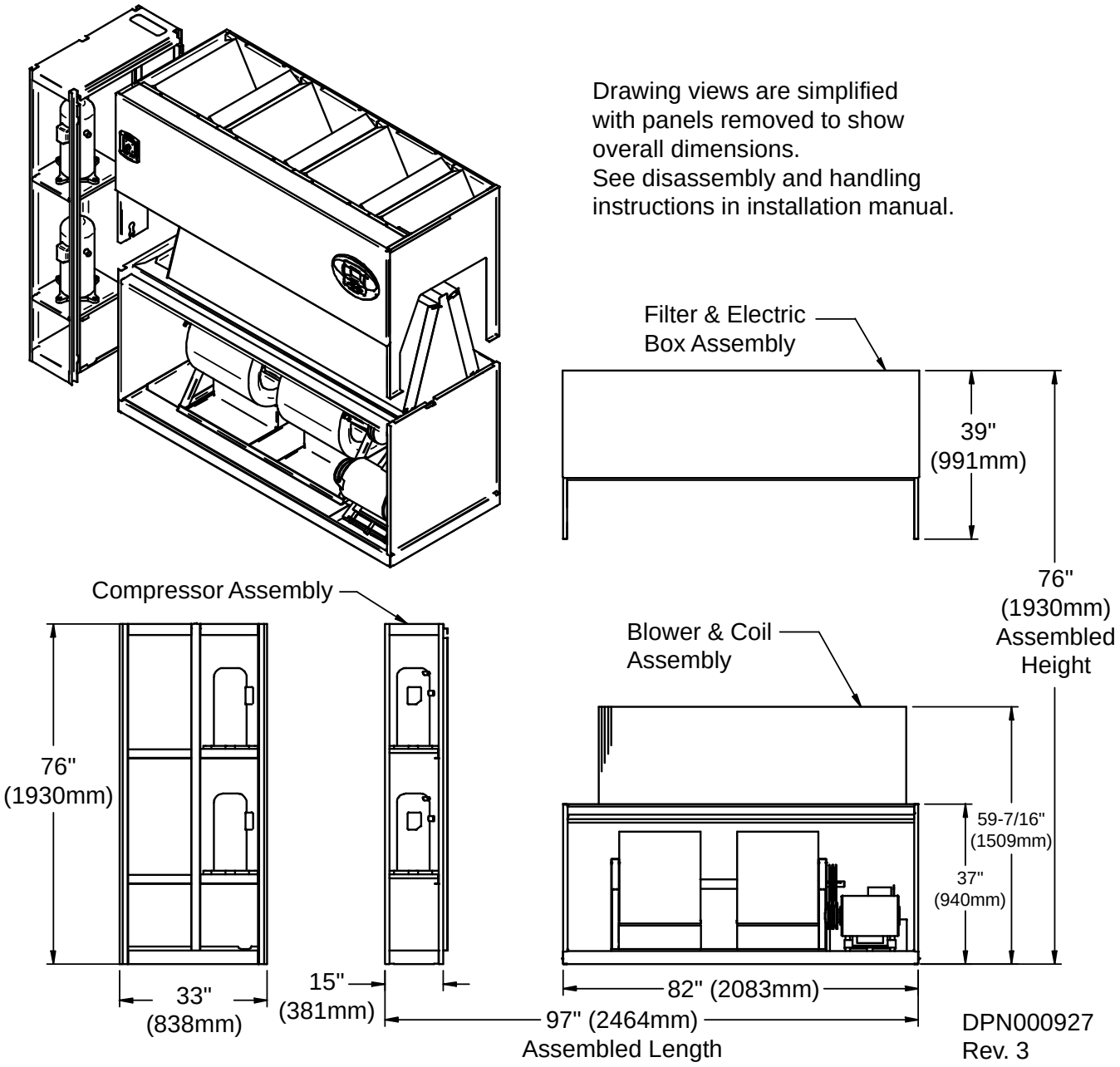


Table 33 Component weights—downflow, air-cooled, 53-77kW (15-22 ton), scroll/digital scroll; forward-curved and EC fan

Dry Weight, Approximate, Including Panels, lb (kg)		
Component	**Air-Cooled**	**Dual-Cool**
Compressor Assembly	540 (246)	540 (246)
Filter & Electric Box Assembly	250 (114)	250 (114)
Blower & Coil Assembly	1230 (560)	1410 (641)

Figure 48 Component dimensions—downflow water/glycol, GLYCOOL, 53-77kW (15-22 ton), all compressor models; forward-curved and EC fan

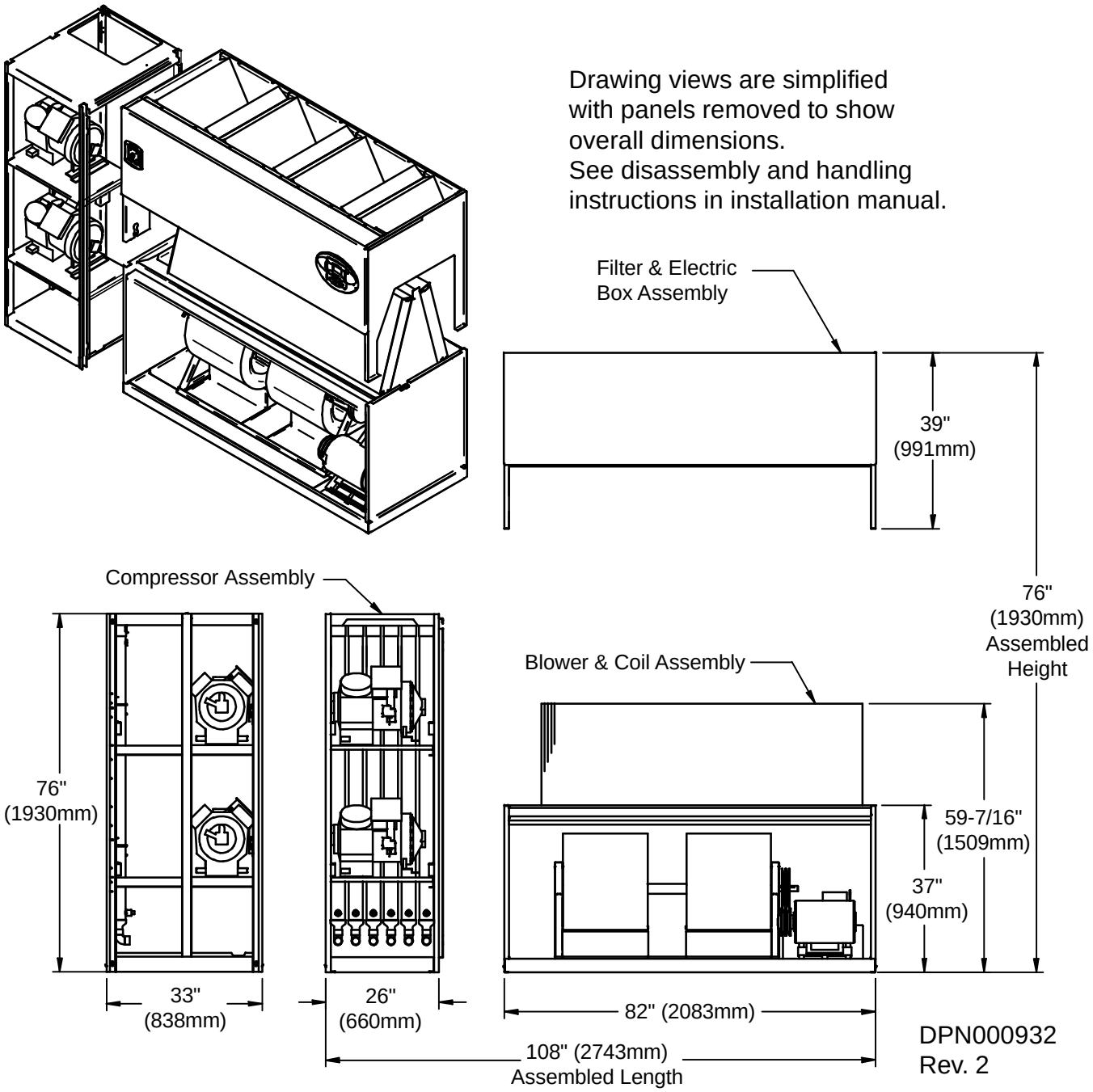


Table 34 Component weights—downflow water/glycol, GLYCOOL, 53-77kW (15-22 ton), all

Liebert DS Section	Semi-Hermetic Compressor		Scroll Compressor	
	Water/Glycol lb (kg)	GLYCOOL Dual-Cool lb (kg)	Water/Glycol lb (kg)	GLYCOOL Dual-Cool lb (kg)
Compressor Assembly	1270 (578)	1270 (578)	840 (382)	840 (382)
Filter and Electric Box Assembly	250 (114)	250 (114)	250 (114)	250 (114)
Blower & Coil Assembly	1230 (560)	1410 (641)	1230 (560)	1410 (641)

Figure 49 Component dimensions—downflow, air-cooled, 105kW (30 ton), semi-hermetic compressor models; forward-curved and EC fan

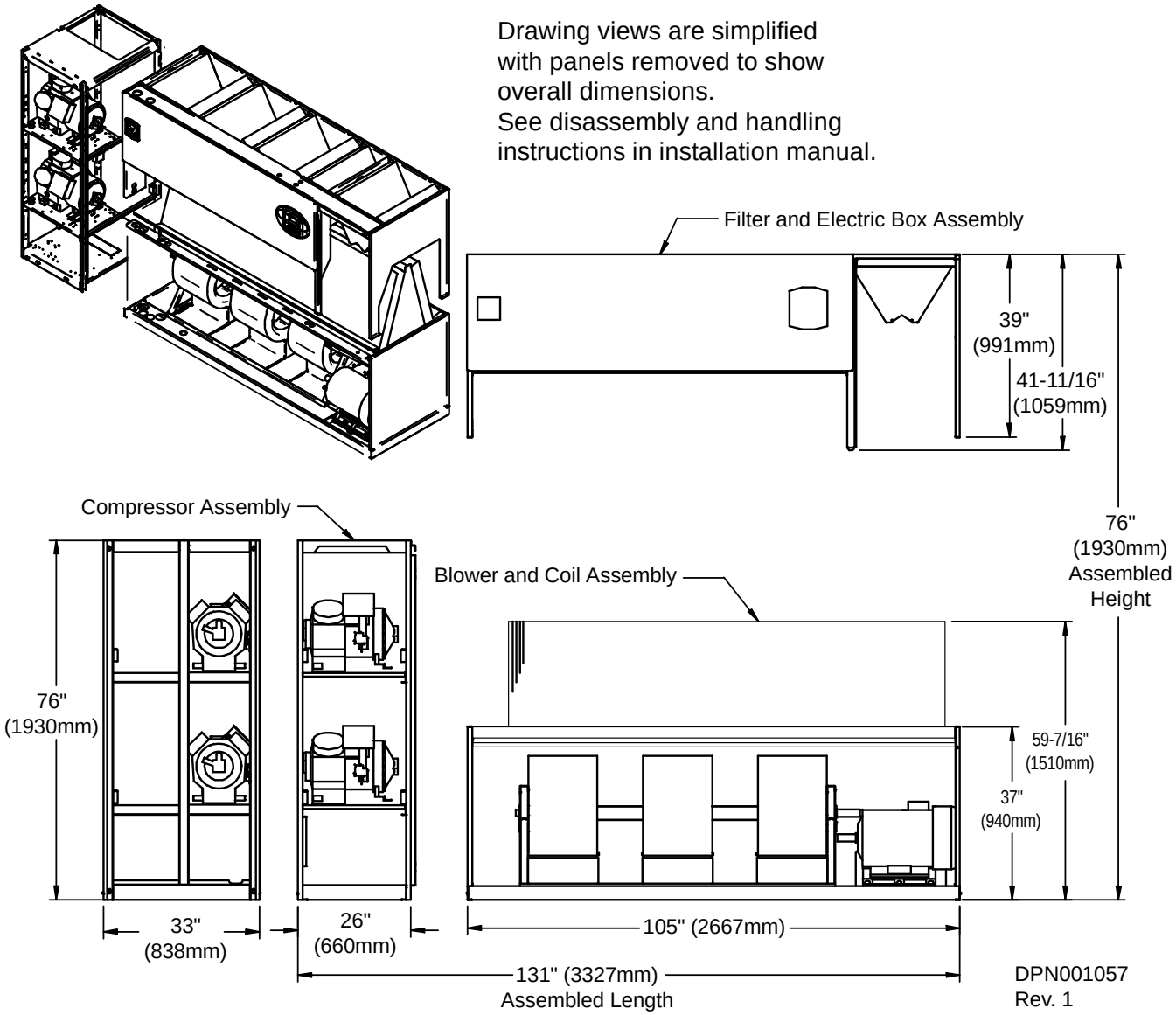


Table 35 Component weights—downflow, air-cooled, 105kW (30 ton), semi-hermetic compressors; forward-curved and EC fan

Component	Dry Weight, lb (kg) Approximate (Includes Panels)			
	Forward Curved Fans		EC Fans	
	Air-Cooled	Dual Cool	Air-Cooled	Dual Cool
Compressor Assembly	950 (432)	950 (432)	950 (432)	950 (432)
Filter & Electric Box Assembly	270 (123)	270 (123)	270 (123)	270 (123)
Blower & Coil Assembly	1820 (827)	2180 (991)	1560 (708)	1915 (870)

Figure 50 Component dimensions—downflow, air-cooled, 105kW (30 ton), scroll compressor models; forward-curved and EC fan

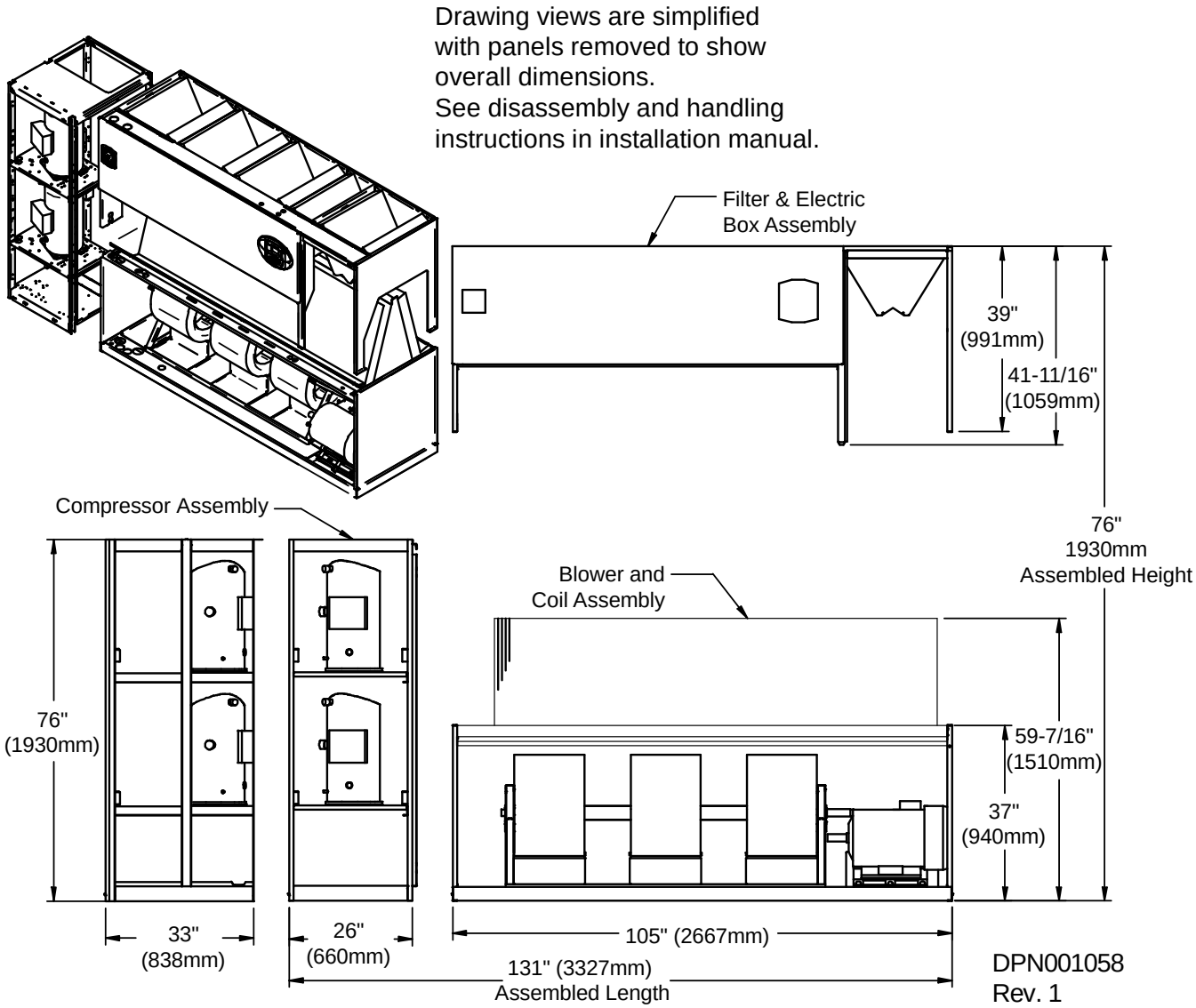


Table 36 Component weights—downflow, air-cooled, 105kW (30 ton), scroll compressor models; forward-curved and EC fan

Component	Dry Weight, lb (kg) Approximate (Includes Panels)			
	Forward Curved Fans		EC Fans	
	Air-Cooled	Dual Cool	Air-Cooled	Dual Cool
Compressor Assembly	830 (377)	830 (377)	830 (377)	830 (377)
Filter & Electric Box Assembly	270 (123)	270 (123)	270 (123)	270 (123)
Blower & Coil Assembly	1820 (827)	2180 (991)	1560 (708)	1915 (870)

Figure 51 Component dimensions—downflow, water/glycol/GLYCOOL, 105kW (30 ton), forward-curved and EC fan, all compressor models; forward-curved and EC fan

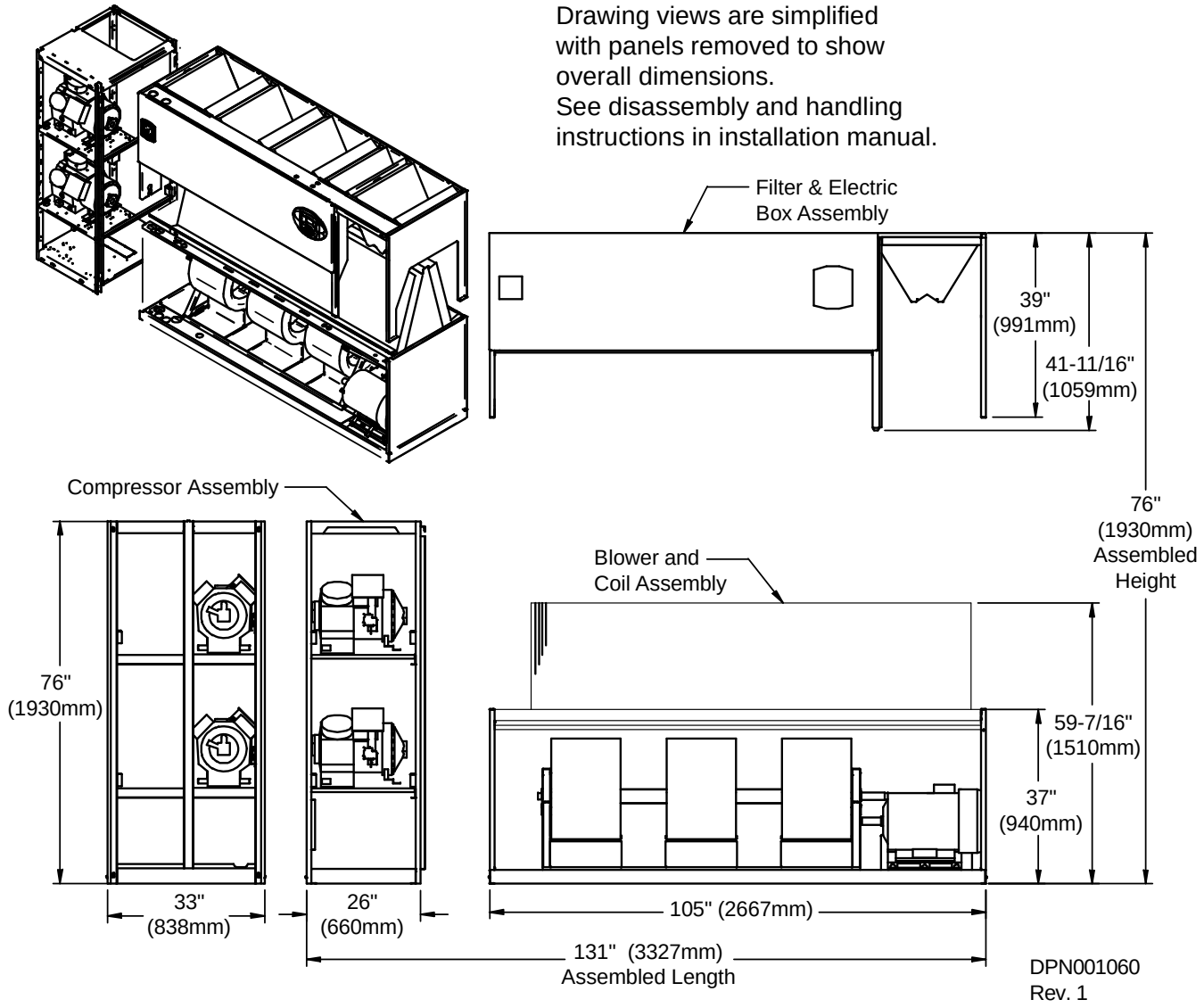


Table 37 Component weights—downflow, water/glycol/GLYCOOL, 105kW (30 ton), all compressor models; forward-curved and EC fan

Dry Weight, Approximate, Including Panels, lb (kg)				
	Semi-Hermetic Compressor		Scroll Compressor	
Component	**Water/Glycol**	**GLYCOOL/Dual-Cool**	**Water/Glycol**	**GLYCOOL/Dual-Cool**
Compressor Assembly	1320 (600)	1320 (600)	1200 (545)	1200 (545)
Filter & Electric Box Assembly	270 (123)	270 (123)	270 (123)	270 (123)
Blower & Coil Assembly, Forward-Curve Fan / EC Fan)	1820 (827) / 1560 (708)	2180 (991) / 1915 (870)	1820 (827) / 1560 (708)	2180 (991) / 1915 (870)

7.5 Disassembly—Upflow Units

For detailed views of upflow units, see **Figures 52** through **60**.

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 deadfront 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).

      For steam generating humidifiers: Remove the quick-connect plugs from the following low-voltage connections: 35-1, H-24H and H-24G, and 35-7 and HAR-24H.
   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 a nitrogen holding charge. Water, glycol and GLYCOOL units are factory charged with refrigerant. Refer to **9.0 - Piping** for piping guidelines and to the ASHRAE Refrigeration Handbook for general, good-practice refrigeration piping.

    # NOTICE

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

    Emerson recommends front-seating the compressor service valves. Front-seating the valves keeps the nitrogen or refrigerant charge in the compressor and prevents moisture from contaminating the compressor oil. 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 nitrogen bleed out before cutting all the way through the pipe.

NOTE

Emerson does not recommend unsweating refrigerant connections.

18. Unsweat 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.

7.5.1 Remove Compressor Assembly

1. Secure the compressor wire harness to the compressor assembly.
2. Remove the 10 thread-cutting bolts holding compressor section together.
   a. Begin removing bolts at the bottom of the Liebert DS 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

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 Liebert DS. Do not remove the shipping blocks from the semi-hermetic compressors until the Liebert DS is fully reassembled and ready for installation.

NOTE

Emerson recommends using piano jacks when moving this section.

7.5.2 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. May cause damage to the Liebert DS.

- The blower and electric box assembly should be moved forward and set on the floor.
- Emerson recommends 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 Liebert DS to the installation location.

7.6 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 (25Nm).
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 **9.0 - Piping** for piping guidelines and to the ASHRAE Refrigeration Handbook for general, good-practice refrigeration piping.
13. Open service valves on compressor.
14. Reinsert plastic bushings.
15. Charge the Liebert DS 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.

7.7 Reassembly Checklist

___ 1. Thread-cutting bolts reconnected at a torque specification of 225 in-lb (25Nm).

___ 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

Figure 52 Component dimensions—upflow, air-cooled, 28-42kW (8-12 ton), semi-hermetic compressor models

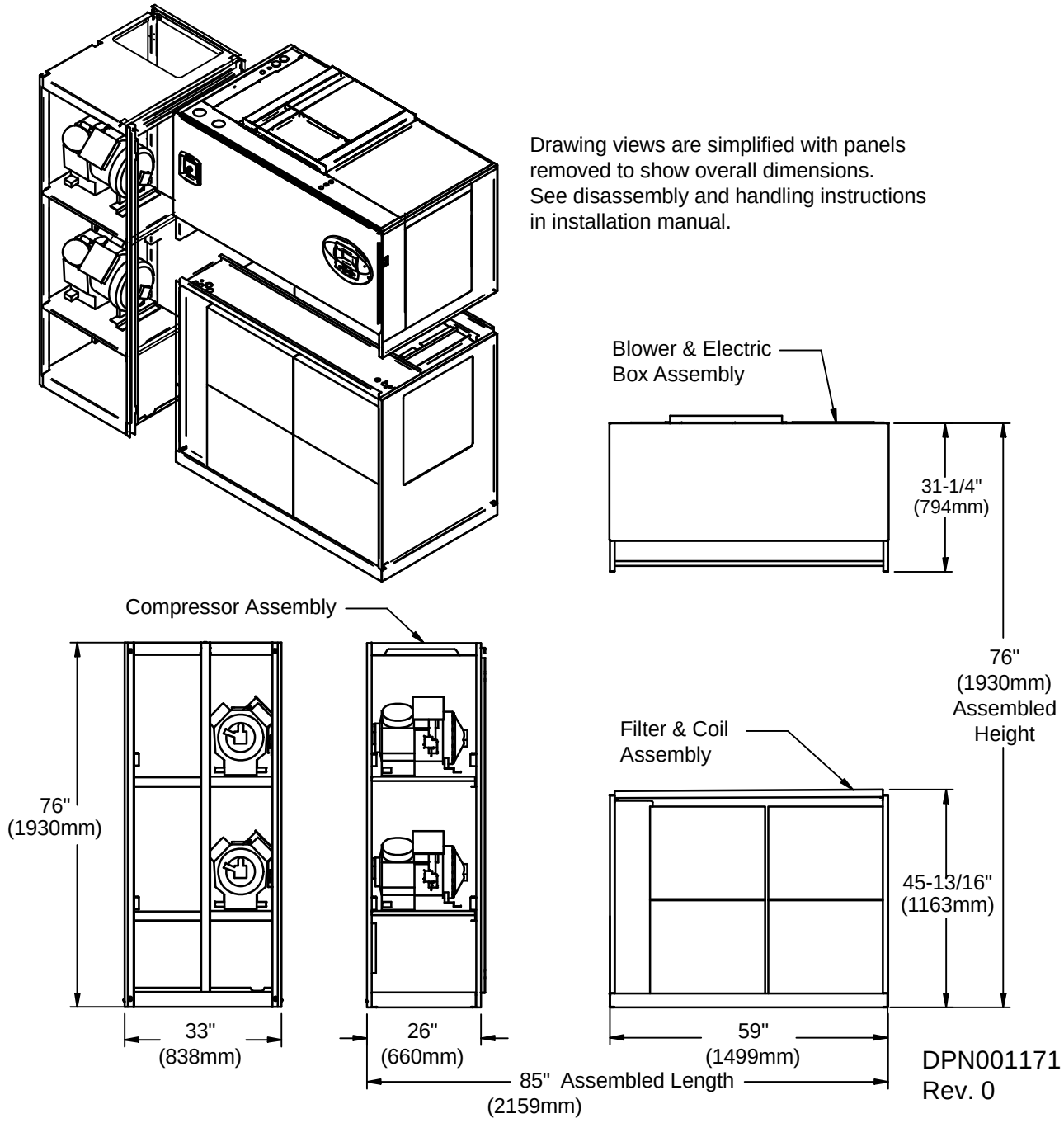


Table 38 Component weights—upflow, air-cooled, 28-42kW (8-12 ton), semi-hermetic compressor models

Dry Weight, Approximate, Including Panels, lb (kg)		
Component	**Air-Cooled**	**Dual-Cool**
Compressor Assembly	800 (364)	800 (364)
Blower & Electric Box Assembly	510 (231)	510 (231)
Filter & Coil Assembly	520 (236)	670 (304)

Figure 53 Component dimensions—upflow, air-cooled, 28-42kW (8-12 ton), scroll/digital scroll compressor models

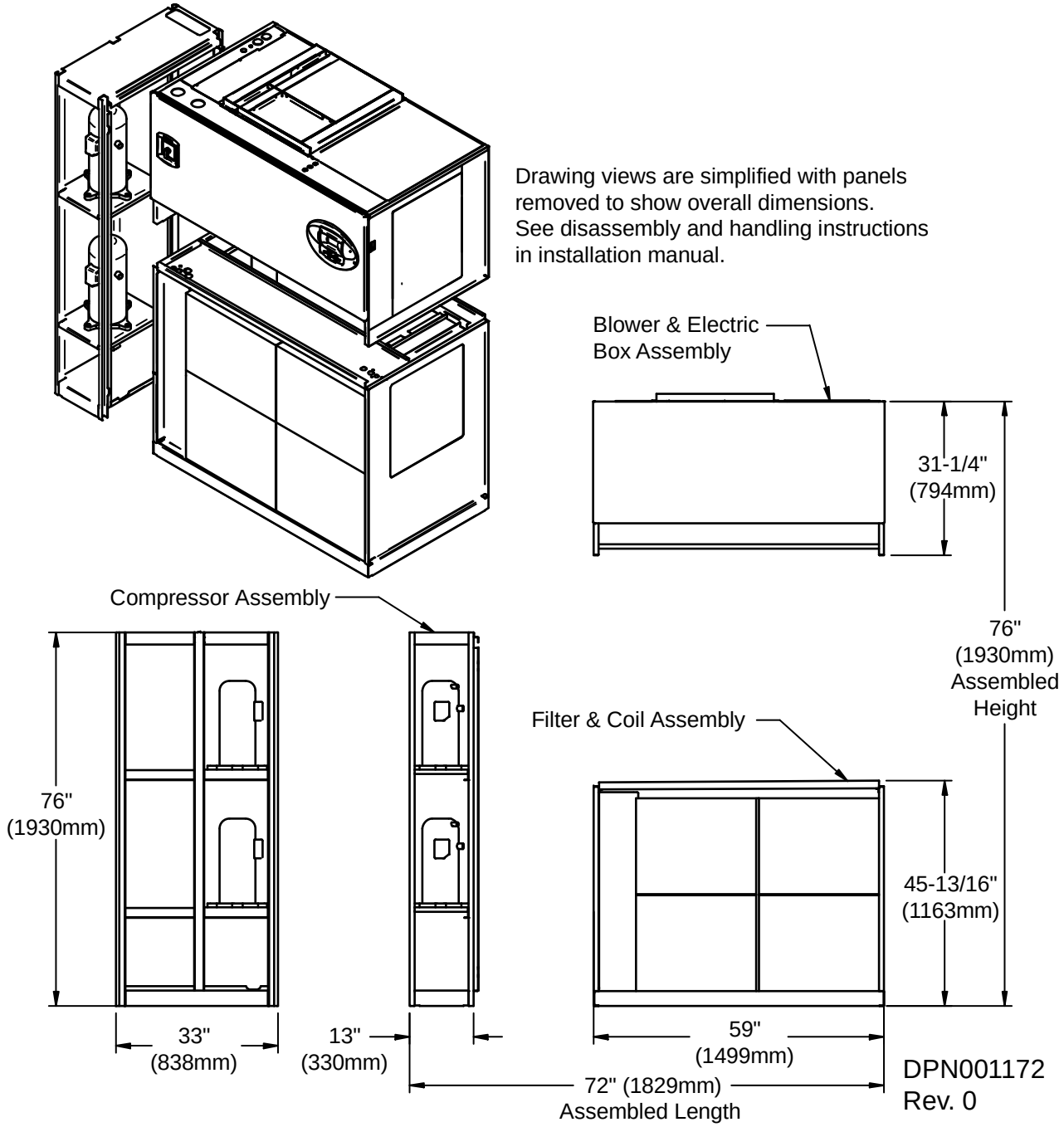


Table 39 Component weights—upflow, air-cooled, 28-42kW (8-12 ton), scroll/digital scroll compressor models

Dry Weight, Approximate, Including Panels, lb (kg)		
Component	**Air-Cooled**	**Dual-Cool**
Compressor Assembly	490 (223)	490 (223)
Blower & Electric Box Assembly	510 (231)	510 (231)
Filter & Coil Assembly	520 (236)	670 (304)

Figure 54 Component dimensions—upflow, water/glycol/GLYCOOL, 28-42kW (8-12 ton), all compressor models

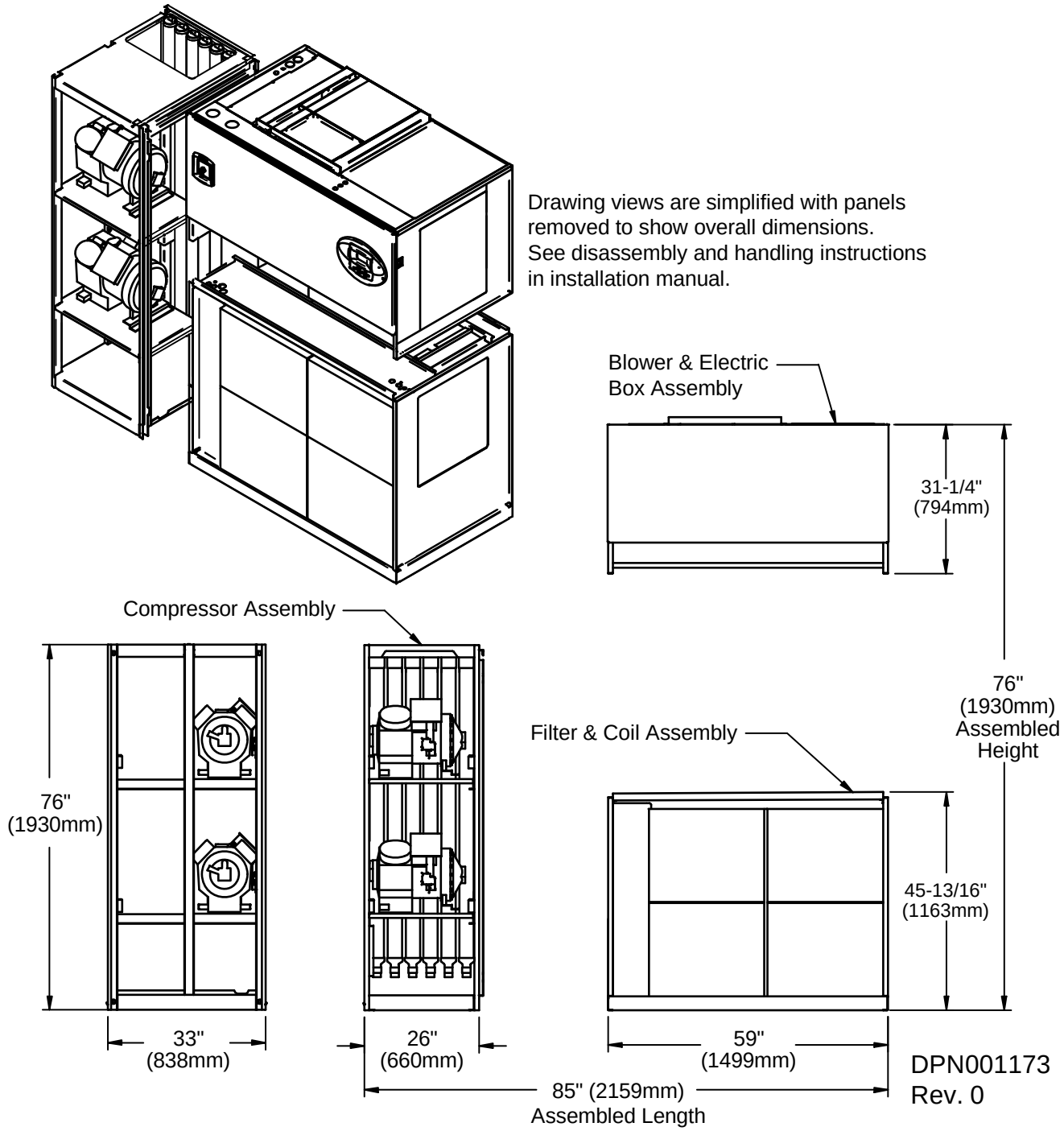


Table 40 Component weights—upflow, water/glycol/GLYCOOL, 28-42kW (8-12 ton), all compressor models

Dry Weight, Approximate, Including Panels, lb (kg)				
	Semi-Hermetic Compressor		Scroll Compressor	
Component	Water/Glycol	GLYCOOL/Dual-Cool	Water/Glycol	GLYCOOL/Dual-Cool
Compressor Assembly	950 (432)	950 (432)	800 (364)	800 (364)
Blower & Electric Box Assembly	510 (231)	510 (231)	510 (231)	510 (231)
Filter & Coil Assembly	520 (236)	670 (304)	520 (236)	670 (304)

Figure 55 Component dimensions—upflow, air-cooled, 53-77kw (15-22 ton), semi-hermetic compressor models

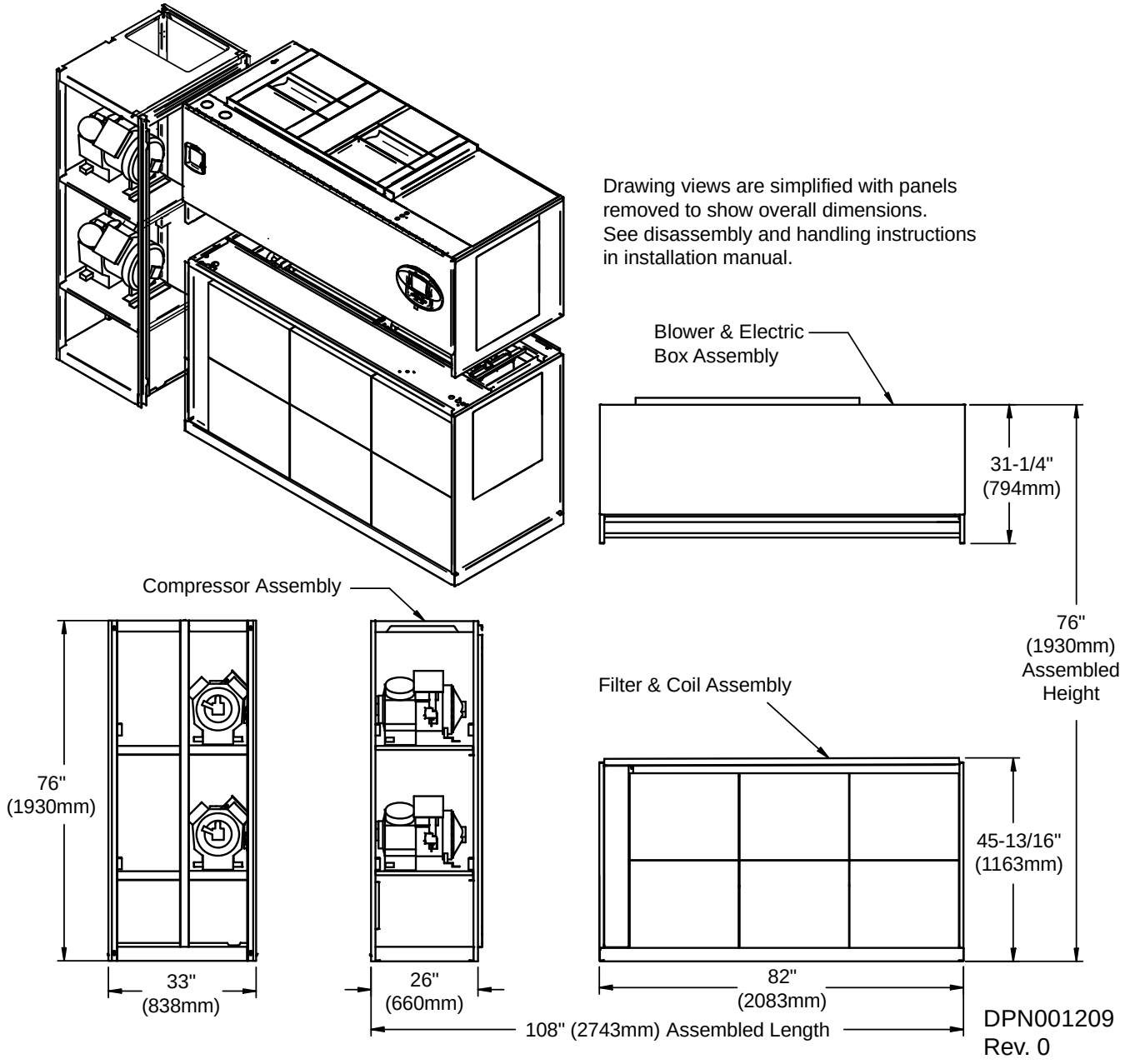


Table 41 Component weights—upflow air-cooled 53-77kw (15-22 ton), semi-hermetic compressor models

Dry Weight, Approximate, Including Panels, lb (kg)		
Component	**Air-Cooled**	**Dual-Cool**
Compressor Assembly	970 (441)	970 (441)
Blower & Electric Box Assembly	770 (349)	770 (349)
Filter & Coil Assembly	760 (345)	940 (426)

Figure 56 Component dimensions—upflow, air-cooled, 53-77kw (15-22 ton), scroll/digital scroll compressor models

