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**Important Notice**

This manual is the property of the owner.

Please be sure to leave it with the owner when you leave the job.

**Use of Symbols**

This publication includes warnings, cautions and information icons that point out safety related issues or conditions as well as other pertinent information relative to a safe installation, service or maintenance situation. The following icons should be interpreted as follows:

- **ELECTRICAL HAZARD**
  - The electrical hazard icon indicates the presence of an electrical hazard which could result in electrical shock or death.

- **WARNING**
  - The warning icon indicates a potentially hazardous situation which could result in death or serious bodily injury if not avoided.

- **CAUTION**
  - The caution icon indicates a potentially hazardous situation which may result in minor or moderate injury if not avoided.

- **INFORMATION**
  - The information icon indicates a situation that may result in equipment or property damage. The information provided alerts the reader to relevant facts and/or conditions.
COOLSPOT CONFIGURATIONS

CS
Self Contained
Air-cooled (CS) Shown
Water-cooled (CSW) Available
Chilled Water (CCW) Available

CSR
Remote Condenser Section

CSR B (*)
Remote Condenser Section

CSRC
Multiple Evaporators w/ Single Remote Condensing Section

CSRC B (Dual Circuit) (*)
Remote Condensers or Condensing Sections can also be Water-cooled

FIGURE 1: CoolSpot Configurations

(*) Remote Condensers or Condensing Sections can also be Water-cooled
INSPECTION OF EQUIPMENT
Immediately upon receiving the unit it should be inspected for possible external damage incurred during transit. If damage is evident it should be noted on the carrier’s freight bill. A separate request for inspection by the carrier’s agent should be made in writing. Protective packaging and skids should not be removed until the unit is at the point of installation. When removing packaging, be careful not to scratch and dent the unit.
After removal of packaging, all access panels should be removed to inspect the interior compartments for damage.

INFORMATION
NOTE: Items that are shipped loose are typically shipped independent of the unit. Make sure these are available for the unit installation. However, in some cases the shipped loose items may be located in the unit. If this is the case, a label will be placed on a panel to indicate where the items are located.

INFORMATION
NOTE: The supply and return grilles (with filter installed) are boxed separately. This box is placed on top of the unit and the unit and grilles are then covered with a box.

HANDLING
To facilitate handling, the unit is set on a wooden skid so that it can be moved by a forklift or by a hand truck. Under no circumstances should the unit be “walked” on the corners.

LOCATION
Unit can be installed as a complete package or split configuration. Unit can be air-cooled, water-cooled or chilled water.

Before the unit is installed, a thorough study should be made of the structure. Attention must be given to structural load limitations where the unit will be suspended from. Careful consideration must be given to location of wiring, condensate disposal, ductwork for air-cooled units and water piping (or valves) for water-cooled units. Confirm that for chilled water units appropriate access and space is available for piping and valves.

It is necessary that a minimum clearance space be allowed on each side of the unit to accommodate maintenance and service. Adequate space must be allowed on the end of the unit for wiring and service at the control box. A minimum of 18” should be maintained.

CAUTION
Unit should NOT be located in space subject to freezing temperatures.

MINIMUM SERVICE ACCESS
All Service and Maintenance access is through both sides of the unit. 18” is required for the 1 and 1-1/2 ton units, 26” for all larger units.

APPLICATION DATA

<table>
<thead>
<tr>
<th>Voltage Variation</th>
<th>208 / 230</th>
<th>460</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variety</td>
<td>187 / 253</td>
<td>414 / 504</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cooling (Air Over Evap.)</th>
<th>DB (Min./Max.)</th>
<th>65 / 105</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WB (Min./Max.)</td>
<td>57 / 72</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Heat Pump (Air Over ID Coil)</th>
<th>DB (Min./Max.)</th>
<th>50 / 80</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Water Cooled</th>
<th>GPM/Ton (Min./Max.)</th>
<th>2.5 / 3.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enter Water Temp. (Min./Max.)</td>
<td>55 / 95</td>
<td></td>
</tr>
</tbody>
</table>
MOUNTING

The CoolSpot is an air conditioning system designed specifically for ceiling grid applications.

The unit fits above a commercial drop ceiling. For mounting the unit follow the instructions below.

A typical drop ceiling consists of a quantity of T-bars that are hung from the building structure with wires. The primary function of the T-bar is to support the ceiling tiles.

**CAUTION**

At no time should the T-bar ceiling grid be used to support the CoolSpot unit.

1. After the T-bars are in place, the grilles supplied with the unit can be placed on top of the T-bar.

2. The hinged filter grille goes on the return air side of the unit. Make sure that the grilles are pointed away from the discharge side. The orientation of the grilles are shown in Figure 2. The discharge grille is a 3-way adjustable grille. The direction of the grille can be adjusted based on the side the customer wants the discharge air to be delivered. It should be ensured that the grilles are mounted as shown to prevent short cycling of air.

3. If it is a self-contained air-cooled unit, disconnect the electrical wiring that runs between the terminal block of the condenser blower section and the electrical box on the main unit.

   Remove the six horizontal bolts (three on each side of the unit) located beside the red mounts. This is shown as Bolt A in Figure 3A.

   Also remove the six sheet metal screws that hold the condenser blower section onto the main unit and slowly separate the two sections.

4. The main unit without the condenser blower section can be lifted from underneath and secured into place using four 3/8" threaded rods (field supplied). They pass through the vibration isolators in the mounting arms on the side of the units as shown in Figures 3A and 3B. Two more 3/8" threaded rods will be needed (field-supplied) to support the condenser blower section.
5. The unit is shipped with vibration isolators. The rubber mounts are of different kinds for load balancing and to reduce the vibrations. Refer to Table 1 and Figure 3A for specific unit configuration and color of isolator. It should be insured that the nuts and washers for the 3/8" threaded rod are secure. (Nuts, washers and threaded rods are field-supplied.)

### INFORMATION

**NOTE:** Do not over tighten the rubber mounts as this may affect the performance of the mounts in absorbing vibrations.

### TABLE 1: Vibration Isolator Color Codes

<table>
<thead>
<tr>
<th>Model</th>
<th>Unit Configuration</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS</td>
<td>Air-Cooled, Self Contained</td>
<td>Red</td>
<td>Red</td>
<td>Blue</td>
</tr>
<tr>
<td>CSR</td>
<td>Air-Cooled, Remote Condenser</td>
<td>Red</td>
<td>Red</td>
<td>–</td>
</tr>
<tr>
<td>CSRC</td>
<td>Air-Cooled, Remote Condensing</td>
<td>Red</td>
<td>Black</td>
<td>–</td>
</tr>
<tr>
<td>CSW</td>
<td>Water-Cooled, Self Contained</td>
<td>Red</td>
<td>Red</td>
<td>–</td>
</tr>
<tr>
<td>CSWRC</td>
<td>Water-Cooled, Remote Condensing</td>
<td>Red</td>
<td>Black</td>
<td>–</td>
</tr>
<tr>
<td>CSC</td>
<td>Chilled Water</td>
<td>Red</td>
<td>Black</td>
<td>–</td>
</tr>
</tbody>
</table>

6. Gently lower the main unit section without the condenser blower section by turning the nuts on the top of the threaded rod so that the main unit gently rests on the gasket provided on the grilles.

7. For air-cooled units, the condenser blower section is lifted separated from the unit and it should be ensured that the flange on the top panel of the condenser section goes inside the top panel of the main unit and is then secured by means of sheet metal screws. Reinstall the six bolts at the mounting flanges. The condenser blower section is supported by two threaded rods passing through the rails at the discharge end. Ensure that the angles with the bolts connect the main unit and condenser blower section secured by nuts to absorb vibrations. (Ref. Figure 3A.)

8. At the condenser air inlet for air-cooled units, flanges are provided on one side of the unit to connect the condenser air inlet duct. See Figure 3A. The other side of the unit is blocked. These are interchangeable based on which side the customer wants his ductwork to be fitted. The condenser air inlet and outlet must be ducted.

For better performance of the system the CoolSpot is provided with acoustic insulation and vibration absorbers for a low noise system. Rubber gaskets are provided for a better air seal between the unit and the grilles.

### ELECTRICAL WIRING

The wiring diagram is provided on the backside of the cover of the electrical box. The power wiring to the unit is brought through connection A of Figure 4 to a terminal block inside the control box. The control wiring is brought through connection B of Figure 4 to a terminal strip inside the control box.

For 277/1/60 (option) power supply the unit must be provided with a buck boost transformer. (Refer to buck/boost transformer option.)

### CAUTION

Use copper conductors only.

### INFORMATION

**NOTE:** Verify the unit electrical ratings and the power source to be applied before installation to verify correctness.

### GROUND

The unit must be grounded to earth through the ground lug provided in the electrical box.

### TABLE 2: Control Wire Sizes

<table>
<thead>
<tr>
<th>Wire Size</th>
<th>AWG. Gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>40</td>
<td>120</td>
</tr>
<tr>
<td>19</td>
<td>150</td>
</tr>
<tr>
<td>18</td>
<td>190</td>
</tr>
<tr>
<td>16</td>
<td>305</td>
</tr>
</tbody>
</table>

**Maximum Wire Length** 2 Feet

**Notes:**

1. Solid, Class II copper wire
2. Based on a voltage drop of 1.2 volts per wire.
3. Total wire length is from unit to room thermostat, and back to unit.

### ACCESSIBILITY

The CoolSpot units are designed for easy accessibility. These units can be serviced in the ceiling with easy access to components through the components access panels located on each side of the unit.
The electrical box on this unit is outside the evaporator end. When placing units make sure adequate clearance is provided for access to the controls.

**DRAIN PIPE CONNECTIONS**

The CoolSpot units are provided with a condensate pump as a standard feature. (Refer to section on Condensate pump for installation.) The unit is provided with a drain pan overflow switch (standard) that turns off the unit under abnormal conditions when the drain pan fills. An optional drain connection is provided outside the sheet metal cabinet. This drain line is capped when the unit is shipped. When this drain line is used a P-trap must be installed (field-provided) for proper drainage. The height of the P-trap must exceed the total static pressure of the system for proper drainage as shown in Figure 5. To work well, a P-trap should be at least 1-1/2" deep. With a unit sitting flush on the ceiling, the room for installing a trap this deep is limited. One way to overcome this is to run the drain line horizontally until you reach a place in the ceiling where there is a change in height that will allow you to construct a trap that is at least 1-1/2" deep. The long horizontal drain line ahead of the trap will work fine if you use at least 1/2" tubing and you keep the tubing perfectly straight and level and support it with hangers.

**DUCT CONNECTION**

On air-cooled, self-contained, units it is recommended to use a flex collar or other means to isolate any unit vibration from being transmitted to the duct or structure.

**SYSTEM COMPONENTS**

**Thermostat:**

The standard unit is supplied with a single stage thermostat (no heating). When a programmable thermostat or microprocessor control is used, refer to the Installation Instruction for that specific controller.

**INFORMATION**

NOTE: Other types of thermostats are available as an option.

**Compressor:**

See Figure 6. The models CS, CSW, CSR and CSWR contain a single reciprocating compressor. A scroll compressor is an option. The models CSRC and CSWRC do not contain a compressor.

