



WeatherMaker® 50FCQ*17-28
Single Package Rooftop Heat Pump
with Puron® (R-410A) Refrigerant
and EcoBlue™ Fan Technology

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. 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 can use multiple disconnects. Check convenience outlet for power status before opening unit for service. Locate the disconnect switch and lock it in the open position it. LOCKOUT/TAGOUT this switch to notify others.

WARNING

UNIT OPERATION AND SAFETY HAZARD

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

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

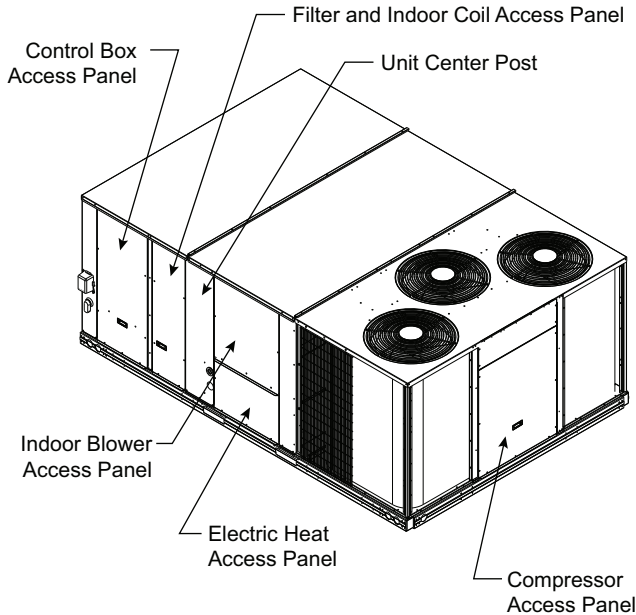
High velocity water from a pressure washer, garden hose, or compressed air should never be used to clean a coil. The force of the water or air jet will bend the fin edges and increase airside pressure drop.

IMPORTANT: Lockout/Tag-out is a term used when electrical power switches are physically locked preventing power to the unit. A placard is placed on the power switch alerting service personnel that the power is disconnected.

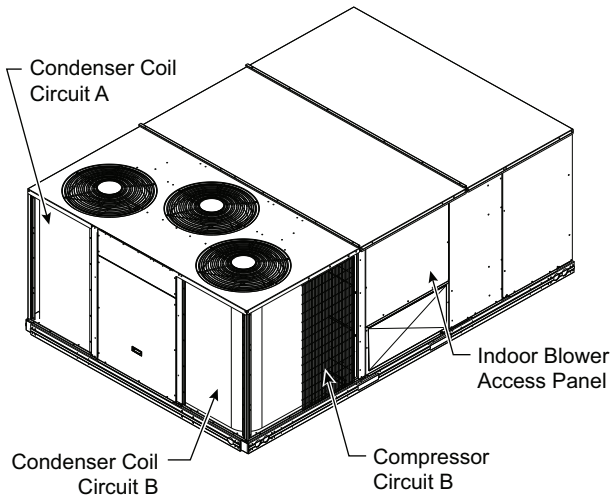
UNIT ARRANGEMENT AND ACCESS

General

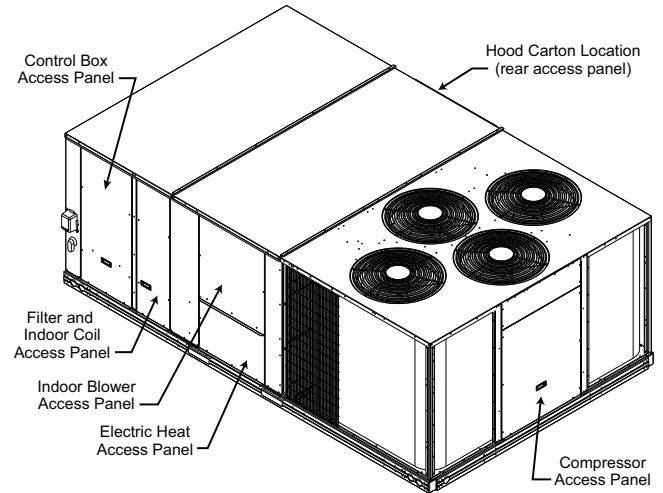
Figures 1 and 2 show general unit arrangement and access locations.



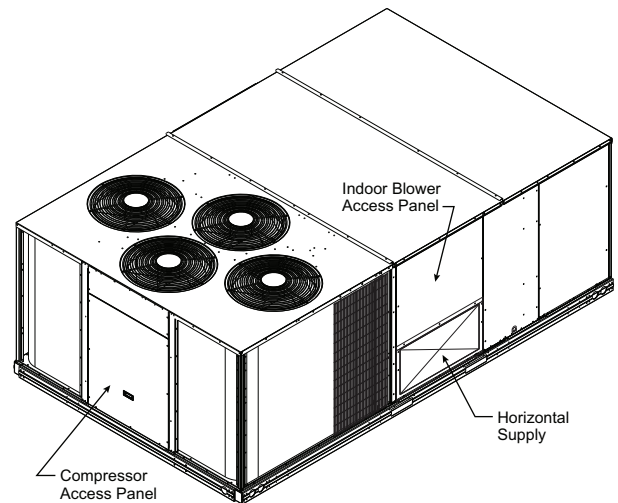
**Fig. 1 — Typical Access Panel Locations
(50FCQ*17 Unit Front Shown)**



**Fig. 2 — Typical Access Panel Location
(50FCQ*17 Unit Back Shown)**



**Fig. 3 — Typical Access Panel Locations
(50FCQ*24-28 Unit Front Shown)**



**Fig. 4 — Typical Access Panel Location
(50FCQ*24-28 Unit Back Shown)**

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)

- Return air filter replacement
- Outdoor hood inlet filters cleaned
- Condenser coil cleanliness checked
- Condensate drain checked

SEASONAL MAINTENANCE

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

Air Conditioning

- Ensure outdoor fan motor mounting bolts are tight
- Ensure compressor mounting bolts are tight
- Inspect outdoor fan blade positioning
- Ensure control box is clean
- 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 debris and dirt

Air Filters and Screens

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

Each of these filters and screens will need to be periodically replaced or cleaned.

Filters

RETURN AIR FILTERS

Return air filters are disposable fiberglass media type. Access to the filters is through the vertical panel to the right of the control box. Filters are situated on slide out racks for easy inspection and repair. (See Fig. 1 and Fig. 3.)

To remove the filters:

1. Remove the six (6) screws holding the access panel in place.
2. Grasp the bottom flange of the access panel.
3. Lift up and swing the bottom out until the panel disengages and pulls out.
4. Pull the slide out filter rack to access all of the filters.
5. Replace filters as required with similar replacement filters of same size.

To re-install the access panel:

1. Slide the top of the panel up under the unit top panel.
2. Slide the bottom into the side channels.
3. Push the bottom flange down until it contacts the base.
4. Reinstall the six access panel screws.

OUTSIDE AIR HOOD SCREENS

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

These inlet screens are secured by a retainer angle across the top edge (see Fig. 5, Item #3 and Fig. 6) and bottom edge of the hood (see Fig. 5, Item #1 and Fig. 6).

To remove the screen, lift the screen towards the upper retainer angle created by the angle along the top edge (Fig. 5, Item #3). This will lift the screen above the bottom edge of the lower retainer angle (Fig. 5, Item #1). Pull the bottom of the filter forward to remove.

To re-install, placing the screen frame in retainer angle along the top edge (Fig. 5, Item #3). Rotate the bottom of the screen frame toward the unit into position and slide the frame down into the retainer angle along the bottom edge (see Fig. 6).

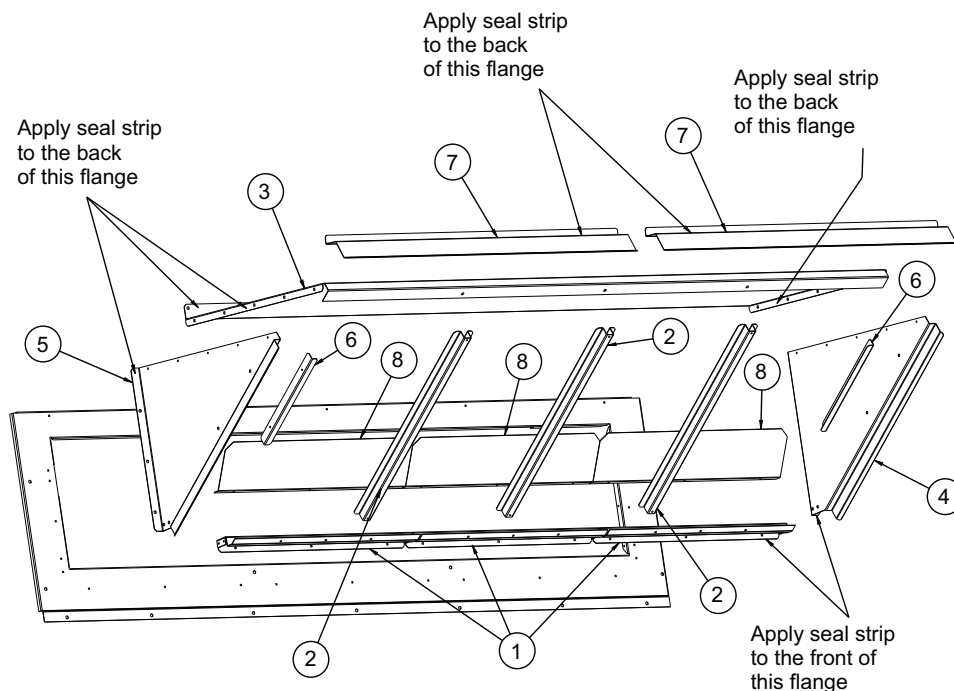
CAUTION

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.



ITEM #	DESCRIPTION	QTY
1	Filter Support	3
2	Central Retainer	3
3	Side Retainer	2
4	Hood Top	1
5	Left Hood Side	1
6	Right Hood Side	1
7	Top Diverters	2
8	Deflector	3

Fig. 5 — Hood Assembly and Hood Part Identification/Seal Strip Application Areas

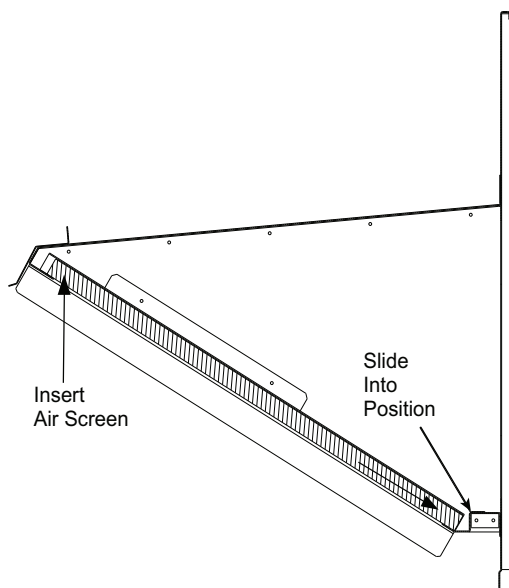


Fig. 6 — Air Screen Installation

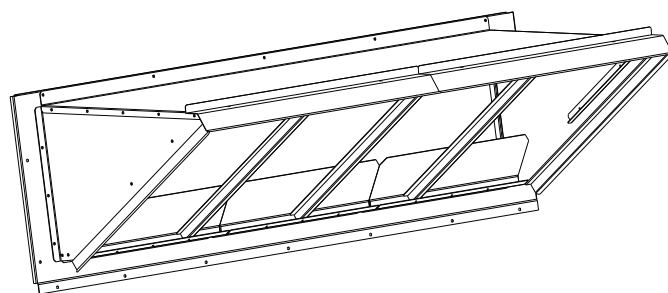


Fig. 7 — Hood Assembly Complete

SUPPLY FAN (BLOWER) SECTION

⚠ WARNING

ELECTRICAL SHOCK HAZARD

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

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

All FC units have the EcoBlue™ direct drive vane axial fan system. The fan is driven by an ECM motor with speed that is user set through the Unit Control Board (UCB). Speeds are fully configurable from 40% to 100% of motor's maximum speed. See Fig. 8 and 9.



The direct drive ECM blower motor uses a constant speed design. Motor speed is controlled by a 0-10 vdc signal, where 10 vdc is equal to motor's maximum rpm.

All units come factory set for 7.8 vdc or approximately 78% of the motor's maximum speed. Fan speed should be set per job specification cfm (cubic feet per minute) and ESP (external static pressure) required and per Fan Speed Set Up label included on the unit's high voltage cover. In some cases, the Fan Speed Set Up label may already include the field setting if unit was previously installed. Check the box on the lower half of the label to see if the field voltage setting was filled in and if so, set fan speed to that voltage. Otherwise see detailed instructions below.

NOTE: For units equipped with the Humidi-MiZer option, when replacing the UCB cut JMP 1,2 and 3 in the REHEAT/HP section of the replacement UCB.



FAN SPEED SET UP:

- 1 Calculate VDC from CFM and ESP plus field accessories.
- 2 Connect multimeter
- 3 Set Switch to A, B, or C from Switch Range chart below.
- 4 Turn dial to fine tune VDC reading.
- 5 Fill in Field Setting.

Vdc Calculator		ESP in. wg										
		0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	
UNIT MODEL NUMBER	CFM	6000	5.6	6.1	6.5	6.9	7.3	7.6	8.0	8.3	8.6	8.9
		6500	6.0	6.4	6.8	7.2	7.6	7.9	8.3	8.6	8.9	9.2
		7000	6.4	6.8	7.2	7.6	7.9	8.2	8.6	8.9	9.2	9.5
		7500	6.8	7.2	7.5	7.9	8.2	8.6	8.9	9.2	9.5	9.7
		8000	7.2	7.6	7.9	8.2	8.6	8.9	9.2	9.5	9.8	
		8500	7.6	8.0	8.3	8.6	8.9	9.2	9.5	9.8		
		9000	8.0	8.4	8.7	9.0	9.3	9.6	9.8			
		9500	8.5	8.8	9.1	9.3	9.6	9.9				
		10000	8.9	9.2	9.4	9.7	10.0					
Field Accessories:												
Economizer		0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	

Factory Setting:
9.0 VDC

Field Setting:
Record field setting here _____ VDC

Switch Range: *	
A	4.1 - 7.5
B	6.9 - 8.7
C	7.7 - 10.0

* Overlap in A, B, C switch range designed for maximum field adjustment potential. For example 7.2 can be set at either A or B.

NOTE(S):
Values in the Field Accessories section are VDC adders.

Fig. 11 — Example of Fan Speed Set Up Labels for Electro-Mechanical Controls

Units with SystemVu™ controls

On units equipped with the factory-installed SystemVu controller the Fan Speed settings are accessed through the SystemVu interface.

1. Check the job specifications for the cfm (cubic feet per minute) and ESP (external static pressure) required.
2. Using the chart on the Fan Speed Set Up labels (see Fig. 12), calculate the rpm from the cfm and ESP for the base unit.
3. If installing any accessories listed at the bottom of the Set Up Label, add accessory rpm to base unit rpm in upper portion of label.
4. The Fan Speed Set Up labels are located on the High Voltage cover in the Control Box.
5. Press any key on the SystemVu interface to activate the display backlight and then press the MENU key.
6. Using the UP and DOWN arrow keys highlight SETTINGS and then press ENTER.

7. Use the DOWN arrow key highlight the UNIT CONFIGURATIONS menu then press ENTER.
8. Highlight UNIT CONFIGURATIONS then press ENTER.
9. Highlight INDOOR FAN and then press ENTER.
10. Refer to the job specifications to set the following, determining the values per the rpm Calculator label (see Fig. 12). Use the UP and DOWN arrow keys and the BACK key to set the values. Press ENTER after setting each value to continue to the next selection.
 - IDF VENT SPD
 - IDF HEAT SPD
 - IDF LOW COOL SPD
 - IDF HIGH SPD
 - IDF FREE COOL SPD

For further details see the *FCQ/GCQ Series Single Package Rooftop Units with SystemVu Controller Controls, Start-Up, Operation and Troubleshooting* manual.

SystemVu™

MAIN MENU:

SETTINGS

→ UNIT CONFIGURATIONS

→ INDOOR FAN

→ IDF VENT SPD -RPM
 → IDF HEAT SPD -RPM
 → IDF HIGH COOL SPD -RPM
 → IDF FREE COOL SPD -RPM

FAN SPEED SETUP (RPM)

↓ DETERMINE RPM FROM BELOW ↓

48TC003136 REV. B

RPM Calculator

RPM Calculator		ESP in. wg										
		0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	
UNIT MODEL NUMBER	CFM	6000	1250	1348	1441	1528	1610	1688	1762	1832	1899	1963
	6500	1336	1428	1515	1598	1677	1753	1824	1893	1959	2021	
	7000	1423	1509	1591	1670	1746	1819	1888	1955	2020	2081	
	7500	1510	1591	1669	1744	1817	1887	1954	2019	2082	2143	
	8000	1598	1675	1749	1820	1890	1957	2022	2085	2146		
	8500	1687	1759	1829	1898	1964	2029	2092	2153			
	9000	1776	1845	1912	1977	2041	2103	2163				
	9500	1866	1931	1995	2057	2118	2178					
	10000	1955	2018	2079	2138	2197						
Field Accessories:												
Economizer		89	89	89	89	89	89	89	89	89	89	

NOTE(S):
 Values in the Field Accessories section are RPM adders.

Fig. 12 — Example of Fan Speed Set Up Labels for SystemVu™ Controls

TROUBLESHOOTING THE ECM MOTOR

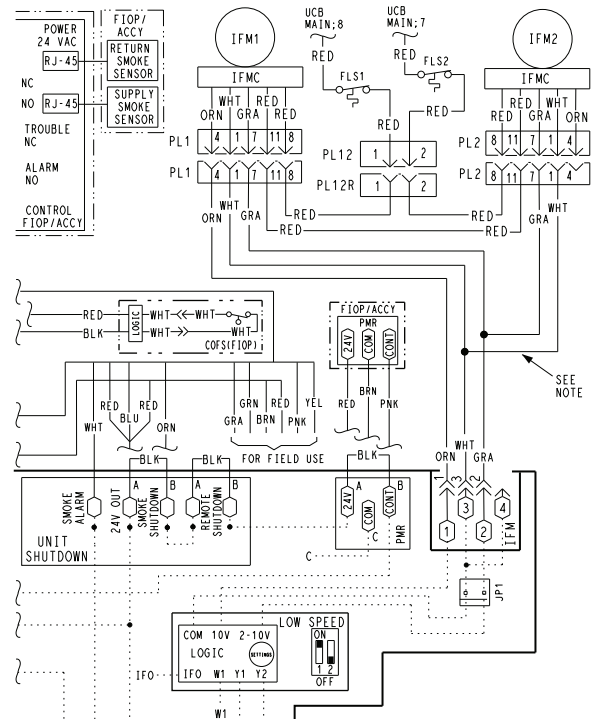
EcoBlue™ motors are designed with several built-in protections included in the motor software. If the motor detects a fault it will safely shut down. See Table 15, “Supply Fan Motor Logic and Safety Relays” on page 42 for a complete list.

Troubleshooting the motor requires a voltmeter.

1. Disconnect main power to the unit.
2. Disconnect motor plug in supply section of the unit.
3. Restore main unit power.
4. Check for proper line voltage at motor power leads Black (PL1-1), Yellow (PL1-2), and Blue (PL1-3). Blue is only present on 3-phase motors. See the following table.

50FCQ UNIT VOLTAGE	MOTOR VOLTAGE	MIN-MAX VOLTS
208/230	230	187-253
460	460	414-506
575	575	518-633

5. Disconnect main power.
6. Reconnect motor plug in supply section of unit.
7. Restore main power.
8. Check for proper motor control voltage signal of 9.7 vdc to 10.3 vdc at IFM-1 and IFM-3 on Unit Control Board (UCB). See Fig. 13.
9. Using a jumper wire from unit control terminals R to G, engage motor operation.
10. Verify control signal from user speed selection switch by placing voltmeter taps in provided terminals marked vdc. Signal should be between 3.8 vdc and 10.3 vdc.
11. If the motor does not start and run, remove the fan assembly and replace the motor with one having the same part number. Do not substitute with an alternate design motor as the voltage/speed programming will not be the same as that on an original factory motor.



NOTE(S):
On all horizontal supply units, IFM2 GRA and WHT wires will include in-line resistors to reduce its speed. The two resistors are 1/2 watt rated with resistance values as follow: R1 = 787 ohms and R2 = 100K ohms

Fig. 13 — Supply Fan Control Wiring Diagram

Removing the Motor and Fan Assembly

NOTE: Due to press fit design of composite Rotor on Motor, it is highly recommended that any time a motor is replaced the fan rotor is replaced as well. The rest of the assembly may be reused.

See Fig. 14.

1. Unplug motor harness from control box harness and cut wire tie at the fan deck.
2. Unplug connectors from stator temperature limit switch.
3. Remove four brackets at front of stator on fan deck.
4. Slide fan assembly forward a couple of inches to clear rear brackets and lift assembly out.

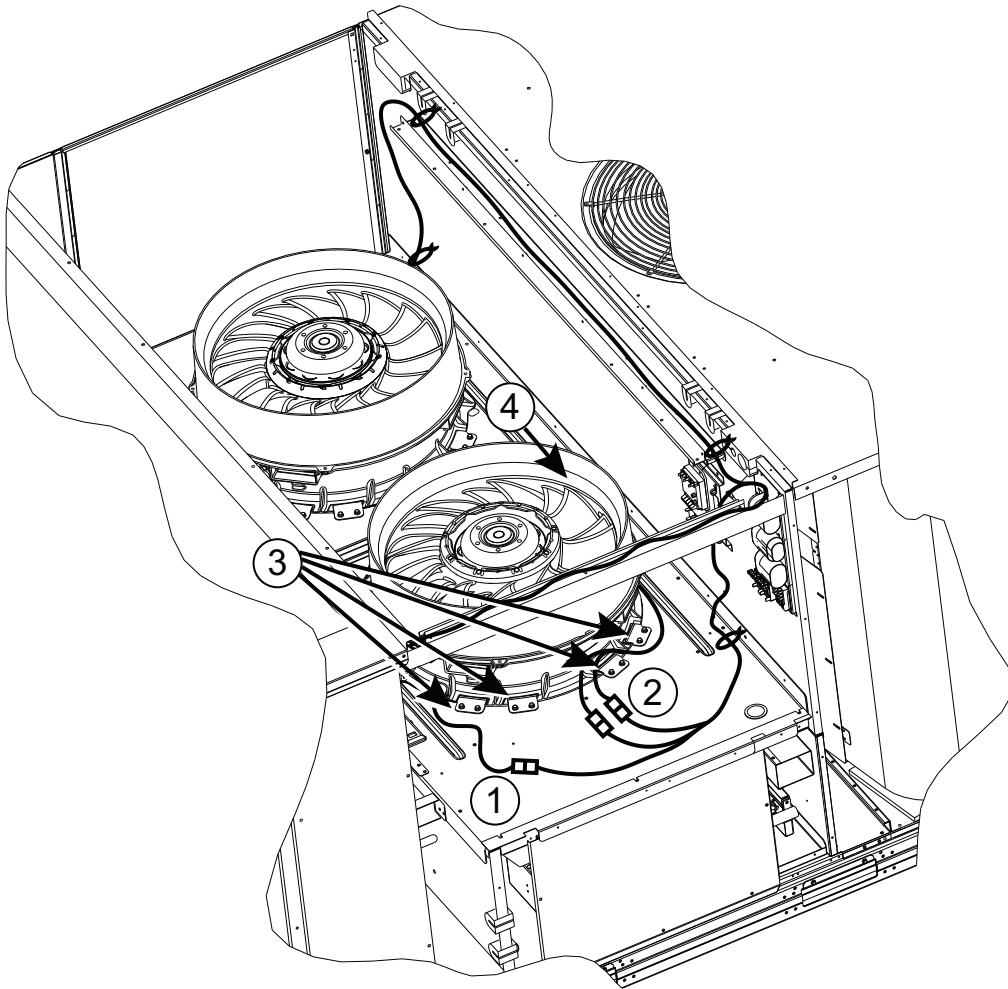


Fig. 14 — Fan Assembly Removal

Disassembling Standard/Medium Motor and Fan Assembly

See Fig. 15.

NOTE: Refer to “MODEL NUMBER NOMENCLATURE” on page 85, position 10 for specific unit requirements.

1. Remove 4 screws from U-clips in fan casing.
2. Remove casing from assembly.
3. Remove 3 screws connecting rotor to motor flange.
4. Remove rotor from motor.
5. Remove 4 screws connecting motor to stator.
6. Remove stator from motor.
7. If required, remove fan limit switch from stator.
8. If replacing motor, remove heat shield from motor and keep.

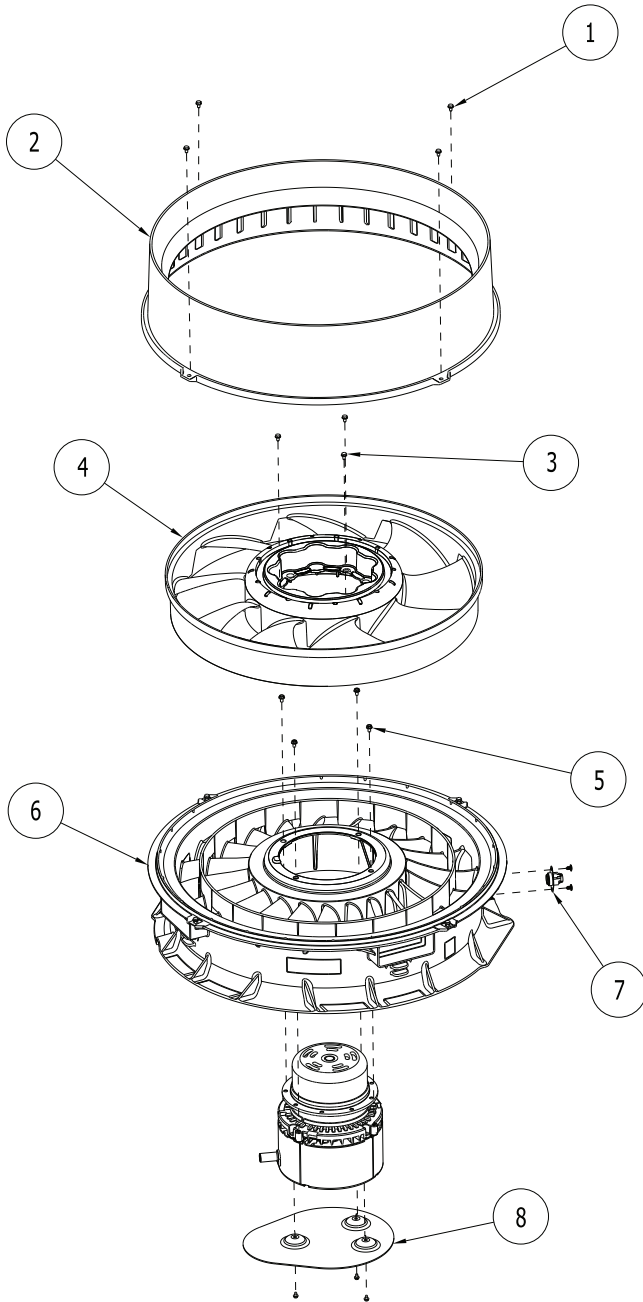


Fig. 15 — Disassembling Standard or Medium Static Motor and Fan Assembly

Disassembling High Static Motor and Fan Assembly

See Fig. 16.

NOTE: Refer to “MODEL NUMBER NOMENCLATURE” on page 85, position 10 for specific unit requirements.

1. Remove 4 screws from U-clips in fan casing.
2. Remove casing from assembly.
3. Remove 3 screws connecting rotor to motor flange.
4. Remove rotor from motor.
5. Remove heat shield from motor. Keep.
6. Remove 6 screws connecting motor to stator.
7. Remove motor from stator.
8. If required, remove fan limit switch from stator.

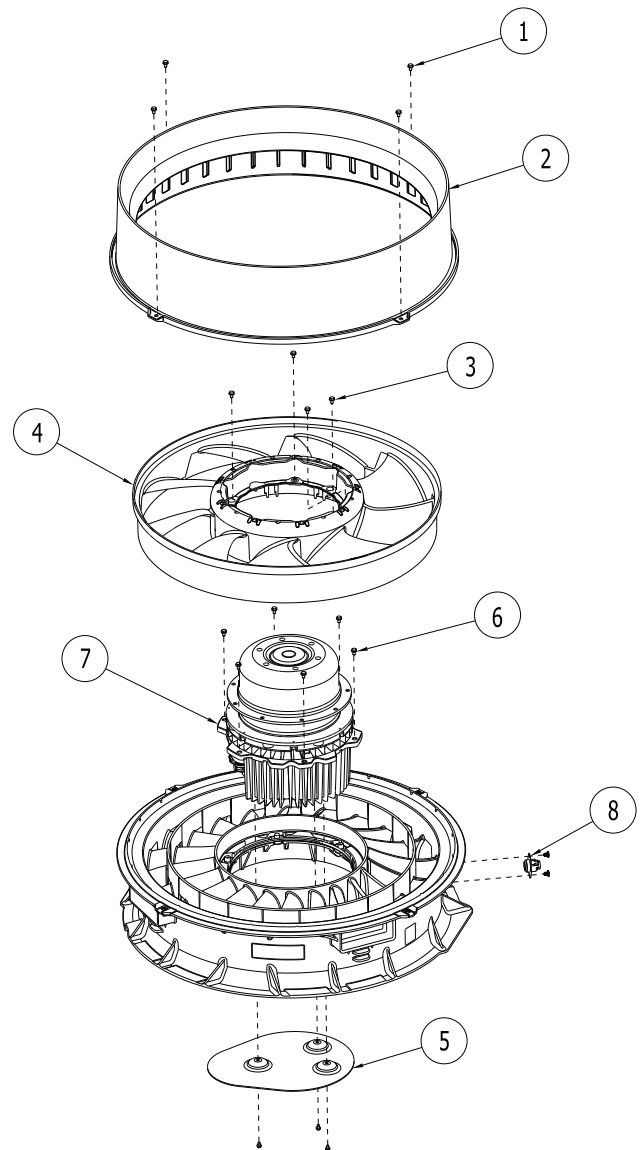


Fig. 16 — Disassembling High Static Motor and Fan Assembly

Reassembly of Standard/Medium Motor and Fan Assembly

See Fig. 17.

NOTE: Refer to “MODEL NUMBER NOMENCLATURE” on page 85, position 10 for specific unit requirements.

1. Place motor on flat surface. Install Heat shield on back of motor.
2. If required, reinstall limit switch on stator with two plastic fastener plugs (48TM005675).
3. Line up keying features on stator and motor and set stator onto motor. Install four 1/4-20 x 1-in. screws (AC67AP170) to attach stator to motor. Tighten to 50 in.-lb (5.65 Nm).
4. Set rotor onto motor flange. Install three 1/4-20 x 1-in. screws (AC67AP170) to attach rotor to motor. Tighten to 50 in.-lb (5.65 Nm).
5. Set casing onto stator. Install four #10-16 x 3/4-in. screws (AP13AD128) through U-Clips in casing. Tighten to 14 in.-lb (1.58 Nm).
6. Pull motor harness out through guide feature in stator if not already completed.

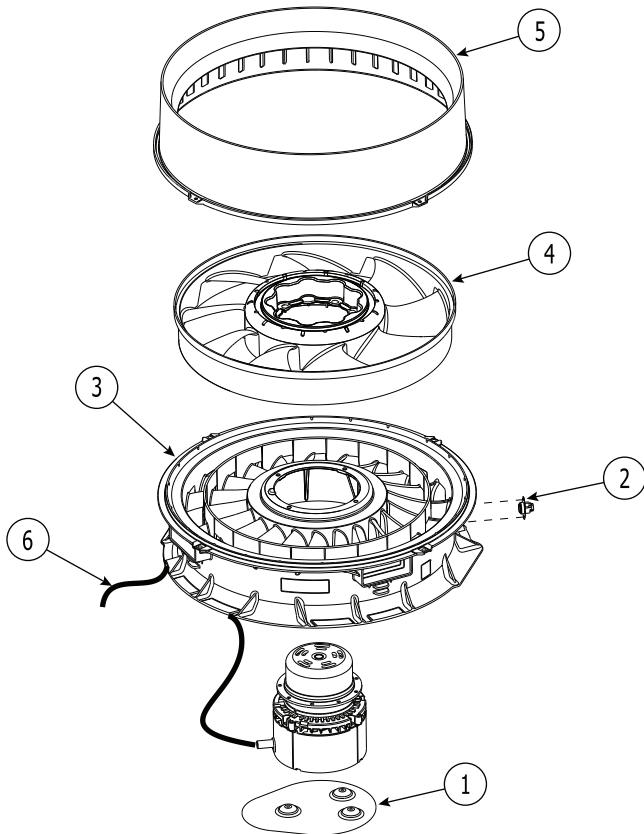


Fig. 17 — Standard/Medium Fan System Re-Assembly

Reassembly of High Static Motor and Fan Assembly

See Fig. 18.

NOTE: Refer to “MODEL NUMBER NOMENCLATURE” on page 85, position 10 for specific unit requirements.

1. Place stator on flat surface.
2. If required, reinstall limit switch on stator with two plastic fastener plugs (48TM005675).
3. Line up keying features on stator and motor and set motor onto stator. Motor wire Harness should align with guide feature in stator. Install six 1/4-20 x 1-in. screws (AC67AP170) to attach stator to motor. Tighten to 30 in.-lb (3.39 Nm).
4. Install Heat shield on back of motor.
5. Set rotor onto motor flange. Install three 1/4-20 x 1-in. screws (AC67AP170) to attach rotor to motor. Tighten to 50 in.-lb (5.65 Nm).
6. Set casing onto stator. Install four #10-16 x 3/4-in. screws (AP13AD128) through U-Clips in casing. Tighten to 14 in.-lb (1.58 Nm).
7. Pull motor harness out through guide feature in stator if not already completed.

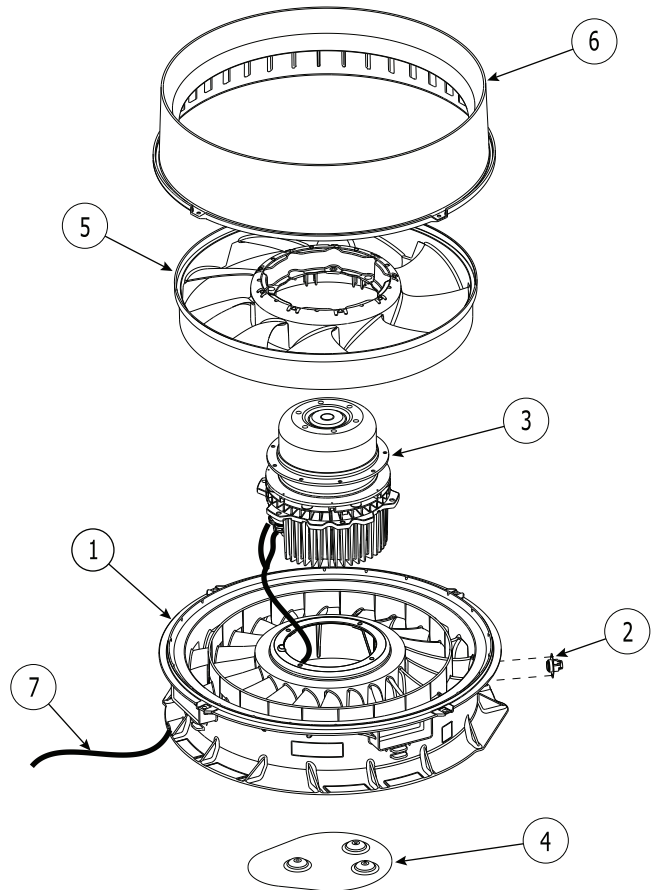


Fig. 18 — High Static Fan System Re-Assembly

Reinstalling Motor and Fan Assembly

See Fig. 19.

1. Align motor harness/grommet at ~7 o'clock (facing installer) and align the bottom flats on right and left sides of fan stator with fan deck ribs. Drop fan assembly down into fan deck opening and slide back until aluminum stator is under the rear fan deck brackets.
2. Replace four front brackets and secure each with 2 #10 x 5/8-in. hex head screws (P/N: AL48AM217). Tighten to 50 in.-lb (5.65 Nm).
3. Reconnect wires for stator temperature limit switch.
4. Pull motor harness tight through grommet and plug it in to the control box harness and secure in the corner with snap-in wire tie.

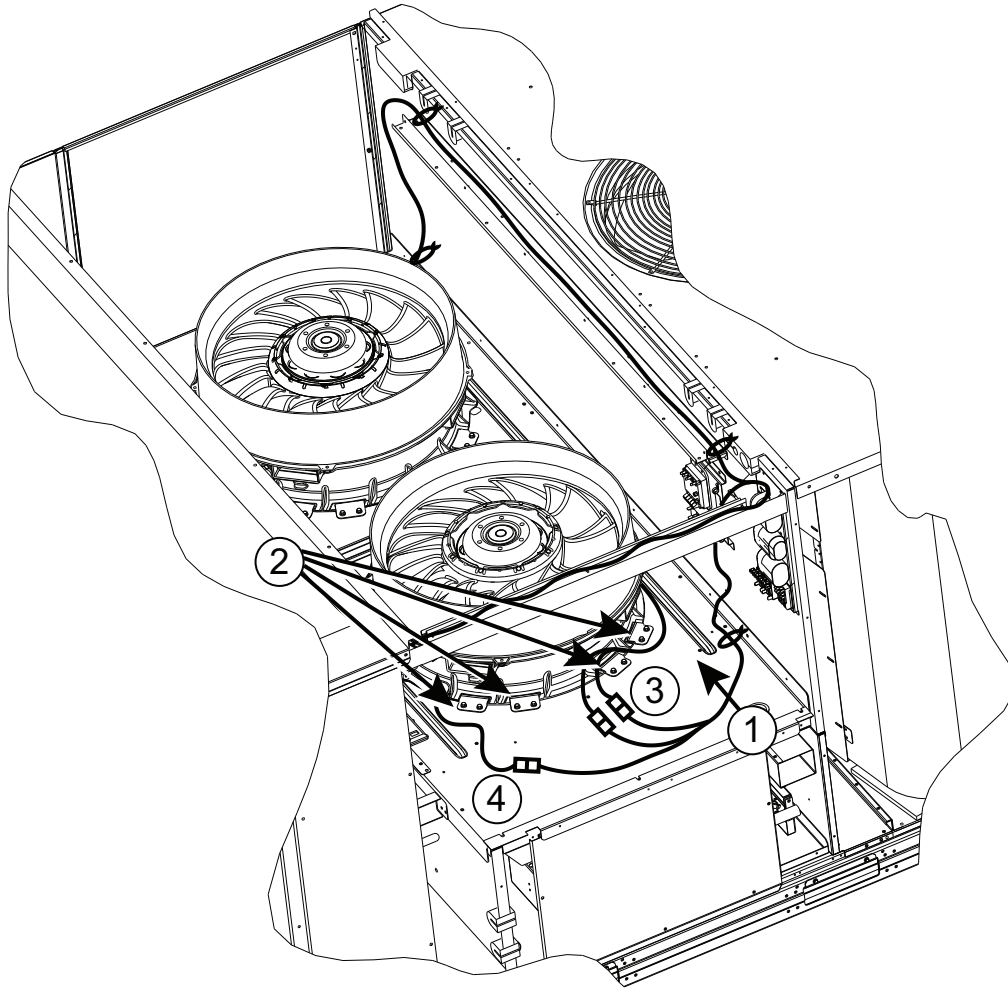


Fig. 19 — Fan Assembly Installation

Staged Air Volume

All 50FCQ units with EcoBlue™ technology come factory set to automatically adjust the indoor fan motor speed in sequence with the unit's ventilation, cooling, and heating operation. When the first stage of cooling is requested, unit fan will operate at 66% of the user set full load airflow. When the second stage of cooling is required, UCB will allow the full design airflow rate for the unit (100%). During the heating mode, the unit will allow total design airflow rate (100%). During ventilation mode, the fan will operate at 66% speed.

COOLING

⚠ 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. Gauge set, hoses, and recovery system must be designed to handle R-410A refrigerant. If unsure about equipment, consult the equipment manufacturer.

Condenser Coil

The condenser coil is fabricated with round tube copper hairpins and plate fins of various materials and/or coatings (see Model Number Nomenclature in Appendix A to identify the materials provided in this unit). The coil may be one-row or composite-type two-row. Composite two-row coils are two single-row coils fabricated with a single return bend end tubesheet.

Condenser Coil Maintenance and Cleaning Recommendation

Routine cleaning of coil surfaces is essential to maintain 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 may 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 to the coating of a protected coil) if 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 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 a very low velocity water stream to avoid damaging the fin edges. Monthly cleaning as described below is recommended. Rinsing coils in the opposite direction of airflow is recommended.

ROUTINE CLEANING OF COIL SURFACES

Periodic cleaning with Totaline®¹ environmentally balanced coil cleaner is essential to extend the life of coils. This cleaner is available from Replacement Components Division as P/N: P902-0301 for a one gallon container, and P/N: P902-0305 for a 5 gallon container. It is recommended that all coils, including standard aluminum, pre-coated, copper/copper or e-coated coils be cleaned with the Totaline environmentally balanced coil cleaner as described below. Coil cleaning should be part of the unit's regularly scheduled maintenance procedures to ensure long life of the coil. Failure to clean the coils may result in reduced durability in the environment.

Avoid use of:

- coil brighteners
- acid cleaning prior to painting
- high pressure washers
- poor quality water for cleaning

Totaline environmentally balanced coil cleaner is nonflammable, hypo-allergenic, 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 since coil and unit durability could be affected.

Clean coil as follows:

1. Turn off unit power, tag disconnect.
2. Remove all screws from the top panel except the screws securing the condenser fan to the top panel. See Fig. 20.

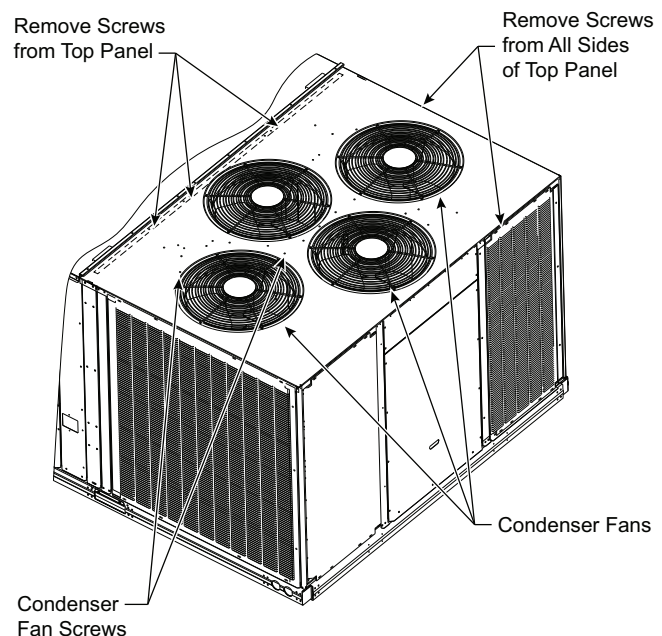


Fig. 20 — Location of Top Panel Screws and Coil Corner Post

3. Lift the top panel at the condenser fan end and support the top panel so it remains level while resting on the condenser fans as shown in Fig. 21.
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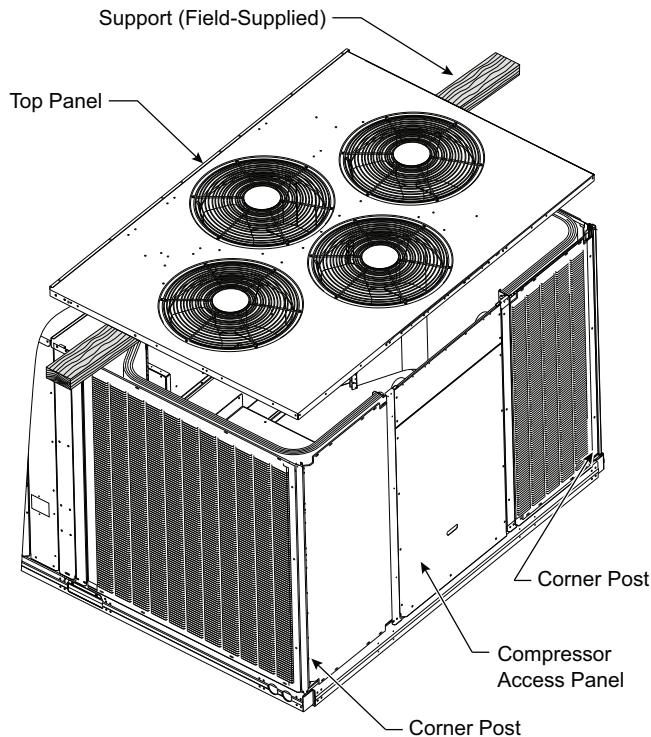


Fig. 21 — Top Panel Removal

4. Remove the compressor access panel to access the lower coil clips. The condenser coil corner post may also be removed. See Fig. 21.
5. Remove the screws from both sides of the 4 coil retaining clips on the hairpin end of the coil tube sheets. See Fig. 22.
6. Remove the 4 retaining clips.

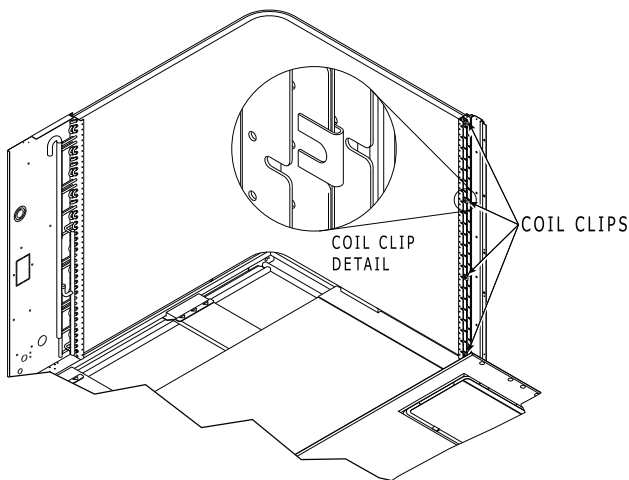


Fig. 22 — Condenser Coil Clips

7. Draw the inner coil inward to separate the coils for cleaning.
8. Insert a spacer (field-supplied) between the tube sheets to hold the coils apart. See Fig. 23.
9. Clean the outer coil surface to remove surface loaded fibers or dirt. See "Remove Surface Loaded Fibers" on page 14 for details.
10. Use a water hose or other suitable equipment to flush down between the 2 coil sections to remove dirt and debris. If a coil cleaner is used be sure to rinse the coils completely before reassembly.

11. Move the inner coil back into position. Reinstall the 4 coil clips. Reinstall the top panel and replace all screws. Replace the compressor access panel.

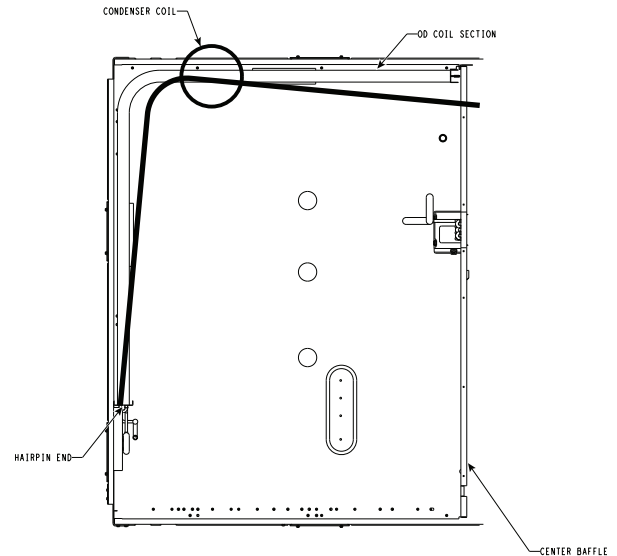


Fig. 23 — Separating Coil Sections (Top View)

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 airside pressure drop.

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.

Totaline®1 Environmentally Balanced Coil Cleaner Application Equipment

- 2-1/2 gallon garden sprayer
- Water rinse with low velocity spray nozzle

Totaline Environmentally Balanced Coil Cleaner Application Instructions

1. Proper eye protection such as safety glasses is recommended during mixing and application.
2. Remove all surface loaded fibers and dirt with a vacuum cleaner as described above.
3. Thoroughly wet finned surfaces with clean water and a low velocity garden hose, being careful not to bend fins.
4. Mix Totaline environmentally balanced coil cleaner in a 2-1/2 gallon garden sprayer according to the instructions

included with the cleaner. The optimum solution temperature is 100°F.

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

5. Thoroughly apply Totaline environmentally balanced 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. Interior and exterior finned areas must be thoroughly cleaned. Finned surfaces should remain wet with cleaning solution for 10 minutes. Ensure surfaces are not allowed to dry before rinsing. Reapply cleaner as needed to ensure 10-minute saturation is achieved.
8. 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.

Evaporator Coil

Cleaning the Evaporator Coil

1. Turn unit power off. Install lockout tag. Remove evaporator coil access panel.
2. If economizer or two-position damper is installed, remove economizer by disconnecting Molex[®]1 plug and removing mounting screws.
3. Slide filters out of unit.
4. Clean coil using a commercial coil cleaner or dishwasher detergent in a pressurized spray canister. Wash both sides of coil and flush with clean water. For best results, back-flush toward return-air section to remove foreign material. Flush condensate pan after completion.
5. Reinstall economizer and filters.
6. Reconnect wiring.
7. Replace access panels.

Evaporator Coil Metering Devices

50FCQ 17-28 units with or without the Humidi-MiZer option use a TXV-distributor system.

Typical Unit Piping

Each heat pump system includes two compressors, a reversing valve, dual-function outdoor and indoor coils, a common liquid line with bi-flow TXV, and dedicated cooling and heating TXVs. 50FCQ*17-28 unit indoor coils contain a vapor header check valve. See Fig. 24-27 and Tables 1-9 for typical unit piping schematic parallel coil circuits during evaporator-function operation and converging coil circuits during the condenser-function operation.