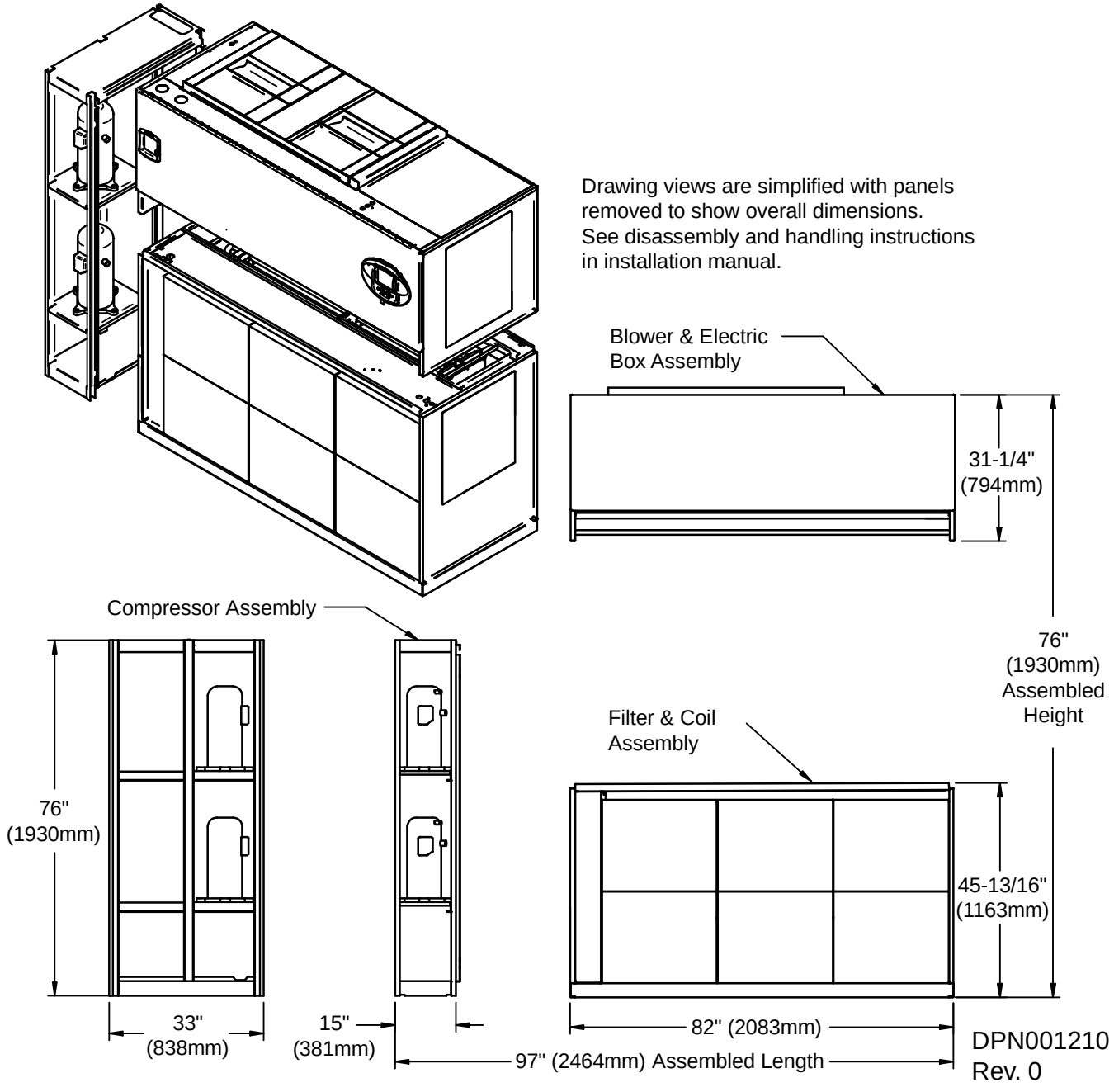


Table 42 Component weights—upflow, air-cooled, 53-77kw (15-22 ton), scroll /digital scroll compressor models

Dry Weight, Approximate, Including Panels, lb (kg)		
Component	**Air-Cooled**	**Dual-Cool**
Compressor Assembly	540 (246)	540 (246)
Blower & Electric Box Assembly	770 (349)	770 (349)
Filter & Coil Assembly	760 (345)	940 (426)

Figure 57 Component dimensions—upflow water/glycol/GLYCOOL 53-77kw (15-22 ton), all compressor models

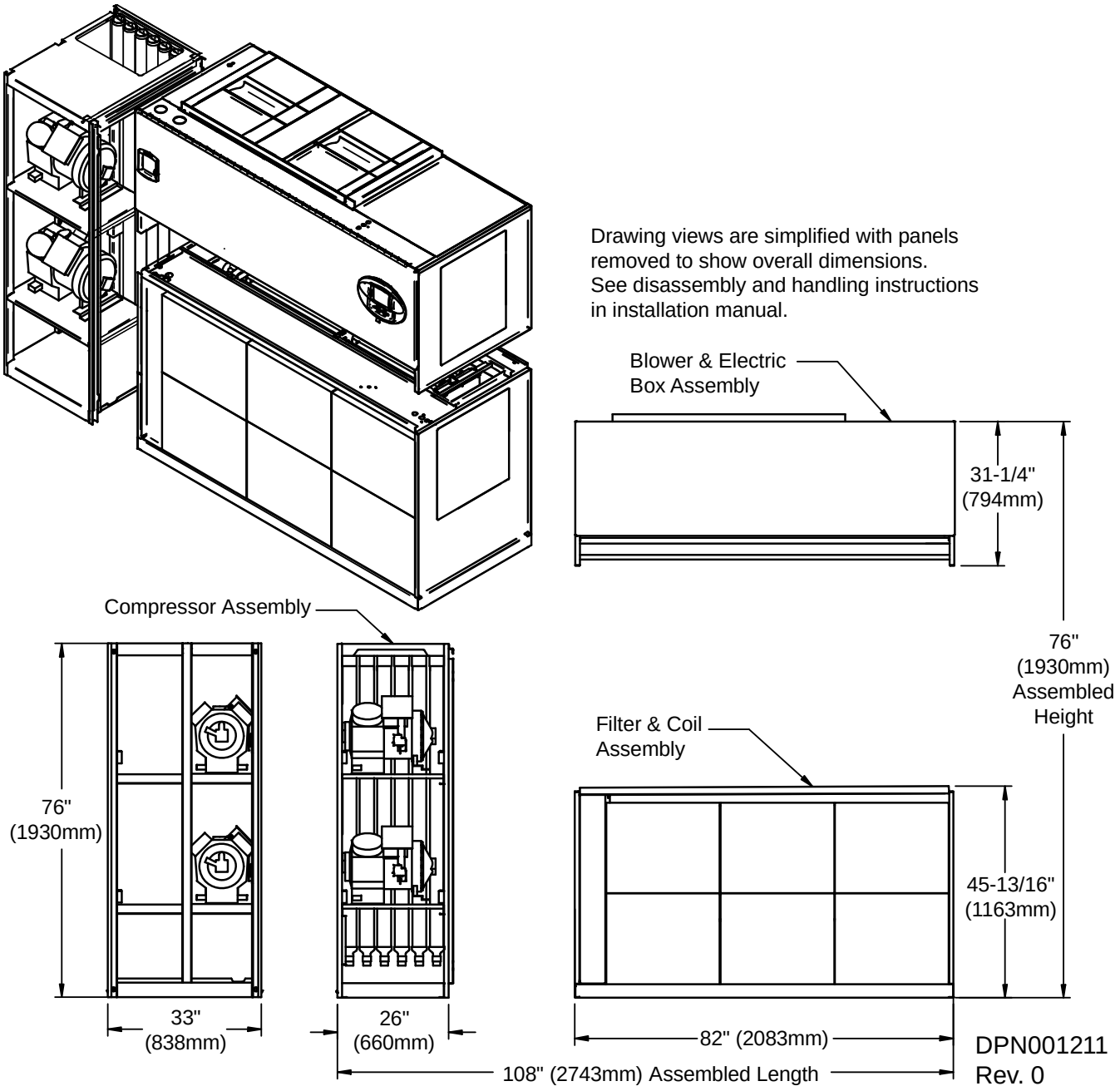


Table 43 Component weights—upflow water/glycol/GLYCOOL, 53-77kW (15-22 ton) all compressor models

Dry Weight, Approximate, Including Panels, lb (kg)				
	Semi-Hermetic Compressor		Scroll or Digital Scroll Compressor	
Component	Water/Glycol	GLYCOOL/Dual-Cool	Water/Glycol	GLYCOOL/Dual-Cool
Compressor Assembly	1270 (578)	1270 (578)	840 (382)	840 (382)
Blower & Electric Box Assembly	770 (349)	770 (349)	770 (349)	770 (349)
Filter & Coil Assembly	760 (345)	940 (426)	760 (345)	940 (426)

Figure 58 Component dimensions—upflow, air-cooled, 105kW (30 ton), semi-hermetic compressor models

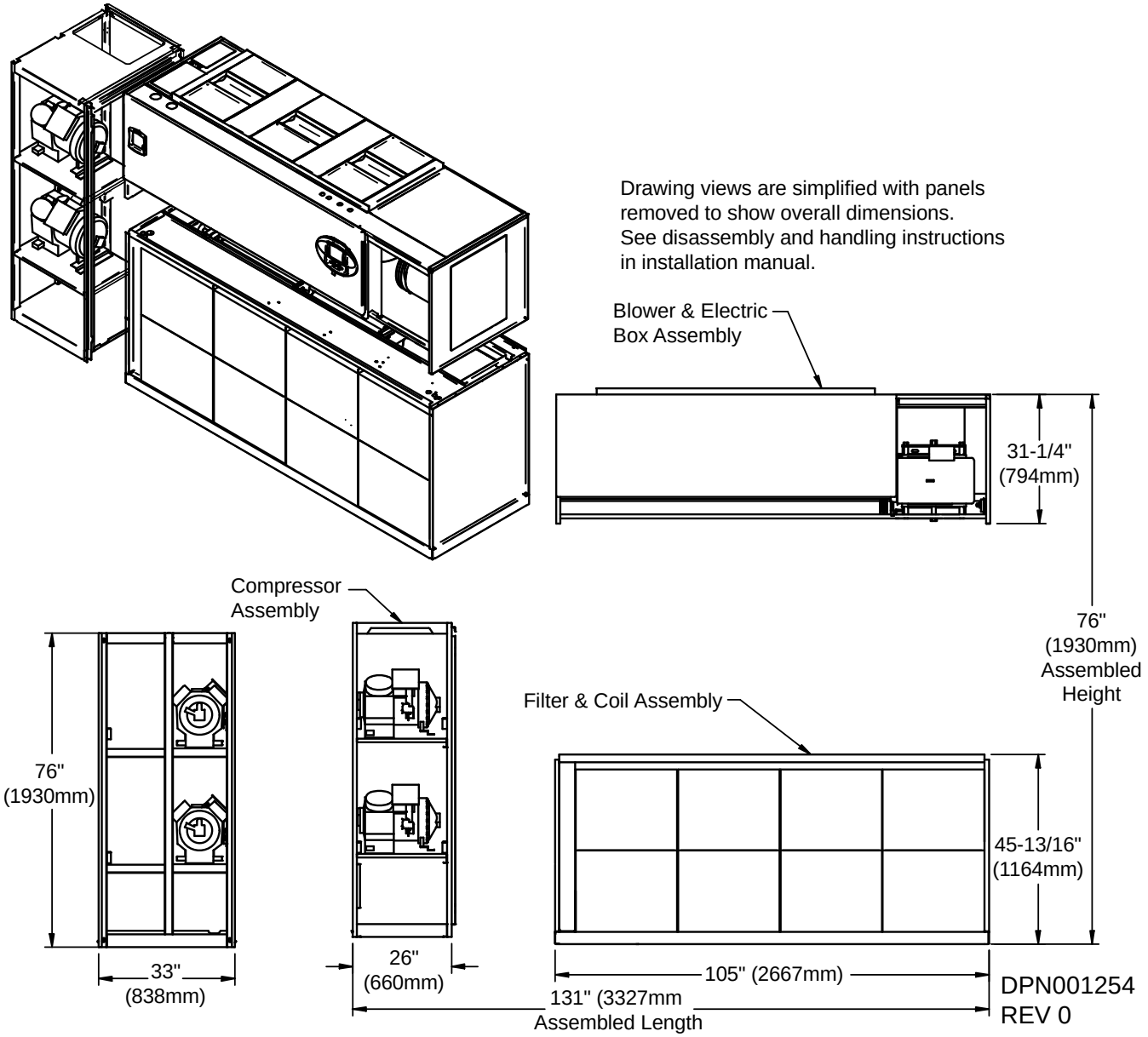


Table 44 Component weights—upflow, air-cooled, 105kW (30 ton), semi-hermetic compressor models

Dry Weight, Approximate, Including Panels, lb (kg)		
Component	**Air-Cooled**	**Dual-Cool**
Compressor Assembly	950 (431)	950 (431)
Blower & Electric Box Assembly	1080 (490)	1080 (490)
Filter & Coil Assembly	970 (440)	1300 (590)

Figure 59 Component dimensions—upflow, air-cooled, 105kW (30 ton), scroll/digital scroll compressor models

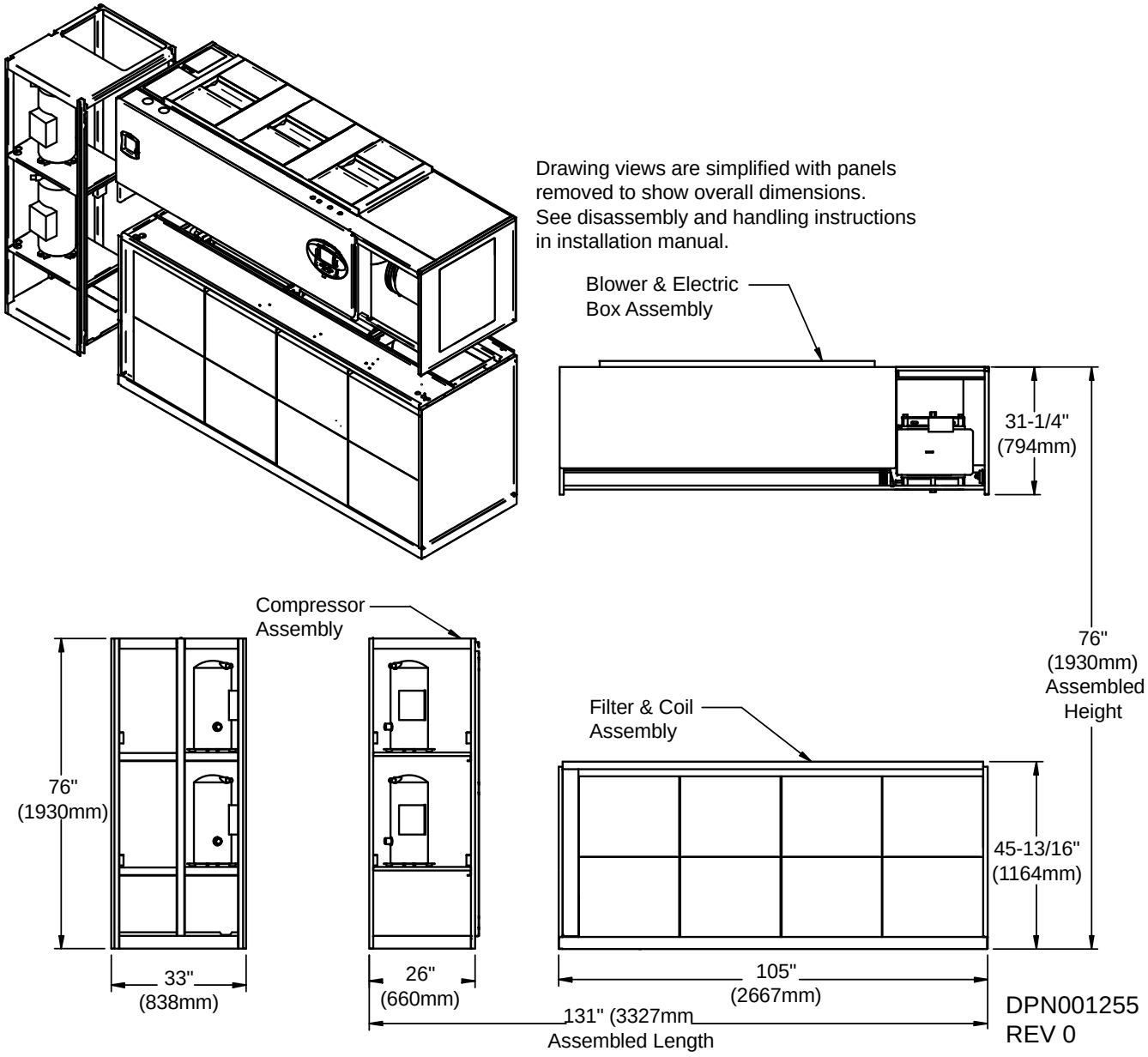


Table 45 Component weights—upflow, air-cooled, 105kW (30 ton), scroll/digital scroll compressor models

Dry Weight, Approximate, Including Panels, lb (kg)		
Component	**Air-Cooled**	**Dual-Cool**
Compressor Assembly	830 (376)	830 (376)
Blower & Electric Box Assembly	1080 (490)	1080 (490)
Filter & Coil Assembly	970 (440)	1300 (590)

Figure 60 Component dimensions—upflow, water/glycol/GLYCOOL, 105kW (30 ton), all compressor models

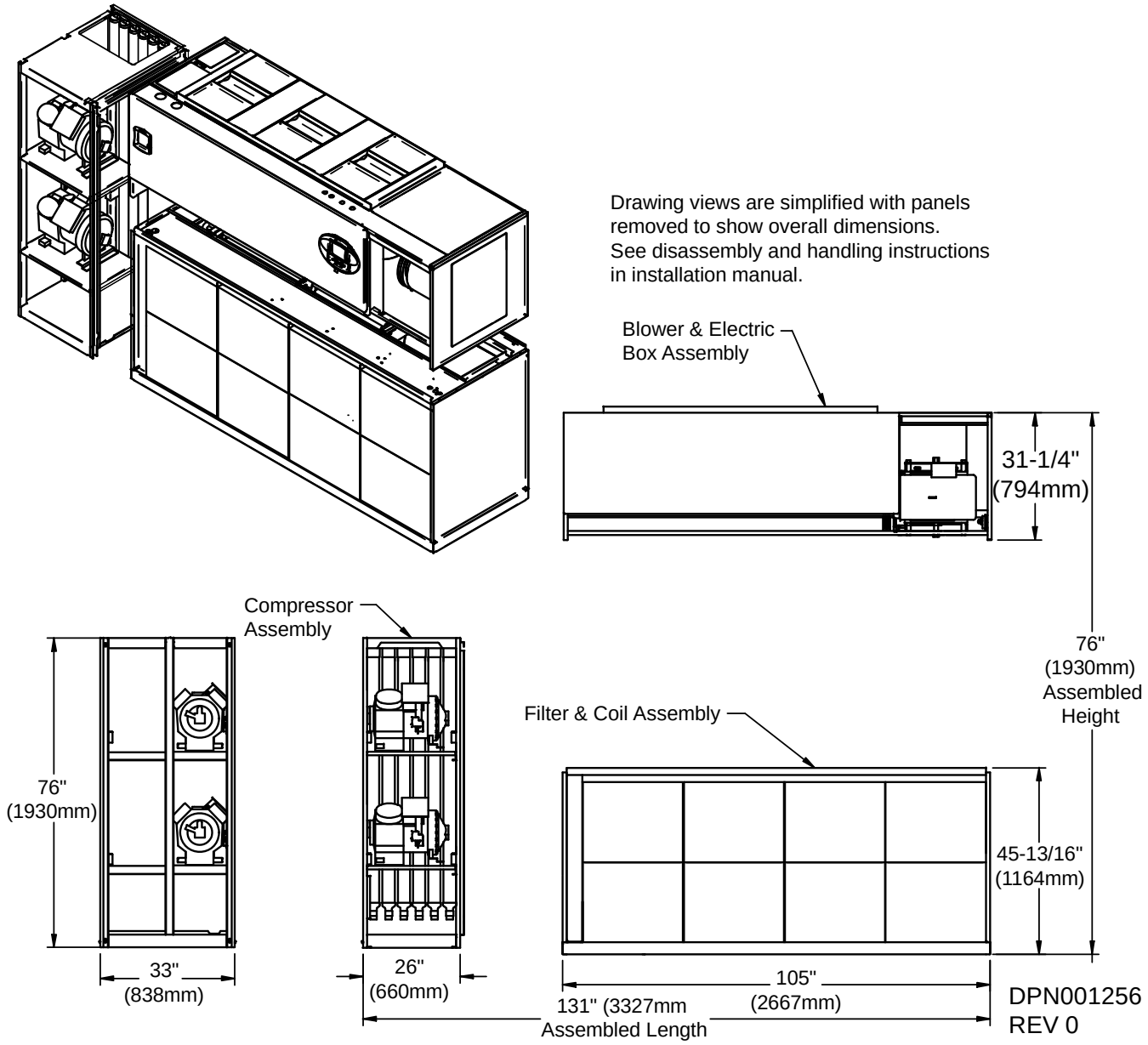


Table 46 Component weights—upflow, water/glycol/GLYCOOL, 105kW (30 ton), all compressor models

Dry Weight, Approximate, Including Panels, lb (kg)				
	Semi-Hermetic Compressor		Scroll or Digital Scroll Compressor	
Component	Water/Glycol	GLYCOOL/Dual-Cool	Water/Glycol	GLYCOOL/Dual-Cool
Compressor Assembly	1320 (599)	1320 (599)	1200 (544)	1200 (544)
Blower & Electric Box Assembly	1080 (490)	1080 (490)	1080 (490)	1080 (490)
Filter & Coil Assembly	970 (440)	1300 (590)	970 (440)	1300 (590)

8.0 ELECTRICAL CONNECTIONS

Three-phase electrical service is required for all models. Electrical service must conform to national and local electrical codes. Refer to equipment nameplate regarding wire size and circuit protection requirements. Refer to electrical schematic when making connections. Refer to **Figure 61** for electrical service entrances into unit.

A manual electrical disconnect switch should be installed in accordance with local codes and distribution system. Consult local codes for external disconnect requirements.

WARNING

Risk of electric shock. Can cause injury or death.

Disconnect local and remote power supplies before working within.

Use voltmeter to make sure power is turned off before making any electrical connections.

Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power.

50Hz Models Only: Re-install all terminal covers before connecting power to the unit. Failure to install these covers exposes high-voltage terminals.

Follow all local codes.

WARNING

Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, injury or death.

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

NOTE

Seal openings around piping and electrical connection to prevent air leakage. Failure to do so could reduce the unit's cooling performance.

NOTICE

Risk of improper electrical connection of three-phase input power. Can cause unit damage.

Service technicians should use a gauge set on the Liebert DS system during the initial startup to verify that the three-phase power is connected properly. The EC fans are not a reliable indicator of proper connection. The blowers will rotate the same direction, regardless of the three-phase power input.

NOTICE

Risk of backward compressor rotation. Can cause equipment damage.

Three-phase power must be connected to the unit line voltage terminals in the proper sequence so that scroll compressors rotate in the proper direction.

NOTICE

Risk of improper electrical supply connection. Can cause equipment damage.

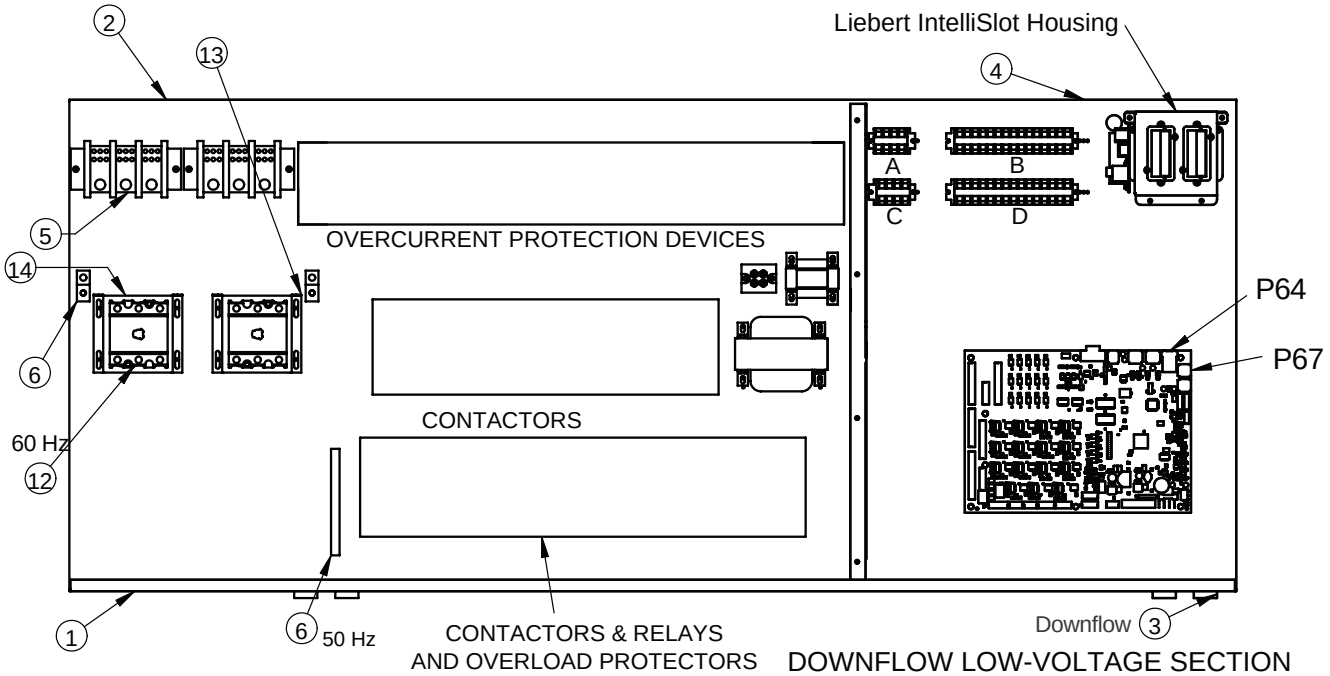
See transformer label for primary tap connections. Installer will need to change transformer primary taps if applied unit voltage is other than pre-wired tap voltage.

NOTICE

Risk of overheated terminals. Can cause wiring and component damage.

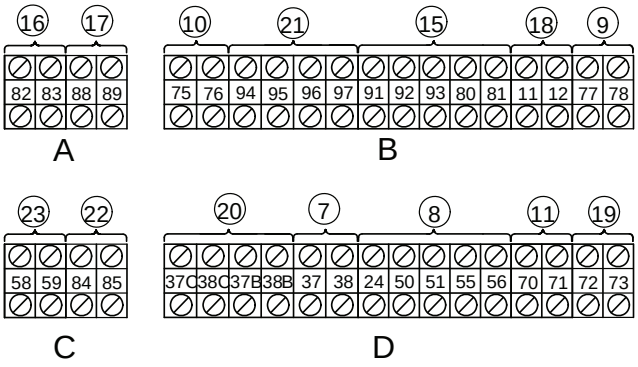
Use copper wiring only. Make sure that all connections are tight.

Figure 61 Electrical field connections for upflow and downflow models

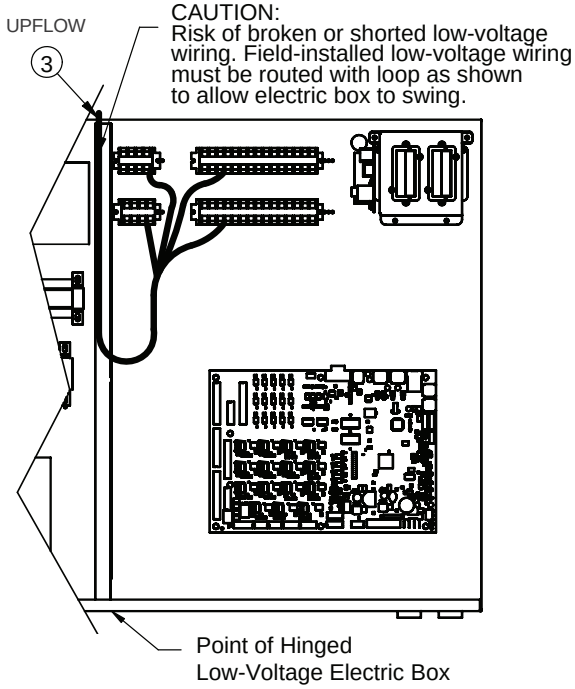


DOWNFLOW LOW-VOLTAGE SECTION

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



Refer to Table 47 on page 78 for keys to numbered items.



UPFLOW LOW-VOLTAGE SECTION

DPN000806
Rev. 4

Table 47 Electrical field connection descriptions

STANDARD ELECTRICAL CONNECTIONS

1. **Primary high voltage entrance** - 2.50" (64mm); 1.75" (44mm); 1.375" (35mm) diameter concentric knockouts in bottom of box.
2. **Secondary high voltage entrance** - 2.50" (64mm); 1.75" (44mm); 1.375" (35mm) diameter concentric knockouts in top of box.
3. **Primary low voltage entrance** - Quantity (3) 1.125" (28mm) diameter knockouts in bottom of unit.
4. **Secondary low voltage entrance** - Quantity (3) 1.125" (28mm) diameter knockouts in top of box.
5. **Three-phase electrical service** - Terminals are on high voltage terminal block (disregard if unit has optional disconnect switch). Three-phase service not by Emerson.
6. **Earth ground** - Terminal for field-supplied earth grounding wire. Earth grounding required for all 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. **Liebert SiteScan** - Terminals 77(-) & 78(+) for a 2-wire, twisted-pair, communication cable (available from Emerson) to optional Liebert SiteScan. The communication cable must be shielded on units with VFD or EC fans.
10. **Common alarm** - On any alarm, normally open dry contact is closed across Terminals 75 & 76 for remote indication. 1A, 24VAC max load. Use field-supplied Class 1 wiring.
11. **Heat rejection interlock** - On any call for compressor operation, normally open dry contact is closed across Terminals 70 & 71 to heat rejection equipment. 1A, 24VAC max load. Use field-supplied Class 1 wiring.

OPTIONAL ELECTRICAL CONNECTIONS

12. **Factory-installed disconnect switch**.
13. **Secondary disconnect switch and earth ground**.
14. **Three-phase electrical service** - Terminals are on top of disconnect switch. Three-phase service not by Emerson.
15. **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. 1A, 24VAC max load. Use field-supplied Class 1 wiring.
16. **Reheat and humidifier lockout** - Remote 24VAC required at Terminals 82 & 83 for lockout of reheat and humidifier.
17. **Condensate alarm (with condensate pump option)** - On pump high water indication, normally open dry contact is closed across Terminals 88 & 89 for remote indication. 1A, 24VAC max load. Use field-supplied Class 1 wiring.
18. **Analog inputs** - Terminals for up to two customer-supplied analog inputs. Device 1 wires to 41(-) and 42(+). Device 2 wires to 43(-) and 44(+).
19. **Remote humidifier** - On any call for humidification, normally open dry contact is closed across Terminals 11 & 12 to signal field-supplied remote humidifier. 1A, 24VAC max load. Use field-supplied Class 1 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. 1A, 24VAC max load. Use field-supplied Class 1 wiring.

OPTIONAL LOW VOLTAGE TERMINAL PACKAGE CONNECTIONS

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

DPN000807
Rev. 2

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

8.1 Variable Speed Drive

WARNING

Risk of electric shock from leakage current. Can cause injury or death.

Reconnect earth ground if servicing or replacing the variable speed drive (VSD).

An optional Variable Speed Drive (VSD) is available on some Liebert DS models. The VSD reduces power consumption by reducing the blower speed to match the unit's load.

This packaged unit is factory-set and should not require field-adjustment.

WARNING

Risk of contact with nearby high speed moving parts. Can cause injury or death.

Do not attempt to adjust or view variable frequency drive settings at the display on the face of the VSD. Instead, use a remote display (Liebert service item part number 196632P1) and connect to the VSD remote cable in the extra low voltage electric panel.

NOTICE

Risk of improper program adjustment. Can cause equipment damage and loss of warranty.

The VSD is factory-programmed for proper operation. Altering the VSD program without authorization from the factory may void the warranty.

NOTE

Emerson requires the Liebert DS to have a grounded supply. The VSD may be damaged if it is operated on an ungrounded supply.

8.1.1 VSD Power Supply—Field-Adjustment May Be Required

The installer/startup technician must determine the type of three-phase supply power (Wye-connected or Delta-connected) being used at the building power distribution panel for the VSD-controlled unit.

NOTICE

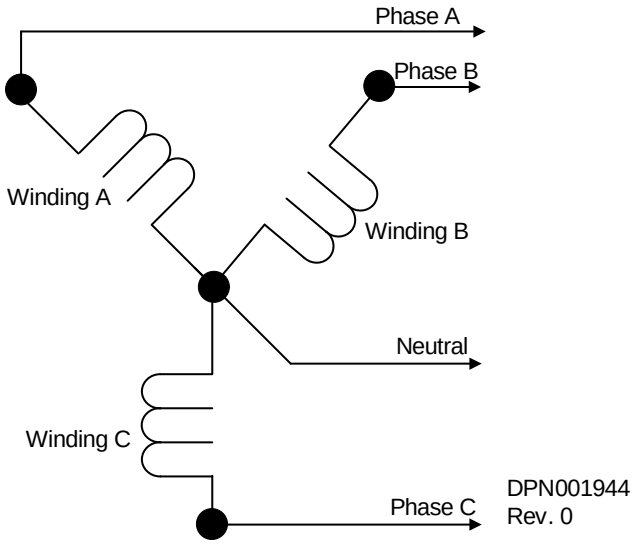
Risk of mismatched input power supply and VSD requirements. May cause equipment damage and failure.

The EMC filter must be removed from the VSD if the power supply is Delta-connected.

8.1.2 Wye-Connected Power Supply

No control changes are required if the Liebert VSD Control unit will be operated with Wye-connected power.

Figure 62 Wye-connected power diagram



8.1.3 Delta-Connected Power Supply

For Delta-connected power, the EMC filter must be removed from the VSD unit during installation. The size of the inverter (C, D, or 2) must be determined by **Table 48**, based on the unit's electrical requirements and horsepower. Failure to disconnect or remove EMC filter from VSD with delta connected power may result in failure of VSD and the fan motor to operate.

Figure 63 Delta-connected power diagram

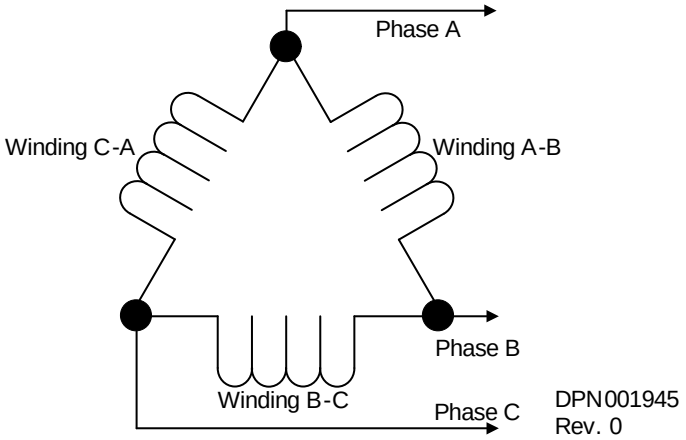


Table 48 Inverter type

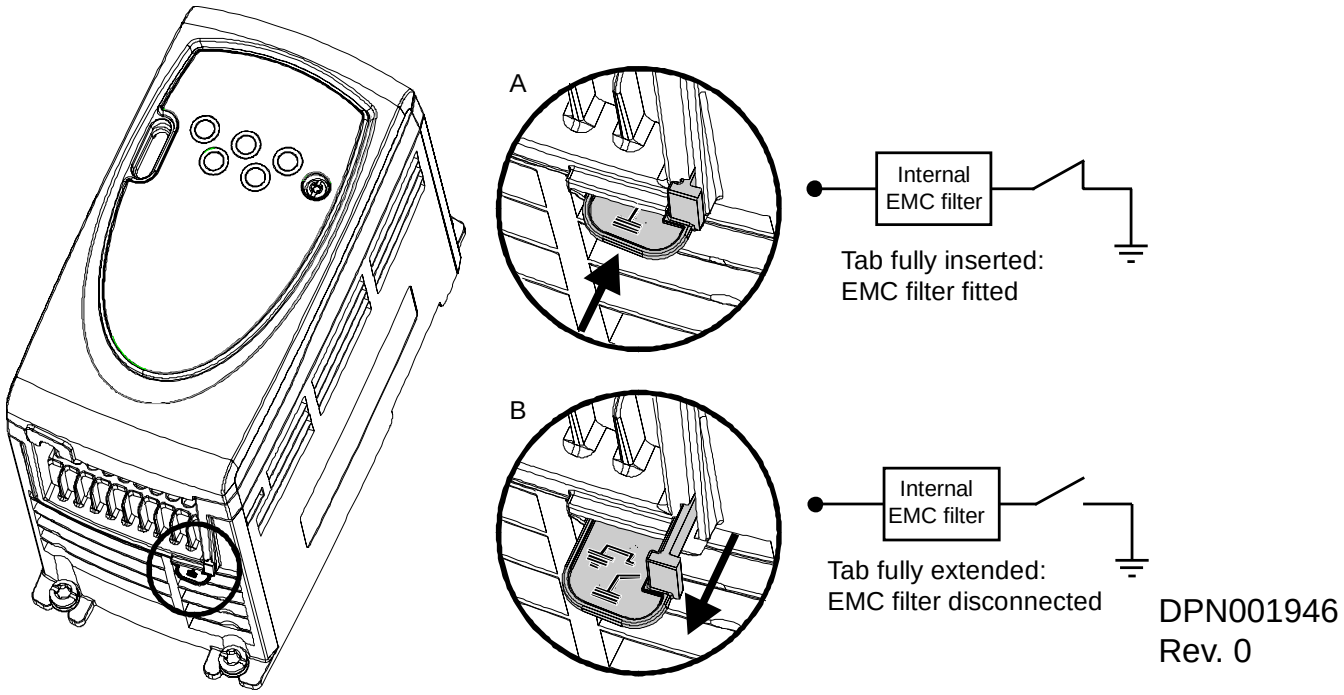
Motor hp	Unit Electrical Requirements, Voltage, Phase, Hz						
	208-3-60	230-3-60	380-3-60	460-3-60	575-3-60	200-3-50	380/415-3-50
3hp	Size C	Size C	Size C	Size C	N/A	N/A	Size C
5hp	Size D	Size D	Size C	Size C	N/A	N/A	Size C
7.5hp	Size 2	Size 2	Size D	Size D	N/A	N/A	Size D
10hp	N/A	Size 2	Size 2	Size D	N/A	N/A	Size 2

Disconnect EMC Filter for Delta-Connected Power for Size C & D Inverters

The EMC filter on the VSD must be disconnected if the Liebert VSD control DS unit will be operated with Delta-connected power.

1. Disconnect the power supply before working on the unit.
2. Locate the VSD (refer to **Figure 1** for the drive's location on downflow units; see **Figure 2** for the location on upflow units).
3. Remove electrical junction box cover.
4. Using **Figure 64**, locate the small black plastic tab immediately to the right of the wiring connection block of the VFD control.
5. Pull the tab to fully extend it, disconnecting the EMC filter from the circuit.
6. Reinstall the electrical junction box cover.

Figure 64 Disconnecting EMC filter for operation with Delta-connected power size C & D inverters



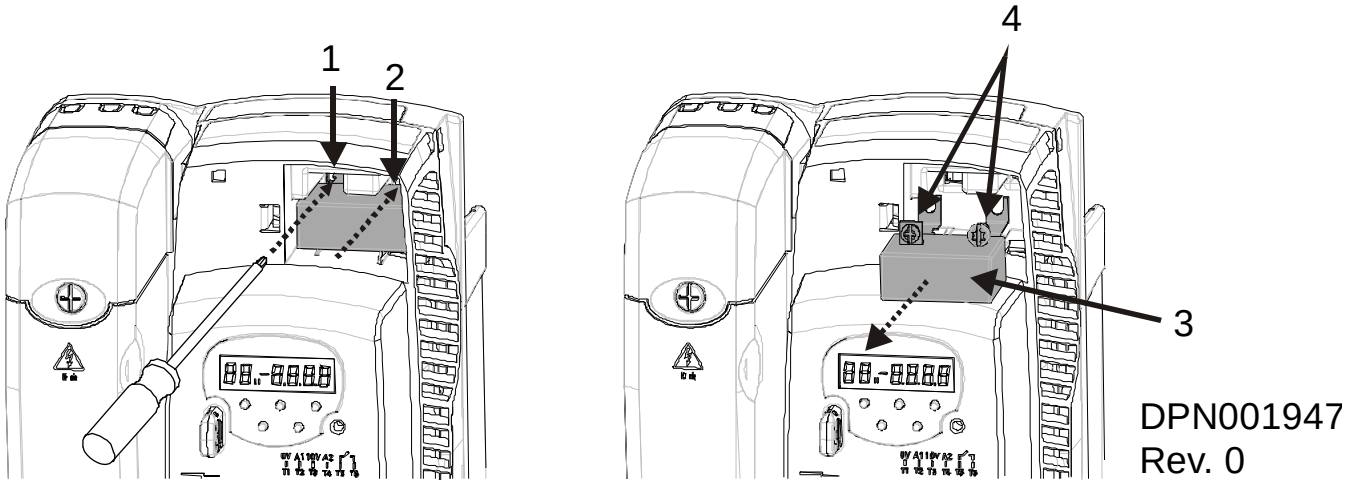
Remove EMC Filter for Delta-Connected Power for Type 2 inverters

The EMC filter on the VSD must be disconnected if the Liebert VSD control DS unit will be operated with Delta-connected power.

NOTE
This procedure requires substantial work.

