Installation Instructions

50TCQ units for installation in the United States contain use of Carrier's Staged Air Volume (SAV™) 2-speed indoor fan control system. This complies with the U.S. Department of Energy (DOE) efficiency standard of 2018.

50TCQ units for installation outside the United States may or may not contain use of the SAV 2-speed indoor fan control system, as they are not required to comply with the U.S. Department of Energy (DOE) efficiency standard of 2018.

For specific details on operation of the Carrier SAV 2-speed indoor fan system, refer to the Variable Frequency Drive (VFD) Factory-Installed Option 2-Speed Motor Control Installation, Setup and Troubleshooting manual.

NOTE: Read the entire instruction manual before starting the installation.

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50TCQ08-12 Single Package Rooftop with Heat Pump with Puron® (R-410A) Refrigerant
SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloths for brazing operations and have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and appropriate national electrical codes (in USA, ANSI/NFPA70, National Electrical Code (NEC); in Canada, CSA C22.1) for special requirements.

It is important to recognize safety information. This is the safety-alert symbol ⚠. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, CAUTION, and NOTE. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which will result in severe personal injury or death. WARNING signifies hazards which could result in personal injury or death. CAUTION is used to identify unsafe practices, which may result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which will result in enhanced installation, reliability, or operation.

GENERAL

See Fig. 1-3 for unit options and dimensions.

Rated Indoor Airflow (cfm)

Table 1 lists the rated indoor airflow used for the AHRI efficiency rating for the units covered in this document.

<table>
<thead>
<tr>
<th>MODEL NUMBER</th>
<th>FULL LOAD AIRFLOW (CFM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50TCQD08</td>
<td>3000</td>
</tr>
<tr>
<td>50TCQD09</td>
<td>3400</td>
</tr>
<tr>
<td>50TCQD12</td>
<td>3500</td>
</tr>
</tbody>
</table>
### Fig. 1 — Model Number Nomenclature

<table>
<thead>
<tr>
<th>Position:</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example:</td>
<td>5</td>
<td>0</td>
<td>T</td>
<td>C</td>
<td>Q</td>
<td>D</td>
<td>1</td>
<td>2</td>
<td>A</td>
<td>1</td>
<td>A</td>
<td>6</td>
<td>–</td>
<td>0</td>
<td>B</td>
<td>2</td>
<td>A</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Refrigeration Systems Options

- **D** = Two Stage Cooling Models

#### Cooling Tons

- 08 - 7.5 ton
- 09 - 8.5 ton
- 12 - 10 ton

#### Sensor Options

- **A** = None
- **B** = RA Smoke Detector
- **C** = SA Smoke Detector
- **D** = RA + SA Smoke Detector
- **E** = CO₂
- **F** = RA Smoke Detector and CO₂
- **G** = SA Smoke Detector and CO₂
- **H** = RA + SA Smoke Detector and CO₂
- **J** = Condensate Overflow Switch (electro-mechanical controls only)
- **K** = Condensate Overflow Switch and RA Smoke Detectors
- **L** = Condensate Overflow Switch and RA and SA Smoke Detectors

#### Indoor Fan Options

- **1** = Standard Static Option – Belt Drive
- **2** = Medium Static Option – Belt Drive
- **3** = High Static Option – Belt Drive

#### Coil Options (Outdoor - Indoor - Hail Guard)

- **A** = Al/Cu - Al/Cu
- **B** = Precoat Al/Cu - Al/Cu
- **C** = E-coat Al/Cu - Al/Cu
- **D** = E-coat Al/Cu - E-coat Al/Cu
- **E** = Cu/Cu - Al/Cu
- **F** = Cu/Cu - Cu/Cu
- **M** = Al/Cu - Al/Cu — Louvered Hail Guard
- **N** = Precoat Al/Cu - Al/Cu — Louvered Hail Guard
- **P** = E-coat Al/Cu - Al/Cu — Louvered Hail Guard
- **Q** = E-coat Al/Cu - E-coat Al/Cu — Louvered Hail Guard
- **R** = Cu/Cu - Al/Cu — Louvered Hail Guard
- **S** = Cu/Cu - Cu/Cu — Louvered Hail Guard

#### Voltage

- **1** = 575/3/60
- **5** = 208-230/3/60
- **6** = 460/3/60

#### Design Revision

- **=** Factory Design Revision

#### Factory Assigned

- **0** = Standard
- **1** = LTL
- **3** = CA Seismic Complaint
- **4** = LTL and CA Seismic Compliant

#### Electrical Options

- **A** = None
- **C** = Non-Fused Disconnect
- **D** = Thru-The-Base Connections
- **F** = Non-Fused Disconnect and Thru-The-Base Connections
- **G** = 2-Speed Indoor Fan (VFD) Controller
- **J** = 2-Speed Indoor Fan (VFD) Controller and Non-Fused Disconnect
- **K** = 2-Speed Indoor Fan (VFD) Controller and Thru-The-Base Connections
- **M** = 2-Speed Indoor Fan (VFD) Controller with Non-Fused Disconnect and Thru-The-Base Connections

#### Service Options

- **0** = None
- **1** = Unpowered Convenience Outlet
- **2** = Powered Convenience Outlet
- **3** = Hinged Panels
- **4** = Hinged Panels and Unpowered Convenience Outlet
- **5** = Hinged Panels and Powered Convenience Outlet

#### Intake / Exhaust Options

- **A** = None
- **B** = Temperature Economizer with Barometric Relief
- **F** = Enthalpy Economizer with Barometric Relief
- **K** = 2-Position Damper
- **U** = Temperature Ultra Low Leak Economizer with Barometric Relief
- **W** = Enthalpy Ultra Low Leak Economizer with Barometric Relief

#### Base Unit Controls

- **0** = Electro-mechanical Controls can be used with W7212 EconoMi$er® IV (Non-Fault Detection and Diagnostic)
- **1** = PremierLink™ Controller*
- **2** = RTU Open Multi-Protocol Controller
- **6** = Electro-mechanical with W7220 Economizer controller Controls. Can be used with W7220 EconoMi$er X (with Fault Detection and Diagnostic)

* PremierLink controller can not be used with Staged Air Volume (SAV™) 2-speed indoor fan motor.
It is recommended with models using Staged Air Volume (SAV) 2-speed indoor fan motor control that the EconoMi$er X system be used because it contains two ventilation set points, one for each fan speed.
Fig. 3 — Unit Dimensional Drawing – 12 Size Unit
<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DIMENSION</th>
<th>CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A</strong></td>
<td>48-in. (1219 mm)</td>
<td>Unit disconnect is mounted on panel</td>
</tr>
<tr>
<td></td>
<td>18-in. (457 mm)</td>
<td>No disconnect, convenience outlet option</td>
</tr>
<tr>
<td></td>
<td>18-in. (457 mm)</td>
<td>Recommended service clearance</td>
</tr>
<tr>
<td></td>
<td>12-in. (305 mm)</td>
<td>Minimum clearance</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>42-in. (1067 mm)</td>
<td>Surface behind servicer is grounded (e.g., metal, masonry wall)</td>
</tr>
<tr>
<td></td>
<td>36-in. (914 mm)</td>
<td>Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass)</td>
</tr>
<tr>
<td></td>
<td>Special</td>
<td>Check sources of flue products within 10 ft of unit fresh air intake hood</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>36-in. (914 mm)</td>
<td>Side condensate drain is used</td>
</tr>
<tr>
<td></td>
<td>18-in. (457 mm)</td>
<td>Minimum clearance</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>42-in. (1067 mm)</td>
<td>Surface behind servicer is grounded (e.g., metal, masonry wall, another unit)</td>
</tr>
<tr>
<td></td>
<td>36-in. (914 mm)</td>
<td>Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass)</td>
</tr>
</tbody>
</table>

NOTE: Unit not designed to have overhead obstruction. Contact Application Engineering for guidance on any application planning overhead obstruction or for vertical clearances.

Fig. 4 — Service Clearance Dimensional Drawing (Sizes 08, 09)
**NOTE:** Unit not designed to have overhead obstruction. Contact Application Engineering for guidance on any application planning overhead obstruction or for vertical clearances.

---

**REFRIGERATION SYSTEM COMPONENTS**

Each heat pump refrigeration system includes a compressor, accumulator, reversing valve, dual-function outdoor coil with vapor header check valve, cooling liquid line with a filter drier and a check valve, dual-function indoor coil with a vapor header check valve, and heating liquid line with a check valve and a strainer. Size 08, 09, and 12 units have two compressor-circuits. See Fig. 6 for typical unit piping schematic (4-row indoor coil with two compressor-circuits is shown).

Dual-function outdoor and indoor coils are designed to provide parallel coil circuits during evaporator-function operation and converging coil circuits during the condenser-function operation.

**Reversing Valve and Check Valve Position**

See Fig. 6 (on page 10) and Tables 2-4.

**Troubleshooting Refrigerant Pressure Problems and Check Valves**

Refer to Fig. 6 and Tables 2 and 3.

---

**Refrigerant System Pressure Access Ports**

There are two access ports in each circuit - on the suction tube and the discharge tube near the compressor. These are brass fittings with black plastic caps. The hose connection fittings are standard 1/4-in. SAE male flare couplings.

The brass fittings are two-piece High Flow valves, with a receptacle base brazed to the tubing and an integral spring-closed check valve core screwed into the base. See Fig. 7 on page 11. This check valve is permanently assembled into this core body and cannot be serviced separately. Replace the entire core body if necessary. Service tools are available from RCD that allow the replacement of the check valve core without having to recover the entire system refrigerant charge. Apply compressor refrigerant oil to the check valve core’s bottom O-ring. Install the fitting body and torque to 96 ± 10 in. lbs (10.9 ± 1 Nm). Do not exceed 106 in. lbs (11.9 Nm) when tightening.

---

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>DIMENSION</th>
<th>CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>48-in. (1219 mm)</td>
<td>Unit disconnect is mounted on panel</td>
</tr>
<tr>
<td>A</td>
<td>18-in. (457 mm)</td>
<td>No disconnect, convenience outlet option</td>
</tr>
<tr>
<td>A</td>
<td>18-in. (457 mm)</td>
<td>Recommended service clearance</td>
</tr>
<tr>
<td>A</td>
<td>12-in. (305 mm)</td>
<td>Minimum clearance</td>
</tr>
<tr>
<td>B</td>
<td>42-in. (1067 mm)</td>
<td>Surface behind servicer is grounded (e.g., metal, masonry wall)</td>
</tr>
<tr>
<td>B</td>
<td>36-in. (914 mm)</td>
<td>Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass)</td>
</tr>
<tr>
<td>B</td>
<td>Special</td>
<td>Check sources of flue products within 10 ft of unit fresh air intake hood</td>
</tr>
<tr>
<td>C</td>
<td>36-in. (914 mm)</td>
<td>Side condensate drain is used</td>
</tr>
<tr>
<td>C</td>
<td>18-in. (457 mm)</td>
<td>Minimum clearance</td>
</tr>
<tr>
<td>D</td>
<td>42-in. (1067 mm)</td>
<td>Surface behind servicer is grounded (e.g., metal, masonry wall, another unit)</td>
</tr>
<tr>
<td>D</td>
<td>36-in. (914 mm)</td>
<td>Surface behind servicer is electrically non-conductive (e.g., wood, fiberglass)</td>
</tr>
</tbody>
</table>

**Fig. 5 — Service Clearance Dimensional Drawing (Size 12)**
Table 2 — Cooling Mode (each circuit)

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>STATUS/POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reversing Valve</td>
<td>Energized</td>
</tr>
<tr>
<td>Check Valve A</td>
<td>Closed</td>
</tr>
<tr>
<td>Check Valve B</td>
<td>Open</td>
</tr>
<tr>
<td>Check Valve C</td>
<td>Closed</td>
</tr>
<tr>
<td>Check Valve D</td>
<td>Open</td>
</tr>
</tbody>
</table>

Table 3 — Heating Mode (each circuit)

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>STATUS/POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reversing Valve</td>
<td>De-energized</td>
</tr>
<tr>
<td>Check Valve A</td>
<td>Open</td>
</tr>
<tr>
<td>Check Valve B</td>
<td>Closed</td>
</tr>
<tr>
<td>Check Valve C</td>
<td>Open</td>
</tr>
<tr>
<td>Check Valve D</td>
<td>Closed</td>
</tr>
</tbody>
</table>

Table 4 — Defrost Mode

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>STATUS/POSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Defrost Thermostat</td>
<td>Closed</td>
</tr>
<tr>
<td>Outdoor Fan(s)</td>
<td>Off</td>
</tr>
<tr>
<td>Reversing Valve</td>
<td>Energized</td>
</tr>
<tr>
<td>Check Valve A</td>
<td>Closed</td>
</tr>
<tr>
<td>Check Valve B</td>
<td>Open</td>
</tr>
<tr>
<td>Check Valve C</td>
<td>Closed</td>
</tr>
<tr>
<td>Check Valve D</td>
<td>Open</td>
</tr>
</tbody>
</table>

Fig. 6 — Typical Unit Piping Schematic
Jobsite Survey
Complete the following checks before installation.
1. Consult local building codes and the NEC (National Electrical Code) ANSI/NFPA 70 for special installation requirements.
2. Determine unit location (from project plans) or select unit location.
3. Check for possible overhead obstructions which may interfere with unit lifting or rigging.

Step 1 — Plan for Unit Location
Select a location for the unit and its support system (curb or other) that provides for the minimum clearances required for safety. This includes the clearance to combustible surfaces, unit performance and service access below, around and above unit as specified in unit drawings. See Fig. 4 (for size 08 and 09 units) and Fig. 5 (for size 12 units).

NOTE: Consider also the effect of adjacent units.

