Est. 1978
DESERT AIRE

Installation and Operation Manual

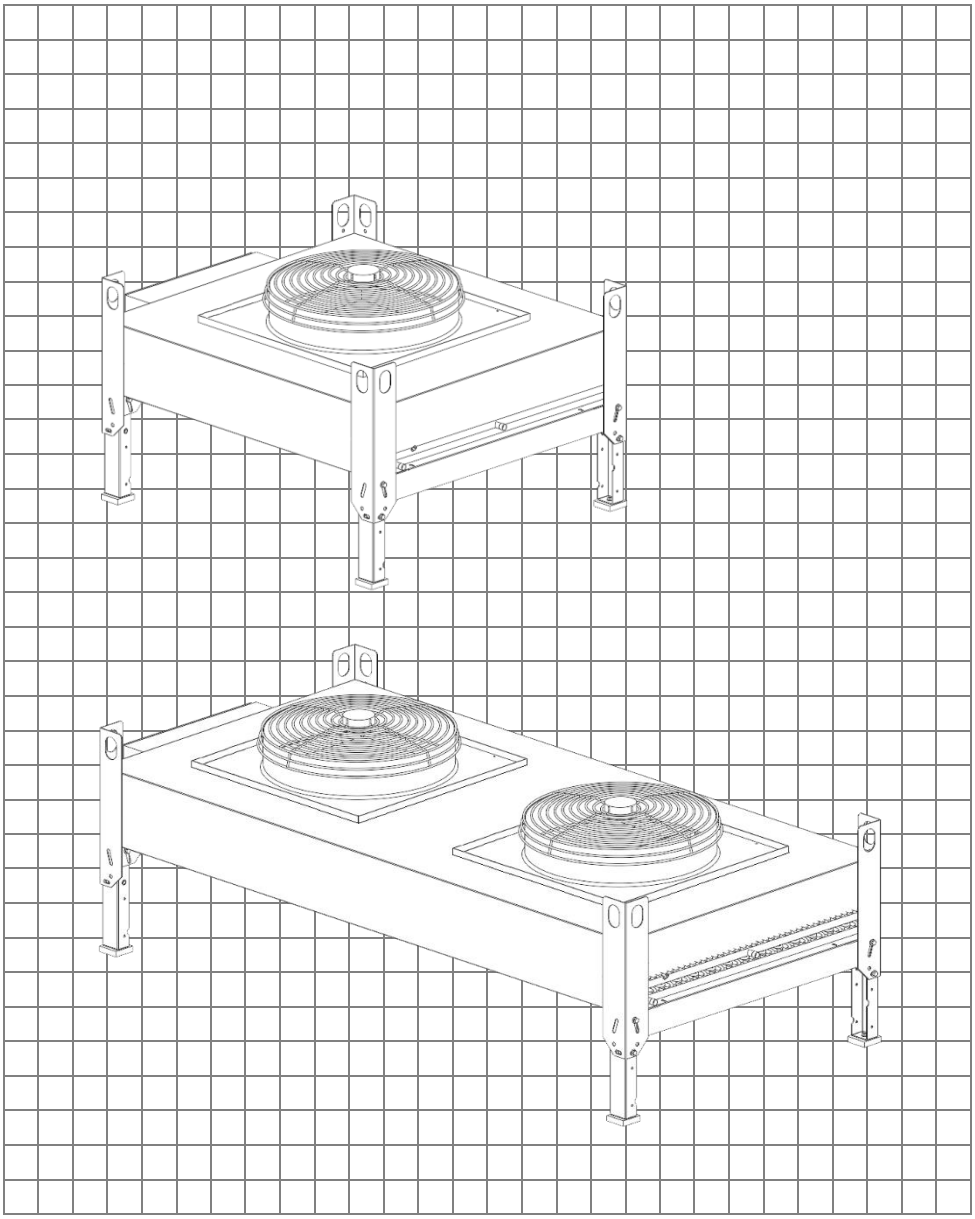
RC SERIES™
by Desert Aire

RCD - Remote Air-Cooled Condensers

Powder coated galvannealed steel cabinet provides years of durable finish protection and aesthetics.

Variable speed fan control for optimal year-round operation.

Optional coil coating provides a uniform, flexible coating over the entire coil.



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Desert Aire
Dehumidification Equipment Standard Limited Warranty

Desert Aire warrants the dehumidifying unit to be free from defects in materials and workmanship subject to the terms, conditions and limitations stated herein.

TERMS

Desert Aire warrants all components (except as noted) for a period of one (1) year from the date of shipment contingent on validation of unit startup by Desert Aire Technical Support. Upon connection of the associated air handler to Desert Aire's AireGuard™ remote access system via onboard Ethernet connection the warranty is extended one additional year for a total warranty period of two (2) years from date of shipment. This requires validation of unit start up by Desert Aire Technical Support. This warranty shall be limited to the supply of new or rebuilt parts for the part which has failed because of defects in workmanship or material, and does not include the cost of labor, transportation or other costs not herein provided for. Replaced parts are warranted only for the remaining portion of the original warranty period.

CONDITIONS

The warranty is subject to the following conditions:

1. The unit must be properly installed and maintained in accordance with the Desert Aire "Installation and Operation Manual" provided with each unit and / or other documentation provided.
2. The Start-Up Report must be completed and returned to Desert Aire Technical Support for evaluation. If no deficiencies are identified a Warranty Validation Letter will be issued that provides all warranty dates and coverage. If installation or start-up deficiencies are present, these must be corrected and communicated to Desert Aire in order to activate warranty.
3. This warranty shall not apply to any part that has been tampered with, or has been subject to misuse, negligence or accident. A warranty can be obtained for altered equipment but only with written consent from Desert Aire.
4. The following parts and components are excluded from the warranty: belts, filters, driers, fuses and refrigerant.
5. Refrigerant coils or other components that corrode due to improperly balanced pool chemistry or corrosive air quality will not be warranted.
6. All replacements or repairs will be FOB Germantown, WI.
7. This warranty shall be null and void if defects or damages result from unauthorized opening of the refrigerant circuit, tampering with factory set controls, or operating outside the original design conditions.
8. Desert Aire shall not be liable for labor costs incurred in diagnosing the problem, or the removal or replacement of the part or parts being repaired.
9. Desert Aire must preauthorize all warranty coverage described herein.

Extended Warranty:
Your Desert Aire unit may have extended warrantees beyond this Standard Limited Warranty document. Extended warrantees are only available at the time of the purchase of the original equipment. These extended warrantees are covered under a separate document and their terms and conditions are separate from this document. It is mentioned in this document for informational purposes only. Any Extended Warranties will be identified on the Warranty Validation letter.

Any and all incidental or consequential damages are expressly excluded from this warranty. Some states do not allow the exclusion of incidental or consequential damages for personal injury, so the above limitations may not apply to you for certain damages. This warranty gives you specific legal rights, and you may also have other rights, which vary from state to state. No person or representative is authorized to make any warranty or assume any liability not strictly in accordance with the aforementioned.

Inquiries regarding warranty matters should be addressed to:

Desert Aire Corp
c/o Service Manager
N120 W18485 Freistadt Road
Germantown, WI 53022
PH: (262) 946-7400
E-MAIL: service@desert-aire.com

Additional copies of this manual can be purchased for a nominal fee from Desert Aire. Desert Aire also posts the most current revision of our I/O Manuals on our website. For a digital copy of the I/O Manual for your unit revision, please submit request to the contact information listed above.

Table of Contents

1 Safety

1.1 ISO Safety Symbols

Read and understand safety precautions prior to installation and operation.

Improper installation and operation or neglecting to follow instructions may result in significant property damage, severe injury, and/or death. The symbol graphics used within this manual are classified by the following general appearance shown below:

	Mandatory action required where ignoring mandatory action can result in property damage, significant injury, and / or death.
	General Hazard warning where if the corresponding precautions are not taken it could result in significant property damage, severe injury and / or death.
	Prohibited Action. You must never perform the action shown or described.
	Important additional information and advice for user.

1.2 ISO Safety Symbols - Defined

	Before installation, start-up, and operation, read these instructions carefully to ensure correct use. Use this manual to work safely with and on the equipment. They contain safety instructions that must be complied with as well as information required for optimal performance of the equipment. Failure to follow instructions can result in significant property damage, severe injury and / or death.
	Before servicing equipment read these instructions carefully. They contain safety instructions and hazard warnings that must be complied with. Failure to follow instructions can result in significant property damage, severe injury and / or death.
	Lock Electrical Disconnect Switch or Circuit Breaker supplying the equipment when opening any access doors or covers. Follow Lock Out - Tag Out protocol when servicing equipment.
	Disconnect all incoming sources of power before opening any access doors or covers on the equipment.

	Equipment has High Leakage Current. Protective Earth connection essential before connecting mains supply. Minimum ground wire size: 8.4mm² Cu.
	Equipment operates with refrigerant which can be dangerous when servicing. Eye protection required.
	Wear protective gloves. Equipment can contain contaminated refrigerant and oil which can cause severe burns.
	Lift point.
	Never operate the equipment with doors or covers removed. Access to hazardous voltage and moving parts can result in significant property damage, severe injury, and / or death.
	Warning, equipment contains hazardous voltage and live electrical parts. Coming in to contact with these parts can result in severe injury, and / or death. Take necessary precautions to avoid contact with live parts.
	This unit contains an electronically commutated motor which retains hazardous voltage even after power is disconnected. Wait at least three minutes after you disconnect power before you attempt to service motors or electrical components within the remote condenser unit. Sealed electrical components shall be replaced. Intrintsically safe components must be replaced.
	Warning, equipment has potential arc flash hazard. Appropriate PPE and tools required when working on this equipment. Failure to comply may result in severe injury, and / or death.
	Warning, equipment contains hazard due to contact with rotating fan blade. Coming into contact with rotating fan blade can result in significant property damage, severe injury, and / or death. Take necessary precautions.
	Warning, equipment contains Flammable Gas. No smoking, no open flames, no sparks.

1.3 Safety – Warnings

WARNING

The appliance is not to be used by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction.

WARNING

Children should be supervised to ensure that they do not play with the appliance.

DANGER

Only trained, qualified personnel should install and / or service Desert Aire equipment. Serious injury, death and property damage can result from improper installation/service of this equipment. High voltage electrical components and refrigerant under pressure are present.

For any unit labeled Class 1, Group D, Division 2, all wiring must be in accordance to Class 1,

Group D, Division 2 requirements. Ensure that all local, state, national and any other applicable codes are adhered to when connecting any device to this equipment. All electrical connections to units labeled Class 1, Group D, Division 2 must be done with a conduit seal.

When this product is used with a refrigerant in safety group, A2L the following warnings apply:

WARNING

WARNING – Risk of fire. Flammable refrigerant used. To be repaired only by trained service personnel. Do not puncture refrigerant tubing.

DANGER – Risque d'incendie. Contient un frigorigène inflammable. Confier la réparation à une personne qualifiée. Ne pas perforer la tubulure contenant le frigorigène.

WARNING

WARNING – Risk of fire. Dispose of properly in accordance with federal or local regulations. Flammable refrigerant used.

ATTENTION – Risque d'incendie. Mettre au rebut conformément aux règlements fédéraux ou locaux. Contient un frigorigène inflammable.

2 Introduction

This installation and operation manual addresses persons entrusted with planning, installation, commissioning, maintenance, servicing, and operation of the equipment who have the corresponding qualifications, certifications, and skills for their respective job.

Keep this installation and operation manual together with the equipment for continued use. It must be ensured that all people that are to work on or operate the equipment can refer to these instructions at any time. They must be passed on to all successive owners, users, and final customers.

If these instructions are damaged or lost during the life cycle of the equipment, a replacement

can be ordered from Desert Aire by calling our Technical Support number +1 (262) 946-7400, or by visiting our website desert-aire.com.

2.1 Intended Use of Equipment

The Desert Aire Remote Condenser is an industrial refrigeration based partial unit that is designed for heat rejection to outdoor air. The product is optimized to work with the design temperatures and pressures of Desert Aire dehumidifiers and the design conditions they are used in. The remote condenser consists of an air-cooled coil, variable speed fan, and a PLC control system with the required sensors.

The equipment is specifically sized and designed to the specifications contractually agreed upon between the user and Desert Aire. Operation outside of these specifications can result in reduced equipment performance and reduced equipment life.

Other uses which do not coincide with or exceed the agreed upon specifications will be deemed unauthorized. Damages resulting from unauthorized use will be the sole liability of the user, and not the liability of Desert Aire.

Reading and complying with this instruction manual – especially the safety notifications – are considered part of intended use.

2.2 Order Code

Figure 1 provides a breakdown of the order code. This order code is found on the remote condenser's nameplate. When referencing data in this manual, the order code, or parts of it, are used to distinguish between options. The letter "X" represents a placeholder.

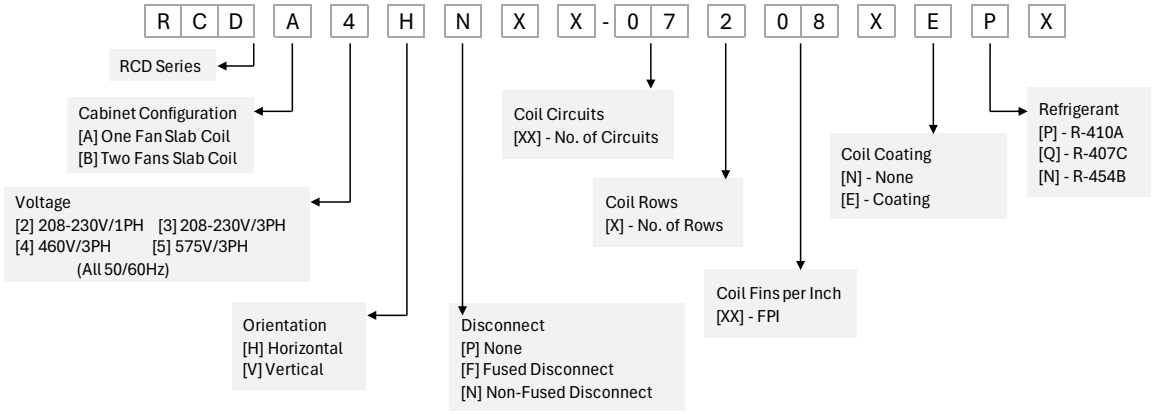


Figure 1 - Remote Condenser Order Code

2.3 Technical Assistance

Desert Aire has a Technical Support team dedicated to providing technical assistance for our equipment throughout its life cycle. This ranges from the commissioning of units, troubleshooting unit failures, sending replacement components, and diagnosing equipment performance.

Technical Assistance can be provided, and replacement parts can be ordered or specified through the Desert Aire website: https://www.desert-aire.com/dehumidifier-service or by calling the technical support number: +1262-946-7400 weekdays from 08:00am to 17:00pm CST/CDT (-5/-6 UTC).

3 Equipment Safety

Desert Aire inspects and tests each climate control unit before it leaves the factory so that you receive a safe, quality piece of equipment. The equipment and its accessories must be installed, serviced, and operated in compliance with these instructions to ensure continued safe operation.

Unfortunately, equipment may become damaged in transit. Inspect the unit carefully before signing the receiving papers. Check for both visible and concealed damage. Remove crating and inspect the exterior cabinet for damage. Dented panels, broken crating or any fluid leaking from the unit should be documented upon delivery. Do not operate equipment that shows signs of damage.