1. Disconnect the power supply before working on the unit.
2. Locate the VSD (refer to **Figure 1** for the drive's location on downflow units; see **Figure 2** for the location on upflow units).
3. Remove inverter assembly. Follow instructions in **13.2.4 - Electronic Variable Speed Drive - Inverter**.
4. Loosen and remove the screws as shown (#1 in **Figure 65**) and (#2 in **Figure 65**).
5. Remove filter (#3 in **Figure 65**).
6. Reinsert and tighten the screws removed in **Step 4**.

Figure 65 Figure bb Disconnecting EMC filter for operation with Delta-connected power Type 2 inverters



9.0 PIPING

All fluid and refrigeration connections to the unit, with the exception of the condensate drain, are sweat copper. Factory-installed piping brackets must not be removed. Field-installed piping must be installed in accordance with local codes and must be properly assembled, supported, isolated and insulated. Avoid piping runs through noise-sensitive areas, such as office walls and conference rooms.

Refer to specific text and detailed diagrams in this manual for other unit-specific piping requirements.

All piping below the elevated floor must be located so that it offers the least resistance to air flow. Careful planning of the piping layout under the raised floor is required to prevent the air flow from being blocked. When installing piping on the subfloor, it is recommended that the pipes be mounted in a horizontal plane rather than stacked one above the other. Whenever possible, the pipes should be run parallel to the air flow.

9.1 Fluid Connections

NOTICE

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

This unit requires a water drain connection. Drain lines must be inspected regularly and maintenance must be performed to ensure that drain water runs freely through the drain system and that lines are clear and free of obstructions and in good condition with no visible sign of damage or leaks. This unit may also require an external water supply to operate.

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

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

Emerson recommends installing leak detection equipment for unit and supply lines.

NOTE

Seal openings around piping and electrical connection to prevent air leakage. Failure to do so could reduce the unit's cooling performance.

9.1.1 Condensate Piping—Field-Installed

- Do not reduce drain lines
- Do not expose drain line to freezing temperatures
- Drain line may contain boiling water. Use copper or other suitable material
- Drain line must comply with local building codes
- Emerson recommends installing under-floor leak detection equipment

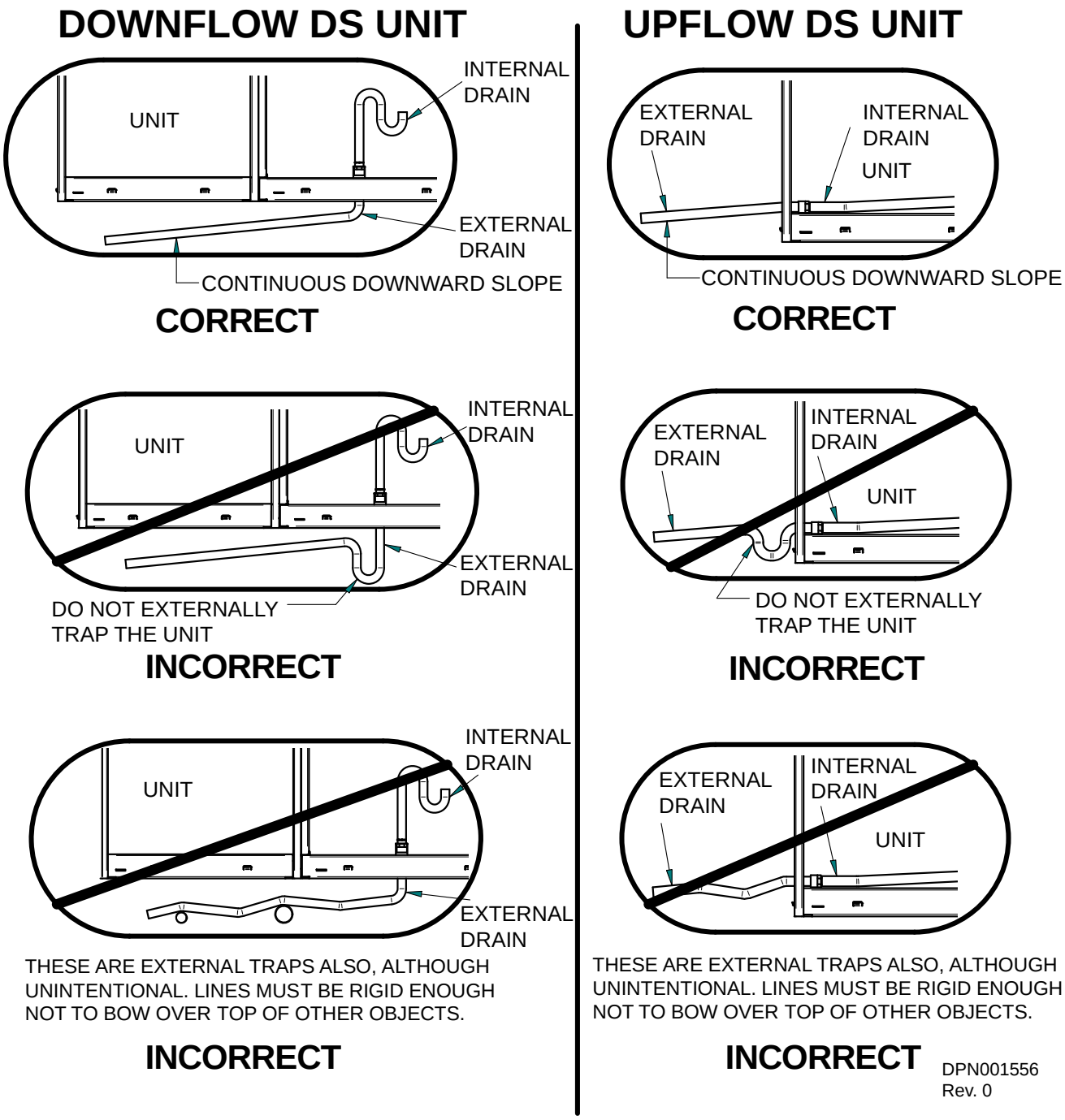
Gravity Drain—Units Without Factory-Installed Condensate Pump

- 3/4" FPT drain connection is provided on units **without** optional factory-installed condensate pump with infrared humidifier or no humidifier; 1-1/4" FPT connection is provided on units with steam generating humidifier
- Pitch drain line toward drain a minimum of 1/8" (3mm) per 1 foot (305mm) of length
- Drain is trapped internally. Do not trap external to equipment
- Drain line must be sized for 2 gpm (7.6 l/m) flow

NOTICE

The drain line must not be trapped outside the unit or water may back up in the drain pan.

Figure 66 Gravity drain for downflow and upflow units



Condensate Pump

- 1/2" copper sweat connection is provided on units **with** optional factory-installed condensate pump
- Condensate Pump (60Hz): Condensate pump is rated for approximately 400 gph at 10 feet total head
- Condensate Pump (50Hz): Condensate pump is rated for approximately 315 gph at 10 feet total head
- Size piping based on available condensate head

9.1.2 Humidifier Supply Water—Optional Infrared

- 1/4" supply line; maximum water pressure is 150 psi (1034kPa)
- Size humidifier supply line for 1 gpm (3.8 l/m), with a minimum water pressure of 20 psi (138kPa)
- Do not supply de-ionized water to the humidifier

9.1.3 Humidifier Supply Water—Optional Steam Generating

- 1/4" supply line; maximum water pressure is 145psi (1000kPa)
- Fill valve is sized for pressure range of 30 to 120psi (207-827kPa)
- Do not supply steam generating humidifier with softened water
- Do not use hot water source
- Water conductivity must be in the range of 330-750 micro-siemens

9.1.4 Requirements of Systems Using Water or Glycol

These guidelines apply to field leak checking and fluid requirements for field piping systems, including Liebert chilled water, hot water, condenser (water or glycol), GLYCOOL and drycooler circuits.

General Guidelines

- Equipment damage and personal injury can result from improper piping installation, leak checking, fluid chemistry and fluid maintenance.
- Follow local piping codes, safety codes.
- Qualified personnel must install and inspect system piping.
- Contact a local water consultant regarding water quality, corrosion protection and freeze protection requirements.
- Install manual shutoff valves at the supply and return line to each indoor unit and drycooler to permit routine service and emergency isolation of the unit.

NOTICE

Risk of frozen fluids. Can cause equipment damage and building damage.

Freezing system fluids can rupture piping. Complete system drain-down cannot be ensured. When the field piping or unit may be exposed to freezing temperatures, charge the system with the proper percentage of glycol and water for the coldest design ambient.

Automotive antifreeze is unacceptable and must NOT be used in any glycol fluid system.

NOTICE

Risk of corrosion. Can cause equipment damage.

Read and follow individual unit installation instructions for precautions regarding fluid system design, material selection and use of field-provided devices. Liebert systems contain iron and copper alloys that require appropriate corrosion protection.

Contact a water consultant about water quality, corrosion and freeze protection requirements.

Water chemistry varies greatly by location, as do the required additives, called inhibitors, that reduce the corrosive effect of the fluids on the piping systems and components. The chemistry of the water used must be considered, because water from some sources may contain corrosive elements that reduce the effectiveness of the inhibited formulation. Preferably, surface waters that are classified as soft and are low in chloride and sulfate ion content should be employed. Proper inhibitor maintenance must be performed to prevent corrosion of system components. Consult glycol manufacturer for testing and maintenance of inhibitors.

Commercial ethylene glycol (Union Carbide Ucartherm, Dow Chemical Dowtherm SR-1 and Texaco E.G. Heat Transfer Fluid 100), when pure, is generally less corrosive to the common metals of construction than water itself. It will, however, assume the corrosivity of the water from which it is prepared and may become increasingly corrosive with use if not properly inhibited.

NOTICE

Risk of fluid leaks from tubing and piping corrosion. Can cause serious equipment and building damage.

Idle fluid allows the collection of sediment that prevents the formation of a protective oxide layer on the inside of tubes. Keep unit switched ON and system pump operating.

Leak Checking of Unit and Field Piping

Liebert unit fluid systems are factory-checked for leaks and may be shipped with a nitrogen holding charge. Liebert unit fluid circuits should be checked for leaks at installation as described below.

NOTE

During leak checking of field-installed piping, Emerson recommends that the unit be isolated using field-installed shutoff valves. When the Liebert units are included in a leak test, use of fluid for pressure testing is recommended. When pressurized gas is used for leak testing the Liebert unit, the maximum recommended pressure is 30 psig (2 bars) and tightness of the unit should be verified by pressure decay over time, (<2 psig/hour [0.3 bars/hour]) or sensing a tracer gas with suitable instrumentation. Dry seals in fluid valves and pumps may not hold a high gas pressure.

9.2 Refrigeration Piping

WARNING

Risk of explosive discharge from high-pressure refrigerant. Can cause injury or death.

This unit contains fluids and/or gases under high pressure.

Relieve pressure before working with piping.

WARNING

Risk of refrigerant system rupture or explosion from over pressurization. Can cause equipment damage, injury or death.

For systems requiring EU CE-compliance (50Hz), the system installer must provide and install a discharge pressure relief valve rated for a maximum of 500 psig (34bar) in the high side refrigerant circuit. 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."

NOTE

The Liebert indoor cooling unit has a factory-installed high-pressure safety switch in the high side refrigerant circuit. A pressure relief valve is provided with Liebert Lee-Temp™ condensers. Consult local building codes to determine whether the Liebert Fan Speed Control and VFD condensers will require field provided pressure relief devices.

NOTICE

Risk of oil contamination with water. Can cause equipment damage.

Some Liebert DS Systems require the use of POE (polyolester) oil. See **13.10.1 - Compressor Oil** for requirements. POE oil absorbs water at a much faster rate when exposed to air than previously used oils. Because water is the enemy of a reliable refrigeration system, extreme care must be used when opening systems during installation or service. If water is absorbed into the POE oil, it will not be easily removed and will not be removed through the normal evacuation process. If the oil is too wet, it may require an oil change. POE oils also have a property that makes them act as a solvent in a refrigeration system. Maintaining system cleanliness is extremely important because the oil will tend to bring any foreign matter back to the compressor.

NOTICE

Risk of improper refrigerant charging. Can cause equipment damage.

Refrigerant charge must be weighed into scroll and digital scroll compressors before they are started. Starting scroll and digital scroll compressors without proper refrigerant charging can cause the compressors to operate at less than 5°F (-15°C) evaporator temperature and at less than 20psig (138kPa). Operation for extended periods at less than 20psig (138kPa) can cause premature compressor failure.

9.2.1 Piping Guidelines—Air-Cooled Units

- Indoor unit ships with a nitrogen holding charge; do not vent the evaporator until all refrigerant piping is in place, ready for connection to the unit and condenser
- Use copper piping with high temperature brazed joints
- Isolate piping from building using vibration-isolating supports
- Refer to **Table 49** for piping sizes
- Refer to condenser installation manual for charging information
- Install traps on hot gas (discharge) lines at the base of vertical risers and every 25 feet (7.6m) of vertical rise.
- Consult factory if condenser is installed more than 15 feet (4.6m) below the evaporator
- Consult factory if piping run exceeds 150 feet (46m) equivalent length
- Keep piping clean and dry, especially on units with R-407C refrigerant
- Avoid piping runs through noise-sensitive areas
- Do not run piping directly in front of airstream
- Refrigerant oil – do not mix oil types (see **13.10.1 - Compressor Oil**)

Refer to ASHRAE Refrigeration Handbook for general, good-practice refrigeration piping.

Table 49 Recommended refrigerant line sizes - OD copper (inches)*

Standard Scroll Models (Non-Digital Scroll)														
Model	**028**		**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**	**Hot Gas Line**	**Liquid Line**
50 ft (15m)	7/8	1/2	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 (30m)	7/8	5/8	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	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
4-Step Semi-Hermetic and Digital Scroll Models														
Model	**028**		**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**	**Hot Gas Line**	**Liquid Line**
50 ft (15m)	3/4	1/2	3/4	1/2	7/8	5/8	7/8	7/8	1-1/8*	7/8	1-1/8	7/8	1-3/8	7/8
100 ft (30m)	3/4	5/8	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*	5/8	1-1/8	7/8	1-1/8	7/8	1-1/8	7/8	1-3/8	1-1/8

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

Table 50 Indoor unit approximate refrigerant charge for R-22 or R-407C

System Type	Model	R-22 Charge per Circuit, lb (kg)	R-407C Charge per Circuit, lb (kg)
Air-Cooled	028, 035, 042	6.5 (3.0)	5.5 (2.5)
	053, 070, 077	9.5 (5.0)	8.0 (3.6)
	105	11.0 (5.0)	9.5 (4.3)
Water, Glycol/GLYCOOL	028, 035, 042	13.0 (5.9)	12.2 (5.6)
	053, 070, 077	18.5 (8.4)	17.0 (7.8)
	105	24.0 (10.9)	22.5 (10.3)

Table 51 Interconnecting piping refrigerant charge

Line Size, O.D., in.	R-22, lb/100 ft. (kg/30m)		R-407C, lb/100 ft. (kg/30m)	
	Liquid Line	Hot Gas Line	Liquid Line	Hot Gas Line
1/2	7.3 (3.3)	—	6.9 (3.1)	—
5/8	11.7 (5.3)	2.1 (1.0)	11.0 (5.0	2.2 (1.0)
3/4	16.6 (7.5)	3.0 (1.4)	15.7 (7.1)	3.1 (1.3)
7/8	24.4 (11.1)	4.4 (2.0)	23.0 (10.4)	4.5 (1.9)
1-1/8	41.4 (18.9)	7.8 (3.5)	39.3 (17.8)	7.8 (3.5)
1-3/8	63.3 (28.7)	11.8 (5.4)	59.8 (27.1	11.8 (5.4)

Table 52 R-22 and R-407C refrigerant required, approximate

Standard Condenser Models	Approximate R-22 Refrigerant Needed		Approximate R-407C Refrigerant Needed	
	Dual Circuit lb/circuit (kg/circuit)		Dual Circuit lb/circuit (kg/circuit)	
	FSC or VFD	Lee-Temp (includes receiver)	FSC or VFD	Lee-Temp (includes receiver)
165	5 (2.3)	27 (12.3)	5 (2.3)	26 (11.8)
205	7 (3.2)	56 (25.3)	7 (3.2)	54 (24.4)
251	10 (4.6)	38 (17.2)	10 (4.6)	36 (16.3)
308	11 (5.0)	58 (26.3)	11 (5.0)	55 (24.9)
415	25 (11.3)	107 (48.4)	24 (10.9)	102 (46.2)
510	30 (13.6)	149 (67.6)	29 (13.2)	142 (64.4)
Quiet-Line Condenser Models				
143	N/A	64 (29.0)	N/A	61 (27.7)
214	N/A	81 (36.7)	N/A	77 (34.9)
286	N/A	125 (56.7)	N/A	119 (54.0)
409	N/A	129 (58.5)	N/A	125 (55.8)
572	N/A	196 (88.9)	N/A	186 (84.4)

9.2.2 Scroll and Digital Scroll—Additional Oil Requirements

System charges over 40 lb (18.1kg) per circuit may require additional oil charge to be added. See **Table 53** for the amount required for various system charge levels.

After the system has been fully charged with refrigerant, use a hand pump to add the additional oil at the suction side of the system while the system is running.

The amount of oil added by field service must be recorded on the tag marked "Oil Added Field Service Record," attached to each compressor. The date of oil addition must be included as well.

Table 53 Additional oil required per refrigerant charge

	System Charge Per Circuit - lb (kg) *								
	40lb (18.1kg)	60lb (27.2kg)	80lb (36.3kg)	100lb (45.4kg)	120lb (54.4kg)	140lb (63.5kg)	160lb (72.6kg)	180lb (81.6kg)	200lb (90.7kg)
Model	Additional Oil Required Per Circuit - Ounces (Grams)								
DS028 DS035 DS042	0	4 (113)	7 (198)	10 (283)	13 (369)	16 (454)	20 (567)	23 (652)	26 (737)
DS053-60Hz	7.5 (213)	15.5 (439)	23.5 (666)	31.5 (893)	39.5 (1120)	47.5 (1347)	55.5 (1573)	63.5 (1800)	71.5 (2027)
DS053-50Hz DS070 DS077 DS105	5 (142)	13 (369)	21 (595)	29 (822)	37 (1049)	45 (1276)	53 (1502)	61 (1729)	69 (1956)

* For system charges over 200lb (90.7kg), consult your Emerson representative.

NOTICE

Risk of improper compressor lubrication. Can cause compressor and refrigerant system damage.

Failure to use oil types, viscosities and quantities recommended by the compressor manufacturer may reduce compressor life and void the compressor warranty. See **Table 64** for compressor oil types.

- Do not mix polyolester (POE) and mineral-based oils.
- Do not mix oils of different viscosities.
- Consult Emerson or the compressor manufacturer if questions arise.

9.3 Dehydration/Leak Test and Charging Procedures for R-407C and R-22

9.3.1 Air-Cooled Condenser with Variable Fan Speed Head Pressure Control Systems

The Variable Fan Speed Control systems (FSC & VFD) use pressure activated electronic fan speed control systems and remotely located thermostat(s) to ensure operation at ambient temperatures as low as 0°F (-18°C). For this ambient temperature range, the VFD Control Condenser must be used with digital scroll indoor units and can be used for energy savings with any Liebert DS indoor unit.

Variable Fan Speed Control Piping

Two discharge lines and two liquid lines must be field-installed between the indoor unit and the outdoor condenser. See **Figures 67** and **69** for details.

Variable Fan Speed Control Materials Supplied

- Built-in, pre-wired condenser control box
- Air-Cooled condenser
- Piping access cover to be reinstalled when piping is complete
- Bolts—four per leg (3/8" x 5/8")
- Terminal block for two-wire, 24V interlock connection between unit and condenser
- Condenser legs—four with 1-fan, 2-fan and 3-fan models; six with 4-fan models

Variable Fan Speed Control Leak Check and Evacuation Procedure

Proper leak check and evacuation can be accomplished only with all system solenoid valves open and check valves accounted for.

NOTE
*Systems with scroll or digital scroll compressors include a factory-installed check valve and an additional downstream Schrader valve with core in the compressor discharge line. Proper evacuation of the condenser side of the compressor can be accomplished only using the downstream Schrader valve. See piping schematic (**Figures 67** and **69**).*

1. If unit power is available, open the unit liquid line solenoid valves using the evacuation function for System #1 and System #2 in the diagnostic section of the Liebert iCOM control (refer to the Liebert iCOM user manual, SL-18835). If unit power is not available, a field-supplied 24VAC / 75VA power source must be directly connected to each of the unit solenoid valves.
2. For semi-hermetic compressors, connect refrigeration gauges to the suction and discharge service valves of both compressors.
3. For scroll and digital scroll compressors, connect refrigerant gauges to the suction rotalock valves and discharge line Schrader valves (see **Note** above) on both compressors.
4. Starting with Circuit #1, open the service valves and place a 150 PSIG (1034 kPa) of dry nitrogen with a tracer of refrigerant. Check system for leaks with a suitable leak detector.
5. With pressure still in Circuit #1, open the compressor service valves in Circuit #2. If pressure increases in Circuit #2, the system is cross-circuited and must be rechecked for proper piping. If there is no pressure increase, repeat the leak check procedure for Circuit #2.
6. After completion of leak testing, release the test pressure (per local code) and pull an initial deep vacuum on the system with a suitable pump.
7. After four hours, check the pressure readings and, if they have not changed, break vacuum with dry nitrogen. Pull a second (R-407C and R-22) and third (R407C only) vacuum to 250 microns or less. Recheck the pressure after two hours. After completing this step, proceed to **Variable Fan Speed Charging**.

Variable Fan Speed Charging

1. Check unit nameplate for refrigerant type to be used. Unit control configurations differ depending on refrigerant type.
2. Refrigerant charging requires unit operation. Refer to **11.0 - Checklist for Completed Installation**.
3. Calculate the amount of charge for the system. Refer to the unit, condenser and refrigerant line charge data in **Tables 50**, **51** and **52**.
4. Weigh in as much of the system charge as possible before starting the unit.

CAUTION

Risk of improper refrigerant charging. Can cause equipment damage.

Refrigerant R407C is a blend of three components and must be introduced and charged from the cylinder only as a liquid.

When adding liquid refrigerant to an operating system, it may be necessary to add the refrigerant through the compressor suction service valve. Care must be exercised to avoid damage to the compressor. Emerson recommends connecting a sight glass between the charging hose and the compressor suction service valve. This will permit adjustment of the cylinder hand valve so that liquid can leave the cylinder while allowing vapor to enter the compressor.

5. Turn on unit disconnect switch. Operate the unit for 30 minutes using the charging function for System #1 and System #2 in the diagnostic section of the Liebert iCOM control (see Liebert iCOM user manual, SL-18835). The charging function operates the compressor at full capacity and energizes the blower motor and the liquid line solenoid valve. The reheat and humidifier are disabled. A minimum 20psig (138kPa) must be established and maintained for the compressor to operate. The charging function can be reset as many times as required to complete unit charging.

Table 54 Fan speed suction pressure transducer settings

Function	R-22		R-407C	
	Gauge (Sea Level) psiG (kPa)	Absolute psiA (kPa)	Gauge (Sea Level) psiG (kPa)	Absolute psiA (kPa)
Pump-Down Cutout	35 (241)	50 (344)	35 (241)	50 (345)
Pump-Down Reset	65 (448)	80 (552)	65 (448)	80 (552)
Minimum to Start-Cooling	35 (241)	50 (344)	35 (241)	50 (344)
Low-Pressure Cutout	20 (138)	35 (241)	20 (138)	35 (241)
Freeze Protection (DX w/Econ-O-Coil)	48 (331)	63 (434)	52 (358)	67 (461)

Due to control processing time, the pumpdown pressure at compressor shutoff will be approximately 20psiG (138kPa) / 35psiA (241 kPa) even though the setpoint is 35 psiG (241 kPa) / 50 psiA (344kPa).

6. Charge the unit until the liquid line sight glass becomes clear. Then add one additional pound (2.2kg) of refrigerant.

NOTE

A digital scroll compressor will have a clear sight glass only when operating at 100% capacity. When operating below 100%, the sight glass may show bubbles with each 15-second unloading cycle.

7. As head pressure builds, the variable fan speed controlled condenser fan begins rotating. The fan will run at full speed when sufficient head pressure is developed—fan starts to rotate at 190 psig (1310 kPA) and is full speed at 250 psig (1724 kPA).

9.3.2 Air-Cooled Condenser with Liebert Lee-Temp "Flooded Condenser" Head Pressure Control System

The Liebert Lee-Temp system consists of a modulating type head pressure control valve and insulated receivers with heater pads to ensure operation at ambient temperatures as low as -30°F (-34.4°C). The Liebert Lee-Temp system can be used with any Liebert DS compressor choice.

Liebert Lee-Temp Piping

Two discharge lines and two liquid lines must be field-installed between the indoor unit and the outdoor condenser. See **Figures 67** and **69** for details.

Liebert Lee-Temp Controlled Materials Supplied

- Built-in, pre-wired condenser control box
- Air-Cooled condenser
- Piping access cover to be reinstalled when piping is complete (models with one to four fans only)
- Bolts—four per leg (3/8" x 5/8")
- Terminal block for two-wire, 24V interlock connection between unit and condenser
- Condenser legs—four with 1-fan, six on two-, three- and six-fan models and eight on four- and eight-fan models
- Bolts—six per receiver (3/8" x 1")
- Lee-Temp system:
  - Insulated storage receiver—one per circuit
  - Head pressure control valve with integral check valve - one per circuit
  - Service valve—one per circuit
  - Pressure relief valve—one per circuit
  - Liquid level sight glass—two per circuit
  - Check valve—one per circuit

NOTE

Lee-Temp heater pads require a separate, continuous electrical source. See nameplate on unit for proper voltage.

Lee-Temp Leak Check and Evacuation Procedure

Proper leak check and evacuation can be accomplished only with all system solenoid valves open and check valves accounted for.

NOTE

*Systems with scroll or digital scroll compressors include a factory-installed check valve and an additional downstream Schrader valve with core in the compressor discharge line. Proper evacuation of the condenser side of the compressor can be accomplished only using the downstream Schrader valve. See piping schematic (**Figure 69**).*

1. If unit power is available, open the unit liquid line solenoid valves using the evacuation function for System #1 and System #2 in the diagnostic section of the Liebert iCOM control. If unit power is not available, a field-supplied 24VAC / 75VA power source must be directly connected to each of the unit solenoid valves.
2. Attach a jumper hose from the service valve fitting on the outlet of the receiver and the Schrader fitting on the discharge header of the condenser. Front-seat the service valve approximately two (2) turns.
3. For semi-hermetic compressors, connect refrigeration gauges to the suction and discharge service valves of both compressors.
4. For scroll and digital scroll compressors, connect refrigerant gauges to the suction rotalock valves and discharge line Schrader valves (see **Note** above) on both compressors.
5. Starting with Circuit #1, open the service valves and place a 150 PSIG (1034 kPa) of dry nitrogen with a tracer of refrigerant. Check system for leaks with a suitable leak detector.
6. With pressure still in Circuit #1, open the compressor service valves in Circuit #2. If pressure increases in Circuit #2, the system is cross-circuited and must be rechecked for proper piping. If there is no pressure increase, repeat the leak check procedure for Circuit #2.

7. After completion of leak testing, release the test pressure (per local code) and pull an initial deep vacuum on the system with a suitable pump.
8. After four hours, check the pressure readings and, if they have not changed, break vacuum with dry nitrogen. Pull a second (R-407C and R-22) and third (R407C only) vacuum to 250 microns or less. Recheck the pressure after two hours. After completing this step, proceed to **Variable Fan Speed Charging on page 90**.
9. Remove the jumper hose installed previously from between the service valve fitting and the condenser. After completing this step, proceed to **Lee-Temp Charging**.

Lee-Temp Charging

1. Check unit nameplate for refrigerant type to be used. Unit control configurations differ depending on refrigerant type.
2. Refrigerant charging requires unit operation. Refer to **11.0 - Checklist for Completed Installation**.
3. Calculate the amount of charge for the system. Refer to the unit, condenser and refrigerant line charge data in **Tables 50**, **51** and **52**.
4. Weigh in as much of the system charge as possible before starting the unit.

NOTICE

Risk of improper refrigerant charging. Can cause equipment damage.

Refrigerant R407C is a blend of three components and must be introduced and charged from the cylinder only as a liquid.

When adding liquid refrigerant to an operating system, it may be necessary to add the refrigerant through the compressor suction service valve. Care must be exercised to avoid damage to the compressor. Emerson recommends connecting a sight glass between the charging hose and the compressor suction service valve. This will permit adjustment of the cylinder hand valve so that liquid can leave the cylinder while allowing vapor to enter the compressor.

5. Turn on unit disconnect switch. Operate the unit for 30 minutes using the charging function for System # 1 and System # 2 in the diagnostic section of the Liebert iCOM control. The charging function operates the compressor at full capacity and energizes the blower motor and liquid line solenoid valve. The reheat and humidifier are disabled. A minimum 20psig (138kPa) must established and maintained for the compressor to operate. The charging function can be reset as many times as required to complete unit charging.

Table 55 Lee-Temp suction pressure transducer settings

Function	R-22		R-407C	
	Gauge (Sea Level) psiG (kPa)	Absolute psiA (kPa)	Gauge (Sea Level) psiG (kPa)	Absolute psiA (kPa)
Pump-Down Cutout	35 (241)	50 (344)	35 (241)	50 (344)
Pump-Down Reset	65 (448)	80 (552)	65 (448)	80 (552)
Minimum to Start-Cooling	50 (345)	65 (448)	50 (345)	65 (448)
Low-Pressure Cutout (DX only)	20 (138)	35 (241)	20 (138)	35 (241)
Freeze Protection (DX w/Econ-O-Coil)	48 (331)	63 (434)	52 (358)	67 (461)

Due to control processing time, the pumpdown pressure at compressor shut off will be approximately 20psiG (138kPa) / 35psiA (241kPa) even though the setpoint is 35psiG (241kPa) / 50psiA (344kPa).

6. Charge the unit until the liquid line sight glass becomes clear. Then add one additional pound (2.2 kg) of refrigerant.

NOTE

A digital scroll compressor will have a clear sight glass only when operating at 100% capacity. When operating below 100%, the sight glass may show bubbles with each 15-second unloading cycle.

Lee-Temp Receiver Refrigerant Level

On each receiver at the condenser are two refrigerant-level sight glasses. Refrigerant level will vary with outside temperature. Check refrigerant level after the unit has been on for at least 15 minutes.

Sight Glass Levels

40°F (4.5°C) and lower—bottom sight glass is 3/4 full

40 to 60°F (4.5 to 15.5°C)—bottom sight glass is full

60°F (15.5°C) and higher—top sight glass is 3/4 full.

9.3.3 Water/Glycol Cooled System

The water/glycol cooled system is factory-charged and includes and includes a Paradenser condenser and control valves.

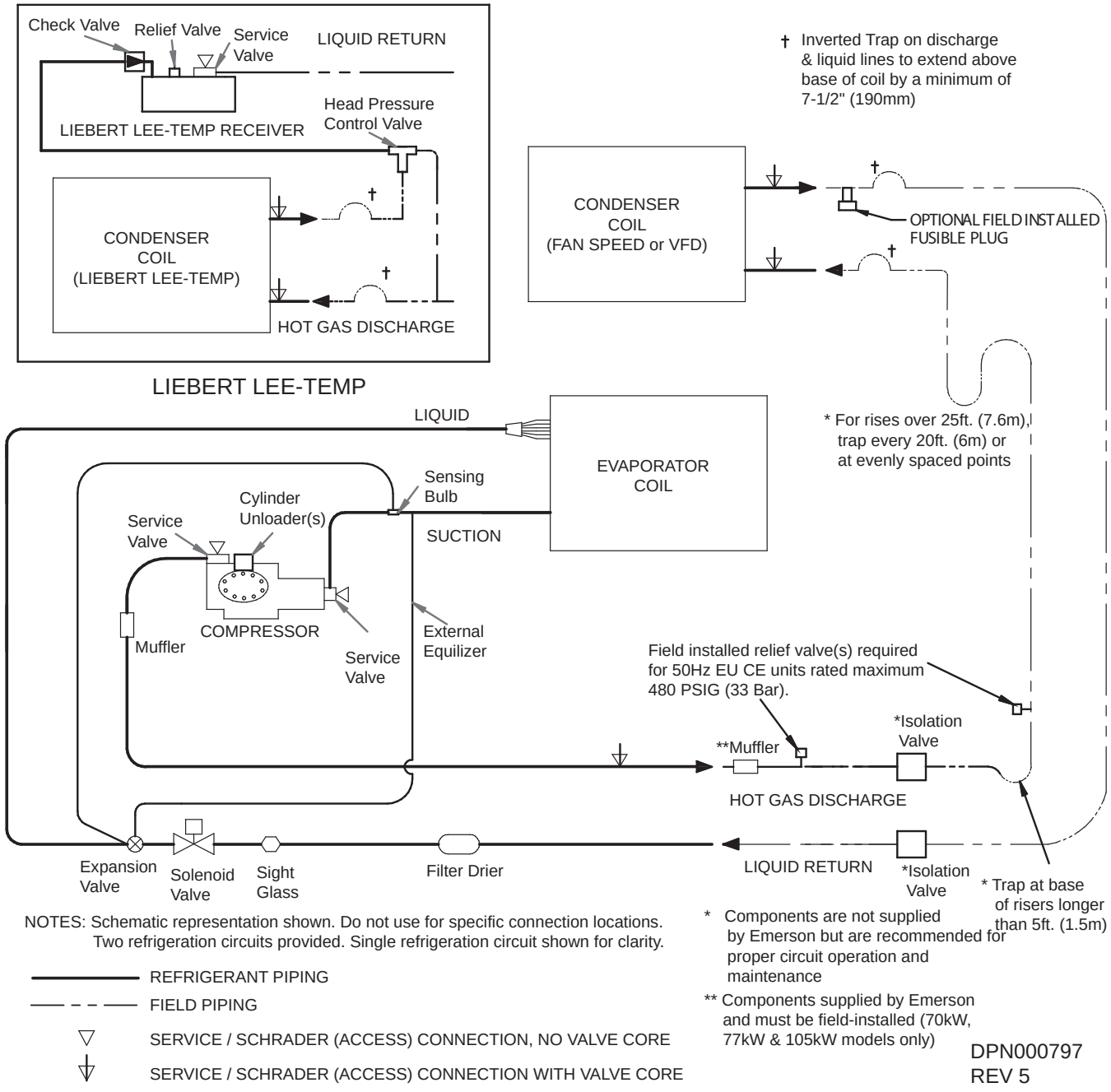
Table 56 Water/Glycol-cooled and GLYCOOL suction pressure transducer settings

Function	R-22		R-407C	
	Gauge (Sea Level) psiG (kPa)	Absolute psiA (kPa)	Gauge (Sea Level) psiG (kPa)	Absolute psiA (kPa)
Pump-Down Cutout	35 (241)	50 (344)	35 (241)	50 (344)
Pump-Down Reset	65 (448)	80 (552)	65 (448)	80 (552)
Minimum to Start-Cooling	50 (345)	65 (448)	50 (345)	65 (448)
Low-Pressure Cutout (DX only)	20 (138)	35 (241)	20 (138)	35 (241)
Freeze Protection (DX w/Econ-O-Coil)	48 (331)	63 (434)	52 (358)	67 (461)

Due to control processing time, the pumpdown pressure at compressor shut off will be approximately 20 psiG (138 kPa) / 35 psiA (241 kPa) even though the set point is 35 psiG (241 kPa) / 50 psiA (344kPa).

10.0 PIPING SCHEMATICS

Figure 67 Piping schematic—air-cooled, semi-hermetic compressor models



NOTES: Schematic representation shown. Do not use for specific connection locations. Two refrigeration circuits provided. Single refrigeration circuit shown for clarity.

