Air Cooled Condensers

Installation, Operation and Maintenance Manual
This manual is intended to assist trained service personnel providing necessary guidelines for this particular equipment. Service provided for Data Aire units is to be done by qualified individuals with an adequate experience and training in HVAC, electrical, plumbing and electronics (as applicable).

Service performed by unauthorized or unqualified technicians may void manufacturer’s warranties and could result in property damage and/or personal injury.

Special care should be given to those areas where caution symbols appear.

Data Aire, Inc. reserves the right to make design changes for the purposes of product improvement or to withdraw any design without notice.
# Table of Contents

1.0  **Installation** ................................................................................................................. 4  
1.1  Inspection .......................................................................................................................... 4  
1.2  Storage .............................................................................................................................. 4  
1.3  Warranty ........................................................................................................................... 4  
1.4  Paperwork ......................................................................................................................... 5  
1.5  Location ............................................................................................................................ 5  
1.6  Vibration ........................................................................................................................... 6  
1.7  Rigging .............................................................................................................................. 6  
1.8  Leg Assembly .................................................................................................................... 6  

2.0  **Electrical Connections** ............................................................................................... 7  
2.1  Electrical Service ............................................................................................................. 7  
2.2  Nameplate Ratings .......................................................................................................... 7  
2.3  Grounding ......................................................................................................................... 7  
2.4  Voltage Requirements ..................................................................................................... 7  
2.5  Phase .................................................................................................................................. 7  
2.6  Wiring Diagrams ............................................................................................................... 7  

3.0  **Piping** ........................................................................................................................ 8  
3.1  Discharge Lines ................................................................................................................ 8  
3.2  Discharge Gas Pulsation ................................................................................................. 8  
3.3  Liquid Lines ...................................................................................................................... 8  
3.4  Field Piping ...................................................................................................................... 9  
3.5  Connection Sizes ............................................................................................................. 9  
3.6  Leak Testing ................................................................................................................... 9  
3.7  Evacuation ...................................................................................................................... 9  

4.0  **Charging** .................................................................................................................... 10  
4.1  Fan Speed Control/Fan Cycling ....................................................................................... 10  
4.2  Ambient Thermostats .................................................................................................... 10  
4.3  Charging with Fan Speed Control (R-407C) .................................................................. 11  
4.4  Flooded Systems ............................................................................................................ 11  
4.4.1  Charging Flooded Systems ...................................................................................... 12  
4.5  R-410A - Charging/Installation Work Procedures ....................................................... 12  
4.6  Refrigerant Handling ...................................................................................................... 13  
4.7  Condenser with EC Motor/Fan Blade Combinations .................................................... 13  
4.7.1  Trouble Shooting Guide (Units with EC motors) ................................................... 14  
4.7.2  Confirm Incoming Voltage ....................................................................................... 15  
4.7.3  Checking the Relay Outputs to the Motor ............................................................... 15  
4.7.4  General Note on Control Wiring .............................................................................. 16  

5.0  **Maintenance** ............................................................................................................. 16  
5.1  Warranty ......................................................................................................................... 17  
5.2  Line Sizing ...................................................................................................................... 18-19  
5.3  Temperature/Pressure Chart ......................................................................................... 20  
5.4  Drawings ......................................................................................................................... 21-24  
5.5  Contact Data Aire, Inc ................................................................................................. 27
1.0 INSTALLATION

There is no intent on the part of Data Aire, Inc. to define local codes or statutes which may supersede common trade practices. Data Aire assumes no responsibility for their interpretation. Consult local building codes and the National Electric Code (NEC) for special installation requirements.

1.1 Inspection

This Data Aire unit has been factory run-tested and has gone through a comprehensive inspection prior to its packaging and shipment to ensure that it arrives in excellent condition. However, shipping damage can occur and a visual inspection of the outer crating immediately upon delivery should be performed.

Note any external damage or other transportation damage on the freight carrier’s forms. Inspect the unit for internal damage. A claim should be filed with the shipping company if the equipment is damaged or incomplete.

Loose items such as remote control panels, disconnect switch handles, etc. are packed inside the unit’s electrical panel.

⚠️ Freight damage claims are the responsibility of the purchaser. Action to recover losses should be filed immediately. Please notify Data Aire traffic personnel of any claims.

1.2 Storage

Data Aire equipment comes ready for immediate installation. In some instances it may be necessary to store the equipment for a period of time. If you must store the equipment it should be done in a dry area, out of the weather, protected from freezing weather, protected from damage by other equipment in storage or transportation equipment, never stacked (if uncrated). Avoid frequent relocation.

If equipment is stored more than 30 days special precautions must be taken to avoid coil damage. All coils should be charged and sealed with a low pressure (1-3 PSIG) inert gas, such as nitrogen. This prevents contaminates from entering the coil(s). When the seal is broken at installation, the rush of escaping gas verifies the coil is still leak free. If coils are not charged and sealed condensation mixes with air pollutants forming a weak acid and over time can cause pin hole leaks to develop in the coil tubes.

