



Service and Maintenance Instructions

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SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

Follow all safety codes, including ANSI (American National Standards Institute) Z223.1. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguisher available for all brazing operations.

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.

WARNING

ELECTRICAL OPERATION HAZARD

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

Before performing service or maintenance operations on unit, LOCKOUT/TAGOUT the main power switch to unit. Electrical shock and rotating equipment could cause severe injury.

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.

WARNING

UNIT OPERATION AND SAFETY HAZARD

Failure to follow this warning could cause personal injury, death and/or equipment damage.

R-410A refrigerant systems operate at higher pressures than standard R-22 systems. Do not use R-22 service equipment or components on R-410A refrigerant equipment.

WARNING

FIRE, EXPLOSION HAZARD

Failure to follow this warning could result in death, serious personal injury and/or property damage.

Never use air or gases containing oxygen for leak testing or for operating refrigerant compressors. Pressurized mixtures of air or gases containing oxygen can lead to an explosion.

WARNING

FIRE, EXPLOSION HAZARD

Failure to follow this warning could result in death, serious personal injury and/or property damage.

Never use non-certified refrigerants in this product. Non-certified refrigerants could contain contaminants that could lead to unsafe operating conditions. Use ONLY refrigerants that conform to AHRI Standard 700.

CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in reduced unit performance or unit shutdown.

High velocity water from a pressure washer, garden hose, or compressed air should never be used to clean a coil. The force of the water or air jet will bend the fin edges and increase air-side pressure drop.

UNIT ARRANGEMENT AND ACCESS

General

Figures 1 and 2 show general unit arrangement and access locations.

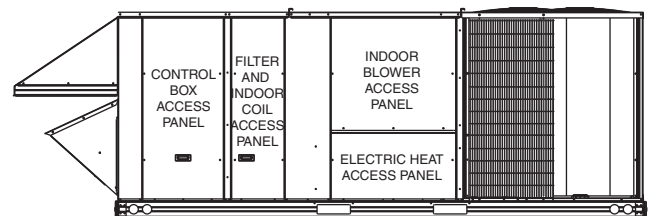


Fig. 1 — Typical Access Panel Location (Front)

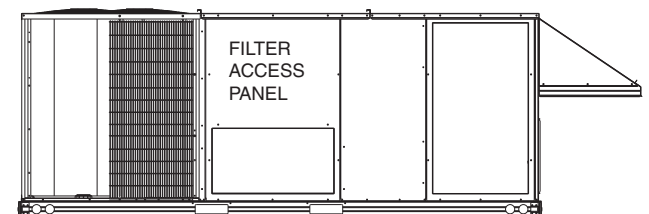


Fig. 2 — Typical Access Panel Locations (Rear)

Routine Maintenance

These items should be part of a routine maintenance program, to be checked every month or two, until a specific schedule for each can be identified for this installation.

QUARTERLY INSPECTION (AND 30 DAYS AFTER INITIAL START)

- Replace return air filter
- Clean outdoor hood inlet filters

- Check belt tension
- Check belt condition
- Inspect pulley alignment
- Check fan shaft bearing locking collar tightness
- Check outdoor coil cleanliness
- Check condensate drain

Seasonal Maintenance

The following items should be checked at the beginning of each season (or more often if local conditions and usage patterns dictate).

AIR CONDITIONING/HEAT PUMP

- Ensure outdoor fan motor mounting bolts are tight
- Ensure compressor mounting bolts are tight
- Inspect outdoor fan blade positioning
- Ensure control box is clean of dirt and debris
- Check control box wiring condition
- Ensure wire terminals are tight
- Check refrigerant charge level
- Ensure indoor coils are clean
- Check supply blower motor amperage

ELECTRIC HEATING

- Inspect power wire connections
- Ensure fuses are operational
- Ensure manual-reset limit switch is closed

ECONOMIZER OR OUTSIDE AIR DAMPER

- Check inlet filters condition
- Check damper travel (economizer)
- Check gear and dampers for dirt and debris

AIR FILTERS AND SCREENS

Each unit is equipped with return air filters. If the unit has an economizer, it also has an outside air screen. If a manual outside air damper is added, it also has an inlet air screen.

Each of these filters and screens will need periodic cleaning or replacement.

RETURN AIR FILTERS

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this CAUTION can result in premature wear and damage to equipment.

DO NOT OPERATE THE UNIT WITHOUT THE RETURN AIR FILTERS IN PLACE.

Dirt and debris can collect on heat exchangers and coils possibly resulting in a small fire. Dirt buildup on components can cause excessive current used resulting in motor failure.

Return air filters are disposable fiberglass filters. Access to the filters is through the filter and indoor coil access panel located to the right of the control box. The filters are situated on slide out racks for easy inspection and replacement. See Fig. 1.

Removing the return air filters:

1. Remove the vertical filter access panel.
2. Reach into the filter access opening and remove the filters from the filter rack.
3. Replace filters as required with similar replacement filters of same size.

Installing the return filters and access panel:

1. Slide the filters into the slide-out racks.
2. Place the vertical filter access panel on the unit.
3. Replace the mounting hardware attaching the panel to the unit and tighten securely.

IMPORTANT: DO NOT OPERATE THE UNIT WITHOUT RETURN-AIR FILTERS!

OUTSIDE AIR HOOD

Outside air hood inlet screens are permanent aluminum-mesh type filters. Check filters for dirt and debris. Remove the screens when cleaning is required. Clean by washing with hot low-pressure water and soft detergent and replace all screens before restarting the unit. Observe the flow direction arrows on the side of each filter frame when reinstalling.

ECONOMIZER AND MANUAL OUTSIDE AIR SCREENS

This air screen is retained by spring clips under the top edge of the hood. (See Fig. 3.)

To remove the filter, remove screws in horizontal filter retainers on leading edge of hood. Slide filters out. To re-install filters, slide clean or new filters into hood side retainers. Once positioned, re-install horizontal filter retainer.

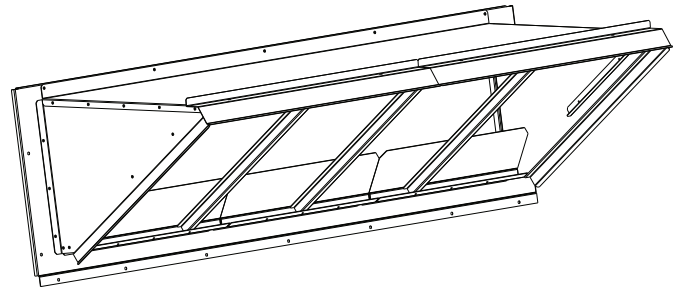


Fig. 3 — Filter Installation

SUPPLY FAN (BLOWER) SECTION

⚠ CAUTION

ELECTRICAL SHOCK HAZARD

Failure to follow this warning could cause personal injury or death.

Before performing service or maintenance operations on the fan system, shut off all unit power and lockout/tag-out the unit disconnect switch. **DO NOT** reach into the fan section with power still applied to unit.

Supply Fan (Belt-Drive)

The belt-drive supply fan system consists of a forward-curved centrifugal blower wheel on a solid shaft with two concentric-type bearings, one on each side of the blower housing. A fixed-pitch driver pulley is attached to the fan shaft and an adjustable-pitch driver pulley is on the motor. The pulleys are connected using a V-belt. See Fig. 4.

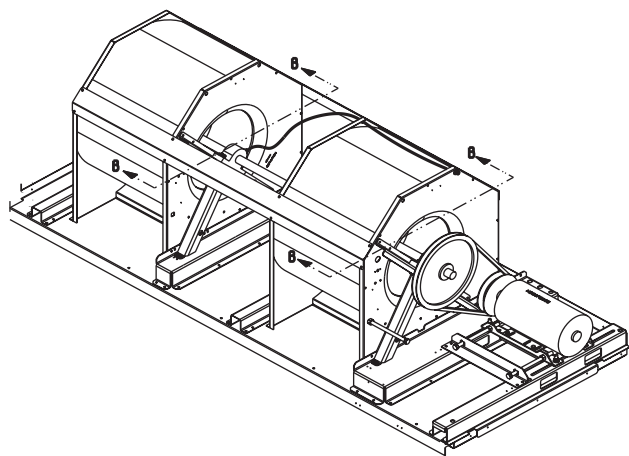


Fig. 4 — Belt Drive Motor Mounting

Belt

Check the belt condition and tension quarterly. Inspect the belt for signs of cracking, fraying or glazing along the inside surfaces. Check belt tension by using a spring-force tool (such as Browning's "Belt Tension Checker" (P/N 1302546 or equivalent tool); tension should be 6 lb at a 5/8-in. (1.6 cm) deflection when measured at the centerline of the belt span. This point is at the center of the belt when measuring the distance between the motor shaft and the blower shaft.

NOTE: Without the spring-tension tool, place a straightedge across the belt surface at the pulleys, then push down on the belt at mid-span using one finger until a 1/2-in. (1.3 cm) deflection is reached. See Fig. 5.

Adjust belt tension by loosening the motor mounting plate front and rear bolts and sliding the plate toward the fan (to reduce tension) or away from fan (to increase tension). Ensure the blower shaft and the motor shaft are parallel to each other (pulleys aligned). When finished, tighten all bolts and torque to 65 to 70 in.-lb (7.4 to 7.9 Nm).

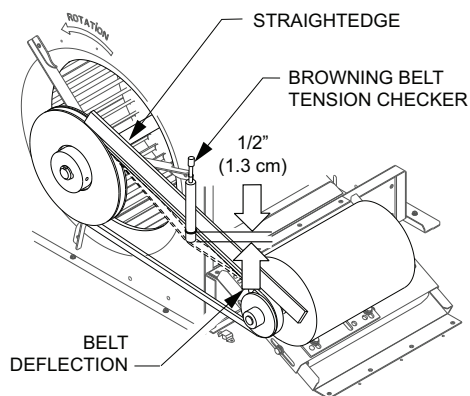


Fig. 5 — Checking Blower Motor Belt Tension

REPLACING THE V-BELT

NOTE: Use a belt with the same section type or similar size. Do not substitute a FHP-type (cogged) belt. When installing the new belt, do not use a screwdriver or pry-bar to force the belt over the pulley flanges, this will stress the belt and cause a reduction in belt life. Damage to the pulley can also occur.

CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this CAUTION can result in premature wear and damage to equipment.

Do not use a screwdriver or a pry bar to place the new V-belt in the pulley groove. This can cause stress on the V-belt and the pulley resulting in premature wear on the V-belt and damage to the pulley.

1. Loosen the four front and rear motor mounting plate bolts (see Fig. 6).
2. Loosen the two jack bolt jam nuts.
3. Turn the two jack bolts counterclockwise to loosen bringing the motor closer to the blower.
4. Remove the belt by gently lifting the old belt over one of the pulleys.
5. Install the new belt by gently sliding the belt over both pulleys, and then sliding the motor and plate away from the fan housing until proper tension is achieved.
6. Turn the jack bolts clockwise to increase the tension of the V-belt.
7. Adjust the V-belt tension using Browning's "Belt Tension Checker" (P/N 1302546 or equivalent tool) to 6 lb at a 5/8-in. (1.6 cm) deflection when measured at the centerline of the belt span. The tension can also be checked depressing the belt at mid-span with one finger until a 1/2-in. (1.3 cm) deflection is reached.
8. Check alignment of the pulleys, adjust the motor mounting base as needed. Tighten four motor mounting bolts. Torque all bolts to 65 to 70 in.-lb (7.4 to 7.9 Nm).
9. Tighten two jack bolt jam nuts. Torque jam nuts to 65 to 70 in.-lb (7.4 to 7.9 Nm).
10. Check the tension after a few hours of runtime and re-adjust as required.

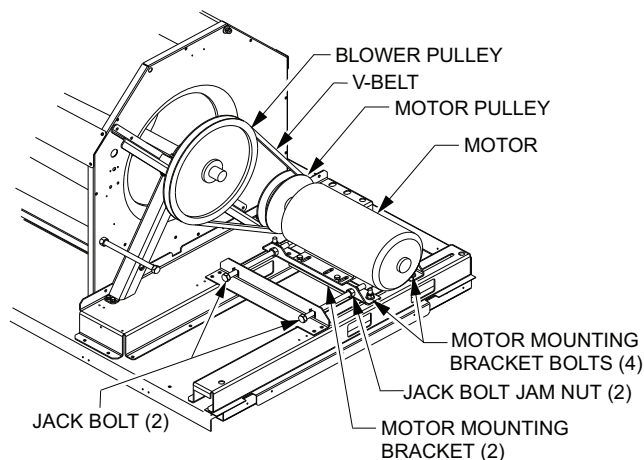


Fig. 6 — Replacing the V-Belt

Adjustable-Pitch Pulley on Motor

The motor pulley is an adjustable-pitch type that allows a servicer to implement changes in the fan wheel speed to match previously installed ductwork systems. The pulley consists of a fixed flange side that faces the motor (secured to the motor shaft) and a movable flange side that can be rotated around the fixed flange side that increases or reduces the pitch diameter of this driver pulley. See Fig. 7.

As the pitch diameter is changed by adjusting the position of the movable flange, the centerline on this pulley shifts laterally (along the motor shaft). This creates a requirement for a realignment of the pulleys after any adjustment of the movable flange. Reset the belt tension after each realignment.

Check the condition of the motor pulley for signs of wear. Glazing of the belt contact surfaces and erosion on these surfaces are signs of improper belt tension and/or belt slippage. Replace pulley if necessary.

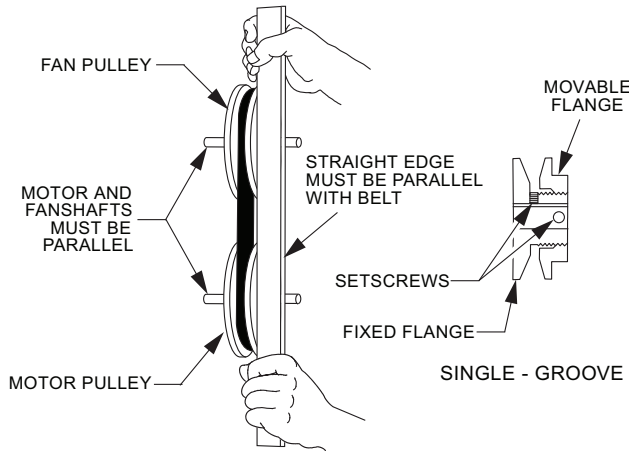


Fig. 7 — Supply-Fan Pulley Adjustment

Changing the Fan Speed

1. Shut off unit power supply. Use proper lockout/tag-out procedures.
2. Loosen belt by loosening fan motor mounting nuts. See Fig. 7.
3. Loosen movable pulley flange setscrew. See Fig. 7.
4. Screw movable flange toward fixed flange to increase speed and away from fixed flange to decrease speed. Increasing fan speed increases load on motor. Do not exceed the maximum specified speed.
5. Set movable flange at nearest keyway of pulley hub. Tighten setscrew and torque to 65 to 70 in.-lb (7.4 to 7.9 Nm).

Aligning Fan and Motor Pulleys

1. Loosen fan pulley setscrews.
2. Slide fan pulley along fan shaft. Make angular alignment by loosening motor mounting plate front and rear bolts.
3. Tighten fan pulley setscrews and motor mounting bolts and torque to 65 to 70 in.-lb (7.4 to 7.9 Nm).
4. Recheck belt tension.

Bearings

The fan system uses bearings featuring concentric split locking collars. A Torx¹ T25 socket head cap screw is used to tighten the locking collars. Tighten the locking collar by holding it firmly against the inner race of the bearing and tightening the socket head cap screw. Torque the socket head cap screw 55 to 60 in.-lb (6.2 to 6.8 Nm). See Fig. 8.

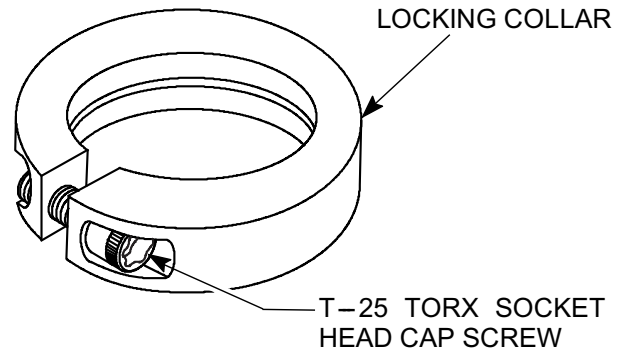


Fig. 8 — Tightening Locking Collar

Motor

Always replace the external-tooth lock washer (star washer) under the motor mounting base; this is part of the motor grounding system. Ensure the teeth on the lock washer are in contact with the motor's painted base. Tighten motor mounting bolts and torque to 120 ± 12 in.-lb (14 ± 1.4 Nm).

Change fan wheel speed by changing the fan pulley (larger pitch diameter to reduce wheel speed, smaller pitch diameter to increase wheel speed) or select a new system (both pulleys and matching belt). The horsepower rating of the belt is primarily dictated by the pitch diameter of the smaller pulley in the drive system (typically the motor pulley in these units). Do not install a replacement motor pulley with a smaller pitch diameter than was provided on the original factory pulley.

Before changing pulleys to increase fan wheel speed, check the fan performance at the target speed and airflow rate to determine new motor loading (bhp). Use the fan performance tables or use the Packaged Rooftop Builder software program. Confirm that the motor in this unit is capable of operating at the new operating condition. Fan shaft loading increases dramatically as wheel speed is increased.

To reduce vibration, replace the motor's adjustable pitch pulley with a fixed pitch pulley (after the final airflow balance adjustment). This will reduce the amount of vibration generated by the motor/belt-drive system.

STAGED AIR VOLUME (SAV) CONTROL: 2-SPEED FAN WITH VARIABLE FREQUENCY DRIVE (VFD)

Staged Air Volume (SAV) Indoor Fan Speed System

The SAV system utilizes a fan speed control board and Variable Frequency Drive (VFD) to automatically adjust the indoor fan motor speed in sequence with the unit's ventilation, cooling and heating operation. Conforming to ASHRAE 90.1 2010 Standard Section 6.4.3.10.b, during the first stage of cooling operation the SAV system will adjust the fan motor to provide 66% of the design airflow rate for the unit. When the call for the second stage of cooling is required, the SAV system will allow the design airflow rate for the unit established (100%). During the heating mode, the SAV system will allow total design airflow rate (100%) operation. During ventilation mode, the SAV system will operate the fan motor at 66% speed.

Identifying Factory Option

This section only applies to units that meet the criteria detailed in Table 1. See Appendix A for the model number nomenclature breakdown.

1. Torx is a registered trademark of Acument Intellectual Properties LLC.

Table 1 — Model-Size / VFD Option Indicator

| UNIT | POSITION IN MODEL NUMBER | VFD FIOP INDICATOR |
|-------------|--------------------------|--------------------|
| 50TCQ 17,24 | 17 | G, J |

Unit Installation with SAV Option

50TCQ ROOFTOP

Refer to the base unit installation instructions for standard required operating and service clearances.

NOTE: The Remote VFD Keypad is a field-installed option. It is not included as part of the factory-installed VFD option. See “Variable Frequency Drive (VFD) Installation, Setup and Troubleshooting Supplement” for wiring schematics and performance charts and configuration. See Fig. 9 for location of the VFD as mounted on the various 50TCQ models.

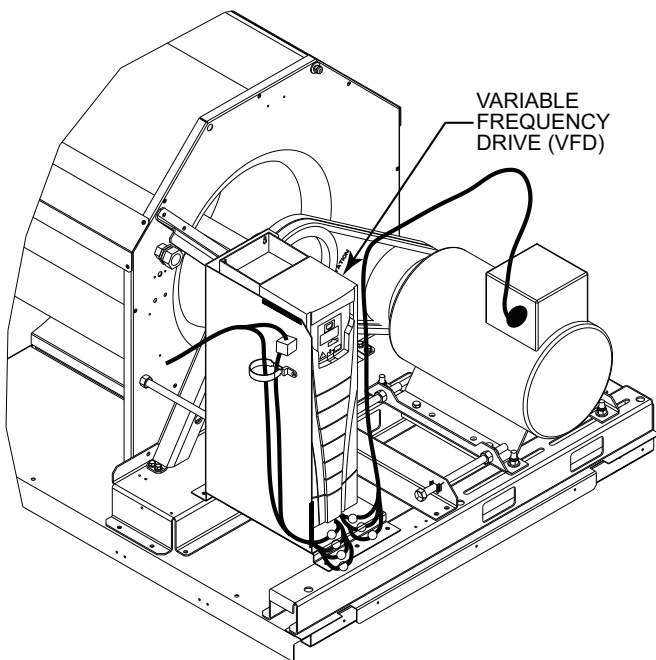


Fig. 9 — VFD Location for 50TCQ 15-20 Ton Units

ADDITIONAL VFD INSTALLATION AND TROUBLESHOOTING

Additional installation, wiring and troubleshooting information for the VFD can be found in the following manuals: “Variable Frequency Drive (VFD) Installation, Setup and Troubleshooting Supplement.”

HEAT PUMP REFRIGERATION SYSTEM

⚠ WARNING

UNIT OPERATION AND SAFETY HAZARD

Failure to follow this warning could cause personal injury, death and/or equipment damage.

This system uses R-410A refrigerant, which has higher pressures than R-22 and other refrigerants. No other refrigerant may be used in this system. Gage set, hoses, and recovery system must be designed to handle R-410A refrigerant. If unsure about equipment, consult the equipment manufacturer.

Outdoor Coil

The 50TCQ outdoor coil is fabricated with round tube copper hairpins and plate fins of various materials and/or coatings (see Appendix A to identify the materials provided in this unit). All unit sizes use composite-type two-row coils. Composite two-row coils are two single-row coils fabricated with a single return bend end tubesheet.

Indoor Coil

The indoor coil is traditional round-tube, plate-fin technology. Tube and fin construction is of various optional materials and coatings (see Appendix A). Coils are multiple-row.

Recommended Coil Maintenance and Cleaning

Routine cleaning of coil surfaces is essential in maintaining proper operation of the unit. Elimination of contamination and removal of harmful residues will greatly increase the life of the coil and extend the life of the unit. The following maintenance and cleaning procedures are recommended as part of the routine maintenance activities to extend the life of the coil.

REMOVE SURFACE LOADED FIBERS

Surface loaded fibers or dirt should be removed with a vacuum cleaner. If a vacuum cleaner is not available, a soft non-metallic bristle brush can be used. In either case, the tool should be applied in the direction of the fins. Coil surfaces can be easily damaged (fin edges can be easily bent over and damage the coating of a protected coil) when the tool is applied across the fins.

NOTE: Use of a water stream, such as a garden hose, against a surface loaded coil will drive the fibers and dirt into the coil. This will make cleaning efforts more difficult. Surface loaded fibers and dirt must be completely removed prior to using low velocity clean water rinse.

PERIODIC CLEAN WATER RINSE

A periodic clean water rinse is very beneficial for coils that are applied in coastal or industrial environments. However, it is very important that the water rinse is made with very low velocity water stream to avoid damaging the fin edges. Monthly cleaning as described below is recommended.

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution can result in reduced unit performance or unit shutdown.

Use only the recommended approved cleaning procedures for proper system performance.

ROUTINE CLEANING OF INDOOR COIL SURFACES

Periodic cleaning with Totaline® Environmentally Sound Coil Cleaner is essential in extending the life of coils. This cleaner is available from Carrier Replacement Components Division (P/N P902-0301 for a one gallon (3.8L) container, and P/N P902-0305 for a 5 gallon (19L) container). It is recommended that all coils (including standard aluminum, pre-coated, copper/copper or E-coated coils) be cleaned with the Totaline Environmentally Sound Coil Cleaner as described below.

Coil cleaning should be part of the unit’s regularly scheduled maintenance procedures ensuring the long life of the coil. Failure to clean the coils can result in reduced durability in the environment.

Avoid the use of:

- coil brighteners
- acid cleaning prior to painting
- high pressure washers

- poor quality water for cleaning

Totaline Environmentally Sound Coil Cleaner is non-flammable, hypoallergenic, non bacterial and a USDA accepted biodegradable agent that will not harm the coil or surrounding components, such as electrical wiring, painted metal surfaces or insulation. Use of non-recommended coil cleaners is strongly discouraged because coil and unit durability can be affected.

Clean coil as follows

1. Turn off unit power. Use lockout/tag-out procedures on unit power switch.
2. Remove top panel screws on outdoor section.
3. Remove coil corner posts and access panel. See Fig. 10.
4. Lift and hold top cover open.
5. Hold the top panel open by placing the coil corner post between the top panel and the center post. See Fig. 11.
6. Remove fasteners holding coil sections together at return end of condenser coil. Carefully separate the outdoor coil section three to four inches. See Fig. 12.
7. Clean the outer surfaces with a stiff brush in the normal manner. Use a water hose or other suitable equipment to flush down between the two coil sections to remove dirt and debris.
8. Secure inner and outer coil rows together with a field-supplied fastener.
9. Reposition the outer coil section and remove the coil corner post from between the top panel and center post. Reinstall both coil corner posts and access panel. Replace all screws. See Fig. 10.

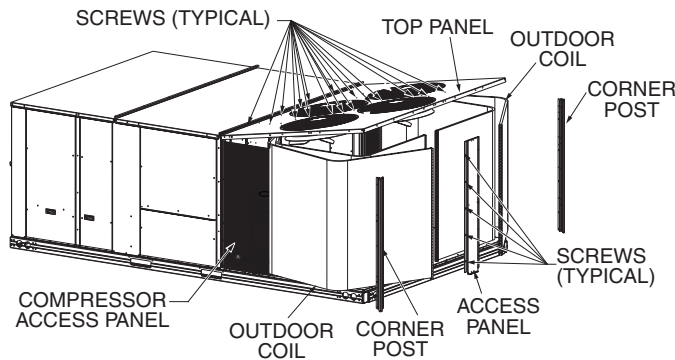


Fig. 10 — Cleaning Condenser Coil

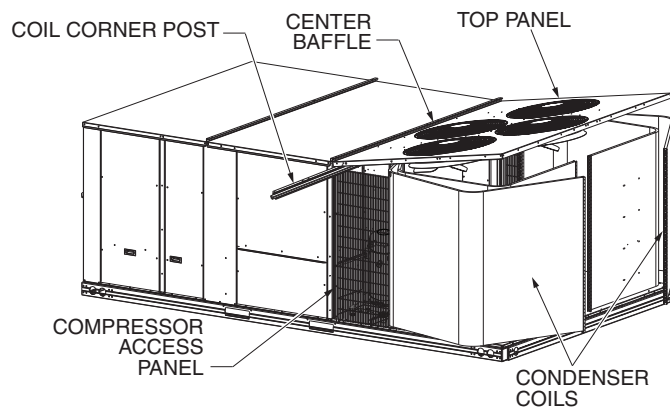


Fig. 11 — Propping Up Top Panel

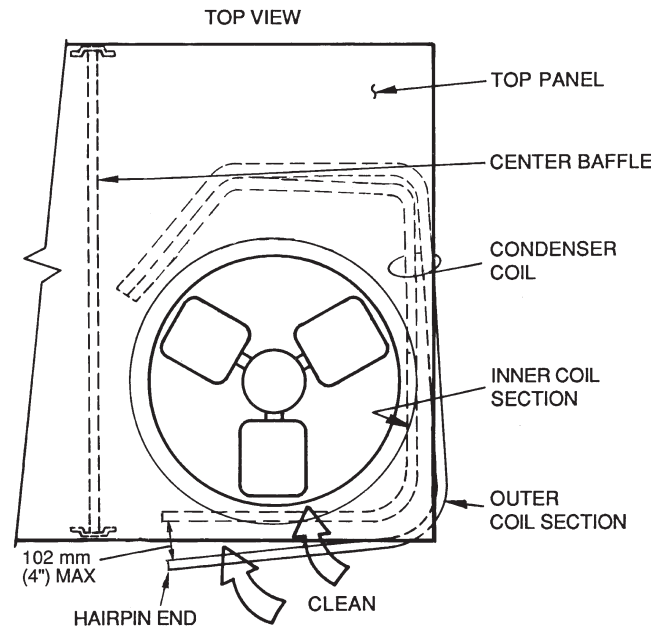


Fig. 12 — Separating Coil Sections

Totaline Environmentally Sound Coil Cleaner Application Equipment:

- 2.5 gal (9.5L) garden sprayer
- Water rinse with low velocity spray nozzle

CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in accelerated corrosion of unit parts.

Harsh chemicals, household bleach or acid or basic cleaners should not be used to clean outdoor or indoor coils of any kind. These cleaners can be very difficult to rinse out of the coil and can accelerate corrosion at the fin/tube interface where dissimilar materials are in contact. If there is dirt below the surface of the coil, use the environmentally balanced coil cleaner.

CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in reduced unit performance or unit shutdown.

High velocity water from a pressure washer, garden hose, or compressed air should never be used to clean a coil. The force of the water or air jet will bend the fin edges and increase air-side pressure drop.

Totaline Environmentally Sound Coil Cleaner Application Instructions:

1. Proper protection equipment, such as approved safety glasses and gloves, is recommended during mixing and application of Totaline environmentally sound coil cleaner.
2. Remove all surface loaded fibers and debris using a vacuum cleaner or a soft non-metallic bristle brush as described above.
3. Thoroughly wet all finned surfaces with clean water using a low velocity garden hose being careful not to bend fins.
4. Mix Totaline environmentally sound coil cleaner in a 2.5 gal (9.5L) garden sprayer according to the instructions included

with the cleaner. The optimum solution temperature is 100°F (38°C).

NOTE: Do NOT USE water in excess of 130°F (54°C), as the enzymatic activity will be destroyed.

5. Thoroughly apply Totaline environmentally sound coil cleaner solution to all coil surfaces including finned area, tube sheets and coil headers.
6. Hold garden sprayer nozzle close to finned areas and apply cleaner with a vertical, up-and-down motion. Avoid spraying in horizontal pattern to minimize potential for fin damage.
7. Ensure cleaner thoroughly penetrates deep into finned areas.
8. Interior and exterior finned areas must be thoroughly cleaned.
9. Finned surfaces should remain wet with cleaning solution for 10 minutes.
10. Ensure surfaces are not allowed to dry before rinsing. Reapply cleaner as needed to ensure 10 minute saturation is achieved.
11. Thoroughly rinse all surfaces with low velocity clean water using downward rinsing motion of water spray nozzle. Protect fins from damage from the spray nozzle.

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 check valve and a strainer. Unit sizes D17 - D24 have two compressor circuits. See Fig. 13 for typical unit piping schematic.

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.

Refrigerant flow metering in the evaporator-function sequence is provided by multiple Accutrol™ fixed-bore metering devices that are located in the tee nipples between the liquid header and the entrance to each coil circuit. The Accutrol metering device is brazed into the nipple tube between the liquid header end and the side-port tube. See Fig. 14. During evaporator-function operation, flow is straight through the nipple and into each evaporator circuit. Flow continues through the parallel evaporator circuits and into the vapor header.

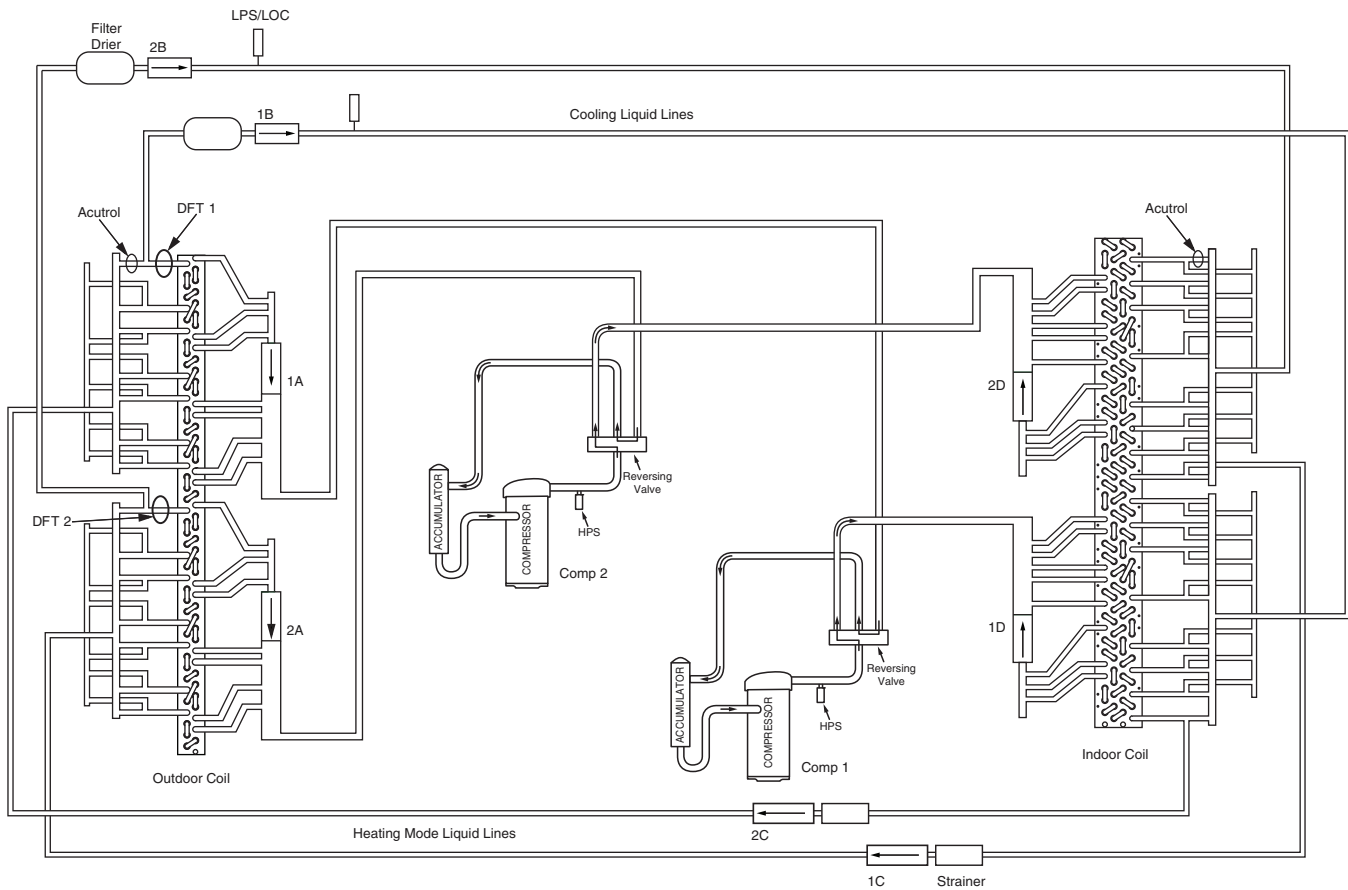


Fig. 13 — Typical Unit Piping Schematic with TXV Valves on the Indoor Coils

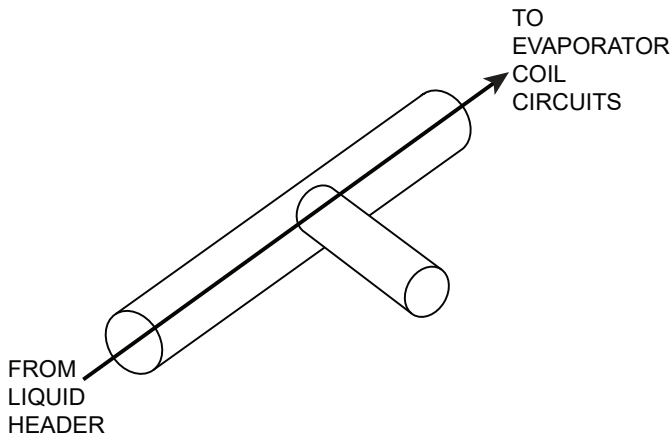


Fig. 14 — Heat Pump — Flow as Evaporator Function
OUTDOOR COILS ONLY

Converging circuit flow in the condenser-function operation is accomplished with the check valve in the vapor header and the liquid transfer header connected to the side ports on all but one of the Accutrol tee nipples in each circuit. During condenser-function operation, hot gas from the compressor discharge enters the header until it reaches the check valve which blocks further flow. The hot gas exits the header through the tubes above the check valve and enters these coil circuits. At the outlet of these desuperheating and condensing circuits, the refrigerant enters the Accutrol tees from the coil end. The refrigerant exits the tee at the side port and enters the liquid transfer header (see Fig. 15). The refrigerant moves through the liquid transfer header and exits through the remaining tubes, through the side ports on the Accutrol tees (see Fig. 16) and back into the coil circuits where additional condensing occurs. These circuits exit into the vapor header behind the check valve and exit through the remaining tube on the vapor header. In this last pass through the coil, the refrigerant is sub-cooled. Subcooled liquid exits at the last Accutrol tee (see Fig. 17) where the side port is connected to the specific mode liquid line.

Each liquid line has a check valve to prevent back-flow through the liquid line in its opposite mode. This ensures correct flow direction through the filter driers and the strainers preventing emptying of off-mode liquid lines into the evaporator-function coil circuits.

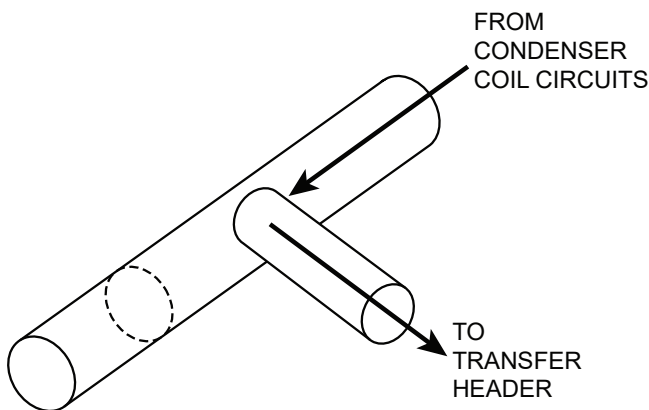


Fig. 15 — Heat Pump Accutrol — Flow as Condenser Function/Exiting First Pass

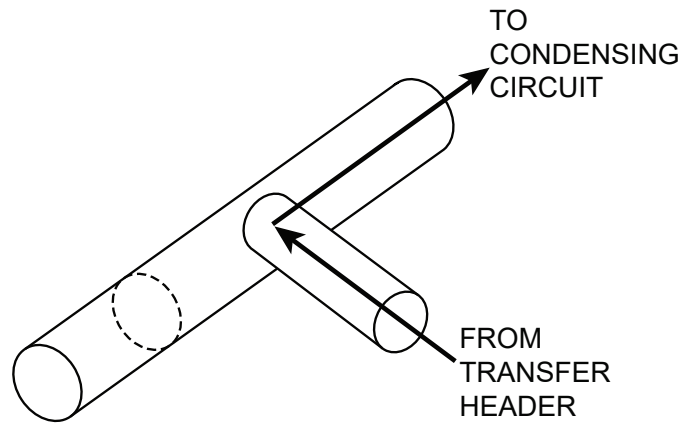


Fig. 16 — Heat Pump Accutrol — Flow as Condenser Function/Entering Second Pass

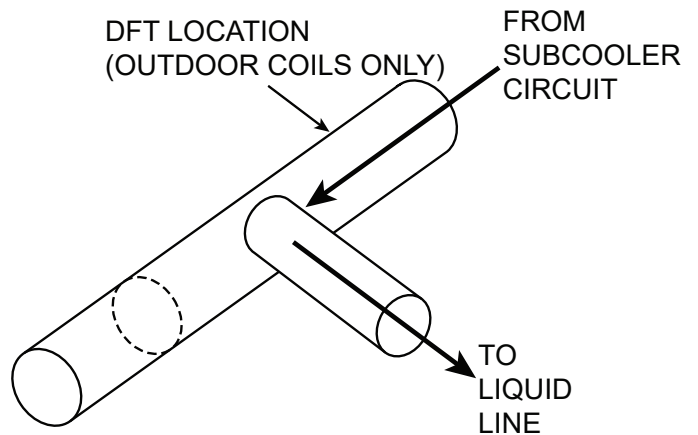


Fig. 17 — Heat Pump Accutrol — Flow as Condenser Function/Exiting Subcooler Pass

Reversing Valve and Check Valve Position

See Fig. 13 and Tables 2-4.

Table 2 — Cooling Mode (each circuit)

| COMPONENT | STATUS/POSITION |
|-----------------|-----------------|
| Reversing Valve | Energized |
| Check Valve A | Closed |
| Check Valve B | Open |
| Check Valve C | Closed |
| Check Valve D | Open |

Table 3 — Heating Mode (each circuit)

| COMPONENT | STATUS/POSITION |
|-----------------|-----------------|
| Reversing Valve | De-energized |
| Check Valve A | Open |
| Check Valve B | Closed |
| Check Valve C | Open |
| Check Valve D | Closed |

Table 4 — Defrost Mode

| COMPONENT | STATUS/POSITION |
|--------------------|-----------------|
| Defrost Thermostat | Closed |
| Outdoor Fan(s) | Off |
| Reversing Valve | Energized |
| Check Valve A | Closed |
| Check Valve B | Open |
| Check Valve C | Closed |
| Check Valve D | Open |

Troubleshooting Refrigerant Pressure Problems and Check Valves

Refer to Fig. 13, on page 8, and the Cooling Mode and Heating Mode tables (Tables 2-4).

COIL METERING DEVICES (OUTDOOR COILS ONLY)

The metering devices are multiple fixed-bore devices (Accutrol) brazed into the horizontal outlet tubes from the liquid header, located at the entrance to each evaporator coil circuit path. These metering devices are non-adjustable. Service requires replacing the entire liquid header assembly.

Check for possible blockage of one or more of these metering devices by creating a low load condition on the evaporator-function coil and then observing the frosting pattern on the finned portion of the coil.

To check the indoor coil, disconnect the supply fan signal or contactor (IFC) coil, then start the circuit in a Cooling Mode (jumper R to Y1 or Y2) and observe the frosting pattern on the face of the indoor coil. A frost pattern should develop uniformly across the face of the indoor coil starting at each tube at the Accutrol nipple locations.

To check the outdoor coil, disconnect the outdoor fan motor. Start the circuit in a Heating Mode (jumper R to W1 or W2) and observe the frost pattern on the face of the outdoor coil.

Failure to develop frost at an outlet tube can indicate a plugged or a missing orifice.

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. 18. 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.-lb (10.9 ± 1 Nm). Do not over-tighten.

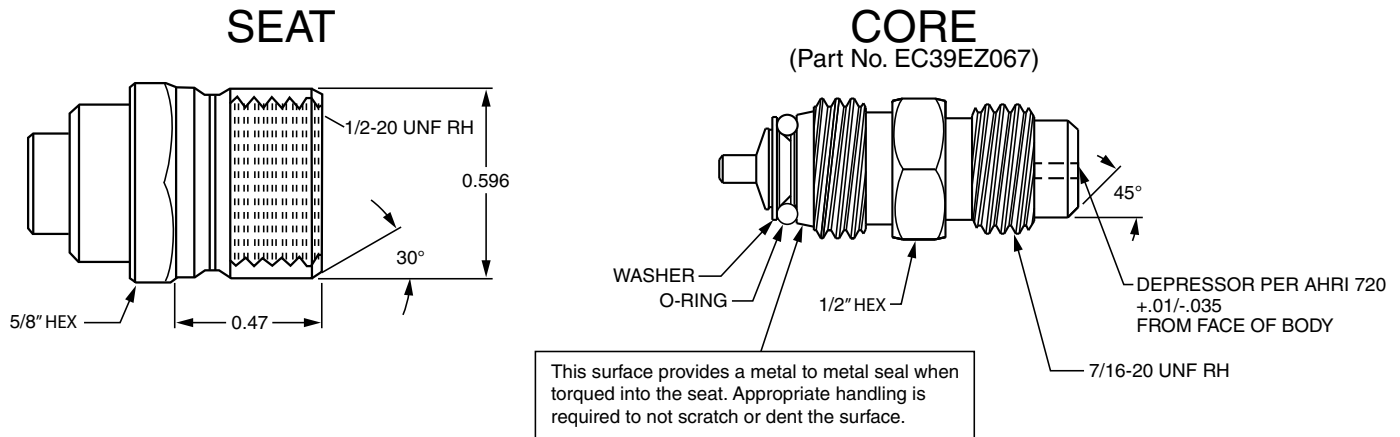


Fig. 18 — CoreMax¹ Access Port Assembly

1. CoreMax is a registered trademark of Fastest, Inc.

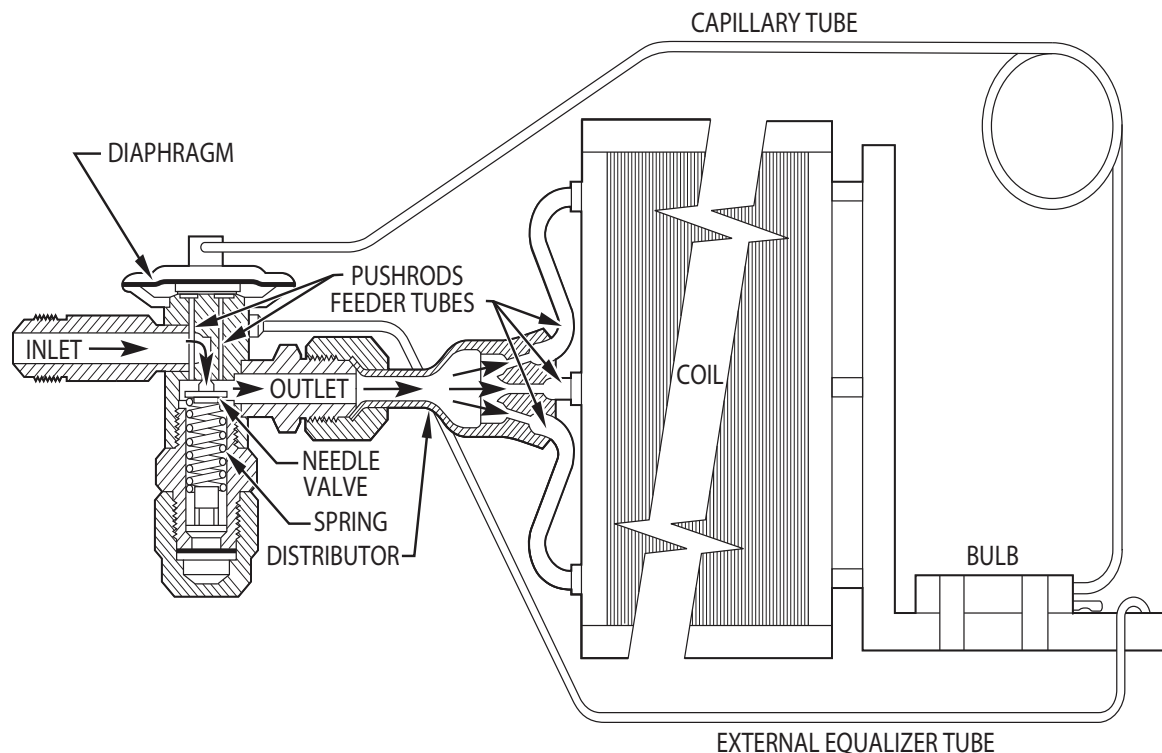


Fig. 19 — Thermostatic Expansion Valve (TXV) Operation

THERMOSTATIC EXPANSION VALVE (TXV)

All 50TCQ units have a factory installed nonadjustable thermostatic expansion valve (TXV). The TXV will be a bi-flow, bleed port expansion valve with an external equalizer. TXVs are specifically designed to operate with Puron® refrigerant; use only factory authorized TXVs. See Fig. 19.

TXV Operation

The TXV is a metering device that is used in air conditioning and heat pump systems to adjust to changing load conditions by maintaining a preset superheat temperature at the outlet of the evaporator coil. The volume of refrigerant metered through the valve seat is dependent upon the following.

1. Superheat temperature is sensed by the cap tube sensing bulb on the suction tube at outlet of the evaporator coil. This temperature is converted into pressure by refrigerant in the bulb pushing downward on the diaphragm which opens the valve using the push rods. As long as this bulb and cap tube contain any liquid refrigerant, this temperature is converted into suction pressure pushing downward on the diaphragm, which tends to open the TXV valve through the push rods.
2. The suction pressure at the outlet of the evaporator coil is transferred through the external equalizer tube to the underside of the diaphragm.
3. The needle valve on the pin carrier is spring loaded, exerting pressure on the underside of the diaphragm. Therefore, the bulb pressure equals evaporator pressure (at outlet of coil) plus spring pressure. If the load increases, the temperature increases at the bulb, which increases the pressure on the top side of the diaphragm, pushing the carrier away from the seat, opening the valve and increasing the flow of refrigerant. The increased refrigerant flow causes increased leaving evaporator pressure which is transferred through the equalizer tube to the underside of the diaphragm. This causes pin carrier spring pressure to close the TXV valve. The refrigerant flow is effectively stabilized to the load demand with a negligible change in superheat.

Replacing TXV

⚠ CAUTION

PERSONAL INJURY HAZARD

Failure to follow this caution can result in injury to personnel and damage to components.

Always wear approved safety glasses, work gloves and other recommended Personal Protective Equipment (PPE) when working with refrigerants.

1. Recover refrigerant.
2. Remove TXV support clamp using a $5/16$ -in. nut driver.
3. Remove TXV using a backup wrench on connections to prevent damage to tubing.
4. Remove equalizer tube from suction line of coil. Use file or tubing cutter to cut brazed equalizer line approximately 2 inches above suction tube.
5. Remove bulb from vapor tube inside cabinet.
6. Install the new TXV and avoid damaging the tubing or the valve when attaching the TXV to the distributor.
7. Attach equalizer tube to suction line. If coil has mechanical connection, then use wrench and back up wrench to attach. If coil has brazed connection, use file or tubing cutters to remove mechanical flare nut from equalizer line. Then use coupling to braze the equalizer line to stub (previous equalizer line) in suction line.
8. Attach TXV bulb in the same location as original (in the sensing bulb indent), wrap bulb in protective insulation and secure using the supplied bulb clamp. See Fig. 20.
9. Route equalizer tube through suction connection opening (large hole) in fitting panel and install fitting panel in place.
10. Sweat inlet of TXV marked "IN" to liquid line. Avoid excessive heat which could damage valve.

PURON (R-410A) REFRIGERANT

This unit is designed for use with Puron (R-410A) refrigerant. Do not use any other refrigerant in this system.

Puron (R-410A) refrigerant is provided in pink (rose) colored cylinders. These cylinders are available with and without dip tubes; cylinders with dip tubes will have a label indicating this feature. For a cylinder with a dip tube, place the cylinder in the upright position (access valve at the top) when removing liquid refrigerant for charging. For a cylinder without a dip tube, invert the cylinder (access valve on the bottom) when removing liquid refrigerant.

Because Puron (R-410A) refrigerant is a blend, it is strongly recommended that refrigerant always be removed from the cylinder as a liquid. Add liquid refrigerant into the system in the discharge line. If adding refrigerant into the suction line, use a commercial metering/expansion device at the gage manifold; remove liquid from the cylinder, pass it through the metering device at the gage set and then pass it into the suction line as a vapor. Do not remove Puron (R-410A) refrigerant from the cylinder as a vapor.

Refrigerant Charge

The amount of refrigerant charge is listed on the unit's nameplate. Refer to Carrier Publication, "GTAC2-5 Charging, Recovery, Recycling and Reclamation Training Manual" and the following procedures.

Unit panels must be in place when unit is operating during the charging procedure. If unit is equipped with a head pressure control device, bypass it to ensure full fan operation during charging.

NOTE: Charge checking and adjustments must be made while the system is operating in Cooling only.

NO CHARGE

Use standard evacuation techniques for Puron (R-410A) refrigerant. After evacuating system, weigh the specified amount of refrigerant.

LOW-CHARGE COOLING

Using Cooling Charging Charts (Fig. 21-24), vary refrigerant until the conditions of the appropriate chart are met. Note the charging charts are different from type normally used. Charts are based on charging the units to the correct superheat for the various operating conditions. An accurate pressure gage and temperature sensing device are required. Connect the pressure gage to the service port on the suction line. Mount the temperature sensing device on the suction line and insulate it so that outdoor ambient temperature does not affect the reading. Indoor-air cfm must be within the normal operating range of the unit.

How To Use Cooling Charging Charts

Take the outdoor ambient temperature and read the suction pressure gage. Refer to chart to determine what suction temperature should be. If suction temperature is high, add refrigerant. If suction temperature is low, carefully recover some of the charge. Recheck the suction pressure as charge is adjusted.

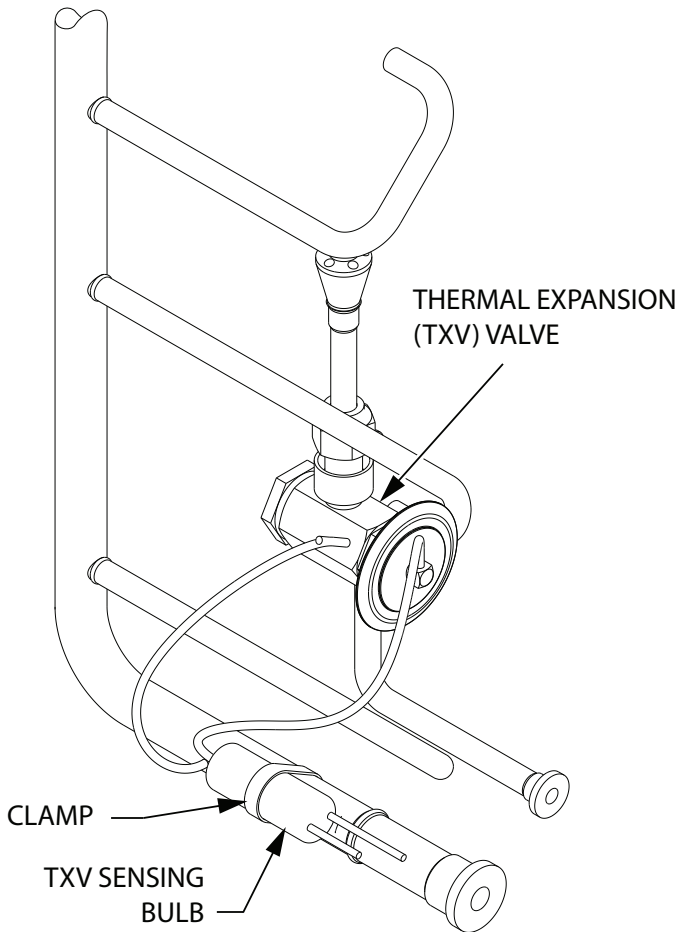
EXAMPLE:

Model 50TCQ*D17

Outdoor Temperature 85°F (29°C)

Suction Pressure 140 psig (965 kPa)

Suction Temperature 55°F (13°C)

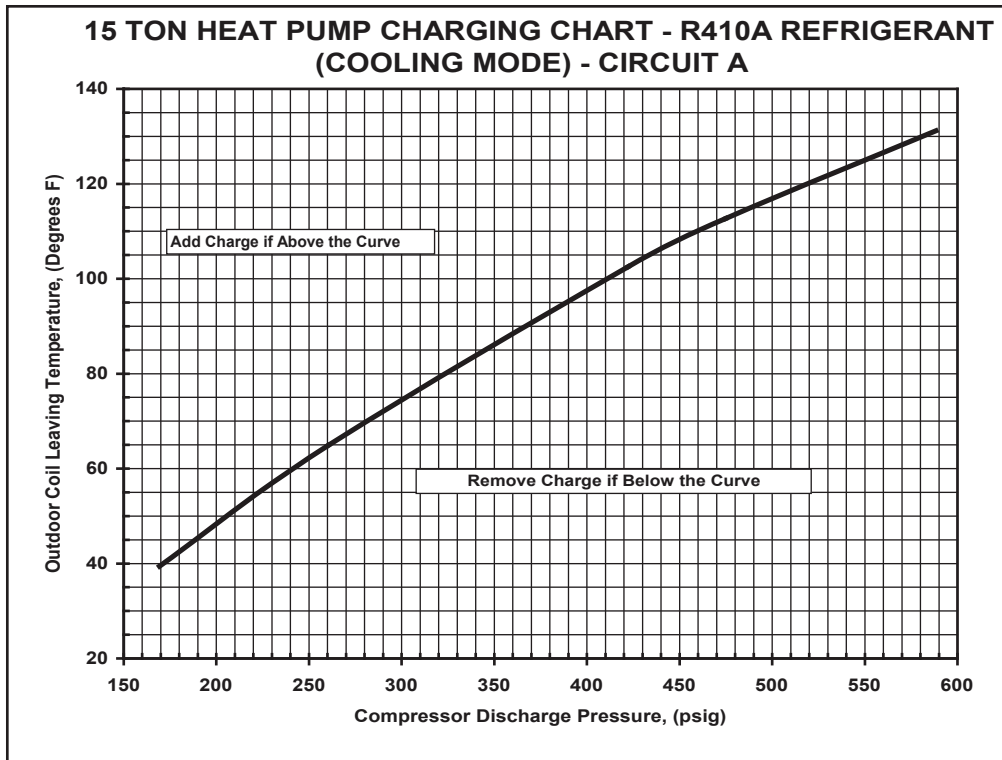


SENSING BULB INSULATION REMOVED FOR CLARITY

Fig. 20 — TXV Valve and Sensing Bulb

COOLING CHARGING CHARTS

CAUTION DO NOT OVERCHARGE UNIT
OVERCHARGING UNIT INCREASES THE RISK OF
NUISANCE HIGH PRESSURE SWITCH TRIPS

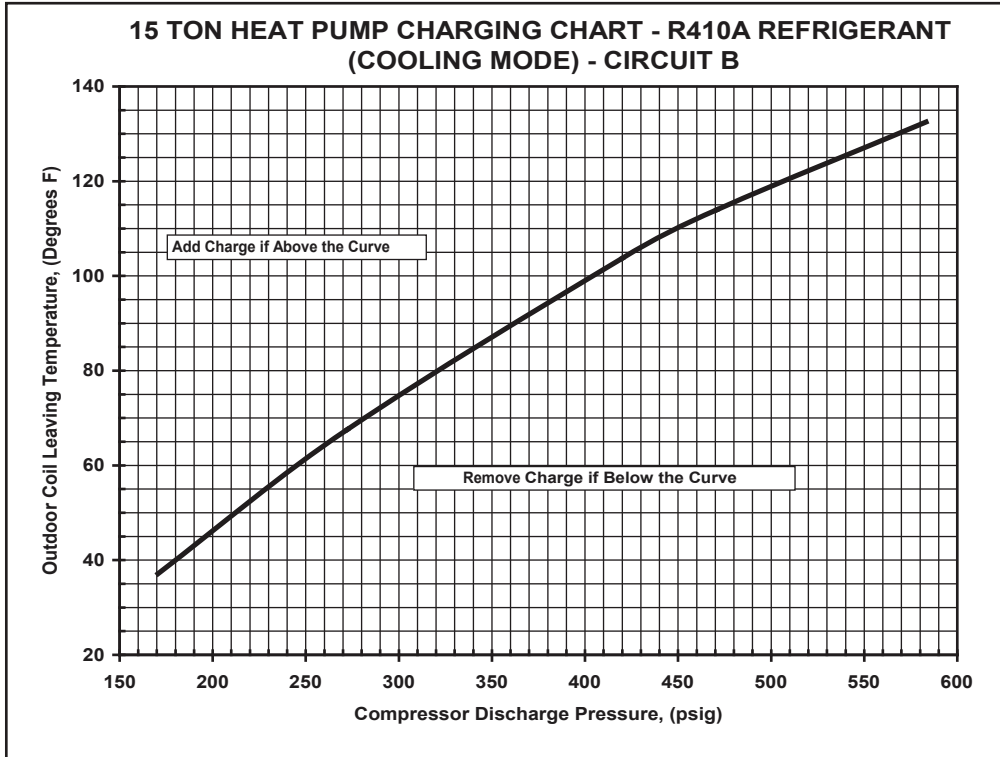


50HE501614 - A

IN HEATING MODE,
RECLAIM CHARGE AND RECHARGE UNIT PER NAMEPLATE

Fig. 21 — Cooling Charging Chart — 50TCQ-D17 Circuit A

CAUTION DO NOT OVERCHARGE UNIT
OVERCHARGING UNIT INCREASES THE RISK OF
NUISANCE HIGH PRESSURE SWITCH TRIPS

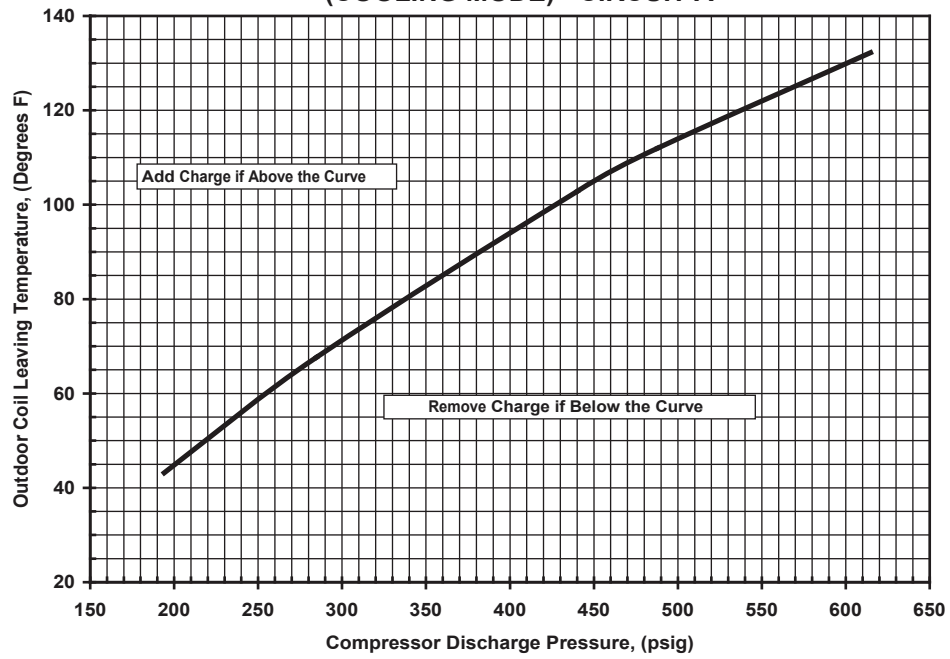


IN HEATING MODE,
RECLAIM CHARGE AND RECHARGE UNIT PER NAMEPLATE

Fig. 22 — Cooling Charging Chart — 50TCQ-D17 Circuit B

CAUTION DO NOT OVERCHARGE UNIT
OVERCHARGING UNIT INCREASES THE RISK OF
NUISANCE HIGH PRESSURE SWITCH TRIPS

20 TON HEAT PUMP CHARGING CHART - R410A REFRIGERANT
(COOLING MODE) - CIRCUIT A

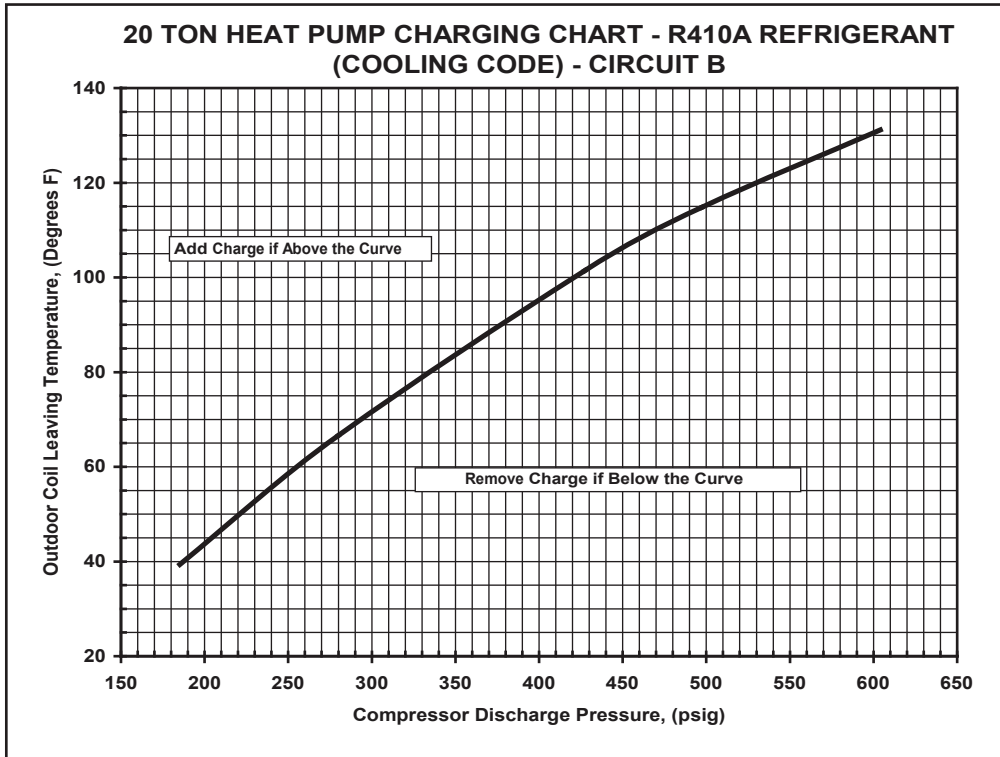


50HE501616 - A

IN HEATING MODE,
RECLAIM CHARGE AND RECHARGE UNIT PER NAMEPLATE

Fig. 23 — Cooling Charging Chart — 50TCQ-D24 Circuit A

CAUTION DO NOT OVERCHARGE UNIT
OVERCHARGING UNIT INCREASES THE RISK OF
NUISANCE HIGH PRESSURE SWITCH TRIPS



50HE501617 - A

IN HEATING MODE,
RECLAIM CHARGE AND RECHARGE UNIT PER NAMEPLATE

Fig. 24 — Cooling Charging Chart — 50TCQ-D24 Circuit B

Compressors

LUBRICATION

Compressors are charged with the correct amount of oil at the factory.

⚠ CAUTION

UNIT DAMAGE HAZARD

Failure to follow this caution may result in damage to components.

The compressor is in a R-410A refrigerant system and uses a polyolester (POE) oil. This oil is extremely hygroscopic, meaning it absorbs water readily. POE oils can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Avoid exposure of the oil to the atmosphere.

REPLACING COMPRESSOR

⚠ WARNING

FIRE, EXPLOSION HAZARD

Failure to follow this warning could result in death, serious personal injury and/or property damage.

Never use air or gases containing oxygen for leak testing or for operating refrigerant compressors. Pressurized mixtures of air or gases containing oxygen can lead to an explosion.

⚠ CAUTION

INSTALLATION SITE DAMAGE

Failure to follow this caution can result in damage to equipment location site.

R-410A refrigerant contains polyolester (POE) oil that can damage the roof membrane. Caution should be taken to prevent POE oil from spilling onto the roof surface.

The factory also recommends that the suction and discharge lines be cut with a tubing cutter instead of using a torch to remove brazed fittings.

NOTE: Only factory-trained service technicians should remove and replace compressor units.

Compressors using Puron refrigerant contain a polyolester (POE) oil. This oil has a high affinity for moisture. Do not remove the compressor's tube plugs until ready to insert the unit suction and discharge tube ends.

COMPRESSOR ROTATION

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution can result in premature wear and damage to equipment.

Scroll compressors can only compress refrigerant if rotating in the right direction. Reverse rotation for extended times can result in internal damage to the compressor. Scroll compressors are sealed units and cannot be repaired on site location.

NOTE: When the compressor is rotating in the wrong direction, the unit makes an elevated level of noise and does not provide cooling.

On 3-phase units with scroll compressors, it is important to be certain compressor is rotating in the proper direction.

To determine whether or not compressor is rotating in the proper direction:

1. Connect service gages to suction and discharge pressure fittings.
2. Energize the compressor.
3. The suction pressure should drop and the discharge pressure should rise, as is normal on any start-up.

NOTE: If the suction pressure does not drop and the discharge pressure does not rise to normal levels:

4. Note that the evaporator fan is probably also rotating in the wrong direction.
5. Turn off power to the unit.
6. Reverse any two of the three unit power leads.
7. Reapply electrical power to the compressor.
8. The suction pressure should drop and the discharge pressure should rise which is normal for scroll compressors on start-up.
9. Replace compressor if suction/discharge pressures are not within specifications for the specific compressor.

FILTER DRIER

Replace the filter drier whenever refrigerant system is exposed to atmosphere. Only use factory specified liquid-line filter driers with working pressures no less than 650 psig (4482 kPa).

⚠ CAUTION

EQUIPMENT DAMAGE

Failure to follow this caution can result in equipment damage.

Do not install a suction-line filter drier in liquid line. A liquid-line filter drier designed for use with R-410A refrigerant is required on every unit.

OUTDOOR FAN LOCATION

See Fig. 25.

1. Shut off unit power supply. Apply lockout/tag-out procedures.
2. Remove condenser-fan assembly (grille, motor, and fan).
3. Loosen fan hub setscrews.
4. Adjust fan height as shown in Fig. 25.
5. Tighten setscrews to 84 in.-lb (9.5 Nm).
6. Replace condenser-fan assembly.

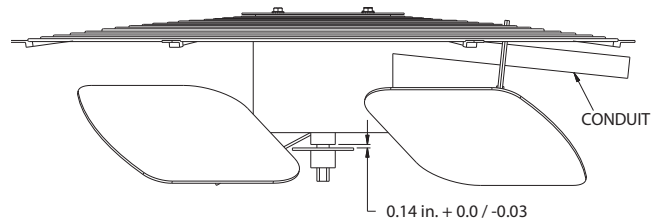


Fig. 25 — Outdoor Fan Adjustment

Troubleshooting Cooling System

Refer to Table 5 for additional troubleshooting topics.

Table 5 — Heating and Cooling Troubleshooting

| PROBLEM | CAUSE | REMEDY |
|--|--|---|
| Compressor and Outdoor Fan Will Not Start | Power failure. | Call power company. |
| | Fuse blown or circuit breaker tripped. | Replace fuse or reset circuit breaker. Determine root cause. |
| | Defective thermostat, contactor, transformer, control relay, or capacitor. | Replace component. |
| | Insufficient line voltage. | Determine cause and correct. |
| | Incorrect or faulty wiring. | Check wiring diagram and rewire correctly. |
| | Thermostat setting too high. | Lower thermostat setting below room temperature. |
| | High pressure switch tripped. | See problem "Excessive head pressure." |
| | Low pressure switch tripped. | Check system for leaks. Repair as necessary. |
| Compressor Will Not Start But Outdoor Fan Runs | Freeze-up protection thermostat tripped. | See problem "Suction pressure too low." |
| | Faulty wiring or loose connections in compressor circuit. | Check wiring and repair or replace. |
| | Compressor motor burned out, seized, or internal overload open. | Determine cause. Replace compressor or allow enough time for internal overload to cool and reset. |
| | Defective run/start capacitor, overload, start relay. | Determine cause and replace compressor. |
| Compressor Cycles (Other Than Normally Satisfying Thermostat) | One leg of 3-phase power dead. | Replace fuse or reset circuit breaker. Determine cause. |
| | Refrigerant overcharge or undercharge. | Recover refrigerant, evacuate system, and recharge to nameplate. |
| | Defective compressor. | Replace and determine cause. |
| | Insufficient line voltage. | Determine cause and correct. |
| | Blocked outdoor coil or dirty air filter. | Determine cause and correct. |
| | Defective run/start capacitor, overload, or start relay. | Determine cause and replace. |
| | Defective thermostat. | Replace thermostat. |
| Compressor Operates Continuously | Faulty outdoor-fan (cooling) or indoor-fan (heating) motor or capacitor. | Replace. |
| | Restriction in refrigerant system. | Locate restriction and remove. |
| | Dirty air filter. | Replace filter. |
| | Unit undersized for load. | Decrease load or increase unit size. |
| | Thermostat set too low (cooling). | Reset thermostat. |
| | Low refrigerant charge. | Locate leak; repair and recharge. |
| Compressor Makes Excessive Noise | Air in system. | Recover refrigerant, evacuate system, and recharge. |
| | Outdoor coil dirty or restricted. | Clean coil or remove restriction. |
| Excessive Head Pressure | Compressor rotating in the wrong direction. | Reverse the 3-phase power leads as described in Start-Up. |
| | Dirty outside air or return air filter (heating). | Replace filter. |
| | Dirty outdoor coil (cooling). | Clean coil. |
| | Refrigerant overcharged. | Recover excess refrigerant. |
| | Air in system. | Recover refrigerant, evacuate system, and recharge. |
| Head Pressure Too Low | Condensing air restricted or air short-cycling. | Determine cause and correct. |
| | Low refrigerant charge. | Check for leaks; repair and recharge. |
| | Compressor scroll plates defective. | Replace compressor. |
| Excessive Suction Pressure | Restriction in liquid tube. | Remove restriction. |
| | High heat load. | Check for source and eliminate. |
| | Compressor scroll plates defective. | Replace compressor. |
| Suction Pressure Too Low | Refrigerant overcharged. | Recover excess refrigerant. |
| | Dirty air filter (cooling). | Replace filter. |
| | Dirty or heavily iced outdoor coil (heating). | Clean outdoor coil. Check defrost cycle operation. |
| | Low refrigerant charge. | Check for leaks; repair and recharge. |
| | Metering device or low side restricted. | Remove source of restriction. |
| | Insufficient indoor airflow (cooling mode). | Increase air quantity. Check filter and replace if necessary. |
| | Temperature too low in conditioned area. | Reset thermostat. |
| | Field-installed filter drier restricted. | Replace. |
| Outdoor ambient below 25°F (cooling). | Install low-ambient kit. | |
| Outdoor fan motor(s) not operating (heating). | Check fan motor operation. | |

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 50TCQ models: non-powered and unit-powered. Both types provide a 125VAC/15A Ground-Fault Circuit Interrupter (GFCI) duplex receptacle behind a hinged waterproof access cover, located on the end panel of the unit. See Fig. 26.