REFRIGERANT PIPING

FIELD PIPING

SERVICE / SCHRADER (ACCESS) CONNECTION, NO VALVE CORE

SERVICE / SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

* Components are not supplied by Emerson but are recommended for proper circuit operation and maintenance

** Components supplied by Emerson and must be field-installed (70kW, 77kW & 105kW models only)

DPN000797
REV 5

Figure 68 Piping schematic—air-cooled, scroll compressor models

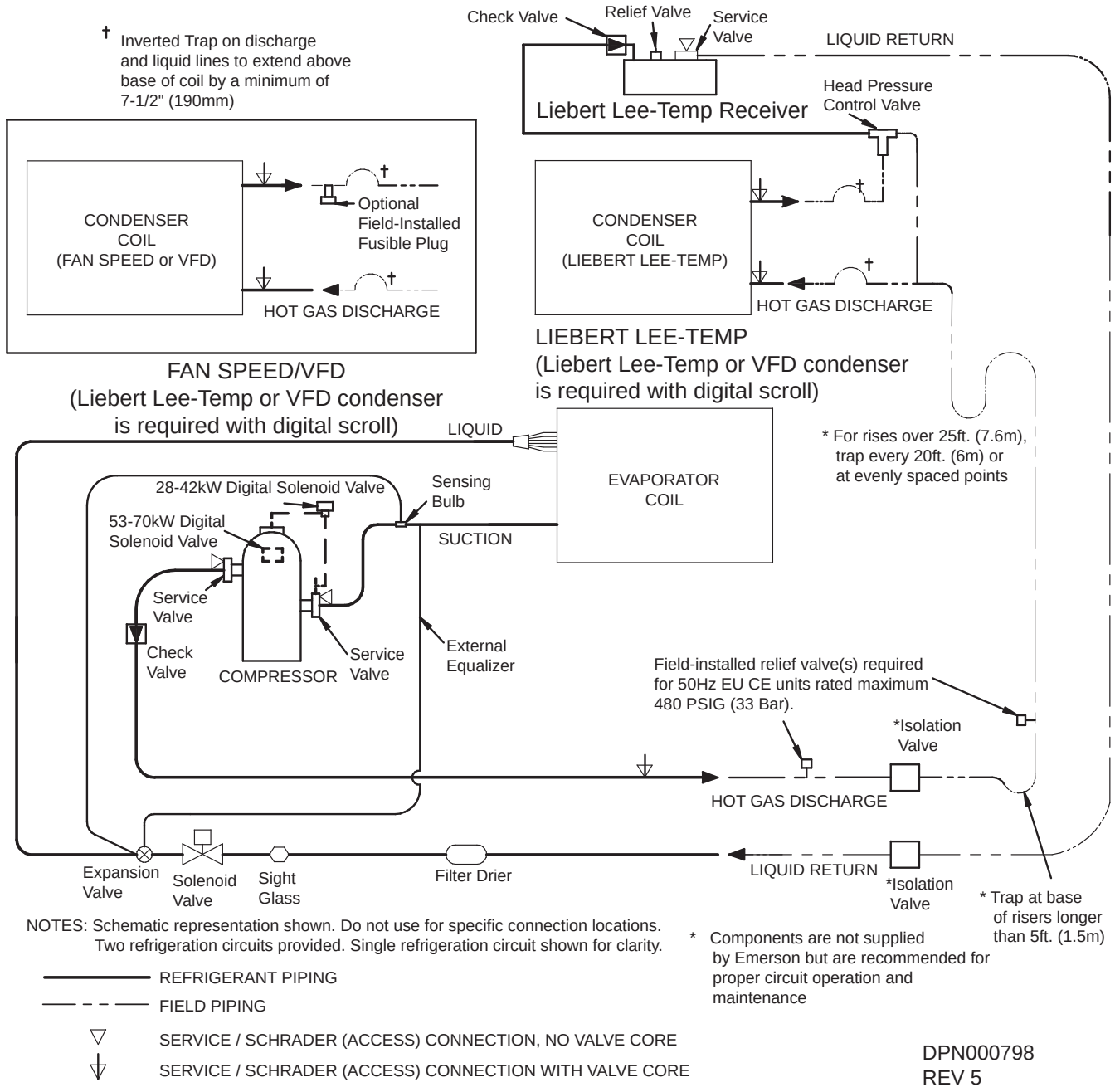
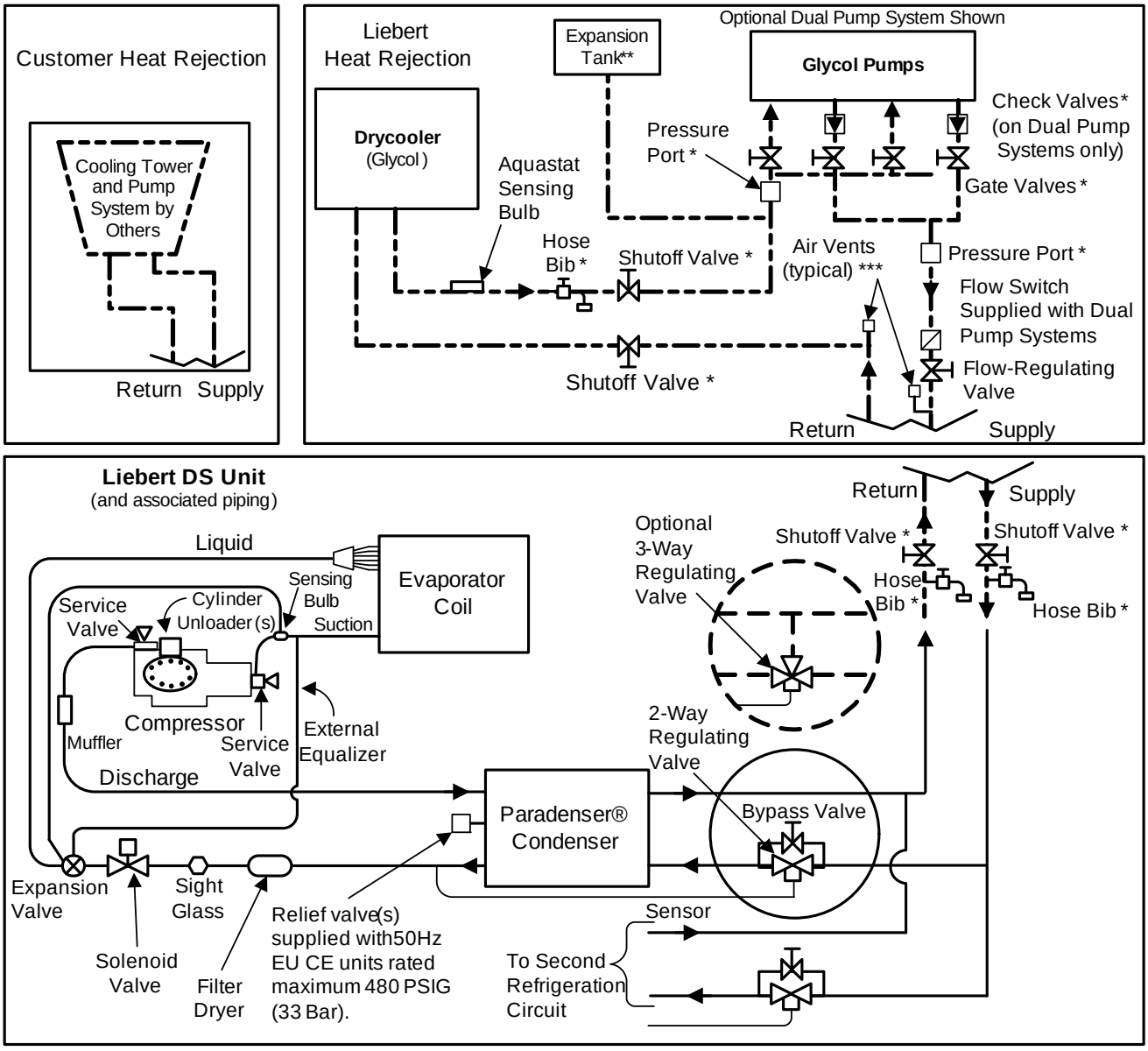


Figure 69 Piping schematic—water/glycol, semi-hermetic compressor models

**For systems with drycoolers,
refer to 13.14.3 - Drycooler Settings.**



Factory Piping
Field Piping
Optional Factory Piping
Service/Schrader (Access) Connection No Valve Core
Service/Schrader (Access) Connection With Valve Core

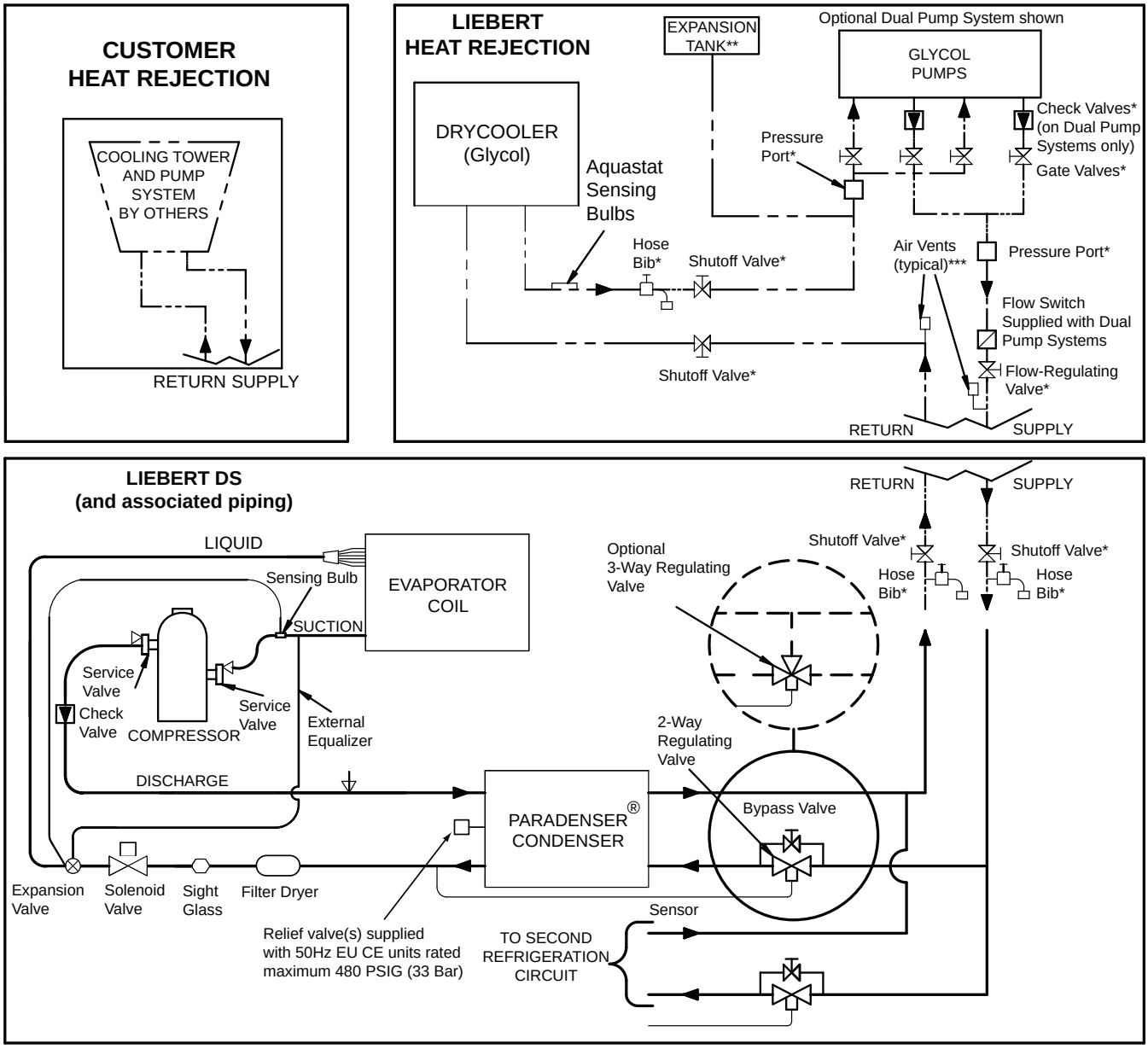
* Components are not supplied by Liebert, but are recommended for proper circuit operation and maintenance
** Field-installed at highest point In system on return line to pumps
*** Locate at tops of all risers and any intermediate system high points

Note: Schematic representation shown This schematic does not imply or define elevations and component location unless specifically noted ..
Two refrigeration circuits provided Single refrigeration circuit shown for clarity

DPN00895
Rev. 2

Figure 70 Piping schematic—water/glycol with scroll compressor models

**For systems with drycoolers,
refer to 13.14.3 - Drycooler Settings.**



Factory Piping

Field Piping

Optional Factory Piping

Service/Schrader (Access) Connection No Valve Core

Service/Schrader (Access) Connections With Valve Core

Note: Schematic representation shown. This schematic does not imply or define elevations and component location unless specifically noted.
Two refrigeration circuits provided. Single refrigeration circuit shown for clarity.

* Components are not supplied by Liebert but are recommended for proper circuit operation and maintenance

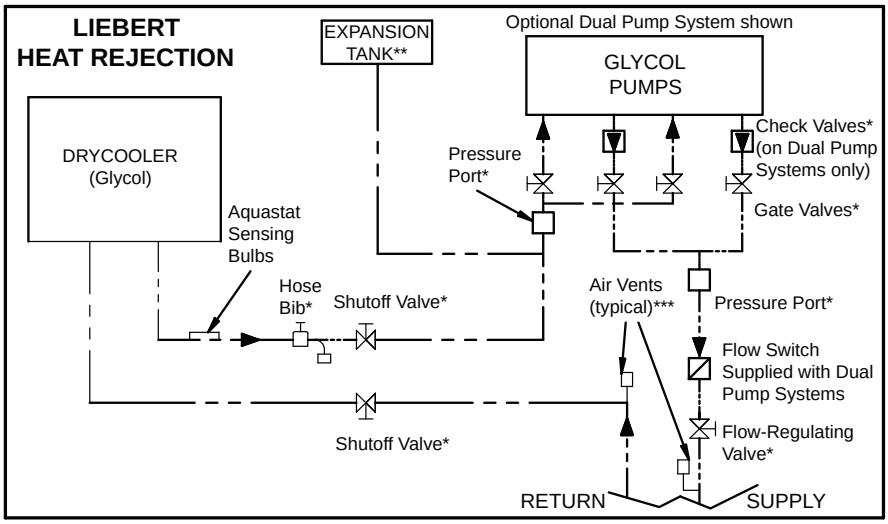
** Field-installed at highest point in system on return line to pumps

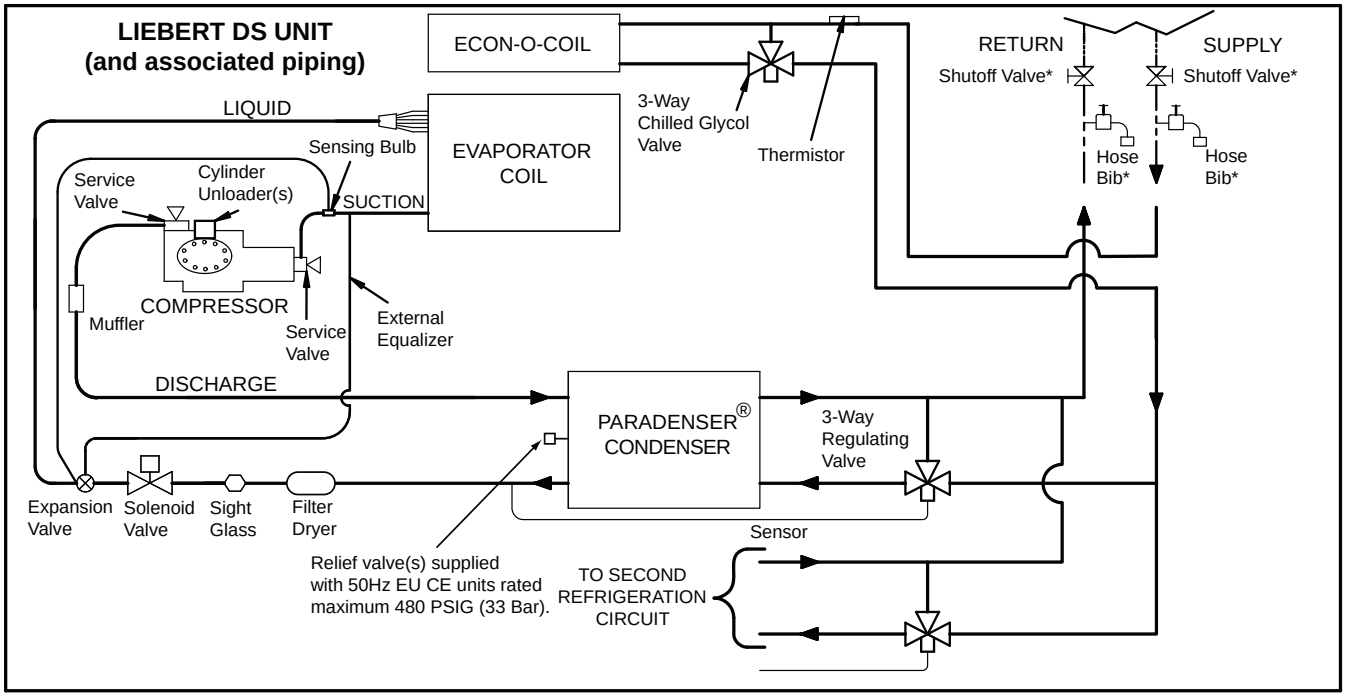
*** Locate at tops of all risers and any intermediate system high points

DPN000896
REV 3

Figure 71 Piping schematic—GLYCOOL semi-hermetic compressor models

For systems with drycoolers, refer to 13.14.3 - Drycooler Settings.





Factory Piping

Field Piping

▽ Service/Schrader (Access) Connection No Valve Core

Service/Schrader (Access) Connections With Valve Core

* Components are not supplied by Liebert but are recommended for proper circuit operation and maintenance

** Field-installed at highest point in system on return line to pumps

*** Locate at tops of all risers and any intermediate system high points

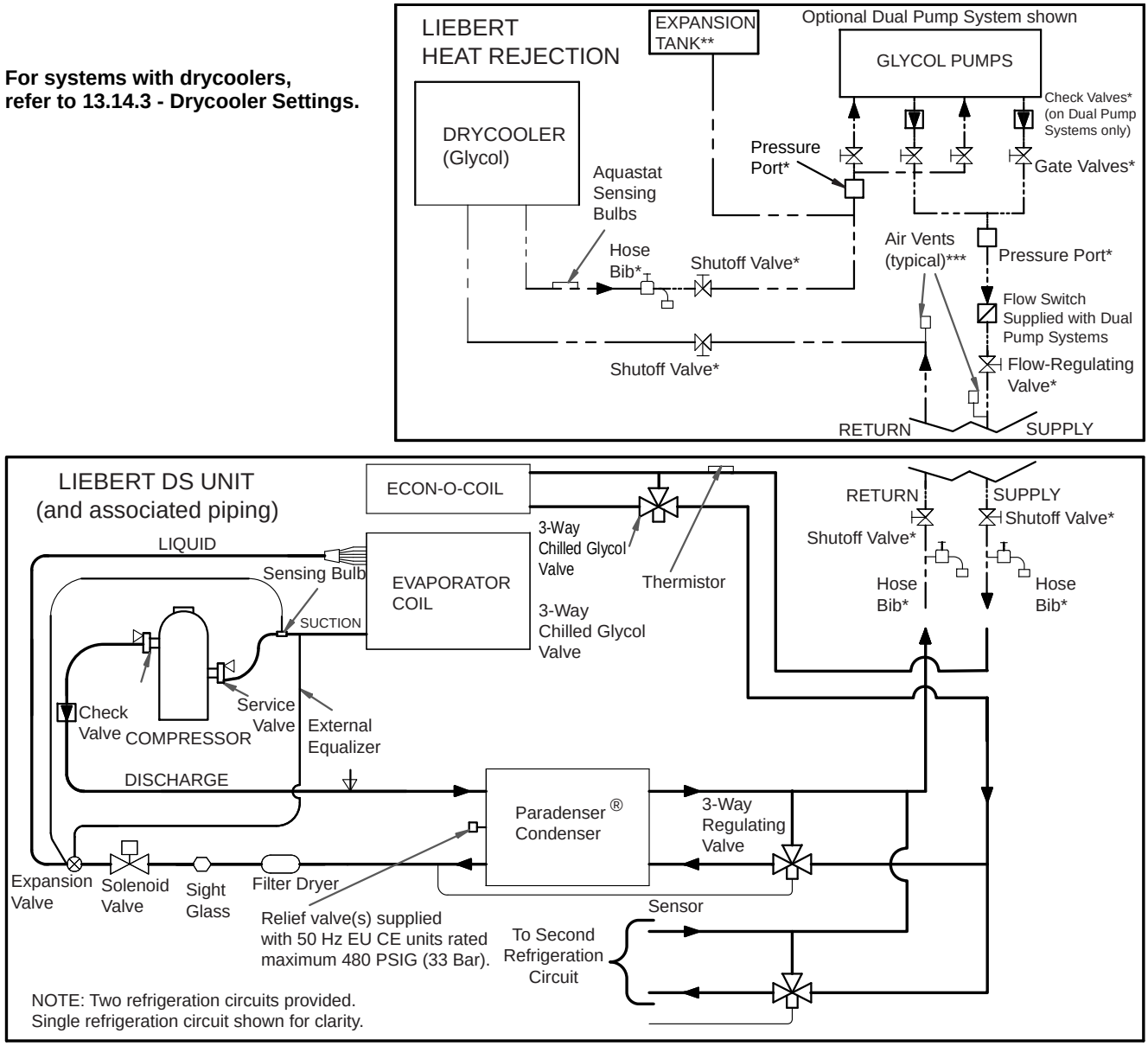
Notes: Schematic representation shown. This schematic does not imply or define elevations and component location unless specifically noted.

Two refrigeration circuits provided. Single refrigeration circuit shown for clarity

DPN000897
Rev. 02

Figure 72 Piping schematic—GLYCOOL with scroll compressor models

For systems with drycoolers, refer to 13.14.3 - Drycooler Settings.



FIELD PIPING
FACTORY PIPING

▽ SERVICE / SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

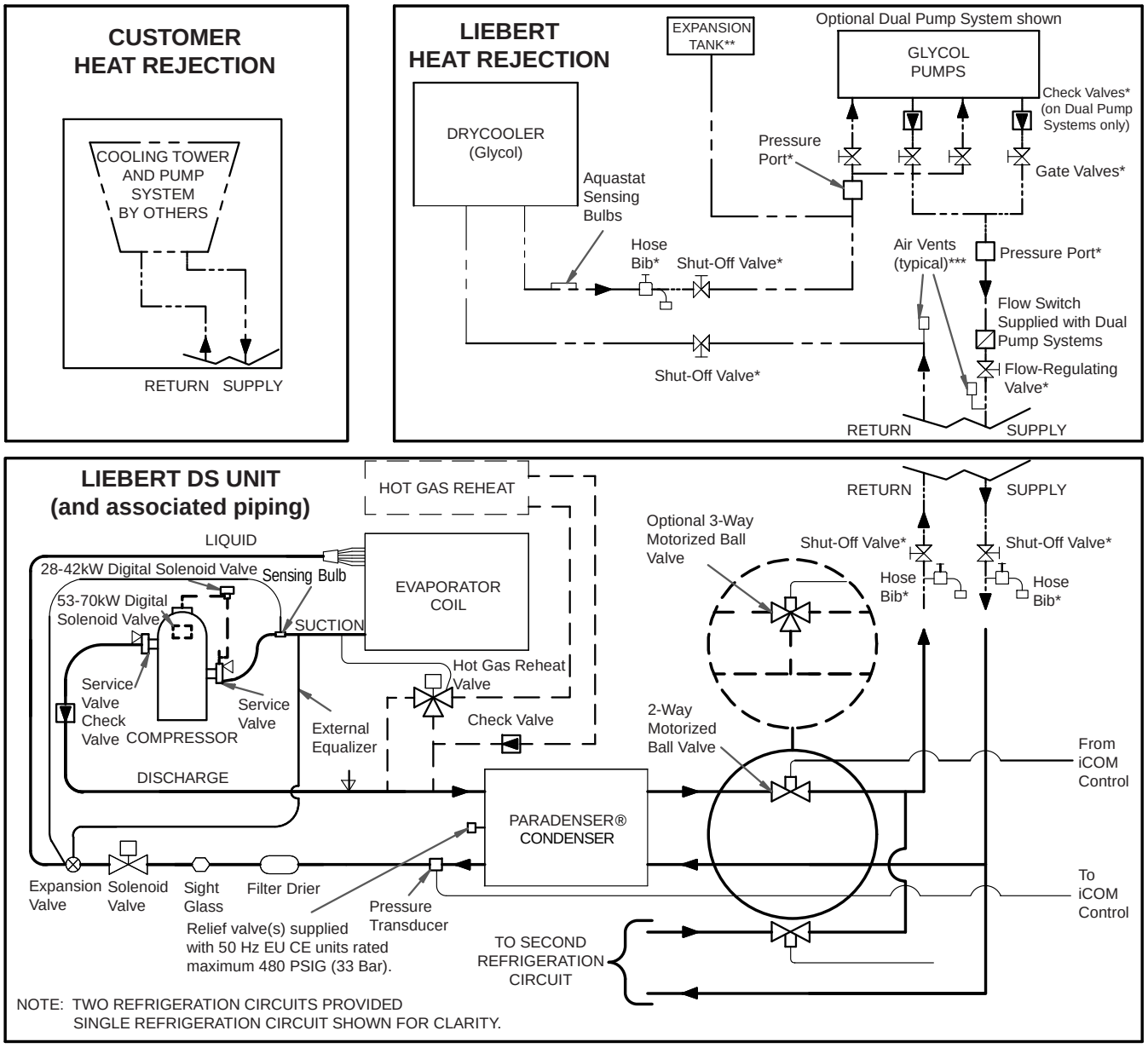
⏚ SERVICE / SCHRADER (ACCESS) CONNECTION NO VALVE CORE

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

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

DPN000898
REV 3

Figure 73 Piping schematic—water/glycol with digital scroll compressor models



FACTORY PIPING

FIELD PIPING

OPTIONAL FACTORY PIPING

SERVICE / SCHRADER (ACCESS) CONNECTION NO VALVE CORE

SERVICE / SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

* Components are not supplied by Liebert but are recommended for proper circuit operation and maintenance

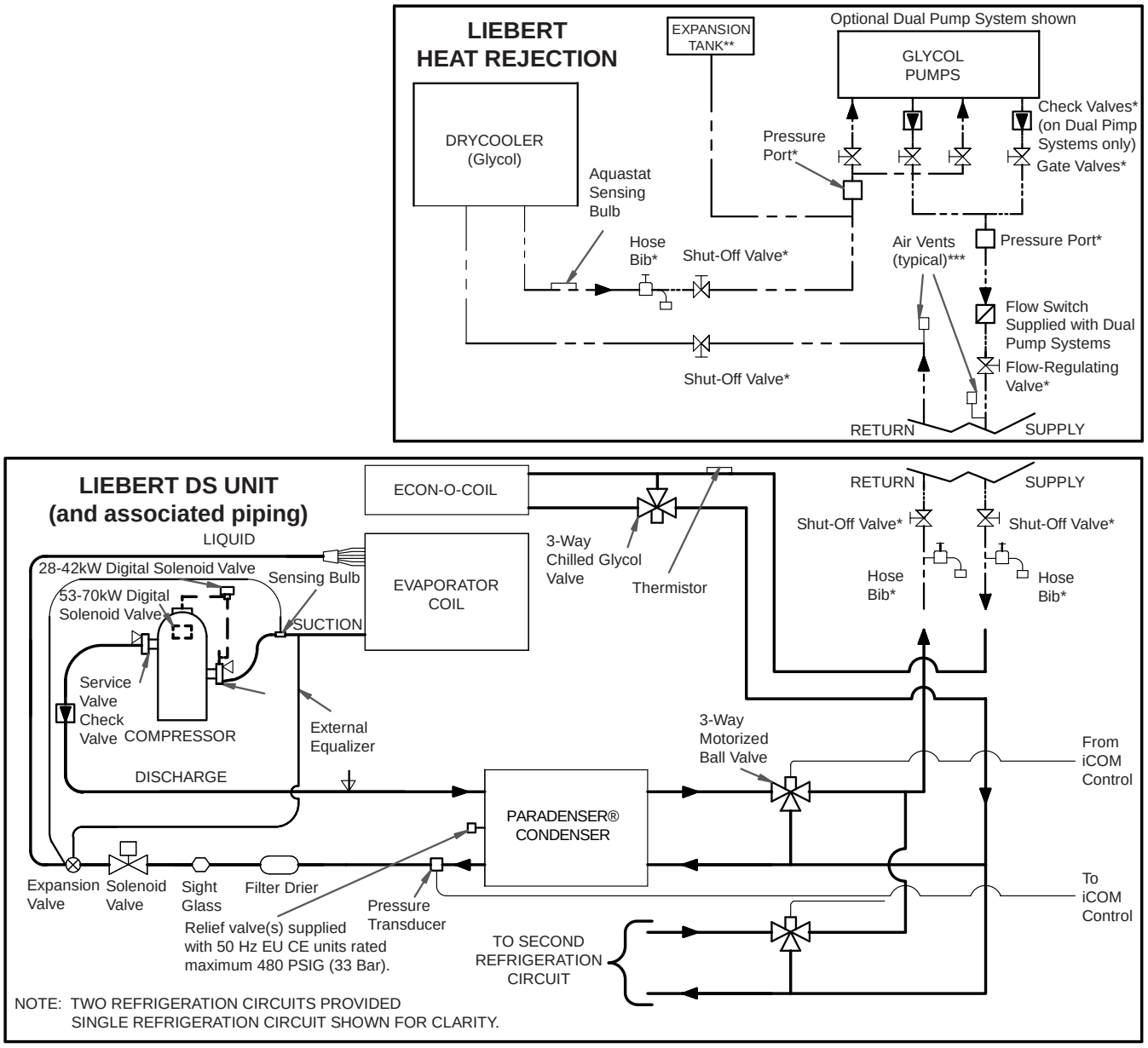
** Field installed at highest point in system on return line to pumps

*** 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.

DPN001430
Rev. 0

Figure 74 GLYCOOL with digital scroll compressor models



FACTORY PIPING

FIELD PIPING

SERVICE / SCHRADER (ACCESS) CONNECTION NO VALVE CORE

SERVICE / SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

* Components are not supplied by Liebert but are recommended for proper circuit operation and maintenance

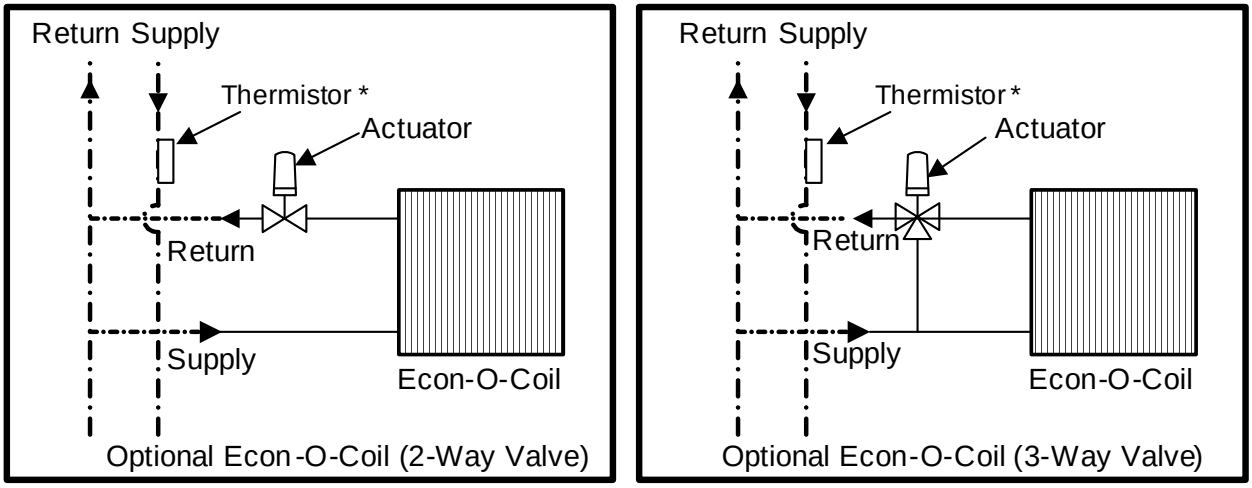
** Field installed at highest point in system on return line to pumps

*** 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.

DPN001432
Rev. 0

Figure 75 Optional piping schematic for Econ-O-Coil



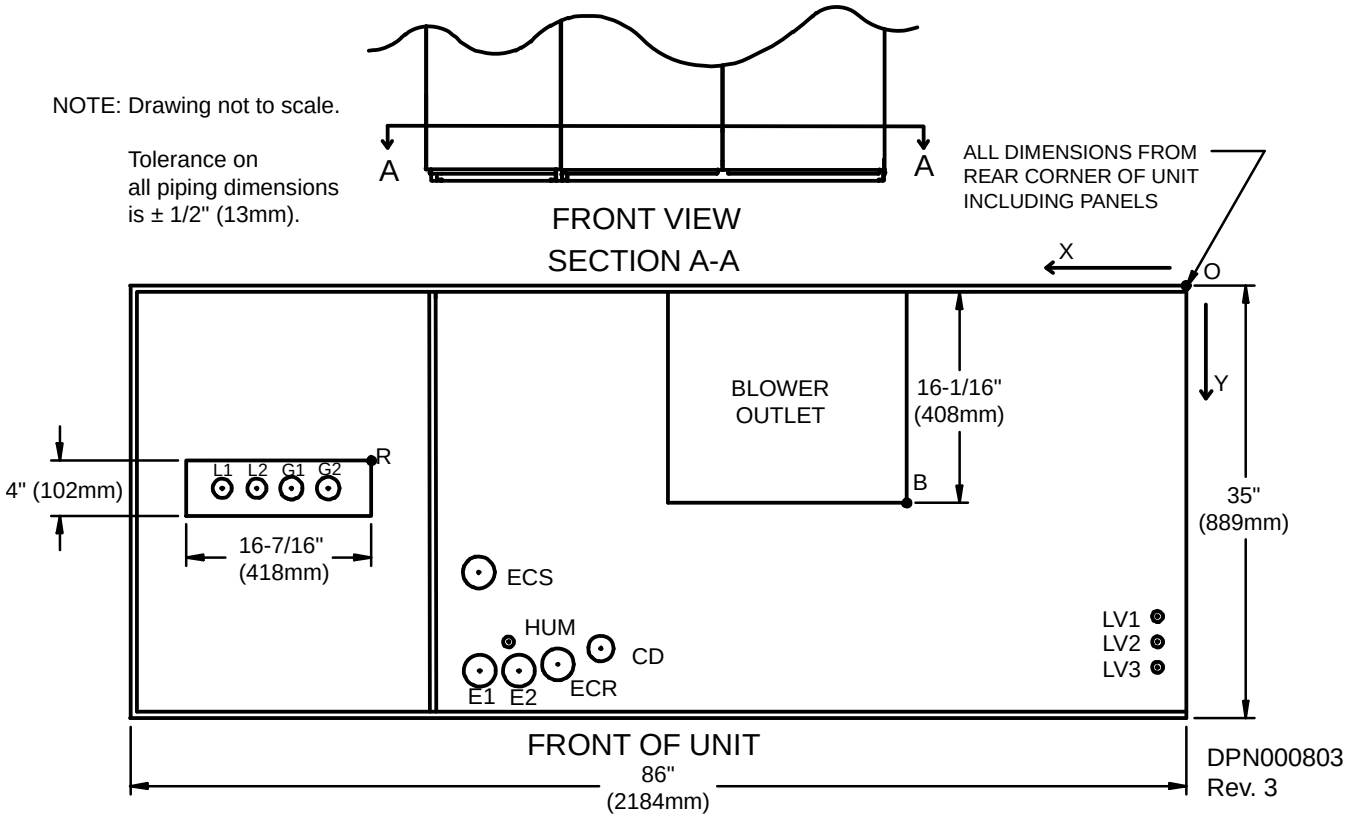
Factory Piping
Field Piping

* Supplied with 10 feet (3m) 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

DPN000805
Rev. 1

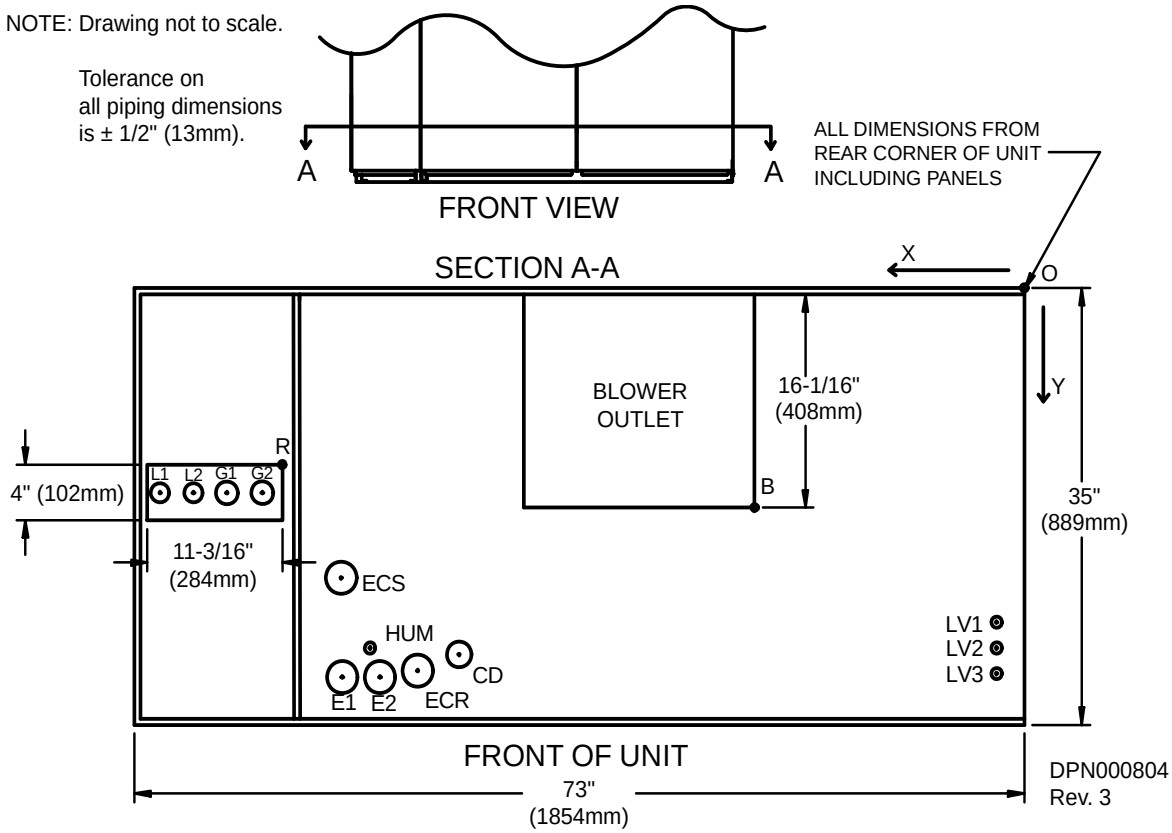
Figure 76 Primary connection locations—downflow, air-cooled, 28-42kW (8-12 ton), semi-hermetic compressor models



Point	Description	X inches (mm)	Y inches (mm)	Connection Size / Opening inches (mm)
R	Refrigerant Access	63 (1600)	13-13/16 (351)	16-7/16 x 4 (418 x 102)
L1	Liquid Line System 1	79-3/16 (2011)	16-3/4 (425)	1/2 Cu Sweat
L2	Liquid Line System 2	76-1/2 (1943)	16-3/4 (425)	1/2 Cu Sweat
G1	Hot Gas Discharge 1	73-7/8 (1876)	16-3/4 (425)	5/8 Cu Sweat
G2	Hot Gas Discharge 2	70-1/8 (1780)	16-3/4 (425)	5/8 Cu Sweat
CD	Condensate Drain* (infrared humidifier or no humidifier)*	46 (1168)	29-1/2 (749)	3/4 FPT
	Condensate Drain* (steam generating humidifier)*	46 (1168)	29-1/2 (749)	1-1/4 FPT
	W/ Optional Pump	46 (1168)	29-1/2 (749)	1/2 Cu Sweat
HUM	Humidifier Supply Line	53-1/2 (1359)	29 (737)	1/4 Cu Sweat
ECS	Econ-O-Coil Supply	54-7/8 (1394)	22-9/16 (573)	1-5/8 Cu Sweat
ECR	Econ-O-Coil Return	49-3/8 (1254)	30-3/4 (781)	1-5/8 Cu Sweat
E1	Electrical Connection (High Volt)	55-1/2 (1410)	31-1/4 (794)	2-1/2
E2	Electrical Connection (High Volt)	52-7/16 (1332)	31-1/4 (794)	2-1/2
LV1	Electrical Connection (Low Volt)	2-1/4 (57)	27 (686)	7/8
LV2	Electrical Connection (Low Volt)	2-1/4 (57)	29 (737)	7/8
LV3	Electrical Connection (Low Volt)	2-1/4 (57)	31 (787)	7/8
B	Blower Outlet	21-15/16 (558)	18-1/16 (459)	18-3/4 x 16-1/16 (476 x 408)

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

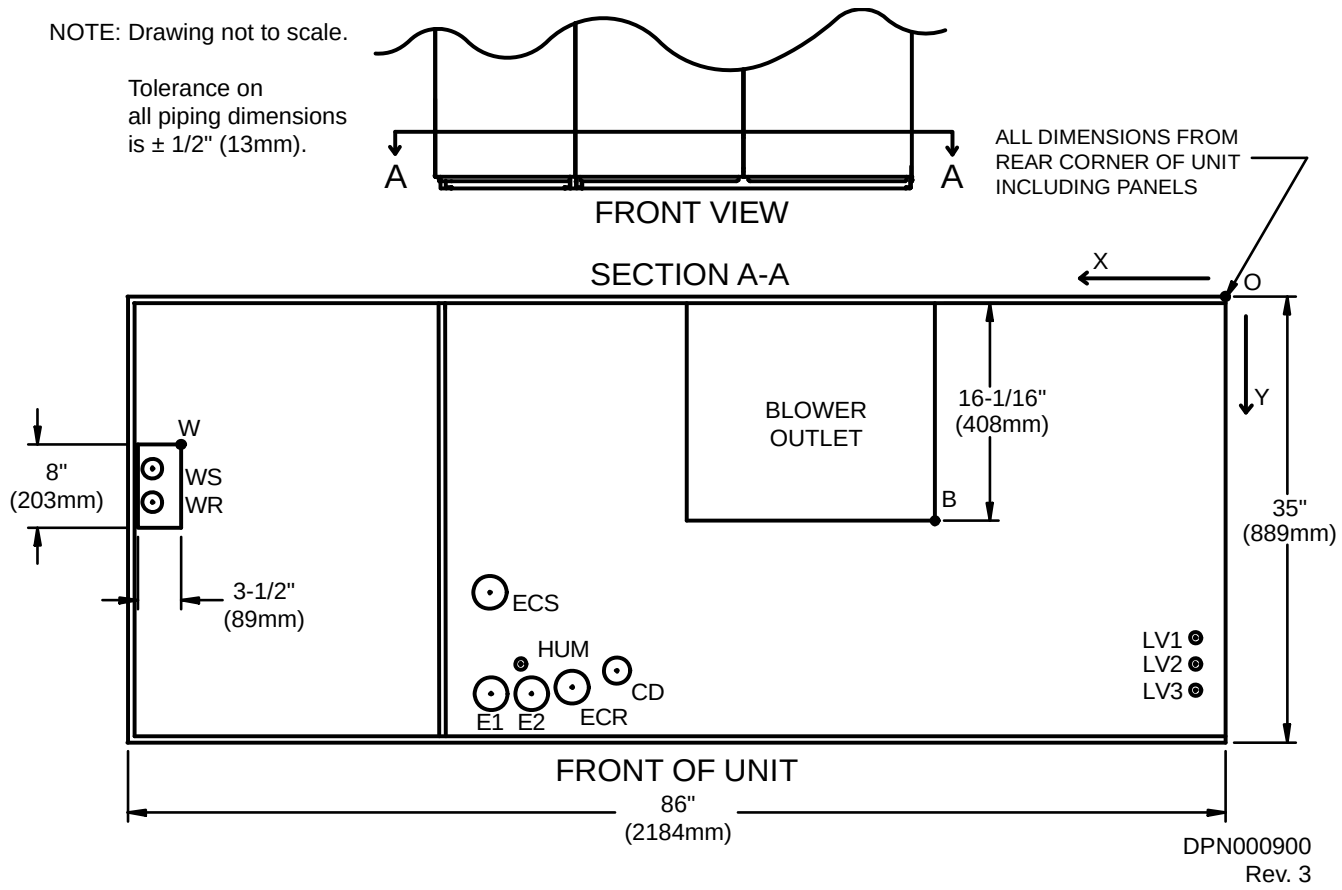
Figure 77 Primary connection locations—downflow, air-Cooled, 28-42kW (8-12 ton) with scroll compressor models



Point	Description	X inches (mm)	Y inches (mm)	Connection Size / Opening inches (mm)
R	Refrigerant Access	59-5/16 (1507)	14-3/4 (375)	11-3/16 x 4 (284 x 102)
L1	Liquid Line System 1	69-15/16 (1776)	16-13/16 (411)	1/2 Cu Sweat
L2	Liquid Line System 2	67-5/8 (1718)	16-13/16 (411)	1/2 Cu Sweat
G1	Hot Gas Discharge 1	65-1/2 (1664)	16-13/16 (411)	5/8 Cu Sweat
G2	Hot Gas Discharge 2	62-7/16 (1586)	16-13/16 (411)	5/8 Cu Sweat
CD	Condensate Drain* (infrared humidifier or no humidifier)	46 (1168)	29-1/2 (749)	3/4 FPT
	Condensate Drain* (steam generating humidifier)	46 (1168)	29-1/2 (749)	1-1/4 FPT
	W/ Optional Pump	46 (1168)	29-1/2 (749)	1/2 Cu Sweat
HUM	Humidifier Supply Line	53-1/2 (1359)	29 (737)	1/4 Cu Sweat
ECS	Econ-O-Coil Supply	54-7/8 (1394)	22-9/16 (573)	1-5/8 Cu Sweat
ECR	Econ-O-Coil Return	49-3/8 (1254)	30-3/4 (781)	1-5/8 Cu Sweat
E1	Electrical Connection (High Volt)	55-1/2 (1410)	31-1/4 (794)	2-1/2
E2	Electrical Connection (High Volt)	52-7/16 (1332)	31-1/4 (794)	2-1/2
LV1	Electrical Connection (Low Volt)	2-1/4 (57)	27 (686)	7/8
LV2	Electrical Connection (Low Volt)	2-1/4 (57)	29 (737)	7/8
LV3	Electrical Connection (Low Volt)	2-1/4 (57)	31 (787)	7/8
B	Blower Outlet	21-15/16 (557)	18-1/16 (459)	18-3/4 x 16-1/16 (476 x 408)