Unit may be installed directly on wood flooring or on Class A, B, or C roof-covering material when roof curb is used.
Do not install unit in an indoor location. Do not locate air inlets near exhaust vents or other sources of contaminated air.
Although unit is weatherproof, avoid locations that permit water to enter from higher level runoff and overhangs to fall onto the unit.
Select a unit mounting system that provides adequate height to allow for removal and disposal of frost and ice that will form during the heating-defrost mode as well as allow installation of condensate trap per requirements. Refer to Step 10 — Install External Condensate Trap and Line on page 17 for required trap dimensions.

ROOF MOUNT
Check building codes for weight distribution requirements. Unit operating weight is shown in Table 5.

Step 2 — Plan for Sequence of Unit Installation
The support method used for this unit will dictate different sequences for the steps of unit installation. For example, on curb-mounted units, some accessories must be installed on the unit before the unit is placed on the curb. Review the following for recommended sequences for installation steps.

CURB-MOUNTED INSTALLATION
1. Install curb
2. Install field-fabricated ductwork inside curb
3. Install accessory thru-base service connection package (affects curb and unit) (refer to accessory installation instructions for details)
4. Prepare bottom condensate drain connection to suit planned condensate line routing (refer to Step 10 — Install External Condensate Trap and Line on page 17 for details)
5. Rig and place unit
6. Install outdoor air hood
7. Install condensate line trap and piping
8. Make electrical connections
9. Install other accessories

PAD-MOUNTED INSTALLATION
1. Prepare pad and unit supports
2. Check and tighten the bottom condensate drain connection plug
3. Rig and place unit
4. Convert unit to side duct connection arrangement
5. Install field-fabricated ductwork at unit duct openings
6. Install outdoor air hood

---

Table 5 — Operating Weights

<table>
<thead>
<tr>
<th>Component</th>
<th>50TCQD</th>
<th>D08</th>
<th>D09</th>
<th>D12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50TCQD D08-01</td>
<td>885</td>
<td>910</td>
<td>1050</td>
<td></td>
</tr>
<tr>
<td>50TCQD D09-01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50TCQD D12-01</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Economizer Vertical</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical Control</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td>Horizontal Control</td>
<td>105(48)</td>
<td>105(48)</td>
<td>105(48)</td>
<td></td>
</tr>
<tr>
<td>Powered Outlet</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14-in.(356 mm)</td>
<td>143(65)</td>
<td>143(65)</td>
<td>143(65)</td>
<td></td>
</tr>
<tr>
<td>24-in.(610 mm)</td>
<td>153(69)</td>
<td>153(69)</td>
<td>153(69)</td>
<td></td>
</tr>
</tbody>
</table>

1. CoreMax is a registered trademark of Fastest, Inc.
7. Install condensate line trap and piping
8. Make electrical connections
9. Install other accessories

FRAME-MOUNTED INSTALLATION
Frame-mounted applications generally follow the sequence for a curb installation. Adapt as required to suit specific installation plan.

Step 3 — Inspect Unit
Inspect unit for transportation damage. File any claim with transportation agency.
Confirm before installation of unit that voltage, amperage and circuit protection requirements listed on unit data plate agree with power supply provided.
On units with hinged panel option, check to be sure all latches are snug and in closed position.
Locate the carton containing the outside air hood parts (see Fig. 16 on page 16). Do not remove carton until unit has been rigged and located in final position.

Step 4 — Provide Unit Support
ROOF CURB MOUNT
Accessory roof curb details and dimensions are shown in Fig. 9. Assemble and install accessory roof curb in accordance with instructions shipped with the curb.
NOTE: The gasketing of the unit to the roof curb is critical for a watertight seal. Install gasket supplied with the roof curb as shown in Fig. 9. Improperly applied gasket can also result in air leaks and poor unit performance.
Curb should be level. This is necessary for unit drain to function properly. Unit leveling tolerances are shown in Fig. 8. Refer to Accessory Roof Curb Installation Instructions for additional information as required.

SLAB MOUNT (HORIZONTAL UNITS ONLY)
Provide a level concrete slab that extends a minimum of 6-in. (150 mm) beyond unit cabinet. Install a gravel apron in front of condenser coil air inlet to prevent grass and foliage from obstructing airflow.
NOTE: Horizontal units may be installed on a roof curb if required.

ALTERNATE UNIT SUPPORT (IN LIEU OF CURB OR SLAB MOUNT)
A non-combustible sleeper rail can be used in the unit curb support area. If sleeper rails cannot be used, support the long sides of the unit with a minimum of 3 equally spaced 4-in. x 4-in. (102 mm x 102 mm) pads on each side.

Fig. 8 — Unit Leveling Tolerances
Install insulation, cant strips, roofing felt, and counter flashing as shown. Ductwork must be attached to curb and not to the unit. The accessory thru-the-base power package must be installed before the unit is set on the roof curb.
If electric and control wiring is to be routed through the basepan, attach the accessory thru-the-base service connections to the basepan in accordance with the accessory installation instructions.

<table>
<thead>
<tr>
<th>A-B</th>
<th>B-C</th>
<th>A-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5” (13)</td>
<td>1.0” (25)</td>
<td>1.0” (25)</td>
</tr>
</tbody>
</table>
**NOTE:**
1. ROOF CURB ACCESSORY IS SHIPPED DISASSEMBLED.
2. INSULATED PANELS: 25.4 [1"] THICK POLYURETHANE FOAM, 44.5 [1-3/4"] # DENSITY.
3. ROOF CURB: 18 GAUGE STEEL.
4. ATTACH DUCTWORK TO CURB. (FLANGES OF DUCT REST ON CURB).
5. SERVICE CLEARANCE: 4 FEET ON EACH SIDE.
6. DIRECTION OF AIR FLOW.
7. CONNECTOR PACKAGE CRBTMPWR002A01 IS FOR THRU-THE-CURB GAS TYPE.
8. CONNECTOR PACKAGE CRBTMPWR004A01 IS FOR THRU-THE-BOTTOM GAS CONNECTIONS.

---

**Fig. 9 — Roof Curb Details**

<table>
<thead>
<tr>
<th>ROOF CURB ACCESSORY #</th>
<th>A</th>
<th>NOTES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRBTMPWR002A01</td>
<td>1/4&quot; [3.17]</td>
<td>1. ROOF CURB ACCESSORY IS SHIPPED DISASSEMBLED.</td>
</tr>
<tr>
<td>CRBTMPWR004A01</td>
<td>2-3/8&quot; [61.0]</td>
<td>2. INSULATED PANELS: 25.4 [1&quot;] THICK POLYURETHANE FOAM, 44.5 [1-3/4&quot;] # DENSITY.</td>
</tr>
</tbody>
</table>

---

**Drawing Details**

- **View "B"**
  - SUPPLY AIR
  - RETURN AIR
  - ROOFING MATERIAL (FIELD SUPPLIED)
  - UNIT GASKET (SUPPLIED WITH CURB)
  - RIGID INSULATION (FIELD SUPPLIED)
  - DUCT (FIELD SUPPLIED)
  - NAIL (FIELD SUPPLIED)

---

**Certified Drawing**

- **SECTION THRU SIDE**
  - GAS SERVICE PLATE THRU THE CURB
  - DRILL HOLE 2" [50.8] @ ASSEMBLY (IF REQUIRED) (SEE NOTE #8)

---

**Connector Package**

- **CRBTMPWR002A01**
  - THRU-THE-CURB
  - 3/4" [19] NPT
- **CRBTMPWR004A01**
  - THRU-THE-BOTTOM
  - 1/2" [12.7] NPT
**Step 5 — Field Fabricate Ductwork**

Cabinet return-air static pressure (a negative condition) shall not exceed 0.35 in. wg (87 Pa) with economizer or 0.45 in. wg (112 Pa) without economizer.

For vertical ducted applications, secure all ducts to roof curb and building structure. *Do not connect ductwork to unit.*

Fabricate supply ductwork so that the cross sectional dimensions are equal to or greater than the unit supply duct opening dimensions for the first 18 in. (458 mm) of duct length from the unit basepan.

Insulate and weatherproof all external ductwork, joints, and roof openings with counter flashing and mastic in accordance with applicable codes.

Ducts passing through unconditioned spaces must be insulated and covered with a vapor barrier.

If a plenum return is used on a vertical unit, the return should be ducted through the roof deck to comply with applicable fire codes.

**CAUTION**

**PROPERTY DAMAGE HAZARD**
Failure to follow this caution may result in damage to roofing materials.

Membrane roofs can be cut by sharp sheet metal edges. Be careful when placing any sheet metal parts on such roof.

Horizontal applications require a minimum clearance to combustible surfaces of 1-in. (25 mm) from duct for first 12-in. (305 mm) away from unit. Vertical applications do not require a minimum clearance around ductwork.

Outlet grilles must not lie directly below unit discharge.

**WARNING**

**PERSONAL INJURY HAZARD**
Failure to follow this warning could cause personal injury.

For vertical supply and return units, tools or parts could drop into ductwork and cause an injury. Install a 90 degree turn in the return ductwork between the unit and the conditioned space. If a 90 degree elbow cannot be installed, then a grille of sufficient strength and density should be installed to prevent objects from falling into the conditioned space. Due to electric heater, supply duct will require 90 degree elbow.

**Step 6 — Rig and Place Unit**

Keep unit upright and do not drop. Spreader bars are not required if top crating is left on unit. Rollers may be used to move unit across a roof. Level by using unit frame as a reference. See Table 5 (on page 11) and Fig. 10 for additional information.

Lifting holes are provided in base rails as shown in Fig. 10. Refer to rigging instructions on unit.

Rigging materials under unit (cardboard or wood) must be removed PRIOR to placing the unit on the roof curb.

When using the standard side drain connection, ensure the red plug in the alternate bottom connection is tight. Do this before setting the unit in place. The red drain pan can be tightened with a 1/2-in. square socket drive extension. For further details, see Step 10 — Install External Condensate Trap and Line on page 17.

Before setting the unit onto the curb, recheck gasketing on curb.

**CAUTION**

**UNIT DAMAGE HAZARD**
Failure to follow this caution may result in equipment damage.

All panels must be in place when rigging. Unit is not designed for handling by fork truck when packaging is removed.

If using top crate as spreader bar, once unit is set, carefully lower wooden crate off building roof top to ground. Ensure that no people or obstructions are below prior to lowering the crate.

**POSITIONING ON CURB**
Position unit on roof curb so that the following clearances are maintained: 1/4-in. (6.4 mm) clearance between the roof curb and the base rail inside the front and rear, 0.0-in. clearance between the roof curb and the base rail inside on the duct end of the unit. This will result in the distance between the roof curb and the base rail inside on the condenser end of the unit being approximately 1/4-in. (6.4 mm).

Although unit is weatherproof, guard against water from higher level runoff and overhangs.

After unit is in position, remove the compressor access panel. Holding the blocking between compressors with one hand, cut the strapping. Carefully remove the blocking without damaging tubing, wiring, or controls. Remove the strapping and replace the access panel.

Remove all shipping materials and top skid. Recycle or dispose of all shipping materials.
Fig. 10 — Rigging Details

Step 7 — Convert to Horizontal and Connect Ductwork (when required)

Unit is shipped in the vertical duct configuration. Unit without factory-installed economizer or return-air smoke detector option may be field-converted to horizontal ducted configuration. To convert to horizontal configuration, remove screws from side duct opening covers (see Fig. 11) and remove covers. Use the screws to install the covers on vertical duct openings with the insulation-side down. The panels must be inserted into the notches on the basepan to properly seal. The notches are covered by the tape used to secure the insulation to the basepan and are not easily seen. See Fig. 12 for position of the notches in the basepan. Seals around duct openings must be tight. Secure with screws as shown in Fig. 13. Cover seams with foil duct tape.

Field-supplied flanges should be attached to horizontal duct openings and all ductwork should be secured to the flanges. Insulate and weatherproof all external ductwork, joints, and roof or building openings with counter flashing and mastic in accordance with applicable codes.

Do not cover or obscure visibility to the unit’s informative data plate when insulating horizontal ductwork.

NOTES:
1. Dimensions in ( ) are in millimeters.
2. Hook rigging shackles through holes in base rail, as shown in detail “A.” Holes in base rails are centered around the unit center of gravity. Use wooden top to prevent rigging straps from damaging unit.

Fig. 11 — Horizontal Conversion Panels

Fig. 12 — Location of Notches
Step 8 — Install Outside Air Hood

1. The hood is shipped in knock-down form and must be field assembled. The indoor coil access panel is used as the hood top while the hood sides, divider and filter are packaged together, attached to a metal support tray using plastic stretch wrap, and shipped in the return air compartment behind the indoor coil access panel. The hood assembly’s metal tray is attached to the basepan and also attached to the damper using two plastic tie-wraps.

2. To gain access to the hood, remove the filter access panel. (See Fig. 14 and 15.)

3. Locate the (2) screws holding the metal tray to the basepan and remove. Locate and cut the (2) plastic tie-wraps securing the assembly to the damper. (See Fig. 16.) Be careful to not damage any wiring or cut tie-wraps securing any wiring.

4. Carefully lift the hood assembly through the filter access opening and assemble per the steps outlined in Economizer Hood and Two-Position Hood.

NOTE: If the power exhaust accessory is to be installed on the unit, the hood shipped with the unit will not be used and must be discarded. Save the aluminum filter for use in the power exhaust hood assembly.

1. The indoor coil access panel will be used as the top of the hood. Remove the screws along the sides and bottom of the indoor coil access panel. See Fig. 17.

2. Swing out indoor coil access panel and insert the hood sides under the panel (hood top). Use the screws provided to attach the hood sides to the hood top. Use screws provided to attach the hood sides to the unit. See Fig. 18.

3. Remove the shipping tape holding the economizer barometric relief damper in place (economizer only).

4. Insert the hood divider between the hood sides (see Fig. 18 and 19). Secure hood divider with 2 screws on each hood side. The hood divider is also used as the bottom filter rack for the aluminum filter.

5. Open the filter clips which are located underneath the hood top. Insert the aluminum filter into the bottom filter rack (hood divider). Push the filter into position past the open filter clips. Close the filter clips to lock the filter into place. See Fig. 19.

