Liebert® DSE™

User Manual Supplement—165kW, 47 Tons, Downflow, 60Hz

EMERSON
Network Power

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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important safety instructions that should be followed during the installation and maintenance of the Liebert DSE, Model DA165. Read this manual thoroughly before attempting to install or operate this unit. For additional information, refer to the Liebert DSE user manual, SL-18925.

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

Arc flash and electric shock hazard. Open all local and remote electric power disconnect switches, verify that power is off with a voltmeter and wear appropriate personal protective equipment per NFPA 70E before working within the electrical control enclosure. Failure to comply can cause injury or death.

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

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

The 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. Can cause equipment damage, injury or death. Do not install a shutoff valve between the compressor and the field-installed pressure relief valve.

For systems requiring EU CE compliance (50Hz), the system installer must provide and install a discharge pressure relief valve rated for a maximum of 650 psig (45bar) in the high side refrigerant circuit. The pressure relief valve must be CE-certified to the EU Pressure Equipment Directive by an EU "Notified Body."

WARNING

Risk of very heavy 145 lb (65.7kg) 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.

WARNING

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

Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. Shipping weights and unit weights are listed in **Table 3** and **Figure 1**. Use the center of gravity indicators on the unit to determine the position of the slings (refer to the Liebert DSE user manual, SL-18925). The center of gravity varies depending on the unit size and selected options. The slings must be equally spaced on either side of the center of gravity indicator.

WARNING

Risk of contact with high-speed rotating fan blades. Can cause injury or death.

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

Do not operate unit with any or all cabinet panels removed.

CAUTION

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

Only properly trained and qualified 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.

CAUTION

Risk of contact with hot surfaces. Can cause injury.

The compressors, fan motors, 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, fan motors, discharge lines, humidifiers and reheats.

CAUTION

Risk of improper handling of cabinet panels. 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. Consult local building codes to determine whether the Liebert Premium Efficiency Control (PCB) 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 monitored leak detection equipment for unit and supply lines.

NOTICE

Risk of internal system corrosion and frozen coolant fluid. Can cause equipment damage and major fluid leaks resulting in serious building damage, expensive repair costs and costly system down time.

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 of freezing and premature corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature coil, piping and heat exchanger corrosion. The water or water/glycol solution must be analyzed by a competent local water treatment specialist before startup to establish the inhibitor and antifreeze solution requirement and at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

The complexity of water/glycol solution condition problems and the variations of required treatment programs make it extremely important to obtain the advice of a competent and experienced water treatment specialist and follow a regularly scheduled coolant fluid system maintenance program.

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. It is important to have the system running with flow through exchangers maintained at initial system fill for 24 to 48 hours depending on size and system configuration.

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. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The water/coolant fluid must be treated and circulating through the system continuously to prevent the buildup of sediment deposits and or growth of sulfate reducing bacteria.

Proper inhibitor maintenance must be performed in order to prevent corrosion of the system. Consult glycol manufacturer for testing and maintenance of inhibitors.

Commercial ethylene glycol (examples are Dow Chemical Dowtherm SR-1 Union Carbide Ucartherm 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.

1.0 PRE-INSTALLATION GUIDELINES

1.1 Operating Conditions

1.1.1 Cooling, Dehumidification and Humidification

The Liebert DSE must be operated in a conditioned space within the operating envelope ASHRAE recommends for data centers: Maximum return air temperature of 105°F (40°C) and maximum dew point of 59°F (15°C).The recommended minimum return air temperature setpoint for the Liebert DSE is 75°F (24°C).

Operating outside this envelope can decrease equipment reliability.

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

NOTE

If running in supply air control, the minimum supply air setpoint is 64°F (18°C).

DA165 Dehumidification Control

The DA165 is designed to maximize sensible cooling not latent cooling loads. With all four compressors running, no reheat will be available at this dehumidification load point (Stage 4).

The room load must be 94.1kW (74% of unit capacity) to prevent overcooling the room at 85°F (29°C) return air temperature. If the room load is too low to maintain the setpoint, the compressors will cycle On and Off. During Stage 3, with three of the four compressors running, 10kW of reheat will be available to offset cooling. During Stage 1 and 2, with one and two compressors running respectively, 30kW of reheat is available to offset cooling. For rooms with multiple units, Emerson® recommends performing dehumidification via Teamwork mode to prevent compressor cycling in case of lightly loaded rooms or having standard Liebert DS units available to perform dehumidification. Liebert DSE units in dehumidification mode might not hold the temperature setpoint unless there is sufficient room load. This will allow for better dehumidification of the room. The Liebert DSE will allow the return air temperature to run down to 68°F (20°C) regardless of the temperature setpoint during dehumidification mode of operation.

1.1.2 Heating

The Liebert DSE is qualified for heating-only operation at temperatures not exceeding 80°F (27°C).

1.1.3 Humidification Control

To prevent the humidifier from running when not required (especially when return air temperatures exceed 75°F [24°C]), the default control for humidity and dehumidification is based on dew point temperature, not relative humidity. If this default control is changed, adjust the relative humidity setpoint based on return air temperature to prevent from overhumidifying the space.

2.0 AIR-COOLED SYSTEMS

2.1 Capacity and Physical Data

Table 1 Performance data, air-cooled unit with EC fans

Model	DA165
NET CAPACITY DATA, kW (kBTUH)	
95°F DB, 67.7°F WB, 52.3°F DP (35°C DB, 19.8°C WB) 24% RH	
Total kW (kBTUH)	181 (53)
Sensible kW (kBTUH)	181 (53)
Net Full-Load SCOP (kW/kW) @ Outdoor Ambient (Compressor Mode	3.2
90°F DB, 66.1°F WB, 52.3°F DP (32.2°C DB, 18.9°C WB) 28% RH	
Total kW (kBTUH)	172 (50)
Sensible kW (kBTUH)	172 (50)
Net Full-Load SCOP (kW/kW) @ Outdoor Ambient (Compressor Mode	3.0
85°F DB, 64.5°F WB, 52.3°F DP (29.4°C DB, 18.1°C WB) 32% RH	
Total kW (kBTUH)	163 (48)
Sensible kW (kBTUH)	162 (48)
Net Full-Load SCOP (kW/kW) @ Outdoor Ambient (Compressor Mode	2.9
80°F DB, 62.8°F WB, 52.3°F DP (26.7°C DB, 17.1°C WB) 38% RH	
Total kW (kBTUH)	154 (45)
Sensible kW (kBTUH)	154 (45)
Net Full-Load SCOP (kW/kW) @ Outdoor Ambient (Compressor Mode	2.7
75°F DB, 61.1°F WB, 52.3°F DP (23.9°C DB, 19.8°C WB) 45% RH	
Total kW (kBTUH)	147 (43)
Sensible kW (kBTUH)	147 (43)
Net Full-Load SCOP (kW/kW) @ Outdoor Ambient (Compressor Mode	2.5
FAN SECTION - DOWNFLOW MODELS WITH EC FANS	
Standard Air Volume, CFM (CMH) 0.2" external static	20,000 (33980)
Operating Fan kW, Total for All Fans	8.0
Number of Fans	3
PHYSICAL DATA	
Evaporator Coil - A-Frame, Copper Tube/Aluminum Fins	
Face Area, ft^2 (m^2)	56.2 (5.2)
Rows of Coil	6
Face Velocity - FPM (m/s), standard air volume	354 (1.8)
Reheat Section	
Electric - Three-State Stainless Steel Fin Tubular (capacity does not include fan motor heat)	
Capacity, Standard Selection, kW (kBTUH)	30.0 (102)
Capacity, Optional Selection, kW (kBTUH)	10.0 (34.1)
HUMIDIFIER SECTION	
Infrared Humidifier Capacity, lb/hr (kg/hr)	22.0 (10.0)
FILTER SECTION - DISPOSABLE TYPE	
Nominal Size, inches	21.5 x 24
Number	10
LINE SIZES	
Liquid Line, O.D. Copper (2 per unit), up to 300 eq. ft.	7/8"
Hot Gas Line, O.D. Copper (2 per unit), up to 300 eq. ft.	1-3/8"
Infrared Humidifier, O.D. Copper	1/4"
Condensate Drain, FPT	1-1/8"
Condensate Drain w/Optional Condensate Pump, OD	1/2"

