



- 100% Outdoor Air Systems & High Outdoor Air Systems
- Aura™ (QS), dedicated outdoor air system, offers a high quality dehumidifier with various options to cover multiple applications
- TotalAire™ (QS), dedicated outdoor air systems, offers an optional energy recovery wheel that recovers both sensible and latent heat.
- VerticalAire™ (QV), dedicated outdoor air system, is a high-quality cost-effective dehumidifier that's designed for tight spaces

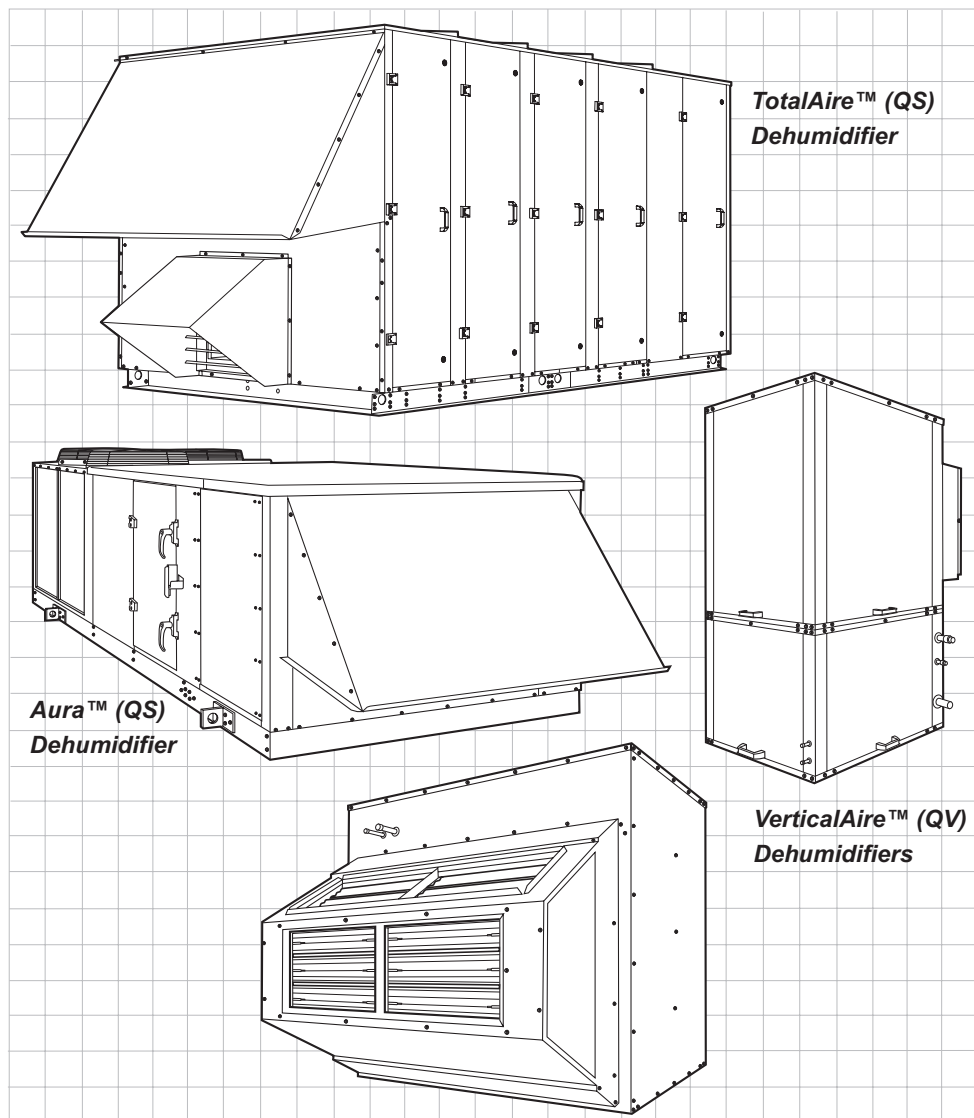
Indoor Air Quality

Aura™ (QS)

TotalAire™ (QS)

VerticalAire™ (QV)

Installation and Operation Manual



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.

DANGER

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

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 two (2) years from the date of shipment. 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 for 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 Service 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 warranties beyond this Standard Limited Warranty document. Extended warranties are only available at the time of the purchase of the original equipment. These extended warranties 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 • FAX: (262) 946-7401 • 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.

Gas Heat Exchanger Ten (10)-Year Prorated Warranty Terms (For Aura™ units with gas heat only)

Desert Aire offers an extended prorated eight (8)-year warranty for gas heat exchanger. All other heater components are covered under the initial 2 year warranty.

2 Years Parts Only from date of shipment. Prorated from years 3-9 as follows:

- Year 3: Desert Aire warrants 70% of replacement price
- Year 4: Desert Aire warrants 60% of replacement price
- Year 5: Desert Aire warrants 50% of replacement price
- Year 6: Desert Aire warrants 40% of replacement price
- Year 7: Desert Aire warrants 30% of replacement price
- Year 8: Desert Aire warrants 20% of replacement price
- Year 9: Desert Aire warrants 10% of replacement price

For Units w/Gas Heat:

For Your Safety Read Before Operating

WARNING: If you do not follow these instructions exactly a fire or explosion may result causing property damage, personal injury or loss of life.

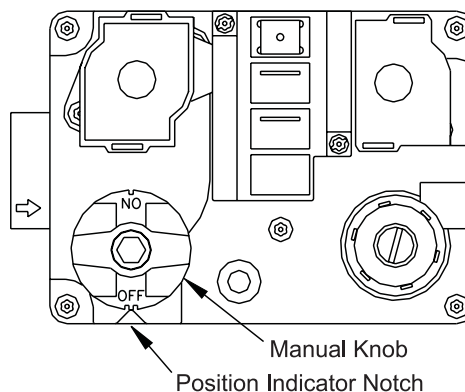
- A. This appliance does not have a pilot. It is equipped with an ignition device that automatically lights the burner. Do not try to light the burner by hand.
- B. **BEFORE OPERATING** smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
 - Do not touch any electric switch; do not use any phone in your building. Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
 - If you cannot reach your gas supplier, call the fire department.
- C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
 - D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control that has been under water.

OPERATING INSTRUCTIONS

1. **STOP!** Read the safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device that automatically lights the burner. Do not try to light the burner by hand.
5. Turn gas control knob clockwise ↻ to "OFF" position.
6. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, **STOP!** Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.
7. Turn gas control knob ↺ counterclockwise to "ON" position.
8. Turn on all electric power to unit.
9. Set thermostat to desired setting.
10. If appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.



TO TURN OFF GAS TO APPLIANCE

1. Set thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Turn gas control knob clockwise ↻ to "OFF" position.

Safety Labels are used throughout this manual. They comply with the ANSI Z535.4 Standard. Please be familiar with the following labels and their definitions.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible death or injury.



DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

CAUTION

Caution used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, could result in property damage.

Product Warning for the State of California



WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov

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1. Introduction

Desert Aire dehumidifiers are designed to provide years of reliable service when installed properly. Read these instructions carefully before you install the dehumidifier.

1.1. Inspection

Desert Aire inspects and tests each dehumidifier before it leaves the factory so that you receive a quality piece of equipment. Unfortunately, equipment may become damaged in transit. Inspect the dehumidifier 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.

1.2. Freight Damage Claims

If the dehumidifier has been damaged, document the extent of the damage. Take pictures if possible. Next, obtain a claim form from the carrier. Promptly fill out and return the form. Carriers may deny claims that you have not filled out within a week of delivery. Notify Desert Aire of any damage. Damaged units must have signed documents at the time of delivery to be eligible for a freight claim.

1.3. Rigging

WARNING

1. **Failure to observe rigging instructions may lead to equipment damage, personal injury, or death.**
2. **Lifting method and procedure must comply with all local and national codes and regulations.**
3. **The use of safety slings in addition to lifting lugs is required.**
4. **Do not lift the dehumidifier in high winds or above people.**

Desert Aire dehumidifiers are solidly built and can be very heavy. Avoid personal injury and damaging the equipment by planning the installation carefully. Use moving equipment whenever possible.

1.3.1. Rigging the Dehumidifier

Depending upon the unit type, various rigging methods are used to best lift the equipment. Please reference the applicable sections below:

- **All Products (QV and QS)**

Personnel should avoid stepping on the top of the unit. Desert Aire dehumidifiers are not designed to support the weight of a person on all portions of the roof. Damage incurred through caved or distorted top panels will not be covered under warranty. If you must walk on the top panels, carefully walk on the edges where structural integrity is greatest.

- **VerticalAire™ Products (QV)**

- **4-15 Ton**

Move the unit to the desired installation location with the unit on the wood skid. To remove unit from skid, position fork lift parallel to the boards on the top of the skid. Carefully slide forks between the unit and cross braces to pick the unit off the skid. The unit will have to be carefully removed from the fork lift and placed into the desired location using hand truck equipment dollies or pipe rollers. Use caution to not damage the unit with the fork lift or tip the unit over ensuring it is kept as level as possible. The QV15 unit is shipped in two pieces requiring assembly before operation. The unit should be assembled as close to the location of installation as possible.

- **20-30 Ton**

The base is equipped with a built-in 12 gauge skid. Use a fork lift to move the unit into place. Use caution to not damage the unit with the fork lift or tip the unit over ensuring it is kept as level as possible. In all cases, use appropriate safety practices while lifting the unit. Forklift tie-down clamps, straps, and other restraints where applicable should be used to prevent tipping of the load.

- **Aura™ and TotalAire™ Products (QS)**

Aura™ and TotalAire™ dehumidifiers are equipped with four or more lifting points. Use spreader bars and safety straps when you rig the equipment.

- Utilize all of the lifting lugs provided when hoisting the unit.

- Test-lift the dehumidifier to verify that it is properly balanced.

- Refer to diagram below for additional lifting instructions.

Large System Rigging

Notes:

1. The number of lifting points will vary between units. All lifting points must be used to lift unit.
2. Spreader bar must be used. Unit top panel is not designed to handle loading.
3. Lifting method/procedure to comply with all local and national regulations.
4. Use safety slings (not shown) in addition to lifting lugs.
5. Be sure that the lifting hooks do not contact the sides of the unit.
6. Use appropriate lifting strategy for unit. Examples:

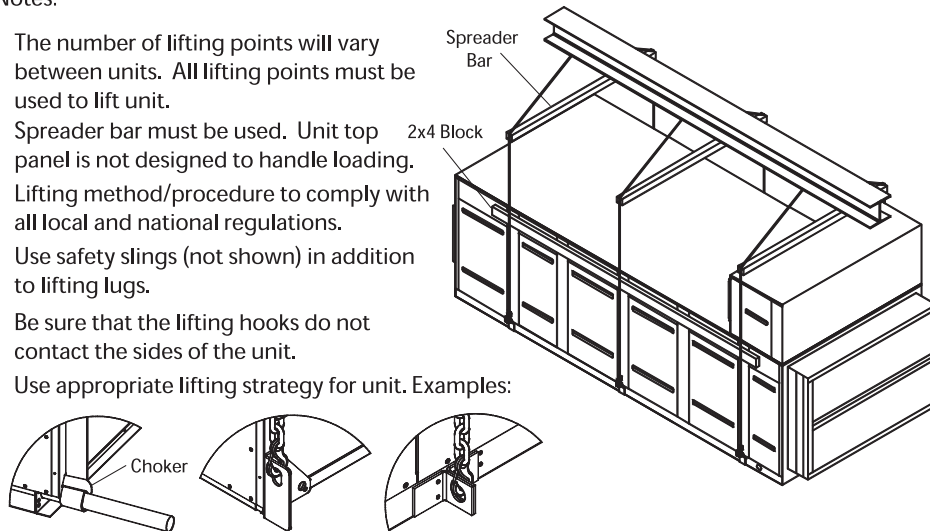


Figure 1 - Typical Rigging for an IAQ Dehumidifier

! CAUTION

1. Do not tip the dehumidifier on its side.
2. Avoid dropping the unit down stairways or subjecting it to severe mechanical shock.

2 Installation

Manual applies to standard unit configurations only.

2.1 Location of Dehumidifier

Desert Aire TotalAire™ dehumidifiers are configured to allow single-side access. This means you can make your service connections and perform routine maintenance when you must install one side of the dehumidifier close to a wall or other restriction. The “service side” is determined when the order is placed at the factory and cannot be changed in the field. It is recommended that clearance be provided on all sides to allow for ease of serviceability in the event large components require replacement. Aura™ and VerticalAire™ units may require service access from multiple sides. Refer to the general arrangement drawing for further details.

Allow a minimum of 36 inches of clearance around the service side of the dehumidifier for piping, electrical connections, and service access. The non-access side of the unit should contain 12 inches of clearance for large component removal. A minimum one unit width clearance shall be maintained in all directions of outside air intake hood on outdoor units to allow for un-obstructed airflow into the unit. For packaged units, ensure a minimum of one unit width of clearance is maintained to allow for proper airflow through the condensing section. If three or more walls surround the unit consult the factory for proper unit location to allow for adequate airflow through the condenser section.

Install the unit on a sturdy, level mounting base or platform that will prevent vibration and sound transmission. Never install the dehumidifier on a wooden or metal platform without consulting the design engineer for spring isolation requirements and sound control materials. Do not install the unit near occupied rooms such as offices or guestrooms. Do not attempt to conserve installation space by fabricating restrictive ductwork with abrupt bends. You may reduce the operating efficiency and the moisture removal capacity of the dehumidifier. See section 5.2 for detailed duct installation instructions.

Units located in unconditioned spaces may form condensation on the exterior of the cabinet. Precautions should be taken for indoor units located within unconditioned spaces to prevent damage resulting from condensation.

Do not install an indoor-rated dehumidifier in an outdoor or a wet environment.

If you must install a dehumidifier outside you must use an outdoor-rated dehumidifier. Desert Aire seals and weatherproofs outdoor dehumidifiers to help prevent water infiltration. You can determine whether your dehumidifier is outdoor-rated by inspecting the unit rating plate. See section 5.6 for details.

2.2 Duct Installation

Duct design and installation should conform to the latest ASHRAE and SMACNA low velocity duct standards. See section 5.2 for details. Undersized, restrictive ductwork with abrupt turns or transitions, can decrease the efficiency and the moisture removal capacity of your dehumidifier. Size the ductwork for an acceptable air pressure drop at the airflow volume of your dehumidifier. Use neoprene flex connectors when you attach ductwork to the dehumidifier to prevent transmission of excess vibration and noise.

Select the grilles, registers and diffusers for low static pressure loss, required throw distance, and the specified CFM rating. You can find this information in most grille manufacturer's catalogs. If you are installing the grilles in a corrosive environment, choose components made from anodized aluminum.

If you must install ductwork in an unconditioned area, use fiberglass duct wrap with vapor barrier facing. You must install the outdoor air intake away from all sources of airborne contamination such as exhaust fans or plumbing vents. You can use galvanized sheet metal ducts for most applications. However, you should use aluminum or stainless steel ducts for extreme applications such as chemical-laden environments.

The QV15 VerticalAire™ unit requires the installation of the fan section. Due to the height of the assembled unit, the fan section is shipped separately. The fan section is placed on top of the refrigeration section and secured with the four bolts in the four corners of the fan section. Tighten these bolts securely before proceeding. The wiring for the fans must be passed through the grommets into the lower refrigeration section and connected with the wiring harness.

Select the appropriate door to remove in the fan section for connecting the ductwork. The unit is shipped with a door in each potential opening. If the opening is to be a horizontal connection and not through the top opening, swap the door with the connection port that ships mounted in the top of the fan section. Place the connection port in the appropriate opening and bolt it into place. Place the removed door in the top opening over the fan and bolt it into place.

2.3 Condensate Drain Piping

CAUTION

Condensate drain lines installed in an unconditioned space must be heat taped to prevent freezing. Check the heat tape yearly before winter operation.

The condensate drain connection may be on the side or the bottom of the dehumidifier, depending on the size and style of the cabinet used. Use concrete blocks or steel dunnage to raise the dehumidifier high enough above the floor to provide clearance for the field-supplied condensate drain trap.

Note: Dehumidifiers with gas heating option may have condensate form inside the furnace heat exchanger since it is located downstream from the cooling coil. On indoor units, you must also connect the heater's drain line (if present) to your field-installed condensate drainage plumbing.

Note: While the supply blower runs, the drain pan area inside the dehumidifier operates at a negative pressure. Your unit requires a P-trap in the condensate drain pipe to prevent condensate from being drawn into the cabinet of the dehumidifier.

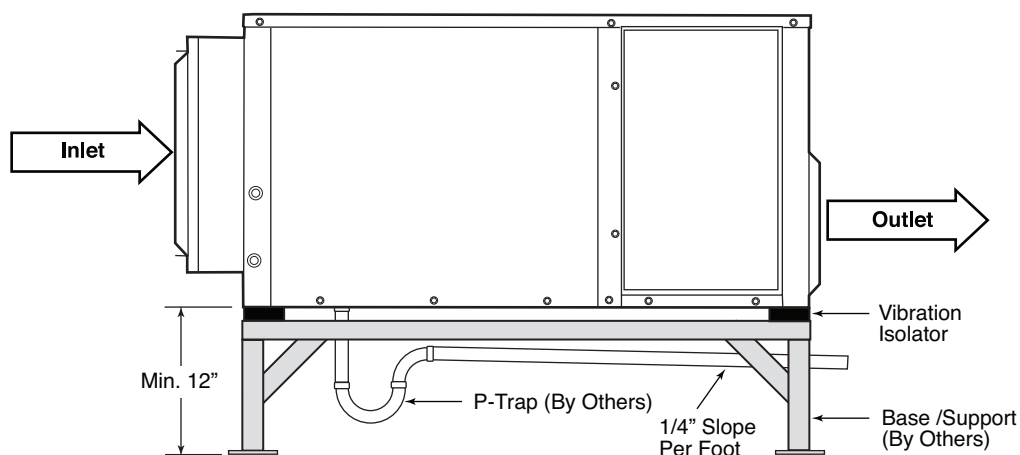


Figure 2 - Condensate Piping (Bottom-Mounted Drain Shown)

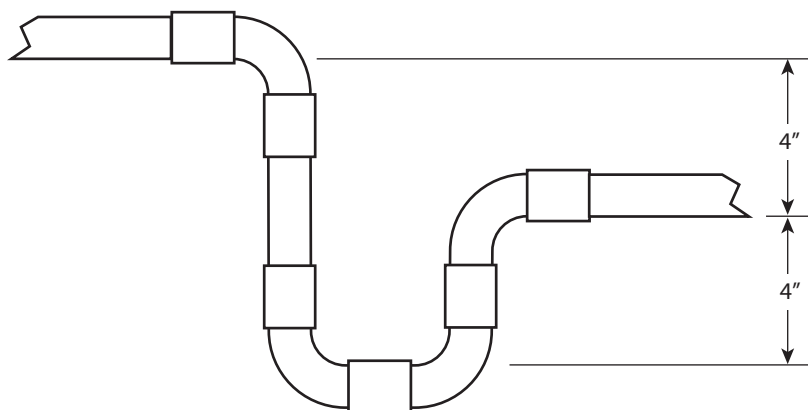


Figure 3 - Sectional View of Condensate Trap Requirements

Trap the condensate as shown in Figure 3. The P-trap dimensions in Figure 3 are sized for a maximum return air static of 2.0" of water. If your return air static exceeds this specification, consult Desert Aire for help in resizing the P-trap.

You may also need to install a cleanout tee or plug near the trap. Note that the drain opening

in the drain pan is off-center to simplify its cleaning and servicing. Once you have designed and installed the trap, follow this sequence:

1. Connect the trap to a main drain line with 1/4" of downward pitch per linear foot of run.
2. Support the drain pipe every five feet to prevent sagging.
3. After you install the drain piping, prime the trap by pouring water into the drain pan of the dehumidifier.