3.1 Operating Range

Maximum allowable pressure	4.5 MPa (650 psig)
Maximum altitude	5,000 meters
Maximum operating temperature	49°C (120°F)

Figure 2 - Maximum Operating Conditions

3.2 Improper Use & Reasonably Foreseeable Misuse

	Do not use equipment in an explosive atmosphere, or with improperly balanced air chemistry or corrosive air quality that causes undue corrosion on refrigerant coils and other components. Do not use the equipment as a resting surface, climbing aid, or storage device. Do not allow children to play with or around the equipment. Children near the equipment must be supervised at all times. Do not attempt unauthorized constructional modifications, unauthorized opening of the refrigeration circuit, tampering with the factory set controls, or operation outside the original design conditions.
	Do not attempt any electrical work if you are not a qualified/ licensed electrician or technician. Do not power the system using an extension cable or smaller than specified gauge wiring. Do not share the electrical supply mains with other appliances. Improper or insufficient power supply can cause undesirable operation, fire or electrical shock. For all electrical work follow all local and national wiring standards and regulations as well as this installation manual. You must use an independent overcurrent protection device to supply power. For all electrical work use the specified cables. Ensure cable connections are tight and clamped securely to prevent external forces from damaging the terminals. Improper electrical connections can overheat and cause fire, and / or electrical shock.

3.3 Equipment Installation

	1. Installation must be performed according to the installation instructions. 2. Installation must be performed by a licensed and trained technician. In addition, they must be knowledgeable about the safety regulations, rules for the prevention of accidents, and national / in-house regulations. 3. Only use the included accessories, parts and specified items for installation. Using non-OEM parts can cause equipment failure which can lead to serious injury or death. 4. Install the equipment on top of a firm structure that can fully support its weight. If the chosen location cannot support the equipment's weight, or the installation is not done properly, the equipment may fall and cause significant property damage, severe injury, and / or death.
	Equipment has High Leakage Current. Protective earth connection essential before connecting mains power supply. Minimum ground wire size: 8.4mm² Cu.

3.4 Equipment Maintenance and Service

	Disconnect Supply Mains Power and use Lock Out - Tag Out procedures before servicing equipment. It is generally forbidden to carry out work on electrical live parts. Protection class of equipment with doors and covers removed is IP00! Failure to disconnect power and follow Lock Out - Tag Out can result in contact with Hazardous Live Voltages. This can cause serious injury and / or death.
	Maintenance must be performed according to the service instructions. Maintenance must be performed by a licensed and trained technician. Replacement of any electrical/ mechanical part, or supply wiring must be performed by a licensed and trained technician.
	Equipment operates with refrigerant which can be dangerous when servicing. Eye protection required.
	Wear protective gloves. Equipment can contain contaminated refrigerant and oil which can cause severe burns.

When breaking into the refrigerant circuit to make repairs – or for any other purpose – conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure shall be adhered to:

- Evacuate the circuit;
- Purge the circuit with inert gas (optional for A2L);
- Evacuate (optional for A2L);
- Continuously flush or purge with inert gas when using flame to open circuit; and
- Open the circuit.

Repair and maintenance to 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:

- Capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
- No live electrical components and wiring are exposed while charging, recovering or purging the system;
- There is continuity of earth bonding.

4 Equipment Life Cycle

4.1 Transport

	Equipment weight exceeds unassisted lifting limits. The use of lifting equipment is mandatory any time the unit is to be moved.
	• Always observe weight specifications and permissible carrying loads of means of transport. • Failure to observe rigging instructions may lead to equipment damage, personal injury, or death. • Lifting method and procedure must comply with all local and national codes and regulations. • The use of safety slings in addition to lifting lugs is required. • Do not lift the equipment in high winds or above people. • Never stand underneath suspended equipment because defective transport equipment could cause death. • Avoid mechanical shocks and impacts to the equipment during transport. • Avoid extreme heat or cold. • Do not stack equipment • Only handle equipment with suitable hoisting gear. • Do not tip the unit on its side. • Do not step on top of unit.

4.2 Storage

	Store equipment in original packaging in a dry area protected from weather and dirt until final installation. Do not stack equipment! Avoid extreme heat or cold. Avoid prolonged storage.

4.3 Rigging

Desert Aire remote condensers are solidly built and can be very heavy. Plan the installation carefully to avoid personal injury and damaging the equipment. For equipment weight and dimensions see the general arrangement drawing provided with the equipment.

The equipment is designed to be lifted only by the lifting lugs installed on the unit. Use all available lifting lugs when rigging the unit. Always use a spreader bar that is at least as long as the distance between the furthest lifting lugs. See Figure 3 for the recommended rigging and lifting procedure.

Under no circumstances should the coil headers, return bends, or electrical box be used to lift or move this equipment.

It is most convenient to install the unit mounting leg assemblies when the unit is in the vertical airflow position (fans facing upward) and supported by the rigging.

The longer lifting lugs on one side of the unit (top side on shipping pallet) may be used temporarily to lift the unit off of the shipping pallet and lay horizontally on the ground.

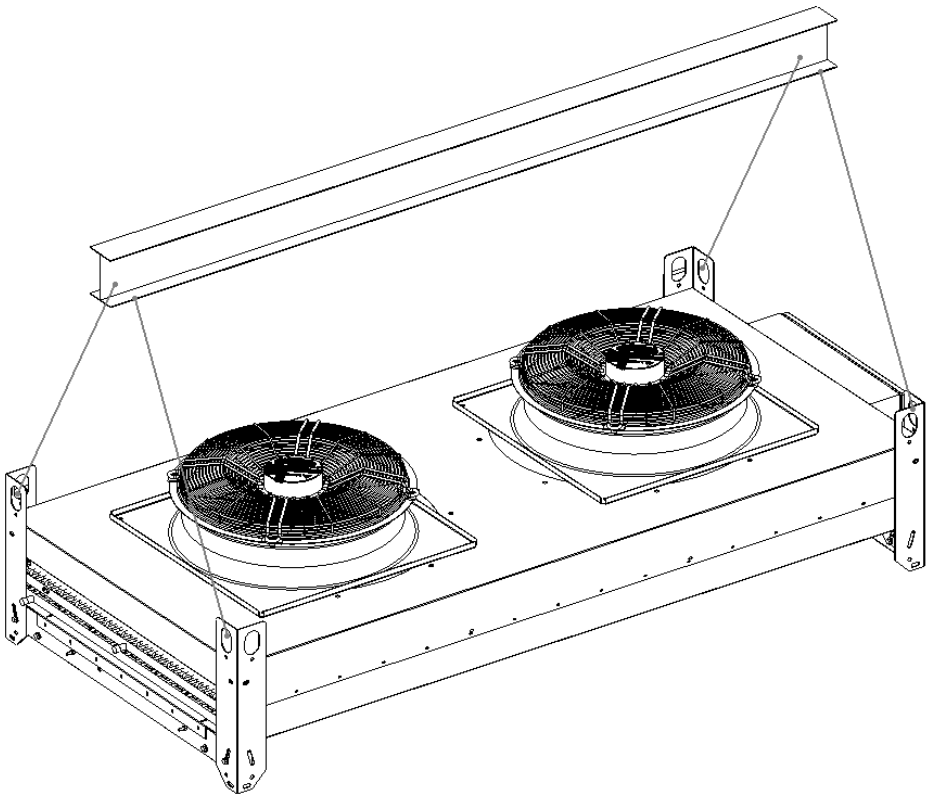


Figure 3 - Rigging Method, Using Built-In Lift Lugs

4.4 Disposal / Recycling / Decommissioning

	This equipment contains potentially hazardous materials. When disposing of this appliance, the law requires special collection and treatment. Do not dispose of this product as household waste or unsorted municipal waste. Follow the Equipment Decommissioning and Removal Sign Off Checklist. Disposing of this appliance improperly, or in other natural surroundings, endangers your health and is bad for the environment. Hazardous substances may leak into the ground water and enter the food chain. Please follow the proper disposal protocol.
	This Equipment contains refrigerants, oils and other harmful liquids. These liquids shall not be permitted to enter municipal wastewater or ground water sources. Dispose of liquids as required by local environmental law. Equipment shall be labelled stating that it has been de-commissioned 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 the equipment contains FLAMMABLE REFRIGERANT.
	This equipment contains electronics, and other components/hazardous materials. Do not dispose as household waste or unsorted municipal waste. Dispose or recycle as required by local environmental law.
	This Equipment contains metals and other recyclable materials which must be recycled as required by local environmental law.

4.4.1 Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its details. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task commences.

- Become familiar with the equipment and its operation
- Isolate the system electrically.
- 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.

- Pump down refrigerant system, if possible.
- If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- Make sure that cylinder is situated on the scales before recovery takes place.
- Start the recovery machine and operate in accordance with instructions.
- Do not overfill cylinders (no more than 80 % volume liquid charge).
- Do not exceed the maximum working pressure of the cylinder, even temporarily.
- 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.
- Recovered refrigerant shall not be charged into another REFRIGERATING SYSTEM unless it has been cleaned and checked.

5 Installation

Manual applies to standard unit configurations only.

5.1 Location of Remote Condenser System

	Minimum clearances specified in front of electrical cabinet must be maintained. Failure do so can result in hazards due to fire and / or electrical shock.
	The foundation supporting the condenser shall be of noncombustible construction and capable of supporting loads imposed by the remote condenser.

The equipment is designed for outdoor installation and may be mounted on a roof or concrete slab. The units should be mounted level on roofs, slabs and/or structural supports that are sufficiently strong to support the total equipment operating weight. Consult with a professional engineer to determine safe mounting loads.

Sufficient space for uninhibited airflow should be provided when near: overhangs; walls; pits; fences; other equipment; and building air intakes, vents or exhaust fans. Locate the remote condenser far enough away from obstructions to provide adequate clearance for ambient air inlet and discharge to prevent 1) reducing the airflow through the condenser coil; and 2) causing air recirculation which heats the air entering the coil above ambient. See Figure 4 for recommendations.

Do not attach ductwork to the coil inlet or outlet. Be sure to allow ample space for maintenance work.

Locate equipment away from occupied spaces to reduce the transmission of objectionable sound and/or vibration. Use refrigerant piping flexible to prevent transmission of noise and vibration into the building. Use isolation hangers to support refrigerant lines. The unit must be secured in its final location. Holes are provided in the mounting legs for this purpose.

The unit must be secured in its final location. Holes are provided in the mounting legs for this purpose.

A corrosive environment, whether it comes from the jobsite or from another nearby source, will significantly shorten the service life of the coil. Consider selecting a unit with coil coating or copper fins to extend the life of the unit.

5.2 Unit Assembly and Installation

5.2.1 Unfolding Legs and Securing

The leg assemblies are attached to the coil, but in a retracted position. Follow the instructions in Figure 5 and Figure 6 to unfold and secure legs. Follow the instructions in Figure 7 for mounting the vibration dampers for vertical airflow installations, or review the next section for horizontal airflow installations. All installation hardware is included with the leg assemblies.

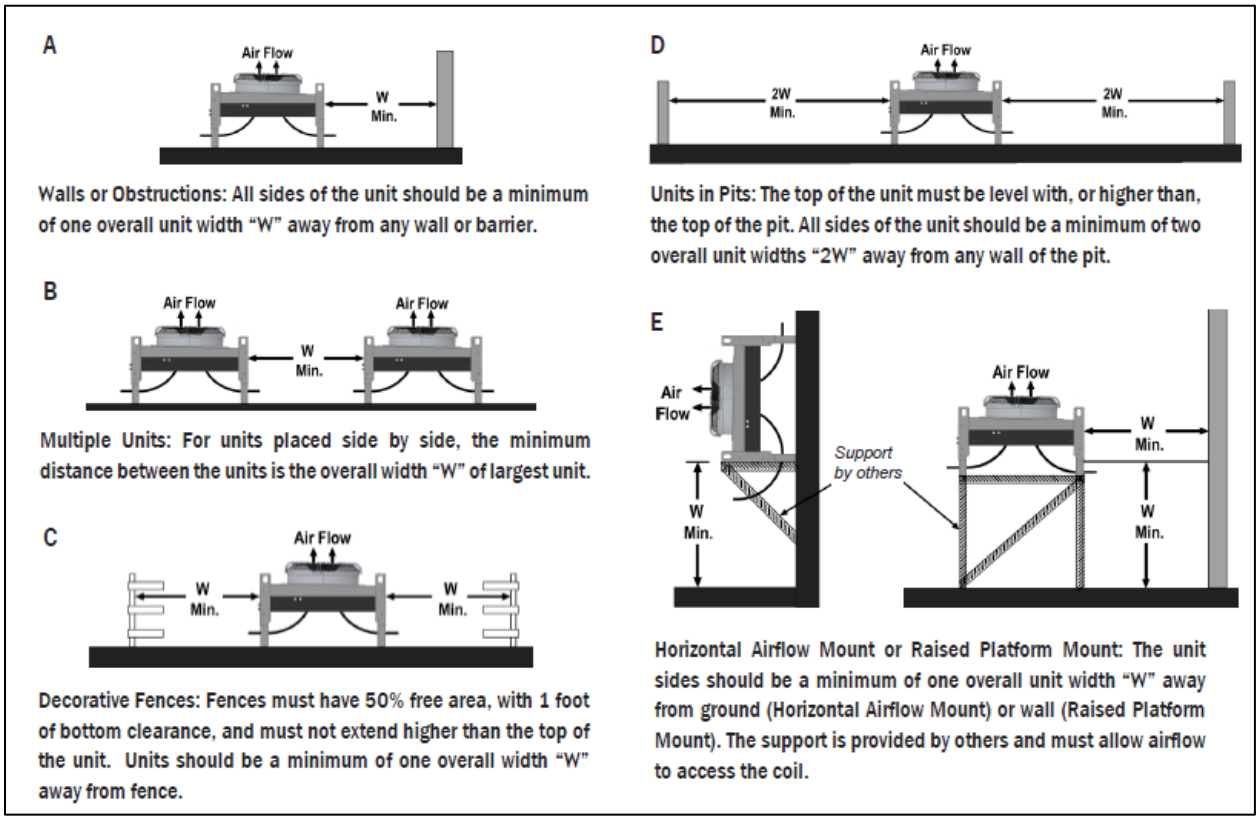


Figure 4 - Space and Location Requirements

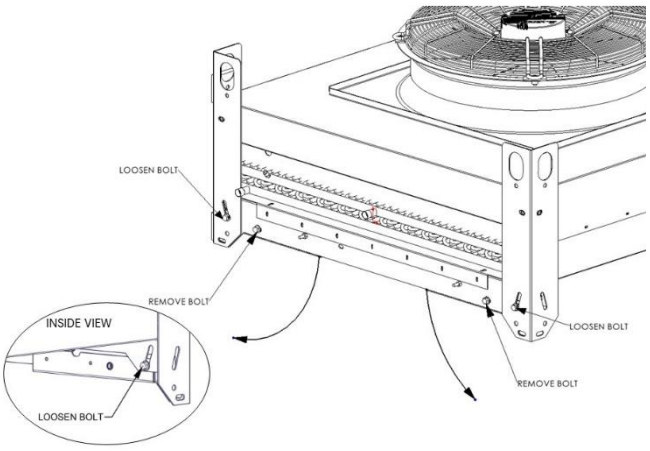


Figure 5 - Legs Folded for Shipping

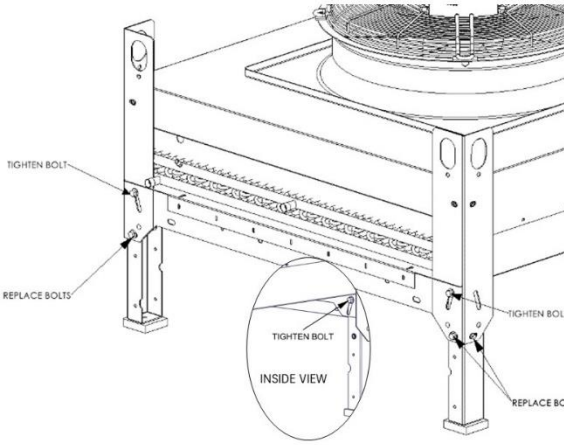
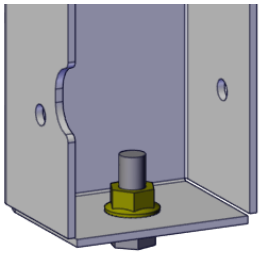
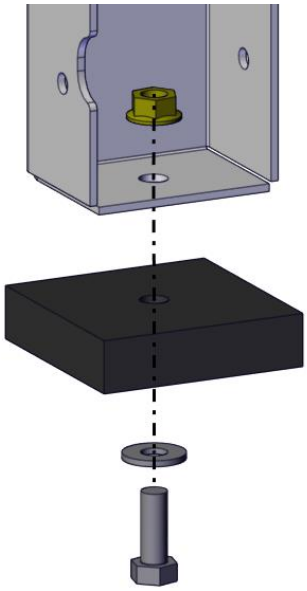


Figure 6 - Legs Unfolded and Secured





Remote condensers that will be installed with a vertical airflow ship with the hardware installed on the feet. The vibration dampers are stored inside the electrical cabinet.