Table 2 Electrical data

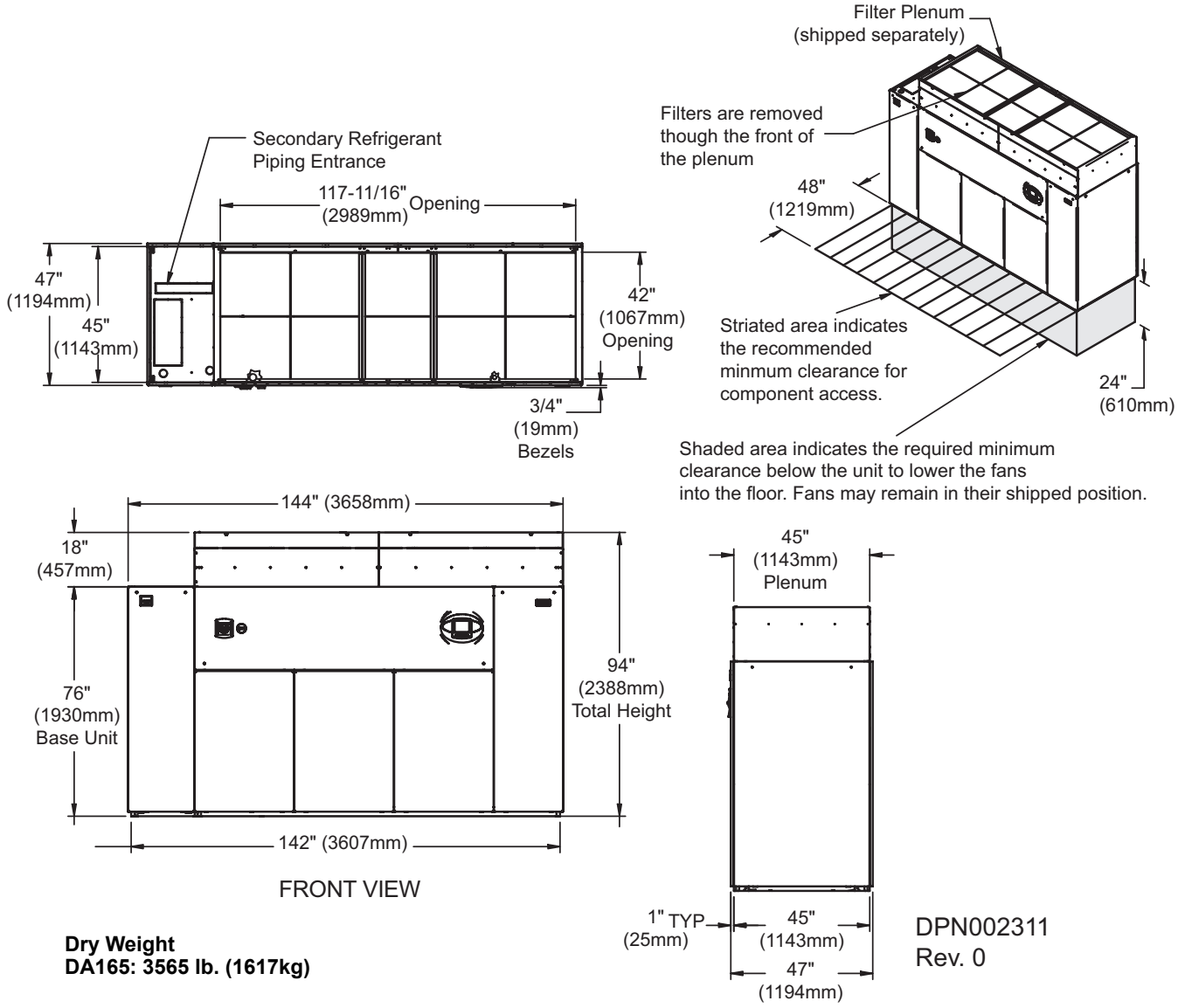
Voltage VAC	Reheat and Humidifier			Humidifier Only			Reheat Only			No Reheat; No Humidifier		
	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
380	130.4	137.0	150	130.4	137.0	150	118.2	128.1	150	118.2	124.8	150
460	105.5	110.7	125	105.5	110.7	125	95.8	106.6	110	93.9	99.1	110
575	86.2	90.3	100	86.2	90.3	100	75.6	84.0	90	74.6	78.7	90

3.0 LIEBERT DSE DIMENSIONS AND WEIGHTS

Table 3 Shipping dimensions and weights—domestic and export

Model #	Domestic Packaging		Export Packaging	
	Dimensions L x W x H, in. (mm)	Weight lb (kg)	Dimensions L x W x H, in. (mm)	Weight lb (kg)
DA165	153 x 54 x 85 (3886 x 1372 x 2159)	3785 (1717)	153.5 x 54.5 x 83.5 (3899 x 1384 x 2121)	3991 (1810)

Figure 1 Cabinet and floor planning dimensions—downflow, air-cooled, DA165, tandem scroll compressor models



Dry Weight
DA165: 3565 lb. (1617kg)

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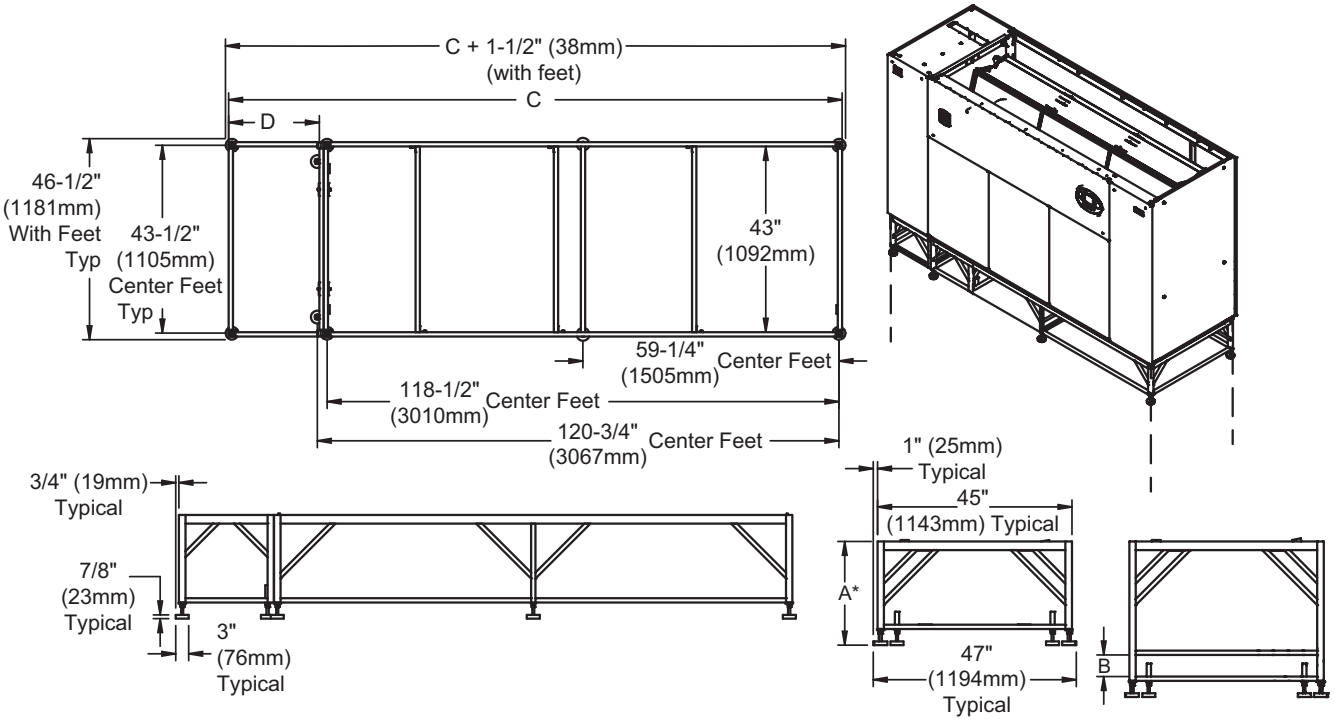
Rev. 0