When equipment is installed after storage caution should be taken to inspect and replace parts. All moving parts, such as blowers and motors, should be hand tested to ensure they are free and prior to start-up.

1.3 Warranty

This equipment is designed to operate properly and produce rated capacities when installed in accordance with accepted industry standards. Failure to do so could result in voiding the system warranty. The following conditions should be met:

1. System piping must be installed following accepted industry practices
2. Inert gas must be charged into piping during brazing
3. System must be thoroughly leak checked and evacuated before charging (using a high vacuum gauge capable of reading microns)
4. Power supply requirements to the system (Section 2.4)
5. All control and safety switch circuits must be properly connected per unit wiring diagram
6. Factory installed wiring can only be changed with written factory approval

1.4 Paperwork
It is the responsibility of the installing contractor to return the start-up and warranty registration card to Data Aire for proper activation of the unit warranty. Failure to do so may cause delays and in some cases void the warranty.

**WARNING:** This equipment may contain substance that has been deemed harmful to public health and the environment. Venting of refrigerants to the atmosphere is illegal. Refrigerant recovery devices must be used when installing and/or servicing these types of products.

1.5 Locating the remote heat exchanger
Air cooled condensers should be located in secure areas where service is easily accessible. Areas where public access is available should be avoided. Avoid areas that contribute to ice and snow accumulation. Condensers should be located in clean areas free from debris or foreign matter that could block the coil surface. Avoid areas of hot air or fume exhaust. Condensers should not be located near steam vents.

Condensers should not be closer than 36 inches from a wall or any obstruction. With proper clearance on all other sides units can be placed side by side. Additional units should be placed no closer than 48 inches apart. Avoid air recirculation conditions that could be caused by walls, screening, etc. Do not connect ductwork to the coil inlet or fan outlet. Keep fan discharge away from building air intakes.

The remote heat exchanger must be located in an area that will ensure airflow into and out of the heat exchanger plus adequate service access clearance. Short circuiting of the airflow or the intake of warmer air from another unit will seriously degrade the performance of the air cooled heat exchanger.

Do not locate the heat exchanger in a location that is bordered by tall obstructions (i.e. higher than 10 feet) on no more that two sides. See figure on page 21 for minimum clearance from obstructions and between units. With proper clearance on all sides, two units can be placed side by side. Additional units should be placed at least 48 inches apart.

Noise factors should be considered when locating an air cooled heat exchanger. Proximity to windows, walls and surrounding structures can cause objections by the occupants. An acoustical expert should be consulted when noise is of a particular concern.

Air cooled condensers should be placed at a level that is higher than the indoor evaporator. Mounting the remote heat exchanger more than 10 feet below the evaporator is not recommended. Excessive liquid line pressure drop can cause poor evaporator performance.

Piping must be supported within 18 inches of the inlet and outlet connections. The inlet connection is located on the top header on all remote heat exchangers and the outlet connection is located on the bottom header of all units.
1.6 Vibration
Avoid installing units near occupied spaces, above or outside utility spaces and corridors whenever possible in order to reduce sound transmission and/or vibration to occupied spaces. Refrigerant piping should be flexible enough to prevent transmission noise or vibration from the unit. Isolation hangers should be used to prevent the transmission of vibration on all suspended (from the building) refrigerant lines.

1.7 Rigging
The heat exchanger should be moved to its mounting location (typically rooftop) using a crane or fork lift. Each fan section has heavy steel leg supports with lifting holes at the top.

![Diagram of Multi-Fan Units and Single-Fan Units]

Do not lift with a choke sling around the unit. Spreader bars are recommended for lifting multiple fan units. Under no circumstances should the coil headers or piping be used for lifting the unit. The unit should be kept in the shipping crate until it is ready to be set in place.

1.8 Leg Assembly
The legs must be unbolted from their collapsed shipping position and extended prior to placing the unit on its pad. Each leg extends down 18 inches and reattaches using the same nuts and bolts. Failure to extend the legs will result in improper air distribution over the condenser coil resulting in significant performance loss. Concrete pads or a rail system are often used to provide support for the heat exchanger.

Bolt holes in the bottom of the leg assembly are provided for anchoring the unit.
2.0 ELECTRICAL CONNECTIONS

Before proceeding with the electrical connections make certain that the voltage, hertz and phase correspond to that specified on the unit’s electrical nameplate. Only use copper connectors.

2.1 Electrical Service
Check to be sure that the service provided by the utility is sufficient to handle the additional load imposed by this equipment. Most units with a secondary heat exchanger will require a separate power source and field provided interconnecting control wires (see Auxiliary Control Wiring).

Remote condensers typically require one power source.