1. Disassemble hardware from bottom of the leg (nut, bolt, washer)
2. Remove vibration dampers package from electrical box
3. Reassemble hardware and damper together with the rubber between washer and the bottom of the leg

Figure 7 - Installing the vibration dampers on vertical airflow installations

5.2.2 Horizontal Flow

The condenser can be configured for horizontal airflow. Add the vibration dampers to the locations shown in Figure 8 and Figure 9.

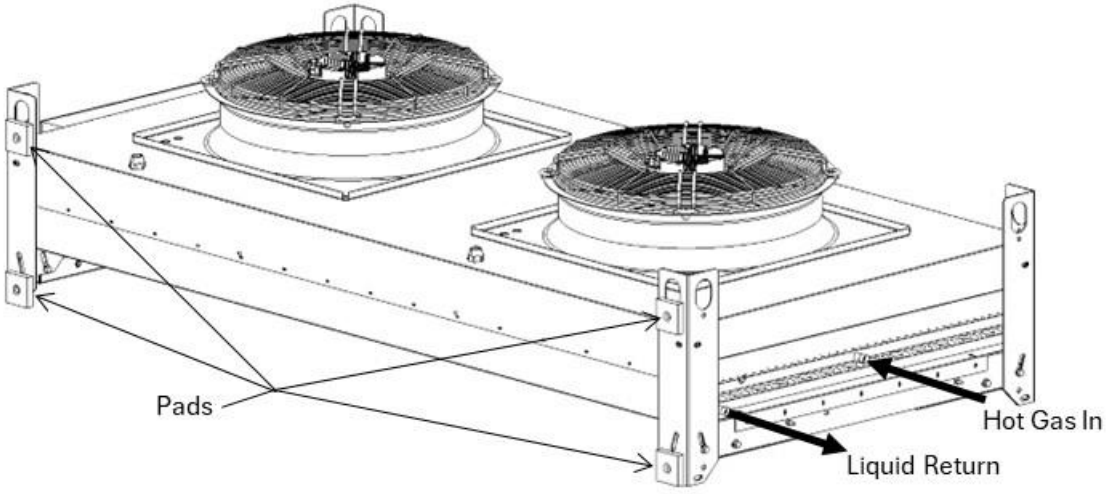


Figure 8 - Unit with Vibration Damper Pads mounted on Side, ready for Horizontal Airflow Install

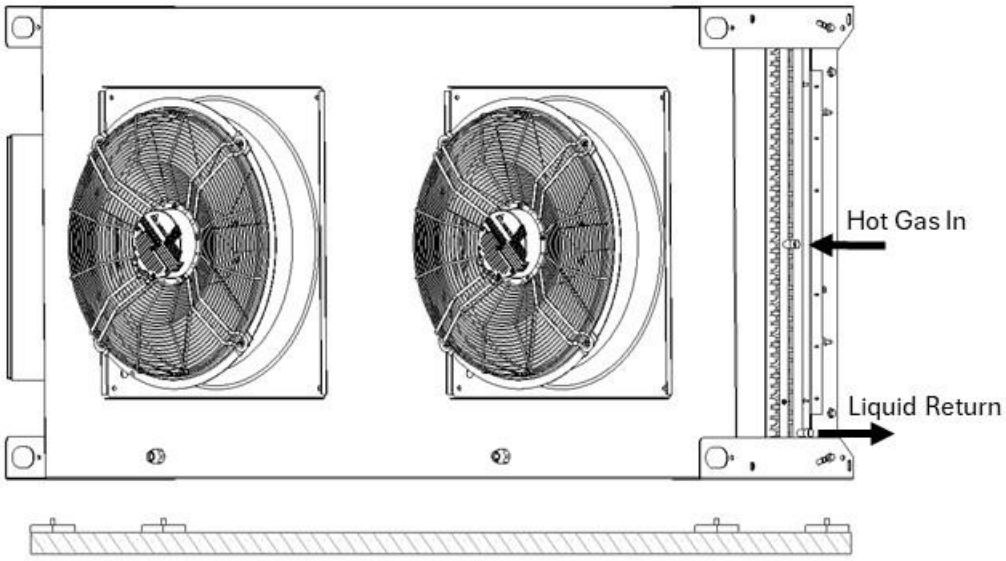


Figure 9 - Unit Oriented with Horizontal Airflow and Liquid Return Line at Bottom

Note that fasteners used to secure the brackets to the concrete pad or roof are to be supplied by others according to requirements of the substrate, wind load, seismic restraint, or any other special condition.

Remote condensers should be securely mounted to prevent unwanted movement. Mounting holes are provided on each leg of the remote condenser. Should mounting dimensions be required please consult the Desert Aire Remote Condenser Brochure.

5.3 Piping Design

	Inadequate pipe sizing & routing can cause performance issues. Refer to the lineset design (pipe diameter, and lengths) provided with the dehumidifier for correct pipe sizing. If connected to a unit not provided by Desert Aire, ensure the piping design is approved by the unit manufacturer.

Desert Aire model LC, LV, LW, SA and SP dehumidifiers – Factory supplied check valve(s) are shipped with the Desert Aire model LC, LV, LW, SA or SP dehumidifier. One valve shall be installed on the hot gas inlet to the condenser for each circuit. The valves shall be installed as close to the remote condenser as possible. Check valves can be oriented in a horizontal or upward position. They must not be facing downward. The valve prevents liquid refrigerant from draining or migrating to areas close to the 3-way heat reclaim valve in the dehumidifier. Failure to install this valve may cause liquid to expand rapidly and result in line noise, vibration and, in extreme circumstances, tube distortion and refrigerant leaks. Specific install instructions are shipped with the valves and unit.

Desert Aire models QS, QV, GA, GS and GV – These units do not ship with the loose check valve, because it is not required on these products.

Installing the remote condenser with long lines and significantly below the dehumidifier can lead to insufficient (or no) subcooling. A project like this should be specified with a special condenser that has an increased sub-cooling section. Follow the original design specified at the time of unit order or contact Desert Aire Technical Support for an alternate condenser specification.

Provisions must be made to accommodate thermal expansion and contraction of the lines, especially where the lines have long runs with few elbows or bends. The lines must also be supported at frequent intervals in accordance with good piping practice. This is especially critical at the condenser connections where all piping connected directly to the condenser must be supported as close to the condenser as possible.

The inlet piping should always feed downward to the inlet header and be equipped with a pressure tap (purge) type valve at its highest point.

Refrigerant lines should be sloped in the direction of flow 1/8” per foot minimum to aid in the movement of oil and refrigerant throughout the system. Line diameters and refrigeration charges for standard applications are indicated on a label attached to the dehumidifier adjacent to the condenser tube connections. The maximum total line length allowed will vary depending on the dehumidifier model size and remote condenser combination selected.

The maximum liquid line riser for a standard dehumidifier and remote condenser is 10 ft.

Do not exceed the maximum line length or liquid line riser on standard configurations. A unit may also have been specially ordered with custom internal components to allow for longer total line lengths or greater liquid line risers. When the unit has been ordered for a specific line configuration, a label attached to the unit will indicate the line diameters and charges to be used.

Discharge line traps should be installed at the base of all vertical risers and every 15 ft up the riser. These traps should be formed from short radius ells or preformed traps and kept as short as possible. Figure 11

through Figure 15 provide examples of proper trap locations on discharge lines. Traps are not required on the liquid return line. Contact Desert Aire Technical Support at 262-946-7400 with any questions about the requirements. The trap increases the refrigerant velocity and carries oil up the vertical section of discharge line under lower loads. In doing so, additional oil will collect in the trap during these lower loads and/or staging of compressor capacity. Support and clamp condenser tubing at regular intervals. Figure 10 shows the maximum allowed spans between clamps for different pipe diameters.

Tube Size	Maximum Span Between Clamps
1/2" – 7/8"	5ft
1 1/8"	6ft
1 3/8"	7ft
1 5/8"	8ft

Figure 10 - Maximum Span between Clamps

The distance between the dehumidifier cabinet and the first clamp, shall not exceed the span provided in Figure 10. Ensure the tubing is centered within pipe seal grommet at the cabinet penetration before fully tightening the field installed clamp(s). Forces occurring during mode shifts may move piping slightly.

After tightening check to ensure there is a minimum of 1/2" clearance around all field installed tubing to any structure or other obstruction.

Provide means of preventing dissimilar metal contact such as copper clamps, plastic coated hangers, or similar. Rubber isolation at connection is recommended for applications where there may be sensitivity to noise or vibration. Follow ANSI/MSS SP-69 clamping guidelines.

Consider the use of U-Loops or Z- Bends for extended lengths of straight tubing subject to wide ranges in temperature conditions. Refer to ASHRAE Handbook HVAC Systems and Equipment for examples.

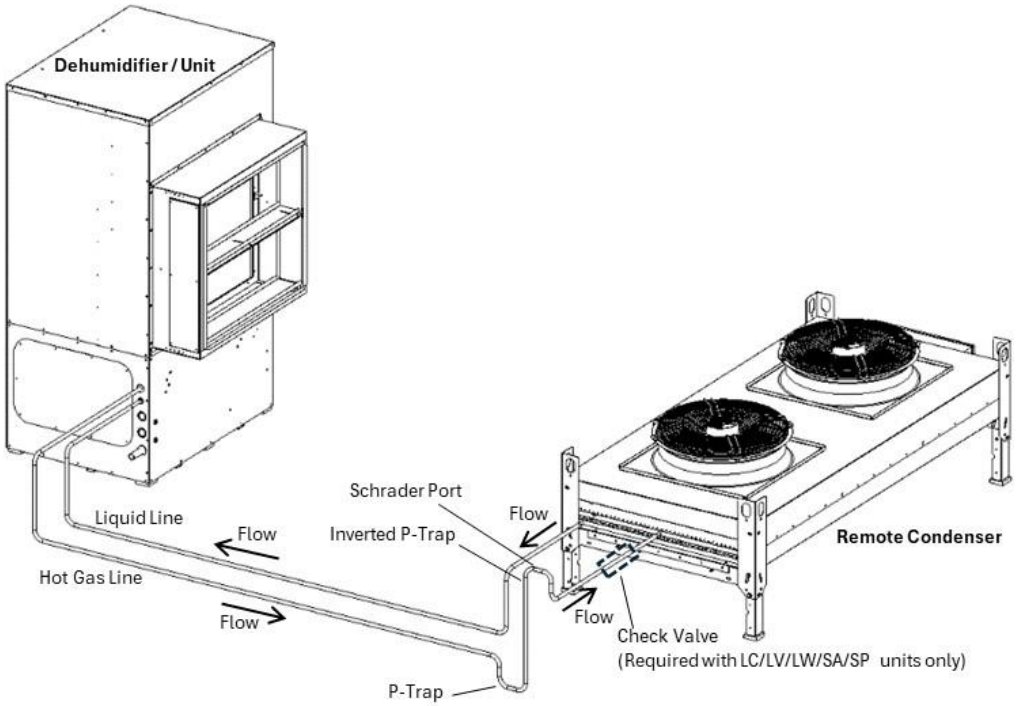


Figure 11 - Example Piping: Unit and Remote Condenser Installed on the Same Level

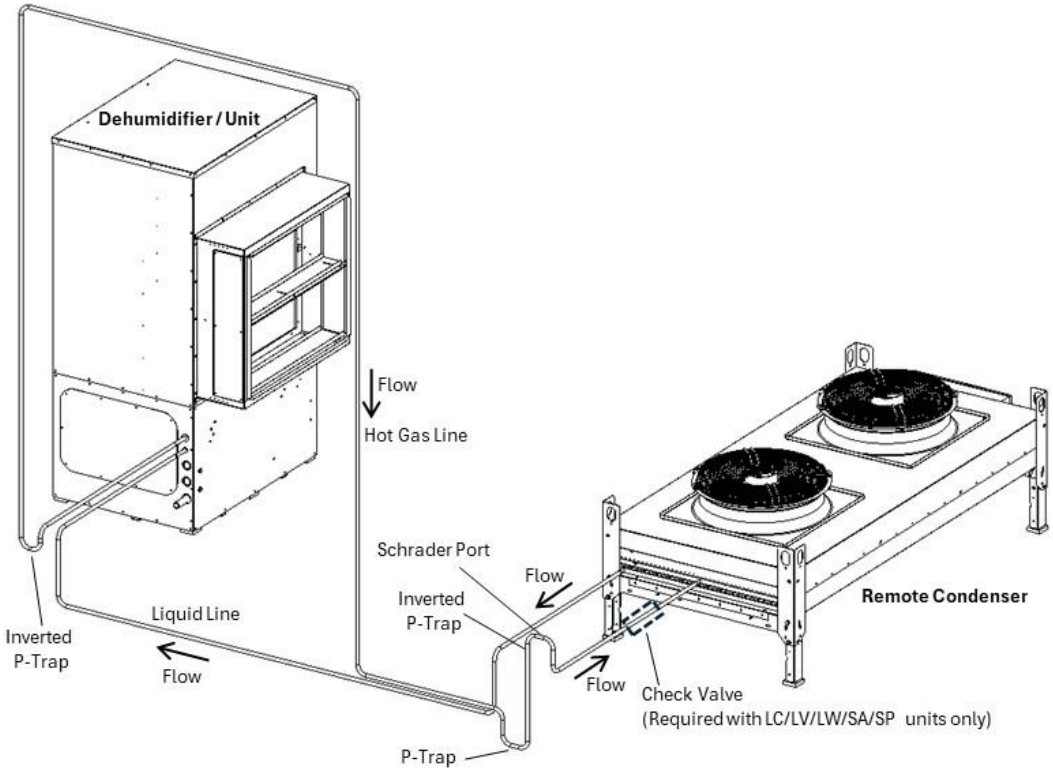


Figure 12 - Example Piping: Unit on Same Level, Hot Gas Line Routed Over Obstruction

