



Vertiv™ CoolPhase Row

System Design Catalog

Row-Based Cooling System - 600-mm and 300-mm Wide, Air-cooled
Units; 60 Hz

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Vertiv recommends installing a monitored fluid detection system that is wired to activate the automatic closure of field-installed coolant fluid supply and return shut off valves, where applicable, to reduce the amount of coolant fluid leakage and consequential equipment and building damage. Refer to local regulations and building codes relating to the application, installation, and operation of this product. The consulting engineer, installer, and/or end user is responsible for compliance with all applicable laws and regulations relating to the application, installation, and operation of this product.

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Technical Support Site

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

Visit <https://www.Vertiv.com/en-us/support/> for additional assistance.

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1 Nomenclature and Components

This section describes the model number for Vertiv™ CoolPhase Row units and components.

1.1 Model Number Nomenclature

Table 2.1 and Table 2.2 below describe the model number for the Vertiv™ CoolPhase Row cooling units.

Table 2.1 Model Number Descriptions for the Vertiv™ Evaporator Unit.

For the full description of configuration and model number refer to [Model Number Nomenclature](#).

Table 1.1 Model Number Nomenclature

Model Number															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	R	D	0	3	0	0	-	0	0	0	A	0	0	0	0

Table 1.2 CoolPhase Row CRD030 and CRD040 Model number Digit and Description Nomenclature

Digits, variables and descriptions
Digits 1-2 - Unit Family <ul style="list-style-type: none"> CR= Vertiv™CoolPhase Row
Digit 3 - System Type <ul style="list-style-type: none"> D= Air Cooled
Digit 4-6 - Model Number <ul style="list-style-type: none"> 0, 030, 040
Digit 7 - Power Supply <ul style="list-style-type: none"> 0= 208/230 V, 1-phase, 50/60 Hz, UL 1= 208/230 V, 3-phase, 60 Hz, UL 4= 460 V, 3-phase, 60 Hz UL
Digit 8 - Separator
Digit 9 - Cooling System <ul style="list-style-type: none"> 0= Cooling Only P= Reheat and humidifier
Digit 10 - Free Digit
Digit 11 - Free Digit
Digit 12 - Revision <ul style="list-style-type: none"> A-Z
Digits 13 - 16 - Factory Configuration Number <ul style="list-style-type: none"> 0000 = Standard 4 digits other than 0= Engineering To Order designated number

1.2 Component Location

The unit component locations are described in the submittal documents included in the [Submittal Drawings](#). The following table lists the relevant documents by number and title.

Table 1.3 Component Location Drawings

Document Number	Title
20000303	Component Location, 24in (600 mm) Air Cooled Models
20000304	Component Location, 12in (300 mm) Air Cooled Models

1.3 Cooling Configurations and Vertiv™ CoolPhase Row Overview

The Vertiv™ CoolPhase Row is a precision cooling unit available air-cooled, heat rejection to be installed within a row of high-density computing racks in a hot aisle-cold aisle configuration.

Air enters the rear of the Vertiv™ CoolPhase Row from the hot aisle, is filtered, cooled and conditioned, then discharged into the cold aisle. CoolPhase Row provides all the necessary functions of a standard thermal management unit, including cooling, heating, humidification, dehumidification, air filtration, condensate management, temperature control, alarm monitoring and data communication. (The 12 inch [300 mm] models do not provide heating, humidification, or dehumidification.) The CoolPhase Row is optimized for maximum cooling capacity in a minimal footprint.

The CoolPhase Row 030 and 040 series thermal management units are meant for location within a row of heat generating IT equipment racks.

The Vertiv™ CoolPhase Row is optimized for maximum cooling capacity in a minimal footprint. The extremely energy efficient components of the system are managed by the Liebert® iCOM™ control system. The environment is monitored in real time by the Liebert® iCOM™ control through sensors positioned in a variety of locations. Sensors located in the return air, supply air and rack inlets allow the unit to optimize its operations for both performance and energy efficiency.

All operations and sensor data can be reported remotely via a variety of communication protocols, providing a built-in rack temperature monitoring system.

The supply air baffle directs the air leaving the CoolPhase Row to the racks, maximizing its effectiveness, reducing the chance for hot spots, and improving overall system efficiency. The angle and spacing of the baffle vanes series are optimized through CFD modeling, laboratory testing, and real-world installations.

All service and maintenance is 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.

Table 1.4 Vertiv™ CoolPhase Row Configurations

Series	Width	Cooling Type	Nominal Cooling Capacity, kW	Input Power 60 Hz
CRD040	24 in. (600 mm)	Air	040	208-230V/ 1 Ph 208-230V/ 3 Ph 460 V/ 3 Ph
CRD030	12 in. (300 mm)	Air	030	208-230V/ 1 Ph 208-230 V/ 3 Ph 460 V/ 3 Ph

The Vertiv™ CoolPhase Row standard and optional features are described in the submittal documents included in the [Submittal Drawings](#).

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

Table 1.5 Standard and Optional Features Submittals

Document Number	Title
Standard and Optional Features	
Air Cooled 24-inch (600 mm) Models	
20000140	Standard and Optional Features 24 inch (600 mm) Air Cooled Models.

Table 1.5 Standard and Optional Features Submittals (continued)

Document Number	Title
Air Cooled 12 inch (300 mm) Models	
20000139	Standard and Optional Features 12 inch (300 mm) Air Cooled Models

2 System Data

2.1 Air Cooled System Performance and Physical Data

Table 2.1 Air Cooled Data - 60 Hz Models

		Model Size	CRD030	CRD040
Return Air Conditions	Width, in. (mm)	12 (300)	24 (600)	
DX Evaporator - Net Capacity Data at 95°F (35°C) Outdoor Ambient				
Vertiv™ CoolPhase Condensing Unit Matchup at 95°F (35°C) Outdoor Ambient		CUD28	CUD35	
105°F DB, 70.7°F WB, 52°F DP, 17% RH (40.6°C DB, 21.5°C WB)	Total, kW (BTUH)	33.9 (115,667)	48.2 (164,474)	
	Sensible, kW (BTUH)	33.9 (115,667)	48.2 (164,474)	
100°F DB, 69.2°F WB, 52°F DP, 20% RH (37.8°C DB, 20.7°C WB)	Total, kW (BTUH)	32.3 (110,191)	45.7 (155,949)	
	Sensible, kW (BTUH)	32.3 (110,191)	45.7 (155,949)	
95°F DB ¹ , 67.7°F WB, 52°F DP, 23% RH (35°C DB, 19.8°C WB)	Total, kW (BTUH)	30.8 (105,102)	43.3(147,701)	
	Sensible, kW (BTUH)	30.8 (105,102)	43.3(147,701)	
90°F DB, 66.1°F WB, 52°F DP, 27% RH (32.2°C DB, 18.9°C WB)	Total, kW (BTUH)	29.3 (99,966)	40.9 (139,537)	
	Sensible, kW (BTUH)	28.3 (96,554)	40.9 (139,537)	
85°F DB, 64.4°F WB, 52°F DP, 32% RH (29.4°C DB, 18°C WB)	Total, kW (BTUH)	28.1 (95,895)	38.5 (131,359)	
	Sensible, kW (BTUH)	24.8 (84,625)	38.5 (131,359)	
80°F DB, 62.7°F WB, 52°F DP, 38% RH (26.7°C DB, 17.1°C WB)	Total, kW (BTUH)	27.1 (92,447)	36.2 (123,508)	
	Sensible, kW (BTUH)	21.6 (73,701)	36.2 (123,508)	
Fan Section				
Return Air Volume, ACFM (ACMH)		3,900 (6,626)	5,700 (9,684)	
Standard Fan Motor, hp (kw)		1.2 (0.88)	3.78 (2.82)	
Number of Fans		6	8	
External Static Pressure, in.w.g. (Pa)		0 ¹	0 ¹	
<ol style="list-style-type: none"> 1. Certified in accordance with the AHRI Datacom Cooling Certification Program at AHRI Standard 1360 (I-P) Standard Rating Conditions. Certified units may be found in the AHRI Directory at www.ahrirectory.org. 2. Some options or combinations of options may result in reduced air flow. Consult factory for recommendations. 3. Data rated at 100% fan speed and with Standard Feature filter (MERV8 for 300 mm and MERV8 for 600 mm). 4. Net capacity data has fan motor heat factored in for all ratings. 5. Consult factory for alternate performance outputs. Performance data generated in GRS (Global Rating System). 				

Table 2.2 Physical Data - Air Cooled, 600 mm (24 in.)

Parameter	CRD040
Evaporator Coil	
Face Area, ft2(m2)	8.27 (0.77)
Rows	6
Face Velocity, FPM (m/s)	689 (3.5)
Electric Reheat Single Stage	
Capacity, kW	(6.0)
Steam Generating Humidifier	
Capacity, lb/hr (kg/hr)	6.61 (3)
Capacity, kW	2.25
Filter Section - Disposable Type	
	MERV 8 - Standard Pleated Filter
Number	2
Nominal Size, in (mm)	33.875 x 21.375 x 1.75 (860 x 543 x 44)
Effective Surface Area - ft2 (m2)	15.2 (1.41)
	MERV 11 - Optional Pleated Filter
Quantity	2
Nominal Size, in (mm)	33.875 x 21.375 x 1.75 (860 x 543 x 44)
Effective Surface Area - ft2 (m2)	15.2 (1.41)

Table 2.3 Physical Data—Air Cooled, 300 mm (12 in.)

System	CRD030
Evaporator Coil	
Face Area, ft2 (m2)	11 (1.022)
Rows	3
NOTE: The coil for this unit is V-shaped.	
Face Velocity, FPM (m/s)	354.3 (1.8)
Electric Reheat Single Stage	
Capacity, kW	3.0
Steam Generating Humidifier	
Capacity, lb/hr (kg/hr)	6.61 (3)
Capacity, kW	2.25
Filter Section—MERV 8, Washable Type	

Table 2.3 Physical Data—Air Cooled, 300 mm (12 in.) (continued)

System	CRD030
Quantity	2
Nominal Size, in. (mm)	33.875 x 9.625 x 1.75 (860 x 244 x 44)
Effective Surface Area, ft ² (m ²)	7.3 (0.68)

2.1.1 Operating Limits for Air Cooled Systems

The Vertiv™ CoolPhase Row operates within the working ranges in [Operating limits—Air Cooled Systems](#) below . These limits refer to new units and those that have been correctly installed and serviced.

Table 2.4 Operating limits—Air Cooled Systems

Parameter		Design Condition	
		Minimum	Maximum
Unit Entering Air Conditions	Temperature	64.4°F (18°C)	113°F(45°C)
	Relative Humidity	17%	60%
Storage Conditions	Temperature	-4°F (-20°C)	118°F (48°C)
Power Supply Tolerances		Voltage ± 10%	
		Frequency ±2Hz	

2.1.2 Sound Data for Air Cooled Systems

Table 2.5, and Table 2.6, show the sound pressure level in free field at 5 feet (1.5 m) high and 6-1/2 feet (2 m) in front of the air conditioner, with compressor and fan in operation. The sound data is without the Low Sound Package compressor jacket and sound deadening panel insulation installed.

Sound power is an absolute measurement that can be used for comparisons when all sound measurement parameters match exactly.

Table 2.5 Sound Data - CoolPhase Row CRD040

Model Type		Air Cooled CRD040, 24 in. (600 mm) with 2 Fans with Filter			
Sound Power Level (PWL, dB (A))	Factory Fan Speed %		100	75	55
	Airflow	SCFM	5700	4270	2837
		m3/h	9684	7254	4280
	Octave Band Frequency (Hz)	31.5	29.2	33.7	27.7
		63	42.4	44.6	40.2
		125	49.1	51.8	45.4
		250	63.2	57.5	55.6
		500	78	64.5	55.7
		1000	74	67	62
		2000	76.4	71.7	64.5
		4000	73.2	68.3	60.3
		8000	67.8	61.8	52
		A-Scale Weighted, dB (A)	85.7	80.7	74.5
Sound Pressure Level (SPL, dB)	At Suction Side, 2 m Distance, Free Field Conditions (2m, f.f, dBA)	81.3	78.8	72	

Table 2.6 Sound Data CoolPhase Row - CRD030

Model Type		Air Cooled CRD030, 12 in. (300 mm) with 6 Fans with Filter				
Sound Power Level (PWL, dB)	Fan Speed %		100	75	50	
	Airflow	SCFM	3900	3186	2112	
		m3/h	7300	5413	3588	
		Octave Band Frequency (Hz)	31.5	33	29.4	27.2
			63	46.7	42.6	38.9
			125	57.8	52.4	46.9
			250	67	61	57
			500	76.9	74.7	59.4
			1000	75.9	72.2	64.2
			2000	80.2	73.4	64.6
			4000	78.8	71	61.1
	8000		72	63.5	52	
	A-Scale Weighted, dB(A)		90.5	84	75.1	
	Inlet, dB(A)		81.3	78.9	72	
Outlet, dB(A)		82.1	81.3	74.4		
Sound Pressure Level (SPL, dB)	At Suction Side, 2 m Distance, 1.5 m Above Ground, Free Field Conditions (2 m, f.f, dBA)		82.1	79	72	
	At Discharge Side, 2 m Distance, 1.5 m Above Ground, Free Field Conditions (2 m, f.f, dBA)		88.2	81.4	72.3	
Normal operation of unit at 208- 230 V/3 Ph/60 Hz						

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3 Electrical Power Requirements

NOTICE

Risk of exceeding voltage limit. Can cause equipment damage.

The electrically commutated (DC) motors included in 3 Ph / 1ph 208-230VAC CRD030 and CRD040 units are suitable for connection to power supplies with 48VDC output (power supply included). This DC source operates within 200 to 277 VAC (nominal). Exceeding this voltage level can cause equipment damage.

3.1 Air Cooled Systems Electrical Data

Table 3.1 Electrical Data—Air Cooled CRD030, 12 in. (300 mm) with Condensate Pump

Voltage	208-230 V/ 3 Ph/ 60 Hz	208-230 V/ 1 Ph/ 60 Hz	460 V/ 3 Ph/ 60 Hz
Reheat with Humidifier			
FLA	19.5	N/A	8.2
MCA	24.7	N/A	11
MOPD	40	N/A	15
Cooling Only			
FLA	N/A	13.25	N/A
MCA	N/A	16.88	N/A
MOPD	N/A	30	N/A
FLA = Full Load Amps; MCA = Minimum Circuit Ampacity; MOPD = Maximum Overcurrent Protection Device.			

Table 3.2 Electrical Data—Air Cooled CRD040, 24 in. (600 mm) with Condensate Pump

Voltage	208-230V/ 3 Ph/ 60Hz	208-230V/ 1 Ph/ 60Hz	460V/ 3 Ph/ 60Hz
Reheat with Humidifier			
FLA	30.74	N/A	13.3
MCA	38.74	N/A	17.3
MOPD	50	N/A	20
Cooling Only			
FLA	N/A	18.25	N/A
MCA	N/A	23.13	N/A
MOPD	N/A	40	N/A
FLA = Full Load Amps; MCA = Minimum Circuit Ampacity; MOPD = Maximum Overcurrent Protection Device.			

3.2 Electrical Field Connections

Electrical service must conform to national and local electrical codes.

The electrical connections are described in the submittal documents included in the Submittal Drawings . The following table lists the relevant documents by number and title.

Table 3.3 Electrical Field Connection Drawings

Document Number	Title
Electrical Field Connections	
20000325	CoolPhase Row 12in./24in. (300/600mm) Electrical Field Connections and Terminal Blocks
Electrical Schematics	
10080202	Vertiv™ CoolPhase Row 40kW 460V 3PH 50-60HZ
10080203	Vertiv™ CoolPhase Row 30kW 460V 3PH 50-60HZ
10080204	Vertiv™ CoolPhase Row 40kW 208-230V 3PH 50-60HZ
10080205	Vertiv™ CoolPhase Row 30kW 208-230V 3PH 50-60HZ
10080206	Vertiv™ CoolPhase Row 40kW 208-230V 1PH 50-60HZ
10080207	Vertiv™ CoolPhase Row 30kW 208-230V 1PH 50-60HZ
10159904	DVI-I DUAL LINK DIGITAL AND ANALOG MONITOR CABLE

4 Dimensions and Weights

4.1 Unit Weights

Table 4.1 Shipping Weights

Model No.	Net Weight lb (kg)	Shipping Weight without pallet lb (kg)	Shipping Weight with pallet lb (kg)
CRD030	421 (191)	564 (256)	654 (297)
CRD040	573 (260)	703 (319)	793 (360)

4.2 Planning Dimensions

The unit, floor stand, and plenum dimensions are described in the submittal documents included in the [Submittal Drawings](#).

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

Table 4.2 Dimension Planning Drawings

Document Number	Title
20000144	Cabinet Dimensional Data CoolPhase Row24 in (600 mm) Models
20000145	Cabinet Dimensional Data CoolPhase Row12 in (300 mm) Models

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5 Piping Connections

Field installed piping must be installed in accordance with local codes.

The pipe connection locations, piping general arrangement, and schematics are described in the submittal documents included in the [Submittal Drawings](#).

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

Table 5.1 Piping General Arrangement Drawings

Document Number	Title
20000141	Piping Arrangement for Vertiv™ CoolPhase Row 300 and 600 series with Vertiv™ CoolPhase Condensing Unit Models

Table 5.2 Piping Connection Drawings

Document Number	Title
20000142	Primary Connection Locations Vertiv™ CoolPhase Row24 in (600 mm) Air Cooled Models
20000143	Primary Connection Locations Vertiv™ CoolPhase Row12 in (300 mm) Air Cooled Models
20000324	Vertiv™ CoolPhase Row Piping Schematic Condenser Above Indoor Unit.

5.1 Refrigerant Line Sizes and Equivalent Lengths

Table 5.3 Vertiv™ CoolPhase Row recommended refrigerant line sizes, O.D. CU for Vertiv™ CoolPhase Condensing Unit

Vertiv™ CoolPhase Row	Total Equivalent Length, ft. (m)	Suction Line, in. (mm)	Liquid Line, in. (mm)
CRD030	0 to 10 (0 to 32.8)	7/8 (22)	1/2 (12.7)
	10 to 30 (32.8 to 98.4)	1, 1/8 (28)	5/8 (16)
	30 to 80 (98.4 to 262.4)	1, 3/8 (35)	3/4 (19)
	80 to 90 (262.4 to 295.2)	1, 5/8 (41)	7/8 (22)
CRD040	0 to 10 (0 to 32.8)	7/8 (22)	1/2 (12.7)
	10 to 30 (32.8 to 98.4)	1, 1/8 (28)	5/8 (16)
	30 to 80 (98.4 to 262.4)	1, 3/8 (35)	3/4 (19)
	80 to 90 (262.4 to 295.2)	1, 5/8 (41)	7/8 (22)

Contact your Vertiv representative for line sizing for runs longer than 295.2 ft. (90 m) equivalent length.

*Must down size vertical riser one trade size (1-1/8" to 7/8", 7/8" to 3/4", 3/4" to 5/8", 5/8" to 1/2").

Table 5.4 Vertiv™ CoolPhase Condensing Unit Connection Sizes

Condensing Unit	Item	Pipe Size in (mm)	Coupling Size in (mm)
CUD/ CUL 28	Liquid pipe	5/8 (16)	5/8 (16) SLD
	Suction pipe	7/8 (22)	7/8 (22) SLD
CUD/ CUL 35	Liquid pipe	5/8 (16)	5/8 (16) SLD
	Suction pipe	7/8 (22)	7/8 (22) SLD

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6 Heat Rejection Vertiv™ CoolPhase Condensing Unit

6.1 Vertiv™ CoolPhase Condensing Unit Electrical Power Requirements

Table 6.1 below lists the power requirements by model number.

Table 6.1 Electrical Data, Three Phase, 60Hz Condenser, Premium EC Fan Control

Model	Voltage	FLA	MCA	MOPD
CUD28	208/230 V	51.1	61.8	100
	460 V	35.9	44.1	70
CUD35	208/230 V	55.3	66.9	110
	460 V	44.1	54	90

1. FLA = Full Load Amps; MCA = Minimum Circuit Ampacity; MOPD = Maximum Overcurrent Protection Device.

6.2 Vertiv™ CoolPhase Condensing Unit Planning Dimensions

The condenser dimensions are described in the submittal documents included in the [Submittal Drawings](#). Condensers mounted above and below the relative elevation of the indoor unit must follow the guidelines found in the submittal drawings listed in the table.

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

Table 6.2 Dimension Planning Drawings

Document Number	Title
20000136	Cabinet Dimensions Vertiv™ CoolPhase Condensing Unit 28 kW
20000126	Cabinet Dimensions Vertiv™ CoolPhase Condensing Unit 35 kW

6.3 Vertiv™ CoolPhase Condensing Unit Piping

Field installed piping must be installed in accordance with local codes.

The pipe connection locations are described in the submittal documents included in the [Submittal Drawings](#). The following table lists the relevant documents by number and title.

Table 6.3 Piping Connection Drawings

Document Number	Title
20000326	Piping Dimensional Data Vertiv™ CoolPhase Condensing Unit

6.4 Vertiv™ CoolPhase Condensing Unit Electrical Field Connections

Condenser rated voltage should be verified with available power supply before installation. Refer to the unit's electrical schematic and serial tag for specific electrical requirements. Line voltage electrical service is required for all condensers at the location of the condenser. Consider using UPS equipment on both data center cooling units and Vertiv™ CoolPhase Condensing Unit to maintain uninterrupted cooling capability. Refer to the unit's serial tag for specific condenser electrical requirements. A unit disconnect is standard. However, a site disconnect may be required per local code to isolate the unit for maintenance. Route the supply power to the site disconnect switch and then to the unit. Route the conduit to the knockout provided at the bottom right end of the electrical control enclosure. Connect the earth ground wire lead to the marked earth ground connection terminal provided near the factory installed disconnect switch.

See [Table 3.1](#) on page , to [table 3.2](#) , for power requirements.

The electrical connections are described in the submittal documents included in the [Submittal Drawings](#) . The following table lists the relevant documents by number and title.

Table 6.4 Electrical Field Connection Drawings

Document Number	Title
20000328	Vertiv™ CoolPhase Condensing Unit 28/35kW Electrical Field Connections and Terminal Blocks

7 Appendices

Appendix A: Technical Support and Contacts

A.1 Technical Support/Service in the United States

Vertiv™ Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

Liebert® Thermal Management Products

1-800-543-2378

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

A.2 Locations

United States

Vertiv™ Headquarters

1050 Dearborn Drive

Columbus, OH, 43085, USA

Europe

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road

Wanchai, Hong Kong

Appendix B: Model Number Nomenclature Detail

Table B.2 below describes each digit of the 16-digit configuration number.

Table 7.1 Vertiv™ CoolPhase Row 16 digit configuration number

Model Number															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	R	D	0	3	0	0	-	0	0	0	A	0	0	0	0

Table 7.2 Vertiv™ CoolPhase Row Model Number Digit Definitions

Digit	Variable	Description
Digits 1 and 2 = Unit Family	C	Vertiv™ CoolPhase Row
	R	
Digit 3 = System Type	D	Air- Cooled
Digit 4-6 = Model Number	030, 040	Model Number
Digit 7 = Power Supply	0, 1, 4	<ul style="list-style-type: none"> 208/230 V, 1-phase, 50/60 Hz, UL 208/230 V, 3-phase, 60 Hz, UL 460 V, 3-phase, 60 Hz UL
Digit 8 = Separator	-	Separator
Digit 9 = Cooling System	0, P	<ul style="list-style-type: none"> Cooling Only Reheat and Humidifier
Digit 10 = Free Digit	0	Free Digit
Digit 11 = Free Digit	0	Free Digit
Digit 12 = Revision	A-Z	Revision
Digits 13 - 16 = Factory Configuration Number	0000-1234	<ul style="list-style-type: none"> 0000 = Standard 4 digits other than 0= Engineering To Order designated number

Appendix C: Optional Configuration for Vertiv™ CoolPhase Row Non-Seismic Application

Electrical wiring, conduit, and/or other connections to the equipment are the responsibility of others. Data and recommendations are supplied in the [Submittal Drawings](#), and in the unit installation supplement for non-seismic installation.

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

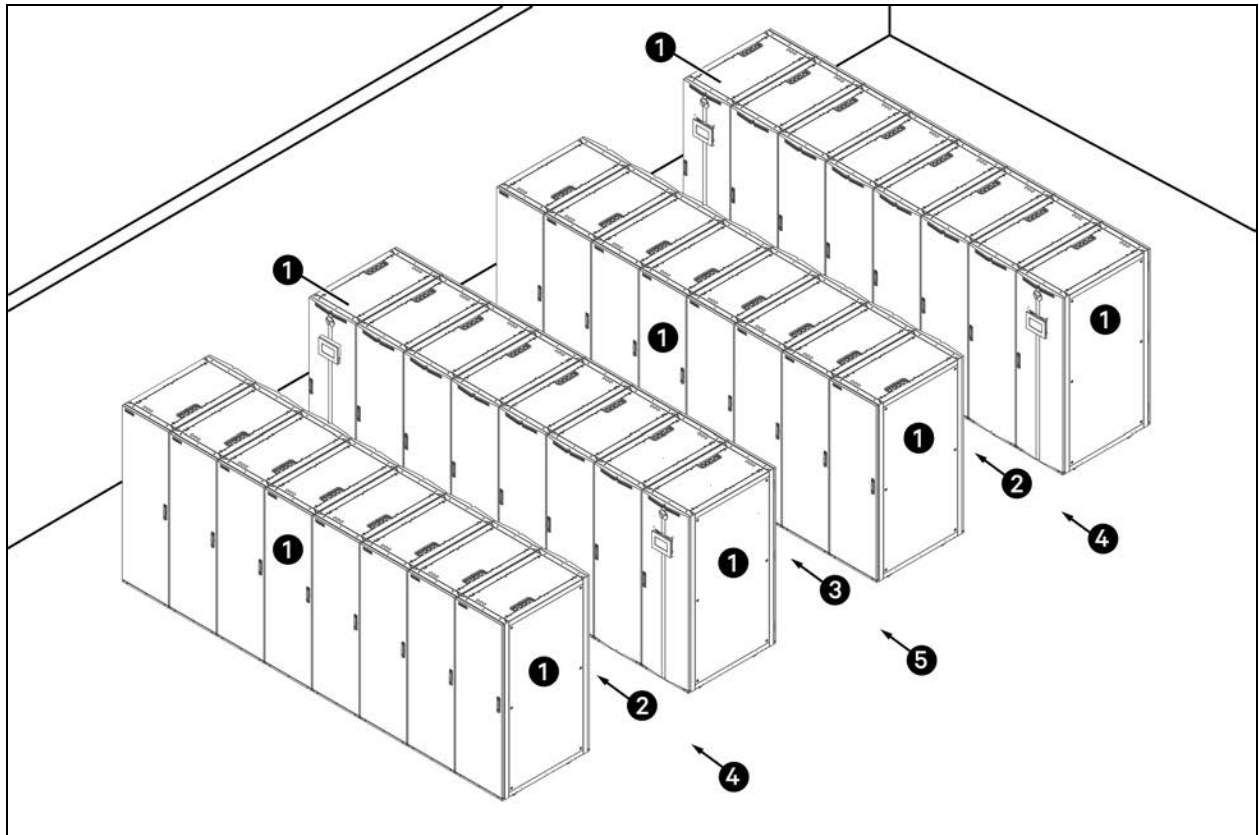
Table 7.3 Vertiv™ CoolPhase Row Non-Seismic Application Drawings

Document Number	Title
600 mm (24 inch) Models	
20000307	Dimensional Data for Vertiv™ CoolPhase Row24 in (600 mm) Rigid Floor Mount Bracket
300 mm (12 inch) Models	
20000309	Dimensional Data for Vertiv™ CoolPhase Row12 in (300 mm) Rigid Floor Mount Bracket

Appendix D: Vertiv™ CoolPhase Row Intended Application

The Vertiv™ CoolPhase Row 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 Liebert® SmartRow™ from Vertiv™.

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



Item	Description	Item	Description
1	Vertiv™ CoolPhase Row	4	Cold Aisle
2	Front of Racks	5	Hot Aisle
3	Rear of Racks	-	-

D.1 Unit-to-Unit (U2U)—Coordinated Cooling Operation

The iCOM™ controls can network the Vertiv™ CoolPhase Row units and coordinating operation to improve cooling and efficiency. In U2U mode, the networked CoolPhase Row share data from the standard temperature sensors to increase or reduce cooling. For further information, see [Standard and Optional Feature Submittals](#).

D.2 Placing Vertiv™ CoolPhase Row Units in Rows of Racks for Efficiency.

These are examples of typical Vertiv™ CoolPhase Row 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 2T rack temperature sensors on the front door of all equipment that the Vertiv™ CoolPhase Row is cooling.

Use walls or opposing racks to minimize the width of the hot and cold aisles. Target 2 to 6 feet (0.6 to 1.8 m). For site specific recommendations on optimizing your space for row based cooling, contact your local Vertiv representative.

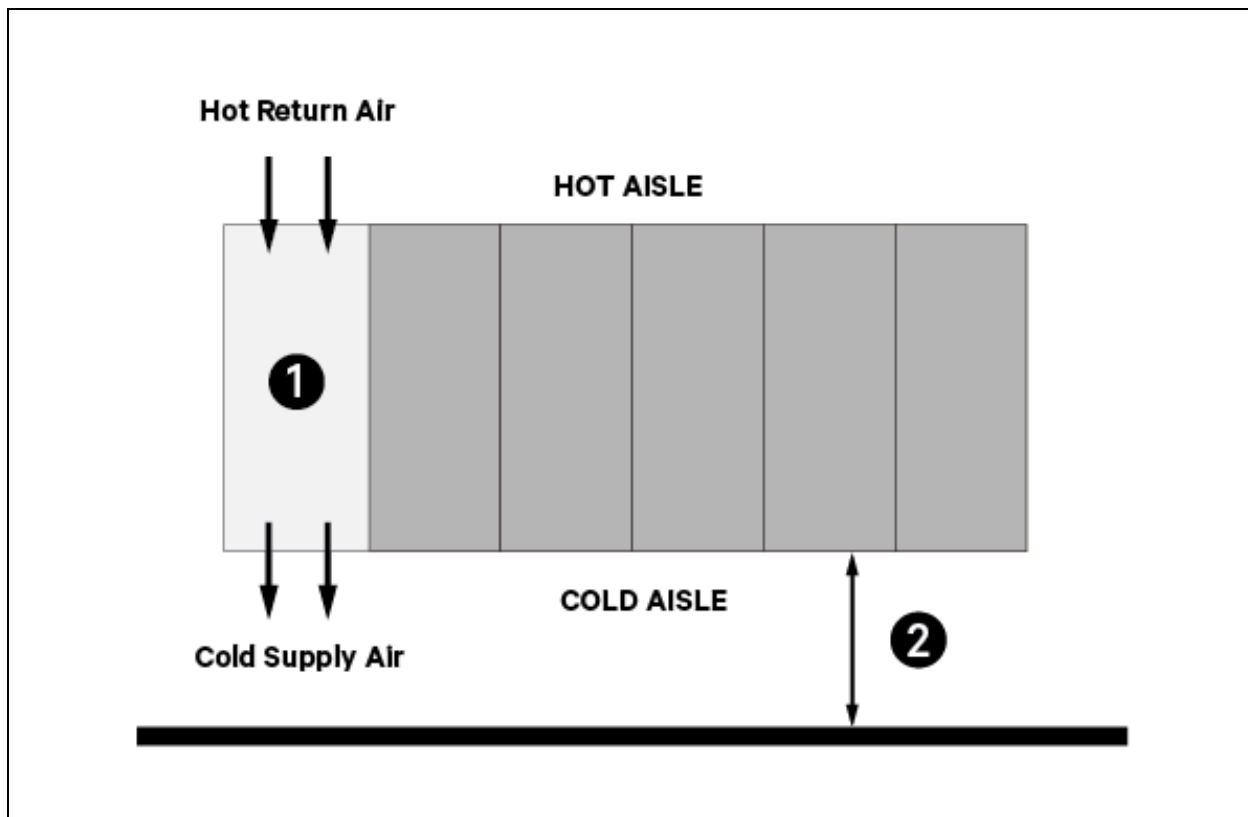
Row Placement

The Vertiv™ CoolPhase Row can be placed either at the end of a row or in between server racks. Locating a CoolPhase Row 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 2T rack temperature sensors sample supply and return air temperatures.

When deploying multiple Vertiv™ CoolPhase Row 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 Appendix D . 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 Appendix D .

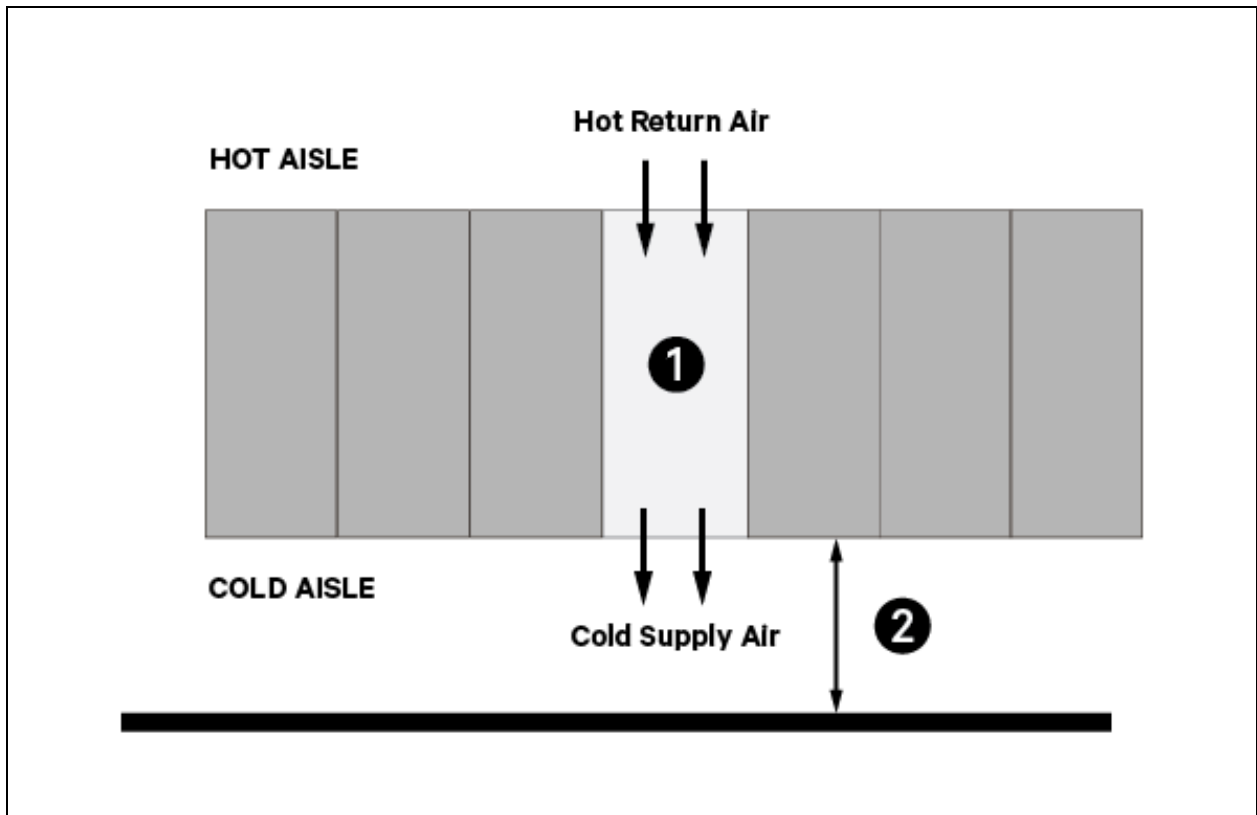
Cooling unit location within a row becomes less critical when deployed in Liebert® SmartRow™ containment, but we recommend that you evenly space CoolPhase Row in each row. Using room barriers, such as walls shown in Figure 1.4 , and Figure 1.5 , can be very effective in simulating aisle containment. When the depth of a CoolPhase Row 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 Vertiv™ CoolPhase Row Recommended Placement.



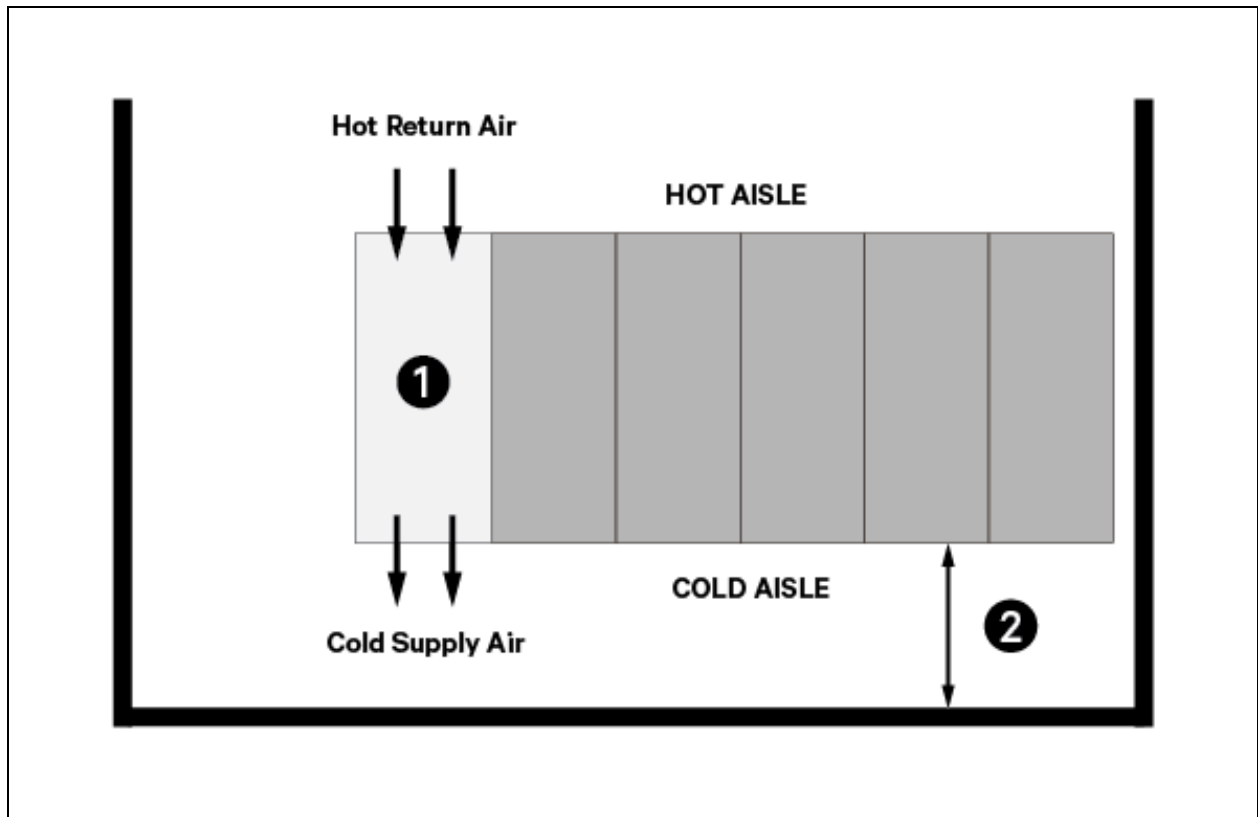
Item	Description
1	Vertiv™ CoolPhase Row unit.
2	Maximum distance to barrier: 6ft (1.8m)

Figure 7.3 One Vertiv™ CoolPhase Row, Alternate Placement



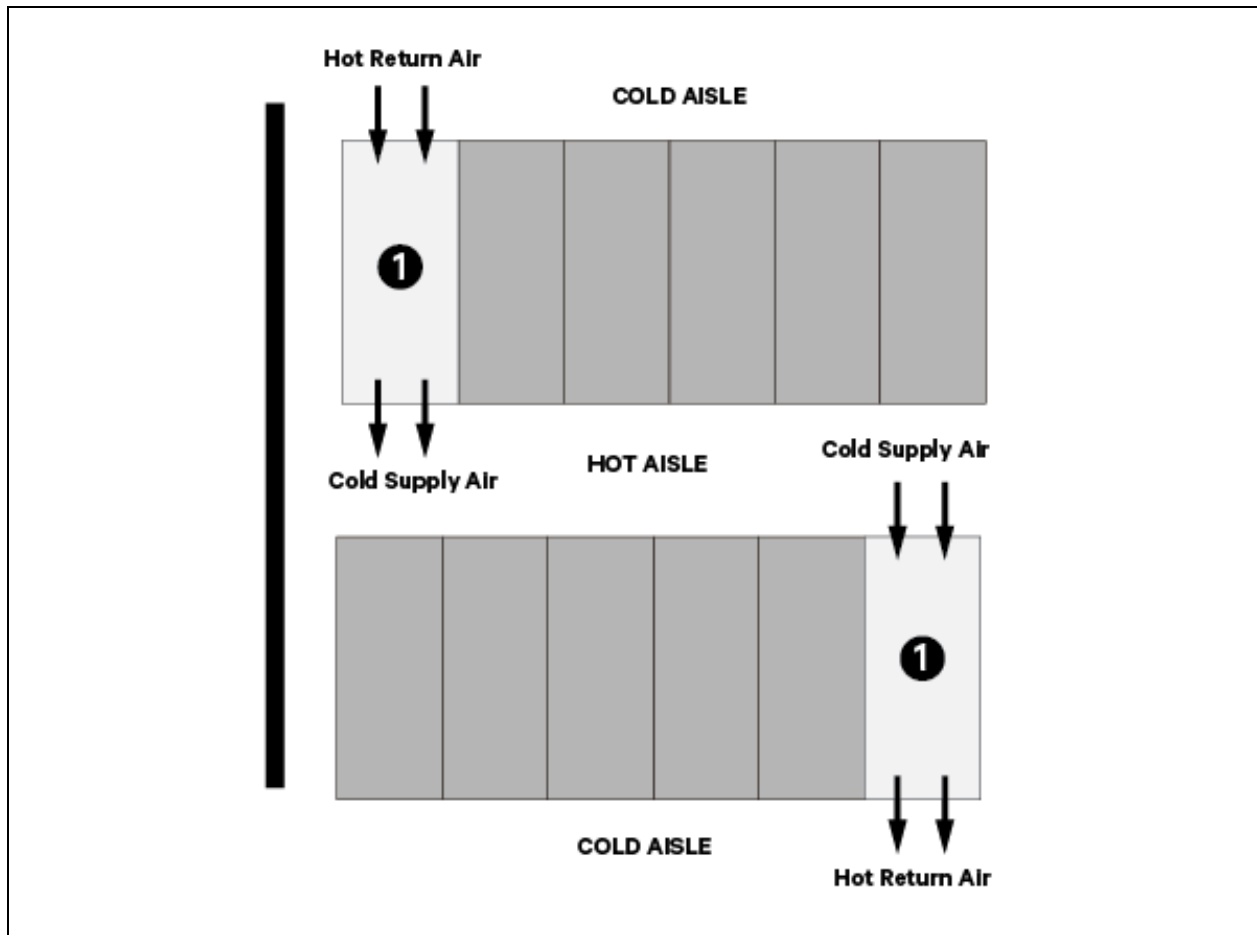
Item	Description
1	Vertiv™ CoolPhase Row unit.
2	Maximum distance to barrier: 6ft (1.8m)

Figure 7.4 Simulated Aisle Containment Using Room Barriers—Single Row



Item	Description
1	Vertiv™ CoolPhase Row unit.
2	Maximum distance to barrier: 6ft (1.8m)

Figure 7.5 Simulated Aisle Containment Using Room Barriers—Multiple Rows



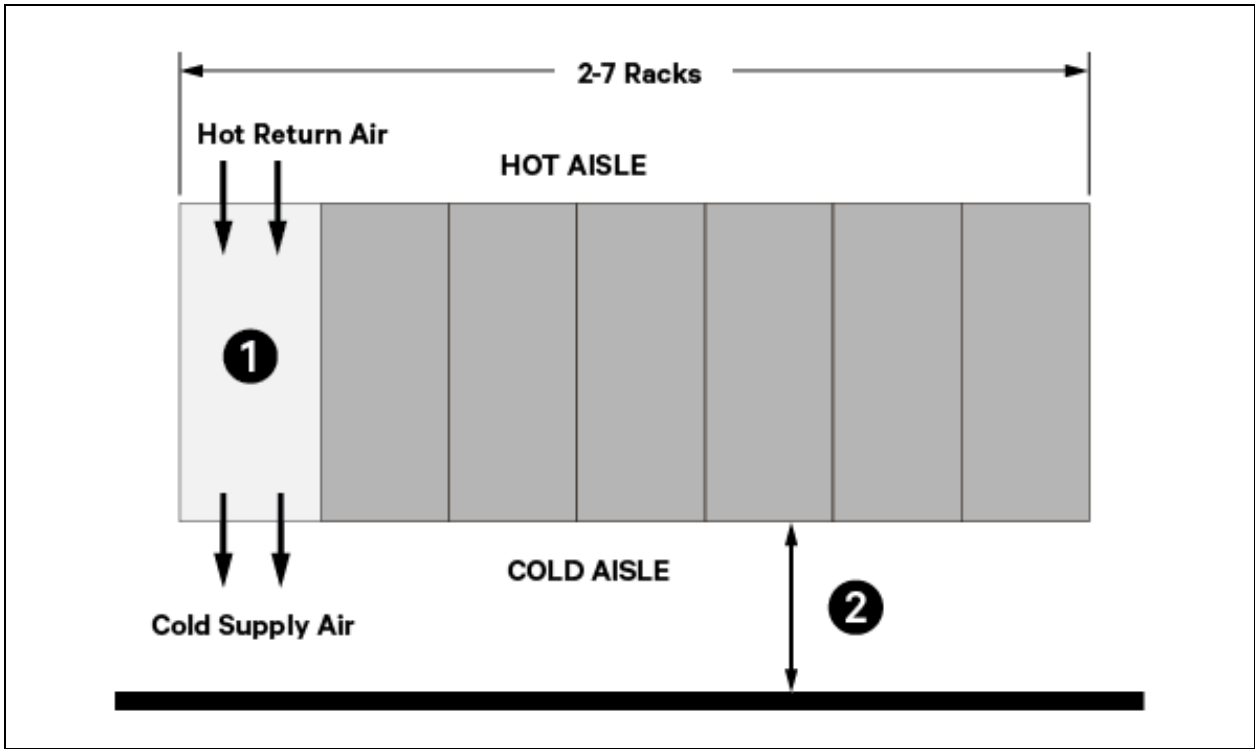
Item	Description
1	Vertiv™ CoolPhase Row unit.

Number of Racks and Row Length

The number of racks that the Vertiv™ CoolPhase Row can condition depends on the equipment's heat load and airflow requirements. We recommend that you oversize the CoolPhase Row 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 Liebert® SmartRow™ cold aisle containment, the CoolPhase Row can be more closely matched to the server equipment needs.

When the CoolPhase Row is significantly oversized, the cooling unit can effectively distribute air six to seven racks away. Initially over-sizing the unit allows future data center expansion flexibility with nearly no energy consumption or footprint penalty. The intelligent Vertiv™ 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



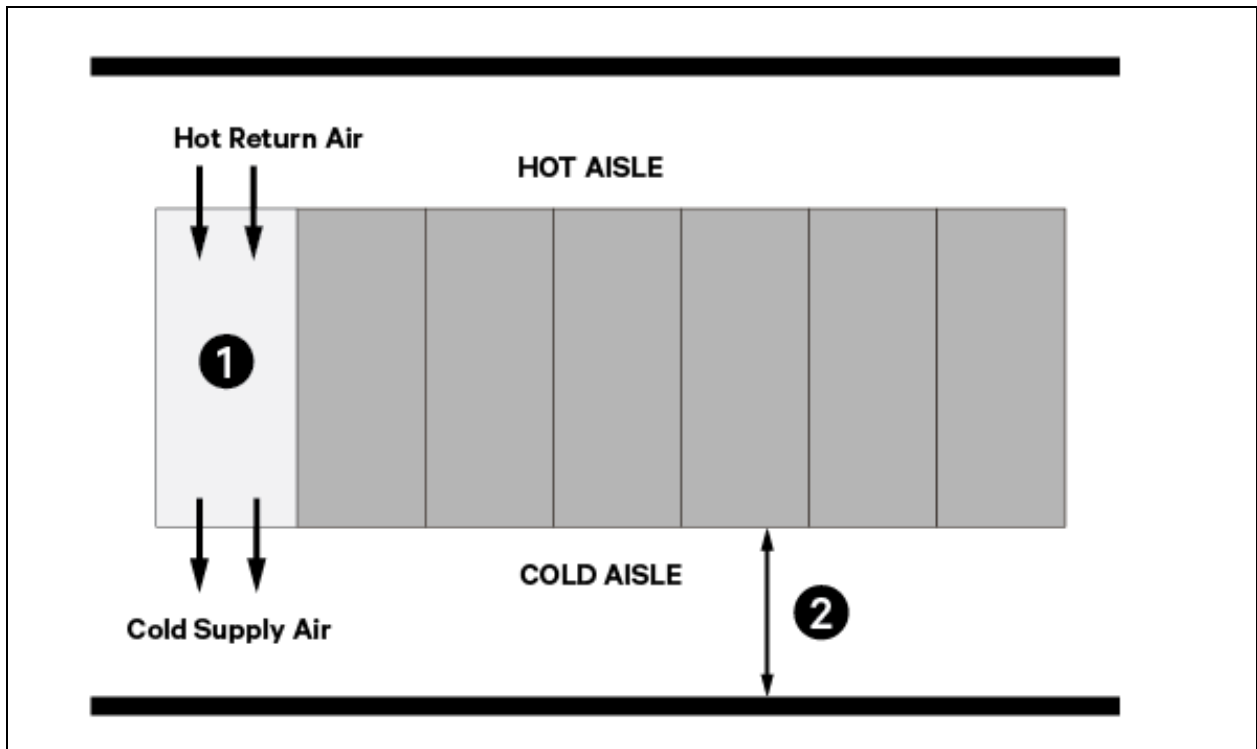
Item	Description
1	Vertiv™ CoolPhase Row unit.
2	Maximum distance to barrier: 6ft (1.8m)

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 (0.6 to 1.8 m).

We recommend the Vertiv™ Liebert® SmartRow™ cold aisle containment system for maximum performance. While the Vertiv™ CoolPhase Row 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 2T rack sensors.

Figure 7.7 Depth of Hot/Cold Aisles

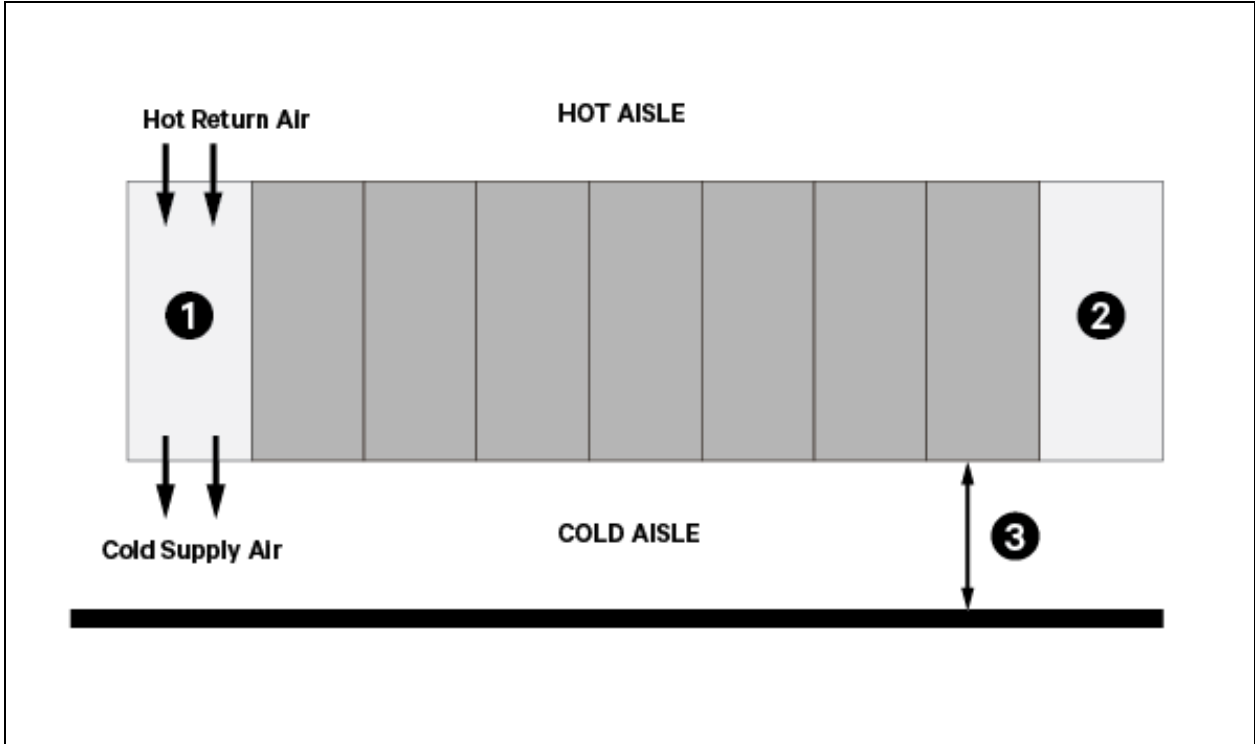


Item	Description
1	Vertiv™ CoolPhase Row unit.
2	Maximum distance to barrier: 6ft (1.8m)

D.3 Redundancy Arrangement

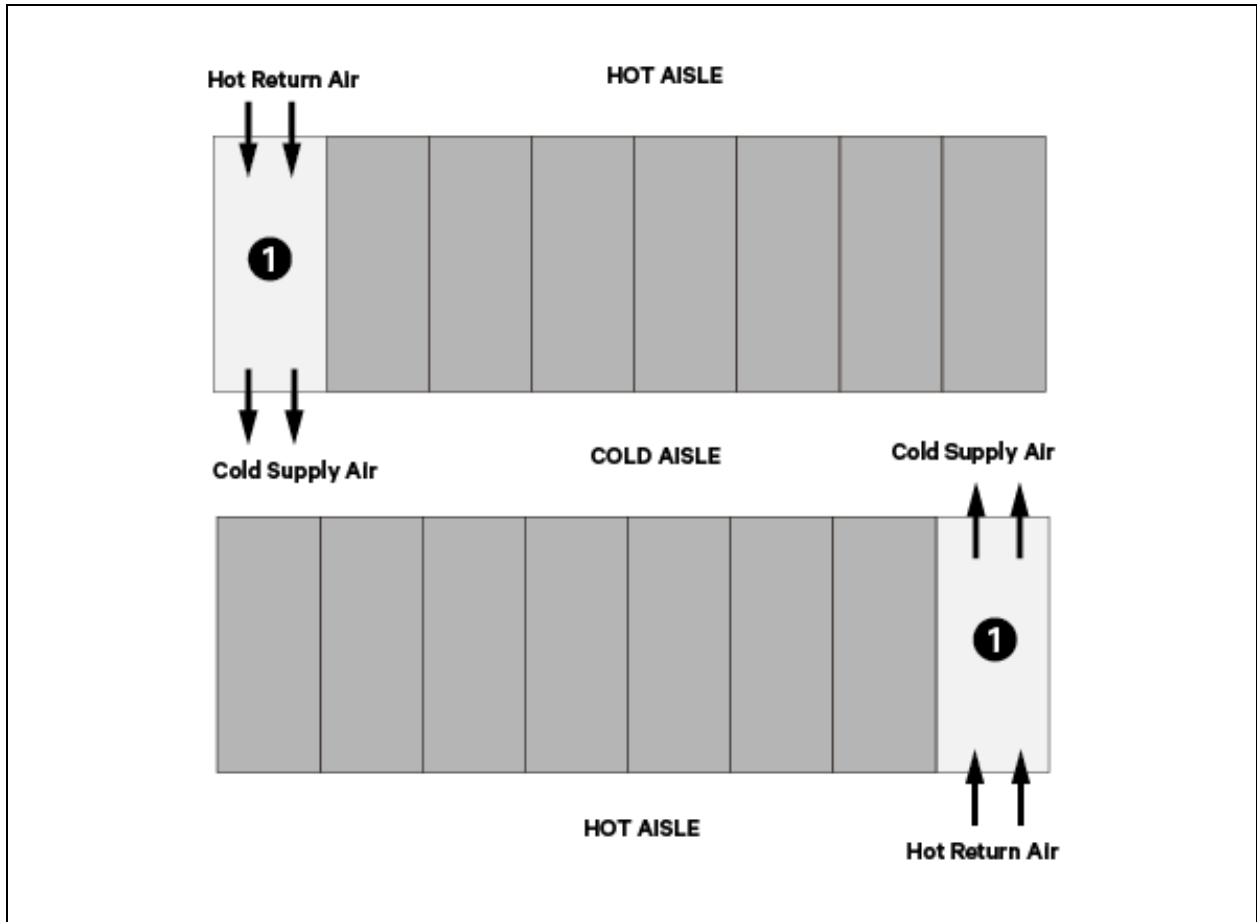
When laying out row based units for redundancy, it is better to run all units at a lower operating level than to shut off extra units. The units must be sufficiently sized to achieve the required cooling capacity if any of the other units within the same row fail. Figure 1.8 , and Figure E.9 on the next page , show examples of N+1 redundancy properly applied.

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



Item	Description
1	Vertiv™ CoolPhase Row unit.
2	Vertiv™ CoolPhase Row unit off.
3	Maximum distance to barrier: 6ft (1.8m)

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

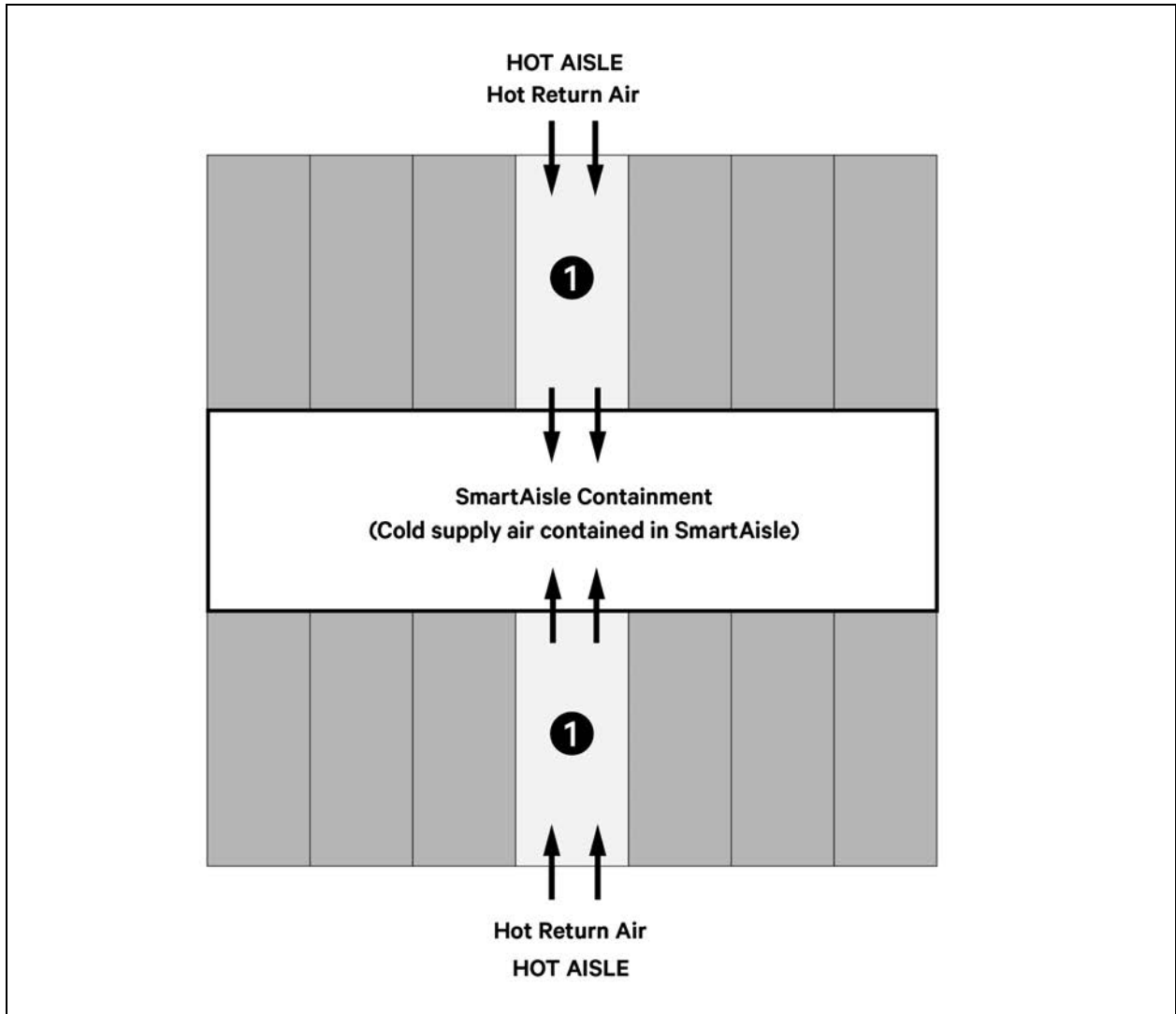


Item	Description
1	Vertiv™ CoolPhase Row unit.

D.4 Vertiv™ CoolPhase Row Applied in Liebert® SmartRow™ Cold Aisle Containment.

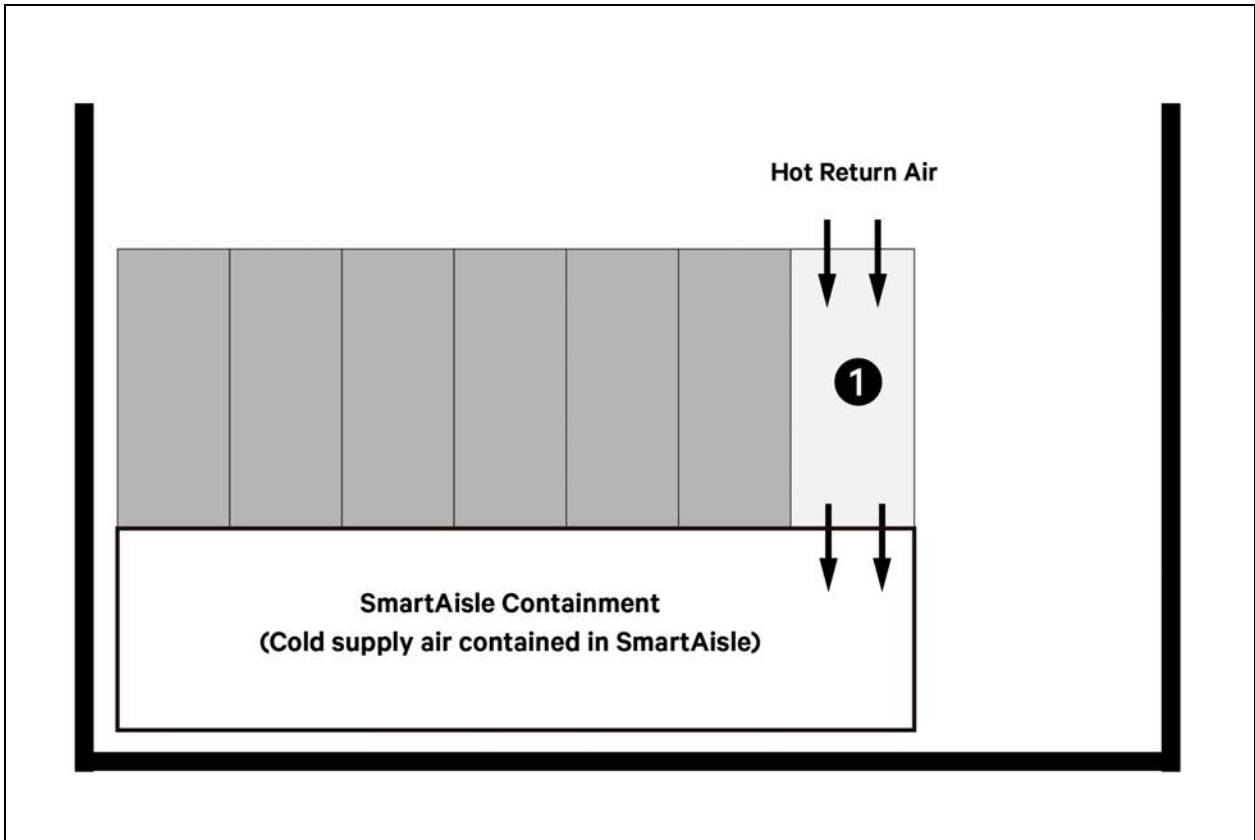
Using the Vertiv™ CoolPhase Row with the Liebert® SmartRow™ is always recommended but not required. It is an excellent solution when attempting to cool widely varying heat loads, loads exceeding 10-kW per rack, and when seeking the highest efficiency systems. For additional information about the Liebert®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

Figure 7.10 Vertiv™ CoolPhase Row Placement with Liebert® SmartRow™ Cold Aisle Containment— Vertiv™ CoolPhase Row in the Center of Two Rows.



Item	Description
1	Vertiv™ CoolPhase Row unit.

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



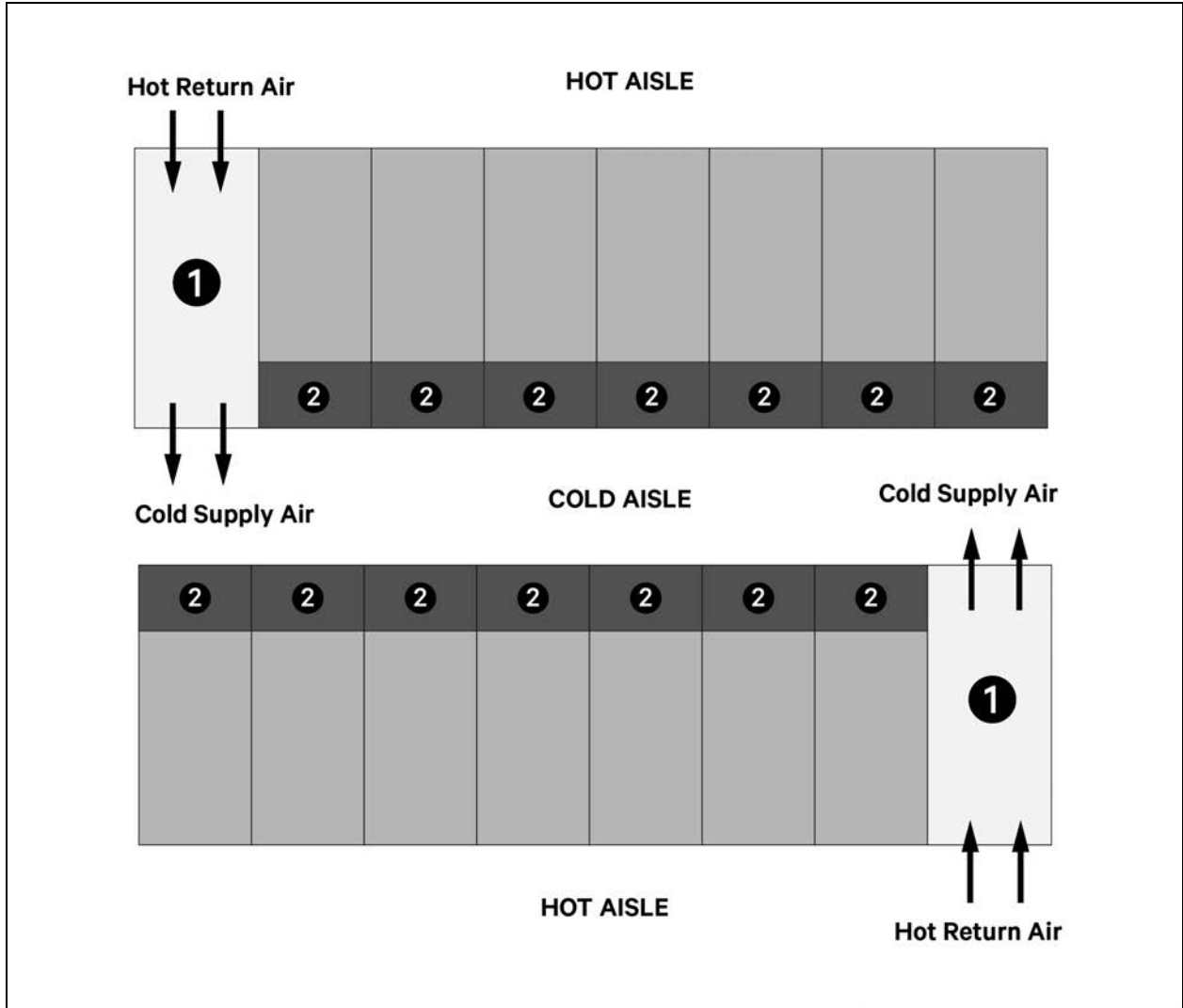
Item	Description
1	Vertiv™ CoolPhase Row unit.

D.5 Vertiv™ CoolPhase Row and Vertiv™ Liebert® XD Systems.

When larger spaces (approximately 20 racks or more) require high density cooling, row based CoolPhase Row can be used to support Liebert® XD cooling systems. When used together, these systems are more efficient than row based units alone.

Figure E.12 below, illustrates the layout of a typical installation with two rows of racks and Vertiv™ Liebert® XDV modules. Two Vertiv™ CoolPhase Row units support the Vertiv™ Liebert® XD system and provide N+1 redundant humidity control. For additional information about Liebert® XD cooling systems, see www.Vertiv.com.

Figure 7.12 Vertiv™ CoolPhase Row Placement with Liebert® XDV.



Item	Description
1	Vertiv™ CoolPhase Row unit.
2	Liebert® XDV modules

Appendix E: Extra Airflow—Standard on 600 Series, Manually Configurable Airflow on 300 Series

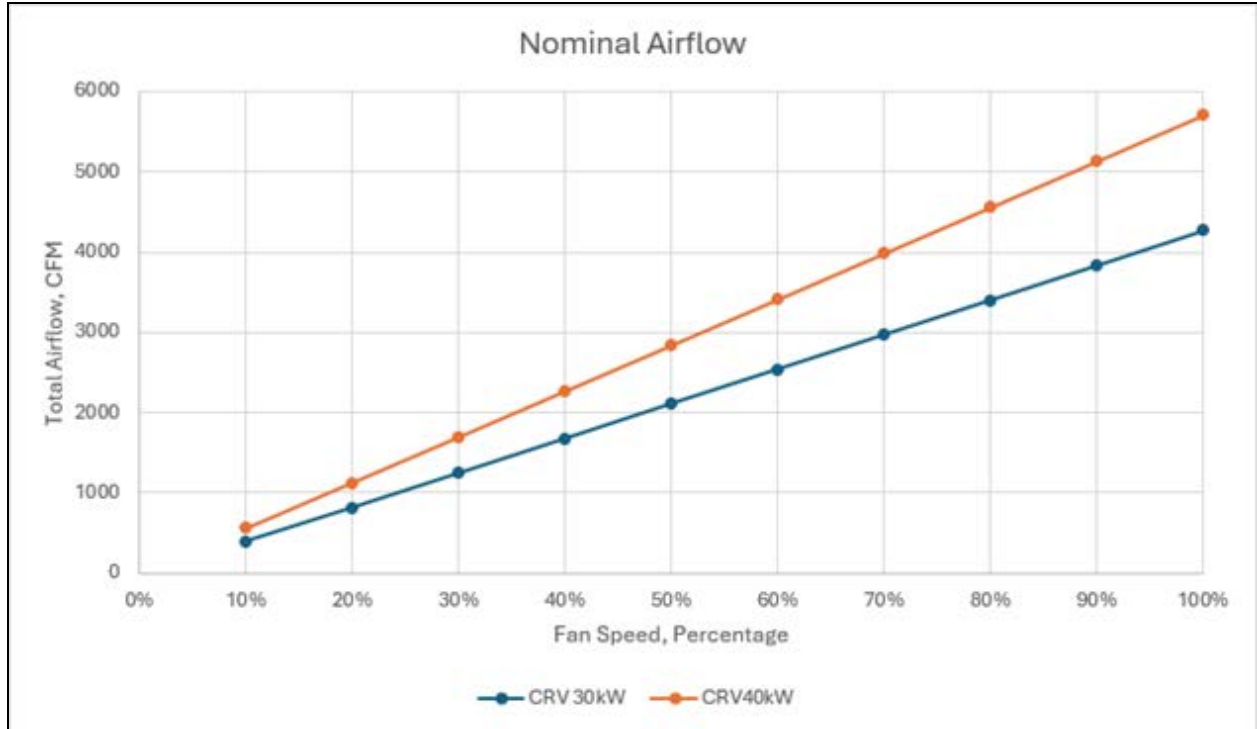
The Vertiv™ CoolPhase Row can provide additional airflow to correct for lower density air at higher elevations and during emergency conditions. During normal operation, the CoolPhase Row automatically modulates its airflow and cooling capacity to satisfy the aisle's requirements. The unit automatically increases the fan speed above the factory default speed during the following conditions:

- If there are multiple fans, when one fan is faulty, the fan output increases by 5% (REQ-33504).
- If a different Vertiv™ CoolPhase Row experiences a problem that requires help from other, nearby CoolPhase Row units, the healthy units will automatically increase their fan speed above 100% to provide additional airflow and/or cooling (requires Vertiv™ iCOM™ unit-to-unit Teamwork communication).
- If a room becomes extremely hot during a power failure when heat generating server equipment continues to run on backup power while air conditioners are without power. The Vertiv™ CoolPhase Row will automatically utilize its extra airflow if a room is extremely hot after a power outage to cool the room back to setpoint as fast as possible.

Table 7.4 Vertiv™ CoolPhase Row Nominal Airflow

Model	Factory Default Rating 100 % (CFM)	Maximum Fan Speed (CFM)	Extra Airflow
CoolPhase Row CRD030	3900	4300	9%
CoolPhase Row CRD040	5700	5700	-%

Figure 7.13 Nominal Airflow



Appendix F: Guide Specifications

The following are the guide specifications for the Vertiv™ CoolPhase Row.

**Vertiv™ CoolPhase Row
Row-based Environmental Control System
Guide Specifications**

1.0 GENERAL

1.1 Summary

These specifications describe the requirements for a Thermal Management system. The system shall be designed to control temperature and humidity conditions in rooms containing electronic equipment, with good insulation and vapor barrier. The manufacturer shall design and furnish all equipment to be fully compatible with the heat dissipation requirements of the room.

1.2 Design Requirements

The Thermal Management system shall be CSA-Listed to the harmonized U.S. and Canadian product safety standards "CSA C22.2 No. 60335-1/UL60335-1 Household and similar electrical appliances - Safety - Part 1: General requirements & CSA C22.2 No. 60335-2-40/UL 60335-2-40 Household and similar electrical appliances - Safety - Part 2: Particular requirements for electrical heat pumps, air conditioners and dehumidifiers" and are marked with CSA c-us logo.

The system shall be AHRI Listed, the trusted mark of performance assurance for heating, ventilation, air conditioning and commercial refrigeration equipment, using AHRI Standard 1360.

1.2.1 Submittals

Submittals shall be provided with the proposal and shall include: Single-Line Diagrams; Dimensional, Electrical, and Capacity Data; Piping and Electrical Connection Drawings.

2.0 PRODUCT

2.1 Cooling System

2.1.1 Air-Cooled Refrigeration System

Refrigeration System

The single refrigeration circuit shall include a liquid-line filter drier, a ball valve, a refrigerant sight glass with moisture indicator, an electronic expansion valve, and a liquid-line solenoid valve. The indoor evaporator refrigerant piping shall be spun shut with a nitrogen holding charge. Field relief of the Schrader valve shall indicate a leak-free system.

Hydrophilic-Coated Evaporator Coil

1. Model CRD030

The direct expansion, “V-shape” cooling coil shall have 11 ft² (1.02 m²) face area, three rows deep. It shall be constructed of copper tubes and hydrophilic-coated aluminum fins. The hydrophilic coating shall significantly improve the speed of condensate drainage from the fins and shall provide superior water carryover resistance. Two stainless steel condensate drain pans shall be provided, one in the middle of the coil and one in the bottom side of the coil.

2. Model CRD040

The direct expansion, slab cooling coil shall have 8.26ft² (0.768 m²) face area, six rows deep. It shall be constructed of copper tubes and hydrophilic-coated aluminum fins. The hydrophilic coating shall significantly improve the speed of condensate drainage from the fins and shall provide superior water carryover resistance. Two stainless steel condensate drain pans shall be provided, one in the middle of the coil and one in the bottom side of the coil.

Fan Motors

The CR030 unit shall be equipped with six axial fans and the CR040 with eight axial fans: direct-driven axial fans with diagonal shape impeller and electronically commutated DC motors. The fan speed shall be variable and automatically regulated by the Liebert® iCOM™ through all modes of operation. Each fan should have a dedicated motor, fault monitoring circuitry and speed controller, which provides a level of redundancy. The EC axial fans shall be mounted in front of the unit and draw air through the coil.

2.2 Advanced Airflow Management

2.2.1 Supply Air Baffle System

1. Models CRD030 & CRD040

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 air-flow requirements within the row. The five modular baffle segments shall be easily reconfigurable to redirect air flow as cooling requirements change. Controlling the air flow 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.

2.3 Cabinet Construction and Accessibility

2.3.1 Cabinet Construction

1. Models CRD030 & CRD040

The exterior panels shall be 20-gauge steel and powder-coated with charcoal color paint to protect against corrosion. The double-wall side panels separate the half-inch, 2.0 lb./ft³ insulation from the air stream and increase unit rigidity. The unit shall be mounted on casters for quick installation and provided

with leveling feet. The perforated inlet and outlet panels shall have 81% open area. The rear door shall utilize a Vertiv™ Liebert® Knürr™ rack style handle and hinges to mirror the appearance of neighboring server racks.

2.3.2 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.

1. Models CRD030 & CRD040

The Superior Service Access Panel shall provide additional access to the top of the system components. Side access shall not be required.

The variable-speed EC axial fans shall be individually replaceable through the front door of the unit. The condensate pump and canister humidifier shall be conveniently mounted near the edge of the unit.

2.4 Locking Disconnect Switch

1. Models CRD030 & CRD040

A manual disconnect switch shall be mounted in the electrical panel and capable of disrupting the power flow to the unit. The electrical panel compartment shall only be accessible when the switch is in the OFF position. It should be located on the rear door, above the E-box, to allow quick and safe access.

2.5 Short Circuit Current Rating (SCCR)

1. Models CRD030 & CRD040

The electrical panel shall provide at least 65,000A SCCR.

2. Model CRD030 & CRD040 208-230/1/60Hz

The electrical panel shall provide at least 65,000A SCCR.

3. Model CRD030 & CRD040 208-230/3/60Hz

The electrical panel shall provide at least 65,000A SCCR.

4. Model CRD030 & CRD040 460/3/60Hz

The electrical panel shall provide at least 65,000A SCCR.

2.6 Filtration

1. Models CRD030 & CRD040

a. MERV 8

The filter channel shall be an integral part of the system, located within the cabinet and serviceable from the rear. The two filters shall be deep-pleated, 4 inches thick with an ASHRAE 52.2 MERV8 rating (30% ASHRAE 52.1). A filter clog alarm shall be included. Mesh type, cleanable filters shall be unacceptable.

b. Optional - MERV 11

The filter channel shall be an integral part of the system, located within the cabinet and serviceable from the rear. The two filters shall be deep-pleated, 4 inches thick with an ASHRAE 52.2 MERV11 rating (60-65% ASHRAE 52.1). A filter clog alarm shall be included. Mesh type, cleanable filters shall be unacceptable.

2.7 Electric Reheat

The PTC aluminum 6063 tube electric reheat shall be capable of maintaining room dry bulb conditions when the system is calling for dehumidification. The reheat section shall include UL/CSA recognized safety switches to protect the system from overheating. The capacity of the PTC reheat shall be

controlled in one stage.

Must be controlled with control signal 0-10V from main controller and controlled by SSR (Solid State Relays) in phase angle mode.

2.8 Steam Generating Canister Humidifier

A canister-type steam-generating humidifier shall be factory-installed in the cooling unit and operated by the Vertiv™ Liebert® iCOM™. It shall be complete with disposable cylinder, all supply and drain valves, steam distributor and electronic controls. The need to change the canister shall be indicated on the Liebert® iCOM™. The humidifier shall be designed to operate with water conductivity from 75 to 1250 (60Hz) microS/cm. The system shall automatically fill and drain as well as maintain the required water level based on conductivity. An air gap within the humidifier assembly shall prevent back-flow of the humidifier supply water. The humidifier canister shall be removable from the rear of the cabinet.

2.9 Condensate Pump—Models CRD030 & CRD040

The condensate pump shall have a minimum capacity of 2.64 GPM (10 l/min) at 19.69 ft. (6 m) head.

3.0 CONTROL

3.1 Vertiv™ Liebert® iCOM™ Microprocessor Control with 7 Inch Color Touchscreen

The Liebert® iCOM™ shall be microprocessor-based with a 7" color touchscreen display and shall be mounted in an ergonomic, aesthetically pleasing housing. The controls shall be menu driven. The system shall display user menus for active alarms, event log, graphic data, unit view/status overview (including the monitoring of room conditions, operational status in percentage of each function, date, and time), total run hours, various sensors, display setup and service contacts. A password shall be required to make system changes. Service menus shall include setpoints, standby settings (lead/lag), timers/sleep mode, alarm setup, sensor calibration, maintenance/wellness settings, options setup, system/network setup, auxiliary boards, and diagnostics/service mode.

- Password Protection - The Liebert® iCOM™ shall contain two unique passwords to protect against unauthorized changes. An auto hide/show feature shall allow the user to see applicable information based on the login used.
- Unit Backup and Restore - The user shall be able to create safe copies of important control parameters. The Liebert® iCOM™ shall have the capacity for the user to automatically backup unit configuration settings to internal memory or USB storage drive. Configuration settings may be transferred to another unit for a more stream-lined unit startup.
- Parameter Download - The Liebert® iCOM™ shall enable the user to download a report that lists parameter names, factory default settings and user programmed settings in .csv format for remote reference.
- Parameter Search - The Liebert® iCOM™ shall have search fields for efficient navigation and parameter lookup.
- Setup Wizards - The Liebert® iCOM™ shall contain step-by-step tutorials or wizards to provide easy setup of the control.
- Context-Sensitive Help - The Liebert® iCOM™ shall have an on-board help database. The database shall provide context-sensitive help to assist with setup and navigation of the menus.
- Display Setup - The user shall be able to configure the display information based on the specific user's preference. Language, units of measure, screen contrast, home screen layout, back-light timer and the hide/show of certain readouts shall be configurable through the display.
- Additional Readouts - The display shall enable the user to configure custom widgets on the main screen. Widget options will include items such as fan speed, call for cooling, call for free-cooling, maintenance status, call for hot water reheat, call for electric reheat, call for dehumidification, call for humidification, airflow, static pressure, fluid flow rate and cooling capacity.
- Status LED's - The Liebert® iCOM™ shall show the unit's operating status using an integral LED. The LED shall indicate if the unit has an active alarm; if the unit has an active alarm that has been acknowledged; or if the unit is On, Off or in standby status.
- Event Log - The Liebert® iCOM™ shall automatically store the last 400 unit-only events (messages, warnings, and alarms).
- Service Contact Information - The Liebert® iCOM™ shall be able to store the local service or sales contact information.
- Upgradeable - Liebert® iCOM™ upgrades shall be performed through a USB connection.
- Timers/Sleep Mode - The menus shall allow various customer settings for turning the unit On or Off.

- Menu Layout - The menus shall be divided into two main menus: User and Service. The User screen shall contain the menus to access parameters required for basic unit control and setup. The Service screen shall be de-signed for service personnel and shall provide access to advanced control setup features and diagnostic information.
- Sensor Calibration - The menus shall allow unit sensors to be calibrated with external sensors.
- Maintenance/Wellness Settings - The menus shall allow reporting of potential component problems before they occur.
- Options Setup - The menus shall provide operation settings for the installed components.
- Auxiliary Boards - The menus shall allow setup of optional expansion boards.
- Diagnostics/Service Mode - The Vertiv™ Liebert® iCOM™ control shall be provided with self-diagnostics to aid in troubleshooting. The microcontroller board shall be diagnosed and reported as pass/not pass. Control inputs shall be indicated as On or Off at the front display. Control outputs shall be able to be turned On or Off from the front display without using jumpers or a service terminal. Each control output shall be indicated by an LED on a circuit board.

3.2 Alarms

All unit alarms shall be annunciated through both audio and visual cues, clearly displayed on the screen, automatically recorded in the event log, and communicated to the customers Building Management System/Building Automation System. The Liebert® iCOM™ shall activate an audible and visual alarm in event of any of the following conditions:

- High or Low Pressure
- Discharge High Temperature
- Low discharge superheat
- High- or Low-pressure lock
- Discharge high temperature lock alarm
- Discharge low super heat lock alarm
- Return air high or low temperature alarm
- Supply air high or low temperature alarm
- Remote air high or low temperature alarm
- Filter clogged
- Remote powering off alarm
- Return air temperature sensor failure
- Return air humidity sensor failure
- High- or low-pressure sensor failure
- Suction temperature sensor failure
- Discharge temperature sensor failure
- EEV communication failure
- Compressor driver communication failure
- Electric heater failure

- Water leakage alarm
- Return air high or low humidity alarm
- Air flow loss alarm
- Fan detection board communication failure
- Fan failure alarm
- Power loss alarm
- Power over or under voltage alarm
- Power frequency offset alarm
- High condensate water alarm
- Teamwork addresses duplicated
- Teamwork primary unit loss
- Teamwork secondary unit loss
- Smoke alarm
- Fire alarm
- Custom Alarms

Custom alarm inputs shall be provided to indicate facility-specific events. Custom alarms can be identified with programmable labels. Frequently used alarm inputs include:

- Humidifier failure alarm
- CP driver protect
- CP driver lock
- EEV driver abnormal
- Air pressure sensor failure
- Power meter communication failure
- Filter maintenance

Each alarm (unit and custom) shall be separately enabled or disabled.

3.3 Vertiv™ Liebert® iCOM™ Control Methods and Options

The Liebert® iCOM™ shall be factory-set to allow precise monitoring and control of the condition of the air entering and leaving the unit. This control shall include predictive methods to control air flow and cooling capacity-based control sensors installed. Proportional and Tunable PID shall also be user-selectable options.

3.4 Controlling Sensor Options

Liebert® iCOM™ shall be flexible in the sense that it shall allow for controlling the capacity and fan from multiple different sensor selections. The sensor selections shall be:

Cooling Capacity

- Supply
- Remote
- Return

Fan Speed

- Supply
- Remote
- Return
- Manual (for diagnostic or to receive a signal from the BMS through the Liebert remote monitoring devices or analog input).

3.4.10 Temperature Compensation

The Liebert® iCOM™ shall be able to adjust the capacity output based on supply and return temperature conditions to meet SLA guidelines while operating to highest efficiency.

3.4.10 Humidity Control

Dew point and relative humidity control methods shall be available (based on user preference) for humidity control within the conditioned space

3.5 Multi-Unit Coordination

Liebert® iCOM™ teamwork shall save energy by preventing multiple units in an area from operating in opposing modes. Teamwork allows the control to optimize a group of connected cooling units equipped with Liebert® iCOM™ using the U2U (Unit-to-Unit) network. There shall be three modes of teamwork operation:

- Teamwork Mode 1: Is best in small rooms with balanced heat loads. The controlling temperature and humidity sensor readings of all units in operation (fan on) are collected to be used for an average or worst-case sensor reading (user selectable). The master unit shall send the operating requirements to all operating units in the group. The control band (temperature, fan, and humidity) is divided and shared among the units in the group.
- Teamwork Mode 2: The Liebert® iCOM™ calculates the worse-case demand for heating, cooling humidification and dehumidification. Based on the greatest demand within the group, each unit operates independently, meaning that the unit may respond to the thermal load and humidity conditions based on the unit's controlling sensors.

- **Teamwork Mode 3 - Optimized Aisle:** May be employed in large and small rooms with varying heat loads. Optimized Aisle is the most efficient teamwork mode that allows the unit to match cooling capacity with heat load. In the Optimized Aisle mode, the fans operate in parallel. Fans can be controlled exclusively by remote temperature or using static pressure with a secondary remote temperature sensor(s) as an override to ensure that the inlet rack temperature is being met. Cooling (Compressors) is controlled through unit supply-air conditions. Vertiv™ Liebert® iCOM™ calculates the average or worst-case sensor reading (user-selectable) for heating, cooling humidification, and dehumidification. Based on the demand within the group, units will be allowed to operate within that mode until room conditions are satisfied.

3.6 Standby Lead - Lag

The Liebert® iCOM™ shall allow scheduled rotation to keep equal run time on units and provide automated emergency rotation of operating and standby units.

3.7 Standby Unit Cascading

The Liebert® iCOM™ cascade feature provides an additional control layer to the standby / lead-lag routine. For situations where all units within a given network group are not required to operate simultaneously, standby units are readily available to 'cascade' ON / OFF in order to assist with cooling, reheat or airflow needs. Cascade in Teamwork Mode 1 is based on cooling / reheat, or cooling needs only while cascade for Teamwork Mode 3 is based on Fanspeed or Fan PI settings.

3.8 Wired Supply Sensor

Each Liebert® iCOM™ shall have one factory-supplied and connected supply-air NTC sensor that may be used as a controlling sensor or reference. When multiple sensors are applied for control purposes, the user shall be able to control based on a maximum or average temperature reading.

3.9 Virtual Primary

As part of the robust architecture of the Liebert® iCOM™ control, it shall allow for a virtual primary that coordinates operation. The Virtual Primary function shall provide smooth control operation if the group's communication is compromised. When the lead unit, which is in charge of component staging in teamwork, unit staging and standby rotation, becomes disconnected from the network, the Liebert® iCOM™ shall automatically assign a virtual primary. The virtual primary shall assume the same responsibilities as the primary until communication is restored.

3.10 Compressor Short Cycle Control

To help maximize the life of the compressor, there shall be start-to-next start delay for the compressor. The control shall monitor the number of compressor starts in an hour. If the compressor starts more than 10 times in 60 minutes, the local display and remote monitoring shall notify the user through a Compressor 1 Short Cycle event.

3.11 Vertiv™ Liebert® CoolPhase Condenser

Units may be matched to a premium efficiency condenser control with enhanced monitoring, alarming, and diagnostics. The condenser control shall have an automated, low-noise mode and fan reversal for cleaning mode.

3.12 System Auto Restart

The auto restart feature shall automatically restart the system after a power failure. Time delay shall be programmable.

3.13 Sequential Load Activation

On initial startup or restart after power failure, each operational load shall be sequenced with a minimum delay of one second to minimize total inrush current.

3.14 Low Pressure Monitoring

Units shall ship standard with low-pressure transducers for monitoring compressor suction pressure. If the pressure falls due to loss of charge or other mechanical cause, the corresponding circuit shall shut down to prevent equipment damage. The user shall be notified of the low-pressure condition through the local display and remote monitoring.

3.15 Winter Start Time Delay - Air - Cooled Models

An adjustable software timer shall be provided to assist with compressor starting during cold weather. When the compressor starts, the low-pressure input shall be ignored for the period set in the user-adjustable timer. Once the time period has elapsed after the compressor start, the low-pressure input should remain in the normal state. If the low-pressure input does not remain in the normal state when the time delay has elapsed, the circuit shall lock out on low pressure. The low-pressure alarm shall be announced on the local display and communicated to remote monitoring systems.

3.16 Refrigerant Pressure Transducer Failure

The control shall monitor the high-side and low-side refrigerant pressure transducers. If the control senses the transducer has failed, has been disconnected, has shorted or the reading has gone out of range, the user shall be notified through an event on the local display and remote monitoring. The corresponding circuit that the failure has occurred on shall be disabled to prevent unit damage.

3.17 Oil Return Protection

The control shall monitor compressor operation and staging to ensure that liquid and hot gas velocity are maintained for proper oil return to the compressor.

3.18 Scroll High Temperature Protection

The control shall monitor digital scroll temperature during unit operation. A compressor temperature limit shall be imposed to help prevent damage to the compressor. If the temperature reaches the maximum temperature limit, the compressor shall be locked out and an alarm shall be annunciated on the local display and through monitoring. After the initial lockout, the control shall continue to monitor compressor temperature during the off-cycle and re enable the circuit once a safe operating temperature is reached. The control shall store the number of high temperature trips. The number of trips shall be accessible through the local display.

3.19 Compressor Run Time Monitoring

The control shall log these compressor statistics:

- Number of high-pressure alarms
- Operating phase in which the high-pressure alarm occurred
- Number of low-pressure alarms
- Operating phase in which the low-pressure alarm occurred
- Number of high-temperature alarms

The user shall have the ability to monitor compressor operating temperature and pressure from the local display to be used as a diagnostic tool.

3.20 Refrigerant Leak Detection (RLD)

Refrigerant Leak Detection (RLD): provided on direct expansion products with R32 low global warming potential (LGWP) refrigerant. The RLD shall detect flammable concentrations of gas within the ambient air during a refrigerant leak event. The RLD shall aid in detecting the lower flammability limit (LFL) of the refrigerant and allow the unit to continue operation during low concentrations or run fan speeds at a dedicated mitigation speed should the concentration level reach undesirable levels.

3.21 Rack Temperature Sensors

The Vertiv™ CoolPhase Row shall be provided with Vertiv™ Liebert® 2T Rack temperature sensor. The sensors shall provide real-time, direct feedback to the cooling unit to optimize the amount of cooling and airflow provided. The sensor data shall be available to remote BMS and monitoring systems. The sensor network shall consist of one CAN wire leaving the cooling unit and connecting to a 2T sensor. Each remaining 2T sensor is connected to the previous sensor.

3.22 Additional CAN Cables for Rack Sensors

_____ additional feet long CAN cables shall be provided.

3.23 Communication Interfaces

3.23.10 Remote Shutdown Terminal

The remote shutdown terminal shall provide a location to remotely shut down the unit, complying with the National Fire Code.

3.23.10 Common Alarm Contact

The common alarm contact shall provide a set of normally open contacts for remote indication of unit alarms.

3.23.10 Vertiv™ CoolPhase Row CRD030 & CRD040 Cabinet Reheat / Humidifier Lockout

The reheat and humidifier lockout shall include the necessary relays to disable the reheat and humidifier from an external 24V signal while on emergency power.

3.23.10 Vertiv™ CoolPhase Row Cabinet (Model CRD030 & CRD040) One Extra Common Alarm Contact

One additional contact (total of two sets) of normally open (n/o) contacts for remote indication of unit alarms shall be provided.

3.23.10 Vertiv™ Liebert® IntelliSlot Unity-DP Card

The Liebert® IntelliSlot Unity Card (IS-UNITY-DP) shall provide ground fault isolated RS-485 Modbus, BACnet IP and Modbus IP network connectivity to Building Management Systems for unit monitoring and management. Also, it shall provide ground fault isolated 10/100 baseT Ethernet connectivity for unit monitoring and management. The supported management interfaces include SNMP for Network Management Systems, HTTP for Web page viewing, SMTP for e-mail and SMS for mobile messaging. The card shall support IP and 485 protocols simultaneously.

3.23.10 Refrigerant Leak Detector

Due to the slightly flammable nature of Refrigerant R-32, a refrigerant leak detector is installed into the unit.

Operation

When the sensor is powered up, a LED will indicate the sensor status. The LED is located on the reverse side of the sensor near the sensor membrane. While the sensor is mounted, the LED will backlight the sensor and be visible by the reflection from the mounting surface.

Model Number	Description
Solid Green	Sensor power-up and self-test
Blinking green	Normal operation (heartbeat)
Solid red	Alarm state – gas detected
Blinking red	Sensor fault

In case of leakage the following actions will be taken:

- The compressor will shut down
- The evaporator and condenser fans will be activated at 50% of their speed
- The EEV will be closed completely
- Shut off Valve activates and will close completely, preventing additional refrigerant flow

NOTES: - In case of leakage the unit will start mitigation actions and will send an alarm - For the alarm to be reset, the sensor reading must be a minimum of 2.5% below the alarm setpoint (threshold). - The mitigation actions will continue 5 minutes after the problem has been solved - The Leak Detector Sensor verifies that there's no leakage - The alarm will disappear from the smart display once the sensor doesn't detect the concentration of R32 refrigerant and the LSR Relay Located in the EBOX has been restarted by authorized personnel. It is imperative to verify physically if the leakage was mitigated before restarting the relay.

4.0 HEAT REJECTION

4.1 Air Cooled Vertiv™ CoolPhase Condenser

4.1.1 Standard Features

The condenser shall consist of microchannel condenser coil(s), propeller fan(s) direct driven by individual fan motor(s), electrical controls, housing. Microchannel coils shall provide superior heat transfer, reduce air side pressure drop, increase energy efficiency, and shall significantly reduce the system refrigerant volume required. EC fans and fan operating techniques shall provide reduced maximum sound levels. Various methods shall be available to match indoor unit type, maximum outdoor design ambient and maximum sound requirements.

The unit includes service valves, low-pressure and high-pressure transducer, crankcase and heating belt for low/ambient application.

4.1.2 Compressor

The compressor shall be scroll-type with variable capacity operation from 20-100%, commonly known as a variable speed scroll. The compressor shall have vibration isolators an 100% operating speed of 5100 rpm at 60Hz for CRD030 and 6000 rpm at 60Hz for CRD040. The compressor shall be located outside the air stream and shall be removable and serviceable from the front of the unit.

R32 Refrigerant

The system shall be designed for use with R32 refrigerant, which meets the U.S. Clean Air Act for phaseout of HCFC refrigerants.

4.1.3 Condenser Coil

Aluminum Microchannel Coil

Microchannel coils shall be constructed of aluminum microchannel tubes, fins, and manifolds. Tubes shall be flat and contain multiple, parallel flow microchannels and span between aluminum headers. Full-depth, louvered aluminum fins shall fill spaces between the tubes. Tubes, fins, and aluminum headers shall be oven-brazed to form a complete refrigerant-to-air heat exchanger coil. Copper stub pipes shall be electric resistance welded to aluminum coils and joints protected with polyolefin to seal joints from corrosive environmental elements. Complete coil/piping assembly shall be filled and sealed with an inert gas holding charge for shipment.

Aluminum Microchannel Coil with E-Coat

Aluminum microchannel coil with E-coat shall be epoxy-coated for extended coil life in corrosive environments, such as coastal areas. Factory-applied E-coat using immersion and baking process shall provide a flexible epoxy-coating to all coil surfaces. Coil color shall be black and shall be protected from solar UV ray degradation with a factory-applied UV topcoat. E-coat shall increase coil corrosion protection and shall reduce heat rejection capacity degradation to less than 10% after a severe 2000-hour 5% neutral salt spray test (ref. ASTM B117). The coating process shall ensure complete coil encapsulation.

4.1.4 Fan Motor/Blade Assembly

The fan motor/blade assembly shall have an external rotor motor, fan blades and fan/finger guard. Fan blades shall be constructed of cast aluminum or glass-reinforced polymeric material. Fan guards shall be heavy gauge, close-meshed steel wire, coated with a black, corrosion-resistant finish. Fan terminal blocks shall be located enclosure located on the top of the fan motor. Fan assemblies shall be factory- balanced, tested before shipment and mounted securely to the condenser structure.

EC Fan Motor

SL-80069_REVB_03-26

The EC fan motors shall be electronically commutated for variable speed operation and shall have ball bearings. The EC fans shall provide internal overload protection through built-in electronics. Each EC fan motor shall have a built-in controller and communication module, linked via RS-485, allowing each fan to receive and respond to precise fan speed inputs from the controller.

4.1.5 Electrical Controls

Electrical controls and service connection terminals shall be provided and factory-wired inside the attached control panel section. A locking disconnect switch shall be factory-mounted and wired to the electrical panel and controlled via an externally mounted locking and lockable door handle. Only high-voltage supply wiring and low-voltage indoor unit communication/interlock wiring shall be required at condenser installation.

Premium Control

The EC fan/Premium Control System shall include an electronic control board, EC fan motor(s) with internal overload protection, refrigerant and ambient temperature thermistors, and refrigerant pressure transducers. The control board shall receive an indoor unit run signal via field-supplied low voltage interlock wires to the compressor side switch via field-supplied CANbus communication wires from the indoor unit's Vertiv™ Liebert® iCOM™ or via both. The control board shall use sensor and communication inputs to maintain refrigerant pressure by controlling each EC fan on the same refrigerant circuit to the same speed.

Locking Disconnect

A locking-type disconnect switch shall be factory-mounted and wired to the electrical panel. The switch shall be accessible from the outside of the unit with the door closed and shall prevent access to the high-voltage electrical components until switched to the Off position. The locking disconnect shall be lockable in support of lockout/tag-out safety programs.

Short Circuit Current Rating

The electrical panel shall provide at least 65,000A SCCR.

4.1.6 Cabinet

The condenser cabinet shall be constructed of galvanized steel sheet with powder coating finish and shall have a fan. Internal structural support members including microchannel supports and wire grill to protect microchannel, shall be galvanized steel with powder coating finish for strength and corrosion resistance. A panel door shall be provided next to the electrical enclosure to permit microchannel cleaning. And an electrical panel shall be contained inside a factory mounted, IP54 weatherproof electrical enclosure.

5.0 EXECUTION

5.1 Installation of Thermal Management Units

5.1.1 General

Install cooling units in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated and maintain manufacturer's recommended clearances.

5.1.2 Electrical Wiring

Install and connect electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's electrical connection diagram submittal to electrical contractor.

5.1.3 Piping Connections

Install and connect devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's piping connection diagram submittal to piping contractor.

5.1.4 Refrigerant Charging

Charge completed cooling system in accordance with manufacturer's refrigerant charging instructions.

5.1.5 Field Quality Control

Start-up cooling units in accordance with manufacturer's startup instructions. Test controls and demonstrate compliance with requirements. These specifications describe requirements for a computer room environmental control system. The system should be designed to maintain temperature and humidity conditions in the rooms containing electronic equipment.

The manufacturer shall design and furnish all equipment to be fully compatible with heat dissipation requirements.

5.1.6 Supply and Drain Water Piping

Connect water supply and drains to air conditioning unit. Provide pitch and trap as manufacturer's instructions and local codes require.

Appendix G: Submittal Drawings

Table 7.5 Standard and Optional Features Submittals

Document Number	Title
Standard and Optional Features	
Air Cooled 24 in (600 mm) Models	
20000140	Standard and Optional Features 24 in (600 mm) Air Cooled Models.
Air Cooled 12 in (300 mm) Models	
20000139	Standard and Optional Features 12 in (300 mm) Air Cooled Models
Component Locations	
20000303	Component Location, 24 in (600 mm) Air Cooled Models
20000304	Component Location, 12 in (300 mm) Air Cooled Models
Planning Dimensions	
20000144	Cabinet Dimensional Data 24 in (600 mm) models
20000145	Cabinet Dimensions CoolPhase Row 030 kW
Piping Schematics and Connection Locations - Air Cooled Systems	
20000141	General Arrangement Diagram CRD 030-040 kW CoolPhase Row
20000142	Primary Connection Locations, 24 in (600 mm) Air Cooled Models
20000143	Primary Connection Locations, 12 in (300 mm) Air Cooled Models
20000324	Air Cooled CoolPhase Row Piping Schematic Condenser Above Indoor Unit
Electric Field Connections – 24 in (600 mm) / 12 in (300 mm) Models	
20000325	CoolPhase Row 12in/ 24in (300/ 600 mm) Electrical Field Connections and Terminals blocks
Vertiv™ CoolPhase Condensing Unit Dimensional Data	
20000136	Cabinet Dimensions Vertiv™ CoolPhase Condensing Unit, 21kW/ 28kW
20000126	Cabinet Dimensions Vertiv™ CoolPhase Condensing Unit, 21kW/ 28kW
Vertiv™ CoolPhase Condensing Unit Piping	
20000326	Piping Dimensional Data Vertiv™ CoolPhase Condensing Unit - CoolPhase Row
Vertiv™ CoolPhase Condensing Unit Power Supply Wiring	
20000328	Vertiv™ CoolPhase Condensing Unit 28/35 kW Electrical Field Connections and Terminals Blocks
Vertiv™ CoolPhase Row Non-Seismic Application	
600 mm (24 inch) Models	
20000307	Dimensional Data 24 in (600 mm) rigid floor mount bracket
300 mm (12 inch) Models	
20000309	Dimensional Data 12 in (300 mm) rigid floor mount bracket
Electrical Schematics	
10080202	Vertiv™ CoolPhase Row 40kw 460V 3PH 50-60HZ
10080203	Vertiv™ CoolPhase Row 30kW 460V 3PH 50-60HZ

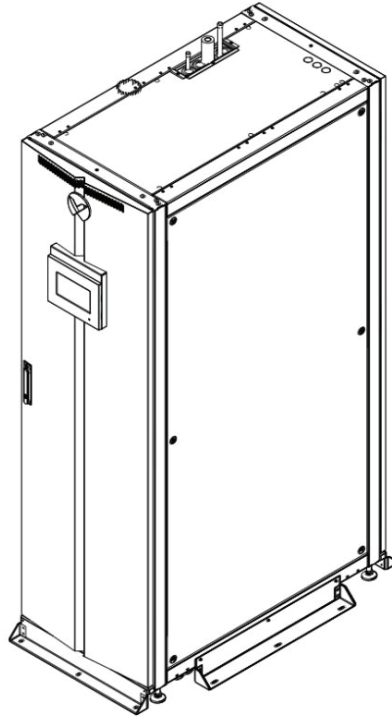
Table 7.5 Standard and Optional Features Submittals (continued)

Document Number	Title
10080204	Vertiv™ CoolPhase Row 40kW 208-230V 3PH 50-60HZ
10080205	Vertiv™ CoolPhase Row 30kW 208-230V 3PH 50-60HZ
10080206	Vertiv™ CoolPhase Row40kW 208-230V 1PH 50-60HZ
10080207	Vertiv™ CoolPhase Row 30kW 208-230V 1PH 50-60HZ
10159904	DVI-Dual Link Digital and Analog Monitor Cable
DX Products with R-32	
20000457	A2L refrigerant dispersal volume calculation R-32.



VERTIV COOLPHASE ROW

STANDARD FEATURES 600mm (24in) AIR COOLED MODELS



STANDARD FEATURES (Refer to product data sheet for options supplied)

DX COOLING COIL. The evaporator coil has 11.39 ft² (1.05 m²) face area, 6 rows deep. It is constructed of copper tubes and hydrophilic coated aluminium fins. The hydrophilic coating provides superior water carryover resistance. Two stainless steel condensate drain pans are provided.

REFRIGERATION SYSTEM. Single refrigeration circuit includes a liquid line filter drier, a refrigerant sight glass with moisture indicator an adjustable externally equalized expansion valve, and a liquid line solenoid valve.

FAN. The unit is equipped with eight plug fans: direct driven centrifugal fans with backward curved blades and Electronically Commutated DC motors; commonly referred to as EC plug fans. The fan speed is variable and automatically regulated by the Liebert[®] iCOM control through all modes of operation. Each fan has a dedicated motor and speed controller which provides a level of redundancy. The fans pull air through the coil and are located in front of the unit.

SUPPLY AIR BAFFLE A field adjustable, modular supply air baffle is located in the discharge air stream. It can be quickly and easily reconfigured to redirect airflow. The angles of the vanes have been optimized to effectively distribute air to heat generating equipment in a wide variety of applications.

LIEBERT[®] iCOM[™] CONTROL SYSTEM. The Vertiv CoolPhase Row is controlled by the Liebert[®] iCOM[™] Control System. The standard user interface is a 7 inch color HMI touch screen which presents system information and allows all parameters to be viewed and adjusted. It features a 3-level password protection system. Unit-to-Unit communication with other Vertiv CoolPhase Row's and a Liebert[®] IntelliSlot communication are included as standard.



VERTIV COOLPHASE ROW

STANDARD FEATURES 600mm (24in) AIR COOLED MODELS

REMOTE SHUTDOWN TERMINAL. Provides the customer with a location to remotely shut down the unit.

COMMON ALARM CONTACT. Provides the customer with one normally open (n/o) contact for remote alarm indication of the unit.

CABINET. The exterior steel panels are custom powder coated to protect against corrosion. The double wall constructed side panels separate the ½ inch, 2.0 lb/ft³ insulation from the airstream. The unit is mounted on casters for quick installation and provided with levelling feet. The perforated inlet and outlet panels have 81% open area, and the rear door utilizes a Swing Handle and hinges.

SERVICE ACCESS. All service and maintenance is performed through the front and rear of the unit; including any component removal. No side access is required. All electrical and piping connections are made through the top and/or bottom of the unit. All units are provided with a Superior Service Access Panel to provide additional access.

FILTER. The unit is equipped with two deep pleated 2inch filters rated MERV8 (based on ASHRAE 52.2-2012), located within the cabinet, and accessible from the rear of the unit. A filter clog alarm is included.

LOCKING DISCONNECT SWITCH. A moulded case circuit interrupter disrupts the flow of power to the unit. The electric panel high voltage compartment can only be accessed with the switch in the 'off' position. Conveniently located behind the rear service door for quick access.

65,000 AMP SHORT CIRCUIT CURRENT RATING (SCCR). The electrical panel provides a 65k amp SCCR.

DUAL-FLOAT CONDENSATE PUMP. It has a capacity of 2.64 GPM (10 L/min) at 6m head. Pump is complete with integral primary and secondary float switches, pump, brushless motor assembly, and reservoir. The secondary float shall send a signal to the local alarm and shut down the unit upon high water condition.



VERTIV COOLPHASE ROW

OPTIONAL FEATURES 600mm (24in) AIR COOLED MODELS

OPTIONAL FEATURES (Refer to product data sheet for options supplied)

HUMIDIFIER. A steam generating canister humidifier is factory-installed in the cooling unit and is operated by the Liebert® iCOM™ control system. It is complete with disposable cylinder, all supply and drain valves, steam distributor and electronic controls. The need to change the canister is indicated on the Liebert® iCOM™ display. The humidifier is designed to operate with water conductivity from 350-1250 $\mu\text{S}/\text{cm}$. System automatically fills and drains as well as maintains the required water level based on conductivity. An air-gap within the humidifier assembly shall prevent backflow of the humidifier supply water. The humidifier is removable from the rear of the cabinet.

ELECTRIC REHEAT. The electric reheat coils are low watt density, 304 stainless steel fin-tubular construction, protected by thermal safety switches and controlled in one stage.

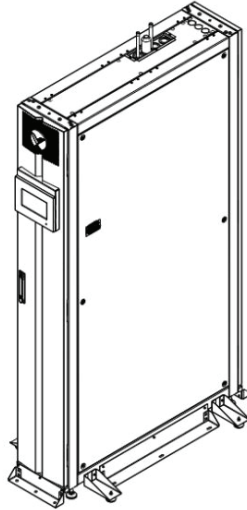
REHEAT / HUMIDIFIER LOCKOUT. Includes the necessary relays to disable the reheat and humidifier from an external 24 volt signal.

REMOTE TEMPERATURE SENSORS. The unit can be connected up to ten 10 temperature sensors. The sensors provide real-time, direct feedback to the cooling unit to optimize the amount of cooling and airflow required; increasing energy efficiency and ensuring proper rack inlet air temperatures. The sensor data can also be reported to remote monitoring systems. The sensor network consists of one CAN wire leaving the cooling unit and connecting to a 2T sensor.



VERTIV COOLPHASE ROW

STANDARD FEATURES 300mm (12in) AIR COOLED MODELS



STANDARD FEATURES

(Refer to product data sheet for options supplied)

DX COOLING COIL. The evaporator has a V-shaped Coil with (1.8m) 5.9ft of height, 3 rows deep. It is constructed of copper tubes and hydrophilic coated aluminium fins. The hydrophilic coating provides superior water carryover resistance. Two stainless steel condensate drain pans are provided.

REFRIGERATION SYSTEM. Single refrigeration circuit includes a liquid line filter drier, a refrigerant sight glass with moisture indicator an adjustable externally equalized expansion valve, and a liquid line solenoid valve.

FAN. The unit is equipped with six plug fans: direct driven centrifugal fans with backward curved blades and Electronically Commutated DC motors; commonly referred to as EC plug fans. The fan speed is variable and automatically regulated by the Liebert® iCOM control through all modes of operation. Each fan has a dedicated motor and speed controller which provides a level of redundancy. The fans pull air through the coil and are located in front of the unit.

SUPPLY AIR BAFFLE A field adjustable, modular supply air baffle is located in the discharge air stream. It can be quickly and easily reconfigured to redirect airflow. The angles of the vanes have been optimized to effectively distribute air to heat generating equipment in a wide variety of applications.

LIEBERT® iCOM™ CONTROL SYSTEM. The Vertiv CoolPhase Row is controlled by the Liebert® iCOM™ Control System. The standard user interface is a 7 inch color HMI touch screen which presents system information and allows all parameters to be viewed and adjusted. It features a 3-level password protection system. Unit-to-Unit communication with other Vertiv CoolPhase Row's and a Liebert® IntelliSlot communication are included as standard.



VERTIV COOLPHASE ROW

STANDARD FEATURES 300mm (12in) AIR COOLED MODELS

REMOTE SHUTDOWN TERMINAL. Provides the customer with a location to remotely shut down the unit.

COMMON ALARM CONTACT. Provides the customer with one normally open (n/o) contact for remote alarm indication of the unit.

CABINET. The exterior steel panels are custom powder coated to protect against corrosion. The double wall constructed side panels separate the ½ inch, 2.0 lb/ft³ insulation from the airstream. The unit is mounted on casters for quick installation and provided with levelling feet. The perforated inlet and outlet panels have 81% open area, and the rear door utilizes a Swing Handle and hinges.

SERVICE ACCESS. All service and maintenance is performed through the front and rear of the unit; including any component removal. No side access is required. All electrical and piping connections are made through the top and/or bottom of the unit. All units are provided with a Superior Service Access Panel to provide additional access.

FILTER. The unit is equipped with two deep pleated 2 inch filters rated MERV8 (based on ASHRAE 52.2-2012), located within the cabinet, and accessible from the rear of the unit. A filter clog alarm is included.

LOCKING DISCONNECT SWITCH. A moulded case circuit interrupter disrupts the flow of power to the unit. The electric panel high voltage compartment can only be accessed with the switch in the 'off' position. Conveniently located behind the rear service door for quick access.

65,000 AMP SHORT CIRCUIT CURRENT RATING (SCCR). The electrical panel provides a 65k amp SCCR.

DUAL-FLOAT CONDENSATE PUMP. It has a capacity of 2.64 GPM (10 L/min) at 6m head. Pump is complete with integral primary and secondary float switches, pump, brushless motor assembly, and reservoir. The secondary float shall send a signal to the local alarm and shut down the unit upon high water condition.



VERTIV COOLPHASE ROW

OPTIONAL FEATURES 300mm (12in) AIR COOLED MODELS

OPTIONAL FEATURES (Refer to product sheet for options supplied)

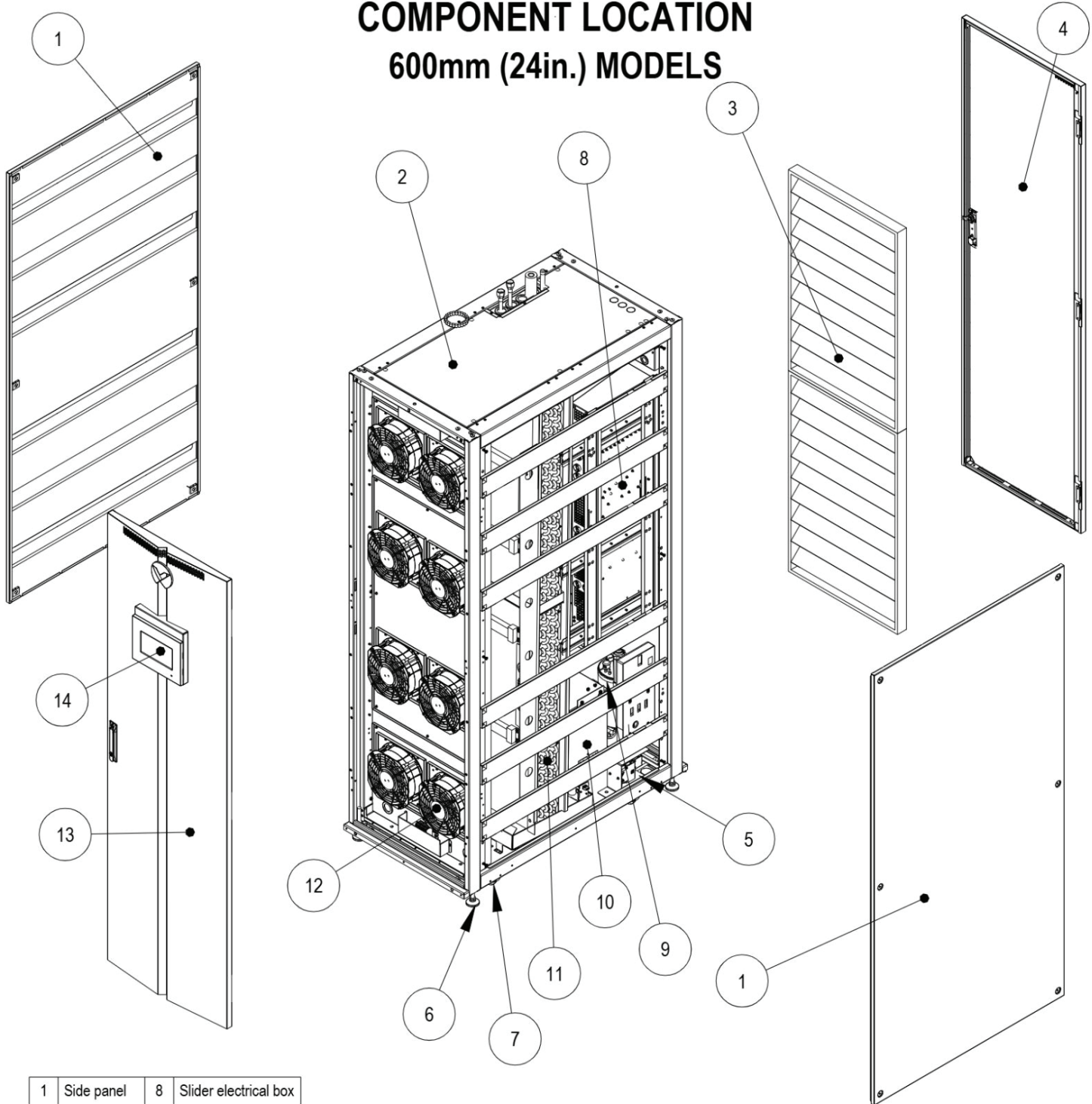
HUMIDIFIER. A steam generating canister humidifier is factory-installed in the cooling unit and is operated by the Liebert® iCOM™ control system. It is complete with disposable cylinder, all supply and drain valves, steam distributor and electronic controls. The need to change the canister is indicated on the Liebert® iCOM™ display. The humidifier is designed to operate with water conductivity from 350-1250 $\mu\text{S}/\text{cm}$. System automatically fills and drains as well as maintains the required water level based on conductivity. An air-gap within the humidifier assembly shall prevent backflow of the humidifier supply water. The humidifier is removable from the rear of the cabinet.

ELECTRIC REHEAT. The electric reheat coils are low watt density, 304 stainless steel fin-tubular construction, protected by thermal safety switches and controlled in one stage.

REHEAT / HUMIDIFIER LOCKOUT. Includes the necessary relays to disable the reheat and humidifier from an external 24 volt signal.

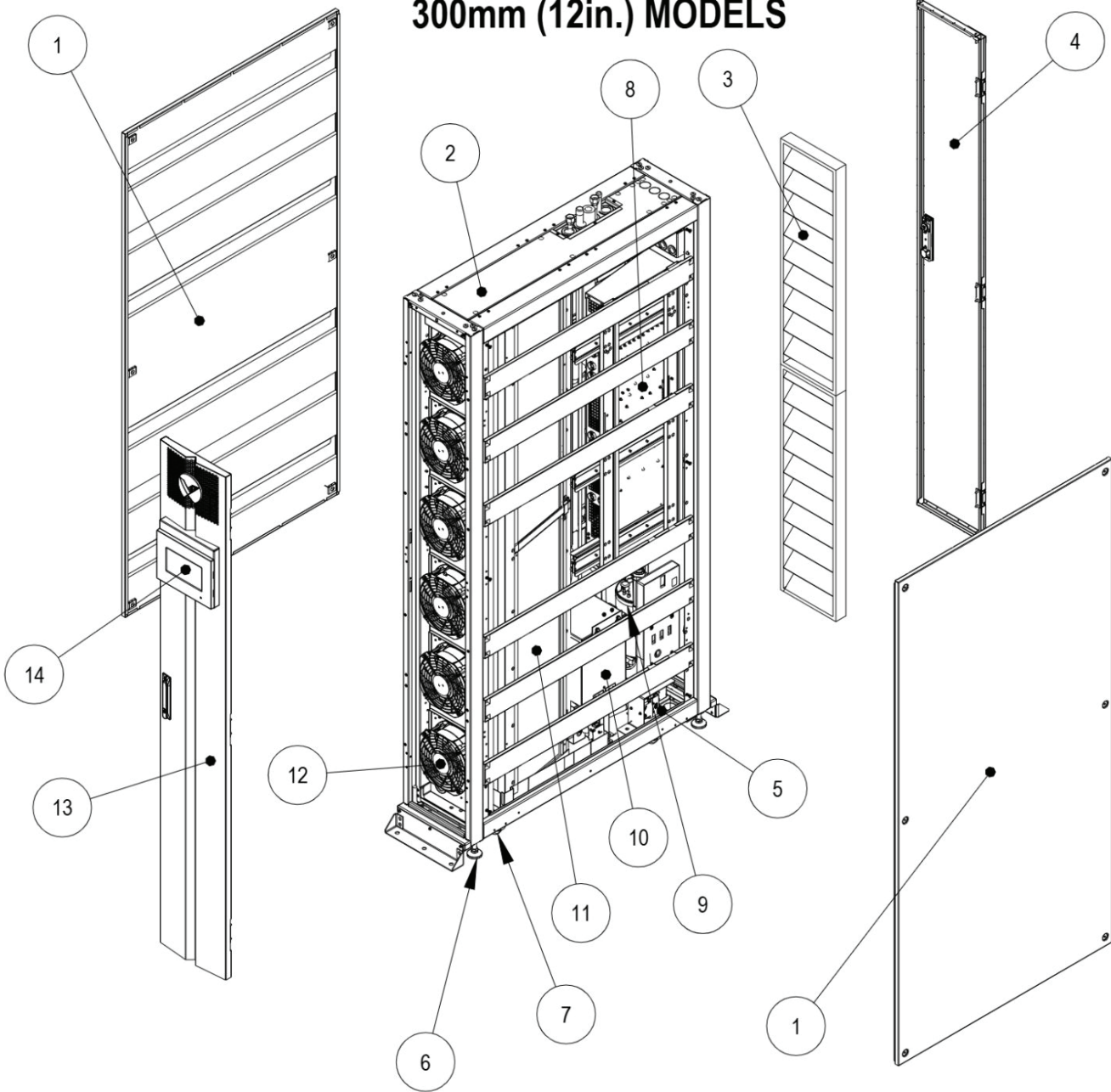
REMOTE TEMPERATURE SENSORS. The unit can be connected up to ten 10 temperature sensors. The sensors provide real-time, direct feedback to the cooling unit to optimize the amount of cooling and airflow required; increasing energy efficiency and ensuring proper rack inlet air temperatures. The sensor data can also be reported to remote monitoring systems. The sensor network consists of one CAN wire leaving the cooling unit and connecting to a 2T sensor.

COMPONENT LOCATION 600mm (24in.) MODELS



1	Side panel	8	Slider electrical box
2	Top panel	9	Humidifier (optional)
3	Filter	10	Transformer
4	Rear door	11	Heat exchanger
5	Bottom panel	12	EC fans
6	Leveling feet	13	Front door
7	Casters	14	iCOM display

COMPONENT LOCATION 300mm (12in.) MODELS

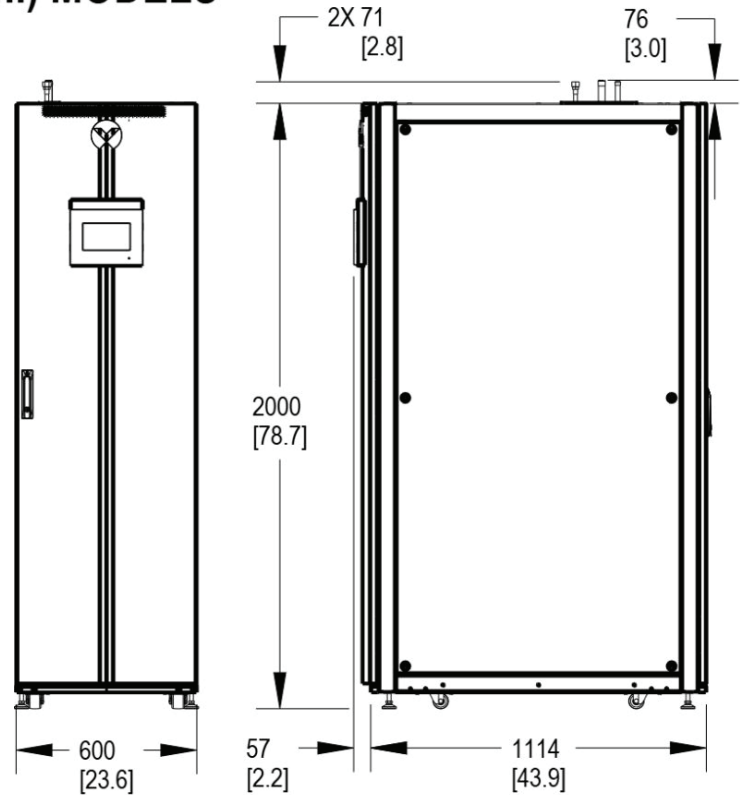
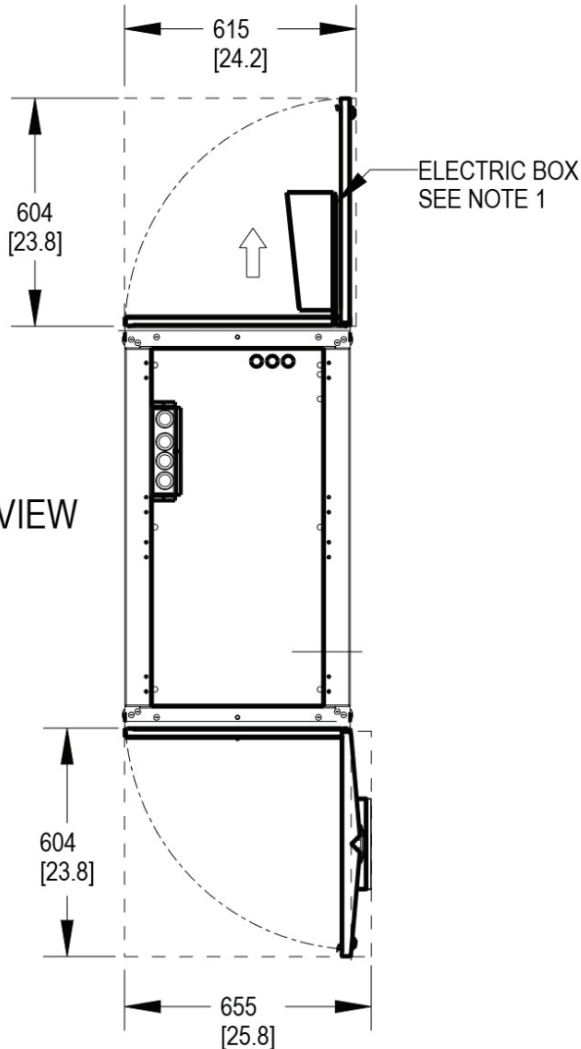


1	Side panel	8	Slider electrical box
2	Top panel	9	Humidifier (optional)
3	Filter	10	Transformer
4	Rear door	11	Heat exchanger
5	Bottom panel	12	EC fans
6	Leveling feet	13	Front door
7	Casters	14	iCOM display

CABINET DIMENSIONAL DATA

600mm (24in.) MODELS

ACCESS REQUIRED FOR SERVICE THE UNIT
WITHIN THE ROW

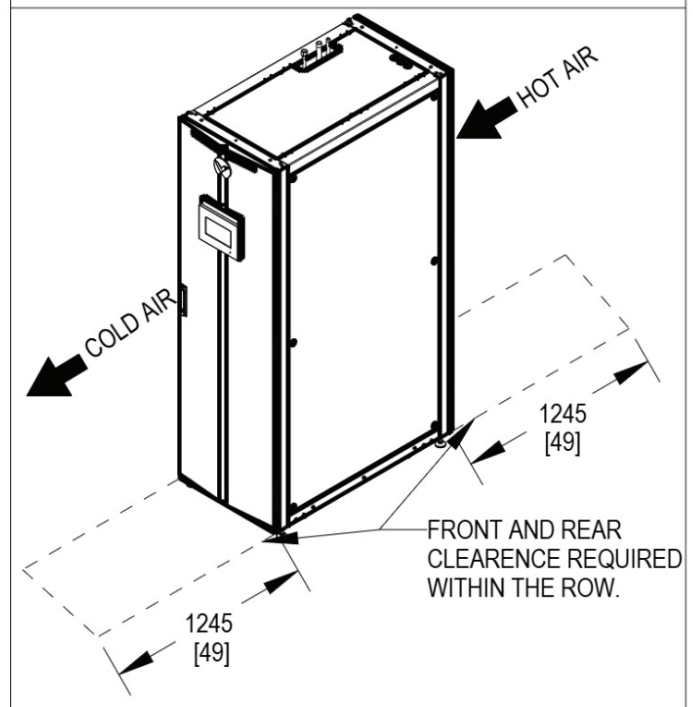


Cooling System	Dry Weight, +/- 5% lbs (kg)
AIR	703 (319)

NOTES:

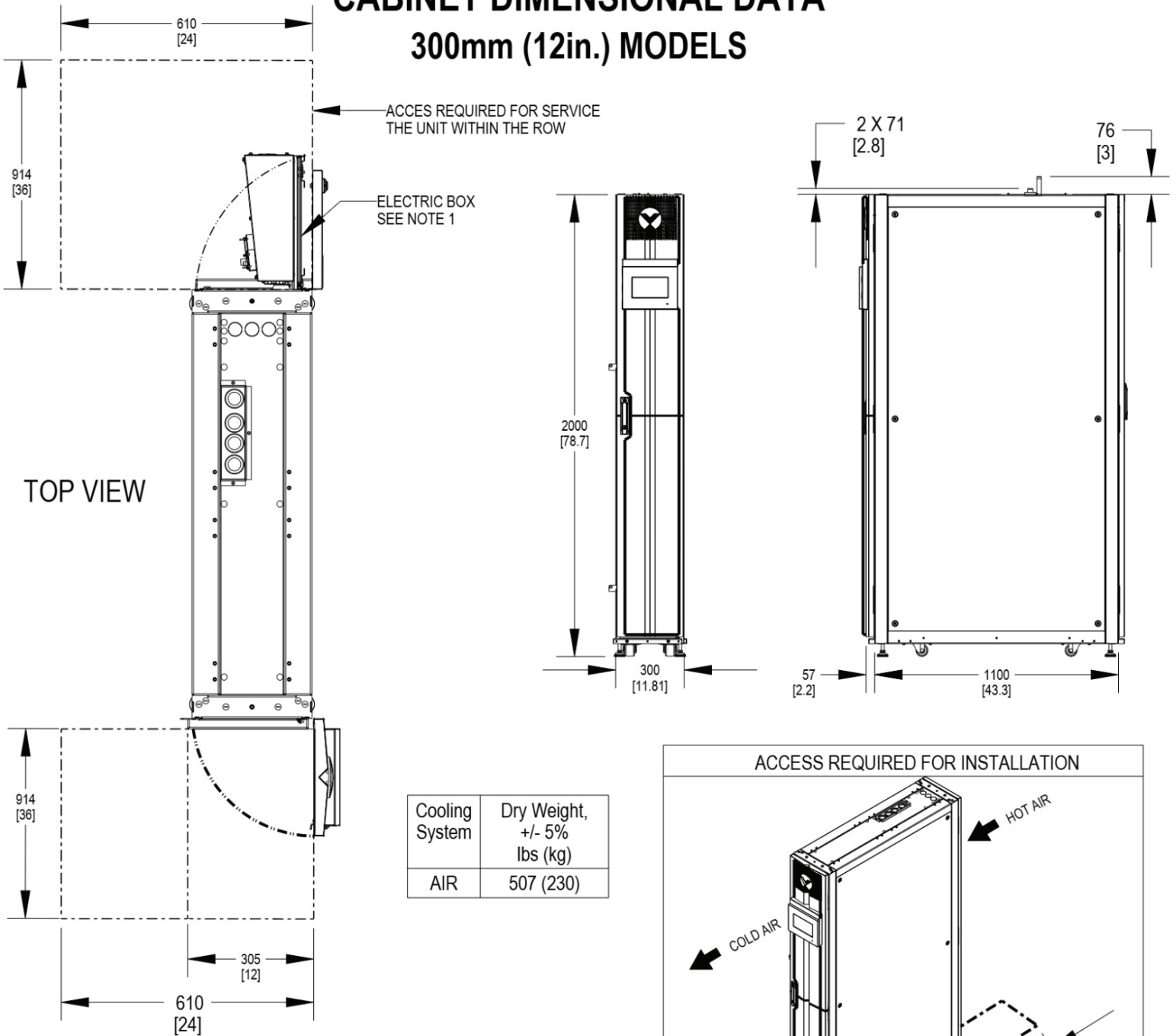
1. ELECTRIC BOX IS IN REAR OF UNIT (SHOWN FULLY EXTENDED). FOR SERVICE ACCESS TO ELECTRIC BOX REMOVE REAR DOOR. SLIDE ELECTRIC BOX REARWARD IN DIRECTION OF ARROW. ELECTRIC BOX DOOR SWINGS OPEN AS SHOWN. REAR EDGE OF UNIT MUST BE FLUSH WITH ADJACENT CABINET WITH REAR DOOR INSTALLED.

ACCESS REQUIRED FOR INSTALLATION

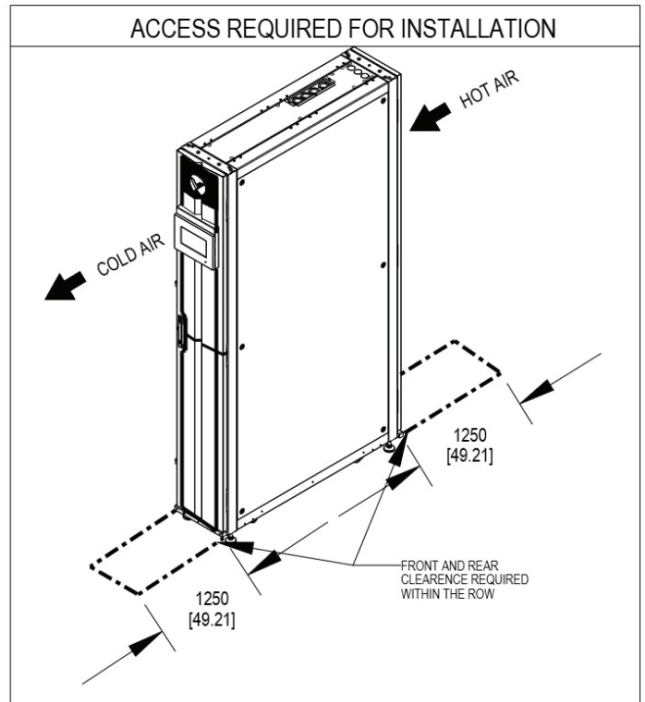


CABINET DIMENSIONAL DATA

300mm (12in.) MODELS



Cooling System	Dry Weight, +/- 5% lbs (kg)
AIR	507 (230)



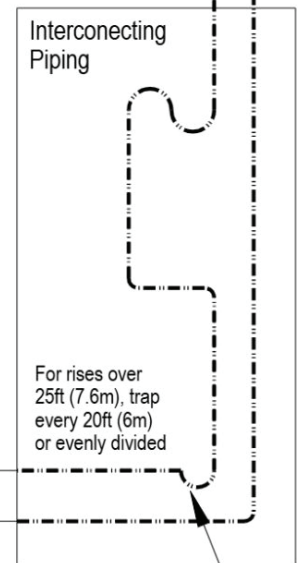
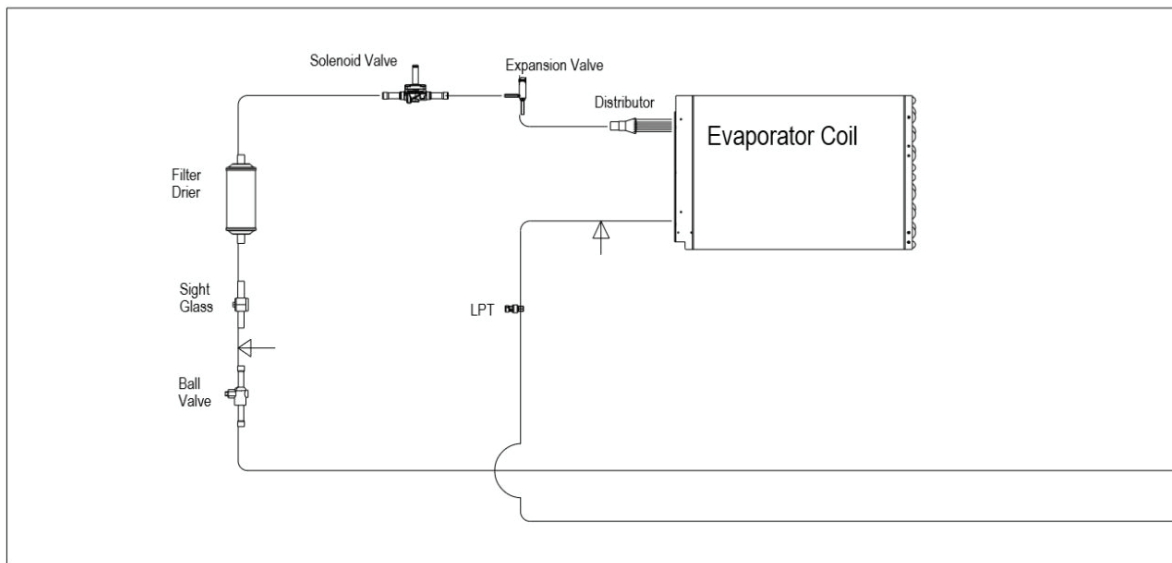
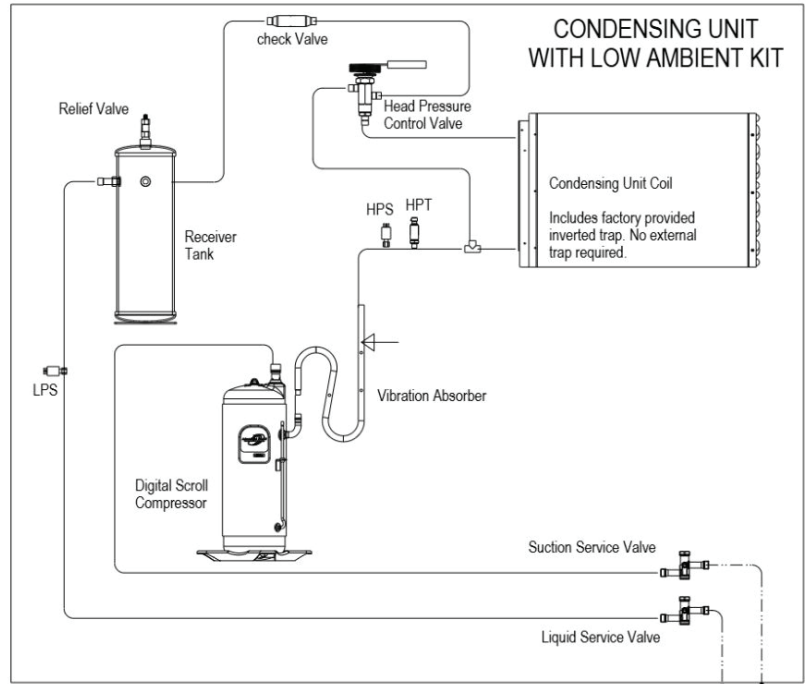
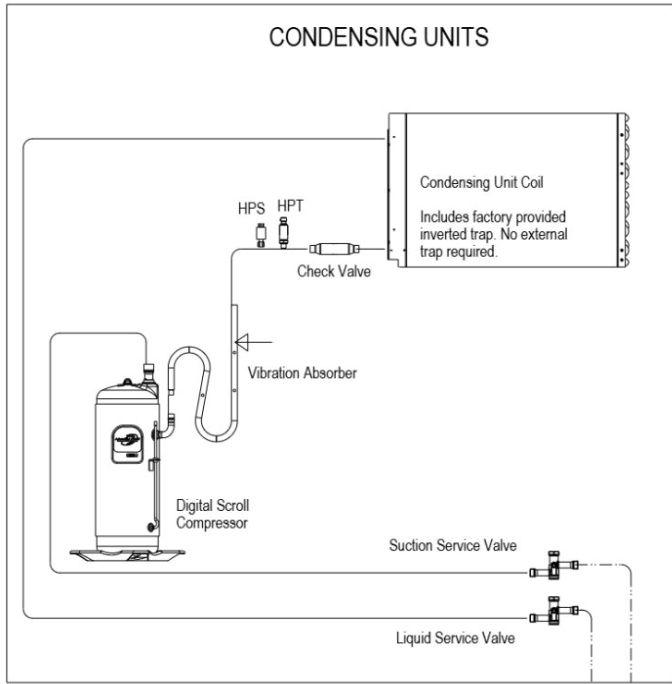
NOTES:

1. ELECTRIC BOX IS IN REAR OF UNIT (SHOWN FULLY EXTENDED). FOR SERVICE ACCESS TO ELECTRIC BOX REMOVE REAR DOOR. SLIDE ELECTRIC BOX REARWARD IN DIRECTION OF ARROW. ELECTRIC BOX DOOR SWINGS OPEN AS SHOWN. REAR EDGE OF UNIT MUST BE FLUSH WITH ADJACENT CABINET WITH REAR DOOR INSTALLED.



VERTIV™ VERTIV COOLPHASE ROW 300/600

GENERAL ARRANGEMENT DIAGRAM 300/600 MM (12/24IN) AIR COOLED MODELS



————— FACTORY REFRIGERANT PIPING
 - - - - - FIELD PIPING

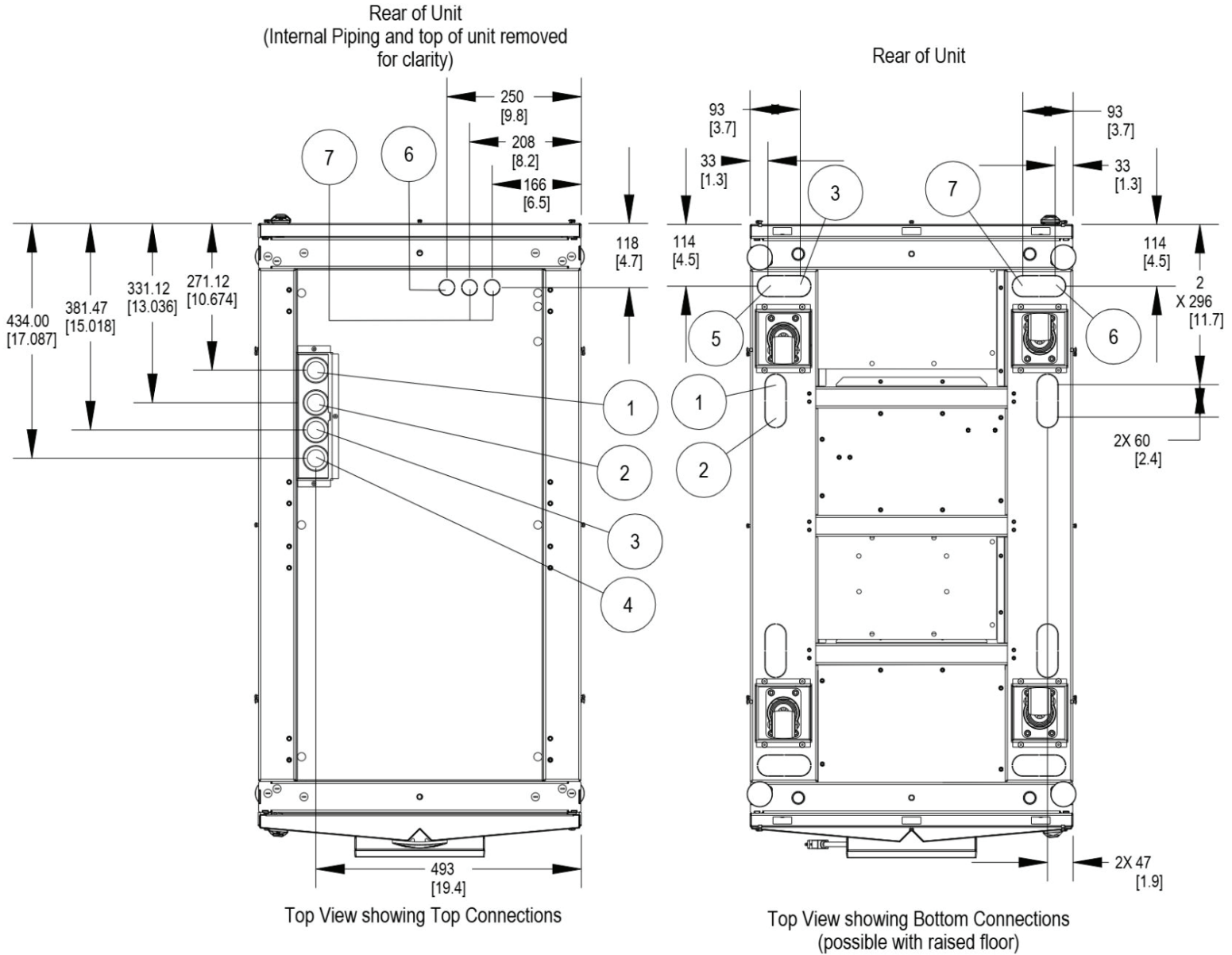
▽ SERVICE / SCHRADER (ACCESS) CONNECTION NO VALVE CORE
 ▽ SERVICE / SCHRADER (ACCESS) CONNECTION WITH VALVE CORE

Notes:

1. Schematic representation shown. Do not use for specific connection locations.
2. Interconnecting Piping are not supplied by Vertiv™, but are required for proper circuit operation and maintenance. Vertiv CoolPhase Row has an internal trap at the base of the unit. For field piping the discharge line vertical rise starts at the base of the unit and not the top of the unit.
3. Do not isolate any refrigerant circuit from over pressurization protection.
4. Traps must be installed and horizontal lines pitched to ensure proper oil return and to reduce liquid floodback to compressor. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.

VERTIV COOLPHASE ROW

Primary Connection Locations 600mm (24in.) Air Cooled Models

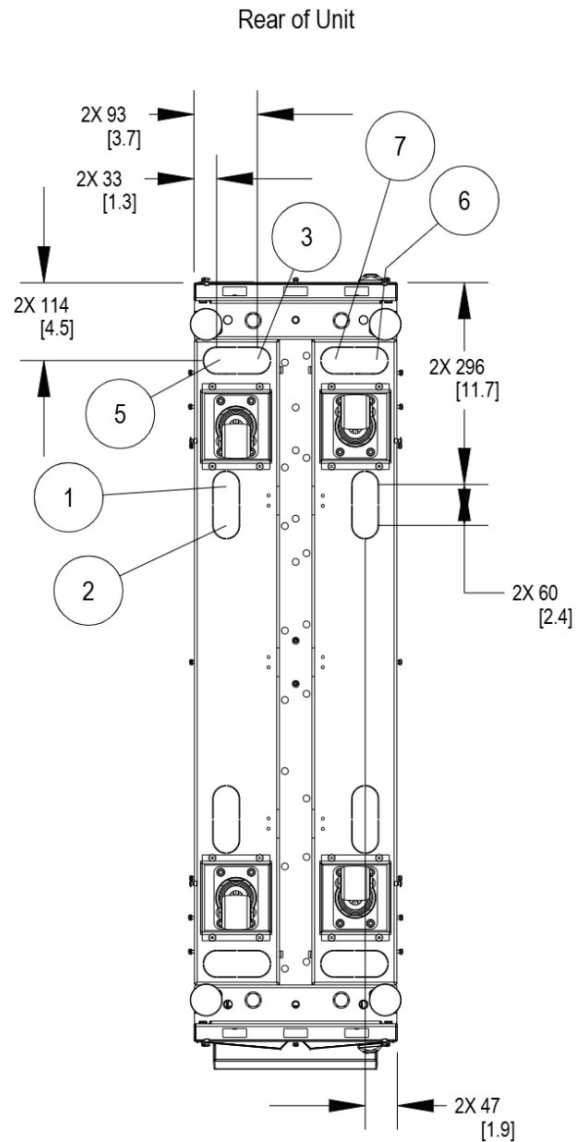
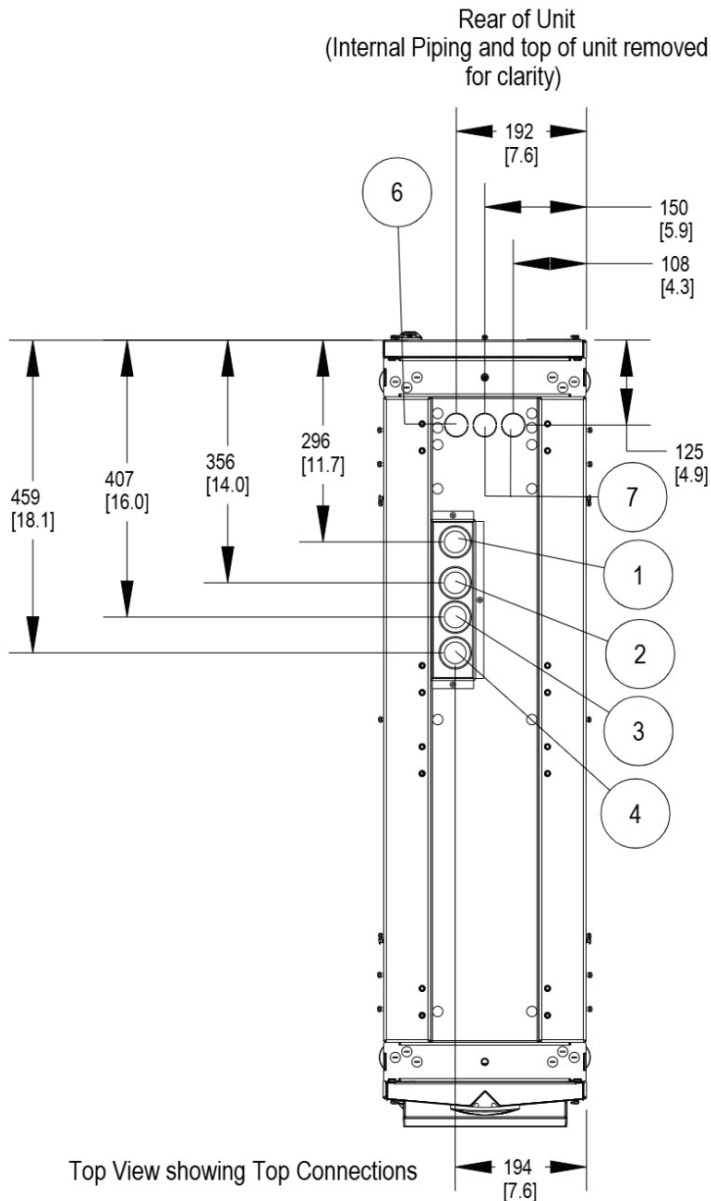


1	RLT	Refrigerant liquid line inlet	5/8 in. O.D. copper sweat
2	RGT	Refrigerant gas line outlet	7/8 in. O.D. copper sweat
3	HF	Humidifier Supply	G 3/4 x Rc 1/2 in.
4	CPT	Condensate pump outlet	Rc 1/2 in. female copper, threaded joint
5	CGT	Condensate gravity outlet	Rc 1/2 in. female copper threaded joint
6	HVT	High Voltage Cable access	Combination knockout: 28 mm (1-1/8 in.)
7	LVT	Low Voltage cable access	Combination knockout: 22 mm (7/8 in.)
NOTE: All dimensions are in mm (in.).			

PIPING AND ELECTRICAL CONNECTIONS AVAILABLE AT THE TOP AND BOTTOM OF UNIT.
ATTENTION, AIR COOLED SYSTEMS MAY REQUIRE ADDITIONAL OIL TO BE ADDED IN THE FIELD IN ORDER TO ALLOW FOR SUFFICIENT COMPRESSOR LUBRICATION. SEE UNIT USER MANUAL FOR DETAILS.

VERTIV COOLPHASE ROW

Primary Connection Locations 300mm (12in.) Air Cooled Models



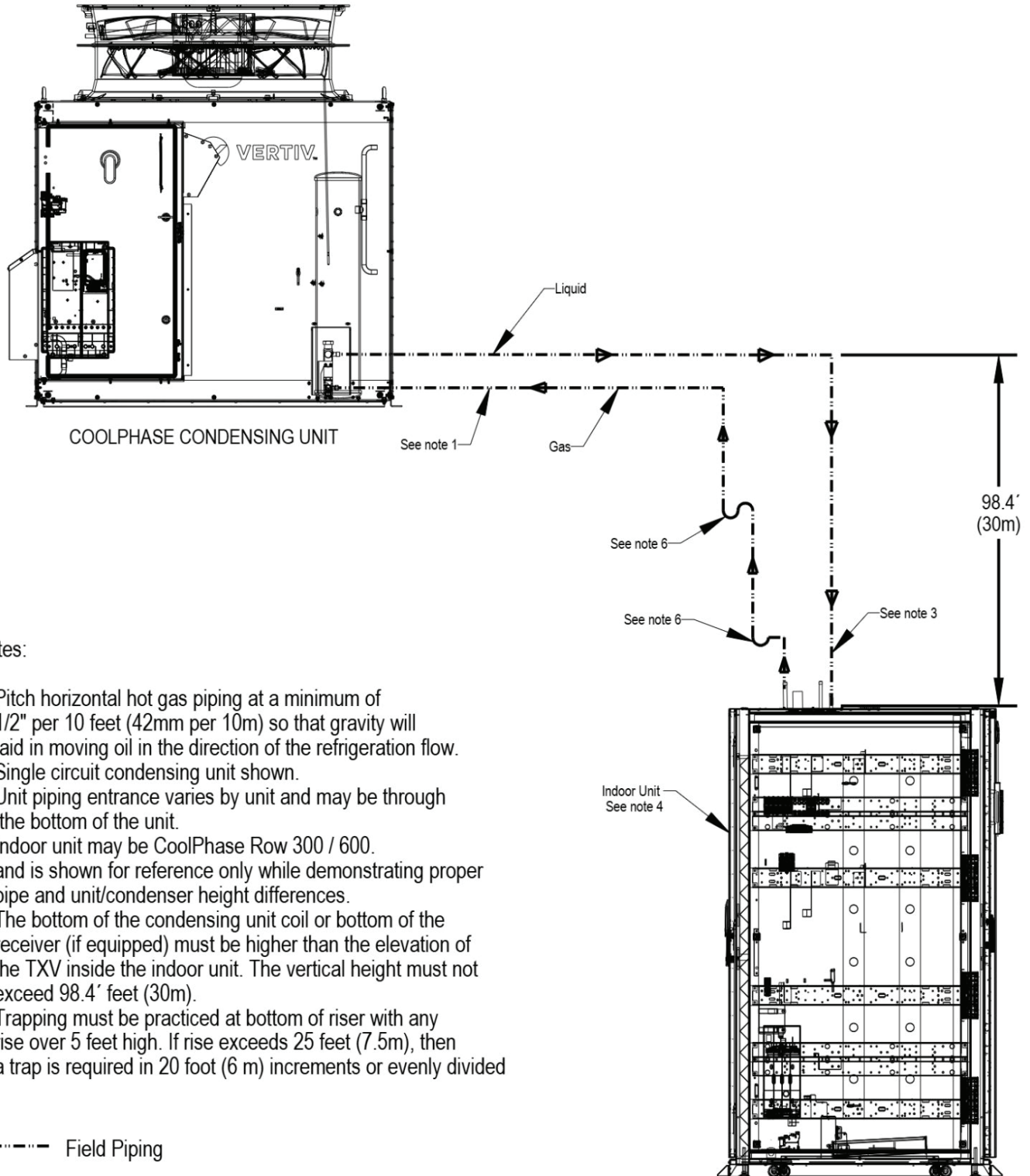
1	RLT	Refrigerant liquid line inlet	5/8 in. O.D. copper sweat
2	RGT	Refrigerant gas line outlet	7/8 in. O.D. copper sweat
3	HF	Humidifier Supply	G 3/4 x Rc 1/2 in.
4	CPT	Condensate pump outlet	Rc 1/2 in. female copper, threaded joint
5	CGT	Condensate gravity outlet	Rc 1/2 in. female copper threaded joint
6	HVT	High Voltage Cable access	Combination knockout: 28 mm (1-1/8 in.)
7	LVT	Low Voltage cable access	Combination knockout: 22 mm (7/8 in.)
NOTE: All dimensions are in mm (in.).			

PIPING AND ELECTRICAL CONNECTIONS AVAILABLE AT THE TOP AND BOTTOM OF UNIT.
ATTENTION, AIR COOLED SYSTEMS MAY REQUIRE ADDITIONAL OIL TO BE ADDED IN THE FIELD IN ORDER TO ALLOW FOR SUFFICIENT COMPRESSOR LUBRICATION. SEE UNIT USER MANUAL FOR DETAILS.



VERTIV. VERTIV COOLPHASE CONDENSING UNIT

PIPING SCHEMATIC CONDENSING UNIT ABOVE INDOOR UNIT 21 & 28kW



Notes:

1. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
2. Single circuit condensing unit shown.
3. Unit piping entrance varies by unit and may be through the bottom of the unit.
4. Indoor unit may be CoolPhase Row 300 / 600. and is shown for reference only while demonstrating proper pipe and unit/condenser height differences.
5. The bottom of the condensing unit coil or bottom of the receiver (if equipped) must be higher than the elevation of the TXV inside the indoor unit. The vertical height must not exceed 98.4' feet (30m).
6. Trapping must be practiced at bottom of riser with any rise over 5 feet high. If rise exceeds 25 feet (7.5m), then a trap is required in 20 foot (6 m) increments or evenly divided

----- Field Piping



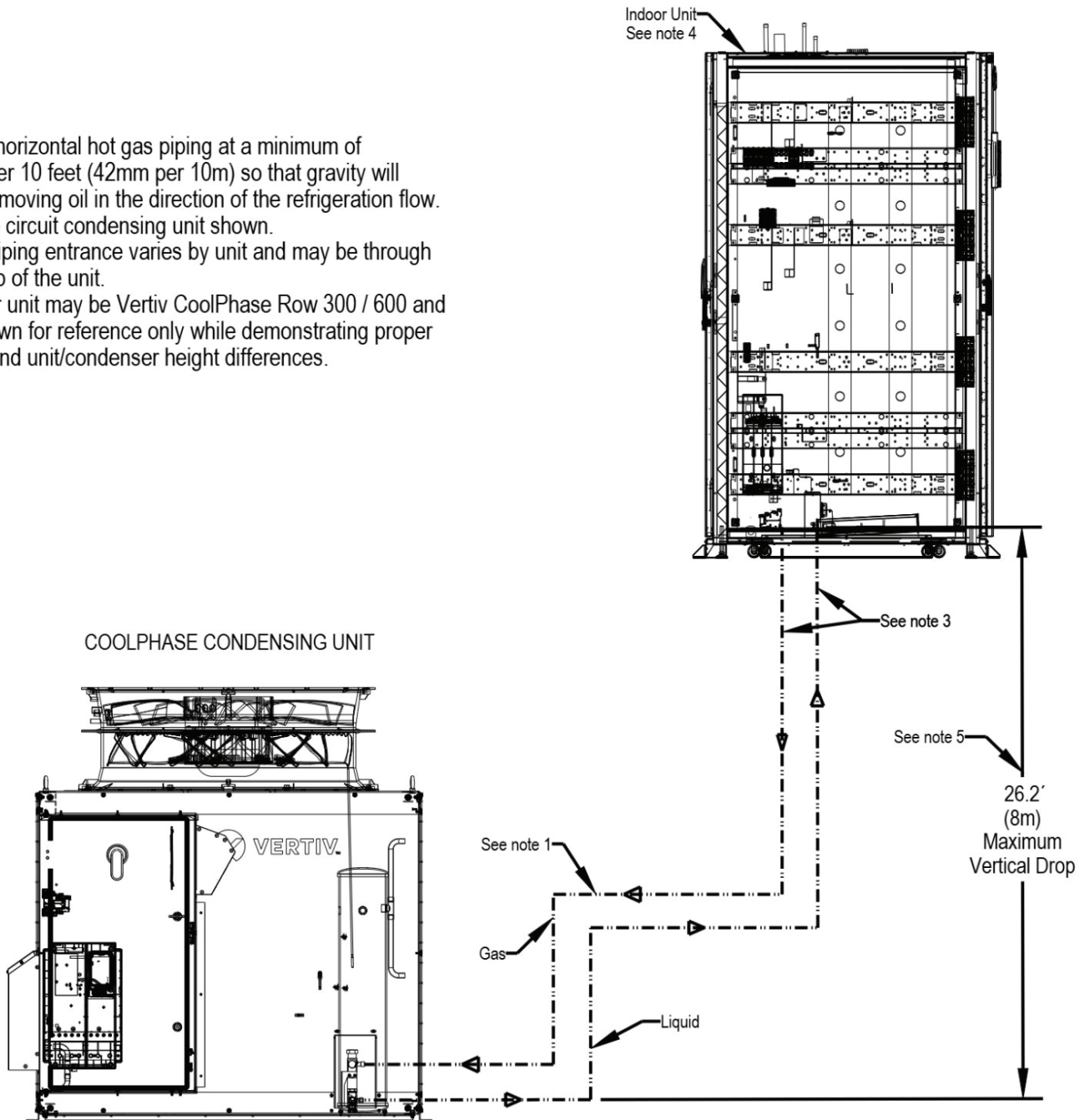
VERTIV. VERTIV COOLPHASE CONDENSING UNIT

PIPING SCHEMATIC

CONDENSING UNIT BELOW INDOOR UNIT 21 & 28kW

Notes:

1. Pitch horizontal hot gas piping at a minimum of 1/2" per 10 feet (42mm per 10m) so that gravity will aid in moving oil in the direction of the refrigeration flow.
2. Single circuit condensing unit shown.
3. Unit piping entrance varies by unit and may be through the top of the unit.
4. Indoor unit may be Vertiv CoolPhase Row 300 / 600 and is shown for reference only while demonstrating proper pipe and unit/condenser height differences.



----- Field Piping



COOLPHASE ROW

ELECTRICAL FIELD CONNECTIONS & TERMINAL BLOCKS CONNECTIONS

STANDARD ELECTRICAL CONNECTIONS

- 1) **High Voltage connection through the top of the CoolPhase Row** - 1.37" (35mm) diameter concentric knockout.
- 2) **Communication connection through the top of the CoolPhase Row** - 1.37" (35mm) diameter concentric knockout. connect according diagram in the corresponding ethernet port.
- 3) **Electrical service (hard wired)** - refer to serial tag information for unit electrical service requirement

- **Three Phase - 208-230V 60HZ / 460 60HZ**

- **Single Phase - 208-230V 60HZ**

Connect to terminals on disconnect switch. Electrical service not by Vertiv. Use copper conductors only, Wire per local codes. Refer to specification sheet for total unit full load amps, wire size amps and max over current protection device size.

4) **Main Power Box**

- Factory Installed Disconnect Switch.
- TBK 37-2 and 38-2 Remote Shut Down terminals prepared to customer connections.
- TBK 24-2 and 51-2 Water Under Flow Option prepared to customer connections.
- TBK 75-2 and 76-2 Common Alarm Option prepared to customer connections.

5) **Communication Bracket**

- Z1 Can communication 1 Connect ICOM2 P74 (Embedded Unity Card Port).
- Z2 (Not Used)
- Z3 TEAMWORK Connect ICOM2 P64.
- Z4 Modbus (RS485) Communication for outdoor unit.

6) **Terminal Blocks Control Distribution Voltage / Power Voltage Terminals / Communication RS485**

- TBK L1 - L2 - L3 Transformer Connection only for 460VAC Units (X1-X4).
- TBK PE Terminal Ground.
- TBK 242 and G2 Control Distribution Voltage 24VAC 242 (L) G2 (N).
- TBK-G1 and TBK 241 Control Distribution Voltage 24VAC Insulated Voltage from Transformer 1:1.
- TBK A and TBK B RS485 Communication Distribution Terminal Blocks.
- TBK-92 and TBK-93 Control Voltage to activate the Reheat Relay.

7) **Fans Terminal Blocks**

- TBK 48V 48VDC + Distribution.
- TBK GND 48VDC - Distribution.
- TBK- FCTR Fan Control Signal 0-10V Distribution.

Reference models showed in this document are 300MM units. All connections, terminal block locations and communication ports also apply for 600MM units.

COOLPHASE ROW

ELECTRICAL FIELD CONNECTIONS & TERMINAL BLOCKS CONNECTIONS

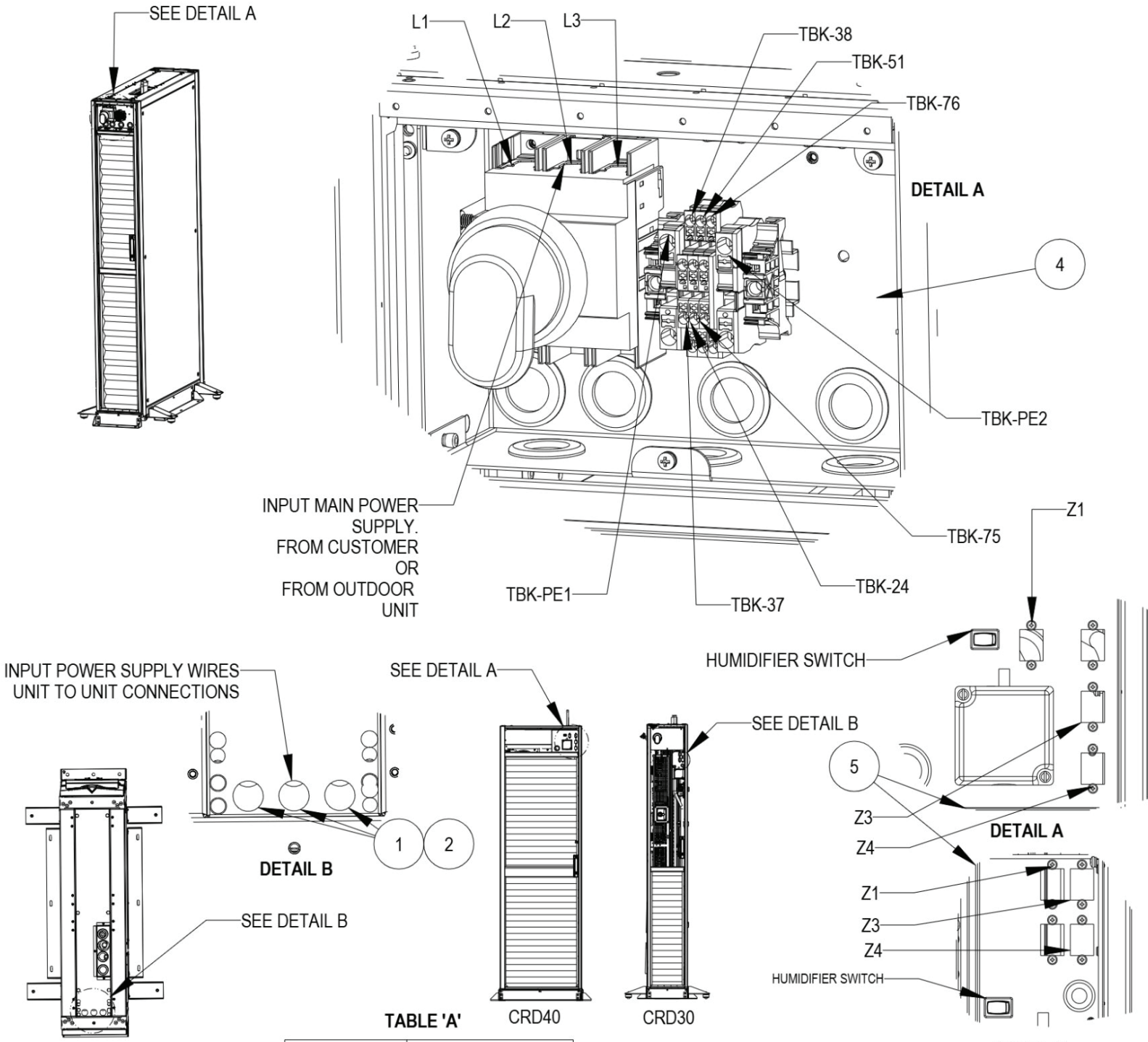


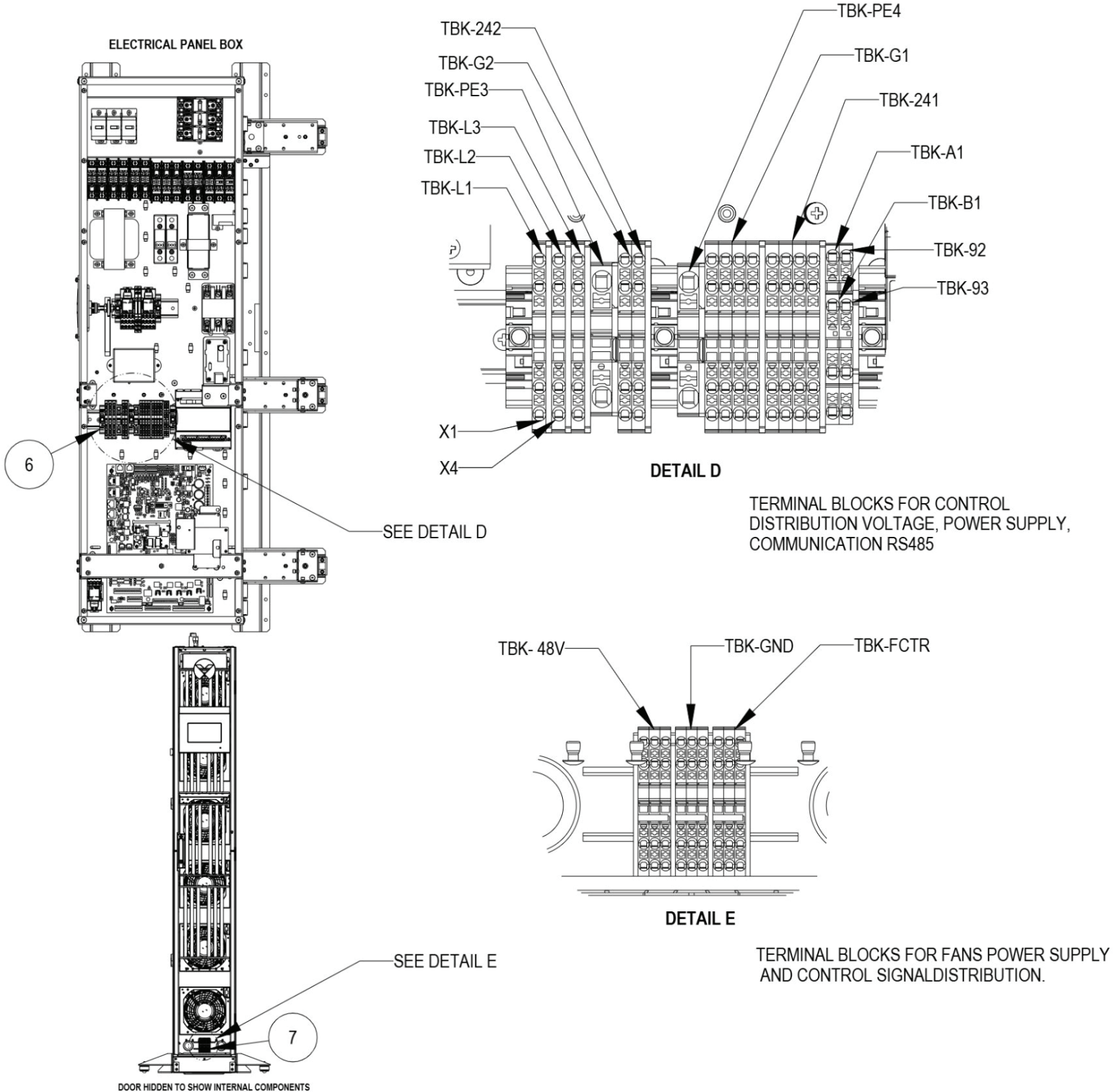
TABLE 'A'

PIN OUT	DESCRIPTION
Z4-1 / Z4-8	MODBUS A / B
Z4-3/Z4-4	24VAC L / 24VAC N

ETHERNET CABLE CONFIGURATION MUST BE STRAIGHT CONFIGURATION.
Z4 PIN OUT (INDOOR - OUTDOOR COMMUNICATION) SEE TABLE 'A'

COOLPHASE ROW

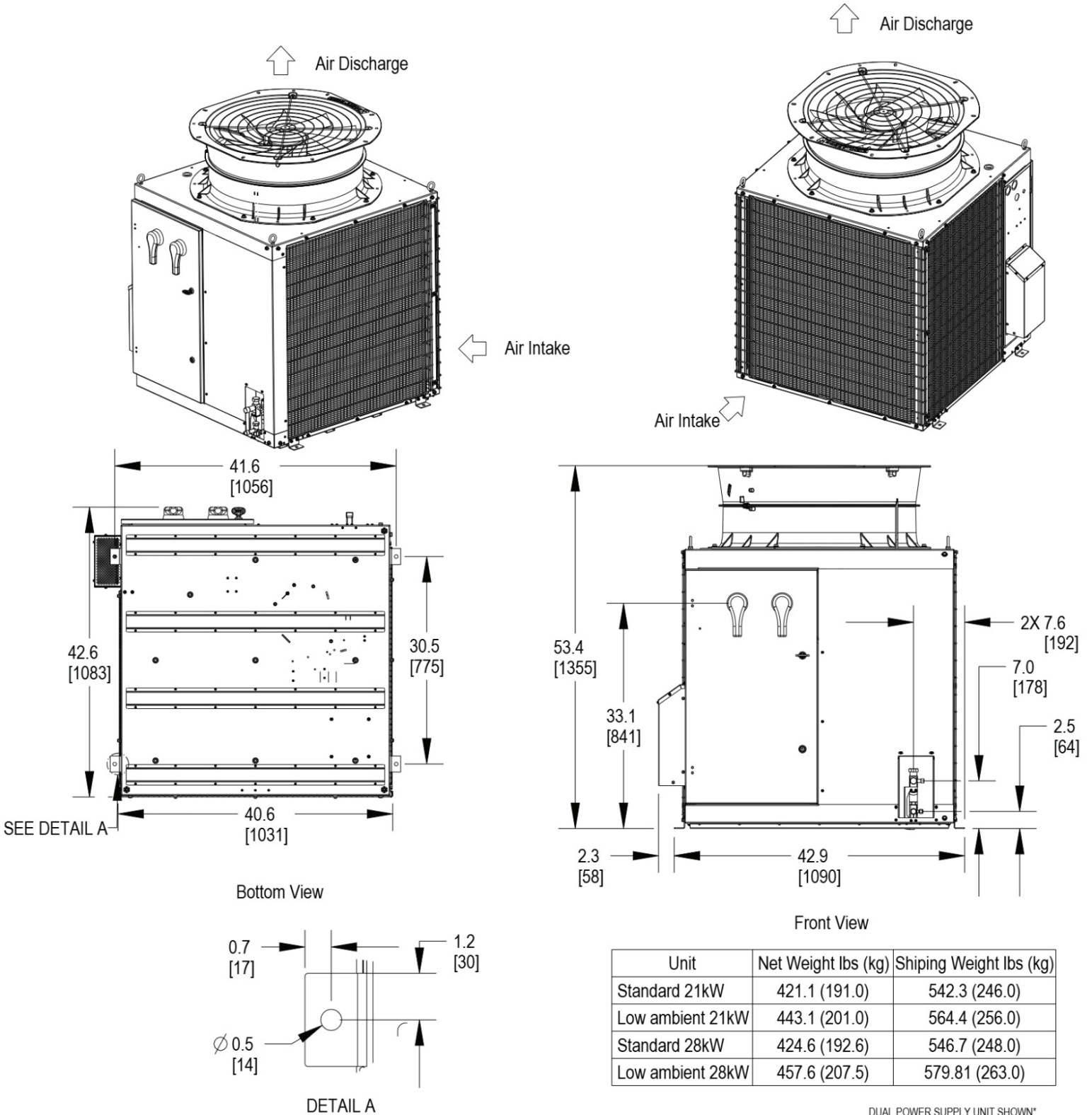
ELECTRICAL FIELD CONNECTIONS & TERMINAL BLOCKS CONNECTIONS





VERTIV VERTIV COOLPHASE CONDENSING UNIT

CABINET DIMENSIONS CONDENSING UNIT 21/28KW

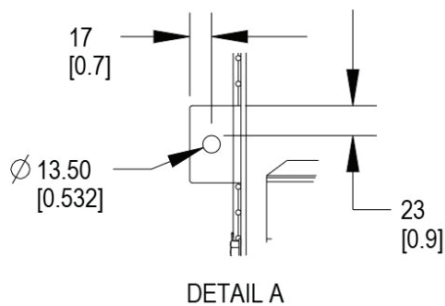
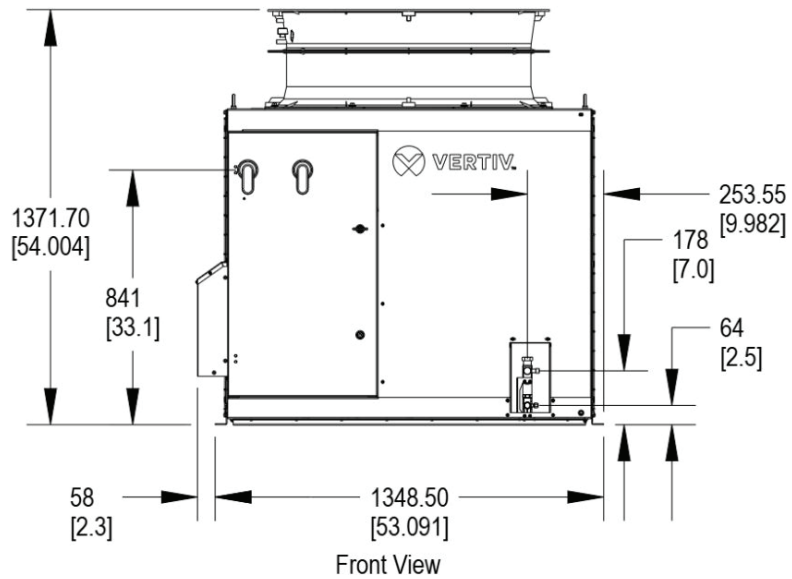
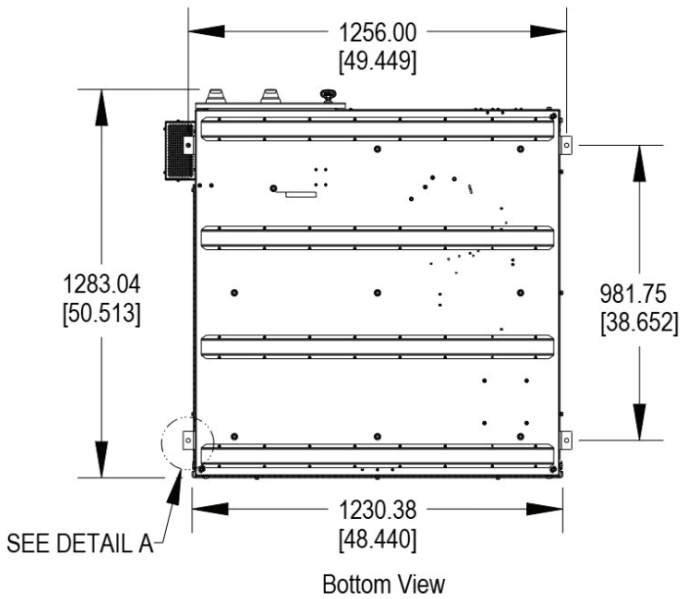
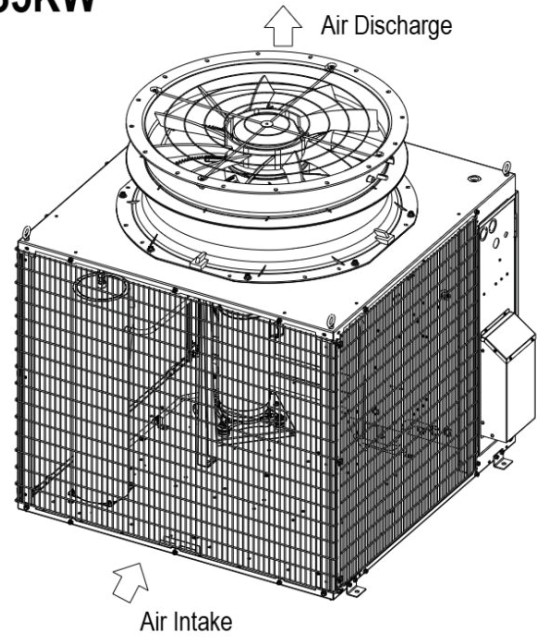
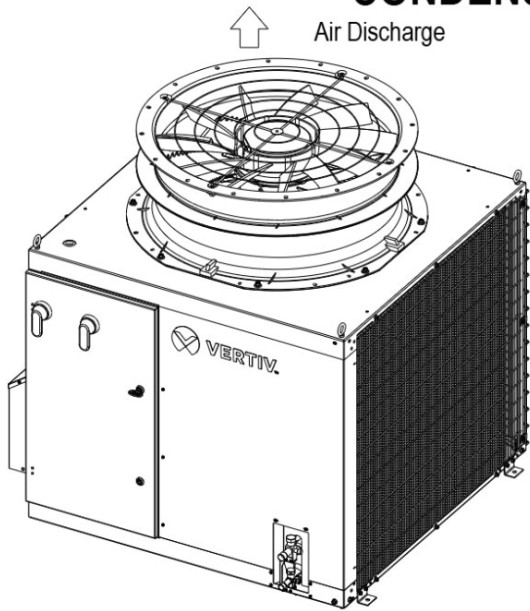


Unit	Net Weight lbs (kg)	Shipping Weight lbs (kg)
Standard 21kW	421.1 (191.0)	542.3 (246.0)
Low ambient 21kW	443.1 (201.0)	564.4 (256.0)
Standard 28kW	424.6 (192.6)	546.7 (248.0)
Low ambient 28kW	457.6 (207.5)	579.81 (263.0)

DUAL POWER SUPPLY UNIT SHOWN*

COOLPHASE CONDENSING UNIT

CABINET DIMENSIONS CONDENSING UNIT 35KW



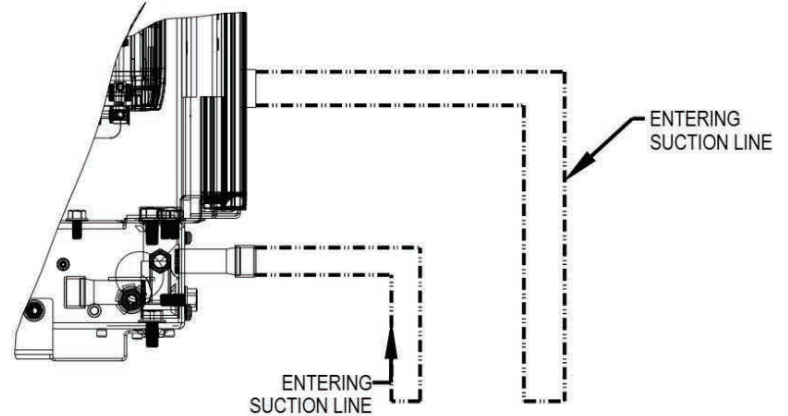
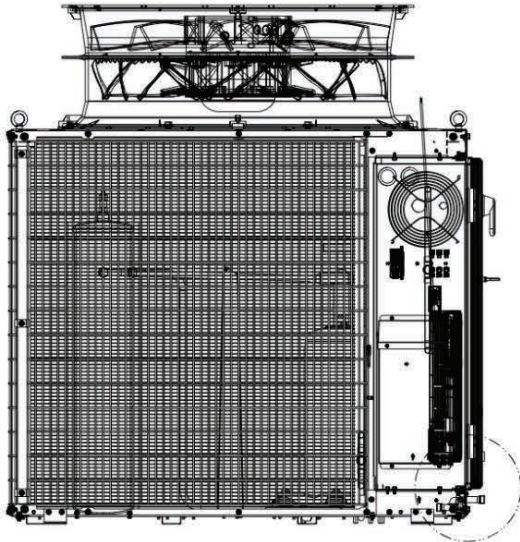
Unit	Net Weight kg (lb)	Shipping Weight kg (lb)
Standard unit	236 (519.2)	294 (648.15)
Low Ambient Unit	258 (567.6)	316 (696.66)

DUAL POWER SUPPLY UNIT SHOWN*



VERTIV VERTIV COOLPHASE CONDENSING UNIT

PIPING DIMENSIONAL DATA CONDENSING UNITS 28 & 35 kW



OPTIONAL FUSIBLE PLUG SERVICE KIT TO BE BRAZED INTO THE LIQUID LINE(S) IN EITHER THE VERTICAL OR HORIZONTAL POSITION. (WHERE REQUIRED)

(VERTICAL POSITION IS PREFERRED, HORIZONTAL POSITION IS OPTIONAL.)

--- FIELD PIPING

□ CONNECTION SIZES:

Model / Capacity	Length (mts)	Length (ft)	Liquid Line Ø (mm)	Liquid Line Ø (ANSI)	Suction Line Ø (mm)	Suction Line Ø (ANSI)
CU28 kW	1	3.28	12.7	1/2	22.23	7/8
	5	16.40	12.7	1/2	22.23	7/8
	10	32.81	15.88	5/8	22.23	7/8
	15	49.21	15.88	5/8	28.58	1 1/8
	20	65.62	15.88	5/8	28.58	1 1/8
	25	82.02	15.88	5/8	28.58	1 1/8
	30	98.43	19.05	3/4	28.58	1 1/8
	35	114.83	19.05	3/4	34.93	1 3/8
	40	131.23	19.05	3/4	34.93	1 3/8
	45	147.64	19.05	3/4	34.93	1 3/8
	50	164.04	19.05	3/4	34.93	1 3/8
	55	180.45	19.05	3/4	34.93	1 3/8
	60	196.85	19.05	3/4	34.93	1 3/8
	65	213.25	19.05	3/4	34.93	1 3/8
	70	229.66	19.05	3/4	34.93	1 3/8
	75	246.06	19.05	3/4	34.93	1 3/8
	80	262.47	22.23	7/8	34.93	1 3/8
	85	278.87	22.23	7/8	41.28	1 5/8
90	295.28	22.23	7/8	41.28	1 5/8	
95	311.68	22.23	7/8	41.28	1 5/8	
100	328.08	22.23	7/8	41.28	1 5/8	
105	344.49	22.23	7/8	41.28	1 5/8	
110	360.89	22.23	7/8	41.28	1 5/8	
115	377.30	22.23	7/8	41.28	1 5/8	
120	393.70	22.23	7/8	41.28	1 5/8	

Model / Capacity	Length (mts)	Length (ft)	Liquid Line Ø (mm)	Liquid Line Ø (ANSI)	Suction Line Ø (mm)	Suction Line Ø (ANSI)
CU35 kW	1	3.28	12.7	1/2	22.23	7/8
	5	16.40	12.7	1/2	22.23	7/8
	10	32.81	15.88	5/8	28.58	1 1/8
	15	49.21	15.88	5/8	28.58	1 1/8
	20	65.62	15.88	5/8	28.58	1 1/8
	25	82.02	19.05	3/4	34.93	1 3/8
	30	98.43	19.05	3/4	34.93	1 3/8
	35	114.83	19.05	3/4	34.93	1 3/8
	40	131.23	19.05	3/4	34.93	1 3/8
	45	147.64	19.05	3/4	34.93	1 3/8
	50	164.04	19.05	3/4	34.93	1 3/8
	55	180.45	19.05	3/4	34.93	1 3/8
	60	196.85	22.23	7/8	41.28	1 5/8
	65	213.25	22.23	7/8	41.28	1 5/8
	70	229.66	22.23	7/8	41.28	1 5/8
	75	246.06	22.23	7/8	41.28	1 5/8
	80	262.47	22.23	7/8	41.28	1 5/8
	85	278.87	22.23	7/8	41.28	1 5/8
90	295.28	22.23	7/8	41.28	1 5/8	
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110	360.89	22.23	7/8	41.28	1 5/8	
115	377.30	22.23	7/8	41.28	1 5/8	
120	393.70	22.23	7/8	41.28	1 5/8	



COOLPHASE CONDENSING UNIT

ELECTRICAL FIELD CONNECTIONS

Condensing unit-rated voltage should be verified with available power supply before installation. Refer to the unit's electrical schematic and serial tag for specific electrical requirements. Line voltage electrical service is required for all condensing units at the location of the condensing units. The voltage supply to the condensing unit may not be the same voltage supply as required by the indoor unit. Consider using UPS equipment on both data center cooling units and CoolPhase Condensing units to maintain uninterrupted cooling capability. Refer to the unit's serial tag for specific condenser electrical requirements. A unit disconnect is standard. However, a site disconnect may be required per local code to isolate the unit for maintenance. Route the supply power to the site disconnect switch and then to the unit. Route the conduit to the knockout provided in the top right end of the electrical control enclosure. Connect the earth ground wire leads to the marked earth ground connection terminal provided near the factory-installed disconnect switch.

NOTE

CoolPhase Condensing unit may include a dual power supply option, this will require a separate line voltage electrical supply from an emergency power supply.

KEY ELECTRICAL POWER SUPPLY DETAILS:

- 1) **Three phase electrical service (primary source)** - The connection terminals are on top of fused switch. Three phase service not by Vertiv. See note 4.
- 2) **Earth ground (primary source)** - Field lug terminal for earth ground connection.
- 3) **Three phase electrical service (secondary source)** - The connection terminals are on top of fused switch, the fused switch is located at the top and right side of the E-box. Three phase service not by Vertiv. See note 4.
- 4) **Earth ground (secondary source)** - Terminal for field-supplied earth grounding wire.
- 5) **Three phase electrical to feed the interior unit** - The connection terminals are on the load side of the fuse block; it is in the bottom and right side of the E-box.
- 6) **Modbus terminal connections (RS-485) from the interior unit** - The ethernet port Z4 are located in the bracket. See DETAIL C on page 3 CONNECT.
 - RS485+ terminal is the input terminal for RS485 signal (positive).
 - RS485- terminal is the input terminal for RS485 signal (negative).
 - CGND terminal is the input terminal for signal reference ground.
 - POWER METER RS485+ terminals are the input terminal for RS485 signal when using the Power Meter accessory. Refer to its QIG for more details on installation.
- 8) **24V terminal connections from the interior unit** - The connection terminals are located in TB-A. See DETAIL B on page 3.
 - 24V terminal is the input terminal for the hot wire used for leak detection mitigation on the indoor unit.
 - COM terminal is the input terminal for the common wire used for leak detection mitigation on the indoor unit.
- 7) **Three phase electrical service entrance (primary source)** - One 1.875in (47.63mm) diameter knockout located at the top and left side of the E-Box.
- 8) **Three phase electrical service entrance (secondary source)** - One 1.875in (47.63mm) diameter knockout located at the top and left side of the E-Box.
- 9) **Three phase power to feed the interior unit** - One 1.38in (35mm) diameter knockout located at the middle and left side of the box.
- 10) **Modbus terminal connections (RS-485) from the interior unit** - Field connections for Modbus cable connection: One - 0.70" (18mm) diameter knockout located at the middle and left side of the E-Box.

NOTES:

1. Refer to specification sheet for unit voltage rating, full load amp, minimum circuit ampacity and maximum circuit protection.
2. The modbus (RS485) wiring is field supplied and must be (See drawing on page 3 for wire configuration):
 - STP straight through wire type.
 - 22-18AWG stranded tinned copper.
 - Twisted pair (minimum 4 twist per foot).
 - Low Capacitance (15pF/FT or less).
 - Must be rated to meet local codes and conditions.
3. Do not run in same conduit, raceway, or chase as high voltage wiring.
4. All wiring must be sized and selected for insulation case per NEC and other local codes.
5. Do not bend cables to less than four times the diameter of the cable.
6. UL approved temperature rated to 75°C.
7. UV - and moisture-resistance for exterior and if it is not provided in conduits.
8. Do not deform cables when securing in bundles or when hanging them.
9. Avoid running the cables by devices that may introduce noise, such as machines, fluorescent lights, and electronics.
10. Avoid stretching cables.



VERTIV™

COOLPHASE CONDENSING UNIT

ELECTRICAL FIELD CONNECTIONS

NOTICE

RISK OF IMPROPER INPUT POWER CAN CAUSE EQUIPMENT DAMAGE.

The electronically commutated motors included in the COOLPHASE CONDENSING UNITS - included in 480V in COOLPHASE ROW30 + CONDENSING UNIT AND COOLPHASE ROW40 + CONDENSING UNIT - are suitable for connection to an electrical service providing input power to the unit with 300V or less line -to-ground potential only.

Acceptable unit input electrical service for 208V(230V) nominal units:
208V wye with solidly grounded neutral and 120V line-to-ground.

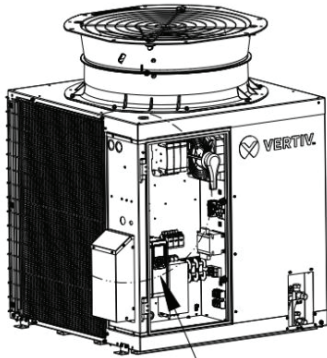
Acceptable unit input electrical service for 460V(480V) nominal units:
480V wye with solidly grounded neutral and 277V line-to-ground.

Unacceptable unit input electrical service for 208V to 460V (480V) nominal units:
Wye with high resistance (or impedance) ground
Delta without ground or with floating ground
Delta with corner ground
Delta with grounded center tap

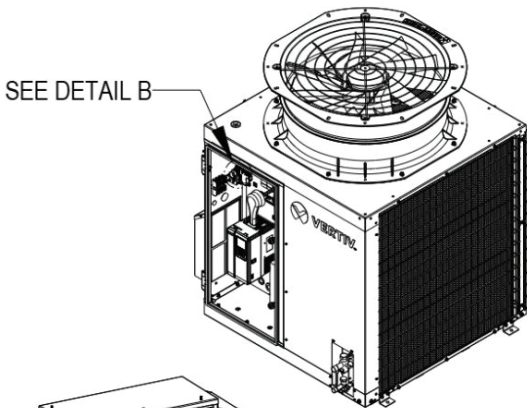


VERTIV. COOLPHASE CONDENSING UNIT

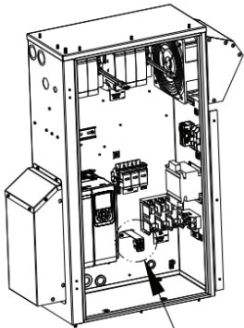
ELECTRICAL FIELD CONNECTIONS



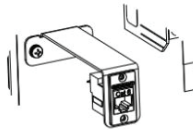
SEE DETAIL A



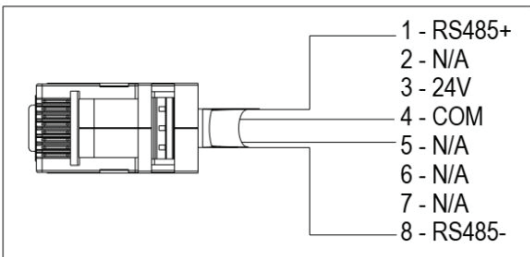
SEE DETAIL B



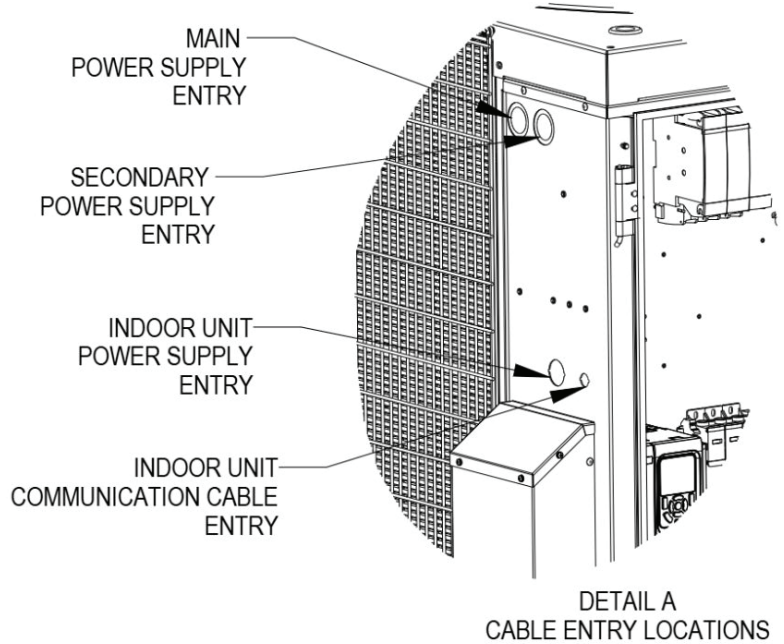
SEE DETAIL A



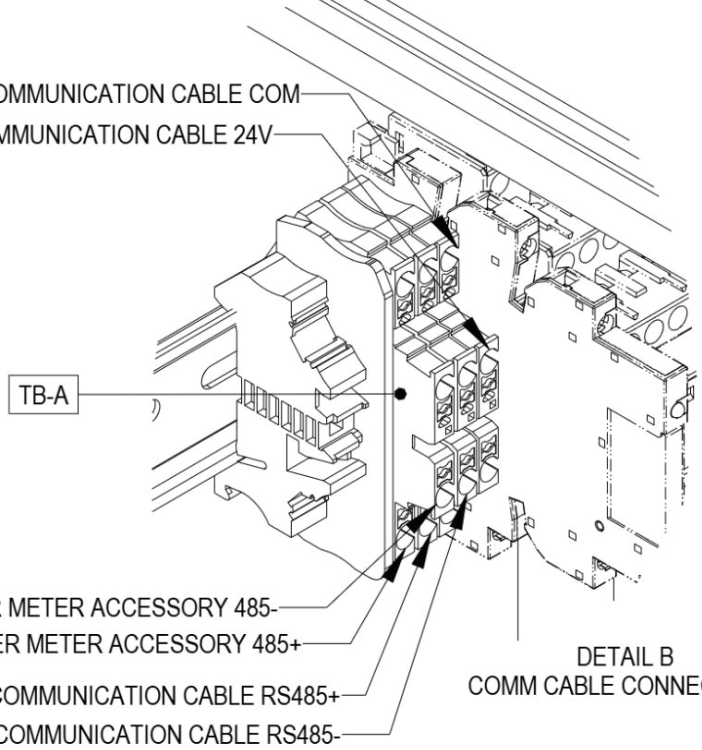
DETAIL A
ETHERNET PORT
COMMUNICATION
INDOOR - OUTDOOR
Z4



INDOOR-OUTDOOR COMMUNICATION
CABLE CONFIGURATION
USE ETHERNET SHIELDED STRAIGHT THROUGH



INDOOR COMMUNICATION CABLE COM
INDOOR COMMUNICATION CABLE 24V

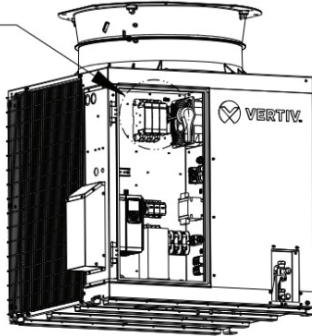




COOLPHASE CONDENSING UNIT

ELECTRICAL FIELD CONNECTIONS

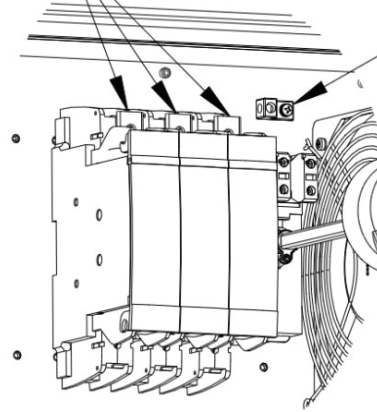
SEE DETAIL C



SINGLE POWER SUPPLY OPTIONS

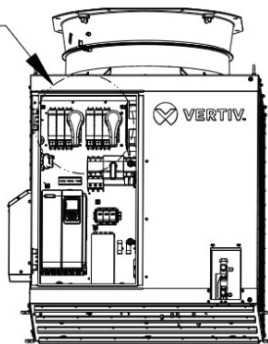
MAIN POWER SUPPLY
L1, L2, L3

MAIN POWER SUPPLY
GROUND LUG



DETAIL C
MAIN POWER SUPPLY CONNECTIONS
SINGLE POWER OPTION

SEE DETAIL D



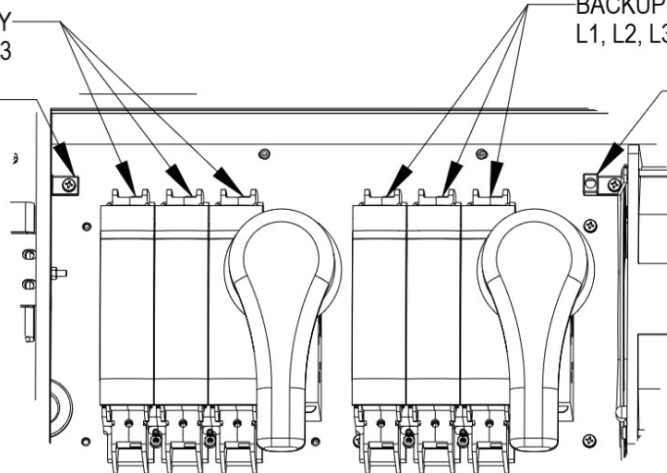
DUAL POWER SUPPLY OPTIONS

MAIN POWER SUPPLY
L1, L2, L3

MAIN
POWER SUPPLY
GROUND LUG

BACKUP POWER SUPPLY
L1, L2, L3

BACKUP
POWER SUPPLY
GROUND LUG

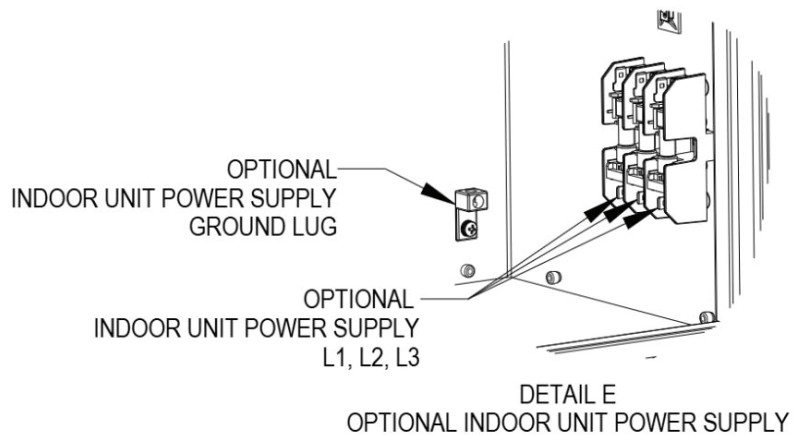
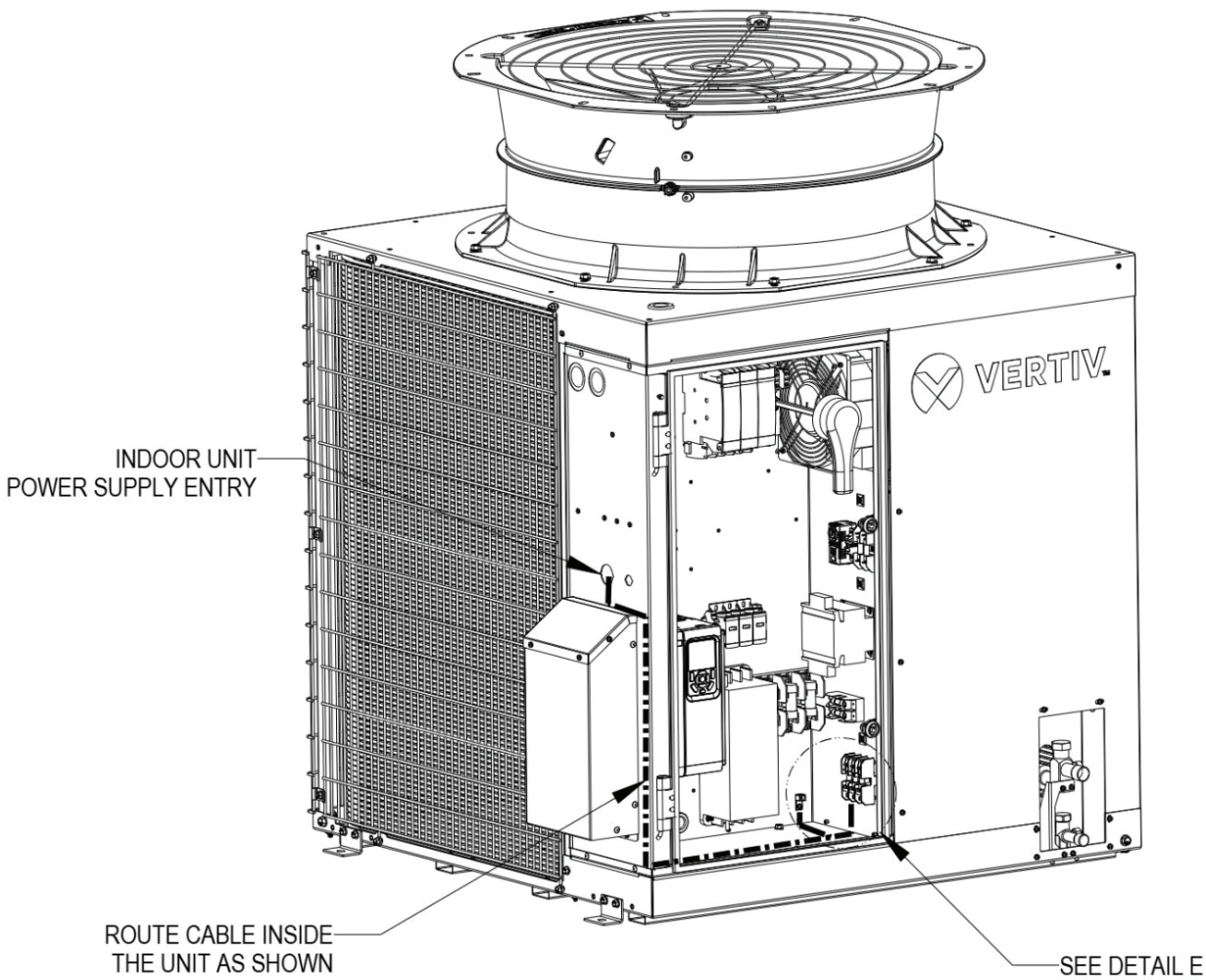


DETAIL D
MAIN POWER SUPPLY CONNECTIONS
DUAL POWER OPTION



COOLPHASE CONDENSING UNIT

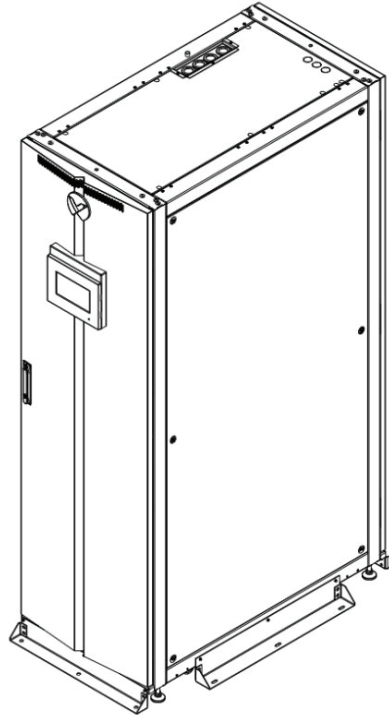
ELECTRICAL FIELD CONNECTIONS



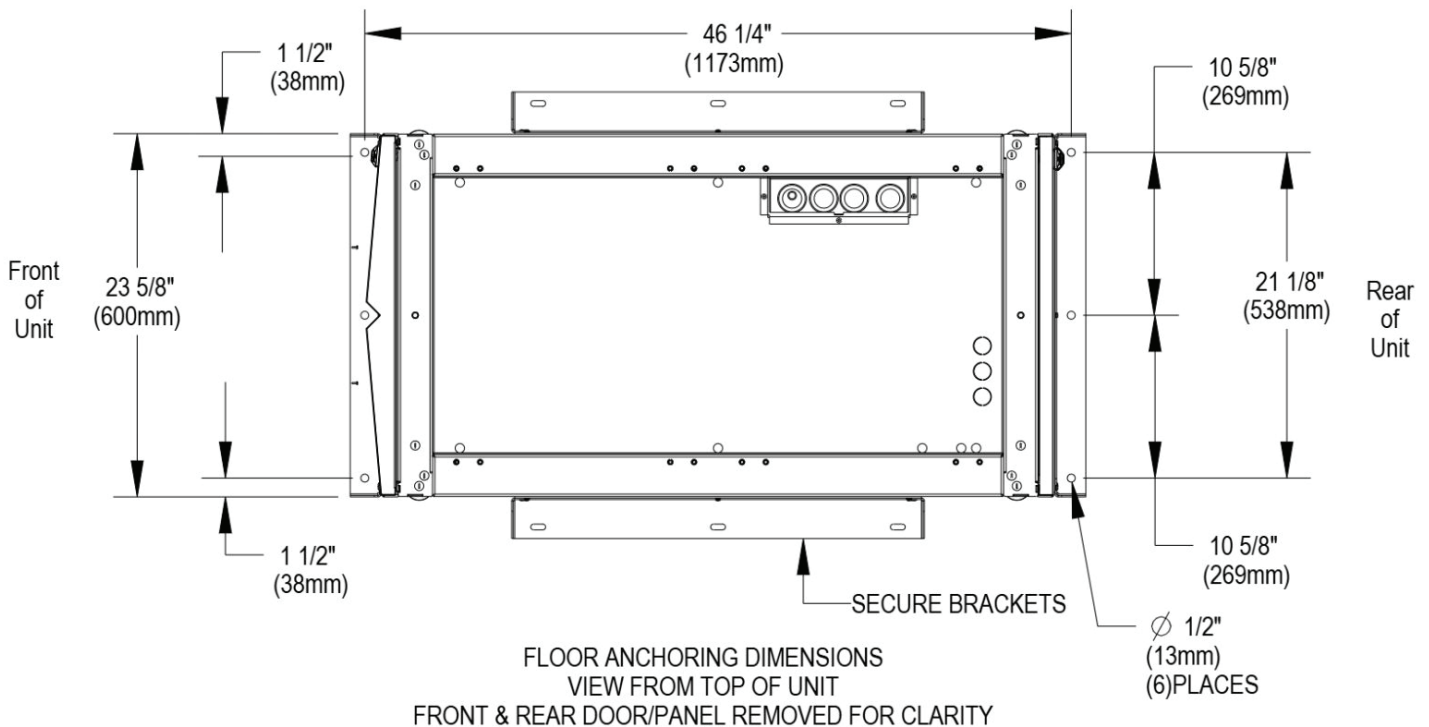
VERTIV COOLPHASE ROW

DIMENSIONAL DATA

600mm (24in.) RIGID FLOOR MOUNT BRACKET

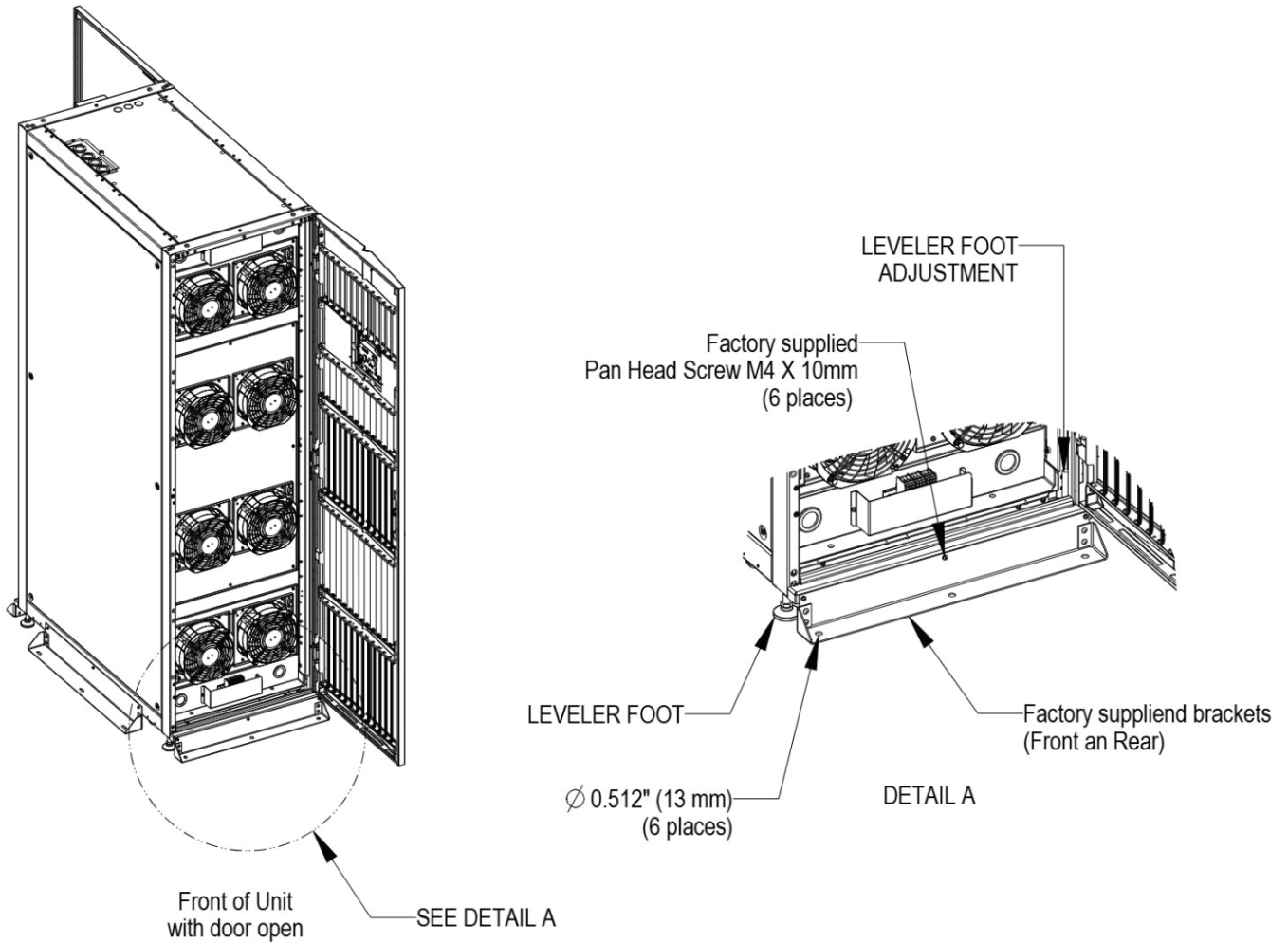


ISO VIEW ON FLOOR



DIMENSIONAL DATA

600mm (24in.) RIGID FLOOR MOUNT BRACKET



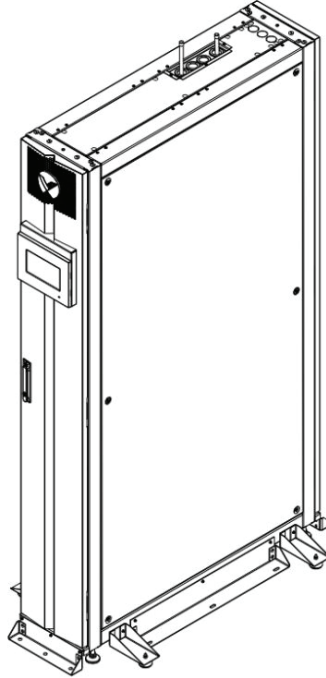
Notes:

1. Prior to mounting brackets, lower the four leveling feet (See Detail "A") until they make contact with the floor. Ensure that the unit is level to avoid corrosion or health hazards caused by condensate accumulation.
2. Anchor the brackets to the unit using the screws that are provided.
3. The brackets are to be secured to the floor using field supplied anchors.
4. The same mounting brackets are used in the front and rear of the unit.
5. This document is not to be used for field installation, see Vertiv™ CoolPhase Row User Manual.

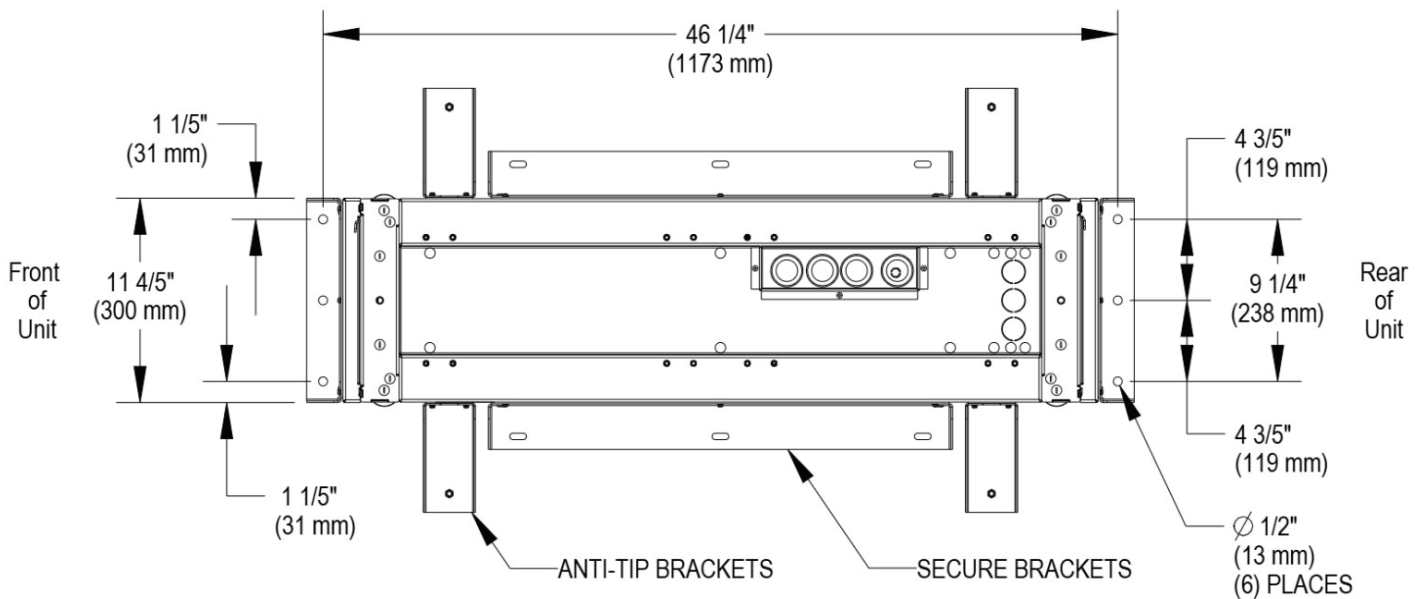
VERTIV COOLPHASE ROW

DIMENSIONAL DATA

300mm (12in) RIGID FLOOR MOUNT BRACKET



ISO VIEW ON FLOOR

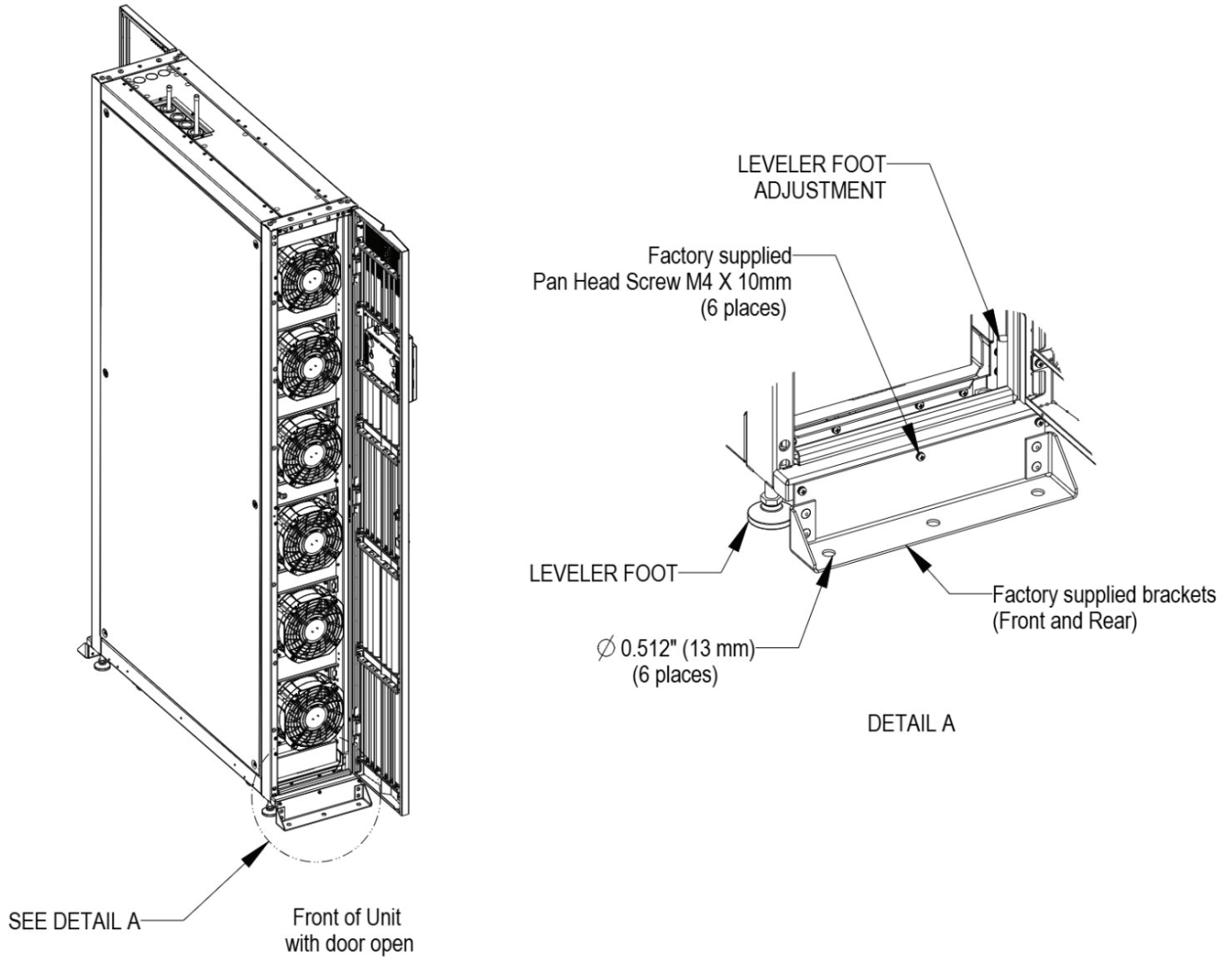


FLOOR ANCHORING DIMENSIONS

VIEW FROM TOP OF UNIT
FRONT & REAR DOOR/PANEL REMOVED FOR CLARITY

DIMENSIONAL DATA

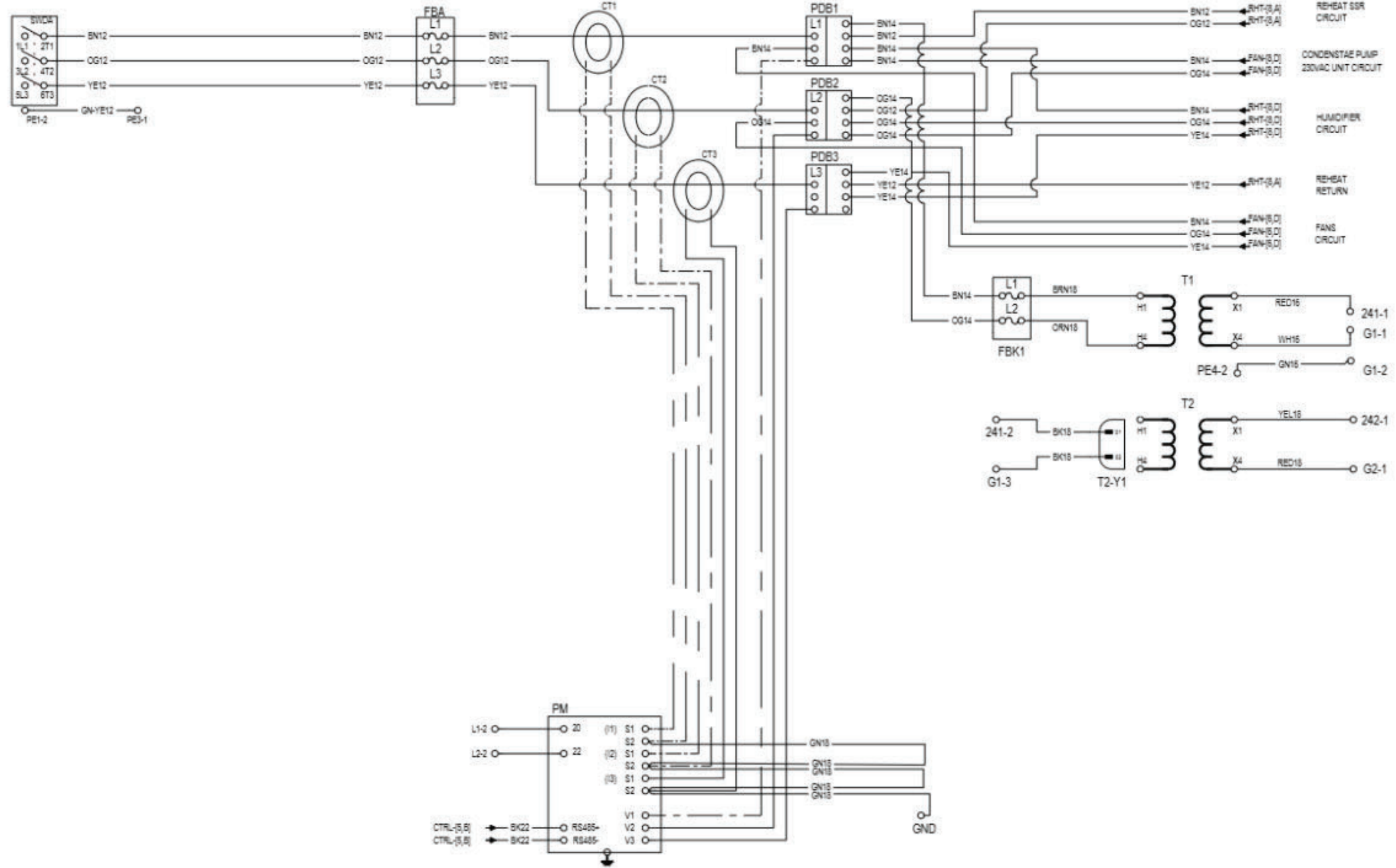
300mm (12in) RIGID FLOOR MOUNT BRACKET



Notes:

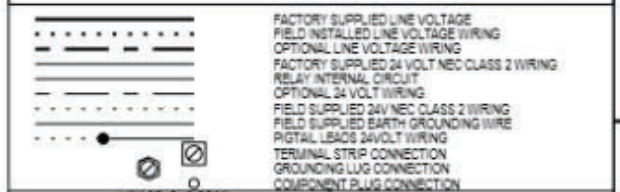
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2. Anchor the brackets to the unit using the screws that are provided.
3. The brackets are to be secured to the floor using field supplied anchors.
4. The same mounting brackets are used in the front and rear of the unit.
5. This document is not to be used for field installation, see Vertiv™ CoolPhase Row User Manual.

LINE VOLTAGE
3 PHASE SUPPLY (A)



- NOTES:
1. ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
 2. SEE INSTALLATION AND USER MANUAL(S).
 3. JUMPER TO BE REMOVED WHEN OPTIONAL COMPONENT IS USED.
 4. ALL RJ45 ETHERNET CABLES MUST BE STRAIGHT THROUGH.
 5. 10 D CARD INSTALLED ON THE FAN PANEL.

NOMENCLATURE			
STANDARD DEVICES	COORD	OPTIONAL DEVICES	COORD
FBA - FUSE BLOCK A	8,D	CT1 - CURRENT TRANSFORMER 1	8,D
FBS - FUSE BLOCK B	8,D	CT2 - CURRENT TRANSFORMER 2	8,D
FBK1 - FUSE BLOCK 1 CONTROL	4,C	CT3 - CURRENT TRANSFORMER 3	8,D
KAC - CONTACTOR RELAY ATS C	6,C	PM - POWER METER	8,B
KAD - CONTACTOR RELAY ATS D	6,C		
KMA - CONTACTOR ATS A	6,C		
KMB - CONTACTOR ATS B	6,C		
POB1 - POWER DIST BLOCK L1	5,D		
POB2 - POWER DIST BLOCK L2	5,D		
POB3 - POWER DIST BLOCK L3	5,D		
SWDA - SWITCH DISCONNECT A	8,D		
SWDB - SWITCH DISCONNECT B	8,D		
T1 - CONTROL TRANSFORMER	3,C		
T2 - ISOLATION TRANSFORMER	3,C		



WIRE COLOR CODE		
OG - ORANGE	PP - PURPLE	BL - BLUE
RD - RED	GR - GREEN	BR - BLACK
BL - BRN/WH	YEL - YELLOW	WH - WHITE

VERTIV® CRV DX 40kW
480V 3PH 50-60HZ
iCOM2 LARGE CONTROL
WITH HUMIDIFIER & REHEAT
HMI TOUCH SCREEN

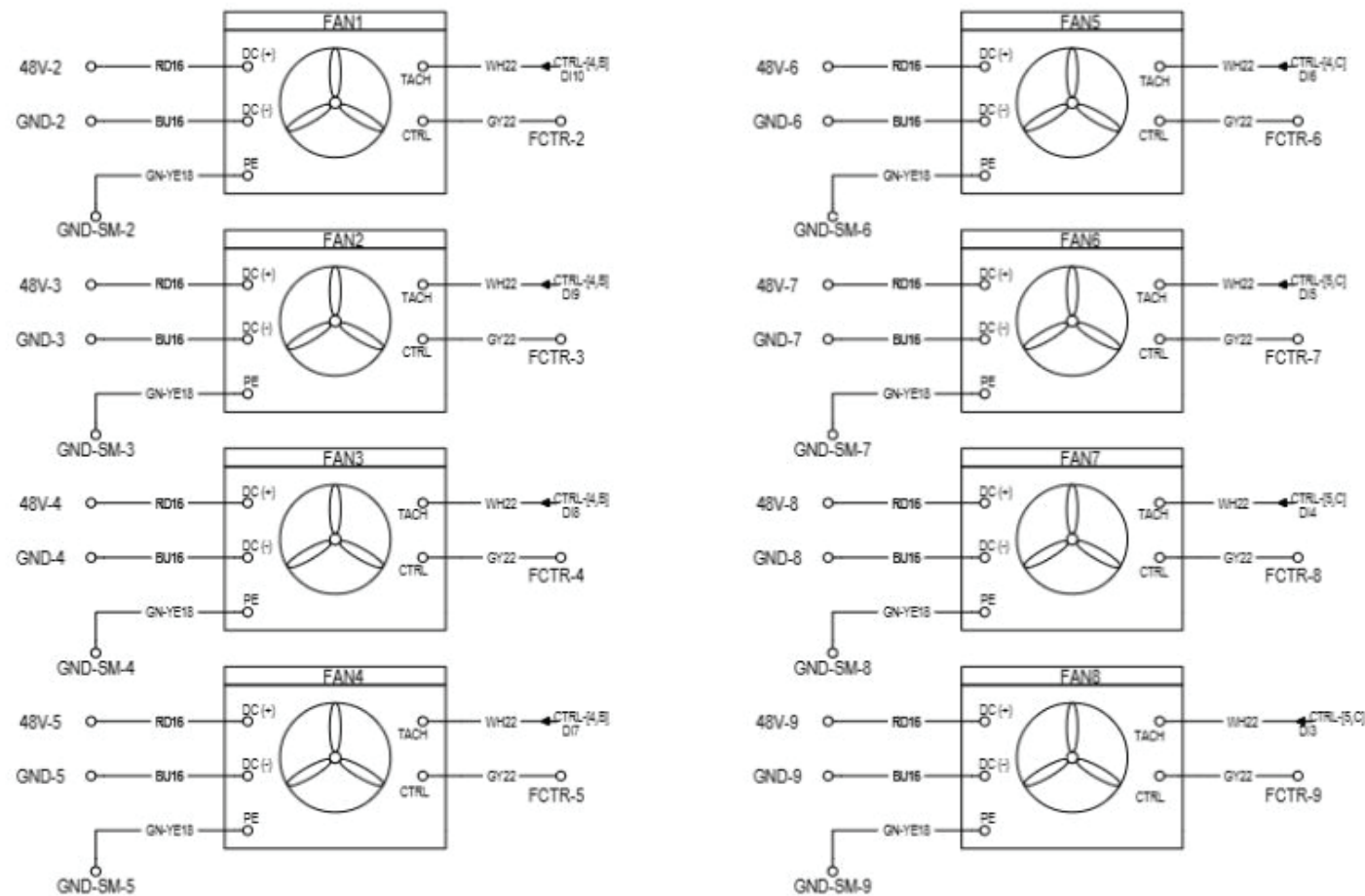
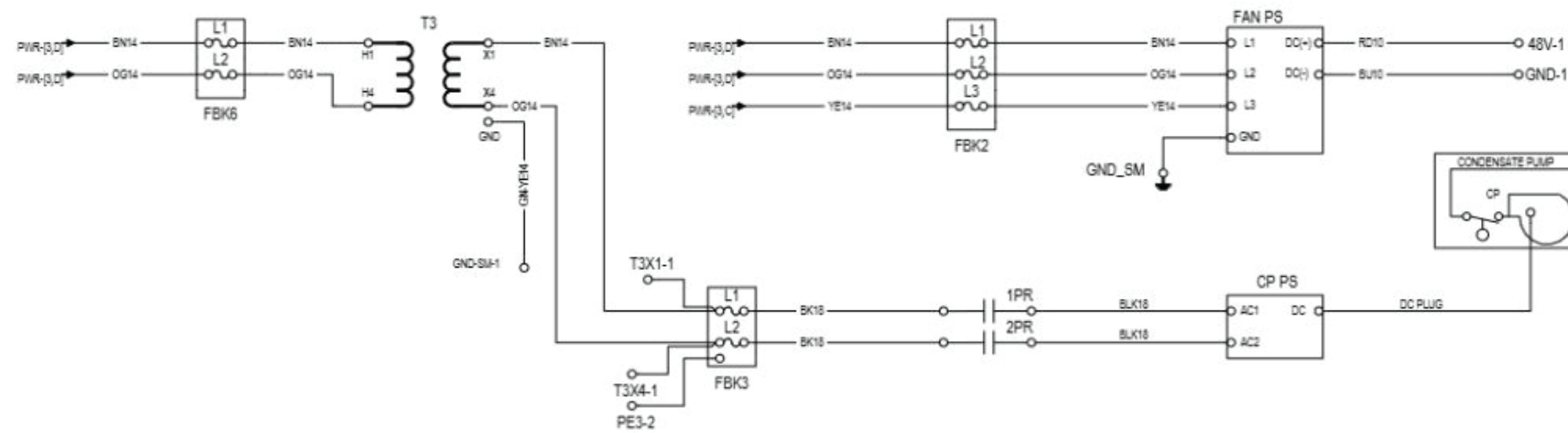
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CHECKED	A. TORRES	DATE	2025/03/23
APPROVED	A. TORRES	DATE	2025/03/23

DRAWING NO: 10080202DRW REV: G



POWER SUPPLY

SHEET 1 OF 4



- NOTES:
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 5. 10 DI CARD INSTALLED ON THE FAN PANEL.

STANDARD DEVICES		NOMENCLATURE	
COORD	DESCRIPTION	COORD	DESCRIPTION
5,C	CPPS - CP POWER SUPPLY 24VDC		
5,D	FANPS - FANS POWER SUPPLY 48VDC		
6,D	FBK2 - FUSE BLOCK 2 FANS		
6,C	FBK3 - FUSE BLOCK 3 CP		
8,D	FBK6 - FUSE BLOCK 6 T3		
7,D	T3 - FAN TRANSFORMER		



WIRE COLOUR CODE		
OR - ORANGE	PR - PURPLE	BL - BLUE
RD - RED	GR - GREEN	BK - BLACK
BY - BROWN	YL - YELLOW	WH - WHITE



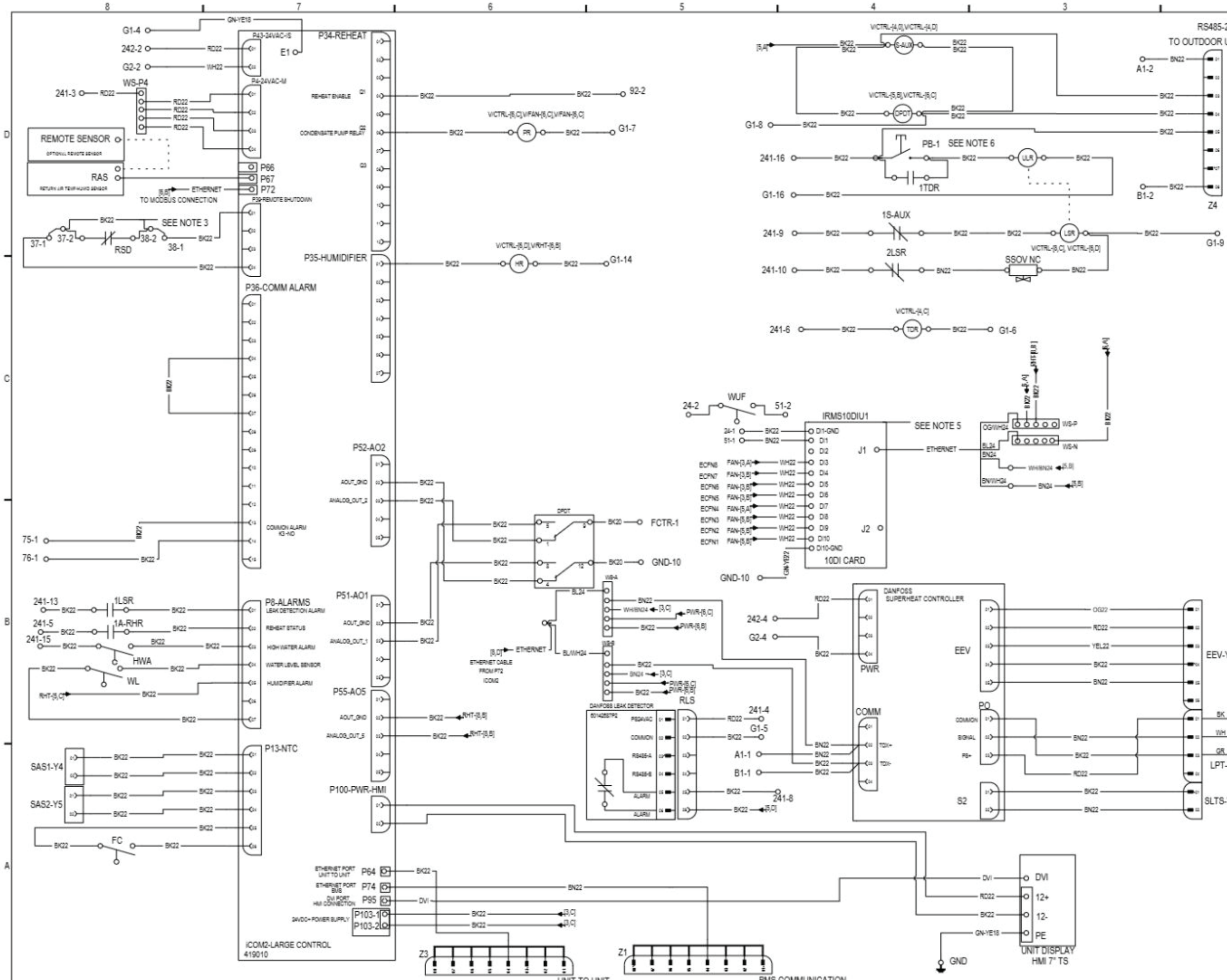
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ELECTRICAL SCHEMATIC
VERTIV® CRV DX 40kW
460V 3PH 50-60HZ
iCOM2 LARGE CONTROL
WITH HUMIDIFIER & REHEAT
HMI TOUCH SCREEN

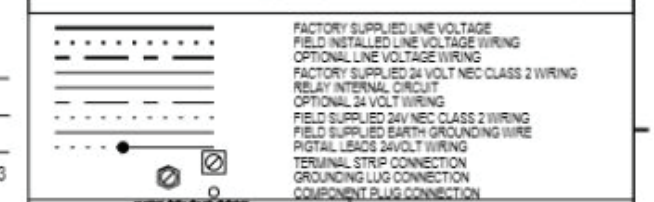
DATE	BY	DATE	BY
2025/03/23	P. BELMAREZ	2025/03/23	A. TORRES
2025/03/23	A. TORRES	2025/03/23	A. TORRES

FANS & CP
SHEET 2 OF 4
DRAWING NO: 10080202DRW
REV: G



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NOMENCLATURE			
STANDARD DEVICES	COORD	OPTIONAL DEVICES	COORD
EEV - ELECTRONIC EXP VALVE	3,A	RSD - REMOTE SHUTDOWN DEVICE	8,C
FC - FILTER CLOG SWITCH	8,C	SSOV - SAFETY SHUT-OFF VALVE	5,D
HR - HUMIDIFIER RELAY	6,C	WUF - WATER UNDER FLOOR	8,A
HWA - HIGH WATER ALARM	6,C		
LPT - LOW PRESSURE TRANSDUCER	3,A		
LSR - LEAK SENSOR RELAY	6,D		
PR - CONDENSATE PUMP RELAY	6,C		
RLS - REFRIGERANT LEAK SENSOR	6,A		
SAS1-4 - SUPPLY AIR SENSORS 1-4	8,B		
SLTS - SUCTION LINE TEMP SENSOR	3,A		
WL - WATER LEVEL SENSOR	8,C		
ULR - UNLATCHING RELAY	3,D		
TDR - TIME DELAY RELAY	4,C		



WIRE COLOUR CODE

OG - ORANGE	PR - PURPLE	BL - BLUE
RD - RED	GR - GREEN	BLK - BLACK
BRN - BROWN	YEL - YELLOW	WH - WHITE

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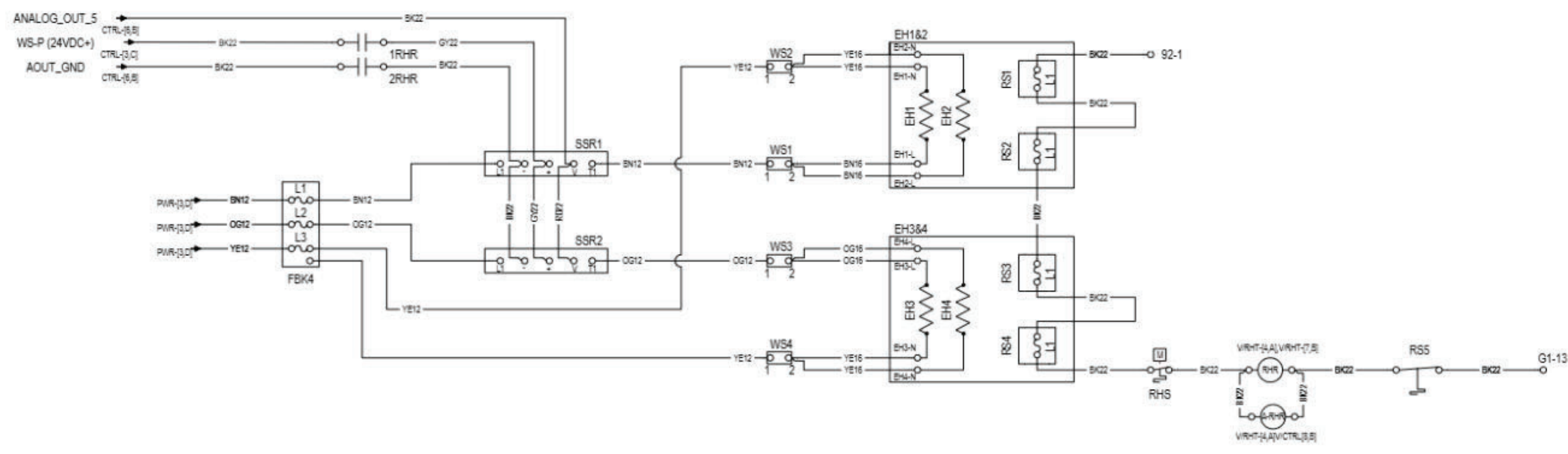
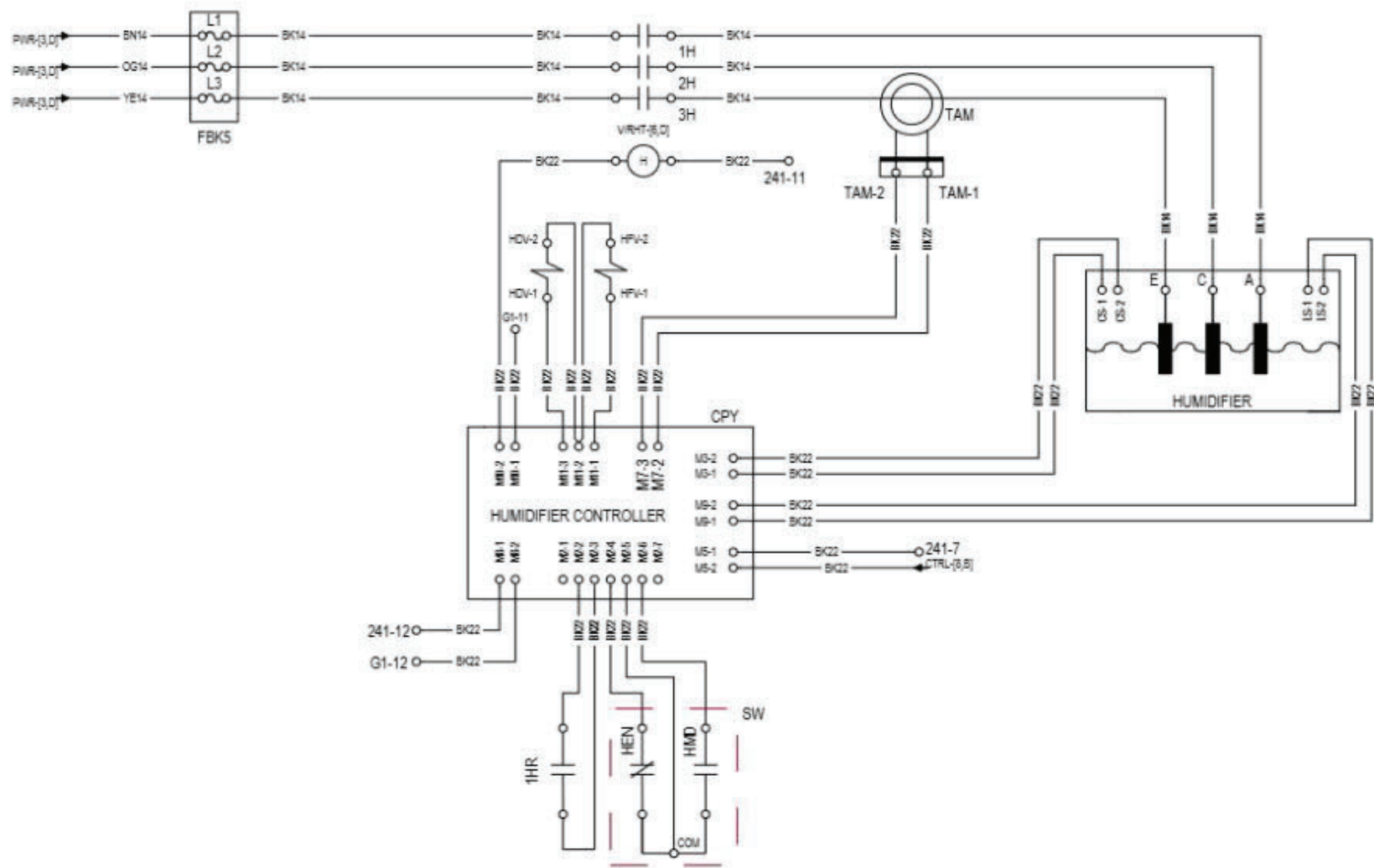
ELECTRICAL SCHEMATIC
VERTIV® CRV DX 40kW
460V 3PH 50-60HZ
iCOM2 LARGE CONTROL
WITH HUMIDIFIER & REHEAT
HMI TOUCH SCREEN

CONTROL

SHEET 3 OF 3

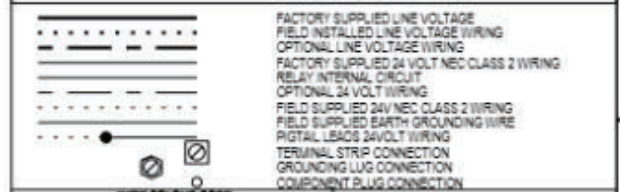
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CHECKED	A. TORRES	DATE	2025/03/23
REVIS	A. TORRES	DATE	2025/03/23

DRAWING NO: 10080202DRW REV: G



- NOTES
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 4. 10 D/ CARD INSTALLED ON THE FAN PANEL.

NOMENCLATURE			
STANDARD DEVICES	COORD	OPTIONAL DEVICES	COORD
BH1-2 - ELECTRICAL REHEAT 1, 2	5, B		
BH3-4 - ELECTRICAL REHEAT 3, 4	5, A		
FBK4 - FUSE BLOCK 4 REHEAT	7, A		
FBK5 - FUSE BLOCK 5 HUMIDIFIER	7, D		
H - HUMIDIFIER CONTACTOR	6, D		
HDV - HUMIDIFIER DRAIN VALVE	6, D		
HPV - HUMIDIFIER FILL VALVE	6, D		
RHR - REHEAT RELAY	7, D		
RS5 - THERMAL CUT-OFF SWITCH	6, D		
SSR1 - SOLID STATE RELAY 1	6, B		
SSR2 - SOLID STATE RELAY 2	6, A		
TAM - HUM CURRENT TRANSFORMER	5, D		
A-RH AUXILIARY CONTACT RHT			
RHS - MANUAL RESET THERMAL CUT-OFF SWITCH	4, D		



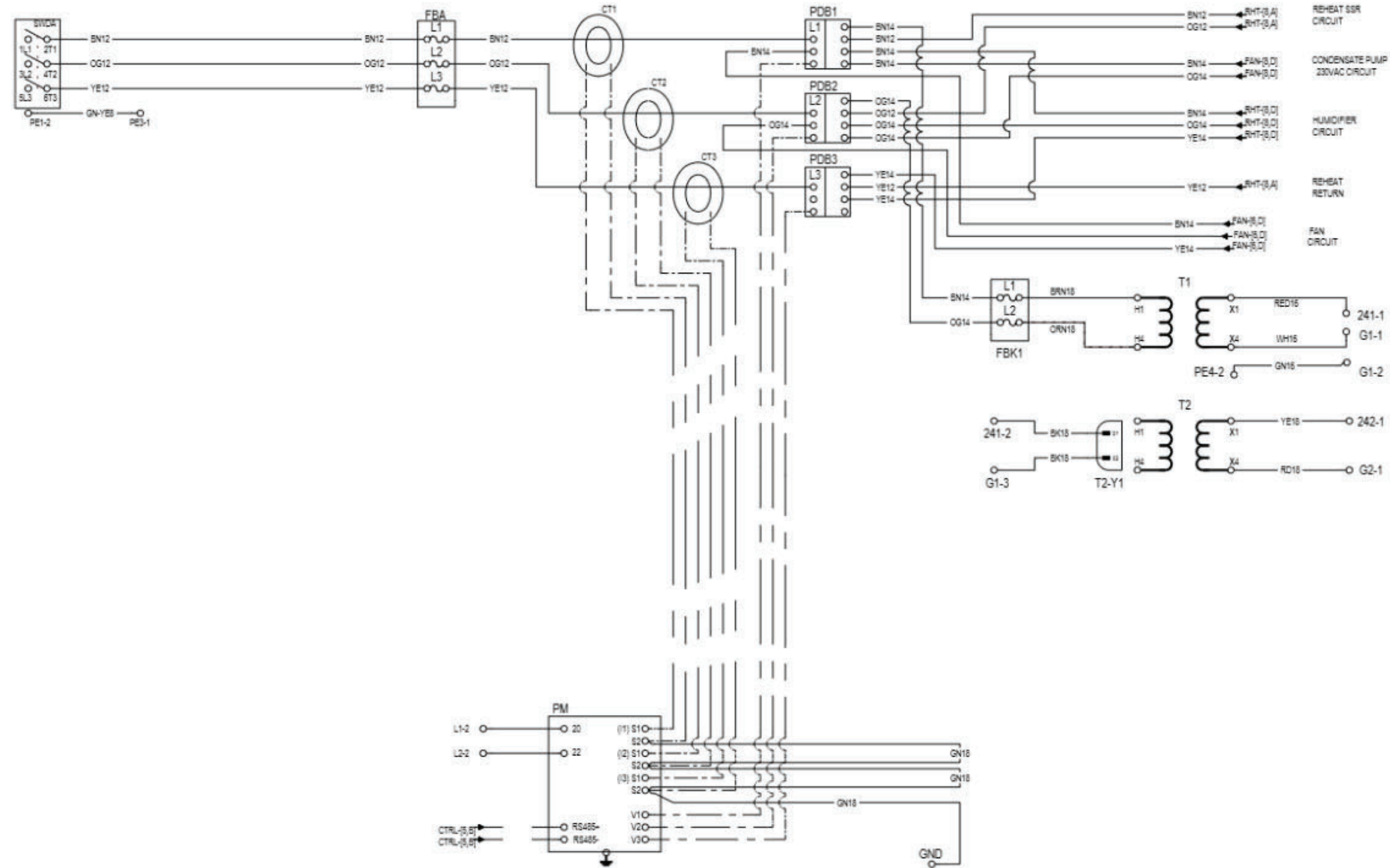
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VERTIV® CRV DX 40kW
460V 3PH 50-60HZ
iCOM2 LARGE CONTROL
WITH HUMIDIFIER & REHEAT
HMI TOUCH SCREEN
REHEAT & HUMIDIFIER

DESIGN	P. BELMAREZ	DATE	2026/03/23
CHECKED	A. TORRES	DATE	2026/03/23
ISSUED	A. TORRES	DATE	2026/03/23

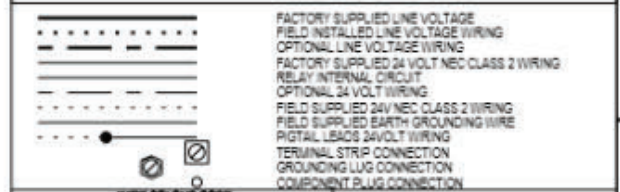
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LINE VOLTAGE
3 PHASE SUPPLY (A)



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KAC - CONTACTOR RELAY ATS C	6,C	PM - POWER METER	5,B
KAD - CONTACTOR RELAY ATS D	6,C		
KMA - CONTACTOR ATS A	6,C		
KMB - CONTACTOR ATS B	6,C		
PDB1 - POWER DIST BLOCK L1	5,D		
PDB2 - POWER DIST BLOCK L2	5,D		
PDB3 - POWER DIST BLOCK L3	5,D		
SWDA - SWITCH DISCONNECT A	6,D		
SWDB - SWITCH DISCONNECT B	6,D		
T1 - CONTROL TRANSFORMER	3,C		
T2 - ISOLATION TRANSFORMER	3,C		



WIRE COLOUR CODE		
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1900 HARBOR DRIVE, P.O. BOX 22186
COLUMBUS, OHIO 43222

DATE CODE
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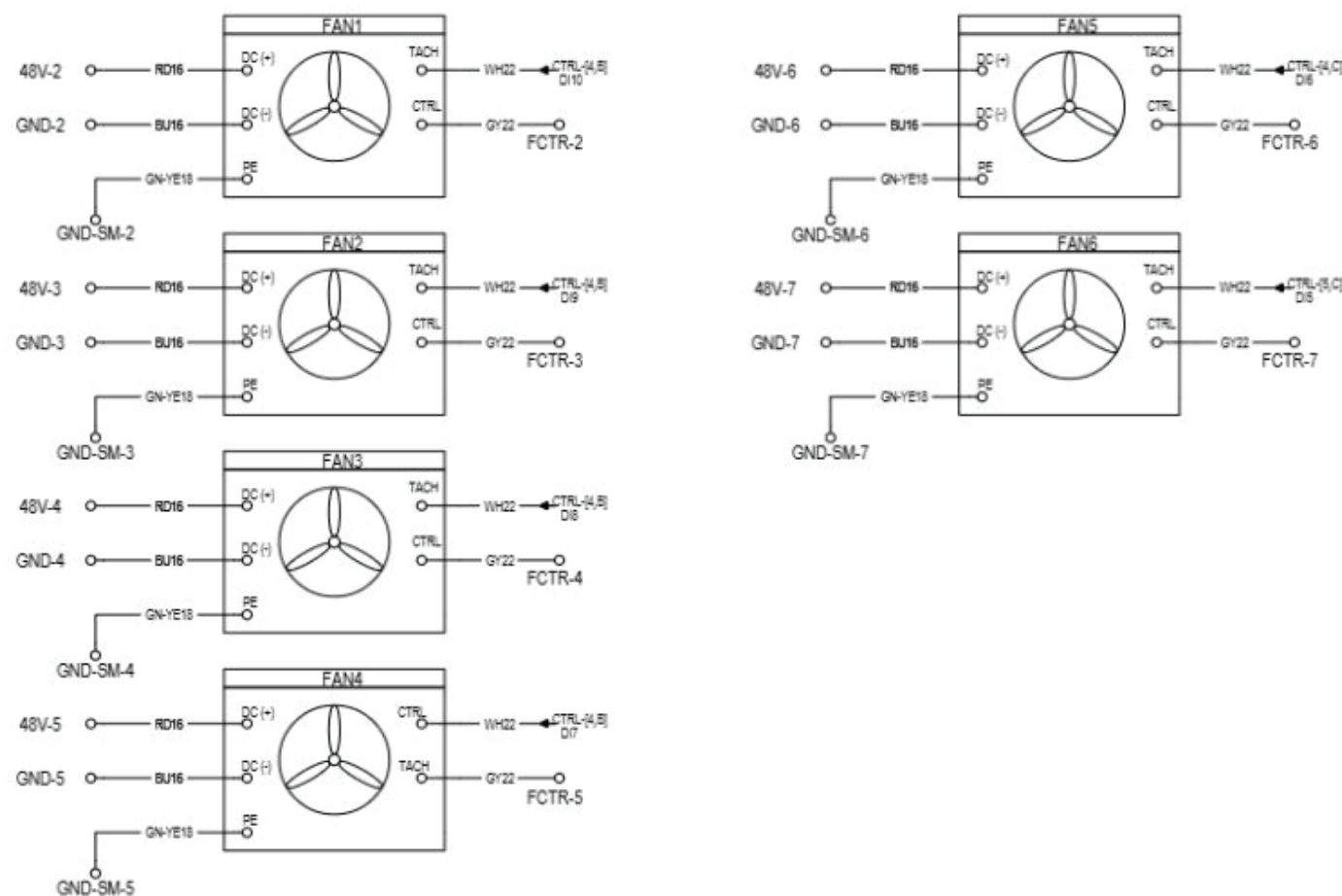
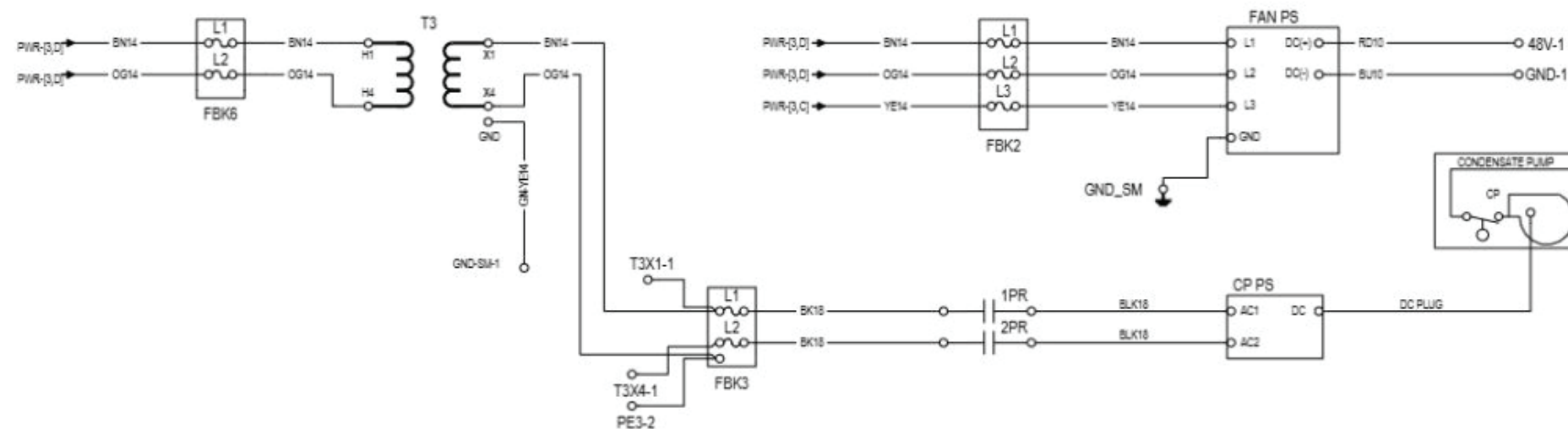
ELECTRICAL SCHEMATIC

VERTIV® CRV DX 30kW
460V 3PH 50-60HZ
iCOM2 LARGE CONTROL
WITH HUMIDIFIER & REHEAT
HMI TOUCH SCREEN

DATE	BY	CHKD	DATE	DRWING NO.	REV.
2026/03/24	P. BELMAREZ			10080203DRW	G
2026/03/24	A. TORRES				
2026/03/24	A. TORRES				

POWER SUPPLY

SHEET 1 OF 4

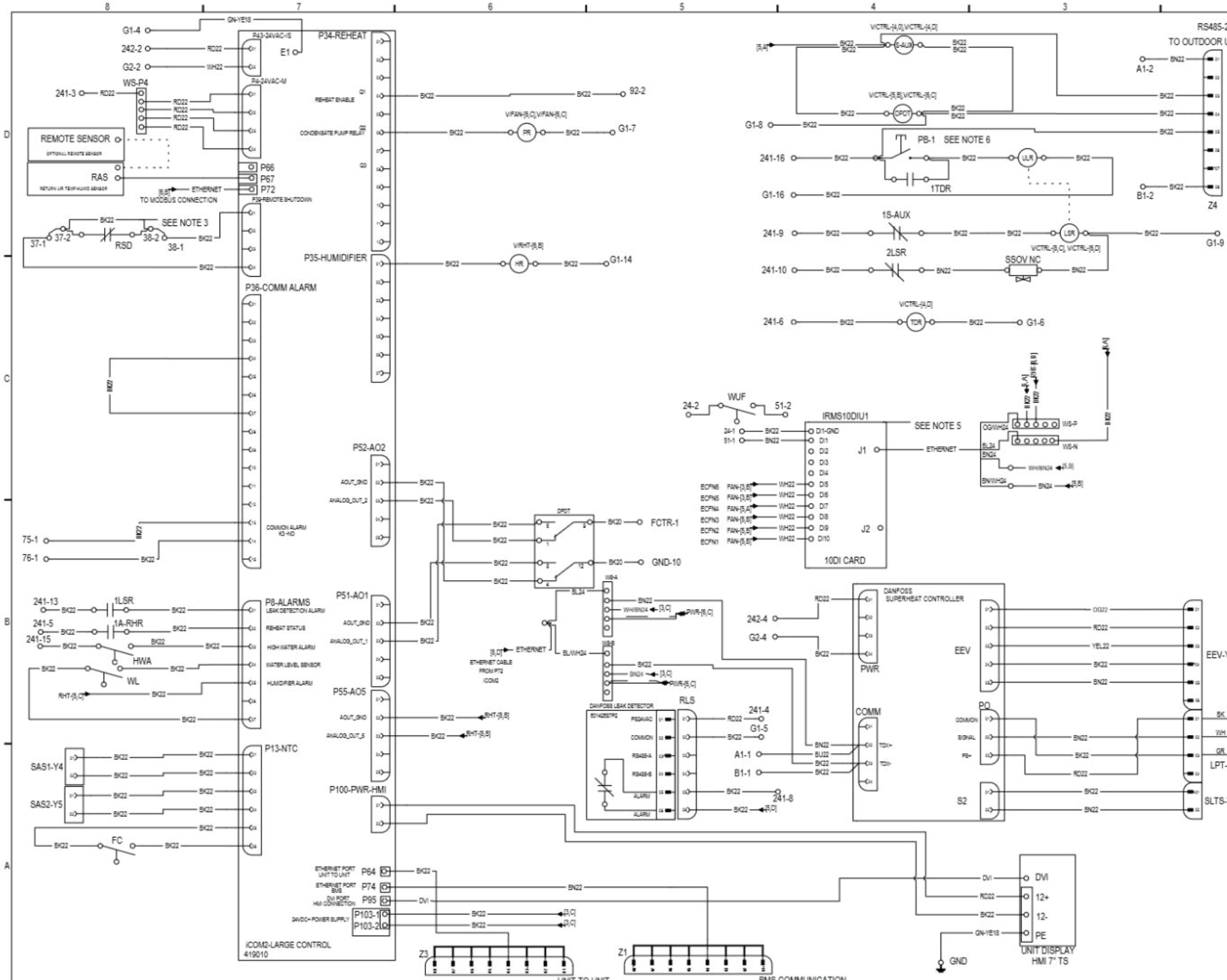


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OPTIONAL DEVICES		NOMENCLATURE	
OPTIONAL DEVICES	COORD	OPTIONAL DEVICES	COORD
CPPS - CP POWER SUPPLY 24VDC	5, C		
FANPS - FANS POWER SUPPLY 48VDC	5, D		
FBK2 - FUSE BLOCK 2 FANS	6, D		
FBK3 - FUSE BLOCK 3 CP	6, C		
FBK6 - FUSE BLOCK 6 T3	6, D		
T3 - FAN TRANSFORMER	7, D		



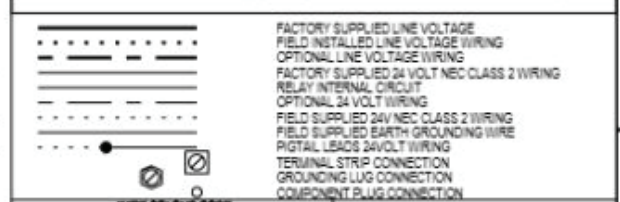
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OG - ORANGE	PR - PURPLE	BL - BLUE										
RD - RED	GR - GREEN	BK - BLACK										
BR - BROWN	YEL - YELLOW	WH - WHITE										
<p>1800 DEARBORN DRIVE, P.O. BOX 23186 COLUMBUS, OHIO 43223 18002</p>												
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<p>DRAWN P. BELMAREZ DATE 2026/03/24</p>	<p>CHECKED A. TORRES DATE 2026/03/24</p>	<p>DATE 2026/03/24</p>		<p>DRAWING NO 10080203DRW</p>								



NOTES

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NOMENCLATURE			
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FC - FILTER CLOG SWITCH	8,C	SSOV - SAFETY SHUT-OFF VALVE	5,D
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HWA - HIGH WATER ALARM	6,C		
LPT - LOW PRESSURE TRANSDUCER	3,A		
LSR - LEAK SENSOR RELAY	6,D		
PR - CONDENSATE PUMP RELAY	6,C		
RLS - REFRIGERANT LEAK SENSOR	6,A		
SAS1-4 - SUPPLY AIR SENSORS 1-4	8,B		
SLTS - SUCTION LINE TEMP SENSOR	3,A		
WL - WATER LEVEL SENSOR	8,C		
ULR - UNLATCHING RELAY	3,D		
TDR - TIME DELAY RELAY	4,D		



WIRE COLOUR CODE

OG - ORANGE	PR - PURPLE	BL - BLUE
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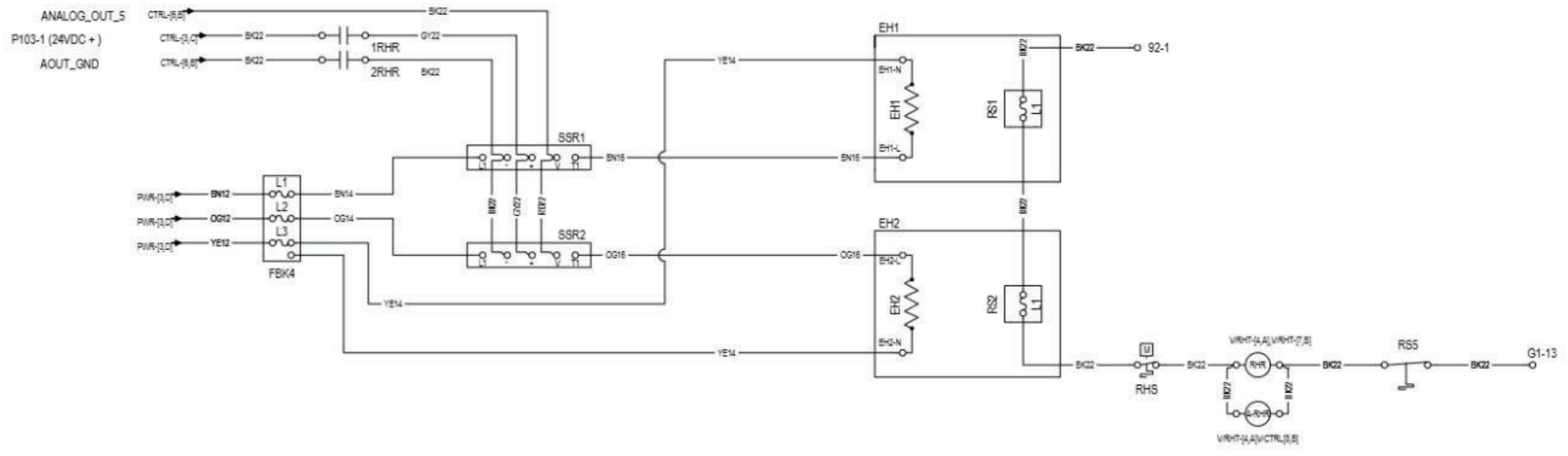
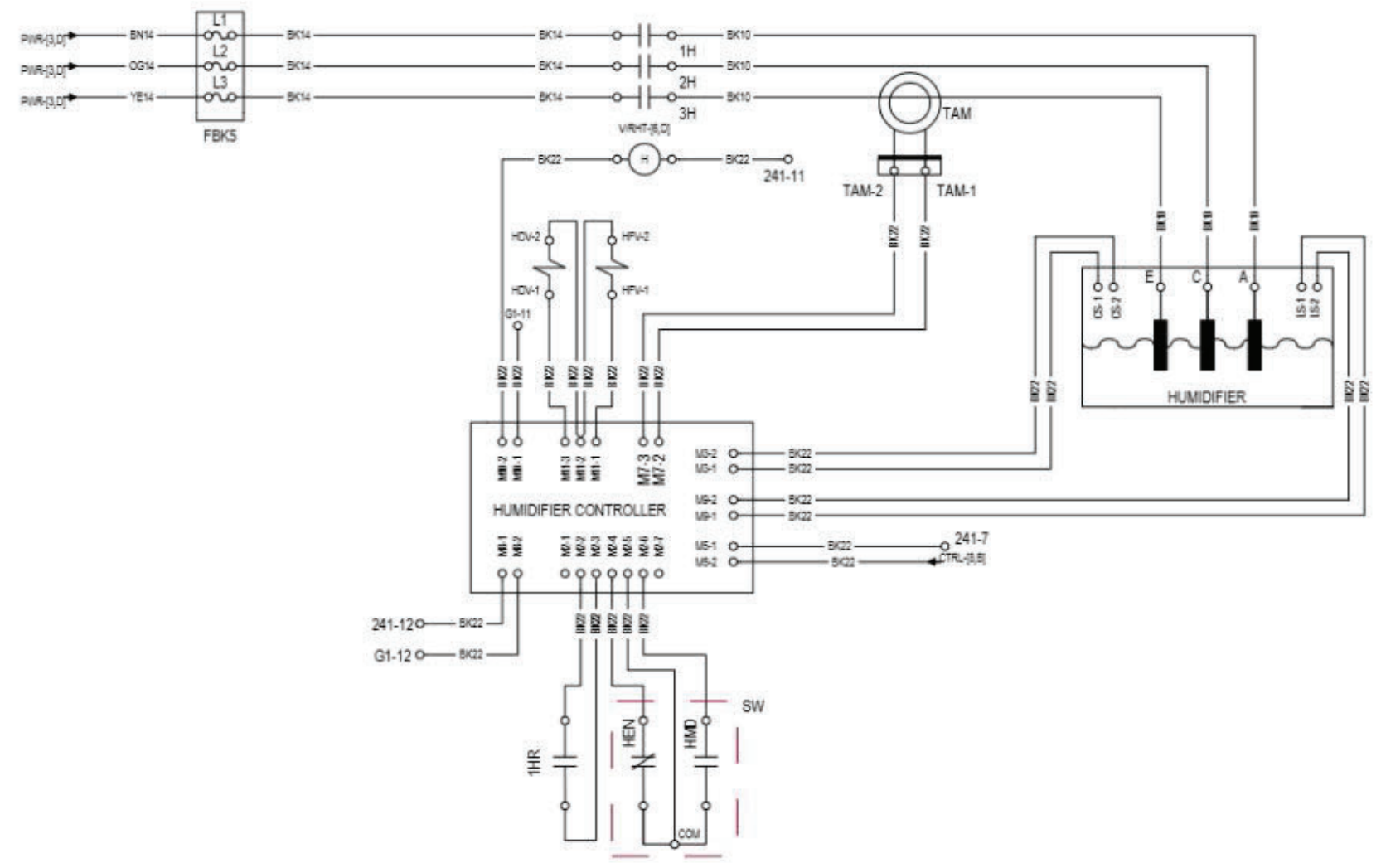
ELECTRICAL SCHEMATIC
VERTIV® CRV DX 30kW
460V 3PH 50-60HZ
iCOM2 LARGE CONTROL
WITH HUMIDIFIER & REHEAT
HMI TOUCH SCREEN
CONTROL

DRAWN	P. BELMAREZ	DATE	2025/03/24
CHECKED	A. TORRES	DATE	2025/03/24
REVIS	A. TORRES	DATE	2025/03/24

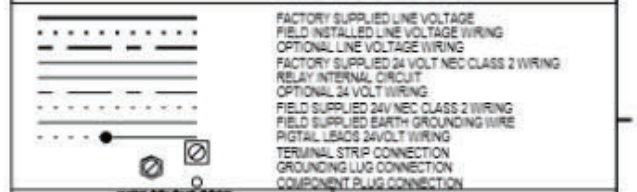
DRAWING NO: 10080203DRW REV: G

SHEET 3 OF 3

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NOMENCLATURE			
OPTIONAL DEVICES	COORD	OPTIONAL DEVICES	COORD
BH1 - ELECTRICAL REHEAT 1	5, B		
BH2 - ELECTRICAL REHEAT 2	5, A		
FBK4 - FUSE BLOCK 4 REHEAT	7, A		
FBK5 - FUSE BLOCK 5 HUMIDIFIER	7, D		
H - HUMIDIFIER CONTACTOR	6, D		
HDV - HUMIDIFIER DRAIN VALVE	6, D		
HPV - HUMIDIFIER FILL VALVE	6, D		
RHR - REHEAT RELAY	7, D		
RSS - THERMAL CUT-OFF SWITCH	6, D		
SSR1 - SOLID STATE RELAY 1	6, B		
SSR2 - SOLID STATE RELAY 2	6, A		
TAM - HUM CURRENT TRANSFORMER	5, D		
RSS - MANUAL RESET THERMAL CUT-OFF SWITCH	4, D		

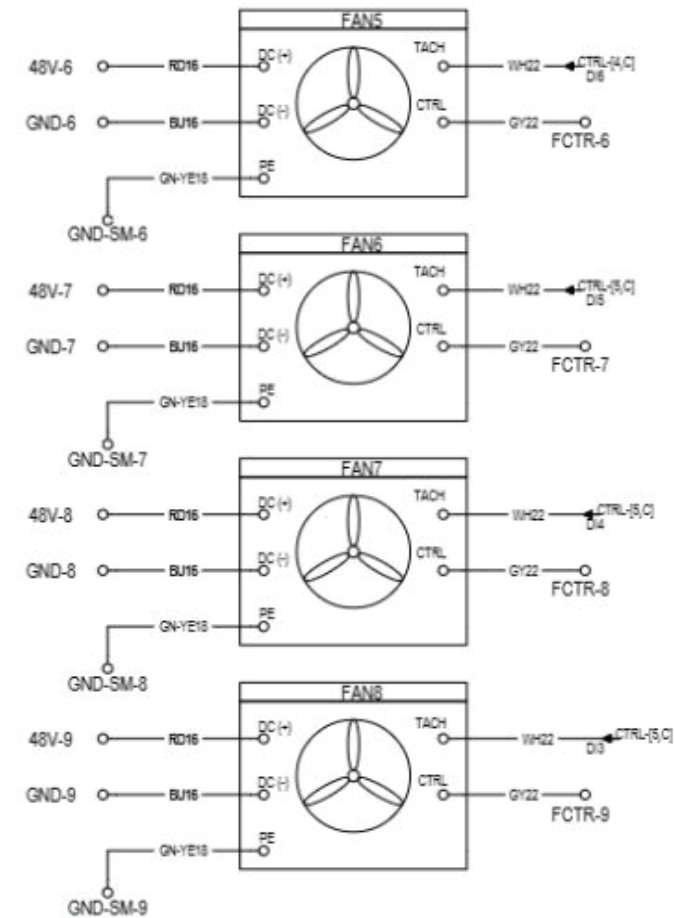
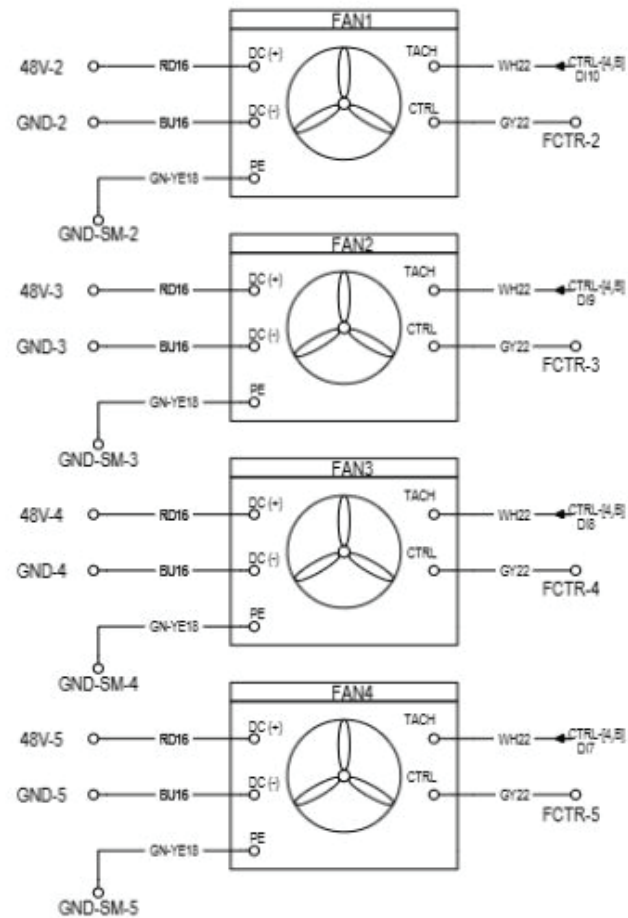
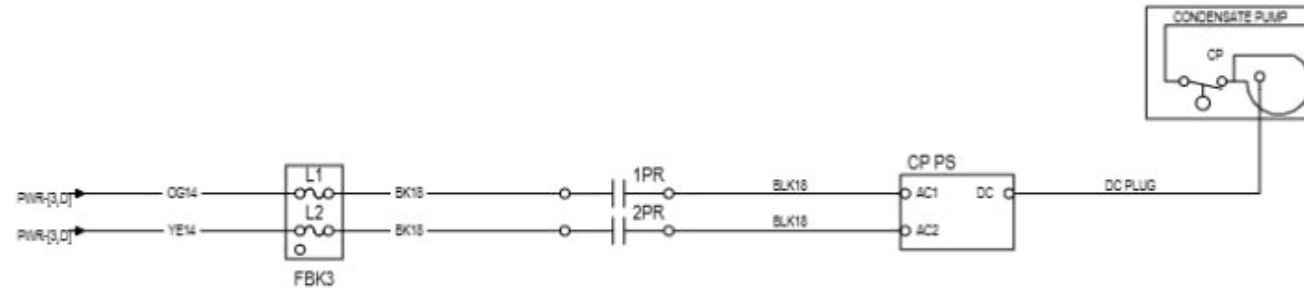


WIRE COLOUR CODE		
OG - ORANGE	PR - PURPLE	BL - BLUE
RD - RED	GR - GREEN	BK - BLACK
BN - BROWN	YL - YELLOW	GN - WHITE

VERTIV® CRV DX 30kW
460V 3PH 50-60HZ
iCOM2 LARGE CONTROL
WITH HUMIDIFIER & REHEAT
HMI TOUCH SCREEN
REHEAT & HUMIDIFIER

DESIGN	P. BELMAREZ	DATE	2025/03/24
CHECKED	A. TORRES	DATE	2025/03/24
REVISOR	P. BELMAREZ	DATE	2025/03/24

DRAWING NO: 10080203DRW



- NOTES:
1. ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
 2. SEE INSTALLATION AND USER MANUAL(S).
 3. JUMPER TO BE REMOVED WHEN OPTIONAL COMPONENT IS USED.
 4. ALL RJ45/ETHERNET CABLES MUST BE STRAIGHT THROUGH.
 5. 10 D1 CARD INSTALLED ON THE FAN PANEL.

STANDARD DEVICES		NOMENCLATURE	
COORD	OPTIONAL DEVICES	COORD	OPTIONAL DEVICES
5,C			
5,D			
6,D			
6,C			



WIRE COLOUR CODE		
OG - ORANGE	PR - PURPLE	BL - BLUE
RD - RED	GR - GREEN	BK - BLACK
BY - BROWN	YL - YELLOW	WH - WHITE



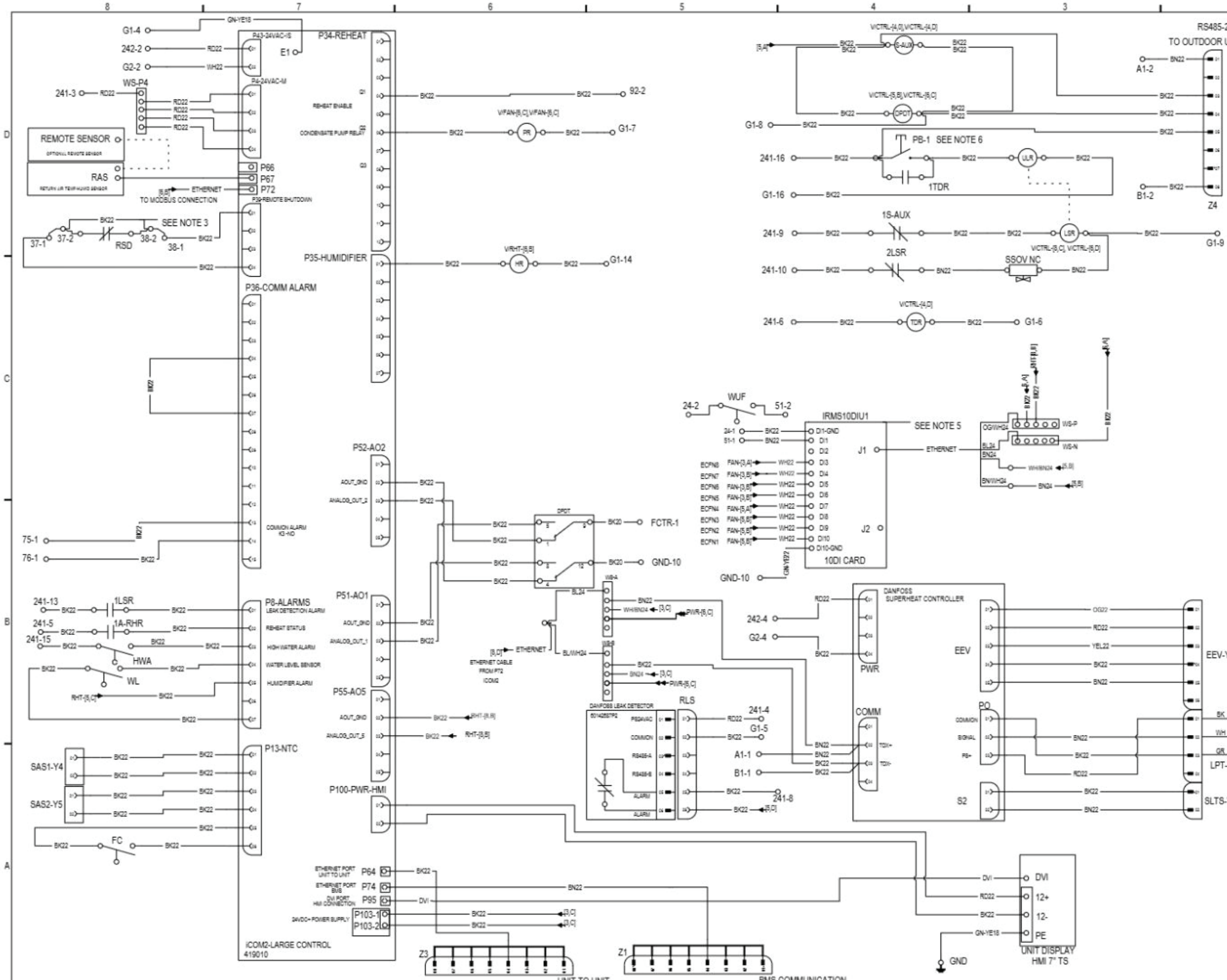
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COLUMBUS, OHIO 43222 15002

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ELECTRICAL SCHEMATIC
VERTIV® CRV DX 40kW
208-230V 3PH 50-60HZ
iCOM2 LARGE CONTROL
WITH HUMIDIFIER & REHEAT
HMI TOUCH SCREEN

DATE	DATE	DATE
2026/03/24	2026/03/24	2026/03/24

FANS & CP
SHEET 2 OF 4
DRAWING NO: 10080204DRW
REV: G



- NOTES:
1. ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
 2. SEE INSTALLATION AND USER MANUAL(S).
 3. JUMPER TO BE REMOVED WHEN OPTIONAL COMPONENT IS USED.
 4. ALL RJ45 ETHERNET CABLES MUST BE STRAIGHT THROUGH.
 5. 10 DI CARD INSTALLED ON THE FAN PANEL.
 6. PUSH BUTTON IS FOR RESETING THE UNIT AFTER A REFRIGERANT LEAK IS REMEDIATED.

NOMENCLATURE			
STANDARD DEVICES	COORD	OPTIONAL DEVICES	COORD
EEV - ELECTRONIC EXP VALVE	3,A	RSD - REMOTE SHUTDOWN DEVICE	8,C
FC - FILTER CLOG SWITCH	8,C	SSOV - SAFETY SHUT-OFF VALVE	5,D
HR - HUMIDIFIER RELAY	6,C	WUF - WATER UNDER FLOOR	8,A
HWA - HIGH WATER ALARM	6,C		
LPT - LOW PRESSURE TRANSDUCER	3,A		
LSR - LEAK SENSOR RELAY	6,D		
PR - CONDENSATE PUMP RELAY	6,C		
RLS - REFRIGERANT LEAK SENSOR	6,A		
SAS1-4 - SUPPLY AIR SENSORS 1-4	8,B		
SLTS - SUCTION LINE TEMP SENSOR	3,A		
WL - WATER LEVEL SENSOR	8,C		
ULR - UNLATCHING RELAY	3,D		
TDR - TIME DELAY RELAY	4,D		



WIRE COLOUR CODE

OG - ORANGE	PR - PURPLE	BL - BLUE
RD - RED	GR - GREEN	BLK - BLACK
BRN - BROWN	YEL - YELLOW	WH - WHITE

100 DANFOS DRIVE, P.O. BOX 23186
COLUMBUS, OHIO 43223 15002

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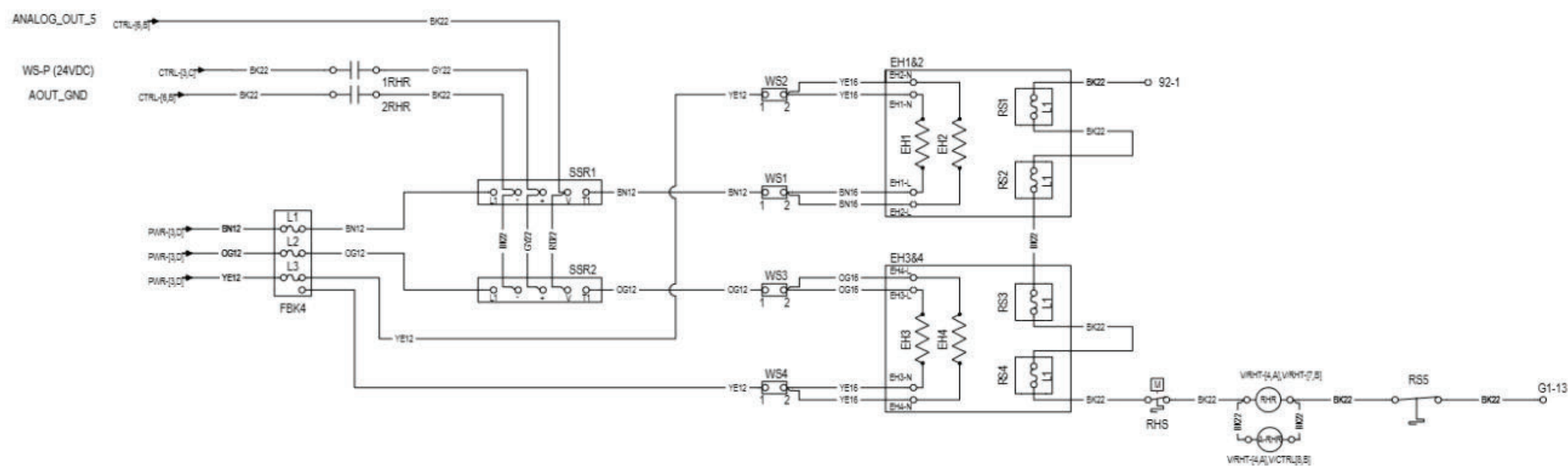
VERTIV

ELECTRICAL SCHEMATIC
VERTIV® CRV DX 40kW
208-230V 3PH 50-60HZ
iCOM2 LARGE CONTROL
WITH HUMIDIFIER & REHEAT
HMI TOUCH SCREEN

CONTROL
SHEET 3 OF 4

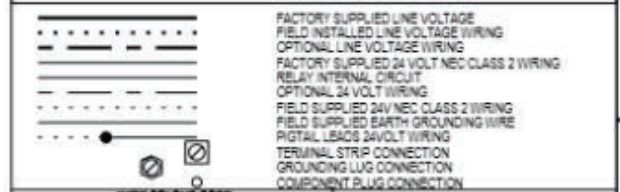
DRAWN	P. BELMAREZ	DATE	2025/03/24
CHECKED	A. TORRES	DATE	2025/03/24
BY	A. TORRES	DATE	2025/03/24

DRAWING NO: 10080204DRW REV: G



- NOTES
1. ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
 2. SEE INSTALLATION AND USER MANUAL(S).
 3. ALL RJ45 ETHERNET CABLES MUST BE STRAIGHT THROUGH.
 4. 10 D/ CARD INSTALLED ON THE FAN PANEL.

NOMENCLATURE			
STANDARD DEVICES	COORD	OPTIONAL DEVICES	COORD
BH1-2 - ELECTRICAL REHEAT 1, 2	5,8		
BH3-4 - ELECTRICAL REHEAT 3, 4	5,8		
FBK4 - FUSE BLOCK 4 REHEAT	7,0		
FBK5 - FUSE BLOCK 5 HUMIDIFIER	7,0		
H - HUMIDIFIER CONTACTOR	6,0		
HDV - HUMIDIFIER DRAIN VALVE	6,0		
HPV - HUMIDIFIER FILL VALVE	6,0		
RHR - REHEAT RELAY	7,0		
RS5 - THERMAL CUT-OFF SWITCH	6,0		
SSR1 - SOLID STATE RELAY 1	6,8		
SSR2 - SOLID STATE RELAY 2	6,8		
TAM - HUM CURRENT TRANSFORMER	5,0		
A-RHR - AUXILIARY CONTACT RHR			
RHS - MANUAL RESET THERMAL CUT-OFF SWITCH	4,0		



WIRE COLOUR CODE		
OG - ORANGE	PR - PURPLE	BL - BLUE
RD - RED	GR - GREEN	BR - BLACK
BR - BROWN	YL - YELLOW	WH - WHITE



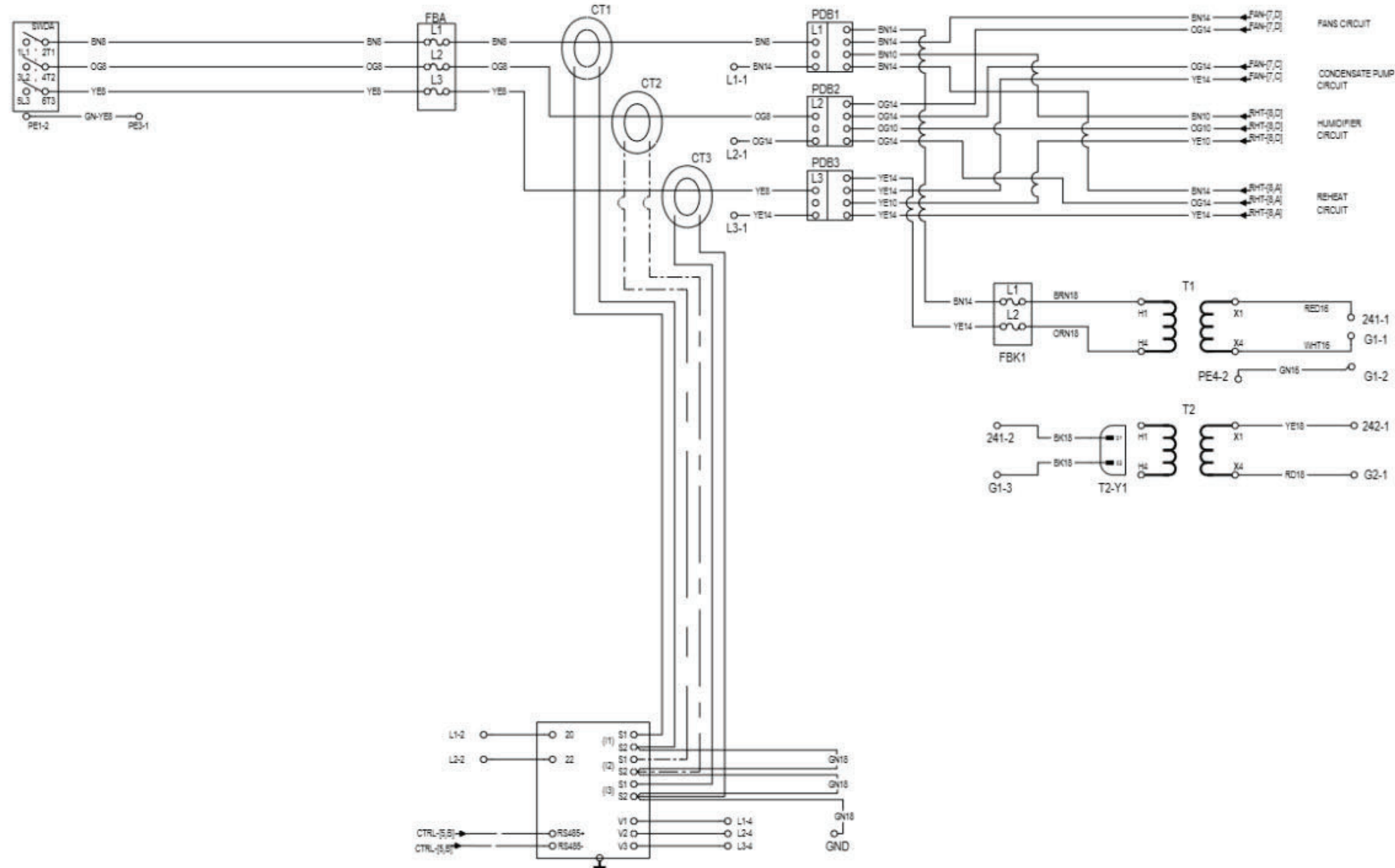
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ELECTRICAL SCHEMATIC
 VERTIV® CRV DX 40kW
 208-230V 3PH 50-60HZ
 iCOM2 LARGE CONTROL
 WITH HUMIDIFIER & REHEAT
 HMI TOUCH SCREEN
 REHEAT & HUMIDIFIER

DRAWN	P. BELMAREZ	DATE	2026/03/24
CHECKED	A. TORRES	DATE	2026/03/24
REVISOR	A. TORRES	DATE	2026/03/24

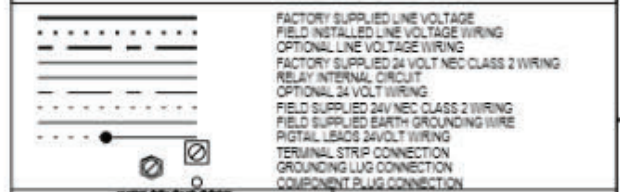
SHEET 4 OF 4
 DRAWING NO: 10080204DRW
 REV: G

LINE VOLTAGE
3 PHASE SUPPLY (A)



- NOTES
1. ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
 2. SEE INSTALLATION AND USER MANUAL(S).
 3. JUMPER TO BE REMOVED WHEN OPTIONAL COMPONENT IS USED.
 4. ALL FIBERETHERNET CABLES MUST BE STRAIGHT THROUGH.
 5. 10 I/O CARD INSTALLED ON THE FAN PANEL.

NOMENCLATURE			
STANDARD DEVICES	COORD	OPTIONAL DEVICES	COORD
FBA - FUSE BLOCK A	6,0	CT1 - CURRENT TRANSFORMER 1	5,0
FBS - FUSE BLOCK B	6,0	CT2 - CURRENT TRANSFORMER 2	5,0
FBK1 - FUSE BLOCK 1 CONTROL	4,C	CT3 - CURRENT TRANSFORMER 3	5,0
KAC - CONTACTOR RELAY ATS C	6,C	PM - POWER METER	5,5
KAD - CONTACTOR RELAY ATS D	6,C		
KMA - CONTACTOR ATS A	6,C		
KMB - CONTACTOR ATS B	6,C		
PDB1 - POWER DIST BLOCK L1	5,0		
PDB2 - POWER DIST BLOCK L2	5,0		
PDB3 - POWER DIST BLOCK L3	5,0		
SWDA - SWITCH DISCONNECT A	6,0		
SWDB - SWITCH DISCONNECT B	6,0		
T1 - CONTROL TRANSFORMER	3,C		
T2 - ISOLATION TRANSFORMER	3,C		



WIRE COLOUR CODE		
OG - ORANGE	PR - PURPLE	BL - BLUE
RD - RED	GR - GREEN	BR - BLACK
BR - BROWN	YL - YELLOW	WH - WHITE



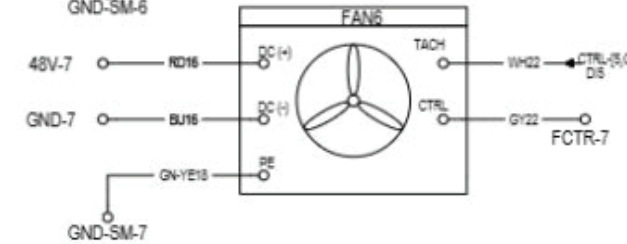
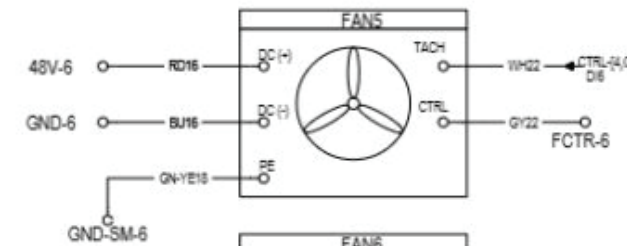
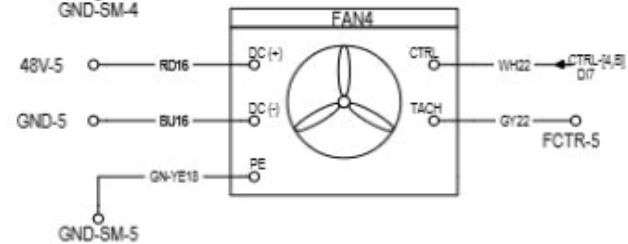
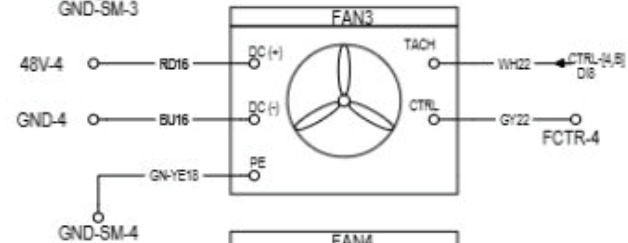
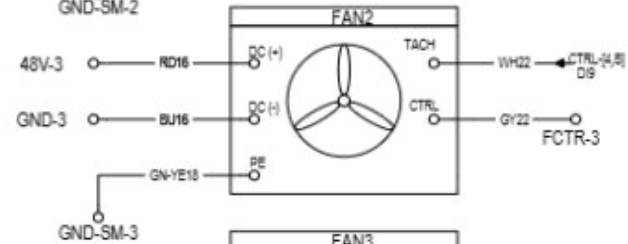
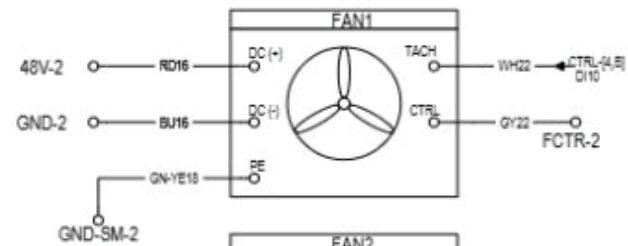
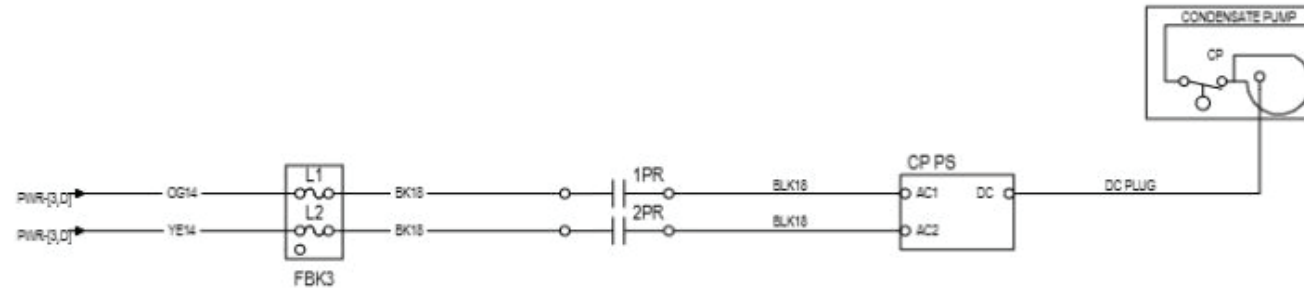
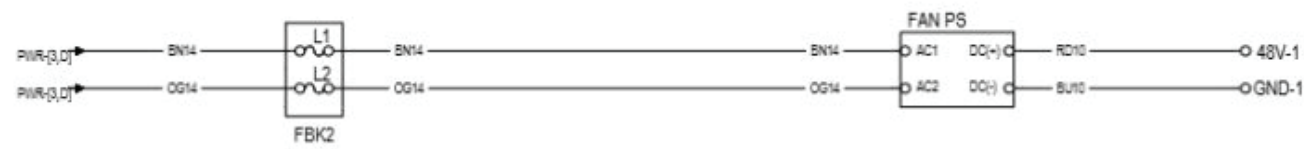
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COLUMBUS, OHIO 43233 160C3

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ELECTRICAL SCHEMATIC
VERTIV® CRV DX 30kW
208-230V 3PH 50-60HZ
iCOM2 LARGE CONTROL
WITH HUMIDIFIER & REHEAT
HMI TOUCH SCREEN

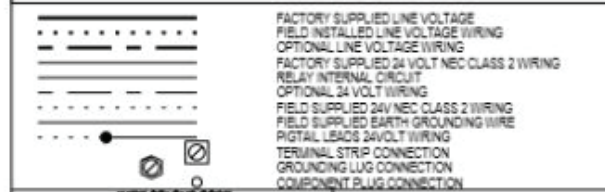
DRAWN P. BELMAREZ	DATE 2026/03/24
CHECKED A. TORRES	DATE 2026/03/24
REVISOR A. TORRES	DATE 2026/03/24

POWER SUPPLY
SHEET 1 OF 4
DRAWING NO: 10080205DRW
REV: G



- NOTES:
1. ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
 2. SEE INSTALLATION AND USER MANUAL(S).
 3. JUMPER TO BE REMOVED WHEN OPTIONAL COMPONENT IS USED.
 4. ALL RJ45/ETHERNET CABLES MUST BE STRAIGHT THROUGH.
 5. 10 DI CARD INSTALLED ON THE FAN PANEL.

NOMENCLATURE			
STANDARD DEVICES	COORD	OPTIONAL DEVICES	COORD
CPPS - CP POWER SUPPLY 24VDC	5,C		
FANPS - FANS POWER SUPPLY 48VDC	5,D		
FBK2 - FUSE BLOCK 2 FANS	6,D		
FBK3 - FUSE BLOCK 3 CP	6,C		



WIRE COLOUR CODE

OG - ORANGE	RD - PURPLE	BL - BLUE
RD - RED	GF - GREEN	BN - BLACK
BN - BROWN	YL - YELLOW	WH - WHITE



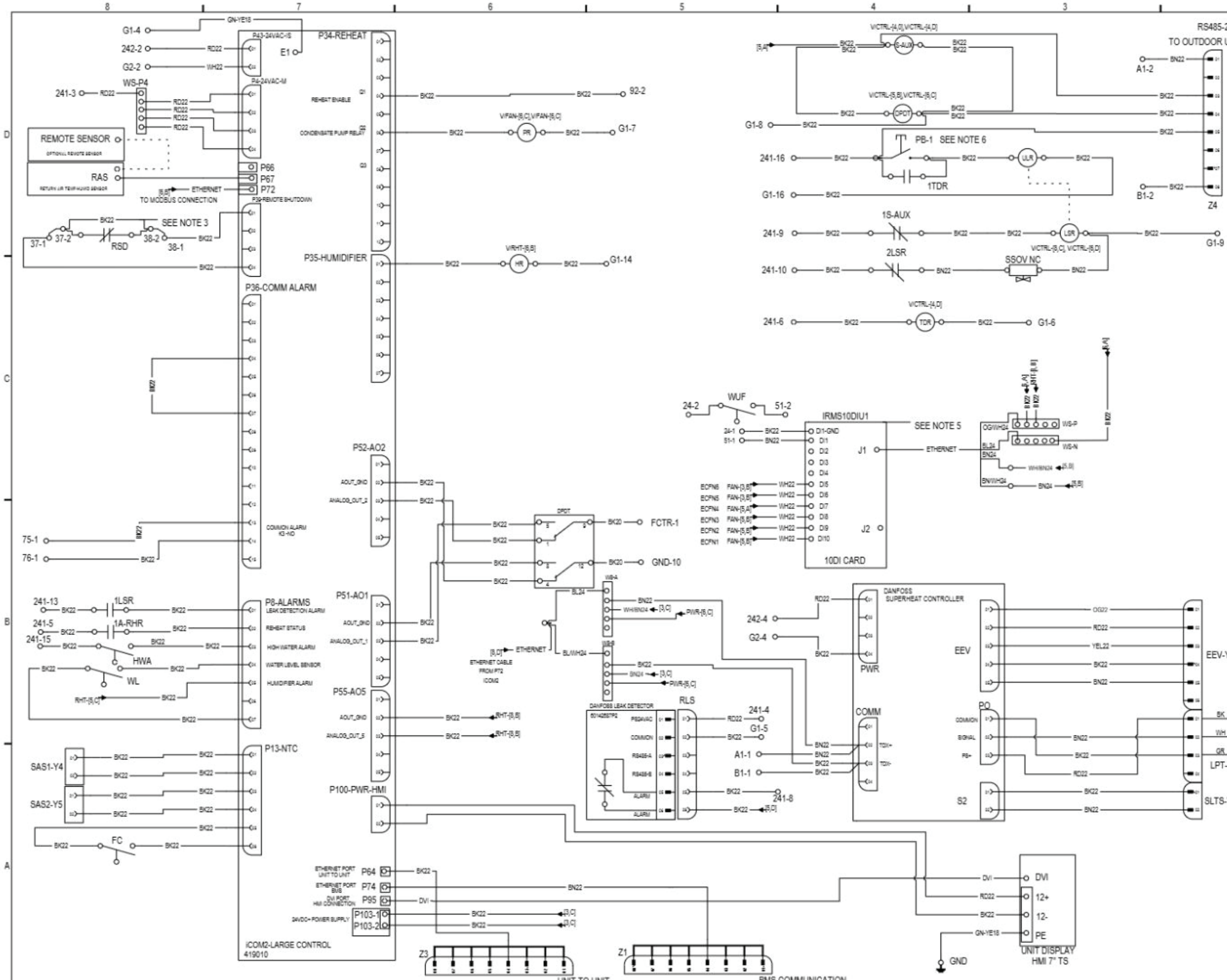
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ELECTRICAL SCHEMATIC
VERTIV® CRV DX 30kW
208-230V 3PH 50-60HZ
iCOM2 LARGE CONTROL
WITH HUMIDIFIER & REHEAT
HMI TOUCH SCREEN

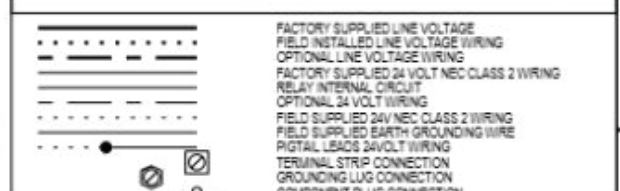
DRAWN	DATE
P. BELMAREZ	2025/03/04
CHECKED	DATE
A. TORRES	2025/03/04
BY	DATE
A. TORRES	2025/03/04

FANS & CP
SHEET 2 OF 4
DRAWING NO: 10080205DRW
REV: G



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 6. PUSH BUTTON IS FOR RESETTING THE UNIT AFTER A REFRIGERANT LEAK IS REMEDIATED.

NOMENCLATURE			
STANDARD DEVICES	COORD	OPTIONAL DEVICES	COORD
EEV - ELECTRONIC EXP VALVE	3,A	RSD - REMOTE SHUTDOWN DEVICE	8,C
FC - FILTER CLOG SWITCH	8,C	SSOV - SAFETY SHUT-OFF VALVE	5,D
HR - HUMIDIFIER RELAY	6,C	WUF - WATER UNDER FLOOR	8,A
HWA - HIGH WATER ALARM	8,D		
LPT - LOW PRESSURE TRANSDUCER	3,A		
LSR - LEAK SENSOR RELAY	6,D		
PR - CONDENSATE PUMP RELAY	6,C		
RLS - REFRIGERANT LEAK SENSOR	6,A		
SAS1-4 - SUPPLY AIR SENSORS 1-4	8,B		
SLTS - SUCTION LINE TEMP SENSOR	3,A		
WL - WATER LEVEL SENSOR	8,C		
ULR - UNLATCHING RELAY	3,D		
TDR - TIME DELAY RELAY	4,D		



VERTIV

100 DANFORS DRIVE, P.O. BOX 21186
COLUMBUS, OHIO 43221 15002

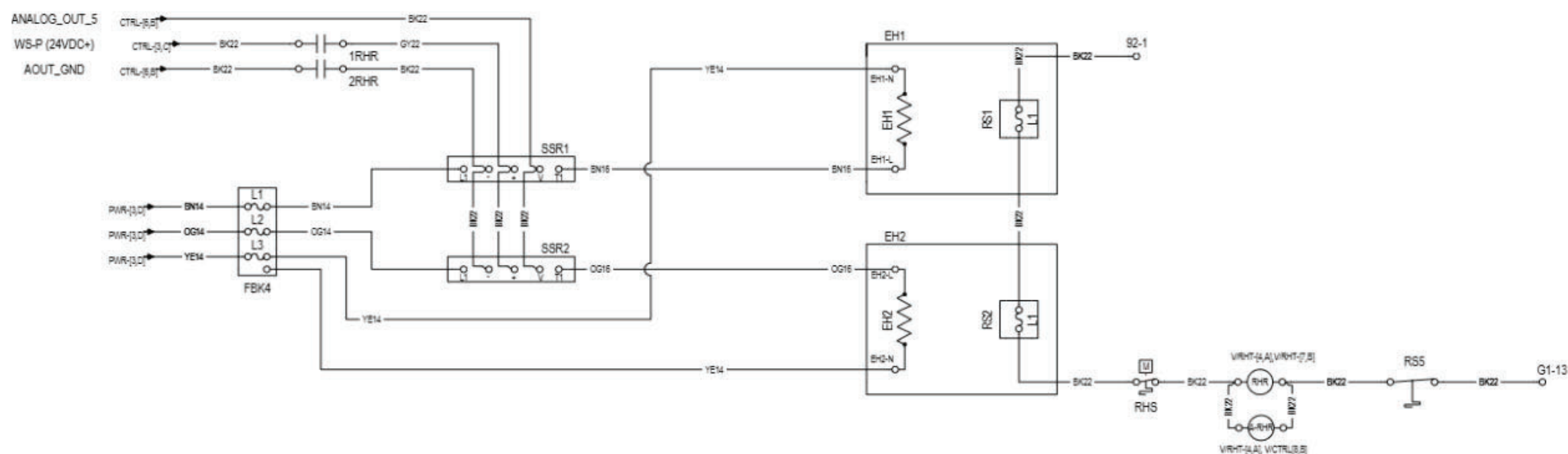
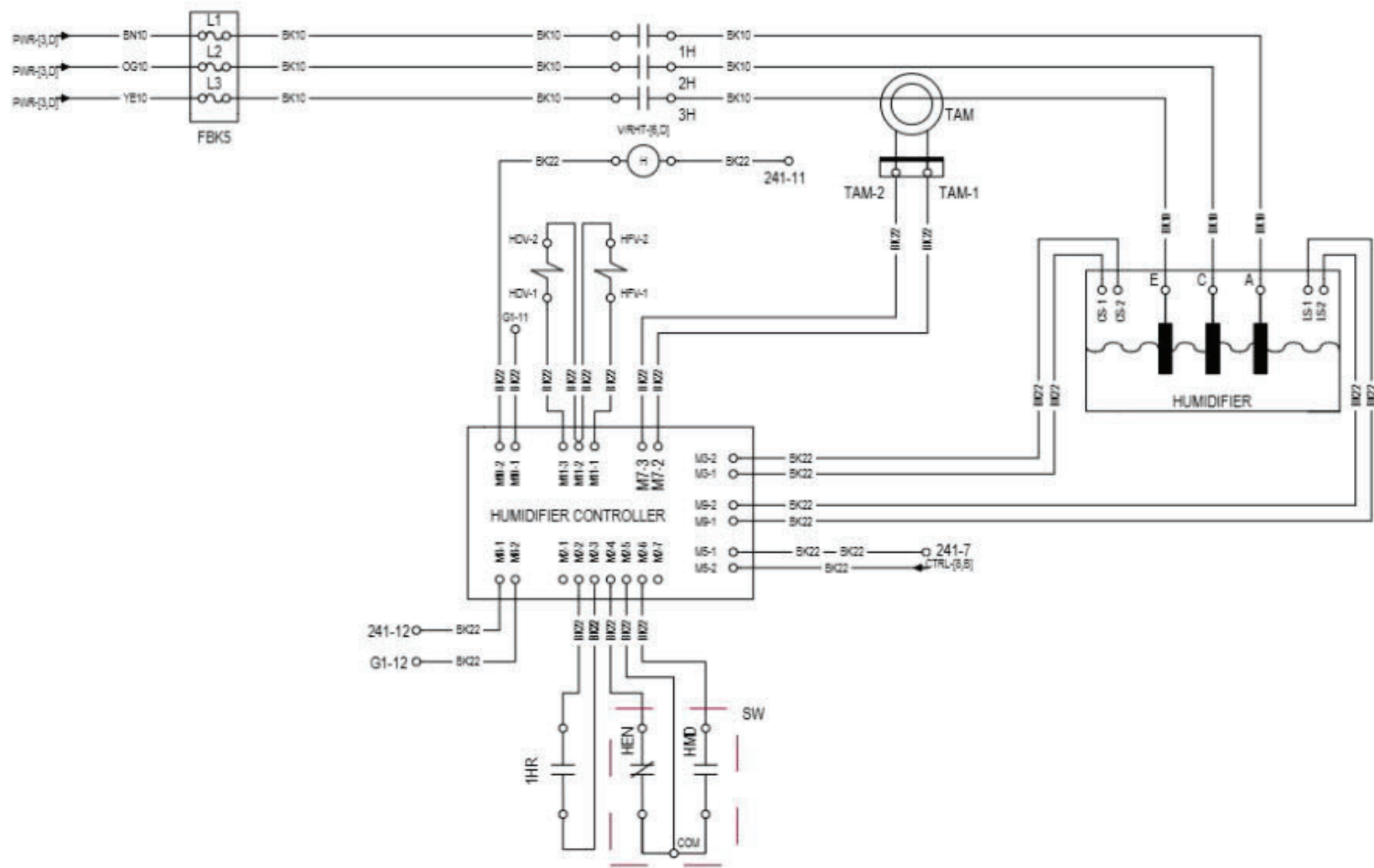
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ELECTRICAL SCHEMATIC
VERTIV® CRV DX 30kW
208-230V 3PH 50-60HZ
iCOM2 LARGE CONTROL
WITH HUMIDIFIER & REHEAT
HMI TOUCH SCREEN
CONTROL

DRAWN: P. BELMAREZ DATE: 2025/03/24
CHECKED: A. TORRES DATE: 2025/03/24
REVISOR: A. TORRES DATE: 2025/03/24

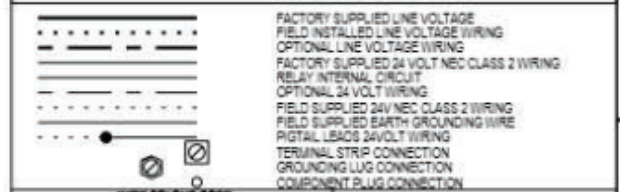
DRAWING NO: 10080205DRW REV: G

SHEET 3 OF 3



- NOTES
1. ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
 2. SEE INSTALLATION AND USER MANUAL(S).
 3. ALL RJ45 ETHERNET CABLES MUST BE STRAIGHT THROUGH.
 4. 10 D/ CARD INSTALLED ON THE FAN PANEL.

NOMENCLATURE			
STANDARD DEVICES	COORD	OPTIONAL DEVICES	COORD
EH1 - ELECTRICAL REHEAT 1	5,8		
EH2 - ELECTRICAL REHEAT 2	5,8		
FBK4 - FUSE BLOCK 4 REHEAT	7,0		
FBK5 - FUSE BLOCK 5 HUMIDIFIER	7,0		
H - HUMIDIFIER CONTACTOR	6,0		
HDV - HUMIDIFIER DRAIN VALVE	6,0		
HPV - HUMIDIFIER FILL VALVE	6,0		
RHR - REHEAT RELAY	7,0		
RSS - THERMAL CUT-OFF SWITCH	6,0		
SSR1 - SOLID STATE RELAY 1	6,8		
SSR2 - SOLID STATE RELAY 2	6,8		
TAM - HUM CURRENT TRANSFORMER	5,0		
A-RHR - AUXILIARY CONTACT RHR			
RSS - MANUAL RESET THERMAL CUT-OFF SWITCH	4,0		



WIRE COLOUR CODE		
OG - ORANGE	PR - PURPLE	BL - BLUE
RD - RED	GR - GREEN	BR - BLACK
BN - BROWN	YL - YELLOW	WH - WHITE



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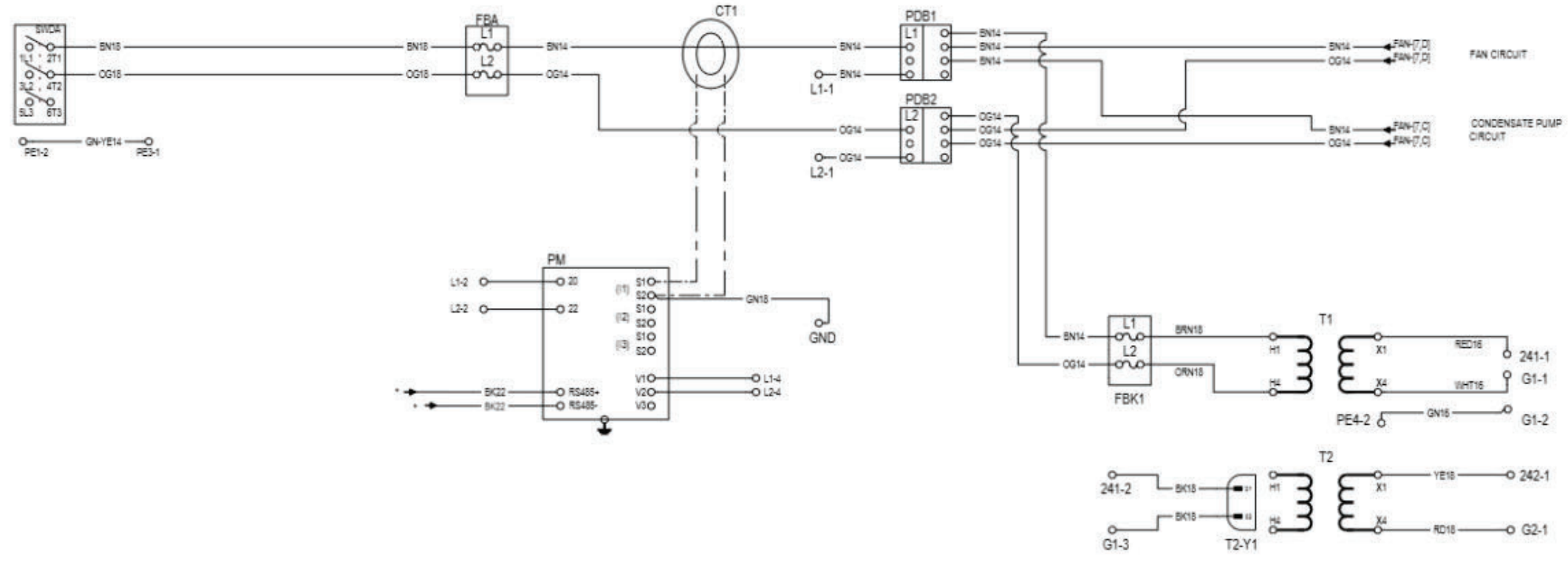
ELECTRICAL SCHEMATIC
 VERTIV® CRV DX 30kW
 208-230V 3PH 50-60HZ
 iCOM2 LARGE CONTROL
 WITH HUMIDIFIER & REHEAT
 HMI TOUCH SCREEN
 REHEAT & HUMIDIFIER

DATE	DATE	DATE
2025/03/04	2025/03/04	2025/03/04

SHEET 4 OF 4
 DRAWING NO: 10080205DRW
 REV: G

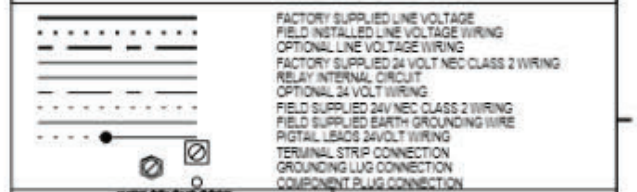
LINE VOLTAGE
1 PHASE SUPPLY (A)

SEE UNIT NAMEPLATE
FOR MAIN SUPPLY
WIRE SIZING



- NOTES:
1. ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
 2. SEE INSTALLATION AND USER MANUAL(S).
 3. JUMPER TO BE REMOVED WHEN OPTIONAL COMPONENT IS USED.
 4. ALL RJ45 ETHERNET CABLES MUST BE STRAIGHT THROUGH.
 5. 10 D/ CARD INSTALLED ON THE FAN PANEL.

NOMENCLATURE			
STANDARD DEVICES	COORD	OPTIONAL DEVICES	COORD
FBA - FUSE BLOCK A	6,D	CT1 - CURRENT TRANSFORMER 1	5,D
FBS - FUSE BLOCK B	6,D	CT2 - CURRENT TRANSFORMER 2	5,D
FBK1 - FUSE BLOCK 1 CONTROL	4,C	PM - POWER METER	6,C
KA1 - RELAY ATS FEEDBACK	7,D		
KMA - CONTACTOR ATS A	7,D		
PDB1 - POWER DIST BLOCK L1	5,D		
PDB2 - POWER DIST BLOCK L2	5,D		
SWDA - SWITCH DISCONNECT A	8,D		
SWDB - SWITCH DISCONNECT B	8,D		
T1 - CONTROL TRANSFORMER	3,C		
T2 - ISOLATION TRANSFORMER	3,C		



WIRE COLOUR CODE		
OG - ORANGE	PR - PURPLE	BL - BLUE
RD - RED	GR - GREEN	BK - BLACK
BR - BROWN	YEL - YELLOW	WH - WHITE

VERTIV® CRV DX 40kW
208-230V 1PH 50-60HZ
iCOM2 LARGE CONTROL
W/O HUMIDIFIER & REHEAT
HMI TOUCH SCREEN

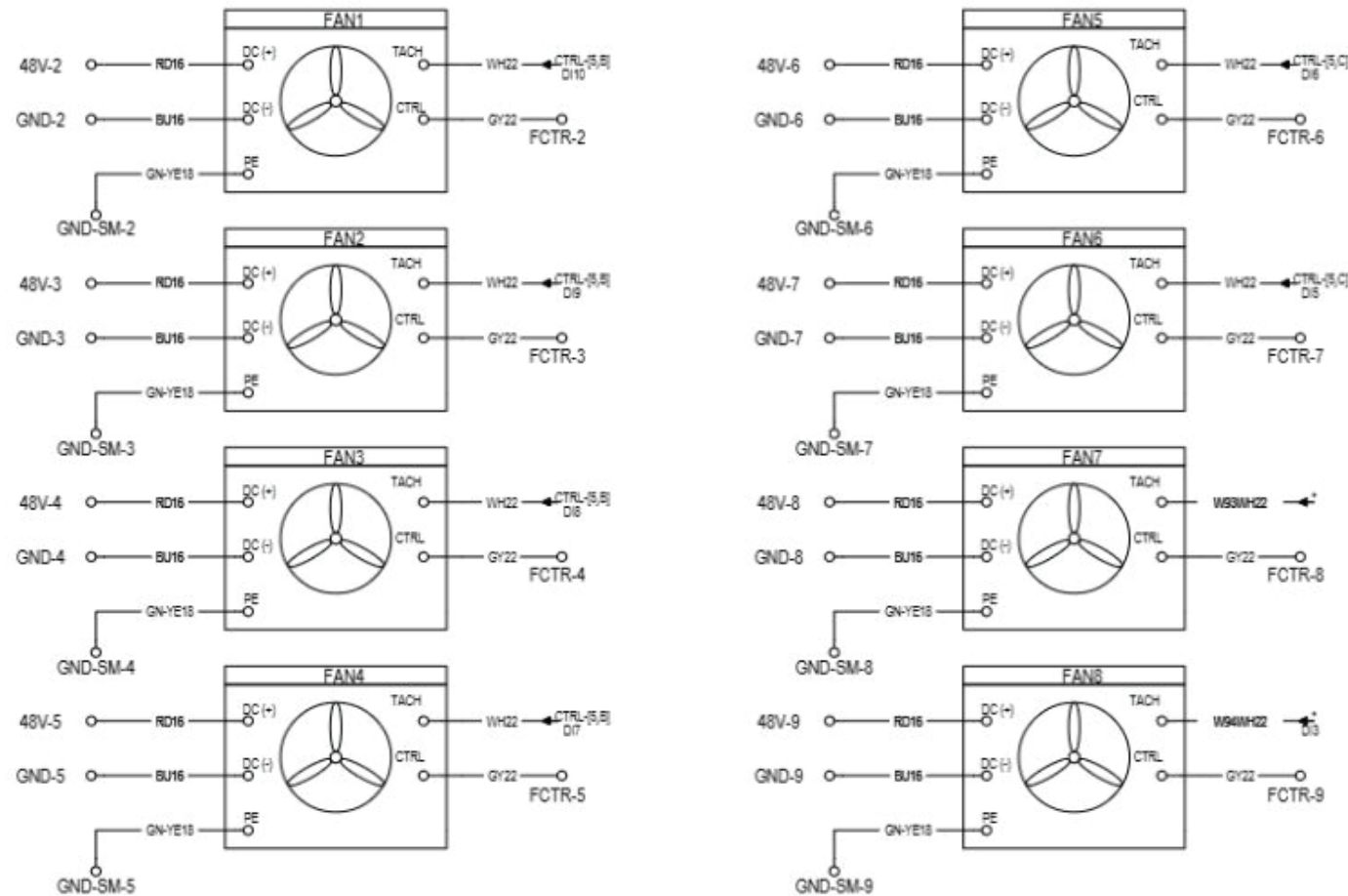
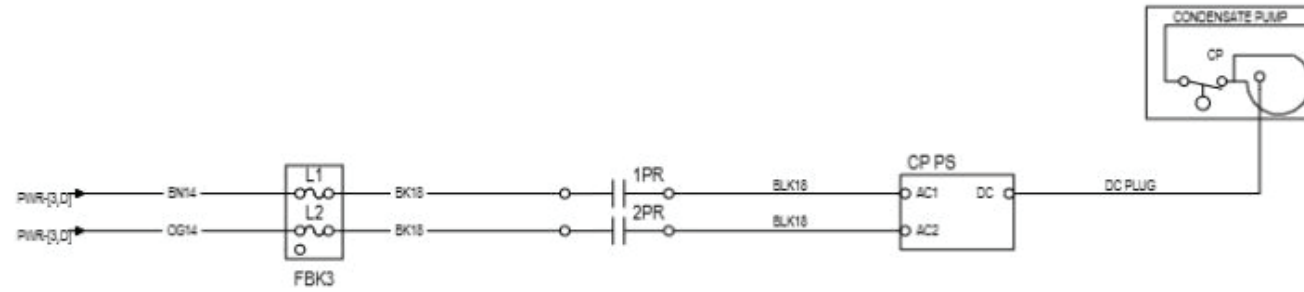
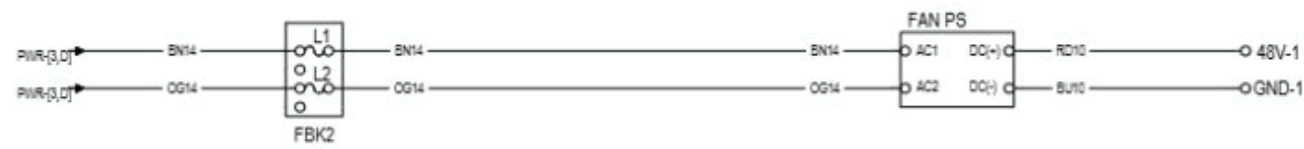
POWER SUPPLY

DRAWN	P. BELMAREZ	DATE	2026/03/30
CHECKED	A. TORRES	DATE	2026/03/30
REVISOR	A. TORRES	DATE	2026/03/30

DRAWING NO: 10080206DRW

SHEET 1 OF 3

REV: G



- NOTES:
1. ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
 2. SEE INSTALLATION AND USER MANUAL(S).
 3. JUMPER TO BE REMOVED WHEN OPTIONAL COMPONENT IS USED.
 4. ALL RJ45/ETHERNET CABLES MUST BE STRAIGHT THROUGH.
 5. 10 DI CARD INSTALLED ON THE FAN PANEL.

STANDARD DEVICES		NOMENCLATURE	
COORD	OPTIONAL DEVICES	COORD	OPTIONAL DEVICES
5,C			
5,D			
6,D			
6,C			



WIRE COLOUR CODE		
DC - ORANGE	RE - PURPLE	BL - BLUE
RD - RED	GR - GREEN	BN - BLACK
BY - BROWN	YL - YELLOW	WH - WHITE



1800 DEARBORN DRIVE, P.O. BOX 23186
COLUMBUS, OHIO 43223 18002

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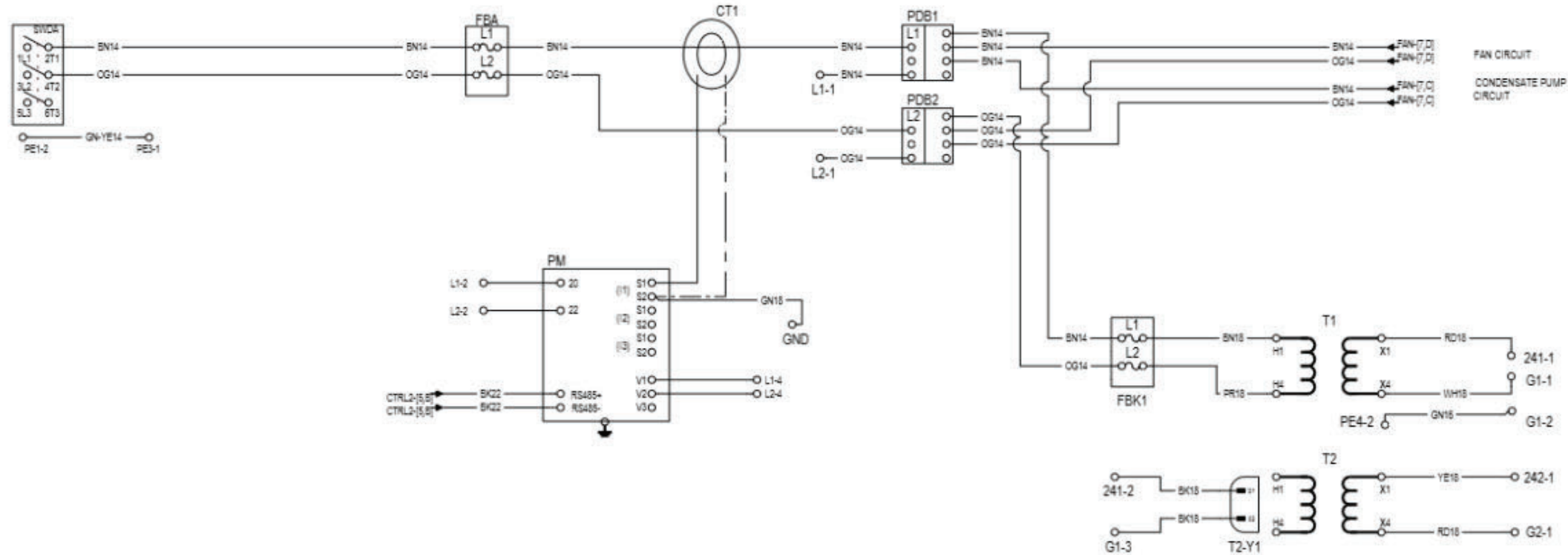
ELECTRICAL SCHEMATIC
VERTIV® CRV DX 40kW
208-230V 1PH 50-60HZ
iCOM2 LARGE CONTROL
W/O HUMIDIFIER & REHEAT
HMI TOUCH SCREEN

DATE	BY	DATE	BY
2026/03/30	P. BELLMAREZ	2026/03/30	A. TORRES
2026/03/30	A. TORRES	2026/03/30	A. TORRES

FANS & CP
SHEET 2 OF 3
DRAWING NO: 10080206DRW
REV: G

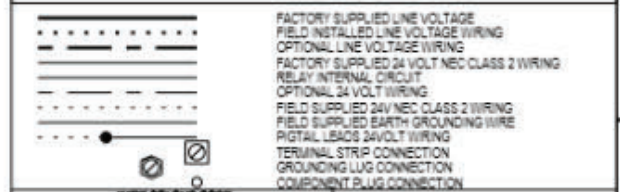
LINE VOLTAGE
1 PHASE SUPPLY (A)

SEE UNIT NAMEPLATE
FOR MAIN SUPPLY
WIRE SIZING



- NOTES
1. ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
 2. SEE INSTALLATION AND USER MANUAL(S).
 3. JUMPER TO BE REMOVED WHEN OPTIONAL COMPONENT IS USED.
 4. ALL FIBERETHERNET CABLES MUST BE STRAIGHT THROUGH.
 5. 10/100 CARD INSTALLED ON THE FAN PANEL.

NOMENCLATURE			
STANDARD DEVICES	COORD	OPTIONAL DEVICES	COORD
FBA - FUSE BLOCK A	6,D	CT1 - CURRENT TRANSFORMER 1	5,D
FBS - FUSE BLOCK B	6,D	CT2 - CURRENT TRANSFORMER 2	5,D
FBK1 - FUSE BLOCK 1 CONTROL	4,C	PM - POWER METER	6,C
KA1 - RELAY ATS FEEDBACK	7,D		
KMA - CONTACTOR ATS A	7,D		
PDB1 - POWER DIST BLOCK L1	5,D		
PDB2 - POWER DIST BLOCK L2	5,D		
SWDA - SWITCH DISCONNECT A	8,D		
SWDB - SWITCH DISCONNECT B	8,D		
T1 - CONTROL TRANSFORMER	3,C		
T2 - ISOLATION TRANSFORMER	3,C		



WIRE COLOR CODE		
OG - ORANGE	PR - PURPLE	BL - BLUE
RD - RED	GR - GREEN	BR - BLACK
BY - BROWN	YL - YELLOW	WH - WHITE

100 DEARBORN DRIVE, P.O. BOX 33186
COLUMBUS, OHIO 43233

CHRG CODE
16003



ELECTRICAL SCHEMATIC

VERTIV® CRV DX 30kW
208-230V 1PH 50-60HZ
iCOM2 LARGE CONTROL
W/O HUMIDIFIER & REHEAT
HMI TOUCH SCREEN

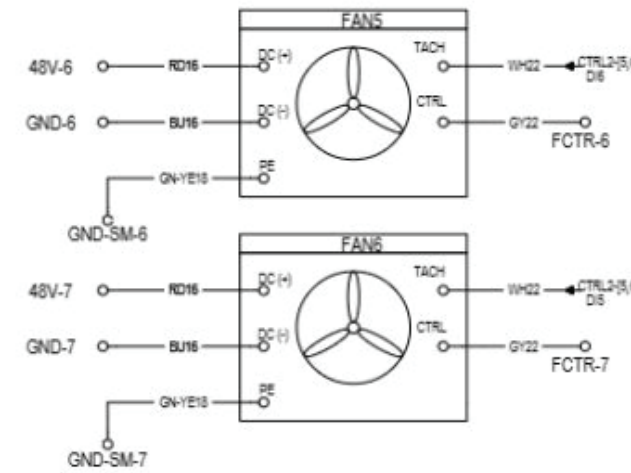
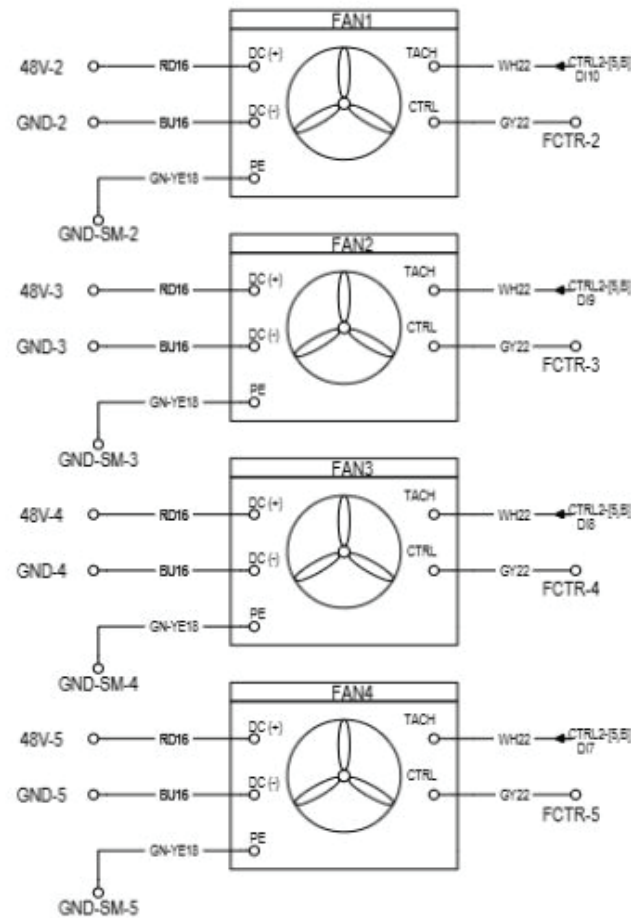
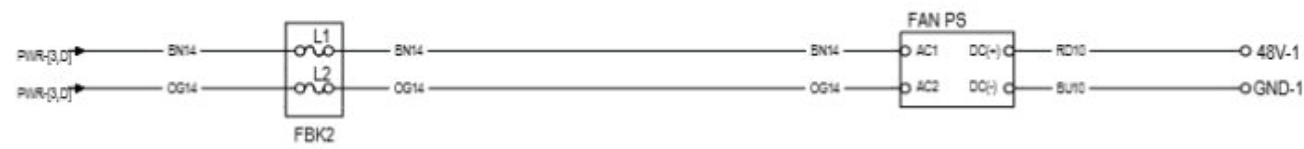
POWER SUPPLY

DRAWN	P. BELMAREZ	DATE	2026/03/30
CHECKED	A. TORRES	DATE	2026/03/30
REVIS	P. BELMAREZ	DATE	2026/03/30

DRAWING NO: 10080207DRW

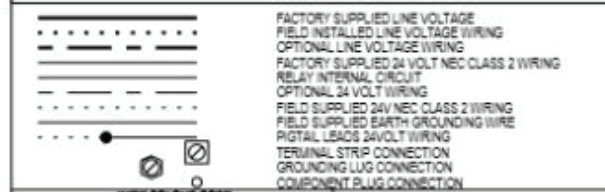
SHEET 1 OF 3

REV: H



- NOTES:
1. ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
 2. SEE INSTALLATION AND USER MANUAL(S).
 3. JUMPER TO BE REMOVED WHEN OPTIONAL COMPONENT IS USED.
 4. ALL RJ45 ETHERNET CABLES MUST BE STRAIGHT THROUGH.
 5. 10/100 RJ45 CARD INSTALLED ON THE FAN PANEL.

STANDARD DEVICES		NOMENCLATURE	
COORD	OPTIONAL DEVICES	COORD	OPTIONAL DEVICES
5,C			
5,D			
5,E			
5,F			



WIRE COLOR CODE		
OG - ORANGE	PR - PURPLE	BL - BLUE
RD - RED	GR - GREEN	BR - BLACK
BY - BROWN	YL - YELLOW	WH - WHITE



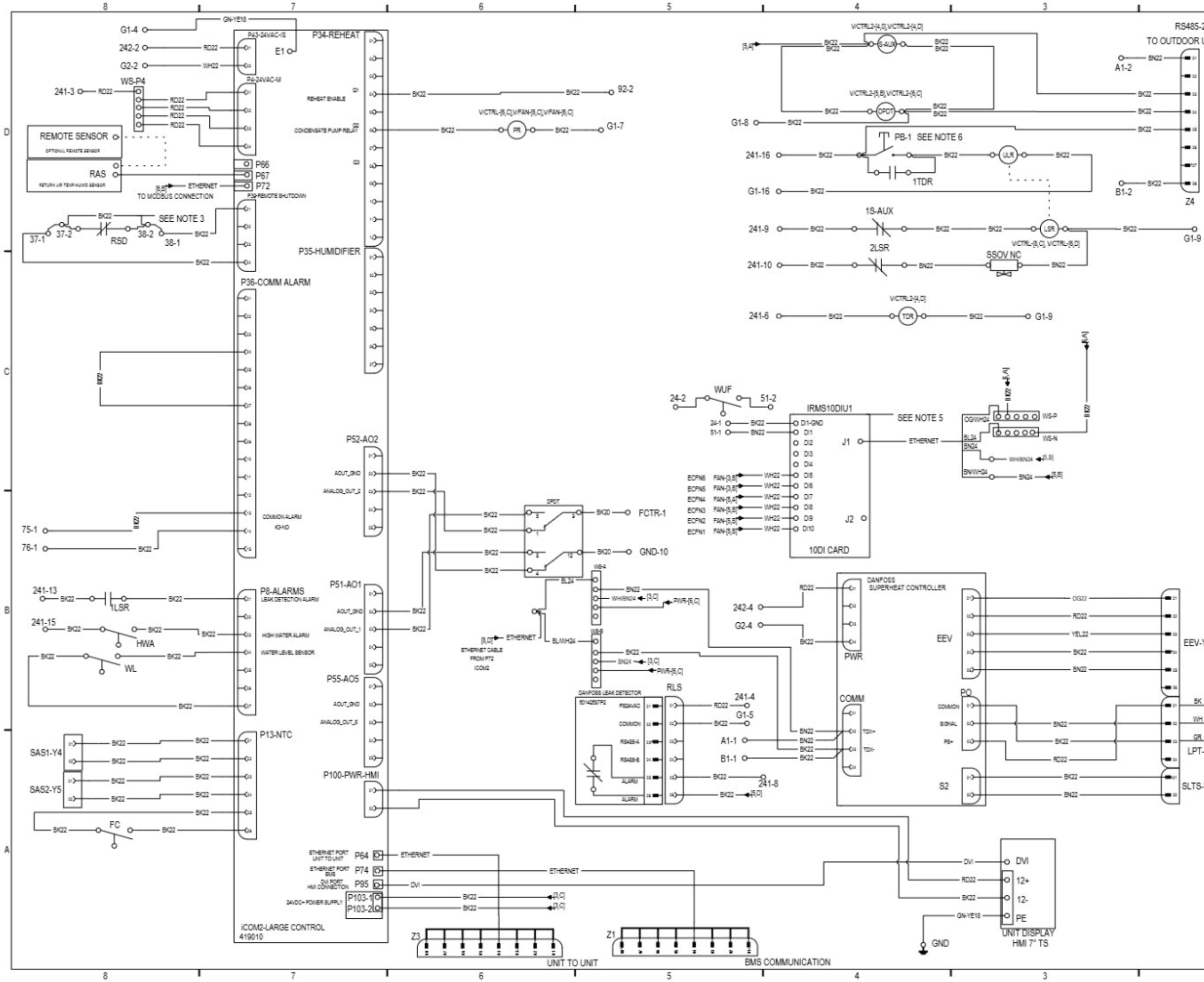
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COLUMBUS, OHIO 43223-1802

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VERTIV® CRV DX 30kW
208-230V 1PH 50-60HZ
iCOM2 LARGE CONTROL
W/O HUMIDIFIER & REHEAT
HMI TOUCH SCREEN

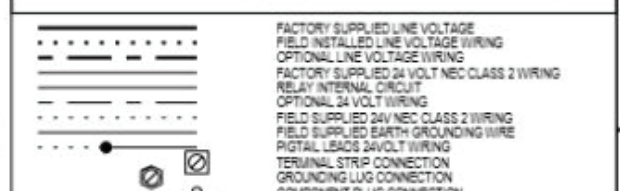
DATE	BY	DATE	BY
2026/03/30	P. BELMAREZ	2026/03/30	A. TORRES
2026/03/30	P. BELMAREZ	2026/03/30	P. BELMAREZ

FANS & CP
SHEET 2 OF 3
DRAWING NO: 10080207DRW
REV: H



- NOTES:
1. ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
 2. SEE INSTALLATION AND USER MANUAL(S).
 3. JUMPER TO BE REMOVED WHEN OPTIONAL COMPONENT IS USED.
 4. ALL RS485ETHERNET CABLES MUST BE STRAIGHT THROUGH.
 5. 10 DI CARD INSTALLED ON THE FAN PANEL.
 6. PUSH BUTTON IS FOR RESETING THE UNIT AFTER A REFRIGERANT LEAK IS REMEDIED.

NOMENCLATURE			
STANDARD DEVICES	COORD	OPTIONAL DEVICES	COORD
EEV - ELECTRONIC EXP VALVE	3,A	RSD - REMOTE SHUTDOWN DEVICE	8,C
FC - FILTER CLOG SWITCH	8,C	SSOV - SAFETY SHUT-OFF VALVE	5,D
HR - HUMIDIFIER RELAY	6,C	WUF - WATER UNDER FLOOR	8,A
HWA - HIGH WATER ALARM	8,D		
LPT - LOW PRESSURE TRANSDUCER	3,A		
LSR - LEAK SENSOR RELAY	6,D		
PR - CONDENSATE PUMP RELAY	6,C		
RLS - REFRIGERANT LEAK SENSOR	6,A		
SAS1-4 - SUPPLY AIR SENSORS 1-4	8,B		
SLTS - SUCTION LINE TEMP SENSOR	3,A		
WL - WATER LEVEL SENSOR	8,C		
ULR - UNLATCHING RELAY	3,D		
TDR - TIME DELAY RELAY	4,D		



WIRE COLOUR CODE

OG - ORANGE	PR - PURPLE	BL - BLUE
RD - RED	GR - GREEN	BK - BLACK
BR - BROWN	YL - YELLOW	WH - WHITE

100 DANFORS DRIVE, P.O. BOX 2186
COLUMBUS, OHIO 43228 15002

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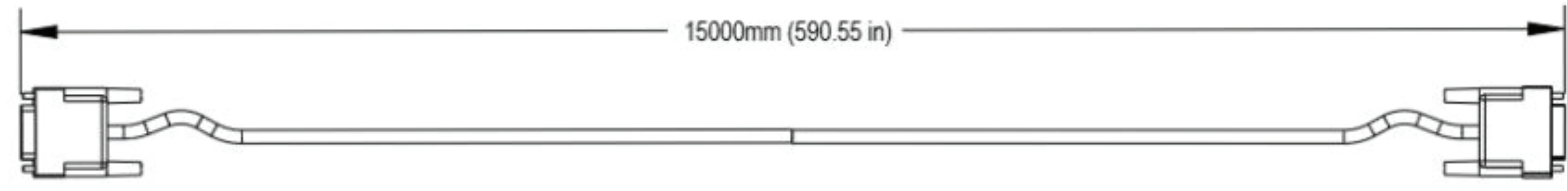
CONTROL
SHEET 3 OF 3

DRAWN	P. BELMAREZ	DATE	2026/03/30
CHECKED	A. TORRES	DATE	2026/03/30
BY	P. BELMAREZ	DATE	2026/03/30

DRAWING NO: 10080207DRW REV: H

VERTIV PN	LENGTH	MANUFACTURER	MFG PN	DESCRIPTION
10159904P2	15000mm	TRIPP-LITE	P560-050	CBL M-M DVI-D DUAL LINK 50' SHLD

CO NO	REV	DESCRIPTION	DRAWN BY:	DATE
CO-1114550	A	PRODUCTION RELEASE	A.TORRES	06/09/2025
			D. MACIEL	06/09/2025



CORPORATE CAGE CODE 1EDC2	805 N. CLEVELAND AVE WESTERVILLE, OHIO 43082	10159904P2 PART NUMBER	CBL M-M DVI-D DUAL LINK 50' SHLD DESCRIPTION																																
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MATERIAL: NONE		<table border="1"> <thead> <tr> <th colspan="4">UNLESS OTHERWISE SPECIFIED TOLERANCE</th> </tr> <tr> <th>SI (PRIMARY)</th> <th>INCHES (SECONDARY)</th> <th>SI (PRIMARY)</th> <th>INCHES (SECONDARY)</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>±0.1</td> <td>(X)</td> <td>±0.1</td> </tr> <tr> <td>X</td> <td>±0.5</td> <td>(X)</td> <td>±0.05</td> </tr> <tr> <td>(X)</td> <td>±0.001</td> <td>(X)</td> <td>±0.001</td> </tr> <tr> <td>(X)</td> <td>±0.005</td> <td>(X)</td> <td>±0.005</td> </tr> <tr> <td>HOLE DIA</td> <td>±0.10</td> <td>HOLE DIA</td> <td>±0.05</td> </tr> <tr> <td>REGULAR</td> <td></td> <td>REGULAR</td> <td>±1F</td> </tr> </tbody> </table>		UNLESS OTHERWISE SPECIFIED TOLERANCE				SI (PRIMARY)	INCHES (SECONDARY)	SI (PRIMARY)	INCHES (SECONDARY)	X	±0.1	(X)	±0.1	X	±0.5	(X)	±0.05	(X)	±0.001	(X)	±0.001	(X)	±0.005	(X)	±0.005	HOLE DIA	±0.10	HOLE DIA	±0.05	REGULAR		REGULAR	±1F
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REGULAR		REGULAR	±1F																																
DESIGNED BY: A.TORRES	DATE: 06/09/2025	WEIGHT: -																																	
DRAWN BY: A.TORRES	DATE: 06/09/2025	SHEET: 1/1																																	
		CONTROL CHARACTERISTICS	PART DESCRIPTION CBL M-M DVI-D DUAL LINK 50' SHLD																																
THIRD ANGLE PROJECTION		SIZE B	SCALE 1:1																																
DOCUMENT NUMBER 10159904P2DRW		REV A																																	



DX PRODUCTS WITH R32

A2L REFRIGERANT DISPERSAL VOLUME CALCULATION R32

Engineer of record to determine the Refrigerant Charge m_c and required minimum Effective Dispersal Volume V_{ED} of the space to which the appliance can be utilized for the cooling of ITE AREAS.

The required minimum EFFECTIVE DISPERSAL VOLUME V_{ED} is a function of the refrigerant charge, m_c and is represented by the following equation:

$$V_{ED} = m_c / 0.5 \times \text{LFL}$$

V_{ED} = the minimum Effective Dispersal Volume in ft^3 (m^3)

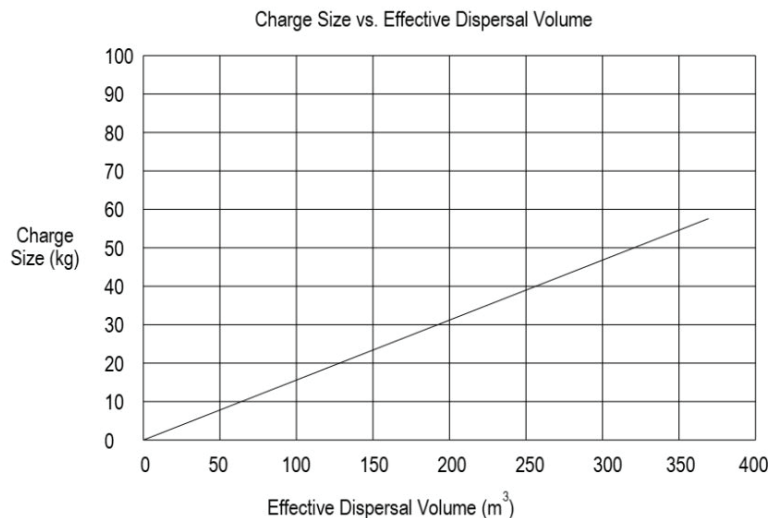
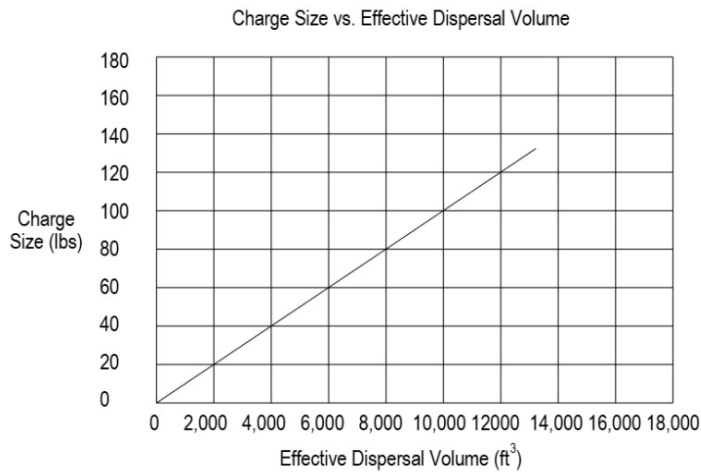
m_c = the refrigerant charge of the largest single circuit of a unit in lbs (kg)

0.5 = the concentration factor

LFL = the Lower Flammability Limit in $\text{lbs}/1000 \text{ft}^3$ (kg/m^3)

Note: The LFL of R32 is $19.2 \text{ lbs}/1000 \text{ft}^3$ ($307.0 \text{ g}/\text{m}^3$) according to ASHRAE 34-2022.

Minimum Effective Dispersal Volume V_{ED} of the space shall be based on altitude of the installation location. For locations above sea level, the engineer of record will need to adjust the value of LFL in accordance with ANSI/ASHRAE 34 before applying it to the equation for determining the required minimum Effective Dispersal Volume V_{ED} .





A2L REFRIGERANT DISPERSAL VOLUME CALCULATION R32**How to Determine the Effective Dispersal Volume of an ITE Area**

Volume Calculations shall be based on the overall volume of space available to which the refrigerant disperses within the CIRCULATION AIRFLOW in the event of a refrigerant leak. This overall volume shall be modified with the appropriate deductions. For the purposes of determining the EFFECTIVE DISPERSAL VOLUME of an ITE AREA the following shall apply:

- a) The EFFECTIVE DISPERSAL VOLUME shall only include the circulated airflow of the system.
- b) The EFFECTIVE DISPERSAL VOLUME shall initially include the ITE AREA enclosed by the floor, walls, and ceiling of that space.
- c) When the CIRCULATION AIRFLOW includes underfloor spaces, suspended ceiling spaces, or other partitioned spaces, such as equipment galleries, the volume of those spaces may be included.

In general, the volume of equipment, piping, wiring, or other apparatus that consume space within and are isolated from the CIRCULATION AIRFLOW shall be deducted from the EFFECTIVE DISPERSAL VOLUME. The following deductions shall be applied:

- a) When the CIRCULATION AIRFLOW has been fully contained on both hot and cold sides of the aisle, via ducts or other apparatus, any room volume outside of that containment shall not be included when calculating the EFFECTIVE DISPERSAL VOLUME.
- b) When the overall volume of space available, or a partitioned portion of that volume includes ducted openings from partially ducted systems, some volume of that space may require a deduction. No volume greater than 4 feet away in height from the upper most supply or return duct opening in the space may be included when calculating the EFFECTIVE DISPERSAL VOLUME, unless an analysis of the airflow has been conducted to show that the volume of air has effective movement for the mixing of a leaked refrigerant.
- c) Obstructions of tubing, piping, wiring, etc., consuming more than 0.0071 m^3 (0.25 ft^3) of space shall be included in the deductions from the overall volume.
- d) The ITE within the circulated airflow shall be evaluated for their deduction from the EFFECTIVE DISPERSAL VOLUME. The deducted volume of the ITE shall be based on the designed maximum capacity or fill of the servers.
- e) As a maximum value, no more than 75 % of the ITE's volume shall be included as circulating air space in the EFFECTIVE DISPERSAL VOLUME. The total volume of the ITE shall be defined by the overall dimensions of its ITE ENCLOSURE. Small gaps in between individual server racks shall not be included in the EFFECTIVE DISPERSAL VOLUME.
- f) Any other volume within the circulation airflow that is otherwise enclosed or partitioned off from the airflow shall be deducted in the calculation of the EFFECTIVE DISPERSAL VOLUME.

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