Liebert®

MC™

Installer/User Guide

60-Hz, Air-cooled Microchannel Condenser, Premium/EC Fan

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Technical Support Site

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

TABLE OF CONTENTS

1 IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important safety instructions that should be followed during the installation and maintenance of the Liebert® MC. 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, notices and installation, operating and safety instructions on the unit and in this manual. Follow all installation, operation and maintenance instructions and all applicable national and local building, electrical and plumbing codes.

WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious 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® controller 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 controller. The factory-supplied 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 over-pressurization of the refrigeration system. Can cause explosive discharge of high-pressure refrigerant, loss of refrigerant, environmental pollution, equipment damage, injury, or death. This unit contains fluids and gases under high pressure. Use extreme caution when charging the refrigerant system. Do not pressurize the system higher than the design pressure marked on the unit's nameplate.

WARNING! Risk of contact with high-speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure.

WARNING! Risk of improper wiring, piping, moving, lifting and handling. Can cause equipment damage, serious 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 and who are wearing appropriate, OSHA-approved PPE.

WARNING! Risk of improper wire sizing/rating and loose electrical connections. Can cause overheated wire and electrical connection terminals resulting in smoke, fire, equipment and building damage, injury or death. Use correctly sized copper wire only and verify that all electrical connections are tight before turning power On. Check all electrical connections periodically and tighten as necessary.

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

CAUTION: Risk of improper moving, lifting and handling. Can cause equipment damage or injury. Only properly trained and qualified personnel should work on this equipment. Fan modules for MCL models weigh in excess of 92 lb (40.8 kg) each and fan modules for MCS and MCM models weigh in excess of 40 lb (18.1 kg) each. Use proper lifting techniques and wear appropriate, OSHA-approved PPE to avoid injury and dropping the fan module during removal. Equipment used in handling/lifting, and/or installing the fan assembly must meet OSHA requirements. Use handling/lifting equipment rated for the weight of the fan assembly. Use ladders rated for the weight of the fan assembly and technicians if used during installation. Refer to handling/lifting, and/or installation equipment operating manual for manufacturer's safety requirements and operating procedures.

NOTICE

Risk of improper power-supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example: back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power-source voltages should be stabilized and regulated to within ±10% of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

NOTICE

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

Polyolester oil (POE oil), required with R-407C/R-410A and used with some R-22 systems, is much more hygroscopic than mineral oils. This means that POE oil absorbs water at a much faster rate when exposed to air than previously used mineral 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 or plug the microchannel coil. Always use a flow of dry nitrogen when brazing.

NOTICE

Risk of control malfunction. Can cause improper unit operation.

Verify that all low-voltage electrical wiring has been performed per the schematic diagram provided and that all low-voltage wiring connections are tight.

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2 NOMENCLATURE AND COMPONENTS

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

2.1 Liebert MC Model-number Nomenclature

Table 2.2 on the next page describes each digit of the 25-digit configuration number. The 14-digit model number consists of the first 10 digits and last four digits of the configuration number.

Table 2.1 Liebert MC 25-digit Configuration Number Example

Model # Part 1										Model Details											Model # Part 2			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
M	C	M	0	4	0	E	1	A	D	0	A	0	V	U	0	0	0	0	0	0	*	*	*	*

Table 2.2 MC Model-number Digit Definitions

Digit	Description
Digits 1 and 2 = Unit Family	MC = Microchannel Condenser
Digit 3 Platform Size	S = Small M = Medium L = Large
Digits 4-6 - Nominal Capacity, kW	028, 040, 055, 056, 080, 110, 160, 165, 220 Example: 040 = 40kW @ 95°F(35°C) & 27°R (15°K) ITD
Digit 7 - Control/Fan Type	E = Premium control and EC fan
Digit 8 - Refrigerant Circuits/System Refrigerant Type	1 = Single refrigerant circuit, R-410A 2 = Dual refrigerant circuit, R-410A 7 = Single refrigerant circuit, R-407C, R-22 8 = Dual refrigerant circuit, R-407C, R-22
Digit 9 - Power Supply	A = 460V / 3ph / 60Hz B = 575V / 3ph / 60Hz Y = 208/230V / 3ph / 50Hz B = 380V / 3ph / 60Hz

Table 2.2 MC Model-number Digit Definitions (continued)

Digit	Description
Digit 10 - Packaging D = Domestic, non-stackable E = Export crating, non-stackable	
Digit 11 - Coil Coating 0 = None E = E-coat (epoxy) with UV top coat	
Digit 12 - Panel Material A = Bright aluminum	
Digit 13 - Connection Pipe Unit of Measurement 0 = Inches (std. ACR copper)	
Digit 14 - Legs Included V = 18-in. tall legs (standard) X = 36-in. tall legs with bracing Y = 48-in. tall legs with bracing Z = 60-in. tall legs with bracing	
Digit 15 - Agency Certification U = CSA listed, marked with CSA c-us logo 1 = IBC/OSHPD Seismic Certification, IBC/FBC Wind Load Certification and IBC Snow Load Certification	
Digit 16 - Undefined, Reserved for future use.	
Digit 17 - Receiver/Leg/Software Configuration 0 = No Receiver Leg/Software 1 = Liebert® Lee-Temp Receiver Leg/Software 2 = Liebert® DSE and PDX unheated Receiver Leg/Software	
Digits 18-21 - Undefined, Reserved for future use.	
Digits 22-25 - Factory Configuration Number	

2.2 Product Description and Features

The Liebert® MC condenser is a low-profile, direct-drive propeller-fan type, air-cooled heat-rejection unit suitable for mounting outdoors. It provides heat rejection for one or two separate refrigeration circuits, matches the heat rejection capacity corresponding with the outdoor ambient temperature and with each corresponding compressor heat-rejection requirements. Constructed with an aluminum cabinet, a galvanized-steel frame, and aluminum microchannel coil, the unit is quiet and corrosion resistant. The condenser is quickly and easily installed, because all internal wiring is completed at the factory with only electrical connections to be made at the job site. All electrical connections and controls are enclosed in an integral, weatherproof section of the condenser.

Figure 2.1 Two-fan Liebert MC

2.2.1 Control, Fan Types and Features

Premium Efficiency Control/EC Fan

Premium Efficiency Controls and EC fans are matched to provide superior system energy efficiency. The premium control board allows CANbus communication with the indoor unit's Liebert® iCOM™ control. This communication feature provides compressor run signals, condenser operating mode changes, condenser alarm monitoring, simplified system charging procedures and outdoor temperature monitoring.

The Premium Efficiency Control board on a Liebert® MC with a dual refrigeration circuit adjusts the speed of fans on each circuit to match each circuit's head pressure conditions. On a condenser with multiple fans and a single refrigeration circuit, the premium control adjusts the fans to the same speed to maintain head pressure. The control system provides refrigerant head-pressure control for outdoor ambient temperatures as low as -30°F (-35°C), provided that the total design range (from minimum to maximum) is 125°F (70°C) or less. For traditional DX applications, Liebert® Lee-Temp™ kits are required only when the design temperature ranges exceed 125°F (70°C) for standard-sound match-ups. Liebert® Lee-Temp™ kits are always required for Liebert® Quiet-Line™ (low noise) match-ups.

Anti-freezing Operation

The EC fans must be operated periodically in cold weather to reduce the possibility of lock-up due to ice and snow accumulation. During periods of fan inactivity and outdoor temperatures below 35°F (1.6°C), the EC fans will spin for at least 30 seconds every 15 minutes at 60% of the maximum fan speed.

Fan Reversal for Cleaning

The Liebert® iCOM™ can run the Premium EC fans in reverse to clear loose debris from the coil between scheduled coil cleanings. You can reverse the fans manually or automatically with a programmed schedule. The automatic fan-reversal interval occurs when the indoor unit is Off (BMS Off, U2U network standby or Remote Shut Down [RSD]).

Surge Protective Device

An optional Surge Protective Device (SPD) can be field-wired to protect the condenser from power surges that threaten sensitive equipment. The condenser's electrical panel provides a terminal block to allow the SPD to be wired in parallel with the high-voltage power. An additional low-voltage terminal block is provided on condensers to allow monitoring of the SPD alarm circuit.

ASCO Series 420 surge-protective device provides 50 kA per mode of surge current protection. An illuminated green LED indicates the SPD is On and operating properly. An illuminated red LED indicates that the device may require replacement.

When both LEDs are Off, there is no power to the condenser, either from a power failure or because the condenser disconnect is in the Off position.

2.2.2 Features available for DX-only systems

Quiet-Line Low-noise Feature

The Quiet-Line, low-noise feature limits the condenser fan speed to reduce operating noise at certain times. Special match-ups of condensers are available for applications to meet stringent sound regulations. Lower sound levels are achieved by oversizing the condenser, which decreases the maximum air flow of each fan and thus sound level produced by the condenser. This feature requires special set up of the indoor unit. A Liebert® Lee-Temp receiver is required for each refrigerant circuit. The premium control has gain schedules that override the customer-defined low-noise schedule to prevent indoor-unit high-pressure alarm conditions from occurring should higher-than-design temperatures occur. This feature only functions with DX systems, and the feature is controlled using Liebert® iCOM Low-noise mode.

Liebert Lee-Temp™ Refrigerant Control

The Liebert® Lee-Temp head-pressure control system uses head-pressure-control valve(s), extra refrigerant, and insulated refrigerant receiver(s) with heater pads to assist system starting. The Lee-Temp control system also maintains proper operating head pressures when outdoor temperatures fall below the temperature approved for system match-up without Lee-Temp receivers. The system floods the condenser coil with liquid refrigerant to a level that balances the system condensing requirements with the condenser-coil surface available to reject the system heat. During the summer, the system requires the entire condenser coil surface for heat rejection and most of the refrigerant is stored in the receiver. In the winter, the same amount of heat can be rejected by only a fraction of the coil surface. As head pressure begins to fall, the control valve restricts the flow of liquid refrigerant from the condenser. This extra liquid refrigerant reduces the effective condenser surface area available for heat transfer. The head-pressure-control valve also bypasses hot gas into the receiver to warm the liquid and maintain liquid pressure for proper operation of the expansion valve. The Lee-Temp kit is optional for condensers and is field-installed. Condenser control boards are factory-configured for Lee-Temp if they are ordered with Lee-Temp receivers and can be field-configured if a Lee-Temp system is added later.

2.2.3 Features Available for EconoPhase Systems

Liebert DSE and PDX-EEV Unheated Receiver

Liebert DSE and Liebert PDX with EEV systems require unheated receivers to manage refrigerant volume fluctuations in the evaporator coil, which occur during normal operation. The receivers are field-mounted on the Liebert MC condenser and are field-piped in the liquid line between the condenser and the indoor unit. The receiver discharge must be mounted higher than the EEV height of the indoor unit.

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3 PRE-INSTALLATION PREPARATION AND GUIDELINES

The unit dimensions, pipe-connection locations, and piping schematics are described in the submittal documents included in the Submittal Drawings on page 83.

- Install the condenser in a location offering maximum security and access for maintenance.
- Avoid ground-level sites with public access and areas prone to heavy snow or ice accumulations.
- To ensure adequate air supply, we recommend that condensers be installed in an area with clean air, away from loose dirt and foreign matter that might clog the coil. In addition, condensers should be located no closer than 3 ft (1 m) from a wall, obstruction or adjacent unit.
- For roof installation, mount the condenser on suitable curbs or other supports in accordance with local codes.
- Locations that require additional coil-corrosion protection, such as coastal regions, heavy industrial, or agricultural air pollution, should specify coils with the optional epoxy e-coat.
- Condensers must not be installed in a pit.
- Condensers must be installed on a level surface to ensure proper refrigerant flow.
- Use caution when installing condensers below the indoor unit. Condensers without receivers must not be installed more than 15 ft (4.6 m) below the indoor unit. Condensers with Liebert® Lee-Temp™, Liebert® DSE, and Liebert® PDX-EEV receivers must be installed at or above the level of the indoor units to maintain proper subcooling.
- Receiver tanks should be mounted on the condenser legs for proper operation. Contact Vertiv's Application Engineering Department for assistance with applications requiring remote mounting of receivers.
- Condensers must be installed in vertical airflow orientation to maintain the electrical box's NEMA 3R rating.

3.1 Planning Dimensions

The condenser dimensions are described in the submittal documents included in the Submittal Drawings on page 83. Condensers mounted above and below the relative elevation of the indoor unit must follow the guidelines found in the submittal drawings listed in the table.

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

Table 3.1 Dimension Planning Drawings

Document Number	Title
DPN003436	Condenser Dimensional Data, MCS028, MCM040, MCL055
DPN003437	Condenser Dimensional Data, MCS056, MCM080, MCL110, dual-circuit
DPN003756	Condenser Dimensional Data, MCM080, MCL110, single-circuit
DPN003438	Condenser Dimensional Data, MCL165
DPN003439	Condenser Dimensional Data, MCM160 and MCL220
Receiver-mounting	
DPN003839	PDX-EEV Receiver mounting for single-circuit MCS028, MCM040, and MCM080
DPN003455	DSE Receiver mounting for single-circuit MCM080
DPN002554	DSE and PDX-EEV Receiver mounting for single-circuit MCL055, MCL110, MCL165, and MCL220 and for dual-circuit MCL110 and MCL220
DPN002383	DSE receiver mounting, MCM160, dual-circuit
Condenser Elevation Above/Below Indoor Unit	
DPN003954	Condenser without Receiver mounted above/same level/below indoor unit
DPN003993	Condenser with Receiver mounted above/same level as Liebert® PDX with EEV
DPN003994	Condenser with Receiver mounted above/same level as Liebert® DSE models DA050 to DA165

3.2 Shipping Dimensions and Weights

Table 3.2 Condenser shipping weights, dimensions and volume, approximate

Model Number	Number of Fans	Domestic Packaging			Export Packaging		
		Weight, lb (kg)	Dimensions L x W x H, in. (cm)	Volume, ft^3 (m^3)	Weight, lb (kg)	Dimensions L x W x H, in. (cm)	Volume, ft^3 (m^3)
MCS028	1	359 (163)	76 x 36 x 63 (193 x 91 x 160)	100 (2.8)	476 (216)	77 x 37 x 64 (196 x 94 x 163)	106 (3.0)
MCS056	2	562 (255)	122 x 36 x 63 (310 x 91 x 160)	160 (4.5)	734 (333)	123 x 37 x 64 (312 x 94 x 163)	169 (4.8)
MCM040	1	439 (199)	76 x 36 x 63 (193 x 91 x 160)	100 (2.8)	556 (252)	77 x 37 x 64 (196 x 94 x 163)	106 (3.0)
MCM080	2	769 (349)	122 x 36 x 63 (310 x 91 x 160)	160 (4.5)	941 (427)	123 x 37 x 64 (312 x 94 x 163)	169 (4.8)
MCM160	4	1509 (684)	256 x 36 x 63 (650 x 91 x 160)	336 (9.5)	1834 (832)	257 x 37 x 64 (653 x 94 x 163)	352 (10)
MCL055	1	552 (250)	76 x 36 x 63 (193 x 91 x 160)	100 (2.8)	669 (303)	77 x 37 x 64 (196 x 94 x 163)	106 (3.0)
MCL110	2	962 (436)	136 x 36 x 63 (345 x 91 x 160)	179 (5.0)	1134 (514)	137 x 37 x 64 (348 x 94 x 163)	188 (5.3)
MCL165	3	1364 (619)	196 x 36 x 63 (498 x 91 x 160)	257 (7.3)	1619 (734)	197 x 37 x 64 (500 x 94 x 163)	270 (7.7)
MCL220	4	1835 (832)	256 x 36 x 63 (650 x 91 x 160)	336 (9.5)	2160 (980)	257 x 37 x 64 (653 x 94 x 163)	352 (10)

Packaged weights will increase with factory options, such as legs taller than 18" (457mm), coated coils, 575V and seismic/wind options. See **Table 3.3** on the next page, **Table 3.4** on the next page and **Table 3.5** on page 19 for option weights to add to the packaged weights above. Consult factory for additional information.

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

3.2.1 Condenser and Options Net Weights

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

Table 3.3 Condenser and option net weights—Small condensers

Condenser Model		MCS028	MCS056
Refrigeration Circuits		1	2
Condenser Dry Weight, lb (kg)	18" Leg	154 (70)	270 (122)
	36" Leg	286 (130)	419 (190)
	48" Leg	318 (144)	451 (205)
	60" Leg	349 (158)	482 (219)
Additional Weight for Options, lb (kg)			
PDX-EEV Receiver		45 (20)	—
Liebert® Lee-Temp Receiver		55 (25)	110 (50)
575V Transformer		55 (25)	65 (29)
Coated Coil		4 (2)	8 (4)
Seismic/Wind Bracing, 18-in. legs		40 (18)	40 (18)
Condenser + PDX-EEV Receiver or Liebert Lee-Temp + Coated Coil + 575V Transformer + Seismic/Wind Bracing = Total Weight			
Source: DPN003034, Rev. 4			

Table 3.4 Condenser and option net weights—Medium condensers

Condenser Model		MCM040	MCM080	MCM080	MCM160
Refrigeration Circuits		1	1	2	2
Condenser Dry Weight, lb (kg)	18" Leg	231 (105)	441 (200)	441 (200)	860 (390)
	36" Leg	363 (165)	590 (268)	590 (268)	1066 (484)
	48" Leg	395 (179)	622 (282)	622 (282)	1114 (505)
	60" Leg	426 (193)	653 (296)	653 (296)	1160 (526)
Additional Weight for Options, lb (kg)					
PDX-EEV Receiver		45 (20)	45 (20)	—	—
Liebert® Lee-Temp Receiver		55 (25)	100 (45)	110 (50)	220 (100)
Liebert® DSE Receiver DA050/080/085		—	45 (20)	—	90 (41)
Liebert® DSE Receiver DA125/150/165		—	92 (42)	—	184 (83)
575V Transformer		60 (27)	70 (32)	70 (32)	80 (36)
Coated Coil		5 (2)	10 (5)	10 (5)	20 (9)
Seismic/Wind Bracing, 18-in. legs		40 (18)	40 (18)	40 (18)	57 (26)
Condenser + PDX-EEV Receiver or Liebert Lee-Temp or DSE Receiver + Coated Coil + 575V Transformer + Seismic/Wind Bracing = Total Weight					
Source: DPN003034, Rev. 4					

Table 3.5 Condenser and option net weights—Large condensers

Condenser Model		MCL055	MCL110	MCL110	MCL165	MCL220	MCL220
Refrigeration Circuits		1	1	2	1	1	2
Condenser Dry Weight, lb (kg)	18" Leg	344 (156)	602 (273)	602 (273)	891 (404)	1186 (538)	1186 (538)
	36" Leg	486 (220)	766 (347)	766 (347)	1136 (515)	1453 (659)	1453 (659)
	48" Leg	518 (235)	798 (362)	798 (362)	1184 (537)	1501 (681)	1501 (681)
	60" Leg	549 (249)	829 (376)	829 (376)	1230 (558)	1547 (702)	1547 (702)
Additional Weight for Options, lb (kg)							
PDX-EEV Receiver		45 (20)	—	—	—	—	—
Liebert® Lee-Temp Receiver		60 (27)	115 (52)	120 (54)	175 (79)	215 (98)	240 (109)
Liebert® DSE Receiver DA050/080/085		—	45 (20)	90 (41)	45 (20)	45 (20)	90 (41)
Liebert® DSE Receiver DA125/150/165		—	94 (43)	—	94 (43)	94 (43)	188 (85)
575V Transformer		67 (30)	77 (35)	77 (35)	118 (54)	118 (54)	118 (54)
Coated Coil		8 (4)	16 (7)	16 (7)	24 (11)	32 (15)	32 (15)
Seismic/Wind Bracing, 18-in. legs		40 (18)	40 (18)	41 (19)	57 (26)	57 (26)	57 (26)

Condenser + PDX-EEV Receiver or Liebert Lee-Temp or DSE Receiver + Coated Coil + 575V Transformer + Seismic/Wind Bracing = Total Weight

Source: DPN003034, Rev. 4

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4 EQUIPMENT INSPECTION AND HANDLING

SAFETY INFORMATION

WARNING! Risk of improper moving, lifting, or handling of the unit. Can cause equipment damage, injury or death. Read all of the following instructions and verify that all lifting and moving equipment is rated for the weight of the unit before attempting to move, lift, remove packaging from or prepare the unit for installation. See Table 3.2 on page 17, for weights.

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

NOTICE

Risk of improper lifting. Can cause equipment damage. Make sure that the spreader bars are wider than the unit. If the spreader bars are too short, the slings may crush the unit.

NOTICE

Risk of doorway/hallway interference. Can cause unit and/or structure damage. The unit may be too large to fit through a doorway or hallway while on the skid. Measure the unit and passageway dimensions, and refer to the installation plans prior to moving the unit to verify clearances.

NOTICE

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

Upon arrival of the unit and before unpacking:

- Verify that the labeled equipment matches the bill of lading.
- Carefully inspect all items for visible or concealed damage.
- Report damage immediately to the carrier and file a damage claim with a copy sent to Vertiv or to your sales representative.
- If you have the seismic mounting kit, refer to Optional Configuration for Liebert MC Seismic Application on page 81.

Equipment Recommended for Handling the Unit:

- Forklift
- Lift beam
- Slings
- Spreader bars
- Crane

4.1 Packaging Material

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

4.2 Unit Storage

Store the condenser in the original packaging in an area protected from excessive dirt, debris and contact damage until final installation

4.3 Handling Unit on the Skid

Transport unit using a fork lift or a crane with sling and spreader bars.

Using a forklift

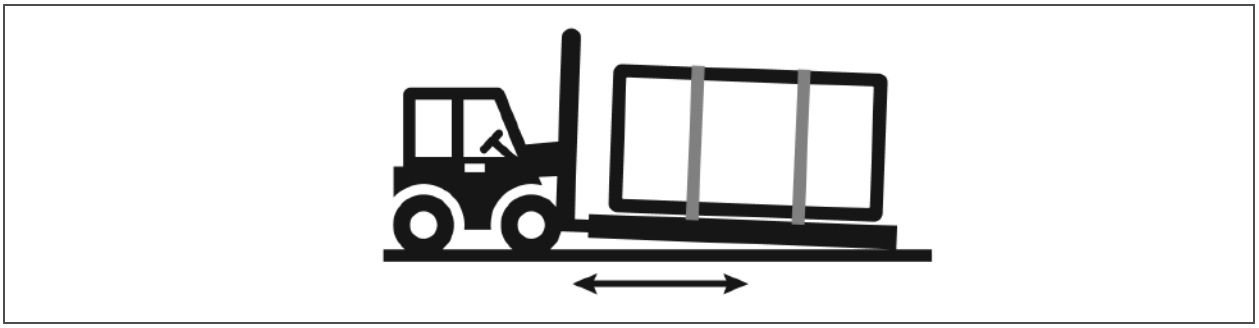
NOTICE

Risk of improper forklift handling. Can cause unit damage.

Keep the forklift tines level and at a height that will fit under the skid.

- Make sure the forks (if adjustable) are spread to the widest allowable distance to still fit under the skid.
- Type of forklift used will depend on the terrain the unit is to be moved across during handling.
- Minimum forklift fork length:
  - for 1-fan and 2-fan units—48 in (1219 mm)
  - for 3-fan and 4-fan units—72 in. (1829 mm)
- When moving the packaged unit, do not lift it any higher than 6 in. (152 mm). If the unit must be lifted higher than 6-in. (152 mm), you must exercise great care, and no one may be closer than 20 ft (6 m) to the lift point.
- We recommend lifting one end off the ground no more than 6 in. (152 mm)and using the forklift to push or pull the unit.

Figure 4.1 Forklift position with 1- to 4-fan condensers



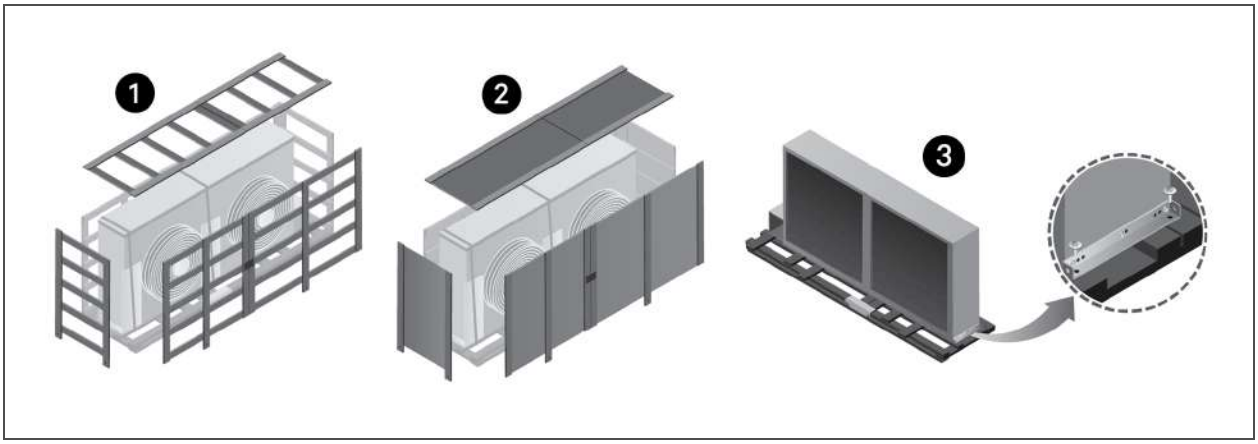
Using a Crane

- We recommend using slings rated for the unit weight.
- Spreader bars must be used for sling stability and to keep the slings from pressing against the unit. Make sure spreader bars are wider than the unit.
- Place the slings near the ends of the unit, under the top deck boards of the skid.

4.4 Unpacking the Condenser—All Unit Sizes

Refer to Figure 4.2 below for the steps:

Figure 4.2 Removing protective material



Item	Step
1	Remove the fence for domestic packaging, then remove the exterior foam from around the electric box. • If legs are shipped with the unit, set the legs aside but keep them accessible
2	Remove the crate for export packaging, then remove the exterior foam from around electric box. • If legs are shipped with the unit, set the legs aside but keep them accessible
3	Remove the bolts securing unit to the skid, then remove the bolts securing the brackets to the unit and recycle the brackets.

4.5 Preparing a Condenser for Moving and Installation

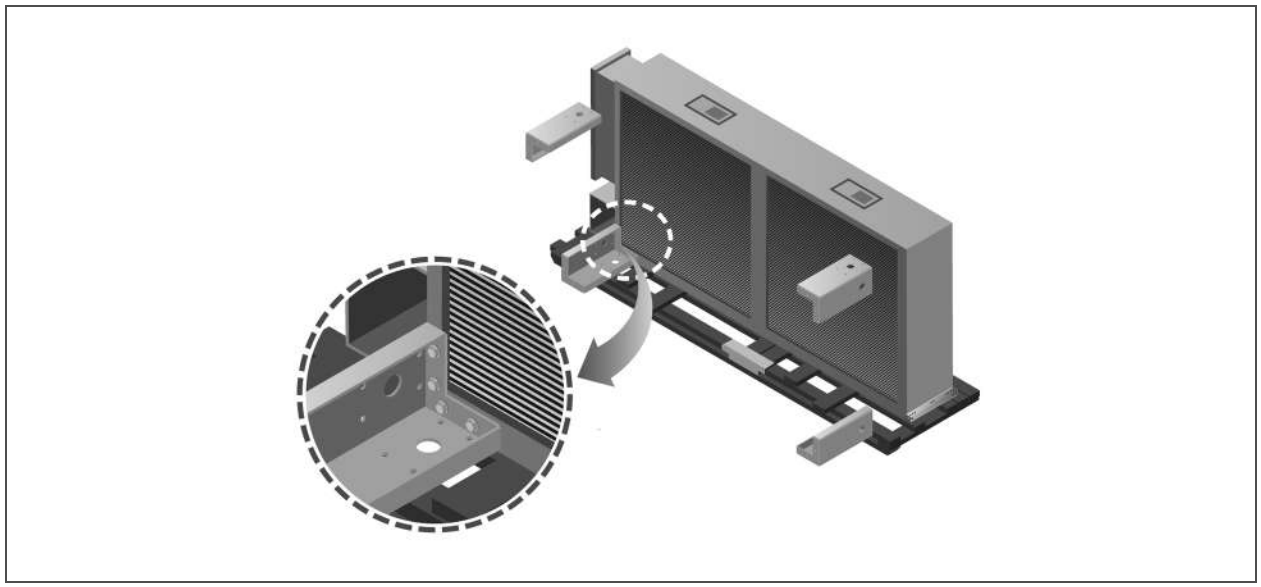
The following procedure is one method for removing a Liebert® condenser from its shipping skid. Other methods may be used, provided that they are safe for personnel, the condenser and other equipment.

4.5.1 Attaching 18-in. (457 mm) Legs, Removing the Skid and Attaching Slings

NOTE: For units supplied with 36-60" (914-1524mm) legs go to Attaching 36-in. to 60-in. (914 mm to 1524 mm) Legs, Removing the Skid and Attaching Slings on page 26.

1. Attach legs to the unit at indicated locations, using the fasteners provided with the legs.
   - Recommended tools for attachment is a 13 mm socket and ratchet.
   - More legs may be available for installation than are shown. This depends on the unit type and number of fans.

Figure 4.3 Attaching legs to condensers

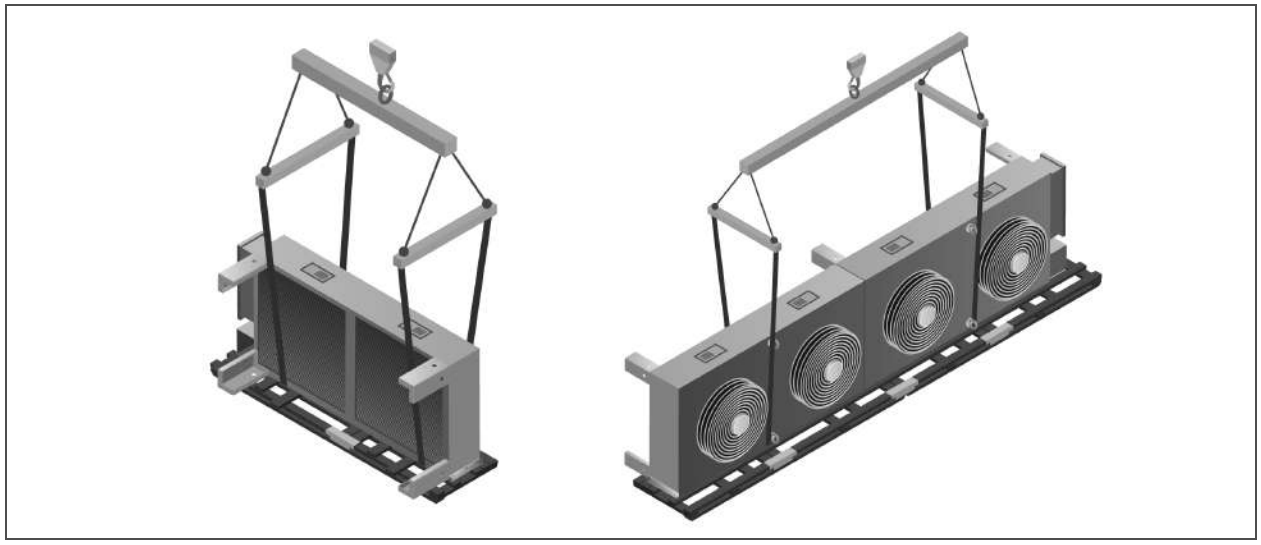


2. Place slings around the unit between the unit and the top deck boards of the skid as shown in Figure 4.4 below:
   - 1-fan and 2-fan units: against the inside of the attached legs.
   - 3-fan and 4-fan units: against the outside of the attached eye bolts.
3. Use spreader bars, a lift beam and a crane to lift the unit off the skid. Make sure spreader bars are wider than the unit.

NOTICE

Risk of improper lifting. Can cause equipment damage. Make sure that the spreader bars are wider than the unit. If the spreader bars are too short, the slings may crush the unit.

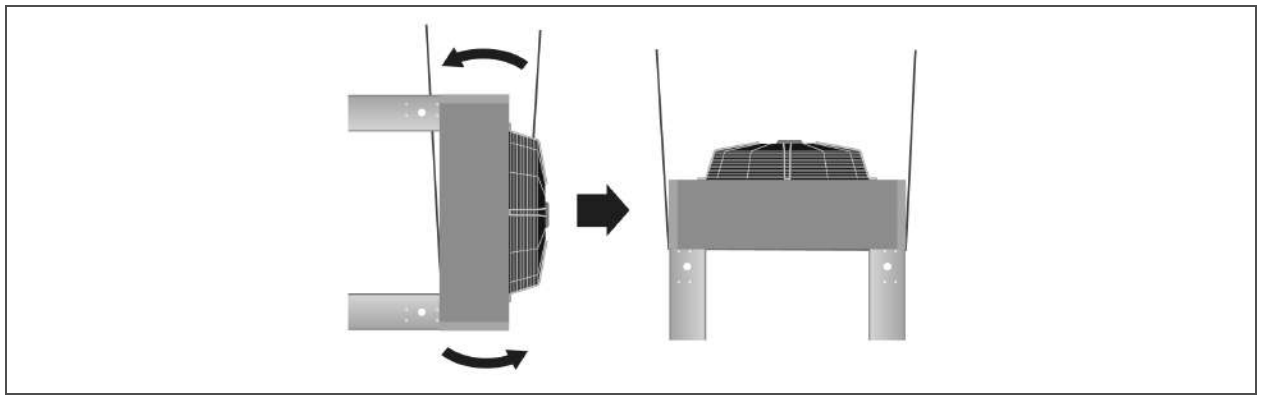
Figure 4.4 Securing slings to condensers for lifting off skid



4. Lift the unit 24 in. (610 mm) off the top deck of the skid.

5. Remove the skid from under the unit.
6. To rotate the unit, a mechanized method is recommended, but if one is not available, use a minimum of four properly-protected individuals to rotate the elevated unit 90 degrees so the unit legs are pointing toward the ground, Figure 4.5 below.
7. Set the upright unit on the ground so the legs support unit weight.
8. Remove the straps from around unit.

Figure 4.5 Rotate and set condenser on floor



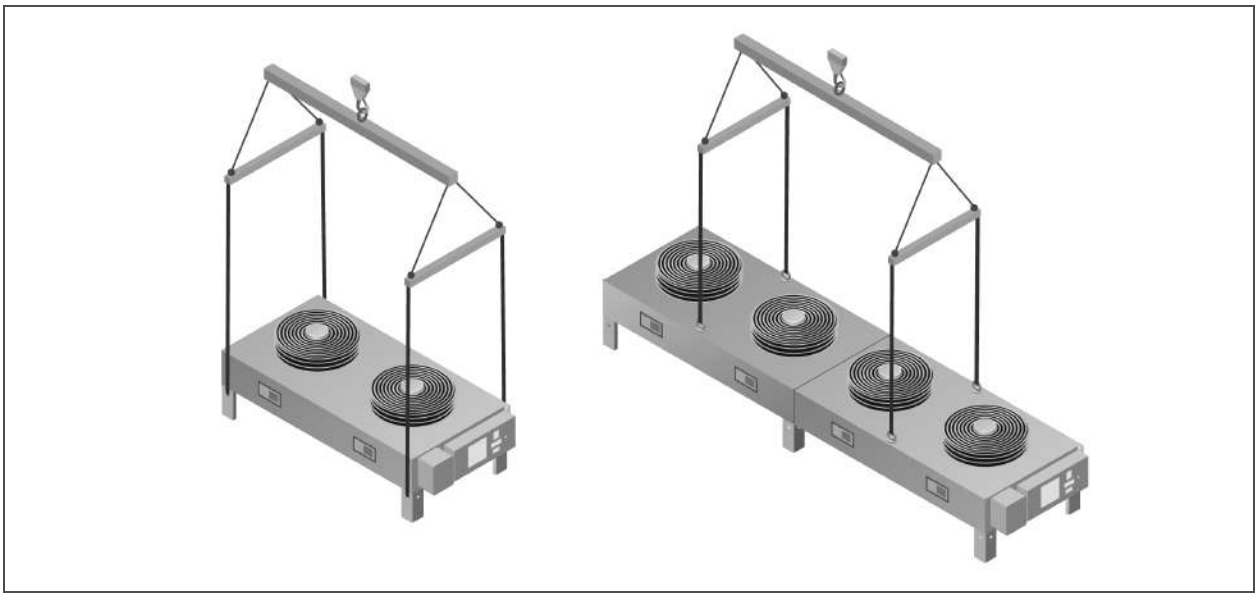
9. Refer to Figure 4.6 on the next page to attach rigging for lifting.
   Spreader bars are still required. Make sure that the spreader bars are wider than the unit to prevent crushing force.
   - 1-fan and 2-fan units: Route the straps through the large holes in the side of the legs.
   - 3-fan and 4-fan units: Secure straps or chains to the eye bolts on top of the unit.

NOTICE

Risk of improper lifting. Can cause equipment damage. Make sure that the spreader bars are wider than the unit. If the spreader bars are too short, the slings may crush the unit.

The unit is ready to be lifted and moved to its installation location.

Figure 4.6 Rigging to lift condensers

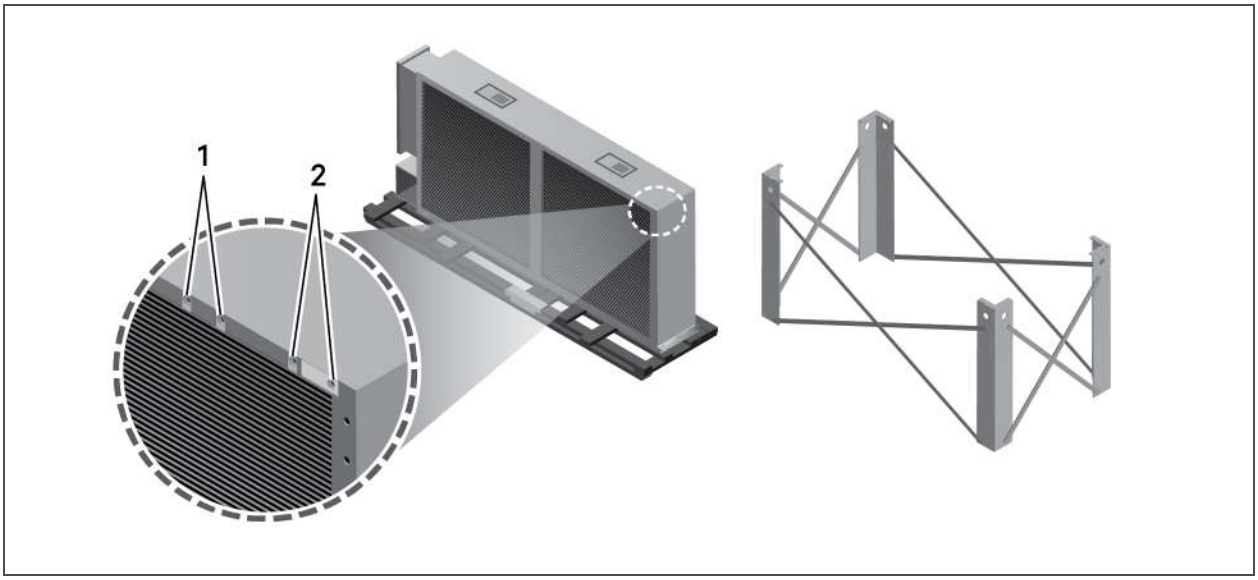


4.5.2 Attaching 36-in. to 60-in. (914 mm to 1524 mm) Legs, Removing the Skid and Attaching Slings

1. Install bolts for sling-containment guides during lifting/rotation:
   - Locate the recommended bolt locations shown in Figure 4.7 on the facing page.
   - Insert 4 leg bolts, 2 on each end, leaving approximately 1/4 in. (6 mm) of the fastener threads exposed.
   - Do not insert bolt in the secondary bolt locations. These are used to attached the legs after the unit is moved into the installation location.
2. Assemble the leg structure according to the instructions supplied with the legs. Cross-bracing for 4 legs is shown in Figure 4.7 on the facing page.

NOTE: When assembling the leg structure, DO NOT tighten the cross-brace hardware until the condenser cabinet is fastened to the legs.

Figure 4.7 Recommended bolt locations for lifting, example cross-bracing for 4 legs



Item	Description
1	Recommended bolt location (4 places)
2	Secondary bolt location (4 places)

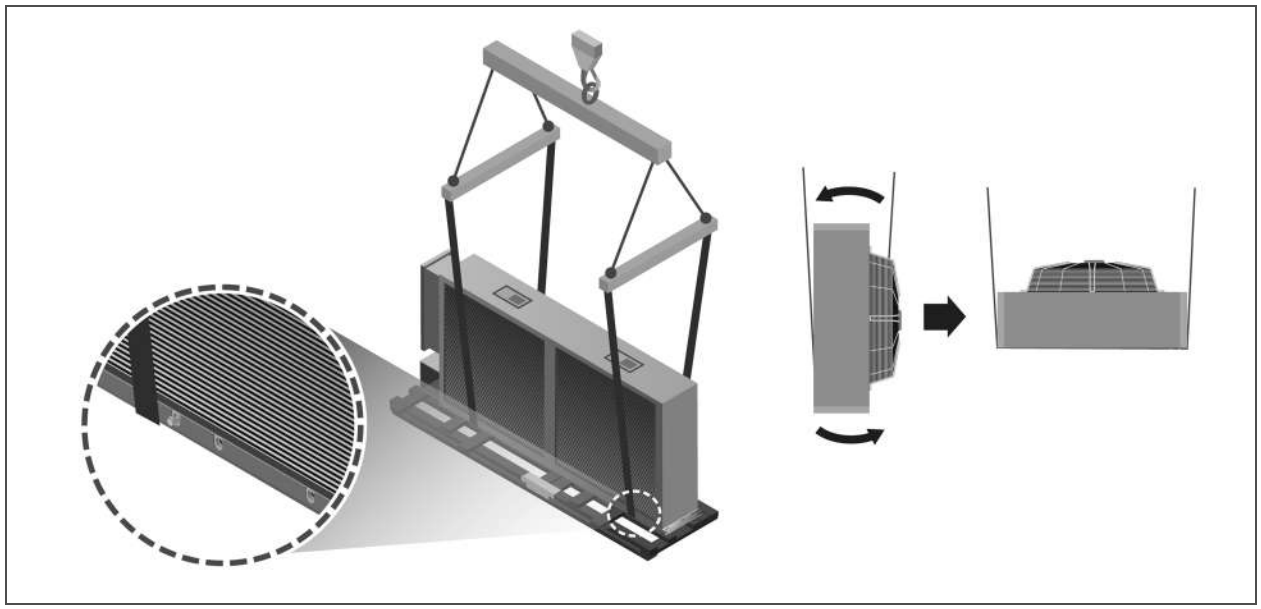
3. To attach rigging for lifting, attach slings between the unit and the top deck boards of the skid as follows:
   Spreader bars are required. Make sure that the spreader bars are wider than the unit to prevent crushing force.
   - 1-fan and 2-fan units: Route the slings against the inside of the inserted leg bolts as shown in Figure 4.8 on the next page.
   - 3-fan and 4-fan units: Route the slings against the outside of the attached eye bolts.

NOTICE

Risk of improper lifting. Can cause equipment damage. Make sure that the spreader bars are wider than the unit. If the spreader bars are too short, the slings may crush the unit.

4. Use spreader bars, lift beam and crane to lift the unit 24 in. (610 mm) off the skid. Remove the skid from under the unit
5. To rotate the unit, a mechanized method is recommended, but if one is not available, use a minimum of four properly-protected individuals to rotate the elevated unit 90 degrees so the unit fans are facing up, Figure 4.8 on the next page.

Figure 4.8 Sling placements and unit rotation



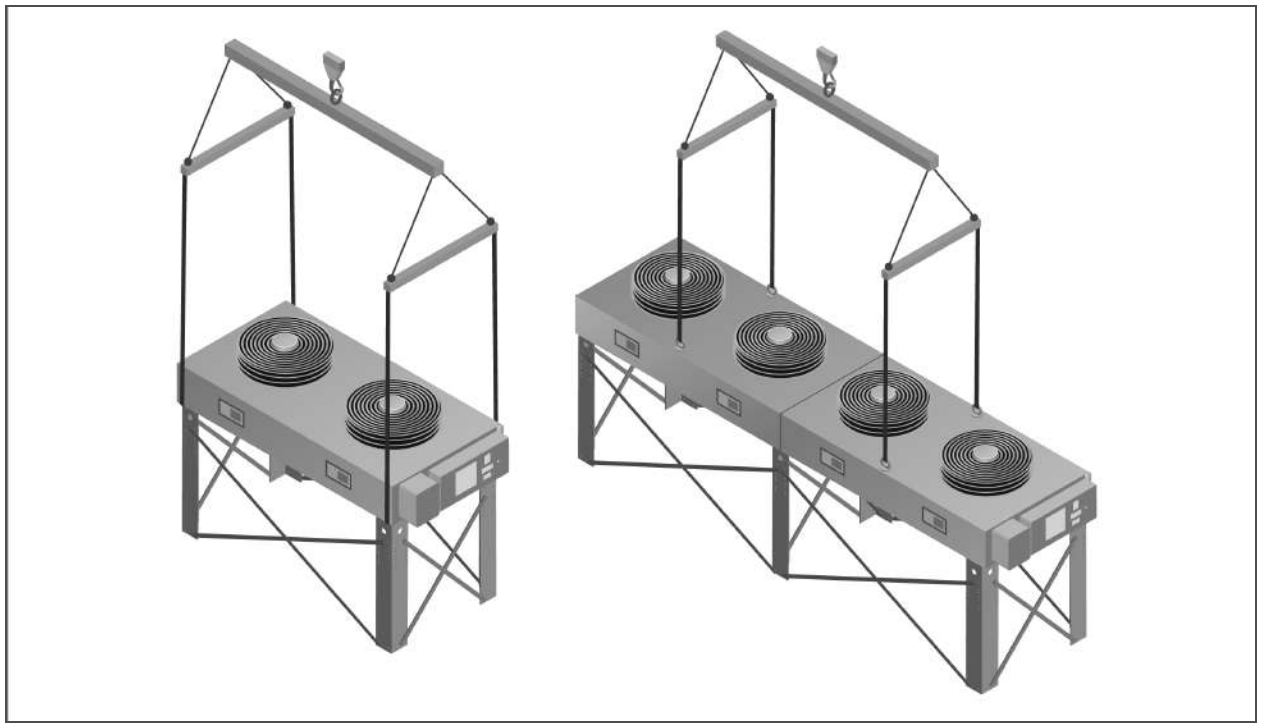
6. Place the unit on the leg structure, resting the unit on the legs.
7. Remove the bolts inserted for strap containment. If the secondary locations were used, remove the bolts just before setting the unit on its legs.
8. Align, insert and tighten all hardware securing the unit to the leg structure.
9. Square-up the leg structure and tighten all cross-brace angle hardware.
10. Lower the unit so the leg structure supports the weight of the unit, and remove the straps from around the unit.
11. Refer to **Figure 4.9** on the facing page to attach rigging for lifting.
    Spreader bars are still required. Make sure that the spreader bars are wider than the unit to prevent crushing force.
    - **1-fan and 2-fan units:** Route the straps through the large holes in the side of the legs.
    - **3-fan and 4-fan units:** Secure straps or chains to the eye bolts on top of the unit.

NOTICE

Risk of improper lifting. Can cause equipment damage. Make sure that the spreader bars are wider than the unit. If the spreader bars are too short, the slings may crush the unit.

The unit is ready to be lifted and moved to its installation location.

Figure 4.9 Rigging to lift the unit for installation



4.6 Mounting the Condenser

The condenser must be installed so that it is level within 1/2-in. (13 mm) to ensure proper refrigerant flow. For roof installation, mount the condenser on suitable curbs or other supports. Follow all local and national codes.

4.6.1 Standard Mounting Requirements

Secure the legs to the mounting surface using field-supplied 3/8-in. (9.5 mm) diameter Grade 5 bolts with a flat washer in each of the two 1/2-in. x 1-in. (12.7-mm x 25.4 mm) obround holes in each leg. For anchor dimensions, see the appropriate planning-dimension submittal documents for your unit included in the Submittal Drawings on page 83.

4.6.2 Seismic-certified and Wind-certified Mounting Requirements

Mounting requirement details such as anchor brand, type, embedment depth, edge spacing, anchor-to-anchor spacing, concrete strength, special inspection, and attachment to non-building structures must be outlined and approved by the engineer of record for the project or building.

Structural floors and housekeeping pads must also be designed and approved by the project or building structural engineer of record to withstand the seismic- or wind-anchor loads as defined on the installation drawings. The installing contractor is responsible for the proper installation of all anchors and mounting hardware, observing the mounting requirements detailed in the seismic- or wind-installation drawings and additionally outlined by the engineer of record.