Table 1 — 50FCQ*17 – Cooling Mode

COMPONENT	STATUS/POSITION
Reversing Valve	Energized
Check Valve A	Closed
Check Valve B	Closed
Check Valve C	Open
Check Valve D	Open
Check Valve E	Open
Check Valve F	Closed
Check Valve G	Closed
Check Valve H	Open

Table 2 — 50FCQ*17 – Heating Mode

COMPONENT	STATUS/POSITION
Reversing Valve	De-energized
Check Valve A	Open
Check Valve B	Open
Check Valve C	Closed
Check Valve D	Closed
Check Valve E	Closed
Check Valve F	Open
Check Valve G	Open
Check Valve H	Closed

Table 3 — 50FCQ*17 – Defrost Mode

COMPONENT	STATUS/POSITION
Defrost Thermostat	Closed
Outdoor Fan(s)	Off
Reversing Valve	Energized
Check Valve A	Closed
Check Valve B	Closed
Check Valve C	Open
Check Valve D	Open
Check Valve E	Open
Check Valve F	Closed
Check Valve G	Closed
Check Valve H	Open

Table 4 — 50FCQ*24 – Cooling Mode

COMPONENT	STATUS/POSITION
Reversing Valve	Energized
Check Valve A	Closed
Check Valve B	Closed
Check Valve C	Open
Check Valve D	Open
Check Valve E	Open
Check Valve F	Closed
Check Valve G	Closed
Check Valve H	Open

Table 5 — 50FCQ*24 – Heating Mode

COMPONENT	STATUS/POSITION
Reversing Valve	De-energized
Check Valve A	Open
Check Valve B	Open
Check Valve C	Closed
Check Valve D	Closed
Check Valve E	Closed
Check Valve F	Open
Check Valve G	Open
Check Valve H	Closed

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Table 6 — 50FCQ*24 – Defrost Mode

COMPONENT	STATUS/POSITION
Defrost Thermostat	Closed
Outdoor Fan(s)	Off
Reversing Valve	Energized
Check Valve A	Closed
Check Valve B	Closed
Check Valve C	Open
Check Valve D	Open
Check Valve E	Open
Check Valve F	Closed
Check Valve G	Closed
Check Valve H	Open

Table 7 — 50FCQ*28 – Cooling Mode

COMPONENT	STATUS/POSITION
Reversing Valve	Energized
Check Valve A	Closed
Check Valve B	Closed
Check Valve C	Open
Check Valve D	Open
Check Valve E	Open
Check Valve F	Closed
Check Valve G	Closed
Check Valve H	Open

Table 8 — 50FCQ*28 – Heating Mode

COMPONENT	STATUS/POSITION
Reversing Valve	De-energized
Check Valve A	Open
Check Valve B	Open
Check Valve C	Closed
Check Valve D	Closed
Check Valve E	Closed
Check Valve F	Open
Check Valve G	Open
Check Valve H	Closed

Table 9 — 50FCQ*28 – Defrost Mode

COMPONENT	STATUS/POSITION
Defrost Thermostat	Closed
Outdoor Fan(s)	Off
Reversing Valve	Energized
Check Valve A	Closed
Check Valve B	Closed
Check Valve C	Open
Check Valve D	Open
Check Valve E	Open
Check Valve F	Closed
Check Valve G	Closed
Check Valve H	Open

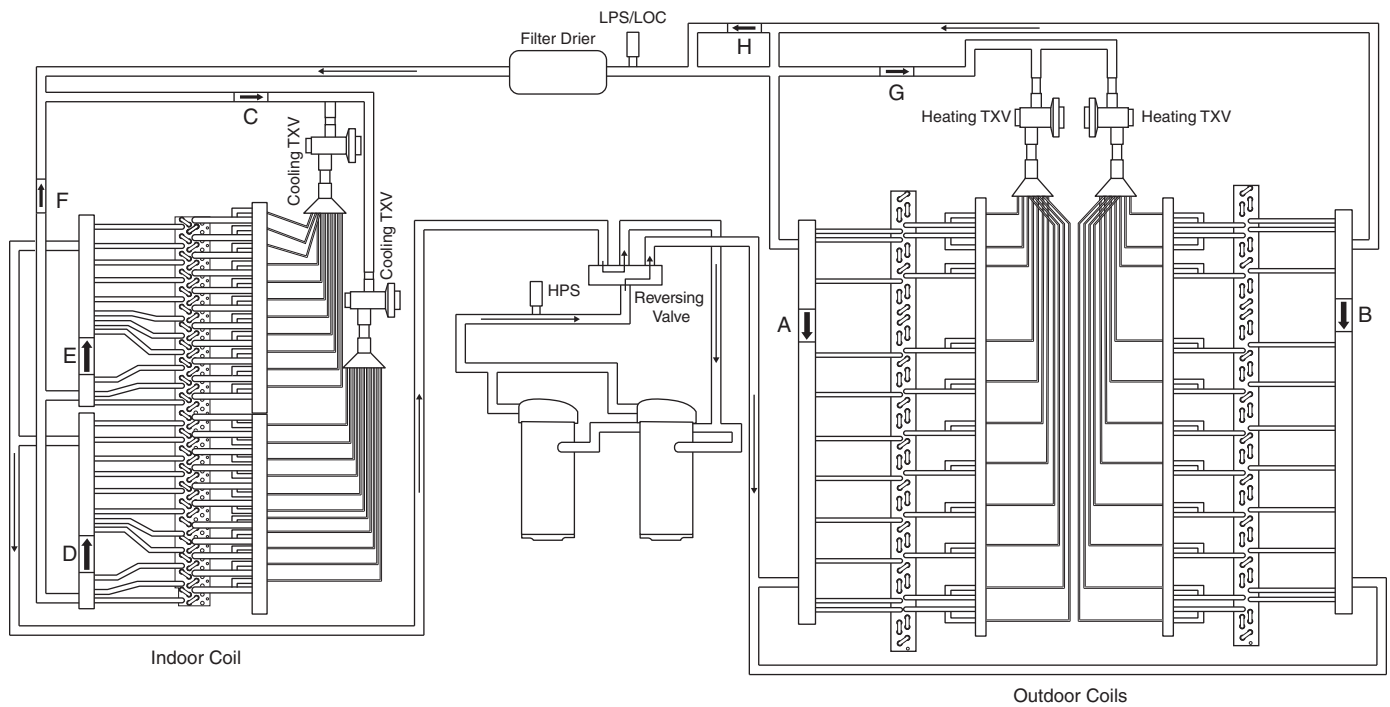


Fig. 24 — Piping Schematic — 50FCQ*17 Cooling Mode

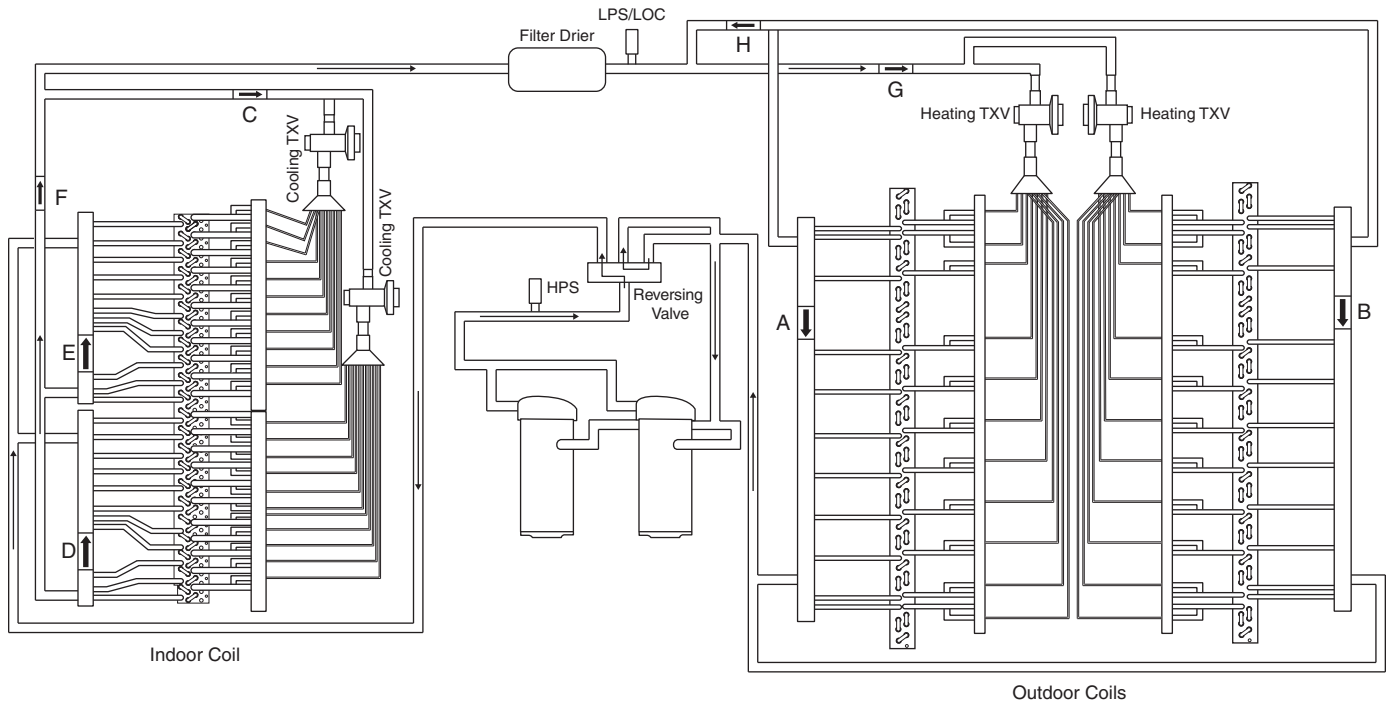


Fig. 25 — Piping Schematic — 50FCQ*17 Heating Mode

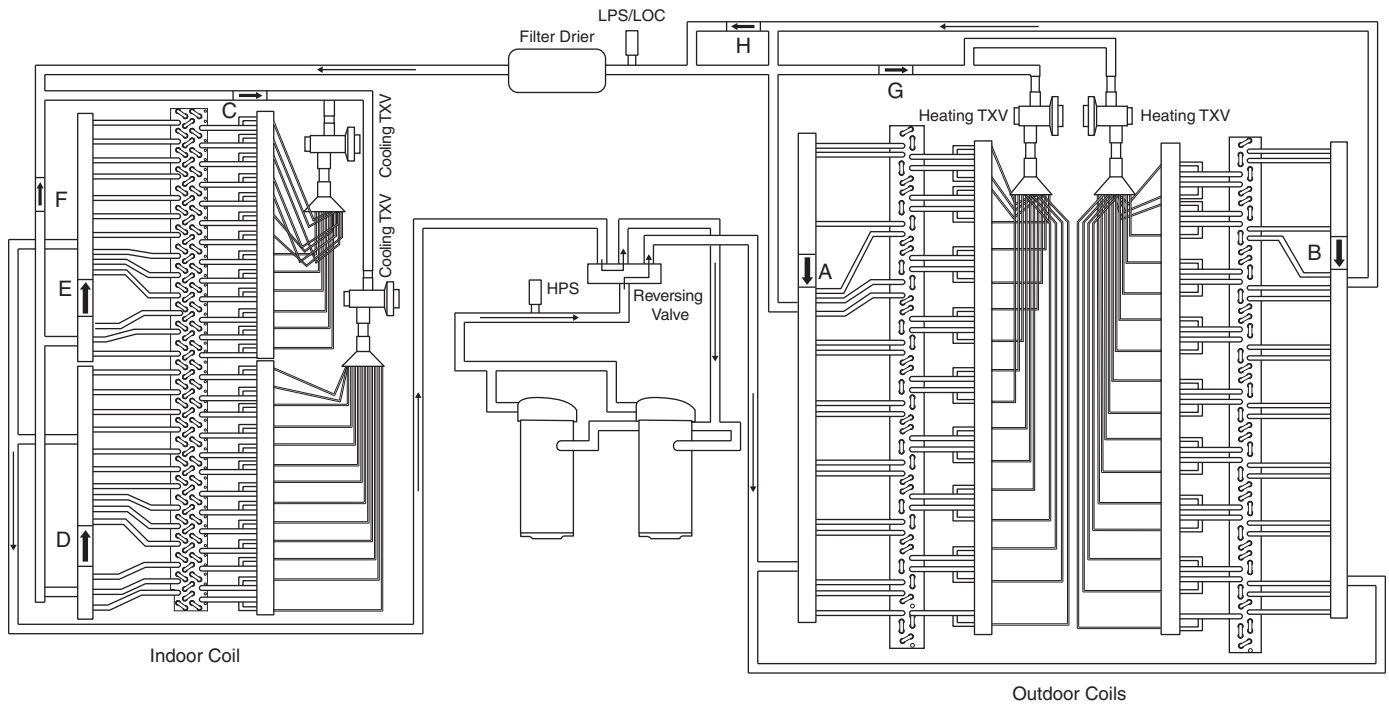


Fig. 26 — Piping Schematic — 50FCQ*24/28 Cooling Mode

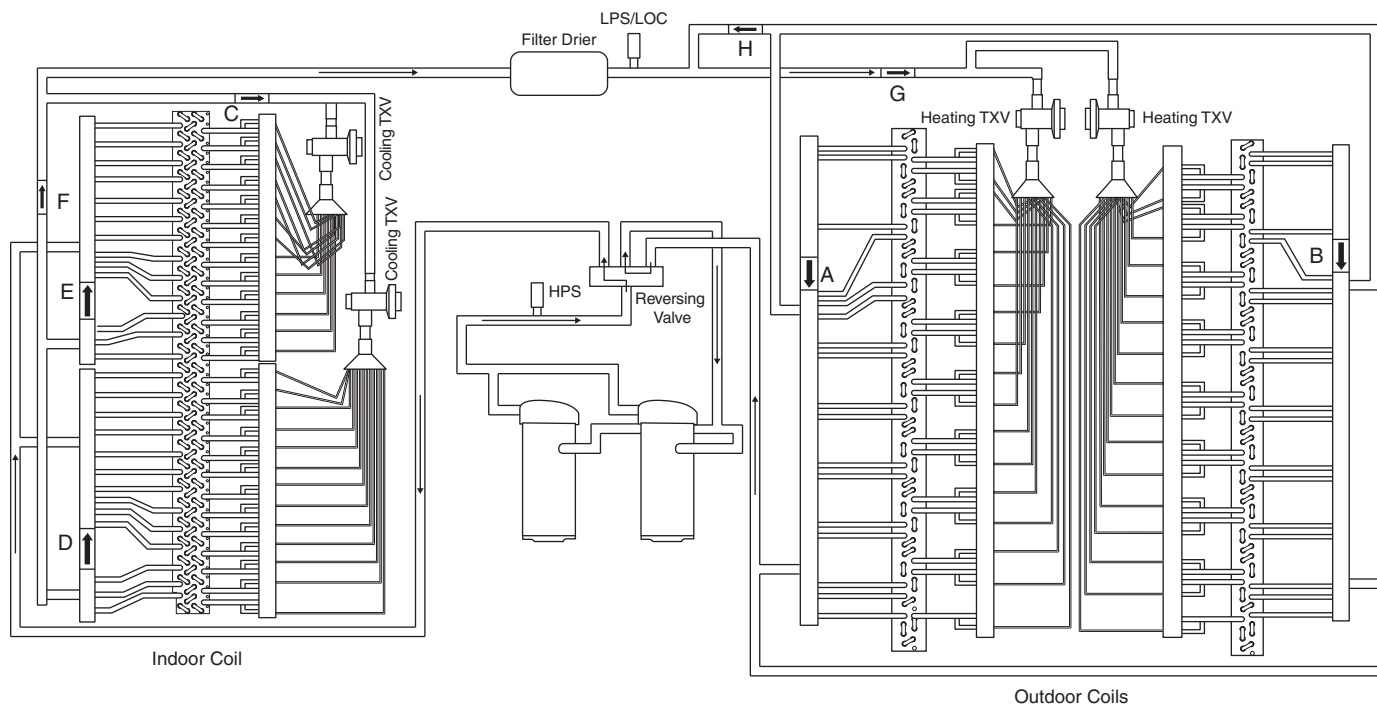


Fig. 27 — Piping Schematic — 50FCQ*24/28 Heating Mode

THERMOSTATIC EXPANSION VALVE (TXV)

The TXV is a bi-flow, bleed port expansion valve with an external equalizer. The TXVs are specifically designed to operate with Puron® refrigerant. Use only factory-authorized TXVs.

TXV Operation

The TXV is a metering device that is used in air conditioning and heat pump systems to adjust to the 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 cap tube sensing bulb on suction tube at outlet of 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.
2. The suction pressure at the outlet of the evaporator coil is transferred through the external equalizer tube to the underside of the diaphragm. This opens the valve and increases the flow of refrigerant. The increased refrigerant flow causes the leaving evaporator temperature to decrease. This lowers the pressure on the diaphragm and closes the pin. The refrigerant flow is effectively stabilized to the load demand with negligible change in superheat.

Replacing TXV

1. Recover refrigerant.
2. Remove TXV support clamp using a 5/16-in. nut driver.
3. Remove TXV using a wrench and an additional 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 using a wrench and an additional wrench on connections to prevent damage to tubing while attaching TXV to distributor.
7. Attach the equalizer tube to the suction line. If the coil has a mechanical connection, then use a wrench and an additional wrench on connections to prevent damage. If the coil has a brazed connection, use a file or a tubing cutter to remove the mechanical flare nut from the equalizer line. Then use a new coupling to braze the equalizer line to the stub (previous equalizer line) in suction line.
8. Attach TXV bulb in the same location where the original (in the sensing bulb indent) was when it was removed, using the supplied bulb clamps. See Fig. 28.
9. Route equalizer tube through suction connection opening (large hole) in fitting panel and install fitting panel in place.
10. Sweat the inlet of TXV marked "IN" to the liquid line. Avoid excessive heat which could damage the TXV valve. Use quenching cloth when applying heat anywhere on TXV.

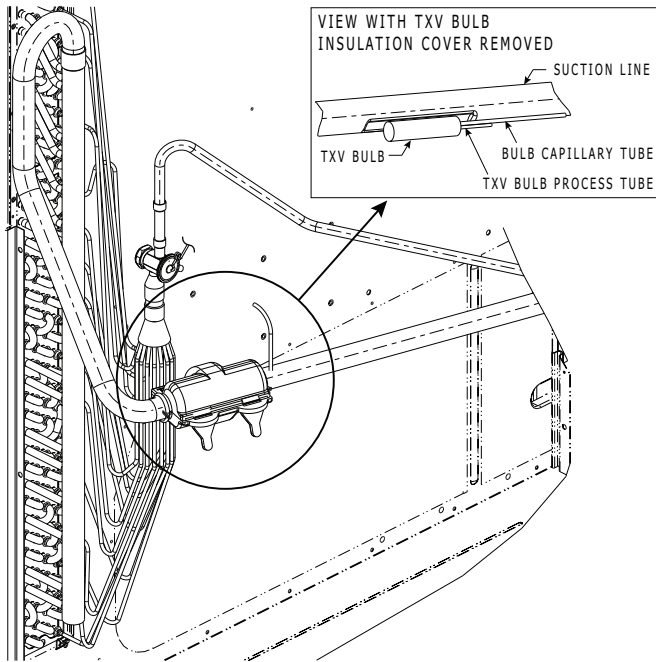


Fig. 28 — TXV Valve and Sensing Bulb Location

Refrigerant System Pressure Access Ports

There are two access ports in the system: on the suction tube near the compressor and on 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. 29. 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 with 96 ± 10 in.-lb (10.85 ± 1.1 Nm) of torque; do not over-tighten.

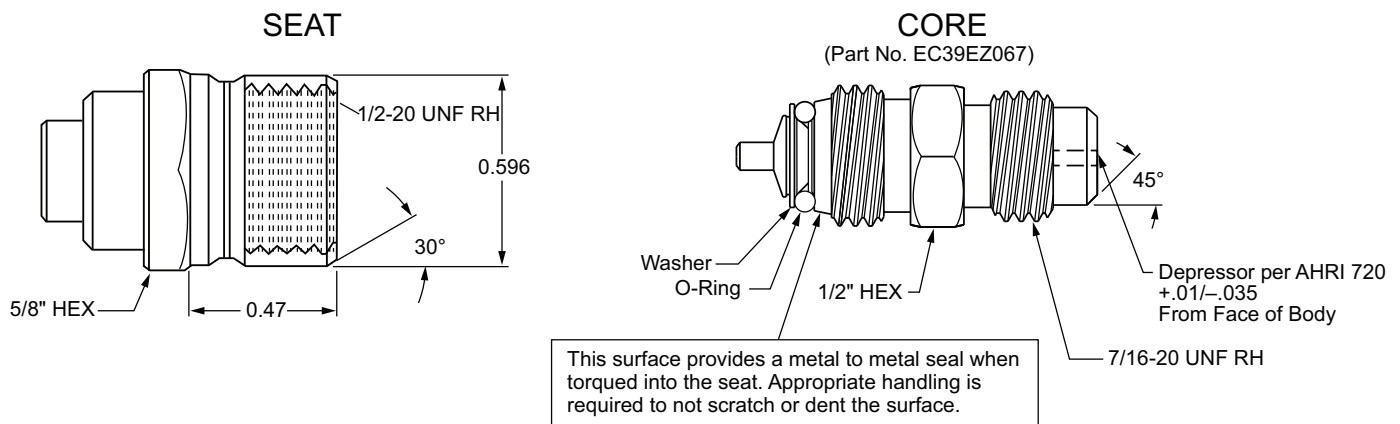


Fig. 29 — CoreMax™¹ Access Port Assembly

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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. Admit liquid refrigerant into the system in the discharge line. If adding refrigerant into the suction line, use a commercial metering/expansion device at the gauge manifold; remove liquid from the cylinder, pass it through the metering device at the gauge 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

Amount of refrigerant charge is listed on the unit's nameplate. Refer to *Carrier 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.

NO CHARGE

Use standard evacuating techniques. After evacuating system, weigh in the specified amount of refrigerant.

LOW-CHARGE COOLING

Using Cooling Charging Charts, Fig. 30-32, 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 sub-cooling for the various operating conditions. Accurate pressure gauge and temperature sensing device are required. Connect the pressure gauge to the service port on the liquid line. Mount the temperature sensing device on the liquid 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.

50FCQ SIZE DESIGNATION	NOMINAL TONS REFERENCE
17	15
24	20
28	25

EXAMPLE:

Model. 50FCQ*24
Outdoor Temperature 85°F (29°C)
Suction Pressure 140 psig (965 kPa)
Suction Temperature should be 65°F (18°C)

USING COOLING CHARGING CHARTS

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

COOLING CHARGING CHARTS

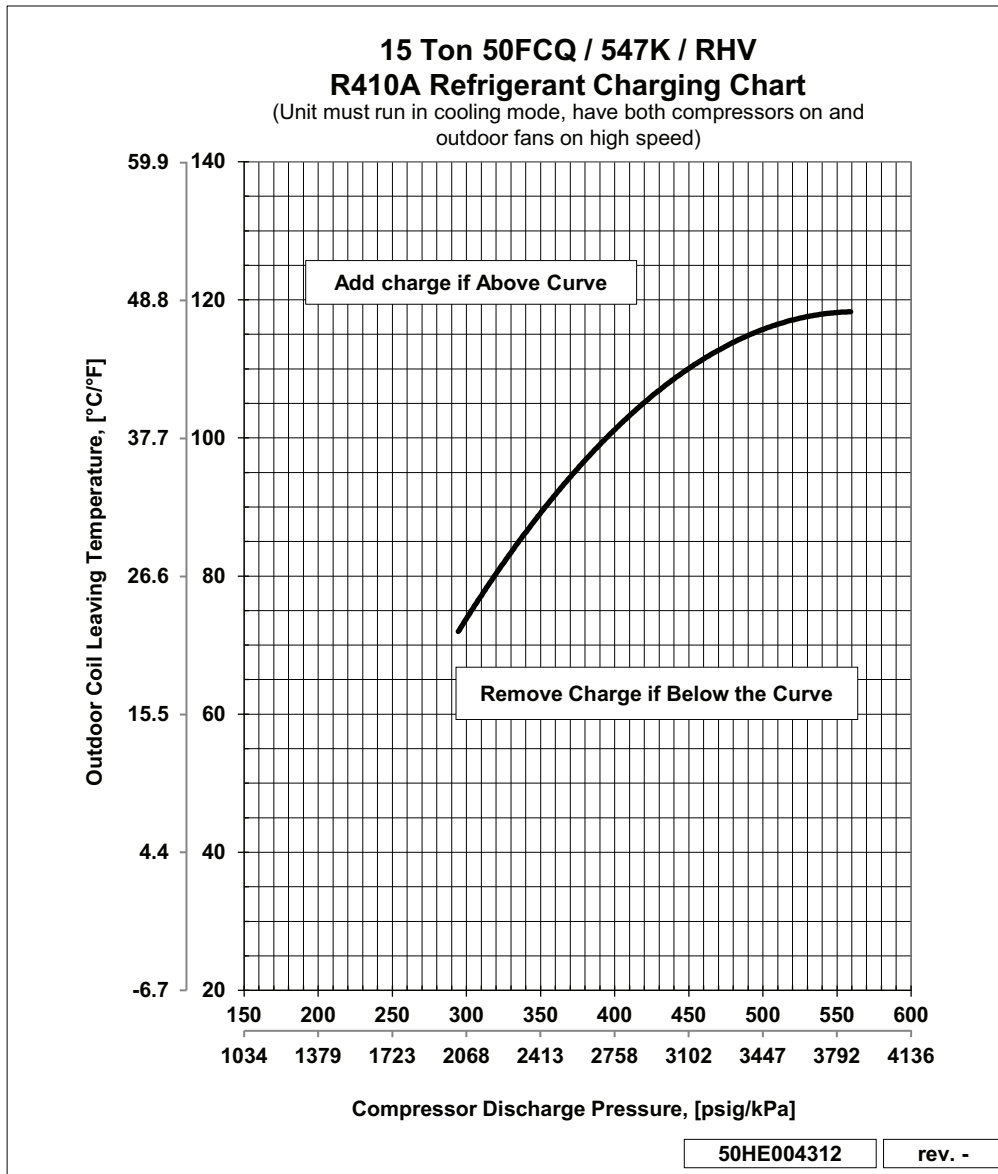


Fig. 30 — Cooling Charging Chart — 15 Ton

COOLING CHARGING CHARTS

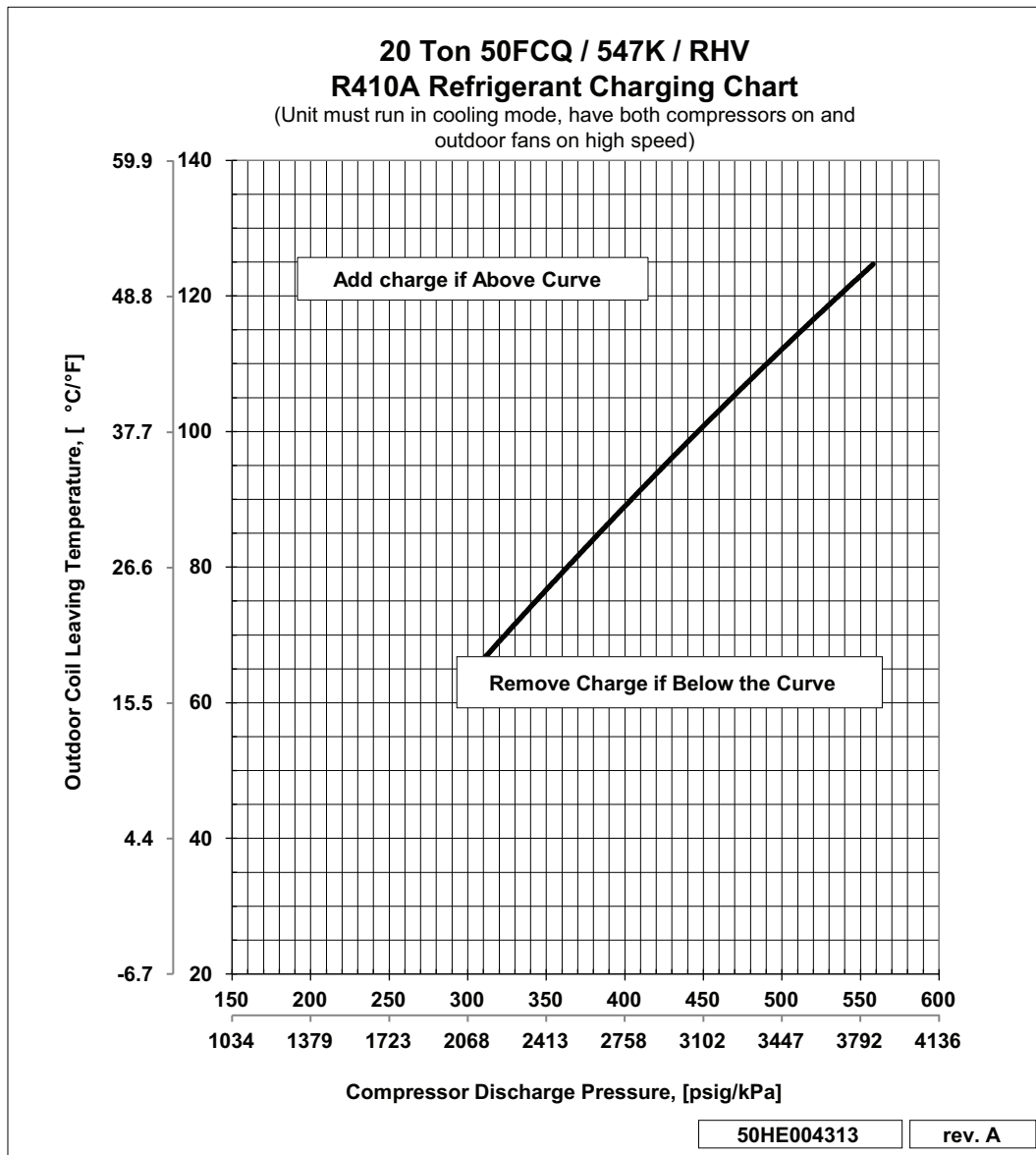


Fig. 31 — Cooling Charging Chart — 20 Ton

COOLING CHARGING CHARTS

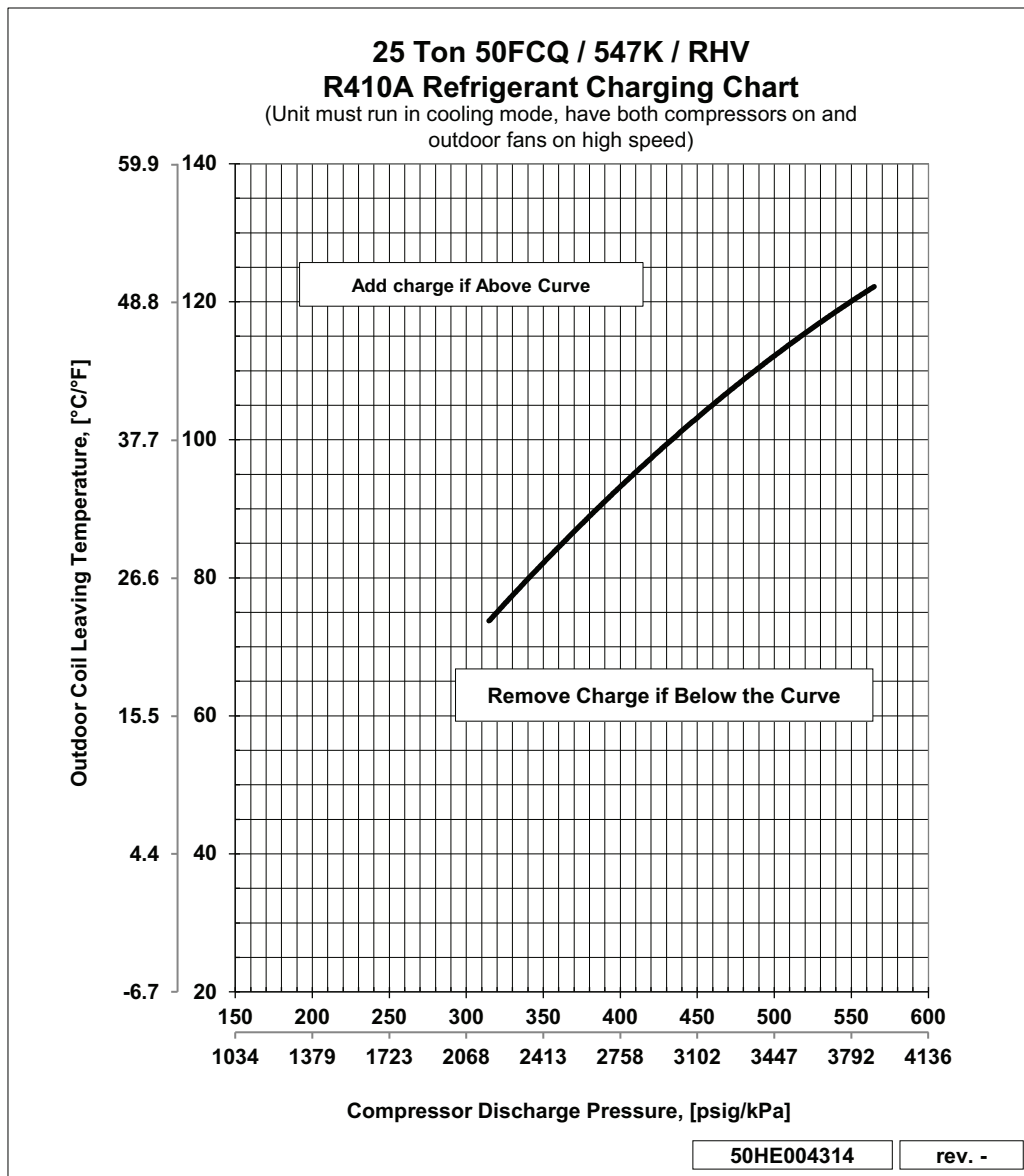


Fig. 32 — Cooling Charging Chart — 25 Ton

COMPRESSOR

Lubrication

The compressor is 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 Puron® 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.

⚠ 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.

Replacing Compressor

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

⚠ CAUTION

INSTALLATION SITE DAMAGE

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

Puron (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.

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 gauges 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.
4. If the suction pressure does not drop and the discharge pressure does not rise to normal levels, 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. The suction pressure should drop and the discharge pressure should rise which is normal for scroll compressors on start-up.
8. Replace compressor if suction/discharge pressures are not within specifications for the specific compressor.

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

Filter Drier

Replace whenever refrigerant system is exposed to atmosphere. Only use factory specified liquid-line filter driers with working pressures no less than 650 psig. Do not install a suction-line filter drier in liquid line. A liquid-line filter drier designed for use with Puron refrigerant is required on every unit.

Condenser-Fan Adjustment

1. Shut off unit power supply. Install lockout tag.
2. Remove condenser-fan assembly (grille, motor, and fan). See Fig. 33.
3. Loosen fan hub setscrews.
4. Adjust fan height by pushing fan until it stops on the fan shaft.
5. Tighten set screw to 84 in.-lb (9.5 Nm) \pm 12 in.-lb (1.5 Nm).
6. Replace condenser-fan assembly.

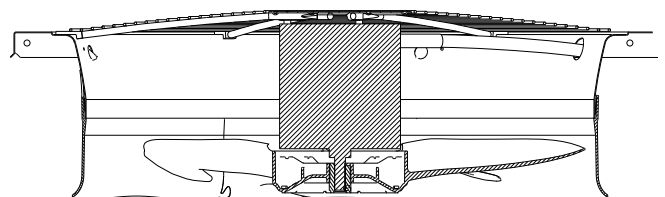


Fig. 33 — Condenser Fan Adjustment

Troubleshooting Cooling System

Refer to Table 10 for additional troubleshooting topics.

Table 10 – Troubleshooting

SYMPTOM	CAUSE	SOLUTION
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.	Replacement 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.
	Freeze-up protection thermostat tripped.	See problem “Suction pressure too low.”
Compressor Will Not Start but Outdoor Fan Runs	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. Replace compressor or allow enough time for internal overload to cool and reset.
	One leg of 3-phase power dead.	Replace fuse or reset circuit breaker. Determine cause.
Compressor Cycles (Other Than Normally Satisfying Thermostat)	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, start relay.	Determine cause and correct.
	Defective thermostat.	Replace thermostat.
	Faulty outdoor-fan (cooling) or indoor-fan (heating) motor or capacitor.	Replace faulty part.
	Restriction in refrigerant system.	Locate restriction and remove.
	Defective loader plug.	Determine cause and replace.
Compressor Operates Continuously	Dirty air filter.	Replaced 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.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Outdoor coil dirty or restricted.	Clean coil or remove restriction.
Compressor Makes Excessive Noise	Compressor rotating in the wrong direction.	Reverse the 3-phase power leads as described in Start-Up.
Excessive Head Pressure	Dirty outside.	Replace filter.
	Dirty outdoor coil (cooling).	Clean coil.
	Refrigerant overcharged.	Recover excess refrigerant.
	Air in system.	Recover refrigerant, evacuate system, and recharge.
	Condensing air restricted or air short-cycling.	Determine cause and correct.
Head Pressure Too Low	Low refrigerant charge.	Check for leaks; repair and recharge
	Compressor scroll plates defective.	Replace compressor
	Restriction in liquid tube.	Remove restriction.
Excessive Suction Pressure	High heat load.	Check for source and eliminate.
	Compressor scroll plates defective.	Replace compressor.
	Refrigerant overcharge.	Recover excess refrigerant.
Suction Pressure Too Low	Dirty air filter (cooling).	Replace filter.
	Dirt 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 temperature 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.

Convenience Outlets

Two types of convenience outlets are offered on 50FCQ models: non-powered and unit-powered. Both types provide a 125 vac ground-fault circuit-interrupt (GFCI) duplex receptacle rated at 15A behind a hinged waterproof access cover, located on the end panel of the unit. See Fig. 34.

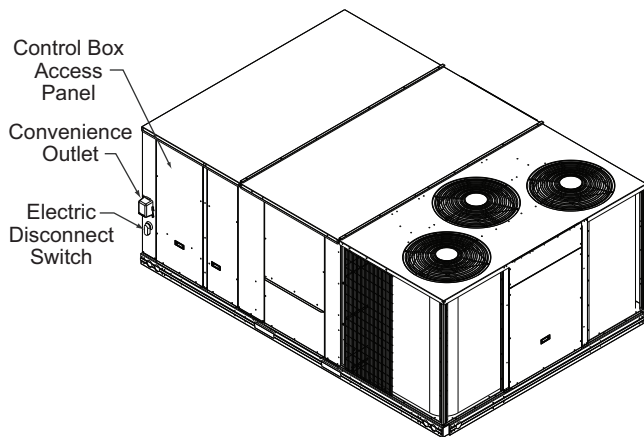


Fig. 34 — Convenience Outlet Location

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 UNIT AND 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 is 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. 35.
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.

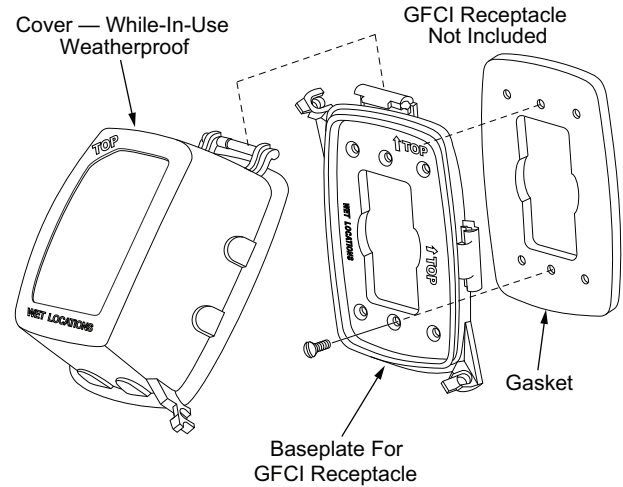


Fig. 35 — Weatherproof Cover Installation

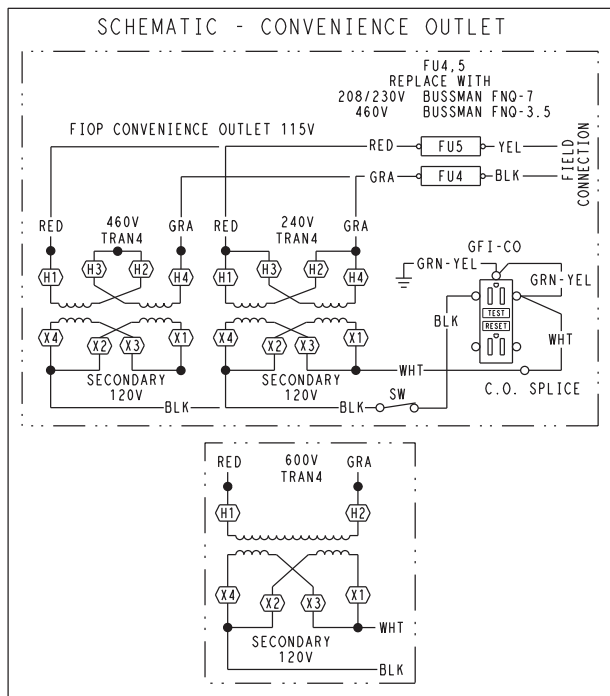
Non-Powered Type

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

Unit-Powered Type

A unit-mounted transformer is factory-installed to step-down the main power supply voltage to the unit to 115-v at the duplex receptacle. This option also includes a manual switch with fuse, located in a utility box and mounted on a bracket behind the convenience outlet; access is through the unit's control box access panel. See Fig. 34.

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 a unit-mounted non-fused disconnect or Heating, Air Conditioning and Refrigeration (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. 36.



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. 36 — 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 15A loading for continuous duty loads (such as electric heaters for overnight use). Observe a 50% limit on circuit loading above 8A (i.e., limit loads exceeding 8A to 30 minutes of operation every hour).

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 Powered Type

The factory fuse is a Bussmann™ “Fusetron™1” T-15, non-renewable screw-in (Edison base) type plug fuse.

USING UNIT-MOUNTED CONVENIENCE OUTLETS

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

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COMMERCIAL DEFROST CONTROL

On 50FCQ units equipped with electro-mechanical controls the Defrost Control Board (DFB) coordinates thermostat demands for supply fan control, 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. 37 for board arrangement.

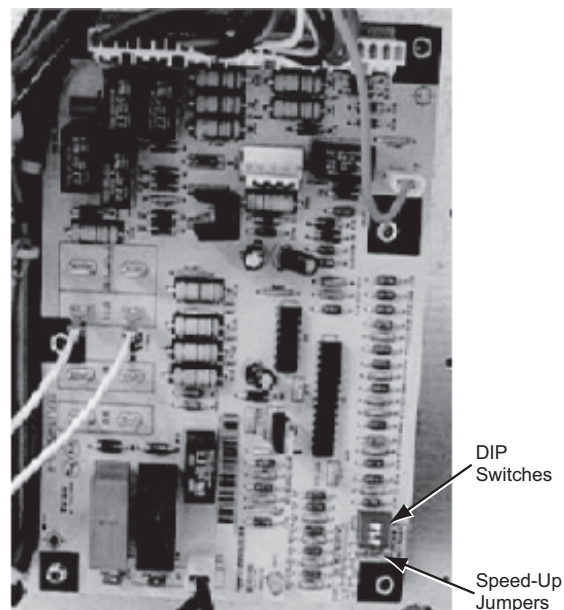


Fig. 37 — Defrost Control Board Arrangement

The DFB is located on the right side wall of the control box of the 50FCQ unit (see Fig. 38). All connections are factory-made through harnesses to the UCB (unit control board) to the ECM (direct-drive motor), reversing valve solenoids and to defrost thermostats. Refer to Table 11 for details of DFB Inputs and Outputs.

NOTE: The Defrost Control Board is not used on units equipped with the factory-installed SystemVu™ controller option.

Reversing Valve Control

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

Compressor Control

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

Auxiliary (Electric) Heat Control

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

Table 11 — 50FCQ Defrost Board I/O and Jumper Configurations^{a,b}

POINT NAME	TYPE OF I/O	CONNECTION PIN NUMBER	UNIT CONNECTION	NOTE
INPUTS				
G Fan	DI, 24 vac	P2-3	UCB-REHEAT/HP-6	
Y1 Cool 1	DI, 24 vac	P2-5	UCB-REHEAT/HP-1	
Y2 Cool 2	DI, 24 vac	P2-4	UCB-REHEAT/HP-3	
W1 Heat 1	DI, 24 vac	P2-7	UCB-MAIN-3	
W2 Heat 2	DI, 24 vac	P2-6	UCB-MAIN-2	
R Power	24 vac	P3-1	UCB-MAIN-6	
C Common	24 vac	P3-2	UCB-MAIN-9	
DFT 1	DI, 24 vac	DFT-1 to DFT-1	—	DFT1 input not used
DFT 2	DI, 24 vac	DFT-2 to DFT-2	—	
OUTPUTS				
IFO Fan On	DO, 24 vac	P3-9	USB-REHEAT/HP-4	
OF OD Fan On	DO, 24 vac	OF	OFC and TBR-4	
RVS1	DO, 24 vac	P3-7 to P3-5	RVSR	Energize in COOL
RVS2	DO, 24 vac	P3-6 to P3-4	RVSR	Energize in COOL
COMP 1	DO, 24 vac	P3-10	UCB-REHEAT/HP-2	
COMP2	DO, 24 vac	P3-8	UCB-REHEAT/HP-4	
HEAT 2	DO, 24 vac	E-HEAT	EHR	
CONFIGURATION				
Select Jumper	24 vac	P1-1 to P1-3	—	
SPEED-UP CONFIGURATION				
Speed-Up Jumper	—	JMP17	—	
Speed-Up Jumper	—	JMP18	—	

NOTE(S):

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

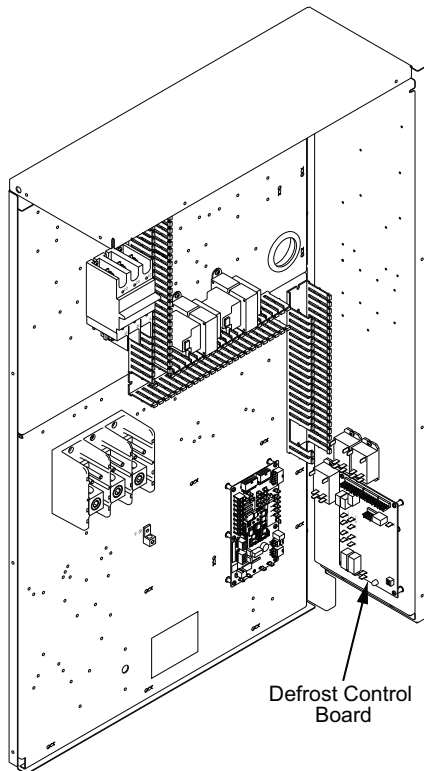


Fig. 38 — Defrost Control Board Location

Defrost

The defrost control mode is a time/temperature sequence. There are two time components: The continuous run period and the test/defrost cycle period. The temperature component is provided by Defrost Thermostat 1 and 2 (DFT1 and DFT2) mounted on the outdoor coil. These are wired in series into the DFT2 input on the DFB controller or wired in series as input to SystemVu™ controller.

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

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.

DIP SWITCH SETTINGS - DEFROST BD

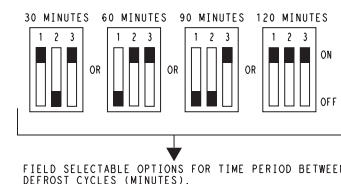


Table 12 — DIP Switch Positions

	1	2		1	2		1	2		1	2		3	
1	•		1		•	1			1	•	•	1	•	On
0		•	0	•		0	•	•	0			0		Off
	30 minutes (factory default)			60 minutes			90 minutes			120 minutes			Fan Delay	

ELECTRIC HEATERS

The 50FCQ units can 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 and control contactor(s), using a combination of 24-v control side break/auto-reset or line-break/auto-reset limit switches and a pilot-circuit/manual reset limit switch to protect the unit against over-temperature situations. All 50FCQ model electric heaters are one module containing either one or two banks of electric heat coils. Heaters may be installed on both Standard SCCR and High SCCR rated units.

Heater modules are installed in the compartment below the indoor (supply) fan outlet. Access is through the indoor blower access panel. Heater modules slide into the compartment on tracks along the bottom of the heater opening. See Fig. 40-42.

Each kit (CRHEATER454A00 to CRHEATER471A00) contains the heater module, wire ties, and three 1/4-20 nuts. Refer to “*Electric Heater Accessory, Single Package Rooftop Units, Select 17.5 to 27.5 Tons*” for unit electrical data and kit usage. Not all available heater modules can be used in every unit. Use only those heater modules that are UL listed for use in a specific size unit. Refer to the label on the unit cabinet regarding approved heaters.

NOTE: All vertical supply units with electric heat require a field-supplied 90-degree elbow. The elbow must be installed in the supply ductwork below the unit discharged connection.

Refer to accessory instructions for the correct single point kit to use when single point power entry is desired. The single point kit required varies with the specific heater accessory used.

For units equipped with a non fused disconnect switch, the disconnect must be adequately sized for the electric heater. If the disconnect switch supplied with the equipment is not sized to handle the ampacity of the electric heater accessory kit for cooling units or the electric heater accessory kit plus the unit ampacity for heat pump units, the electric heater kit must be wired to a separate disconnect switch sized to handle the electric heater accessory kit ampacity. Refer to the unit’s nameplate or the product data for the unit.

Heater Installation (All Units)

Perform the following procedure to install the accessory electric heaters:

1. Turn off power to the unit.
2. Remove electric heater section access panel, control box access panel, filter access panel, and blower access panel from base rooftop unit. (See Fig. 40.)
3. Remove the block-off plate and save screws. Remove post adjacent to control box and post located between filter access and blower access. (See Fig. 41.)
4. Insert heater assembly through opening where block-off plate was previously removed. Let back end of heaters slide along support rails beneath fan deck. (See Fig. 42.)
5. Slide heaters until completely installed such that heater controls are completely in the unit. Using screws saved from Step 3, secure heater assembly. (See Fig. 43.)

6. Route heater power wires through grommets notches in vertical fan deck support. (See Fig. 42.) Continue routing wires under coil and filter support through the bottom notched section of the control box. Avoid sheet metal edges and any protruding screws.
7. To be used with Standard SCCR (5ka) Units Only. Refer to Fig. 47 for wiring single point kit accessory when required. Using three 1/4-20 nuts, connect power wires to the load side of terminal block.

If single point power entry is desired, a single point kit must be used. See “*Electric Heater Accessory, Single Package Rooftop Units, Select 17.5 to 27.5 Tons*” for details on selecting the correct single point kit for the accessory heater being installed. Terminal block and fuse holder can be mounted using screws provided, locating the combination below unit terminal block. (See Fig. 46.) Heaters will be connected to the load side of the terminal block provided with kit. Load side of fuses to be connected to terminal block of main unit, at factory-installed option non-fused disconnect switch and molded case switch for 230v units with the High SCCR (Short-Circuit Current Rating) option or fuse holders for 460v units with the High SCCR option.

For dual power entry, purchase terminal block HY11UC313 for 208-230 volt applications. Six 1/4-20 field supplied lock nuts required (P/N AT56AB171). For 400v-50 Hz, 460v and 575v-60Hz applications purchase terminal block HY11UC125. Three 1/4-20 field-supplied screws required (P/N AA45AB167). Mount in pre-drilled holes using field-supplied fasteners. Connect power leads from heaters to field-supplied terminal block.

8. Connect low voltage control plug from heater to the control plug from unit.
9. Re-install posts previously removed. When re-installing screws verify that wires do not come into contact with screw tips.
10. Re-install blower access, heater access, filter and control box access panels.
11. Mark nameplate with a check mark next to heater installed.

460V HIGH SCCR UNIT INSTALLATION (65KA SCCR)

1. Remove shroud screws and shroud. Install fuse block assembly in location shown in Fig. 44.
2. Route heater wires to fuse holders.
3. Insert wires in top holes of lugs.
4. Tighten screws in lug to clamp down on wires. Torque to 7.9 Nm (70 in.-lb).
5. Repeat for all heater wires.
6. Reattach shroud with 2 screws.

230V HIGH SCCR UNIT INSTALLATION (60KA SCCR)

1. Install terminal block assembly in location shown in Fig. 45.
2. Remove cover from terminal block assembly.

3. Route heater wires to terminal block assembly.
NOTE: There may be 2 or 4 wires per leg depending on heater configuration.
4. Heater wires will be either 2 wires per leg or 4 wires per leg. Component assembly order is important for maintaining secure assembly and maximum distancing between components on each leg.

For 4 wire/leg assembly: add lock washers (Item 5), turn bottom two wires so barrel of terminal is down as shown in Fig. 45. Add nut (Item 4) and tighten to 9-10 Nm (79-88 in.-lb). Add second lock washer (Item 5), the top

two wires shall be installed with barrels “up.” Add second nut (Item 4) and tighten to 9-10 Nm (79-88 in.-lb).

For 2 wire/lug assembly: add lock washers (Item 5), wire terminal barrels may be up or down. Add nut (Item 4) and tighten to 9-10 Nm (79-88 in.-lb).

5. Repeat for all heater wires maintain wire color continuity - black to black; yellow to yellow; blue to blue.
6. Remove leg cover from line side of control box main fuse block. Install line side power wires into bottom holes of fuse block lugs. Maintain wire color continuity. Torque set screw in lug 42 Nm (375 in.-lb). Reinstall cover.

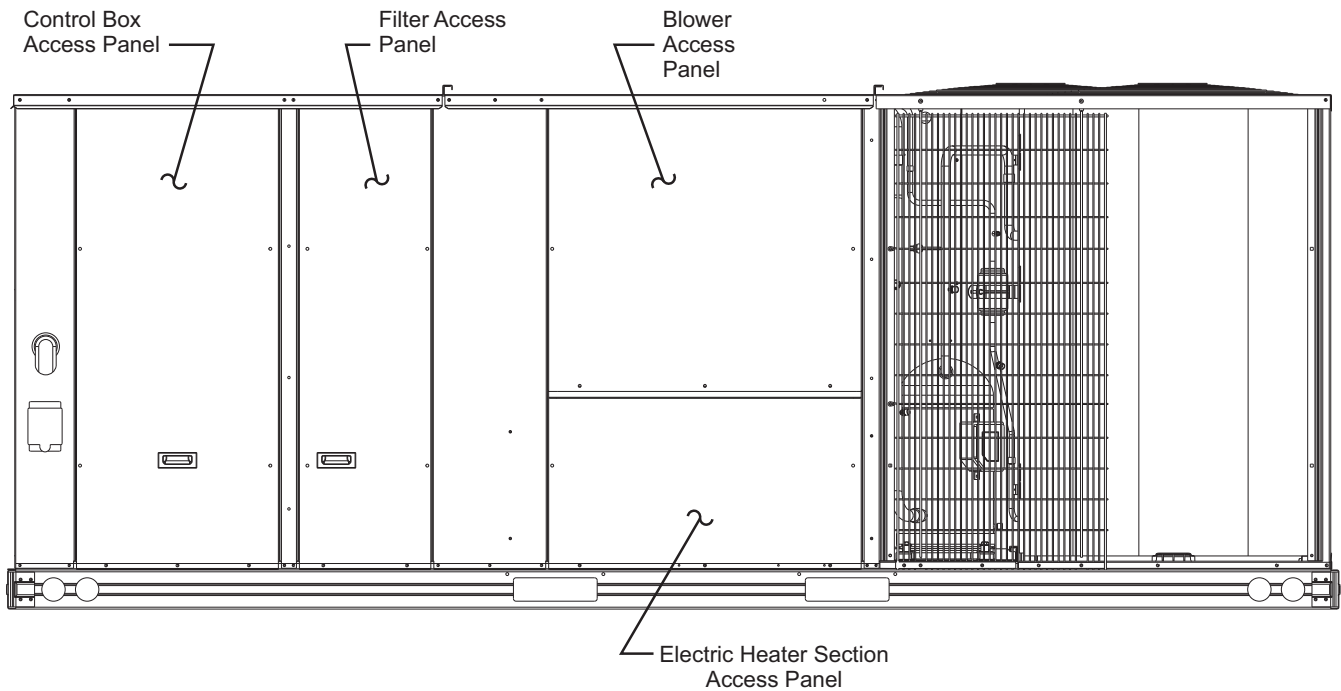


Fig. 40 — Typical Unit — Access Panel Locations

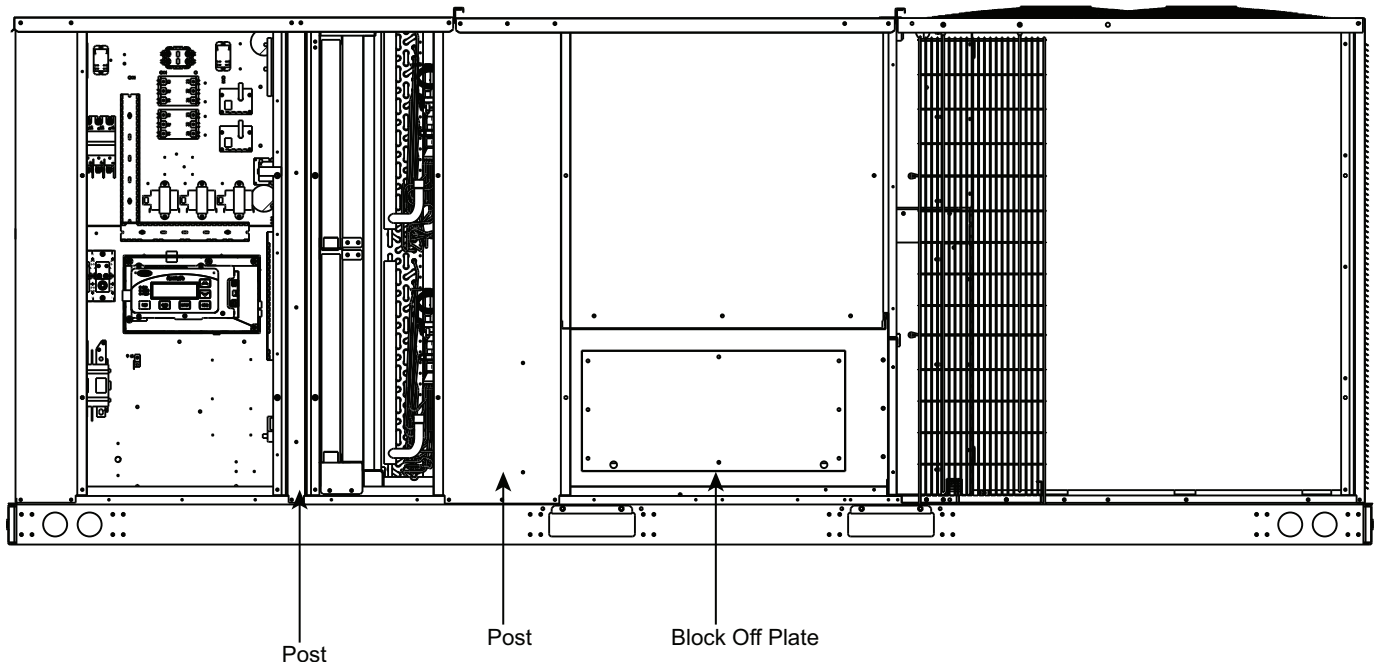


Fig. 41 — Block-Off Plate and Post Locations

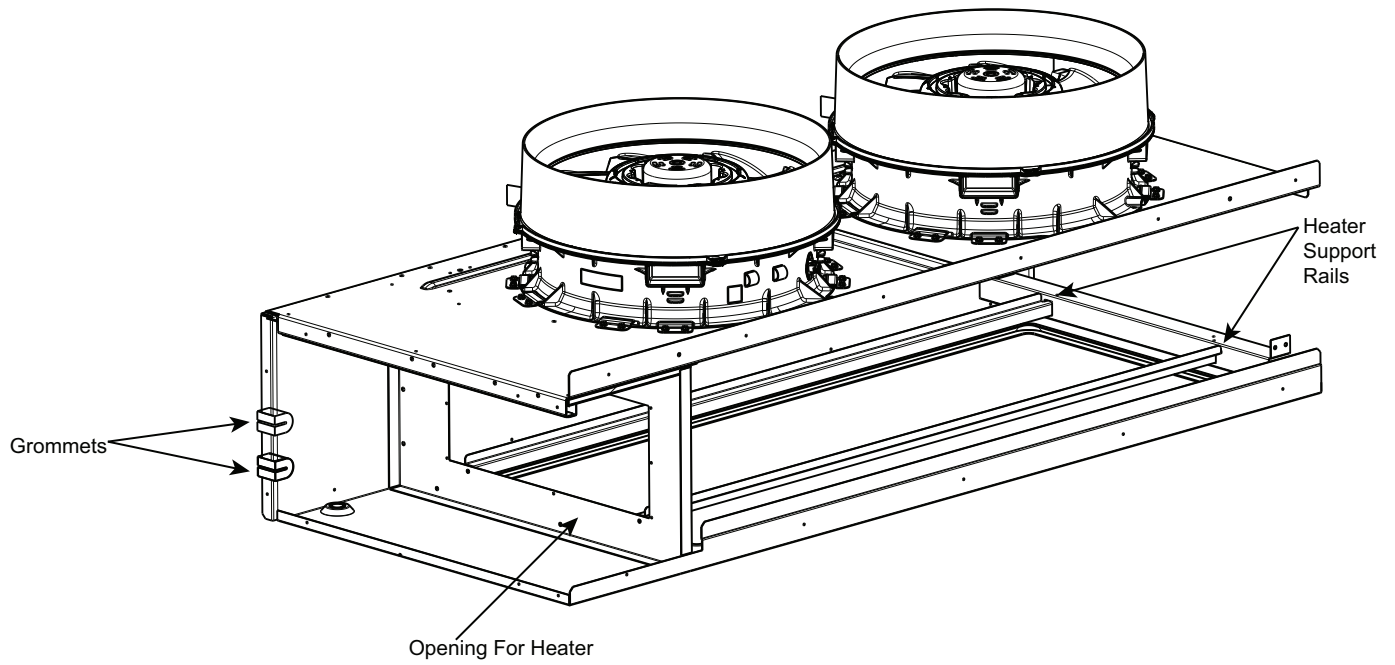


Fig. 42 — Opening for Electric Heater

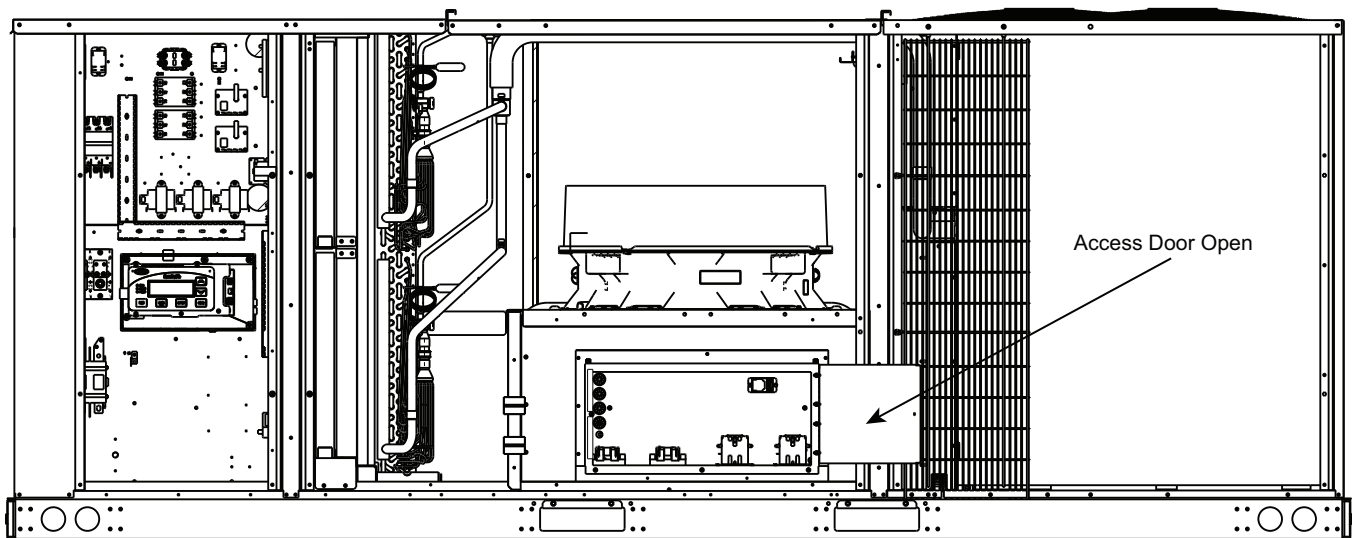


Fig. 43 — Electric Heater Accessory In Place (Shown with Access Door Opened)

