VERTIV.

Liebert® EconoPhase

Installer/User Guide

14 to 72 Ton (50 to 250 kW) Capacity, 50 and 60 Hz

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Technical Support Site

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures.

Visit https://www.vertiv.com/en-us/support/ for additional assistance.

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1 Important Safety Instructions

SAVE THESE INSTRUCTIONS

This manual contains important safety instructions that should be followed during the installation and maintenance of the Vertiv™ Liebert® EconoPhase. 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. Can cause serious injury or death. Building and equipment damage may also result. Disconnect all local and remote electric power supplies and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable.

Verify with a voltmeter that power is Off. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components still require and receive power even during the "Unit Off" mode of the Liebert® iCOM™ controller. The factory-supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic.

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

WARNING! Risk of electric shock. Can cause serious injury or death. Building and equipment damage may also result. Open all local and remote electric power supply disconnect switches and verify that power is off with a voltmeter before working within any electric connection enclosures. The Liebert® iCOM™ microprocessor does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "unit off" mode of the Liebert® iCOM™ control.

Installation, 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 over-pressurization of the refrigeration system. Can cause serious injury or death. Building and equipment damage may also result. Can cause explosive discharge of high-pressure refrigerant, loss of refrigerant, environmental pollution, or building and equipment damage. 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 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.

WARNING! Risk of improper wiring, piping, moving, lifting and handling. Can cause serious injury or death. Improper handling can cause building or equipment damage. 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 moving. Can cause serious injury or death. Building and equipment damage may also result. Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. The center of gravity varies depending on the unit size and selected options. The slings must be equally spaced on either side of the center of gravity indicator. Shipping weights and unit weights are listed in the tables in Table 4.2 on page 19 . Use the center of gravity indicators on the unit to determine the position of the slings.

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 contact with hot surfaces. Can cause injury. Personal burn injury can be the result of touching the refrigerant discharge lines, pump motor, and some other electrical components that are extremely hot during unit operation. Allow sufficient time for them to cool to a touch safe temperature before working within the unit cabinet. Use extreme caution and wear appropriate, OSHA-approved PPE when working on or near hot components.

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.

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

NOTICE

Risk of improper electrical connection of three-phase input power. Can cause backward pump rotation and unit damage. Service technicians should use a gauge set on the system during the initial start up to verify that the three-phase power is connected properly. Three-phase power must be connected to the unit line voltage terminals in the proper sequence so that the pump rotates in the proper direction. Incoming power must be properly phased to prevent pump from running backward. We recommend checking the unit's phasing with proper instrumentation to ensure that the power connections were made correctly. We also recommend verifying discharge and suction pressures during start up to ensure that the pumps are running in the correct direction.

NOTICE

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

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

NOTICE

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

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

NOTICE

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

NOTICE

Risk of improper storage. Can cause unit damage.

Keep the unit upright, indoors and protected from dampness, freezing temperatures and contact damage.

NOTICE

Risk of improper control circuits. Can cause equipment damage.

When using jumpers for troubleshooting, always remove jumpers when maintenance is complete. Jumpers left connected could override controls and cause equipment damage.

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2 Nomenclature and Components

This section describes the model configuration numbers for Vertiv™ Liebert® EconoPhase units and components.

2.1 Model Number Nomenclature Detail

Liebert® EconoPhase Model Number Digit Definitions below describes each digit of the model number.

Table 2.1 Liebert® EconoPhase Model Number Example

1	2	3	4	5	6	7	8	9	10	11	12
P	R	1	2	5	A	A	6	D	D	—	*

Table 2.2 Liebert® EconoPhase Model Number Digit Definitions

Digit	Description
Digits 1 to 2 - Product Family	PR = Liebert® Pumped Refrigerant Economizer System
Digits 3 to 5 - Nominal Sensible Capacity, kW	050 085 125 200 250
Digit 6 - Air Discharge	A = Air cooled heat rejection
Digit 7 - Power Supply	A = 460-3-60 B = 575-3-60 G = 415-3-50 Y = 208/230-3-60 2 = 380-3-60
Digit 8 - Disconnect Switch, Amperage	5 = 5,000 Amp SCCR 6 = 65,000 Amp SCCR
Digit 9 - Pump Configuration	S = Single D = Dual
Digit 10 - Packaging	D = Domestic

Table 2.2 Liebert® EconoPhase Model Number Digit Definitions (continued)

Digit	Description
	C = Export Crating
Digit 11 - Pump Design (internal reference only)	
Digit 12 - Configuration Code	
	0 = No SFAs (Any Numeric or Alpha letter except S)
	S = SFA

Table 2.3 Liebert® EconoPhase Specifications and Electrical Power Requirements

Digits				Volts	Phase	Hertz	FLA	Minimum Supply Circuit Ampacity	Max Fuse Size	Single Pump Motor (One Pump per Circuit)	
1-5 Product Family	7 Power Supply	9 Pump Configuration	11 Pump Design							HP	FLA
PRO50	A	S	-	460	3	60	3.5	4.4	15	1.6	3.5
PRO50	Y	S	-	208/230	3	60	6.9	8.6	15	1.6	6.9
PRO50	B	S	_	575	3	60	2.8	3.5	15	1.6	3.5
PRO50	2	S	_	380	3	60	4.2	5.3	15	1.6	4.2
PRO50	G	3	_	415	3	50	3.7	4.7	15	1.2	3.7
PRO50	A	S	H	460	3	60	1.3	1.6	15	0.75	1.3
PRO50	Y	S	H	208/230	3	60	2.6	3.3	15	0.75	2.6
PRO50	B	S	H	575	3	60	1	1.3	15	0.75	1.3
PRO50	2	S	H	380	3	60	1.6	2	15	0.75	1.6
PRO50	G	S	H	415	3	50	1.2	1.5	15	0.75	1.2
PR085	A	D	-	460	3	60	7	7.9	15	1.6	3.5
PR085	Y	D	-	208/230	3	60	13.8	15.5	20	1.6	6.9
PR085	B	D	-	575	3	60	5.6	6.3	15	1.6	3.5
PR085	2	D	-	380	3	60	8.4	9.5	15	1.6	4.2
PR085	G	D	-	415	3	50	7.4	8.3	15	1.2	3.7
PR085	A	D	H	460	3	60	2.6	2.9	15	0.75	1.3
PR085	Y	D	H	208/230	3	60	5.2	5.9	15	0.75	2.6
PR085	B	D	H	575	3	60	2	2.3	15	0.75	1.3
PR085	2	D	H	380	3	60	3.2	3.6	15	0.75	1.6
PR085	G	D	H	415	3	50	2.4	2.7	15	0.75	1.2
PR125	A	D	-	460	3	60	7	7.9	15	1.6	3.5

Table 2.3 Liebert® EconoPhase Specifications and Electrical Power Requirements (continued)

Digits				Volts	Phase	Hertz	FLA	Minimum Supply Circuit Ampacity	Max Fuse Size	Single Pump Motor (One Pump per Circuit)	
1-5 Product Family	7 Power Supply	9 Pump Configuration	11 Pump Design							HP	FLA
PR125	Y	D	-	208/230	3	60	13.8	15.5	20	1.6	6.9
PR125	B	D	-	575	3	60	5.6	6.3	15	1.6	3.5
PR125	2	D	-	380	3	60	8.4	9.5	15	1.6	4.2
PR125	G	D	-	415	3	50	7.4	8.3	15	1.2	3.7
PR125	A	D	4	460	3	60	6.4	7.2	15	1.5	3.2
PR125	B	D	4	575	3	60	5.2	5.9	15	1.5	2.6
PR125	2	D	4	380	3	60	7.8	8.8	15	1.5	3.9
PR200	A	D	3	460	3	60	4.6	5.2	15	1.5	2.3
PR200	B	D	3	575	3	60	3.6	4.1	15	1.5	1.8
PR200	2	D	3	380	3	60	5.6	6.3	15	1.5	2.8
PR250	A	D	2	460	3	60	7	7.9	15	1.6	3.5
PR250	Y	D	2	208/230	3	60	13.8	15.5	20	1.6	6.9
PR250	B	D	2	575	3	60	5.6	6.3	15	1.6	3.5
PR250	2	D	2	380	3	60	8.4	9.5	15	1.6	4.2
PR250	2	D	5	380	3	60	7.8	8.8	15	1.5	3.9
PR250	G	D	2	415	3	50	7.4	8.3	15	1.2	3.7
PR250	A	D	5	460	3	60	6.4	7.2	15	1.5	3.2
PR250	B	D	5	575	3	60	5.2	5.9	15	1.5	2.6
Source DPN002327 Rev. 14 and DPN004355 Rev. 3											

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3 Vertiv™ Liebert® EconoPhase Pumped Refrigerant Economizer with a Vertiv™ Liebert® DSE System

Liebert® DSE systems are designed to provide precision air conditioning to computer racks in a data center or computer room as efficiently and effectively as possible.

A Liebert® DSE system with Liebert® EconoPhase is composed of individually-shipped components or components assembled together on skids. Some examples are:

System example 1

- Liebert® DSE—High efficiency, floor mounted indoor unit
- Vertiv™ Liebert® MC Condenser—Air cooled microchannel condenser, premium version
- Liebert® EconoPhase—Liebert® EconoPhase pumped refrigerant economizer (PRE)

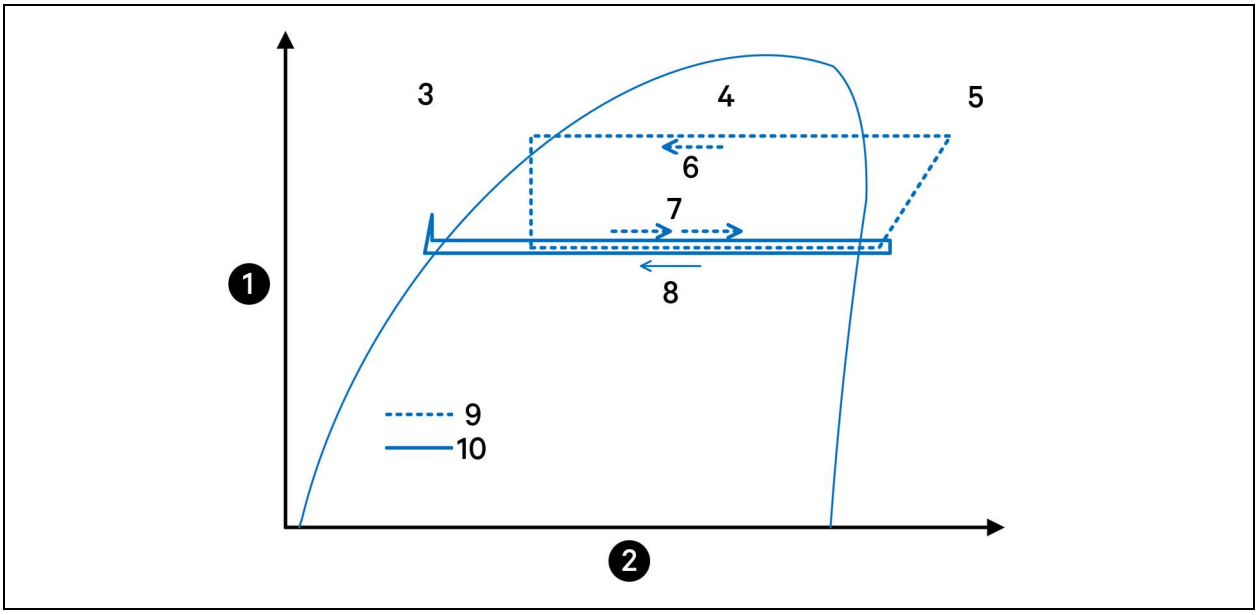
System example 2

- Liebert® DSE—High efficiency, floor mounted indoor unit
- Vertiv™ Liebert® MCV Heat rejection skid—Air cooled microchannel condenser, premium version with a Liebert® EconoPhase pumped-refrigerant economizer (PRE)

The Liebert® EconoPhase PRE is an add on module for use with an air cooled Liebert® DSE system. The Liebert® EconoPhase allows the system to switch to EconoPhase operation when the outdoor temperature is low enough to provide the required temperature difference between the inside air and the outside air, which, in turn, provides significant energy savings because the compressor(s) do not operate. At lower temperatures, the system switches one or both circuits from Compressor Mode to Pump Mode. The pump consumes roughly one-tenth of the power consumed by the compressor.

The Liebert® EconoPhase system maintains this energy efficiency by employing the heat absorption properties of a liquid (pumped refrigerant) through a phase change. Refrigerant is pumped as a liquid, becomes a gas within the Liebert® DSE evaporator and is then returned to the condenser where it condenses to a liquid. The sub-cooled liquid refrigerant from the condenser is run directly into the Liebert® EconoPhase pumps and circulates back to the Liebert® DSE unit (see Figure 3.1 on the next page). The system operates as a typical air cooled direct expansion system when outdoor ambient conditions are unfavorable to Liebert® EconoPhase operation. The pumps in the Liebert® EconoPhase PRE are turned off and by-passed during compressor operation.

Figure 3.1 Vertiv™ Liebert® EconoPhase Pumped Refrigerant Pressure Enthalpy Diagram



Item	Description	Item	Description
1	Pressure	6	Condenser (DX mode)
2	Enthalpy	7	Indoor unit
3	Liquid	8	Condenser (pump mode)
4	Liquid/Vapor maximum	9	Traditional vapor-compression cycle
5	Vapor	10	Liebert® EconoPhase cycle

3.1 Overview of Operating Modes

Each circuit on a system combining a Vertiv™ Liebert® EconoPhase, Vertiv™ Liebert® DSE and Vertiv™ Liebert® MC condenser has 6 distinct operating modes:

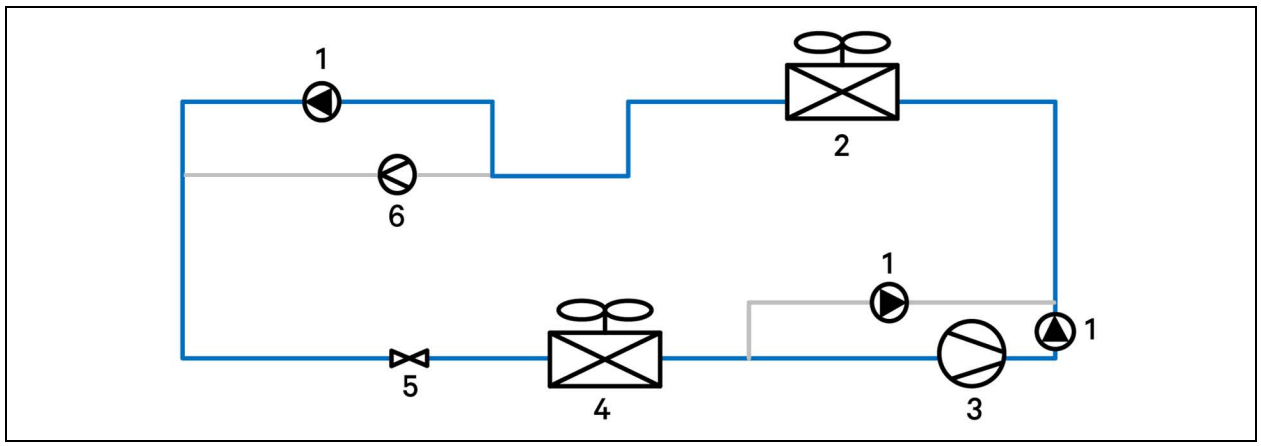
- Idling with compressor and pumps Off
- Start up
- Compressor operation
- Compressor to pump changeover
- Pump operation
- Pump to compressor changeover

A circuit will run most of the time in either compressor or pump operation mode. These modes both efficiently remove heat from the conditioned space and reject it via the air cooled condenser. The flow paths during each mode of operation are detailed in Figure 3.2 below and Figure 3.3 on the next page .

A couple of differences to note between Compressor Mode and Vertiv™ Liebert® EconoPhase operation:

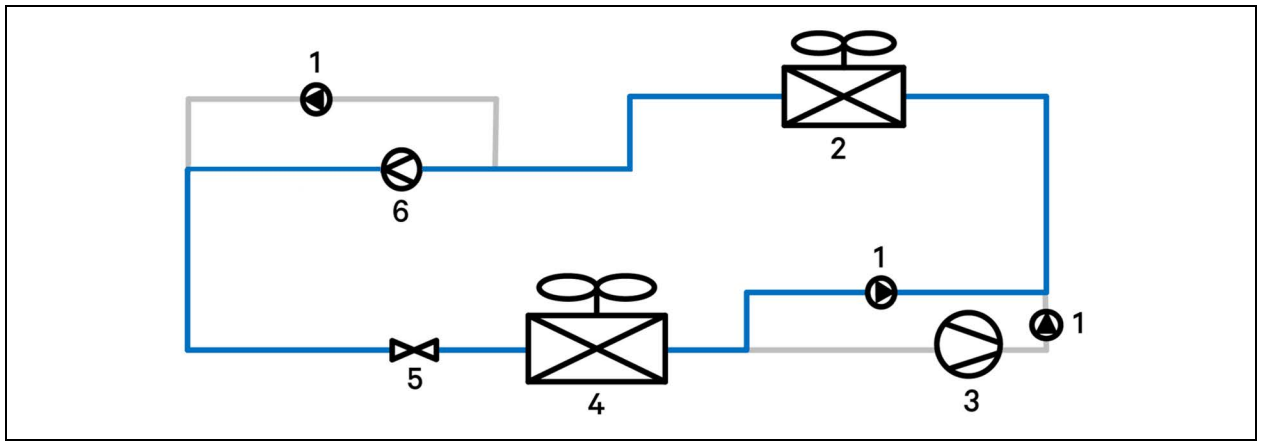
- The unit does not dehumidify in Liebert® EconoPhase operation. If dehumidification is desired, EconoPhase operation must be disabled.
- Bubbles may be seen in the site glass in the indoor unit when the system is in Liebert® EconoPhase operation. This does not necessarily mean the system is low on charge. Refer to the Vertiv™ Liebert® DSE user manual (available at www.Vertiv.com) for complete charging instructions for the Liebert® DSE/Liebert® EconoPhase system.

Figure 3.2 Compressorized Operation Flow Path



Item	Description	Item	Description
1	Check valve	4	Evaporator
2	Condenser	5	Electronic expansion valve (EEV)
3	Compressor	6	Pump

Figure 3.3 Pump Operation Flow Path



Item	Description	Item	Description
1	Check valve	4	Evaporator
2	Condenser	5	Electronic expansion valve (EEV)
3	Compressor	6	Pump

3.2 Vertiv™ Liebert® EconoPhase Operation

The Liebert® EconoPhase unit enables the Vertiv™ Liebert® DSE system to operate in any of 3 modes to control temperature, depending on the outdoor temperature and the load.

- Compressor Mode
- Pump Mode
- Mixed Mode

When the outdoor temperature becomes low enough to provide the required temperature difference between the inside air and the outside air, there is no need to compress the refrigerant to a higher pressure/temperature. When the outdoor temperature is low enough, the system switches from Compressor Mode to Pump Mode or to Mixed Mode.

- Compressor Mode: All available compressors may be used to maintain the control temperature. All the available Liebert® EconoPhase pumps are Off. The control will typically run in this mode when the load and temperatures are such that full or partial Liebert® EconoPhase operation is not possible, or because certain pumps have experienced alarms.
- Pump Mode: All of the available pumps may be used to maintain the Control Temperature. All the compressors in the system are Off. The control will typically run in this mode when load and temperatures permit.
- Mixed Mode (Dual pump models only): The pump in Circuit 1 is On and the compressor(s) in Circuit 2 is On. Some systems may not have Mixed Mode capability, depending on the manufacture date. Contact the factory to inquire about a software upgrade.

3.2.1 Vertiv™ Liebert® EconoPhase Control

Liebert® EconoPhase operation has three main controlled parameters:

- Room temperature
- Refrigerant temperature
- Pump pressure differential (outlet pressure - inlet pressure)

Room Temperature

When the system is in Pump Mode, the room temperature is controlled by modulating the pump speed with a variable frequency drive. The load requirement will determine if one pump or two are needed. Figure 3.4 below , shows the sequence of operation in terms of pump speed. Minimum speed is 45% and maximum speed is 100%. See Table 3.1 below , for more detail on the events depicted and the conditions that trigger action.