2.2 Nameplate Ratings
Refer to the unit’s electrical nameplate for equipment electrical requirements. Minimum circuit ampacity (MCA) also known as wire sizing amps will dictate the minimum required wire gauge. Maximum over-current protection (MOP) device amps will dictate the maximum circuit breaker or fuse size.

2.3 Grounding
The unit cabinet must have an uninterrupted true earth ground. An electrical ground wire of adequate size must be connected to the ground lug provided inside the main electrical box.

2.4 Voltage Requirements
Supply voltage requirements:
• 208-230 units – not less than 198 volts or more than 253 volts
• All other voltages must not exceed +/- 10% of the nameplate rating
• Phase imbalance should not exceed 3%

The local utility company should be contacted for correction of improper line voltage. Deviation from voltage ratings can cause premature failures and possibly void unit warranty.

Check all wiring connections to the unit control panel to ensure they tight. Screw terminal may become loose during shipment. Tightening of wire connections is the responsibility of the installing contractor.

2.5 Phase
The air cooled condenser may be ordered as three phase but the individual fan motors are single phase and will only run in one direction. Check operation by placing a momentary jumper across field terminals #39 and #40 (refer to unit electrical wiring diagram). This energizes the control circuit.

If the fans do not run:
• The thermostat setpoint is above the current ambient
• The head pressure has not exceeded 200 PSI. The #1 fan (with fan speed control) reacts to head pressure
• Multiple fan units also have a pressure control on the second motor

2.6 Wiring Diagrams
Every Data Aire condenser is shipped with a wiring diagram. The diagrams are ladder type schematics intended for service personnel. The evaporator section will have a wiring diagram as well.
3.0 PIPING

Refer to the line sizing chart on page 18 and 19 for a guideline to sizing refrigerant lines. The ultimate responsibility for line size selection is that of the installing contractor or project engineer. Data Aire does not assume this responsibility. The chart covers distances up to 200 equivalent feet. For installations greater than this distance refer to ASHRAE or similar references.

Standard piping practice must be used to ensure proper oil return and efficient operation. The interconnecting lines to the remote air cooled condenser must be installed by a qualified refrigeration mechanic.

- Only use refrigerant grade copper tubing (ACR preferred)
- Soft solder joints are not acceptable
- Put dry nitrogen through the lines while brazing
- Do not leave dehydrated piping or components open to atmosphere any longer than is required

3.1 Discharge Lines

Discharge lines (also called hot gas lines) should be trapped at the top (inverted) and the bottom. In addition, a trap should be installed for every 15 – 20 feet of vertical rise. Discharge line check valves are recommended on all installations especially those with long pipe runs or in cold climates. Check valves should be installed 6 to 10 feet from the compressor.

Proper design will minimize refrigerant pressure drop and will maintain sufficient gas velocity to carry oil through the condenser. Discharge line pressure drop should not exceed 6 PSI. Recommended gas velocity for proper oil return is 1,000 FPM. Slope horizontal lines downward in the direction of refrigerant flow (1/2" for every 10 feet of line length).

3.2 Discharge Gas Pulsation

Gas pulsation in a refrigeration system is most commonly attributed to the compressor and connecting discharge piping. The presence and magnitude of these pulsations can be caused by the system piping configuration, line sizing, operating pressures and/or compressor and component mounting.

3.3 Liquid Lines

Liquid line size is determined by pressure drop and velocity. The liquid line pressure drop should not exceed 5 PSI. The recommended velocity should be between 200 and 300 FPM.

To avoid excessive liquid line pressure drop the air cooled condenser should be located above or at the same level of the as the evaporator section. Condenser installation more than 10 feet below the evaporator section is not recommended and should be avoided.
3.5 Connection Sizes

⚠️ Field connections at the indoor evaporator section and remote condenser will not necessarily be the same as the field pipe size required. These could vary significantly.

3.6 Leak Testing

No installation is complete until the entire system has been thoroughly checked for leaks. This includes checking the refrigerant tubing, flare fittings, pressure controls, Shraeder fittings and compressor rota-lock service valves.

With recent changes in the handling and recovery of refrigerant, it is not permissible to release refrigerant into the atmosphere. Many leak-test methods recommended in the past are no longer possible. Current standard practices must be used.

Pressurize the system’s circuit(s) to 150 PSIG (1034 kPa) by using dry nitrogen with a trace of refrigerant. Check the entire system for leaks with a suitable leak finder (per local code) including but not limited to all braze joints, caps, fittings and flare nuts on both field and factory furnished components. After completion of leak testing, release test pressure and pull a vacuum on the system.

⚠️ Tightening of fittings and valves is the responsibility of the installing contractor.

3.7 Evacuation

Evacuate the refrigerant lines, condenser coil evaporator coil to 250 microns or lower (micron gauge and 2-stage vacuum pump are required). Valve off and turn off the vacuum pump and wait at least 15 minutes to make sure the micron gauge reading does not go back above 700 microns. If it does, restart the vacuum pump and evacuate until the system reaches 250 microns. If the system still does not hold the pressure below 700 microns the system needs to be rechecked for leaks.
After the system has been satisfactorily evacuated the lines can be charged with refrigerant. Connect the pressure gauge manifold set to the high and low ports near the compressor. Connect the charging line to the refrigerant tank and set it for liquid feed. Open the refrigerant tank valve and purge the line at the manifold, then open the high side valve on the manifold only and allow the refrigerant to flow until the system pressure equalizes. At this point the system will have 75 to 80% of the total refrigerant charge. Start the blower and then the compressor checking the operating pressures and temperature.

⚠️ DO NOT APPLY POWER TO THE COMPRESSOR WHEN IN A VACUUM

4.0 CHARGING (R-407C)

4.1 Fan Speed Control/Fan Cycling
Data Aire air cooled condensers (DARC) utilizes a fan speed controller. On single fan condensers this is the only means of control.

Multiple fan condensers are provided with fan speed control on the first motor (nearest the header). The fan speed control is pre-programmed and there is no need to adjust the unit in the field. The header fan will cycle with the head pressure of the unit.

Units shipped with R-407C the starting pressure is 220 PSIG and the fan will be at full speed at 285 PSIG. Units shipped with R-410A the starting pressure is 320 PSIG and the fan will be at full speed at 400 PSIG.

When the condenser load exceeds the output capacity of the fan speed controller fan, the second fan is turned ON to full speed in conjunction with the fan speed controlled motor and the fan speed controlled motor modulates to a new start pressure. This allows the condenser load to be modulated by the cooling effect of two fans instead of one.

4.2 Ambient Thermostats
Additional motors (subsequent to the fan speed control operated motors) on multiple fan heat exchangers are cycled by ambient sensing thermostats. These thermostats have a capillary tube with remote sensing bulb. They function best with the sensing bulb mounted below the coil, away from exposure to direct sun light and the bulb in the vertical position. An instruction set comes as part of a mounting kit that includes a sheet metal bracket, mounting clamps and TEK screws. This includes directions for field mounting and adjustment. Desired head pressure should be maintained at approximately 230-270 PSIG for R-407C and 340-400 PSIG for R-410A.

Typical factory settings:

<table>
<thead>
<tr>
<th>Number of Fans</th>
<th>Motor Number 1</th>
<th>Motor Number 2</th>
<th>Motor Number 3</th>
<th>Motor Number 4</th>
<th>Motor Number 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FSC</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>FSC</td>
<td>Pressure Control</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>3</td>
<td>FSC</td>
<td>Temperature</td>
<td>50°F</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4</td>
<td>FSC</td>
<td>Temperature</td>
<td>75°F</td>
<td>50°F</td>
<td>N/A</td>
</tr>
<tr>
<td>5</td>
<td>FSC</td>
<td>Temperature</td>
<td>85°F</td>
<td>75°F</td>
<td>50°F</td>
</tr>
</tbody>
</table>
As the ambient air temperature decreases the capacity of the condenser increases. The capacity increase is directly proportional to the temperature difference (TD) between the condensing temperature and the ambient air temperature entering the condenser coil. Air cooled condensers are required to operate over a wide range of ambient air temperatures. Provisions must be made to maintain the overall system balance. Air cooled condensers tend to run at low head pressure when operating in low ambient condition. Low head pressure can cause poor expansion valve operation and poor system performance.

4.3 Charging with Fan Speed Control (R-407C)

As previously noted, the standard Data Aire air cooled condenser comes equipped with fan speed control on the lead motor (nearest the header). After field refrigerant piping is properly completed connect the refrigerant drum to the low side of the system and charge with vapor (refer to Section 3.6 LEAK TESTING and Section 3.7 EVACUATION prior to charging the system). Connect the refrigerant drum to the high side and charge with liquid. Charge with approximately 2.55 pounds per nominal ton. Make sure all hoses are properly purged.

Before starting the compressor(s) the crankcase should be energized for a minimum of 12 hours to reduce the possibility of liquid slugging on start-up. Failure to energize the crankcase heater could result in compressor damage.

Use the manual override switches (evaporator motor and compressor) on the unit mounted controllers (DAP-III). Switch the units to the ON position (all automatic control will be disabled but safety switches will remain functional).

Start the evaporator fan and then the compressor. Check the liquid line sight glass to get a feel for the approximate charge. Bubbles in the sight-glass are not unusual at this point. It is more likely that more refrigerant will be required to complete the charging procedure.

Adjust the refrigerant charge until the system measures 8 - 10°F of sub-cooling. Units with dual refrigerant circuits should have both compressors energized. The unit should be allowed to stabilize for at least 20 minutes before meaningful measurements can be recorded.

After the system is allowed to stabilize, a few key measurements should be noted. The (discharge) head pressure should be about 245 to 285 PSI and sub-cooling should be 8 - 10°F depending on ambient conditions. Suction pressure should be 52 PSI or greater. The superheat at the compressor suction line (at least 6 inches away from the compressor) should be 8 – 15°F.

*Note:* Charging to a full liquid line sight-glass should never be the sole means of determining the correct refrigerant charge. Other parameters such as superheat, suction pressure, head pressure, sub-cooling and ambient air temperature are also important. A system charged to a full sight-glass is often overcharged.

4.4 Flooded Systems

Flooded systems are units having refrigerant circuits with optional liquid receiver and head pressure control (recommended for low ambient conditions). When the ambient temperature falls during cold weather, the head pressure control valve will regulate the flow of refrigerant to ensure nearly constant receiver pressure. The condenser is partially flooded with liquid refrigerant in cold weather. In warm weather the extra refrigerant is stored in the receiver.
Data Aire units with optional receivers are either provided within the evaporator section (depending on the unit size) or shipped loose for field installation. The receiver includes heaters and thermostat. A thermostat monitors temperature in the receiver and prevent overheating (overheating of receivers may cause the soft plug to blow and loss of refrigerant charge).

### 4.4.1 Charging Flooded Systems

Flooded systems require more refrigerant than condensers with fan speed control. With the unit under a vacuum, add liquid refrigerant directly into the receiver. Make sure all hoses are properly purged.

Use the manual override switches (evaporator motor and compressor) on the unit mounted controllers (DAP-II/DAP-III). Switch the units to the ON position (all automatic control will be disabled but safety switches will remain functional).

Hook up charging gauges to the suction line. Charge with refrigerant vapor only. If the receiver (head) pressure is below 280 PSI, block part of the condenser coil surface until the pressure rises to 280 PSI or higher. During extremely cold weather all the condenser fans may have to be de-energized to maintain 280 PSI.

Observe the sight-glass on the receiver. Add refrigerant liquid through the suction line until the level of liquid in the receiver is approximately 1/3 from the bottom of the sight-glass which is about 80% full. Outdoor receivers will be difficult to observe. However, the steps are required for proper charging.

Units with dual refrigerant circuits should have both compressors running. The unit should be allowed to stabilize for 20 minutes before meaningful measurements can be recorded.

After the system is allowed to stabilize, the superheat at the compressor suction line (at least 6 inches away from the compressor) should be 8 - 15°F. Remove the block from the condenser coil. If the ambient air temperature while charging is below 60°F, some of the refrigerant will be backed up in the condenser coil, causing the liquid level in the receiver to drop.

**Note:** Charging to a full liquid line sight-glass should never be the sole means of determining the correct refrigerant charge. Other parameters such as superheat, suction pressure, head pressure, sub-cooling and ambient air temperature are also important. A system charged to a full sight-glass is often overcharged.

### 4.5 R-410A – Charging /Installation Work Procedures

The basic installation work procedures are the same as conventional refrigerant. Since the working pressure is 1.6 times higher than the conventional refrigerant, some of the piping, installation and tools are special.

**Special Service Equipment**
- High pressure manifold gauge set
- High pressure recovery machine
- High pressure recovery tank (DOT 4BA400 or ABW400)

**Charging the System (Air Cooled)**
1. Charge with liquid refrigerant only
2. Check sight-glass (a few bubbles are not unusual)
3. Allow unit to stabilize
4. Discharge pressure should be between 340 – 415 psig
5. Sub-cooling should be between 8 - 10°F
6. Suction pressure should be 104 psig or greater

**Recommended Control Settings**
- High pressure cut out: 610 psig
- High pressure cut-in: approximately 500 psig
- Low pressure control setting: 50 psig

⚠️ **NOTE:** R-407C and R-410A units use POE oil that is prone to absorbing moisture. The system should never be left open to the atmosphere

### 4.6 Refrigerant Handling

The use of recovery/recycling units is required by the U.S. Environmental Protection Agency (EPA) regulations. Technician who service and dispose of air conditioning and refrigeration equipment must recover the refrigerant instead of venting it to the atmosphere.

Except for extremely small releases of refrigerant such as what occurs when disconnecting service hoses (diminutive release), a technician who knowingly releases or vents refrigerant to the atmosphere is in violation of this regulation. Freon purchases must be made by certified technicians and have a valid EPA certification card.

### 4.7 Condenser with EC Motor/Fan Blade Combinations

Units provided with Electronically Commutated (EC) motor/fan blade combinations provide variable speed condenser control. The motor has all the required components to run at variable speeds.

⚠️ **WARNING:** When connecting the unit to the power supply, dangerous voltages can occur. Do not open the motor within the first five minutes after disconnecting all phases. **THE UNIT MUST BE ISOLATED.**

⚠️ **WARNING:** Dangerous external voltages can be present at terminal KL2 even with the unit turned off.

⚠️ **WARNING:** After a power failure and with a control voltage fed in or a set speed being saved, the motor will automatically start after a power failure.

**Speed Adjustments**

The EC motor varies its speed linearly based on a 0-10V input signal from the head pressure transducers. The fans are scaled per the following table:

<table>
<thead>
<tr>
<th>Refrigerant</th>
<th>Cut-in 100°F</th>
<th>Full Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-407C</td>
<td>226</td>
<td>270</td>
</tr>
<tr>
<td>R-410A</td>
<td>319</td>
<td>370</td>
</tr>
</tbody>
</table>
4.7.1 Trouble Shooting Guide (Units with EC Motors)
Use this document for troubleshooting a non-working EC motor that has factory default settings. Follow the steps in the listed order for best results.

Before you begin:
Read the Operating Instructions for detailed instructions and critical safety information regarding this product.

Tools required for initial troubleshooting:
- T20 Torx bit for removing the terminal box cover and ground lug
- 1/8" wide slotted screwdriver for the terminal wiring
- AC/DC volt meter
- Continuity meter
- Jumper wire (10VDC rating)

Confirm there are no obstructions to the blade or rotor:

⚠️ Caution: do not attempt to remove any obstruction without first disconnecting the power to the motor. Once the obstruction is removed the motor will start if powered.

Disconnect AC power to the motor, determine if the blade will spin and rotate freely. Any blockage or rubbing will cause the motor to stop operation until the obstruction is removed.

Confirm that the unit does not have any visible external damage (damaged or missing blades, bent impeller, missing balance weights, etc.):

Do not power up any module (EC motor/fan blade) that has external damage. The module should be replaced (contact Data Aire Technical Service at 800-347-2473).

Confirm that the unit has not stopped due to operating in temperatures above the recommended operating range:

The motor may have been exposed to temperature above the maximum operating temperature. Under such conditions the motor will stop and NOT restart automatically. The motor must be reset by disconnecting the AC power for 3 minutes. This will internally reset the motor. Reapply the AC power. The motor should run at full speed.

Confirm and correct the reason for the over temperature condition.

If the motor does not operate, proceed to next steps.

Confirm that there has been no damage due to water or excessive moisture into the module’s terminal box:

Check for signs of water penetration into the motor’s terminal box. Typically, this can be confirmed by the presence of a white, powdery residue on the inside or under the terminal box or around the cable gland or threads in any one of the three ports.
Water entry is a result of a loose terminal box cover, loose sealing nuts on the cable gland, the body of the cable glands not tightened ensuring a seal between the housing and the cable gland, or missing or improperly installed O-rings.

Evidence of water entry may indicate other damage and the motor module should be replaced.

### 4.7.2 Confirm Incoming Voltage

Check the fuses, circuit breakers, motor or any device that controls power to the motor.

Confirm the power lead insulation or a loose crimp on a contact tip is not preventing an electrical connection with the motor terminals.

Confirm that the correct AC voltage is present on all three phases at the fan terminals including a good ground connection.

Check for damage or any short in the power leads to the motor.

> To simplify troubleshooting, all of the control wiring at KL3 and alarm relay wiring KL2 should be labeled, capped or taped and removed from the motor. This will prevent any external issues from effecting the troubleshooting. **Caution** – Make sure that the removal of the control and relay wiring at the motor will not result in any issues in the overall system operation.

### 4.7.3 Checking DC Outputs from the Motor

After the correct AC voltage has been confirmed and with the power still applied to the module, the low voltage DC outputs at KL3 should have the following readings:

- \( +20\text{V} \) and GND = 20VDC
- \( +10\text{V} \) and GND = 10VDC

If either of these readings are not present, there probably is a defect internal to the motor (the module should be replaced).

If the readings are correct, the fan can be made to operate at full speed by connecting a jumper wire between \(+10\text{V}\) and 0-10V PWM. **Caution** – Turn off the AC power and wait a full five minutes before making a jumper connection. Confirm that the motor operation at full RPM will not cause any safety issues.

If the motor does not operate there probably is a defect internal to the motor (the module needs to be replaced).

If the unit operates normally in these tests then the likely cause for the motor not operating is in the control scheme and should be further investigated.

### 4.7.4 General Note on Control Wiring

Confirm that the insulation or any crimped tips are not preventing electrical contact to the motor.

Confirm that the control wiring is wired properly according to the condenser’s wiring diagram.
Confirm that the control signal is present at the motor. Measure the signal at the motor pin or by applying the signal to a motor that is known to operate correctly.

If an analog is being sent to the motor, using a multi-meter, confirm the proper voltage is present at the input of the motor by measuring at the spring contact on the motor at the terminal block.

Confirm that the PWM or 4-20mA signal is correct using the appropriate measuring instrument.

If the motor still does not operate, remove and replaced.

*Typically, problems can be found and corrected by following the listed guidelines. If the module will still not operate, it should be replaced.*

## 5.0 MAINTENANCE

Inspect the motor/fan/fan blade assembly ensuring the bearings are free and the motor mounts and fans are secure.

Periodically clean the condenser coil of all debris that could restrict air flow.

In winter do not allow snow to accumulate or build-up around the sides or underneath the condenser coil.

Check all refrigerant lines and connections for signs of oil.
WARRANTY

Seller warrants its equipment to Buyer to be free from defects in material and workmanship for a period of eighteen (18) months from date of shipment, as long as equipment is utilized under normal conditions and service and is properly installed; however, the warranty shall not be applicable to any of the following items: refrigerant, belts, filters, humidifier, heaters not regularly cleaned, light bulbs, and any other items either consumed or worn out by normal wear and tear, or by conditions beyond Seller’s control, including (without limitation as to generally) polluted or contaminated air or water.

The Seller’s obligation under this warranty is limited solely to the repair or replacement, at Seller’s options, of any part or parts thereof which shall, within eighteen (18) months from date of shipment of the equipment to the original purchaser be returned to the factory, transportation charges prepaid, which upon examination shall disclose to the Seller’s satisfaction to have been defective under normal use and service. This agreement to repair or replace defective parts is expressly in lieu of all other warranties, expressed or implied and all other obligations or liabilities on the part of Seller and Seller neither assumes nor authorizes any other person to assume for it any liability or obligation in connection with the sales or service of its equipment, except said repair or replacement of defective parts set forth above.

This warranty does not include any labor charges for work done outside of the factory for replacement of parts, adjustments, repairs, or any other work. Seller’s liability does not include any resulting damage to persons, property, equipment, goods or merchandise arising out of any defect in or failure of any equipment of its manufacture and Buyer hereby waives any claim against Seller arising out of such claim. This warranty shall not cover the repair or replacement of any equipment which has been repaired or altered outside of the factory in any way or which has been subject to negligence, misuse, or abuse, or to pressures in excess of stated limits.

This warranty applies only to the original purchaser of the equipment and does not extend, expressly or by implication, to the third parties or others without the specific written approval and acknowledgment of Seller. Buyer’s exclusive remedy and Seller’s maximum liability for any and all loss, injury, damage, costs, or expense arising from any defect covered by this warranty shall be limited to the repair or replacement, but not the installation of any defective material, F.O.B., Seller’s plant; provided however, that Seller shall not be required to replace any part or component (a) which can be repaired, or (b) unless Buyer has given Seller immediate written notice that replacement or repair. In Addition, Seller shall not be liable for any cost or expense of repair or repair contracted for by Buyer with any third person, unless, and then only to the extent that Seller authorizes in writing, such costs or expense.

Seller shall not be liable for any direct, indirect incidental, consequential, or other form of loss, injury, damage, cost, or expense, whether caused by delay, failure, or performance, breach of warranty, or by any cause whatsoever.

Seller’s obligation under this warranty shall be void if Buyer fails: (a) without legal justification to pay Seller, when due, the full purchase price for the equipment sold hereunder; or (b) to have the equipment sold hereunder installed, maintained, and serviced by competent personnel and in accordance with Seller’s instructions.
# LINE SIZES

**RECOMMENDED LINE SIZING FOR AIR COOLED SPLIT SYSTEMS - UP TO 200 EQUIVALENT FEET**

## SINGLE CIRCUIT SYSTEMS – HOT GAS LINES

<table>
<thead>
<tr>
<th>Tons</th>
<th>Tons/Circuit</th>
<th>To 50 Feet</th>
<th>To 100 Feet</th>
<th>To 150 Feet</th>
<th>To 200 Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>5/8</td>
<td>5/8</td>
<td>5/8</td>
<td>7/8</td>
</tr>
<tr>
<td>1.5</td>
<td>1.5</td>
<td>5/8</td>
<td>5/8</td>
<td>7/8</td>
<td>7/8</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>5/8</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
</tr>
<tr>
<td>2.5</td>
<td>2.5</td>
<td>5/8</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
<td>1-1/8</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>7/8</td>
<td>1-1/8</td>
<td>1-1/8</td>
<td>1-1/8</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>7/8</td>
<td>1-1/8</td>
<td>1-1/8</td>
<td>1-1/8</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>1-1/8</td>
<td>1-1/8</td>
<td>1-3/8</td>
<td>1-3/8</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>1-1/8</td>
<td>1-1/8</td>
<td>1-3/8</td>
<td>1-3/8</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>1-1/8</td>
<td>1-3/8</td>
<td>1-3/8</td>
<td>1-3/8</td>
</tr>
</tbody>
</table>

## DUAL CIRCUIT SYSTEMS – HOT GAS LINES

<table>
<thead>
<tr>
<th>Tons</th>
<th>Tons/Circuit</th>
<th>To 50 Feet</th>
<th>To 100 Feet</th>
<th>To 150 Feet</th>
<th>To 200 Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>3</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
<td>1-1/8</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>7/8</td>
<td>1-1/8</td>
<td>1-1/8</td>
<td>1-1/8</td>
</tr>
<tr>
<td>13</td>
<td>6.5</td>
<td>7/8</td>
<td>1-1/8</td>
<td>1-1/8</td>
<td>1-1/8</td>
</tr>
<tr>
<td>16</td>
<td>8</td>
<td>1-1/8</td>
<td>1-1/8</td>
<td>1-3/8</td>
<td>1-3/8</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
<td>1-1/8</td>
<td>1-1/8</td>
<td>1-3/8</td>
<td>1-3/8</td>
</tr>
<tr>
<td>26</td>
<td>13</td>
<td>1-1/8</td>
<td>1-3/8</td>
<td>1-3/8</td>
<td>1-3/8</td>
</tr>
<tr>
<td>30</td>
<td>15</td>
<td>1-3/8</td>
<td>1-3/8</td>
<td>1-3/8</td>
<td>1-5/8</td>
</tr>
</tbody>
</table>
### SINGLE CIRCUIT SYSTEMS – LIQUID LINES

<table>
<thead>
<tr>
<th>Tons</th>
<th>Tons/Circuit</th>
<th>To 50 Feet</th>
<th>To 100 Feet</th>
<th>To 150 Feet</th>
<th>To 200 Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>3/8</td>
<td>3/8</td>
<td>3/8</td>
<td>3/8</td>
</tr>
<tr>
<td>1.5</td>
<td>1.5</td>
<td>3/8</td>
<td>3/8</td>
<td>3/8</td>
<td>3/8</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>3/8</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>2.5</td>
<td>2.5</td>
<td>3/8</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>1/2</td>
<td>5/8</td>
<td>5/8</td>
<td>5/8</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>1/2</td>
<td>5/8</td>
<td>5/8</td>
<td>5/8</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>1/2</td>
<td>5/8</td>
<td>5/8</td>
<td>5/8</td>
</tr>
<tr>
<td>8</td>
<td>8</td>
<td>5/8</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
<td>5/8</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
</tr>
<tr>
<td>13</td>
<td>13</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
</tr>
</tbody>
</table>

### DUAL CIRCUIT SYSTEMS – LIQUID LINES

<table>
<thead>
<tr>
<th>Tons</th>
<th>Tons/Circuit</th>
<th>To 50 Feet</th>
<th>To 100 Feet</th>
<th>To 150 Feet</th>
<th>To 200 Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>3</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>1/2</td>
<td>5/8</td>
<td>5/8</td>
<td>5/8</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>1/2</td>
<td>5/8</td>
<td>5/8</td>
<td>5/8</td>
</tr>
<tr>
<td>13</td>
<td>6.5</td>
<td>1/2</td>
<td>5/8</td>
<td>5/8</td>
<td>5/8</td>
</tr>
<tr>
<td>16</td>
<td>8</td>
<td>5/8</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
<td>5/8</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
</tr>
<tr>
<td>26</td>
<td>13</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
</tr>
<tr>
<td>30</td>
<td>15</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
<td>7/8</td>
</tr>
<tr>
<td>Temperature (°F)</td>
<td>R-407C Pressure (PSIG)</td>
<td>R-410A Pressure (PSIG)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------</td>
<td>------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>43.6</td>
<td>89.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>44.7</td>
<td>91.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>45.9</td>
<td>93.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>47.1</td>
<td>95.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>48.4</td>
<td>97.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>49.6</td>
<td>99.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>50.9</td>
<td>101.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>52.1</td>
<td>103.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>53.4</td>
<td>105.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>54.8</td>
<td>107.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>56.2</td>
<td>110.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>57.5</td>
<td>112.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>58.9</td>
<td>114.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>60.3</td>
<td>116.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>61.7</td>
<td>118.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>63.1</td>
<td>121.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>64.6</td>
<td>123.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>66.1</td>
<td>125.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>67.6</td>
<td>128.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>69.1</td>
<td>130.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>70.6</td>
<td>133.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>72.2</td>
<td>135.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>73.8</td>
<td>138.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>75.4</td>
<td>140.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>77.1</td>
<td>143.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>106.0</td>
<td>156.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>116.2</td>
<td>170.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>127.0</td>
<td>185.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>138.5</td>
<td>201.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>150.6</td>
<td>218.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>163.5</td>
<td>235.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>177.0</td>
<td>254.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>191.3</td>
<td>274.3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>206.4</td>
<td>295.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>222.3</td>
<td>316.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>239.0</td>
<td>339.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>256.5</td>
<td>364.1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>274.9</td>
<td>389.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td>294.2</td>
<td>416.4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>314.5</td>
<td>444.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>335.7</td>
<td>474.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>135</td>
<td>357.8</td>
<td>505.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140</td>
<td>380.9</td>
<td>537.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>145</td>
<td>405.1</td>
<td>571.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>430.3</td>
<td>607.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Location of Remote Heat Exchanger

WALL

36"

48"

36"

WALL