2.4 Auxiliary Heat Coil Piping

The Desert Aire dehumidifier may be equipped with an optional hot water or steam air heating coil. This coil, when properly sized, will provide space heating during the winter months. Use proper practice when designing and installing the coil piping to prevent poor coil performance, shortened service life, or damage to the coil.

- The supply connections must not be supported by the coil headers.
- The control valve should be sized according to the pressure and flow rate requirements, not by the coil connection size.
- On steam systems, use strainers, dirt pockets, and isolation valves to prevent clogging the control valve and to simplify service.
- Install swing joints in the connection piping to prevent damage to the coil header from thermal expansion.
- Use a backup wrench on the pipe stubs when attaching connections to prevent damage to the header.

2.5 Water Piping Installation (for Q-Pump and Water Cooled Systems Only)

As an option, the dehumidifier may be equipped with a tower water or a heat pump loop condenser. Use industry standard piping practices when connecting to such a dehumidifier. Connections are copper stubs. Refer to submittal documentation for specific size per model.

Water Quality and General System Design

A 60 mesh or finer strainer must be installed in the water inlet line. Flush field installed piping thoroughly before you put the dehumidifier into service. A piping system not properly flushed or filtered will cause the brazed-plate heat exchanger to lose efficiency or fail prematurely due to clogging and/or fouling.

To prevent premature failure of the heat exchanger, maintain the water at a pH of 7.4, but never below 6.0. Do not use water with high concentration of sulfur, chlorine, or sodium chloride.

A dedicated circulating pump must be used unless the main pump can develop enough head to overcome the combined resistance of the water condenser and the piping connected to it. See specific Flow Rate section for the required water flow rate and head for your application.

Install an air eliminator at any high point in the water piping. Air trapped in the water circuit of the dehumidifier can lead to elevated operating pressures, unexpected service calls, and decreased equipment life.

If the water system is connected to a variable frequency drive or to water loops with multiple units, flow regulating valves should be installed to ensure flow rate is maintained.

CAUTION

Do not exceed these guidelines as excessive flow rates will erode the condenser and piping.

Aura™ Products Flow Rate

The flow rate and antifreeze concentration (if used) will depend on the application. Please refer to Figure 4 and 5 for the required flow rate and temperature limits for the given application and unit type. If the application deviates from these conditions, please contact Desert Aire Service at 262-946-7400 for further review.

Unit Size (Nom. Tons)	Fluid Flow Rate (GPM)	Fluid Pressure Drop (psig)
8	24	4.0
10	30	5.6
12	36	4.1
15	45	3.6
20	60	3.4
25	75	6.4
30	90	4.0

Figure 4- Aura™ Q-Pump Water Flow Rates

Glycol Percent	Min. Fluid Temp. (°F)
0	40
5	37
10	34
15	31
20	27
25	25
30	25
35	25
40	25
45	25
50	25

Figure 5 - Aura™ Q-Pump Minimum Water Temperature

TotalAire™ and VerticalAire™ Products Flow Rate

The flow rate and antifreeze concentration (if used) will depend on the application. Please refer to Figure 6 and 7 for the required flow rate and temperature limits for the given application and unit type as well as the glycol concentration requirements. If the application exceeds these conditions, please contact Desert Aire Service at 262-946-7400 for further review.

Unit Size (Nom. Tons)	Fluid Flow Rate (GPM)	Fluid Pressure Drop (psig)	
		Water Cooled Units	Q-Pump™ Units
2	9	0.9	2.3
3	15	1.3	2.9
4	15	1.7	4.2
5	19	2.6	6.3
8	20	2.3	5.5
10	28	2.8	6.5
15	45	2.7	6.3
20	57	2.7	6.2
25	70	2.7	6.2
30	87	2.8	6.4
36	99	3.1	6.5
40	123	2.8	6.5
46	135	2.8	6.4
50	143	3.1	6.5
56	156	3.1	6.4
60	172	3.1	6.5
<p>Notes: Boiler/Tower loop temperature range must be pure water between 55°F & 95°F</p> <p>Ground source loop temperature range must be 30% glycol between 35°F & 105°F</p>			

Figure 6 - Water Flow Rates

Glycol Percent	Min. Entering Water Temperature (°F)
0	48
5	47
10	45
15	40
20 and up	35

Figure 7 - Glycol Concentration Requirements

2.6 Remote Condenser Installation (Air-Cooled Systems Only)

Important: Refer to the separate Air Cooled Condensers Installation and Operation manual for additional details on line design, traps, clamping, and other condenser installation requirements.

TotalAire™ and VerticalAire™ dehumidifiers installed with remote condensers may require additional oil and refrigerant charge at the time of field installation. Refer to the submittal documentation or label adjacent to the remote condenser connections to confirm the charge and connection tube sizes.

2.7 High Voltage Wiring

WARNING

1. **Disconnect power before servicing.** The unit contains high voltage wiring and moving parts which may cause serious injury or death.
2. **Failure to properly wire the dehumidifier may create the possibility of shock and can lead to premature system failure.**

DANGER

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

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 power block mounted on the electrical panel. Test the phasing by “bumping” the blower contactor. Verify that the blower rotates in the proper direction. If it rotates the wrong direction, switch any two of the three wires at the power block.

2.7.1 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 upper section of the electrical compartment.

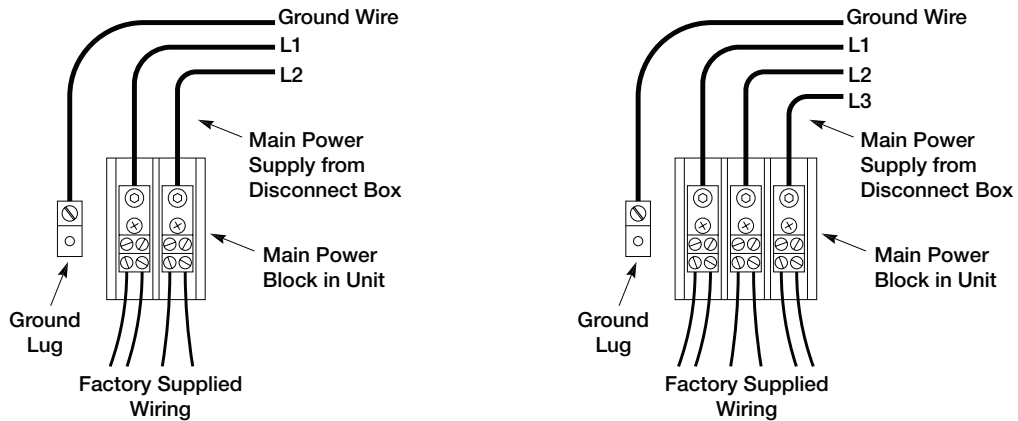


Figure 8 - Single-Phase and Three-Phase System Power Connection

2.7.2 Wire and Fuse Sizing

The field-installed power supply wires and over current devices must be sized to handle the minimum amperage of the dehumidifier without exceeding the maximum fuse size rating. Both the minimum amperage and the maximum fuse size are printed on the unit rating plate.

2.8 Controls and Sensors

! DANGER

For any with Intrinsically Safe circuits, wiring to these devices must be done only to Intrinsically Safe terminal strip. Refer to the wiring schematic for details of these devices and wiring parameters. The length, capacitance, resistance, and inductance of the cable used to connect the field wiring of the Intrinsically Safe circuit shall not overload the rating of the Intrinsically Safe barrier.

The standard Desert Aire IAQ dehumidifiers are controlled by a microprocessor controller. This controller is designed for precise monitoring and control of air temperature and relative humidity (RH) within a conditioned environment. A separate controls manual has been provided. Refer to this separate manual for controller and sensor specifications, operation, and options. The microprocessor has the option for a duct-mount sensor, remote room sensor(s), or CO₂ sensors.

The IAQ dehumidifiers are equipped with either an internal display terminal (IDT), as part of the controller, or a wall-mountable remote display terminal (RDT), in cases where the controller mounted display or IDT would prove hard to view or use. See the controller manual for details on wiring and environmental limits.

2.8.1 Duct-Mount Sensor

The duct-mount sensor is used in applications where continuous blower operation is desired. A duct-mount sensor helps ensure consistent conditions throughout the space. A drawback to this sensor is that it relies on a continuous stream of air moving past it. Using a duct-mount sensor with a non-continuous blower may lead to short-cycling of the refrigeration compressor.

2.8.2 Remote Room Sensor(s)

The remote room sensor is supplied with orders for the zone reset option. Up to four of these sensors may be wired to the system using the standard control logic, if additional sensors are required, please consult the factory.

2.8.3 CO₂ Sensors

The CO₂ sensors are supplied with orders for the CO₂ control package. The sensors monitor the indoor and outdoor CO₂ levels. The measurements are used to determine the CO₂ differential level in the conditioned space. This differential is the variable compared to the CO₂ set point and is used in the control loop to provide more or less outdoor air into the conditioned space.

2.9 Auxiliary Heating Control Wiring

Note: You must use the Desert Aire control system to control or interlock with the room heating system. This prevents wide fluctuations in room air temperature. It also prevents the heater from trying to heat the room while the dehumidifier is running in cooling.

2.9.1 Auxiliary Heating – Dry Contact Closure

Desert Aire will provide a dry contact closure to interlock with the building heating system. This contact closure is normally used to interlock with a gas or electric duct heater which has its own power supply transformer. When the room air temperature drops below the set point, the dry contact will close to energize the auxiliary heater. See the dehumidifier wiring diagram for details.

2.9.2 Auxiliary Heating – Proportional Signal

Desert Aire will provide a proportional signal to modulate a heating coil control valve on units equipped with an integral heating coil.

This signal is reverse acting or direct acting depending on the settings in the controller. It is critical that units with hot water or steam coils be set properly for freeze protection. See controller manual for details on the settings and outputs.

Most proportional valves have either three or four terminals for field-installed wiring.

- Four-terminal valves have two terminals for 24 VAC power and two terminals for the signal input.
- Three-terminal valves have one terminal for the "hot" 24 VAC input, a second terminal for the "positive" signal input, and a third, common terminal for the "neutral" 24 VAC input and the "negative" signal input.

You must follow the instructions included with the valve cut sheet. Observe the proper polarity, or you may damage both the valve and the Desert Aire controller. See the unit wiring schematic for information on signal wire connection points.

2.10 Gas Heater (Optional)

Several optional gas heater sizes and configurations are available to provide for heating of the outdoor air during cold conditions. Several sizes, heat exchanger designs, and combinations of capacities are available in natural gas or liquid propane fuel. Additionally, custom configurations can be specified. Installation instructions below are guidelines for installation. Refer to the separate gas heat instruction manual for additional instructions.

2.10.1 Gas Heater Installation

The Desert Aire dehumidifier may be equipped with an optional Category III gas-fired heater to provide air heating during the winter months. You must read and understand the following guidelines and warnings before you connect the heating section. Failure to follow these guidelines can result in improper and unsafe operation of this equipment, which can cause severe personal injury, death, or substantial property damage. Observe the following precautions:

- Follow all appropriate national and local codes and guidelines when installing gas-heating equipment. Failure to follow CGA, NFPA, and/or ANSI standards may cause equipment damage, personal injury, or death.
- Corrosive environments may reduce heater service life. This furnace is not to be used for temporary heating of buildings or structure under construction. Many of the chemicals used during construction form acid-bearing condensate when burned. This can substantially reduce the life of the heat exchanger.
- Gas heating equipment located indoors requires adequate combustion air. If you install the equipment inside a penthouse or mechanical room, an indoor unit heater and terminal kit must be used.
- Connect this furnace to an approved vent system only. Combustion products must be vented outdoors.

- Use a soap-bubble solution or an electronic detector to check for gas leaks. Never use a lighter or open flame to find leaks.
- The return air duct of the furnace must be sealed air tight to prevent starvation of the combustion air, especially if the furnace is located in a closet or confined area.
- Because of the potential of odorant fade, a gas leak may not be detected by smell. If this equipment is installed below grade, contact your gas supplier for a gas detector.
- Maximum gross stack temperature must not exceed 480°F (249°C) under any circumstances.
- Care must be taken not to wet electronic components during leak test. Wetting the electronic components may damage circuitry and cause a hazardous situation. Dry moisture from all leads and terminals if minor wetting occurs. Wait at least 24 hours for the circuit to fully dry before energizing the burner circuit.
- The gas burner and its individual gas shutoff valve must be disconnected from the gas supply during pressure testing of the gas supply system at pressures in excess of 0.5 psig (14.0" wc).
- Copper and brass tubing and fittings (except tin lined) shall not be used if the gas contains more than a trace (0.3 grains per 100 cubic ft.) of hydrogen sulfide gas. Check with your gas supplier.
- For initial start-up of the furnace after installation, it may be necessary to purge the air out of the gas line. This should be done by a qualified heating contractor. If excessive gas escapes when purging the gas supply at the union, allow the area to ventilate for at least 15 minutes before attempting to start the furnace. LP gas is especially dangerous because it is heavier than air and may accumulate to a dangerous concentration at the floor level.

2.10.2 Gas Piping

Gas supply piping installation should conform with good practice and to national and local codes. The orifice for the burners are sized for either natural gas (having a heating value of 1025 BTU per cubic foot and a specific gravity of 0.60) or for liquefied propane gas (with a heating value of 2500 BTU per cubic foot and a specific gravity of 1.53). If the gas at the installation does not meet this specification, consult the factory for proper orificing.

Seal the opening for the gas supply pipe with the grommet provided.

Gas piping must be large enough to provide adequate gas with minimal pressure drop. Use the table below as a guide to capacity. Note that each gas heat module in a TotalAire™ unit will have an independent connection. Aura™ units have a single gas heat connection. Ensure that any branch connection is also properly sized for a minimal pressure drop.

Capacity of Piping						
Cubic Feet per Hour based on 0.3" w.c. Pressure Drop						
Specific Gravity for Natural Gas - 0.6 (Natural Gas - 1000BTU/Cubic Ft.)						
Specific Gravity for Propane Gas - 1.6 (Propane Gas - 2550BTU/Cubic Ft.)						
Length of Pipe	Diameter of Piping					
	1/2"		3/4"		1"	
	Natural	Propane	Natural	Propane	Natural	Propane
20'	92	56	190	116	350	214
30'	73	45	152	93	285	174
40'	63	38	130	79	245	149
50'	56	34	115	70	215	131
60'	50	31	105	64	195	119
70'	46	28	96	59	180	110
80'	43	26	90	55	170	104
90'	40	24	84	51	160	98
100'	38	23	79	48	150	92
125'	34	21	72	44	130	79
150'	31	19	64	39	120	73
175'	28	17	59	36	110	67
200'	26	16	55	34	100	61
Length of Pipe	Diameter of Piping					
	1-1/4"		1-1/2"		2"	
	Natural	Propane	Natural	Propane	Natural	Propane
20'	730	445	1100	671	2100	1281
30'	590	360	890	543	1650	1007
40'	500	305	760	464	1450	885
50'	440	268	670	409	1270	775
60'	400	244	610	372	1105	674
70'	370	226	560	342	1050	641
80'	350	214	530	323	990	604
90'	320	195	490	299	930	567
100'	305	186	460	281	870	531
125'	275	168	410	250	780	476
150'	250	153	380	232	710	433
175'	225	137	350	214	650	397
200'	210	128	320	195	610	372
Note: When sizing supply lines, consider possibilities of future expansion and increased requirements.						
Refer to National Fuel Gas Code for additional information on line sizing.						

Figure 9 - Gas Pipe Capacity in Cubic Feet per Hour

Gas connection sizes are shown in Figure 10. Note that these are connection sizes only. Supply lines must be sized based on pressure drop and capacity as indicated in Figure 9.

Model Size	100 - 250	300 - 400
Natural Gas	1/2"	3/4"
Propane Gas	1/2"	1/2"

Figure 10 - Gas Connection Sizes

Gas piping must conform to all applicable codes and standards. Follow standard gas piping practices, including:

- Pitch gas piping downward in the direction of flow so condensed moisture can drain freely.
- Install a drip leg at the lowest point in the gas line to prevent moisture and debris from clogging the gas train. The National Fuel Gas Code requires the installation of a trap with a minimum of 3" drip leg. Local codes may require a longer drip leg, typically 6".
- Install a ground joint union and manual shutoff valve in an accessible position close to the equipment.
- Ensure that the pipe and fittings are free from chips and debris. Make sure that the threads are clean and properly cut.
- Seal pipe threads with pipe dope or a suitable joint compound that is compatible with the gas you are using. Do not use Teflon tape to seal gas pipe joints.
- Support gas piping using suitable straps or hangers to avoid stressing the gas valve or manifold.
- Use a backup wrench when you tighten gas pipe and fittings.
- Piping from the natural gas meter to the furnace shall be in accordance with requirements of the local utility. Piping from the LP tank to the furnace must follow the recommendations of the gas supplier.
- A readily accessible, certified manual shut off valve with a non-displaceable rotor member should be installed within six feet of the gas equipment it serves.

A union or flanged connection shall be provided downstream from the manual valve to permit removal of controls. Provide a 1/8" N.P.T. plugged tapping at the inlet of the gas control for connection of a test gauge to check gas supply pressure to the furnace. Unions must be a ground joint type or flanged-jointed using a gasket resistant to LP gas. Pipe dope or sealant certified to be resistant to the action of liquefied petroleum gases should be used on all threaded joints.

- A drip leg must be used on both LP and natural gas installations prior to the furnace to trap oil, condensate and other impurities which might otherwise lodge in the gas valve or plug the burner orifice. When there is excessive condensation between the gas meter and the furnace, a drip leg shall be provided at the outlet of the gas meter. Failure to install a drip leg may void the warranty on the dehumidifier.
- High fire manifold gas pressure is regulated by the combination valve to 3.5" wc. Inlet pressure to the valve must be a minimum 5" wc or as noted on the rating plate and maximum of 14" wc for natural gas. **Note:** Always check the rating plate for minimum gas supply pressure. Minimum supply pressure requirements vary based on size of burner and gas control option. Most units require a minimum of 5" wc as stated above, but Sizes 350 and 400 with electronic modulation require a minimum of 6" wc natural gas supply pressure.
- **LP Only:** Experience has proved that the pressure drop in the gas line running from the outside propane gas tank to the gas appliances inside is the most frequent cause of equipment malfunctions. A single pressure regulator, located at the tank, will not reliably regulate the high tank pressures (up to 200 psi) down to 11" wc. Varying pressures will occur at the appliances as outside temperatures and usage demands vary. Two-stage regulation is the only effective method of controlling these variables.

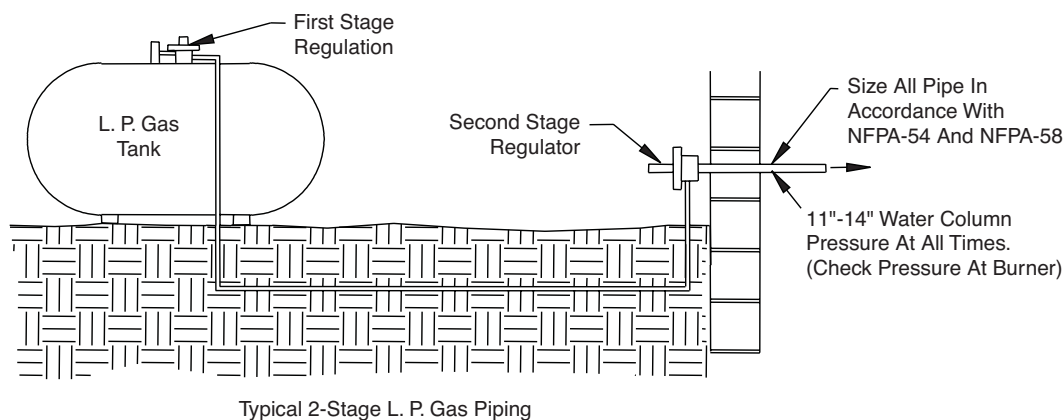


Figure 11 - Recommended LP Gas Piping Method

- **LP Only:** Use the following line size chart to size the gas piping or tubing between the LP tank and the second-stage regulator:

Section 1						Section 2						
	If the length of line between regulators (tank to building) is this long.						If the length of line between second-stage regulator and furnace is this long.					
Use this size tubing to keep pressure drop below 2 lbs. for maximum flow shown.	Total input load (Btu/h) on line	25'	50'	75'	100'	Use this size tubing or pipe to keep pressure drop below 1/2" water column for maximum flow shown.	Total input load (Btu/h) on line	10'	20'	30'	40'	50'
	125,000	3/8" O. D. Copper					75,000	5/8" O. D. Copper				
	250,000	3/8" O. D. Copper		1/2" O. D. Copper			125,000	5/8" O. D. Copper	3/4" Black Pipe			
	375,000	1/2" O. D. Copper					187,500	3/4" Black Pipe				
	500,000	1/2" O. D. Copper					250,000	3/4" Black Pipe				
							375,000	3/4" Black Pipe	1" Black Pipe			
						500,000	1" Black Pipe					

Figure 12 - LP Gas Pipe Sizing Information

- **LP Only:** Seamless copper tubing may only be used with gases that are not corrosive to it. See the note below to check with your LP gas supplier before using copper. Seamless copper tubing must comply with standard type K or L for seamless copper water tube, ASTM B 88; or seamless copper tube for air conditioning field service, ASTM B 280.
- **LP Only:** Copper and brass tubing and fittings (except tin lined) shall not be used if the gas contains more than a trace (0.3 grains per cubic ft.) of hydrogen sulfide gas. Check with your gas supplier.
- **LP Only:**
 - **TotalAire™ units** - maximum supply pressure for liquefied petroleum (LP) gas is 14" wc and minimum supply for purpose of input adjustment is 11" wc.
 - **Aura™ units** – maximum supply pressure for liquefied petroleum (LP) gas is 13.5" wc and minimum supply for purpose of input adjustment is 11" wc.

Before attempting to measure or adjust high fire manifold gas pressure, the inlet (supply) pressure must be within the specified range for the gas being both used when the heater is in operation and on standby. Incorrect inlet pressure could cause excessive manifold gas

pressure immediately or at some future time. With the manual valve, on the combination valve, positioned to prevent flow to the main burners, connect a manometer to the 1/8" pipe outlet pressure tap on the valve. Open the valve and operate the heater to measure the manifold gas pressure. **Note:** A manometer (fluid filled gauge) is recommended rather than a spring type gauge due to the difficulty of maintaining calibration of a spring type gauge. Normally adjustments should not be necessary to the factory present regulator. If adjustment is necessary, set pressures to above settings by turning regulator screw IN (clockwise) to increase pressure. Turn regulator screw OUT (counter clockwise) to decrease pressure. Consult the valve manufacturer's literature provided with the heater for more detailed information.

2.10.3 Gas Heater Location

The following items must be considered when choosing the size and location of the furnace. Note that dehumidifiers designed for outdoor use are already equipped with combustion air intakes and venting means. Field-installed venting is only required on indoor dehumidifiers.

- All local codes and/or regulations take precedence over the instructions in this manual and should be followed accordingly. In the absence of local codes, installation must conform to these instructions, regulations of the National Fire Protection Association, provisions of National Electrical Code (ANSI/NFPA70 latest edition), and the National Fuel Gas Code (ANSI Z223.1 latest edition).
- **Indoor units only:** The dehumidifier should be located as near the vent terminal as practical to minimize the numbers of elbows and the length of any horizontal run of connecting flue pipe which may be required.
- Definitions of "combustible material" and "non-combustible material" as issued by ANSI Z223.1 are as follows:
 - Combustible Material: Material made of or surfaced with wood, compressed paper, plant fibers, plastics or other material that will ignite and burn whether flameproof or not or whether plastered or not.
 - Non-Combustible Material: Material which will not ignite and burn; such materials consisting entirely of steel, iron, brick, concrete, slate, glass, plaster, or combination thereof.
- **Indoor units only:** The dehumidifier must be located on a level, dry surface in an area which is free from and protected from excessive drafts or wind. It must be installed so that the electrical components are protected from water. If the area becomes wet or damp at times, the dehumidifier should be raised above the floor using concrete blocks or steel dunnage.

- Measures should be taken to prevent the entry of corrosive chemicals or vapors to the combustion and ventilation air supply. Such chemicals include but are not limited to chlorinated and/or fluorinated hydrocarbons such as found in refrigerants, aerosol propellants, dry cleaning fluids, degreasers, and removers. Other harmful compounds may come from bleaches, air fresheners or mastics. Vapors from such products can form acid compounds when burned in a gas flame. Should acid compounds form in your furnace; it may reduce the life of the furnace. Please follow these guidelines for providing outside air directly to the appliance to avoid this problem.
- The return air duct of the dehumidifier must be sealed air tight to prevent starvation of the combustion air, especially if the burner is located in a confined area.

All separated combustion, power vented units **MUST BE** equipped with both combustion air and exhaust piping to the outdoors. The unique concentric adapter assembly designed for use with this heater allows for both combustion air and exhaust piping with only one horizontal or vertical penetration hole in the building.

The systems indicated in this manual are the only venting/combustion air systems approved for these separated combustion units. Do not use this concentric adapter box with any other product.

WARNING

Do not use an existing venting system. This heater **REQUIRES installation of the combustion air/vent system supplied with the unit.**

Installation should be done by a qualified agency in accordance with these instructions. The qualified service agency installing this separated combustion system is responsible for the installation.

Hazards of Chlorine – The presence of chlorine vapors in the combustion air of gas-fired heating equipment presents a potential corrosive hazard. Chlorine, found usually in the form of Freon or degreaser vapors, when exposed to flame, will precipitate from the compound, and go into solution with any condensation that is present in the heat exchanger or associated parts. The result is hydrochloric acid which readily attacks all metal including 300 grade stainless steel. Care should be taken to separate these vapors from the combustion process. This may be done by wise location of unit vent terminal and combustion air inlet with regard to exhausters or prevailing wind directions. Remember, chlorine is heavier than air. This fact should be kept in mind when determining installation location of these heaters and building exhaust systems.

WARNING

Desert Aire units are not designed or approved for use in atmospheres containing flammable vapors or atmospheres highly laden with chlorinated vapors.

The following requirements must be followed when connecting this furnace to a vent system:

- The connection of this burner to the vent system shall be in accordance with the local building codes, the vent manufacturer's instructions and Part 7, venting of equipment, of the National Fuel Gas Code, ANSI Z223.1 (latest edition).
- You must tightly seat all joints of the vent. The inside of the vent should be free of all obstructions.
- All vents and vent connections must fit tightly to avoid air leaks.
- All vent connectors connecting the furnace to the vent must be rigidly supported with hangers and straps, in order to prevent sagging and movement after installation. The vent connector must be supported every four feet for the design and weight of the material used, to maintain clearances, and to prevent physical damage. The vent pipe must slope upward 1/4" minimum for each foot of horizontal run away from the furnace.
- Vent connectors used in connecting the furnace to the vent cannot be channeled through floors, ceilings, and walls without the proper protective construction. This construction must be in accordance with the requirements of the National Fuel Gas Code (ANSI Z223.1 latest edition).
- The venting system must be installed to avoid possible contact with concealed plumbing or electrical wiring.

The addition to following the requirements outlined by local codes, follow the guidelines below when locating the vent terminal to help ensure trouble-free operation of your horizontally vented burner:

- Avoid locating the vent terminal on a wall facing the prevailing winds or wide-open areas. When this is not practical, choose locations that protect the vent from strong wind, such as behind a fence or a hedge. (**Note:** The vent terminal must be located sufficiently distant from bushes, shrubs and vegetation so as not to have the flue products restricted or blocked by such vegetation.).

- In areas with considerable snowfall, locate the vent terminal higher than the recommended minimum 12 inches above the ground as protection from blockage by snow accumulation or drifting.
- Locating the vent terminal as close as possible to the outside corner of a building rather than centered on an open wall will also minimize the effect of direct winds. Avoid alcoves and similar areas that may increase wind loading of the vent termination.

Follow these steps outlined in the National Fuel Gas Code, NFPA 54/ANSI Z223.1 – latest edition to resize the vent system to approach the minimum size using the appropriate tables in the Appendix of that code. The National Fuel Gas Code may be obtained by writing the American Gas Association Laboratories, 8501 East Pleasant Valley Road, Cleveland, OH 44131 or the National Fire Protection Association, Batterymarch Park, Quincy, PA 02269.

Refer to the documents located in the heater module for more detail instructions on installation on your specific terminal unit.

2.11 Electric Heater (Optional) For Aura™ Products

In order to keep the controls of the electrical heater cool, there are two openings in the panel adjacent to the heater. The hoods for rain protection of these openings are shipped with the unit, and the mounting hardware is already in place. Mount the hoods over the heater cooling openings using this hardware.

2.12 Auxiliary Heat Coil Piping (Optional)

The Desert Aire dehumidifier may be equipped with an optional hot water or steam air heating coil. This coil, when properly sized, will provide space heating during the winter months. Use proper practice when designing and installing the coil piping to prevent poor coil performance, shortened service life, or damage to the coil.

- The supply connections must not be supported by the coil headers.
- The control valve should be sized according to the pressure and flow rate requirements not by the coil connection size.
- On steam systems, use strainer, dirt pockets, and isolation valves to prevent clogging the control valve and to simplify service.
- Install swing joints in the connection piping to prevent damage to the coil header from thermal expansion.
- Use a backup wrench on the pipe stubs when attaching connections to prevent damage to the header.

2.13 Smoke Alarm Interlock

Desert Aire IAQ dehumidifiers are equipped with a set of terminal blocks for interlocking with a smoke alarm (alarm provided and installed by others). The smoke alarm contacts must be rated for at least 15 amps at 24 VAC. The contacts must break when smoke is present. This will shut off the blower(s) and compressors. See the dehumidification wiring diagram for connection details.

2.14 Cover Plates (if applicable)

Cover plates for the lifting bar locations are shipped with outdoor TotalAire™ units. The plates can be used to block access under the unit when installed on a curb. Cover plates should be installed after the final positioning of the unit.

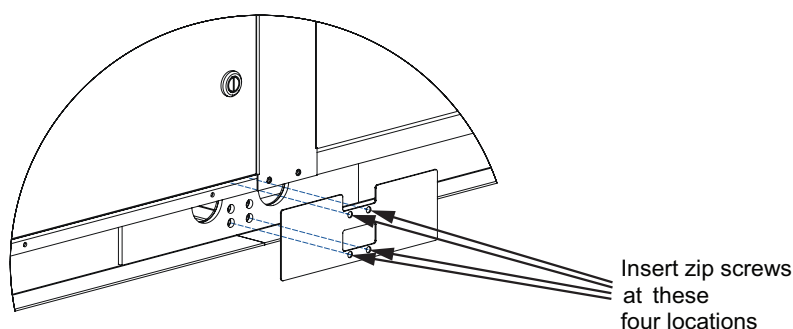


Figure 13 - Cover Plate Installation

1. The Packet should contain items as shown in the Table below, for various Plate Sub-Assemblies. The Plate Sub-Assembly to be used will depend upon size of the Unit. Please check the packet for correctness of items and quantities.

Sub-Assembly	Cover Plates Quantity	Zip Screws Quantity
TA-RAIL PLT 4-2	2	8
TA-RAIL PLT 4-4	4	16
TA-RAIL PLT 4-6	6	24
TA-RAIL PLT 6-2	2	8
TA-RAIL PLT 6-4	4	16
TA-RAIL PLT 6-6	6	24
TA-RAIL PLT 6-8	8	32

Figure 14 - Sub-Assembly Quantities

2. One cover plate is to be used for each channel stiffener. The purpose of installing this plate is to cover the two rigging holes in stiffener to minimize leakage of air through them.
3. Align the cover plate with the channel stiffener as shown in Figure 13. Place the cover plate on the channel stiffener, ensuring that the holes in the cover plate coincide with the four blank holes in the stiffener.

4. Drive four 1/4 x 1 1/4 zip screws through these four holes into the channel behind the stiffener as illustrated in the figure. Tighten the screws until the plate is firmly held against the stiffener.
5. Complete the installation of remaining cover plates following the above procedure.

2.15 Roof Curb w/ Wood Nailer (if applicable)

Certain options for curbs shipped with the Aura™ units include a treated wood nailer and flashing installed on the side of the curb. This allows for draining of the pan installed under the condenser section. The nailer and flashing should be carefully inspected on final installation of the roof material. Any separation of the flashing from the curb due to transportation and lifting will cause water to penetrate behind the flashing and past the roof materials. Re-caulk as required to close any gaps that may have occurred.

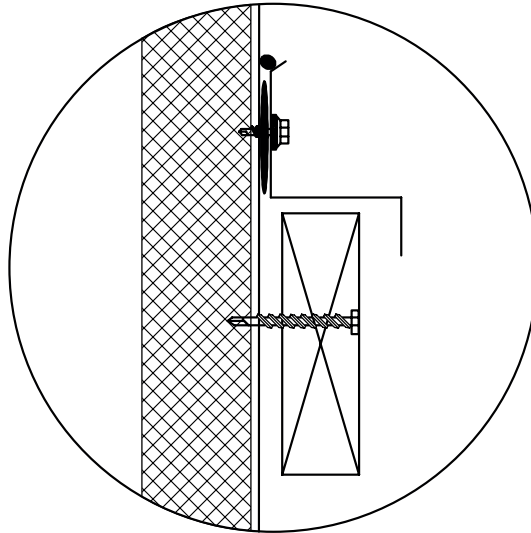


Figure 15 - Wood Nailer

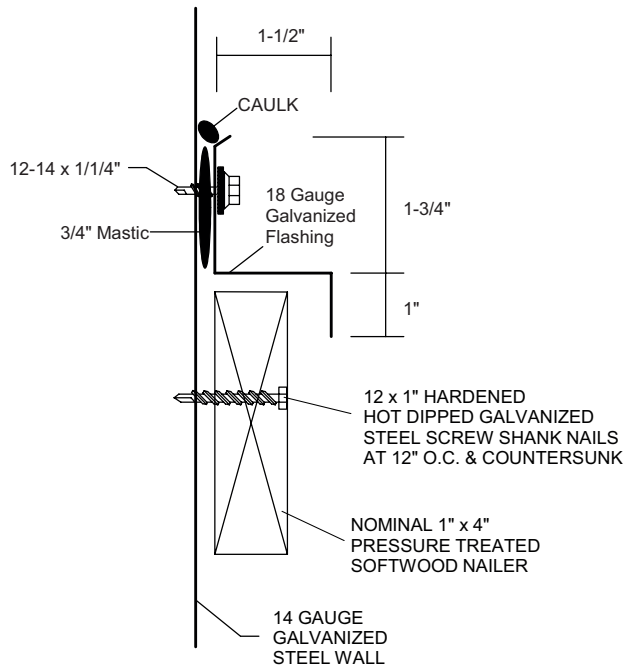


Figure 16 - Wood Nailer Detailed

2.16 Wheel Module Installation (Optional for Aura™ Products)

As soon as the main unit is acceptably located, locate the wheel module such that the duct connection is aligned to the intake of the main unit as closely as possible. If the system is on a curb, place the module such that it is supported on the curb while still aligning the duct connection as accurately as possible.

Use come-along winches to draw the two components together. As soon as they are aligned, screw together the mating flanges from the inside using the holes on the main unit for guidance. All holes must be populated. Caulk the seam between the two mating flanges on the top and sides. Install the top cover piece and caulk it to the duct connection.

Cables for power and communication to the wheel are provided within the wheelmodule behind the door adjacent to the connection. Flexible conduit is also provided. Insert the flexible conduit into the flexible conduit fittings on the unit and the module. Tighten the fittings. Thread the power cable through the cable gland on the inside rear of the module and into the main unit. Continue threading the cable through each gland up to the electrical cabinet for the unit. When the cable is entirely within the electrical cabinet, verify the cable has not bunched in any location and there is only minimal slack to the cable. It is not necessary to pull the cable

taught, just enough to prevent excessive slack that could be displaced by airflow. Tighten all cable glands through which the power cable passes. Land the wires in the open terminals of the power block per the wiring diagrams.

Repeat the above process for the communication cable, landing the leads in the appropriate terminal block per the wiring diagram.

For outdoor units, an exhaust hood will be shipped inside the unit to be field installed. Install the hood using the hardware provided. Align the hood by the fastening locations on the side of the hood first, and the top last.

3 Start-Up Procedure

Read this section thoroughly before attempting to commission the Desert Aire dehumidifier. A complete start-up will minimize operational problems and expensive callbacks. The start-up will be quicker and easier if there is a heat and humidity load present in the space. Energize any external auxiliary heaters before start-up so that the air is at the design temperature.

3.1 Preliminary Inspection

Verify that all contractors have completed their work. Find the Desert Aire Start-Up Report for QS/QV Models, which is near the end of this manual. You must fill out the start-up report to validate the dehumidifier warranty. Check the following items:

- Before starting unit, remove wooden shipping blocks found beneath compressor(s).
- Before starting unit, remove shipping restraining brackets on supply and/or exhaust blower equipped with a spring isolation base, if applicable.
- 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 dehumidifier. The available power supply voltage must be within $\pm 10\%$ of the voltage printed on the rating plate.
- With the power supply disconnected and locked, tighten all field and factory electrical connections. This includes all connections in the compressor and motors.
- Check and adjust the belt tension for proper deflection at the mid-point of the blower belt(s). This does not apply to QV units with an EC fan.
- The deflection is based on the belt length. The belt length can be found on the belt itself. Determine the force using the Belt Deflection Force table below. This does not apply to QV units with an EC fan.

Specified Belt Deflection	
Belt Length	Deflection
25" to 50"	0.25"
51" to 70"	0.375"
71" to 110"	0.625"

Figure 17 - Specified Belt Deflection Table

Belt Deflection Force						
HP	New Belt Force (lbs.)			Used Belt Force (lbs.)		
	1 Belt	2 Belts	3 Belts	1 Belt	2 Belts	3 Belts
0.5	3			2 - 2.5		
1						
1.5						
2						
3	7			5 - 6		
5						
7.5						
10	12	7		9 - 10	5 - 6	
15						
20						
25						
30		12			8 - 9	
40			12			8 - 9

Figure 18 - Belt Deflection Force Table

- Inspect the air filters and coils to assure they are clean. If necessary, clean the coils and install new filters.
- Check the field and factory piping for leaks. The internal piping may have been damaged during shipping.
- Purge any air, dirt, or debris from water lines (if used) to avoid clogging the internal passages of optional heating coils or water side heat exchangers.
- Check the drain pan and the condensate piping. Test the drain and prime the p-trap by pouring water into the drain pan.
- Verify that all service valves in the refrigeration lines are fully open.

3.2 Gas Heater Start-Up (Optional)

This optional furnace does not have a pilot. It is equipped with an igniter that automatically lights the burner. Do not attempt to light the burner by hand. Check the following items before the initial start-up:

- Check all wiring for loose connections and proper hookup. Leak test the gas piping connections.
- Check the rubber tubing to the inducer fan pressure switch to make sure it is pushed firmly onto the pressure tap.
- Indoor units only: Check all venting connections for tightness and to make sure there is no blockage.

It may be necessary to purge the air out of the gas line for initial start-up of the furnace after installation. This should be done by a qualified heating contractor. If excessive gas escapes when purging the gas supply at the union, allow the area to ventilate for at least 15 minutes before attempting to start the furnace. LP gas is especially dangerous because it is heavier

than air and can accumulate to dangerous concentrations at floor level. Heat exchanger oil will burn off on initial firing creating an unpleasant odor. To prevent this odor from occurring more than once, open doors and windows and run the blower for at least 30 minutes or until odor disappears.