Figure 3.4 Two Circuit Pump Control

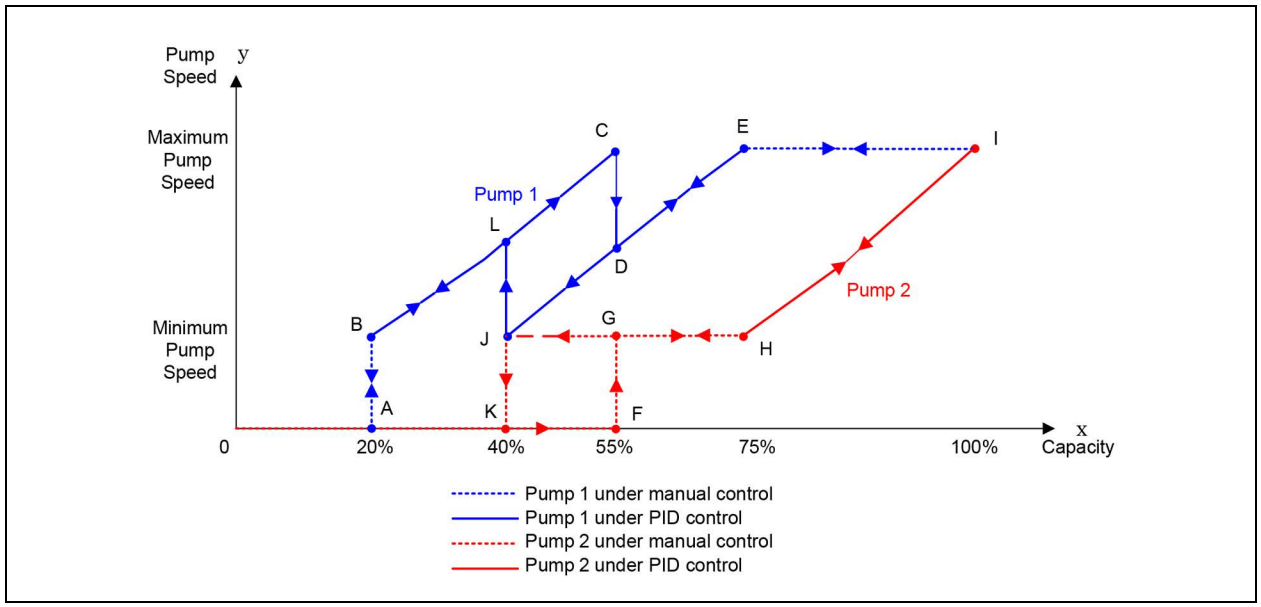


Table 3.1 Events and Actions of Two Circuit Pump Control

Event	Condition to Trigger Action	Action
B to A	Pump 2 Off; and (Pump 1 at minimum speed for 60 sec.; and Delta T [indoor air temperature - setpoint] < -4°F (2.2°C).	Pump 1 turns Off; Pump 2 remains Off
A to B	Both Pump 1 and Pump 2 Off; and Delta T >0°F (0°C)	Pump 1 turns On and runs on PID; Pump 2 remains Off
F to G	Pump 2 Off; and Pump 1 at maximum speed for 600 seconds; and Delta T >1°F (-0.6°C)	Pump 2 turns On at starting speed, then goes to minimum speed immediately. Pump 1 continues to run on PID
At E and H upward	Pump 1 at maximum speed; and Pump 2 at minimum speed; and Delta T >1°F (-0.6°C)	Pump 1 runs at maximum speed, while Pump 2 runs on PID

Table 3.1 Events and Actions of Two Circuit Pump Control (continued)

Event	Condition to Trigger Action	Action
At E and H downward	Pump 1 at maximum speed; and Pump 2 at minimum speed; and Delta T < -1°F (-0.6°C)	Pump 1 runs on PID, while Pump 2 runs at minimum speed
J to K	Both Pump 1 and Pump 2 at minimum speed for 60 sec.; and Delta T < -1°F (-0.6°C)	Pump 2 turns Off, while Pump 1 runs at minimum speed
Pump 2 Early Startup	Pump 2 Off; and Delta T >2°F (1.1°C)	No action to Pump 1; turn On Pump 2 at 80% speed, once the start-up procedure is finished, step change to minimum speed immediately

In the case of a transition from Compressor Mode to Pump Mode, the pumps will be given initial speeds based on the call for cooling at the time of transition. The pumps will go to this initial speed after the start-up routine is completed. This will mean that, depending on the load, both pumps will start immediately at the transition to Pump Mode from Compressor Mode.

When the system is in Mixed Mode, the room temperature is controlled either by modulating the digital compressor(s) on Circuit 2 with the pump on Circuit 1 at 100%, or by modulating the pump speed on Circuit 1 with the compressor(s) operating at the minimum digital percent.

Refrigerant Temperature

When a circuit is running in Pump Mode, the refrigerant temperature is controlled by the condenser fan speed. When a circuit switches from Compressor Mode to Pump Mode, the condenser fan speed control changes from pressure control to temperature control, with the controlled parameter being condenser outlet refrigerant temperature.

The default setpoint on Circuit 1 is 45°F, while on Circuit 2 it is 37°F. The condenser fan speed will modulate to provide the respective temperature. But if the outdoor temperature is warm enough, or if the load is high enough, the fans might be at 100% and the actual refrigerant temperature might be above the setpoint. In that case, the temperature will depend on the heat rejection capability of the condenser at the given conditions.

Actual fan speed will depend on the load and the outdoor temperature. The fan speed will be lower for a given heat load with lower outdoor temperature in order to maintain the setpoint.

Because the refrigerant temperature could be below the dew point inside, the indoor piping must be insulated to prevent condensation. In addition, the outdoor piping must be insulated so that heat is not lost to the outdoor air at very low ambient temperatures, causing the refrigerant temperature to fall and increasing the possibility of frost at the evaporator.

Pump Pressure Differential

The pump pressure differential must to be maintained above a minimum for cooling and lubricating flow to be provided to the pump motor and bearings. The differential is controlled by EEV position. When the system switches to Vertiv™ Liebert® EconoPhase operation, the EEV control changes from superheat control to manual control. The Vertiv™ Liebert® iCOM™ controller then signals the EEV to control its position based on pump differential , unless during pump mode operation, the suction superheat drops below the minimum acceptable level, then the EEV will begin to close and restrict refrigerant mass flow to build superheat.

The pump differential setpoint is 20 psid. If the pump is running at a high speed at steady state, the actual pump differential may be above 25 psid.

If the pump differential drops below 5 psid continuously for 30 minutes, the system will switch to direct expansion mode for 30 minutes. The system will switch back to Liebert® EconoPhase operation if the conditions are still qualified for pump operation.

3.2.2 Pump Start-up Routine

When either pump attempts to start, the first attempt will be at 80% of full speed. If flow is not established (as detected by pump differential being at least 12 psid within 60 seconds), the pump will turn Off for 10 seconds before trying again at 90% speed. If flow is still not established, the pump will turn Off for 10 seconds before trying again at 100% speed. If flow is not established after the 100% speed attempt, the system will switch to DX mode for 10 minutes before attempting to start the pumps again if the conditions are still compatible.

The second start-up routine is the same as above. If the second start-up attempt is unsuccessful, the system will switch to DX mode for 60 minutes before trying again.

The third start-up routine will be the same as above. If the third start-up attempt is unsuccessful, a “Pump Startup Fail” alarm will be displayed and Vertiv™ Liebert® EconoPhase operation will be locked out until the user manually resets the event at the Vertiv™ Liebert® iCOM™.

3.2.3 Switch from Compressor Operation to Pump Operation

The Vertiv™ Liebert® iCOM™ runs the system in the most efficient operating mode, given the load and temperature conditions. If Mixed Mode is available, the system will change from Compressor Mode to Mixed Mode when partial Vertiv™ Liebert® EconoPhase operation is possible and from Compressor or Mixed Mode to Pump Mode when full EconoPhase operation is possible.

3.2.4 Switch from Pump Operation to Compressor Operation

The unit will switch from Pump Mode to Mixed Mode or Compressor Mode when at least one of the following is true:

- The difference between the actual controlled air temperature and the setpoint is 75% into the Cooling Proportional Band for 5 minutes. The default is 75%, but the percentage can be changed at the Vertiv™ Liebert® iCOM™.

NOTE: At start-up and at switchover from compressor operation to pump operation, more time is allowed to bring the temperature under control, but the temperature will never be allowed to go outside the cooling proportional band of +2°F (1.2°C).

- The pump differential pressure is below 5 psid for 30 minutes.
- The refrigerant temperature leaving the pump is below 30°F for 60 minutes.
- The pump does not establish flow at a pump start-up attempt.
- Power is lost at the Vertiv™ Liebert® EconoPhase unit.

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4 Pre-installation Preparation and Guidelines

NOTE: Before installing unit, determine whether any building alterations are required to run piping, wiring and duct work. Follow all unit dimensional drawings and refer to the submittal engineering dimensional drawings of individual units for proper clearances.

Refer to Nomenclature and Components on page 5 and the appropriate submittal drawings, to determine the type of system being installed and anticipate building alterations, piping and duct work needed.

The unit dimensions, pipe connection locations, and piping schematics are described in the submittal documents included in the .

- Verify that the floor is level, solid and sufficient to support the unit. See Table 4.2 on page 19 . for unit weights.
- Allow at least the minimum recommended clearances for maintenance and service. See the appropriate submittal drawings for dimensions.
- We recommend installing an under floor water detection system. Contact your Vertiv™ representative for information.

4.1 Standard Air Cooled Systems versus Vertiv™ Liebert® EconoPhase Systems

There are differences between the standard air cooled Vertiv™ Liebert® DSE system and a system designed with the Liebert® EconoPhase. You should be aware of these differences to achieve the best operation the Liebert® DSE and Liebert® EconoPhase. This section summarizes the differences.

- Liebert® EconoPhase Operation—when the outdoor temperature is low enough to provide the required temperature difference between the indoor air and the outside air, the compressors turn off and the Liebert® EconoPhase pumps turn on.
- Refrigerant Pumping—during Liebert® EconoPhase operation, the refrigerant is pumped around the air-cooled loop instead of going through the vapor compression cycle. System pressures will vary significantly depending on whether the system is operating in standard, air cooled mode or in Liebert® EconoPhase operation.
- Energy Savings—the system's coefficient of performance increases significantly during Liebert® EconoPhase operation, which results in significant energy savings.
- EEV—an electronic expansion valve is employed during both direct expansion and Liebert® EconoPhase operation. The EEV provides energy savings and helps the pump maintain proper differential during Liebert® EconoPhase operation.
- Piping—The condenser piping is larger than the size typically specified for Vertiv™ Liebert® Thermal Management systems. The pipe sizing allows oil return to the compressor and efficient operation in both modes of operation. All field-piped lines must be insulated because the fluid temperatures can be well below the dew point during Liebert® EconoPhase operation. All outdoor insulation must be UV rated and rated for outdoor use.
- Unit/Module Communications—A CANbus connection links the Liebert® DSE and the condenser and the Liebert® EconoPhase to achieve the most efficient operation.

4.2 Determine Cooling Requirements of the System

Refer to the Vertiv™ Liebert® DSE user manual for complete instructions.

1. Calculate the total cooling required.
2. Determine placement of the Liebert units.
3. Determine required line sizes.
4. Calculate the refrigerant volume of the Liebert® DSE/Liebert® EconoPhase system.
5. Complete design details including, electrical, mounting, piping, etc.

4.3 Mechanical Considerations

The Vertiv™ Liebert® EconoPhase pump is located at the condenser (receiver) outlet and always needs liquid at its inlet for proper function. The lines between the receiver and the Liebert® EconoPhase unit must be sloped down toward the EconoPhase unit without any traps and with minimal bends. Traps in those lines will prevent the pump from establishing and from maintaining flow.

It is equally important to pump operation that the receiver be sufficiently above the Liebert® EconoPhase unit. See Placement Options and Piping Restriction for the Vertiv™ Liebert® EconoPhase Unit and Vertiv™ Liebert® MC Condenser on page 26 for the proper height difference. The maximum equivalent piping between the Liebert® MC Condenser and Liebert® EconoPhase unit is 25 ft (7.6 m). The Liebert® EconoPhase unit must be mounted outdoors for proper operation.

It is also important that the circuits do not get crossed between the indoor unit, the condenser and the Liebert® EconoPhase unit. If they get crossed, the system will not operate correctly, in DX mode or in Liebert® EconoPhase operation.

4.4 Planning Dimensions

The unit is described in the submittal documents included in the Submittal Drawings on page 37 .

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

Table 4.1 Dimension Planning Drawings

Document Number	Title
DPN002326	Cabinet Dimensional Data, PR050 - PR250

4.5 Vertiv™ Liebert® EconoPhase Unit Weights

Table 4.2 Typical Liebert® EconoPhase Unit Weights

Model	Circuits	Unit Voltage, Hz	Approximate Unit Weight, lb (kg)
PR050	1	208/230 V, 460 V, 60 Hz	217 (98)
		380 V, 575 V, 60 Hz	242 (110)
		415 V, 50 Hz	217 (98)
PR085 - PR125 and PR250	2	208/230 V, 460 V, 60 Hz	340 (154)
		380 V, 575 V, 60 Hz	390 (177)
		415 V, 50 Hz	347 (157)
PR200	2	460 V, 60 Hz	350 (159)
PR200	2	380 V, 575 V, 60 Hz	400 (181)
Source DPN002326 Rev. 11			

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5 Equipment Handling

Vertiv™ Liebert® EconoPhase modules are installed with the Vertiv™ Liebert® DSE, Liebert® DSE Packaged Free Cooling Solution (60 kW, 400 and 500 kW) and the Vertiv™ Liebert® MC condenser or Vertiv™ Liebert® MCV condenser. When your system uses Liebert® MCV condensers, or is included with the Liebert® DSE Packaged Free Cooling Solution, the Liebert® EconoPhase unit is factory installed on the skid, so no unpacking or moving is needed.

WARNING! Risk of improper wiring, piping, moving, lifting and handling. Can cause serious injury or death. Building and equipment damage may also result. 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 moving. Can cause serious injury or death. Building and equipment damage may also result. Use only lifting equipment that is rated for the unit weight by an OSHA-certified rating organization. The center of gravity varies depending on the unit size and selected options. The slings must be equally spaced on either side of the center of gravity indicator. Shipping weights and unit weights are listed in Table 4.2 on page 19 . Use the center of gravity indicators on the unit to determine the position of the slings.

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.

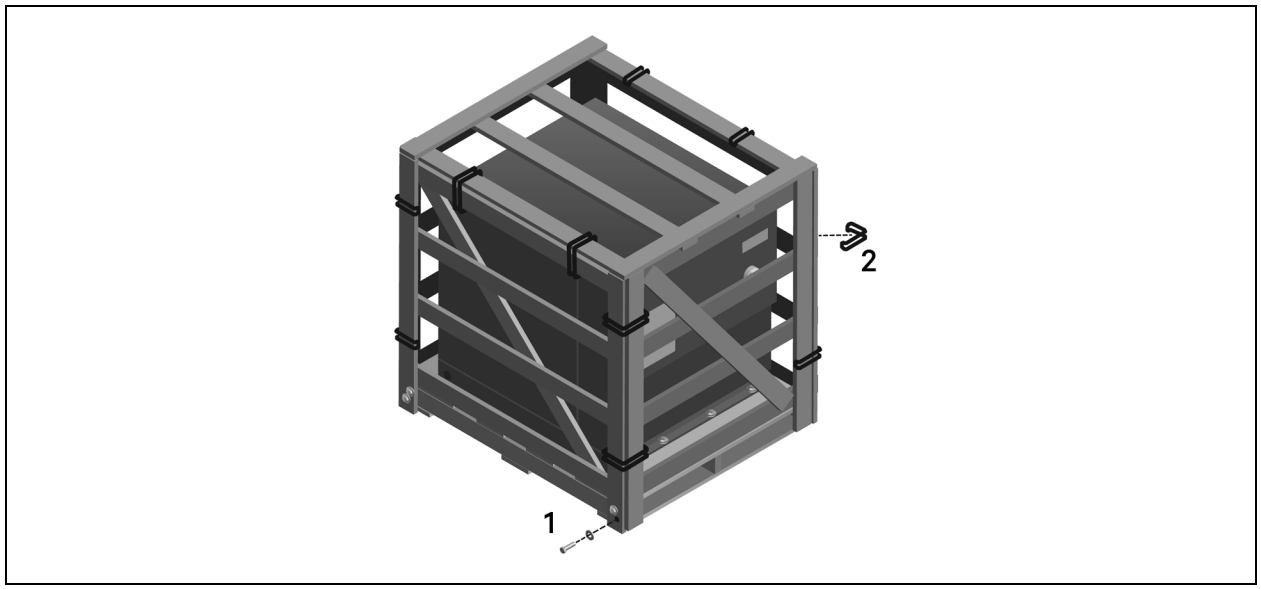
NOTICE

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

5.1 Unpacking and Moving the Vertiv™ Liebert® EconoPhase Unit

1. Referring to Figure 5.1 on the next page , remove the screw and washers and the retaining clips from the shipping crate, them remove the crate from the unit.

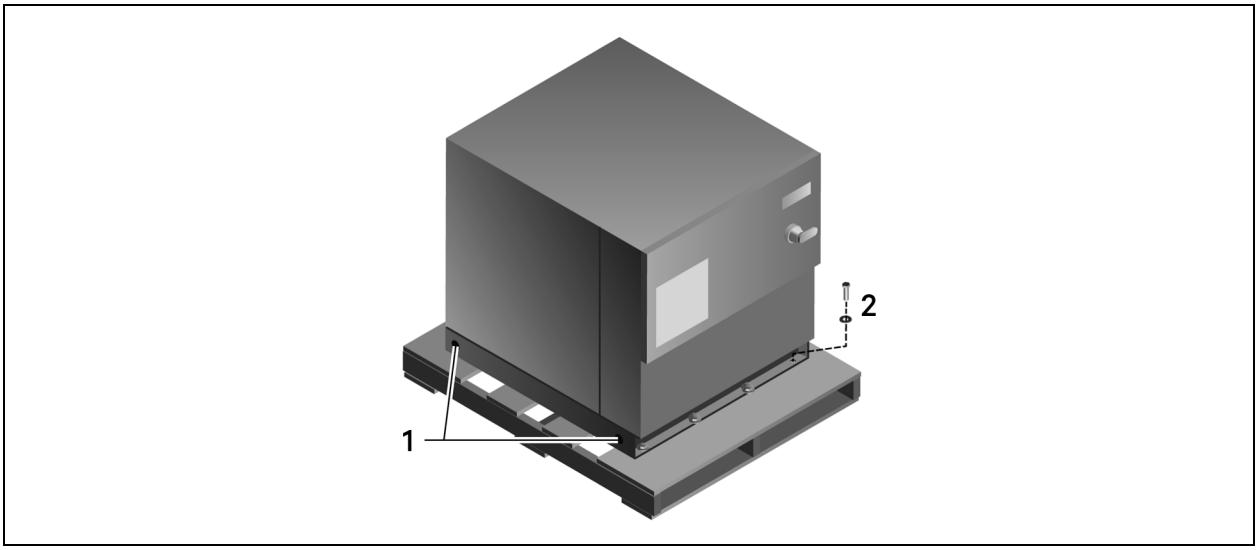
Figure 5.1 Removing the Shipping Crate



Item	Description	Item	Description
1	Screw and washer (typically 8 places)	2	Retaining clip (typically 12 places)

2. Remove the screws and washers that secure the unit to the skid, Figure 5.2 below .
3. Use the four 1-1/32 in. (26.2mm) diameter holes, shown in Figure 5.2 below , to lift and move the unit.
    - After installation, place the hole plugs that are included with the manual in the lifting holes.

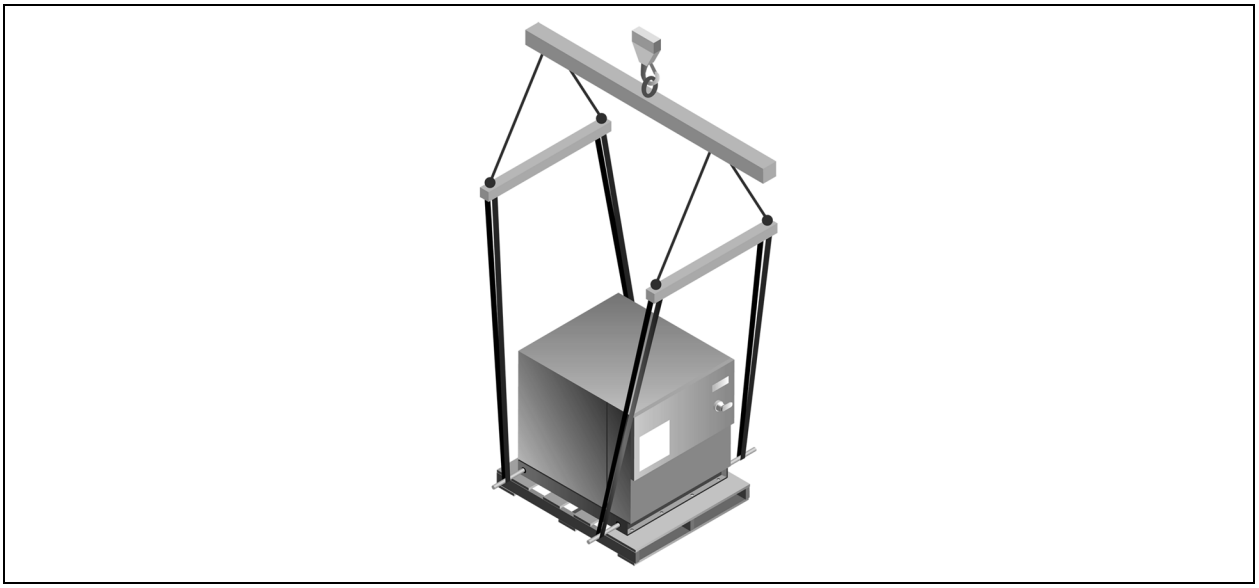
Figure 5.2 Removing Screws Securing the Unit to the Skid



Item	Description	Item	Description
1	Lifting holes, 2 each side	2	Screw and washer (typically 8 places)

4. See Figure 5.3 below , for the typical use of lifting holes and sling arrangement.

Figure 5.3 Typical Sling Arrangement for Lifting Unit



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6 Piping and Refrigerant Requirements

Field installed piping must be installed in accordance with local codes and must be properly assembled, supported, isolated and insulated. Avoid piping runs through noise sensitive areas, such as office walls and conference rooms.

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

The pipe connection locations, piping general arrangement and schematics are described in the submittal documents included in the Submittal Drawings on page 37 .

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

Table 6.1 Typical Vertiv™ Liebert® EconoPhase to Condenser Arrangement Drawings

Document Number	Title
DPN005215	Considerations for mounting Liebert® MC Condenser/Liebert® EconoPhase Above or at Same Level as DA050
DPN003994	Considerations for mounting MC Condenser/EconoPhase Above or at Same Level as DA080-165
DPN003965	Air Cooled Piping Schematic Liebert® MCV Mounted above Liebert® DA125-250
DPN005207	Air Cooled Piping Schematic Liebert® MCV Mounted above DA265

Table 6.2 Piping General Arrangement Drawings

Document Number	Title
Schematics	
10016390	Piping Schematic DA050 Models with Liebert® MC
DPN002615	Piping Schematic DA080, DA085 Models with Liebert® MC
DPN002340	Piping Schematic DA125, DA150, DA165 with Liebert® MC
DPN004476	Piping Schematic DA125, DA150, DA165, and DA250 with Liebert® MCV
DPN005206	Piping Schematic DA265 with Liebert® MCV
DPN004566	Piping Schematic DP060
DPN004345	Piping Schematic 400/500 kW Perimeter and Rooftop Unit
Internal Piping	
DPN003553	General Arrangement Diagram PR050 Models
DPN002325	Typical General Arrangement Diagram PR085, PR125, and PR250 Models
10013561	Typical General Arrangement Diagram PR200 Models

6.1 Placement Options and Piping Restriction for the Vertiv™ Liebert® EconoPhase Unit and Vertiv™ Liebert® MC Condenser

The Liebert® MC condenser and Liebert® EconoPhase must be installed next to each other (For guidelines, refer to the appropriate drawing for your system in the Submittal Drawings on page 37 . The Liebert® EconoPhase is dependent on sub-cooled liquid leaving the condenser and entering the pumps. For this reason there must be no large pressure drop between the two units because that could lead to flashing of the refrigerant and pump cavitation. There must be no traps in the liquid line between the condenser and the Liebert® EconoPhase unit because these will allow vapor to enter the pump suction during start up.

NOTE: The condenser must not be installed below the level of the Vertiv™ Liebert® DSE. The condenser may be installed on the same level as the Liebert® DSE or as much as 60 ft (18.3 m) above the DSE. See DPN003994 in the Submittal Drawings on page 37 , for details.

6.2 Refrigerant Piping and Charging

Proper line size selections are critical to proper operation of the Vertiv™ Liebert® EconoPhase system. The line sizes shown in Table 6.3 below , must be followed for proper operation and maximum efficiency of the Liebert® EconoPhase and vapor compression modes. The line size selections have been optimized to reduce pressure drop throughout the system and still maintain oil return to the compressor for reliability.

Refer to the Vertiv™ Liebert® DSE user manual for complete list of piping guidelines and instructions.

Table 6.3 Line Sizing for Liebert® DSE/Liebert® EconoPhase System

Model	DA050		DA080 and DA085		DA125		DA150 and DA165		DA250 and DA265	
Equivalent Length	Hot Gas Line, in.	Liquid Line, in.	Hot Gas Line, in.	Liquid Line, in.	Hot Gas Line, in.	Liquid Line, in.	Hot Gas Line, in.	Liquid Line, in.	Hot Gas Line, in.	Liquid Line, in.
50 ft (15 m)	1-1/8	7/8	1-1/8	7/8	1-3/8	7/8	1-3/8	7/8	1-5/8	1-3/8
100 ft (30 m)	1-1/8	7/8	1-1/8	7/8	1-3/8	7/8	1-3/8	1-1/8	1-5/8	1-3/8
150 ft (45 m)	1-1/8	7/8	1-1/8	7/8	1-3/8	7/8	1-3/8	1-1/8	1-5/8*	1-3/8*
300 ft (90 m)	1-1/8	7/8	1-1/8	7/8	1-3/8	7/8	1-3/8	1-1/8	1-5/8*	1-3/8*
450 ft (137 m)**	1-1/8	7/8	1-1/8	7/8	1-3/8	7/8	1-3/8	1-1/8	—	—

*Liebert® DA250 and Liebert® DA265 unit can be extended to a maximum 200 ft (61m) linear or 300 ft (91m) equivalent length.

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

Source: DPN000788. Rev. 14

6.2.1 Refrigerant Charge for Vertiv™ Liebert® EconoPhase Systems

WARNING! Risk of over-pressurization of the refrigeration system. Can cause serious injury or death. Building and equipment damage may also result. Can cause explosive discharge of high-pressure refrigerant, loss of refrigerant, or environmental pollution. 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.

Table 6.4 System Refrigerant Pressures

Maximum Design Pressure (High Side)	530 psig	3655 kPa	Noted on the unit serial tag
Source: DPN000788, Rev. 16			

Before charging system, make sure disconnect switch is in the “OFF” position. After charging is complete, turn disconnect switch to the “ON” position. Refer to the Vertiv™ Liebert® DSE Installer/User Guide (SL-18933 for DA050-165 units or SL-18945 for DA250-265 units) for complete charging instructions for the Liebert® DSE/Liebert® EconoPhase system.

Table 6.5 Liebert® EconoPhase Refrigerant Charge

Model	R410A Charge per Circuit, lb (kg)
PR050	5.4 (2.5)
PR085	5.4 (2.5)
PR125	5.4 (2.5)
PR200	5.4 (2.5)
PR250	9.2 (4.2)

NOTE: Field installed interconnecting piping should be properly selected based on local codes and unit labeling.

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7 Electrical Connections

WARNING! Arc flash and electric shock hazard. Can cause serious injury or death. Building and equipment damage may also result. Disconnect all local and remote electric power supplies and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable.

Verify with a voltmeter that power is Off. The Vertiv™ Liebert® iCOM™ controller does not isolate power from the unit, even in the “Unit Off” mode. Some internal components still require and receive power even during the “Unit Off” mode of the Liebert® iCOM™ controller. The factory-supplied, optional disconnect switch is inside the unit. The line side of this switch contains live high voltage. The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch. Refer to unit electrical schematic.

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

WARNING! Risk of electric shock. Can cause serious injury or death. Building and equipment damage may also result. Open all local and remote electric power supply disconnect switches and verify that power is off with a voltmeter before working within any electric connection enclosures. The Liebert® iCOM™ 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 Liebert® iCOM™ controller.

Installation, 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 improper wire sizing/rating and loose electrical connections causing overheated wire and electrical connection terminals resulting in smoke or fire. Can cause serious injury or death. Building and equipment damage may also result. 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.

WARNING! Risk of improper wiring, piping, moving, lifting and handling. Can cause serious injury or death. Building and equipment damage may also result. 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.

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.

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

NOTICE

Risk of improper electrical connection of three-phase input power. Can cause backward pump rotation and unit damage. Service technicians should use a gauge set on the system during the initial start up to verify that the three-phase power is connected properly. Three-phase power must be connected to the unit line voltage terminals in the proper sequence so that the pump rotates in the proper direction. Incoming power must be properly phased to prevent pump from running backward. We recommend checking the unit's phasing with proper instrumentation to ensure that the power connections were made correctly. We also recommend verifying discharge and suction pressures during start up to ensure that the pumps are running in the correct direction.

NOTE: Seal openings around piping and electrical connections to prevent air leakage.

7.1 High Voltage Electrical Connections

Three phase electrical service is required for all models. Electrical service must conform to national and local electrical codes. Refer to equipment nameplate regarding wire size and circuit protection requirements. Refer to electrical schematic when making connections. A manual electrical disconnect switch should be installed in accordance with local codes and distribution system. Consult local codes for external disconnect requirements.

The electrical connections and service entrances to the unit are described in the submittal documents included in the Submittal Drawings on page 37 .

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

Table 7.1 Electrical Field Connection Drawings

Document Number	Title
DPN004355	Electrical Field Connections PR050 Single Circuit Models
DPN002327	Electrical Field Connections, PR085 - PR250 Dual Circuit Models

7.2 Low Voltage, Communication Wiring Connections

The Vertiv™ Liebert® DSE, Vertiv™ Liebert® MC condenser, and Vertiv™ Liebert® EconoPhase PRE require communication when combined into a system. This is done through a CANbus communication interface. A CANbus cable must be connected from the Liebert® DSE at the designated terminal(s) to TB49 on the Liebert® MC-condenser board (refer to the Liebert® DSE user manual, SL-18934). If there is an additional condenser, TB50 of the first condenser will continue out to TB49 on the second condenser.

In a system equipped with an Liebert® EconoPhase, the CANbus cable must be connected from TB50 on the last condenser to TB49 on the EconoPhase CANbus terminal block.

The two devices that are connected at the ends of the CANbus will require termination to be set by jumper or plug. One end will be at the last outdoor device in the connection chain; the other end of the CANbus is either in the indoor unit or at a remote sensor. To terminate, place a jumper on J6 Pins 1 and 2 on the Liebert® MC condenser or Liebert® EconoPhase board. For other Vertiv™ Liebert® iCOM™ boards directly associated with the indoor unit, terminate by placing a jumper on P78 Pins 2 and 3.

See Figure 7.1 on the next page or Figure 7.2 on the next page for CANbus connections, jumper and DIP switch settings.

- Length Restrictions
  - The indoor Vertiv™ Liebert® DSE can be no more than 300 ft. (91 m) from the condenser. The CAN communication cable can be longer, but the total length should not exceed 500 ft. (152 m) between the indoor Liebert® DSE unit and all outdoor equipment.
- Cable Type
  - Conductors—22-18AWG stranded, tinned copper
  - Twisted pair (one pair is required for connection)
  - Braided shield or foil shield with drain wire
  - Low capacitance (<=15pF/ft)
  - Cat5e or similar
  - UL approved temperature rated to 75°C (167°F)
  - UL approved voltage rated to 300 V
  - UV – and moisture – resistant if not run in conduit
  - Plenum rated—NEC type CMP, if required by national or local codes
- High Voltage Restrictions
  - Do not run communications cable with high voltage cable.
  - When routing cable, avoid laying, fastening or coiling near or on high voltage wiring, conduit, or light ballasts. Communication signals in equipment may be disturbed.
  - Keep communications cable away from other electrical noise sources.
- Environmental and Safety
  - We recommend routing cable inside conduit where the cable exits the building to outdoor units, between outdoor units and any other location where environmental conditions could degrade the cable's integrity.
  - Follow all national and local codes regarding cable routing, ratings, etc.

Figure 7.1 CANbus Cable Connections for Single Circuit System, PR050 and DA050

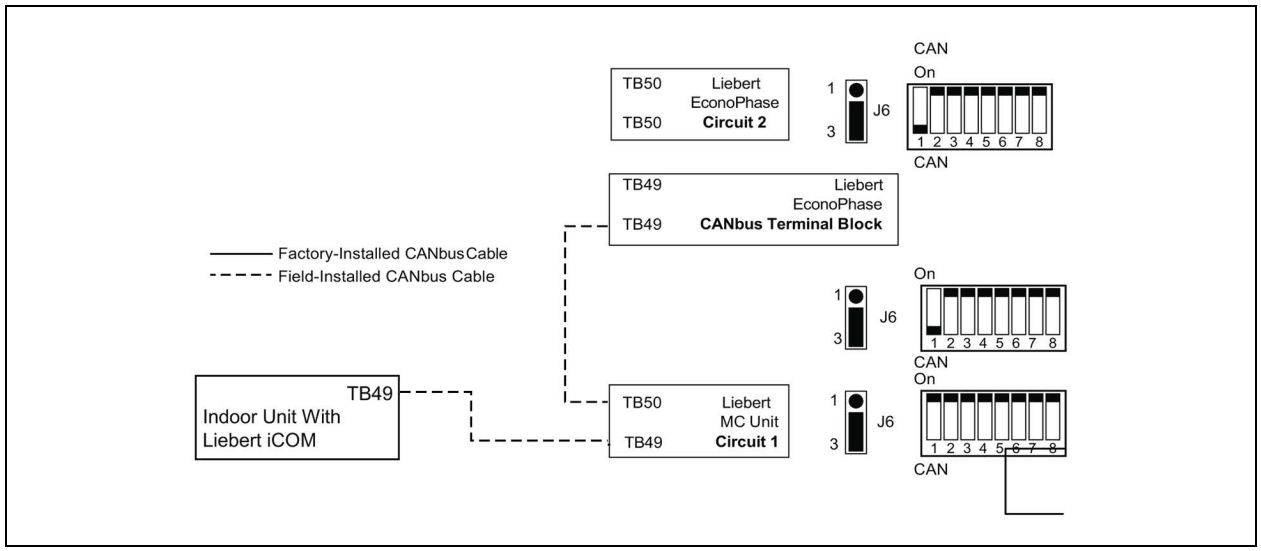
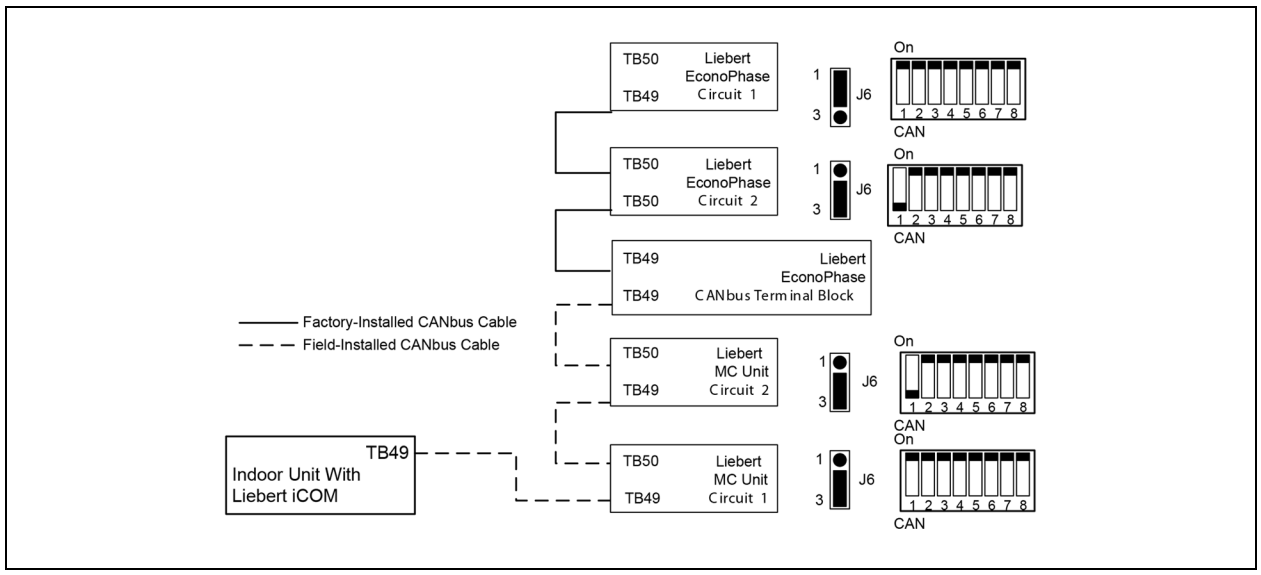


Figure 7.2 CANbus Cable Connections for Dual Circuit System, PR080 to PR250



8 Troubleshooting

NOTICE

Risk of improper control circuits. Can cause equipment damage.

When using jumpers for troubleshooting, always remove jumpers when maintenance is complete. Jumpers left connected could override controls and cause equipment damage.

Table 8.1 below , shows the current list of alarms that will display, along with a list of possible causes for the alarm condition.