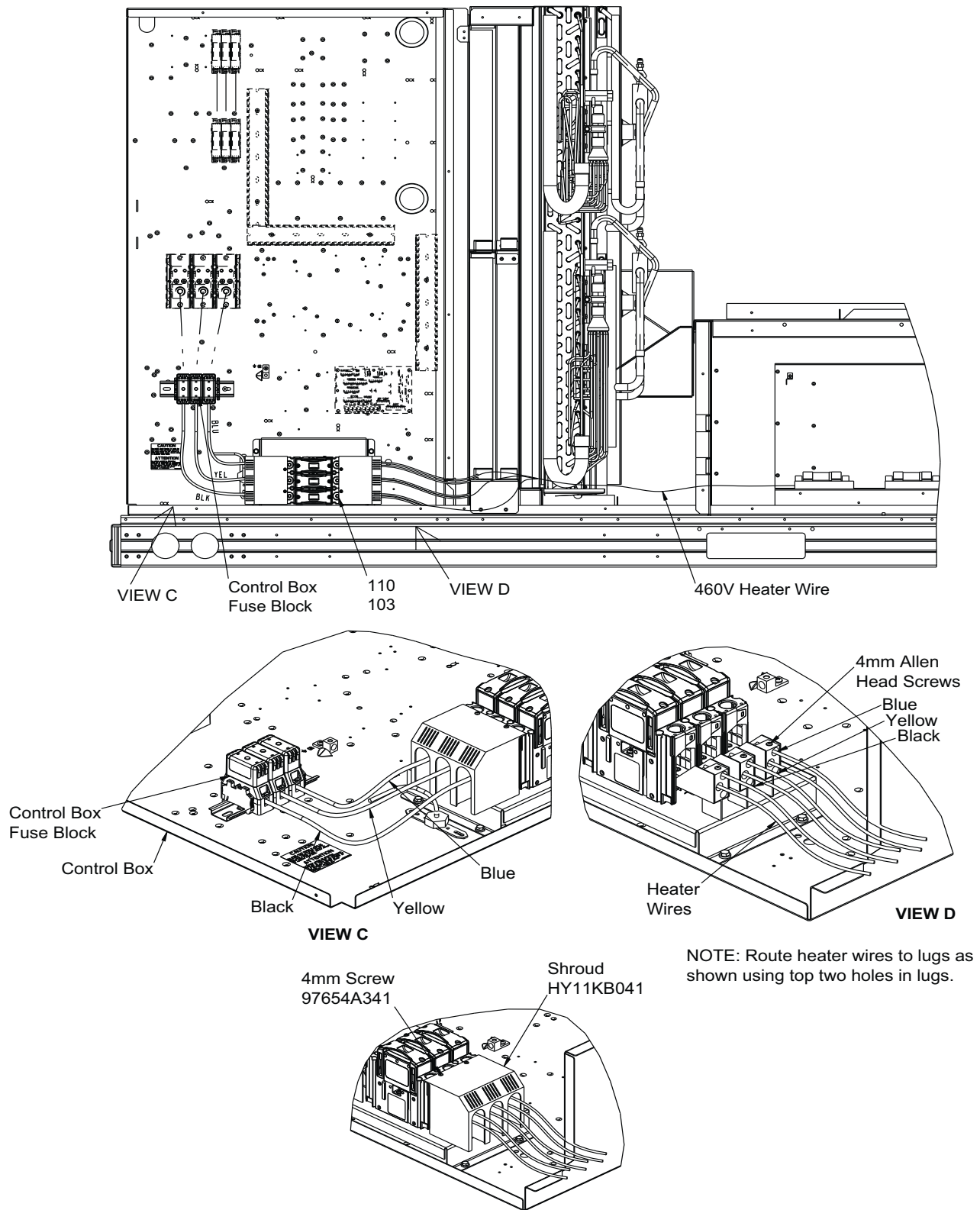


Fig. 44 — 460V Single Point Power Assembly Location (High SCCR)

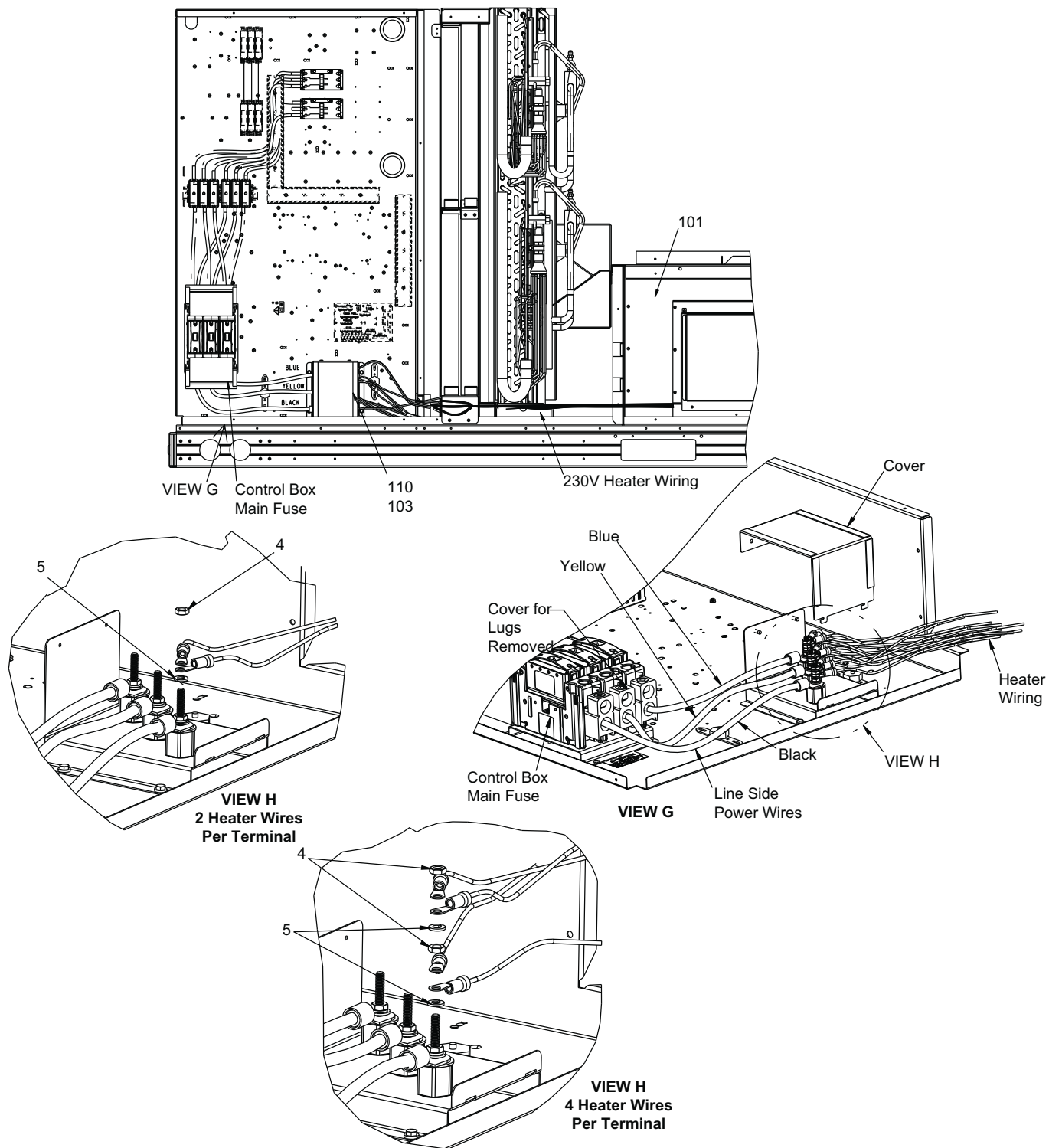


Fig. 45 — 230V Single Point Power Assembly Location (High SCCR)

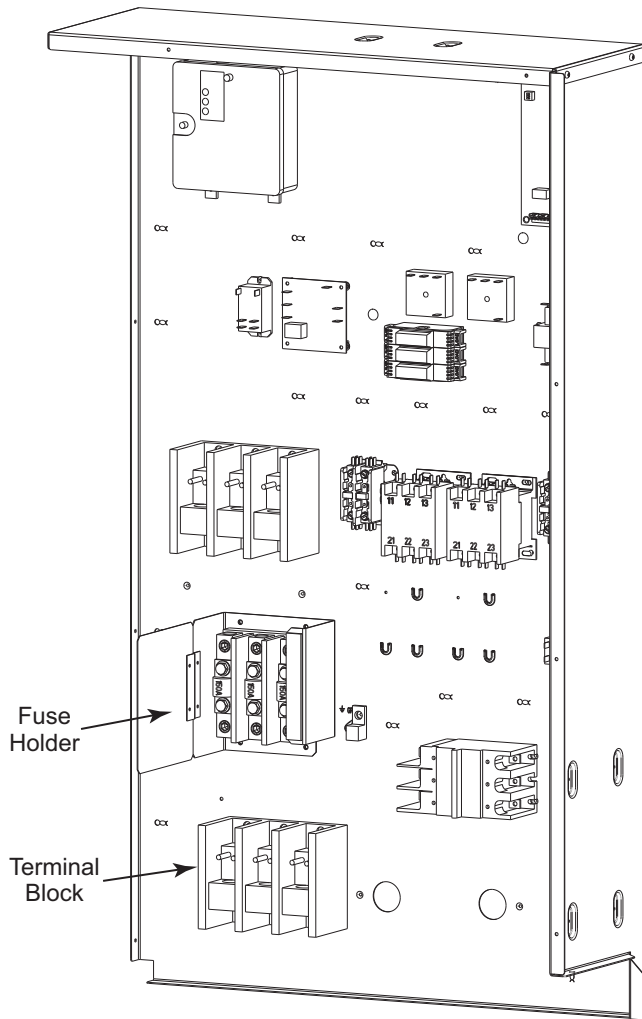


Fig. 46 — Single Point Installation

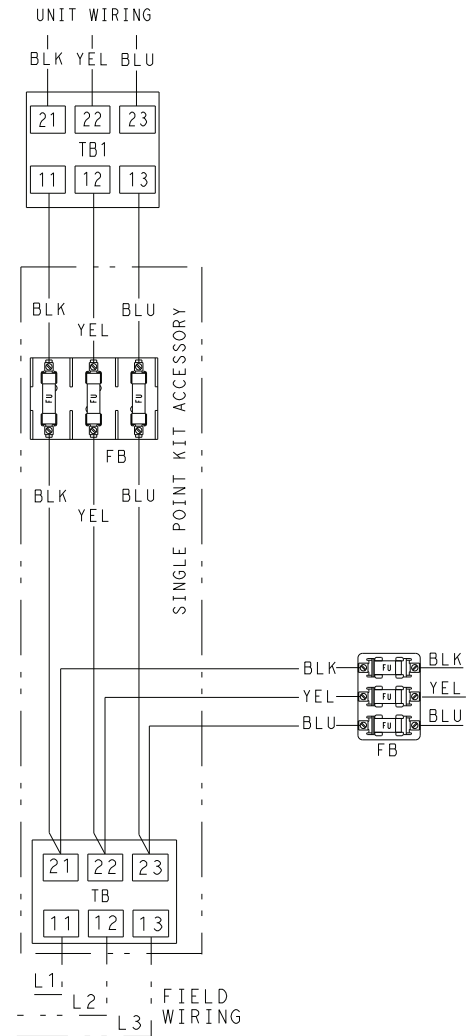


Fig. 47 — Wiring Diagram for Single Point Kit Accessory When Required

Completing Heater Installation

1. Check electrical connections
2. Turn thermostat to OFF position.
3. Restore power to unit.
4. Check voltage supply and match the reading against unit and heater nameplate.
5. Slowly turn thermostat up until fan comes on. First stage of electric heat should be on depending on thermostat.
6. Continue raising thermostat until stage 2 comes on.
7. Set temperature to desired level or return thermostat to the OFF position.

SMOKE DETECTORS

Smoke detectors are available as factory-installed options on 50FCQ models. Smoke detectors may be specified for supply air only, for return air without or with economizer, or in combination of supply air and return air. 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 may 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. 48) 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).

Smoke Detector Sensor

The smoke detector sensor (see Fig. 49) 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.

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.

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

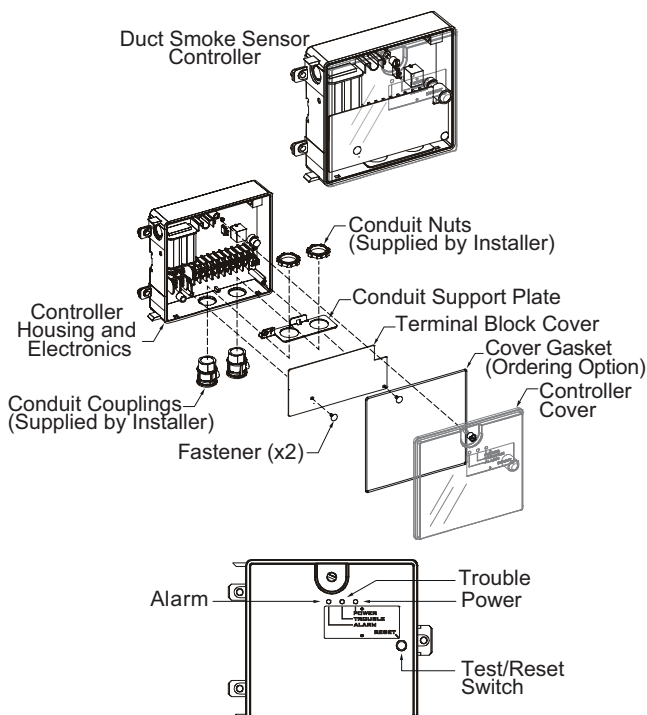


Fig. 48 — Controller Assembly

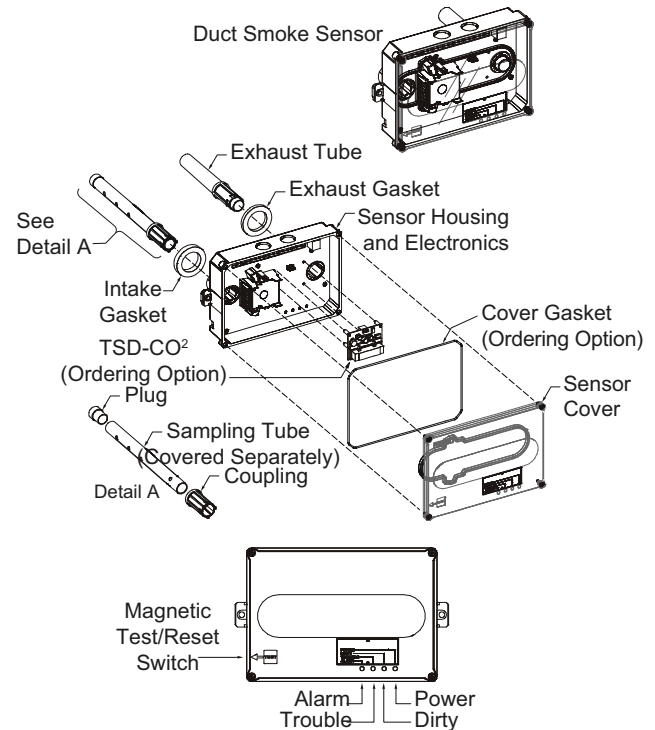


Fig. 49 — Smoke Detector Sensor

Smoke Detector Locations

SUPPLY AIR

The supply air smoke detector sensor is located to the right of the unit's indoor (supply) fan. See Fig. 50. Access is through the fan access panel. The sampling tube inlet extends through the fan deck (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.

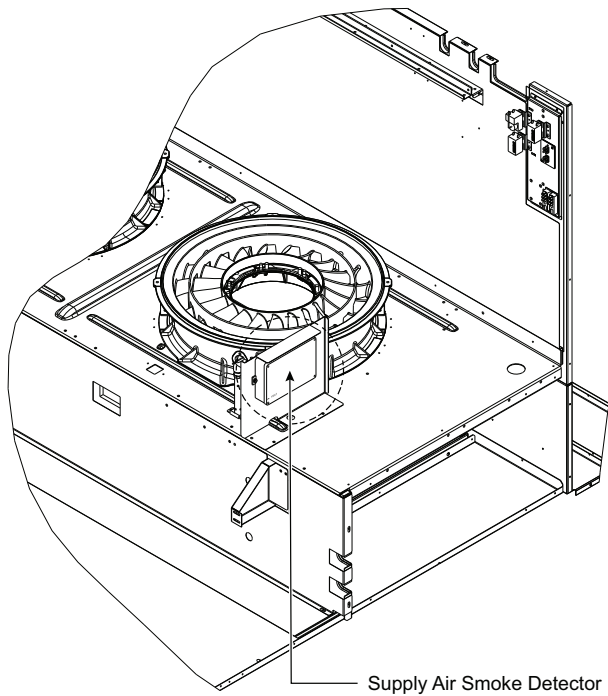


Fig. 50 — Typical Supply Air Smoke Detector Sensor Location

RETURN AIR SMOKE DETECTOR SENSOR WITHOUT ECONOMIZER

The sampling tube is located across the return air opening on the unit basepan. See Fig. 51. The holes in the sampling tube face into the return air stream. The sampling tube is connected through tubing to the return air sensor that is mounted in the unit control box. The smoke control harness is located in the box and should be routed through the return air section and connected to the smoke detector sensor.

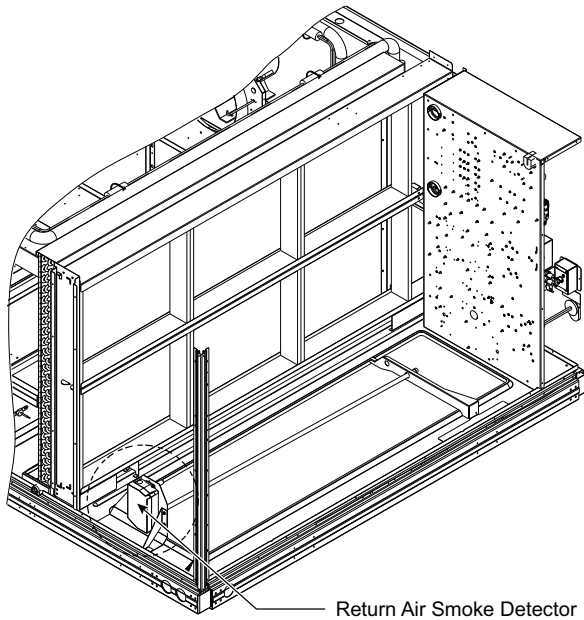


Fig. 51 — Typical Return Air Smoke Detector Location

RETURN AIR SMOKE DETECTOR SENSOR 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 basepan. The holes in the sampling tube face into the return air stream. See Fig. 52 and 53 for sensor assembly locations, sampling tube location and orientation, and airflow direction example. The sampling tube is connected using tubing to the return air sensor mounted on a bracket low on the partition, near the return air filter and opposite the controller location.

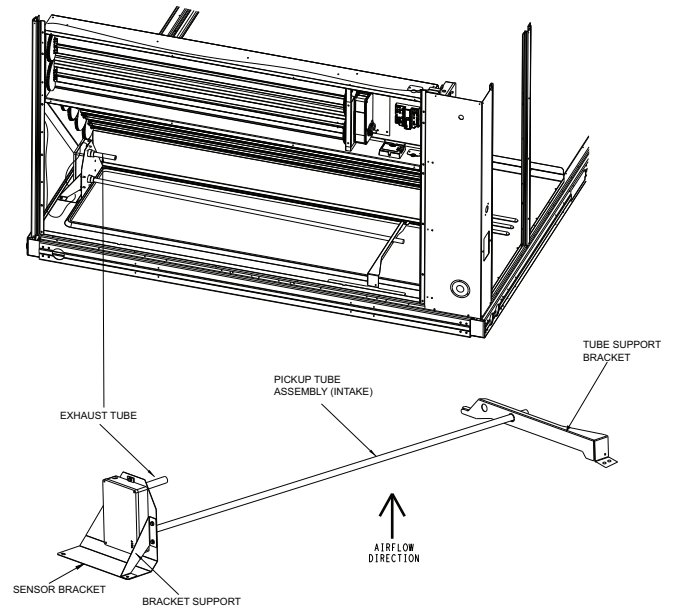


Fig. 52 — Vertical Return Air Sampling Sensor Assembly and Tube Location
(View reoriented to show opposite side for clarity.)

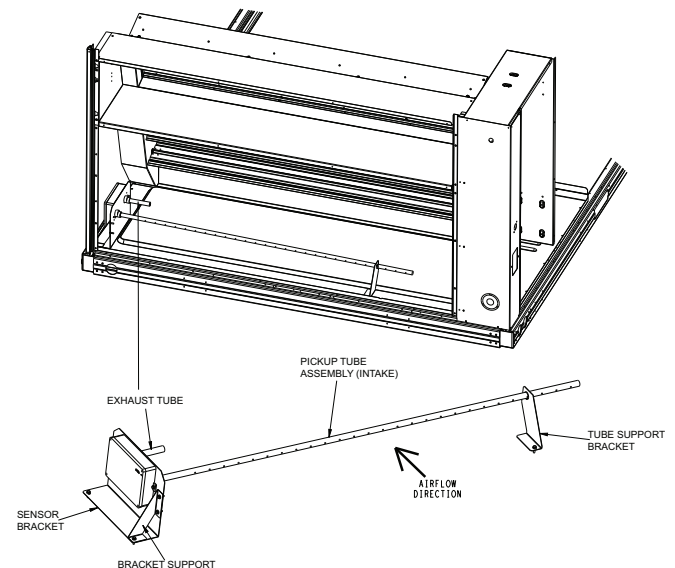


Fig. 53 — Horizontal Return Air Sampling Sensor Assembly and Tube Location
(View reoriented to show opposite side for clarity.)

FIOP Smoke Detector Wiring and Response

ALL UNITS

The FIOP smoke detector is configured to automatically shut down all unit operations when a smoke condition is detected. See Fig. 54, Smoke Detector Wiring.

HIGHLIGHT A

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

HIGHLIGHT B

24-v power signal using the ORN lead is removed at the smoke detector input on UCB; all unit operations cease immediately.

HIGHLIGHT C

Remove designated jumpers on the terminal board when adding smoke detectors, occupancy and remote shutdown.

ADDITIONAL APPLICATION DATA

Refer to the application data document “Factory Installed Smoke Detectors for Small and Medium Rooftop Units 2-25 Tons” for discussions on additional control features of these smoke detectors including multiple unit coordination.

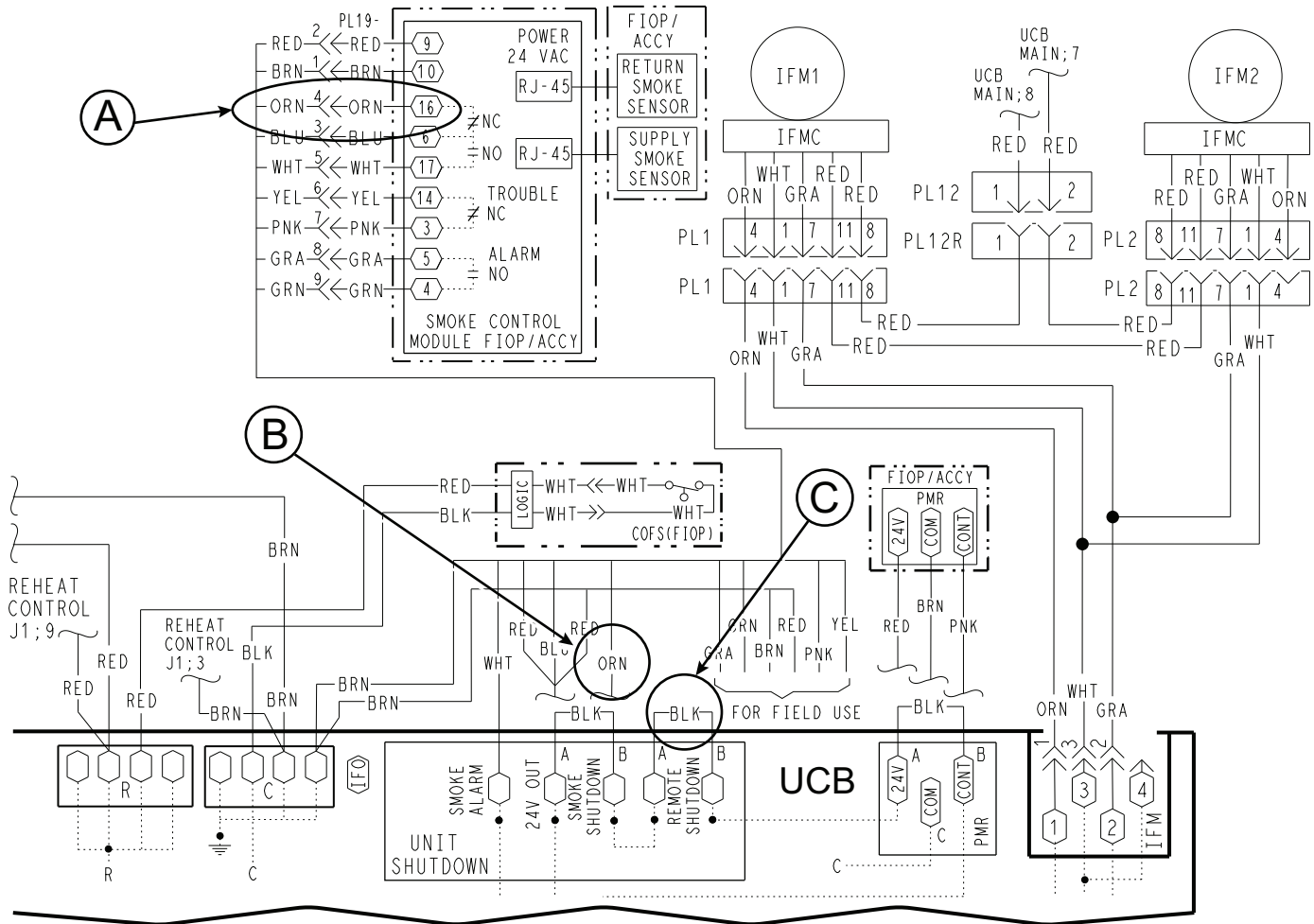


Fig. 54 — Typical Smoke Detector System Wiring

SENSOR AND CONTROLLER TESTS

Sensor Alarm Test

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

IMPORTANT: Failure to follow this ALERT can 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.
4. 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.

Controller Alarm Test Procedure

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

IMPORTANT: Failure to follow this ALERT can 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.

Dirty Controller Test

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

IMPORTANT: Failure to follow this ALERT can 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

1. Press the controller's test/reset switch for two seconds.
2. 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. A field provided SD-MAG test magnet must be used to initiate a sensor dirty test. The sensor's Dirty LED indicates the results of the dirty test as shown in Table 13.

IMPORTANT: Failure to follow this ALERT can 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 13 — 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

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

IMPORTANT: Failure to follow this ALERT can 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

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

Remote Station Test

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

IMPORTANT: Failure to follow this ALERT can 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.

SD-TRK4 Remote Alarm Test Procedure

1. Turn the key switch to the RESET/TEST position for seven seconds.
2. Verify that the test/reset station's Alarm LED turns on.
3. Reset the sensor by turning the key switch to the RESET/TEST position for two seconds.
4. 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. 55 and configured to operate the controller's supervision relay. For more information, see "Dirty Sensor Test" on page 39.

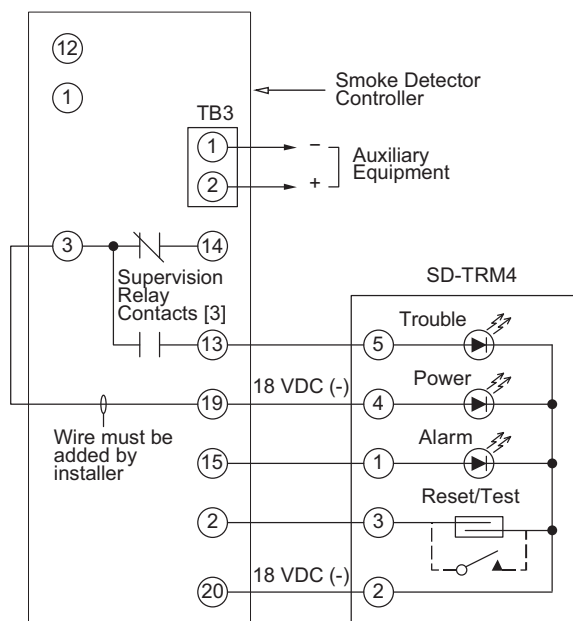


Fig. 55 — Remote Test/Reset Station Connections

IMPORTANT: Failure to follow this ALERT can result in an unnecessary evacuation of the facility.

If the test/reset station's key switch is left in the RESET/TEST position for longer than seven seconds, the detector will automatically go into the alarm state and activate all automatic alarm responses.

IMPORTANT: Failure to follow this ALERT can result in an unnecessary evacuation of the facility.

Holding the test magnet to the target area for longer than seven seconds will put the detector into the alarm state and activate all automatic alarm responses.

Dirty Sensor Test Using an SD-TRK4

1. Turn the key switch to the RESET/TEST position for two seconds.
2. Verify that the test/reset station's Trouble LED flashes.

Detector Cleaning

CLEANING THE SMOKE DETECTOR

Clean the duct smoke sensor when the Dirty LED is flashing continuously or sooner, if conditions warrant.

IMPORTANT: OPERATIONAL TEST ALERT

Failure to follow this ALERT can result in an unnecessary evacuation of the facility.

If the smoke detector is connected to a fire alarm system, first notify the proper authorities that the detector is undergoing maintenance then disable the relevant circuit to avoid generating a false alarm.

1. Disconnect power from the duct detector then remove the sensor's cover. See Fig. 56.
2. Using a vacuum cleaner, clean compressed air, or a soft bristle brush, remove loose dirt and debris from inside the sensor housing and cover. Use isopropyl alcohol and a lint-free cloth to remove dirt and other contaminants from the gasket on the sensor's cover.

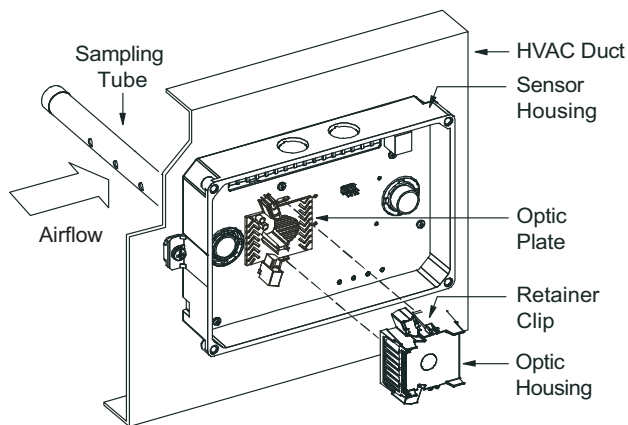


Fig. 56 — Sensor Cleaning Diagram

3. Squeeze the retainer clips on both sides of the optic housing.
4. Lift the housing away from the printed circuit board.
5. Gently remove dirt and debris from around the optic plate and inside the optic housing.
6. Replace the optic housing and sensor cover.
7. Connect power to the duct detector then perform a sensor alarm test.

Indicators

NORMAL STATE

The smoke detector operates in the normal state in the absence of any trouble conditions and when its sensing chamber is free of smoke. In the normal state, the Power LED on both the sensor and the controller are on and all other LEDs are off.

ALARM STATE

The smoke detector enters the alarm state when the amount of smoke particulate in the sensor's sensing chamber exceeds the alarm threshold value. (See Table 14.) Upon entering the alarm state:

- The sensor's Alarm LED and the controller's Alarm LED turn on.
- The contacts on the controller's two auxiliary relays switch positions.
- The contacts on the controller's alarm initiation relay close.
- The controller's remote alarm LED output is activated (turned on).
- The controller's high impedance multiple fan shutdown control line is pulled to ground Trouble state.

The SuperDuct™ duct smoke detector enters the trouble state under the following conditions:

- A sensor's cover is removed and 20 minutes pass before it is properly secured.
- A sensor's environmental compensation limit is reached (100% dirty).
- A wiring fault between a sensor and the controller is detected.

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

- The contacts on the controller's supervisory relay switch positions. (See Fig. 57.)
- 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.

Table 14 — 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.

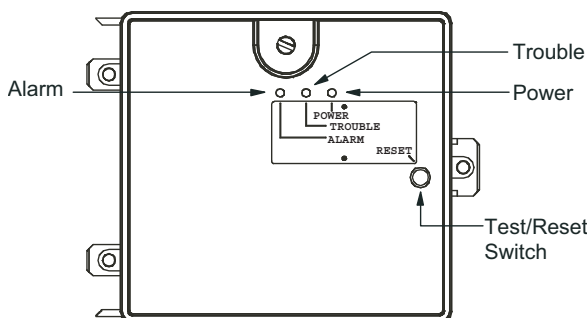


Fig. 57 — Controller Assembly

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.

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 (indicated by LED). 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. 55. Repair or replace loose or missing wiring.
2. Configure the sensor dirty test to activate the controller's supervision relay. See "Dirty Sensor Test" on page 39.

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

Remove JMP1 on the controller.

PROTECTIVE DEVICES

Compressor Protection

OVERCURRENT

The compressor has internal line-break motor protection.

OVERTEMPERATURE

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

MIXED TEMPERATURE SENSOR

The Mixed Temperature Sensor (MTS) is installed on the return side of the unit filter bracket. See Fig. 58.

The switch opens to prevent mechanical cooling operation at low return temperatures (below 60°F [$\pm 1.5^\circ\text{F}$]). When the switch is open, compressor operation is disabled but indoor fan and economizer operation may continue.

The switch closes when return air warms to 65°F ($\pm 1.5^\circ\text{F}$) allowing compressor operation to resume.

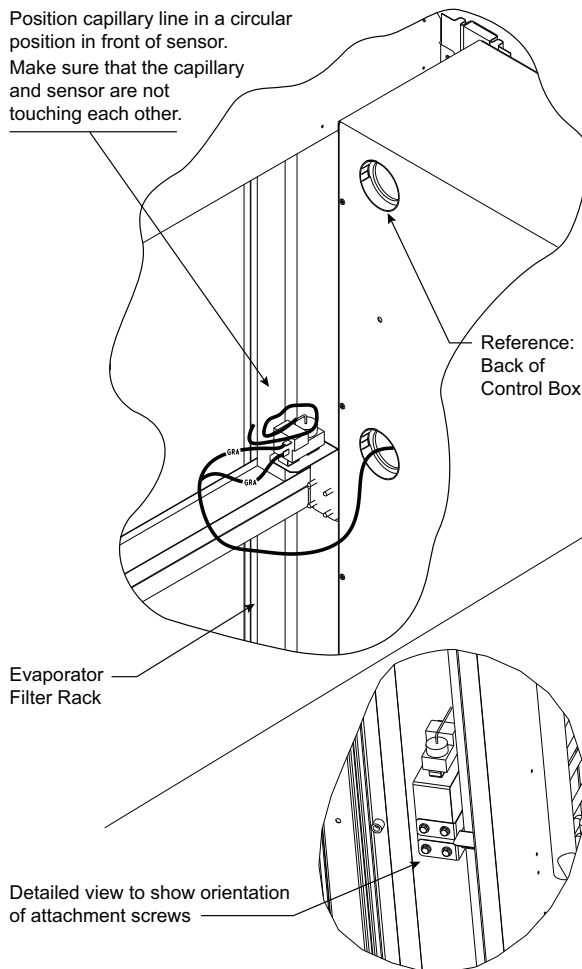


Fig. 58 — Mixed Temperature Sensor Location

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 ± 10 psig (4344 ± 69 kPa) when hot. Reset is automatic at 505 psig (3482 kPa).

LOW PRESSURE SWITCH

The system is protected against a loss of charge and low evaporator coil loading condition by a low pressure switch located on the suction line near the compressor. The switch is stem-mounted. Trip setting is 54 psig ± 5 psig (372 ± 34 kPa). Reset is automatic at 117 ± 5 psig (807 ± 34 kPa).

EVAPORATOR FREEZE PROTECTION

The system is protected against evaporator coil frosting and low temperature conditions by a temperature switch mounted on the evaporator coil hairpin. Trip setting is 30°F $\pm 5^\circ\text{F}$ ($-1^\circ\text{C} \pm 3^\circ\text{C}$). Reset is automatic at 45°F (7°C).

SUPPLY (INDOOR) FAN MOTOR PROTECTION

Disconnect and lockout power when servicing fan motor.

Supply fan motors contain a safety relay that opens in the event of a fault. This relay protects the motor against certain supply power conditions as well as over-temperature and over-current protection. If the relay is open it will remove 24V to R on the UCB and will also prevent cooling/heating operation to protect the unit until the fault condition clears. Do not bypass this switch to correct trouble. Determine the cause and correct it. (See Table 15.)

CONDENSER FAN MOTOR PROTECTION

The condenser fan motor is internally protected against over-temperature.

Relief Device

A soft solder joint at the suction service access port provides pressure relief under abnormal temperature and pressure conditions (i.e., fire in building). Protect this joint during brazing operations near this joint.

Control Circuit, 24-V

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

Table 15 — Supply Fan Motor Logic and Safety Relays

DESCRIPTION	START DELAY
No Error	—
NTC Over-Temperature Protection	Automatic Reset – Motor starts 12 seconds after the temperature falls below reset limit.
Phase Fault	Automatic Reset – Motor to start after 3 phases present.
Over Current Protection	Automatic Reset – If motor over-current protection trips, motor restarts after 20 seconds off time. If over-current is detected 3 times consecutively, the motor is off for 3 minutes and restarts. Cycle starts again after 20 seconds.
Locked Rotor Protection, Start-up	Automatic Reset – If motor detects locked rotor, it attempts to restart after 5 seconds.
Locked Rotor Protection, Running	If motor detects 3 consecutive faults, the motor waits 3 minutes and restarts. Cycle starts again after 20 seconds.
Over/Under Voltage	Automatic Reset – Motor restarts as soon as input voltage is back within $\pm 10\%$.
Current Sampling Error	Manual Reset – Power off and wait 2 minutes and restart motor.
Microelectronic (MCU) Fault	Automatic Reset – Motor restarts 3 minutes after fault clears. Manual Reset – Power off and wait 2 minutes and restart motor.

SYSTEMVU CONTROL SYSTEM

The SystemVu™ control is a comprehensive unit-management system. The control system is easy to access, configure, diagnose and troubleshoot.

The SystemVu control system is fully communicating and cable-ready for connection to the Carrier Comfort Network® (CCN), Carrier i-Vu®, and Third Party BACnet¹ building management systems. The control provides high-speed communications for remote monitoring via the Internet. Multiple units can be linked together (and to other Direct Digital Control (DDC) equipped units) using a 3-wire communication bus.

The SystemVu control system is easy to access through the use of a integrated display module. A computer is not required for start-up. Access to control menus is simplified by the ability to quickly select from 7 main menu items. An expanded readout provides detailed explanations of control information. Only six buttons are required to maneuver through the entire controls menu. The display readout is designed to be visible even in bright sunlight. See Fig. 59.

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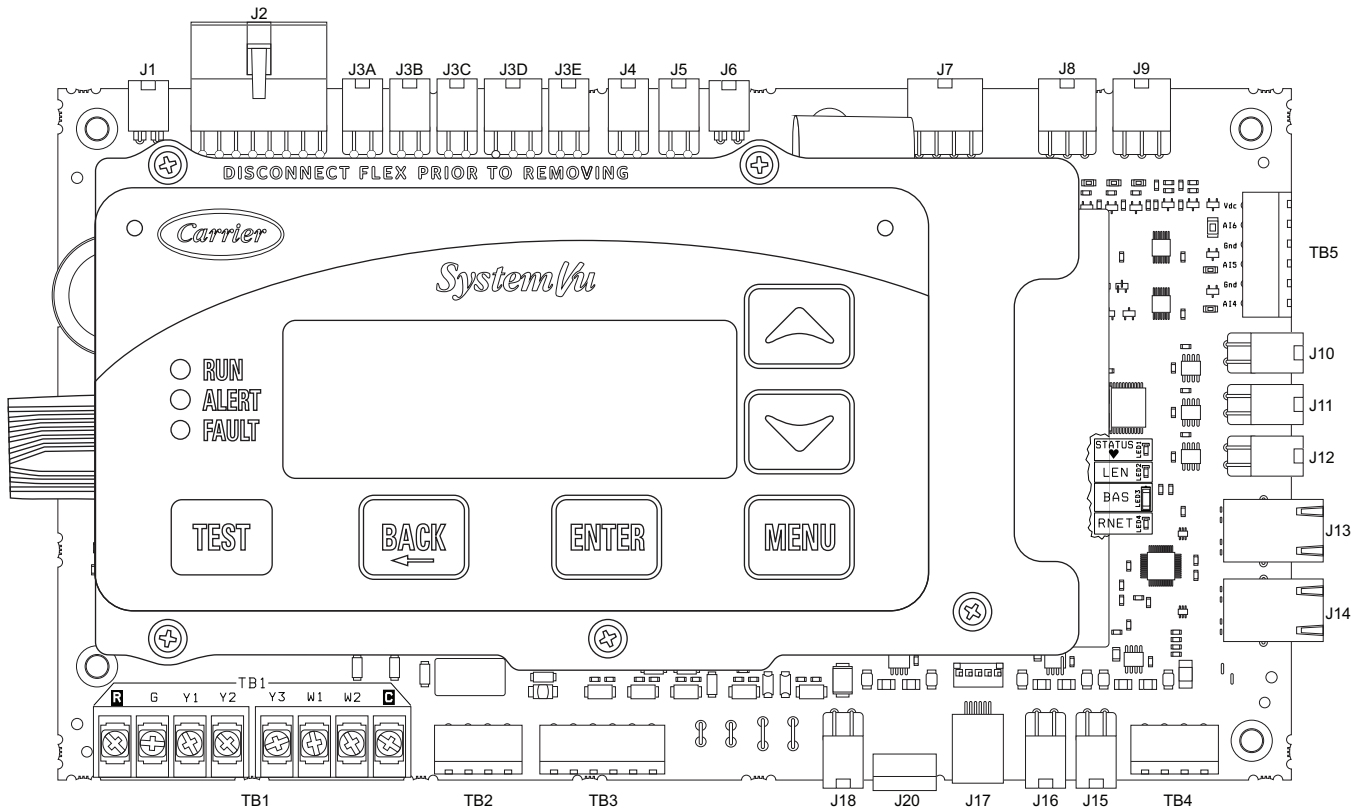


Fig. 59 — SystemVu Control

SystemVu Interface

This integrated device is the keypad interface used to access the control information, read sensor values, and test the unit. The interface is located in the main control box.

Through the SystemVu interface, the user can access all of the inputs and outputs to check on their values and status, configure operating parameters, and evaluate the current decision status for operating modes. The control also includes an alarm history which can be accessed from the display. The user can access a built-in test routine that can be used at start-up commissioning and troubleshooting.

Additional SystemVu Installation and Troubleshooting

Additional installation, wiring and troubleshooting information for the SystemVu Controller can be found in the following manual: "FCQ/GCQ Series Single Package Rooftop Units with SystemVu Controller Controls, Start-Up, Operation and Troubleshooting."

ECONOMIZER SYSTEMS

The unit may be equipped with a factory-installed or accessory (field-installed) economizer system. Three types are available: two with a logic control system (EconomizerONE and EconoMiSer X) and one without a control system (EconoMiSer 2). See Fig. 60 for component locations on each type.

Economizers use direct-drive damper actuators.

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 your economizer on your unit.

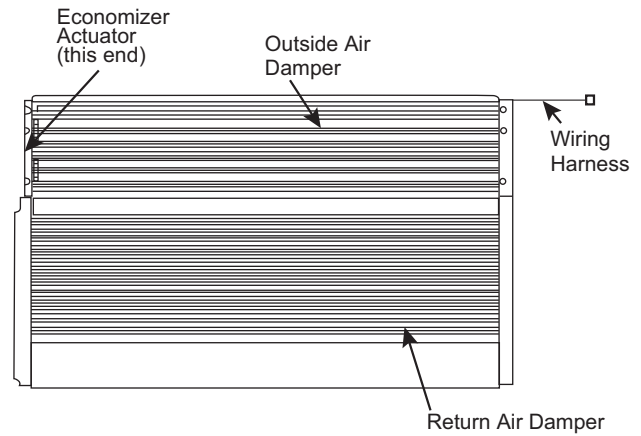


Fig. 60 — Economizer Component Locations

EconoMi\$er2

IMPORTANT: The optional EconoMi\$er®2 does not include a controller. The EconoMi\$er2 is operated by a 4 mA to 20 mA signal from an existing field-supplied controller. See Fig. 61 for wiring information.

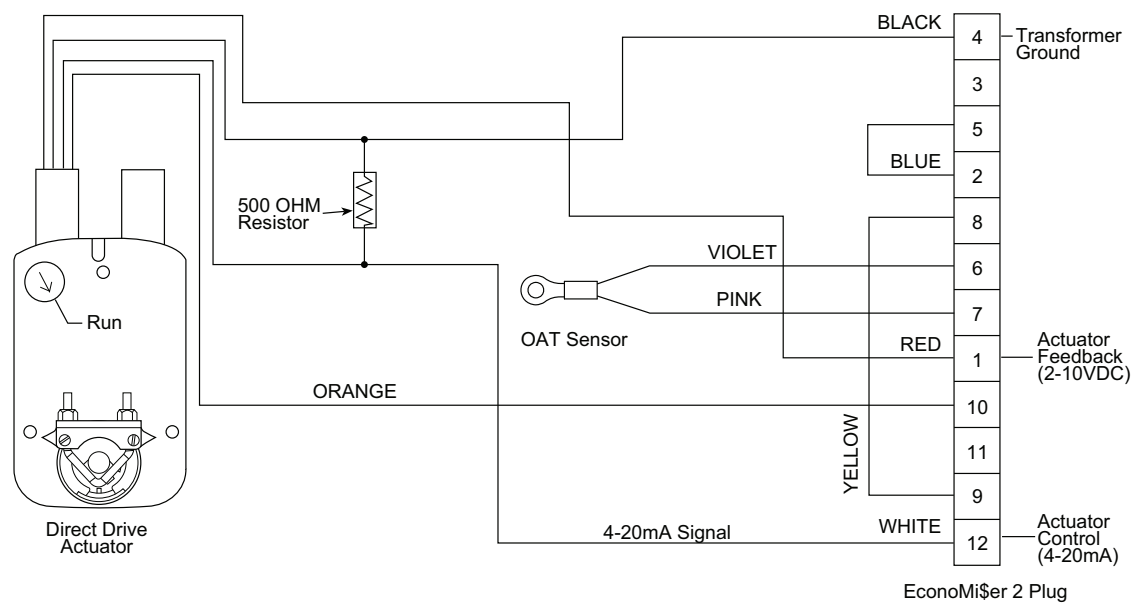


Fig. 61 — EconoMi\$er2 with 4 to 20 mA Control Wiring

EconoMi\$er X (Factory-Installed Option)

PRODUCT DESCRIPTION

The EconoMi\$er® X system is an expandable economizer control system, which includes a W7220 economizer module (controller) with an LCD and keypad (see Fig. 62). The W7220 module can be configured with optional sensors.



Fig. 62 — 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 EconoMi\$er X system includes an economizer module, 20k mixed air sensor, damper actuator, and either a 20k outdoor air temperature sensor or S-Bus enthalpy sensors.

Economizer Module

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

S-Bus Enthalpy Control Sensors

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

CO₂ Sensor (optional)

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

SPECIFICATIONS

W7220 Economizer Module

The module is designed for use with 2 to 10 vdc or bus communicating actuator. The module includes terminals for CO₂ sensor, Mixed Air sensor, and an Outdoor Dry Bulb sensor. Enthalpy and other options are available with bus sensors.

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 \pm 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 65°C)

Temperature accuracy $-0^{\circ}\text{F}/+2^{\circ}\text{F}$

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 $-0^{\circ}\text{F}/+2^{\circ}\text{F}$

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 48 for wiring details).

24 vac power supply

20 to 30 vac 50/60Hz; 100 VA Class 2 transformer.

OUTPUTS

Actuator Signal:

2-10 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. 63 and Tables 16 and 17 to locate the wiring terminals for the Economizer module.

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

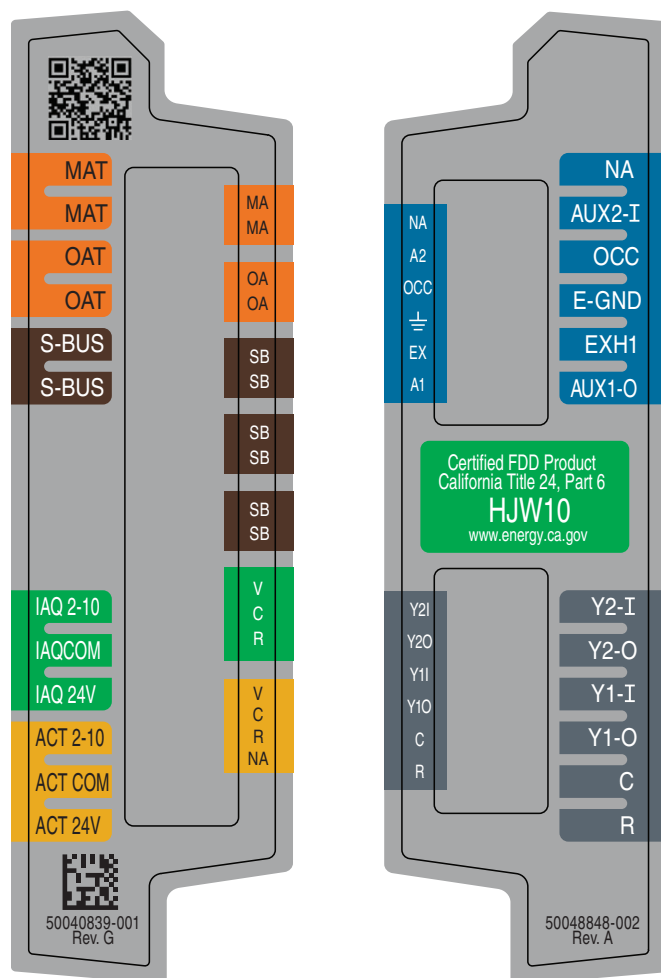


Fig. 63 — W7220 Wiring Terminals

Table 16 — Economizer Module — Left Hand Terminal Blocks

LABEL	TYPE	DESCRIPTION
Top Left Terminal Block		
MAT MAT	20k NTC and COM	Mixed Air Temperature Sensor (Polarity Insensitive Connection)
OAT OAT	20k NTC and COM	Outdoor Air Temperature Sensor (Polarity Insensitive Connection)
S-BUS 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 24-v	24 vac	Damper Actuator 24 vac Source

NOTE(S):

- a. Third-party trademarks and logos are the property of their respective owners.

Table 17 — 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. 64 and Table 18 to locate the wiring terminals for each S-Bus sensor.

Use Fig. 64 and Table 18 to locate the wiring terminals for each enthalpy control sensor.

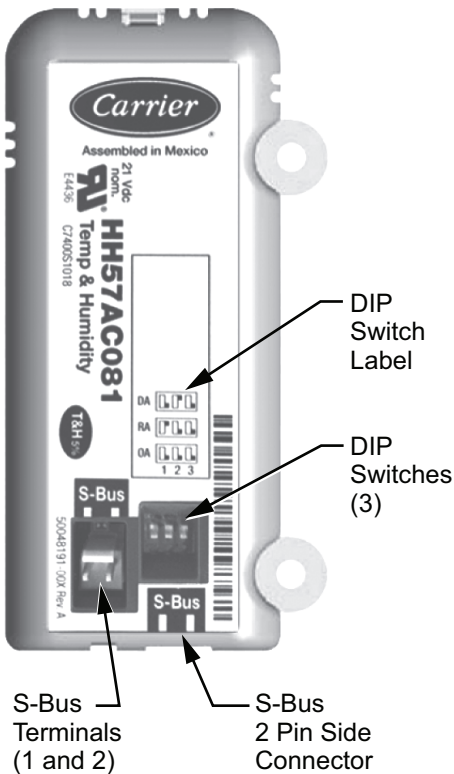


Fig. 64 — S-Bus Sensor DIP Switches

Table 18 — HH57AC081 Sensor Wiring Terminations

TERMINAL NUMBER	LABEL	TYPE	DESCRIPTION
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. 64 and Table 19 to set the DIP switches for the desired use of the sensor.

Table 19 — 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 a 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. 65 for CO₂ sensor wiring.

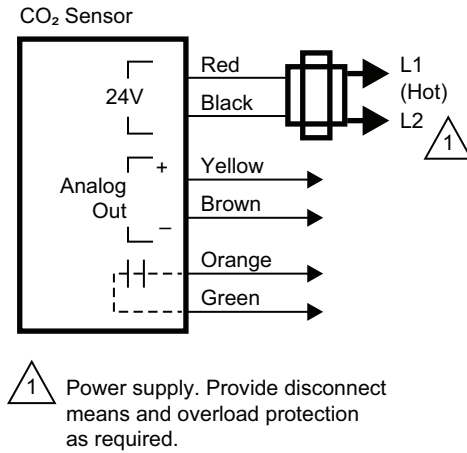


Fig. 65 — CO₂ Sensor Wiring

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

The four navigation buttons (see Fig. 66) are used 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.

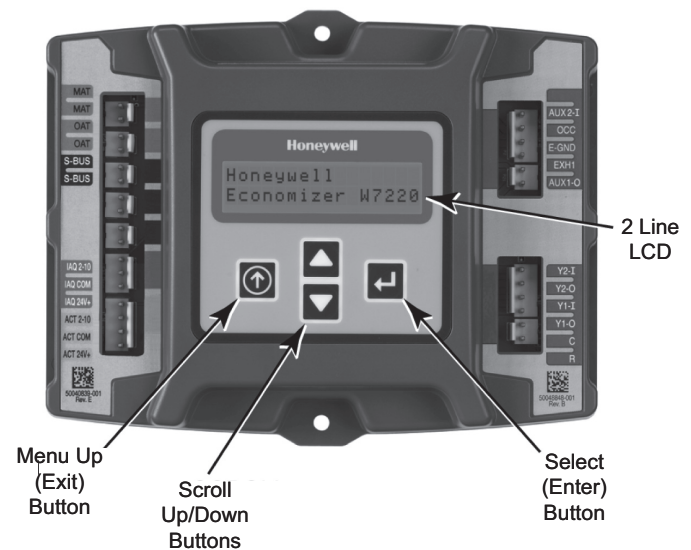


Fig. 66 — W7220 Controller Navigation Buttons

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

1. Navigate to the desired menu.
2. Press the \leftarrow (Enter) button to display the first item in the currently displayed menu.
3. Use the \blacktriangle and \blacktriangledown buttons to scroll to the desired parameter.
4. Press the \leftarrow (Enter) button to display the value of the currently displayed item.
5. Press the \blacktriangle button to increase (change) the displayed parameter value.
6. Press the \blacktriangledown button to decrease (change) the displayed parameter value.
7. When values are displayed, pressing and holding the \blacktriangle or \blacktriangledown button causes the display to automatically increment.
8. Press the \leftarrow (Enter) button to accept the displayed value and store it in nonvolatile RAM.
9. "CHANGE STORED" displays.
10. Press the \leftarrow (Enter) button to return to the current menu parameter.
11. Press the \uparrow (Menu Up/Exit) button to return to the previous menu.

MENU STRUCTURE

Table 20 illustrates the complete hierarchy of menus and parameters for the EconoMiSer® X system.

The Menus in display order are:

- STATUS
- SET POINTS
- SYSTEM SETUP
- ADVANCED SETUP
- CHECKOUT
- ALARMS

IMPORTANT: Table 20 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 and only MIN POS will display. If you have a CO₂ sensor, the DCV MIN and DCV MAX will appear AND if you have 2 speed fan DCV MIN (high and low speed) and DCV MAX (high and low speed will appear).

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 setup 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 \blacktriangle and \blacktriangledown arrow buttons to move forward and backward through the menus and press the button to select and confirm setup item changes.

TIME-OUT AND SCREENSAVER

When no buttons have been pressed for 10 minutes, the LCD displays a screen saver, which cycles through the Status items. Each Status items displays in turn and cycles to the next item after 5 seconds.