At a minimum, 3/8-in. Grade 5 anchors with American National Standard Series W, Type A, plain washers (ANSI B18.22.1-1965, R1975) selected to match the nominal anchor diameter must be installed at each anchor location between the anchor head and equipment for tension load distribution. See Optional Configuration for Liebert MC Seismic Application on page 81, for additional information.

5 PIPING

All refrigeration connections to the unit 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.

Refer to specific text and to the submittal documents included in the Submittal Drawings on page 83, for other unit-specific piping requirements.

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

Table 5.1 Piping General-arrangment Drawings

Document Number	Title
DPN002188	Piping Schematic, Typical Air-cooled DX systems
DPN002858	Piping Schematic, CRV 600-mm (24-in.) DX systems
DPN002808	Piping Schematic, CRV 600-mm (12-in.) DX systems
DPN003730	Piping Schematic, DS DX systems with scroll and digital-scroll compressors
DPN004216	Piping Schematic, DS DX systems with semi-hermetic compressors
DPN002615	Piping Schematic, DSE DA050, DA080, and DA085 systems
DPN002340	Piping Schematic, DSE DA125, DA150, and DA165 systems
DPN002929	Piping Schematic, PDX DX systems with TXV
DPN003843	Piping Schematic, PDX DX systems with EEV

Table 5.2 Piping Connection Drawings

Document Number	Title
DPN002166	Piping, single-circuit, 1, 2, 3, and 4 fan units
DPN002167	Piping, single-circuit with Liebert® Lee-Temp receiver
DPN003839	Piping, single-circuit with PDX-EEV Receiver
DPN002425	Piping, dual-circuit, 2 and 4 fan units
DPN002426	Piping, dual-circuit with Liebert® Lee-Temp receiver

5.1 Refrigerant Piping and Charging

WARNING! Risk of over-pressurization of the refrigeration system. Can cause explosive discharge of high-pressure refrigerant, loss of refrigerant, environmental pollution, equipment damage, injury, or death. This unit contains fluids and gases under high pressure. Use extreme caution when charging the refrigerant system. Do not pressurize the system higher than the design pressure marked on the unit's nameplate.

CAUTION: Risk of excessive refrigerant line pressure. Can cause tubing and component rupture resulting in equipment damage and personal injury. Do not close off the refrigerant-line isolation valve for repairs unless a pressure-relief valve is field- installed in the line between the isolation valve and the check valve. The pressure-relief valve must be rated 5% to 10% higher than the system-design pressure. An increase in ambient temperature can cause the pressure of the isolated refrigerant to rise and exceed the system-design pressure rating (marked on the unit nameplate).

Consult local building and plumbing codes for installation requirements of additional pressure-relief devices when isolation valves are field installed. Do not isolate any refrigerant circuits from over-pressurization protection.

NOTICE

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

Polyolester oil (POE oil), required with R-407C/R-410A and used with some R-22 systems, is much more hygroscopic than mineral oils. This means that POE oil absorbs water at a much faster rate when exposed to air than previously used mineral 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 or plug the microchannel coil. Always use a flow of dry nitrogen when brazing.

5.1.1 Refrigerant Piping Guidelines for Air-cooled Systems

- Air-cooled units and condensers ship with an inert-gas holding charge. Do not vent the charge 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 1-3 ft^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 in. (460 mm) of the brazing site by wrapping them with a wet cloth or with a suitable heat-sink compound.
- Isolate piping from building using vibration-isolating supports.
- Consult factory if the condenser equipped with receivers is below the evaporator or if a condenser not equipped with receivers is more than 15 ft (4.6 m) below the evaporator.
- Consult factory if piping run exceeds 150 ft (46 m) equivalent length on traditional R-407C DX units.
- Consult factory if piping run exceeds 300 ft (91 m) equivalent length on traditional R-410A DX units.
- Consult factory if piping run exceeds 300 ft (91 m) actual length or 450 ft (137.2 m) equivalent length on units with Liebert® EconoPhase units.
- Install traps on hot-gas (discharge) lines at the base of vertical risers over 5 ft (1.5 m) and then for vertical rises over 25 ft (7.6 m), install a trap in 20-ft (6-m) increments or evenly-divided over the vertical rise.
- Pitch horizontal hot-gas piping down at a minimum rate of 1/2 in. per 10 ft (42 mm per 10 m) so that gravity will aid in moving oil in the direction of refrigerant/oil flow.
- Keep piping clean and dry, especially on units with R-410A or R-407C refrigerant.
- Avoid piping runs through noise-sensitive areas.
- Do not run piping directly in front of indoor-unit discharge air stream.
- Refrigerant oil – do not mix oil types. Consult the indoor-unit installation/user guide for refrigerant type and oil requirements.

NOTE: Failure to use compressor oils recommended by compressor manufacturer will void compressor warranty. Consult Vertiv Technical Support or the compressor manufacturer for further recommendations or if you have questions about compressor oils.

Refer to ASHRAE Refrigeration Handbook for general, good-practice refrigeration piping. The 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 receivers. A fusible plug kit is available for field installation on condensers without receivers. A fusible plug kit is installed in each Liebert® DSE receiver and Liebert® PDX-EEV receiver.

NOTE: Liebert® DSE systems require all indoor and outdoor field refrigerant piping to be insulated 1/2 in. minimum. All outdoor insulation must be UV and ozone resistant.

- Refer to Recommended Refrigerant Line Sizes on the next pageRefrigerant Line Sizes and Equivalent Lengths,for recommended refrigerant piping sizes based on equivalent pipe lengths.
- Refer to Refrigerant Charge Requirements on page 35Refrigerant Charge Requirements for Air-cooled Systems, for the refrigerant-charge requirements of the system.

5.1.2 Recommended Refrigerant Line Sizes

Table 5.3 Recommended Refrigerant-line Sizes for R-410A with Standard- and Digital-scroll compressors

Indoor-unit Model		Equivalent Length, ft (m)				
		50 (15)	100 (30)	150 (45)	300 (91)	450 (137)
		Line sizes, OD Cu, in.				
CR019RA/ CR020RA	Hot Gas Line	3/4	3/4	3/4	7/8[1]	—
	Liquid Line	5/8	5/8	5/8	3/4	—
CR035RA	Hot Gas Line	7/8	7/8	7/8	1-1/8[1]	—
	Liquid Line	3/4	3/4	3/4	7/8	—
PX011	Hot Gas Line	1/2	5/8[1]	5/8[1]	5/8[1]	—
	Liquid Line	3/8	1/2	1/2	1/2	—
PX018	Hot Gas Line	5/8	5/8	5/8	3/4[1]	—
	Liquid Line	1/2	1/2	1/2	5/8	—
PX023	Hot Gas Line	3/4	3/4	3/4	7/8[1]	—
	Liquid Line	5/8	5/8	5/8	5/8	—
PX029	Hot Gas Line	7/8	7/8	7/8	1-1/8[1]	—
	Liquid Line	5/8	5/8	5/8	3/4	—
DA050/ DA080/ DA085	Hot Gas Line	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8[2]
	Liquid Line	7/8	7/8	7/8	7/8	7/8[2]
DA125	Hot Gas Line	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8[2]
	Liquid Line	7/8	7/8	7/8	7/8	7/8[2]
DA150	Hot Gas Line	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8[2]
	Liquid Line	7/8	1-1/8	1-1/8	1-1/8	1-1/8[2]
DA165	Hot Gas Line	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8[2]
	Liquid Line	7/8	1-1/8	1-1/8	1-1/8	1-1/8[2]

Consult factory for proper line sizing for piping runs longer than the listed maximum equivalent length.

1. Downsize vertical riser one trade size (1-1/8" to 7/8" or 7/8" to 3/4" or 5/8" to 1/2").

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

Source: DPN000788 Rev. 13

Table 5.4 Recommended Refrigerant-line Sizes for R-407C by compressor type

Indoor-unit Model	Compressor Type:	Standard (non-digital) scroll			4-step Semi-hermetic or Digital-scroll		
	Equivalent Length, ft (m):	50 (15)	100 (30)	150 (45)	50 (15)	100 (30)	150 (45)
		Line sizes, OD Cu, in.					
DS035	Hot Gas Line	7/8	7/8	7/8	3/4	7/8	7/8
	Liquid Line	1/2	5/8	5/8	1/2	5/8	5/8
DS042	Hot Gas Line	7/8	7/8	7/8	7/8	7/8	1-1/8[1]
	Liquid Line	1/2	5/8	5/8	5/8	5/8	5/8
DS053	Hot Gas Line	7/8	1-1/8	1-1/8	7/8	1-1/8[1]	1-1/8[1]
	Liquid Line	5/8	7/8	7/8	5/8	7/8	7/8
DS070	Hot Gas Line	1-1/8	1-1/8	1-1/8	1-1/8[1]	1-1/8[1]	1-1/8[1]
	Liquid Line	7/8	7/8	7/8	7/8	7/8	7/8
DS077[2]	Hot Gas Line	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8	1-1/8
	Liquid Line	7/8	7/8	7/8	7/8	7/8	7/8
DS105[2]	Hot Gas Line	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8	1-3/8
	Liquid Line	7/8	7/8	1-1/8	7/8	7/8	1-1/8

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

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

2. Digital-scroll not available on 077 and 105 models.

Source: DPN000788 Rev. 13

5.1.3 Refrigerant Charge Requirements

To calculate the charge requirements:

1. Determine the charge for your units by model number from the following tables and the tables in the indoor-unit's Installer/User guide.
2. Determine the charge for the piping by line size and length.
3. Add these all together to obtain the total refrigerant charge for your system.

These values can be used for obtaining adequate refrigerant for the system, but should not be used for final charging.

NOTE: Due to the much smaller coil volume, the performance, especially subcooling, of a Liebert® MC condenser is quite sensitive to the amount of refrigerant charge. Ensure that an accurate amount of refrigerant charge is added.

Table 5.5 Approximate refrigerant required, R-410A

Condenser Models	Single Circuit Condensers			Dual Circuit Condensers		
	Condensers without Liebert® Lee-Temp	Condensers with Liebert® Lee-Temp	Condensers with Liebert® DSE or PDX-EEV Small Receiver/Large Receiver*	Condensers without Liebert® Lee-Temp	Condensers with Liebert® Lee-Temp	Condensers with Liebert® DSE Small Receiver/Large Receiver*
	Approximate R-410A Refrigerant Needed, lb/circuit (kg/circuit)					
MCS028	2.5 (1.2)	21.7 (9.8)	11.0 (5.0)	—	—	—
MCS056	—	—	—	2.5 (1.2)	21.7 (9.8)	—
MCM040	3.5 (1.6)	22.7 (10.3)	12.0 (5.4)	—	—	—
MCM080	8.5 (3.8)	39.8 (18.1)	17.0 (7.7)	3.5 (1.6)	22.7 (10.3)	—
MCM160	—	—	—	8.5 (3.8)	39.8 (18.1)	17 (7.7) / 24 (10.9)
MCL055	5.0 (2.3)	24.2 (11.0)	13.5 (6.1)	—	—	—
MCL110	10.7 (4.9)	49.1 (22.3)	19.5 (8.8)	5.2 (2.4)	24.4 (11.1)	14.0 (6.4)
MCL165	18.4 (8.4)	79.9 (36.2)	27.0 (12.2) / 34.0 (15.4)	—	—	—
MCL220	27.0 (12.3)	102.9 (46.7)	42.5 (19.3)	12.3 (5.6)	50.7 (23.0)	21.0 (9.5) / 28.0 (12.7)

*Small receiver (28-in. long) is used with DA050, DA080 and DA085; large receiver (60-in. long) is used with DA125, DA150 and DA165.

Source: DPN002411, Rev. 8

Table 5.6 Approximate Refrigerant required, R-407C

x	Single Circuit Condensers		Dual Circuit Condensers	
	Condensers without Liebert® Lee-Temp	Condensers with Liebert® Lee-Temp	Condensers without Liebert® Lee-Temp	Condensers with Liebert® Lee-Temp
	Approximate R-407C Refrigerant Needed, lb/circuit (kg/circuit)			
MCS028	2.2 (1.0)	23.1 (10.5)	—	—
MCS056	—	—	2.2 (1.0)	23.1 (10.5)
MCM040	3.0 (1.4)	23.9 (10.8)	—	—
MCM080	7.5 (3.4)	44.5 (20.2)	3.0 (1.4)	23.9 (10.8)
MCM160	—	—	7.5 (3.4)	44.5 (20.2)
MCL055	5.0 (2.3)	25.9 (11.7)	—	—
MCL110	10.5 (4.8)	52.1 (23.7)	5.1 (2.3)	26.0 (11.8)
MCL165	18.3 (8.3)	84.8 (38.5)	—	—
MCL220	27.0 (12.3)	108.9 (49.4)	12.2 (5.6)	53.8 (24.4)

Source: DPN002411, Rev. 8

Table 5.7 Interconnecting piping refrigerant charge, lb/100 ft (kg/30m)

Line Size O.D., in.	R-407C		R-410A	
	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line
3/8	—	3.6 (1.6)	—	3.2 (1.4)
1/2	0.5 (0.2)	6.7 (3.0)	0.7 (0.3)	5.9 (2.7)
5/8	0.8 (0.4)	10.8 (4.8)	1.1 (0.5)	9.6 (4.3)
3/4	1.2 (0.5)	16.1 (7.2)	1.6 (0.7)	14.3 (6.4)
7/8	1.7 (0.8)	22.3 (10.0)	2.3 (1.0)	19.8 (8.8)
1-1/8	2.9 (1.3)	38.0 (17.0)	3.9 (1.7)	33.8 (15.1)
1-3/8	4.4 (2.0)	57.9 (25.9)	5.9 (2.6)	51.5 (23.0)
1-5/8	6.2 (2.8)	—	8.4 (3.7)	—
Data based on 50°F Evap, 15°F superheat, 125°F SCT, 10°F subcooling Source: DPN002411, Rev. 8				

5.1.4 Additional Oil Requirements

Refer to the indoor unit's Installer/User Guide to determine if additional oil is required for each circuit. The need for additional oil is affected by compressor type, piping lengths, receiver, and total refrigerant charge.

5.2 Equipment Application Guidelines

Pump-down must be disabled on the indoor unit when using the Liebert® MC condenser, due to the reduced volume in the condenser coil.

We recommend adding a discharge-line check valve and crankcase heater when connecting the MC condenser to Liebert® indoor units built before 2012. The check valve and crankcase heater are needed for compressor protection. Additional liquid-line Schrader ports are required at the indoor unit to properly charge systems with MC condensers.

5.3 System Dehydration/Leak Test

Refer to the indoor unit's Installer/User Guide for the leak-check and evacuation procedures for the entire thermal-management system. Refer to the section that refers to the winter control system used on the condenser.

5.4 Charging for Condensers with Liebert Lee-Temp™ Receivers

Consult the indoor unit's installer/user guide for charging systems with Liebert® Lee-Temp receivers. These procedures are identical to systems with fin/tube condenser coils, but the refrigerant volumes will be much lower.

5.5 Charging for Condensers with PDX-EEV Receivers

Refer to the Liebert® PDX/PCW Installer/User Guide for the leak-check and evacuation procedures for the entire thermal-management system. All Liebert® PDX units with EEV require either a heated Lee-Temp receiver or an unheated PDX-EEV receiver.

5.6 Charging for Condensers with DSE Receivers

Refer to the Liebert® DSE Installer/User Guide for the leak-check and evacuation procedures for the entire thermal-management system. All Liebert® DSE Thermal Management Systems require a DSE receiver on each condenser circuit whether or not the system includes a Liebert® EconoPhase pump module.

5.7 Charging for Condensers without Receivers

Consult the indoor unit's installer/user guide for charging systems without receivers. MC condensers are charge-sensitive and require accurate calculation of system charge to avoid over-charging.

6 ELECTRICAL CONNECTIONS

Line-voltage 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 the appropriate submittal drawing, listed in Table 6.1 on the next page, 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.

All internal wiring is completed at the factory.

WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious 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® controller 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 controller. The factory-supplied 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 improper wiring, piping, moving, lifting and handling. Can cause equipment damage, serious 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 and who are wearing appropriate, OSHA-approved PPE.

WARNING! Risk of contact with high-speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure.

NOTICE

Risk of improper power-supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example: back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power-source voltages should be stabilized and regulated to within ±10% of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

NOTE: Use copper wiring only. Make sure that all connections are tightened to the proper torque mentioned on the component.

NOTE: Installation and service of this equipment should be done only by properly-trained and qualified personnel who are specially-trained in the installation of air-conditioning equipment.

The electrical connections are described in the submittal documents included in the Submittal Drawings on page 83.

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

Table 6.1 Electrical Field-connection Drawings

Document Number	Title
DPN002169	Electrical Field Connections, Premium Efficiency Control
DPN002374	Electrical Field Connections, Premium Efficiency Control with Liebert® Lee-Temp
DPN003284	CANbus and Interlock Connections between Liebert® DSE, 1 MC Condenser and Optional EconoPhase Unit
DPN002361	CANbus and Interlock Connections between Liebert® DSE, 2 MC Condensers and Optional EconoPhase Unit
DPN003267	CANbus and Interlock Connections between Liebert® DS and 1 MC Condenser
DPN002841	CANbus and Interlock Connections Between Liebert® CRV 600-mm (24-in.) and MC Condenser
DPN003036	CANbus and Interlock Connections Between Liebert® CRV 300-mm (12-in.) and MC Condenser
DPN003266	CANbus and Interlock Connections Between Liebert® PDX and MC Condenser
DPN003047	Electrical Field Connections, 575-V option
DPN002960	Surge-protective Device Options

6.1 Line Voltage Wiring

WARNING! Risk of electrical fire and short circuit. Can cause property damage, injury or death. Select and install the line side electrical supply wire and overcurrent protection device(s) according to the specifications on the unit nameplate(s), per the instructions in this manual and according to the applicable national, state and local code requirements. Use copper conductors only. Verify that all electrical connections are tight. Unit-specific wiring diagrams are provided on each unit.

NOTICE

Risk of improper power-supply connection. Can cause equipment damage and loss of warranty coverage.

Prior to connecting any equipment to a main or alternate power source (for example: back-up generator systems) for start-up, commissioning, testing, or normal operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. In general, power-source voltages should be stabilized and regulated to within ±10% of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phased at any time.

NOTE: For acceptable and unacceptable power supplies, see Wye- vs. Delta-connected Power Supply on page 44.

Condenser-rated voltage should be verified with available power supply before installation. Refer to the unit's electrical schematic and serial tag for specific electrical requirements.

Liebert® MC condenser power connections are provided for 3 phase wires and 1 earth-ground wire. Line-voltage electrical service is required for all condensers at the location of the condenser. The voltage supply to the condenser may not be the same voltage supply as required by the indoor unit. Consider using a UPS on both indoor cooling units and MC condensers to maintain uninterrupted cooling capability. Refer to the unit's serial tag for specific condenser electrical requirements. A unit disconnect is standard. However, a site disconnect may be required by local code to isolate the unit for maintenance. Route the supply power to the site disconnect switch and then to the unit. Route the conduit to the knockout provided in the bottom-right end of the electrical-control enclosure. Connect the earth-ground wire lead to the marked earth-ground connection terminal provided near the factory-installed disconnect switch per the appropriate drawing in the Submittal Drawings on page 83.

NOTE: Liebert® Lee-Temp™ kits require a separate line voltage electrical supply for the heated receivers. See Table 6.2 on page 43 for power requirements.

NOTE: A separate neutral wire does not need to be run to the Liebert® MC Condenser.

6.2 Electrical Power Requirements

Table 6.2 on the facing page lists the power requirements by model number and size. Table 6.3 on the facing page lists the additional electrical requirements if your system includes a Liebert® Lee-Temp™ Receiver.

Table 6.2 Electrical data, three-phase, 60Hz condenser, Premium EC-fan Control

Model	Voltage	FLA	WSA	OPD
Small Platform				
MCS028	208/230V	3.0	3.8	15
	380V	1.4	1.8	15
	460V	1.4	1.8	15
	575V	1.2	1.5	15
MCS056	208/230V	6.0	6.8	15
	380V	2.8	3.3	15
	460V	2.8	3.3	15
	575V	2.3	2.8	15
Medium Platform				
MCM040	208/230V	2.3	3.2	15
	380V	1.4	1.9	15
	460V	1.4	1.9	15
	575V	1.2	1.6	15
MCM080	208/230V	4.6	5.5	15
	380V	2.8	3.3	15
	460V	2.8	3.3	15
	575V	2.3	2.8	15
MCM160	208/230V	9.2	9.8	15
	380V	5.6	6.0	15
	460V	5.6	6.0	15
	575V	4.7	5.0	15
Large Platform				
MCL055	208/230V	5.7	7.1	15
	380V	2.8	3.5	15
	460V	2.8	3.5	15
	575V	2.3	2.9	15

Table 6.2 Electrical data, three-phase, 60Hz condenser, Premium EC-fan Control (continued)

Model	Voltage	FLA	WSA	OPD
MCL110	208/230V	11.4	12.8	15
	380V	5.6	6.3	15
	460V	5.6	6.3	15
	575V	4.7	5.3	15
MCL165	208/230V	17.1	18.5	20
	380V	8.4	9.1	15
	460V	8.4	9.1	15
	575V	7.0	7.6	15
MCL220	208/230V	22.8	24.2	25
	380V	11.2	11.9	15
	460V	11.2	11.9	15
	575V	9.3	9.9	15

1. FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device.
2. Refer to Wye- vs. Delta-connected Power Supply on the next page, for acceptable power-supply configurations.

Table 6.3 Electrical data, Lee-Temp™ receiver, 60Hz

Rated Voltage - Single-Phase:	120		208/230	
Watts/Receiver	150	300	150	300
Amps	1.4	2.8	0.7	1.4
Wire Size Amps	1.8	3.5	0.9	1.8
Maximum Overcurrent Protection Device, Amps	15	15	15	15

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

6.3 Wye- vs. Delta-connected Power Supply

Acceptable Power Supplies—208 V to 575 V Nominal Units

- 208-V Wye with solidly-grounded neutral and 120-V line-to-ground
- 380-V Wye with solidly-grounded neutral and 220-V line-to-ground
- 480-V Wye with solidly-grounded neutral and 277-V line-to-ground
- 575-V Wye with solidly-grounded neutral and 322-V line-to-ground (uses step-down transformers)
- Wye with high-resistance (or impedance) ground
- Delta with corner ground

Unacceptable Power Supplies

- Delta without ground or with floating ground
- Delta with grounded center tap

6.4 Low-voltage Control Wiring—CANbus Communication

NOTICE

Risk of control malfunction. Can cause improper unit operation.

Verify that all low-voltage electrical wiring has been performed per the schematic diagram provided and that all low-voltage wiring connections are tight.

CANbus communication and interlock wiring are required between the indoor and the outdoor units. CANbus cables are supplied by others to connect the indoor unit to the outdoor condenser. No special considerations are required when the total external cable connection between the indoor unit and outdoor unit is less than 450 ft (137 m). A CANbus isolator is required for total external cable connections longer than 450 ft (137 m) but less than 800 ft (243 m).

The control-wiring connections are described in the submittal documents included in the Submittal Drawings on page 83.

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

Table 6.4 CANbus Communication Connection Drawings

Document Number	Title
DPN003284	CANbus and Interlock Connections between Liebert® DSE, 1 MC Condenser and Optional EconoPhase Unit
DPN002361	CANbus and Interlock Connections between Liebert® DSE, 2 MC Condensers and Optional EconoPhase Unit
DPN003267	CANbus and Interlock Connections between Liebert® DS and 1 MC Condenser
DPN002841	CANbus and Interlock Connections Between Liebert® CRV 600-mm (24-in.) and MC Condenser
DPN003036	CANbus and Interlock Connections Between Liebert® CRV 300-mm (12-in.) and MC Condenser
DPN003266	CANbus and Interlock Connections Between Liebert® PDX and MC Condenser

7 CHECKLIST FOR COMPLETED INSTALLATION

7.1 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.

7.2 Electrical Installation Checks

1. Line voltage connected and matches equipment nameplate.
2. Power-line circuit breakers or fuses have proper ratings for equipment installed.
3. CANbus communication and interlock wiring connections completed between indoor cooling unit and condenser.
4. All internal and external high- and low-voltage wiring connections are tight.
5. Confirm that unit is properly grounded to an earth ground.
6. Control transformer setting matches incoming power.
7. Electrical service conforms to national and local codes.
8. Verify that the condenser is not connected to an unacceptable power supply, see Wye- vs. Delta-connected Power Supply on page 44.
9. Verify that the CANbus wiring, CANbus “END of Line” jumper position, and the CANbus “Device Address DIP Switch” setting are correct according to the application at the job site.
10. Verify that Terminals 70, 71, (and 230 when applicable) are used and properly-wired for interlock wiring, particularly on systems that use two condensers for one indoor unit.

7.3 Piping Installation Checks

1. Piping completed to corresponding indoor cooling-unit refrigeration circuit.
2. Piping is leak-checked, evacuated and charged with specified refrigerant.
3. Additional refrigerant oil is added per circuit, if required.
4. Piping is properly sized, sloped, and trapped for proper oil return.
5. Check piping inside and outside of equipment for proper support and adequate spacing to prevent rub-through or chafing.
6. Hot-gas line on Liebert® Lee-Temp receiver is fastened to the side of the cabinet and isolated for vibration reduction, if applicable.

7.4 Other Installation Checks

1. Installation materials and tools have been removed from equipment (literature, shipping materials, construction materials, tools, etc.).
2. Locate blank start-up sheet, ready for completion by installer or start-up technician.

8 INITIAL START-UP CHECKS AND COMMISSIONING PROCEDURE FOR WARRANTY INSPECTION

WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious 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® controller 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 controller. The factory-supplied 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 improper wiring, piping, moving, lifting and handling. Can cause equipment damage, serious 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 and who are wearing appropriate, OSHA-approved PPE.

WARNING! Risk of contact with high-speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure.

- Confirm that all items on Checklist for Completed Installation on the previous page have been done.
- Locate "Liebert® MC Warranty Inspection Check Sheet" in the unit's electric panel. (PSWI-8542-408CO).
- Complete "Liebert® MC Warranty Inspection Check Sheet" during start-up. (PSWI-8542-408CO).
- Forward the completed "Liebert® MC Warranty Inspection Check Sheet" to your local sales office. This information must be completed and forwarded to validate warranty.
- Contact your local sales representative or technical support if you have any questions or problems during unit start-up and commissioning. Visit https://www.vertivco.com/en-us/support/ or call 1-800-543-2778 for contacts.

9 TROUBLESHOOTING

Table 8.1 Troubleshooting

Symptom	Possible cause	Check or Remedy
Condenser will not start	No power to condenser.	Check voltage at input terminal block.
	Circuit breaker or fuse for low-voltage transformer in condenser is tripped.	Locate problem in condenser electrical panel and repair.
	No low-voltage signal to/from indoor unit.	Locate open circuit and repair.
Low discharge pressure	Faulty head pressure control valve or premium efficiency control board.	Replace if defective.
High discharge pressure	Dirty condenser fins.	Clean coil.
	Condenser fans not operating.	Check for low-voltage signal from indoor unit.
		Check fan motors and fuses.
	High refrigerant charge	Check refrigerant charge.
SPD green and red LEDs are extinguished	No voltage or improper phasing exists at condenser.	Check voltage at input terminal block.
	Electrical connections to SPD are faulty.	Locate connection problem and repair.
	Condenser disconnect is turned Off.	Recheck lights with disconnect switch in the On position.
SPD red LED is illuminated	A surge exceeding the rating of the SPD has occurred.	Replace SPD and inspect other components for damage and replace them if necessary.
Control Board LEDs do not light.	Connection to P24 is loose or disconnected.	Check the connection to P24 to verify that is connected securely.
		Check the connector from the transformer for loose terminals.
	Fuse located next to P24 has blown.	Verify that the fuses next to P24 have not blown. Replace as needed.
	24V transformer has failed.	With a voltmeter verify that the output from the transformer is 24Vac ±10%. If the value exceeds ±10%, verify that the correct primary leads are being used.
	Premium Efficiency Control Board has failed.	If there is no output voltage, verify that the primary connections are secure and receiving the correct voltage. If they are, replace the transformer.
Fan will not run	Jumper not installed between 24V and DIN1 (for Ziehl-Abegg fan motor).	Install jumper between 24V and DIN1 (for Ziehl Abegg fan motor).

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10 CONTROL OPERATION

The Liebert® MC Premium Efficiency Control takes about 30 seconds to boot during which time, the LED on the Premium Efficiency Control Board reads “888.” When fully booted, “F00” displays, then the value for F00. When using the control, the condenser fan(s) respond less than 5 seconds after receiving a "compressor-on" signal from the indoor unit. Consider using UPS equipment on both data-center cooling units and Liebert® MC condensers to maintain uninterrupted cooling capability.

For the first 60 seconds of operation after the compressor turns on, the condenser fan(s) run at a factory-set fixed speed, based on ambient temperature: faster at higher temperatures, slower at lower temperatures. After 60 seconds, the control adjusts the fan speed based on the liquid-pressure transducer. If the liquid-pressure transducer fails, the condenser uses temperature sensors to control the fan speed based on the liquid-line temperature. The condenser fans continue to operate for approximately 30 seconds after compressors turn Off.

The MC fans have various alarm conditions, such as loss-of-voltage and loss-of-control-signal, that stop the condenser fans. When an alarm condition is no longer present the fans turn on automatically if compressors are On.

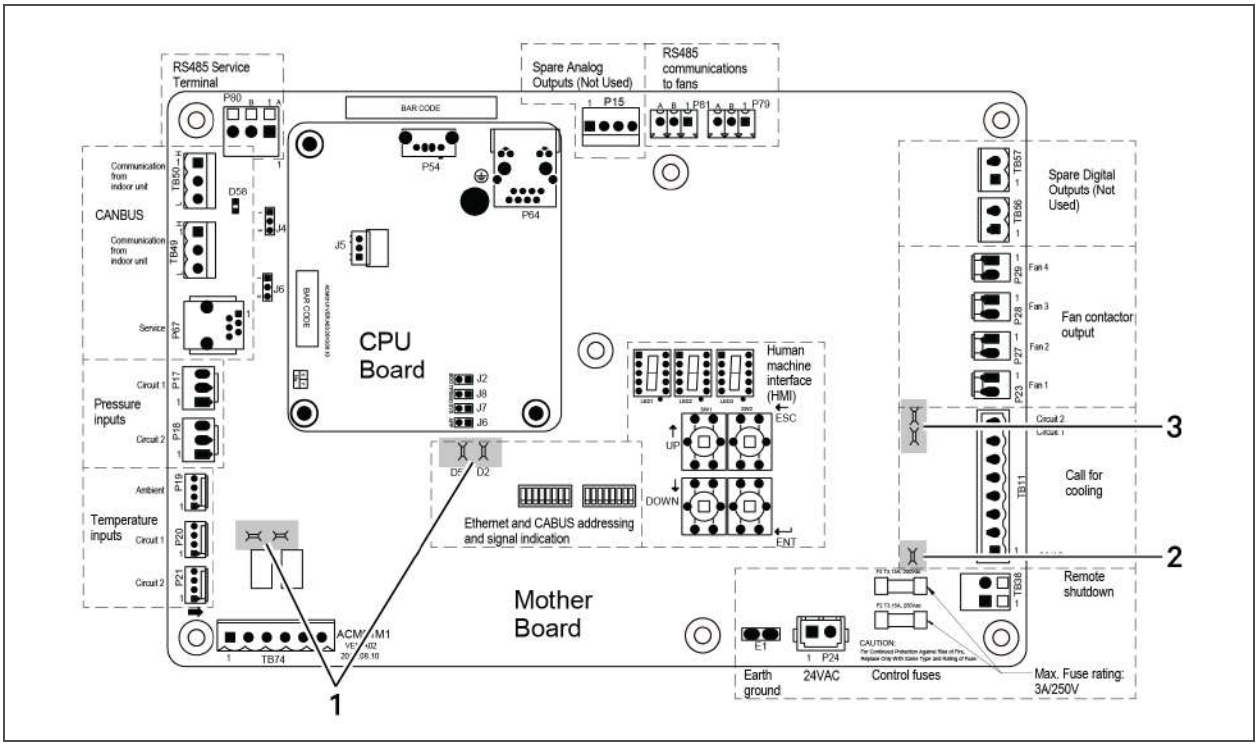
10.1 Premium Efficiency Control Board and Interface

The Premium Efficiency Control board has a stacked-board arrangement. The human-machine interface consists of three, 7-segment LEDs and keys (see Figure 9.2 on the next page).

NOTE: Indicator lights should be On to indicate signal is present. See Figure 9.1 on the next page.

The Premium Efficiency Controls are factory-configured for refrigerant type, whether or not a receiver is included, and the indoor cooling unit. No field-configuration is necessary for proper and efficient condenser operation.

Figure 9.1 Premium efficiency fan control board



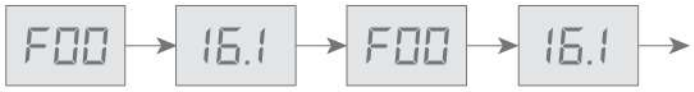
Item	Description
1	LED indicates "signal is present" when lit.
2	LED indicates "signal is present" when lit.
3	LED indicates "signal is present" when lit.

Figure 9.2 Control-board HMI

10.1.1 Initial Display upon Power-On

After power-on, first item of the analog-signals menu displays. *F00* and the pressure value of condenser 1 display alternately. *F00* is the item ID of Condenser Pressure 1, see Table 9.1 on page 54, for the description of the analog-signal item IDs. Figure 9.3 below, shows the alternating ID and example compressor-1 pressure of 16.1.

Figure 9.3 Initial Display on the Controller



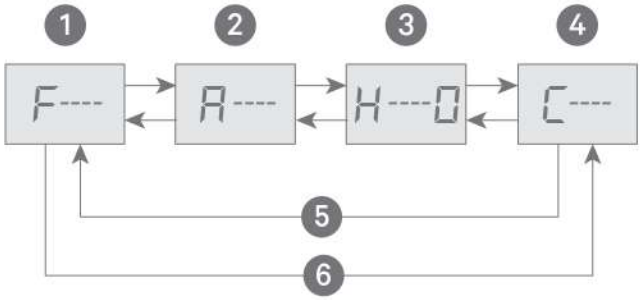
10.1.2 Navigating the Controller-interface Main Menu

At the initial display, press ESC to display the first item of the main menu, which includes 4 options:

- Analog Signals Menu
- Active Alarms Menu
- History Alarms Menu
- Configuration Menu

Use the Up and Down keys to scroll through the menus, and press ENT to enter the sub menus. Figure 9.4 below, shows the operation and structure of the main menu.

Figure 9.4 Main Menu operation and structure



Item	Description
1	Analog signals menu
2	Active alarms menu
3	History alarms menu
4	Configuration menu
5	Pressing up arrow from analog-signals displays the configuration menu.
6	Pressing down arrow from configuration menu displays the analog-signals menu.

NOTICE

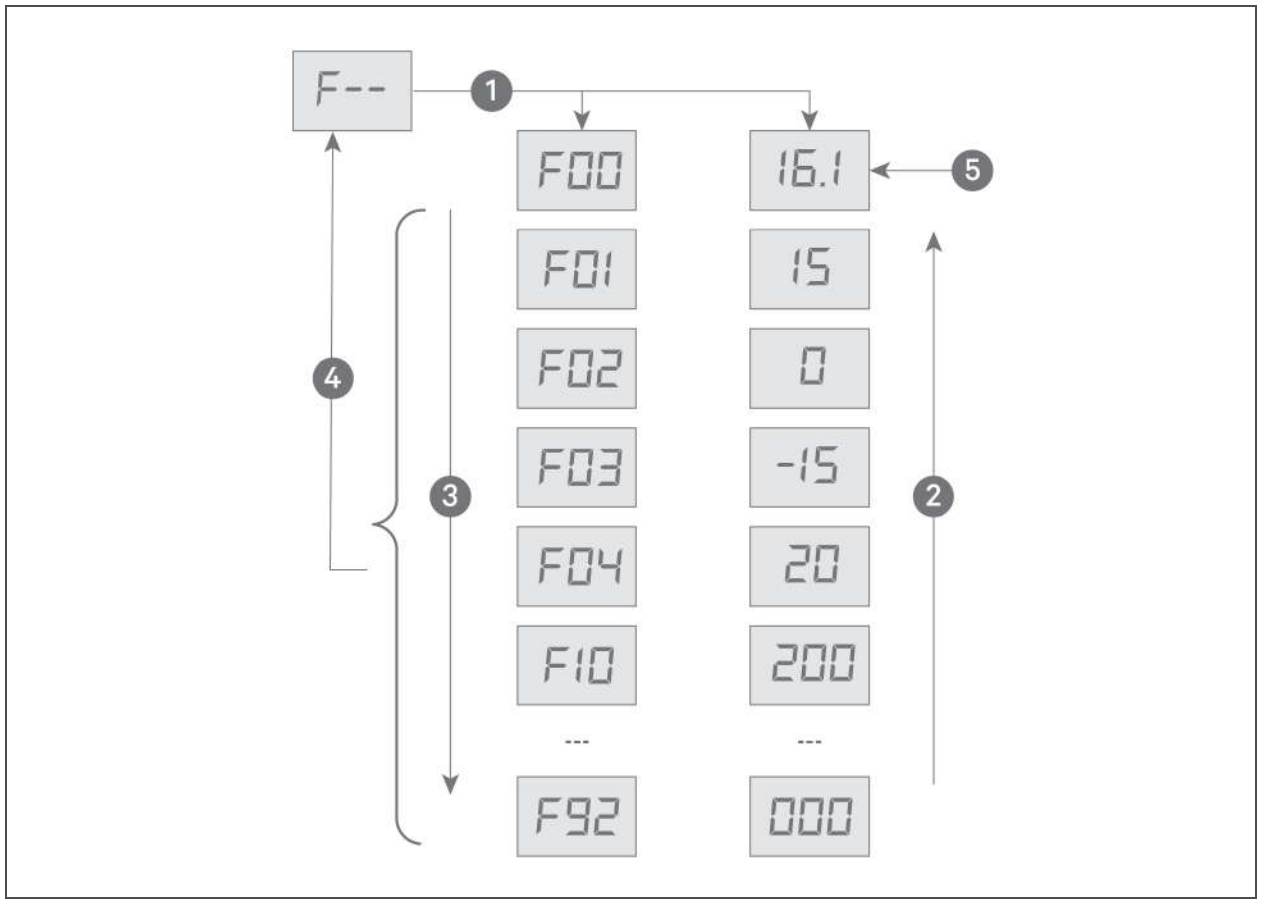
Risk of improperly altered configuration menu settings. Can compromise equipment operation.

Changing the configuration menu settings can cause unanticipated results. These settings should be changed only by properly trained and qualified personnel or as directed by the factory.

10.1.3 Analog Signals Menu

In the analog-signals menu, F––, press ENT to enter the analog-signal items described in Table 9.1 on page 54. The item ID and signal value display alternately. Figure 9.5 on the facing page, shows the operation and item structure of analog signals menu.

Figure 9.5 Analog Signals Menu



Item	Description
1	Pressing ENT displays the first analog-signal item which alternately displays the ID and the reading.
2	Pressing up arrow, cycles "up" through the menu items/readings.
3	Pressing down arrow, cycles "down" through the menu items/readings.
4	Pressing ESC returns to the analog-signals menu.
5	Initial screen, item F00 with example 16.1 reading.
6	Down from configuration menu displays the analog-signals menu.

Table 9.1 Analog signal definitions

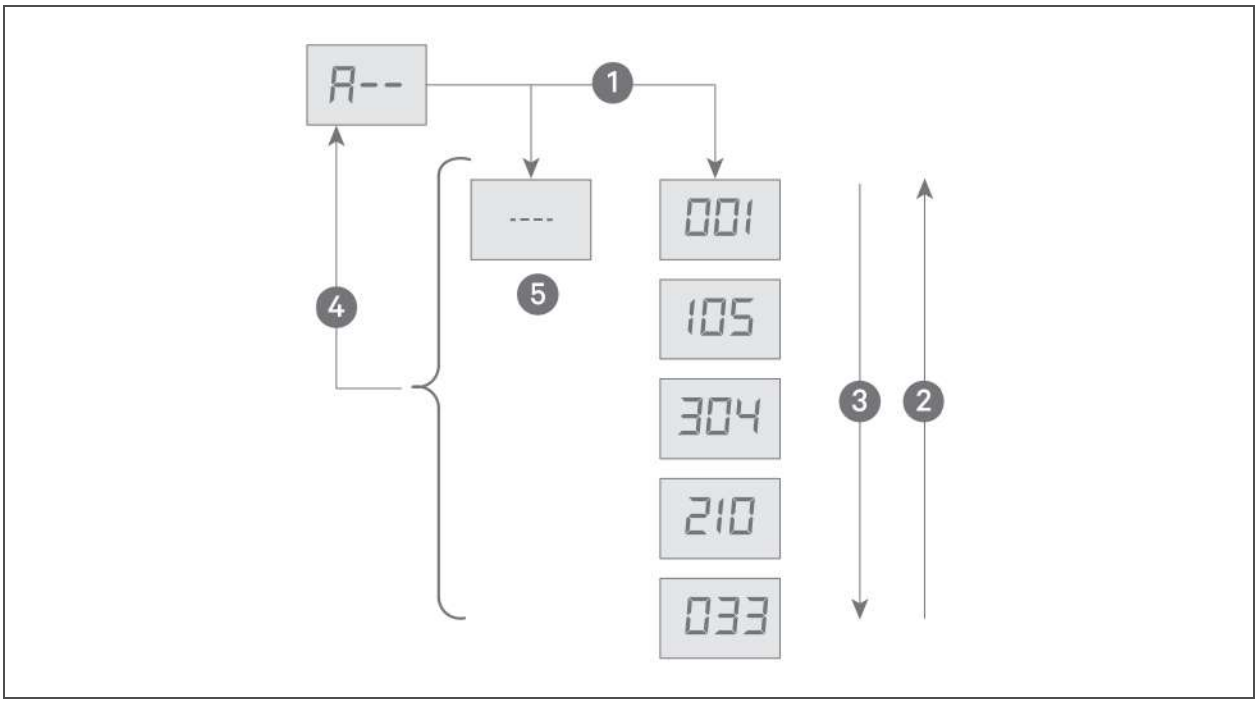
Item ID	Meaning	Units (C90)	
		Imperial	Metric
F00	Condenser pressure 1	psi	bar
F01	Condenser pressure 2	psi	bar
F02	Ambient temperature	°F	°C
F03	Refrigerant temperature 1	°F	°C
F04	Refrigerant temperature 2	°F	°C
F10	EC Fan 1 actual speed	RPM	RPM
F11	EC Fan 1 requested speed	%	%
F12	EC Fan 1 power	kW	kW
F13	EC Fan 1 firmware version	Hex format	Hex format
F20	EC Fan 2 actual speed	RPM	RPM
F21	EC Fan 2 requested speed	%	%
F22	EC Fan 2 power	kW	kW
F23	EC Fan 2 firmware version	Hex format	Hex format
F30	EC Fan 3 actual speed	RPM	RPM
F31	EC Fan 3 requested speed	%	%
F32	EC Fan 3 power	kW	kW
F33	EC Fan 3 firmware version	Hex format	Hex format
F40	EC Fan 4 actual speed	RPM	RPM
F41	EC Fan 4 requested speed	%	%
F42	EC Fan 4 power	kW	kW
F43	EC Fan 4 firmware version	Hex format	Hex format
F50	Subcooling 1	°F	°C
F51	Subcooling 2	°F	°C
F90	Firmware Version Major		1.02.004
F91	Firmware Version Minor	—	
F92	Firmware Version Build	—	

Source: 303847 Rev. 5

10.1.4 Active Alarms Menu

In the active-alarms menu, A——, press ENT to enter the active-alarm items, which displays all the active alarms of condenser, see Table 9.2 on page 57, and Table 9.3 on page 58, for descriptions of the system and EC-fan alarms. When there are multiple alarms, the IDs display by order received/initiated with the most-recent alarm displayed first. Figure 9.6 below, shows the operation and structure of active alarms menu.

Figure 9.6 Active alarms menu

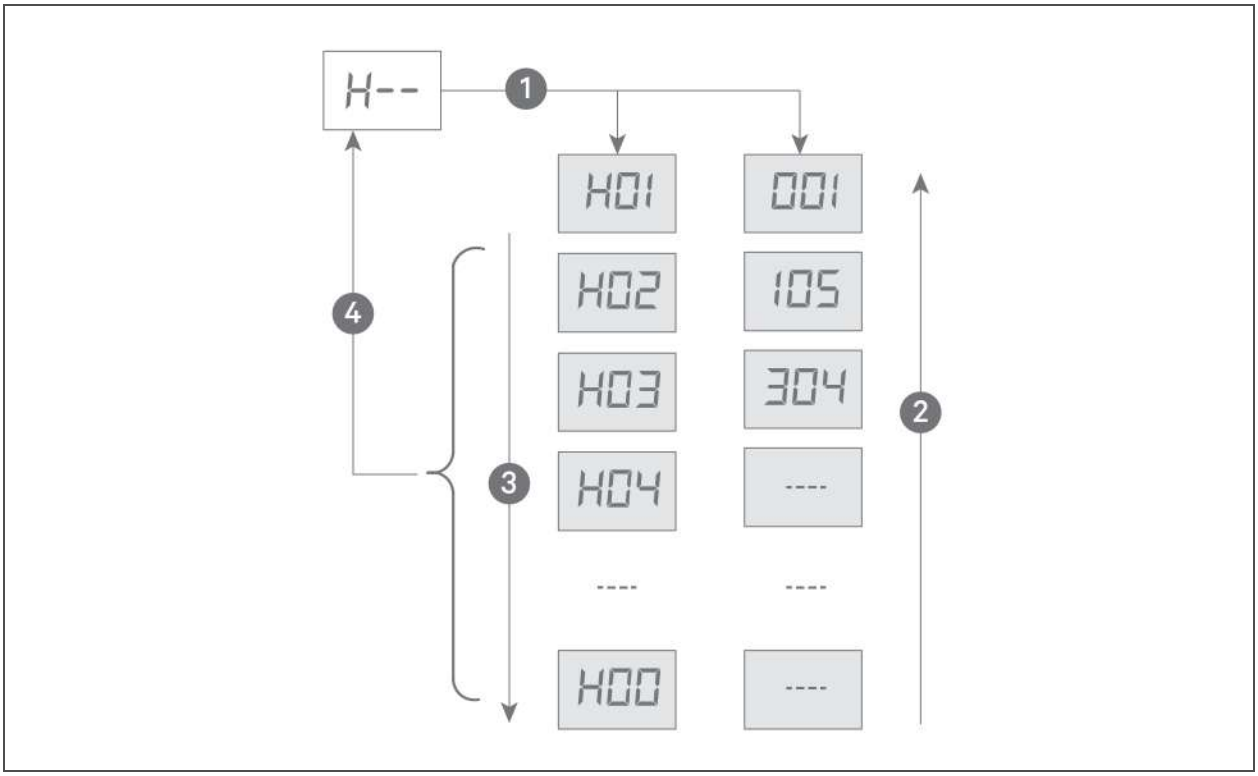


Item	Description
1	Pressing ENT displays dashes to indicate no alarm, or displays the most-recent alarm ID first then in the order received/initiated. See Table 9.2 on page 57, and Table 9.3 on page 58, for a description of the alarm IDs.
2	Pressing up arrow, cycles "up" through the alarm IDs.
3	Pressing down arrow, cycles "down" through the alarm IDs.
4	Pressing ESC returns to the active-alarms menu.
5	Dashes-only display indicates no active alarms.

10.1.5 History Alarms Menu

In the history-alarms menu, H——, press ENT to enter the history-alarm items, which displays 100 history alarm records of the condenser, see Table 9.2 on page 57, and Table 9.3 on page 58, for descriptions of the system and EC-fan alarms. The item ID is the sequence number of the history alarms. The item ID and alarm-information ID display alternately. When there are no alarms, dashes "–––" display. You can clear the alarm history using the C98 configuration-menu item. Figure 9.7 on the next page, shows the operation and items structure.

Figure 9.7 History alarms menu



Item	Description
1	Pressing ENT displays the history alarm item(s), which alternately displays the sequence number and the alarm ID.
2	Pressing up arrow, cycles "up" through the sequence numbers.
3	Pressing down arrow, cycles "down" through the sequence numbers.
4	Pressing ESC returns to the history-alarms menu.

Table 9.2 System alarm information

Alarm ID	Meaning	Possible Cause	Handling Method
000	CAN communication failure	Communication circuit missing or damaged	Check communication circuit. Ignore alarm on condensers without CAN connections
001	Ethernet communication failure	Ethernet hardware or connection failure	Ignore alarm, Ethernet connection is not present
002	USB communication failure	USB device or file is damaged.	Replace USB device or file.
003	Data corruption	Memory chip is damaged	Replace PCB board
004	System error	Internal error	Reboot. If reboot fails, consult factory.