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

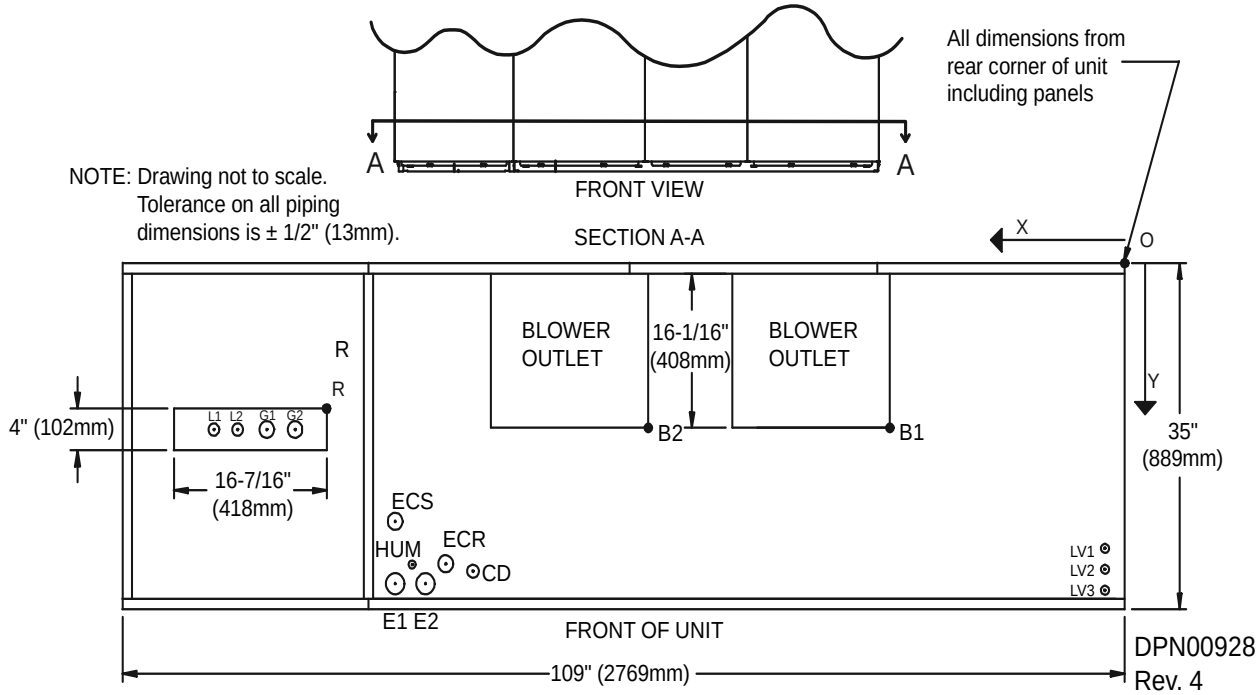
Figure 78 Primary connection locations—downflow water/glycol/GLYCOOL 28-42kW (8-12 ton), all compressor models



Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening in. (mm)
W	Water/Glycol/GLYCOOL Access	79-15/16 (2030)	9-1/16 (230)	3-1/2 x 8 (89 x 203)
WS	Water/Glycol/GLYCOOL Supply	82-15/16 (2107)	10-15/16 (278)	1-5/8" Cu Sweat
WR	Water/Glycol/GLYCOOL Return	82-15/16 (2107)	14-1/16 (357)	1-5/8" Cu Sweat
CD	Condensate Drain (infrared humidifier or no humidifier) *	46 (1168)	29-1/2 (749)	3/4" FPT
	Condensate Drain (steam generating humidifier) *	46 (1168)	29-1/2 (749)	1-1/4" FPT
	W/ Optional Pump	46 (1168)	29-1/2 (749)	1/2" Cu Sweat
HUM	Humidifier Supply Line	53-1/2 (1359)	29 (737)	1/4" Cu Sweat
ECS	Econ-O-Coil Supply	54-7/8 (1394)	22-9/16 (573)	1-5/8" Cu Sweat
ECR	Econ-O-Coil Return	49-13/16 (1265)	28-1/2 (724)	1-5/8" Cu Sweat
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)	31-1/4 (794)	2-1/2"
LV1	Electrical Conn. (Low Volt)	2-1/4 (57)	27 (686)	7/8"
LV2	Electrical Conn. (Low Volt)	2-1/4 (57)	29 (737)	7/8"
LV3	Electrical Conn. (Low Volt)	2-1/4 (57)	31 (787)	7/8"
B	Blower Outlet	21-15/16 (557)	18-1/16 (459)	18-3/4 x 16-1/16 (476 x 408)

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

Figure 79 Primary connection locations—downflow, air-Cooled, 53-77kW (15-22 ton), semi-hermetic compressor models

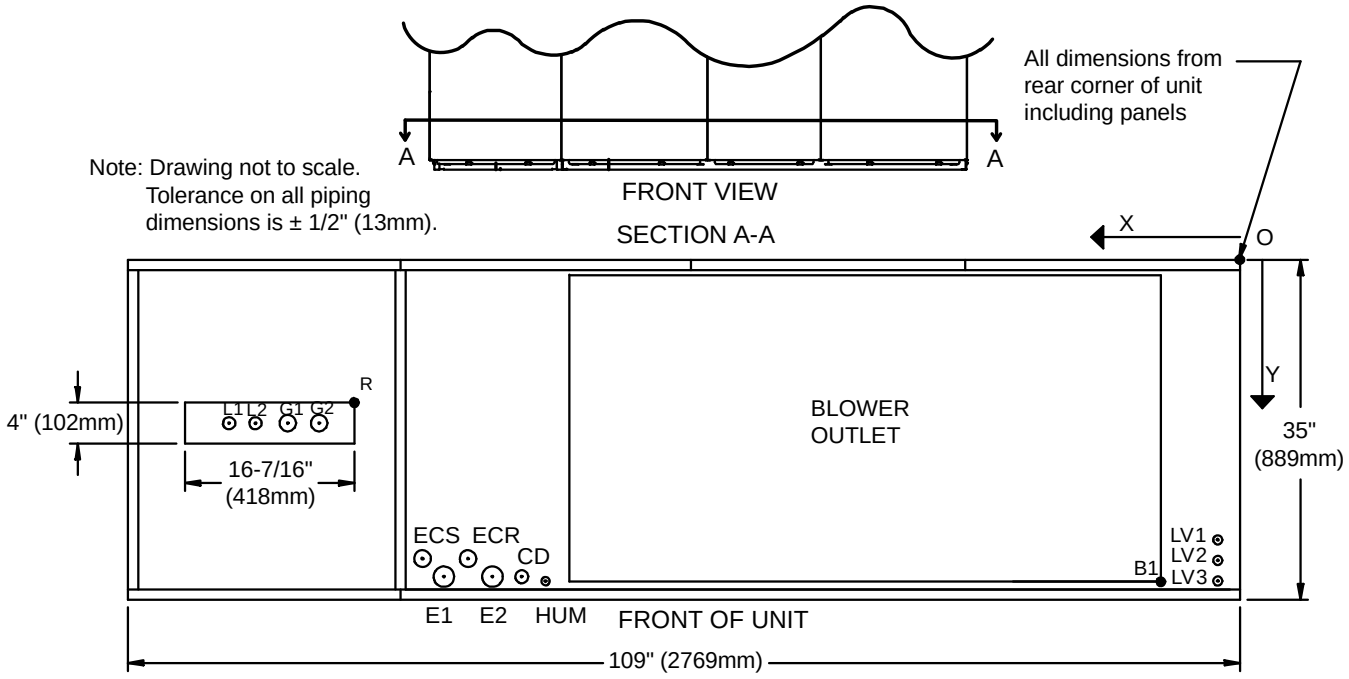


Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening in. (mm)
R	Refrigerant Access	82-3/4 (2102)	13-7/8 (352)	16-7/16 x 4 (418 x 102)
				53kW (15 tons) / 70 & 77kW (20 & 22 tons)
L1	Liquid Line System 1	97 (2464)	16-7/8 (428)	1/2" / 5/8" Cu Sweat
L2	Liquid Line System 2	93-5/16 (2370)	16-7/8 (428)	1/2" / 5/8" Cu Sweat
G1	Hot Gas Discharge 1	90-5/8 (2302)	16-5/8 (422)	7/8" / 1-1/8" Cu Sweat
G2	Hot Gas Discharge 2	88 (2235)	16-5/8 (422)	7/8" / 1-1/8" Cu Sweat
CD	Condensate Drain (infrared humidifier or no humidifier) *	69-1/4 (1759)	30 (762)	3/4" FPT
	Condensate Drain (steam generating humidifier)*	69-1/4 (1759)	30 (762)	1-1/4" FPT
	W/ Optional Pump	69-1/4 (1759)	30 (762)	1/2" Cu Sweat
HUM	Humidifier Supply Line	76-1/2 (1943)	29 (736)	1/4" Cu Sweat
ECS**	Econ-O-Coil Supply	78-5/8 (1997)	22-1/4 (565)	2-1/8" Cu Sweat
ECR**	Econ-O-Coil Return	72 (1829)	29 (737)	2-1/8" Cu Sweat
E1	Electrical Conn. (High Volt)	78-1/2 (1994)	31-1/8 (790)	2-1/2"
E2	Electrical Conn. (High Volt)	75-3/8 (1915)	31-1/8 (790)	2-1/2"
LV1	Electrical Conn. (Low Volt)	1-7/8 (48)	28-1/2 (724)	7/8"
LV2	Electrical Conn. (Low Volt)	1-7/8 (48)	30-1/4 (768)	7/8"
LV3	Electrical Conn. (Low Volt)	1-7/8 (48)	32 (813)	7/8"
B1	Blower Outlet (15 x 15)	23-1/8 (587)	18-1/16 (459)	18-3/4 x 16-1/16 (476 x 408)
	Blower Outlet (15 x 11)	27-3/4 (705)	18-1/16 (459)	14-3/4 x 16-1/16 (375 x 408)
B2	Blower Outlet (15 x 15)	50-3/8 (1280)	18-1/16 (459)	18-3/4 x 16-1/16 (476 x 408)
	Blower Outlet (15 x 11)	54-3/8 (1381)	18-1/16 (459)	14-3/4 x 16-1/16 (375 x 408)

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

** Supplied on Dual Cooling Systems only (4 pipe system)

Figure 80 Primary connection locations downflow air cooled 53-77kW (15-22 tons) semi-hermetic compressor models, with EC fan



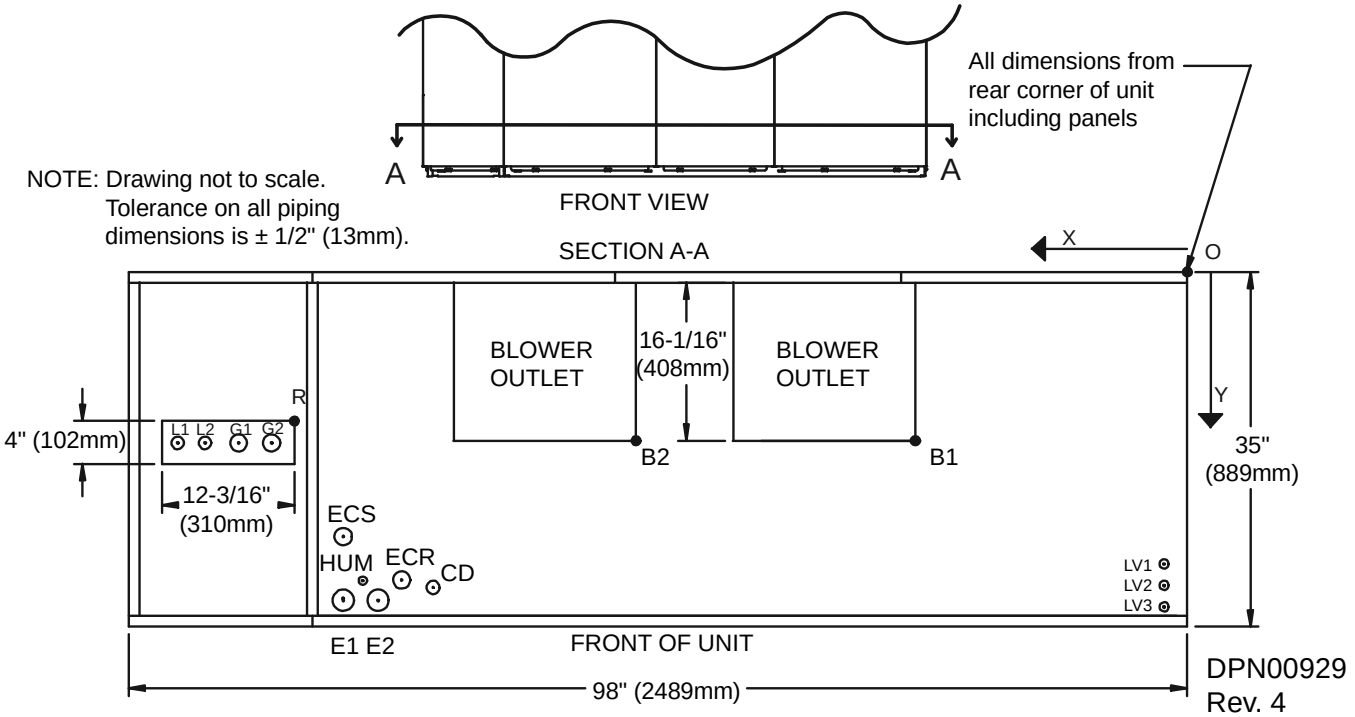
DPN002179
Rev. 0

Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening in. (mm)
R	Refrigerant Access	82-3/4 (2102)	13-7/8 (352)	16-7/16 x 4 (4181 x 102mm)
				53kW (15 Tons)/70 & 77kW (20 & 22 Tons)
L1	Liquid Line System 1	97 (2464)	16-7/8 (428)	1/2" / 5/8" Cu Sweat
L2	Liquid Line System 2	93-5/16 (2370)	16-7/8 (428)	1/2" / 5/8" Cu Sweat
G1	Hot Gas Discharge 1	90-5/8 (2302)	16-5/8 (422)	7/8" / 1-1/8" Cu Sweat
G2	Hot Gas Discharge 2	88 (2235)	16-5/8 (422)	7/8" / 1-1/8" Cu Sweat
CD	Condensate Drain (infrared humidifier or no humidifier)*	68-3/8 (1737)	31-3/8 (797)	3/4" FPT
	W/ Optional Pump	68-3/8 (1737)	31-3/8 (797)	1/2" Cu Sweat
HUM	Humidifier Supply Line	76-1/2 (1943)	29 (736)	1/4 Cu Sweat
ECS**	Econ-O-Coil Supply	78-5/8 (1997)	22-1/4 (565)	2-1/8 Cu Sweat
ECR**	Econ-O-Coil Return	73-15/16 (1862)	26-9/16 (675)	2-1/8 Cu Sweat
HS	Hot Water Reheat Supply	CONSULT FACTORY		
HR	Hot Water Reheat Return	CONSULT FACTORY		
E1	Electrical Conn. (High Volt)	78-1/2 (1994)	31-1/8 (790)	2-1/2"
E2	Electrical Conn. (High Volt)	75-3/8 (1915)	31-1/8 (790)	2-1/ "
LV1	Electrical Conn. (Low Volt)	2 (51)	29 (737)	7/8"
LV2	Electrical Conn. (Low Volt)	2 (51)	30-7/8 (784)	7/8"
LV3	Electrical Conn. (Low Volt)	2 (51)	32 (813)	7/8"

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

** Supplied on Dual Cooling Systems only (four-pipe system)

Figure 81 Primary connection locations—downflow, air-Cooled, 53-77kW (15-22 ton) with scroll compressor models

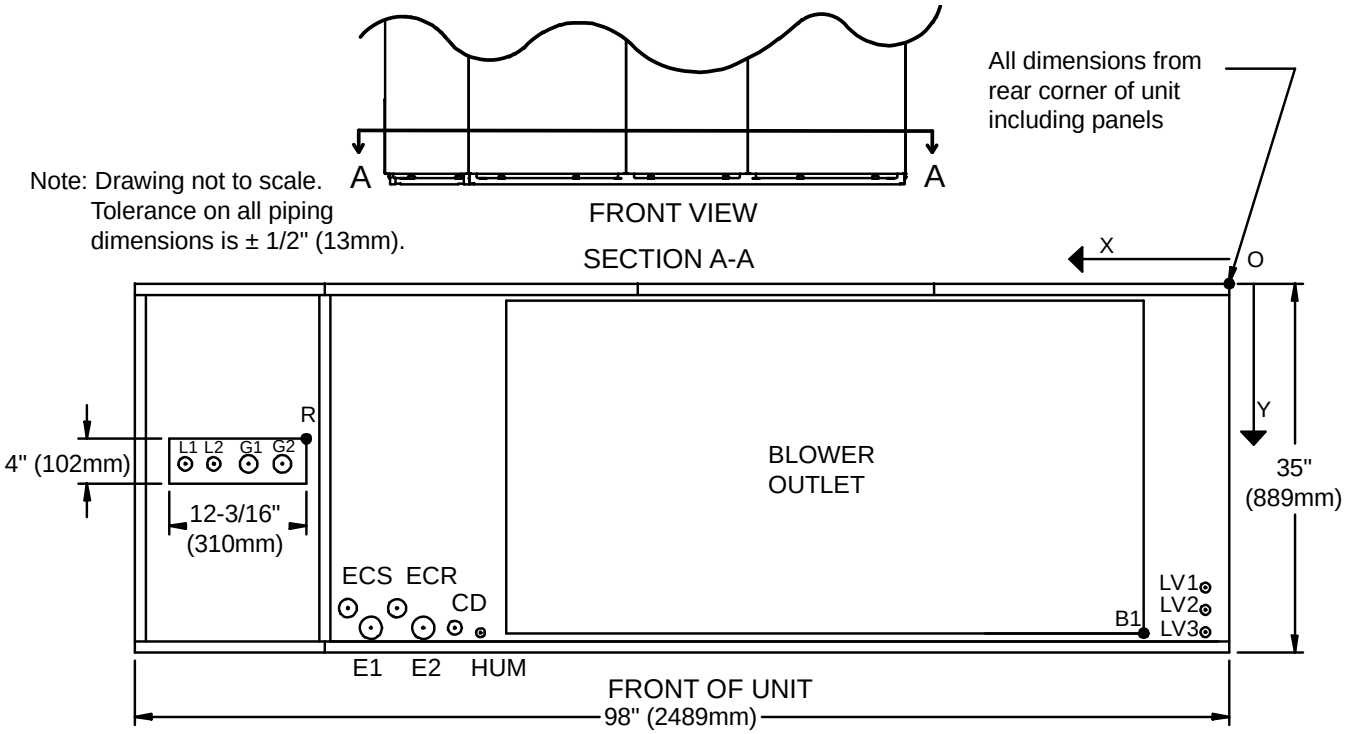


Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening in. (mm)
R	Refrigerant Access	81-3/4 (2076)	14-3/4 (374)	12-3/16 x 4 (310 x 102)
				53kW (15 tons) / 70&77kW (20&22 tons)
L1	Liquid Line System 1	94-11/16 (2405)	16-3/4 (425)	1/2" / 5/8" Cu Sweat
L2	Liquid Line System 2	91-7/8 (2334)	16-3/4 (425)	1/2" / 5/8" Cu Sweat
G1	Hot Gas Discharge 1	88-3/4 (2254)	16-3/8 (416)	7/8" / 1-1/8" Cu Sweat
G2	Hot Gas Discharge 2	85-9/16 (2173)	16-3/8 (416)	7/8" / 1-1/8" Cu Sweat
CD	Condensate Drain (infrared humidifier or no humidifier)*	69-1/4 (1759)	30 (762)	3/4" FPT
	Condensate Drain (steam generating humidifier)*	69-1/4 (1759)	30 (762)	1-1/4" FPT
	W/ Optional Pump	69-1/4 (1759)	30 (762)	1/2" Cu Sweat
HUM	Humidifier Supply Line	76-1/2 (1943)	29 (736)	1/4" Cu Sweat
ECS**	Econ-O-Coil Supply	78-5/8 (1997)	22-1/4 (565)	2-1/8" Cu Sweat
ECR**	Econ-O-Coil Return	72 (1829)	29 (737)	2-1/8" Cu Sweat
E1	Electrical Conn. (High Volt)	78-1/2 (1994)	31-1/8 (790)	2-1/2"
E2	Electrical Conn. (High Volt)	75-3/8 (1915)	31-1/8 (790)	2-1/2"
LV1	Electrical Conn. (Low Volt)	1-7/8 (48)	28-1/2 (724)	7/8"
LV2	Electrical Conn. (Low Volt)	1-7/8 (48)	30-1/4 (768)	7/8"
LV3	Electrical Conn. (Low Volt)	1-7/8 (48)	32 (813)	7/8"
B1	Blower Outlet (15 x 15)	23-1/8 (587)	18-1/16 (459)	18-3/4 x 16-1/16 (476 x 408)
	Blower Outlet (15 x 11)	27-3/4 (705)	18-1/16 (459)	14-3/4 x 16-1/16 (375 x 408)
B2	Blower Outlet (15 x 15)	50-3/8 (1280)	18-1/16 (459)	18-3/4 x 16-1/16 (476 x 408)
	Blower Outlet (15 x 11)	54-3/8 (1381)	18-1/16 (459)	14-3/4 x 16-1/16 (375 x 408)

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

** Supplied on Dual Cooling Systems only (4 pipe system)

Figure 82 Primary connection locations—downflow, air-Cooled, 53-77kW (15-22 ton) with scroll compressor models, with EC fan



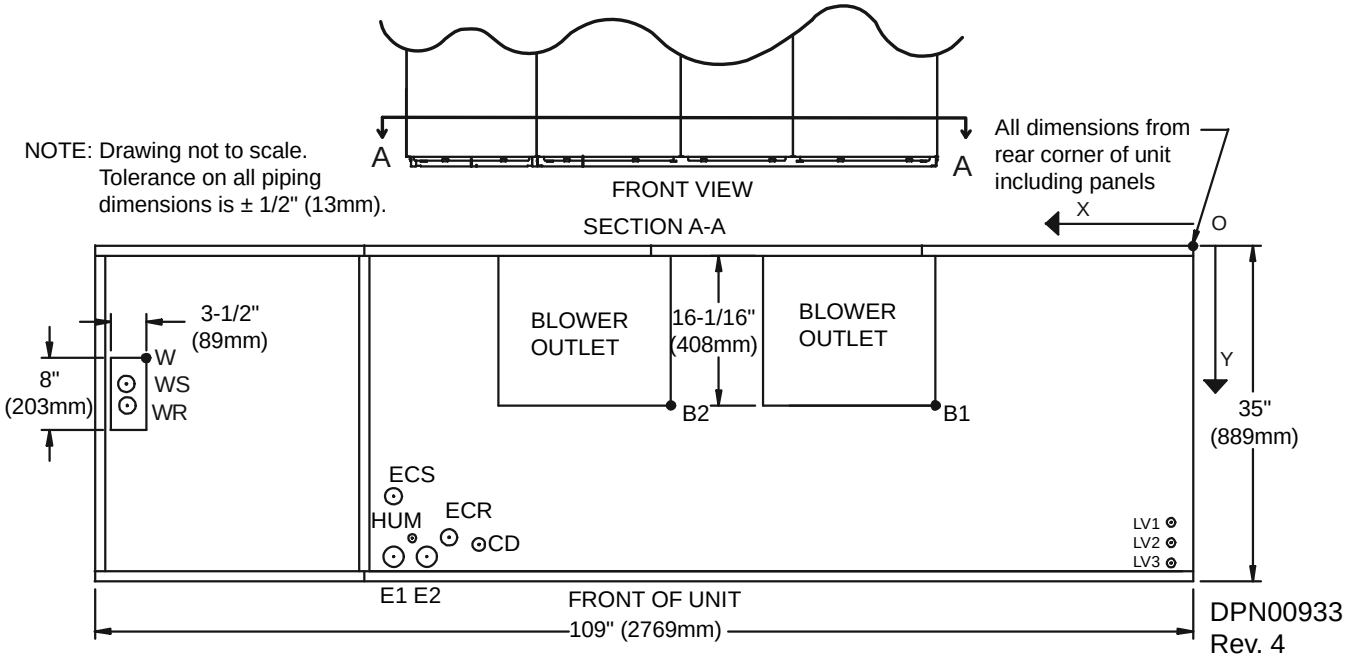
DPN002182
Rev. 0

Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening in. (mm)
R	Refrigerant Access	81-3/4 (2076)	14-3/4 (374)	12-3/16 (310) X 4" (102)
				53kW (15 Tons) / 70 & 77kW (20 & 22 Tons)
L1	Liquid Line System	94-11/16 (2405)	16-3/4 (425)	1/2 / 5/8" Cu Sweat
L2	Liquid Line System 2	91-7/8 (2334)	16-3/4 (425)	1/2 / 5/8" Cu Sweat
G1	Hot Gas Discharge 1	88-3/4 (2254)	16-3/8 (416)	7/8 / 1-1/8" Cu Sweat
G2	Hot Gas Discharge 2	85-9/16 (2173)	16-3/8 (416)	7/8 / 1-1/8" Cu Sweat
CD	Condensate Drain (Infrared Humidifier or No Humidifier)*	68-3/8 (1737)	31-3/8 (797)	3/4 FPT
	W/ Optional Pump	68-3/8 (1737)	31-3/8 (797)	1/2 Cu Sweat
HUM	Humidifier Supply Line	76-1/2 (1943)	29 (736)	1/4 Cu Sweat
ECS**	Econ-O-Coil Supply	78-5/8 (1997)	22-1/4 (565)	2-1/8 Cu Sweat
ECR**	Econ-O-Coil Return	73-15/16 (1862)	26-9/16 (675)	2-1/8 Cu Sweat
HS	Hot Water Reheat Supply	CONSULT FACTORY		
HR	Hot Water Reheat Return	CONSULT FACTORY		
E1	Electrical Conn. (High Volt)	78-1/2 (1994)	31-1/8 (790)	2-1/2"
E2	Electrical Conn. (High Volt)	75-3/8 (1915)	31-1/8 (790)	2-1/2"
LV1	Electrical Conn. (Low Volt)	2 (51)	29 (737)	7/8"
LV2	Electrical Conn. (Low Volt)	2 (51)	30-7/8 (784)	7/8"
LV3	Electrical Conn. (Low Volt)	2 (51)	32 (813)	7/8"
B1	Blower Outlet	4-1/2 (114)	33 (838)	58-3/8 x 30 (1483x762)

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

** Supplied on Dual Cooling Systems only (four-pipe system)

Figure 83 Primary connection locations—downflow, water/glycol/GLYCOOL, 53-77kW (15-22 ton), all compressor models

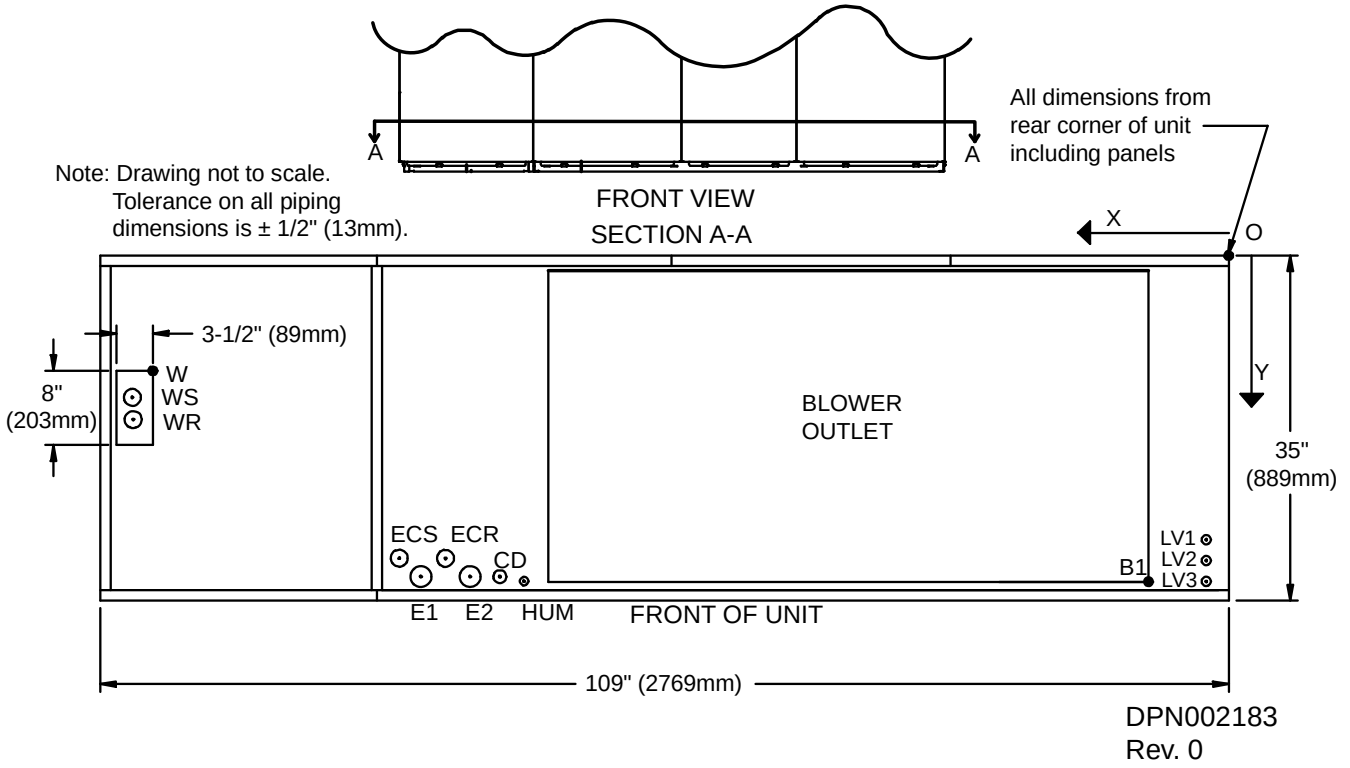


Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening in. (mm)
W	Water/Glycol/GLYCOOL Access	103 (2616)	9 (229)	3-1/2 x 8 (89 x 203)
WS	Water/Glycol/GLYCOOL Supply	104-3/4 (2661)	11 (279)	2-1/8" Cu Sweat
WR	Water/Glycol/GLYCOOL Return	104-3/4 (2661)	15 (381)	2-1/8" Cu Sweat
CD	Condensate Drain (infrared humidifier or no humidifier)*	69-1/4 (1759)	30 (762)	3/4" FPT
	Condensate Drain (steam generating humidifier)*	69-1/4 (1759)	30 (762)	1-1/4" FPT
	W/ Optional Pump	69-1/4 (1759)	30 (762)	1/2" Cu Sweat
HUM	Humidifier Supply Line	76-1/2 (1943)	29 (736)	1/4" Cu Sweat
ECS**	Econ-O-Coil Supply	78-5/8 (1997)	22-1/4 (565)	2-1/8" Cu Sweat
ECR**	Econ-O-Coil Return	72 (1829)	29 (737)	2-1/8" Cu Sweat
E1	Electrical Conn. (High Volt)	78-1/2 (1994)	31-1/8 (790)	2-1/2"
E2	Electrical Conn. (High Volt)	75-3/8 (1915)	31-1/8 (790)	2-1/2"
LV1	Electrical Conn. (Low Volt)	1-7/8 (48)	28-1/2 (724)	7/8"
LV2	Electrical Conn. (Low Volt)	1-7/8 (48)	30-1/4 (768)	7/8"
LV3	Electrical Conn. (Low Volt)	1-7/8 (48)	32 (813)	7/8"
B1	Blower Outlet (15 x 15)	23-1/8 (587)	18-1/16 (459)	18-3/4 x 16-1/16 (476 x 408)
	Blower Outlet (15 x 11)	27-3/4 (705)	18-1/16 (459)	14-3/4 x 16-1/16 (375 x 408)
B2	Blower Outlet (15 x 15)	50-3/8 (1280)	18-1/16 (459)	18-3/4 x 16-1/16 (476 x 408)
	Blower Outlet (15 x 11)	54-3/8 (1381)	18-1/16 (459)	14-3/4 x 16-1/16 (375 x 408)

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

** Supplied on Dual Cooling Systems only (4 pipe system)

Figure 84 Primary connection locations—downflow, water/glycol/GLYCOOL, 53-77kW (15-22 ton), all compressor models, with EC fan

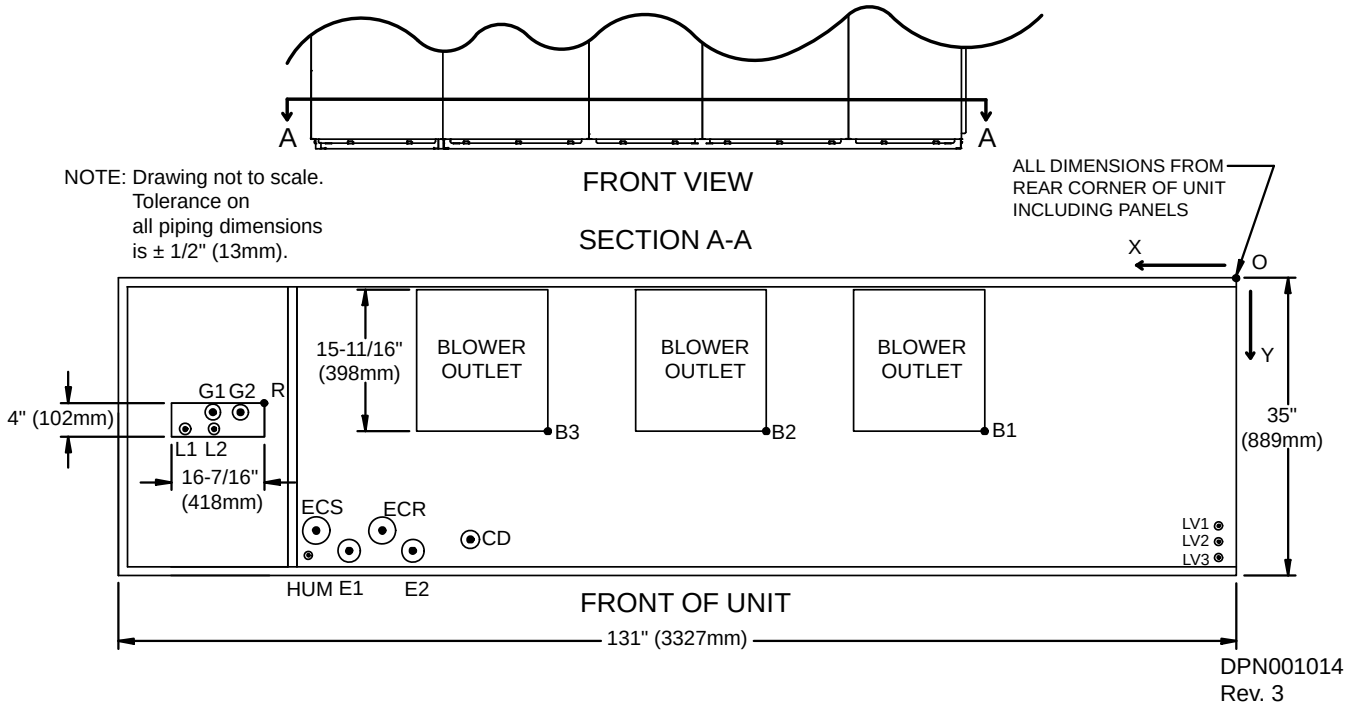


Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening in. (mm)
W	Water/Glycol/GLYCOOL Access	103 (2616)	9 (229)	3-1/2 x 8 (89 x 203)
WS	Water/Glycol/GLYCOOLSupply	104-3/4 (2661)	11 (279)	2-1/8 Cu Sweat
WR	Water/Glycol/GLYCOOL Return	104-3/4 (2661)	15 (381)	2-1/8 Cu Sweat
CD	Condensate Drain (Infrared Humidifier or No Humidifier)*	68-3/8 (1737)	31-3/8 (797)	3/4 FPT
	W/Optional Pump	68-3/8 (1737mm) "	31-3/8 (797)	1/2 Cu Sweat
HUM	Humidifier Supply Line	76-1/2 (1943)	29 (736)	1/4 Cu Sweat
ECS**	Econ-O-Coil Supply	78-5/8 (1997)	22-1/4 (565)	2-1/8 Cu Sweat
ECR**	Econ-O-Coil Return	73-15/16 (1862)	26-9/16 (675)	2-1/8 Cu Sweat
HS	Hot Water Reheat Supply	CONSULT FACTORY		
HR	Hot Water Reheat Return	CONSULT FACTORY		
E1	Electrical Conn. (High Volt)	78-1/2 (1994)	31-1/8 (790)	2-1/2"
E2	Electrical Conn. (High Volt)	75-3/8 (1915)	31-1/8 (790)	2-1/2"
LV1	Electrical Conn. (Low Volt)	2 (51)	29 (737)	7/8"
LV2	Electrical Conn. (Low Volt)	2 (51)	30-7/8 (784)	7/8"
LV3	Electrical Conn. (Low Volt)	2 (51)	32 (813)	7/8"
B1	Blower Outlet	4-1/2 (114)	33 (838)	58-3/8 x 30 (1483 x 762)

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

** Supplied on Dual Cooling Systems only (four- pipe system)

Figure 85 Primary connection locations—downflow, air-cooled, 105kW (30 ton), all compressor models



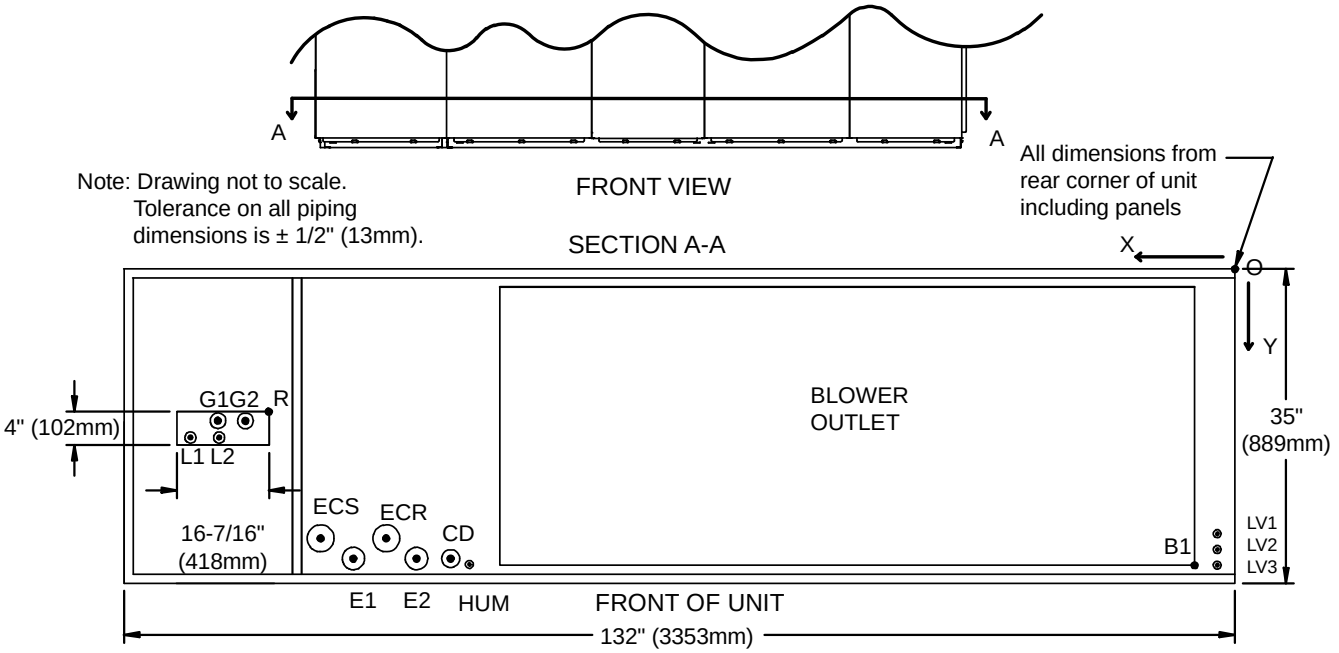
DPN001014
Rev. 3

Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening in. (mm)
R	Refrigerant Access	109 (2769)	15-3/4 (400)	16-7/16" x 4 (418 x 102)
L1	Liquid Line System 1	121-3/4 (3092)	16-3/4 (425)	5/8" Cu Sweat
L2	Liquid Line System 2	118-1/8 (3000)	16-3/4 (425)	5/8" Cu Sweat
G1	Hot Gas Discharge 1	118-1/4 (3004)	14-1/4 (362)	1-1/8" Cu Sweat
G2	Hot Gas Discharge 2	115-5/8 (2937)	14-1/4 (362)	1-1/8" Cu Sweat
CD	Condensate Drain (infrared humidifier or no humidifier)*	83-13/16 (2129)	30 (762)	3/4" FPT
	Condensate Drain (steam generating humidifier)*	83-13/16 (2129)	30 (762)	1-1/4" FPT
	W/ Optional Pump	83-13/16 (2129)	30 (762)	1/2" Cu Sweat
HUM	Humidifier Supply Line	102-3/4 (2610)	31-3/4 (806)	1/4" Cu Sweat
ECS**	Econ-O-Coil Supply	101-7/8 (2588)	29 (737)	2-5/8" Cu Sweat
ECR**	Econ-O-Coil Return	94-9/16 (2402)	29 (737)	2-5/8" Cu Sweat
E1	Electrical Conn. (High Volt)	98-1/8 (2492)	31-1/4 (794)	2-1/2"
E2	Electrical Conn. (High Volt)	91 (2311)	31-1/4 (794)	2-1/2"
LV1	Electrical Conn. (Low Volt)	2 (51)	28-1/4 (718)	7/8"
LV2	Electrical Conn. (Low Volt)	2 (51)	30-1/4 (768)	7/8"
LV3	Electrical Conn. (Low Volt)	2 (51)	32 (813)	7/8"
B1	Blower Outlet	27-7/8 (708)	18 (457)	14-1/2 x 15-11/16 (368 x 398)
B2	Blower Outlet	52-1/16 (1322)	18 (457)	14-1/2 x 15-11/16 (368 x 398)
B3	Blower Outlet	76-1/4 (1937)	18 (457)	14-1/2 x 15-11/16 (368 x 398)

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

** Supplied on Dual Cooling Systems only (4 pipe system)

Figure 86 Primary connection locations—downflow, air-cooled, 105kW (30 ton), all compressor models, with EC fan