Figure 2 Floor stand and floor planning dimensions—downflow model



1. This floor stand should be used when EC fans are intended to be lowered into the floor stand. The standard Liebert floor stand can be used if the fans are to remain in their original raised position.
2. All paneled sides of unit overhang floorstand 1" (25mm).
3. The floor stand used with EC units is not symmetrical and proper orientation required for lowering the blowers. Unless the floor stand is installed in the correct position, the blowers will not lower into the 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 individually.

5) Jack to lower blowers not provided with 18" floor stand.

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

Table 4 Floor stand and floor planning dimensions—downflow, 165kW (47 ton) models

Height, in. (mm)	
A *	B *
24 (610)	—
30 (762)	—
36 (914)	5 (127)
42 (1067)	11 (279)
48 (1219)	17 (432)

	Dimensions, in. (mm)	
Coolant Type	C	D
Air Cooled	142 (3607)	21 (533)

Source: DPN002315, Rev. 1

Figure 3 Condenser planning dimensions, MCL165 and MCL220

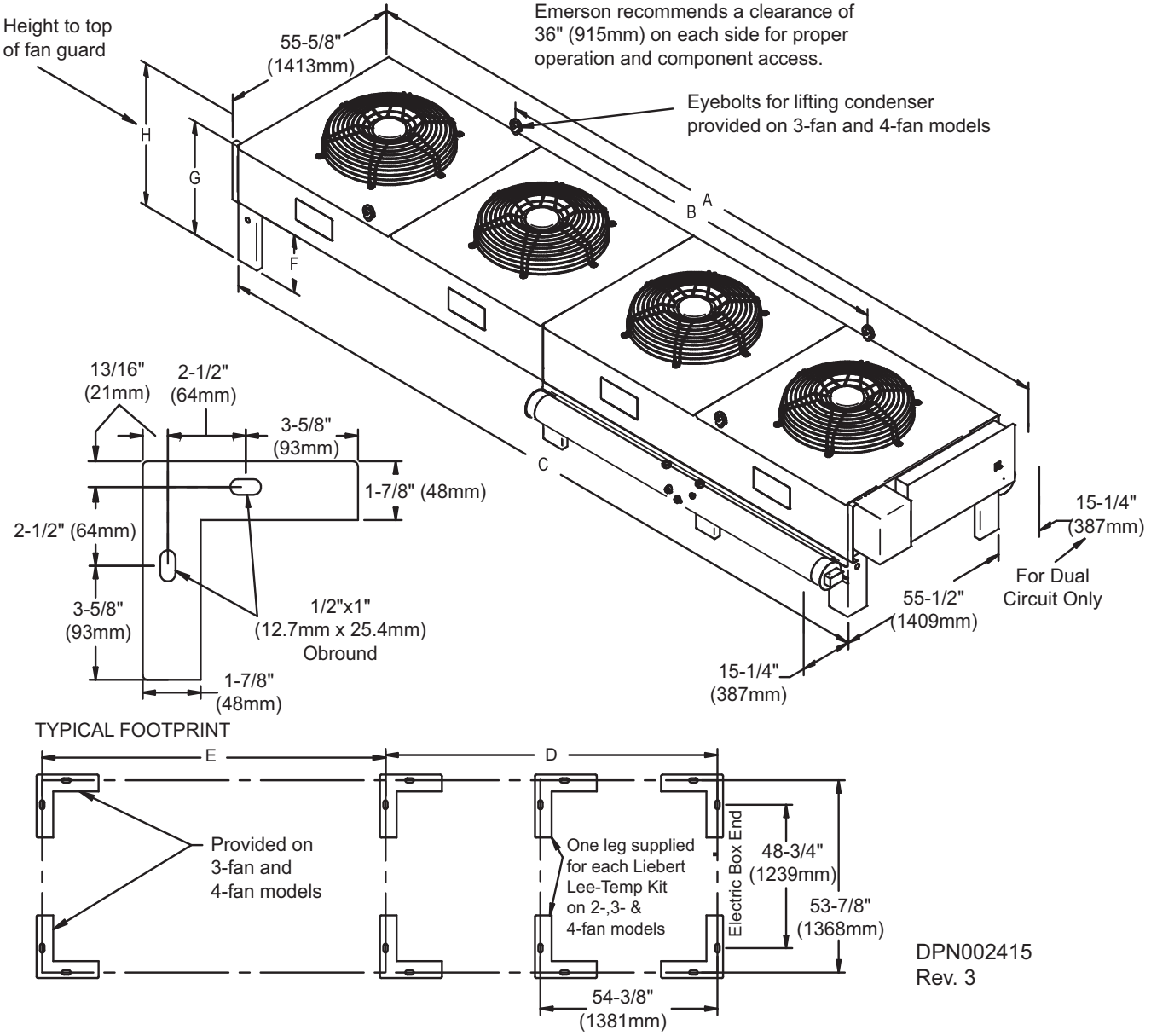


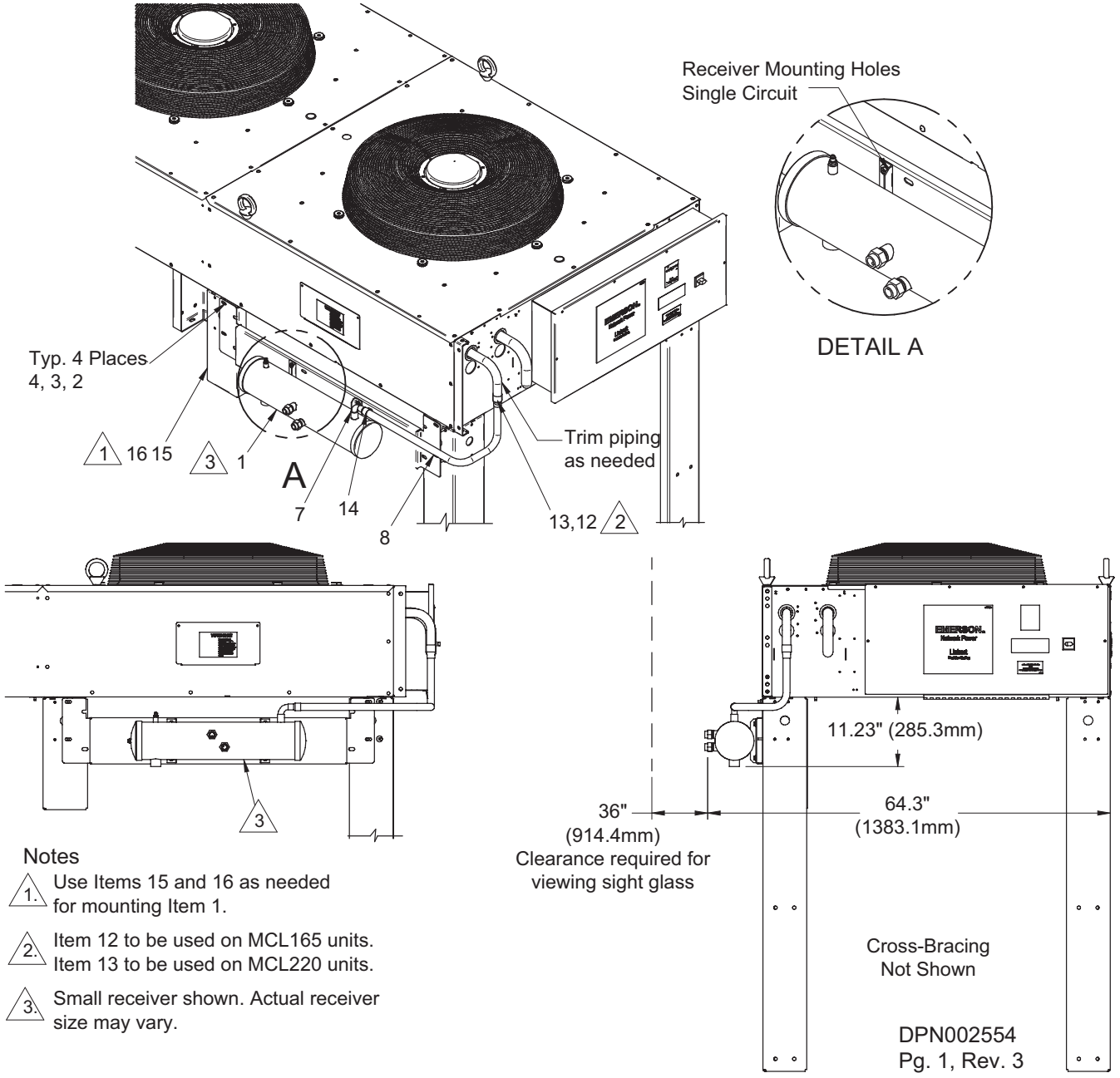
Table 5 Cabinet and anchor dimensions, MCL165 and MCL220 with receivers