The orifice for the burners was sized for either natural gas (having a heating value of 1025 BTU per cubic foot and a specific gravity of 0.60) or for liquefied propane gas (with a heating value of 2500 BTU per cubic foot and a specific gravity of 1.53). See the rating plate of your dehumidifier to determine which type of fuel the heater is configured for.

To verify the actual input of your natural gas burner, proceed as follows:

- Call your gas supplier and ask for the BTU content (heating value) of one cubic foot of the gas supplied to the installation area. An alternate approach is to assume a value of 1025 BTU/ft³, which is the national average.
- With all other gas appliances turned off, operate the burner for at least ten minutes. After the equipment has warmed up, use a stop watch to clock the time required for the small dial on the gas meter to make one full revolution. A label on the meter will state how many cubic feet have flowed per revolution (usually one, two or five).

$$\text{Input BTU/hour} = (\text{BTU/ft}^3 \times \text{ft}^3 \times 3600 \text{ seconds}) / (\text{seconds} / \text{revolution})$$

$$\text{EXAMPLE: } (1025 \text{ BTU/ft}^3 \times 2 \text{ ft}^3 \times 3600) / 74.8 \text{ seconds} = 98,663 \text{ BTU Input}$$

Check for the input of the burner, the type of gas, and the required manifold pressure on the rating plate located on the exterior of the dehumidifier.

Make sure that the gas supply pressure to the furnace falls within the maximum range of 6" to 14" wc pressure for natural gas and 11.0" to 14.0" wc for LP gas. The pressure to the furnace must be checked while the furnace burner and any other gas appliances on the same supply system are operating.

The burners are equipped with fixed orifices sized for the manifold pressure shown on the rating plate. The input can only be increased or decreased by adjusting the manifold pressure. Remove the 1/8" threaded pipe plug located on the top right side of the gas valve.

Use a U tube manometer or a pressure gauge to measure the pressure. To adjust the pressure, remove the screw from the regulator on the outlet side of the gas valve. Turn the

adjustment screw counterclockwise to decrease the pressure or clockwise to increase the pressure. ADJUSTMENTS TO THE LISTED PRESSURE MUST NOT EXCEED 0.3" wc. A 0.3" wc adjustment will increase or decrease the input approximately 0.4%. Replace the screw cap when the adjustment is complete.

Shut off the gas supply to the furnace. Remove the pressure gauge and re-install the pipe plug using a threaded compound resistant to the action of LP gases.

If the rated input cannot be obtained with the present orifice at the correct pressure, your local gas supplier will assist in sizing the proper orifice. The Desert Aire Service Department will gladly help you size the orifice if you provide them with the heating value in BTU per cubic foot and the specific gravity of the gas.

3.2.1 Burner Adjustment

TotalAire™ and Aura™ units only: Burner air shutters are not normally required on natural gas furnaces. Air shutters are required on propane gas units and may require adjustment. Before making any adjustments to the air shutters, allow the heater to operate for about fifteen minutes with the air shutters open. The slotted screw on the end manifold bracket moves the air shutters and adjusts all burners simultaneously. Turning the screw clockwise opens the shutters; counterclockwise closes the shutters. After the furnace has been in operation for 15 minutes, close the air shutters observing the flame for yellow-tipping. Open the shutters until the yellow disappears. A limited amount of yellow tipping is permissible for liquefied petroleum gases. Natural gas should not display any yellow-tipping. When making the adjustment, close the air shutters no more than is necessary to eliminate the problem condition.

After 15 – 20 minutes of continuous operation, the air temperature rise across the burner must be no higher than 85°F. If the outlet or supply duct temperature is too high, you must balance the supply airflow.

3.3 Airflow Balancing

To ensure code compliance and long equipment service life, proper airflow must be verified by a qualified air balancer. Shut off the compressor to prevent the refrigeration from running while you balance the air. If the unit is equipped with a Supply Fan Variable Frequency Drive (VFD) then the blower speed will be modified at the VFD.

Unit airflow rate is specified at the time of order. The flow rate each unit has been designed for is indicated on a label near the air balance ports. A pressure differential across a fixed set of components that corresponds with the flow rate is shown on the label as well. This is a convenient method of setting and checking the flow. Alternatively, external test and balance may be completed with velometer, anemometer, flow hood, or other testing devices. In all cases the flow rate should be set according to the label to ensure appropriate operation and system reliability.

3.3.1 Blower Adjustment Procedure



WARNING

Disconnect Power to the Unit before you adjust the Blower.

3.3.1.1 Units with an EC Blower

Aura™ and VerticalAire™ units use electronically commutated (EC) blowers. The speed of these blowers is controlled by a 0-10 VDC signal from the controller. Airflow monitoring is achieved within the unit based on differential pressure measured by a transducer. Airflow rate is maintained by a control loop which varies the signal to the blower in order to achieve the differential pressure associated with the required airflow.

Once the airflow is adjusted, review the motor current draw. If the current draw is in excess of the current rating listed on the unit nameplate or the drive is unable to achieve the airflow at the maximum setting, the unit may be experiencing external static pressure in excess of the design condition. Check the external static of the ducting to/from the unit and reduce it until it is equal to or less than the design condition indicated on the rating plate. If issues persist, consult the Desert Aire Service Department 262-946-7400. Prior to any calls to the Desert Aire Service Department please have the unit serial number and model number available.

3.3.1.2 Unit without a VFD

Change the blower speed by adjusting the motor pulley if so equipped. To adjust the variable pitch pulley, first loosen the set screw. To slow down the blower, turn the outer pulley face counterclockwise (to decrease its pitch diameter). To speed up the blower, turn the outer pulley face clockwise (to increase its pitch diameter).

After every adjustment be sure to:

- Tighten the set screw against the flat spot on the pulley hub so you don't damage any threads.
- Adjust the belt tension if needed.
- Check to assure that the blower motor current draw does not exceed the rating printed on the rating plate.

If the blower motor current draw exceeds its rating but your airflow is still too low, the static pressure losses in the ductwork and grilles may be higher than

the unit was designed for. If this happens, consult the Desert Aire Service Department 262-946-7400. Prior to any calls to the Desert Aire Service Department please have the unit serial number and model number.

3.3.1.3 Unit with a VFD

The usage of the VFD controlled blowers allows for a simple way to achieve the correct speed required for proper air balancing. Starting and stopping of the blowers shall be controlled by the CM3500 control system outputs. Therefore, the VFD needs to run in the automatic mode.

CAUTION: When modifying the VFD settings, the minimum speed should not be set to allow the airflow to fall below the air flow required for the unit as shown on the unit nameplate. The maximum frequency setting of the blower motor assembly is 75 Hz.

Since the VFD is being used to set one specific speed, the analog reference is not used. This should be confirmed by examining the wiring schematic diagram. If no analog reference signal is connected to the VFD, the drive will always run at the minimum speed setting when it is commanded on. Determination of this speed needs to be done during the test and balance phase of the commissioning by increasing the minimum speed setting, as a frequency, until the proper CFM is achieved. This frequency should be recorded near the VFD for future reference.

Once the airflow is adjusted, review the motor current draw. If the current draw is in excess of the current rating listed on the unit nameplate or the drive is unable to achieve the airflow at the maximum 75 Hz setting, consult the Desert Aire Service Department 262-946-7400. Prior to any calls to the Desert Aire Service Department please have the unit serial number and model number.

3.3.2 Airflow Balancing for Dedicated Outside Air Systems (DOAS)

Dehumidifiers designed for dedicated outside air operation without unoccupied recirculation mode have a single flow path for supply air. The unit may have an energy recovery wheel and an exhaust airstream, but these paths do not mix in a DOAS unit. A damper is installed on the intake of the units ordered for outdoor installation; provisions for field installed damper are provided on units to be installed indoors. Damper actuator is two-position. Damper should be in the fully closed position during unoccupied mode and fully open in occupied mode. Before starting the balancing process check the damper to ensure it has fully indexed to the open position, and check that the ductwork is clear of any obvious restrictions.

Once the outside air damper is fully open, verify the correct airflow. If too little airflow there is likely too much external static resistance. Evaluate ducts for high restriction or

adjust the blower speed as required per blower adjustment procedure.

3.3.2.1 Aura™ and TotalAire™ Units

The total airflow of a TotalAire™ or Aura™ system can be checked by measuring the static pressure drop across one or more of the following components depending on the configuration: the reheat condenser, the evaporator coil, or the enthalpy wheel. The dehumidifier features an EC blower to simplify air balancing. To measure airflow of Aura™ units, measure the pressure drop across both the reheat condenser and dry evaporator. Aura™ units have convenient ports located in the electrical system compartment.

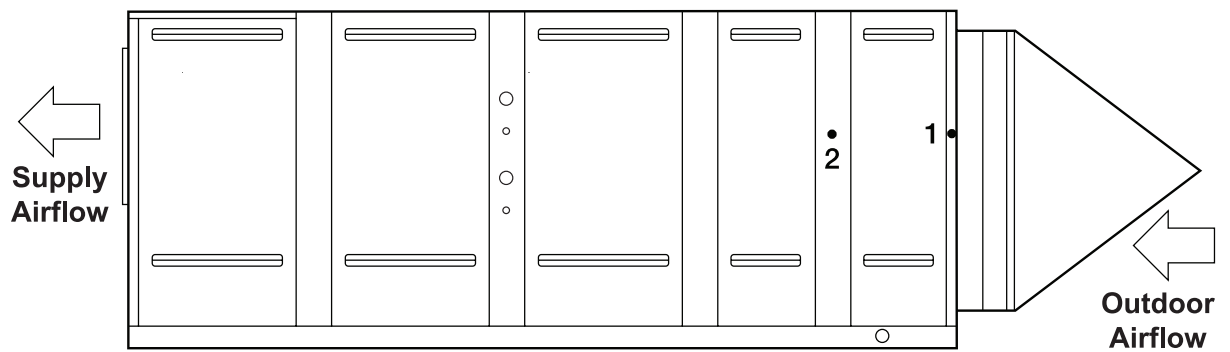


Figure 19 - QS side view showing location of Air Balance Ports

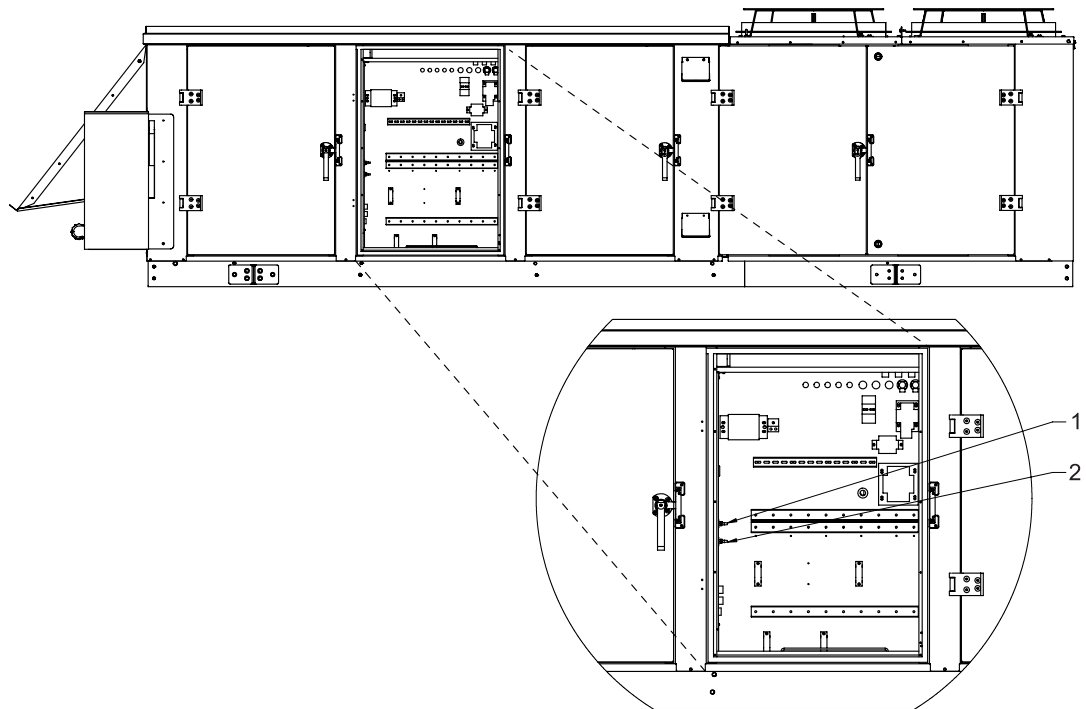


Figure 20 - Aura™ side view showing location of Air Balance Ports

Procedure:

1. Check the condition of the air filters to assure that they are clean.
2. Check for any obvious restrictions in the ductwork.
3. Start the supply air blower.
4. Drive the outdoor air damper open, start the supply air blower, and energize the field-installed exhaust air blower by turning on the “occupied” switch. Consult wiring diagram for location of occupied binary input jumper or use the operating controller occupied scheduling feature.
5. **For TotalAire™ Units without Enthalpy Wheel:** Use a magnehelic or inclined manometer or a differential pressure meter to measure the air pressure drop across the reheat condenser (ports #1 and #2). Compare this value to the value printed on the airflow label on the side of the dehumidifier.

For TotalAire™ Units with Enthalpy Wheel: Use a magnehelic or inclined manometer or a differential pressure meter to measure the air pressure drop across the upper and lower sections of the enthalpy wheel. Compare these values to the values printed on the airflow label on the side of the dehumidifier.

For Aura™ units: Use a magnehelic or inclined manometer or a differential pressure meter to measure the air pressure drop across the reheat and dry evaporator. Compare this value to the value printed on the airflow label on the side of the dehumidifier.

6. Change the airflow, if necessary, by adjusting the motor pulley or any balancing dampers in the field-installed ductwork.

Always measure the current draw of the blower motor after you make any changes to the airflow quantity. If the motor draws more than its FLA rating but the total airflow is still low, check the resistance of the ductwork. Verify that all grilles and dampers have been opened and that there are no sudden turns or restrictions in the ductwork. Refer to the mechanical equipment schedule or other indication from the building designer for required flow rates.

3.3.2.2 Airflow Balancing for QV Dehumidifiers

The total airflow of a Desert Aire VerticalAire™ QV system can be checked by measuring the static pressure drop across the reheat condenser and the dry evaporator coil for models 4-15 tons. For QV units 20-30 tons, the airflow may be checked by measuring the airflow across the reheat coil.

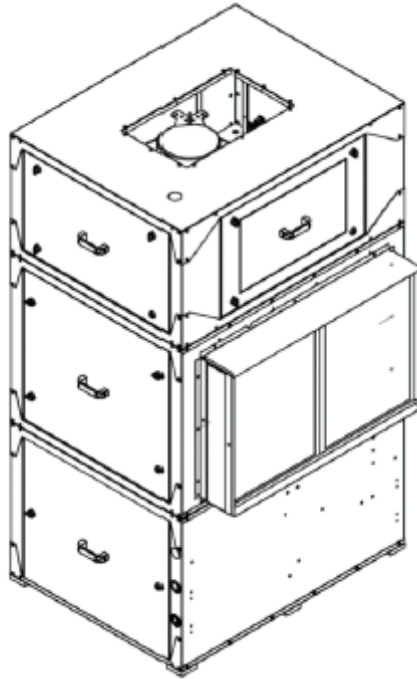


Figure 21 - QV (4-15) ton showing location of Air Balance Ports

Procedure for QV 4 – 15 ton systems:

1. Check the condition of the air filters to assure that they are clean.
2. Check for any obvious restrictions in the ductwork.
3. Start the supply air blower.
4. Drive the outdoor air damper open, start the supply air blower, and energize the field-installed exhaust air blower by turning on the “occupied” switch.
5. Use a magnehelic or inclined manometer or a differential pressure meter to measure the air pressure drop across the evaporator and reheat coil (ports #1 and #2). **Note:** Ensure test is performed with refrigeration off and evaporator coil dry. See Figure 21. Compare this value to the value printed on the airflow label on the side of the dehumidifier.
6. Change the airflow, if necessary, through the controller program.

Always measure the current draw of the blower motor after you make any changes to the airflow quantity. If the motor draws more than its FLA rating but the total airflow is still low, check the resistance of the ductwork. Verify that all grilles and dampers have been opened and that there are no sudden turns or restrictions in the ductwork.

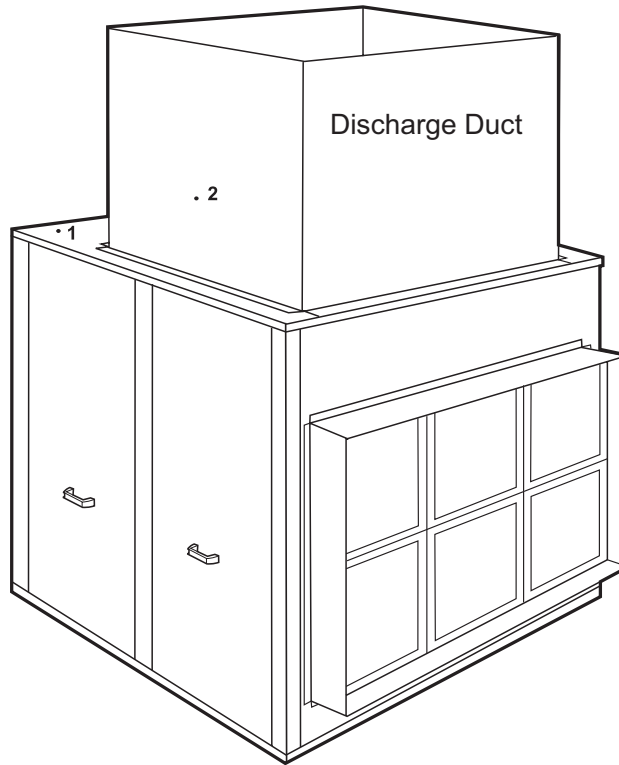


Figure 22 - QV (20-30) ton showing location of Air Balance Ports

Procedure for QV 20 – 30 ton systems:

1. Check the condition of the air filters to assure that they are clean.
2. Check for any obvious restrictions in the ductwork.
3. Start the supply air blower.
4. Drive the outdoor air damper open, start the supply air blower, and energize the field-installed exhaust air blower by turning on the “occupied” switch.
5. Use a magnehelic or inclined manometer or a differential pressure meter to measure the air pressure drop across the reheat coil. See Figure 22.
Note: Port #1 is measuring the internal cabinet pressure downstream of the fan (high side) and port #2 is added in the discharge duct in the field, downstream of the reheat coil (low side).

Always measure the current draw of the blower motor after you make any changes to the airflow quantity. If the motor draws more than its FLA rating but the total airflow is still low, check the resistance of the ductwork. Verify that all grilles and dampers have been opened and that there are no sudden turns or restrictions in the ductwork.

VerticalAire™ dehumidifiers may be equipped with a damper box that isolates the unit when in unoccupied mode. A damper actuator in the box positions the damper open when occupied. Airflow must be balanced in this mode. If this option is equipped, operate the unit in occupied mode of operation and balance according to the DOAS procedure above.

3.3.2.2.1 Damper Box Equipped VerticalAire™ Systems

VerticalAire™ dehumidifiers may be equipped with a damper box that allows the unit to operate with recirculation air in the unoccupied mode. Damper actuators in the box position the dampers in the box to operate in full outdoor air mode or full recirculation mode. Airflow must be balanced in both modes.

3.3.3 Airflow Balancing for Dedicated Outdoor Air System (DOAS) with Unoccupied Recirculation

For Aura™ Products

Dehumidifiers designed for dedicated outdoor air operation with unoccupied recirculation mode have two potential flow paths for supply air: full outdoor air or full recirculation. The unit may have an energy recovery wheel and an exhaust airstream, but these paths do not mix in a DOAS unit. A damper is installed on the intake of the units ordered for outdoor installation; provisions for field installed damper are provided on units to be installed indoors. A recirculation damper is installed within the unit. Damper actuator control acts as binary. Outside air damper should be in the fully closed position during unoccupied mode and fully open in the occupied mode with the recirculation damper always in the opposite condition. Before starting the balancing process, check that the ductwork is clear of any obvious restrictions.

Begin in occupied mode. Once the airflow damper is fully open and the recirculation damper is fully closed, verify that the controller indicates the correct airflow. If too little airflow is displayed, but the blower control signal is at maximum, there is too much external static resistance. Evaluate ducts for high restriction. Repeat the process for unoccupied mode, verifying that the outside air damper is fully closed and the recirculation damper is fully open. Allow the blower to reach steady state before verifying that the controller indicates the correct airflow.

For Aura™ units with an external enthalpy wheel, in occupied mode, use a magnehelic or inclined manometer or a differential pressure meter to measure the air pressure drop of the exhaust blower. Increase the controller signal up or down until the exhaust air pressure drop matches the pressure drop indicated on the wheel module label. DOAS units do not have automatic control of the exhaust blowers. Verify that, in unoccupied mode, the exhaust blower shuts down.

For TotalAire™ and VerticalAire™ Products

Dehumidifiers designed for dedicated outdoor air operation with unoccupied

recirculation mode have two potential flow paths for supply air: full outdoor air or full recirculation. The unit may have an energy recovery wheel and an exhaust airstream, but these paths do not mix in a DOAS unit. A damper is installed on the intake of the units ordered for outdoor installation; provisions for field installed damper are provided on units to be installed indoors. A recirculation damper is installed within the unit. Damper actuator control acts as binary. Outside air damper should be in the fully closed position during unoccupied mode and fully open in the occupied mode with the recirculation damper always in the opposite condition. Before starting the balancing process, check that the ductwork is clear of any obvious restrictions. Begin in occupied mode. Once the airflow damper is fully open and the recirculation damper is fully closed, verify that the airflow is correct. If too little airflow, there is too much external static resistance. Evaluate ducts for high restriction and adjust the blower speed as required per blower adjustment procedure. Repeat the process for unoccupied mode, verifying that the outside air damper is fully closed and the recirculation damper is fully open. Verify that the airflow is correct. If too little airflow, there is too much external static resistance. Evaluate ducts for high restriction and adjust the blower speed as required per blower adjustment procedure.

Note, if total static pressure does not match in both modes of operation, and one mode has higher airflow, it may be necessary to induce additional static pressure in one mode to reduce the airflow for that mode. To accomplish this a maximum damper opening percentage may be set within the controller.

3.3.4 Airflow Balancing for High Outdoor Air Systems (HOAS) For Aura™ Products

Dehumidifiers designed for high outdoor air operation mix outdoor air and return air before treating it. A damper is installed on the intake of the units ordered for outdoor installation; provisions for field installed damper are provided on units to be installed indoors. A recirculation damper is installed within the unit. Damper actuator control is proportional for both dampers. Controls may be set to allow for a mixed air condition during occupied mode and full recirculation during unoccupied mode. Airflow must be balanced in both modes.

Note that duct airflow measurement equipment will be required to measure the amount of airflow in each mode. Before starting the balancing process, check that the ductwork is clear of any obvious restrictions.

Operate the unit in occupied mode of operation. Initially the controller will index the outside air damper fully open and the return air damper fully closed. Verify the blower is maintaining design airflow; it should maintain the design airflow throughout balancing so long as damper position changes are done slowly.

Use the controller to adjust the recirculation damper to a more open position. Check the return air duct flow rate after every adjustment, and continue adjusting until the

ratio of flows is correct. In cases where the return air static pressure is high, the recirculation damper may be fully open without the desired ratio being attained. In this case, keep the recirculation damper fully open and adjust the outside air damper to a more closed position. Check the return air duct flow rate after every adjustment, and continue adjusting until the ratio of flows is correct. Verify the blower has maintained the supply airflow.

Switch to unoccupied mode and verify that the outside air damper closed completely, the recirculation damper opened completely, and the supply airflow is maintained at steady state (this may take a few moments as the blower control loop stabilizes).

3.3.4.1 For Units with External Enthalpy Wheel (Aura™)

In occupied mode, use a magnehelic or inclined manometer or a differential pressure meter to measure the air pressure drop of the exhaust blower. Increase the controller signal up or down until the exhaust air pressure drop matches the pressure drop indicated on the nameplate. Then complete the balancing from section 3.3.4.

Check the pressure drop of the exhaust blower after balancing the dampers and adjust the exhaust blower signal as necessary. Verify the exhaust blower adjustment did not alter supply air operation. If the adjustment has altered supply air operation, repeat the supply air balancing and then the exhaust air adjustment until all airstreams are within specifications. Verify that, in unoccupied mode, the exhaust blower shuts down.

3.3.4.2 For Units with CO₂ Control (Aura™)

Dehumidifiers designed for CO₂ control can have mixed airflow composed of a range from 100% outside air to a minimum ratio of outside air dictated by the design. The outside air damper, recirculation damper, supply blower, and exhaust blower are all controlled by PID loops. To balance, set the CO₂ set point to 200 ppm and verify the pressure drop across the supply side of the wheel is at a minimum indicated on the nameplate. Also, verify the supply blower is maintaining the design airflow.

Adjust the CO₂ set point to 2000 ppm and verify the outside air damper opens fully, the recirculation damper closes fully, and the supply blower still maintains the design airflow.

For TotalAire™ Products

TotalAire™ dehumidifiers may be equipped with a recirculation damper that allows for mixing of outdoor air and return air. A separate damper and actuator are installed between the return air and outside air streams prior to the exhaust air entering the enthalpy wheel. Controls may be set to allow for a mixed air condition during occupancy and/or full recirculation air during unoccupied mode. Airflow must be balanced in both modes.

Note that duct airflow measurement equipment will be required to measure the amount of airflow in each mode.

3.3.4.3 Recirculation Mode (TotalAire™)

Operate the unit in unoccupied mode of operation. Check to ensure that the outside air damper indexes to the fully closed position, the return air damper indexes to the fully open position, and the exhaust fan and enthalpy wheel turn off. Adjust the blower speed such that the airflow meets specifications.

3.3.4.4 Mixed Air Mode (TotalAire™)

Operate the unit in occupied mode of operation. Initially the unit will index the outdoor air damper fully open and the return air damper fully closed. Use the maximum open position setting within the controller on the recirculation damper to adjust the damper to a more open position in this mode. Check the return air duct flow rate until the ratio of flows and the total flow is correct. Do not adjust the blower speed at this time.

In cases where the return air static pressure is high, you may reach the full open position of the outside air damper before the desired ratio is obtained. Additionally, the airflow may be significantly higher than the specification in this mode when this is the case. If this occurs, use the controller to adjust the outdoor air damper maximum open position to limit the stroke of the actuator to a less open position during this mode.

Adjust the return air damper to the close position and outdoor air damper to the open position until the desired ratio and total specified airflow is achieved in occupied mode.

Check the pressure drop across the enthalpy wheel according to the airflow label on the side of the unit. Change the exhaust airflow, if necessary, by adjusting the motor pulley or any balancing dampers in the field-installed ductwork.

Verify exhaust air adjustments did not alter supply air operation. If so, repeat above procedures until all airstreams are within specifications.

3.3.4.5 For Units with Systems Equipped with Demand Controlled Ventilation Option (TotalAire™)

TotalAire™ units equipped with the CO₂ Control option include VFD's for the supply and exhaust as well as a recirculation damper. Pressure differential across several components within the systems are measured. All of these devices are connected to the unit controller which takes the inputs from these pressure transducers and controls the fan speed accordingly.

The system is substantially self-balancing, but all modes must be checked at startup to ensure static pressures are within design criteria.

3.3.4.5.1 Unoccupied Mode with Recirculation (when specified) (TotalAire™)

Units that are set for unoccupied mode of operation through the controls should be balanced in this mode first. This mode of operation is specified at the time of order and the unit will come pre-set from the factory.

It is possible to add this mode of operation through the controller setup functions in the field. See the Controller IO Manual for details. It should be noted that supply fan capability may be limited if the unit was not specified for this operation at time of order.

Unoccupied mode may be programmed with Fan Cycling operation or Continuous in the controller. For balancing purposes, adjust the operation to Continuous.

Operate unit in unoccupied mode. Unit will close outdoor air damper, open the recirculation damper, disable the exhaust fan, and turn off the wheel. Confirm that the exhaust air gravity damper is shut. Supply air fan will modulate to maintain the programmed pressure differential over the reheat coil in the unit, maintaining the supply air flow rate. Check the pressure drop according to the airflow label on the side of the unit. It is possible if the static pressures are higher than specified that the flow rate may be lower. Check the VFD speed. Units will leave the factory with a maximum VFD speed of 65 Hz. This can be increased to 75 Hz maximum, subject to the current draw limitations of the fan motor. Review the settings in the VFD drive to increase the speed.

When the static pressure of the reheat coil is correct, check the motor current draw and compare to the FLA indicated on the unit rating plate.

3.3.4.5.2 Occupied Mode Minimum Outdoor Air (TotalAire™)

Place the unit in occupied mode and create a low space CO₂ reading (less than 200 PPM). An offset should be placed in the controller input to reduce the indoor sensor reading. If the reading is supplied by the BMS network, it is recommended that this reading be overridden at the BMS control.

The unit will modulate the exhaust and supply air variable speed drives, open the return air damper, and modulate the outdoor air damper. Check the pressure drop according to the airflow label on the side of the unit. It is possible if the static pressures are higher than specified that the flow rate may be lower. Check the VFD speed. Units will leave the factory with a maximum VFD speed of 65 Hz. This can be increased to **75 Hz maximum**, subject to the current draw limitations of the fan motor. Review the settings in the VFD drive to increase the speed.

3.3.4.5.3 Occupied Mode Maximum Outdoor Air (TotalAire™)

Place the unit in occupied mode and create a high space CO₂ reading (greater than 2000 PPM). An offset should be placed in the controller input to reduce the indoor sensor reading. If the reading is supplied by the BMS net work, it is recommended that this reading be overridden at the BMS control.

Check the pressure drop according to the airflow label on the side of the unit. It is possible if the static pressures are higher than specified that the flow rate may be lower. Check the VFD speed. Units will leave the factory with a maximum VFD speed of 65 Hz. This can be increased to **75 Hz maximum**, subject to the current draw limitations of the fan motor. Review VFD drive settings to increase the speed.

For VerticalAire™ Products

VerticalAire™ dehumidifiers may be equipped with a mixing box that allows the unit to operate with recirculation air in the unoccupied mode and/or mixing of airstreams during occupied mode. Two independent actuators allow positioning of the dampers to the appropriate settings. Airflow must be balanced in all modes.

If option is equipped, first operate the unit in occupied mode and adjust the damper positions via the controller display independently until the desired flow of the outdoor air and the return air is achieved. Outside air and return air duct will need to be measured independently by traverse or similar method if this includes mixing.

Operate the unit in unoccupied mode of operation. Typically the outdoor air damper will be set to 0% open position. Adjust the recirculation damper position to meet the required flow rate according to static pressure differential per the balance label or independent test and balance measurements. The airflow should be in the static pressure differential range or within +/- 10% of the specified airflow.

Should the flow rate be too high or too low, note the static pressure in the mixing box and compare to the value measured during the occupied mode. Duct static pressures that are significantly different will affect airflow during the shifting of modes. Dampers or grille adjustments will be needed to create similar static pressure drops in each mode. Evaluate the system and adjust the dampers accordingly.

3.4 Refrigeration Testing

Refrigeration based cooling systems are sometimes referred to as “sealed systems”. This is in reference to the refrigeration system being hermetically sealed, no refrigerant can leave the system and no contaminants are allowed inside. Factory equipment and procedures ensure a clean and tight refrigeration system where only the specified refrigerant and oil are in the system. This is a critical component to the longevity of the system.

Some Desert Aire systems are shipped as two appliances to allow for installation of the appliances in a location much different than another. An example is a unit with a remote condenser ready circuit. The dehumidifier may be installed indoors near the conditioned space while the remote condenser used to reject waste heat is located outdoors. The piping of the condenser is completed in the field before the unit is commissioned. The design and processing of the field piping is just as important as the factory piping in ensuring the longevity of the system.

Selection of quality components, quality procedures, and full testing help to ensure the sealed system failures are minimized wherever possible. Nonetheless, the mechanical nature of many components creates some unforeseen wear and failure in certain instances. Some units may need service at a point in the life of the product that requires opening of the hermetic refrigeration system. Special care must be taken to ensure that the system is returned to service without contamination.

Whenever servicing Desert Aire equipment, observe the following:

- Use only equipment rated for the pressures of the refrigerant being serviced.
- Use only equipment dedicated to service the refrigerant in the system. Do not use equipment to service multiple refrigerant types.
- Purge all hoses and equipment of non-condensable gasses before connecting to the sealed system.
- Use only original equipment parts or factory approved equivalent for servicing.
- Use required refrigerant system oil.
- Minimize the time the system is open to atmosphere while servicing. Cap all connections when there is no active service work on the system. This is particularly important with units that contain POE oils as moisture will be absorbed quickly and cannot be removed with a vacuum.
- Never open the system while under a vacuum. Should system require opening to repair a leak or other service when in vacuum, fill with dry nitrogen to atmospheric pressure before opening.
- Have a Schrader core replacement tool available when servicing the refrigeration system. Although rare, defective or damaged Schrader valve cores can contribute to refrigerant loss.
- Charge systems only by weight after servicing. Review the rating plate and any field charge labels.
- When servicing, additional liquid line filter dryers and suction filters may be required. This does not

apply to installation of remote condensers.

- Charge refrigerant blends, including R-410A and R-407C, with liquid only. Charging should be done into the high side of the system whenever possible. Refer to section 5.5 for additional procedures related to charging.

Note that the superheat should be stable and within +/- 3 degrees of fluctuation. For example: the factory setting for superheat is 18°F resulting in an allowable range of 21°F to 15°F once the unit has operated in a mode for 10 or more minutes. During all portions of operation the superheat should remain above 12°F.

3.4.1 Dehumidification / Cooling Mode

For Aura™ Products

In order to test the unit in dehumidification / cooling mode, the air temperature entering the DX evaporator must be approximately 40°F or higher. If the condition entering the evaporator is lower, the evaporator may accumulate significant amounts of frost and/or a suction pressure alarm may occur.

If a low outdoor air temperature condition prevents the unit from running long enough to take data, note this on a startup report and proceed to heat pump mode. During the first Preventative Maintenance visit that is recommended during spring and fall, the service contractor should complete the Dehumidification/Cooling Mode section of the startup report.

To perform start-up checks on the compressor, the supply air dewpoint set point should be lower than the incoming dewpoint by at least 10°F. See the Controller IO Manual for instructions on setting the dewpoint set point. Note the original setting. Once the set point is adjusted, switch the unit to occupied mode.

Note, for the Aura Q-Pump units the compressor is controlled by a PID loop that will modulate the speed of the compressor to the level necessary to achieve the desired dewpoint. It can take up to 15 minutes for the unit to reach steady state during which time, the noise of the compressor will vary in frequency and intensity. This is normal as the unit reaches steady state. During steady state operation, it is common for the compressor to ramp up for short periods (about 30 seconds) in order to ensure proper oil return. This will not substantially affect leaving air conditions and the unit will return to steady state within a few minutes.

Oil charge has been confirmed at the factory. In the rare case that the compressor is observed to ramp up for oil return more than twice per hour, 20 oz additional POE oil should be added to the system.

While in steady state operation, record the data required for the start-up report. If the compressor is at maximum speed in steady state operation, it may be operating outside of design conditions. Check the air flow to verify excessive airflow is not limiting the dewpoint capabilities of the unit. If the dewpoint set point was adjusted, return it to its original value.

For TotalAire™ and VerticalAire™ Products

In order to test the unit in dehumidification / cooling mode, the air temperature entering the DX evaporator must be approximately 50°F or higher. If the condition entering the unit is lower, the unit may experience difficulties resulting in poor operation or shutdown due to low suction pressure.

If a low outdoor air temperature condition prevents the unit from running long enough to take data, note this on a startup report and proceed to heat pump mode. During the first Preventative Maintenance visit that is recommended during spring and fall, the service contractor should complete the Dehumidification/Cooling Mode section of the startup report.

To perform start-up checks on the compressor, the supply air dewpoint set point should be lower than the incoming dewpoint by at least 10°F. See the Controller IO Manual for instructions on setting the dewpoint set point. Note the original setting. Once the set point is adjusted, switch the unit to occupied mode.

It can take up to 15 minutes for the unit to reach steady state. While in steady state operation, record the data required for the start-up report. If the dewpoint set point was adjusted, return it to its original value.

3.4.2 Heat Pump Mode Q-Pump (WSHP)

For Aura™ Products

In order to test the unit in heat pump mode, the air temperature entering the reheat condenser must be approximately 90°F or lower. If the condition entering the condenser is higher, the unit may run elevated head pressures and a high discharge pressure alarm may occur.

If a high outdoor air temperature condition prevents the unit from running long enough to take data, note this on the startup report. During the first Preventative Maintenance visit that is recommended during spring and fall, the service contractor should complete the Heat Pump Mode section of the startup report.

To perform start-up checks on the compressor in heat pump mode, the supply air temperature set point should be higher than the incoming air temperature by at least 10°F. See the Controller IO Manual for instructions on setting the supply air temperature set point. Note the original setting. Once the set point is adjusted, switch the unit to occupied mode.

The compressor is controlled by a PID loop that will modulate the speed of the compressor to the level necessary to achieve the desired supply air temperature. It can take up to 15 minutes for the unit to reach steady state during which time, the noise of the compressor will vary in frequency and intensity. This is normal as the unit reaches steady state. During steady state operation, it is common for the compressor to ramp up for short periods (about 30 seconds) in order to ensure proper oil return. This will not substantially affect leaving air conditions and the unit will return to steady state within a few minutes.

Oil charge has been confirmed at the factory. In the rare case that the compressor is observed to ramp up for oil return more than twice per hour, 20 oz additional POE oil should be added to the system.

While in steady state operation, record the data required for the start-up report. If the compressor is at maximum speed in steady state operation, it may be operating outside of design conditions. Check the air flow to verify excessive airflow is not limiting the heat pump capabilities of the unit. If the supply air temperature set point was adjusted, return it to its original value.

For TotalAire™ and VerticalAire™ Products

In order to test the unit in heat pump mode, the air temperature entering the reheat condenser must be approximately 90°F or lower. If the condition entering the condenser is higher, the unit may run elevated head pressures and a high discharge pressure alarm may occur.

If a high outdoor air temperature condition prevents the unit from running long enough to take data, note this on the startup report. During the first Preventative Maintenance visit that is recommended during spring and fall, the service contractor should complete the Heat Pump Mode section of the startup report.

To perform start-up checks on the compressor in heat pump mode, the supply air temperature set point should be higher than the incoming air temperature by at least 10°F and the incoming air humidity and the supply air dewpoint set point should be higher than the incoming dewpoint by at least 10°F. See the Controller IO Manual for instructions on setting the supply air and dew point temperature set points. Note the original setting. Once the set point is adjusted, switch the unit to occupied mode.

It can take up to 15 minutes for the unit to reach steady state. While in steady state operation, record the data required for the start-up report. If the supply air temperature set point was adjusted, return it to its original value.

3.5 General Testing

After you balance the airflow and test the refrigeration circuits, verify that the other equipment and accessories connected to the dehumidifier work properly. Although this may be difficult, since the dehumidifier is usually interlocked with a variety of equipment installed by different contractors, you must not skip this step.