Table 20 — W7220 Menu Structure^a

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT ^b	NOTES
STATUS	ECONO 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 1 stage cooling
	OCCUPIED ^c	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	N/A	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 ^d	__ . __ F	0°F to 140°F (-17°C to 60°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	0°F to 140°F (-17°C to 60°C)	DISCHARGE AIR TEMPERATURE, after Heating section displays when Discharge Air 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	-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 sensor. Displays __ % if not connected short, or out-of-range.
	RA TEMP	__ . __ F	0°F to 140°F (-17°C to 60°C)	RETURN AIR TEMPERATURE Displays measured value of return air temperature from RAT 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 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.
	DCV STATUS	N/A	ON/OFF	DEMAND CONTROLLED VENTILATION STATUS Displays ON if above setpoint and OFF if below setpoint, 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	N/A	0 to 100%	Displays actual position of outdoor air damper actuator.
	ACT COUNT	N/A	1 to 65535	Displays number of times actuator has cycled. 1 cycle equals 180 deg. of actuator movement in any direction.
	ACTUATOR	N/A	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 Output of EXH1 terminal: ON = relay closed OFF = relay open
	EXH2 OUT	OFF	ON/OFF	EXHAUST STAGE 2 RELAY OUTPUT Output of AUX terminal; displays only if AUX = EXH2
	ERV	OFF	ON/OFF	ENERGY RECOVERY VENTILATOR Output of AUX terminal; displays only if AUX = ERV

Table 20 — W7220 Menu Structure^a (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT ^b	NOTES
STATUS (cont)	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	N/A	LOW or HIGH	SUPPLY FAN SPEED Displays speed setting of fan on a 2-speed fan unit.
	W (HEAT ON)	N/A	ON/OFF	HEAT DEMAND STATUS Displays status of heat demand on a 2-speed fan unit.
SETPOINTS	MAT SET ^d	53°F	38°F to 70°F (3°C to 21°C); increment by 1°F	MIXED AIR SETPOINT Setpoint determines where the economizer will modulate the OA damper to maintain the mixed air temperature.
	LOW T LOCK	32°F	–45°F to 80°F (–43°C to 27°C); increment by 1°F	COMPRESSOR LOW TEMPERATURE LOCKOUT Setpoint determines outdoor temperature when the mechanical cooling cannot be turned on. Commonly referred to as the Compressor lockout.
	DRYBLB SET ^e	63°F	48°F to 80°F (9°C to 27°C); increment by 1°F	OA DRY BULB TEMPERATURE CHANGEOVER SETPOINT Setpoint 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. DRYBULB SET is only displayed if the economizer has a single dry bulb sensor.
	DRYBLB DIFF	0°F	0°F to 6°F Increment by 2°F	Drybulb Differential will only show if using dual drybulb - i.e., when an outdoor air temperature sensor C7250 is attached to OAT terminals and C7400S sensor is wired to S-Bus and configured for RAT (return air). Free cooling will be assumed whenever OA temp is at or below RAT minus this drybulb setting.
	ENTH CURVE	ES3	ES1, ES2, ES3, ES4, or ES5	ENTHALPY CHANGEOVER CURVE (Requires enthalpy sensor option) Enthalpy boundary “curves” for economizing using single enthalpy.
	DCV SET	1100ppm	500 to 2000 ppm; increment by 100	DEMAND CONTROLLED VENTILATION SETPOINT Displays only if CO ₂ sensor is connected. Setpoint for Demand Controlled Ventilation of space. Above the setpoint, the OA dampers will modulate open to bring in additional OA to maintain a space ppm level below the setpoint.
	MIN POS	4.4-v	2 to 10 vdc	VENTILATION MINIMUM POSITION Only displayed if controller is set for single speed unit under FAN TYPE, and if DCV is NOT used.
	MIN POS L	6.0-v	2 to 10 vdc	VENTILATION MINIMUM POSITION AT LOW SPEED Only displays if unit is set for 2 or 3 speed and CO ₂ is not used. If using 2 speed with 1 heat and 1 cool then set for HEATING ventilation. If using 3 speed with 1 heat and 2 cool then set for LOW SPEED COOLING ventilation.
	MIN POS M	5.4-v	2 to 10 vdc	VENTILATION MINIMUM POSITION AT MEDIUM SPEED Only displays if unit is set for 3 speed with 1 heat and 2 cool, and CO ₂ is not used. Set for HEATING ventilation.
	MIN POS H	4.4-v	2 to 10 vdc	VENTILATION MINIMUM POSITION AT HIGH SPEED Only displays if unit is set for 2 or 3 speed and CO ₂ is not used. IF using 2 speed with 1 heat and 1 cool then set for COOLING ventilation. If using 3 speed with 1 heat and 2 cool then set for HIGH SPEED COOLING ventilation.
	VENTMAX L	6.0-v	2 to 10 vdc	DCV MAXIMUM DAMPER POSITION AT LOW SPEED Only displays if unit is set for 2 speed or 3 speed with 1 heat and 2 cool. IF using 2 speed with 1 heat and 1 cool then set for HEATING ventilation. If using 3 speed with 1 heat and 2 cool then set for LOW SPEED COOLING.
	VENTMAX M	5.4-v	2 to 10 vdc	DCV MAXIMUM DAMPER POSITION AT MEDIUM SPEED Only displays if unit is set for 3 speed with 1 heat and 2 cool. Set for HEATING ventilation.
	VENTMAX H	4.4-v	2 to 10 vdc	DCV MAXIMUM DAMPER POSITION AT HIGH SPEED Only displays if unit is set for 2 speed or 3 speed with 1 heat and 2 cool. IF using 2 speed with 1 heat and 1 cool then set for COOLING ventilation. If using 3 speed with 1 heat and 2 cool then set for HIGH SPEED COOLING ventilation.
	VENTMIN L	3.7-v	2 to 10 vdc	DCV MINIMUM DAMPER POSITION AT LOW SPEED Only displays if unit is set for 2 speed or 3 speed with 1 heat and 2 cool. IF using 2 speed with 1 heat and 1 cool then set for HEATING ventilation. If using 3 speed with 1 heat and 2 cool then set for LOW SPEED COOLING.
	VENTMIN M	3.4-v	2 to 10 vdc	DCV MINIMUM DAMPER POSITION AT MEDIUM SPEED Only displays if unit is set for 3 speed with 1 heat and 2 cool. Set for HEATING ventilation.
	VENTMIN H	2.8-v	2 to 10 vdc	DCV MINIMUM DAMPER POSITION AT HIGH SPEED Only displays if unit is set for 2 speed or 3 speed with 1 heat and 2 cool. IF using 2 speed with 1 heat and 1 cool then set for COOLING ventilation. If using 3 speed with 1 heat and 2 cool then set for HIGH SPEED COOLING ventilation.

Table 20 — W7220 Menu Structure^a (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT ^b	NOTES
SETPOINTS (cont)	ERV OAT SP ^f	32°F	0°F to 50°F (-18°C to 10°C); increment by 1°F	ENERGY RECOVERY VENTILATOR UNIT OUTDOOR AIR TEMPERATURE SETPOINT Only displayed when AUX1 O = ERV.
	EXH1 SET	50%	0 to 100%	Exhaust fan set point for single speed units. Based on OA Damper position to activate power exhaust.
	EXH1 L SET	65%	0 to 100%	EXHAUST FAN 1 SETPOINT AT LOW SPEED on 2 speed or 3 speed with 1 heat and 2 cool. Based on economizer OA damper position to activate power exhaust.
	EXH1 M SET	60%	0 to 100%	EXHAUST FAN 1 SETPOINT AT MEDIUM SPEED. Only displays if unit is set for 3 speed with 1 heat and 2 cool. Based on economizer OA damper position to activate power exhaust.
	EXH1 H SET	50%	0 to 100%	EXHAUST FAN 1 SETPOINT AT HIGH SPEED on 2 speed or 3 speed with 1 heat and 2 cool. Based on economizer OA damper position to activate power exhaust.
	EXH2 L SET	80%	0 to 100%	EXHAUST FAN 2 SETPOINT AT LOW SPEED on 2 speed or 3 speed with 1 heat and 2 cool. Based on economizer OA damper position to activate power exhaust.
	EXH2 M SET	77%	0 to 100%	EXHAUST FAN 2 SETPOINT AT MEDIUM SPEED. Only displays if unit is set for 3 speed with 1 heat and 2 cool. Based on economizer OA damper position to activate power exhaust.
	EXH2 H SET	75%	0 to 100%	EXHAUST FAN 2 SETPOINT AT HIGH SPEED on 2 speed or 3 speed with 1 heat and 2 cool. Based on economizer OA damper position to activate power exhaust.
SYSTEM SETUP	INSTALL	01/01/17	N/A	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	Conventional or HP	CONV = conventional; HP O/B = Enable Heat Pump mode. Use AUX2 I for Heat Pump input from thermostat or controller. ⁹
	AUX2 IN	W	SD/W or 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. ⁹ 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 2SP H/C 3 speed	Sets the economizer controller operation based on 1 speed, 2 speed, 2 speed heat/cool (2SP H/C), or 3 speed supply fan. NOTE: Multi-speed fan options also need Heat (W1) programmed in AUX 2 In. ⁹
	FAN CFM	5000 cfm	100 to 15000 cfm; increment by 100	UNIT DESIGN AIRFLOW (CFM) Enter only if using DCVAL ENA = AUTO 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 ^f • EXH2 = second damper position relay closure 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.
ADVANCED SETUP	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. NOTE: RECHECK AUX2 IN and FANTYPE for required 2-speed values.
	MA LO SET	45°F	35°F to 55°F (2°C to 13°C); Incremented by 10°F	SUPPLY AIR TEMPERATURE LOW LIMIT Temperature to achieve Freeze Protection (close damper and alarm if temperature falls below setup value).
	FREEZE POS	CLO	CLO or MIN	FREEZE PROTECTION DAMPER POSITION Damper position when freeze protection is active (closed or MIN POS).
	CO2 ZERO	0 ppm	0 to 500 ppm; Increment by 10	CO ₂ ppm level to match CO ₂ sensor start level.
	CO2 SPAN	2000 ppm	1000 to 3000 ppm; Increment by 10	CO ₂ ppm span to match CO ₂ sensor.

Table 20 — W7220 Menu Structure^a (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT ^b	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 and mechanical cooling is second stage. 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)	35°F to 65°F (2°C to 18°C); Incremented 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)	70°F to 180°F (21°C to 82°C); Incremented by 5°F	Used for alarm for when the DA air temperature is too high. Set 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 3 RA, OA, and MA sensors.
	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	N/A	N/A	The checkout for the damper minimum position is based on the system.
	DAMPER OPEN	N/A	N/A	Position damper to the full open position. Exhaust fan contacts enable during the DAMPER OPEN test. Make sure you pause in the mode to allow exhaust contacts to energize due to the delay in the system.
	DAMPER CLOSE	N/A	N/A	Positions damper to the fully closed position.
	CONNECT Y1-O	N/A	N/A	Closes the Y1-O relay (Y1-O).
	CONNECT Y2-O	N/A	N/A	Closes the Y2-O relay (Y2-O).
	CONNECT AUX1-O	N/A	N/A	Energizes the AUX output. If Aux setting is: • NONE — not 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. ^f • SYS — 24 vac out. Issues a system alarm.
	CONNECT EXH1	N/A	N/A	Closes the power exhaust fan 2 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	N/A	N/A	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	N/A	N/A	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	N/A	N/A	OUTSIDE AIR S-BUS SENSOR ERROR
	OA SYLK H ERR	N/A	N/A	Outdoor air enthalpy sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues.
	RA SYLK T ERR	N/A	N/A	RETURN AIR S-BUS SENSOR ERROR
	RA SYLK H ERR	N/A	N/A	Return air enthalpy sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues.

Table 20 — W7220 Menu Structure^a (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT ^b	NOTES
ALARMS (cont)	DA SYLK T ERR	N/A	N/A	DISCHARGE AIR S-BUS SENSOR ERROR Discharge air sensor has failed or become disconnected - check wiring then replace sensor if the alarm continues.
	OA SENS T ERR	N/A	N/A	OUTSIDE AIR TEMPERATURE SENSOR ERROR Outdoor air temperature sensor has failed or become disconnected - check wiring then replace if the alarm continues.
	ACT ERROR	N/A	N/A	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.
	FREEZE ALARM	N/A	N/A	Check if outdoor temperature is below the LOW Temp Lockout on setpoint menu. Check if Mixed air temperature on STATUS menu is below the Lo Setpoint on Advanced menu. When conditions are back in normal range then the alarm will go away.
	SHUTDOWN ACTIVE	N/A	N/A	AUX2 IN is programmed for SHUTDOWN and 24-v has been applied to AUX2 IN terminal.
	DMP CAL RUNNING	N/A	N/A	DAMPER CALIBRATION ROUTINE RUNNING If DCV Auto enable has been programmed, when the W7220 is completing a calibration on the dampers, this alarm will display. Wait until the calibration is completed and the alarm will go away. Must have OA, MA, and RA sensors for DCV calibration; set up in the Advanced setup menu.
	DA SENS ALM	N/A	N/A	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.
	SYS ALARM	N/A	N/A	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.
	ACT UNDER V	N/A	N/A	ACTUATOR VOLTAGE LOW Voltage received by actuator is above expected range.
	ACT OVER V	N/A	N/A	ACTUATOR VOLTAGE HIGH Voltage received by actuator is below expected range.
	ACT STALLED	N/A	N/A	ACTUATOR STALLED Actuator stopped before achieving commanded position.

NOTE(S):

- Table 20 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.
- STATUS → OCCUPIED — The factory-standard Occupancy signal originates with a thermostat or other controller call for indoor fan operation at UCB terminal G. This signal passes through the Unit Control Board's OCCUPIED jumper JMP1 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.
- 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.
- SETPOINTS → DRYBLB SET — This point is not displayed if a Return Air (differential) temperature sensor or an Outdoor Air enthalpy sensor is connected.
- 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.
- SYSTEM SETUP parameters must be configured as noted for Multi-Speed unit operation:
EQUIPMENT = CONV
AUX2 IN = W
FAN SPEED = 2SPEED

LEGEND

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

2 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 21.

Table 21 — 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.

Refer to Table 22 for economizer operation.

Table 22 — Economizer Operation - FAN TYPE = 2SPEED

INPUTS					OUTPUTS				
DEMAND CONTROLLED VENTILATION (DCV)	OUTSIDE AIR GOOD TO ECONOMIZE	W (HEAT ON)	COOL Y1-IN	COOL Y2-IN	COOL Y1-OUT	COOL Y2-OUT	FAN SPEED (reference only)	DAMPER POSITION	
								OCCUPIED	UNOCCUPIED
NONE	NO	ON	N/A	N/A	OFF	OFF	HIGH	MIN POS H	Closed
		OFF	OFF	OFF	OFF	OFF	LOW	MIN POS L	Closed
		OFF	ON	OFF	ON	OFF	LOW	MIN POS L	Closed
		OFF	ON	ON	ON	ON	HIGH	MIN POS H	Closed
	YES	ON	N/A	N/A	OFF	OFF	HIGH	MIN POS H	Closed
		OFF	OFF	OFF	OFF	OFF	LOW	MIN POS L	Closed
		OFF	ON	OFF	OFF	OFF	LOW	MIN POS L to Full Open	Closed to Full Open
		OFF	ON	ON	ON	OFF ^a	HIGH	MIN POS H to Full Open	Closed to Full Open
Below CO ₂ Set	NO	ON	N/A	N/A	OFF	OFF	HIGH	VENTMIN H	Closed
		OFF	OFF	OFF	OFF	OFF	LOW	VENTMIN L	Closed
		OFF	ON	OFF	ON	OFF	LOW	VENTMIN L	Closed
		OFF	ON	ON	ON	ON	HIGH	VENTMIN H	Closed
	YES	ON	N/A	N/A	OFF	OFF	HIGH	VENTMIN H	Closed
		OFF	OFF	OFF	OFF	OFF	LOW	VENTMIN L	Closed
		OFF	ON	OFF	OFF	OFF	LOW	VENTMIN L to Full Open	Closed to Full Open
		OFF	ON	ON	ON	OFF ^a	HIGH	VENTMIN H to Full Open	Closed to Full Open
Above CO ₂ Set	NO	ON	N/A	N/A	OFF	OFF	HIGH	VENTMIN H to VENTMAX H	Closed
		OFF	OFF	OFF	OFF	OFF	LOW	VENTMIN L to VENTMAX L	Closed
		OFF	ON	OFF	ON	OFF	LOW	VENTMIN L to VENTMAX L	Closed
		OFF	ON	ON	ON	ON	HIGH	VENTMAX H to VENTMAX H	Closed
	YES	ON	N/A	N/A	OFF	OFF	HIGH	VENTMIN H to VENTMAX H	Closed
		OFF	OFF	OFF	OFF	OFF	LOW	VENTMIN L to VENTMAX L	Closed
		OFF	ON	OFF	OFF	OFF ^a	LOW	VENTMIN L to Full Open	Closed to Full Open
		OFF	ON	ON	ON	OFF ^a	HIGH	VENTMIN H to Full Open	Closed to Full Open

NOTE(S):

a. With stage 3 delay (STG3 DLY) in Advanced setup, COOL Y2-OUT will be turned ON after the delay time specified.

LEGEND

N/A — Not Applicable

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 67 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 23 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 67 shows the 5 current boundaries. There is also a high limit boundary for differential enthalpy. The high limit boundary is ES1 when there are no stages of mechanical cooling energized and HL (high limit) when a compressor stage is energized.

Table 23 provides the values for each boundary limit.

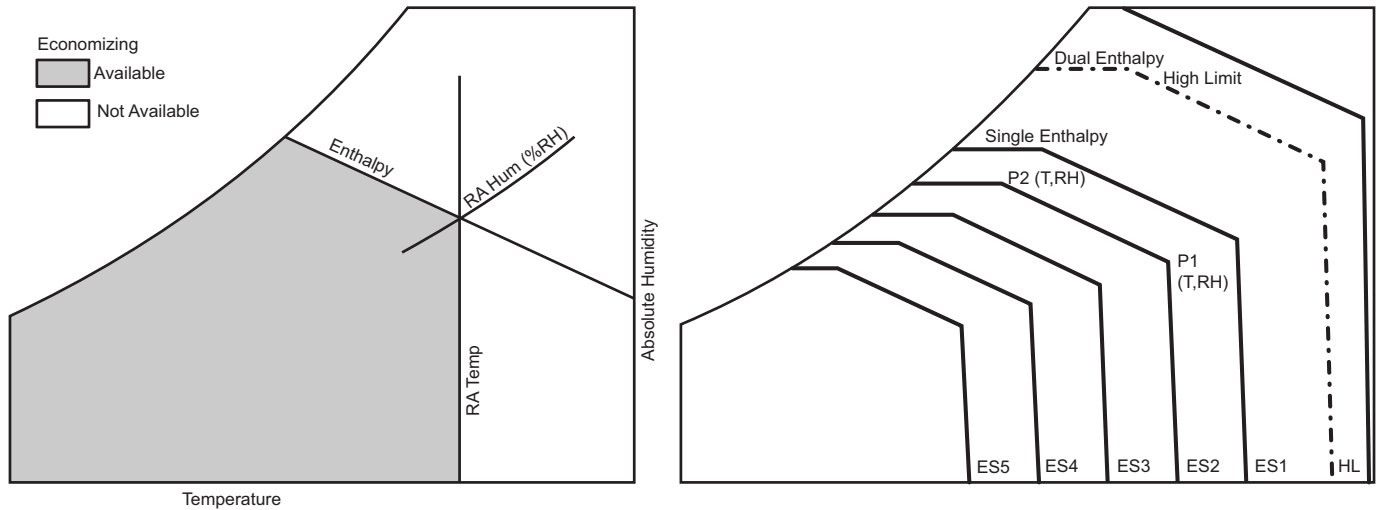


Fig. 67 — Single Enthalpy Curve Boundaries

Table 23 — 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 48.

WARNING

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

Before performing service or maintenance operations on unit, always turn off main power switch to unit and install lock(s) and lockout tag(s). Unit may have more than one power switch. Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate.

If any wiring changes are required, first be sure to remove power from the Economizer module before starting work. Pay particular attention to verifying the power connection (24 vac).

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 setpoints 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 20) 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 48.

Checkout Tests

Use the Checkout menu (see page 53) 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 48.

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/Exit) 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

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

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

EconomizerONE (Field-Installed Accessory)

MOUNTING, INSTALLATION, AND WIRING

⚠ WARNING

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

Mounting the Economizer Controller Base Module

Before mounting, leave specific mounting clearances so that there is space for mounting, wiring, and servicing. See Fig. 68 and Table 24 for economizer controller wiring details.

POL224 can be mounted to sheet metal. Use two no. 6-3/4 in. self-tapping screws to mount POL224. Order screws and spacers separately, as they are not provided with the products.

See the installation instructions included with the controller for detailed clearance requirements and graphical mounting instructions.

Mounting Devices Connected to the Economizer Controller

Devices like damper actuators, sensors (temperature sensor, humidity sensor, combination temperature and humidity sensor, CO₂ sensor), thermostats, and exhaust fans can be connected to the economizer controller. For information on how to mount the devices, see the device's installation instructions.

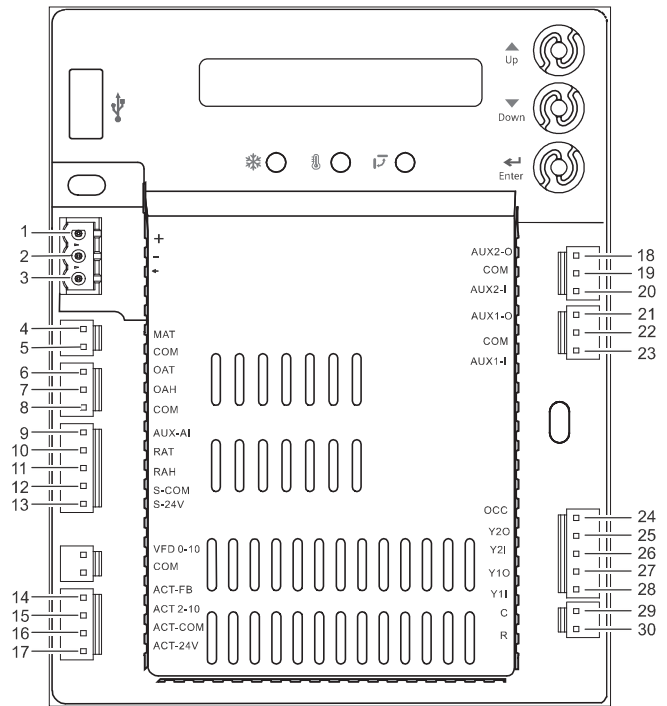


Fig. 68 — Economizer Control Wiring

Table 24 — Economizer Control Wiring Settings

NO.	LABEL	TYPE	DESCRIPTION
1	+	RS485 Modbus A	Line A
2	-	RS485 Modbus B	Line B
3	⏏	GND_ISO	Earth Ground
4	MAT	Type II NTC 10K or 0-10 vdc	Mixed or Discharge Air Temperature Sensor
5	COM	COM	Mixed or Discharge Air Temperature Sensor Common
6	OAT	Type II NTC 10K or 0-10 vdc	Outside Air Temperature Sensor
7	OAHI	0-10 vdc or 4-20mA	Outside Air Relative Humidity Sensor
8	COM	COM	Outside Air Temperature Sensor or Outside Air Relative Humidity Sensor Common
9	AUX-AI	0-10 vdc, 2-10 vdc or 0-5 vdc	Air Quality Sensor or Pressure Sensor
10	RAT	Type II NTC 10K or 0-10 vdc	Return Air Temperature Sensor
11	RAHI	0-10 vdc or 4-20mA	Return Air Relative Humidity Sensor
12	S-COM	COM	24 vac Common
13	S-24V	24 vac	24 vac Power Out to Sensors
14	ACT-FB	2-10 vdc	Damper Actuator Feedback
15	ACT2-10	2-10 vdc	Damper Actuator Output
16	ACT-COM	COM	Damper Actuator Output Common
17	ACT-24V	24 vac	24 vac Power Out to Damper Actuator
18	AUX2-O	24 vac OUT	Configurable: • Cooling Stage 3 Output • Exhaust Fan (1 or 2) • System Alarm Output (Title 24)
19	COM	COM	24 vac Common
20	AUX2-1	24 vac IN	Configurable: • Cooling Stage 3 Input • Shut Down • Heat Conventional (W1) • Heat Pump Changeover (reversing valve OB) • Pre-Occupancy
21	AUX1-O	24 vac OUT	Configurable: • Cooling Stage 3 Output • Exhaust Fan (1 or 2) • VFD On/Off (Variable Speed Supply Fan Enable or Disable) • System Alarm Output (Title 24)
22	COM	COM	24 vac Common
23	AUX1-I	24 vac IN	Configurable: • Cooling Stage 3 Input • Shut Down • Heat Conventional (W1) • Heat Pump Changeover (reversing valve OB) • Pre-Occupancy
24	OCC	24 vac IN	Occupancy Input
25	Y2O	24 vac OUT	Cooling Stage 2 Output to Stage 2 Mechanical Cooling
26	Y2I	24 vac IN	Cooling Stage 2 Input from Commercial Thermostat
27	Y1O	24 vac OUT	Cooling Stage 1 Output to Stage 1 Mechanical Cooling
28	Y1I	24 vac IN	Cooling Stage 1 Input from Commercial Thermostat
29	C	COM	24 vac Common
30	R	24 vac	24 vac Power

CONNECTING PERIPHERAL DEVICES TO THE ECONOMIZER CONTROLLER

See Fig. 69-73 for wiring details.

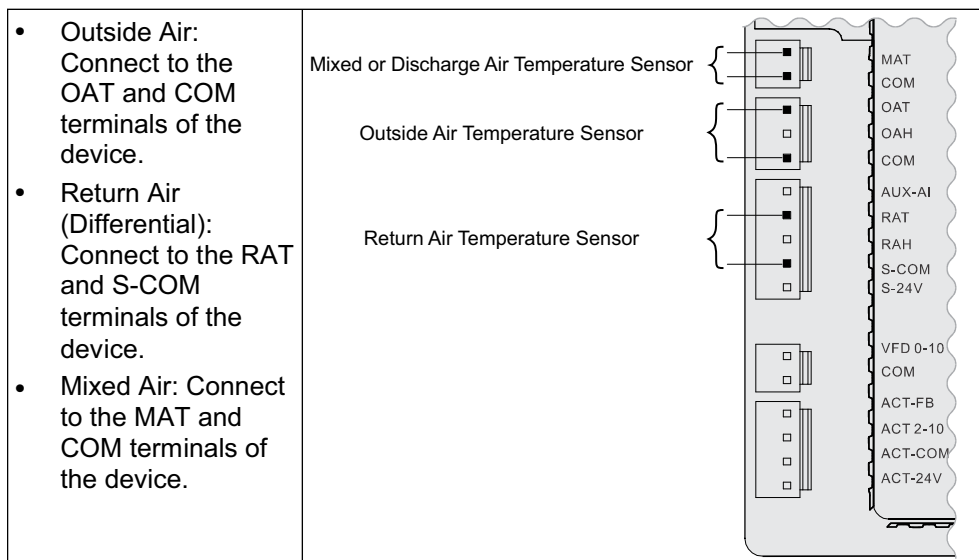


Fig. 69 — Temperature Sensor Connection

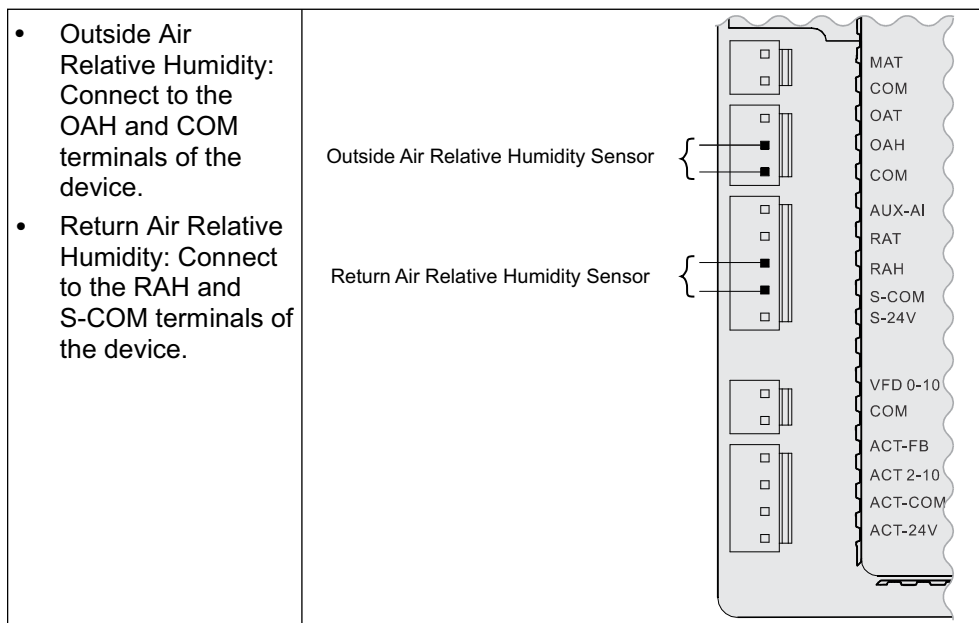


Fig. 70 — Relative Humidity Sensor Connection

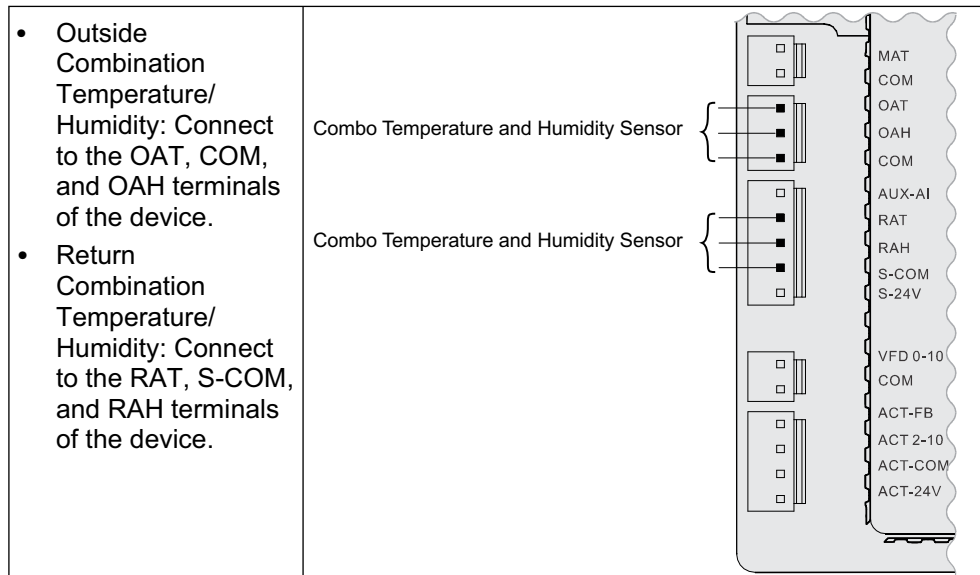


Fig. 71 — Combination Temperature/Humidity Sensor Connection

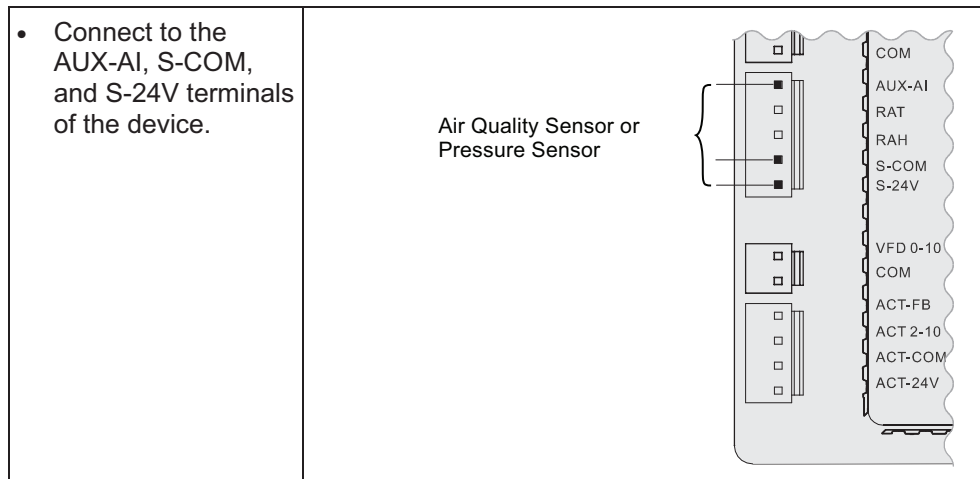


Fig. 72 — CO₂/Pressure Sensor Connection

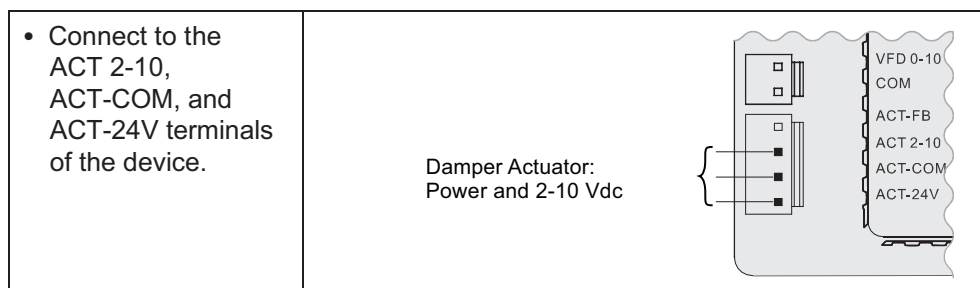


Fig. 73 — Damper Actuator Connection

EconomizerONE (Factory Option)

ECONOMIZER SETTINGS

Interface Overview

EconomizerONE

The factory-installed accessory consists of the following:

- Ultra Low Leak Economizer Assembly
- HH79NZ039 OA Dry Bulb Sensor
- HH79NZ039 Mixed Air Sensor
- POL224 Controller
- 50HE005489 Harness

POL224 Economizer Module Wiring

The economizer controller used on electromechanical units is a Siemens POL224, which is to be located in the RTU base unit's control box. See Fig. 74 for a button description for the POL224 controller. Refer to the unit dimensional drawings for the location of the control box access panel.

The POL224 controller provides the following:

1. One-line LCD — After a period of inactivity, the controller displays the default HMI screen (free cooling status, 1FREE-COOL YES, or 1FREE COOL NO). See Fig. 74-78.
2. Operation button (Up button) — Move to the previous value, step, or category.
3. Operation button (Down button) — Move to the next value, step, or category.
4. Operation button (Enter button):
 - a. Press Enter to edit the current value or option.
 - b. Press Enter to confirm a newly selected value or option.
 - c. Press Enter + Up to jump up one entire category.
5. Press Enter + Down to jump down one entire category.

User Interface and Keypad

The controller user interface consists of an LCD display and a 3-button keypad for input. The LCD is a 16 character by 1-line dot matrix display. The keypad is used to navigate and change the desired menu items on the display. See Fig. 74.

The Climatix™ mobile application allows for installation, commissioning, and servicing. Scanning a QR code on the controller allows users to download the mobile application on Android™ or Apple iOS®, but a Wi-Fi/WLAN stick is needed. See Fig. 74 and 75. Plug Wi-Fi/WLAN stick into controller USB port for temporary connection for mobile application setup. The Wi-Fi/WLAN stick can be used for multiple units.

Menu Structure

Menus are displayed in the economizer controller in categories. There are 8 first-level menus, each of which is represented by a number at the beginning of the line on the LCD. Pressing Enter + Up or Down can toggle between different first-level menus. Sub-menus follow the numbered first-level menus closely. Pressing Up or Down can toggle between different submenus.

At the end of the line, the LCD displays the value of the current submenu (if any). If the value is editable, pressing Enter will put the terminal in Edit mode. The value is then highlighted for change. After making a change by pressing Up or Down, press Enter to confirm the change and exit the Edit mode. See Fig. 77.

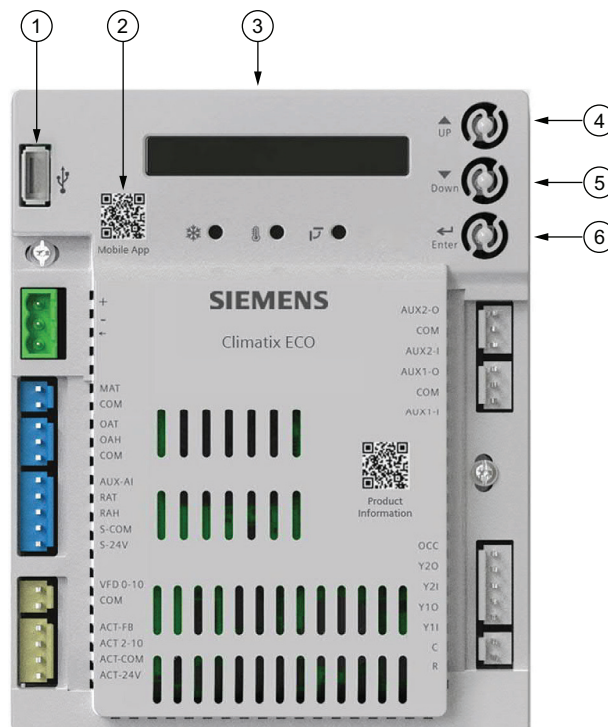
Powering the Economizer Controller

The POL224 controller power connections are made through the economizer harness (P/N 50HE005489). Connections from the harness are made to the C (24 vac common) and R (24 vac power) terminals of the economizer controller. See Fig. 76.

LED Indication

NOTE: If different faulty events occur at the same time, the sensor/DAC LED lights up following this priority: Red → Yellow → Off. For example, if there is a humidity sensor error and air temperature failure at the same time, the sensor LED turns red rather than yellow. See Fig. 78 and Table 25.

IMPORTANT: After the economizer controller enters the running state, it may take one minute for peripheral devices to complete initialization. Before that, LED indication might be unstable.



NOTE: QR codes in this image are for reference only.

NO.	DESCRIPTION
1	USB port for Wi-Fi/WLAN stick
2	QR code to download Climatix™ mobile application
3	One-line LCD. After a period of inactivity, the controller displays the default HMI screen (free cooling status, 1FREECOOL YES or 1FREECOOL NO)
4	Operation button (Up button) - Move to the previous value, step or category
5	Operation button (Down button) - Move to the next value, step or category
6	Operation button (Enter button): <ul style="list-style-type: none">• Press to edit the current value or option.• Press to confirm a newly selected value or option.• Press Enter + Up to jump up one entire category.• Press Enter + Down to jump down one entire category.

Fig. 74 — POL224 Controller



NOTE: QR codes in this image are for reference only.

Fig. 75 — Wi-Fi/WLAN Stick

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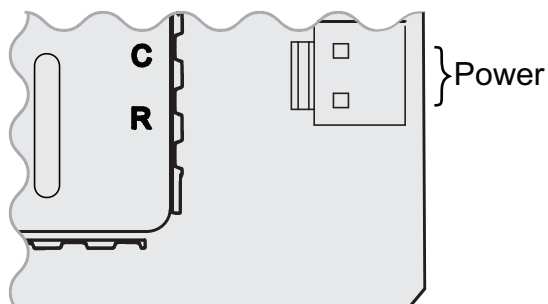
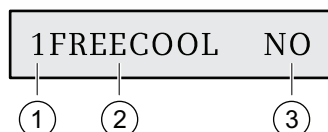


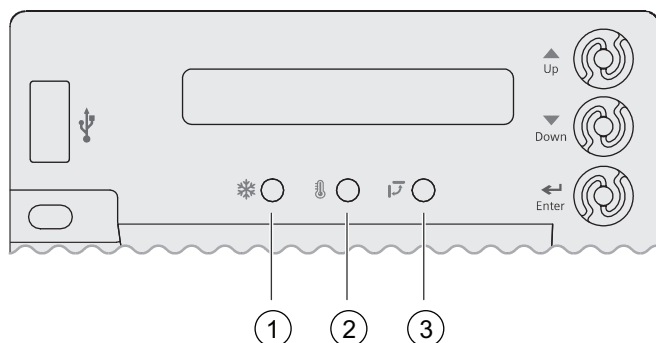
Fig. 76 — Powering the Economizer Controller



No.	Description
1	Number representing the first-level menu of Status Display . Different numbers represent different menus: 1: Status Display 2: Basic Settings 3: Advanced Settings 4: Alarms 5: Enter Configuration State and Reset 6: I/O Config 7: Testing 8: Enter Running State
2	Submenu ^a
3	Value of the current submenu ^a

a. See Setup and Configuration on page 72 for detailed submenus, together with possible values or ranges.

Fig. 77 — Menu Structure Descriptions



NO.	DESCRIPTION
1	Free Cooling LED
2	Sensor LED
3	DAC LED

Fig. 78 — LED Indication

Table 25 — LED Indication

STATUS	FREE COOLING LED	SENSOR LED	DAC LED
Commissioning mode	Yellow Blinking	Yellow Blinking	Yellow Blinking
Power start-up	Yellow On	Yellow On	Yellow On
Free cooling is running	Green On	—	—
Free cooling is available but not running	Green Blinking	—	—
Not economizing when it should	Red Blinking	—	—
Economizing when it should not	Red On	—	—
Sensor working okay	—	Green On	—
Humidity sensor error	—	Yellow On	—
CO₂ sensor error	—	LED Off	—
Air temperature fault/failure	—	Red On	—
Excess outdoor air	—	Red Blinking	—
Damper working okay	—	—	Green On
Damper not modulating	—	—	Red On
Damper slippage	—	—	Red Blinking
Damper unplugged	—	—	Fast Red Blinking
Terminal ACT-FB is configured but no available feedback signal	—	—	LED Off

Functions

Free Cooling Economizing

Free cooling uses unconditioned outside air to cool the space directly. The economizer controller enables or disables free cooling after it judges which control mode is active. It also uses hysteresis to ensure a smooth switchover.

Depending on the sensors that are used, there are 4 different control modes. In different control modes, the assessed conditions are different. See Table 26.

Default Hysteresis Setting

Hysteresis setting (DB) defaults to 2°F (–16.6°C). See Fig. 79.

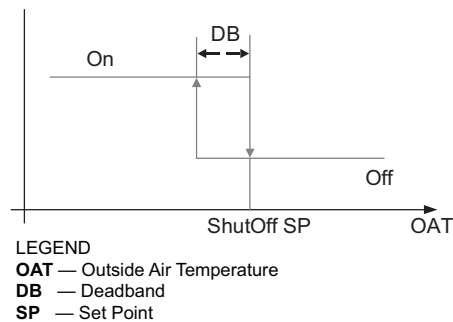


Fig. 79 — Hysteresis Settings

Table 26 — Free Cooling Functions

CONTROL MODE	SENSORS USED	ENABLE FREE COOLING?
Control Mode 1 • Fixed Dry Bulb	OA (outside air) Temperature Sensor and MA (Mixed Air) Temperature Sensor	The outside air dry bulb temperature is compared with the set temperature shutoff set point. If the outside air dry bulb temperature is below the temperature shutoff set point, then the outside air is used to meet all or part of the cooling demand.
Control Mode 2 • Differential Dry Bulb (Dual Dry Bulbs)	OA Temperature Sensor, RA (Return Air) Temperature Sensor, and MA Temperature Sensor	The outside air dry bulb temperature is compared with the return air dry bulb temperature. If both OAT and RAT are higher than the temperature high limitation, then free cooling is prohibited. If OAT or RAT is lower than the temperature high limitation and the outside air dry bulb temperature is lower than the return air dry bulb temperature, then the outside air is used to meet all or part of the cooling demand.
Control Mode 3 • Combination Fixed Enthalpy and Fixed Dry Bulb Control	OA Temperature and Humidity Sensor and MA Temperature Sensor	The outside air dry bulb temperature and enthalpy are compared with the set temperature and enthalpy shutoff set points. If the outside air enthalpy is lower than the set enthalpy shutoff set point, and the outside air dry bulb temperature is lower than the temperature shutoff set point, then the outside air can be used for economizing.
Control Mode 4 • Combination of Differential Enthalpy and Fixed Dry Bulb	OA Temperature and Humidity Sensor, RA Temperature and Humidity Sensor, and MA Temperature Sensor	The outside air dry bulb temperature and enthalpy are compared with the temperature shutoff set point and return air enthalpy. If both OA enthalpy and RA enthalpy are higher than the enthalpy high limitation, then free cooling is prohibited. If OA enthalpy or RA enthalpy is lower than the enthalpy high limitation, outside air enthalpy is lower than the return-air enthalpy, and the outside air dry bulb temperature is lower than the set temperature shutoff set point, then outside air can be used for economizing.

Damper Modulation During Free Cooling

Once outside air is suitable for free cooling, the controller modulates the damper based on MAT (mixed air temperature, default) or OAT (outside air temperature). Refer to Table 26.

If MAT is used when free cooling is enabled, then MAT set point (**3MAT SET**, configurable in Parameter Settings — Advanced — see page 75) is used for MAT modulating. When MAT falls below the anti-freeze set point (**3FRZ PROT**), the damper either fully closes or opens to the minimum position (configurable in Parameter Settings — Advanced — see page 75).

1. If MAT is lower than MAT set point, then the damper is modulated to maintain MAT set point, toward fully closed or open to the minimum position based on occupancy status if MAT continues dropping.
2. If MAT is in the range [MAT set point, (MAT set point + neutral zone band [1°F (0.5°C) by default])], then the damper position does not change.
3. If MAT is higher than (MAT set point + neutral zone band), then the damper modulates toward fully open.
4. If MAT is 10°F (5.5°C) higher than MAT set point, then the damper fully opens to 100%.

If OAT is used when there is a cooling demand, then the damper can be opened to different positions depending on different outside air temperatures:

1. If outside air is higher than 50°F (10°C) but lower than the temperature shutoff set point, then the damper is fully open.
2. If outside air is higher than OAT lockout set point but lower than 50°F (10°C), then linear modulation is applied when only Cooling Stage 1 Input (Y1I) is ON. Result of the following formula indicate the damper's open position:

$$([OAT - OAT Lockout Set Point] / [50 - OAT Lockout Set Point]) * (80\% - MIN POS) + MIN POS$$

NOTE: When both free cooling and mechanical cooling are on, damper remains fully open regardless of the modulating logic.

Location-Based Shutoff Set Points

The economizer controller can get location-based temperature and enthalpy shutoff set points automatically if it is connected to the Climatix™ mobile application. Once a Wi-Fi/WLAN stick is plugged in, the economizer controller can establish network connection with the mobile application. The temperature and enthalpy shutoff set points obtained via the phone or tablet's GPS functionality can then be synchronized to the economizer controller.

Cooling Stage Operation

The economizer controller accepts inputs for 1 and 2-stage cooling inputs, and reroutes to the RTU through the relay connection Y1 and Y2.

The operation of the cooling stages is determined by the availability of Free Cooling provided by the economizer operation mode. See Cooling Stage I/O Logic tables, see Tables 27-28. Based on the use of Free Cooling, the operating modes are as follows:

- Y1 is Stage 1 Cooling Demand
- Y2 is Stage 2 Cooling Demand
- Free Cooling is always the first cooling stage
- Cooling Stage 1 call from the Commercial Thermostat (Y1) energizes the Y1 input to the Economizer Controller
- Cooling Stage 2 call from the Commercial Thermostat (Y2) energizes the Y2 input to the Economizer Controller

Table 27 — 1 and 2-Stage Cooling Stage I/O Logic

ECONOMIZER CONDITION MET	Y1	Y2	COOLING STAGE 1	COOLING STAGE 2
NO	On	On	On	On
NO	On	Off	On	Off
NO	Off	Off	Off	Off
YES	On	On	On	On/Off ^a
YES	On	Off	Off	Off
YES	Off	Off	Off	Off

NOTE(S):

- a. If OAT ≤ MAT set point (**3MAT SET**), then Relay 2 is always **OFF** to disable Cooling Stage 2. Otherwise, if both stages of cooling (Y1 and Y2) are **ON** for more than a set time (15 minutes by default), Y2 remains **ON**, and the OAT is higher than MAT set point, then Relay 2 energizes to allow Y2 pass-through to enable Cooling Stage 2.

Table 28 — 2-Stage Cooling Stage I/O Logic

ECONOMIZER CONDITION MET	Y1	Y2	COOLING STAGE 1	COOLING STAGE 2
NO	On	On	On	On
NO	On	On	On	On
NO	On	Off	On	Off
NO	Off	Off	Off	Off
YES	On	On	On	On
YES	On	On	On	On/Off
YES	On	Off	Off	Off
YES	Off	Off	Off	Off

IMPORTANT: The Economizer Controller can tolerate thermostat wiring mismatch, e.g., Thermostat Y1 → Economizer Y2-IN, Thermostat Y2 → Economizer Y1-IN. The handling logic is Stage = Y1I + Y2I. For example, Y1O = 1 if Stage ≥ 1, Y2O = 1 if Stage ≥ 2.

Multi-Speed Fan Support

The Economizer Controller supports connection to 1 and 2-speed fans. When the unit is equipped with a multi-speed fan, the damper responds to multiple fan speeds via multiple minimum positions (**MIN POS**) to keep minimum airflow. See Tables 29-31.

Table 29 — Damper MIN POS for 2-Speed Fan^a

Y1	Y2	W1 or O/B	Spd L	Spd H	Pos L	Pos H
X	—	—	X	—	X	—
X	X	—	—	X	—	X
—	—	X	—	X	—	X

NOTE(S):

- a. A multi-speed fan is not controlled by the economizer controller but an external logic board.

LEGEND

Pos L — Damper MIN POS for Low-Speed Fan
Pos H — Damper MIN POS for High-Speed Fan
Spd L — Low Speed (Fan)
Spd H — High Speed (Fan)

Table 30 — Different Fan Speeds with Different Configured Outputs^a

FAN TYPE	1-SPEED COOLING ^b	2-STAGE COOLING ^b
1-SPEED FAN^c	• Spd H (regardless of cooling demand, OCC=Yes)	• Spd H (regardless of cooling demand, OCC=Yes)
2-SPEED FAN^c	• Spd L (0 or 1 cooling demand) • Spd H (2 cooling demands)	• Spd L (0 or 1 cooling demand) • Spd H (2 cooling demands)

NOTE(S):

- a. If a single-speed fan connects to the controller, then it opens directly on the call of cooling/heating. The damper position is Pos H.
b. Configured by Y1O or Y2O.
c. Configured by 6FAN.

LEGEND

Spd L — Low Speed (Fan)
Spd H — High Speed (Fan)

Table 31 — Different Damper Minimum Positions with Different Configured Outputs

FAN TYPE	1-SPEED COOLING ^a	2-STAGE COOLING ^a
1-SPEED FAN^b	• Pos H (regardless of cooling demand, OCC=Yes)	• Pos H (regardless of cooling demand, OCC=Yes)
2-SPEED FAN^b	• Pos H (regardless of cooling demand, OCC=Yes)	• Pos L (0 or 1 cooling demand) • Pos H (2 cooling demands)

NOTE(S):

- a. Configured by Y1O or Y2O.
b. Configured by 6FAN.

LEGEND

Pos L — Damper MIN POS for Low-Speed Fan
Pos H — Damper MIN POS for High-Speed Fan

If DCV (demand controlled ventilation) is enabled, then each fan speed corresponds to 2 damper position ventilation set points (**VENT MIN**, **VENT MAX**), e.g., Pos L corresponds to 2VENTMIN L... 2VENTMAX L. See Table 32 for Different Damper Position Setting with Different Configured Outputs with DCV enabled.

If CO₂ sensor is connected but DCV is disabled, then each fan speed corresponds to one minimum damper position ventilation set point. See Table 33 for Different Damper Position Setting with Different Configured Outputs with DCV disabled.

Table 32 — Different Damper Position Setting with Different Configured Outputs (DCV is Enabled)

FAN TYPE	1-STAGE COOLING ^a	2-STAGE COOLING ^a
1-SPEED FAN^b	• 2VENTMIN H to 2VENTMAX H (regardless of cooling demand, OCC=Yes)	• 2VENTMIN H to 2VENTMAX H (regardless of cooling demand, OCC=Yes)
2-SPEED FAN^b	• 2VENTMIN H to 2VENTMAX H (regardless of cooling demand, OCC=Yes)	• 2VENTMIN L to 2VENTMAX L (0 or 1 cooling demand) • 2VENTMIN H to 2VENTMAX H (2 cooling demands)

NOTE(S):

a. Configured by Y1O or Y2O.

b. Configured by 6FAN.

Table 33 — Different Damper Position Setting with Different Configured Outputs (DCV is Disabled, CO₂ sensor is connected)

FAN TYPE	1-STAGE COOLING ^a	2-STAGE COOLING ^a
1-SPEED FAN^b	• 2VENTMIN H (regardless of cooling demand, OCC=Yes)	• 2VENTMIN H (regardless of cooling demand, OCC=Yes)
2-SPEED FAN^b	• 2VENTMIN H (regardless of cooling demand, OCC=Yes)	• 2VENTMIN L (0 or 1 cooling demand) • 2VENTMIN H (2 cooling demands)

NOTE(S):

a. Configured by Y1O or Y2O.

b. Configured by 6FAN.

Cooling Delay via Increasing Fan Speed

If there is cooling demand while outside air is suitable for economizing, then the economizer controller tries to increase fan speed to maximize the use of outside air first. If the cooling demand is not reached within a set time, then mechanical cooling will be enabled.

Typical field application:

- Prerequisites:
 - Outside air is suitable for economizing and free cooling is ON.
 - Fan connected to the controller supports multiple speeds. Cooling delay function does not work if only a one-speed fan is connected to the controller.
- If it is a 2-speed fan and there are 2 cooling demand inputs/outputs, when Y1-Input is called, the controller sets fan speed to Speed Low. Damper is fully open (100%).

If Y2-Input is also called, then the controller increases fan speed to Speed High and starts fan delay (**2FAN DLY**) time. After the delay time runs out, the controller starts Y1-Output.

Demand Controlled Ventilation (DCV)

If a field-installed CO₂ sensor is connected to the EconomizerONE controller, then a demand-controlled ventilation strategy will operate automatically. As the CO₂ level in the space increases above the set point (on the EconomizerONE controller), the minimum position of the dampers will be increased proportionally until the Maximum Ventilation setting is reached. As the space CO₂ level decreases because of the increase in fresh air, the outdoor damper will follow the higher demand condition from the DCV mode or from the free cooling mode.

The controller modulates the outside air damper based on the CO₂ level through the ppm value selected between the range of 500 and 2000 ppm. The measured CO₂ concentration value is compared with the set DCV set point. If the measured CO₂ concentration value is below the DCV set point, keep the damper to the minimum position. Otherwise, enable DCV. Once DCV is enabled, the DCV PID starts to run to control the indoor CO₂ concentration value towards the DCV set point. The damper opens to the maximum position.

NOTE: DCV is disabled if the controller receives no occupancy signal.

DCV operation is available in Occupied and Unoccupied periods with EconomizerONE system. However, a control modification will be required on the unit system to implement the Unoccupied period function. Refer to controller accessory installation instruction manual for further controls and command operation information.

High Humidity Limitation

The economizer controller applies high limit of humidity to enthalpy-based economizing. When the OA dew point is below the dew point set point, enthalpy-based economizing is available. Otherwise, enthalpy-based economizing is unavailable.

Anti-Freeze Protection

The economizer controller initiates the anti-freeze protection if MAT or OAT temperature falls below the anti-freeze set point.

MAT-Based Anti-Freeze Protection

- If MAT temperature falls below the anti-freeze set point (**3FRZ PROT**) and:
 - If unit type is conventional unit and cooling/heating conventional operation mode is enabled, then the controller closes both damper and compressor.
 - If unit type is heat pump and heat pump operation mode is enabled, then the controller closes the damper.
- If the MAT sensor fails, MAT is substituted by OAT to continue the anti-freeze assessment. If OAT sensor also fails, then the controller closes the damper immediately.

OAT-Based Anti-Freeze Protection

If OAT temperature falls below the OAT lockout set point (**3OAT LOCK**) and:

- If unit type is conventional unit and cooling/heating conventional operation mode is enabled, then the controller stops the compressor from running.
- If unit type is heat pump and heat pump operation mode is enabled, then the controller compressor is bypassed.

Exhaust Fan Operation

Up to 2 exhaust fans can be connected to the economizer controller.

- If Exhaust Fan 1 is connected and configured, then Exhaust Fan 1 parameter group (L, M, and H) is available, depending on fan configuration.

- If Exhaust Fan 2 is connected and configured, then Exhaust Fan 2 parameter group (L, M, and H) is available, depending on fan configuration.
- The controller energizes Exhaust Fan Relay 1 and Exhaust Fan Relay 2 if the damper position reaches Exhaust Fan 1 parameter setting and Exhaust Fan Relay 2 parameter setting respectively. The selection of L, M, or H matches the current fan speed.

NOTE: If terminal ACT-FB is configured, then the damper position is the damper feedback position. If feedback signal is unavailable, then it is the simulated position.

Occupancy Input

The economizer controller can receive an occupancy signal from the connected thermostat or work under Occupied mode all the time. This is configurable in the Thermostat setup from Climatix™ mobile application or under the menu of I/O Configuration on the inbuilt display. See “Parameter Settings — I/O Configurations” on page 75 for more information.

IMPORTANT: On the call of cooling, when the controller is configured to receive signal from the thermostat but the thermostat is working under the Unoccupied mode, the damper is fully closed if outside air is not suitable for economizing. If outside air is suitable for economizing, then the damper is fully open.

Pre-occupancy Purge

The Pre-Occupancy purge demand comes from the configuration of the Auxiliary features in Climatix™ mobile application or **6AUX2-I** under the menu of I/O Configuration on the inbuilt display.

During pre-occupancy purge on the call of heating, or when there is no cooling/heating demand, the damper position is MIN POS.

During pre-occupancy purge on the call of cooling, the damper position is MIN POS if outside air is not suitable for economizing. If outside air is suitable for economizing, then the damper is fully open.

Airflow Commissioning

Airflow measurement station (differential pressure signal) can connect to the controller temporarily to run airflow commissioning to calculate, calibrate, and store 4 fan speed characteristic curves automatically at damper positions 40%, 60%, 80%, and 100%. The controller places the damper to a proper position to meet minimum or any other airflow requests in cfm. Users can enable this function only from the mobile application if the related function is available in the current mobile application version.

Fault Detection and Diagnostics

The economizer controller can detect and diagnose free cooling faults, sensor operation faults, and damper modulating faults. It can also report anti-freeze and shutdown notifications and actuator errors. Following is a list of all detectable or reportable information:

- Sensor disconnected or has no signal.
- Sensor short or high signal (under range or over range).
- Not economizing.
- Unexpected economizing.
- Excess outdoor air.
- Damper not modulating.
- Input power monitor and brownout. After detecting brownout, the economizer controller enters the brownout protection mode and disables all of the relay outputs.
- Anti-freeze notifications.
- Shutdown notifications.
- Actuator errors.
- Leaving air temperature is too low or too high.
- Cooling/heating error.
- Damper actuator cycle count. Parameter **1ACT CNT** indicates number of times actuator has cycled. It is resettable via HMI item **8ACT CNT RESET**.

IMPORTANT: The first 6 faults are detectable via LEDs or alarm reports on the LCD. See LED Indication on page 63 and Alarms on page 76 for fault indications. These faults can also be displayed in the Operating section of the Climatix™ mobile application.

Firmware Update

NOTE: Back up configurations before firmware update. All the previous configuration data are erased after firmware update.

NOTE: Contact Application Engineering for more information on support for firmware.

IMPORTANT: If the controller enters the configuration state for the convenience of I/O configurations, then users can manually switch to the running state after finishing configurations. To do so, press Enter + Up at the same time, then press Enter to confirm the switch after 8RUN STATE appears on the LCD.

⚠ WARNING

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

Mounting Devices Connected to the Economizer Controller

Devices like damper actuators, sensors (temperature sensor, humidity sensor, combination temperature and humidity sensor, CO₂ sensor), thermostats, and exhaust fans can be connected to the economizer controller. For information on how to mount the devices, see the device's installation instructions. See Fig. 80 and Table 34 for economizer controller wiring details.

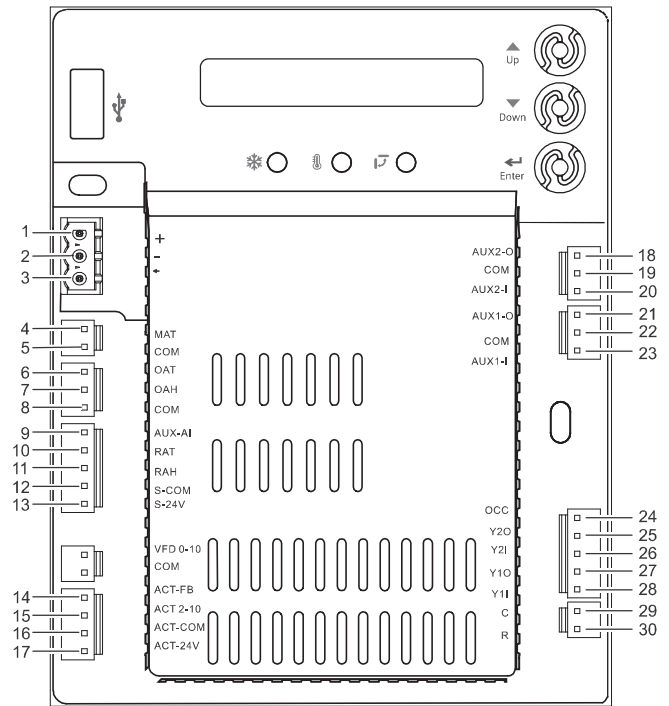


Fig. 80 — Economizer Control Wiring

Table 34 — Economizer Control Wiring Settings

NO.	LABEL	TYPE	DESCRIPTION
1	+	RS485 Modbus A	Line A
2	-	RS485 Modbus B	Line B
3	⏏	GND_ISO	Earth Ground
4	MAT	Type II NTC 10K or 0-10 vdc	Mixed or Discharge Air Temperature Sensor
5	COM	COM	Mixed or Discharge Air Temperature Sensor Common
6	OAT	Type II NTC 10K or 0-10 vdc	Outside Air Temperature Sensor
7	OAHR	0-10 vdc or 4-20mA	Outside Air Relative Humidity Sensor
8	COM	COM	Outside Air Temperature Sensor or Outside Air Relative Humidity Sensor Common
9	AUX-AI	0-10 vdc, 2-10 vdc or 0-5 vdc	Air Quality Sensor or Pressure Sensor
10	RAT	Type II NTC 10K or 0-10 vdc	Return Air Temperature Sensor
11	RAHR	0-10 vdc or 4-20mA	Return Air Relative Humidity Sensor
12	S-COM	COM	24 vac Common
13	S-24V	24 vac	24 vac Power Out to Sensors
14	ACT-FB	2-10 vdc	Damper Actuator Feedback
15	ACT2-10	2-10 vdc	Damper Actuator Output
16	ACT-COM	COM	Damper Actuator Output Common
17	ACT-24V	24 vac	24 vac Power Out to Damper Actuator
18	AUX2-O	24 vac OUT	Configurable: • Exhaust Fan (1 or 2) • System Alarm Output (Title 24)
19	COM	COM	24 vac Common
20	AUX2-I	24 vac IN	Configurable: • Shut Down • Heat Conventional (W1) • Heat Pump Changeover (reversing valve OB) • Pre-Occupancy
21	AUX1-O	24 vac OUT	Configurable: • Exhaust Fan (1 or 2) • System Alarm Output (Title 24)
22	COM	COM	24 vac Common
23	AUX1-I	24 vac IN	Configurable: • Shut Down • Heat Conventional (W1) • Heat Pump Changeover (reversing valve OB) • Pre-Occupancy
24	OCC	24 vac IN	Occupancy Input
25	Y2O	24 vac OUT	Cooling Stage 2 Output to Stage 2 Mechanical Cooling
26	Y2I	24 vac IN	Cooling Stage 2 Input from Commercial Thermostat
27	Y1O	24 vac OUT	Cooling Stage 1 Output to Stage 1 Mechanical Cooling
28	Y1I	24 vac IN	Cooling Stage 1 Input from Commercial Thermostat
29	C	COM	24 vac Common
30	R	24 vac	24 vac Power

Connecting Peripheral Devices to the Economizer Controller

See Fig. 81-85 for wiring details.

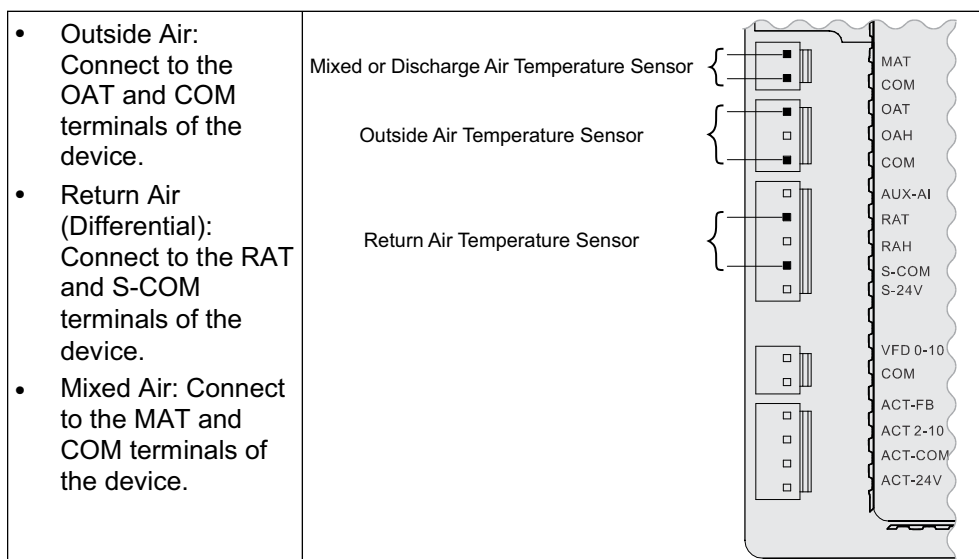


Fig. 81 — Temperature Sensor Connection

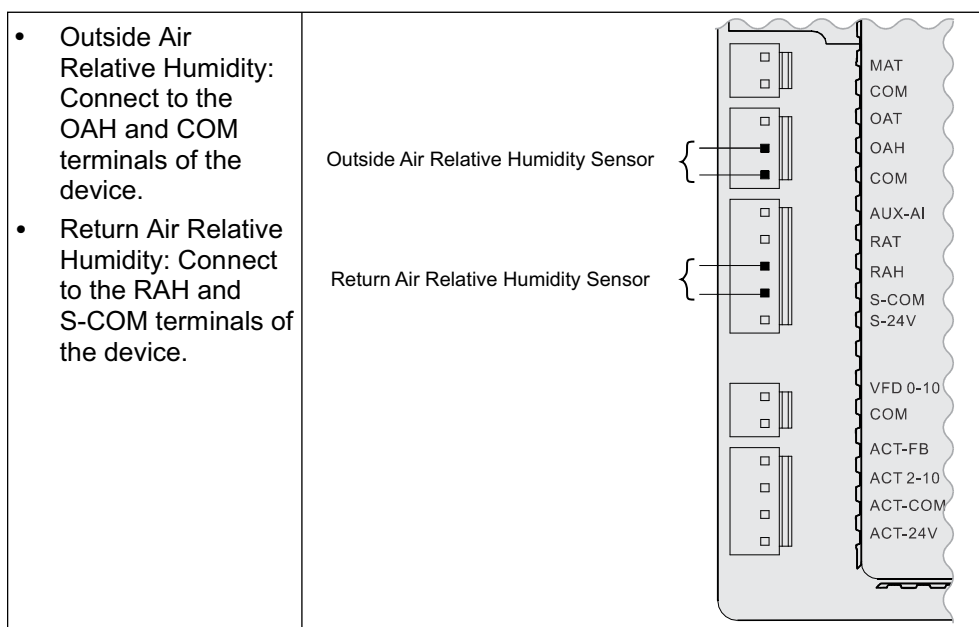


Fig. 82 — Relative Humidity Sensor Connection

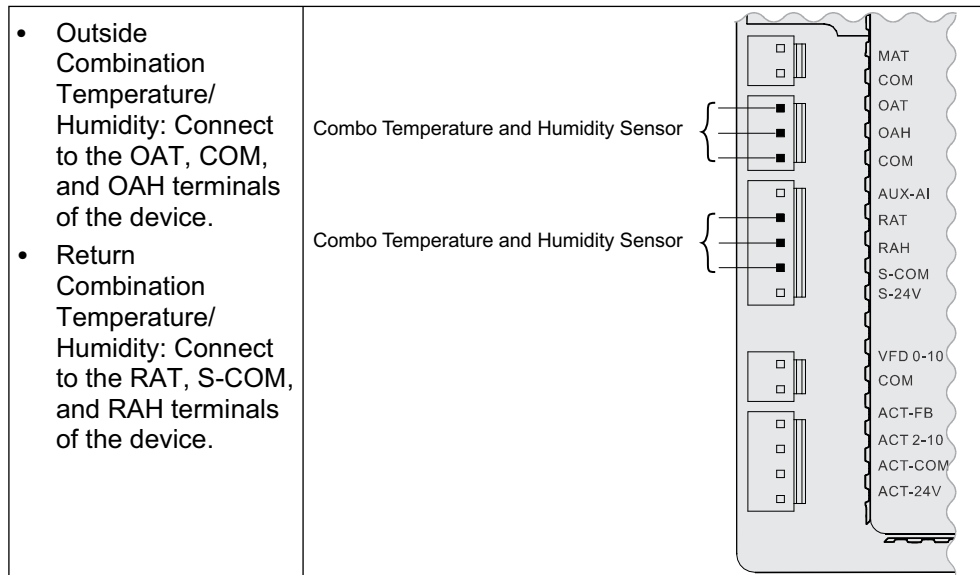


Fig. 83 — Combination Temperature/Humidity Sensor Connection

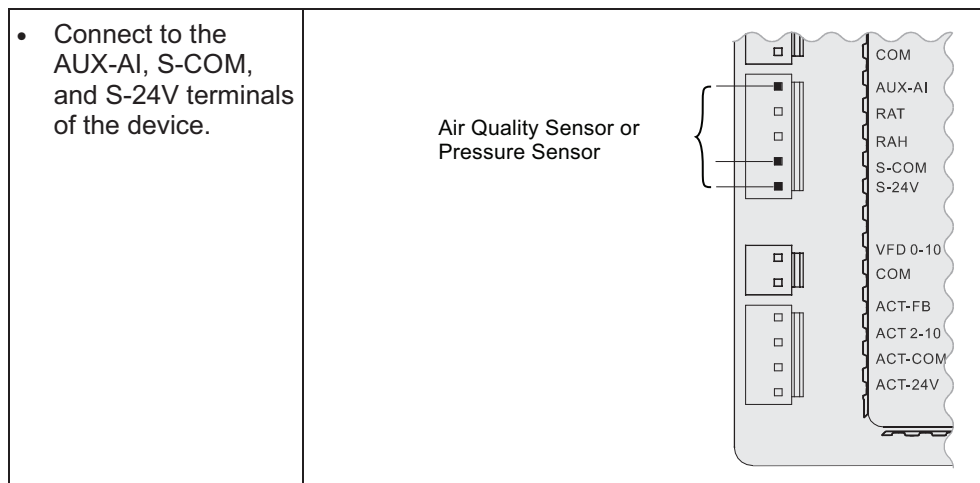


Fig. 84 — CO₂/Pressure Sensor Connection

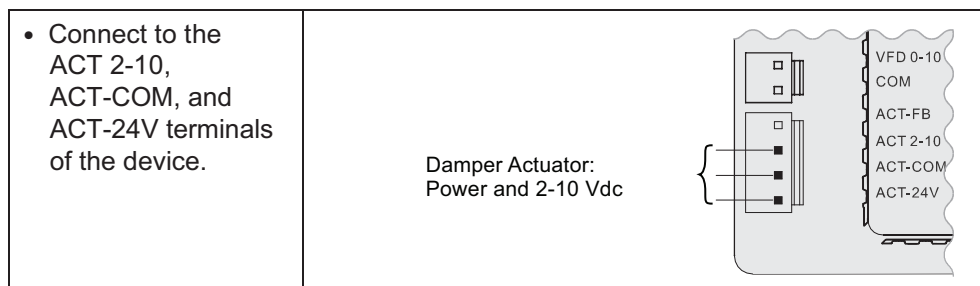


Fig. 85 — Damper Actuator Connection

SETUP AND CONFIGURATION

IMPORTANT: Before setup and configuration, it is recommended to obtain some location-based values, such as shutoff points, or utilize the location services in the Climatix™ mobile application.

Set up and configure the economizer controller before putting it into usage. This can be accomplished by using the Climatix™ mobile application or the inbuilt display. After sensor, compressor, thermostat, or actuator is connected to the economizer controller, values/statuses are displayed in the Operating section of the mobile application and on the LCD. Users can manually change basic and advanced settings, configure I/Os, and test the damper operation and any configured outputs by modifying the corresponding parameter values in the local device or mobile application. See Tables 35-42 for a complete list of all parameters that users can find on the LCD display. Refer to it during the setup and configuration process.

NOTE: For all units, the Climatix application login is: **Administrator**. For units coming from the factory with CO₂ configuration or single enthalpy (control mode 3), the controller password is OneBT2.1. For all other units, use the controller password OneBT.

NOTE: Parameters and display menus may display differently/dynamically if different applications are configured. See Tables 35-42.

IMPORTANT: Not all operations are available on the local POL 224. For example, users can only obtain shutoff set points and perform cfm commissioning via the Climatix™ mobile application. Setup and configuration on the local device are only recommended if operations from the mobile application are unavailable. Check the mobile application for all operations that can be performed from the mobile application end.

IMPORTANT: By connecting the RS485 port to a PC, all parameters are also readable or writable from PC tools such as Modbus Poll.exe via Modbus®^a and Yabe.exe via BACnet™^a MSTP (Bps 38400 [default], Bps 9600, Bps 19200, Bps 115200). Note that an external End of Line (EOL) element is required to achieve Baud Rate 115200 at a maximum cable length of 4000 ft (1.2 km).

NOTE(S):

a. Third-party trademarks and logos are the property of their respective owners.

Table 35 — Status Display

PARAMETER	DESCRIPTION	VALUE
1FREECOOL	Indicates if the system can use outdoor air for free cooling.	YES NO
1ECON ENAB	Indicates if outdoor air is being used for the first stage of cooling.	
1OCCUPIED	Indicates if the space is occupied. If users choose ALWAYS for 6OCC when configuring I/Os, the parameter value is YES ; if users keep the default selection T-STAT for 6OCC and the controller receives 24-v signal from OCC input, the value is YES . Otherwise, the value is NO .	
1Y1-IN	Y1-IN call from thermostat for Cooling Stage 1.	ON OFF
1Y1-OUT	Y1-OUT signal to compressor for Cooling Stage 1.	
1Y2-IN	Y2-IN call from thermostat for Cooling Stage 2.	
1Y2-OUT	Y2-OUT signal to compressor for Cooling Stage 2. Dynamic item: Appears only if Y2-OUT terminal is configured.	
1AUX1-I	Aux1-IN signal. Dynamic item: Appears only if Aux1-In terminal is configured.	
1AUX1-O	Aux1-OUT signal. Dynamic item: Appears only if Aux1-OUT terminal is configured.	
1AUX2-I	Aux2-IN signal. Dynamic item: Appears only if Aux2-In terminal is configured.	
1AUX2-O	Aux2-OUT signal. Dynamic item: Appears only if Aux2-OUT terminal is configured.	
1COMP STAGE	Indicates compressor current stage.	Off 1 2 3
1HEAT ENAB	Indicates if heating is enabled.	YES NO
1MIX AIR LOW	Indicates if the anti-freeze protection function is enabled for a mixed air temperature sensor. If the detected air temperature is lower than the anti-freeze protection set point (3FRZ PROT), the parameter value is YES . Otherwise, it is NO .	
1MAT PRES	Indicates the present value of the mixed air temperature (MAT) sensor. Dynamic item: Appears only if MAT or AUTO is selected for 3DIF T LOC under Parameter Settings — Advanced on page 75.	The corresponding detected value is displayed on the LCD.
1LAT PRES	Indicates the present value of the leaving air temperature (LAT) sensor. Dynamic item: Appears only if LAT or AUTO is selected for 3DIF T LOC .	
1OAT PRES	Indicates the present value of the outdoor air temperature (OAT) sensor. Dynamic item: Appears only if an OAT sensor is configured.	
1OAH PRES	Indicates the present value of the outdoor air relative humidity (OAH) sensor. Dynamic item: Appears only if an OAH sensor is configured.	
1RAT PRES	Indicates the present value of the return air temperature (RAT) sensor. Dynamic item: Appears only if a RAT sensor is configured.	
1RAH PRES	Indicates the present value of the return air relative humidity (RAH) sensor. Dynamic item: Appears only if a RAH sensor is configured.	
1CO2 PRES	Indicates the present value of the CO ₂ sensor. Dynamic item: Appears only if a CO ₂ sensor is configured.	
1DCV STATUS	Indicates the demand controlled ventilation (DCV) status. Dynamic item: Appears only if a CO ₂ sensor is configured. Displays ON if the measured CO ₂ concentration value is above the DCV set point and OFF if below the DCV set point.	ON OFF
1FAN SPD LV	Indicates the current fan speed status (low, medium, or high). If a one-speed fan is connected and configured, this item is invisible. Dynamic item: Appears only if “ 6FAN ” is configured as “ 2SPEED ” under Parameter Settings — I/O Configurations on page 75.	L H
1ACT OUT	Indicates current position of damper actuator in v.	The corresponding detected value is displayed on the LCD.
1ACT FB	Indicates feedback signal of damper actuator in v.	
1ACT POS	Indicates current position of damper actuator in % Open.	
1ACT CNT	Indicates number of times actuator has cycled (1 cycle = 180 degrees of movement in any direction). Resettable via HMI item 8ACT CNT RESET under Enter Running State on page 77.	
1EQUIP	Indicates the equipment type. If HP(O) or HP(B) is chosen for 6AUX1-I , the parameter value is HP(O) or HP(B) respectively. If neither is chosen, the value is CON RTU .	HP(O) HP(B) CON RTU
1OAT LOCK	Indicates status of the OAT cooling lockout function.	NO LCKOUT OVRD
1INS	Indicates the installation date of the Economizer Controller. If the installation date is incorrect, press Enter to change and confirm month, date and year.	—

Table 36 — Parameter Settings — Basic

PARAMETER	DESCRIPTION	RANGE	DEFAULT
2 TEMP OFF	Temperature shutoff set point can be obtained automatically if a smartphone or tablet is connected to the network provided by a Wi-Fi/WLAN stick plugged into the Economizer Controller and the mobile application is installed on the phone or tablet. This can also be a manually defined set point.	48...80°F; increment by 1	63°F
2ENTH OFF	Enthalpy shutoff set point can be obtained automatically if a smartphone or tablet is connected to the network provided by a Wi-Fi/WLAN stick plugged into the Economizer Controller and the mobile application is installed on the phone or tablet. This can also be a manually defined set point. Dynamic item: Appears only if an OAH sensor is configured.	22...30 Btu/lbm; increment by 1	28 Btu/lbm
2DVC	Demand controlled ventilation set point can be obtained automatically if a smartphone or tablet is connected to the network provided by a Wi-Fi/WLAN stick plugged into the Economizer Controller and the mobile application is installed on the phone or tablet. This can also be a manually defined set point. Dynamic item: Appears only if a CO ₂ sensor is configured.	300...2000PPM; increment by 100	1100PPM
2FAN L ACT	Damper minimum position when fan runs at a low speed. Dynamic item: Appears only if "6FAN" is configured as "2SPEED" under Parameter Settings — I/O Configurations on page 75.	2...10V; increment by 0.1	3.6V
2FAN H ACT	Damper minimum position when fan runs at a high speed. Dynamic item: Appears only if "6FAN" is configured as "1SPEED" or "2SPEED".	2...10V; increment by 0.1	2.8V
2VENTMAX L	DCV maximum position when fan runs at a low speed. Dynamic item: Appears only if a CO ₂ sensor is configured and "6FAN" is configured as "2SPEED".	2...10V; increment by 0.1	3.6V
2VENTMAX H	DCV maximum position when fan runs at a high speed. Dynamic item: Appears only if a CO ₂ sensor is configured and "6FAN" is configured as "1SPEED" or "2SPEED".	2...10V; increment by 0.1	3.6V
2VENTMIN L	DCV minimum position when fan runs at a low speed. Dynamic item: Appears only if a CO ₂ sensor is configured and "6FAN" is configured as "2SPEED".	2...10V; increment by 0.1	3.1V
2VENTMIN H	DCV minimum position when fan runs at a high speed. Dynamic item: Appears only if a CO ₂ sensor is configured and "6FAN" is configured as "1SPEED" or "2SPEED".	2...10V; increment by 0.1	2.3V
CFM COMM	Air Flow Chart: CFM commissioning can only be initiated from the mobile application. When CFM commissioning is in progress, the local device reads "CFM COMM".	—	—
2DEGREES	Temperature unit (°F or °C).	—	°F
2FAN	Fan cfm.	100...50,000cfm; increment by 100	5000cfm
2EX1 L	Exhaust Fan 1 low-speed parameter setting. Dynamic item: Appears only if: • Exhaust Fan 1 is configured. • "6FAN" is configured as "2SPEED".	0...100%; increment by 1	65%
2EX1 H	Exhaust Fan 1 high-speed parameter setting. Dynamic item: Appears only if: • Exhaust Fan 1 is configured. • "6FAN" is configured as "1SPEED" or "2SPEED".	0...100%; increment by 1	50%
2EX2 L	Exhaust Fan 2 low-speed parameter setting. Dynamic item: Appears only if: • Exhaust Fan 2 is configured. • "6FAN" is configured as "2SPEED".	0...100%	80%
2EX2 H	Exhaust Fan 2 high-speed parameter setting. Dynamic item: Appears only if: • Exhaust Fan 2 is configured. • "6FAN" is configured as "1SPEED" or "2SPEED".	0...100%; increment by 1	75%
2THL	Temperature high limitation. Dynamic item: Appears only if an RAT sensor is configured.	0...100%; increment by 1	83%
2EHL	Enthalpy high limitation. Dynamic item: Appears only if an RAH sensor is configured.	30...50 Btu/lbm, increment by 1	33 Btu/lbm
2FAN DLY	Cooling delay via increasing fan speed.	0...30 min; increment by 1	5 min.

Table 37 — Parameter Settings — Advanced

PARAMETER	DESCRIPTION	VALUE/RANGE	DEFAULT
3FREEZE POS	Anti-freeze protection damper position (closed or minimum).	CLO MIN	CLO
3SD ACT POS	Damper position during shutdown (open or closed).	CLO OPN	CLO
3DIF T LOC	MAT sensor location: • Choose MAT if the sensor is installed before the DX (Direct Expansion) coil. • Choose LAT if the sensor is installed after the DX coil. • Choose AUTO to let the Economizer Controller automatically detect the location.	MAT LAT AUTO	LAT
3LAT LOW	Low limit of leaving air temperature. Dynamic item: Appears only if LAT or AUTO is selected for 3DIF T LOC .	35...65°F; increment by 1	45°F
3LAT HIGH	High limit of leaving air temperature. Dynamic item: Appears only if LAT or AUTO is selected for 3DIF T LOC .	70...180°F; increment by 1	80°F
3OAT CAL	OAT sensor calibration.	–2.5...2.5°F; increment by 0.5	0°F
3RAT CAL	RAT sensor calibration. Dynamic item: Appears only if an RAT sensor is configured.	–2.5...2.5°F; increment by 0.5	—
3OAH CAL	OAH sensor calibration. Dynamic item: Appears only if an OAH sensor is configured.	–10...10%; increment by 0.5	0%
3RAH CAL	RAH sensor calibration. Dynamic item: Appears only if an RAH sensor is configured.		
3MAT CAL	MAT or LAT sensor calibration.	–2.5...2.5°F; increment by 0.5	0°F
3MAT SET	Set point of MAT or LAT sensor.	38...70°F; increment by 1	53°F
3FRZ PROT	Anti-freeze protection set point of MAT sensor.	35...55°F; increment by 1	45°F
3ACT TOLR	Actuator tolerance setpoint between output (in percent) and feedback (in percent).	0...15%; increment by 1	8%
3OAT LOCK	OAT lockout set point for anti-freeze protection.	–45...80°F; increment by 1	32°F
3OAT LCKOVRD	When OAT LOCKOUT is enabled, choose to override the cooling lockout function or not.	YES NO	NO
3OAT LOCKODY	Indicates the overridden time if “YES” is selected for “ 3OAT LCKOVRD ”.	0...300 min; increment by 1	45 min.

Table 38 — Parameter Settings — I/O Configurations

PARAMETER	DESCRIPTION	VALUE	DEFAULT
6OCC	Configures if occupancy status receives signal from the connected thermostat or is displayed as ALWAYS in the Economizer Controller.	T-STAT ALWAYS	T-STAT
6AUX1-I	Auxiliary DI-1. Configurable as: • None. • Heat Conventional (W1) from thermostat. • Heat pump (reversing valve O). • Heat pump (reversing valve B). • Pre-occupancy signal from thermostat. • Shutdown signal from unit.	NONE HP(O) HP(B) PREOCC SHUTDWN	W1
6AUX2-I	Auxiliary DI-2. Configurable as: • None. • Heat stage 1 (W1) from thermostat. • Heat pump (reversing valve O). • Heat pump (reversing valve B). • Pre-occupancy signal from thermostat. • Shutdown signal from unit. NOTE: Whichever is chosen for 6AUX1-I does not appear in the list of 6AUX2-I.	NONE W1 HP(O) HP(B) PREOCC SHUTDWN	NONE
6OAT SIG	Configures signal type of OAT sensor.	0-10V NTC10K	NTC10K
6RAT SIG	Configures signal type of RAT sensor.	0-10V NTC10K NONE	NONE
6OAH SIG	Configures signal type of OAH sensor.	0-10V 4-20mA NONE	NONE
6RAH SIG	Configures signal type of RAH sensor.		
6MAT SIG	Configures signal type of MAT or LAT sensor.	0-10V NTC10K	NTC10K
6AUX-AI1	Auxiliary AI-1. Configurable as: • CO ₂ sensor. • Static pressure (temporarily for CFM commissioning) sensor. • None.	PRESSURE CO ₂ NONE	NONE
6X-AI1 SIG	Configures CO ₂ sensor type. Dynamic item: Appears only if “CO ₂ ” is selected for “ 6AUX-AI1 ”.	0-10V 2-10V 0-5V	0-10V
6CO₂ Rng L	Configures the low limit of CO ₂ measuring range. Dynamic item: Appears only if “CO ₂ ” is selected for “ 6AUX-AI1 ”.	0...500; increment by 10	0
6CO₂ Rng H	Configures the high limit of CO ₂ measuring range. Dynamic item: Appears only if “CO ₂ ” is selected for “ 6AUX-AI1 ”.	1000...3000; increment by 50	2000

Table 38 — Parameter Settings — I/O Configurations (cont)

PARAMETER	DESCRIPTION	VALUE	DEFAULT
6AUX-AI2	Choose ACT FB if feedback signal is available from the connected damper actuator. Otherwise, choose NONE .	ACT FB NONE	ACT FB
6Y2O	Choose " COOL 2 " if Cooling Stage 2 is available (another compressor is connected to the Economizer). Otherwise, choose " NONE ".	COOL 2 NONE	COOL 2
6AUX1-O	Auxiliary DO-1. Configurable as: <ul style="list-style-type: none"> None. Exhaust fan (1 or 2). Alarm output to thermostat (Title 24). 	NONE ALARM EXHAUST	EXHAUST
6AUX2-O	Auxiliary DO-2. Configurable as: <ul style="list-style-type: none"> None. Exhaust fan (1 or 2). Alarm output to thermostat (Title 24). NOTE: Except for Exhaust Fan, whichever is chosen for 6AUX1-O does not appear in the list of 6AUX2-O.	NONE ALARM EXHAUST	ALARM
6RS485	Switch between MSTP and Modbus.	MSTP MODBUSLV	MSTP

Table 39 — Alarm Parameters^{a,b}

PARAMETER	DESCRIPTION
NO ALARM	No alarm is activated.
4MAT SEN ALARM	MAT sensor has failed, gone out of range or become disconnected.
4CO2 SEN ALARM	CO ₂ sensor has failed, gone out of range or become disconnected.
4OAT SEN ALARM	OAT sensor has failed, gone out of range or become disconnected.
4OAH SEN ALARM	OAH sensor has failed, gone out of range or become disconnected.
4RAT SEN ALARM	RAT sensor has failed, gone out of range or become disconnected.
4RAH SEN ALARM	RAH sensor has failed, gone out of range or become disconnected.
4FREEZE ALARM	Anti-freeze notification when MAT sensor is below anti-freeze protection set point.
4RTU SHUTDOWN	Notification of Shutdown Active when SHUTDWN is chosen for 6AUX1-I or 6AUX2-I.
4ACTUATOR ALARM	Actuator gets disconnected or has failed.
4ACT UNDER V	Voltage received by the actuator is below expected range.
4ACT OVER V	Voltage received by the actuator is above expected range.
4ACT STALLED	Damper actuator stopped before achieving commanded position.
4ACT SLIPPING	Damper actuator slips after reaching commanded position.
4NOT ECON	Not Economizing when it should.
4ECON SHOULDNT	Economizing when it should not.
4EXCESS OA	Excess outdoor air. Outside air intake is significantly higher than it should be.
4LLA ALARM	Leaving air temperature is lower than the low limit (3LAT LOW).
4HLA ALARM	Leaving air temperature is higher than the high limit (3LAT HIGH).

NOTE(S):

- All alarms are dynamic items. An alarm appears only if a related symptom mentioned above is detected.
- An alarm activation triggers a general alarm, then the configured system alarm output (AUX1-O or AUX2-O) is activated. If there is no alarm, NO ALARM is displayed on the HMI.

Table 40 — Test Commands

PARAMETER	DESCRIPTION
7DAMPER MIN POS	Press Enter to test if the Economizer Controller can drive damper to minimum position.
7DAMPER CLOSE	Press Enter to test if the Economizer Controller can drive damper to 100% Closed.
7DAMPER OPEN	Press Enter to test if the Economizer Controller can drive damper to 100% Open.
7DAMPER ALL	Press Enter to perform all the above tests.
7DAMPER	Press Enter to test if the Economizer Controller can drive damper to the selected voltage.
7Y1O	Press Enter to test if the Economizer Controller can turn on or off the first stage of cooling (close or open relay Y1O).
7Y2O	Press Enter to test if the Economizer Controller can turn on or off the second stage of cooling (close or open relay Y2O).
7AUX1-O	Press Enter to test AUX1-O connection (close or open relay AUX1-O).
7AUX2-O	Press Enter to test AUX2-O connection (close or open relay AUX2-O).

Table 41 — Enter Running State

PARAMETER	DESCRIPTION
8RUN STATE	Change to Running State. Press Enter to confirm the change.
8ENTER RUN?	Confirm the change to Running State.
8FACTORY DEF	Perform factory reset. Press Enter to confirm the reset. (This action resets the controller password to default: OneBT.)
8DEF CONFIRM?	Confirm the factory reset.
8ACT CNT RESET	Damper count reset.
8VER x.x.x	Firmware version information such as 0.1.10.

Table 42 — Enter Configuration State and Restart

PARAMETER	DESCRIPTION
5CONFIG STATE	Change to Configuration State. Press Enter to confirm the change.
5ENTER CONFIG?	Confirm the change to Configuration State.
5RESTART	Restart the Economizer Controller. Press Enter to confirm the restart.
5CONF RESTART	Confirm the restart.

INSTALLING OPTIONAL HH57LW001 SINGLE OUTSIDE AIR ENTHALPY SENSOR

When using the HH57LW001 enthalpy sensor (see Fig. 86) for outside air changeover, the existing HH79NZ039 dry bulb sensor (see Fig. 87) must be removed. The enthalpy sensor will be mounted in the same location as the dry bulb sensor (see Fig. 88). When the enthalpy sensor's OA (Outside Air) temperature, enthalpy, and dew point are below their respective set points, outside air can be used for free cooling. When any of these are above their set point, free cooling will not be available. Enthalpy set points are configurable and create an enthalpy boundary according to the user's input. For additional details, see Fig. 89-90 and Table 43.

Harness 48TC005213 is required to be connected between the EconomizerONE harness in the return air chamber. Harness

48TC005213 has a 5-pin plug that connects directly to the HH57LW001 enthalpy sensor. The CRENTSEN001A00 accessory kit includes enthalpy sensor (HH57LW001) and associated 5-pin plug (48TC005213) and may be ordered as a finished good.

Enthalpy Control Sensor Configuration

The optional enthalpy control sensor (P/N: HH57LW001) communicates with the POL224 economizer controller using the 5-wire harness, 48TC005213. The HH57LW001 sensor can be used as a single outside air enthalpy, a differential return enthalpy, or a differential return temperature sensor. Refer to the base unit control wiring diagrams found earlier in this book to wire the HH57LW001 enthalpy sensor for each option. See Fig. 86 and Table 45 on page 80 to locate the wiring terminals for each enthalpy control sensor.

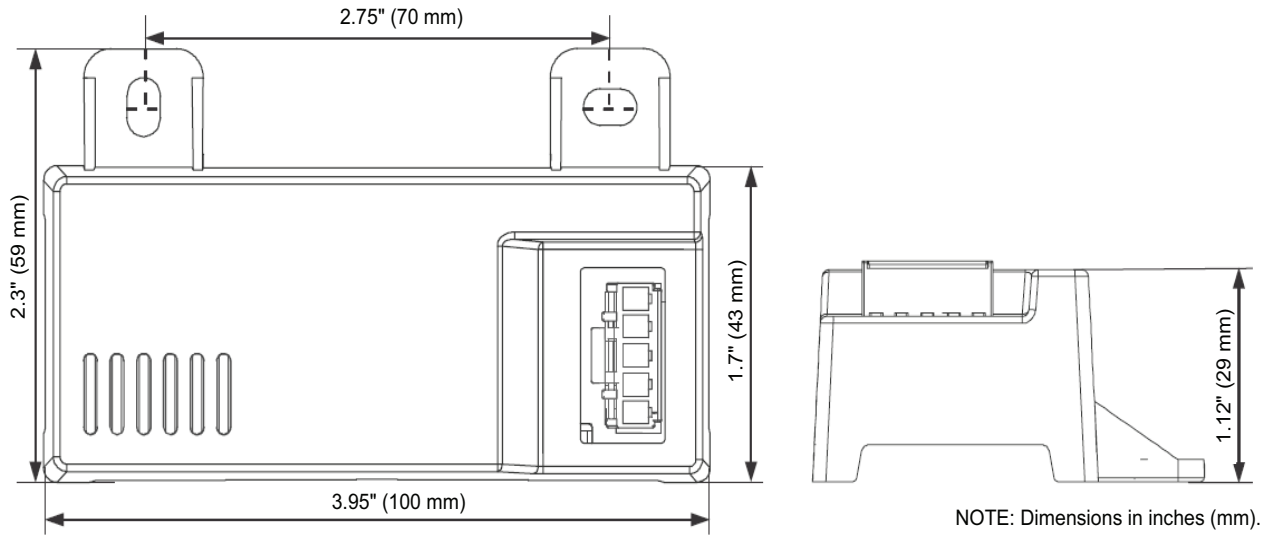


Fig. 86 — HH57LW001 Dimensional, Connection and Switching Information

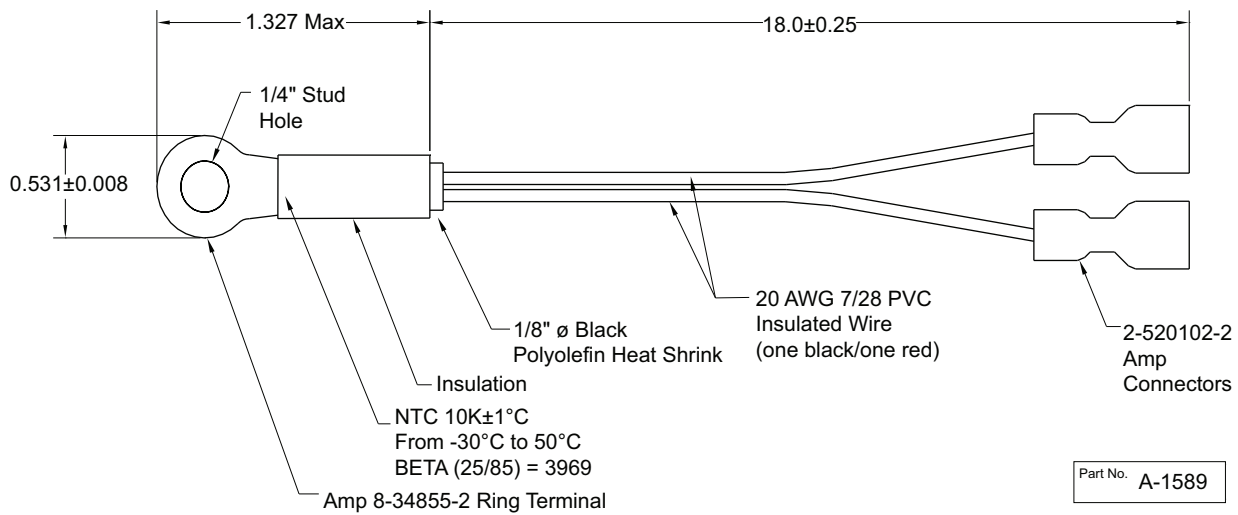


Fig. 87 — HH79NZ039 Dry Bulb and Mixed Air Sensor Wiring

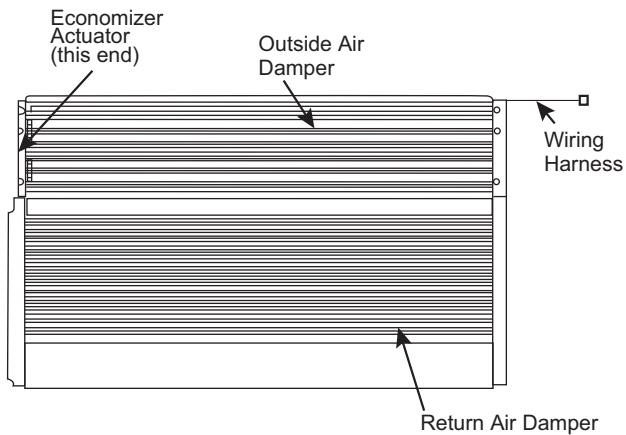


Fig. 88 — EconomizerONE System Component Locations

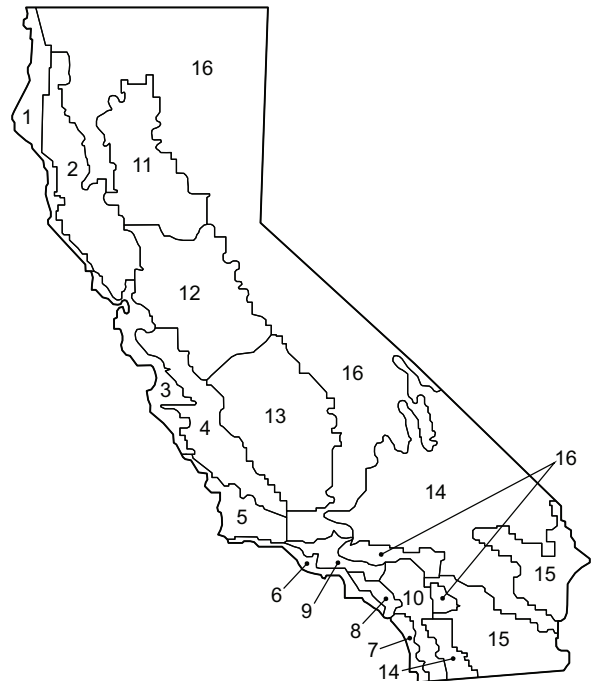


Fig. 89 — California Title 24 Zones

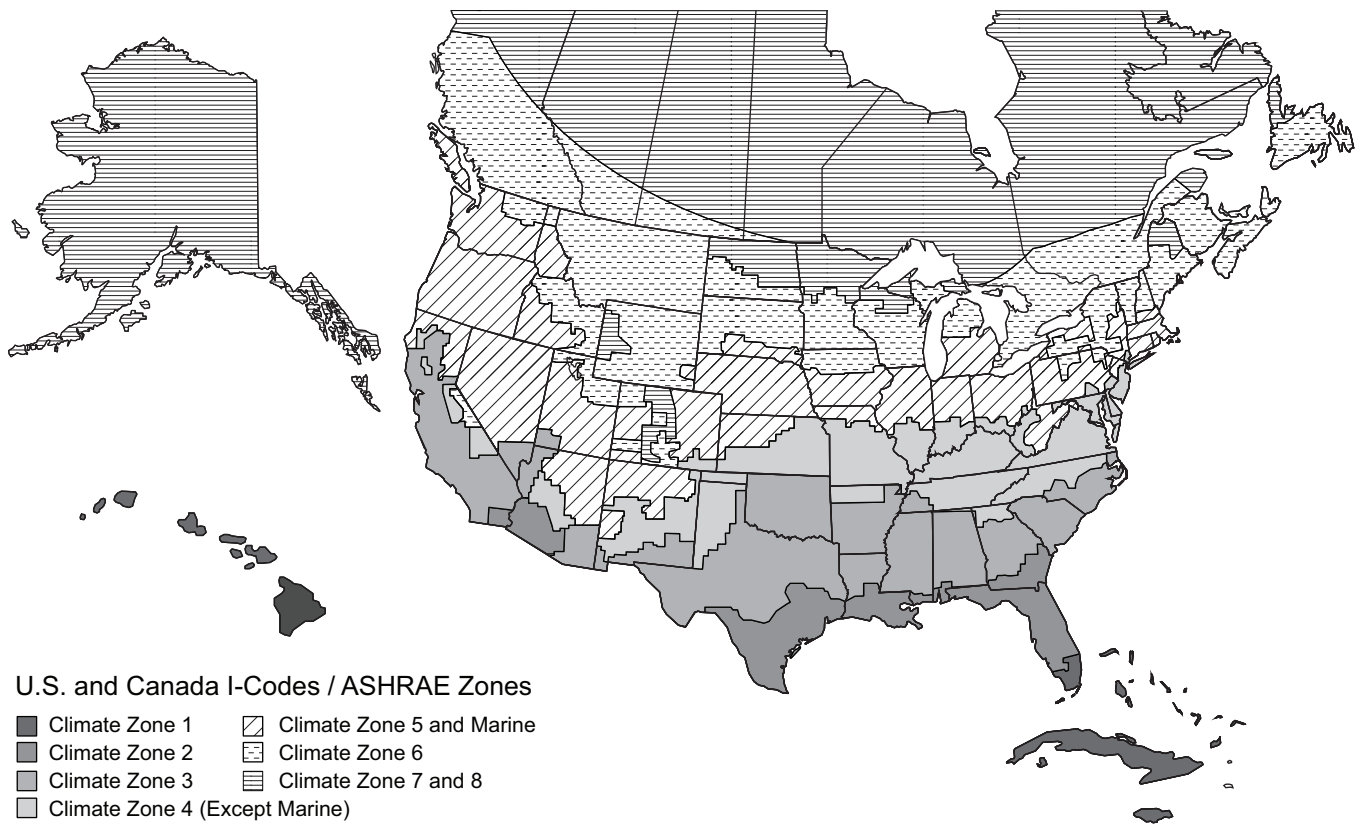


Fig. 90 — U.S. and Canada Climate Zones

Table 43 — Enthalpy Manual Entry Set Points for EconomizerONE Per Climate Zone

CLIMATE ZONES ^a	2 TEMP OFF	LOWEST SETTING	RH%	2 ENTH OFF	RH%	2THL	2EHL	RH%
1	65°F	22 Btu/lbm	43%	28 Btu/lbm	86%	83°F	33 Btu/lbm	48%
2	65°F	22 Btu/lbm	43%	28 Btu/lbm	86%	83°F	33 Btu/lbm	48%
3	65°F	22 Btu/lbm	43%	28 Btu/lbm	86%	83°F	33 Btu/lbm	48%
4	65°F	22 Btu/lbm	43%	28 Btu/lbm	86%	83°F	33 Btu/lbm	48%
5	70°F	22 Btu/lbm	28%	28 Btu/lbm	65%	83°F	33 Btu/lbm	48%
6	70°F	22 Btu/lbm	28%	28 Btu/lbm	65%	83°F	33 Btu/lbm	48%
7 and 8	75°F	22 Btu/lbm	19%	28 Btu/lbm	50%	83°F	33 Btu/lbm	48%
CALIFORNIA TITLE 24 ZONES ^b	2 TEMP OFF	LOWEST SETTING	RH%	2 ENTH OFF	RH%	2THL	2EHL	RH%
1	75°F	22 Btu/lbm	19%	28 Btu/lbm	50%	83°F	33 Btu/lbm	48%
2	73°F	22 Btu/lbm	22%	28 Btu/lbm	55%	83°F	33 Btu/lbm	48%
3	75°F	22 Btu/lbm	19%	28 Btu/lbm	55%	83°F	33 Btu/lbm	48%
4	73°F	22 Btu/lbm	22%	28 Btu/lbm	55%	83°F	33 Btu/lbm	48%
5	75°F	22 Btu/lbm	19%	28 Btu/lbm	50%	83°F	33 Btu/lbm	48%
6	71°F	22 Btu/lbm	28%	28 Btu/lbm	62%	83°F	33 Btu/lbm	48%
7	69°F	22 Btu/lbm	32%	28 Btu/lbm	68%	83°F	33 Btu/lbm	48%
8	71°F	22 Btu/lbm	28%	28 Btu/lbm	62%	83°F	33 Btu/lbm	48%
9	71°F	22 Btu/lbm	28%	28 Btu/lbm	62%	83°F	33 Btu/lbm	48%
10	73°F	22 Btu/lbm	22%	28 Btu/lbm	55%	83°F	33 Btu/lbm	48%
11	75°F	22 Btu/lbm	19%	28 Btu/lbm	50%	83°F	33 Btu/lbm	48%
12	75°F	22 Btu/lbm	19%	28 Btu/lbm	50%	83°F	33 Btu/lbm	48%
13	75°F	22 Btu/lbm	19%	28 Btu/lbm	50%	83°F	33 Btu/lbm	48%
14	75°F	22 Btu/lbm	19%	28 Btu/lbm	50%	83°F	33 Btu/lbm	48%
15	75°F	22 Btu/lbm	19%	28 Btu/lbm	50%	83°F	33 Btu/lbm	48%
16	75°F	22 Btu/lbm	19%	28 Btu/lbm	50%	83°F	33 Btu/lbm	48%
CONTROLLER DEFAULT SETTINGS	2 TEMP OFF	—	—	2 ENTH OFF	—	2THL	2EHL	RH%
DEFAULT SET POINTS	63°F	—	—	28 Btu/lbm	94%	83°F	33 Btu/lbm	48%

NOTE(S):

- a. Refer to Fig. 90 for map of U.S. and Canada climate zones.
b. Refer to Fig. 89 for map of California Title 24 zones.

Economizers are shipped standard with an HH79NZ039 outside air dry bulb sensor (refer to Fig. 87). System default setting (high temp limit) is 63°F (17°C) and has a range of 48°F to 80°F (9°C to 27°C). Sensor is factory installed on economizer.

A second HH79NZ039 sensor is provided for mixed air temperature.

California high temperature setting requirements by region are shown in Table 44.

Enthalpy Settings (Enthalpy OPTION)

If installing the optional HH57LW001 enthalpy sensor, the HH79NZ039 dry bulb outside air sensor must first be removed. Wire sensor to harness 48TC005213 and the (5) wires from the harness to the EconomizerONE harness in the return air chamber. Harness 48TC005213 has a 5-pin plug that connects directly to the HH57LW001 enthalpy sensor. Refer to the base unit control wiring diagrams earlier in this book for wiring connections. Refer to Fig. 86 and see Table 45.

California's Title 24 High Temperature Limit Settings

California's Title 24 code requires a high temperature limit setting for all dry bulb outside air economizer changeover. The temperatures vary by the region within California. See Table 44 for high limit settings.

Table 44 — California Title 24 Regional High Limit Dry Bulb Temperature Settings^a

DEVICE TYPE ^b	CLIMATE ZONES	REQUIRED HIGH LIMIT DESCRIPTION (ECONOMIZER OFF WHEN)
FIXED DRY BULB	1, 3, 5, 11-16	OAT exceeds 75°F (23.8°C)
	2, 4, 10	OAT exceeds 73°F (22.7°C)
	6, 8, 9	OAT exceeds 71°F (21.6°C)
	7	OAT exceeds 69°F (20.5°C)
DIFFERENTIAL DRY BULB	1, 3, 5, 11-16	OAT exceeds RA temperature
	2, 4, 10	OAT exceeds return air temperature -2°F (-18.8°C)
	6, 8, 9	OAT exceeds return air temperature -4°F (-20°C)
	7	OAT exceeds return air temperature -6°F (-21.1°C)
FIXED ENTHALPY^c + FIXED DRY BULB	All	OAT exceeds 28 Btu/lb of dry air ^b or OAT exceeds 75°F (23.8°C)

NOTE(S):

- This table is sourced from 2019 California Energy Code, Title 24, Part 6, Table 140.4-E Air Economizer High Limit Shut Off Control Requirements.
- Only the high limit control devices listed are allowed to be used and at the set points listed. Others, such as Dew Point, Fixed Enthalpy, Electronic Enthalpy, and Differential Enthalpy Controls, may not be used in any climate zone for compliance with Section 140.4(e)1 unless approval for use is provided by the Energy Commission Executive Director.
- At altitudes substantially different than sea level, the Fixed Enthalpy limit value shall be set to the enthalpy value at 75°F and 50% relative humidity. As an example, at an approximately 6,000 foot elevation, the fixed enthalpy limit is approximately 30.7 Btu/lb.

LEGEND

OAT — Outdoor-Air Thermostat
RA — Return Air

Table 45 — HH57LW001 Sensor Wiring Terminations

TERMINAL		TYPE	DESCRIPTION
NUMBER	LABEL		
1	TCOM	NTC 10k	Outside Air Temperature Sensor Output
2	TSIG	NTC 10k	Outside Air Temperature Sensor Output
3	HSIG	0-10 vdc	Outside Air Relative Humidity Sensor Output
4	HCOM	COMMON	Sensor 24-v Common Input
5	H24V	24 vac	Sensor 24-v Operating Voltage Input

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 Test Commands tests (refer to Table 40).

For information about menu navigation and use of the keypad see Interface Overview on page 62.

WARNING

ELECTRIC SHOCK HAZARD

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

Before performing service or maintenance operations on unit, always turn off main power switch to unit and install lock(s) and lockout tag(s). Unit may have more than one power switch. Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate.

If any wiring changes are required, first be sure to remove power from the economizer module before starting work. Pay particular attention to verifying the power connection (24 vac).

Power Up

After the POL224 module is mounted and wired, apply power.

Initial Menu Display

On initial start up, "Welcome" displays on the economizer HMI screen. After a brief pause, the Parameter Settings — I/O Configuration (refer to Table 38) of the software appears, allowing the user to check that presets and default values are configured correctly.

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 (refer to Table 35) 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 62.

Checkout Tests

Use the Test Commands menu (refer to Table 40) to test the damper operation and any configured outputs. Only items that are configured are shown in the Test Commands menu.

NOTE: For information about menu navigation and use of the keypad, see Interface Overview on page 62.

To perform a Test Command test:

1. Scroll to the desired test in Test Command menu 7 using the Up and Down 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 Enter + Up 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

For EconomizerONE troubleshooting issues, see Table 46.

Table 46 — Operating Issues and Concerns

SYMPTOM	REASON	SOLUTION
An alarm is displayed on the LCD	Sensor, damper, or the whole working system may not work properly	Check sensor, damper, or the whole working system following the detailed alarm information.
DAC LED is blinking RED	Damper slippage	Check whether the damper works properly.
DAC LED is blinking RED quickly	Damper unplugged	Check whether the damper is connected.
DAC LED is OFF	Terminal ACT-FB is configured but there is no available feedback signal	Check whether the feedback signal is connected; check if ACT-FB is faulty.
Economizer controller has no alarm, but the Free Cooling LED will not turn on when the OA seems to be suitable for Free Cooling	Shutoff SP setting error	Shutoff temperature and/or enthalpy set point is incorrectly set up. Consult an HVAC professional to set up the shutoff set point correctly.
	OA temp is too low	The OA temperature is too low; therefore, there is no cooling demand. This could possibly enable anti-freeze protection.
	OA temp is too high or too humid	In DIFF mode, even though OA temperature is lower than RA temperature, if both OA and RA temperatures exceed the high limit, then Free Cooling turns off. In Differential Enthalpy control mode, even though OA enthalpy is lower than RA enthalpy, if both OA and RA enthalpy exceed the high limit, then Free Cooling turns off.
Economizer controller/mechanical cooling is not operating	No input power	Use a multi-meter to check whether there is 24 vac \pm 25% (18-30 vac) at the POWER terminals. If there is no voltage or if the voltage is significantly low, then check the transformer output voltage at the RTU. If 24-v is not present at the transformer secondary side, then check the primary line voltage to the transformer. If the line voltage is not present at the transformer primary side, then check the primary power to the RTU, fuses, circuit breaker, and so on.
	Brownout	If voltage is below 17-v, then the economizer controller may be in Brownout Protection mode. This mode disables all of the relay outputs. When the power is 19 vac or higher, the economizer controller and RTU operate normally.
	Y1/Y2 signal is missing from the thermostat	Mechanical cooling does not run until there is cooling demand (Y1/Y2 Active). Check the wiring from Y11 and Y21 terminals to the commercial thermostat. 24-v should be present between Y11/Y21 and Y10/Y20 respectively.
	24 vac~ and 24 vac \perp are incorrectly wired	24 vac power supply has polarity when all devices are powered by the same 24 vac transformer; reversing polarity may cause a short circuit that can damage the system. Follow the transformer polarity mark, check the wiring of 24-v~ (or G or 24-v+), and ensure that they are tied to the same polar of 24 vac power supply; while checking the wiring of \perp (or G0 or 24-v- or COM), ensure that they are all tied to another polar of 24 vac power supply.
Firmware update failure	Application file is damaged, operation is incorrect, and/or USB flash disk does not work properly	Reload a BIN file, restart the controller, update firmware ^a , or change a USB flash disk. Contact service provider if failure still exists.
Free Cooling LED is solid RED	Sensor, damper, or whole working system may not work properly	Check sensor, damper, or the whole working system following the detailed alarm information.
Free Cooling LED is blinking RED	Not economizing when it should	Check the whole economizer working system, such as the sensor, damper, and thermostat.
Incorrect controller password error on mobile application	For CO ₂ and single enthalpy (control mode 3) configurations from the factory, the password has changed	For units coming from the factory with CO ₂ configuration or single enthalpy (control mode 3), use the controller password OneBT2.1. For all other units, use the controller password OneBT. Performing a factory reset on the controller will also reset the password to OneBT.
RS485 communication failure	RS485 signal or configuration error	Check wiring, configuration, Baud Rate (using mobile application), and other network communication parameters.
Sensor LED is blinking RED	Excess outdoor air	Check the whole economizer working system, such as the sensor, damper, and thermostat.
Sensor LED is solid RED	Mixed Air (MA) sensor error	Check the MA sensor. It must be either a Type II NTC 10K or 0-10 vdc sensor.
	Outside Air (OA)/Return Air (RA) sensor error	Check the wiring and signal of the OA sensor. If in Differential (DIFF) mode, also check the RA sensor. The following sensor signals are valid: Type II NTC 10K or 0-10 vdc temperature. 0-10 vdc or 4-20 mA humidity.
	Air temperature failure/fault	Check the air temperature sensor signal. The valid signal must be Type II NTC 10K or 0-10 vdc.
Sensor LED is OFF	CO ₂ sensor error	Check CO ₂ sensor connection, sensor signal (under range or over range), and sensor signal type.
Sensor LED is YELLOW	Humidity sensor error	Check humidity sensor connection, sensor signal (under range or over range), and sensor signal type.
Wi-Fi connection failure	Wi-Fi/WLAN stick error or wrong user name and password	Unplug and re-plug in the Wi-Fi/WLAN stick, enter a correct user name and password, restart the controller, or replace the Wi-Fi/WLAN stick. If the Wi-Fi/WLAN stick is POL903.00/100, then the default user name and password are Siemens-WLAN-Stick and SIBPAdmin. DNS name is siemens.wlanstick. Contact Application Engineering for information on this accessory.

NOTE(S):

- Back up configurations before firmware update. All the previous configuration data is erased after firmware update. Contact Application Engineering for more information on support for firmware.
IMPORTANT: If the controller enters the configuration state for the convenience of I/O configurations, then users can manually switch to the running state after finishing configurations. To do so, press Enter + Up at the same time, then press Enter to confirm the switch after 8RUN STATE appears on the LCD.

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/tagout 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.
3. Make 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. Be sure that connections are completed and tight. Be sure that 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. Make sure that condenser-fan blade are correctly positioned in fan orifice. See Condenser Fan Adjustment section for more details.
 - b. Make sure that air filter(s) is in place.
 - c. Make sure that condensate drain trap is filled with water to ensure proper drainage.
 - d. Make sure that all tools and miscellaneous loose parts have been removed.

START-UP, GENERAL

Unit Preparation

Make sure that unit has been installed in accordance with installation instructions and applicable codes.

In addition to the base unit start-up (unit with electro-mechanical control), there are a few steps needed to properly start-up units with optional direct digital controls (DDC). The DDC'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 DDC Alarms for initial insight to any potential issues. Refer to the *Controls, Start-up, Operation and Troubleshooting Instructions* manual for the specific DDC. Inspect the SAT sensor for relocation as intended during installation. Inspect special wiring as directed below.

Return-Air Filters

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

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.

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.

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 gauges 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 install lockout tag.
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.

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 at AUTO. position. Adjust thermostat to a setting below room temperature. Compressor starts on closure of contactor. Check unit charge. Refer to Refrigerant Charge section on page 21.