Table 8.1 Vertiv™ Liebert® EconoPhase Alarms and Possible Causes

Liebert® iCOM™ Alarm Text	Event Description	Notes (Possible Causes/ Troubleshooting)	Reset Type MA = Manual Acknowledge MR = Manual Reset AR = Auto Reset
PB1/2 BOARD FAIL	An unrecoverable fatal system error has occurred. Pump shut down. Pump board must be rebooted to reset event.	Reboot system but a new pump board must be installed.	MA, MR
PB1/2 IN PRES SENS FAIL	Inlet refrigerant pressure sensor failure. Pump shut down. Event is reset when condition clears.	Plug disconnected at board. Disconnected at sensor. Sensor failure.	MA, AR
PB1/2 IN TEMP SENS FAIL	Inlet refrigerant temperature sensor failure. Pump shut down. Event is reset when condition clears.	Sensor unplugged at board. Lead material separated from resistor element (damaged sensor). Short circuit.	MA, AR
PB1/2 INV DATA SHUTDOWN	Invalid data detected and pump has been shut down. Event is reset when Liebert® iCOM™requests a new start up.	CAN communication error Software error (reboot system if occurring continually) Mismatched versions of code between the Liebert® iCOM™ and Pump boards.	MA, AR
PB1/2 LO DIFF PRESSURE	Pump differential pressure fell below a lower threshold and pump has been shut down. Event is reset when Liebert® iCOM™ requests a new start up.	EEV not operating properly (see EEV operating mode for Liebert® EconoPhase). Pump phased incorrectly. Pressure transducers reversed. Pressure transducers reading incorrectly. Line between condenser and Liebert® EconoPhase not sloped properly or has traps. Pump failure (mechanical or electrical).	MA, AR
PB1/2 LO OUTLET TEMP	Pump outlet refrigerant temperature fell below a lower threshold and pump has been shut down. Event is reset when Liebert® iCOM™ requests a new start up.	Refrigerant temperature sensor failure at condenser outlet. Condenser fans not operating correctly. Indoor load too low at very low outdoor temperatures.	MA, AR

Table 8.1 Vertiv™ Liebert® EconoPhase Alarms and Possible Causes (continued)

Liebert® iCOM™ Alarm Text	Event Description	Notes (Possible Causes/ Troubleshooting)	Reset Type MA = Manual Acknowledge MR = Manual Reset AR = Auto Reset
PB1/2 OUT PRES SEN FAIL	Outlet refrigerant pressure sensor failure. Pump shut down. Event is reset when condition clears.	Plug disconnected at board. Disconnected at sensor. Sensor failure.	MA, AR
PB1/2 OUT TEMP SEN FAIL	Outlet refrigerant temperature sensor failure. Pump shut down. Event is reset when condition clears.	Sensor unplugged at board. Lead material separated from resistor element (damaged sensor). Short circuit.	MA, AR
PB1/2 COMMS ERROR	Liebert® iCOM™ lost CAN communications with pump board. Pump shut down. Event is reset when condition clears.	Hardware failure on the pump board. Pump board should be replaced.	MA, AR
PB1/2 REMOTE SHUTDWN	Remote shutdown alarm state. Pump shut down. Event is reset when condition clears.	Jumper removed on PCB at TB38.	MA, AR
PB1/2 STARTUP FAIL	Three pump start ups in a row have failed. Event must be manually reset by user.	Low refrigerant charge. Pump phased incorrectly. Pressure transducers reversed. Pressure transducers reading incorrectly. Line between condenser and Liebert® EconoPhase not sloped properly or has traps. Condenser fans not operating properly. (See condenser operating mode for Liebert® EconoPhase). EEV not operating properly (see EEV operating mode for Liebert® EconoPhase). Pump failure (mechanical or electrical). Refrigerant circuits crossed.	MA, MR
PB1/2 COMMUNICATE FAIL	Ethernet communications failure. Pump not shut down. Event is reset when condition clears. USB communications failure. Pump not shut down. Event is reset when condition clears.	Hardware failure on the pump board. Pump board should be replaced.	MA, AR
PB1/2 INVERTER FAIL	Pump Board inverter fail.	Refer to inverter display and manual for cause of failure.	MA, AR
PB1/2 PUMP HRS EXCEEDED	Liebert® EconoPhase pump hours exceeded. Event is reset when condition clears.	Hours since last maintenance have exceeded the designated limit.	MA, AR
PB1/2 TVSS FAILURE		Power surge has tripped TVSS. TVSS must be replaced.	MA, AR

Appendices

Appendix A: Technical Support and Contacts

A.1 Technical Support/Service in the United States

Vertiv Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Liebert® Thermal Management Products

1-800-543-2378

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

A.2 Locations

United States

Vertiv Headquarters

505 N. Cleveland Ave.

Westerville, OH 43082, 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: Submittal Drawings

Table B.1 Submittal Drawings Contents

Document Number	Title
Dimensional Planning Drawings	
DPN002326	Cabinet Dimensional Data, PR050 - PR250
EconoPhase to Condenser Arrangement	
DPN005215	Air Cooled Piping Schematic Liebert® MC Mounted Above Liebert® DA050
DPN003994	Air Cooled Piping Schematic Liebert® MC Mounted Above Liebert® DA080-165
DPN003965	Air Cooled Piping Schematic Liebert® MCV Mounted above Liebert® DA125-250
DPN005207	Air Cooled Piping Schematic Liebert® MCV Mounted above DA265
Piping Schematics	
10016390	Piping Schematic DA050, DA080 & DA085 Models with Liebert® MC without receivers
DPN002615	Piping Schematic DA080, DA085 Models with Liebert® MC with receivers
10034546	Piping Schematic DA125, DA150, DA165 with Liebert® MC without receivers
DPN002340	Piping Schematic DA125, DA150, DA165 with Liebert® MC with receivers
DPN004476	Piping Schematic DA125, DA150, DA165, and DA250 with Liebert® MCV with receivers
DPN005206	Piping Schematic DA125, DA150, DA165, DA250 & DA265 with Liebert® MCV without receivers
DPN004345	Piping Schematic 400/500 kW Perimeter and Rooftop Unit
Unit Internal Piping	
DPN003553	General Arrangement Diagram PR050 Models
DPN002325	Typical General Arrangement Diagram PR085, PR125, and PR250 Models
10013561	Typical General Arrangement Diagram PR200 Models
Electrical Field Connection	
DPN004355	Electrical Field Connections PR050 Single Circuit Models
DPN002327	Electrical Field Connections, PR085 - PR250 Dual Circuit Models

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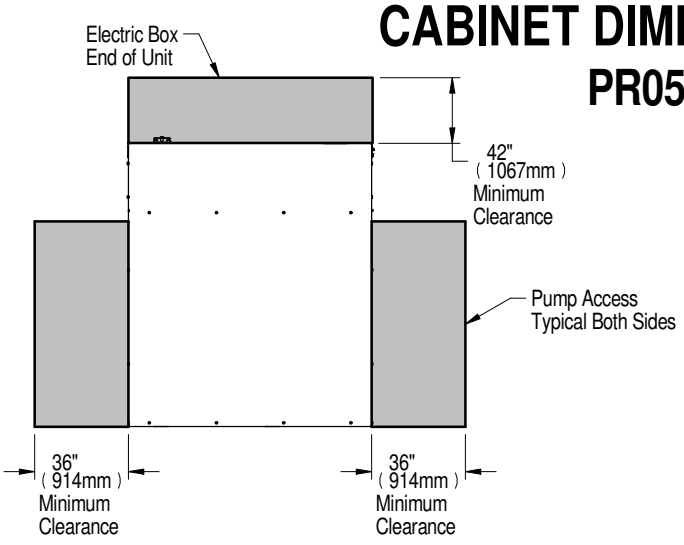
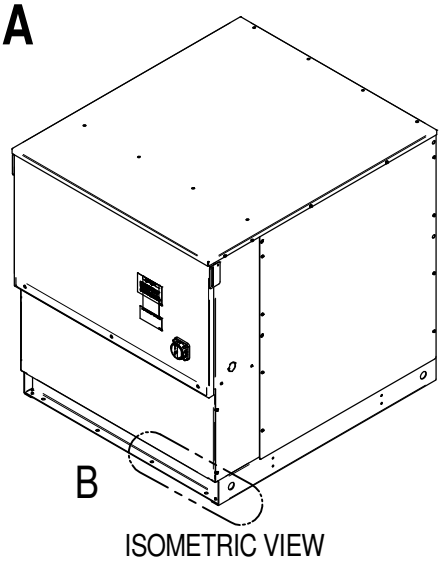
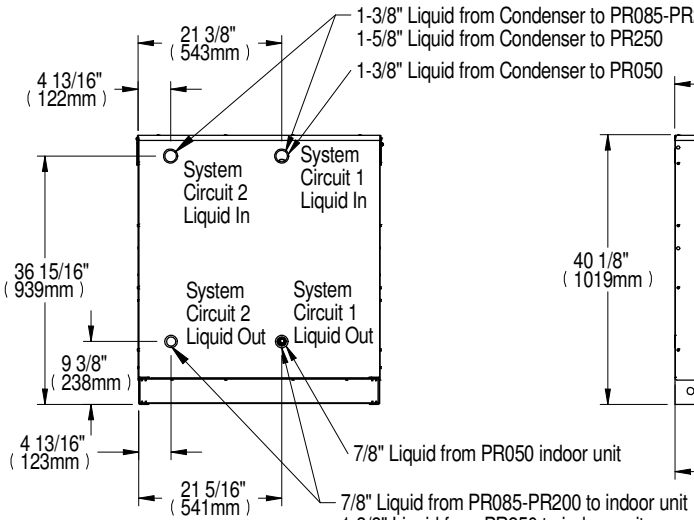
CABINET DIMENSIONAL DATA

PR050 - PR250

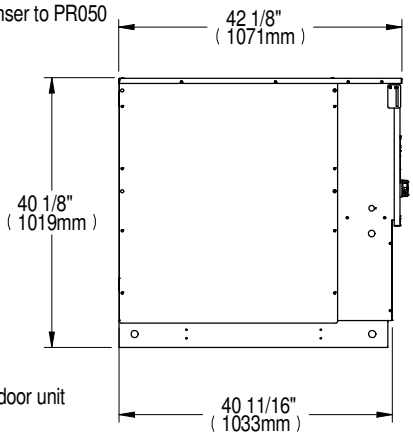




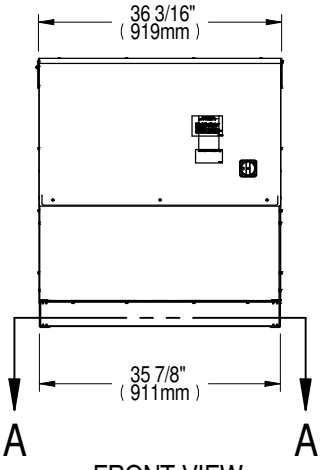
ISOMETRIC VIEW



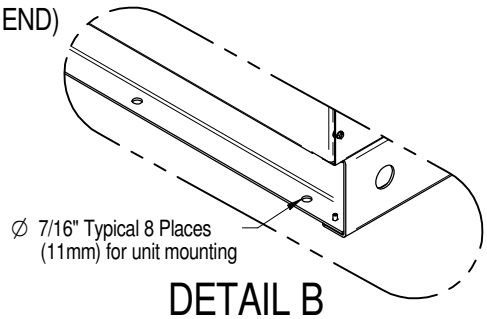
REAR VIEW
(PIPING END)



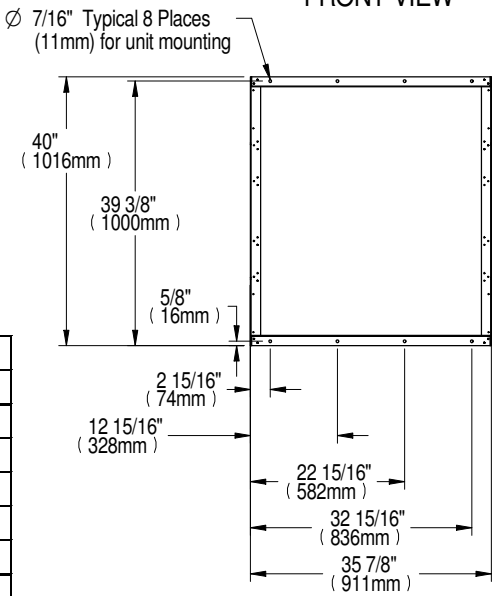
LEFT SIDE VIEW



FRONT VIEW



DETAIL B



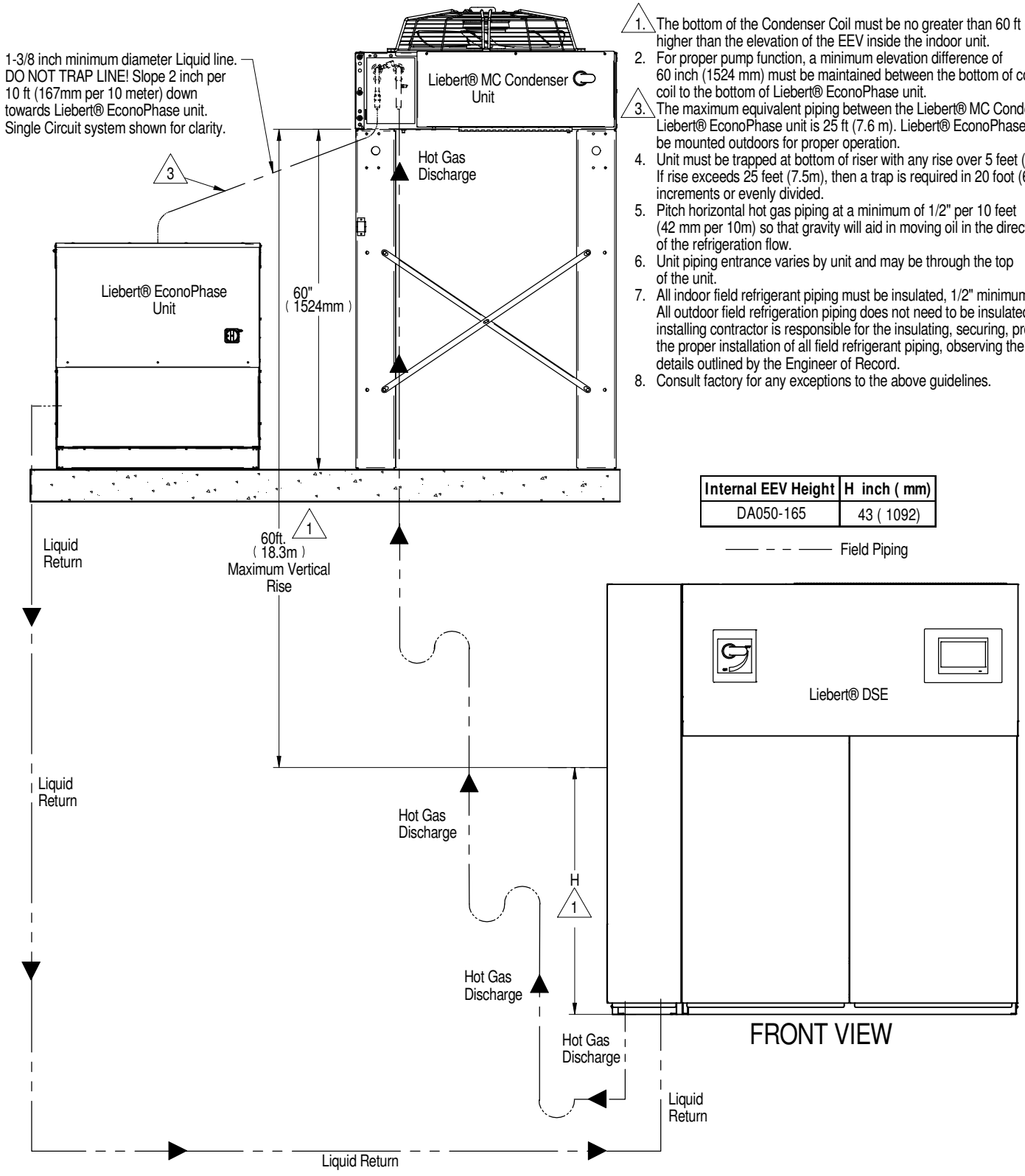
SECTION A-A

Model	Circuits	Unit Voltage, Hz	Approximate Dry Weight lbs (kg)
PR050	1	208/230V, 460V 60Hz	217 (98)
		380V, 575V 60Hz	242 (110)
		415V 50Hz	217 (98)
PR085-125 and PR250	2	208/230V, 460V 60Hz	340 (154)
		380V, 575V 60Hz	390 (177)
		415V 50Hz	347 (157)
PR200	2	460V 60Hz	350 (159)
PR200	2	380V, 575V 60Hz	400 (181)

LIEBERT® DSE

AIR COOLED PIPING SCHEMATIC

LIEBERT® MC WITHOUT RECEIVERS MOUNTED ABOVE DA050-165



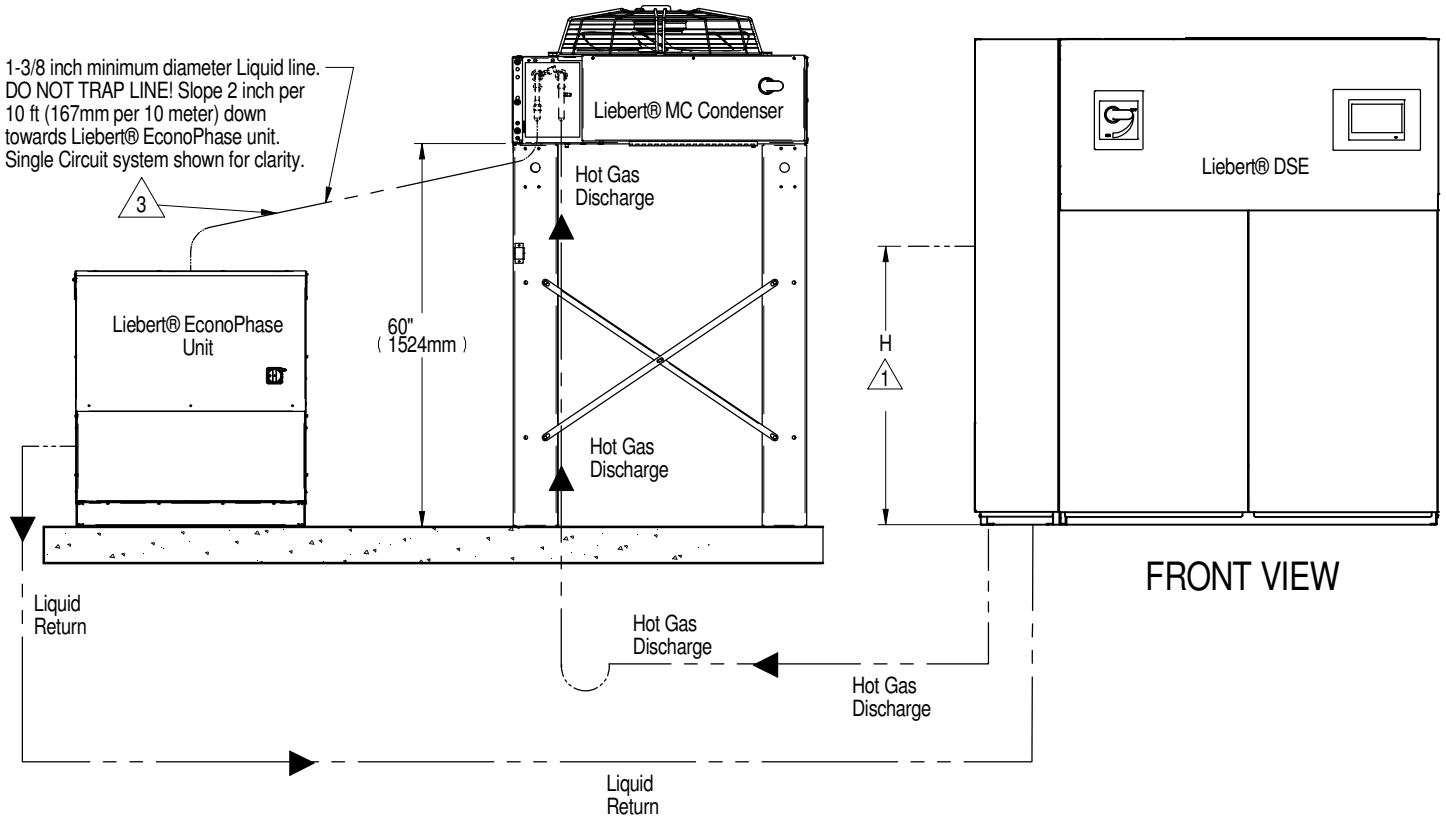
Notes:

1. The bottom of the Condenser Coil must be no greater than 60 ft (18.3m) 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 Liebert® EconoPhase unit.
3. The maximum equivalent piping between the Liebert® MC Condenser and Liebert® EconoPhase unit is 25 ft (7.6 m). Liebert® 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 field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigeration piping does not need to be insulated.The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.
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
DA050-165 AND LIEBERT® MC WITHOUT RECEIVERS AT SIMILAR LEVELS



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

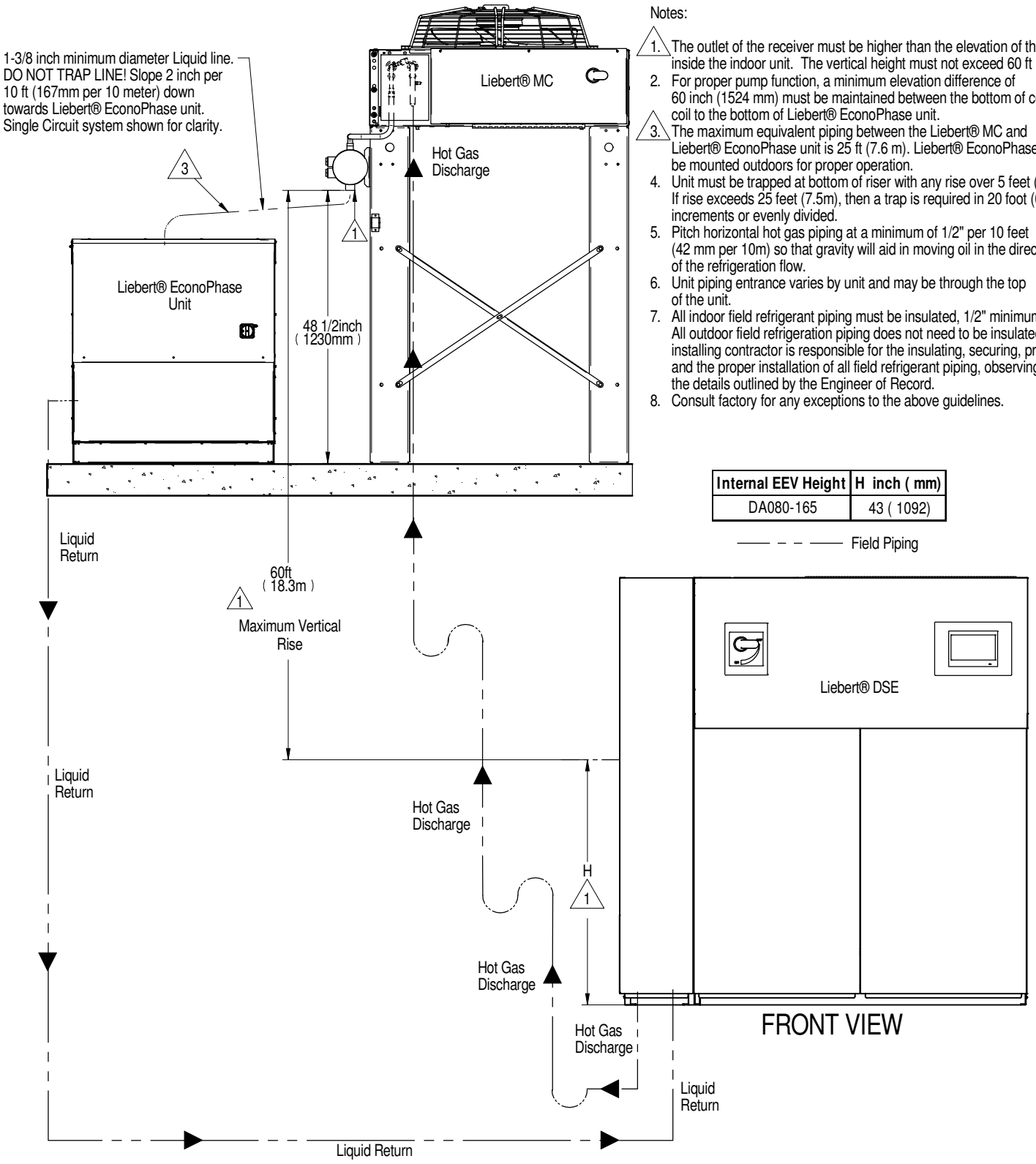
—— – – —— Field Piping

Notes:

1. The bottom of the condenser coil cannot be more than 15ft (4.6m) below 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 Liebert® EconoPhase unit.
3. The maximum equivalent piping between the Liebert® MC Condenser and Liebert® EconoPhase unit is 25 ft (7.6 m). Liebert® 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 field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigeration piping does not need to be insulated.The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.
8. Consult factory for any exceptions to the above guidelines.

LIEBERT® DSE

AIR COOLED PIPING SCHEMATIC
LIEBERT® MC WITH RECEIVERS MOUNTED ABOVE DA080-165



Notes:

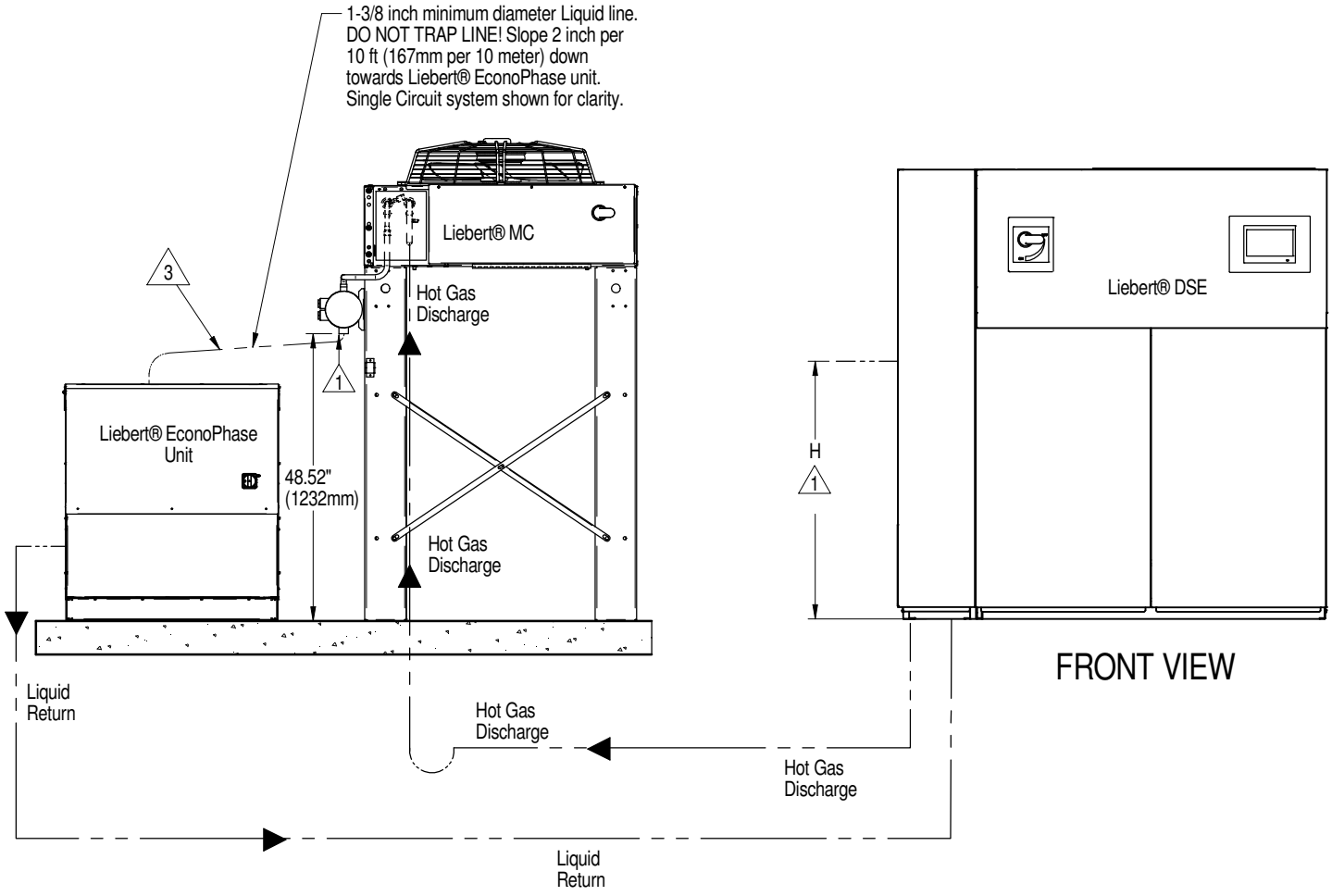
1. The outlet of the receiver must be higher than the elevation of the EEV inside the indoor unit. The vertical height must not exceed 60 ft (18.3m).
2. For proper pump function, a minimum elevation difference of 60 inch (1524 mm) must be maintained between the bottom of condenser coil to the bottom of Liebert® EconoPhase unit.
3. The maximum equivalent piping between the Liebert® MC and Liebert® EconoPhase unit is 25 ft (7.6 m). Liebert® 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 field refrigerant piping must be insulated, 1/2" minimum thickness All outdoor field refrigeration piping does not need to be insulated.The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.
8. Consult factory for any exceptions to the above guidelines.

Internal EEV Height	H inch (mm)
DA080-165	43 (1092)

—— – – – —— Field Piping

AIR COOLED PIPING SCHEMATIC

DA080-165 AND LIEBERT® MC WITH RECEIVERS AT SIMILAR LEVELS



Internal EEV Height	H inch (mm)
DA080-165	43 (1092)

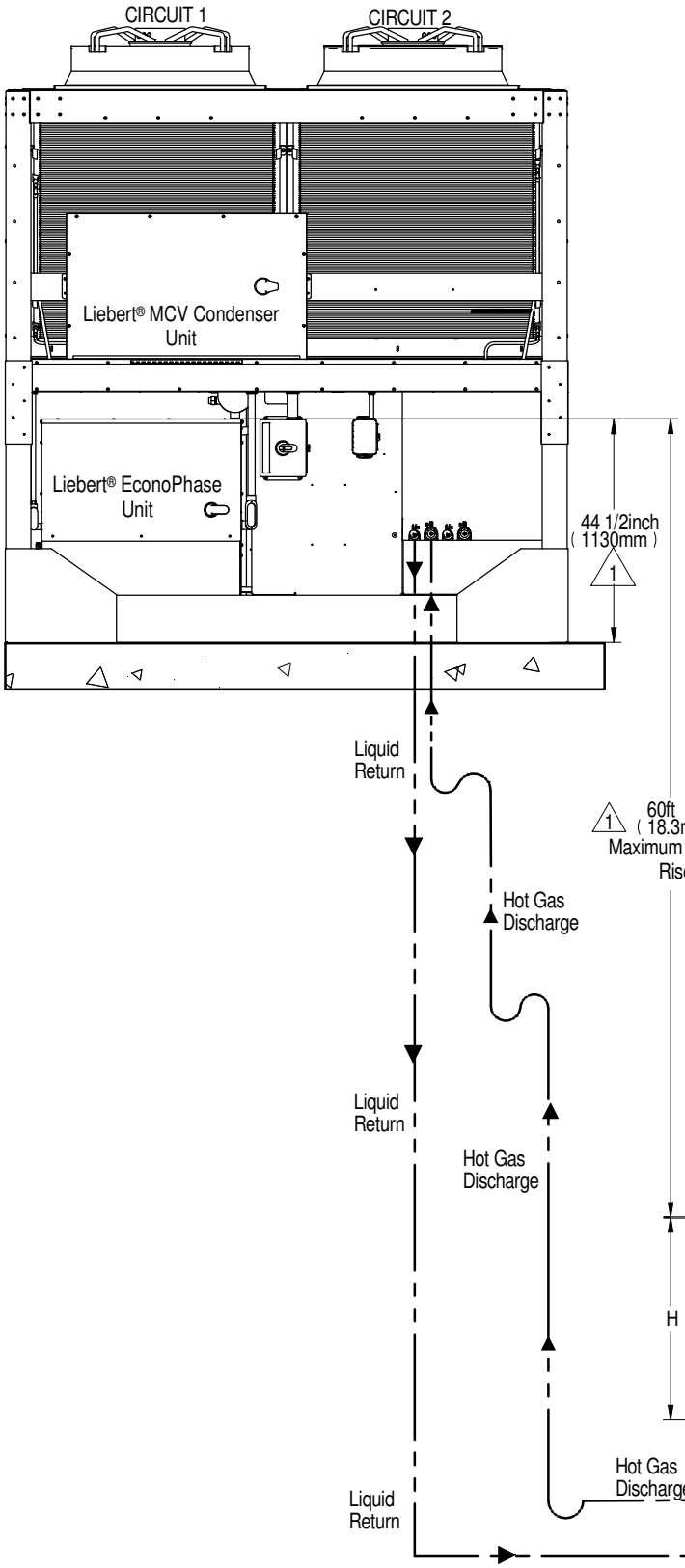
—— – – —— Field Piping

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 Liebert® EconoPhase unit.
3. The maximum equivalent piping between the Liebert® MC and Liebert® EconoPhase unit is 25 ft (7.6 m). Liebert® 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 field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigeration piping does not need to be insulated.The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.
8. Consult factory for any exceptions to the above guidelines.

LIEBERT® DSE

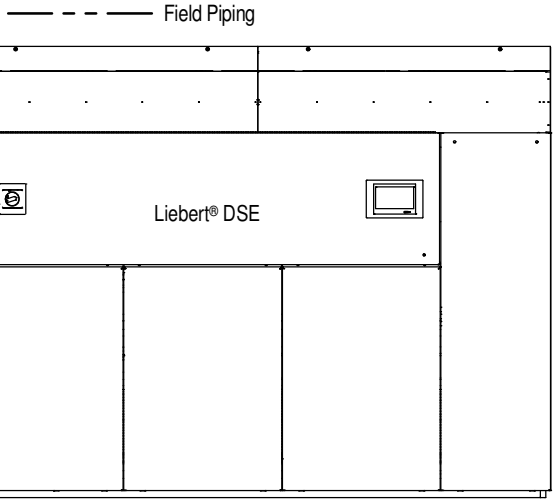
AIR COOLED PIPING SCHEMATIC
LIEBERT® MCV WITH RECEIVERS MOUNTED ABOVE DA125-250



Notes:

1. The outlet of the receiver must be higher than the elevation of the EEV inside the indoor unit. The vertical height must not be greater than 60 ft (18.3 m).
2. Unit must be trapped at bottom of riser with any rise over 5 feet (1.5m) high. If rise exceeds 25 feet (7.5m), then a trap is required in 20 foot (6.1m) increments or evenly divided. DA250 with horizontal discharge has internally installed traps on the hot gas discharge line.
3. Pitch horizontal hot gas piping at a minimum of ½ inch per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
4. Unit piping entrance varies by unit and may be through the top of the unit.
5. All indoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigerant piping does not need to be insulated. The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.
6. Consult factory for any exceptions to the above guidelines.

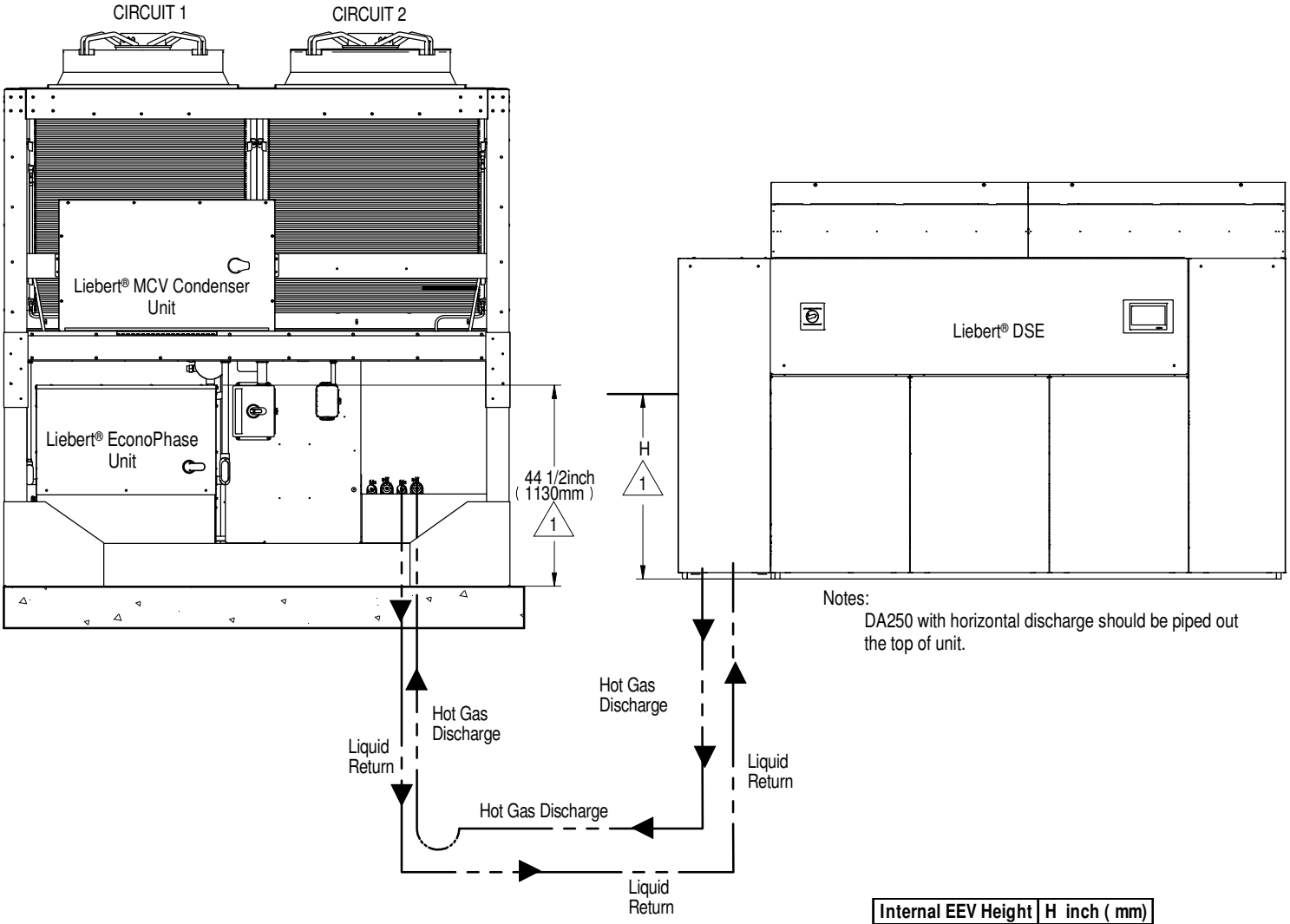
Internal EEV Height	H inch (mm)
DA125-DA165	43 (1092)
DA250	56 (1422)



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

LIEBERT® DSE

AIR COOLED PIPING SCHEMATIC
DA125-250 AND LIEBERT® MCV WITH RECEIVERS AT SIMILAR LEVELS



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

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

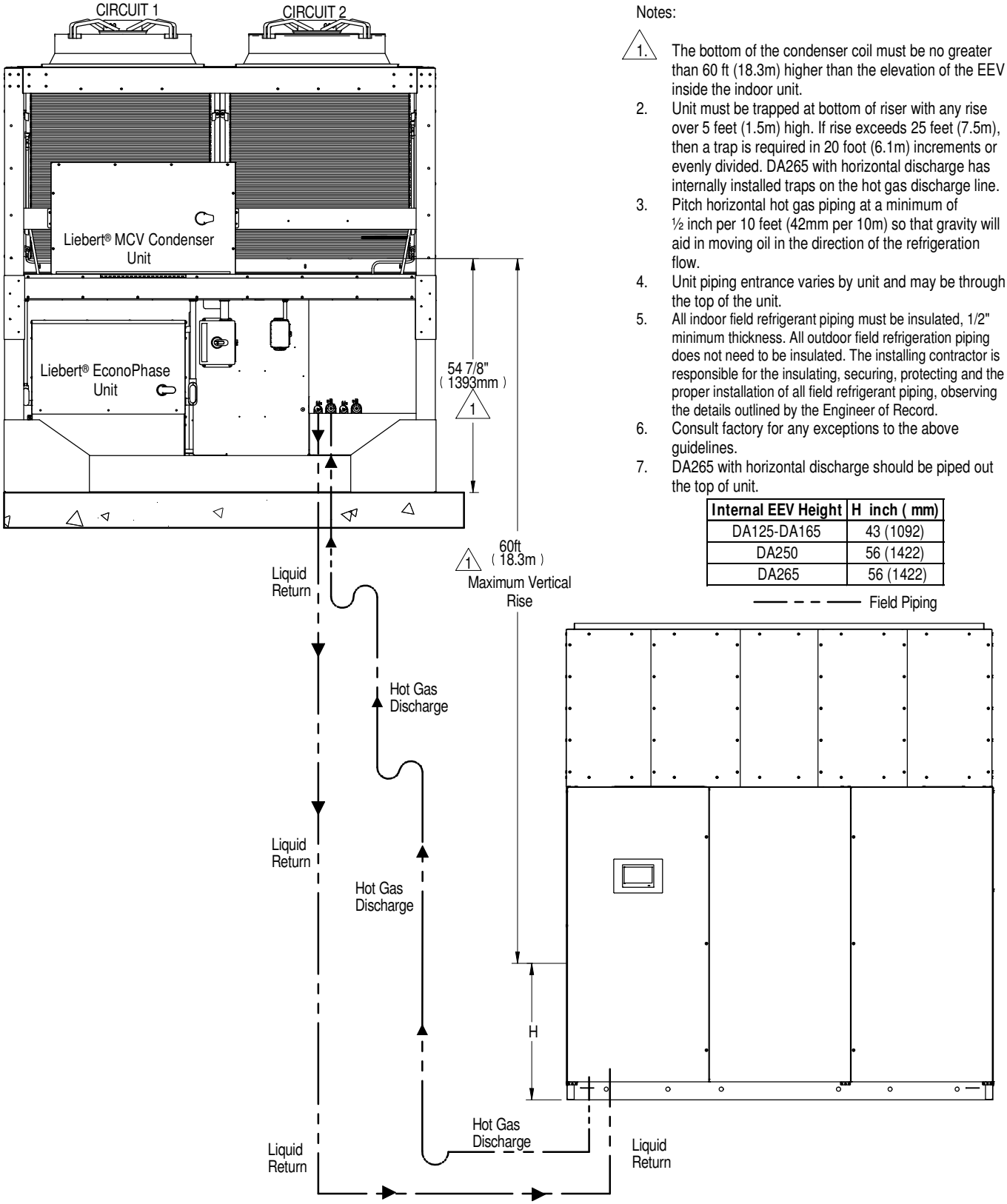
—— – – – —— Field Piping

Notes:

1. The outlet of the receiver must be higher than the elevation of the EEV inside the indoor unit.
2. Unit must be trapped at bottom of riser with any rise over 5 feet (1.5m) high. If rise exceeds 25 feet (7.5m), then a trap is required in 20 foot (6.1m) increments or evenly divided. DA250 with horizontal discharge has internally installed traps on the hot gas discharge line.
3. Pitch horizontal hot gas piping at a minimum of ½ inch per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
4. Unit piping entrance varies by unit and may be through the top of the unit.
5. All indoor field refrigerant piping must be insulated, 1/2" minimum thickness. All external field refrigeration piping between the indoor and Liebert® Heat Rejection unit do not need to be insulated.The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.
6. Consult factory for any exceptions to the above guidelines.

LIEBERT® DSE

AIR COOLED PIPING SCHEMATIC
Liebert® MCV WITHOUT RECEIVERS MOUNTED ABOVE DA125-265



Notes:

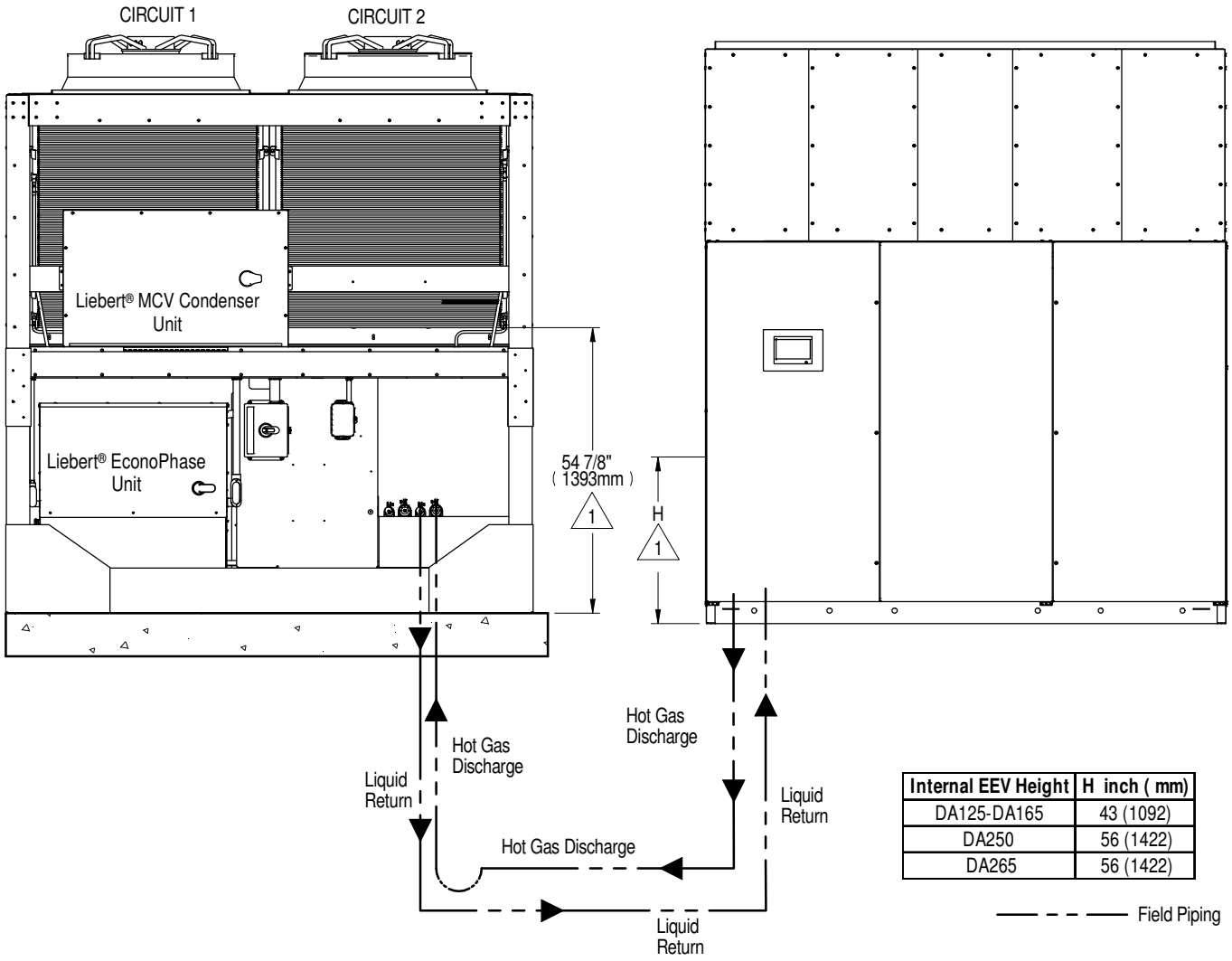
1. The bottom of the condenser coil must be no greater than 60 ft (18.3m) higher than the elevation of the EEV inside the indoor unit.
2. Unit must be trapped at bottom of riser with any rise over 5 feet (1.5m) high. If rise exceeds 25 feet (7.5m), then a trap is required in 20 foot (6.1m) increments or evenly divided. DA265 with horizontal discharge has internally installed traps on the hot gas discharge line.
3. Pitch horizontal hot gas piping at a minimum of ½ inch per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
4. Unit piping entrance varies by unit and may be through the top of the unit.
5. All indoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigeration piping does not need to be insulated. The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.
6. Consult factory for any exceptions to the above guidelines.
7. DA265 with horizontal discharge should be piped out the top of unit.

Internal EEV Height	H inch (mm)
DA125-DA165	43 (1092)
DA250	56 (1422)
DA265	56 (1422)

— — — Field Piping

LIEBERT® DSE

AIR COOLED PIPING SCHEMATIC
DA125-265 AND Liebert® MCV WITHOUT RECEIVERS AT SIMILAR OR BELOW LEVELS



Internal EEV Height	H inch (mm)
DA125-DA165	43 (1092)
DA250	56 (1422)
DA265	56 (1422)

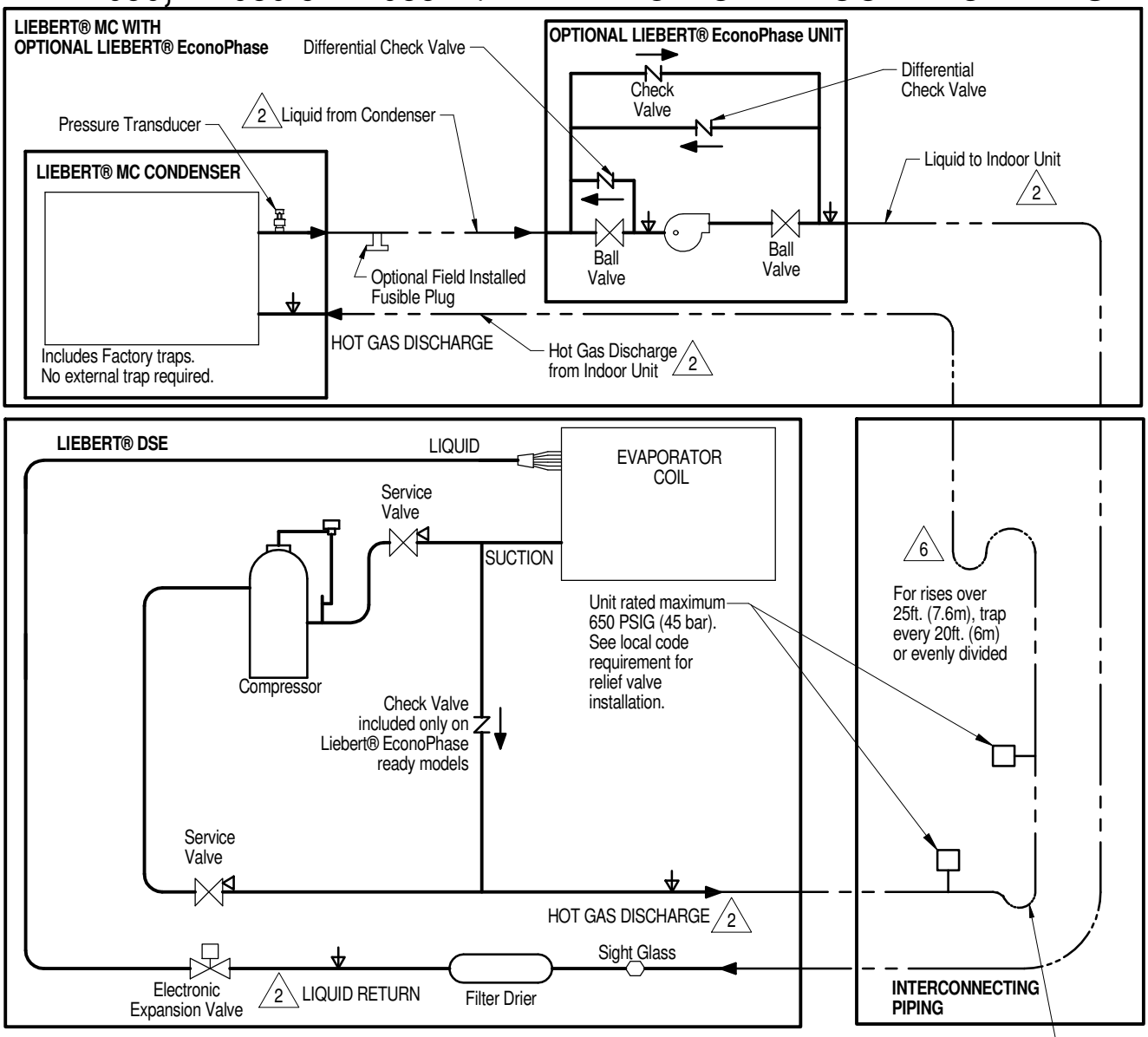
Notes:

1. The bottom of the condenser coil must be less than 15ft(4.6m) below 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. DA265 with horizontal discharge has internally installed traps on the hot gas discharge line.
3. Pitch horizontal hot gas piping at a minimum of ½ inch per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
4. Unit piping entrance varies by unit and may be through the top of the unit.
5. All indoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigeration piping does not need to be insulated. The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.
6. Consult factory for any exceptions to the above guidelines.
7. DA265 with horizontal discharge should be piped out the top of unit.

LIEBERT® DSE

PIPING SCHEMATIC

DA050, DA080 & DA085 W/ LIEBERT® MC WITHOUT RECEIVERS



Notes:

1. Single refrigeration circuit provided on DA050.
   Two refrigeration circuits provided on DA080 & DA085. Single refrigeration circuit shown for clarity.
2. Circuit 1 must be maintained between indoor unit, condenser and Liebert® EconoPhase unit.
3. Schematic representation shown. Do not use for specific connection locations.
4. The bottom of the Condenser Coil must be no greater than 60ft. (18.3m) above, and less than 15ft. (4.6m) below the elevation of the EEV inside the indoor unit.
5. All indoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigeration piping does not need to be insulated.The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.

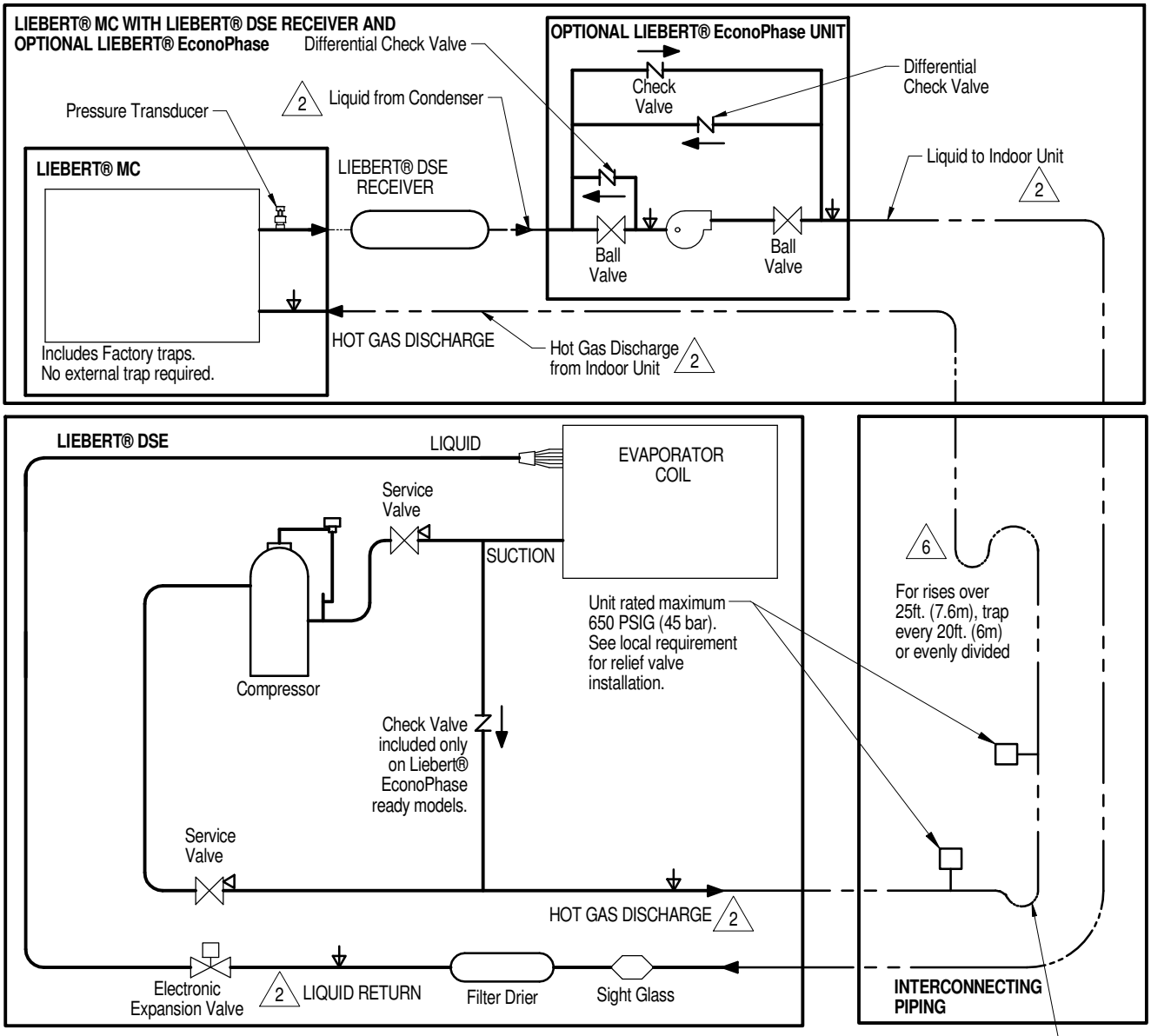
6. Components are not supplied by Vertiv but are required for proper circuit operation and maintenance.

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

LIEBERT® DSE

PIPING SCHEMATIC

DA080 & DA085 MODELS W/ LIEBERT® MC WITH RECEIVERS

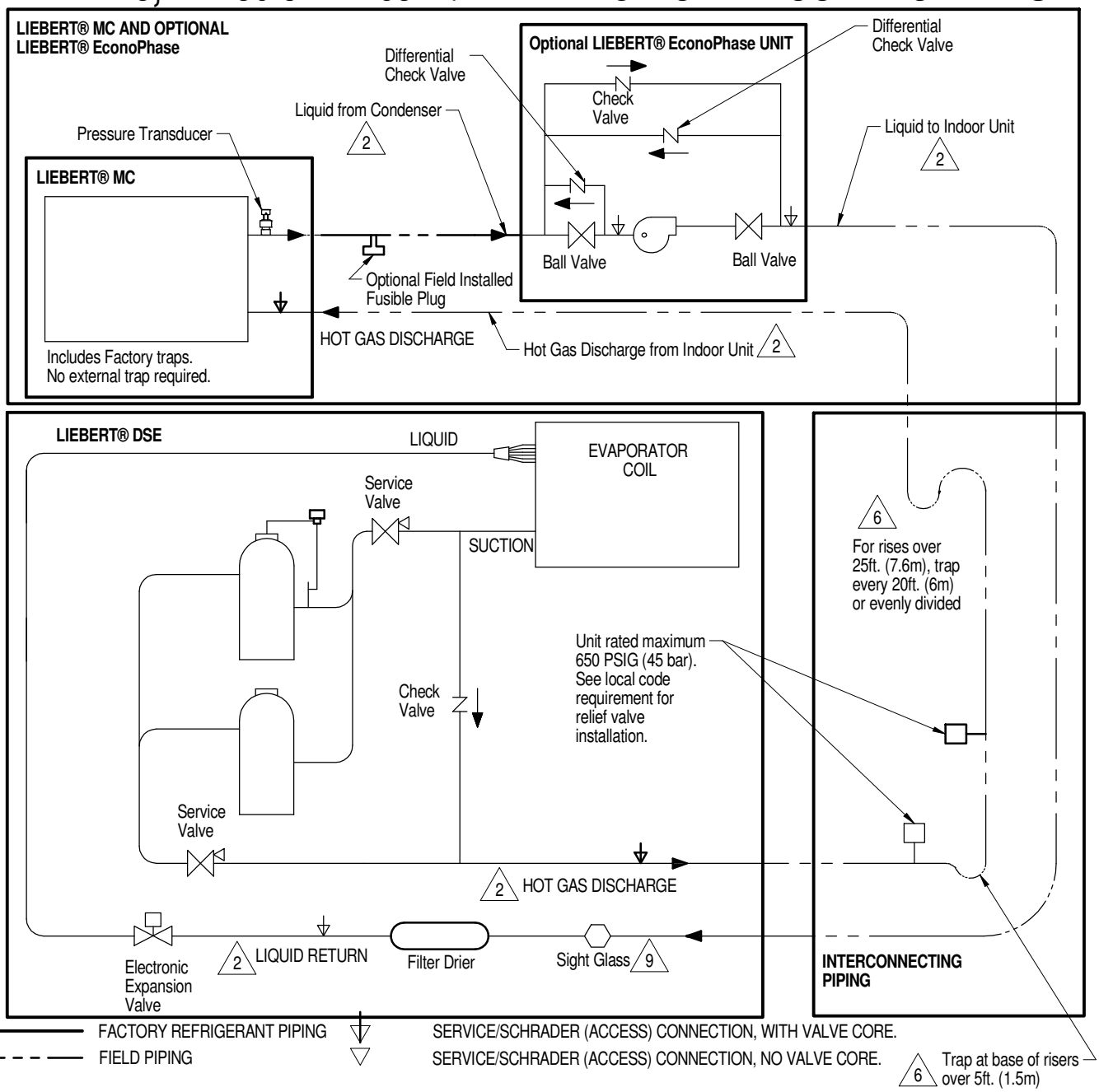


Notes:

1. Two refrigeration circuits provided on DA080 & DA085. Single refrigeration circuit shown for clarity.
2. Circuit 1 must be maintained between indoor unit, condenser and Liebert® EconoPhase unit. Circuit 2 must be maintained between indoor unit, condenser and Liebert® 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 Liebert® EconoPhase unit.
5. All indoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigeration piping does not need to be insulated.The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.
6. Components are not supplied by Vertiv but are required for proper circuit operation and maintenance.
7. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid flood back to compressor. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of refrigeration flow.
8. Do not isolate any refrigeration circuits from over pressurization protection.

LIEBERT® DSE

PIPING SCHEMATIC
DA125, DA150 & DA165 W/ LIEBERT® MC WITHOUT RECEIVERS



Notes:

1. Two refrigeration circuits provided. Single refrigeration circuit shown for clarity.

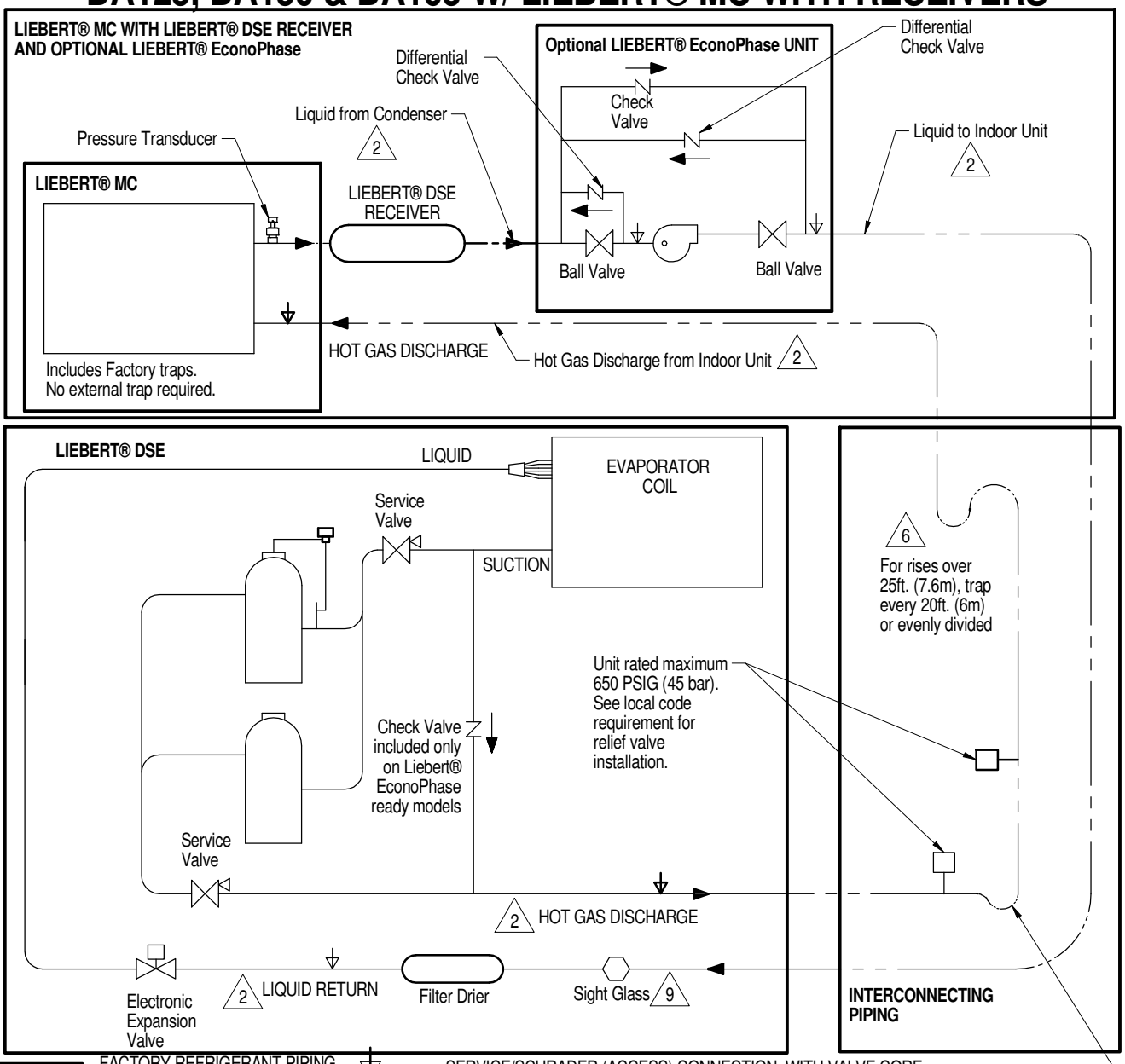
2. Circuit 1 must be maintained between indoor unit, condenser and Liebert® EconoPhase unit. Circuit 2 must be maintained between indoor unit, condenser and Liebert® EconoPhase unit.
3. Schematic representation shown. Do not use for specific connection locations.
4. The bottom of the condenser coil must be no greater than 60ft (18.3m) above and less than 15ft (4.6m) below the elevation of the EEV inside the indoor unit.
5. All indoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigeration piping does not need to be insulated.The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.

6. Components are not supplied by Vertiv 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.

9. Typical location for Sight Glass on DA150 and DA165. On DA125, Sight Glass is located between Filter Drier and Electronic Expansion Valve.

LIEBERT® DSE

PIPING SCHEMATIC
DA125, DA150 & DA165 W/ LIEBERT® MC WITH RECEIVERS

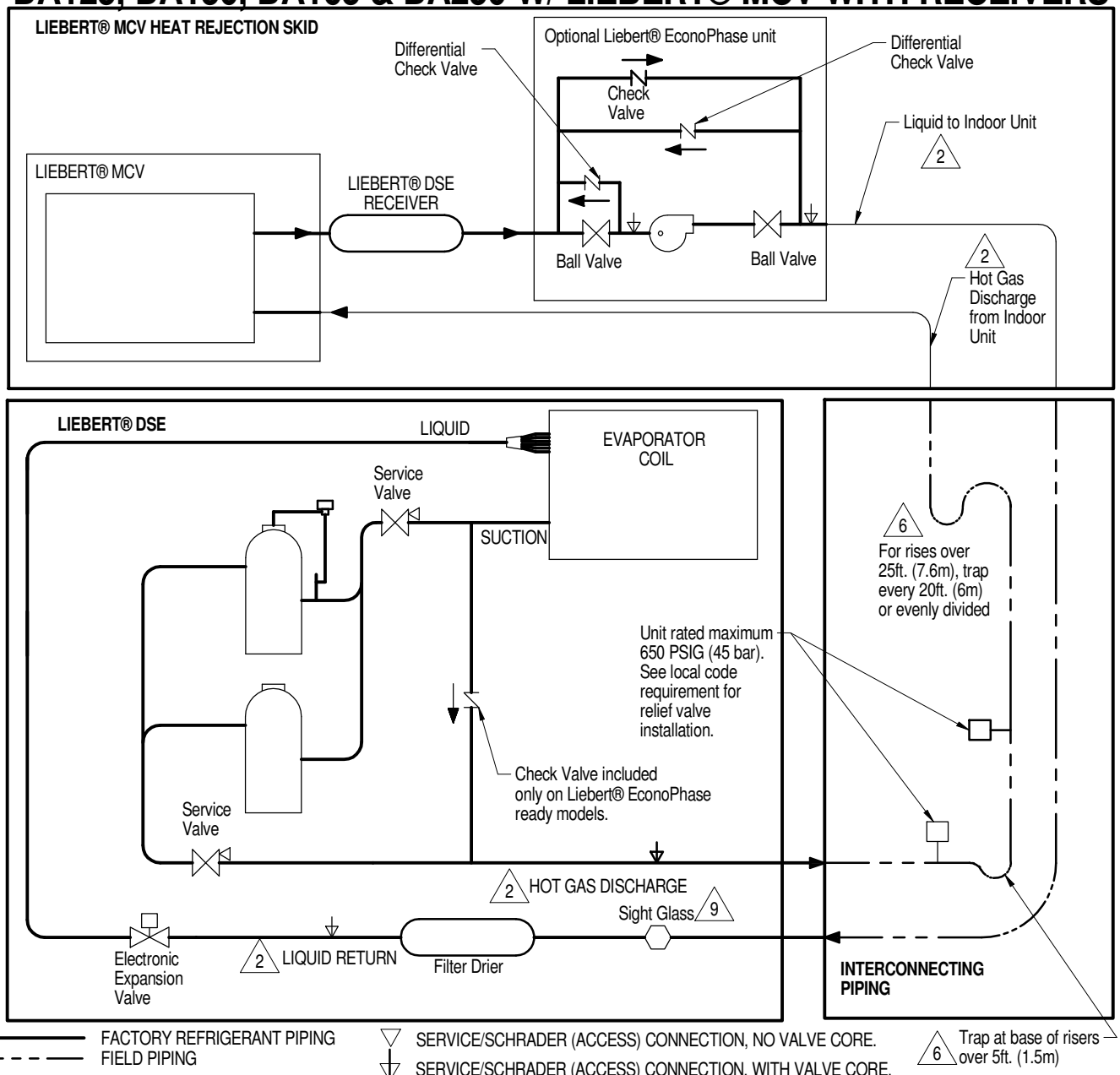


Notes:

1. Two refrigeration circuits provided. Single refrigeration circuit shown for clarity.
2. Circuit 1 must be maintained between indoor unit, condenser and Liebert® EconoPhase unit. Circuit 2 must be maintained between indoor unit, condenser and Liebert® 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 Liebert® EconoPhase.
5. All indoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigeration piping does not need to be insulated.The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.
6. Components are not supplied by Vertiv 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.
9. Typical location for Sight Glass on DA150 and DA165. On DA125, Sight Glass is located between Filter Drier and Electronic Expansion Valve.

LIEBERT® DSE

PIPING SCHEMATIC
DA125, DA150, DA165 & DA250 W/ LIEBERT® MCV WITH RECEIVERS



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

Notes:

1. Two refrigeration circuits provided. Single refrigeration circuit shown for clarity.

2. Circuit 1 must be maintained between indoor unit, condenser and Liebert® EconoPhase unit. Circuit 2 must be maintained between indoor unit, condenser and Liebert® 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 Liebert® EconoPhase unit.
5. All indoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigeration piping does not need to be insulated.The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.

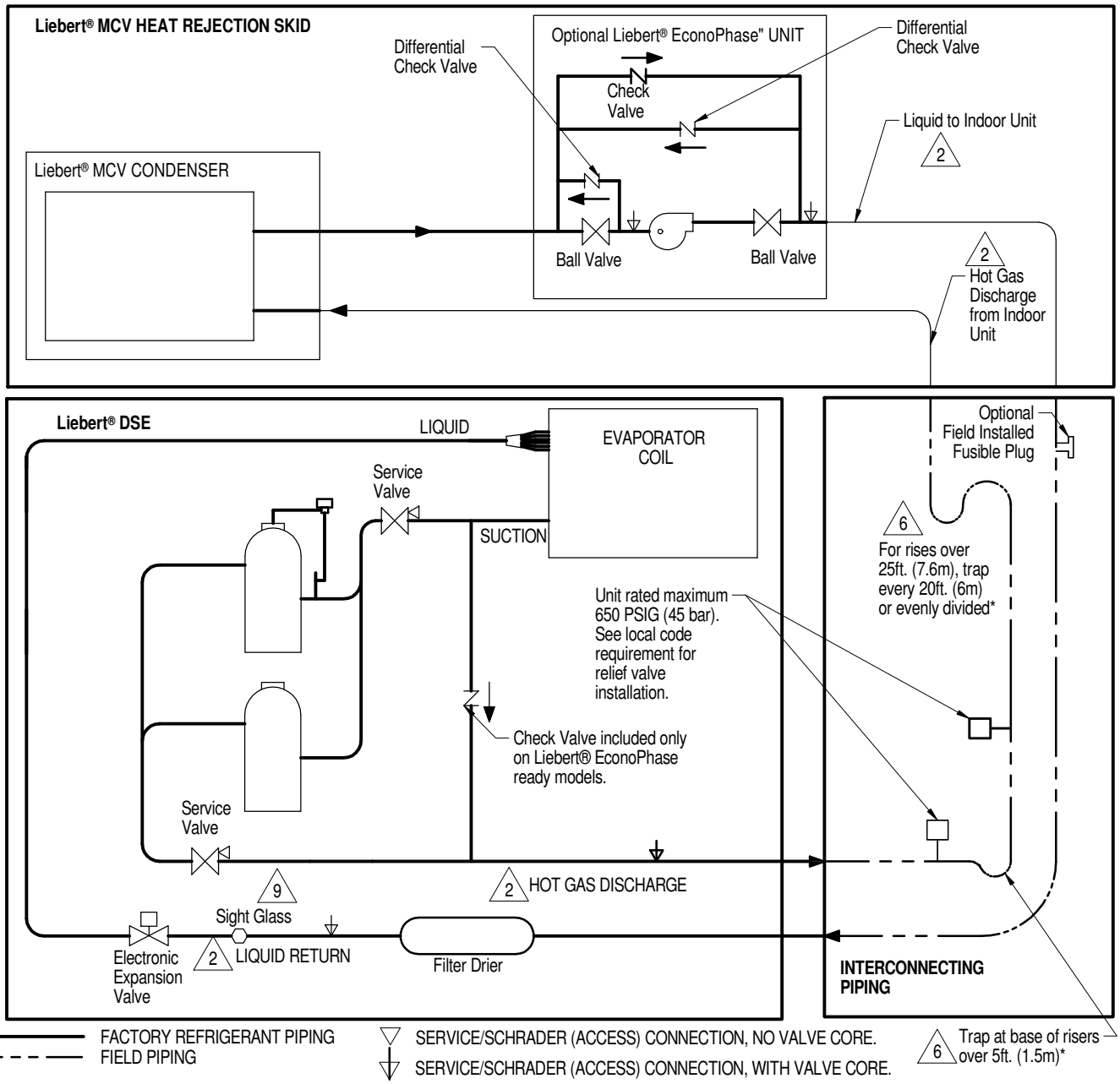
6. Components are not supplied by Vertiv but are required for proper circuit operation and maintenance (DA250 with top piping has internally installed traps on the discharge lines).
7. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid flood back to compressor. Pitch horizontal gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
8. Do not isolate any refrigeration circuits from over pressurization protection.

9. Typical location for Sight Glass on DA150 and DA165. On DA125 and DA250, Sight Glass is located between Filter Drier and Electronic Expansion Valve.

LIEBERT® DSE

PIPING SCHEMATIC

DA125, DA150, DA165, DA250, & DA265 W/ LIEBERT® MCV WITHOUT RECEIVERS

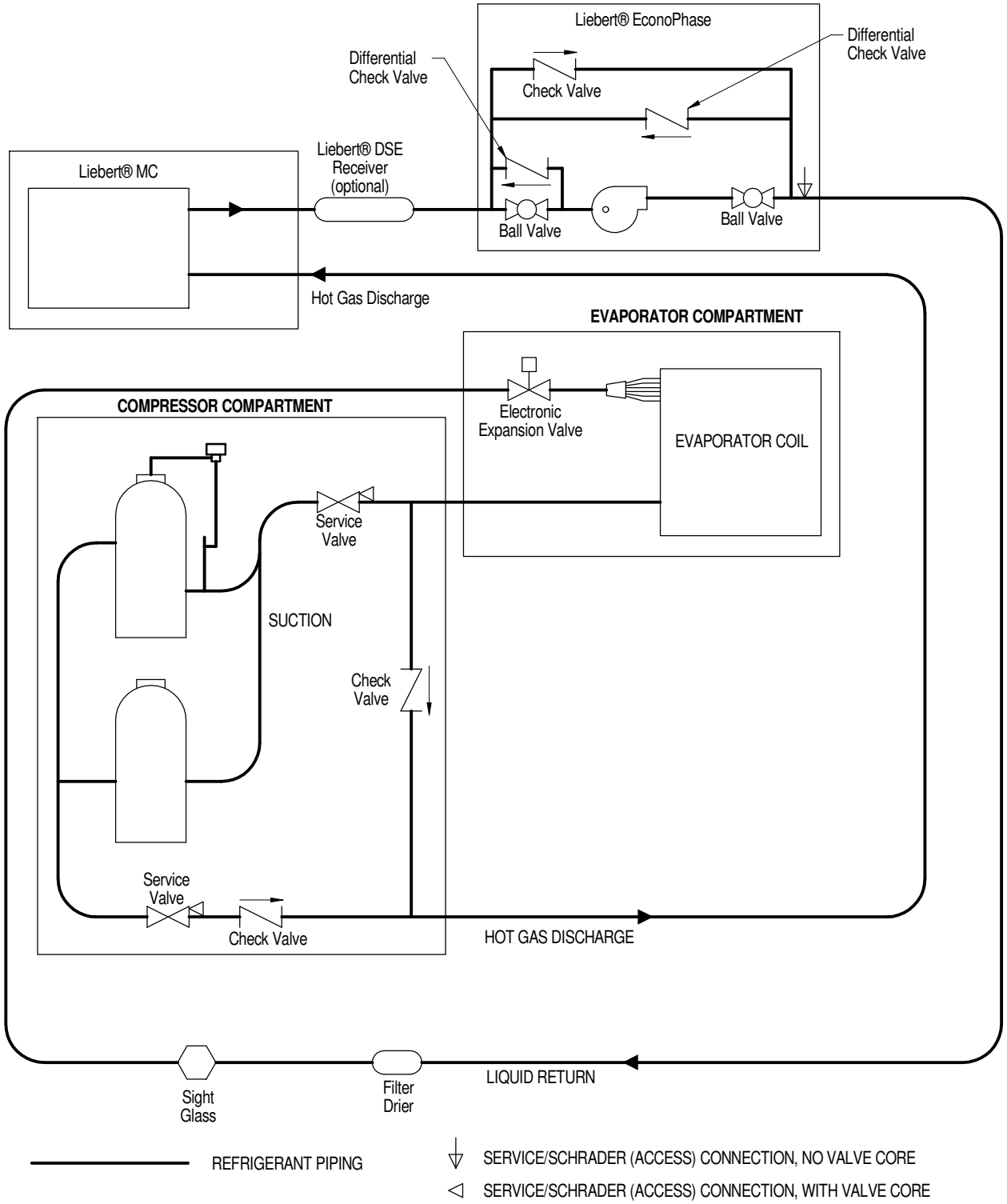


Notes:

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 Liebert® EconoPhase unit.
3. Schematic representation shown. Do not use for specific connection locations.
4. The bottom of the condenser coil must be no greater than 60 ft (18.3m) above and less than 15 ft (4.6m) below the elevation of the EEV inside the indoor unit.
5. All indoor field refrigerant piping must be insulated, 1/2" minimum thickness. All outdoor field refrigeration piping does not need to be insulated.The installing contractor is responsible for the insulating, securing, protecting and the proper installation of all field refrigerant piping, observing the details outlined by the Engineer of Record.
6. Components are not supplied by Liebert but are required for proper circuit operation and maintenance (DA250 and DA265 with top piping has internally installed traps on the discharge lines).
7. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid flood back to compressor. Pitch horizontal gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
8. Do not isolate any refrigeration circuits from over pressurization protection.
9. Typical location for Sight Glass on DA125, DA250, and DA265. On DA150 and DA165, Sight Glass is located between Filter Drier and customer piping connection.