6. Caulk the ends of the joint between the unit top panel and the hood top.

7. Replace the filter access panel.
Step 9 — Units with Hinged Panels Only

Relocate latch shipped inside the compressor compartment behind the hinged compressor door to location shown in Fig. 20 after unit installation.

If the unit does not have hinged panels, skip this step and continue at Step 10.

Step 10 — Install External Condensate Trap and Line

The unit has one 3/4-in. condensate drain connection on the end of the condensate pan and an alternate connection on the bottom. See Fig. 21. Unit airflow configuration does not determine which drain connection to use. Either drain connection can be used with vertical or horizontal applications.

When using the standard side drain connection, ensure the red plug in the alternate bottom connection is tight. Do this before setting the unit in place. The red drain pan can be tightened with a 1/2-in. square socket drive extension.

To use the alternate bottom drain connection, remove the red drain plug from the bottom connection (use a 1/2-in. square socket drive extension) and install it in the side drain connection.

The piping for the condensate drain and external trap can be completed after the unit is in place. See Fig. 22.
NOTE: All units must have an external trap for condensate drainage. Install a trap at least 4-in. (102 mm) deep and protect against freeze-up. If drain line is installed downstream from the external trap, pitch the line away from the unit at 1-in. per 10 ft (25 mm in 3 m) of run. Do not use a pipe size smaller than the unit connection (3/4-in.).

Step 11 — Make Electrical Connections

**WARNING**

Failure to follow this warning could result in personal injury or death.

Do not use gas piping as an electrical ground. Unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. This ground may consist of electrical wire connected to unit ground lug in control compartment, or conduit approved for electrical ground when installed in accordance with NEC (National Electrical Code); ANSI/NFPA 70, latest edition (in Canada, Canadian Electrical Code CSA [Canadian Standards Association] C22.1), and local electrical codes.

FIELD POWER SUPPLY

*If equipped with optional Powered Convenience Outlet*

The power source leads to the convenience outlet’s transformer primary are not factory connected. Installer must connect these leads according to required operation of the convenience outlet. If an always-energized convenience outlet operation is desired, connect the source leads to the line side of the unit-mounted disconnect. (Check with local codes to ensure this method is acceptable in your area.) If a de-energize via unit disconnect switch operation of the convenience outlet is desired, connect the source leads to the load side of the unit disconnect. On a unit without a unit-mounted disconnect, connect the source leads to compressor contactor C and indoor fan contactor IFC pressure lugs with unit field power leads.

All units except 208/230-v units are factory wired for the voltage shown on the nameplate. If the 208/230-v unit is to be connected to a 208-v power supply, the control transformer must be rewired by moving the black wire with the 1/4-in. female spade connector from the 230-v connection and moving it to the 200-v 1/4-in. male terminal on the primary side of the transformer. Refer to unit label diagram for additional information. Field power wires will be connected line-side pressure lugs on the power terminal block or at factory-installed option non-fused disconnect.

Field power wires are connected to the unit at line-side pressure lugs on compressor contactor C and indoor fan contactor IFC or terminal board (see wiring diagram label for control box component arrangement) or at factory-installed option non-fused disconnect switch. Max wire size is #2 AWG (copper only). See Fig. 24.

**WARNING**

Failure to follow this warning could result in intermittent operation or performance satisfaction.

Do not connect aluminum wire between disconnect switch and unit. Use only copper wire.

---

**Fig. 23 — Disconnect Switch and Unit**

Units Without Disconnect Option

- C
- IFC
- L1
- L2
- L3

Units With Disconnect Option

- L1
- L2
- L3

**Fig. 24 — Power Wiring Connections**

See Fig. 25-28 for wiring diagrams.
Fig. 27 — 50TCQ 08-09 Power Wiring Diagram
Fig. 28 — Typical 90TCQ 12 Power Wiring Diagram (208/230-v, 3 Phase, 60Hz Unit Shown)
UNITS WITH FACTORY-INSTALLED NON-FUSED DISCONNECT

The factory-installed option non-fused disconnect (NFD) switch is located in a weatherproof enclosure located under the main control box (see Fig. 29). The manual switch handle is accessible through an opening in the access panel. Discard the factory test leads (see Fig. 24).

Field-Installation of the NFD Shaft and Handle
1. Remove the Control Box access panel. The NFD enclosure is located below the Control Box (see Fig. 29).
2. Remove (3) cap head screws that secure the NFD enclosure front cover — (2) on the face of the cover and (1) on the left side cover. See Fig. 30.
3. Remove the front cover of the NFD enclosure.
4. Make sure the NFD shipped from the factory is at OFF position (the arrow on the black handle knob is at OFF).
5. Insert the shaft with the cross pin on the top of the shaft in the horizontal position. See Fig. 30.
6. Measure from the tip of the shaft to the top surface of the black pointer; the measurement should be 3.75 to 3.88 in. (95 to 99 mm).
7. Tighten the locking screw to secure the shaft to the NFD.
8. Turn the handle to the OFF position with red arrow pointing at OFF.
9. Install the handle on to the painted cover horizontally with the red arrow pointing to the left.
10. Secure the handle to the painted cover with (2) screws and lock washers supplied.
11. Engaging the shaft into the handle socket, re-install (3) hex screws on the NFD enclosure.
12. Re-install the unit front panel.

Fig. 29 — Location of Non-Fused Disconnect Enclosure

Fig. 30 — Handle and Shaft Assembly for NFD

UNITS WITHOUT FACTORY-INSTALLED NON-FUSED DISCONNECT

When installing units, provide a disconnect switch per NEC (National Electrical Code) of adequate size. Disconnect sizing data is provided on the unit informative plate. Locate on unit cabinet or within sight of the unit per national or local codes. Do not cover unit informative plate if mounting the disconnect on the unit cabinet.

ALL UNITS

All field wiring must comply with NEC and all local codes. Size wire based on MCA (Minimum Circuit Amps) on the unit informative plate. See Fig. 24 and the unit label diagram for power wiring connections to the unit power terminal blocks and equipment ground. Maximum wire size is #2 ga AWG per pole.

Provide a ground-fault and short-circuit over-current protection device (fuse or breaker) per NEC Article 440 (or local codes). Refer to unit informative data plate for MOCP (Maximum Over-current Protection) device size.

All field wiring must comply with the NEC and local requirements.

NOTE: Check all factory and field electrical connections for tightness.

CONVENIENCE OUTLETS

WARNING

ELECTRICAL OPERATION HAZARD

Failure to follow this warning could result in personal injury or death.

Units with convenience outlet circuits may use multiple disconnects. Check convenience outlet for power status before opening unit for service. Locate its disconnect switch, if appropriate, and open it. Lock-out and tag-out this switch, if necessary.

Two types of convenience outlets are offered on 50TCQD models: non-powered and unit-powered. Both types provide a 125-v GFCI (ground-fault circuit-interrupter) duplex receptacle rated at 15-A behind a hinged waterproof access cover, located on the end panel of the unit. See Fig. 31.
Installing Weatherproof Cover

A weatherproof while-in-use cover for the factory-installed convenience outlets is now required by UL standards. This cover cannot be factory-mounted due its depth; it must be installed at unit installation. For shipment, the convenience outlet is covered with a blank cover plate.

The weatherproof cover kit is shipped in the unit’s control box. The kit includes the hinged cover, a backing plate and gasket.

**DISCONNECT ALL POWER TO UNIT AND CONVENIENCE OUTLET. LOCK-OUT AND TAG-OUT ALL POWER.**

Remove the blank cover plate at the convenience outlet; discard the blank cover.

Loosen the two screws at the GFCI duplex outlet, until approximately 1/2-in. (13 mm) under screw heads are exposed. Press the gasket over the screw heads; slip the backing plate over the screw heads at the keyhole slots and align with the gasket; tighten the two screws until snug (do not over-tighten).

Mount the weatherproof cover to the backing plate as shown in Fig. 32. Remove two slot fillers in the bottom of the cover to permit service tool cords to exit the cover. Check for full closing and latching.

**Non-powered type**

This type requires the field installation of a general-purpose 125-volt 15-A circuit powered from a source elsewhere in the building. Observe national and local codes when selecting wire size, fuse or breaker requirements and disconnect switch size and location. Route 125-v power supply conductors into the bottom of the utility box containing the duplex receptacle.

**Unit-powered type**

A unit-mounted transformer is factory-installed to stepdown the main power supply voltage to the unit to 115-v at the duplex receptacle. This option also includes a manual switch with fuse, located in a utility box and mounted on a bracket behind the convenience outlet; access is through the unit’s control box access panel. See Fig. 31.

The primary leads to the convenience outlet transformer are not factory-connected. Selection of primary power source is a customer option. If local codes permit, the transformer primary leads can be connected at the line-side terminals on the unit-mounted non-fused disconnect switch or HACR breaker switch; this will provide service power to the unit when the unit disconnect switch or HACR switch is open. Other connection methods will result in the convenience outlet circuit being de-energized when the unit disconnect or HACR switch is open. See Fig. 33.

**Duty Cycle**

The unit-powered convenience outlet has a duty cycle limitation. The transformer is intended to provide power on an intermittent basis for service tools, lamps, etc; it is not intended to provide 15-amps loading for continuous duty loads (such as electric heaters for overnight use). Observe a 50% limit on circuit loading above 8-amps (i.e., limit loads exceeding 8-amps to 30 minutes of operation every hour).

Test the GFCI receptacle by pressing the TEST button on the face of the receptacle to trip and open the receptacle. Check for proper grounding wires and power line phasing if the GFCI receptacle does not trip as required. Press the RESET button to clear the tripped condition.

**Fuse on power type**

The factory fuse is a Bussman “Fusetron” T-15, non-renewable screw-in (Edison base) type plug fuse.

**Using unit-mounted convenience outlets**

Units with unit-mounted convenience outlet circuits will often require that two disconnects be opened to de-energize all power to the unit. Treat all units as electrically energized until the convenience outlet power is also checked and de-energization is confirmed. Observe National Electrical Code Article 210, Branch Circuits, for use of convenience outlets.

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1. Bussman and Fusetron are trademarks of Cooper Technologies Company.
Test the GFCI receptacle by pressing the TEST button on the face of the receptacle to trip and open the receptacle. Check for proper grounding wires and power line phasing if the GFCI receptacle does not trip as required. Press the RESET button to clear the tripped condition.

**FACTORY-OPTION THRU-BASE CONNECTIONS**

This service connection kit consists of a 1/2-in. electrical bulkhead connector and a 3/4-in. electrical bulkhead connector, all factory-installed in the embossed (raised) section of the unit basepan in the condenser section. The 1/2-in. bulkhead connector enables the low-voltage control wires to pass through the basepan. The 3/4-in. electrical bulkhead connector allows the high-voltage power wires to pass through the basepan. See Fig. 35 for size 08-09 units and Fig. 36 for size 12 units.

Field-supplied and field-installed liquid tight conduit connectors and conduit may be attached to the connectors on the basepan. Pull correctly rated high voltage and low voltage through appropriate conduits. Connect the power conduit to the internal disconnect (if unit is so equipped) or to the external disconnect (through unit side panel). A hole must be field cut in the main control box bottom on the left side so the 24-v control connections can be made. Connect the control power conduit to the unit control box at this hole.

**UNITS WITHOUT THRU-BASE CONNECTIONS**

1. Install power wiring conduit through side panel openings. Install conduit between disconnect and control box.
2. Install power lines to terminal connections as shown in Fig. 24.

**ALL UNITS**

Voltage to compressor terminals during operation must be within voltage range indicated on unit nameplate. On 3-phase units, voltages between phases must be balanced within 2% and the current within 10%. Use the formula shown below to determine the percent of voltage imbalance. Operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components. Such operation would invalidate any applicable Carrier warranty.

Example: Supply voltage is 230-3-60

\[
\begin{align*}
AB &= 224 \text{ v} \\
BC &= 231 \text{ v} \\
AC &= 226 \text{ v}
\end{align*}
\]

\[
\text{Average Voltage} = \frac{(224 + 231 + 226)}{3} = \frac{681}{3} = 227
\]
Determine maximum deviation from average voltage.
(AB) 227-224 = 3 v
(BC) 231-227 = 4 v
(AC) 227-226 = 1 v
Maximum deviation is 4 v.

Determine percent of voltage imbalance.
% Voltage Imbalance = 100x \frac{4}{227} \approx 1.78%

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

**IMPORTANT:** If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.

**NOTE:** Check all factory and field electrical connections for tightness.

**FIELD CONTROL WIRING**

The 50TCQ unit requires an external temperature control device. This device can be a thermostat (field-supplied) or a PremierLink™ controller (available as factory-installed option or as field-installed accessory, for use on a Carrier Comfort Network® system or as a stand alone control) or the RTU Open Controller for Building Management Systems using non-CCN protocols. (RTU Open is available as a factory-installed option only.)

**THERMOSTAT**

Install a Carrier-approved accessory 2 stage Cooling/Heating thermostat according to installation instructions included with the accessory. The 50TCQ models do not require a thermostat with an O function to control the reversing valve operation. If using an electronic thermostat, configure it for “non-heat pump” operation. Locate the thermostat accessory on a solid wall in the conditioned space to sense average temperature in accordance with the thermostat installation instructions.

If the thermostat contains a logic circuit requiring 24-v power, use a thermostat cable or equivalent single leads of different colors with minimum of seven leads. If the thermostat does not require a 24-v source (no “C” connection required), use a thermostat cable or equivalent with minimum of six leads. Check the thermostat installation instructions for additional features which might require additional conductors in the cable.

For wire runs up to 50 ft. (15 m), use no. 18 AWG (American Wire Gage) insulated wire (35°C [95°F] minimum). For 50 to 75 ft. (15 to 23 m), use no. 16 AWG insulated wire (35°C [95°F] minimum). For over 75 ft. (23 m), use no. 14 AWG insulated wire (35°C [95°F] minimum). All wire sizes larger than no. 18 AWG cannot be directly connected to the thermostat and will require a junction box and splice at the thermostat.

---

**Fig. 37 — Typical Low-Voltage Control Connections**

**Central Terminal Board**

The Central Terminal Board (CTB) is a pass through connection point. The CTB provides the capability to add factory-installed options and field-installed accessories to the units by cutting jumper wires without having to change or reroute wires through the structure of the unit. The CTB does not provide any microprocessor control; it is simply a basic multifunction wiring terminal configuration.

**Commercial Defrost Control**

The Commercial Defrost Control Board (DFB) coordinates thermostat demands for supply fan control, 1 or 2 stage cooling, 2 stage heating, emergency heating and defrost control with unit operating sequences. The DFB also provides an indoor fan off delay feature (user selectable). See Fig. 38 for board arrangement.
The DFB is located in the 50TCQ unit’s main control box (see Fig. 40). All connections are factory-made through harnesses to the unit’s CTB, to IFC (belt-drive motor) or to ECM (direct-drive motor), reversing valve solenoids and to defrost thermostats. Refer to Table 6 for details of DFB Inputs and Outputs.

REVERSING VALVE CONTROL
The DFB has two outputs for unit reversing valve control. Operation of the reversing valves is based on internal logic; this application does not use an “O” or “B” signal to determine reversing valve position. Reversing valves are energized during the cooling stages and the defrost cycle and de-energized during heating cycles. Once energized at the start of a cooling stage, the reversing valve will remain energized until the next heating cycle demand is received. Once de-energized at the start of a Heating cycle, the reversing valves will remain de-energized until the next cooling stage is initiated.

COMPRESSOR CONTROL
The DFB receives inputs indicating Stage 1 Cooling, Stage 2 Cooling and Stage 1 Heating from the space thermostat or unit control system (PremierLink™ controller or RTU Open controller); it generates commands to start compressors with or without reversing valve operation to produce Stage 1 Cooling (one compressor runs), Stage 2 Cooling (both compressors run) or Stage 1 Heating (both compressors run).

AUXILIARY (ELECTRIC) HEAT CONTROL
The 50TCQ unit can be equipped with one or two auxiliary electric heaters, to provide a second stage of heating. The DFB will energize this Heating System for a Stage 2 Heating Command (heaters operate concurrently with compressor(s) in the Stage 1 Heating cycle), for an Emergency Heating sequence (compressors are off and only the electric heaters are energized) and also during the Defrost cycle (to eliminate a “cold blow” condition in the space).

DEFROST
The defrost control mode is a time/temperature sequence. There are two time components: The continuous run period and the test/defrost cycle period. The temperature component is provided by Defrost Thermostat 1 and 2 (DFT1 and DFT2) mounted on the outdoor coil.

The continuous run period is a fixed time period between the end of the last defrost cycle (or start of the current Heating cycle) during which no defrost will be permitted. This period can be set at 30, 60, 90 or 120 minutes by changing the positions of DIP switches SW1 and SW2 (see Fig. 39 and Table 7). The default run period is 60 minutes for unit sizes 08, 09, and 12.

Shorting the jumpers for a period of 5 to 20 seconds bypasses the remaining continuous run period and places the unit in a Forced Defrost mode. If the controlling DFT is closed when this mode is initiated, the unit will complete a normal defrost period that will terminate when the controlling DFT opens or the 10 minute defrost cycle limit is reached. If the controlling DFT is open when this mode is initiated, the Defrost cycle will run for 30 seconds. Both modes end at the end of the Defrost cycle.
**Table 6 — 50TCQ Defrost Board I/O and Jumper Configurations**

<table>
<thead>
<tr>
<th>POINT NAME</th>
<th>TYPE OF I/O</th>
<th>CONNECTION PIN NUMBER</th>
<th>UNIT CONNECTION</th>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INPUTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G Fan</td>
<td>DI, 24 vac</td>
<td>P2-3</td>
<td>CTB-G</td>
<td></td>
</tr>
<tr>
<td>Y1 Cool 1</td>
<td>DI, 24 vac</td>
<td>P2-5</td>
<td>CTB-Y1</td>
<td></td>
</tr>
<tr>
<td>Y2 Cool 2</td>
<td>DI, 24 vac</td>
<td>P2-4</td>
<td>CTB-Y2</td>
<td></td>
</tr>
<tr>
<td>W1 Heat 1</td>
<td>DI, 24 vac</td>
<td>P2-7</td>
<td>CTB-W1</td>
<td></td>
</tr>
<tr>
<td>W2 Heat 2</td>
<td>DI, 24 vac</td>
<td>P2-6</td>
<td>CTB-W2</td>
<td></td>
</tr>
<tr>
<td>R Power</td>
<td>24 vac</td>
<td>P3-1</td>
<td>CONTL BRD-8</td>
<td></td>
</tr>
<tr>
<td>C Common</td>
<td>24 vac</td>
<td>P3-2</td>
<td>CONTL BRD-4</td>
<td></td>
</tr>
<tr>
<td>DFT 1</td>
<td>DI, 24 vac</td>
<td>DFT-1 to DFT-1</td>
<td></td>
<td>—</td>
</tr>
<tr>
<td>DFT 2</td>
<td>DI, 24 vac</td>
<td>DFT-2 to DFT-2</td>
<td></td>
<td>—</td>
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<tr>
<td><strong>OUTPUTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IFO Fan On</td>
<td>DO, 24 vac</td>
<td>P3-9</td>
<td>REHEAT/HP-2</td>
<td></td>
</tr>
<tr>
<td>OF OD Fan On</td>
<td>DO, 24 vac</td>
<td>OF</td>
<td>OFR</td>
<td></td>
</tr>
<tr>
<td>RVS1</td>
<td>DO, 24 vac</td>
<td>P3-7 to P3-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RVS2</td>
<td>DO, 24 vac</td>
<td>P3-6 to P3-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMP 1</td>
<td>DO, 24 vac</td>
<td>P3-10</td>
<td>FPT1-REHEAT/HP-6</td>
<td></td>
</tr>
<tr>
<td>COMP2</td>
<td>DO, 24 vac</td>
<td>P3-8</td>
<td>FPT2-REHEAT/HP-8</td>
<td></td>
</tr>
<tr>
<td>HEAT 2</td>
<td>DO, 24 vac</td>
<td>E-HEAT</td>
<td>TB4-1</td>
<td></td>
</tr>
<tr>
<td>COM</td>
<td>24 vac</td>
<td>P3-3</td>
<td>TB4-3</td>
<td></td>
</tr>
<tr>
<td><strong>CONFIGURATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Select Jumper</td>
<td>24 vac</td>
<td>P1-1</td>
<td></td>
<td>—</td>
</tr>
<tr>
<td>2 Compressor</td>
<td>24 vac</td>
<td>P1-3</td>
<td></td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Use for 50TCQD</td>
<td></td>
</tr>
<tr>
<td><strong>SPEED-UP CONFIGURATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed-Up Jumper</td>
<td>—</td>
<td>JMP17</td>
<td></td>
<td>—</td>
</tr>
<tr>
<td>Speed-Up Jumper</td>
<td>—</td>
<td>JMP18</td>
<td></td>
<td>—</td>
</tr>
</tbody>
</table>

**NOTES:**
1. Jumper for 1-3 seconds: Factory Test — The defrost interval timing is reduced by a factor of 0.1 seconds/minute based on the positions of DIP switches SW1 and SW2 (i.e. 90 minutes will be reduced to 9 seconds).
2. Jumper for 5-20 seconds: Forced Defrost — Defrost runs for 30 seconds if DFT2 is open.

**Table 7 — DIP Switch Positions**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>1</th>
<th>2</th>
<th>1</th>
<th>2</th>
<th>1</th>
<th>2</th>
<th>1</th>
<th>2</th>
<th>On</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>•</td>
<td>0</td>
<td>•</td>
<td>0</td>
<td>•</td>
<td>0</td>
<td>•</td>
<td>0</td>
<td>•</td>
<td>Off</td>
</tr>
</tbody>
</table>

| 30 minutes | 60 minutes (factory default) | 90 minutes | 120 minutes | Fan Delay |

**UNIT WITHOUT THRU-BASE CONNECTION KIT**

Pass the thermostat control wires through the hole provided in the corner post; then feed the wires through the raceway built into the corner post to the control box. Pull the wires over to the terminal strip on the upper-left corner of the Central Terminal Board (CTB). See Fig. 41.

**NOTE:** If thru-the-bottom connections accessory is used, refer to the accessory installation instructions for information on routing power and control wiring.

---

**Fig. 41 — Field Control Wiring Raceway**
HEAT ANTICIPATOR SETTINGS
Set heat anticipator settings at 0.14 amp for the first stage and 0.14 amp for second-stage heating, when available.

Electric Heaters
The 50TCQ units may be equipped with field-installed accessory electric heaters. The heaters are modular in design, with heater frames holding open coil resistance wires strung through ceramic insulators, limit switches and one or two control contacts. One or two heater modules may be used in a unit.

Heater modules are installed in the compartment below the indoor (supply) fan outlet. Access is through the indoor access panel. Heater modules slide into the compartment on tracks along the bottom of the heater opening. See Fig. 42 - 44.

Not all available heater modules may be used in every unit. Use only those heater modules that are UL listed for use in a specific size unit. Refer to the label on the unit cabinet for the list of approved heaters.

Unit heaters are marked with heater model numbers. But heaters are ordered as and shipped in cartons marked with a corresponding heater sales package part number. See Table 8 for correlation between heater model number and sales package part number.

NOTE: The value in position 9 of the part number differs between the sales package part number (value is 1 or 3) and a bare heater model number (value is 0).
SINGLE POINT BOXES AND SUPPLEMENTARY FUSES

When the unit MOCP device value exceeds 60-A, unit-mounted supplementary fuses are required for each heater circuit. These fuses are included in accessory single point boxes, with power distribution and fuse blocks. The single point box will be installed directly under the unit control box, just to the left of the partition separating the indoor section (with electric heaters) from the outdoor section. The single point box has a hinged access cover. See Fig. 45. The single point box also includes pigtail to complete the wiring between the single point box and the unit’s main control box terminals. Refer to the accessory heater and single point box installation instructions for details on tap connections.

All fuses on 50TCQ units are 60-A. (Note that all heaters are qualified for use with a 60-A fuse, regardless of actual heater ampacity, so only 60-A fuses are necessary.)

SINGLE POINT BOXES WITHOUT FUSES

Refer to accessory heater and single point box installation instructions for details on tap connections.

LOW-VOLTAGE CONTROL CONNECTIONS

Run the low-voltage control leads from the heater module(s) - VIO and BRN (two of each if two modules are installed) - to the 4-pole terminal board TB4 located on the heater bulkhead to the left of Heater #1. Except for CRHEATER128B00-129B00, connect the VIO leads from Heater #1 and Heater #2 to terminal TB4-1. Connect the BRN leads to terminal TB4-3. See Fig. 46.

For CRHEATER128B00-129B00 only

Connect the ORN lead from HR1 (Heater Relay 1) and the VIO lead from HR3 (Heater Relay 3) to terminal TB4-1. Connect the BRN lead from HR1 to TB4-3. See Fig. 47.
EconoMi$er® X (Factory Option)

The EconoMi$er X system is an expandable economizer control system, which includes a W7220 economizer module (controller) with an LCD and keypad (see Fig. 48). The W7220 can be configured with optional sensors.

**User Interface**

Provides status for normal operation, setup parameters, checkout tests, and alarm and error conditions with a 2-line 16 character LCD display and four button keypad.

**Electrical**

- Rated Voltage — 20 to 30 vac RMS, 50/60 Hz
- Transformer — 100 va maximum system input
- Nominal Power Consumption (at 24 vac, 60 Hz) — 11.5 VA without sensors or actuators
- Relay Digital Output Rating at 30 vac (maximum power from Class 2 input only) — 1.5A run: 3.5A inrush at 0.45PF (200,000 cycles) or 7.5A inrush at 0.45PF (100,000 cycles)
- External Sensors Power Output — 21 vdc ± 5% at 48mA

**INPUTS**

**Sensors**

NOTE: A Mixed Air (MA) analog sensor is required on all W7220 units; either an Outdoor Air (OA) sensor for dry bulb change over or an OA bus sensor for outdoor enthalpy change over is required in addition to the MA sensor. An additional Return Air (RA) bus sensor can be added to the system for differential enthalpy or dry bulb changeover. For differential dry bulb changeover a 20k ohm sensor is required in the OA and a bus sensor in the RA. DIP switch on RA bus sensor must be set in the RA position.

- Dry Bulb Temperature (optional) and Mixed Air (required), 20k NTC
  2-wire (18 to 22 AWG); Temperature range –40°F to 150°F (–40°C to 65°C)
  Temperature accuracy: 0°F/+2°F
- Temperature and Humidity, C7400S1000 (optional)
  S-Bus; 2-wire (18 to 22 AWG)
  Temperature: range –40°F to 150°F (–40°C to 65°C)
  Temperature accuracy: 0°F/+2°F (–18°C/–17°C)
  Humidity: range 0 to 100% RH with 5% accuracy.
- NOTE: Up to three (3) S-Bus sensors may be connected to the W7220 economizer module for outdoor air (OA), return air (RA) and discharge (supply) air (DA).
- 4 Binary Inputs
  1-wire 24 vac + common GND (see page 32 for wiring details).
- 24 vac power supply
  20 to 30 vac 50/60Hz; 100 VA Class 2 transformer.

**OUTPUTS**

**Actuator Signal**

2 to 10 vdc; minimum actuator impedance is 2k ohm; bus two-wire output for bus communicating actuators.

**Exhaust fan, Y1, Y2 and AUX1 O**

All Relay Outputs (at 30 vac):
- Running: 1.5A maximum
- Inrush: 7.5A maximum

**ENVIRONMENTAL**

**Operating Temperature**

–40°F to 150°F (–40°C to 65°C).

Exception of display operation down to –4°F (–20°C) with full recovery at –4°F (–20°C) from exposure to –40°F (–40°C)

**SYSTEM COMPONENTS**

The EconoMi$er X system includes an economizer module, 20k mixed air sensor, damper actuator, and either a 20k outdoor air temperature sensor or S-Bus enthalpy sensors.

**Economizer Module**

The module is the core of the EconoMi$er X system. The module is mounted in the unit’s control box, and includes the user interface for the system. The W7220 economizer module provides the basic inputs and outputs to provide simple economizer control. When used with the optional sensors, the economizer module provides more advanced economizer functionality.

**S-Bus Enthalpy Control Sensors**

The sensor is a combination temperature and humidity sensor which is powered by and communicates on the S-Bus. Up to three sensors may be configured with the W7220 economizer module.

**CO₂ Sensor (optional)**

The sensor can be added for Demand Controlled Ventilation (DCV).

**SPECIFICATIONS**

**W7220 Economizer Module**

The module is designed for use with 2 to 10 vdc or bus communicating actuator. The module includes terminals for CO₂ sensor, Mixed Air sensor, and an Outdoor Dry Bulb sensor. Enthalpy and other options are available with bus sensors.
Storage Temperature
–40°F to 150°F (–40°C to 65°C)

Shipping Temperature
–40°F to 150°F (–40°C to 65°C)

Relative Humidity
5% to 95% RH non-condensing

ECONOMIZER MODULE WIRING DETAILS
Use Fig. 49 and Tables 9 and 10 to locate the wiring terminals for the Economizer module.

NOTE: The four terminal blocks are removable. Slide out each terminal block, wire it, and then slide it back into place.

Table 9 — Economizer Module - Left Hand Terminal Blocks

<table>
<thead>
<tr>
<th>LABEL</th>
<th>TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT MAT 20k NTC and COM</td>
<td>Mixed Air Temperature Sensor (Polarity Insensitive Connection)</td>
<td></td>
</tr>
<tr>
<td>OAT OAT 20k NTC and COM</td>
<td>Outdoor Air Temperature Sensor (Polarity Insensitive Connection)</td>
<td></td>
</tr>
<tr>
<td>S-BUS S-BUS (Sylk* Bus)</td>
<td>Enthalpy Control Sensor (Polarity Insensitive Connection)</td>
<td></td>
</tr>
</tbody>
</table>

Table 10 — Economizer Module - Right Hand Terminal Blocks

<table>
<thead>
<tr>
<th>LABEL</th>
<th>TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUX2 I 24 vac IN</td>
<td>The first terminal is not used.</td>
<td></td>
</tr>
<tr>
<td>OCC 24 vac IN</td>
<td>Shut Down (SD) or HEAT (W) Conventional only and Heat Pump Changeover (O-B) in Heat Pump mode.</td>
<td></td>
</tr>
<tr>
<td>E-GND E-GND</td>
<td>Occupied/Unoccupied Input</td>
<td></td>
</tr>
<tr>
<td>EXH1 24 vac OUT</td>
<td>Exhaust Fan 1 Output</td>
<td></td>
</tr>
<tr>
<td>AUX1 O 24 vac OUT</td>
<td>Programmable: Exhaust fan 2 output or ERV or System alarm output</td>
<td></td>
</tr>
</tbody>
</table>

S-Bus Sensor Wiring
The labels on the sensors and controller are color coded for ease of installation. Orange labeled sensors can only be wired to orange terminals on the controller. Brown labeled sensors can only be wired to S-bus (brown) terminals. Use Fig. 50 and Table 11 to locate the wiring terminals for each S-Bus sensor.

Use Fig. 49 and Table 11 to locate the wiring terminals for each enthalpy control sensor.
Fig. 50 — S-Bus Sensor DIP Switches

Use Fig. 50 and Table 12 to set the DIP switches for the desired use of the sensor.

Table 11 — HH57AC081 Sensor Wiring Terminations

<table>
<thead>
<tr>
<th>TERMINAL NUMBER</th>
<th>LABEL TYPE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S-BUS</td>
<td>S-BUS Communications (Enthalpy Control Sensor Bus)</td>
</tr>
<tr>
<td>2</td>
<td>S-BUS</td>
<td>S-BUS Communications (Enthalpy Control Sensor Bus)</td>
</tr>
</tbody>
</table>

Use Fig. 50 and Table 12 to set the DIP switches for the desired use of the sensor.

Table 12 — HH57AC081 Sensor DIP Switch

<table>
<thead>
<tr>
<th>USE</th>
<th>DIP SWITCH POSITIONS FOR SWITCHES 1, 2, AND 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>DA</td>
<td>OFF OFF OFF</td>
</tr>
<tr>
<td>RA</td>
<td>ON   OFF</td>
</tr>
<tr>
<td>OA</td>
<td>OFF OFF OFF</td>
</tr>
</tbody>
</table>

NOTE: When an S-Bus sensor is connected to an existing network, it will take 60 minutes for the network to recognize and auto-configure itself to use the new sensor.

During the 60-minute setup period, no alarms for sensor failures (except SAT) will be issued and no economizing function will be available.

CO₂ Sensor Wiring

When using a CO₂ sensor the black and brown common wires are internally connected and only one is connected to “IAQ COM” on the W7220. Use the power from the W7220 to power the CO₂ sensor OR make sure the ground for the power supplies are common. See Fig. 51 for CO₂ sensor wiring.

Fig. 51 — CO₂ Sensor Wiring

INTERFACE OVERVIEW

This section describes how to use the EconoMi$er® user interface for:

- Keypad and menu navigation
- Settings and parameter changes
- Menu structure and selection

User Interface

The user interface consists of a 2-line LCD display and a 4-button keypad on the front of the economizer controller.

Keypad

Use the four navigation buttons (see Fig. 52) to scroll through the menus and menu items, select menu items, and to change parameter and configuration settings.

To use the keypad when working with menus:

1. Navigate to the desired menu.
2. Press the ✈ (Enter) button to display the first item in the currently displayed menu.
3. Use the ▲ and ▼ buttons to scroll to the desired parameter.

To use the keypad when working with Setpoints, System and Advanced Settings, Checkout tests and Alarms:

1. Navigate to the desired menu.
2. Press the ✈ (Enter) button to display the first item in the currently displayed menu.
3. Use the ▲ and ▼ buttons to scroll to the desired parameter.

Fig. 52 — W7220 Controller Navigation Buttons
4. Press the  (Enter) button to display the value of the currently displayed item.
5. Press the ▲ button to increase (change) the displayed parameter value.
6. Press the ▼ button to decrease (change) the displayed parameter value.

NOTE: When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment or decrement.
1. Press the  (Enter) button to accept the displayed value and store it in nonvolatile RAM. “CHANGE STORED” displays.
2. Press the  (Enter) button to return to the current menu parameter.
3. Press the ✧ (Menu Up/Exit) button to return to the previous menu.

Menu Structure
Table 13 illustrates the complete hierarchy of menus and parameters for the EconoMi$er® X system.
The Menus in display order are:
- STATUS
- SETPOINTS
- SYSTEM SETUP

### Table 13 — W7220 Menu Structure*

<table>
<thead>
<tr>
<th>MENU</th>
<th>PARAMETER</th>
<th>PARAMETER DEFAULT VALUE</th>
<th>PARAMETER RANGE AND INCREMENT</th>
<th>EXPANDED PARAMETER NAME</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATUS</td>
<td>ECON AVAIL</td>
<td>NO</td>
<td>YES/NO</td>
<td>FIRST STAGE COOLING DEMAND (Y1–IN)</td>
<td>YES = economizing available; the system can use outside air for free cooling when required</td>
</tr>
<tr>
<td></td>
<td>ECONOMIZING</td>
<td>NO</td>
<td>YES/NO</td>
<td>FIRST STAGE COOLING RELAY OUTPUT</td>
<td>YES = outside air being used for first stage cooling</td>
</tr>
<tr>
<td></td>
<td>OCCUPIED</td>
<td>NO</td>
<td>YES/NO</td>
<td>OCCUPIED</td>
<td>YES = OCC signal received from space thermostat or unitary controller</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NO = 24 vac on terminal OCC</td>
<td>NO = 0 vac on terminal OCC</td>
</tr>
<tr>
<td></td>
<td>HEAT PUMP</td>
<td>N/A**</td>
<td>COOL, HEAT</td>
<td>HEAT PUMP MODE</td>
<td>Displays COOL or HEAT when system is set to heat pump (Non-conventional)</td>
</tr>
<tr>
<td></td>
<td>COOL Y1—IN</td>
<td>OFF</td>
<td>ON/OFF</td>
<td>FIRST STAGE COOLING DEMAND (Y1–IN)</td>
<td>Y1–I signal from space thermostat or unitary controller for cooling stage 1. ON = 24 vac on terminal Y1–I OFF = 0 vac on terminal Y1–I</td>
</tr>
<tr>
<td></td>
<td>COOL Y1—OUT</td>
<td>OFF</td>
<td>ON/OFF</td>
<td>FIRST STAGE COOLING RELAY OUTPUT</td>
<td>Cool stage 1 Relay Output to stage 1 mechanical cooling (Y1–OUT terminal)</td>
</tr>
<tr>
<td></td>
<td>COOL Y2—IN</td>
<td>OFF</td>
<td>ON/OFF</td>
<td>SECOND STAGE COOLING DEMAND (Y2–IN)</td>
<td>Y2–I signal from space thermostat or unitary controller for second stage cooling. ON = 24 vac on terminal Y2–I OFF = 0 vac on terminal Y2–I</td>
</tr>
<tr>
<td></td>
<td>COOL Y2—OUT</td>
<td>OFF</td>
<td>ON/OFF</td>
<td>SECOND STAGE COOLING RELAY OUTPUT</td>
<td>Cool Stage 2 Relay Output to mechanical cooling (Y2–OUT terminal)</td>
</tr>
<tr>
<td></td>
<td>MA TEMP</td>
<td>(or _ _ _ °F)</td>
<td>–40°F to 150°F (–40°C to 66°C)</td>
<td>SUPPLY AIR TEMPERATURE, Cooling Mode</td>
<td>Displays value of measured mixed air from MAT sensor. Displays _ _ _ °F if not connected, short or out of range.</td>
</tr>
<tr>
<td></td>
<td>DA TEMP</td>
<td>(or _ _ _ °F)</td>
<td>–40°F to 150°F (–40°C to 66°C)</td>
<td>DISCHARGE AIR TEMPERATURE, after Heating section</td>
<td>Displays measured discharge temperature. Displays _ _ _ °F if sensor sends invalid value, if not connected, short or out of range.</td>
</tr>
<tr>
<td></td>
<td>OA TEMP</td>
<td>(or _ _ _ °F)</td>
<td>–40°F to 140°F (–40°C to 60°C)</td>
<td>OUTSIDE AIR TEMP</td>
<td>Displays measured value of outdoor air temperature. Displays _ _ _ °F if sensor sends invalid value, short or out of range.</td>
</tr>
</tbody>
</table>

IMPORTANT: During setup, the economizer module is live at all times.

The setup process uses a hierarchical menu structure that is easy to use. Press the ▲ and ▼ arrow buttons to move forward and backward through the menus and press the button to select and confirm setup item changes.

Time-Out and Screensaver
When no buttons have been pressed for 10 minutes, the LCD displays a screen saver, which cycles through the Status items. Each Status items displays in turn and cycles to the next item after 5 seconds.
## Table 13 — W7220 Menu Structure* (cont)

<table>
<thead>
<tr>
<th>MENU</th>
<th>PARAMETER</th>
<th>PARAMETER DEFAULT VALUE</th>
<th>PARAMETER RANGE AND INCREMENT†</th>
<th>EXPANDED PARAMETER NAME</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OA HUM</td>
<td>_ _ %</td>
<td>0 to 100%</td>
<td>OUTSIDE AIR RELATIVE HUMIDITY</td>
<td>Displays measured value of outdoor humidity from OA Sylk Bus sensor. Displays _ _ % if not connected short, or out of range.</td>
</tr>
<tr>
<td></td>
<td>RA TEMP</td>
<td>_ _ °F (or _ _ _ °C)</td>
<td>0°F to 140°F (–18°C to 60°C)</td>
<td>RETURN AIR TEMPERATURE</td>
<td>Displays measured value of return air temperature from RAT Sylk Bus sensor. Displays _ _ °F if sensor sends invalid value, if not connected, short or out of range.</td>
</tr>
<tr>
<td></td>
<td>RA HUM</td>
<td>_ _ %</td>
<td>0 to 100%</td>
<td>RETURN AIR RELATIVE HUMIDITY</td>
<td>Displays measured value of return air humidity from RA Sylk Bus sensor. Displays _ _ % if sensor sends invalid value, if not connected, short or out of range.</td>
</tr>
<tr>
<td></td>
<td>IN CO2</td>
<td>_ _ ppm</td>
<td>0 to 2000 ppm</td>
<td>SPACE/RETURN AIR CO₂</td>
<td>Displays value of measured CO₂ from CO₂ sensor. Invalid if not connected, short or out of range. May be adjusted in Advanced menu by Zero offset and Span.</td>
</tr>
<tr>
<td>STATUS (cont)</td>
<td>DCV STATUS</td>
<td>N/A</td>
<td>ON/OFF</td>
<td>DEMAND CONTROLLED VENTILATION STATUS</td>
<td>Displays ON if above set point and OFF if below set point, and ONLY if a CO₂ sensor is connected.</td>
</tr>
<tr>
<td></td>
<td>DAMPER OUT</td>
<td>2.0v</td>
<td>2.0 to 10.0v</td>
<td>Displays voltage output to the damper actuator.***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACT POS</td>
<td>N/A</td>
<td>0 to 100%</td>
<td>Displays actual position of actuator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACT COUNT</td>
<td>N/A</td>
<td>1 to 65,535</td>
<td>Displays number of times actuator has cycled. 1 cycle equals 180 degrees of actuator movement in any direction.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACTUATOR</td>
<td>N/A</td>
<td>OK/Alarm (on Alarm menu)</td>
<td>Displays ERROR if voltage or torque is below actuator range.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EXH1 OUT</td>
<td>OFF</td>
<td>ON/OFF</td>
<td>EXHAUST STAGE 1 RELAY OUTPUT</td>
<td>Displays ON when damper position reaches programmed percentage set point. Output of EXH1 terminal: ON = relay closed OFF = relay open</td>
</tr>
<tr>
<td></td>
<td>EXH2 OUT</td>
<td>OFF</td>
<td>ON/OFF</td>
<td>EXHAUST STAGE 2 RELAY OUTPUT</td>
<td>Output of AUX1 O terminal Displays ON when damper position reaches programmed percentage set point. ON = 24 vac output OFF = No output Displays only if AUX1 O = EXH2</td>
</tr>
<tr>
<td></td>
<td>ERV</td>
<td>OFF</td>
<td>ON/OFF</td>
<td>ENERGY RECOVERY VENTILATOR</td>
<td>Output of AUX1 O terminal; displays only if AUX1 O = ERV ON = 24 vac output OFF = No Output.</td>
</tr>
<tr>
<td></td>
<td>MECH COOL ON or HEAT STAGES ON</td>
<td>0</td>
<td>0, 1, or 2</td>
<td>Displays stage of mechanical cooling that is active. Displays the stage of heat pump heating that is active.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FAN SPEED</td>
<td>N/A</td>
<td>LOW or HIGH</td>
<td>SUPPLY FAN SPEED Displays speed setting of fan on a 2-speed fan unit.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>W (HEAT IN)</td>
<td>N/A</td>
<td>ON/OFF</td>
<td>HEAT DEMAND STATUS Displays status of heat demand on a 2-speed fan unit.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MAT SET</td>
<td>53°F (12°C)</td>
<td>38°F to 70°F (3°C to 21°C); increment by 1 degree</td>
<td>SUPPLY AIR SETPOINT The economizer will modulate the OA damper to maintain the mixed air temperature at the set point</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LOW T LOCK</td>
<td>32°F (0°C)</td>
<td>–45°F to 80°F (–43°C to 27°C); increment by 1 degree</td>
<td>COMPRESSOR LOW TEMPERATURE LOCKOUT Set point determines outdoor temperature when the mechanical cooling cannot be turned on. Commonly referred to as the Compressor lockout. At or below the set point, the Y1-O and Y2-O will not be energized on the controller.</td>
<td></td>
</tr>
<tr>
<td>SETPOINTS</td>
<td>DRYBB SET</td>
<td>63°F (17°C)</td>
<td>48°F to 80°F (9°C to 27°C); increment by 1 degree</td>
<td>O.A DRY BULB TEMPERATURE CHANGEOVER SETPOINT Dry bulb set point will only appear if using dry bulb changover. Set point determines where the economizer will assume outdoor air temperature is good for free cooling; e.g.; at 63°F unit will economize at 62°F and below and not economize at 64°F and above. There is a 2°F deadband.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENTH CURVE</td>
<td>ES3</td>
<td>ES1, ES2, ES3, ES4, or ES5</td>
<td>ENTHALPY CHANGEOVER CURVE ES curve will only appear if using enthalpy changover. Enthalpy boundary “curves” for economizing using single enthalpy. See page 40 for description of enthalpy curves.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DCV SET</td>
<td>1100ppm</td>
<td>500 to 2000 ppm; increment by 100</td>
<td>DEMAND CONTROLLED VENTILATION Displays only if CO₂ sensor is connected. Set point for Demand Controlled Ventilation of space. Above the set point, the OA dampers will modulate open to bring in additional OA to maintain a space ppm level below the set point.</td>
<td></td>
</tr>
</tbody>
</table>
### Setpoints (Cont)

**Ventilation Minimum Position**
- **MIN POS**: 2.8 V (2 to 10 vdc)
  - Displays only if a CO2 sensor is NOT connected.

**Ventilation Maximum Position**
- **VENTMAX**: 2.8 V (2 to 10 vdc)
  - 100 to 9990 cfm; increment by 10
  - If OA, MA, RA, and CO2 sensors are connected and DCV CAL ENABLE is set to AUTO mode, the OA dampers are controlled by CFM and displays from 100 to 9990 CFM.

**Ventilation Minimum Damper Position**
- **VENTMIN**: 2.25 V (2 to 10 vdc)
  - 100 to 9990 cfm; increment by 10
  - If OA, MA, RA, and CO2 sensors are connected and DCV CAL ENABLE is set to AUTO mode, the OA dampers are controlled by CFM and displays from 100 to 9990 CFM.

**Energy Recovery Ventilator Unit Outdoor Air Temperature Setpoint**
- **ERV OAT SPT**: 32°F (0°C) to 50°F (10°C); increment by 1 degree
  - Only when AUX1 O = ERV

**Exhaust Fan Stage 1 Setpoint**
- **EXH1 SET**: 50% (0 to 100%)
  - Increment by 1
  - Setpoint for OA damper position when exhaust fan 1 is powered by the economizer.

**Exhaust Fan Stage 2 Setpoint**
- **EXH2 SET**: 75% (0 to 100%)
  - Increment by 1
  - Setpoint for OA damper position when exhaust fan 2 is powered by the economizer. Only used when AUX1 O is set to EHX2.

### System Setup

**Install**
- **INSTALL**: 01/01/10 (N/A)
  - Display order = MM/DD/YY
  - Setting order = DD, MM, then YY.

**Units Deg**
- **UNITS DEG**: °F or °C
  - Sets economizer controller in degrees Fahrenheit or Celsius

**Equipment Conv**
- **EQUIPMENT CONV**: CONV or HP
  - CONV = conventional; HP O/B = Enable Heat Pump mode. Use AUX2 I for Heat Pump input from thermostat or controller.

**Aux2 In**
- **AUX2 IN**: W
  - Shutdown (SD) Heat (W1)
    - HP(O)
    - HP(B)
  - In CONV mode:
    - SD = Enables configuration of shutdown (default); W = informs controller that system is in heating mode. In HP O/B mode:
    - HP(O) = energize heat pump on Cool (default);
    - HP(B) = energize heat pump on heat.

**Fan Speed**
- **FAN SPEED**: 2 speed
  - 1 speed/2 speed
  - Sets the economizer controller for operation of 1 speed or 2 speed supply fan. The controller does not control the fan, but positions the OA and RA dampers to heating or cooling mode.

**Fan CFM**
- **FAN CFM**: 5000 cfm
  - 100 to 15000 cfm; increment by 100
  - UNIT DESIGN AIRFLOW (CFM)
    - Enter only if using DCV CAL ENA = AUTO
    - This is the capacity of the RTU. The value is found on the nameplate label for the specific unit.

**Aux1 Out**
- **AUX1 OUT**: NONE
  - NONE
  - ERV
  - EXH2
  - SYS
  - Select OUTPUT for AUX1 O relay
    - None = not configured (output is not used)
    - ERV = Energy Recovery Ventilator††
    - EXH2 = second damper position 24 vac out for second exhaust fan
    - SYS = use output as an alarm signal

**Occ**
- **OCC**: INPUT
  - INPUT or ALWAYS
  - OCCUPIED MODE BY EXTERNAL SIGNAL
    - When using a setback thermostat with occupancy out (24 vac), the 24 vac is input “INPUT” to the OCC terminal. If no occupancy output from the thermostat, then change program to “ALWAYS” OR add a jumper from terminal R to OCC terminal.

**Factory Default**
- **FACTORY DEFAULT**: NO
  - NO or YES
  - Resets all set points to factory defaults when set to YES. LCD will briefly flash YES and change to NO but all parameters will change to the factory default values.

**Ma Lo Set**
- **MA LO SET**: 45°F (7°C)
  - 35°F to 65°F (2°C to 18°C); increment by 1 degree
  - SUPPLY AIR TEMPERATURE LOW LIMIT
    - Temperature to activate Freeze Protection (close damper or modulate to MIN POS if temp falls below set value).

**Freeze Pos**
- **FREEZE POS**: CLO
  - CLO or MIN
  - FREEZE PROTECTION DAMPER POSITION
    - Damper position when freeze protection is active (closed or MIN POS).

**CO2 Zero**
- **CO2 ZERO**: 0 ppm
  - 0 to 500 ppm; increment by 10
  - CO2 ppm level to match CO2 sensor start level.
### Table 13 — W7220 Menu Structure* (cont)

<table>
<thead>
<tr>
<th>MENU</th>
<th>PARAMETER</th>
<th>PARAMETER DEFAULT VALUE</th>
<th>PARAMETER RANGE AND INCREMENT†</th>
<th>EXPANDED PARAMETER NAME</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADVANCED SETUP (cont)</td>
<td>CO2 SPAN</td>
<td>2000ppm</td>
<td>1000 to 3000 ppm; Increment by 50</td>
<td>CO2 ppm span to match CO2 sensor; e.g.; 500-1500 sensor output would be 500 CO2 zero and 1000 CO2 span.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>STG3 DLY</td>
<td>2.0h</td>
<td>0 min, 5 min, 15 min, then 15 min intervals. Up to 4 hrs or OFF</td>
<td>COOLING STAGE 3 DELAY</td>
<td>Delay after stage 2 cool has been active. Turns on second stage of cooling when economizer is first stage call and mechanical cooling is second stage call. Allows three stages of cooling, 1 economizer and 2 mechanical. OFF = no Stage 3 cooling.</td>
</tr>
<tr>
<td></td>
<td>SD DMPR POS</td>
<td>CLO</td>
<td>CLO or OPN</td>
<td>Indicates shutdown signal from space thermostat or unitary controller. When controller receives 24 vac input on the SD terminal in conventional mode, the OA damper will open if programmed for OPN and OA damper will close if programmed for CLO. All other controls, e.g., fans, etc. will shut off.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DA LO ALM</td>
<td>45°F (7°C)</td>
<td>35°F to 65°F (2°C to 18°C); Increment by 5°F</td>
<td>Used for alarm when the DA air temperature is too low. Set lower range of alarm, below this temperature the alarm will show on the display.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DA HI ALM</td>
<td>80°F (27°C)</td>
<td>70°F to 180°F (21°C to 82°C); Increment by 5°F</td>
<td>Used for alarm when the DA air temperature is too high. Sets upper range of alarm; above this temperature, the alarm will show on the display.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DCVCAL ENA</td>
<td>MAN</td>
<td>MAN (manual) AUTO</td>
<td>Turns on the DCV automatic control of the dampers. Resets ventilation based on the RA, OA, and MA sensor conditions. Requires all (RA, OA, MA, CO2) sensors. This operation is not operable with a 2-speed fan unit.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MAT T CAL</td>
<td>0.0°F</td>
<td>± 2.5°F</td>
<td>SUPPLY AIR TEMPERATURE CALIBRATION</td>
<td>Allows for the operator to adjust for an out of calibration temperature sensor.</td>
</tr>
<tr>
<td></td>
<td>OAS T CAL</td>
<td>0.0°F</td>
<td>± 2.5°F</td>
<td>OUTSIDE AIR TEMPERATURE CALIBRATION</td>
<td>Allows for the operator to adjust for an out of calibration temperature sensor.</td>
</tr>
<tr>
<td></td>
<td>OA H CAL</td>
<td>0% RH</td>
<td>±10% RH</td>
<td>OUTSIDE AIR HUMIDITY CALIBRATION</td>
<td>Allows for operator to adjust for an out of calibration humidity sensor.</td>
</tr>
<tr>
<td></td>
<td>RA T CAL</td>
<td>0.0°F</td>
<td>± 2.5°F</td>
<td>RETURN AIR TEMPERATURE CALIBRATION</td>
<td>Allows for the operator to adjust for an out of calibration temperature sensor.</td>
</tr>
<tr>
<td></td>
<td>RA H CAL</td>
<td>0% RH</td>
<td>±10% RH</td>
<td>RETURN AIR HUMIDITY CALIBRATION</td>
<td>Allows for operator to adjust for an out of calibration humidity sensor.</td>
</tr>
<tr>
<td></td>
<td>DA T CAL</td>
<td>0.0°F</td>
<td>± 2.5°F</td>
<td>DISCHARGE AIR TEMPERATURE CALIBRATION</td>
<td>Allows for the operator to adjust for an out of calibration temperature sensor.</td>
</tr>
<tr>
<td></td>
<td>2SP FAN DELAY</td>
<td>5 Minutes</td>
<td>0 to 20 minutes in 1 minute increments</td>
<td>TIME DELAY ON SECOND STAGE ECONOMIZING</td>
<td>When in economizing mode, this is the delay for the high speed fan to try to satisfy the call for second stage cooling before the first stage mechanical cooling is enabled.</td>
</tr>
<tr>
<td></td>
<td>DAMPER MINIMUM POSITION</td>
<td>N/A</td>
<td>N/A</td>
<td>The checkout for the damper minimum position is based on the system. See Table 14.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DAMPER OPEN</td>
<td>N/A</td>
<td>N/A</td>
<td>Position damper to the full open position. Exhaust fan contacts enable during the DAMPER OPEN test. Make sure to pause in the mode to allow exhaust contacts to energize due to the delay in the system.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DAMPER CLOSE</td>
<td>N/A</td>
<td>N/A</td>
<td>Positions damper to the fully closed position.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CONNECT Y1–O</td>
<td>N/A</td>
<td>N/A</td>
<td>Closes the Y1-O relay (Y1-O).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CONNECT Y2–O</td>
<td>N/A</td>
<td>N/A</td>
<td>Closes the Y2-O relay (Y2-O).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CONNECT AUX1–O</td>
<td>N/A</td>
<td>N/A</td>
<td>Energizes the AUX output. If Aux setting is: • NONE — no action taken • ERV — 24 vac out. Turns on or signals an ERV that the conditions are not good for economizing but are for ERV operation.†† • SYS — 24 vac out. Issues a system alarm.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CONNECT EXH1</td>
<td>N/A</td>
<td>N/A</td>
<td>Closes the power exhaust fan 1 relay (EXH1)</td>
<td></td>
</tr>
</tbody>
</table>

### CHECKOUT***

<table>
<thead>
<tr>
<th></th>
<th>ALARMS</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MAT SENS ERR</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>CO2 SENS ERR</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

---

*CONT"
LEGEND
CLO — Compressor Lockout
ERV — Energy Recovery Ventilator
LCD — Liquid Crystal Display
MA — Mixed Air
MAT — Mixed Air Temperature
N/A — Not Applicable
OA — Outdoor Air
OAT — Outdoor Air Temperature
OCC — Occupied
RA — Return Air
RAT — Return Air Temperature
RTU — Rooftop Unit
SYS — System

Table 13 — W7220 Menu Structure* (cont)

<table>
<thead>
<tr>
<th>MENU</th>
<th>PARAMETER</th>
<th>PARAMETER DEFAULT VALUE</th>
<th>PARAMETER RANGE AND INCREMENT†</th>
<th>EXPANDED PARAMETER NAME</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALARMS (CONT)</td>
<td>OA SYLK T ERR</td>
<td>N/A</td>
<td>N/A</td>
<td>OUTSIDE AIR S-BUS SENSOR ERROR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OA SYLK H ERR</td>
<td>N/A</td>
<td>N/A</td>
<td>Outdoor air enthalpy sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RA SYLK T ERR</td>
<td>N/A</td>
<td>N/A</td>
<td>RETURN AIR S-BUS SENSOR ERROR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RA SYLK H ERR</td>
<td>N/A</td>
<td>N/A</td>
<td>Return air enthalpy sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DA SYLK T ERR</td>
<td>N/A</td>
<td>N/A</td>
<td>DISCHARGE AIR S-BUS SENSOR ERROR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OA SENS T ERR</td>
<td>N/A</td>
<td>N/A</td>
<td>OUTSIDE AIR TEMPERATURE SENSOR ERROR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACT ERROR</td>
<td>N/A</td>
<td>N/A</td>
<td>ACTUATOR ERROR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FREEZE ALARM</td>
<td>N/A</td>
<td>N/A</td>
<td>Check if outdoor temperature is below the LOW Temp Lockout on set point menu. Check if Mixed air temperature on STATUS menu is below the Lo Set point on Advanced menu. When conditions are back in normal range, the alarm will go away.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SHUTDOWN ACTIVE</td>
<td>N/A</td>
<td>N/A</td>
<td>AUX2 IN is programmed for SHUTDOWN and 24 V has been applied to AUX2 IN terminal.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DMP CAL RUNNING</td>
<td>N/A</td>
<td>N/A</td>
<td>DAMPER CALIBRATION ROUTINE RUNNING</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DA SENS ALM</td>
<td>N/A</td>
<td>N/A</td>
<td>DISCHARGE AIR TEMPERATURE SENSOR ALARM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SYS ALARM</td>
<td>N/A</td>
<td>N/A</td>
<td>When AUX1-0 is set to SYS and there is any alarm (e.g., failed sensors, etc.), the AUX1-0 terminal has 24 vac out.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACT UNDER V</td>
<td>N/A</td>
<td>N/A</td>
<td>ACTUATOR VOLTAGE LOW</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACT OVER V</td>
<td>N/A</td>
<td>N/A</td>
<td>ACTUATOR VOLTAGE HIGH</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ACT STALLED</td>
<td>N/A</td>
<td>N/A</td>
<td>ACTUATOR STALLED</td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. STATUS —> OCCUPIED — The factory-standard Occupancy signal originates with a thermostat or other controller for indoor fan operation at UCB terminal G. This signal passes through the Unit Control Board's OCCUPANCY jumper to the ECONO connector and to the W7220's OCC input terminal. An external timeclock or relay is required to implement an Occupancy schedule on the economizer damper position.
2. STATUS —> MA TEMP, SETPOINTS —> MAT SET — The W7220 menu parameters and labels include designations MA, MAT and Mixed Air for the economizer cooling control sensor. On these rooftop units, the economizer control sensor is located downstream of the evaporator/indoor coil in the supply fan section where this sensor is designated as Supply Air Temperature (SAT) sensor.
3. SETPOINTS —> DRYBLB SET — This point is not displayed if a Return Air (differential) temperature sensor or an Outdoor Air enthalpy sensor is connected.
4. SYSTEM SETUP parameters must be configured as noted for 2-Speed unit operation:
   EQUIPMENT = CONV
   AUX2 I = W
   FAN SPEED = 2SPEED

For damper minimum position settings and checkout menu readings, see Table 14. For dry bulb operation with or without DCV, see Tables 15 and 16. For enthalpy operation with or without DCV, see Tables 17 and 18.
### Table 14 — Damper Minimum Position Settings and Readings on Checkout Menu

<table>
<thead>
<tr>
<th>FAN SPEED</th>
<th>DEMAND CONTROLLED VENTILATION (CO₂ SENSOR)</th>
<th>SETPOINTS</th>
<th>CHECKOUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NO</td>
<td>MIN POS</td>
<td>VMAX–HS</td>
</tr>
<tr>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>YES</td>
<td>VENT MIN</td>
<td>VMAX–HS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VENT MAX</td>
<td>VMAX–HS</td>
</tr>
</tbody>
</table>

### Table 15 — Dry Bulb Operation Without DCV (CO₂ Sensor) — 1 Speed Fan

<table>
<thead>
<tr>
<th>DEMAND CONTROLLED VENTILATION (DCV)</th>
<th>OUTSIDE AIR GOOD TO ECONOMIZE</th>
<th>Y1-I</th>
<th>Y2-I</th>
<th>FAN SPEED</th>
<th>Y1-O</th>
<th>Y2-O</th>
<th>OCCUPIED</th>
<th>UNOCCUPIED</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NONE</strong></td>
<td></td>
<td>Off</td>
<td>Off</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>MIN POS</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>Off</td>
<td>High</td>
<td>24-v/On</td>
<td>0-v/Off</td>
<td>MIN POS</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>On</td>
<td>High</td>
<td>24-v/On</td>
<td>24-v/On</td>
<td>MIN POS</td>
<td>Closed</td>
</tr>
<tr>
<td><strong>YES</strong></td>
<td></td>
<td>Off</td>
<td>Off</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>MIN POS</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>Off</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>MIN POS</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>On</td>
<td>High</td>
<td>24-v/On</td>
<td>0-v/Off*</td>
<td>MIN POS to Full-Open</td>
<td>Closed to Full-Open</td>
</tr>
</tbody>
</table>

*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2–O after the delay if the call for Y1–I and Y2–I have not been satisfied.

### Table 16 — Dry Bulb Operation With DCV (CO₂ Sensor) — 1 Speed Fan

<table>
<thead>
<tr>
<th>DEMAND CONTROLLED VENTILATION (DCV)</th>
<th>OUTSIDE AIR GOOD TO ECONOMIZE</th>
<th>Y1-I</th>
<th>Y2-I</th>
<th>FAN SPEED</th>
<th>Y1-O</th>
<th>Y2-O</th>
<th>OCCUPIED</th>
<th>UNOCCUPIED</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Below CO₂ set</strong></td>
<td></td>
<td>Off</td>
<td>Off</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>VENTMIN</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>Off</td>
<td>High</td>
<td>24-v/On</td>
<td>0-v/Off</td>
<td>VENTMIN</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>On</td>
<td>High</td>
<td>24-v/On</td>
<td>24-v/On</td>
<td>VENTMIN</td>
<td>Closed</td>
</tr>
<tr>
<td><strong>Above CO₂ set</strong></td>
<td></td>
<td>Off</td>
<td>Off</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>VENTMIN to VENTMAX</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>Off</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>VENTMIN to VENTMAX</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>On</td>
<td>High</td>
<td>24-v/On</td>
<td>0-v/Off*</td>
<td>VENTMIN to Full-Open</td>
<td>Closed to Full-Open</td>
</tr>
</tbody>
</table>

*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2–O after the delay if the call for Y1–I and Y2–I have not been satisfied.

### Table 17 — Enthalpy Operation Without DCV (CO₂ Sensor) — 1 Speed Fan

<table>
<thead>
<tr>
<th>DEMAND CONTROLLED VENTILATION (DCV)</th>
<th>OUTSIDE AIR GOOD TO ECONOMIZE</th>
<th>Y1-I</th>
<th>Y2-I</th>
<th>FAN SPEED</th>
<th>Y1-O</th>
<th>Y2-O</th>
<th>OCCUPIED</th>
<th>UNOCCUPIED</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NONE</strong></td>
<td></td>
<td>Off</td>
<td>Off</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>MIN POS</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>Off</td>
<td>High</td>
<td>24-v/On</td>
<td>0-v/Off</td>
<td>MIN POS</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>On</td>
<td>High</td>
<td>24-v/On</td>
<td>24-v/On</td>
<td>MIN POS</td>
<td>Closed</td>
</tr>
<tr>
<td><strong>YES</strong></td>
<td></td>
<td>Off</td>
<td>Off</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>MIN POS</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>Off</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>MIN POS</td>
<td>Closed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>On</td>
<td>High</td>
<td>24-v/On</td>
<td>0-v/Off*</td>
<td>MIN POS to Full-Open</td>
<td>Closed to Full-Open</td>
</tr>
</tbody>
</table>

*With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2–O after the delay if the call for Y1–I and Y2–I have not been satisfied.
**ENTHALPY SETTINGS**

When the OA temperature, enthalpy and dew point are below the respective set points, the Outdoor Air can be used for economizing. Figure 53 shows the new single enthalpy boundaries in the W7220. There are 5 boundaries (set points ES1 through ES5), which are defined by dry bulb temperature, enthalpy and dew point.

Refer to Table 19 for ENTH CURVE set point values.

The W7220 calculates the enthalpy and dew point using the OA temperature and humidity input from the OA enthalpy sensor.

When the OA temperature, OA humidity and OA dew point are all below the selected boundary, the economizer sets the economizing mode to YES, economizing is available.

When all of the OA conditions are above the selected boundary, the conditions are not good to economize and the mode is set to NO.

Figure 53 shows the 5 current boundaries. There is also a high limit boundary for differential enthalpy. The high limit boundary is ES1 when there are no stages of mechanical cooling energized and HL (high limit) when a compressor stage is energized.

---

**Table 18 — Enthalpy Operation With DCV (CO₂ Sensor) — 1 Speed Fan**

<table>
<thead>
<tr>
<th>DEMAND CONTROLLED VENTILATION (DCV)</th>
<th>OUTSIDE AIR GOOD TO ECONOMIZE</th>
<th>Y1-I</th>
<th>Y2-I</th>
<th>FAN SPEED</th>
<th>Y1-O</th>
<th>Y2-O</th>
<th>OCCUPIED</th>
<th>UNOCCUPIED</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Below CO₂ set</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Off</td>
<td>Off</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>VENTMIN</td>
<td>Closed</td>
<td></td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>High</td>
<td>24-v/On</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>VENTMIN</td>
<td>Closed</td>
<td></td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>High</td>
<td>24-v/On</td>
<td>24-v/On</td>
<td>VENTMIN</td>
<td>Closed</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Yes</strong></td>
<td>Off</td>
<td>Off</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>VENTMIN</td>
<td>Closed</td>
<td></td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>High</td>
<td>24-v/On</td>
<td>0-v/Off</td>
<td>0-v/Off†</td>
<td>VENTMIN to Full-Open</td>
<td>Closed to Full-Open</td>
<td></td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>High</td>
<td>24-v/On</td>
<td>0-v/Off†</td>
<td>VENTMIN to Full-Open</td>
<td>Closed to Full-Open</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Above CO₂ set</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Off</td>
<td>Off</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>VENTMIN</td>
<td>Closed</td>
<td></td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>High</td>
<td>24-v/On</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>VENTMIN L to VENTMAX</td>
<td>Closed</td>
<td></td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>High</td>
<td>24-v/On</td>
<td>24-v/On</td>
<td>VENTMIN</td>
<td>Closed</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Yes</strong></td>
<td>Off</td>
<td>Off</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>VENTMIN</td>
<td>Closed</td>
<td></td>
</tr>
<tr>
<td>On</td>
<td>Off</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off</td>
<td>0-v/Off†</td>
<td>VENTMIN to VENTMAX</td>
<td>Closed</td>
<td></td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>High</td>
<td>0-v/Off</td>
<td>0-v/Off†</td>
<td>VENTMIN</td>
<td>Closed to Full-Open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On</td>
<td>On</td>
<td>DELAY*</td>
<td>24-v/On</td>
<td>0-v/Off†</td>
<td>VENTMIN</td>
<td>Closed to Full-Open</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.

†With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2–O after the delay if the call for Y1–I and Y2–I have not been satisfied.

---

**Fig. 53 — Single Enthalpy Curve Boundaries**
CHECKOUT
Inspect all wiring connections at the economizer module’s terminals, and verify compliance with the installation wiring diagrams. For checkout, review the Status of each configured parameter and perform the Checkout tests.
NOTE: For information about menu navigation and use of the keypad see Interface Overview on page 33.

Power Up
After the W7220 module is mounted and wired, apply power.

Initial Menu Display
On initial start up, Honeywell displays on the first line and economizer W7220 on the second line. After a brief pause, the revision of the software appears on the first line and the second line will be blank.

Power Loss (Outage or Brownout)
All set points and advanced settings are restored after any power loss or interruption.
NOTE: All settings are stored in non-volatile flash memory.

Status
Use the Status menu (see Table 13) to check the parameter values for the various devices and sensors configured.
NOTE: For information about menu navigation and use of the keypad, see Interface Overview on page 33.

Checkout Tests
Use the Checkout menu (see page 37) to test the damper operation and any configured outputs. Only items that are configured are shown in the Checkout menu.
NOTE: For information about menu navigation and use of the keypad, see Interface Overview on page 33.

To perform a Checkout test:
1. Scroll to the desired test in the Checkout menu using the ▲ and ▼ buttons.
2. Press the △ (Enter) button to select the item. RUN? appears.
3. Press the △ (Enter) button to start the test. The unit pauses and then displays IN PROGRESS. When the test is complete, DONE appears.
4. When all desired parameters have been tested, press the ◀ (Menu Up) button to end the test.

The Checkout tests can all be performed at the time of installation or at any time during the operation of the system as a test that the system is operable.

TROUBLESHOOTING

Alarms
The economizer module provides alarm messages that display on the 2-line LCD.
NOTE: Upon power up, the module waits 60 minutes before checking for alarms. This allows time for all the configured devices (e.g. sensors, actuator) to become operational. The exception is the SAT sensor which will alarm immediately.
If one or more alarms are present and there has been no keypad activity for at least 5 minutes, the Alarms menu displays and cycles through the active alarms.
You can also navigate to the Alarms menu at any time.

Clearing Alarms
Once the alarm has been identified and the cause has been removed (e.g. replaced faulty sensor) the alarm can be cleared from the display.
To clear an alarm, perform the following:
1. Navigate to the desired alarm.
2. Press the △ (Enter) button. ERASE? displays.
3. Press the △ (Enter) button. ALARM ERASED displays.
4. Press the ◀ (Menu up/Exit) button to complete the action and return to the previous menu.

If the alarm still exists after clearing it, it is redisplayed within 5 seconds.

PremierLink™ (Factory Option)
For details on operating 50TCQ units equipped with the factory-installed PremierLink controller option, refer to the PremierLink Retrofit Rooftop Controller Version 3.x Installation, Start-Up, and Configuration Instructions manual.

RTU-Open Controller System (Factory-Installed Option)
For details on operating 50TCQ units equipped with the factory-installed RTU Open controller, refer to the “Factory-Installed RTU Open Multi-Protocol Controller Control, Start-Up, Operation and Troubleshooting” manual.

Smoke Detectors
Smoke detectors are available as factory-installed options on 50TCQ models. Smoke detectors may be specified for supply air only, for return air without or with economizer, or in combination of supply air and return air. All components necessary for operation are factory-provided and mounted. The unit is factory-configured for immediate smoke detector shutdown operation; additional wiring or modifications to unit terminal board may be necessary to complete the unit and smoke detector configuration to meet project requirements.
Units equipped with factory-optional return air smoke detectors require a relocation of the sensor module at unit installation. See Fig. 54 for the as-shipped location.

Table 19 — Single Enthalpy and Dual Enthalpy High Limit Curves

<table>
<thead>
<tr>
<th>ENTHALPY CURVE</th>
<th>TEMP. DRY BULB (F)</th>
<th>TEMP. DEWPOINT (F)</th>
<th>ENTHALPY (btu/lb/da)</th>
<th>POINT P1</th>
<th>POINT P2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TEMP. (F)</td>
<td>HUMIDITY (%)</td>
<td>TEMP. (F)</td>
<td>HUMIDITY (%)</td>
<td></td>
</tr>
<tr>
<td>ES1</td>
<td>80</td>
<td>60</td>
<td>28.0</td>
<td>80</td>
<td>66.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>36.8</td>
<td>80.1</td>
</tr>
<tr>
<td>ES2</td>
<td>75</td>
<td>57</td>
<td>26.0</td>
<td>75</td>
<td>63.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>39.6</td>
<td>80.0</td>
</tr>
<tr>
<td>ES3</td>
<td>70</td>
<td>54</td>
<td>24.0</td>
<td>70</td>
<td>59.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>42.3</td>
<td>81.4</td>
</tr>
<tr>
<td>ES4</td>
<td>65</td>
<td>51</td>
<td>22.0</td>
<td>65</td>
<td>55.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>44.8</td>
<td>84.2</td>
</tr>
<tr>
<td>ES5</td>
<td>60</td>
<td>48</td>
<td>20.0</td>
<td>60</td>
<td>51.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>46.9</td>
<td>88.5</td>
</tr>
<tr>
<td>HL</td>
<td>86</td>
<td>66</td>
<td>32.4</td>
<td>86</td>
<td>72.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>38.9</td>
<td>80.3</td>
</tr>
</tbody>
</table>

CAUTION
Failure to follow this caution may result in damage to equipment. Be sure to allow enough time for compressor startup and shutdown between checkout tests so that you do not short-cycle the compressors.
COMPLETING INSTALLATION OF RETURN AIR SMOKE SENSOR

1. Unscrew the two screws holding the Return Air Smoke Detector assembly. See Fig. 55, Step 1. Save the screws.
2. Turn the assembly 90 degrees and then rotate end to end. Make sure that the elbow fitting is pointing down. See Fig. 55, Step 2.
3. Screw the sensor and detector plate into its operating position using screws from Step 1. See Fig. 55, Step 3.
4. Connect the flexible tube on the sampling inlet to the sampling tube on the basepan.

ADDITIONAL APPLICATION DATA

Refer to the Application Data sheet titled, Factory Installed Smoke Detectors for Small and Medium Rooftop Units 2 to 25 Tons for discussions on additional control features of these smoke detectors including multiple unit coordination.

Step 12 — Adjust Factory-Installed Options

SMOKE DETECTORS

Smoke detector(s) will be connected at the Controls Connections Board, at terminals marked “Smoke Shutdown”. Remove jumper JMP 3 when ready to energize unit.

ECONOMISER IV OCCUPANCY SWITCH

Refer to Fig. 56 for general EconoMi$er IV wiring. External occupancy control is managed through a connection on the Central Terminal Board.

If external occupancy control is desired, connect a time clock or remotely controlled switch (closed for Occupied, open for Unoccupied sequence) at terminals marked OCCUPANCY on CTB. Remove or cut jumper JMP 2 to complete the installation.

Step 13 — Install Accessories

Available accessories include:
- Roof curb
- Thru-base connection kit (must be installed before unit is set on curb)
- Manual outside damper
- Two-position motorized outside damper
- EconoMi$er IV (with control and integrated barometric relief)
- EconoMi$er2 (without control/for external signal and integrated barometric relief)
- Power exhaust
- Differential dry-bulb sensor (EconoMi$er IV)
- Outdoor enthalpy sensor
- Differential enthalpy sensor
- Time Guard II compressor anti-cycle control
- Outdoor coil hail guard
- Outdoor coil protector grille
- Head pressure control
- Programmable setback thermostat
- Electro-mechanical thermostat and subbase
- Thermidistat™ device
- Humidistat
- Electric heaters
- Single point kits
- Thermostat / sensors
- CO₂ sensor
- DDC interface (PremierLink™ controller)
- Louvered hail guard
- Phase monitor control

Refer to separate installation instructions for information on installing these accessories.
Step 14 — Check Belt Tension

Measure the belt span length as shown in Fig. 57. Calculate the required deflection by multiplying the belt span length by $\frac{1}{64}$. For example, if the belt span length is 32 inches:

$$32 \times \frac{1}{64} = \frac{1}{2}\text{-in. deflection}.$$ 

**BELT FORCE — DEFLECTION METHOD**

Check the belt tension with a spring-force belt force deflection gage (available from drive belt manufacturer).

1. Place a straightedge along the belt between the two pulleys. Measure the distance between the motor shaft and the blower shaft.
2. Set the tension gage to the desired tension (see Table 1 in Fig. 57). Place the large O-ring at that point.
3. Press the tension checker downward on the belt until the large O-ring is at the bottom of the straightedge.
4. Adjust the belt tension as needed.

Adjust belt tension by loosing the motor mounting plate front bolts and rear bolt (see Fig. 58) and slide the plate towards the fan (to reduce tension) or away from the fan (to increase tension). Ensure the blower shaft and motor shaft are parallel to each other (pulleys aligned). Tighten all bolts securely when finished.

---

**Table 1**

<table>
<thead>
<tr>
<th>BELT CROSS SECTION</th>
<th>SMALLEST SHEAVE DIAMETER</th>
<th>UNNOTCHED BELTS</th>
<th>NOTCHED BELTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>USED</td>
<td>NEW</td>
<td>USED</td>
</tr>
<tr>
<td>A, AX</td>
<td>3.0-3.6</td>
<td>3.7</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>3.8-4.8</td>
<td>4.5</td>
<td>6.8</td>
</tr>
<tr>
<td></td>
<td>5.0-7.0</td>
<td>5.4</td>
<td>8.0</td>
</tr>
<tr>
<td>B, BX</td>
<td>3.4-4.2</td>
<td>5.3</td>
<td>7.9</td>
</tr>
<tr>
<td></td>
<td>4.4-5.6</td>
<td>6.3</td>
<td>9.4</td>
</tr>
</tbody>
</table>

**Table 2**

<table>
<thead>
<tr>
<th>BELT CONDITION</th>
<th>TENSION FORCE IN BELT (LBS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New</td>
<td>100</td>
</tr>
<tr>
<td>Used</td>
<td>80</td>
</tr>
</tbody>
</table>
BELT TENSION METHOD
Requires belt tension gage that measures tension in belt in units of lbs force.

Fig. 58 — Belt Drive Motor Mounting
START-UP CHECKLIST
(Remove and use for job file)

NOTE: To avoid injury to personnel and damage to equipment or property when completing the procedures listed in this start-up checklist, use good judgment, follow safe practices, and adhere to the safety considerations/information as outlined in preceding sections of this Installation Instructions document.

I. PRELIMINARY INFORMATION
MODEL NO ____________________________________________
JOB NAME_____________________________________________
SERIAL NO ____________________________________________
ADDRESS _____________________________________________
START-UP DATE________________________________________
TECHNICIAN NAME _____________________________________
ADDITIONAL ACCESSORIES

II. PRE-START-UP
Verify that all packaging materials have been removed from unit (Y/N) _____
Verify installation of outdoor air hood (Y/N) ______
Verify installation of flue exhaust and inlet hood (Y/N) ______
Verify that condensate connection is installed per instructions (Y/N) ______
Verify that all electrical connections and terminals are tight (Y/N) ______
Check that indoor-air filters are clean and in place (Y/N) _____
Check that outdoor-air inlet screens are in place (Y/N) _____
Verify that unit is level (Y/N) ______
Check fan wheels and propeller for location in housing/orifice and verify setscrew is tight (Y/N) ______
Verify that fan sheaves are aligned and belts are properly tensioned (Y/N) ______
Verify installation of thermostat (Y/N) ______

III. START-UP
ELECTRICAL
Supply Voltage L1-L2_____________ L2-L3_____________ L3-L1_____________
Compressor Amps 1 L1   _____________ L2   _____________ L3   _____________
Compressor Amps 2 L1   _____________ L2   _____________ L3   _____________
Supply Fan Amps L1   _____________ L2   _____________ L3   _____________

TEMPERATURES
Outdoor-air Temperature ______ _______ °F DB (Dry Bulb)
Return-air Temperature _____________ °F DB _____________ °F WB (Wet Bulb)
Cooling Supply Air Temperature _____________ °F

PRESSURES
Refrigerant Suction CIRCUIT A PSIG CIRCUIT B PSIG
Refrigerant Discharge CIRCUIT A PSIG CIRCUIT B PSIG

Verify Refrigerant Charge using Charging Charts (Y/N) ______
GENERAL
Economizer minimum vent and changeover settings to job requirements (if equipped) (Y/N) _____
Verify smoke detector unit shutdown by utilizing magnet test (Y/N) _____

IV. HUMIDI-MIZER® START-UP
NOTE: Units equipped with either SystemVu™ or RTU Open controls have Service Test menus or modes that can assist with the Humidi-Mizer System Start-Up function and provide the means to make the observations listed for this start-up.

STEPS
1. Check CTB for jumper 5, 6, 7 (Jumper 5, 6, 7 must be cut and open) (Y/N) _____
2. Open humidistat contacts (Y/N) _____
3. Start unit In cooling (Close Y1) (Y/N) _____

OBSERVE AND RECORD
A. Suction pressure _______________ PSIG
B. Discharge pressure _______________ PSIG
C. Entering air temperature _______________ ° F
D. Liquid line temperature at outlet or reheat coil _______________ ° F
E. Confirm correct rotation for compressor (Y/N) _____
F. Check for correct ramp-up of outdoor fan motor as condenser coil warms (Y/N) _____
4. Check unit charge per charging chart (Y/N) _____
   (Jumper 32L Motormaster® temperature sensor during this check. Remove jumper when complete.)
5. Switch unit to high-latent mode (sub-cooler) by closing humidistat with Y1 closed (Y/N) _____

OBSERVE
A. Reduction in suction pressure (5 to 7 psi expected) (Y/N) _____
B. Discharge pressure unchanged (Y/N) _____
C. Liquid temperature drops to 50°F to 55°F range (Y/N) _____
D. LSV solenoid energized (valve closes) (Y/N) _____
6. Switch unit to dehumid (reheat) by opening Y1 (Y/N) _____

OBSERVE
A. Suction pressure increases to normal cooling level
B. Discharge pressure decreases (35 to 50 psi) (Limited by Motormaster control)
C. Liquid temperature returns to normal cooling level
D. LSV solenoid energized (valve closes)
E. DSV solenoid energized, valve opens
7. With unit in dehumid mode close W1 compressor and outdoor fan stop; LSV and DSV solenoids de-energized (Y/N) _____
8. Open W1 restore unit to dehumid mode (Y/N) _____
9. Open humidistat input compressor and outdoor fan stop; LSV and DSV solenoids de-energized (Y/N) _____
10. Restore set-points for thermostat and humidistat (Y/N) _____

REPEAT PROCESS FOR 2 COMPRESSOR SYSTEMS.