Reset thermostat at a position above room temperature. Compressor will shut off. Evaporator fan will shut off after a 30-second delay.

To shut off unit, set system selector switch at OFF position. Resetting thermostat at a position above room temperature shuts 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 the first stage of the electric heaters. Second stage of thermostat energizes the second stage of 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.

To 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. Evaporator fan operates continuously to provide constant air circulation. When the evaporator-fan selector switch is turned to the OFF position, there is a 30-second delay before the fan turns off.

FASTENER TORQUE VALUES

Stator motor mounting screws	50 in.-lb (5.7 Nm) \pm 5 in.-lb (0.6 Nm)
Fan rotor mounting screws (2.4 HP)	50 in.-lb (5.7 Nm) \pm 5 in.-lb (0.6 Nm)
Fan rotor mounting screws (3 and 5 HP)	30 in.-lb (3.4 Nm) \pm 2 in.-lb (0.2 Nm)
Fan deck bracket screws	50 in.-lb (5.7 Nm) \pm 5 in.-lb (0.6 Nm)
Fan casing screws	10 in.-lb (1.1 Nm) \pm 1 in.-lb (0.1 Nm)
Heat shield screws	30 in.-lb (3.4 Nm) \pm 2 in.-lb (0.2 Nm)
Condenser motor mounting screws	30 in.-lb (3.4 Nm) \pm 2 in.-lb (0.2 Nm)
Condenser hub set screw	84 in.-lb (9.5 Nm) \pm 12 in.-lb (1.5 Nm)
Compressor mounting bolts	12 ft-lb (16.2 Nm) \pm 2 ft-lb (2.7 Nm)
Tandem rail mounting bolts	8 ft-lb (10.8 Nm) \pm 0.5 ft-lb (0.6 Nm)
Crankcase heater	22.5 in.-lb (2.5 Nm) \pm 2.5 in.-lb (0.3 Nm)

START-UP, SYSTEMVU CONTROLS

IMPORTANT: SET-UP INSTRUCTIONS

Installation, wiring and troubleshooting information for the SystemVu™ Controller.: "FCQ/GCQ Series Single Package Rooftop Units with SystemVu Controller Controls, Start-Up, Operation and Troubleshooting" manual. Have a copy of this manual available at unit start-up.

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	F	C	Q	M	2	4	A	2	A	6	-	0	A	0	A	0

Unit Heat Type

50 = Cooling Packaged Rooftop

Model Series - WeatherMaker®

FC = Standard Efficiency (EcoBlue™ Technology)

Heat Type

Q = Heat Pump
(Field-Installed Electric Heat)

Refrig. Systems Options

M = Two Stage Cooling/One Circuit Models

Cooling Tons

17 = 15.0 tons
24 = 20.0 tons
28 = 25.0 tons

Sensor Options

A = None
B = Return Air Smoke Detector (RA)
C = Supply Air Smoke Detector (SA)
D = RA + SA Smoke Detector
E = CO₂ Sensor
F = RA Smoke Detector and CO₂ Sensor
G = SA Smoke Detector and CO₂ Sensor
H = RA + SA Smoke Detector and CO₂ Sensor
J = Condensate Overflow Switch (COFS)
K = COFS + RA Smoke Detector
L = COFS + RA and SA Smoke Detectors
M = COFS + SA Smoke Detector
N = COFS + CO₂ Sensor
P = COFS + RA Smoke Detector and CO₂ Sensor
Q = COFS + SA Smoke Detector and CO₂ Sensor
R = COFS + RA and SA Smoke Detector and CO₂ Sensor

Indoor Fan Options - Vane Axial EcoBlue Fan System

2 = Standard/Medium Static Motor - Vertical Supply
3 = High Static Motor - Vertical Supply
5 = Standard/Medium Static Motor - Vertical Supply and Filter Status Switch
6 = High Static Motor - Vertical Supply and Filter Status Switch
J = High Static Motor - Horizontal Supply
L = High Static Motor - Horizontal Supply and Filter Status Switch

Coil Options – RTPF (Outdoor – Indoor) – Hail Guards

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 Guards
N = Precoat Al/Cu – Al/Cu – Louvered Hail Guards
P = E-coat Al/Cu – Al/Cu – Louvered Hail Guards
Q = E-coat Al/Cu – E-coat Al/Cu – Louvered Hail Guards
R = Cu/Cu – Al/Cu – Louvered Hail Guards
S = Cu/Cu – Cu/Cu – Louvered Hail Guards

Voltage

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

Packaging Compliance

0 = Standard

Electrical Options

A = None
C = Non-Fused Disconnect
N = Phase Monitor/Protection
Q = Phase Monitor/Protection
and Non-Fused Disconnect
1 = HSCCR Protection

Service Options

0 = None
1 = Unpowered Convenience Outlet
2 = Powered Convenience Outlet
3 = Hinged Access Panels
4 = Hinged Access Panels and
Unpowered Convenience Outlet
5 = Hinged Access Panels and
Powered Convenience Outlet
6 = 4" MERV 13 High Efficiency Filter Track
7 = Unpowered Convenience Outlet and 4" MERV 13
High Efficiency Filter Track
8 = Powered Convenience Outlet and 4" MERV 13
High Efficiency Filter Track
9 = Hinged Access Panels and 4" MERV 13 High
Efficiency Filter Track
A = Hinged Access Panels, Unpowered Convenience
Outlet and 4" MERV 13 High Efficiency Filter Track
B = Hinged Access Panels, Powered Convenience
Outlet and 4" MERV 13 High Efficiency Filter Track

Intake / Exhaust Options

A = None
B = Low Leak Temp Economizer w/ Baro Relief
D = Low Leak Temp Economizer w/ PE (cent) Vert Only
F = Low Leak Enthalpy Economizer w/ Baro Relief
H = Low Leak Enthalpy Economizer w/ PE (cent) Vert Only
U = ULTRA Low Leak Temp Economizer w/ Baro Relief
V = ULTRA Low Leak Temp Economizer w/ PE (cent)
Vert Only
W = ULTRA Low Leak Enthalpy Economizer w/ Baro Relief
X = ULTRA Low Leak Enthalpy Economizer w/ PE (cent)
Vert Only

Base Unit Controls

0 = Electromechanical Controller
3 = SystemVu™ Controller
6 = Electromechanical Controls — with W7220
EconoMi\$er X (includes FDD^a)
8 = Electromechanical Controls — with POL224
EconomizerONE (includes FDD^a)

Design Revision

- = Factory Design Revision

^a FDD (Fault Detection and Diagnostic) capability per California
Title 24 section 120.2.

Fig. A — Model Number Nomenclature

APPENDIX B — PHYSICAL DATA

Table A — 50FCQ 17 to 28 Physical Data

50FCQ UNIT	50FCQM17	50FCQM24	50FCQM28
NOMINAL TONS	15	20	25
BASE UNIT OPERATING WT (lb)^a	1627	2057	2125
REFRIGERATION SYSTEM			
No. Circuits / No. Compressors / Type	1 / 2 / Scroll	1 / 2 / Scroll	1 / 2 / Scroll
Puron® (R-410A) Charge (lb-oz)	27-0	48-0	48-0
Cooling Metering Device	TXV	TXV	TXV
Heating Metering Device	TXV	TXV	TXV
High-Pressure Trip / Reset (psig)	630 / 505	630 / 505	630 / 505
Loss of Charge Trip / Reset	27 / 44	27 / 44	27 / 44
EVAPORATOR COIL			
Material (Tube / Fin)	Cu / Al	Cu / Al	Cu / Al
Coil Type (in. RTPF)	3/8	3/8	3/8
Rows / FPI	4 / 15	4 / 15	4 / 15
Total Face Area (ft²)	22	26	26
Condensate Drain Connection Size (in.)	3/4	3/4	3/4
CONDENSER COIL			
Material (Tube / Fin)	Cu / Al	Cu / Al	Cu / Al
Coil Type (in. RTPF)	5/16	5/16	5/16
Rows / FPI	2 / 18	2 / 18	2 / 18
Total Face Area (ft²)	41.6	59.2	59.2
EVAPORATOR FAN AND MOTOR			
Standard/Medium Static 3 Phase			
Motor Qty / Drive Type	2 / Direct	2 / Direct	2 / Direct
Max Cont bhp	2.4	2.4	3
Range (rpm)	250-2000	250-2000	250-2200
Fan Qty / Type	2 / Vane Axial	2 / Vane Axial	2 / Vane Axial
Fan Diameter (in.)	22	22	22
Vertical High Static 3 Phase			
Motor Qty / Drive Type	2 / Direct	2 / Direct	2 / Direct
Max Cont bhp	3	5	5
Range (rpm)	250-2200	250-2200	250-2200
Fan Qty / Type	2 / Vane Axial	2 / Vane Axial	2 / Vane Axial
Fan Diameter (in.)	22	22	22
Horizontal High Static 3 Phase			
Motor Qty / Drive Type	2 / Direct	2 / Direct	2 / Direct
Max Cont bhp	5	5	5
Range (rpm)	250-2200	250-2200	250-2200
Fan Qty / Type	2 / Vane Axial	2 / Vane Axial	2 / Vane Axial
Fan Diameter (in.)	22	22	22
CONDENSER FAN AND MOTOR			
Qty / Motor Drive Type	3 / Direct	4 / Direct	4 / Direct
Motor hp / rpm	1/4 / 1100	1/4 / 1100	1/4 / 1100
Fan Diameter (in.)	22	22	22
FILTERS			
RA Filter Qty / Size (in.)	6 / 25x25x2	9 / 20x25x2	9 / 20x25x2
OA Inlet Screen Qty / Size (in.)	4 / 16x25x1	4 / 16x25/1	4 / 16x25/1

NOTE(S):

a. Base unit operating weight does not include weight of options.

LEGEND

bhp — Brake Horsepower
FPI — Fins Per Inch
OA — Outdoor Air
RA — Return Air

APPENDIX C — FAN PERFORMANCE

GENERAL FAN PERFORMANCE NOTES

1. Interpolation is permissible. Do not extrapolate.
2. External static pressure is the static pressure difference between the return duct and the supply duct plus the static pressure caused by any FIOPs or accessories.
3. Tabular data accounts for pressure loss due to clean filters, unit casing and wet coils.
4. Factory options and accessories may effect static pressure losses. For fan selections with low or medium heat models, the user must deduct low and medium heat static pressures. Selection software is available, through your salesperson, to help you select the best motor/drive combination for your application.
5. The fan performance tables offer motor/drive recommendations. In cases when two motor/drive combinations would work, the lower horsepower option is recommended.
6. For information on the electrical properties of the fan motors, please see the Electrical information section of the product specifications book.
7. For more information on the performance limits of the fan motors, see the application data section of the product specifications book.
8. The EPACT (Energy Policy Act of 1992) regulates energy requirements for specific types of indoor fan motors. Motors regulated by EPACT include any general purpose, T-frame (three-digit, 143 and larger), single-speed, foot mounted, polyphase, squirrel cage induction motors of NEMA (National Electrical Manufacturers Association) design A and B, manufactured for use in the United States. Ranging from 1 to 200 Hp, these continuous-duty motors operate on 230 and 460 volt, 60 Hz power. If a motor does not fit into these specifications, the motor does not have to be replaced by an EPACT compliant energy-efficient motor. Variable-speed motors are exempt from EPACT compliance requirements.

APPENDIX C — FAN PERFORMANCE (cont)

50FCQM17 — 15 Ton Vertical Supply (rpm - bhp)

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	936	0.61	1065	0.90	1180	1.23	1285	1.59	1380	1.97
4875	991	0.73	1112	1.03	1224	1.37	1325	1.74	1418	2.14
5250	1048	0.86	1161	1.18	1268	1.53	1366	1.91	1457	2.32
5625	1106	1.02	1211	1.34	1314	1.71	1410	2.11	1498	2.53
6000	1166	1.19	1263	1.52	1362	1.90	1454	2.31	1540	2.75
6375	1226	1.38	1317	1.72	1410	2.11	1499	2.53	1584	2.99
6750	1287	1.59	1371	1.93	1460	2.33	1546	2.76	1628	3.23
7125	1349	1.82	1428	2.16	1511	2.56	1594	3.01	1674	3.48
7500	1412	2.07	1485	2.40	1563	2.80	1643	3.26	1721	3.74

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	1470	2.38	1554	2.81	1634	3.27	1710	3.74	1782	4.24
4875	1505	2.55	1588	3.00	1666	3.46	1741	3.95	1812	4.46
5250	1542	2.75	1623	3.21	1700	3.69	1773	4.18	1844	4.71
5625	1581	2.97	1660	3.44	1735	3.93	1807	4.44	1876	4.97
6000	1622	3.21	1699	3.69	1772	4.19	1843	4.71	1911	5.25
6375	1663	3.46	1739	3.95	1811	4.46	1880	4.99	1946	5.54
6750	1706	3.71	1780	4.22	1850	4.74	1918	5.28	1983	5.83
7125	1750	3.98	1822	4.49	1891	5.02	1958	5.57	2022	6.14
7500	1794	4.24	1866	4.77	1933	5.30	1999	5.86	—	—

Std/Med Static 936-2000 rpm, 4.8 Max bhp (2.4 Max bhp per fan motor)

High Static 936-2200 rpm, 6.0 Max bhp (3.0 Max bhp per fan motor)

50FCQM17 — Standard/Medium Static — 15 Ton Vertical Supply (rpm - Vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
4500	936	4.5	1065	5.2	1180	5.8	1285	6.3	1380	6.8
4875	991	4.8	1112	5.4	1224	6.0	1325	6.5	1418	7.0
5250	1048	5.1	1161	5.7	1268	6.2	1366	6.7	1457	7.2
5625	1106	5.4	1211	5.9	1314	6.5	1410	7.0	1498	7.4
6000	1166	5.7	1263	6.2	1362	6.7	1454	7.2	1540	7.6
6375	1226	6.0	1317	6.5	1410	7.0	1499	7.4	1584	7.9
6750	1287	6.3	1371	6.8	1460	7.2	1546	7.7	1628	8.1
7125	1349	6.7	1428	7.1	1511	7.5	1594	7.9	1674	8.3
7500	1412	7.0	1485	7.4	1563	7.8	1643	8.2	1721	8.6

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
4500	1470	7.3	1554	7.7	1634	8.1	1710	8.5	1782	8.9
4875	1505	7.5	1588	7.9	1666	8.3	1741	8.7	1812	9.0
5250	1542	7.6	1623	8.1	1700	8.5	1773	8.8	1844	9.2
5625	1581	7.8	1660	8.3	1735	8.6	1807	9.0	1876	9.4
6000	1622	8.1	1699	8.5	1772	8.8	1843	9.2	—	—
6375	1663	8.3	1739	8.7	1811	9.0	1880	9.4	—	—
6750	1706	8.5	1780	8.9	1850	9.2	—	—	—	—
7125	1750	8.7	1822	9.1	1891	9.4	—	—	—	—
7500	1794	8.9	1866	9.3	—	—	—	—	—	—

Std/Med Static 936-2000 rpm

APPENDIX C — FAN PERFORMANCE (cont)

50FCQM17 – High Static – 15 Ton Vertical Supply (rpm - Vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
4500	936	4.2	1065	4.8	1180	5.3	1285	5.8	1380	6.2
4875	991	4.4	1112	5.0	1224	5.5	1325	6.0	1418	6.4
5250	1048	4.7	1161	5.2	1268	5.7	1366	6.2	1457	6.6
5625	1106	5.0	1211	5.4	1314	5.9	1410	6.4	1498	6.8
6000	1166	5.2	1263	5.7	1362	6.1	1454	6.6	1540	7.0
6375	1226	5.5	1317	5.9	1410	6.4	1499	6.8	1584	7.2
6750	1287	5.8	1371	6.2	1460	6.6	1546	7.0	1628	7.4
7125	1349	6.1	1428	6.4	1511	6.8	1594	7.2	1674	7.6
7500	1412	6.4	1485	6.7	1563	7.1	1643	7.4	1721	7.8

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
4500	1470	6.6	1554	7.0	1634	7.4	1710	7.7	1782	8.1
4875	1505	6.8	1588	7.2	1666	7.5	1741	7.9	1812	8.2
5250	1542	7.0	1623	7.3	1700	7.7	1773	8.0	1844	8.4
5625	1581	7.1	1660	7.5	1735	7.9	1807	8.2	1876	8.5
6000	1622	7.3	1699	7.7	1772	8.0	1843	8.4	1911	8.7
6375	1663	7.5	1739	7.9	1811	8.2	1880	8.5	1946	8.8
6750	1706	7.7	1780	8.1	1850	8.4	1918	8.7	1983	9.0
7125	1750	7.9	1822	8.3	1891	8.6	1958	8.9	2022	9.2
7500	1794	8.1	1866	8.5	1933	8.8	1999	9.1	—	—

High Static 936-2200 rpm

APPENDIX C — FAN PERFORMANCE (cont)

50FCQM24 — 20 Ton Vertical Supply (rpm - bhp)

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	1038	0.84	1148	1.14	1251	1.47	1351	1.86	1448	2.28
6500	1103	1.01	1207	1.32	1304	1.66	1398	2.05	1490	2.48
7000	1169	1.19	1269	1.52	1360	1.87	1448	2.26	1535	2.69
7500	1234	1.38	1332	1.74	1418	2.09	1501	2.48	1583	2.91
8000	1299	1.58	1395	1.95	1478	2.32	1557	2.72	1634	3.14
8500	1364	1.78	1459	2.18	1540	2.56	1615	2.95	1689	3.37
9000	1427	1.97	1524	2.40	1602	2.79	1674	3.18	1745	3.60
9500	1491	2.17	1589	2.62	1665	3.02	1735	3.41	1802	3.83
10000	1553	2.36	1653	2.84	1729	3.25	1797	3.65	1862	4.06

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	1539	2.74	1624	3.22	1703	3.72	1777	4.22	1847	4.74
6500	1578	2.95	1662	3.44	1741	3.96	1816	4.49	1887	5.04
7000	1619	3.16	1701	3.66	1779	4.19	1854	4.74	1924	5.30
7500	1663	3.38	1742	3.88	1818	4.41	1892	4.97	1962	5.55
8000	1711	3.60	1786	4.10	1859	4.62	1931	5.18	2000	5.76
8500	1761	3.83	1832	4.31	1903	4.83	1972	5.37	2039	5.94
9000	1813	4.04	1882	4.52	1949	5.02	2015	5.55	2081	6.11
9500	1868	4.26	1933	4.72	1998	5.21	2061	5.72	2124	6.27
10000	1925	4.49	1987	4.94	2049	5.41	2110	5.91	2170	6.43

Std/Med Static 1038-2000 rpm, 4.8 Max bhp (2.4 Max bhp per fan motor)

High Static 1038-2200 rpm, 10.0 Max bhp (5.0 Max bhp per fan motor)

50FCQM24 — Standard/Medium Static — 20 Ton Vertical Supply (rpm - Vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
6000	1038	5.1	1148	5.6	1251	6.1	1351	6.7	1448	7.2
6500	1103	5.4	1207	5.9	1304	6.4	1398	6.9	1490	7.4
7000	1169	5.7	1269	6.2	1360	6.7	1448	7.2	1535	7.6
7500	1234	6.1	1332	6.6	1418	7.0	1501	7.4	1583	7.9
8000	1299	6.4	1395	6.9	1478	7.3	1557	7.7	1634	8.1
8500	1364	6.7	1459	7.2	1540	7.6	1615	8.0	1689	8.4
9000	1427	7.1	1524	7.6	1602	8.0	1674	8.3	1745	8.7
9500	1491	7.4	1589	7.9	1665	8.3	1735	8.6	1802	9.0
10000	1553	7.7	1653	8.2	1729	8.6	1797	9.0	1862	9.3

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
6000	1539	7.6	1624	8.1	1703	8.5	1777	8.9	1847	9.2
6500	1578	7.8	1662	8.3	1741	8.7	1816	9.1	1887	9.4
7000	1619	8.0	1701	8.5	1779	8.9	1854	9.2	—	—
7500	1663	8.3	1742	8.7	1818	9.1	1892	9.4	—	—
8000	1711	8.5	1786	8.9	1859	9.3	—	—	—	—
8500	1761	8.8	1832	9.1	1903	9.5	—	—	—	—
9000	1813	9.0	1882	9.4	1949	9.7	—	—	—	—
9500	1868	9.3	1933	9.7	—	—	—	—	—	—
10000	1925	9.6	1987	9.9	—	—	—	—	—	—

Std/Med Static 1038-2000 rpm

APPENDIX C — FAN PERFORMANCE (cont)

50FCQM24 – High Static – 20 Ton Vertical Supply (rpm - Vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
6000	1038	4.6	1148	5.1	1251	5.6	1351	6.1	1448	6.5
6500	1103	4.9	1207	5.4	1304	5.9	1398	6.3	1490	6.7
7000	1169	5.2	1269	5.7	1360	6.1	1448	6.5	1535	6.9
7500	1234	5.5	1332	6.0	1418	6.4	1501	6.8	1583	7.2
8000	1299	5.8	1395	6.3	1478	6.7	1557	7.0	1634	7.4
8500	1364	6.1	1459	6.6	1540	7.0	1615	7.3	1689	7.6
9000	1427	6.4	1524	6.9	1602	7.2	1674	7.6	1745	7.9
9500	1491	6.7	1589	7.2	1665	7.5	1735	7.9	1802	8.2
10000	1553	7.0	1653	7.5	1729	7.8	1797	8.1	1862	8.4

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
6000	1539	6.9	1624	7.3	1703	7.7	1777	8.0	1847	8.4
6500	1578	7.1	1662	7.5	1741	7.9	1816	8.2	1887	8.6
7000	1619	7.3	1701	7.7	1779	8.1	1854	8.4	1924	8.7
7500	1663	7.5	1742	7.9	1818	8.2	1892	8.6	1962	8.9
8000	1711	7.7	1786	8.1	1859	8.4	1931	8.8	2000	9.1
8500	1761	8.0	1832	8.3	1903	8.6	1972	8.9	2039	9.3
9000	1813	8.2	1882	8.5	1949	8.8	2015	9.1	2081	9.5
9500	1868	8.5	1933	8.8	1998	9.1	2061	9.4	2124	9.6
10000	1925	8.7	1987	9.0	2049	9.3	2110	9.6	2170	9.9

High Static 1038-2200 rpm

APPENDIX C — FAN PERFORMANCE (cont)

50FCQM28 — 25 Ton Vertical Supply (rpm - bhp)

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
7500	1099	1.27	1174	1.55	1256	1.90	1343	2.32	1433	2.82
8125	1177	1.58	1246	1.87	1319	2.22	1397	2.64	1479	3.13
8750	1256	1.92	1319	2.23	1385	2.58	1456	3.00	1530	3.48
9375	1337	2.32	1394	2.63	1455	2.99	1519	3.40	1586	3.87
10000	1417	2.74	1471	3.06	1526	3.42	1585	3.83	1646	4.29
10625	1498	3.18	1548	3.51	1600	3.88	1654	4.28	1710	4.73
11250	1579	3.65	1626	3.98	1675	4.36	1725	4.76	1777	5.20
11875	1661	4.17	1705	4.51	1751	4.88	1798	5.29	1846	5.72
12500	1743	4.78	1785	5.14	1828	5.52	1872	5.93	1917	6.37

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
7500	1521	3.38	1604	3.96	1683	4.58	1757	5.21	1828	5.86
8125	1561	3.68	1642	4.28	1720	4.92	1794	5.58	1864	6.26
8750	1606	4.02	1683	4.63	1758	5.28	1830	5.95	1900	6.66
9375	1655	4.40	1727	5.00	1798	5.64	1869	6.33	1937	7.05
10000	1710	4.81	1776	5.39	1843	6.02	1910	6.70	1976	7.42
10625	1769	5.24	1829	5.79	1891	6.40	1954	7.06	2018	7.78
11250	1831	5.69	1887	6.23	1944	6.81	2003	7.45	2063	8.14
11875	1896	6.20	1948	6.72	2001	7.29	2056	7.90	2111	8.56
12500	1964	6.85	2012	7.36	2061	7.91	2112	8.51	2164	9.16

Std/Med Static 1099-2200 rpm, 6.0 Max bhp (3.0 Max bhp per fan motor)

High Static 1099-2200 rpm, 10.0 Max bhp (5.0 Max bhp per fan motor)

50FCQM28 — Standard/Medium Static — 25 Ton Vertical Supply (rpm - Vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
7500	1099	4.9	1174	5.3	1256	5.6	1343	6.0	1433	6.5
8125	1177	5.3	1246	5.6	1319	5.9	1397	6.3	1479	6.7
8750	1256	5.6	1319	5.9	1385	6.2	1456	6.6	1530	6.9
9375	1337	6.0	1394	6.3	1455	6.6	1519	6.9	1586	7.2
10000	1417	6.4	1471	6.6	1526	6.9	1585	7.2	1646	7.4
10625	1498	6.8	1548	7.0	1600	7.2	1654	7.5	1710	7.7
11250	1579	7.1	1626	7.4	1675	7.6	1725	7.8	1777	8.0
11875	1661	7.5	1705	7.7	1751	7.9	1798	8.1	1846	8.4
12500	1743	7.9	1785	8.1	1828	8.3	1872	8.5	1917	8.7

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
7500	1521	6.9	1604	7.2	1683	7.6	1757	8.0	1828	8.3
8125	1561	7.1	1642	7.4	1720	7.8	1794	8.1	1864	8.4
8750	1606	7.3	1683	7.6	1758	8.0	1830	8.3	—	—
9375	1655	7.5	1727	7.8	1798	8.1	1869	8.5	—	—
10000	1710	7.7	1776	8.0	1843	8.4	—	—	—	—
10625	1769	8.0	1829	8.3	1891	8.6	—	—	—	—
11250	1831	8.3	1887	8.6	—	—	—	—	—	—
11875	1896	8.6	—	—	—	—	—	—	—	—
12500	—	—	—	—	—	—	—	—	—	—

Std/Med Static 1099-2200 rpm

APPENDIX C — FAN PERFORMANCE (cont)

50FCQM28 — High Static — 25 Ton Vertical Supply (rpm - Vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
7500	1099	4.9	1174	5.3	1256	5.6	1343	6.0	1433	6.5
8125	1177	5.3	1246	5.6	1319	5.9	1397	6.3	1479	6.7
8750	1256	5.6	1319	5.9	1385	6.2	1456	6.6	1530	6.9
9375	1337	6.0	1394	6.3	1455	6.6	1519	6.9	1586	7.2
10000	1417	6.4	1471	6.6	1526	6.9	1585	7.2	1646	7.4
10625	1498	6.8	1548	7.0	1600	7.2	1654	7.5	1710	7.7
11250	1579	7.1	1626	7.4	1675	7.6	1725	7.8	1777	8.0
11875	1661	7.5	1705	7.7	1751	7.9	1798	8.1	1846	8.4
12500	1743	7.9	1785	8.1	1828	8.3	1872	8.5	1917	8.7

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
7500	1521	6.9	1604	7.2	1683	7.6	1757	8.0	1828	8.3
8125	1561	7.1	1642	7.4	1720	7.8	1794	8.1	1864	8.4
8750	1606	7.3	1683	7.6	1758	8.0	1830	8.3	1900	8.6
9375	1655	7.5	1727	7.8	1798	8.1	1869	8.5	1937	8.8
10000	1710	7.7	1776	8.0	1843	8.4	1910	8.7	1976	9.0
10625	1769	8.0	1829	8.3	1891	8.6	1954	8.9	2018	9.2
11250	1831	8.3	1887	8.6	1944	8.8	2003	9.1	2063	9.4
11875	1896	8.6	1948	8.8	2001	9.1	2056	9.3	2111	9.6
12500	1964	8.9	2012	9.1	2061	9.4	2112	9.6	2164	9.8

High Static 1099-2200 rpm

APPENDIX C — FAN PERFORMANCE (cont)

50FCQM17 — 15 Ton Horizontal Supply (rpm - bhp)

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	1055	0.71	1171	0.97	1279	1.26	1379	1.58	1472	1.92
4875	1122	0.85	1231	1.12	1334	1.43	1430	1.76	1520	2.11
5250	1190	1.01	1293	1.30	1390	1.61	1482	1.95	1569	2.32
5625	1259	1.19	1356	1.49	1448	1.81	1536	2.16	1621	2.54
6000	1329	1.39	1420	1.69	1508	2.03	1592	2.39	1674	2.78
6375	1399	1.60	1486	1.92	1570	2.26	1650	2.63	1728	3.02
6750	1470	1.83	1553	2.16	1632	2.51	1710	2.89	1785	3.28
7125	1541	2.08	1620	2.42	1696	2.77	1770	3.15	1842	3.56
7500	1612	2.34	1688	2.69	1761	3.06	1832	3.44	1902	3.85

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	1560	2.29	1642	2.67	1721	3.29	1796	3.74	1870	4.22
4875	1605	2.49	1685	2.88	1762	3.29	1835	3.99	1906	4.47
5250	1652	2.70	1730	3.10	1805	3.53	1877	4.27	1946	4.75
5625	1701	2.94	1777	3.35	1850	3.78	1920	4.57	1988	5.07
6000	1751	3.18	1826	3.60	1897	4.04	1966	4.90	2032	5.41
6375	1803	3.43	1876	3.86	1945	4.31	2013	5.26	2078	5.79
6750	1857	3.70	1927	4.13	1995	4.59	2061	5.65	2125	6.19
7125	1913	3.98	1981	4.42	2047	4.88	2111	6.07	2173	6.62
7500	1969	4.27	2035	4.72	2099	5.18	2162	6.52	—	—

High Static 1055-2200 rpm, 10.0 Max bhp (5.0 Max bhp per fan motor)

50FCQM17 — High Static — 15 Ton Horizontal Supply (rpm - Vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
4500	1055	4.7	1171	5.3	1279	5.7	1379	6.2	1472	6.6
4875	1122	5.0	1231	5.5	1334	6.0	1430	6.4	1520	6.9
5250	1190	5.3	1293	5.8	1390	6.3	1482	6.7	1569	7.1
5625	1259	5.7	1356	6.1	1448	6.5	1536	6.9	1621	7.3
6000	1329	6.0	1420	6.4	1508	6.8	1592	7.2	1674	7.6
6375	1399	6.3	1486	6.7	1570	7.1	1650	7.5	1728	7.8
6750	1470	6.6	1553	7.0	1632	7.4	1710	7.7	1785	8.1
7125	1541	7.0	1620	7.3	1696	7.7	1770	8.0	1842	8.3
7500	1612	7.3	1688	7.6	1761	8.0	1832	8.3	1902	8.6

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
4500	1560	7.0	1642	7.4	1721	7.8	1796	8.1	1870	8.5
4875	1605	7.3	1685	7.6	1762	8.0	1835	8.3	1906	8.6
5250	1652	7.5	1730	7.8	1805	8.2	1877	8.5	1946	8.8
5625	1701	7.7	1777	8.0	1850	8.4	1920	8.7	1988	9.0
6000	1751	7.9	1826	8.3	1897	8.6	1966	8.9	2032	9.2
6375	1803	8.2	1876	8.5	1945	8.8	2013	9.1	2078	9.4
6750	1857	8.4	1927	8.7	1995	9.1	2061	9.4	2125	9.7
7125	1913	8.7	1981	9.0	2047	9.3	2111	9.6	2173	9.9
7500	1969	8.9	2035	9.2	2099	9.5	2162	9.8	—	—

High Static 1055-2200 rpm

APPENDIX C — FAN PERFORMANCE (cont)

50FCQM24 — 20 Ton Horizontal Supply (rpm - bhp)

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	1267	1.20	1361	1.49	1451	1.81	1538	2.15	1621	2.52
6500	1356	1.45	1443	1.75	1527	2.07	1609	2.43	1688	2.80
7000	1446	1.73	1527	2.04	1606	2.37	1683	2.73	1758	3.11
7500	1537	2.03	1612	2.35	1687	2.69	1760	3.05	1831	3.44
8000	1628	2.36	1699	2.68	1769	3.03	1838	3.40	1906	3.79
8500	1719	2.71	1786	3.04	1853	3.40	1918	3.77	1983	4.16
9000	1811	3.09	1875	3.43	1938	3.79	2000	4.17	2061	4.56
9500	1904	3.50	1964	3.85	2024	4.21	2083	4.59	2142	4.99
10000	1997	3.94	2054	4.29	2111	4.66	2167	5.04	—	—

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	1700	2.90	1777	3.32	1850	3.74	1921	4.19	1989	4.65
6500	1764	3.20	1838	3.62	1909	4.05	1977	4.50	2043	4.97
7000	1831	3.51	1901	3.93	1970	4.37	2036	4.83	2100	5.30
7500	1900	3.84	1968	4.27	2033	4.71	2098	5.17	2160	5.64
8000	1972	4.20	2037	4.63	2100	5.07	2162	5.53	—	—
8500	2046	4.57	2108	5.00	2169	5.45	—	—	—	—
9000	2122	4.97	2181	5.40	—	—	—	—	—	—
9500	2199	5.40	—	—	—	—	—	—	—	—
10000	—	—	—	—	—	—	—	—	—	—

High Static 1267-2000 rpm, 10.0 Max bhp (5.0 Max bhp per fan motor)

50FCQM24 — High Static — 20 Ton Horizontal Supply (rpm - Vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
6000	1267	5.7	1361	6.1	1451	6.5	1538	6.9	1621	7.3
6500	1356	6.1	1443	6.5	1527	6.9	1609	7.3	1688	7.6
7000	1446	6.5	1527	6.9	1606	7.3	1683	7.6	1758	8.0
7500	1537	6.9	1612	7.3	1687	7.6	1760	8.0	1831	8.3
8000	1628	7.4	1699	7.7	1769	8.0	1838	8.3	1906	8.6
8500	1719	7.8	1786	8.1	1853	8.4	1918	8.7	1983	9.0
9000	1811	8.2	1875	8.5	1938	8.8	2000	9.1	2061	9.4
9500	1904	8.6	1964	8.9	2024	9.2	2083	9.5	2142	9.7
10000	1997	9.1	2054	9.3	2111	9.6	2167	9.8	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
6000	1700	7.7	1777	8.0	1850	8.4	1921	8.7	1989	9.0
6500	1764	8.0	1838	8.3	1909	8.7	1977	9.0	2043	9.3
7000	1831	8.3	1901	8.6	1970	8.9	2036	9.2	2100	9.5
7500	1900	8.6	1968	8.9	2033	9.2	2098	9.5	2160	9.8
8000	1972	8.9	2037	9.2	2100	9.5	2162	9.8	—	—
8500	2046	9.3	2108	9.6	2169	9.9	—	—	—	—
9000	2122	9.6	2181	9.9	—	—	—	—	—	—
9500	2199	10.0	—	—	—	—	—	—	—	—
10000	—	—	—	—	—	—	—	—	—	—

High Static 1267-2000 rpm

APPENDIX C — FAN PERFORMANCE (cont)

50FCQM28 — 25 Ton Horizontal Supply (rpm - bhp)

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
7500	1406	2.11	1483	2.47	1559	2.87	1636	3.32	1711	3.80
8125	1509	2.60	1580	2.98	1651	3.40	1722	3.86	1792	4.35
8750	1614	3.16	1679	3.56	1744	3.98	1810	4.45	1876	4.96
9375	1719	3.78	1779	4.19	1840	4.63	1902	5.11	1963	5.62
10000	1824	4.44	1880	4.87	1938	5.33	1995	5.81	2053	6.34
10625	1930	5.16	1983	5.60	2036	6.06	2091	6.56	2145	7.09
11250	2036	5.91	2086	6.35	2137	6.83	2187	7.32	—	—
11875	2143	6.67	2190	7.12	—	—	—	—	—	—
12500	—	—	—	—	—	—	—	—	—	—

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
7500	1783	4.30	1853	4.82	1921	5.37	1986	5.94	2048	6.51
8125	1861	4.87	1928	5.42	1993	5.98	2055	6.56	2116	7.16
8750	1941	5.49	2005	6.05	2067	6.63	2128	7.24	2187	7.86
9375	2024	6.16	2085	6.74	2144	7.33	—	—	—	—
10000	2111	6.89	2168	7.46	—	—	—	—	—	—
10625	2199	7.63	—	—	—	—	—	—	—	—
11250	—	—	—	—	—	—	—	—	—	—
11875	—	—	—	—	—	—	—	—	—	—
12500	—	—	—	—	—	—	—	—	—	—

High Static 1406-2200 rpm, 10.0 Max bhp (5.0 Max bhp per fan motor)

50FCQM28 — High Static — 25 Ton Horizontal Supply (rpm - Vdc)

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	0.2		0.4		0.6		0.8		1.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
7500	1406	6.3	1483	6.7	1559	7.0	1636	7.4	1711	7.7
8125	1509	6.8	1580	7.1	1651	7.5	1722	7.8	1792	8.1
8750	1614	7.3	1679	7.6	1744	7.9	1810	8.2	1876	8.5
9375	1719	7.8	1779	8.1	1840	8.3	1902	8.6	1963	8.9
10000	1824	8.3	1880	8.5	1938	8.8	1995	9.1	2053	9.3
10625	1930	8.8	1983	9.0	2036	9.2	2091	9.5	2145	9.7
11250	2036	9.2	2086	9.5	2137	9.7	2187	9.9	—	—
11875	2143	9.7	2190	10.0	—	—	—	—	—	—
12500	—	—	—	—	—	—	—	—	—	—

CFM	AVAILABLE EXTERNAL STATIC PRESSURE (in. wg)									
	1.2		1.4		1.6		1.8		2.0	
	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc	rpm	Vdc
7500	1783	8.1	1853	8.4	1921	8.7	1986	9.0	2048	9.3
8125	1861	8.4	1928	8.7	1993	9.0	2055	9.3	2116	9.6
8750	1941	8.8	2005	9.1	2067	9.4	2128	9.7	2187	9.9
9375	2024	9.2	2085	9.5	2144	9.7	—	—	—	—
10000	2111	9.6	2168	9.9	—	—	—	—	—	—
10625	2199	10.0	—	—	—	—	—	—	—	—
11250	—	—	—	—	—	—	—	—	—	—
11875	—	—	—	—	—	—	—	—	—	—
12500	—	—	—	—	—	—	—	—	—	—

High Static 1406-2200 rpm

APPENDIX D — WIRING DIAGRAMS

50FCQ*17-28 — Standard SCCR Wiring Diagrams

UNIT SIZE	VOLTAGE	CONTROL	PAGE	POWER	PAGE
50FCQ*17 with Electro-Mechanical Controller – W7220	208/230-3-60	50HE004159	98	50HE006215	110
	460-3-60	50HE004158	99	50HE006216	111
	575-3-60			50HE006217	112
50FCQ*24-28 with Electro-Mechanical Controller – W7220	208/230-3-60	50HE004159	98	50HE003738	113
	460-3-60	50HE004158	99	50HE003758	114
	575-3-60			50HE003759	115
50FCQ*17 with POL224 Controller	208/230-3-60	50HE006337	100	50HE006215	110
	460-3-60	50HE006336	101	50HE006216	111
	575-3-60			50HE006217	112
50FCQ*24-28 with POL224 Controller	208/230-3-60	50HE006337	100	50HE003738	113
	460-3-60	50HE006336	101	50HE003758	114
	575-3-60			50HE003759	115
50FCQ*17 with SystemVu Controller	208/230-3-60	50HE004168	102	50HE006218	116
	460-3-60	50HE004167	103	50HE006219	117
	575-3-60			50HE006220	118
50FCQ*24-28 with SystemVu Controller	208/230-3-60	50HE004168	102	50HE004090	119
	460-3-60	50HE004167	103	50HE004096	120
	575-3-60			50HE004097	121

50FCQ*17-28 — High SCCR Wiring Diagrams

UNIT SIZE	VOLTAGE	CONTROL	PAGE	POWER	PAGE
50FCQ*17 with Electro-Mechanical Controller – W7220	208/230-3-60	50HE006399	104	50HE006403	122
	460-3-60	50HE006400	105	50HE006404	123
50FCQ*24-28 with Electro-Mechanical Controller – W7220	208/230-3-60	50HE006399	104	50HE006159	124
	460-3-60	50HE006400	105	50HE006163	125
50FCQ*17 with POL224 Controller	208/230-3-60	50HE006523	106	50HE006403	122
	460-3-60	50HE006524	107	50HE006404	123
50FCQ*24-28 with POL224 Controller	208/230-3-60	50HE006523	106	50HE006159	124
	460-3-60	50HE006524	107	50HE006163	125
50FCQ*17 with SystemVu Controller	208/230-3-60	50HE006401	108	50HE006405	126
	460-3-60	50HE006402	109	50HE006406	127
50FCQ*24-28 with SystemVu Controller	208/230-3-60	50HE006401	108	50HE00616	128
	460-3-60	50HE006402	109	50HE006172	129

APPENDIX D – WIRING DIAGRAMS (cont)

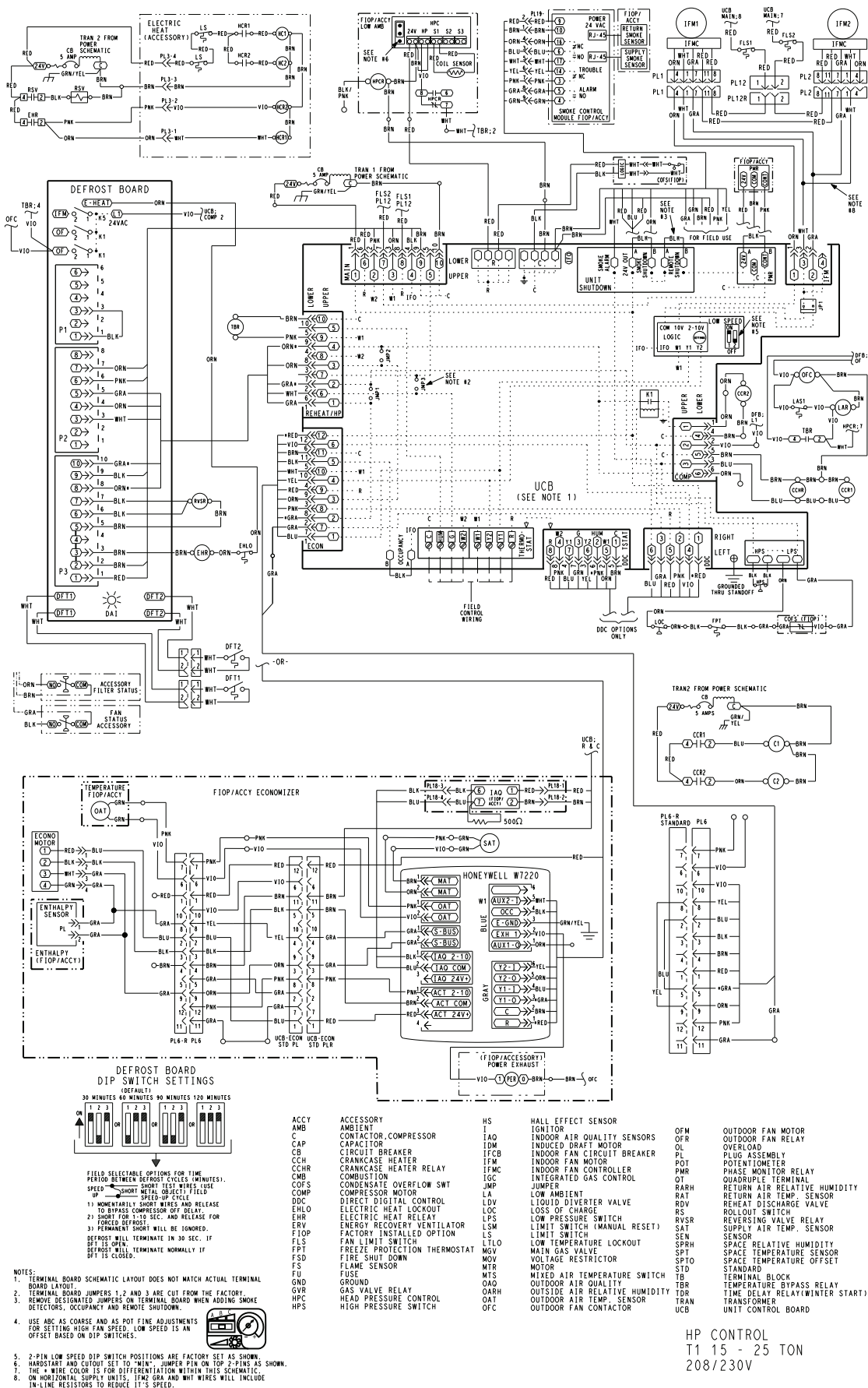


Fig. B – Typical 50FCQ*17-28 Control Wiring Diagram – Electro-Mechanical – W7220 (208/230-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

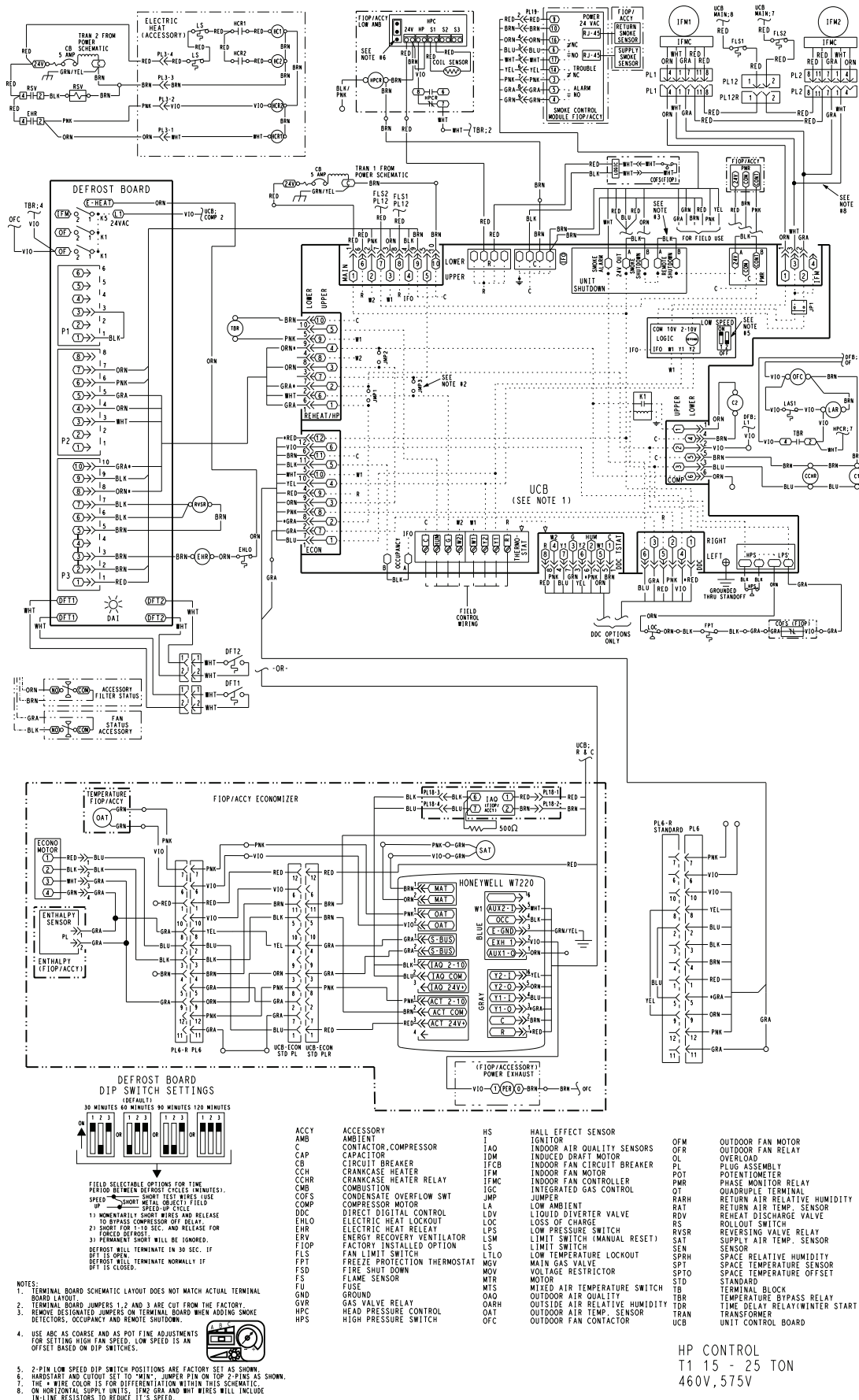
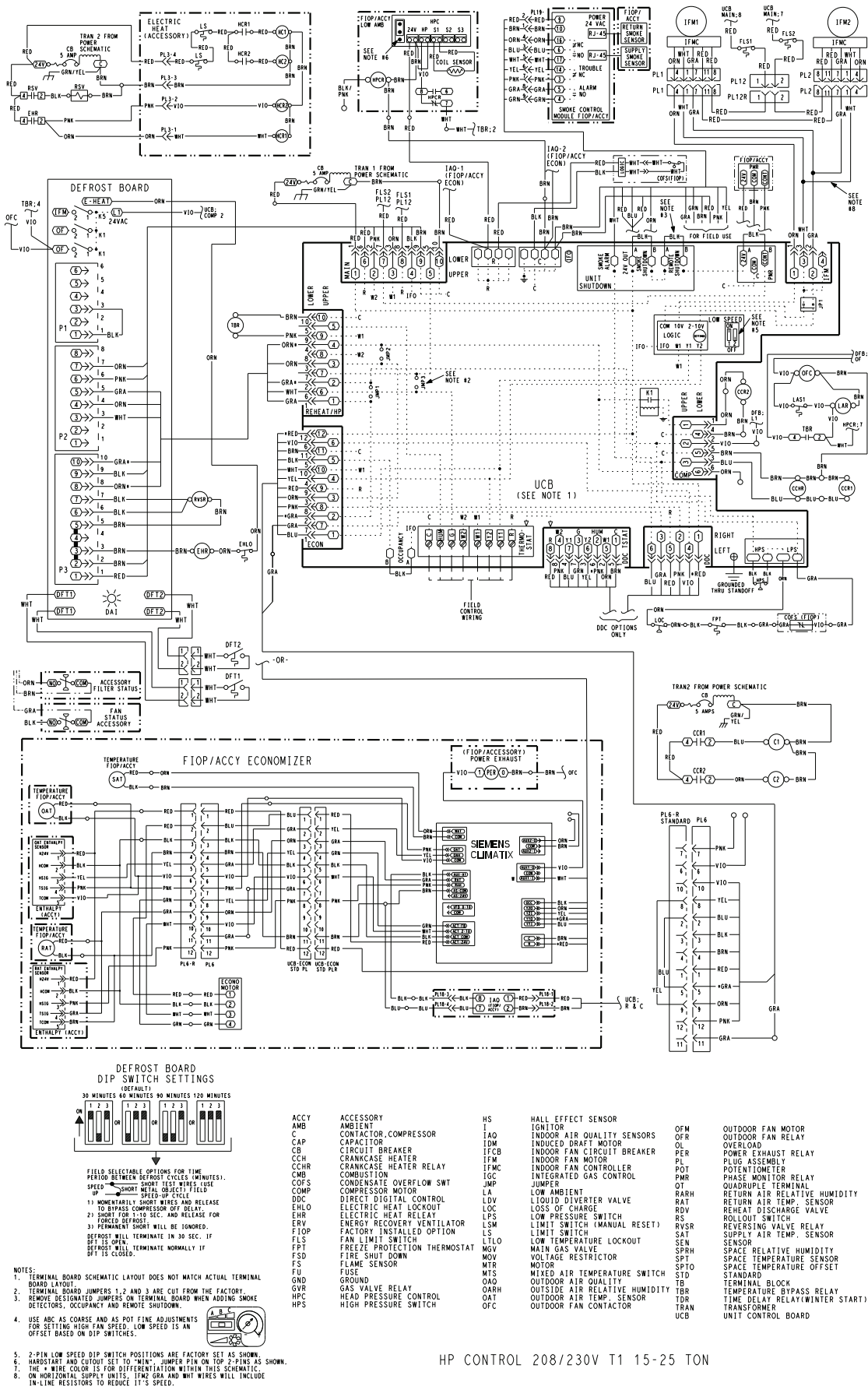


Fig. C — Typical 50FCQ*17-28 Control Wiring Diagram — Electro-Mechanical — W7220 (460, 575-3-60)

APPENDIX D – WIRING DIAGRAMS (cont)

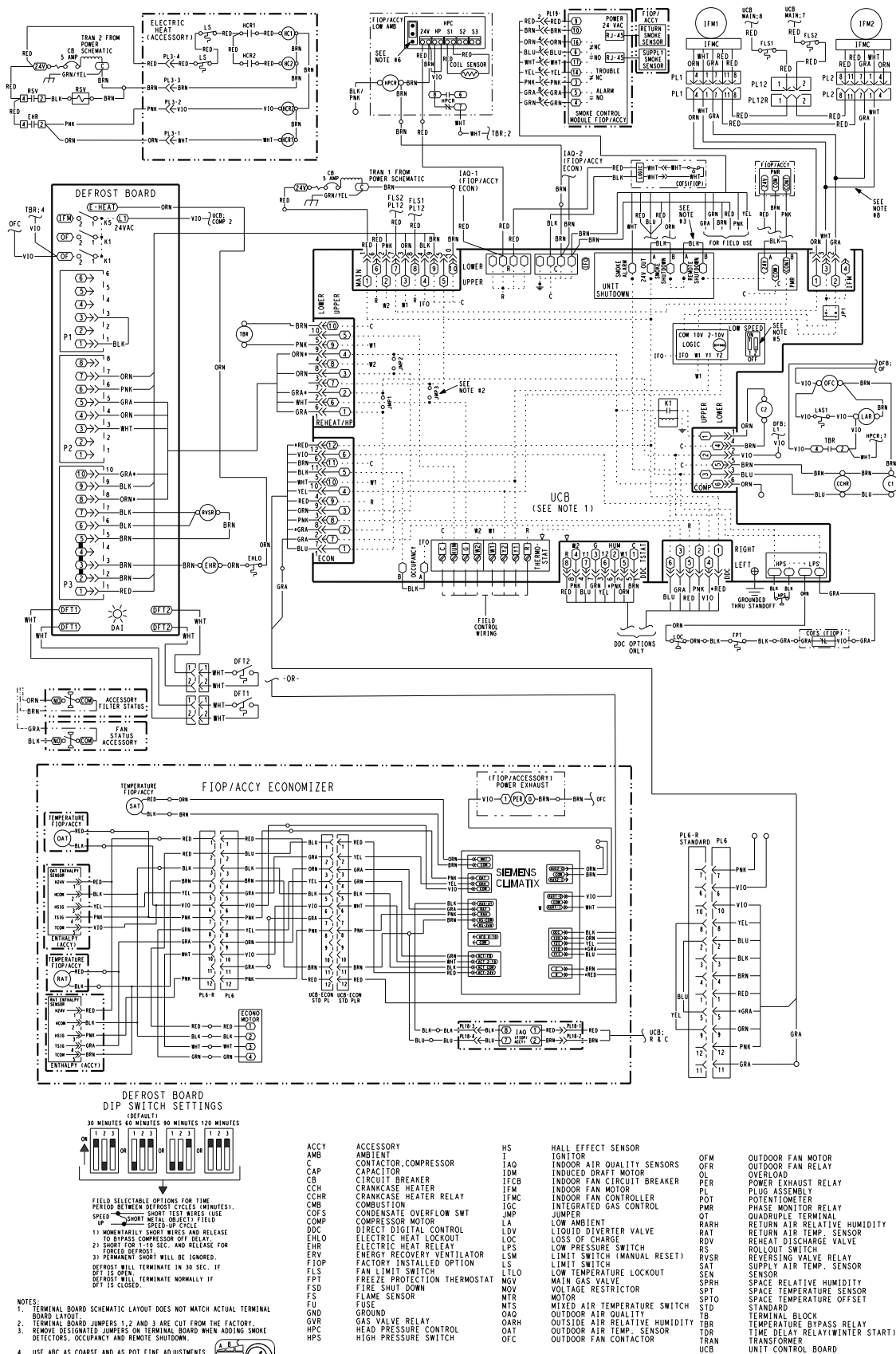


HP CONTROL 208/230V T1 15-25 TON

50HE006337 A

Fig. D – Typical 50FCQ*17-28 Control Wiring Diagram with POL224 (208/230-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)



HP CONTROL 460V , 575V T1 15-25 TON

50HE006336	A
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Fig. E — Typical 50FCQ*17-28 Control Wiring Diagram with POL224 (460, 575-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