Table 9.2 System alarm information (continued)

Alarm ID	Meaning	Possible Cause	Handling Method
005	Remote shutdown	1. Remote shutdown signal is available 2. TB38 is not connected	For Cause 1, check the remote shutdown signal. For Cause 2, connect TB38.
006	Shutdown due to EC Fan alarm	All fans have failed	Consult factory
007	SPD alarm	SPD damaged	Replace SPD
008	Condenser pressure Sensor 2 failure	Condenser pressure Sensor 1 damaged	Replace condenser pressure Sensor 1
009	Condenser pressure Sensor 2 failure	Condenser pressure Sensor 2 damaged	Replace condenser pressure Sensor 2
010	Condenser pressure 1 high alarm	High pressure: Fan failure, clogged coils. Low pressure: Loss of charge	High-pressure alarms: Fix fan and clean coil. Low-pressure alarms: Check for refrigerant leak.
011	Condenser pressure 2 high alarm		
012	Condenser pressure 1 low alarm		
013	Condenser pressure 2 low alarm		
014	EC Fan speed mode maximum must be overridden due to condenser pressure 1 high	Condenser pressure 1 high	No action is needed.
015	EC Fan speed mode maximum must be overridden due to condenser pressure 2 high	Condenser pressure 2 high	No action is needed.
016	Ambient temperature sensor failure	Ambient temperature sensor damaged	Replace ambient temperature sensor
017	Ambient temperature high alarm	Ambient temperature high	No action is needed.
018	Ambient temperature low alarm	Ambient temperature low	No action is needed.
019	Condenser temperature Sensor 2 failure	Condenser temperature Sensor 2 damaged	Replace condenser temperature Sensor 1
020	Condenser temperature Sensor 2 failure	Condenser temperature Sensor 2 damaged	Replace condenser temperature Sensor 2
021	Condenser temperature 1 high alarm	High temperature: Fan failure, clogged coils. Low temperature: Consult factory	High-temperature alarms: Fix fan and clean coils. Low-temperature alarms: consult factory.
022	Condenser temperature 2 high alarm		
023	Condenser temperature 1 low alarm		
024	Condenser temperature 2 low alarm		
025	EC Fan speed mode maximum must be overridden due to refrigerant temperature 1 high	Refrigerant temperature 1 high	No action is needed.
026	EC Fan speed mode maximum must be overridden due to refrigerant temperature 2 high	Refrigerant temperature 2 high	No action is needed.

NOTE: In Table 9.3 below, (1-4) indicates the EC-fan addresses. For example, (1-4) 00 means 100 for EC Fan1, and means 200 for EC Fan2, and means 300 for EC Fan3, and means 400 for EC Fan4.

Table 9.3 EC Fan alarm information

Alarm ID	Meaning	Possible Cause	Handling Method
(1-4) 00	EC Fan high link current	1. EC Fan is locked. 2. EC Fan is damaged.	For cause 1, check if EC Fan is locked. For cause 2, replace EC Fan
(1-4) 01	EC Fan drive error	EC Fan is damaged.	Replace EC Fan
(1-4) 02	EC Fan earth to ground fault	EC Fan is damaged.	Replace EC Fan
(1-4) 03	EC Fan electronics heat sink thermal overload	1. EC Fan is locked. 2. EC Fan is damaged. 3. Ambient temperature is too high	For cause 1, check if EC Fan is locked. For cause 2, replace EC Fan For cause 3, check ambient temperature.
(1-4) 04	EC Fan Hall failure	EC Fan is damaged.	Replace EC Fan
(1-4) 05	EC Fan IGBT failure	EC Fan is damaged.	Replace EC Fan
(1-4) 06	EC Fan line fault	Power supply abnormal	Check power supply
(1-4) 07	EC Fan motor locked	Motor is locked	Check if EC Fan is locked.
(1-4) 08	EC Fan motor thermal overload	1. EC Fan is locked. 2. EC Fan is damaged. 3. Ambient temperature is too high	For cause 1, check if EC Fan is locked. For cause 2, replace EC Fan For cause 3, check ambient temperature.
(1-4) 09	EC Fan phase failure alarm	Phase failure	Check power supply
(1-4) 10	EC Fan-specific uncategorized alarm detected	Internal EC Fan issue	Re-boot condenser if fans not running. If alarm persists and fans not running, replace fan.
(1-4) 11	EC Fan-specific uncategorized warning detected		
(1-4) 12	EC Fan electronics high-temperature condition.	1. EC Fan is locked. 2. EC Fan is damaged. 3. Ambient temperature is too high	For cause 1, check if EC Fan is locked. For cause 2, replace EC Fan For cause 3, check ambient temperature.
(1-4) 13	EC Fan high link voltage	1. EC Fan input power supply high voltage 2. EC Fan is damaged.	For cause 1, measure power supply voltage and check if the voltage is normal For cause 2, replace EC Fan
(1-4) 14	EC Fan low link voltage	1. EC Fan input power supply low voltage 2. EC Fan detection error	
(1-4) 15	EC Fan 485 communication failure	1. Communication between EC Fan and PCB board failure 2. EC Fan 485 communication failure 3. Board has problems 4. EC fan not receiving power	For cause 1, check EC Fan communication circuit For cause 2, replace EC Fan For cause 3, replace PCB board For cause 4, check fan model is not set for "0", check that the contactor for the particular fan is energized, and check fan fuses.

11 MAINTENANCE

WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious 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® controller 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 controller. The factory-supplied 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 electric shock. Can cause equipment damage, injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within any electric connection enclosures. Service and maintenance work must be performed only by properly trained and qualified personnel and in accordance with applicable regulations and manufacturers' specifications. Opening or removing the covers to any equipment may expose personnel to lethal voltages within the unit even when it is apparently not operating and the input wiring is disconnected from the electrical source.

WARNING! Risk of contact with high-speed rotating fan blades. Can cause serious injury or death. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. If control voltage is applied, the fan motor can restart without warning after a power failure.

- 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.
- We recommend the use of trained and authorized service personnel, extended service contracts and factory-specified replacement parts. Contact your Vertiv sales representative.

11.1 General Condenser Maintenance

Record the unit model number, serial number and voltage. Please record those numbers in the spaces below.

- Model Number _____
- Serial Number _____
- Voltage / Phase / Frequency _____

Periodic attention is necessary for continued satisfactory operation of your unit. Restricted air flow through the condenser coil, reduced airflow from non-functioning fans and low refrigerant system charge levels will reduce the operating efficiency of the unit and can result in high condensing temperatures and loss of cooling. In winter, do not permit snow to accumulate around the sides or underneath the condenser coil.

Monthly and semi-annual inspections and maintenance are recommended for proper system operation. Use copies of for each of these inspections.

If performance or operation problem are detected at anytime, refer to for required action.

11.2 Condenser Cleaning

Keeping the outdoor condenser coils clean is an important factor in maintaining peak efficiency, reliability, and long life of the equipment. The unit will operate more efficiently with frequent cleanings. If you delay cleaning until heavy build-up occurs, head-pressure problems with the evaporator units can develop.

11.2.1 When to Clean the Condenser Coil

Normal conditions typically dictate cleaning twice a year, in spring and fall. On-site or area conditions such as cottonwood trees, construction, etc., can increase cleaning frequency. On your standard monthly preventive maintenance schedule, we recommend a visual inspection of the coil to monitor conditions.

11.2.2 What to Use to Clean the Condenser Coil

NOTICE

Risk of improper cleaning agent selection, including non-base paint solvents. Can cause building and equipment damage and loss of refrigerant charge.

Using acid-based or sodium hydroxide-based cleaners can damage the condenser coil and cause a loss of charge. This could cause equipment damage as well as damage to the surrounding structure.

Start with removing dirt, leaves, fibers, etc. with a soft brush or vacuum cleaner fitted with a soft-brush attachment. Do not use a wire brush or scrape the coil with a metal vacuum hose. The best overall condenser coil cleaner is plain water. If the coil is maintained and cleaned at regular intervals, water is sufficient to remove dirt and debris from the fins. Water pressure from a garden hose and sprayer usually works well. If a pressure washer is used, make sure that the equipment is set to a lower pressure setting and that the nozzle is set to the fan spray, not stream. Otherwise, damage to the fins could result. If a cleaner is required, we recommend using a neutral cleaner, neither acidic nor base. Acid-type cleaners can damage the coil fins and surrounding areas. Many sites do not allow the use of acidic cleaners for environmental reasons.

11.2.3 Cleaning the Condenser Coil

The condenser coil is accessible through the cleaning window, which allows you to clean the coil without removing the fans from the unit.

To clean the coil:

1. Disconnect the power supply before working on the unit.
2. Open the cleaning window(s) on the side of the condenser by loosening the mounting screws.
3. Insert a spray nozzle on the end of a suitable extension and apply the water/cleaning solution, working back and forth across the coil face.
   The solution pushes dirt and debris out the bottom of the coil.
   - If you are using a cleaner along with the spraying process, follow recommended manufacturer instructions and be sure to rinse the coil thoroughly. Any residue left on the coil can act as a magnet to dirt.
4. Reinstall the cleaning window(s) and reconnect the power supply to the condenser.
5. Coils will possibly retain water after cleaning and rinsing, so manually reverse the fans briefly using condenser controls to speed drying of the coils and prevent a possible high-head-pressure condition when the condenser is put back into service.

NOTE: Spraying the coil from the outside repeatedly can push a majority of the dirt to the inner section of the fins and continue to restrict air flow. Keep in mind you may not have the luxury of shutting the unit(s) down for an extended time. A scheduled shutdown with the operator may be in order.

11.3 Replacing the Condenser Fan

WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious 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® controller 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 controller. The factory-supplied 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 electric shock. Can cause serious injury or death. Open all local and remote electric power supply disconnect switches and verify with a voltmeter that power is off before working within the component electric-connection enclosures. Fan-motor controls can maintain an electric charge for 10 minutes after power is disconnected. Wait 10 minutes after power is verified as off before working within the fan electric control/connection enclosures.

WARNING! Risk of contact with high-speed, rotating fan impeller blades. Can cause injury or death. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is off, and verify that all fan impellers have stopped rotating before working in the unit cabinet.

CAUTION: Risk of contact with hot surfaces. Can cause burn injury. The EC fans, electronics housing, humidifier pan and water contained within are extremely hot during operation. Allow sufficient time for them to cool to a touch-safe temperature before handling. Use extreme caution and wear appropriate, OSHA-approved PPE when replacing or performing maintenance on the EC fans.

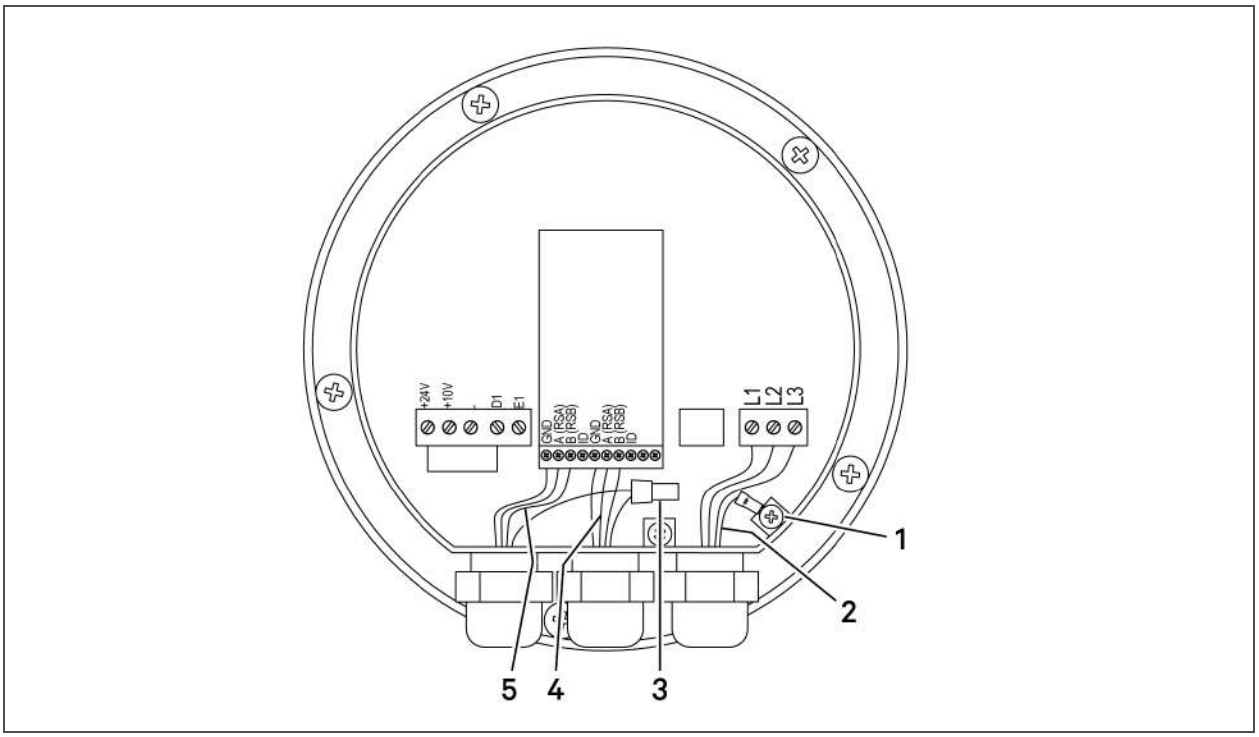
CAUTION: Risk of improper moving, lifting and handling. Can cause equipment damage or injury. Only properly trained and qualified personnel should work on this equipment. Fan modules for MCL models weigh in excess of 92 lb (40.8 kg) each and fan modules for MCS and MCM models weigh in excess of 40 lb (18.1 kg) each. Use proper lifting techniques and wear appropriate, OSHA-approved PPE to avoid injury and dropping the fan module during removal. Equipment used in handling/lifting, and/or installing the fan assembly must meet OSHA requirements. Use handling/lifting equipment rated for the weight of the fan assembly. Use ladders rated for the weight of the fan assembly and technicians if used during installation. Refer to handling/lifting, and/or installation equipment operating manual for manufacturer's safety requirements and operating procedures.

NOTE: If at any time a parameter is entered and the condenser display does not show 888 or if the display shows Err, re-enter the parameter. If the display still shows Err after ENT is pressed, power cycle the control board by unplugging P24, waiting 15 seconds and plugging P24 back in. Contact the factory if the parameter still displays Err after ENT is pressed.

To replace the fan:

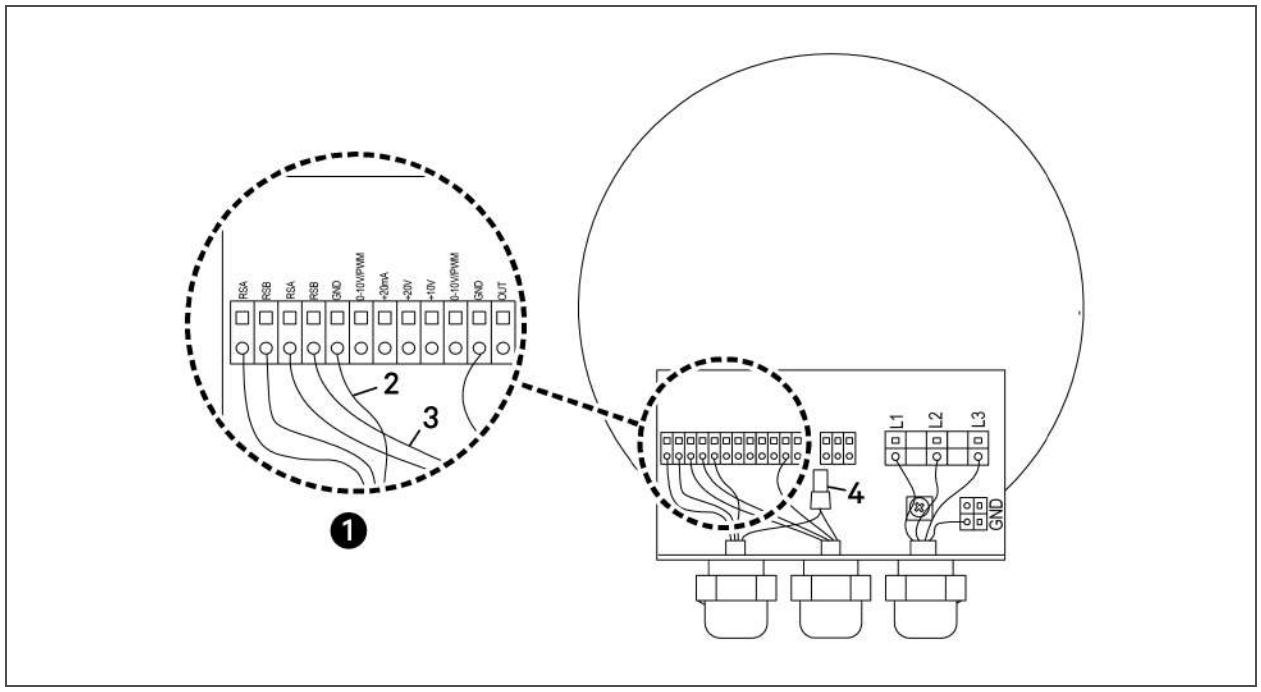
1. Turn Off power to the unit using the disconnect.
2. Use a voltmeter verify that voltage is no longer present at the unit. Wait a minimum of 10 minutes to allow the EC fan capacitors to discharge before proceeding.
3. Remove the fan cover, disconnect electrical connections internal to the EC fan and remove the cable glands from the EC fan to be replaced (see Figure 10.1 on the facing page, and Figure 10.2 on page 64.

Figure 10.1 Internal wiring of Ziehl-Abegg fan in Condenser



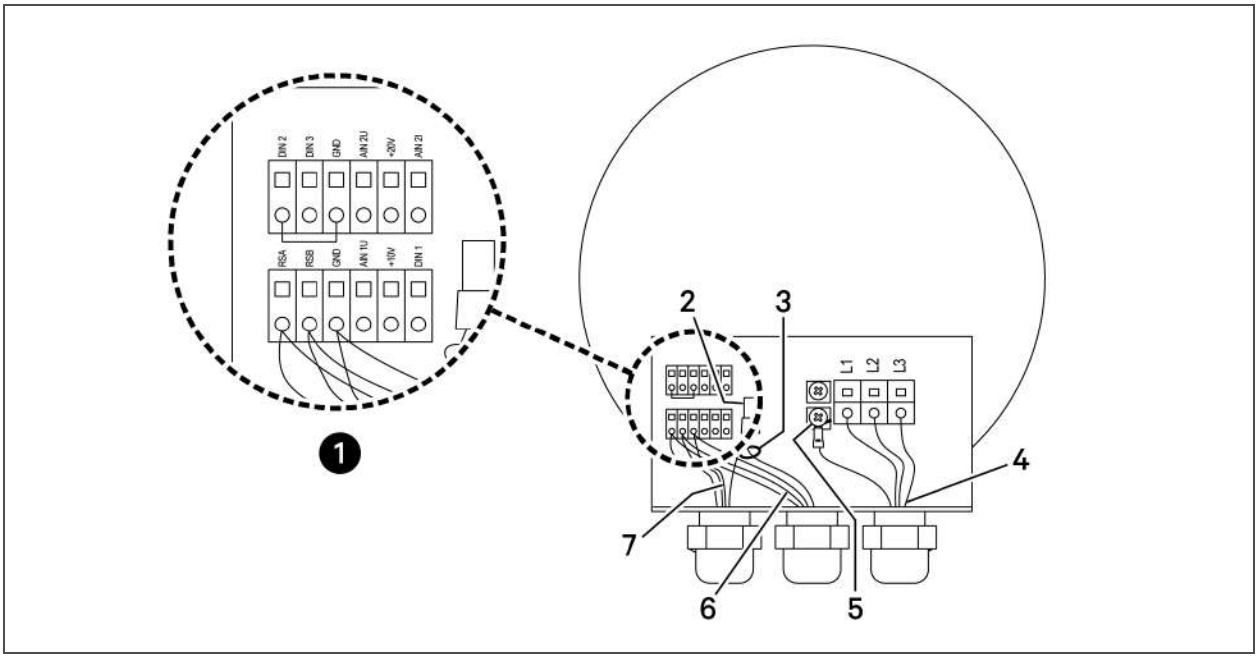
Item	Description
1	GND
2	Edge of cable's outer jacket should only extend far enough into the enclosure to make the electrical connections.
3	Not used on last fan.
4	Communication-cable connection to the next fan. Not used on last fan.
5	Communication-cable connection from the previous fan or electrical box.

Figure 10.2 Internal wiring of small and medium EBM fan in MCS- or MCM-model Condenser



Item	Description
1	Wiring terminal detail.
2	Communication cable from the previous fan or from the electric box.
3	Communication cable connected to the next fan (not used on the last fan).
4	Not used on last fan.

Figure 10.3 Internal wiring of large EBM fan in MCL-model Condenser



Item	Description
1	Wiring terminal detail.
2	Not used on last fan.
3	Must be cable-tied together away from high-voltage terminals
4	Edge of out cable jacket should only extend far enough into enclosure to be able to make the electrical connections.
5	GND
6	Communication cable connected to the next fan (not used on the last fan).
7	Communication cable from the previous fan or from the electric box.

4. Remove hardware that attaches the EC fan to the condenser.
5. Use lifting equipment or an adequate number of personnel to remove the EC fan from the condenser.

NOTE: A spreader bar may be required for the lifting equipment if only one technician is performing the fan replacement.

6. Install a spreader bar over the new EC fan if only one technician is performing the fan replacement.
7. Verify that the wire harness on the new EC fan is secured out of the way before lifting the fan.
8. Verify that the lifting cable/chains are not in contact with fan blades before lifting the new fan into place on the condenser.
9. Install the new fan in the condenser and connect the mounting hardware.
10. Verify that the fan blades rotate freely when installed in unit.

11. Install the new cable glands included with the new EC Fan. Torque for the cable glands is:
    - 630-mm and 710-mm fans: 19.5 to 24.75 in-lb (2.2 to 2.8 Nm)
    - 800-mm fans: 32.75 to 38 in-lb (3.7 to 4.3Nm)

    Dispose of the old cable glands once the new glands are installed.
12. Add a compression nut to the wire—Do not tighten the nut.
13. Reconnect the wiring to the proper terminals and verify that the run jumper is in place. See **Figure 10.1** on page 63, and **Figure 10.2** on page 64, for wiring details.
    - The torque for the electrical terminals is 11.5 in-lb (1.3 Nm). Tighten the compression nut to a torque of 22 in-lb (2.5 Nm).
14. With the PCB powered, the board display should read *F00*. Refer to and.
15. Press the **ESC** button.
16. Press the **UP**-arrow button once:
    - If *P- -* is displayed, perform step 17.
    - if *P- -* is not displayed, perform steps 18 through 46.
17. If *P- -* is displayed, press the **ENT** button to enter the P- - Menu.

    The P- - Menu allows compact set-up/preparation of the condenser in the factory or in the field. Use the functions described in **Table 10.1** on the facing page, to establish a default control configuration for the board.

NOTE: The complete list of P--, C--, and F-- parameters is located inside the lid of the electrical-box panel.

Table 10.1 P-- menu items and definitions

Item ID	Meaning	Default	Notes
P01	Enter Preparation Mode	0	Setting this value to '1' enables preparation mode. All other 'P—'menu items are disabled until this value is '1'. Note that control operations may be affected during preparation mode, therefore the cooling unit should be off. Setting this value back to '0' creates new default values based upon selections in this menu. After default values are established, the board exits preparation mode and reboots.
P02	Automatic VSD Configuration	1	This item should only be used to address the VSDs for the unit. The value entered indicates the model of the VSD: 1 – EBM 2 – Ziehl-Abegg 3 – Fans Tech All fans must be the same model to use this parameter. When *ENT* is pressed, the board will operate and power contactors for the VSDs and assign ModBus addresses. This procedure may take up to 5 minutes to complete.
P03	Refrigerant Type	2	1 = R22 2 = R407C 3 = R410A
P04	Number of Circuits	1	1 = Single Circuit 2 = Dual Circuit
P05	Liebert® Lee Temp Option	0	0 = No Lee Temp installed 1 = Liebert® Lee-Temp installed
P06	Condenser	1	0 = Small

18. Turn the power On.
19. The control board flashes *F00* on the display when it has completed its boot cycle.
20. Press the **ESC** button.
21. Use the **UP** or **DOWN** arrow button until *C--* displays.
22. Press the **ENT** button.
23. Use the **UP** or **DOWN** arrow button until *C03* displays
24. Press the ENT button.
25. Use the **UP** or **DOWN** arrow button to select one of three options:

Configuration Code	Fan #	Value
C03	Fan 1	0 = No Fan 1 = EBM Papst 2 = Ziehl-Abegg
C04	Fan 2	
C05	Fan 3	
C06	Fan 4	

26. Press the **ENT** button.
27. If the new value is entered into the control board, the display flashes "*888*."

28. Press the ESC button to display *C03* .
29. Repeat steps 20 through 27 for the remaining fans' configuration codes, *C04, C05* and *C06*.
30. Unplug all the contactor output plugs except for the fan to be addressed. Plugs are:
    - P23 = Fan 1
    - P27 = Fan 2
    - P28 = Fan 3
    - P29 = Fan 4
31. Wait 30 seconds.
32. Use the UP or DOWN arrow button to select one of the following parameters.

    The correct parameter depends on the supplier of the fan that will be addressed.

    - C00—EBM Papst fan
    - C01—Ziehl-Abegg fan
33. Press the ENT button.
34. Use the UP or DOWN arrow button to the correct fan address number. Fan 1 should be 1 (fan closest to electric panel end). Fan 2 should be 2, etc.
35. Press the ENT button. The display flashes "*888* " when the command is accepted.
36. Press the ESC button for the parameter to be shown on the display.
37. Repeat steps 30 through 36 for the rest of the fans that need to be addressed.
38. After the last fan is addressed, unplug the power plug, P24, from the control board, and wait 30 seconds.
39. Plug all the contactor output plugs back into the board in their correct positions.
40. Plug P24 back into the control board.
41. After the control board completes its boot cycle and all the contactors are energized, wait 5 seconds.
42. Press the ESC button.
43. Use the UP or DOWN arrow button until *A--* is on the display.
44. Press ENT button.
45. Use the UP or DOWN arrow button to see if any of the following errors are shown.

    115: Unable to communicate with Fan 1.

    215: Unable to communicate with Fan 2.

    315: Unable to communicate with Fan 3.

    415: Unable to communicate with Fan 4.

    - If any of these errors appear, check the communication wiring at the problem fan and the fan before it.
    - If the wiring is correct and properly wired to the terminal, repeat the fan addressing procedure in steps 30 through 36.
46. If none of the errors listed in step 45 displays, press the ESC button.

11.3.1 Verifying the Fan Address

To verify that each fan has a unique address:

1. Use the UP or DOWN arrow button until *C--* displays.
2. Press the ENT button.
3. In the Manual/System Control Selection parameter use the UP or DOWN arrow button until *C24* displays.
4. In the Manual Control configuration parameter, press the ENT button.
5. Use the UP or DOWN arrow button to select *0*.
6. Press the ENT button.
   The reads "*888*" if the command is accepted.
7. Press the ESC button to display *C24* .
8. Use the UP or DOWN arrow button until *C34* displays.
9. Press ENT button.
   If Fan 1 is running, the fans speed should display in terms of percentage of full speed. If Fan 1 is not running, *0.00* should display.
10. Use the UP or DOWN arrow button to enter *100%* speed.
11. Press the ENT button.
    The display reads "*888*" if the command is accepted.
    - Fan 1 should speed up to 100%, and all the other fans should stay the same speed.
12. If Fan 1 is not running or if any of the other fans also speed up to 100%, steps 30 through 36 of Replacing the Condenser Fan on page 61, must be repeated.
13. Press the ESC button for the parameter to be shown on the display.
14. Repeat steps 3 through 8 for the rest of the fans, if present.
    - C35: for Fan 2.
    - C36: for Fan 3.
    - C37: for Fan 4.

NOTE: All fans should be at 100% speed.

15. Use the UP or DOWN arrow button until *C24* displays.
16. Press the ENT button.
17. In the System Control configuration parameter, use the UP or DOWN arrow button to select *1*.
18. Press the ENT button.
    The display flashes "*888*" if the command is accepted.
19. Press the ESC button to display *C24*.
    All fans should return to a normal speed based on the pressure input and the state of indoor unit's compressor.

11.4 Replacing the Premium-efficiency Control Board

Use these steps to replace the Premium-efficiency Control Board in the condenser.

WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious 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® controller 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 controller. The factory-supplied 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.

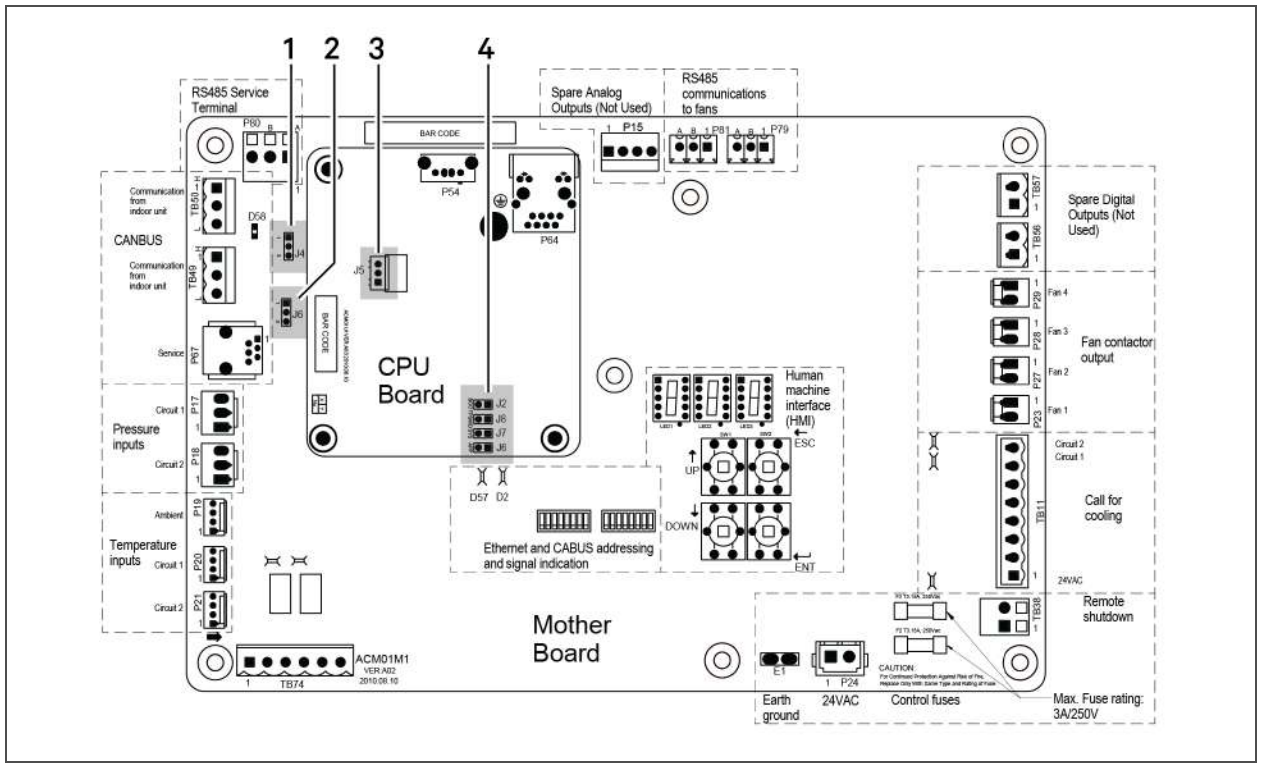
11.4.1 Preparing to Replace the Board

1. Verify that the following jumpers are installed on the new board (see **Figure 10.4** on the facing page):
   - Jumper at J4 and J6 on Pins 2 and 3.
   - Jumper on J2.
   - Jumper on J5 on Pins 1 and 2.
2. Locate the latest revision of the HMI parameters label, 303847P1, included with the new control board.

NOTE: In Figure 10.4 on the facing page, J6 is the CANbus termination jumper. J4 is the RS485 service termination jumper. If the condenser is the last device in the CANbus communication line, the jumper must be placed between Pins 1 and 2 of J6. If the condenser is not the last device in the CANbus communication line, the jumpers on J6 must be placed on Pins 2 and 3. If the jumper is not in the correct positions, CANbus communication errors may occur. The jumper on J4 will always be placed between Pins 1 and 2.

NOTE: In Figure 10.4 on the facing page, a jumper must be present at J2. If a jumper is not present, the control board will not boot properly during power startup.

Figure 10.4 Jumper locations on Control Board



Item	Description
1	J4, RS485 service termination jumper
2	J6, Canbus termination jumper
3	J5
4	J2

11.4.2 Installing the Replacement Board

WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause serious 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® controller 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 controller. The factory-supplied 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.

1. Turn Off the disconnect switch on the condenser enclosure cover.
2. Open the control enclosure cover.
3. Manually turn On the disconnect switch.

NOTE: Power is On and a shock hazard exists with exposure to hazardous voltage components.

4. If the board can still be powered up and has a display, record the parameter settings.
   - To obtain parameters go to the *C*-- menu and press the UP or DOWN arrow button to read and record the values for C03-09 and C27.
5. Record all of the DIP switch positions for the CANbus DIP switch package. Retain these for setting up the new board.
6. Record the positions of the jumpers for J2, J4, J5 and J6 on control board in the unit. Retain these for setting up the new board.
7. Disconnect power from the condenser by turning Off the main disconnect switch.
8. Use a voltmeter to verify that voltage is no longer present in the unit.
9. Remove the plugs and field-installed wires from the old board. Note the polarity for the CANbus wiring going to P49 and P50, if present.
10. Mark wires P49-1, P49-3, etc, if they are not already marked.
11. Remove the mechanical fasteners holding the control board in place and remove the old control board.
12. Install the new control board using the fasteners removed in step 11.
13. Reattach the plugs. Refer to the hot-stamps on the wire harnesses that correspond to the correct plug on the board. Verify that the plugs are installed properly.
14. Change the CANbus DIP switch positions so they match the control board that was removed. If the condenser is the second condenser on the CANbus communication line, set Position 1 of the CANbus DIP switch from On to Off.
15. Change the jumper positions for J2, J4, J5 and J6 to match the control board that was removed. If the condenser is the last device on the CANbus communication line, move the jumper at J6 from Pins 2 and 3 to Pins 1 and 2 (see Figure 10.4 on the previous page).
16. Power up the unit.

17. Change the parameters to match the parameters from the control board that was removed if they were obtained from the old board in step 4. See step 18 if the parameters were unavailable.
18. If the old board parameters were unavailable, use the new HMI label included in kit to obtain the proper settings. Parameters C03, C04, C05 and C06 must be programmed with the proper EC fan supplier used on the unit.
19. Address the fans (refer to Replacing the Condenser Fan on page 61).
20. Compare the HMI label on the unit with the latest revision.
    - If there are differences, clean and dry the surface of the old HMI label; attach the new label on top of the old label, covering the old label with the new one.
21. Verify that the control board is reading pressure and temperature.
22. Verify that there are no communication alarms with the fans or with the cooling unit the condenser is serving.
23. Verify proper fan operation by adjusting the cooling unit that this condenser serves so that it calls for cooling.

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12 PREVENTIVE MAINTENANCE CHECKLIST

Source: DPN003119, Rev 1

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

Not all units will have all components. To determine your unit's configuration, compare the Indoor Unit Model # above and the information in the Components and Nomenclature section.

Good maintenance practices are essential to minimizing operation cost and maximizing product life. Read and follow all applicable maintenance checks listed below. At a minimum, these checks should be performed semi-annually. However, maintenance intervals may need to be more frequent based on site-specific conditions. Review the unit user manual for further information on unit operation. We recommend the use of trained and authorized service personnel, extended service contracts, and factory-certified replacement parts. Contact your local sales representative for more details.

Check all that apply:

1. Coil clean and free of debris
2. Fans free of debris
3. Fans securely mounted
4. Motor bearings in good condition
5. Check all refrigerant lines for vibration isolation. Support as necessary
6. Check/Re-torque wire connections
7. Check contactors for pitting (replace if pitted)
8. Check surge-protection device status-indicator lights (if equipped)
9. Verify operation sequence/set points
10. Check refrigerant lines for signs of leaks/repair as found
11. Charge verification:
    a. Outdoor Ambient Temperature _____
    b. Subcooling _____
    c. Indoor-unit Return-air Temperature _____
    d. Sight-glass level (if Lee-Temp or pumped refrigerant) _____
12. Motor amp draw

#1	L1	L2	L3
#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

EconoPhase Pumped-refrigerant Economizer

1. Check for refrigerant leaks
2. Check/Re-torque wire connections
3. Check contactors for pitting (replace if pitted)
4. Verify pump-speed control operation
5. Check pump mounting

MAINTENANCE NOTES

Name

Signature

Company

Make photocopies for your records. Compare readings/information to previous maintenance worksheet.

To locate your local Vertiv representative for Vertiv-engineered parts, check https://www.vertivco.com/en-us/support/ or Call 1-800-543-2778.

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APPENDICES

Appendix A: Technical Support and Contacts

A.1 Technical Support/Service in the United States

Vertiv™ Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Liebert® Thermal Management Products

1-800-543-2778

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

A.2 Locations

United States

Vertiv Headquarters

1050 Dearborn Drive

Columbus, OH, 43085, USA

Europe

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road

Wanchai, Hong Kong

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Appendix B: Optional Configuration for Liebert MC Seismic Application

Electrical wiring, conduit, and/or other connections to the equipment is the responsibility of others. Data and recommendations are supplied in the Submittal Drawings on page 83, and in the unit installation supplement for seismic installation.

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

Table B.1 Seismic-application Drawings

Document Number	Title
DPN002414	Seismic Anchorage Data

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Appendix C: Submittal Drawings

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

Table C.1 Submittal-drawings Contents

Document Number	Title
Planning Dimensions	
DPN003436	Condenser Dimensional Data, MCS028, MCM040, MCL055
DPN003437	Condenser Dimensional Data, MCS056, MCM080, MCL110, dual-circuit
DPN003756	Condenser Dimensional Data, MCM080, MCL110, single-circuit
DPN003438	Condenser Dimensional Data, MCL165
DPN003439	Condenser Dimensional Data, MCM160 and MCL220
Planning Dimensions - Receiver-mounting	
DPN003839	PDX-EEV Receiver mounting for single-circuit MCS028, MCM040, and MCM080
DPN003455	DSE Receiver mounting for single-circuit MCM080
DPN002554	DSE and PDX-EEV Receiver mounting for single-circuit MCL055, MCL110, MCL165, and MCL220 and for dual-circuit MCL110 and MCL220
DPN002383	DSE receiver mounting, MCM160, dual-circuit
Planning - Condenser Elevation Above/Below Indoor Unit	
DPN003954	Condenser without Receiver mounted above/same level/below indoor unit
DPN003993	Condenser with Receiver mounted above/same level as Liebert® PDX with EEV
DPN003994	Condenser with Receiver mounted above/same level as Liebert® DSE models DA050 to DA165
Piping Schematics	
DPN002188	Piping Schematic, Typical Air-cooled DX systems
DPN002858	Piping Schematic, CRV 600-mm (24-in.) DX systems
DPN002808	Piping Schematic, CRV 600-mm (12-in.) DX systems
DPN003730	Piping Schematic, DS DX systems with scroll and digital-scroll compressors
DPN004216	Piping Schematic, DS DX systems with semi-hermetic compressors
DPN002615	Piping Schematic, DSE DA050, DA080, and DA085 systems
DPN002340	Piping Schematic, DSE DA125, DA150, and DA165 systems
DPN002929	Piping Schematic, PDX DX systems with TXV
DPN003843	Piping Schematic, PDX DX systems with EEV
Piping Connections	
DPN002166	Piping, single-circuit, 1, 2, 3, and 4 fan units
DPN002167	Piping, single-circuit with Liebert® Lee-Temp receiver

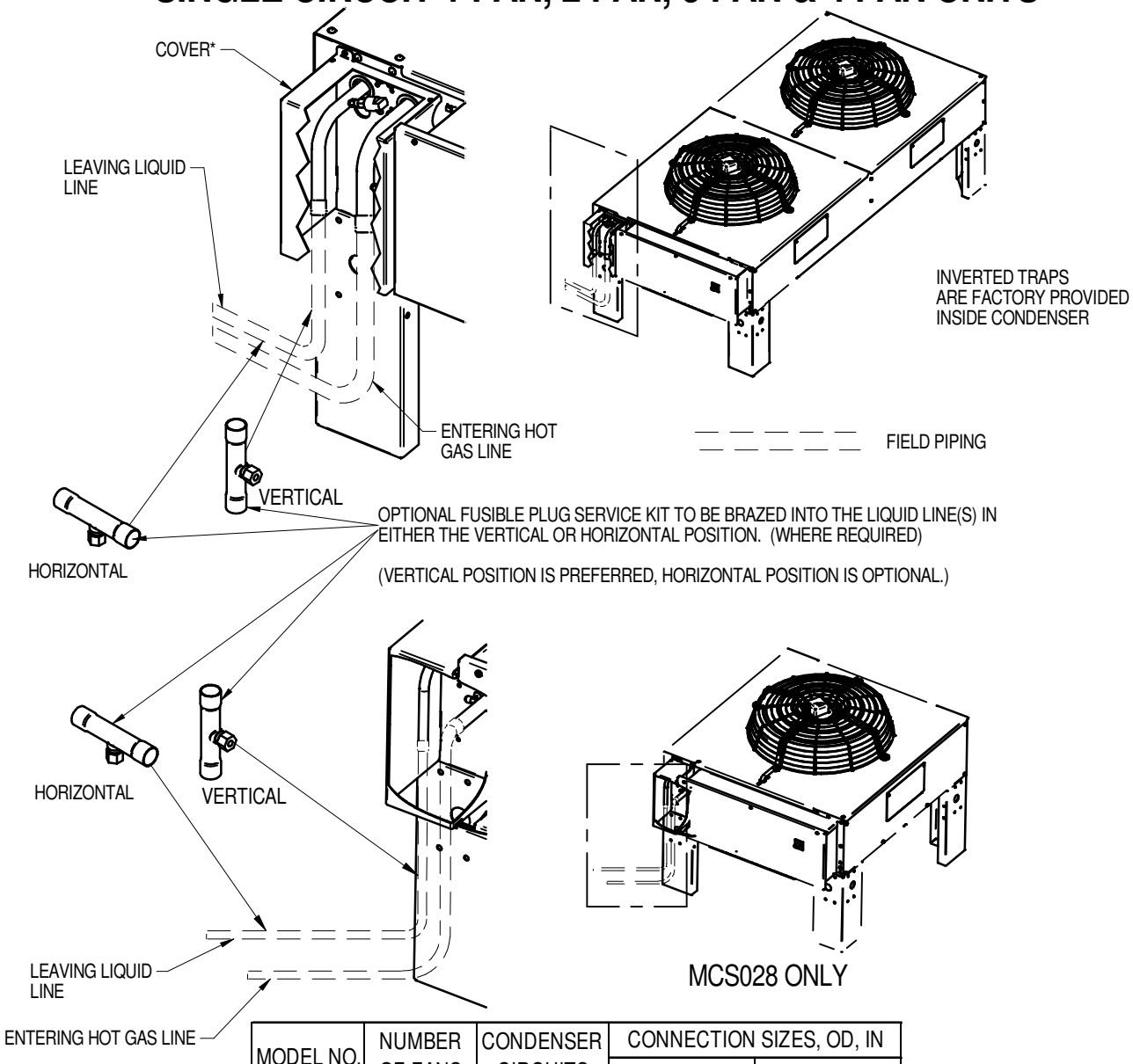
Table C.1 Submittal-drawings Contents (continued)

Document Number	Title
DPN003839	Piping, single-circuit with PDX-EEV Receiver
DPN002425	Piping, dual-circuit, 2 and 4 fan units
DPN002426	Piping, dual-circuit with Liebert® Lee-Temp receiver
Electrical Connections	
DPN002169	Liebert® MC Condenser Electrical Field Connections without Liebert® Lee-Temp™
DPN002374	Liebert® MC Condenser Electrical Field Connections with Liebert® Lee-Temp™
DPN003284	CANbus and Interlock Connections between Liebert® DSE, 1 MC Condenser and Optional EconoPhase Unit
DPN002361	CANbus and Interlock Connections between Liebert® DSE, 2 MC Condensers and Optional EconoPhase Unit
DPN003267	CANbus and Interlock Connections between Liebert® DS and 1 MC Condenser
DPN002841	CANbus and Interlock Connections Between Liebert® CRV 600-mm (24-in.) and MC Condenser
DPN003036	CANbus and Interlock Connections Between Liebert® CRV 300-mm (12-in.) and MC Condenser
DPN003266	CANbus and Interlock Connections Between Liebert® PDX and MC Condenser
DPN003047	Electrical Field Connections, 575-V option
DPN002960	Surge-protective Device Options
Seismic Anchorage Data	
DPN002414	Seismic Anchorage for MC Condensers

LIEBERT MC CONDENSER

PIPING DIMENSIONAL DATA

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

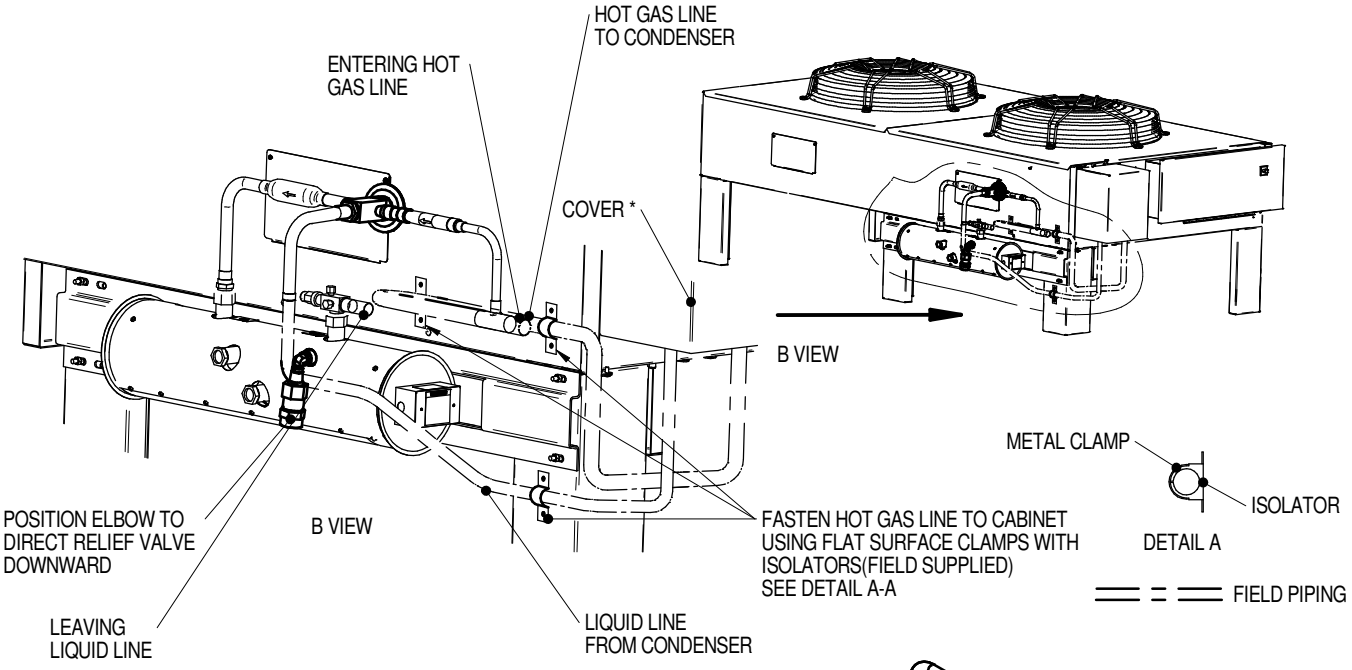


MODEL NO.	NUMBER OF FANS	CONDENSER CIRCUITS	CONNECTION SIZES, OD, IN	
			HOT GAS LINE	LIQUID LINE
MCS 028	1	1	7/8	5/8
MCM 040	1	1	7/8	5/8
MCM 080	2	1	1-1/8	7/8
MCL 055	1	1	1-1/8	7/8
MCL 110	2	1	1-3/8	1-1/8
MCL 165	3	1	1-3/8	1-1/8
MCL 220	4	1	1-5/8	1-3/8

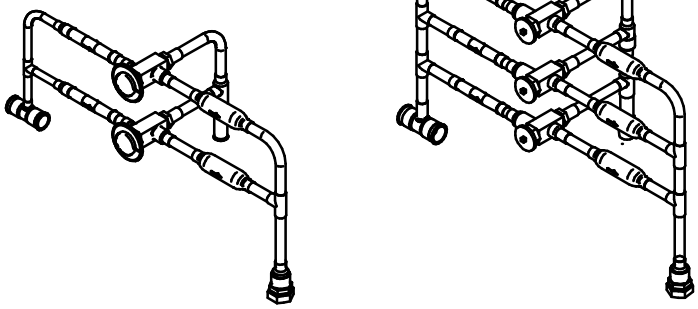
* SHIPPING COVER IS NOT NECESSARY FOR PROPER CONDENSER OPERATION AND MAY BE RECYCLED IF FIELD PIPING INTERFERES WITH PROPER REATTACHMENT.

LIEBERT MC CONDENSER

PIPING LOCATIONS
SINGLE CIRCUIT WITH LEE-TEMP



GENERAL ARRANGEMENT



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

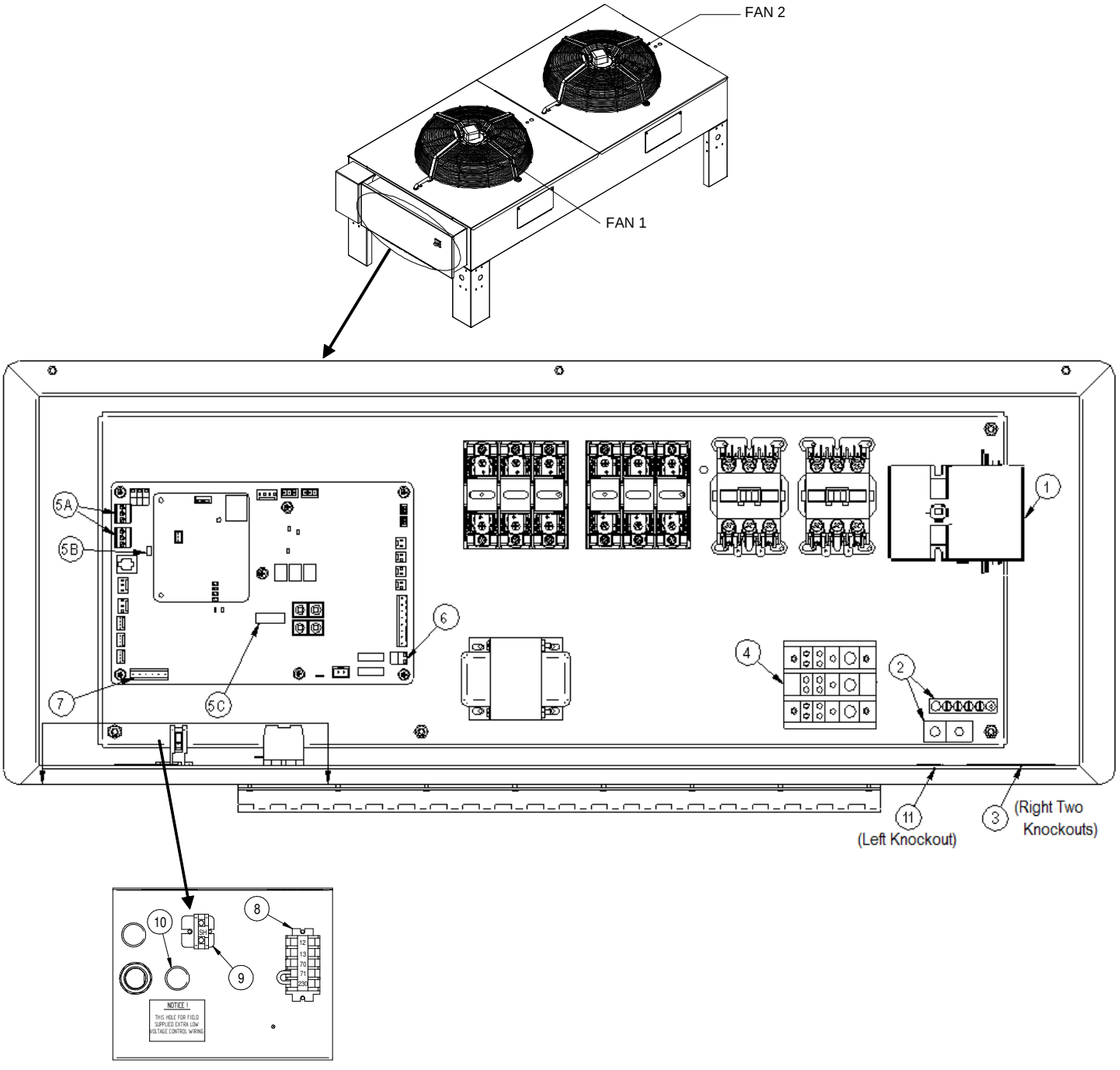
NOTE:

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

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

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

ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL



KEY ELECTRICAL DETAILS:

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

ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL

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

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

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

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

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

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

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

NOTES:

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

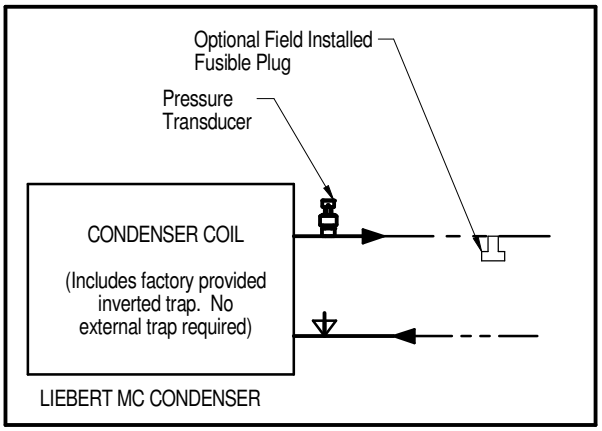
ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL

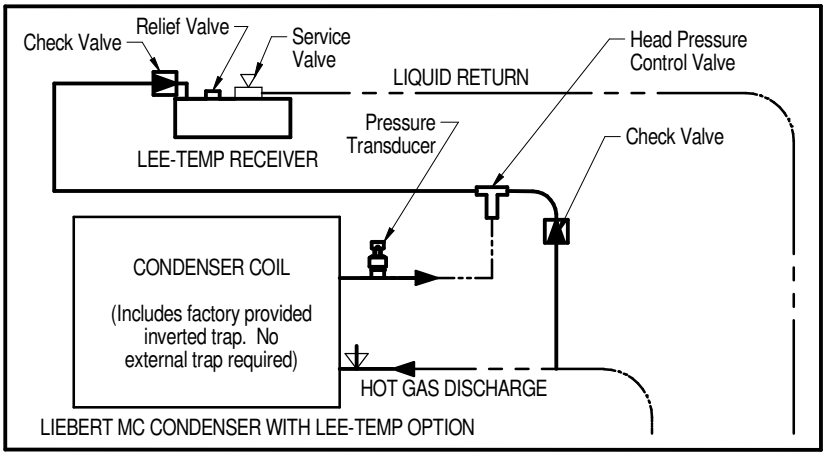
5. All wiring must be sized and selected for insulation case per NEC and other local codes.
6. Do not bend cables to less than four times the diameter of the cable.
7. Do not deform cables when securing in bundles or when hanging them.
8. Avoid running the cables by devices that may introduce noise,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

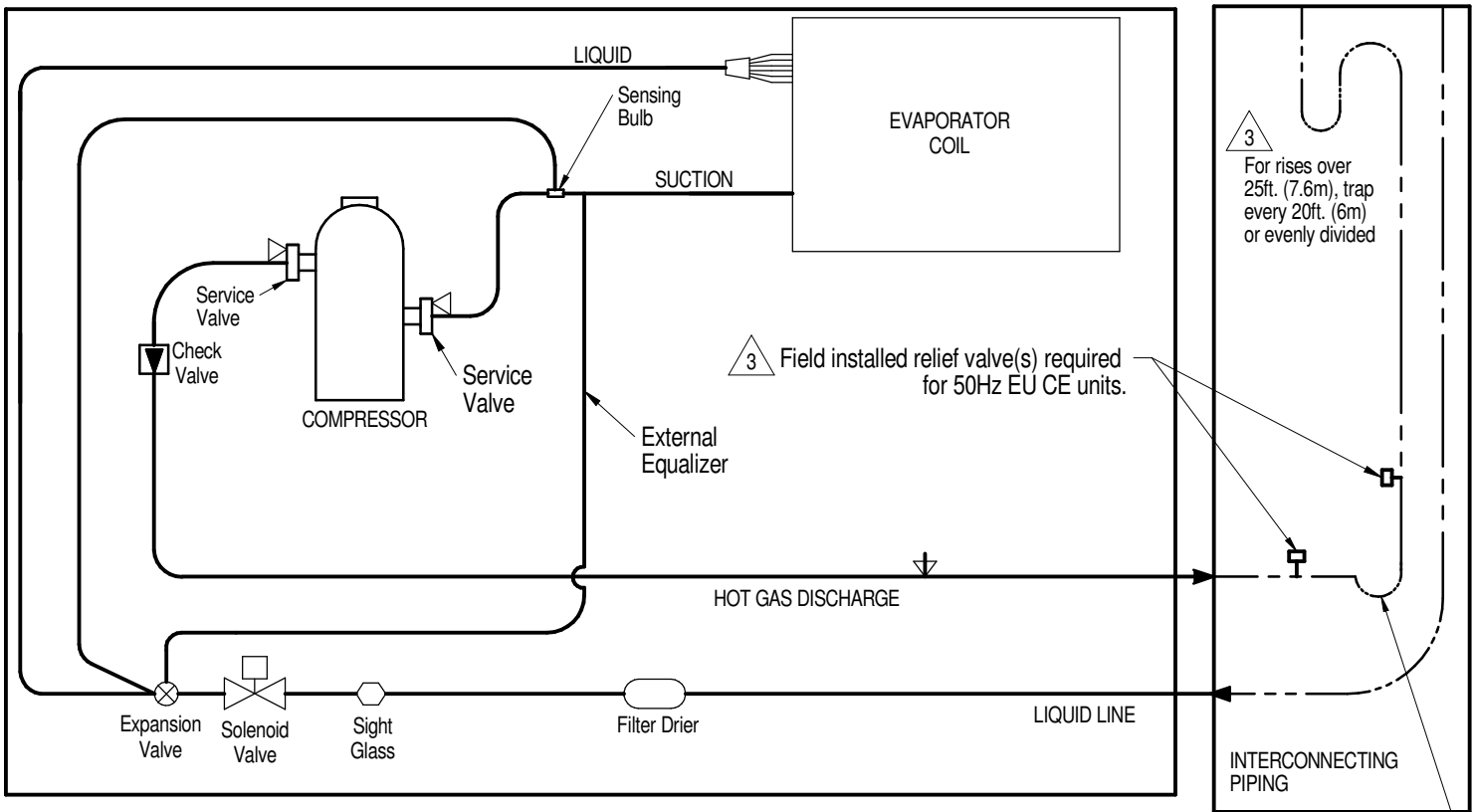
    b. Unacceptable power supplies for 208V to 575V nominal units:
        - Delta without ground or with floating ground;
        - Delta with grounded center tap.

LIEBERT MC CONDENSER

TYPICAL PIPING SCHEMATIC FOR AIR-COOLED DX SYSTEMS







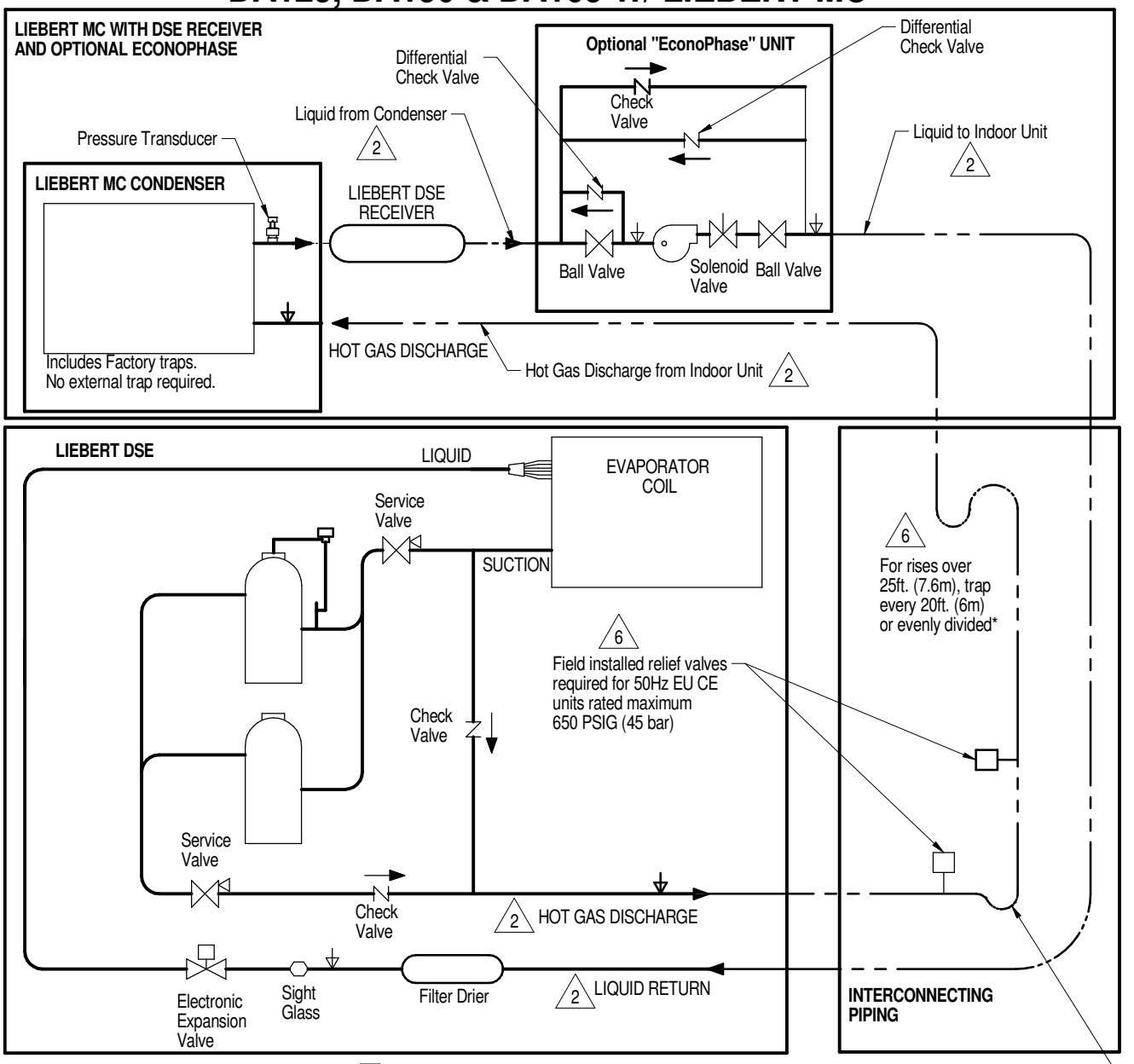
Notes:
1. Single refrigeration circuit shown for clarity.
2. Schematic representation shown. Do not use for specific connection locations.

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

4. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid floodback to compressor. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
5. Do not islolate any refrigeration circuits from over pressurization protection.

LIEBERT DSE

PIPING SCHEMATIC
DA125, DA150 & DA165 W/ LIEBERT MC

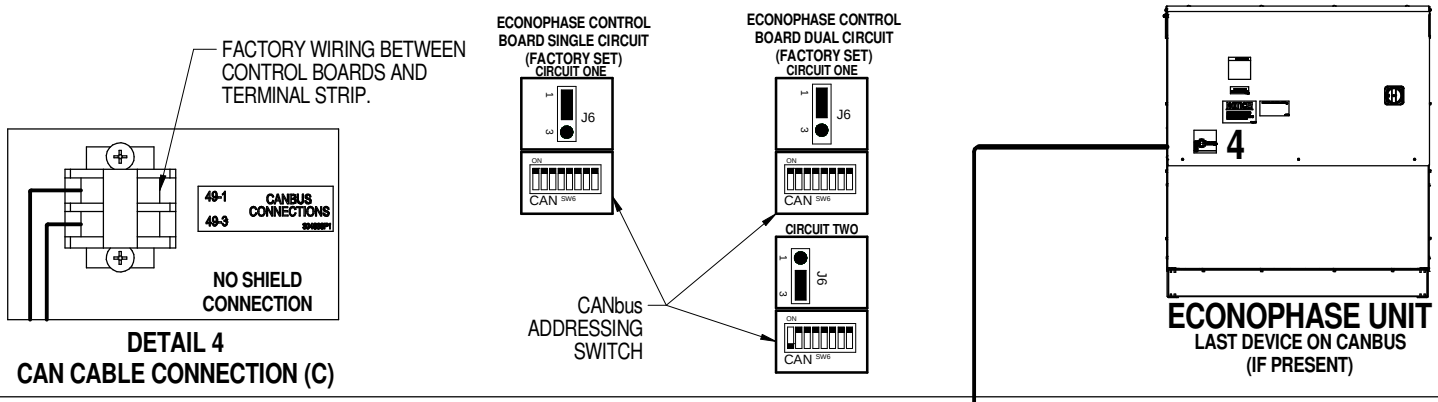


Notes:

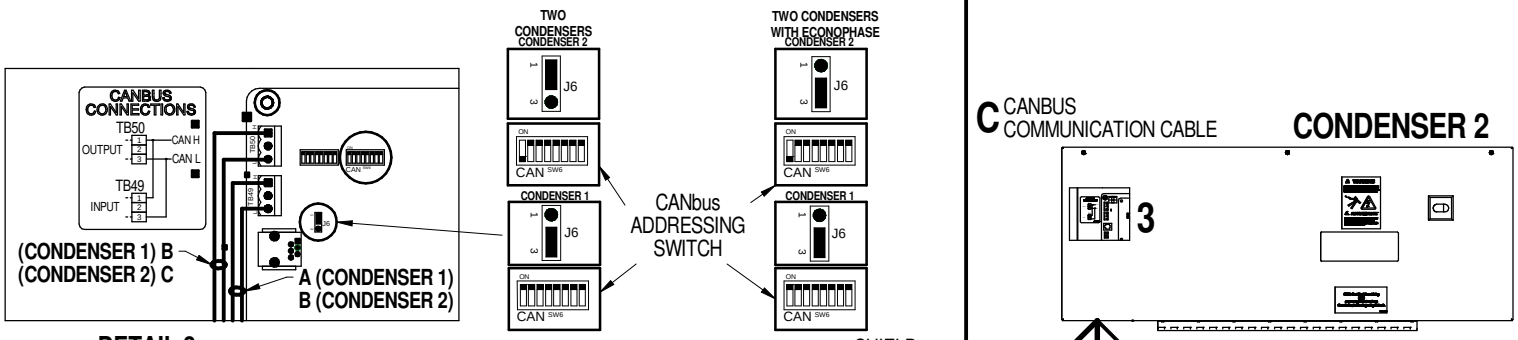
1. Two refrigeration circuits provided. Single refrigeration circuit shown for clarity.
2. Circuit 1 must be maintained between indoor unit, condenser and EconoPhase unit. Circuit 2 must be maintained between indoor unit, condenser and EconoPhase unit.
3. Schematic representation shown. Do not use for specific connection locations.
4. The outlet of the receiver must be higher than the elevation of the EEV inside the indoor unit. This vertical height must not exceed 60ft. (18.3m). Liebert DSE Receiver required for systems with or without EconoPhase.
5. All indoor and outdoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor insulation must be UV and ozone resistant.
6. Components are not supplied by Liebert but are required for proper circuit operation and maintenance.
7. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid flood back to compressor. Pitch horizontal gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
8. Do not isolate any refrigerant circuits from over pressurization protection.

LIEBERT DSE

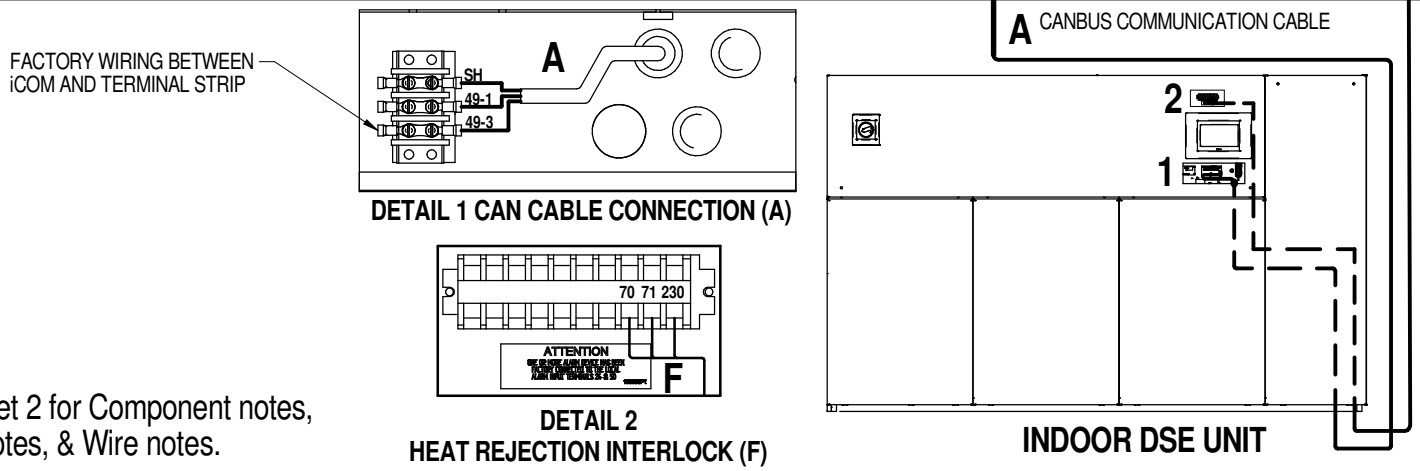
CANbus & INTERLOCK CONNECTIONS
USING 2 LIEBERT MC CONDENSERS & OPTIONAL ECONOPHASE UNIT



DETAIL 4
CAN CABLE CONNECTION (C)



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



DETAIL 1 CAN CABLE CONNECTION (A)

DETAIL 2
HEAT REJECTION INTERLOCK (F)

INDOOR DSE UNIT

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

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

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

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

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

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

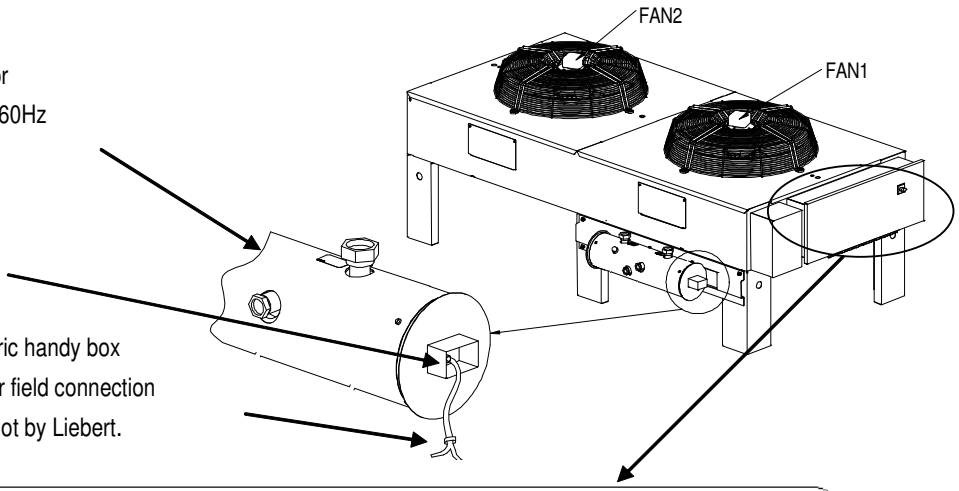
ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL WITH LEE-TEMP

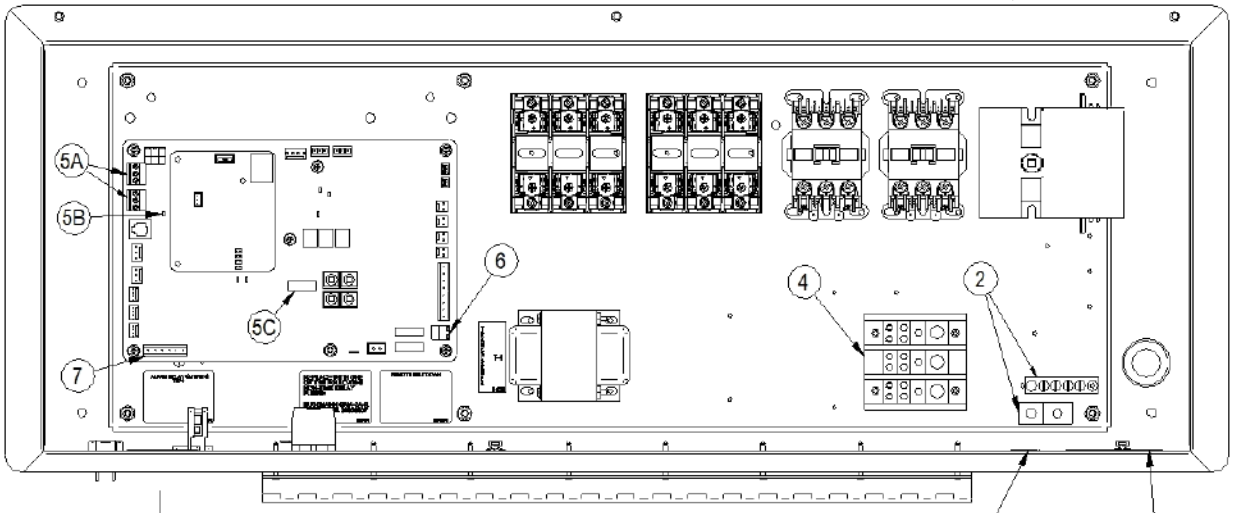
Electrical Connections for Lee-Temp Receiver

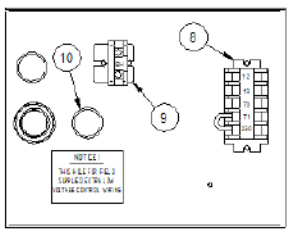
Lee-Temp receiver tank (1 per circuit).
NOTE: Heater pad voltage available for
120V/1 phase/60 Hz or 230V/1 phase/60Hz
150 or 300 Watt, varies by condenser.

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

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







KEY ELECTRICAL DETAILS:

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

ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL WITH LEE-TEMP

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

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

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

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

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

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

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

NOTES:

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

ELECTRICAL FIELD CONNECTIONS
PREMIUM EFFICIENCY CONTROL WITH LEE-TEMP

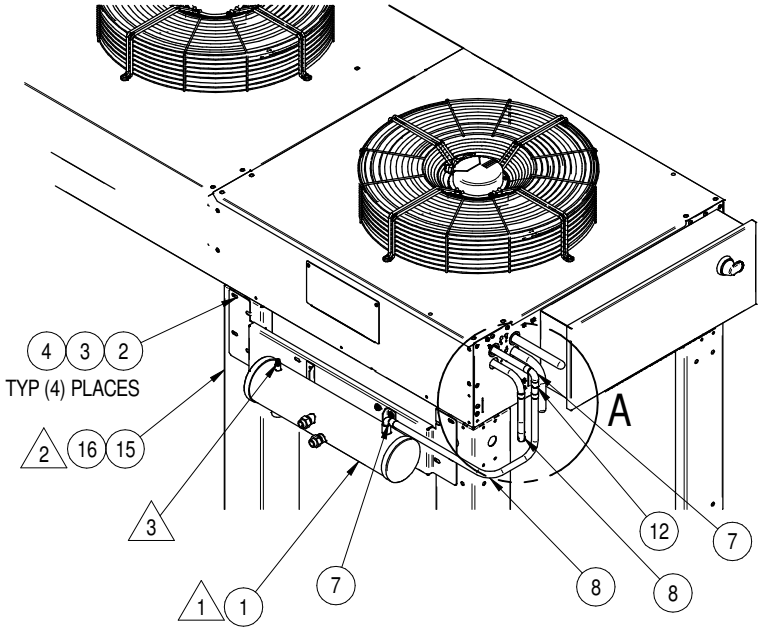
5. All wiring must be sized and selected for insulation case per NEC and other local codes.
6. Do not bend cables to less than four times the diameter of the cable.
7. Do not deform cables when securing in bundles or when hanging them.
8. Avoid running the cables by devices that may introduce noise,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

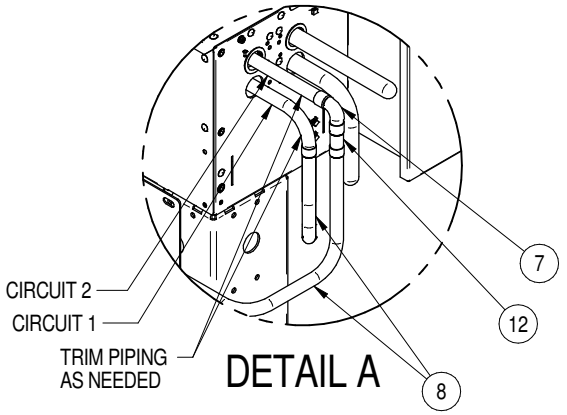
    B. Unacceptable power supplies for 208V to 575V nominal units:
        - Delta without ground or with floating ground;
        - Delta with grounded center tap.

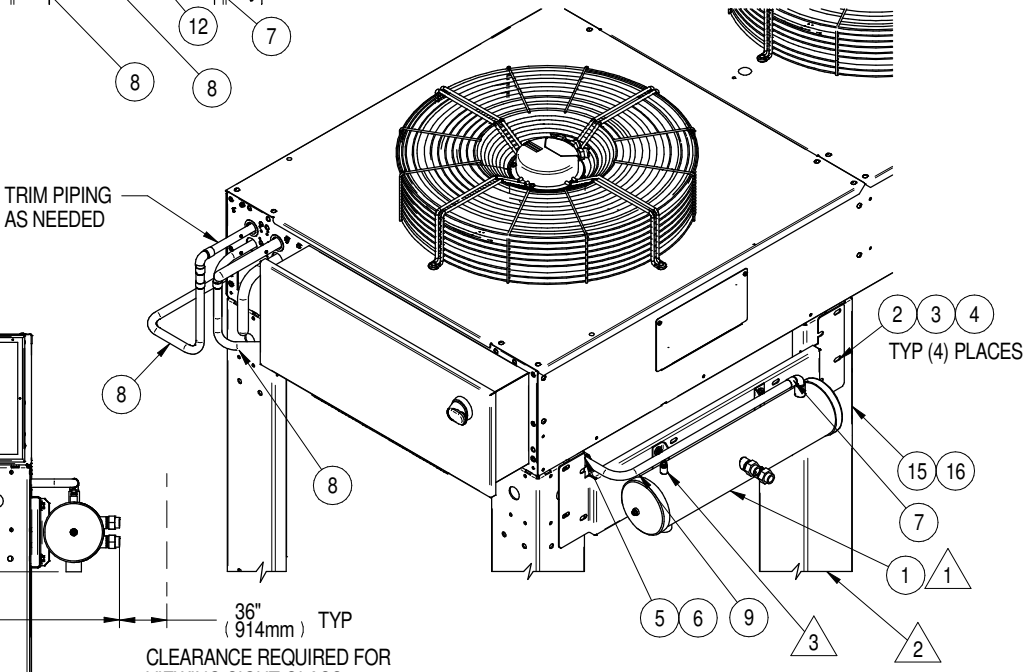
LIEBERT MC CONDENSER

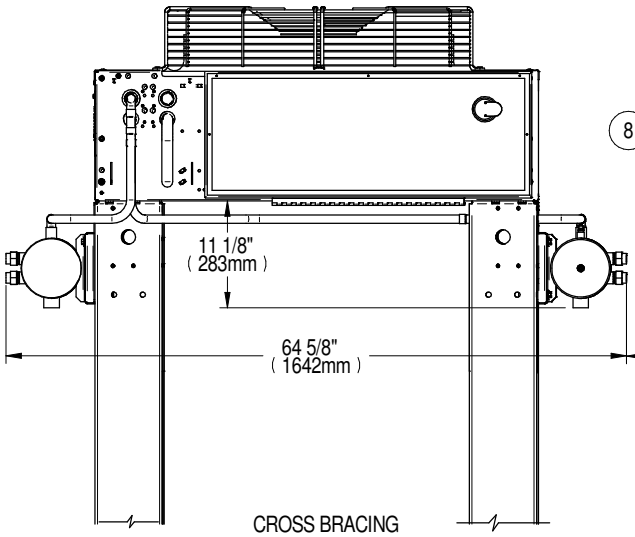
DSE RECEIVER MOUNTING

MCM160 DUAL CIRCUIT DUAL CONDENSER OUTLET RECEIVERS









36" (914mm) TYP

CLEARANCE REQUIRED FOR VIEWING SIGHT GLASS.

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

NOTES

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

LIEBERT MC CONDENSER

SEISMIC ANCHORAGE DATA
ONE FAN MODELS

WITHOUT RECEIVER

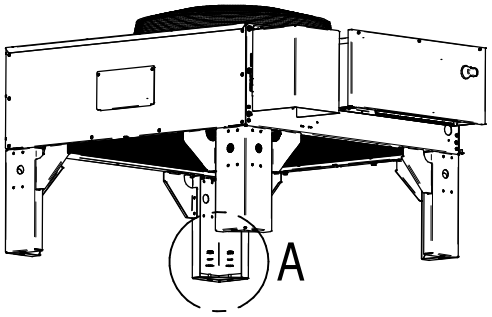
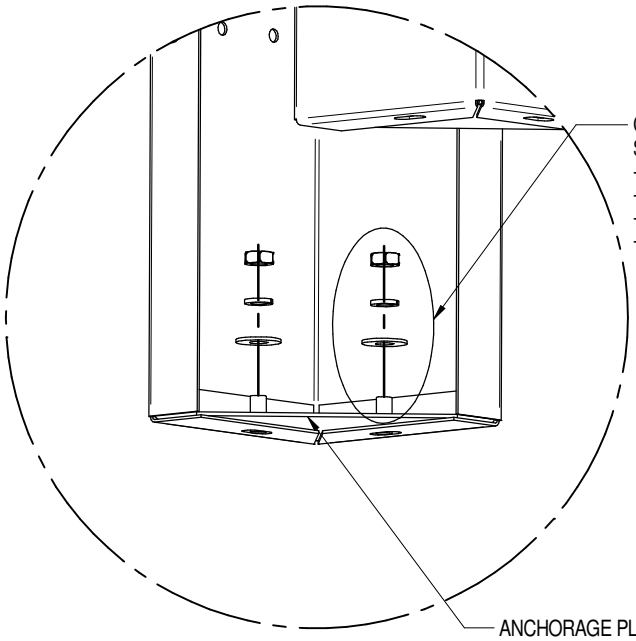


FIGURE 1



DETAIL A
TYPICAL ALL 18" ALUMINUM LEGS

WITH RECEIVER
(VIEWS SHOW RECEIVER BRACKET ONLY. RECEIVER REMOVED FOR CLARITY).

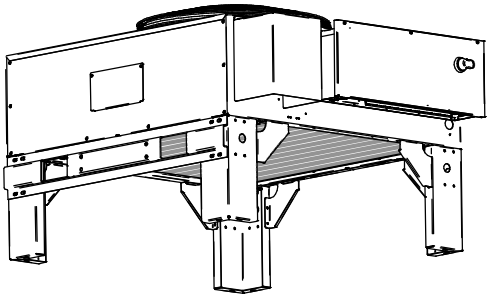


FIGURE 2

NOTES:

1.MOUNTING REQUIREMENT DETAILS SUCH AS ANCHOR BRAND, TYPE, EMBEDMENT DEPTH, EDGE SPACING, ANCHOR-TO-ANCHOR SPACING, CONCRETE STRENGTH, SPECIAL INSPECTION AND ATTACHMENT TO NON-BUILDING STRUCTURES MUST BE OUTLINED AND APPROVED BY THE ENGINEER OF RECORD FOR THE PROJECT OR BUILDING. STRUCTURAL FLOORS AND HOUSEKEEPING PADS MUST ALSO BE SEISMICALLY DESIGNED AND APPROVED BY THE PROJECT OR BUILDING STRUCTURAL ENGINEER OF RECORD TO WITHSTAND THE SEISMIC ANCHOR LOADS DEFINED IN THE TABLE BELOW. THE INSTALLING CONTRACTOR IS RESPONSIBLE FOR THE PROPER INSTALLATION OF ALL ANCHORS AND MOUNTING HARDWARE, OBSERVING THE MOUNTING REQUIREMENTS DETAILED IN THE SEISMIC INSTALLATION DRAWINGS AND ADDITIONALLY OUTLINED BY THE ENGINEER OF RECORD.

2.ALL BRACES AND FASTENERS ARE REQUIRED TO MAINTAIN IBC/OSHPD CERTIFICATION OF CONFORMITY.

3.USE WASHER, LOCK WASHER AND SCREW TO CONNECT BRACE TO CONDENSER BOTTOM BEAM (SEE SHEET 2).

4.USE WASHER, LOCK WASHER,SCREW AND NUT TO CONNECT BRACE TO CONDENSER LEG (SEE SHEET 2).

5.PLACE ANCHORAGE PLATE INSIDE EACH CONDENSER FOOT PRIOR TO FASTENING TO THE STRUCTURE. USE FLAT WASHER, LOCK WASHER AND NUT TO CONNECT CONDENSER TO THE CUSTOMER SUPPLIED ANCHOR ON THE SOLID SURFACE (REFERENCE VIEW DETAIL A). AS A MINIMUM 3/8" GRADE ANCHORS WITH AMERICAN NATIONAL STANDARD SERIES W, TYPE A, PLAIN WASHERS (ANSI B18.22.1-1965, R1975) SELECTED TO MATCH THE NOMINAL ANCHOR DIAMETER MUST BE INSTALLED AT EACH ANCHOR LOCATION BETWEEN THE ANCHOR HEAD AND EQUIPMENT FOR TENSION LOAD DISTRUBUTION.

MODEL	FIGURE	IMPORTANCE FACTOR Ip=1.0			IMPORTANCE FACTOR Ip=1.5		
		MAXIMUM COMPRESSIVE REACTION	MAX.ANCHOR LOADS(ASD)		MAXIMUM COMPRESSIVE REACTION	MAX.ANCHOR LOADS(ASD)	
			TENSILE	SHEAR		TENSILE	SHEAR
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
MODELS: MCS028							
WITHOUT RECEIVER	1	37	14	14	47	24	21
WITH RECEIVER	2	43	15	23	56	27	35
MODELS: MCM040							
WITHOUT RECEIVER	1	37	14	14	47	24	21
WITH RECEIVER	2	43	15	23	56	27	35
MODELS: MCL055							
WITHOUT RECEIVER	1	37	14	14	47	24	21
WITH RECEIVER	2	43	15	23	56	27	35

* ALL LOADS ARE CALCULATED PER ASCE 7-05, CHAPTER 13.6 S_{ds}=2.0, R_p=6.0, a=2.5

LIEBERT MC CONDENSER

SEISMIC ANCHORAGE DATA
TWO FAN MODELS

WITHOUT RECEIVER

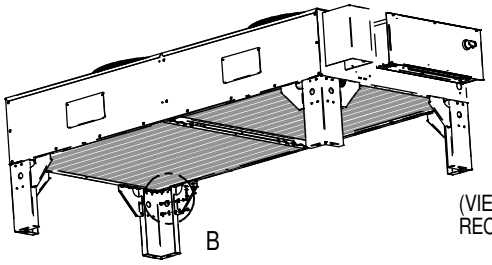


FIGURE 3

WITH RECEIVER

(VIEWS SHOW RECEIVER BRACKET ONLY. RECEIVER NOT SHOWN FOR CLARITY)

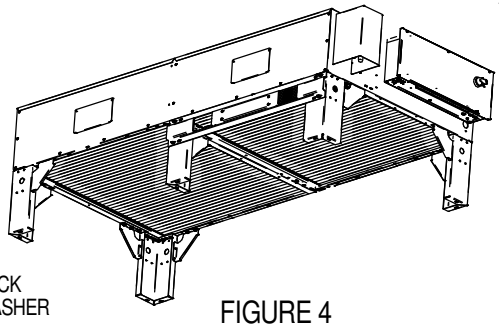
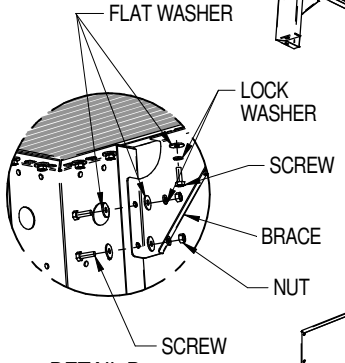


FIGURE 4



DETAIL B
TYPICAL

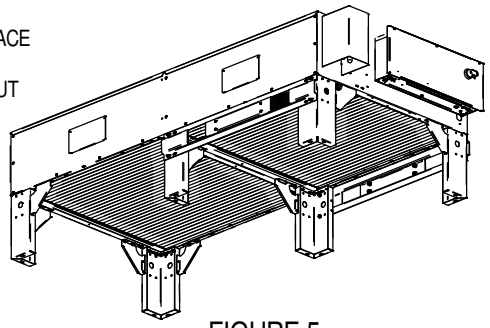


FIGURE 5

NOTES:

1.MOUNTING REQUIREMENT DETAILS SUCH AS ANCHOR BRAND, TYPE, EMBEDMENT DEPTH, EDGE SPACING, ANCHOR-TO-ANCHOR SPACING, CONCRETE STRENGTH, SPECIAL INSPECTION AND ATTACHMENT TO NON-BUILDING STRUCTURES MUST BE OUTLINED AND APPROVED BY THE ENGINEER OF RECORD FOR THE PROJECT OR BUILDING. STRUCTURAL FLOORS AND HOUSEKEEPING PADS MUST ALSO BE SEISMICALLY DESIGNED AND APPROVED BY THE PROJECT OR BUILDING STRUCTURAL ENGINEER OF RECORD TO WITHSTAND THE SEISMIC ANCHOR LOADS DEFINED IN THE TABLE BELOW. THE INSTALLING CONTRACTOR IS RESPONSIBLE FOR THE PROPER INSTALLATION OF ALL ANCHORS AND MOUNTING HARDWARE, OBSERVING THE MOUNTING REQUIREMENTS DETAILED IN THE SEISMIC INSTALLATION DRAWINGS AND ADDITIONALLY OUTLINED BY THE ENGINEER OF RECORD.

2.ALL BRACES AND FASTENERS ARE REQUIRED TO MAINTAIN IBC/OSHPD CERTIFICATION OF CONFORMITY.

3.USE WASHER, LOCK WASHER AND SCREW TO CONNECT BRACE TO CONDENSER BOTTOM BEAM (REFERENCE VIEW DETAIL B).

4.USE WASHER,LOCK WASHER,SCREW AND NUT TO CONNECT BRACE TO CONDENSER LEG (REFERENCE VIEW DETAIL B).

5.PLACE ANCHORAGE PLATE INSIDE EACH CONDENSER FOOT PRIOR TO FASTENING TO THE STRUCTURE. USE FLAT WASHER, LOCK WASHER AND NUT TO CONNECT CONDENSER TO THE CUSTOMER SUPPLIED ANCHOR ON THE SOLID SURFACE (SEE SHEET 1). AS A MINIMUM 3/8" GRADE ANCHORS WITH AMERICAN NATIONAL STANDARD SERIES W, TYPE A, PLAIN WASHERS (ANSI B18.22.1-1965, R1975) SELECTED TO MATCH THE NOMINAL ANCHOR DIAMETER MUST BE INSTALLED AT EACH ANCHOR LOCATION BETWEEN THE ANCHOR HEAD AND EQUIPMENT FOR TENSION LOAD DISTRUBUTION.

MODEL	FIGURE	IMPORTANCE FACTOR Ip=1.0			IMPORTANCE FACTOR Ip=1.5		
		MAXIMUM COMPRESSIVE REACTION	MAX.ANCHOR LOADS(ASD) TENSILE	SHEAR	MAXIMUM COMPRESSIVE REACTION	MAX.ANCHOR LOADS(ASD) TENSILE	SHEAR
			Lbs.	Lbs.		Lbs.	Lbs.
MODELS: MCS056		Lbs.			Lbs.		
WITHOUT RECEIVER	3	63	20	23	78	35	34
WITH RECEIVER	5	69	15	30	75	30	45
MODELS: MCM080							
SINGLE OR DUAL CIRCUIT WITHOUT RECEIVER	3	94	30	34	116	53	50
SINGLE CIRCUIT WITH RECEIVER	4	87	34	38	99	59	57
DUAL CIRCUIT WITH RECEIVERS	5	90	24	38	98	44	57
MODELS: MCL110							
SINGLE OR DUAL CIRCUIT WITHOUT RECEIVERS	3	146	42	55	179	76	82
SINGLE CIRCUIT WITH RECEIVER	4	131	47	53	158	83	80
DUAL CIRCUIT WITH RECEIVERS	5	117	31	51	136	59	77

* ALL LOADS ARE CALCULATED PER ASCE 7-05, CHAPTER 13.6 S_{ds}=2.0, R_p=6.0, a=2.5

LIEBERT MC CONDENSER

SEISMIC ANCHORAGE DATA
THREE FAN MODELS

WITHOUT RECEIVER

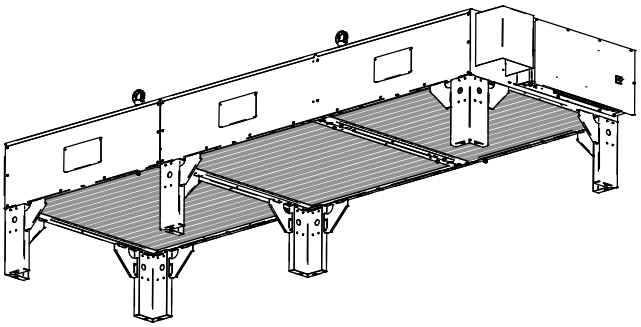


FIGURE 6

WITH RECEIVER

(VIEWS SHOW RECEIVER BRACKET ONLY.
RECEIVER NOT SHOWN FOR CLARITY)

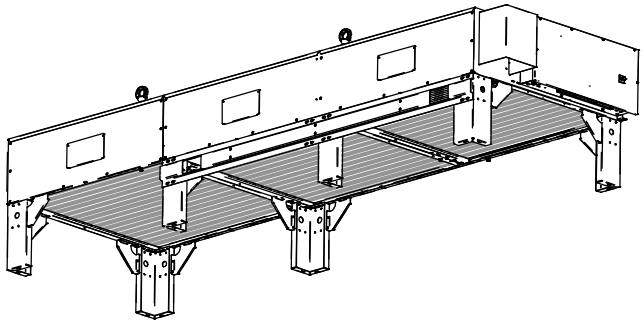


FIGURE 7

NOTES:

1.MOUNTING REQUIREMENT DETAILS SUCH AS ANCHOR BRAND, TYPE, EMBEDMENT DEPTH, EDGE SPACING, ANCHOR-TO-ANCHOR SPACING, CONCRETE STRENGTH, SPECIAL INSPECTION AND ATTACHMENT TO NON-BUILDING STRUCTURES MUST BE OUTLINED AND APPROVED BY THE ENGINEER OF RECORD FOR THE PROJECT OR BUILDING. STRUCTURAL FLOORS AND HOUSEKEEPING PADS MUST ALSO BE SEISMICALLY DESIGNED AND APPROVED BY THE PROJECT OR BUILDING STRUCTURAL ENGINEER OF RECORD TO WITHSTAND THE SEISMIC ANCHOR LOADS DEFINED IN THE TABLE BELOW. THE INSTALLING CONTRACTOR IS RESPONSIBLE FOR THE PROPER INSTALLATION OF ALL ANCHORS AND MOUNTING HARDWARE, OBSERVING THE MOUNTING REQUIREMENTS DETAILED IN THE SEISMIC INSTALLATION DRAWINGS AND ADDITIONALLY OUTLINED BY THE ENGINEER OF RECORD.

2.ALL BRACES AND FASTENERS ARE REQUIRED TO MAINTAIN IBC/OSHPD CERTIFICATION OF CONFORMITY.

3.USE WASHER, LOCK WASHER AND SCREW TO CONNECT BRACE TO CONDENSER BOTTOM BEAM (SEE SHEET 2).

4.USE WASHER,LOCK WASHER,SCREW AND NUT TO CONNECT BRACE TO CONDENSER LEG (SEE SHEET 2).

5.PLACE ANCHORAGE PLATE INSIDE EACH CONDENSER FOOT PRIOR TO FASTENING TO THE STRUCTURE. USE FLAT WASHER, LOCK WASHER AND NUT TO CONNECT CONDENSER TO THE CUSTOMER SUPPLIED ANCHOR ON THE SOLID SURFACE (SEE SHEET 1). AS A MINIMUM 3/8" GRADE ANCHORS WITH AMERICAN NATIONAL STANDARD SERIES W, TYPE A, PLAIN WASHERS (ANSI B18.22.1-1965, R1975) SELECTED TO MATCH THE NOMINAL ANCHOR DIAMETER MUST BE INSTALLED AT EACH ANCHOR LOCATION BETWEEN THE ANCHOR HEAD AND EQUIPMENT FOR TENSION LOAD DISTRUBUTION.