Each of these devices (which may include auxiliary air and water heaters, smoke alarms, circulating pumps, and a building management system) is vital in maintaining the performance of the unit. Many customer complaints are caused by improper interlocks between these devices. Make sure you check the following:

- Check the outdoor air and exhaust devices. The outdoor air and exhaust dampers must open when they receive an “occupied” signal from the dehumidifier. If you have installed an exhaust blower, make sure that it is interlocked with the “occupied” signal or with an end switch on the outdoor air damper actuator.
- Check the condensate drain to make sure it has been trapped and primed with water. Verify that it drains freely, with no leaks. If the drain is outside or in an unconditioned space, make sure it has been heat traced. If you installed a condensate pump, make sure it operates properly.
- Check the operation of the remote condenser (on units equipped with this option). Make sure that the fans cycling switches, which are mounted on the condenser, are correctly piped and have been set according to the Desert Aire condenser wiring diagram. Verify that the fans are blowing air vertically upward when they run.
- Check the temperature and humidity readings displayed on the controller. If you think the values are incorrect, check the sensor or its field-installed wiring for damage.
- Check the operation of the auxiliary heaters by temporarily raising the air temperature set point on the Desert Aire controller. The duct heater(s) or heating valve should energize.

3.6 Routine Maintenance Schedule

3.6.1 Service Every Month

- Check the air filters and replace them if necessary.
- Check the coils in the dehumidifier and the remote condenser. Use compressed air or a commercial coil cleaner if they are dirty or plugged.
- Verify that the air flow around the remote condenser or packaged condenser section remains unobstructed.

3.6.2 Service Every Six Months

- Check the blower belts for wear or glazing, if so equipped. Tighten or replace them if necessary. Do not use the belt dressing compound.
- Check and tighten all field and factory electrical connections.
- Check for dirty coils in the dehumidifier and the optional remote condenser.
- Check and clean the drain pans and blow out the condensate drain line. If the drain is plugged, water will back up into the dehumidifier and flood the mechanical room.

- Check and adjust the air flow per specifications. Dirty ducts, filters, and coils may have reduced the total air volume.
- Check the operating pressures of the refrigeration circuits.
- Check the current draw of each blower motor.
- Check the current draw of each compressor
- Lubricate the blower motor(s), if so equipped.
- Lubricate the blower bearings, if so equipped.

Suggested Grease Brands and Types

Supplier	Type	Base	Range temperature (min-max)
FINA	Marson HTL 3	Lithium	-30°C / +120°C
SHELL	Alvania Fett 3	Lithium	-20°C / +130°C
ESSO	Beacon 3	Lithium	-20°C / +130°C
MOBIL	Mobilux EP3	Lithium	-30°C / +130°C

3.6.3 Service Every Year

3.6.3.1 Energy Recovery Wheel (Optional)

Dehumidifiers equipped with the optional energy recovery wheel must be inspected regularly. Check the drive belt and clean the wheel annually using either compressed air or a mixture of mild detergent and water. If you clean the wheel with soapy water, rinse the suds out using clear water. Vacuum or blow out any excess moisture from the wheel, dry off the base pans, and return the equipment to operation. The moving airflow will evaporate any moisture remaining within the wheel.

Note that equipment used to dehumidify smoking areas or dusty industrial environments should be inspected and cleaned every two to three months to ensure high operating efficiency. See the enthalpy wheel instruction manual for more detailed information on maintaining and troubleshooting the wheel.

3.6.3.2 Gas Heater (Optional)

Dehumidifiers equipped with optional gas heating should be inspected annually before each heating season. Check the following items:

- Ensure that the vents and air intakes are clean and unobstructed.
- Clean the vent and condensate drain line if necessary. Repair any damaged sections of the vent.

- Inspect the pressure switch tubing connections. Verify that the inducer fan is free of corrosion, warp-age, deterioration, and carbon buildup. If necessary, clean the housing and the blower wheel with a damp cloth. Vacuum any lint or dust from the inducer motor assembly.

See the separate gas heater manual for detailed service information.

Note: Please have the following information available if you need to call the Desert Aire Service Department:

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

4 Troubleshooting

Although Desert Aire dehumidifiers 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 dehumidifier. Your common sense and experience can help you solve the majority of these problems.

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

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

4.1 The Blower Does Not Run

POSSIBLE CAUSES	REMEDY
"Occupied" switch is in the open position	Close "occupied" switch
Loss of main power	Check for tripped circuit breaker or blown fuses
Damper is stuck or frozen, preventing the actuator end switch from closing	Free the damper or replace the actuator if it is defective
Blower overload has tripped	Correct cause and reset overload
Faulty control wiring	Check for loose or incorrect wires on system and controller

Note: Occupied can be activated by 1 of 3 methods. Contact closure from installed device, use of the time clock on the Desert Aire operating controller, or through a Building Automation System if equipped.

4.2 The Compressor(s) Do Not Run

Note: When there is a demand for outdoor air (the “occupied” switch is on) and the outdoor air does not need mechanical dehumidification, the compressor and the refrigeration circuits of the dehumidifier will be inactive as the OA is acceptable for delivering into the building. See Section 5.4 for more details on the Sequence of Operation.

POSSIBLE CAUSES	REMEDY
Loss of main power	Check for tripped circuit breaker or blown fuses
Blower overload has tripped	Correct cause of reset overload
Faulty wiring	Check for loose or faulty wiring on system and dehumidifier
Compressor overload has tripped	Correct cause and reset overload
Compressor failure may have occurred IF:	
• Compressor draws locked rotor amps	Replace compressor (or check fuses on 3-phase units)
• Compressor starts but does not pump	Replace compressor
• Motor windings have shorted	Replace compressor
Compressor delay time	Wait 3 minutes for timer

4.3 High Pressure Alarms / Readings Above High Pressure Trip Set Point

See CM3500 Series Controller IO Manual for more information.

POSSIBLE CAUSES	REMEDY
Lack of air flow at remote condenser (On units with air-cooled condensers)	Assure coil is clean and no air flow restrictions exist around unit
Remote condenser blower does not run	Check for power at motor leads
Lack of adequate water flow (on units with tower condensers)	Install flow meter or circuit setter to ensure correct flow rate
Excessive incoming water temperature (on units with tower condensers)	If water temp. is above 90°F, consult factory for required flow rates
Excessive air in condenser water lines (on units with tower condenser)	Purge lines thoroughly or install an air eliminator in the system piping
Overload tripped (3 phase only)	Reduce blower speed and reset overload
Contactors faulty	Replace contactor
Blower cycling on internal overload (single phase only)	Reduce blower speed
Service valve closed or not fully open	Fully open service valves
Excessive pressure drop in line sets	Re-evaluate remote condenser installation
Non-condensables in refrigeration system	Properly evacuate and recharge refrigeration system
Note: When the remote condenser is active and the outdoor temperature is above 95°F, normal head pressure can be as high as 480 PSIG.	

4.4 Low Pressure Alarms (Below 97 PSIG) / Evaporator Coil Icing

POSSIBLE CAUSES	REMEDY
Faulty or improperly set hot-gas bypass valve	Set hot-gas valve to maintain 30°F suction (97 PSIG) or replace if defective
Insufficient evaporator air flow rate	Assure coil is clean and belts are tight
Lack of refrigerant	Re-evaluate system charge
Restricted refrigerant filter-drier	Evaluate filter pressure drop and replace if necessary
Defective expansion valve	Evaluate expansion valve performance and replace if necessary
Restriction in refrigeration piping	Check coil for kinks in tubing and check for debris in distributor

5 Appendix

5.1 Compressor Failure

Although some compressors fail because they are mechanically flawed, most failures are due to system-related problems. Compressor failure can be caused by liquid flood back, air/moisture in the refrigeration system, solid contaminants, excessive heat or electrical service malfunctions. To avoid repeated callbacks, you must determine the cause of the failure and then correct it.

If the compressor has failed because its motor has burned out, the refrigerant, oil, and piping may have become severely contaminated. If a burnout has occurred, use the following procedures to replace the compressor and clean the refrigerant system. Use an oil test kit to determine the severity of the burnout. Make sure you use rubber gloves and eye protection, as contaminated refrigerant and oil can cause severe burns!

CAUTION

You must clean the system thoroughly to prevent repeated compressor burnouts.

5.1.1 Compressor Replacement

Desert Aire dehumidifiers are designed with scroll compressors. Scroll compressors are known for operating more reliably than other compressors in air conditioning and dehumidification applications due to their ability to cope with occasional periods of liquid refrigerant return. There are fewer moving parts in a scroll compressor subject to wear compared to alternative compressor designs. Nonetheless, there are still many mechanical and electrical parts with close tolerances. Replacement of the compressor may be required during the normal service life of the dehumidifier.

Inspection and Initial Diagnosis

Generally, the compressor will have two basic failure modes, mechanical or electrical. The compressors are a hermetic design, meaning all components, including the motor, are in a sealed shell. It can be very difficult to determine which issue was the root cause of the failure in the field by inspection of the damaged compressor. For example, an initial bearing failure inside the compressor may create debris that contaminates motor windings. High current draw may be related to a bearing issue or a motor winding issue. The initial inspection must be combined with a final analysis of the machine when returned to working order to confirm diagnosis.

Specific items should be noted before the replacement to give the best indications of the failure and complete the diagnosis as the new compressor is installed.

The following data should be taken to assist in diagnosis:

- Current draw for each leg of power (if the compressor will run and pump).
- High side and low side pressure (if the compressor will run and pump).
- Resistance of each leg to leg on three phase compressors or each leg to neutral on single phase compressors.
- Check of continuity from each leg to ground.
- Review of all system alarms including the relative timing of the alarms and mode of operation.

It is important to note that other components or lines may have been damaged if the compressor has failed. At times the internal damage to a compressor creates extreme levels of vibration before complete failure. Refrigerant lines and connections may be damaged before the compressor stops. Inspect tubing and components of the system before completing the compressor replacement.

Compressor Replacement

- Refrigeration oil must be tested for acid and particulate during any compressor replacement. For the initial testing, the compressor sump should be used to sample the oil. Oil can be recovered through the Schrader port on the low point compressor shell or through the suction line connection after the compressor has been removed.
- Use Virginia KMP, New-Calgon Phase III, Sporlan Test-All, or equivalent oil test where oil is sampled into a container. Vapor sampling methods may not show particulate and should not be used.
- Read the oil test kit manufacturer's instructions to determine if there is acid present in the oil. Determine if there are other contaminants by viewing the samples for darkness, cloudiness, or particulate.

The following procedures must be used depending on the results of the test above:

Any Compressor Service

- A new filter dryer must be installed when the system has been opened. If there is no acid or particulates indicated, the new compressor can be installed and run. Proceed to Testing and Final Diagnosis.

Acid Indicated

- Install a suction line filter shell and charcoal activated core such as a Sporlan or Emerson HH core type of equivalent. The acid levels will be monitored and several core changes may be required. Install ball valves on either side of the suction filter to facilitate these changes. Note that larger Desert Aire systems will have suction filter shells installed from the factory. The shell can be used with charcoal activated cores. Note that a “safety screen” may be required with some manufacturer’s cores to prevent small pieces of the core from dislodging and finding their way to the compressor. Follow filter shell core manufacturer’s instructions.
- Review compressor and suction line for area where future oil samples can be taken from the system. If an access fitting exists on the compressor shell below the oil level, no further action is needed. If this is not available, an access fitting can be located at the bottom of a trap in the suction line. Braze in a fitting as required to be able to remove an oil sample. Note: It is acceptable to use acid test kits that sample the refrigerant and connect to Schrader fittings.
- Ensure there are access fittings directly upstream and downstream of the suction filter. There is typically one fitting installed on the suction filter. There may be a bulkhead fitting attached to the compressor suction side.
- Do not use acid neutralizing additives or other chemicals for acid removal. The refrigeration system must contain only oil and refrigerant. Precipitates of additives and acids may be considered contamination in the refrigeration system. Other compounds may be present in additives as carriers. Long-term effects of specific additives or compounds with a particular system or design are unknown without significant controlled testing.

Particulate Indicated

- Install a replaceable core liquid line filter shell. Note that larger Desert Aire systems will have replaceable core liquid line filter shells installed from the factory. The pressure drop levels will be monitored and several core changes may be required. Install ball valves on either side of the filter shell to facilitate these changes.
- Install a secondary filter such as Sporlan FS-series or equivalent 20 micron filter in a replaceable core.
- Ensure there are access fittings directly upstream and downstream of the liquid filter. There is typically one fitting installed on the filter shell. There is

typically a fitting installed on the outlet side of the receiver.

Returning to Service

- See section 5.5 for evacuation and charging.
- Restart unit and set unit to run compressors.
- Record the pressure drop across the suction filter and liquid line filter dryer.
- Check sight-glass indicator for moisture level.
- Monitor pressure drop across the liquid and suction filters during the first hour of operation. Compare the reading taken earlier. If the pressure differential across the filters is 5 PSI or greater, isolate the filters using the valves installed and recover the refrigerant from the filters. Replace cores. If activate carbon filters were installed in the suction side to remove acid, replace with similar cores. If a secondary filter was installed in the liquid line core to remove particulate, install cores and secondary filter in this location.
- Run unit for 24 hours and review acid levels (if found previously) and pressure differentials.
 - If acid is found, replace with activated charcoal cores and test at 24 hour intervals until acids are at acceptable levels. Once acid is no longer detected, replace cores with standard filter elements. Remove outlet screens if they were required by filter manufacturer.
 - If the pressure differential across the liquid line filter is 5 PSI or greater, replace cores and secondary filter with new components and test at 24 hour intervals until pressure drop is at acceptable levels. Once pressure differential is less than 5 PSI, remove secondary filter and replace cores.

Testing and Final Diagnosis

It is of critical importance to ensure that the system is operating as expected before unit is returned to normal service. Complete a QS-QV Series Compressor Replacement Form located inside this manual. Validation of this report allows for the continued coverage of the compressor under the original warranty.

It is possible that there was an internal defect in the compressor or normal mechanical wear occurred over time. Compressors longevity generally is a function of load, lubrication, electrical input conditions, and temperatures.

The cause for the compressor failure must be identified before unit is placed back into full service. Both the identification of the cause of compressor failure and the proper cleanup of the system must be addressed to avoid repeat compressor damage.

5.2 Recommended Duct Design Per SMACNA (Sheet Metal & Air Conditioning Contractor's National Association)

You must use proper duct design to ensure that the dehumidifier operates efficiently and without problems. Undersized or restrictive ducts reduce the system airflow, which can cause premature compressor failure. Use the following diagrams as a guide when you design the duct system.

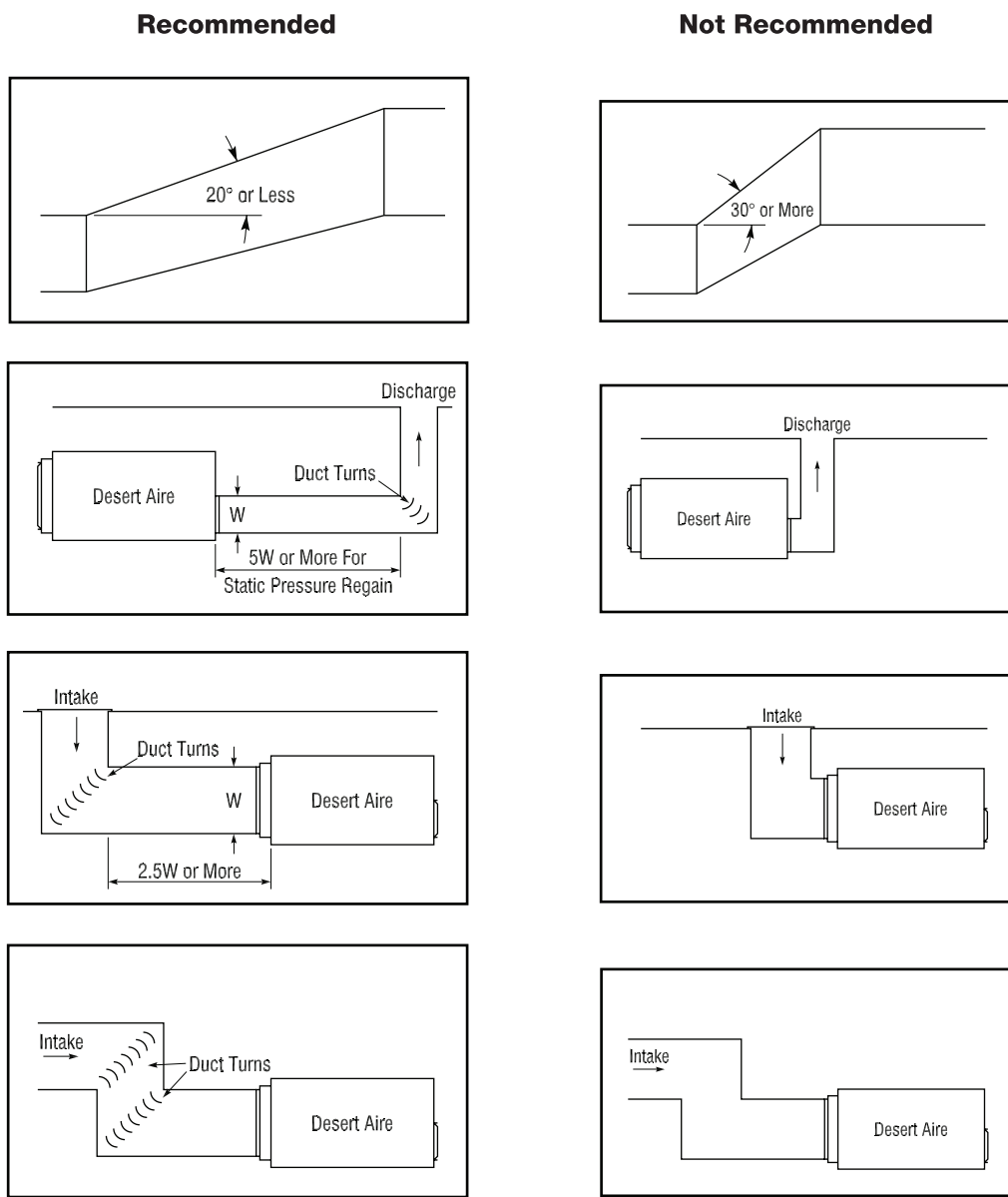


Figure 23 - Recommended Duct Designs for Desert Aire Dehumidifiers

5.3 Recommended Controller Settings

It is important to determine your comfort set points and to avoid further controller adjustments. It takes time for the unit to establish equilibrium at a given set point. Therefore, continued set point adjustments will lead to high energy consumption and user discomfort. Continuous blower operation is recommended. This will reduce air stratification and assure that the refrigeration circuit is activated only when it is necessary.

RECOMMENDED SET POINT:

- Humidity: Typical dewpoint set points range from 50°F to 60°F. Consult the Building Design Engineer for appropriate setting for specific application.
- Normal Suction Pressure Range (R-410A) 100 to 155 PSIG
- Normal Discharge Pressure Range (R410A) 290 to 480 PSIG

5.4 IAQ Sequence of Operation

5.4.1 Basic Sequence

In the past, the industry has had difficulty in providing controlled supply air. System short-cycling, overcooling or overheating of the space, and lack of a fine tuned reheat / cooling loop have been major issues. During the original conception of our IAQ products, Desert Aire took these issues into consideration and incorporated a unique solution, as well as a unique heat pump design. The following sequence of operation will provide a detailed description of the unit controls and also explain the heat pump design.

All Desert Aire IAQ products sense the temperature and relative humidity of the air entering the evaporator and use this data as the process variable to determine the unit mode of operation. On IAQ units without an energy recovery device (enthalpy wheel), the sensing point is downstream of the filter rack. On those QS units that include an energy recovery device, the sensing point is downstream of the filter rack and the energy recovery device. Desert Aire refers to this point as the Intake Air, or IA. This sensing point provides for stable unit operation and ensures that air delivered to the supply is less than the design dewpoint. In the case of QS units with energy recovery components upstream of the evaporator, sensing the IA at this point also provides the advantage of disabling the compressors periodically.

Desert Aire has standardized a control program that features two subroutines. These two subroutines act independently of each other, but together provide for precise humidity and temperature control. The first subroutine determines the basic mode of operation – heating, cooling, or dehumidification. Measuring the IA temperature and humidity will determine the mode. The second subroutine controls the supply air temperature (SAT), which is done by measuring the SAT in the supply air ductwork.

The unit constantly measures the IA humidity and temperature. The controller calculates the IA dewpoint. When the IAQ conditions are above the dewpoint set point of the system, the dehumidification mode will be enabled. This condition will take priority over any heating or cooling modes. With an IA dewpoint set point of 55°F, the supply air dewpoint will be held at or below 55°F, and the SAT will be held at the SAT set point. Although the dewpoint will never go above 55°F, during low load days the supply air dewpoints could be lower. Once the moisture is removed to below the design dewpoint condition, the controller modulates the hot gas reheat coil to warm the supply air to the desired SAT set point. The SAT set point is a programmable value on the IAQ standard controller. Any excess reheat energy not used for reheat is either rejected to the remote condenser or to the water loop.

Since the unit is constantly measuring the IA temperature, an IA condition below the heating set point will place the unit in the heating mode. Any temperature above the cooling set point will place the unit in a cooling mode. Again, these modes will only occur when the unit is NOT in its dehumidification mode. When the IA temperature is between the heating and cooling set point and dehumidification is not required, un-conditioned air will be provided to the space. This condition is commonly referred to as an Economizer Mode.

5.4.2 Blower Operation

The following is the blower control sequence for the standard IAQ control system.

In all cases, the blower will not run in an alarm condition. If the blower cycles off, the blower will remain off for a minimum of 1 minute to avoid the possibility of rapid cycling, specifically from the automatic reset safety devices.

When the blower operation is set for CONTINUOUS, the blower will run in all cases except when a compressor is commanded ON and a low suction pressure condition exists.

When the blower is set for FIELD DAMPER, the blower will run if the unit is in the OCCUPIED mode and the DAMPER END SWITCH is activated, indicating the damper is fully open. However, the exception that overrides the FIELD DAMPER setting is if a compressor is commanded ON and a low suction pressure condition exists.

When the blower is set for MIXING BOX, the blower will run if the unit is in the OCCUPIED mode, except when a compressor is commanded ON and a low suction pressure condition exists. If the unit is in the UN-OCCUPIED mode, the blower will run on a call for unoccupied dehumidification, cooling or heating (not economizer mode), except if a compressor is commanded ON and a low suction pressure condition exists.

5.4.3 Dehumidification Operation For Aura™ Products

5.4.3.1 Packaged Units

Dehumidification operation is enabled when the IA dewpoint is greater than the dewpoint set point. The standard IAQ controller allows for a wide range of operating conditions through the use of predictive capacity equations embedded in the controller. Based on the unit size, airflow, dry bulb and wet bulb temperatures, and design supply dewpoint, the controller calculates the IA enthalpy which dictates when the lag compressor is required. Short-cycling will not occur since IA conditions do not change rapidly.

5.4.3.2 Q-Pump Inverter + Units

Dehumidification operation is enabled when the intake air dewpoint (air entering the DX evaporator, downstream of the enthalpy wheel, if equipped) is greater than the dewpoint set point. The controller allows for a wide range of operation conditions by varying the speed of the compressors to meet demand. Since the air downstream of the evaporator but prior to the reheat condenser is saturated, the temperature of this air is equal to the dewpoint of the supply air. As the dewpoint temperature rises, the compressor speed increases to drive the temperature back down. For 30-ton capacity units, an additional fixed speed compressor is present for a greater range of capacity. Modulating valves then reheat the air to reach the desired supply air set point. The compressor speed may ramp up periodically to maintain oil level in the compressor. This provides optimal energy efficiency while meeting the design conditions in a very stable manner. Short cycling will not occur since intake air conditions do not change rapidly.

For TotalAire™ and VerticalAire™ Products

Dehumidification operation is enabled when the IA dewpoint is greater than the dewpoint set point. The standard IAQ controller allows for a wide range of operating conditions through the use of predictive capacity equations embedded in the controller. Based on the unit size, airflow, dry bulb and wet bulb temperatures, and design supply dewpoint, the controller calculates the IA enthalpy which dictates when the lag compressor is required. For units greater than 30-tons capacity, one, two, three or all four compressors may be cycled to more closely match the unit capacity to the load. This provides optimal energy efficiency while meeting the design conditions in a very stable manner as the IA enthalpy condition is independent of the output of the control. Short-cycling will not occur since IA conditions do not change rapidly.

Running one compressor in a four compressor system during the dehumidification mode does have one caveat. Since the IA has a relatively low sensible load, additional warmer supply air may be required to attain a neutral temperature. Also, the supply air for the indoor space may require additional sensible heating to maintain the required preset condition, especially if the outdoor air unit serves a perimeter space or the unit was designed for very low dewpoints. When these circumstances arise where there is a relatively low outdoor air load, the sensible load of the outdoor air is relatively low compared to a proportionally higher latent load. In this case, energizing the second stage compressor allows the unit to work as a relatively effective heat pump, converting the

outdoor latent load into sensible energy.

Our standard IAQ controller allows for one compressor operation of a 4 compressor unit in this 25% load region, except when the calculated maximum leaving air temperature with one compressor is less than the supply air set point. When this is the case, two compressors will be energized. This maximizes the efficiency and provides additional heating capacity at this part load condition without the connected load of auxiliary heating.

5.4.4 Cooling Operation **For Aura™ Products**

5.4.4.1 Packaged Units

The standard IAQ controller allows for predictive operation of compressor stages. While compressor operation is allowed at IA temperatures above 70°F, the use of a predictive calculation based on airflow will be used to determine the number of compressor stages required to meet the supply air temperature set point. Compressor capacity can be accurately predicted based on the unit nominal capacity and the airflow. In contrast to the dehumidification staging where enthalpy is used to calculate the compressor stages, the cooling can be accomplished based on dry bulb temperature alone since no dehumidification is required.

Since it is obvious that during dehumidification mode the cooling of the air to the design dew point will also provide more sensible capacity, dehumidification stages will take precedence over cooling stages.

5.4.4.2 Q-Pump Inverter + Units

When cooling, but no dehumidification is needed, the supply air set point is achieved by varying the speed of the compressor for more or less capacity based on the temperature of the supply air. As more capacity is required, the compressor speed will increase. The compressor speed may ramp up periodically to maintain oil level in the compressor. For 30-ton capacity units, an additional fixed speed compressor is present for a greater range of capacity. If at minimum turndown of the compressor, the supply air temperature is below the set point, a small amount of reheat will be allowed to meet design conditions.

For TotalAire™ and VerticalAire™ Products

The standard IAQ controller allows for predictive operation of compressor stages. While compressor operation is allowed at IA temperatures above 70°F, the use of a predictive calculation based on airflow will be used to determine the number of compressor stages required to meet the supply air temperature set point. Compressor capacity can be accurately predicted based on the unit nominal capacity and the airflow. In contrast to the dehumidification staging where enthalpy is used to calculate the compressor stages, the cooling can be accomplished based on dry bulb temperature alone since no dehumidification is required.

Since it is obvious that during dehumidification mode the cooling of the air to the design dewpoint will also provide more sensible capacity, dehumidification stages will take precedence over cooling stages. Also note that the single compressor staging in a four compressor unit will take place without the caveat described in the dehumidification section.

5.4.5 Heating Operation

5.4.5.1 Water Source Heat Pump

For Aura™ Products

For water source heat pump units, Desert Aire does not use a reversing valve in the refrigeration circuit. Instead, Desert Aire uses solenoid valves which direct the refrigerant flow such that it always travels counter to the water flow in the coaxial heat exchanger.

Heating operation is enabled when the intake air temperature (air entering the DX evaporator, downstream of the enthalpy wheel, if equipped) is below the supply air temperature set point and the supply air temperature dewpoint.

The supply air set point is achieved by varying the speed of the compressor for more or less capacity based on the temperature of the supply air. As more capacity is required, the compressor speed will increase. The compressor speed may ramp up periodically to maintain oil level in the compressor, the supply air temperature is above the set point, a bypass valve will open to prevent overheating of the space.

Should auxiliary heating be installed, a modulating output will activate when the capacity of the heat pump is insufficient to heat the air to the desired leaving air temperature. Use of the modulating output is determined when the reheat valves reach 100% for a set period of time, capability is available should there be higher airflow than anticipated.

For TotalAire™ and VerticalAire™ Products

For water source heat pump units, Desert Aire does not use a reversing valve in the refrigeration circuit(s). Instead, Desert Aire uses solenoid valves which direct the refrigerant flow to either a DX coil (cooling or dehumidification mode) or a water to refrigerant exchanger (heating mode). The Desert Aire sequence allows for constant control of the SAT without the swings typically experienced with a reversing valve system. In addition, Desert Aire also utilized a fully modulating hot gas reheat valve which provides for more precise control of the SAT.

The standard IAQ controller allows for predictive operation of the heat pump heating stages. While compressor operation is still allowed at IA temperatures below 68°F, the use of a predictive calculation based on unit size and airflow determines the number of compressor stages required to meet the SAT set point. This can be accurately predicted based on the unit nominal capacity and the airflow.

Should auxiliary heating be installed, a modulating output will activate when the capacity of the heat pump is insufficient to heat the air to the desired leaving air temperature. Use of the modulating output is determined when the reheat valves reach 100% for a set period of time, capability is available should there be higher airflow than anticipated.

5.4.5.2 Auxiliary Heat

In non-heat pump units, an auxiliary heating contact is energized whenever the IA is less than 68°F and a modulating output is controlled based on the supply air temperature set point.

5.4.6 SAT Control Options

Three different options exist for control of the supply air provided to the space. The most basic is the Supply Air Temperature (SAT) control and requires a supply air temperature sensor in the supply ductwork. SAT control varies the reheat valve position based on the SAT set point and the SAT sensor with a PID (proportional, integral, derivative) control loop. PID control loops correct the error between a measured process variable and the desired set point by calculating and then adjusting the process output accordingly. The Zone Reset and the Outside Air Reset options still use this SAT PID control loop and still require the SAT sensor. These options vary the SAT set point that is used in the PID control loop to more closely match the requirements of the space.

The Zone Reset of the SAT uses a zone sensor to vary the SAT set point. If the zone temperature rises, the SAT set point is lowered to provide cooler air to the space and if the zone temperature falls, the SAT set point is raised to provide warmer air to the space. The Zone Reset is accomplished by a second PID control loop, the output of which is the SAT set point. This control loop also allows for setting the maximum and minimum SAT set point limits. Up to four of these sensors can be used, providing multi-zone control. Multiple sensors may be set to either average the zone readings, or set for High / Low zone control. Averaging would be used in large or shared spaces where the conditions are similar from zone to zone. High / Low would be applicable to areas where there are different conditions in the group. This would include a south facing windowed wall in the group, where the zone may be quite a bit warmer in the summer.

The Outside Air Reset allows for four different SAT set points to be used based upon the outside air temperature. For instance, if the outside air temperature is below 60°F, then the SAT set point will be 80°F. If the outside air temperature is between 70°F and 80°F, then the SAT set point will be 75°F. And if the outside air temperature is above 80°F, then the SAT set point will be 65°F. All of these set points are adjustable. Note that this option should be used with care if an energy recovery device is in the unit, as the IA sensor is not sensing outside air.

Note: The IAQ standard controller outputs a 2 – 12 Pulse Width Modulating signal (PWM). Field-purchased heaters must be compatible with the signal provided OR field-supplied alternative controls must be used.

5.4.7 Compressor Rotation

For any unit with more than one compressor, the compressors rotate based upon the last compressor to start, not the run hours. For units with 4 compressors, the refrigeration circuits

rotate as well. So if compressor 1 starts and then stops, a compressor in circuit B will be the next to start.

5.4.8 CO₂ Operation

The standard IAQ controller that has CO₂ control will command more outdoor air into the space when CO₂ levels rise and use less outdoor air when CO₂ levels fall. Although possible, occupancy will not be commanded based on the CO₂ level. Since there is a minimum value for room area regardless of CO₂, occupancy must be either commanded independently by a time schedule or manually overridden.

Additional hardware requirements for CO₂ control include two modulating actuators for the outdoor air damper and the recirculation damper. A variable frequency drive (VFD) for the supply air blower and a VFD for the exhaust air blower are also required. Three differential air pressure transducers are included, one sensing the pressure drop across the reheat condenser (P1), one sensing the heat wheel supply pressure drop (P2) and the third sensing the heat wheel exhaust pressure drop (P3). A sensor mounted outdoors to provide a base reading as well as a CO₂ sensor in the conditioned space will also be supplied.

A PID control loop has been added to determine the P2 set point based upon the CO₂ difference (the conditioned space reading minus the outdoor reading) and comparing this to a set point of the ASHRAE recommended default set point of 700 ppm. The output of the PID control loop will be the P2 set point and will vary from a low limit to a high limit. Both of the low and high limits and the 700 ppm CO₂ set point are user adjustable. This varying set point is used to control the modulating damper actuator.

A control loop has been added to control the damper actuator positions. The outside air damper will vary from a minimum to a maximum based upon the heat wheel supply pressure drop (P2) and the calculated P2 set point. The modulating damper actuators work in opposition to each other. As the outside air damper opens "x"%, the recirculation air damper closes "x"%. The program also includes control loops for the supply blower VFD and the exhaust blower VFD. The supply blower speed will vary as the output of a PID loop to maintain a constant pressure drop across the reheat condenser. The P1 pressure set point is a fixed value for the system and is adjustable by the user. The exhaust blower speed will vary as the output of a PID loop to maintain a constant difference from the calculated P2 set point and the actual P2 pressure. This difference is adjustable from a negative 0.300" wc to a positive 0.300" wc by the user as well to meet the building requirements.

5.4.9 Suction Pressure Operation

The suction pressure needs to protect the unit when a refrigerant circuit loses its charge. The glycol concentration in the water circuit of the brazed plate heat exchanger may also allow for a lower suction pressure cutout value when the compressors are running in the heat pump mode. Also, restarting after an unoccupied cold soak condition needs to be addressed.

Whenever the suction pressure in either circuit falls below 22 psig for R-410A, the unit will stop with an alarm indication and will not be allowed to restart automatically. The suction pressure must rise to above 29 psig and the alarm must be reset by the operator before the unit will restart.

When the compressors are running in the dehumidification or cooling modes, the suction pressure will turn the compressors and blowers off below 58 psig. The compressors will be allowed to restart when the suction pressure rises to above 106 psig. Note that the compressors will be off for at least 5 minutes on the recycle timer. Also note that the blower will be forced off in this condition until the suction pressure rises above 106 psig for 5 minutes to prevent un-conditioned air from being blown to the space.

When compressors are running in the heat pump mode, the suction pressure cutout is a calculated value which is dependent on the glycol concentration. The higher the glycol concentration, the lower the suction pressure can be before damage to the heat exchanger will take place. Certain units will be turned off during the unoccupied times. This will occur mostly at night, which may lower the suction pressure below the calculated glycol value due to low temperature conditions. On a restart, the suction pressure trip value will be the minimum value allowable, 22 psig, so that the compressors are given a chance to start. This will be allowed for 90 seconds (adjustable) and then the calculated suction pressure cutout value will be used to cycle the compressors. This cycling will not be indicated as an alarm or recorded in the alarm history.

If the low suction pressure cycle occurs 3 (adjustable) times in a 1 (adjustable) hour time period, then an alarm will be indicated and recorded in the alarm history as a multiple suction pressure alarm. This alarm will be reset, by the controller, after a 4 (adjustable) hour delay. This controller reset will be tried only 4 (adjustable) times in a 36 (adjustable) hour period. After the fourth controller reset, if the multiple suction pressure alarm occurs again, an operator initiated reset will be required to restart the unit.

5.4.10 Enthalpy Wheel Operation

For units that include an enthalpy wheel, the enthalpy wheel will run whenever the supply blower is running. Freeze protection may be included with the unit. If this is the case, an extra humidity sensor is installed to sense the exhaust air condition, and a VFD is supplied for the enthalpy wheel so that it will be slowed proportionally from 100% speed with humidity levels up to 95% RH, to 0% speed at 100% RH.

5.5 Component Replacement, Charge, Evacuation, & Leak Instructions

Note that a new liquid line filter dryer will be required any time a refrigeration system is opened for servicing. New dryer should be the same capacity as the original or larger.

Recovery

When there has not been a major refrigeration system leak, the system will contain refrigerant. This refrigerant must be either recovered to separate cylinders appropriate for the refrigerant type or isolated

in a portion of the refrigeration system that will not be open for service. In all cases you must comply with Section 608 Refrigerant Recycling Rule of the Clean Air Act.

Recovery of Systems with Refrigeration System Leak

As much refrigerant as possible must be recovered into separate refrigerant cylinders appropriate for the refrigerant being serviced. System pressure near the leak site should be monitored closely to ensure this area is not pulled to a vacuum. Isolated sections of the system as required and recover independently to avoid refrigerant contamination. Uncontaminated refrigerant can be reused in the refrigeration system it was recovered from.

Recovery of Systems without a Leak

System that do not have leaks, but still require refrigeration system service, may have charge isolated in receivers and condensers if these particular components do not require direct service.

Desert Aire dehumidifiers have different receiver sizes depending on the model and size. Condenser sizes and configurations may also vary. In general, larger receivers will come equipped with isolation valves that will allow for a portion of the charge to be contained in the receiver during servicing. Units equipped with remote condensers will have isolation valves located inside the unit cabinet near the area where the connections are made.

The compressor can be used to move refrigerant to the system components that will be used to temporarily hold the charge. Note that cooling a condenser by running as many fans as possible and/or cooling the coil surface with a stream of water can assist in storing charge.

The low side pressure should be monitored closely while using this procedure to store charge. Under no circumstances should a compressor be allowed to run in a vacuum. When most of the refrigerant is isolated in the receiver and/or condensers, recover remaining charge into separate refrigerant cylinders appropriate for the refrigerant being serviced. Carefully track the amount of refrigerant charge removed as this exact amount should be placed into the unit when re-charging.

Repair / Component Replacement

- If any portion of the system was at a vacuum, place dry nitrogen in the system until atmosphere pressure is reached.
- It is preferred that components are removed by heating the braze alloy to the re-melt temperature and mechanically moving the component. When this is not possible due to proximity of cabinet structure or other components, a tubing cutter can be used to remove sections of piping. Where new tube is required for replacement, use dehydrated tube where possible. Use the same type of fittings as original. Route the pipe in the exact manner as originally routed.

- Use Type K per ASTM B 88 or ASTM B 819 or Type ACR per ASTM B280 copper tubing or for all tubes 1 1/8" and smaller.
- Tubes 1 3/8" and larger shall use Type K per ASTM B 88 or ASTM B 819.
- Cap sections of tube and components that are not actively being installed to prevent infiltration of moisture and contaminants.
- Use only braze alloy 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 phosphorous bearing alloys be considered for copper to copper connections due to their self-fluxing on copper to copper joints. Refer to 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 placed throughout the system. These valves can be opened to allow for nitrogen to flow without generating pressure behind the braze joint that is being created.
- See section 5.1.1 for special procedures related to compressor replacement
- Replace liquid line filter dryer as last step in system repair. Note that the dryer will readily absorb moisture from the ambient air and must be open only for as long as required for installation.
- After completion of all repairs, pressure test system using nitrogen pressure decay test or nitrogen with tracer gas and appropriate leak detector.

Evacuation

- Carefully inspect pump and related equipment before connecting to system. Ensuring gaskets are in good condition and pump is capable of low vacuum levels can save time. Connect pump(s) to as many locations as possible ensuring all locations are well sealed. If a field charge will be required,

connecting a refrigerant tank to the system with a good valve is recommended. Any hose connections requiring purging of non-condensable can be done at this point.

- 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.
- 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.

Alternative Evacuation Specified by Process

After components have been repaired or replaced evacuation procedure should take place. Very small amounts of refrigerant may still be mixed with the oil in the system. Out-gassing of this refrigerant may interfere with the evacuation and vacuum decay testing.

IF, AND ONLY IF, a unit has been previously charged with refrigerant, and standard evacuation method has not been successful after 24 hours minimum using the standard procedure, the following alternative method should be used.

1. Check vacuum level. It should be a maximum of 1,500 microns absolute pressure. If this is not the case, review system for leaks and continue evacuation process until 1,500 microns is achieved.
2. Purge system with nitrogen to atmospheric pressure (0 gauge pressure). Ensure all portions of systems are at this pressure. Seal system and wait 10 minutes.
3. Start vacuum pump and draw system to 1,500 microns or less.
4. Purge system with nitrogen to atmospheric pressure (0 gauge pressure). Ensure all portions of systems are at this pressure. Seal system and wait 10 minutes.
5. Start vacuum pump and draw system to 500 microns. Seal system. System may rise to higher level,

but should not rise above 1000 microns in 10 minutes timeframe. If unsuccessful, continue evacuation or check for leaks.

It is anticipated that the system was clean and tight from the original process and refrigerant only is mixed with oil. Alternative process should not be considered if there is chance of free water entering the system or the system was open for any significant time.

Charging

- Charge should be weighed into the system using a scale. In cases where the full charge was recovered, weigh in the charge with the recovered refrigerant and add the appropriate amount to meet the rating plate and field charge (if applicable). This should be placed in the high side of the system at the receiver.
- In cases where the full charge cannot be added to the system high side, the charge can be added to the low side of the system only when compressors are energized. If this is required, 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.

Testing and Final Diagnosis

Check the oil level in the compressor after the system has been running for 24 hours. Oil may have been contained in the liquid refrigerant when recovered from the system. Most of this oil will be returned if the recovered refrigerant is used. If new refrigerant is added, additional oil should be added based on the following ratio:

$$\text{New Refrigerant Charge Added, lbs.} \times 0.352 = \text{Oil charge, oz.}$$

It is critically important to ensure that the system is operating as expected before unit is returned to normal service. Test component replaced and function of the system. Many times a separate component in the system may have set a condition that causes a failure of another. Thoroughly test systems to ensure repeat failures do not occur.

Note: Compressors supplied with an oil sight glass should be viewed and filled to 50% capacity.

5.6 System Rating Plate

The system rating plate is attached near the electrical enclosure of the dehumidifier.

System Model and Serial Numbers →

System electrical specifications →


Compressor electrical specifications →

Heat wheel electrical specifications →

Refrigerant factory charge →

System wiring diagrams →

Model No. QV20V4E53011
Serial No. 2911E20845



Voltage /Phase /Hz 460-3-60 Control Voltage 24
Unit Minimum Ampacity 122.0
Maximum Overcurrent Protection Device 150

Compressors

Mtr. #	RLA	LRA
2	23.1	150.0
3	23.1	150.0
4	N/A	N/A
5	N/A	N/A

Blower(s)

Mtr. #	HP	FLA
1	5.00	6.6
10	N/A	N/A

Heat Wheel Motor

Mtr. #	HP	FLA
11	N/A	N/A

Condenser Fans

Qty.	HP	FLA
N/A	N/A	N/A

Factory Charge (lbs.)

Circuit A	58.0
Circuit B	0

Electric Heater

kW 90.0 FLA 112.9

R410A ONLY

Maximum Design Pressures (psig):
625 High Side
250 Low Side

Wiring Diagram Numbers:
HQV300-A / LQV-300-FD / LQ-300-CRL / HT1

This Unit Is For Indoor Use

Blower(s) electrical specifications ←

Condenser Fan electrical specifications ←

Electric Heater electrical specifications ←

Refrigerant Type ←

System working pressure range ←

Indoor or Outdoor system rating ←

Patent No. 6,055,818 (QS): Patent No. 6,666,040 (Q-Pump)

Desert Aire Corporation

N120 W18485 Freistadt Rd. Germantown, WI 53022

(262) 946-7400 Fax: (262) 946-7401

Figure 24 - System Rating Plate

5.7 Start-Up Supervision Supplemental Information

A Desert Aire factory start-up is an option which is normally purchased with the equipment. A factory start-up includes several key services:

- The expertise of an accomplished, factory-trained mechanic who will supervise the commissioning of the equipment.
- This Desert Aire representative will assist the installing contractor with filling out the Start-Up Report.
- He will also inspect the installation to make sure that the dehumidifier has been properly integrated with the rest of the equipment on the jobsite.
- Finally, he can train the maintenance personnel to operate and service the equipment if necessary.

A factory start-up does not include installation assistance. The installing contractor is responsible for ensuring that the system is ready for start-up when the Desert-Aire representative arrives.

When the installing contractor is confident the system will be ready, he should contact the Desert Aire Sales representative to schedule the start-up. Please call at least two weeks before the desired start-up date to help prevent scheduling conflicts.

5.8 System Start-Up Report

A copy of the system "Start-Up Report" can be found on the following pages. This report needs to be filled out thoroughly by a qualified service technician and returned to Desert Aire for warranty validation. Please ensure that the model and serial number of the unit are noted on this form. The model and serial number can be found on the system's rating plate located on or near the electrical compartment service door. Failure to complete and return this form will void the unit's warranty. These reports are also helpful when trying to correct existing problems. Should you need system diagnosis help, fax the completed worksheet to Desert Aire's Service Department using the number provided. Be sure to include your name and a telephone number where you can be reached.



N120 W18485 Freistadt Road
Germantown, WI 53022
(262) 946-7400 Fax: (262) 946-7401
www.desert-aire.com

Start-up request form for Total Aire units **Models QS/QV**

Factory Assisted Start-Up consists of a Desert Aire Service Department Technician to visit the job-site and provide supervisory experience to installing contractors as they perform the required procedures as outlined in our warranty activation start-up report. The company technician will also present an educational review of the dehumidifier's operating and maintenance requirements.

Factory Assisted Start-Up is not an installation bid & therefore the system must be ready to run before scheduling.

CST Start-Up is performed by a local Certified Service Technician who has been trained by Desert Aire. The CST performs all duties listed above. In addition they will supply the "items to be supplied for start-up" as listed below. Please note charges for refrigerant will apply if refrigerant is necessary to complete the start up.

Items to be completed by the installing contractor before any Start-Up can be scheduled:

- ☐ Dehumidifier leak checked and inspected for internal concealed damage – remove access panels and inspect the interior of the unit for transit damage. Contact Desert Aire immediately if damage is noted (800) 443-5276
- ☐ Dehumidifier leveled and properly supported per the installation manuals recommendations.
- ☐ Condensate P Trap installed with heat trace for winter operation.
- ☐ Remote condenser plumbed, leak checked, evacuated, and charged if necessary. Some units require additional field charging. See unit labeling for details. Refrigerant added _____ lbs.(if applicable)
- ☐ All electrical connections terminated and verified for proper voltage at the unit and the condenser (if applicable)
- ☐ All field controls, sensors and actuators installed and circuits verified that they are wired correctly.
If you have questions, contact Desert Aire for instructions (800) 443-5276.
- ☐ Units with heat pump option – verify water flow and design temperature – See unit labeling for details. (if applicable)
- ☐ Inspect all water lines for leaks and purge air from lines. (If applicable)
- ☐ Verify that gas lines are installed, purged and set to the proper pressure – see label for gas pressure ratings (if applicable)

Items to be supplied by the installing contractor (Factory Assisted Start-Up only)

- ☐ Equipped service vehicle and service technician – Technician will be trained.
- ☐ Refrigerant manifold gauges – 2 sets
- ☐ Air balancing equipment (magnehelic or manometer differential pressure gauge – one inch scale)
- ☐ Volt/Amp/OHM meters in working order.
- ☐ Digital thermometer with sensors.
- ☐ 50# of the appropriate refrigerant & scale.
- ☐ Hand pump for adding oil to compressors.

If you are unable to supply any of the required equipment you must contact Desert Aire before returning this document.

I agree that all of the above has been completed as of _____(Date) If a return trip must be scheduled due to insufficient job-site preparation an additional purchase order must be issued to Desert Aire for re-scheduling. **A two week minimum is needed to schedule start-up.** Once the form is completed please fax or email both pages to the Desert Aire service department. Fax (262) 946-7400 Email: service@desert-aire.com

Signature of responsible party: _____ (print) _____ (sign)

Company Name: _____ Phone #: _____



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Germantown, WI 53022
(262) 946-7400 Fax: (262) 946-7401
www.desert-aire.com

Start-up request form for Total Aire units
Models QS/QV

Unit Information

Model # _____

Serial # _____

Jobsite Information

Job site name _____

Job Site Address _____

Contractor Information

Installing Contractor: _____

Manager's Name : _____ Phone #: _____

Job Site Contact: _____ Cell # _____

Controls Company Name: _____

Controls Contact: _____ Cell# _____

Test and Balance Company: _____

Contact: _____ Cell# _____

Factory use only – To be filled out by Desert Aire

Scheduled Start-up Date: _____

Unit Controls Protocol: JCI Metasys JCI FX Carel Honeywell Other: _____

Diagrams Forwarded to CST: Yes / No email address _____

Installing Contractor Contacted by: _____ Date: _____

Network to be operational at time of start up: yes / no T&B to be on site during start up: yes / no

Additional Information: _____



QS/QV Series Start up Report

Important – To ensure warranty validation and continued customer satisfaction, complete this form and return it to Desert Aire immediately after start-up. Validation of this report activates the warranty.

Desert Aire Corporation
c/o Service and Warranty Department
N120W18485 Freistadt Road
Germantown, WI 53022
(800) 443-5276

Instructions

- **Warning** – Only trained, qualified personnel should install and service Desert Aire equipment. Serious Injury or death can result from improper handling of this equipment. High voltage electrical components and refrigeration under pressure are present.
- Before continuing, read the Installation and Operations manual. If you do not fully understand the manual contact the Desert Aire Service Department. Please be prepared with the model and serial numbers located on the rating plate of the unit.
- Use one start up report per unit. Print or type all information. If there is not enough space available for readings or comments please attach additional pages directly to the start up report.

Location and Unit Information

Installation Name: _____

Installation Address: _____

Desert Aire Representative: _____

Dehumidifier Model #: _____ Serial #: _____

Remote Condenser Model #: _____ Serial #: _____

Form Completed By (Print): _____ Signed: _____

Company Name: _____ Date: _____

Company Address: _____ Telephone #: () _____

Application: _____

*** Denotes that this is a model dependant item**

Proper Installation Checklist		
<input type="checkbox"/> Installation manual read and understood	<input type="checkbox"/> Tighten all field and factory wiring	<input type="checkbox"/> Open all refrigeration service valves and tighten packing nuts
<input type="checkbox"/> Dehumidifier installed and leveled properly	<input type="checkbox"/> Adjust and tighten blower belts if necessary	<input type="checkbox"/> Check field and factory piping for leaks
<input type="checkbox"/> Condensate drain trapped and primed	<input type="checkbox"/> Check rotation of blower on 3 phase units	<input type="checkbox"/> Inspect air filters. Clean or replace as necessary
<input type="checkbox"/> Verify that the power supply matches the rating plate	<input type="checkbox"/> Check rotation of remote condenser fans.	<input type="checkbox"/> 120 volt circuit run to heat trace and powered up.

Unit Power Supply Information				
Voltage at power block - No motors running	L1-L2	Control Voltage - No Motors running	Transformer 1	VA Rating
	L2-L3		Transformer 2	VA Rating
	L1-L3		Transformer 3	VA Rating

Line-set Installation*				
This pertains to units with Remote Outdoor Condensers. Refer to Installation and operation manual for instructions				
Lineset Length		Elevation Change	ABOVE / BELOW	
Hot gas line trapped at every riser	Yes / No	Inverted traps at top of last riser	Yes / No	
Line-set pitched in direction of flow	Yes / No	Line-set Clamped per I/O Manual	Yes / No	
Line Sizes	Circuit A		Circuit B	
	Hot Gas		Hot Gas	
	Liquid Return		Liquid Return	
Additional R410A Added	LBS		LBS	
Additional Oil Added	OZS		OZS	

Fan Cycle Controller Settings*						
This pertains to units with Remote Outdoor Condensers. Refer to Installation and operation manual for instructions.						
SENS	SN-1		SN-2		SN-3	
OUTR ¹	ON ¹	OFF ¹	ONT ¹	OFT ¹	SNF ¹	SENS ¹
OUTR ²	ON ²	OFF ²	ONT ²	OFT ²	SNF ²	SENS ²
OUTR ³	ON ³	OFF ³	ONT ³	OFT ³	SNF ³	SENS ³
OUTR ⁴	ON ⁴	OFF ⁴	ONT ⁴	OFT ⁴	SNF ⁴	SENS ⁴

Air Flow Readings: Refer to Installation and Operations manual for correct balancing procedures.

Supply Airflow

Evaporator Pressure Drop	"wc	Supply Duct Static Pressure	"wc
Reheat Condenser Pressure Drop	"wc	OA Duct Static Pressure	"wc
Enthalpy Wheel Pressure Drop	"wc	Evap + Reheat Press Drop (QVSmall)	"wc

Exhaust Airflow – Wheeled units only

Enthalpy Wheel Pressure Drop	"wc	Return Duct Static Pressure	"wc
		Exhaust Duct Static Pressure	"wc

Motor Information

	Supply Blower	Exhaust Blower*	Enthalpy Wheel Motor*
FLA off Nameplate	Amps	Amps	Amps
Amperage at Design Airflow	L1	L1	L1
	L2	L2	L2
	L3	L3	L3

Temperature Readings

Outdoor Air Temperature	°F	Outdoor Relative Humidity	%
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Compressors and Refrigeration in Cooling/Dehumidification Mode

(Airside Evaporator Coil Active)

	Circuit A		Circuit B	
Motor #				
RLA off nameplate	amps	amps	amps	amps
Amperage	L1	L1	L1	L1
	L2	L2	L2	L2
	L3	L3	L3	L3
Head Pressure	Psig		Psig	
Suction Pressure	Psig		Psig	
Refrigerant Sight Glass Clear	Yes / No		Yes / No	
Superheat	°F		°F	
Subcooling	°F		°F	
Compressor Oil Level Sight Glass* (level should be at least 3/4 full at completion of the start up)	1/2 3/4 F		1/2 3/4 F	

Water Flow Information*		
	Circuit A	Circuit B
Pipe Size		
Flow Rate	GPM	GPM

Compressors and Refrigeration in Heat Pump Mode* (Chiller Barrel Active)		
	Circuit A	Circuit B
Head Pressure	Psig	Psig
Suction Pressure	Psig	Psig
Refrigerant Sight Glass Clear	Yes / No	Yes / No
Superheat	°F	°F
Subcooling	°F	°F
Water In Temperature*	°F	°F
Water Out Temperature*	°F	°F
Compressor Oil Level Sight Glass* (level should be at least 3/4 full at completion of the start up)	1/2 3/4 F	1/2 3/4 F

Auxiliary Water / Steam Coil Information*				
	Signal	Inlet Temp	Outlet Temp	Discharge Air Temp
Water Coil		°F	°F	°F
Steam Coil		°F	°F	°F

Auxiliary Electric Heater Information*					
	Signal	L1 Amps	L2 Amps	L3 Amps	Discharge Air Temp
Electric Heater					°F

Building Management System Information*		
Communication Type (circle one)	BACnet MS/TP - BACnet Ethernet - Modbus - Lon - N/A	
BACnet MS/TP	Device Instance	
	MAC Address	
	Baud Rate	
BACnet Ethernet	IP Address	
	Netmask	
	Gateway	
Modbus	Baud Rate	
	Address	

Additional Comments:_____



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Compressor Replacement Form

Location and Unit Information

Installation Name:			
Dehumidifier Model #:		Serial #:	
Form Completed By (Print):		Signed:	
Company Name:		Date:	
Company Address:		Phone #:	
		Fax #:	
Defective Comp. Model #:		Serial#:	
(If Tandem Set – Only list the specific failed compressor)			
New Compressor Model #:		Serial#:	

Compressor Condition at Time of Initial Review

Continuity (0 resistance) to Ground on one or more legs	<input type="checkbox"/>	Compressor drawing higher current than design	<input type="checkbox"/>
Continuity (0 resistance) between two or more legs (3 phase units)	<input type="checkbox"/>	Compressor drawing locked rotor current	<input type="checkbox"/>
Other (describe):	<input type="checkbox"/>	Runs without pumping: Pressures: ____ / ____	<input type="checkbox"/>

Continuity (0 resistance) to Ground on one or more legs	<input type="checkbox"/>	Compressor drawing higher current than design	<input type="checkbox"/>
Continuity (0 resistance) between two or more legs (3 phase units)	<input type="checkbox"/>	Compressor drawing locked rotor current	<input type="checkbox"/>
Other (describe):	<input type="checkbox"/>	Runs without pumping: Pressures: ____ / ____	<input type="checkbox"/>

Final Determination of Failure

Liquid Floodback	<input type="checkbox"/>	Low Superheat	<input type="checkbox"/>	Debris	<input type="checkbox"/>	Defective Expansion Valve	<input type="checkbox"/>
Low Sump Oil	<input type="checkbox"/>	Insufficient Motor Cooling	<input type="checkbox"/>	Other (Describe):	<input type="checkbox"/>		

Diagnostic/Corrective Action Summary

Describe what corrective action was taken to prevent a repeat failure.

Compressor Replacement Checklist

Required		Choose One		For Test Results Showing Acid or Particulate	
Acid and particulate test completed	<input type="checkbox"/>	Unit Evacuated to 500 microns absolute and vacuum decay passed	<input type="checkbox"/>	HH Cores used – Acid Core	<input type="checkbox"/>
Liquid Line Filter Replaced	<input type="checkbox"/>	Alternate triple evacuation process used	<input type="checkbox"/>	SF filter used	<input type="checkbox"/>

Air Flow Readings: Refer to Installation and Operations manual for correct balancing procedures.

Evaporator Static Pressure Drop	"WC	Supply Duct Static Pressure Drop	"WC
Reheat Condenser Static Pressure Drop	"WC	Return Duct Static Pressure Drop	"WC

Temperature Readings

Room Air Temperature	°F	Water Temp (Circle: Pool / Tower)	°F	Room Relative Humidity	%
Outdoor Air Temperature	°F	Water Temp (Circle: Pool / Tower)*	°F	Outdoor Relative Humidity	%

Compressors and Refrigeration in Reheat Mode

	Circuit A – Use both sides for tandem set			Circuit B – Use both sides for tandem set		
Motor # (See wiring schematic for details)						
Discharge Pressure		PSIG	PSIG		PSIG	PSIG
Liquid Line Pressure (At access fitting nearest TXV)		PSIG	PSIG		PSIG	PSIG
Suction Pressure (At compressor)		PSIG	PSIG		PSIG	PSIG
Liquid Line Temperature (At access fitting nearest TXV)		°F	°F		°F	°F
Suction Temperature (At Compressor)		°F	°F		°F	°F
Refrigerant Sight Glass Condition (Clear, Intermittent Vapor, Flashing)						
Comp. Oil Level Sight Glass (Shut down comps., wait 5 minutes)	½	¾	F	½	¾	F

Compressors and Refrigeration in Cooling Mode

	Circuit A – Use both sides for tandem set			Circuit B – Use both sides for tandem set		
Motor # (See wiring schematic for details)						
Discharge Pressure		PSIG	PSIG		PSIG	PSIG
Liquid Line Pressure (At access fitting nearest TXV)		PSIG	PSIG		PSIG	PSIG
Suction Pressure (At compressor)		PSIG	PSIG		PSIG	PSIG
Liquid Line Temperature (At access fitting nearest TXV)		°F	°F		°F	°F
Suction Temperature (At Compressor)		°F	°F		°F	°F
Refrigerant Sight Glass Condition (Clear, Intermittent Vapor, Flashing)						
Comp. Oil Level Sight Glass (Shut down comps., wait 5 minutes)	½	¾	F	½	¾	F



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