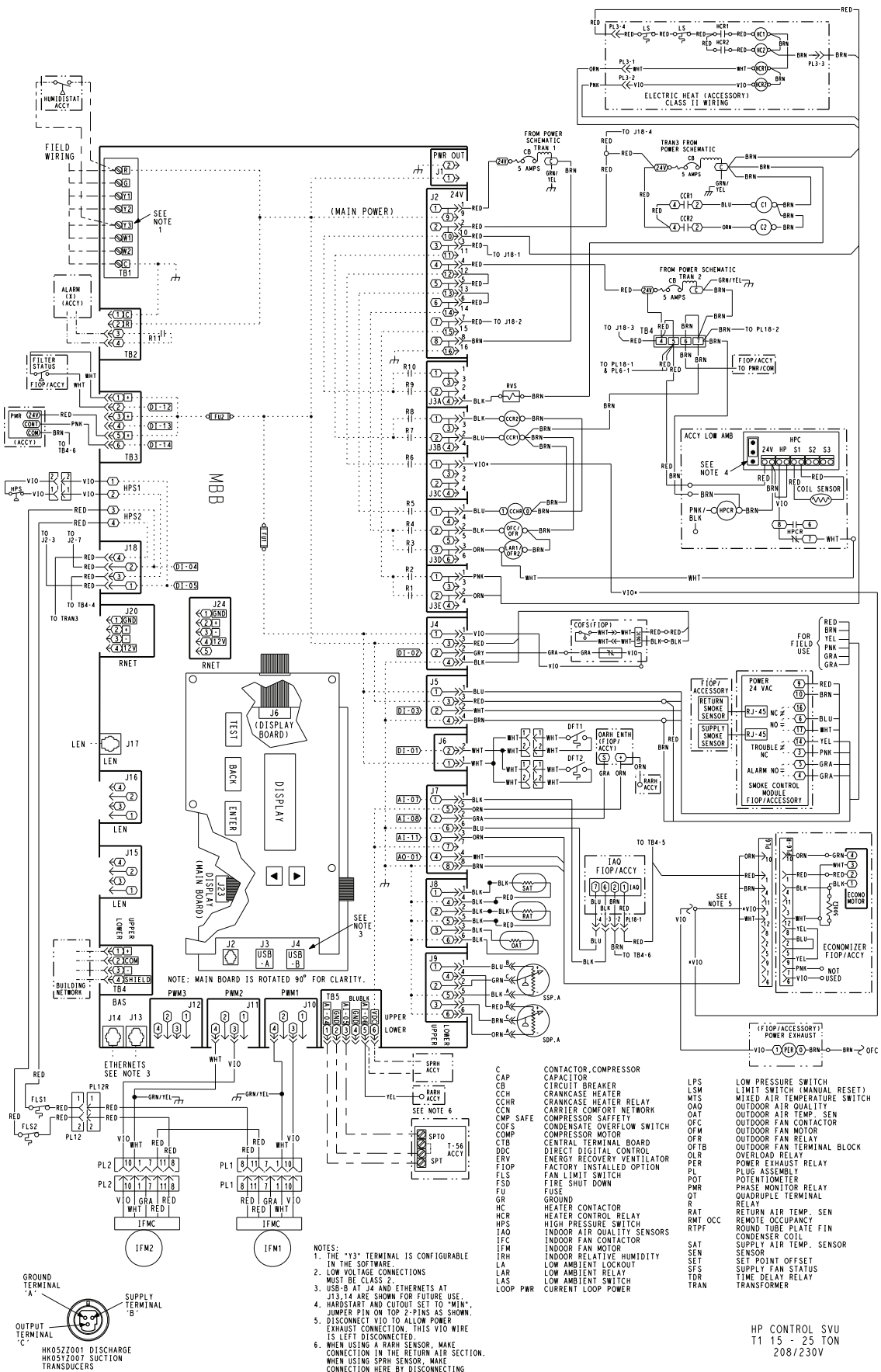


Fig. F — Typical 50FCQ*17-28 Control Wiring Diagram with SystemVu (208/230-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

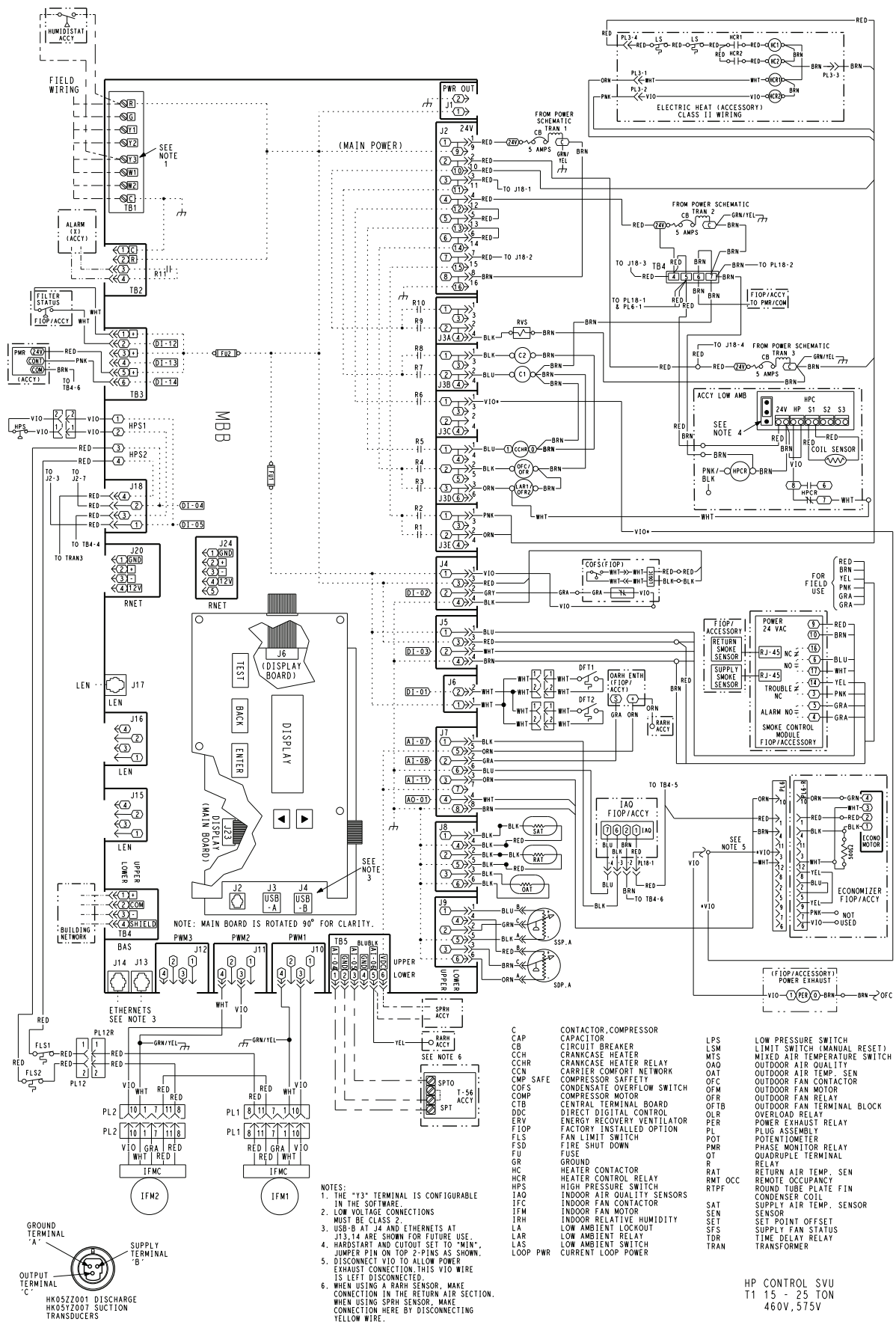


Fig. G — Typical 50FCQ*17-28 Control Wiring Diagram with SystemVu (460, 575-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

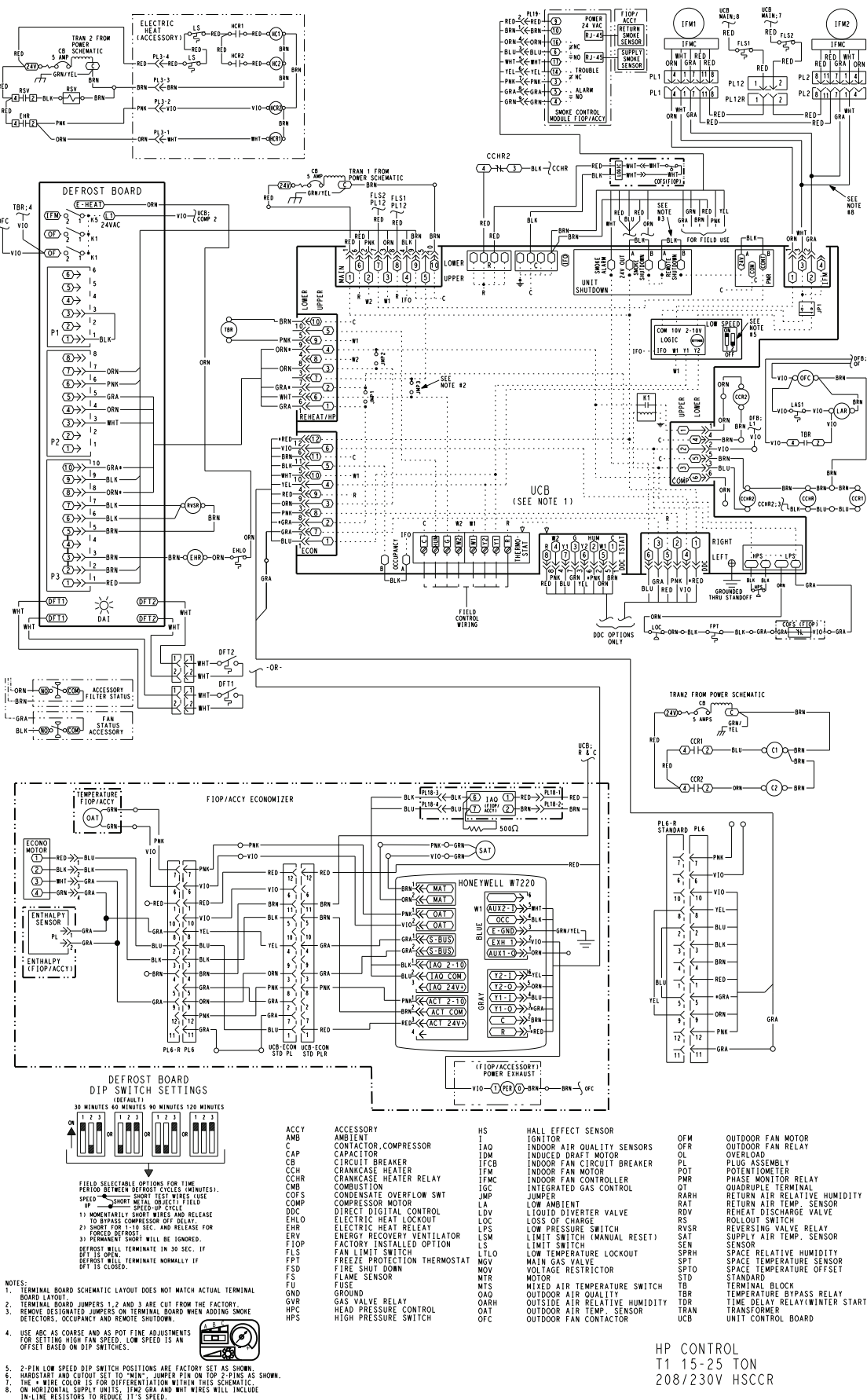


Fig. H — Typical 50FCQ*17-28 Control Wiring Diagram (208/230-3-60) — High SCCR

APPENDIX D — WIRING DIAGRAMS (cont)

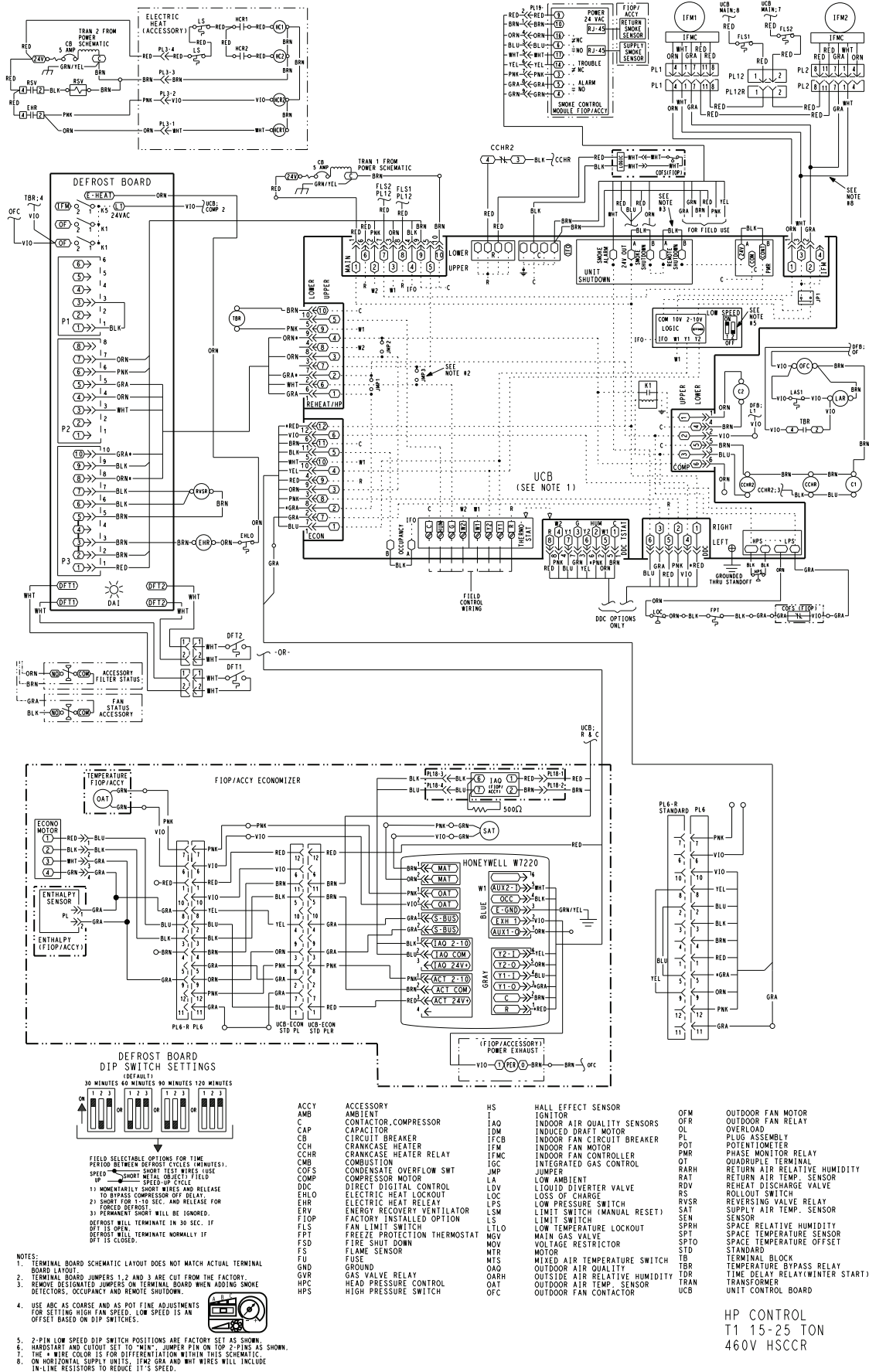
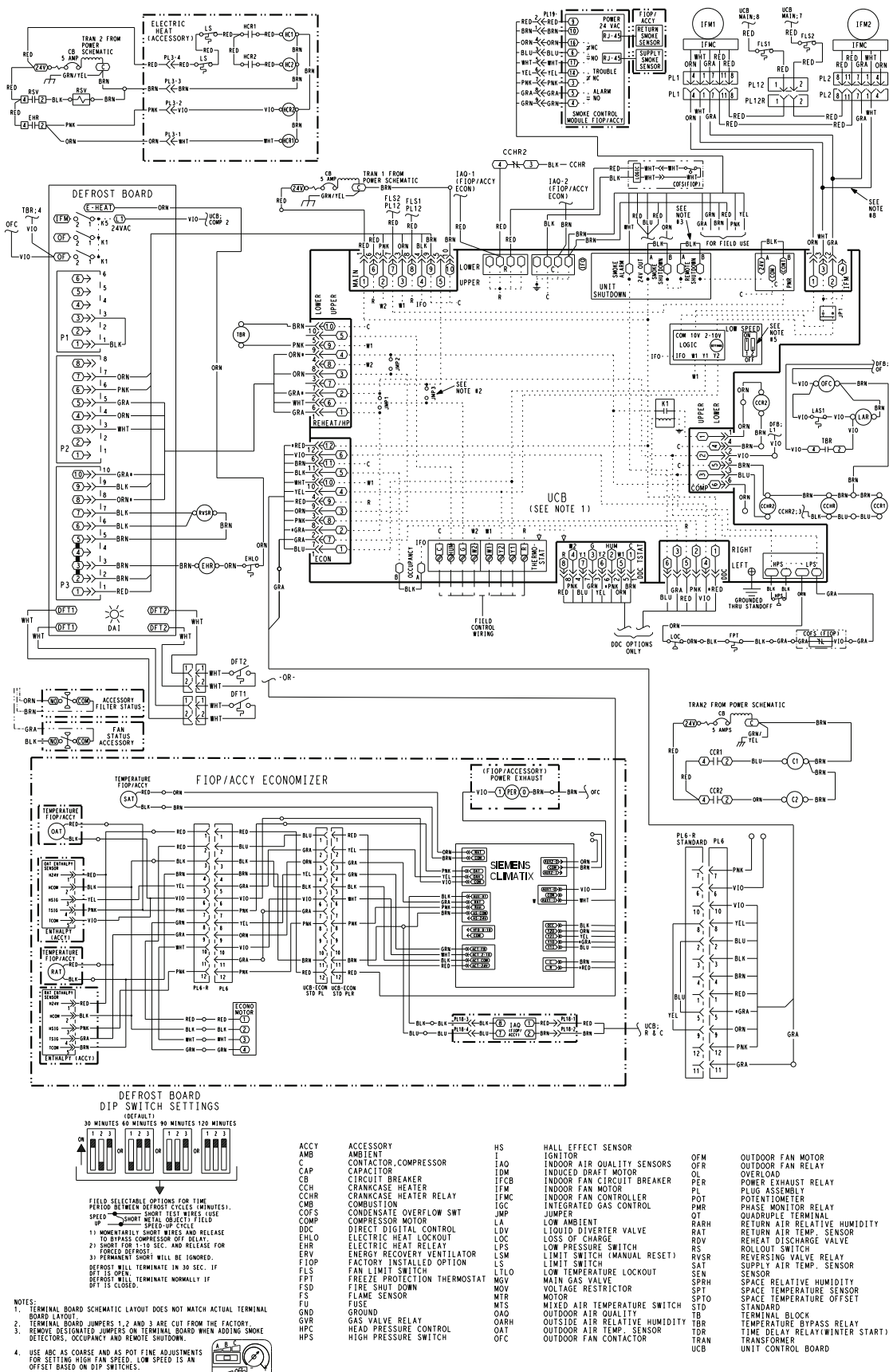


Fig. I — Typical 50FCQ*17-28 Control Wiring Diagram (460-3-60) — High SCCR

APPENDIX D – WIRING DIAGRAMS (cont)

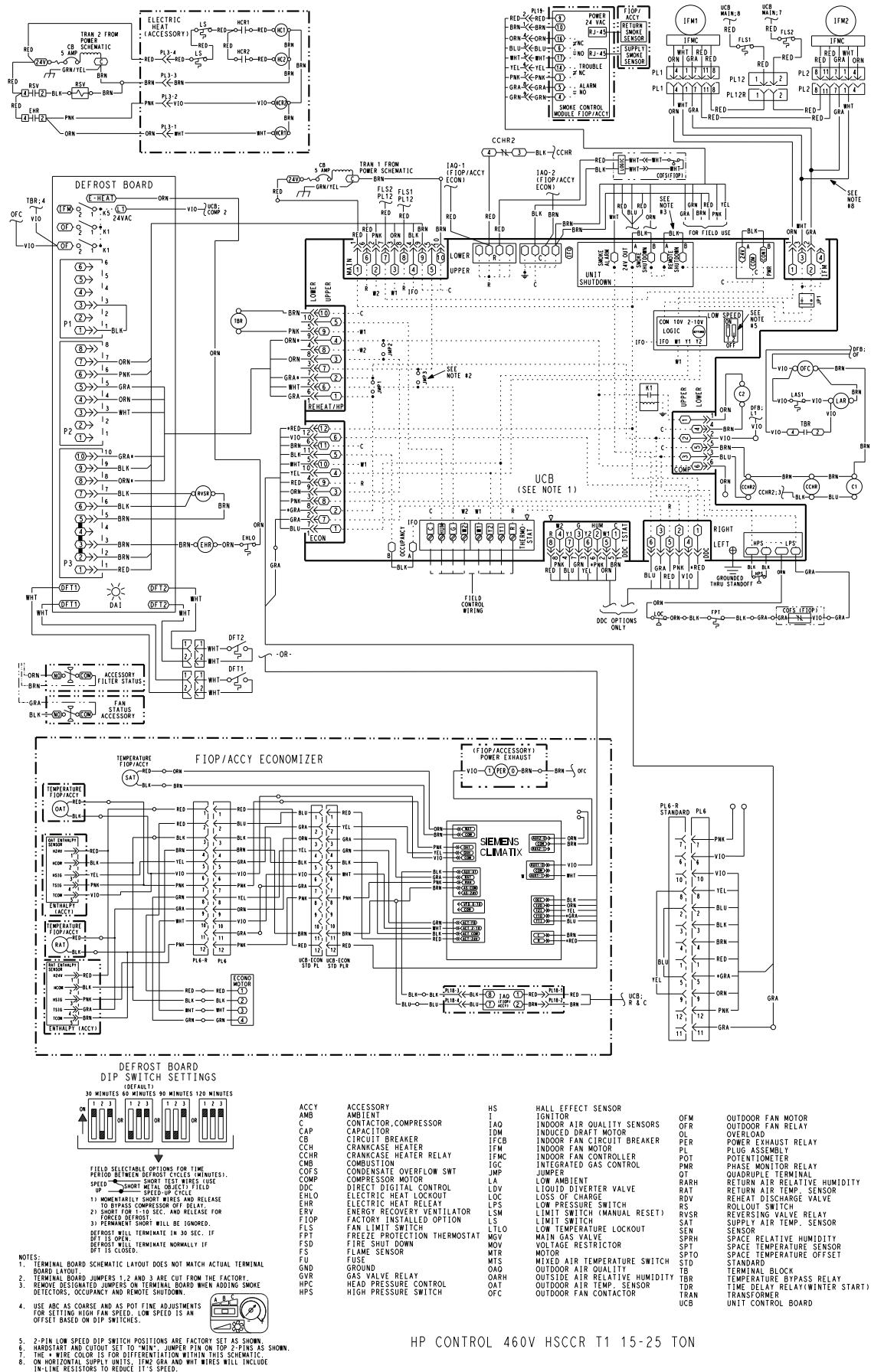


HP CONTROL 208/230V HSCCR T1 15-25 TON

50HE006523 A

Fig. J – Typical 50FCQ*17-28 Control Wiring Diagram with POL224 (208/230-3-60) – High SCCR

APPENDIX D — WIRING DIAGRAMS (cont)



HP CONTROL 460V HSCCR T1 15-25 TON

50HE006524 A

Fig. K — Typical 50FCQ*17-28 Control Wiring Diagram with POL224 (460-3-60) — High SCCR

APPENDIX D — WIRING DIAGRAMS (cont)

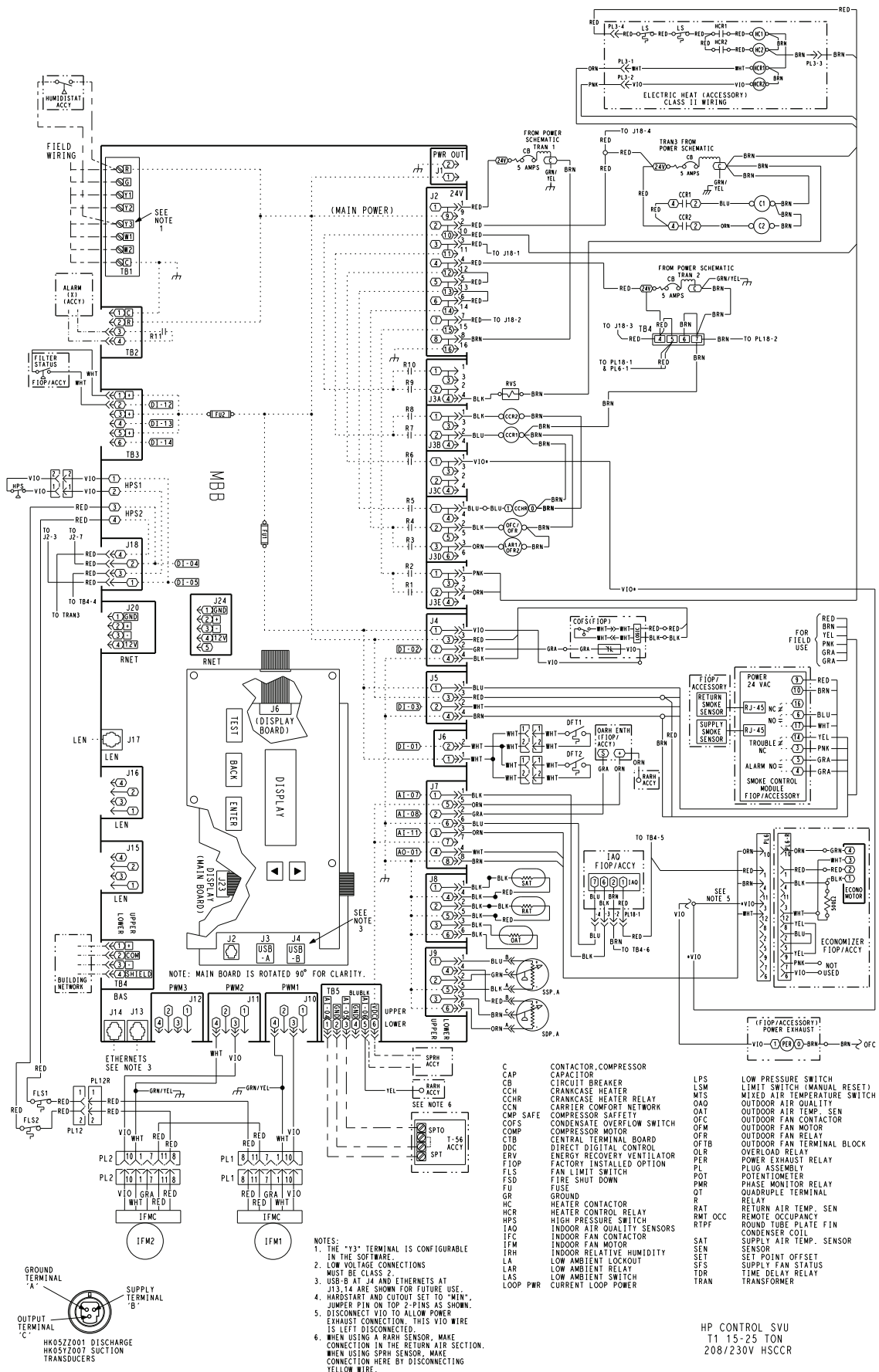


Fig. L — Typical 50FCQ*17-28 Control Wiring Diagram with SystemVu (208/230V-60) — High SCCR

APPENDIX D — WIRING DIAGRAMS (cont)

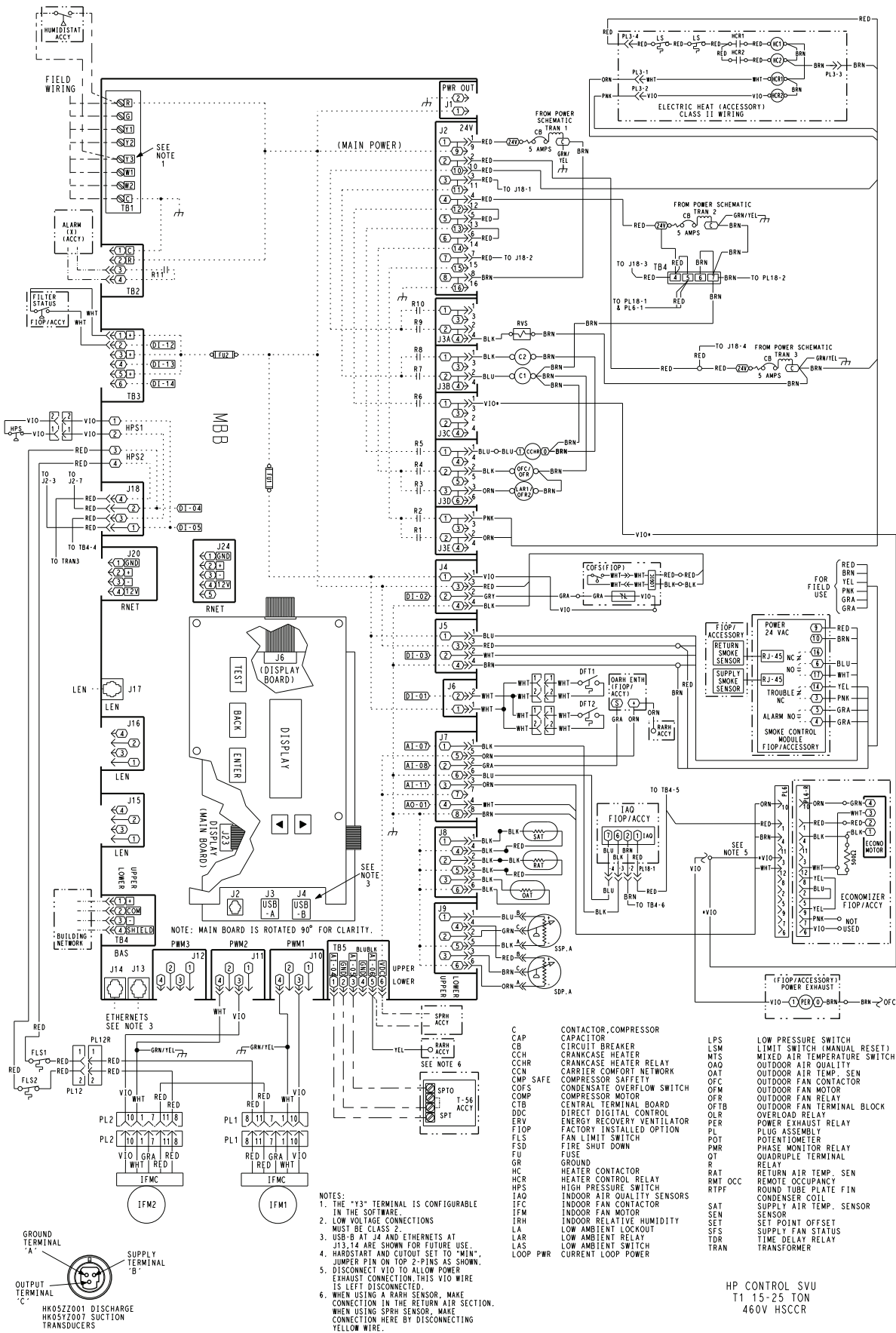


Fig. M — Typical 50FCQ*17-28 Control Wiring Diagram with SystemVu (460-3-60) — High SCCR

APPENDIX D – WIRING DIAGRAMS (cont)

HP POWER T1 15 TON
208/230V

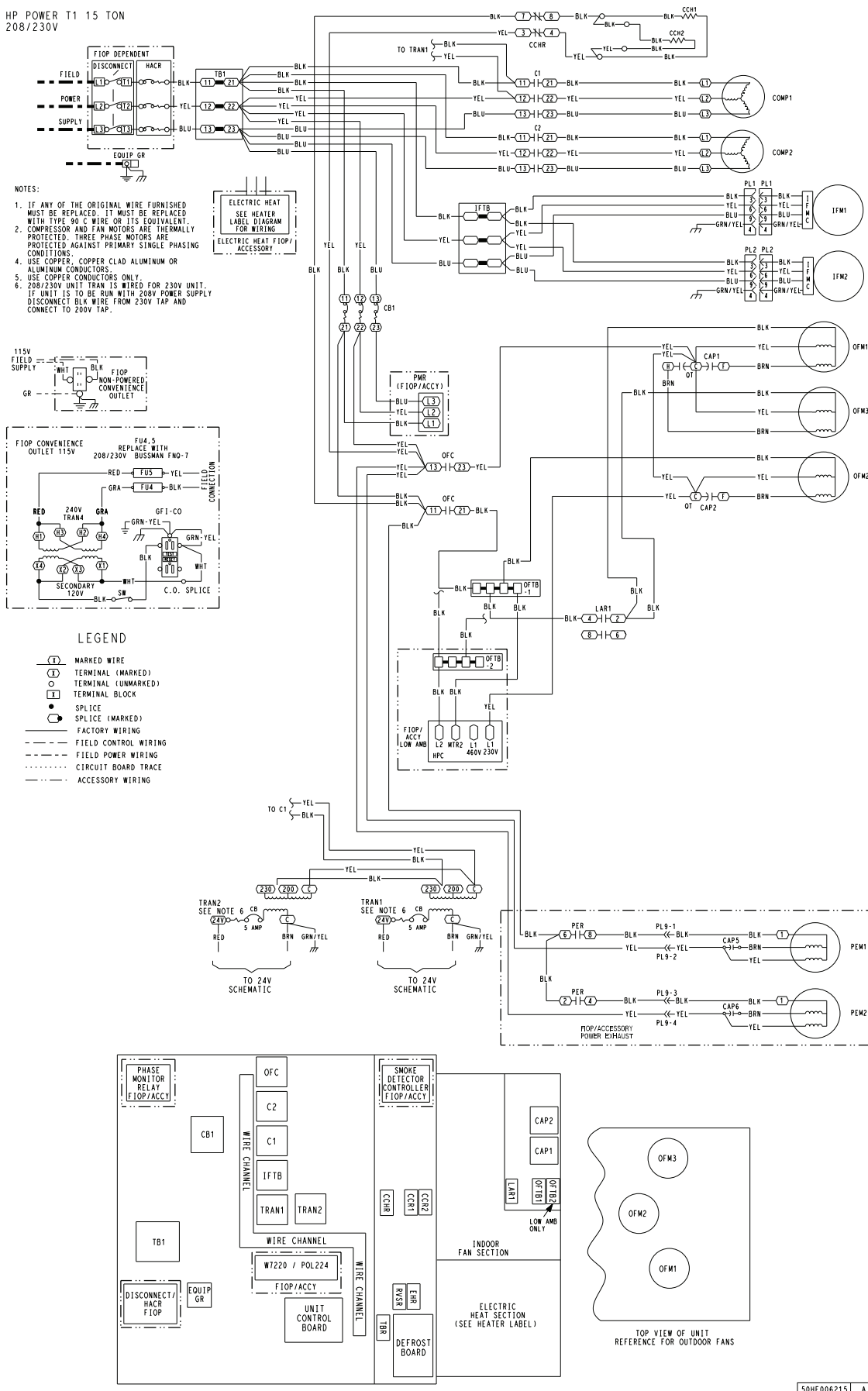


Fig. N — Typical 50FCQ*17 Power Wiring Diagram — Electro-Mechanical and POL224 (208/230-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

HP POWER T1 15 TON
460V

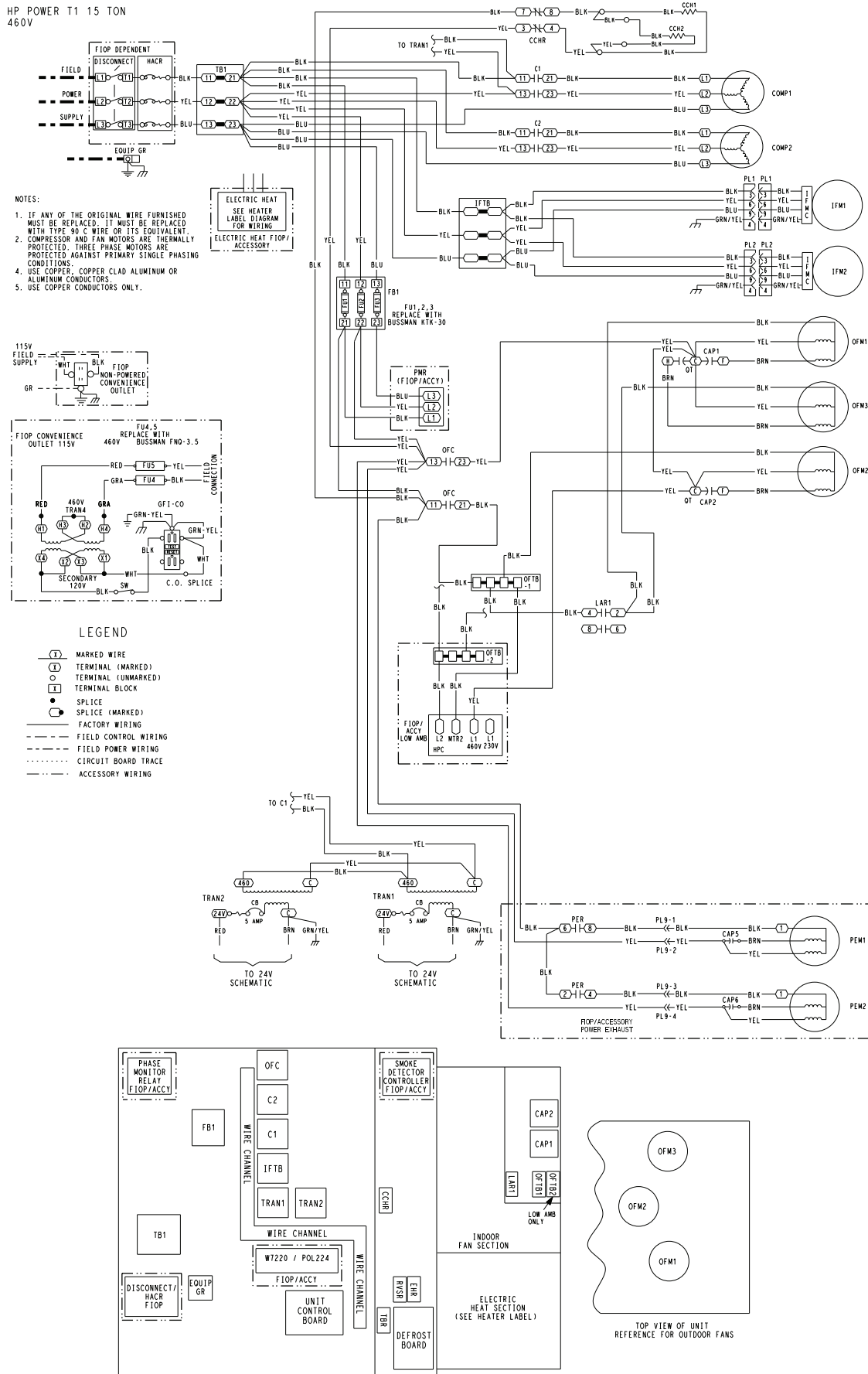


Fig. O — Typical 50FCQ*17 Power Wiring Diagram — Electro-Mechanical and POL224 (460-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

HP POWER T1 15 TON
575V

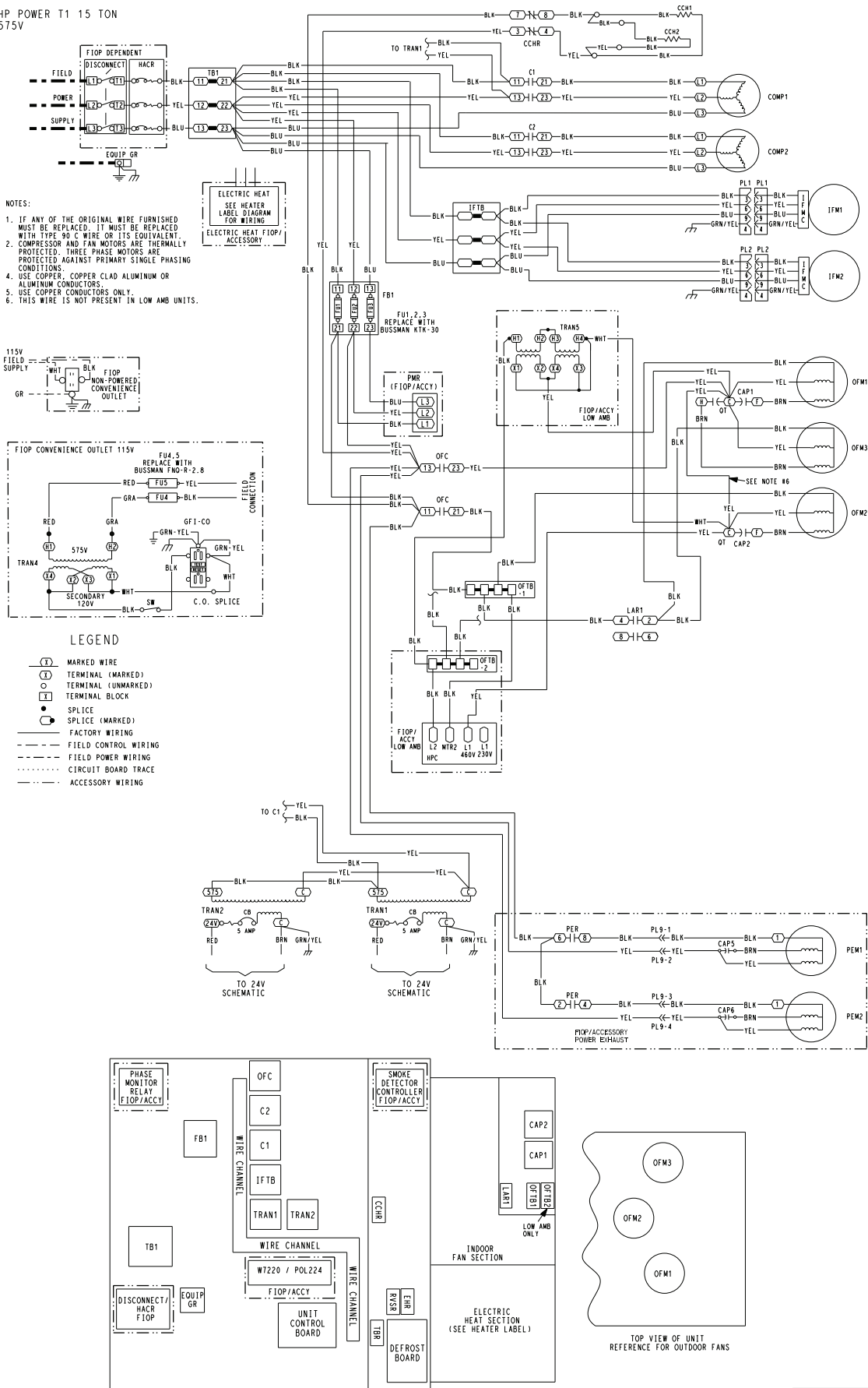


Fig. P — Typical 50FCQ*17 Power Wiring Diagram — Electro-Mechanical and POL224 (575-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

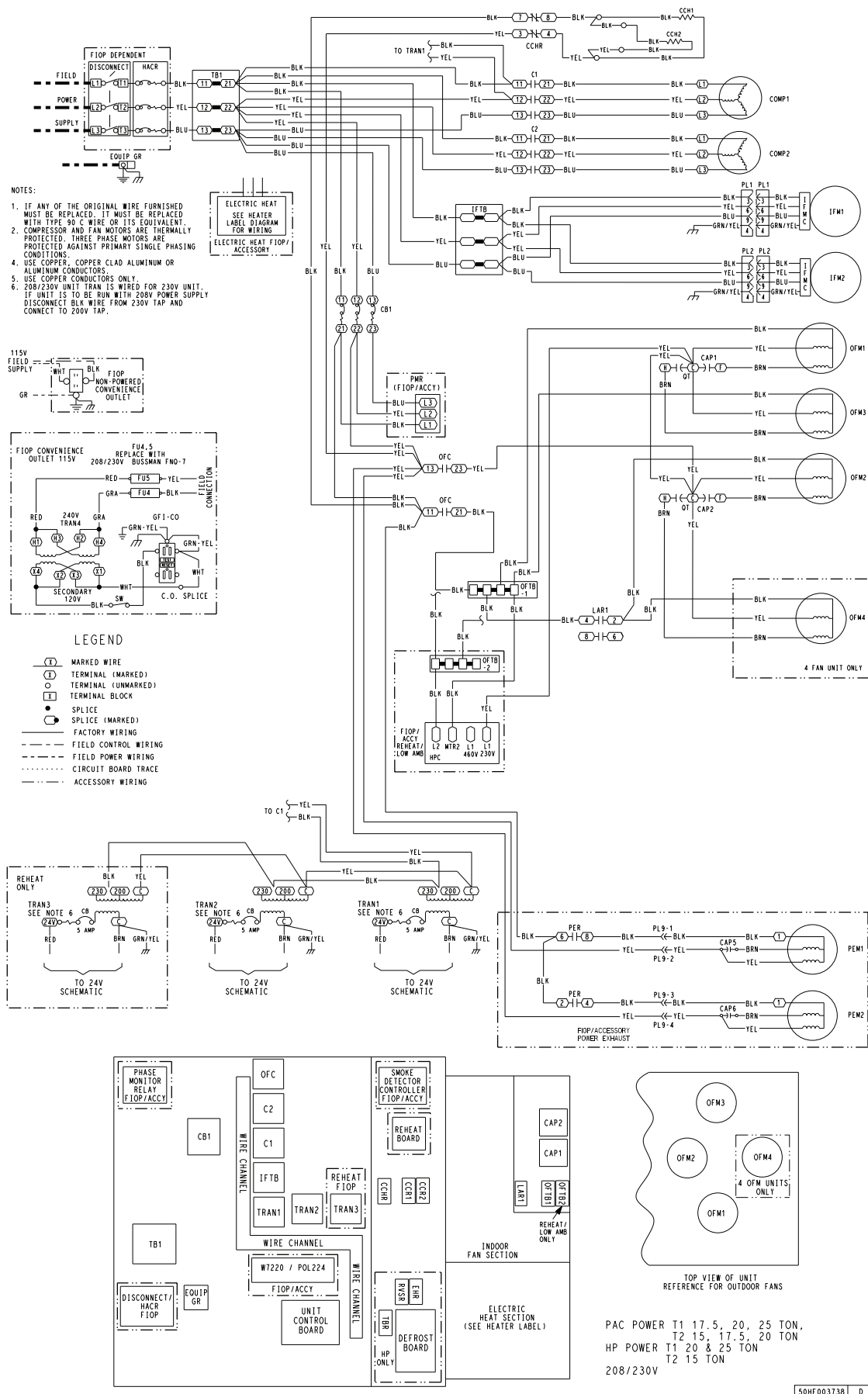


Fig. Q — Typical 50FCQ*24-28 Power Wiring Diagram — Electro-Mechanical and POL224 (208/230-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

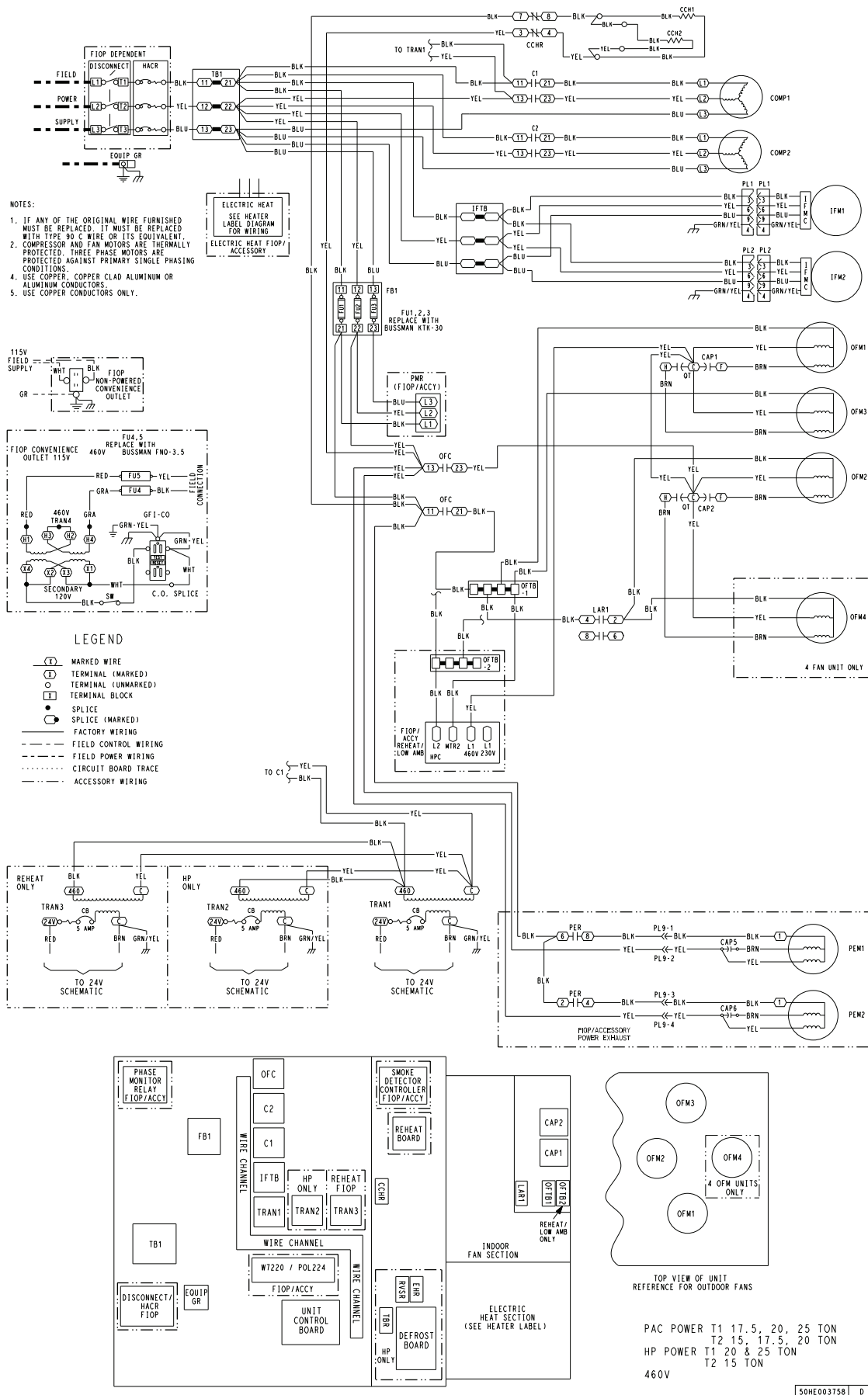


Fig. R — Typical 50FCQ*24-28 Power Wiring Diagram — Electro-Mechanical and POL224 (460-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

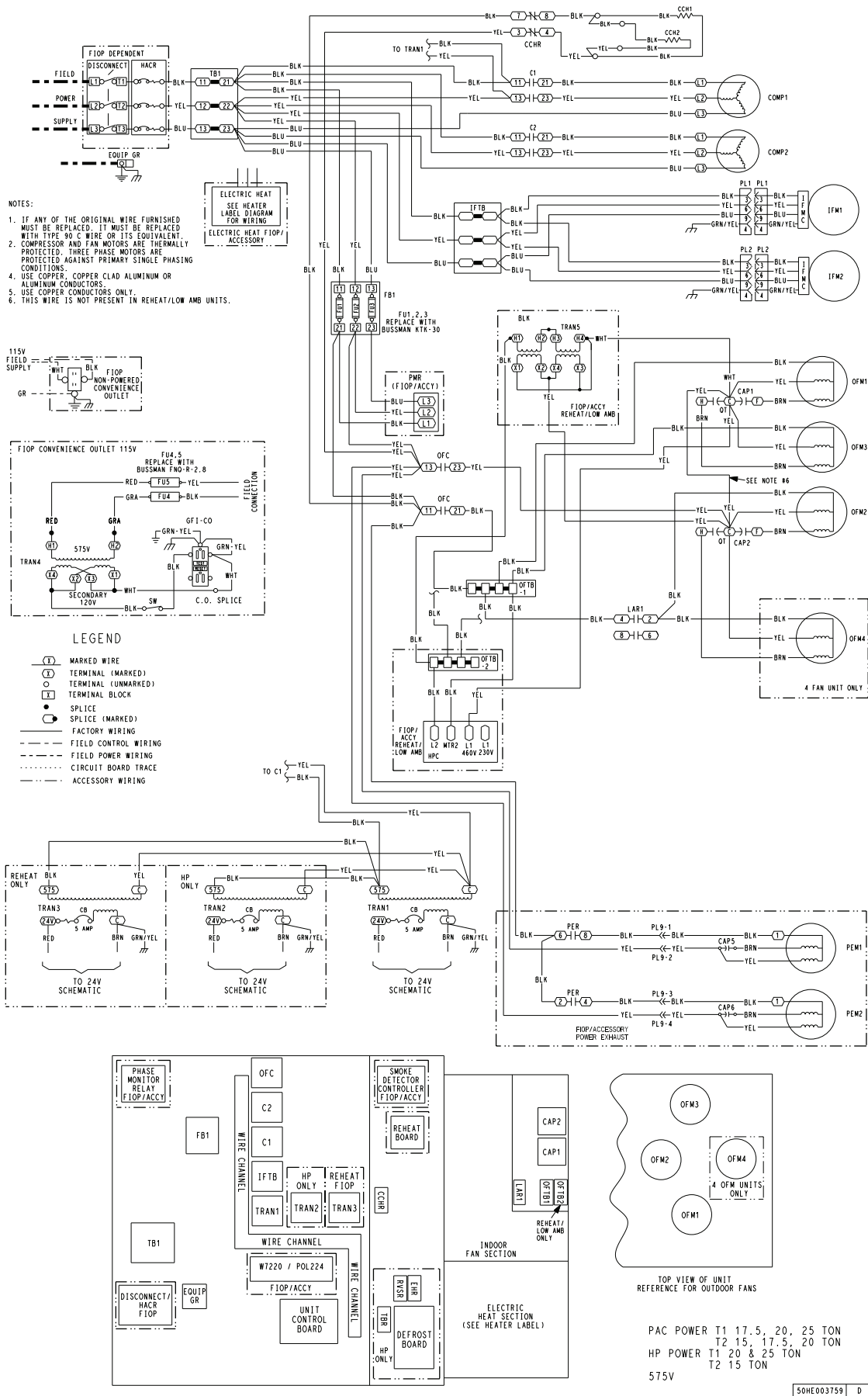


Fig. S — Typical 50FCQ*24-28 Power Wiring Diagram — Electro-Mechanical and POL224 (575-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

HP POWER T1 15 TON
208/230V SVU

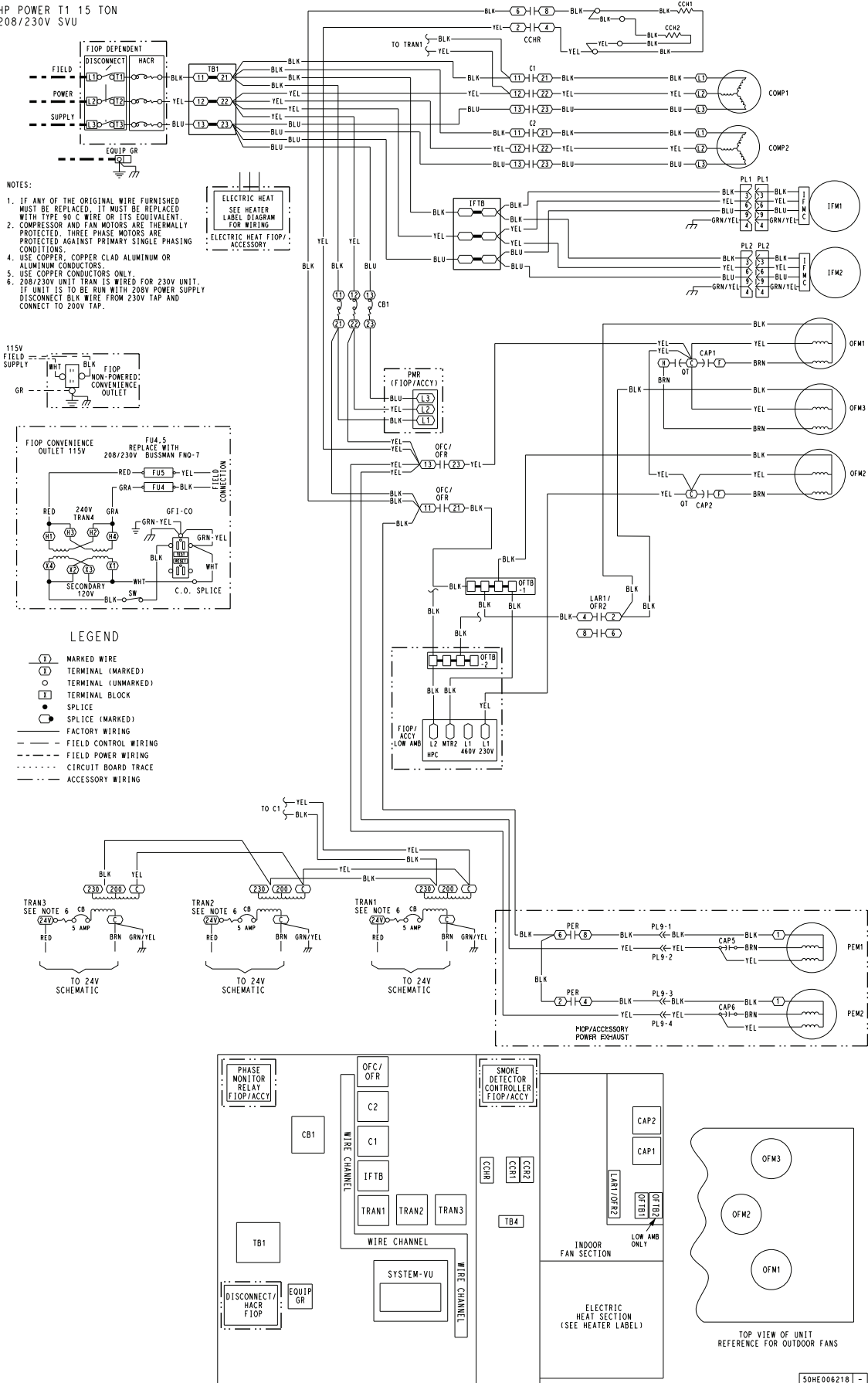


Fig. T — Typical 50FCQ*17 Power Wiring Diagram — SystemVu Controller (208/230-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

HP POWER T1 15 TON
460V SVU

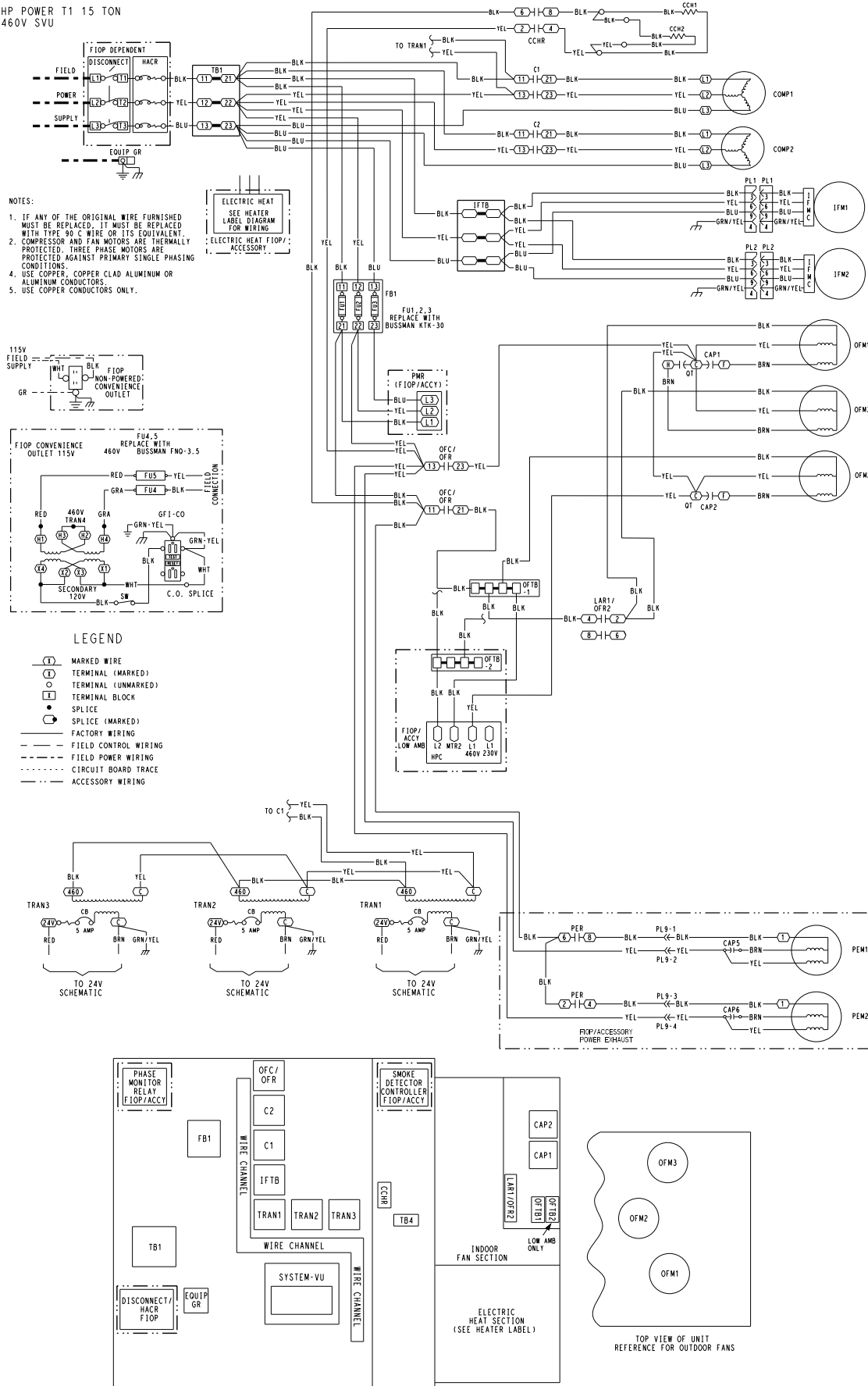


Fig. U — Typical 50FCQ*17 Power Wiring Diagram — SystemVu Controller (460-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

HP POWER T1 15 TON
575V SVU

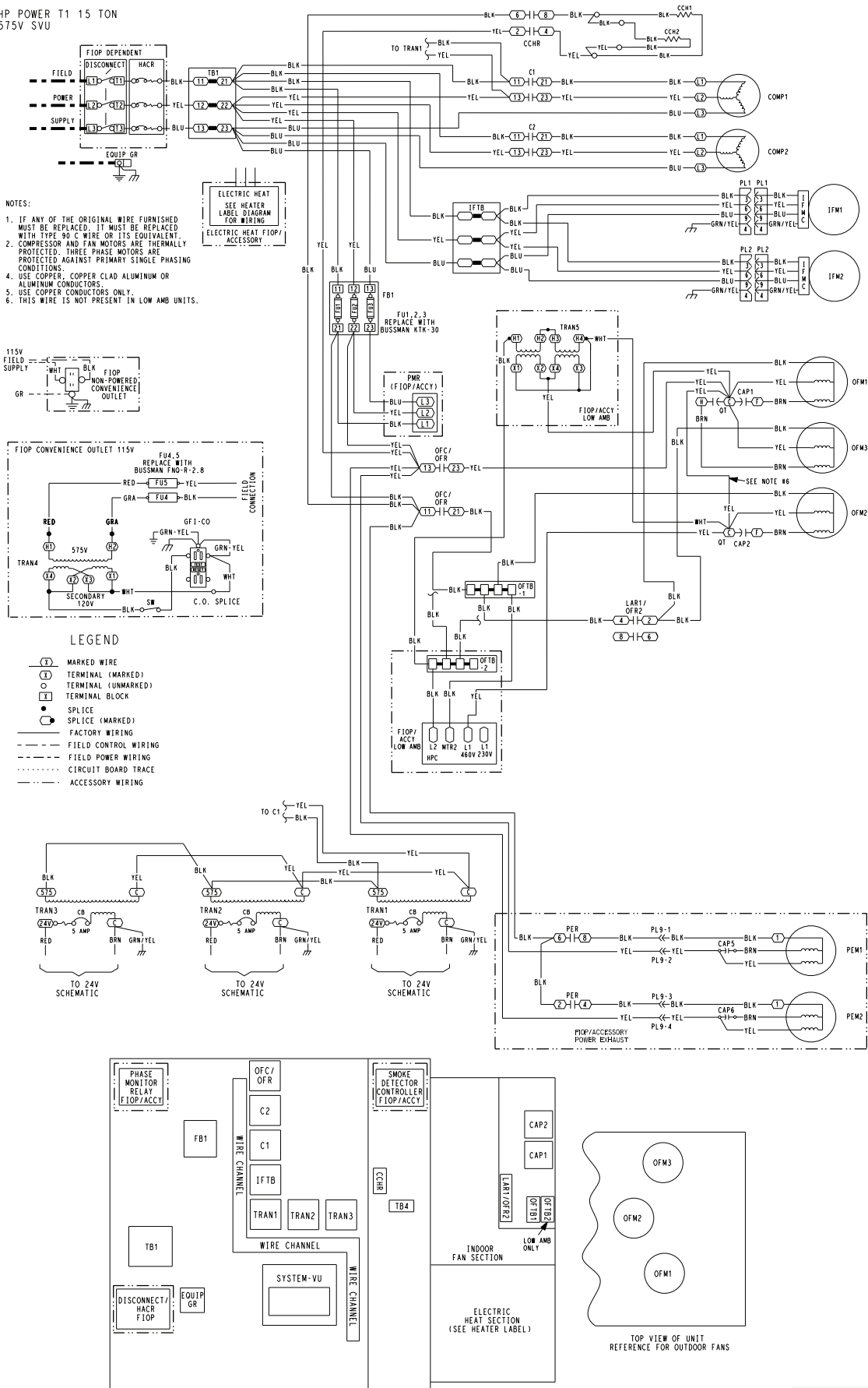


Fig. V — Typical 50FCQ*17 Power Wiring Diagram — SystemVu Controller (575-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

PAC POWER T1 17.5, 20, 25 TON
HP POWER T1 20 & 25 TON
208/230V SVU

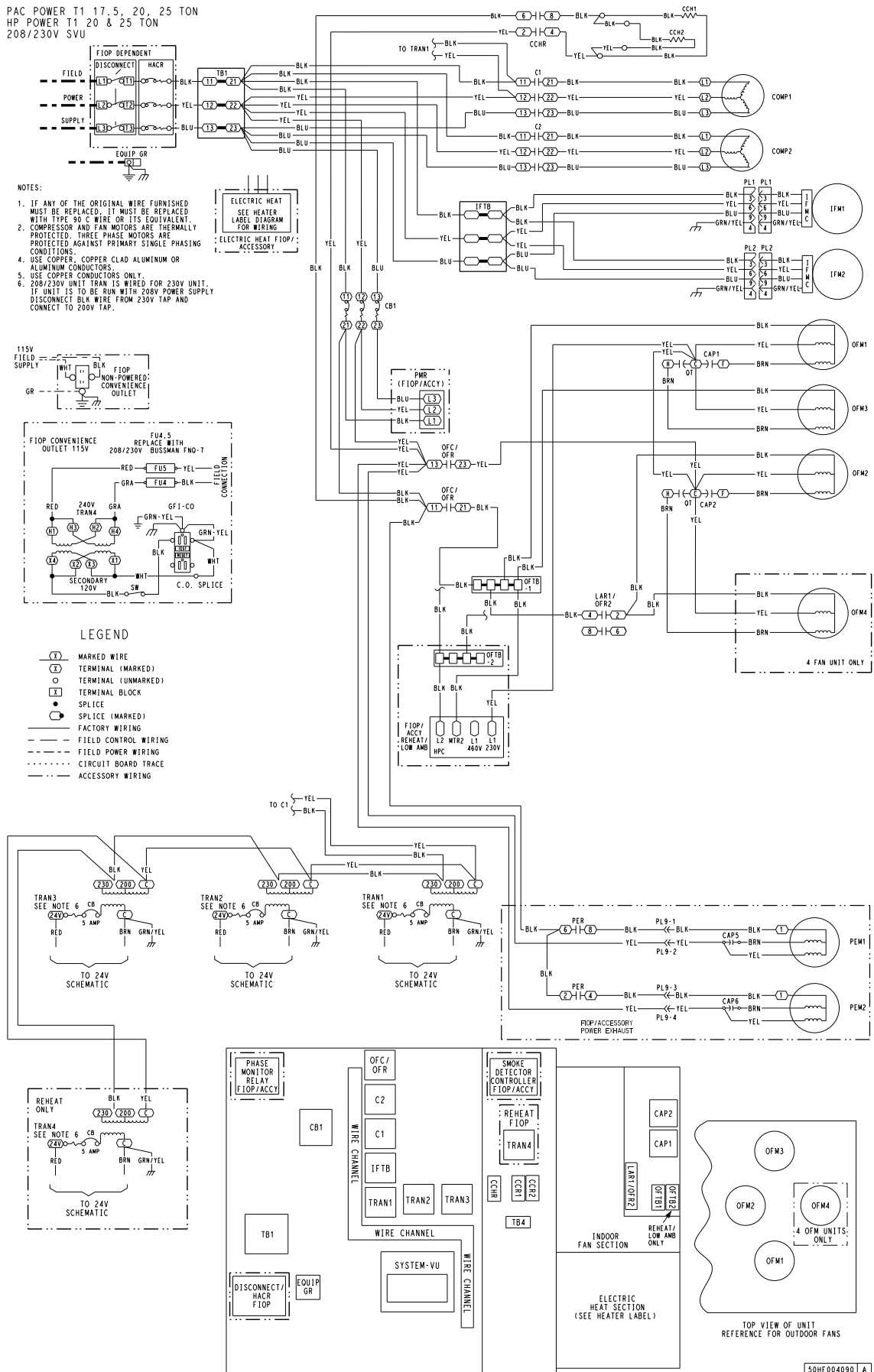


Fig. W — Typical 50FCQ*24-28 Power Wiring Diagram — SystemVu Controller (208/230-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

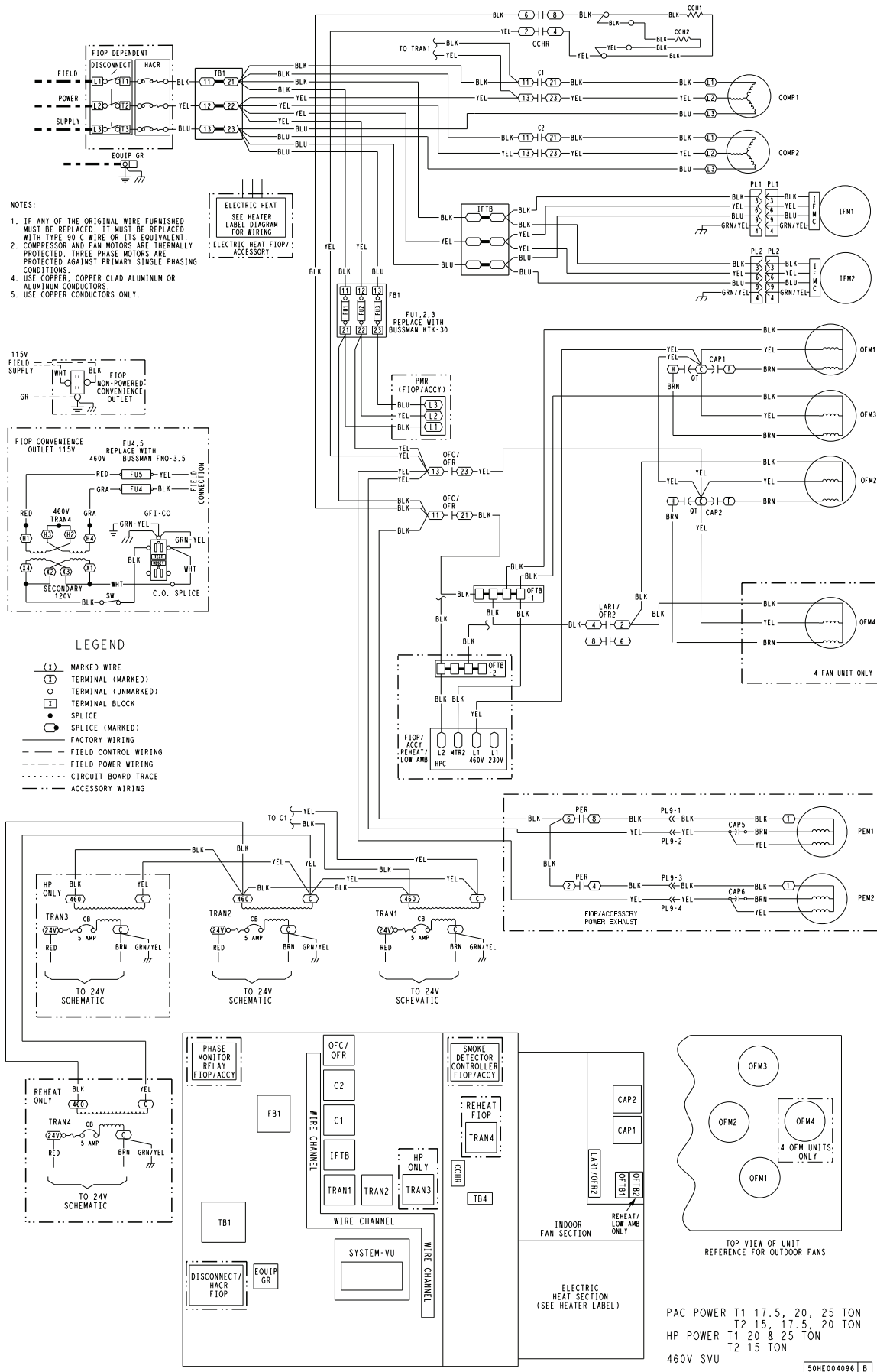


Fig. X — Typical 50FCQ*24-28 Power Wiring Diagram — SystemVu Controller (460-3-60)

APPENDIX D – WIRING DIAGRAMS (cont)

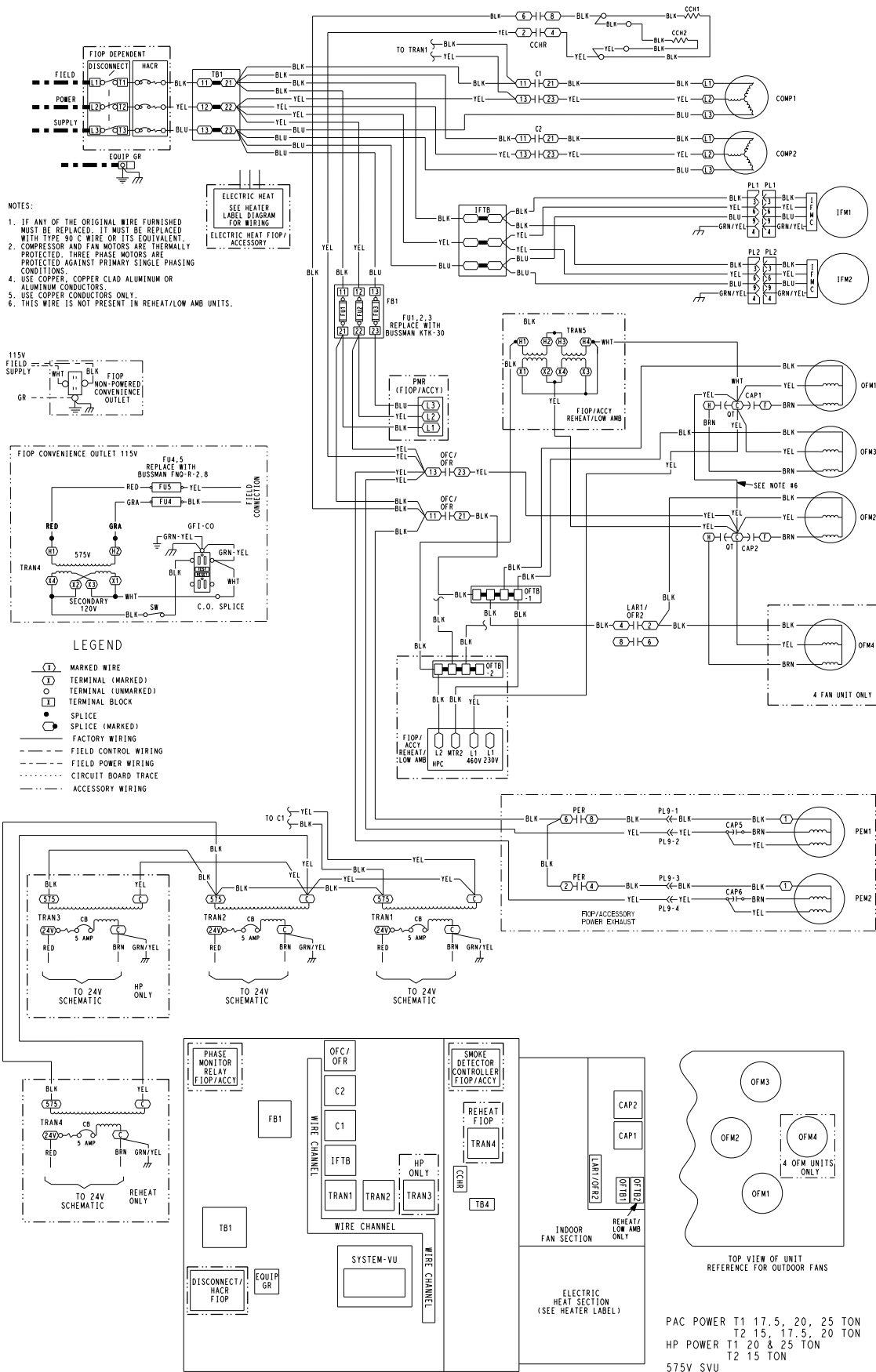


Fig. Y — Typical 50FCQ*24-28 Power Wiring Diagram — SystemVu Controller (575-3-60)

APPENDIX D — WIRING DIAGRAMS (cont)

HP POWER T1 15 TON
208/230V HSCCR

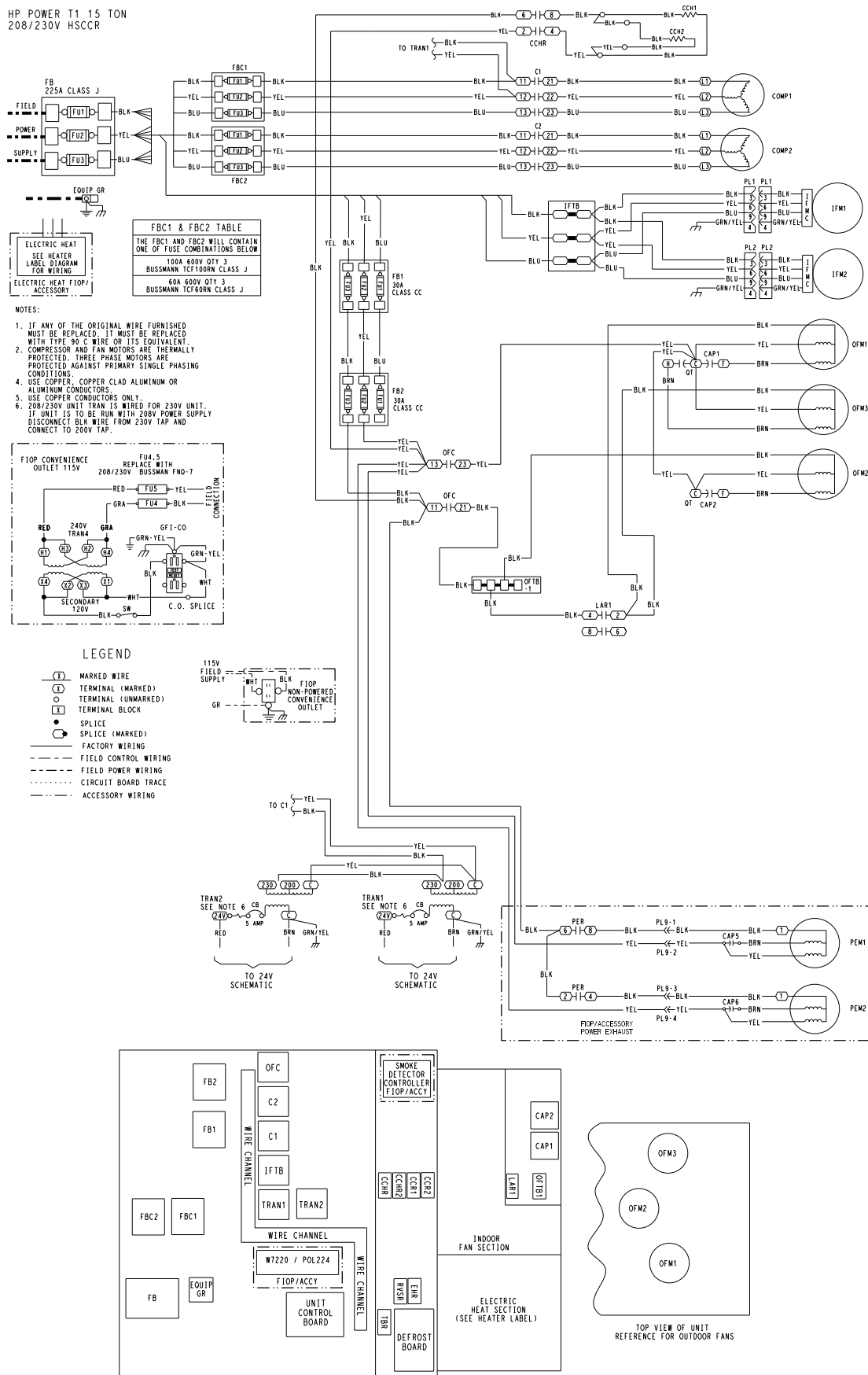


Fig. Z — Typical 50FCQ*17 Power Wiring Diagram — Electro-Mechanical and POL224 (208/230-3-60) — High SCCR

APPENDIX D — WIRING DIAGRAMS (cont)

HP POWER T1 15 TON
460V HSCCR

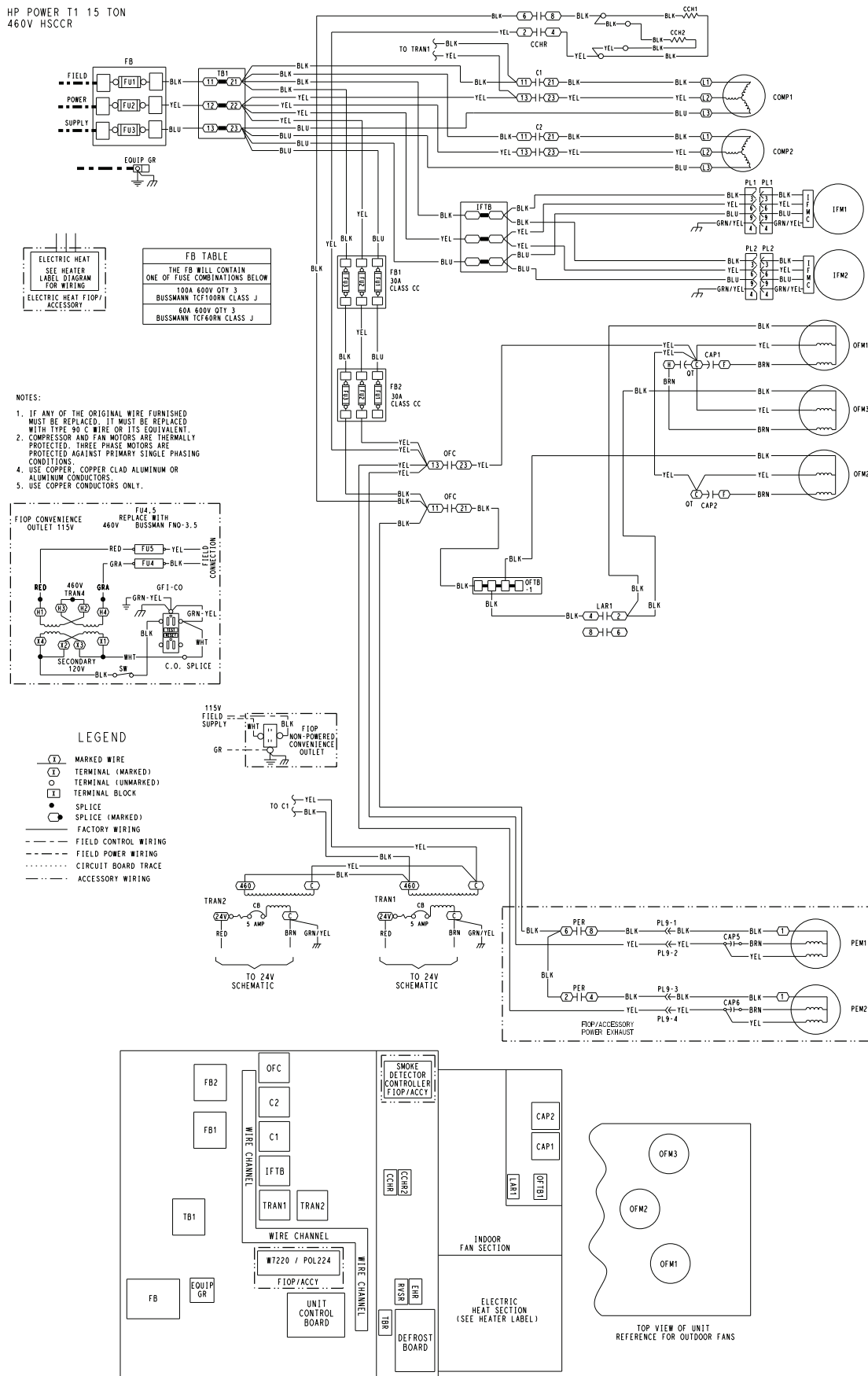


Fig. AA — Typical 50FCQ*17 Power Wiring Diagram — Electro-Mechanical and POL224 (460-3-60) — High SCCR

APPENDIX D – WIRING DIAGRAMS (cont)

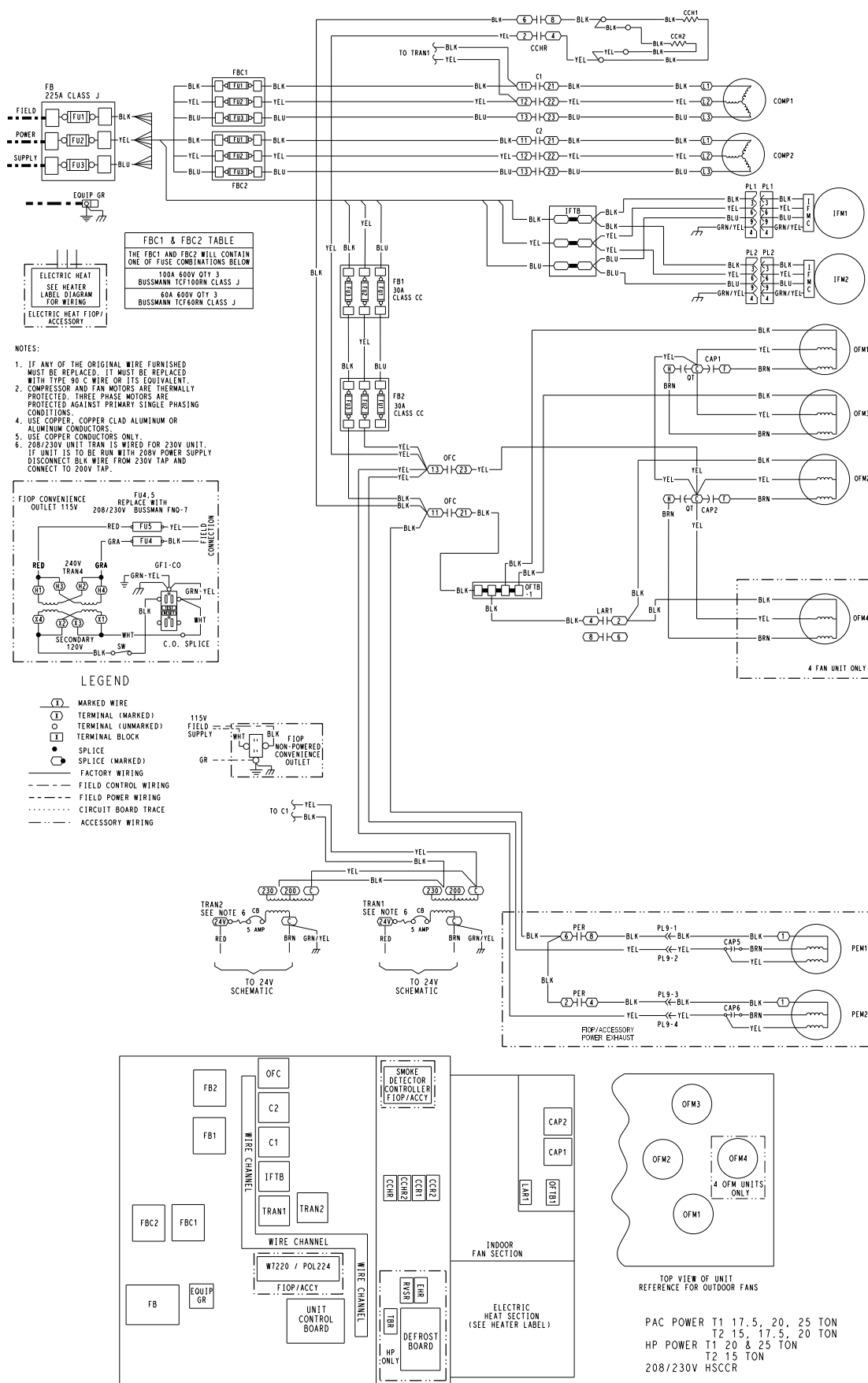


Fig. AB — Typical 50FCQ*24-28 Power Wiring Diagram — Electro-Mechanical and POL224 (208/230-3-60) — High SCCR

APPENDIX D — WIRING DIAGRAMS (cont)

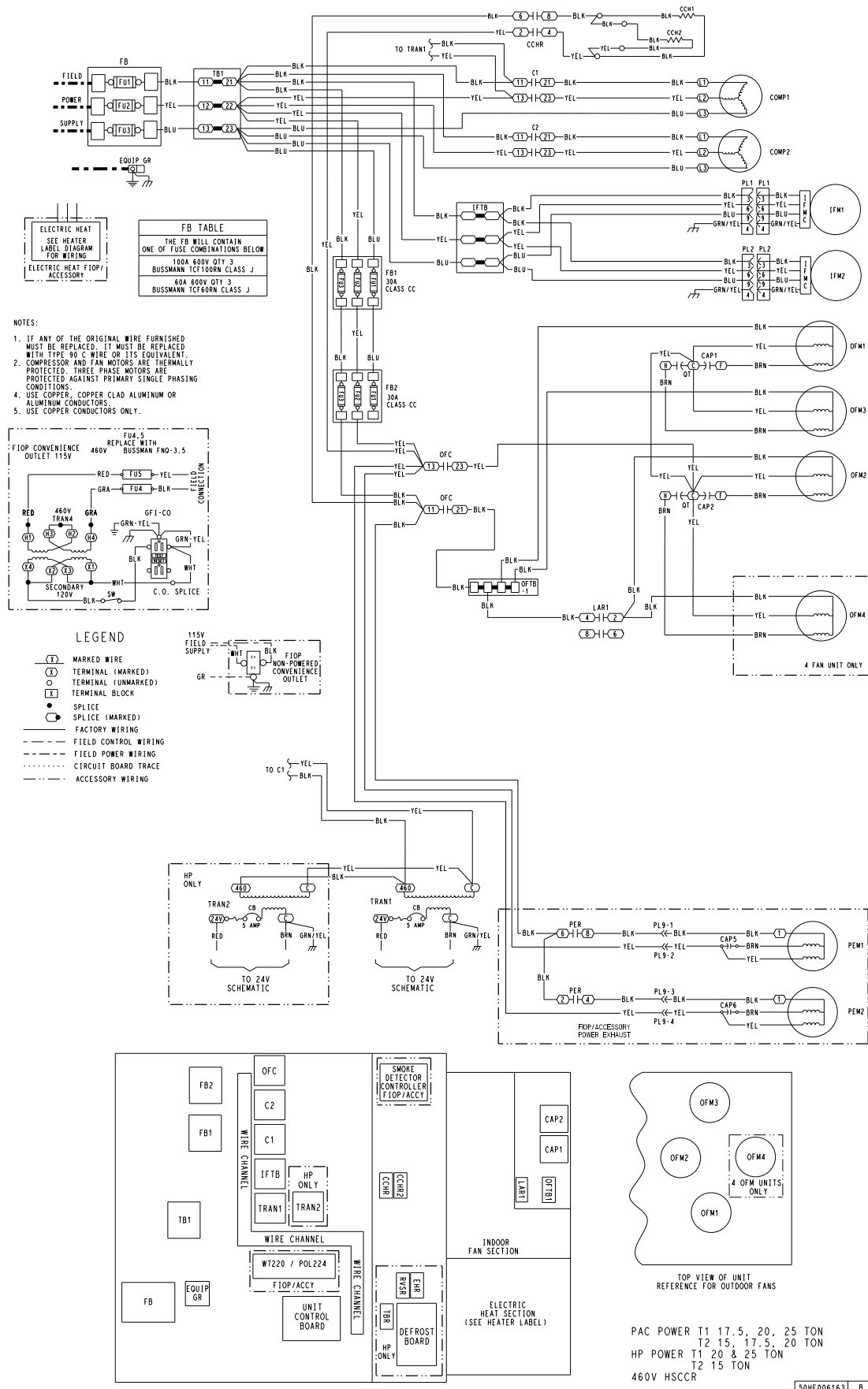


Fig. AC — Typical 50FCQ*24-28 Power Wiring Diagram — Electro-Mechanical and POL224 (460-3-60) — High SCCR

APPENDIX D — WIRING DIAGRAMS (cont)

HP POWER T1 15 TON
208/230V SVU HSCCR

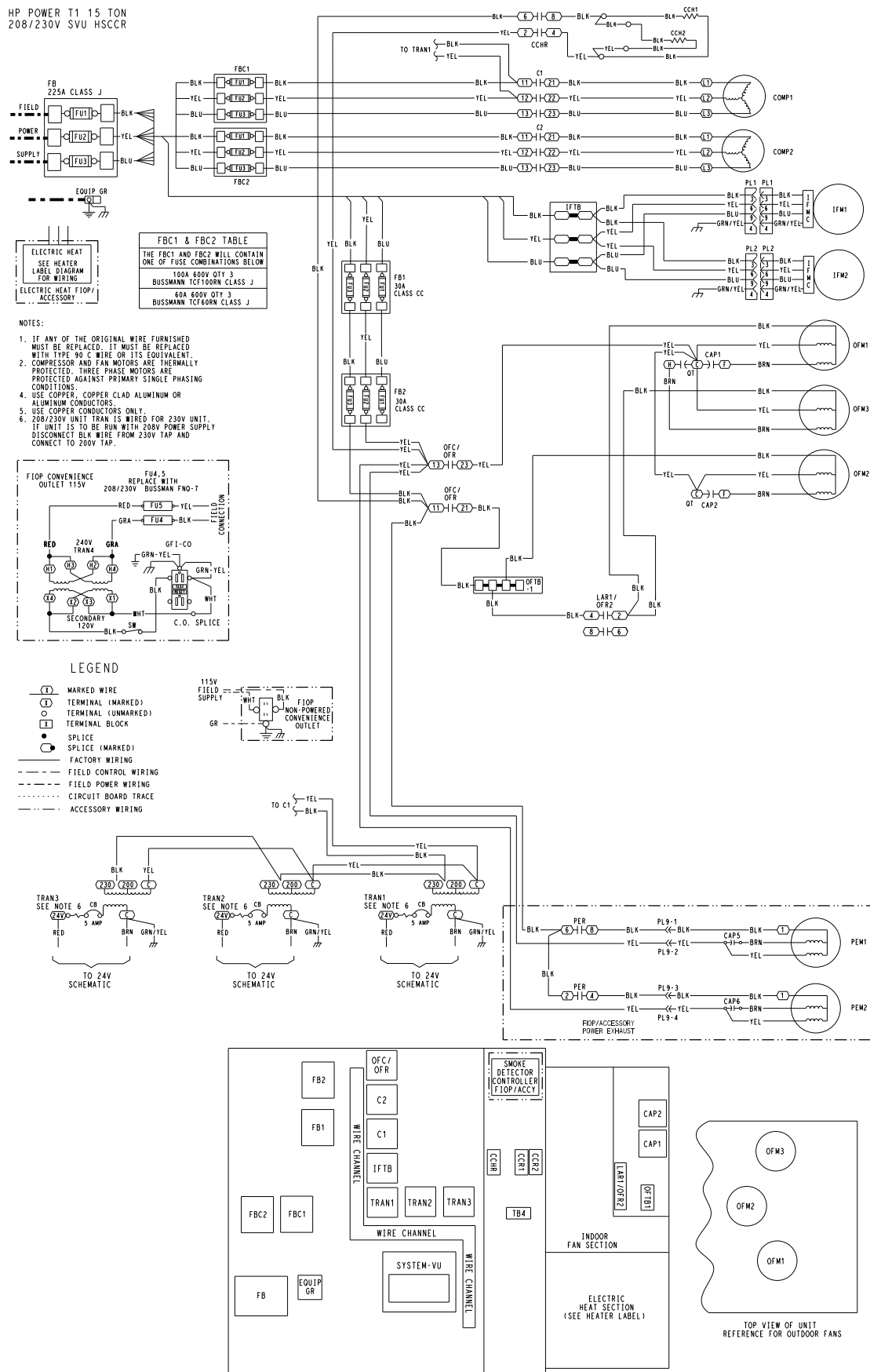


Fig. AD — Typical 50FCQ*17 Power Wiring Diagram —
SystemVu Controller (208/230-3-60) — High SCCR

APPENDIX D — WIRING DIAGRAMS (cont)

HP POWER T1 15 TON
460V SVU HSCCR

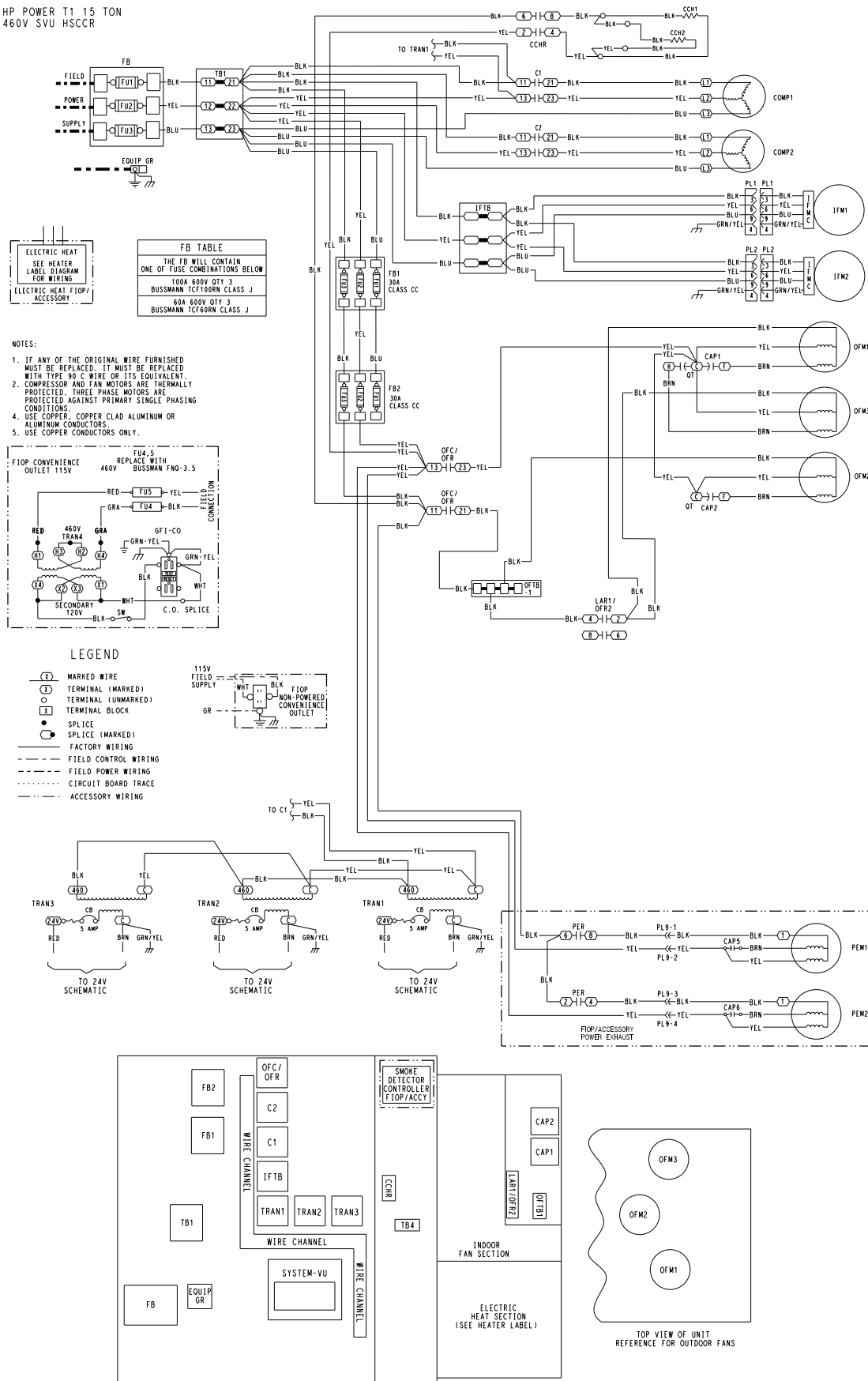


Fig. AE — Typical 50FCQ*17 Power Wiring Diagram — SystemVu Controller (460-3-60) — High SCCR

APPENDIX D — WIRING DIAGRAMS (cont)

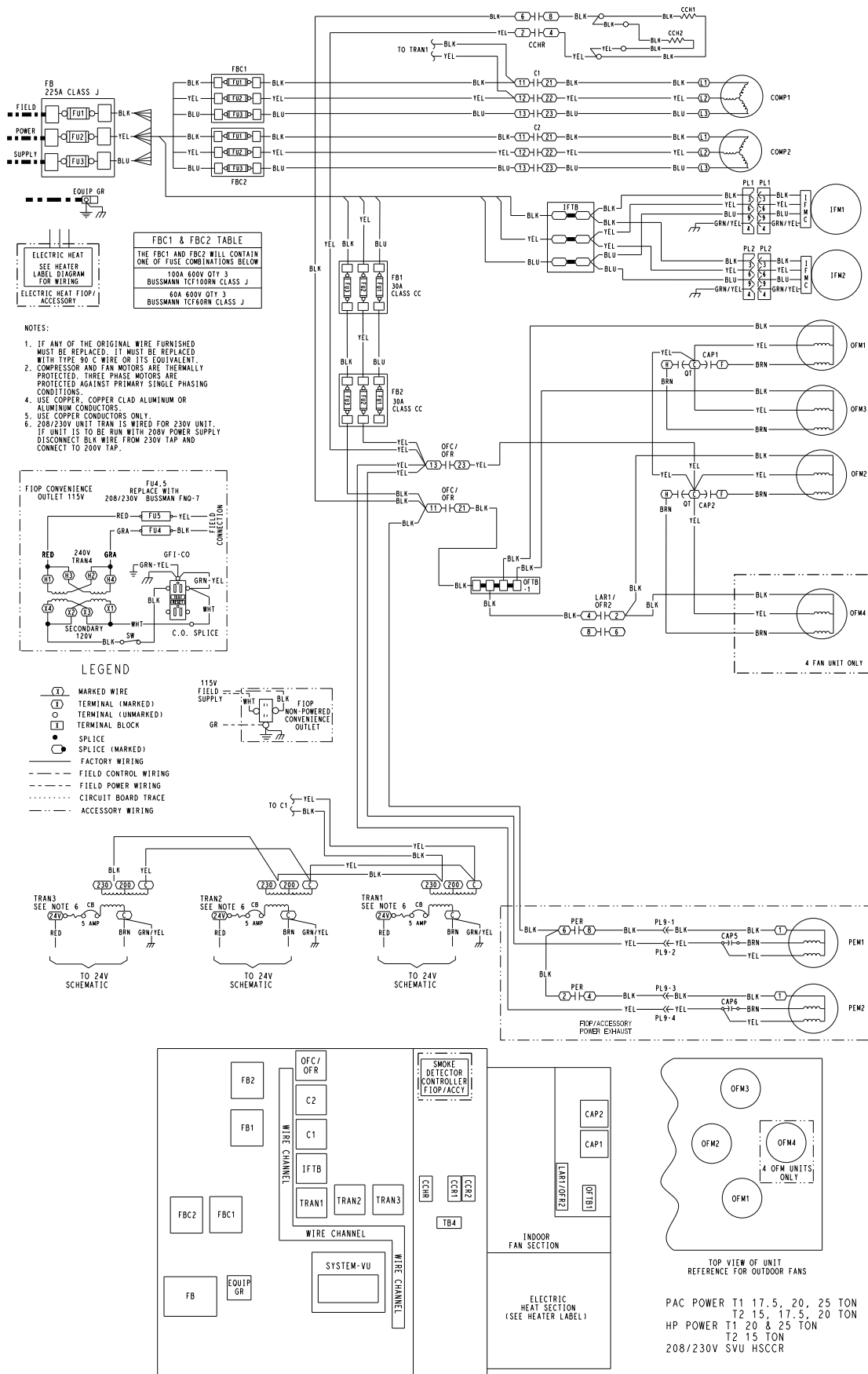


Fig. AF — Typical 50FCQ*24-28 Power Wiring Diagram — SystemVu Controller (208/230-3-60) — High SCCR

APPENDIX D — WIRING DIAGRAMS (cont)

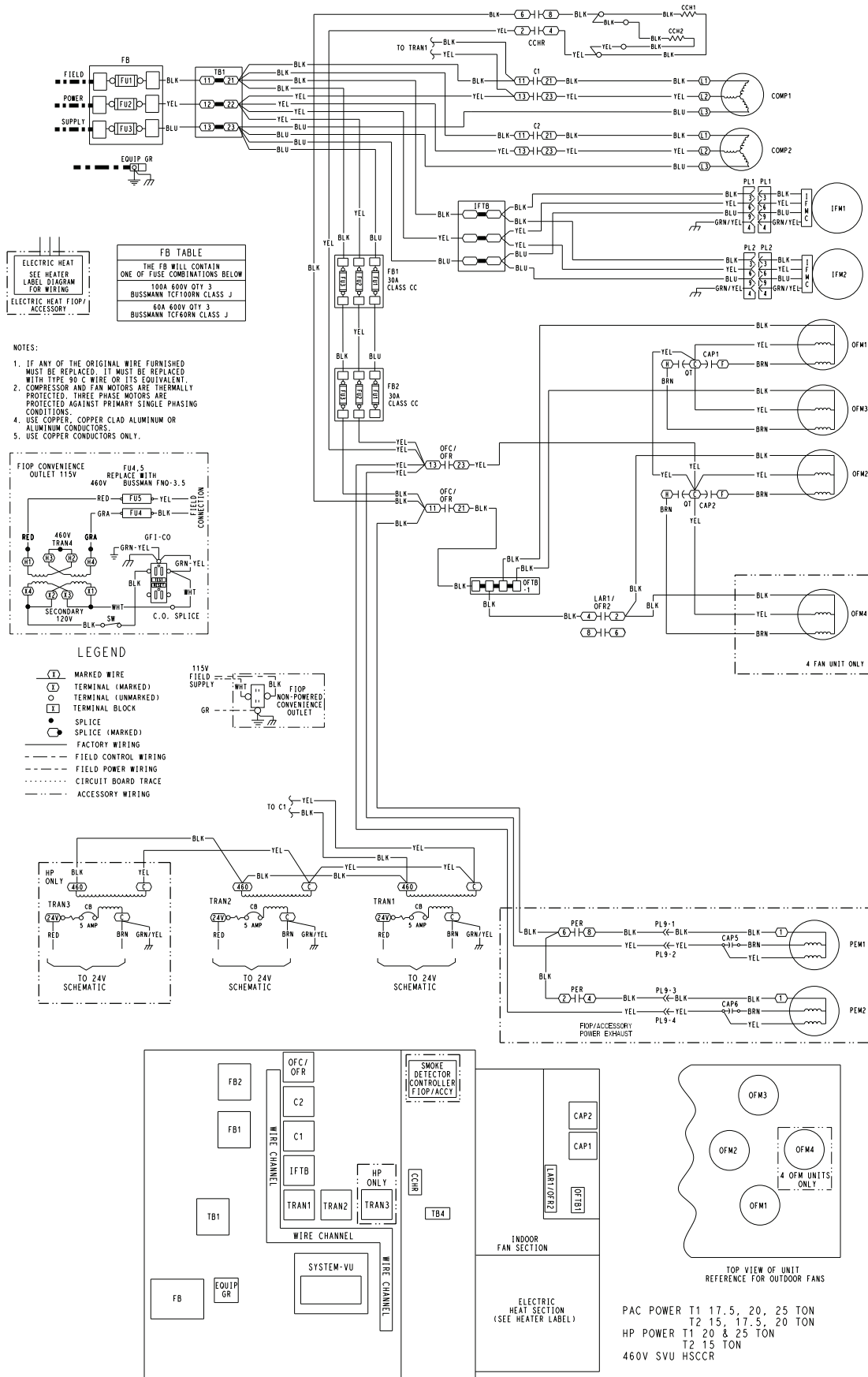
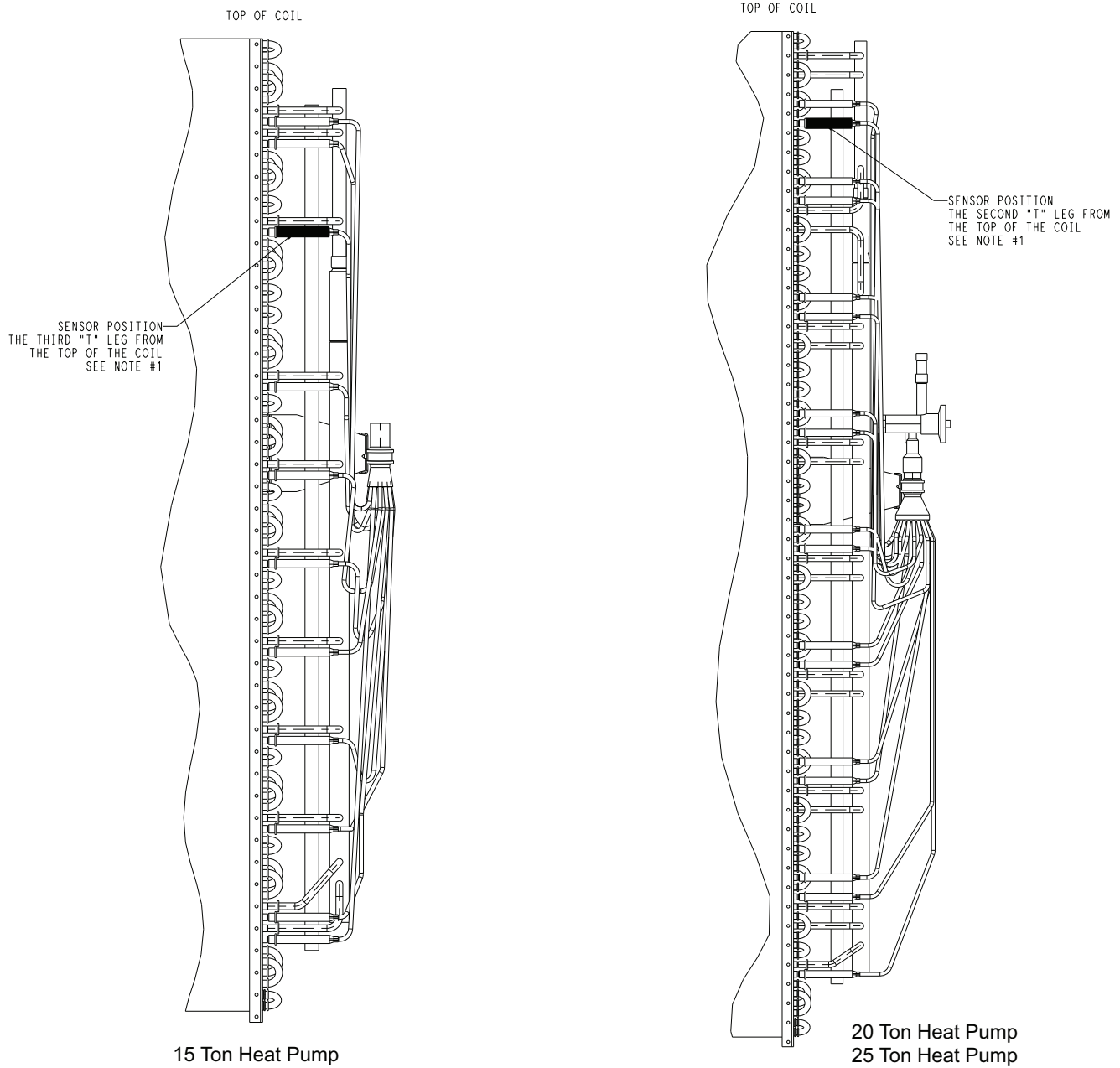


Fig. AG — Typical 50FCQ*24-28 Power Wiring Diagram — SystemVu Controller (460-3-60) — High SCCR

APPENDIX E — LOW AMBIENT CONTROL SENSOR LOCATION



NOTE(S):

1. Apply conductive grease supplied with coil sensor (Item #1) on specified leg before attaching sensor to location with wire tie (Item #5).

Fig. AH — 50FCQ*17 and 50FCQ*24-28 Outdoor Circuited

START-UP CHECKLIST

50FCQ*17-28 Single Package Rooftop Heat Pump Unit

(Remove and use for job file)

NOTE: To avoid injury to personnel and damage to equipment or property when completing the procedures listed in this start-up checklist, use good judgment, follow safe practices, and adhere to the safety considerations/information as outlined in preceding sections of this Service and Maintenance 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 all packaging materials have been removed from unit. (Y/N) _____

Verify installation of outdoor air hood. (Y/N) _____

Verify installation of flue exhaust and inlet hood. (Y/N) _____

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

Verify that all electrical connections and terminals are tight. (Y/N) _____

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

Check that outdoor air inlet screens are in place. (Y/N) _____

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

Verify that fan assembly is free of obstructions and rotor spins freely. (Y/N) _____

Verify that scroll compressors are rotating in the correct direction. (Y/N) _____

Verify installation of thermostat. (Y/N) _____

Verify that crankcase heaters have been energized for at least 24 hours. (Y/N) _____

III. START-UP

ELECTRICAL

Supply Voltage L1-L2 _____ L2-L3 _____ L3-L1 _____

Compressor 1Amps L1 _____ L2 _____ L3 _____

Compressor 2 Amps / Stage 2 Amps L1 _____ L2 _____ L3 _____

Supply Fan Amps L1 _____ L2 _____ L3 _____

Outdoor Fan Amps L1 _____ L2 _____

TEMPERATURES

Outdoor-air Temperature _____ °F DB (Dry Bulb)

Return-air Temperature _____ °F DB _____ °F WB (Wet Bulb)

Cooling Supply Air Temperature _____ °F

PRESSURES

Refrigerant Suction _____ PSIG
Refrigerant Discharge _____ PSIG
Verify Refrigerant Charge using Charging Charts (Y/N) _____

GENERAL

Economizer minimum vent and changeover settings to job requirements (if equipped) (Y/N) _____
Verify smoke detector unit shutdown by utilizing magnet test (Y/N) _____
Verify outdoor fan operation. On units with head pressure controls, verify outdoor fan ramps up (Y/N) _____

IV. HUMIDI-MIZER® SYSTEM START-UP

STEPS

1. Start unit In cooling (Close Y1) (Y/N) _____

OBSERVE AND RECORD

- a. Suction pressure

b. Discharge pressure

c. Entering air temperature

d. Leaving air temperature
- _____ PSIG

_____ PSIG

_____ ° F

_____ ° F
2. Switch unit to mixed cool and reheat mode (subcool) (Y/N) _____

OBSERVE

- a. Reduction in suction pressure (5-7 psi expected)

b. Discharge pressure unchanged

c. Delta temperature decreases, close to neutral air
- (Y/N) _____

(Y/N) _____

(Y/N) _____
3. Switch unit to hot gas reheat mode.

OBSERVE

- a. Suction pressure increases to normal cooling level

b. Discharge pressure decreases (35-50 psi) (Limited by head pressure control)

c. Liquid temperature returns to normal cooling level
- _____

4. With unit in dehumid mode switch to heating and verify compressor and outdoor fan stop (Y/N) _____
5. Turn off heating, cooling, and reheat, restore set points for thermostat and humidistat (Y/N) _____

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE