Liebert® CRV CRD10

System Design Catalog

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1 Nomenclature and Components

1.1 Product Overview

The Vertiv™ Liebert® CRV CRD10 row-based cooling unit is specifically designed for small to medium data centers, computer rooms, equipment rooms, and similar high heat density environments.

The Liebert® CRV CRD10 is a direct expansion air cooled Thermal Management unit to be installed within a row of racks. It is equipped with variable speed compressor, electronic expansion valve and variable speed EC fans to match the server load and to save energy. Air heated by the room IT equipment enters the unit from the rear side (hot aisle) and is discharged to the front side (to the cold aisle).

The Liebert® CRV can provide cooling, air filtration, condensate management, temperature control, alarm functions and data communications.

It is optimized to ensure maximum cooling capacity in a minimal footprint. The system's extremely energy efficient components are managed by the Vertiv™ Liebert® iCOM™ Control which enables the unit to optimize its operations in terms of performance and energy efficiency.

Service and maintenance are performed through the front and rear of the unit, including all component replacement. All piping and electrical connections are made through the top or bottom of the unit.

1.2 Model Nomenclature

The following tables describe the model number for the Vertiv™ Liebert® CRD10 indoor unit.

Table 1.1 Liebert® CRD10 Model Number Example

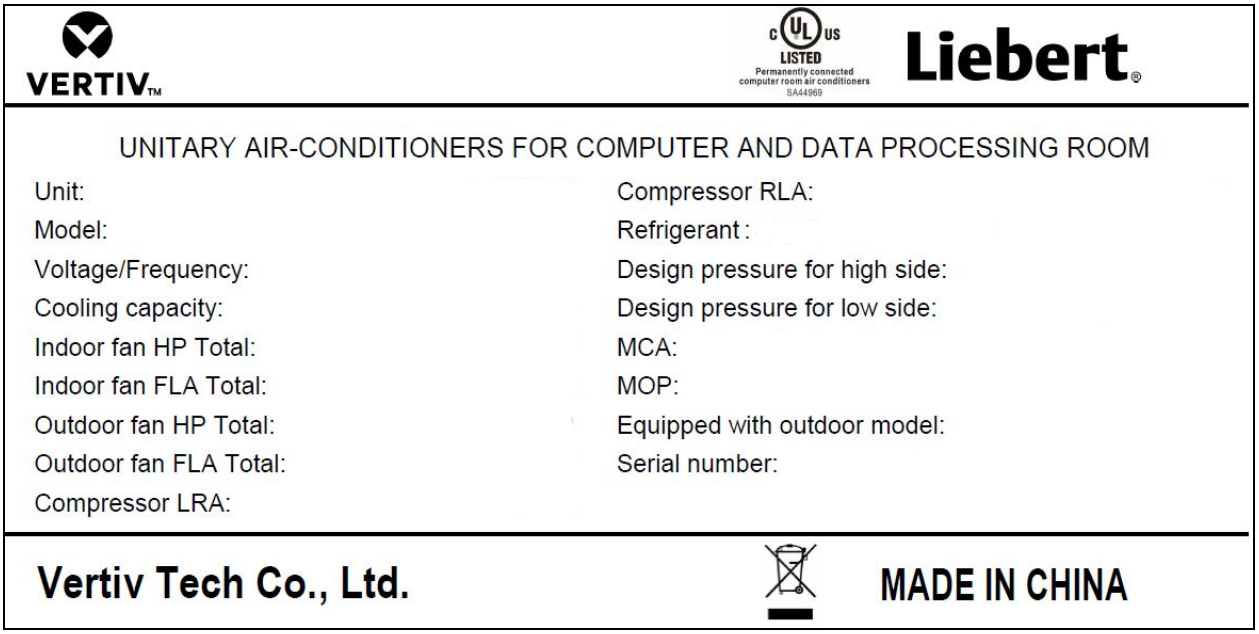
Model Number											
1	2	3	4	5	6	7	8	9	10	11	12
C	R	D	1	0	0	-	0	D	0	0	A

Table 1.2 Liebert® CRD10 Model Number Digit Definitions

Digit	Variable	Description
1	C	CRD10 row-based cooling unit
2	R	
3	D	Air cooled
4	1	Model number
5	0	
6	0, 1, 2	0: 208 V / 230 V, 1 Ph, 60 Hz, UL 1: 208 V / 230 V, 3 Ph, 60 Hz, UL 2: 230 V, 1 Ph, 50 Hz / 60 Hz, CE
7	-	Separator
8	0, 1	0: cooling only 1: reheat only
9	D	Dual power supply
10	0	R410A refrigerant
11	0	Free digit
12	A- Z	Revision

1.3 Name Plate and Components

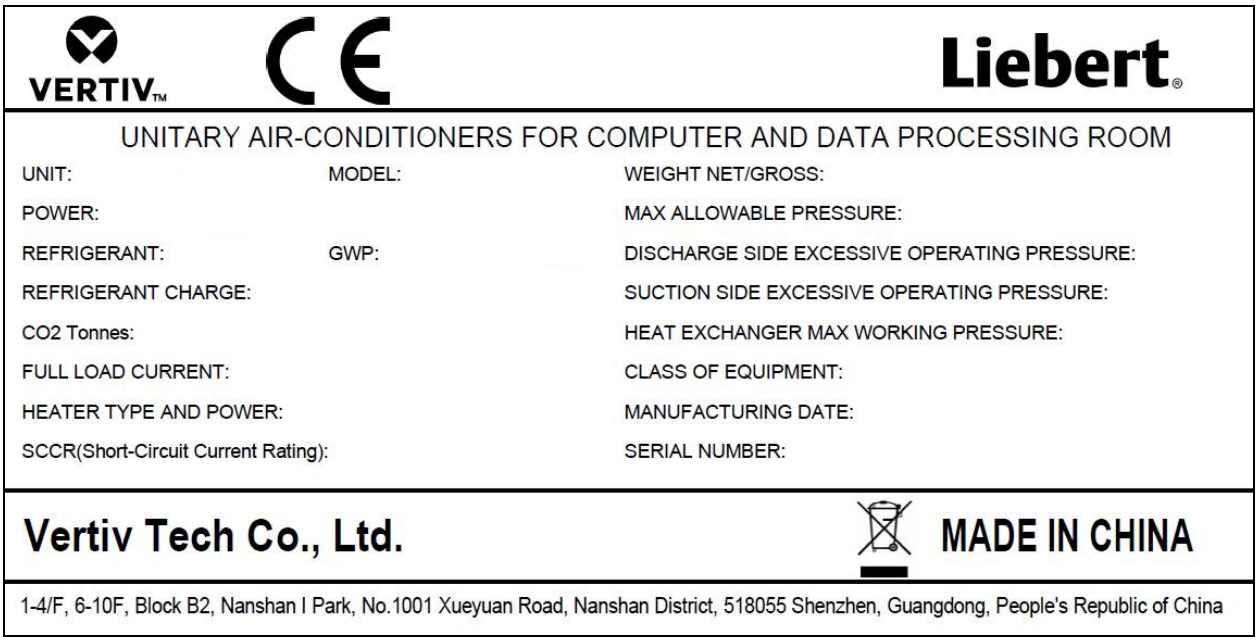
Figure 1.1 Name Plate and Description (UL)



Notes to figure:

- **Unit:** Unit defined by 6 digits.
- **Model:** Model defined by 12 digits.
- **Indoor fan HP Total:** Indoor fan power in total.
- **Indoor fan FLA Total:** Indoor fan full load current in total.
- **Outdoor fan HP Total:** Outdoor fan power in total.
- **Outdoor fan FLA Total:** Outdoor fan full load current in total.
- **Compressor LRA:** Locked rotor current of compressor.
- **Compressor RLA:** Rated load current of compressor.
- **Refrigerant:** Refrigerant category and the amount of refrigerant charged on site.
- **Design Pressure for High Side:** Discharge side excessive operating pressure.
- **Design Pressure for Low Side:** Suction side excessive operating pressure.
- **MCA:** Minimum Circuit Amps.
- **MOP:** Maximum Overcurrent Protection.

Figure 1.2 Name Plate and Description (CE)



Notes to figure:

- UNIT: Unit defined by 6 digits.
- MODEL: Model defined by 12 digits.
- REFRIGERANT: Refrigerant category.
- REFRIGERANT CHARGE: The amount of refrigerant charged on site.
- GWP: Global Warming Potential.

Figure 1.3 Rear View of Components and Component Locations

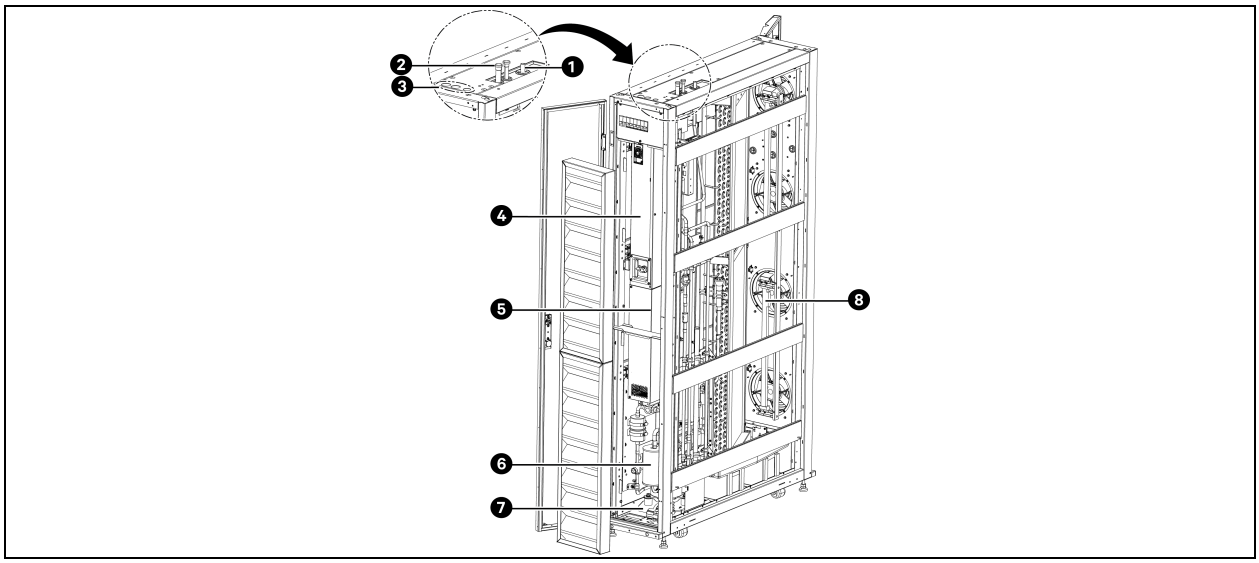
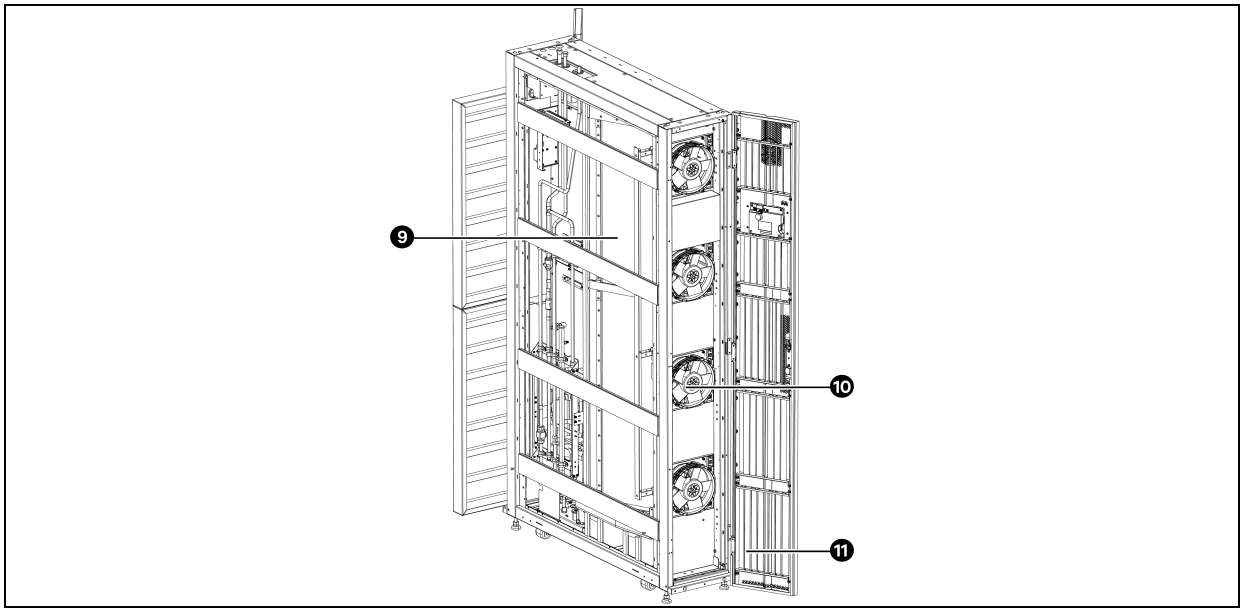


Figure 1.4 Front View of Components and Component Locations



Item	Description	Item	Description
1	Pump drainage pipe	7	Condensate pump
2	Discharge and suction pipe	8	Electric heaters (for CE model)
3	Electrical access locations on top plate	9	Evaporate coil
4	Electric box	10	EC fans
5	Compressor driver	11	Baffles
6	Compressor		

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2 System Data

2.1 Technical Specifications

Table 2.1 Technical Specifications

Parameters	Specifications		
Unit	CRD100	CRD101	CRD102
Model	CRD100-0D00A	CRD101-0D00A	CRD102-1D00A
Certification	UL		CE
Cooling type	Air cooled		
Cold source type	DX		
Refrigerant	R410A		
Compressor type	Twin rotary DC inverter compressor		
Flow control	Electronic expansion valve		
Fan type	EC fan		
Air filter	MERV8		G4
Air discharge baffles	Standard		
Drain pump	Standard		
Filter clogged switch	Standard		
Unity card	Standard		
Remote temperature sensors	Standard		
Reheat	None		Standard
Outdoor model	CCD100S-00A		CCD101S-00A

2.2 Performance Data

Table 2.2 Performance Data

Certification	UL		CE
Unit	CRD100	CRD101	CRD102
Model	CRD100-0D00A	CRD101-0D00A	CRD102-1D00A
Voltage/Frequency	208 V / 230 V, 1 Ph, 60 Hz	208 V / 230 V, 3 Ph, 60 Hz	230 V, 1 Ph, 50 Hz / 60 Hz
Cooling capacity (kW)	10.0	10.0	10.0
Heating capacity (kW)	-	-	2.0
Power input (kW)	3.2	3.2	3.2 (without electric heater)
Full load current (A)	-	-	38 (with electric heater) 28 (without electric heater)

Table 2.2 Performance Data (continued)

Certification	UL		CE
MCA (A)	29	21	-
MOP (A)	40	30	-
Test condition: • Return air: 29.4 °C (85 °F), 32% RH • Outdoor temperature: 35 °C (95 °F)			

NOTE: The allowed thermal load should not be lower than 20% of nominal air conditioner cooling capacity. Lower thermal load will cause imprecise temperature and humidity control and frequent compressor(s) switch on/off.

Table 2.3 Performance Data of AHRI

Model Number	CRD100-0D00A		CRD101-0D00A	
Voltage (Volts/Phase/Hz)	208/1/60	230/1/60	208/3/60	230/3/60
Net total cooling capacity kW (kBtu/h)	10.0 (34.1)	9.98 (34.0)	10.32 (35.2)	10.41 (35.5)
Net sensible cooling capacity kW (kBtu/h)	9.92 (33.8)	9.96 (33.9)	10.08 (34.4)	10.12 (34.5)
Net sensible coefficient of performance (NSenCOP) kW/kW	3.57	3.62	3.69	3.71
Unit airflow (ACFM)	1960	1961	1897	1898
Unit airflow (SCFM)	1896	1887	1835	1836
External static pressure (Pa)	0.0		0.0	
Humidification	None		None	
Refrigerant	R-410A		R-410A	
Return air condition: 95 °F DB, 52 °F DP (35 °C DB, 11.1 °C DP) 32% RH				
Outdoor ambient temperature: 95 °F (35 °C)				
Certified in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 Standard Rating Conditions. Certified units may be found in the AHRI Directory at www.ahridirectory.org				

2.3 Performance Specifications and Physical Data

Table 2.4 Performance Specifications

CRD10 Performance	Outdoor Temperature			
	35°C(95°F)	37°C(98.6°F)	40°C(104°F)	45°C(113°F)
40°C(104°F) 20%				
Net Total kW	12.7	12.5	11.9	10.5
Net Sensible kW	12.7	12.5	11.9	10.5
Unit Power Input kW	3.75	3.88	4.09	4.2
Heat Rejection kW	16.45	16.38	15.99	14.70
Supply Air Temperature °C(°F)	27.5(81.5)	27.7(81.9)	28.1(82.6)	30.9(87.6)
37°C(98.6°F) 24%				
Net Total kW	11.9	11.5	11.1	10.1
Net Sensible kW	11.9	11.5	11.1	10.1
Unit Power Input kW	3.72	3.86	4.06	4.18
Heat Rejection kW	15.62	15.36	15.16	14.28
Supply Air Temperature °C(°F)	25.3(77.5)	25.8(78.4)	26.1(79.0)	29.2(84.6)
35°C(95°F) 26%				
Net Total kW	11.3	11.1	10.7	9.8
Net Sensible kW	11.3	11.1	10.7	9.8
Unit Power Input kW	3.71	3.83	4.03	4.11
Heat Rejection kW	15.01	14.93	14.73	13.91
Supply Air Temperature °C(°F)	24.0(75.2)	24.2(75.6)	24.6(76.3)	27.8(82.0)
32°C(89.6°F) 28%				
Net Total kW	10.7	10.4	10.2	9.6
Net Sensible kW	10.7	10.4	10.2	9.6
Unit Power Input kW	3.58	3.71	3.81	3.87
Heat Rejection kW	14.28	14.11	14.01	13.47
Supply Air Temperature °C(°F)	22.2(72.0)	22.5(72.5)	22.7(72.9)	23.2(73.8)
30°C(86°F) 30%				
Net Total kW	10.5	10.2	10.0	9.4
Net Sensible kW	10.5	10.2	10.0	9.4
Unit Power Input kW	3.53	3.63	3.72	3.78
Heat Rejection kW	14.03	13.83	13.72	13.18
Supply Air Temperature °C(°F)	20.3(68.5)	20.5(68.9)	20.7(69.3)	21.3(70.3)
28°C(82.4°F) 32%				

Table 2.4 Performance Specifications (continued)

CRD10 Performance	Outdoor Temperature			
	35°C(95°F)	37°C(98.6°F)	40°C(104°F)	45°C(113°F)
Net Total kW	10.1	9.8	9.5	9.1
Net Sensible kW	10.1	9.8	9.5	9.1
Unit Power Input kW	3.45	3.5	3.6	3.70
Heat Rejection kW	13.55	13.3	13.1	12.8
Supply Air Temperature °C(°F)	18.7(65.7)	19.0(66.2)	19.2(66.6)	19.6(67.3)

NOTE:

- **Unit Power input includes both indoor and outdoor unit.**
- **Performance at fan speed 75%.**
- **Performance at maximum compressor capacity.**

Table 2.5 Vertiv™ Liebert® CRD10 Physical Data

Model	CRD100	CRD101	CRD102
Evaporator Coil			
Face Area, m2(ft2)	0.544(5.856)	0.544(5.856)	0.544(5.856)
Rows	3	3	3
Face Velocity, m/s(FPM)	1.63(321)	1.63(321)	1.63(321)
Electric Reheat			
Capacity, kW(BTU/h)	-	-	2(6824)
Filter Section - G4/Merv8 as Standard			
Quantity	2	2	2
Nominal Size, mm(inch)	864 x 246 x 60 (34.02 x 9.69 x 2.36)	864 x 246 x 60 (34.02 x 9.69 x 2.36	864 x 246 x 60 (34.02 x 9.69 x 2.36
Effective Surface Area, m2(ft2)	0.0128(0.138)	0.0128(0.138)	0.0128(0.138)

Table 2.6 Vertiv™ Liebert® CCD10 Physical Data

Model	CCD100S	CCD101S
Condensing Coil		
Face Area, m2(ft2)	0.8174	0.8174
Rows	3	3
Face Velocity, m/s(FPM)	2.07(407.4)	2.07(407.4)

2.4 Sound Data

Table 2.7 Sound Data (50dB to 630dB)

1/3 Octave Band Center Freq (Hz)	Air m^3h	Volume (SCFM)	50 dB	63 dB	80 dB	100 dB	123 dB	160 dB	200 dB	250 dB	315 dB	400 dB	500 dB	630 dB
IDFAN 75%	3250	1913	28.6	25.4	33.8	33.7	32.3	40.2	42.7	46.4	52.9	68.3	67.3	58.0
IDFAN 70%	3000	1766	29.1	24.5	34.7	31.2	30.9	38.2	40.5	45.2	53.6	64.4	58.9	56.2
DFAN 60%	2500	1471	24.8	26.8	28.9	28.9	30.9	33.9	39.3	45	59.3	59.5	53.2	59.4

Table 2.8 Sound Data (800dB to 10000dB)

1/3 Octave Band Center Freq (Hz)	Air m^3h	Volume (SCFM)	800 dB	100 dB	1250 dB	1600 dB	2000 dB	2500 dB	3150 dB	4000 dB	5000 dB	6300 dB	8000 dB	10000 dB	dB (A)
IDFAN 75%	3250	1913	62.1	58.7	64.4	64.4	63.6	64.1	61.5	60.1	57.8	55.2	52.6	47.2	76.3
IDFAN 70%	3000	1766	60	59.2	59.7	60.4	59	59.7	57.4	55.4	53.1	50.1	47.1	42.3	73.1
IDFAN 60%	2500	1471	800	100	1250	1600	2000	2500	3150	4000	5000	300	8000	10000	70.1

NOTE: The sound is tested in semi-anechoic chambers, 2 m (6.6 ft) away from the unit and 1 m (3.3 ft) away from the ground.

2.5 Operating and Storage Conditions for Vertiv™ Liebert® CRD10

Table 2.9 Operating Conditions

Item	Requirement		
Ambient temperature	Indoor environment: • Temperature: 18 °C (64.4 °F) to 40 °C (104 °F) • Relative humidity 17% to 60% Outdoor environment: • Temperature: -15 °C (5 °F) to 45 °C (113 °F) without low ambient kit • Temperature: -34 °C (-29.2 °F) to 45 °C (113 °F) with low ambient kit		
Protection level	• Indoor unit: IP20 • Outdoor unit: IPX4		
Altitude	< 2000 m (6561.6 ft). If the altitude is above this value, please contact Vertiv		
Operation voltage range	CRD100-0D00A	CRD101-0D00A	CRD102-1D00A
	208 V / 230 V, 1 Ph, 60 Hz	208 V / 230 V, 3 Ph, 60 Hz	230 V, 1 Ph, 50 Hz / 60 Hz

Table 2.10 Storage Conditions

Item	Requirement
Storage environment	Indoor, clean (without dust)
Ambient humidity	< 95% RH at 30 °C (86 °F)
Ambient temperature	-40 °C (-40 °F) to 70 °C (158 °F)
Storage time	Total transportation and storage time should not exceed six months. Otherwise, the performance needs to be re-calibrated

2.6 Operating and Storage Environment for Vertiv™ Liebert® CCD10

Table 2.11 Operation Environment

Item	Requirements
Installation position	The maximum equivalent pipe length between the indoor unit and the condenser is 91.4 m (300 ft) Vertical difference: -8 m (-26.2 ft) ≤ Δ H ≤ 30 m (98.4 ft)
Installation mode	Standard condenser: horizontal airflow installation and vertical airflow installation. Condenser with low ambient kit: vertical airflow installation.
Ambient temperature	Standard condenser: -15 °C to +45 °C (5 °F to 113 °F). Condenser with low ambient kit: -34 °C to +45 °C (-29.2 °F to 113 °F).
Ambient humidity	Outdoor: 5% RH to 95% RH.
Operation power	CCD101S: 230 V ±10%, 1 Ph, 50/60 Hz.
Altitude	≤ 2000 m (6562 ft). Derating is required if the altitude exceeds 2000 m (6562 ft).
Protection level	IPX4
Notes: • The value of vertical difference is positive if the condenser is installed higher than the indoor unit; otherwise the value is negative. • Vertical difference varies with pipe length. For details, see Vertical Distance between Condenser and Indoor Unit in Vertiv™ Liebert® CRV CRD10 Row-Based Cooling Unit User Manual.	

Table 2.12 Storage Environment

Item	Requirements
Storage environment	Clean indoor environment with good ventilation and no dust.
Ambient temperature	-40 °C to +70 °C (-40 °F to 158 °F).
Ambient humidity	5% RH to 95% RH.
Storage time	The total storage time should not exceed 6 months, or its performance needs to be re-calibrated.

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3 Electrical Connection

A port of greater than a 350 short-circuit-ratio is required between the user power and the grid. Permission is required from the power supply department to ensure that the air conditioner is connected to a power greater than 350 short-circuit-ratio.

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 unit's 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 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 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.

NOTICE

Risk of improper power-supply connection. It can cause damage to the equipment 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.

3.1 Installation Notes

1. Electrical connection and maintenance must be carried out by authorized personnel or trained engineers.
2. The connection of all power cables, control cables, and ground cables and cable sizes should be in compliance with local and national electrical protocols and rules.
3. Observe the unit nameplate for the full load current.

Model	Power Supply
CRD100-0D00A	208 V / 230 V, 1 Ph, 60 Hz
CRD101-0D00A	208 V / 230 V, 3 Ph, 60 Hz
CRD102-1D00A	230 V, 1 Ph, 50 / 60 Hz

4. If the power cable is damaged, it must be replaced immediately.
5. Before electrical connection, a voltmeter must be used to measure the voltage and ensure that power supply is switched off.
6. The unit power grid adheres to the TN or TT star connection power distribution system.

7. A disconnector switch should be installed. The Short-Circuit Current Rating (SCCR) of the unit is 6 kA (CE Model) and 10 kA (UL Model).

3.2 Connecting Power Supply Cables

3.2.1 Electrical Control Box

The location of dual power supply circuit breakers, outdoor breaker, and terminal blocks are shown in Figure 3.1 below.

Dual power supply enables that when one power supply fails, another power supply automatically takes over. When the failed power supply restores, it will automatically resume its function as the primary power supply.

Figure 3.1 Electrical Control Box (Single Phase Unit)

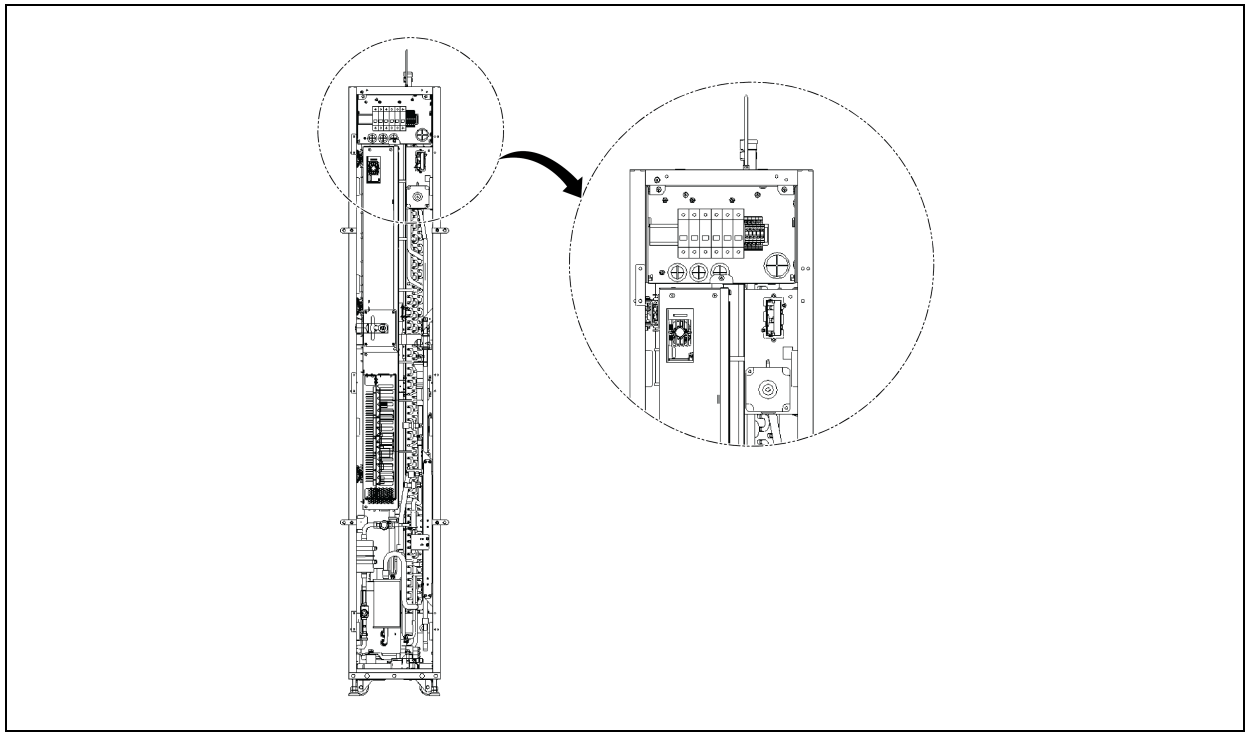


Figure 3.2 Electrical Control Box (Three Phase Unit)

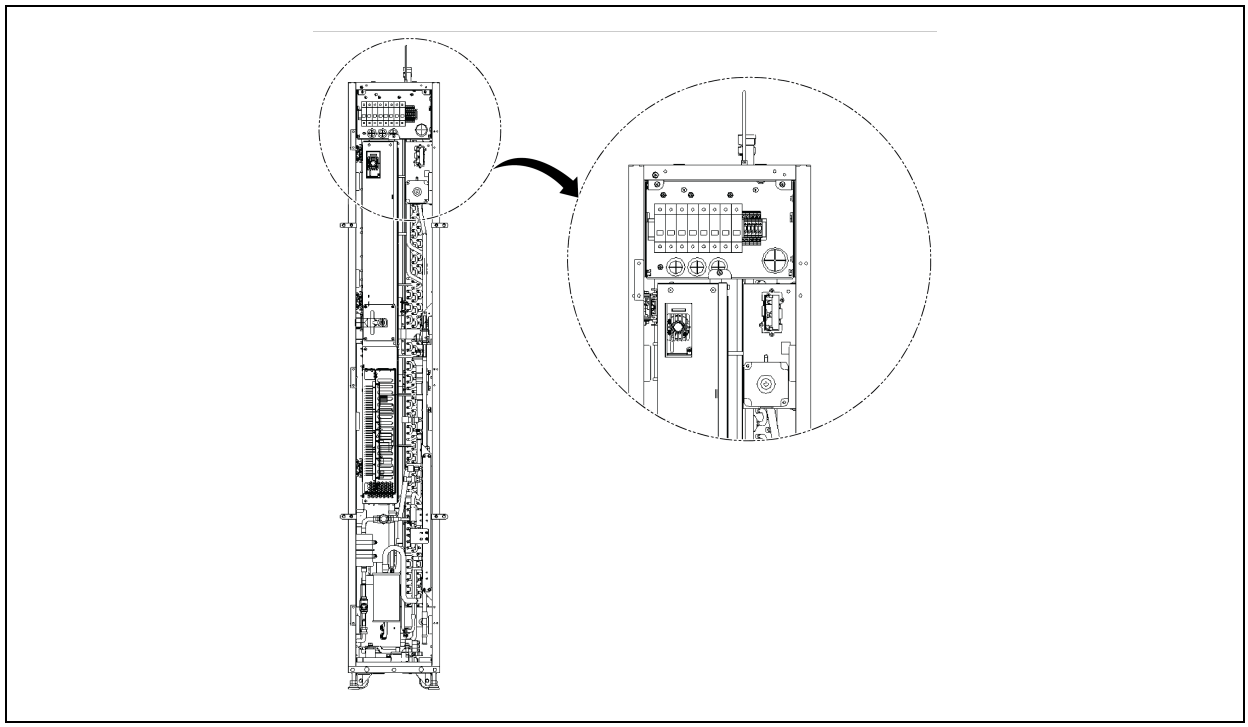


Table 3.1 MCB Current Rating

Model	MCB	Current (A)
CRD100-0D00A	NDB2-63C40/2	40
CRD101-0D00A	NDB2-63C25/3	25
CRD102-1D00A	NDM1-63C50/2	50

3.2.2 Connecting the Power Cable of the Indoor Unit

Connect the L, N, and PE (or L1, L2, and G, or L1, L2, L3, and G) terminals to the external power supply. Fix the power supply cables to the cable clamp. The cable sizes must adhere to the local wiring regulations and protocols.

Table 3.2 Full Load Current (Unit A)

Region	UL		CE
Model	CRD100-0D00A	CRD101-0D00A	CRD102-1D00A
Full Load Current (A)	-	-	38 (with electric heater) 28 (without electric heater)
MCA (A)	29	21	-
MOP (A)	40	30	-

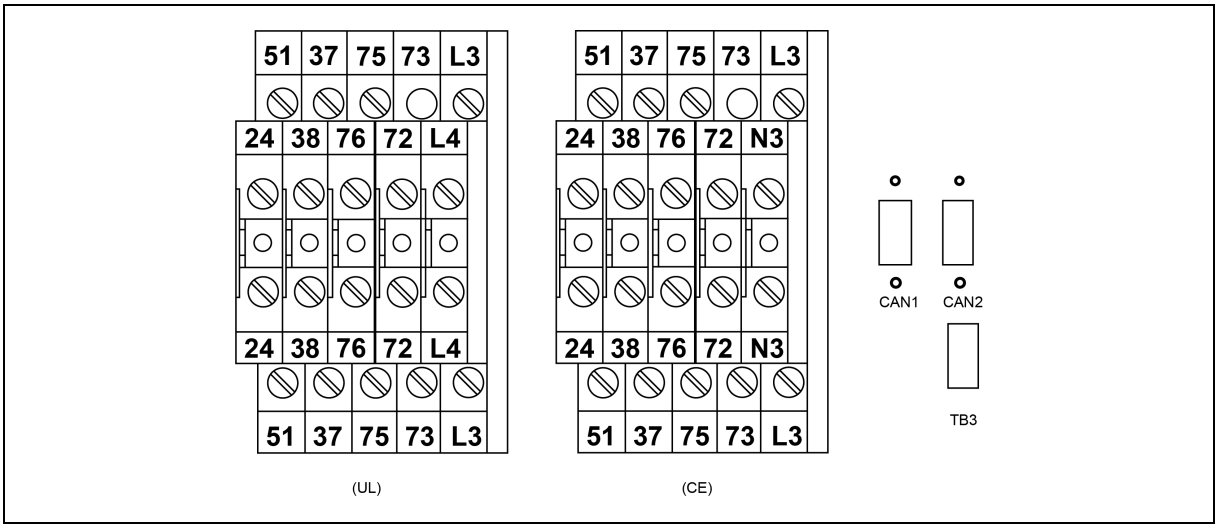
3.2.3 Connecting the Power Cable of the Outdoor Unit

The outdoor unit is controlled by the indoor unit. Connect the L, N, and PE (or L1, L2, and G) circuit breaker terminals to related terminals in the outdoor unit.

3.3 Connecting Communication Cables

NOTE: Take anti-static measures when connecting communication cables.

Figure 3.3 Terminal Block



Item	Description
L3, L4 (or L3, N3)	Heater breaker for low ambient kit
72, 73	Liquid Line Solenoid Valve (LLSV)
75, 76	Common alarm
37, 38	Remote shutdown
51, 24	Water underfloor
CAN-1, CAN-2	Teamwork communication
TB3	Remote temperature sensor

3.3.1 Connecting the Water Underfloor Sensor

NOTICE

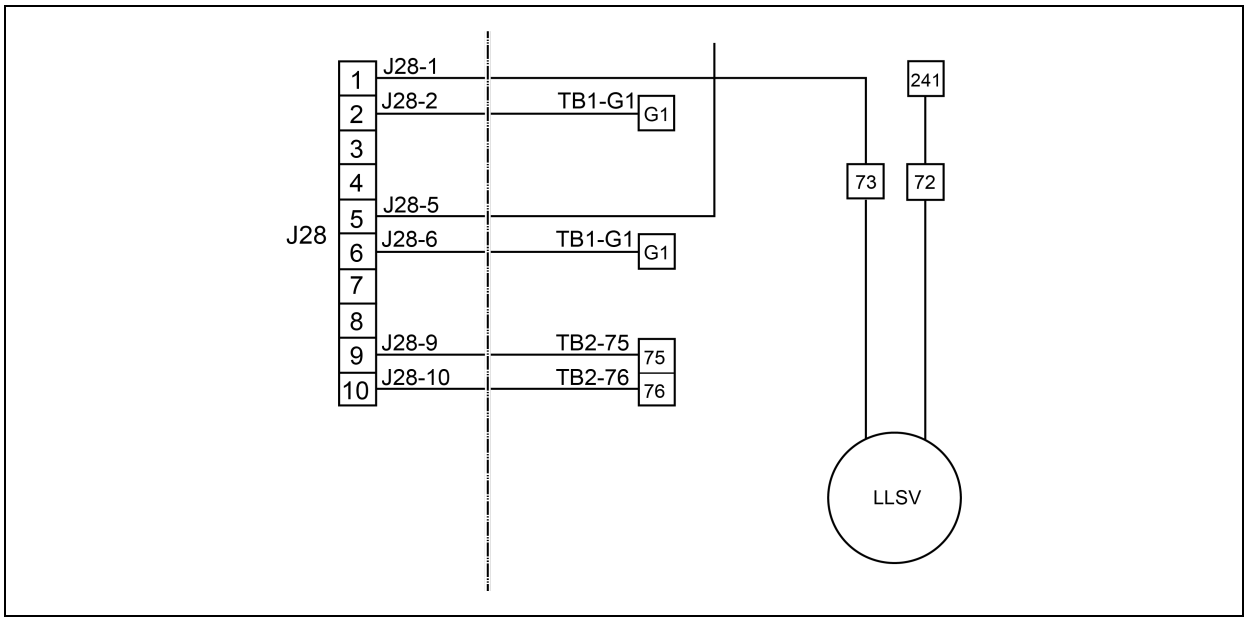
Risk of clogged or leaking drain lines and leaking water-supply lines. It can cause damage to the equipment and building. This unit requires a water drain connection. Drain lines must be inspected at start-up and periodically, and maintenance must be performed to ensure that drain water runs freely through the drain system and that lines are clear and free of obstructions and in good condition with no visible sign of damage or leaks. This unit may also require an external water supply to operate. Improper installation, application and service practices can result in water leakage from the unit. Water leakage can result in catastrophic and expensive building and equipment damage and loss of critical data center equipment. Do not locate unit directly above any equipment that could sustain water damage. We recommend installing a monitored fluid-detection system to immediately discover and report coolant-fluid system and condensate drain-line leaks.

The unit accessories are equipped with a water underfloor sensor. Connect one end of the sensor to terminal 51 and the other end to terminal 24.

3.3.2 Connecting the Solenoid Valve Kit

When installing the solenoid valve kit (LLSV), connect one end of the solenoid valve coil cable to terminal 72 and the other end to terminal 73. Figure 3.4 belowshows the connection between the liquid line solenoid valve and the terminal block.

Figure 3.4 Connection between Liquid Line Solenoid Valve and Terminal Block

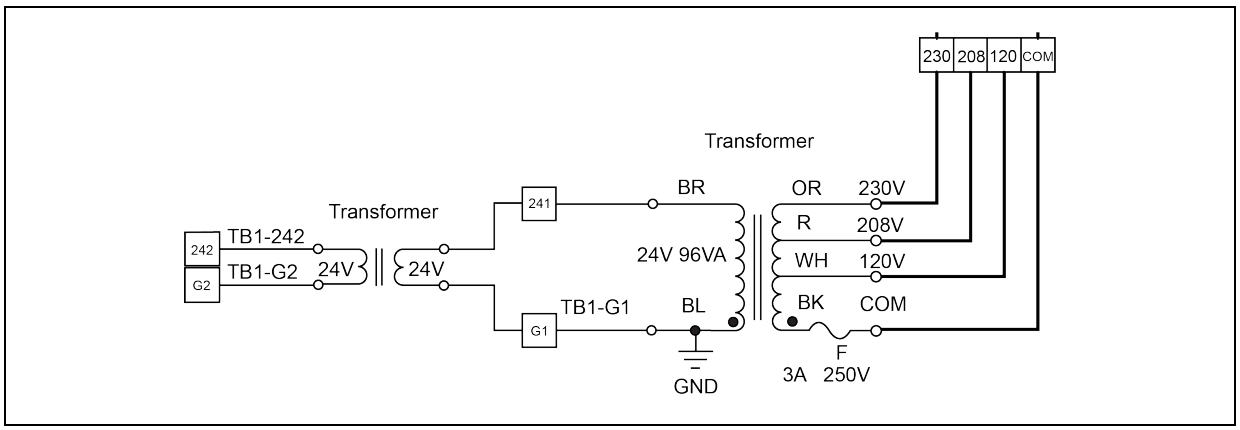


3.3.3 Connecting the Transformer

NOTICE

The 96VA transformer default wiring is orange cable (230V to 24V). If the unit rated voltage is 208V, a properly trained and qualified electrician must change the transformer wiring from orange to red cable (208V to 24V).

Figure 3.5 Transformer Wiring Diagram



3.3.4 Connecting the Low Ambient Kit

Power is supplied to the low ambient kit by the indoor unit. Connect the cable of low ambient kit to terminal L3 and L4 (or L3 and N3).

3.3.5 Connecting the Remote Temperature Sensor

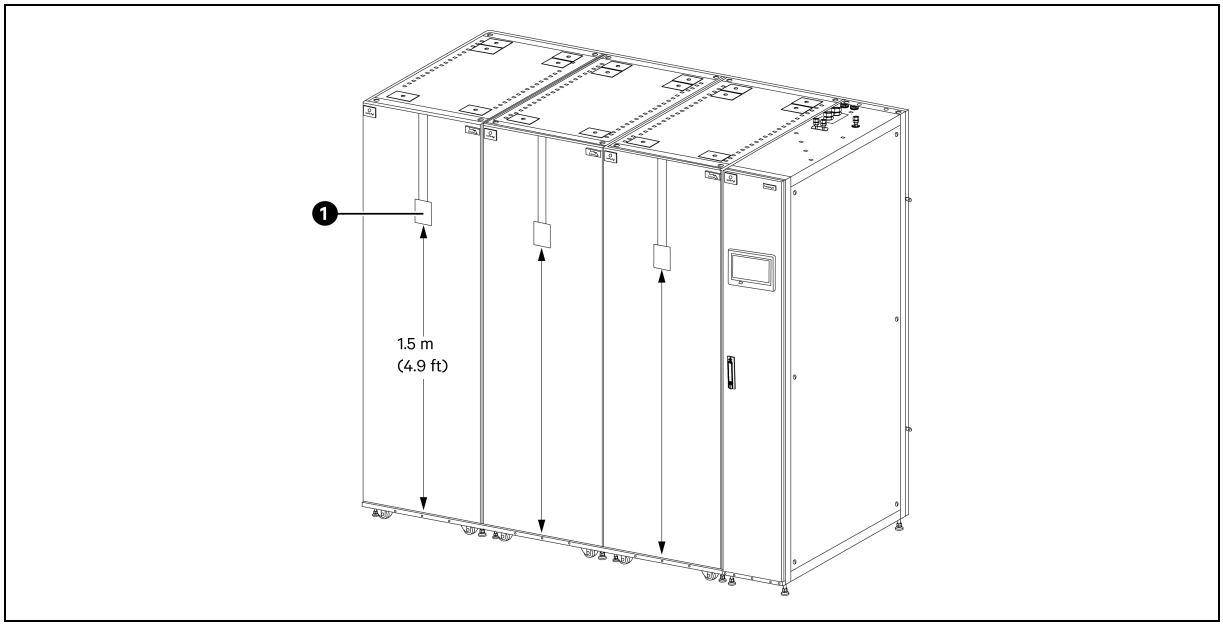
Each unit is equipped with a remote temperature sensor. The unit can be connected with a maximum of 10 temperature sensors. It is recommended to place the sensors in front of the heat loads, 1.5 m (4.9 ft) higher than the unit base.

1. Insert the connector of the sensor to the TB3 port. Route the cable through the top or bottom of the unit. Connect the second sensor to the first sensor.
2. Fix the sensor on rack surface using the magnets provided in the kit. Do not fix it on an empty rack. The following table shows the address settings for sensors.

Table 3.3 Address Settings for Remote Temperature Sensors

Sensor	1	2	3	4	5	6	ID
Remote temperature sensor 1	OFF	OFF	OFF	ON	OFF	OFF	10
Remote temperature sensor 2	OFF	OFF	OFF	ON	OFF	ON	11
Remote temperature sensor 3	OFF	OFF	OFF	ON	ON	OFF	12
Remote temperature sensor 4	OFF	OFF	OFF	ON	ON	ON	13
Remote temperature sensor 5	OFF	OFF	ON	OFF	OFF	OFF	20
Remote temperature sensor 6	OFF	OFF	ON	OFF	OFF	ON	21
Remote temperature sensor 7	OFF	OFF	ON	OFF	ON	OFF	22
Remote temperature sensor 8	OFF	OFF	ON	OFF	ON	ON	23
Remote temperature sensor 9	OFF	OFF	ON	ON	OFF	OFF	30
Remote temperature sensor 10	OFF	OFF	ON	ON	OFF	ON	31

Figure 3.6 Layout of Remote Temperature Sensors



Item	Description
1	Remote temperature sensor

3.3.6 Connecting the Remote Power Off Device (Optional)

Connect the remote power off device to the terminal 37 and 38 on the terminal block. These two terminals have been connected with a cable in factory, and you need to remove this cable before connecting to the remote power off device.

NOTE: If the cable between the 37 and 38 terminals is removed and no remote power off device is connected to the terminals, the unit cannot be powered on.

3.3.7 Connecting Alarm Devices (Optional)

Connect alarm devices to terminal 75 and 76 on the terminal block. This enables the Vertiv™ Liebert® iCOM™ Edge to send alarms to the alarm device.

3.3.8 Connecting for Teamwork

Connect the CAN port of one unit to the CAN port of another unit using a CAN network cable. Then set the unit CAN ID on the DIP SW3 of the Liebert® iCOM™ Edge board.

CAN ID 0 is master unit. Teamwork parameters only can be set in master unit and then shared to subordinate units. Subordinate unit uploads operation status and alarms to the master unit.

Figure 3.7 DIP SW3

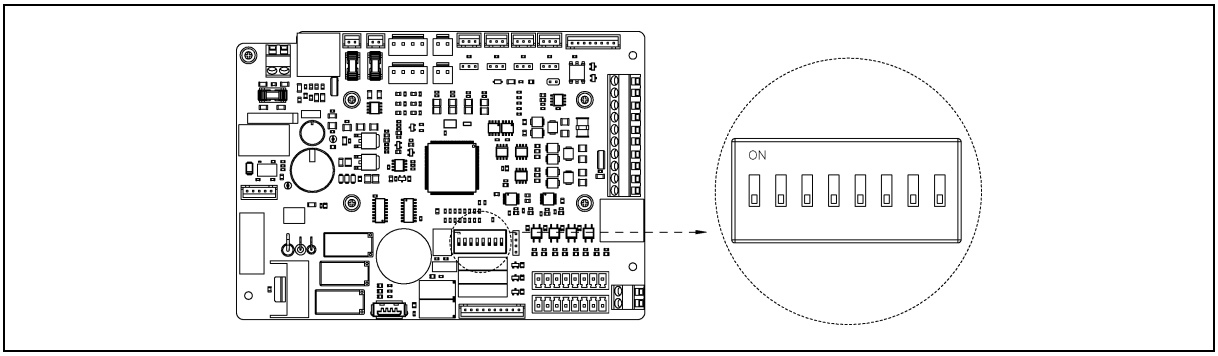


Table 3.4 Address Settings of CAN ID

CAN ID	SW3-1	SW3-2	SW3-3	SW3-4	SW3-5	SW3-6	SW3-7	SW3-8	Note
0	ON	ON	ON	ON	ON	ON	ON	ON	Master Unit
1	OFF	ON	ON	ON	ON	ON	ON	ON	Subordinate Unit 1
2	ON	OFF	ON	ON	ON	ON	ON	ON	Subordinate Unit 2
3	OFF	OFF	ON	ON	ON	ON	ON	ON	Subordinate Unit 3
4	ON	ON	OFF	ON	ON	ON	ON	ON	Subordinate Unit 4
5	OFF	ON	OFF	ON	ON	ON	ON	ON	Subordinate Unit 5
6	ON	OFF	OFF	ON	ON	ON	ON	ON	Subordinate Unit 6

Table 3.4 Address Settings of CAN ID (continued)

CAN ID	SW3-1	SW3-2	SW3-3	SW3-4	SW3-5	SW3-6	SW3-7	SW3-8	Note
7	OFF	OFF	OFF	ON	ON	ON	ON	ON	Subordinate Unit 7
8	ON	ON	ON	OFF	ON	ON	ON	ON	Subordinate Unit 8
9	OFF	ON	ON	OFF	ON	ON	ON	ON	Subordinate Unit 9
10	ON	OFF	ON	OFF	ON	ON	ON	ON	Subordinate Unit 10
11	OFF	OFF	ON	OFF	ON	ON	ON	ON	Subordinate Unit 11
12	ON	ON	OFF	OFF	ON	ON	ON	ON	Subordinate Unit 12
13	OFF	ON	OFF	OFF	ON	ON	ON	ON	Subordinate Unit 13
14	ON	OFF	OFF	OFF	ON	ON	ON	ON	Subordinate Unit 14
15	OFF	OFF	OFF	OFF	ON	ON	ON	ON	Subordinate Unit 15

NOTE: The Vertiv™ Liebert® iCOM™ Edge can connect up to 16 units. Unit CAN ID address must be set in sequence from 0 to 15.

3.4 Checklist for Electrical Installation

Table 3.5 Electrical Installation Checklist

Item	Result
The power voltage is the same as the rated voltage on the unit nameplate.	
No open-circuit or short-circuit exists in the electrical connection.	
The power cables and grounding cables are correctly connected to the disconnect switch, indoor unit, and outdoor unit.	
The circuit breakers or fuses have correct ratings for the installed equipment.	
The control connections are configured and fixed properly.	
All the wiring and connector connections, including the fixing blocks, are fixed firmly and appropriately.	

NOTE: Do not power on or operate the unit before authorized professional technicians from Vertiv perform the check and confirm that the installation is correct.

4 Dimensions and Weights

Table 4.1 Vertiv™ Liebert® CRD10 Dimensions and Weights

Model	Unit Dimension (W x D x H) mm (in)	Shipping Dimensions (W x D x H) mm (in)	Unit Weight kg (lb)	Shipping Weight kg (lb)
CRD100-0D00A	300 x 1132 x 2000 (11.8 x 44.6 x 78.7)	776 x 1276 x 2228 (30.6 x 50.2 x 87.7)	231 (509)	313 (690)
CRD101-0D00A				
CRD102-1D00A				

Table 4.2 Vertiv™ Liebert® CCD10 Dimensions and Weights (Without Stands)

Condenser Model	Unit Dimensions (Without Legs) (W x D x H) mm (in)	Shipping Dimensions (W x D x H) mm (in)	Net Weight kg (lb)	Shipping Weight kg (lb)
CCD100S-00A	1300 × 450 × 745 (51.2 × 17.7 × 29.3)	1620 × 560 × 950 (63.8 × 22.0 × 37.4)	56 (123)	106 (234)
CCD101S-00A				

Table 4.3 Vertiv™ Liebert® CRD10 Accessories Dimensions and Weights

Type	Type	Part Number	Region	Description	Long Description	Net Dimensions (W x D x H) mm (in)	Net Weight kg (lb)	Package Dimensions (W x D x H) mm (in)	Shipping Weight kg (lb)
CRD10	Accessories	TE20CR11	ALL	Top Frame Extension for CRV+ 1100mm	267mm - Top extension frame (total unit height 2267mm). For unit depth 1132mm	300 x 1132 x 267 (11.8 x 44.6 x 10.5)	14 (30.86)	1311 x 366 x 448 (51.6 x 14.4 x 17.6)	9.3 (20.5)
		TE20CR12	ALL	Top Frame Extension for CRV+ 1200mm	267mm - Top extension frame (total unit height 2267mm). For unit depth 1232mm	300 x 1232 x 267 (11.8 x 48.5 x 10.5)	15 (33.07)	1311 x 366 x 448 (51.6 x 14.4 x 17.6)	10.0 (22.05)
		FE10CR	ALL	Front Frame Extension for 100mm	100mm front extension to increase the unit depth to 1232mm	300 x 100 x 2000 (11.8 x 3.94 x 78.7)	10.7 (23.6)	2026 x 376 x 298 (79..8 x 14.8 x 11.7)	10.0 (22.05)
		277072	ALL	Remote Sensor	Rack Temperature Sensor	44 x 22 x 97 (1.73 x 0.87 x 3.82)	0.1 (0.22)	160 x 62 x 38 (6.3 x 2.4 x 1.5)	0.2 (0.44)

Table 4.3 Vertiv™ Liebert® CRD10 Accessories Dimensions and Weights (continued)

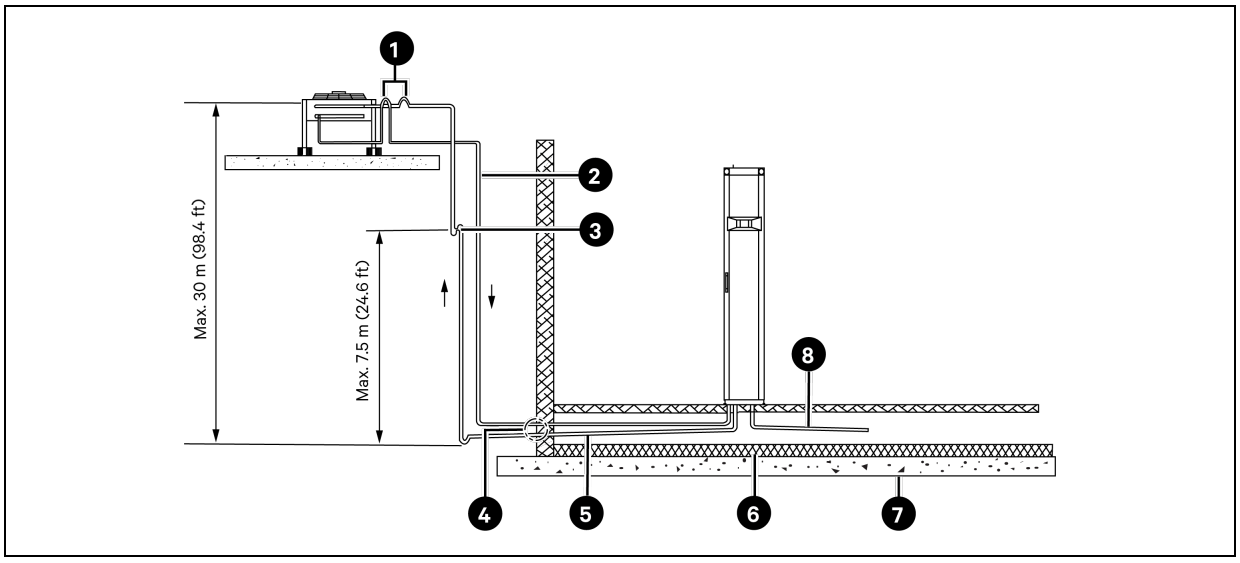
Type	Type	Part Number	Region	Description	Long Description	Net Dimensions (W x D x H) mm (in)	Net Weight kg (lb)	Package Dimensions (W x D x H) mm (in)	Shipping Weight kg (lb)
		SCBL10CR	ALL	Modbus/Canbus Cable(10m) with Box	10m long Modbus Cable for Remote Sensor also as Canbus cable for unit to unit communication (Teamwork) with RJ45 connector	10000 (393.7)	1 (2.2)	325 x 220 x 100 (12.8 x 8.7 x 3.9)	0.7 (1.54)
		LAK10UL	AMERICAS	Low Ambient Kit UL certified	Kit for System operation down to -34C with UL certification	785 x 250 x 450 (30.9 x 9.85 x 17.72)	15 (33.07)	870 x 520 x 445 (34.2 x 20.5 x 17.6)	40 (88.18)
		LAK10CE	EMEA	Low Ambient Kit CE certified	Kit for System operation down to -34C with CE certification	785 x 250 x 450 (30.9 x 9.85 x 17.72)	15 (33.07)	870 x 520 x 445 (34.2 x 20.5 x 17.6)	40 (88.18)

5 Piping Details

5.1 Installation Drawings

5.1.1 Layout of Indoor and Outdoor Units

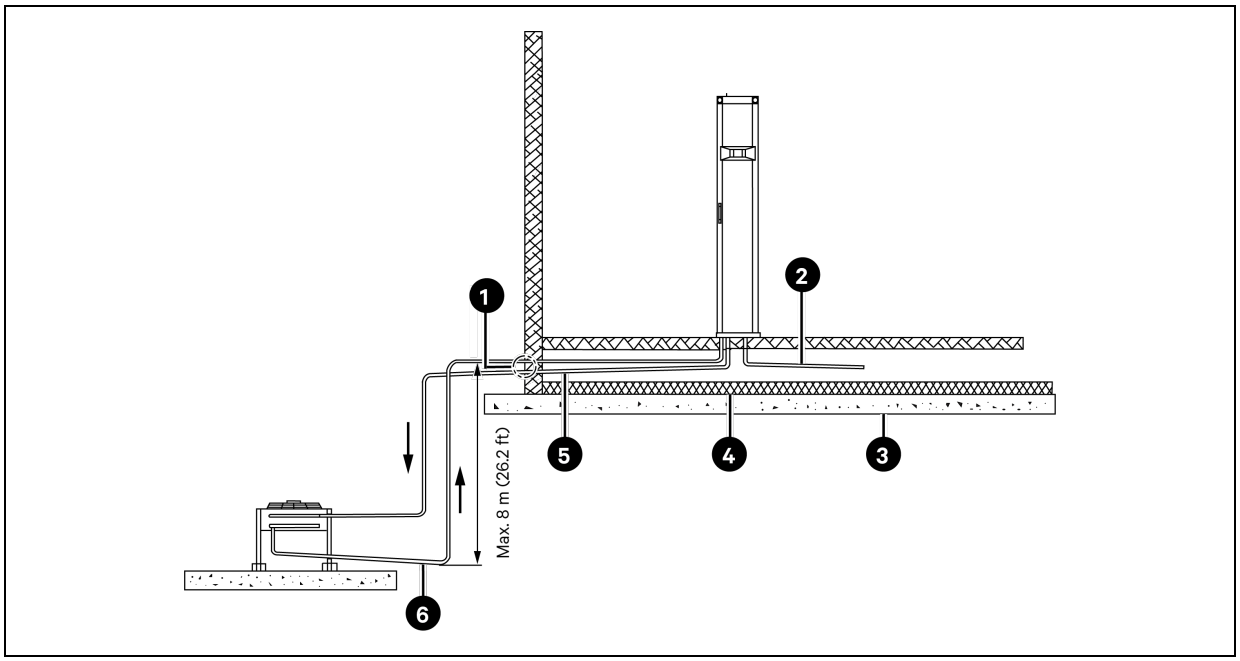
Figure 5.1 Outdoor Unit Placed Higher than the Indoor Unit



Item	Description
1	Inverted trap
2	Liquid pipe
3	Oil trap
4	The gap between the pipe and the wall needs to be sealed
5	Gas pipe with a slope
6	Heat insulation floor
7	Floor
8	Condensate water

NOTE: If the condenser is installed higher than the compressor, install an inverted trap in the gas pipe and the liquid pipe of the condenser, to prevent liquid refrigerant from flowing back once the condenser stops. The top end of the inverted trap must be at least 150 mm (5.9 in) higher than the pipe of the condenser. Install an oil trap every 7.5 m (24.6 ft) of the vertical gas pipe.

Figure 5.2 Outdoor Unit Placed Lower than the Indoor Unit



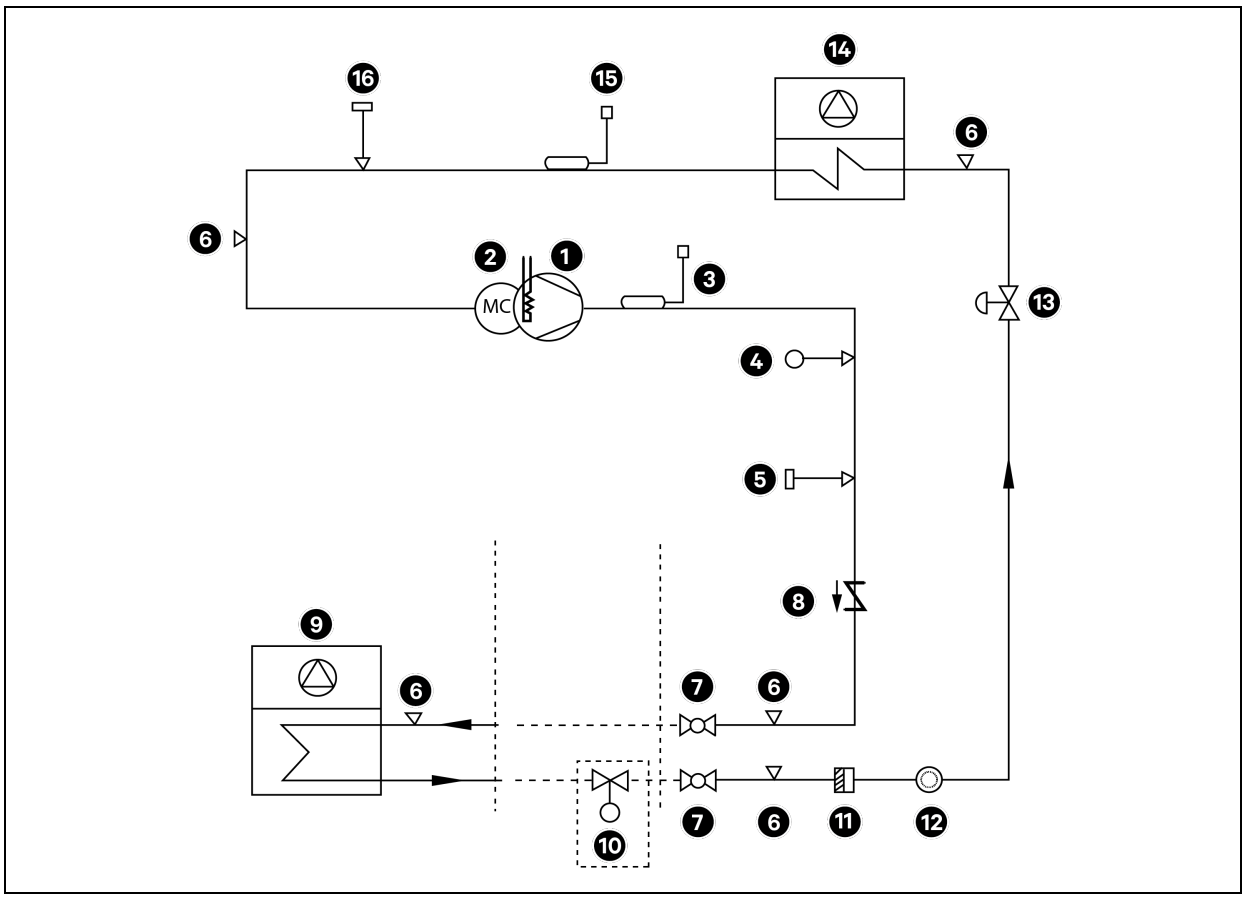
Item	Description
1	The gap between the pipe and the wall needs to be sealed
2	Condensate water
3	Floor
4	Heat insulation floor
5	Gas pipe with a slope
6	Liquid pipe with a slope

Table 5.1 Vertical Distance between the Outdoor Unit and the Indoor Unit

Positioning of the Outdoor Unit		Height						
Outdoor unit is higher than the Indoor unit		Maximum: +30 m (98.4 ft)						
Outdoor unit is lower than the indoor unit		Maximum: -8 m (-26.2 ft)						
Outdoor unit (with low ambient kit) is lower than the indoor unit	Equivalent pipe length m (ft)	10 (33)	15 (49)	30 (99)	45 (147)	60 (197)	75 (246)	91 (300)
	Max. height m (ft)	-5 (-16)	-4.7 (-15)	-3.7 (-12)	-2.8 (-9)	-1.9 (-6)	-1 (-3)	0 (0)

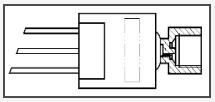
5.1.2 System Diagram

Figure 5.3 System Diagram



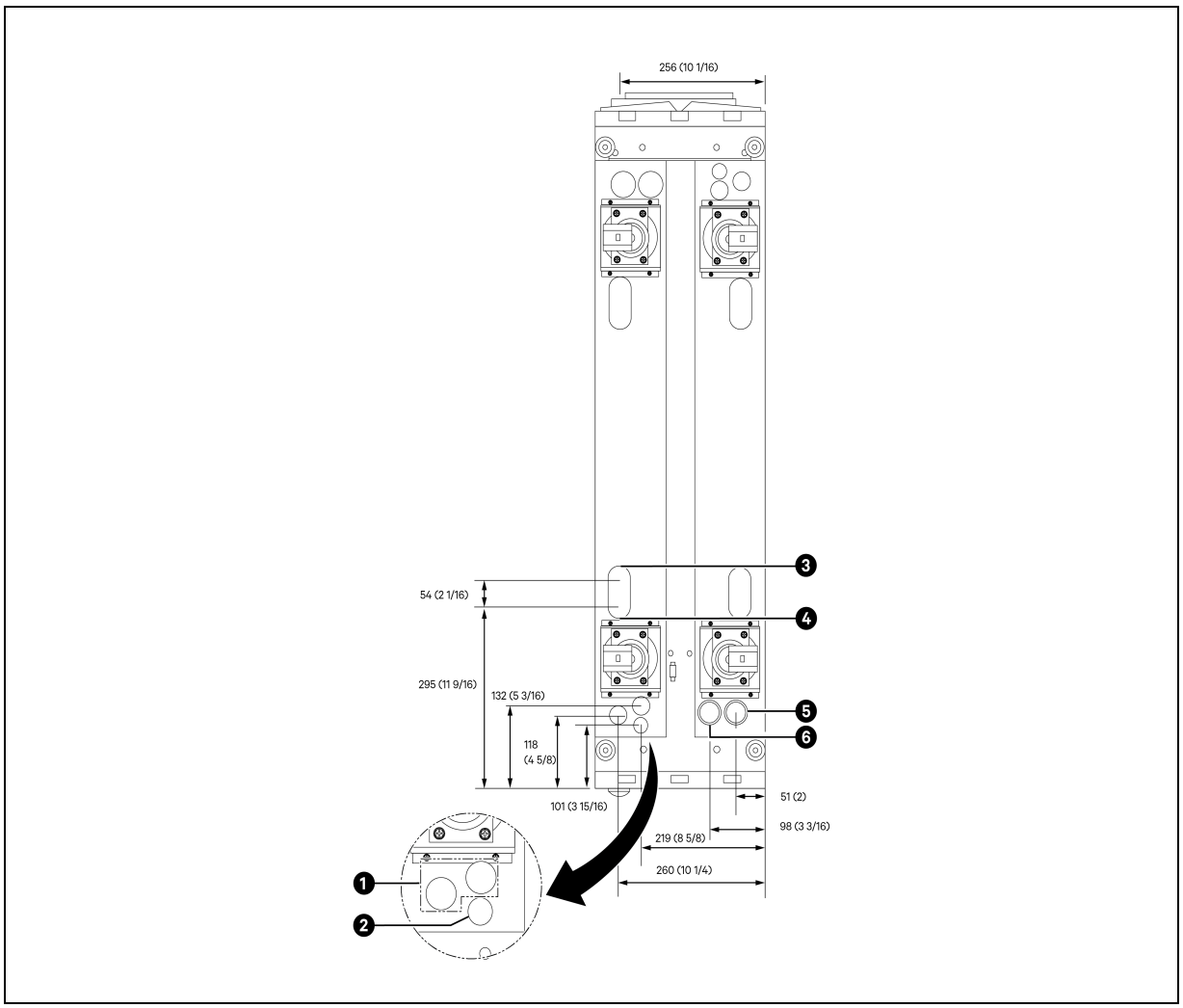
Item	Description	Item	Description
1	Compressor	9	Condenser
2	Crankcase heater	10	Solenoid valve (connected on site)
3	Discharge temperature sensor	11	Filter drier
4	High pressure switch	12	Sight glass
5	High pressure sensor	13	Electronic expansion valve
6	Schrader valve	14	Evaporating coil
7	Ball valve	15	Suction temperature sensor
8	Check valve	16	Low pressure sensor

Table 5.2 Safety Components

Refrigeration Circuit Item No.	Component	Setting	Image	Contact
4	High pressure switch	Open: 4.1 ± 0.1 MPa Close: 3.3 ± 0.1 MPa		Normally closed
5	High pressure sensor	Range: 0 - 4.5 MPa (0.5 - 4.5 VDC)		-
16	Low pressure sensor	Range: 0 - 1.73 MPa (0.5 - 4.5 VDC)		-
-	Clogged filter differential pressure switch	Range: 50 - 400 Pa		Normally closed

5.1.3 Pipe and Cable Access Locations and Dimensions

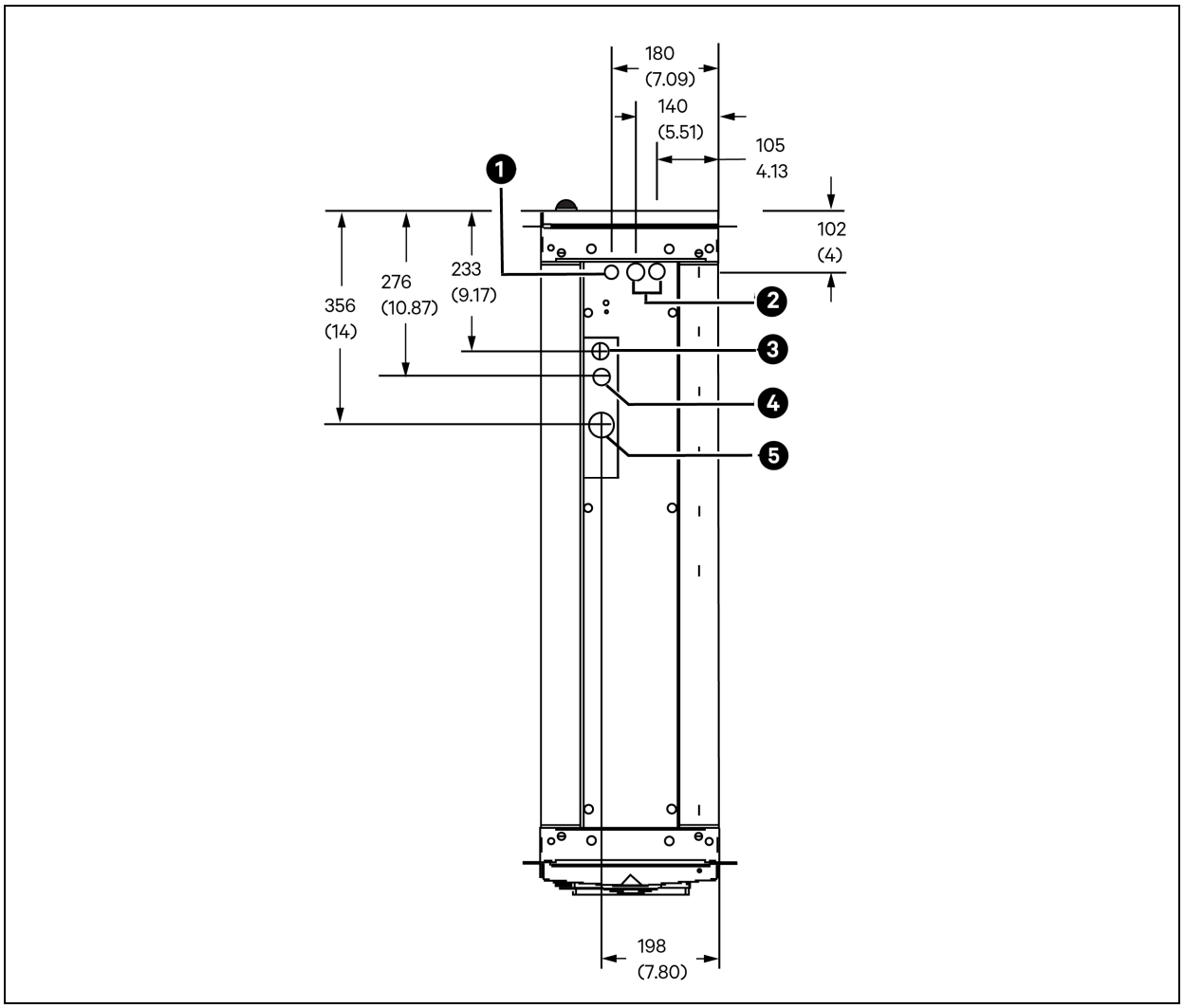
Figure 5.4 Pipe and Cable Access Locations and Dimensions on Base Plate (Unit: mm (in))



Item	Description		
1	HVT	High voltage cable access	Combination knockout: 29 mm (1-1/8 in)
2	LVT	Low voltage cable access	Knockout hole diameter: 22 mm (7/8 in)
3	RGT	Refrigerant gas line outlet	5/8 in O.D. copper
4	RLT	Refrigerant liquid line inlet	1/2 in O.D. Copper
5	CGT	Condensate gravity outlet	NPT 1/2 in (Rc 1/2 in) female copper threaded joint
6	CPT	Condensate pump outlet	NPT 1/2 in. (Rc 1/2 in) female copper threaded joint

NOTE: NPT threaded joint is for UL model. Rc threaded joint is for CE model.

Figure 5.5 Pipe and Cable Access Locations and Dimensions on Top Plate (Unit: mm (in))



Item	Description		
1	LVT	Low voltage cable access	Knockout hole diameter: 22 mm (7/8 in)
2	HVT	High voltage cable access	Combination knockout: 29 mm (1-1/8 in)
3	RGT	Refrigerant gas line outlet	5/8 in O.D. copper sweat
4	RLT	Refrigerant liquid line inlet	1/2 in O.D. copper sweat
5	CPT	Condensate pump outlet	NPT 1/2 in (Rc 1/2 in) female copper threaded joint

NOTE: NPT threaded joint is for UL model. Rc threaded joint is for CE model.

5.2 Connecting Pipelines

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.

NOTICE

On-site pipeline connection must comply with local regulations, such as ASHRAE 15, CSA B52 and local construction laws. It must be completed by qualified technician.

NOTICE

Before connecting pipelines, open the ball vales on the liquid line and gas line and release the nitrogen air from the needle valves.

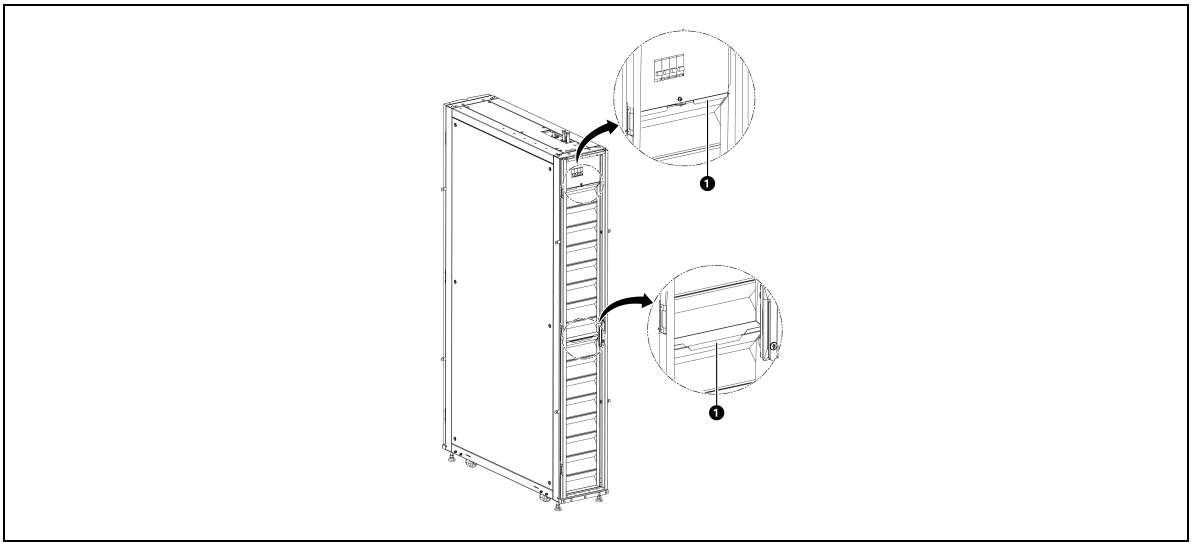
NOTICE

Pipeline welding can cause overheating of the pipeline and open flame. The installation environment must be free of combustible materials to avoid fire.

5.2.1 Removing Filters

1. Unlock the rear door and open the door.
2. Pull the handle of the fastening plate to remove the plate. Then remove the upper filter.
3. Remove the plate. Then remove the lower filter.

Figure 5.6 Removing the Filters



Item	Description
1	Fastening plate

5.2.2 Connecting the Condensate Drainage Pipe of the Indoor Unit

The condensate water from the coil accumulates in the drain pan and is drained through the top or bottom of the unit.

Top Connection

A pipe has been pre-installed between the pump and the drainage copper pipe. The top end of the drainage copper pipe has been routed through the condensate pump outlet on the top plate. Connect the top end to your drainage system using a pipe.

Bottom Connection

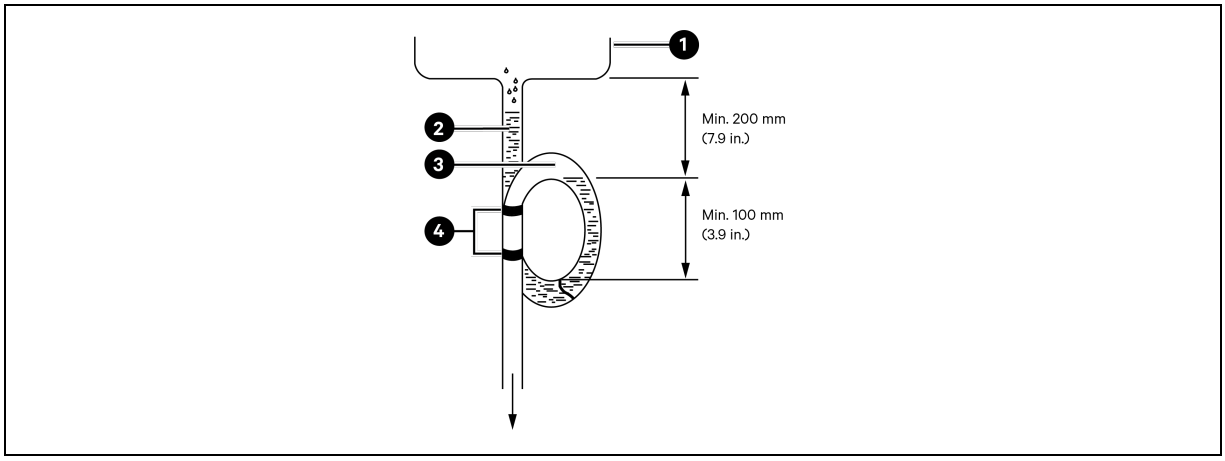
NOTE: To drain the condensate water from the bottom, it is recommended to use pump drainage as well. Otherwise you need to disable the pump drainage. To disable it, press the menu button on the HMI display, choose Maintenance > System Settings, and select No for Enable Condensate Pump.

1. A pipe has been pre-installed from the drain pan. Route the pipe through the condensate gravity outlet on the base plate. Wrap a drain trap under the drain pan.
2. Remove the soft pipe between the pump and the drainage copper pipe, use the extended soft pipe provided in the accessories and route the pipe through the condensate pump outlet on the base plate to your drainage system.

NOTE: The recommended maximum vertical rise of the pump lift is 5 m (16.4 ft). Ensure at least a 2% gradient towards the drain.

NOTE: There must be a drain trap placed at least 200 mm (7.9 in) below the drain tray. Fill the drain trap with water.

Figure 5.7 Draining the Condensate Water



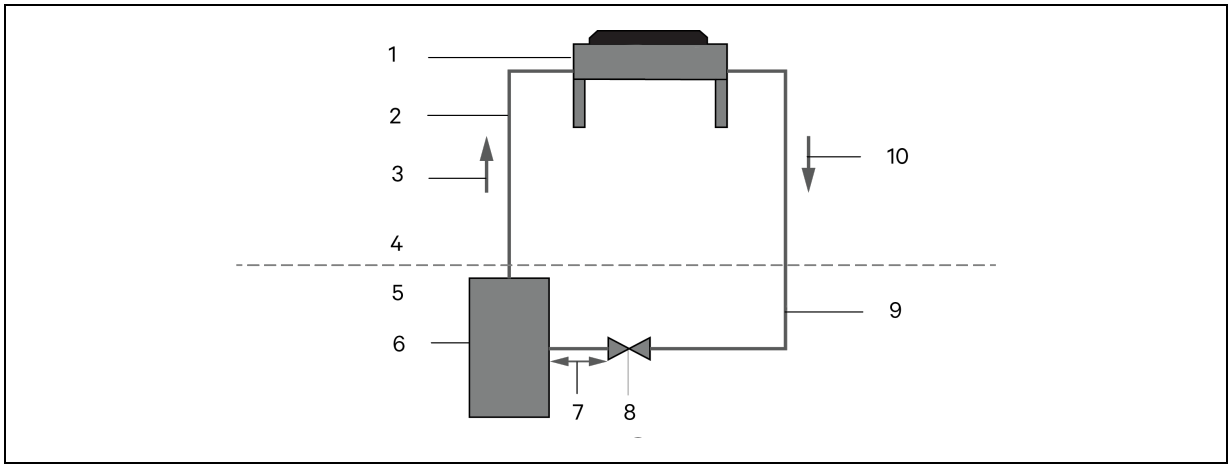
Item	Description
1	Drain pan
2	Filling water in the trap
3	Trap
4	Bracket: 2 pieces

5.2.3 Installing the Solenoid Valve

NOTE: It is recommended to install the solenoid valve horizontally. The valve body must be upward.

Install the solenoid valve on the liquid pipe, as close to the indoor unit as possible. The distance from the solenoid valve to the indoor unit pipe should not exceed 2 m (6.6 ft) The valve body and the coil of the solenoid valve are separated when the valve is shipped. Mount the valve body horizontally on the refrigerant pipe. Ensure that the arrow on the valve body points towards the indoor unit.

Figure 5.8 Pipe Dimensions and Installation Position of Solenoid Valve



Item	Description
1	Condenser
2	Gas pipe Diameter: • 16 mm (5/8 in) if pipe length ≤ 40 m (131.2 ft) • 18 mm (3/4 in) if 40 m (131.2 ft) < pipe length ≤ 91 m (300.0 ft)
3	Refrigerant flow direction
4	Outdoor
5	Indoor
6	CRD10 indoor unit
7	Max 2 m (6.6 ft)
8	Solenoid valve
9	Liquid pipe Diameter: • 12.7 mm (1/2 in) if pipe length ≤ 40 m (131.2 ft) • 16 mm (5/8 in) if 40 m (131.2 ft) < pipe length ≤ 91 m (300.0 ft)
10	Refrigerant flow direction

5.2.4 Connecting the Copper Pipes between the Indoor and Outdoor Units

The indoor and outdoor units are connected using type ACR copper pipes. Take into account the effect of pipe diameter on system pressure drop. For details, consult Vertiv technician.

Table 5.3 Recommended Refrigerant Pipe Sizes

Pipe Length L, m (ft.)	External Diameter x Pipe Thickness mm (in)	
	Discharge Pipe	Liquid Pipe
0 < L≤ 40 (131.2)	16 (5/8) x 1 (0.04)	12.7 (1/2) x 1 (0.04)
40 (131.2) < L ≤ 91 (300.0)	18 (3/4) x 1 (0.04)	16 (5/8) x 1 (0.04)

NOTE: Pipe length = Actual length + Equivalent length of components

Table 5.4 Equivalent Length of Components

Liquid Pipe, External Diameter x Pipe Thickness mm (in)	Equivalent Length m (ft)		
	90° Bend	45° Bend	T Type Three-Way
12.7 (1/2) x 1 (0.04)	0.5 (1.64)	0.25 (0.82)	0.76 (2.49)
16 (5/8) x 1 (0.04)	0.55 (1.8)	0.27 (0.88)	0.76 (2.49)
18 (3/4) x 1 (0.04)	0.6 (1.96)	0.3 (0.98)	0.76 (2.49)
22.2 (7/8) x 1.2 (0.05)	0.7 (2.29)	0.35 (1.14)	1.1 (3.6)

Note the following during the piping process:

- The horizontal sections of the gas pipe must be tilted downwards from the compressor with a slope of at least 1:200 (5 mm down for every 1m run). The gas pipe must be insulated from heat.
- Cut the copper pipe (a little bit of the compressor lubricating oil may leak). Do not braze-weld the copper cap on the seal directly, as this may heat the oil and cause fire.
- All the joints of the refrigerating pipes must be silver-brazed. Do not expose the pipes for more than 15 minutes. Otherwise, the PVE refrigeration oil will absorb moisture from air and contaminate the refrigerant. This may affect the life of key components and the stability of the unit.
- Use a flow of dry nitrogen through the pipeline during brazing to prevent formation of copper oxide scale inside the piping. When copper is heated in the presence of air, copper oxide forms. PVE 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.

NOTE: After all the pipelines are connected, use plastic caps to cover the unused holes on the top and bottom plates.

5.3 Charging Refrigerant and Lubricating Oil

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.

NOTICE

Risk of oil contamination with water. It can cause damage to the equipment. The unit requires the use of PVE (FV50S) oil. PVE oil absorbs water at a much faster rate when exposed to air than previously used oils. Because water is the enemy of a reliable refrigeration system, extreme care must be used when opening systems during installation or service. If water is absorbed into the PVE 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. PVE oils also have a property that makes them act as a solvent in a refrigeration system. Maintaining system cleanliness is extremely important because the oil will tend to bring any foreign matter back to the compressor.

NOTICE

Risk of improper refrigerant charging. It can cause damage to the equipment. Refrigerant charge must be weighed into air-cooled compressorized systems before they are started. Starting compressors without proper refrigerant charging can cause the compressors to operate at less than 5°F (–15°C) evaporator temperature and at less than 20 psig (138 kPa). Operation for extended periods at less than 20 psig (138 kPa) can cause premature compressor failure.

5.3.1 Amount of Refrigerant and Lubricating Oil

NOTE: The unit is not charged with refrigerant in factory. You need to charge refrigerant on site, according to **Table 5.5** below.

NOTE: The unit has been charged with 1270 ml FV50S lubricating oil in factory. You do not need to add extra lubricating oil, when the liquid pipe between the indoor and outdoor units is shorter than 30 m (98.4 ft) and no low ambient kit is installed. You need to add extra lubricating oil, when the liquid pipe is longer than 30 m (98.4 ft) or a low ambient kit is installed. Refer to **Table 5.5** below for the amount of extra charge. It is recommended to charge FV50S lubricating oil. If this type of oil cannot be obtained, you can use FVC68D which can be mixed with FV50S in any ratio for CRD10 compressor.

NOTE: Do not use refrigerant and lubricating oil of poor quality or wrong type, as they can damage the system.

Table 5.5 Charging Amount of Refrigerant and Lubricating Oil

Liquid Pipe Length m	Total Refrigerant Charging Amount		Additional Lubricating Oil Charging Amount		Liquid Pipe Length ft	Total Refrigerant Charging Amount		Additional Lubricating Oil Charging Amount	
	Without Low Ambient Kit kg	With Low Ambient Kit kg	Without Low Ambient Kit ml	With Low Ambient Kit ml		Without Low Ambient Kit lb	With Low Ambient Kit lb	Without Low Ambient Kit oz	With Low Ambient Kit oz
≤10	4.1	9.0	-	1000	≤32.8	9.0	19.8	-	33.8
15	4.6	9.5	-	1000	45	9.9	20.7	-	33.8
20	5.2	10.1	-	1000	60	11.0	21.8	-	33.8
25	5.7	10.6	-	1000	75	12.0	22.8	-	33.8
30	6.2	11.1	-	1000	98.4	13.7	24.5	-	33.8
35	6.8	11.7	134	1134	120	15.3	26.1	6.0	39.8
40	7.3	12.2	268	1268	131.2	16.1	26.9	9.1	42.9
45	9.2	14.1	544	1544	150	20.4	31.2	19.3	53.1
50	9.9	14.8	725	1725	165	21.9	32.7	24.9	58.7
55	10.6	15.5	906	1906	180	23.3	34.1	30.5	64.3
60	11.4	16.3	1088	2088	195	24.8	35.6	36.1	69.9
65	12.1	17.0	1269	2269	210	26.3	37.1	41.7	75.5
70	12.8	17.7	1450	2450	225	27.7	38.5	47.4	81.2
75	13.5	18.4	1631	2631	240	29.2	40.0	53.0	86.8
80	14.3	19.2	1813	2813	255	30.6	41.4	58.6	92.4
85	15.0	19.9	1994	2994	270	32.1	42.9	64.2	98.0
91	15.8	20.7	2211	3211	285	33.6	44.4	69.8	103.6
					300	35.0	45.8	75.4	109.2

"-" indicates no need to charge additional lubricating oil

Table 5.6 Base Refrigerant Charge

Model	Base Refrigerant Charge without Low Ambient Kit kg (lb)	Base Refrigerant Charge with Low Ambient Kit kg (lb)	Base Lubricating Oil Charge with Low Ambient Kit ml (oz)	Additional Lubricating Oil Charge ml (oz)	Total Refrigerant Charge kg (lb)
Indoor unit: CRD10 **Outdoor unit:** CCD100S and CCD101S	4.1 (9.0)	9.0 (19.8)	1000 (33.8)	b	c

- b (ml) = Refrigerant charge per meter (kg/m) × [Total length of liquid pipe (m) - 30 (m)] × 1000 × 25%
- b (oz) = Refrigerant charge per foot (lb/ft) × [Total length of liquid pipe (ft) - 98.4 (ft)] × 3.84
- c (kg) = Base refrigerant charge (kg) + Refrigerant charge per meter (kg/m) × [Total length of liquid pipe (m) - 10 (m)]
- c (lb) = Base refrigerant charge (lb) + Refrigerant charge per foot (lb/ft) × [Total length of liquid pipe (ft) - 32.8 (ft)]

Table 5.7 Refrigerant Charge Per Meter of Liquid Pipe

Liquid Pipe Diameter x Thickness mm(in)	Refrigerant Charge Per Meter of Liquid Pipe kg/m (lb/ft)
12.7 x 1 (1/2 x 0.04)	0.107 (0.0719)
16 x 1 (5/8 x 0.04)	0.145 (0.0974)

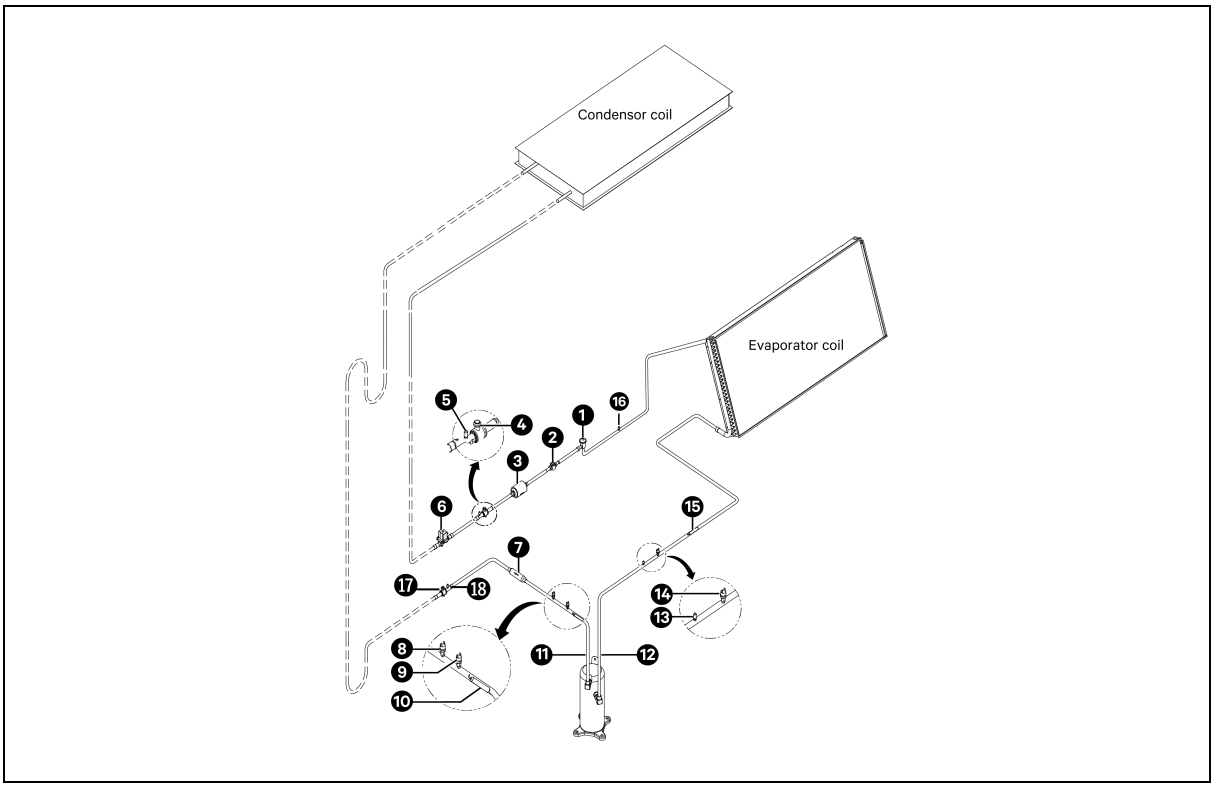
5.3.2 Vacuuming the Unit

NOTE: Before vacuuming the unit, switch off the circuit breaker of the indoor fans and the compressor.

1. Switch on the circuit breaker of the transformer.
2. On the HMI display, choose **Maintenance** > **Manual Mode**, and select **On** for **Vacuumize Pipeline**.
3. Open all the ball valves, EEV, and solenoid valve.
4. Connect a manifold gauge to the vacuum pump. Connect the manifold gauge to Schrader valve 5 and 16, as shown in **Figure 5.9** on the next page
    a. Pull an initial deep vacuum of 500 microns on the system with a suitable pump.
    b. After 4 hours, check the pressure readings and, if they have not changed, break vacuum with dry nitrogen. Pull a second and third vacuum to 500 microns or less. Re-check the pressure after 2 hours.

NOTE: The Fan/Power Failure alarm or the Low Pressure Sensor Failure alarm can be generated. This does not affect normal operation.

Figure 5.9 Schrader Valves in the System



Item	Description
1	EEV
2	Sight glass
3	Filter drier
4	Ball valve
5	Schrader valve
6	Solenoid valve
7	Check valve
8	High pressure sensor
9	High pressure switch
10	Discharge temperature sensor
11	Discharge pipe
12	Suction pipe
13	Schrader valve
14	Low pressure sensor
15	Suction temperature sensor

Item	Description
16	Schrader valve
17	Ball valve
18	Schrader valve

NOTE: You can open the EEV and solenoid valve by selecting On for Vacuumize Pipeline in the HMI display, or you can manually open them.

NOTE: Never use the compressor to vacuum the system. This invalidates its guarantee.

5.3.3 Adding Lubricating Oil

NOTE: The lubricating oil used in the unit is PVE (FV50S). The unit has been charged with 1270 ml base lubricating oil in factory. When the liquid pipe between the indoor unit and the outdoor unit is shorter than 30 m (98.4 ft) and the unit is not equipped with a low ambient kit, you do not need to add extra lubricating oil. When the liquid pipe is longer than 30 m (98.4 ft), you need to add extra lubricating oil according to Table 5.5 on page 36.

NOTE: Do not use refrigerant and lubricating oil of poor quality or wrong type, as they can damage the system.

NOTE: Oil FVC68D can be used for field additions too. It can be mixed with oil FV50S in any ratio.

After vacuuming the unit, connect the lubricating oil tank to Schrader valve 13, as shown in Figure 5.9 on the previous page. The oil is drawn into the unit.

5.3.4 Charging the Refrigerant

Charging refrigerant statically

Connect a manifold gauge to the refrigerant cylinder (air in the hoses needs to be drained-out). Connect the manifold gauge to Schrader valve 5 and 16, as shown in Figure 5.9 on the previous page. Charge the refrigerant and keep the cylinder handstand during this process.

NOTE: Do not over charge the unit. Charge the unit dynamically only if the unit is not charged with enough refrigerant.

NOTE: After charging the refrigerants statically, do not turn on the compressor to charge the refrigerant dynamically until the compressor has been pre-heated for more than 12 hours.

NOTE: Before charging the refrigerant dynamically, switch on the circuit breaker of the indoor fans and the compressor.

Charging refrigerant dynamically

On the HMI display, press and hold the ON/OFF button for three seconds to start the unit. Choose Maintenance > Manual Mode, and select Yes for Enable Manual Mode. Set the output value to 75% for the fan, start the compressor after 5 minutes, and adjust the compressor output to 72%. Connect the refrigerant cylinder to Schrader valve 16 , as shown in Figure 5.9 on the previous page, and keep the refrigerant cylinder handstand. After the compressor starts to operate, the refrigerant will be drawn into the unit.

NOTE: Do not charge the unit too fast. Otherwise the compressor can be damaged.

NOTE: After charging the refrigerant dynamically, if the unit needs to be powered off, press and hold the ON/OFF button on the HMI display to power it off. Do not power off the unit by turning off the circuit breakers, as this may damage the compressor.

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6 Heat Rejection-Vertiv™ Liebert® CCD10

6.1 Model Number Nomenclature

The following tables describe the model number for Liebert® CCD10 condenser.

Table 6.1 Liebert® CCD10 Model Number Example

Model Number										
1	2	3	4	5	6	7	8	9	10	11
C	C	D	1	0	0	S	-	0	0	A

Table 6.2 Liebert® CCD10 Model Number Digit Definitions

Digit	Variable	Description of Variable
1	CCD	CCD10 condenser
2		
3		
4	10	Model number
5		
6	0, 1	0: 208/230V/1Ph/60Hz, UL 1: 230V/1Ph/50/60Hz, CE
7	S	Standard temperature (-15 °C to 45 °C (5 °F to 113 °F))
8	-	Separator
9	0	R410A refrigerant
10	0	Free digit
11	A - Z	Revision

Table 6.3 Match-up Table

Indoor Unit	Condensing Unit	Low Ambient Kit	Compliance Approval
CRD100-0D00A	CCD100S-00A	LAK10UL	UL
CRD101-0D00A			
CRD102-1D00A	CCD101S-00A	LAK10CE	CE

6.2 Main Components

6.2.1 Fan

The AC axial fan uses low-noise fan blades and a high-performance single-phase motor.

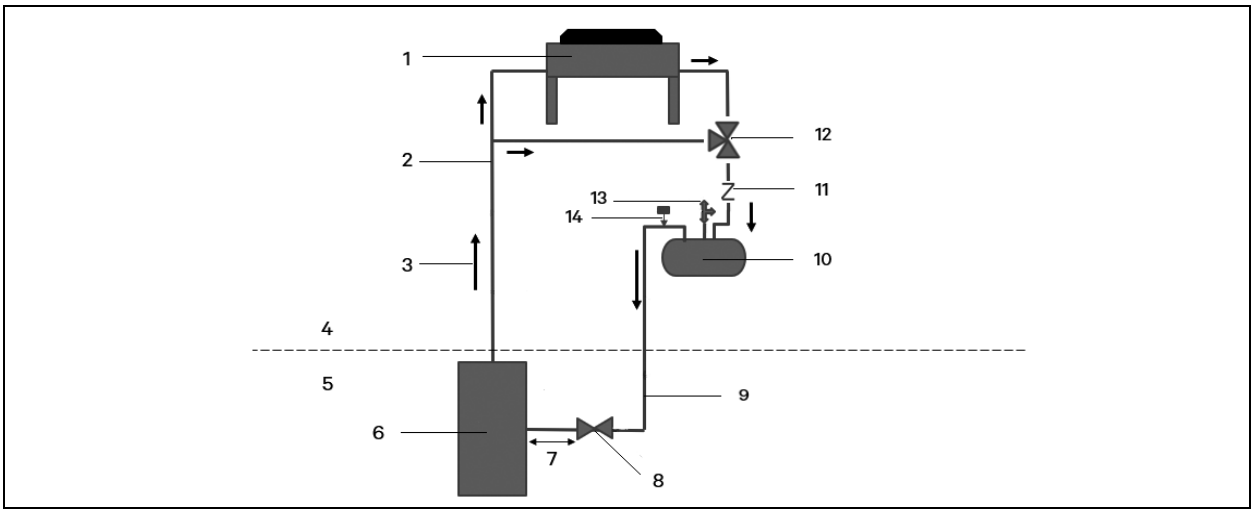
6.2.2 Heat Exchanger

The finned-tube heat exchanger provides high heat-dissipating efficiency and is convenient for maintenance.

6.2.3 Low Ambient Kit

The low ambient kit consists of a receiver with two heater pads, a head pressure valve, a safety valve, a check valve, and a pressure switch. The kit is designed to maintain proper operating pressure in outdoor temperature down to-34 °C (-29.2 °F). The low ambient kit is an optional component and is field-installed.

Figure 6.1 Diagram of Condenser with Low Ambient Kit



Item	Description
1	Condenser
2	Discharge pipe Diameter: • 16 mm (5/8 in) if pipe length ≤ 40 m (131.2 ft) • 18 mm (3/4 in) if 40 m (131.2 ft) < pipe length ≤ 91 m (300.0 ft)
3	Refrigerant flow direction
4	Outdoor environment
5	Indoor environment
6	Cooler
7	Max 2 m (6.6 ft)
8	Solenoid valve
9	Liquid pipe

Item	Description
	Diameter: • 12.7 mm (1/2 in) if pipe length ≤ 40 m (131.2 ft) • 16 mm (5/8 in) if 40 m (131.2 ft) < pipe length ≤ 91 m (300.0 ft)
10	Receiver
11	Check valve
12	Head pressure valve
13	Safety valve
14	Pressure switch

Receiver

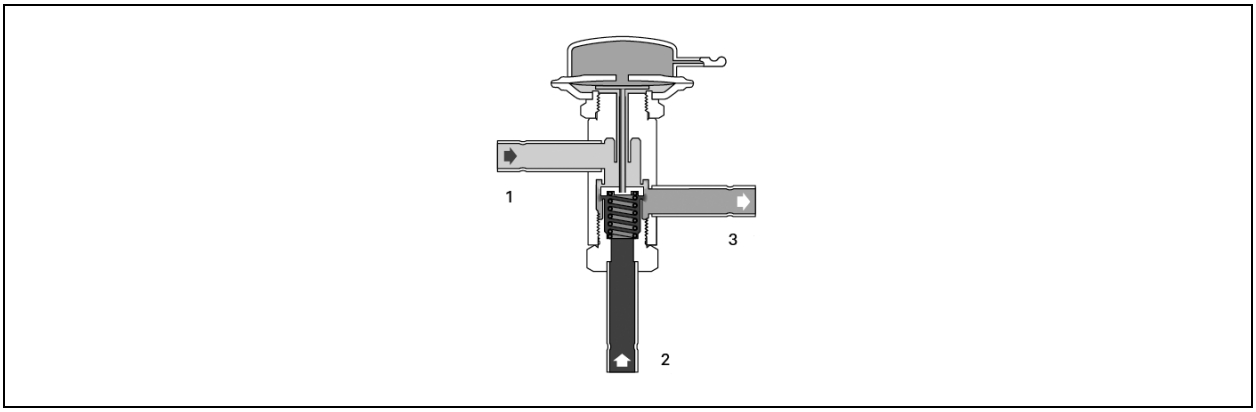
The receiver stores refrigerant to help fulfill the needs for low temperature load in winter and high temperature load in summer. There are three connection ports in the receiver to connect refrigerant inlet pipe, refrigerant outlet pipe, and safety valve. Two sight glasses are also installed on the receiver to observe the refrigerant level in the receiver conveniently.

Head Pressure Valve

The head pressure valve is a three-way modulating valve that responds to discharge pressure. When the discharge pressure falls below a certain value, the discharge port is opened and the discharge gas bypasses the condenser. When the discharge pressure is high, the discharge port is closed and there is full liquid flow to the condenser.

During the soldering process, care must be taken not to overheat and damage valves.

Figure 6.2 Structure Diagram of Head Pressure Valve



Item	Description
1	Connected with discharge pipe
2	Connected with condenser
3	Connected with receiver

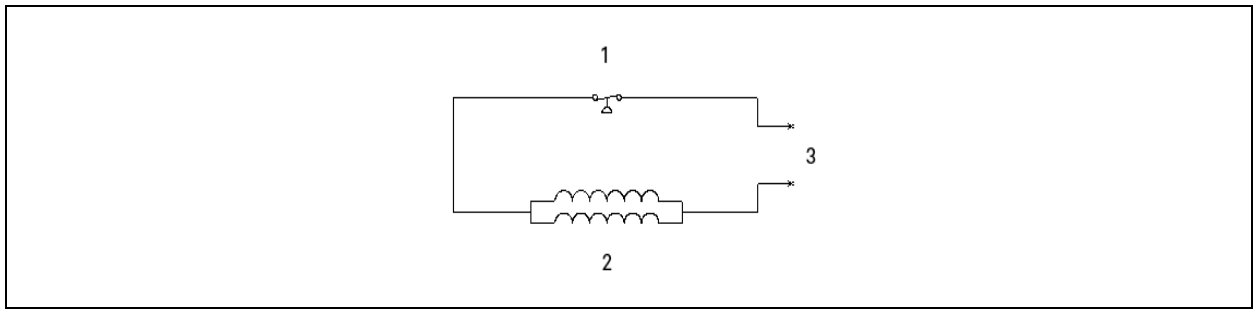
Heater Pad

The receiver is equipped with two heater pads which consume a total power of 150 Watts. The heater pad is controlled by the pressure of refrigerant in the receiver. When the pressure is lower than 1.4 MPa, the heater pad will start heating. When the pressure is higher than 1.9 MPa, the heater pad will stop heating.

Pressure Switch

Pressure switch controls the heater pad. When the refrigerant pressure in the receiver is lower than 1.4 MPa, the pressure switch will be closed and the heater pad will start working. When the refrigerant pressure in the receiver is higher than 1.9MPa, the pressure switch will be opened and the heater pad will stop working.

Figure 6.3 Circuit Diagram of Heater Pad and Pressure Switch



Item	Description
1	Pressure switch
2	Heater pad
3	Power supply

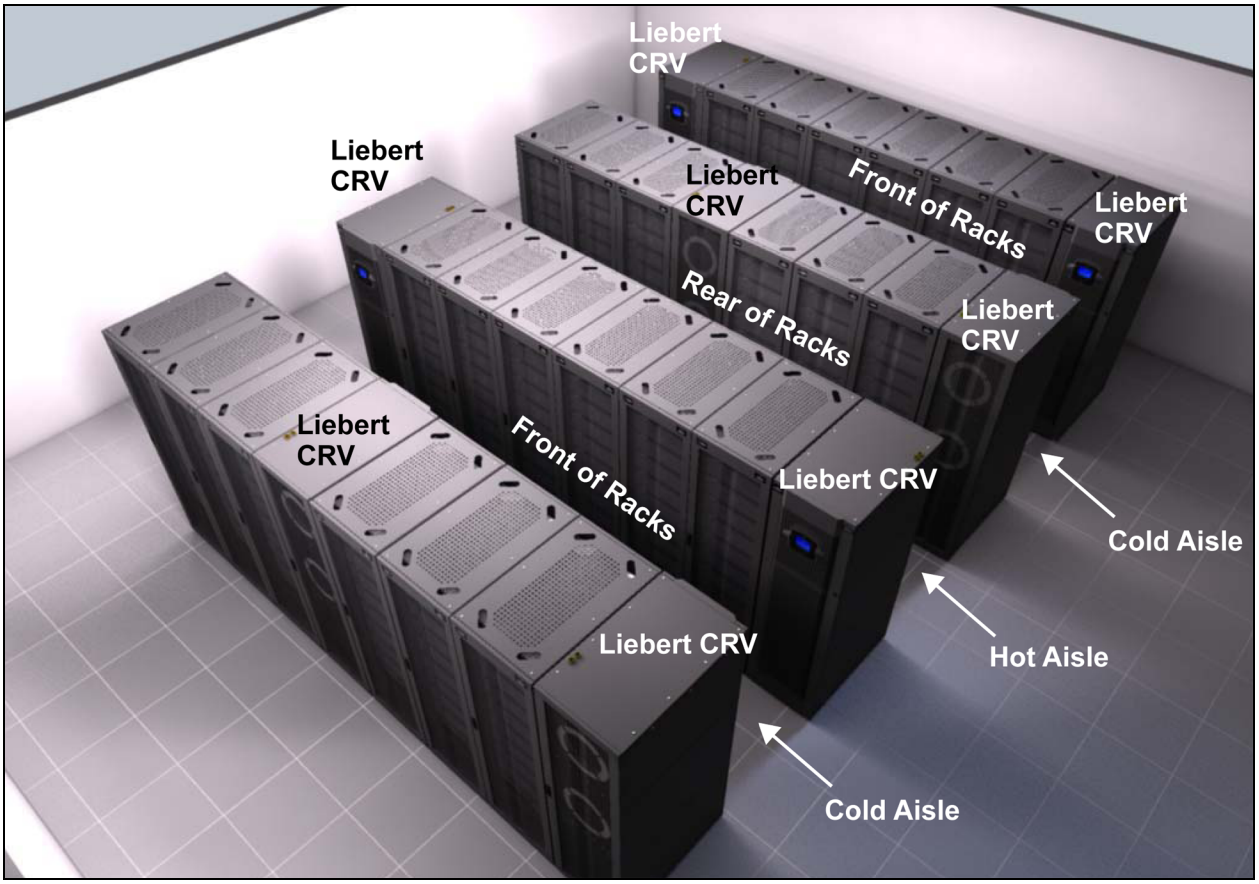
Check Valve

Check valve is installed between the head pressure valve and the receiver on the liquid line, to prevent the refrigerant from flowing back to the condenser. The arrow on the valve indicates the direction of the flow and it should point towards the receiver.

7 Vertiv™ Liebert® CRV CRD10 Intended Application

The Liebert® CRV CRD10 can be applied in virtually any application. Because the unit provides complete temperature and humidity control along with filtration, it can be deployed as the only cooling unit in smaller data centers and network closets. Larger data centers benefit from its standard, rack-sized footprint, deploying it as a supplemental spot cooler to address both hot spots and high density racks. The small footprint and variable cooling and airflow allow the unit to be initially oversized in anticipation of future IT expansion with minimal footprint or energy consumption penalties. The unit can be applied on both raised and non-raised floors, allowing it to work with existing under floor and overhead cooling systems. The unit is compatible with all forms of aisle containment, but the control algorithms have been optimized for cold aisle containment with Vertiv™ SmartRow™ from Vertiv.

Figure 7.1 Example of High Density Installation with Alternating Cold and Hot Aisles



7.1 Teamwork Unit-to-Unit (U2U)—Coordinated Cooling Operation

The Liebert controls can network the Liebert® CRV CRD10 units and coordinating operation to improve cooling and efficiency. In U2U mode, the networked Liebert® CRV CRD10s share data from the standard temperature sensors to increase or reduce cooling. CRD10 is standard with teamwork function.

7.2 Placing Vertiv™ Liebert® CRV CRD10 Units in Rows of Racks for Efficiency

These are examples of typical Liebert® CRV CRD10 installations. For best performance, observe the following guidelines:

- Create defined hot and cold aisles. Eliminate gaps between server racks and use blanking plates to fill open sections within the racks.
- Install the rack temperature sensors on the front door of all equipment that the Liebert® CRV CRD10 is cooling.
- Use walls or opposing racks to minimize the width of the hot and cold aisles. Target 2 to 6 ft. (0.6 to 1.8 m).

For site specific recommendations on optimizing your space for row based cooling, contact your local Vertiv representative.

Row Placement

The Liebert® CRV CRD10 can be placed either at the end of a row or in between server racks. Locating a Liebert® CRV CRD10 at the end of a row helps to isolate the end of the cold aisle from the surrounding space, protecting it from hot air wrapping around the sides of the aisle. The rack temperature sensors sample supply and return air temperatures.

When deploying multiple Liebert® CRV CRD10 units, we recommend that you install the units at the end of rows with the baffles set to direct cold supply air toward the server equipment (Figure 7.2 below). Depending on row length, heat density and airflow requirements, additional cooling units can be installed throughout the row with their baffles set to direct supply air left and right as it leaves the unit as seen in Figure 7.3 on the facing page.

Cooling unit location within a row becomes less critical when deployed in Vertiv™ SmartRow™ containment, but we recommend that you evenly space Liebert® CRV CRD10s in each row. Using room barriers, such as walls shown in Figure 7.4 on the facing page, and Figure 7.5 on page 48, can be very effective in simulating aisle containment. When the depth of a Liebert® CRV CRD10 and neighboring server rack are not the same, it is important to align the front edges of the unit with the front edges of the neighboring server racks for proper air distribution.

Figure 7.2 One Liebert® CRV CRD10 , Recommended Placement

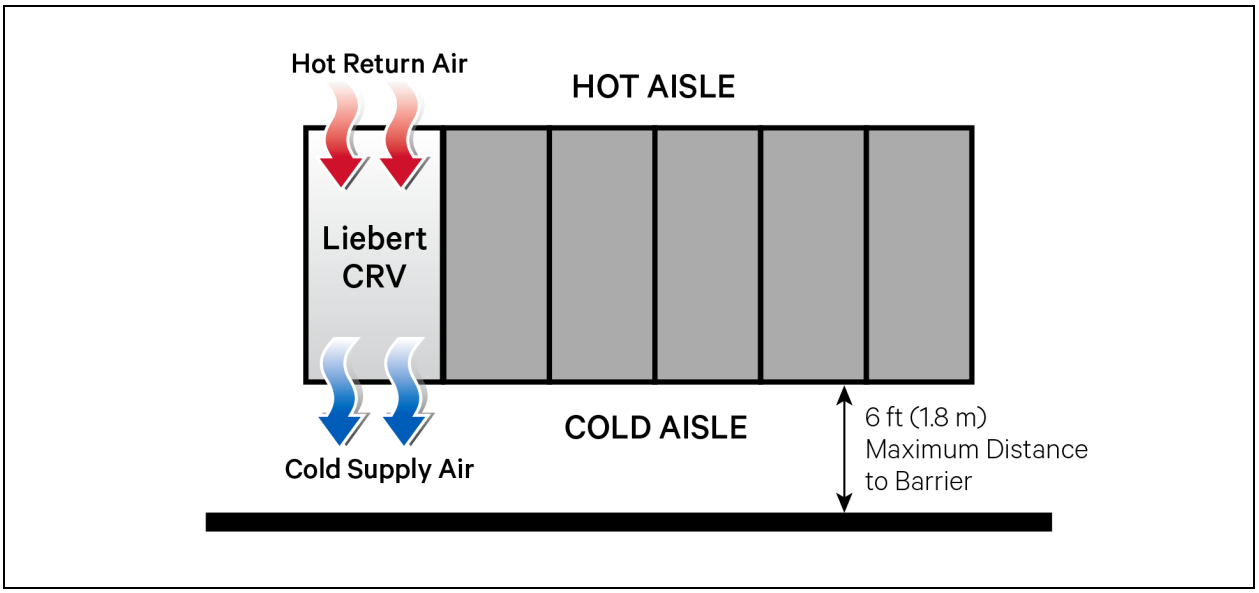


Figure 7.3 One Vertiv™ Liebert® CRV, Alternate Placement

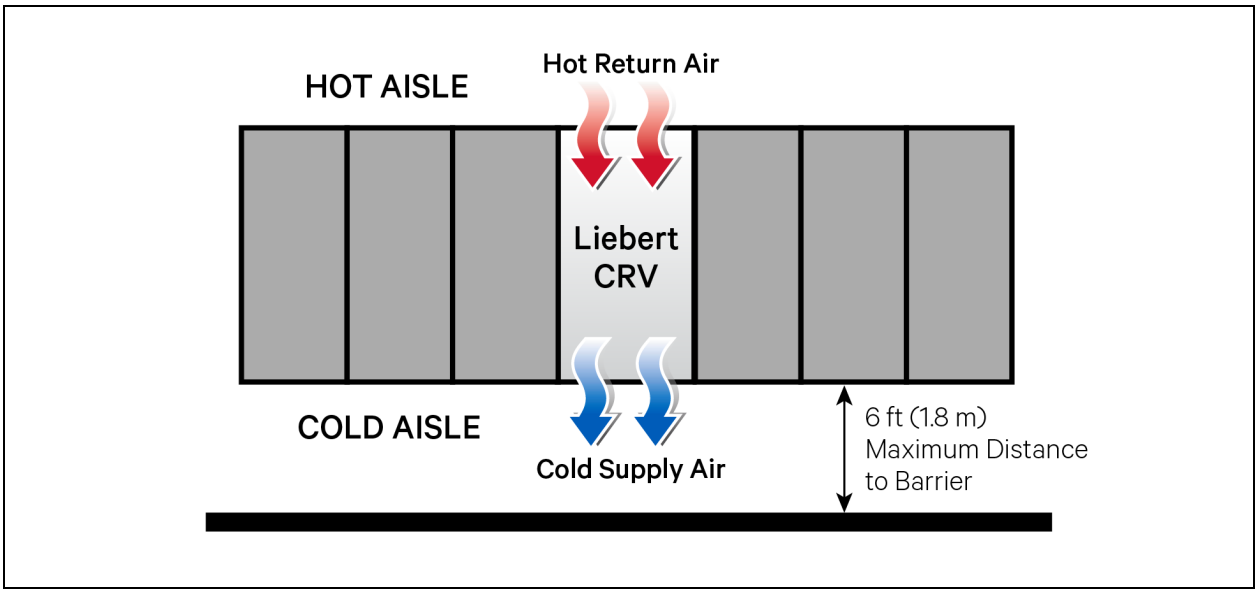


Figure 7.4 Simulated Aisle Containment Using Room Barriers—Single Row

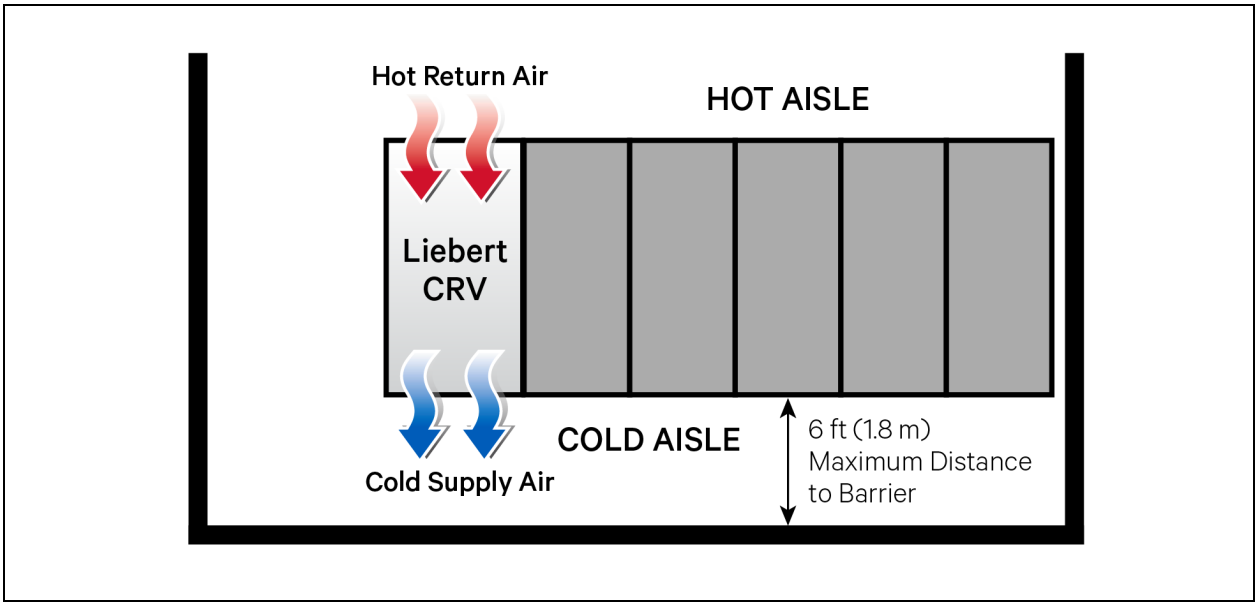
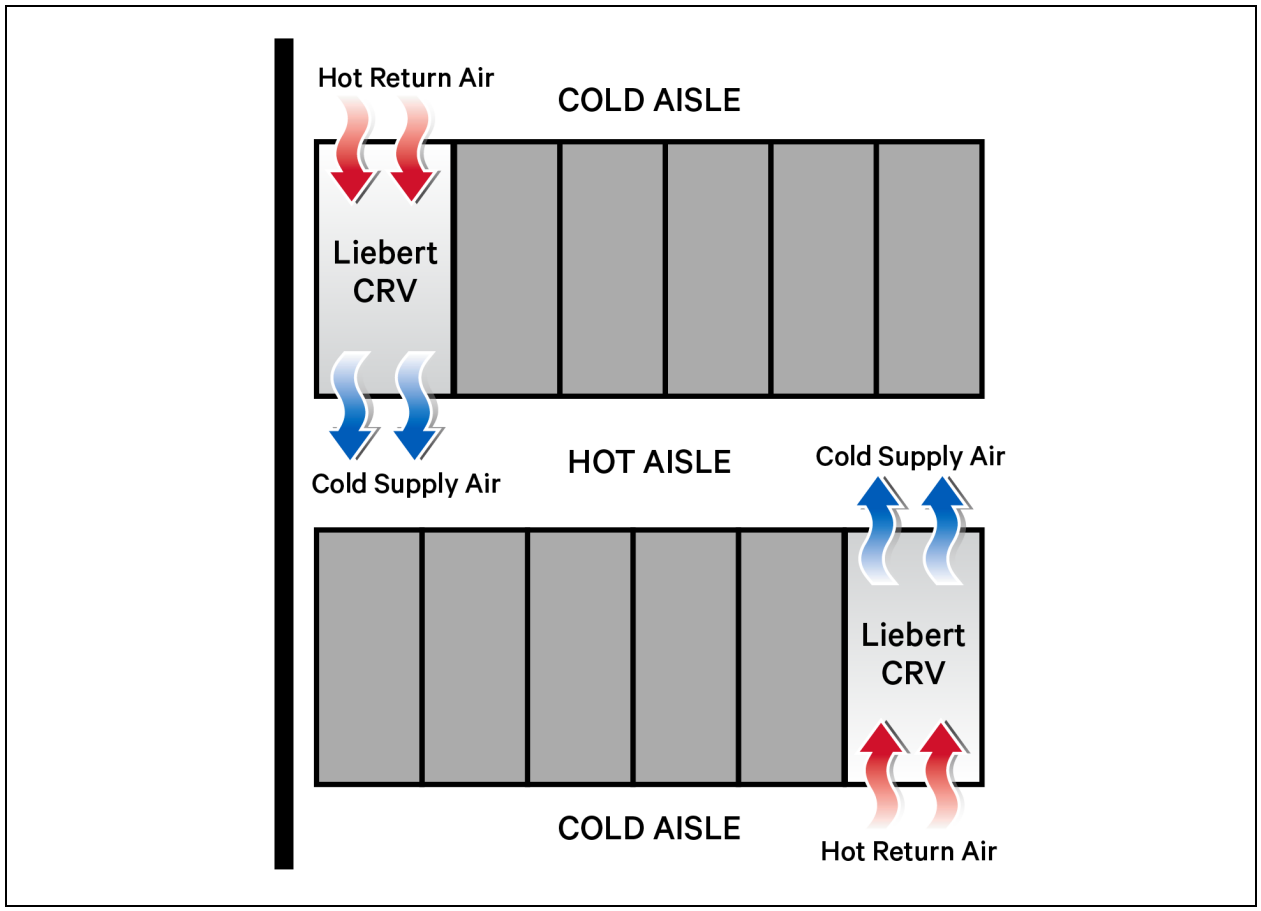


Figure 7.5 Simulated Aisle Containment Using Room Barriers—Multiple Rows

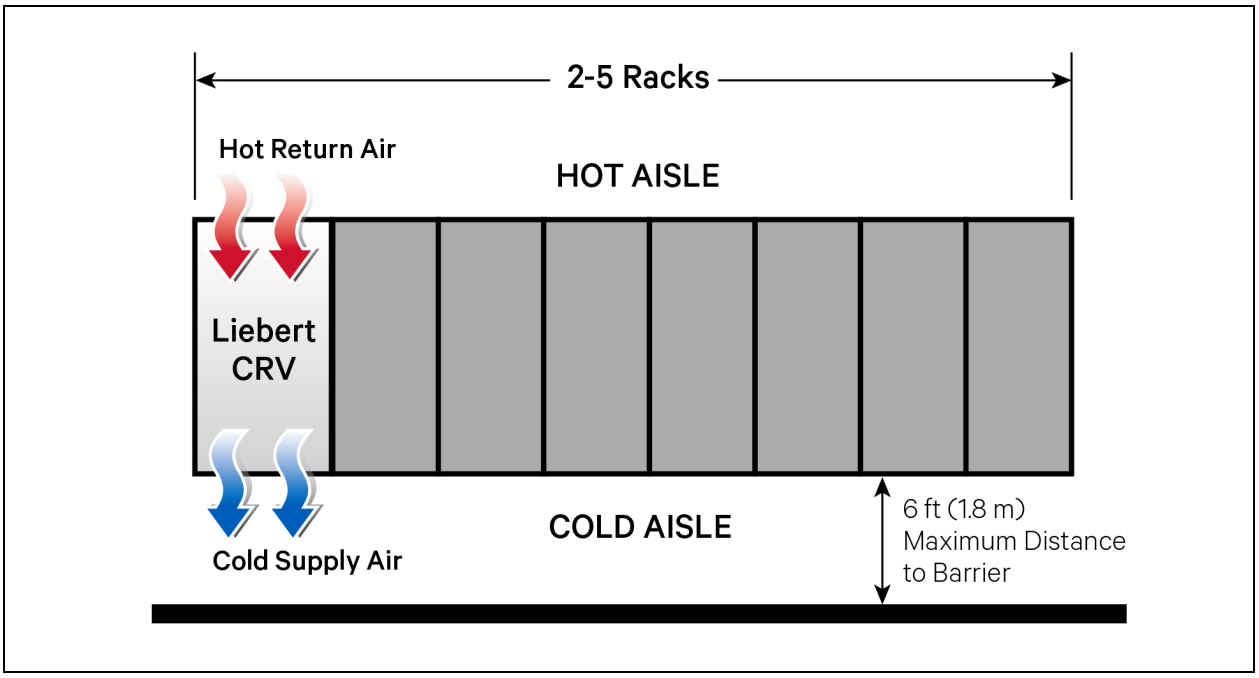


Number of Racks and Row Length

The number of racks that the Vertiv™ Liebert® CRV CRD10 can condition depends on the equipment's heat load and airflow requirements. We recommend that you oversize the Liebert® CRV CRD10 by approximately 20% to account for gaps where cold air is lost through server racks, obstructions (pillars, people, partly open rack doors) reducing air distribution efficiency and error in estimating server equipment heat and airflow requirements. When deployed with Vertiv™ SmartRow™ cold aisle containment, the Liebert® CRV CRD10 can be more closely matched to the server equipment needs.

When the Liebert® CRV CRD10 is significantly oversized, the cooling unit can effectively distribute air four to five racks away. Initially over-sizing the unit allows future data center expansion flexibility with nearly no energy consumption or footprint penalty. The intelligent Vertiv™ Liebert® iCOM™ control and variable system components allow the unit to minimize its operation without sacrificing environmental control.

Figure 7.6 Number of Racks, Row Length

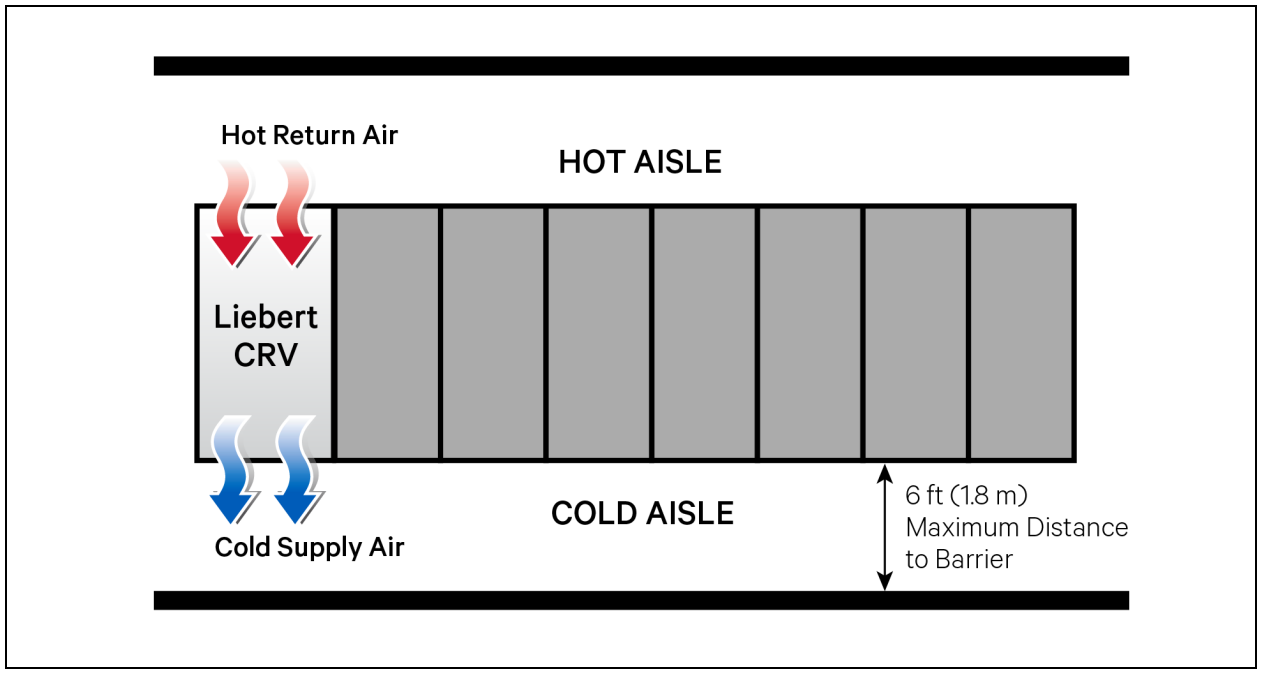


Depth of Hot Aisle and Cold Aisle

For optimal air distribution, use opposing racks or walls to clearly define the hot and cold aisles. This helps create an efficient and effective air circulation path from the cooling unit, to the server racks, and back to the cooling unit helping to avoid loss of cold air to the room and preventing hot air from entering the cold aisle. The supply air baffle is optimized for aisle spacing of 2 to 6 feet wide.

We recommend the Vertiv™ SmartRow™ cold aisle containment system for maximum performance. While the Vertiv™ Liebert® CRV CRD10 is compatible with all forms of aisle containment, its control algorithms are optimized for partial and full cold aisle containment, allowing for increased operating efficiency and reducing the number of rack sensors.

Figure 7.7 Depth of Hot/Cold Aisles



7.3 Redundancy Arrangement

When laying out row based units for redundancy, it is better to run all units at a lower operating level than to shut off extra units. The units must be sufficiently sized to achieve the required cooling capacity if any of the other units within the same row fail. Figure 7.8 below, and Figure 7.9 on the next page, show examples of N+1 redundancy properly applied.

Figure 7.8 Example of an Application with One Row and N+1 Redundancy—Right Side Unit Failed

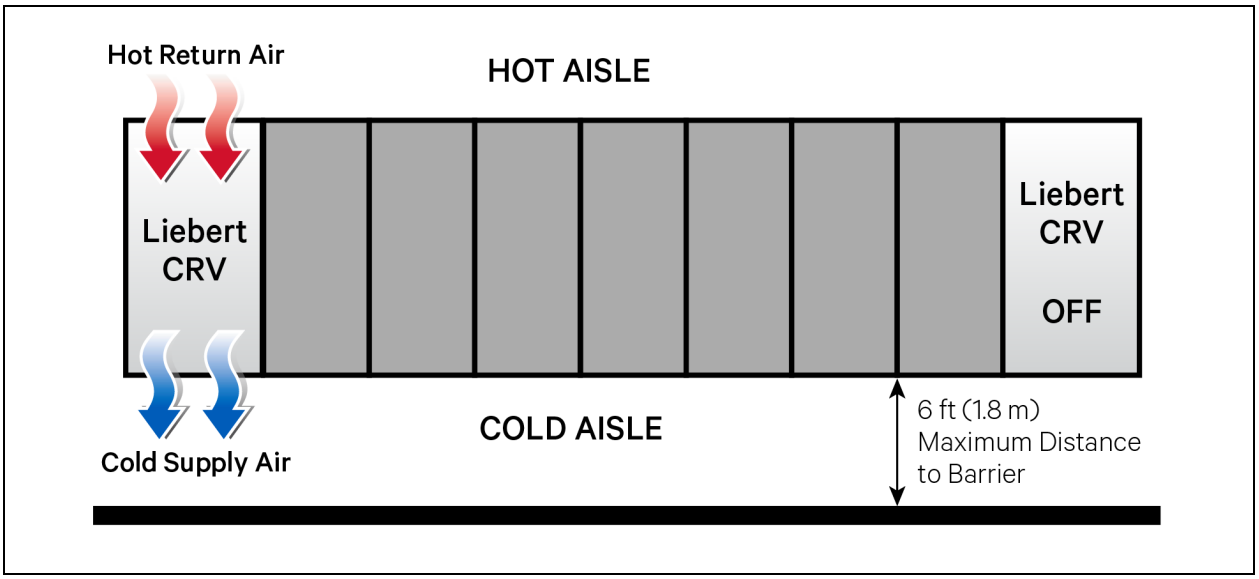
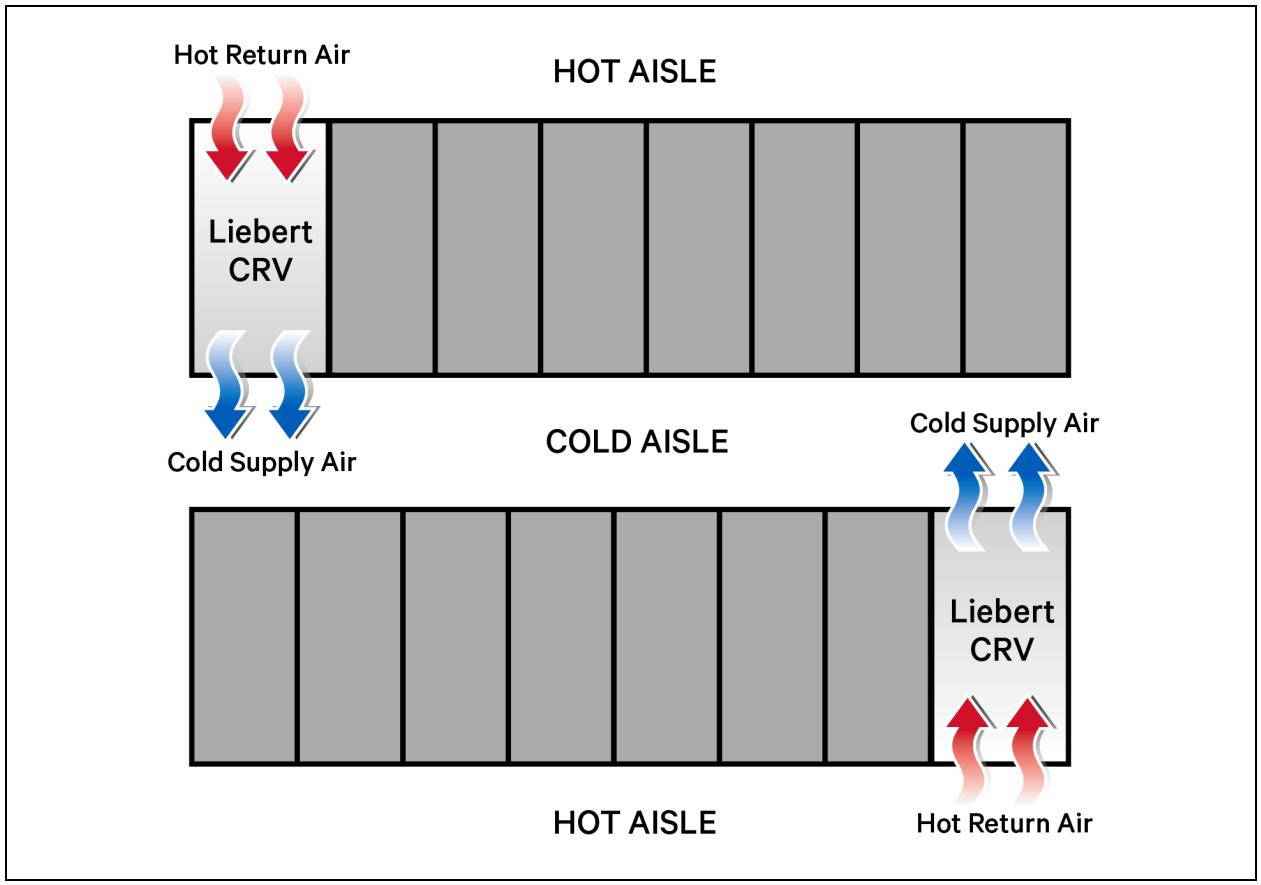


Figure 7.9 Example of an Application with Two Rows and N+1 Redundancy—Unit at Lower Right Failed



7.4 Vertiv™ Liebert® CRV CRD10 Applied in Vertiv™ SmartRow™ Cold Aisle Containment

Using the Liebert® CRV CRD10 with the SmartRow™ is always recommended but not required. It is an excellent solution when attempting to cool widely varying heat loads, loads exceeding 10-kW per rack, and when seeking the highest efficiency systems. For additional information about the SmartRow™, see *www.Vertiv.com*.

Figure 7.10 CRV Placement with SmartRow™ Cold Aisle Containment—Liebert® CRVs in the Center of Two Rows

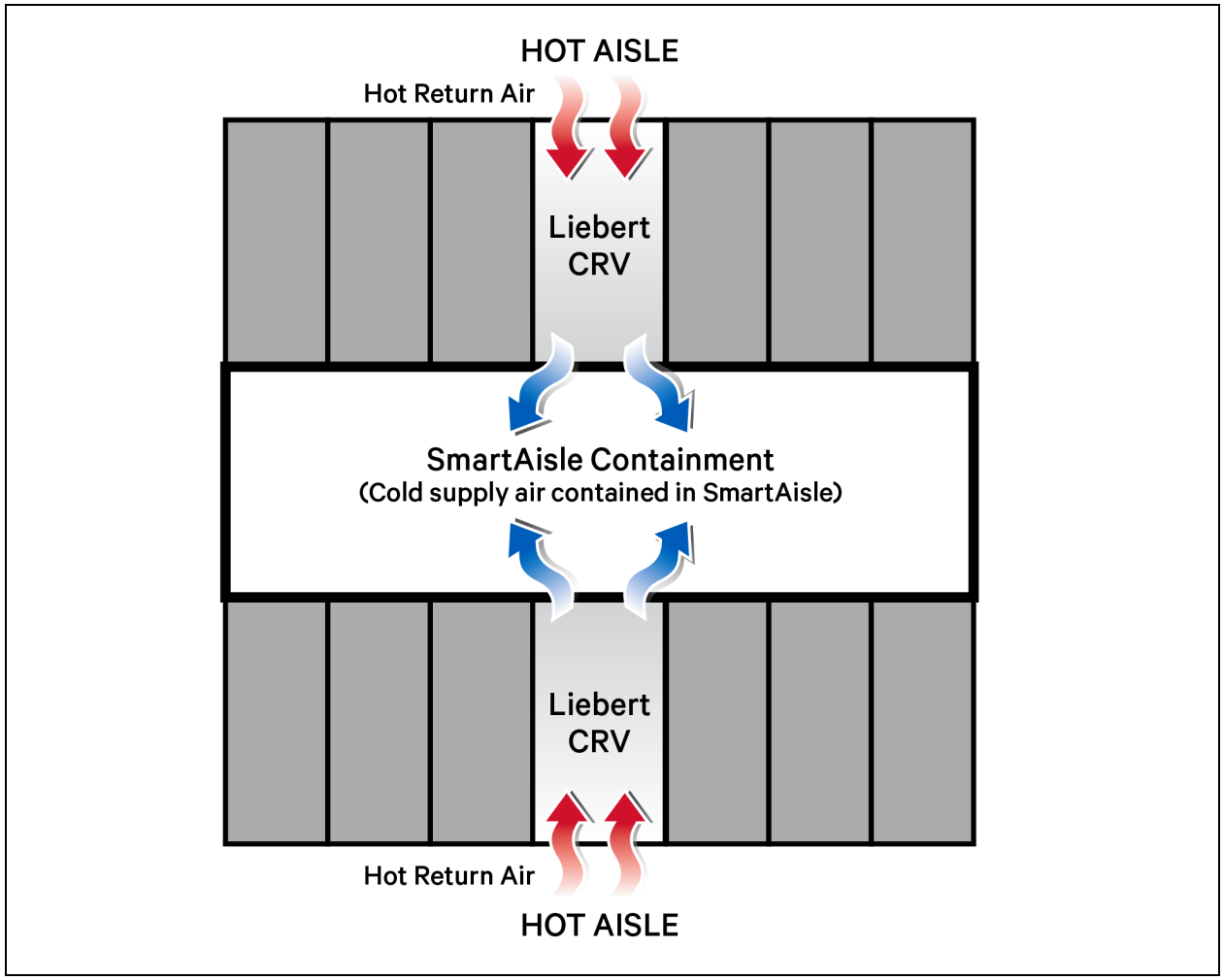
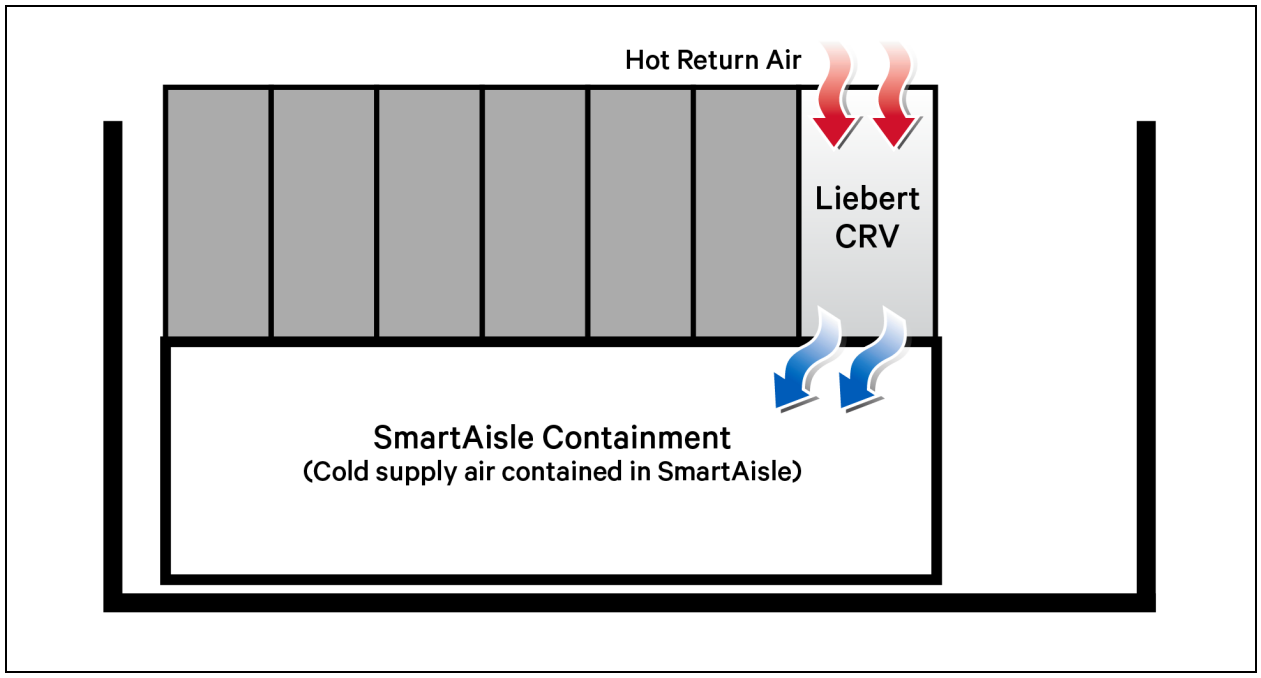


Figure 7.11 Vertiv™ Liebert® CRV Placement with Vertiv™ SmartRow™ Cold Aisle Containment—CRV at the End of One Row



Appendices

Appendix A: Technical Support and Contacts

United States: +1800 543 2378; +1800 543 2778; +1800 222 5877

Europe, the Middle East and Africa: For technical support please contact your local Vertiv or Partner office. You can also contact us using the contact details on our website: https://www.vertiv.com/en-emea/contacts2

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Appendix B: Guide Specifications

Table B.1 Guide Specifications

Sr. No.	Document Name	Region
1	Vertiv™ Liebert® CRV DX 10kW Guide Specifications	NAM
2	Vertiv™ Liebert® CRV DX 10kW Guide Specifications	EMEA

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Appendix C: Submittal Drawings

Table C.1 Submittal Drawing Contents NAM

Document Name	Title
Liebert® CRD10	Cabinet Dimensional Data and Primary Connection Locations
Liebert® CRV Condenser	Cabinet and Anchor Dimensional Data and Electrical Field Connections

Table C.2 Submittal Drawing Contents EMEA

Document Name	Title
Liebert® CRD10	Cabinet Dimensional Data and Primary Connection Locations
Liebert® CRV Condenser	Cabinet and Anchor Dimensional Data and Electrical Field Connections

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Vertiv™ Liebert® CRV DX 10kW

GUIDE SPECIFICATIONS

1 GENERAL

1.1 Summary

These specifications describe requirements for an environmental control system. The system shall be designed to maintain temperature and relative humidity conditions within the row(s) of racks.

1.2 Design Requirements

The environmental control system shall be a Liebert® CRV factory assembled unit. It shall be floor mounted, optimized for maximum cooling capacity in a minimum footprint. The unit shall be UL and AHRI certified.
It shall be specifically designed for service from the front and rear of the unit. The system shall be designed to ensure even air distribution to the entire face area of the coil. Thanks to optional adjustable air supply diffusers, the unit shall be able to mount between the racks or at the end of the row. The unit shall modulate cooling capacity and airflow based on requirements.

CRD100/101 (DX version)
Each system shall be capable of handling up to 1883 SCFM (3200 CMH) with a horizontal airflow pattern. It shall have a net sensible cooling capacity rated no less than 10 kW, based on the entering air condition of 85°F (29.4°C) dry bulb, 32% Relative Humidity, and 95°F (35°C) condensing temperature. These units are to be supplied with 208-230 Volt, 1 phase, 60 Hz power supply of CRD100, with 208-230 Volt, 3 phases, 60Hz of CRD101.

1.3 Submittals

Submittals shall be provided with the proposal and shall include: Dimensional/installation, refrigerant – hydraulic and electrical connections data, refrigerant, and hydraulic circuit's drawings.

1.4 Warranty

The system shall be provided with a warranty against defects in material and quality.

1.5 Quality Assurance

The specified system shall be factory-tested before shipment and designed to meet UL requirements. The system shall be designed and manufactured according to world-class quality standards. The manufacturer shall be ISO 9001 certified.

2 PRODUCT

2.1 COOLING CIRCUITS

The unit shall be equipped with one refrigeration circuit, incorporating DC brushless compressor, evaporator, electronic expansion valve, sight glass, and filter dryer.

The compressor is an R410A double rotor DC inverter-driven type with variable capacity operation from 20%-100%. The compressor has a suction gas-cooled motor, and the system has an automatic reset high-pressure switch, low pressure, and high-pressure transducer, crankcase heater.

The evaporator coil is manufactured from copper tubes and hydrophilic painted aluminum fins, with a galvanized steel condensate drain pan. The evaporator coil has 0.544m^2 face area and three rows. The hydrophilic coating provides superior water carryover resistance.

The electronic expansion valve (EEV) is designed for modulating control of the refrigerant mass flow with precision. The EEV simultaneously collects temperature, and pressure signals regulate the refrigerant flow accurately. The wide operating envelope of EEV also lowers down the condensing pressure, thereby resulting in significant energy savings

2.2 Fan section

The unit is equipped with four axial inverter fans, commonly referred to as EC plug fans. The fan speed is variable and automatically regulated by the controller through all modes of operation. The fans pull air through the coil and are located on the front side of the unit.

2.3 Cabinet and Frame

The exterior 1.0mm thick steel panels are custom powder coated to protect against corrosion. The side panels are equipped with 13mm thick insulation. The unit is mounted with levelling feet. The perforated inlet and outlet panels have 74% open area.

2.4 Air Filtration

The unit is equipped with two air filters rated MERV8/G4, located within the cabinet, and accessible from the rear of the unit. A filter clog alarm is available as an option.

2.5 Refrigerant

The unit is suitable for operation with R410A refrigerant.

2.6 Supply Air Baffle System

A field-adjustable, modular supply air baffle system shall be located in the discharge air stream on the front of the cabinet to direct air toward the equipment racks and balance airflow requirements within the row. The modular baffle segments shall be easily reconfigurable to redirect airflow (left, right, or both sides) as cooling requirements change. Controlling the airflow prevents hot spots and maintains high return air temperatures by not blowing cold air over racks or out the ends of aisles. By focusing the cold air where it is needed, and meeting the servers' requirements, the need for excessive air flow and energy consumption is eliminated.

2.7 Serviceability

The cabinet shall be designed so all components are easily accessible for service and maintenance through either the front or rear of the unit. Units that are not fully accessible from front and rear or not serviceable in place shall be unacceptable.

2.8 Unit Controls

2.8.1 Microprocessor Controller

Liebert® CRV models are controlled by the iCOM Edge controller. The controller board is microprocessor-based. It can be programmed to control the function of every device within the unit via I/O.

The controller allows setting and monitoring of the room parameters. The unit utilizes multiple temperature sensors placed at the rack inlet to ensure management and control of temperature by the rack. Each unit should be connected up to 10 Sensors.
The controller allows setting and monitoring of the following space parameters:

- Air inlet Temperature
- Air supply Temperature (remote sensors at rack inlet)
- Return Temperature set-point
- Supply Temperature set-point
- Return Temperature band
- Supply Temperature band
- Humidity (inlet)
- Humidity set-point
- Humidity band
- Rack Min, Max, and Average temperature

The example of available warnings / alarms:

- High supply temperature
- Low supply temperature
- High return temperature
- Air lost
- High return humidity
- Low return humidity
- High exhaust temperature
- High exhaust lock
- Low exhaust temperature
- Low exhaust lock
- High-pressure alarm
- High-pressure lock
- Low-pressure alarm
- Low-pressure lock
- Low-pressure sensor lock
- Water alarm
- Fan alarm
- Reheat alarm
- Humidity alarm
- Filters alarm
- Filters maintain
- Remote alarm
- etc

The following features are incorporated in the controller:

- Status Report of the latest 500 event-messages of the unit
- Input for remote on-off and volt-free contacts for simple remote monitoring of low and high priority alarms: high/low temperature, high/low refrigerant pressure, fan/control failure, compressor/control failure and others are available
- Automatic restart is provided after a power failure

2.8.2 Display:

LCD Display is 800 × 480 dot colorful touch screen, symbolic representation of unit functions, diagnostics feature. A buzzer provides an audible indication in case of the ‘Warning’ or ‘Alarm’ event.

2.8.3 Remote Shutdown Terminal

It provides the customer with a location to remotely shut down the unit.

2.8.4 Common Alarm Contact

It provides the customer with a set of normally open (n/o) contacts for remote indication of unit alarms.

2.9 Monitoring

The unit shall also include a Monitoring Card, it provides an RJ45 port, a Micro-USB port, an RS-485 port and a Liebert® sensor-network port.
Use the Web UI to monitor intelligent equipment and the environment through the Web server function provided by the Monitoring card.
Use the network management system (NMS) to monitor intelligent equipment and the environment through the SNMP agent function provided by the Monitoring card.
Use the other equipment and 3rd-party systems to monitor intelligent equipment and the environment through the BACnet IP/BACnet MSTP/Modbus TCP/Modbus RTU/SNMP/YDN23 protocols provided by the Monitoring card.

2.10 Condenser (DX Air cooled version only)

The condenser should be constructed from sturdy aluminum structure body, copper tube, and aluminum fins heat exchanger, axial fan and fan speed controller designed & set for use with R410A refrigerant. The condenser should work from 5°F (-15 °C) to 113°F (+45 °C) ambient temperature, 29.2°F (-34 °C) to 113°F (+45 °C) with Low Ambient Kit. The circuit breaker shall be IP20. The entire unit shall be IPX4 type of protection. The motorized fan shall be IP44, protection class B.

2.11 Additional Features as Standard

2.11.1 Condensate Pump

A factory installed condensate pump shall be available as an option. It shall have a capacity of 5.8 L/min at 4m head. It shall be a DC brushless pump, having idling protection and overload protection functions.

2.11.2 Liquid Line Solenoid Kit

Liquid Line Solenoid Kit is a solenoid valve used to prevent refrigerant from condensing into liquid line in condenser and pipe of outdoor when the unit is turned off at the condition of low ambient temperature.

2.11.3 Remote Temperature Sensor

1 piece of Remote Temperature Sensor is a standard accessory compatible with CRD10 units. Each unit can connect with up to a maximum of 10 pieces of remote temperature sensor.

2.11.4 Ramp

CRD units shall be removed from the pallet easily with two pieces of ramp, which are as standard accessories in the package.

Vertiv™ Liebert® CRV DX 10kW

GUIDE SPECIFICATIONS

1 GENERAL

1.1 Summary

These specifications describe requirements for an environmental control system. The system shall be designed to maintain temperature and relative humidity conditions within the row(s) of racks.

1.2 Design Requirements

The environmental control system shall be a Liebert® CRV factory assembled unit. It shall be floor mounted, optimized for maximum cooling capacity in a minimum footprint. The unit shall be CE and EUROVENT certified.
It shall be specifically designed for service from the front and rear of the unit. The system shall be designed to ensure even air distribution to the entire face area of the coil. Thanks to optional adjustable air supply diffusers, the unit shall be able to mount between the racks or at the end of the row. The unit shall modulate cooling capacity and airflow based on requirements.

CRD102 (DX version)
Each system shall be capable of handling up to 3200 CMH with a horizontal airflow pattern. It shall have a net sensible cooling capacity rated no less than 10 kW, based on the entering air condition of 29.4°C dry bulb, 32% Relative Humidity, and 35°C condensing temperature. These units are to be supplied with 230 Volt, 1 phase, 50 Hz. The reheat shall have a capacity of 2kW.

1.3 Submittals

Submittals shall be provided with the proposal and shall include: Dimensional/installation, refrigerant – hydraulic and electrical connections data, refrigerant, and hydraulic circuit's drawings.

1.4 Warranty

The system shall be provided with a warranty against defects in material and quality.

1.5 Quality Assurance

The specified system shall be factory-tested before shipment and designed to meet CE requirements. The system shall be designed and manufactured according to world-class quality standards. The manufacturer shall be ISO 9001 certified.

2 PRODUCT

2.1 COOLING CIRCUITS

The unit shall be equipped with one refrigeration circuit, incorporating DC brushless compressor, evaporator, electronic expansion valve, sight glass, and filter dryer.

The compressor is an R410A double rotor DC inverter-driven type with variable capacity operation from 20%-100%. The compressor has a suction gas-cooled motor, and the system has an automatic reset high-pressure switch, low pressure, and high-pressure transducer, crankcase heater.

The evaporator coil is manufactured from copper tubes and hydrophilic painted aluminum fins, with a galvanized steel condensate drain pan. The evaporator coil has 0.544m^2 face area and three rows. The hydrophilic coating provides superior water carryover resistance.

The electronic expansion valve (EEV) is designed for modulating control of the refrigerant mass flow with precision. The EEV simultaneously collects temperature, and pressure signals regulate the refrigerant flow accurately. The wide operating envelope of EEV also lowers down the condensing pressure, thereby resulting in significant energy savings

2.2 Fan section

The unit is equipped with four axial inverter fans, commonly referred to as EC plug fans. The fan speed is variable and automatically regulated by the controller through all modes of operation. The fans pull air through the coil and are located on the front side of the unit.

2.3 Cabinet and Frame

The exterior 1.0mm thick steel panels are custom powder coated to protect against corrosion. The side panels are equipped with 13mm thick insulation. The unit is mounted with levelling feet. The perforated inlet and outlet panels have 74% open area.

2.4 Air Filtration

The unit is equipped with two air filters rated G4/MERV8, located within the cabinet, and accessible from the rear of the unit. A filter clog alarm is available as an option.

2.5 Refrigerant

The unit is suitable for operation with R410A refrigerant.

2.6 Supply Air Baffle System

A field-adjustable, modular supply air baffle system shall be located in the discharge air stream on the front of the cabinet to direct air toward the equipment racks and balance airflow requirements within the row. The modular baffle segments shall be easily reconfigurable to redirect airflow (left, right, or both sides) as cooling requirements change. Controlling the airflow prevents hot spots and maintains high return air temperatures by not blowing cold air over racks or out the ends of aisles. By focusing the cold air where it is needed, and meeting the servers' requirements, the need for excessive air flow and energy consumption is eliminated.

2.7 Serviceability

The cabinet shall be designed so all components are easily accessible for service and maintenance through either the front or rear of the unit. Units that are not fully accessible from front and rear or not serviceable in place shall be unacceptable.

2.8 Unit Controls

2.8.1 Microprocessor Controller

Liebert® CRV models are controlled by the iCOM Edge controller. The controller board is microprocessor-based. It can be programmed to control the function of every device within the unit via I/O.

The controller allows setting and monitoring of the room parameters. The unit utilizes multiple temperature sensors placed at the rack inlet to ensure management and control of temperature by the rack. Each unit should be connected up to 10 Sensors.
The controller allows setting and monitoring of the following space parameters:

- Air inlet Temperature
- Air supply Temperature (remote sensors at rack inlet)
- Return Temperature set-point
- Supply Temperature set-point
- Return Temperature band
- Supply Temperature band
- Humidity (inlet)
- Humidity set-point
- Humidity band
- Rack Min, Max, and Average temperature

The example of available warnings / alarms:

- High supply temperature
- Low supply temperature
- High return temperature
- Air lost
- High return humidity
- Low return humidity
- High exhaust temperature
- High exhaust lock
- Low exhaust temperature
- Low exhaust lock
- High-pressure alarm
- High-pressure lock
- Low-pressure alarm
- Low-pressure lock
- Low-pressure sensor lock
- Water alarm
- Fan alarm
- Reheat alarm
- Humidity alarm
- Filters alarm
- Filters maintain
- Remote alarm
- etc

The following features are incorporated in the controller:

- Status Report of the latest 500 event-messages of the unit
- Input for remote on-off and volt-free contacts for simple remote monitoring of low and high priority alarms: high/low temperature, high/low refrigerant pressure, fan/control failure, compressor/control failure, and others are available
- Automatic restart is provided after a power failure

2.8.2 Display:

- LCD Display is 800 × 480 dot colorful touch screen, symbolic representation of unit functions, diagnostics feature. A buzzer provides an audible indication in case of the ‘Warning’ or ‘Alarm’ event.

2.8.3 Remote Shutdown Terminal

It provides the customer with a location to remotely shut down the unit.

2.8.4 Common Alarm Contact

It provides the customer with a set of normally open (n/o) contacts for remote indication of unit alarms.

2.9 Monitoring

The unit shall also include a Monitoring Card. It provides an RJ45 port, a Micro-USB port, an RS-485 port and a Liebert® sensor-network port.
Use the Web UI to monitor intelligent equipment and the environment through the Web server function provided by the Monitoring card.
Use the network management system (NMS) to monitor intelligent equipment and the environment through the SNMP agent function provided by the Monitoring card.
Use the other equipment and 3rd-party systems to monitor intelligent equipment and the environment through the BACnet IP/BACnet MSTP/Modbus TCP/Modbus RTU/SNMP/YDN23 protocols provided by the Monitoring card.

2.10 Condenser (DX Air cooled version only)

The condenser should be constructed from sturdy aluminum structure body, copper tube, and aluminum fins heat exchanger, axial fan and fan speed controller designed & set for use with R410A refrigerant. The condenser should work from -15 °C (5°F) to +45 °C (113°F) ambient temperature, -34 °C (29.2°F) to +45 °C (113°F) with Low Ambient Kit. The circuit breaker shall be IP20. The entire unit shall be IPX4 type of protection. The motorized fan shall be IP44, protection class B.

2.11 Additional Features as Standard

2.11.1 Electric Re-heat

CRD102 unit shall be equipped with single-step electric heater. The heater element should be a PTC heater with a sound overheat protection function. Heater capacity should be 2kW.

2.11.2 Condensate Pump

A factory installed condensate pump shall be available as an option. It shall have a capacity of 5.8 L/min at 4m head. It shall be a DC brushless pump, having idling protection and overload protection functions.

2.11.3 Liquid Line Solenoid Kit

Liquid Line Solenoid Kit is a solenoid valve used to prevent refrigerant from condensing into liquid line in condenser and pipe of outdoor when the unit is turned off at the condition of low ambient temperature.

2.11.4 Remote Temperature Sensor

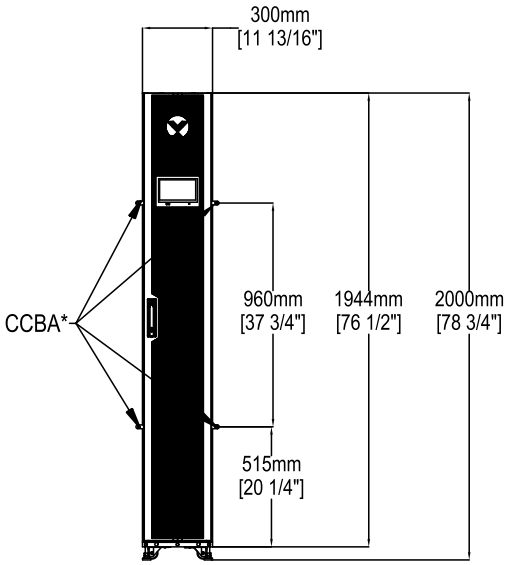
1 piece of Remote Temperature Sensor is a standard accessory compatible with CRD10 units. Each unit can connect with up to a maximum of 10 pieces of remote temperature sensor.

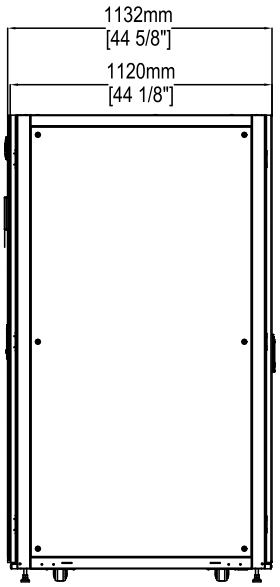
2.11.5 Ramp

CRD units shall be removed from the pallet easily with two pieces of ramp, which are as standard accessories in the package.

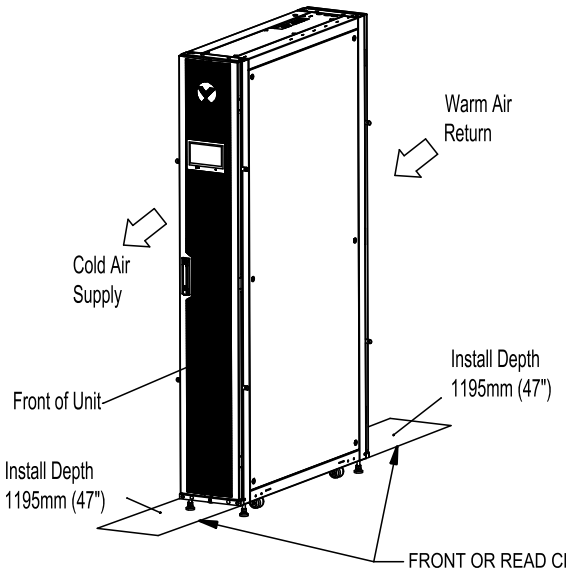
LIEBERT CRD10

CABINET DIMENSIONAL DATA (42U)





* Cabinet Connection Bracket Angle height



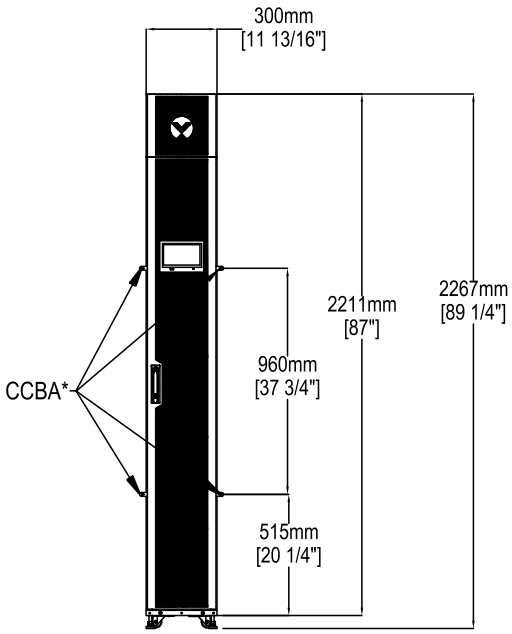
FRONT OR READ CLEARANCE REQUIRED FOR INSTALLATION OF CRD10 UNIT BETWEEN RACKS ALREADY INSTALLED IN THE ROW. 915MM (36") CLEARANCE REQUIRED IN BOTH FRONT AND BACK FOR SERVICE ACCESS.

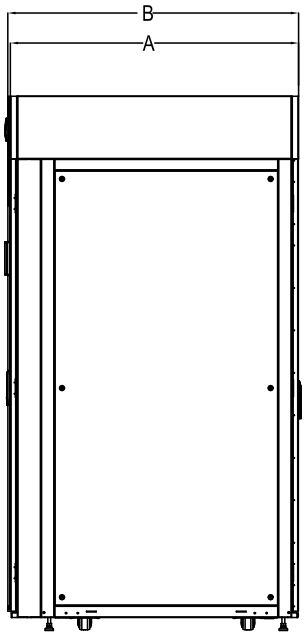
MODEL #	MODULE WEIGHT kg (lb) net
CRD10	231(509)

REV : 0
REV DATE : 11/20

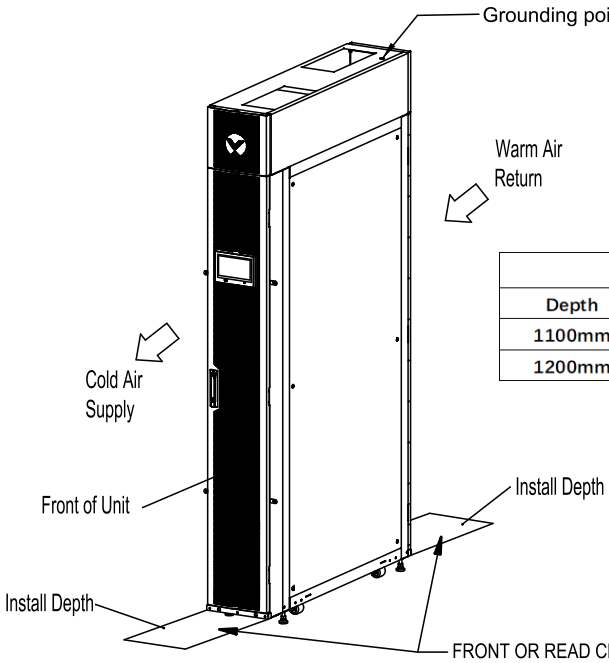
LIEBERT CRD10

CABINET DIMENSIONAL DATA (48U)





* Cabinet Connection Bracket Angle height



CABINET DIMENSIONAL DATA (48U)			
Depth	A	B	Install Depth
1100mm	1120mm (44 1/8")	1132mm (44 5/8")	1195mm (47")
1200mm	1220mm (48")	1232mm (48 1/2")	1295mm (51")

FRONT OR READ CLEARANCE REQUIRED FOR INSTALLATION OF CRD10 UNIT BETWEEN RACKS ALREADY INSTALLED IN THE ROW. 915MM (36") CLEARANCE REQUIRED IN BOTH FRONT AND BACK FOR SERVICE ACCESS.

MODEL #	MODULE WEIGHT kg (lb) net
CRD10	236(520)

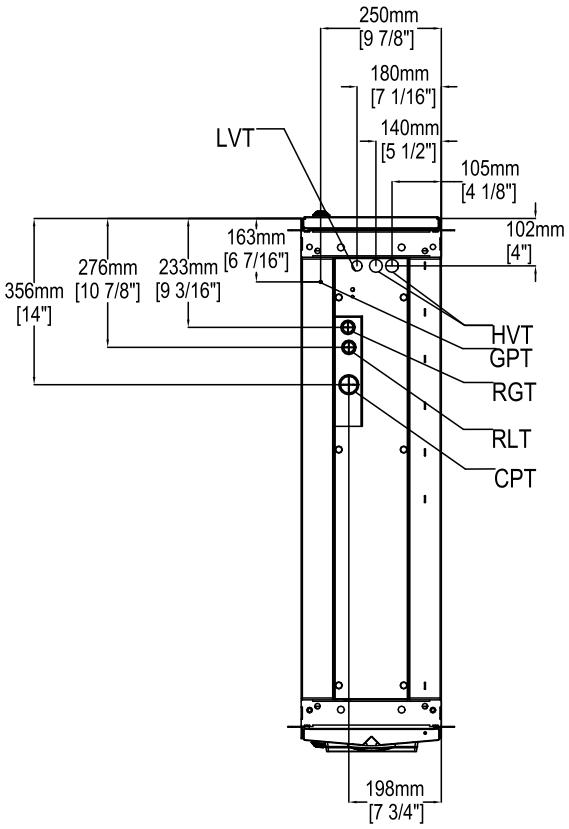
REV : 0
REV DATE : 11/20

LIEBERT CRD10

PRIMARY CONNECTION LOCATIONS

PIPING AND ELECTRICAL CONNECTIONS AVAILABLE AT THE TOP AND BOTTOM OF UNIT

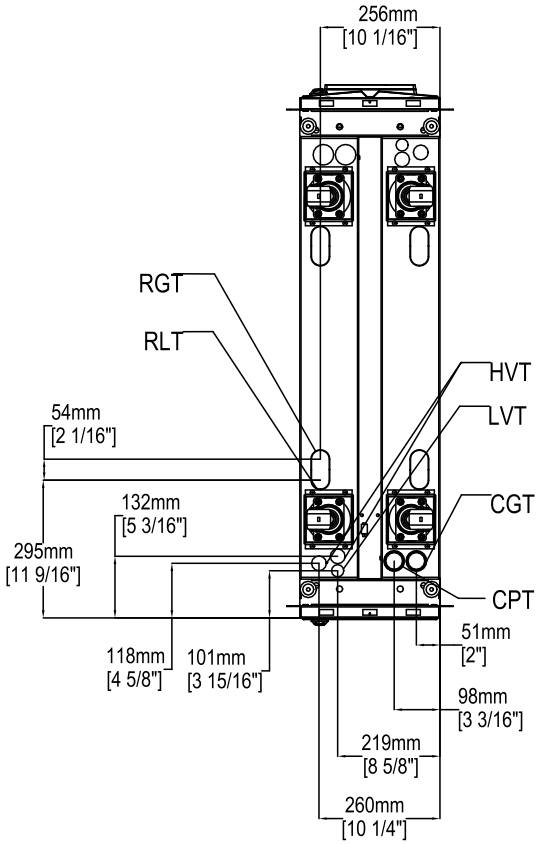
TOP CONNECTIONS



FRONT OF UNIT

BOTTOM CONNECTIONS

FRONT OF UNIT

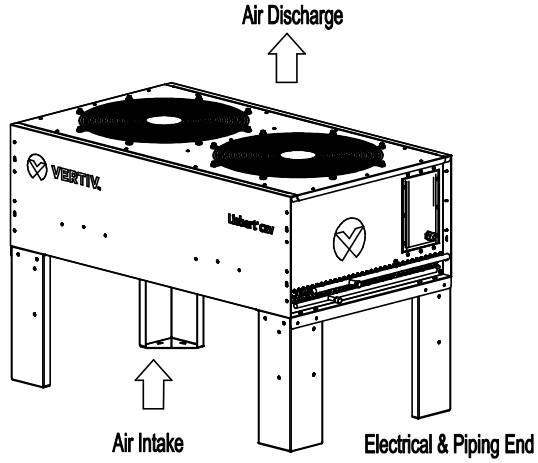


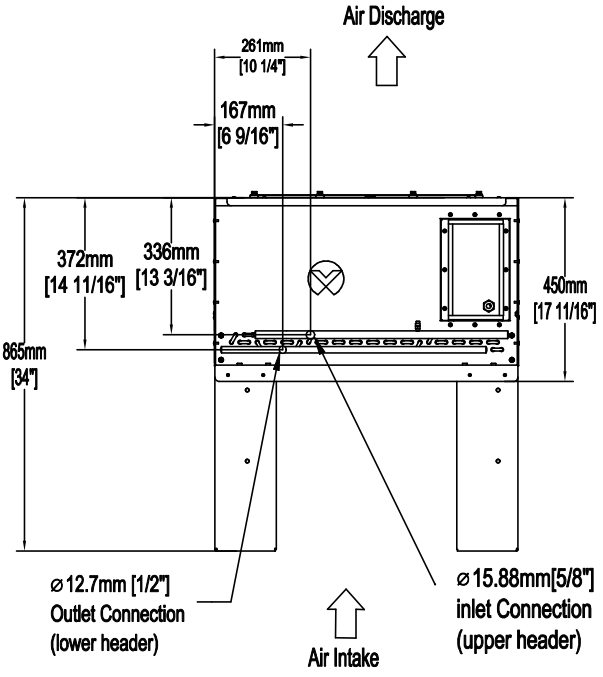
UNIT TOP CONNECTIONS			UNIT BOTTOM CONNECTIONS		
RLT	Refrigerant Liquid Line Inlet	1/2" O.D. Copper Sweat	RLT	Refrigerant Liquid Line Inlet	1/2" O.D. Copper
RGT	Refrigerant Gas Line Outlet	5/8" O.D. Copper Sweat	RGT	Refrigerant Gas Line Outlet	5/8" O.D. Copper
CPT	Condensate Pump	1/2" NPTF FEMALE	CPT	Condensate Pump	1/2" NPTF FEMALE
HVT	High Voltage Top Connection	Combination Knockout 1-1/8" (29 mm)	HVT	High Voltage Bottom Connection	Combination Knockout 1-1/8" (29 mm)
LVT	Low Voltage Top Connection	Knockout Hole Diameter 7/8" (22 mm)	LVT	Low Voltage Bottom Connection	Knockout Hole Diameter 7/8" (22 mm)
GPT	Grounding Point	Thread hole M8	CGT	Condensate Gravity	1/2" NPTF FEMALE

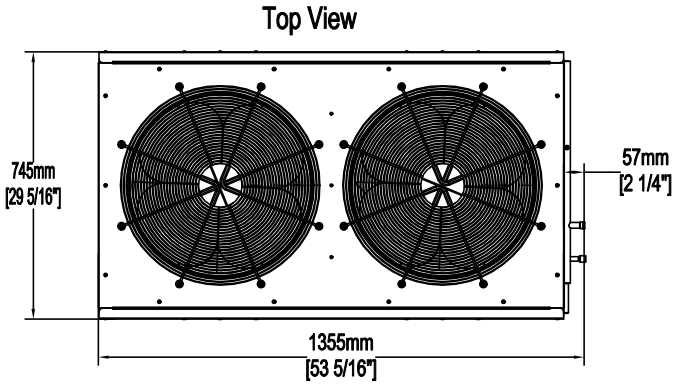
REV : 0
REV DATE : 11/20

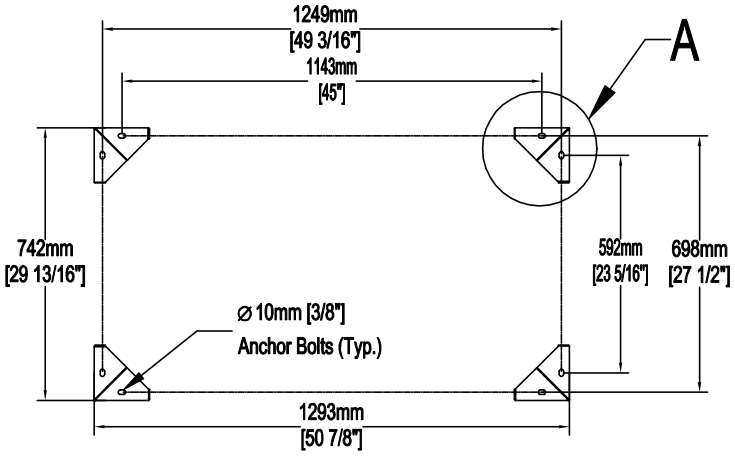
LIEBERT CRV CONDENSER

CABINET & ANCHOR DIMENSIONAL DATA (VERTICAL AIRFLOW)

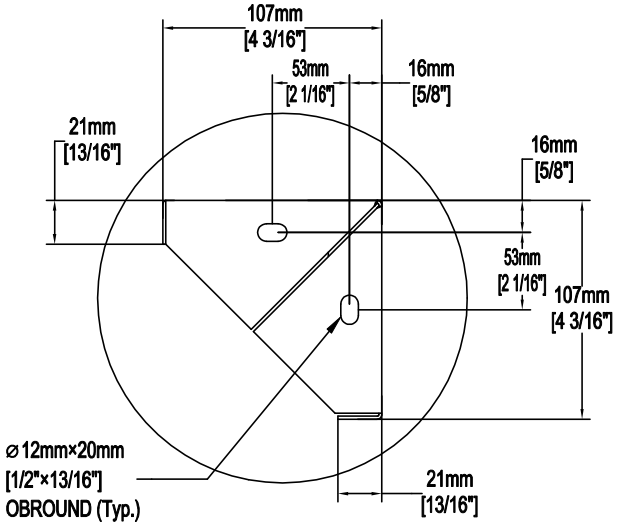








Unit Anchor Plan



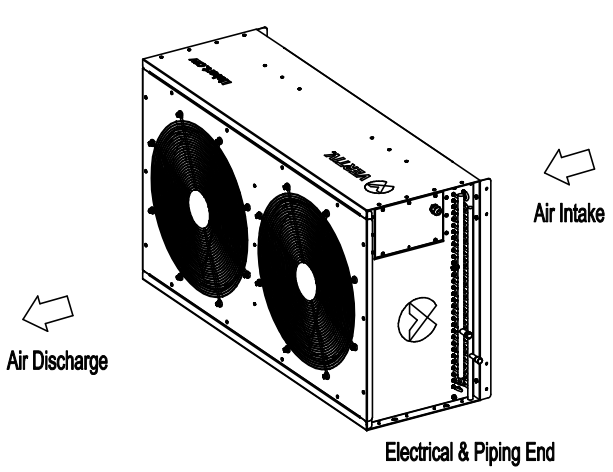
DETAIL A

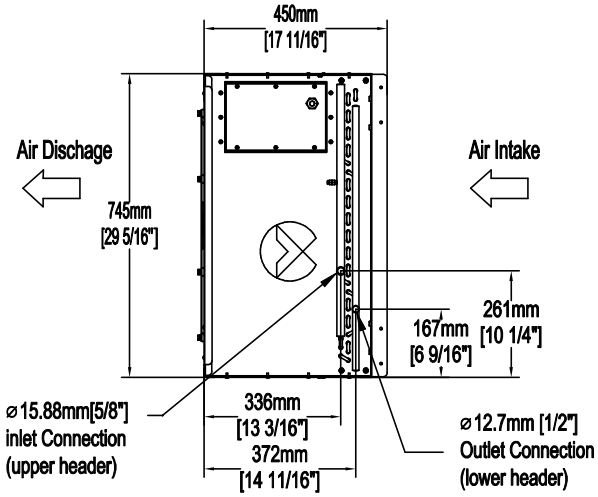
MODEL #	MODULE WEIGHT kg (lb) net
60 HZ	
CCD100S	56(123)

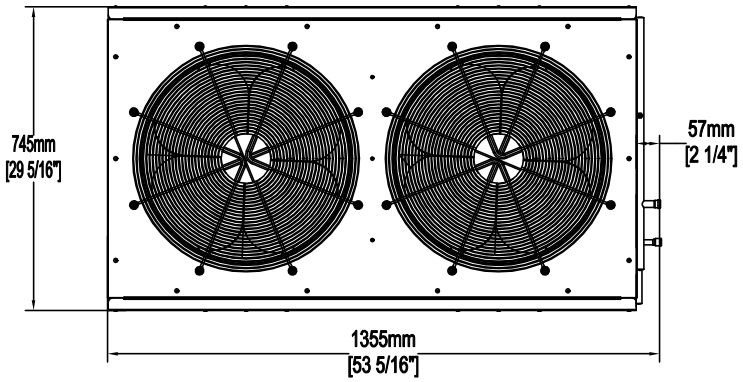
REV : 0
REV DATE : 08/30

LIEBERT CRV CONDENSER

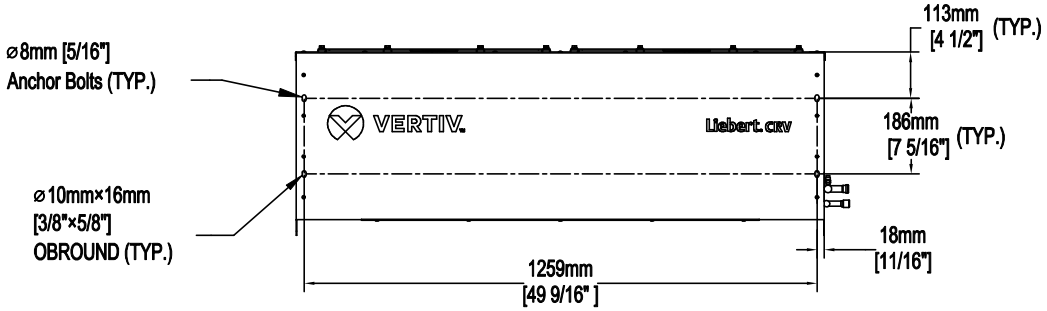
CABINET & ANCHOR DIMENSIONAL DATA (HORIZONTAL AIRFLOW)







Top View



Bottom View

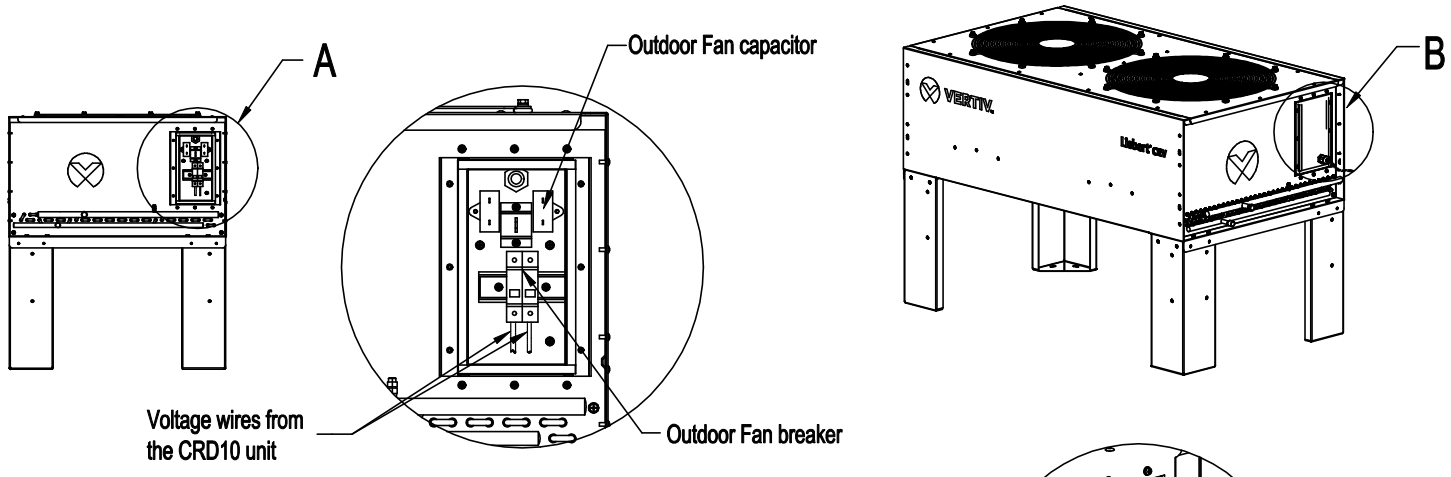
Unit Anchor Plan

MODEL #	MODULE WEIGHT kg (lb) net
60 HZ	
CCD100S	56(123)

REV : 0
REV DATE : 08/30

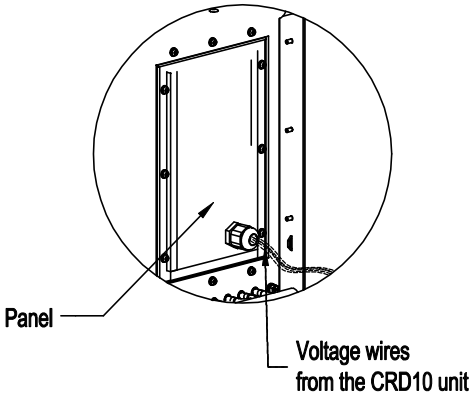
LIEBERT CRV CONDENSER

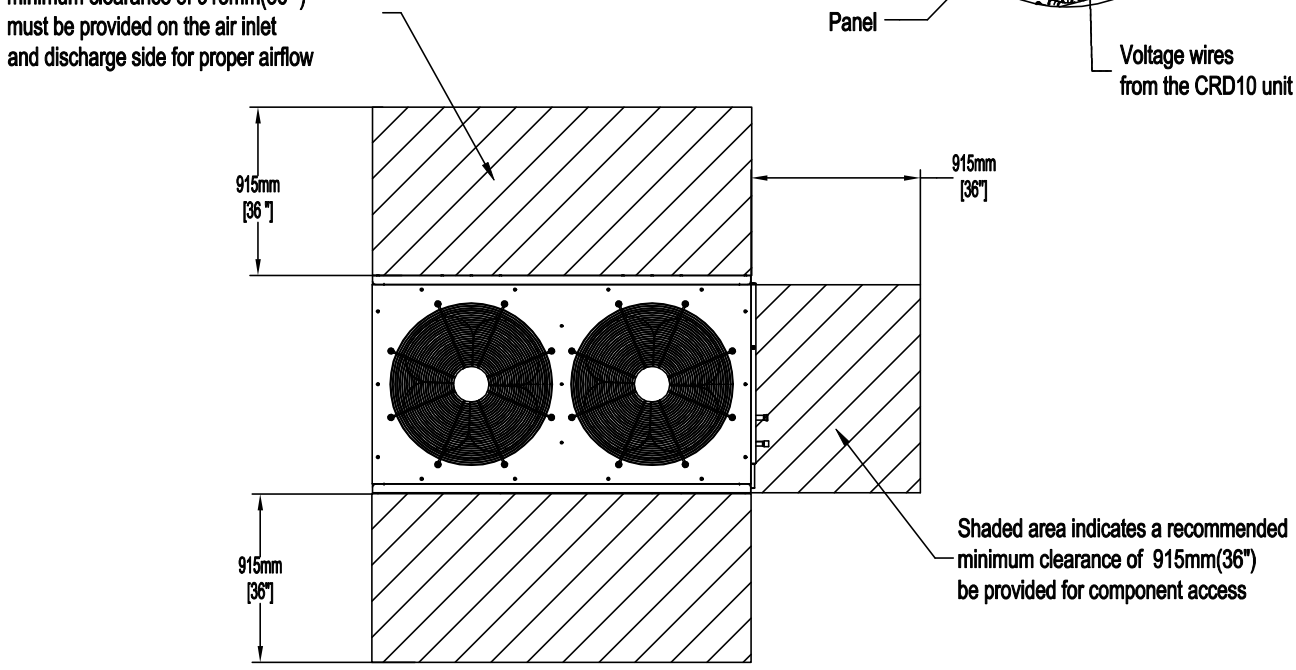
ELECTRICAL FIELD CONNECTIONS



DETAIL A

Electrical & Piping End [Panel removed for clarity]



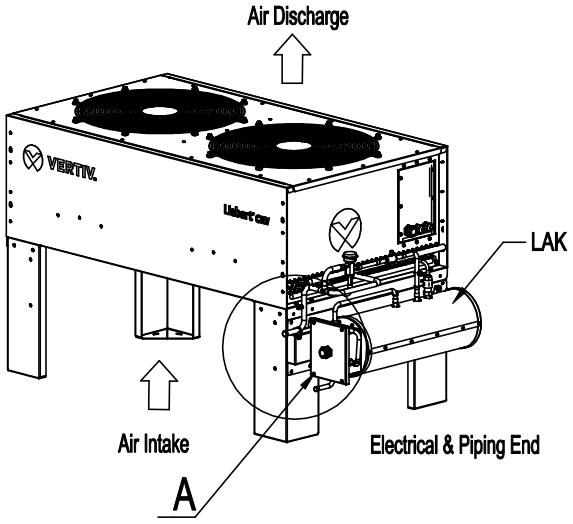


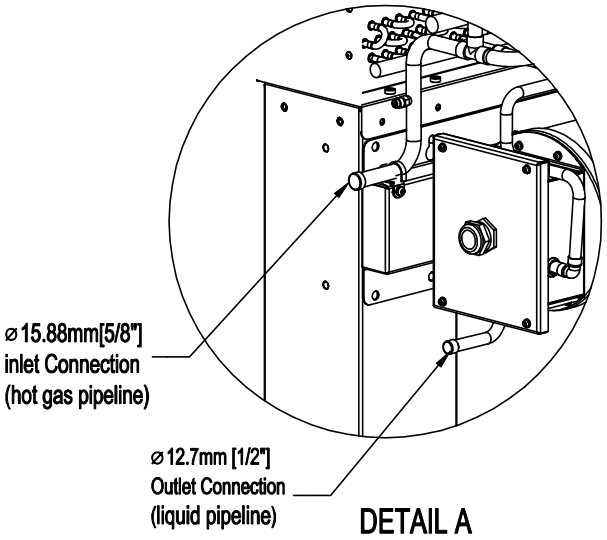
Top View

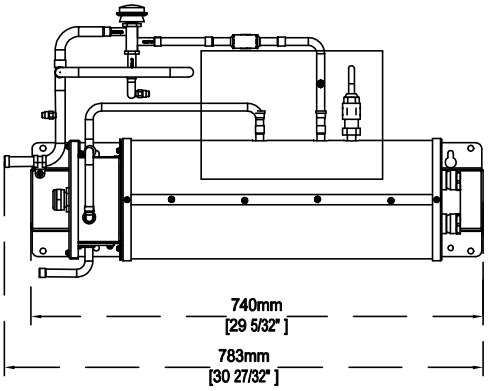
REV : 0
REV DATE : 08/30

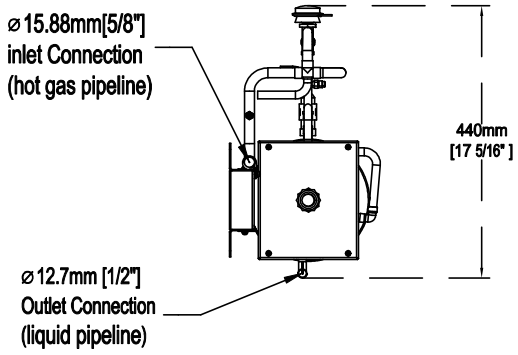
LIEBERT CRV CONDENSER

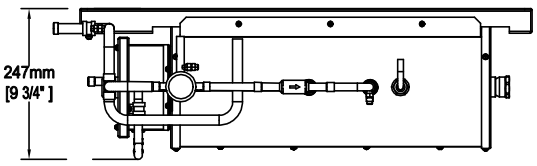
CABINET WITH LAK DIMENSIONAL DATA (VERTICAL AIRFLOW)

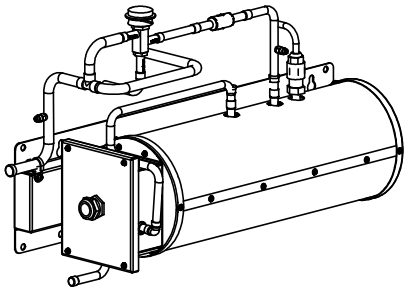








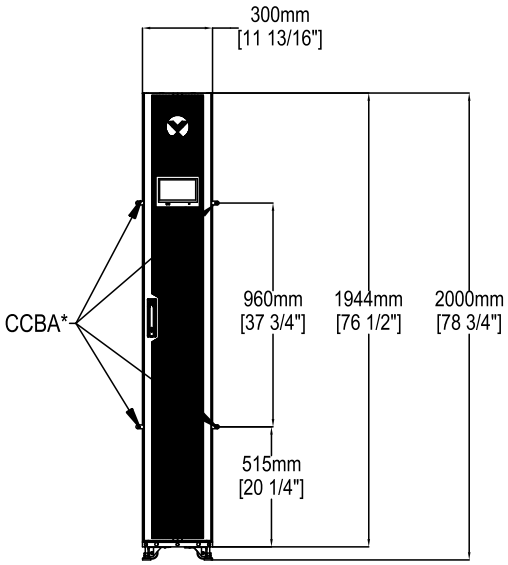


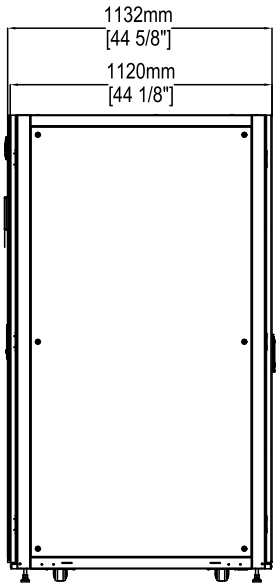


REV : 0
REV DATE : 08/30

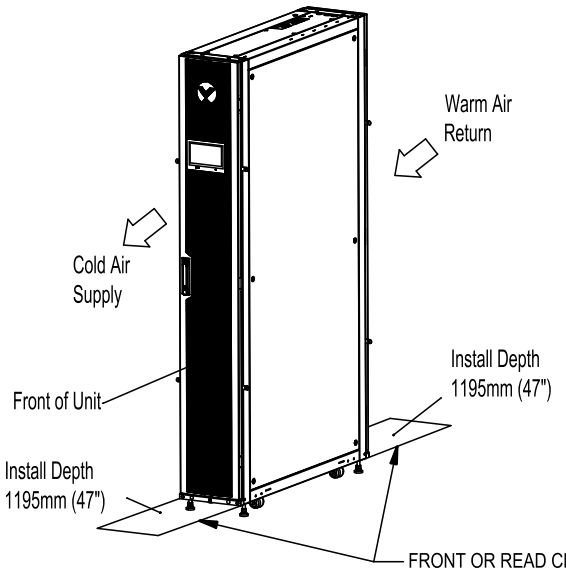
LIEBERT CRD10

CABINET DIMENSIONAL DATA (42U)





* Cabinet Connection Bracket Angle height



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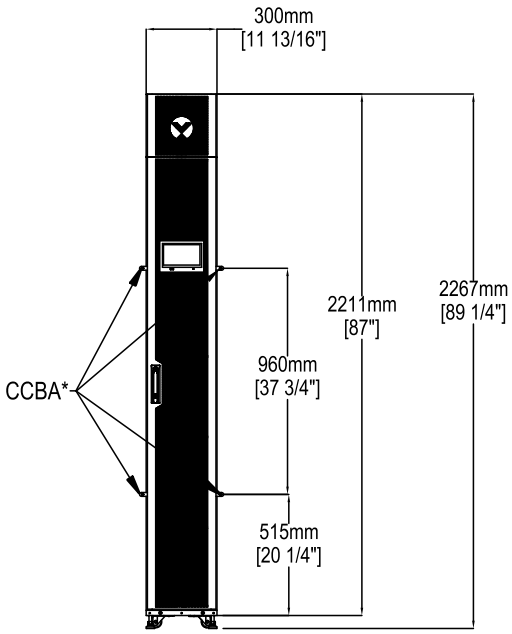
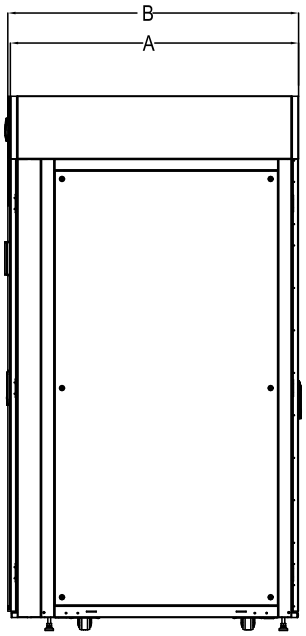
MODEL #	MODULE WEIGHT kg (lb) net
CRD10	231(509)

REV : 0
REV DATE : 11/20

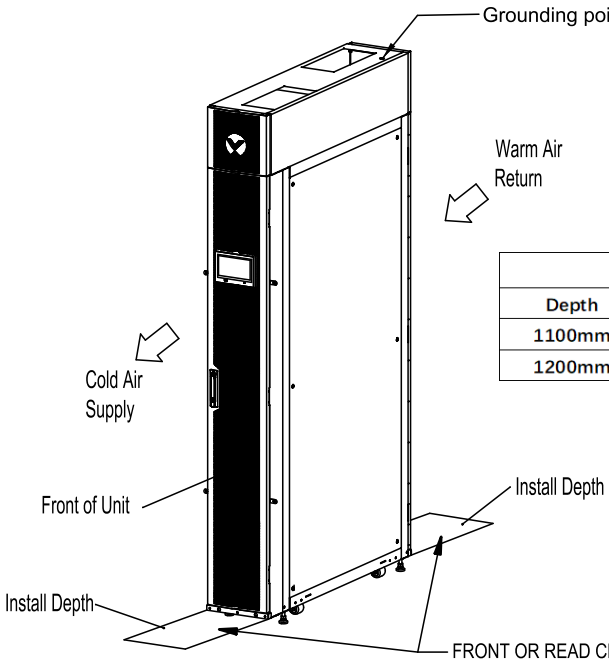
LIEBERT CRD10

CABINET DIMENSIONAL DATA (48U)





* Cabinet Connection Bracket Angle height



CABINET DIMENSIONAL DATA (48U)			
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MODEL #	MODULE WEIGHT kg (lb) net
CRD10	236(520)

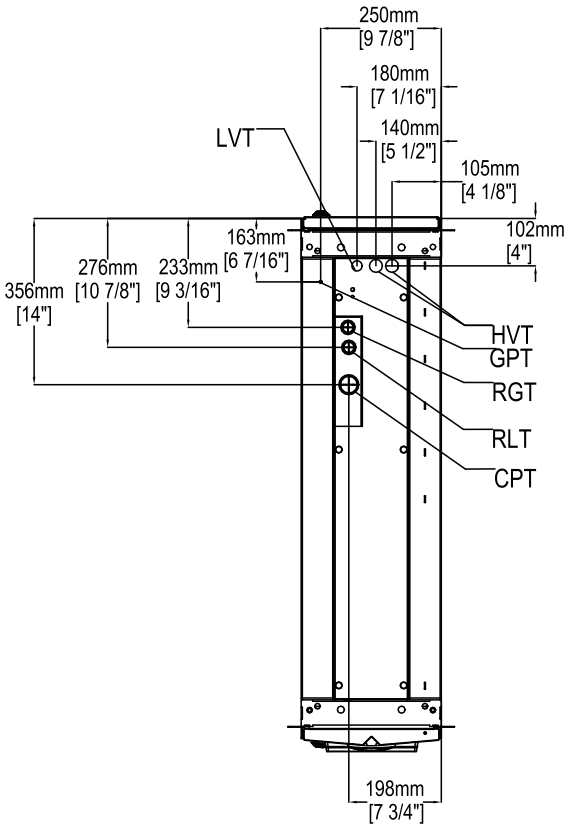
REV : 0
REV DATE : 11/20

LIEBERT CRD10

PRIMARY CONNECTION LOCATIONS

PIPING AND ELECTRICAL CONNECTIONS AVAILABLE AT THE TOP AND BOTTOM OF UNIT

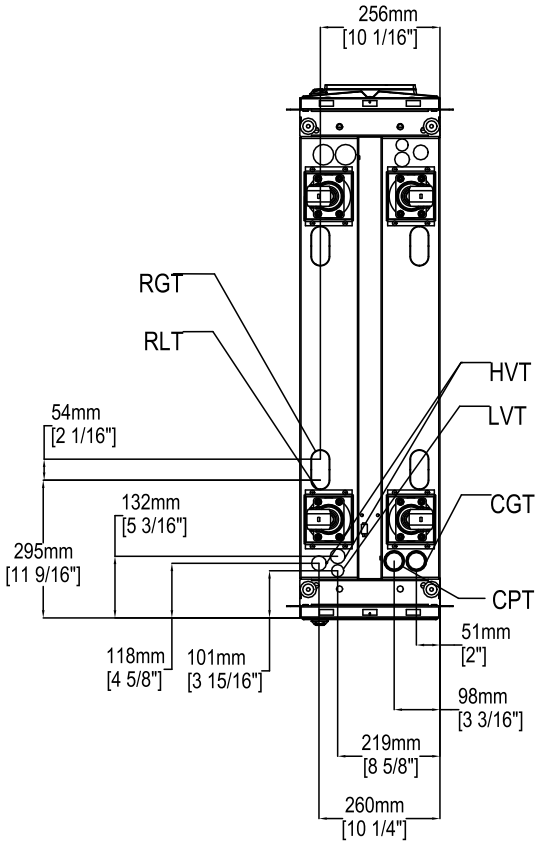
TOP CONNECTIONS



FRONT OF UNIT

BOTTOM CONNECTIONS

FRONT OF UNIT

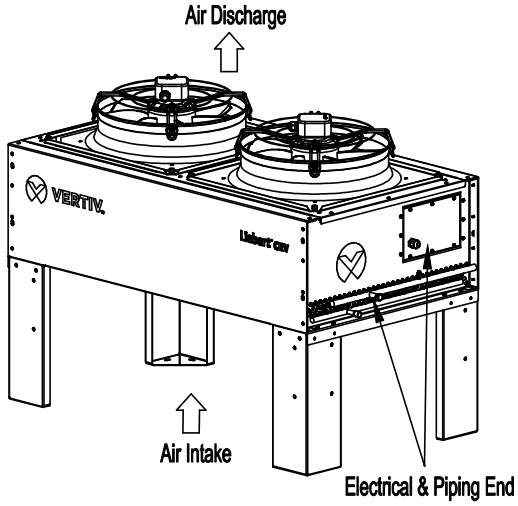


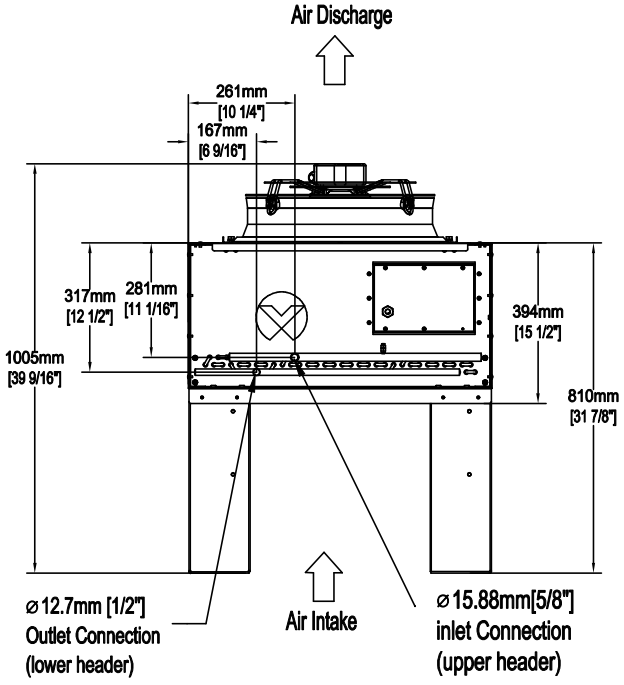
UNIT TOP CONNECTIONS			UNIT BOTTOM CONNECTIONS		
RLT	Refrigerant Liquid Line Inlet	1/2" O.D. Copper Sweat	RLT	Refrigerant Liquid Line Inlet	1/2" O.D. Copper
RGT	Refrigerant Gas Line Outlet	5/8" O.D. Copper Sweat	RGT	Refrigerant Gas Line Outlet	5/8" O.D. Copper
CPT	Condensate Pump	1/2" NPTF FEMALE	CPT	Condensate Pump	1/2" NPTF FEMALE
HVT	High Voltage Top Connection	Combination Knockout 1-1/8" (29 mm)	HVT	High Voltage Bottom Connection	Combination Knockout 1-1/8" (29 mm)
LVT	Low Voltage Top Connection	Knockout Hole Diameter 7/8" (22 mm)	LVT	Low Voltage Bottom Connection	Knockout Hole Diameter 7/8" (22 mm)
GPT	Grounding Point	Thread hole M8	CGT	Condensate Gravity	1/2" NPTF FEMALE

REV : 0
REV DATE : 11/20

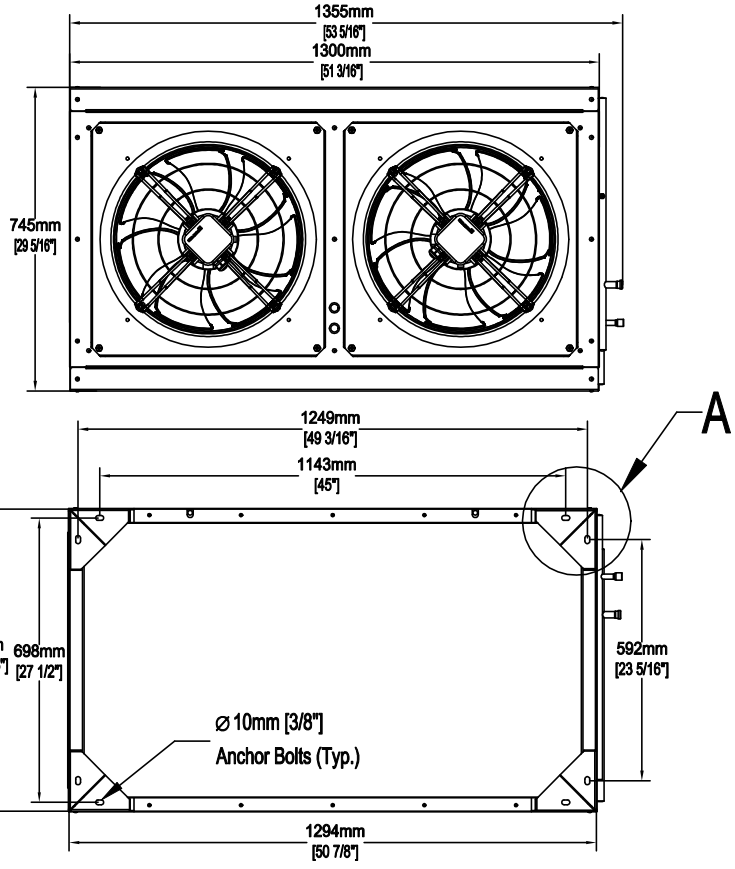
LIEBERT CRV CONDENSER

CABINET & ANCHOR DIMENSIONAL DATA (VERTICAL AIRFLOW)

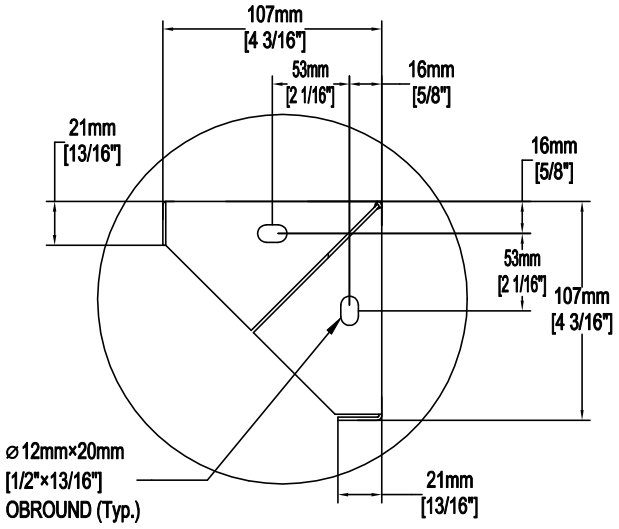




Top View



Unit Anchor Plan



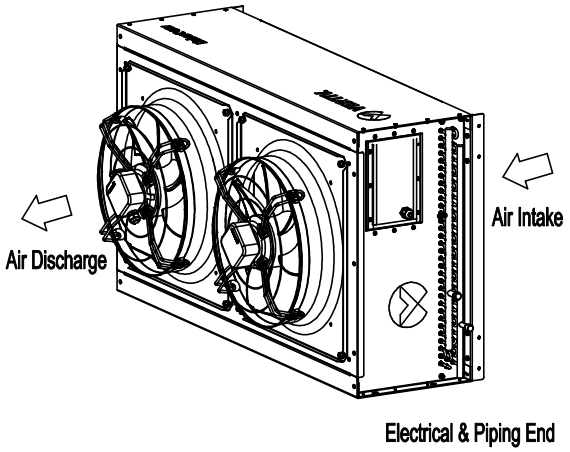
DETAIL A

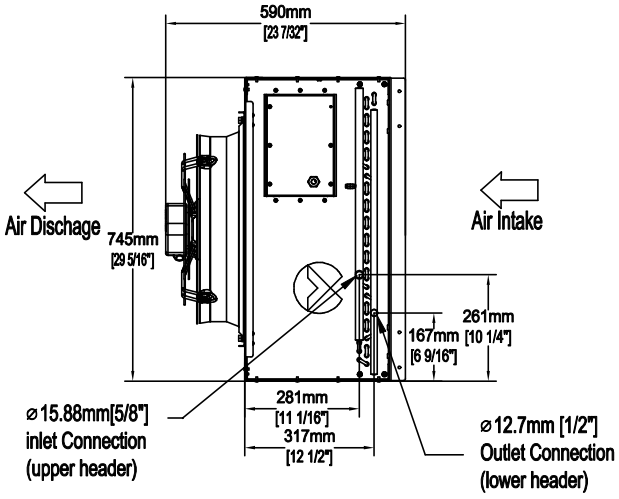
MODEL #	MODULE WEIGHT kg (lb) net
50/60 HZ	
CCD101S	66(145.5)

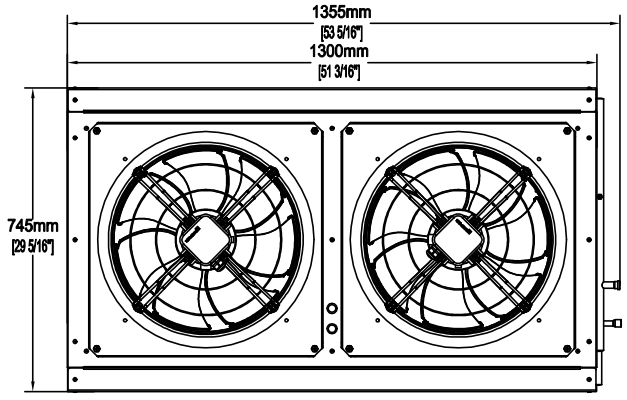
REV : 0
REV DATE : 10/21

LIEBERT CRV CONDENSER

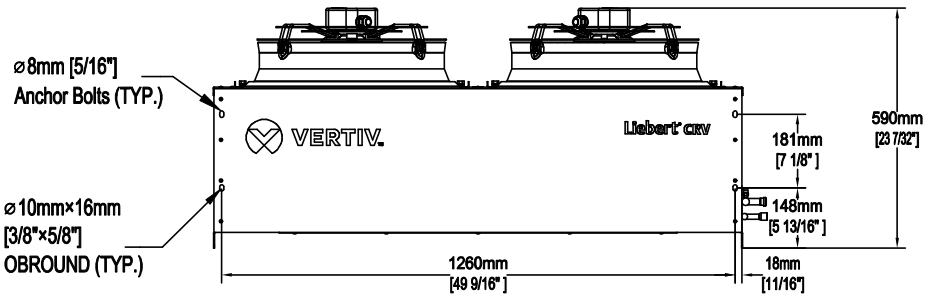
CABINET & ANCHOR DIMENSIONAL DATA (HORIZONTAL AIRFLOW)







Top View



Bottom View

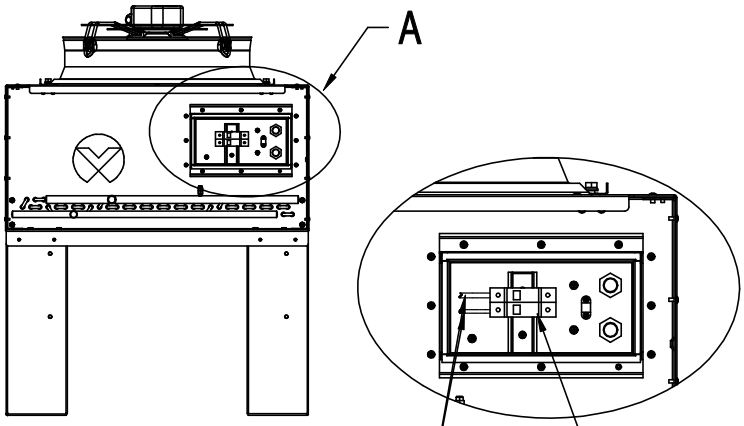
Unit Anchor Plan

MODEL #	MODULE WEIGHT
50/60 HZ	kg (lb) net
CCD101S	66(145.5)

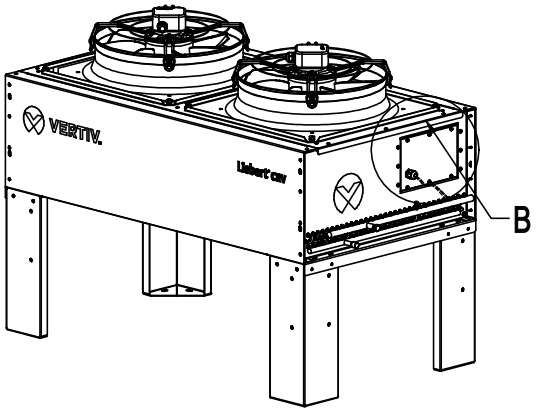
REV : 0
REV DATE : 10/21

LIEBERT CRV CONDENSER

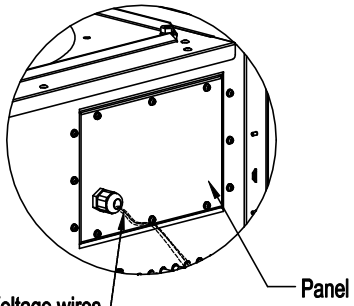
ELECTRICAL FIELD CONNECTIONS



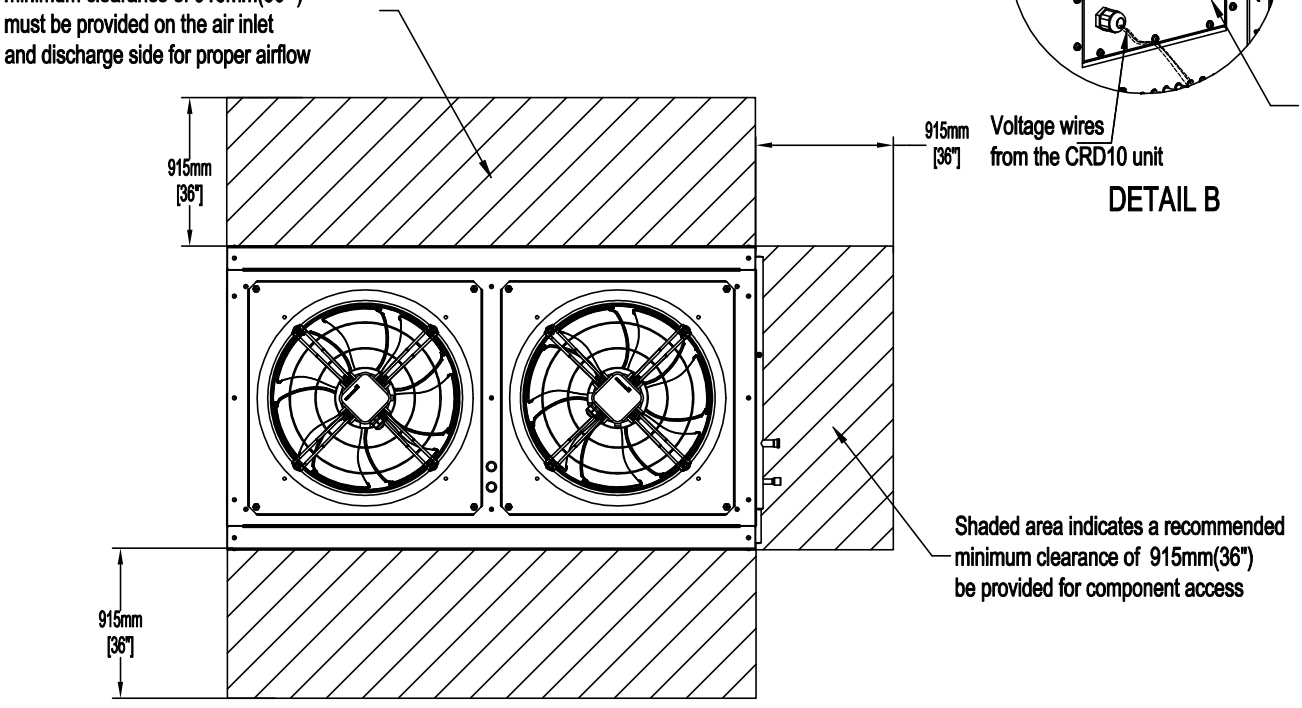
DETAIL A



Electrical & Piping End [Panel removed for clarity]



DETAIL B

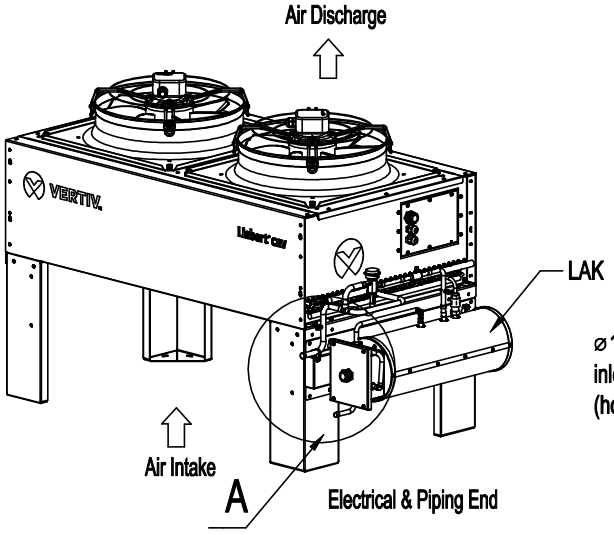


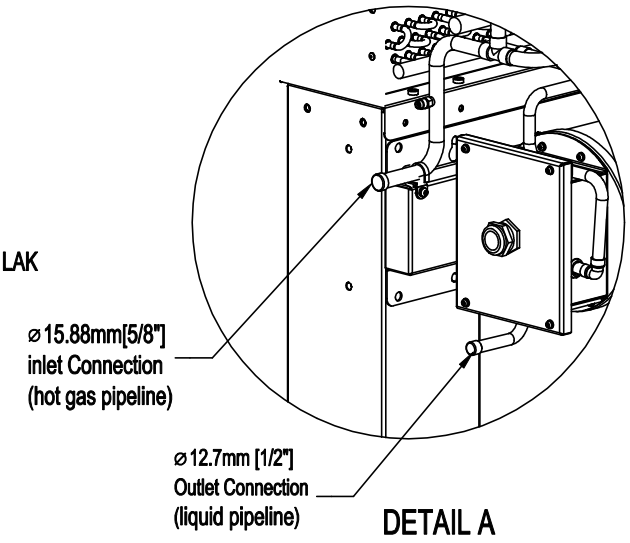
Top View

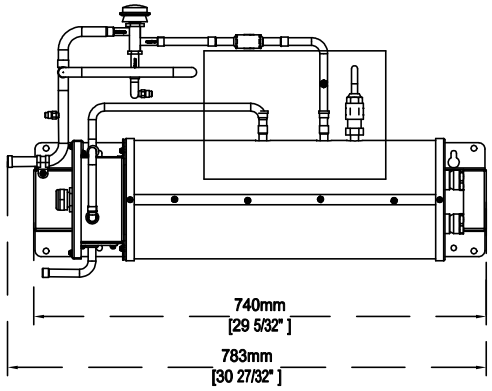
REV : 0
REV DATE : 10/21

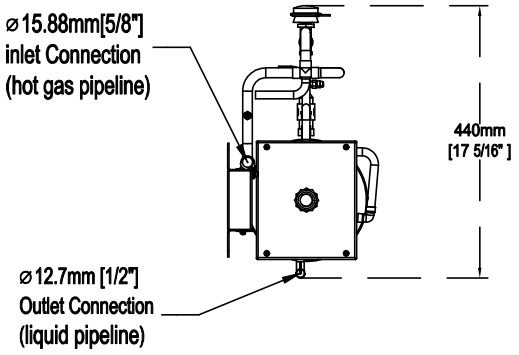
LIEBERT CRV CONDENSER

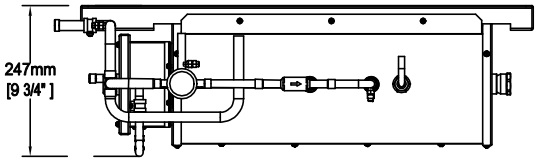
CABINET WITH LAK DIMENSIONAL DATA (VERTICAL AIRFLOW)

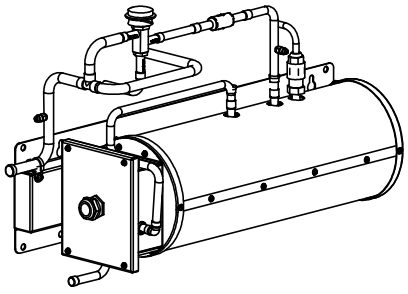












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REV DATE : 10/21

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