Vertiv™ CoolPhase Condensing Unit

Installer/User Guide

28 kW and 35 kW

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Technical Support Site

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

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

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1 Important Safety Instructions

This manual contains important safety instructions that should be followed during the installation and maintenance of the Coolphase Condensing Unit.

Read this manual thoroughly before attempting to install or operate this unit. Only qualified personnel should move, install, or service this equipment.

Adhere to all warnings, cautions, notices, installation, operating, and safety instructions on the unit and in this manual. Follow all installation, operation, and maintenance instructions and all applicable national to local building, electrical, and plumbing codes.

Any operation that requires the removal of equipment panels must be carried out only by adequately trained and qualified personnel.

For assistance or spare parts, look for the model and serial number on the nameplate located on the service access panel.

Warning labels on the Coolphase Condensing Unit remind users that:

- The unit restarts automatically in case of a blackout (Located on the right side above the Inverter Access Panel).
- All power sources must be disconnected before accessing the internal compartment for any operation (Located on the Inverter Access Panel).

The following safety guidelines are intended to prevent unforeseen risks or damage from unsafe or incorrect operation.

Coolphase Condensing Unit must be paired only with Vertiv™ Coolphase products.

This appliance is not intended for use by people (including children) with reduced physical, sensory, or mental capabilities or lack of experience and knowledge unless they have been given supervision or instruction concerning its use by a person responsible for their safety.

This appliance is designed to be installed in areas with a maximum altitude of 9,843 ft (2000 m).

This is for installation only in locations not accessible to the general public.

The appliance shall be installed according to national wiring regulations. For USA and Canada, follow NFPA 70 National Electrical Code and Canadian Electrical Code for the proper electrical installation.

Decommissioned equipment shall be labeled, stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed, stating that the equipment contains flammable refrigerant.

Refrigerant Safety Group A2L

WARNING! Air outlet of the appliance must always be clear of obstructions.

WARNING! An unventilated area where the appliance using flammable refrigerant is installed shall be constructed so that any refrigerant leak will not stagnate to create a fire or explosion hazard.

WARNING! Disconnect all electric power supplies, verify with a voltmeter that the power is off, and wear approved personal protective equipment (PPE) before working within the electric control enclosure. Failure to comply can cause severe injury or death. The customer must provide earth ground to the unit, per national and local codes. Before proceeding with installation, read all instructions, verify that all the parts are included, and check the nameplate to be sure the voltage matches the available utility power. The Vertiv™ CoolPhase Condensing Unit controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "Unit Off" mode of the controller. The only way to ensure NO voltage inside the unit is to install and disconnect all power supply sources. Refer to the unit electrical schematic. Follow all national and local codes.

WARNING! Power down the unit for 10 minutes before removing any cover.

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

WARNING! Risk of contact with high-speed rotating fan blades. It can cause severe injury or death. Disconnect all electric power supply sources, verify with a voltmeter that the power is off, and confirm that all fan blades have stopped rotating before working in the unit cabinet or on the fan assembly. Fan motor and compressor controls can maintain an electric charge for 10 minutes after disconnecting the power. If the control voltage is applied, the fan motor can restart without warning after a power failure.

WARNING! Risk of hair, clothing, and jewelry entanglement with high-speed rotating fan blades. It can cause equipment damage, serious injury, or death. Keep hair, jewelry, and loose clothing secure and away from rotating fan blades during unit operation.

WARNING! Risk of heavy unit falling over. Improper handling can cause equipment damage, injury, or death. Read all the following instructions and verify that all lifting and moving equipment is rated for the unit's weight before attempting to move, lift, remove packaging from, or prepare the unit for installation. Unit weights are specified in section 2.5, "Dimensions and Weights".

WARNING! Risk of contact with extremely hot and/or cold surfaces. It can cause injury. Verify that all components have reached a safe temperature for human contact or wear appropriate PPE before working within the electric connection enclosures or unit cabinet. Perform maintenance only when the system is de-energized, and component temperatures have become safe for human contact.

WARNING! Risk of improper wiring, piping, moving, lifting, and handling. It can cause equipment damage, serious injury, or death. Installation and service of this equipment should be done only by qualified personnel who have been specially trained in the installation of air conditioning equipment and who are wearing appropriate PPE.

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

WARNING! Do not pierce or burn. Be aware that refrigerants may not contain an odour.

CAUTION: To avoid a hazard due to inadvertent resetting of the thermal cut-off, this appliance must not be supplied through an external switching device, such as a timer, or connected to a circuit that is regularly switched on and off by the utility.

CAUTION: Risk of improper moving, lifting, and handling. It can cause equipment damage or injury. Only properly trained and qualified personnel should work on this equipment. Condenser fan modules are heavy objects. Use proper lifting techniques and wear appropriate PPE to avoid injury and dropping the fan module during removal. Equipment used in handling/lifting and/or installing the fan assembly must meet Health and Safety national and local requirements. Handling/lifting equipment should be rated for the weight of the fan assembly. Use ladders rated for the weight of the fan assembly and technicians if used during installation. Refer to the operating manual for handling/lifting and/or installing equipment for the manufacturer's safety requirements and operating procedures.

CAUTION: Risk of exposure to harmful noise levels. It can cause hearing injury or loss. A sound pressure level greater than 70 dB(A) may arise depending on the installation and operating conditions. Take appropriate technical safety measures. Operating personnel must wear proper PPE and observe all appropriate hearing protection safety requirements.

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

CAUTION: A high-touch current and earth connection is essential before connecting the supply.

NOTICE

Servicing must be performed only as recommended by this manual.

NOTICE

Risk of improper power supply connection. It can cause equipment damage and loss of warranty coverage. Before connecting any equipment to a main or alternate power source (for example, backup generator systems) for startup, commissioning, testing, or regular operation, ensure that these sources are correctly adjusted to the nameplate voltage and frequency of all equipment to be connected. Power source voltages should generally be stabilized and regulated to within ±10% of the load nameplate nominal voltage. Also, ensure that no three-phase sources are single-phase at any time.

NOTICE

Risk of oil contamination with water. It can cause equipment damage.

Vertiv™ CoolPhase Condensing Unit systems require polyvinyl ether (FW68S) oil. PVE oil absorbs water much faster when exposed to air than previously used oils. Because water is the enemy of a reliable refrigeration system, extreme care must be used when opening systems during installation or service. If water is absorbed into the oil, it will not be easily removed and will not be removed through the normal evacuation process. If the oil is too wet, an oil change may be required. Oils also have a property that makes them act as a solvent in a refrigeration system. Maintaining system cleanliness is extremely important because the oil will return any foreign matter to the compressor.

NOTICE

Risk of improper refrigerant charging. It can cause equipment damage.

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

NOTICE

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

NOTICE

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

NOTICE

Risk of improper storage can cause unit damage. Keep the unit upright and indoors, protecting it from dampness, freezing temperatures, and contact damage.

NOTICE

Risk of release of hazardous substances into the environment. It can cause environmental pollution and violation of environmental regulations.

The Vertiv™ CoolPhase Condensing Unitcontains substances and components hazardous to the environment (electronic components, refrigerating gases, and oils). At the end of its useful life, specialized refrigerating technicians must dismantle it. The unit must then be delivered to suitable centers specializing in collecting and disposing of equipment containing hazardous substances.

1.1 Pipe Work

Pipe-work shall be kept to a minimum.

Pipe-work shall be protected from physical damage and shall not be installed in an unventilated space.

Compliance with national gas regulations shall be observed.

Mechanical connections shall be accessible for maintenance purposes.

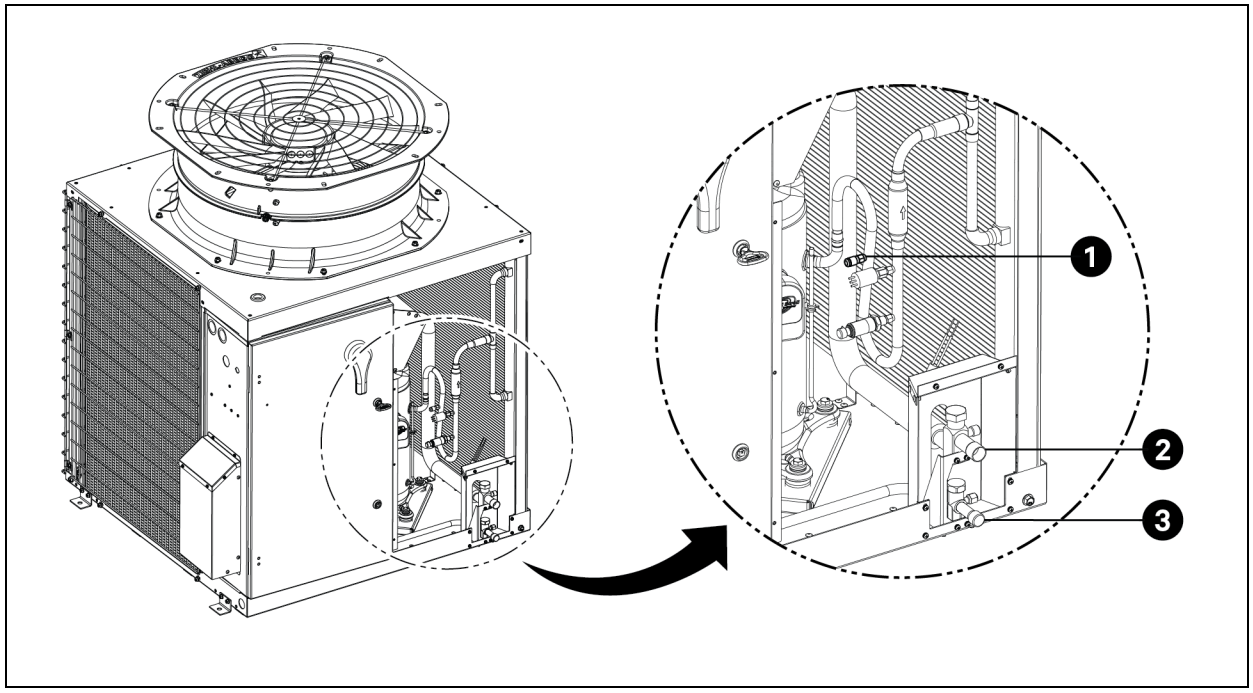
Pipe-work, including piping material, pipe routing, and installation, shall include protection from physical damage in operation and service and follow national and local codes and standards, such as ASHRAE 15, ASHRAE 15.2, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection before being covered or enclosed.

After completion of field piping for split systems, the field pipework shall be pressure tested with an inert gas and then vacuum tested before refrigerant charging.

For a proper vacuum, ensure to connect hoses in the suction and liquid service valves located in the Condensing Unit.

Additionally, connect a hose to the Schrader valve on the compressor discharge line. Refer to Figure 1.1 below to see its location.

Figure 1.1 Schrader Valve Location.



Item	Description	Item	Description
1	Schrader Valve	3	Liquid line
2	Suction line		

Field-made refrigerant joints indoors shall be Leak tested. The test method shall have a sensitivity of 5 grams per year of refrigerant or better under a pressure of at least 0.25 times the maximum allowable pressure. No leak shall be detected.

1.2 Qualification of workers

Competent personnel shall only carry out every working procedure that affects safety means.

Information on procedures, in addition to the usual information for refrigerating appliance installation, repair, maintenance, and decommission procedures, is required when an appliance with flammable refrigerants is affected.

The training of these procedures is carried out by national training organizations or manufacturers that are accredited to teach the relevant national competency standards that may be set in legislation. A certificate should document the achieved competence.

1.2.1 Safety concepts

Unventilated. The safety of the appliance does not depend on ventilation of the housing. Switching off the appliance or opening the housing has no significant effect on safety. Nevertheless, it is possible that leaking refrigerant may accumulate inside the enclosure, and a flammable atmosphere will be released when the enclosure is opened.

Ventilated enclosure. The safety of the appliance depends on the ventilation of the housing. Switching off the appliance or the enclosure opening has a significant effect on safety. Care should be taken to ensure sufficient ventilation before.

Ventilated room. The safety of the appliance depends on the ventilation of the room. Switching off the appliance or opening the housing has no significant effect on safety. The ventilation of the room shall not be switched off during repair procedures.

1.2.2 Correct working procedures

1.2.2.1 Commissioning

Ensure that the floor area is sufficient for the refrigerant charge or that the ventilation duct is assembled correctly.

Connect the pipes and carry out a leak test before charging with refrigerant.

Check safety equipment before putting it into service.

1.2.2.2 Maintenance

Ensure sufficient ventilation at the repair place.

Be aware that equipment malfunction may be caused by refrigerant loss, and a refrigerant leak is possible.

Discharge capacitors in a way that won't cause any spark. The standard procedure to short-circuit the capacitor terminals usually creates sparks.

Reassemble sealed enclosures accurately. If seals are worn, replace them.

Check safety equipment before putting it into service.

1.2.2.3 Repair

Ensure sufficient ventilation at the repair place.

Be aware that equipment malfunction may be caused by refrigerant loss, and a refrigerant leak is possible.

Discharge capacitors in a way that won't cause any sparks.

When brazing is required, the following procedures shall be carried out in the right order:

- Safely remove the refrigerant following local and national regulations. If national regulations do not require the recovery, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should be assigned to guard the outlet. Take special care that the drained refrigerant will not float back into the building.
- Evacuate the refrigerant circuit.
- Purge the refrigerant circuit with nitrogen for 5 minutes (recommended).
- Evacuate again (recommended).
- Remove parts to be replaced by cutting, not by flame.
- Purge the braze point with nitrogen during the brazing procedure.
- Carry out a leak test before charging with refrigerant.

Reassemble sealed enclosures accurately. If seals are worn, replace them.

Check safety equipment before putting it into service.

1.2.2.4 Decommissioning

If the safety is affected when the equipment is put out of service, the refrigerant charge shall be removed before decommissioning.

Ensure sufficient ventilation at the equipment location.

Be aware that equipment malfunction may be caused by refrigerant loss, and a refrigerant leak is possible.

Discharge capacitors in a way that won't cause any sparks.

Remove the refrigerant. If national regulations do not require the recovery, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should be assigned to guard the outlet. Take special care to ensure that the drained refrigerant does not float back into the building.

When flammable refrigerants, except A2L refrigerants, are used:

- Evacuate the refrigerant circuit.
- Purge the refrigerant circuit with nitrogen for 5 minutes.
- Evacuate again.
- Fill with nitrogen up to atmospheric pressure.
- Put a label on the equipment that the refrigerant has been removed.

1.2.2.5 Disposal

Ensure sufficient ventilation at the working place.

When flammable refrigerants are used:

- Evacuate the refrigerant circuit.
- Purge the refrigerant circuit with oxygen-free nitrogen for 5 minutes.
- Evacuate again (recommended).
- Cut out the compressor and drain the oil.

1.3 Installation, Maintenance, Repair and Decommissioning

1.3.1 Checks to the area

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized. For repair to the refrigerating system, servicing procedures shall be completed before conducting work on the system.

1.3.2 Work procedure

Work shall be undertaken under a controlled procedure so as to minimize the risk of flammable gas or vapor being present while the work is being performed.

1.3.3 General work area

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

1.3.4 Checking for the presence of refrigerant

The area shall be checked with an appropriate refrigerant detector prior to and during work to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with A2L refrigerants, i.e., non-sparking, adequately sealed, or intrinsically safe.

1.3.5 Presence of Fire Extinguisher

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire-extinguishing equipment shall be available to hand. Have a dry powder or CO_2 fire extinguisher adjacent to the charging area.

1.3.6 No ignition sources

No person carrying out work in relation to a refrigerant system that involves exposing any pipe work shall use any ignition sources in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the installation site, repair, removal, and disposal, during which refrigerant can possibly be released into the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to ensure there are no flammable hazards or ignition risks. “No Smoking” signs shall be displayed.

1.3.7 Ventilated area

Ensure the area is open or adequately ventilated before breaking into the system or conducting hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

1.3.8 Checks to the refrigerant equipment

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times, the Vertiv™ maintenance and service guidelines shall be followed. If in doubt, consult the technical department for assistance.

The following checks shall be applied to installations using flammable refrigerants:

- The actual refrigerant charge is in accordance with the room size within which the refrigerant-containing parts are installed.
- The ventilation machinery and outlets are operating adequately and are not obstructed.
- If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.
- Markings to the equipment continue to be visible and legible. Markings and signs that are illegible shall be corrected.
- Refrigerating pipes or components are installed in a position where they are unlikely to be exposed to any substance that may corrode refrigerant-containing components unless the components are constructed of materials that are inherently resistant to being corroded or are suitably protected against being so corroded.

1.3.9 Checks to electrical devices

Repair and maintenance of electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately, but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment, so all parties are advised.

Initial safety checks shall include:

- That capacitors are discharged: this shall be done safely to avoid sparking.
- That no live electrical components and wiring are exposed while charging, recovering or purging the system.
- That there is continuity of earth bonding.

1.3.9.1 Repair to sealed components and intrinsically safe components.

- Sealed electrical components shall be replaced.
- Intrinsically safe components must be replaced.

1.3.10 Cabling

Check that cabling is not subject to wear, corrosion, excessive pressure, vibration, sharp edges, or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

1.3.11 Detection of flammable refrigerants

Under no circumstances shall potential ignition sources be used to search for or detect refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

Electronic leak detectors may be used to detect refrigerant leaks; in the case of flammable refrigerants, the sensitivity may not be adequate or may need recalibration. Detection equipment shall be calibrated in a refrigerant-free area. Ensure that the detector is not a potential ignition source and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the refrigerant's Lower Flammable Limit (LFL). It shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25% maximum) is confirmed.

Leak-detection fluids are also suitable for use with most refrigerants. Still, chlorine-containing detergents shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipework. Examples of leak detection fluids are the bubble method and fluorescent method agents.

All naked flames shall be removed/extinguished if a leak is suspected.

If refrigerant leakage requires brazing, all of the refrigerant shall be recovered from the system or isolated (by means of shut-off valves) in a part of the system remote from the leak. Removal of refrigerant shall be done according to the removal and evacuation procedures.

1.3.12 Removal and evacuation

Conventional procedures shall be used when breaking into the refrigerant circuit to make repairs or for any other purpose. However, for flammable refrigerants, best practices must be followed since flammability is a consideration. The following procedure shall be adhered to:

- Safely remove refrigerant following local and national regulations.
- Evacuate.
- Purge the circuit with inert gas
- Evacuate
- Continuously flush or purge with inert gas when using flame to open the circuit.
- Open the circuit

The refrigerant charge shall be recovered into the correct recovery cylinders. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.

For appliances containing flammable refrigerants, refrigerant purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the maximum allowable pressure is achieved, then venting to the atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. This operation is vital if brazing operations on the pipework are to take place.

The outlet for the vacuum pump is not close to any potential ignition sources, and ventilation shall be available.

1.3.13 Charging procedures

In addition to conventional charging procedures, the following requirements shall be followed:

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerating system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigerating system.

Before recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging, before commissioning. A follow-up leak test shall be carried out before leaving the site..

1.3.14 Decommissioning

Before carrying out this procedure, the technician must be completely familiar with the equipment and all its details. It is recommended good practice that all refrigerants be recovered safely. Before the task is carried out, an oil and refrigerant sample shall be taken in case analysis is required before reusing the recovered refrigerant. Electrical power must be available before the task is commenced.

a. Become familiar with the equipment and its operation.

b. Isolate the system electrically.
c. Before attempting the procedure, ensure that:
    - Mechanical handling equipment is available, if required, for handling refrigerant cylinders.
    - All personal protective equipment is available and being used correctly.
    - The recovery process is supervised at all times by a competent person.
    - Recovery equipment and cylinders conform to the appropriate standards.
d. Pump down the refrigerant system, if possible.
e. If a vacuum is not possible, make a manifold so refrigerant can be removed from various system parts.
f. Make sure the cylinder is situated on the scales before recovery occurs.
g. Start the recovery machine and operate it following the instructions.
h. Do not overfill cylinders (no more than 80 % volume liquid charge).
i. Do not exceed the maximum working pressure of the cylinder, even temporarily.
j. When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
k. Recovered refrigerant shall not be charged to another refrigerating system unless it has been cleaned and checked.

1.3.15 Labeling

Equipment shall be labeled stating that it has been decommissioned and emptied of refrigerant. The label shall be dated and signed. For appliances containing flammable refrigerants, ensure that there are labels on the equipment stating that the equipment contains flammable refrigerant.

1.3.16 Recovery

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants be removed safely.

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labeled for that refrigerant (i.e., Special cylinders for the recovery of refrigerant). Cylinders shall be complete with a pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of all appropriate refrigerants, including, when applicable, flammable refrigerants. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained, and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult the manufacturer if in doubt.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to prevent flammable refrigerant from remaining within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

1.4 Symbol Description

The unit is marked with various symbols for different purposes; read the part with the symbol(s) carefully and follow the instructions to avoid any risk.

Table 1.1 Symbol Description

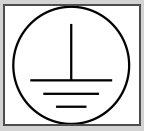
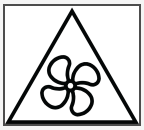
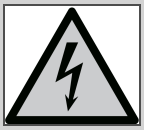
Symbology	Description	
	This symbol is displayed to indicate matters and operations that can cause risk.	
	**WARNING**	This symbol means that if the warning is not heeded, it can cause death or severe injury.
	**WARNING**	This symbol means that if the precaution is not taken, it may cause minor or moderate injury.
	This symbol is displayed to indicate protective earthing. Permanent earthing shall always remain connected other than for small periods of maintenance.	
	These symbols are displayed to indicate matters related to the appliance's operation.	
	This symbol is displayed to indicate matters related to the servicing of the appliance. The information in the manual is intended for use by a qualified service technician familiar with the safety procedures and equipped with the proper tools and test instruments.	
 	These symbols are displayed to indicate matters related to flammable refrigerants.	

Table 1.1 Symbol Description (continued)

Symbology	Description
	This symbol is displayed to indicate moving fan blades during regular operation.
	This symbol is displayed to indicate hazardous voltage involved or risk of electric shock. This symbol might be followed by ´CAUTION´ or ´WARNING´ wording to indicate the level of risk.
	This symbol is displayed to indicate potential hot surfaces.

2 Product Introduction

2.1 Product Overview

2.1.1 Condensing Unit Overview

The Vertiv™ CoolPhase Condensing Unit is an air-cooled condenser with a compressor that rejects the heat removed from the IT space into ambient air for use with low GWP R32. This unit is always used with an Evaporator unit and is controlled and operated from it. Unlike the smaller units (3-11 kW), these 28-35 kW units can only be installed outdoors and are vertically constructed. The end-user must provide overcurrent protective devices, overvoltage protective devices, and main connections in accordance with the installation instructions.

2.2 Model Nomenclature

The Vertiv™ CoolPhase Condensing Unit is available in 32 models in the North American market, including both Standard and Low-Ambient versions. The following tables describe the model numbers for the condenser units in this region.

2.2.1 Model Number Nomenclature Detail

The following tables describe each digit of the model number Nomenclature displayed:

Table 2.1 Model Number Nomenclature

1	2	3	4	5	6	-	7	8	9	10	11	12	13	14	15
C	U	D	2	8	1	-	E	D	0	0	A	0	0	0	0

Table 2.2 Condensing Unit Model-number Digit Description

Digit	Description
Digits 1 - 2	Unit Family: CU - Vertiv™ CoolPhase Condensing Unit
Digit 3	Version: D - Air-Cooled Standard Ambient L - Air-Cooled Low Ambient
Digit 4 - 5	Size: 28 = 28 kW 35 = 35 kW
Digit 6	Voltage: 1 = 208/230 V; 60 Hz; 3 PH (NAM) 4 = 460 V; 60 Hz; 3 PH (NAM)
7	Protection: 0- No coating E - E-coating (Aggressive environments)

Table 2.2 Condensing Unit Model-number Digit Description (continued)

Digit	Description
8	Power Supply feature: 0 = Single power supply configuration D = Dual power supply configuration
9	Free
10	Free
11	Revision: A - Revision A
12-15	Factory Configuration number: 0000 = Standard 4 digits other than 0= Engineering To Order designated number

2.2.2 Technical Description

Table 2.3 Condensing Unit Technical Description

Item	CUD281 CUL281	CUD351 CUL351	CUD284 CUL284	CUD354 CUL354
Certification marks	cCSAus (UL 60335-2-40 and CSA C22.2 No. 60335-2-40)			
Piping Connections	Sweat Connection			
Compressor	Variable speed Inverter-driven			
Condenser Fan	EC Motor			
Controls	Vertiv iCOM 2			
Power Supply	208/230, /3ph, 50-60Hz (±10%)		460, 3ph, 60Hz (±10%)	
Refrigerant	R32			

Figure 2.1 Vertiv™ CoolPhase Condensing Unit Name Plate Information

Power Supply #1

Model No. **Serial No.** **Volts:** **Ph:** **Hz:** **Date:**

Total System Inputs Amps: **Minimum Supply Circuit Ampacity:**

Maximum Fuse or Circuit Breaker Size:

Condenser Motor FLA: **HP:** **QTY:**

[Certification marks and QR code]

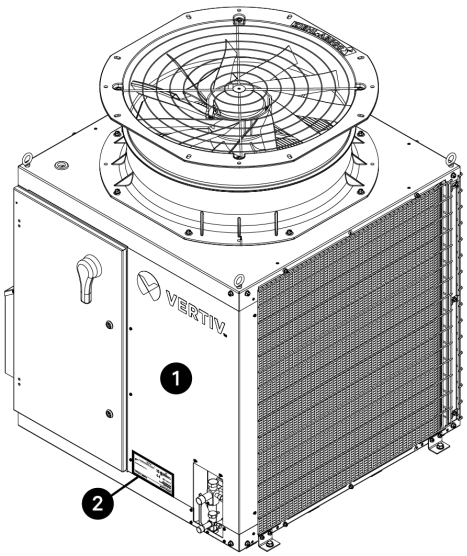
Unit Design Pressure (PSIG):

VERTIV.

[Manufacturing location]

Name Plate Information	Description
Power Supply	
Model	Model defined by 15 digits
Serial Number	Serial number defined by 6 digits

Figure 2.2 Nameplate Location

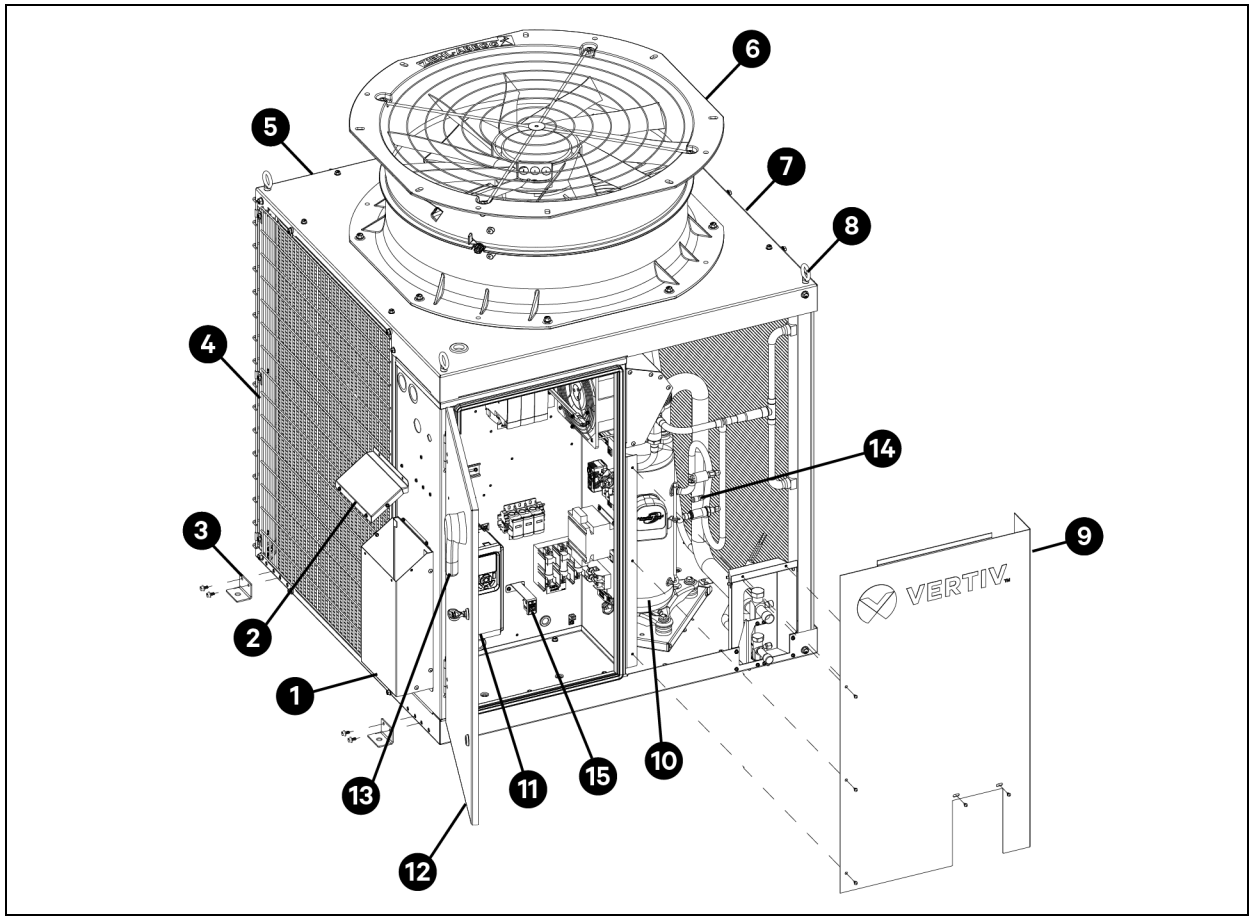


Item	Description
1	Service Access Panel
2	Nameplate

2.3 Components

2.3.1 Component Location

Figure 2.3 Vertiv™ CoolPhase Condensing Unit Component Location



Item	Description	Item	Description
1	Air Filter	9	Service Access Panel
2	Air Filter cover	10	Compressor
3	Base brackets (4)	11	Inverter
4	Left Side Grill	12	Electrical box cover
5	Center Side Grill	13	Disconnect Handle
6	EC Axial Fan	14	Schrader Valve
7	Right Side Grill	15	Evaporator Control Signal Connection
8	Lifting Eyebolts (4)		

2.3.2 Main Components (Standard version)

The standard version of the unit mainly consists of a compressor, fan, and heat exchanger, and it is designed to maintain proper operating pressure in outdoor temperatures of -4~118°F (-20~+48 °C). The Main components of the Condensing Unit are described below:

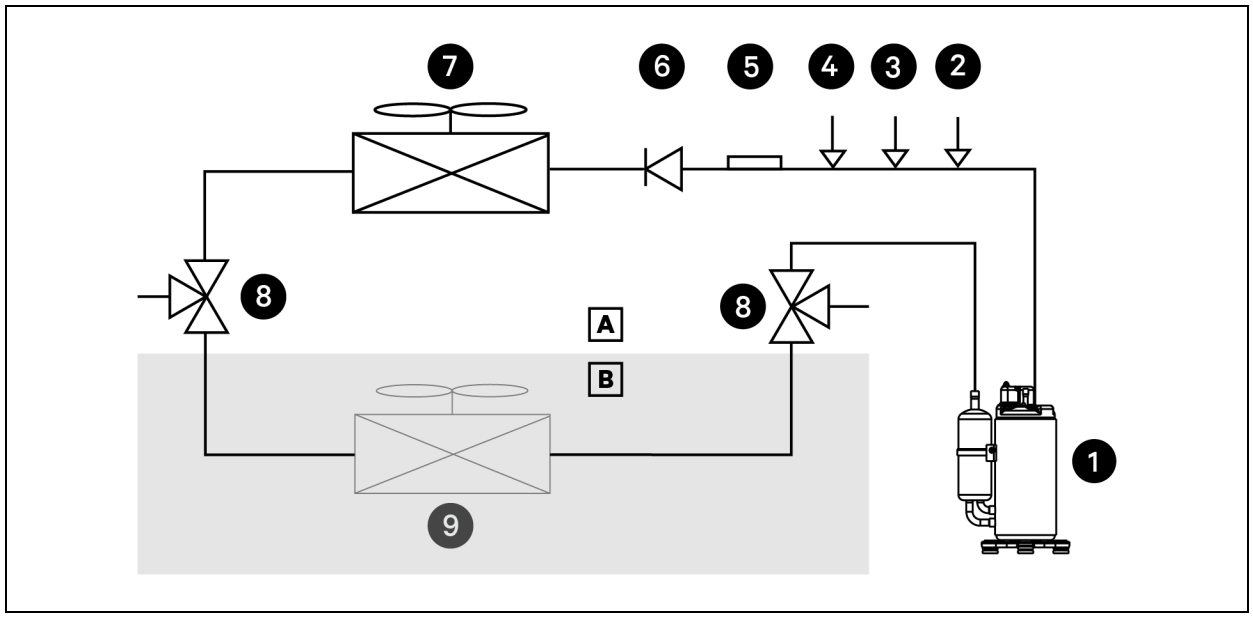
Fan

The EC axial fan uses low-noise fan blades and a high-performance three-phase motor.