MODEL	FIGURE	IMPORTANCE FACTOR Ip=1.0			IMPORTANCE FACTOR Ip=1.5		
		MAXIMUM COMPRESSIVE REACTION	MAX.ANCHOR LOADS(ASD)		MAXIMUM COMPRESSIVE REACTION	MAX.ANCHOR LOADS(ASD)	
			TENSILE	SHEAR		TENSILE	SHEAR
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
MODELS: MCL165							
SIGNLE CIRCUIT WITHOUT RECEIVER	6	158	39	62	181	73	93
SINGLE CIRCUIT WITH RECEIVER	7	153	38	65	170	73	97

* ALL LOADS ARE CALCULATED PER ASCE 7-05, CHAPTER 13.6 S_{ds}=2.0, R_p=6.0, a=2.5

LIEBERT MC CONDENSER

SEISMIC ANCHORAGE DATA
FOUR FAN MODELS

WITHOUT RECEIVER

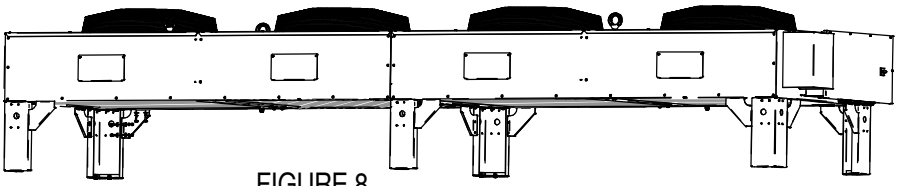


FIGURE 8

WITH RECEIVER
(VIEWS SHOW RECEIVER BRACKET ONLY.
RECEIVER NOT SHOWN FOR CLARITY)

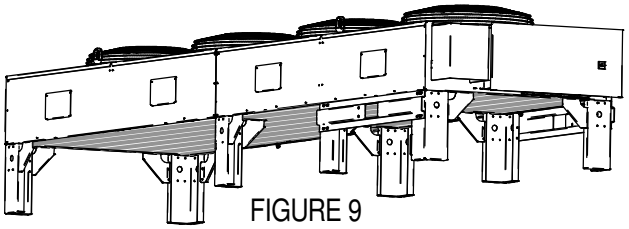


FIGURE 9

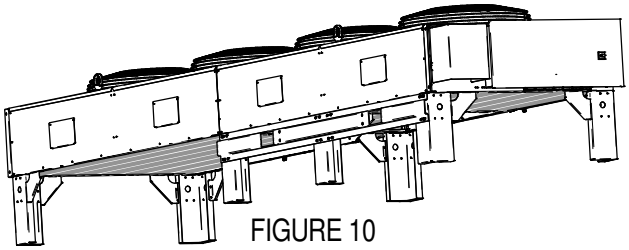


FIGURE 10

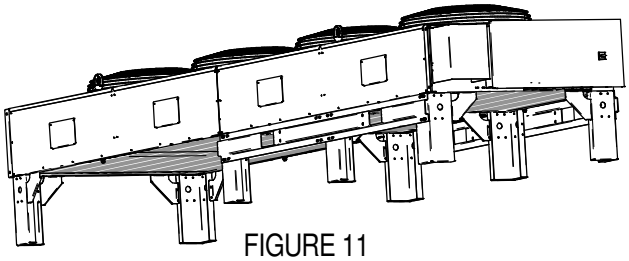


FIGURE 11

NOTES:
1.MOUNTING REQUIREMENT DETAILS SUCH AS ANCHOR BRAND, TYPE, EMBEDMENT DEPTH, EDGE SPACING, ANCHOR-TO-ANCHOR SPACING, CONCRETE STRENGTH, SPECIAL INSPECTION AND ATTACHMENT TO NON-BUILDING STRUCTURES MUST BE OUTLINED AND APPROVED BY THE ENGINEER OF RECORD FOR THE PROJECT OR BUILDING. STRUCTURAL FLOORS AND HOUSEKEEPING PADS MUST ALSO BE SEISMICALLY
DESIGNED AND APPROVED BY THE PROJECT OR BUILDING STRUCTURAL ENGINEER OF RECORD TO WITHSTAND THE SEISMIC ANCHOR LOADS DEFINED IN THE TABLE BELOW. THE INSTALLING CONTRACTOR IS RESPONSIBLE FOR THE PROPER INSTALLATION OF ALL ANCHORS AND MOUNTING HARDWARE, OBSERVING THE MOUNTING REQUIREMENTS DETAILED IN THE SEISMIC INSTALLATION DRAWINGS AND ADDITIONALLY OUTLINED BY THE ENGINEER OF RECORD.

2.ALL BRACES AND FASTENERS ARE REQUIRED TO MAINTAIN IBC/OSHPD CERTIFICATION OF CONFORMITY.

3.USE WASHER, LOCK WASHER AND SCREW TO CONNECT BRACE TO CONDENSER BOTTOM BEAM (SEE SHEET 2).

4.USE WASHER,LOCK WASHER,SCREW AND NUT TO CONNECT BRACE TO CONDENSER LEG (SEE SHEET 2).

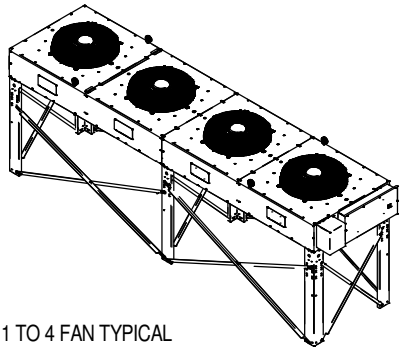
5.PLACE ANCHORAGE PLATE INSIDE EACH CONDENSER FOOT PRIOR TO FASTENING TO THE STRUCTURE. USE FLAT WASHER, LOCK WASHER AND NUT TO CONNECT CONDENSER TO THE CUSTOMER SUPPLIED ANCHOR ON THE SOLID SURFACE (SEE SHEET 1). AS A MINIMUM 3/8" GRADE ANCHORS WITH AMERICAN NATIONAL STANDARD SERIES W, TYPE A, PLAIN WASHERS (ANSI B18.22.1-1965, R1975) SELECTED TO MATCH THE NOMINAL ANCHOR DIAMETER MUST BE INSTALLED AT EACH ANCHOR LOCATION BETWEEN THE ANCHOR HEAD AND EQUIPMENT FOR TENSION LOAD DISTRUBUTION.

MODEL	FIGURE	IMPORTANCE FACTOR Ip=1.0			IMPORTANCE FACTOR Ip=1.5		
		MAXIMUM COMPRESSIVE REACTION	MAX.ANCHOR LOADS(ASD)		MAXIMUM COMPRESSIVE REACTION	MAX.ANCHOR LOADS(ASD)	
			TENSILE	SHEAR		TENSILE	SHEAR
		Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
MODELS: MCM160							
DUAL CIRCUIT WITHOUT RECEIVERS	8	122	37	42	148	65	62
DUAL CIRCUIT WITH RECEIVERS	9	120	33	42	145	59	63
MODELS: MCL220							
SINGLE OR DUAL CIRCUIT WITHOUT RECEIVERS	8	194	53	69	232	95	104
SINGLE CIRCUIT WITH RECEIVER	10	191	51	74	221	92	110
DUAL CIRCUIT WITH RECEIVERS	11	176	45	60	211	82	90

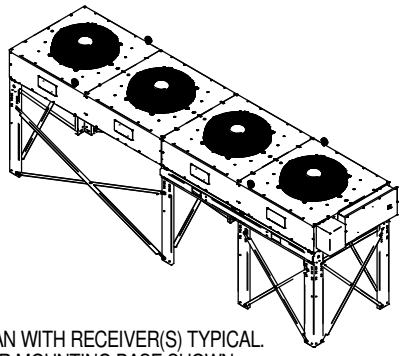
* ALL LOADS ARE CALCULATED PER ASCE 7-05, CHAPTER 13.6 S_{ds}=2.0, R_p=6.0, a=2.5

LIEBERT MC CONDENSER

SEISMIC ANCHORAGE DATA
36" - 60" EXTENDED LEG



1 TO 4 FAN TYPICAL



1 TO 4 FAN WITH RECEIVER(S) TYPICAL.
RECEIVER MOUNTING BASE SHOWN

INSTRUCTIONS:
1. MOUNTING REQUIREMENT DETAILS SUCH AS ANCHOR BRAND, TYPE, EMBEDMENT DEPTH, EDGE SPACING, ANCHOR-TO-ANCHOR SPACING, CONCRETE STRENGTH, SPECIAL INSPECTION AND ATTACHMENT TO NON-BUILDING STRUCTURES MUST BE OUTLINED AND APPROVED BY THE ENGINEER OF RECORD FOR THE PROJECT OR BUILDING. STRUCTURAL FLOORS AND HOUSEKEEPING PADS MUST ALSO BE SEISMICALLY DESIGNED AND APPROVED BY THE PROJECT OR BUILDING STRUCTURAL ENGINEER OF RECORD TO WITHSTAND THE SEISMIC ANCHOR LOADS DEFINED IN THE TABLE BELOW.
2. ALL BRACES AND FASTENERS ARE REQUIRED TO MAINTAIN IBC/O SHPD CERTIFICATION OF CONFORMITY.
3. USE FLAT WASHER, LOCK WASHER AND NUT TO CONNECT CONDENSER TO THE CUSTOMER SUPPLIED BOLT ON THE SOLID SURFACE (SEE SHEET 1).
4. REFER TO DOCUMENT 308616 FOR ASSEMBLY INSTRUCTION DETAILS.

MODEL	IMPORTANCE FACTOR Ip=1.0			IMPORTANCE FACTOR Ip=1.5		
	MAXIMUM COMPRESSIVE REACTION	MAX.ANCHOR LOADS(ASD)		MAXIMUM COMPRESSIVE REACTION	MAX.ANCHOR LOADS(ASD)	
		TENSILE	SHEAR		TENSILE	SHEAR
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
MODELS: MCS028 AND MCS056						
SINGLE FAN	189	127	31	260	197	46
SINGLE FAN WITH RECEIVER	234	167	40	328	260	60
TWO FAN	251	167	40	344	260	61
TWO FAN WITH (2) RECEIVER	240	175	44	337	273	66
MODELS: MCM040 THROUGH MCM160						
SINGLE FAN	190	125	32	260	195	48
SINGLE FAN WITH RECEIVER	238	164	40	329	255	61
TWO FAN SINGLE OR DUAL CIRCUIT	323	218	51	444	339	77
TWO FAN SINGLE CIRCUIT WITH RECEIVER	283	262	53	389	405	79
TWO FAN DUAL CIRCUIT WITH RECEIVER	298	218	51	418	339	77
FOUR FAN DUAL CIRCUIT	397	267	62	544	414	93
FOUR FAN DUAL CIRCUIT WITH RECEIVER	397	276	60	544	428	90
MODELS: MCL055 THROUGH MCL220						
SINGLE FAN	327	219	56	449	341	84
SINGLE FAN WITH RECEIVER	372	254	64	514	396	95
TWO FAN SINGLE OR DUAL CIRCUIT	446	287	80	607	448	119
TWO FAN SINGLE CIRCUIT WITH RECEIVER	390	336	73	529	521	110
TWO FAN DUAL CIRCUIT WITH RECEIVER	365	253	67	506	395	101
THREE FAN SINGLE CIRCUIT	422	276	78	583	432	118
THREE FAN SINGLE CIRCUIT WITH RECEIVER	370	303	79	506	473	118
FOUR FAN SINGLE OR DUAL CIRCUIT	543	351	93	739	548	140
FOUR FAN SINGLE CIRCUIT WITH RECEIVER	466	377	94	626	587	141
FOUR FAN DUAL CIRCUIT WITH RECEIVER	490	328	78	665	510	117

** ALL LOADS ARE CALCULATED PER ASCE 7-05, CHAPTER 13.6* $S_{ds}=2.0$, $R_p=6.0$, $a=2.5$

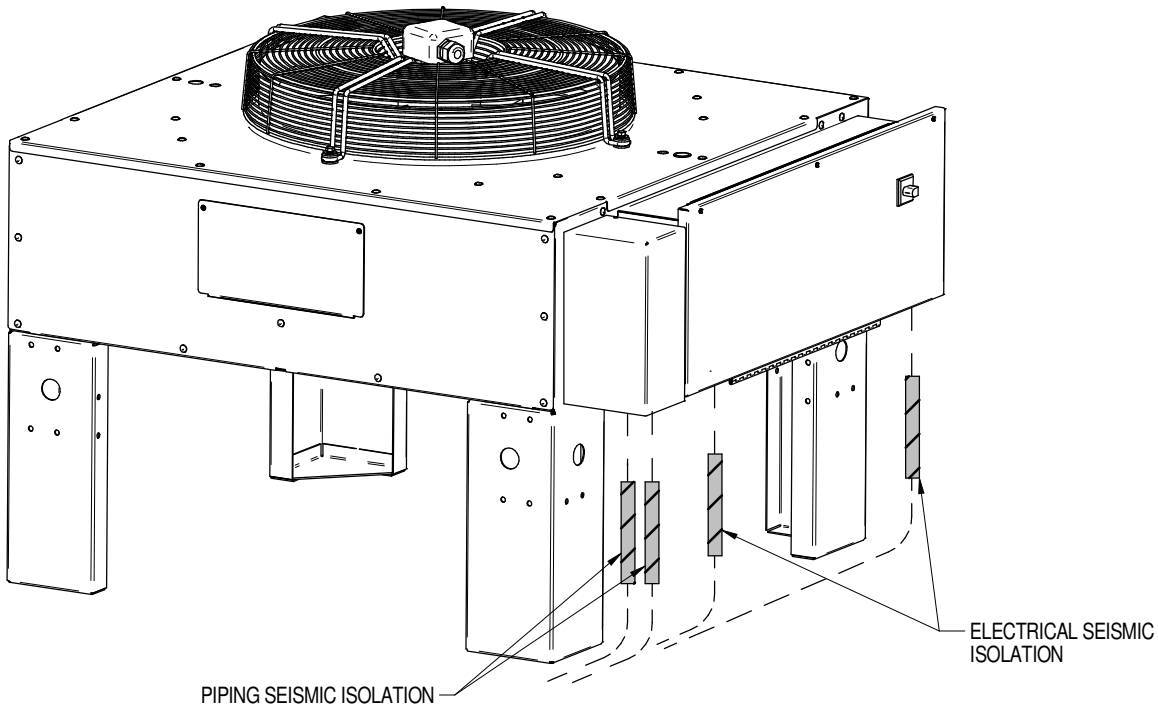
SEISMIC ANCHORAGE DATA
PIPING & ELECTRICAL WIRING CONSIDERATIONS

SEISMIC PIPING CONSIDERATIONS

Condensers for seismic application, shall be attached to the piping system using field supplied flexible loops designed for seismic movement. Flexible loops shall be capable of movement in three dimensions and must isolate the condenser from field piping. The loops shall be suitable for an operating pressure and temperature of the system. Follow manufacturer's installation instructions for proper seismic application of flexible loops. The selection of isolation brand and type must be outlined and approved by the engineer of record for the project or building.

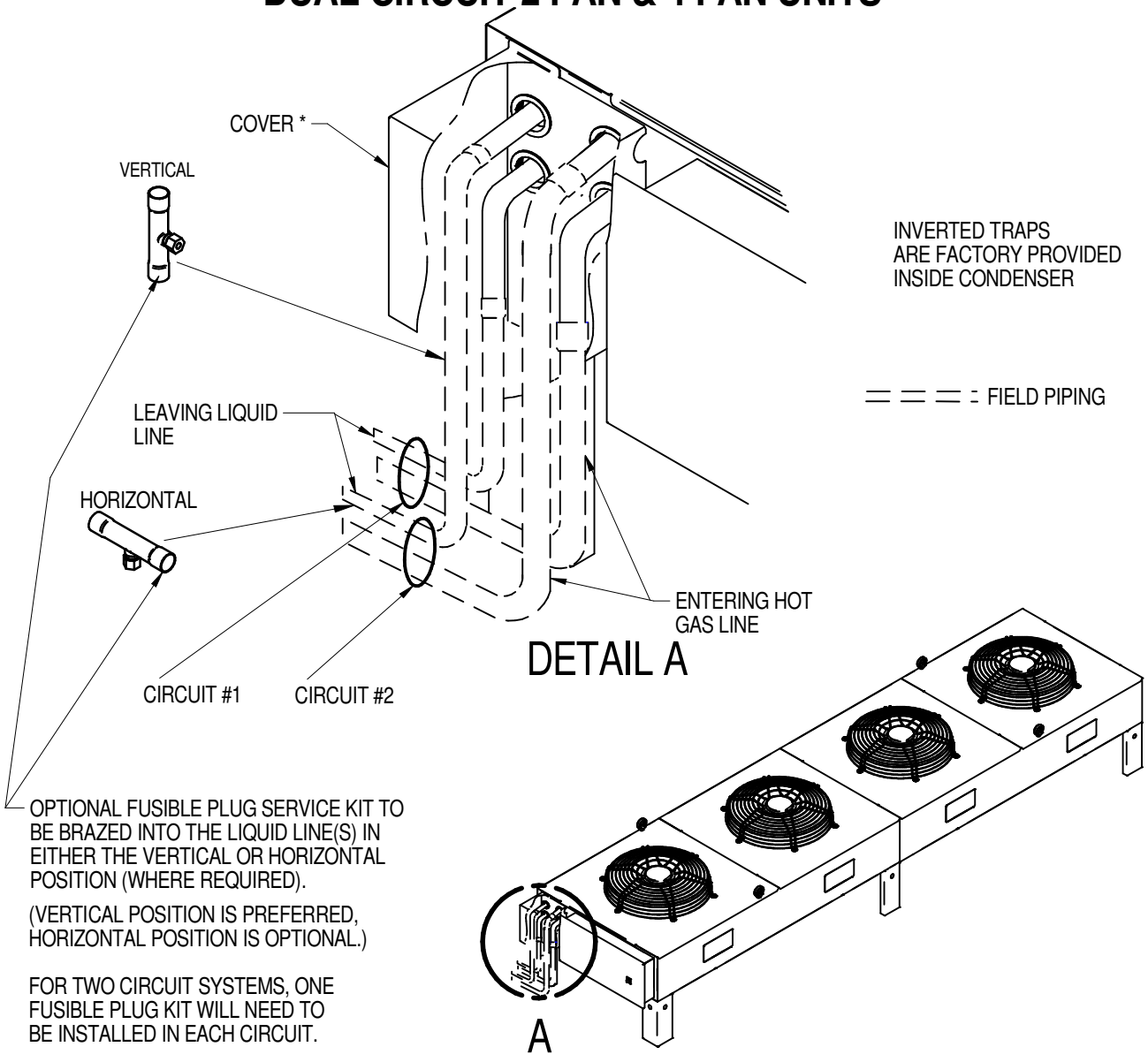
SEISMIC ELECTRICAL WIRING CONSIDERATIONS

Condensers for seismic application, shall be connected to power and control circuits using field supplied flexible conduit and conductors to allow for movement of the condenser in three dimensions during a seismic event. The flexible conduit shall have at least one bend between the rigid connection at the unit cabinet and the connection to rigid conduit or foundation.



LIEBERT MC CONDENSER

PIPING DIMENSIONAL DATA
DUAL CIRCUIT 2 FAN & 4 FAN UNITS

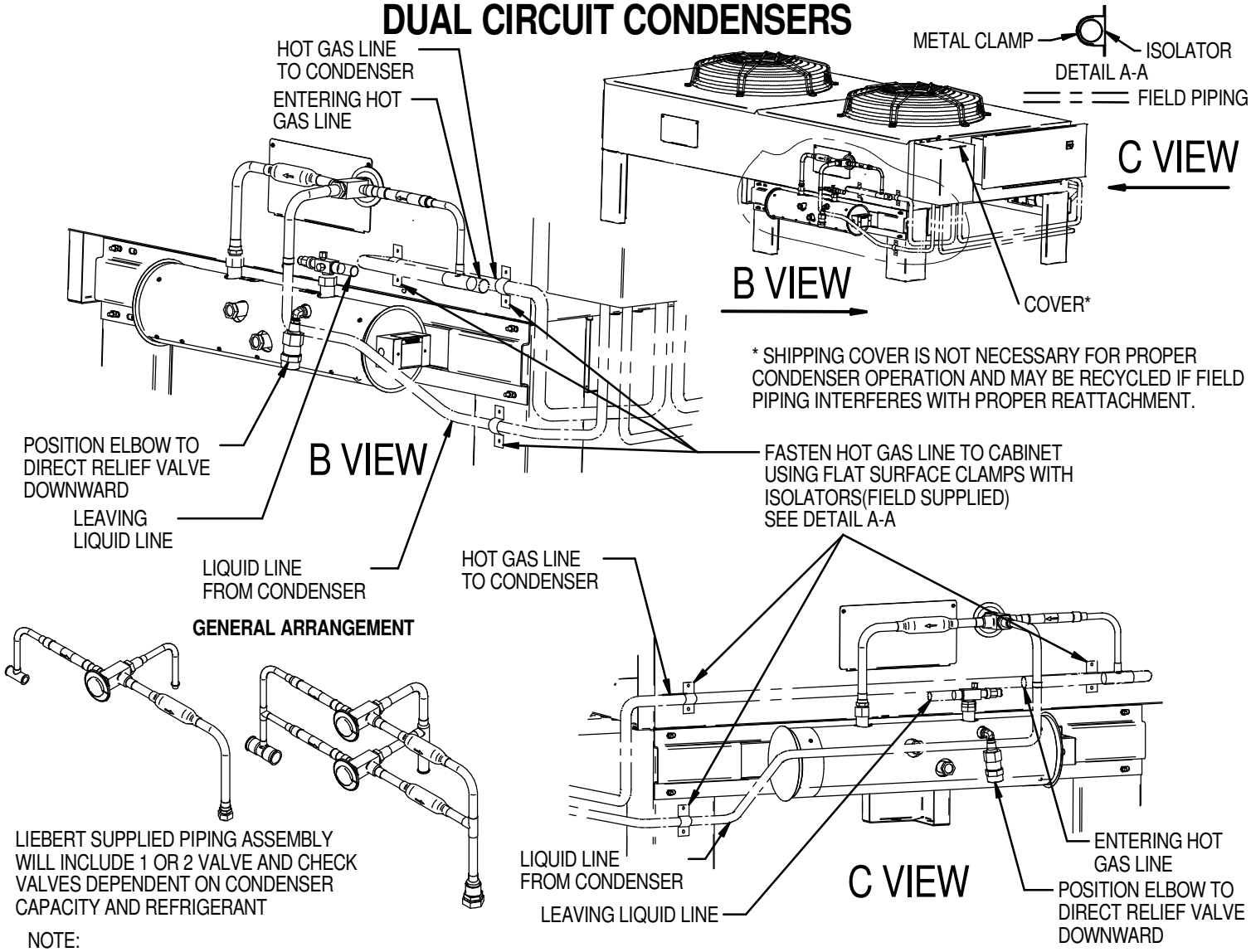


MODEL NO.	NUMBER OF FANS	CONDENSER CIRCUITS	CONNECTION SIZES ,OD,IN	
			HOT GAS LINE	LIQUID LINE
MCS 056	2	2	7/8	5/8
MCM 080	2	2	7/8	5/8
MCL 110	2	2	1-1/8	7/8
MCM 160	4	2	1-1/8	7/8
MCL 220	4	2	1-3/8	1-1/8

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

LIEBERT MC CONDENSER

PIPING: DIMENSIONAL DATA WITH LEE-TEMP
DUAL CIRCUIT CONDENSERS



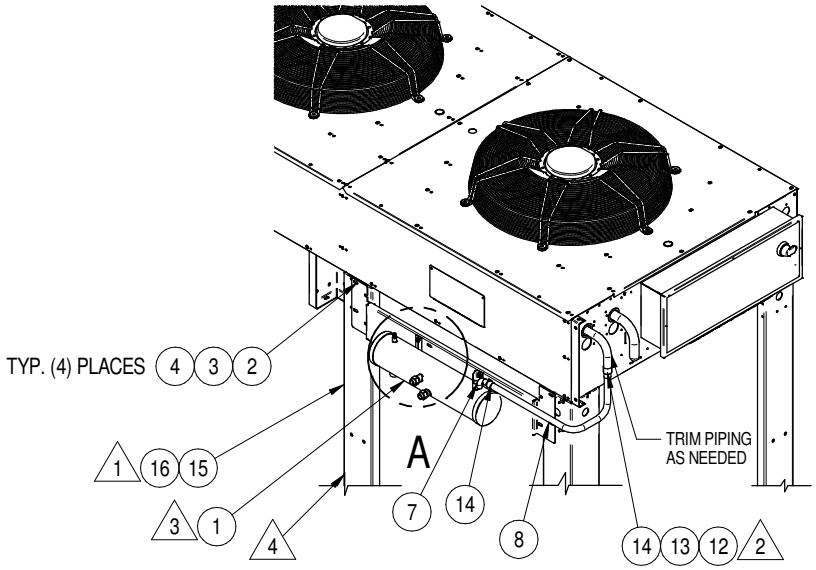
NOTE:

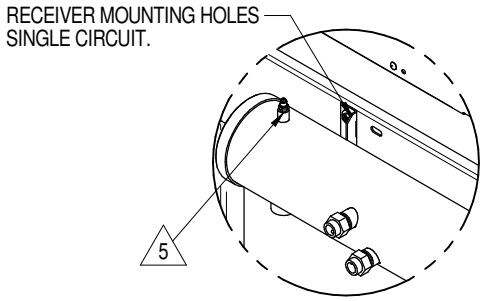
1. THE FOLLOWING MATERIALS ARE SUPPLIED BY LIEBERT, SHIPPED LOOSE FOR EACH CIRCUIT, AND FOR FIELD INSTALLATION:
   INSULATED LIEBERT LEE-TEMP RECEIVER TANK WITH ELECTRIC HEATER PADS AND SIGHT GLASSES, PIPING ASSEMBLY WITH HEAD PRESSURE CONTROL VALVE AND CHECK VALVE, ROTO-LOCK VALVE AND PRESSURE RELIEF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

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

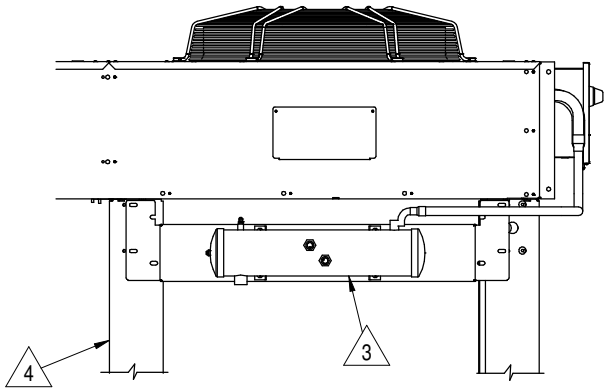
LIEBERT MC CONDENSER

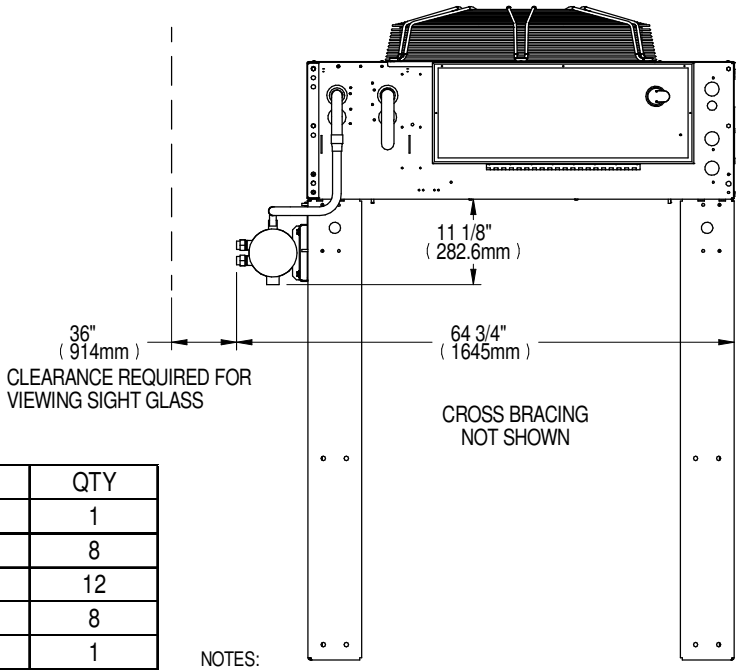
LEFT SIDE DSE & PDX-EEV RECEIVER MOUNTING KIT
MCL055, MCL110, MCL165 & MCL220 SINGLE CIRCUIT CONDENSER





DETAIL A





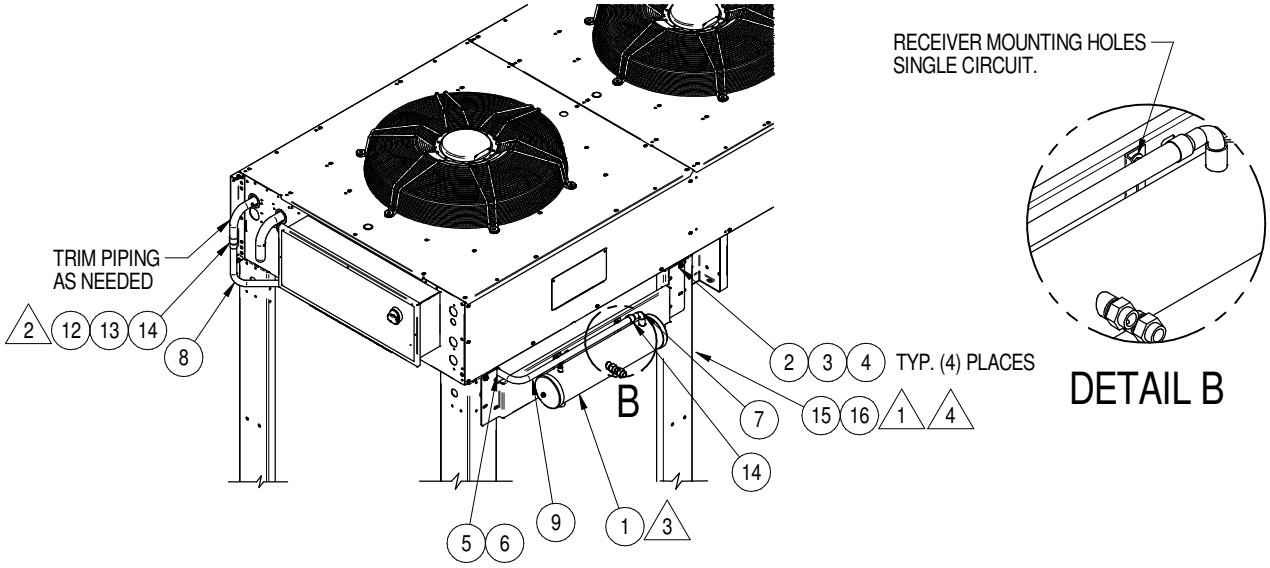
ITEM NO.	DESCRIPTION	QTY
1	RECEIVER AND BRACKET ASSEMBLY	1
2	CAP SCREW HXDIN933M8-1.25X25A2	8
3	FENDER WASHER DIN9021 M8X24 A2	12
4	LOCK NUT HEX NYL INSR M8	8
7	90° ELBOW FTGXFTG 7/8" CU	1
8	COPPER FORMED TUBE 1-1/8"	1
12	COUPLING CU 1-1/8"	1
13	REDUCER CU CXC 1-3/8"X1-1/8"	1
14	REDUCER CU CXC 1-1/8"X7/8"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

NOTES:

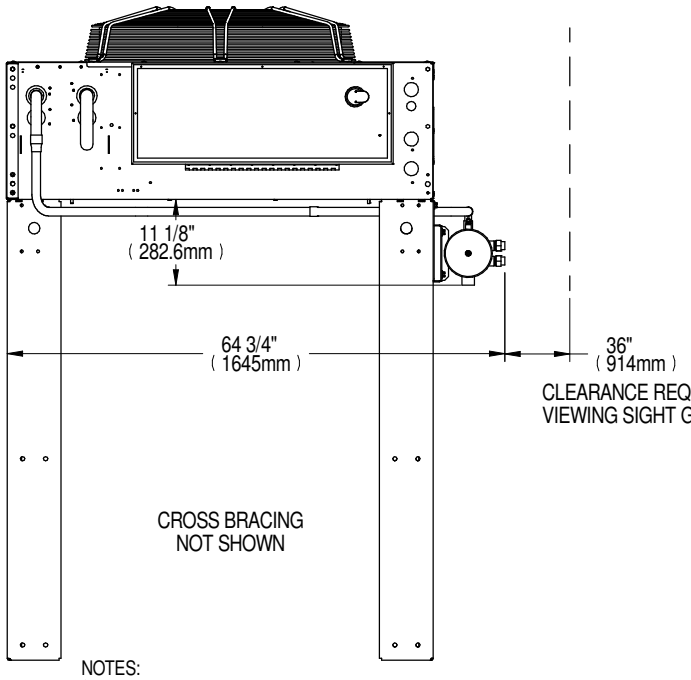
1. USE ITEMS 15 AND 16 AS NEEDED FOR MOUNTING OF ITEM 1.
2. ITEM 12 TO BE USED ON MCL110 & MCL165 UNITS.
   ITEM 13 TO BE USED ON MCL220 UNITS.
   ITEM 14 TO BE USED ON MCL055 UNITS.
3. SMALL RECEIVER SHOWN. ACTUAL RECEIVER SIZE MAY VARY.
4. RECEIVER LEG IS SAME HEIGHT AS OTHER LEGS AND NEEDS TO BE ANCHORED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

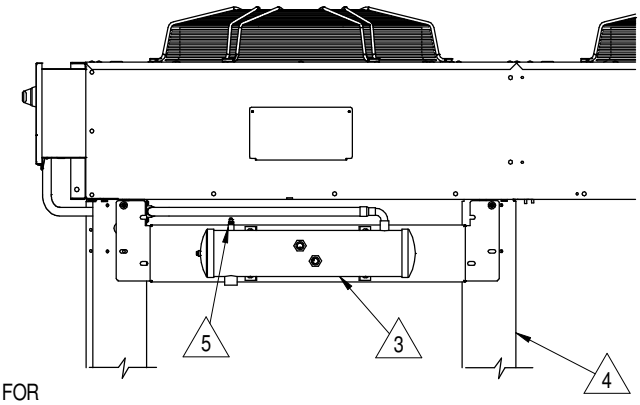
LIEBERT MC CONDENSER

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



DETAIL B





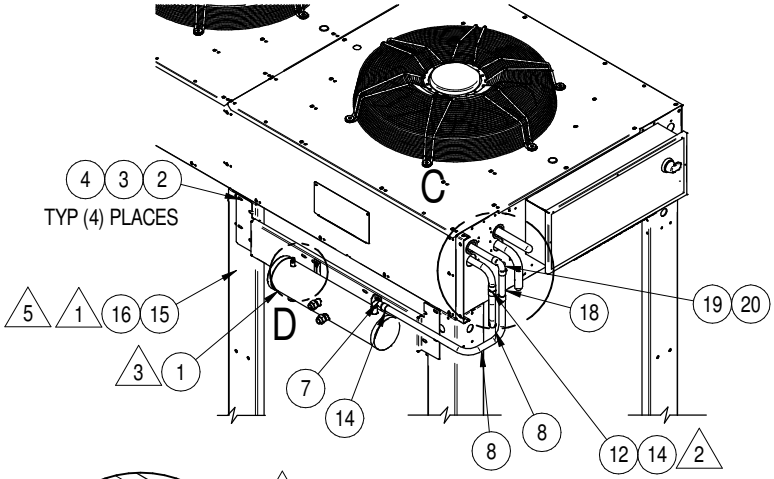
ITEM NO.	DESCRIPTION	QTY
1	RECEIVER AND BRACKET ASSEMBLY	1
2	CAP SCREW HXDIN933M8-1.25X25A2	8
3	FENDER WASHER DIN9021 M8X24 A2	12
4	LOCK NUT HEX NYL INSR M8	8
5	CLAMP OMEGA 7/8"	7
6	SCREW SD HWH YZ 10-16 X 5/8	2
7	90° ELBOW FTGXFTG 7/8" CU	1
8	COPPER FORMED TUBE 1-1/8"	1
9	COPPER FORMED TUBE 1-1/8"	2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

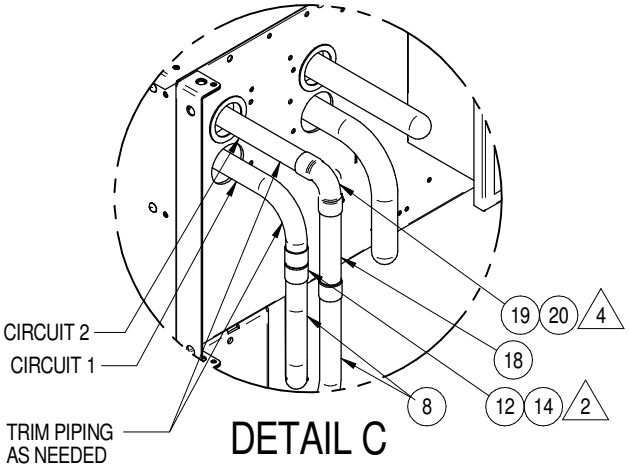
NOTES:

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

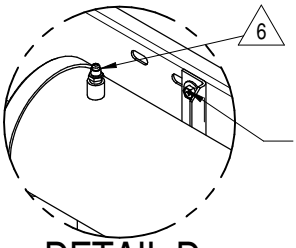
LIEBERT MC CONDENSER

DSE RECEIVER MOUNTING KITS
MCL110 & MCL220 DUAL CIRCUIT CONDENSER

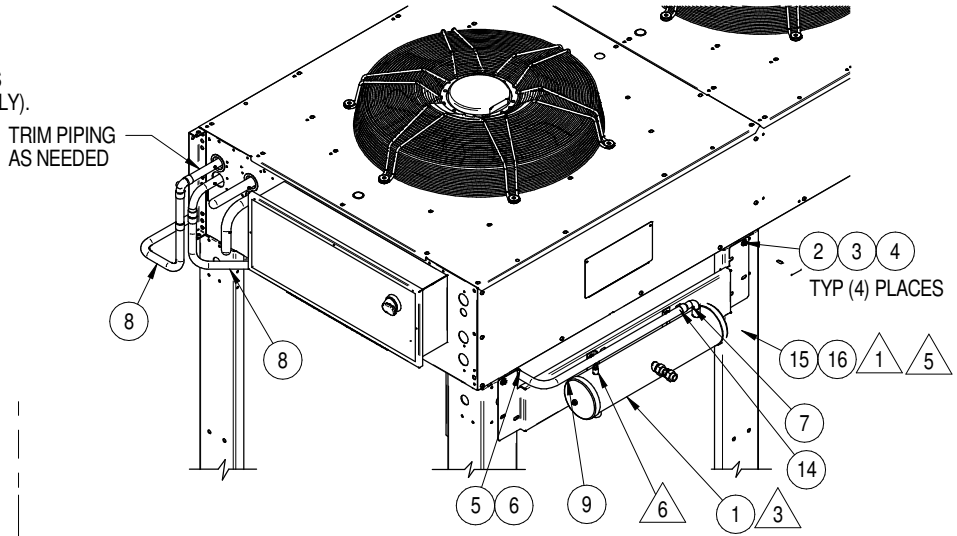


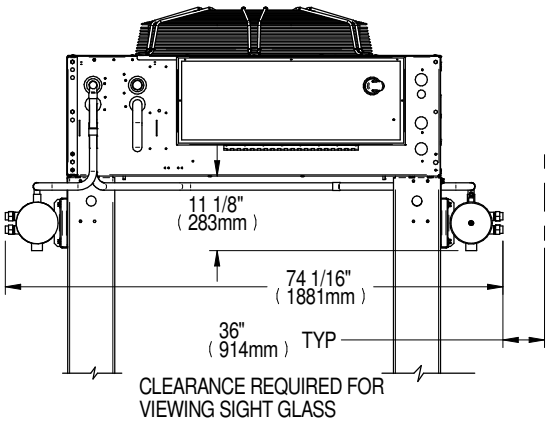


DETAIL C



DETAIL D





CLEARANCE REQUIRED FOR
VIEWING SIGHT GLASS

CROSS BRACING
NOT SHOWN

NOTES:

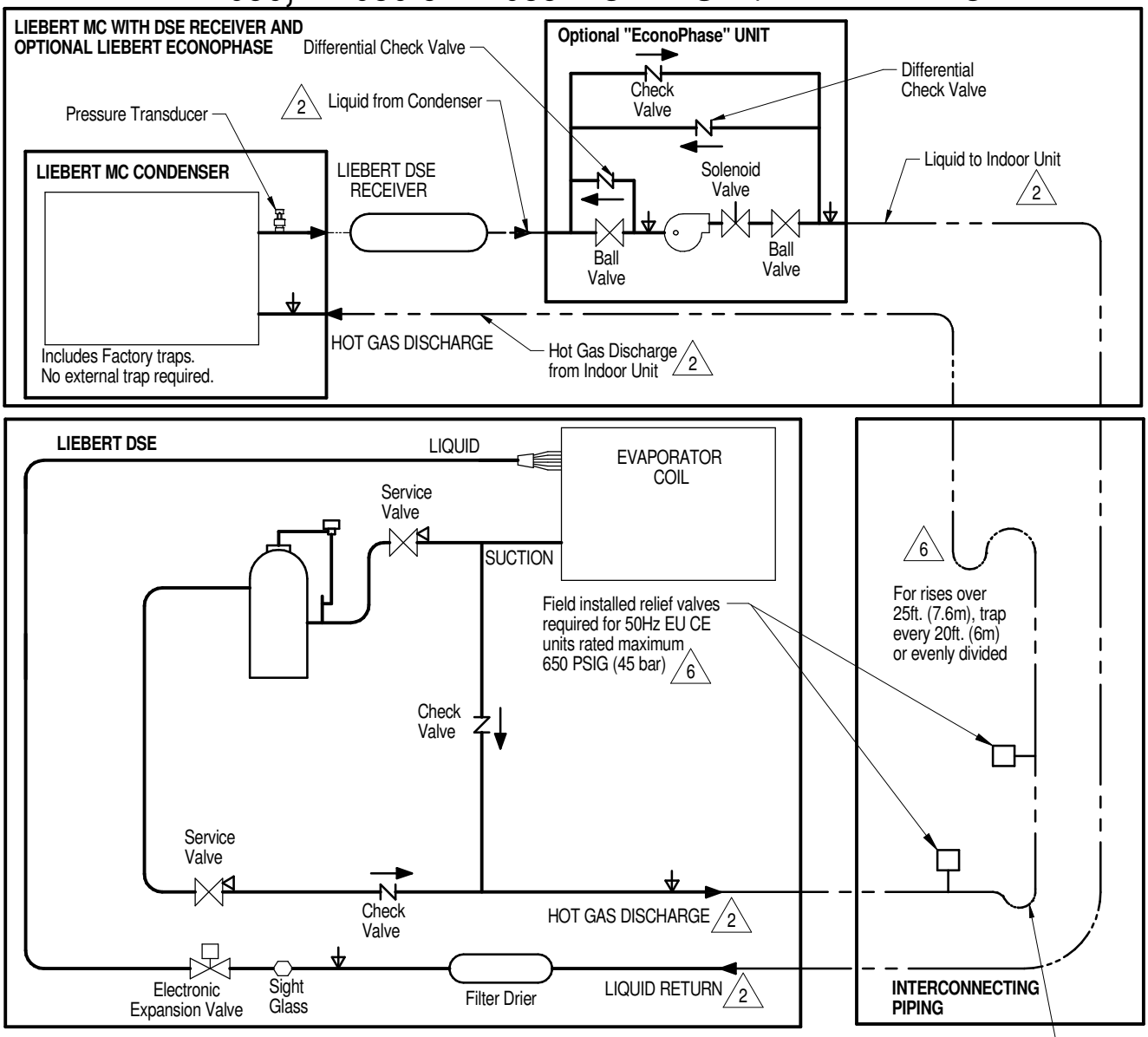
1. USE ITEMS 15 AND 16 AS NEEDED FOR MOUNTING OF ITEM 1.
2. ITEM 14 TO BE USED ON MCL110 UNITS.
   ITEM 12 TO BE USED ON MCL220 UNITS.
3. SMALL RECEIVER SHOWN. ACTUAL RECEIVER SIZE MAY VARY.
4. ITEM 20 TO BE USED ON MCL110 UNITS.
   ITEM 19 TO BE USED ON MCL220 UNITS.
5. RECEIVER LEG IS SAME HEIGHT AS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

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

LIEBERT DSE

PIPING SCHEMATIC

DA050, DA080 & DA085 MODELS W/ LIEBERT MC

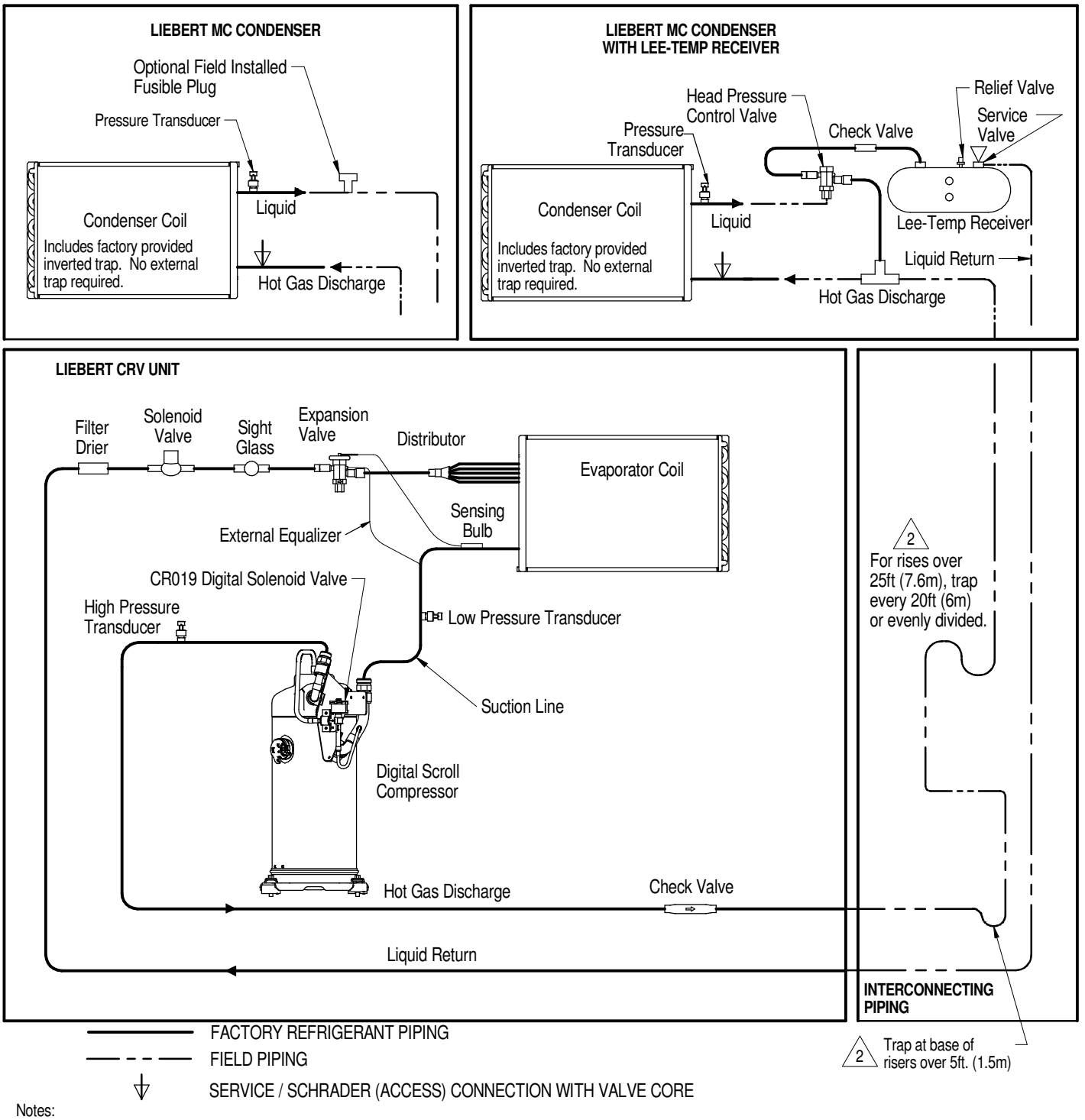


Notes:

1. Two refrigeration circuits provided on DA080 & DA085. Single refrigeration circuit provided on DA050. Single refrigeration circuit shown for clarity.
2. Circuit 1 must be maintained between indoor unit, condenser and EconoPhase unit. Circuit 2 must be maintained between indoor unit, condenser and EconoPhase unit.
3. Schematic representation shown. Do not use for specific connection locations.
4. The outlet of the receiver must be higher than the elevation of the EEV inside the indoor unit. This vertical height must not exceed 60ft. (18.3m). Liebert DSE Receiver required for systems with or without EconoPhase unit.
5. All indoor and outdoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor insulation must be UV and ozone resistant.
6. Components are not supplied by Liebert but are required for proper circuit operation and maintenance.
7. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid flood back to compressor. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of refrigeration flow.
8. Do not isolate any refrigeration circuits from over pressurization protection.