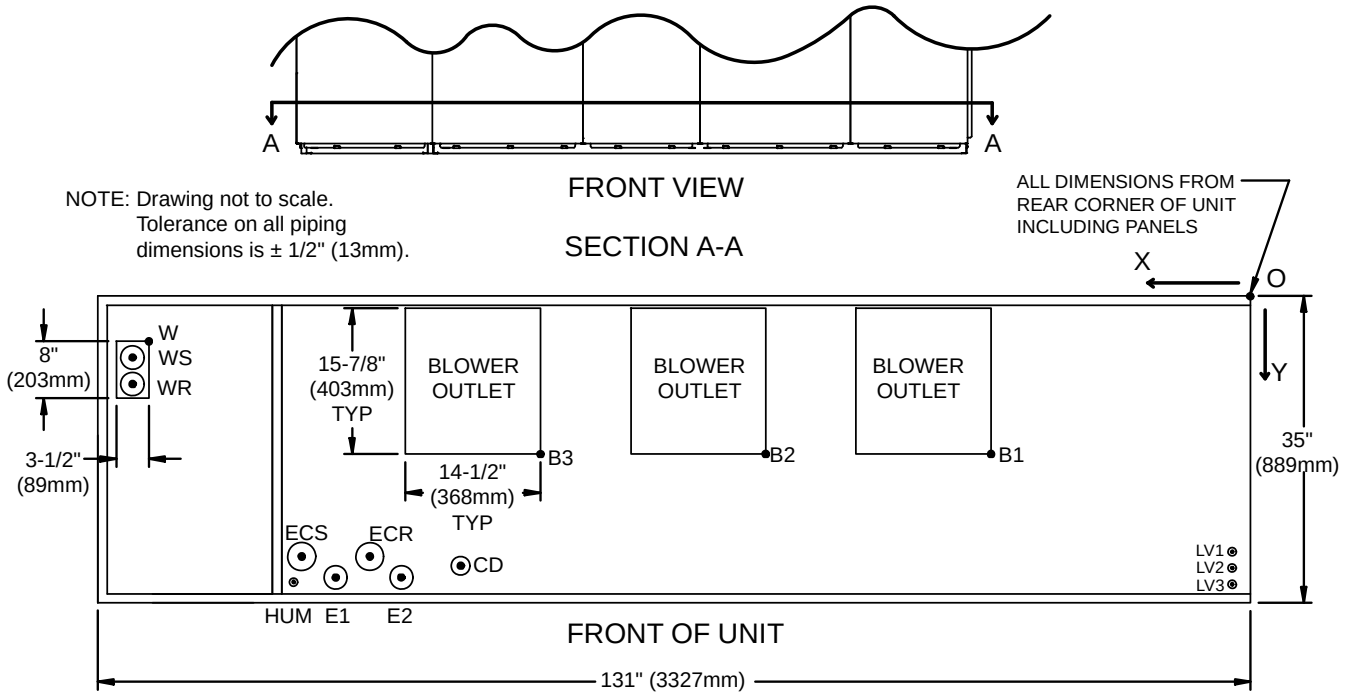
DPN002154
Rev. 0

Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening in. (mm)
R	Refrigerant Access	109 (2769)	15-3/4 (400)	16-7/16 (418) x 4 (102)
L1	Liquid Line System 1	121-3/4 (3092)	16-3/4 (425)	5/8 Cu Sweat
L2	Liquid Line System 2	118-1/8 (3000)	16-3/4 (425)	5/8 Cu Sweat
G1	Hot Gas Discharge 1	118-1/4 (3004)	14-1/4 (362)	1-1/8 Cu Sweat
G2	Hot Gas Discharge 2	115-5/8 (2937)	14-1/4 (362)	1-1/8 Cu Sweat
CD	Condensate Drain (Infrared Humidifier Or No Humidifier)*	87-3/8 (2220)	31 (787)	3/4 FPT
	W/ Optional Pump	83-13/16 (2129)	30 (762)	1/2 Cu Sweat
HUM	Humidifier Supply Line	85-5/16 (2167)	32-1/2 (825)	1/4 Cu Sweat
ECS **	Econ-O-Coil Supply	101-7/8 (2588)	29 (737)	2-5/8 Cu Sweat
ECR **	Econ-O-Coil Return	94-9/16 (2402)	29 (737)	2-5/8 Cu Sweat
HS	Hot Water Reheat Supply	CONSULT FACTORY		
HR	Hot Water Reheat Return	CONSULT FACTORY		
E1	Electrical Conn. (High Volt)	98-1/8 (2492)	31 (788)	2-1/2
E2	Electrical Conn. (High Volt)	91 (2311)	31 (788)	2-1/2
LV1	Electrical Conn. (Low Volt)	2 (51)	29 (737)	7/8
LV2	Electrical Conn. (Low Volt)	2 (51)	30-7/8 (784)	7/8
LV3	Electrical Conn. (Low Volt)	2 (51)	32 (813)	7/8
B1	Blower Outlet	4-1/2 (114)	33 (838)	77-3/8 x 30 (1965 x 762)

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

** Supplied on Dual Cooling Systems only (four-pipe system)

Figure 87 Primary connection locations—downflow, water/glycol/GLYCOOL, 105kW (30 ton), all compressor models



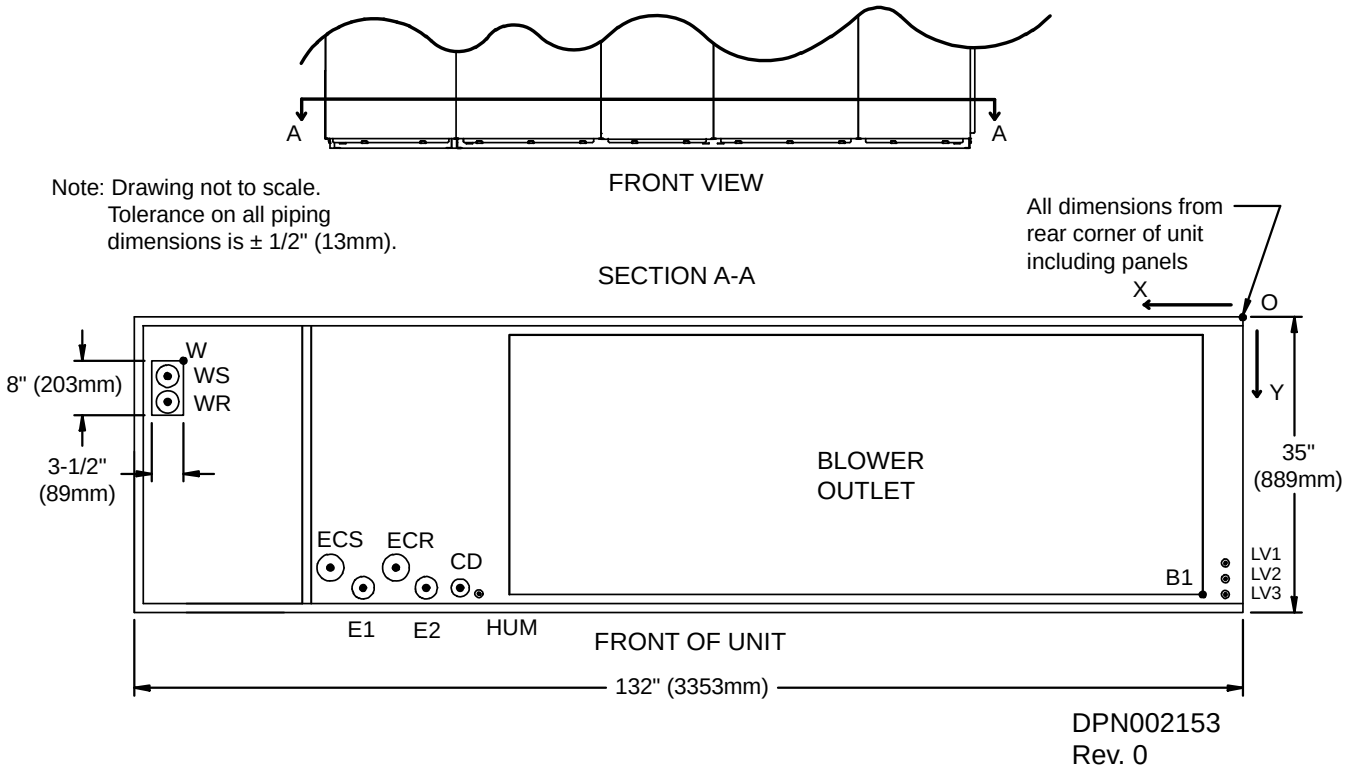
DPN001015
Rev. 3

Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening in. (mm)
W	Water/Glycol/GLYCOOL Access	125-15/16 (3199)	9 (229)	3-1/2 x 8 (89 x 203)
WS	Water/Glycol/GLYCOOL Supply	127-7/8 (3248)	10-1/16 (256)	2-1/8" Cu Sweat
WR	Water/Glycol/GLYCOOL Return	127-7/8 (3248)	13-1/4 (337)	2-1/8" Cu Sweat
CD	Condensate Drain (infrared humidifier or no humidifier)*	83-13/16 (2129)	30 (762)	3/4" FPT
	Condensate Drain (steam generating humidifier)*	83-13/16 (2129)	30 (762)	1-1/4" FPT
	W/ Optional Pump	83-13/16 (2129)	30 (762)	1/2" Cu Sweat
HUM	Humidifier Supply Line	102-3/4 (2610)	31-3/4 (806)	1/4" Cu Sweat
ECS**	Econ-O-Coil Supply	101-7/8 (2588)	29 (737)	2-5/8" Cu Sweat
ECR**	Econ-O-Coil Return	94-9/16 (2402)	29 (737)	2-5/8" Cu Sweat
E1	Electrical Conn. (High Volt)	98-1/4 (2496)	30 (762)	2-1/2"
E2	Electrical Conn. (High Volt)	88-7/16 (2246)	30 (762)	2-1/2"
LV1	Electrical Conn. (Low Volt)	2 (51)	27-1/2 (796)	7/8"
LV2	Electrical Conn. (Low Volt)	2 (51)	30-1/4 (768)	7/8"
LV3	Electrical Conn. (Low Volt)	2 (51)	32 (813)	7/8"
B1	Blower Outlet	28-1/4 (718)	18 (457)	14-1/2 x 15-7/8 (368 x 403)
B2	Blower Outlet	52 (1321)	18 (457)	14-1/2 x 15-7/8 (368 x 403)
B3	Blower Outlet	75-11/16 (1922)	18 (457)	14-1/2 x 15-7/8 (368 x 403)

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

** Supplied on Dual Cooling systems only (4 piping system).

Figure 88 Primary connection locations downflow water/glycol/GLYCOOL 105kW (30 tons) all compressor models, with EC fan



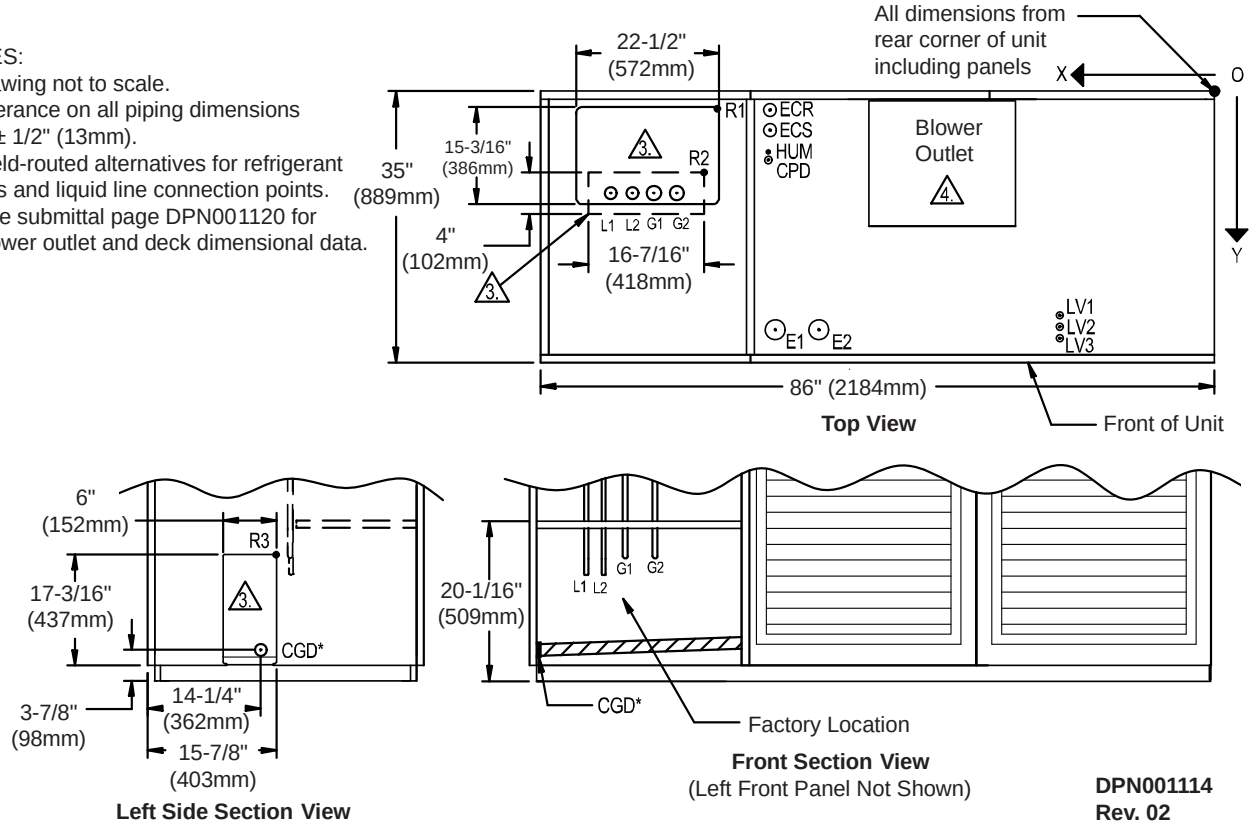
Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening in. (mm)
W	Water/Glycol/GLYCOOL Access	125-15/16 (3199)	9 (229)	3-1/2 (89) X 8" (203)
WS	Water/Glycol/GLYCOOL Supply	127-7/8 (3248)	10-1/16 (256)	2-1/8 Cu Sweat
WR	Water/Glycol/GLYCOOL Return	127-7/8 (3248)	13-1/4 (337)	2-1/8 Cu Sweat
CD	Condensate Drain (Infrared Humidifier or No Humidifier)*	87-3/8 (2220)	31 (787)	3/4 FPT"
	W/Optional Pump	83-13/16 (2129) "	30 (762)	1/2 Cu Sweat
HUM	Humidifier Supply Line	85-5/16 (2167)	32-1/2 (825)	1/4" Cu Sweat
ECS	Econ-O-Coil Supply	101-7/8 (2588)	29 (737)	2-5/8" Cu Sweat
ECR	Econ-O-Coil Return	94-9/16 (2402)	29 (737)	2-5/8" Cu Sweat
HS	Hot Water Reheat Supply	CONSULT FACTORY		
HR	Hot Water Reheat Return	CONSULT FACTORY		
E1	Electrical Conn. (High Volt)	98-1/8 (2492)	31 (788)	2-1/2"
E2	Electrical Conn. (High Volt)	91 (2311)	31 (788)	2-1/2"
LV1	Electrical Conn. (Low Volt)	2 (51)	29 (737)	7/8"
LV2	Electrical Conn. (Low Volt)	2 (51)	30-7/8 (784)	7/8"
LV3	Electrical Conn. (Low Volt)	2 (51)	32 (813)	7/8"
B1	Blower Outlet	4-1/2 (114)	33 (838)	77-3/8 x 30 (1965 x 762)

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

** Supplied on Dual Cooling systems only (4 piping system).

Figure 89 Primary connection locations—upflow, air-cooled, 28-42kw (8-12 ton), semi-hermetic compressor models

NOTES:
1. Drawing not to scale.
2. Tolerance on all piping dimensions is ± 1/2" (13mm).
3. Field-routed alternatives for refrigerant gas and liquid line connection points.
4. See submittal page DPN001120 for blower outlet and deck dimensional data.

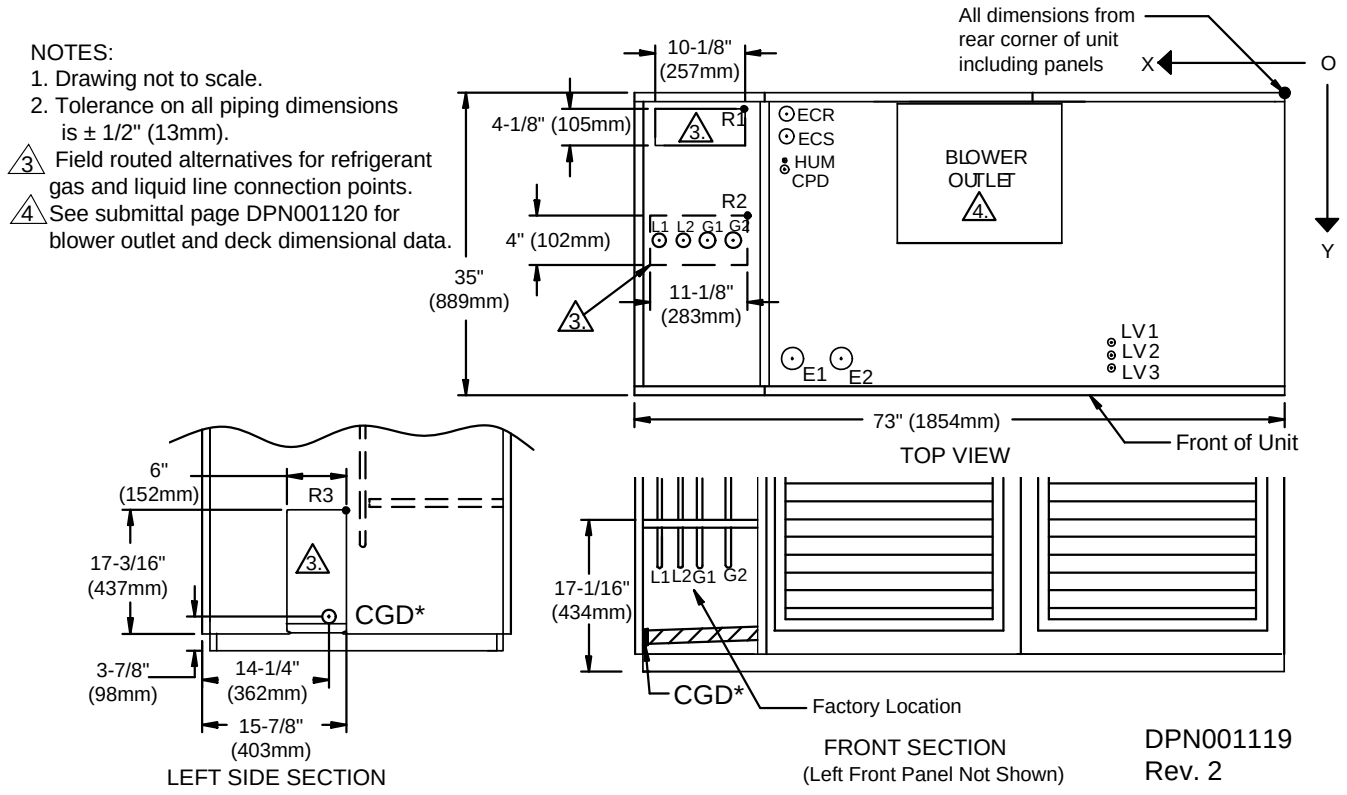


Point	Description	X inches (mm)	Y inches (mm)	Connection Size / Opening inches (mm)
R1 (3)	Refrigerant Access (Top)	60-11/16 (1542)	1-7/8 (48)	22-1/2 x 15-3/16 (572 x 386)
R2 (3)	Refrigerant Access (Bottom)	63 (1600)	13-13/16 (351)	16-7/16 x 4 (418 x 102)
L1	Liquid Line System 1	79-3/16 (2011)	16-3/4 (425)	1/2 Cu Sweat
L2	Liquid Line System 2	76-1/2 (1943)	16-3/4 (425)	1/2 Cu Sweat
G1	Hot Gas Discharge 1	73-7/8 (1876)	16-3/4 (425)	5/8 Cu Sweat
G2	Hot Gas Discharge 2	70-1/8 (1780)	16-3/4 (425)	5/8 Cu Sweat
R3 (3)	Refrigerant Access (Side)	-	-	6 x 17-3/16 (152 x 437)
CGD*	Condensate Gravity Drain	-	-	3/4 FPT
CPD	Condensate Pump Discharge (Opt)	56-1/4 (1429)	11-1/8 (283)	1/2 Cu Sweat
HUM	Humidifier Supply Line	56-1/4 (1429)	9-1/8 (233)	1/4 Cu Sweat
ECS**	Econ-O-Coil Supply	56 (1423)	7-5/16 (186)	1-5/8 Cu Sweat
ECR**	Econ-O-Coil Return	56 (1423)	4-1/2 (114)	1-5/8 Cu Sweat
E1	Electrical Connection (High Voltage)	52-3/8 (1330)	30 (762)	2-1/2
E2	Electrical Connection (High Voltage)	46-7/8 (1191)	30 (762)	2-1/2
LV1	Electrical Connection (Low Voltage)	19-1/2 (495)	29-1/16 (738)	7/8
LV2	Electrical Connection (Low Voltage)	19-1/2 (495)	30-1/2 (775)	7/8
LV3	Electrical Connection (Low Voltage)	19-1/2 (495)	31-15/16 (811)	7/8

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

** Supplied on Dual-Cool systems only (4-pipe system)

Figure 90 Primary connection locations—upflow, air-Cooled, 28-42kW (8-12 ton), semi-hermetic compressor models



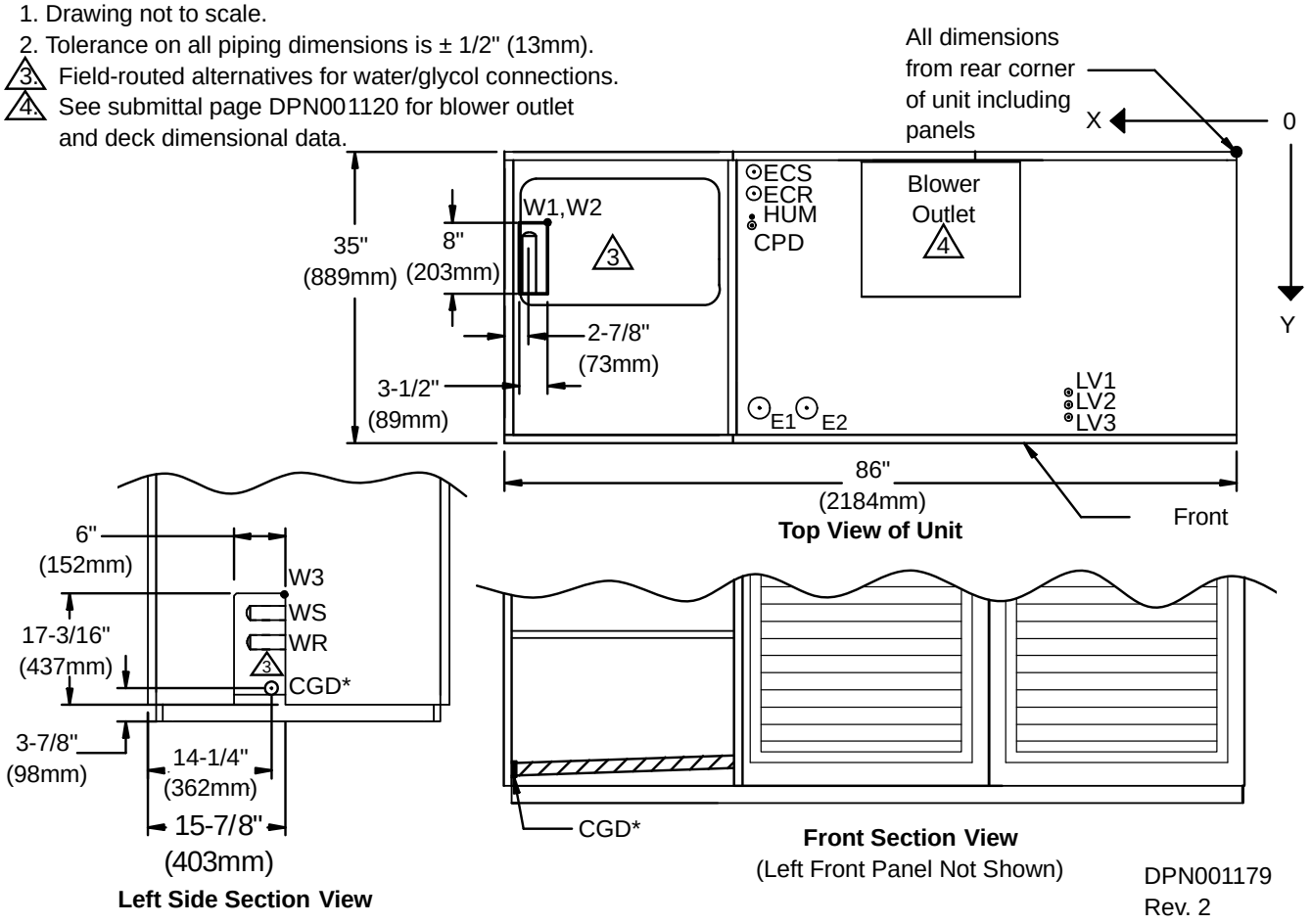
Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening in. (mm)
R1 3	Refrigerant Access (Top)	60-1/2 (1537)	1-7/8" (48mm)	10-1/8 x 4-1/8 (257 x 105)
R2 3	Refrigerant Access (Bottom)	59-3/8" (1508mm)	14-3/4" (375mm)	11-1/8 x 4 (283 x 102)
L1	Liquid Line System 1	70" (1778mm)	16-3/4 (425)	1/2" Cu Sweat
L2	Liquid Line System 2	67-5/8" (1718mm)	16-3/4 (425)	1/2" Cu Sweat
G1	Hot Gas Discharge 1	65-3/8" (1661mm)	16-5/8 (422)	5/8" Cu Sweat
G2	Hot Gas Discharge 2	63" (1600mm)	16-5/8 (422)	5/8" Cu Sweat
R3 3	Refrigerant Access (Side)	—	—	6 x 17-3/16 (152 x 437)
CGD*	Condensate Gravity Drain	—	—	3/4" FPT
CPD	Condensate Pump Discharge (Opt)	56-1/4 (1429)	11-1/8 (283)	1/2" Cu Sweat
HUM	Humidifier Supply Line	56-1/4 (1429)	9-1/8 (233)	1/4" Cu Sweat
ECS**	Econ-O-Coil Supply	56 (1423)	7-5/16 (186)	1-5/8" Cu Sweat
ECR**	Econ-O-Coil Return	56 (1423)	4-1/2 (114)	1-5/8" Cu Sweat
E1	Electrical Conn. (High Volt)	52-3/8 (1330)	30 (762)	2-1/2"
E2	Electrical Conn. (High Volt)	46-7/8 (1191)	30 (762)	2-1/2"
LV1	Electrical Conn. (Low Volt)	19-1/2 (495)	29-1/16 (738)	7/8"
LV2	Electrical Conn. (Low Volt)	19-1/2 (495)	30-1/2 (775)	7/8"
LV3	Electrical Conn. (Low Volt)	19-1/2 (495)	31-15/16 (811)	7/8"

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

** Supplied on Dual Cooling Systems only

Figure 91 Primary connection locations—upflow, water/glycol/GLYCOOL, 28-42kW (8-12 ton), all compressor models

NOTES:
1. Drawing not to scale.
2. Tolerance on all piping dimensions is ± 1/2" (13mm).
3. Field-routed alternatives for water/glycol connections.
4. See submittal page DPN001120 for blower outlet and deck dimensional data.



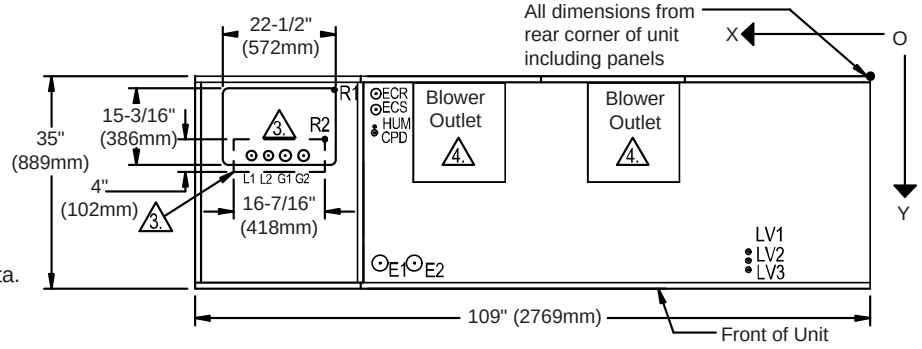
Point	Description	X in. (mm)	Y in. (mm)	Connection Size / Opening in. (mm)
W1 3	Water/Glycol/GLYCOOL Access (Bottom)	79-15/16 (2030)	9 (229)	3-1/2 x 8 (89 x 203)
W2 3	Water/Glycol/GLYCOOL Access (Top)	79-15/16 (2030)	9 (229)	3-1/2 x 8 (89 x 203)
W3 3	Water/Glycol/GLYCOOL Access (Side)	—	—	6 x 17-3/16 (152 x 437)
WS 3	Water/Glycol/GLYCOOL Supply	—	—	1-5/8 Cu Sweat
WR 3	Water/Glycol/GLYCOOL Return	—	—	1-5/8 Cu Sweat
CGD	Condensate Gravity Drain	—	—	3/4 FPT
CPD	Condensate Pump Discharge (Opt)	56-1/4 (1429)	11-1/8 (282)	1/2 Cu Sweat
HUM	Humidifier Supply Line	56-1/4 (1429)	9-1/8 (232)	1/4 Cu Sweat
ECS**	Econ-O-Coil Supply	56 (1423)	7-5/16 (186)	1-5/8 Cu Sweat
ECR**	Econ-O-Coil Return	56 (1423)	4-1/2 (114)	1-5/8 Cu Sweat
E1	Electrical Connection (High Voltage)	52-3/8 (1330)	30 (762)	2-1/2
E2	Electrical Connection (High Voltage)	46-7/8 (1191)	30 (762)	2-1/2
LV1	Electrical Connection (Low Voltage)	19-1/2 (495)	29-1/16 (738)	7/8
LV2	Electrical Connection (Low Voltage)	19-1/2 (495)	30-1/2 (775)	7/8
LV3	Electrical Connection (Low Voltage)	19-1/2 (495)	31-15/16 (811)	7/8

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

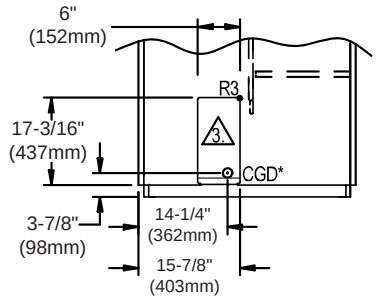
** Supplied on Dual-Cool systems only (4-pipe system)

Figure 92 Primary connection locations—upflow, air-cooled, 53-77kW (15-22 ton), semi-hermetic compressor models

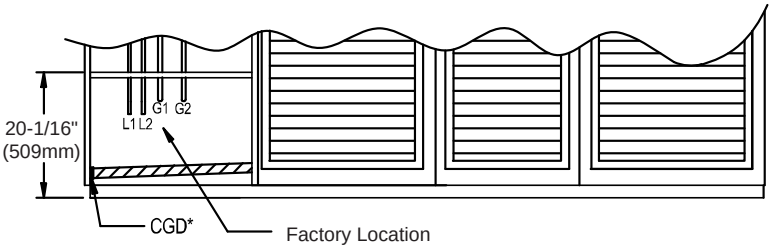
NOTES:
1. Drawing not to scale.
2. Tolerance on all piping dimensions is ± 1/2" (13mm).
3. Field routed alternatives for refrigerant gas and liquid line connection points.
4. See submittal page DPN001191 for blower outlet and deck dimensional data.



TOP VIEW OF UNIT



LEFT SIDE SECTION VIEW OF UNIT



FRONT SECTION VIEW OF UNIT
(Left Front Panel Not Shown)

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

** Supplied on Dual Cooling Systems only

DPN001212
Rev. 2

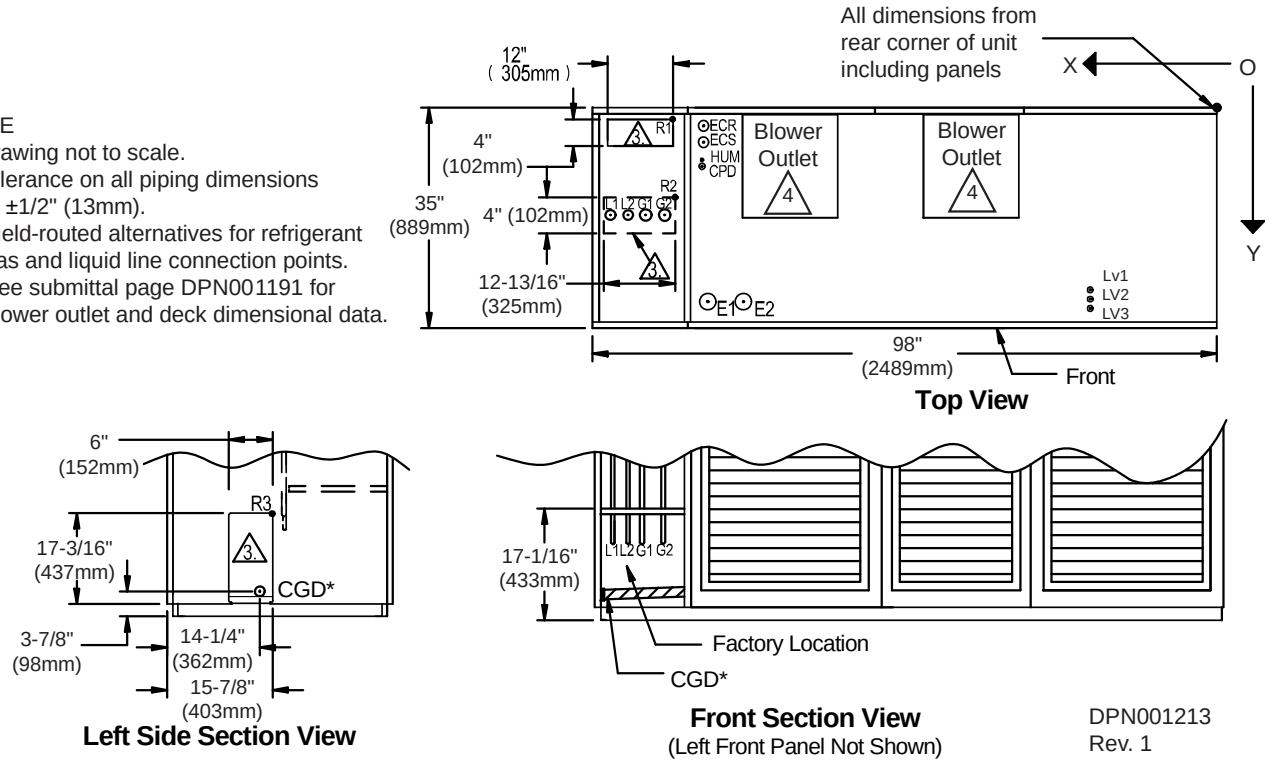
Point	Description	X inches (mm)	Y inches (mm)	Connection Size / Opening inches (mm)
R1 (3)	Refrigerant Access (Top)	83-3/4 (2127)	1-7/8 (48)	22-1/2 x 15-3/16 (572 x 386)
R2 (3)	Refrigerant Access (Bottom)	86 (2184)	13-7/8 (352)	16-7/16 x 4 (418 x 102)
				53kW (15 ton)/70 & 77kW (20 & 22 ton)
L1	Liquid Line System 1	97 (2464)	16-3/4 (425)	1/2 / 5/8 Cu Sweat
L2	Liquid Line System 2	93-5/16 (2370)	16-3/4 (425)	1/2 / 5/8 Cu Sweat
G1	Hot Gas Discharge 1	90-5/8 (2302)	16-5/8 (422)	7/8 / 1-1/8 Cu Sweat
G2	Hot Gas Discharge 2	88 (2235)	16-5/8 (422)	7/8 / 1-1/8 Cu Sweat
R3 (3)	Refrigerant Access (Side)	-	-	6 x 17-3/16 (152 x 437)
CGD*	Condensate Gravity Drain	-	-	3/4 FPT
CPD	Condensate Pump Discharge (Opt)	79-5/16 (2015)	11-7/8 (302)	1/2 Cu Sweat
HUM	Humidifier Supply Line	79-5-16 (2015)	9-7/8 (251)	1/4 Cu Sweat
ECS**	Econ-O-Coil Supply	78-5/8 (1998)	7-7/8 (200)	2-1/8 Cu Sweat
ECR**	Econ-O-Coil Return	78-5/8 (1998)	4-5/8 (117)	2-1/8 Cu Sweat
E1	Electrical Connection (High Voltage)	75-3/8 (1915)	30 (762)	2-1/2
E2	Electrical Connection (High Voltage)	69-7/8 (1775)	30 (762)	2-1/2
LV1	Electrical Connection (Low Voltage)	19-1/2 (495)	29-1/16 (738)	7/8
LV2	Electrical Connection (Low Voltage)	19-1/2 (495)	30-1/2 (775)	7/8
LV3	Electrical Connection (Low Voltage)	19-1/2 (495)	31-15/16 (811)	7/8

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

** Supplied on Dual-Cool systems only (4-pipe system)

Figure 93 Primary connection locations—upflow, air-cooled, 53-77kW (15-22 ton), scroll compressor models

NOTE
1. Drawing not to scale.
2. Tolerance on all piping dimensions is ±1/2" (13mm).
3. Field-routed alternatives for refrigerant gas and liquid line connection points.
4. See submittal page DPN001191 for blower outlet and deck dimensional data.