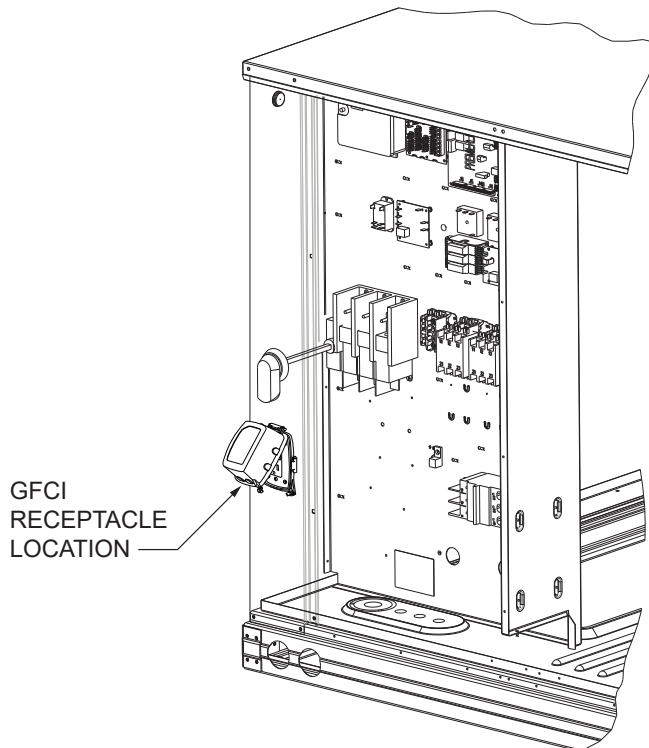


Fig. 26 — Convenience Outlet Location

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 to its depth. The cover 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.

NOTE: DISCONNECT ALL POWER TO THE UNIT AND TO THE CONVENIENCE OUTLET. Use approved lockout/tag-out procedures.

1. Remove the blank cover plate at the convenience outlet; discard the blank cover.
2. Loosen the two screws at the GFCI duplex outlet, until approximately 1/2-in. (13 mm) under screw heads are exposed.
3. 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).
4. Mount the weatherproof cover to the backing plate as shown in Fig. 27.
5. Remove two slot fillers in the bottom of the cover to permit service tool cords to exit the cover.
6. Check cover installation for full closing and latching.

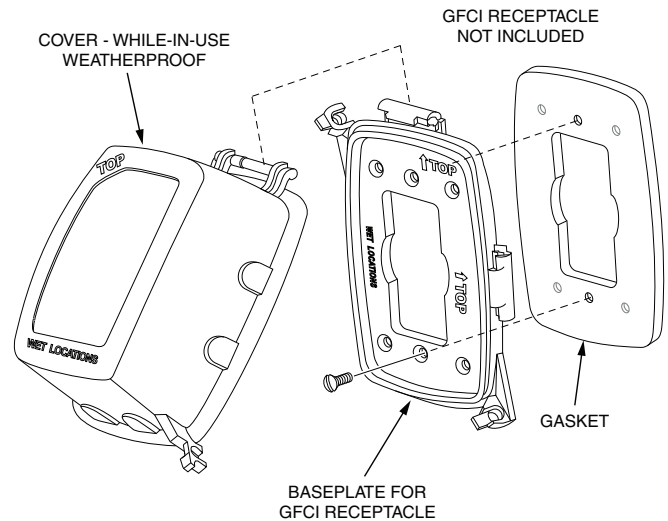


Fig. 27 — Weatherproof Cover Installation

NON-POWERED TYPE

This type requires the field installation of a general-purpose 125VAC/15AC 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 125VAC 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 step-down the main power supply voltage to the unit to 115VAC 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. 26.

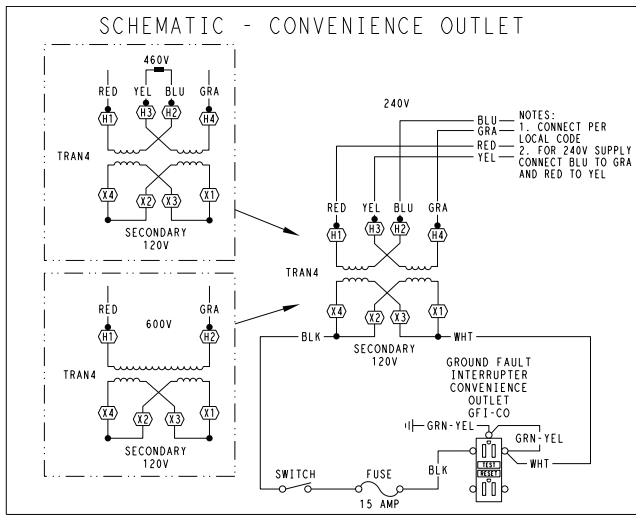
The primary leads to the convenience outlet transformer are not factory-connected. Selection of primary power source is a customer option. If local codes permit, the transformer primary leads can be connected at the line-side terminals on the unit-mounted non-fused disconnect or HACR breaker switch. 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. 28.

HEAT PUMP CONTROLS

Central Terminal Board

The Central Terminal Board (CTB) is a large printed circuit board that is located in the center of the unit control box. This printed circuit board contains multiple termination strips and connectors to simplify factory control box wiring and field control connections. Terminals are clearly marked on the board surface. See Fig 29.

The CTB contains no software and no logic. But it does include seven configuration jumpers that are cut to configure the board to read external optional and accessory controls, including the unit is a heat pump. Jumpers JMP5, JMP6 and JMP7 are located in notches across the top of the CTB. See Fig. 29. These jumpers are factory cut on all heat pump units (see Table 6). Visually check these jumpers to confirm that they have been cut.



| UNIT VOLTAGE | CONNECT AS | PRIMARY CONNECTIONS | TRANSFORMER TERMINALS |
|--------------|------------|--|-----------------------|
| 208, 230 | 240 | L1: RED +YEL L2: BLU + GRA | H1 + H3 H2 + H4 |
| 460 | 480 | L1: RED Splice BLU + YEL L2: GRA | H1 H2 + H3 H4 |
| 575 | 600 | L1: RED L2: GRA | H1 H2 |

Fig. 28 — Powered Convenience Outlet Wiring

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.

Maintenance

Periodically test the GFCI receptacle by pressing the TEST button on the face of the receptacle. This should cause the internal circuit 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 Cooper Bussmann¹ 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.

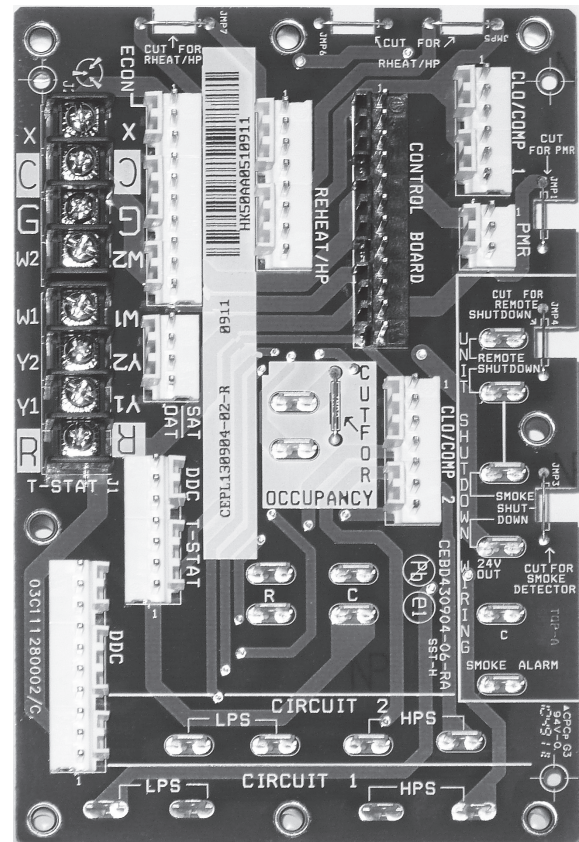


Fig. 29 — Central Terminal Board (CTB)

Table 6 — Jumper Configuration

| JUMPER | CONTROL FUNCTION | NOTE |
|--------|-------------------------|--------------------|
| JMP1 | Phase Monitor | |
| JMP2 | Occupancy Control | |
| JMP3 | Smoke Detector Shutdown | |
| JMP4 | Remote Shutdown | |
| JMP5 | Heat Pump / Reheat | 50TCQ default: Cut |
| JMP6 | Heat Pump / Reheat | 50TCQ default: Cut |
| JMP7 | Heat Pump / Reheat | 50TCQ default: Cut |

1. Bussmann and Fusetron are trademarks of Cooper Technologies Company.

PROTECTIVE CONTROLS

Compressor Protection

OVER-CURRENT

The compressor has internal line-break motor protection.

OVER-TEMPERATURE

The compressor has an internal protector to protect it against excessively high discharge gas temperatures.

HIGH PRESSURE SWITCH

The system is provided with a high pressure switch mounted on the discharge line. The switch is stem-mounted and brazed into the discharge tube. Trip setting is 630 psig \pm 10 psig (4344 \pm 69 kPa) when hot. Reset is automatic at 505 psig (3482 kPa).

LOSS OF CHARGE SWITCH

The system is protected against a loss of charge and low evaporator coil loading condition by a loss of charge switch located on the liquid line and a freeze protection thermostat on the indoor coil. The switch is stem-mounted. The loss of charge switch trip setting is 27 psig \pm 3 psig (186 \pm 21 kPa). Reset is automatic at 44 \pm 3 psig (303 \pm 21 kPa).

The Freeze Protection Thermostat trip setting is 30°F \pm 5°F (-1°C \pm 3°C). Reset is automatic at 45°F \pm 5°F (7°C \pm 3°C).

Supply (Indoor) Fan Motor Protection

Disconnect and lockout power when servicing fan motor. 2.9 and 3.7 bhp motors are equipped with an over-temperature or protection device. The type of device depends on the motor size. See Table 7.

Table 7 — Overload Device per Motor Size

| MOTOR SIZE (bhp) | OVERLOAD DEVICE | RESET |
|------------------|----------------------------|-----------|
| 1.7 | Internal Linebreak | Automatic |
| 2.4 | Internal Linebreak | Automatic |
| 2.9 | Thermix | Automatic |
| 3.7 | Thermix | Automatic |
| 4.7 | External (Circuit Breaker) | Manual |

The high static option supply fan motor is equipped with a pilot-circuit Thermix™ combination over-temperature/over-current protection device. This device resets automatically. Do not bypass this switch to correct trouble. Determine the cause and correct it.

The Thermix device is a snap-action over-temperature protection device that is imbedded in the motor windings. It is a pilot-circuit device that is wired into the unit's 24-v control circuit. When this switch reaches its trip set point, it opens the 24-v control circuit and causes all unit operation to stop. This device resets automatically when the motor windings cool. Do not bypass this switch to correct trouble. Determine the cause and correct it.

The external motor overload device is a specially-calibrated circuit breaker that is UL recognized as a motor overload controller. It is an over-current device. When the motor current exceeds the circuit breaker set point, the device opens all motor power leads and the motor shuts down. Reset requires a manual reset at the overload switch. This device (designated IFCB) is located on the side of the supply fan housing, behind the fan access panel.

TROUBLESHOOTING SUPPLY FAN MOTOR OVERLOAD TRIPS

The supply fan used in the 50TCQ units is a forward-curved centrifugal wheel. At a constant wheel speed, this wheel had a characteristic that causes the fan shaft load to DECREASE when the static pressure in the unit-duct system increases and to INCREASE when the static pressure in the unit-duct system decreases (and fan airflow rate increases). Motor overload conditions

typically develop when the unit is operated with an access panel removed, with unfinished duct work, in an economizer-open mode, or a leak develops in the duct system that allows a bypass back to unit return opening.

Outdoor Fan Motor Protection

The outdoor fan motor is internally protected against overtemperature.

Control Circuit, 24v

The control circuit is protected against over-current conditions by a circuit breaker mounted on control transformer TRAN. Reset is manual.

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. 30 for board arrangement. See Table 8 for I/O and jumper configuration.

The DFB is located in the 50TCQ unit's main control box (see Fig. 31). All connections are factory-made through harnesses to the unit's CTB, to IFC (belt-drive motor), reversing valve solenoids and to defrost thermostats.

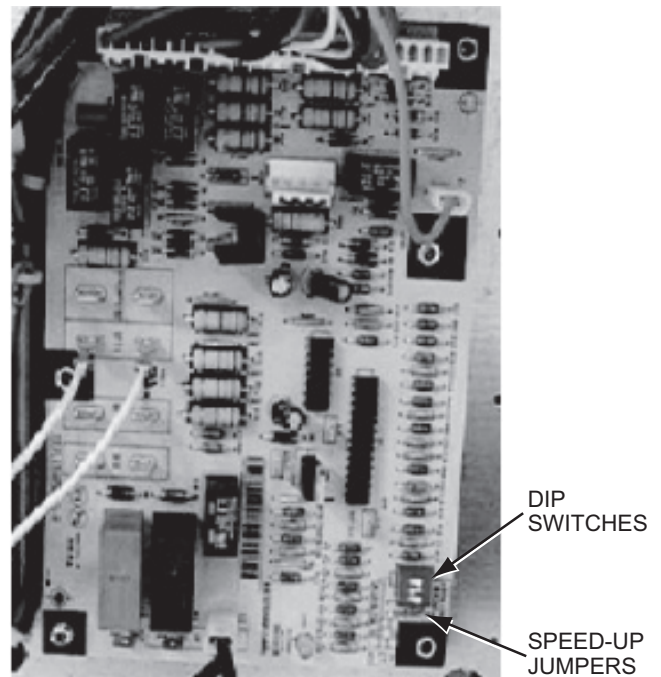


Fig. 30 — Defrost Control Board (DFB) Arrangement

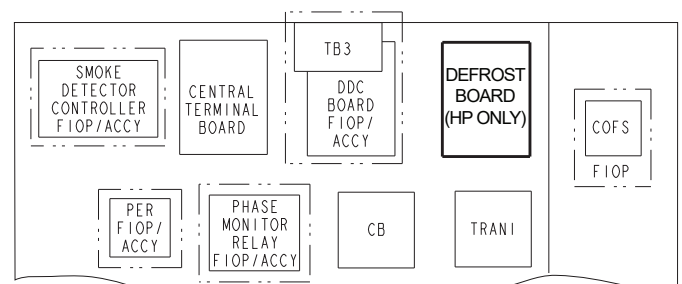


Fig. 31 — Defrost Control Board (DFB) Location

Table 8 — 50TCQ Defrost Board I/O and Jumper Configurations

| INPUTS | | | | |
|------------------------|-------------|-----------------------|-----------------|------------------|
| POINT NAME | TYPE OF I/O | CONNECTION PIN NUMBER | UNIT CONNECTION | NOTE |
| G Fan | DI, 24Vac | P2-3 | LCTB-G | |
| Y1 Cool 1 | DI, 24Vac | P2-5 | LCTB-Y1 | |
| Y2 Cool 2 | DI, 24Vac | P2-4 | LCTB-Y2 | |
| W1 Heat 1 | DI, 24Vac | P2-7 | LCTB-W1 | |
| W2 Heat 2 | DI, 24Vac | P2-6 | LCTB-W2 | |
| R Power | 24Vac | P3-1 | CONTL BRD-8 | |
| C Common | 24Vac | P3-2 | CONTL BRD-4 | |
| DFT1 | DI, 24Vac | DFT-1 to DFT-1 | | |
| DFT 2 | DI, 24Vac | DFT-2 to DFT-2 | | |
| OUTPUTS | | | | |
| POINT NAME | TYPE OF I/O | CONNECTION PIN NUMBER | UNIT CONNECTION | NOTE |
| IFO Fan On | DO, 24Vac | P3-9 | REHEAT-2 | |
| OF OD Fan On | DO, 24Vac | OF | OFR | |
| RVS1 | DO, 24Vac | P3-7 to P3-5 | | Energize in COOL |
| RVS2 | DO, 24Vac | P3-6 to P3-4 | | Energize in COOL |
| COMP 1 | DO, 24Vac | P3-10 | FPT -REHEAT-6 | |
| COMP 2 | DO, 24Vac | P3-8 | REHEAT-8 | |
| HEAT 2 | DO, 24Vac | E-HEAT | HC-1 (TB4-1) | |
| COM | 24Vac | P3-3 | HC-1 (TB4-3) | |
| CONFIGURATION | | | | |
| POINT NAME | TYPE OF I/O | CONNECTION PIN NUMBER | UNIT CONNECTION | NOTE |
| Select Jumper | 24Vac | P1-1 | | |
| 2 Compressor | 24Vac | P1-3 | | Use for 50TCQD |
| SPEED-UP CONFIGURATION | | | | |
| POINT NAME | TYPE OF I/O | CONNECTION PIN NUMBER | UNIT CONNECTION | NOTE |
| Speed-Up Jumper | | JMP17 | | |
| Speed-Up Jumper | | JMP18 | | |

Jumper for 1-3 seconds: Factory Test, defrost runs for 9 seconds.
 Jumper for 5-20 seconds: Forced Defrost, defrost runs for 30 seconds if DFT2 is open.

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 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 (sizes 08 and 09 only) and Stage 1 Heating from the space thermostat or unit control system (PremierLink™ or RTU-OPEN); it generates commands to start compressors with or without reversing valve operation to produce Stage 1 Cooling (one compressor), Stage 2 Cooling (both compressors run) or Stage 1 Heating (both compressors run).

Auxiliary (Electric) Heat Control

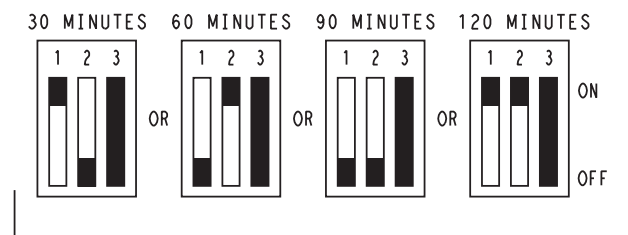
The 50TCQ unit can be equipped with one or two auxiliary electric heaters, to provide a second stage of Heating. The DFB will energize this Heating system for a Stage 2 Heating command (heaters operate concurrently with both compressors in the Stage 1 Heating cycle), for an Emergency Heating sequence (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 the defrost thermostat(s) (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. 32 and Table 9).

DIP SWITCH SETTINGS - DEFROST BD



FIELD SELECTABLE OPTIONS FOR TIME PERIOD BETWEEN DEFROST CYCLES (MINUTES).

Fig. 32 — DIP Switch Settings — Defrost Board

Table 9 — Dip Switch Position

| | 1 | 2 | | 1 | 2 | | 1 | 2 | | 1 | 2 | | 3 | |
|---|------------|---|---|------------|---|---|------------|---|---|-------------|---|---|-----------|-----|
| 1 | | | 1 | | • | 1 | • | | 1 | • | • | 1 | | On |
| 0 | • | • | 0 | • | | 0 | | • | 0 | | | 0 | • | Off |
| | 90 minutes | | | 60 minutes | | | 30 minutes | | | 120 minutes | | | Fan Delay | |

At the end of the continuous run period, the defrost control will test for a need to defrost. On the single circuit compressor designs, DFT1 controls the start and termination of the defrost cycle. If DFT1 is still open, the defrost test/run window is closed and the control repeats the continuous run period. If DFT1 is closed, the defrost cycle is initiated. The defrost period will end when DFT1 opens (indicating the outdoor coil has been cleared of frost and ice) or a 10 minute elapsed period expires, whichever comes first.

DFT2 (located on the bottom circuit of the outdoor coil) controls the start and termination of the defrost cycle. If DFT2 is still open, the defrost test/run window is closed and the control repeats the continuous run period. If DFT2 is closed, the defrost cycle is initiated in Circuit 2. The defrost period will end when DFT2 opens (indicating the outdoor coil has been cleared of frost and ice) or a 10 minute elapsed period expires, whichever comes first.

Circuit 1's defrost thermostat DFT1 (located on the upper circuit of the outdoor coil) cannot initiate a unit defrost cycle; only DFT2 can do this. But once Circuit 2 is in defrost, the DFB will monitor the status of DFT1. If DFT1 closes during a Circuit 2 defrost cycle, Circuit 1 will also enter a defrost cycle. Circuit 1's defrost cycle will end when DFT1 opens (indicating the upper portion of the outdoor coil is cleared of frost and ice) or the Circuit 2 defrost cycle is terminated.

At the end of the unit defrost cycle, the unit will be returned to Heating cycle for a full continuous run period.

If the space heating load is satisfied and compressor operation is terminated, the defrost control will remember where the run period was interrupted. On restart in Heating, the defrost control will resume unit operation at the point in the run period where it was last operating.

DEFROST THERMOSTATS

These are temperature switches that monitor the surface temperature of the outdoor coil circuits. These switches are mounted on the liquid tube exiting the outdoor coil heating circuits. These switches close on temperature drop at 30°F (-1°C) and reset open on temperature rise at 80°F (27°C).

Indoor Fan Off Delay

The DFB can provide a 30 second delay on Indoor Fan Off if the thermostat's fan selector switch is set on AUTO control. DIP Switch SW3 on the DFB selects use of the fan off time delay feature. Setting SW3 in the OPEN position turns the Fan Off Delay feature on; setting SW3 in the CLOSED position disables this feature. The delay period begins when Y1 demand or W1 demand by the space thermostat is removed.

Defrost Speedup Functions

The DFB permits the servicer to speed-up the defrost cycle. There are two speed-up sequences: relative speed-up and an immediate forced defrost. Speed-up sequences are initiated by shorting jumper wires JMP17 and JMP18 together (see Fig. 30); use a straight-edge screwdriver.

Shorting the jumpers for a period of 1 to 3 seconds reduces the defrost timer periods by a factor of 0.1 sec/minute. (For example, the 90 minute run period is reduced to 9 seconds) The DFB will step the unit through a Heating cycle and a Defrost cycle using these reduced time periods. This mode ends after the Defrost cycle.

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.

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, line-break limit switches and a control contactor. One or two heater modules may be used in a unit. See Fig. 33 for control connections.

Heater modules are installed in the heater section access panel located just below the blower access panel. Heater modules slide into the compartment on tracks along the bottom of the heater opening. See Fig. 34-36.

Not all available heater modules may be used in every unit. Use only those heater modules that are ETL listed for use in a specific size unit. Refer to the label on the unit cabinet for the list of approved heaters. See Table 10.

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.

NOTE: The value in position 9 of the part number differs between the sales package part number (value is 1) and a bare heater model number (value is 0).

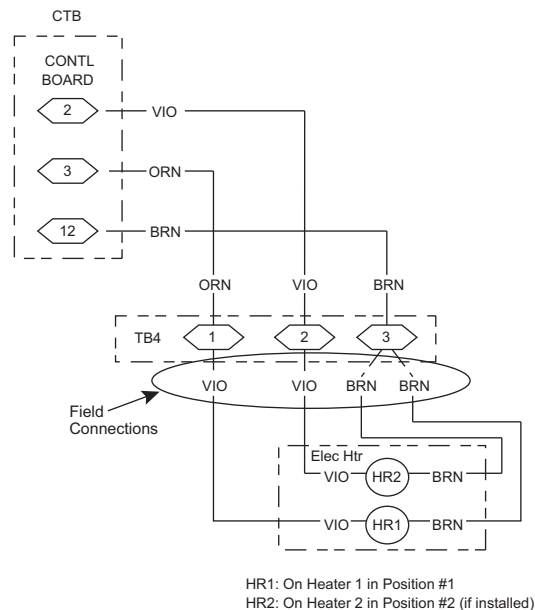


Fig. 33 — Accessory Electric Heater Control Connections

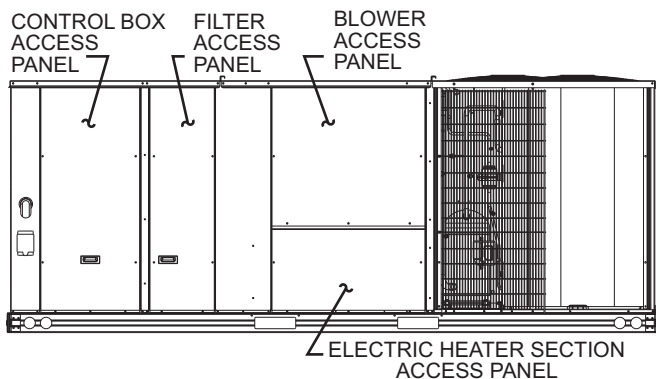


Fig. 34 — Typical Access Panel Location

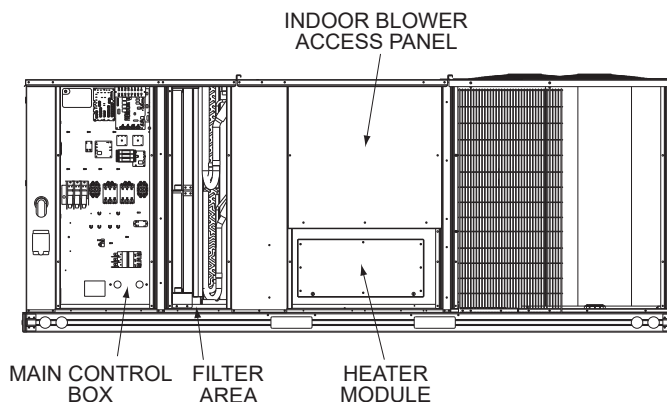


Fig. 35 — Typical Component Location

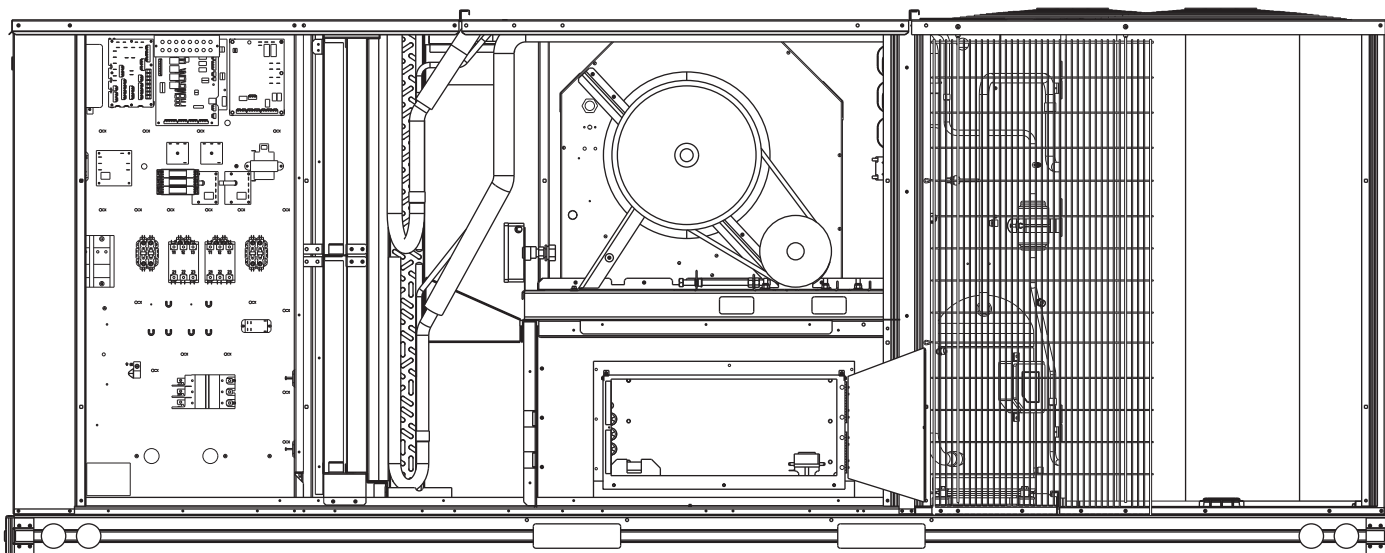


Fig. 36 — Typical Module Installation

Table 10 — Heater Model Numbers

| ACCESSORY HEATER PART NUMBER | HEATER/ BASE UNIT VOLTAGE | HEATER kW* | FAN DISCHARGE | STAGES |
|------------------------------|---------------------------|------------|---------------|--------|
| CRHEATER270A00 | 208/230-3-60 | 25 | Horizontal | 2 |
| CRHEATER271A00 | 208/230-3-60 | 50 | Horizontal | 2 |
| CRHEATER272A00 | 208/230-3-60 | 75 | Horizontal | 2 |
| CRHEATER273A00 | 460/400-3-60/50 | 25/17.4 | Horizontal | 2 |
| CRHEATER274A00 | 460/400-3-60/50 | 50/34.7 | Horizontal | 2 |
| CRHEATER275A00 | 460/400-3-60/50 | 75/52 | Horizontal | 2 |
| CRHEATER276A00 | 575-3-60 | 25 | Horizontal | 2 |
| CRHEATER277A00 | 575-3-60 | 50 | Horizontal | 2 |
| CRHEATER278A00 | 575-3-60 | 75 | Horizontal | 2 |
| CRHEATER279A00 | 208/230-3-60 | 25 | Vertical | 2 |
| CRHEATER240A00 | 208/230-3-60 | 50 | Vertical | 2 |
| CRHEATER241A00 | 208/230-3-60 | 75 | Vertical | 2 |
| CRHEATER242A00 | 460/400-3-60/50 | 25/17.4 | Vertical | 2 |
| CRHEATER243A00 | 460/400-3-60/50 | 50/34.7 | Vertical | 2 |
| CRHEATER244A00 | 460/400-3-60/50 | 75/52 | Vertical | 2 |
| CRHEATER245A00 | 575-3-60 | 25 | Vertical | 2 |
| CRHEATER246A00 | 575-3-60 | 50 | Vertical | 2 |
| CRHEATER247A00 | 575-3-60 | 75 | Vertical | 2 |

*kW rated at 240, 480/400 and 600 volts.

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 box, with power distribution and fuse blocks. The single point kit fuse holder and terminal block will be installed into the unit control box-back wall, bottom left corner. See Fig. 37. The single point box also includes a set of power taps to complete the wiring between the single point box and the unit's main control box terminals. Refer to accessory heater and single point box installation instructions for details on tap connections.

On 50TCQ units, all fuses are 60-A. Single point boxes containing fuses for 208/230-v applications use UL Class RK5 250-v fuses (Bussman FRNR 60 or Shawmut TR 60R). Single point boxes for 460-v and 575-v applications use UL Class T 600-v fuses (Bussman JJS 60 or Shawmut A6T 60). (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.)

Unit heater applications not requiring supplemental fuses require a special single point box without any fuses. Connect power supply conductors to heater conductors and field-supplied base unit power tap leads (see "Completing Heater Installation") inside the empty single point box using UL-approved connectors.

SAFETY DEVICES

Electric heater applications use a combination of line-break/auto-reset limit switches and a pilot-circuit/manual reset limit switch to protect the unit against over-temperature situations.

Line-break/auto-reset limit switches are mounted on the base plate of each heater module. See Fig. 38. These are accessed through the indoor access panel. Remove the switch by removing two screws into the base plate and extracting the existing switch.

Pilot-circuit/manual reset limit switch is located in the side plate of the indoor (supply) fan housing. See Fig. 38.

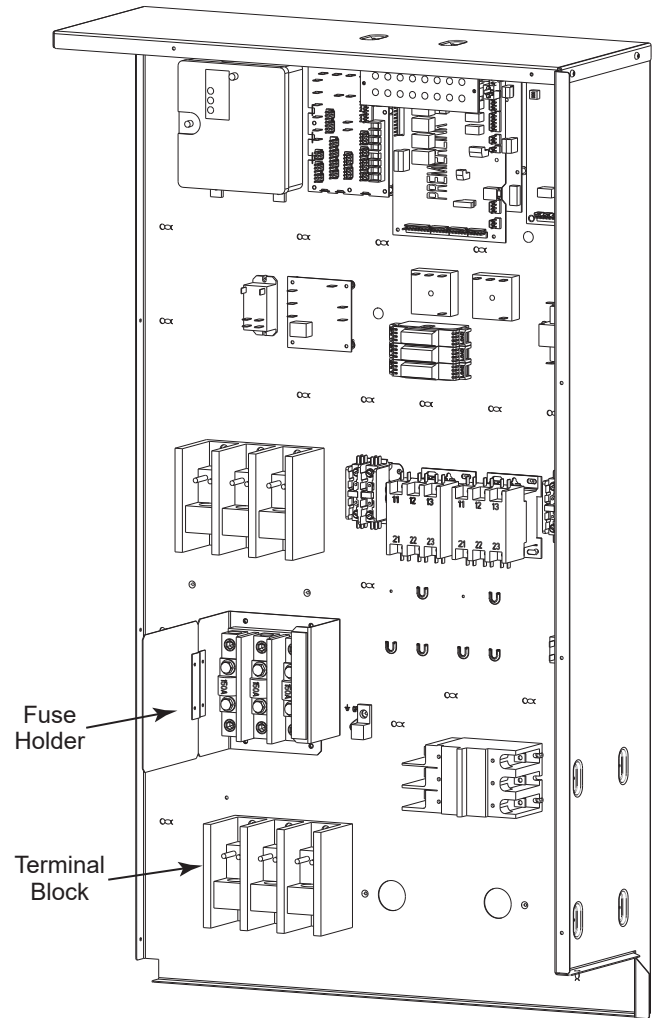


Fig. 37 — Typical Single Point Installation

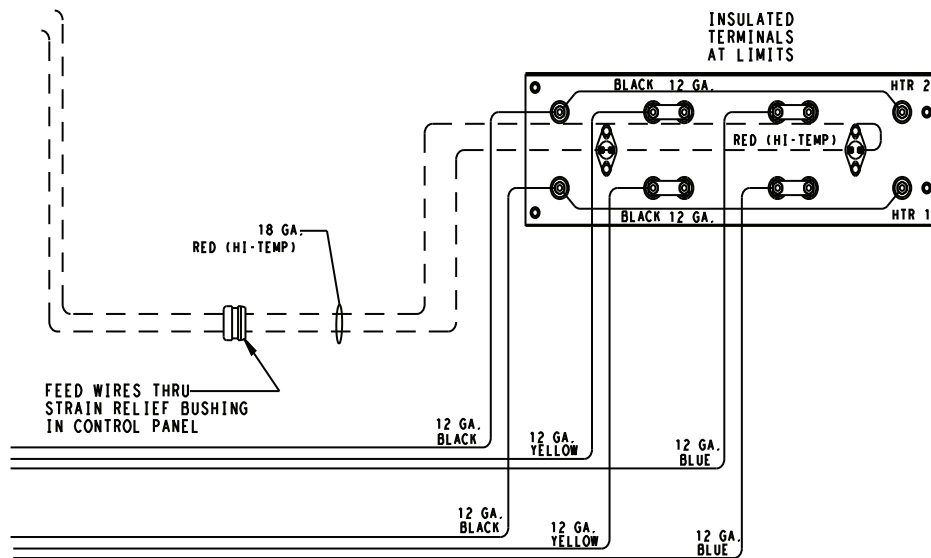


Fig. 38 — Typical Location of Heater Limit Switches (3-phase heater shown)

Completing Heater Installation

FIELD POWER CONNECTIONS

Tap conductors must be installed between the base unit's field power connection lugs and the single point box (with or without fuses). See Fig. 32. Refer to unit wiring schematic. Use copper wire only. For connection using the single point box without fuses, connect the field power supply conductors to the heater power leads and the field-supplied tap conductors inside the single point box. Use UL approved pressure connectors (field-supplied) for these splice joints.

LOW-VOLTAGE CONTROL CONNECTIONS

Pull the low-voltage control leads from the heater module(s) - VIO and BRN (two of each if two modules are installed; identify for Module #1) - to the 4-pole terminal board TB4 located on the heater bulkhead to the left of Heater #1. Connect the VIO lead from Heater #1 to terminal TB4-1. Connect the VIO lead from Heater #2 to terminal TB4-2. Connect both BRN leads to terminal TB4-3. See Fig. 35.

SMOKE DETECTORS

Smoke detectors are available as factory-installed options on 50TCQ models. Smoke detectors can be specified for supply air only, for return air with or without economizer, or in combination of supply air and return air. Return-air smoke detectors are arranged for vertical return configurations only. 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 can be necessary to complete the unit and smoke detector configuration to meet project requirements.

System

The smoke detector system consists of a four-wire controller and one or two sensors. Its primary function is to shut down the rooftop unit in order to prevent smoke from circulating throughout the building. It is not to be used as a life saving device.

Controller

The controller (see Fig. 39) includes a controller housing, a printed circuit board, and a clear plastic cover. The controller can be connected to one or two compatible duct smoke sensors. The clear plastic cover is secured to the housing with a single captive screw for easy access to the wiring terminals. The controller has three LEDs (for Power, Trouble and Alarm) and a manual test/reset button (on the cover face).

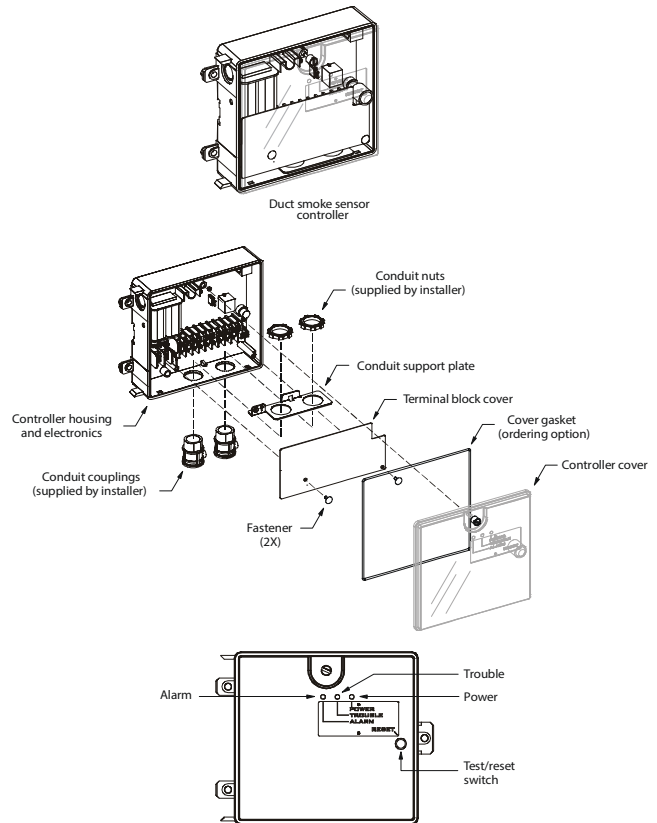


Fig. 39 — Controller Assembly

Sensor

The sensor (see Fig. 40) includes a plastic housing, a printed circuit board, a clear plastic cover, a sampling tube inlet and an exhaust tube. The sampling tube (when used) and exhaust tube are attached during installation. The sampling tube varies in length depending on the size of the rooftop unit. The clear plastic cover permits visual inspections without having to disassemble the sensor. The cover attaches to the sensor housing using four captive screws and forms an airtight chamber around the sensing electronics. Each sensor includes a harness with an RJ45 terminal for connecting to the controller. Each sensor has four LEDs (for Power, Trouble, Alarm, and Dirty) and a manual test/reset button (on the left-side of the housing).

Air is introduced to the duct smoke detector sensor's sensing chamber through a sampling tube that extends into the HVAC duct and is directed back into the ventilation system through a (shorter) exhaust tube. The difference in air pressure between the two tubes pulls the sampled air through the sensing chamber. When a sufficient amount of smoke is detected in the sensing chamber, the sensor signals an alarm state and the controller automatically takes the appropriate action to shut down fans and blowers, change over air handling systems, notify the fire alarm control panel, etc.

The sensor uses a process called differential sensing to prevent gradual environmental changes from triggering false alarms. A rapid change in environmental conditions, such as smoke from a fire, causes the sensor to signal an alarm state but dust and debris accumulated over time does not.

For installations using two sensors, the duct smoke detector does not differentiate which sensor signals an alarm or trouble condition.

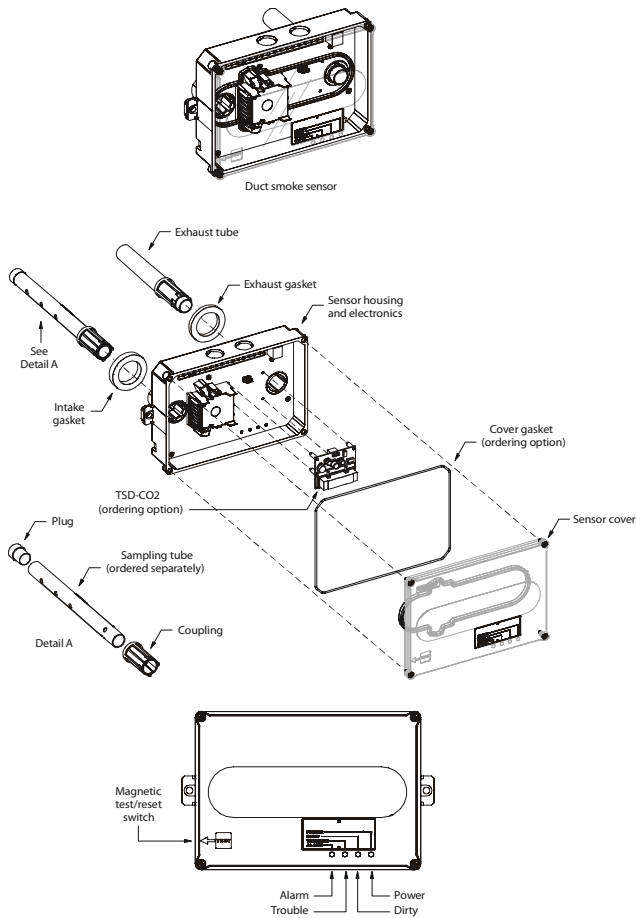


Fig. 40 — Smoke Detector Sensor

Smoke Detector Locations

SUPPLY AIR

The supply air smoke detector sensor is located to the left of the unit's indoor (supply) fan. See Fig. 41. Access is through the fan access panel. There is no sampling tube used at this location. The sampling tube inlet extends through the side plate of the fan housing (into a high pressure area). The controller is located on a bracket to the right of the return filter, accessed through the lift-off filter panel.

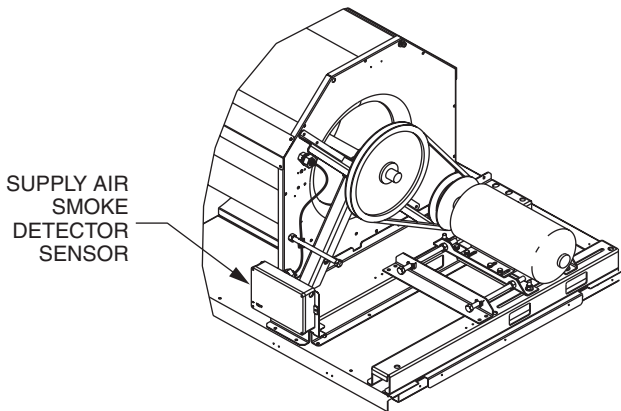


Fig. 41 — Typical Supply Air Smoke Detector Sensor Location

RETURN AIR WITHOUT ECONOMIZER

The sampling tube is located across the return air opening on the unit base pan. See Fig. 42. The holes in the sampling tube face downward, into the return air stream. The sampling tube is connected by tubing to the return air sensor that is mounted on a

bracket high on the partition between return filter and controller location. (This sensor is shipped in a flat-mounting location. Installation requires that this sensor be relocated to its operating location and the tubing to the sampling tube be connected. See "Completing Installation of Return Air Smoke Sensor" for installation steps.)

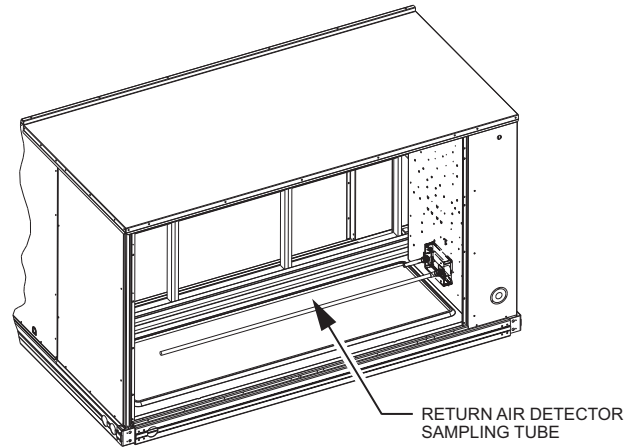


Fig. 42 — Typical Return Air Detector Location

RETURN AIR WITH ECONOMIZER

The sampling tube is inserted through the side plates of the economizer housing, placing it across the return air opening on the unit base pan. See Fig. 43. The holes in the sampling tube face downward, into the return air stream. The sampling tube is connected via tubing to the return air sensor that is mounted on a bracket high on the partition between return filter and controller location. (This sensor is shipped in a flat-mounting location. Installation requires that this sensor be relocated to its operating location and the tubing to the sampling tube be connected. See "Completing Installation of Return Air Smoke Sensor" for installation steps.)

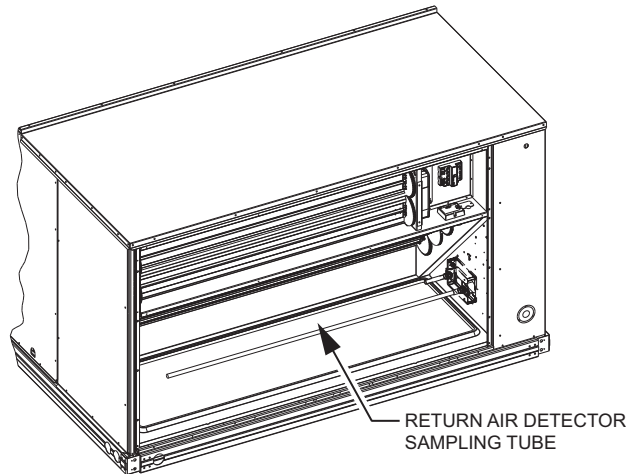


Fig. 43 — Return Air Sampling Tube Location

Completing Installation of Return Air Smoke Sensor

1. Remove blower access panel.
2. Locate bracket and secure and secure to fan deck. Secure with #10 screws provided.
3. Remove plastic cover from sensor. See Fig. 44.
4. Mount the sensor to the bracket as shown using two #8 screws. See Fig. 45.
5. Install plastic adapter to the smoke sensor.
6. Locate short pick-up tube and EMT to seal-tight assembly. Secure adapter to pick-up tube.

7. Locate seal-tight assembly and secure it to the adapter. Snap seal-tight into the smoke sensor.
8. Remove $\frac{7}{8}$ -in. knockout plug in blower side plate. Refer to Fig. 45 for location depending on the configuration of the unit.
9. Snap seal-tight assembly into knockout hole.
10. Route seal-tight assembly to connector and complete connection. See Fig. 45. Ensure seal-tight assembly does not interfere with blower operation. Cut away any excess seal-tight material.
11. Route 10 ft (3.05 m) cable through opening on lower right of control box. Route with indoor fan wires securing cable to wires with wire ties provided.
12. Route into sensor through knockout hole and plug end into the RJ45 connector. Ensure knockout hole is sealed with grommet mounted to cable.
13. Reinstall plastic cover.
14. Installation is now complete. Refer to “Sensor and Controller” section for operation.

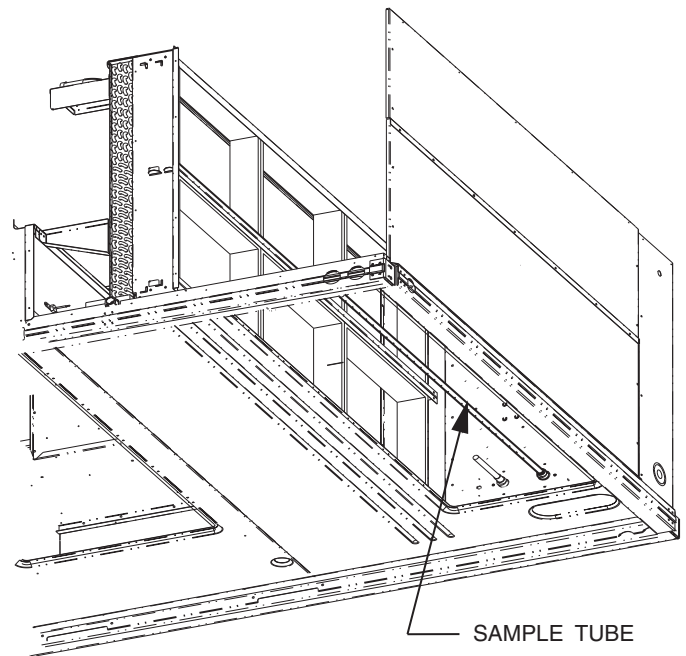
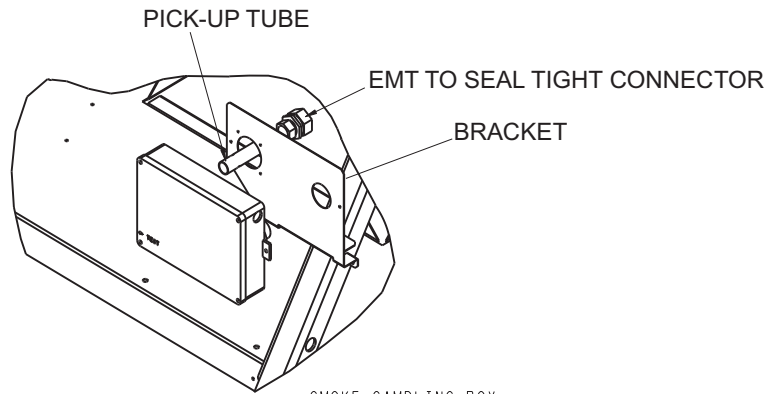


Fig. 44 — Return Air Detector Shipping Position



SMOKE SAMPLING BOX
EXPLODED DETAIL
SCALE 5:16

DETAIL A

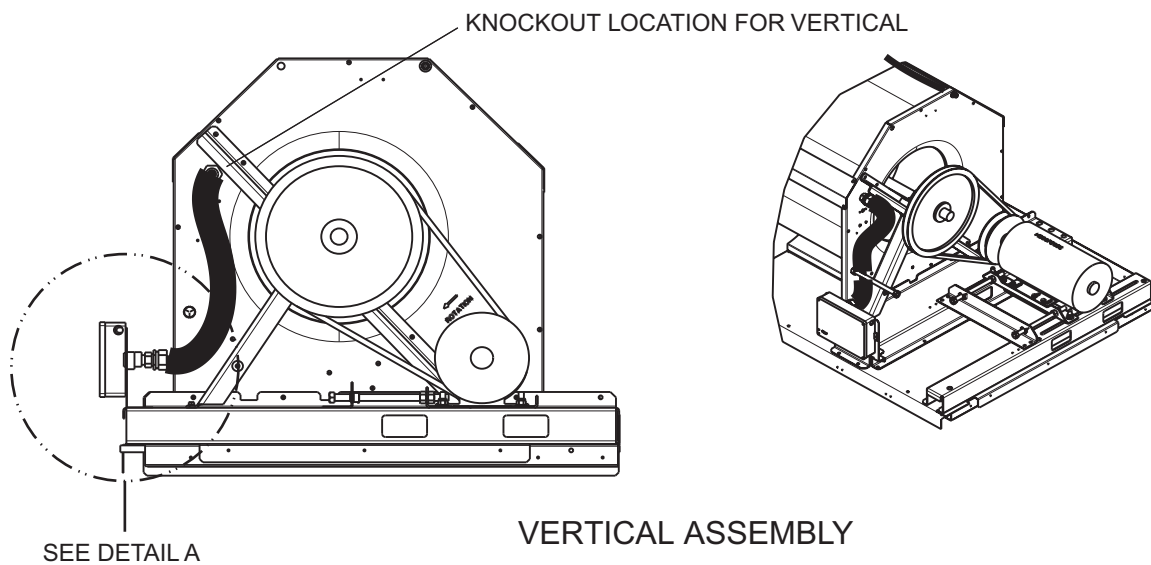
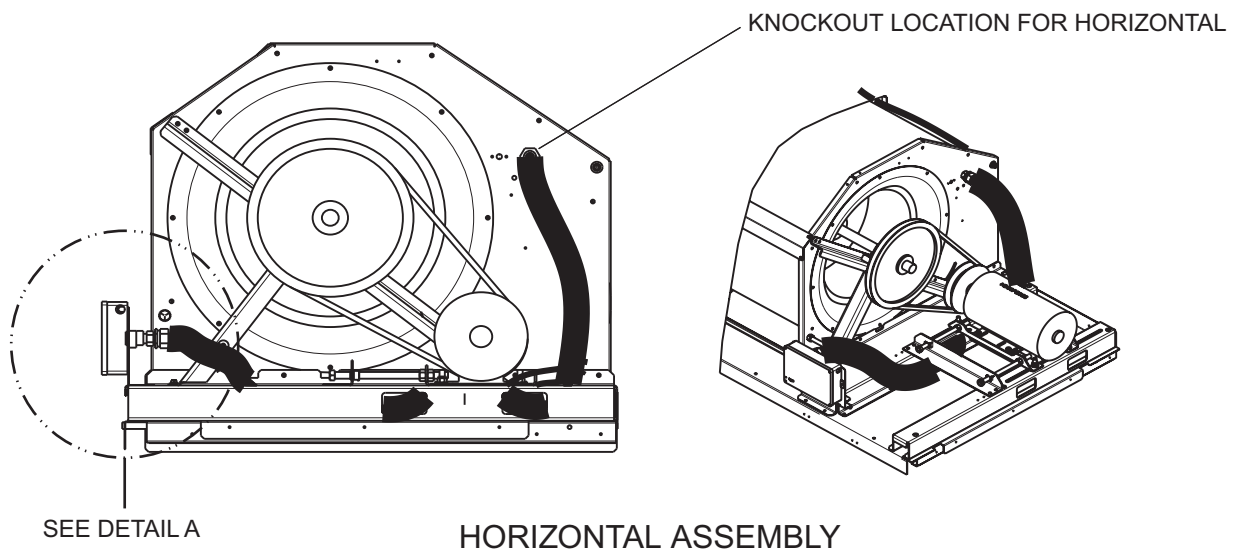


Fig. 45 — Supply Air Smoke Detector Sensor Location

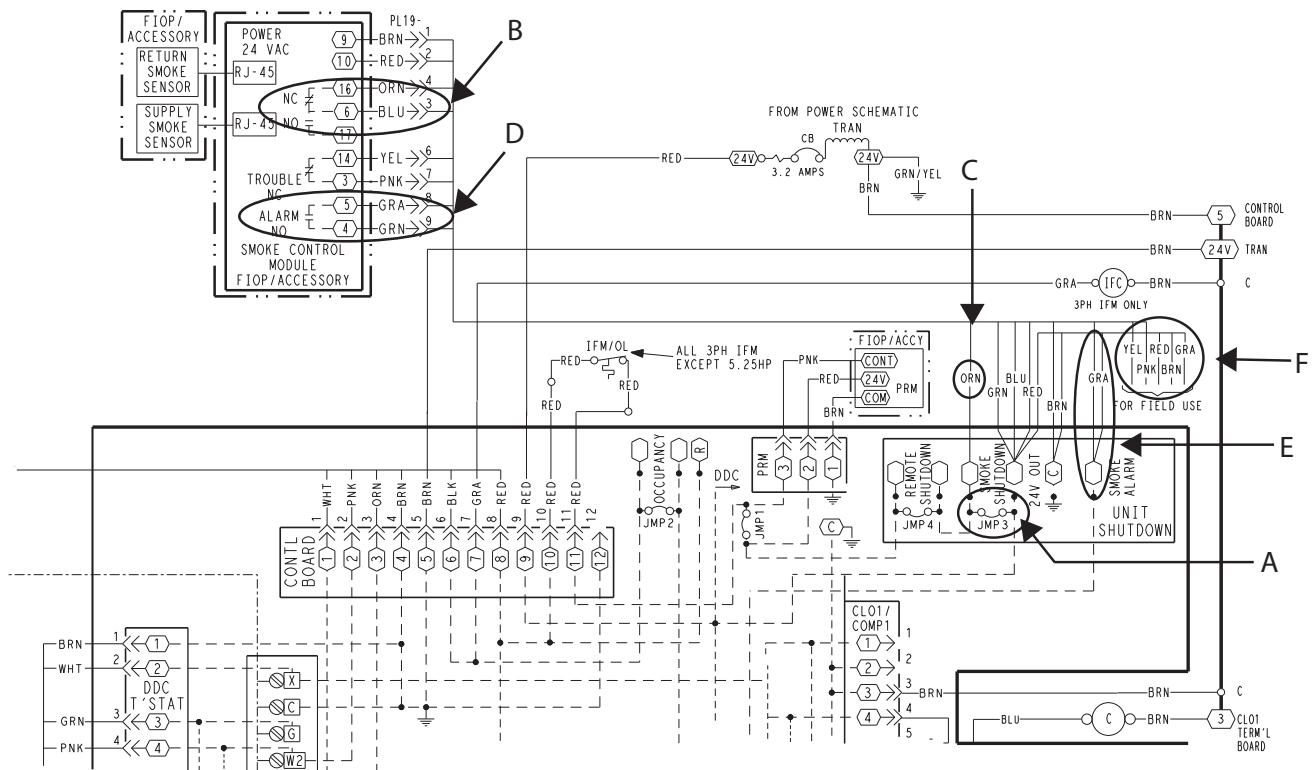


Fig. 46 — Typical Smoke Detector System Wiring

FIOP Smoke Detector Wiring and Response

All units: FIOP smoke detector is configured to automatically shut down all unit operations when a smoke condition is detected. See Fig. 46 for typical smoke detector system wiring.

HIGHLIGHT A

JMP 3 is factory-cut, transferring unit control to smoke detector.

HIGHLIGHT B

Smoke detector NC contact set will open on smoke alarm condition, de-energizing the ORN conductor.

- For units with an economizer, the sampling tube is integrated into the economizer housing but the connection of the flexible tubing to the sampling tube is the same.

HIGHLIGHT C

24-v power signal via ORN lead is removed at Smoke Detector input on CTB (Control Terminal Board); all unit operations cease immediately.

PREMIERLINK AND RTU OPEN CONTROLS

Unit operating functions (fan, cooling and heating) are terminated as described above.

Highlight D

On smoke alarm condition, the smoke detector NO Alarm contact will close, supplying 24-v power to GRA conductor.

Highlight E

GRA lead at Smoke Alarm input on CTB provides 24-v signal to FIOP DDC control.

PremierLink

This signal is conveyed to PremierLink FIOPs TB1 at terminal TB1-6 (BLU lead). This signal initiates the FSD sequence by the PremierLink control. FSD status is reported to connected CCN network.

RTU-OPEN

The 24-v signal is conveyed to the RTU-OPEN J1-10 input terminal. This signal initiates the FSD sequence by the RTU-OPEN control. FSD status is reported to connected BAS network.

USING REMOTE LOGIC

Five conductors are provided for field use (see Highlight F in Fig. 46) for additional annunciation functions.

ADDITIONAL APPLICATION DATA

Refer to *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. See Fig. 46.

Sensor and Controller Tests

SENSOR ALARM TEST

The sensor alarm test checks a sensor’s ability to signal an alarm state. This test requires the use of a field provided SD-MAG test magnet.

NOTICE: OPERATIONAL TEST NOTICE
 Failure to follow this NOTICE may result in an unnecessary evacuation of the facility.
 This test places the duct detector into the alarm state. Unless part of the test, disconnect all auxiliary equipment from the controller before performing the test. If the duct detector is connected to a fire alarm system, notify the proper authorities before performing the test.

Sensor Alarm Test Procedure

1. Hold the test magnet where indicated on the side of the sensor housing for seven seconds.
2. Verify that the sensor’s Alarm LED turns on.
3. Reset the sensor by holding the test magnet against the sensor housing for two seconds.

- Verify that the sensor's Alarm LED turns off.

CONTROLLER ALARM TEST

The controller alarm test checks the controller's ability to initiate and indicate an alarm state.

NOTICE: OPERATIONAL TEST NOTICE

Failure to follow this NOTICE may result in an unnecessary evacuation of the facility.

This test places the duct detector into the alarm state. Unless part of the test, disconnect all auxiliary equipment from the controller before performing the test. If the duct detector is connected to a fire alarm system, notify the proper authorities before performing the test.

Controller Alarm Test Procedure

- Press the controller's test/reset switch for seven seconds.
- Verify that the controller's Alarm LED turns on.
- Reset the sensor by pressing the test/reset switch for two seconds.
- Verify that the controller's Alarm LED turns off.

DIRTY CONTROLLER TEST

The dirty controller test checks the controller's ability to initiate a dirty sensor test and indicate its results.

NOTICE: OPERATIONAL TEST NOTICE

Failure to follow this NOTICE may result in an unnecessary evacuation of the facility.

Pressing the controller's test/reset switch for longer than seven seconds will put the duct detector into the alarm state and activate all automatic alarm responses.

Dirty Controller Test Procedure

- Press the controller's test/reset switch for two seconds.
- Verify that the controller's Trouble LED flashes.

DIRTY SENSOR TEST

The dirty sensor test provides an indication of the sensor's ability to compensate for gradual environmental changes. A sensor that can no longer compensate for environmental changes is considered 100% dirty and requires cleaning or replacing. Use a field provided SD-MAG test magnet to initiate a sensor dirty test. The sensor's Dirty LED indicates the results of the dirty test as shown in Table 11.

NOTICE: OPERATIONAL TEST NOTICE

Failure to follow this NOTICE may result in an unnecessary evacuation of the facility.

Holding the test magnet against the sensor housing for more than seven seconds will put the duct detector into the alarm state and activate all automatic alarm responses.

Table 11 — Dirty LED Test

| FLASHES | DESCRIPTION |
|---------|--|
| 1 | 0-25% dirty. (Typical of a newly installed detector) |
| 2 | 25-50% dirty |
| 3 | 51-75% dirty |
| 4 | 76-99% dirty |

Dirty Sensor Test Procedure

- Hold the test magnet where indicated on the side of the sensor housing for two seconds.
- Verify that the sensor's Dirty LED flashes.

NOTICE: OPERATIONAL TEST NOTICE

Failure to follow this NOTICE may result in an unnecessary evacuation of the facility.

Changing the dirty sensor test operation will put the detector into the alarm state and activate all automatic alarm responses. Before changing dirty sensor test operation, disconnect all auxiliary equipment from the controller and notify the proper authorities if connected to a fire alarm system.

CHANGING THE DIRT SENSOR TEST

By default, sensor dirty test results are indicated by:

- The sensor's Dirty LED flashing.
- The controller's Trouble LED flashing.
- The controller's supervision relay contacts toggle.

The operation of a sensor's dirty test can be changed so that the controller's supervision relay is not used to indicate test results. When two detectors are connected to a controller, sensor dirty test operation on both sensors must be configured to operate in the same manner.

To Configure the Dirty Sensor Test Operation

- Hold the test magnet where indicated on the side of the sensor housing for approximately 60 seconds until the sensor's Alarm LED turns on and its Dirty LED flashes twice.
- Reset the sensor by removing the test magnet and then holding it against the sensor housing again for approximately 2 seconds until the sensor's Alarm LED turns off.

REMOTE STATION TEST

The remote station alarm test checks a test/reset station's ability to initiate and indicate an alarm state.

NOTICE: OPERATIONAL TEST NOTICE

Failure to follow this NOTICE may result in an unnecessary evacuation of the facility.

Changing the dirty sensor test operation will put the detector into the alarm state and activate all automatic alarm responses. Before changing the dirty sensor test operation, disconnect all auxiliary equipment from the controller and notify proper authorities if connected to a fire alarm system.

SD-TRK4 REMOTE ALARM TEST PROCEDURE

- Turn the key switch to the RESET/TEST position for seven seconds.
- Verify that the test/reset station's Alarm LED turns on.
- Reset the sensor by turning the key switch to the RESET/TEST position for two seconds.
- Verify that the test/reset station's Alarm LED turns off.

REMOTE TEST/RESET STATION DIRTY SENSOR TEST

The test/reset station dirty sensor test checks the test/reset station's ability to initiate a sensor dirty test and indicate the results. It must be wired to the controller as shown in Fig. 47 and configured to operate the controller's supervision relay. For more information, see "Changing the Dirty Sensor Test."

Table 12 — Detector Indicators

| CONTROL OR INDICATOR | DESCRIPTION |
|-----------------------------------|---|
| Magnetic test/reset switch | Resets the sensor when it is in the alarm or trouble state. Activates or tests the sensor when it is in the normal state. |
| Alarm LED | Indicates the sensor is in the alarm state. |
| Trouble LED | Indicates the sensor is in the trouble state. |
| Dirty LED | Indicates the amount of environmental compensation used by the sensor (flashing continuously = 100%) |
| Power LED | Indicates the sensor is energized. |

An internal sensor fault is detected upon entering the trouble state:

- The contacts on the controller’s supervisory relay switch positions. (See Fig. 49.)
- If a sensor trouble, the sensor’s Trouble LED the controller’s Trouble LED turn on.
- If 100% dirty, the sensor’s Dirty LED turns on and the controller’s Trouble LED flashes continuously.
- If a wiring fault between a sensor and the controller, the controller’s Trouble LED turns on but not the sensor’s.

NOTE: All troubles are latched by the duct smoke detector. The trouble condition must be cleared and then the duct smoke detector must be reset in order to restore it to the normal state.

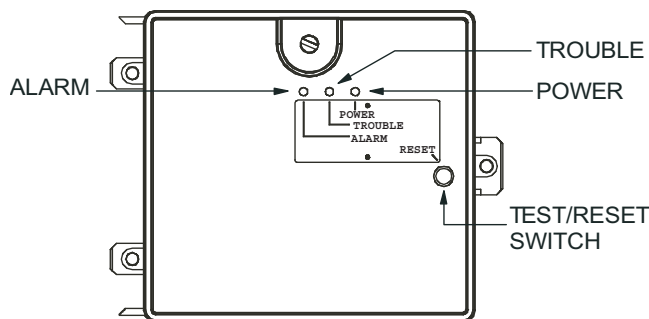


Fig. 49 — Controller Assembly

Resetting Alarm and Trouble Condition Trips

Manual reset is required to restore smoke detector systems to Normal operation. For installations using two sensors, the duct smoke detector does not differentiate which sensor signals an alarm or trouble condition. Check each sensor for Alarm or Trouble status. Clear the condition that has generated the trip at this sensor. Then reset the sensor by pressing and holding the reset button (on the side) for 2 seconds. Verify that the sensor’s Alarm and Trouble LEDs are now off. At the controller, clear its Alarm or Trouble state by pressing and holding the manual reset button (on the front cover) for 2 seconds. Verify that the controller’s Alarm and Trouble LEDs are now off. Replace all panels.

Troubleshooting

CONTROLLER’S TROUBLE LED IS ON

1. Check the Trouble LED on each sensor connected to the controller. If a sensor’s Trouble LED is on, determine the cause and make the necessary repairs.
2. Check the wiring between the sensor and the controller. If wiring is loose or missing, repair or replace as required.

CONTROLLER’S TROUBLE LED IS FLASHING

1. One or both of the sensors is 100% dirty.
2. Determine which Dirty LED is flashing then clean that sensor assembly as described in the detector cleaning section.

SENSOR’S TROUBLE LED IS ON

1. Check the sensor’s Dirty LED. If it is flashing, the sensor is dirty and must be cleaned.
2. Check the sensor’s cover. If it is loose or missing, secure the cover to the sensor housing.

3. Replace sensor assembly.

SENSOR’S POWER LED IS OFF

1. Check the controller’s Power LED. If it is off, determine why the controller does not have power and make the necessary repairs.
2. Check the wiring between the sensor and the controller. If wiring is loose or missing, repair or replace as required.

CONTROLLER’S POWER LED IS OFF

1. Make sure the circuit supplying power to the controller is operational. If not, make sure JP2 and JP3 are set correctly on the controller before applying power.
2. Verify that power is applied to the controller’s supply input terminals. If power is not present, replace or repair wiring as required.

REMOTE TEST/RESET STATION’S TROUBLE LED DOES NOT FLASH WHEN PERFORMING A DIRTY TEST, BUT THE CONTROLLER’S TROUBLE LED DOES

1. Verify that the remote test/station is wired as shown in Fig. 47. Repair or replace loose or missing wiring.
2. Configure the sensor dirty test to activate the controller’s supervision relay. See “Changing Sensor Dirty Test Operation.”

SENSOR’S TROUBLE LED IS ON, BUT THE CONTROLLER’S TROUBLE LED IS OFF

Remove JP1 on the controller.

PremierLink™ Control

For details on operating 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 Control System

For details on operating 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.

ECONOMISER SYSTEMS

IMPORTANT: Any economizer that meets the economizer requirements as laid out in California’s Title 24 mandatory section 120.2 (fault detection and diagnostics) and/or prescriptive section 140.4 (life-cycle tests, damper leakage, 5 year warranty, sensor accuracy, etc), will have a label on the economizer. Any economizer without this label does not meet California’s Title 24. The five-year limited parts warranty referred to in section 140.4 only applies to factory installed economizers. Please refer to the economizer on the unit.

The 50TCQ units may be equipped with a factory-installed or accessory (field-installed) EconoMi\$er system. Three types are available: with a logic control system (EconoMi\$er IV and EconoMi\$er X) and without a control system (EconoMi\$er2). See Fig. 50-52 for component locations on each type. The W7212

controller is used for EconoMiSer IV and the W7220 controller is used for EconoMiSer X system. See Fig. 53-56 for EconoMiSer section wiring diagrams.

All three economizers use direct-drive damper actuators.

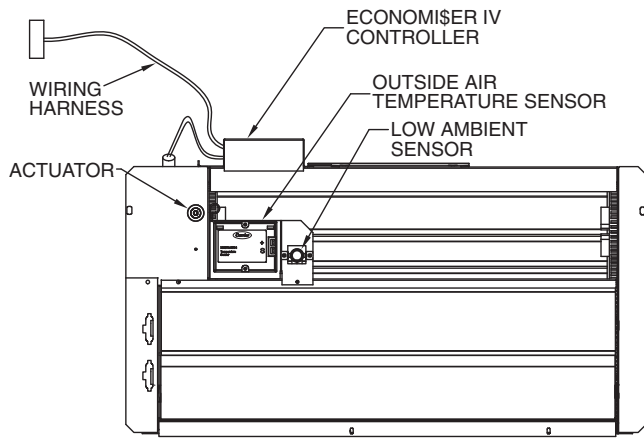


Fig. 50 — EconoMiSer IV Component Locations

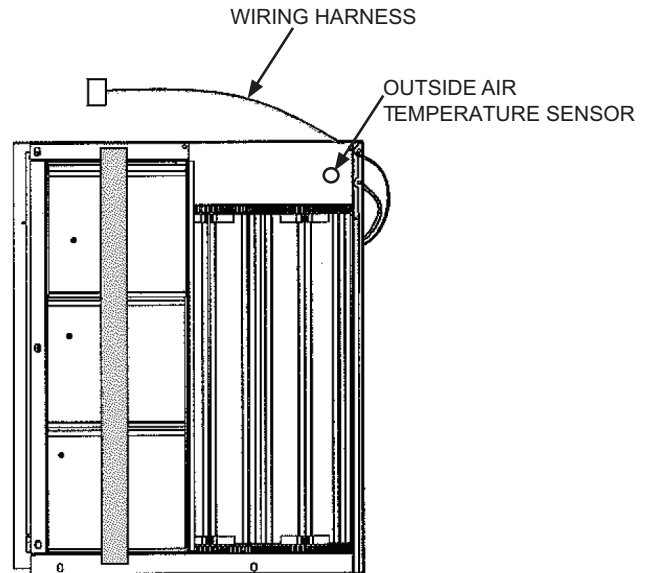


Fig. 51 — EconoMiSer X Component Locations

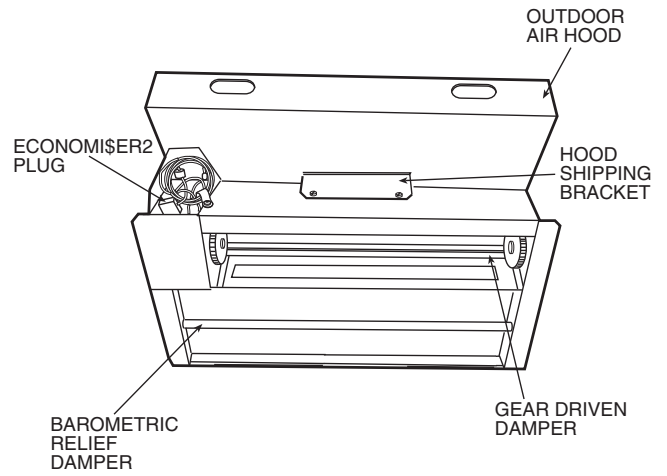
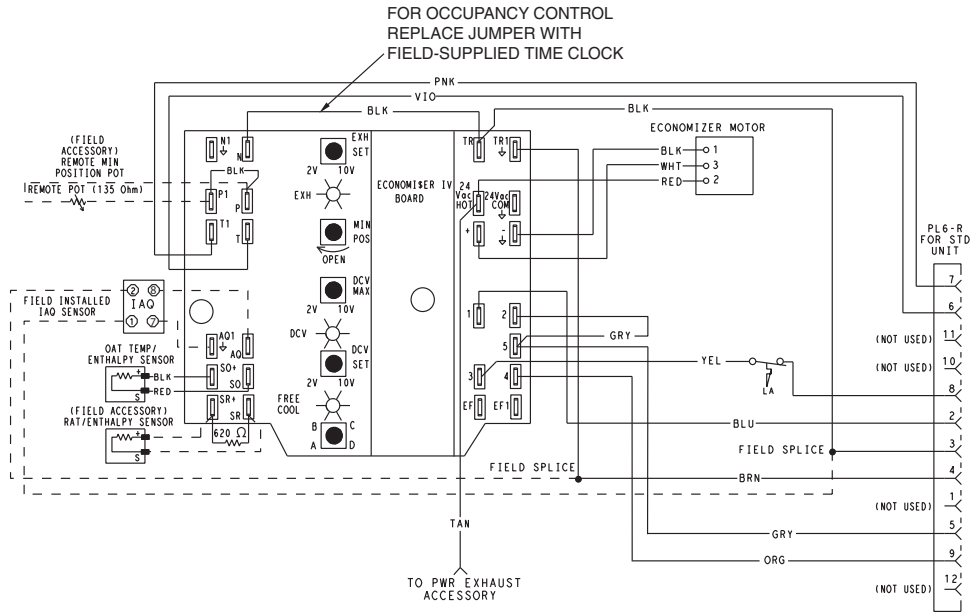


Fig. 52 — EconoMiSer 2 Component Locations



LEGEND

- DCV** — Demand Controlled Ventilation
- IAQ** — Indoor Air Quality
- LA** — Low Ambient Lockout Device
- OAT** — Outdoor Air Temperature
- POT** — Potentiometer
- RAT** — Return Air Temperature

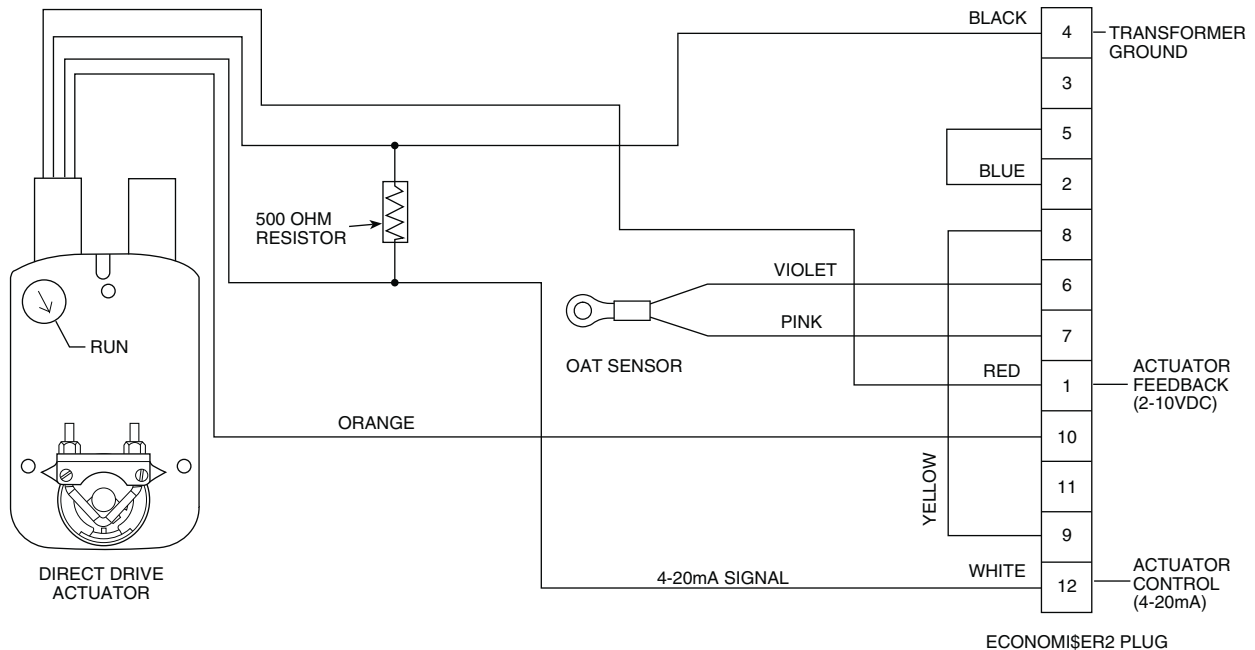
- Potentiometer
- Power Exhaust
- Minimum Pos.
- DCV Max.
- DCV Set
- Enthalpy

- Defaults Settings:**
- Middle
 - Fully Closed
 - Middle
 - Middle
 - C Setting

NOTES:

1. 620 ohm, 1 watt 5% resistor should be removed only when using differential enthalpy or dry bulb.
2. If a separate field-supplied 24 v transformer is used for the IAQ sensor power supply, it cannot have the secondary of the transformer grounded.
3. For field-installed remote minimum position POT, remove black wire jumper between P and P1 and set control minimum position POT to the minimum position.

Fig. 55 — EconoMiSer IV Wiring



NOTES:

1. Switch on actuator must be in run position for economizer to operate.
2. PremierLink™ control requires that the standard 50HJ540569 outside-air sensor be replaced by either the CROASENR001A00 dry bulb sensor or HH57A077 enthalpy sensor.
3. 50HJ540573 actuator consists of the 50HJ540567 actuator and a harness with 500-ohm resistor.

Fig. 56 — EconoMiSer2 with 4 to 20 mA Control Wiring

EconoMi\$er IV Standard Sensors

Table 13 provides a summary of EconoMi\$er IV Logic. A functional view of the EconoMi\$er is shown in Fig. 57. Typical settings, sensor ranges, and jumper positions are also shown. An EconoMi\$er IV simulator program is available from Carrier to help with EconoMi\$er IV training and troubleshooting.

OUTDOOR AIR TEMPERATURE (OAT) SENSOR

The outdoor air temperature sensor (HH57AC074) is a 10 to 20 mA device used to measure the outdoor-air temperature. The outdoor-air temperature is used to determine when the EconoMi\$er IV can be used for free cooling. The sensor is factory-installed on the EconoMi\$er IV in the outdoor airstream. (See Fig. 58.) The operating range of temperature measurement is 40°F to 100°F (4°C to 38°C). See Fig. 59.

Table 13 — EconoMi\$er IV Input/Output Logic

| Demand Controlled Ventilation (DCV) | INPUTS | | | | OUTPUTS | | | |
|-------------------------------------|-----------------------------|--------|-----|-----|------------|---------|--|---|
| | Enthalpy* | | Y1 | Y2 | Compressor | | N Terminal† | |
| | Outdoor | Return | | | Stage 1 | Stage 2 | Occupied | Unoccupied |
| | | | | | | | Damper | |
| Below set (DCV LED off) | High (Free Cooling LED off) | Low | On | On | On | On | Minimum position | Closed |
| | | | On | Off | On | Off | | |
| | | | Off | Off | Off | Off | | |
| | Low (Free Cooling LED on) | High | On | On | On | Off | Modulating** (between min. position and full-open) | Modulating** (between closed and full-open) |
| | | | On | Off | Off | Off | | |
| | | | Off | Off | Off | Off | | |
| Above set (DCV LED on) | High (Free Cooling LED off) | Low | On | On | On | On | Modulating†† (between min. position and DCV maximum) | Modulating†† (between closed and DCV maximum) |
| | | | On | Off | On | Off | | |
| | | | Off | Off | Off | Off | | |
| | Low (Free Cooling LED on) | High | On | On | On | Off | Modulating*** | Modulating††† |
| | | | On | Off | Off | Off | | |
| | | | Off | Off | Off | Off | | |

*For single enthalpy control, the module compares outdoor enthalpy to the ABCD set point.
 †Power at N terminal determines Occupied/Unoccupied setting: 24 vac (Occupied), no power (Unoccupied).
 **Modulation is based on the supply-air sensor signal.
 ††Modulation is based on the DCV signal.

*** Modulation is based on the greater of DCV and supply-air sensor signals, between minimum position and either maximum position (DCV) or fully open (supply-air signal).
 ††† Modulation is based on the greater of DCV and supply-air sensor signals, between closed and either maximum position (DCV) or fully open (supply-air signal).

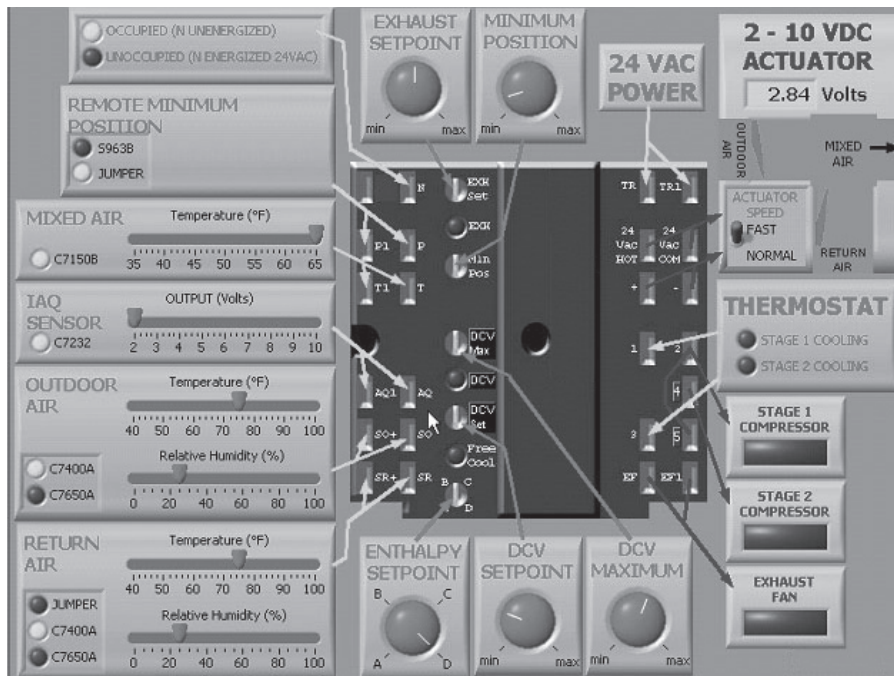


Fig. 57 — EconoMi\$er IV Functional View

SUPPLY AIR TEMPERATURE (SAT) SENSOR

The supply air temperature sensor is a 3 K thermistor located at the inlet of the indoor fan. (See Fig. 58.) This sensor is factory installed. The operating range of temperature measurement is 0°F to 158°F (-18°C to 70°C).

The temperature sensor looks like an eyelet terminal with wires running to it. The sensor is located in the “crimp end” and is sealed from moisture.

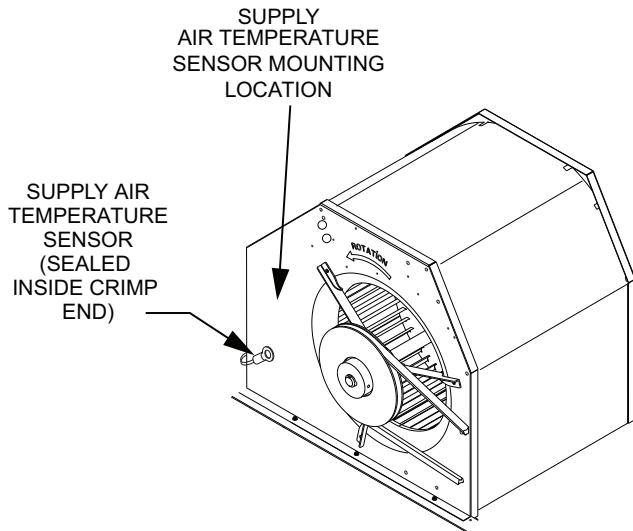


Fig. 58 — Supply Air Sensor Location

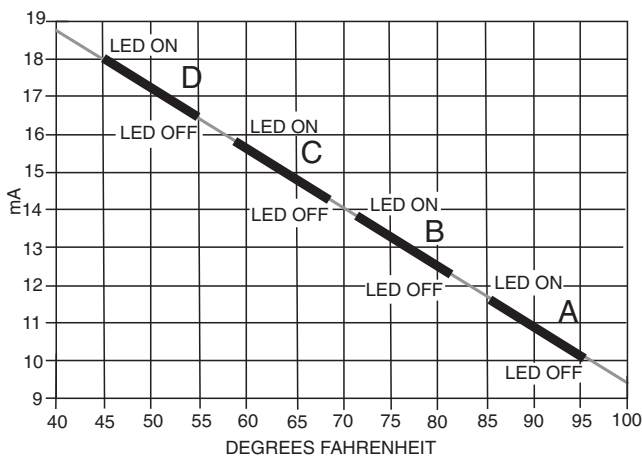


Fig. 59 — Outside Air Temperature Changeover Setpoints

OUTDOOR AIR LOCKOUT SENSOR

The EconoMiSer IV is equipped with an ambient temperature lockout switch located in the outdoor airstream which is used to lock out the compressors below a 42°F (6°C) ambient temperature. (See Fig. 50.)

ECONOMISER IV CONTROL MODES

IMPORTANT: The optional EconoMiSer2 does not include a controller. The EconoMiSer2 is operated by a 4 to 20 mA signal from an existing field-supplied controller. See Fig. 56 for wiring information.

Determine the EconoMiSer IV control mode before set up of the control. Some modes of operation may require different sensors. (See Table 14.) The EconoMiSer IV system is supplied from the factory with a supply-air temperature sensor and an outdoor-air temperature sensor. This allows for operation of the EconoMiSer IV with outdoor air dry bulb changeover control. Additional

accessories can be added to allow for different types of change-over control and operation of the EconoMiSer IV and unit.

OUTDOOR DRY BULB CHANGEOVER

The standard controller is shipped from the factory configured for outdoor dry bulb changeover control. The outdoor air and supply air temperature sensors are included as standard. For this control mode, the outdoor temperature is compared to an adjustable setpoint selected on the control. If the outdoor-air temperature is above the setpoint, the EconoMiSer IV controller will adjust the outside air dampers to minimum position. If the outdoor-air temperature is below the setpoint, the position of the outside air dampers will be controlled to provide free cooling using outdoor air. When in this mode, the LED next to the free cooling setpoint potentiometer will be on. The changeover temperature setpoint is controlled by the free cooling setpoint potentiometer located on the control (see Fig. 60.) The scale on the potentiometer is A, B, C, and D. See Fig. 61 for the corresponding temperature change-over values.

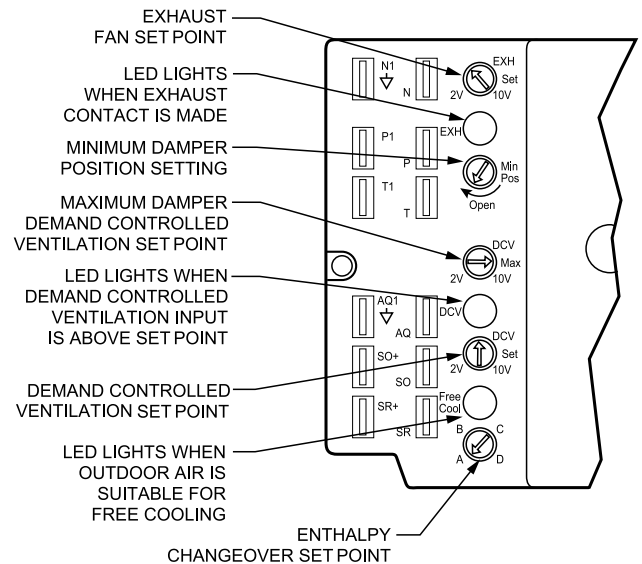


Fig. 60 — EconoMiSer IV Controller Potentiometer and LED Locations

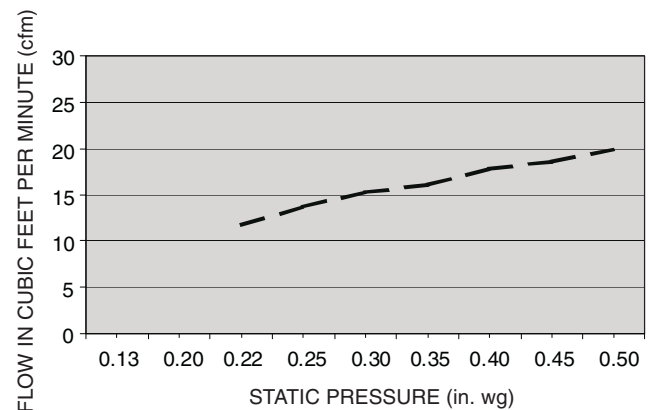


Fig. 61 — Outdoor-Air Damper Leakage

DIFFERENTIAL DRY BULB CONTROL

For differential dry bulb control, the standard outdoor dry bulb sensor is used in conjunction with an additional accessory dry bulb sensor (part number CRTEMPSN002A00). The accessory sensor must be mounted in the return airstream. (See Fig. 62.) Wiring is provided in the EconoMiSer IV wiring harness.

In this mode of operation, the outdoor-air temperature is compared to the return-air temperature and the lower temperature airstream is used for cooling. When using this mode of changeover control,

turn the enthalpy setpoint potentiometer fully clockwise to the D setting. (See Fig. 60.)

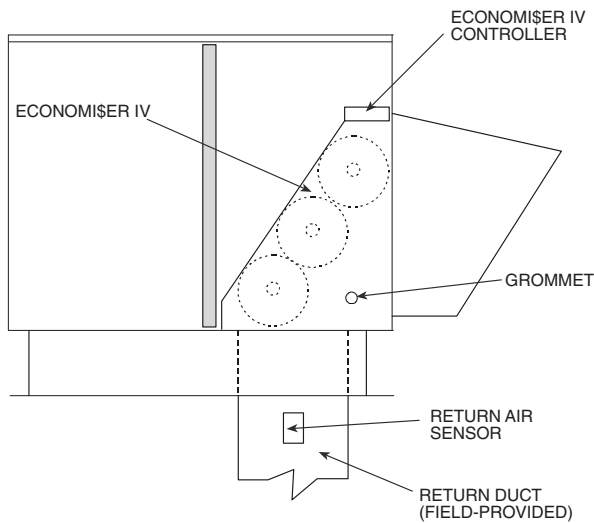


Fig. 62 — Return-Air Temperature or Enthalpy Sensor Mounting Location

OUTDOOR ENTHALPY CHANGEOVER

For enthalpy control, accessory enthalpy sensor (part number HH57AC078) is required. Replace the standard outdoor dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location. (See Fig. 62.) When the outdoor air enthalpy rises above the outdoor enthalpy changeover setpoint, the outdoor air damper moves to its minimum position. The outdoor enthalpy changeover setpoint is set with the outdoor enthalpy setpoint potentiometer on the EconoMiSer IV controller. The setpoints are A, B, C, and D. (See Fig. 63.) The factory-installed 620-ohm jumper must be in place across terminals SR and SR+ on the EconoMiSer IV controller (see Fig. 64).

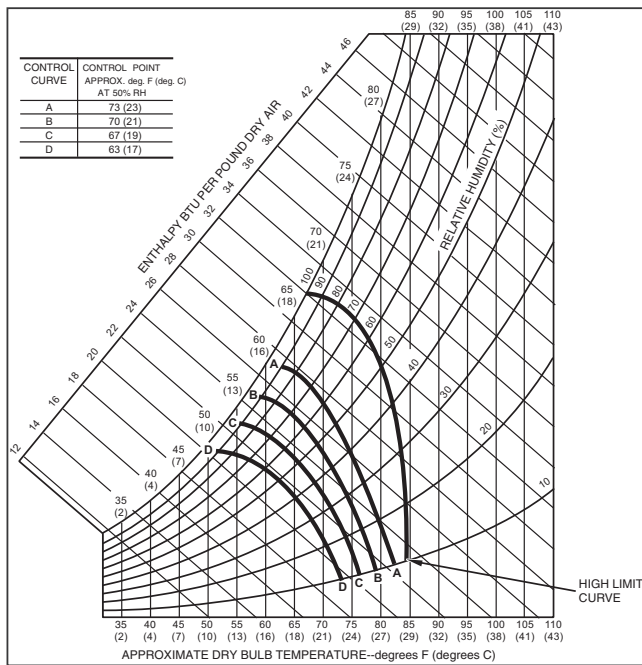


Fig. 63 — Enthalpy Changeover Setpoints

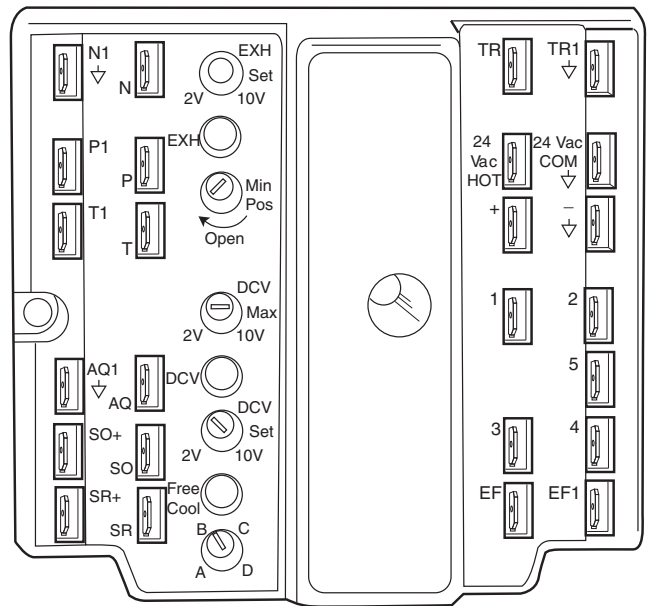


Fig. 64 — EconoMiSer IV Control

DIFFERENTIAL ENTHALPY CONTROL

For differential enthalpy control, the EconoMiSer IV controller uses two enthalpy sensors (HH57AC078 and CRENT-DIF004A00), one in the outside-air duct and one in the return-air duct. The EconoMiSer IV controller compares the outdoor air enthalpy to the return air enthalpy to determine EconoMiSer IV use. The controller selects the lower enthalpy air (return or outdoor) for cooling. For example, when the outdoor air has a lower enthalpy than the return air, the EconoMiSer IV opens to bring in outdoor air for free cooling.

Replace the standard outside air dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location. See Fig. 50. Mount the return air enthalpy sensor in the return air duct. See Fig. 62. Wiring is provided in the EconoMiSer IV wiring harness. See Fig. 55. The outdoor enthalpy changeover setpoint is set with the outdoor enthalpy setpoint potentiometer on the EconoMiSer IV controller. When using this mode of changeover control, turn the enthalpy setpoint potentiometer fully clockwise to the D setting.

INDOOR AIR QUALITY (IAQ) SENSOR INPUT

The IAQ input can be used for demand controlled ventilation control based on the level of CO₂ measured in the space or return air duct.

Mount the accessory IAQ sensor according to manufacturer specifications. The IAQ sensor should be wired to the AQ and AQ1 terminals of the controller. Adjust the DCV potentiometers to correspond to the DCV voltage output of the indoor air quality sensor at the user-determined setpoint. See Fig. 65.

If a separate field-supplied transformer is used to power the IAQ sensor, the sensor must not be grounded or the EconoMiSer IV control board will be damaged.

When using demand ventilation, the minimum damper position represents the minimum ventilation position for VOC (volatile organic compounds) ventilation requirements. The maximum demand ventilation position is used for fully occupied ventilation.

When demand ventilation control is not being used, the minimum position potentiometer should be used to set the occupied ventilation position. The maximum demand ventilation position should be turned fully clockwise.

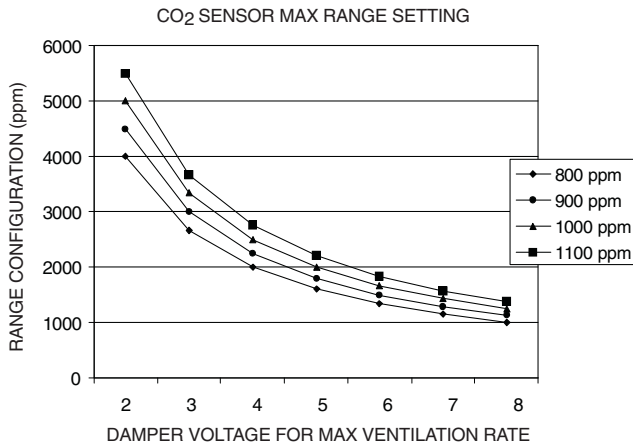


Fig. 65 — CO₂ Sensor Maximum Range Settings

EXHAUST SETPOINT ADJUSTMENT

The exhaust setpoint will determine when the exhaust fan runs based on damper position (if accessory power exhaust is installed). The setpoint is modified with the Exhaust Fan Setpoint (EXH SET) potentiometer. See Fig. 60. The setpoint represents the damper position above which the exhaust fans will be turned on. When there is a call for exhaust, the EconoMiSer IV controller provides a 45 ± 15 second delay before exhaust fan activation to allow the dampers to open. This delay allows the damper to reach the appropriate position to avoid unnecessary fan overload.

MINIMUM POSITION CONTROL

There is a minimum damper position potentiometer on the EconoMiSer IV controller. See Fig. 60. The minimum damper position maintains the minimum airflow into the building during the occupied period.

When using demand controlled ventilation, the minimum damper position represents the minimum ventilation position for Volatile Organic Compound (VOC) ventilation requirements. The maximum demand ventilation position is used for fully occupied ventilation.

When demand control ventilation is not being used, the minimum position potentiometer should be used to set the occupied ventilation position. The maximum demand ventilation position should be turned fully clockwise.

Adjust the minimum position potentiometer to allow the minimum amount of outdoor air, as required by local codes, to enter the building. Make minimum position adjustments with at least 10°F temperature difference between the outdoor and return-air temperatures.

To determine the minimum position setting, perform the following procedure:

1. Calculate the appropriate mixed air temperature using the following formula:

$$(T_O \times \frac{OA}{100}) + (T_R \times \frac{RA}{100}) = T_M$$

T_O = Outdoor-Air Temperature

OA = Percent of Outdoor Air

T_R = Return-Air Temperature

RA = Percent of Return Air

T_M = Mixed-Air Temperature

As an example, if local codes require 10% outdoor air during occupied conditions, outdoor-air temperature is 60°F, and return-air temperature is 75°F.

$$(60 \times 0.10) + (75 \times 0.90) = 73.5^\circ\text{F}$$

2. Disconnect the supply air sensor from terminals T and T1.

3. Ensure that the factory-installed jumper is in place across terminals P and P1. If remote damper positioning is being used, make sure that the terminals are wired according to Fig. 60 and that the minimum position potentiometer is turned fully clockwise.
4. Connect 24 vac across terminals TR and TR1.
5. Carefully adjust the minimum position potentiometer until the measured mixed air temperature matches the calculated value.
6. Reconnect the supply air sensor to terminals T and T1.

Remote control of the EconoMiSer IV damper is desirable when requiring additional temporary ventilation. If a field-supplied remote potentiometer (Honeywell part number S963B1128) is wired to the EconoMiSer IV controller, the minimum position of the damper can be controlled from a remote location.

To control the minimum damper position remotely, remove the factory-installed jumper on the P and P1 terminals on the EconoMiSer IV controller. Wire the field-supplied potentiometer to the P and P1 terminals on the EconoMiSer IV controller. (See Fig. 64.)

DAMPER MOVEMENT

Damper movement from full open to full closed (or vice versa) takes 2½ minutes.

THERMOSTATS

The EconoMiSer IV control works with conventional thermostats that have a Y1 (cool stage 1), Y2 (cool stage 2), W1 (heat stage 1), W2 (heat stage 2), and G (fan). The EconoMiSer IV controller does not support space temperature sensors. Connections are made at the thermostat terminal connection board located in the main control box.

OCCUPANCY CONTROL

The factory default configuration for the EconoMiSer IV controls is occupied mode. Occupied status is provided by the black jumper from terminal TR to terminal N. When unoccupied mode is desired, install a field-supplied timeclock function in place of the jumper between TR and N. When the timeclock contacts are closed, the EconoMiSer IV controls will be in occupied mode. When the timeclock contacts are open (removing the 24-v signal from terminal N), the EconoMiSer IV system will be in unoccupied mode.

DEMAND CONTROLLED VENTILATION (DCV)

When using the EconoMiSer IV system for demand controlled ventilation, there are some equipment selection criteria which should be considered. When selecting the heat capacity and cool capacity of the equipment, the maximum ventilation rate must be evaluated for design conditions. The maximum damper position must be calculated to provide the desired fresh air.

Typically the maximum ventilation rate will be about 5 to 10% more than the typical cfm required per person, using normal outside air design criteria.

A proportional anticipatory strategy should be taken with the following conditions: a zone with a large area, varied occupancy, and equipment that cannot exceed the required ventilation rate at design conditions. Exceeding the required ventilation rate means the equipment can condition air at a maximum ventilation rate that is greater than the required ventilation rate for maximum occupancy. A proportional-anticipatory strategy will cause the fresh air supplied to increase as the room CO₂ level increases even though the CO₂ setpoint has not been reached. By the time the CO₂ level reaches the setpoint, the damper will be at maximum ventilation and should maintain the setpoint.

In order to have the CO₂ sensor control the EconoMiSer damper in this manner, first determine the damper voltage output for minimum or base ventilation. Base ventilation is the ventilation required to remove contaminants during unoccupied periods. The

following equation may be used to determine the percent of outside air entering the building for a given damper position. For best results, there should be at least a 10°F difference in outside-air and return-air temperatures.

$$(T_O \times \frac{OA}{100}) + (T_R \times \frac{RA}{100}) = T_M$$

T_O = Outdoor-Air Temperature

OA = Percent of Outdoor Air

T_R = Return-Air Temperature

RA = Percent of Return Air

T_M = Mixed-Air Temperature

Once base ventilation has been determined, set the minimum damper position potentiometer to the correct position.

The same equation can be used to determine the occupied or maximum ventilation rate to the building. For example, an output of 3.6 volts to the actuator provides a base ventilation rate of 5% and an output of 6.7 volts provides the maximum ventilation rate of 20% (or base plus 15 cfm per person). Use Fig. 65 to determine the maximum setting of the CO₂ sensor. For example, an 1100 ppm setpoint relates to a 15 cfm per person design. Use the 1100 ppm curve on Fig. 65 to find the point when the CO₂ sensor output will be 6.7 volts. Line up the point on the graph with the left side of the chart to determine that the range configuration for the CO₂ sensor should be 1800 ppm. The EconoMi\$er IV controller will output the 6.7 volts from the CO₂ sensor to the actuator when the CO₂ concentration in the space is at 1100 ppm. The DCV setpoint may be left at 2 volts since the CO₂ sensor voltage will be ignored by the EconoMi\$er IV controller until it rises above the 3.6 volt setting of the minimum position potentiometer.

Once the fully occupied damper position has been determined, set the maximum damper demand control ventilation potentiometer to this position. Do not set to the maximum position, as this can result in over-ventilation to the space and potential high humidity levels.

CO₂ SENSOR CONFIGURATION

The CO₂ sensor has preset standard voltage settings that can be selected anytime after the sensor is powered up. See Table 14.

Use setting 1 or 2 for Carrier equipment. See Table 14.

1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode twice. The STDSET Menu will appear.
3. Use the Up/Down button to select the preset number. (See Table 14.)
4. Press Enter to lock in the selection.
5. Press Mode to exit and resume normal operation.

Table 14 — EconoMi\$er IV Sensor Usage

| APPLICATION | ECONOMI\$ER IV WITH OUTDOOR-AIR DRY BULB SENSOR | | |
|---|---|----|------------------|
| | Accessories Required | | |
| Outdoor Air Dry Bulb | None. The outdoor air dry bulb sensor is factory installed. | | |
| Differential Dry Bulb | CRTEMPSN002A00* | | |
| Single Enthalpy | HH57AC078 | | |
| Differential Enthalpy | HH57AC078 and CRENTDIF004A00* | | |
| CO ₂ for DCV Control using a Wall-Mounted CO ₂ Sensor | 33ZCSENCO2 | | |
| CO ₂ for DCV Control using a Duct-Mounted CO ₂ Sensor | 33ZCSENCO2† and 33ZCASPCO2** | OR | CRCBDIOX005A00†† |

* CRENTDIF004A00 and CRTEMPSN002A00 accessories are used on many different base units. As such, these kits may contain parts that will not be needed for installation.

† 33ZCSENCO2 is an accessory CO₂ sensor.

** 33ZCASPCO2 is an accessory aspirator box required for duct-mounted applications.

†† CRCBDIOX005A00 is an accessory that contains both 33ZCSENCO2 and 33ZCASPCO2 accessories.

The custom settings of the CO₂ sensor can be changed any time after the sensor is energized. Follow the steps below to change the non-standard settings:

1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode twice. The STDSET Menu will appear.
3. Use the Up/Down button to toggle to the NONSTD menu and press Enter.
4. Use the Up/Down button to toggle through each of the nine variables, starting with Altitude, until the desired setting is reached.
5. Press Mode to move through the variables.
6. Press Enter to lock in the selection, then press Mode to continue to the next variable.

DEHUMIDIFICATION OF FRESH AIR WITH DCV (DEMAND CONTROLLED VENTILATION) CONTROL

If normal rooftop heating and cooling operation is not adequate for the outdoor humidity level, an energy recovery unit and/or a dehumidification option should be considered.

ECONOMI\$ER IV PREPARATION

This procedure is used to prepare the EconoMi\$er IV for troubleshooting. No troubleshooting or testing is done by performing the following procedure.

NOTE: This procedure requires a 9-v battery, 1.2 kilo-ohm resistor, and a 5.6 kilo-ohm resistor, which are not supplied with the EconoMi\$er IV.

IMPORTANT: Be sure to record the positions of all potentiometers before starting troubleshooting.

1. Disconnect power at TR and TR1. All LEDs should be off. Exhaust fan contacts should be open.
2. Disconnect device at P and P1.
3. Jumper P to P1.
4. Disconnect wires at T and T1. Place 5.6 kilo-ohm resistor across T and T1.
5. Jumper TR to 1.
6. Jumper TR to N.

7. If connected, remove sensor from terminals SO and +. Connect 1.2 kilo-ohm 4074EJM checkout resistor across terminals SO and +.
8. Put 620-ohm resistor across terminals SR and +.
9. Set minimum position, DCV setpoint, and exhaust potentiometers fully CCW (counterclockwise).
10. Set DCV maximum position potentiometer fully CW (clockwise).
11. Set enthalpy potentiometer to D.
12. Apply power (24 vac) to terminals TR and TR1.

DIFFERENTIAL ENTHALPY

To check differential enthalpy:

1. Make sure EconoMiSer IV preparation procedure has been performed.
2. Place 620-ohm resistor across SO and +.
3. Place 1.2 kilo-ohm resistor across SR and +. The Free Cool LED should be lit.
4. Remove 620-ohm resistor across SO and +. The Free Cool LED should turn off.
5. Return EconoMiSer IV settings and wiring to normal after completing troubleshooting.

SINGLE ENTHALPY

To check single enthalpy:

1. Make sure EconoMiSer IV preparation procedure has been performed.
2. Set the enthalpy potentiometer to A (fully CCW). The Free Cool LED should be lit.
3. Set the enthalpy potentiometer to D (fully CW). The Free Cool LED should turn off.
4. Return EconoMiSer IV settings and wiring to normal after completing troubleshooting.

DCV (DEMAND CONTROLLED VENTILATION) AND POWER EXHAUST

To check DCV and Power Exhaust:

1. Make sure EconoMiSer IV preparation procedure has been performed.
2. Ensure terminals AQ and AQ1 are open. The LED for both DCV and Exhaust should be off. The actuator should be fully closed.
3. Connect a 9-v battery to AQ (positive node) and AQ1 (negative node). The LED for both DCV and Exhaust should turn on. The actuator should drive to between 90 and 95% open.
4. Turn the Exhaust potentiometer CW until the Exhaust LED turns off. The LED should turn off when the potentiometer is approximately 90%. The actuator should remain in position.
5. Turn the DCV setpoint potentiometer CW until the DCV LED turns off. The DCV LED should turn off when the potentiometer is approximately 9-v. The actuator should drive fully closed.
6. Turn the DCV and Exhaust potentiometers CCW until the Exhaust LED turns on. The exhaust contacts will close 30 to 120 seconds after the Exhaust LED turns on.
7. Return EconoMiSer IV settings and wiring to normal after completing troubleshooting.

DCV MINIMUM AND MAXIMUM POSITION

To check the DCV minimum and maximum position:

1. Make sure EconoMiSer IV preparation procedure has been performed.
2. Connect a 9-v battery to AQ (positive node) and AQ1 (negative node). The DCV LED should turn on. The actuator should drive to between 90 and 95% open.
3. Turn the DCV Maximum Position potentiometer to midpoint. The actuator should drive to between 20 and 80% open.
4. Turn the DCV Maximum Position potentiometer to fully CCW. The actuator should drive fully closed.
5. Turn the Minimum Position potentiometer to midpoint. The actuator should drive to between 20 and 80% open.
6. Turn the Minimum Position Potentiometer fully CW. The actuator should drive fully open.
7. Remove the jumper from TR and N. The actuator should drive fully closed.
8. Return EconoMiSer IV settings and wiring to normal after completing troubleshooting.

SUPPLY-AIR SENSOR INPUT

To check supply-air sensor input:

1. Make sure EconoMiSer IV preparation procedure has been performed.
2. Set the Enthalpy potentiometer to A. The Free Cool LED turns on. The actuator should drive to between 20 and 80% open.
3. Remove the 5.6 kilo-ohm resistor and jumper T to T1. The actuator should drive fully open.
4. Remove the jumper across T and T1. The actuator should drive fully closed.
5. Return EconoMiSer IV settings and wiring to normal after completing troubleshooting.

ECONOMISER IV TROUBLESHOOTING COMPLETION

This procedure is used to return the EconoMiSer IV to operation. No troubleshooting or testing is done by performing the following procedure.

1. Disconnect power at TR and TR1.
2. Set enthalpy potentiometer to previous setting.
3. Set DCV maximum position potentiometer to previous setting.
4. Set minimum position, DCV setpoint, and exhaust potentiometers to previous settings.
5. Remove 620-ohm resistor from terminals SR and +.
6. Remove 1.2 kilo-ohm checkout resistor from terminals SO and +. If used, reconnect sensor from terminals SO and +.
7. Remove jumper from TR to N.
8. Remove jumper from TR to 1.
9. Remove 5.6 kilo-ohm resistor from T and T1. Reconnect wires at T and T1.
10. Remove jumper from P to P1. Reconnect device at P and P1.
11. Apply power (24 vac) to terminals TR and TR1.

EconoMiSer® X (Factory Option)

The EconoMiSer X system is an expandable economizer control system, which includes a W7220 economizer module (controller) with an LCD and keypad (see Fig. 66). The W7220 can be configured with optional sensors.



Fig. 66 — W7220 Economizer Module

The W7220 economizer module can be used as a stand-alone economizer module wired directly to a commercial set-back space thermostat and sensors to provide outside air dry-bulb economizer control.

The W7220 economizer module can be connected to optional sensors for single or differential enthalpy control. The W7220 economizer module provides power and communications for the sensors.

The W7220 economizer module automatically detects sensors by polling to determine which sensors are present. If a sensor loses communications after it has been detected, the W7220 economizer controller indicates a device fail error on its LCD.

SYSTEM COMPONENTS

The EconoMiSer 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 EconoMiSer 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 CO₂ 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.

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

IMPORTANT: All inputs and outputs must be Class 2 wiring.

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 66°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 (-0°C/+1°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 45 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)

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. 67 and Tables 15 and 16 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.

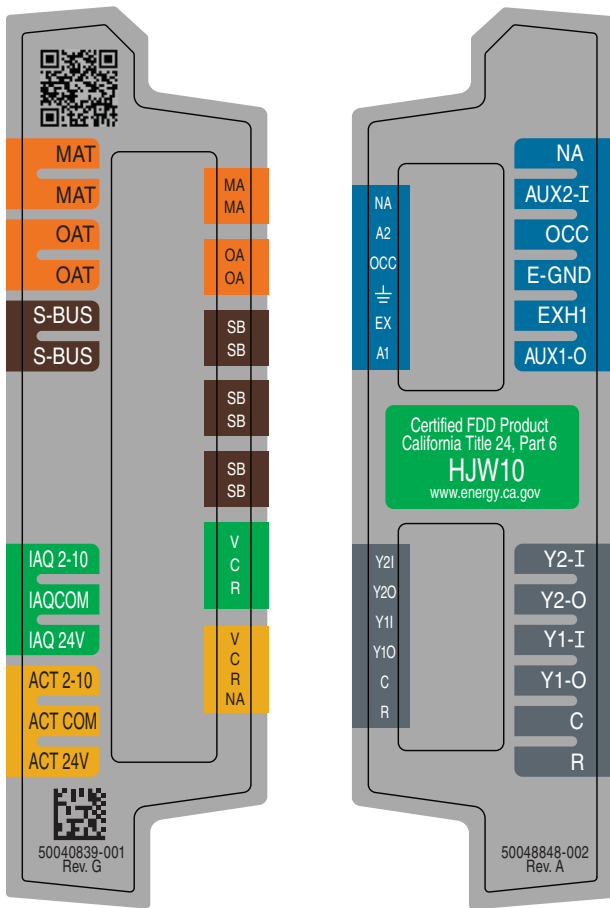


Fig. 67 — W7220 Wiring Terminals

Table 15 — Economizer Module (Left Hand Terminal Blocks)

| LABEL | TYPE | DESCRIPTION |
|-----------------------------------|-------------------|--|
| Top Left Terminal Block | | |
| MAT | 20k NTC and COM | Mixed Air Temperature Sensor (Polarity Insensitive Connection) |
| OAT | 20k NTC and COM | Outdoor Air Temperature Sensor (Polarity Insensitive Connection) |
| S-BUS | S-BUS (Sylk* Bus) | Enthalpy Control Sensor (Polarity Insensitive Connection) |
| Bottom Left Terminal Block | | |
| IAQ 2-10 | 2-10 vdc | Air Quality Sensor Input (e.g. CO ₂ sensor) |
| IAQ COM | COM | Air Quality Sensor Common |
| IAQ 24V | 24 vac | Air Quality Sensor 24 vac Source |
| ACT 2-10 | 2-10 vdc | Damper Actuator Output (2-10 vdc) |
| ACT COM | COM | Damper Actuator Output Common |
| ACT 24v | 24 vac | Damper Actuator 24 vac Source |

*Sylk is a trademark of Honeywell International Inc.

Table 16 — Economizer Module (Right Hand Terminal Blocks)

| LABEL | TYPE | DESCRIPTION |
|-------------------------------------|------------|--|
| Top Right Terminal Blocks | | |
| AUX2 I | 24 vac IN | The first terminal is not used. |
| OCC | 24 vac IN | Shut Down (SD) or HEAT (W) Conventional only and Heat Pump Changeover (O-B) in Heat Pump mode. |
| E-GND | E-GND | Occupied/Unoccupied Input |
| EXH1 | 24 vac OUT | Exhaust Fan 1 Output |
| AUX1 O | 24 vac OUT | Programmable: Exhaust fan 2 output or ERV or System alarm output |
| Bottom Right Terminal Blocks | | |
| Y2-I | 24 vac IN | Y2 in - Cooling Stage 2 Input from space thermostat |
| Y2-O | 24 vac OUT | Y2 out - Cooling Stage 2 Output to stage 2 mechanical cooling |
| Y1-I | 24 vac IN | Y1 in - Cooling Stage 2 Input from space thermostat |
| Y1-O | 24 vac OUT | Y1 out - Cooling Stage 2 Output to stage 2 mechanical cooling |
| C | COM | 24 vac Common |
| R | 24 vac | 24 vac Power (hot) |

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. 68 and Table 17 to locate the wiring terminals for each S-Bus and enthalpy control sensor.

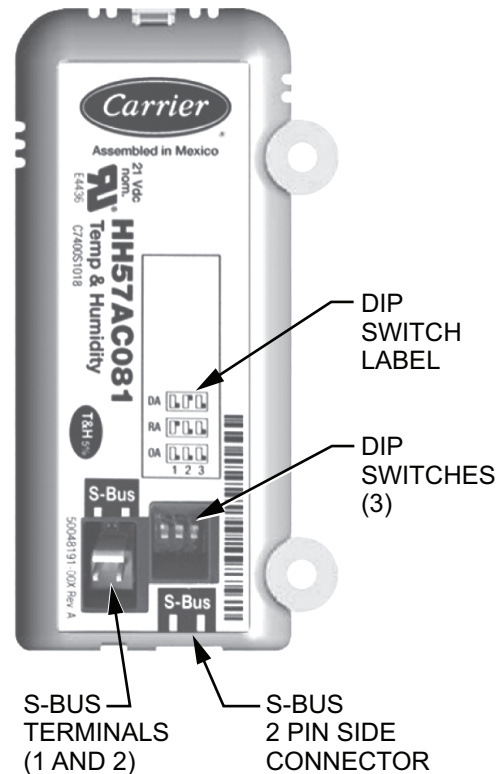


Fig. 68 — S-Bus Sensor DIP Switches

Table 17 — HH57AC081 Sensor Wiring Terminations

| TERMINAL | | TYPE | DESCRIPTION |
|----------|-------|-------|--|
| NUMBER | LABEL | | |
| 1 | S-BUS | S-BUS | S-BUS Communications (Enthalpy Control Sensor Bus) |
| 2 | S-BUS | S-BUS | S-BUS Communications (Enthalpy Control Sensor Bus) |

Use Fig. 68 and Table 18 to set the DIP switches for the desired use of the sensor.

Table 18 — HH57AC081 Sensor DIP Switch

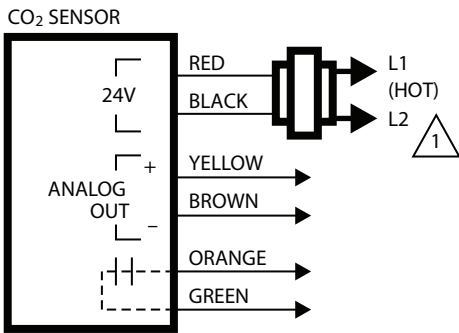
| USE | DIP SWITCH POSITIONS FOR SWITCHES 1, 2, AND 3 | | |
|-----|---|-----|-----|
| | 1 | 2 | 3 |
| DA | OFF | ON | OFF |
| RA | ON | OFF | OFF |
| OA | OFF | OFF | OFF |

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. 69 for CO₂ sensor wiring.



1 POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

Fig. 69 — CO₂ Sensor Wiring

INTERFACE OVERVIEW

This section describes how to use the EconoMiSer[®] X 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. 70) 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:

- Press the ▲ (Up arrow) button to move to the previous menu.
- Press the ▼ (Down arrow) button to move to the next menu.
- Press the ↵ (Enter) button to display the first item in the currently displayed menu.
- Press the ⏴ (Menu Up/Exit) button to exit a menu’s item and return to the list of menus.

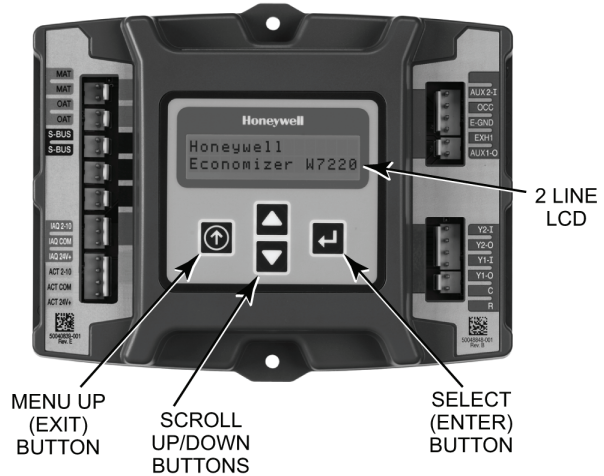


Fig. 70 — W7220 Controller Navigation Buttons

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.
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 19 illustrates the complete hierarchy of menus and parameters for the EconoMiSer[®] X system.

The Menus in display order are:

- STATUS
- SETPOINTS
- SYSTEM SETUP
- ADVANCED SETUP
- CHECKOUT
- ALARMS

NOTE: Some parameters in the menus use the letters MA or MAT, indicating a mixed air temperature sensor location before the cooling coil. This unit application has the control sensor located after the cooling coil, in the fan section, where it is designated as (Cooling) Supply Air Temperature or SAT sensor.

SETUP AND CONFIGURATION

Before being placed into service, the W7220 Economizer module must be set up and configured for the installed system.

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 item displays in turn and cycles to the next item after 5 seconds.

Table 19 — W7220 Menu Structure*

| MENU | PARAMETER | PARAMETER DEFAULT VALUE | PARAMETER RANGE AND INCREMENT† | EXPANDED PARAMETER NAME Notes |
|---------------|-------------|-------------------------------|-----------------------------------|--|
| STATUS | ECON AVAIL | NO | YES/NO | FIRST STAGE COOLING DEMAND (Y1-IN) YES = economizing available; the system can use outside air for free cooling when required |
| | ECONOMIZING | NO | YES/NO | FIRST STAGE COOLING RELAY OUTPUT YES = outside air being used for first stage cooling |
| | OCCUPIED | NO | YES/NO | OCCUPIED YES = OCC signal received from space thermostat or unitary controller YES = 24 vac on terminal OCC NO = 0 vac on terminal OCC |
| | HEAT PUMP | —** | COOL HEAT | HEAT PUMP MODE Displays COOL or HEAT when system is set to heat pump (Non-conventional) |
| | COOL Y1—IN | OFF | ON/OFF | FIRST STAGE COOLING DEMAND (Y1-IN) 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 |
| | COOL Y1—OUT | OFF | ON/OFF | FIRST STAGE COOLING RELAY OUTPUT Cool stage 1 Relay Output to stage 1 mechanical cooling (Y1—OUT terminal) |
| | COOL Y2—IN | OFF | ON/OFF | SECOND STAGE COOLING DEMAND (Y2-IN) 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 |
| | COOL Y2—OUT | OFF | ON/OFF | SECOND STAGE COOLING RELAY OUTPUT Cool Stage 2 Relay Output to mechanical cooling (Y2—OUT terminal) |
| | MA TEMP | — . — . °F (or — . — . °C) | —40°F to 150°F (—40°C to 66°C) | SUPPLY AIR TEMPERATURE, Cooling Mode Displays value of measured mixed air from MAT sensor. Displays — . — . F if not connected, short or out of range. |
| | DA TEMP | — . — . °F (or — . — . °C) | —40°F to 150°F (—40°C to 66°C) | DISCHARGE AIR TEMPERATURE, after Heating section Displays when Discharge Air Syk Bus sensor is connected and displays measured discharge temperature. Displays — . — . F if sensor sends invalid value, if not connected, short or out of range. |
| | OA TEMP | — . — . °F (or — . — . °C) | —40°F to 140°F (—40°C to 60°C) | OUTSIDE AIR TEMP Displays measured value of outdoor air temperature. Displays — . — . F if sensor sends invalid value, short or out of range. |
| | OA HUM | — % | 0 to 100% | OUTSIDE AIR RELATIVE HUMIDITY Displays measured value of outdoor humidity from OA Syk Bus sensor. Displays — % if not connected short, or out of range. |
| | RA TEMP | — . — . °F (or — . — . °C) | 0°F to 140°F (—18°C to 60°C) | RETURN AIR TEMPERATURE Displays measured value of return air temperature from RAT Syk Bus sensor. Displays — . — . F if sensor sends invalid value, if not connected, short or out of range |
| | RA HUM | — % | 0 to 100% | RETURN AIR RELATIVE HUMIDITY Displays measured value of return air humidity from RA Syk Bus sensor. Displays — % if sensor sends invalid value, if not connected, short or out of range |
| | IN CO2 | — — — ppm | 0 to 2000 ppm | SPACE/RETURN AIR CO ₂ Displays value of measured CO ₂ from CO ₂ sensor. Invalid if not connected, short or out of range. May be adjusted in Advanced menu by Zero offset and Span. |

Table 19 — W7220 Menu Structure* (cont)

| MENU | PARAMETER | PARAMETER DEFAULT VALUE | PARAMETER RANGE AND INCREMENT† | EXPANDED PARAMETER NAME Notes |
|------------------|--------------------------------------|-------------------------------|---|--|
| STATUS (cont) | DCV STATUS | — | ON/OFF | DEMAND CONTROLLED VENTILATION STATUS Displays ON if above set point and OFF if below set point, and ONLY if a CO ₂ sensor is connected. |
| | DAMPER OUT | 2.0v | 2.0 to 10.0v | Displays voltage output to the damper actuator.*** |
| | ACT POS | — | 0 to 100% | Displays actual position of actuator |
| | ACT COUNT | — | 1 to 65,535 | Displays number of times actuator has cycled. 1 cycle equals 180 degrees of actuator movement in any direction. |
| | ACTUATOR | — | OK/Alarm (on Alarm menu) | Displays ERROR if voltage or torque is below actuator range. |
| | EXH1 OUT | OFF | ON/OFF | EXHAUST STAGE 1 RELAY OUTPUT Displays ON when damper position reaches programmed percentage set point. Output of EXH1 terminal: ON = relay closed OFF = relay open |
| | EXH2 OUT | OFF | ON/OFF | EXHAUST STAGE 2 RELAY OUTPUT 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 |
| | ERV | OFF | ON/OFF | ENERGY RECOVERY VENTILATOR Output of AUX1 O terminal; displays only if AUX1 O = ERV ON = 24 vac output OFF = No Output |
| | MECH COOL ON or HEAT STAGES ON | 0 | 0, 1, or 2 | Displays stage of mechanical cooling that is active. Displays the stage of heat pump heating that is active. |
| | FAN SPEED | — | LOW or HIGH | SUPPLY FAN SPEED Displays speed setting of fan on a 2-speed fan unit. |
| | W (HEAT IN) | — | ON/OFF | HEAT DEMAND STATUS Displays status of heat demand on a 2-speed fan unit. |
| SETPOINTS | MAT SET | 53°F (12°C) | 38°F to 70°F (3°C to 21°C); increment by 1°F | SUPPLY AIR SETPOINT The economizer will modulate the OA damper to maintain the mixed air temperature at the set point |
| | LOW T LOCK | 32°F (0°C) | -45°F to 80°F (-43°C to 27°C); increment by 1°F | 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. |
| | DRYBLB SET | 63°F (17°C) | 48°F to 80°F (9°C to 27°C); increment by 1°F | OA DRY BULB TEMPERATURE CHANGEOVER SETPOINT Dry bulb set point will only appear if using dry bulb changeover. 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. |
| | ENTH CURVE | ES3 | ES1, ES2, ES3, ES4, or ES5 | ENTHALPY CHANGEOVER CURVE ES curve will only appear if using enthalpy changeover. Enthalpy boundary "curves" for economizing using single enthalpy. See page 55 for description of enthalpy curves. |
| | DCV SET | 1100ppm | 500 to 2000 ppm; increment by 100 | DEMAND CONTROLLED VENTILATION Displays only if CO ₂ 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. |
| | MIN POS | 2.8 V | 2 to 10 vdc | VENTILATION MINIMUM POSITION Displays ONLY if a CO ₂ sensor is NOT connected. With 2-speed fan units, MIN POS L (low speed fan) and MIN POS H (high speed fan) settings are required. Default for MIN POS L is 3.2V and MIN POS H is 2.8V. |
| | VENTMAX | 2.8 V | 2 to 10 vdc | DCV MAXIMUM DAMPER POSITION Displays only if a CO ₂ sensor is connected. Used for Vbz (ventilation max cfm) set point. VENTMAX is the same setting as MIN POS would be if unit did not have CO ₂ sensor. |
| | | | 100 to 9990 cfm; increment by 10 | If OA, MA, RA, and CO ₂ 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. |
| | | | 2 to 10 vdc | With 2-speed fan units, VENTMAX L (low speed fan) and VENTMAX H (high speed fan) settings are required. Default for VENTMAX L is 3.2V and VENTMAX H is 2.8V |

Table 19 — W7220 Menu Structure* (cont)

| MENU | PARAMETER | PARAMETER DEFAULT VALUE | PARAMETER RANGE AND INCREMENT† | EXPANDED PARAMETER NAME Notes |
|---------------------|-----------------|------------------------------|--|--|
| SETPOINTS (cont) | VENTMIN | 2.25 V | 2 to 10 vdc or 100 to 9990 cfm increment by 10 | DCV MINIMUM DAMPER POSITION Displays only if a CO ₂ sensor is connected. Used for Va (ventilation min cfm) set point. This is the ventilation for less than maximum occupancy of the space. |
| | | | 100 to 9990 cfm; increment by 10 | If OA, MA, RA, and CO ₂ 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. |
| | | | 2 to 10 vdc | With 2-speed fan units VENTMIN L (low speed fan) and VENTMIN H (high speed fan) settings are required. Default for VENTMIN L is 2.5V and VENTMIN H is 2.25V |
| | ERV OAT SP†† | 32°F (0°C) | 0°F to 50°F (-18°C to 10°C); increment by 1°F | ENERGY RECOVERY VENTILATOR UNIT OUTDOOR AIR TEMPERATURE SETPOINT Only when AUX1 O = ERV |
| | EXH1 SET | 50% | 0 to 100%; increment by 1 | EXHAUST FAN STAGE 1 SETPOINT Set point for OA damper position when exhaust fan 1 is powered by the economizer. With 2-speed fan units, Exh1 L (low speed fan) and Exh1 H (high speed fan) settings are required. Default for Exh1 L is 65% and Exh1 H is 50% |
| EXH2 SET | 75% | 0 to 100%; increment by 1 | EXHAUST FAN STAGE 2 SETPOINT Set point for OA damper position when exhaust fan 2 is powered by the economizer. Only used when AUX1 O is set to EXH2. With 2-speed fan units, Exh2 L (low speed fan) and Exh2 H (high speed fan) settings are required. Default for Exh2 L is 80% and Exh2 H is 75% | |
| SYSTEM SETUP | INSTALL | 01/01/10 | — | Display order = MM/DD/YY Setting order = DD, MM, then YY. |
| | UNITS DEG | °F | °F or °C | Sets economizer controller in degrees Fahrenheit or Celsius |
| | 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 | 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. NOTE: If using 2-speed fan mode, you must program CONV mode for W. Shutdown is not available in 2-speed fan mode. In HP O/B mode: HP(O) = energize heat pump on Cool (default); HP(B) = energize heat pump on heat. |
| | 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. NOTE: 2-speed fan option also needs Heat (W1) programmed in AUX 2 In. |
| | FAN CFM | 5000 cfm | 100 to 15000 cfm; increment by 100 | UNIT DESIGN AIRFLOW (CFM) Enter only if using DCVCAL ENA = AUTO This is the capacity of the RTU. The value is found on the nameplate label for the specific unit. |
| | 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 | 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 | 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. |
| ADVANCED SETUP | MA LO SET | 45°F (7°C) | 35°F to 65°F (2°C to 18°C); Increment by 1°F | 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 | CLO | CLO or MIN | FREEZE PROTECTION DAMPER POSITION Damper position when freeze protection is active (closed or MIN POS). |
| | CO2 ZERO | 0ppm | 0 to 500 ppm; Increment by 10 | CO ₂ ppm level to match CO ₂ sensor start level. |
| | CO2 SPAN | 2000ppm | 1000 to 3000 ppm; Increment by 50 | CO ₂ ppm span to match CO ₂ sensor, e.g.: 500-1500 sensor output would be 500 CO ₂ zero and 1000 CO ₂ span. |

Table 19 — W7220 Menu Structure* (cont)

| MENU | PARAMETER | PARAMETER DEFAULT VALUE | PARAMETER RANGE AND INCREMENT† | EXPANDED PARAMETER NAME Notes |
|------------------------------|--|-------------------------|---|---|
| ADVANCED SETUP (cont) | STG3 DLY | 2.0h | 0 min, 5 min, 15 min, then 15 min intervals. Up to 4 hrs or OFF | COOLING STAGE 3 DELAY 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 |
| | SD DMPR POS | CLO | CLO or OPN | 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. |
| | DA LO ALM | 45°F (7°C) | NONE 35°F to 65°F (2°C to 18°C); Increment by 5°F | Used for alarm for when the DA air temperature is too low. Set lower range of alarm, below this temperature the alarm will show on the display. |
| | DA HI ALM | 80°F (27°C) | NONE 70°F to 180°F (21°C to 82°C); Increment by 5°F | Used for alarm for when the DA air temperature is too high. Sets upper range of alarm; above this temperature, the alarm will show on the display. |
| | DCVCAL ENA | MAN | MAN (manual) AUTO | 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, CO ₂) sensors. This operation is not operable with a 2-speed fan unit. |
| | MAT T CAL | 0.0°F | ± 2.5°F | SUPPLY AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor. |
| | OAS T CAL | 0.0°F | ± 2.5°F | OUTSIDE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor. |
| | OA H CAL | 0% RH | ±10% RH | OUTSIDE AIR HUMIDITY CALIBRATION Allows for operator to adjust for an out of calibration humidity sensor. |
| | RA T CAL | 0.0°F | ± 2.5°F | RETURN AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor. |
| | RA H CAL | 0% RH | ±10% RH | RETURN AIR HUMIDITY CALIBRATION Allows for operator to adjust for an out of calibration humidity sensor. |
| | DA T CAL | 0.0°F | ± 2.5°F | DISCHARGE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor. |
| | 2SP FAN DELAY | 5 Minutes | 0 to 20 minutes in 1 minute increments | TIME DELAY ON SECOND STAGE ECONOMIZING 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. |
| CHECKOUT*** | DAMPER MINIMUM POSITION | — | — | The checkout for the damper minimum position is based on the system. See Table 20. |
| | DAMPER OPEN | — | — | 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. |
| | DAMPER CLOSE | — | — | Positions damper to the fully closed position |
| | CONNECT Y1-O | — | — | Closes the Y1-O relay (Y1-O) |
| | CONNECT Y2-O | — | — | Closes the Y2-O relay (Y2-O) |
| | CONNECT AUX1-O | — | — | 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 |
| CONNECT EXH1 | — | — | Closes the power exhaust fan 1 relay (EXH1) | |
| ALARMS | Alarms display only when they are active. The menu title "ALARMS(#)" includes the number of active alarms in parenthesis (). When using SYLK bus sensors, "SYLK" will appear on the screen, and when using 20k OA temperature sensors, "SENS T" will appear on the screen | | | |
| | MA T SENS ERR | — | — | SUPPLY AIR TEMPERATURE SENSOR ERROR Mixed air sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues. |
| | CO2 SENS ERR | — | — | CO ₂ SENSOR ERROR CO ₂ sensor has failed, gone out of range or become disconnected - check wiring then replace sensor if the alarm continues. |
| | OA SYLK T ERR | — | — | OUTSIDE AIR S-BUS SENSOR ERROR |
| | OA SYLK H ERR | — | — | Outdoor air enthalpy sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues. |

Table 19 — W7220 Menu Structure* (cont)

| MENU | PARAMETER | PARAMETER DEFAULT VALUE | PARAMETER RANGE AND INCREMENT† | EXPANDED PARAMETER NAME Notes |
|------------------|-----------------|-------------------------------|--------------------------------------|---|
| ALARMS (cont) | RA SYLK T ERR | — | — | RETURN AIR S-BUS SENSOR ERROR Return air enthalpy sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues. |
| | RA SYLK H ERR | — | — | DISCHARGE AIR S-BUS SENSOR ERROR Discharge air sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues. |
| | DA SYLK T ERR | — | — | OUTSIDE AIR TEMPERATURE SENSOR ERROR Outdoor air temperature sensor has failed or become disconnected - check wiring, then replace if the alarm continues. |
| | OA SENS T ERR | — | — | ACTUATOR ERROR Actuator has failed or become disconnected - check for stall, over voltage, under voltage and actuator count. Replace actuator if damper is movable and supply voltage is between 21.6 V and 26.4 V. Check actuator count on STATUS menu. |
| | ACT ERROR | — | — | 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. |
| | FREEZE ALARM | — | — | AUX2 IN is programmed for SHUTDOWN and 24 V has been applied to AUX2 IN terminal. |
| | SHUTDOWN ACTIVE | — | — | DAMPER CALIBRATION ROUTINE RUNNING If DCV Auto enable has been programmed, this alarm will display when the W7220 is completing a calibration on the dampers. Wait until the calibration is completed and the alarm will go away. Must have OA, MA and RA sensors for DCV calibration; set up is in the Advanced setup menu. |
| | DMP CAL RUNNING | — | — | DISCHARGE AIR TEMPERATURE SENSOR ALARM Discharge air temperature is out of the range set in the ADVANCED SETUP Menu. Check the temperature of the discharge air. |
| | DA SENS ALM | — | — | When AUX1-O is set to SYS and there is any alarm (e.g., failed sensors, etc.), the AUX1-O terminal has 24 vac out. |
| | SYS ALARM | — | — | ACTUATOR VOLTAGE LOW Voltage received by actuator is above expected range. |
| | ACT UNDER V | — | — | ACTUATOR VOLTAGE HIGH Voltage received by actuator is below expected range. |
| | ACT OVER V | — | — | ACTUATOR STALLED Actuator stopped before achieving commanded position. |
| | ACT STALLED | — | — | |

LEGEND

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

* Table 19 illustrates the complete hierarchy. Your menu parameters may be different depending on your configuration. For example, if you do not have a DCV (CO₂) sensor, then none of the DCV parameters appear.

† When values are displayed, pressing and holding the ▲ or ▼ button causes the display to automatically increment.

** — = Not Applicable.

†† ERV Operation: When in cooling mode AND the conditions are NOT OK for economizing - the ERV terminal will be energized. In the Heating mode, the ERV terminal will be energized when the OA is below the ERV OAT set point in the set point menu.

*** After 10 minutes without a command or mode change, the controller will change to normal operation.

NOTES:

1. STATUS → OCCUPIED — The factory-standard Occupancy signal originates with a thermostat or other controller call for indoor fan operation at CTB terminal G. This signal passes through the Central Terminal 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 20. For dry bulb operation with a 1-speed fan, with or without DCV, see Tables 21 and 22. For enthalpy operation with a 1-speed fan, with or without DCV, see Tables 23 and 24. For dry bulb operation with a 2-speed indoor fan, with or without DCV, see Tables 25 and 26. For enthalpy operation with a 2-speed indoor fan, with or without DCV, see Tables 27 and 28.

Table 20 — Damper Minimum Position Settings and Readings on Checkout Menu

| DEMAND CONTROLLED VENTILATION (CO ₂ SENSOR) | FAN SPEED | SETPOINTS | CHECKOUT |
|--|-----------|------------------------|--------------------|
| NO | 1 | MIN POS | VMAX-HS |
| | | — | — |
| | 2 | MIN POS H MIN POS L | VMAX-HS VMAX-LS |
| YES | 1 | VENT MIN | VMAX-HS |
| | | VENT MAX | VMAX-HS |
| | 2 | VENT MIN H | VMAX-HS |
| | | VENT MAX H | VMAX-LS |
| | | VENT MIN L | — |
| | | VENT MAX L | — |

Table 21 — Dry Bulb Operation without DCV (CO₂ Sensor) — 1 Speed Fan

| DEMAND CONTROLLED VENTILATION (DCV) | OUTSIDE AIR GOOD TO ECONOMIZE | Y1-I | Y2-I | FAN SPEED | Y1-O | Y2-O | OCCUPIED | UNOCCUPIED |
|-------------------------------------|-------------------------------|------|------|-----------|---------|----------|----------------------|---------------------|
| NONE | No | Off | Off | High | 0-v/Off | 0-v/Off | MIN POS | Closed |
| | | On | Off | High | 24-v/On | 0-v/Off | MIN POS | Closed |
| | | On | On | High | 24-v/On | 24-v/On | MIN POS | Closed |
| | Yes | Off | Off | High | 0-v/Off | 0-v/Off | MIN POS | Closed |
| | | On | Off | High | 0-v/Off | 0-v/Off | MIN POS to Full-Open | Closed to Full-Open |
| | | On | On | High | 24-v/On | 0-v/Off* | MIN POS to Full-Open | Closed to Full-Open |

*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 Y-I and Y2-I have not been satisfied.

Table 22 — Dry Bulb Operation with DCV (CO₂ Sensor) — 1 Speed Fan

| DEMAND CONTROLLED VENTILATION (DCV) | OUTSIDE AIR GOOD TO ECONOMIZE | Y1-I | Y2-I | FAN SPEED | Y1-O | Y2-O | OCCUPIED | UNOCCUPIED |
|-------------------------------------|-------------------------------|------|------|-----------|---------|----------|----------------------|---------------------|
| Below CO ₂ set | No | Off | Off | High | 0-v/Off | 0-v/Off | VENTMIN | Closed |
| | | On | Off | High | 24-v/On | 0-v/Off | VENTMIN | Closed |
| | | On | On | High | 24-v/On | 24-v/On | VENTMIN | Closed |
| | Yes | Off | Off | High | 0-v/Off | 0-v/Off | VENTMIN | Closed |
| | | On | Off | High | 0-v/Off | 0-v/Off | VENTMIN to Full-Open | Closed to Full-Open |
| | | On | On | High | 24-v/On | 0-v/Off* | VENTMIN to Full-Open | Closed to Full-Open |
| Above CO ₂ set | No | Off | Off | High | 0-v/Off | 0-v/Off | VENTMIN to VENTMAX | Closed |
| | | On | Off | High | 24-v/On | 0-v/Off | VENTMIN to VENTMAX | Closed |
| | | On | On | High | 24-v/On | 24-v/On | VENTMIN to VENTMAX | Closed |
| | Yes | Off | Off | High | 0-v/Off | 0-v/Off | VENTMIN to VENTMAX | Closed |
| | | On | Off | High | 0-v/Off | 0-v/Off | VENTMIN to Full-Open | Closed to Full-Open |
| | | On | On | High | 24-v/On | 0-v/Off* | VENTMIN to Full-Open | Closed to Full-Open |

*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 Y-I and Y2-I have not been satisfied.