Heat Exchanger

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

Figure 2.4 Condensing Unit Standard Components Diagram.



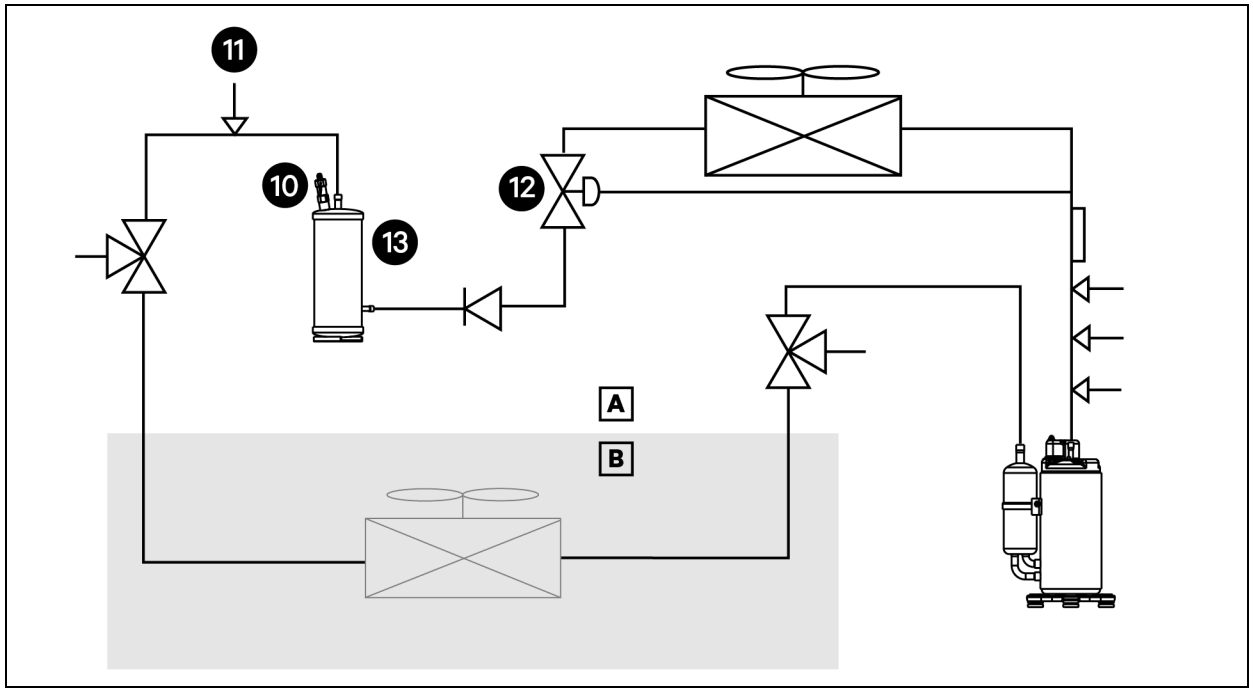
Item	Description	Item	Description
A	Outdoor	5	Discharge Temperature Sensor
B	Indoor	6	Check Valve
1	Compressor	7	Condensing Coil with EC Fan
2	High-Pressure Switch	8	Service Valve
3	Discharge Pressure Transducer	9	Evaporator Unit
4	Schrader Service Valve w/Core		

2.3.3 Main Components (Low Ambient Version)

The low ambient version of the unit has additional components for its system, such as a receiver with a heater belt, a head pressure valve, a safety valve, a check valve, and a pressure switch. This version is designed to maintain proper operating pressure in outdoor temperatures lower than the standard version; the lowest operating temperature for these models is -31°F (-35 °C).

The low ambient version is a factory-made installed option selected at the time of the purchase.

Figure 2.5 Diagram of Low Ambient Components.



Item	Description	Item	Description
A	Outdoor	11	Low Pressure Switch
B	Indoor	12	Head Pressure Control Valve
10	Relief Valve	13	Liquid Receiver

Main Components of this version:

Liquid Receiver Tank

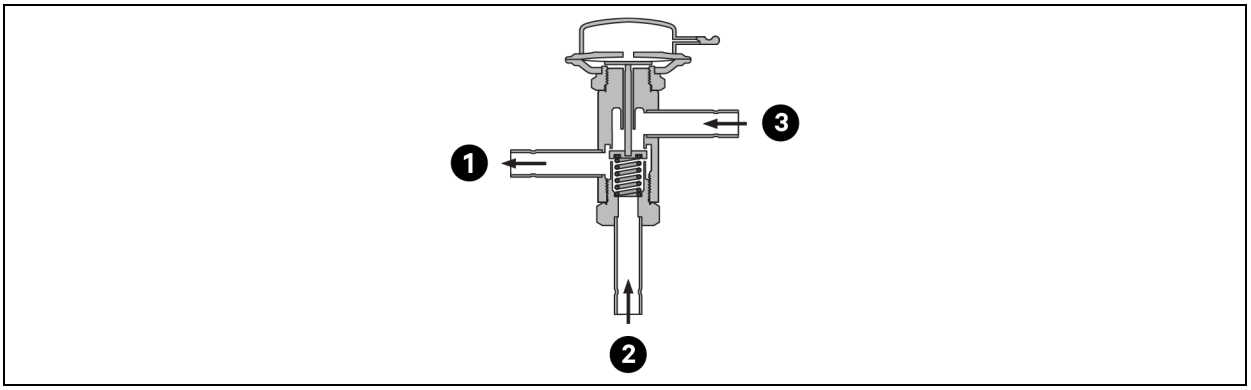
The receiver stores refrigerant to help fulfill the needs for low-temperature loads in winter and high-temperature loads in summer. The receiver has three connection ports to connect the refrigerant inlet pipe, refrigerant outlet pipe, and safety valve.

Head Pressure Valve

The head pressure valve is a three-way modulating valve that responds to discharge pressure. When the system head pressure falls below the setting of the Head pressure valve, flow from the condenser coil outlet is reduced by mixing both valve inlets (Discharge Gas, Liquid from Condenser coil) to the valve outlet (Receiver Inlet), causing the liquid refrigerant to stack within the condenser coil reducing its heat of rejection capacity. Steady system pressure is achieved when enough refrigerant has flooded the condenser coil to reduce the heat exchange capacity, maintaining the minimum system head pressure. The receiver size is based on the liquid refrigerant holding capacity of the condenser coil while maintaining a liquid column of refrigerant to the expansion valve. See figure 2.6 below for reference.

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

Figure 2.6 Structure Diagram of Head Pressure Valve



Item	Description
1	Connected with Receiver
2	Connected with Condenser
3	Connected with Discharge pipe

Heater Belt

The receiver is equipped with four heater belts, which consume a total power of 300 Watts. The heater belt is controlled by the pressure of refrigerant in the receiver. The heater belt will heat when the pressure exceeds 1.4 MPa (203.1 psig). The heater belt will stop heating when the pressure exceeds 1.9 MPa (275.6 psig).

Check Valve

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

2.4 Accessories

The accessories for the Coolphase Condensing Unit are listed below. These items are sold separately. For further mounting information, refer to the Quick Installation Guide document for each accessory.

2.4.1 Hail Guard

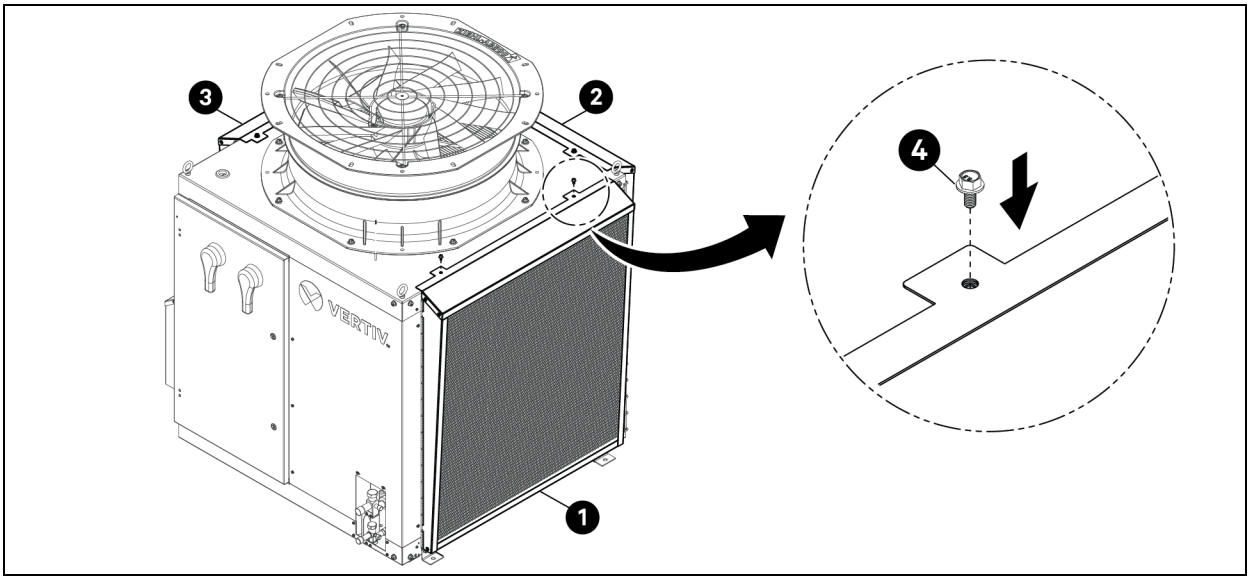
Hail Guards protect the coil against hail produced during storms. This accessory should be added when the unit is located in an area with extreme weather conditions.

NOTE: With the Hail Guard kit installed, the maximum ambient air temperature is 118.4°F (48°C), but cooling capacity will be reduced by 0.5%.

Table 2.4 Hail Guard SKUs.

SKU	Item Description	Applicable Models
CUHAILGRD-21/28	Hail Guard for 28 kW Units	CUD28 CUL28
CUHAILGRD-35	Hail Guard for 35 kW Units	CUD35 CUL35

Figure 2.7 28 kw Condensing Unit with Hail Guards (CUHAILGRD-21/28) Attached.



Item	Description	Item	Description
1	Right Hail Guard	3	Left Hail Guard
2	Back Hail Guard	4	M6 bolts attachment detail

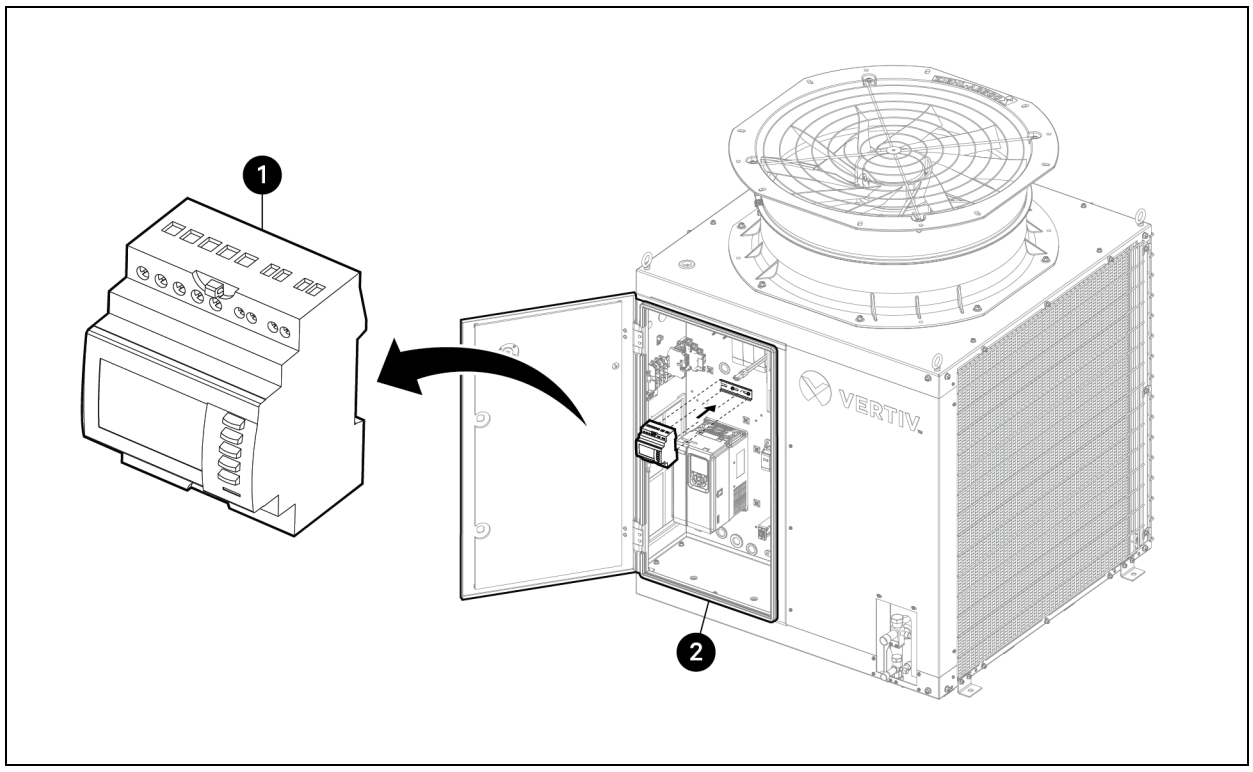
2.4.2 Power Meter

The power meter is a device that measures energy consumption in the Condensing Unit. It can be installed to monitor electrical parameters in real time, whose data can be used for technical and maintenance purposes. It is not included with the unit and must be purchased separately.

Table 2.5 Power Meter SKU

SKU	Item Description	Applicable Models
CRVPWRMTR-1	CRV Power Meter 208/230V, 3Ph	CUD281 CUL281 CUD351 CUL351
CRVPWRMTR-4	CRV Power Meter 460V, 3Ph	CUD284 CUL284 CUD354 CUL354

Figure 2.8 Power meter installed on the Condensing Unit.



Item	Description
1	Power Meter
2	Electrical Box

2.5 Dimensions and weights

Figure 2.9 Condensing Unit Dimensions.

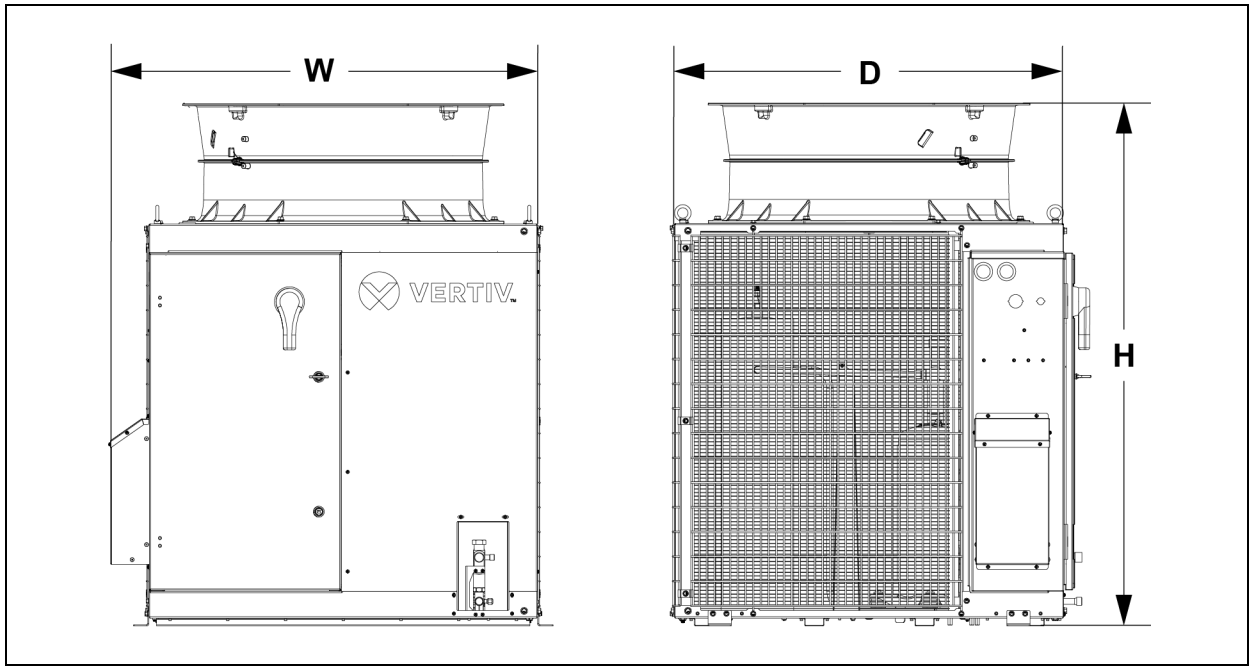


Table 2.6 Dimensions and Weights

Model	Unit Dimensions (Width x Depth x Height) in (mm)	Shipping Dimensions (Width x Depth x Height) in (mm)	Net Weight lb (kg)	Shipping Weight lb (kg)
CUD28 CUL28	39.76 x 42.40 x 53.37 (1010 x 1010 x 1355.7)	48 x 48 x 61.01 (1219.2 x 1219.2 x 1549.6)	424.6 (193)	546.15 (247.73)
			457.6 (208)	579.22 (262.73)
CUD35 CUL35	47.64 x 50.27 x 54 (1210 x 1277 x 1371.7)	57.09 x 57.09 x 61.65 (1450 x 1450 x 1565.9)	519.2 (236)	647.40 (293.66)
			567.6 (258)	695.91 (315.66)

2.6 Operating limits

Table 2.7 Operating limits

Applicable models: CUD281 CUL281		CUD351 CUL351	CUD284 CUL284	CUD354 CUL354
Parameter		Design Condition		
Operating Temperature range		Standard ambient condensing Unit: -4°F (-20°C) ~118°F (48°C) Low ambient condensing unit: -31°F (-35°C) ~118°F (48°C)		
Power supply tolerances		208/230V, 3ph, 50-60 Hz (±10%)	460, 3ph, 50-60Hz (±10%)	
Equivalent length of pipe between evaporator and condenser ft (m)		295.3 (90)		
External Static Pressure (Pa)		20		
Height between evaporator and condenser ft (m)	Condenser placed higher than the evaporator	98 (30)		
	Condenser placed lower than the evaporator	-26 (-8)		

NOTE: The value of the vertical difference is positive if the condenser is installed higher than the indoor unit; otherwise, the value is negative.

NOTE: If the altitude exceeds 3280.8 ft (1000 m), contact Vertiv™.

2.7 Storage environment

Table 2.8 Storage Environment

Item	Requirements
Storage environment	Store the unit in its original factory packaging in a clean indoor environment with good ventilation and no dust.
Ambient temperature	-40 °F to 122 °F (-40 °C to +50 °C)
Ambient humidity	Less than 95% RH @ 86°F (30°C)

2.8 Electrical Data

Table 2.9 Electrical Data

Models	Tons	Volts / phases	Compressor Qty.	Compressor Inverter (A)	Fan Qty.	Fan (A)	Crank Case + Heating belt (A)	FLA (A)	MCA (A)	MOP (A)
CUD281 CUL281	8	208/230 3Ph	1	42.9	1	3.0	0/0.5	51.1	61.8	100
CUD284 CUL284	8	460 3ph	1	32.9	1	8.2	0/0.5	35.9	44.1	70
CUD351 CUL351	10	208/230 3Ph	1	46.7	1	8.6	0/0.5	55.3	66.9	110
CUD354 CUL354	10	460 3ph	1	39.7	1	4.4	0/0.5	44.1	54	90

3 Pre-Installation Preparation

WARNING! Every working procedure that affects safety means shall only be carried out by competent persons.

WARNING! Before breaking into the system or conducting any hot work, ensure the working area is open or adequately ventilated. Ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

WARNING! Under no circumstances, potential sources of ignition shall be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

WARNING! If a refrigerant leakage is found that requires brazing, all the refrigerant shall be recovered from the system or isolated (by means of shut-off valves) in a part of the system remote from the leak. Refrigerant removal shall be performed following manufacturer instructions.

WARNING! Risk of heavy unit falling over. Improper handling can cause equipment damage, injury, or death. Read all the following instructions and verify that all lifting and moving equipment is rated for the unit's weight before attempting to move, lift, remove packaging from, or prepare the unit for installation. Unit weights are specified in section 2.5, "Dimensions and Weights".

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

NOTICE

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

NOTICE

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

3.1 Inspecting the Unit

Upon the unit's arrival and before unpacking:

- Verify that the labeled equipment matches the contents listed on the bill of lading.
- Inspect the package for any visible or concealed damage.
- Additional unit inspection is warranted to ensure no exterior or internal damage.

Report any damage immediately to the carrier and file a damage claim, sending a copy to Vertiv™ or your sales representative.

3.2 Moving the packaged Unit

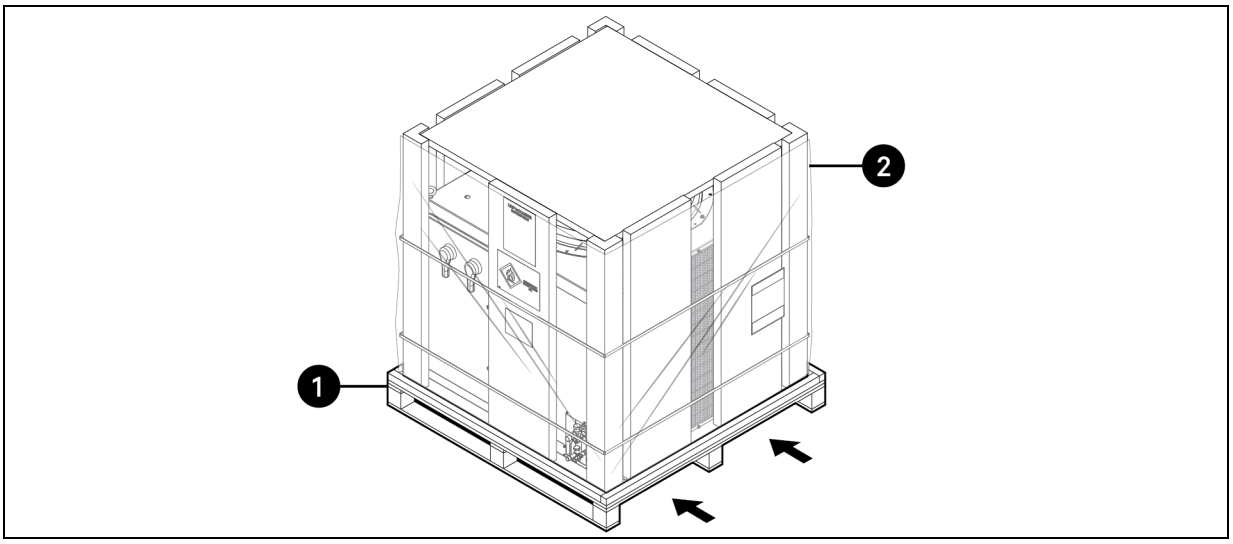
WARNING! Risk of heavy unit falling over. Improper handling can cause equipment damage, injury, or death. Read all the following instructions and verify that all lifting and moving equipment is rated for the unit's weight before attempting to move, lift, remove packaging from, or prepare the unit for installation. Unit weights are specified in section 2.5, "Dimensions and Weights".

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

Mechanical transport equipment, such as a forklift or crane, must be used when unloading and transferring the condenser closest to the installation site.

When a forklift is used, insert the tines in the direction shown in the figure below.

Figure 3.1 Inserting the Forklift in this direction.



Item	Description
1	Pallet
2	Packaged Unit

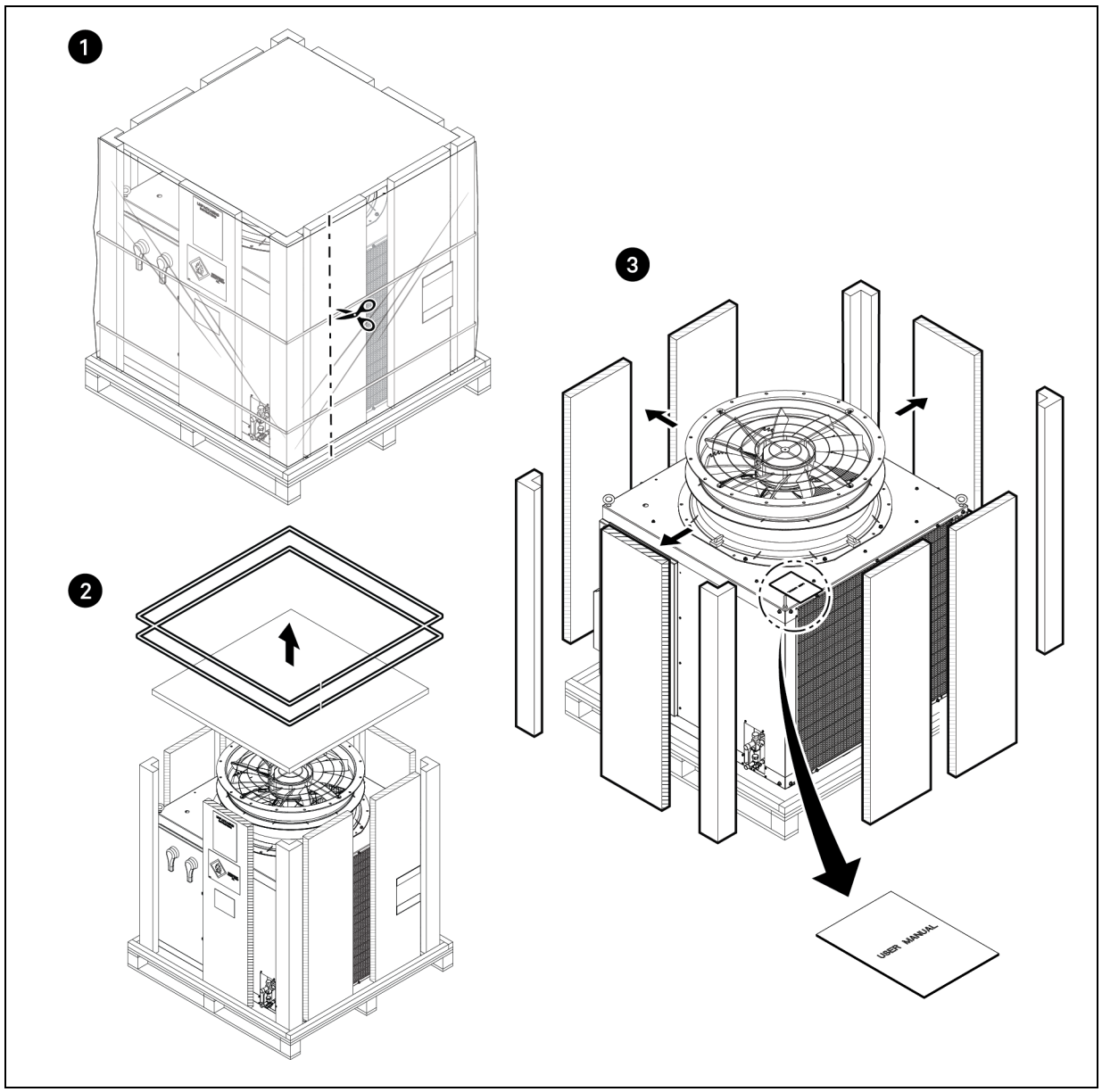
3.3 Unpacking the Unit

To unpack the Vertiv™ CoolPhase Condensing Unit from the cardboard box:

1. Place the package on a flat surface, then trim the plastic wrap and the polystraps to release the unit.
2. Remove the top honeycomb piece.
3. Step aside the honeycomb placed in the sides of the unit, including the foam of the corners, then take out the user manual for Installation.

Follow the instructions in the next section to remove the unit from the pallet.

Figure 3.2 Unpacking the unit.



3.4 Removing Unit from the Pallet

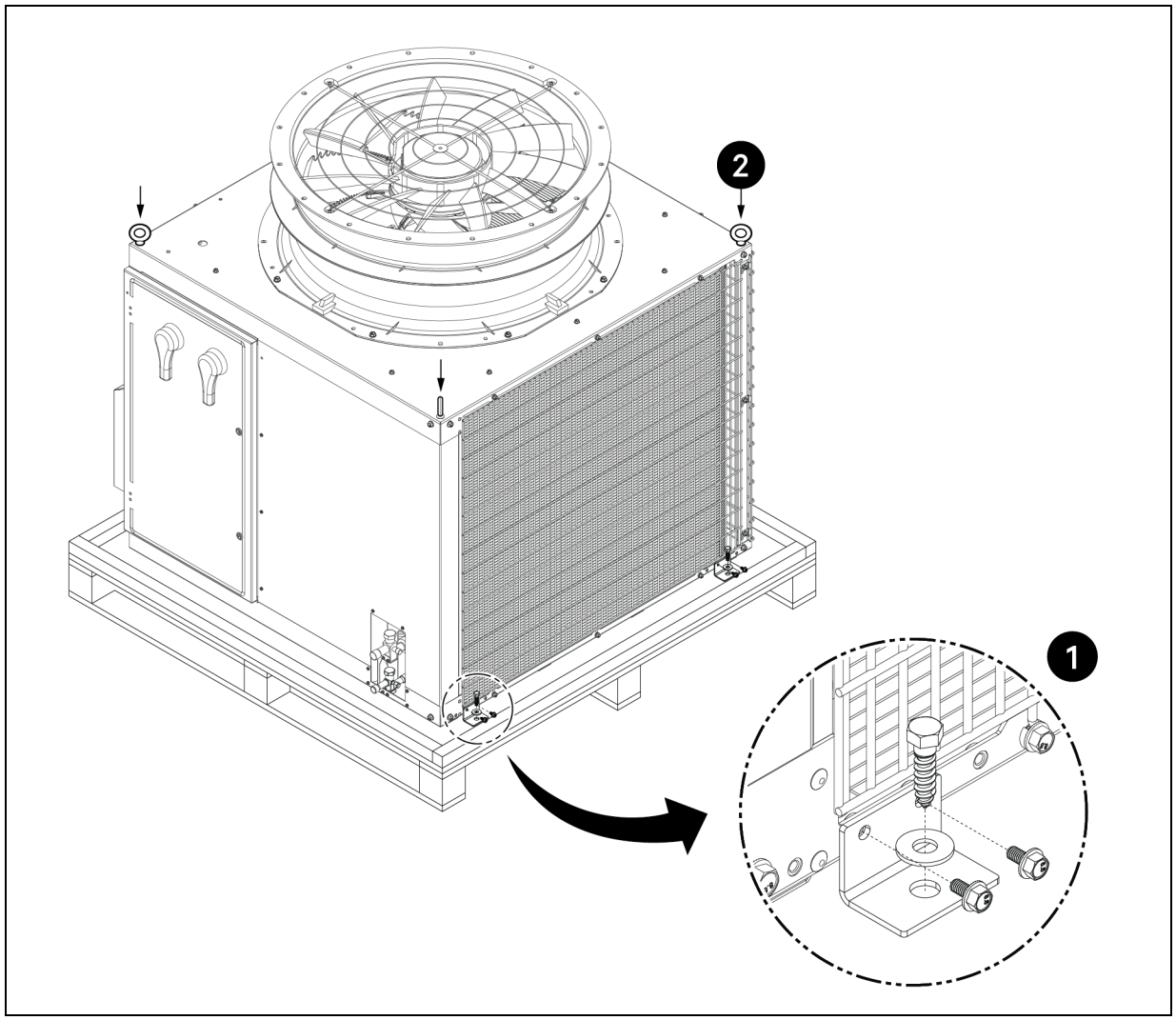
To remove the unit from the pallet:

1. Take off the shipping brackets from the pallet by detaching the four 3/8” hex screws and washers of each bracket.
2. Lift the unit with the help of a crane anchoring the slings to the four eyebolt lifts located on the corners of the top of the unit.