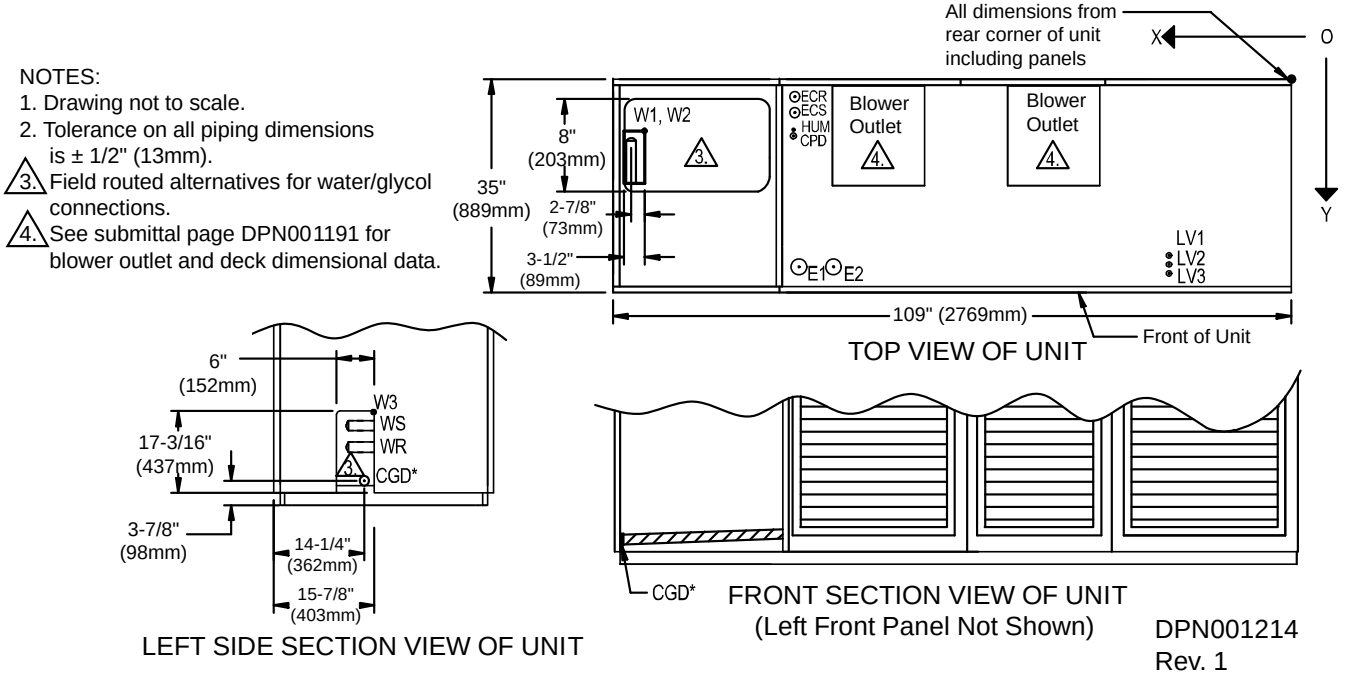


Point	Description	X inches (mm)	Y inches (mm)	Connection Size / Opening inches (mm)
R1 (3)	Refrigerant Access (Top)	83-5/8 (2124)	2 (51)	12 x 4 (305 x 102)
R2 (3)	Refrigerant Access (Bottom)	82-3/4 (2102)	14-3/4 (374)	12-3/16 x 4 (310 x 102)
				53kW (15 tons)/70 & 77kW (20 & 22 ton)
L1	Liquid Line System 1	94-11/16 (2405)	16-3/4 (425)	1/2 / 5/8 Cu Sweat
L2	Liquid Line System 2	91-7/8 (2334)	16-3/4 (425)	1/2 / 5/8 Cu Sweat
G1	Hot Gas Discharge 1	88-3/4 (2254)	16-3/8 (416)	7/8 / 1-1/8 Cu Sweat
G2	Hot Gas Discharge 2	85-9/16 (2173)	16-3/8 (416)	7/8 / 1-1/8 Cu Sweat
R3 (3)	Refrigerant Access (Side)	-	-	6 x 17-3/16 (152 x 437)
CGD*	Condensate Gravity Drain	-	-	3/4 FPT
CPD	Condensate Pump Discharge (Opt)	79-5/16 (2015)	11-7/8 (302)	1/2 Cu Sweat
HUM	Humidifier Supply Line	79-5/16 (2015)	9-7/8 (251)	1/4 Cu Sweat
ECS**	Econ-O-Coil Supply	78-5/8 (1998)	7-7/8 (200)	2-1/8 Cu Sweat
ECR**	Econ-O-Coil Return	78-5/8 (1998)	4-5/8 (117)	2-1/8 Cu Sweat
E1	Electrical Connection (High Voltage)	75-3/8 (1915)	30 (762)	2-1/2
E2	Electrical Connection (High Voltage)	69-7/8 (1775)	30 (762)	2-1/2
LV1	Electrical Connection (Low Voltage)	19-1/2 (495)	29-1/16 (738)	7/8
LV2	Electrical Connection (Low Voltage)	19-1/2 (495)	30-1/2 (775)	7/8
LV3	Electrical Connection (Low Voltage)	19-1/2 (495)	31-15/16 (811)	7/8

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

** Supplied on Dual-Cool systems only (four-pipe system)

Figure 94 Primary connection locations—upflow, water/glycol/GLYCOOL, 53-77kW (15-22 ton), all compressor models



Point	Description	X inches (mm)	Y inches (mm)	Connection Size / Opening inches (mm)
W1 3	Water/Glycol/GLYCOOL Access (Bottom)	102-15/16 (2615)	9 (229)	3-1/2 x 8 (89 x 203)
W2 3	Water/Glycol/GLYCOOL Access (Top)	102-15/16 (2615)	9 (229)	3-1/2 x 8 (89 x 203)
W3 3	Water/Glycol/GLYCOOL Access (Side)	-	-	6 x 17-3/16 (152 x 437)
WS 3	Water/Glycol/GLYCOOL Supply	-	-	2-1/8 Cu Sweat
WR 3	Water/Glycol/GLYCOOL Return	-	-	2-1/8 Cu Sweat
CGD*	Condensate Gravity Drain	-	-	3/4 FPT
CPD	Condensate Pump Discharge (Option)	79-5/16 (2015)	11-7/8 (302)	1/2 Cu Sweat
HUM	Humidifier Supply Line	79-5/16 (2015)	9-7/8 (251)	1/4 Cu Sweat
ECS**	Econ-O-Coil Supply	78-5/8 (1998)	7-7/8 (200)	2-1/8 Cu Sweat
ECR**	Econ-O-Coil Return	78-5/8 (1998)	4-5/8 (117)	2-1/8 Cu Sweat
E1	Electrical Connection (High Voltage)	75-3/8 (1915)	30 (762)	2-1/2
E2	Electrical Connection (High Voltage)	69-7/8 (1775)	30 (762)	2-1/2
LV1	Electrical Connection (Low Voltage)	19-1/2 (495)	29-1/16 (738)	7/8
LV2	Electrical Connection (Low Voltage)	19-1/2 (495)	30-1/2 (775)	7/8
LV3	Electrical Connection (Low Voltage)	19-1/2 (495)	31-15/16 (811)	7/8

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

** Supplied on Dual-Cool systems only (four-pipe system)

Figure 95 Primary connection locations—upflow, air-cooled, 105kW (30 ton), all

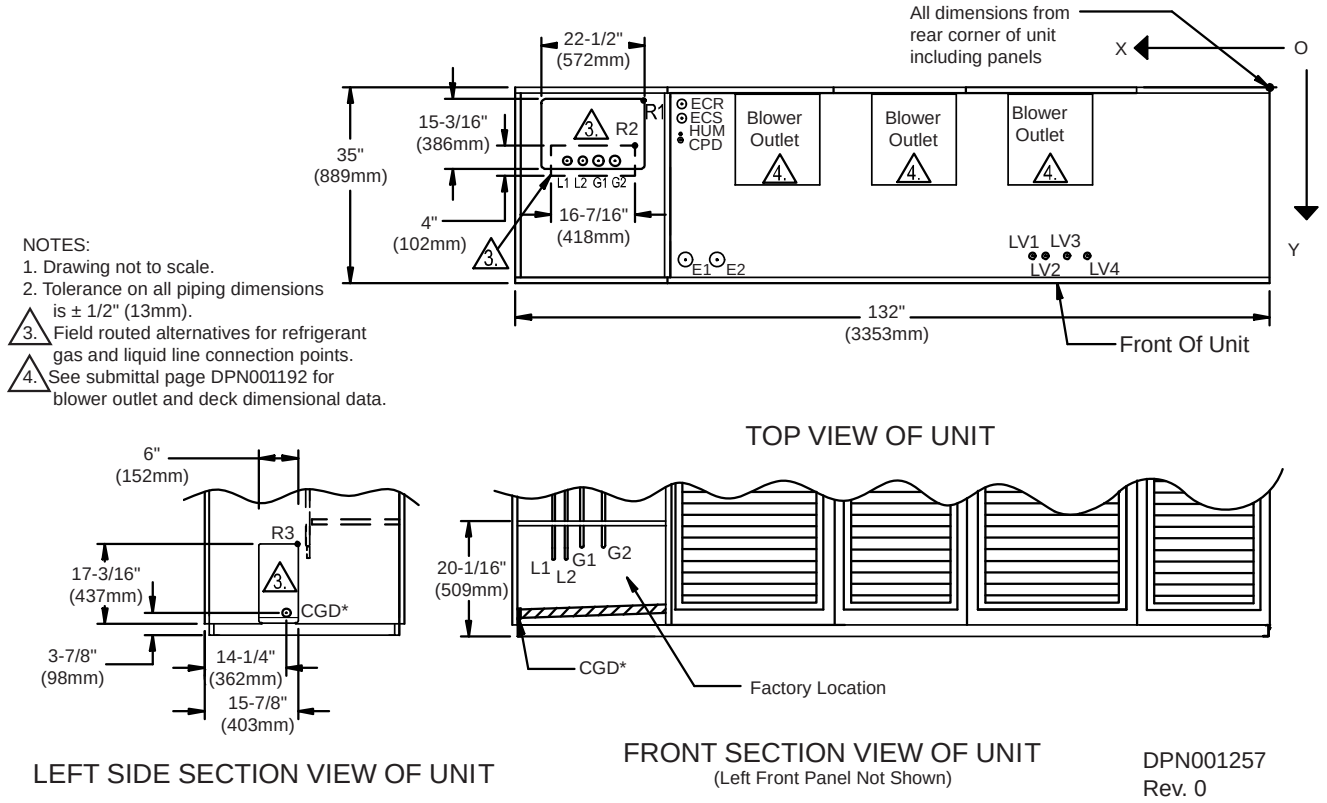


Table 57 Piping data—upflow, air-cooled 105kW (30 ton), all

Point	Description	X	Y	Connection Size / Opening
R1 3	Refrigerant Access (Top)	106-7/8 (2715)	1-7/8 (48)	22-1/2 x 15-3/16 (572 x 386)
R2 3	Refrigerant Access (Bottom)	109-1/8 (2772)	13-7/8 (352)	16-7/16 x 4 (418 x 102)
L1	Liquid Line System 1	121-3/4 (3092)	16-3/4 (425)	5/8 Cu Sweat
L2	Liquid Line System 2	118-1/8 (3000)	16-3/4 (425)	5/8 Cu Sweat
G1	Hot Gas Discharge 1	118-1/4 (3004)	14-1/4 (362)	1-1/8 Cu Sweat
G2	Hot Gas Discharge 2	115-5/8 (2937)	14-1/4 (362)	1-1/8 Cu Sweat
R3 3	Refrigerant Access (Side)	-	-	6 x 17-3/16 (152 x 437)
CGD*	Condensate Gravity Drain	-	-	3/4 FPT
CPD	Condensate Pump Discharge (Opt)	102-3/8 (2600)	13-5/8 (346)	1/2 Cu Sweat
HUM	Humidifier Supply Line	101-1/8 (2569)	13-1/8 (333)	1/4 Cu Sweat
ECS	Econ-O-Coil Supply	101-1/8 (2569)	10-1/4 (260)	2-5/8 Cu Sweat
ECR	Econ-O-Coil Return	101-1/8 (2569)	5-1/4 (133)	2-5/8 Cu Sweat
E1	Electrical Conn. (High Volt)	98-1/2 (2502)	30 (762)	2-1/2
E2	Electrical Conn. (High Volt)	93 (2362)	30 (762)	2-1/2
LV1	Electrical Conn. (Low Volt)	41-1/8 (1045)	30-3/8 (772)	7/8
LV2	Electrical Conn. (Low Volt)	38-7/8 (987)	30-3/8 (772)	7/8
LV3	Electrical Conn. (Low Volt)	35-1/8 (892)	30-3/8 (772)	7/8
LV4	Electrical Conn. (Low Volt)	31-5/8 (803)	30-3/8 (772)	7/8

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

Figure 96 Primary connection locations—upflow, water/glycol/GLYCOOL, 105kW (30 ton), all

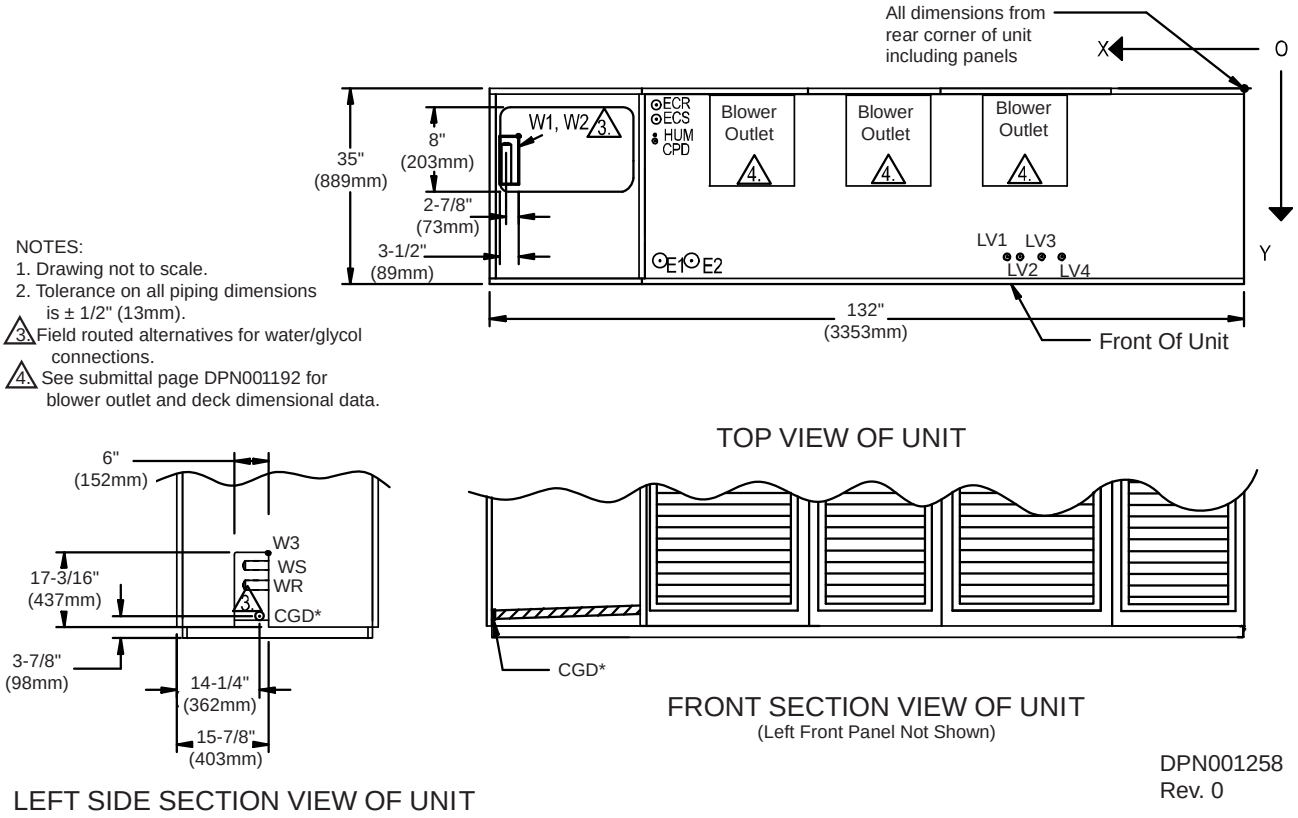


Table 58 Piping data—upflow, upflow, water/glycol/GLYCOOL, 105kW (30 ton), all

Point	Description	X inches (mm)	Y inches (mm)	Connection Size / Opening, inches (mm)
W1 3	Water/Glycol/GLYCOOL Access (Bottom)	126-1/8 (3204)	9 (229)	3-1/2 x 8 (89 x 203)
W2 3	Water/Glycol/GLYCOOL Access (Top)	126-1/8 (3204)	9 (229)	3-1/2 x 8 (89 x 203)
W3 3	Water/Glycol/GLYCOOL Access (Side)	-	-	6 x 17-3/16 (152 x 437)
WS 3	Water/Glycol/GLYCOOL Supply	-	-	2-1/8 Cu Sweat
WR 3	Water/Glycol/GLYCOOL Return	-	-	2-1/8 Cu Sweat
CGD*	Condensate Gravity Drain	-	-	3/4 FPT
CPD	Condensate Pump Discharge (Opt)	102-3/8 (2600)	13-5/8 (346)	1/2 Cu Sweat
HUM	Humidifier Supply Line	101-1/8 (2569)	13-1/8 (333)	1/4 Cu Sweat
ECS	Econ-O-Coil Supply	101-1/8 (2569)	10-1/4 (260)	2-5/8 Cu Sweat
ECR	Econ-O-Coil Return	101-1/8 (2569)	5-1/4 (133)	2-5/8 Cu Sweat
E1	Electrical Conn. (High Volt)	98-1/2 (2502)	30 (762)	2-1/2
E2	Electrical Conn. (High Volt)	93 (2362)	30 (762)	2-1/2
LV1	Electrical Conn. (Low Volt)	41-1/8 (1045)	30-3/8 (772)	7/8
LV2	Electrical Conn. (Low Volt)	38-7/8 (987)	30-3/8 (772)	7/8
LV3	Electrical Conn. (Low Volt)	35-1/8 (892)	30-3/8 (772)	7/8
LV4	Electrical Conn. (Low Volt)	31-5/8 (803)	30-3/8 (772)	7/8

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

11.0 CHECKLIST FOR COMPLETED INSTALLATION

11.1 Moving and Placing Equipment

___ 1. Unpack and check received material.

___ 2. Proper clearance for service access has been maintained around the equipment.

___ 3. Equipment is level and mounting fasteners are tight.

___ 4. If the equipment has been disassembled for installation, unit must be reassembled per instructions.

11.2 Electrical

___ 1. Supply voltage and phase matches equipment nameplate.

___ 2. Wiring connections completed between disconnect switch, evaporator unit and heat rejection equipment.

___ 3. Power line circuit breakers or fuses have proper ratings for equipment installed.

___ 4. Control wiring connections completed between indoor evaporator and heat rejection equipment.

___ 5. All internal and external high- and low-voltage wiring connections are tight.

___ 6. Confirm that unit is properly grounded to an earth ground.

___ 7. Control transformer setting matches incoming power.

___ 8. Electrical service conforms to national and local codes.

___ 9. Check blowers and compressors (scroll only) for proper rotation.

___ 10. Upflow units only: Field installed low volt wiring routed with loop to allow electric box to swing.

___ 11. For units with variable speed drive (VSD) operating on Delta-connected power, ensure that the EMC filter has been disconnected; see **8.1 - Variable Speed Drive** for details.

___ 12. Check for loose electrical connections on steam generating humidifier. Confirm that electrode plugs are pressed firmly onto the electrode pins.

11.3 Piping

___ 1. Piping completed to refrigerant or coolant loop (if required).

___ 2. Piping has been leak-checked, evacuated and charged (if required).

___ 3. Additional oil has been added for system charges over 40 pounds (18.1kg) per circuit (see **9.2.2 - Scroll and Digital Scroll—Additional Oil Requirements**.

___ 4. Piping is properly sized, sloped and trapped as shown in the piping schematics

___ 5. Check piping inside and outside of equipment for proper supportand adequate spacing to prevent rub-through.

___ 6. Ensure TXV equalizer lines and sensing bulb lines have sufficient clearance and do not rub against other refrigerant lines.

___ 7. Ensure that factory clamps have been reinstalled.

___ 8. Drain line connected and pitched per local code.

___ 9. Water supply line connected to humidifier.

11.4 Other

___ 1. Ducting complete (if required), maintain access to filters.

___ 2. Filters installed.

___ 3. Check fasteners that secure compressors, reheats, humidifier and motors—some may have become loose during shipment.

___ 4. Verify water detection is properly installed around all units (recommended).

___ 5. Control panel DIP switches are set based on user requirements.

___ 6. Blower drive system rotates freely and belts are properly aligned and tensioned.

___ 7. Compressor shipping blocks removed and springs adjusted (see **5.3 - Semi-Hermetic Compressor Spring Isolation System**).

___ 8. Remove rubber band from float in optional infrared humidifier.

___ 9. Seal openings around piping and electrical connections.

___ 10. Installation materials and tools have been removed from equipment (literature, shipping materials, construction materials, tools, etc.).

___ 11. Locate blank startup sheet, ready for completion by installer or startup technician.

12.0 INITIAL STARTUP CHECKS AND COMMISSIONING PROCEDURE FOR WARRANTY INSPECTION

WARNING

Risk of electric shock. Can cause injury or death

Disconnect local and remote power supplies before working within.

Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power.

Follow all local codes.

WARNING

Risk of improper wiring, piping, moving, lifting and/or handling. Can cause equipment damage, injury or death.

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

Read all installation, operating and safety instructions before proceeding.

Read and follow all warnings in this manual.

WARNING

Risk of fire suppression and alarm system activation. Can cause injury during building evacuation and mobilization of emergency fire and rescue services.

Startup operation of optional electric reheat elements may activate facility alarm and fire suppression system. Prepare and take appropriate steps to manage this possibility. Activating reheat during initial startup may burn off particulates from electric reheat elements.

Check the steam generating humidifier electrode plugs to ensure that they are pressed firmly onto the pins. Loose connections will cause the cylinder and plugs to overheat.

Before beginning initial startup checks, make certain that unit was installed according to the instructions in this manual. All exterior panels must be in place.

NOTICE

Risk of improper electrical connection of three-phase input power. Can cause unit damage.

Service technicians should use a gauge set on the Liebert DS system during the initial startup to verify that the three-phase power is connected properly. The EC fans are not a reliable indicator of proper connection. The blowers will rotate the same direction, regardless of the three-phase power input.

- Confirm that all items on **11.0 - Checklist for Completed Installation** have been done.
- Locate "Liebert DS Warranty Inspection Check Sheet" in unit electric panel. (Document number SAFM-8542-29)
- Complete "Liebert DS Warranty Inspection Check Sheet" during startup. (Document number SAFM-8542-29).
- Forward the completed "Liebert DS Warranty Inspection Check Sheet" to your local Emerson sales office. **This information must be completed and forwarded to Emerson to validate warranty.**
- Contact your local Emerson sales representative or Liebert Air Product Support if you have any questions or problems during unit startup and commissioning.
- Local Emerson Sales offices and Liebert Air Product Support contacts can be found at **www.liebert.com** or by calling 1-800-LIEBERT.

Liebert DS warranty startup procedures includes the following steps. These steps must be completed to validate warranty.

12.1 Information for Warranty Inspection—Remove Power From Unit Disconnect

Complete the following items on the warranty inspection form:

- Installer name and address
- Owner name and address
- Site contact name and phone number
- Installation date
- Indoor unit model number and serial number
- Outdoor unit (condenser or drycooler) model number and serial number
- Condition of unit when received
- Is there a freight damage claim in process? If so, have all relevant parties been notified?
- Have manuals been kept with unit?
- Is the Liebert Precision Cooling unit connected to site monitoring or switchover controls?
- Provide model and serial of connected controls for switchover controls.

12.2 Startup Checks With Panels Removed and Main Disconnect Off

___ 1. Check all internal piping clamps and tighten or secure if needed.

___ 2. Check field piping for proper support and proper connection.

___ 3. Check unit belts for correct tension and alignment.

___ 4. Check unit electrical connections, including and Mate N' Loc connections to the control boards, and tighten or secure if needed.

___ 5. Remove all debris, tools and documents from unit area.

12.2.1 Inspect and Record

Main Fan hp: _____

Voltage: _____

Proper Belt Tension and Alignment: _____

Belt Size: _____

Motor Sheave: _____

Fan Pulley: _____

EC Plug Fan: Assemblies Tight and Secured (check one)

___ Fan secured in UP position

___ Fan secured in Down position

Filter Size: _____

Quantity: _____

Piping Size (Air Cooled Only)

Discharge: _____

Liquid: _____

___ Piping trapped according to installation manual (air cooled)

Total Equivalent Length for Discharge and Liquid Piping: _____

#1 Compressor Model #: _____

#1 Compressor Serial #: _____

#2 Compressor Model #: _____

#2 Compressor Serial #: _____

12.3 Startup

1. Turn On the Main Disconnect.
2. Check voltage at disconnect and record.
   L1-L2 _____ L2-L3 _____ L1-L3 _____
3. Check control voltage transformers for proper output. Secondary voltage(s) should not exceed 27VAC under load. Change tap if necessary.
   T1 _____ Volts.
4. Check fan rotation for proper direction. Change wiring at contactor if necessary.
5. Service technicians should use a gauge set on the Liebert DS system during the initial startup to verify that the three-phase power is connected properly. The rotation direction of EC blowers is not a reliable indicator of proper connection. The blowers will rotate the same direction, regardless of the three-phase power input.
6. Check Main Fan amps and record.
   L1 _____ L2 _____ L3 _____ Fuse _____
7. Increase temperature setpoint to energize reheats. Check and record amperage.
   #1 _____ #2 _____ #3 _____ Fuse _____
8. Increase humidity setpoint to energize humidifier. Check and record amperage
   L1-L2 _____ L2-L3 _____ L1-L3 _____
9. **Infrared**: Check water level and adjust high limit float for proper operation.
10. If condensate pump has been supplied, check for proper operation.
11. **Chilled water and Econ-O-Coil (GLYCOOL) only**:
    a. Decrease temperature setpoint to energize valve motor. Check for full valve travel in cooling mode.
    b. Adjust controls out of cooling mode. Check for valve closure.
12. Decrease humidity setpoint to call for dehumidification. Check for valve travel in dehumidification mode.
13. Decrease temperature setpoint to energize compressor(s). Check and record compressor amps.
    #1 L1 _____ L2 _____ L3 _____ Fuse _____
    #2 L1 _____ L2 _____ L3 _____
14. Check compressor operating pressure and record. (Check digital compressors fully loaded position.)
    Suction Pressure 1 _____ 2 _____
    Discharge Pressure 1 _____ 2 _____
15. Sight Glass clear? 1 _____ 2 _____
    some flashing may occur with system fluctuations and/or R-407c blend refrigerants
16. Sight Glass dry? 1 _____ 2 _____
17. Check compressor oil sight glass , should be 1/2 to 3/4 full while running. Adjust accordingly.
18. Check superheat on each circuit. Should be approximately 10°-25°.
    Circuit 1 _____ Circuit 2 _____
19. Check low pressure settings.
    Low pressure cutout 1 _____ 2 _____
    Low pressure cut in 1 _____ 2 _____
20. Winter Control System (air-cooled only)
    Liebert Lee-Temp liquid level correct _____
    Record voltage to heater pads _____Volts
21. If the head pressures recorded above equal 105°F condensing temperature, no adjustment of the glycol/water regulating valves is required If the system has balancing valves in it, these valves also should be adjusted. After the condensing temperature has been set up properly, the system should be allowed to run for 10 to 15 minutes to obtain stable conditions.
    Entering condenser water/glycol temperature _____
    Leaving condenser water/glycol temperature _____

12.4 Commissioning Procedure With Panels On

1. Disconnect all power to the environmental control unit and check.
2. Remove all line voltage fuses except the main fan fuses and the control voltage fuses in the electric panel. (Use Liebert iCOM to activate loads.)
3. Turn On power to the unit and check line voltage on main unit disconnect switch. Line voltage must be within 10% of nameplate voltage.
4. Turn On the main unit disconnect switch and check secondary voltage at transformer T1. Voltage at T1 must be 24VAC ±2.5VAC (check at TB1-1 and TB1-5). T1 voltage must not exceed 28VAC. Change primary tap if necessary.
5. Push the On button. Blower will start and the On lamp will light.
6. Check fan rotation if not correct make necessary changes to the line side of the unit disconnect with power Off. **(The unit is phased at the factory.)**
7. Unit will operate at the factory-set configuration for all component operations. The operator may set the values for temperature and humidity setpoints, the proportional band and the deadband. The user menu may be used to set alarms and other control functions. Refer to the Liebert iCOM user manual, SL-18835, for large or small display operation and settings.

NOTICE

Risk of improper operation. Can cause damage to equipment.

Do not change Advanced Menu parameter settings in the Liebert iCom without first getting permission from Emerson Network Power Liebert Services.

Lowering this parameter to less than 100% will cause the coil to freeze on DX units, will overheat the reheat components on any unit and cause condensation problems on any unit equipped with a humidifier.

8. Turn Off the unit with the On/Off button.
9. Remove power from main unit disconnect and main breaker and check with a meter.
10. Replace all fuses removed in **Step 2**.
11. Restore power to the unit.
12. Turn On the main unit disconnect switch.
13. Press the On button.
14. Check and record the current draw on all line voltage components and match with serial tag.

NOTE

*Electric Reheat. See **Warning on page 126**. Activate for a minimum of five (5) minutes.*

15. Check for unusual noises and vibration. Note observations on the warranty inspection form's comments section.
16. Check all refrigerant and water lines for leaks. Note observations on warranty inspection form.
17. Record all of the following on the warranty inspection form:
    - All component voltages and current draws
    - All air / water temperatures indoor and outdoor
    - All refrigerant and water / glycol pressures,
    - All levels of refrigerant and oil in sight glasses
    - Record refrigerant pressure switch settings and operating pressures
    - Record superheat and subcooling.

NOTE

Unit superheat should be in the range of 10 to 20°F (-12 to -6°C).

18. Test all control sequences and functions of your unit for proper operation. Use Liebert iCOM user manual as a guide to system control operations.
19. Complete the warranty inspection form with sign-off data.

Return Completed Startup Form to Your Local Emerson Sales Office

Local Emerson sales offices and air product support contacts can be found on the Liebert Web site: **www.liebert.com** or call 1-800-LIEBERT for Precision Cooling product support.

13.0 MAINTENANCE

WARNING

Risk of electric shock. Can cause injury or death.

Disconnect local and remote power supplies before working within.

Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power.

Follow all local codes.

WARNING

Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, injury or death.

Only qualified service personnel should work on this equipment.

Read all installation, operating and safety instructions before proceeding.

Read and follow all warnings in this manual

NOTICE

Risk of improper operation. Can cause damage to equipment.

Do not change Advanced Menu parameter settings in the Liebert iCom without first getting permission from Emerson Network Power Liebert Service.

Lowering this parameter to less than 100% will cause the coil to freeze on DX units, will overheat the reheat components on any unit and cause condensation problems on any unit equipped with a humidifier.

The Liebert DS product is a single component in the facility heat removal system. The system includes air distribution (raised floors, duct systems), outdoor heat rejection (condensers, pumps, drycoolers, cooling towers, piping, heat rejection fluid, ambient temperature, etc.) and indoor cooling and humidity loads (equipment load, location, outside air infiltration). Proper application and maintenance of the entire system is critical to the life and reliability of the Liebert DS.

- Good maintenance practices are essential to minimizing operation costs and maximizing product life.
- Read and follow monthly and semi-annual maintenance schedules included in this manual. These MINIMUM maintenance intervals may need to be more frequent based on site-specific conditions.
- See the Liebert iCOM user manual, SL-18835, for instructions on how to utilize the unit controller to predict some service maintenance intervals.
- Emerson recommends the use of trained and authorized service personnel, extended service contracts and factory-specified replacement parts. Contact your local Emerson representative.

13.1 Filters

NOTICE

Risk of improper filter installation and filter collapse. Can cause equipment damage.

Pleat direction is non-standard. Use only short-pleat filters (see **Figure 97**). Long-pleat filters are subject to collapse at high airflows.

To maximize the performance and reliability of Liebert DS equipment, use only Liebert filters. Contact your local Emerson representative to order replacement filters.

Table 59 Filter quantities, downflow units

Unit Size	Filter Size Width x Length	Filter Quantities	
		4" Filter Option Merv 8 or Merv 11	2" Primary / 2" Pre-Filter Option Merv 11 Primary Filter / Merv 7 Pre-Filter
DS 028, 035, 042	16 x 25	5	5/5
DS 053, 070, 077		7	7/7
DS 105		9	9/9

Table 60 Filter quantities, upflow units

Upflow Models	Filter Size Width x Length	Filter Quantities	
		4" Filter Option Merv 8 or Merv 11	2" Primary/2" Pre-Filter Option Merv 11 Primary/Merv 7 Pre-Filter
VS025, 035, 042	25 x 20"	4	4/4
VS053, 070, 077		6	6/6
VS105		8	8/8

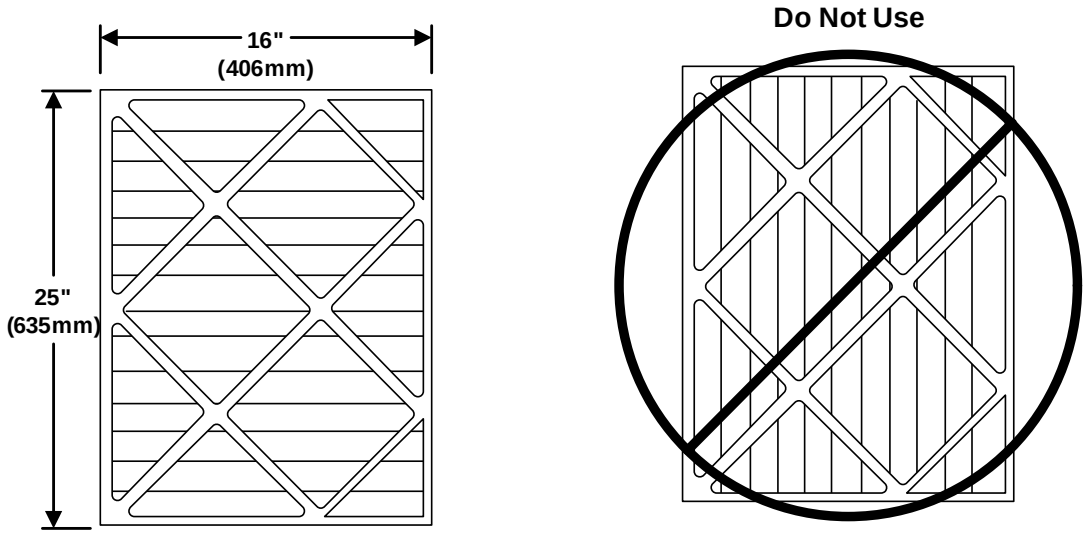
13.1.1 Filter Replacement Procedure—Downflow Units

1. Disconnect power from the Liebert DS.
2. Using a stepladder, remove filters from the top of the unit.
   The optional downflow return air plenum includes a filter access door.
3. Replace with new filters—install the filters in the proper direction of the airflow (see **Figure 97**).
4. Test the operation of the filter clog switch.
   The unit panels must be in place and closed to find this point.
5. Start the blower and turn the switch counterclockwise until the alarm is energized.
6. Turn the adjusting knob one turn clockwise or to the desired filter change point.

13.1.2 Filter Replacement Procedure—Upflow Units

1. Disconnect power from the Liebert DS.
2. Remove the lower front access panel and remove the filters.
   For upflow front return units, remove the lower front access panels, lift filters to the top of the filter rack and tilt forward for removal.
   For upflow rear return units, remove filters using filter access door in rear return filter box.
3. Replace with new filters—install the filters in the proper direction of the airflow (see **Figure 97**).
4. Test the operation of the filter clog switch.
   The unit panels must be in place and closed to find this point.
5. Start the blower and turn the switch counterclockwise until the alarm is energized.
6. Turn the adjusting knob one turn clockwise or to the desired filter change point.

Figure 97 Proper filter pleat direction



13.2 Blower Drive System—Centrifugal Fans

Blower drive system components that are part of the maintenance schedule include the blower wheel(s) drive shaft, bearings, pulley, belts, sheave, motor auto-tension base and motor. See **Blower Section on page 150**.

WARNING

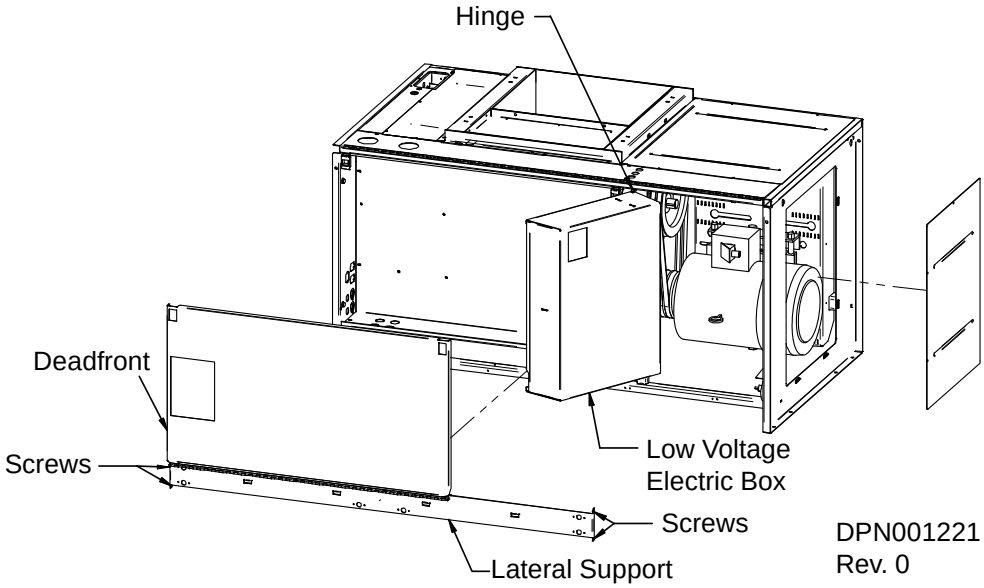
Risk of crushing and pinching action from spring-loaded motor base. Can cause serious injury to hands and fingers.

Improper drive belt removal may cause the motor base to slam down suddenly. Read the directions in this manual and on the unit instruction labels before servicing the belts, motors or pulleys. Follow all directions when servicing the unit.

13.2.1 Upflow Motor Access

1. Remove the lateral support (sheet metal channel) under electric box by removing two screws at each end.
2. Removed the hinged deadfront panel (30-ton units have open access to the motor).
3. Remove two screws on the right side of the low-voltage electric box that secure the low volt electric box to the sheet metal shoulder.
4. Swing open low-voltage electric box to gain access to the motor.

Figure 98 Upflow motor access



13.2.2 Belt Removal

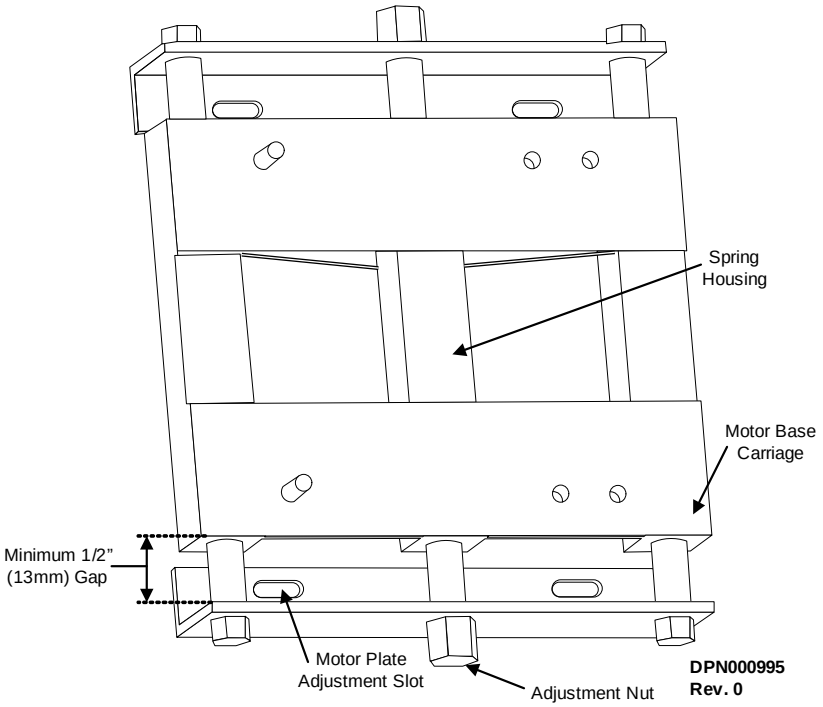
1. Disconnect power to unit.
   Do not pry the belts off sheave or pulley.
2. Refer to instruction labels on unit near motor base.
3. Turn adjustment nut (see **Figure 99**) counterclockwise (left) to loosen belts and bring motor base internal spring out of compression.
4. Remove belts.

13.2.3 Belt Installation and Tensioning

1. Select the appropriate replacement of belts (matched set) and position on drive package.

   To maximize performance and reliability of Liebert DS equipment, use only Liebert belts. Contact your local Emerson representative for replacement belts.
2. Ensure pulley grooves are properly aligned. If adjustment is required, loosen (do not remove) four nuts in adjustment slots (see **Figure 99**) holding motor base to unit frame and slide motor base assembly into alignment.
3. Tension belts by turning adjustment nut clockwise (right) **until motor base carriage stops moving downward.**
4. Ensure minimum 1/2" (12.7mm) clearance exists from motor base carriage to base front flange (see **Figure 99**). If the clearance is less than 1/2" (12.7mm), select shorter belts.
5. Mark the adjustment nut and rotate clockwise (right) five additional full turns. This sets internal spring for proper belt tension, no readjustments necessary.

Figure 99 Auto-belt tensioning motor base



Blower Bearing Maintenance

- Field lubrication is NOT required for the life of the bearing.
- Bearings are permanently sealed and self-lubricating and cannot be greased.

Blower Bearing Inspection

1. Disconnect power to unit.
2. Remove drive belts (see **13.2.2 - Belt Removal**).
3. Inspect bearing for tightness of set screws and mounting bolts.
4. Rotate fan wheel by hand.
5. Listen for *unusual* noise and look for signs of *unusual* play.

Blower Bearing Replacement

1. To maximize performance and reliability of Liebert DS equipment, use only SealMaster Reduced Maintenance pillow block bearing with tapered lands race and double lock set screws. Contact local Emerson representative to order replacement bearings.
2. Properly mount and align bearings on shaft. Tighten set-screws in proper sequence and to proper torque using a torque wrench in accordance with the manufacturer's instructions.

Blower Motor

Inspect motor at regular intervals. Keep motor clean and ventilation openings clear of dust, dirt and other debris.

Blower Motor Lubrication

- Motor comes pre-lubricated from factory and does NOT require initial lubrication.
- Emerson recommends a 5-year lubrication interval for motor bearings that have grease fittings.
- Greases of different bases may not be compatible when mixed.
- Contact specific motor manufacturer to determine type of grease to be used.

Blower Wheel

Check to see if wheel(s) are tightly mounted on fan shaft. Rotate wheel(s) and make sure they do not rub against fan housing. The wheel(s) should be periodically cleaned of dirt and debris.

13.2.4 Electronic Variable Speed Drive - Inverter

On Liebert DS models with digital scroll, an optional, variable speed drive is available. This packaged unit is factory-set and should not require field adjustment.

Removing VSD from Liebert DS

1. Turn off power at the unit disconnect.
2. Remove the front right panel.
3. Remove the VSD subassembly from the unit shoulder (downflow) or from the unit floor (upflow). To find the inverter in downflow units, see **Figure 1**; refer to **Figure 2** for the inverter's location in upflow units.
4. Remove the VSD sheet metal cover from the VSD subassembly.
5. Label the wires from the VSD, then disconnect the wires from the VSD junction box.
6. Remove the VSD from the sheet metal bracket.
7. Install the new VSD on the sheet metal bracket.
8. Reconnect wires to the VSD.
9. Reinstall the VSD sheet metal cover.
10. Re-mount the VSD on the unit shoulder or on the unit floor.
11. Reinstall the right panel.
12. Engage power to the unit disconnect.

13.3 Blower Drive System—EC Fans

13.3.1 Fan Impellers and Bearings

Fan impellers should be periodically inspected and any debris removed. Check to ensure that the impellers can rotate freely and that the fan guards are still properly mounted for sufficient protection against accidentally contacting the impeller. Bearings used on the units are maintenance-free. Consult the factory for more information.

13.3.2 Protective Features

Monitoring functions protect the motor against overtemperature of electronics, overtemperature of motor and incorrect rotor position detection. With any of these failures, an alarm will display through the Liebert iCOM and the motor stops electronically. There is no automatic restart. The power must be switched off for a minimum of 20 seconds once the motor is at a standstill.

The motor also provides locked rotor protection, undervoltage/phase failure detection and motor current limitation. These conditions will display an alarm through the Liebert iCOM.

WARNING

Risk of electric shock. Can cause injury or death.

Disconnect all local and remote electrical power supplies before working within the unit.

When connecting the motor to input power, dangerous voltages occur. Do not open the motor within the first 5 minutes after disconnection of all phases.

WARNING

Risk of electric shock. Can cause injury or death.

Dangerous external voltages can be present at main fan terminal KL2 even after the motor has been turned off.

WARNING

Risk of improper handling. Can cause injury.

Use proper skin protection when touching the electronics housing or allow time for the housing to cool before replacing parts.

The electronics housing can get hot and can cause severe burns

CAUTION

Risk of improper moving, lifting and handling. Can cause equipment damage or injury.

Only properly trained and qualified personnel should work on this equipment. Fan modules weigh in excess of 100lb. (45kg) each. Take precautions to avoid back injury and dropping during removal.

NOTICE

Risk of improper installation. Can cause equipment damage.

Only a properly trained and qualified technician should install or open this motor.

Use 60/75°C copper wire only. Use Class 1 wires only.

13.4 Humidifier—Infrared

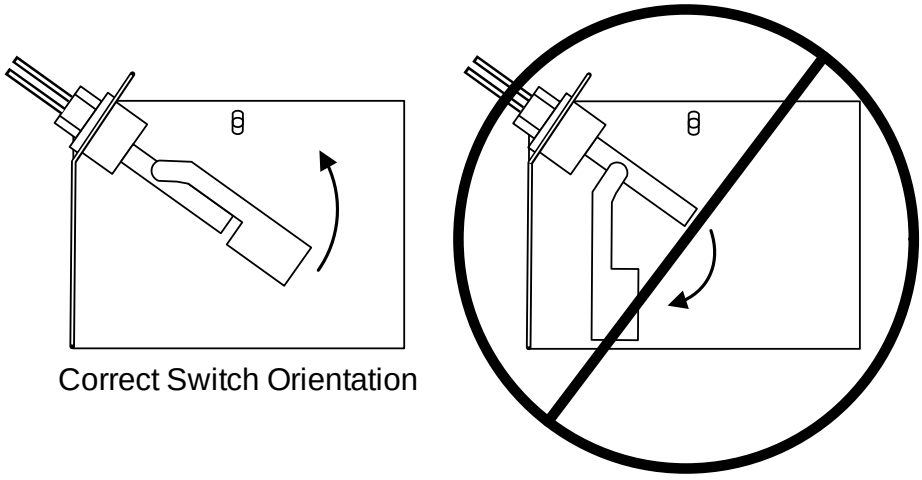
During normal humidifier operation, deposits of mineral solids will collect in humidifier pan and on the float switch. These must be cleaned periodically to ensure proper operation. Frequency of cleaning must be locally established since it is dependant on humidifier usage and local water quality. A spare pan is recommended to reduce maintenance time at unit. The Liebert autoflush system can greatly increase the time between cleanings, but does not eliminate the need for periodic checks and maintenance (see Liebert iCOM user manual SL-18835 for autoflush setup). To help reduce excessive scaling in locations with difficult water quality, the use of Vapure is recommended (contact your local Emerson representative).

13.4.1 Cleaning Humidifier Pan and Float Switch

Before turning off unit:

1. With unit operating, remove call for humidification at the Liebert iCOM control.
2. Let the blower operate 5 minutes to allow the humidifier and water to cool.
3. If unit has a condensate pump, turn unit OFF at Liebert iCOM control.
4. Pull out the humidifier standpipe in pan.
5. Inspect the O-ring (replace if necessary).
6. Let the pan drain and condensate pump operate (if applicable).
7. Disconnect power from the unit.
8. Disconnect the drain coupling from the bottom of the pan.
9. Remove the thermostat from the bottom of the pan and the retaining screws from the sides of the pan.
10. Slide the pan out.
11. Loosen scale on side and bottom of pan with a stiff nylon brush or plastic scraper.
12. Flush with water.
13. Carefully clean scale off float switch (make sure to reinstall correctly (see **Figure 100**).
14. Reinstall the pan, thermostat, standpipe, drain coupling and screws into the humidifier.
15. Operate the humidifier and check for leaks.

Figure 100Correct orientation of float switch



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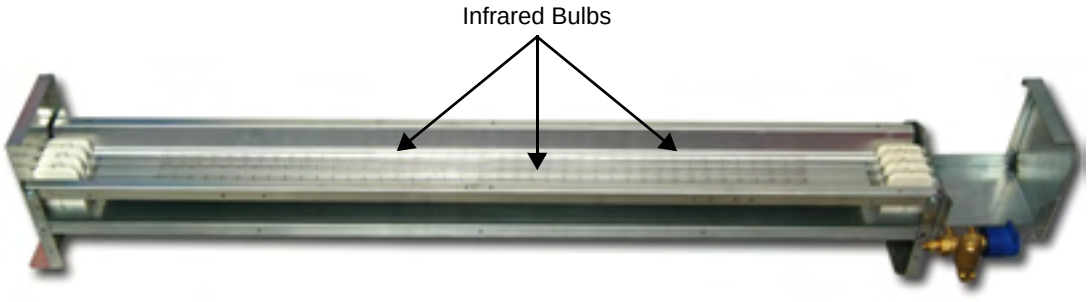
Rev. 0

13.4.2 Changing Humidifier Lamps

NOTE
Touching quartz lamps with bare hands will severely shorten bulb life. Skin oils create hot spots on lamp surface. Wear clean cotton gloves when handling lamps.

1. Remove humidifier pan (see **13.4.1 - Cleaning Humidifier Pan and Float Switch**, **Steps 1** through **10**).
2. Disconnect power from unit.
3. At humidifier, remove screws and cover from high-voltage compartment.
4. Disconnect one end of purple jumper wires.
5. Using a continuity meter, locate burned out lamp.
6. Remove lamp brackets under lamps.
7. Loosen two screws securing lamp lead wires to junction block.
8. Pull bulb straight down and discard.
9. Wrap lead wires once around new lamp's metal ends. This will support lamp and allow for thermal expansion. Insert lead wires into junction block and torque screws to 30 in-lb.
10. Reassemble by reversing **Steps 1** through **9**.

Figure 101Infrared humidifier lamps



13.5 Humidifier—Steam Generating

The humidifier drains and refills to maintain a current setpoint and alert the operator when the humidifier canister needs to be replaced.

Figure 102Steam generating humidifier canister

13.5.1 Replacing the Steam Generating Humidifier Canister

WARNING

Risk of electric shock. Can cause injury or death.

Disconnect local and remote power supplies before working within.

Before proceeding with installation, read all instructions, verify that all the parts are included and check the nameplate to be sure the voltage matches available utility power.

Follow all local codes.

WARNING

Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, injury or death.

Only properly trained and qualified service personnel should work on this equipment.

Read all installation, operating and safety instructions before proceeding.

Read and follow all warnings in this manual.

WARNING

Risk of fire. Can cause equipment damage, injury or death.

Do not ignore humidifier problem alarms. Resetting humidifier without addressing cause may result in fire or damage due to leaking water. See **Table 62**, for alarm corrective actions.

After an extended period of operation, in accordance with life expectancy information, the cylinder is completely used as indicated by the amber high water sensor light illuminated on the cabinet. When this condition is reached, a new replacement cylinder is to be installed.

NOTE

The amber high water sensor light may come on during initial startup but this instance does not indicate that the cylinder should be replaced.

The steam cylinder is disposable and must be replaced at the end of the cylinder's life. Cylinder life will vary according to water supply conditions and humidifier usage.

WARNING

Risk of humidifier canister meltdown, smoke and fire. Can cause fire suppression system activation, fire and smoke alarm activation, serious equipment and building damage, injury and death.

Using a humidifier canister that has reached the end of it's service life can be extremely hazardous. If the canister cannot be replaced immediately at the end of life condition, turn Off the power and water supply to the humidifier and remove the canister until a replacement canister can be installed.

Table 61 Humidifier canister part numbers

Unit Model	200V, 208V, 230V	380/415V, 460V, 575V	Humidifier Model
DS 028-042	163814P1	163814P4	MES 10
DS 053-105	163814P1	163814P2	MES 20

Removing the Old Canister

To replace a used-up humidifier cylinder, refer to **Figure 103** and perform these steps:

1. Turn off the water supply to unit.
2. The old cylinder must be drained completely before removing. This is done by pushing the auto on/off/drain switch to the Drain position.
3. When completely drained, push the auto on/off/drain switch to the Off position.
4. Open the main electrical disconnect during the entire cylinder change operation.
5. The power wires to the cylinder are attached by cylinder plugs to the electrode pins on top of the cylinder. Pull up to remove the plugs from the pins.
6. Use slotted screwdriver to loosen the steam hose clamp(s)
7. Disconnect the steam hose by pulling it straight up.
8. Loosen reversible cylinder zip tie.
9. The cylinder is now ready to be lifted out of the unit.

Figure 103Removing the old canister

Mandatory Cleaning of the Drain Valve

Always clean the drain valve before installing a new cylinder. **Figure 104** shows an exploded view of the drain valve for reference to clean it.

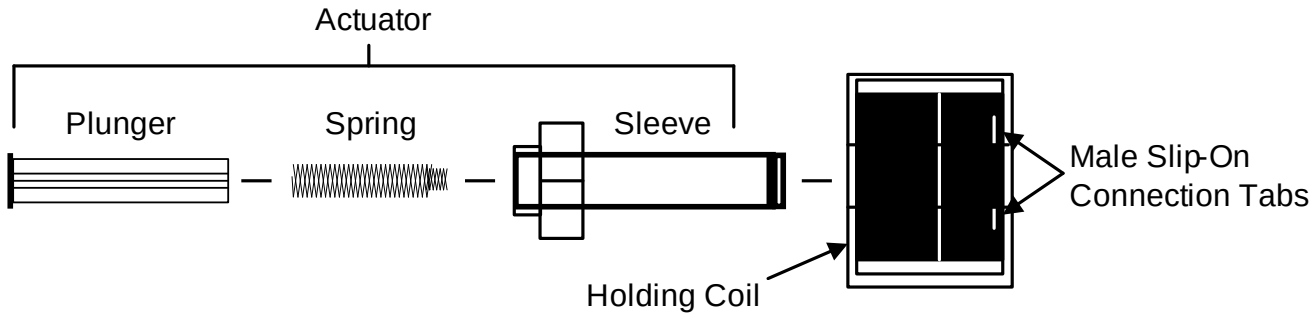
1. Remove old cylinder as previously described.
2. Note that the ring terminal for the drain valve green ground wire is sandwiched between the drain valve and the drain pan.
3. Remove the two screws securing the drain valve body to the drain pan.
4. Remove the hose clip and hose connection from the drain valve body.
5. Drain valve assembly is now free to be taken to a sink for disassembly and cleaning.
6. Remove the snap fit red cap from the coil assembly and slide the coil off the actuator.
7. Loosen actuator using a wrench and unscrew from the plastic body.
8. Clean the exposed core, spring and plastic drain valve pot
9. Reinstall in the reverse order.

NOTE

Be cautious when putting the spring back into the plunger, the taper end of the spring must be installed toward the solenoid.

10. Hand tighten the actuator back into place, then secure it by using a wrench to turn it a quarter of a turn.
11. Clean out the end of the hose, then reconnect it to the drain valve body with the clamp.
12. Fit mounting screws back through the drain valve body, one through ring terminal on the green wire.

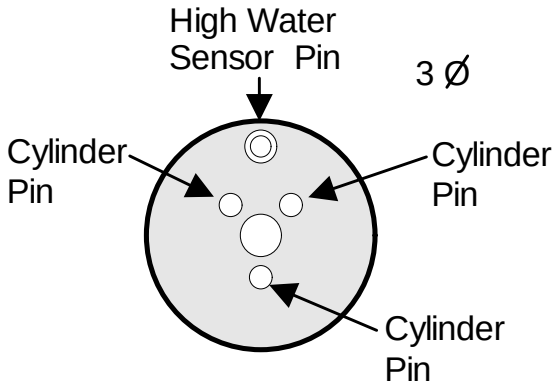
Figure 104Drain valve assembly



Installing the New Canister

1. The reverse procedure should be followed to install a new cylinder. The main electrical disconnect is to be left open until the cylinder is completely installed and reconnected.
2. The blue sensor plug on all units is for the high water sensor pin, which always goes on the single pin with collar offset from the others. See **Figure 105**.
3. Ensure that cylinder plugs are snug on the pins. Replace any loose fitting plugs as these may result in hazardous operation.

Figure 105Canister plugs



WARNING

Risk of humidifier canister meltdown, smoke and fire. Can cause fire suppression system activation, fire and smoke alarm activation, equipment or serious building damage, injury and death.

Check steam generating humidifier electrode plugs to ensure that they are pressed firmly onto pins. Loose connections will cause overheating of cylinder and plugs..

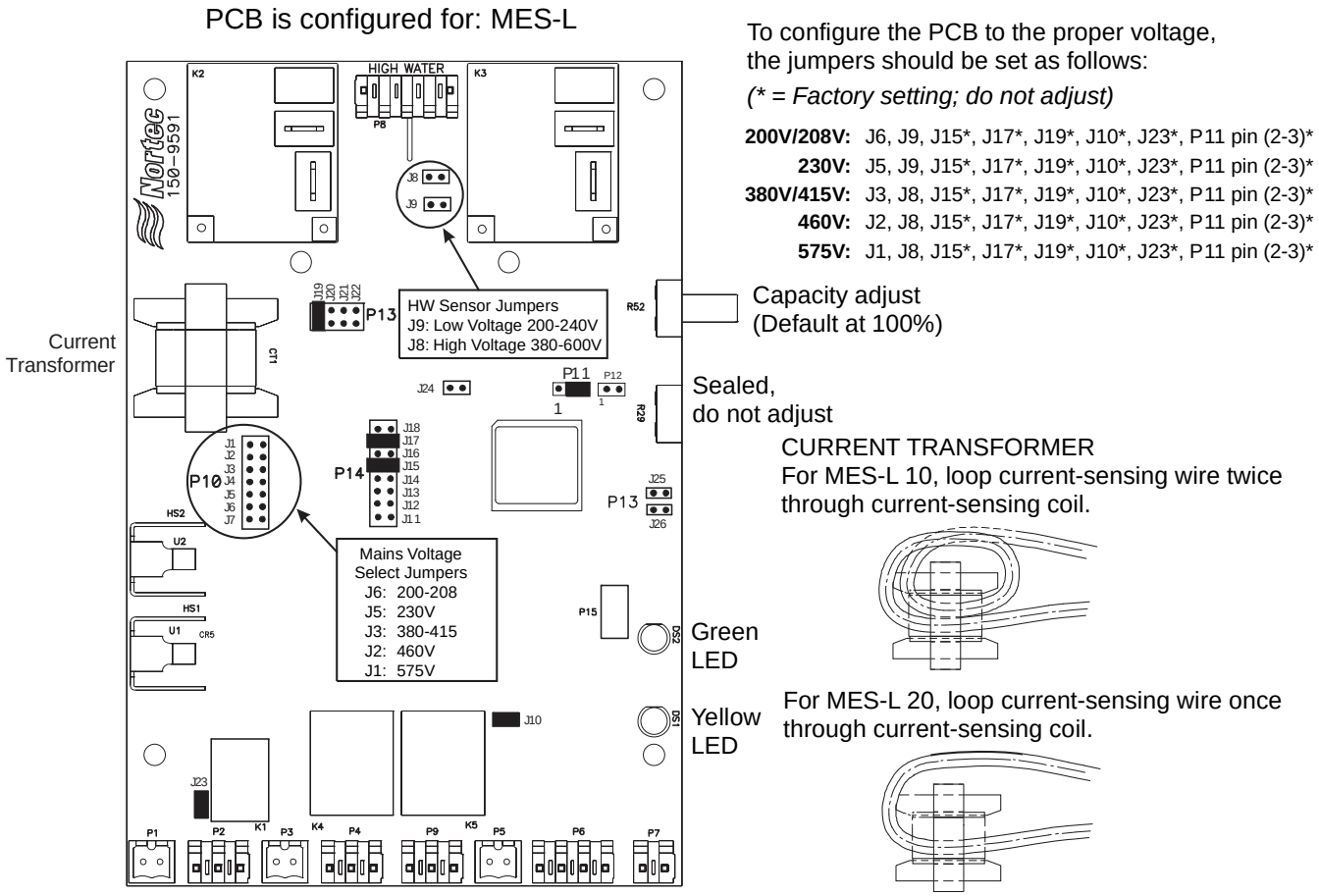
Table 62 Steam generating humidifier status lamps: causes, corrective action

Unit Status Lamp			
Yellow	**Green**	**Symptom**	**Corrective Actions**
On	On	Maximum water level inside cylinder.	This usually happens on initial startup after replacing the cylinder (normal). Water is concentrated with minerals inside the cylinder. Let unit run, yellow light will disappear when the unit is at full output. This may take a day or two.
Off	Off	No power to the board.	Check for main power supply fault. Turn power switch to DRAIN position. If drain valve is activated (sound of solenoid), check connection to the board or board itself. When no sound present, check fuse (replace with 3A, if needed), transformer (voltage should be present between fuse holder and ground screw).
One flash sequence	Off	Excess current. Operating amperage exceeded 130% of rated amps. Water is drained from the cylinder (drain valve on for 10 min.).	Check drain valve operation, drain time, possible drain restrictions. Check if fill valve leaks (not holding supply water). Back-pressure may also cause very conductive water conditions. Check for short cycling. Water conductivity too high.
Two flashes in sequence	Off	No current detection for 30 minutes with continuous call for humidity.	Check water level in the cylinder - should be more than one-quarter full. If it is not, check the fill rate, 24VAC voltage on fill valve terminals (unit must be on with call for humidity - green light steady on). Verify fresh water supply to the humidifier. Leaking drain valve can be at fault (minerals blocking the plunger). If cylinder is more than ¼ full, check primary power, connections to the cylinder, continuity of wires to cylinder. Are power wires connected to proper terminals on the cylinder? (Color coding) Low water conductivity.
Three flashes in sequence	Off	No current detected with high water sensor activated.	Check L1 to ensure that power is properly connected. Check that L1 wire runs through CT of main PCB. Cylinder may be defective, check for conductivity between powered pins and H.W.S. (should be an opened circuit). Ensure all legs are drawing similar current. Low water conductivity. Are power wires connected to proper terminals on the cylinder? (Color coding). Foaming.
Four flashes in sequence	Off	End of cylinder life; change cylinder.	Check water level in the cylinder; it should be about three-fourths full. Check for foaming if water level lower or cylinder life shorter than expected. Change cylinder, clean drain valve.

Table 63 Steam generating humidifier troubleshooting guide

Symptom	Possible Cause	Check or Remedy
Unit in call for humidification, humidifier will not operate	Humidifier not receiving power	Verify ON/OFF/DRAIN switch is in ON position.
		Check fuses or CB's and replace or reset if necessary.
Humidifier Contactor pulled in, but no water enters canister	No water available to unit	Check external water shut-off valves.
	Clogged fill line strainer	Clean or replaced fill line strainer
Excessive arcing in canister	Drain valve clogged or defective	Verify that drain valve operates freely when activated. Clean valve and replace if defective. Flush canister several times and replace if arcing persists.
	Improper water supply	If water is commercially softened, reconnect humidifier to raw water supply, drain canister and restart. If connected to hot water supply, reconnect to cold water.
	Insufficient drain rate	Verify that drain valve operates freely when activated. Clean valve and replace if defective. Flush canister several times and replace if arcing persists.
	Excessive mineral content in water	Analyze mineral content of water. If mineral content is excessive contact Liebert service.

Figure 106Circuit board diagram



13.6 Condensate Drain and Condensate Pump Systems

13.6.1 Condensate Drain

Check and clear obstructions in tubing during routine maintenance.

13.6.2 Condensate Pump

- Disconnect power to unit using disconnect switch.

WARNING

Risk of electric shock. Can cause injury or death.

The Liebert iCOM microprocessor does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "unit off" mode of the Liebert iCOM control.

Disconnect local and remote power supplies before working within.

- Check and clear obstructions in gravity lines leading to condensate pump.
- Remove sump and clean with a stiff nylon brush and flush with water.
- Inspect and clear clogs in discharge check valve and float mechanism.
- Reassemble and check for leaks.

13.7 Air-Cooled Condenser and Drycoolers

- Clear coil surface of all debris that will inhibit airflow.
- Check for bent or damaged coil fins and correct.
- Do not permit snow to accumulate around or under outdoor unit.
- Periodically consider commercial cleaning of coil surface
- Inspect fans, motors and controls for proper operation.
- Check all piping and capillaries for proper support.
- Inspect for leaks.

13.8 Reheat—Electric Reheat (Three-Stage and SCR)

- Inspect and clean reheat elements.
- Inspect and tighten support hardware.

13.9 Thermostatic Expansion Valve

The Thermostatic Expansion Valve (TEV) performs one function: It keeps the evaporator supplied with enough refrigerant to satisfy load conditions. It does not effect compressor operation.

Proper valve operation can be determined by measuring superheat. The correct superheat setting is between 10 and 20°F (-12 and -6°C). If too little refrigerant is being fed to the evaporator, the superheat will be high; if too much refrigerant is being supplied, the superheat will be low.

13.9.1 Determine Suction Superheat

To determine superheat:

1. Measure the temperature of the suction line at the point the TEV bulb is clamped.
2. Obtain the gauge pressure at the compressor suction valve.
3. Add the estimated pressure drop between the bulb's location and the suction valve.
4. Convert the sum of the two pressures to the equivalent temperature.
5. Subtract this temperature from the actual suction line temperature. The difference is superheat.

13.9.2 Adjust Superheat Setting with the TEV

To adjust the superheat setting:

1. Remove the valve cap at the bottom of the valve.
2. Turn the adjusting stem counterclockwise to lower the superheat.
3. Turn the adjusting stem clockwise to increase the superheat.

NOTE

Make no more than one turn of the stem at a time. As long as thirty minutes may be required for the new balance to take place.

13.10 Compressor

13.10.1Compressor Oil

NOTICE

Risk of improper compressor lubrication. Can cause compressor and refrigerant system damage.

Failure to use oil types, viscosities and quantities recommended by the compressor manufacturer may reduce compressor life and void the compressor warranty. See oil types specified in **Table 64**.

- Do NOT mix polyolester (POE) and mineral-based oils.
- Do NOT mix oils of different viscosities.

Consult Emerson or the compressor manufacturer if you have questions.

Table 64 Compressor oil types

Compressor Type	Refrigerant Type	
	R-22	R-407c
Carlyle Semi-Hermetic	Mineral Oil [1]	POE Oil - ISO 68 Viscosity [2]
Copeland Scroll and Digital Scroll	POE Oil - ISO 32 Viscosity [3]	

1. Use Carlyle Mineral Oil Totaline P903-2001, Witco Suniso 3GS or other Carlyle-approved oils.
2. Use Carlyle POE Oil Totaline P903-1001, Castrol SW68 or other Carlyle-approved oils.
3. Use Copeland POE Oil ULTRA 32-3MAF or other Copeland-approved oils.

13.10.2Semi-Hermetic Compressors

Oil level can be viewed at the sight glass on semi-hermetic compressors. Normal operating oil level is 1/4 to 3/4 up the sight glass.

After a compressor has been idle for an extended length of time, foaming will usually be present when compressor first starts. Wait until compressor has been operating for at least five minutes before viewing the oil level.

If oil level is low, the cause must be corrected and oil level returned to its proper level.

13.10.3Scroll and Digital Scroll Compressors

Hermetic scroll and digital scroll compressors do not have an oil sight glass.

NOTE

*Refer to **9.2.2 - Scroll and Digital Scroll—Additional Oil Requirements** for approved oil types and additional oil required based on the system's refrigerant charge.*

13.11 Compressor Replacement

Replacement compressors are available through your local Emerson office. Compressors are shipped in reusable packaging. If unit is under warranty, complete and include Liebert Service Credit Application (LSCA) with the compressor that is being returned. The original compressor should be returned in the same packaging.

13.11.1Compressor Motor Burnout

If a burnout has occurred, a full system clean-out is required; if not, compressor and system problems will continue.

For clean-out warnings and procedures, see Copeland Application Engineering Bulletin 24-1105 "Principles of Cleaning Refrigeration Systems" or Carlyle Service Guide, Literature # 020-611.

13.11.2Digital Compressor Unloading Solenoid(s)

Models 028, 035 and 042

When replacing a digital scroll compressor, digital solenoid valve and coil must be replaced. Compressor and valve kit are shipped separately. Valve kit must be field-brazed to top of compressor in proper orientation and supported with original factory bracket.

Models 053, 070 and 077

When replacing a digital scroll compressor, digital solenoid coil must be replaced. Compressor and coil kit are shipped separately.

13.11.3Compressor Replacement Procedure

1. Disconnect power and follow all warnings at front of this manual.
2. Attach suction and discharge gauges to access fittings.
3. Front-seat service valves to isolate the compressor. Reclaim charge from compressor.
4. Remove marked pressure transducer and discharge pressure switch. Disconnect all electrical connections.
5. Detach service valves from compressor.
6. Remove failed compressor.
7. If required, follow compressor manufacturer's suggested clean-out procedures.
8. Install replacement compressor and make all connections. Replace gaskets or seals on service valves. Replace unloading solenoid.
9. Evacuate, charge and operate per **9.3 - Dehydration/Leak Test and Charging Procedures for R-407C and R-22**.
10. Semi-hermetic only: see **5.3 - Semi-Hermetic Compressor Spring Isolation System** for compressor spring adjustment.

NOTICE

Risk of improper component reinstallation. Can cause equipment damage.

Identify and mark location of suction pressure transducer and discharge pressure switch. These devices look similar and they must be reinstalled in their original location.

13.12 Facility Fluid and Piping Maintenance

Facility water and glycol quality remain a requirement throughout the life of the piping system. Fluid and piping system maintenance schedules must be established and performed. A local fluid maintenance program must be established that will evaluate fluid chemistry and apply necessary treatment. A periodic leak inspection of facility and unit fluid piping is recommended. Refer to **9.1.4 - Requirements of Systems Using Water or Glycol**.

13.13 Paradenser—Water-Cooled Condenser

During normal Paradenser operation, deposits will collect on inside wall of condenser tubes. It must be cleaned periodically to ensure proper operation. Frequency of cleaning must be locally established because it varies according to Paradenser usage and local fluid quality. See **13.12 - Facility Fluid and Piping Maintenance**.

13.13.1 Cleaning Instructions

Refer to **Figure 1 - Downflow model component locations**.

1. Disconnect power to unit.
2. Close field-installed isolation valves to isolate this unit's condenser system from facility water or glycol circuit.
3. Remove access panel from front of compressor section.
4. Locate the 1/2" NPT drain plugs located at lower front of compressor section and provide means to collect fluid drained from system
5. Remove the 1/2" drain plugs using two wrenches to prevent damage to drain lines.
6. Locate and remove the 3" diameter clean out plugs on top of shell assemblies (use Craftsman™ 1-3/16" drag link socket, Sears item # 00944514000 or similar).
7. Brush and flush each of the nominal 5/8" inner diameter, rifled copper tubes. Recommend using John R. Robinson, Inc. or similar:
   - Motorized Tube Cleaner, Model JR3800-1200
   - Nylon brush 9/16" diameter, Model JRRB211N-916
   - Flexible shaft, Model JRRFS702-25
8. Reinstall 1/2" drain plugs 6 to 7 turns using Loctite 567 PST Thread Sealant as instructed by the manufacturer.
9. Wipe clean the machine threads and sealing surfaces of 3" diameter clean out plugs.
10. Remove and install new O-rings (Liebert part number 180750P1) on the 3" diameter clean out plugs. (Do not use thread sealant).
11. Hand tighten 3" diameter clean out plugs and torque using drag link socket to 25 ft-lb.
12. Leak check fluid system (refer to **Leak Checking of Unit and Field Piping on page 85**).
13. Bleed system using Schrader ports near the top of the Paradenser.
14. Ensure that condensing fluid isolation valves are fully open.
15. Unit is ready to be put on-line.

13.14 Water/Glycol Control Valves

13.14.1Regulating Valves – Semi Hermetic and Standard Scroll Compressors

The water regulating valves automatically regulate the amount of fluid necessary to remove the heat from the refrigeration system, permitting more water to flow when load conditions are high and less fluid to flow when load conditions are low. The valve consists of a brass body, balance spring, valve seat, valve disc holders, capillary tube to discharge pressure, and adjusting screw.

Adjustment—Johnson Controls/Penn Johnson Valves

The valves may be adjusted with a standard refrigeration service valve wrench or screwdriver.

Table 65 Recommended refrigerant pressures

System Design	PSIG (kPa)
Water-Cooled	
65 to 75°F water (18 to 24°C)	210 (1450)
85°F water (29°C)	225 (1550)
Glycol-Cooled	295 (2035)
Maximum	330 (2275)
High Pressure Cut-out	400 (2859)

To lower the head pressure setting, turn the square adjusting screw clockwise until the high pressure gauge indicates the desired setting. To raise the head pressure setting, turn the adjusting screw counterclockwise until the desired setting is obtained. Consult the factory if your unit is equipped with valves from other manufacturers.

Testing Function of Valve

First, turn off the refrigeration system. When the refrigeration system has been off for approximately 10 to 15 minutes, the water flow should stop. If the water continues to flow, the valve is either improperly adjusted (with head pressure too low) or the pressure-sensing capillary is not connected properly to the condenser.

Location

The water regulating valves are located in the condenser fluid supply line.

13.14.2Motor Ball Valve—Digital Scroll Compressors

On digital scroll units discharge pressure is controlled by a motorized ball valve. During unloaded operation, the pressure changes during each digital cycle could result in excessive repositions with a pressure operated water regulating valve. The control algorithm for the motorized ball valve uses an intelligent sampling rate and adjustable pressure thresholds to reduce valve repositions. The valve assembly consists of the brass valve, linkage and actuator.

Control

The valve actuator operates on 24VAC power and is controlled by a 2-10VDC proportional control signal. The valve full open to full close time is 60 seconds. At 2VDC the valve is closed; at 10VDC the valve is fully open. There is a 20-second delay to position the motorized ball valve before starting the compressor.

Control Method

The control utilizes an upper and lower pressure threshold with a 35 PSI (241 kPa) deadband to reduce valve movement. If the liquid pressure is between the upper and lower threshold the valve remains at the current position. If the liquid pressure exceeds the upper threshold the valve opens, and if the pressure falls below the lower threshold the valve closes. There are multiple adjustment bands to ease discharge pressure back into control range.

Adjustment

Both pressure thresholds can be shifted simultaneously over a 50 PSI (345 kPa) range (the 35 PSI [241 kPa] differential remains constant). The ball valve setpoint offset parameter in the Service menu can be adjusted from 0 to 50 PSI (345 kPa) to raise or lower the control band similar to the pressure adjustment on a water regulating valve. Changing the setpoint offset will adjust the pressure thresholds for both circuits. Units are factory set at a 30 PSI (207 kPa) setpoint offset (30 PSI [207 kPa] above minimum). This results in a 220 PSIA (1517 kPa) lower threshold and a 255 PSIA (1758 kPa) upper threshold pressure.

Startup

The setpoint offset is adjusted to the minimum value during startup, then transitions to the set value once the compressor reaches normal operating pressures. Due to the control dead band it is possible for each circuit to stabilize at different pressures within the dead band. Additionally changes in fluid temperature could cause pressure changes that do not result in valve movement within the dead band. Fan cycling stats should be set to prevent continuous fluid temperature swings greater than 10^{o}F (5.6^{o}C) (see **13.14.3 - Drycooler Settings**).

Location

The motorized ball valves are located in the condenser fluid return line. Three-way valves are piped in a mixing arrangement with the common port at the valve outlet.

Manual Control

The valve can be manually set by disconnecting AC power, depressing the manual override button on the valve actuator, and adjusting the valve position with the handle. You also have the option to control the MBV's through the Service menu using manual mode to override the normal control.

13.14.3Drycooler Settings

Applications with the Optional Stat Setting require field piping to be insulated to prevent condensation. **Table 66** shows acceptable applications where stats must be adjusted to Optional Setting. Aquastats must be field-adjusted to Optional Setting for:

- GLYCOOL/Dual Cool applications
- Single Drycooler loops with motor ball valve flow controls (motor ball valves are used on all Liebert DS units with digital compressors). These units have a "D" or "G" in the seventh character: DS/VS/xxxx**D** or DS/VS/xxxx**G**.

Table 66 Water/glycol system conditions requiring optional settings for aquastats

Cooling Type	Glycool				Glycol			
Flow Control	MBV		WRV		MBV		WRV	
Drycoolers in Loop	1	Multiple	1	Multiple	1	Multiple	1	Multiple
Stat Setting*	Optional	Optional	Optional	Optional	Optional	Factory	Factory	Factory
Insulate Field Piping	Yes	Yes	Yes	Yes	Yes	No	No	No

* See **Tables 67** through **69**
MBV=motor ball valve; WRV=water regulating valve

Table 67 Aquastat settings—two-fan through four-fan drycoolers

Dial Setting (Stat Open Temp) Set for Mid Differential 8°F (4.4°C) Rise to Close			
Aquastat #	Fans	Factory Setting (Glycol) (see Notes 1 and 2)	Optional Setting (GLYCOOL) (see Note 3)
AQ1	F1	65°F (18.3°C)	35°F (1.7°C)
AQ2	F2 & F3	75°F (23.9°C)	45°F (7.2°C)
AQ3	F4	70°F (21.1°C)	40°F (4.4°C)

Table 68 Aquastat settings—six-fan drycoolers

Dial Setting (Stat Open Temp) Set for Mid Differential 8°F (4.4°C) Rise to Close				
Aquastat #	Fans	Stat Location Cabinet	Factory Setting (Glycol) (see Notes 1 and 2)	Optional Setting (GLYCOOL) (see Note 3)
AQ1	F1	Main	65°F (18.3°C)	35°F (1.7°C)
AQ2	F2	Main	70°F (21.1°C)	40°F (4.4°C)
AQ3	F3 & F4	Auxiliary	73°F (22.8°C)	43°F (6.1°C)
AQ4	F5 & F6	Auxiliary	75°F (23.9°C)	45°F (7.2°C)

Table 69 Aquastat settings—eight-fan drycoolers

Dial Setting (Stat Open Temp) Set for Mid Differential 8°F (4.4°C) Rise to Close				
Aquastat #	Fans	Stat Location Cabinet	Factory Setting (Glycol) (see Notes 1 and 2)	Optional Setting (GLYCOOL) (see Note 3)
AQ1	F1	Main	65°F (18.3°C)	35°F (1.7°C)
AQ2	F2	Main	70°F (21.1°C)	40°F (4.4°C)
AQ3	F3 & F4	Auxiliary	73°F (22.8°C)	43°F (6.1°C)
AQ4	F5 & F6	Auxiliary	75°F (23.9°C)	45°F (7.2°C)
AQ5	F7 & F8	Main	78°F (25.6°C)	48°F (8.9°C)

NOTE

1. *All drycoolers are shipped at Factory Setting.*
2. *Factory Setting is used for all glycol applications, except single drycooler loops with motor ball valve controls.*
3. *Stats must be field-adjusted to Optional Setting for GLYCOOL/Dual Cool applications and all single drycooler loops using motor ball valve flow controls.*

14.0 HVAC MAINTENANCE CHECKLIST

Inspection Date		Job Name	
Indoor Unit Model #		Indoor Unit Serial Number #	
Condenser/Drycooler Model #		Condenser/Drycooler Serial #	
Room Temperature/Humidity	° %	Ambient Temperature	°

Filters

___ 1. Check/replace filters
___ 2. Grille area unrestricted
___ 3. Wipe section clean
___ 4. Coil clean

Blower Section

___ 1. Blower wheels free of debris
___ 2. Check belt tension and condition (replace if needed)
___ 3. Check/lube bearings
___ 4. Check sheave/pulley (replace if worn)
___ 5. Check motor mount
___ 6. Motor amp draw L1_____ L2 _____ L3_____
____Compare to nameplate amps

Reheat

___ 1. Inspect elements
___ 2. Check wire connections (inside reheat box)
___ 3. Reheat amp draw
___ a. #1
___ a. #2
___ a. #3

Steam Generating Humidifier

___ 1. Check drain valve/drain lines/trap for clogs
___ 2. Check water make-up valve and all hoses for leaks
___ 3. Clean the fill strainer
___ 4. Replace humidifier bottle if necessary
___ 5. Check operation of humidifier
___ 6. Humidifier amp draw L1 _____ L2 _____L3_____

Infrared Humidifier

___ 1. Check drain lines and trap for clogs
___ 2. Check/clean pan for mineral deposits
___ 3. Clean reflector
___ 4. Check water make-up valve for leaks
___ 5. Check humidifier lamps (replace if burnt out)
___ 6. Check wire connections (inside humidifier box)
___ 7. Humidifier amp draw L1 _____ L2 _____L3_____

Condensate Pump

___ 1. Check for debris in sump

___ 2. Check operation of float(s) (free movement)

Refrigeration Piping

___ 1. Check refrigerant lines (clamps secure/no rubbing/no leaks)

___ 2. Check for moisture (sight glass)

Water-Cooled Condensers

___ 1. Check water regulating valve operation

___ 2. Cap tubes (not rubbing)

___ 3. Check for water/glycol leaks

___ 4. Entering water temperature _____ °

___ 5. Leaving water

Drain Piping

___ 1. Check for free running drain system

___ 2. Clear out obstructions and material buildup on tubing walls

___ 3. Check for leaks

___ 4. Check for tubing kinks or damage

Compressor Section

___ 1. Check oil level

___ 2. Check for oil leaks

___ 3. Check compressor mounts (springs/bushings)

___ 4. Cap tubes (not rubbing)

___ 5. Check wire connections (inside compressor box)

___ 6. Compressor operation (vibration/noise)

___ 7. Suction Pressure Circuit#1 _____ Circuit#2_____

___ 8. Discharge Pressure Circuit#1 _____ Circuit#2_____

___ 9. Superheat Circuit#1 _____ Circuit#2_____

___ 10. Low pressure switch cut out Circuit#1 _____Circuit#2_____

___ 11. Low pressure cut in Circuit#1 _____Circuit#2_____

___ 12. High pressure cut out Circuit#1 _____Circuit#2_____

___ 13. Amp draw

____Circuit #1

___ a. L1 L2 L3

____Circuit #2

___ a. L1 L2 L3

Electrical Panel

___ 1. Check fuses

___ 2. Check contactors for pitting

___ 3. Check wire connections

Controls

___ 1. Check/Verify Control Operation (Sequence)
___ 2. Check humidifier high water alarm operation
___ 3. Check operation of the air safety switch
___ 4. Check setting/operation of the filter clog switch
___ 5. Check/test changeover device(s)
___ 6. Check/test water detection device(s)

Air-Cooled Condenser / Drycooler

___ 1. Coil surfaces and fans free of debris (clean, wash and straighten fins as needed)
___ 2. Fan motors securely mounted
___ 3. Motor bearings in good condition
___ 4. Check all piping and capillaries for vibration isolation; support and secure as necessary
___ 5. Check fuses
___ 6. Check contactors for pitting
___ 7. Check wire connections
___ 8. Fan speed control operation
___ 9. Check operational sequence/thermostat setpoints
___ 10. Check refrigerant/glycol lines for signs of leaks/repair leaks as found
___ 11. Check refrigerant level in each Liebert Lee-Temp receiver
___ 12. Glycol level
___ 13. Glycol solution_____ %
___ 14. Motor amp draw

#1	L1	_____	L2	_____	L3	_____
		(L1 and L2 on Fan Speed Control Motor)				
#2	L1	_____	L2	_____	L3	_____
#3	L1	_____	L2	_____	L3	_____
#4	L1	_____	L2	_____	L3	_____
#5	L1	_____	L2	_____	L3	_____
#6	L1	_____	L2	_____	L3	_____
#7	L1	_____	L2	_____	L3	_____
#8	L1	_____	L2	_____	L3	_____

Glycol Pump

___ 1. Check pump rotation
___ 2. Check for glycol leaks
___ 3. Pump pressures

#1	Suction	_____	Discharge	_____
#2	Suction	_____	Discharge	_____

___ 4. Amp Draw

#1	L1	_____	L2	_____	L3	_____
#2	L1	_____	L2	_____	L3	_____

___ 5. Pump changeover (if multiple pumps)

Maintenance Notes_____

Signature _____

Company _____

Make photocopies for your records. Compare readings / information to previous maintenance worksheet. To locate your local Emerson representative for Liebert-engineered parts, check the Liebert Web site: **www.liebert.com** or call 1-800-LIEBERT.

NOTES

COMPLIANCE WITH EUROPEAN UNION DIRECTIVES

Fabbricante – Manufacturer – Hersteller – Fabricant – Fabricante
Fabricante – Tillverkare – Fabrikant – Valmistaja – Produsent
Fabrikant – Κατασκεναστης – Producent

Liebert Corporation
1050 Dearborn Drive
P.O. Box 29186
Columbus, OH 43229
USA

Il Produttore dichiara che, se munito di marchio CE, il prodotto è conforme alle direttive dell'Unione europea:

The Manufacturer hereby declares that this product, when bearing the CE mark, conforms to the European Union directives:

Der Hersteller erklärt hiermit, dass das vorliegende Produkt, sollte es die CE-Kennzeichnung tragen, den folgenden Richtlinien der Europäischen Union entspricht:

Le fabricant déclare par la présente que ce produit, portant la marque CE, est conforme aux directives de l'Union européenne :

El fabricante declara por la presente que si este producto lleva el marcado CE es conforme con las directivas de la Unión Europea:

O fabricante declara por este meio que este produto, quando ostenta a marca CE, está em conformidade com as directivas da União Europeia:

Tillverkaren tillkännager härmed att den här produkten, när den är CE-märkt, överensstämmer med EU:s direktiv:

De fabrikant verklaart hierbij dat dit product, indien het van de CE-markering is voorzien, conform de EU-richtlijnen is:

Valmistaja vakuuttaa täten, että mikäli tuotteessa on CE-merkintä, se täyttää seuraavien EU-direktiivien vaatimukset:

Produsenten erklærer herved at dette produktet, når det er CE-merket, er i samsvar med EU-direktiver:

Producenten erklærer hermed, at dette produkt overholder EU's direktiver, når det bærer CE-mærket:

Ο Κατασκευαστής δηλώνει ότι το προϊόν αυτό, το οποίο φέρει σήμανση CE, είναι σύμμορφο με τις οδηγίες της Ε.Ε.:

2006/42/EC; 2004/108/EC; 2006/95/EC; 97/23/EC