Liebert Model No.	No. Fans	Dimensions				
		A, in. (mm)	B, in. (mm)	C, in. (mm)	D, in. (mm)	E, in. (mm)
MCL165	3	180-1/4 (4578)	73-7/16 (1866)	168-1/4 (4274)	110-1/2 (2806)	56-1/8 (1425)
MCL220	4	236-5/16 (6003)	129-9/16 (3291)	224-3/8 (5699)	110-1/2 2806)	112-1/4 (2851)

* Cross-bracing required for legs longer than 18" (457mm); varies per model and options selected.
Source: DPN002415, Rev. 3

Leg Height		
F *	G	H
18 (457)	35-7/8 (911)	43-5/8 (1108)
36 (914)	53-7/8 (1368)	61-5/8 (1565)
48 (1219)	65-7/8 (1673)	73-5/8 (1870)
60 (1524)	77-7/8 (1978)	85-5/8 (2175

Figure 4 Required receiver mounting MCL165, MCL220 units, left-side mounting outlet receiver



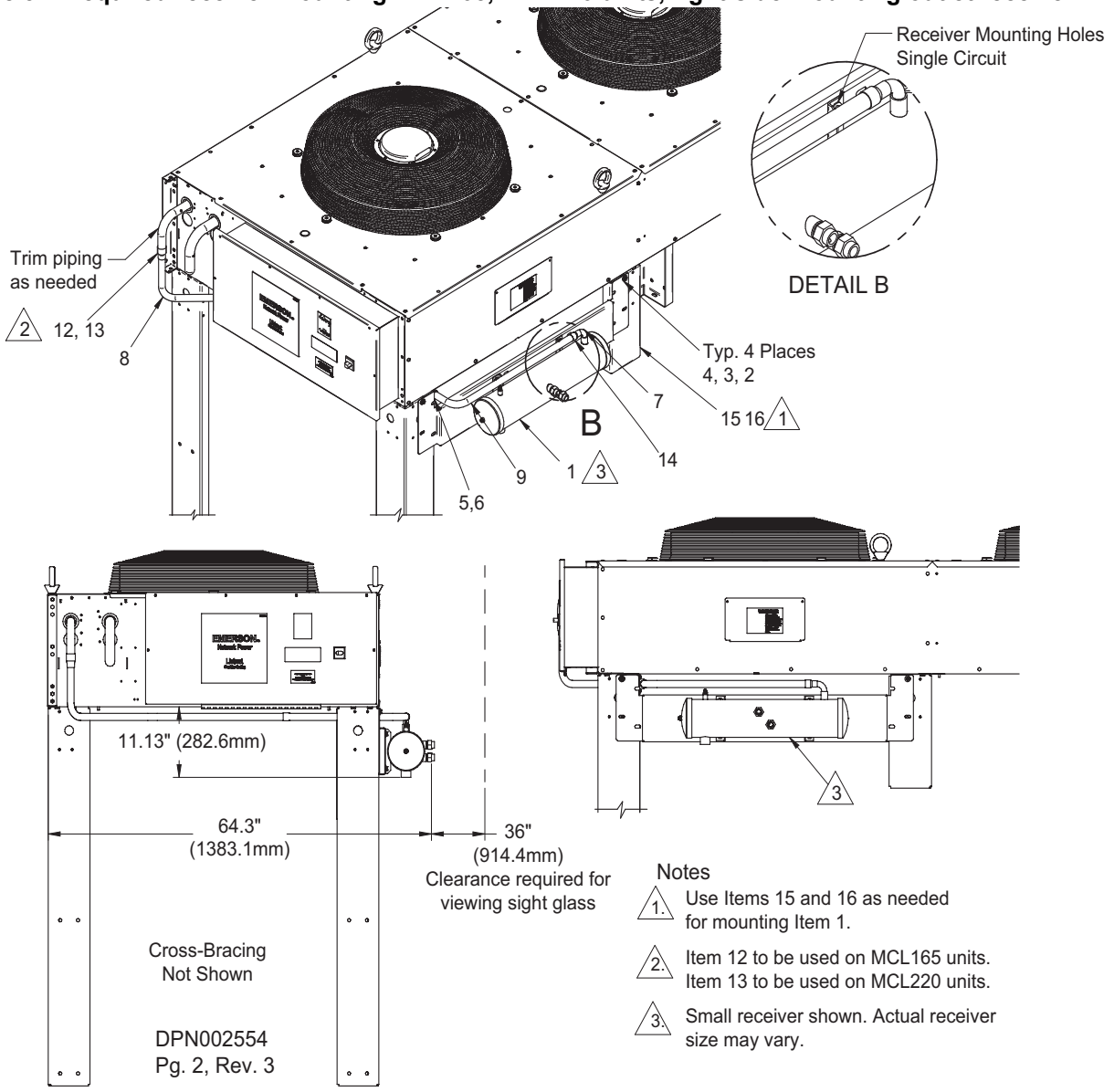
Notes

1. Use Items 15 and 16 as needed for mounting Item 1.
2. Item 12 to be used on MCL165 units. Item 13 to be used on MCL220 units.
3. Small receiver shown. Actual receiver size may vary.