NOTE: Do not throw away the shipping brackets; they are necessary for installing the unit.

NOTE: A minimum height span of 19.68 in (50cm) is required to lift the unit off the shipping pallet safely.

Figure 3.3 Removing Unit from pallet.



4 Unit Installation

4.1 Installation Notes

- Vertiv™ CoolPhase Condensing Units are always used with Vertiv Evaporator Units. Read the Evaporator User Manual before installing and using this Condensing Unit.
- Do not install the unit in an environment with noise restrictions.
- Do not place the unit near vapors and hot waste gases.
- Install the unit in a clean place and keep it away from dust and foreign objects.
- When the ambient temperature is lower than -2°F (- 20°C) up to -40°F (-40°C), the low ambient version needs to be used.

4.2 Placing the Unit

WARNING! Risk of heavy unit falling over. Improper handling can cause equipment damage, injury, or death. Read all the following instructions and verify that all lifting and moving equipment is rated for the unit's weight before attempting to move, lift, remove packaging from, or prepare the unit for installation. Unit weights are specified in section 2.5, "Dimensions and Weights".

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

CAUTION: Do not tilt the Unit more than 5 degrees to prevent compressor damage.

CAUTION: To prevent Unit malfunction, power on the unit within 6 hours after all installations are completed, but don't turn it on yet.

The Condensing Unit must be placed on a leveled horizontal surface, rooftop, or floor. Move the unit the closest to the final location with the help of a crane.

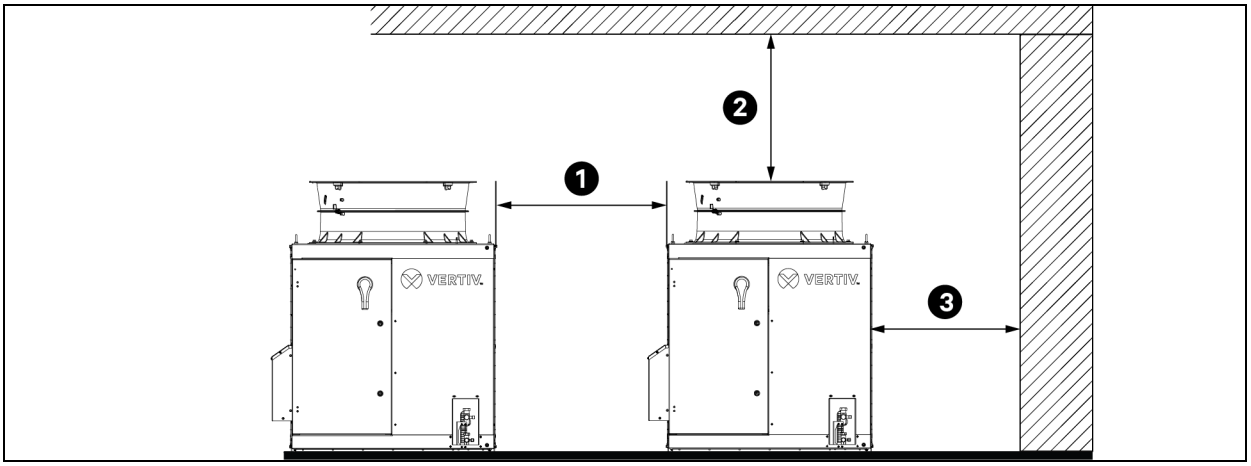
If it will be installed on a rooftop, use the eyebolt lifts on the top cover, shown in Figure 3.5 in section 3.4, and attach the hardware equipment to them to lift the unit securely. A minimum height span of 19 in (50 cm) is required to lift the unit off the shipping pallet safely.

NOTE: Do not place the unit where animals and/or plants will be on the warm air path or where the warm air and/or noise will disturb neighbors.

4.3 Clearance Requirements

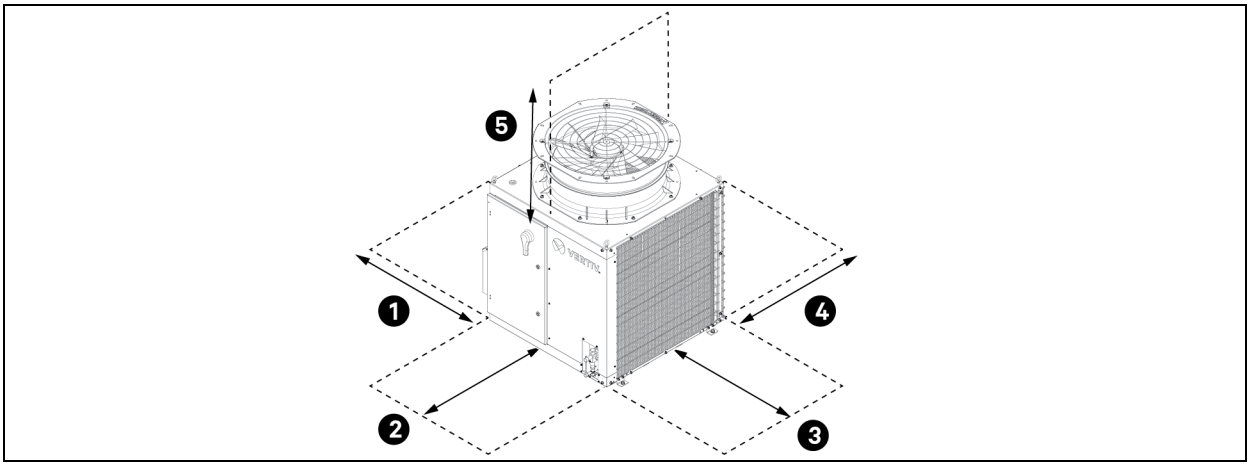
Proper airflow through the Condensing unit coil is critical for correct unit operation. When installing, consider the service, inlet, and outlet, and minimum allowable space requirements as illustrated in figure 4.1 on the facing page.

Figure 4.1 Condensing unit clearances, airflow considerations.



Item	Description	Item	Description
1	39 in (100 cm) Minimum distance	3	39 in (100 cm) Minimum distance
2	39 in (100 cm) Minimum distance		

Figure 4.2 Condensing unit clear space required for service access.

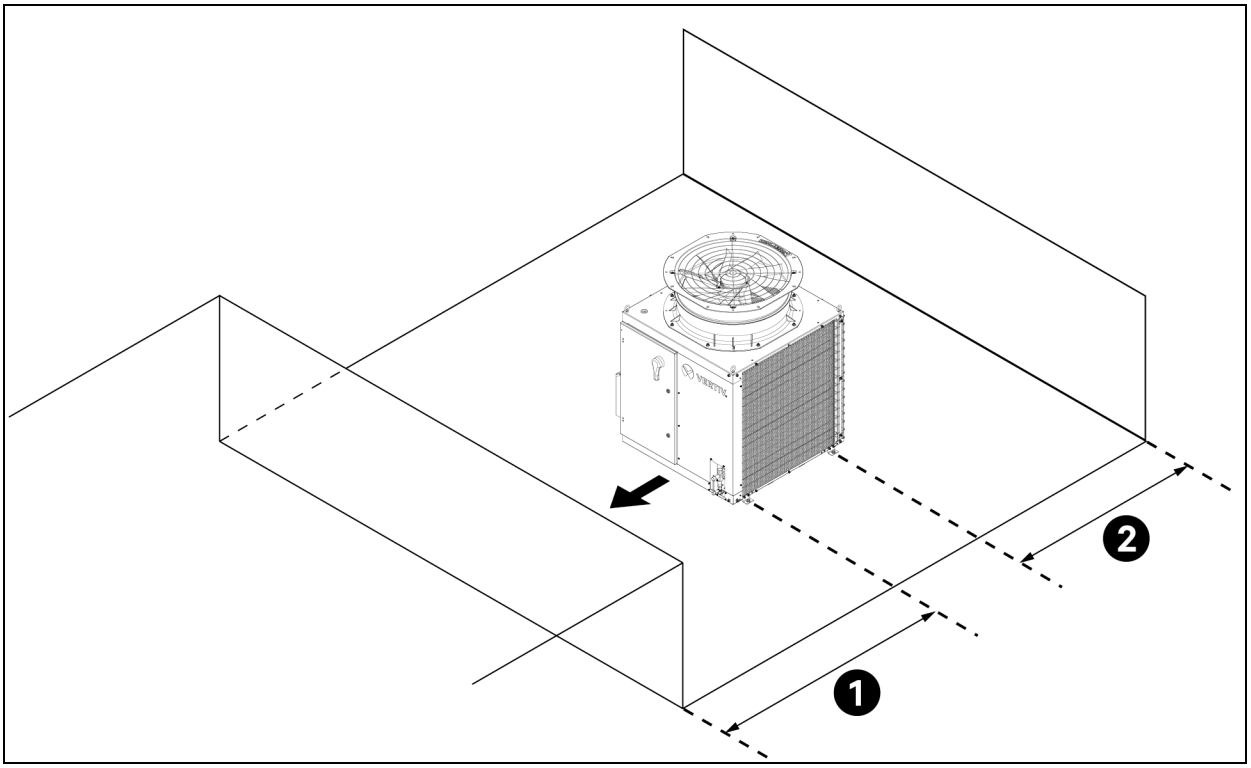


Item	Description	Item	Description
1	39 in (100 cm) Minimum distance	4	39 in (100 cm) Minimum distance
2	39 in (100 cm) Minimum distance	5	39 in (100 cm) Minimum distance
3	39 in (100 cm) Minimum distance		

When placing the Condensing unit under an overhang, awning, sunroof, or other “roof-like” structure, observe the clearance requirements (as shown in figure 4.1) for height in relation to the unit. This clearance ensures that heat radiation from the condenser is not restricted around the unit. See figure 4.3 for recommendations when other obstacles are present.

Adhere to all clearance requirements if installing the unit on a roof. Be sure to level the unit and ensure that the unit is adequately anchored. Consult local codes for rooftop mounting requirements.

Figure 4.3 Clearances when there are obstacles on both air-inlet and air-outlet sides.



Item	Description
1	39 in (100 cm) Minimum distance
2	39 in (100 cm) Minimum distance

NOTE: In figure 4.3 above, the obstacle on the outlet side is lower than the Condensing Unit.

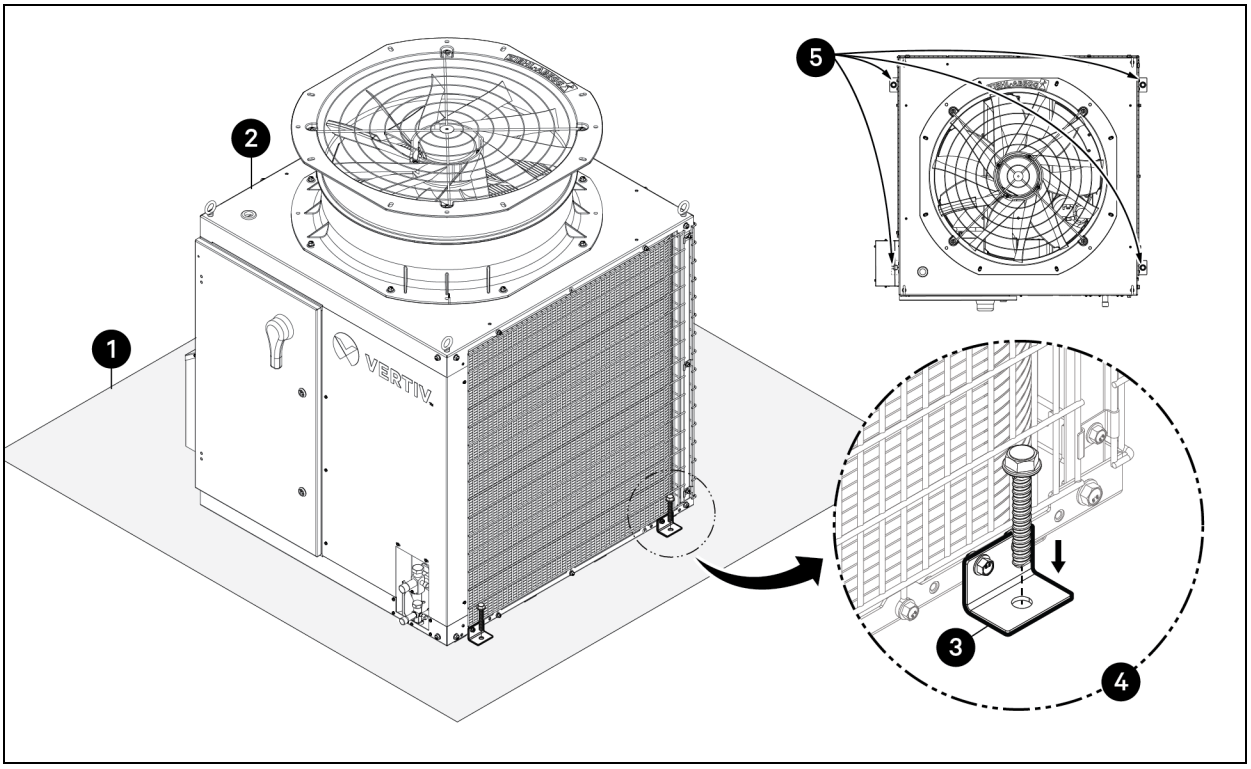
4.4 Mounting the Condensing Unit

The Vertiv™ CoolPhase Condensing Unit should be placed in a well-ventilated area, over a flat, leveled rooftop or floor, with enough room to install the connecting pipes and cables to access them for maintenance.

The proper hardware size to securely attach the Condensing Unit to the surface is field-supplied 1/2" -13 UNC concrete anchors, as shown in figure 4.4 below. Follow local codes for clearance, mounting, anchoring, and vibration attenuation requirements.

NOTE: For the installation, shipping brackets must be reused as base brackets to attach the unit to the surface.

Figure 4.4 Attachment of the unit.



Item	Description	Item	Description
1	Flat surface (Roof or Floor)	4	Concrete anchor placement detail
2	Condensing Unit	5	Concrete anchor distribution on the unit
3	Base Brackets		

4.5 Considerations for Snow and Ice Conditions

CAUTION: Risk of run-off water freezing on sidewalks and driveways. It can cause falls and injuries. When selecting the location for the Condensing Unit, be sure to choose an area where run-off from defrost will not accumulate and freeze on sidewalks or driveways.

In climates that experience snow build-up, place the unit on a raised platform to ensure condenser airflow. The raised support platform must be high enough for the unit to remain above possible snow drifts. Mount the unit on a field-provided snow stand at a minimum height equal to the average annual snowfall plus 20 in (51 cm). Design the mount base to prevent snow accumulation on the platform in front or back of the unit case. Provide a field fabricated hood to avoid snow, ice, and/or drifting snow from accumulating on the coil surfaces if necessary.

4.6 Location of Main Grounding Point

Refer to figures 6.3 and 6.4 in section 6, Electrical Connections, to locate the grounding point inside the electrical box for the incoming power to the unit.

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5 Piping Connections

Prior to starting with the piping connection, please read the Important Safety Instructions section of this Manual.

5.1 General Connections

WARNING! Do not allow the refrigerant to leak during brazing. If the refrigerant is combusted, it generates a toxic gas that can cause physical injury or death. Do not braze in an enclosed location, and always test for gas leaks before/after brazing. After brazing, check for refrigerant gas leaks.

WARNING! Do not allow the refrigerant to leak during brazing. The threat of suffocation exists due to air displacement from refrigerant gas being heavier than air, especially in small, confined spaces.

WARNING! Competent persons shall only carry out every working procedure that affects safety means.

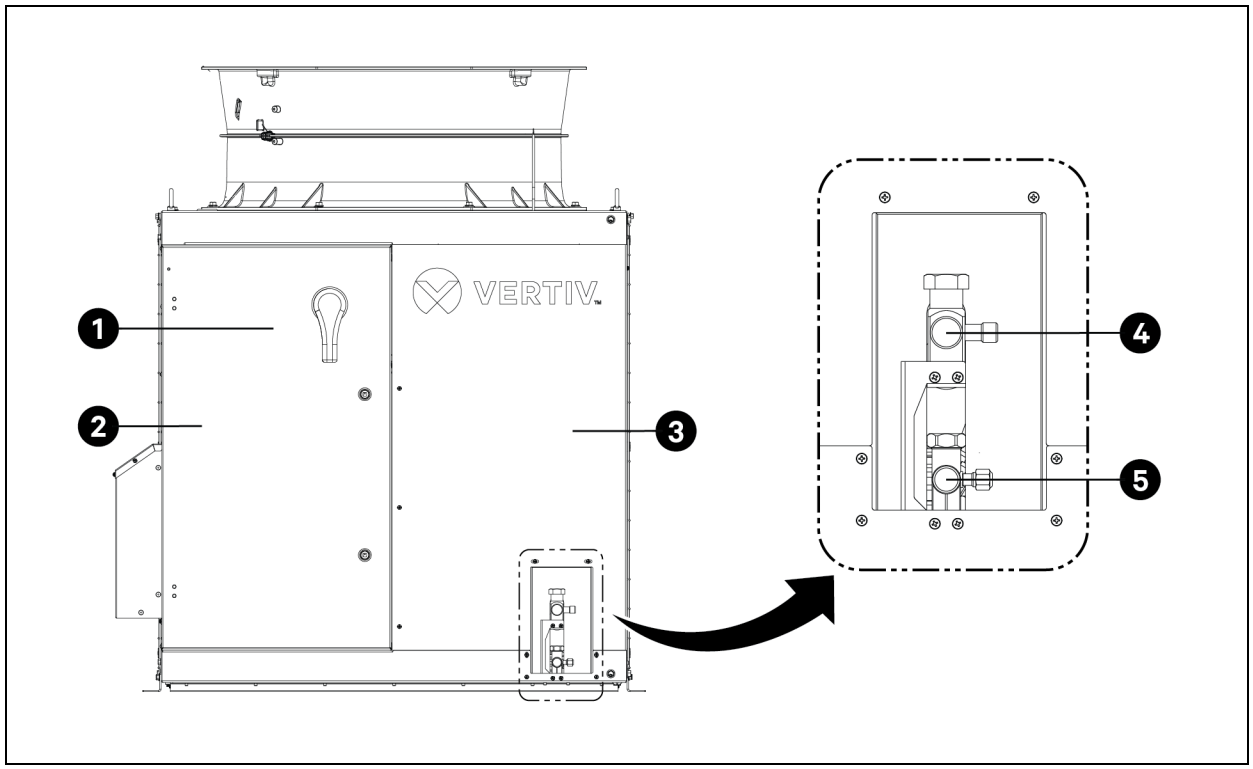
Pipework, including piping material, pipe routing, and installation, shall be in compliance with national gas regulations and local codes and standards, such as ASHRAE 15, ASHRAE 15.2, IAPMO Uniform Mechanical Code, ICC International Mechanical Code, or CSA B52. All field joints shall be accessible for inspection prior to being covered or enclosed.

The following indications must be considered:

- Do not use kinked pipe caused by excessive bending in one specific area on its length.
- Braze the pipes to the service-valve pipe stem of the Condensing Unit.
- Pipe-work shall not be installed in unventilated areas.
- Mechanical connections shall be accessible for maintenance purposes.

5.1.1 General Arrangement

Figure 5.1 Location of Piping Valves in the Unit



Item	Description	Item	Description
1	Power source Fuse Switch Handle	4	Suction Line Valve
2	Electrical box cover	5	Liquid Line Valve
3	Service Access Panel		

Refer to section 2.3, Components, for more information regarding the internal components of both versions of the condensing unit system (Standard and Low Ambient).

5.2 Connection of Condensing Unit to Indoor Unit

5.2.1 Connection Limitations

These systems always consist of one outdoor/condensing unit and one indoor/evaporator unit. One of the most critical elements of a system is the refrigerant piping. See figures 5.2 and 5.3 for the maximum length and elevation of the piping reference.

Table 5.1 Refrigerant-piping limitations

Specifications	Limitations	Distance
Pipe Length, ft (m)	Max Equivalent Length of Pipe	295.3 (90)
Height between indoor unit and condensing unit, ft (m)	The condensing unit is placed higher than the indoor unit.	Maximum: 98.4 (30)
	The condensing unit is placed lower than the indoor unit.	Maximum: -26.2 (-8)

Table 5.2 Equivalent Length for Bends and Valves

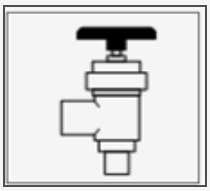
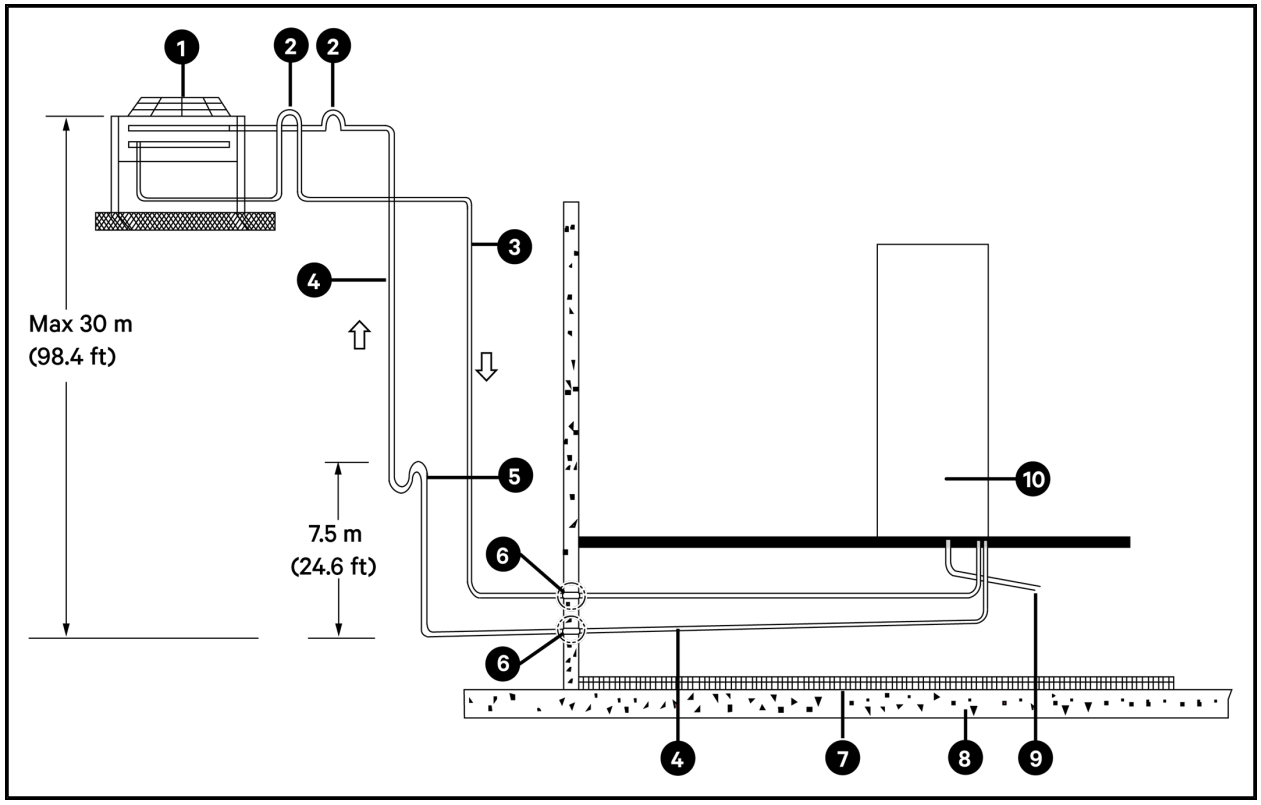
Liquid pipe outer diameter in (mm)	Equivalent length ft (m)			
	90° bend 	45° bend 	180° U bend 	90° shut off valve 
1/4 (6.35)	1.28 (0.39)	0.66 (0.20)	1.94 (0.59)	4.92 (0.15)
3/8 (9.52)	1.44 (0.44)	0.72 (0.22)	2.13 (0.65)	5.91 (1.80)
1/2 (12.7)	1.64 (0.50)	0.82 (0.25)	2.46 (0.75)	6.90 (2.10)
5/8 (16)	1.80 (0.55)	0.88 (0.27)	2.79 (0.85)	7.87 (2..40)
7/8 (22.23)	2.91 (0.89)	2.75 (0.83)	4.0 (1.23)	10.1 (3.10)

Figure 5.2 Condensing Unit Placed Higher than the Indoor Unit.



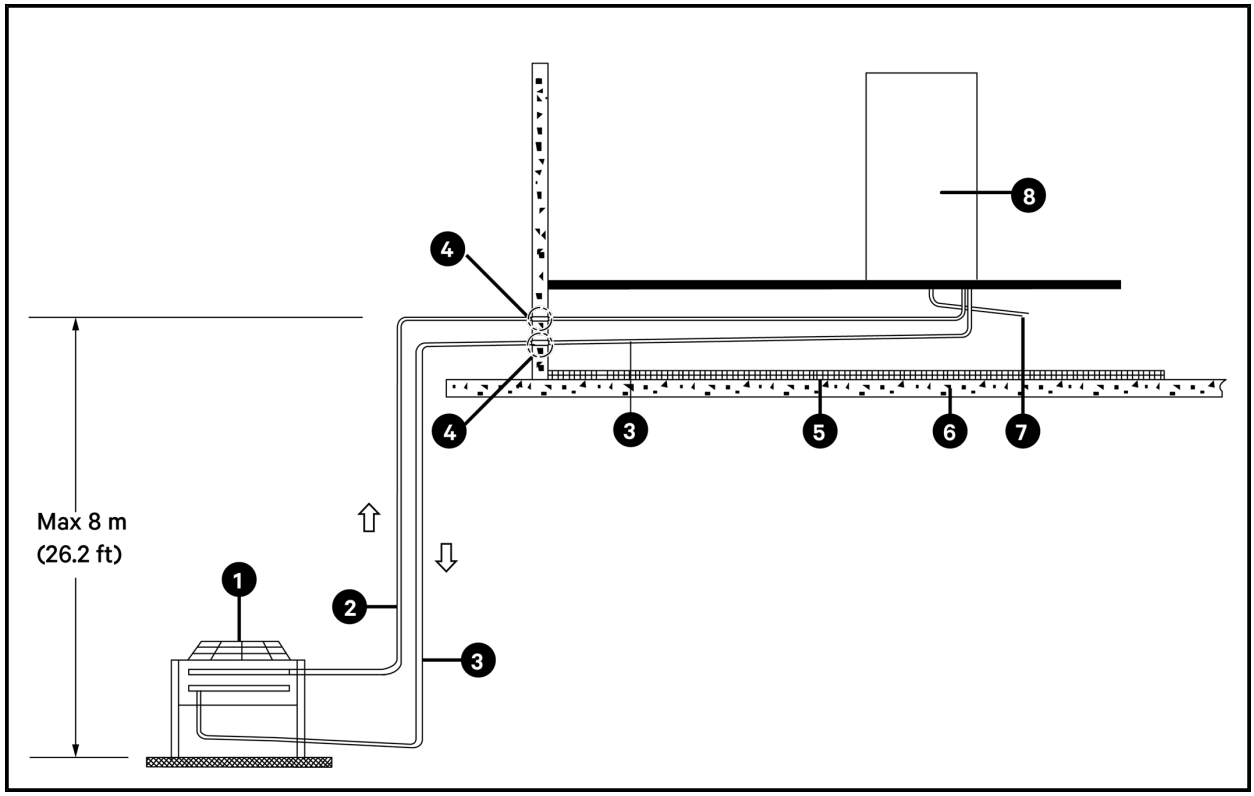
Item	Description	Item	Description
1	Condenser (outdoor)	6	The gap between the pipe and the wall needs to be sealed
2	Inverted trap	7	Heat-insulating floor
3	Liquid pipe	8	Floor
4	Gas pipe	9	Condensate pipe
5	Oil trap	10	Evaporator (indoor)

NOTE: The unit can be top piped as well.

NOTE: It is recommended to still set two inverted traps even with the Low ambient version installed.

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

Figure 5.3 Condenser Placed Lower than the Evaporator.



Item	Description	Item	Description
1	Condenser (outdoor)	5	Heat insulation floor
2	Liquid pipe	6	Floor
3	Gas pipe	7	Condensate pipe
4	The gap between the pipe and the wall needs to be sealed	8	Evaporator (indoor)

Refer to the following tables to see the required distances for the pipe-length limits that must be followed under different Indoor units and their compatible outdoor unit models.

Table 5.3 Connection size

Condensing Unit	Item	Pipe Size	Coupling Size
CUD28 CUL28	Liquid pipe	5/8" (15.875 mm)	5/8" (15.875 mm) SLD
	Suction pipe	7/8"(22.23 mm)	7/8"(22.23 mm) SLD
CUD35 CUL35	Liquid pipe	5/8" (15.875 mm)	5/8" (15.875 mm) SLD
	Suction pipe	7/8"(22.23 mm)	7/8"(22.23 mm) SLD

5.2.2 Liquid Pipe and Gas Pipe Connection

To connect the piping to the Condenser, please follow the indications below:

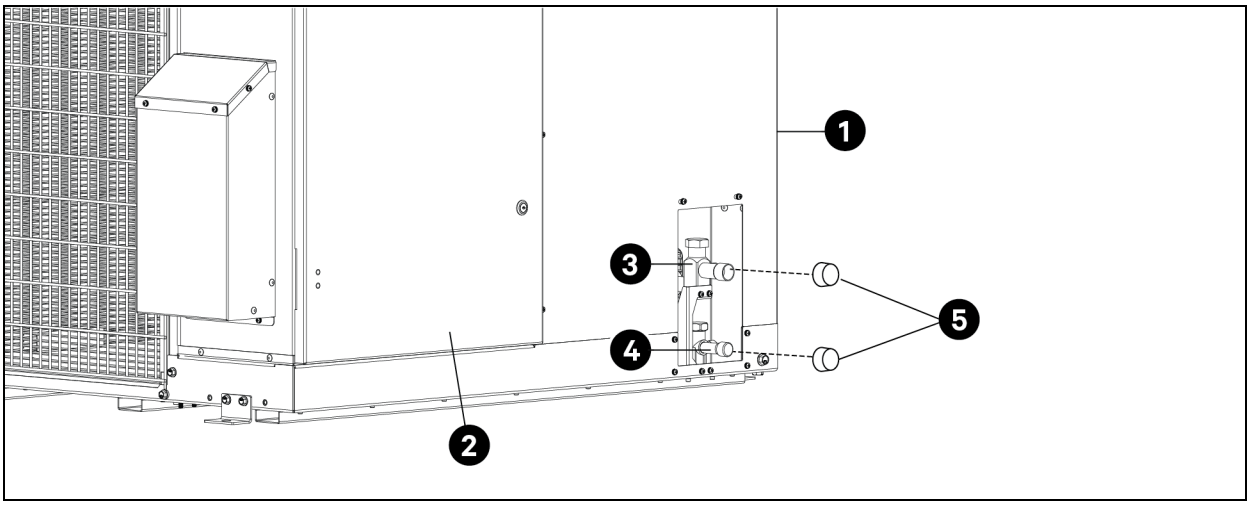
1. Remove the service valve caps.
2. Use as short refrigeration pipelines as possible to minimize the refrigerant's total charge and pressure drops.
3. Reduce the amount of bends to a minimum. The bend must be of a large radius, at least equal to the pipe diameter.
4. Insulate the piping to avoid cable damage if the pipes are next to electrical cables.
5. When the condenser is installed higher than the compressor, install an inverted trap to the discharge line of the evaporator and the liquid line of the condenser. The inverted trap prevents the liquid refrigerant from flowing back when the condenser stops working. The top end of the inverted trap must be higher than the height of the copper pipes of the condenser. Refer to the Evaporator Unit User manual for the minimum required height difference.

NOTE: Consult the factory if the piping run exceeds 397.7 ft (120 m) equivalent length.

6. Install an oil trap every 24.6 ft (7.5 m) of the vertical discharge line.
7. Weld the connections using copper piping with a brazing alloy minimum temperature of 1350°F (732°C), such as Sil-Fos. Avoid soft solders, such as 50/50 or 95/5.

NOTE: Nitrogen gas must be used during brazing to prevent interior piping oxidation, fouling of the refrigerant system, and plugging the system filter dryer.