Table 23 — Enthalpy Operation without DCV (CO₂ Sensor) — 1 Speed Fan

| DEMAND CONTROLLED VENTILATION (DCV) | OUTSIDE AIR GOOD TO ECONOMIZE | Y1-I | Y2-I | FAN SPEED | Y1-O | Y2-O | OCCUPIED | UNOCCUPIED |
|-------------------------------------|-------------------------------|------|------|-----------|---------|----------|----------------------|---------------------|
| NONE | No | Off | Off | High | 0-v/Off | 0-v/Off | MIN POS | Closed |
| | | On | Off | High | 24-v/On | 0-v/Off | MIN POS | Closed |
| | | On | On | High | 24-v/On | 24-v/On | MIN POS | Closed |
| | Yes | Off | Off | High | 0-v/Off | 0-v/Off | MIN POS | Closed |
| | | On | Off | High | 0-v/Off | 0-v/Off | MIN POS to Full-Open | Closed to Full-Open |
| | | On | On | High | 24-v/On | 0-v/Off* | MIN POS to Full-Open | Closed to Full-Open |

*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 Y-I and Y2-I have not been satisfied.

Table 24 — Enthalpy Operation with DCV (CO₂ Sensor) — 1 Speed Fan

| DEMAND CONTROLLED VENTILATION (DCV) | OUTSIDE AIR GOOD TO ECONOMIZE | Y1-I | Y2-I | FAN SPEED | Y1-O | Y2-O | OCCUPIED | UNOCCUPIED |
|-------------------------------------|-------------------------------|------|------|-----------|-------------------|----------|----------------------|---------------------|
| Below CO ₂ set | No | Off | Off | High | 0-v/Off | 0-v/Off | VENTMIN | Closed |
| | | On | Off | High | 24-v/On | 0-v/Off | VENTMIN | Closed |
| | | On | On | High | 24-v/On | 24-v/On | VENTMIN | Closed |
| | Yes | Off | Off | High | 0-v/Off | 0-v/Off | VENTMIN | Closed |
| | | On | Off | High | 0-v/Off | 0-v/Off | VENTMIN to Full-Open | Closed to Full-Open |
| | | On | On | High | 24-v/On | 0-v/Off† | VENTMIN to Full-Open | Closed to Full-Open |
| Above CO ₂ set | No | Off | Off | High | 0-v/Off | 0-v/Off | VENTMIN to VENTMAX | Closed |
| | | On | Off | High | 24-v/On | 0-v/Off | VENTMIN L to VENTMAX | Closed |
| | | On | On | High | 24-v/On | 24-v/On | VENTMIN H to VENTMAX | Closed |
| | Yes | Off | Off | High | 0-v/Off | 0-v/Off | VENTMIN L to VENTMAX | Closed |
| | | On | Off | High | 0-v/Off | 0-v/Off | VENTMIN to Full-Open | Closed to Full-Open |
| | | On | On | High | DELAY* 24-v/On | 0-v/Off† | VENTMIN to Full-Open | Closed to Full-Open |

*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 Y-I and Y2-I have not been satisfied.

Table 25 — Dry Bulb Operation without DCV (CO₂ Sensor) — 2 Speed Fan

| DEMAND CONTROLLED VENTILATION (DCV) | OUTSIDE AIR GOOD TO ECONOMIZE | Y1-I | Y2-I | FAN SPEED | Y1-O | Y2-O | OCCUPIED | UNOCCUPIED |
|-------------------------------------|-------------------------------|------|------|-----------|-------------------|----------|------------------------|---------------------|
| NONE | No | Off | Off | Low | 0-v/Off | 0-v/Off | MIN POS L | Closed |
| | | On | Off | Low | 24-v/On | 0-v/Off | MIN POS L | Closed |
| | | On | On | High | 24-v/On | 24-v/On | MIN POS H | Closed |
| NONE | Yes | Off | Off | Low | 0-v/Off | 0-v/Off | MIN POS L | Closed |
| | | On | Off | Low | 0-v/Off | 0-v/Off | MIN POS L to Full-Open | Closed to Full-Open |
| | | On | On | High | DELAY* 24-v/On | 0-v/Off† | MIN POS H to Full-Open | Closed to Full-Open |

*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 Y-I and Y2-I have not been satisfied.

Table 26 — Dry Bulb Operation with DCV (CO₂ Sensor) — 2 Speed Fan

| DEMAND CONTROLLED VENTILATION (DCV) | OUTSIDE AIR GOOD TO ECONOMIZE | Y1-I | Y2-I | FAN SPEED | Y1-O | Y2-O | OCCUPIED | UNOCCUPIED |
|-------------------------------------|-------------------------------|------|------|-----------|------------------|---------|----------------------|---------------------|
| Below CO ₂ Set | No | OFF | OFF | LOW | 0v/Off | 0v/Off | VENTMIN | Closed |
| | | ON | OFF | LOW | 24v/On | 0v/Off | VENTMIN | Closed |
| | | ON | ON | HIGH | 24v/On | 24v/On | VENTMIN | Closed |
| | Yes | OFF | OFF | LOW | 0v/Off | 0v/Off | VENTMIN | Closed |
| | | ON | OFF | LOW | 0v/Off | 0v/Off | VENTMIN to Full-Open | Closed to Full-Open |
| | | ON | ON | HIGH | 24v/On | 0v/Off | VENTMIN to Full-Open | Closed to Full-Open |
| Above CO ₂ Set | No | OFF | OFF | LOW | 0v/Off | 0v/Off | VENTMIN to VENTMAX | Closed |
| | | ON | OFF | LOW | 24v/On | 0v/Off | VENTMIN to VENTMAX | Closed |
| | | ON | ON | HIGH | 24v/On | 24v/On | VENTMIN to VENTMAX | Closed |
| | Yes | OFF | OFF | LOW | 0v/Off | 0v/Off | VENTMIN to VENTMAX | Closed |
| | | ON | OFF | LOW | 0v/Off | 0v/Off | VENTMIN to Full-Open | Closed to Full-Open |
| | | ON | ON | HIGH | DELAY* 24v/On | 0v/Off† | VENTMIN to Full-Open | Closed to Full-Open |

*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.

Table 27 — Enthalpy Operation without DCV (CO₂ Sensor) — 2 Speed Fan

| DEMAND CONTROLLED VENTILATION (DCV) | OUTSIDE AIR GOOD TO ECONOMIZE | Y1-I | Y2-I | FAN SPEED | Y1-O | Y2-O | OCCUPIED | UNOCCUPIED |
|-------------------------------------|-------------------------------|------|------|-----------|------------------|---------|----------------------|---------------------|
| NO CO ₂ SENSOR | NO | OFF | OFF | LOW | 0v/Off | 0v/Off | MIN POS | Closed |
| | | ON | OFF | LOW | 24v/On | 0v/Off | MIN POS | Closed |
| | | ON | ON | HIGH | 24v/On | 24v/On | MIN POS | Closed |
| | YES | OFF | OFF | LOW | 0v/Off | 0v/Off | MIN POS | Closed |
| | | ON | OFF | LOW | 0v/Off | 0v/Off | MIN POS to Full Open | Closed to Full-Open |
| | | ON | ON | HIGH | DELAY* 24v/On | 0v/Off† | MIN POS to Full Open | Closed to Full-Open |

*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.

Table 28 — Enthalpy Operation with DCV (CO₂ Sensor) — 2 Speed Fan

| DEMAND CONTROLLED VENTILATION (DCV) | OUTSIDE AIR GOOD TO ECONOMIZE | Y1-I | Y2-I | FAN SPEED | Y1-O | Y2-O | OCCUPIED | UNOCCUPIED |
|-------------------------------------|-------------------------------|------|------|-----------|------------------|---------|----------------------|---------------------|
| Below CO ₂ Set | No | OFF | OFF | LOW | 0v/Off | 0v/Off | VENTMIN | Closed |
| | | ON | OFF | LOW | 24v/On | 0v/Off | VENTMIN | Closed |
| | | ON | ON | HIGH | 24v/On | 24v/On | VENTMIN | Closed |
| | Yes | OFF | OFF | LOW | 0v/Off | 0v/Off | VENTMIN | Closed |
| | | ON | OFF | LOW | 0v/Off | 0v/Off | VENTMIN to Full-Open | Closed to Full-Open |
| | | ON | ON | HIGH | 24v/On | 0v/Off | VENTMIN to Full-Open | Closed to Full-Open |
| Above CO ₂ Set | No | OFF | OFF | LOW | 0v/Off | 0v/Off | VENTMIN to VENTMAX | Closed |
| | | ON | OFF | LOW | 24v/On | 0v/Off | VENTMIN to VENTMAX | Closed |
| | | ON | ON | HIGH | 24v/On | 24v/On | VENTMIN to VENTMAX | Closed |
| | Yes | OFF | OFF | LOW | 0v/Off | 0v/Off | VENTMIN to VENTMAX | Closed |
| | | ON | OFF | LOW | 0v/Off | 0v/Off | VENTMIN to Full-Open | Closed to Full-Open |
| | | ON | ON | HIGH | DELAY* 24v/On | 0v/Off* | VENTMIN to Full-Open | Closed to Full-Open |

*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.

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 71 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 30 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 71 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.

TWO-SPEED FAN OPERATION

The W7220 controller has the capability to work with a system using a 2-speed supply fan. The W7220 does not control the supply directly but uses the following input status to determine the speed of the supply fan and controls the OA damper to the required position, see Table 29.

Table 29 — Fan Speed

| STATE | FAN SPEED |
|-------|-----------|
| OCC | Low |
| Y1 | Low |
| Y2 | High |
| W | High |

The W (heating mode) is not controlled by the W7220 but it requires the status to know where to position the OA damper for minimum position for the fan speed.

The 2-speed fan delay is available when the system is programmed for 2-speed fan (in the System Setup menu item). The 2-speed fan delay is defaulted to 5 minutes and can be changed in the Advanced Setup menu item. When the unit has a call for Y1 In and in the free cooling mode and there is a call for Y2 In, the 2-speed fan delay starts and the OA damper will modulate 100% open, the supply fan should be set to high speed by the unit controller.

After the delay, one of two actions will happen:

- The Y2 In call will be satisfied with the damper 100% open and fan on high speed and the call will turn off

OR

- If the call for additional cooling in the space has not been satisfied, then the first stage of mechanical cooling will be enabled through Y1 Out or Y2 Out.

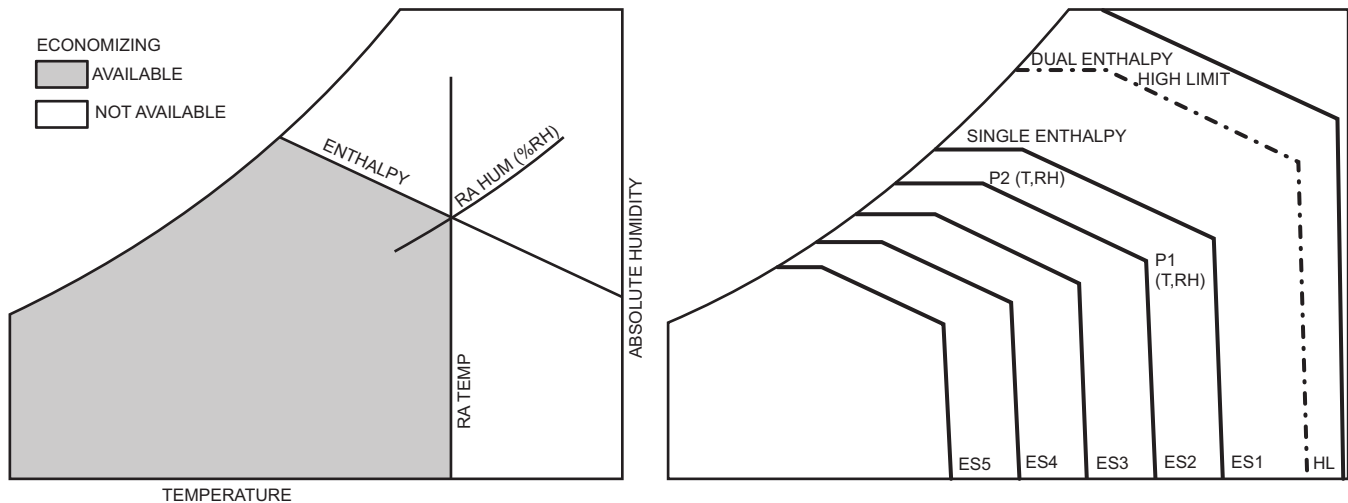


Fig. 71 — Single Enthalpy Curve Boundaries

Table 30 — Single Enthalpy and Dual Enthalpy High Limit Curves

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

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 46.

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 19) 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 46.

Checkout Tests

Use the Checkout menu (see page 50) 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 46.

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.

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage. Be sure to allow enough time for compressor start-up and shutdown between checkout tests so that you do not short-cycle the compressors.

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.

PRE-START-UP / START-UP

WARNING

PERSONAL INJURY HAZARD

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

1. Follow recognized safety practices and wear approved Personal Protective Equipment (PPE), including safety glasses and gloves when checking or servicing refrigerant system.
2. Do not use a torch to remove any component. System contains oil and refrigerant under pressure. To remove a component, wear PPE and proceed as follows:
 - a. Shut off all electrical power to unit. Apply applicable lockout/tag-out procedures.
 - b. Recover refrigerant to relieve all pressure from system using both high-pressure and low pressure ports.
 - c. Do not use a torch. Cut component connection tubing with tubing cutter and remove component from unit.
 - d. Carefully un-sweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.
3. Do not operate compressor or provide any electric power to unit unless compressor terminal cover is in place and secured.
4. Do not remove compressor terminal cover until all electrical power is disconnected and approved lockout/tag-out procedures are in place.
5. Relieve all pressure from system before touching or disturbing anything inside terminal box whenever refrigerant leak is suspected around compressor terminals.
6. Never attempt to repair a soldered connection while refrigerant system is under pressure.

WARNING

ELECTRICAL OPERATION HAZARD

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

The unit must be electrically grounded in accordance with local codes and NEC ANSI/NFPA 70 (American National Standards Institute/National Fire Protection Association).

Proceed as follows to inspect and prepare the unit for initial start-up:

1. Remove all access panels.
2. Read and follow instructions on all WARNING, CAUTION, and INFORMATION labels attached to, or shipped with, unit.

WARNING

PERSONAL INJURY AND ENVIRONMENTAL HAZARD

Failure to follow this warning could cause personal injury or death.

Relieve pressure and recover all refrigerant before system repair or final unit disposal.

Wear safety glasses and gloves when handling refrigerants. Keep torches and other ignition sources away from refrigerants and oils.

3. Perform the following inspections:
 - a. Inspect for shipping and handling damages such as broken lines, loose parts, or disconnected wires, etc.
 - b. Inspect for oil at all refrigerant tubing connections and on unit base. Detecting oil generally indicates a refrigerant leak. Leak-test all refrigerant tubing connections using electronic leak detector, halide torch, or liquid-soap solution.
 - c. Inspect all field-wiring and factory-wiring connections. Ensure all connections are completed and tight. Ensure all electrical wires are not in contact with refrigerant tubing or sharp edges.
 - d. Inspect coil fins. If damaged during shipping and handling, carefully straighten fins with a fin comb.
4. Verify the following conditions:
 - a. Ensure that condenser-fan blades are correctly positioned in fan orifice. See Condenser-Fan Adjustment section for more details.
 - b. Ensure all air filters are in place.
 - c. Ensure that condensate drain trap is filled with water to ensuring proper drainage.
 - d. Ensure that all tools and miscellaneous loose parts have been removed.

START-UP, GENERAL

IMPORTANT: Follow the base unit's start-up sequence as described in the unit's installation instructions.

In addition to the base unit start-up, there are a few steps needed to properly start-up the controls. RTU-OPEN's Service Test function should be used to assist in the base unit start-up and also allows verification of output operation. Controller configuration is also part of start-up. This is especially important when field accessories have been added to the unit. The factory pre-configures options installed at the factory. There may also be additional installation steps or inspection required during the start-up process.

Additional Installation/Inspection

Inspect the field installed accessories for proper installation, making note of which ones do or do not require configuration changes. Inspect the RTU-OPEN's Alarms for initial insight to any potential issues. See troubleshooting section for alarms. Inspect the SAT sensor for relocation as intended during installation. Inspect special wiring as directed in the following sections.

UNIT PREPARATION

Ensure the unit has been installed in accordance with installation instructions and applicable codes.

RETURN-AIR FILTERS

Ensure the correct filters are installed in the unit (see Appendix B). Do not operate unit without return-air filters in place.

OUTDOOR-AIR INLET SCREENS

Outdoor-air inlet screen must be in place before operating unit.

COMPRESSOR MOUNTING

Compressors are internally spring mounted. Do not loosen or remove compressor hold down bolts.

INTERNAL WIRING

Check all electrical connections in unit control boxes. Tighten as required.

COMPRESSOR ROTATION

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution can result in premature wear and damage to equipment.

Scroll compressors can only compress refrigerant if rotating in the right direction. Reverse rotation for extended times can result in internal damage to the compressor. Scroll compressors are sealed units and cannot be repaired on site location.

On 3-phase units with scroll compressors, it is important to be certain compressor is rotating in the proper direction. To determine whether or not compressor is rotating in the proper direction:

1. Connect service gages to suction and discharge pressure fittings.
2. Energize the compressor.
3. The suction pressure should drop and the discharge pressure should rise, as is normal on any start-up.

If the suction pressure does not drop and the discharge pressure does not rise to normal levels:

1. Note that the evaporator fan is probably also rotating in the wrong direction.
2. Turn off power to the unit and apply lockout/tag-out procedures.
3. Reverse any two of the unit power leads.
4. Re-energize to the compressor. Check pressures.

The suction and discharge pressure levels should now move to their normal start-up levels.

NOTE: When the compressor is rotating in the wrong direction, the unit will make an elevated level of noise and will not provide cooling.

REFRIGERANT SERVICE PORTS

Each unit system has two 1/4-in. SAE flare (with check valves) service ports: one on the suction line, and one on the compressor discharge line. Be sure that caps on the ports are tight.

COOLING

Set space thermostat to OFF position. To start unit, turn on main power supply. Set system selector switch at COOL position and fan switch to AUTO. position. Adjust thermostat to a setting below room temperature. Compressor starts on closure of contactor. (Second stage of thermostat will energize Circuit 2 contactor, start Compressor 2.)

Check unit charge. Refer to Refrigerant Charge section.

Reset thermostat at a position above room temperature. Compressor will shut off. Evaporator fan will shut off after a 60 second delay if the dip switch for the indoor fan off delay on the Defrost Control Board (DFB) is set to on.

To shut off unit - set system selector switch to the OFF position. Resetting thermostat at a position above room temperature shuts the unit off temporarily until space temperature exceeds thermostat setting.

HEATING

To start unit, turn on main power supply.

Set system selector switch to the HEAT position and set thermostat at a setting above room temperature. Set fan to AUTO position.

First stage of thermostat energizes compressor heating (both compressors will start). Second stage of thermostat energizes electric heaters (if installed). Check heating effects at air supply grille(s).

If electric heaters do not energize, reset limit switch (located on supply-fan scroll) by pressing button located between terminals on the switch.

Shut unit off - set system selector switch to the OFF position. Resetting thermostat at a position below room temperature temporarily shuts unit off until space temperature falls below thermostat setting.

VENTILATION (CONTINUOUS FAN)

Set fan and system selector switches at ON and OFF positions, respectively. Supply fan operates continuously to provide constant air circulation.

START-UP, PREMIERLINK CONTROLS

NOTICE: SET-UP INSTRUCTIONS

All set-up and set point configurations are factory set and field-adjustable.

Refer to the PremierLink Installation, Start-Up and Configuration Instructions for specific operating instructions for the controller. Have a copy of this manual available at unit start-up.

START-UP, RTU-OPEN CONTROLS

NOTICE: SET-UP INSTRUCTIONS

Refer to the following manuals for additional installation, wiring and troubleshooting information for the RTU-OPEN Controller: "Controls, Start-up, Operation and Troubleshooting Instructions," "RTU Open Installation and Start-up Guide" and "RTU-Open Integration Guide". Have a copy of these manuals available at unit start-up.

FASTENER TORQUE VALUES

Table 31 — Torque Values

| LOCATION | TORQUE VALUES |
|---|--|
| Supply fan motor mounting | 120 in.-lb (13.6 Nm) ± 12 in.-lb (1.4Nm) |
| Supply fan motor adjustment plate | 120 in.-lb (13.6 Nm) ± 12 in.-lb (1.4Nm) |
| Motor pulley setscrew | 72 in.-lb (8.1 Nm) ± 5 in.-lb (0.6 Nm) |
| Fan pulley setscrew | 72 in.-lb (8.1 Nm) ± 5 in.-lb (0.6 Nm) |
| Blower wheel hub setscrew | 72 in.-lb (8.1 Nm) ± 5 in.-lb (0.6 Nm) |
| Bearing locking collar setscrew | 50 in.-lb (6.2 Nm) -60 in.-lb (6.8 Nm) |
| Compressor mounting bolts | 65 in.-lb (7.3 Nm) -75 in.-lb (8.5Nm) |
| Condenser fan motor mounting bolts | 20 in.-lb (2.3 Nm) ± 2 in.-lb 0.2 Nm) |
| Condenser fan hub setscrew | 84 in.-lb (9.5 Nm) ± 12 in.-lb (1.4 Nm) |

APPENDIX A — MODEL NUMBER NOMENCLATURE

| | | | | | | | | | | | | | | | | | | |
|-----------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|
| Position: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| Example: | 5 | 0 | T | C | Q | D | 2 | 4 | A | 1 | A | 6 | - | 0 | A | 0 | A | 0 |

Unit Heat Type

50 - Electric Heat
Packaged Rooftop

Model Series - WeatherMaker®

TC - Standard Efficiency

Heat Options

Q = Heat Pump

Refrig. Systems Options

D = Two stage cooling models

Cooling Tons

17 - 15 ton
24 - 20 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 (electromech. controls only)
 K = Condensate Overflow Switch and RA Smoke Detector
 L = Condensate Overflow Switch and RA + SA Smoke Detector

Indoor Fan Options

1 = Standard Static Option, Vertical
 2 = Medium Static Option, Vertical
 3 = High Static Option, Vertical
 B = Medium Static, High Efficiency Motor, Vertical
 C = High Static, High Efficiency Motor, Vertical

 5 = Standard Static Option, Horizontal*
 6 = Medium Static Option, Horizontal
 7 = High Static Option, Horizontal
 F = Medium Static, High Efficiency Motor, Horizontal
 G = High Static, High Efficiency Motor, Horizontal

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

Packing

0 = Standard

Electrical Options

A = None
 C = Non-Fused Disconnect
 G = 2-Speed Indoor Fan (VFD) Controller
 Standard USA models - (SAV) included
 J = 2-Speed Fan Controller (VFD) and
 Non-Fused Disconnect

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 w/ Barometric Relief
 F = Enthalpy Economizer w/ Barometric Relief
 K = 2-Position Damper
 U = Temperature Ultra Low Leak Economizer
 w/ Barometric Relief
 V = Temperature Ultra Low Leak Economizer
 w/ PE (cent) - Vertical Air Only
 W = Enthalpy Ultra Low Leak Economizer
 w/ Barometric Relief
 X = Enthalpy Ultra Low Leak Economizer
 w/ PE (cent) - Vertical Air Only

Base Unit Controls

0 = Base Electromechanical Controls (can be used
 with W7212 EconoMiSer IV [Non-Fault Detection
 and Diagnostic])
 1 = PremierLink™ Controller
 2 = RTU Open Multi-Protocol Controller
 6 = Electromechanical with 2-Speed Fan and
 W7220 Economizer Controller (can be used with
 W7220 EconoMiSer X [with Fault Detection and
 Diagnostic])

Design Revision

- = Factory Assigned

Voltage

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

* Not available on horizontal 50TCQ 24 units.

Fig. A — 50TCQ*17-24 Model Number Nomenclature

APPENDIX B — PHYSICAL DATA

Table A — Physical Data (Cooling), 15 and 20 Tons — Round Tube/plate Fin (RTPF) Coil Design

| | | 50TCQD17 | 50TCQD24 |
|---------------------------------------|------------------------------------|-----------------|---------------------------|
| REFRIGERATION SYSTEM | | | |
| | # Circuits / # Comp. / Type | 2 / 2 / Scroll | 2 / 2 Scroll |
| | R-410A charge A/B (lbs) | 16.0 / 16.5 | 23.4 / 23.4 |
| | Metering device | TXV | TXV |
| | High-press. Trip / Reset (psig) | 630 / 505 | 630 / 505 |
| | Low-press. Trip / Reset (psig) | 24 / 45 | 24 / 45 |
| EVAP. COIL | | | |
| | Material | Cu / Al | Cu / Al |
| | Tube Diameter | 3/8-in. | 3/8-in. |
| | Rows / FPI | 3 / 15 | 4 / 15 |
| | Total face area (ft ²) | 19.56 | 22 |
| | Condensate drain conn. size | 3/4-in. | 3/4-in. |
| EVAP. FAN AND MOTOR — VERTICAL | | | |
| STANDARD STATIC | Motor Qty. / Drive Type | 1 / Belt | 1 / Belt |
| | Max BHP | 2.9 | 4.9 |
| | RPM range | 514-680 | 690-863 |
| | Motor frame size | 56 | 56 |
| | Fan Qty. / Type | 2 / Centrifugal | 2 / Centrifugal |
| | Fan Diameter (in.) | 15 X 15 | 15 X 15 |
| MEDIUM STATIC | Motor Qty. / Drive Type | 1 / Belt | — |
| | Max BHP | 3.7 | — |
| | RPM range | 679-863 | — |
| | Motor frame size | 56 | — |
| | Fan Qty. / Type | 2 / Centrifugal | — |
| | Fan Diameter (in.) | 15 X 15 | — |
| HIGH STATIC | Motor Qty. / Drive Type | 1 / Belt | — |
| | Max BHP | 4.9 | — |
| | RPM range | 826-1029 | — |
| | Motor frame size | 56 | — |
| | Fan Qty. / Type | 2 / Centrifugal | — |
| | Fan Diameter (in.) | 15 x 15 | — |
| MEDIUM STATIC - HIGH EFF. | Motor Qty. / Drive Type | — | 1 / Belt |
| | Max BHP | — | 6.5 / 6.9 / 7.0 / 8.3 |
| | RPM range | — | 835-1021 |
| | Motor frame size | — | 184T |
| | Fan Qty. / Type | — | 2 / Centrifugal |
| | Fan Diameter (in.) | — | 15 x 15 |
| HIGH STATIC - HIGH EFF. | Motor Qty. / Drive Type | — | 1 / Belt |
| | Max BHP | — | 10.5 / 11.9 / 11.9 / 11.0 |
| | RPM range | — | 941-1176 |
| | Motor frame size | — | 213T |
| | Fan Qty. / Type | — | 2 / Centrifugal |
| | Fan Diameter (in.) | — | 15 x 15 |

APPENDIX B — PHYSICAL DATA

Table A — Physical Data (Cooling), 15 and 20 Tons — Round Tube/plate Fin (RTPF) Coil Design (cont)

| EVAP. FAN AND MOTOR — HORIZONTAL | | 50TCQD17 | 50TCQD24 |
|--|------------------------------------|-------------------|---------------------------|
| STANDARD STATIC | Motor Qty. / Drive Type | 1 / Belt | — |
| | Max BHP | 3.7 | — |
| | RPM range | 514-680 | — |
| | Motor frame size | 56 | — |
| | Fan Qty. / Type | 2 / Centrifugal | — |
| | Fan Diameter (in.) | 18 x 15 / 15 x 11 | — |
| MEDIUM STATIC | Motor Qty. / Drive Type | 1 / Belt | — |
| | Max BHP | 3.7 | — |
| | RPM range | 614-780 | — |
| | Motor frame size | 56 | — |
| | Fan Qty. / Type | 2 / Centrifugal | — |
| | Fan Diameter (in.) | 18 x 15 / 15 x 11 | — |
| HIGH STATIC | Motor Qty. / Drive Type | 1 / Belt | — |
| | Max BHP | 4.9 | — |
| | RPM range | 746-912 | — |
| | Motor frame size | 56 | — |
| | Fan Qty. / Type | 2 / Centrifugal | — |
| | Fan Diameter (in.) | 18 x 15 / 15 x 11 | — |
| STANDARD STATIC - HIGH EFF. | Motor Qty. / Drive Type | — | 1 / Belt |
| | Max BHP | — | 6.5 / 6.9 / 7.0 / 8.3 |
| | RPM range | — | 690-863 |
| | Motor frame size | — | 184T |
| | Fan Qty. / Type | — | 2 / Centrifugal |
| | Fan Diameter (in.) | — | 18 x 15 / 15 x 11 |
| MEDIUM STATIC - HIGH EFF. | Motor Qty. / Drive Type | — | 1 / Belt |
| | Max BHP | — | 6.5 / 6.9 / 7.0 / 8.3 |
| | RPM range | — | 835-1021 |
| | Motor frame size | — | 184T |
| | Fan Qty. / Type | — | 2 / Centrifugal |
| | Fan Diameter (in.) | — | 18 x 15 / 15 x 11 |
| HIGH STATIC - HIGH EFF. | Motor Qty. / Drive Type | — | 1 / Belt |
| | Max BHP | — | 10.5 / 11.9 / 11.9 / 11.0 |
| | RPM range | — | 941-1176 |
| | Motor frame size | — | 213T |
| | Fan Qty. / Type | — | 2 / Centrifugal |
| | Fan Diameter (in.) | — | 18 x 15 / 15 x 11 |
| CONDENSER COIL (CIRCUIT A) | | | |
| | Coil Type | RTPF | RTPF |
| | Coil Length (in) | 70 | 82 |
| | Coil Height (in) | 44 | 44 |
| | Rows / FPI | 2 Rows / 18 FPI | 2 Rows / 18 FPI |
| | Total face area (ft ²) | 21.4 | 25.1 |
| CONDENSER COIL (CIRCUIT B) | | | |
| | Coil Type | RTPF | RTPF |
| | Coil Length (in) | 70 | 82 |
| | Coil Height (in) | 44 | 44 |
| | Rows / FPI | 2 Rows / 17 FPI | 2 Rows / 17 FPI |
| | Total face area (ft ²) | 21.4 | 25.1 |
| CONDENSER FAN / MOTOR | | | |
| | Qty. / Motor Drive Type | 3 / direct | 4 / direct |
| | Motor HP / RPM | 1/4 / 1100 | 1/4 1100 |
| | Fan Diameter (in.) | 22 | 22 |
| FILTERS | | | |
| | RA Filter # / size (in.) | 6 / 20 x 25 x 2 | 6 / 20 x 25 x 2 |
| | OQ Inlet Screen # / size (in.) | 4 / 16 x 25 x 1 | 4 / 16 x 25 x 1 |

APPENDIX C — FAN PERFORMANCE

Table B — 50TCQD17 — 15 TON VERTICAL SUPPLY/RETURN

| CFM | AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG) | | | | | | | | | |
|------|---|-------------|-----|------|-----|------|-----|------|-----|------|
| | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| 4500 | 436 | 0.60 | 529 | 0.89 | 611 | 1.20 | 684 | 1.54 | 749 | 1.90 |
| 4900 | 458 | 0.72 | 546 | 1.02 | 625 | 1.36 | 696 | 1.72 | 760 | 2.09 |
| 5250 | 479 | 0.85 | 561 | 1.16 | 638 | 1.51 | 708 | 1.88 | 771 | 2.27 |
| 5650 | 503 | 1.01 | 580 | 1.33 | 654 | 1.70 | 721 | 2.09 | 784 | 2.50 |
| 6000 | 525 | 1.17 | 598 | 1.50 | 668 | 1.88 | 734 | 2.28 | 795 | 2.71 |
| 6400 | 551 | 1.38 | 619 | 1.72 | 686 | 2.11 | 750 | 2.53 | 810 | 2.97 |
| 6750 | 574 | 1.58 | 638 | 1.93 | 702 | 2.33 | 764 | 2.76 | 822 | 3.22 |
| 7150 | 601 | 1.84 | 661 | 2.20 | 722 | 2.61 | 781 | 3.06 | 838 | 3.53 |
| 7500 | 625 | 2.09 | 682 | 2.46 | 740 | 2.88 | 797 | 3.34 | 852 | 3.82 |

| CFM | AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG) | | | | | | | | | |
|------|---|------|-----|------|-----|------|-------------|-------------|-------------|-------------|
| | 1.2 | | 1.4 | | 1.6 | | 1.8 | | 2.0 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| 4500 | 808 | 2.27 | 864 | 2.66 | 916 | 3.06 | 965 | 3.48 | <i>1012</i> | <i>3.92</i> |
| 4900 | 819 | 2.48 | 874 | 2.89 | 926 | 3.31 | 975 | 3.74 | <i>1021</i> | <i>4.19</i> |
| 5250 | 829 | 2.68 | 884 | 3.10 | 935 | 3.53 | 983 | 3.98 | <i>1029</i> | <i>4.44</i> |
| 5650 | 841 | 2.92 | 895 | 3.36 | 946 | 3.81 | 994 | 4.28 | <i>1040</i> | <i>4.76</i> |
| 6000 | 852 | 3.15 | 906 | 3.61 | 956 | 4.04 | 1003 | 4.56 | — | — |
| 6400 | 865 | 3.43 | 918 | 3.91 | 968 | 4.40 | <i>1015</i> | <i>4.90</i> | — | — |
| 6750 | 878 | 3.70 | 929 | 4.19 | 979 | 4.69 | — | — | — | — |
| 7150 | 892 | 4.03 | 943 | 4.53 | — | — | — | — | — | — |
| 7500 | 905 | 4.33 | 955 | 4.86 | — | — | — | — | — | — |

LEGEND

- STD Static - 514-680 RPM, 2.9 Max BHP
- MED Static - 679-863 RPM, 3.7 Max BHP
- HIGH Static - 826-1009 RPM, 4.9 Max BHP
- Outside operating range
- ITALIC* — Requires high static drive package with different motor pulley
- BOLD** — Requires alternate standard static drive package

APPENDIX C — FAN PERFORMANCE

Table C — 50TCQD17 — 15 TON HORIZONTAL SUPPLY/RETURN

| CFM | AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG) | | | | | | | | | |
|------|---|------|-----|------|-----|------|-----|------|-----|------|
| | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| 4500 | 472 | 1.04 | 549 | 1.12 | 616 | 2.03 | 676 | 2.59 | 731 | 3.19 |
| 4900 | 500 | 1.26 | 573 | 1.40 | 638 | 2.30 | 696 | 2.89 | 750 | 3.51 |
| 5250 | 525 | 1.48 | 595 | 1.60 | 658 | 2.57 | 715 | 3.18 | 767 | 3.82 |
| 5650 | 554 | 1.76 | 620 | 1.82 | 681 | 2.90 | 736 | 3.54 | 787 | 4.21 |
| 6000 | 580 | 2.04 | 643 | 2.10 | 702 | 3.22 | 756 | 3.88 | 806 | 4.58 |
| 6400 | 610 | 2.39 | 670 | 2.41 | 727 | 3.64 | 779 | 4.32 | — | — |
| 6750 | 636 | 2.74 | 695 | 2.70 | 749 | 4.03 | 800 | 4.74 | — | — |
| 7150 | 667 | 3.18 | 723 | 3.02 | 775 | 4.52 | — | — | — | — |
| 7500 | 694 | 3.60 | 748 | 3.42 | — | — | — | — | — | — |

| CFM | AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG) | | | | | | | | | |
|------|---|------|-----|------|-----|-----|-----|-----|-----|-----|
| | 1.2 | | 1.4 | | 1.6 | | 1.8 | | 2.0 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| 4500 | 781 | 3.81 | 828 | 4.46 | — | — | — | — | — | — |
| 4900 | 799 | 4.17 | 845 | 4.84 | — | — | — | — | — | — |
| 5250 | 816 | 4.49 | — | — | — | — | — | — | — | — |
| 5650 | — | — | — | — | — | — | — | — | — | — |
| 6000 | — | — | — | — | — | — | — | — | — | — |
| 6400 | — | — | — | — | — | — | — | — | — | — |
| 6750 | — | — | — | — | — | — | — | — | — | — |
| 7150 | — | — | — | — | — | — | — | — | — | — |
| 7500 | — | — | — | — | — | — | — | — | — | — |

LEGEND

- STD Static - 514-680 RPM, 3.7 Max BHP
- MED Static - 614-780 RPM, 3.7 Max BHP
- HIGH Static - 746-912 RPM, 4.9 Max BHP
- — Outside operating range