Item #	Description	Quantity
1	Receiver and Bracket Assembly	1
2	Cap Screw HXDIN933M8-1.25x25A2	4
3	Fender Washer DIN9021 M8x24 A2	8
4	Lock Nut, Hex Nylon Insert, M8	4
7	90-degree Elbow FTGXC 7/8" Copper	1
8	Copper Formed Tube 1-1/8"	1
12	Coupling, Copper 1-1/8"	1
13	Coupling, Copper 1-1/8" / Reducer, Copper CXC 1-3/8" x 1-1/8"	1
14	Reducer, Copper CXC 1-1/8"x7/8"	1
15	Support Leg	1
16	Fastener assembly: Cap Screw, Lock Washer, Fender Washer	4

Source: DPN002554, Page 1, Rev. 3

Figure 5 Required receiver mounting MCL165, MCL220 units, right-side mounting outlet receiver



Item #	Description	Quantity
1	Receiver and Bracket Assembly	1
2	Cap Screw HXDIN933M8-1.25x25A2	4
3	Fender Washer DIN9021 M8x24 A2	8
4	Lock Nut, Hex, Nylon Insert, M8	4
5	Clamp Omega 1-1/8"	1
6	Screw Self-Drilling HWH YZ 10-16 x 5/8	2
7	90-degree Elbow FTGXFTG 7/8" Copper	1
8	Copper Formed Tube 1-1/8"	1
9	Copper Formed Tube 1-1/8"	1
12	Coupling, Copper 1-1/8"	1
13	Coupling, Copper 1-1/8" / Reducer, Copper CXC 1-3/8" x 1-1/8"	1
14	Reducer, Copper CXC 1-1/8" x 7/8"	1
15	Support Leg	1
16	Fastener assembly: Cap Screw, Lock Washer, Fender Washer	4

Source: DPN002554, Page 2, Rev. 2

4.0 ELECTRICAL CONNECTIONS

4.1 Standard Electrical Field Connections, DA165 Downflow Models

Source: DPN002317, Revision 4; refer to Figure 7 for numbered items

1. **Primary high voltage entrance**—2.5" (64mm); 1.75" (44mm); 1.375" (35mm) diameter concentric knockouts in bottom of box.
2. **Primary low voltage entrance**—Three knockouts, each 1.375" (35mm) diameter, in bottom of unit.
3. **Three-phase electrical service**—Terminals are on top of the disconnect switch. Three-phase service not by Emerson.
4. **Earth ground**—Terminal for field-supplied earth grounding wire. Earth grounding required for Liebert units.
5. **Remote unit shutdown**—Replace existing jumper between Terminals 37 and 38 with field-supplied, normally closed switch having a minimum rating of 75VA, 24VAC. Use field-supplied Class 1 wiring.
6. **Customer alarm inputs**—Terminals for field-supplied, normally open contacts having a minimum rating of 75VA, 24VAC, between Terminals 24 and 50, 51, 55, 56. Use field-supplied Class 1 wiring. Terminal availability varies by unit options.
7. **Common alarm**—On any alarm, normally open dry contact is closed across Terminals 75 and 76 for remote indication. 1 AMP, 24VAC maximum load. Use field-supplied Class 1 wiring.
8. **Heat rejection interlock**—On any call for compressor operation, normally open dry contact is closed across Terminals 70 and 71 (Circuit 1), 230 (Circuit 2) to heat rejection equipment. 1 AMP, 24VAC maximum load. Use field-supplied Class 1 wiring.
9. **CANbus Connector**—Terminal block with 49-1 (CAN-H) and 49-3 (CAN-L). The terminals are used to connect the CANbus communication cable (provided by others) from the indoor unit to the Liebert MC Condenser-Premium Model and Optional PRE unit.
10. **CANbus Cable**—CANbus cable provided by others to connect to the outdoor condenser. Cable must meet the following specifications:
    a. Conductors—22-18AWG stranded, tinned copper
    b. Twisted pair (minimum eight twists per foot)
    c. Braided shield or foil shield with drain wire
    d. Low capacitance—15pf/ft or less
    e. UL approved temperature rated to 75°C
    f. UL approved voltage rated to 300V
    g. UV-resistant and moisture-resistant if not run in conduit.
    h. Plenum rated—NEC type CMP, if required by national or local codes

4.2 Optional Electrical Field Connections, DA165 Downflow Models

Source: DPN002317, Revision 4; refer to Figure 7 for numbered items

11. Factory-installed disconnect switch

12. **Smoke sensor alarm**—Factory-wired dry contacts from smoke sensor are 91-common, 92-NO and 93-NC. Supervised contacts, 80 and 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 maximum load. Use field-supplied Class 1 wiring.
13. **Reheat and humidifier lockout**—Remote 24VAC required at Terminals 82 and 83 for lockout of reheat and humidifier.
14. **Condensate alarm (with condensate pump option)**—On pump high water indication, normally open dry contact is closed across Terminals 88 and 89 for remote indication. 1A, 24VAC maximum load. Use field-supplied Class 1 wiring.
15. **Remote humidifier**—On any call for humidification, normally open dry contact is closed across Terminals 11 and 12 to signal field-supplied remote humidifier. 1A, 24VAC maximum load. Use field-supplied Class 1 wiring.

4.3 Optional Low Voltage Terminal Package Connections, DA165 Downflow Models

Source: DPN002317, Revision 4; refer to Figure 7 for numbered items

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

NOTE

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

Figure 6 Electrical connection locations for DA165 downflow models

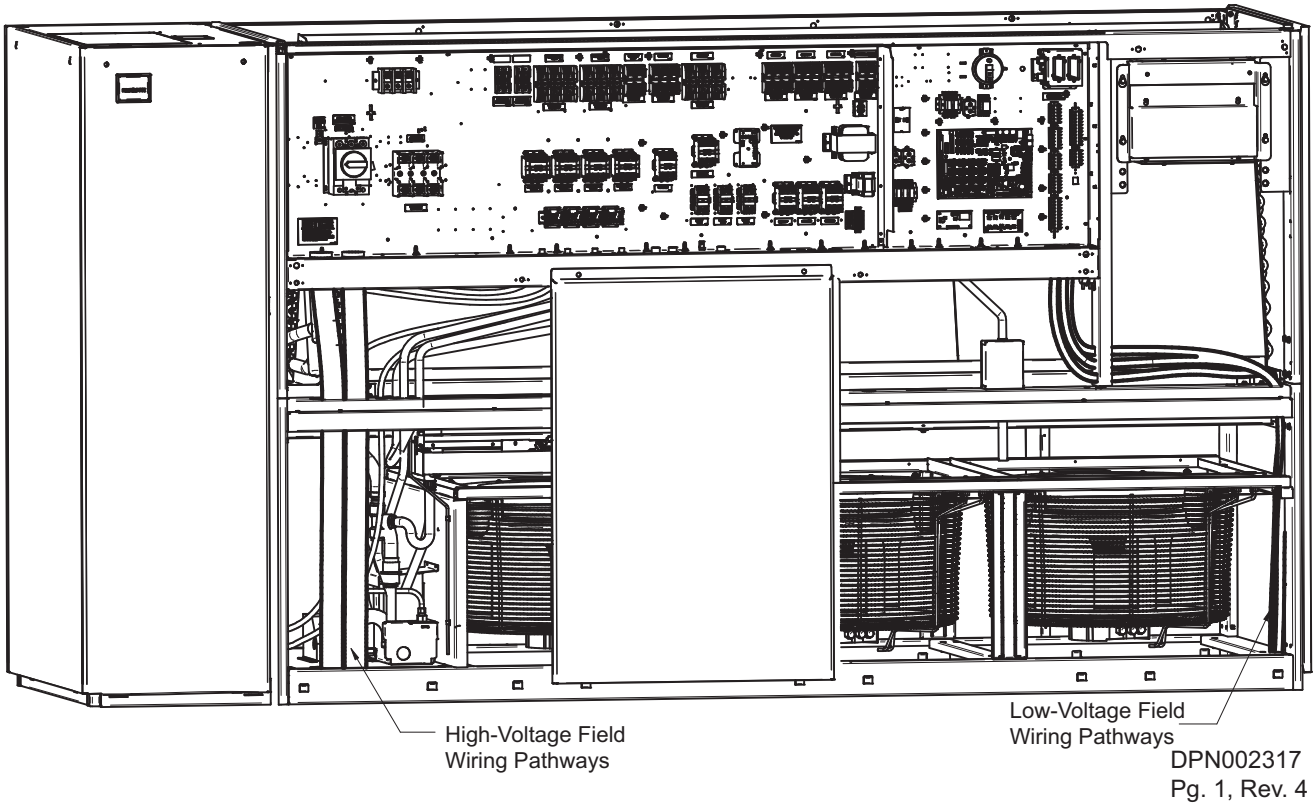
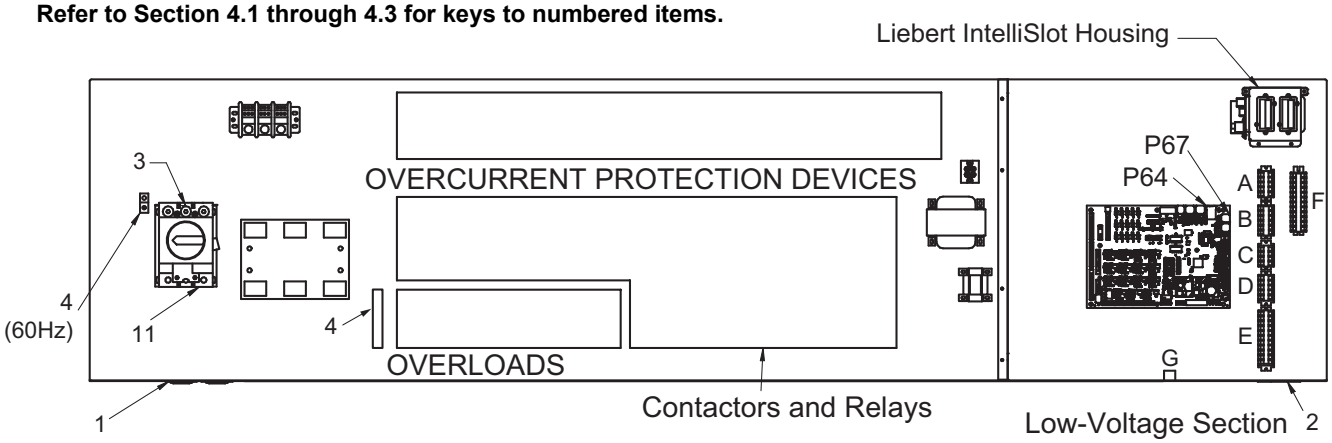
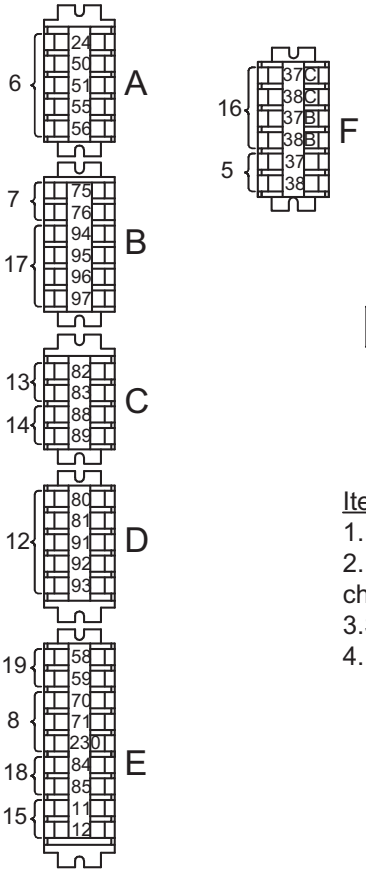


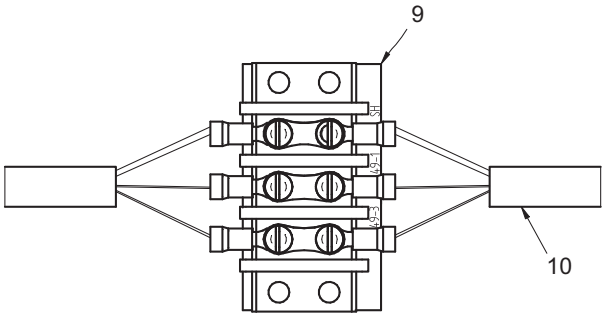
Figure 7 Electrical field connections for DA165 downflow model

Refer to Section 4.1 through 4.3 for keys to numbered items.





Notes:
Typical orientation of components shown.
Component location varies by option and unit size.
Refer to DPN002318 for descriptions of numbered callouts



Item 10 Installation Conditions

1. Follow all local installation codes.
2. Do not run CAN cables in same conduit, raceway, or chase as high voltage wires (120-600V).
3.Separate high volt wires from CAN wires by 12 in. (305mm).
4. Contact factory for runs greater than 350ft (107m).

DPN002317
Pg. 2, Rev. 4

5.0 PIPING

Risk of internal system corrosion and frozen coolant fluid. Can cause equipment damage and major fluid leaks resulting in serious building damage, expensive repair costs, and costly system down time.

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 of freezing and premature corrosion. Fluids in these systems must contain the proper antifreeze and inhibitors to prevent freezing and premature coil, piping and heat exchanger corrosion. The water or water/glycol solution must be analyzed by a competent local water treatment specialist before startup to establish the inhibitor and antifreeze solution requirement and at regularly scheduled intervals throughout the life of the system to determine the pattern of inhibitor depletion.

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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. Sediment deposits prevent the formation of a protective oxide layer on the inside of the coolant system components and piping. The water/coolant fluid must be treated and circulating through the system continuously to prevent the buildup of sediment deposits and or growth of sulfate reducing bacteria.

Proper inhibitor maintenance must be performed in order to prevent corrosion of the system. Consult glycol manufacturer for testing and maintenance of inhibitors.

Commercial ethylene glycol (examples are Dow Chemical Dowtherm SR-1 Union Carbide Ucartherm 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.

5.1 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 a brazing alloy with a minimum temperature of 1350°F (732°C), such as Sil-Fos. Avoid soft solders, such as 50/50 or 95/5.
- Use a flow of dry nitrogen through the piping during brazing to prevent formation of copper oxide scale inside the piping. When copper is heated in the presence of air, copper oxide forms. POE oils will dissolve these oxides from inside the copper pipes and deposit them throughout the system, clogging filter driers and affecting other system components.
- A pure dry nitrogen flow of 1-3ft^3/min (0.5-1.5 l/s) inside the pipe during brazing is sufficient to displace the air. Control the flow using a suitable measuring device.
- Ensure that the tubing surfaces to be brazed are clean and that all burrs have been removed from the ends of the tubes.
- Ensure that all loose material has been cleaned from inside the tubing before brazing.
- Protect all refrigerant line components within 18" (460mm) of the brazing site by wrapping them with a wet cloth or with a suitable heat sink compound.
- Isolate piping from the building using vibration-isolating supports.
- Refer to **Table 6** for piping sizes.
- Install traps on hot gas (discharge) lines at the base of vertical risers over 5 feet high. If the rise exceeds 25 feet (7.5m), then install a trap in 20-foot (6m) increments or evenly divided of vertical rise.
- Pitch horizontal hot gas piping down at a minimum rate of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of refrigerant/oil flow.
- Condenser cannot be installed below the evaporator. The maximum height of the condenser above the evaporator is 60 feet (18.3m).
- Consult factory if piping run exceeds 300 feet (91.4m) actual length, or 450 feet (137.2m) equivalent length.
- Keep piping clean and dry, especially on units with R-410A refrigerant.
- Avoid piping runs through noise-sensitive areas.
- Do not run piping directly in front of indoor unit discharge airstream.
- Refrigerant oil—Do not mix oil types or viscosities (see **refer to the Liebert DSE user manual, SL-18925**).
- Refer to ASHRAE Refrigeration Handbook for general, good-practice refrigeration piping. The Liebert indoor cooling unit has a factory-installed high-pressure safety switch in the high side refrigerant circuit. Consult building codes to determine if condensers without receivers will require field-provided pressure relief devices. A fusible plug kit is available for field installation.

NOTE
All indoor and outdoor field refrigerant piping must have at least 1/2" of insulation. All outdoor insulation must be UV and ozone resistant.

Table 6 Recommended refrigerant line sizes - OD copper

Equivalent Length, ft. (m)	Hot Gas Line, in.	Liquid Line, in.
50 (15)	1-3/8	7/8
100 (30)	1-3/8	1-1/8
150 (45)	1-3/8	1-1/8
300 (90)	1-3/8	1-1/8
450 (137)	1-3/8	1-1/8

NOTE
*Install a 1-3/8" liquid line between the condenser and the Liebert EconoPhase™ unit, regardless of line sizes indicated in **Table 6**. See **Figure 8**.*

Table 7 Indoor unit approximate refrigerant charge for R-410A

System Type	Model	R-410A Charge, lb (kg)	
		Outer Circuit	Inner Circuit
Air-Cooled	DA165	28 (12.7)	25 (11.3)

Table 8 Interconnecting piping refrigerant charge

Line Size, O.D., in.	R-410A, lb/100 ft. (kg/30m)	
	Liquid Line	Hot Gas Line
7/8	19.8 (9.1)	2.3 (1.0)
1-1/8	33.8 (15.5)	3.9 (1.8)
1-3/8	51.5 (23.5)	5.9 (2.7)

Table 9 Condenser refrigerant charge

Standard Condenser Models	R410A Charge per Circuit Including Receiver, lb (kg)	
	Large Receiver	Small Receiver
MCL220E2	27 (12.2)	20 (9.1)
MCL165E1	33 (15)	26 (11.8)
MCL220E1	39 (17.7)	32 (14.5)

Condenser charge includes receivers
Small Receiver: 28" long; Large Receiver: 60" long

Table 10 Liebert PR125/PR085 module charge

System Type	Model	R410A Charge per Circuit, lb (kg)
EconoPhase Pumping Unit	PR125 PR085	5.4 (2.5)

Table 11 Condenser ambient selections

Outdoor Design Ambient	High Efficiency Condenser Match-Ups	Small Footprint Condenser Match-Ups
95°F (35°C)	MCL165 (x2)	MCL165 (x2)
100°F (38°C)	MCL220 (x2) Consult Factory for Alternate Selections	MCL165 (x2)
105°F (41°C)	MCL220 (x2)	MCL220 (x2)

5.2 Scroll and Digital Scroll—Additional Oil Requirements

System charges over 75lb (34kg) per circuit require additional oil charge. See **Table 12** 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 12 Additional oil required per refrigerant charge

Model	System Charge Per Circuit - lb (kg) *								
	40 (18.1)	60 (27.2)	80 (36.3)	100 (45.5)	120 (54.2)	140 (63.8)	160 (73.0)	180 (82.1)	200 (91.3)
	Additional Oil Required Per Circuit - Ounces (Grams)								
DA165	10 (283.5)	26.0 (737.1)	42 (1190.7)	58 (1644.3)	74 (2097.9)	90 (2551.5)	106 (3005)	122 (3458.6)	138 (3912.2)

* Consult your Emerson representative for system charges over 200 lb. (90.7kg).

NOTICE

Risk of improper compressor lubrication. Can cause compressor and refrigerant system damage reduced or loss of cooling capacity and voiding of the compressor warranty.

Use only the oil types, viscosities and quantities recommended by the compressor manufacturer. See the Liebert DSE user manual, SL-18925, 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.

5.3 Dehydration/Leak Test and Charging Procedures for R-410A

5.3.1 Air-Cooled Condenser - Premium Efficiency Control (PCB version)

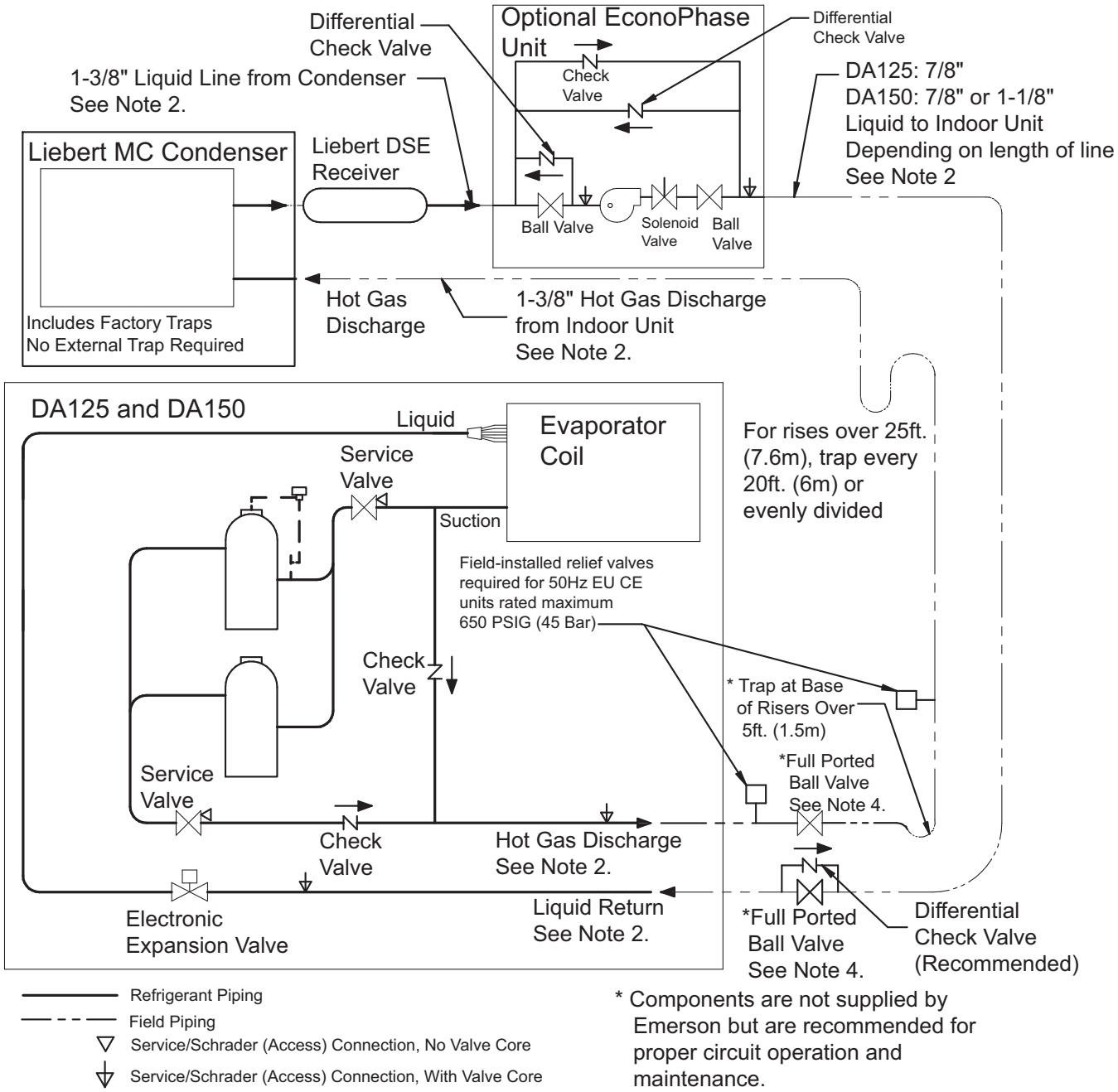
The Liebert Premium Efficiency Control (PCB version) condenser is required for air-cooled Liebert DSE models. The Electronically Commutative (EC) fan control system utilizes a Premium Efficiency Control (PCB) board, EC fan motor(s) operating from 0 to 100% rpm based on refrigerant head pressure, and refrigerant pressure transducer(s). The PCB board determines frequency changes required to adjust the EC fan speed based on refrigerant head pressure. The PCB board, EC fan(s), and transducer(s) are factory-wired. Multiple fan dual refrigeration circuit condensers adjust fan speed independently to match each circuit's head pressure conditions.

NOTE

Liebert EconoPhase™ pumping units cannot be used with the Liebert Lee-Temp™ kit.

6.0 PIPING SCHEMATIC

Figure 8 Piping schematic—air-cooled DA165 models



1. Two refrigeration circuits provided. Single refrigeration circuit shown for clarity.
2. Circuit 1 must be maintained between indoor unit, condenser and EconoPhase unit. Circuit 2 must be maintained between indoor unit, condenser and EconoPhase unit.
3. Schematic representation shown. Do not use for specific connection locations.
4. Port in ball must be the same diameter as the piping I.D.
5. Length of piping between condenser and indoor unit shall be no greater than 300 ft (91.4 m) [Maximum equivalent length of 450 ft (137.2 m)].
6. Vertical height of condenser above indoor unit shall be no greater than 60ft (18.3m).
7. All indoor and outdoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor insulation must be UV- and ozone-resistant

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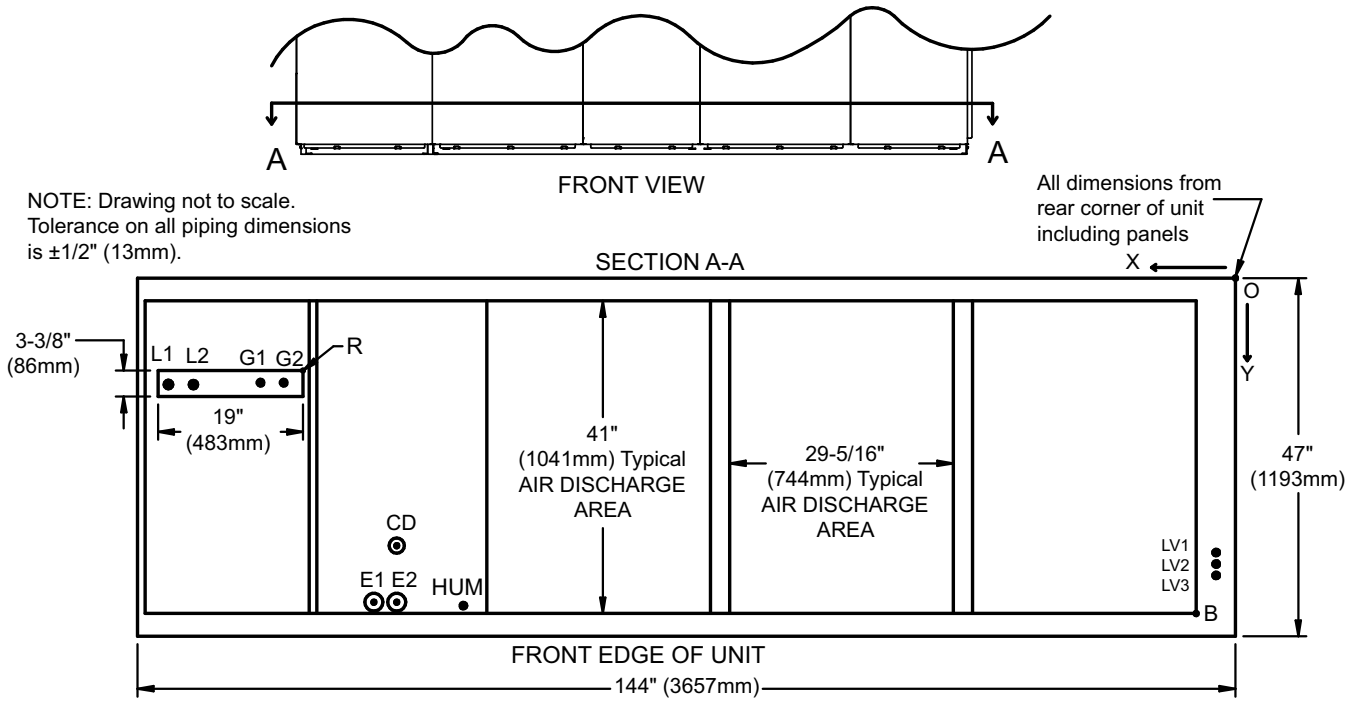
Figure 9 Primary connection locations—downflow, air-cooled DA165 scroll compressor models



* 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.

◎ Opening for conduit chase, E1 and E2 are openings for conduit for connections to 2-1/2", 1-3/4" and 1-3/8" knockouts at electric panel

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Point	Description	X inches (mm)	Y inches (mm)	DX Only	DX with Liebert EconoPhase™
				Connection Size/ Opening, inches (mm)	
R	Refrigerant Access	122-5/16 (3106)	12-1/8 (333)	19 x 3-3/8 (483 x 86)	19 x 3-3/8 (483 x 86)
L1	Liquid Line System 1	140 (3554)	14 (355)	1-1/8 Cu Sweat	1-1/8 Cu Sweat
L2	Liquid Line System 2	136-11/16 (3471)	14 (355)	1-1/8 Cu Sweat	1-1/8 Cu Sweat
G1	Hot Gas Discharge 1	127-7/8 (3248)	13-3/4 (348)	1-3/8 Cu Sweat	1-3/8 Cu Sweat
G2	Hot Gas Discharge 2	124-13/16 (3170)	13-3/4 (348)	1-3/8 Cu Sweat	1-3/8 Cu Sweat
CD	Condensate Drain * (infrared humidifier or no humidifier)	110 (2794)	35-1/16 (891)	1-1/8 FPT	1-1/8 FPT
	Condensate Drain (steam generating humidifier) *	Consult Factory			
	W/ Optional Pump	110 (2794)	35-1/16 (891)	1/2 Cu Sweat	1/2 Cu Sweat
HUM	Humidifier Supply Line	101-1/4 (2572)	43 (1091)	1/4 Cu Sweat	1/4 Cu Sweat
HS	Hot Water Reheat Supply	Consult Factory			
HR	Hot Water Reheat Return	Consult Factory			
E1	Electrical Connection (High Volt)	113 (2870)	42-1/2 (1080)	2-1/2	2-1/2
E2	Electrical Connection (High Volt)	110 (2794)	42-1/2 (1080)	2-1/2	2-1/2
LV1	Electrical Connection (Low Volt)	2-1/2 (64)	36 (914)	7/8	7/8
LV2	Electrical Connection (Low Volt)	2-1/2 (64)	37-1/2 (952)	7/8	7/8
LV3	Electrical Connection (Low Volt)	2-1/2 (64)	39 (991)	7/8	7/8
B	Blower Outlet	5-1/8 (131)	44 (1117)	93 x 41 (2362 x 1041)	93 x 41 (2362 x 1041)

Source: DPN002312, Rev. 4, Pg. 2

NOTES

COMPLIANCE WITH EUROPEAN UNION DIRECTIVES

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

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

Technical Support / Service

Web Site
www.liebert.com
Monitoring
liebert.monitoring@emerson.com
800-222-5877
Outside North America: +00800 1155 4499
Single-Phase UPS & Server Cabinets
liebert.upstech@emerson.com
800-222-5877
Outside North America: +00800 1155 4499
Three-Phase UPS & Power Systems
800-543-2378
Outside North America: 614-841-6598
Environmental Systems
800-543-2778
Outside the United States: 614-888-0246

Locations

United States
1050 Dearborn Drive
P.O. Box 29186
Columbus, OH 43229
Europe
Via Leonardo Da Vinci 8
Zona Industriale Tognana
35028 Piove Di Sacco (PD) Italy
+39 049 9719 111
Fax: +39 049 5841 257
Asia
29/F, The Orient Square Building
F. Ortigas Jr. Road, Ortigas Center
Pasig City 1605
Philippines
+63 2 687 6615
Fax: +63 2 730 9572

SL-18931_REV1_03-14

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Liebert
www.emerson.com