LIEBERT CRV

GENERAL ARRANGEMENT DIAGRAM
300mm (12in.) AIR COOLED W/ LIEBERT MC CONDENSER MODELS



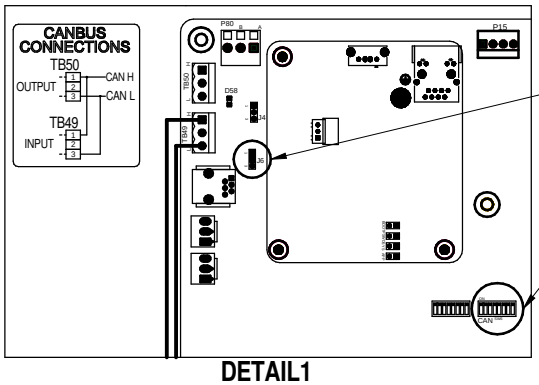
Notes:
1. Schematic representation shown. Do not use for specific connection locations.

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

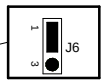
3. Do not isolate any refrigerant circuit from over pressurization protection.
4. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid floodback to compressor. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.

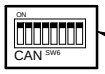
LIEBERT CRV

CANbus & INTERLOCK CONNECTIONS
BETWEEN 600mm (24in.) UNIT & LIEBERT MC CONDENSER (PREMIUM)



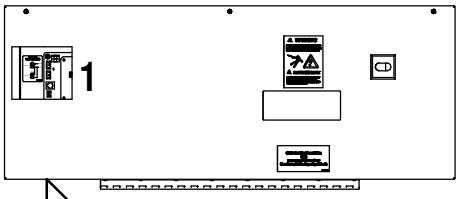
J6 TERMINATION JUMPER
MUST BE SET TO PINS 1 AND 2.





CANbus
ADDRESSING
SWITCH

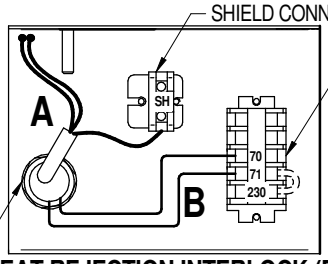
CONDENSER



DETAIL1
CAN CABLE CONNECTION (A)

SHIELD CONNECTION

FACTORY WIRING BETWEEN
MC CONTROL BOARD AND
TERMINAL STRIP.



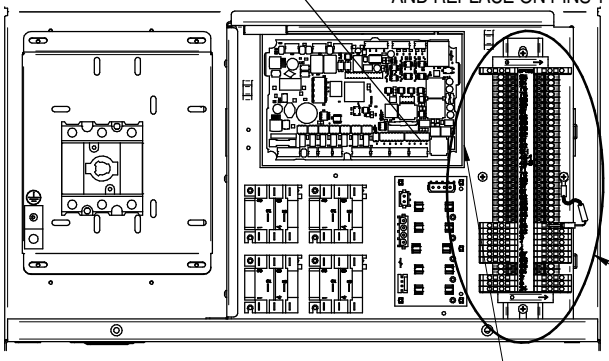
LOW VOLTAGE FIELD ENTRANCE
LOCATED ON BOTTOM LEFT OF
CONDENSER ENCLOSURE.

HEAT REJECTION INTERLOCK (B)

B
HEAT REJECTION INTERLOCK WIRE

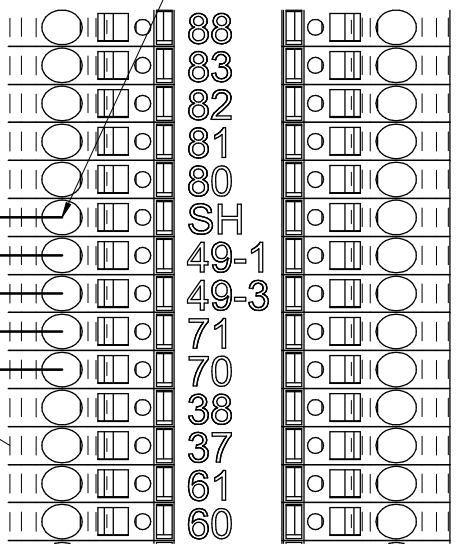
A
CANBUS COMMUNICATION CABLE

P78 TERMINATION JUMPER
FACTORY SET TO PINS 2 AND 3,
FIELD MUST REMOVE JUMPER
AND REPLACE ON PINS 1 AND 2.



PARTIAL VIEW SHOWN FOR CLARITY

SHIELDED CONNECTION



FACTORY WIRING BETWEEN
ICOM & TERMINAL STRIP

PARTIAL VIEW SHOWN FOR CLARITY

CANbus & INTERLOCK CONNECTIONS
BETWEEN 600mm (24in.) UNIT & LIEBERT MC CONDENSER (PREMIUM)

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

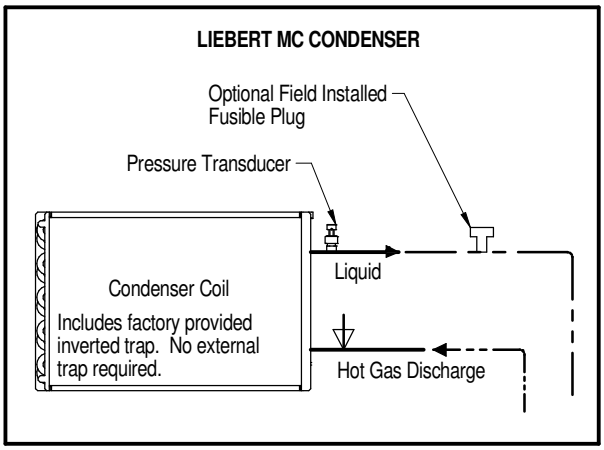
CAN & CABLE NOTES (A):
1. CABLE MUSTHAVE THE FOLLOWING SPECIFICATIONS:
   - BRAIDED SHIELD OR FOIL SHIELD WITH DRAIN WIRE
   - SHIELD MUST BE WIRED TO GROUND AT INDOOR UNIT
   - 22-18AWG STRANDED TINNED COPPER
   - TWISTED PAIR (MINIMUM 4 TWISTS PER FOOT)
   - LOW CAPACITANCE (15pF/FT OR LESS)
   - MUST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

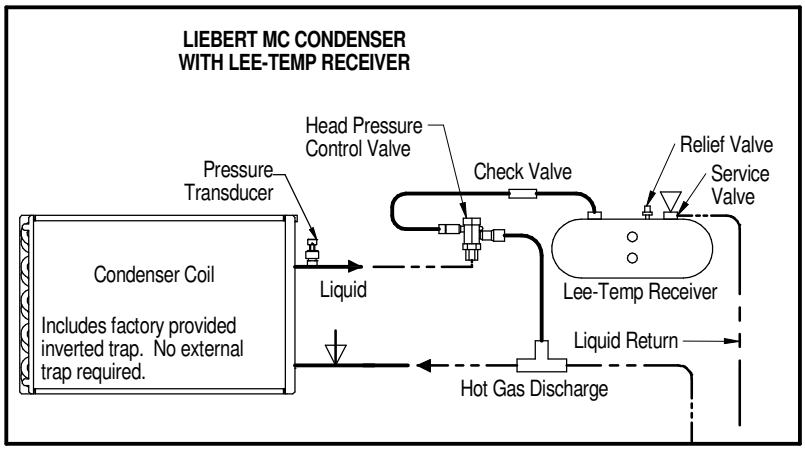
INTERLOCK WIRE NOTES (B):
1. FIELD SUPPLIED WIRE
   - 2 CONDUCTOR 18AWG OR GREATER
   - RATED 600V

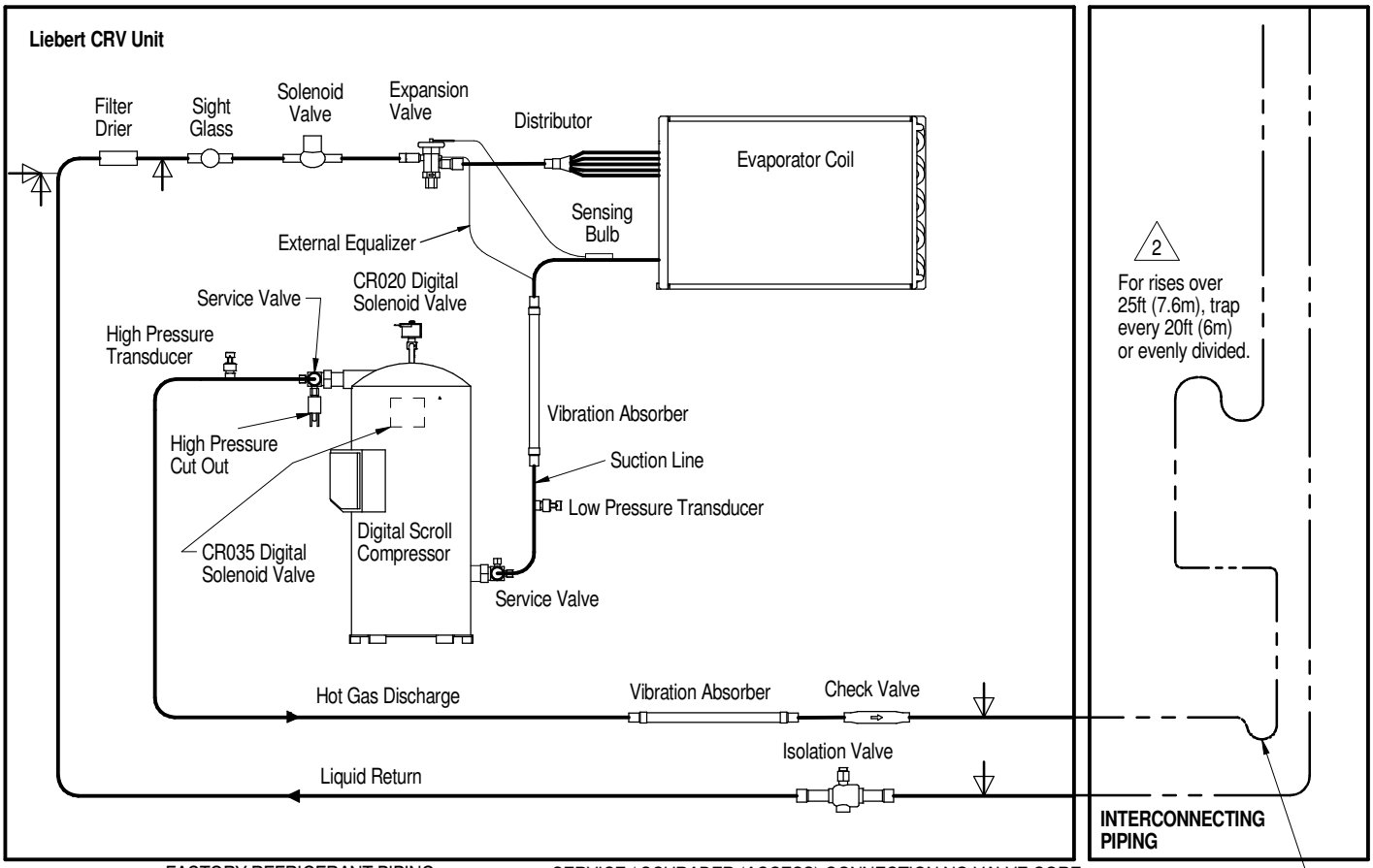
2. RUN FIELD SUPPLIED WIRES BETWEEN THE INDOOR UNIT AND THE CONDENSER.

LIEBERT CRV

GENERAL ARRANGEMENT DIAGRAM
600mm (24in.) AIR COOLED W/ LIEBERT MC CONDENSER MODELS







FACTORY REFRIGERANT PIPING

FIELD PIPING

SERVICE / SCHRADER (ACCESS) CONNECTION NO VALVE CORE

SERVICE / SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

2 Trap at base of risers over 5ft. (1.5m)

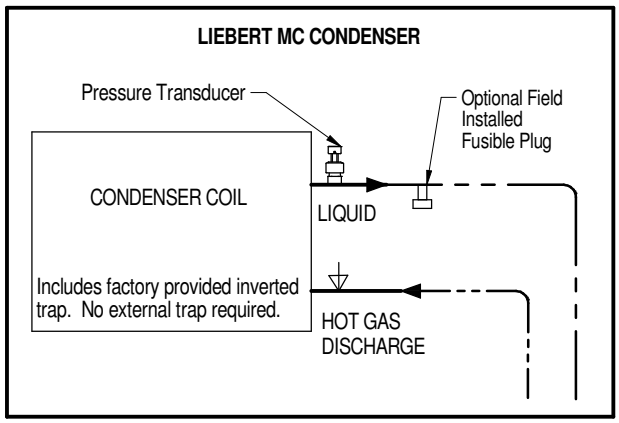
Notes:
1. Schematic representation shown. Do not use for specific connection locations.

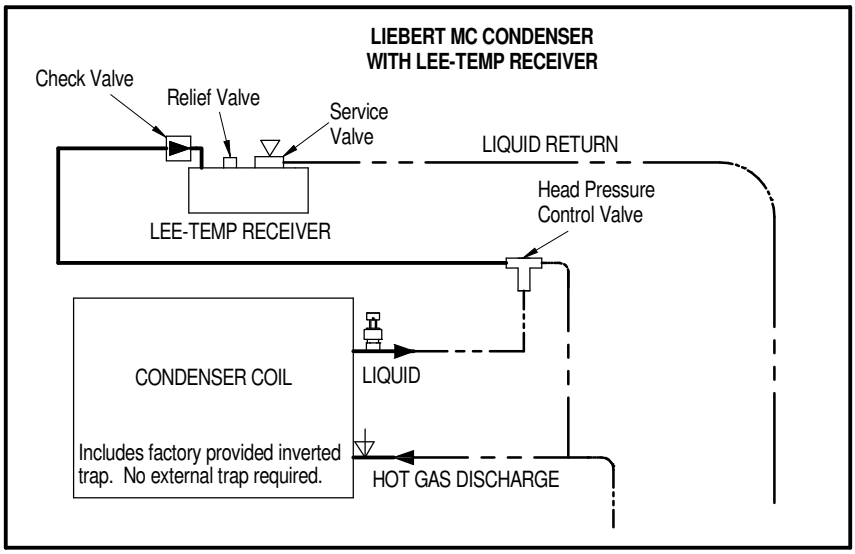
2. Components are not supplied by Liebert, but are required for proper circuit operation and maintenance.

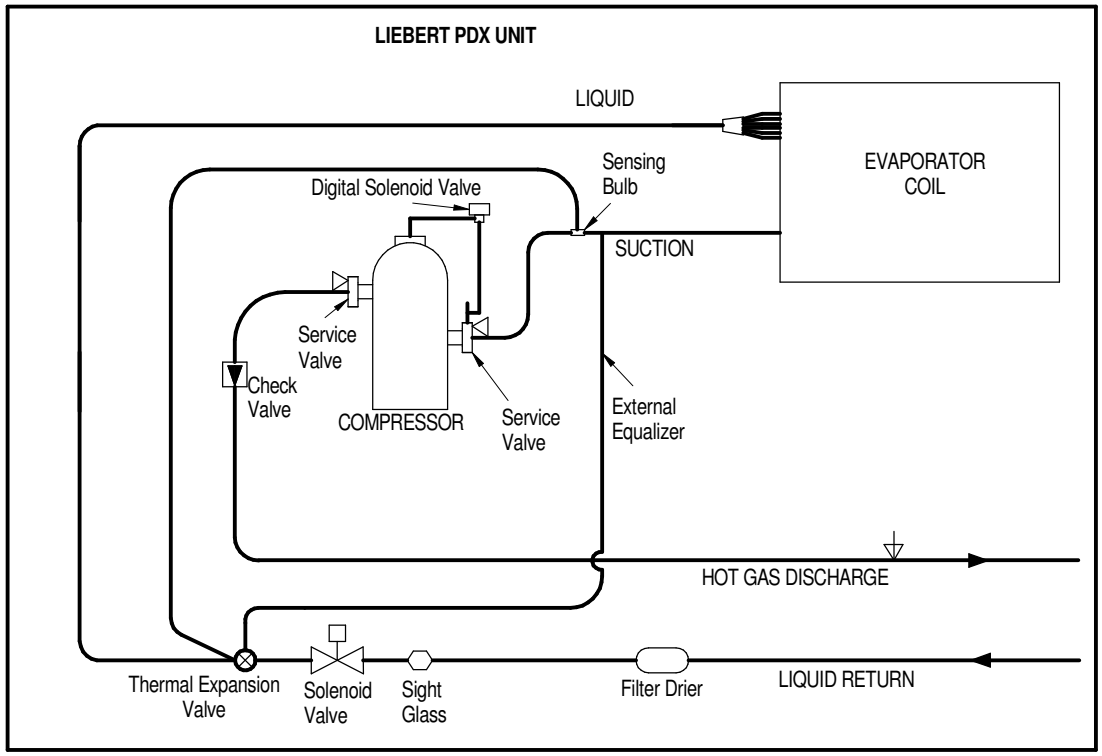
3. Do not isolate any refrigerant circuit from over pressurization protection.
4. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid floodback to compressor. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.

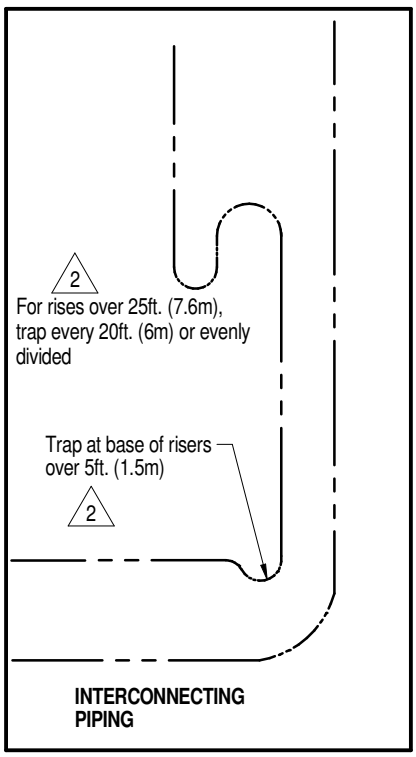
LIEBERT PDX

PIPING SCHEMATIC
AIR COOLED MODELS WITH TXV





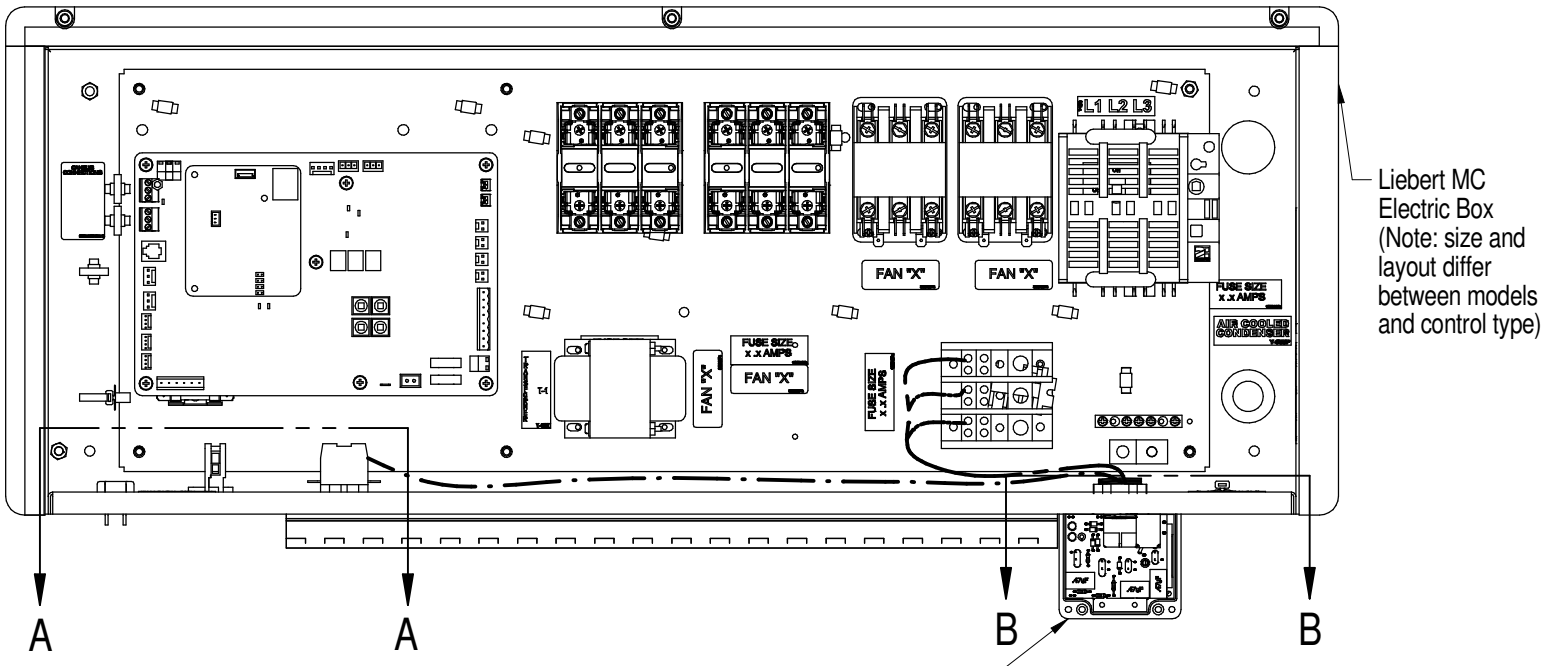




FACTORY REFRIGERANT PIPING
FIELD PIPING
SERVICE / SCHRADER (ACCESS) CONNECTION NO VALVE CORE
SERVICE / SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

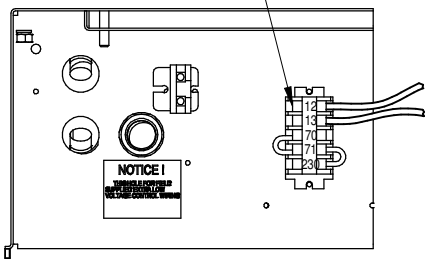
Notes:
1. Schematic representation shown. Do not use for specific connection locations.
2. Components are not supplied by Liebert but are required for proper circuit operation and maintenance.
3. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid floodback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

Installation Instructions for Installing 420 Surge Protective Device (SPD) to Liebert MC



Liebert MC Electric Box (Note: size and layout differ between models and control type)

SPD alarm wires to terminals 12 & 13

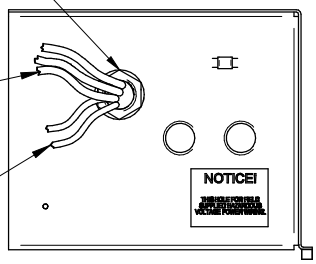


SECTION A-A

The SPD is mounted through the leftmost knockout hole in the bottom of the Electric Box

Phase wires from SPD to load side of Power Block

Orange & Yellow wires from SPD to terminals 12 & 13



SECTION B-B

WARNING: Risk of arc flash and electrical shock! Can cause injury or death!

Open all local and remote electric power supply disconnect switches, verify with a voltmeter that power is off, and wear personal protective equipment per NFPA 70 E before working within the electrical control enclosure or performing any electrical and/or mechanical service and/or maintenance operations. The variable speed control may contain a stored electrical charge. Disconnect all local and remote electrical power supplies and wait 10 minutes before working within the condenser's main electrical enclosure or fan electrical enclosure. The Liebert MC contains lethal voltage in some circuits. The line side of the disconnect remains energized when the condenser unit disconnect is switched to the OFF position.

1. Verify the incoming voltage matches the rated voltage of the Surge Protective Device (SPD).
2. Use the leftmost knockout on the right side of the electrical box bottom (see section B-B above) or drill a 7/8" hole to attach the 420 SPD.
3. Remove the coupler nut from the SPD, but leave the o-ring on the threaded coupler. Pass the wires and threaded coupler through the knockout hole, and pass the wires through the coupler nut. Orient the SPD so the clear cover is visible from the Liebert MC front.
4. Hold the SPD up while tightening the coupler nut to compress the o-ring (approximately 10 in-lbs).
5. Attach the SPD green wire to the earth ground connection.
6. Trim the SPD black phase wires to the minimum length required to reach the power block.
7. Attach the SPD black phase wires to the load side of the power block (see schematic) (approximately 7 in-lbs).
   Note: The SPD black phase wires are NOT phase dependent. (It does not matter which black wire is connected to L1, L2, or L3.)
8. Attach the SPD orange & yellow wires to terminal connections 12 & 13 respectively (see Section A-A) (approximately 16 in-lbs).

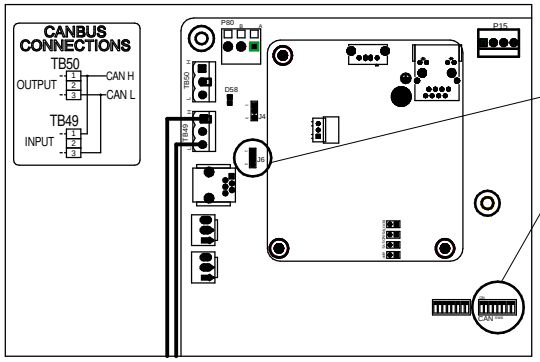
DRAWN: B. POEPPELMAN
CHECKED: N/A
ENGR : M. NEAL

DATE: 4/1/14
DATE: N/A
DATE: 4/1/14

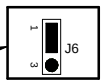
SHEET 1/1
REV 2
DRAWING NUMBER DPN002960

LIEBERT CRV

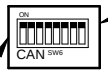
CANbus & INTERLOCK CONNECTIONS
BETWEEN 300mm (12in.) UNIT & LIEBERT MC CONDENSER (PREMIUM)



DETAIL1
CAN CABLE CONNECTION (A)

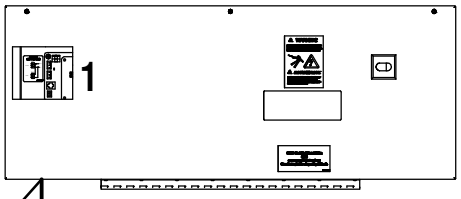


J6 TERMINATION JUMPER
MUST BE SET TO PINS 1 AND 2.

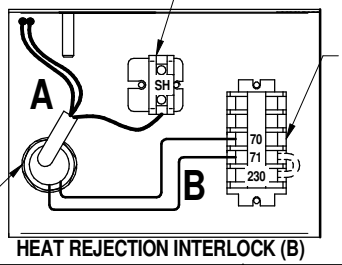


CANbus
ADDRESSING
SWITCH

CONDENSER



SHIELD CONNECTION



FACTORY WIRING BETWEEN
MC CONTROL BOARD AND
TERMINAL STRIP.

A CANbus CABLE CONNECTION

B
HEAT REJECTION INTERLOCK

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

HEAT REJECTION INTERLOCK (B)

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

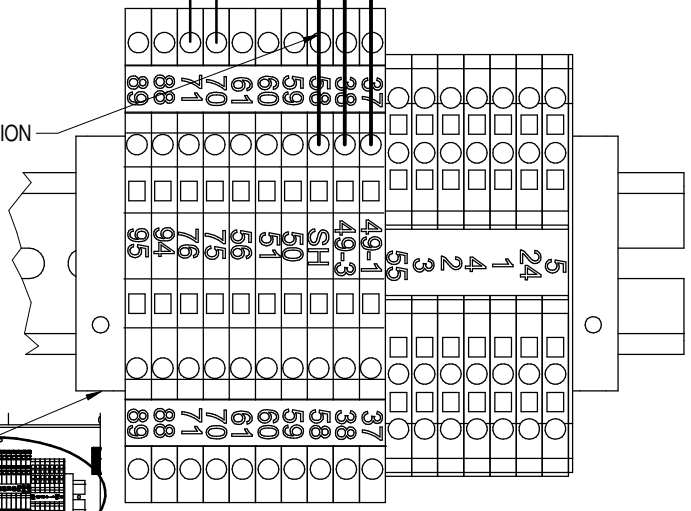
CAN & CABLE NOTES (A):
1. CABLE MUSTHAVE THE FOLLOWING SPECIFICATIONS:
   - BRAIDED SHIELD OR FOIL SHIELD WITH DRAIN WIRE
   - SHIELD MUST BE WIRED TO GROUND AT INDOOR UNIT
   - 22-18AWG STRANDED TINNED COPPER
   - TWISTED PAIR (MINIMUM 4 TWISTS PER FOOT)
   - LOW CAPACITANCE (15pF/FT OR LESS)
   - MUST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

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

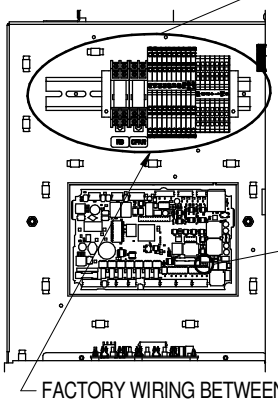
2. RUN FIELD SUPPLIED WIRES BETWEEN THE INDOOR UNIT AND THE CONDENSER.

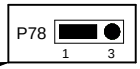
CRV300 INDOOR UNIT

SHIELD CONNECTION



PARTIAL VIEW SHOWN FOR CLARITY



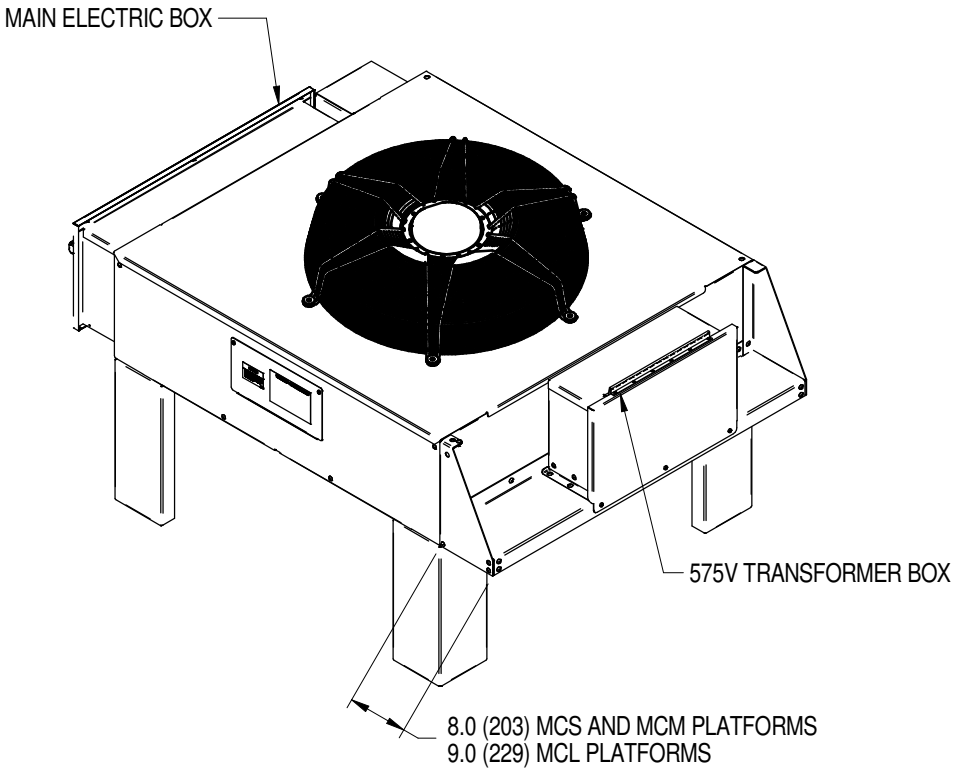


P78 TERMINATION JUMPER
FACTORY SET TO PINS 2 AND 3,
FIELD MUST REMOVE JUMPER
AND REPLACE ON PINS 1 AND 2.

FACTORY WIRING BETWEEN ICOM AND TERMINAL STRIP.

LIEBERT MC CONDENSER

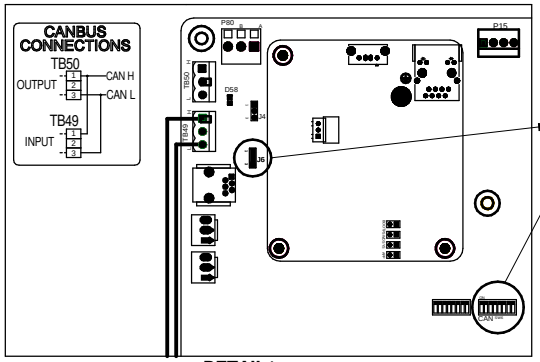
ELECTRICAL: 575V OPTION



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

LIEBERT PDX

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

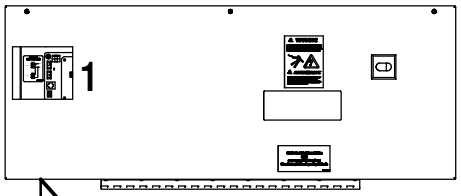


DETAIL1
CAN CABLE CONNECTION (A)

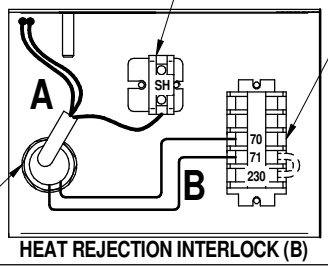
J6 TERMINATION JUMPER MUST BE SET TO PINS 1 AND 2.

CANbus ADDRESSING SWITCH

CONDENSER



SHIELD CONNECTION



FACTORY WIRING BETWEEN MC CONTROL BOARD AND TERMINAL STRIP.

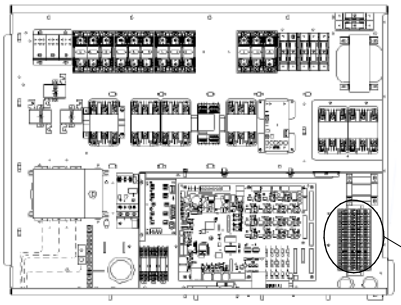
LOW VOLTAGE FIELD ENTRANCE LOCATED ON BOTTOM LEFT OF CONDENSER ENCLOSURE.

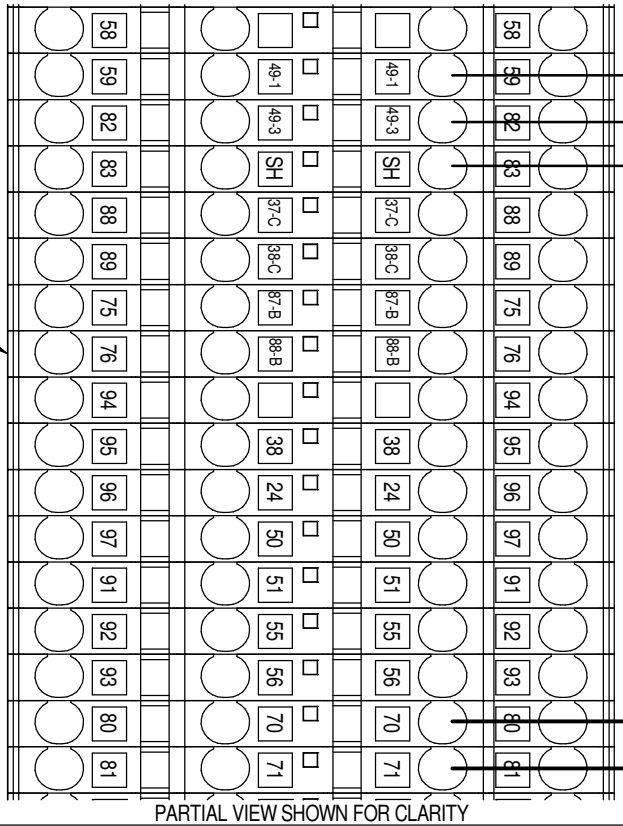
HEAT REJECTION INTERLOCK (B)

A
CANbus CABLE CONNECTION

B
HEAT REJECTION INTERLOCK WIRE

INDOOR UNIT





PARTIAL VIEW SHOWN FOR CLARITY

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

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

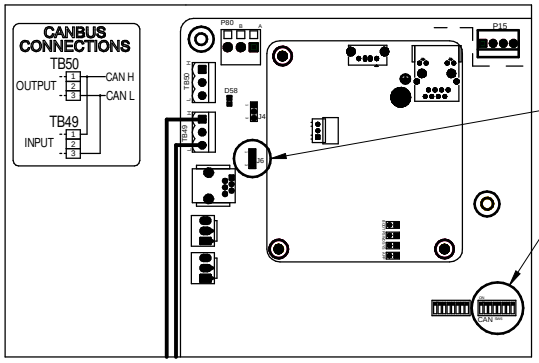
CAN & CABLE NOTES (A):
1. CABLE MUSTHAVE THE FOLLOWING SPECIFICATIONS:
   - BRAIDED SHIELD OR FOIL SHIELD WITH DRAIN WIRE
   - SHIELD MUST BE WIRED TO GROUND AT INDOOR UNIT
   - 22-18AWG STRANDED TINNED COPPER
   - TWISTED PAIR (MINIMUM 4 TWISTS PER FOOT)
   - LOW CAPACITANCE (15pF/FT OR LESS)
   - MUST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

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

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

LIEBERT DS

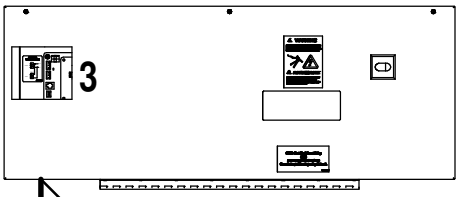
CANbus & INTERLOCK CONNECTIONS
BETWEEN LIEBERT DS & LIEBERT MC CONDENSER (PREMIUM)



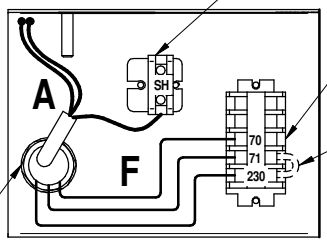
J6 TERMINATION JUMPER MUST BE SET TO PINS 1 AND 2.

CANbus ADDRESSING SWITCH

CONDENSER



DETAIL 3
CAN CABLE CONNECTION (A)



SHIELD CONNECTION

FACTORY WIRING BETWEEN MC CONTROL BOARD AND TERMINAL STRIP.

REMOVE JUMPER FOR DUAL CIRCUIT

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

HEAT REJECTION INTERLOCK (F)

F HEAT REJECTION INTERLOCK

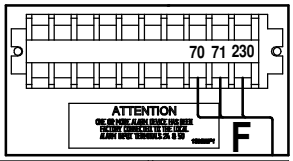
A CANbus CONNECTION

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

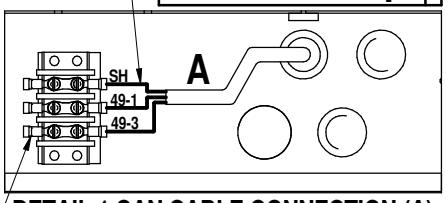
CABLE NOTES (A):
1. CABLE MUSTHAVE THE FOLLOWING SPECIFICATIONS:
   - BRAIDED SHIELD OR FOIL SHIELD WITH DRAIN WIRE
   - SHIELD MUST BE WIRED TO GROUND AT INDOOR UNIT
   - 22-18AWG STRANDED TINNED COPPER
   - TWISTED PAIR (MINIMUM 4 TWISTS PER FOOT)
   - LOW CAPACITANCE (15pF/FT OR LESS)
   - MUST BE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

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

DETAIL 2
HEAT REJECTION INTERLOCK (F)

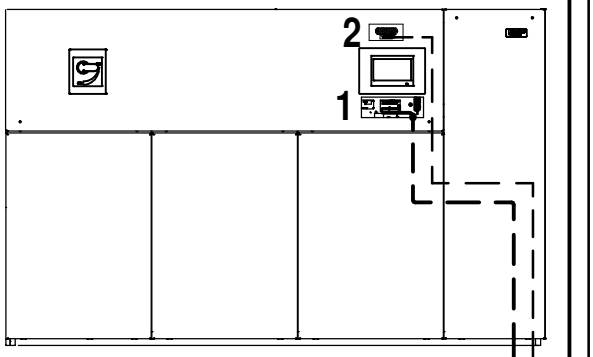


SHIELD CONNECTION



DETAIL 1 CAN CABLE CONNECTION (A)

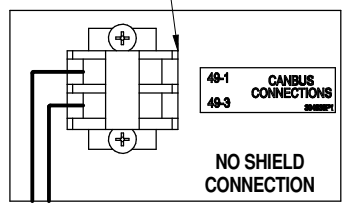
FACTORY WIRING BETWEEN ICOM AND TERMINAL STRIP.



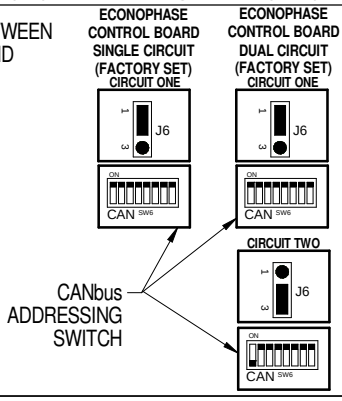
INDOOR DS UNIT

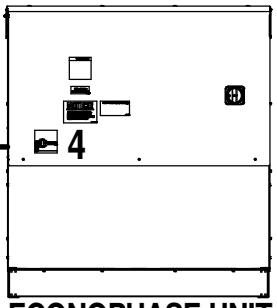
LIEBERT DSE

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

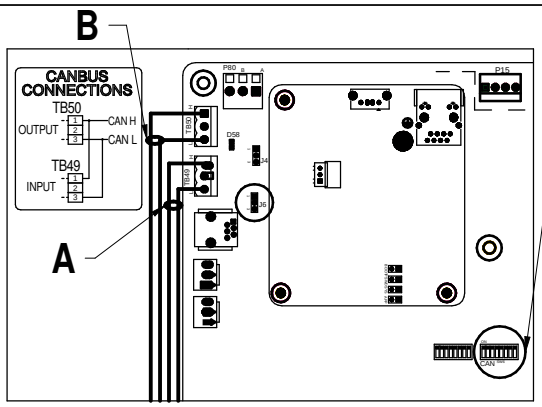


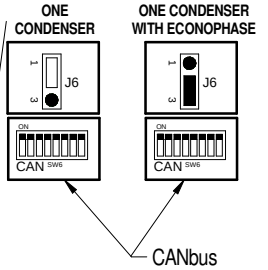
DETAIL 4
CAN CABLE CONNECTION (B)





ECONOPHASE UNIT
LAST DEVICE ON CANBUS (IF PRESENT)

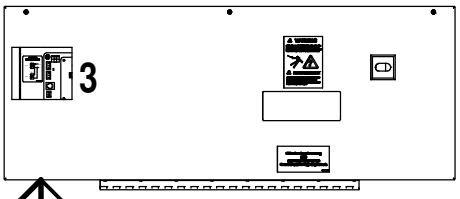


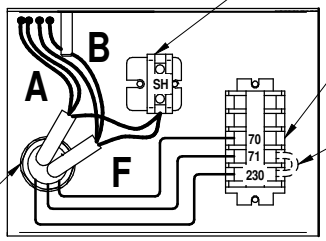


DETAIL 3
CAN CABLE CONNECTION (A) (B)

B CANBUS COMMUNICATION CABLE

CONDENSER



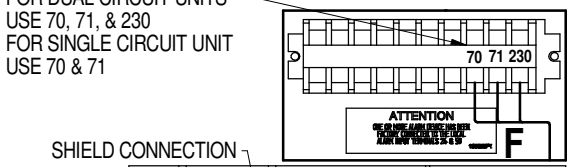


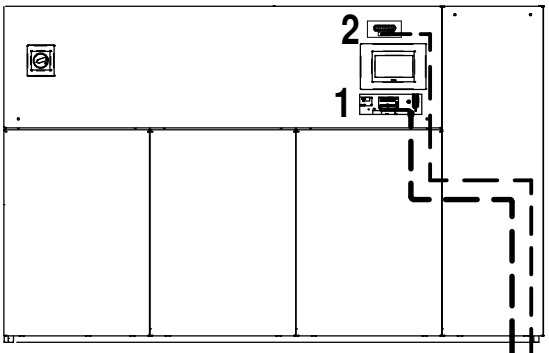
HEAT REJECTION INTERLOCK (F)

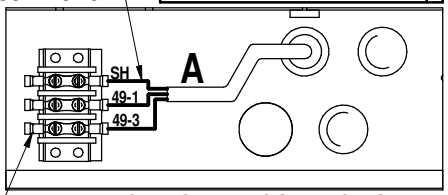
F HEAT REJECTION INTERLOCK WIRE

DETAIL 2
HEAT REJECTION INTERLOCK (F)

A CANBUS COMMUNICATION CABLE







DETAIL 1 CAN CABLE CONNECTION (A)

FACTORY WIRING BETWEEN ICOM AND TERMINAL STRIP.

INDOOR DSE UNIT

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

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

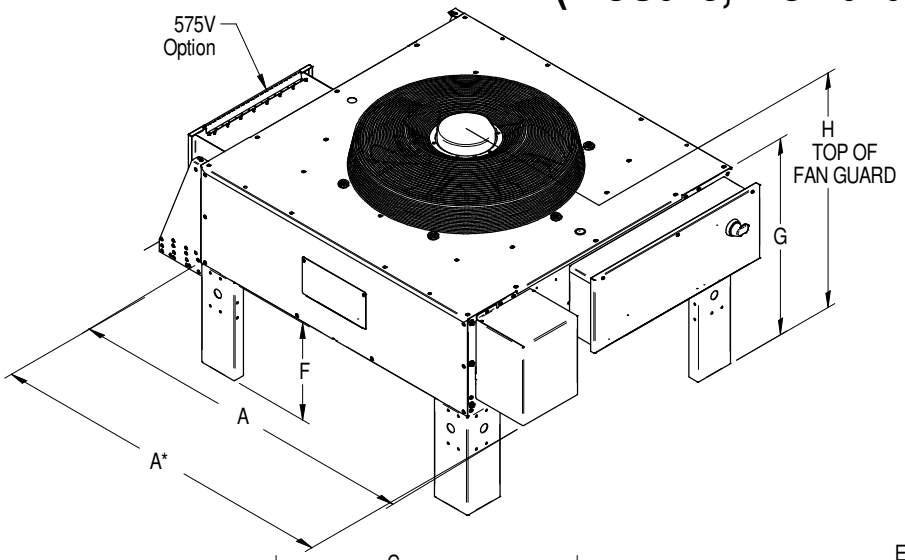
CAN & CABLE NOTES (A, B):
1. CABLE MUSTHAVE THE FOLLOWING SPECIFICATIONS:
   - BRAIDED SHIELD OR FOIL SHIELD WITH DRAIN WIRE
   - SHIELD MUST BE WIRED TO GROUND AT INDOOR UNIT
   - 22-18AWG STRANDED TINNED COPPER
   - TWISTED PAIR (MINIMUM 4 TWISTS PER FOOT)
   - LOW CAPACITANCE (15pF/FT OR LESS)
  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

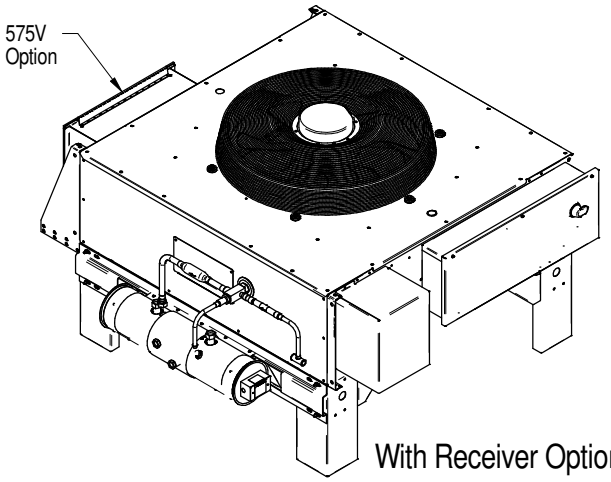
INTERLOCK WIRE NOTES (F):
1. FIELD SUPPLIED WIRE
   - 2 CONDUCTOR 18AWG OR GREATER FOR SINGLE REFRIGERANT CIRCUIT DSE UNITS.
   - 3 CONDUCTOR 18AWG OR GREATER FOR DUAL REFRIGERANT CIRCUIT DSE UNITS.
   - RATED 600V
2. RUN FIELD SUPPLIED WIRES BETWEEN THE INDOOR UNIT AND THE CONDENSER.