**POSITIVE TEMPERATURE COEFFICIENT RESISTOR (PTCR)**

A Start Assist Device (SAD) is utilized on all single-phase units. The purpose of this device is to assist the compressor in starting in low voltage situations.

This device is a Positive Temperature Coefficient Resistor (PTCR) that is placed in parallel across the compressor capacitor. When power is initially supplied, the device will start at approximately 100 ohms and then quickly increase to approximately 30,000 ohms. This provides about 2 to 2-1/2 times the normal starting torque for the compressor.

After the initial start period, the PTCR device will heat up as the resistance increases and block additional power flow through the start windings. When the compressor shuts off, a 3 to 5 minute cool down period is needed for the PTCR device. A compressor off-cycle timer is included in the electrical circuit for this purpose.
Filters:
The filter is accessed through the hinged return air grille in the bottom of the unit as shown in Figure 7. The standard units are provided with a 20 x 20 x 1 filter. When the unit has a MiniMarvel controller the filter is 18 x 20 x 1.

Evaporator blower/motor:
The evaporator blowers are driven by a multi-speed, single-phase direct driven blower motor. The units are provided with a multiple speed fan selector switch. The switch is located on the return air side of the unit behind the filter.

All motors are wired for low/medium speeds. Except CS30 and CS36 with electric heat are wired for medium / high speeds. [white – common, brown / white – capacitor, brown – capacitor]

Condenser blower/motor: (See Figure 8)
On the air-cooled self contained units the condenser blowers are belt driven and are provided with adjustable sheaves to change the speed. The drive belt should be examined periodically for wear and for correct tension. If the belt is too tight it can cause bearing wear and a loose belt will cause slippage. If the two legs of the belt are pressed in, midway between the pulley and the sheave, resulting in 1" to 1-1/2" of movement, the belt is tensioned properly. Belt tension can be adjusted by means of adjusting bolt, which requires loosening a nut to move the motor to change belt tension.

Thermal expansion valve: (See Figure 9)
The CoolSpot unit uses an adjustable externally equalized thermal expansion valve, which has a bulb that senses the temperature of the refrigerant leaving the evaporator to maintain an 8 - 16°F superheat.
Sight glass/moisture indicator:
All CoolSpot units contain a liquid line sight glass located behind the filter. If bubbles appear in the sight glass, the system is either undercharged with refrigerant or there may be a restriction in the liquid line upstream of the sight glass.

INFORMATION

NOTE: If unit has Hot Gas Bypass, bubbles will be present at the sight glass if the Hot Gas Bypass function is activated.

The sight glass has a moisture indicator that changes color when moisture is present in the system.

Condensate Pump: (See Figure 9)

The CoolSpot unit is equipped with a condensate pump that is located in the evaporator drain pan.

High pressure switch: (See Figure 9)
In the event of high discharge pressure, this switch opens at 480 PSIG and shuts the unit off. When the pressure is reduced to 320 PSIG the switch is reset automatically.

Low pressure switch: (See Figure 9)
In the event of a reduction in suction pressure, the switch will open and shut off the unit. This switch will open at 23 PSIG and reset automatically at 48 PSIG.

Filter/drier:
Each unit is provided with a filter drier.
This pump is operated by a float switch that turns the pump on when the level of the condensate rises in the drain pan. The connection for the condensate pump is a 1/4” flare fitting on the side of the unit. Use a 1/4” ID line for condensate pump discharge. Raise the tube for the discharge riser to the highest point above the pump (maximum 12 feet). A 4 ft. rise delivers 50 GPH; a 10 ft. rise delivers 15 GPH. Form an inverted “U” trap as shown in Figure 10, Page 11.

**CAUTION**

Flexible tubing (1/4” I.D.) should be supported to prevent kinking and possible pump damage.

**Water-Cooled Condensing Units**

**Water-cooled Condenser:** (See Figure 11)

The condenser is a tube-in-tube, chemically cleanable configuration. The inner tube carries the water and the outer tube the refrigerant.

**Water Regulating Valve:** (See Figure 12)

Each system is equipped with a factory provided water regulating valve. This is pressure operated; it opens the circuit only when water is needed. The valves are set to open at a head pressure of 235 psi. If it becomes necessary to change the factory adjustment, use a wrench to turn the adjusting screw on top of the spring housing. Counterclockwise increases pressure, clockwise decreases as shown in Figure 12. The standard valve is a 2-way, 150 PSIG rated valve. Other optional valves may be utilized. Dependent upon the water valve type it may be internal or external to the unit.

**Water Piping and Connections:**

Do not reduce the unit pipe sizes from the factory connections on the unit. Both the water inlet and outlet of the condensing package should be equipped with valves (field-supplied). This is needed for shutdown of water supply during long periods of unit shutdown and/or condenser removal, if required. A water strainer (field-supplied) is also recommended.

**CAUTION**

The condensate drain line should not be connected to the condenser outlet, as flooding is likely to occur. Provisions should be made for ease of piping cleaning by using plugged tees at all turns, rather than ordinary elbows.

**Hook Up:**

The system has been designed for 85° entering water temperature with 3 gallons of water per ton per minute. Braze water lines to the water valve stub extensions. For future reference when cleaning is needed, record details on temperatures entering and leaving the heat exchanger and the pressure drop as a new installation. See “Cleaning The Water-cooled Condenser” on page 18.

**Water Connection:**

Install and connect a fresh water strainer (not supplied) to the water in supply. Strainer should be readily accessible for periodic cleaning. Gate valves on both strainer inlet and outlet are recommended to facilitate cleaning.

**CAUTION**

High Temperature Fresh Water – unusually high water temperature (above 95°F) or marginal water pressure at the condenser water inlet may result in nuisance tripping of the high pressure switch.

**WARNING**

Water-cooled units are for use with fresh water application only. Do not use for brackish water or salt water unless appropriate condenser has been installed as an option.
CHILLED WATER UNITS
The chilled water unit is a closed loop circuit in which chilled water is circulated through the chilled water coil. On demand for cooling the chilled water valve opens and water flows through the coil.

WATER VALVE SIZING

<table>
<thead>
<tr>
<th>SERIES</th>
<th>TONS</th>
<th>NO. OF CIRCUITS</th>
<th>3/8&quot;</th>
<th>1/2&quot;</th>
<th>3/4&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoolSpot</td>
<td>1</td>
<td>Single</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.5</td>
<td>Single</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Single</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.5</td>
<td>Single</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Single</td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Standard valves are 2-way 150 PSIG.
2. Optional valves: 2-way 350 PSIG, 3-way 150 PSIG, 3-way 350 PSIG, 2-way N.O. solenoid valve bypass 2-way valve in lieu of 3-way valve.
3. On the CoolSpot series, the following optional valves will not fit into the cabinet: all 3-way and high pressure valves. These valves will be shipped loose for field installation.
4. Water-cooled units are designed for 85 degrees EWT. If water temperature is below 75 degrees or over 95 degrees, contact factory.
5. Nominal 3 GPM/Ton
6. Glycol use derates the unit approximately 15%.
7. Valve settings – head pressure to be 235 PSI
8. Standard heat exchangers are co-axial with counterflow design.
9. United CoolAir uses Propylene Glycol when testing all water-cooled units. When shipped, the water circuit may still have a little of this glycol in it. The water circuit should be flushed with water at the job site before being hooked up to the actual loop.
10. The N.O. solenoid by-pass valve is only available for 150 PSIG applications.

Each system is equipped with a factory adjusted water regulating valve. This is pressure operated; it opens the circuit only when water is needed. The valves are set to open at a preset head pressure of 235 PSI. If it becomes necessary to change the factory adjustment, use a wrench to turn the adjusting screw on top of the spring housing. Counter-clockwise increases pressure and clockwise decreases the pressure. Some valves ship loose for field installation on certain unit sizes because there is not enough space for the valves to be installed inside the unit. These valves must be adjusted after they are installed.

SPLIT SYSTEMS
CSR, CSRC, CSWR and CSWRC units are used with remote condenser (“R” Models) or remote condensing (“RC” Models) sections.

Dependent upon how the unit has been ordered, the refrigerant tubing connections can be provided two ways. The CoolSpot unit might have the refrigerant lines (a) stubbed with a nitrogen holding charge; or (b) with AEROQUIP self-sealing quick connect fittings. Refrigerant piping between the sections is field supplied.

Sizing for the interconnecting refrigerant piping must be determined by the installing contractor using Table 4 and industry accepted guidelines. Pipe sizes must be based on the distance between the sections, elevation difference and location of the evaporator section above or below the condenser/condensing section.

INFORMATION
NOTE: If refrigerant line length will be over 100 ft, contact the factory. Additional refrigerant system components
Table 4: General Guidelines for Tubing Sizes (Up to 100 ft.)

<table>
<thead>
<tr>
<th>TONS</th>
<th>LIQUID LINE UP TO 100’</th>
<th>SUCTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UP TO 50’</td>
<td>50’ TO 100’</td>
</tr>
<tr>
<td>1</td>
<td>3/8</td>
<td>1/2</td>
</tr>
<tr>
<td>1-1/2</td>
<td>3/8</td>
<td>5/8</td>
</tr>
<tr>
<td>2</td>
<td>1/2</td>
<td>3/4</td>
</tr>
<tr>
<td>2-1/2</td>
<td>1/2</td>
<td>3/4</td>
</tr>
<tr>
<td>3</td>
<td>1/2</td>
<td>3/4</td>
</tr>
</tbody>
</table>

Notes:
1. No more than 50 feet rise on liquid line.
2. Maximum evaporator height over condenser / condensing section 20 feet.
3. Additional refrigerant components required for extended runs – consult factory.

INTERCONNECTING REFRIGERANT TUBING

After the separate sections have been installed, the interconnecting tubing can be run, using the self-sealing couplings supplied in the interconnect tubing kit. It is recommended that some refrigerant oil be placed on the coupling threads (Item (10), Figure 14), to facilitate threading. The following instructions apply:

1. Hand thread the female halves (Item (4), Figures 13 and 14) of the self-sealing couplings (supplied with the interconnect tubing kit) onto the male couplings. Turn union nut (Item (11), Figure 14) approximately 1 to 1-1/2 turns. This is to make sure that the interconnecting tubing will be routed and brazed with the self-sealing couplings in their final proper location, so that there will be no difficulty when the final coupling assembly is made.

2. If there is a hot gas bypass option, connect that coupling the same way.

3. Run the interconnecting tubing required.

CAUTION

When brazing tubing to the self-sealing couplings, be sure to use a wet rag on the quick-connects to prevent overheating the valves and damaging the seals.

INFORMATION

NOTE: The interconnect tubing kit contains a sufficient number of Schrader access valves to permit you to install one in each end of both the liquid and suction lines if you desire (field-supplied tubing).
4. After brazing the tubing to the self-sealing coupling halves and installing the Schrader valve fittings, evacuate each line completely. Check to make sure that each line holds a vacuum after removal of the vacuum pump (indicating no leaks). Then add a holding charge of Refrigerant-22 into the Schrader valves. Wipe off coupling seals and threaded surfaces with a clean cloth to prevent the inclusion of dirt or foreign material into the system. Lubricate rubber seal (Item 14) and metal seal (Item 15) in the male halves (Item 5) with refrigerant oil. Thread coupling halves together by hand to ensure proper mating of threads. Continue to hand-thread each half-coupling to its mating half until resistance is felt (approximately 1-1/2 to 1-3/4 turns). Complete the connection of the mating half-couplings with a wrench. The suction line couplings (size-12) will be totally engaged after an additional 5-1/2 to 5-3/4 turns. The liquid line couplings (size-8) will be totally engaged after an additional 4-1/2 to 4-3/4 turns.

5. Insulate the interconnecting suction line completely with 1/2" thick neoprene tubing insulation.

6. Add R-22 charge to the system to compensate for the additional interconnecting tubing as follows:
   a. For 3/8" liquid line – add 0.6 oz. per foot
   b. For 1/2" liquid line – add 1.2 oz. per foot
   c. For 5/8" liquid line – add 1.8 oz. per foot

The suction line should be pitched downward to the compressor, sloping approximately 1/4" every ten feet to facilitate oil return.

**INFORMATION**

**NOTE:** "P" traps (field-supplied) are required for all suction line risers every 15 ft. When the evaporator is above the condensing section, an inverted "P" trap should be incorporated as close as possible to the evaporator (this minimizes floodback/oil slugging during the off cycle). If the condensing section is more than 20 feet above the evaporator, consult the factory for specific refrigeration components.

**CHILLED WATER CONNECTIONS**

The chilled water unit uses sweat fittings for inlet and outlet. The piping should suffice the system pressure drop and pump capacity. The air must be bled from the chilled water loop and piping must be cleaned before operating the system.

**OPTIONS**

**Electric heat:**
Finned tubular heat elements are factory-installed after the evaporator. The electric heaters are provided with a limit control switch that turns the heater off if the temperature rises very high under abnormal conditions.

**Microprocessor controller:**
The CoolSpot can utilize several different microprocessor controls. Refer to the specific controls instructions sent with the unit.

**Humidifier:**
A steam canister humidifier option can be installed at the factory. The humidifier and canister section is located in the same compartment as the compressor.

**CAUTION**

On air-cooled units, care must be taken not to expose the humidifier, supply line and drain line to freezing conditions.

Steam is injected into the air stream with a steam dispensing tube. A 1/4" flare fitting is provided on the side of the unit for the supply water. The humidifier drain is connected to the drain connection tube coming out of the side of the unit. (Refer to section on drain connection, Page 9.)

**INFORMATION**

**NOTE:** The condensate pump and condensate pan are not adequate to handle the condensate and humidifier water volume.

Refer to the installation instructions for the humidifier for specific details on the humidifier function and operation.

Subject to change without notice.
Hot gas bypass:
Hot discharge gas is directed to the inlet of the evaporator after the thermal expansion valve. This places an artificial load on the system when the conditioned space load drops below the design load. The hot gas bypass valve is set to start modulating open at 58 PSIG suction pressure.

Freezestat:
This optional control is mounted on the discharge face of the evaporator coil. If the control senses 35°F, it will deactivate the compressor. The evaporator blower will continue to run. When the sensed temperature reaches 37.5°F, the compressor will again be activated.

Fan Cycling:
This option controls the head pressure by cycling the condenser blower motor off and on. The effective range of use for this option is down to 40°F. A fan cycling bypass thermostat (optional) is also available. This is an adjustable thermostat that is typically set between 65°F and 70°F. This thermostat will bypass the fan cycling control above the set point to minimize rapid or quick fan cycling at moderate outdoor temperatures.

Flooded Condenser:
When the outdoor ambient falls, the condensing pressure falls. This causes the discharge pressure to fall as well. Since the pressure differential across the thermostatic expansion valve port affects the rate of refrigerant flow, low head pressure generally causes insufficient refrigerant to be fed to the evaporator. Failure to have sufficient head pressure will result in low suction pressure and/or iced evaporator coils. The effective range for this option is down to -30°F.

The purpose of a flooded condenser is to hold back enough of the condensed liquid refrigerant so that some of the condenser surface is rendered inactive. This reduction of active condensing surface results in a rise in condensing pressure and sufficient liquid line pressure for normal system operation.

A three-way modulating valve and a receiver make up the flooded condenser refrigerant components.

The valve is placed in the liquid line after the condenser. The receiver is downstream of the valve. The valve limits the flow of liquid refrigerant from the condenser while at the same time regulating the flow of discharge gas around the condenser to the receiver.

During periods of low ambient operation, the receiver pressure falls until it approaches the setting of the control point of the valve (typically 180 PSIG for R-22). The valve then throttles to restrict the flow of liquid from the condenser. This raises the condenser pressure. Since it is the receiver pressure that is being maintained, the valve will then start to throttle open the discharge port when the differential between the condensing pressure and the receiver pressure exceeds 20 PSI. The hot discharge gas serves to heat up the cold liquid being passed from the condenser to the receiver. Thus the liquid reaches the receiver warm and with sufficient pressure to assure proper expansion valve operation.

The receiver is required to hold all of the excess/ additional liquid refrigerant in the system, since the refrigerant will be returned to the receiver when high ambient conditions exist.

In the off-cycle the refrigerant can “migrate” to the condenser, during periods of low outdoor ambient. On a call for start-up, the evaporator pressure may not build up to the cut-in point of the low pressure control. The result may be a failure of the compressor to start or to short cycle. To eliminate this potential problem, a time delay is added to bypass the low pressure switch during start-up.

Buck/Boost Transformer:
Units being applied on a 277-1-60 power supply require the use of a buck/boost transformer. The transformer will reduce the voltage from 277-1-60 to 230-1-60. The CoolSpot unit is supplied with components for 230-1-60 application. Table 5 lists the buck/boost transformers available from United CoolAir. Figure 15 illustrates the wiring for each transformer.

<table>
<thead>
<tr>
<th>United CoolAir Part Number</th>
<th>LOAD</th>
<th>Max. Size of Fuse or Breaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>4CA1901</td>
<td>KVA</td>
<td>1.44</td>
</tr>
<tr>
<td></td>
<td>Amps</td>
<td>6.25</td>
</tr>
<tr>
<td>4CA1902</td>
<td>KVA</td>
<td>2.88</td>
</tr>
<tr>
<td></td>
<td>Amps</td>
<td>12.5</td>
</tr>
<tr>
<td>4CA1903</td>
<td>KVA</td>
<td>4.31</td>
</tr>
<tr>
<td></td>
<td>Amps</td>
<td>18.75</td>
</tr>
<tr>
<td>4CA1904</td>
<td>KVA</td>
<td>5.75</td>
</tr>
<tr>
<td></td>
<td>Amps</td>
<td>25.0</td>
</tr>
<tr>
<td>4CA1905</td>
<td>KVA</td>
<td>8.63</td>
</tr>
<tr>
<td></td>
<td>Amps</td>
<td>37.5</td>
</tr>
<tr>
<td>4CA1906</td>
<td>KVA</td>
<td>11.5</td>
</tr>
<tr>
<td></td>
<td>Amps</td>
<td>50.0</td>
</tr>
<tr>
<td>4CA1907</td>
<td>KVA</td>
<td>17.25</td>
</tr>
<tr>
<td></td>
<td>Amps</td>
<td>75.0</td>
</tr>
</tbody>
</table>

Single-Phase

Subject to change without notice.
FIGURE 15: Transformer Wiring

Line Voltage (Available) 277 Load Voltage (Output) 230

Solenoid Bypass for Water Regulating Valve:
On water-cooled units a N.O. solenoid valve is placed in the water supply loop. During the “off” cycle the solenoid is opened, thus allowing water to bypass the heat exchanger. The solenoid device is rated for 150 PSIG or less.

Chilled Water Valves:
Chilled water valves, if supplied by United CoolAir, are typically on/off only. The valve would be shipped loose for installation in the field. The valve is to be mounted in the outlet line of the coil.

Compressor:
The standard compressor is reciprocating. Scroll compressors are available in certain sizes and voltages.

Three-way water regulating valve:
Three-way water regulating valves modulate the water flow through the heat exchanger to maintain the head pressure. The valves for the 2-1/2 and 3-ton units are shipped loose to be field-installed externally.

High pressure water regulating valve:
Water regulating valves with a pressure rating of 350 PSIG are available. These valves are all shipped loose for field installation external to the unit.

THERMOSTAT
Standard units (no heating) are supplied with single stage thermostats, cool only.

When a programmable thermostat is used, a sixth contact must be added to the terminal board. Three connections must be made from this sixth contact… to the programmable thermostat, to a ground and to the 24 volt coil of the evaporator fan motor contactor (K2). (See Figure 18.)

Heat pump units require a heat pump thermostat. Units with electric heat must utilize a single stage cool/single stage heat thermostat.

FIGURE 16: 2-Way Single Circuit With Bypass

FIGURE 17: 3-Way Single Circuit

FIGURE 18: Adding Sixth Contact
Water Flow Switch Installation

Units ordered with the Head Pressure Control option will MODULATE the water flow to maintain adequate refrigerant head pressure. This reduction in water flow may cause nuisance trips of the water flow switch if installed in the branch tubing feeding condenser water to the air conditioner. Water flow switch trips will cause “loss of water flow” alarms, which in turn will prevent the compressors from starting or will cause the active compressors to shut down.

United CoolAir recommends installing the water flow switch in the MAIN water piping supplying condenser water to the building.

Please see the following illustration below for reference:

* Flow Switch should be installed as close to unit’s supply branch to accurately reflect flow conditions in the main line.
Maintenance Procedures

FILTERS

Do NOT run unit without a filter.
A throwaway filter is supplied and is an Underwriters Laboratories Class 2 pleated extended surface type. Filter should be checked monthly for dirt accumulation and changed when necessary. Replacement filter must be the same type as originally supplied.
Field access is attained by opening the return air grille.

INFORMATION

NOTE: Unit must be shut off at the disconnect switch before the filter is serviced. Be sure to check that the air flow direction arrows on the filter points in the right direction.

TABLE 6: Filter Sizes And Types

<table>
<thead>
<tr>
<th>UNIT</th>
<th>FILTER SIZE/TYP</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>20 x 20 x 1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Throwaway</td>
<td></td>
</tr>
<tr>
<td>With MiniMarvel</td>
<td>18 x 20 x1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Throwaway</td>
<td></td>
</tr>
</tbody>
</table>

CLEANING THE WATER-COOLED CONDENSER

Cleaning a water-cooled condenser helps to improve the heat transfer rate, reduce operation cost, restore efficiency, prolong heat exchanger life and reduce pressure drop pumping cost. Deposits from water or water treatments, such as scale, lime, rust or mud, are removed.

Each installation is unique; therefore, the fluid quality and operating conditions will dictate when the heat exchanger needs to be cleaned.

As a general practice it is beneficial to record the details on temperatures entering and leaving the heat exchanger and the pressure drop across the heat exchanger when first installed (see Page 12, "Hook-Up"). After a period of time these values can be checked to see how much loss of operating performance has occurred. If a 10% or greater change has occurred it would be beneficial to clean the heat exchanger.

A 5% solution of Phosphoric Acid or Oxalic Acid can be considered for cleaning. However, there are several commercially available environmentally safe products on the market that will do an excellent job. Contact your local wholesaler for availability. Follow all safety guidelines published by the cleaner manufacturer.

There is a safety concern whenever using any fluid at elevated temperatures. The cleaner manufacturers recommend using the cleaners at 120°F or lower. Since the heat exchanger might be in operation just prior to the cleaning, it should be cooled to lower than the 120°F threshold. Due to the ability of the heat exchanger mass to hold heat, this may take a period of time. If possible, run cool water through the unit to help dissipate some of the heat.

Check each component as to the suitability of running the cleaner through them. For example, strainers may not be good to run the cleaner through. However, while there cleaning the heat exchanger, it would be a good time to also do a clean and check on the strainer.

NOTE: Do not chemically clean a refrigerant circuit.

1. Record performance values (Ref. following charts). Turn off the fluid source.
2. Cool the heat exchanger, if above 120°F.
3. Close the valves to and from the fluid circuit loop.
4. Open the drain valve and drain all fluid from the heat exchanger.
5. Back flush the heat exchanger to remove any loose particles.
6. Attach pump and hoses as illustrated below, making sure all fittings and connections are secure.
7. Check all valving to make sure valves to system are closed and valves for cleaning loop are open.
8. Calculate the total gallons volume of the heat exchanger and the piping using the following charts:
9. Calculate the volume of de-scaler required:
   Water Quantity = 1/2 Total Gallons = _______ Gallons
   De-Scaler Quantity = 1/2 Total Gallons = _______ Gallons

10. Make sure pump is primed.

11. Circulate the required quantity until fluid characteristics indicate that de-scaling process is complete. Manufacturer's instructions will provide details on this.

12. Disconnect pump, hoses and tank from heat exchanger.

13. Flush heat exchanger with water.

14. Return heat exchanger and system components to service. Check all valves and fitting connections.

15. Record performance values:

   | Pressure Drop | |  |
   | Before | After |
   |
   | Entering Temp. | |  |
   | | |
   | Leaving Temp. | |  |

   Heat Exchanger
   Cleaning Solution
   Pump

   Figure 19: Cleaning Process Diagram
BLOWER

Air-cooled self-contained units are provided with adjustable belt drive blower packages for the condensing section. Check that the blower wheel is tight on the shaft and does not contact the housing. Bearings are permanently sealed, but should be checked periodically for signs of wear. Check for restrictions or foreign material in the air circuit.

The drive may be adjusted for different static pressures. If such an adjustment is made, check that the motor current draw does not exceed the motor nameplate current by more than 10%.

INFORMATION

On units with three-phase fan motors, check for proper blower rotation at start-up. If they run backwards, turn off the power, interchange two of the incoming power leads, then reapply power.

TABLE 7: Blower Capacities

<table>
<thead>
<tr>
<th>UNIT</th>
<th>CONDENSER CFM</th>
<th>MAX ESP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Ton</td>
<td>1100</td>
<td>.5</td>
</tr>
<tr>
<td>1-1/2 Ton</td>
<td>1200</td>
<td>.5</td>
</tr>
<tr>
<td>2 Ton</td>
<td>1500</td>
<td>.5</td>
</tr>
<tr>
<td>2-1/2 Ton</td>
<td>2100</td>
<td>.5</td>
</tr>
<tr>
<td>3 Ton</td>
<td>2500</td>
<td>.5</td>
</tr>
</tbody>
</table>

BLOWER MOTORS

All blower motors are equipped with thermal overload protectors.

CAUTION

Before servicing, open disconnects to unit, as motor will start when automatic thermal overload resets.

BLOWER SPEED ADJUSTMENT

Blower speed may be changed by adjusting the variable diameter sheave provided on the blower drive motor. Sheave may be adjusted by removing the belt and loosening the setscrew located in the hub of the outer flange. With the setscrew loosened, the flange may be turned clockwise to increase blower speed and counter-clockwise to reduce blower speed.

CAUTION

Setscrew must be positioned directly above a flat section of the threaded sheave shaft before tightening to hold adjustment.

INFORMATION

NOTE: Verify that the motor current draw does not exceed the motor nameplate current by more than 10%.

BLOWER MOTOR LUBRICATION

Motor manufacturers indicate that motors never need re-lubrication, but if units run continuously, it is recommended that they be re-lubricated every 5500 hours (7-8 months). If unit motors are run in a cyclical manner, lubrication is recommended every 5 years.

If unit has been inactive or in storage for over a year, re-lubricate before starting.

Use Chevron SRI #2 lubricant or equivalent in the following quantities: 0.6 cu. in. or 2 teaspoons. Keep grease clean, and do not mix dissimilar greases.

Clean area around fitting. Remove purge plug (only on larger motors) for greasing, and replace after at least 20 minutes of operation after greasing. For safety, we recommend re-lubricating while the motor is stopped.

Over-greasing, either in quantity or speed of injection, can cause premature bearing failure. Apply the recommended quantity of grease gradually, taking at least one minute to do so. Rotate the motor while applying the grease.
BELTS
Drive belts should be examined periodically for wear and for correct tension. Too tight a belt can cause bearing wear; too loose a belt will cause slip-page. If the two legs of the belt are pressed in mid-way between the pulley and the sheave, resulting in 1-1/2" to 1" of movement, the belt is tensioned properly. Belt tension can be adjusted by means of the adjusting bolt, which requires loosening of a nut to move the motor and change belt position.

REFRIGERANT SYSTEMS
All United CoolAir systems contain a liquid line sight glass. If bubbles appear in the sight glass, the system is either undercharged with refrigerant, or there may be a restriction in the liquid line upstream of the sight glass. However, the appearance of bubbles may be normal in units with hot gas bypass.

The sight glass contains a moisture indicator which changes color when moisture is present in the system. If sight glass appearance is abnormal, servicing is required.

EVAPORATOR AND AIR-COOLED CONDENSER COILS
Check semimonthly the condition of the face of both the evaporator and condenser coils.

A dirty condenser coil will cause high condensing pressures, resulting in higher power consumption and possibly system shut-down by high-pressure safety control. A dirty evaporator coil will reduce unit capacity and eventually will cause shut-down by the low pressure safety control.
SEQUENCE OF OPERATION

COOLING SEQUENCE OF OPERATION

1. Before starting unit, make sure electrical power has been turned on for a minimum of 24 hours. This ensures that any liquid refrigerant is “driven” out of the crankcase.

2. For water-cooled units, make sure condenser water is available. Open all stop valves. Verify that cooling tower is functioning, if this is the source of condensing water supply. Bleed the air from the loop.

3. The following sequence is based on the unit being controlled by a room thermostat. If another control type is being utilized, reference to the instructions for that device may be required.
   a. Raise thermostat setpoint to highest level.
   b. Set System switch to “OFF” position.
   c. Set Fan switch to the “AUTO” position.
   d. Moving the Fan switch to the “ON” position should cause the evaporator blower motor to run. Moving the Fan switch back to “AUTO” should stop the blower.
   e. Move the System switch to the “COOL” position. Slowly lower the thermostat setting to call for cooling. The evaporator blower should start (assumes Fan switch set to “AUTO”) and the compressor should start.
   f. Set room thermostat at desired space temperature. Set the Fan switch to “AUTO” or “ON”. The unit will cycle as required to maintain conditions.

4. Chill water sequence is the same as above, except compressor activation is replaced by the chill water valve function.

5. Heat pump cooling sequence is the same as above, except the reversing valve will also be activated when the compressor cycle is started.

HEATING SEQUENCE OF OPERATION (OTHER THAN HEAT PUMP)

1. The following sequence is based on the unit being controlled by a room thermostat. If another control type is being utilized, reference to the instructions for that device may be required.
   a. Lower thermostat setpoint to the lowest level.
   b. Set System switch to “OFF” position.
   c. Set Fan switch to “AUTO” position.
   d. Moving the Fan switch to the “ON” position should cause the evaporator blower motor to run. Moving the Fan switch back to “AUTO” should stop the blower.
   e. Move the System switch to the “HEAT” position. Slowly raise the thermostat setting to call for heating. The evaporator blower should start (assumes Fan switch set to “AUTO”) and the electric heating element will be activated.
   f. Set room thermostat at desired space temperature. Set the Fan switch to “AUTO” or “ON”. The unit will cycle as required to maintain conditions.
## PHYSICAL DATA

### TABLE 8: Common Physical Data

<table>
<thead>
<tr>
<th>MODEL</th>
<th>CS</th>
<th>CSR</th>
<th>CSRC</th>
<th>CSW</th>
<th>CSWRC</th>
<th>CSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage (d)</td>
<td>208/230-1-60</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>208/230-3-60</td>
<td>Yes</td>
<td>Yes</td>
<td>(e)</td>
<td>Yes</td>
<td>(e)</td>
</tr>
<tr>
<td></td>
<td>460-3-60</td>
<td>Yes</td>
<td>Yes</td>
<td>(e)</td>
<td>Yes</td>
<td>(e)</td>
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<tr>
<td>Filter</td>
<td>Size</td>
<td>20 x 20 x 1 (b)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Qty</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Type</td>
<td>Pleated Throwaway</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evap. Blower</td>
<td>Qty</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Size</td>
<td>9 - 7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cond. Blower</td>
<td>Qty</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Compressor</td>
<td>Qty</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 9: Air-cooled Physical Data

<table>
<thead>
<tr>
<th>TONS MODEL</th>
<th>1</th>
<th>1-1/2</th>
<th>2</th>
<th>2-1/2</th>
<th>3</th>
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</thead>
<tbody>
<tr>
<td>Supply Air</td>
<td>CFM</td>
<td>400</td>
<td>600</td>
<td>800</td>
<td>1000</td>
</tr>
<tr>
<td>Evap. Blower</td>
<td>HP</td>
<td>1/4</td>
<td>1/4</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>Evaporator Coil</td>
<td>Rows Deep</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Face Area (ft²)</td>
<td></td>
<td></td>
<td></td>
<td>2.1</td>
</tr>
<tr>
<td></td>
<td>FPI</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(a) Air flow performance may require other than standard drive components.
(b) Filter size changes to 18 x 20 x 1 when the MiniMarvel option is utilized.
(c) Includes 2-way, 150 PSIG water regulating valve.
(d) Refer to Technical Data for electrical characteristics.
(e) 3-phase units only available when a humidifier is included.
# PHYSICAL DATA

## TABLE 10: Water-Cooled Physical Data

<table>
<thead>
<tr>
<th>TONS MODEL</th>
<th>1</th>
<th>1-1/2</th>
<th>2</th>
<th>2-1/2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water-Cooled Cond.</td>
<td>Pressure Drop (c)</td>
<td>3.7</td>
<td>9.42</td>
<td>7</td>
<td>6.4</td>
</tr>
<tr>
<td></td>
<td>GPM</td>
<td>3</td>
<td>4.5</td>
<td>6</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>Int. Volume (Water, Gallons)</td>
<td>0.1</td>
<td>0.1</td>
<td>0.12</td>
<td>0.2</td>
</tr>
<tr>
<td>Charge R-22 (Lbs-Ozs)</td>
<td>3 - 3</td>
<td>3 - 5</td>
<td>3 - 8</td>
<td>3 - 12</td>
<td>3 - 13</td>
</tr>
<tr>
<td>Weight (Net Operating)</td>
<td>260</td>
<td>265</td>
<td>270</td>
<td>275</td>
<td>280</td>
</tr>
</tbody>
</table>

## Table 11: Chilled Water Physical Data

<table>
<thead>
<tr>
<th>TONS MODEL</th>
<th>1</th>
<th>1-1/2</th>
<th>2</th>
<th>2-1/2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Air</td>
<td>CFM</td>
<td>400</td>
<td>600</td>
<td>800</td>
<td>1000</td>
</tr>
<tr>
<td>Evap. Blower</td>
<td>HP</td>
<td>1/4</td>
<td>1/4</td>
<td>1/2</td>
<td>1/2</td>
</tr>
<tr>
<td>Chilled Water Coil</td>
<td>Pressure Drop (f)</td>
<td>35</td>
<td>6.4</td>
<td>9.7</td>
<td>3.8</td>
</tr>
<tr>
<td></td>
<td>GPM</td>
<td>2.6</td>
<td>3.6</td>
<td>4.5</td>
<td>5.7</td>
</tr>
<tr>
<td></td>
<td>Rows Deep</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Face Area (ft²)</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>Valve Size</td>
<td>1/2</td>
<td>1/2</td>
<td>3/4</td>
<td>3/4</td>
</tr>
<tr>
<td>Weight (Net Operating)</td>
<td>190</td>
<td>190</td>
<td>195</td>
<td>198</td>
<td>200</td>
</tr>
</tbody>
</table>

(a) Air flow performance may require other than standard drive components.
(b) Filter size changes to 18 x 20 x 1 when the MiniMarvel option is utilized.
(c) Includes 2-way, 150 PSIG water regulating valve.
(d) Refer to Technical Data for electrical characteristics.
(e) 3-phase units only available when a humidifier is included.
(f) Does not include valve.
DIMENSIONS

Maximum clearance for servicing is 26° on all sides.

Notes:
1. All dimensions outside unless otherwise noted.
2. All dimensions ±1/4".

FIGURE 20: Water-cooled, Chilled Water, Remote Condensing Unit
DIMENSIONS

Maximum clearance for servicing is 26° on all sides.

Notes:
1. All dimensions outside unless otherwise noted.
2. All dimensions ± 1/4".

FIGURE 21: Air-cooled Unit
# Troubleshooting Guide

## ELECTRICAL HAZARD

Turn OFF power to unit before conducting any troubleshooting, unless the tests you are performing require system operation. Keep hands, clothing and tools clear of electrical terminals.

## WARNING

Make sure to keep hands and clothing clear of any moving belts, blowers and motors while performing any tests. Failure to do so could result in death or serious bodily injury.

## CAUTION

Any troubleshooting or test procedures are to be conducted by qualified HVAC service personnel or electricians only. Potentially hazardous situations which may result in personal injury, equipment or property damage.

## INFORMATION

For operating and troubleshooting instructions for microprocessor controller, refer to specific controller instructions that accompany the unit.

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control is erratic</td>
<td>1. Control wiring not installed correctly&lt;br&gt;2. Loose control connections&lt;br&gt;3. Broken wiring</td>
<td>1. Check wiring connections against schematic.&lt;br&gt;2. Check all connections for tightness.&lt;br&gt;3. Check wire continuity.</td>
</tr>
<tr>
<td>Blower fails to start</td>
<td>1. Controller not set properly&lt;br&gt;2. Motor failure&lt;br&gt;3. Defective contactor&lt;br&gt;4. Overload tripped&lt;br&gt;5. Controller alarm&lt;br&gt;6. VFD not functioning properly</td>
<td>1. Turn on and set controller for desired operation&lt;br&gt;2. Replace motor&lt;br&gt;3. Replace contactor&lt;br&gt;4. Check cause and resolve then reset manual overload (internal overloads will have to reset themselves)&lt;br&gt;5. Resolve alarm condition&lt;br&gt;6. Confirm VFD programming and operation</td>
</tr>
<tr>
<td>Compressor fails to start</td>
<td>1. Controller not set properly&lt;br&gt;2. Loss of refrigerant charge&lt;br&gt;3. High head pressure&lt;br&gt;4. Low line voltage&lt;br&gt;5. Controller alarm</td>
<td>1. Turn on and set controller for desired operation&lt;br&gt;2. Repair leak, evacuate and recharge refrigerant system&lt;br&gt;3. Confirm proper fluid flow quantity through condenser&lt;br&gt;4. Confirm acceptable fluid temperatures entering the condenser&lt;br&gt;5. Resolve incoming voltage issue&lt;br&gt;6. Resolve alarm condition [Note: Compressor internal overload may require an extended period of time (1 hour or more) to reset]</td>
</tr>
<tr>
<td>Compressor short cycles</td>
<td>1. Reduced air flow&lt;br&gt;2. Loss of refrigerant charge&lt;br&gt;3. Short cycling of conditioned air&lt;br&gt;4. Drain pan switch open</td>
<td>1. Check filters and coil for any blockages&lt;br&gt;2. Replace filters if dirty&lt;br&gt;3. Repair leak, evacuate and recharge refrigerant system&lt;br&gt;4. Make sure that supply air is not short cycling back into return air stream&lt;br&gt;5. Confirm that unit condensate is draining properly.</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>POSSIBLE CAUSE</td>
<td>POSSIBLE SOLUTION</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Evaporator coil ices    | 1. Lack of air flow  
2. Low return air temperature  
3. Loss of refrigerant charge  
4. VFD not functioning properly | 1. Check filters and coil for any blockages  
2. Replace filters if dirty  
3. Verify that blower is rotating in the proper direction  
4. Make sure that supply air is not short cycling back into return air stream  
5. Repair leak, evacuate and recharge refrigerant system |
| Noisy compressor        | 1. Expansion valve stuck open  
2. Worn or scarred compressor bearings  
3. Excessive head pressure  
4. Broken compressor valve (compressor knocking)  
5. Liquid slugging | 1. Ensure thermal expansion valve bulb is tight on suction line  
2. Confirm thermal expansion valve bulb is located properly on suction line  
3. Check superheat  
4. Replace compressor  
5. Reduce head pressure  
6. System overcharged. Reclaim excess refrigerant from the high side of the system. |
| System short of capacity| 1. Flash gas in liquid line  
2. Expansion valve stuck open or possibly obstructed  
3. Clogged filter drier  
4. Iced or clogged evaporator coil  
5. Head pressure control valve not operating properly  
6. Condenser needs cleaned | 1. Check for refrigerant leaks  
2. Repair leak, evacuate and recharge refrigerant system  
3. Check sub-cooling  
4. Ensure thermal expansion valve bulb is tight on suction line  
5. Confirm thermal expansion valve bulb is located properly on suction line  
6. Replace thermal expansion valve  
7. Replace filter drier  
8. Check filters and coil for any blockages  
9. Replace filters if dirty  
10. Verify that blower is rotating in the proper direction  
11. Confirm proper fluid flow quantity through condenser  
12. Confirm acceptable fluid temperatures entering the condenser  
13. Clean condenser |
| Head pressure too high  | 1. Possible non-condensable in system  
2. Overcharge of refrigerant  
3. Condenser water flow not adequate  
4. Condenser entering fluid temperature too hot  
5. Condenser air intake, duct or coil blocked.  
6. Condenser blower not operating or running backwards. | 1. Repair leak, evacuate and recharge refrigerant system. Install new filter drier.  
2. Reclaim excess refrigerant from high side of system  
3. Confirm proper fluid flow quantity through condenser  
4. Confirm acceptable fluid temperatures entering the condenser  
5. Verify that head pressure control valve is operational  
6. Reset high pressure safety switch if tripped  
7. Clean away debris from condenser air circuit.  
8. Check phase of incoming power to unit (3 ph units only). Reverse any two incoming power supply wires (except ground). |
| Head pressure too low    | 1. Condenser water flow too high  
2. Entering fluid temperature too low  
3. Excessive air flow across condenser. | 1. Confirm proper fluid flow quantity through condenser  
2. Confirm acceptable fluid temperatures entering the condenser  
3. Confirm proper air flow amount. Adjust blower drive package as necessary. |
<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSE</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
</table>
| Suction pressure too low | 1. Flash gas in liquid line  
2. Obstructed expansion valve  
3. Loss of fluid in expansion valve bulb  
4. Clogged filter drier  
5. Lack of air flow  
6. Entering WB too low  
7. Evaporator blower running backwards | 1. Check for refrigerant leak  
2. Repair leak, evacuate and recharge refrigerant system.  
3. Replace thermal expansion valve  
4. Replace filter drier  
5. Check filters and coil for any blockages  
6. Verify that blower is rotating in the proper direction  
7. Confirm that entering return air conditions fall within acceptable range  
8. Reset low pressure safety switch if necessary  
9. Check phase of incoming power to unit (3 ph units only). Reverse any two incoming power supply wires (except ground). |
| No cooling           | 1. Controller not set properly  
2. Control wiring issue  
3. Controls in an alarm condition  
4. High or low pressure switch open  
5. Compressor thermal overload open | 1. Turn on and set controller for desired operation  
2. Check wiring connections against schematic.  
3. Check all connections for tightness.  
4. Check wire continuity.  
5. Refer to controller troubleshooting  
6. Reset high or low pressure switch  
7. Compressor internal overload may require an extended period of time (1 hour or more) to reset |
| Condensate carry over | 1. Air flow too high | 1. Reduce air flow |
| Condensate pump does not run | 1. Check to see that power to the pump is present  
2. Confirm that float is moves freely  
3. Confirm that dirt or algae is not interfering with float action | 1. Locate and repair electric issue.  
2. Clean float and sump |
| Condensate pump runs with no discharge | 1. Tubing blocked or kinked  
2. Check valve blocked  
3. Impeller blocked  
4. Tubing elevation or run exceeds head capability. | 1. Inspect, clean or straighten as necessary.  
2. Clean check valve  
3. Remove debris from pump impeller  
4. Verify tubing run is within pump head limitations. |
Limited Warranty

Important Notice!

This Limited Warranty specifically provides that all installation, operation and repairs of product and parts covered under this limited warranty must be made with authorized parts and by a licensed HVAC service provider. The product(s) must be properly installed, and maintained by a licensed HVAC service provider in accordance with the installation, operation, and maintenance instructions provided by United CoolAir Corporation. Failure to conform to such specifications and/or instructions shall void this limited warranty. United CoolAir may request written documentation showing the proper preventative maintenance.

United CoolAir warrants this product to be free from defects in factory workmanship and material under normal use and service and will, at its option, repair or replace any parts that prove to have such defects within a period of one (1) year from the date of product installation. This warranty extends only to the original consumer purchaser in accordance with the then current Terms and Conditions and is non-transferable.

For this warranty to apply, the product must be installed according to United CoolAir recommendations and specifications, and in accordance with all local, state, national and provincial codes. The product must not be moved from its original place of installation. The replacement part assumes the unused portion of this warranty.

This limited warranty applies only to products installed in the continental United States, Alaska, Hawaii and Canada.

Exclusions

This Limited Warranty does not cover any:

1. Shipping, labor or material charges.
2. Damages resulting from transportation, installation or servicing.
3. Damages resulting from accident, abuse, fire, flood, alteration or acts of God.
4. Tampering with, altering, defacing or removing the product serial number will serve to void this warranty.
5. Damages resulting from use of the product in a corrosive atmosphere (such as concentrations of acids or halogenated hydrocarbons).
6. Damages resulting from inadequacy or interruption of electrical service, improper voltage conditions, blown fuses, or other like circumstances.
7. Cleaning or replacement of filters or belts.
8. Damages resulting from failure to properly and regularly clean air and/or water side of condenser and evaporator.
9. Damages resulting from: (I) freezing of condenser water or condensate; (II) use of corrosive water; (III) fouling or restriction of the air/water circuit by foreign material or like causes.
10. Damages resulting from operation with inadequate or interrupted supply of air or water.
11. Damages resulting from use of components or accessories not approved by United CoolAir.
12. This warranty does not apply to the installation, plumbing and wiring not integral to the product.
13. Damages resulting from improper application or sizing of unit.

This warranty is in lieu of all other warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose.

Some states (provinces) do not allow the disclaimer of implied warranty, so that the above disclaimer may not apply to you.

Some states (provinces) allow only a partial limitation on implied warranties to limit the duration of implied warranties to the duration of the express warranty. In such states (provinces), the duration of implied warranties is hereby expressly limited to the duration of the express warranty on the face hereof.

In no event, whether as a result of breach of warranty or contract, tort (including negligence) strict liability or otherwise, shall United CoolAir be liable for special, incidental, or consequential damages, including but not limited to loss of use of the equipment or associated equipment, lost revenues or profits, cost of substitute equipment or cost of fuel or electricity. The above limitations shall inure to the benefit of United CoolAir’s suppliers and subcontractors. The above limitation on consequential damages shall not apply to injuries to persons in the case of consumer goods.

Some states (provinces) do not allow the exclusion or limitation of liability for consequential damages, or for strict liability in tort, so that the above exclusions and limitations may not apply to you.

United CoolAir does not assume, or authorize any other person to assume for United CoolAir, any other liability for the sale of this product.

This warranty gives you specific legal rights. You may also have other rights which vary from state to state (province to province).

To obtain warranty service

Contact the installing or servicing contractor with the details of the problem. Provide the model number, serial number and date of installation. Warranty requests directed to the factory will be referred back through the local distribution network.

Model: _______________ Serial Number: ______________ Date of Installation: ________
Limited Warranty for Hermetic Compressors

United CoolAir warrants the hermetic compressor in this product to be free from defects in factory workmanship and material under normal use and service and will, at its option, repair or replace the hermetic compressor if it proves to have such defects within a period of five (5) years from the date of product installation. This warranty extends only to the original consumer purchaser in accordance with the then current Terms and Conditions and is non-transferable. If a United CoolAir unit is matched with another manufacturer’s unit the compressor warranty is limited to 1 year from the date of product installation.

For this warranty to apply, the product must be installed according to United CoolAir recommendations and specifications, and in accordance with all local, state, national and provincial codes. The product must not be moved from its original place of installation. The replacement part assumes the unused portion of this warranty.

This limited warranty applies only to products installed in the continental United States, Alaska, Hawaii and Canada.

Exclusions

This Limited Warranty does not cover any:

1. Shipping, labor or material charges.
2. Damages resulting from transportation, installation or servicing.
3. Damages resulting from accident, abuse, fire, flood, alteration or acts of God.
4. Tampering with, altering, defacing or removing the product serial number will serve to void this warranty.
5. Damages resulting from use of the product in a corrosive atmosphere (such as concentrations of acids or halogenated hydrocarbons).
6. Damages resulting from inadequacy or interruption of electrical service, improper voltage conditions, blown fuses, or other like circumstances.
7. Cleaning or replacement of filters or belts.
8. Damages resulting from failure to properly and regularly clean air and/or water side of condenser and evaporator.
9. Damages resulting from: (I) freezing of condenser water or condensate; (II) use of corrosive water; (III) fouling or restriction of the air/water circuit by foreign material or like causes.
10. Damages resulting from operation with inadequate or interrupted supply of air or water.
11. Damages resulting from use of components or accessories not approved by United CoolAir.
12. This warranty does not apply to the installation, plumbing and wiring not integral to the product.
13. Damages resulting from improper application or sizing.

This warranty is in lieu of all other warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose.

Some states (provinces) do not allow the disclaimer of implied warranty, so that the above disclaimer may not apply to you.

Some states (provinces) allow only a partial limitation on implied warranties to limit the duration of implied warranties to the duration of the express warranty. In such states (provinces), the duration of implied warranties is hereby expressly limited to the duration of the express warranty on the face hereof.

In no event, whether as a result of breach of warranty or contract, tort (including negligence) strict liability or otherwise, shall United CoolAir be liable for special, incidental, or consequential damages, including but not limited to loss of use of the equipment or associated equipment, lost revenues or profits, cost of substitute equipment or cost of fuel or electricity. The above limitations shall inure to the benefit of United CoolAir’s suppliers and subcontractors. The above limitation on consequential damages shall not apply to injuries to persons in the case of consumer goods.

Some states (provinces) do not allow the exclusion or limitation of liability for consequential damages, or for strict liability in tort, so that the above exclusions and limitations may not apply to you.

United CoolAir does not assume, or authorize any other person to assume for United CoolAir, any other liability for the sale of this product.

This warranty gives you specific legal rights. You may also have other rights which vary from state to state (province to province).

To obtain warranty service

Contact the installing or servicing contractor with the details of the problem. Provide the model number, serial number and date of installation. Warranty requests directed to the factory will be referred back through the local distribution network.

Model: ______________ Serial Number: _______________ Date of Installation: ________
Limited Warranty Condensing Section

United CoolAir warrants this product to be free from defects in factory workmanship and material under normal use and service and will, at its option, repair or replace any parts that prove to have such defects within a period of one (1) year from the date of product installation, to begin no later than six (6) months after product shipment from the factory. This warranty extends only to the original consumer purchaser in accordance with the then current Terms and Conditions and is non-transferable.

For this warranty to apply, the product must be installed according to United CoolAir recommendations and specifications, and in accordance with all local, state, national and provincial codes. The product must not be moved from its original place of installation. The replacement part assumes the unused portion of this warranty.

This limited warranty applies only to products installed in the continental United States, Alaska, Hawaii, Puerto Rico and Canada.

EXCLUSIONS

This Limited Warranty does not cover any:

1. Shipping, labor or material charges.
2. Damages resulting from transportation, installation or servicing.
3. Damages resulting from accident, abuse, fire, flood, alteration or acts of God.
4. Tampering with, altering, defacing or removing the product serial number will serve to void this warranty.
5. Damages resulting from use of the product in a corrosive atmosphere (such as concentrations of acids or halogenated hydrocarbons).
6. Damages resulting from inadequacy or interruption of electrical service, improper voltage conditions, blown fuses, or other like circumstances.
7. Cleaning or replacement of filters or belts.
8. Damages resulting from failure to properly and regularly clean air and/or water side of condenser and evaporator.
9. Damages resulting from: (I) freezing of condenser water or condensate; (II) use of corrosive water; (III) fouling or restriction of the air/water circuit by foreign material or like causes.
10. Damages resulting from operation with inadequate or interrupted supply of air or water.
11. Damages resulting from use of components or accessories not approved by United CoolAir.
12. This warranty does not apply to the installation, plumbing and wiring not integral to the product.
13. Damages resulting from improper application or sizing of unit.
14. In the event that the refrigerant type is changed, as a result of a compressor failure and the same type of compressor is not available, any subsequent refrigerant circuit component failures will not be covered under the Limited Warranty.

This warranty is in lieu of all other warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose.

Some states (provinces) do not allow the disclaimer of implied warranty, so that the above disclaimer may not apply to you.

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In no event, whether as a result of breach of warranty or contract, tort (including negligence) strict liability or otherwise, shall United CoolAir be liable for special, incidental, or consequential damages, including but not limited to loss of use of the equipment or associated equipment, lost revenues or profits, cost of substitute equipment or cost of fuel or electricity. The above limitations shall inure to the benefit of United CoolAir’s suppliers and subcontractors. The above limitation on consequential damages shall not apply to injuries to persons in the case of consumer goods.

Some states (provinces) do not allow the exclusion or limitation of liability for consequential damages, or for strict liability in tort, so that the above exclusions and limitations may not apply to you.

United CoolAir does not assume, or authorize any other person to assume for United CoolAir, any other liability for the sale of this product.

This warranty gives you specific legal rights. You may also have other rights which vary from state to state (province to province).

To obtain warranty service

Contact the installing or servicing contractor with the details of the problem. Provide the model number, serial number and date of installation. Warranty requests directed to the factory will be referred back through the local distribution network.

Continued on Next Page

Model: _______________ Serial Number: _______________ Date of Installation: ________

Subject to change without notice.
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30.1-IM (0520)
Limited Warranty for Hermetic Compressors

United CoolAir warrants the hermetic compressor in this product to be free from defects in factory workmanship and material under normal use and service and will, at its option, repair or replace the hermetic compressor if it proves to have such defects within a period of one (1) year from the date of product installation, to begin no later than six (6) months after product shipment from the factory. This warranty extends only to the original consumer purchaser in accordance with the then current Terms and Conditions and is non-transferable.

For this warranty to apply, the product must be installed according to United CoolAir recommendations and specifications, and in accordance with all local, state, national and provincial codes. The product must not be moved from its original place of installation. A second compressor failure in the same refrigerant circuit is indicative of an application issue and will not be covered under the Limited Warranty.

This limited warranty applies only to products installed in the continental United States, Alaska, Hawaii, Puerto Rico and Canada.

EXCLUSIONS

This Limited Warranty does not cover:

1. Shipping, labor or material charges.
2. Damages resulting from transportation, installation or servicing.
3. Damages resulting from accident, abuse, fire, flood, alteration or acts of God.
4. Tampering with, altering, defacing or removing the product serial number will serve to void this warranty.
5. Damages resulting from use of the product in a corrosive atmosphere (such as concentrations of acids or halogenated hydrocarbons).
6. Damages resulting from inadequacy or interruption of electrical service, improper voltage conditions, blown fuses, or other like circumstances.
7. Cleaning or replacement of filters or belts.
8. Damages resulting from failure to properly and regularly clean air and/or water side of condenser and evaporator.
9. Damages resulting from: (I) freezing of condenser water or condensate; (II) use of corrosive water; (III) fouling or restriction of the air/water circuit by foreign material or like causes.
10. Damages resulting from operation with inadequate or interrupted supply of air or water.
11. Damages resulting from use of components or accessories not approved by United CoolAir.
12. This warranty does not apply to the installation, plumbing and wiring not integral to the product.
13. Damages resulting from improper application or sizing.
14. Discharge air temperature control, if not provided by the factory, will void the compressor Limited Warranty.
15. In the event that the refrigerant type is changed, as a result of a compressor failure and the same type of compressor is not available, any subsequent compressor failures will not be covered under the Limited Warranty.

This warranty is in lieu of all other warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose.

Some states (provinces) do not allow the disclaimer of implied warranty, so that the above disclaimer may not apply to you.

Some states (provinces) allow only a partial limitation on implied warranties to limit the duration of implied warranties to the duration of the express warranty. In such states (provinces), the duration of implied warranties is hereby expressly limited to the duration of the express warranty on the face hereof.

In no event, whether as a result of breach of warranty or contract, tort (including negligence) strict liability or otherwise, shall United CoolAir be liable for special, incidental, or consequential damages, including but not limited to loss of use of the equipment or associated equipment, lost revenues or profits, cost of substitute equipment or cost of fuel or electricity. The above limitations shall inure to the benefit of United CoolAir’s suppliers and subcontractors. The above limitation on consequential damages shall not apply to injuries to persons in the case of consumer goods.

Some states (provinces) do not allow the exclusion or limitation of liability for consequential damages, or for strict liability in tort, so that the above exclusions and limitations may not apply to you.

United CoolAir does not assume, or authorize any other person to assume for United CoolAir, any other liability for the sale of this product.

This warranty gives you specific legal rights. You may also have other rights which vary from state to state (province to province).

To obtain warranty service

Contact the installing or servicing contractor with the details of the problem. Provide the model number, serial number and date of installation. Warranty requests directed to the factory will be referred back through the local distribution network.

Model: ___________________  Serial Number: ___________________  Date of Installation: ___________

Subject to change without notice.
Air-Cooled Unit

Start-Up Procedures (R-410a Systems)

Some of the numbered items below are referenced on the Start Up Form that needs to be completed.

This procedure has been created based on utilizing a standard wall thermostat. If another controller is being utilized some of the steps below may need to be altered.

1. Start up must be performed by a qualified HVAC Technician.

2. Make certain that all power is disconnected at the main power circuit breaker or service disconnect before starting any of this procedure.

3. Check all electrical screw terminals and wiring lugs for tightness internal to the equipment. Components may have loosened due to vibration during transit or handling. Verify that the main power block lug connections made in the field are tight and secure.

4. Confirm that the voltage rating of the equipment data tag coincides with the power that will be delivered to the unit.

5. Verify that the circuit protection for the unit satisfies Local and National Codes according to the unit data tag Minimum Circuit Ampacity (MCA) and Maximum Fuse Size (MFS).

6. Locate the unit thermostat and check all electrical terminations against the unit electrical diagram and for the unit thermostat.

Note: If using a digital thermostat with a “C” (Common) terminal, this terminal MUST be terminated to the “C” terminal in the unit. Failure to do so will result in the thermostat shorting out and being destroyed.

7. Leak check the refrigerant system. While the unit was leak checked at the factory, leaks can develop during transit and / or handling.

8. Confirm that the unit condensate has been adequately trapped and taken to a suitable point for disposal.

9. Verify that the filters are in place, clean and usable.

10. Switch the unit thermostat to the “OFF” position.

11. Apply power to the unit. Switch the circuit breaker or field supplied electrical service disconnect switch to the on position.

Note: If the unit has the flooded condenser option the scroll compressors will have crankcase heaters. If the outdoor ambient is 70˚ F or lower, let the compressors sit for approximately 24 hours before proceeding.

12. Record the voltage at the unit terminals.

13. If possible with the thermostat provided, switch the evaporator blower to the RUN position. Verify that the evaporator blower is activated.

14. Verify that the evaporator blower is rotating in the correct direction (three phase units only).

Note: If the evaporator blower motor runs backwards, shut off all power to the unit. Switch any two of the incoming power leads at the unit terminal block. The unit has been wired and phased properly at the factory. DO NOT change any factory wiring to correct for a phase problem.

Note: Before conducting the following start up sections connect a suitable refrigerant gauge set to the unit Schrader connections. Install temperature sensors to record the appropriate refrigerant line temperatures. Service gauge access ports have been provided in the cabinet corner posts so that the gauge line hoses can be run outside the cabinet with the access panels installed.

15. Set the thermostat switch to a temperature set point approximately 5˚ lower than the space temperature. Set the thermostat fan switch to the AUTO position. Set the thermostat operating mode to the COOL position. This should energize the compressor(s) and both blowers.

Note: Dependent upon the options and/or the thermostat, there may be a delay for the compressor(s) operation.

16. Verify that the condenser blower rotation is correct.

17. While waiting for the compressor(s) to stabilize, record the External Static Pressure (ESP) for both the evaporator and condenser blowers.

Note: Make sure all the unit access panels are in place when taking these readings.

18. Record the return air temperature to the evaporator coil along with the supply air temperature. (The unit should have operated for at least 15 minutes before taking these readings).

19. Record the outdoor ambient entering the condenser coil along with the discharge air temperature of the condensing section.

20. Record the suction line pressure and the suction line temperature for each circuit near the compressor.

Continued on next page
Start-Up Procedures (R-410a Systems) Continued:

21. Using an appropriate pressure / temperature chart for R-410a refrigerant, look up and record the saturation temperature corresponding to the suction pressure.

22. Calculate and record the suction superheat for each circuit by taking the difference between the suction line temperature and the saturation temperature corresponding to the suction pressure.

23. Record the liquid line pressure and the liquid line temperature for each circuit near the condenser coil outlet.

24. Using an appropriate pressure / temperature chart for R-410a refrigerant, look up and record the saturation temperature corresponding to the liquid line pressure.

25. Calculate and record the liquid sub-cooling for each circuit by taking the difference between the liquid line temperature and the saturation temperature corresponding to the liquid line pressure.

26. Record the Amps for the evaporator blower motor, each compressor and the condenser blower motor. If the system is single phase, use L1 and L2 only.
   a. Make sure the pressures on each compressor circuit are within the proper limits:
      i. 290 – 550 Discharge
      ii. 100 – 140 psig Suction
   b. Compressor Amperage is below the RLA Amps listed on the unit data tag.
      i. The maximum compressor operating current (amps) at start up depends a lot on the system loading. The lower the load, the less the current. The higher the load, the higher the current.
   c. The blower motor FLA values should never be exceeded.
      i. If the FLA value is exceeded, shut the unit off and check the duct design, sheave turns open or make sure there is no blockage / obstruction in the duct or filters.

27. Document any additional information deemed appropriate for the specific application or installation.

28. Shut the system down and remove all test instruments and test sensors.

29. Leave the system in the operating mode as appropriate for the customer and the application.

Optional Heating Start Up:

30. If the system has any optional heat, set the room thermostat approximately 5° higher than the actual room temperature. Set the controller operating mode to the HEAT position.

31. Dependent upon the heating source the heating valve or switch / contactor should be activated.

32. After several minutes of operation, record the return air temperature and the supply air temperature.

33. Based on the heating source, document the appropriate temperatures, pressures, voltage or amp values.
### Air-Cooled Unit

#### Start-Up Procedures

Complete the form by listing your name, company name, phone and fax number. Sign and date the form and provide a copy as required to all interested parties.

<table>
<thead>
<tr>
<th>Job Name:</th>
<th>__________________________________________</th>
<th>Date: __________</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address:</td>
<td>__________________________________________</td>
<td>_________________</td>
</tr>
<tr>
<td>City:</td>
<td>State: _____</td>
<td>ZIP: __________</td>
</tr>
<tr>
<td>Country:</td>
<td>__________________________________________</td>
<td>_________________</td>
</tr>
<tr>
<td>Unit Model No.:</td>
<td>________________________________________</td>
<td>_________________</td>
</tr>
<tr>
<td>Unit Serial No.:</td>
<td>________________________________________</td>
<td>_________________</td>
</tr>
</tbody>
</table>

---

Screw Lugs & Terminals OK? ............................................................ Yes _______ No _______

Describe any loose connections and action(s) taken:

---

Power Supply Correct Voltage and Phase? ........................................ Yes _______ No _______

If not in agreement with unit data tag contact the Distributor.

---

Is the Circuit Protection the correct type and does it meet the unit data tag requirements? ......................................................... Yes _______ No _______

If not correct describe what action(s) have been taken to correct:

---

Unit controller wiring verified? ....................................................... Yes _______ No _______

“C” Terminal hooked up if necessary? .............................................. Yes _______ No _______

---

Unit leak checked OK? ................................................................. Yes _______ No _______

If leak was located describe where and how repaired:

---

Condensate trapped & run to a suitable disposal point? ......................... Yes _______ No _______

---

Filters are in place, clean & usable? ............................................... Yes _______ No _______

---

Single Phase Unit

Measured Voltage ................................................................. L1-L2 _____ L1-GND _____ L2-GND _____

Three Phase

Measured Voltage ................................................................. L1-L2 _____ L2-L3 _____ L1-L3 _____

---

Evaporator Blower Motor Rotation OK? .............................................. Yes _______ No _______

If three phase power and rotation is not correct describe action(s) taken to correct:

---

Condenser Blower Motor Rotation OK? .............................................. Yes _______ No _______

If three phase power and rotation is not correct describe action(s) taken to correct:

---

*Continued on Next Page*
Evaporator External Static Pressure: ____________ In. WG ____________

Condenser External Static Pressure: ____________ In. WG ____________

Cooling Mode

System Air Temperatures: Return: °F _________ Supply: °F ____________

Condenser Coil: Outdoor Ambient: °F _________ Condenser Discharge: °F _________

<table>
<thead>
<tr>
<th>Suction Pressure:</th>
<th>Compressor 1</th>
<th>Compressor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>psi</td>
<td>psi</td>
<td></td>
</tr>
<tr>
<td>°F</td>
<td>°F</td>
<td></td>
</tr>
<tr>
<td>Saturation Temperature:</td>
<td>°F</td>
<td>°F</td>
</tr>
<tr>
<td>Suction Superheat:</td>
<td>°</td>
<td>°</td>
</tr>
<tr>
<td>Liquid Line Pressure:</td>
<td>psi</td>
<td>psi</td>
</tr>
<tr>
<td>Saturation Temperature:</td>
<td>°F</td>
<td>°F</td>
</tr>
<tr>
<td>Liquid Line Temperature:</td>
<td>°F</td>
<td>°F</td>
</tr>
<tr>
<td>Sub-cooling:</td>
<td>°</td>
<td>°</td>
</tr>
</tbody>
</table>

Electrical

Evap. Motor Amps: L1 _________ L2 _________ L3 _________
Compressor 1 Amps: L1 _________ L2 _________ L3 _________
Compressor 2 Amps: L1 _________ L2 _________ L3 _________
Cond. Motor Amps: L1 _________ L2 _________ L3 _________

Heating Mode (Optional)

System Air Temperatures: Return: °F _________ Supply: °F ____________

Entering Water Temperature: Return: °F _________ Fluid Type: ____________
Leaving Water Temperature: Return: °F _________
Steam Pressure: psi _________

Electric:

kW: _________ Voltage: ____________
Amps: Stage1: L1 _________ L2 _________ L3 _________
       Stage2: L1 _________ L2 _________ L3 _________

Misc. __________________________________________________________________________________________

Technician (print name): _____________________________________________________________________________
Company: ________________________________________________________________________________________
Phone: __________________________________________________ Fax: ____________________________
Signature: __________________________________________________ Date: ____________________________

Subject to change without notice.
**Water-Cooled Unit**

**Start-Up Procedures (R-410a Systems)**

1. Start up must be performed by a qualified HVAC Technician.

2. Make certain that all power is disconnected at the main power circuit breaker or service disconnect before starting any of this procedure.

3. Check all electrical screw terminals and wiring lugs for tightness internal to the equipment. Components may have loosened due to vibration during transit or handling. Verify that the main power block lug connections made in the field are tight and secure.

4. Confirm that the voltage rating of the equipment data tag coincides with the power that will be delivered to the unit.

5. Verify that the circuit protection for the unit satisfies Local and National Codes according to the unit data tag Minimum Circuit Ampacity (MCA) and Maximum Fuse Size (MFS).

6. Locate the unit thermostat and check all electrical terminations against the unit electrical diagram and for the unit thermostat.

   **Note:** If using a digital thermostat with a “C” (Common) terminal, this terminal MUST be terminated to the “C” terminal in the unit. Failure to do so will result in the thermostat shorting out and being destroyed.

7. Leak check the refrigerant system. While the unit was leak checked at the factory, leaks can develop during transit and/or handling.

8. Confirm that the unit condensate has been adequately trapped and taken to a suitable point for disposal.

9. Verify that the filters are in place, clean and usable.

10. Switch the unit thermostat to the “OFF” position.

11. Apply power to the unit. Switch the circuit breaker or field supplied electrical service disconnect switch to the on position.

   **Note:** If the unit has crankcase heaters and the surrounding ambient is 70°F or lower, let the compressors sit for approximately 24 hours before proceeding.

12. Record the voltage at the unit terminals.

13. If possible with the thermostat provided, switch the evaporator blower to the RUN or ON position. Verify that the evaporator blower is activated.

14. Verify that the evaporator blower is rotating in the correct direction (three phase units only).

   **Note:** If the evaporator blower motor runs backwards, shut off all power to the unit. Switch any two of the incoming power leads at the unit main power terminal block. The unit has been wired and phased properly at the factory. DO NOT change any factory wiring to correct for a phase problem.

   **Note:** Before conducting the following start up sections connect a suitable refrigerant gauge set to the unit Schrader connections. Install temperature sensors to record the appropriate refrigerant line temperatures.

15. Set the thermostat switch to a temperature set point approximately 5° lower than the space temperature. Set the thermostat fan switch to the AUTO position. Set the thermostat operating mode to the COOL position. This should energize the compressor(s) and evaporator blower.

   **Note:** Dependent upon the options and/or the thermostat, there may be a delay for the compressor(s) operation.

16. While waiting for the compressor(s) to stabilize, record the External Static Pressure (ESP) for the evaporator blower.

   **Note:** Make sure all the unit access panels are in place when taking these readings.

17. Verify that the incoming water / fluid pressure does not exceed the rating for the water / fluid control valves.

18. Verify that the unit piping and heat exchangers will not be subjected to freezing conditions.

19. Confirm that no joints are leaking in the cooling fluid circuit(s).

20. Document the type of fluid being used as the cooling medium. If glycol is being used, make sure the mixture is adequate for any low ambient conditions that may be possible.

21. If possible, record the fluid flow rate (GPM).

   a. Make sure the flow rate is within the proper limits:

   i. Minimum 2.5 GPM / Ton
   ii. Maximum 3.5 GPM / Ton

*Continued on next page*
Start-Up Procedures (R-410a Systems) Continued:

22. Record the entering and leaving fluid temperatures.
   b. Make sure the leaving fluid temperature is within the proper limits:
      i. Minimum 60˚ F
      ii. Maximum 115˚ F

23. Record the pressure drop of the water / fluid across the unit.

24. Verify that all valves on each fluid circuit function properly.

25. Check the head pressure adjustment, DO NOT assume that this has been set at the factory. Typically this value is to be 360 psi when 85˚ F water is supplied to the unit at 3 GPM/Ton.

26. Record the return air temperature to the evaporator coil along with the supply air temperature. (The unit should have operated for at least 15 minutes before taking these readings).

27. Record the suction line pressure and the suction line temperature for each circuit near the compressor.

28. Using an appropriate pressure / temperature chart for R-410a refrigerant, look up and record the saturation temperature corresponding to the suction pressure.

29. Calculate and record the suction superheat for each circuit by taking the difference between the suction line temperature and the saturation temperature corresponding to the suction pressure.

30. Record the liquid line pressure and the liquid line temperature for each circuit near the condenser heat exchanger outlet.

31. Using an appropriate pressure / temperature chart for R-410a refrigerant, look up and record the saturation temperature corresponding to the liquid line pressure.

32. Calculate and record the liquid sub-cooling for each circuit by taking the difference between the liquid line temperature and the saturation temperature corresponding to the liquid line pressure.

33. Record the Amps for the evaporator blower motor and each compressor. If the system is single phase, use L1 and L2 only.

34. Document any additional information deemed appropriate for the specific application or installation.

35. Shut the system down and remove all test instruments and test sensors.

36. Leave the system in the operating mode as appropriate for the customer and the application.

Optional Heating Start Up:

37. If the system has any optional heat, set the room thermostat approximately 5° higher than the actual room temperature. Set the thermostat operating mode to the HEAT position.

38. Dependent upon the heating source the heating valve or switch / contactor should be activated.

39. After several minutes of operation, record the return air temperature and the supply air temperature.

40. Based on the heating source, document the appropriate temperatures, pressures, voltage or amp values.
# Start-Up Procedures

Complete the form by listing your name, company name, phone and fax number. Sign and date the form and provide a copy as required to all interested parties.

| Job Name: ____________________________ | Date: ____________ |
| Address: ____________________________ | State: ____________ |
| City: ____________________________ | ZIP: ____________ |
| Country: ____________________________ | Unit Model No.: ____________________________ |
| Unit Serial No.: ____________________________ |  |

Screw Lugs & Terminals OK? Yes ________ No ________

Describe any loose connections and action(s) taken:

---

Power Supply Correct Voltage and Phase? Yes ________ No ________

If not in agreement with unit data tag contact the Distributor.

---

Is the Circuit Protection the correct type and does it meet the unit data tag requirements? Yes ________ No ________

If not correct describe what action(s) have been taken to correct:

---

Unit controller wiring verified? Yes ________ No ________

“C” Terminal hooked up if necessary? Yes ________ No ________

---

Unit leak checked OK? Yes ________ No ________

If leak was located describe where and how repaired:

---

Condensate trapped & run to a suitable disposal point? Yes ________ No ________

---

Air Filters are in place, clean & usable? Yes ________ No ________

---

Single Phase Unit

Measured Voltage: L1-L2 ________ L1-GND ________ L2-GND ________

---

Three Phase

Measured Voltage: L1-L2 ________ L2-L3 ________ L1-L3 ________

---

Evaporator Blower Motor Rotation OK? Yes ________ No ________

If three phase power and rotation is not correct describe action(s) taken to correct:

---

Evaporator External Static Pressure (ESP): ________ In. WG

---

Verify that incoming fluid pressure does not exceed rating for the fluid control valves.

---

Continued on Next Page
Verify that unit piping and heat exchangers will not be subject to freezing conditions. Yes ______ No ______

No cooling fluid leaks. Circuit 1 _______ Circuit 2 ________

Cooling Fluid Type
If Glycol what percentage of mix: _______ Good to a temperature of ________

Water / Fluid flow rate: _______ GPM

Entering Water Temperature (EFT): °F _______ Leaving Water Temperature (LFT): °F _______

Water / Fluid Pressure Drop across unit: _______ PSI

Verify that all valves on each circuit are functioning properly. Yes ______ No ______

Verify water/fluid discharge pressure set point. Yes ______ No ______

### Cooling Mode

System Air Temperatures Return: °F _______ Supply: °F _______

<table>
<thead>
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### Electrical

Evap. Motor Amps: L1 _______ L2 _______ L3 _______
Compressor 1 Amps: L1 _______ L2 _______ L3 _______
Compressor 2 Amps: L1 _______ L2 _______ L3 _______

### Heating Mode (Optional)

System Air Temperatures Return: °F _______ Supply: °F _______

Entering Water Temperature: Return: °F _______ Steam Pressure: psi _______
Leaving Water Temperature: Return: °F _______
Electric kW: _______ Voltage: _______
Amps: Stage1: L1 _______ L2 _______ L3 _______
Stage2: L1 _______ L2 _______ L3 _______

Misc. ________________________________

Technician (print name): ________________________________
Company: ________________________________
Phone: ________________________________ Fax: ________________________________
Signature: ________________________________ Date: ________________________________
CoolSpot Basic Model Designation

EXAMPLE:  
\[ \begin{array}{ccccccc} 
\text{CS} & \text{R} & 12 & G & 1 & \text{AS} & 05 \\
a & b & c & d & e & f & g \\
\end{array} \]

a.  
"CS", "CSW", "CSC"

"CS" Air-cooled Air Conditioner
"CSW" Water-cooled Air Conditioner
"CSC" Chilled Water System

"BCSP" Remote Air-cooled Centrifugal Condenser (1 or 1-1/2 Ton)
"BC" Remote Air-cooled Centrifugal Condenser (2 through 3 Ton)
"BSP" Remote Air-cooled Centrifugal Condensing Section (1 or 1-1/2 Ton)
"B" Remote Air-cooled Centrifugal Condensing Section (2 through 3 Ton)
"BWSP" Remote Water-cooled Condensing Section (1 or 1-1/2 Ton)
"BW" Remote Water-cooled Condensing Section (2 through 3 Ton)
"PBC" Remote Air-cooled Propeller Condenser
"PB" Remote Air-cooled Propeller Condensing Section

b.  
"R" or "RC"

"R" Remote Condenser Unit being used
"RC" Remote Condensing Unit being used

c.  
"12", "18", "24", "30", "36" Nominal Cooling Capacity in MBH
or "1", "1.5", "2", "2.5", "3" Nominal Tons for Remote Condenser/Condensing Section

d.  
"G" Common to all

e.  
"1", "3", "4", "5" or "7" Indicates Voltage

"1" 208-230V, 1 PH
"3" 208-230V, 3 PH
"4" 460V, 3 PH
"5" 575V, 3 PH
"7" 277V, 1 PH

f.  
"AS" Indicates 1 Compressor

g.  
"02", "05" Indicates kW Rating for Heaters

Not all combinations of Basic Model Designations are valid. Check with the factory for correct model identification.
Unique Solutions for All-Indoor HVAC Projects

Authorized Distributor:

LIMITED WARRANTY
United CoolAir Units are backed by a 1 year limited warranty on parts and a 5 year limited warranty on the compressor (labor not included). Maintenance items such as filters and belts are excluded under this limited warranty.

FACTORY TESTED
All units are functionally run tested before shipment to ensure a trouble-free start-up and unit commissioning. Industry proven components are used throughout to enhance system reliability and peace of mind.

491 East Princess Street, York, PA 17403  Phone: 717-843-4311  Fax: 717-854-4462
e-mail: uca@unitedcoolair.com  web: www.unitedcoolair.com

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