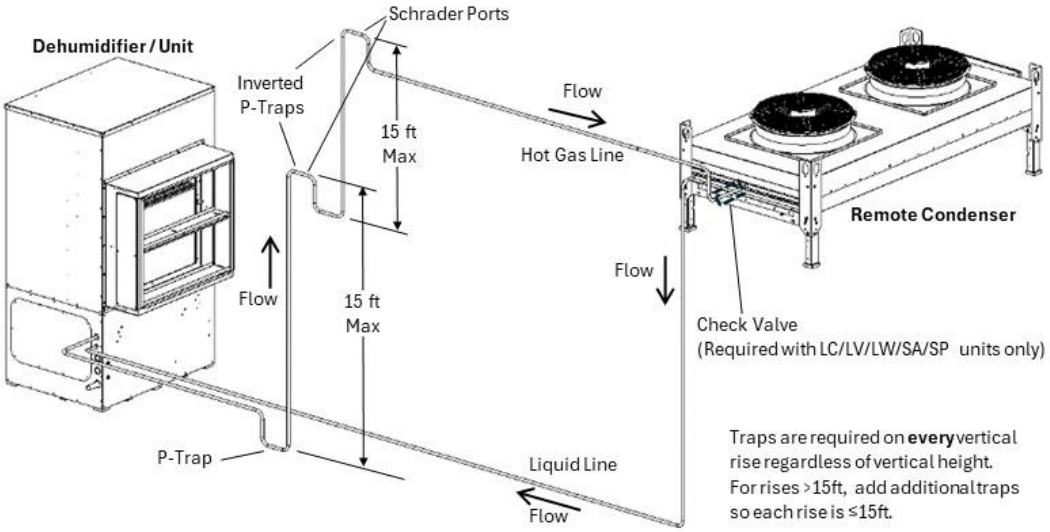


Figure 13 - Example Piping: Remote Condenser Installed Higher than Unit

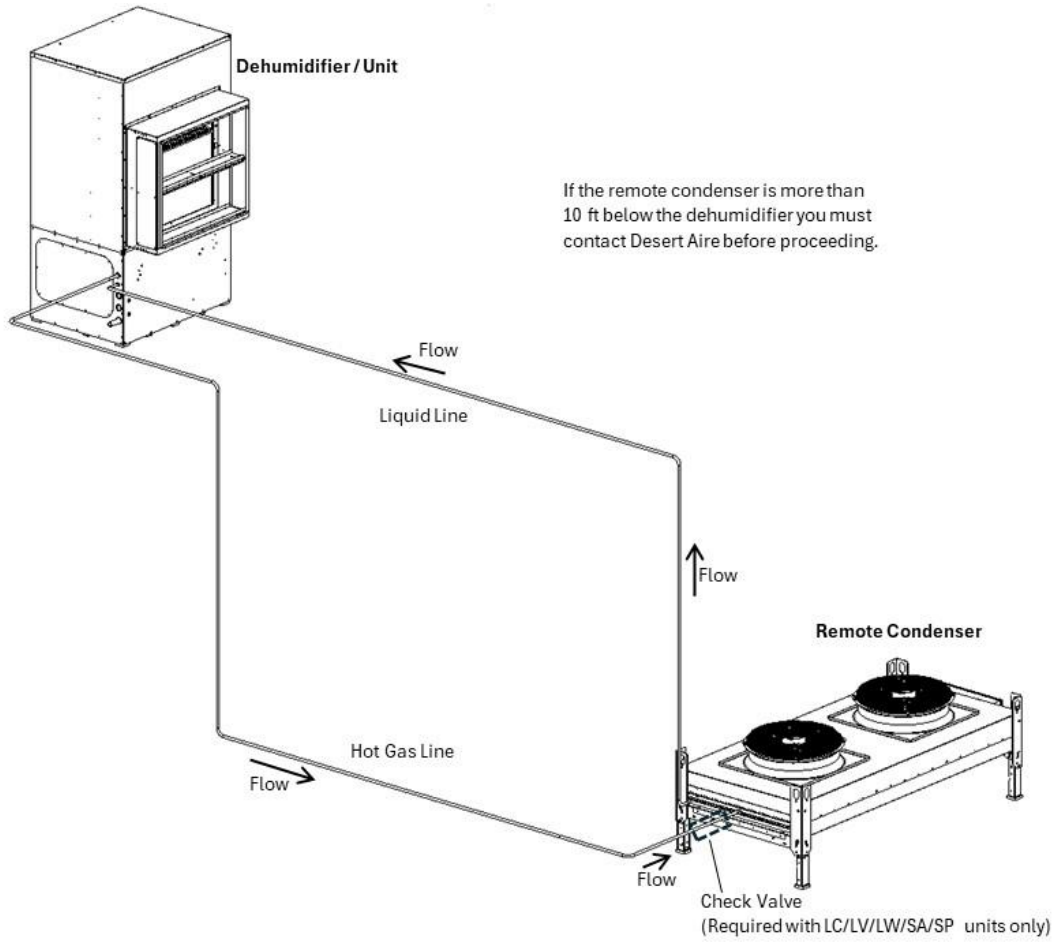


Figure 14 - Example Piping: Remote Condenser Installed Lower than Unit

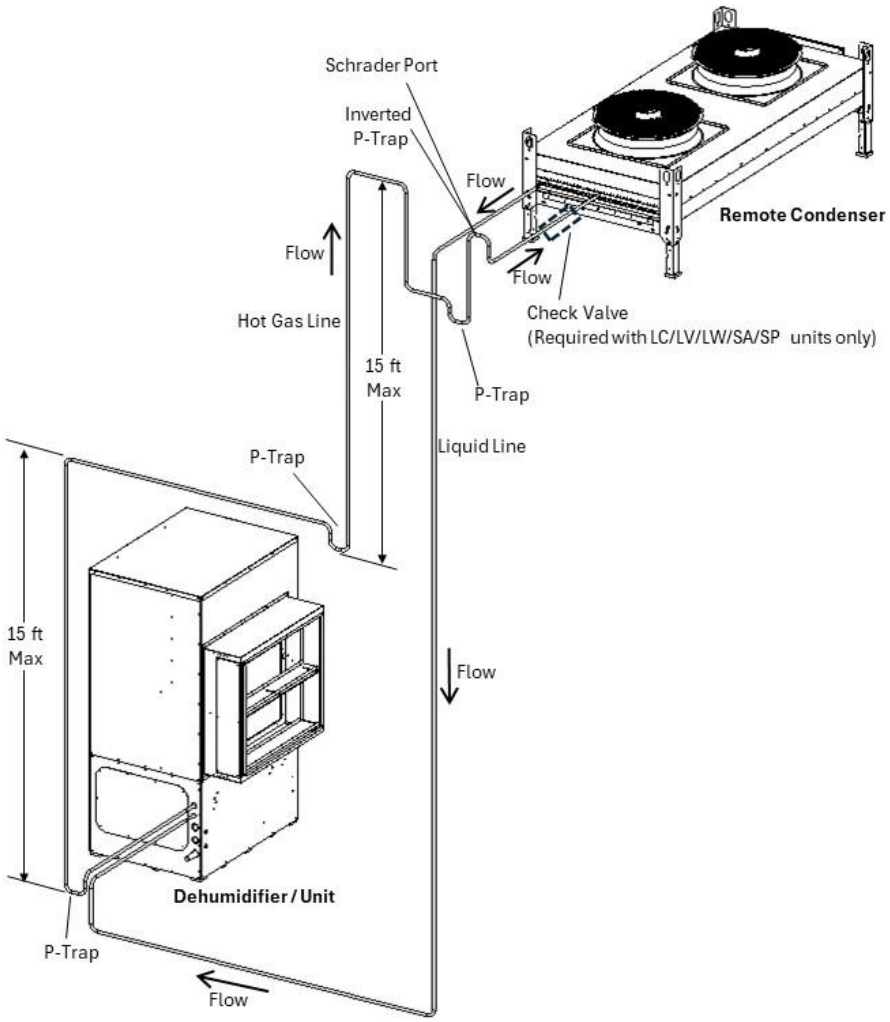


Figure 15 - Example Piping: Remote Condenser Installed Higher than Unit

5.4 Oil Charge

There may be a field oil charge indicated on the unit label that accounts for oil miscible in the liquid refrigerant and some wetting of pipes. However, the addition of traps in the discharge piping will increase the required oil charge, to fill these traps during low load conditions, and ensure there is still sufficient oil in the sump of the compressor. Figure 16 estimates the required additional charge of oil for each trap added to the piping, when using standard trap design.

Discharge Line Tube Diameter	Additional Oil for Each Trap
1/2" - 7/8"	1 oz.
1 1/8" - 1 3/8"	2 oz.
1 5/8"	3 oz.

Figure 16 - Estimated Additional Oil Charge due to Traps in the Discharge Line

Where a compressor oil sight glass is available, observation of the oil level shall **always** be the indicator that sufficient oil has been added to the system. Check each sight glass oil level after 24 hours of circuit run time and add oil as required. Approved POE oil specifications are provided in Figure 17.

5.5 Remote Condenser Piping and Lineset

The installation of the remote condenser is a critical process in the installation of the equipment. To ensure longevity of the refrigeration system components, proper service practice must be followed. During installation, the piping material, pipe routing, and installation shall include protection from physical damage in operation and service, and comply with national and local codes and standards, such as UL 60335, 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

5.6 Procedure for Installation of Remote Condensers

	The remote condenser ships with polymer plugs in the coil stubs. There is a neutral charge of nitrogen inside the coil to provide an inert environment and protect it from corrosion. Only remove the plugs when ready to connect piping, to avoid unnecessary exposure to environmental moisture. The nitrogen charge is at atmospheric pressure, so when the plug is removed there should be no pressure release. Not hearing a release of pressure is normal and does not indicate a coil leak.

- Desert Aire dehumidifiers and remote condensers come equipped with connection sizes suitable for specific pipe routings. Many installations will require adapting to different field tube diameters depending on the distance between components. Use fittings and adapters as close as possible to the system components.
    - Do not open the service valve at the connections until all piping and evacuation is complete.

- Use dehydrated tube where possible.
    - Tubes 1-1/8” and smaller: Use Type K per ASTM B 88 or ASTM B 819, or Type ACR per ASTM B 280.
    - Tubes 1-3/8” and larger: Use Type K per ASTM B 88 or ASTM B 819.
        - All tubes should be kept clean and dry before and during installation.
    - Cap sections of tube that are not actively being installed to prevent infiltration of moisture and contaminants.
        - Ensure that copper chips are not introduced into the system during fabrication of tubing.
    - Use tubing cutter rather than saw when cutting tubes to length.
        - Use only brazed alloys to join tube.
    - The selection of filler metals is highly dependent on the tube fit, clearance, and operator preference for flow. When flux is to be used, care should be taken to ensure that the flux is not introduced to the inside of the tube. It is recommended that phosphorus bearing alloys be considered for copper-to-copper connections due to their self-fluxing on these joints. Refer to the alloy manufacturer’s guidelines for details on compatibility.
        - Flow nitrogen into tubing to prevent the formation of copper oxides.
        - Copper oxides form rapidly when copper is heated to temperatures required by the brazing process and exposed to oxygen in the air. Copper oxides flake easily on the inside of the tubing and dislodge easily when the system is filled with refrigerant and oil. The particulate can move throughout the system and cause contamination on valves and other critical components. System filters may become fouled.
    - Flowing nitrogen into the system and ensuring that the inside of the tube is significantly free from oxygen while brazing ensures that oxides do not form. As the last joints of a system are made, additional thought must be made on the location where the nitrogen can escape. Schrader valves are available on the unit. These valves can be opened to allow for nitrogen to flow without generating pressure behind the braze joint that is being created.
        - If remote condenser piping is pressure tested before evacuation, use a maximum of 80 PSI pressure for R-407C and R-22 systems and 150 PSI for R-410A and R-454B systems to ensure that none of the gas used for testing is forced into the other system sections.
        - Carefully inspect pump and related equipment before connecting to system. Ensure gaskets are in good condition and pump is capable of low vacuum to save time. Connect pump(s) to as many locations as possible ensuring all locations are well sealed. If a field charge is required, connect a refrigerant tank to the system with a good valve.
    - Connect hoses for purging.
    - Evacuate the line and remote condenser to 400 microns measured at a point on the system furthest away from the pump.
    - Note that a gauge installed on the pump or in close proximity will give a lower reading while the unit is being evacuated.
    - A deep vacuum gauge should be used to evaluate the pressure. Compound manifold gauges

do not allow for enough accuracy at the pressures required.

- The system should be able to hold a vacuum under 500 microns for more than 10 minutes.
- The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.
- If pressure continuously rises at a rapid rate there is likely a system leak.
- Review all piping connections and correct before continuing evacuation.
- Pressure rising above 500 microns and tending to stabilize at a higher pressure indicates the system has moisture above specifications. Continue evacuation until 500 microns or lower can be held for a minimum of 10 minutes.
    - If field charge of refrigerant and oil is required, feed into the evacuated condenser.
- To account for the length of piping for remote condensers and the oil traps that occur in the piping, additional oil should be added when additional refrigerant is specified for charging in the field. Note that the factory has already added oil charge for the refrigerant charge in the unit.
- Oil added to the system should be from new, sealed containers. New systems with R-410A, R-407C, or R-454B should use only the oils in Figure 17 (for other refrigerants, contact the Desert Aire factory).
- Oil should not be exposed to atmosphere for more than 5 minutes. Due to the highly hygroscopic nature of POE oils, water is absorbed at high rates and will be removed by the filter dryer in the system. The dryer located inside the unit is sufficient for removal of the moisture introduced during this initial remote condenser connection and oil changing if proper procedures are followed.

  For ease of installation, it is preferable to install oil while a section of the piping is under vacuum. Charge into the high side of the system. The following equation can be used to determine the initial oil charge to be added:

  Field oil charge, oz. = Specified field refrigerant charge, lbs. x 0.352
- Oil can also be introduced into the compressor sump or slowly into the suction line while the compressor is running.
- Every lineset is different and those with larger traps or improperly sloped piping may require more oil. The compressor oil sight glass must be checked after 24 hours of operation to ensure sufficient oil – this does not apply to units without a compressor oil sight glass.

Copeland® Ultra 32-3MAF	Hatcol 22 CC
Lubrizol Emkarate RL 32-3MAF	Copeland® Ultra 22 CC
Parker Emkarate RL 32-3MAF	Mobil Arctic 22 CC
Nu Calgon 4314-66 (RL 32-3MAF)	

Figure 17 - Acceptable Oils for R-410A, R-407C and R-454B

- The remote condenser is the preferred location for field charging as it is the furthest from the compressor in these systems, and it presents the least risk for induction of liquid refrigerant into the compressor sump.

- Charge should be weighed into the system using a scale. Field charge is located on the label attached to the unit near the remote condenser connections. Many Desert Aire dehumidifiers are custom products with special features and due to continuous improvements the I&O manual may differ from this label. Where there is a conflict between the standard charge indicated in the I&O manual and the label, the label field charge should be used.
- In cases where the full field charge cannot be added at the condenser, the charge can be added to the low side of the system only when compressors are energized. See last step for details.
    - Service valves connecting the remote condenser and the unit can be opened after a field charge is added.
    - If the system is being started for the first time the dehumidifier's compressors should be temporarily disabled by removing primary fuses or breaking the 24 volt circuit. An easy method is to open the knife switch 1S on the control voltage terminal block or rotate the ON/OFF switch on the exterior of the unit to the OFF position (whichever is applicable) before powering the dehumidifier unit. Ensure the dehumidifier unit is unoccupied to prevent the fan(s) and other components from energizing. This will energize the crankcase heaters to ensure that any refrigerant that may have migrated to the compressor sump is forced out. The crankcase heater should be energized for 24 hours before the refrigeration system is allowed to operate.
    - If any remaining field charge needs to be added to the system, the compressors should be energized and the charge should be slowly metered into the suction line as far as possible upstream of the compressor. If the unit is equipped with an accumulator the charge needs to be added to the port upstream of this location.
- The bulkhead fittings on the side of the unit should not be used for charge addition. Monitor superheat at the compressor suction inlet using the bulkhead fitting and a temperature sensor on the suction line near the compressor. Superheat should not drop below 10 degrees during the process of adding charge.
    - If repairs or decommissioning must be made after the system is charged, properly and safely remove, and isolate refrigerant and purge the section of the system needing repair with oxygen free nitrogen prior to opening the circuit.
- The refrigerant charge should be recovered into the correctly marked recovery cylinders. Ensure that the correct number of cylinders for holding the total system charge is available. Only use cylinders designated for the recovered refrigerant and labelled for that refrigerant. Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty cylinders are evacuated and, if possible, cooled before recovery occurs.
- Ensure that the outlet for the vacuum pump is not close to any potential ignition sources and that ventilation is available.
- The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder. Do not mix refrigerants.
- Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work

If FLAMMABLE REFRIGERANT is used, the proper service equipment is required. Failure to use proper service tools may result in equipment damage or personal injury.

For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum (optional for A2L). This process shall be repeated until no refrigerant is within the system (optional for A2L). When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.

- Under no circumstances shall potential sources of ignition 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. The following leak detection methods are deemed acceptable for all refrigerant systems.
- Electronic leak detectors may be used to detect refrigerant leaks but, in the case of FLAMMABLE REFRIGERANTS, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and 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 but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipework.
- NOTE Examples of leak detection fluids are
    - Bubble method,
    - Fluorescent method agents.
- If a leak is suspected, all naked flames shall be removed/extinguished.
- If a leakage of refrigerant is found which 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.
- Work shall be undertaken under a controlled procedure to minimize the risk of a flammable gas or vapor being present while the work is performed.
- 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.
- 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, i.e. non-sparking, adequately sealed or intrinsically safe.
- No person carrying out work in relation to a REFRIGERATING SYSTEM which involves exposing any pipe work shall use any sources of ignition 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 site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to 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.

- Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any 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.
- Be aware that refrigerants may not contain an odor.
- Do not pierce or burn.

5.5 Refrigerant Charge

The remote condenser may be manufactured for a safety group A2L refrigerant. Refer to the nameplate on your remote condenser. In these cases, the unit is labeled with the flame symbol shown here. A2L refrigerants are flammable, and all applicable warnings and instructions shall be followed.

If A2L is refrigerant is used, then a CO2 fire extinguisher shall be located adjacent to the charging area. All possible ignition sources, including cigarette smoking, should be kept sufficiently away from the site of installation, servicing, removing and disposal of A2L refrigerants.

Important: Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks.

Important: The following leak detection methods are deemed acceptable for all refrigerant systems:

- Electronic leak detectors calibrated for A2L
- Bubble method

The field refrigerant charge required after installation of the condenser is located on a label attached to the dehumidifier. Some dehumidifier models come equipped with sufficient charge for short linesets and may not require field charge. The label is specific to the combination of Desert Aire dehumidifier and remote condenser.

Guidance regarding field charges and line diameters may also be available in the specific dehumidifier Installation and Operation Manual. Due to the wide variety of combinations and potential customization, the label attached to the unit should be referenced as the authority for line diameters and field charges when installing the equipment.

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.

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

5.7 High Voltage Wiring

Danger Due to Hazardous Live Voltage

Work on electrical components and wiring may only be carried out by trained electricians or by persons instructed in electricity under the supervision of an electrician in accordance with electrical engineering regulations.

A Second person must always be present when working on energized parts or lines.

Disconnect Supply Mains and use Lock Out – Tag Out procedures before servicing equipment. It is generally forbidden to carry out work on electrical live parts. Failure to disconnect power and follow Lock Out – Tag Out can result in contact with Hazardous Live Voltages. This can cause serious injury and/ or death.

When doors and/or covers are removed the equipment protection class becomes IP00.

Warning, equipment has potential arc flash hazard. Appropriate PPE and tools required when working on this equipment. Failure to comply may result in severe injury, and / or death.

- Power supply voltage, phase, and frequency must match specifications shown on the unit nameplate. Always check motors for proper rotation.

- Power supply for 208/230V motors must be between 188V and 253V.

- Power supply for other motor voltages must be within ± 10% of nameplate voltage.

- Phase voltage imbalance must not exceed 2%.

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects.

Electrical wiring must comply with all national, state, and local codes. Refer to the wiring diagram located inside the electrical section for all wiring connections. To connect main power, attach the supply wires to the three-pole or two-pole power block mounted on the electrical panel.

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

The following checks shall be applied to installations using FLAMMABLE REFRIGERANTS:

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

5.7.1 High Voltage Connections

On single-phase units the power supply must have 3 connections (2 power and 1 ground). On three-phase units the power supply must have 4 connections (3 power and 1 ground). Connect the power supply wires to the main power block located in the electrical compartment.

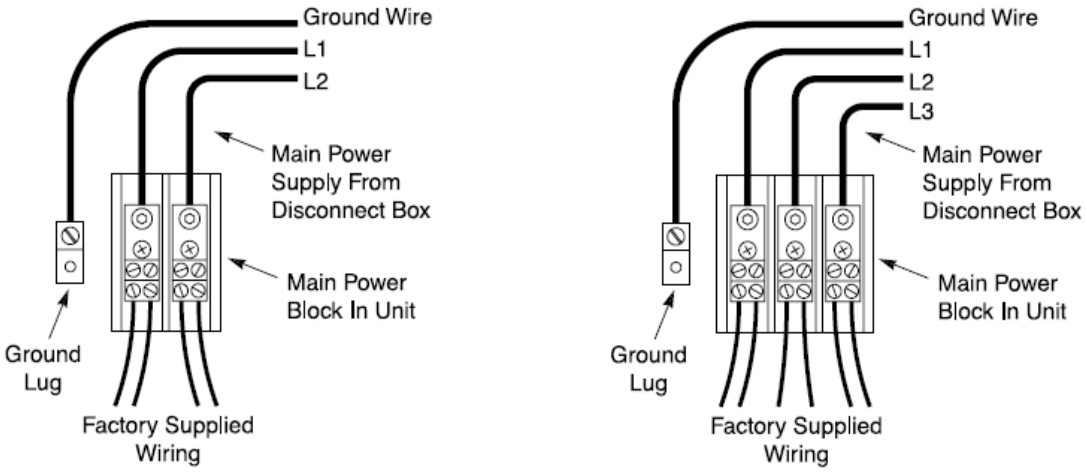


Figure 18 - Single-Phase and Three-Phase System Power Connections

5.7.2 Minimum Electrical Spacings

A minimum of 3ft clear working space must be provided in front of the electrical enclosure. See Figure 19.

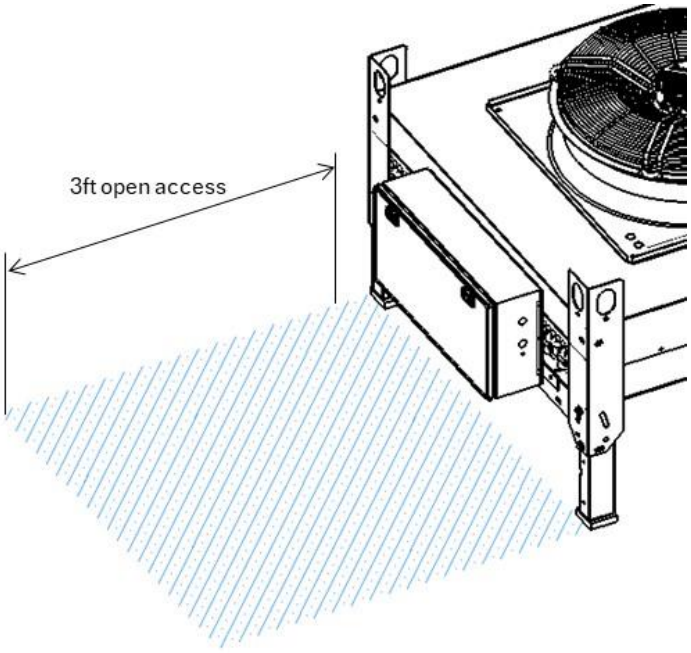


Figure 19 - Required Open Space for Access to Electrical Panel

5.7.3 Wire/ Mains Power Supply Sizing

	All wire sizing and construction design for the connection to Mains Power Supply should follow the local and national codes. When sizing wires the Methods of installation, ambient correction factors, and safety factors should be taken into consideration. Improperly sized wire can lead to risk of fire, electrical shock, serious injury, and death.

The field installed power supply wires must be sized to handle the minimum circuit ampacity. This value can be found on the nameplate of the remote condenser located on the electrical enclosure.

5.7.4 Conduit Knockouts

The unit shall be permanently connected to fixed wiring. The electrical enclosure does not ship with conduit openings or knockouts already punched, because the installer will have a preference on where the wire enters. The installer shall punch a conduit opening in the enclosure side wall or bottom wall to suit the application. Note that the enclosure is built with sheet steel thicker than 0.88 mm and is suitable for securing conduit connections. The installer shall size the conduit connections with diameter to accommodate the conduit according to National Electrical Code (NEC) tables, based on the number and size of fixed wires required for intended installation.

5.7.5 Fuse, Overcurrent Protection Device, or Disconnect Switch Sizing

For Units NOT supplied with a Disconnect Switch or Circuit Breaker from the Manufacturer:

It is the responsibility of the installer of this equipment to provide a suitable disconnect for this equipment. This disconnect must:

- Be suitable for the Voltage and Full Load Ampere Rating of all downstream equipment supplied;
- The supply disconnecting device shall be one of the following types:
  - Switch-disconnector, with or without fuses, in accordance with IEC 60947-3, utilization category AC-23B or DC-23B.
  - As above, except one that has an auxiliary contact that in all cases causes switching devices to break the load circuit before the opening of the main contacts of the disconnector.
  - A circuit breaker suitable as an isolation device per IEC 60947-2.
  - Any other switching device in accordance with an IEC product standard that also meets the isolation requirements of IEC 60947-1 and is appropriate for on-load switching of motors or other inductive loads.
- Be approved for use as a disconnect for the country in which this equipment is installed;
- Be provided with a Lock - Out Tag Out capability in the Off (Down) position;
- If the disconnect acts as an emergency switching off device, the handle must be red in color to denote the emergency use function.

The field-installed Overcurrent Protection Device must be sized to handle the minimum circuit ampacity without exceeding the maximum overcurrent protection device value listed. These values can be found on the equipment nameplate of the remote condenser located on the electrical enclosure.

5.8 Controls Wiring

Wiring circuits of Safety Extra Low Voltage must be done only to Safety Extra Low Voltage terminal strips. Refer to wiring schematic for details.

Remote Enable – Desert Aire will provide terminals for the connection of a dry contact for a remote enable signal. This signal will place the unit in standby mode, or run mode.

General Alarm – Desert Aire will provide terminals for the connection of a dry contact for an Alarm signal. This signal will shut the unit down and place the unit in alarm.

Alarm Output – Desert Aire will provide a dry Alarm contact for customer connection. This dry contact will close when the unit has detected an alarm, and open when no alarm is present.

6 Start-Up and Maintenance

	**<u>DO NOT</u> operate equipment with doors or covers off**! Protection class of equipment with doors and covers off is IP00! It is possible to touch Hazardous Live Voltage and Hazardous Rotating Fan Blades with doors and covers removed. Operation without doors and covers can result in serious injury or death.
	Any faults detected in the electrical system must be corrected immediately. If these faults are not corrected, the equipment is potentially very dangerous and must not be operated.
	Lock Electrical Disconnect Switch or Circuit Breaker supplying the equipment when accessing the electrical panel. Follow Lock Out - Tag Out protocol when servicing equipment.
	Disconnect all incoming sources of power before accessing the electrical panel.

Read this section thoroughly before attempting to commission the Desert Aire unit.

A complete start-up will minimize operational problems and expensive callbacks.

6.1 Preliminary Inspection

Verify that all contractors have completed their work. Find the Desert Aire Start-Up Report for Remote Condenser Models in the dehumidifier's IOM Manual. You must fill out the start-up report to validate the unit warranty. Check the following items:

- Make sure that the unit is level and securely mounted so that it cannot shift or transmit vibration to the building.
- Verify that the incoming power supply matches the rating plate of the unit.
- The available power supply voltage must be within ±10% of the voltage printed on the rating plate.
- With the power supply disconnected and locked, tighten all field and factory electrical connections if applicable.
- Inspect the coils to assure they are clean. If necessary, clean the coils.
- Check the field and factory piping for leaks. The internal piping may have been damaged during shipping.
- Prior to start-up the following items should be checked:
- Fans rotate freely.
- Motors and mounts are securely fastened.
- Legs are securely attached to the unit and to the mounting structure.
- Remove debris from around the unit that could potentially block airflow through the coil.

- Upon start-up the following items should be checked:
- Fans are rotating in the proper direction – airflow should pass through the coil first, then through the fan and away from the unit.
- Fan control settings are correct and operational.

6.2 Routine Maintenance Schedule

 	Warning, equipment contains hazard due to contact with rotating fan blade and Dangerous High Voltage. Only trained individuals should perform maintenance on equipment. Coming into contact with rotating fan blade or Dangerous High Voltage can result in severe injury, and / or death. Take the necessary precautions.
	Never operate the equipment with doors or covers removed. Access to hazardous voltage and moving parts can result in significant property damage, severe injury, and / or death.
	Before accessing any compartments within unit, disconnect power and follow Lock Out - Tag Out procedures. Failure to do so can result in severe injury and / or death.

Air-cooled condensers require little maintenance but regular performance of these items are critical for extended service life and peak performance:

Service Every Month

- Check for dirty coils.
- Remove any debris trapped between the coil and fans.

Service Every Six Months

- Clean the coil fins every 6 months or more frequently in severe conditions. This may be accomplished by brushing and vacuuming or by applying a commercially available coil cleaner specifically developed for cleaning copper and/or aluminum coils. Never use acid-based cleaners. Always follow label directions.
- Comb bent coil fins.
- Tighten all electrical connections.
- Tighten fasteners connecting the motors to their mounts, motor mounts to the unit, legs to the unit and the mounting structure.

7 Operation

7.1 Sequence of Operation

7.1.1 Overview

The Remote Condenser (RC) controller modulates the condenser pressure in the coil by modulating fan speed. When the measured pressure is above a setpoint, the fan speed is increased. When the measured pressure is below the setpoint, the fan speed is reduced.

The RC has a capacity range and is selected for sufficient heat rejection during the hottest ambient air temperature for which the system was designed ('design condition'). In some applications, the RC will have more capacity than designed, resulting in the fans running below full speed, even on a design condition. This is normal operation. In all designs, when the ambient air temperature drops below the design condition, the RC will be able to reject sufficient heat with lower airflow, and the fans will reduce in speed. This too is normal operation.

7.1.2 Fan Speed Control

There are two functions in the controller that control fan speed. One control will work to maintain a pressure setpoint while the other control will act as a safety when the pressure gets too high. A PID function calculates the error between the measured pressure and the pressure setpoint. The controller adjusts the fan speed to minimize this error, by looking at the size of the error, and its rate of change. The default setpoint is specific to the refrigerant being used in the system – see Figure 20.

The second function is a fixed response. This acts as a safety in case the PID response is too slow in any unforeseen conditions. It provides a fixed ramp to prevent the dehumidifier control system tripping out on a high-pressure. The ramp starts at 0% fan speed at 500 psi, and ramps up linearly to 100% fan speed at 525 psi.

The signal sent to the fans is the greater of the two functions described above.

Refrigerant	Pressure Setpoint (Saturation @ 100°F)	Fan 0-100% Ramp Range
R-410A	317 psig	500 - 525 psig
R-407C	222 psig	350 - 375 psig
R-454B	302 psig	500 - 525 psig
R-32	326 psig	500 - 525 psig

Figure 20 - Default Condenser Pressure Setpoints

In two fan systems, both fans are wired separately, but their speed is controlled by the same variable and they run in unison.

7.1.3 Inputs

Enable – the enable is a dry contact input. When closed, the system will be allowed to run. When open, the system remains in standby. The control panel will be powered, but the fans will not be instructed to run. If not used, a jumper should be installed.

General Alarm – the general alarm is a dry contact input. When open, the system will be in alarm, and the unit will not be allowed to run. When closed the unit will be allowed to run under normal operation. If

not used, a jumper should be installed.

The controller is set to measure pressure and adjust its fan speed accordingly. When the RC is enabled and has no alarm input, but the RC is not being used to condense refrigerant, the pressure will be low and lead to the fans slowing to a stop.

7.1.4 Outputs

General Alarm – the general alarm output is a dry contact switch. When it is closed it indicates an alarm and when it is open, it indicates there is no alarm. A general alarm is triggered when the input alarm is active, there is a discharge pressure event (pressure rises above 575 psi), or there is a fan failure. A fan failure can be read via the Modbus connection (Delta and Ziehl Abegg fans). The RC controller passes this alarm through as an available output. Which events trigger an alarm depends upon the manufacturer – refer to the fan manufacturer's literature for more information. For two fan systems, the alarm will trigger when either fan indicates an alarm, or when both fans indicate an alarm.

7.1.5 Sensors

The RC measures the gauge pressure on the refrigerant entering header of the coil. This is the pressure that is used to determine fan speed.

There is a temperature sensor (RTD) on the refrigerant leaving header. This is not used to control the RC. The controller uses it to calculate subcooling, which is displayed on the controller. Note the subcooling accounts for an average pressure drop of 5 psi in the coil, so subcooling is calculated using the measured pressure minus 5 psi.

7.2 Menu Overview and General Instructions

7.2.1 General Notes

Your Desert Aire controller is pre-programmed and configured at the factory for use in the application you have specified. The internal display terminal inside the electrical enclosure allows the operator to monitor and adjust the setpoints of your Desert Aire system. The IDT has an LCD screen and six keys. These keys are labeled as follows:


ALARM Key


PROGRAM (Prg) Key


ESCAPE (Esc) Key


DOWN Key


UP Key


ENTER Key

Unless stated otherwise, pressing **Esc** on a screen takes you back one screen.

Menu screens allow the user to select from a series of actions. The action that is capitalized on the screen is selected by pressing the **ENTER** key. To cycle through the selections on a menu screen, use the **UP** and **DOWN** keys.

If setpoints or selections can be altered on a screen, the **ENTER** key will cycle through those items. Once the cursor is over an item, the **UP** and **DOWN** arrow keys will modify the setting. Numeric values require that the **ENTER** key be pressed to accept the value. An "on" or "off" selection is altered as soon as the **UP** or **DOWN** keys are pressed.

When an alarm is triggered, the red LED behind the **ALARM** key will light and remain on until the alarm is reset.

To view the alarms from any menu, press the **ALARM** key. If no alarm is active, the display will state NO ALARMS. If an alarm is present, it will be displayed along with the date and time it was triggered. The bottom two lines will display two data points recorded when the alarm was triggered.

To reset the alarm, use the **DOWN** key until the reset instructions are shown. Pressing the **ALARM** key for three seconds will reset all active alarms. See Section 3 for further alarm and alarm data logging information.

Screens which display a small **UP** arrow in the upper right and a small **DOWN** arrow in the lower right are part of a series of screens which can be accessed by pressing either the **UP** or **DOWN** arrow keys.

If the operator has not pressed a key for an hour, the remote terminal will return to the Home Screen.

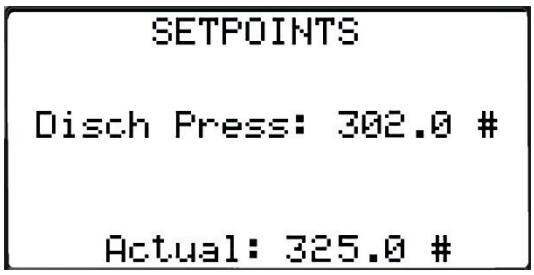
7.2.2 Application Screens

Home Screen

The Home Screen displays the Desert Aire logo and shows the discharge pressure and fan speed.

The unit type is displayed in the upper right of the screen indicating the remote condenser series.

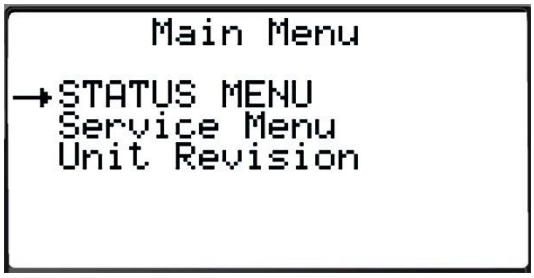
Setpoints



Pressing the **Prg** key from the Home Screen will display the SETPOINTS screen. In the middle of this screen the discharge setpoint is adjustable. At the bottom of the screen the actual discharge pressure is displayed.

To return to the Home Screen, press the **Esc** key.

Main Menu



From the Home screen press the **Esc** key to display the Main Menu. This menu allows the operator to select the Status Menu, enter the Service Menu and view the Unit Revision. Use the **UP** and **DOWN** key to make a selection and then press the **ENTER** key.

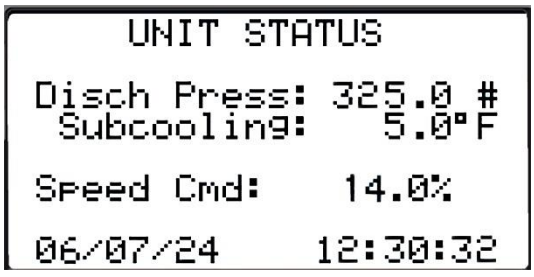
To return to the Home Screen, press the **Esc** key.

Status Menu

From the Status Menu screen the operator can select Unit Status or the I/O Status menus. Use the **UP** and **DOWN** key to make a selection and then press the **ENTER** key.

To return to the MAIN MENU, press the **Esc** key.

Unit Status



On the Unit Status screen the first line displays the discharge pressure.

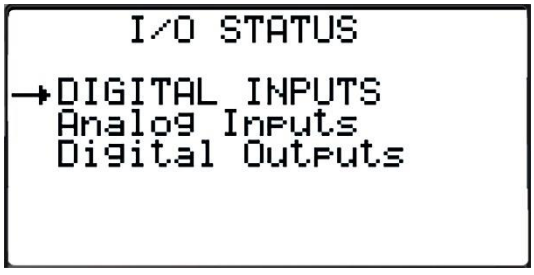
The second line displays the calculated subcooling.

The third line displays the speed command percentage of the fan.

At the bottom of the screen the time and date are displayed.

To return to the STATUS MENU, press the **Esc** key.

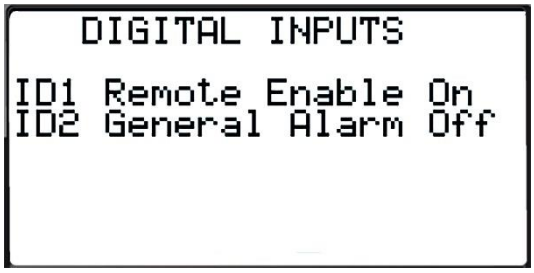
I/O Status



The I/O Status menu provides access to the Digital Inputs, Analog Inputs, and Digital Outputs selection menus. Use the **UP** and **DOWN** key to make a selection and then press the **ENTER** key.

To return to the STATUS MENU, press the **Esc** key.

Digital Inputs

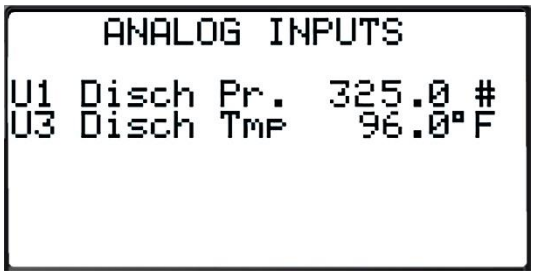


The Digital Inputs screen shows the state of the digital contacts used by the control system. This screen is provided for troubleshooting the control system. The first line displays the status of ID1, the Remote Enable input, as either “On” or “Off”.

The second line displays the status of ID2, the General Alarm input, as either “On” or “Off”.

To return to the I/O STATUS screen, press the **Esc** key.

Analog Inputs

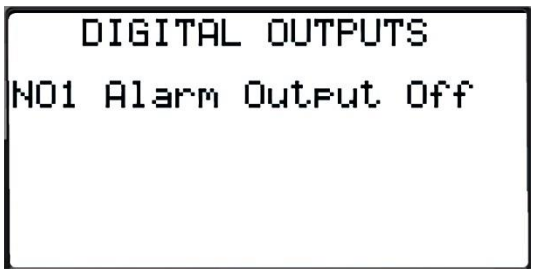


The Analog Inputs screen shows the state of the sensors used by the control system. The first line of this screen displays the status of U1, the discharge pressure transducer.

The second line of this screen displays the status of U3, the discharge temperature sensor.

To return to the I/O STATUS screen, press the **Esc** key.

Digital Outputs



The Digital Outputs screen shows the status of the relay contacts of the control system.

The first line of this screen displays the status of NO1, the general alarm output, as either “On” or “Off”.

To return to the I/O STATUS screen, press the **Esc** key.

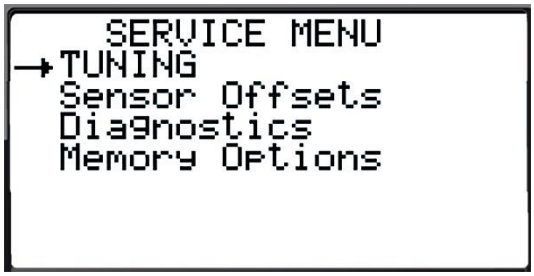
Service Menu Login

The SERVICE MENU LOGIN SCREEN prompts for a user password. Enter the service password, 1234, and press **ENTER**.

To return to the Main Menu, press the **Esc** key.

The user remains logged in for 30 minutes after the password is entered. During this time, the Login Screen reads “Still Logged In – Press Prg to Enter”. To login without entering the password, while this message is shown, press **Prg**.

Service Menu

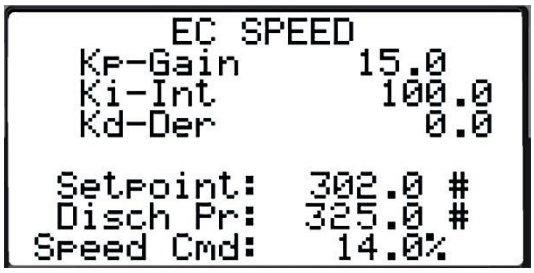


Once logged in the SERVICE MENU allows access to Tuning, Sensor Offsets, Diagnostics, and Memory Options selections.

Use the **UP** and **DOWN** key to make a selection and then press the **ENTER** key.

To return to the MAIN MENU, press the **Esc** key.

Tuning

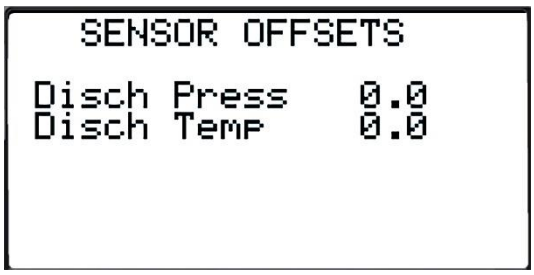


From the EC Speed Tuning screen the proportional, integral, and derivative coefficients for the discharge pressure control loop are all adjustable towards the top of the screen.

On the bottom half of the screen the discharge pressure setpoint is adjustable, and the discharge pressure and condenser fan speed are displayed.

To return to the Service Menu, press the **Esc** key.

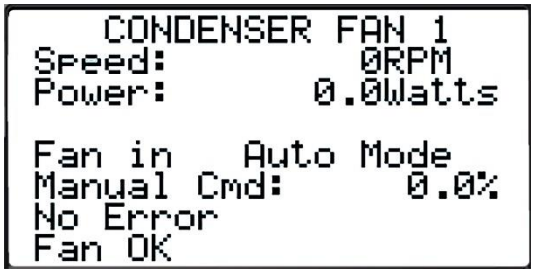
Sensor Offsets



From the sensor offsets screen the Discharge pressure and discharge temperature sensor offsets are adjustable.

To return to the SERVICE MENU, press the **Esc** key.

Diagnostics



From the Condenser Fan 1 Diagnostics screen the Modbus controlled fans will display the Speed and Power towards the top of the screen.

For 0-10VDC and Modbus controlled fans the “Auto Mode” or “Manual Mode” setting is adjustable towards the center of the screen and the manual speed command is adjustable directly below.

For Modbus controlled fans the Modbus error status is displayed below the manual speed command. This can read as one of the following:

“No Error” – Modbus is working properly.

“Device Offline” – The controller is not able to communicate or find device.

“Invalid Response” – Communication failed.

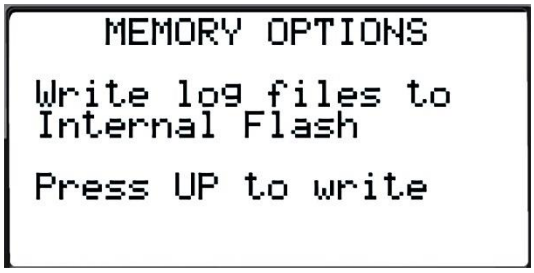
“Error Code” – Communication failed.

“Device Not Queried” – Modbus is not enabled.

At the bottom of the screen the fan alarm status is displayed. This status is specific to the fan vendor.

To return to the Service Menu, press the **Esc** key.

Memory Options



The Memory Options screen allows the user to write logged data files. Towards the top of the screen the user can either select to write the log files to “Internal Flash” or a “USB Pen Drive”.

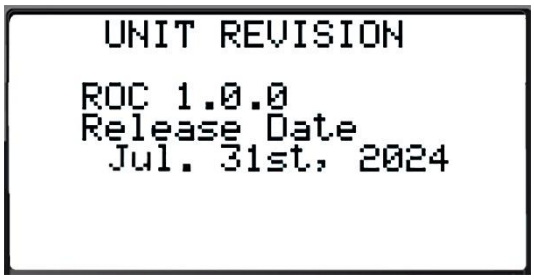
Below this “Press UP to write” can be selected and changed to “…WRITING…”.

If the log files fail to write a message will be displayed “FAILED, try again.”

If the log files write successfully a message will be displayed “Completed”.

To return to the Service Menu, press the **Esc** key.

Unit Revision



The Unit Revision screen shows the version of the application program that is running along with the release date of the software. This information should be passed to Desert Aire in the event a service call is necessary.

To return to the MAIN MENU, press the **Esc** key.

7.3 Airflow

The remote condenser is sized to have a total heat rejection (THR) capacity sufficient for the dehumidifier/unit it is paired with on the hottest design condition. In many cases, the required capacity will be lower than the maximum capacity on a design condition, and more so on cooler days. As a result, the fan speed will adjust to maintain the correct amount of THR. Figure 21 and Figure 22 show the approximate relationship between airflow and heat rejection capacity as a function of the difference in temperature (driving force) between the ambient air and the refrigerant condensing temperature. Different fan solutions are used for different voltages and, as a result, the maximum capacity is different for each combination of coil and fan. The charts in the figures indicate the maximum capacity for each coil and fan combination per degree temperature difference. Note that these calculations are based on an ambient air temperature of 95°F and a refrigerant condensing temperature of 120°F (i.e. the MBH/°F is calculated using a ΔT=25°F) and should be used only for approximating under different conditions.

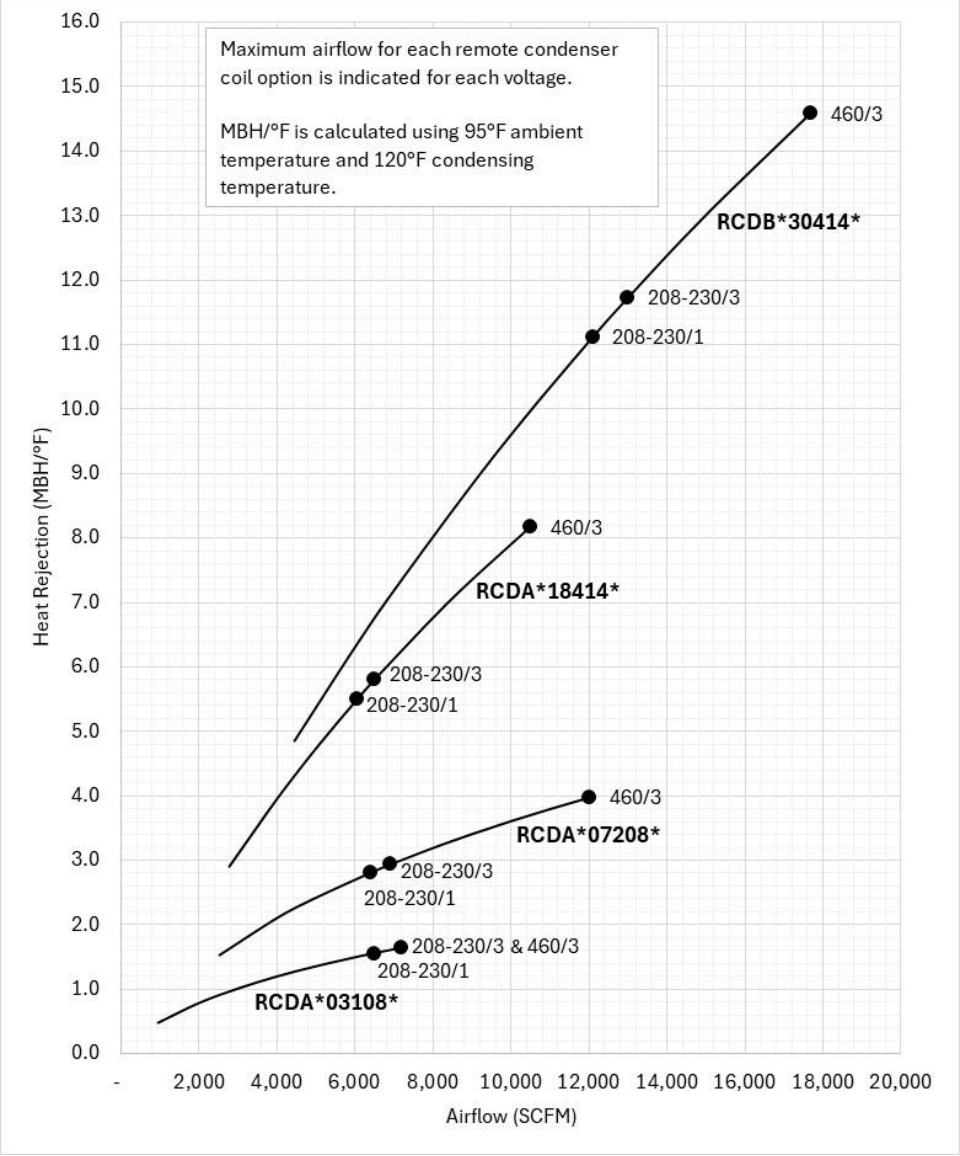


Figure 21 - Approximate Airflow vs. Heat Rejection Capacity for the Various Coil Options, R-410A.

Refer to Figure 1 for unit order codes.

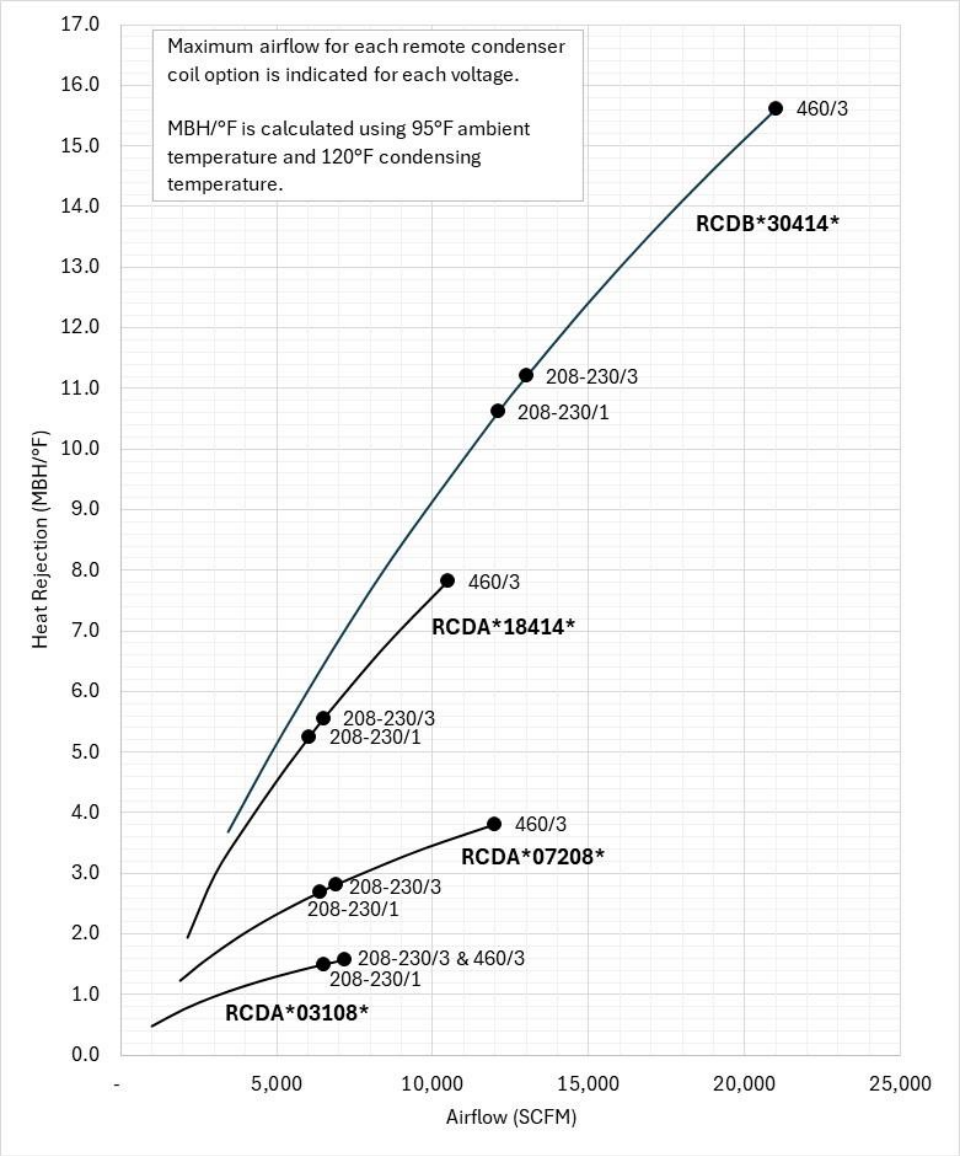


Figure 22 - Approximate Airflow vs. Heat Rejection Capacity for the Various Coil Options, R-454B.

Refer to Figure 1 for unit order codes.

8 Troubleshooting

	**Never operate the equipment with doors or covers removed.** Access to hazardous voltage and moving parts can result in significant property damage, severe injury, and / or death.
 	**WARNING:** Equipment contains hazard due to contact with rotating fan blade and Dangerous High Voltage. Only trained individuals should troubleshoot equipment. Coming into contact with rotating fan blade or Dangerous High Voltage can result in severe injury, and / or death. Take the necessary precautions.
 	Before accessing any compartment within equipment, disconnect power and follow Lock Out - Tag Out procedures. Failure to do so can result in severe injury and / or death.

Although Desert Aire units have been designed for reliable and trouble-free operation, you may occasionally encounter a service-related problem. If you cannot immediately diagnose and fix the problem, do not be intimidated by the apparent complexity of the units. Common sense and experience can help you solve the majority of these problems.

Note: Please have the following information available if you need to call Desert Aire Technical Support:

- Model Number
- Serial Number
- Room Temperature
- Relative Humidity
- Operating Refrigeration Pressures
- Water Temperature
- Compressor Amperage
- Blower Motor(s) Amperage

The following problems or complaints are frequently caused by improper interlocks between the unit and the other equipment and accessories at the jobsite. You may need to consult with contractors who have worked on different portions of this project.

The following list will help diagnose some of the most obvious symptoms of a system which does not work properly.

The Fan Does Not Run

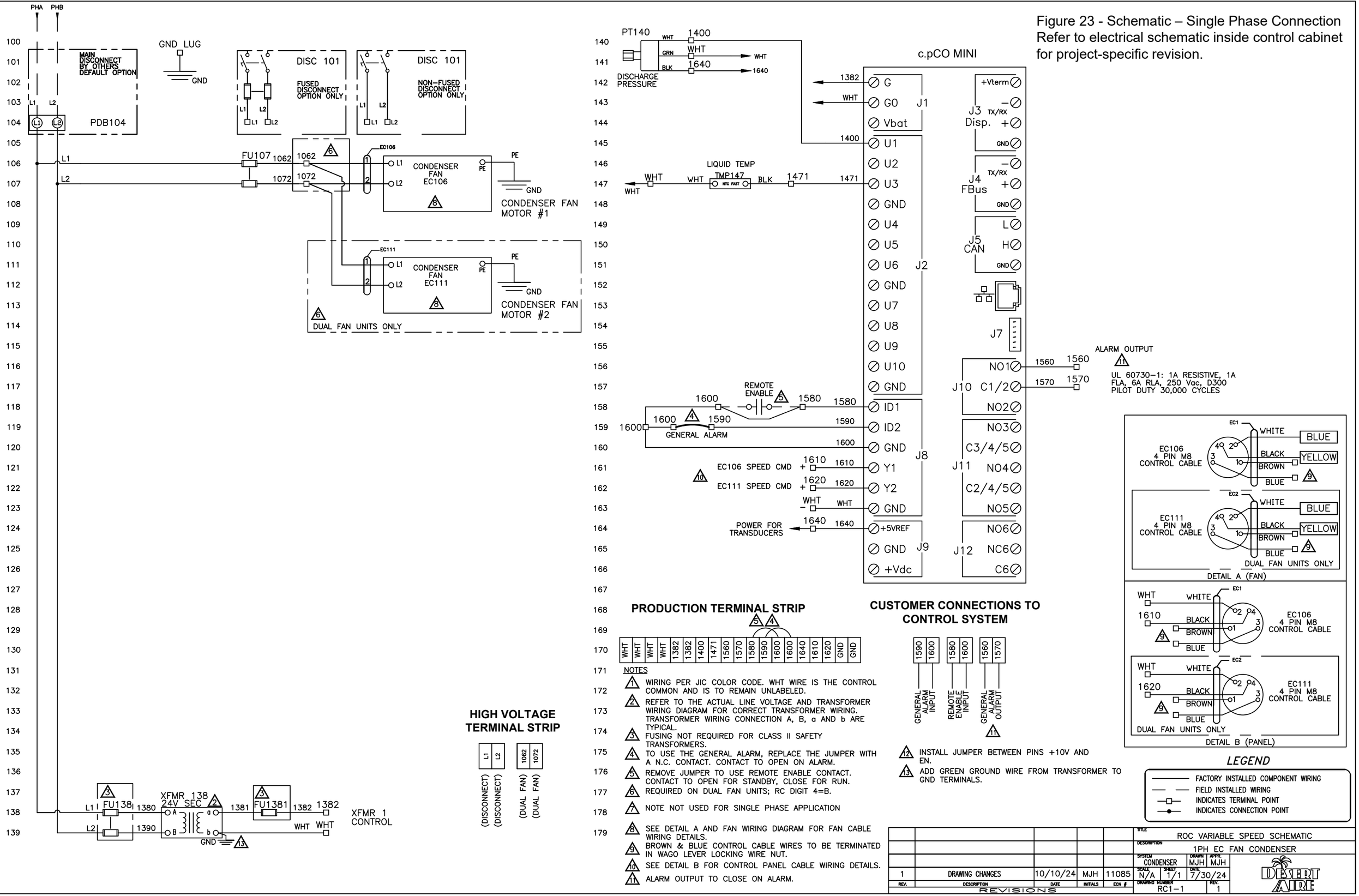
POSSIBLE CAUSES	REMEDY
Loss of main power	Check for tripped circuit breaker or blown fuses. Check building supply is live and disconnect is closed.
Faulty control wiring	Check for loose or incorrect wires on system and controller
Controller is not enabled	Check the remote enable is closed, or a jumper is installed.
General Alarm is disabling unit	Check the contact is closed. Either reset a building alarm input or, if not used, install a jumper.
Discharge pressure is below setpoint	Check setpoint and discharge pressures. Set point should be set to a value shown in Figure 20. If discharge pressure is below setpoint, it is normal for the fan to not run, because there is no heat load.
Controller is set to manual and 0% output	Check the Diagnostics screen and change the setting to “Fan in Auto Mode”.
Fan is not responding	Check the variable output command on the controller. If the signal is being sent but the fan doesn’t run, check the fan. In extreme ambient conditions, the fan may overheat and stop for a time to cool. Monitor fan for a period to see if it starts again.

The Fan Always Runs and Maximum Speed

POSSIBLE CAUSES	REMEDY
Debris buildup on coil face	Clean the coil face periodically to ensure proper airflow.
Extreme ambient temperature	Check the temperature, for which the system was selected, against the actual ambient temperature.
Controller is set to manual and 100% output	Check the Diagnostics screen and change the setting to “Fan in Auto Mode”.
Discharge pressure is above setpoint	Check setpoint and discharge pressures. Set point should be set to a value shown in Figure 20. If discharge pressure is above setpoint, the fan speeds up. If consistently above then the speed will remain at 100%.

9 Appendix

Figure 23 - Schematic – Single Phase Connection
Refer to electrical schematic inside control cabinet for project-specific revision.



PRODUCTION TERMINAL STRIP

WHT	WHT	WHT	WHT	1382	1382	1400	1471	1560	1570	1580	1590	1600	1600	1640	1610	1620	GND	GND

HIGH VOLTAGE TERMINAL STRIP

L1	L2		1062	1072
(DISCONNECT)	(DISCONNECT)		(DUAL FAN)	(DUAL FAN)

CUSTOMER CONNECTIONS TO CONTROL SYSTEM

1590	1600		1580	1600		1560	1570
GENERAL ALARM INPUT			REMOTE ENABLE INPUT			GENERAL ALARM OUTPUT	

NOTES

1. WIRING PER JIC COLOR CODE. WHT WIRE IS THE CONTROL COMMON AND IS TO REMAIN UNLABELED.
2. REFER TO THE ACTUAL LINE VOLTAGE AND TRANSFORMER WIRING DIAGRAM FOR CORRECT TRANSFORMER WIRING. TRANSFORMER WIRING CONNECTION A, B, a AND b ARE TYPICAL.
3. FUSING NOT REQUIRED FOR CLASS II SAFETY TRANSFORMERS.
4. TO USE THE GENERAL ALARM, REPLACE THE JUMPER WITH A N.C. CONTACT. CONTACT TO OPEN ON ALARM.
5. REMOVE JUMPER TO USE REMOTE ENABLE CONTACT. CONTACT TO OPEN FOR STANDBY, CLOSE FOR RUN.
6. REQUIRED ON DUAL FAN UNITS; RC DIGIT 4=B.
7. NOTE NOT USED FOR SINGLE PHASE APPLICATION
8. SEE DETAIL A AND FAN WIRING DIAGRAM FOR FAN CABLE WIRING DETAILS.
9. BROWN & BLUE CONTROL CABLE WIRES TO BE TERMINATED IN WAGO LEVER LOCKING WIRE NUT.
10. SEE DETAIL B FOR CONTROL PANEL CABLE WIRING DETAILS.
11. ALARM OUTPUT TO CLOSE ON ALARM.
12. INSTALL JUMPER BETWEEN PINS +10V AND EN.
13. ADD GREEN GROUND WIRE FROM TRANSFORMER TO GND TERMINALS.

LEGEND

- FACTORY INSTALLED COMPONENT WIRING
- FIELD INSTALLED WIRING
- INDICATES TERMINAL POINT
- INDICATES CONNECTION POINT

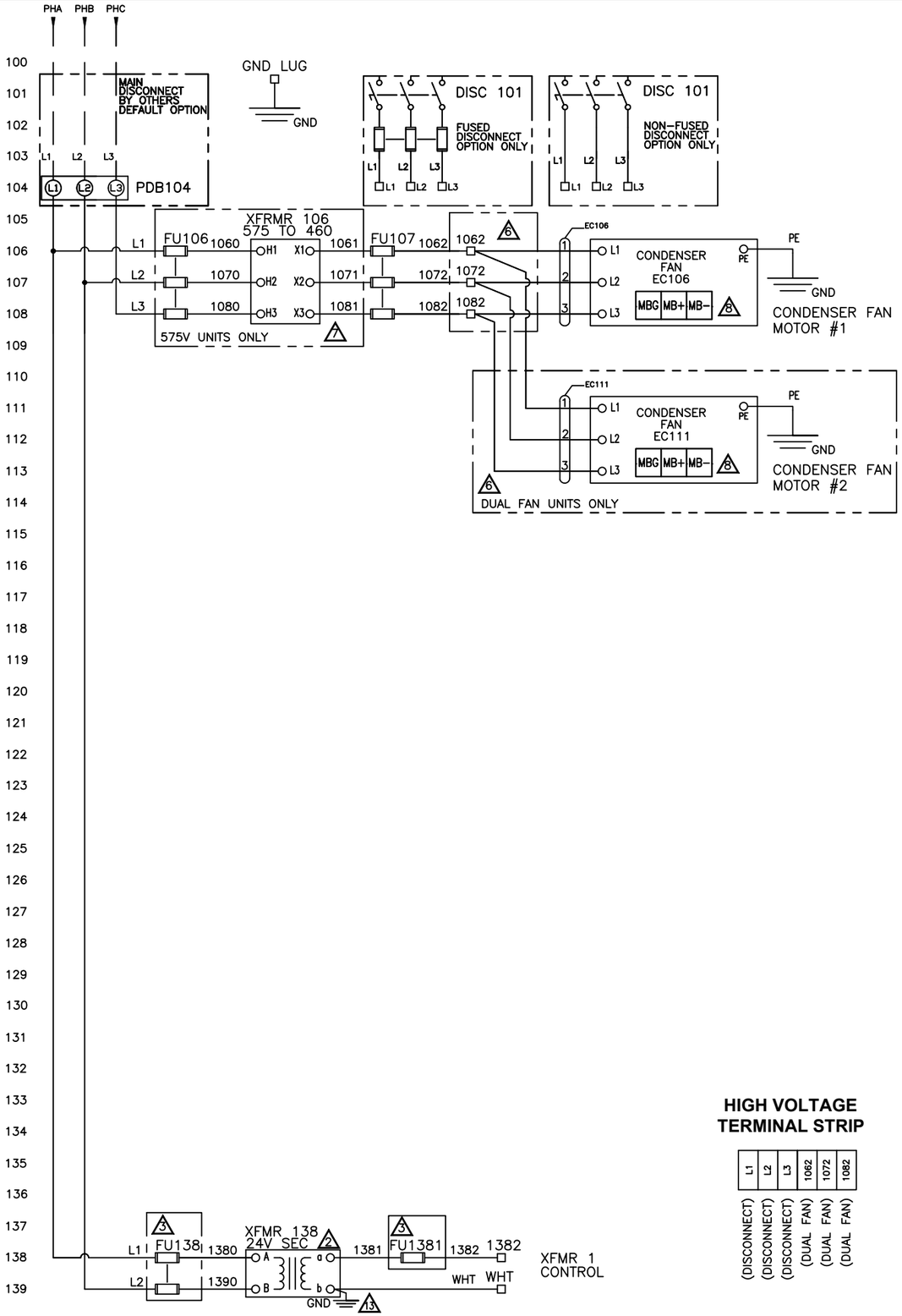
REV.	DESCRIPTION	DATE	INITIALS	ECN #
1	DRAWING CHANGES	10/10/24	MJH	11085

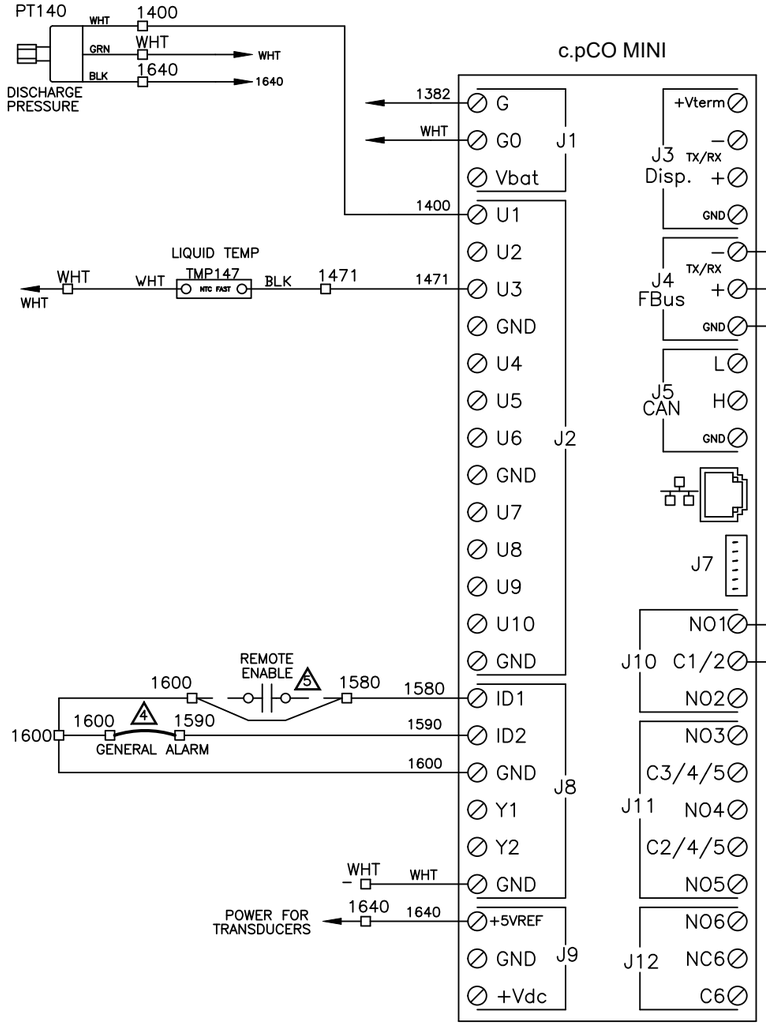
REVISIONS

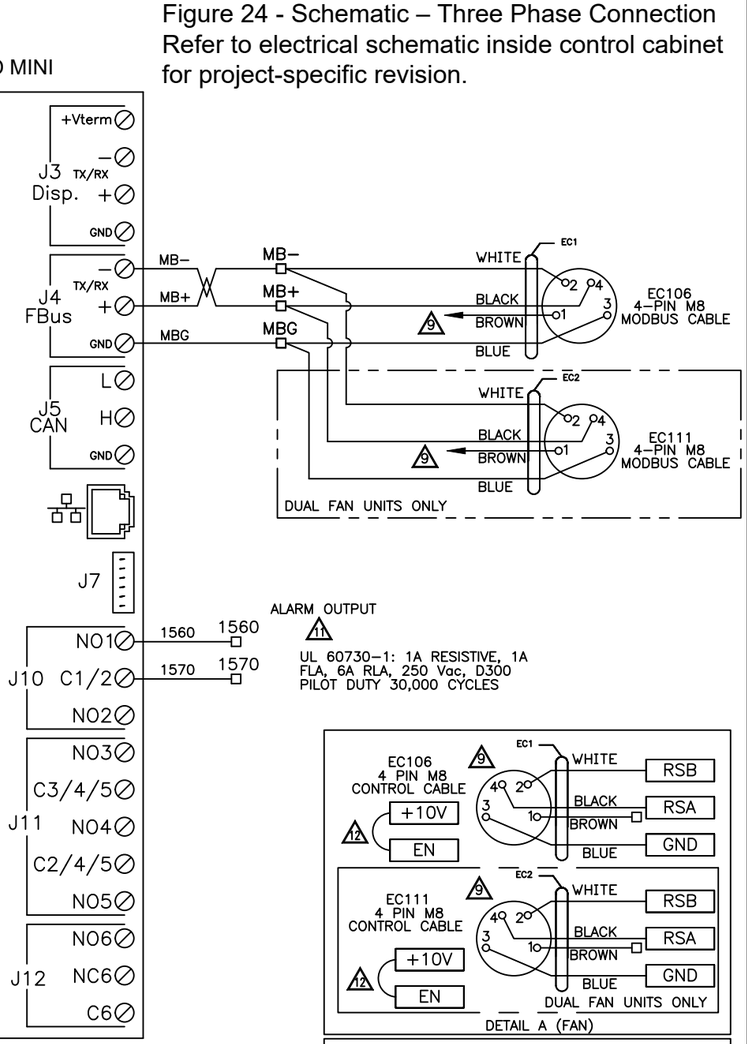
TITLE: ROC VARIABLE SPEED SCHEMATIC
DESCRIPTION: 1PH EC FAN CONDENSER
SYSTEM: CONDENSER
DRAWN: MJH
APPR: MJH
SCALE: N/A
SHEET: 1/1
DATE: 7/30/24
DRAWING NUMBER: RC1-1
REV.: 1

DESERT AIRE

Figure 24 - Schematic – Three Phase Connection
Refer to electrical schematic inside control cabinet for project-specific revision.







PRODUCTION TERMINAL STRIP

WHT	WHT	WHT	WHT	1382	1382	1400	1471	1560	1570	1580	1590	1600	1600	1640	MB–	MB+	MBG	GND	GND

HIGH VOLTAGE TERMINAL STRIP

L1	L2	L3	1062	1072	1082
(DISCONNECT)	(DISCONNECT)	(DISCONNECT)	(DUAL FAN)	(DUAL FAN)	(DUAL FAN)

CUSTOMER CONNECTIONS TO CONTROL SYSTEM

1590 1600	1580 1600	1560 1570
GENERAL ALARM INPUT	REMOTE ENABLE INPUT	GENERAL ALARM OUTPUT

NOTES

1. WIRING PER JIC COLOR CODE. WHT WIRE IS THE CONTROL COMMON AND IS TO REMAIN UNLABELED.
2. REFER TO THE ACTUAL LINE VOLTAGE AND TRANSFORMER WIRING DIAGRAM FOR CORRECT TRANSFORMER WIRING. TRANSFORMER WIRING CONNECTION A, B, a AND b ARE TYPICAL.
3. FUSING NOT REQUIRED FOR CLASS II SAFETY TRANSFORMERS.
4. TO USE THE GENERAL ALARM, REPLACE THE JUMPER WITH A N.C. CONTACT. CONTACT TO OPEN ON ALARM.
5. REMOVE JUMPER TO USE REMOTE ENABLE CONTACT. CONTACT TO OPEN FOR STANDBY, CLOSE FOR RUN.
6. REQUIRED ON DUAL FAN UNITS; RC DIGIT 4=B.
7. REQUIRED ON 575V UNITS; RC DIGIT 5=5.
8. MODBUS CONNECTION TYPICAL. SEE DETAIL A OR B AND FAN WIRING DIAGRAM.
9. BROWN WIRE NOT TO BE USED. TERMINATE IN WIRE NUT.
10. NOTE NOT USED FOR THREE PHASE APPLICATION.
11. ALARM OUTPUT TO CLOSE ON ALARM.
12. INSTALL JUMPER BETWEEN PINS +10V AND EN.
13. ADD GREEN GROUND WIRE FROM TRANSFORMER TO GND TERMINALS.

LEGEND

- FACTORY INSTALLED COMPONENT WIRING
- FIELD INSTALLED WIRING
- INDICATES TERMINAL POINT
- INDICATES CONNECTION POINT

REV.	DESCRIPTION	DATE	INITIALS	ECN #
1	DRAWING CHANGES	10/10/24	MJH	11085

REVISIONS

TITLE: ROC VARIABLE SPEED SCHEMATIC
DESCRIPTION: 3PH EC FAN CONDENSER
SYSTEM: CONDENSER
DRAWN: MJH
APPR: MJH
SCALE: N/A
SHEET: 1/1
DATE: 7/30/24
DRAWING NUMBER: RC1-3
REV.: 1

DESERT AIRE

Additional Comments:

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