LIEBERT MC CONDENSER

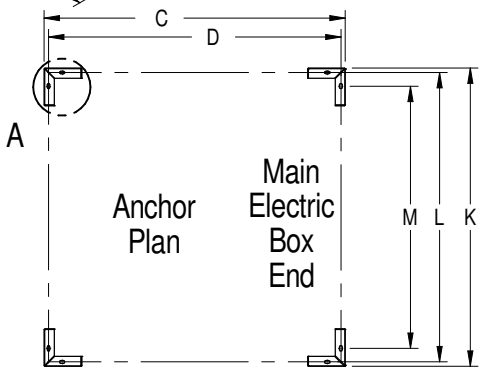
CABINET & ANCHOR DIMENSIONAL DATA

1 FAN (MCS028, MCM040, MCL055)

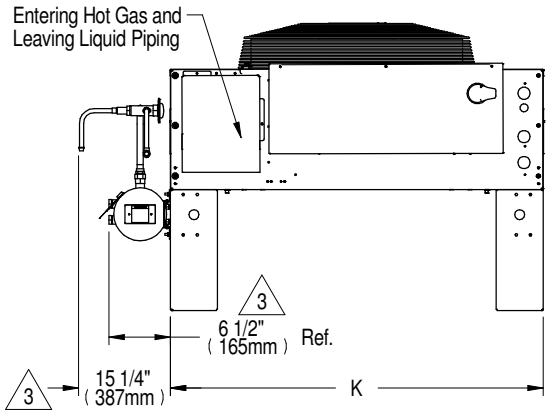




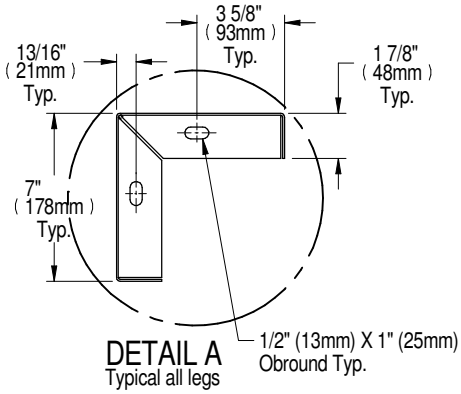
With Receiver Option



Left Side of Unit



Front View (Lee-Temp Shown)



DETAIL A
Typical all legs

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

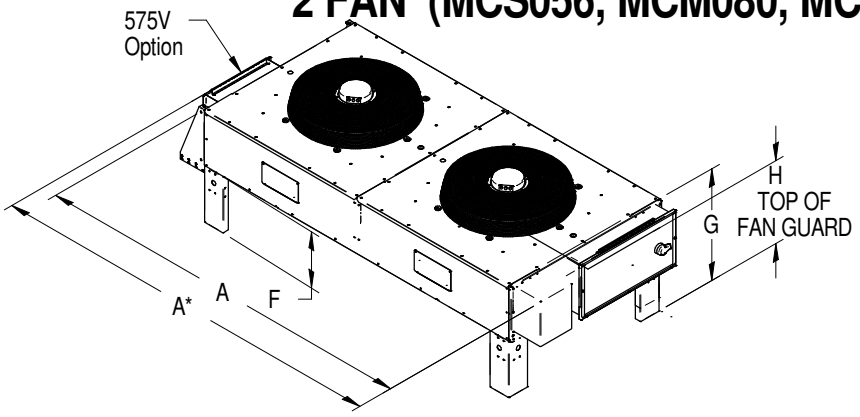
Note:
1. Liebert recommends a clearance of 36" (915mm) on each side for proper operation and component access.
△2. Cross Bracing required for legs longer than 18" (457.2mm). Quantity varies per model & options selected.
△3. For PDX w/EEV systems & unheated refrigerant receivers, 6-1/2" (165mm) is 9-1/4"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

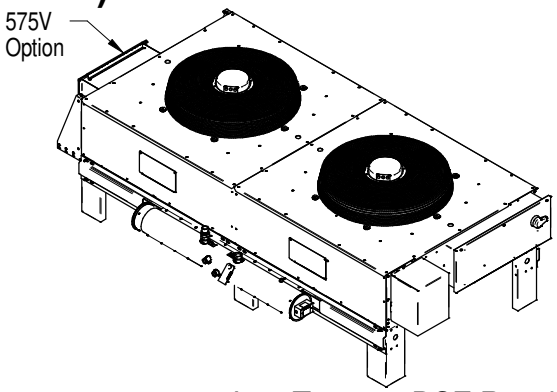
LIEBERT MODEL NUMBER	A in (mm)	A* in (mm) (575V ONLY)	C in (mm)	D in (mm)	K in (mm)	L in (mm)	M in (mm)
MCS028	50-5/8 (1287)	58-7/8 (1495)	44-1/8 (1120)	42-1/2 (1080)	42-1/2 (1080)	40-7/8 (1038)	35-7/8 (910)
MCM040	57-3/16 (1453)	65-3/8 (1661)	48 (1219)	46-5/16 (1177)	46 (1168)	44-3/8 (1127)	39-5/16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

LIEBERT MC CONDENSER

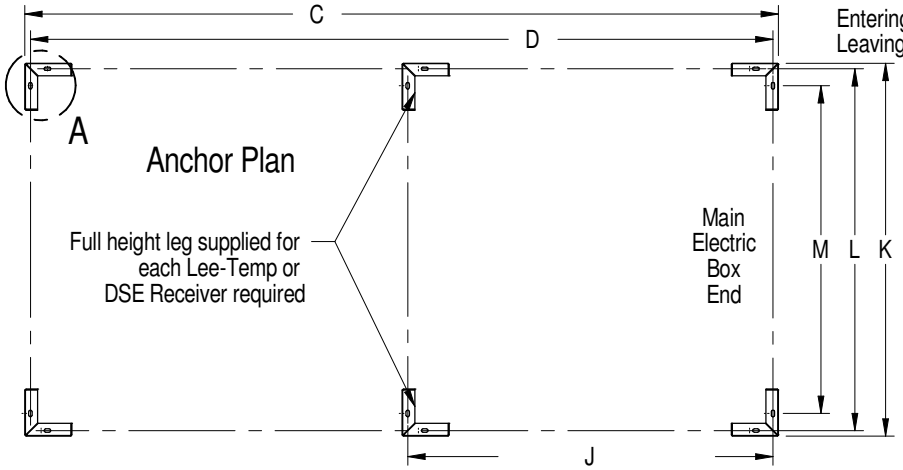
CABINET & ANCHOR DIMENSIONAL DATA

2 FAN (MCS056, MCM080, MCL110) DUAL CIRCUIT

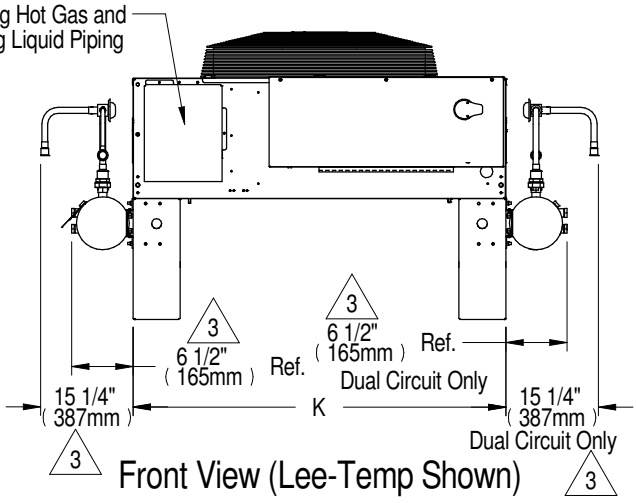




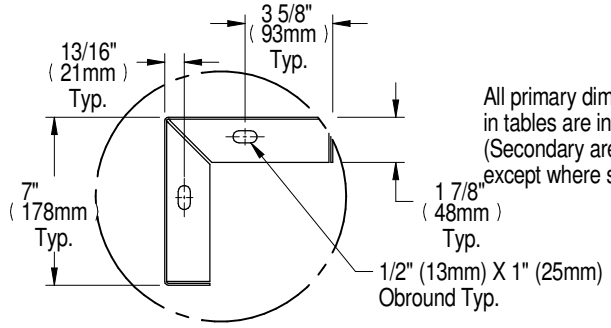
Lee-Temp or DSE Receiver



Left Side of Unit



Front View (Lee-Temp Shown)



DETAIL A
Typical All Legs

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

LIEBERT MODEL NUMBER	F △2 (LEG HEIGHT DIMENSIONS)			
MCS056 MCM080	18 (457)	36 (914)	48 (1219)	60 (1524)
DIM "G"	31-5/8 (803)	49-5/8 (1260)	61-5/8 (1565)	73-5/8 (1870)
DIM "H"	39-5/8 (1006)	57-5/8 (1464)	69-5/8 (1768)	81-5/8 (2073)
MCL110				
DIM "G"	35-7/8 (911)	53-7/8 (1368)	65-7/8 (1673)	77-7/8 (1978)
DIM "H"	43-5/8 (1108)	61-5/8 (1565)	73-5/8 (1870)	85-5/8 (2175)

LIEBERT MODEL NUMBER	A	A* (575V ONLY)	C	D	J Lee-Temp or DSE Receivers Only	K	L	M
MCS056	94-7/8 (2411)	103-1/8 (2619)	88-3/8 (2245)	86-3/4 (2203)	42-1/2 (1079)	42-1/2 (1080)	40-7/8 (1038)	35-7/8 (910)
MCM080	105-1/4 (2674)	113-7/16 (2882)	96-1/16 (2440)	94-7/16 (2398)	46-5/16 (1177)	46 (1168)	44-3/8 (1127)	39-5/16 (999)
MCL110	124-1/8 (3152)	133-1/8 (3381)	112-1/8 (2848)	110-1/2 (2806)	54-3/8 (1381)	55-1/2 (1410)	53-7/8 (1368)	48-3/4 (1238)

Note:

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

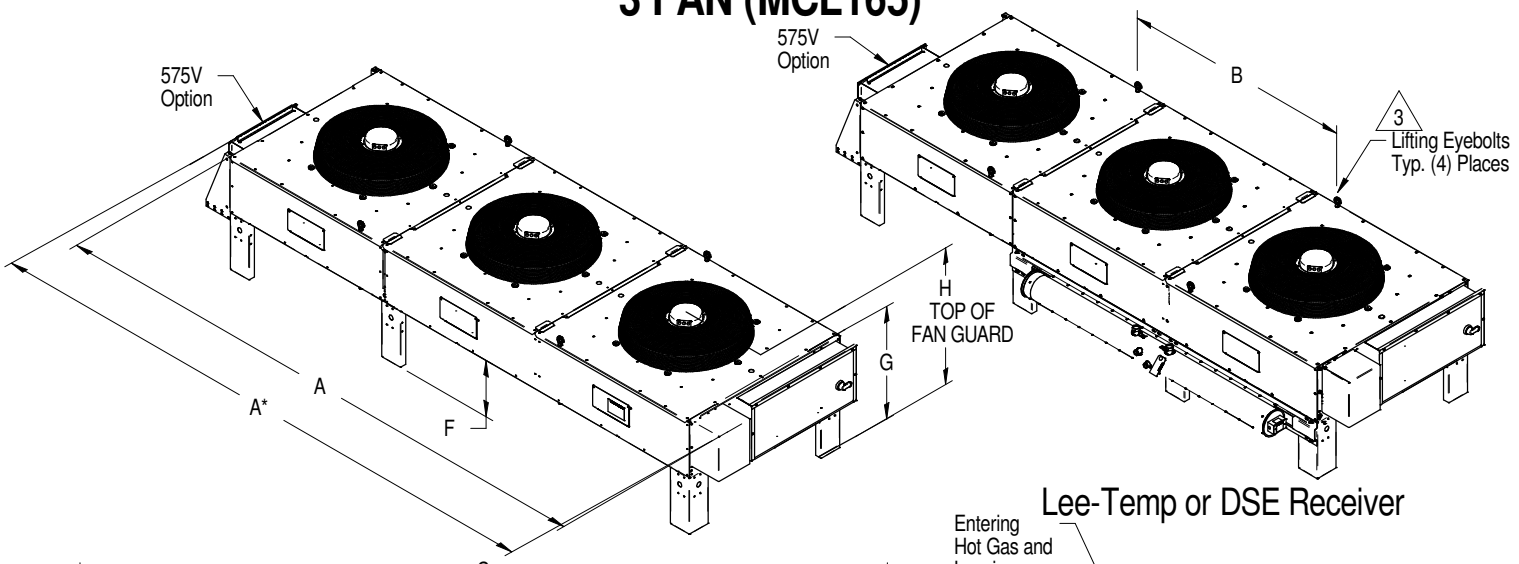
△2 **Cross bracing required for legs longer than 18" (457mm). Quantity varies per model & options selected.**

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

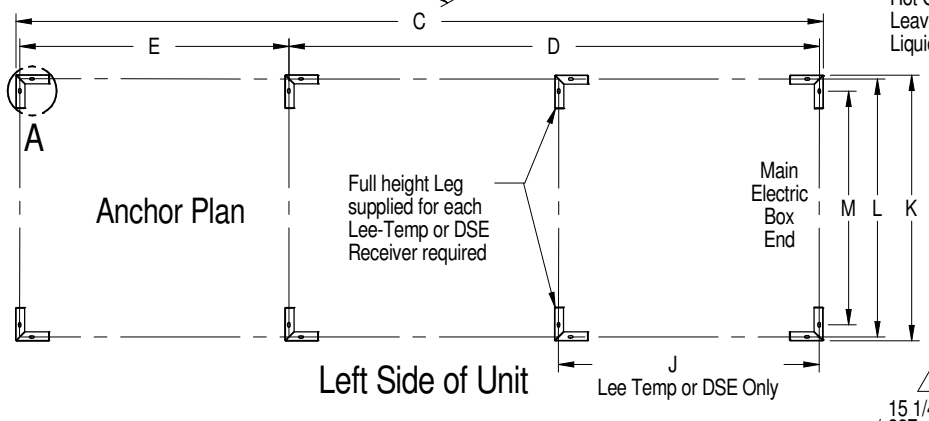
LIEBERT MC CONDENSER

CABINET & ANCHOR DIMENSIONAL DATA

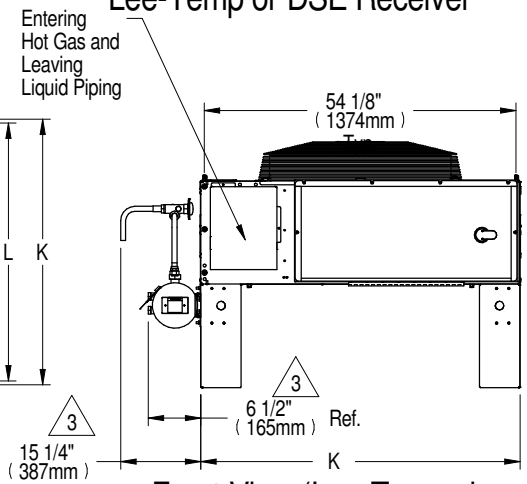
3 FAN (MCL165)



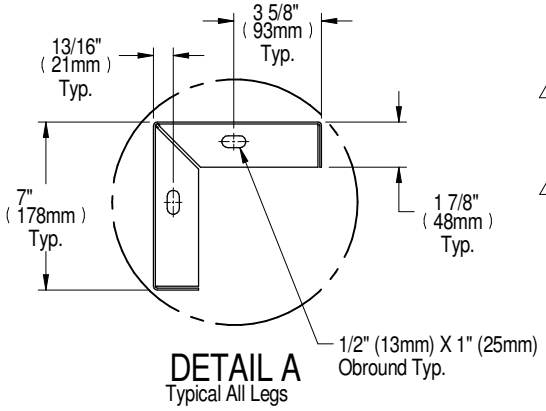
Lee-Temp or DSE Receiver



Left Side of Unit



Front View (Lee-Temp shown)



DETAIL A
Typical All Legs

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

△2 Cross Bracing required for legs longer than 18" (457.2mm). quantity varies per model & options selected.

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

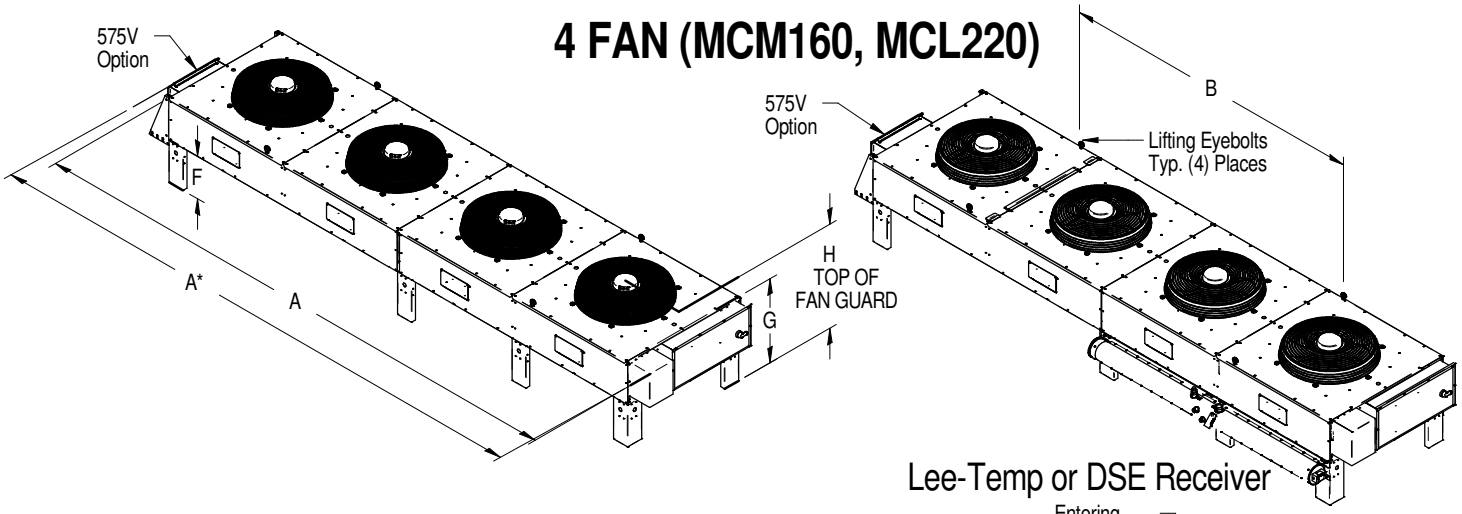
LIEBERT MODEL NUMBER	F △2 LEG HEIGHT DIMENSIONS in. (mm)			
MCL165	18 (457)	36 (914)	48 (1219)	60 (1524)
DIM "G"	35-7/8 (911)	53-7/8 (1368)	65-7/8 (1673)	77-7/8 (1978)
DIM "H"	43-5/8 (1108)	61-5/8 (1565)	73-5/8 (1870)	85-5/8 (2175)

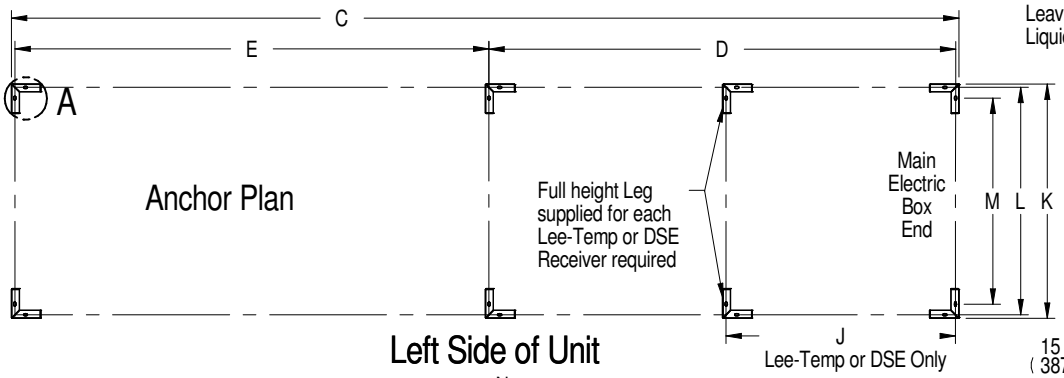
Dimensions in. (mm)										
LIEBERT MODEL NUMBER	A	A* (575V ONLY)	B	C	D	E	J Lee-Temp or DSE Reciever	K	L	M
MCL165	180-1/4 (4578)	189-1/4 (4807)	73-7/16 (1866)	168-1/4 (4274)	110-1/2 (2806)	56-1/8 (1425)	54-3/8 (1381)	55-1/2 (1410)	53-7/8 (1368)	48-3/4 (1238)

LIEBERT MC CONDENSER

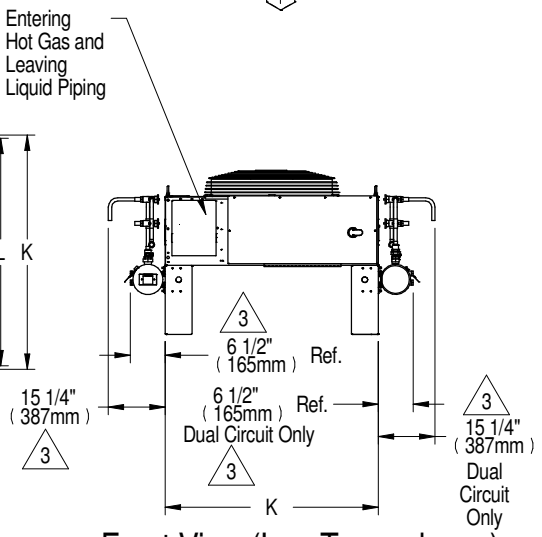
CABINET & ANCHOR DIMENSIONAL DATA

4 FAN (MCM160, MCL220)





Left Side of Unit

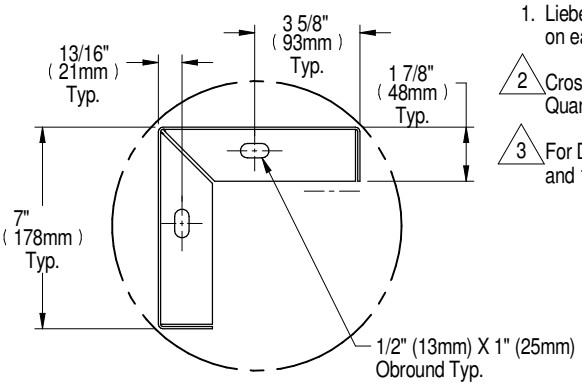


Front View (Lee-Temp shown)

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

2 Cross bracing required for legs longer than 18" (457.2mm). Quantity varies per model & options selected.

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



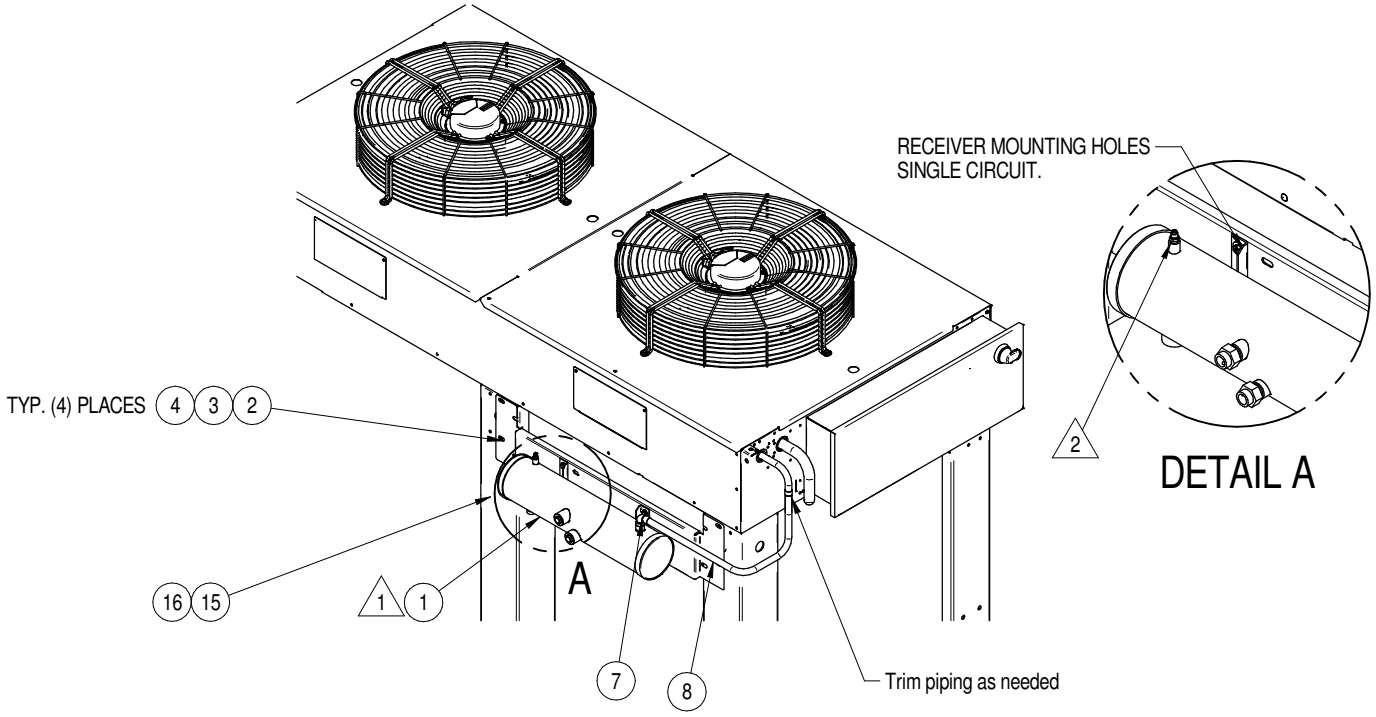
DETAIL A
Typical all legs

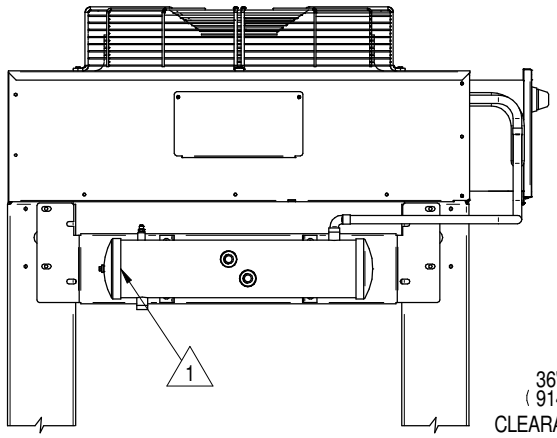
LIEBERT MODEL NUMBER	F 2 LEG HEIGHT DIMENSIONS in. (mm)			
	18 (457)	36 (914)	48 (1219)	60 (1524)
MCM160				
DIM "G"	31-5/8 (803)	49-5/8 (1260)	61-5/8 (1565)	73-5/8 (1870)
DIM "H"	39-5/8 (1006	57-5/8 (1464)	69-5/8 1768)	81-5/8 (2073)
MCL220				
DIM "G"	35-7/8 (911)	53-7/8 (1368)	65-7/8 (1673)	77-7/8 (1978)
DIM "H"	43-5/8 (1108)	61-5/8 (1565)	73-5/8 (1870)	85-5/8 (2175)

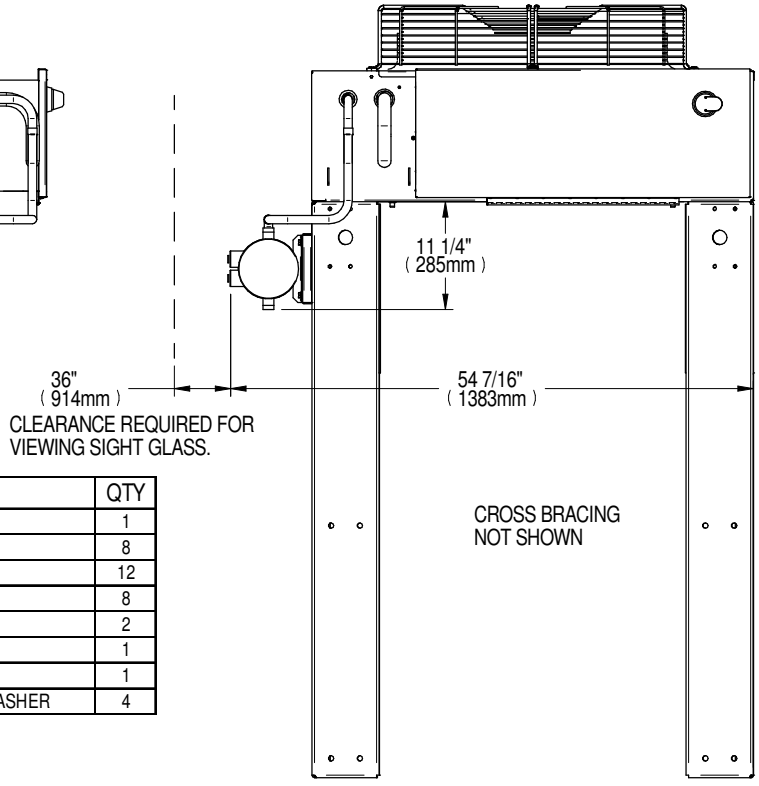
Dimensions in. (mm)										
LIEBERT MODEL NUMBER	A	A* (575V ONLY)	B	C	D	E	J Lee-Temp or DSE Receiver Only	K	L	M
MCM160	202-7/16 (5142)	210-5/8 (5350)	113-1/2 (2883)	192-1/4 (4883)	94-7/16 (2398)	96-3/16 (2444)	46-5/16 (1177)	46 (1168)	44-3/8 (1127)	39-5/16 (999)
MCL220	236-5/16 (6003)	245-5/16 (6231)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

LIEBERT MC CONDENSER

DSE RECEIVER MOUNTING
MCM SINGLE CIRCUIT LEFT SIDE CONDENSER OUTLET RECEIVER







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

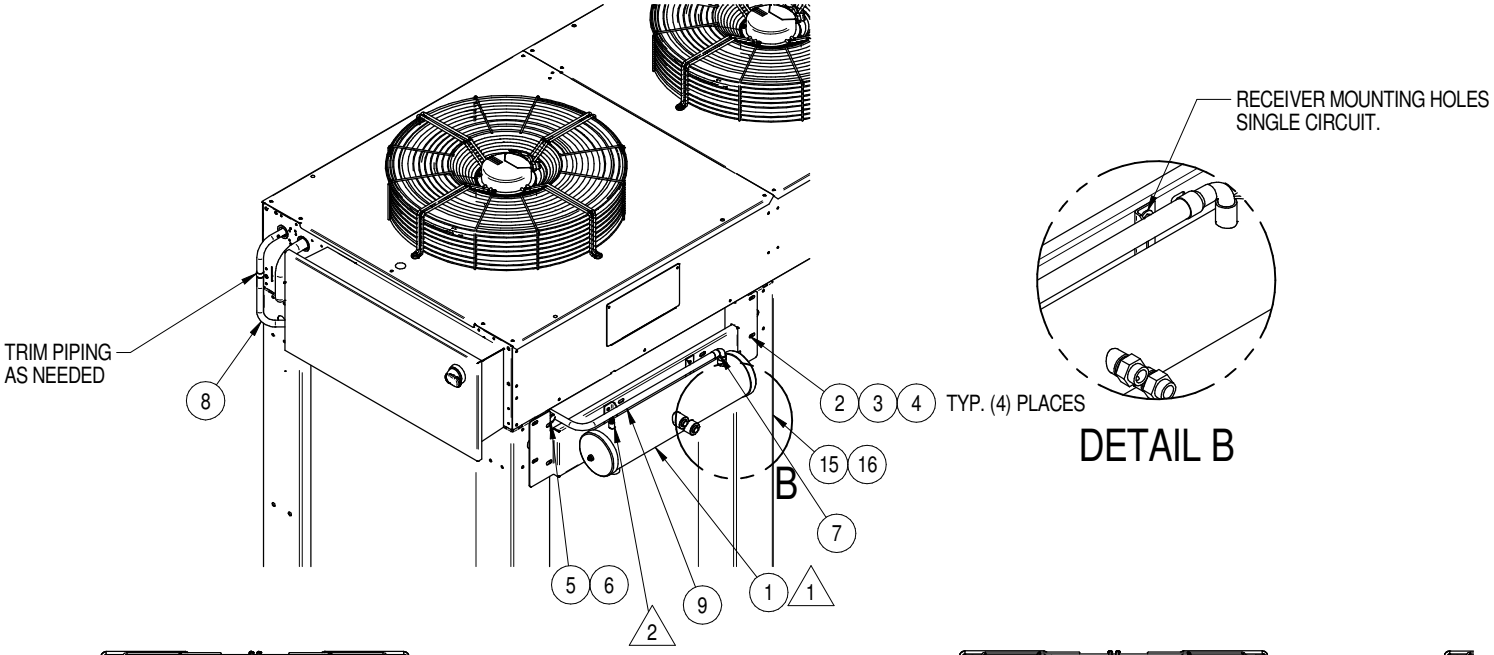
NOTES

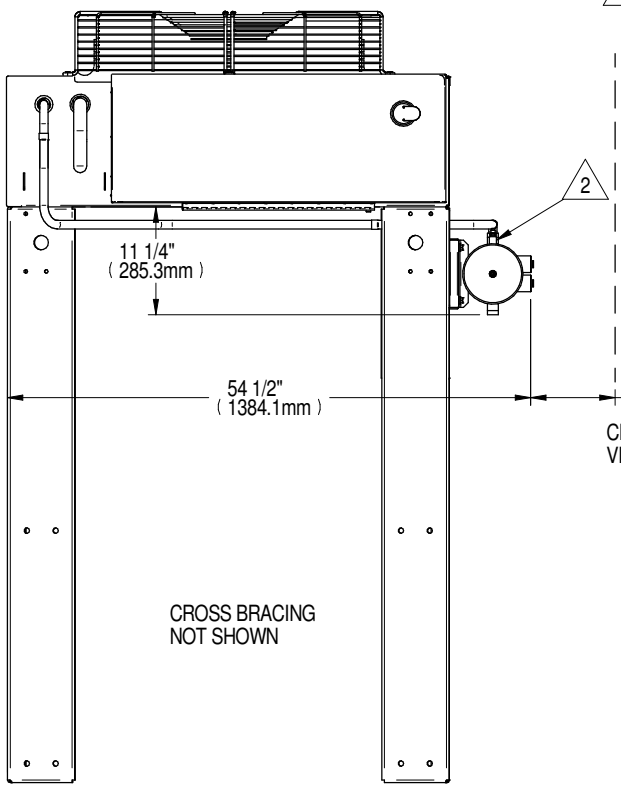
1. SMALL RECEIVER SHOWN. ACTUAL RECEIVER SIZE MAY VARY.

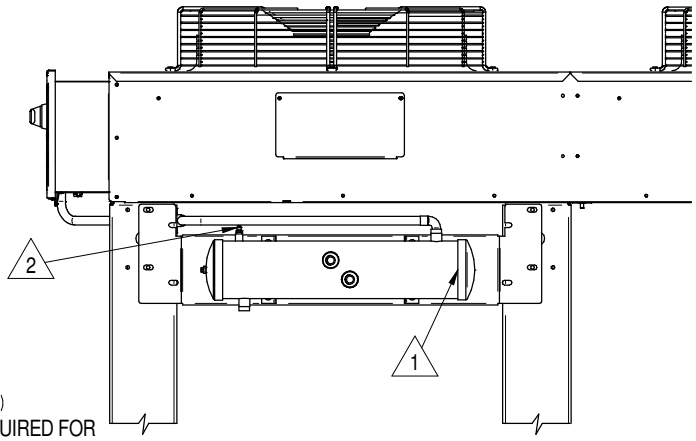
2. SCHRADER PORT FOR PROOF PRESSURE RELIEF ONLY & ACCESS NOT REQUIRED AFTER PIPING.

LIEBERT MC CONDENSER

DSE RECEIVER MOUNTING
MCM080 SINGLE CIRCUIT RIGHT SIDE CONDENSER OUTLET RECEIVER







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

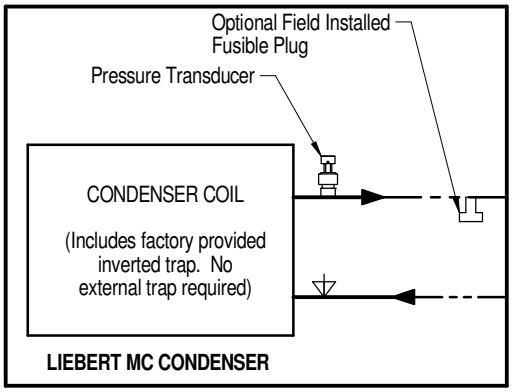
NOTES

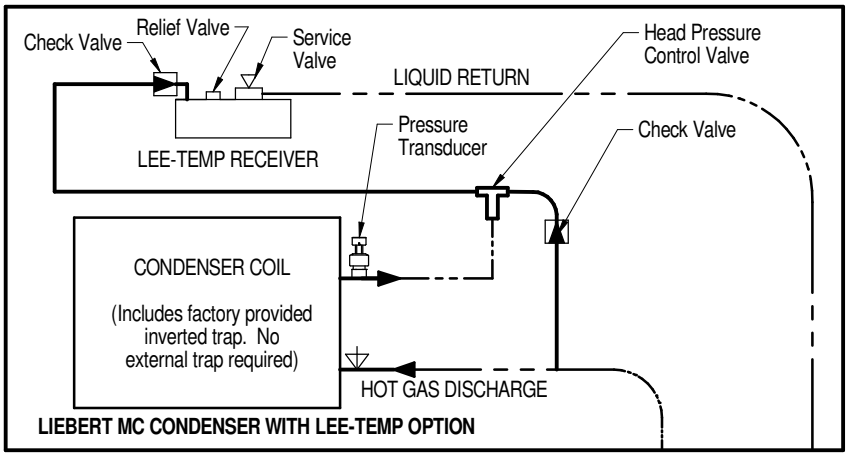
1. SMALL RECEIVER SHOWN. ACTUAL RECEIVER SIZE MAY VARY.

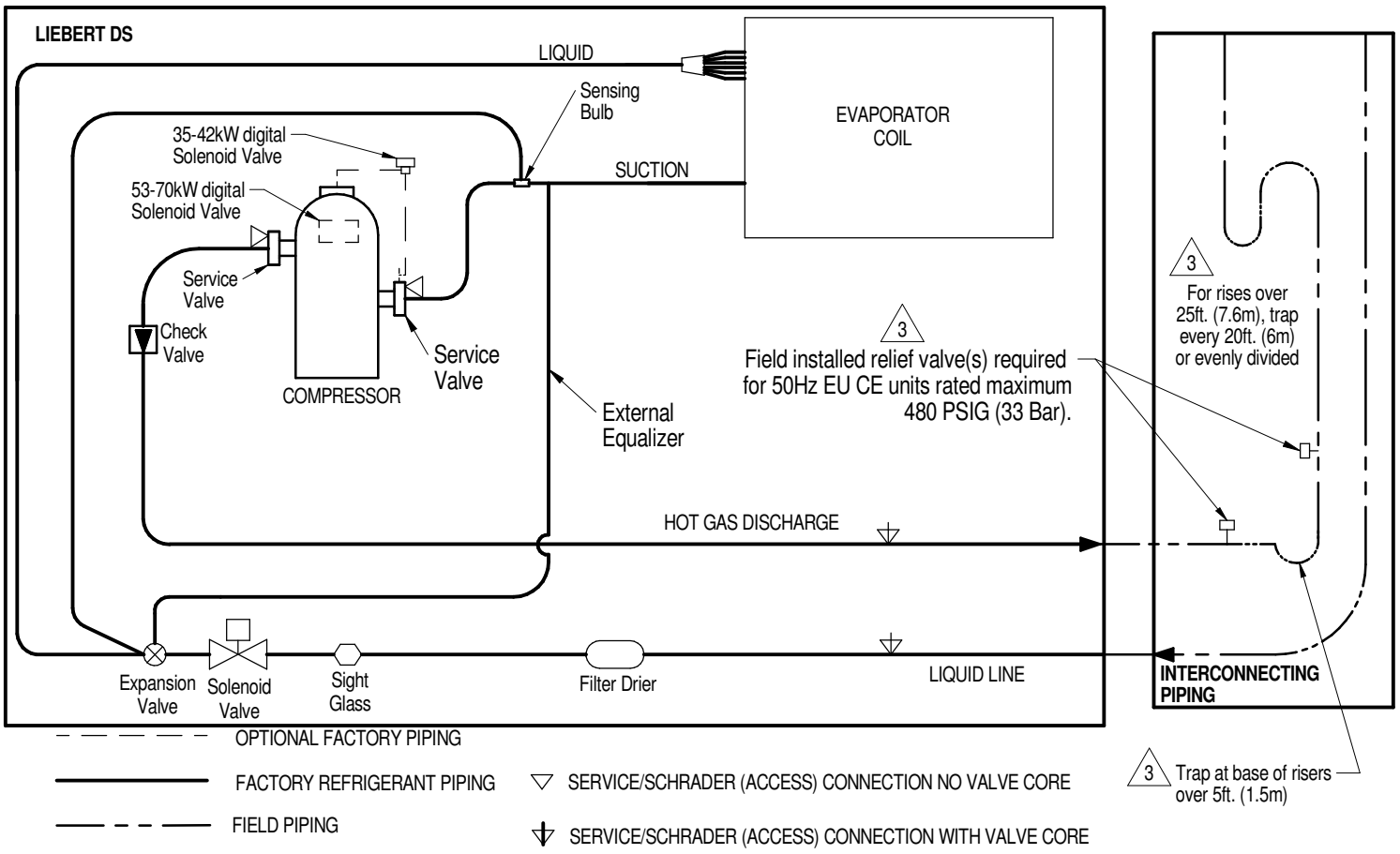
2. SCHRADER PORT FOR PROOF PRESSURE RELIEF ONLY & ACCESS NOT REQUIRED AFTER PIPING.

LIEBERT DS

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





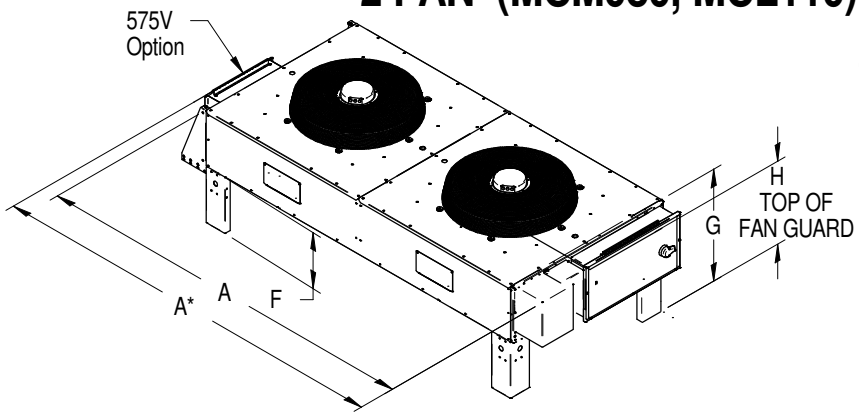


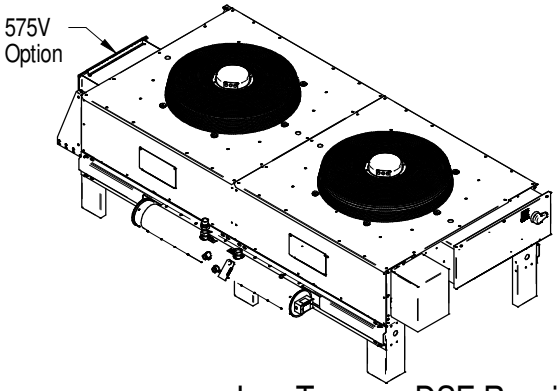
Notes:
1. Single refirigeration circuit shown for clarity.
2. Schematic representation shown. Do not use for specific connection locations.
3. Components are not supplied by Liebert, but are required for proper operation and maintenance.
4. Traps must be installed and horizontal lines pitched to ensure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

LIEBERT MC CONDENSER

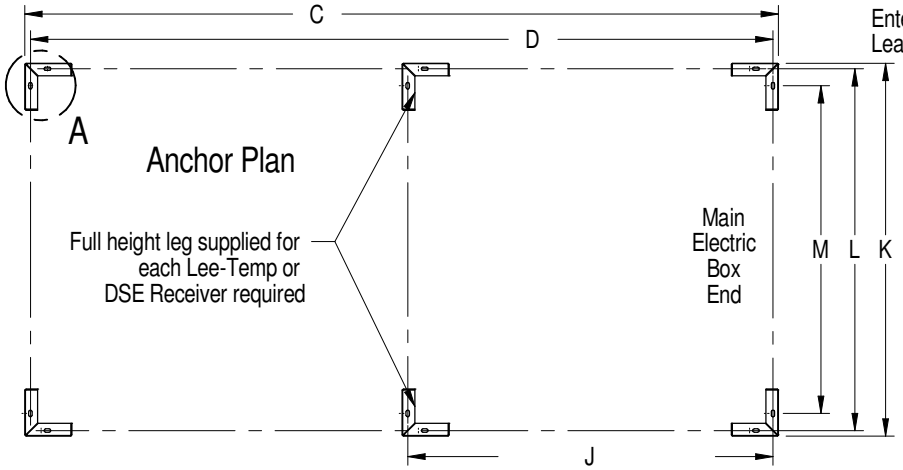
CABINET & ANCHOR DIMENSIONAL DATA

2 FAN (MCM080, MCL110) SINGLE CIRCUIT

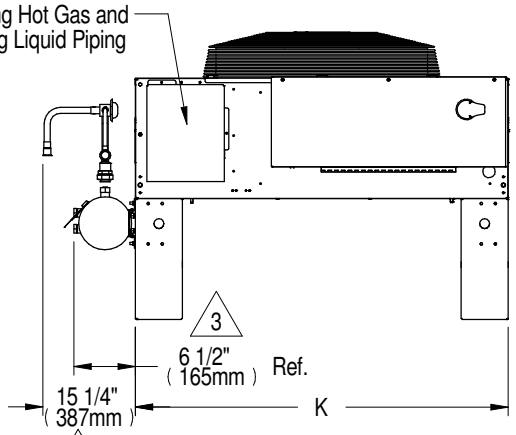




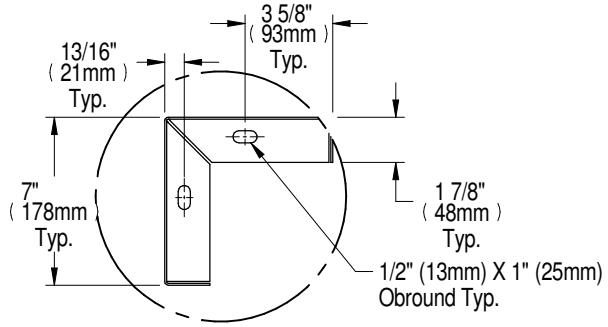
Lee-Temp or DSE Receiver



Left Side of Unit



Front View (Lee-Temp Shown)



DETAIL A
Typical All Legs

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

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

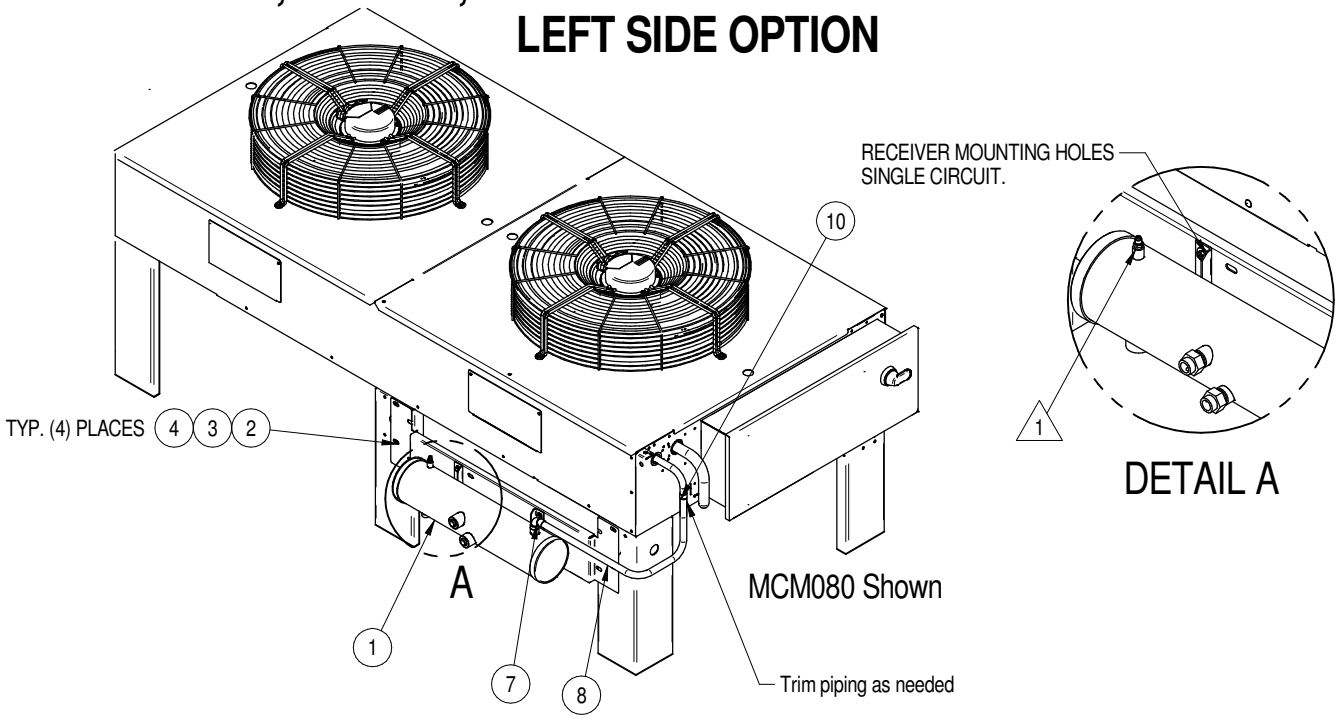
2 Cross bracing required for legs longer than 18" (457mm). Quantity varies per model & options selected.

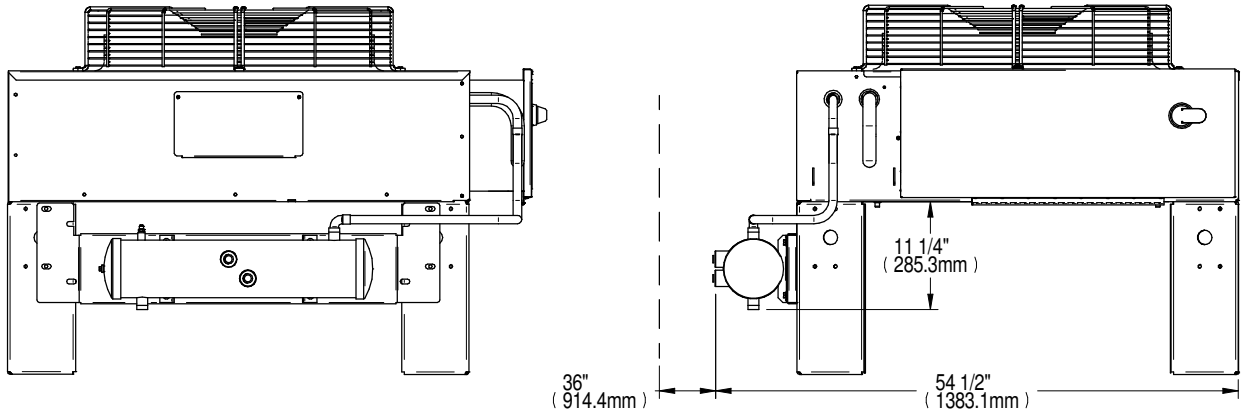
3 For DSE models only, 6-1/2" (165mm) dimension is 9-1/4" (235mm) and 15-1/4 (387mm) dimension is not applicable.

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

LIEBERT MC CONDENSER

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





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

NOTES:

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

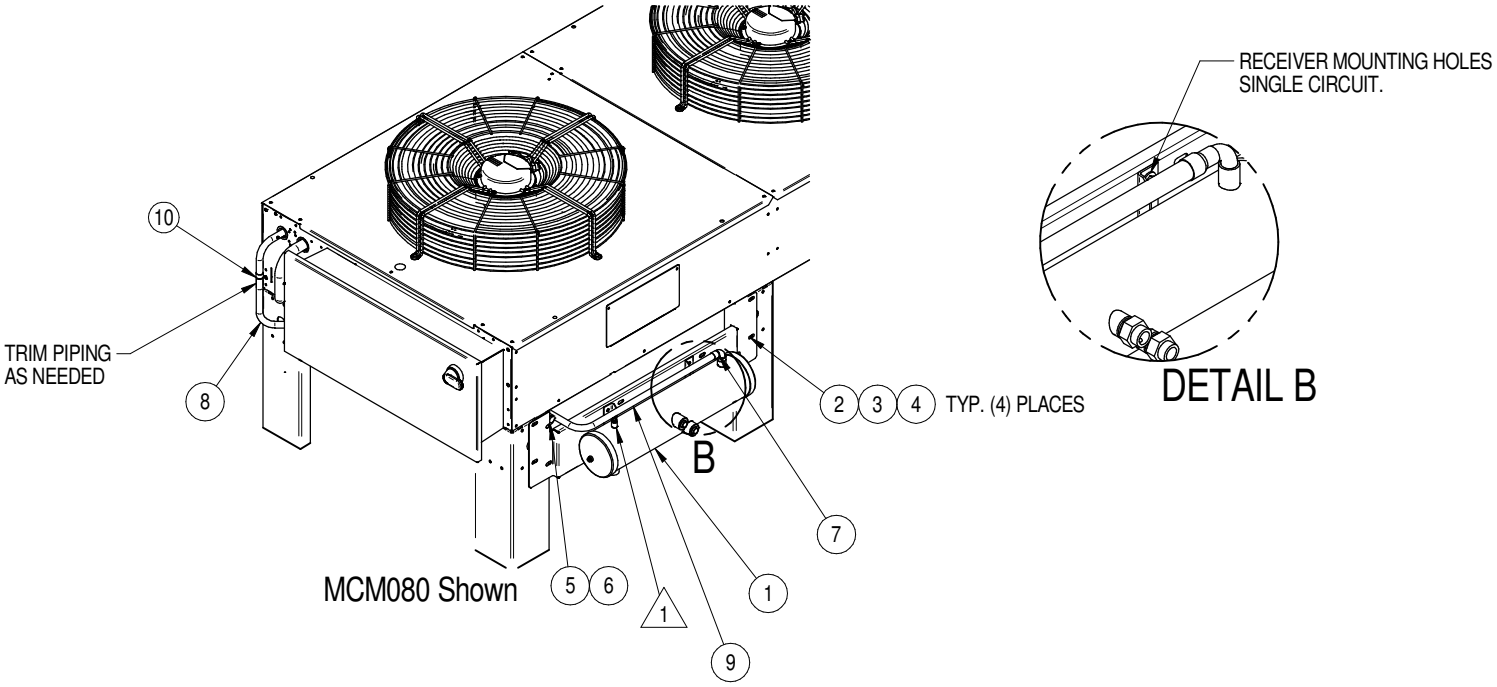
Liebert MC Condenser Hot Gas/Receiver Outlet Connection Sizes*

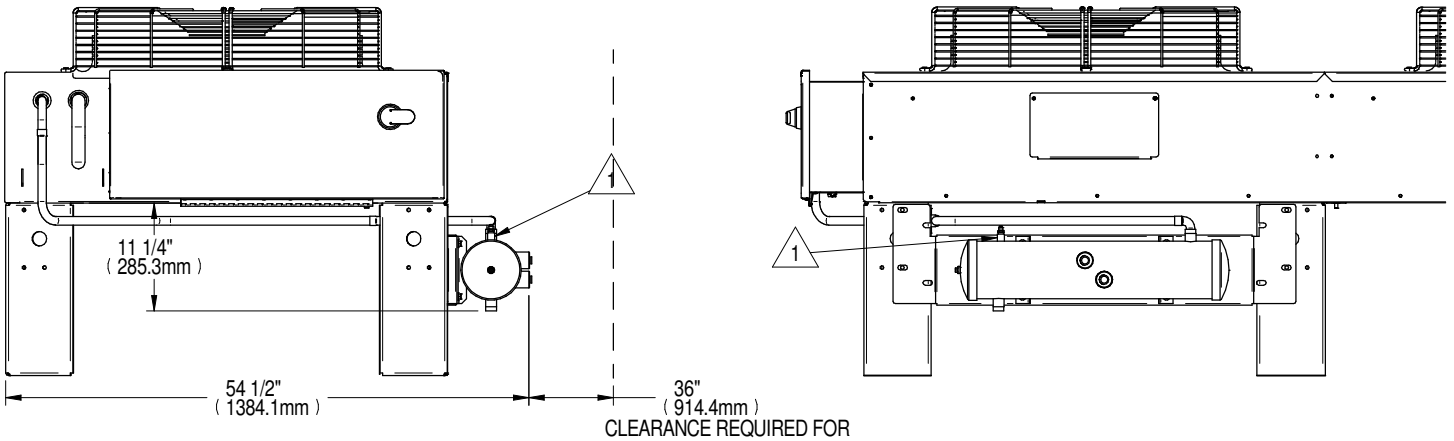
MODEL NO.	CONNECTION SIZES, OD, IN	
	HOT GAS LINE	RECEIVER OUTLET (LIQUID LINE)
MCS 028	7/8	1-3/8
MCM 040	7/8	1-3/8
MCM 080	1-1/8	1-3/8

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

LIEBERT MC CONDENSER

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





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

NOTES:

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

Liebert MC Condenser Hot Gas/Receiver Outlet Connection Sizes*

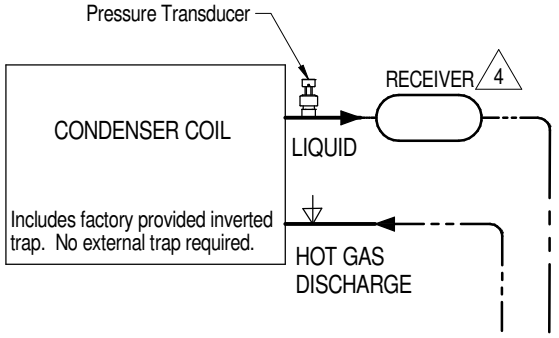
MODEL NO.	CONNECTION SIZES, OD, IN	
	HOT GAS LINE	RECEIVER OUTLET (LIQUID LINE)
MCS 028	7/8	1-3/8
MCM 040	7/8	1-3/8
MCM 080	1-1/8	1-3/8

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

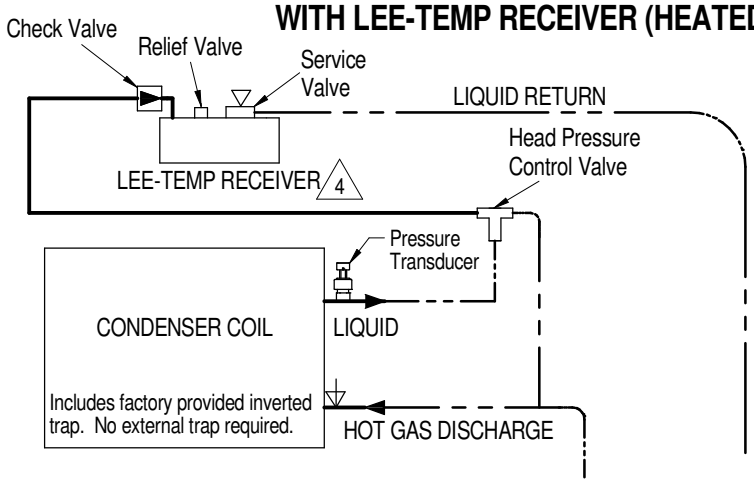
LIEBERT PDX

PIPING SCHEMATIC
AIR COOLED MODELS WITH EEV

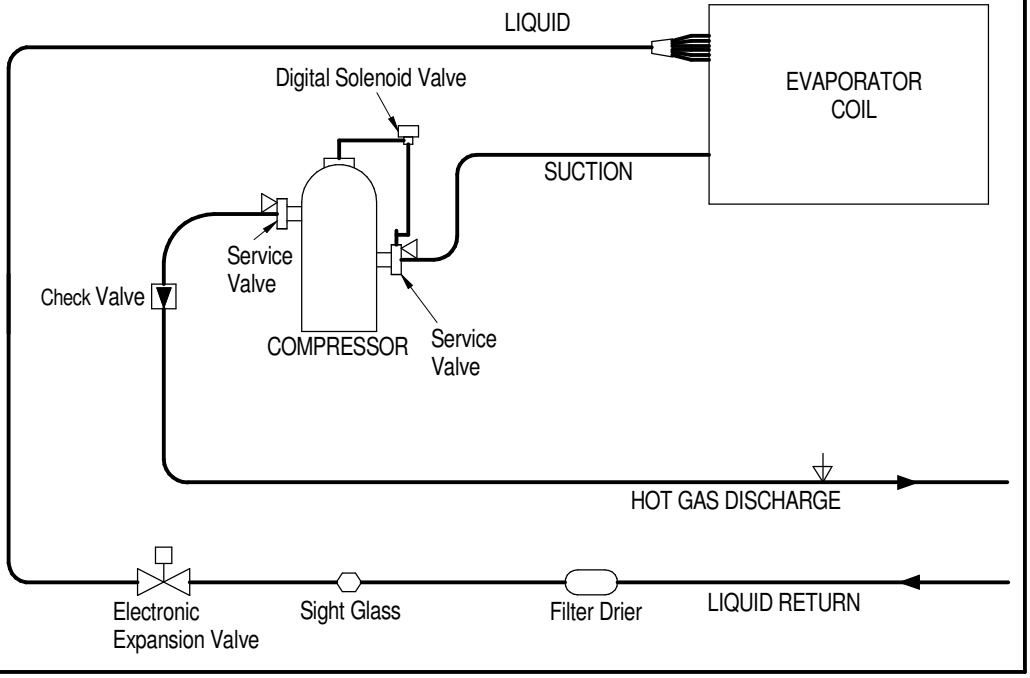
LIEBERT MC CONDENSER WITH REFRIGERANT RECEIVER (UNHEATED)

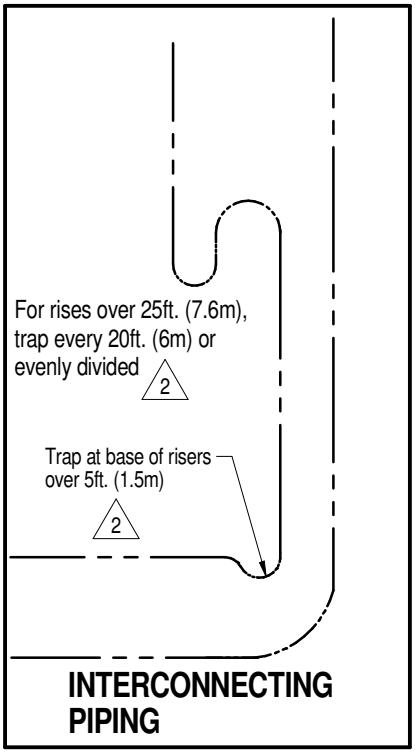


LIEBERT MC CONDENSER WITH LEE-TEMP RECEIVER (HEATED)



LIEBERT PDX UNIT





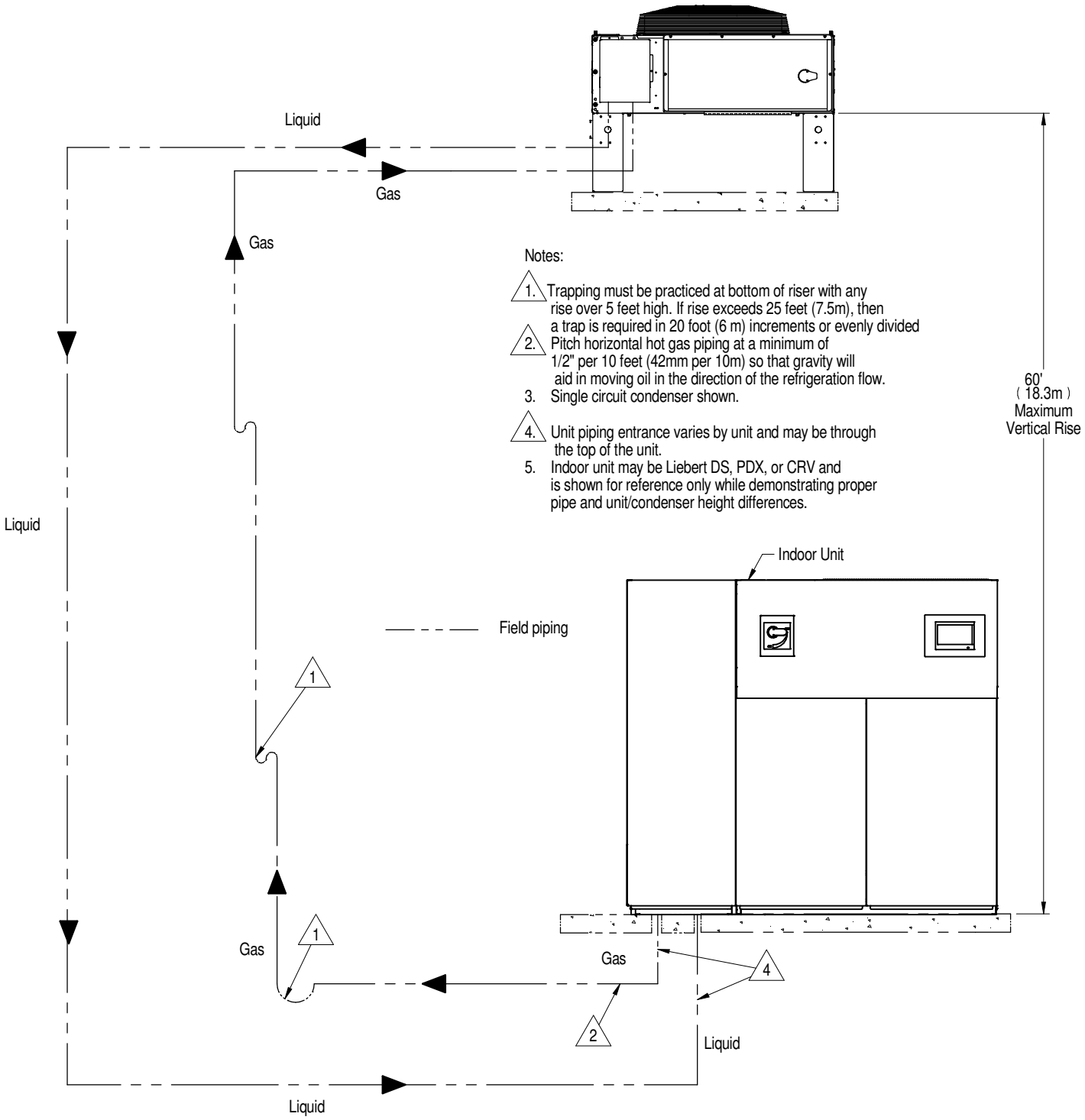
FACTORY REFRIGERANT PIPING
FIELD PIPING

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

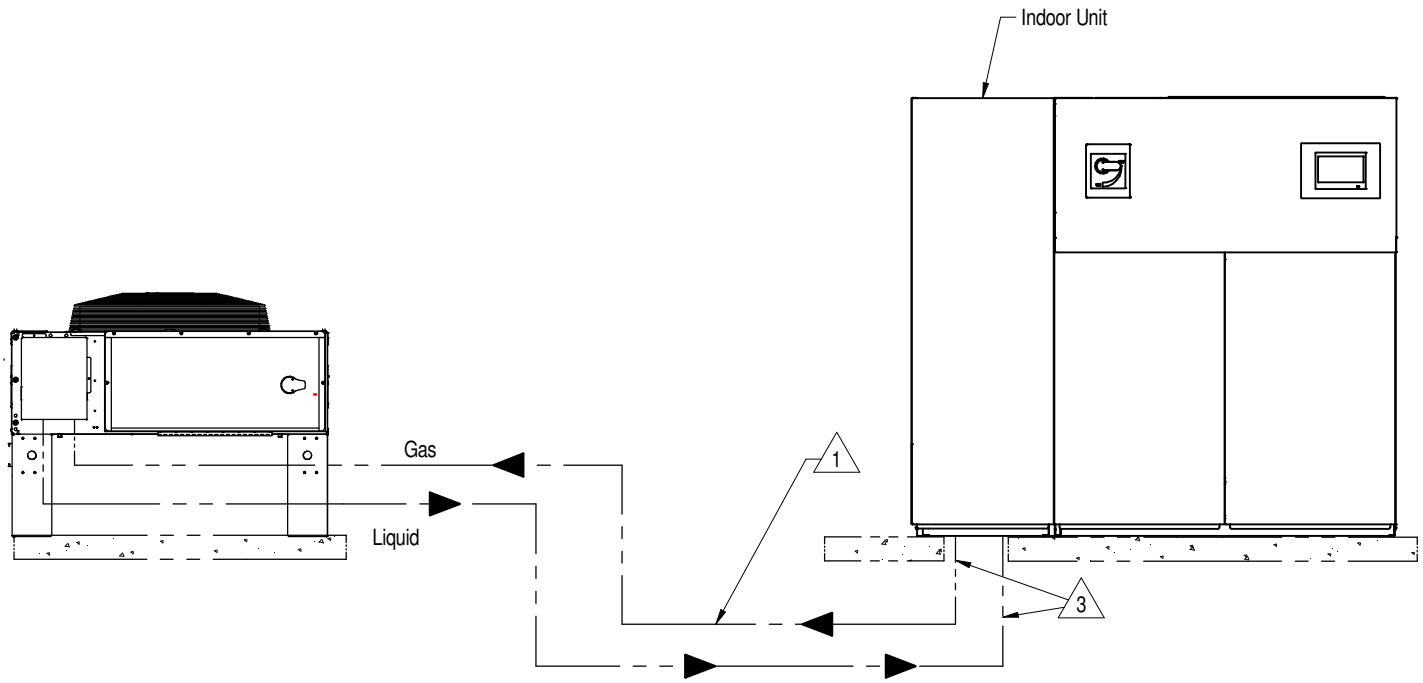
Notes:
1. Schematic representation shown. Do not use for specific connection locations.
2. Components are not supplied by Liebert but are required for proper circuit operation and maintenance.
3. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid floodback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

LIEBERT MC CONDENSER

AIR COOLED PIPING SCHEMATIC
CONDENSER ABOVE INDOOR UNIT



AIR COOLED PIPING SCHEMATIC
CONDENSER AND INDOOR UNIT AT SAME LEVEL

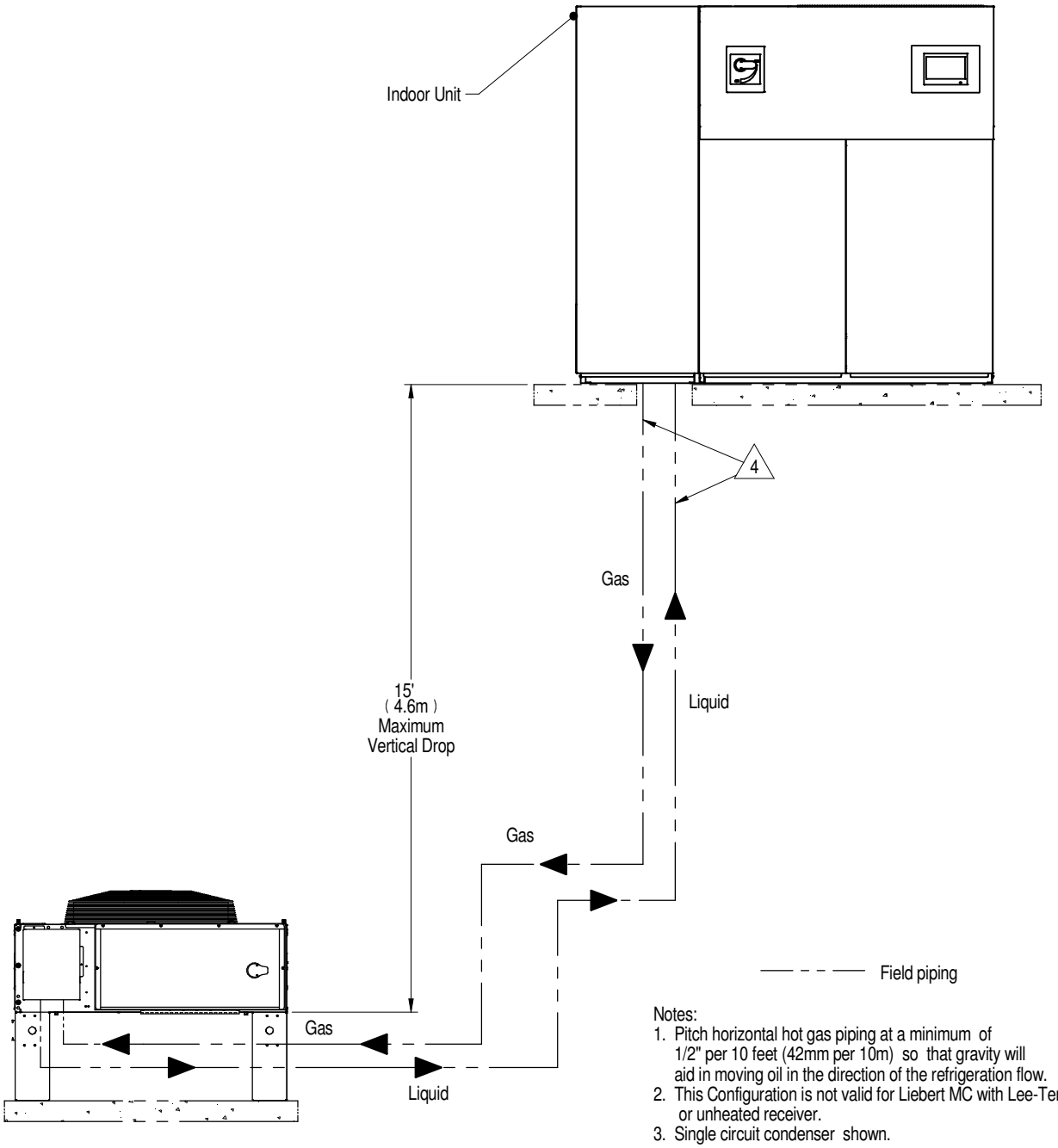


—— – – —— Field piping

Notes:

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

AIR COOLED PIPING SCHEMATIC
CONDENSER BELOW INDOOR UNIT



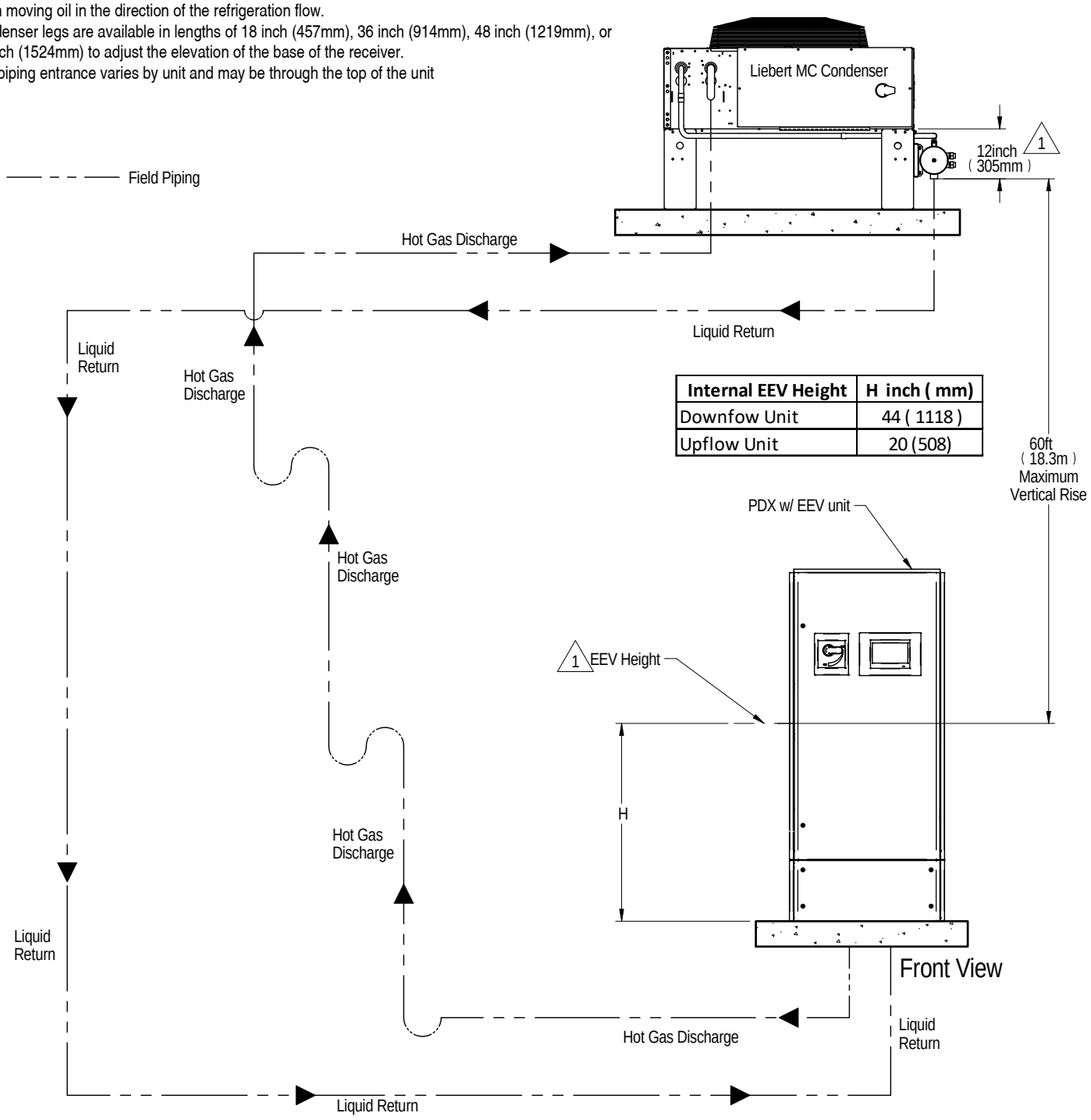
Notes:
1. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
2. This Configuration is not valid for Liebert MC with Lee-Temp or unheated receiver.
3. Single circuit condenser shown.
4. Unit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

LIEBERT PDX w/EEV

AIR COOLED PIPING SCHEMATIC
LIEBERT MC WITH RECEIVER ABOVE UNIT

Notes:

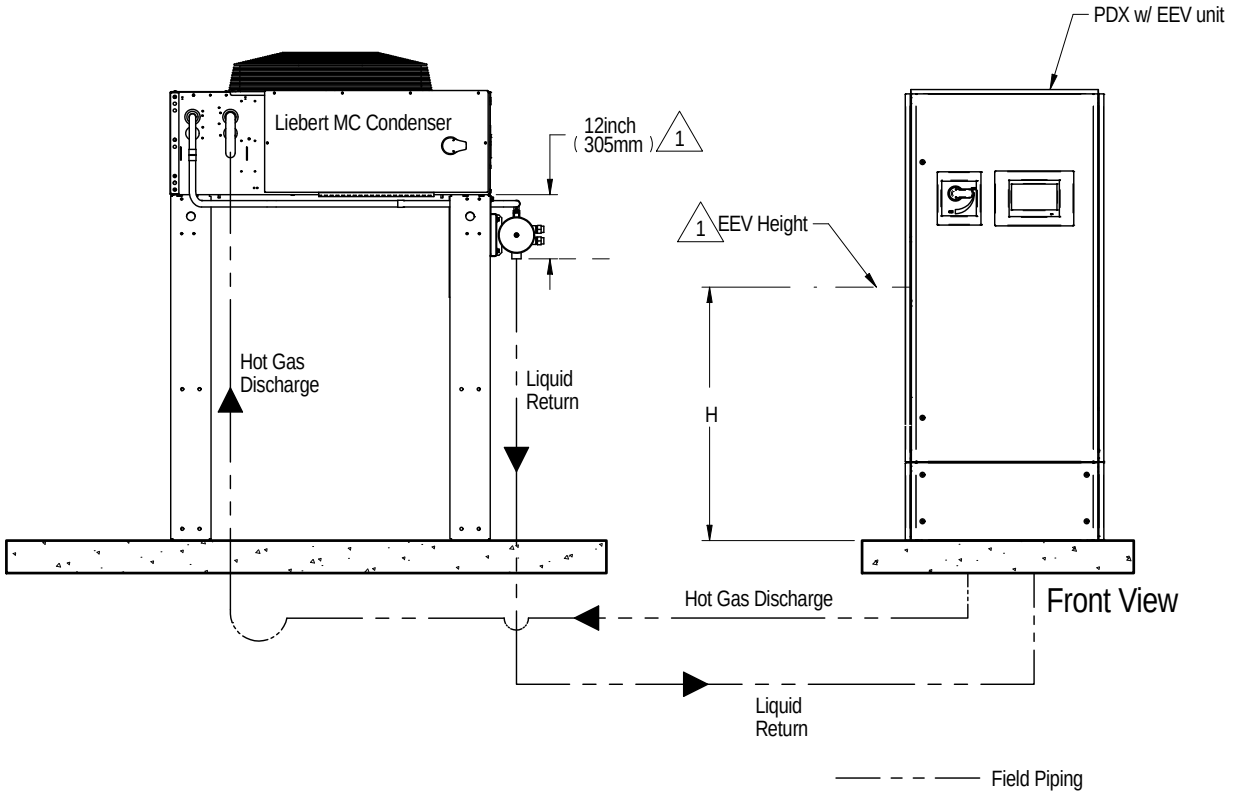
1. The outlet of the required receiver must be higher than the elevation of the EEV inside the indoor unit.
2. Unit must be trapped at bottom of riser with any rise over 5 feet (1.5m) high. If rise exceeds 25 feet (7.5m), then a trap is required in 20 foot (6.1m) increments or evenly divided.
3. Pitch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



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

AIR COOLED PIPING SCHEMATIC

LIEBERT MC WITH RECEIVER MOUNTED AND UNIT AT SIMILIAR LEVEL



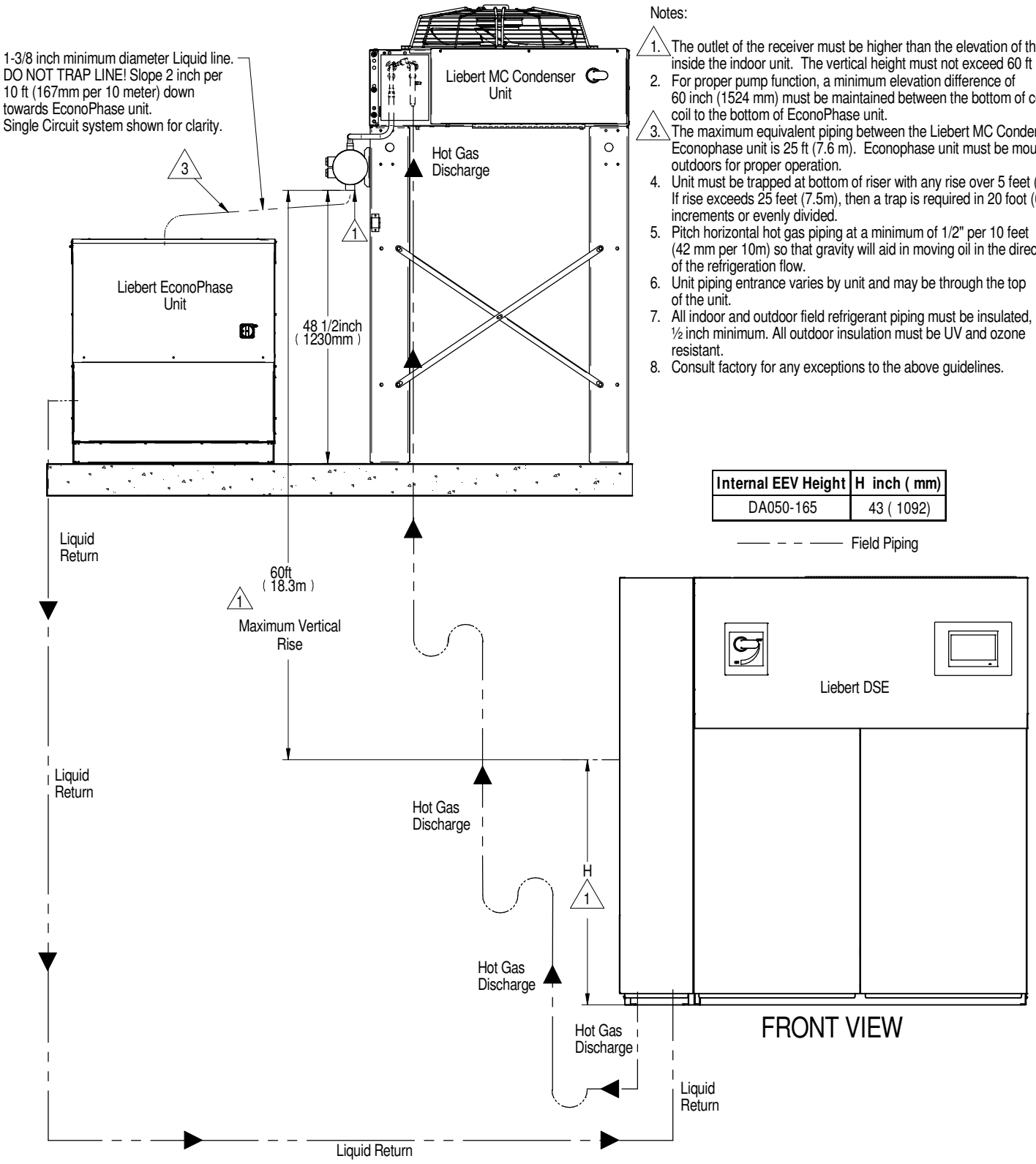
Internal EEV Height	H inch (mm)
Downfow Unit	44 (1118)
Upflow Unit	20 (508)

Notes:

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

LIEBERT DSE

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



Notes:

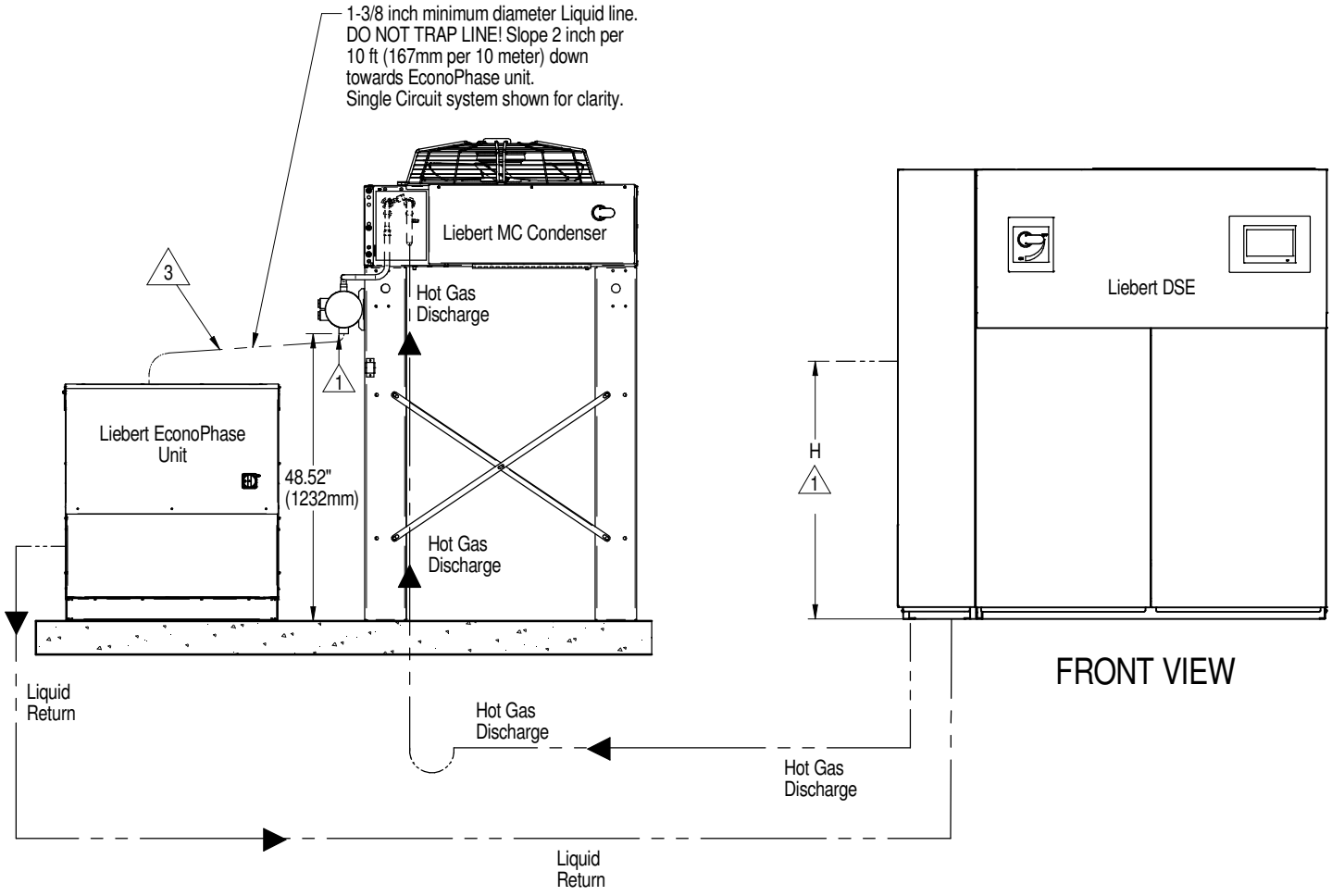
1. The outlet of the receiver must be higher than the elevation of the EEV inside the indoor unit. The vertical height must not exceed 60 ft (18.3m).
2. For proper pump function, a minimum elevation difference of 60 inch (1524 mm) must be maintained between the bottom of condenser coil to the bottom of EconoPhase unit.
3. The maximum equivalent piping between the Liebert MC Condenser and Econophase unit is 25 ft (7.6 m). Econophase unit must be mounted outdoors for proper operation.
4. Unit must be trapped at bottom of riser with any rise over 5 feet (1.5m) high If rise exceeds 25 feet (7.5m), then a trap is required in 20 foot (6.1m) increments or evenly divided.
5. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42 mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
6. Unit piping entrance varies by unit and may be through the top of the unit.
7. All indoor and outdoor field refrigerant piping must be insulated, ½ inch minimum. All outdoor insulation must be UV and ozone resistant.
8. Consult factory for any exceptions to the above guidelines.

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

Field Piping

AIR COOLED PIPING SCHEMATIC

LIEBERT MC AND LIEBERT DA050-165 AT SIMILAR LEVELS



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

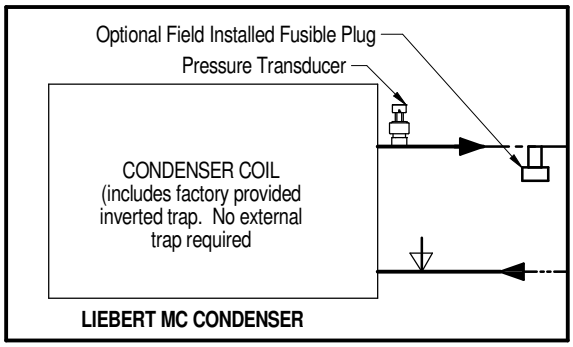
—— – – —— Field Piping

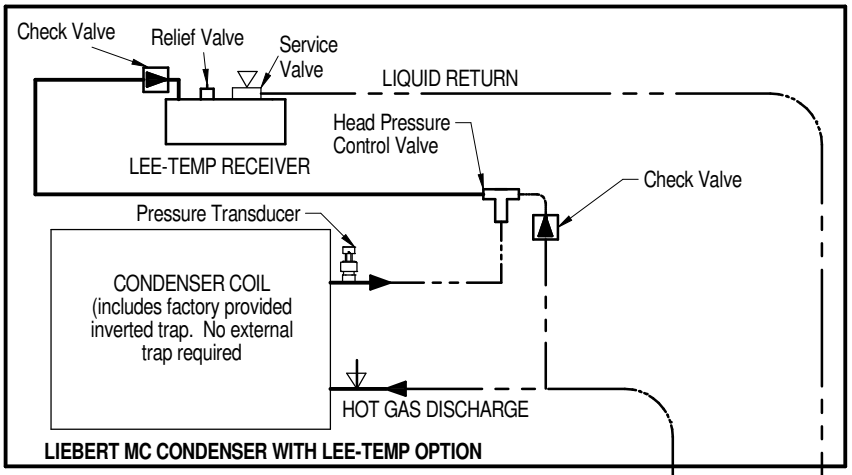
Notes:

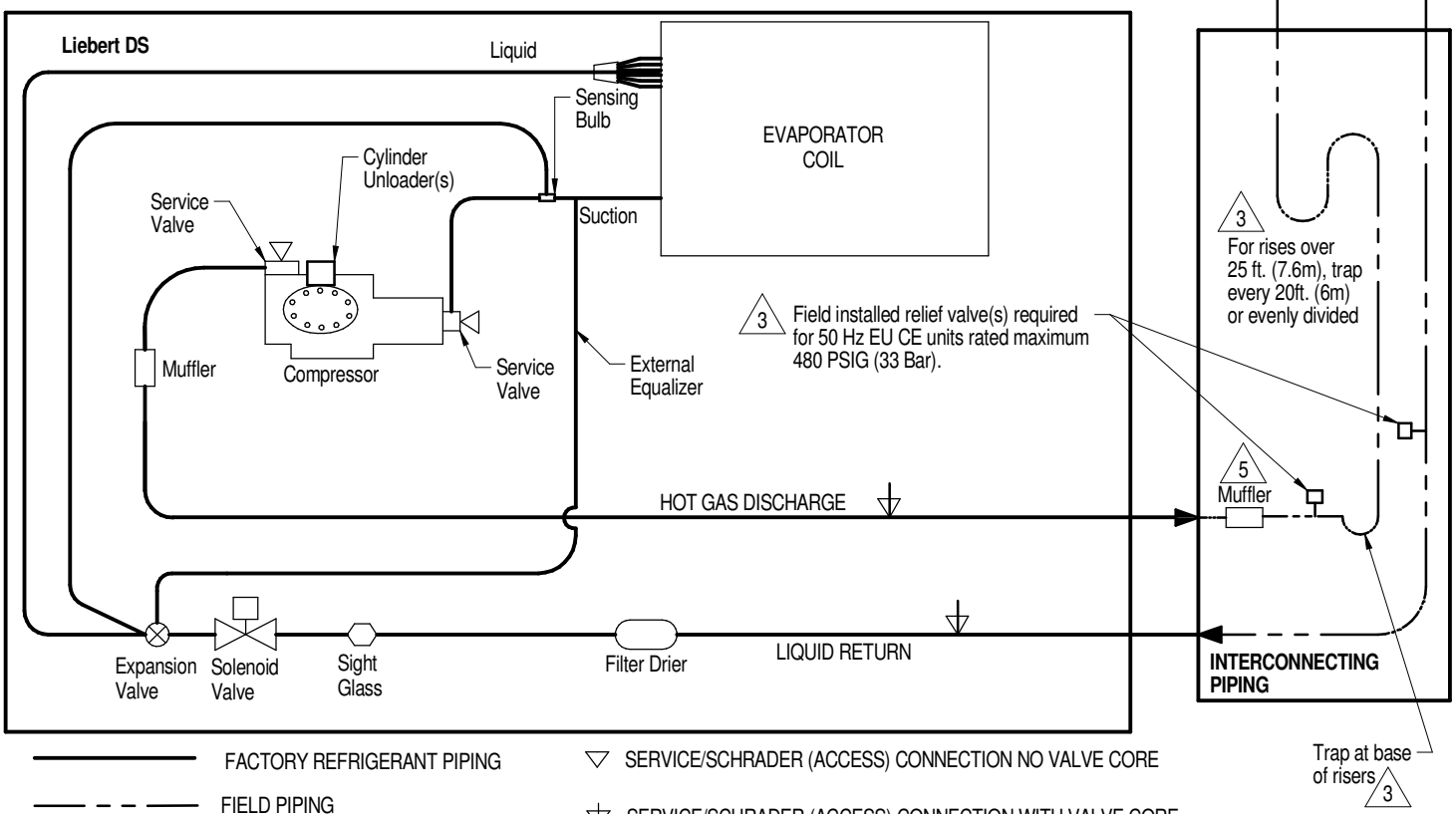
1. The outlet of the receiver must be higher than the elevation of the EEV inside the indoor unit.
2. For proper pump function, a minimum elevation difference of 60 inch (1524 mm) must be maintained between the bottom of condenser coil to the bottom of EconoPhase unit.
3. The maximum equivalent piping between the Liebert MC Condenser and Econophase unit is 25 ft (7.6 m). Econophase unit must be mounted outdoors for proper operation.
4. Unit must be trapped at bottom of riser with any rise over 5 feet (1.5m) high. If rise exceeds 25 feet (7.5m), then a trap is required in 20 foot (6.1m) increments or evenly divided.
5. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42 mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
6. Unit piping entrance varies by unit and may be through the top of the unit.
7. All indoor and outdoor field refrigerant piping must be insulated, ½ inch minimum. All outdoor insulation must be UV and ozone resistant.
8. Consult factory for any exceptions to the above guidelines.

LIEBERT DS

PIPING SCHEMATIC W/ LIEBERT MC CONDENSER
AIR COOLED DS077-105kW SEMI-HERMETIC COMPRESSOR MODELS







FACTORY REFRIGERANT PIPING

FIELD PIPING

SERVICE/SCHRADER (ACCESS) CONNECTION NO VALVE CORE

SERVICE/SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

Notes:

1. Single refrigeration circuit shown for clarity.
2. Schematic representation shown. Do not use for specific connection locations.

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

4. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid floodback to compressor. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.

5. Component supplied by Liebert and must be field installed.

6. Do not isolate any refrigerant circuits from over pressurization protection.

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