PIPING SCHEMATIC

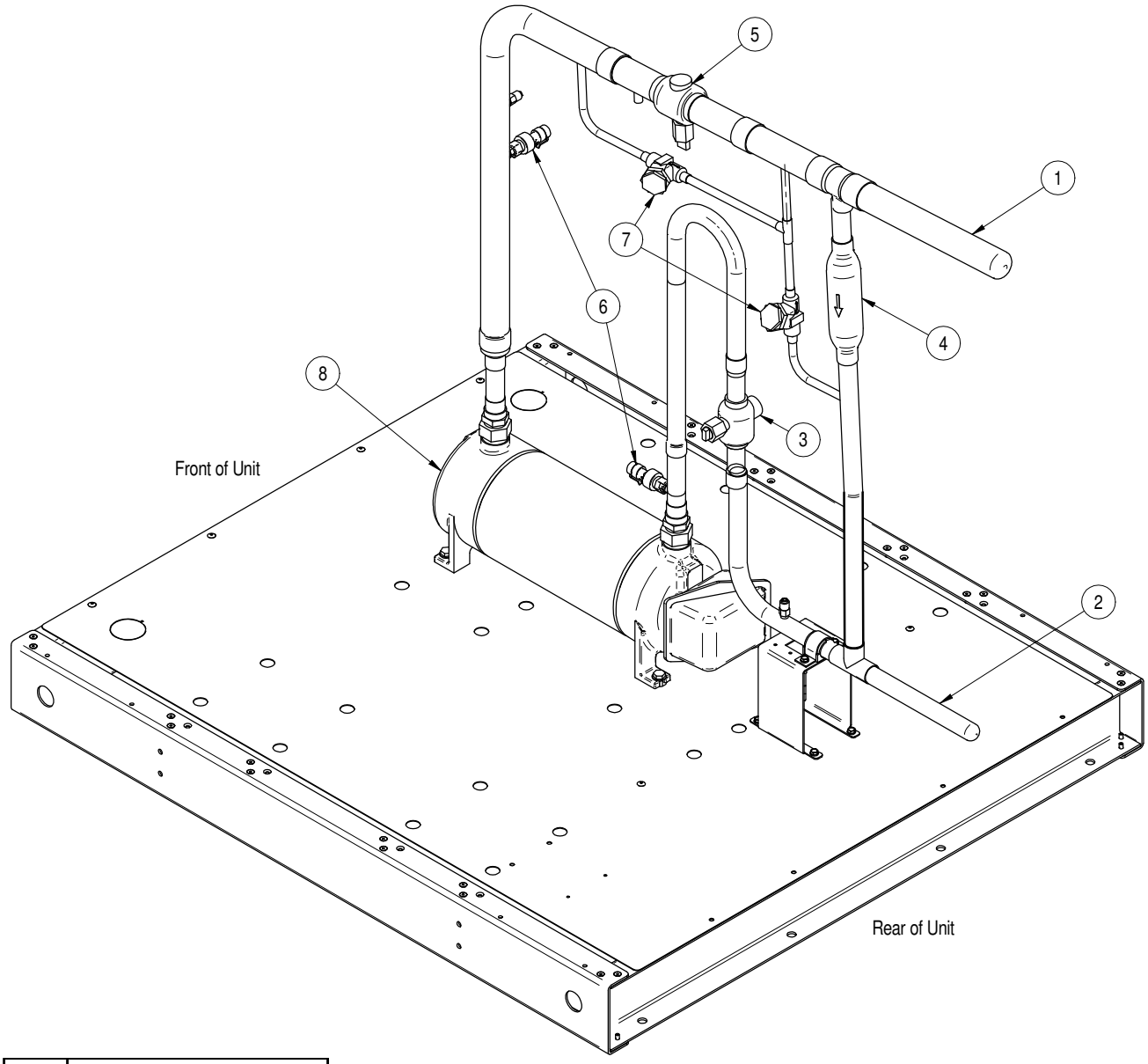
400/500kW PERIMETER & ROOFTOP UNIT



Notes:
1. Four (4) Refrigeration Circuits provided. Single Refrigeration Circuit shown for clarity.
2. Load bank required at system start-up.
3. Refrigerant charge may need to be adjusted at start-up to optimize system performance. See user manual for additional details.

LIEBERT® ECONOPHASE

GENERAL ARRANGEMENT DIAGRAM
PR050 MODELS

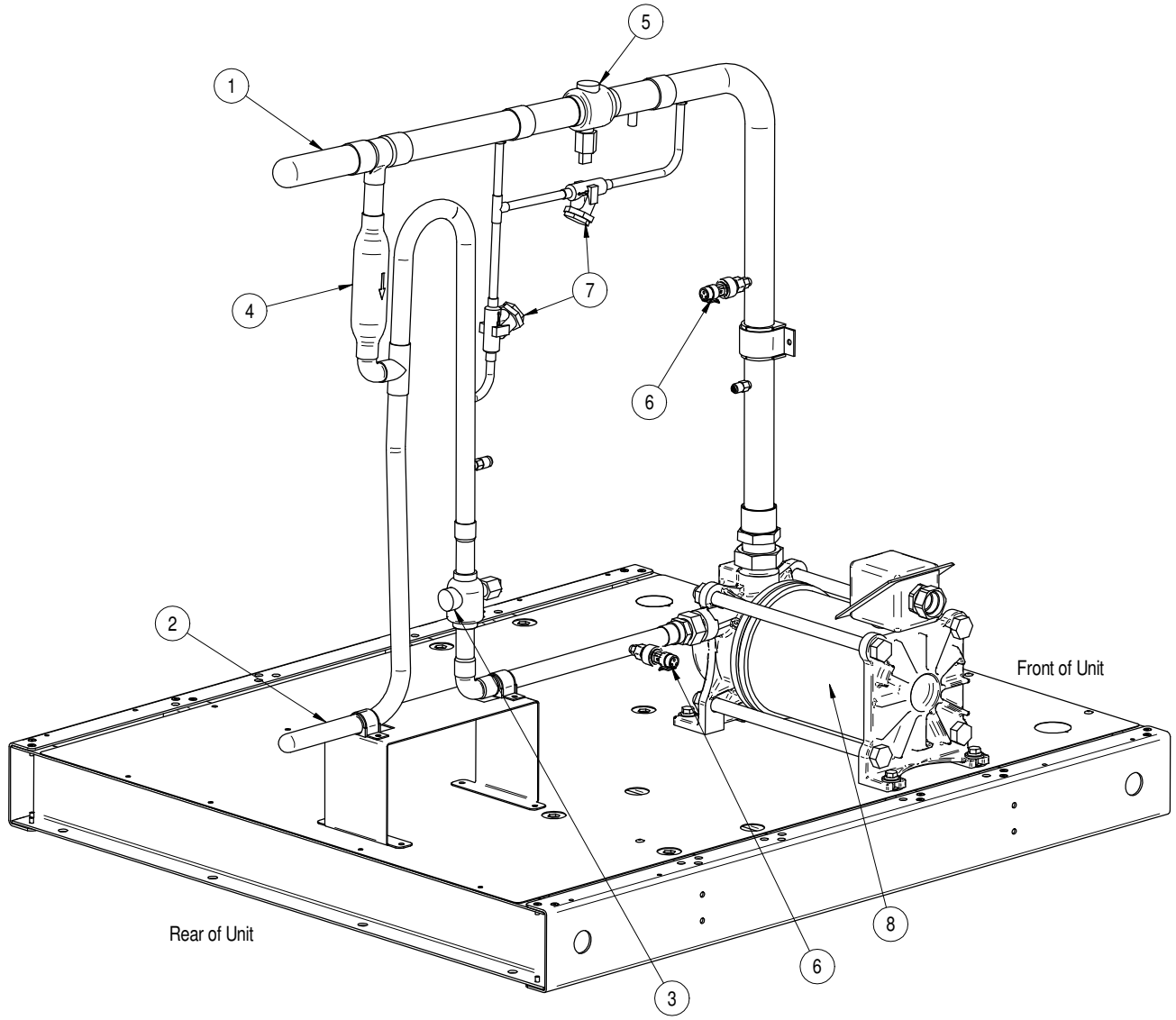


Item #	Description
1	Liquid from Condenser 1-3/8"
2	Liquid to Indoor Unit 7/8"
3	Discharge Ball Valve
4	Check Valve
5	Supply Ball Valve
6	Transducer
7	Differential Check Valves
8	Pump

Single Pump Circuit shown
(Panels removed for clarity)

LIEBERT® ECONOPHASE

TYPICAL GENERAL ARRANGEMENT DIAGRAM
PR085 - PR125, & PR250 MODELS

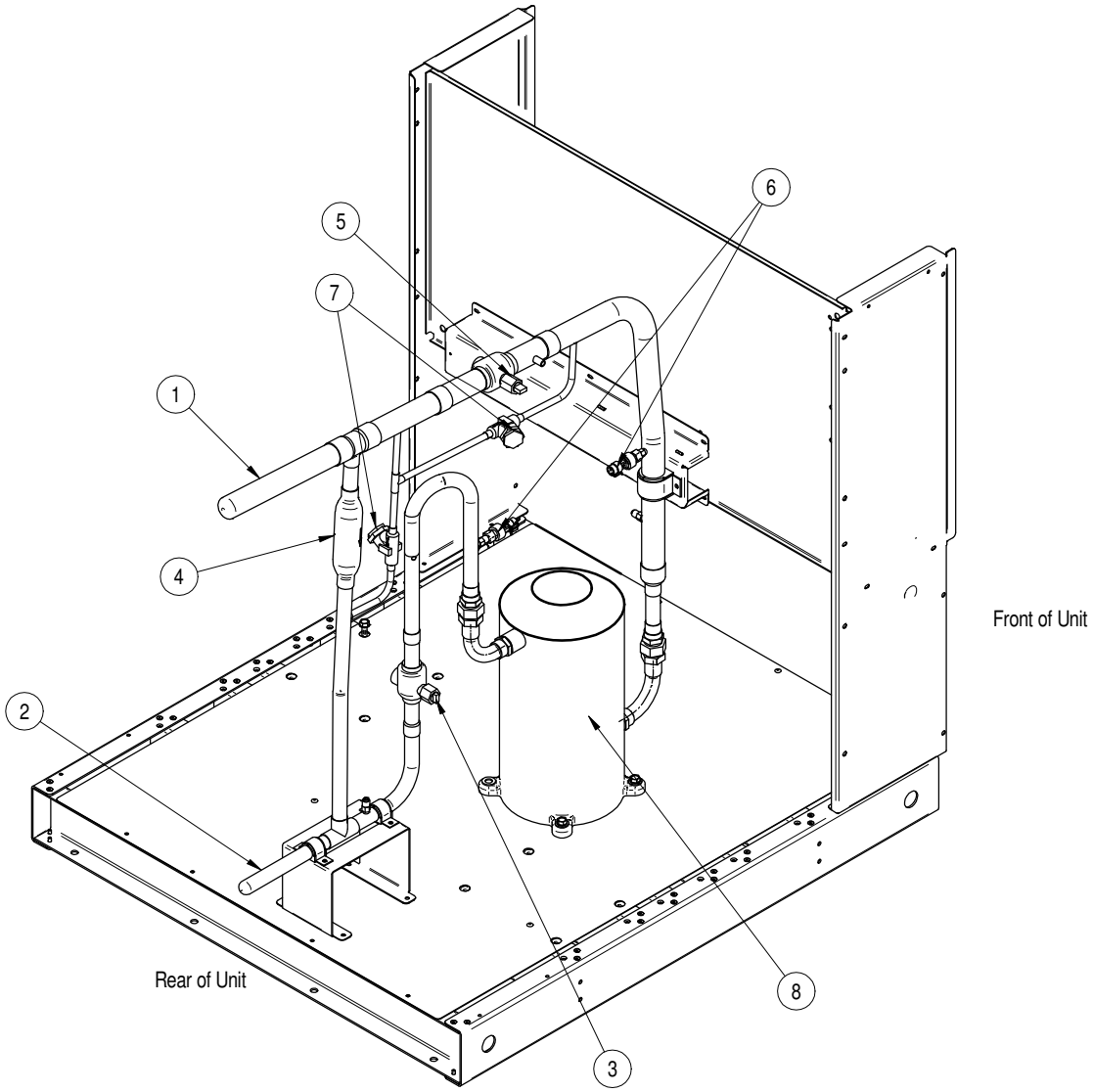


Item #	Description
1	Liquid from Condenser 1-3/8" (PR085-PR125) 1-5/8" (PPR250)
2	Liquid to Indoor Unit 7/8" (PR085-PR125) 1-3/8" (PR250)
3	Discharge Ball Valve
4	Check Valve
5	Supply Ball Valve
6	Transducer
7	Differential Check Valves
8	Pump

Single Pump Circuit shown
(Typical 2 Circuit Systems)
(Panels removed for clarity)

LIEBERT® ECONOPHASE

TYPICAL GENERAL ARRANGEMENT DIAGRAM
PR200 MODELS

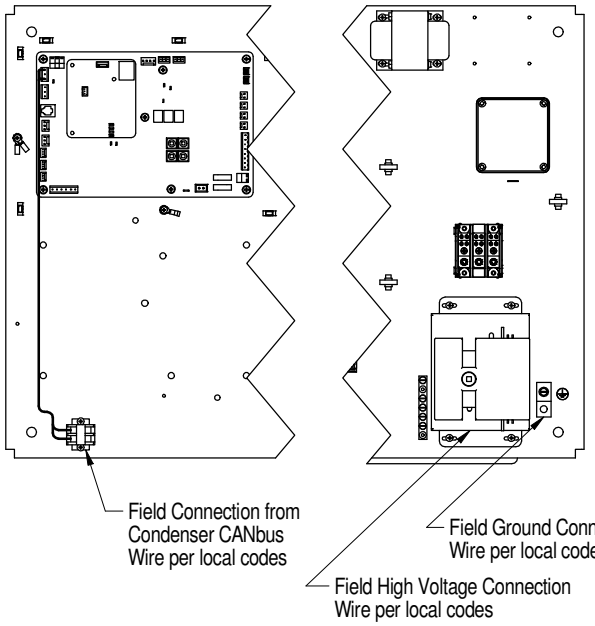


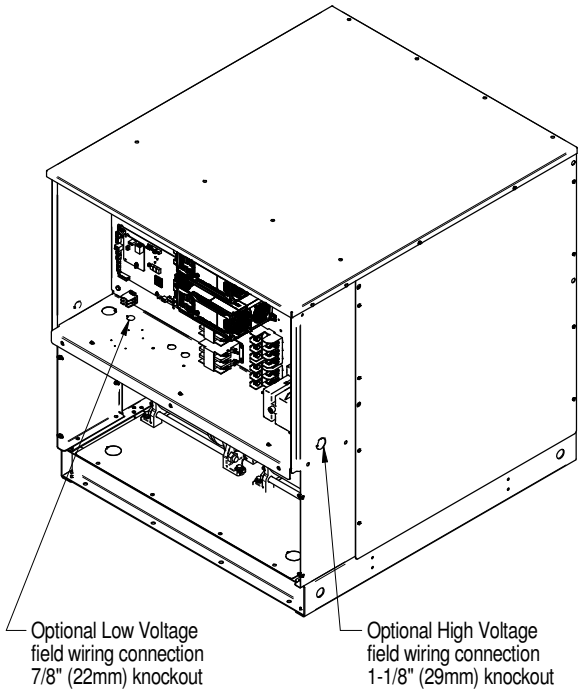
Item #	Description
1	Liquid from Condenser 1-3/8"
2	Liquid to Indoor Unit 7/8"
3	Discharge Ball Valve
4	Check Valve
5	Supply Ball Valve
6	Transducer
7	Differential Check Valves
8	Pump

Single Pump Circuit shown
(Typical 2 Circuit Systems)
(Panels removed for clarity)

ELECTRICAL FIELD CONNECTIONS

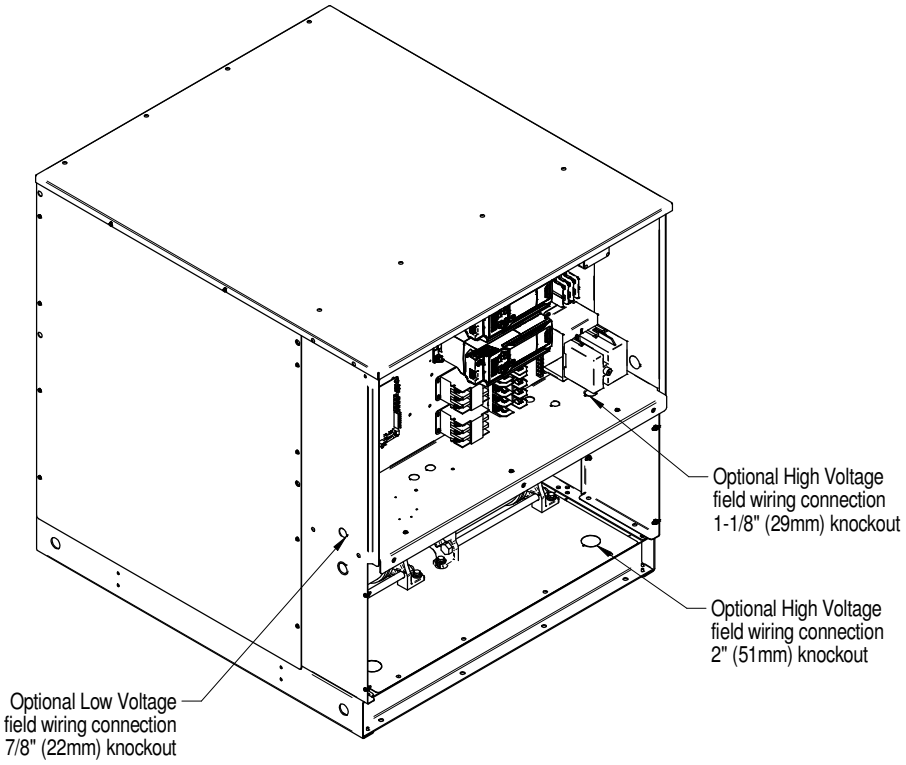
PR050 SINGLE CIRCUIT MODELS

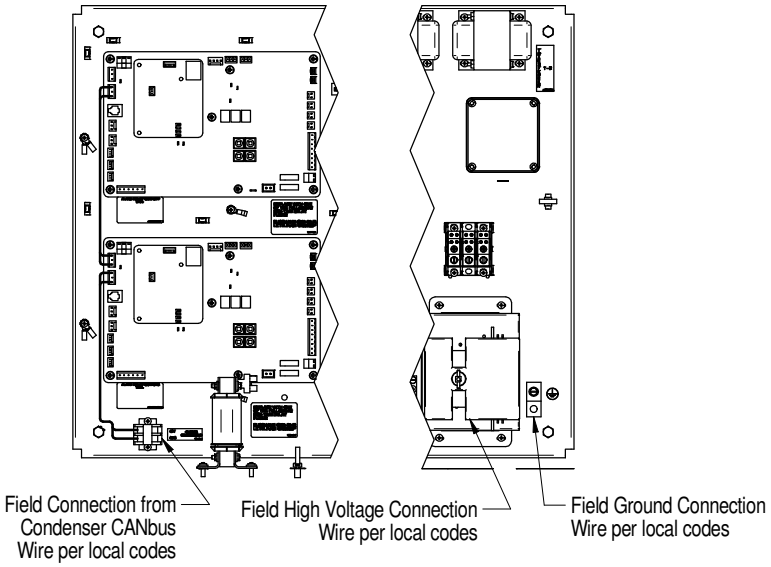




Model	Unit Electrical Specifications						Single Pump Motor	
	Voltage	Phase	Hz	FLA	Minimum Supply Circuit Ampacity	Maximum Fuse Size	HP	FLA
PR050AA***_	460	3	60	3.5	4.4	15	1.6	3.5
PR050AY***_	208/230			6.9	8.6			6.9
PR050AB***_	575			2.8	3.5			3.5
PR050A2***_	380			4.2	5.3			4.2
PR050AG***_	415		50	3.7	4.6		1.2	3.7
PR050AA***H	460		60	1.3	1.6		0.75	1.3
PR050AY***H	208/230			2.6	3.3			2.6
PR050AB***H	575			1	1.3			1.3
PR050A2***H	380			1.6	2			1.6
PR050AG***H	415		50	1.2	1.5			1.2

ELECTRICAL FIELD CONNECTIONS
PR085 - PR250 DUAL CIRCUIT MODELS





ELECTRICAL FIELD CONNECTIONS
PR085 - PR250 DUAL CIRCUIT MODELS

Model	Unit Electrical Specifications						Single Pump Motor (one pump per circuit)	
	Voltage	Phase	Hz	FLA	Minimum Supply Circuit Ampacity	Maximum Fuse Size	HP	FLA
PR085AA***- PR125AA***- PR250AA***2	460	3	60	7.0	7.9	15	1.6	3.5
PR085AY***- PR125AY***- PR250AY***2	208/230			13.8	15.5	20		6.9
PR085AB***- PR125AB***- PR250AB***2	575			5.6	6.3	15		3.5
PR085A2***- PR125A2***- PR250A2***2	380			8.4	9.5			4.2
PR085AG***- PR125AG***- PR250AG***2	415		50	7.4	8.3		1.2	3.7
PR085AA***H	460		60	2.6	2.9		0.75	1.3
PR085AY***H	208/230			5.2	5.9			2.6
PR085AB***H	575			2	2.3			1.3
PR085A2***H	380			3.2	3.6			1.6
PR085AG***H	415		50	2.4	2.7			1.2
PR200AA***3	460		60	4.6	5.2		1.5	2.3
PR125A2***4	380			7.8	8.8			3.9
PR125AA***4	460			6.4	7.2			3.2
PR125AB***4	575			5.2	5.9			2.6
PR200AB***3	575			3.6	4.1			1.8
PR200A2***3	380			5.6	6.3			2.8
PR250A2***5	380			7.8	8.8			3.9
PR250AA***5	460			6.4	7.2			3.2
PR250AB***5	575			5.2	5.9			2.6

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