Figure 5.4 Removing service-valve caps from the Condensing Unit



Item	Description	Item	Description
1	Condensing unit	4	2-way Valve for Liquid line
2	Electrical box cover	5	Valve caps
3	2-way Valve for Suction line		

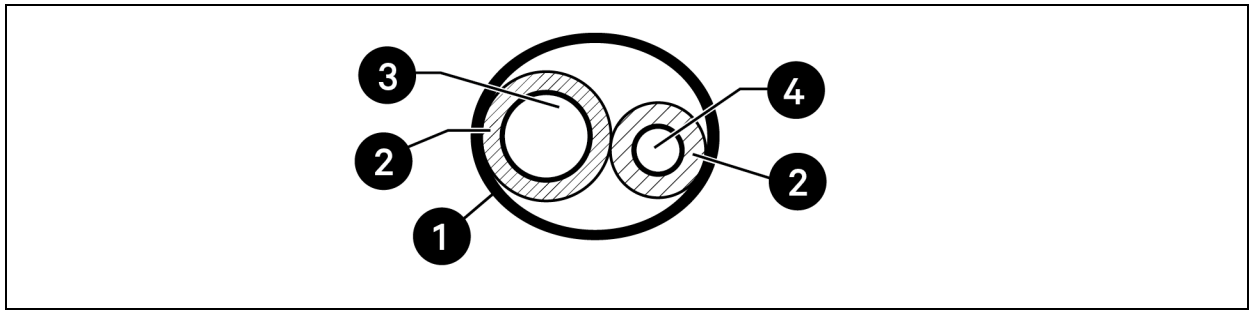
NOTE: Refer to the tables in section 8.3, Refrigerant and lubricating oil charges, to see piping line sizes that must be used.

5.2.3 Piping Insulation

To prevent heat loss or heat gain through the refrigerant piping, all refrigerant piping, including both liquid and vapor lines, must be insulated separately. Insulation must be a minimum of 1/2 in. Thickness may need to be increased based on ambient conditions and local codes.

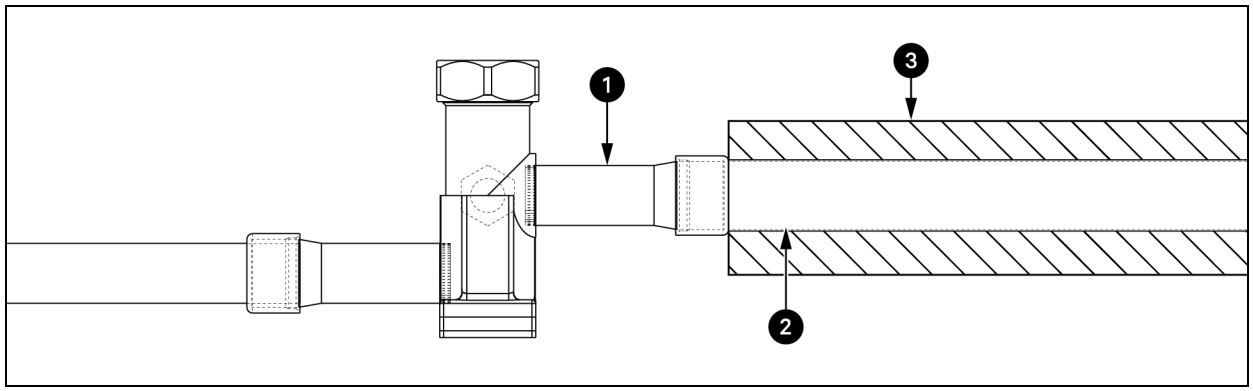
NOTE: Do not insulate gas and liquid pipes together, as this can result in pipe leakage and malfunction due to extreme temperature fluctuations. Ensure that the piping connections are fully insulated.

Figure 5.5 Typical pipe-insulation arrangement



Item	Description	Item	Description
1	Pipe sleeve	3	Suction Line
2	Insulation material	4	Liquid Line

Figure 5.6 Typical butt-joint insulation at outdoor unit



Item	Description	Item	Description
1	Valve	3	Field-supplied pipe insulation
2	Field-supplied pipe		

5.2.4 Piping Leak Test

For the correct Piping leak procedure, please refer to topic 1.3.11, "Detections of Flammable Refrigerants" in section 1.3 of the Important Safety Instructions of this manual.

5.2.5 Evacuation

Before starting the evacuation of the appliance, please read the Important Safety Instructions in this manual and follow the instructions in topic 1.3.12, Removal and Evacuation, in section 1.3.

6 Electrical Connections

WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off, and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause severe injury or death. As applicable, the customer must provide earth ground to the unit, per NEC, CEC, and local codes. Before proceeding with installation, read all instructions, verify that all the parts are included, and check the nameplate to be sure the voltage matches the available utility power. The iCOM 2 controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "Unit Off" mode of the controller. The only way to ensure NO voltage inside the unit is to install and open a remote disconnect switch. Verify that the unit does not include a dual power supply. Refer to the unit electrical schematic. Follow all local codes.

NOTICE

Risk of electrical phase reversal. It can cause equipment damage, unit malfunction, and loss of cooling operation.

Install a field-supplied phase-loss protection circuit if reversed phase, phase loss, momentary blackout, or power going on and off while the system operates is possible.

Do not connect the ground cable to the refrigerant, gas, water piping, lightning rods, telephone ground wiring, or building plumbing system.

To protect the operator from the hazards noted, immediately after working on the unit, replace and securely fasten all control boxes and panel covers.

NOTE: Consider ambient conditions (temperature, direct sunlight, inclement weather, etc.) when selecting, installing, and connecting the power wiring.

6.1 Connecting Power Supply Cable

WARNING! Arc flash and electric shock hazard. It can cause severe injury or death. Disconnect all local and remote electric power supplies and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. As applicable, the customer must provide earth ground to the unit, per NEC, CEC, and local codes.

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

NOTE: The fixed power supply wiring shall be provided with a manual electrical disconnect switch.

NOTE: Wiring should be protected from touched heated surfaces like refrigeration piping and any heated surface to avoid damaging the wiring insulation.

NOTE: A professional, licensed electrical contractor should install the unit's power supply wiring according to local electrical codes.

NOTE: Refer to the corresponding connected evaporator unit manual for the recommended power supply cable wire size.

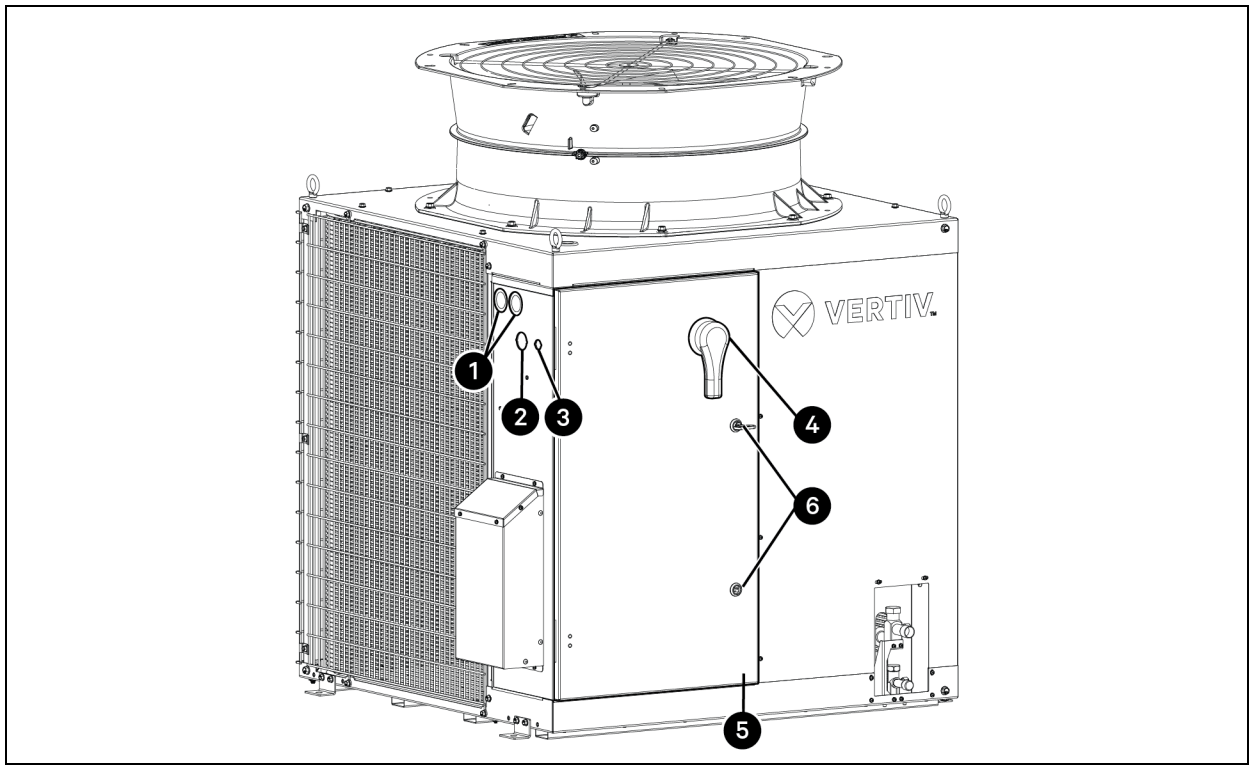
The power supply depends on the unit; refer to Table 2.9, electrical data; to see the power supply voltage for each model. The size of the power cable must support the full load current. Do not fit the supply cable in the raceways inside the electrical panel. Use multipolar cables with sheath (CEI20-22) only.

6.2 Power Supply Connection

Power is supplied to the evaporator from the condenser. Connect one end of the power supply cable to the switch disconnect on the evaporator side and the other to the feeder circuit breaker output inside the electrical panel on the condenser side.

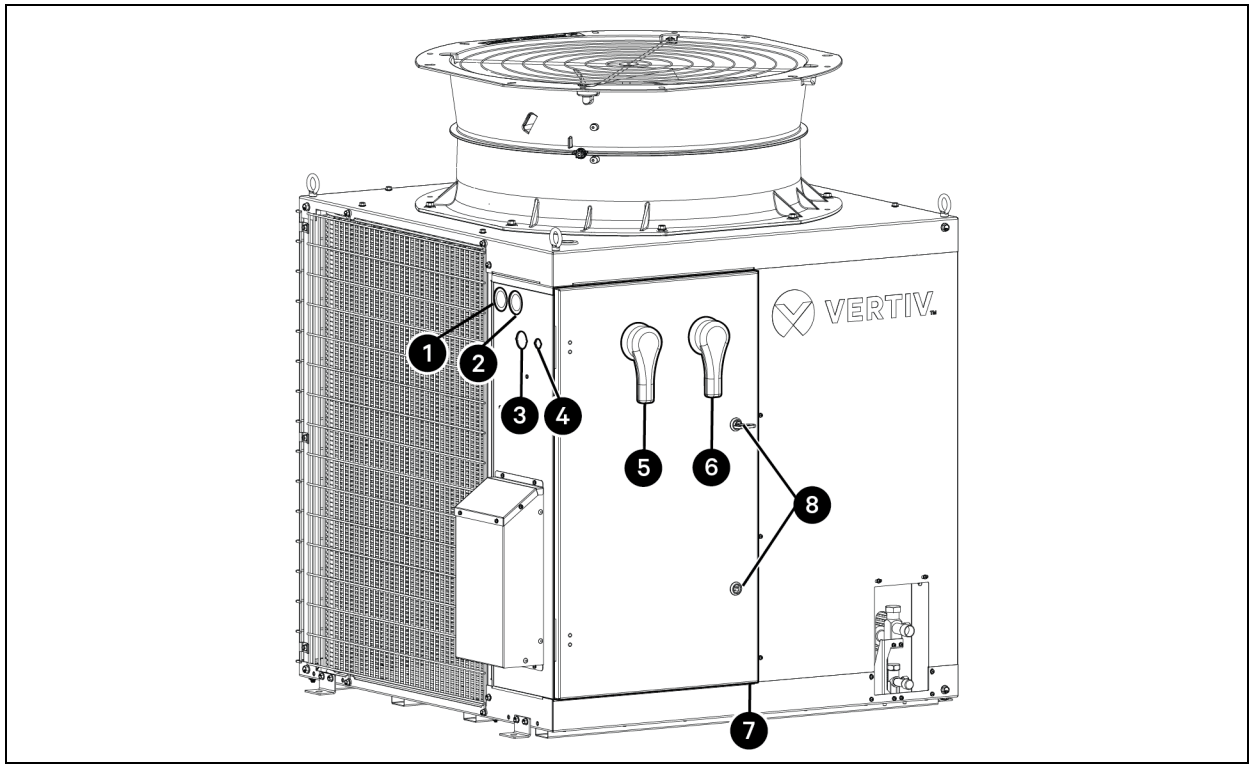
NOTE: Some units have dual power supply included. It works as a secondary power supply in case of current interruption in the main one. When power supply 1 fails, power supply 2 automatically takes over. When power supply 1 is restored, it automatically resumes its function as the primary power feed.

Figure 6.1 Location of the Electrical Connections Panel on Single Power Supply Condenser Units



Item	Description	Item	Description
1	Knockout for Power Cable Input	4	Fuse Switch Handle
2	Knockout for Power Cable Output	5	Electrical box cover
3	Knockout for Communication Cable Input	6	Cover Locks

Figure 6.2 Location of the Electrical Connections Panel on Dual Power Supply Condenser Units

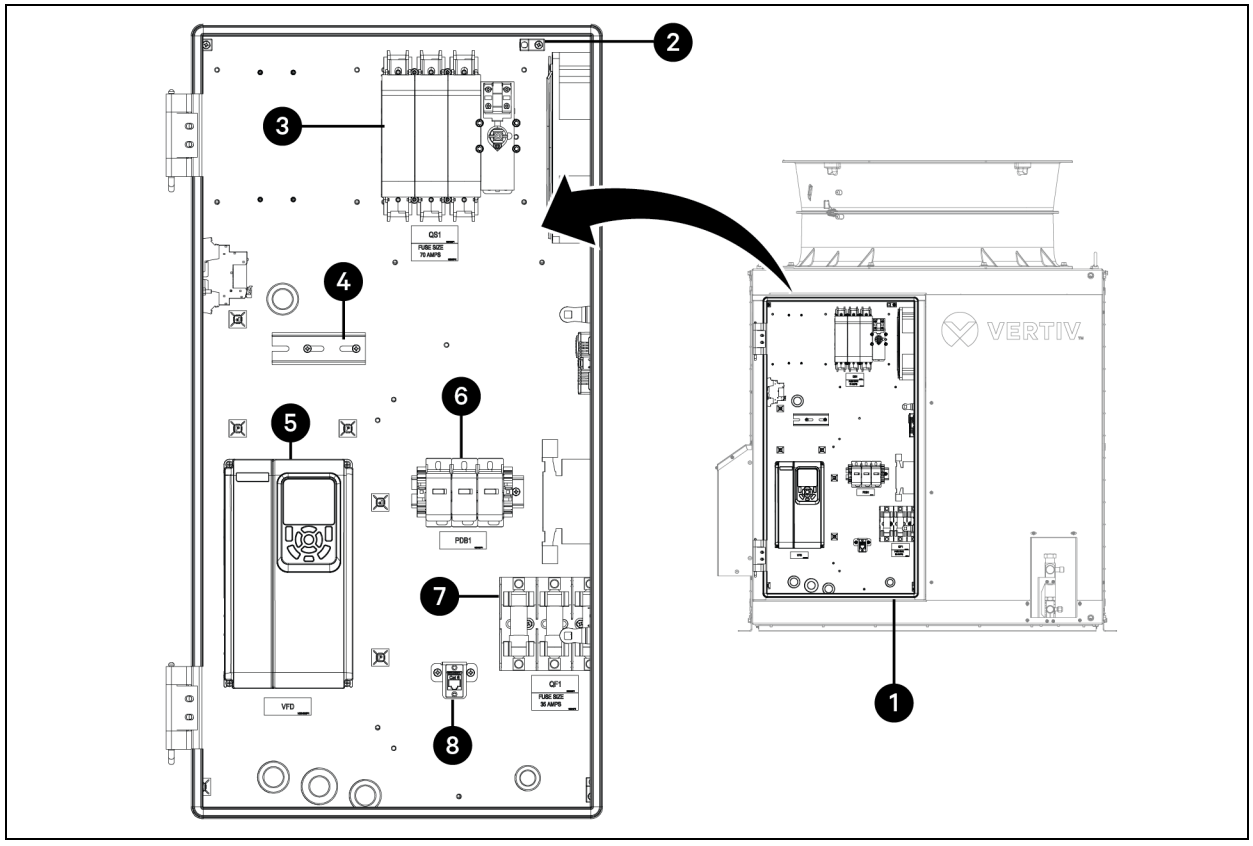


Item	Description	Item	Description
1	Knockout for Primary power source Power Cable Input	5	Primary power source Fuse Switch Handle
2	Knockout for Secondary power source Power Cable Output	6	Secondary power source Fuse Switch Handle
3	Knockout for Power cable Output	7	Electrical Box cover
4	Knockout for Communication Cable Input	8	Cover Locks

To connect the power supply cables:

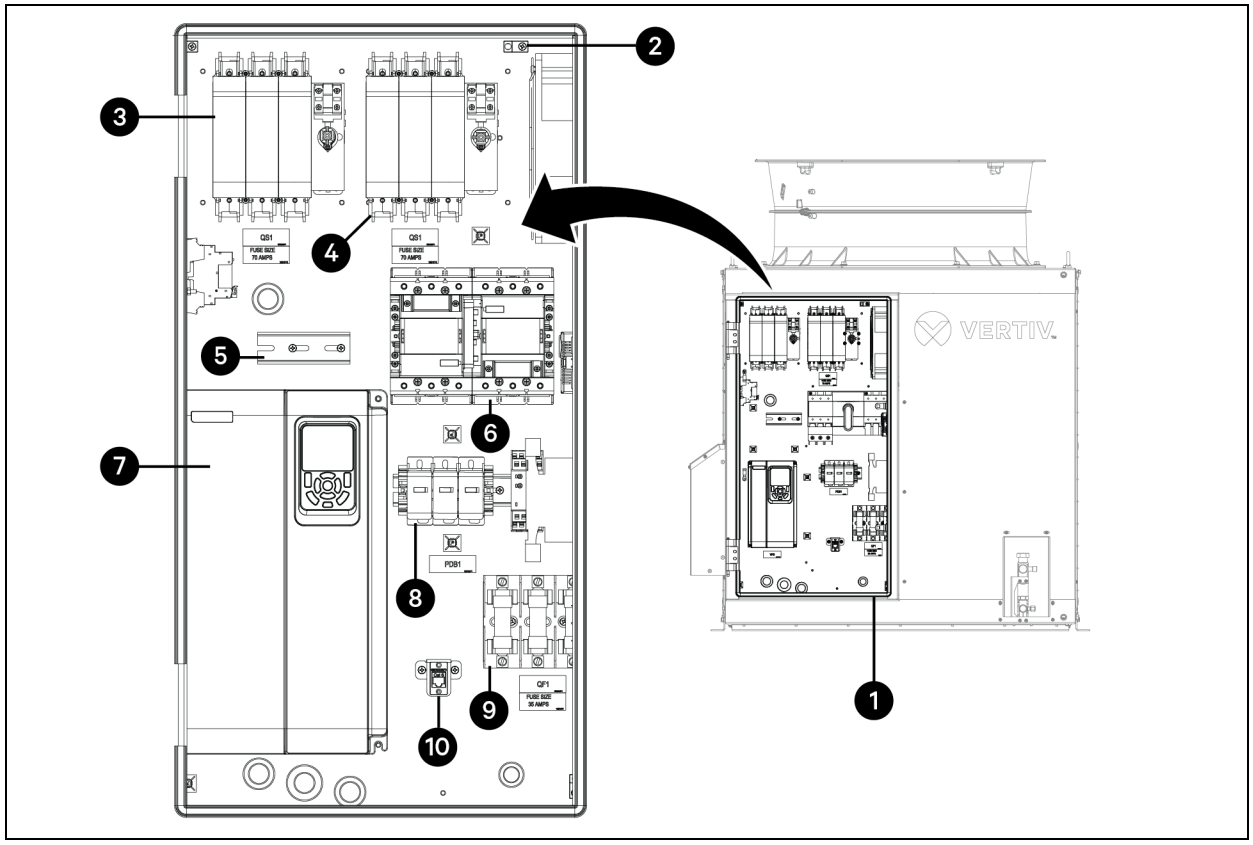
1. The power supply cables must enter the electrical box from the top left side of it. The electrical box includes two knockouts, one for the primary power supply and the second for the dual power supply, in case the unit includes this option. Refer to figure 6.1 to see where they are located on the Condenser.
2. Viewing the unit from the front of the electrical box, the primary source connection is located at the top of the left side fuse switch disconnect; if the unit includes a dual power supply, the secondary power supply connection is located at the top of the proper fuse switch disconnect. Open the electrical box cover and connect it to the main disconnect line fuse switch lugs. The phase connection should be from left to right, L1, L2, and L3.
3. Make the PE connection to the ground lug at the side of the fuse switch disconnect (As shown in figure 6.3). If the unit includes a dual power supply, the PE connection from the secondary source must be connected independently to the ground lug in the left side panel of the electrical box. Refer to figure 6.6 to see where it is located.

Figure 6.3 Inside Electrical box, Single Power Supply units



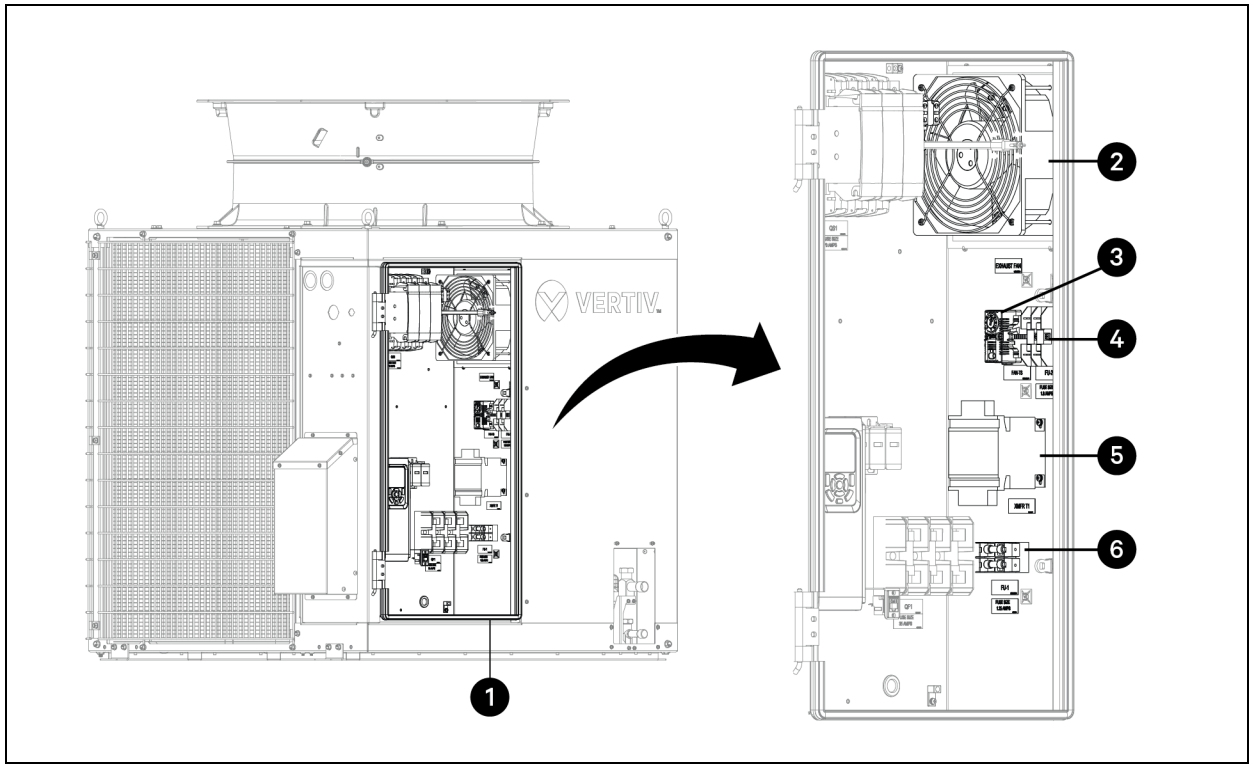
Item	Description	Item	Description
1	Electrical Box (E-box)	5	Inverter
2	PE Terminal	6	Power distribution block
3	Power Supply Disconnect Switch	7	Inverter Fuse
4	Rail for Power Meter Accessory	8	Evaporator Communication Control Port

Figure 6.4 Inside Electrical Box for Dual Power Supply Units.



Item	Description	Item	Description
1	Electrical Box (E-box)	6	Automatic Transfer Switch
2	PE Terminal	7	Inverter
3	Power Supply A disconnect Switch	8	Power distribution blocks
4	Power Supply B disconnect Switch	9	Inverter Fuse
5	Rail for Power Meter Accessory	10	Evaporator Communication Control Port

Figure 6.5 Inside Electrical Box of the Condensing Units, part two.

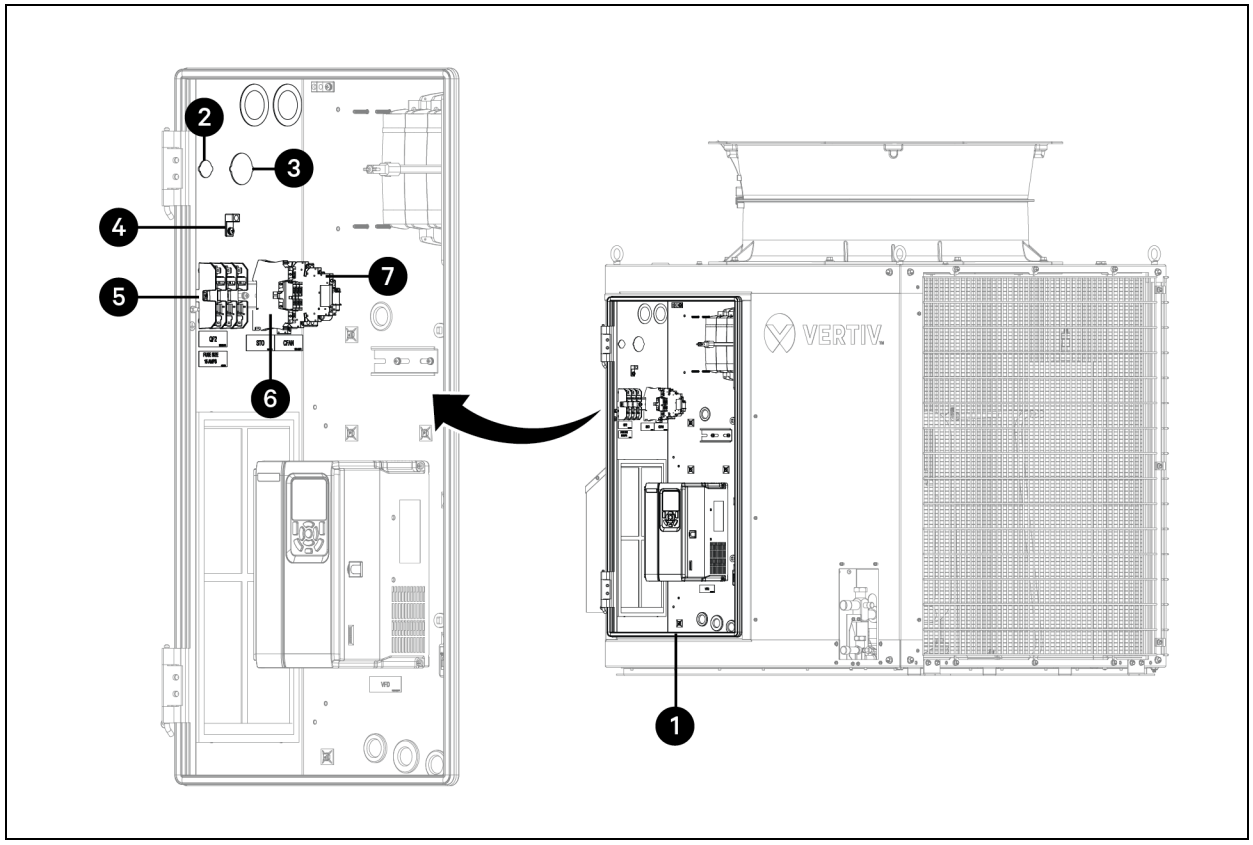


Item	Description	Item	Description
1	Electrical Box (E-box)	4	Exhaust fan / Low Ambient Version fuse block
2	Exhaust fan	5	460:230V Transformer
3	Exhaust fan thermostat	6	Indoor Unit fuse block

NOTE: The 460:230V Transformer comes only in the electrical box of the following Condensing Unit models: CUD284, CUL284, CUD354, CUL354.

NOTE: The temperature setting for the Exhaust Fan Thermostat is 95°F (35°C).

Figure 6.6 Inside Electrical Box of the Condensing Units, part three.



Item	Description	Item	Description
1	Electrical Box (E-box)	5	Fan Motor fuse
2	Knockout for Communication cable input	6	Communication terminal Blocks
3	Knockout for Power cable input	7	Leak detection routine relay
4	PE Terminal		

6.3 Connecting Communications Cable

The communications cable is not provided with the unit. To connect the communications cable, connect one end of the cable to the RJ45 terminal of the evaporator and connect the other end to the other end to the RJ45 terminal provided on the electrical box. This cable has communication wires as well as the 24 V wires used for the leak detection mitigation routine. The iCOM 2 board controls the operation of condenser fans through the communications cable.

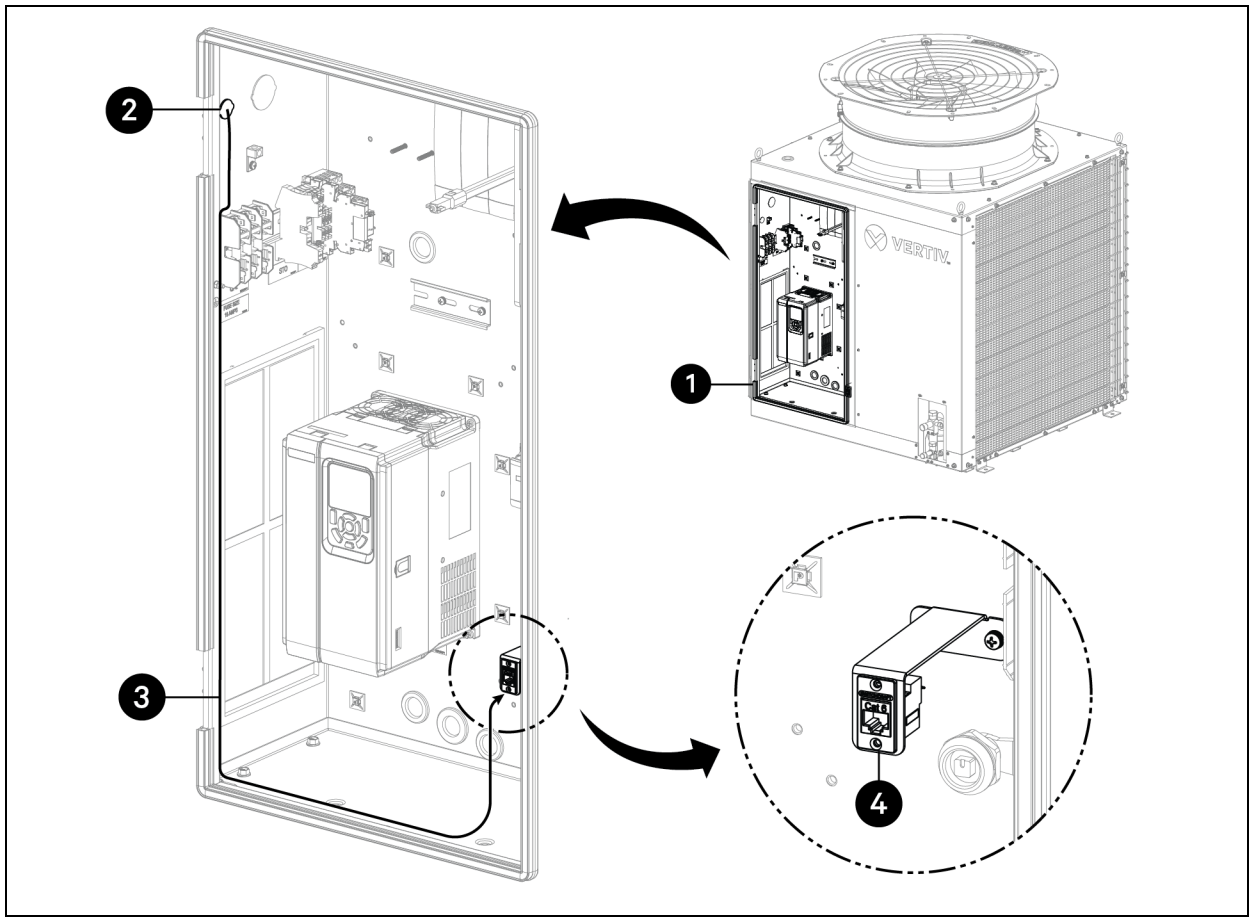
To make this connection, follow the next steps:

1. Open the electrical box cover, ensure the communication cable is routed, and enter through the knockout in the left side of the electrical box.
2. Connect RJ45 terminal in the located into the unit Evaporator Communication Control Port shown in Figure 6.7 .

NOTE: The communication cables plan to be routed at least 12 in (300 mm) from any power cable.

NOTE: Verify against the electrical diagram to ensure proper connection

Figure 6.7 Communications Port location.



Item	Description	Item	Description
1	Electrical Box (E-box)	3	Cable route
2	Knockout for Communication Cable	4	Evaporator Communication Control Port

6.4 Connecting Indoor Unit Electrical Wiring

WARNING! Arc flash and electric shock hazard. Open all local and remote electric power-supply disconnect switches, verify with a voltmeter that power is Off, and wear appropriate, OSHA-approved personal protective equipment (PPE) per NFPA 70E before working within the electric control enclosure. Failure to comply can cause severe injury or death. As applicable, the customer must provide earth ground to the unit, per NEC, CEC, and local codes. Before proceeding with installation, read all instructions, verify that all the parts are included, and check the nameplate to be sure the voltage matches the available utility power. The iCOM 2 controller does not isolate power from the unit, even in the "Unit Off" mode. Some internal components require and receive power even during the "Unit Off" mode of the controller. The only way to ensure NO voltage inside the unit is to install and open a remote disconnect switch. Refer to the unit electrical schematic. Follow all local codes.

The general guidelines for connecting electrical and communication cables to the indoor unit are the same for each system. However, the actual connections on the terminal block will differ. Refer to the manual that you are wiring for the correct connection from the load side of the circuit breaker evaporator feeder. Depending on your indoor unit, the feeder circuit breaker's location and circuit breaker capacity may vary.

Connect the electrical cable to the indoor unit by connecting the wires to the control board individually according to the Condensing Unit connection. Be sure that the color of the cables at the outdoor unit and the terminal numbers are the same as those for the indoor unit.

7 Checklists

7.1 Piping Checklist

Major Component Rough-in

1. The unit was connected properly following local codes and the product installation procedures.
2. All literature and bagged accessories have been removed from the unit.
3. The indoor unit was installed, adequately supported, and located indoors in a noncorrosive environment.
4. The unit's gravity condensate drain line was connected and routed to drain away properly, or, if installed in a mechanical room, it was connected and properly routed to a drain terminal.

Piping and Insulation

1. Copper piping connections.
2. Over 5/8 in. (15.9 mm)—Rigid ACR only
3. 5/8 in. (15.9 mm) and under—can use soft ACR.
4. 15% silver brazing material only.
5. All refrigerant pipes and valves were insulated separately. Insulation butts up against the walls of the indoor units. No gaps or cracks. Insulation was not compressed at the clamps and hangers.

Brazing Practices

1. Dry nitrogen was used for purging during brazing (constant 3 psi (21 kPa) while brazing).

Installation

Refer to the details in the Installation section for more information on any procedure.

Refrigerant Piping

1. All pipe materials were properly stored, capped, and cleaned. All burrs were removed after cutting, and pipe ends were reamed before brazing.
2. During refrigerant pipe installation, each pipe segment was recorded, along with its length (including expansion loops, offsets, and double-back sections), sizes, and the quantity and type of elbows used.
3. All long runs of straight pipe were provided with expansion loops.
4. A torque wrench and backup wrench were used to tighten all flare connections.
5. Before tightening flare fittings, the back side of all flares was lubricated with a small drop of PVE refrigeration oil.
6. Ensure all field-made flares are 45°. Used factory-supplied flare nuts only.
7. Pipe segments were properly supported, and all wall penetrations were sleeved.
8. Pipe insulation was not compressed at any point..
9. Best practice included installing a minimum of 20-in. (51 cm) straight pipe between each elbow.
10. The actual refrigerant charge is in accordance with the room size within which the refrigerant-containing parts are installed.
11. The ventilation machinery and outlets operate adequately and are not obstructed.
12. If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.

13. Markings on the equipment continue to be visible and legible. Markings and signs that are illegible shall be corrected.
14. Refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance that may corrode refrigerant-containing components unless the components are constructed of materials that are inherently resistant to being corroded or are suitably protected against being so corroded.

7.2 Electrical Checklist

After the system's electrical installation is completed, the following requirements should be met.

Power Wire and Communication Cables

1. Power wiring was connected to a power supply corresponding to the unit's nameplate.
2. Ground wire was installed and adequately terminated at the unit.
3. The power supplied was clean, with voltage fluctuations within specifications. (±10% of nameplate).
4. Power wiring to the Condensing Unit was installed per all local electrical code requirements.
5. Power wiring to the indoor unit was installed per all local electrical code requirements.
6. Communication type RS-485-BUS type.
7. Straight-through ethernet cables (RJ45) were used for communication connections.
8. Used appropriate crimping tools to attach ring, spade, or ferrule terminals at all power wiring and control cable terminations.
9. During wiring, the distance between power and control wires should be kept above 15cm. At least two inches (51 mm) must separate the power wire from the communication/ground wire.

Table 7.1 Electrical Inspection Checklist

Particulars	Results
The system's electrical loop has no open-circuit or short-circuit existing in the electrical connection.	
The power supply voltage meets the rated voltage on the unit's nameplate.	
Verify that the power wire sizing matches the recommended gauge for the unit that is being installed.	
Power and ground cables are connected to the breaker switches, indoor unit, and Condensing Unit correctly per the norms.	
The ratings of the Miniature Circuit Breakers (MCBs) and fuses are correct.	
The control cables are configured and, subsequently, appropriately fixed.	
All the cables and connector connections, including the fixing blocks, are firmly and appropriately fixed.	

As soon as all the above particulars are covered, close the electrical connections panel and proceed with the start-up and functional testing. If there is any issue during the start-up and functional testing, follow the troubleshooting indications in Chapter 10.

8 Comission

8.1 Charging the refrigerant

Prior to starting with the piping connection, please read the Important Safety Instructions section of this Manual.

WARNING! This Condensing Unit shall be connected only to an Evaporator Unit suitable for R32 refrigerant.

WARNING! Every working procedure that affects safety means shall only be carried out by competent persons.

NOTE: The unit is not charged with refrigerant from the factory. You need to charge refrigerant on site. The refrigerant for the unit is R32.

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

In addition to conventional charging procedures, the following requirements shall be followed:

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the refrigerant system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete. Indoor and outdoor units are provided with locations where the total refrigerant charge can be written.
- Extreme care shall be taken not to overfill the refrigerant system.

8.2 Adding Lubricating Oil

After evacuating the unit, as indicated in section Pipe Work on page 12 , connect the lubricating oil tank to the Schrader valve, shown in Figure 1.1, the oil is drawn into the unit.

8.3 Refrigerant and Lubricating Oil Charges

NOTICE

Vertiv™ CoolPhase Condensing Unit is designed to be connected with different families of Vertiv™ evaporator units. The refrigerant charge will be determined in the field during the installation of the whole system; nevertheless, these units require a minimum refrigerant charge to work correctly without damage.

Table 8.1 Refrigerant and Lubricant Oil charges for Standard 28 kW Condenser Units paired with Vertiv™ Coolphase Row 300 wide Standard Units.

Total refrigerant charge forVertiv™ CoolPhase Row 300 + CUD281 and CUD284					
Liquid pipe length ft (m)	Liquid Line Diameter in (mm)	Suction Line Diameter in (mm)	Total refrigerant charge lb (kg)	Extra lubricating oil charge oz (ml)	Effective Dispersal Volume ft3 (m3)
16.4(5)	1/2 (12.7)	7/8 (22.23)	10.70 (4.85)	0	1116.96 (31.63)
32.8(10)	1/2 (12.7)	7/8 (22.23)	11.92 (5.41)	0	1244.64 (35.24)
49.2(15)	5/8 (15.88)	1 1/8 (28.58)	15.26 (6.92)	0	1593.19 (45.11)
65.6 (20)	5/8 (15.88)	1 1/8 (28.58)	17.19 (7.80)	0	1794.49 (50.81)
82 (25)	5/8 (15.88)	1 1/8 (28.58)	19.12 (8.67)	0	1995.80 (56.51)
98.4 (30)	5/8 (15.88)	1 1/8 (28.58)	21.06 (9.55)	8.4 (249.1)	2197.10 (62.21)
114.8 (35)	3/4 (19.05)	1 3/8 (34.93)	29.75 (13.50)	11.9 (352.2)	3106.77 (87.97)
131.2 (40)	3/4 (19.05)	1 3/8 (34.93)	32.67 (14.81)	13.1 (386.5)	3409.07 (96.53)
147.6 (45)	3/4 (19.05)	1 3/8 (34.93)	35.55 (16.13)	14.2 (420.7)	3711.61 (105.10)
164 (50)	3/4 (19.05)	1 3/8 (34.93)	38.44 (17.44)	15.4 (455)	4014.14 (113.67)
180.4 (55)	3/4 (19.05)	1 3/8 (34.93)	41.32 (18.76)	16.5 (489.3)	4316.67 (122.23)
196.8 (60)	3/4 (19.05)	1 3/8 (34.93)	44.21 (20.07)	17.7 (523.6)	4619.20 (130.80)
213.2 (65)	3/4 (19.05)	1 3/8 (34.93)	47.09 (21.39)	18.9 (557.9)	4921.51 (139.36)
229.6 (70)	3/4 (19.05)	1 3/8 (34.93)	49.98 (22.70)	20 (592.2)	5224.04 (147.93)
246 (75)	3/4 (19.05)	1 3/8 (34.93)	52.86 (24.02)	21.2 (626.5)	5526.57 (156.50)
262.4 (80)	3/4 (19.05)	1 3/8 (34.93)	55.75 (25.33)	22.3 (660.8)	5829.11 (165.06)
278.8 (85)	7/8 (22.23)	1 5/8 (41.28)	75.70 (34.33)	30.3 (895.4)	7898.52 (223.66)
295.2 (90)	7/8 (22.23)	1 5/8 (41.28)	79.58 (36.09)	31.8 (941.4)	8304.81 (235.17)

NOTE: If the lengths, diameters, and charges are intermediate to those shown in the table, the next higher values should be taken.

Table 8.2 Refrigerant and Lubricant Oil charges for Low ambient 28 kW Condenser Units paired with Vertiv™ CoolPhase Row 300 wide Low Ambient Units.

Total refrigerant charge for Vertiv™ CoolPhase Row 300 Low Ambient + CUL281 and CUL284					
Liquid pipe length ft (m)	Liquid Line Diameter in (mm)	Suction Line Diameter in (mm)	Total refrigerant charge lb (kg)	Extra lubricating oil charge oz (ml)	Effective Dispersal Volume ft3 (m3)
16.4(5)	1/2 (12.7)	7/8 (22.23)	21.72 (9.85)	8.7 (257)	2267.27 (64.20)
32.8(10)	1/2 (12.7)	7/8 (22.23)	22.95 (10.41)	9.2 (271.5)	2394.96 (67.82)
49.2(15)	5/8 (15.88)	1 1/8 (28.58)	26.28 (11.92)	10.5 (311)	2743.50 (77.69)
65.6 (20)	5/8 (15.88)	1 1/8 (28.58)	28.22 (12.80)	11.3 (333.8)	2944.81 (83.39)
82 (25)	5/8 (15.88)	1 1/8 (28.58)	30.14 (13.67)	12.1 (356.6)	3146.11 (89.09)
98.4 (30)	5/8 (15.88)	1 1/8 (28.58)	32.08 (14.55)	12.8 (379.5)	3347.42 (94.79)
114.8 (35)	3/4 (19.05)	1 3/8 (34.93)	40.79 (18.50)	16.3 (482.6)	4257.09 (120.55)
131.2 (40)	3/4 (19.05)	1 3/8 (34.93)	43.67 (19.81)	17.5 (516.9)	4559.39 (129.11)
147.6 (45)	3/4 (19.05)	1 3/8 (34.93)	46.58 (21.13)	18.6 (551.1)	4861.92 (137.67)
164 (50)	3/4 (19.05)	1 3/8 (34.93)	49.47 (22.44)	19.8 (585.4)	5164.45 (146.24)
180.4 (55)	3/4 (19.05)	1 3/8 (34.93)	52.38 (23.76)	21 (619.7)	5466.99 (154.81)
196.8 (60)	3/4 (19.05)	1 3/8 (34.93)	55.27 (25.07)	22.1 (654)	5769.52 (163.37)
213.2 (65)	3/4 (19.05)	1 3/8 (34.93)	58.18 (26.39)	23.3 (688.3)	6071.82 (171.93)
229.6 (70)	3/4 (19.05)	1 3/8 (34.93)	61.07 (27.70)	24.4 (722.6)	6374.36 (180.50)
246 (75)	3/4 (19.05)	1 3/8 (34.93)	63.98 (29.02)	25.6 (756.9)	6676.89 (189.07)
262.4 (80)	3/4 (19.05)	1 3/8 (34.93)	66.88 (30.33)	26.8 (791.2)	6979.42 (197.64)
278.8 (85)	7/8 (22.23)	1 5/8 (41.28)	86.74 (39.33)	34.7 (1025.8)	9048.84 (256.23)
295.2 (90)	7/8 (22.23)	1 5/8 (41.28)	90.58 (41.09)	36.2 (1071.8)	9455.13 (267.74)

NOTE: If the lengths, diameters, and charges are intermediate to those shown in the table, the next higher values should be taken.

Table 8.3 Refrigerant and Lubricant Oil charges for Standard 35 kW Condenser Units paired with Vertiv™ Coolphase Row 600 wide Standard Units.

Total refrigerant charge for Vertiv™ Coolphase Row 600 + CUD351 and CUD354					
Liquid pipe length ft (m)	Liquid Line Diameter in (mm)	Suction Line Diameter in (mm)	Total refrigerant charge lb (kg)	Extra lubricating oil charge oz (ml)	Effective Dispersal Volume ft3 (m3)
16.4(5)	1/2 (12.7)	7/8 (22.23)	11.79 (5.35)	0	1231.99 (34.89)
32.8(10)	1/2 (12.7)	7/8 (22.23)	14.33 (6.50)	0	1506.91 (42.67)
49.2(15)	5/8 (15.88)	1 1/8 (28.58)	16.36 (7.42)	0	1708.22 (48.37)
65.6 (20)	5/8 (15.88)	1 1/8 (28.58)	18.30 (8.30)	0	1909.52 (54.07)
82 (25)	5/8 (15.88)	1 1/8 (28.58)	25.07 (11.37)	10 (296.6)	2616.74 (74.10)
98.4 (30)	5/8 (15.88)	1 1/8 (28.58)	27.95 (12.68)	11.2 (330.9)	2919.27 (82.66)
114.8 (35)	3/4 (19.05)	1 3/8 (34.93)	30.95 (14.04)	12.3 (365.2)	3221.80 (91.23)
131.2 (40)	3/4 (19.05)	1 3/8 (34.93)	33.75 (15.31)	13.5 (399.5)	3524.10 (99.79)
147.6 (45)	3/4 (19.05)	1 3/8 (34.93)	36.66 (16.63)	14.7 (433.8)	3826.64 (108.36)
164 (50)	3/4 (19.05)	1 3/8 (34.93)	39.55 (17.94)	15.8 (468.1)	4129.17 (116.93)
180.4 (55)	3/4 (19.05)	1 3/8 (34.93)	42.46 (19.26)	17 (502.4)	4431.70 (125.49)
196.8 (60)	3/4 (19.05)	1 3/8 (34.93)	57.30 (25.99)	22.9 (678)	5981.41 (169.37)
213.2 (65)	3/4 (19.05)	1 3/8 (34.93)	61.20 (27.76)	24.5 (724.1)	6387.93 (180.89)
229.6 (70)	3/4 (19.05)	1 3/8 (34.93)	65.10 (29.53)	26 (770.2)	6794.22 (192.39)
246 (75)	3/4 (19.05)	1 3/8 (34.93)	68.98 (31.29)	27.6 (816.3)	7200.74 (203.90)
262.4 (80)	3/4 (19.05)	1 3/8 (34.93)	72.88 (33.06)	29.2 (862.3)	7607.03 (215.41)
278.8 (85)	7/8 (22.23)	1 5/8 (41.28)	76.79 (34.83)	30.7 (908.4)	8013.55 (226.92)
295.2 (90)	7/8 (22.23)	1 5/8 (41.28)	80.67 (36.59)	32.3 (954.5)	8419.85 (238.42)

NOTE: If the lengths, diameters, and charges are intermediate to those shown in the table, the next higher values should be taken.

Table 8.4 Refrigerant and Lubricant Oil charges for Low Ambient 35 kW Condenser Units paired with Vertiv™ Coolphase Row 600 wide Low Ambient Units.

Total refrigerant charge for Vertiv™ Coolphase Row 600 Low Ambient + CUL351 and CUL354					
Liquid pipe length ft (m)	Liquid Line Diameter in (mm)	Suction Line Diameter in (mm)	Total refrigerant charge lb (kg)	Extra lubricating oil charge oz (ml)	Effective Dispersal Volume ft3 (m3)
16.4(5)	1/2 (12.7)	7/8 (22.23)	30.53 (13.85)	12.2 (361.3)	3187.52 (90.26)
32.8(10)	1/2 (12.7)	7/8 (22.23)	33.18 (15.05)	13.3 (392.5)	3462.45 (98.05)
49.2(15)	5/8 (15.88)	1 1/8 (28.58)	35.10 (15.92)	14 (415.3)	3663.75 (103.75)
65.6 (20)	5/8 (15.88)	1 1/8 (28.58)	37.04 (16.80)	14.8 (438.1)	3865.06 (109.45)
82 (25)	5/8 (15.88)	1 1/8 (28.58)	43.81 (19.87)	17.5 (518.3)	4572.27 (129.47)
98.4 (30)	5/8 (15.88)	1 1/8 (28.58)	46.69 (21.18)	18.7 (552.6)	4874.80 (138.04)
114.8 (35)	3/4 (19.05)	1 3/8 (34.93)	49.60 (22.50)	19.8 (586.9)	5177.34 (146.61)
131.2 (40)	3/4 (19.05)	1 3/8 (34.93)	52.49 (23.81)	21 (621.2)	5479.64 (155.17)
147.6 (45)	3/4 (19.05)	1 3/8 (34.93)	55.40 (25.13)	22.2 (655.5)	5782.17 (163.73)
164 (50)	3/4 (19.05)	1 3/8 (34.93)	58.29 (26.44)	23.3 (689.7)	6084.71 (172.30)
180.4 (55)	3/4 (19.05)	1 3/8 (34.93)	61.20 (27.76)	24.5 (724)	6387.24 (180.87)
196.8 (60)	3/4 (19.05)	1 3/8 (34.93)	76.04 (34.49)	30.4 (899.7)	7936.94 (224.75)
213.2 (65)	3/4 (19.05)	1 3/8 (34.93)	79.94 (36.26)	32 (945.8)	8343.46 (236.26)
229.6 (70)	3/4 (19.05)	1 3/8 (34.93)	83.84 (38.03)	33.5 (991.9)	8749.76 (247.77)
246 (75)	3/4 (19.05)	1 3/8 (34.93)	87.72 (39.79)	35.1 (1037.9)	9156.28 (259.28)
262.4 (80)	3/4 (19.05)	1 3/8 (34.93)	91.62 (41.56)	36.7 (1084)	9562.57 (270.78)
278.8 (85)	7/8 (22.23)	1 5/8 (41.28)	95.53 (43.33)	38.2 (1130.1)	9969.09 (282.29)
295.2 (90)	7/8 (22.23)	1 5/8 (41.28)	99.41 (45.09)	39.8 (1176.1)	10375.38 (293.80)

NOTE: If the lengths, diameters, and charges are intermediate to those shown in the table, the next higher values should be taken.

8.4 Automatic Restart

The unit will automatically restart when power is restored after a power interruption.

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9 Maintenance

WARNING! Every working procedure that affects safety means shall only be carried out by competent persons.

WARNING! All maintenance operations must be carried out strictly by observing the European and National accident prevention regulations, especially those concerning electrical systems, refrigerators, and manufacturing resources. Only authorized and qualified technicians may maintain air conditioning equipment. The maintenance must adhere to the manufacturer’s instructions to keep all warranties valid.

WARNING! The work shall be performed when the system is de-energized. Stop the system by disconnecting all power supplies and powering the air conditioner. Check that the device's electrical components are off and not receiving a power supply.

WARNING! Power down the unit for 10 minutes before removing any cover.

WARNING! Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimized.

WARNING! Work in confined spaces shall be avoided.

WARNING! Hot work on the refrigerating equipment or any associated parts must be performed with the appropriate fire extinguishing equipment. A dry powder or CO2 fire extinguisher must be adjacent to the charging area.

WARNING! No person carrying out work in relation to the refrigerating system, which involves exposing any pipework, shall use any ignition sources in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the installation site, repair, removal, and disposal, during which refrigerant can be released into the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. “No Smoking” signs shall be displayed.

WARNING! Before breaking into the system or conducting hot work, ensure the area is open or adequately ventilated. Ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

WARNING! If a fault exists that could compromise safety, no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the equipment owner so all parties are advised.

WARNING! Sealed electrical components shall be replaced. Do not attempt to repair those components.

WARNING! Intrinsically safe components must be replaced. Do not attempt to repair those components.

WARNING! Under no circumstances, potential sources of ignition shall be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

WARNING! If a refrigerant leakage requires brazing, all the refrigerant shall be recovered from the system or isolated (by means of shut-off valves) in a part of the system remote from the leak. Refrigerant removal shall be performed following manufacturer instructions.

CAUTION: Work shall be undertaken under a controlled procedure to minimize the risk of flammable gas or vapors being present while the work is being performed.

CAUTION: All maintenance staff and others working in the local area shall be instructed on the nature of the work being carried out.

CAUTION: The area shall be checked with an appropriate refrigerant detector prior to and during work to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants.

SAFETY INFORMATION

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

NOTICE

Risk of release of hazardous substances into the environment. It can cause environmental pollution and violation of environmental regulations.

9.1 Condensing Unit Maintenance

9.1.1 Condenser

To maintain the condenser:

- Clean the air-cooled condenser coil of all debris that will inhibit airflow. This can be done with compressed air, with water from a garden hose, or with a commercial coil cleaner.
- Check that there are no bent or damaged coil fins.
- Do not permit snow to accumulate around the Condensing Unit.
- Inspect fans, motors, and controls for proper operation.
- Check all piping and capillaries for proper support.
- Check all refrigerant lines for signs of leaks.

9.1.2 Fan

Check that the fan runs normally and check it for problems such as abnormal noise, vibration, and bearing failure.

9.1.3 Refrigeration Circuit

Note the following when maintaining the refrigerant circuit:

- When either removing (for repairs) or charging refrigerant, this must be performed on both the compressor's high- and low-pressure sides simultaneously.
- The compressor copper-plated steel connections should be brazed with a SIL-FOS material containing a minimum of 5% silver.

The following procedure must be followed when breaking into the refrigerant circuit to make repairs or for any other purpose:

1. Safely remove refrigerant following local and national regulations
2. Evacuate
3. Purge the circuit with inert gas
4. Evacuate
5. Continuously flush or purge with inert gas when using a flame to open circuit.
6. Open the circuit by cutting or brazing.

9.1.4 Refrigeration System

Perform the following steps for refrigeration system maintenance:

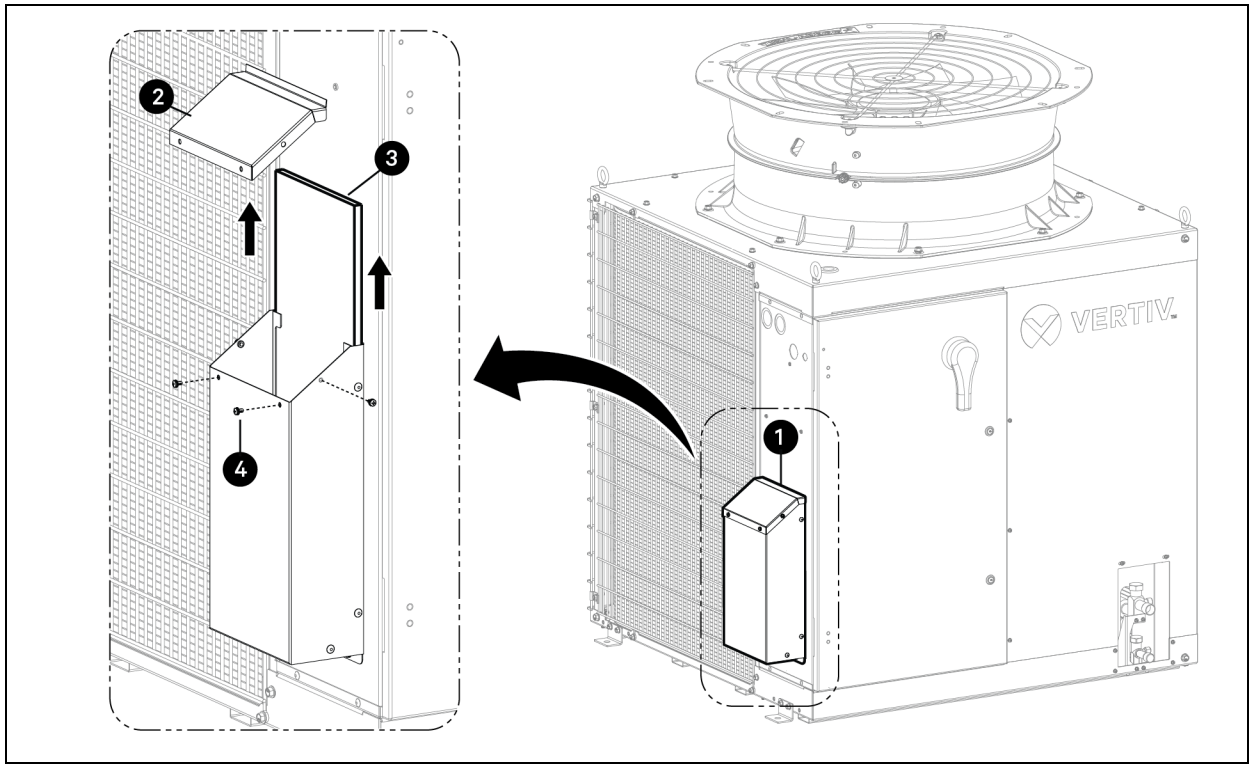
1. Check that the refrigeration pipes are firmly fixed. The refrigeration pipes shall not shake with the vibration of the wall, earth, or equipment frame. Otherwise, reinforce the refrigeration piping with pipe hangers for vibration isolation.
2. Look for signs of oil in or around the evaporator/condenser and interconnecting piping. Check for leaks in those areas with an electronic leak detector or soap bubbles if found.

9.1.5 Variable Frequency Driver (VFD) Box Air Filter

Please follow these steps to clean or replace the VFD box air filter:

1. Remove the VFD Box Cover by untightening the screws shown below.
2. After removing the cover, take out the filter by sliding it up.
3. Rinse the filter with clean water to remove debris.
4. Air-dry the filter completely, then reattach it to the unit.

Figure 9.1 Air Filter Removal



Item	Description	Item	Description
1	VFD Box	3	Air filter
2	Box Cover	4	Screws

9.2 Maintenance Schedule

Conduct monthly, quarterly, biannual, and annual checks according to the following guidelines.

Table 9.1 Maintenance Schedule.

Component	Check Items	Maintenance Period			
		Monthly by user	3 months	6 months	1 year
General	Check for irregular noise from unit fans.	X			
	Check for irregular noise from the compressor.	X			
	Check for irregular noise from remote condenser fans (if applicable).	X			
Fan	Verify that impellers move freely.		X		
	Check bearings.			X	
	Check that motor supports are fixed securely.			X	
Electronics	Check the condition of the contractors.			X	
	Check electrical connections.				X
	Check the operation of the controller.			X	
	Check unit operation sequence.			X	
Refrigerant circuit	Check compressor noise or vibrations.		X		
	Check the main refrigerant circuit pressure.		X		
	Check compressor suction superheat.		X		
	Check discharge temperature.		X		
Electrical Box Air Filter	Check for Debris or obstructions.		X		
Condenser	Check fan bearings.			X	
	Check that the fan motors are firmly secured.			X	
	Check coil condition.			X	
	Check fan speed controller operation.				X

Only original spare parts made by Vertiv™ may be used. Using third-party material can invalidate the warranty. When the spare parts must be brazed, be careful not to damage the internal parts (gaskets, seals, O-rings, etc.).

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10 Troubleshooting

Please check Table 10.1 below before contacting the service. If the problem persists after corrective action, contact Vertiv technical support (refer to Appendix D, Technical Support and Contacts).

Table 10.1 Self-service Troubleshooting

Problem	Possible Cause	Corrective Action
The unit does not work normally.	A burning smell and strange sounds are coming from the unit.	Turn off the unit, unplug the power cable, disconnect the power supply, and contact service.
	Water leaks from the indoor unit even when the humidity level is low.	
	The power cable is damaged, or it is generating excessive heat.	
	A switch, circuit breaker (safety, ground), or fuse is malfunctioning.	
	The unit generates an error code from self-diagnosis.	
	Incorrect cabling.	Check the communication cable connections.
	Incorrect scheduling setup.	Check the programmed Schedule settings.
The unit does not work.	The unit is unplugged.	Check to see if the power cord is plugged into the outlet or if the power isolators are switched on.
	A fuse explodes, or the power supply is blocked.	Check for wiring damage. Replace the fuse or check to see if the circuit breaker is tripped.
	Voltage is too high or too low.	Turn off the unit when a power failure occurs. When the power is restored, wait 3 minutes before turning on the unit.
	The unit was turned off automatically at a scheduled time.	Turn the unit on.
The condenser will not start.	No power to the condenser.	Assure the circuit breaker is in the ON position. Check the voltage at the outdoor breaker.
High-pressure alarm	Insufficient condenser airflow.	Clear the alien objects from the coil surface or near the air inlet.
	The condenser fan does not run.	Check fan motors. Check if the fan circuit breaker is in the ON position. Check if the Condensing Unit power cable connection is loose. Check if the Control cable from the drive is loose.

10.1 Refrigerant Leaks

CAUTION: Risk of exposure to excessive refrigerant concentration and oxygen depletion. It can cause illness or injury. The unit must be installed as indicated. If additional ventilation is needed, follow local or federal codes and take necessary measures to prevent the refrigerant concentration from exceeding safety limits in case of a refrigerant leak. Verify that the maximum refrigerant concentration level in the space where the indoor unit will be mounted meets the concentration limit for the application.

CAUTION: This unit is equipped with electrically powered safety measures. To be effective, the unit must be electrically powered at all times after installation, other than when servicing.

NOTE: Take appropriate actions at the end of HVAC equipment life to recover, recycle, reclaim, or destroy R32 refrigerant according to applicable national rules.

ASHRAE Standards 15-2010 and 34-2010 offer guidelines that address refrigerant safety and the maximum allowable refrigerant concentration in an occupied space. Refrigerant will dissipate into the atmosphere, but a specific volume of air is required for this to occur safely. For R32 refrigerant, the maximum allowable concentration is 4.8 lbs/1,000 ft3 of air in an occupied space. Buildings with 24-hour occupancy allow half of that concentration.

ASHRAE Standards 15 and 34 assume that if a system develops a leak, its entire refrigerant charge will dump into the area where the leak occurs. To meet ASHRAE Standards 15 and 34, calculate the refrigerant concentration that may occur in the smallest room volume on the system and compare the results to the maximum allowable concentration number. Also, consult state and local codes concerning refrigerant safety.

The system is designed to execute mitigation actions to avoid a hazardous refrigerant concentration in case of a leak. Do not turn off the unit. These may cause the refrigerant to stagnate and create a hazardous atmosphere.

Do not try to repair the unit yourself; call service personnel to address this issue.

After the leak has been repaired, the mitigation actions will remain operable for 5 minutes after the unit has been reset to dissipate any rest of refrigerant, and the unit will not be operable.

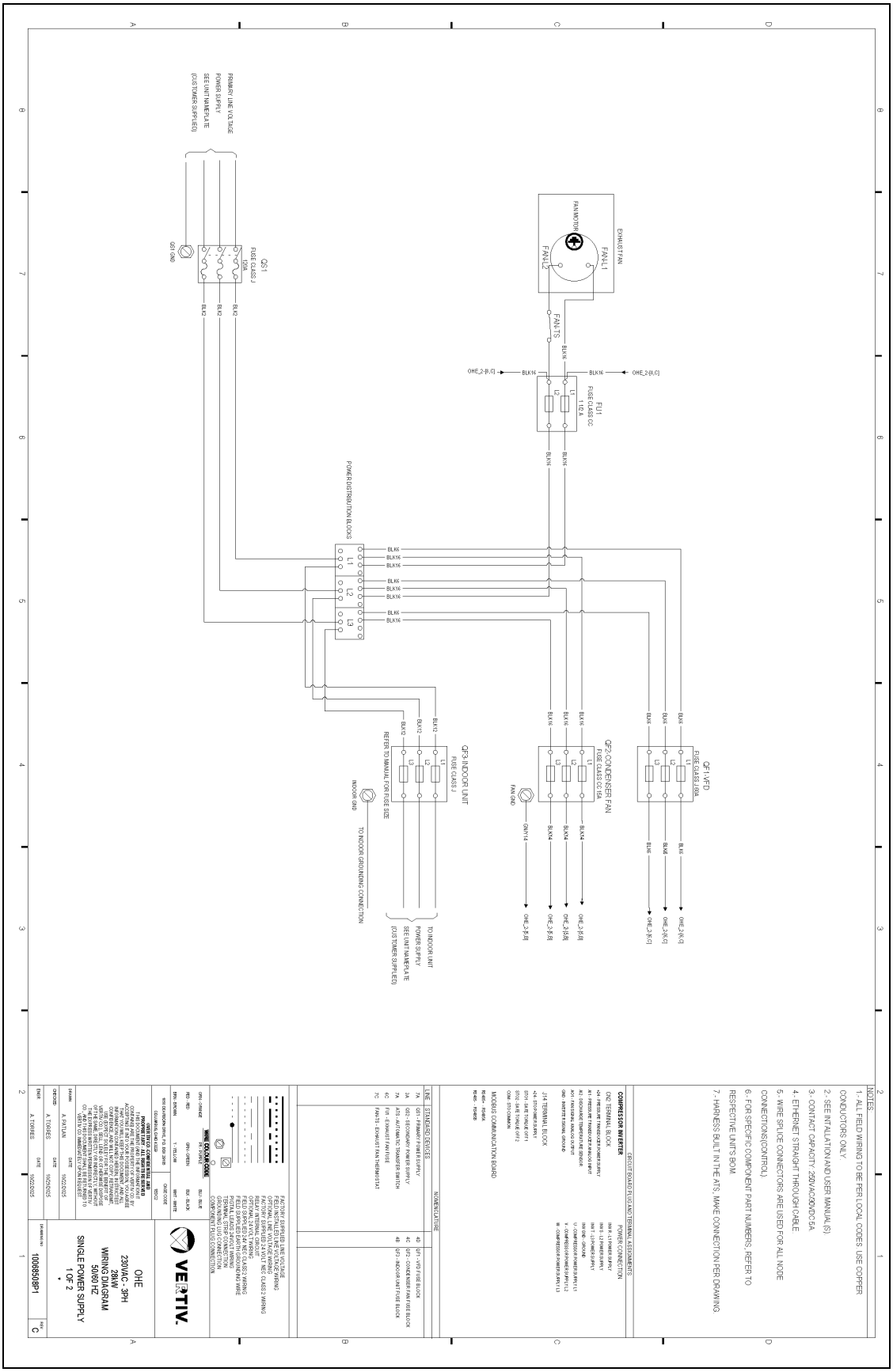
Once the mitigation actions have ended, you can use the appliance normally.

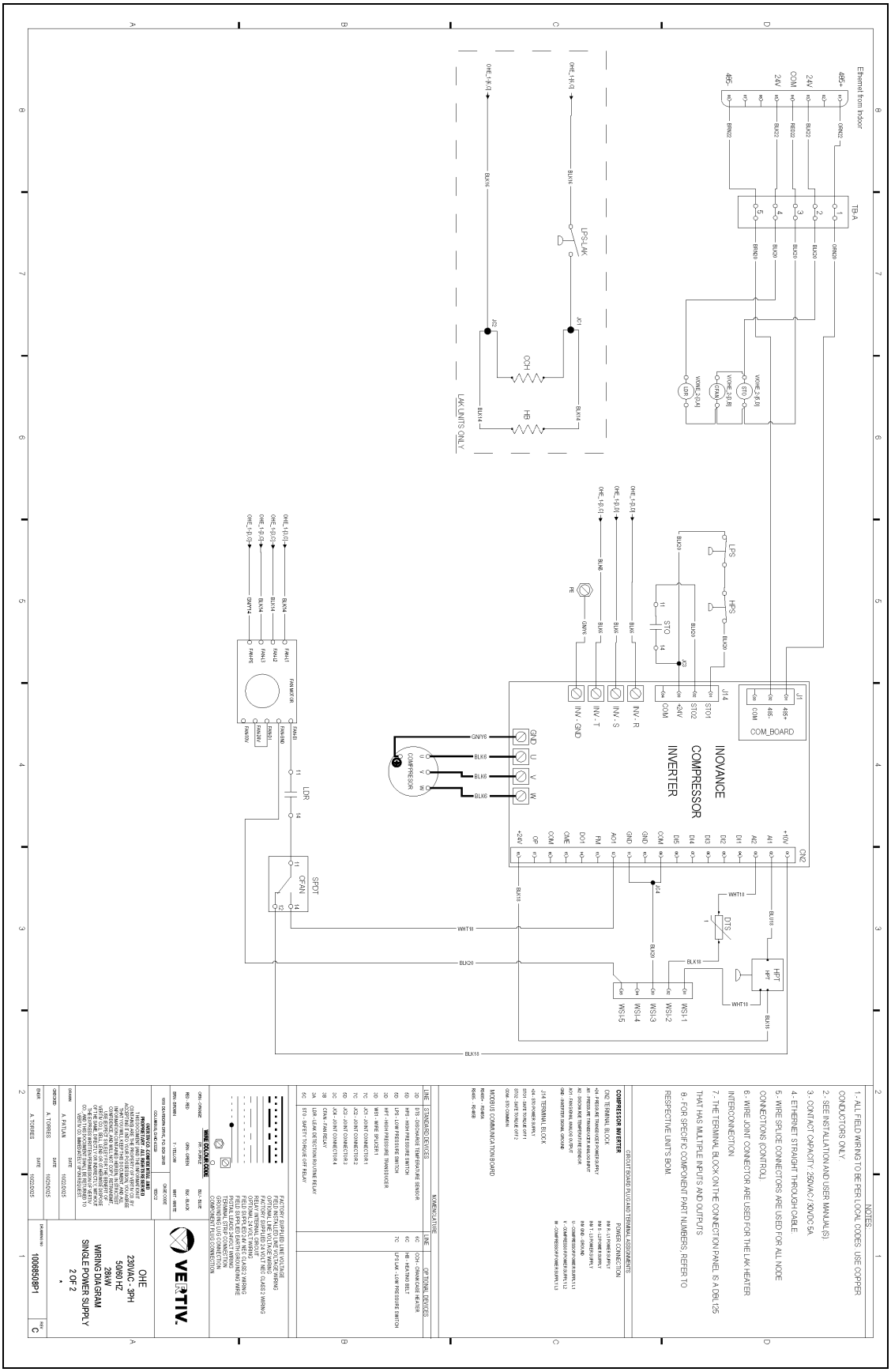
Appendices

Appendix A: Electrical Diagrams

Table 11.1 Electrical Diagrams

Drawing No.	Title
10068508P1DRW	28 kW 208/230V 3PH, Single Supply Models- Wiring Diagram
10068508P2DRW	28 kW 460V 3PH, Single Supply Models- Wiring Diagram
10068508P3DRW	35 kW 208/230V 3PH, Single Supply Models- Wiring Diagram
10068508P4DRW	35 kW 460V 3PH, Single Supply Models- Wiring Diagram
10068508P5DRW	28 kW 208/230V 3PH, Dual Supply Models- Wiring Diagram
10068508P6DRW	28 kW 460V 3PH, Dual Supply Models- Wiring Diagram
10068508P7DRW	35 kW 208/230V 3PH, Dual Supply Models- Wiring Diagram
10068508P8DRW	35 kW 460V 3PH, Dual Supply Models- Wiring Diagram
10068508P6DRW	Power Meter Accessory Wiring Diagram


NOTES:
1- ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
2- SEE INSTALLATION AND USER MANUAL (S).
3- CONTACT CAPACITY: 250VAC/30VDC 5A.
4- ETHERNET STRAIGHT THROUGH CABLE.
5- WIRE SPLICE CONNECTORS ARE USED FOR ALL NODE CONNECTIONS(CONTROL).
6- FOR SPECIFIC COMPONENT PART NUMBERS, REFER TO RESPECTIVE UNIT'S BOM.
7- HARNESS BUILT IN THE ATS, MAKE CONNECTION PER DRAWING.
CIRCUIT BOARD PLUG AND TERMINAL ASSIGNMENTS
COMPRESSOR INVERTER
POWER CONNECTION
CN1: TERMINAL BLOCK
CN2: TERMINAL BLOCK
J24 : PRESSURE TRANSDUCER POWER SUPPLY
J25 : PRESSURE TRANSDUCER ANALOG OUTPUT
J26 : THERMISTOR ANALOG OUTPUT
J27 : THERMISTOR ANALOG OUTPUT
J28 : ENTER FOR FACTORY USE
J14: TERMINAL BLOCK
MODBUS COMMUNICATION BOARD
PRIMARY LINE VOLTAGE
POWER SUPPLY
SEE UNIT NAMEPLATE
(CUSTOMER SUPPLIED)
QS1
FUSE CLASS J
100A
EXHAUST FAN
FAN MOTOR
FAN-L1
FAN-L2
FAN-TS
FU1
FUSE CLASS CC
1 1/2 A
QF1-VFD
FUSE CLASS J 200A
QF2: CONDENSER FAN
FUSE CLASS CC 15A
FAN GND
QF3: INDOOR UNIT
FUSE CLASS J
REFER TO MANUAL FOR FUSE SIZE
INDOOR GND
TO INDOOR GROUNDING CONNECTION
POWER DISTRIBUTION BLOCKS
TO INDOOR UNIT
POWER SUPPLY
SEE UNIT NAMEPLATE
(CUSTOMER SUPPLIED)
LINE
STANDARD DEVICES
NOMENCLATURE
7A
QS1 - PRIMARY POWER SUPPLY
3A
QS2 - SECONDARY POWER SUPPLY
7A
ATS - AUTOMATIC TRANSFER SWITCH
4C
FU1 - EXHAUST FAN FUSE
7C
FAN TS - EXHAUST FAN THERMOSTAT
4D
QF1 - VFD FUSE BLOCK
4C
QF2 - CONDENSER FAN FUSE BLOCK
4B
QF3 - INDOOR UNIT FUSE BLOCK
FACTORY SUPPLIED LINE VOLTAGE
FIELD INSTALLED LINE VOLTAGE WIRING
FACTORY SUPPLIED 24 VOLT, NEC CLASS 2 WIRING
FIELD INSTALLED 24 VOLT, NEC CLASS 2 WIRING
FIELD SUPPLIED 24 VOLT, NEC CLASS 2 WIRING
FIELD SUPPLIED 24 VOLT, NEC CLASS 2 WIRING
PRINTED CIRCUIT BOARD TRACE
FIELD SUPPLIED GROUNDING WIRE
FACTORY GROUNDING WIRE
GROUNDING LUG CONNECTION
COMPONENT/LUG CONNECTION
WIRE COLOR CODE
ORN - ORANGE
GRN - GREEN
YEL - YELLOW
BLU - BLUE
BLK - BLACK
WHT - WHITE
RED - RED
VERTIV.
PROPRIETARY - ALL RIGHTS RESERVED
OHE
230VAC - 3PH
28kW
WIRING DIAGRAM
50/60 HZ
SINGLE POWER SUPPLY
1 OF 2
100868088P1
C
DRAWN A. PATLAN 10/22/2025
CHECKED A. TORRES 10/22/2025
ENGR A. TORRES 10/22/2025


NOTES:
1.- ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
2.- SEE INSTALLATION AND USER MANUAL(S)
3.- CONTACT CAPACITY: 250VAC/ 30VDC 5A
4.- ETHERNET STRAIGHT THROUGH CABLE
5.- WIRE SPLICE CONNECTORS ARE USED FOR ALL NODE CONNECTIONS (CONTROL)
6.- WIRE JOINT CONNECTOR ARE USED FOR THE LAK HEATER INTERCONNECTION
7.- THE TERMINAL BLOCK ON THE CONNECTION PANEL IS A DBL DOS THAT HAS MULTIPLE INPUTS AND OUTPUTS
8.- FOR SPECIFIC COMPONENT PART NUMBERS, REFER TO RESPECTIVE UNITS BOM.
CIRCUIT BOARD PLUG AND TERMINAL ASSIGNMENTS
POWER CONNECTION
COMPRESSOR INVERTER
CN2: TERMINAL BLOCK
J14: TERMINAL BLOCK
TB-A: TERMINAL BLOCK
COM_BOARD
INOVANCE
COMPRESSOR
INVERTER
Ethernet from Indoor
485+
485-
24V
COM
TB-A
LPS-LAK
LAK UNITS ONLY
COH
HB
LPS
HPS
STO
LDR
SPDT
CF-AN
DTS
HPT
FAN MOTOR
COMPRESSOR
INV - GND
INV - T
INV - S
INV - R
WS1-1
WS1-2
WS1-3
WS1-4
WS1-5
LINE
STANDARD DEVICES
NOMENCLATURE
OPTIONAL DEVICES
DTS: DISCHARGE TEMPERATURE SENSOR
HPS: HIGH PRESSURE SWITCH
LPS: LOW PRESSURE SWITCH
HPT: HIGH PRESSURE TRANSDUCER
WS1: WIRE SPLICER 1
JC1: JOINT CONNECTOR 1
JC2: JOINT CONNECTOR 2
JC3: JOINT CONNECTOR 3
JC4: JOINT CONNECTOR 4
CF-AN: FAN RELAY
LDR: LEAK DETECTION ROUTINE RELAY
STO: SAFETY TORQUE OFF RELAY
COH: CRANKCASE HEATER
HB: HEATING BELT
LPS-LAK: LOW PRESSURE SWITCH
FACTORY SUPPLIED UNIT VOLTAGE
FIELD INSTALLED LINE VOLTAGE WIRING
FACTORY SUPPLIED 24 VOLT LIMITED CLASS 2 WIRING
FIELD INSTALLED LOW VOLTAGE WIRING
FIELD SUPPLIED 24 VOLT LIMITED CLASS 2 WARNING
FIELD SUPPLIED 24 VOLT NEC CLASS 2 WARNING
FACTORY INSTALLED GROUNDING WIRE
FIELD INSTALLED GROUNDING WIRE
POSITIVE LEADS (+VOLT) WIRING
NEGATIVE LEADS (-VOLT) WIRING
GROUNDING LUG CONNECTION
COMPONENT PLUG CONNECTION
WIRE COLOR CODE
BLU - BLUE
BLK - BLACK
WHT - WHITE
GRN - GREEN
ORN - ORANGE
RED - RED
YEL - YELLOW
PRP - PURPLE
GRY - GRAY
BRN - BROWN
VERTIV.
OHE
230VAC - 3PH
50/60 HZ
28kW
WIRING DIAGRAM
SINGLE POWER SUPPLY
2 OF 2
A
10088508P1
C
A. PATLAN
A. TORRES
10/22/2025
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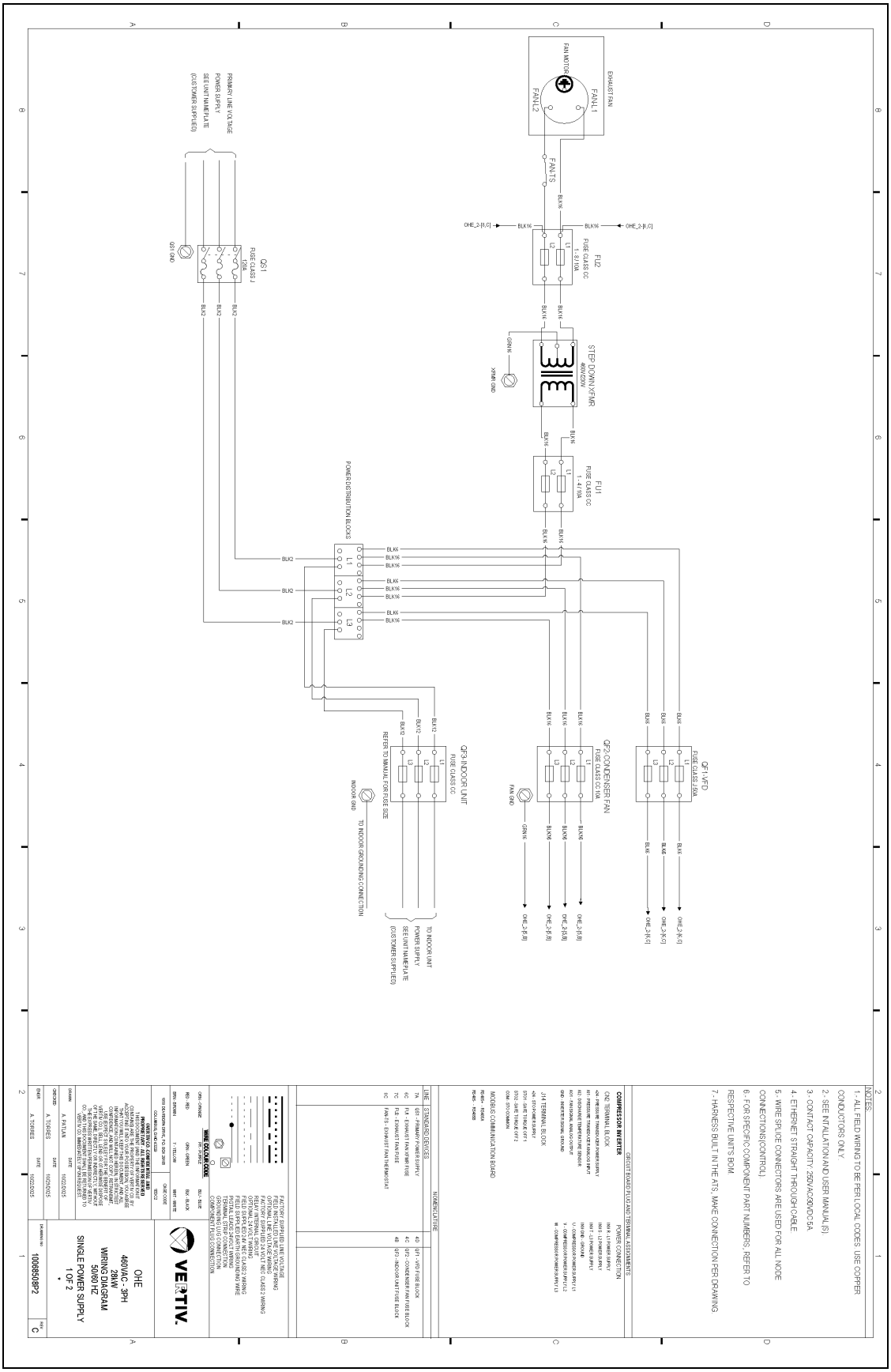
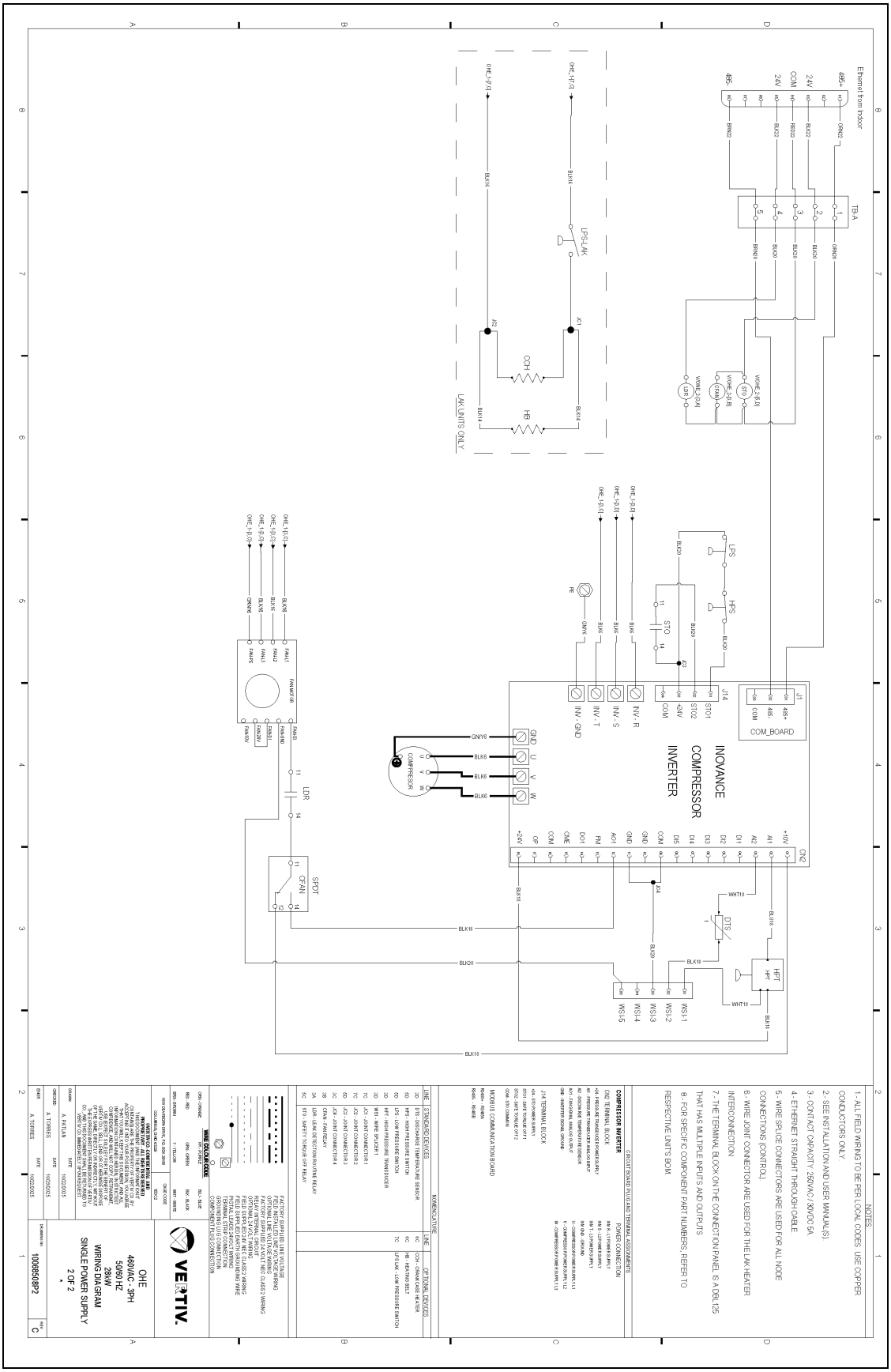

NOTES:
1.- ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
2.- SEE INSTALLATION AND USER MANUAL (S)
3.- CONTACT CAPACITY: 250VAC/30VDC 5A
4.- ETHERNET STRAIGHT THROUGH CABLE
5.- WIRE SPLICE CONNECTORS ARE USED FOR ALL NODE CONNECTIONS (CONTROL).
6.- FOR SPECIFIC COMPONENT PART NUMBERS, REFER TO RESPECTIVE UNIT'S BOM
7.- HARNESS BUILT IN THE ATS, MAKE CONNECTION PER DRAWING.
CIRCUIT BOARD PLUG AND TERMINAL ASSIGNMENTS
COMPRESSOR INVERTER
POWER CONNECTION
CN1: TERMINAL BLOCK
CN2: PRESSURE TRANSDUCER
CN3: PRESSURE TRANSDUCER
CN4: TEMPERATURE SENSOR
CN5: TEMPERATURE SENSOR
CN6: INVERTER SIGNAL CONTROL
J14 TERMINAL BLOCK
MICROBUS COMMUNICATION BOARD
NOMENCLATURE
LINE
STANDARD DEVICES
OHE_1-[6,0]
OHE_2-[6,0]
OHE_3-[6,0]
FAN MOTOR
EXHAUST FAN
FAN-L1
FAN-L2
FAN-TS
FU2
FUSE CLASS CC
1.6/1.0A
STEP DOWN XFMR
460V:220V
XFMR GND
FU1
1.4/1.0A
POWER DISTRIBUTION BLOCKS
QS1
FUSE CLASS J
120A
PRIMARY LINE VOLTAGE
POWER SUPPLY
SEE UNIT NAMEPLATE
(CUSTOMER SUPPLIED)
QF1: VFD
FUSE CLASS RK5
QF2: CONDENSER FAN
FUSE CLASS CC 10A
FAN GND
QF3: INDOOR UNIT
FUSE CLASS CC
REFER TO MANUAL FOR FUSE SIZE
INDOOR GND
TO INDOOR GROUNDING CONNECTION
TO INDOOR UNIT
POWER SUPPLY
SEE UNIT NAMEPLATE
(CUSTOMER SUPPLIED)
FACTORY SUPPLIED UNIT VOLTAGE
FIELD INSTALLED LINE VOLTAGE WIRING
FACTORY SUPPLIED 24 VOLT NEC CLASS 2 WIRING
FIELD INSTALLED LOW VOLTAGE WIRING
FIELD SUPPLIED AT NEC CLASS 2 WIRING
FIELD SUPPLIED AT NEC CLASS 1 WIRING
POSITIVE LEADS (+VOLT) WIRING
GROUNDING LUG CONNECTION
COMPONENT PLUG CONNECTION
WIRE COLOR CODE
PROPRIETARY - ALL RIGHTS RESERVED
OHE
460VAC - 3PH
28kW
WIRING DIAGRAM
50/60 HZ
SINGLE POWER SUPPLY
1 OF 2
1008850P2
C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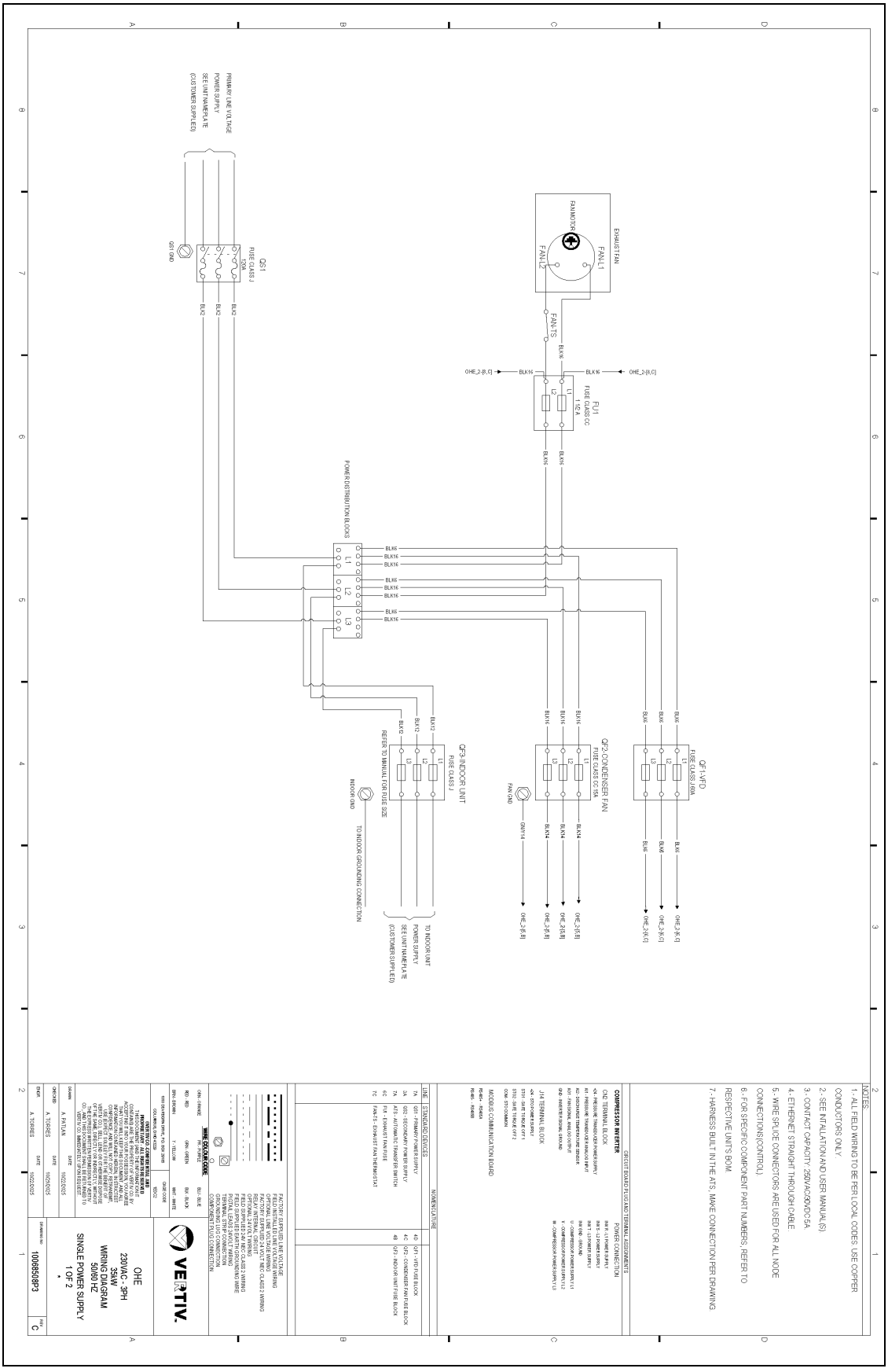
6.- WIRE JOINT CONNECTOR ARE USED FOR THE LAK HEATER INTERCONNECTION
7.- THE TERMINAL BLOCK ON THE CONNECTION PANEL IS A DBL DOS THAT HAS MULTIPLE INPUTS AND OUTPUTS
8.- FOR SPECIFIC COMPONENT PART NUMBERS, REFER TO RESPECTIVE UNITS BOM.
CIRCUIT BOARD PLUG AND TERMINAL ASSIGNMENTS
POWER CONNECTION
COMPRESSOR INVERTER
CN2: TERMINAL BLOCK
J14: TERMINAL BLOCK
J1: TERMINAL BLOCK
MICRO I/O COMMUNICATION BOARD
LINE - STANDARD DEVICES
NOMENCLATURE
LINE - OPTIONAL DEVICES
FACTORY SUPPLIED UNIT VOLTAGE
FIELD INSTALLED LINE VOLTAGE WIRING
FACTORY SUPPLIED 24 VOLT LINKED CLASS 2 WIRING
FIELD SUPPLIED 24 VOLT LINKED CLASS 2 WIRING
FIELD SUPPLIED CONTROL WIRING
FIELD SUPPLIED 24 VOLT LINKED CLASS 2 WIRING
FACTORY INSTALLED OPTIONAL WIRING
FIELD INSTALLED OPTIONAL WIRING
GROUNDING LUG CONNECTION
COMPONENT PLUG CONNECTION
WIRE COLOR CODE
PROPRIETARY AND CONFIDENTIAL
VERTIV
OHE
460VAC- 3PH
50/60 HZ
28kW
WIRING DIAGRAM
SINGLE POWER SUPPLY
2 OF 2
1008850BP2
C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7.- HARNESS BUILT IN THE ATS, MAKE CONNECTION PER DRAWING.
CIRCUIT BOARD FUSES AND TERMINAL ASSIGNMENTS
COMPRESSOR INVERTER
POWER CONNECTION
CHE TERMINAL BLOCK
J14 TERMINAL BLOCK
MOTORS COMMUNICATION BOARD
LINE - STANDARD DEVICES
NOMENCLATURE
WIRE COLOR CODE
FACTORY SUPPLIED LINE VOLTAGE
FIELD INSTALLED LINE VOLTAGE WIRING
FACTORY SUPPLIED 24 VOLT NEC CLASS 2 WIRING
FIELD SUPPLIED 24V NEC CLASS 2 WIRING
OPTIONAL 24VDC WIRING
FIELD SUPPLIED COMMUNICATION WIRING
PIGTAIL LEADS 24VDC WIRING
FIELD SUPPLIED GROUNDING WIRE
GROUNDING LUG CONNECTION
COMPONENT PLUG CONNECTION
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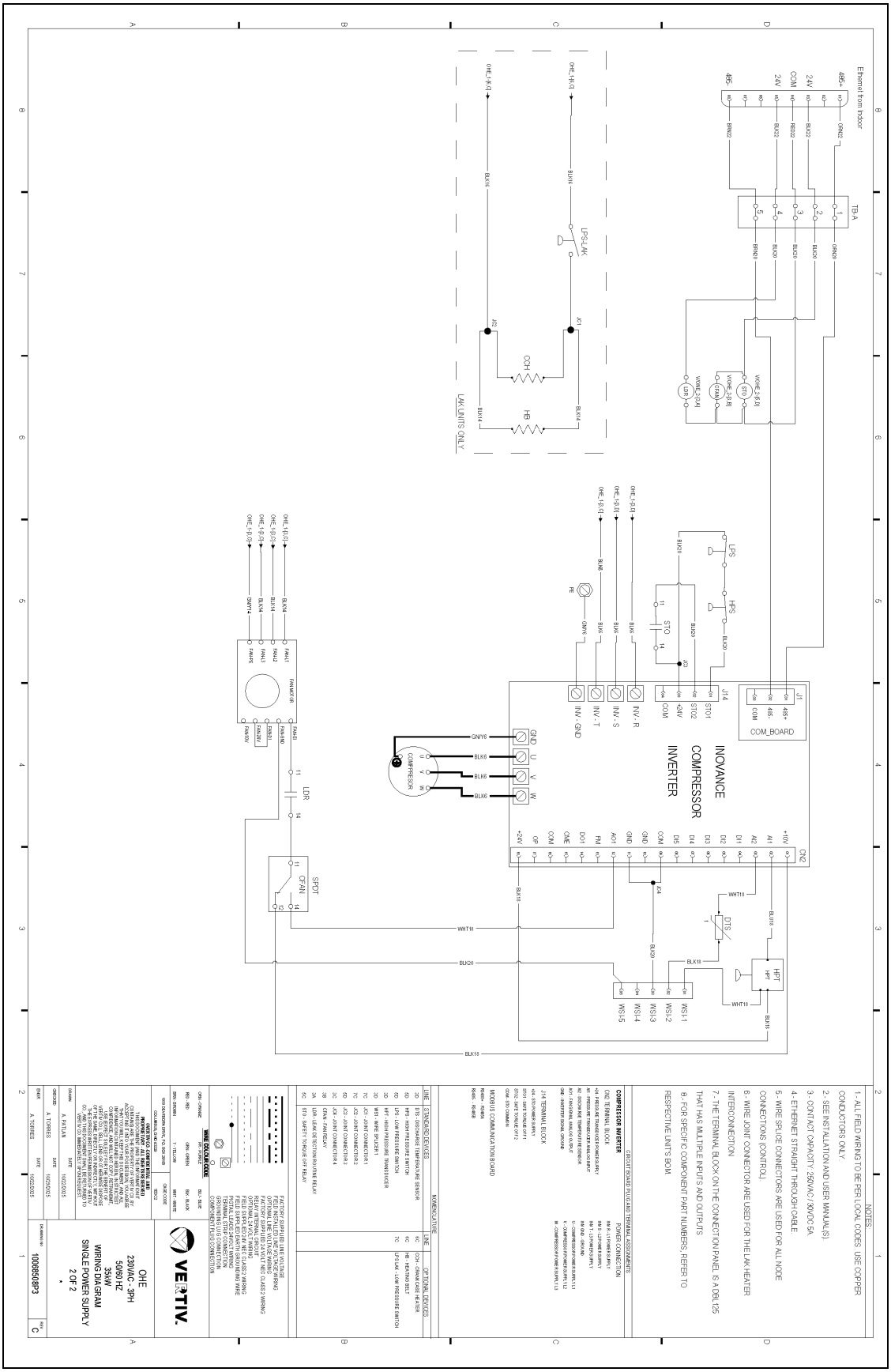
DRAWN A. PATLAN DATE 10/22/2025
CHECKED A. TORRES DATE 10/22/2025
ENGR A. TORRES DATE 10/22/2025
CHE
230VAC - 3PH
35kW
WIRING DIAGRAM
50/60 HZ
SINGLE POWER SUPPLY
1 OF 2
*
DRAWING NO. 1008959873
REV C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CIRCUIT BOARD PLUG AND TERMINAL ASSIGNMENTS
POWER CONNECTION
COMPRESSOR INVERTER
CN2: TERMINAL BLOCK
J4: TERMINAL BLOCK
MICROBUS COMMUNICATION BOARD
LINE - STANDARD DEVICES
NOMENCLATURE
LINE - OPTIONAL DEVICES
FACTORY SUPPLIED UNIT VOLTAGE
FIELD INSTALLED LINE VOLTAGE WIRING
FACTORY SUPPLIED 24 VOLT LOW VOLTAGE CLASS 2 WIRING
FIELD INSTALLED LOW VOLTAGE WIRING
FIELD SUPPLIED 24 VOLT LOW VOLTAGE CLASS 2 WIRING
FIELD SUPPLIED AND INSTALLED GROUNDING WIRE
WIRE COLOR CODE
COMPONENT PLUG CONNECTION
VERTIV.
OHE
230VAC- 3PH
50/60 HZ
35kW
WIRING DIAGRAM
SINGLE POWER SUPPLY
2 OF 2
A
10088508P3
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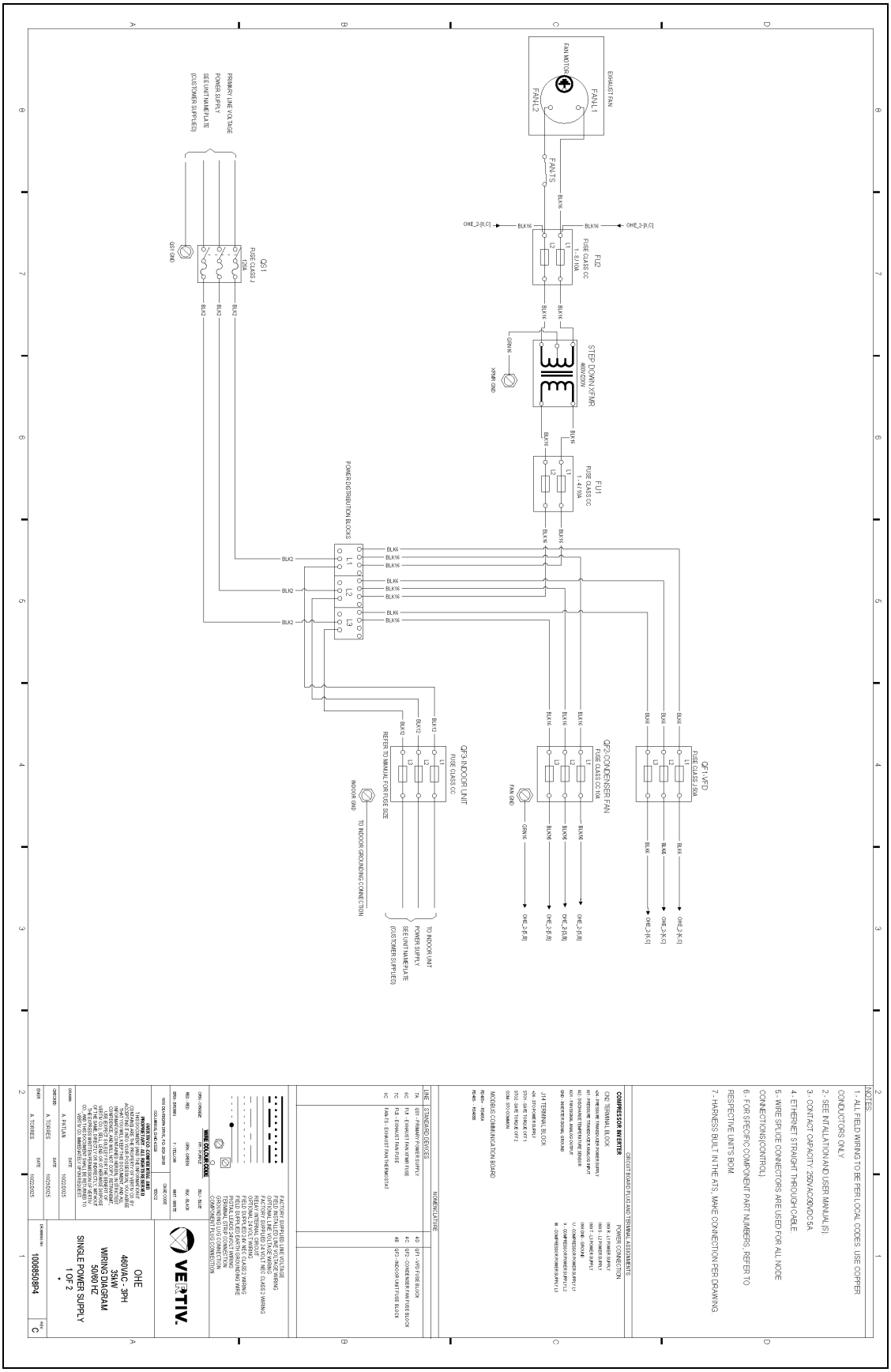
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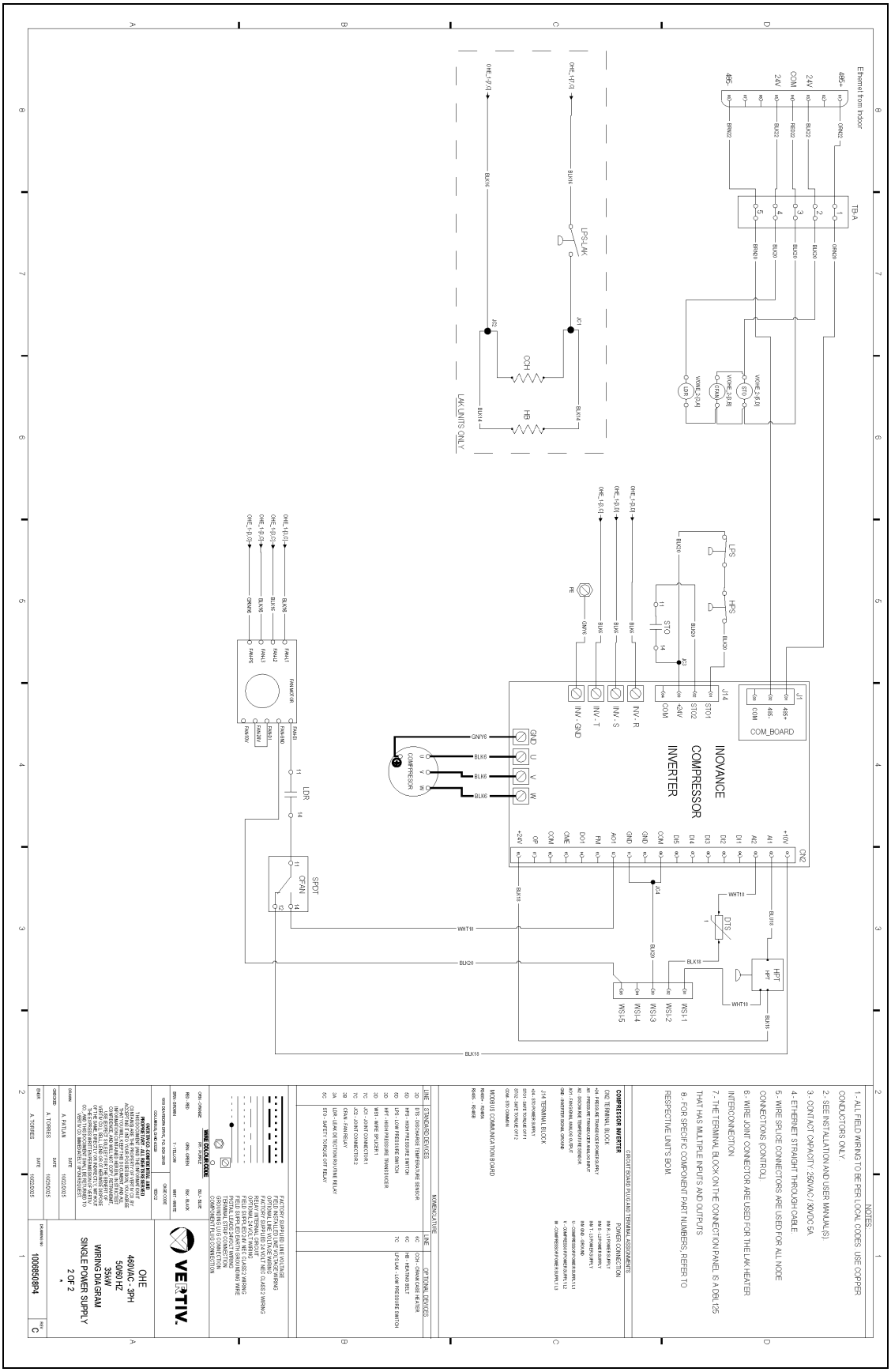
CIRCUIT BOARD PLUG AND TERMINAL ASSIGNMENTS
COMPRESSOR INVERTER
POWER CONNECTION
CN1: TERMINAL BLOCK
CN4: PRESSURE TRANSDUCER
CN5: PRESSURE TRANSDUCER
CN6: TEMPERATURE SENSOR
CN7: TEMPERATURE SENSOR
CN8: INVERTER SIGNAL CONTROL
J14 TERMINAL BLOCK
MICROBUS COMMUNICATION BOARD
LINE
STANDARD DEVICES
NOMENCLATURE
FAN-L1
FAN-L2
EXHAUST FAN
FAN MOTOR
FAN-TS
FU2
FUSE CLASS CC
1.6/1.6A
FU1
FUSE CLASS CC
1.4/1.6A
STEP DOWN XFMR
460V:220V
QS1
FUSE CLASS J
120A
QF1-VFD
FUSE CLASS 60A
QF2-CONDENSER FAN
FUSE CLASS CC 10A
QF3-INDOOR UNIT
FUSE CLASS CC
POWER DISTRIBUTION BLOCKS
PRIMARY LINE VOLTAGE
POWER SUPPLY
SEE UNIT NAMEPLATE
(CUSTOMER SUPPLIED)
REFER TO MANUAL FOR FUSE SIZE
TO INDOOR UNIT
TO INDOOR GROUNDING CONNECTION
FACTORY SUPPLIED UNIT VOLTAGE
FIELD INSTALLED LINE VOLTAGE WIRING
FACTORY SUPPLIED 24 VOLT NEC CLASS 2 WIRING
FIELD INSTALLED LOW VOLTAGE WIRING
FIELD SUPPLIED 24 VOLT NEC CLASS 2 WIRING
FIELD SUPPLIED 24 VOLT NEC CLASS 2 WIRING
POTENTIAL LEADS (24VOLT) WIRING
GROUNDING LUG CONNECTION
COMPONENT PLUG CONNECTION
WIRE COLOR CODE
VERTIV
OHE
460VAC - 3PH
3SNW
WIRING DIAGRAM
50/60 HZ
SINGLE POWER SUPPLY
1 OF 2
1008850P4
C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CIRCUIT BOARD PLUG AND TERMINAL ASSIGNMENTS
POWER CONNECTION
COMPRESSOR INVERTER
CN2: TERMINAL BLOCK
J14: TERMINAL BLOCK
J04: TERMINAL BLOCK
MICROBUS COMMUNICATION BOARD
LINE - STANDARD DEVICES
NOMENCLATURE
LINE - OPTIONAL DEVICES
FACTORY SUPPLIED UNIT VOLTAGE
FIELD INSTALLED LINE VOLTAGE WIRING
FACTORY SUPPLIED 24 VOLT LIMITED CLASS 2 WIRING
FIELD SUPPLIED 24 VOLT WIRING
FIELD SUPPLIED CONTROL WIRING
FIELD SUPPLIED 24 VAC CLASS 2 WIRING
FIELD SUPPLIED GROUNDING WIRE
PIGTAIL LEADS (FACTORY WIRING)
GROUNDING LUG CONNECTION
COMPONENT PLUG CONNECTION
WIRE COLOR CODE
VERTIV.
OHE
460VAC- 3PH
50/60 HZ
35kW
WIRING DIAGRAM
SINGLE POWER SUPPLY
2 OF 2
1008850BP4
C
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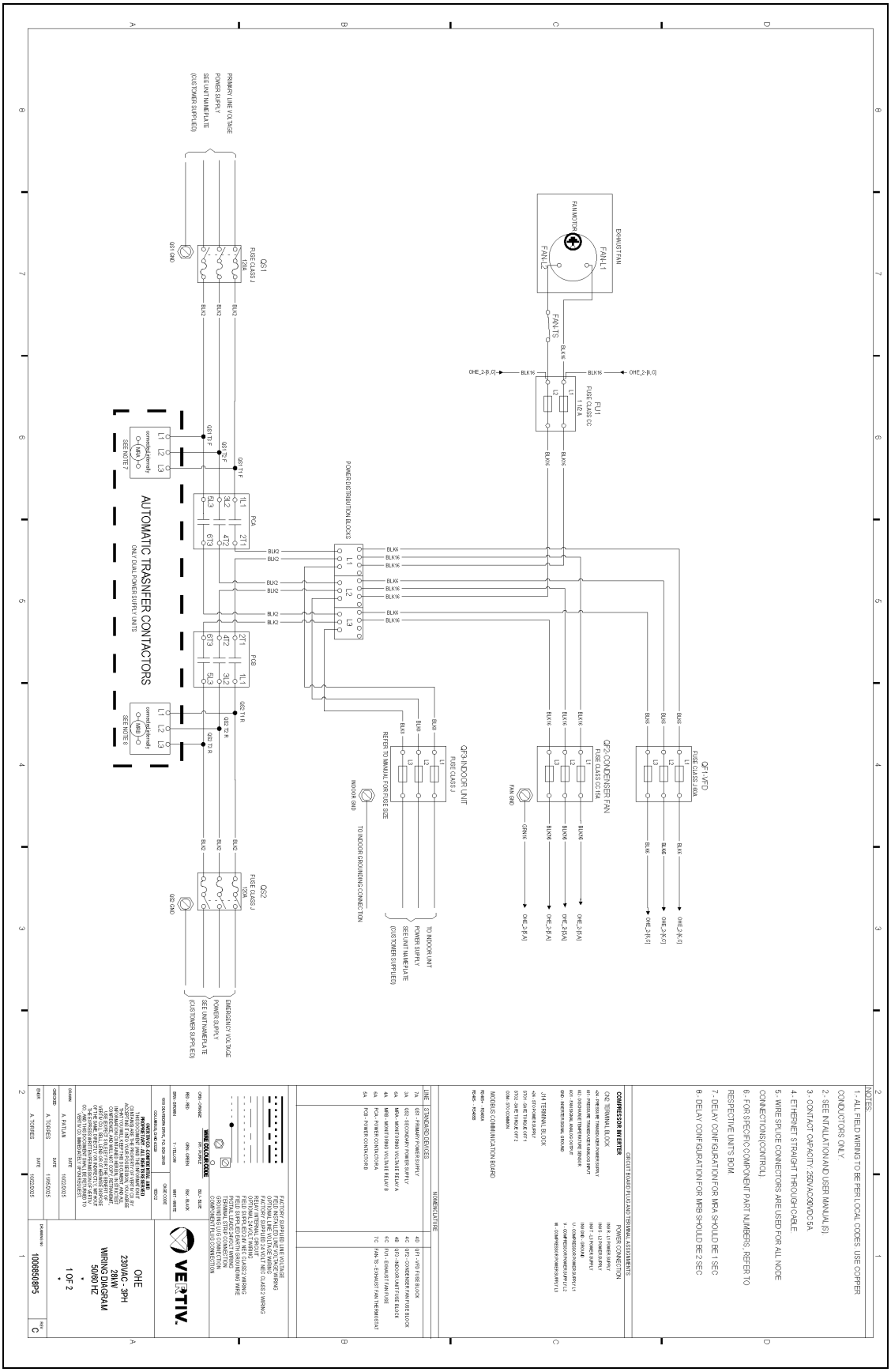
A. PATLAN
A. TORRES
10/22/2025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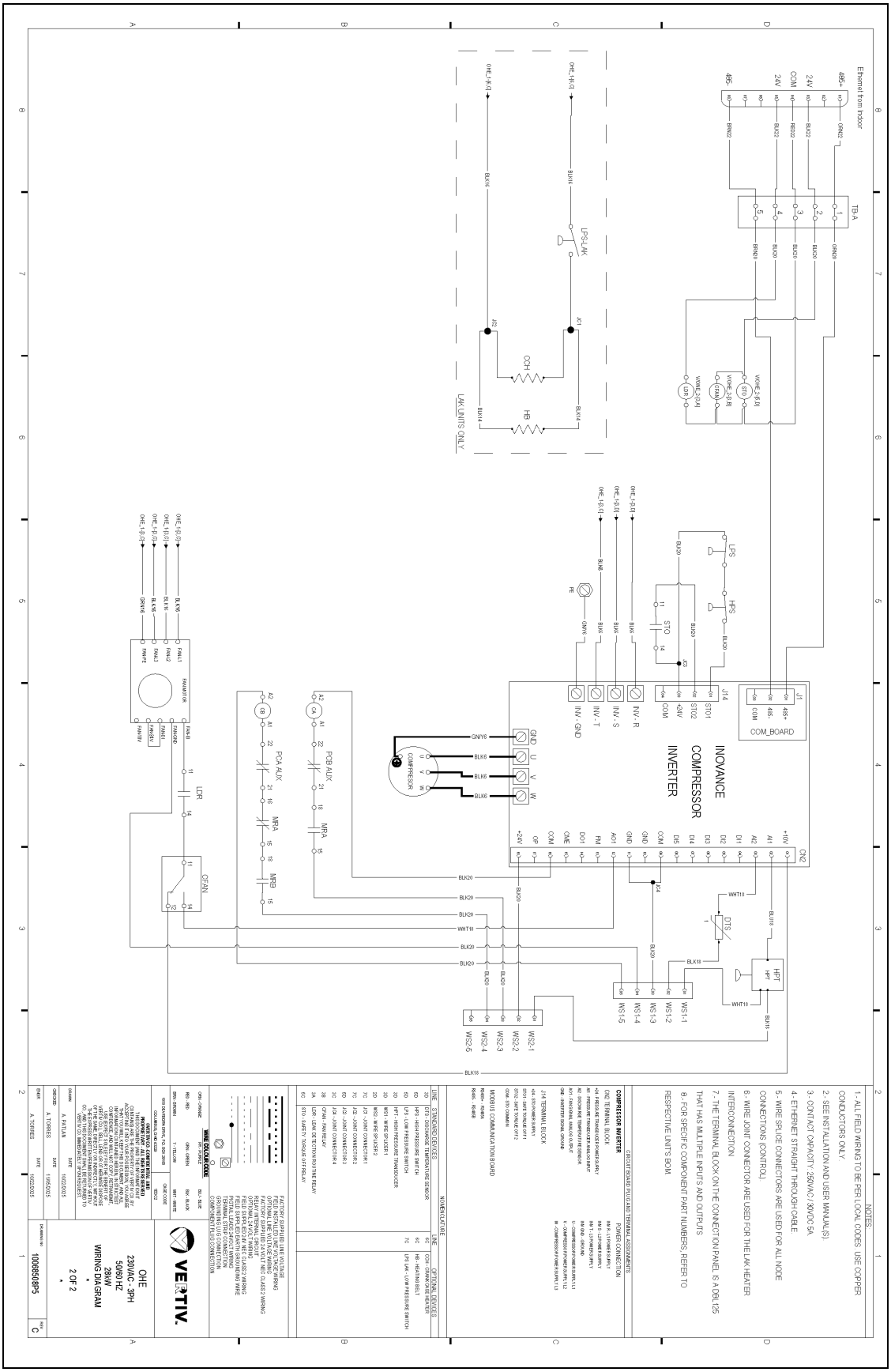
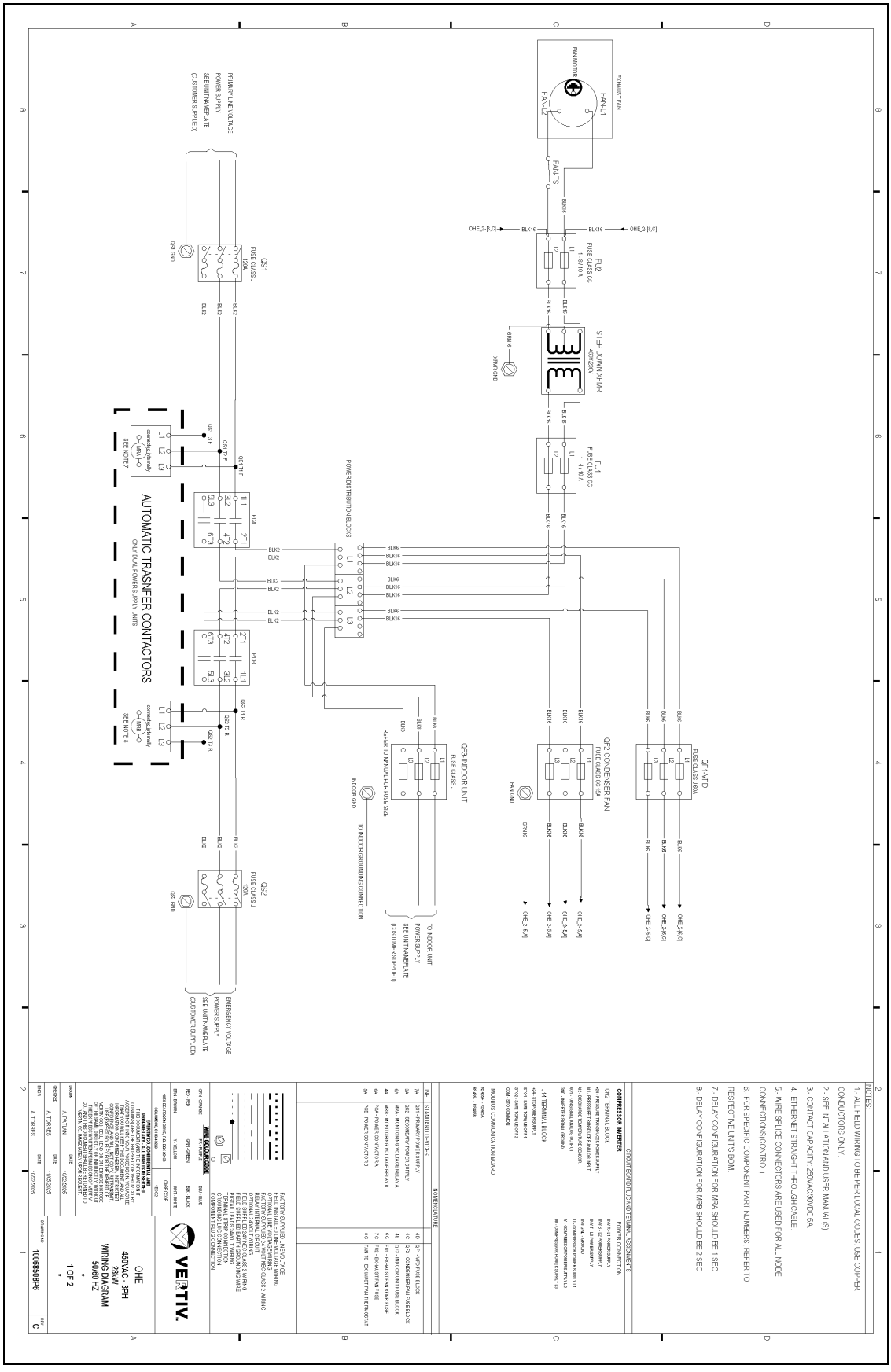
6.- FOR SPECIFIC COMPONENT PART NUMBERS, REFER TO RESPECTIVE UNIT'S BOM
7.- DELAY CONFIGURATION FOR MEA SHOULD BE: 1 SEC
8.- DELAY CONFIGURATION FOR MRB SHOULD BE: 2 SEC
CIRCUIT BOARD PLUG AND TERMINAL ASSIGNMENTS
COMPRESSOR INVERTER
POWER CONNECTION
CN1: TERMINAL BLOCK
CN2: CONTROL BOARD
J4 TERMINAL BLOCK
MICROBUS COMMUNICATION BOARD
LINE STANDARD DEVICES
NOMENCLATURE
WIRE COLOR CODE
VERTIV.
PROPRIETARY - ALL RIGHTS RESERVED
OHE
230VAC - 3PH
28kW
WIRING DIAGRAM
50/60 HZ
1 OF 2
1008850P5
C
AUTOMATIC TRASNFER CONTACTORS
ONLY DUAL POWER SUPPLY UNITS
PRIMARY LINE VOLTAGE
POWER SUPPLY
SEE UNIT NAMEPLATE
(CUSTOMER SUPPLIED)
EMERGENCY VOLTAGE
POWER SUPPLY
SEE UNIT NAMEPLATE
(CUSTOMER SUPPLIED)
EXHAUST FAN
FAN MOTOR
FAN L1
FAN L2
FAN TS
FU1
FUSE CLASS CC
1.6Ω A
QF1: I-VFD
FUSE CLASS J 80A
QF2: CONDENSER FAN
FUSE CLASS CC 15A
QF3: INDOOR UNIT
FUSE CLASS J
QS1
FUSE CLASS J
125A
QS2
FUSE CLASS J
125A
POWER DISTRIBUTION BLOCKS
PCA
PCB
REFER TO MANUAL FOR FUSE SIZE
INDOOR GND
TO INDOOR GROUNDING CONNECTION
TO INDOOR UNIT
POWER SUPPLY
(CUSTOMER SUPPLIED)
FAN GND
GND
OHE_2-[A,B,C]
OHE_3-[A,B,C]
BLK16
BLK6
BLK8
BLK2
GRN16

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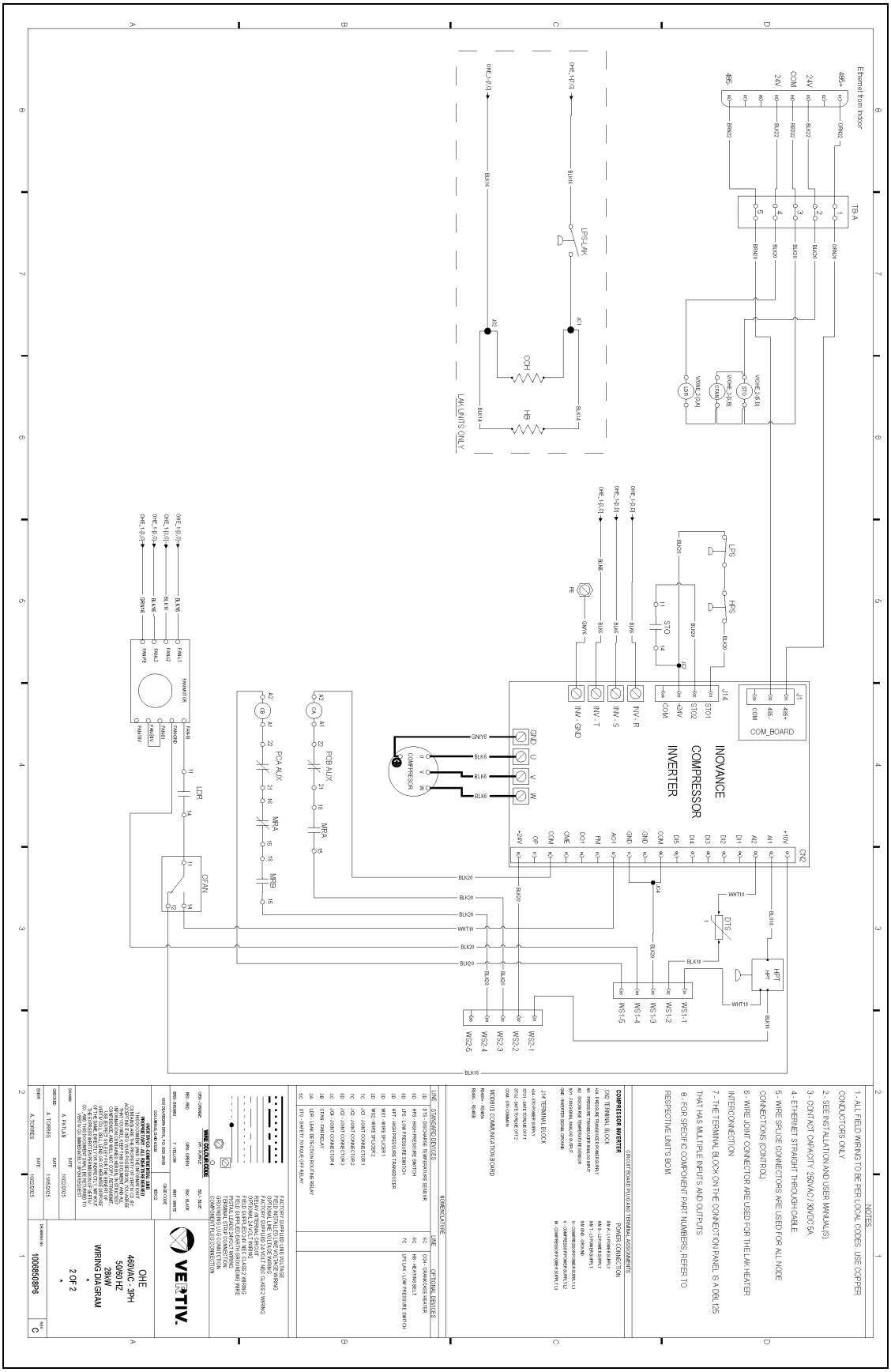
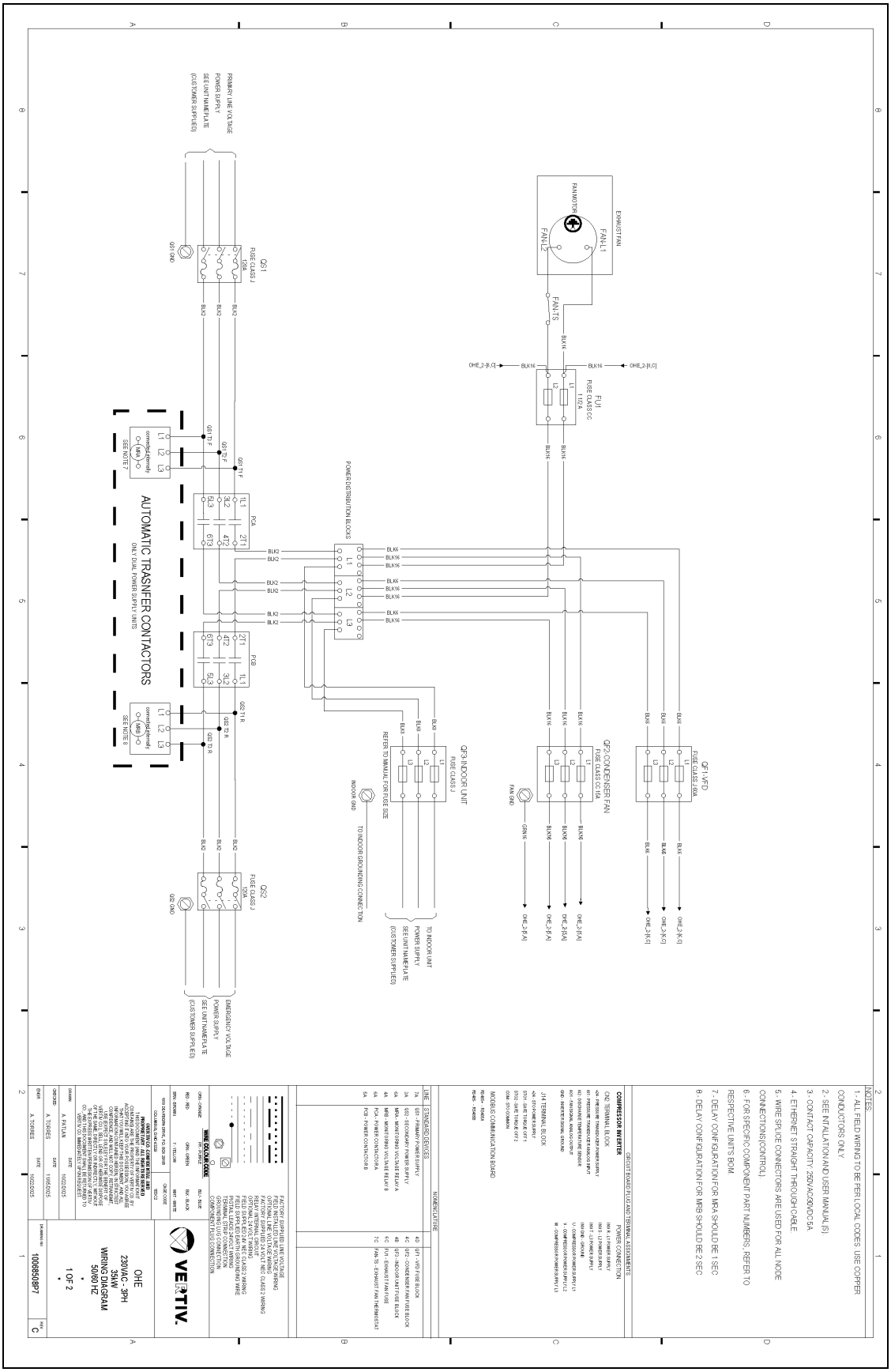
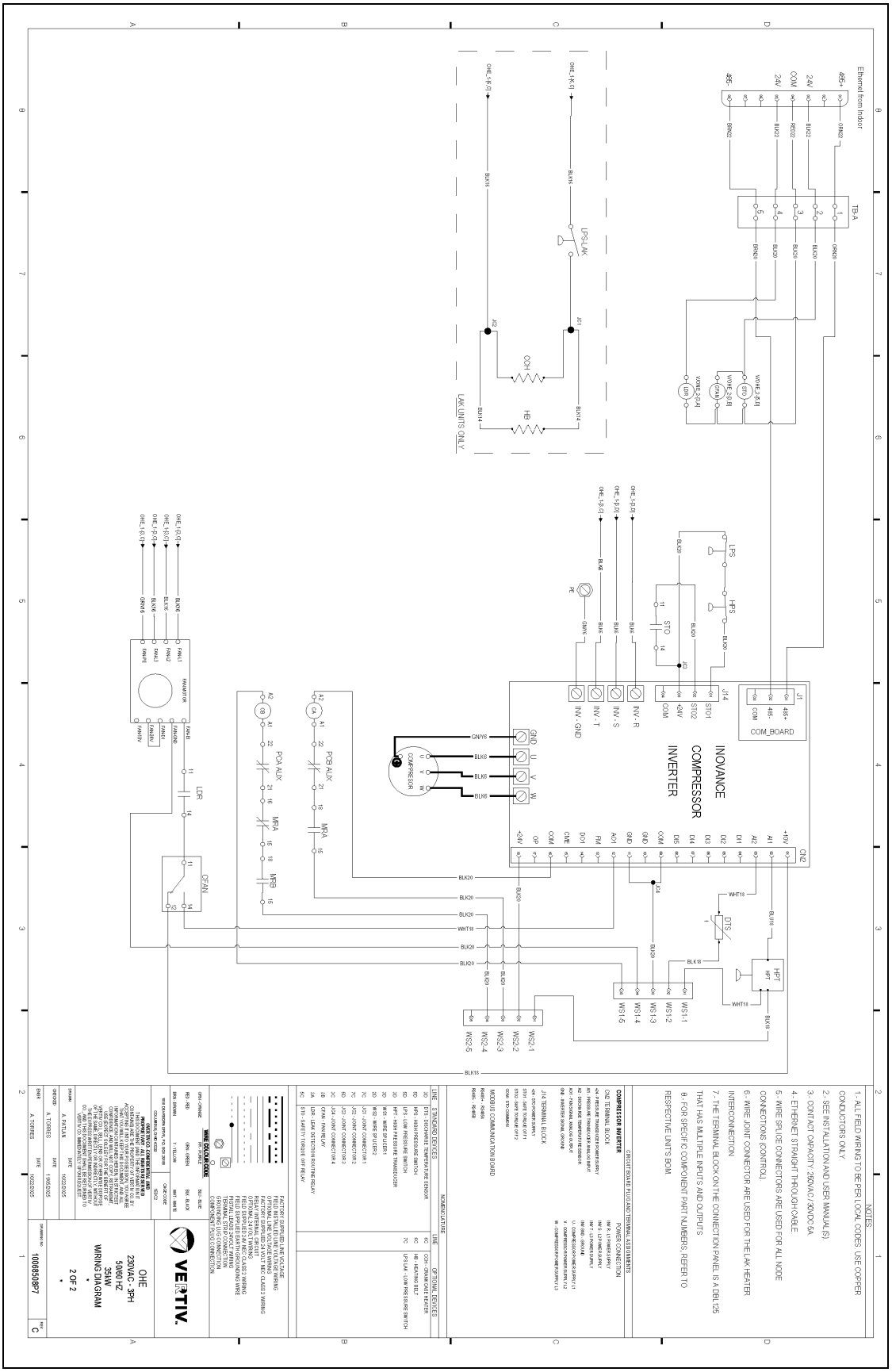
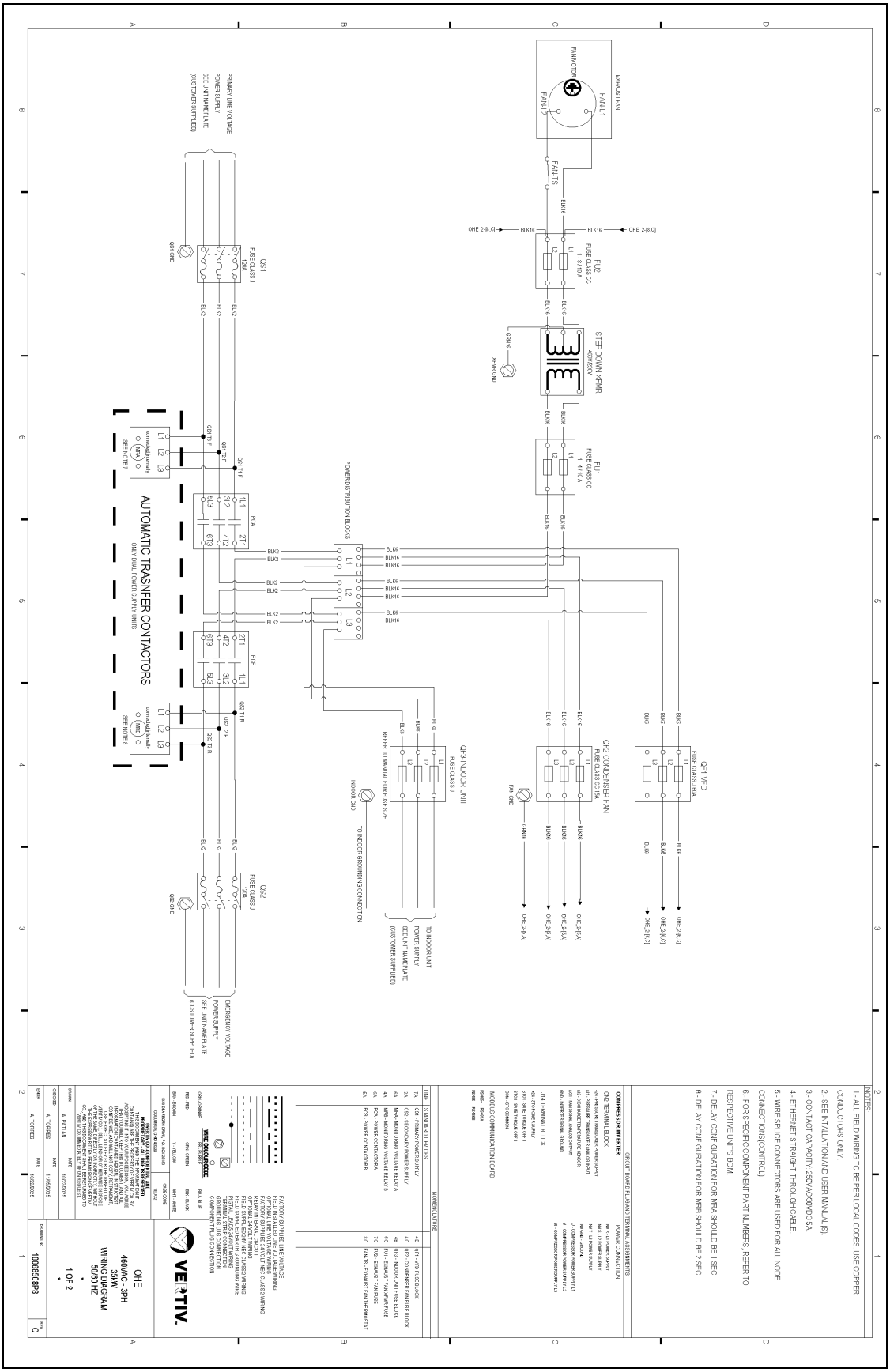
5 - WIRE SPLICE CONNECTORS ARE USED FOR ALL NODE CONNECTIONS(CONTROL)
6 - FOR SPECIFIC COMPONENT PART NUMBERS, REFER TO RESPECTIVE UNIT'S BOM
7 - DELAY CONFIGURATION FOR MRA SHOULD BE: 1 SEC
8 - DELAY CONFIGURATION FOR MRB SHOULD BE: 2 SEC
COMPRESSOR INVERTER
CIRCUIT BOARD PLUG AND TERMINAL ASSIGNMENTS
POWER CONNECTION
CRC TERMINAL BLOCK
J14 TERMINAL BLOCK
MODBUS COMMUNICATION BOARD
LINE - STANDARD DEVICES
NUMERICAL LINE
EXHAUST FAN
FAN-L1
FAN-L2
FAN-TS
STEP DOWN XFMR
FU1
FU2
QF1-VFD
QF2-CONDENSER FAN
QF3-INDOOR UNIT
QS1
QS2
PCA
PCB
FAN MOTOR
POWER DISTRIBUTION BLOCKS
AUTOMATIC TRASNFER CONTACTORS
ONLY DUAL POWER SUPPLY UNITS
PRIMARY LINE VOLTAGE POWER SUPPLY
SEE UNIT NAMEPLATE
(CUSTOMER SUPPLIED)
EMERGENCY VOLTAGE POWER SUPPLY
SEE UNIT NAMEPLATE
(CUSTOMER SUPPLIED)
REFER TO MANUAL FOR FUSE SIZE
TO INDOOR UNIT POWER SUPPLY
SEE UNIT NAMEPLATE
(CUSTOMER SUPPLIED)
TO INDOOR GROUNDING CONNECTION
INDOOR GND
FAN GND
XFMR GND
QS1 GND
QS2 GND
OHE_2-[6,C]
OHE_2-[6,A]
OHE_2-[10,A]
OHE_2-[8,A]
BLK16
BLK2
BLK3
GRN16
VERTIV.
OHE
460VAC - 3PH
28kW
WIRING DIAGRAM
50/60 HZ
1 OF 2
1008590BR6
C





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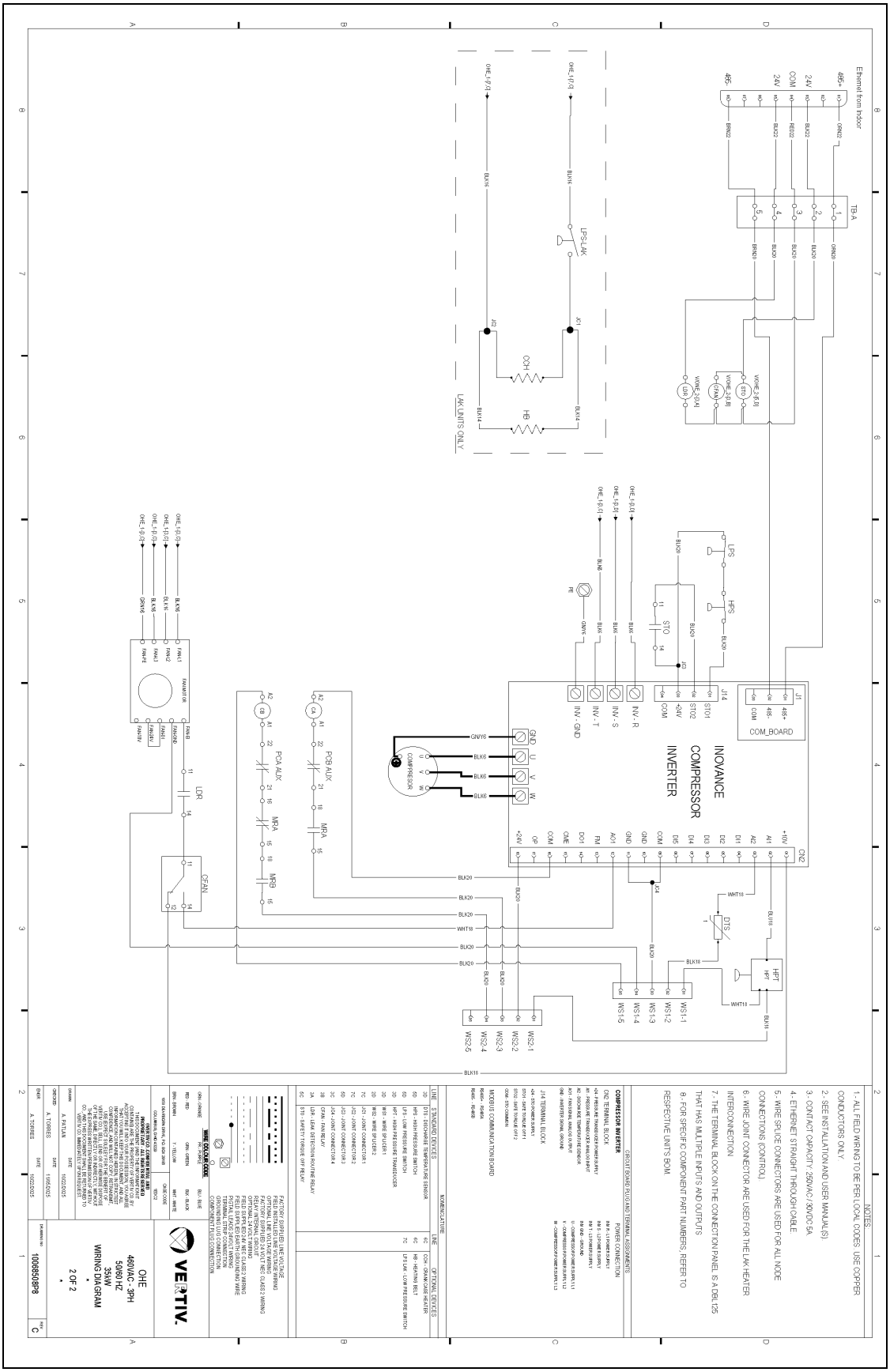
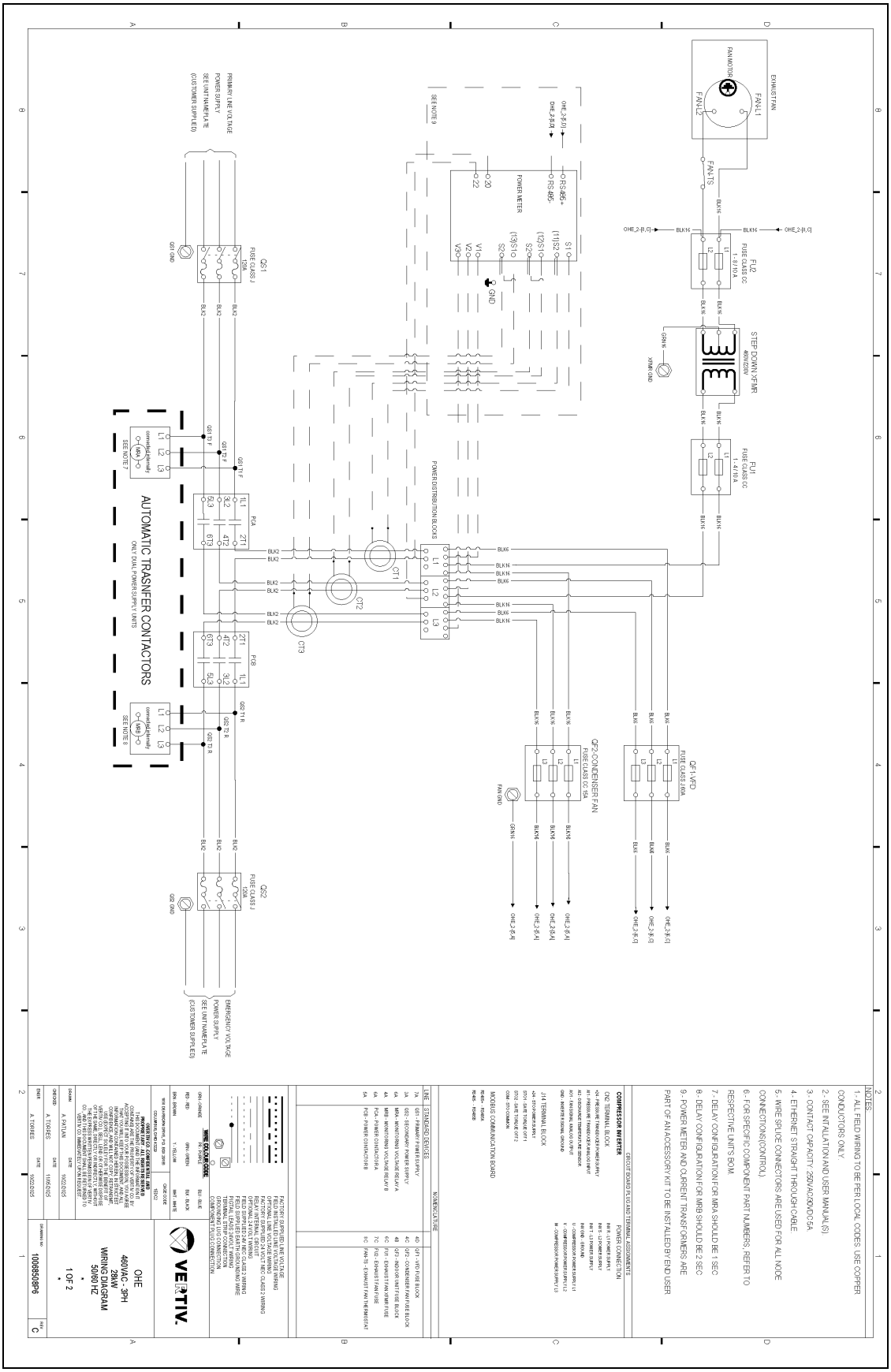
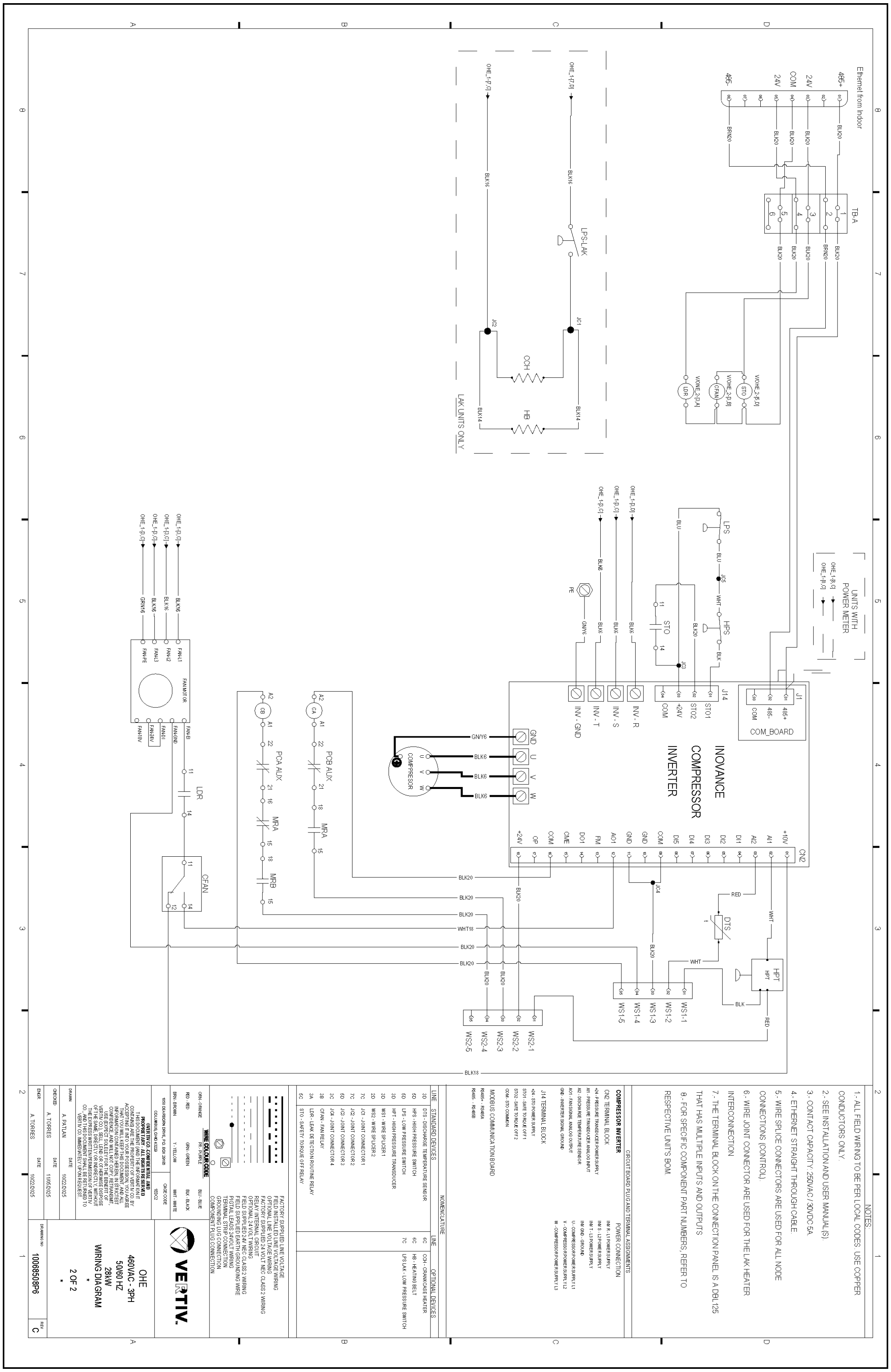
6.- FOR SPECIFIC COMPONENT PART NUMBERS, REFER TO RESPECTIVE UNIT'S BOM.
7.- DELAY CONFIGURATION FOR MFA SHOULD BE: 1 SEC
8.- DELAY CONFIGURATION FOR MFB SHOULD BE: 2 SEC
CIRCUIT BOARD PLUG AND TERMINAL ASSIGNMENTS
COMPRESSOR INVERTER
POWER CONNECTION
CNC TERMINAL BLOCK
CN1: L1 POWER SUPPLY
CN2: L2 POWER SUPPLY
CN3: L3 POWER SUPPLY
CN4: COMPRESSOR U PHASE OUTPUT
CN5: COMPRESSOR V PHASE OUTPUT
CN6: COMPRESSOR W PHASE OUTPUT
J14 TERMINAL BLOCK
J14-1: 115VAC NEUTRAL
J14-2: 115VAC LINE
MODBUS COMMUNICATION BOARD
RS485+: RS485A
RS485-: RS485B
LINE
STANDARD DEVICES
NUMERICAL TYPE
FACTORY SUPPLIED UNIT VOLTAGE
FIELD INSTALLED LINE VOLTAGE WIRING
FACTORY SUPPLIED 24 VOLT LOW VOLTAGE WIRING
FIELD SUPPLIED 24 VOLT LOW VOLTAGE WIRING
WIRE COLOR CODE
PK - PINK
BLU - BLUE
BRN - BROWN
GRY - GREY
BLK - BLACK
RED - RED
GRN - GREEN
WHT - WHITE
Y - YELLOW
ORN - ORANGE
VERTIV.
OHE
460VAC, 3PH
25kW
WIRING DIAGRAM
50/60 HZ
1 OF 2
1008830PB
C




NOTES:
1- ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY
2- SEE INSTALLATION AND USER MANUAL(S)
3 - CONTACT CAPACITY: 250VAC/30VDC/5A
4- ETHERNET STRAIGHT THROUGH CABLE
5- WIRE SPLICE CONNECTORS ARE USED FOR ALL NODE CONNECTIONS(CONTROL)
6- FOR SPECIFIC COMPONENT PART NUMBERS, REFER TO RESPECTIVE UNITS BOM
7- DELAY CONFIGURATION FOR MRA SHOULD BE 1 SEC
8- DELAY CONFIGURATION FOR MRB SHOULD BE 2 SEC
9- POWER METER AND CURRENT TRANSFORMERS ARE PART OF AN ACCESSORY KIT TO BE INSTALLED BY END USER
COMPRESSOR INVERTER
CIRCUIT BOARD/TERMINAL ASSIGNMENTS
POWER CONNECTION
DIC TERMINAL BLOCK
J14 TERMINAL BLOCK
MODBUS COMMUNICATION BOARD
FACTORY SUPPLIED LINE VOLTAGE WIRING
FIELD INSTALLED LINE VOLTAGE WIRING
FACTORY SUPPLIED 24 VOLT NEC CLASS 2 WIRING
FIELD SUPPLIED 24V NEC CLASS 2 WIRING
OPTIONAL 24VDC WIRING
FIELD SUPPLIED COMMUNICATION WIRE
PIGTAIL LEADS (WIRE NUTS)
GROUNDING LUG CONNECTION
COMPONENT PLUG CONNECTION
WIRE COLOR CODE
AUTOMATIC TRASNFER CONTACTORS
ONLY DUAL POWER SUPPLY UNITS
POWER METER
STEP DOWN XFMR
POWER DISTRIBUTION BLOCKS
CONDENSER FAN
EXHAUST FAN
PROPRIETARY AND CONFIDENTIAL
VERTIV.
OHE
460VAC - 3PH
20kW
MRNA020AGSA4AM
50/60 HZ
1 OF 2
C
10086508P6


INOVANCE
COMPRESSOR
INVERTER
COM_BOARD
TB-A
LPS-LAK
LAK UNITS ONLY
UNITS WITH
POWER METER
Ethernet from Indoor
NOTES
1 - ALL FIELD WIRING TO BE PER LOCAL CODES. USE COPPER CONDUCTORS ONLY.
2 - SEE INSTALLATION AND USER MANUAL(S).
3 - CONTACT CAPACITY: 250VAC / 30VDC 5A
4 - ETHERNET STRAIGHT THROUGH CABLE
5 - WIRE SPLICE CONNECTORS ARE USED FOR ALL NODE CONNECTIONS (CONTROL)
6 - WIRE JOINT CONNECTOR ARE USED FOR THE LAK HEATER INTERCONNECTION
7 - THE TERMINAL BLOCK ON THE CONNECTION PANEL IS A DBL 125 THAT HAS MULTIPLE INPUTS AND OUTPUTS
8 - FOR SPECIFIC COMPONENT PART NUMBERS, REFER TO RESPECTIVE UNIT'S BOM.
OHE
460VAC - 3PH
50/60 HZ
28KW
WIRING DIAGRAM
2 OF 2
10068508P6
C

Appendix B: Technical Support and Contacts

B.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

1-800-543-2778

Liebert® Channel Products

1-800-222-5877

Liebert® AC and DC Power Products

1-800-543-2378

B.2 Locations

United States

Vertiv Headquarters

505 N Cleveland Ave

Westerville, OH, 43082, USA

Europe

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road, Wanchai

Hong Kong

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 https://www.instagram.com/vertiv/

 https://www.linkedin.com/company/vertiv/

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Vertiv.com | Vertiv Headquarters, 505 N Cleveland Ave, Westerville, OH 43082 USA

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