APPENDIX C — FAN PERFORMANCE

Table D — 50TCQD24 — 20 TON VERTICAL SUPPLY/RETURN

| CFM | AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG) | | | | | | | | | |
|-------|---|------|-----|------|-----|------|-----|------|-----|------|
| | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| 6000 | 519 | 1.13 | 609 | 1.48 | 682 | 1.80 | 747 | 2.13 | 806 | 2.46 |
| 6500 | 545 | 1.36 | 633 | 1.75 | 705 | 2.11 | 768 | 2.46 | 826 | 2.82 |
| 7000 | 571 | 1.63 | 658 | 2.06 | 728 | 2.45 | 791 | 2.83 | 847 | 3.21 |
| 7500 | 597 | 1.93 | 683 | 2.40 | 753 | 2.83 | 814 | 3.24 | 869 | 3.65 |
| 8000 | 624 | 2.27 | 709 | 2.78 | 777 | 3.25 | 837 | 3.69 | 892 | 4.13 |
| 8500 | 650 | 2.64 | 734 | 3.20 | 802 | 3.71 | 861 | 4.19 | 915 | 4.66 |
| 9000 | 677 | 3.05 | 760 | 3.67 | 827 | 4.21 | 886 | 4.73 | 939 | 5.23 |
| 9500 | 703 | 3.50 | 786 | 4.17 | 853 | 4.76 | 910 | 5.31 | 963 | 5.85 |
| 10000 | 730 | 3.99 | 813 | 4.73 | 878 | 5.36 | 935 | 5.95 | 987 | 6.52 |

| CFM | AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG) | | | | | | | | | |
|-------|---|------|------|------|------|------|------|------|-------------|-------------|
| | 1.2 | | 1.4 | | 1.6 | | 1.8 | | 2.0 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| 6000 | 861 | 2.80 | 912 | 3.15 | 962 | 3.50 | 1008 | 3.86 | 1053 | 4.23 |
| 6500 | 880 | 3.18 | 930 | 3.55 | 978 | 3.92 | 1024 | 4.30 | 1068 | 4.69 |
| 7000 | 900 | 3.60 | 949 | 3.99 | 996 | 4.38 | 1041 | 4.78 | 1085 | 5.19 |
| 7500 | 921 | 4.06 | 969 | 4.47 | 1016 | 4.89 | 1060 | 5.31 | 1102 | 5.74 |
| 8000 | 943 | 4.57 | 990 | 5.00 | 1036 | 5.44 | 1079 | 5.89 | 1121 | 6.34 |
| 8500 | 965 | 5.12 | 1012 | 5.58 | 1056 | 6.05 | 1099 | 6.52 | 1140 | 6.99 |
| 9000 | 988 | 5.72 | 1034 | 6.21 | 1078 | 6.70 | 1120 | 7.19 | 1160 | 7.69 |
| 9500 | 1011 | 6.37 | 1057 | 6.89 | 1100 | 7.41 | 1141 | 7.93 | <i>1181</i> | <i>8.45</i> |
| 10000 | 1035 | 7.07 | 1080 | 7.62 | 1123 | 8.17 | 1163 | 8.72 | — | — |

LEGEND

- STD Static - 690-863 RPM, Max BHP 4.9
- MED Static - 835-1021 RPM
Voltage 208v / 230v / 460v / 575v
Max BHP 6.5 / 6.9 / 7.0 / 8.3
- HIGH Static - 941-1176 RPM
Voltage 208v / 230v / 460v / 575v
Max BHP 10.5 / 11.9 / 11.9 / 11.0
- — Outside operating range
- BOLD** — Requires alternate standard static drive package
- ITALIC* — Requires high static drive package with different motor pulley

APPENDIX C — FAN PERFORMANCE

Table E — 50TCQD24 — 20 TON HORIZONTAL SUPPLY/RETURN

| CFM | AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG) | | | | | | | | | |
|-------|---|-------------|------------|-------------|------------|-------------|------------|-------------|------------|-------------|
| | 0.2 | | 0.4 | | 0.6 | | 0.8 | | 1.0 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| 6000 | 580 | 2.04 | 643 | 2.61 | 702 | 3.22 | 756 | 3.88 | 806 | 4.58 |
| 6500 | 617 | 2.49 | 677 | 3.09 | 733 | 3.74 | 785 | 4.44 | 833 | 5.17 |
| 7000 | 656 | 3.01 | 712 | 3.65 | 765 | 4.33 | 815 | 5.06 | 862 | 5.82 |
| 7500 | 694 | 3.60 | 748 | 4.28 | 798 | 5.00 | 846 | 5.76 | 891 | 6.55 |
| 8000 | 733 | 4.28 | 784 | 4.99 | 832 | 5.74 | 878 | 6.53 | 922 | 7.36 |
| 8500 | 773 | 5.04 | 821 | 5.78 | 867 | 6.57 | 911 | 7.40 | 953 | 8.26 |
| 9000 | 813 | 5.89 | 859 | 6.67 | 902 | 7.49 | 945 | 8.35 | 985 | 9.25 |
| 9500 | 853 | 6.83 | 896 | 7.65 | 939 | 8.51 | 979 | 9.40 | 1018 | 10.33 |
| 10000 | 893 | 7.88 | 935 | 8.73 | 975 | 9.63 | — | — | — | — |

| CFM | AVAILABLE EXTERNAL STATIC PRESSURE (IN. WG) | | | | | | | | | |
|-------|---|-------------|------------|-------------|------------|-------------|------------|-------------|------|-------|
| | 1.2 | | 1.4 | | 1.6 | | 1.8 | | 2.0 | |
| | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP | RPM | BHP |
| 6000 | 853 | 5.31 | 897 | 6.06 | 939 | 6.84 | 979 | 7.64 | 1017 | 8.47 |
| 6500 | 879 | 5.93 | 922 | 6.71 | 963 | 7.52 | 1002 | 8.36 | 1040 | 9.22 |
| 7000 | 906 | 6.61 | 948 | 7.43 | 988 | 8.28 | 1027 | 9.15 | 1064 | 10.05 |
| 7500 | 934 | 7.38 | 975 | 8.23 | 1015 | 9.11 | 1052 | 10.02 | — | — |
| 8000 | 963 | 8.22 | 1003 | 9.11 | 1042 | 10.02 | — | — | — | — |
| 8500 | 993 | 9.15 | 1032 | 10.07 | — | — | — | — | — | — |
| 9000 | 1024 | 10.17 | — | — | — | — | — | — | — | — |
| 9500 | — | — | — | — | — | — | — | — | — | — |
| 10000 | — | — | — | — | — | — | — | — | — | — |

LEGEND

- STD Static - 690-863 RPM; Voltage 208v / 230v / 460v / 575v; Max BHP 6.5 / 6.9 / 7.0 / 8.3
- MED Static – 835-1021 RPM; Voltage 208v / 230v / 460v / 575v; Max BHP 6.5 / 6.9 / 7.0 / 8.3
- HIGH Static – 941-1176 RPM; Voltage 208v / 230v / 460v / 575v ;Max BHP 10.5 / 11.9 / 11.9 / 11.0
- Outside operating range
- BOLD** — Units exceeding Max BHP of unit voltage require a field supplied drive; changes with high static require blower pulley KR51BL017 (805-1007)
- Underscore** — Field supplied drive changes with standard motor required: blower pulley KR51BN615 and belt KR29BF052 (598-731)

Table F — Pulley Adjustment - Vertical Airflow

| UNIT | | MOTOR/DRIVE COMBO | MOTOR PULLEY TURNS OPEN | | | | | | | | | | |
|------|---------|-------------------|-------------------------|------|------|------|------|------|-------------|------|-----|-----|-----|
| | | | 0 | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 |
| 17 | 3 phase | Standard Static | 680 | 663 | 647 | 630 | 614 | 597 | 580 | 564 | 547 | 531 | 514 |
| | | Medium Static | 863 | 845 | 826 | 808 | 789 | 771 | 753 | 734 | 716 | 697 | 679 |
| | | High Static | 1009 | 991 | 972 | 954 | 936 | 918 | 899 | 881 | 863 | 844 | 826 |
| 24 | 3 phase | Standard Static | 863 | 846 | 828 | 811 | 794 | 777 | 759 | 742 | 725 | 707 | 690 |
| | | Medium Static | 1021 | 1002 | 984 | 965 | 947 | 928 | 909 | 891 | 872 | 854 | 835 |
| | | High Static | 1176 | 1153 | 1129 | 1106 | 1082 | 1059 | 1035 | 1012 | 988 | 965 | 941 |

NOTE: Do not adjust pulley further than five turns open.

Factory setting

Table G — Pulley Adjustment - Horizontal Airflow

| UNIT | | MOTOR/DRIVE COMBO | MOTOR PULLEY TURNS OPEN | | | | | | | | | | |
|------|---------|-------------------|-------------------------|------|------|------|------|------|-------------|------|-----|-----|-----|
| | | | 0 | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 | 4.5 | 5 |
| 17 | 3 phase | Standard Static | 680 | 663 | 647 | 630 | 614 | 597 | 580 | 564 | 547 | 531 | 514 |
| | | Medium Static | 780 | 763 | 747 | 730 | 714 | 697 | 680 | 664 | 647 | 631 | 614 |
| | | High Static | 912 | 895 | 879 | 862 | 846 | 829 | 812 | 796 | 779 | 763 | 746 |
| 24 | 3 phase | Standard Static | — | — | — | — | — | — | — | — | — | — | — |
| | | Medium Static | 1021 | 1002 | 984 | 965 | 947 | 928 | 909 | 891 | 872 | 854 | 835 |
| | | High Static | 1176 | 1153 | 1129 | 1106 | 1082 | 1059 | 1035 | 1012 | 988 | 965 | 941 |

NOTE: Do not adjust pulley further than five turns open.

Factory setting

APPENDIX D — WIRING DIAGRAMS

Table H — Unit Wiring Diagrams

| UNIT SIZE | VOLTAGE | CONTROL | POWER |
|------------|--------------|-----------------------------|-----------------------------|
| D17 | 208/230-3-60 | 50HE500937 - G (page 68) | 50HE500894 - L (page 69) |
| | 460-3-60 | | 50HE500895 - L (page 70) |
| | 575-3-60 | | |
| D24 | 208/230-3-60 | 50HE500937 - G (page 68) | 50HE500894 - L (page 69) |
| | 460-3-60 | | 50HE500895 - L (page 70) |
| | 575-3-60 | | |
| ALL | RTU-Open* | 50HE501687 - C (page 71) | |
| ALL | PremierLink* | 50HE500891 - F (page 72) | |

NOTE: Component arrangement on Control; Legend on Power Schematic.

* PremierLink and RTU-OPEN control labels overlay a portion of the base unit control label. The base unit label drawing and the control option drawing are required to provide a complete unit control diagram.

APPENDIX D — WIRING DIAGRAMS

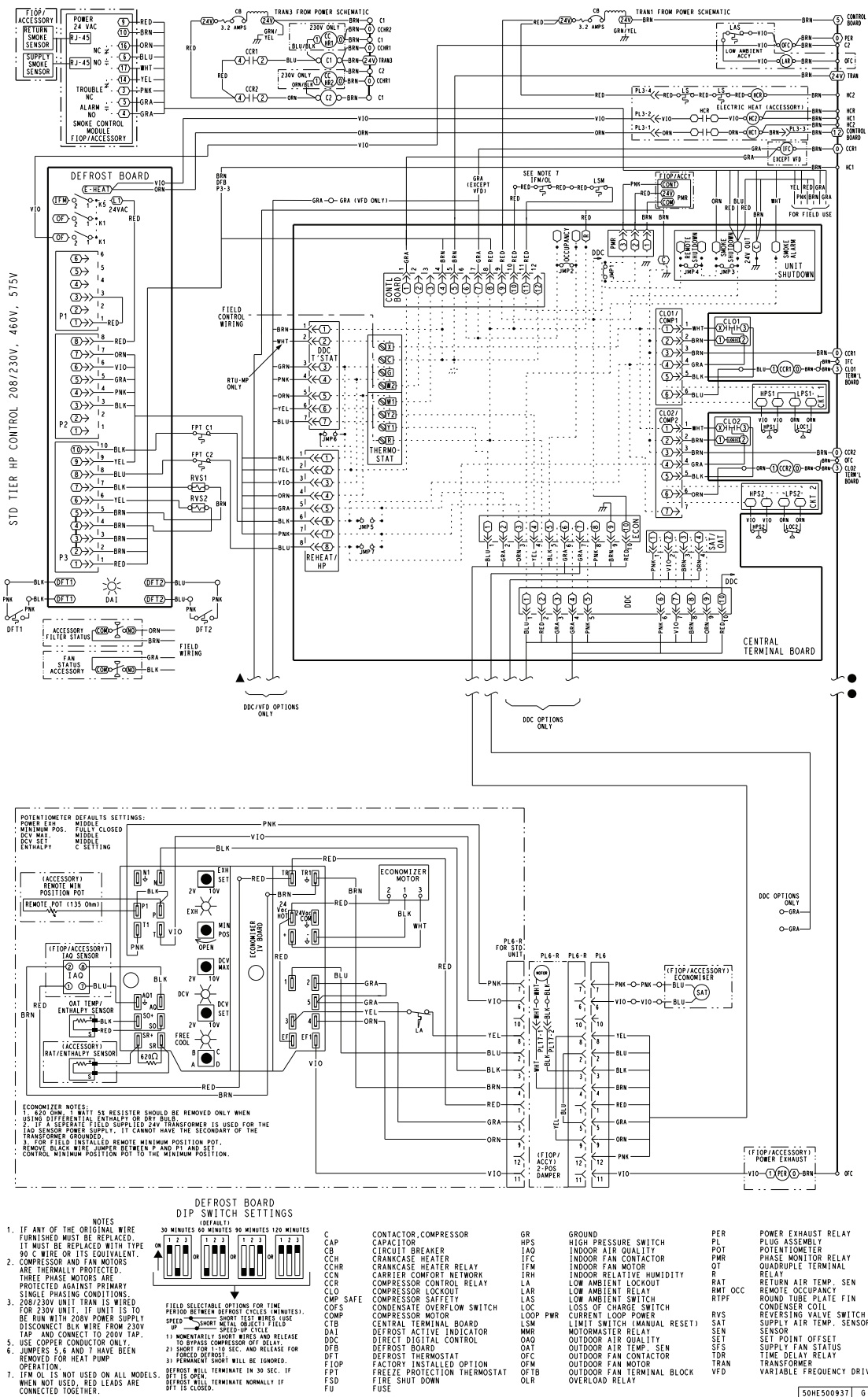


Fig. B — 50TCQD17-24 Control Wiring Diagram

APPENDIX D — WIRING DIAGRAMS

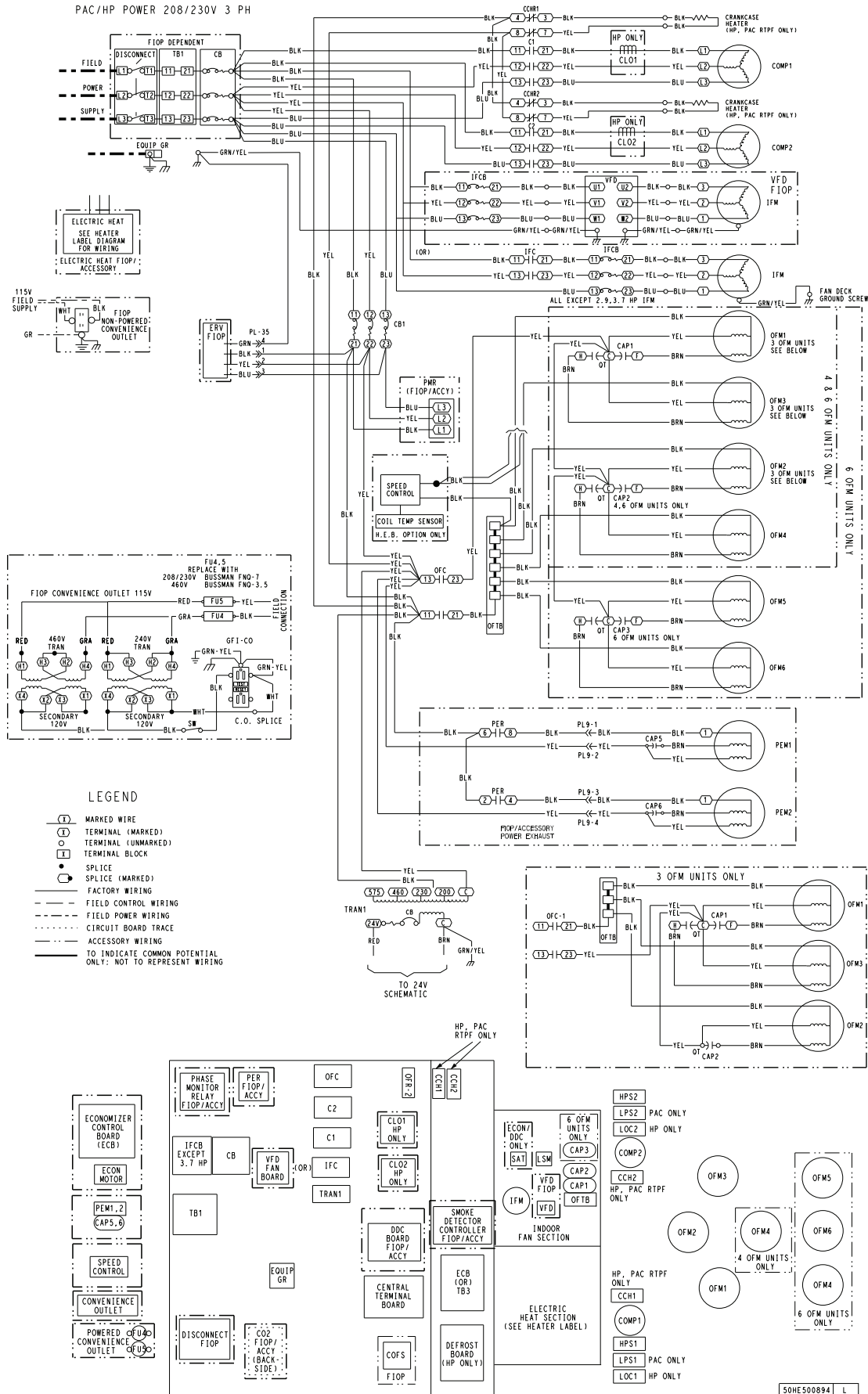


Fig. C — 50TCQD17-24 Power Wiring Diagram (208/230-3-60 Units)

APPENDIX D — WIRING DIAGRAMS

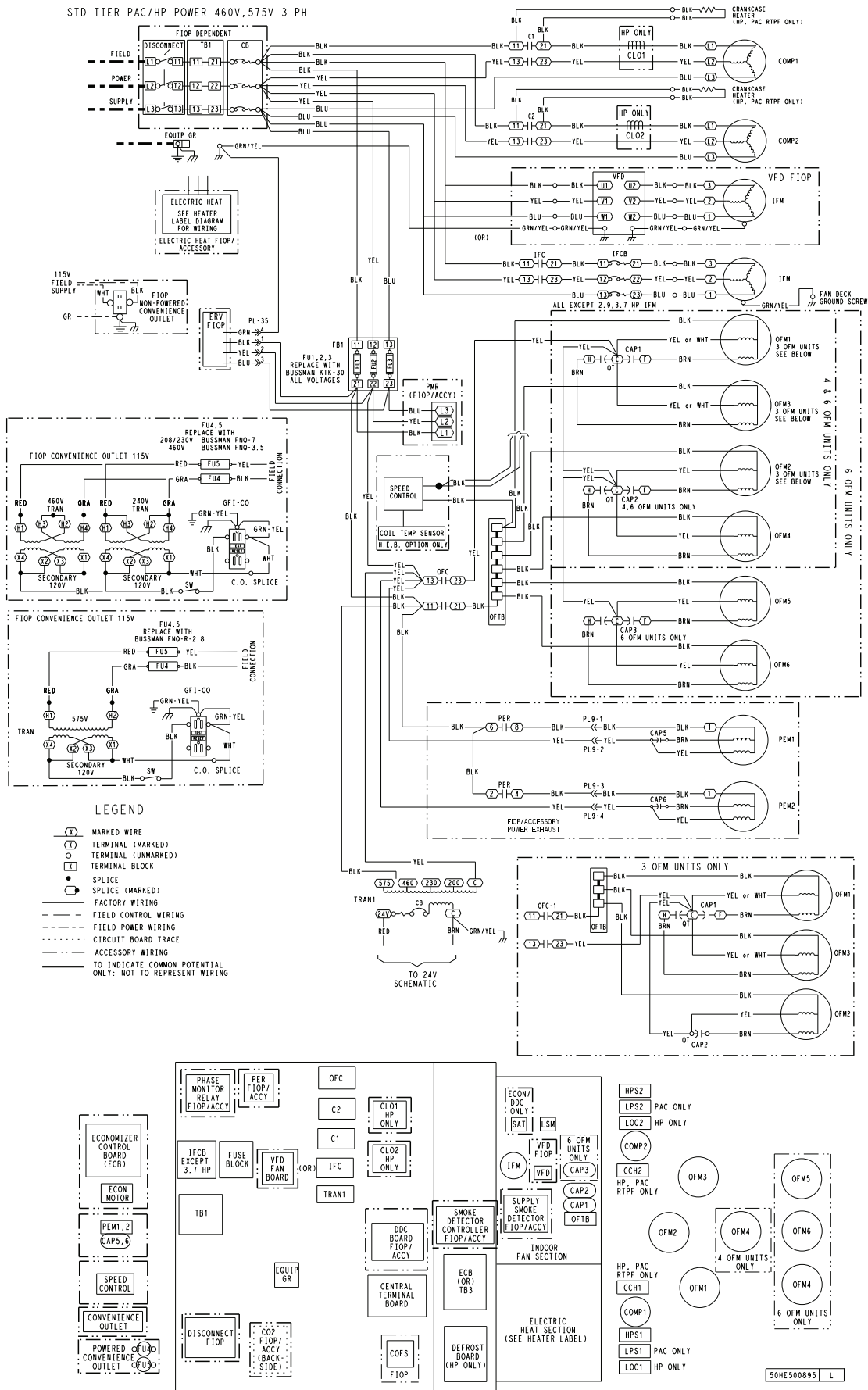


Fig. D — 50TCQD17-24 Power Wiring Diagram (460-3-60, 575-3-60 Units)

APPENDIX D — WIRING DIAGRAMS

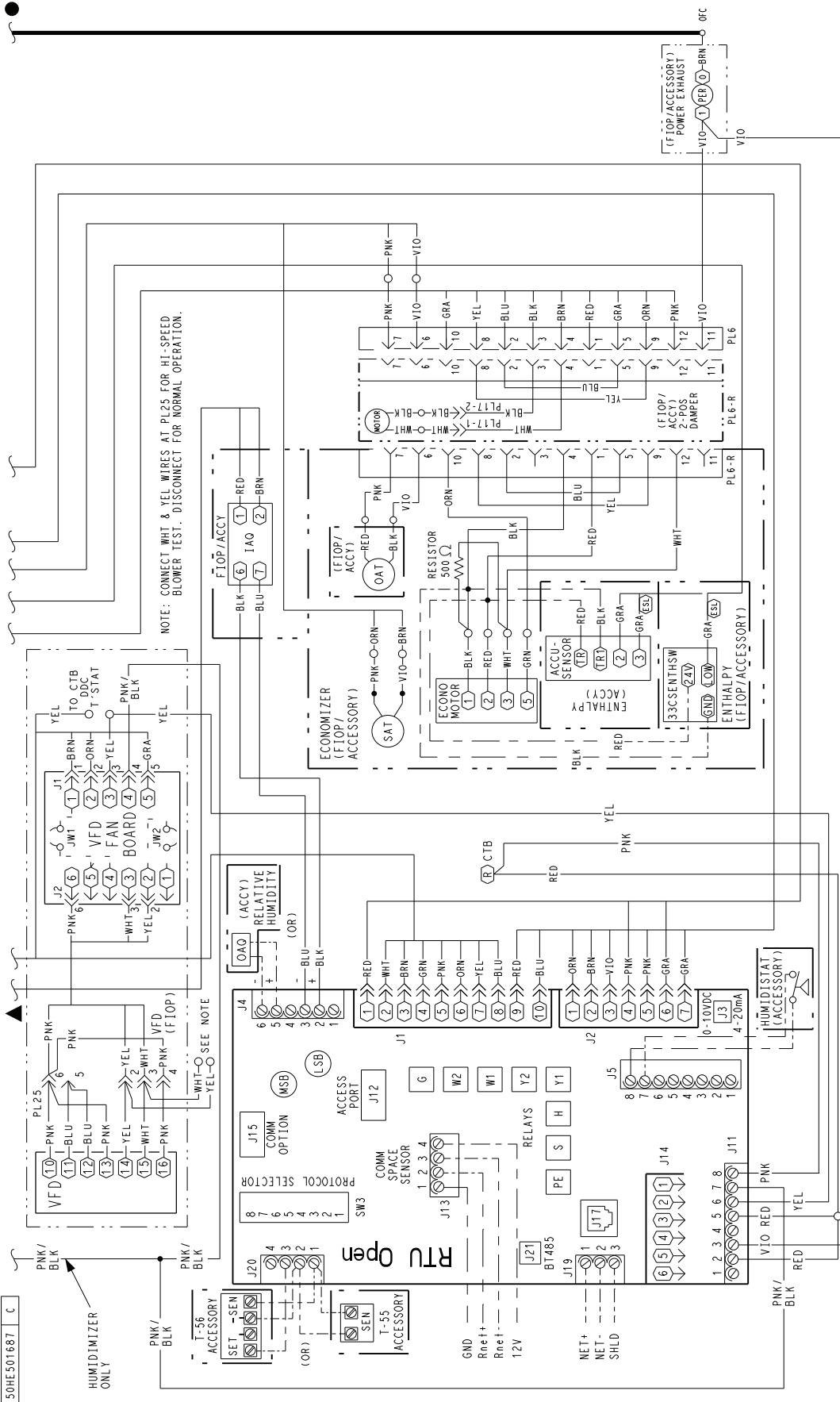


Fig. E — RTU-Open Overlay

APPENDIX D — WIRING DIAGRAMS

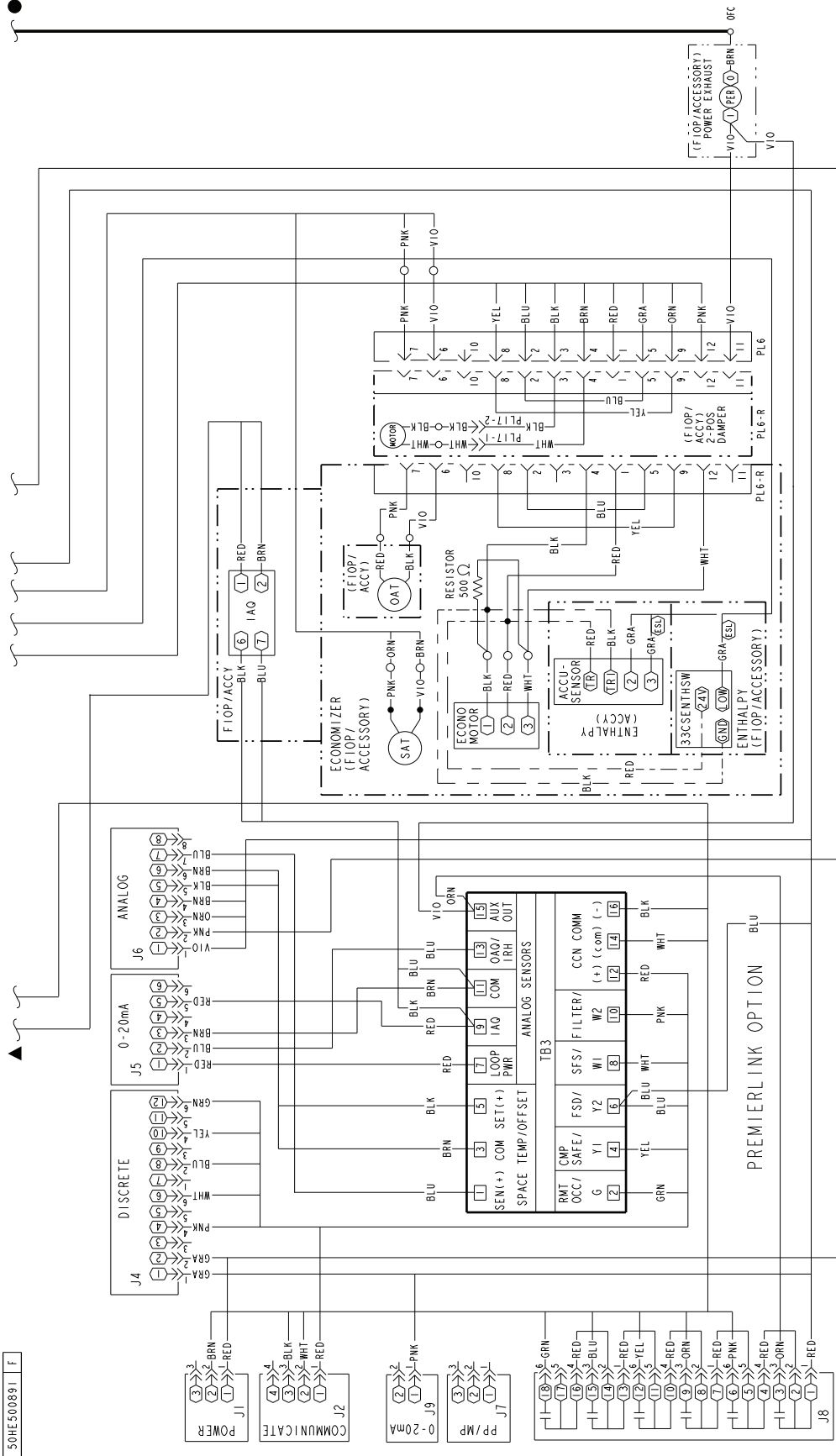


Fig. F — PremierLink Overlay

APPENDIX E — MOTORMASTER SENSOR LOCATION

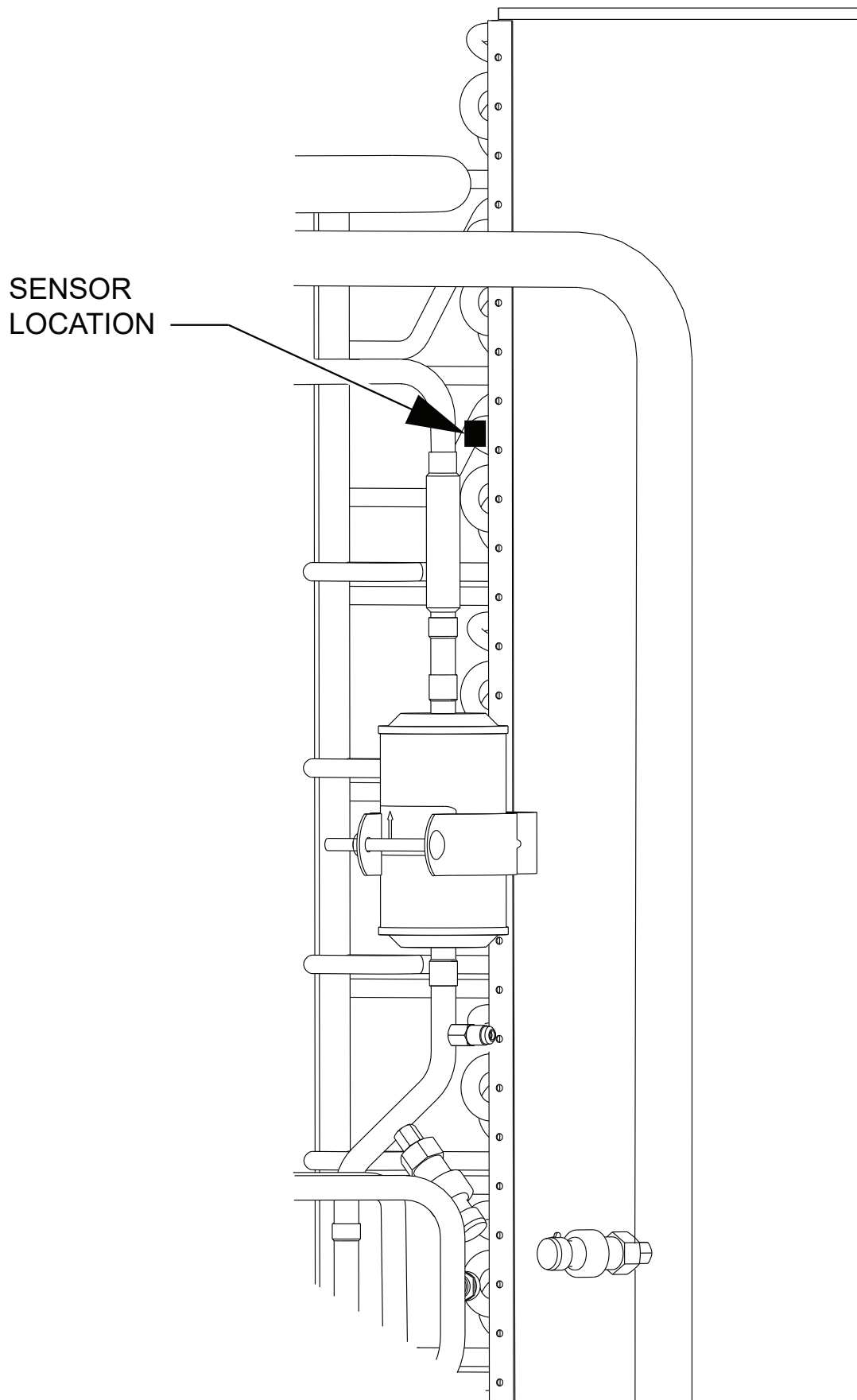


Fig. G — 50TCQD17-24 Motormaster Sensor Location

**START-UP CHECKLIST — 50TCQ 17-24 SINGLE PACKAGE ROOFTOP WITH
HEAT PUMP/ELECTRIC COOLING WITH PURON® (R-410A) REFRIGERANT**

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 Instruction document.

I. PRELIMINARY INFORMATION

MODEL NO. _____

JOB NAME _____

SERIAL NO. _____

ADDRESS _____

START-UP DATE _____

TECHNICIAN NAME _____

ADDITIONAL ACCESSORIES _____

II. PRE-START-UP

Verify that job site voltage agrees with voltage listed on rating plate (Y/N) _____

Verify that all packaging materials have been removed from unit (Y/N) _____

Remove all shipping hold down bolts and brackets per installation instructions (Y/N) _____

Verify that condensate connection is installed per installation instructions (Y/N) _____

Check refrigerant piping for indications of leaks; investigate and repair if necessary (Y/N) _____

Check all electrical connections and terminals for tightness (Y/N) _____

Check that return (indoor) air filters are clean and in place (Y/N) _____

Verify that unit installation is level (Y/N) _____

Check fan wheels and propeller for location in housing/orifice and setscrew tightness (Y/N) _____

Check to ensure that electrical wiring is not in contact with refrigerant lines or sharp metal edges (Y/N) _____

Check pulley alignment and belt tension per installation instructions (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 _____ |
| Indoor Fan Amps | L1 _____ | L2 _____ | L3 _____ |
| Outdoor Fan Amps | NO.1 _____ | NO.2 _____ | NO.3 _____ |
| | NO.4 _____ | NO.5 _____ | NO.6 _____ |

TEMPERATURES

| | | |
|--------------------------------|------------------------|------------------------|
| Outdoor-Air Temperature | _____ °F DB (Dry Bulb) | _____ °F WB (Wet Bulb) |
| Return-Air Temperature | _____ °F DB | _____ °F WB |
| Cooling Supply Air Temperature | _____ °F DB | _____ °F WB |

PRESSURES (COOLING MODE)

REFRIGERANT SUCTION CIRCUIT 1 _____ PSIG _____ °F
 CIRCUIT 2 _____ PSIG _____ °F

REFRIGERANT DISCHARGE CIRCUIT 1 _____ PSIG _____ °F
 CIRCUIT 2 _____ PSIG _____ °F

Verify that 3-phase fan motor and blower are rotating in correct direction (Y/N) _____
Verify that 3-phase scroll compressor is rotating in the correct direction (Y/N) _____
Verify refrigerant charge using charging charts (Y/N) _____

GENERAL

Economizer minimum vent and changeover settings to job requirements (if equipped) (Y/N) _____

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE