

547K*08-14
Single Package Rooftop Heat Pump
with Puron® (R-410A) Refrigerant
7.5 to 12.5 Nominal Tons



Service and Maintenance Instructions

CONTENTS


	Page
SAFETY CONSIDERATIONS	2
UNIT ARRANGEMENT AND ACCESS	3
General	3
Routine Maintenance	3
Filters	3
SUPPLY FAN (BLOWER) SECTION	4
Supply Fan (Direct-Drive)	4
2- Speed Indoor Fan Motor	12
COOLING	12
Condenser Coil (Outdoor)	12
Evaporator Coil (Indoor)	12
Condenser Coil Maintenance and Cleaning Recommendation	12
Evaporator Coil	14
Typical Unit Piping	14
THERMOSTATIC EXPANSION VALVE (TXV)	20
TXV Operation	20
Replacing TXV	20
Refrigerant System Pressure Access Ports	20
PURON (R-410A) REFRIGERANT	20
Refrigerant Charge	21
COMPRESSOR	26
Lubrication	26
Replacing Compressor	26
Compressor Rotation	26
Filter Drier	26
Condenser-Fan Adjustment	26
Troubleshooting Cooling System	27
CONVENIENCE OUTLETS	28
Convenience Outlets	28
Installing Weatherproof Cover	28
Non-Powered Type	28
Unit-Powered Type	28
Duty Cycle	29
Maintenance	29
Fuse on Powered Type	29
COMMERICAL DEFROST CONTROL	29
Reversing Valve Control	31
Compressor Control	31
Auxiliary (Electric) Heat Control	31
Defrost	31
ELECTRIC HEATERS (UNITS 547K*08-12)	32
Single Point Boxes and Supplementary Fuses	32
Safety Devices	32
Field Power Connections	33
Low-Voltage Control Connections	33
Control and Power Wiring Diagrams	33
ELECTRIC HEATERS (UNIT 547K*14)	34
Single Point Boxes and Supplementary Fuses	35
Single Point Boxes without Fuses	35
Low-Voltage Control Connections	35
Safety Devices	35
Control and Power Wiring Diagrams	35
SMOKE DETECTORS	36
System	36
Controller	36
Smoke Detector Sensor	36
Smoke Detector Locations	36
Completing Installation of Return Air Smoke Detector ...	37
FIOP Smoke Detector Wiring and Response	38
SENSOR AND CONTROLLER TESTS	39
Sensor Alarm Test	39
Controller Alarm Test	39
Dirty Controller Test	39
Dirty Sensor Test	39
Changing the Dirt Sensor Test	39
Remote Station Test	39
SD-TRM4 Remote Alarm Test Procedure	39
Remote Test/Reset Station Dirty Sensor Test	40
Dirty Sensor Test Using an SD-TRM4	40
Detector Cleaning	40
Indicators	40
Troubleshooting	41
PROTECTIVE DEVICES	41
Compressor Protection	41
Relief Device	42
Control Circuit, 24-V	42
ECONOMIZER SYSTEMS	43
EconoMiSer2	43
EconoMiSer IV (Field-Installed Accessory)	44
EconoMiSer X (Factory Option)	52
PRE-START-UP/START-UP	65
START-UP, GENERAL	66
Unit Preparation	66
Additional Installation/Inspection	66
Return-Air Filters	66
Outdoor-Air Inlet Screens	66
Compressor Mounting	66
Internal Wiring	66
Refrigerant Service Ports	66
Compressor Rotation	66
Refrigerant Service Ports	66
Cooling	66
Heating	67
Ventilation (Continuous Fan)	67
FASTENER TORQUE VALUES	67
GENERAL FAN PERFORMANCE NOTES	70
APPENDIX A — MODEL NUMBER	
NOMENCLATURE	68
APPENDIX B — PHYSICAL DATA	69
APPENDIX C — FAN PERFORMANCE	70
APPENDIX D — WIRING DIAGRAMS	87
APPENDIX E — LOW AMBIENT CONTROL SENSOR LOCATION	101

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 the basic maintenance functions of replacing filters. Trained service personnel should perform all other operations.

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 extinguishers available for all brazing operations.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and National Electrical Code (NEC) for special requirements.

Recognize safety information. This is the safety ALERT symbol . When you see this symbol on the unit and in instructions or manuals, be aware of the potential for physical injury hazards.

Understand the signal words **DANGER**, **WARNING**, and **CAUTION**. These words are used with the safety ALERT symbol. **DANGER** indicates a hazardous situation which, if not avoided, will result in death or severe personal injury. **WARNING** indicates a hazardous situation which, if not avoided, could result in death or personal injury. **CAUTION** indicates a hazardous situation which, if not avoided, could result in minor to moderate injury or product and property damage. **IMPORTANT** is used to address practices not related to physical injury. **NOTE** is used to highlight suggestions which will result in enhanced installation, reliability, or operation.

WARNING

ELECTRICAL OPERATION HAZARD

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

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

WARNING

ELECTRICAL OPERATION HAZARD

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

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

WARNING

UNIT OPERATION AND SAFETY HAZARD

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

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

WARNING

FIRE, EXPLOSION HAZARD

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

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

WARNING

FIRE, EXPLOSION HAZARD

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

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

CAUTION

UNIT DAMAGE HAZARD

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

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

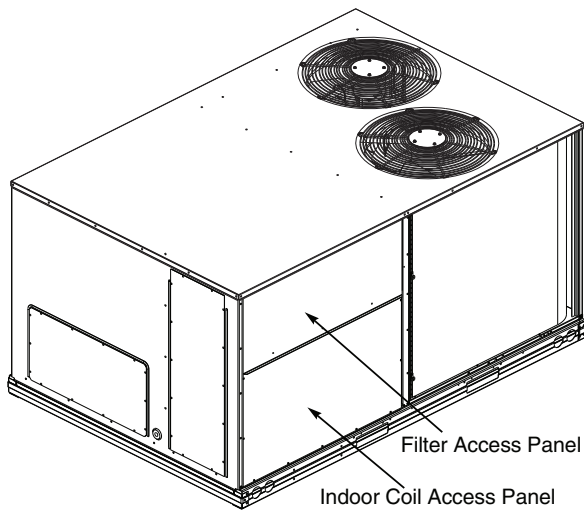


Fig. 1 — Typical Access Panel Locations

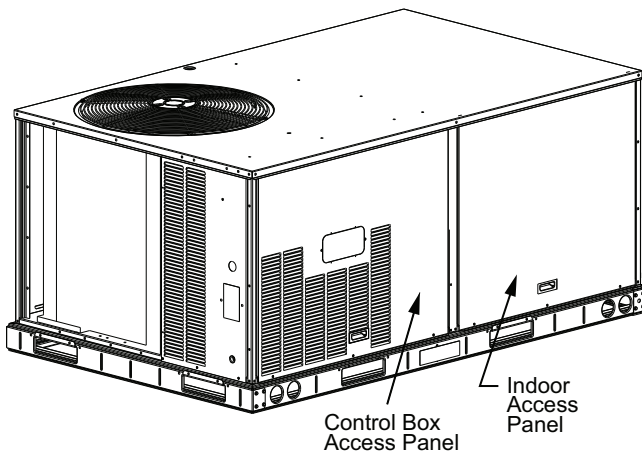


Fig. 2 — Blower Access Panel Location

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

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

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

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

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

Return air filters are disposable fiberglass media type. Access to the filters is through the small lift-out panel located on the rear side of the unit, above the evaporator/return air access panel. (See Fig. 3.)

To remove the filters:

1. Grasp the bottom flange of the upper panel.
2. Lift up and swing the bottom out until the panel disengages and pulls out.
3. Reach inside and extract the filters from the filter rack.
4. Replace these 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 top of the lower panel (or economizer top).

OUTSIDE AIR HOOD

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 restarting the unit. Observe the flow direction arrows on the side of each filter frame.

ECONOMIZER INLET AIR SCREEN

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

SUPPLY FAN (BLOWER) SECTION

⚠ 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.

Supply Fan (Direct-Drive)

All 547K units have the Axion™ Fan Technology 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. 5 and 6.)

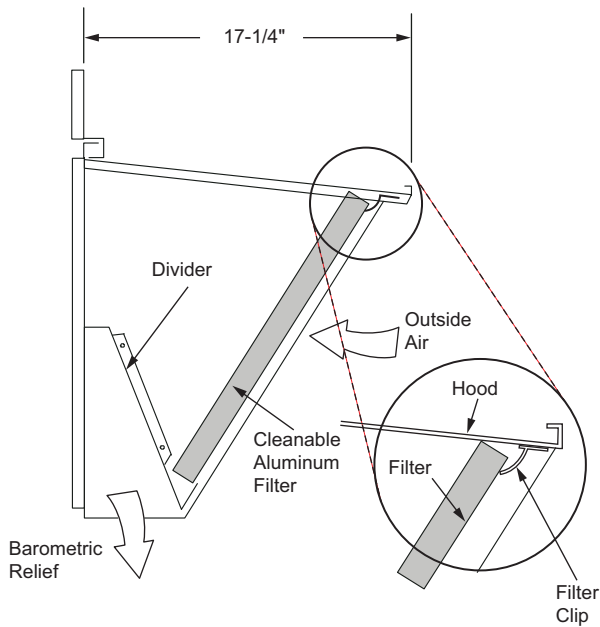


Fig. 3 — Filter Installation

To remove the filter, open the filter clips. Re-install the filter by placing the frame in its track, then closing the filter clips.

MANUAL OUTSIDE AIR HOOD SCREEN

This inlet screen is secured by a retainer angle across the top edge of the hood. (See Fig. 4.)

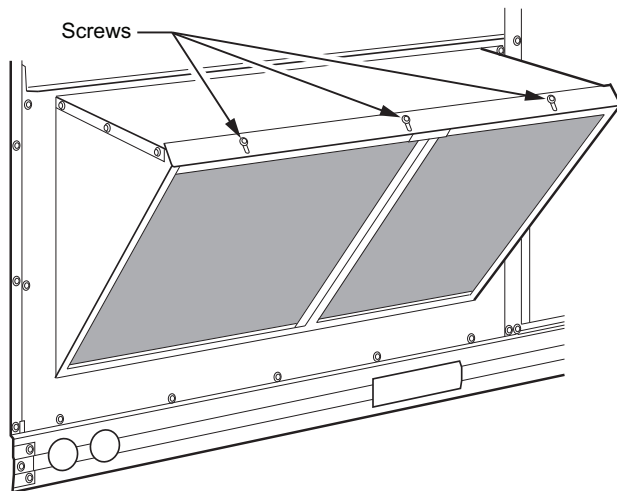


Fig. 4 — Screens Installed on Outdoor-Air Hood

To remove the screen, loosen the screws in the top retainer and slip the retainer up until the filter can be removed. Re-install by placing the frame in its track, rotating the retainer back down, and tightening all screws.

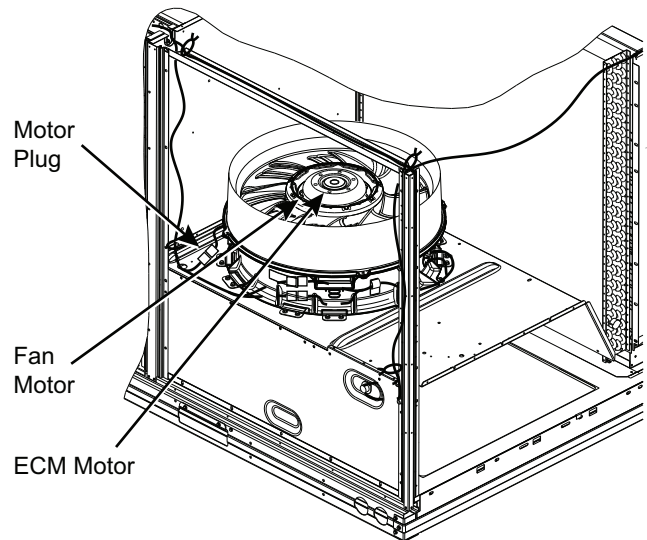


Fig. 5 — Direct-Drive Supply Fan Assembly

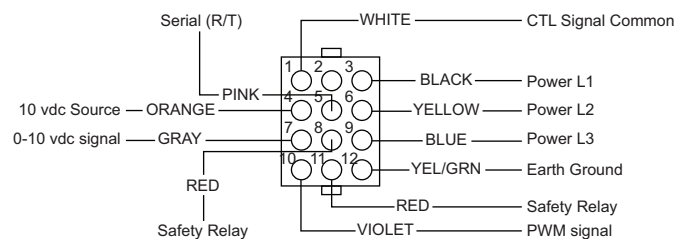


Fig. 6 — ECM Motor Plug Connectors

EVALUATING MOTOR SPEED

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.

SELECTING FAN SPEED

All units come factory set for 9.0 vdc or approximately 90% 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: Fan Speed Set-Up is for full load airflow. If the unit has multiple stages of cooling, low cool and ventilation may operate at lower fan rpms. This offset is factory set and controlled by the UCB. If fan speed verification is being done with a strobe, fan speed should be verified in all unit operation modes.

Units with Electro-Mechanical Controls

The Fan Speed set up controls are located on the lower section of the Unit Control Board (UCB). See Fig. 7 for location.

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. 8), calculate the vdc 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 vdc to base unit vdc in upper portion of label. For electric heaters use only one adder. (ex. 2 stage heater uses only 2 stage adder, not 1 stage plus 2 stage).

NOTE: The Fan Speed Set Up labels are located on the High Voltage cover in the Control Box.

4. Connect a multimeter to the vdc terminals on the UCB.
5. Set the Range Switch to either A, B, or C per the Switch Range table.
6. Using a straight blade screwdriver turn the vdc control dial to fine tune the vdc reading.
7. Record the reading in the Field Setting field.

NOTE: When replacing the UCB cut JMP 1,2 and 3 in the RE-HEAT/HP section of the replacement UCB.

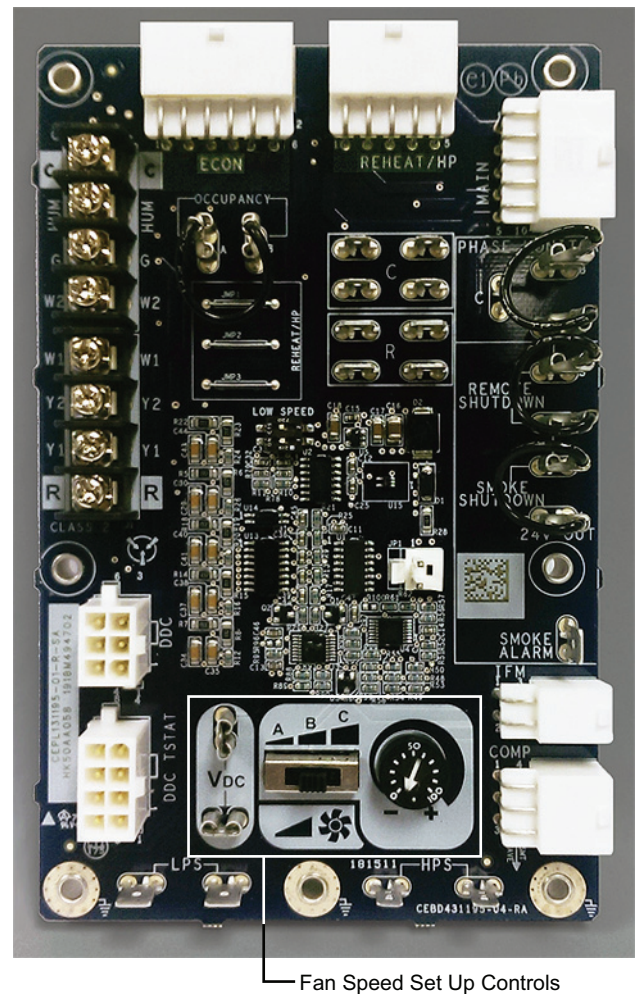
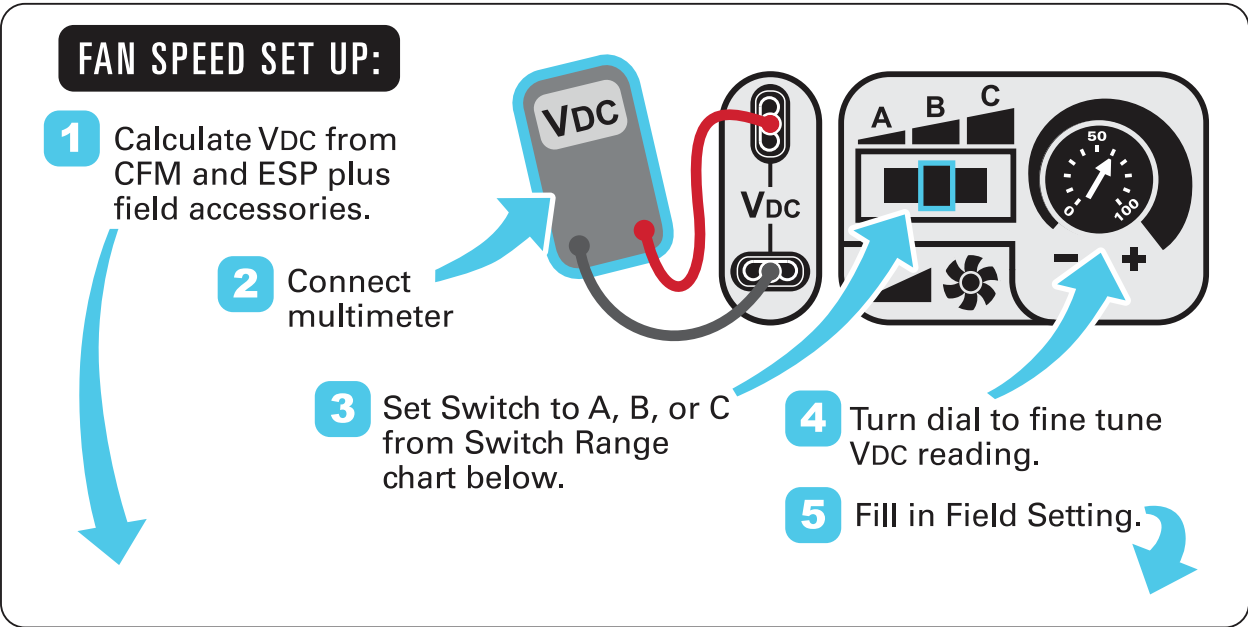


Fig. 7 — UCB Fan Speed Controls



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	1500	5.4	6.2	6.9	7.5	8.1	8.6	9.1	9.6						
		1625	5.8	6.5	7.1	7.7	8.3	8.8	9.3	9.8						
		1750	6.1	6.8	7.4	8.0	8.5	9.0	9.5	9.9						
		1875	6.5	7.1	7.7	8.2	8.7	9.2	9.7							
		2000	6.8	7.4	7.9	8.5	9.0	9.5	9.9							
		2125	7.2	7.7	8.2	8.7	9.2	9.7								
		2250	7.6	8.0	8.5	9.0	9.5	10.0								
		2375	7.9	8.4	8.8	9.3	9.8									
		2500	8.3	8.7	9.2	9.6										
	Field Accessories:															
	Economizer	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1							
	1 Stage E Heat	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2							
	2 Stage E Heat	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3							

Factory Setting:
9.0 Vdc

Field Setting:

Record field setting here
 VDC

Switch Range: *

	A	B	C
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: Values in the Field Accessories section are VDC adders.

Fig. 8 — Example of Fan Speed Set Up Labels for Electro-Mechanical Controls

Axion™ Fan Technology 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 16, “Supply Fan Motor Logic and Safety Relays” on page 42 for a complete list.

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.

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. 9.
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.



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. 10.

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 eight screws at front of stator on fan deck.
4. Slide fan assembly forward a couple of inches to clear rear brackets and lift assembly out.

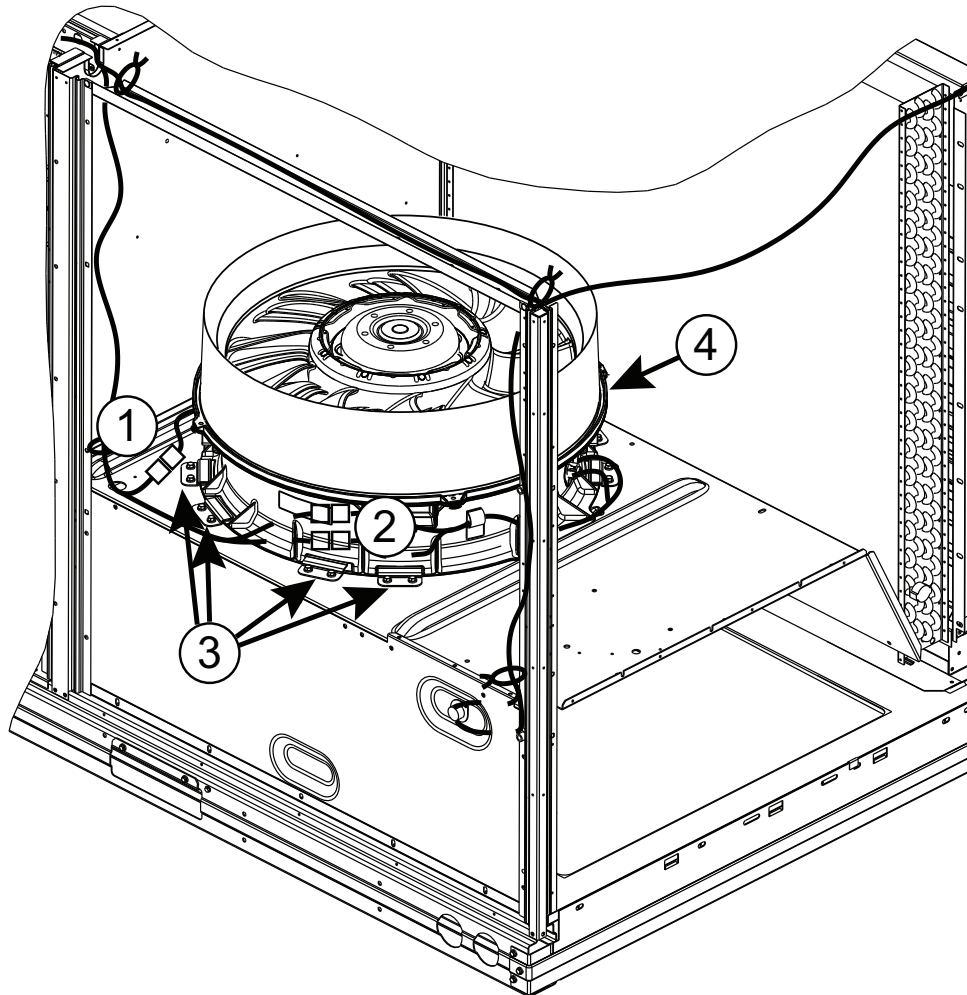


Fig. 10 — Fan Assembly Removal

Disassembling Standard/Medium Motor and Fan Assembly

See Fig. 11.

NOTE: Refer to “Model Number Nomenclature” on page 68, position 13 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.

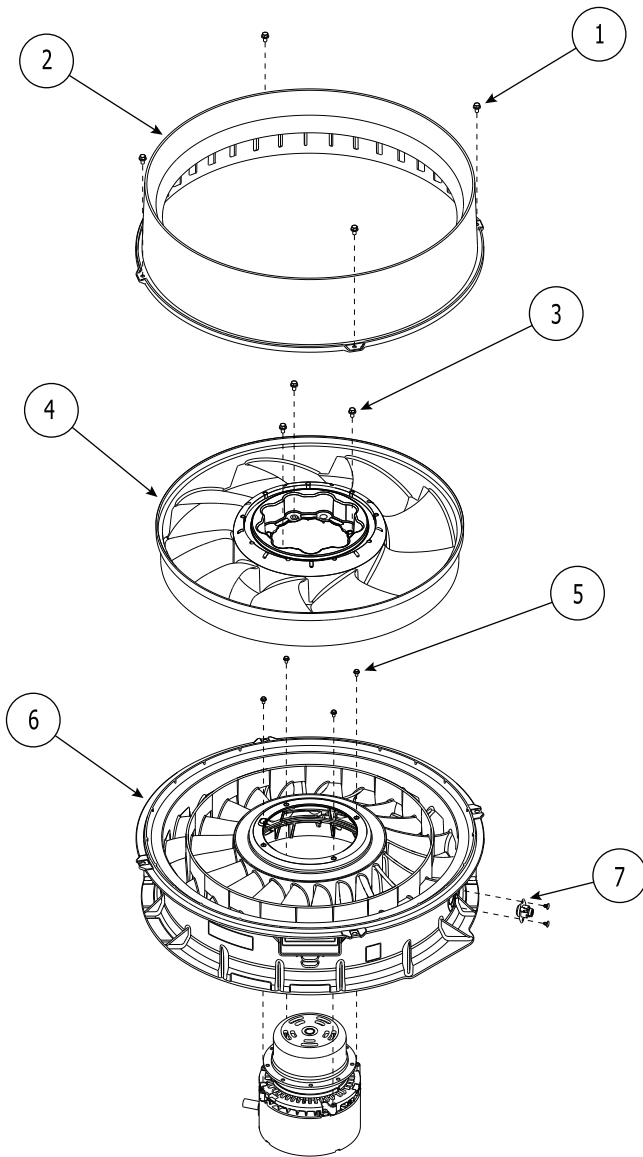


Fig. 11 — Disassembling Standard or Medium Static Motor and Fan Assembly

Disassembling High Static Motor and Fan Assembly

See Fig. 12.

NOTE: Refer to “Model Number Nomenclature” on page 68, position 13 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 6 screws connecting motor to stator.
6. Remove motor from stator.
7. If required, remove fan limit switch from stator.

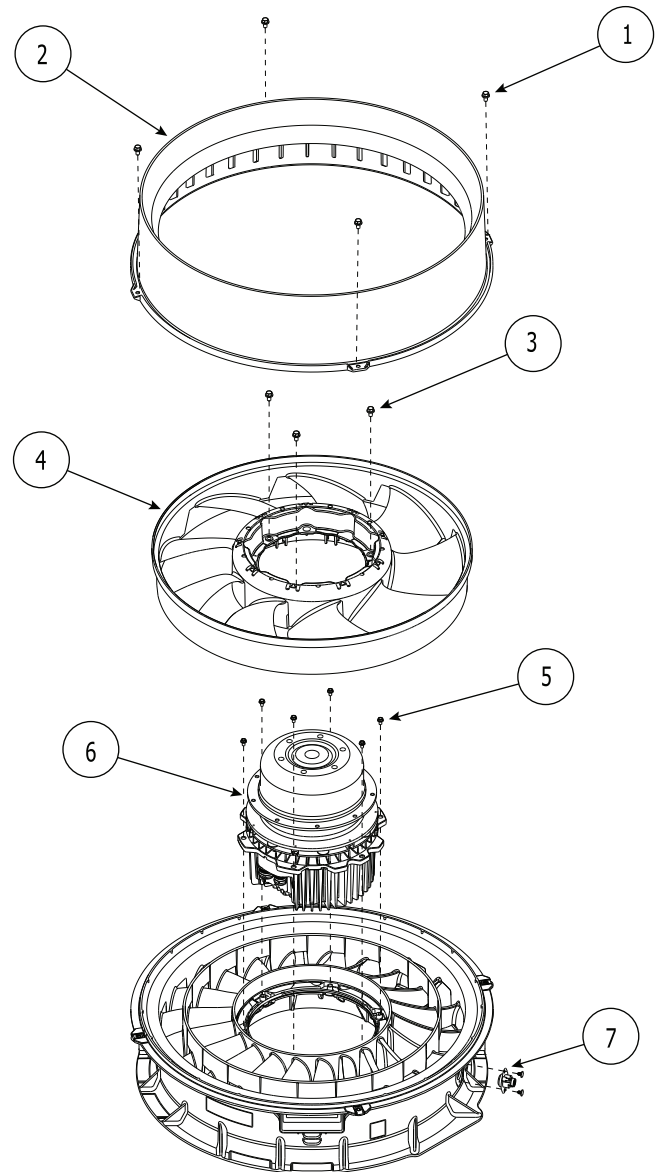


Fig. 12 — Disassembling High Static Motor and Fan Assembly

Reassembly of Standard/Medium Motor and Fan Assembly

See Fig. 13.

NOTE: Refer to “Model Number Nomenclature” on page 68, position 13 for specific unit requirements.

1. Place motor on flat surface.
2. If required, reinstall limit switch on stator with two plastic fastener plugs (P/N: 48TM005675).
3. Line up keying features on stator and motor and set stator onto motor. Install four 1/4-20 x 1-in. screws (P/N: 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 (P/N: 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 (P/N: 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.

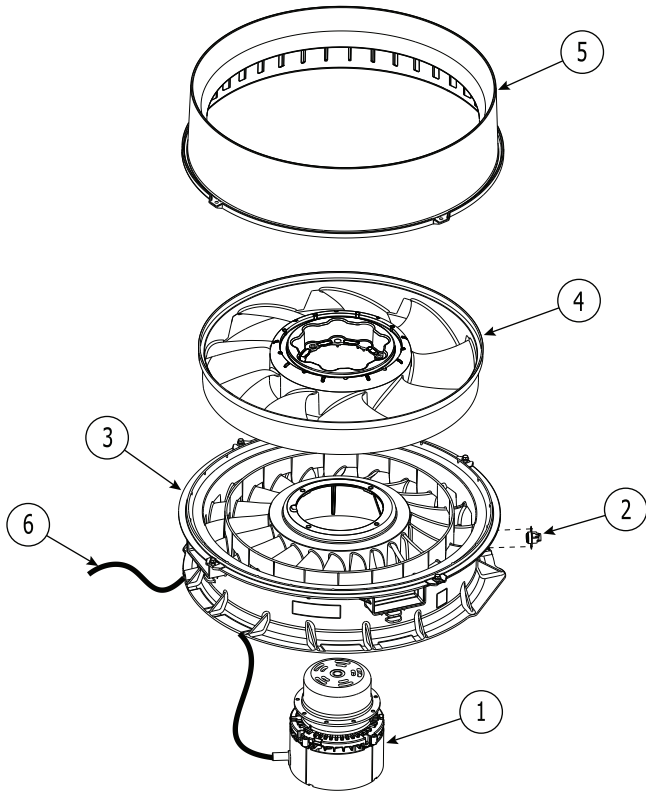


Fig. 13 — Standard/Medium Fan System Re-Assembly

Reassembly of High Static Motor and Fan Assembly

See Fig. 14.

NOTE: Refer to “Model Number Nomenclature” on page 68, position 13 for specific unit requirements.

1. Place stator on flat surface.
2. If required, reinstall limit switch on stator with two plastic fastener plugs (P/N: 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 (P/N: AC67AP170) to attach stator to motor. Tighten to 30 in.-lb (3.39 Nm).
4. Set rotor onto motor flange. Install three 1/4-20 x 1-in. screws (P/N: 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 (P/N: 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.

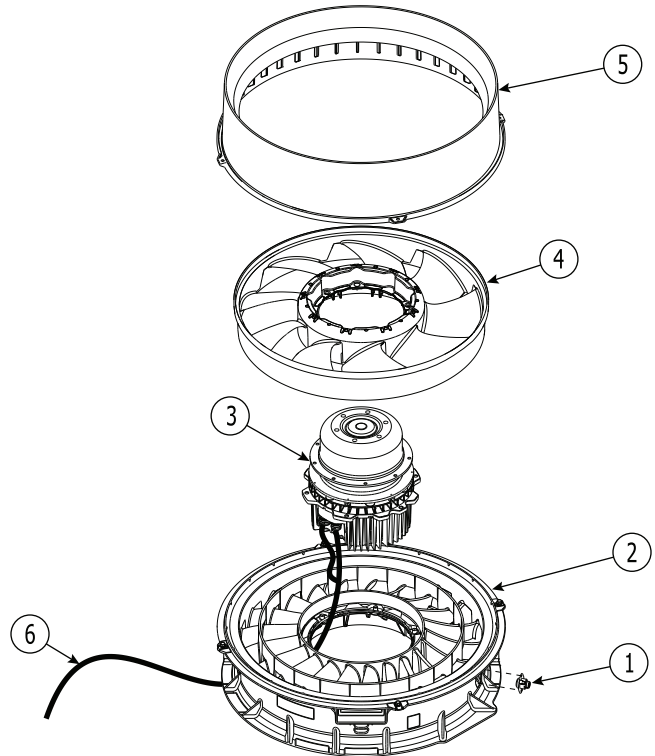


Fig. 14 — High Static Fan System Re-Assembly

Reinstalling Motor and Fan Assembly

See Fig. 15.

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. Align (if necessary) two front holes and fasten stator to fan deck with 8 #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.

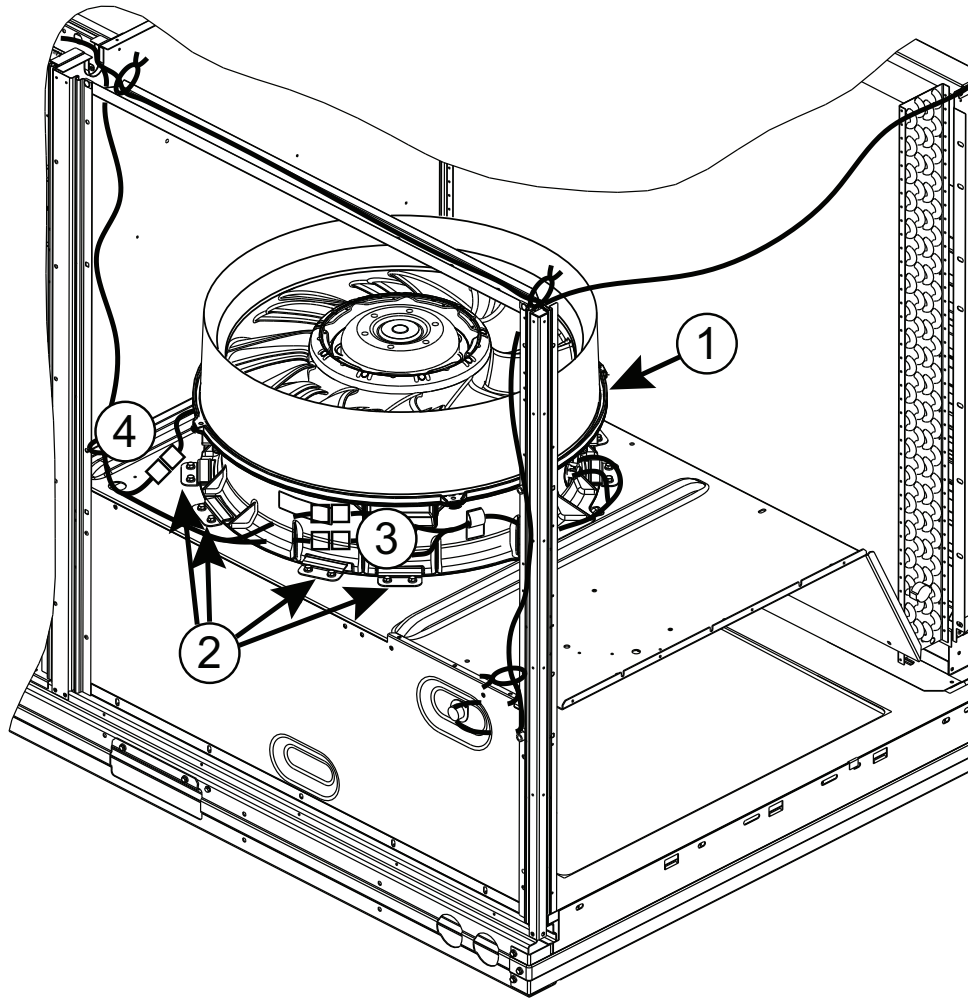


Fig. 15 — Fan Assembly Installation

2- Speed Indoor Fan Motor

All 547K units with Axion™ Fan Technology come factory set to automatically adjust the indoor fan motor speed in sequence with the unit's ventilation, cooling, and heating operation. See Table 1 for fan operation for various modes.

Table 1 — Percentage of Vdc Setting

UNIT	HIGH COOL	HEAT	LOW COOL	VENT
547K*08	100%	100%	60%	60%
547K*09	100%	100%	50%	50%
547K*12	100%	100%	60%	60%
547K*14	100%	100%	60%	60%

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 (Outdoor)

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.

Evaporator Coil (Indoor)

The evaporator coil is traditional round-tube, plate-fin technology. Tube and fin construction is of various optional materials and coatings (See "Model Number Nomenclature" on page 68.). Coils are multiple-row.

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® environmentally balanced coil cleaner is essential to extend the life of coils. This cleaner is available from Replacement Components Division as part number P902-0301 for a one gallon container, and part number 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. 16.)

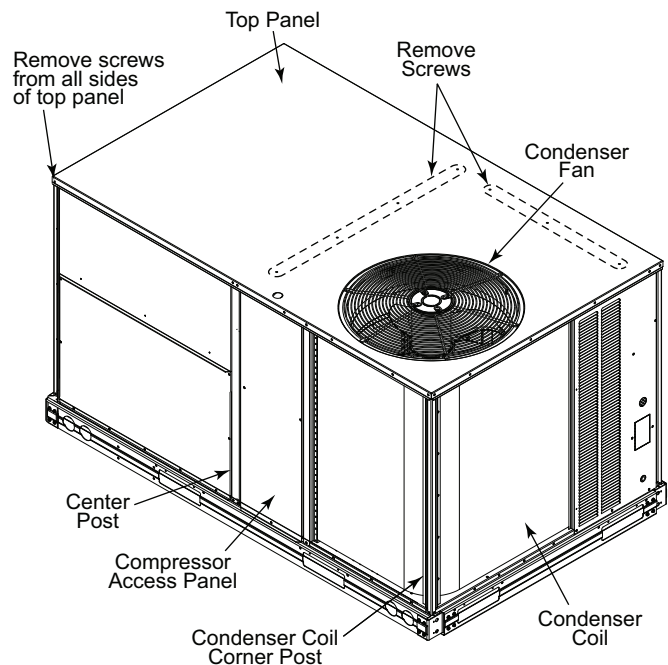


Fig. 16 — Location of Screws and Coil Corner Post

3. Lift and rotate the top panel at the condenser fan end and rotate the panel 90 degrees. Support the top panel so it remains level while resting on the condenser fan as shown in Fig. 17.

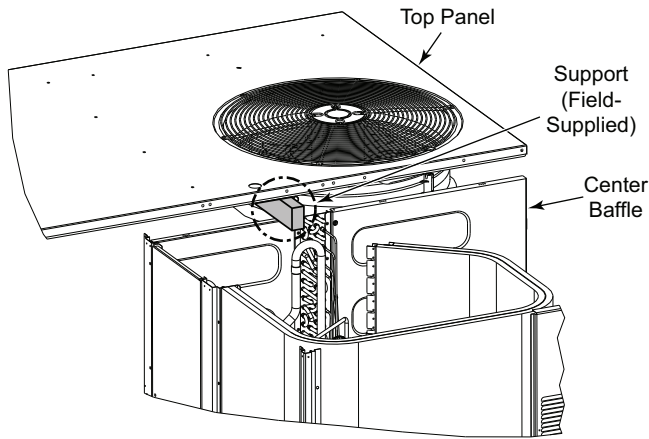


Fig. 17 — Top Panel Position

4. Remove the compressor access panel to access the lower coil clip. The condenser coil corner post may also be removed.
5. Remove the screws from both sides of the 4 coil retaining clips on the hairpin end of the coil tube sheets. (See Fig. 18.)
6. Remove the 4 retaining clips.

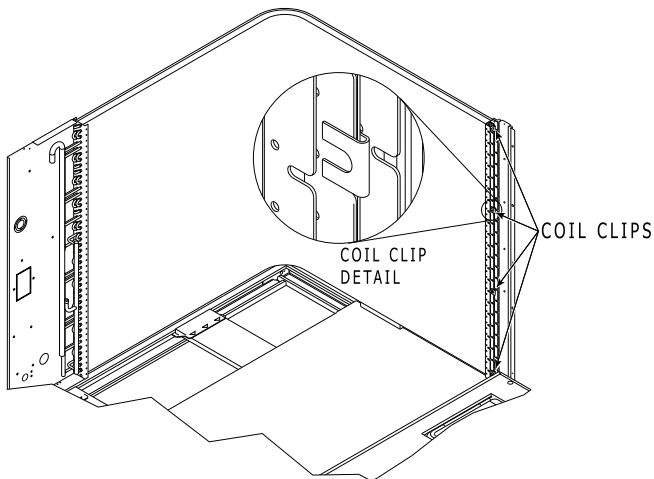
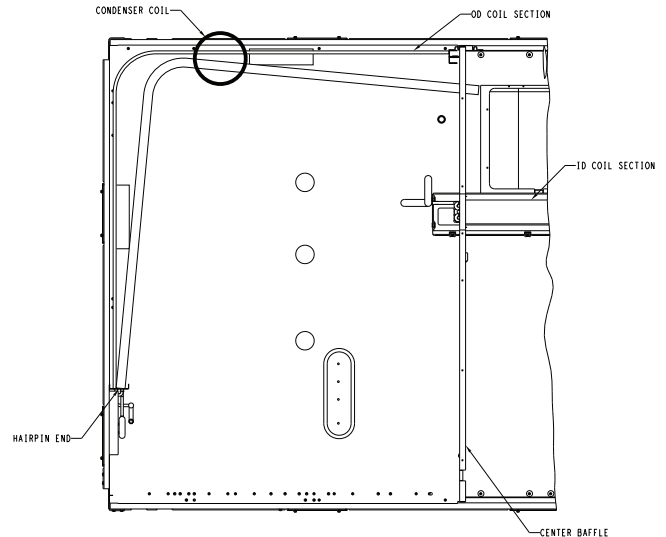


Fig. 18 — Condenser Coil Clips

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. 19.)
9. Clean the outer coil surface to remove surface loaded fibers or dirt. See "Remove Surface Loaded Fibers" on page 12 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.



**Fig. 19 — 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 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.

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. 547K*08 and 547K*09 unit outdoor coils contain a vapor header check valve. 547K*08-14 unit indoor coils contain a vapor header check valve. See Fig. 20-27 and Tables 2-10 for typical unit piping schematic of parallel coil circuits during evaporator-function operation and converging coil circuits during the condenser-function operation.

Table 2 — 547K*08-09 – Cooling Mode

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

Table 3 — 547K*08-09 – Heating Mode

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

Table 4 — 547K*08-09 – Defrost Mode

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

Table 5 — 547K*12 – Cooling Mode

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

Table 6 — 547K*12 – Heating Mode

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

Table 7 — 547K*12 – Defrost Mode

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

Table 8 — 547K*14 – Cooling Mode

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

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Table 9 — 547K*14 – Heating Mode

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

Table 10 — 547K*14 – Defrost Mode

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

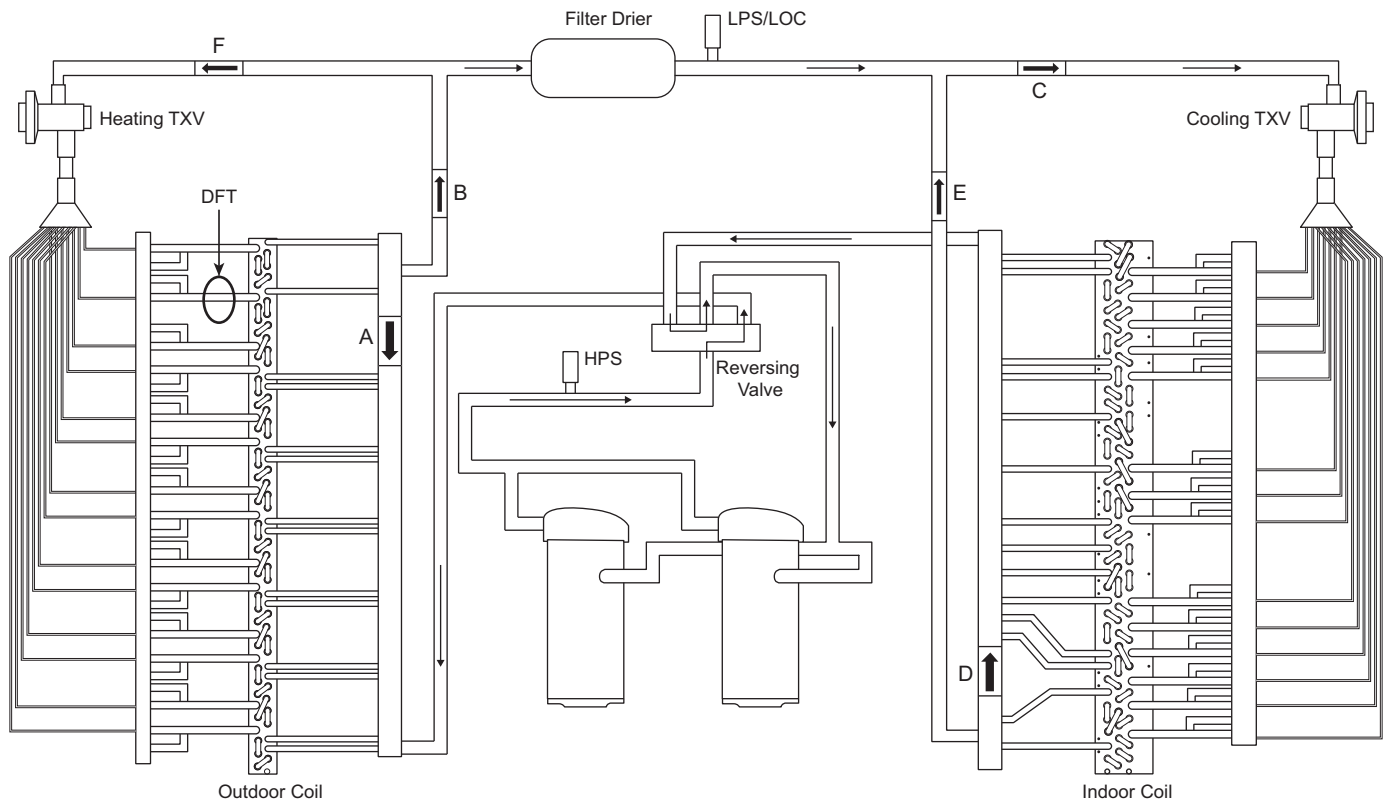


Fig. 20 — Piping Schematic — 547K*08 Cooling Mode

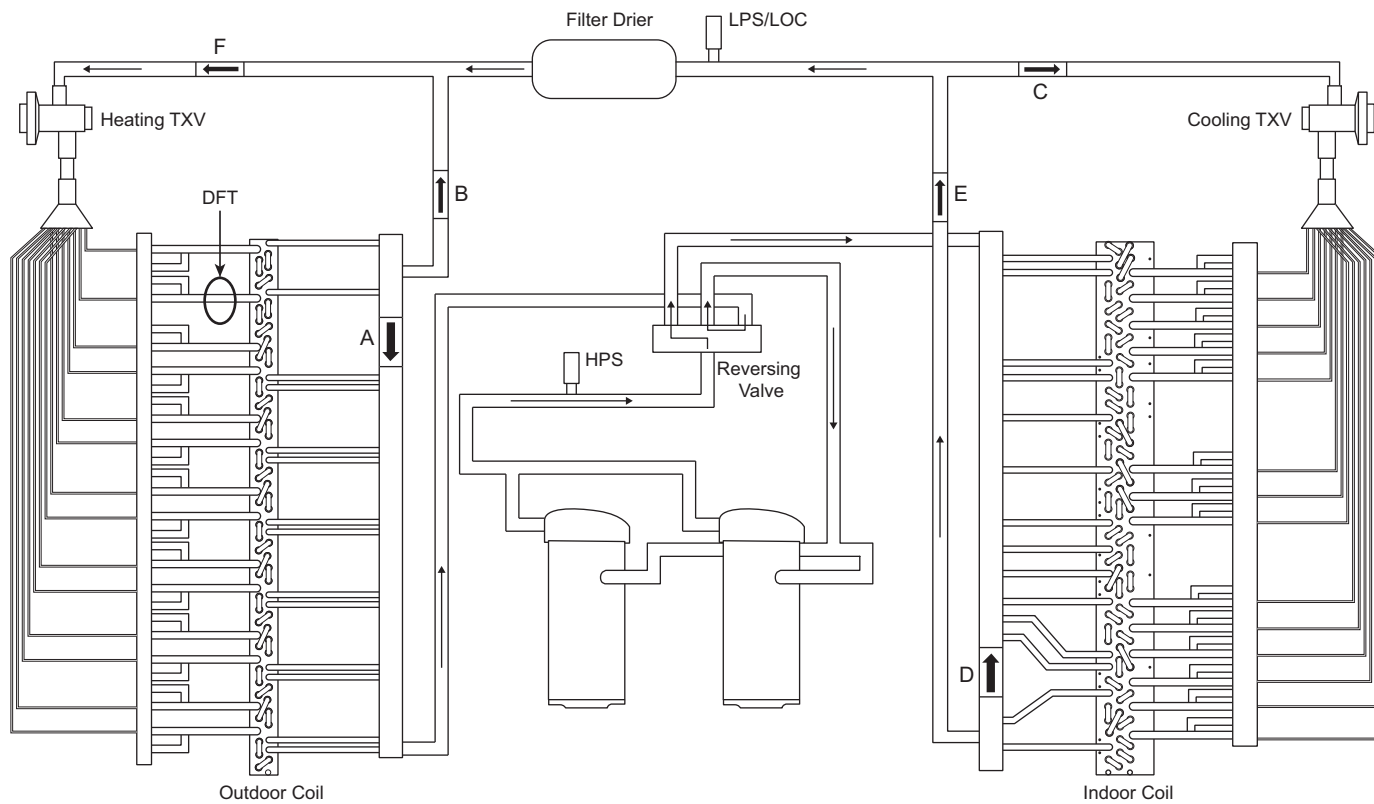


Fig. 21 — Piping Schematic — 547K*08 Heating Mode

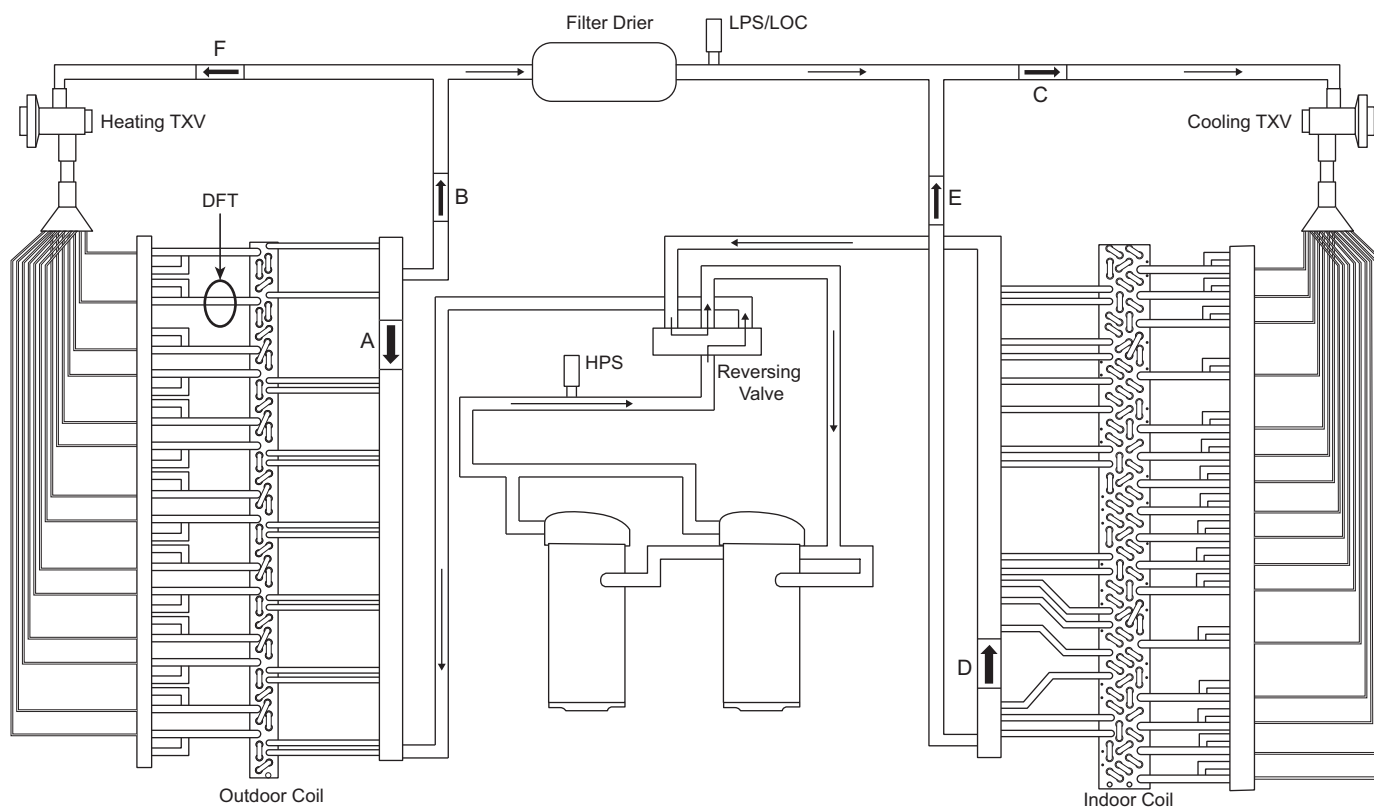


Fig. 22 — Piping Schematic — 547K*09 Cooling Mode

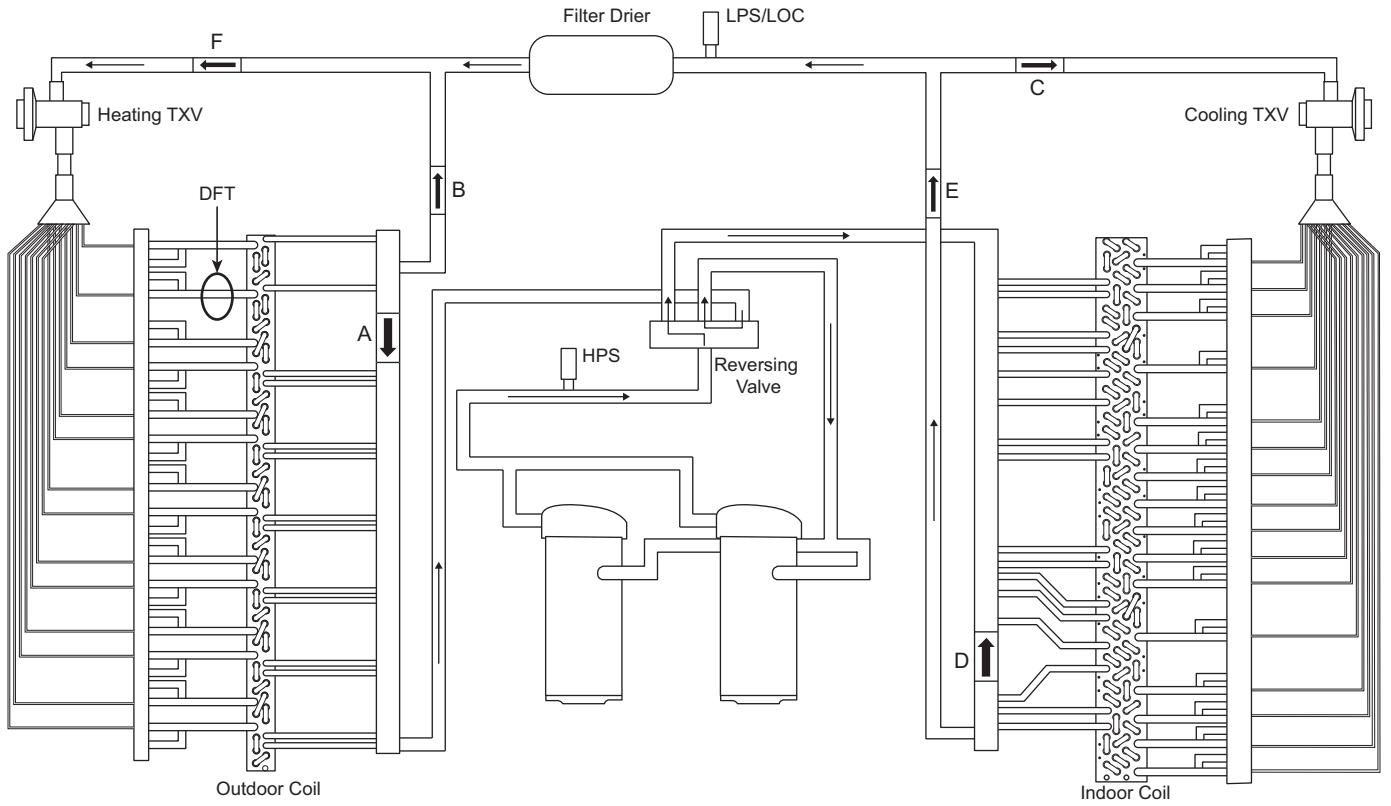


Fig. 23 — Piping Schematic — 547K*09 Heating Mode

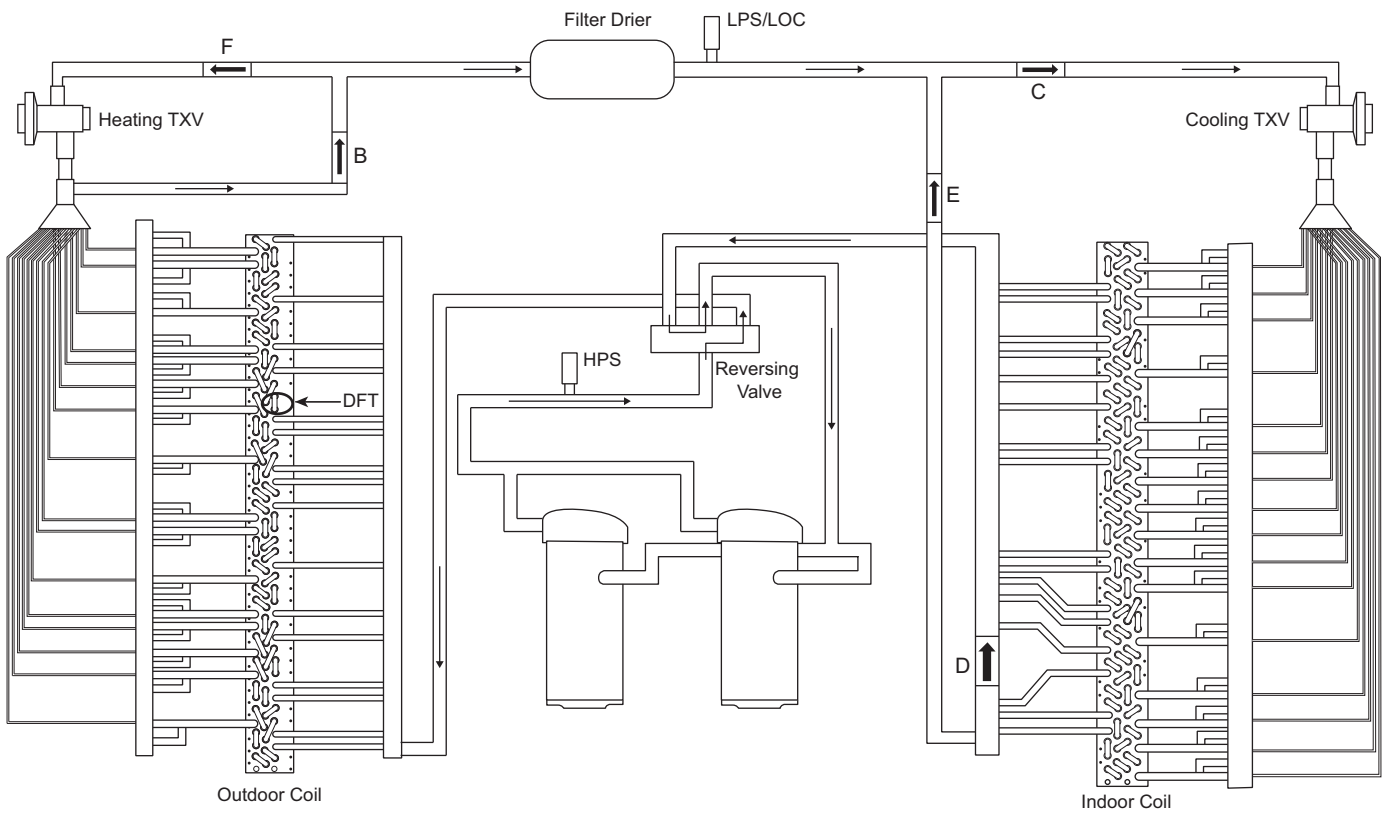


Fig. 24 — Piping Schematic — 547K*12 Cooling Mode

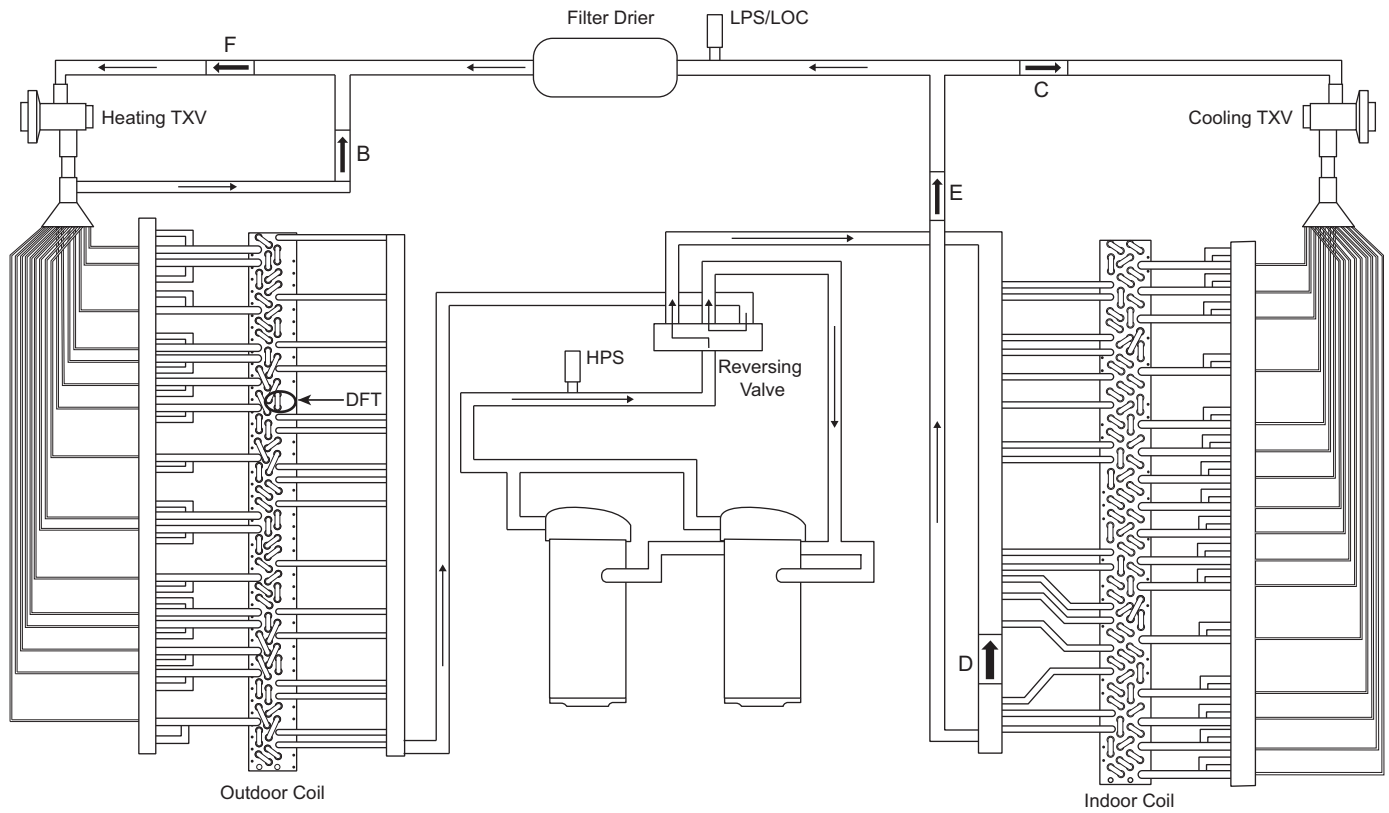


Fig. 25 — Piping Schematic — 547K*12 Heating Mode

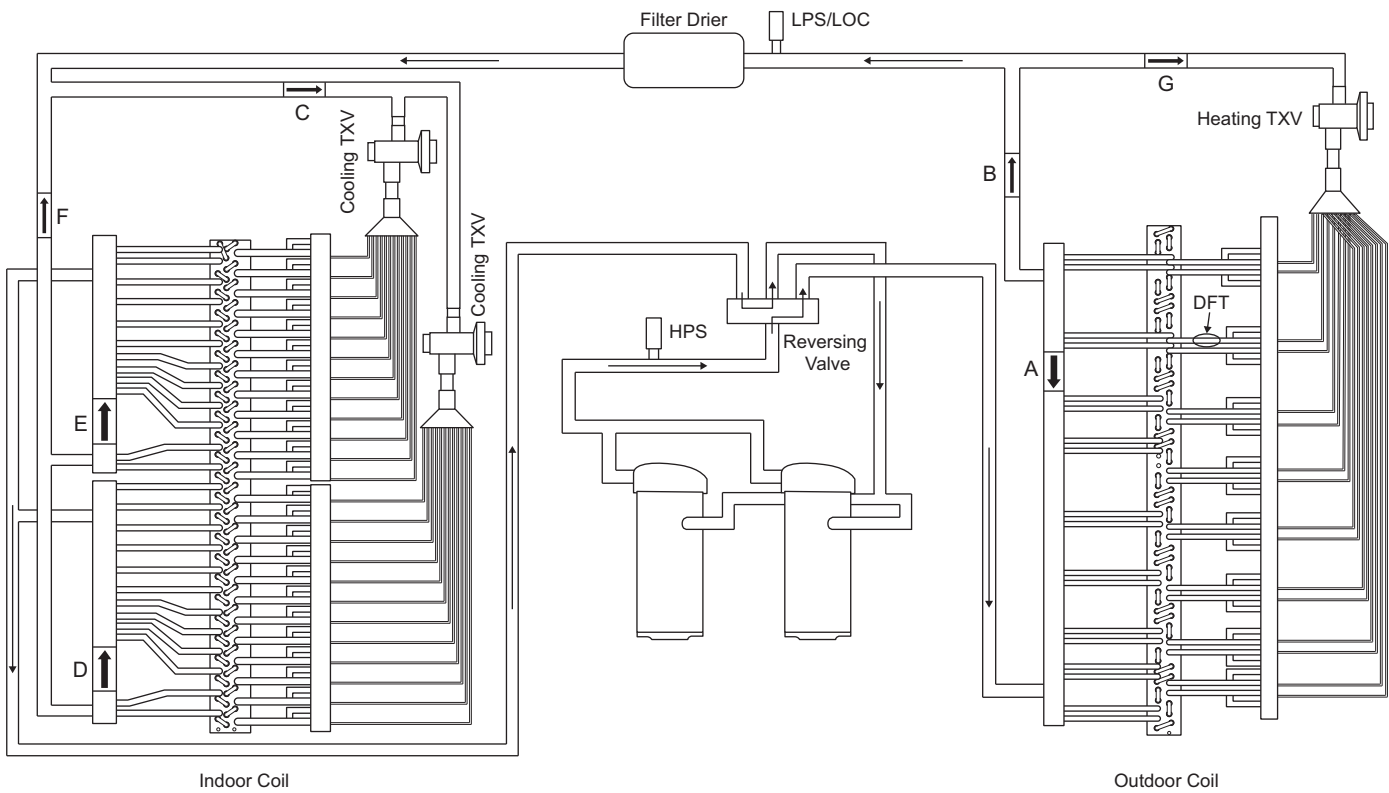


Fig. 26 — Piping Schematic — 547K*14 Cooling Mode

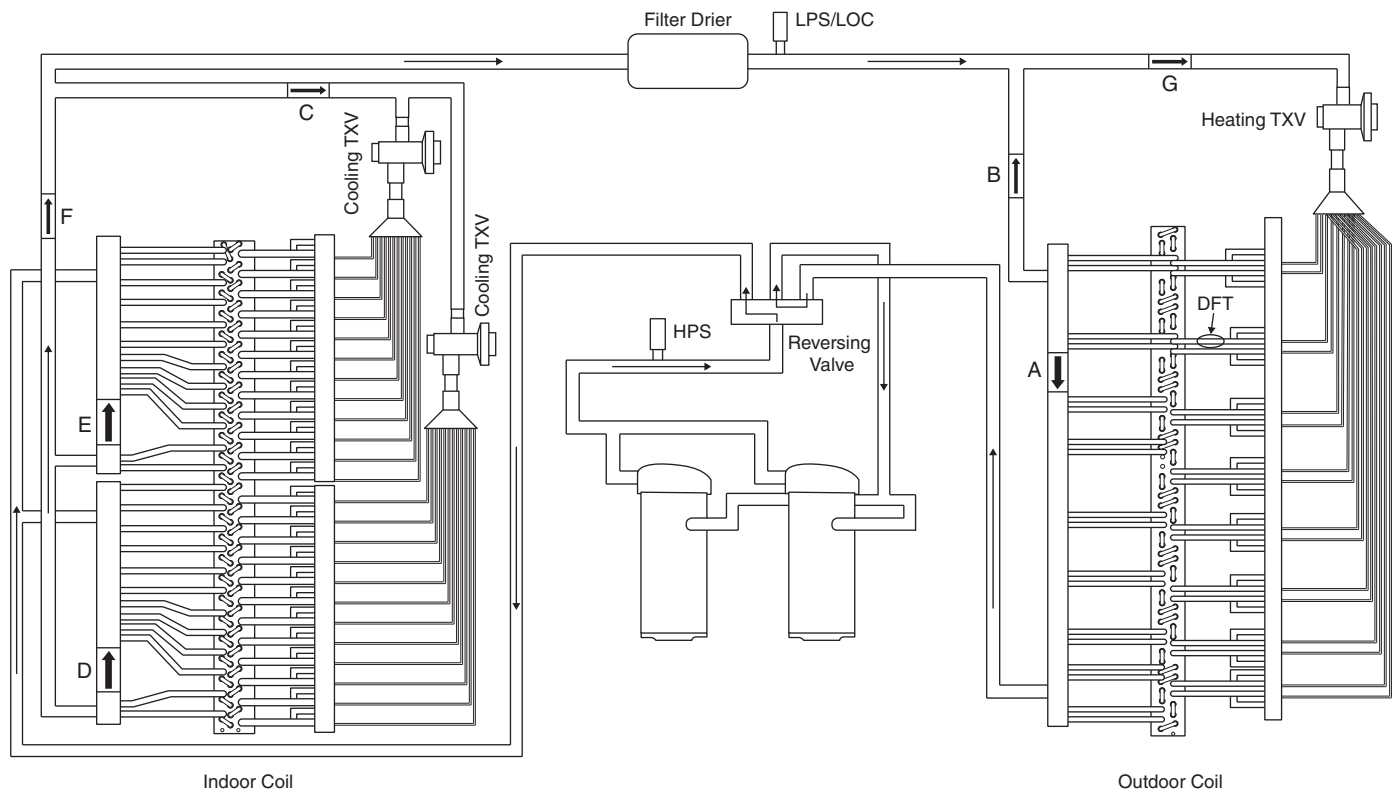


Fig. 27 — Piping Schematic — 547K*14 Heating Mode

THERMOSTATIC EXPANSION VALVE (TXV)

All 547K 08-14 units include TXV control. The TXV is a bi-flow, bleed port expansion valve with an external equalizer. The TXVs are specifically designed to operate with Puron® refrigerant (R-410A). 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.
3. The pin is spring loaded, which exerts pressure on the underside of the diaphragm. Therefore, the bulb pressure works against the spring pressure and evaporator suction pressure to open the valve. If the load increases, the temperature increases at the bulb, which increases the pressure on the top side 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 on page 20.)
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.

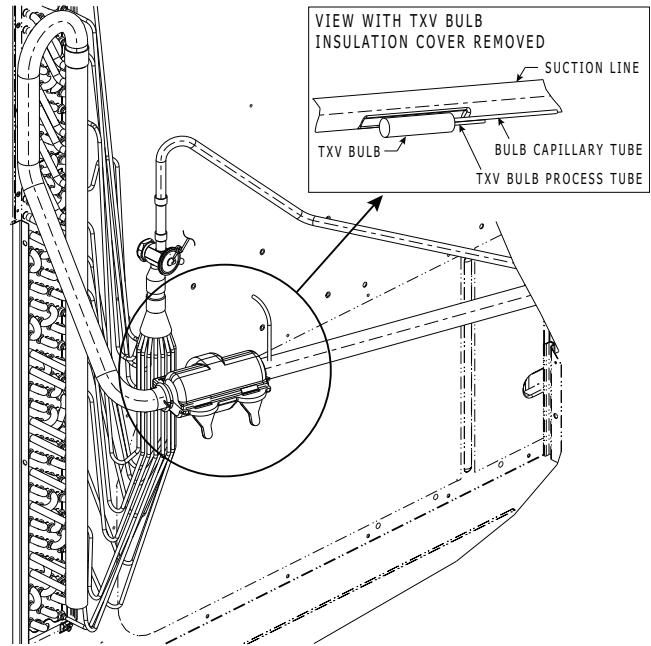


Fig. 28 — TXV Valve and Sensing Bulb Location

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.

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 *Bryant 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. 30-33, 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.

547K SIZE DESIGNATION	NOMINAL TONS REFERENCE
08	7.5
09	8.5
12	10.0
14	12.5

EXAMPLE:

Model	547KM08
Outdoor Temperature	85°F (29°C)
Suction Pressure	140 psig (965 kPa)
Suction Temperature should be	65°F (16°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.

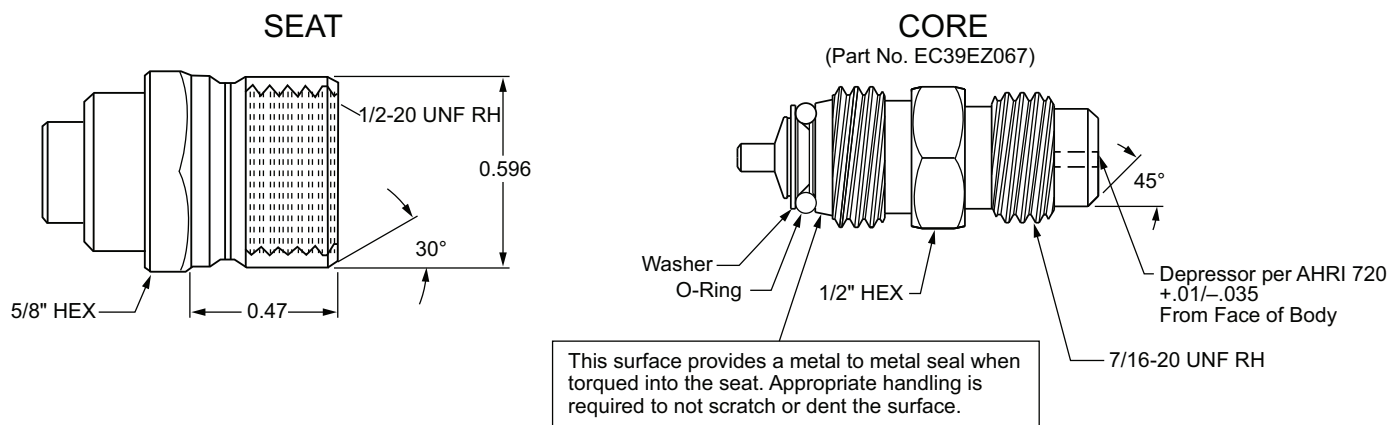


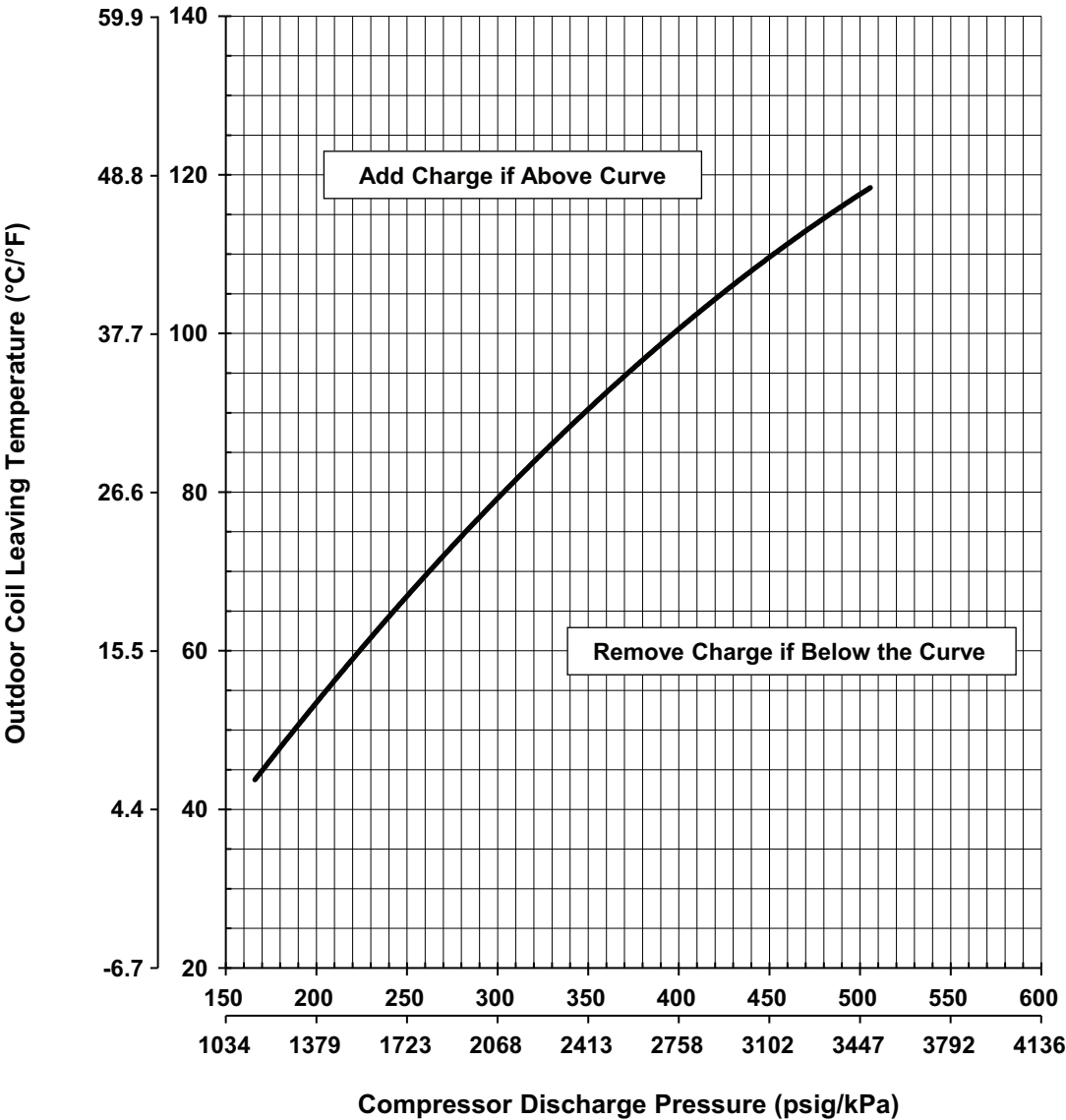
Fig. 29 — CoreMax™ 1 Access Port Assembly

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COOLING CHARGING CHARTS

7.5 Ton 50FCQ / 547K / RHV
R-410A Refrigerant Charging Chart

(Unit must run in cooling mode, have both compressors on and outdoor fans on high speed)



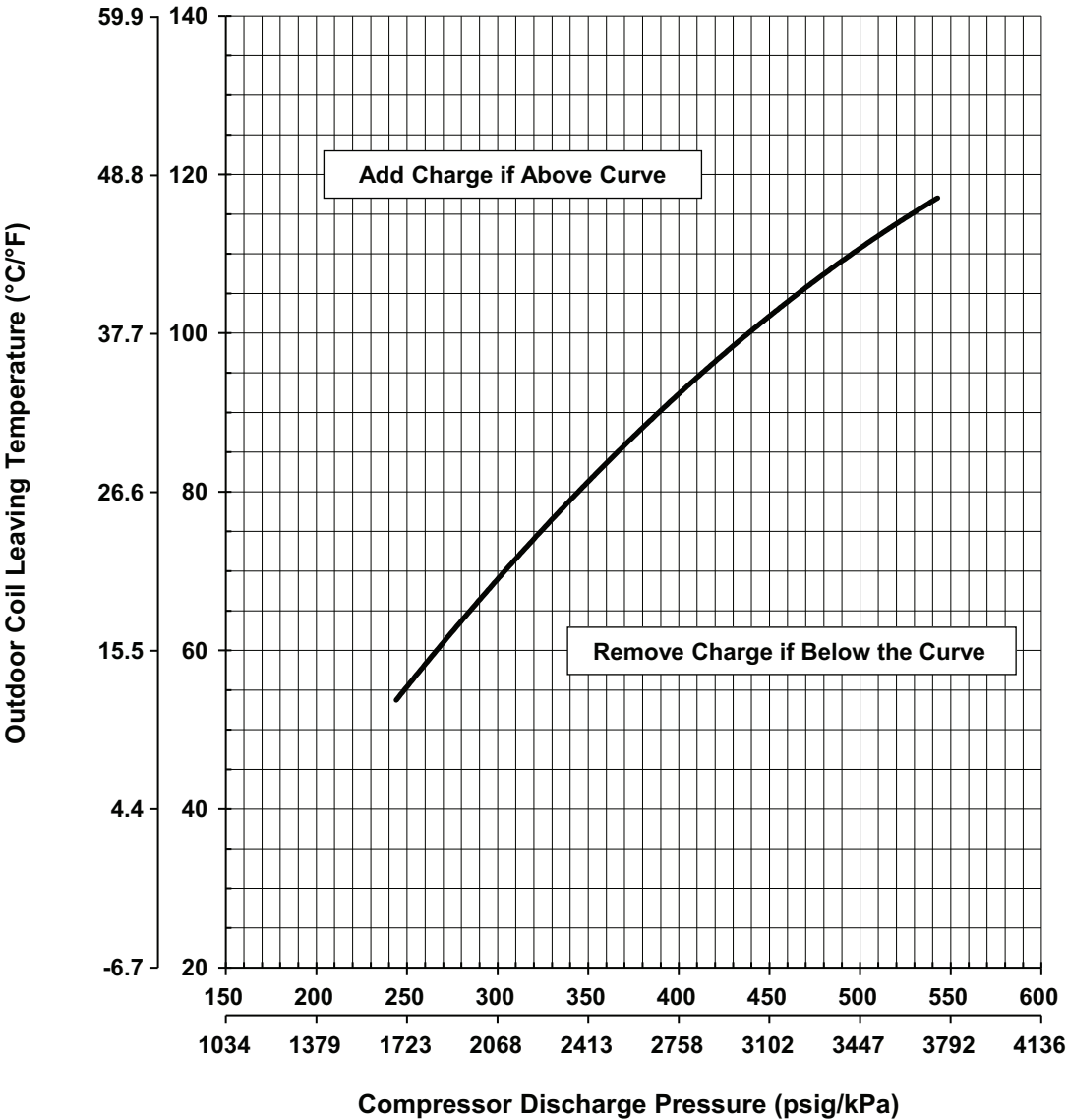
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Fig. 30 — Cooling Charging Chart - 7.5 Ton

COOLING CHARGING CHARTS

**8.5 Ton 50FCQ / 547K / RHV
R-410A Refrigerant Charging Chart**

(Unit must run in cooling mode, have both compressors on and outdoor fans on high speed)



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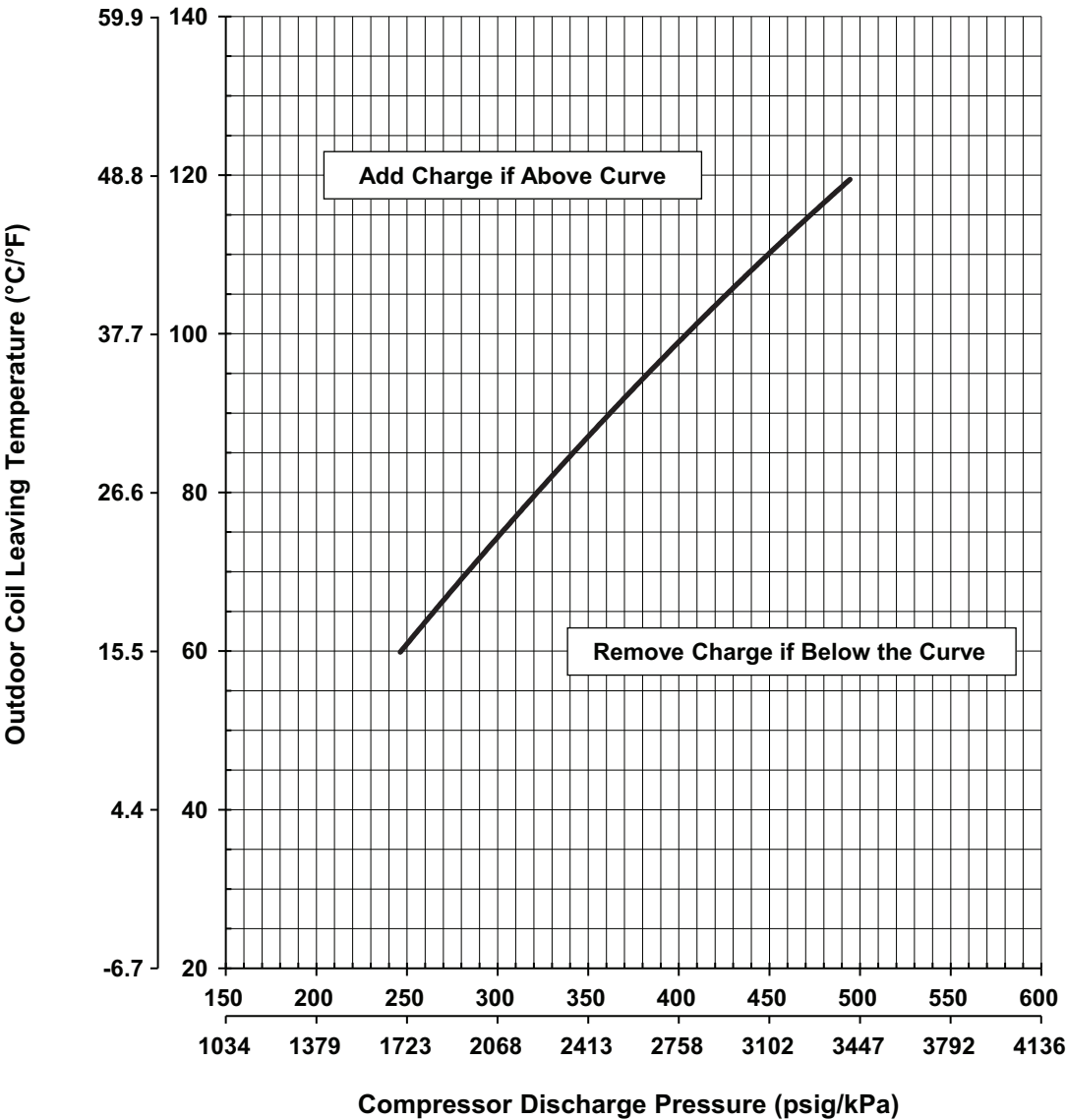
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Fig. 31 — Cooling Charging Chart - 8.5 Ton

COOLING CHARGING CHARTS

10 Ton 50FCQ / 547K / RHV
R-410A Refrigerant Charging Chart

(Unit must run in cooling mode, have both compressors on and outdoor fans on high speed)



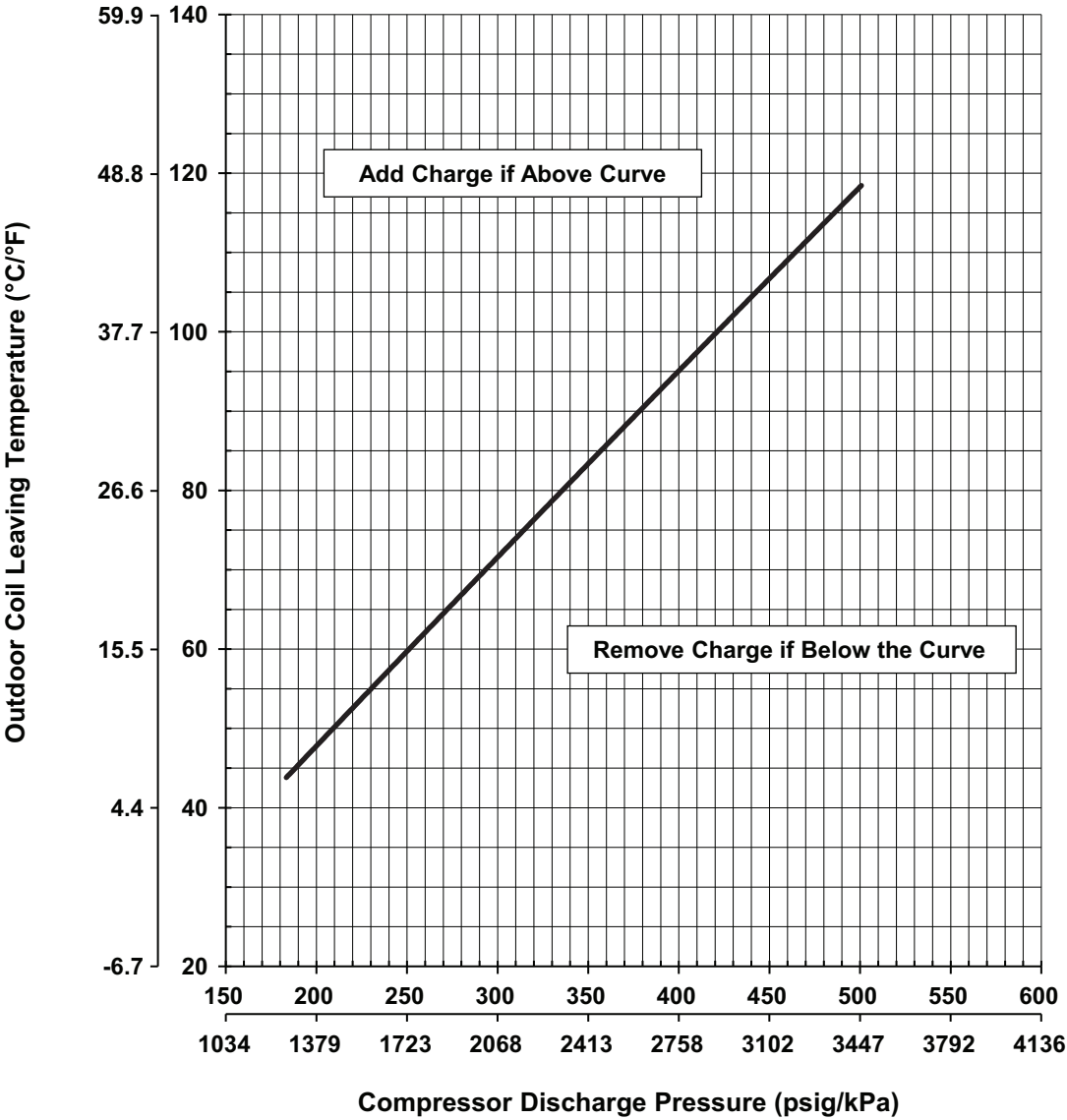
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Fig. 32 — Cooling Charging Chart - 10.0 Ton

COOLING CHARGING CHARTS

**12.5 Ton 50FCQ / 547K / RHV
R-410A Refrigerant Charging Chart**

(Unit must run in cooling mode, have both compressors on and outdoor fans on high speed)



50TM002615 rev. -

Fig. 33 — Cooling Charging Chart - 12.5 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 R-410A refrigerant system and uses a polyolester (POE) oil. This oil is extremely hygroscopic, meaning it absorbs water readily. POE oils can absorb 15 times as much water as other oils designed for HCFC and CFC refrigerants. Avoid exposure of the oil to the atmosphere.

⚠ 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.

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.

NOTE: 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.

4. Turn off power to the unit.
5. Reverse any two of the three unit power leads.
6. 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.
7. 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 (4482 kPa).

⚠ CAUTION

EQUIPMENT DAMAGE

Failure to follow this caution can result in equipment damage.

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

Condenser-Fan Adjustment

1. Shut off unit power supply. Install lockout tag.
2. Remove condenser-fan assembly (grille, motor, and fan). (See Fig. 34.)
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.

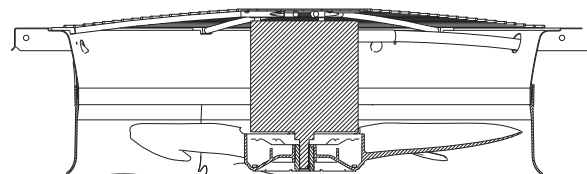


Fig. 34 — Condenser Fan Adjustment

Troubleshooting Cooling System

Refer to Table 11 for additional troubleshooting topics.

Table 11 — 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.	Replace filter.
	Unit undersized for load.	Decrease load or increase unit size.
	Thermostat set too low (cooling).	Reset thermostat.
	Low refrigerant charge.	Locate leak; repair and recharge.
	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 547K 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. 35.)

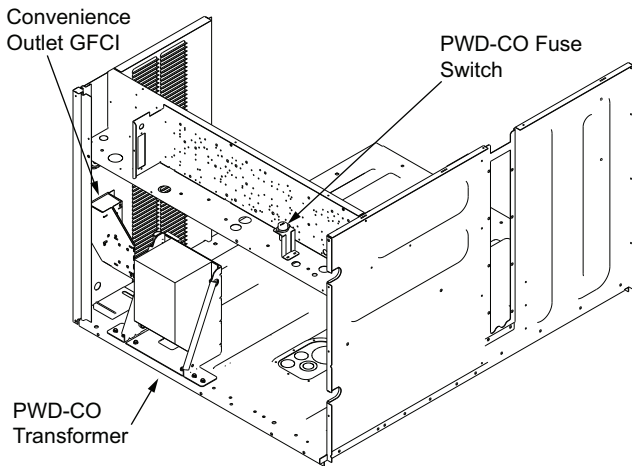


Fig. 35 — Convenience Outlet Location

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 CONVE-NIENCE 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. 36.
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.

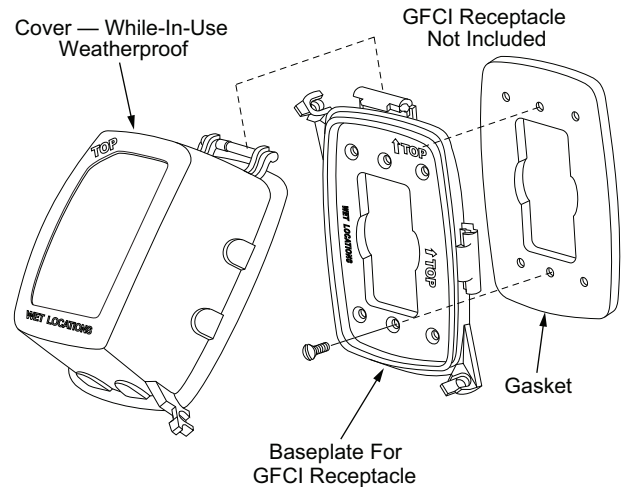


Fig. 36 — Weatherproof Cover Installation

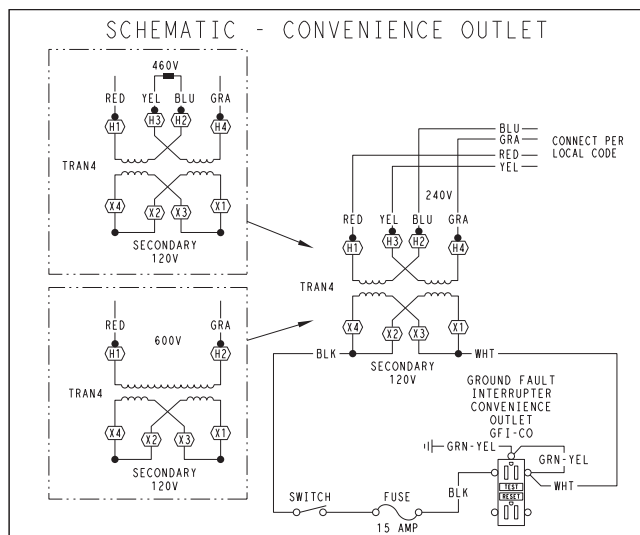
Non-Powered Type

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. 35.)

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 switch; this will provide service power to the unit when the unit disconnect switch is open. Other connection methods will result in the convenience outlet circuit being de-energized when the unit disconnect switch is open. (See Fig. 37.)



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 L2: Splice BLU + YEL L3: GRA	H1 H2 + H3 H4
575	600	L1: RED L2: GRA	H1 H2

Fig. 37 — 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 Fusetron¹ T-15, non-renewable screw-in (Edison base) type plug fuse.

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

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.

COMMERICAL DEFROST CONTROL

On 547K units equipped with electro-mechanical controls the Defrost Control Board (DFB) coordinates thermostat demands for supply fan control, 1 or 2 stage cooling, 2 stage heating, emergency heating and defrost control with unit operating sequences. The DFB also provides an indoor fan off delay feature (user selectable). See Fig. 38 for board arrangement.

The DFB is located in the main control box of the 547K unit (see Fig. 39). All connections are factory-made through harnesses from the UCB (unit control board), OFR (outdoor fan relay), EHR (electric heat relay), reversing valve solenoids, and defrost thermostats. Refer to Table 12 for details of DFB Inputs and Outputs.

NOTE: “IFO” terminal, “IFM” terminal and “SPPCOMPSTG2” terminal are not used on this unit and should remain open.

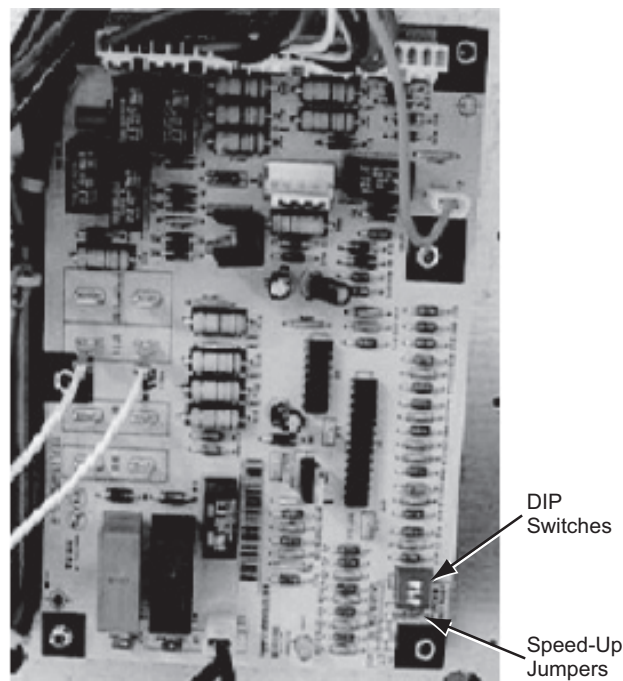


Fig. 38 — Defrost Control Board Arrangement

NOTE: FUSES FOR 230V ARE LOCATED IN CONTROL BOX. FUSES FOR 460/575V ARE LOCATED BELOW THE CONTROL BOX.

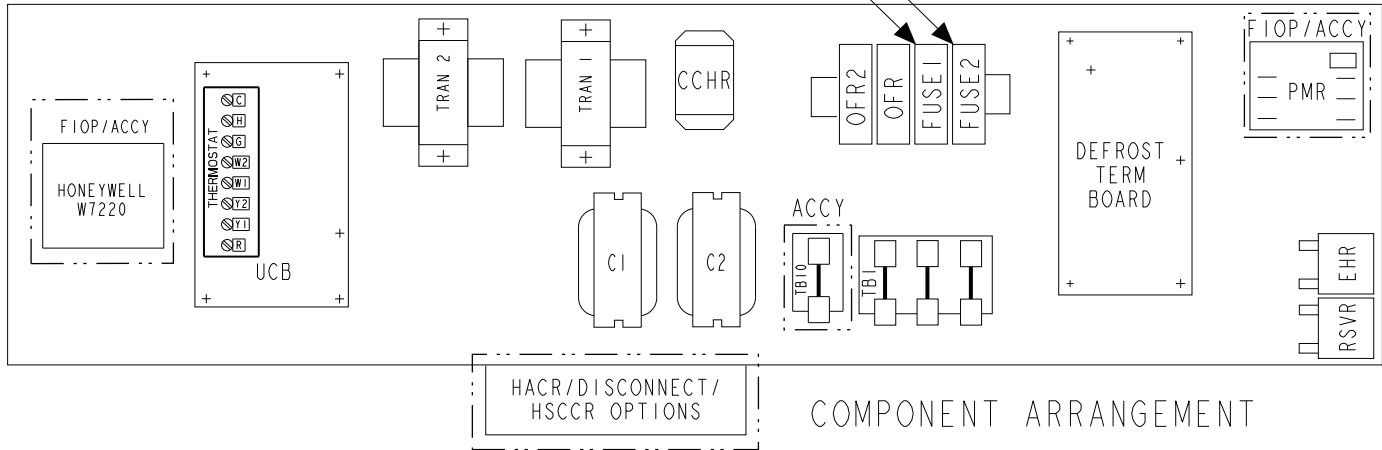


Fig. 39 — Defrost Control Board Location - 547K*08-14 Electro-Mechanical Units

Table 12 — 547K Defrost Board I/O and Jumper Configurations

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	—	Jumper from DFT2
DFT 2	DI, 24 vac	DFT-2 to DFT-2	—	
OUTPUTS				
IFO Fan On	DO, 24 vac	P3-9	UCB-MAIN-4	
OF OD Fan On	DO, 24 vac	OF	OFR	
RVSR	DO, 24 vac	P3-7 and P3-6	—	Energize in COOL
RVSR COM	DO, 24 vac	P3-5	—	Energize in COOL
COMP 1	DO, 24 vac	P3-10	UCB-REHEAT/HP-2	
COMP 2	DO, 24 vac	P3-8	UCB-REHEAT/HP-4	
HEAT 2	DO, 24 vac	E-HEAT	EHR	
COM	24 vac	P3-3	EHR	
CONFIGURATION				
Select Jumper	24 vac	P1-1 to P1-3	—	
SPEED-UP CONFIGURATION^{a,b}				
Speed-Up Jumper	—	JMP17	—	
Speed-Up Jumper	—	JMP18	—	

NOTE(S):

a. Jumper JMP17 to JMP18 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).

b. Jumper JMP17 to JMP18 for 5-20 seconds: Forced Defrost — Defrost runs for 30 seconds if DFT2 is open.

Reversing Valve Control

The DFB has two outputs for unit reversing valve control. Operation of the reversing valves is based on internal logic; this application does not use an “O” or “B” signal to determine reversing valve position. Reversing valves are energized during the cooling stages and 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 (RTU Open controller); it generates commands to start compressors with or without reversing valve operation to produce Stage 1 Cooling (one compressor runs), Stage 2 Cooling (both compressors run) or Stage 1 Heating (both compressors run).

Auxiliary (Electric) Heat Control

The 547K unit can be equipped with one or two auxiliary electric heaters, to provide a second stage of heating. The DFB will energize this Heating System for a Stage 2 Heating Command (heaters operate concurrently with compressor(s) in the Stage 1 Heating cycle), for an Emergency Heating sequence (compressors are off and only the electric heaters are energized) and also during the Defrost cycle (to eliminate a “cold blow” condition in the space).

Defrost

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

The continuous run period is a fixed time period between the end of the last defrost cycle (or start of the current Heating cycle) during which no defrost will be permitted. This period can be set at 30, 60, 90 or 120 minutes by changing the positions of DIP switches SW1 and SW2 (see Fig. 40 and Table 13). 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.

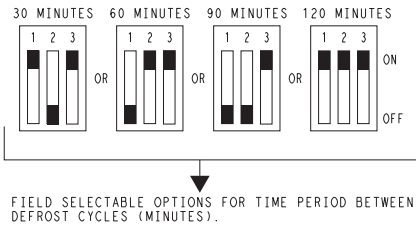


Fig. 40 — DIP Switch Settings - Defrost Board

Table 13 — 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 (UNITS 547K*08-12)

IMPORTANT: The following instructions are for the 547K*08-12 size units. Refer to your model number nomenclature to verify the correct size of your equipment. Instructions for size 14 start on page 34.

The 547K*08-12 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 547K Model electric heaters are one module containing either one or two banks of electric heat coils.

Heater modules are installed in the compartment below the indoor (supply) fan outlet. Access is through the indoor access panel. Heater modules slide into the compartment on tracks along the bottom of the heater opening. (See Fig. 41-43.)

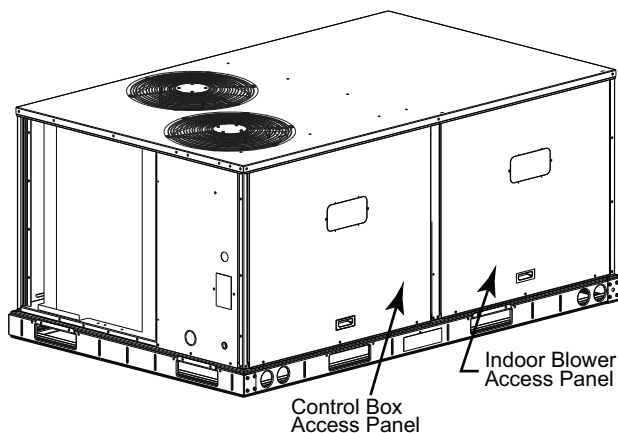


Fig. 41 — Typical Access Panel Location

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.

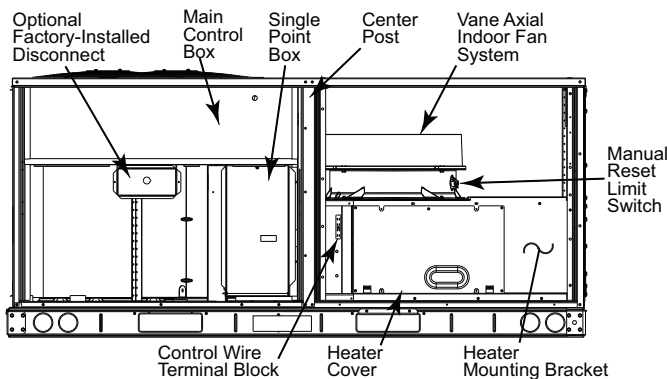


Fig. 42 — Typical Component Location

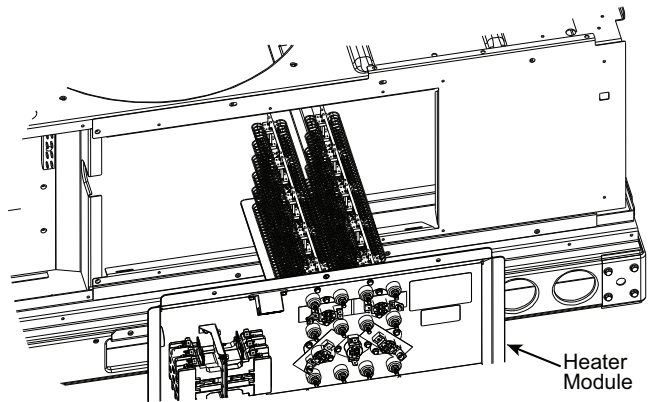


Fig. 43 — Typical Module Installation

Single Point Boxes and Supplementary Fuses

When the unit MOCP device value exceeds 60A, unit-mounted supplementary fuses are required for each heater circuit. These fuses are included in accessory single point boxes, with power distribution and fuse blocks. The single point box will be installed directly under the unit control box, just to the left of the partition separating the indoor section (with electric heaters) from the outdoor section. The single point box has a hinged access cover. (See Fig. 44.)

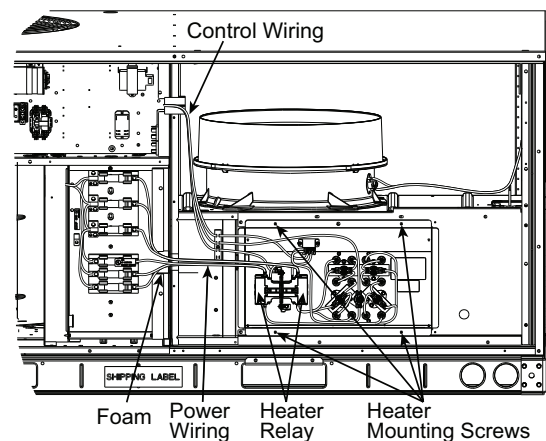


Fig. 44 — Typical Single Point Installation

On 547K units, all fuses are 60A. Single point boxes containing fuses for 208/230-v applications use UL Class RK5 250-v fuses (Bussmann FRNR 60 or Shawmut TR 60R). Single point boxes for 460-v and 575-v applications use UL Class T 600-v fuses (Bussmann JJS 60 or Shawmut A6T 60).

NOTE: All heaters are qualified for use with a 60A fuse, regardless of actual heater ampacity, so only 60A fuses are necessary.

Safety Devices

CRHEATER411A00 - CRHEATER428A00 electric heater applications use a combination of 24-v control side break/auto-reset, line-break/non-resettable "one shot" limit switches and a fan stator/manual reset limit switch to protect the unit against over-temperature situations.

Line-break/auto-reset limit switches, 24-v control side break/auto-reset and line-break/non-resettable "one shot" limit switches are mounted on the base plate of each heater module. See Fig. 45. These are accessed through the indoor access panel. Remove the switch by removing two screws into the base plate and extracting the existing switch.

Fan stator/manual reset limit switch is located in the side plate of the indoor (supply) fan housing. (See Fig. 45.)

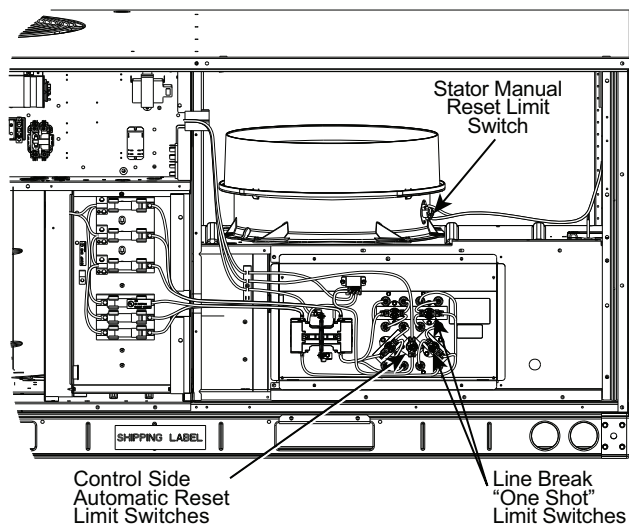


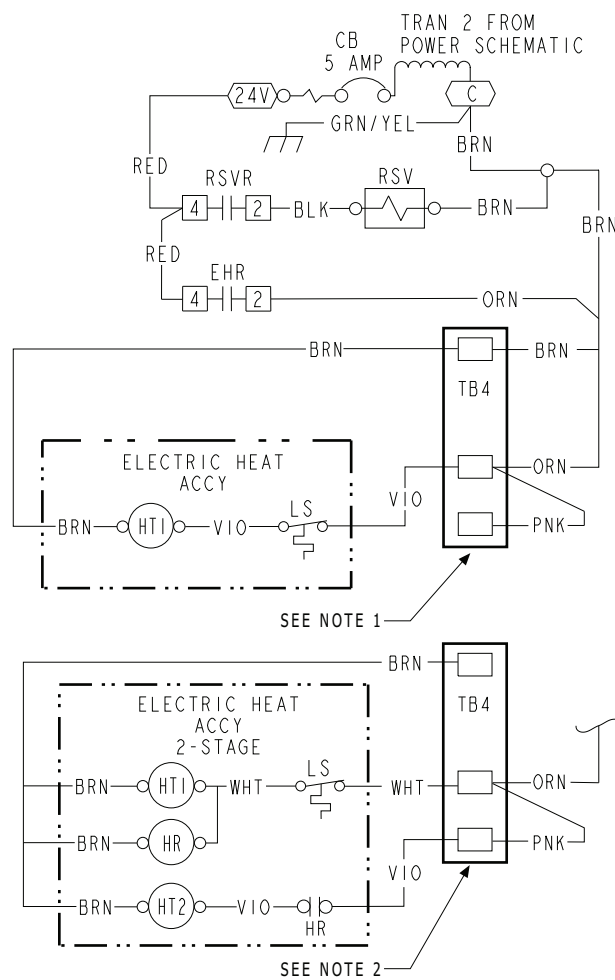
Fig. 45 — Typical Location of Heater Limit Switches (3-phase heater shown)

Field Power Connections

Tap conductors must be installed between the base unit's field power connection lugs and the single point box (with or without fuses). See Fig. 46. Refer to unit wiring schematic. Use copper wire only. For connection using the single point box without fuses, connect the field power supply conductors to the heater power leads and the field-supplied tap conductors inside the single point box. Use UL-approved pressure connectors (field-supplied) for these splice joints.

Low-Voltage Control Connections

Pull the low-voltage control leads from the heater module(s) — ORN, VIO and BRN — to the 4-pole terminal board TB4 located on the heater bulkhead to the left of heater 1. Connect the ORN lead to terminal TB4-1. Connect the VIO lead to terminal TB4-2. Connect the BRN lead to terminal TB4-3. (See Fig. 46.)



- NOTE(S):
 1. TB4 LOCATED IN HEAT SECTION.
 2. TO CONVERT TO A SINGLE STAGE HEATER MOVE THE VIOLET WIRE AT TB4 TO CONNECT WITH WHITE WIRE.

Fig. 46 — Accessory Electric Heater Control Connections

Control and Power Wiring Diagrams

To reference the wiring diagrams for the correct unit configuration, refer to the Wiring Diagram Table on page 87.

ELECTRIC HEATERS (UNIT 547K*14)

IMPORTANT: The following instructions are for the 547K*14 size units. Refer to your model number nomenclature to verify the correct size of your equipment. Instructions for sizes 8-12 start on page 32.

The 547K*14 units may be equipped with field-installed accessory electric heaters. The heaters are modular in design, with heater frames holding open coil resistance wires strung through ceramic insulators, line-break limit switches and a control contactor.

Heater modules are installed in the compartment below the indoor (supply) fan outlet. Access is through the electric heat access panel. (See Fig. 47-49.)

Not all available heater modules may be used in every unit. Use only those heater modules that are UL listed for use in a specific

size unit. Refer to the label on the unit cabinet for the list of approved heaters.

Refer to the *Small Roof Top Units Accessory Electric Heater and Single Point Box* installation instructions for further details.

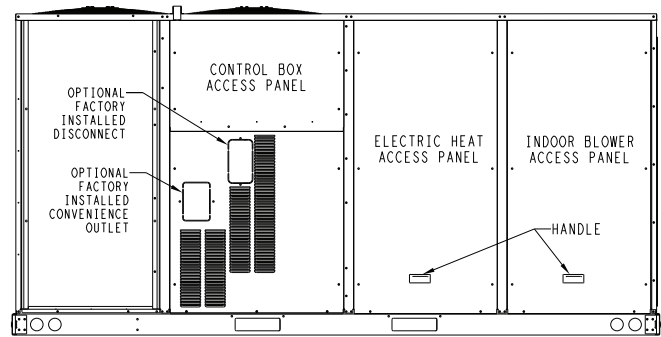
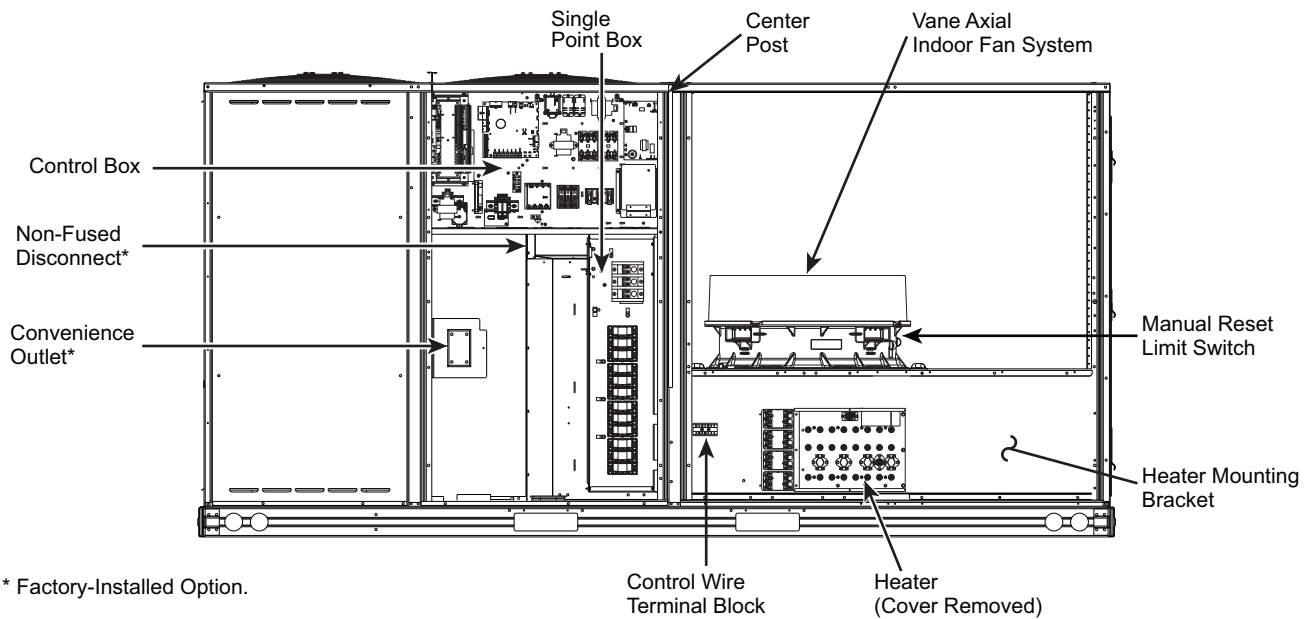


Fig. 47 — Access Panel Location



* Factory-Installed Option.

Fig. 48 — Component Location

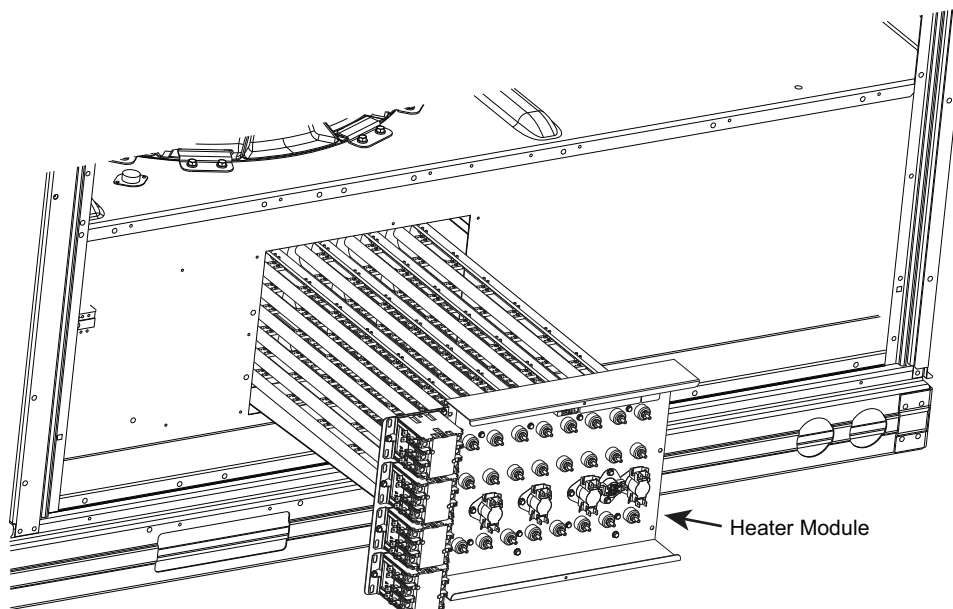


Fig. 49 — Heater Module Installation

Single Point Boxes and Supplementary Fuses

When the unit MOCP device value exceeds 60-A, unit-mounted supplementary fuses are required for each heater circuit. These fuses are included in accessory single point boxes, with power distribution and fuse blocks. The single point box will be installed directly under the unit control box, just to the left of the partition separating the indoor section (with electric heaters) from the outdoor section. The single point box has a hinged access cover. See Fig. 51. The single point box also includes a set of power taps and pigtails to complete the wiring between the single point box and the unit's main control box terminals. Refer to the Small Roof Top Units Accessory Electric Heater and single point box installation instructions for details on tap connections.

All fuses on 547K units are 60-A. (Note that all heaters are qualified for use with a 60-A fuse, regardless of actual heater ampacity, so only 60-A fuses are necessary.)

Single Point Boxes without Fuses

Unit heater applications not requiring supplemental fuses require a special single point box without any fuses. The accessory single point boxes contain a set of power taps and pigtails to complete the wiring between the single point box and the unit's main control box terminals. Refer to accessory heater and single point box installation instructions for details on tap connections.

Low-Voltage Control Connections

Pull the low-voltage control leads from the heater module — WHT, VIO and BRN to the 4-pole terminal board TB4 located on the heater bulkhead to the left of the Heater module. Connect the WHT lead from Heater circuit #1 to terminal TB4-1. For 2 stage heating, connect the VIO lead from Heater circuit #2 to terminal TB4-2. Connect the BRN lead(s) to terminal TB4-3. (See Fig. 50.)

Safety Devices

CRHEATER411A00 - CRHEATER428A00 electric heater applications use a combination of 24-v control side break/auto-reset, line-break/non-resettable "one shot" limit switches and a fan stator/manual reset limit switch to protect the unit against over-temperature situations.

Line-break/auto-reset limit switches, 24-v control side break/auto-reset and line-break/non-resettable "one shot" limit switches are

mounted on the base plate of each heater module. See Fig. 48. These are accessed through the indoor access panel. Remove the switch by removing two screws into the base plate and extracting the existing switch.

Fan stator/manual reset limit switch is located in the side plate of the indoor (supply) fan housing. (See Fig. 48.)

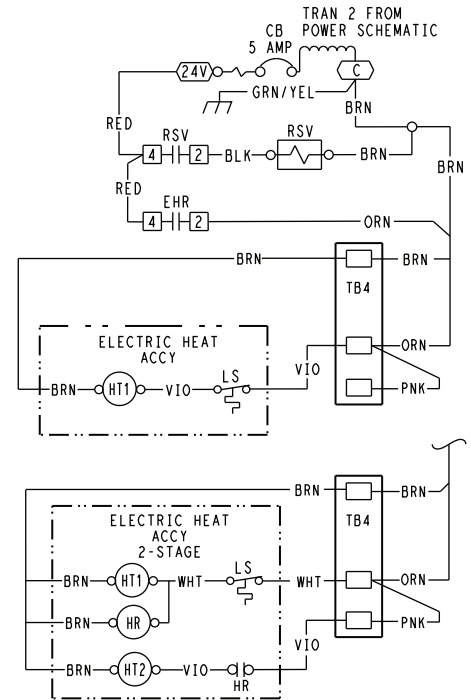


Fig. 50 — Accessory Electric Heater Control Connections
Control and Power Wiring Diagrams

To reference the wiring diagrams for the correct unit configuration, refer to the Wiring Diagram Table on page 87.

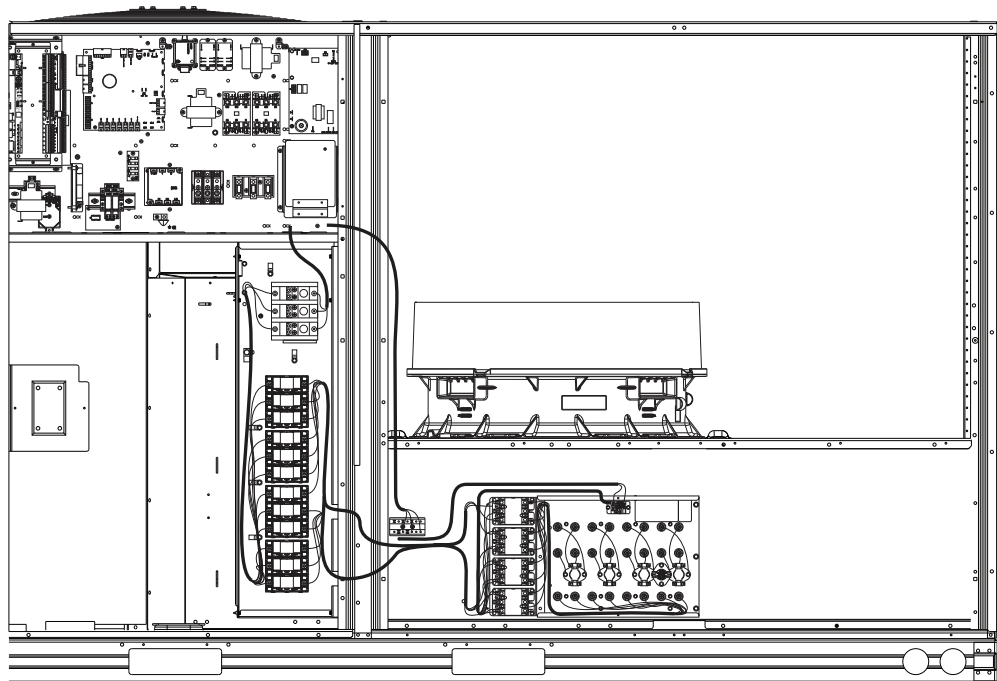


Fig. 51 — Typical Single Point Installation

SMOKE DETECTORS

Smoke detectors are available as factory-installed options on 547K 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. 52) includes a controller housing, a printed circuit board, and a clear plastic cover. The controller can be connected to one or two compatible duct smoke sensors. The clear plastic cover is secured to the housing with a single captive screw for easy access to the wiring terminals. The controller has three LEDs (for Power, Trouble and Alarm) and a manual test/reset button (on the cover face).

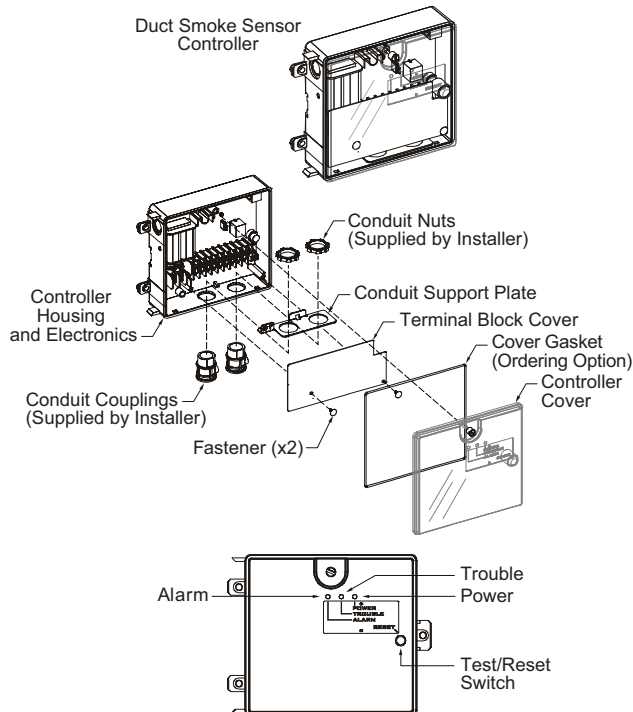


Fig. 52 — Controller Assembly

Smoke Detector Sensor

The smoke detector sensor (see Fig. 53) 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).

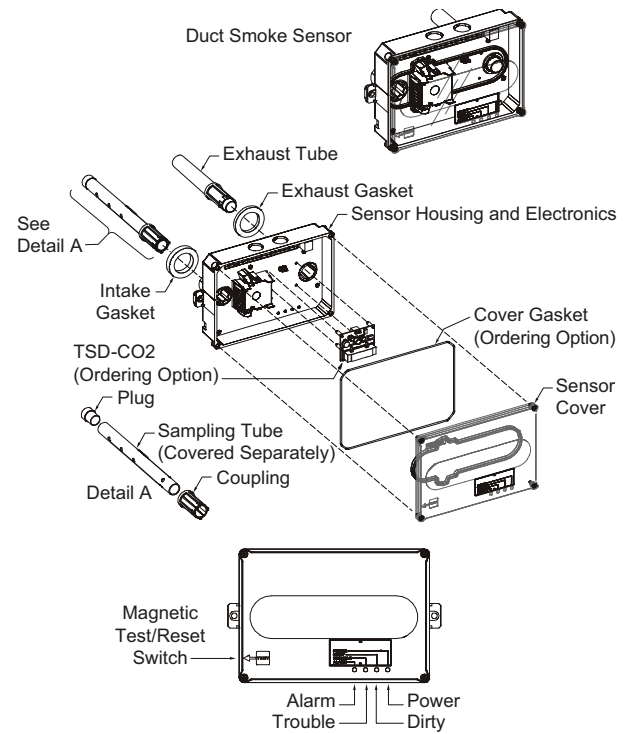


Fig. 53 — Smoke Detector Sensor

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.

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. 54. 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.

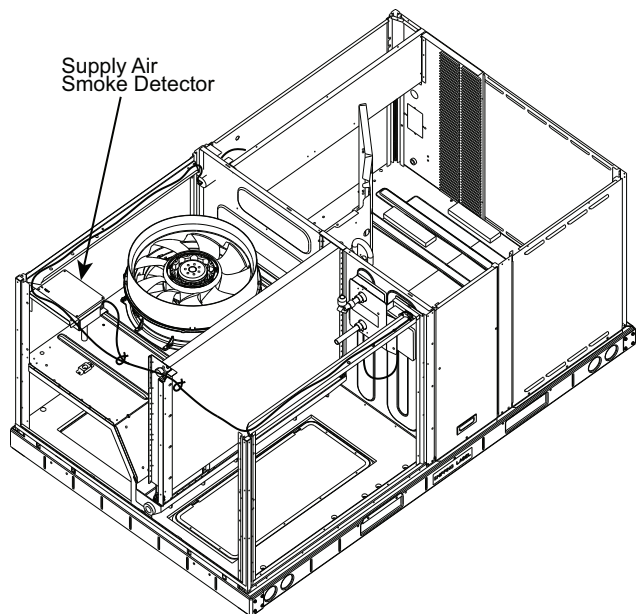


Fig. 54 — Typical Supply Air Smoke Detector Sensor Location

RETURN AIR SMOKE DETECTOR SENSOR WITHOUT ECONOMIZER

The sampling tube is located across the return air opening on the unit basepan. See Fig. 55. The holes in the sampling tube face downward, into the return air stream. The sampling tube is connected through tubing to the return air sensor that is mounted on a bracket high on the partition between return filter and controller location. The sensor is shipped in a flat-mounting location. Installation requires that this sensor be relocated to its operating location and the tubing to the sampling tube be connected. See installation steps.

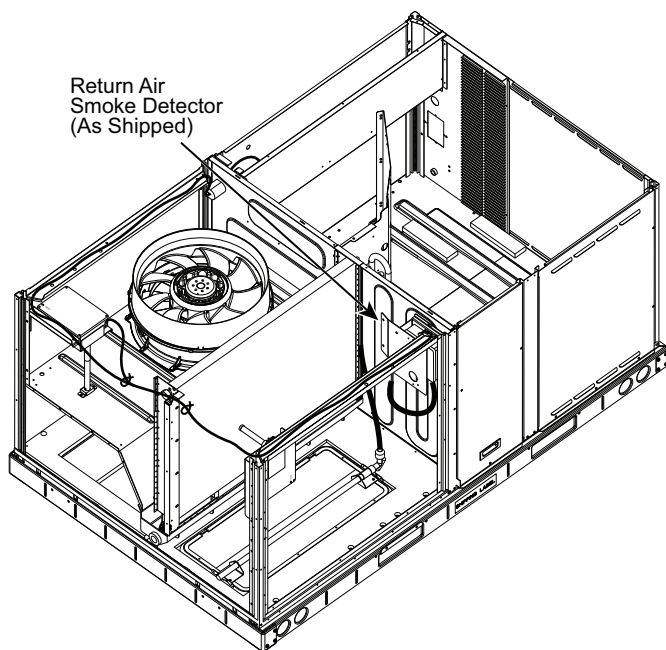


Fig. 55 — Typical Return Air Smoke Detector Location

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. See Fig. 56. The holes in the sampling tube face downward, into the return air stream. The sampling tube is connected using tubing to the return air sensor mounted on a bracket high on the partition between return filter and controller location. The sensor is shipped in a flat-mounting location. Installation requires the sensor be relocated to its operating location and the tubing to the sampling tube be connected. See installation steps below.

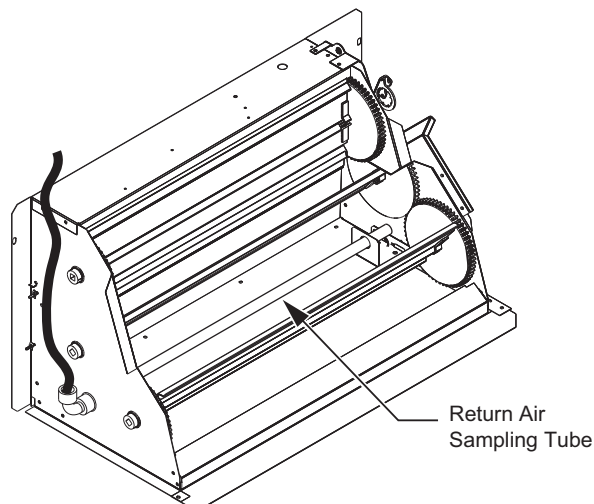


Fig. 56 — Return Air Sampling Tube Location (View reoriented to show opposite side for clarity.)

Completing Installation of Return Air Smoke Detector

Use the following steps to complete the installation of the return air smoke detector.

1. Unscrew the two screws holding the return air sensor detector plate. See Fig. 57. Save the screws.

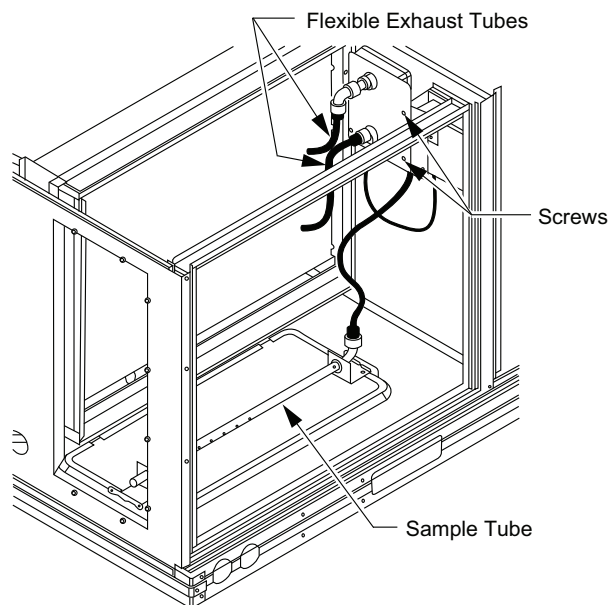


Fig. 57 — Return Air Smoke Detector Shipping Position

2. Remove the return air smoke sensor module and its detector plate.
3. Rotate the detector plate so the sensor is facing outwards and the sampling tube connection is on the bottom. (See Fig. 58.)

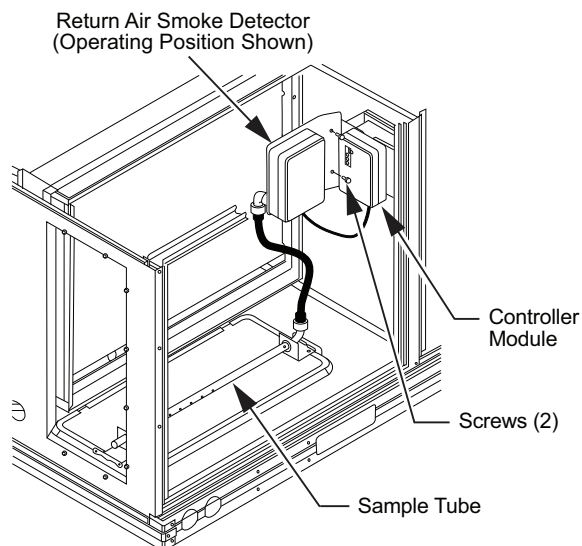


Fig. 58 — Return Air Smoke Detector Operating Position

4. Screw the sensor and detector plate into its operating position using screws from Step 1. Ensure the sampling tube connection is on the bottom and the exhaust tube is on the top.

5. Connect the flexible tube on the sampling inlet to the sampling tube on the basepan.
6. For units with an economizer, the sampling tube is integrated into the economizer housing but connecting the flexible tubing to the sampling tube is the same.

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. 59, Smoke Detector Wiring.

HIGHLIGHT A

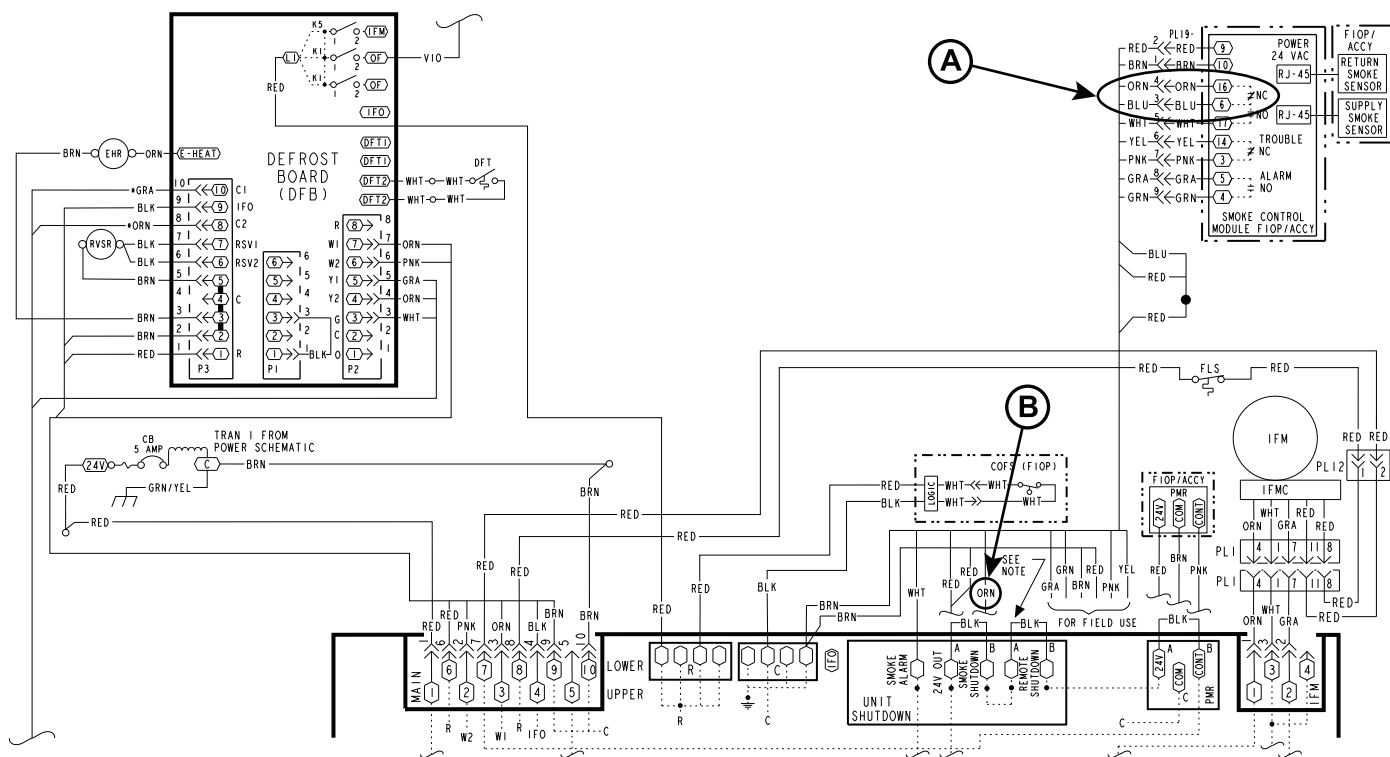
Smoke detector NC contact set will open on smoke alarm condition, de-energizing the ORN conductor.

HIGHLIGHT B

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

ADDITIONAL APPLICATION DATA

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



NOTE: REMOVE DESIGNATED JUMPERS ON UCB WHEN ADDING SMOKE DETECTORS, OCCUPANCY AND REMOTE SHUTDOWN.

Fig. 59 — 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 14.

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 14 — 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-TRM4 Remote Alarm Test Procedure

1. Hold the test magnet to the target area for seven seconds.
2. Verify that the test/reset station's Alarm LED turns on.
3. Reset the sensor by holding the test magnet to the target area for 2 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. 60 and configured to operate the controller’s supervision relay. For more information, see “Dirty Sensor Test” on page 39.

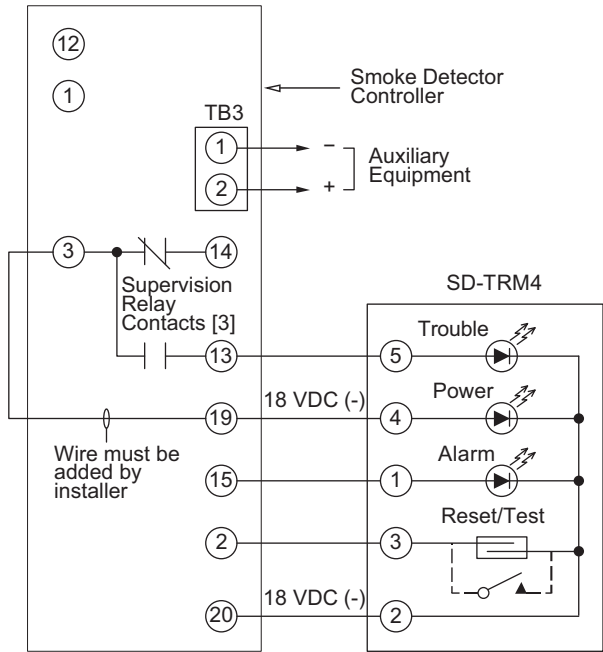


Fig. 60 — Remote Test/Reset Station Connections

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-TRM4

1. Hold the test magnet where indicated on the side of the sensor housing 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. 61.)

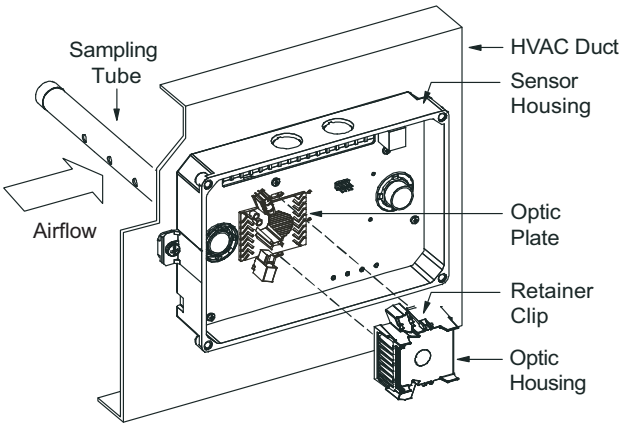


Fig. 61 — Sensor Cleaning Diagram

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.
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 15.) 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

Table 15 — 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.

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. 62.)
- If a sensor trouble, the sensor's Trouble LED and 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.

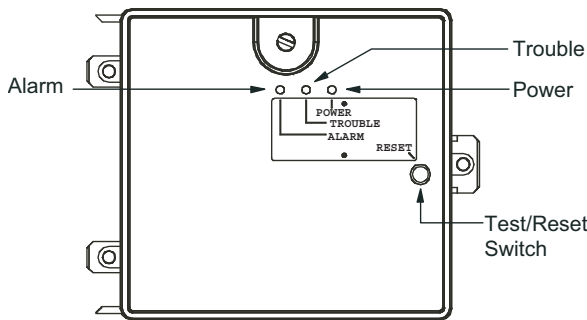


Fig. 62 — Controller Assembly

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. 60. 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 JP1 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. 63.

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.

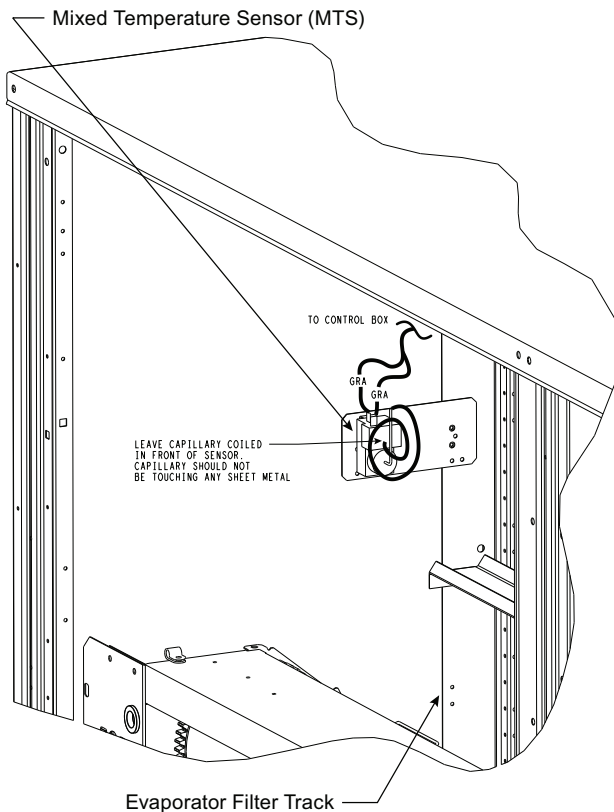


Fig. 63 — Mixed Temperature Sensor Location

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 \pm 10 psig (4344 \pm 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 \pm 5 psig (372 \pm 34 kPa). Reset is automatic at 117 \pm 5 psig (807 \pm 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°F (–1°C \pm 3°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 16.)

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 16 — 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.
Microelectronic (MCU) Fault	Manual Reset – Power off and wait 2 minutes and restart motor.

ECONOMIZER SYSTEMS

The unit may be equipped with a factory-installed or accessory (field-installed) economizer system. Three types are available: two with logic control systems (EconoMiSer®X and EconoMiSer IV) and one without a control system (EconoMiSer2). See Fig. 64-66 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.

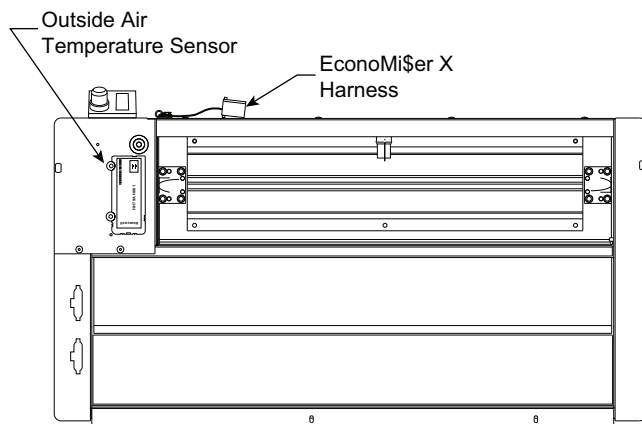


Fig. 64 — EconoMiSer X Component Locations

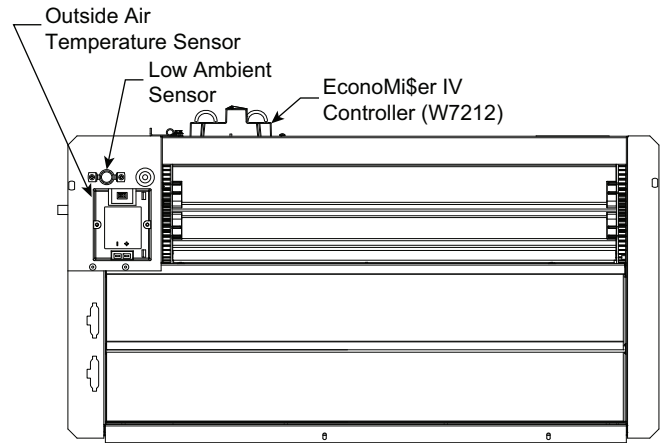


Fig. 65 — EconoMiSer IV Component Locations

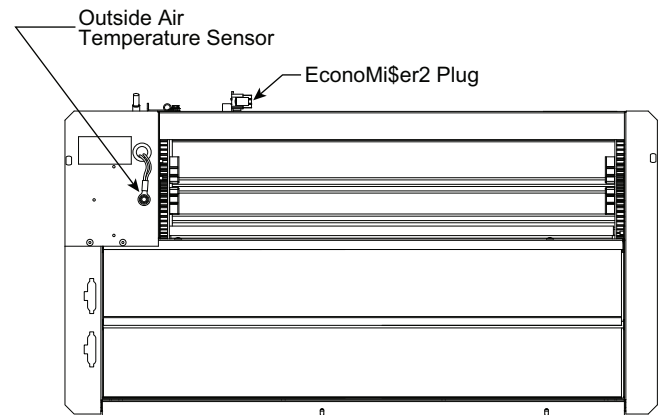


Fig. 66 — EconoMiSer2 Component Locations

EconoMiSer2

IMPORTANT: The optional EconoMiSer®2 does not include a controller. The EconoMiSer2 is operated by a 4 mA to 20 mA signal from an existing field-supplied controller. See Fig. 67 for wiring information.

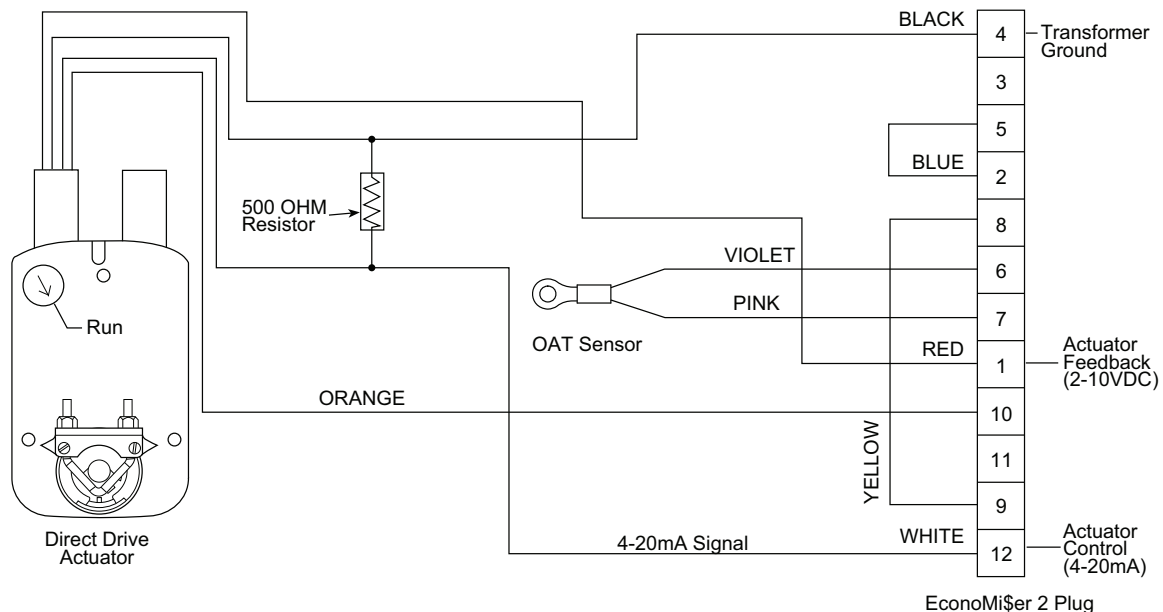


Fig. 67 — EconoMiSer2 with 4 mA to 20 mA Control Wiring

EconoMiSer IV (Field-Installed Accessory)

IMPORTANT: EconoMiSer IV is only available as a field-installed option for 547K*08-14 rooftop units.

ECONOMISER IV STANDARD SENSORS

Troubleshooting instructions are enclosed. A functional view of the EconoMiSer® IV accessory is shown in Fig. 68. Typical settings, sensor ranges, and jumper positions are also shown. An EconoMiSer IV simulator program is available to help with EconoMiSer IV training and troubleshooting. See Fig. 69 and Table 17 for further details.

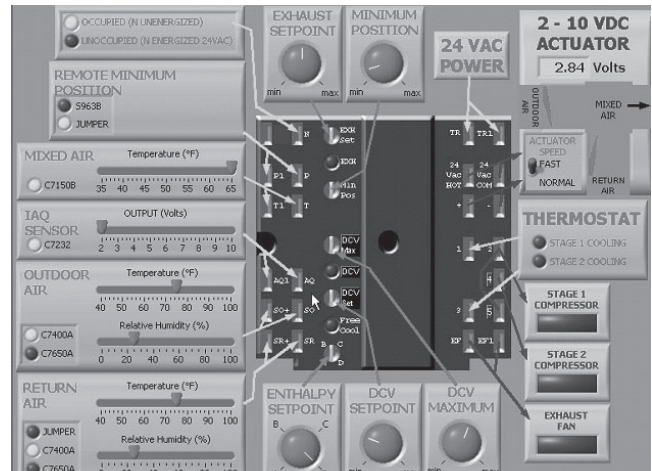


Fig. 68 — EconoMiSer IV Functional View

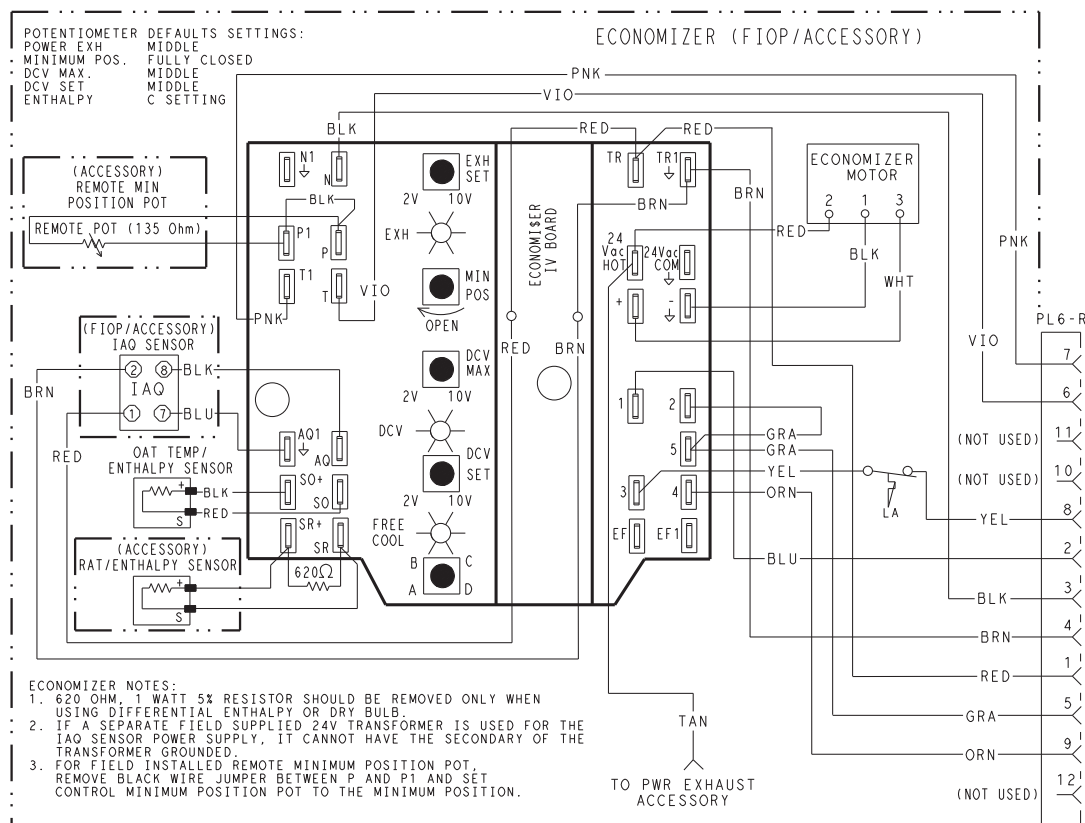


Fig. 69 — Typical EconoMiSer IV (W7212 Controller) Wiring

Table 17 — EconoMiSer IV Input/Output Logic

Demand Controlled Ventilation (DCV)	INPUTS				OUTPUTS			
	Enthalpy ^a		Y1	Y2	Compressor		N Terminal ^b	
	Outdoor	Return			Stage 1	Stage 2	Occupied	Unoccupied
Below set (DCV LED Off)	High (Free Cooling LED Off)	Low	On	On	On	On	Minimum position	Closed
			On	Off	On	Off		
			Off	Off	Off	Off		
	Low (Free Cooling LED On)	High	On	On	On	Off	Modulating ^c (between min. position and full-open)	Modulating ^c (between closed and full-open)
			On	Off	Off	Off		
			Off	Off	Off	Off		
Above set (DCV LED On)	High (Free Cooling LED Off)	Low	On	On	On	On	Modulating ^d (between min. position and DCV maximum)	Modulating ^d (between closed and DCV maximum)
			On	Off	On	Off		
			Off	Off	Off	Off		
	Low (Free Cooling LED On)	High	On	On	On	Off	Modulating ^e	Modulating ^f
			On	Off	Off	Off		
			Off	Off	Off	Off		

NOTE(S):

- a. For single enthalpy control, the module compares outdoor enthalpy to the ABCD set point.
- b. Power at N terminal determines Occupied/Unoccupied setting: 24 vac (Occupied), no power (Unoccupied).
- c. Modulation is based on the supply-air sensor signal.
- d. Modulation is based on the DCV signal.
- e. Modulation is based on the greater of DCV and supply-air sensor signals, between minimum position and either maximum position (DCV) or fully open (supply-air signal).
- f. Modulation is based on the greater of DCV and supply-air sensor signals, between closed and either maximum position (DCV) or fully open (supply-air signal).

Outdoor Air Temperature (OAT) Sensor

The outdoor air temperature sensor (HH57AC074) is a 10 to 20 mA device used to measure the outdoor-air temperature. The outdoor-air temperature is used to determine when the EconoMiSer IV can be used for free cooling. The sensor has 8 selectable temperature changeover setpoints, ranging from 48°F to 78°F. The temperature changeover is set using the 3 dip switches on the sensor. (See Fig. 70.)



Fig. 70 — C7660 Temperature Sensor

Supply Air Temperature (SAT) Sensor

The supply air temperature sensor is a field-installed 3 K thermistor located on the fan deck. See Fig. 71. This sensor is factory installed. The operating range of temperature measurement is 0°F to 158°F (–18°C to 70°C). See Table 18 on page 46 for sensor temperature/resistance values.

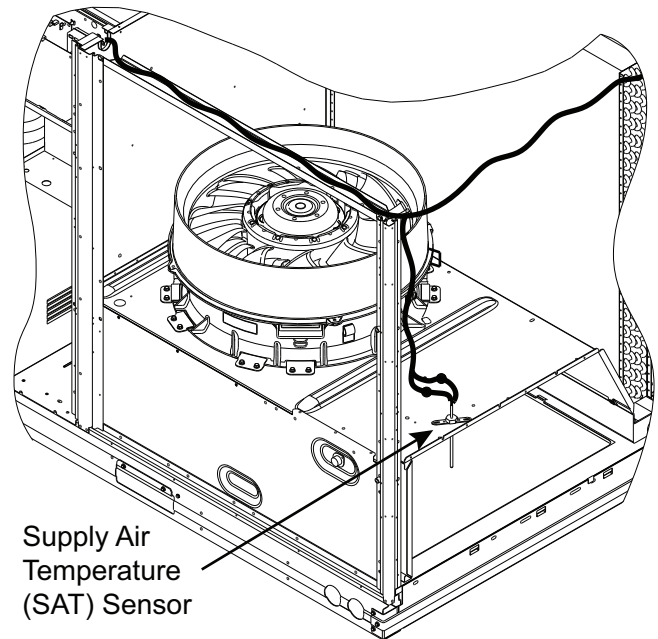


Fig. 71 — Supply Air Temperature Sensor Location

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

Outdoor Air Lockout Sensor

The EconoMiSer IV is equipped with an ambient temperature lockout switch located in the outdoor airstream which is used to lock out the compressors below a 42°F (6°C) ambient temperature. (See Fig. 65 on page 43.)

Table 18 — Supply Air Sensor Temperature/Resistance Values

TEMPERATURE (F)	RESISTANCE (ohms)
-58	220,250
-40	100,000
-22	53,010
-4	29,091
14	16,500
32	9,795
50	5,970
68	3,747
77	3,000
86	2,416
104	1,597
122	1,080
140	746
158	525
176	376
185	321
194	274
212	203
230	153
248	116
257	102
266	89
284	70
302	55

ECONOMISER IV CONTROL MODES

Determine the EconoMiSer IV control mode before set up of the control. Some modes of operation may require different sensors. The EconoMiSer IV accessory is supplied from the factory with a supply-air temperature sensor and an outdoor-air temperature sensor. This allows for operation of the EconoMiSer IV with outdoor air dry bulb changeover control. Additional accessories can be added to allow for different types of changeover control and operation of the EconoMiSer IV and unit.

Outdoor Dry Bulb Changeover

The standard controller is shipped from the factory configured for outdoor dry bulb changeover control. For this control mode, the outdoor temperature is compared to a selectable set point on the OAT sensor. If the outdoor air temperature is above the set point, the EconoMiSer IV will adjust the outdoor air dampers to minimum position. If the outdoor air temperature is below the set point, the position of the outdoor air dampers will be controlled to provide free cooling using outdoor air. When in this mode, the Free Cool LED next to the outdoor enthalpy set point (ABCD) potentiometer will be on. The changeover temperature set point is controlled by the dip switches on the sensor. See Fig. 72 for the switch positions corresponding to the temperature changeover values. The ABCD potentiometer on the controller should be turned fully clockwise (CW) to the “D” position. See Fig. 73-75 for damper leakage.

Outdoor Enthalpy Changeover

For enthalpy control, accessory enthalpy sensor (P/N: HH57AC078) is required. Replace the standard outdoor dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location. See Fig. 76. When the outdoor air enthalpy rises above the outdoor enthalpy changeover set point, the outdoor-air damper moves to its minimum position. The outdoor enthalpy changeover set point is set with the outdoor enthalpy set point potentiometer on the EconoMiSer® IV controller. The set points are A, B, C, and D. See Fig. 77 and 78. The factory-installed 620-ohm jumper must be in place across terminals SR and SR+ on the EconoMiSer IV controller.









DIP Switch Position	Changeover Temperature
ON OFF  1 2 3	48°F
ON OFF  1 2 3	53°F
ON OFF  1 2 3	55°F
ON OFF  1 2 3	58°F
ON OFF  1 2 3	63°F
ON OFF  1 2 3	68°F
ON OFF  1 2 3	73°F
ON OFF  1 2 3	78°F

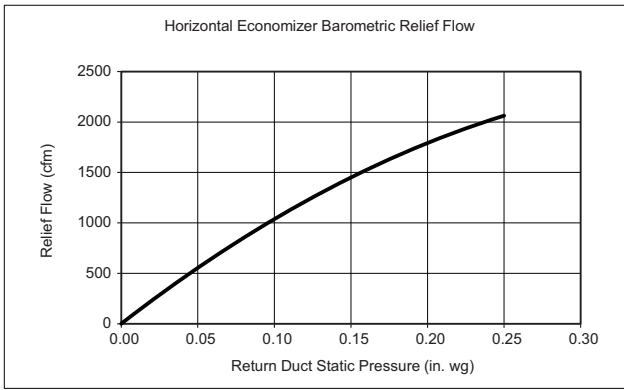
Fig. 72 — Outdoor Air Temperature Changeover Set Points

Differential Enthalpy Control

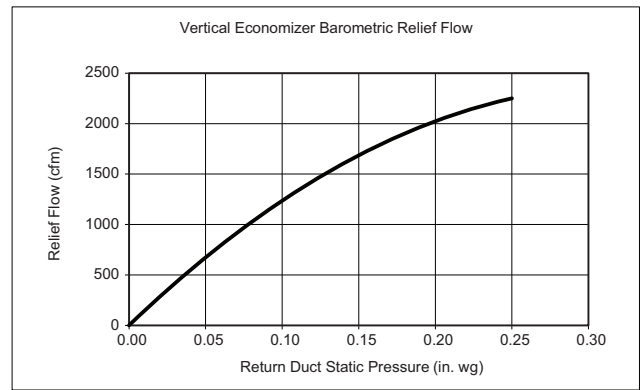
For differential enthalpy control, the EconoMiSer IV controller uses two enthalpy sensors (P/N: HH57AC078 and CRENT-DIF004A00), one in the outside air and one in the return air duct. The EconoMiSer IV controller compares the outdoor air enthalpy to the return air enthalpy to determine EconoMiSer IV use.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

Replace the standard outside air dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location. See Fig. 65 on page 43. Mount the return air enthalpy sensor in the return air duct. See Fig. 76. Wiring is provided in the EconoMiSer IV wiring harness. See Fig. 69 on page 44. The outdoor enthalpy changeover set point is set with the outdoor enthalpy set point potentiometer on the EconoMiSer IV controller. When using this mode of changeover control, turn the enthalpy set point potentiometer fully clockwise to the “D” setting. (See Fig. 77 and 78.)

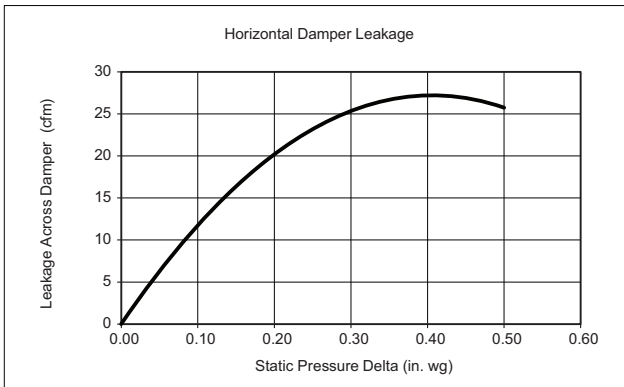
Horizontal Economizer Barometric Relief



Vertical Economizer Barometric Relief



Horizontal Economizer Damper Leakage



Vertical Economizer Damper Leakage

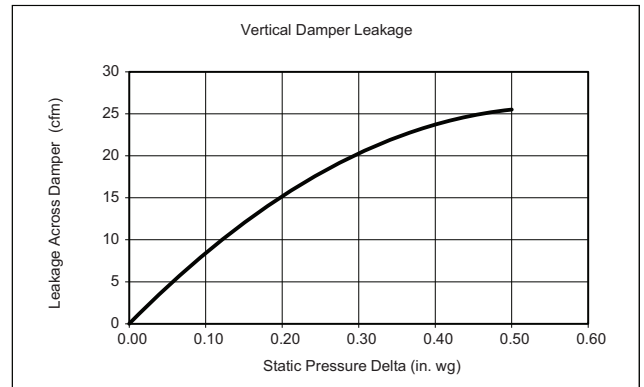
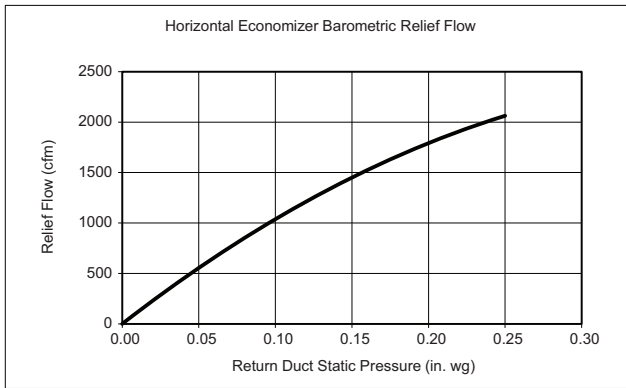
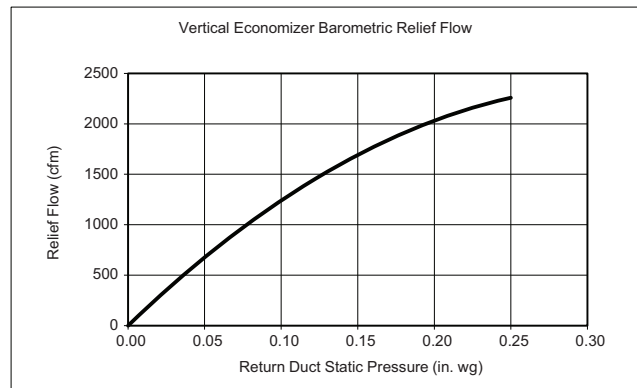


Fig. 73 — Economizer Barometric Relief and Damper Leakage — 7.5 to 10 Ton Units

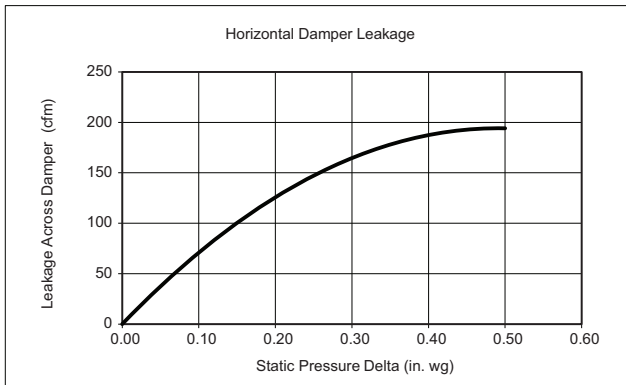
Horizontal Economizer Barometric Relief



Vertical Economizer Barometric Relief



Horizontal Economizer Damper Leakage



Vertical Economizer Damper Leakage

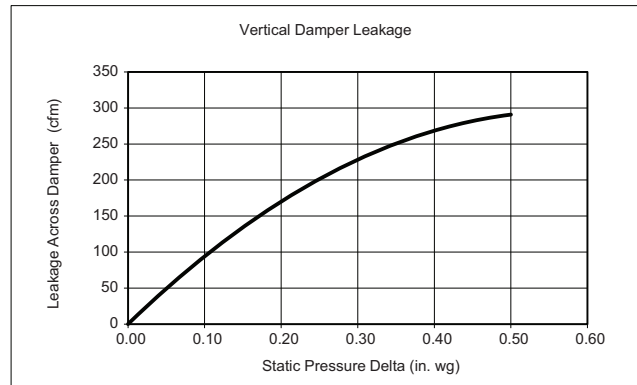
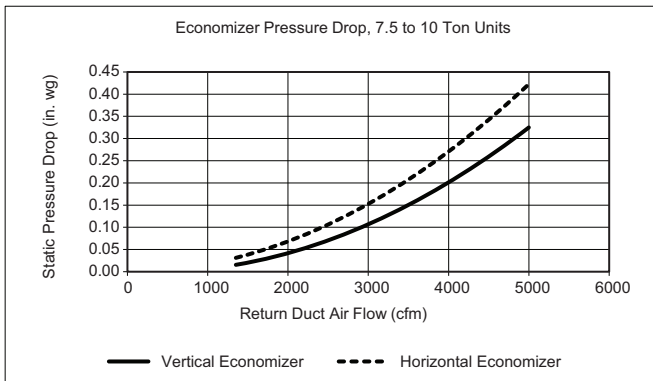


Fig. 74 — Economizer Barometric Relief and Damper Leakage — 12.5 Ton Units

7.5 to 10 Ton Units



12.5 Ton Units

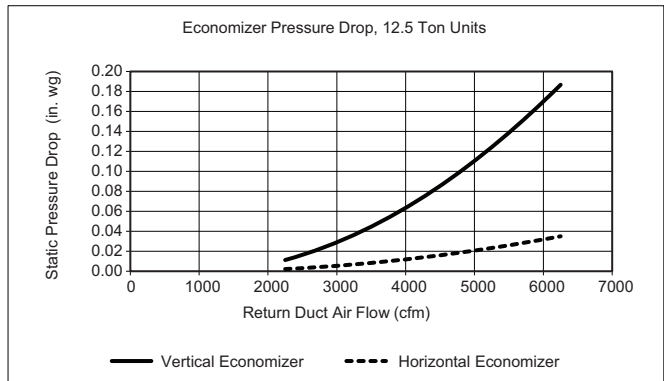


Fig. 75 — Economizer Pressure Drop

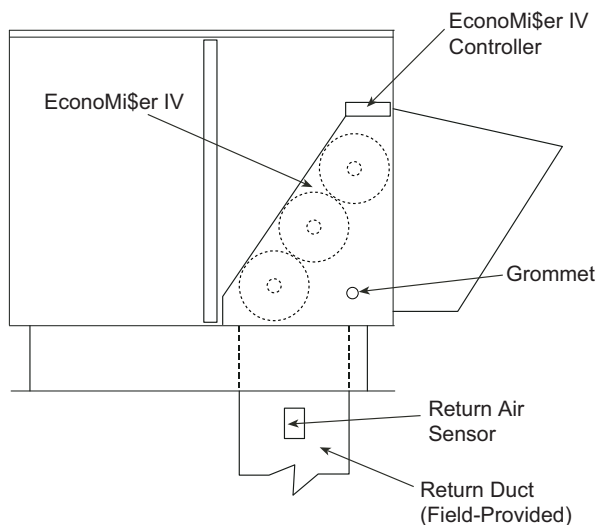


Fig. 76 — Return Air Temperature or Enthalpy Sensor Mounting Location

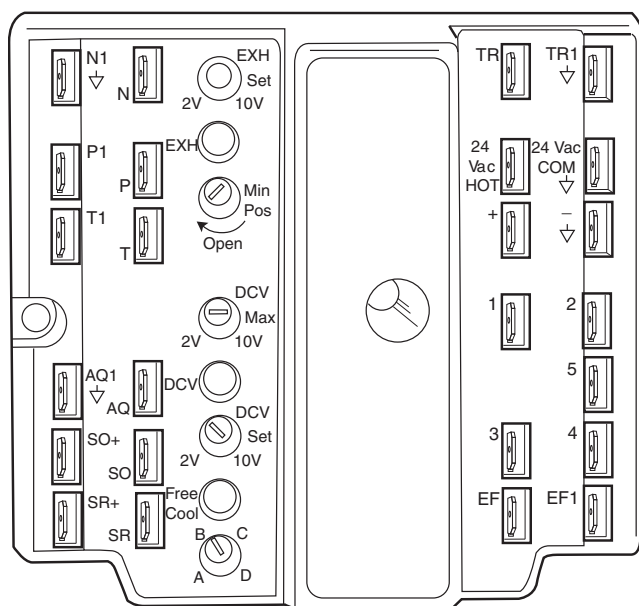


Fig. 77 — EconoMiSer IV W7212 Control

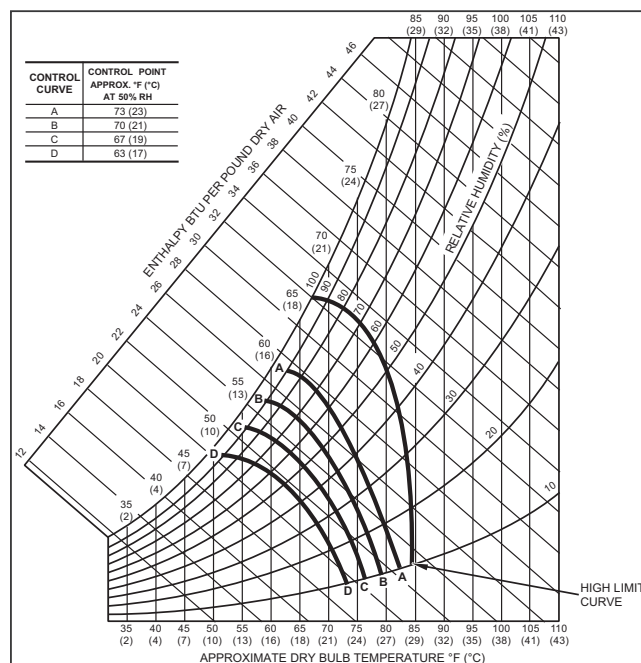


Fig. 78 — Enthalpy Changeover Set Points

Indoor Air Quality (IAQ) Sensor Input

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

Mount the accessory IAQ sensor according to manufacturer specifications. The IAQ sensor should be wired to the AQ and AQ1 terminals of the controller. Adjust the DCV potentiometers to correspond to the DCV voltage output of the indoor air quality sensor at the user-determined set point. (See Fig. 79.)

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

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

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

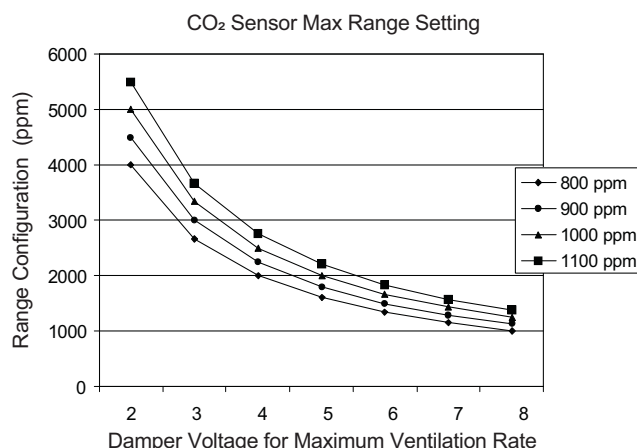


Fig. 79 — CO₂ Sensor Maximum Range Settings

Exhaust Set Point Adjustment

The exhaust set point will determine when the exhaust fan runs based on damper position (if accessory power exhaust is installed). The set point is modified with the Exhaust Fan set point (EXH SET) potentiometer. See Fig. 77. The set point represents the damper position above which the exhaust fans will be turned on. When there is a call for exhaust, the EconoMiSer IV controller provides a 45 ± 15 second delay before exhaust fan activation to allow the dampers to open. This delay allows the damper to reach the appropriate position to avoid unnecessary fan overload.

Minimum Position Control

There is a minimum damper position potentiometer on the EconoMiSer IV controller. See Fig. 77. The minimum damper position maintains the minimum airflow into the building during the occupied period.

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

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

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

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

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

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

T_O = Outdoor-Air Temperature
 OA = Percent of Outdoor Air
 T_R = Return-Air Temperature
 RA = Percent of Return Air
 T_M = Mixed-Air Temperature

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

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

2. Disconnect the supply air sensor from terminals T and T1.
3. Ensure that the factory-installed jumper is in place across terminals P and P1. If remote damper positioning is being used, make sure that the terminals are wired according to Fig. 70 and that the minimum position potentiometer is turned fully clockwise.
4. Connect 24 vac across terminals TR and TR1.
5. Carefully adjust the minimum position potentiometer until the measured mixed air temperature matches the calculated value.
6. Reconnect the supply air sensor to terminals T and T1.

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

To control the minimum damper position remotely, remove the factory-installed jumper on the P and P1 terminals on the EconoMiSer IV controller. Wire the field-supplied potentiometer to the P and P1 terminals on the EconoMiSer® IV controller. (See Fig. 77.)

Damper Movement

Damper movement from full open to full closed (or vice versa) takes 2-1/2 minutes.

Thermostats

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

Occupancy Control

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

Demand Controlled Ventilation (DCV)

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

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

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

In order to have the CO₂ sensor control the economizer damper in this manner, first determine the damper voltage output for minimum or base ventilation. Base ventilation is the ventilation required to remove contaminants during unoccupied periods. The following equation may be used to determine the percent of outside air entering the building for a given damper position. For best results, there should be at least a 10 degree difference in outside and return-air temperatures.

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

T_O = Outdoor-Air Temperature
 OA = Percent of Outdoor Air
 T_R = Return-Air Temperature
 RA = Percent of Return Air
 T_M = Mixed-Air Temperature

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

The same equation can be used to determine the occupied or maximum ventilation rate to the building. For example, an output of 3.6 volts to the actuator provides a base ventilation rate of 5% and an output of 6.7 volts provides the maximum ventilation rate of 20% (or base plus 15 cfm per person). Use Fig. 79 to determine the maximum setting of the CO₂ sensor. For example, an 1100 ppm set point relates to a 15 cfm per person design. Use the 1100 ppm curve on Fig. 79 to find the point when the CO₂ sensor

output will be 6.7 volts. Line up the point on the graph with the left side of the chart to determine that the range configuration for the CO₂ sensor should be 1800 ppm. The EconoMiSer IV controller will output the 6.7 volts from the CO₂ sensor to the actuator when the CO₂ concentration in the space is at 1100 ppm. The DCV set point may be left at 2 volts since the CO₂ sensor voltage will be ignored by the EconoMiSer IV controller until it rises above the 3.6 volt setting of the minimum position potentiometer.

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

CO₂ Sensor Configuration

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

Use setting 1 or 2 for Bryant equipment.

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

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

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

Dehumidification of Fresh Air with DCV (Demand Controlled Ventilation) Control

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

ECONOMISER IV PREPARATION

This procedure is used to prepare the EconoMiSer® IV for troubleshooting. No troubleshooting or testing is done by performing the following procedure.

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

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

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

5. Jumper TR to 1.
6. Jumper TR to N.
7. If connected, remove sensor from terminals SO and +. Connect 1.2 kilo-ohm 4074EJM checkout resistor across terminals SO and +.
8. Put 620-ohm resistor across terminals SR and +.
9. Set minimum position, DCV set point, and exhaust potentiometers fully CCW (counterclockwise).
10. Set DCV maximum position potentiometer fully CW (clockwise).
11. Set enthalpy potentiometer to D.
12. Apply power (24 vac) to terminals TR and TR1.

DIFFERENTIAL ENTHALPY

To check differential enthalpy:

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

SINGLE ENTHALPY

To check single enthalpy:

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

DCV (DEMAND CONTROLLED VENTILATION) AND POWER EXHAUST

To check DCV and Power Exhaust:

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

DCV MINIMUM AND MAXIMUM POSITION

To check the DCV minimum and maximum position:

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

SUPPLY-AIR SENSOR INPUT

To check supply-air sensor input:

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

ECONOMISER IV TROUBLESHOOTING COMPLETION

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

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

EconoMiSer X (Factory Option)

The EconoMiSer® X system is an expandable economizer control system, which includes a W7220 economizer module (controller) with an LCD and keypad (see Fig. 80). The W7220 can be configured with optional sensors. See Fig. 81 for wiring.



Fig. 80 — W7220 Economizer Module

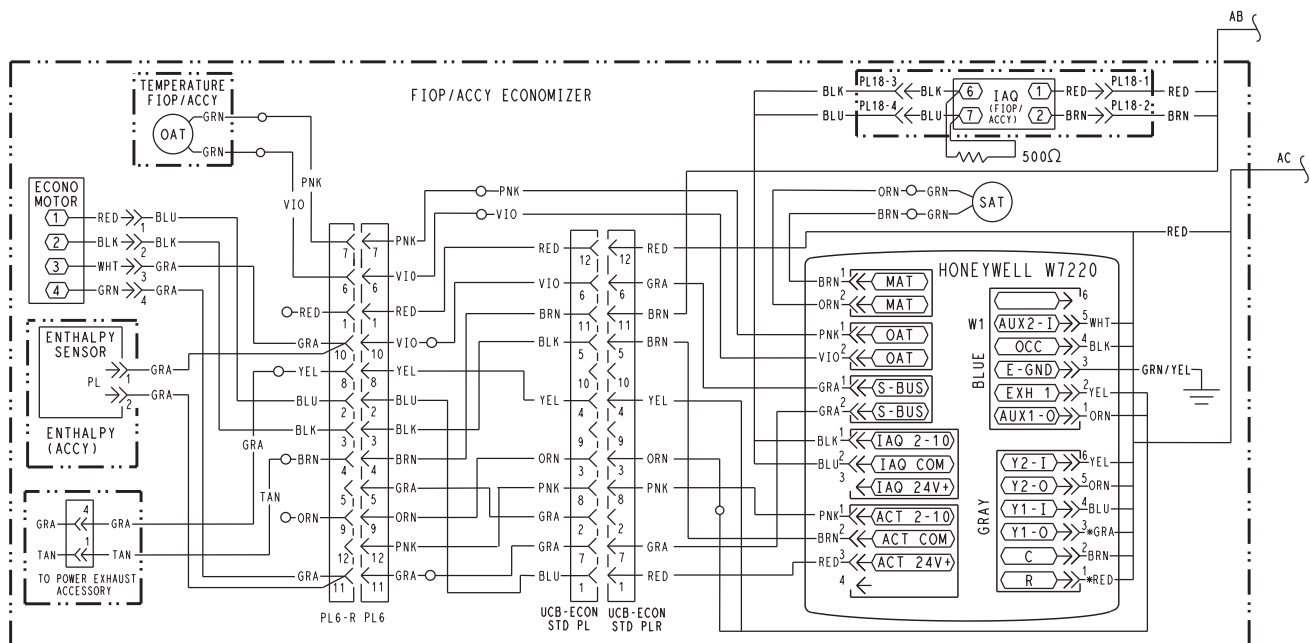


Fig. 81 — Typical EconoMiSer X (W7220 Controller) Wiring

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 48 mA

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 to 150°F (-40 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 to 150°F (-40 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 55 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 to 150°F (-40 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 to 150°F (-40 to 65°C)

Shipping Temperature

-40 to 150°F (-40 to 65°C)

Relative Humidity

5% to 95% RH non-condensing

ECONOMIZER MODULE WIRING DETAILS

Use Fig. 82 and Tables 19 and 20 to locate the wiring terminals for the Economizer module.

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

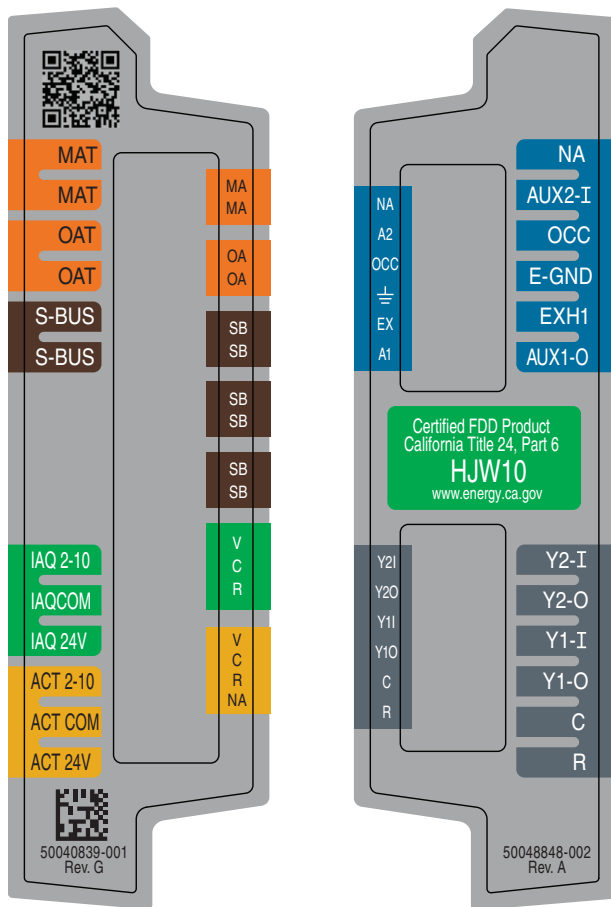


Fig. 82 — W7220 Wiring Terminals

Table 19 — Economizer Module —
Left Hand Terminal Blocks

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

NOTE(S):

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

Table 20 — 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 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. 83 and Table 21 to locate the wiring terminals for each S-Bus sensor.

Use Fig. 83 and Table 21 to locate the wiring terminals for each enthalpy control sensor.

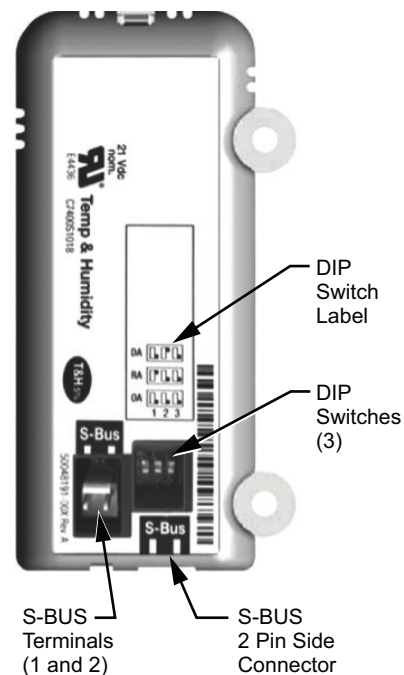


Fig. 83 — S-Bus Sensor DIP Switches

Table 21 — HH57AC081 Sensor Wiring Terminations

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

Use Fig. 83 and Table 22 to set the DIP switches for the desired use of the sensor.

Table 22 — HH57AC081 Sensor DIP Switch

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

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

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

CO₂ SENSOR WIRING

When using a CO₂ sensor the black and brown common wires are internally connected and only one is connected to “IAQ COM” on the W7220. Use the power from the W7220 to power the CO₂ sensor OR make sure the ground for the power supplies are common. See Fig. 84 for CO₂ sensor wiring.

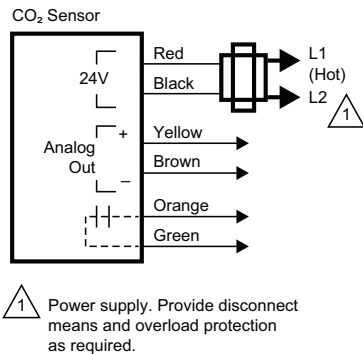


Fig. 84 — CO₂ Sensor Wiring

INTERFACE OVERVIEW

This section describes how to use the EconoMiSer® X user interface for:

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

User Interface

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

Keypad

Use the four navigation buttons (see Fig. 85) 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.

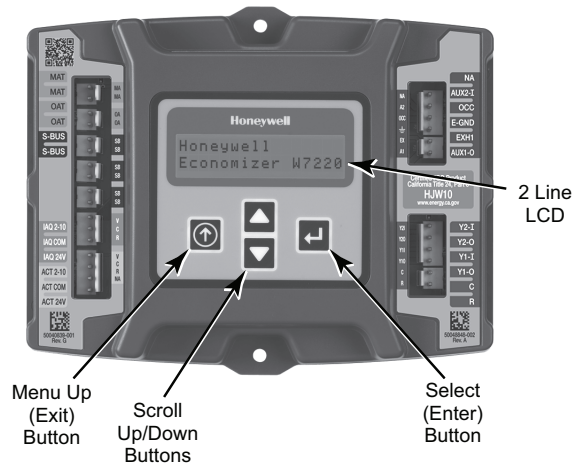


Fig. 85 — W7220 Controller Navigation Buttons

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

1. Navigate to the desired menu.
2. Press the ↵ (Enter) button to display the first item in the currently displayed menu.
3. Use the ▲ and ▼ buttons to scroll to the desired parameter.
4. Press the ↵ (Enter) button to display the value of the currently displayed item.
5. Press the ▲ button to increase (change) the displayed parameter value.
6. Press the ▼ button to decrease (change) the displayed parameter value.

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

7. Press the ↵ (Enter) button to accept the displayed value and store it in nonvolatile RAM. “CHANGE STORED” displays.
8. Press the ↵ (Enter) button to return to the current menu parameter.
9. Press the ⬆ (Menu Up/Exit) button to return to the previous menu.

Menu Structure

Table 23 illustrates the complete hierarchy of menus and parameters for the EconoMiSer® X system.

The Menus in display order are:

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

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

Setup and Configuration

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

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

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

Time-Out and Screensaver

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

Table 23 — W7220 Menu Structure^a

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT ^b	EXPANDED PARAMETER NAME NOTES
STATUS	ECON AVAIL	NO	YES/NO	FIRST STAGE COOLING DEMAND (Y1-IN) YES = economizing available; the system can use outside air for free cooling when required
	ECONOMIZING	NO	YES/NO	FIRST STAGE COOLING RELAY OUTPUT YES = outside air being used for first stage cooling
	OCCUPIED ^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	(or $\text{---}^{\circ}\text{F}$ $\text{---}^{\circ}\text{C}$)	-40°F to 150°F (-40°C to 66°C)	SUPPLY AIR TEMPERATURE, Cooling Mode Displays value of measured mixed air from MAT sensor. Displays $\text{---}^{\circ}\text{F}$ if not connected, short or out of range.
	DA TEMP	(or $\text{---}^{\circ}\text{F}$ $\text{---}^{\circ}\text{C}$)	-40°F to 150°F (-40°C to 66°C)	DISCHARGE AIR TEMPERATURE, after Heating section Displays when Discharge Air Syk Bus sensor is connected and displays measured discharge temperature. Displays $\text{---}^{\circ}\text{F}$ if sensor sends invalid value, if not connected, short or out of range.
	OA TEMP	(or $\text{---}^{\circ}\text{F}$ $\text{---}^{\circ}\text{C}$)	-40°F to 140°F (-40°C to 60°C)	OUTSIDE AIR TEMP Displays measured value of outdoor air temperature. Displays $\text{---}^{\circ}\text{F}$ if sensor sends invalid value, short or out of range.
	OA HUM	$\text{---}\%$	0 to 100%	OUTSIDE AIR RELATIVE HUMIDITY Displays measured value of outdoor humidity from OA Syk Bus sensor. Displays $\text{---}\%$ if not connected short, or out of range.
	RA TEMP	(or $\text{---}^{\circ}\text{F}$ $\text{---}^{\circ}\text{C}$)	0°F to 140°F (-18°C to 60°C)	RETURN AIR TEMPERATURE Displays measured value of return air temperature from RAT Syk Bus sensor. Displays $\text{---}^{\circ}\text{F}$ if sensor sends invalid value, if not connected, short or out of range
	RA HUM	$\text{---}\%$	0 to 100%	RETURN AIR RELATIVE HUMIDITY Displays measured value of return air humidity from RA Syk Bus sensor. Displays $\text{---}\%$ if sensor sends invalid value, if not connected, short or out of range
	IN CO2	$\text{---}\text{ ppm}$	0 to 2000 ppm	SPACE/RETURN AIR CO ₂ Displays value of measured CO ₂ from CO ₂ sensor. Invalid if not connected, short or out of range. May be adjusted in Advanced menu by Zero offset and Span.
	DCV STATUS	N/A	ON/OFF	DEMAND CONTROLLED VENTILATION STATUS Displays ON if above set point and OFF if below set point, and ONLY if a CO ₂ sensor is connected.

Table 23 — W7220 Menu Structure^a (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT ^b	EXPANDED PARAMETER NAME NOTES
STATUS (cont)	DAMPER OUT	2.0v	2.0 to 10.0v	Displays voltage output to the damper actuator. ⁹
	ACT POS	N/A	0 to 100%	Displays actual position of actuator
	ACT COUNT	N/A	1 to 65,535	Displays number of times actuator has cycled. 1 cycle equals 180 degrees 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 Displays ON when damper position reaches programmed percentage set point. Output of EXH1 terminal: ON = relay closed OFF = relay open
	EXH2 OUT	OFF	ON/OFF	EXHAUST STAGE 2 RELAY OUTPUT Output of AUX1 O terminal Displays ON when damper position reaches programmed percentage set point. ON = 24 vac output OFF = No output Displays only if AUX1 O = EXH2
	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 IN)	N/A	ON/OFF	HEAT DEMAND STATUS Displays status of heat demand on a 2-speed fan unit.
SETPOINTS	MAT SET ^d	53°F (12°C)	38°F to 70°F (3°C to 21°C); increment by 1°F	SUPPLY AIR SETPOINT The economizer will modulate the OA damper to maintain the mixed air temperature at the set point
	LOW T LOCK	32°F (0°C)	-45°F to 80°F (-43°C to 27°C); increment by 1°F	COMPRESSOR LOW TEMPERATURE LOCKOUT Set point determines outdoor temperature when the mechanical cooling cannot be turned on. Commonly referred to as the Compressor lockout. At or below the set point, the Y1-O and Y2-O will not be energized on the controller.
	DRYBLB SET ^e	63°F (17°C)	48°F to 80°F (9°C to 27°C); increment by 1°F	OA DRY BULB TEMPERATURE CHANGEOVER SETPOINT Dry bulb set point will only appear if using dry bulb changeover. Set point determines where the economizer will assume outdoor air temperature is good for free cooling (e.g., at 63°F unit will economize at 62°F and below and not economize at 64°F and above. There is a 2°F deadband.)
	ENTH CURVE	ES3	ES1,ES2,ES3, ES4, or ES5	ENTHALPY CHANGEOVER CURVE ES curve will only appear if using enthalpy changeover. Enthalpy boundary "curves" for economizing using single enthalpy. See page 64 for description of enthalpy curves.
	DCV SET	1100ppm	500 to 2000 ppm; increment by 100	DEMAND CONTROLLED VENTILATION Displays only if CO ₂ sensor is connected. Set point for Demand Controlled Ventilation of space. Above the set point, the OA dampers will modulate open to bring in additional OA to maintain a space ppm level below the set point.
	MIN POS	2.8 V	2 to 10 vdc	VENTILATION MINIMUM POSITION Displays ONLY if a CO ₂ sensor is NOT connected. With 2-speed fan units, MIN POS L (low speed fan) and MIN POS H (high speed fan) settings are required. Default for MIN POS L is 3.2V and MIN POS H is 2.8V.
	VENTMAX	2.8 V	2 to 10 vdc 100 to 9990 cfm; increment by 10 2 to 10 vdc	DCV MAXIMUM DAMPER POSITION Displays only if a CO ₂ sensor is connected. Used for Vbz (ventilation max cfm) set point. VENTMAX is the same setting as MIN POS would be if unit did not have CO ₂ sensor. If OA, MA, RA, and CO ₂ sensors are connected and DCV CAL ENABLE is set to AUTO mode, the OA dampers are controlled by CFM and displays from 100 to 9990 CFM. With 2-speed fan units, VENTMAX L (low speed fan) and VENTMAX H (high speed fan) settings are required. Default for VENTMAX L is 3.2V and VENTMAX H is 2.8V

Table 23 — W7220 Menu Structure^a (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT ^b	EXPANDED PARAMETER NAME NOTES
SETPOINTS (cont)	VENTMIN	2.25 V	2 to 10 vdc or 100 to 9990 cfm increment by 10	DCV MINIMUM DAMPER POSITION Displays only if a CO ₂ sensor is connected. Used for Va (ventilation min cfm) set point. This is the ventilation for less than maximum occupancy of the space.
			100 to 9990 cfm; increment by 10	If OA, MA, RA, and CO ₂ sensors are connected and DCV CAL ENABLE is set to AUTO mode, the OA dampers are controlled by CFM and displays from 100 to 9990 CFM.
			2 to 10 vdc	With 2-speed fan units VENTMIN L (low speed fan) and VENTMIN H (high speed fan) settings are required. Default for VENTMIN L is 2.5V and VENTMIN H is 2.25V
	EXH1 SET	50%	0 to 100%; increment by 1	EXHAUST FAN STAGE 1 SETPOINT Set point for OA damper position when exhaust fan 1 is powered by the economizer. With 2-speed fan units, Exh1 L (low speed fan) and Exh1 H (high speed fan) settings are required. Default for Exh1 L is 65% and Exh1 H is 50%
	EXH2 SET	75%	0 to 100%; increment by 1	EXHAUST FAN STAGE 2 SETPOINT Set point for OA damper position when exhaust fan 2 is powered by the economizer. Only used when AUX1 O is set to EXH2. With 2-speed fan units, Exh2 L (low speed fan) and Exh2 H (high speed fan) settings are required. Default for Exh2 L is 80% and Exh2 H is 75%
SYSTEM SETUP^f	INSTALL	01/01/10	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	CONV or HP	CONV = conventional; HP O/B = Enable Heat Pump mode. Use AUX2 I for Heat Pump input from thermostat or controller. See Menu Note f.
	AUX2 IN	W	Shutdown (SD) Heat (W1) HP(O) HP(B)	In CONV mode: SD = Enables configuration of shutdown (default); W = Informs controller that system is in heating mode. NOTE: If using 2-speed fan mode, you must program CONV mode for W. Shutdown is not available in 2-speed fan mode. See Menu Note f. In HP O/B mode: HP(O) = energize heat pump on Cool (default); HP(B) = energize heat pump on heat.
	FAN SPEED	2 speed	1 speed/2 speed	Sets the economizer controller for operation of 1 speed or 2 speed supply fan. The controller does not control the fan, but positions the OA and RA dampers to heating or cooling mode. NOTE: 2-speed fan option also needs Heat (W1) programmed in AUX 2 In. See Menu Note f.
	FAN CFM	5000 cfm	100 to 15000 cfm; increment by 100	UNIT DESIGN AIRFLOW (CFM) Enter only if using DCVCAL ENA = AUTO This is the capacity of the RTU. The value is found on the nameplate label for the specific unit.
	AUX1 OUT	NONE	NONE EXH2 SYS	Select OUTPUT for AUX1 O relay NONE = not configured (output is not used) EXH2 = second damper position 24 vac out for second exhaust fan SYS = use output as an alarm signal
	OCC	INPUT	INPUT or ALWAYS	OCCUPIED MODE BY EXTERNAL SIGNAL When using a setback thermostat with occupancy out (24 vac), the 24 vac is input "INPUT" to the OCC terminal. If no occupancy output from the thermostat, then change program to "ALWAYS" OR add a jumper from terminal R to OCC terminal.
	FACTORY DEFAULT	NO	NO or YES	Resets all set points to factory defaults when set to YES. LCD will briefly flash YES and change to NO but all parameters will change to the factory default values.
ADVANCED SETUP	MA LO SET	45°F (7°C)	35°F to 65°F (2°C to 18°C); Increment by 1°F	SUPPLY AIR TEMPERATURE LOW LIMIT Temperature to activate Freeze Protection (close damper or modulate to MIN POS if temp falls below set value).
	FREEZE POS	CLO	CLO or MIN	FREEZE PROTECTION DAMPER POSITION Damper position when freeze protection is active (closed or MIN POS).
	CO2 ZERO	0ppm	0 to 500 ppm; Increment by 10	CO ₂ ppm level to match CO ₂ sensor start level.
	CO2 SPAN	2000ppm	1000 to 3000 ppm; Increment by 50	CO ₂ ppm span to match CO ₂ sensor (e.g., 500-1500 sensor output would be 500 CO ₂ zero and 1000 CO ₂ span).

Table 23 — W7220 Menu Structure^a (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT ^b	EXPANDED PARAMETER NAME NOTES
ADVANCED SETUP (cont)	STG3 DLY	2.0h	0 min, 5 min, 15 min, then 15 min intervals. Up to 4 hrs or OFF	COOLING STAGE 3 DELAY Delay after stage 2 cool has been active. Turns on second stage of cooling when economizer is first stage call and mechanical cooling is second stage call. Allows three stages of cooling, 1 economizer and 2 mechanical. OFF = no Stage 3 cooling
	SD DMPR POS	CLO	CLO or OPN	Indicates shutdown signal from space thermostat or unitary controller. When controller receives 24 vac input on the SD terminal in conventional mode, the OA damper will open if programmed for OPN and OA damper will close if programmed for CLO. All other controls (e.g., fans, etc. will shut off).
	DA LO ALM	45°F (7°C)	NONE 35°F to 65°F (2°C to 18°C); Increment by 5°F	Used for alarm for when the DA air temperature is too low. Set lower range of alarm, below this temperature the alarm will show on the display.
	DA HI ALM	80°F (27°C)	NONE 70°F to 180°F (21°C to 82°C); Increment by 5°F	Used for alarm for when the DA air temperature is too high. Sets upper range of alarm; above this temperature, the alarm will show on the display.
	DCVCAL ENA	MAN	MAN (manual) AUTO	Turns on the DCV automatic control of the dampers. Resets ventilation based on the RA, OA, and MA sensor conditions. Requires all (RA, OA, MA, CO ₂) sensors. This operation is not operable with a 2-speed fan unit.
	MAT T CAL	0.0°F	± 2.5°F	SUPPLY AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	OAS T CAL	0.0°F	± 2.5°F	OUTSIDE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	OA H CAL	0% RH	±10% RH	OUTSIDE AIR HUMIDITY CALIBRATION Allows for operator to adjust for an out of calibration humidity sensor.
	RA T CAL	0.0°F	± 2.5°F	RETURN AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	RA H CAL	0% RH	±10% RH	RETURN AIR HUMIDITY CALIBRATION Allows for operator to adjust for an out of calibration humidity sensor.
	DA T CAL	0.0°F	± 2.5°F	DISCHARGE AIR TEMPERATURE CALIBRATION Allows for the operator to adjust for an out of calibration temperature sensor.
	2SP FAN DELAY	5 Minutes	0 to 20 minutes in 1 minute increments	TIME DELAY ON SECOND STAGE ECONOMIZING When in economizing mode, this is the delay for the high speed fan to try to satisfy the call for second stage cooling before the first stage mechanical cooling is enabled.
CHECKOUT⁹	DAMPER MINIMUM POSITION	N/A	N/A	The checkout for the damper minimum position is based on the system. See Table 24.
	DAMPER OPEN	N/A	N/A	Position damper to the full open position. Exhaust fan contacts enable during the DAMPER OPEN test. Make sure to pause in the mode to allow exhaust contacts to energize due to the delay in the system.
	DAMPER CLOSE	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 — no action taken • SYS — 24 vac out. Issues a system alarm
	CONNECT EXH1	N/A	N/A	Closes the power exhaust fan 1 relay (EXH1)
ALARMS	Alarms display only when they are active. The menu title "ALARMS(#)" includes the number of active alarms in parenthesis (). When using SYLK bus sensors, "SYLK" will appear on the screen, and when using 20k OA temperature sensors, "SENS T" will appear on the screen			
	MA T SENS ERR	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.

Table 23 — W7220 Menu Structure^a (cont)

MENU	PARAMETER	PARAMETER DEFAULT VALUE	PARAMETER RANGE AND INCREMENT ^b	EXPANDED PARAMETER NAME NOTES
ALARMS (cont)	RA SYLK T ERR	N/A	N/A	RETURN AIR S-BUS SENSOR ERROR Return air enthalpy sensor has failed or become disconnected - check wiring, then replace sensor if the alarm continues.
	RA SYLK H ERR	N/A	N/A	
	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 set point menu. Check if Mixed air temperature on STATUS menu is below the Lo Set point on Advanced menu. When conditions are back in normal range, the alarm will go away.
	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, this alarm will display when the W7220 is completing a calibration on the dampers. Wait until the calibration is completed and the alarm will go away. Must have OA, MA and RA sensors for DCV calibration; set up is in the Advanced setup menu.
	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 23 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 CTB terminal G. This signal passes through the Central Terminal Board's OCCUPANCY jumper to the ECONO connector and to the W7220's OCC input terminal. An external timeclock or relay is required to implement an Occupancy schedule on the economizer damper position.
- 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.
- SYSTEM SETUP parameters must be configured as noted for 2-Speed unit operation:
EQUIPMENT = CONV
AUX2 IN = W
FAN SPEED = 2SPEED
or
FAN SPEED = 3SPEED
- After 10 minutes without a command or mode change, the controller will change to normal operation.

LEGEND

CLO	— Compressor Lockout
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

For damper minimum position settings and checkout menu readings, see Table 24. For dry bulb operation with a 1-speed fan, with or without DCV, see Tables 25 and 26. For enthalpy operation with a 1-speed fan, with or without DCV see Tables 27 and 28. For dry bulb operation with a 2 speed indoor fan, with or without DCV, see Tables 29 and 30. For enthalpy operation with a 2 speed indoor fan, with or without DCV, see Tables 31 and 32.

Table 24 — Damper Minimum Position Settings and Readings on Checkout Menu

DEMAND CONTROLLED VENTILATION (CO ₂ SENSOR)	FAN SPEED	SETPOINTS	CHECKOUT
NO	1	MIN POS	VMAX–HS
		N/A	N/A
	2	MIN POS H	VMAX–HS
		MIN POS L	VMAX–LS
YES	1	VENT MIN	VMAX–HS
		VENT MAX	VMAX–HS
	2	VENT MIN H	VMAX–HS
		VENT MAX H	VMAX–LS
		VENT MIN L	N/A
		VENT MAX L	N/A

Table 25 — Dry Bulb Operation without DCV (CO₂ Sensor) — 1 Speed Fan

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

Table 26 — Dry Bulb Operation with DCV (CO₂ Sensor) — 1 Speed Fan

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

NOTE(S):

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

Table 27 — Enthalpy Operation without DCV (CO₂ Sensor) — 1 Speed Fan

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

Table 28 — Enthalpy Operation with DCV (CO₂ Sensor) — 1 Speed Fan

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

Table 29 — Dry Bulb Operation without DCV (CO₂ Sensor) — 2 Speed Fan

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

NOTE(S):

- With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.
- With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

Table 30 — Dry Bulb Operation with DCV (CO₂ Sensor) — 2 Speed Fan

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

Table 31 — Enthalpy Operation without DCV (CO₂ Sensor) — 2 Speed Fan

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

Table 32 — Enthalpy Operation with DCV (CO₂ Sensor) — 2 Speed Fan

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

NOTE(S):

- With 2SP FAN DELAY (Advanced Setup Menu) when in the economizing mode there is a delay for the high speed fan to try to satisfy the call for second stage cooling by turning on the fan to high and opening the OA damper 100% before the first stage mechanical cooling is enabled.
- With stage 3 delay (STG3 DLY) in Advanced setup menu can turn on second stage of mechanical cooling Y2-O after the delay if the call for Y1-I and Y2-I have not been satisfied.

ENTHALPY SETTINGS

When the OA temperature, enthalpy and dew point are below the respective set points, the Outdoor Air can be used for economizing. Figure 86 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 34 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 86 shows the 5 current boundaries. There is also a high limit boundary for differential enthalpy. The high limit boundary is ES1 when there are no stages of mechanical cooling energized and HL (high limit) when a compressor stage is energized.

TWO-SPEED FAN OPERATION

The W7220 controller has the capability to work with a system using a 2-speed supply fan. The W7220 does not control the supply directly but uses the following input status to determine the speed of the supply fan and controls the OA damper to the required position, see Table 33.

Table 33 — Fan Speed

STATE	FAN SPEED
OCC	Low
Y1	Low
Y2	High
W	High

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

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

After the delay one of two actions will happen:

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

OR

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

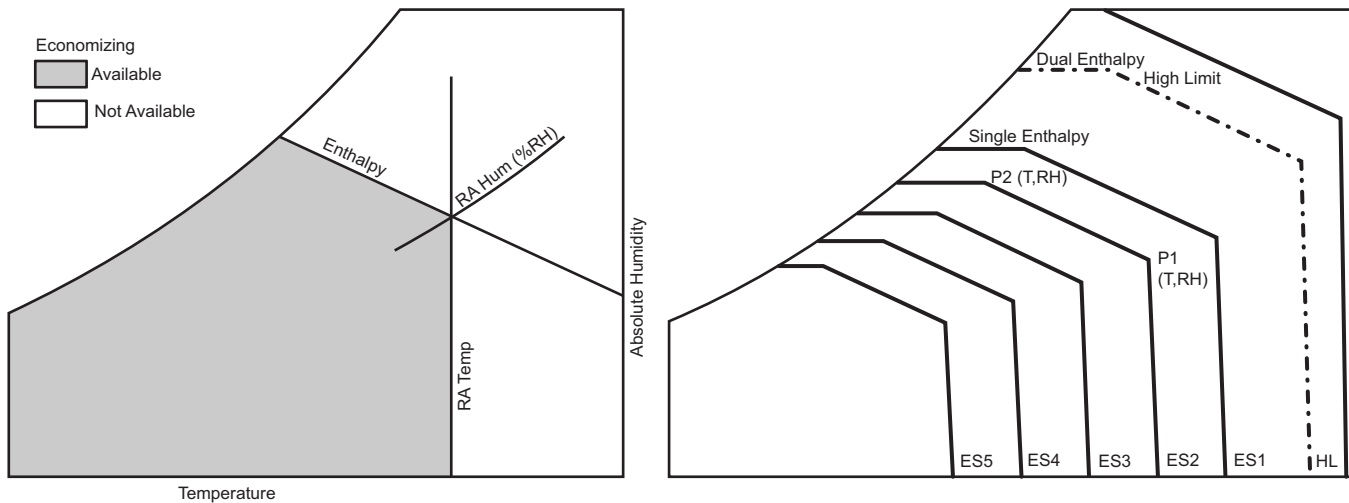


Fig. 86 — Single Enthalpy Curve Boundaries

Table 34 — 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 55.

Power Up

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

Initial Menu Display

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

Power Loss (Outage or Brownout)

All set points and advanced settings are restored after any power loss or interruption.

NOTE: All settings are stored in non-volatile flash memory.

Status

Use the Status menu (see Table 23) 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 55.

Checkout Tests

Use the Checkout menu (see page 59) 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 55.

To perform a Checkout test:

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

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

⚠ CAUTION

EQUIPMENT DAMAGE HAZARD

Failure to follow this caution may result in equipment damage.

Be sure to allow enough time for compressor start-up and shut-down 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.

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 lock-out/tag-out procedures are in place.
5. Relieve all pressure from system before touching or disturbing anything inside terminal box whenever refrigerant leak is suspected around compressor terminals.
6. Never attempt to repair a soldered connection while refrigerant system is under pressure.

⚠ WARNING

ELECTRICAL OPERATION HAZARD

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

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

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

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

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 — on page 69.) 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.

Refrigerant Service Ports

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

Cooling

Set space thermostat to OFF position. To start unit, turn on main power supply. Set system selector switch at COOL position and fan switch 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.

FASTENER TORQUE VALUES

Table 35 — 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)

APPENDIX A — MODEL NUMBER NOMENCLATURE

Position:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Example:	5	4	7	K	E	0	8	N	0	0	0	A	2	A	0	A	A

<p>Unit Type Packaged Rooftop Heat Pump with Field-Installed Electric Heat</p> <hr/> <p>Model K = Puron® (R-410A) Refrigerant with Axion™ Fan</p> <hr/> <p>Voltage E = 460-3-60 P = 208/230-3-60 T = 575-3-60</p> <hr/> <p>Cooling Tons 08 = 7.5 tons 09 = 8.5 tons 12 = 10 tons 14 = 12.5 tons</p> <hr/> <p>Refrig. System Options N = Two Stage Cooling, Single Circuit</p> <hr/> <p>Heat Level (Field-installed electric heaters available) 000 = No Heat</p> <hr/> <p>Coil Options Round Tube/Plate Fin (Condenser - Evaporator - Hail Guard) A = Al/Cu — Al/Cu B = Precoat Al/Cu — Al/Cu C = E-coat Al/Cu — Al/Cu D = E-coat Al/Cu — E-coat Al/Cu E = Cu/Cu — Al/Cu F = Cu/Cu — Cu/Cu M = Al/Cu — Al/Cu — Louvered Hail Guard N = Precoat Al/Cu — Al/Cu — Louvered Hail Guard P = E-coat Al/Cu — Al/Cu — Louvered Hail Guard Q = E-coat Al/Cu — E-coat Al/Cu — Louvered Hail Guard R = Cu/Cu — Al/Cu — Louvered Hail Guard S = Cu/Cu — Cu/Cu — Louvered Hail Guard</p>	<p>Packaging and Control A = Standard Packaging, electro-mechanical controls, no intake or exhaust option. Will allow for use of field-installed economizers (W7212, W7220), manual damper, or two-position damper. B = LTL Packaging, electro-mechanical controls, no intake or exhaust option. Will allow for use of field-installed economizers (W7212, W7220), manual damper, or two-position damper. C = Standard Packaging, electro-mechanical controls that require factory-installed W7220 EconoMi\$er X F = LTL Packaging, electro-mechanical controls that require factory-installed W7220 EconoMi\$er X</p> <hr/> <p>Factory Installed Options 0A = None NOTE: See the 547K 7.5 to 12.5 ton Price Pages for a complete list of factory-installed options.</p> <hr/> <p>Outdoor Air Options A = Electromechanical controls. Allows for use of all field-installed economizers and dampers. B = Temperature Economizer, Barometric Relief, Standard Leak (W7220) E = Temperature Economizer, Barometric Relief, Standard Leak w/CO₂ (W7220) H = Enthalpy Economizer, Barometric Relief, Standard Leak (W7220) L = Enthalpy Economizer, Barometric Relief, Standard Leak w/CO₂ (W7220) U = Temperature Economizer, Barometric Relief, Ultra Low Leak (W7220) W = Enthalpy Economizer, Barometric Relief, Ultra Low Leak (W7220)</p> <hr/> <p>Indoor Fan Options 2 = Standard/Medium Static Motor with Axion™ Fan 3 = High Static Motor with Axion Fan</p>
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Fig. A — Model Number Nomenclature

APPENDIX B — PHYSICAL DATA

547K*08 to 14 Physical Data

UNIT	547K*08	547K*09	547K*12	547K*14
NOMINAL TONS	7.5	8.5	10.0	12.5
BASE UNIT OPERATING WT (lb)^a	805	812	955	1250
REFRIGERATION SYSTEM				
No. Circuits/No. Compressors/Type	1/2/Scroll	1/2/Scroll	1/2/Scroll	1/2/Scroll
Puron® (R-410A) Charge (lb-oz)	17-8	21-2	21-5	24-14
Cooling Metering Device	TXV	TXV	TXV	TXV
Heating Metering Device	TXV	TXV	TXV	TXV
High-Pressure Trip/Reset (psig)	630/505	630/505	630/505	630/505
Loss of Charge Trip/Reset	27/44	27/44	27/44	27/44
EVAPORATOR COIL				
Material (Tube/Fin)	Cu/Al	Cu/Al	Cu/Al	Cu/Al
Coil Type	3/8 in. RTPF	3/8 in. RTPF	3/8 in. RTPF	3/8 in. RTPF
Rows/FPI	3/15	4/15	4/15	3/15
Total Face Area (ft²)	11.1	11.1	11.1	17.5
Condensate Drain Connection Size	3/4 in.	3/4 in.	3/4 in.	3/4 in.
CONDENSER COIL				
Material (Tube/Fin)	Cu/Al	Cu/Al	Cu/Al	Cu/Al
Coil Type	5/16 in. RTPF	5/16 in. RTPF	5/16 in. RTPF	5/16 in. RTPF
Rows/FPI	2/18	2/18	3/18	2/18
Total Face Area (ft²)	25.1	25.1	25.1	36.1
EVAPORATOR FAN AND MOTOR				
Standard/Medium Static 3 Phase				
Motor Qty / Drive Type	1 / Direct	1 / Direct	1 / Direct	1 / Direct
Max Cont bhp	2.4	2.4	2.4	3.0
Range (rpm)	250-2000	250-2000	250-2000	250-2200
Fan Qty / Type	1 / Vane Axial	1 / Vane Axial	1 / Vane Axial	1 / Vane Axial
Fan Diameter (in.)	22	22	22	22
High Static 3 Phase				
Motor Qty / Drive Type	1 / Direct	1 / Direct	1 / Direct	1 / Direct
Max Cont bhp	3	3	5	5
Range (rpm)	250-2200	250-2200	250-2200	250-2200
Fan Qty / Type	1 / Vane Axial	1 / Vane Axial	1 / Vane Axial	1 / Vane Axial
Fan Diameter (in.)	22	22	22	22
CONDENSER FAN AND MOTOR				
Qty / Motor Drive Type	2 / Direct	2 / Direct	1 / Direct	3 / Direct
Motor hp / rpm	1/4 / 1100	1/4 / 1100	1 / Multiple Speeds	1/4 / 1100
Fan Diameter (in.)	22	22	30	22
FILTERS				
RA Filter Qty / Size (in.)	4 / 20x20x2	4 / 20x20x2	4 / 20x20x2	6 / 18x24x2
OA Inlet Screen Qty / Size (in.)	1 / 20x24x1	1 / 20x24x1	1 / 20x24x1	Vertical: 2 / 24x27x1 Horizontal: 1 / 30x39x1

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, high gas heat (on gas heat models) and wet coils.
4. Factory options and accessories may effect static pressure losses. 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 Bryant motors, please see the Electrical information section of the Product Data book.
7. For more information on the performance limits of Bryant motors, see the application data section of the Product Data 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)

547K*08 — 7.5 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
2250	920	0.29	1045	0.43	1158	0.58	1262	0.75	1356	0.93
2440	980	0.35	1097	0.49	1205	0.65	1304	0.82	1397	1.01
2625	1039	0.41	1150	0.56	1252	0.72	1348	0.90	1438	1.09
2815	1101	0.49	1205	0.64	1303	0.81	1396	0.99	1482	1.19
3000	1163	0.57	1261	0.72	1355	0.90	1443	1.08	1527	1.28
3190	1226	0.66	1320	0.82	1409	1.00	1494	1.19	1575	1.39
3375	1289	0.75	1378	0.92	1463	1.10	1545	1.30	1623	1.51
3565	1354	0.86	1438	1.03	1520	1.22	1598	1.42	1674	1.63
3750	1417	0.97	1498	1.15	1576	1.33	1651	1.53	1724	1.75

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
2250	1444	1.12	1527	1.33	1604	1.54	1678	1.76	1748	1.99
2440	1483	1.21	1564	1.42	1640	1.63	1713	1.86	1782	2.10
2625	1522	1.30	1602	1.51	1677	1.73	1748	1.96	1817	2.20
2815	1565	1.40	1642	1.61	1716	1.84	1786	2.08	1853	2.32
3000	1607	1.50	1683	1.72	1755	1.95	1824	2.19	1891	2.44
3190	1652	1.61	1727	1.84	1797	2.07	1865	2.31	1930	2.57
3375	1698	1.72	1770	1.95	1839	2.19	1906	2.44	1970	2.69
3565	1746	1.85	1816	2.08	1884	2.32	1949	2.57	2012	2.83
3750	1795	1.97	1863	2.20	1929	2.45	1993	2.70	2055	2.96

Standard/Medium Static 920-2000 rpm, 2.4 Max bhp

High Static 920-2200 rpm, 3.0 Max bhp

547K*08 — Standard/Medium Static — 7.5 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
2250	920	4.4	1045	5.1	1158	5.7	1262	6.2	1356	6.7
2440	980	4.8	1097	5.4	1205	5.9	1304	6.4	1397	6.9
2625	1039	5.1	1150	5.6	1252	6.2	1348	6.6	1438	7.1
2815	1101	5.4	1205	5.9	1303	6.4	1396	6.9	1482	7.3
3000	1163	5.7	1261	6.2	1355	6.7	1443	7.1	1527	7.6
3190	1226	6.0	1320	6.5	1409	7.0	1494	7.4	1575	7.8
3375	1289	6.3	1378	6.8	1463	7.2	1545	7.7	1623	8.1
3565	1354	6.7	1438	7.1	1520	7.5	1598	7.9	1674	8.3
3750	1417	7.0	1498	7.4	1576	7.8	1651	8.2	1724	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
2250	1444	7.1	1527	7.6	1604	8.0	1678	8.3	1748	8.7
2440	1483	7.3	1564	7.8	1640	8.1	1713	8.5	1782	8.9
2625	1522	7.5	1602	8.0	1677	8.3	1748	8.7	1817	9.1
2815	1565	7.8	1642	8.2	1716	8.5	1786	8.9	1853	9.2
3000	1607	8.0	1683	8.4	1755	8.7	1824	9.1	1891	9.4
3190	1652	8.2	1727	8.6	1797	9.0	1865	9.3	—	—
3375	1698	8.4	1770	8.8	1839	9.2	1906	9.5	—	—
3565	1746	8.7	1816	9.1	1884	9.4	—	—	—	—
3750	1795	8.9	1863	9.3	1929	9.6	—	—	—	—

Standard/Medium Static 920-2000 rpm, 2.4 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*08 — High Static — 7.5 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
2250	920	4.1	1045	4.7	1158	5.2	1262	5.7	1356	6.1
2440	980	4.4	1097	4.9	1205	5.4	1304	5.9	1397	6.3
2625	1039	4.6	1150	5.2	1252	5.6	1348	6.1	1438	6.5
2815	1101	4.9	1205	5.4	1303	5.9	1396	6.3	1482	6.7
3000	1163	5.2	1261	5.7	1355	6.1	1443	6.5	1527	6.9
3190	1226	5.5	1320	5.9	1409	6.3	1494	6.7	1575	7.1
3375	1289	5.8	1378	6.2	1463	6.6	1545	7.0	1623	7.3
3565	1354	6.1	1438	6.5	1520	6.9	1598	7.2	1674	7.6
3750	1417	6.4	1498	6.8	1576	7.1	1651	7.5	1724	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
2250	1444	6.5	1527	6.9	1604	7.2	1678	7.6	1748	7.9
2440	1483	6.7	1564	7.1	1640	7.4	1713	7.8	1782	8.1
2625	1522	6.9	1602	7.2	1677	7.6	1748	7.9	1817	8.2
2815	1565	7.1	1642	7.4	1716	7.8	1786	8.1	1853	8.4
3000	1607	7.3	1683	7.6	1755	7.9	1824	8.3	1891	8.6
3190	1652	7.5	1727	7.8	1797	8.1	1865	8.5	1930	8.8
3375	1698	7.7	1770	8.0	1839	8.3	1906	8.6	1970	8.9
3565	1746	7.9	1816	8.2	1884	8.5	1949	8.8	2012	9.1
3750	1795	8.1	1863	8.4	1929	8.7	1993	9.0	2055	9.3

High Static 920-2200 rpm, 3.0 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*09 — 8.5 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
2550	1035	0.41	1147	0.56	1251	0.73	1348	0.91	1438	1.11
2765	1104	0.50	1209	0.65	1308	0.83	1401	1.02	1488	1.22
2975	1173	0.59	1272	0.76	1365	0.93	1454	1.13	1538	1.34
3190	1244	0.70	1337	0.87	1426	1.06	1511	1.26	1592	1.47
3400	1314	0.82	1402	0.99	1487	1.19	1568	1.39	1646	1.61
3615	1387	0.95	1470	1.13	1551	1.33	1629	1.54	1703	1.76
3825	1458	1.09	1538	1.28	1615	1.48	1689	1.69	1761	1.92
4040	1532	1.24	1608	1.44	1681	1.64	1752	1.86	1822	2.09
4250	1605	1.41	1677	1.60	1747	1.81	1815	2.03	1882	2.27

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
2550	1522	1.32	1602	1.53	1677	1.76	1749	2.00	1817	2.24
2765	1570	1.43	1647	1.65	1721	1.89	1792	2.13	1859	2.38
2975	1618	1.56	1693	1.78	1766	2.02	1835	2.27	1901	2.52
3190	1669	1.69	1743	1.93	1813	2.17	1881	2.42	1946	2.68
3400	1721	1.84	1792	2.07	1861	2.32	1927	2.58	1991	2.84
3615	1776	2.00	1845	2.24	1912	2.49	1976	2.75	2039	3.02
3825	1831	2.16	1898	2.40	1963	2.66	2026	2.92	2087	3.20
4040	1889	2.33	1954	2.58	2017	2.84	2078	3.11	—	—
4250	1947	2.51	2010	2.76	2071	3.02	—	—	—	—

Standard/Medium Static 1035-2000 rpm, 2.4 Max bhp

High Static 1035-2200 rpm, 3.0 Max bhp

547K*09 — Standard/Medium Static — 8.5 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
2550	1035	5.0	1147	5.6	1251	6.1	1348	6.6	1438	7.1
2765	1104	5.4	1209	5.9	1308	6.4	1401	6.9	1488	7.4
2975	1173	5.7	1272	6.3	1365	6.7	1454	7.2	1538	7.6
3190	1244	6.1	1337	6.6	1426	7.0	1511	7.5	1592	7.9
3400	1314	6.5	1402	6.9	1487	7.4	1568	7.8	1646	8.2
3615	1387	6.8	1470	7.3	1551	7.7	1629	8.1	1703	8.5
3825	1458	7.2	1538	7.6	1615	8.0	1689	8.4	1761	8.8
4040	1532	7.6	1608	8.0	1681	8.4	1752	8.7	1822	9.1
4250	1605	8.0	1677	8.3	1747	8.7	1815	9.0	1882	9.4

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
2550	1522	7.5	1602	8.0	1677	8.3	1749	8.7	1817	9.1
2765	1570	7.8	1647	8.2	1721	8.6	1792	8.9	1859	9.3
2975	1618	8.0	1693	8.4	1766	8.8	1835	9.2	1901	9.5
3190	1669	8.3	1743	8.7	1813	9.0	1881	9.4	—	—
3400	1721	8.6	1792	8.9	1861	9.3	—	—	—	—
3615	1776	8.8	1845	9.2	1912	9.5	—	—	—	—
3825	1831	9.1	1898	9.5	—	—	—	—	—	—
4040	1889	9.4	—	—	—	—	—	—	—	—
4250	1947	9.7	—	—	—	—	—	—	—	—

Standard/Medium Static 1035-2000 rpm, 2.4 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*09 — High Static — 8.5 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
2550	1035	4.6	1147	5.1	1251	5.6	1348	6.1	1438	6.5
2765	1104	4.9	1209	5.4	1308	5.9	1401	6.3	1488	6.7
2975	1173	5.3	1272	5.7	1365	6.1	1454	6.6	1538	6.9
3190	1244	5.6	1337	6.0	1426	6.4	1511	6.8	1592	7.2
3400	1314	5.9	1402	6.3	1487	6.7	1568	7.1	1646	7.4
3615	1387	6.2	1470	6.6	1551	7.0	1629	7.4	1703	7.7
3825	1458	6.6	1538	6.9	1615	7.3	1689	7.6	1761	8.0
4040	1532	6.9	1608	7.3	1681	7.6	1752	7.9	1822	8.3
4250	1605	7.3	1677	7.6	1747	7.9	1815	8.2	1882	8.5

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
2550	1522	6.9	1602	7.2	1677	7.6	1749	7.9	1817	8.2
2765	1570	7.1	1647	7.4	1721	7.8	1792	8.1	1859	8.4
2975	1618	7.3	1693	7.7	1766	8.0	1835	8.3	1901	8.6
3190	1669	7.5	1743	7.9	1813	8.2	1881	8.5	1946	8.8
3400	1721	7.8	1792	8.1	1861	8.4	1927	8.7	1991	9.0
3615	1776	8.0	1845	8.4	1912	8.7	1976	9.0	2039	9.3
3825	1831	8.3	1898	8.6	1963	8.9	2026	9.2	2087	9.5
4040	1889	8.6	1954	8.9	2017	9.2	2078	9.4	—	—
4250	1947	8.8	2010	9.1	2071	9.4	—	—	—	—

High Static 1035-2200 rpm, 3.0 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*12 — 10 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
3000	1181	0.60	1279	0.77	1372	0.95	1461	1.14	1544	1.35
3250	1264	0.73	1356	0.91	1443	1.09	1527	1.29	1607	1.51
3500	1348	0.88	1434	1.06	1517	1.25	1596	1.46	1673	1.68
3750	1433	1.04	1514	1.23	1592	1.43	1667	1.64	1740	1.86
4000	1518	1.21	1595	1.41	1669	1.61	1740	1.83	1810	2.06
4250	1605	1.41	1677	1.60	1747	1.81	1815	2.03	1882	2.27
4500	1691	1.60	1760	1.81	1826	2.02	1892	2.24	1955	2.48
4750	1778	1.81	1843	2.01	1907	2.23	1969	2.46	2030	2.69
5000	1866	2.02	1928	2.23	1988	2.44	2048	2.67	2106	2.91

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
3000	1624	1.57	1699	1.80	1771	2.04	1840	2.29	1906	2.54
3250	1684	1.73	1757	1.97	1827	2.21	1894	2.47	1958	2.72
3500	1746	1.91	1817	2.15	1884	2.40	1950	2.66	2013	2.92
3750	1811	2.10	1879	2.34	1945	2.60	2008	2.86	2070	3.13
4000	1878	2.30	1943	2.55	2007	2.81	2069	3.08	2128	3.35
4250	1947	2.51	2010	2.76	2071	3.02	2131	3.29	2189	3.56
4500	2017	2.72	2078	2.97	2138	3.24	2195	3.50	—	—
4750	2090	2.94	2148	3.19	—	—	—	—	—	—
5000	2164	3.15	—	—	—	—	—	—	—	—

Standard/Medium Static 1181-2000 rpm, 2.4 Max bhp

High Static 1181-2200 rpm, 5.0 Max bhp

547K*12 — Standard/Medium Static — 10 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
3000	1181	5.8	1279	6.3	1372	6.8	1461	7.2	1544	7.7
3250	1264	6.2	1356	6.7	1443	7.1	1527	7.6	1607	8.0
3500	1348	6.6	1434	7.1	1517	7.5	1596	7.9	1673	8.3
3750	1433	7.1	1514	7.5	1592	7.9	1667	8.3	1740	8.7
4000	1518	7.5	1595	7.9	1669	8.3	1740	8.7	1810	9.0
4250	1605	8.0	1677	8.3	1747	8.7	1815	9.0	1882	9.4
4500	1691	8.4	1760	8.8	1826	9.1	1892	9.4	1955	9.8
4750	1778	8.9	1843	9.2	1907	9.5	1969	9.8	—	—
5000	1866	9.3	1928	9.6	1988	9.9	—	—	—	—

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
3000	1624	8.1	1699	8.5	1771	8.8	1840	9.2	1906	9.5
3250	1684	8.4	1757	8.8	1827	9.1	1894	9.5	—	—
3500	1746	8.7	1817	9.1	1884	9.4	—	—	—	—
3750	1811	9.0	1879	9.4	—	—	—	—	—	—
4000	1878	9.4	1943	9.7	—	—	—	—	—	—
4250	1947	9.7	—	—	—	—	—	—	—	—
4500	—	—	—	—	—	—	—	—	—	—
4750	—	—	—	—	—	—	—	—	—	—
5000	—	—	—	—	—	—	—	—	—	—

Standard/Medium Static 1181-2000 rpm, 2.4 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*12 — High Static — 10 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
3000	1181	5.3	1279	5.7	1372	6.2	1461	6.6	1544	7.0
3250	1264	5.7	1356	6.1	1443	6.5	1527	6.9	1607	7.3
3500	1348	6.1	1434	6.5	1517	6.8	1596	7.2	1673	7.6
3750	1433	6.5	1514	6.8	1592	7.2	1667	7.5	1740	7.9
4000	1518	6.9	1595	7.2	1669	7.5	1740	7.9	1810	8.2
4250	1605	7.3	1677	7.6	1747	7.9	1815	8.2	1882	8.5
4500	1691	7.7	1760	8.0	1826	8.3	1892	8.6	1955	8.9
4750	1778	8.1	1843	8.4	1907	8.6	1969	8.9	2030	9.2
5000	1866	8.5	1928	8.7	1988	9.0	2048	9.3	2106	9.6

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
3000	1624	7.3	1699	7.7	1771	8.0	1840	8.3	1906	8.6
3250	1684	7.6	1757	8.0	1827	8.3	1894	8.6	1958	8.9
3500	1746	7.9	1817	8.2	1884	8.5	1950	8.8	2013	9.1
3750	1811	8.2	1879	8.5	1945	8.8	2008	9.1	2070	9.4
4000	1878	8.5	1943	8.8	2007	9.1	2069	9.4	2128	9.7
4250	1947	8.8	2010	9.1	2071	9.4	2131	9.7	2189	9.9
4500	2017	9.2	2078	9.4	2138	9.7	2195	10.0	—	—
4750	2090	9.5	2148	9.8	—	—	—	—	—	—
5000	2164	9.8	—	—	—	—	—	—	—	—

High Static 1181-2200 rpm, 3.0 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*14 — 12.5 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
3750	947	0.45	1044	0.60	1140	0.78	1236	0.99	1329	1.23
4065	1019	0.55	1108	0.71	1197	0.90	1286	1.11	1373	1.36
4375	1091	0.68	1174	0.85	1257	1.04	1339	1.26	1421	1.50
4690	1164	0.82	1242	1.00	1319	1.20	1396	1.42	1473	1.67
5000	1237	0.98	1310	1.16	1383	1.37	1455	1.60	1527	1.85
5315	1312	1.16	1381	1.35	1449	1.56	1517	1.79	1585	2.05
5625	1387	1.36	1452	1.56	1516	1.77	1580	2.00	1645	2.26
5940	1463	1.57	1524	1.77	1585	2.00	1646	2.23	1707	2.49
6250	1537	1.79	1596	2.01	1654	2.23	1712	2.48	1770	2.74

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
3750	1419	1.50	1506	1.79	1589	2.11	1668	2.44	1743	2.78
4065	1459	1.63	1542	1.92	1622	2.24	1699	2.57	1773	2.92
4375	1502	1.77	1581	2.07	1658	2.38	1732	2.72	1805	3.08
4690	1549	1.94	1624	2.23	1698	2.55	1769	2.88	1839	3.24
5000	1599	2.12	1670	2.41	1740	2.73	1809	3.07	1877	3.43
5315	1653	2.32	1721	2.62	1787	2.93	1853	3.27	1918	3.63
5625	1709	2.54	1773	2.83	1836	3.14	1899	3.48	1961	3.83
5940	1768	2.77	1829	3.07	1889	3.38	1949	3.71	2008	4.06
6250	1828	3.01	1886	3.31	1943	3.62	2001	3.95	2057	4.29

Standard/Medium Static 947-2200 rpm, 3.0 Max bhp

High Static 947-2200 rpm, 5.0 Max bhp

547K*14 — Standard/Medium Static — 12.5 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
3750	947	4.2	1044	4.7	1140	5.1	1236	5.6	1329	6.0
4065	1019	4.5	1108	5.0	1197	5.4	1286	5.8	1373	6.2
4375	1091	4.9	1174	5.3	1257	5.6	1339	6.0	1421	6.4
4690	1164	5.2	1242	5.6	1319	5.9	1396	6.3	1473	6.6
5000	1237	5.6	1310	5.9	1383	6.2	1455	6.6	1527	6.9
5315	1312	5.9	1381	6.2	1449	6.5	1517	6.8	1585	7.2
5625	1387	6.2	1452	6.5	1516	6.8	1580	7.1	1645	7.4
5940	1463	6.6	1524	6.9	1585	7.2	1646	7.4	1707	7.7
6250	1537	6.9	1596	7.2	1654	7.5	1712	7.7	1770	8.0

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
3750	1419	6.4	1506	6.8	1589	7.2	1668	7.5	1743	7.9
4065	1459	6.6	1542	7.0	1622	7.3	1699	7.7	1773	8.0
4375	1502	6.8	1581	7.1	1658	7.5	1732	7.8	1805	8.2
4690	1549	7.0	1624	7.3	1698	7.7	1769	8.0	—	—
5000	1599	7.2	1670	7.6	1740	7.9	1809	8.2	—	—
5315	1653	7.5	1721	7.8	1787	8.1	—	—	—	—
5625	1709	7.7	1773	8.0	1836	8.3	—	—	—	—
5940	1768	8.0	1829	8.3	—	—	—	—	—	—
6250	1828	8.3	—	—	—	—	—	—	—	—

Standard/Medium Static 947-2200 rpm, 3.0 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*14 — High Static — 12.5 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
3750	947	4.2	1044	4.7	1140	5.1	1236	5.6	1329	6.0
4065	1019	4.5	1108	5.0	1197	5.4	1286	5.8	1373	6.2
4375	1091	4.9	1174	5.3	1257	5.6	1339	6.0	1421	6.4
4690	1164	5.2	1242	5.6	1319	5.9	1396	6.3	1473	6.6
5000	1237	5.6	1310	5.9	1383	6.2	1455	6.6	1527	6.9
5315	1312	5.9	1381	6.2	1449	6.5	1517	6.8	1585	7.2
5625	1387	6.2	1452	6.5	1516	6.8	1580	7.1	1645	7.4
5940	1463	6.6	1524	6.9	1585	7.2	1646	7.4	1707	7.7
6250	1537	6.9	1596	7.2	1654	7.5	1712	7.7	1770	8.0

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
3750	1419	6.4	1506	6.8	1589	7.2	1668	7.5	1743	7.9
4065	1459	6.6	1542	7.0	1622	7.3	1699	7.7	1773	8.0
4375	1502	6.8	1581	7.1	1658	7.5	1732	7.8	1805	8.2
4690	1549	7.0	1624	7.3	1698	7.7	1769	8.0	1839	8.3
5000	1599	7.2	1670	7.6	1740	7.9	1809	8.2	1877	8.5
5315	1653	7.5	1721	7.8	1787	8.1	1853	8.4	1918	8.7
5625	1709	7.7	1773	8.0	1836	8.3	1899	8.6	1961	8.9
5940	1768	8.0	1829	8.3	1889	8.6	1949	8.8	2008	9.1
6250	1828	8.3	1886	8.6	1943	8.8	2001	9.1	2057	9.3

High Static 947-2200 rpm, 5.0 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*08 — 7.5 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
2250	861	0.24	993	0.37	1116	0.52	1227	0.69	1329	0.88
2440	915	0.28	1038	0.41	1155	0.57	1262	0.74	1362	0.94
2625	969	0.33	1084	0.47	1195	0.63	1299	0.81	1396	1.00
2815	1026	0.39	1134	0.53	1238	0.69	1338	0.87	1432	1.07
3000	1082	0.46	1183	0.60	1283	0.76	1378	0.94	1469	1.14
3190	1140	0.53	1236	0.67	1330	0.84	1421	1.02	1509	1.23
3375	1198	0.61	1288	0.75	1378	0.92	1465	1.11	1549	1.31
3565	1257	0.69	1343	0.84	1428	1.01	1512	1.20	1593	1.40
3750	1316	0.78	1398	0.93	1479	1.10	1558	1.29	1637	1.50

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
2250	1422	1.07	1508	1.28	1589	1.50	1665	1.72	1736	1.95
2440	1454	1.14	1539	1.35	1620	1.58	1695	1.80	1767	2.04
2625	1486	1.21	1571	1.43	1650	1.65	1725	1.89	1797	2.13
2815	1520	1.28	1604	1.50	1682	1.73	1757	1.98	1828	2.23
3000	1555	1.36	1637	1.58	1715	1.82	1789	2.07	1859	2.32
3190	1593	1.44	1673	1.67	1749	1.91	1822	2.16	1892	2.42
3375	1631	1.53	1709	1.76	1784	2.00	1855	2.25	1924	2.51
3565	1672	1.62	1747	1.85	1821	2.09	1891	2.35	1959	2.61
3750	1713	1.71	1786	1.94	1858	2.19	1927	2.44	1993	2.70

Standard/Medium Static 861-2000 rpm, 2.4 Max bhp

High Static 861-2200 rpm, 3.0 Max bhp

547K*08 — Standard/Medium Static — 7.5 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
2250	861	4.1	993	4.8	1116	5.5	1227	6.0	1329	6.5
2440	915	4.4	1038	5.1	1155	5.7	1262	6.2	1362	6.7
2625	969	4.7	1084	5.3	1195	5.9	1299	6.4	1396	6.9
2815	1026	5.0	1134	5.5	1238	6.1	1338	6.6	1432	7.1
3000	1082	5.3	1183	5.8	1283	6.3	1378	6.8	1469	7.3
3190	1140	5.6	1236	6.1	1330	6.6	1421	7.0	1509	7.5
3375	1198	5.9	1288	6.3	1378	6.8	1465	7.2	1549	7.7
3565	1257	6.2	1343	6.6	1428	7.1	1512	7.5	1593	7.9
3750	1316	6.5	1398	6.9	1479	7.3	1558	7.7	1637	8.1

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
2250	1422	7.0	1508	7.5	1589	7.9	1665	8.3	1736	8.6
2440	1454	7.2	1539	7.6	1620	8.0	1695	8.4	1767	8.8
2625	1486	7.4	1571	7.8	1650	8.2	1725	8.6	1797	9.0
2815	1520	7.5	1604	8.0	1682	8.4	1757	8.8	1828	9.1
3000	1555	7.7	1637	8.1	1715	8.5	1789	8.9	1859	9.3
3190	1593	7.9	1673	8.3	1749	8.7	1822	9.1	1892	9.4
3375	1631	8.1	1709	8.5	1784	8.9	1855	9.3	1924	9.6
3565	1672	8.3	1747	8.7	1821	9.1	1891	9.4	—	—
3750	1713	8.5	1786	8.9	1858	9.3	1927	9.6	—	—

Standard/Medium Static 861-2000 rpm, 2.4 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*08 — High Static — 7.5 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
2250	861	3.8	993	4.4	1116	5.0	1227	5.5	1329	6.0
2440	915	4.1	1038	4.6	1155	5.2	1262	5.7	1362	6.1
2625	969	4.3	1084	4.8	1195	5.4	1299	5.8	1396	6.3
2815	1026	4.6	1134	5.1	1238	5.6	1338	6.0	1432	6.5
3000	1082	4.8	1183	5.3	1283	5.8	1378	6.2	1469	6.6
3190	1140	5.1	1236	5.6	1330	6.0	1421	6.4	1509	6.8
3375	1198	5.4	1288	5.8	1378	6.2	1465	6.6	1549	7.0
3565	1257	5.6	1343	6.0	1428	6.4	1512	6.8	1593	7.2
3750	1316	5.9	1398	6.3	1479	6.7	1558	7.0	1637	7.4

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
2250	1422	6.4	1508	6.8	1589	7.2	1665	7.5	1736	7.9
2440	1454	6.6	1539	6.9	1620	7.3	1695	7.7	1767	8.0
2625	1486	6.7	1571	7.1	1650	7.5	1725	7.8	1797	8.1
2815	1520	6.9	1604	7.2	1682	7.6	1757	8.0	1828	8.3
3000	1555	7.0	1637	7.4	1715	7.8	1789	8.1	1859	8.4
3190	1593	7.2	1673	7.6	1749	7.9	1822	8.3	1892	8.6
3375	1631	7.4	1709	7.7	1784	8.1	1855	8.4	1924	8.7
3565	1672	7.6	1747	7.9	1821	8.3	1891	8.6	1959	8.9
3750	1713	7.8	1786	8.1	1858	8.4	1927	8.7	1993	9.0

High Static 861-2200 rpm, 3.0 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*09 — 8.5 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
2550	967	0.34	1085	0.48	1198	0.64	1303	0.83	1400	1.02
2765	1030	0.40	1140	0.55	1246	0.72	1346	0.90	1441	1.11
2975	1092	0.48	1195	0.63	1295	0.80	1391	0.99	1482	1.20
3190	1157	0.56	1254	0.72	1348	0.89	1439	1.08	1527	1.30
3400	1222	0.66	1312	0.81	1402	0.99	1489	1.19	1573	1.40
3615	1288	0.76	1374	0.92	1458	1.10	1541	1.30	1621	1.52
3825	1354	0.87	1435	1.04	1515	1.22	1594	1.42	1671	1.64
4040	1422	1.00	1498	1.16	1575	1.35	1650	1.55	1724	1.77
4250	1488	1.12	1561	1.29	1634	1.48	1706	1.69	1776	1.90

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
2550	1490	1.23	1575	1.46	1654	1.69	1729	1.93	1800	2.18
2765	1529	1.32	1612	1.55	1691	1.79	1765	2.04	1835	2.29
2975	1568	1.42	1650	1.65	1727	1.89	1801	2.15	1871	2.41
3190	1611	1.52	1690	1.76	1766	2.00	1839	2.26	1908	2.53
3400	1654	1.63	1731	1.87	1806	2.12	1877	2.38	1945	2.65
3615	1699	1.75	1775	1.99	1847	2.24	1917	2.51	1985	2.79
3825	1746	1.87	1819	2.12	1890	2.37	1958	2.64	2024	2.92
4040	1796	2.00	1866	2.25	1935	2.51	2001	2.77	2066	3.05
4250	1846	2.14	1914	2.38	1980	2.64	2045	2.91	2108	3.18

Standard/Medium Static 967-2000 rpm, 2.4 Max bhp

High Static 967-2200 rpm, 3.0 Max bhp

547K*09 — Standard/Medium Static — 8.5 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
2550	967	4.7	1085	5.3	1198	5.9	1303	6.4	1400	6.9
2765	1030	5.0	1140	5.6	1246	6.1	1346	6.6	1441	7.1
2975	1092	5.3	1195	5.9	1295	6.4	1391	6.9	1482	7.3
3190	1157	5.7	1254	6.2	1348	6.6	1439	7.1	1527	7.6
3400	1222	6.0	1312	6.5	1402	6.9	1489	7.4	1573	7.8
3615	1288	6.3	1374	6.8	1458	7.2	1541	7.6	1621	8.1
3825	1354	6.7	1435	7.1	1515	7.5	1594	7.9	1671	8.3
4040	1422	7.0	1498	7.4	1575	7.8	1650	8.2	1724	8.6
4250	1488	7.4	1561	7.7	1634	8.1	1706	8.5	1776	8.8

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
2550	1490	7.4	1575	7.8	1654	8.2	1729	8.6	1800	9.0
2765	1529	7.6	1612	8.0	1691	8.4	1765	8.8	1835	9.2
2975	1568	7.8	1650	8.2	1727	8.6	1801	9.0	1871	9.3
3190	1611	8.0	1690	8.4	1766	8.8	1839	9.2	1908	9.5
3400	1654	8.2	1731	8.6	1806	9.0	1877	9.4	—	—
3615	1699	8.5	1775	8.8	1847	9.2	1917	9.6	—	—
3825	1746	8.7	1819	9.1	1890	9.4	—	—	—	—
4040	1796	9.0	1866	9.3	1935	9.7	—	—	—	—
4250	1846	9.2	1914	9.6	—	—	—	—	—	—

Standard/Medium Static 967-2000 rpm, 2.4 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*09 — High Static — 8.5 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
2550	967	4.3	1085	4.9	1198	5.4	1303	5.9	1400	6.3
2765	1030	4.6	1140	5.1	1246	5.6	1346	6.1	1441	6.5
2975	1092	4.9	1195	5.4	1295	5.8	1391	6.3	1482	6.7
3190	1157	5.2	1254	5.6	1348	6.1	1439	6.5	1527	6.9
3400	1222	5.5	1312	5.9	1402	6.3	1489	6.7	1573	7.1
3615	1288	5.8	1374	6.2	1458	6.6	1541	7.0	1621	7.3
3825	1354	6.1	1435	6.5	1515	6.8	1594	7.2	1671	7.6
4040	1422	6.4	1498	6.8	1575	7.1	1650	7.5	1724	7.8
4250	1488	6.7	1561	7.1	1634	7.4	1706	7.7	1776	8.0

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
2550	1490	6.7	1575	7.1	1654	7.5	1729	7.8	1800	8.2
2765	1529	6.9	1612	7.3	1691	7.7	1765	8.0	1835	8.3
2975	1568	7.1	1650	7.5	1727	7.8	1801	8.2	1871	8.5
3190	1611	7.3	1690	7.6	1766	8.0	1839	8.3	1908	8.7
3400	1654	7.5	1731	7.8	1806	8.2	1877	8.5	1945	8.8
3615	1699	7.7	1775	8.0	1847	8.4	1917	8.7	1985	9.0
3825	1746	7.9	1819	8.2	1890	8.6	1958	8.9	2024	9.2
4040	1796	8.1	1866	8.5	1935	8.8	2001	9.1	2066	9.4
4250	1846	8.4	1914	8.7	1980	9.0	2045	9.3	2108	9.6

High Static 967-2200 rpm, 3.0 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*12 — 10 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
3000	1100	0.49	1202	0.64	1301	0.81	1396	1.00	1487	1.21
3250	1176	0.59	1270	0.74	1363	0.92	1453	1.11	1539	1.32
3500	1252	0.70	1341	0.86	1428	1.04	1512	1.24	1595	1.45
3750	1330	0.83	1413	1.00	1495	1.18	1575	1.38	1653	1.60
4000	1409	0.97	1487	1.14	1563	1.33	1639	1.53	1714	1.75
4250	1488	1.12	1561	1.29	1634	1.48	1706	1.69	1776	1.90
4500	1568	1.28	1637	1.45	1706	1.65	1774	1.85	1841	2.07
4750	1648	1.44	1714	1.62	1779	1.81	1844	2.02	1908	2.23
5000	1728	1.61	1791	1.79	1853	1.98	1915	2.19	1976	2.40

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
3000	1573	1.43	1654	1.66	1732	1.91	1805	2.16	1875	2.42
3250	1622	1.55	1702	1.79	1777	2.04	1849	2.29	1919	2.57
3500	1674	1.68	1751	1.92	1825	2.18	1895	2.44	1964	2.72
3750	1729	1.83	1803	2.07	1874	2.33	1943	2.59	2010	2.87
4000	1786	1.98	1857	2.22	1926	2.48	1993	2.75	2058	3.03
4250	1846	2.14	1914	2.38	1980	2.64	2045	2.91	2108	3.18
4500	1908	2.30	1973	2.54	2036	2.80	2099	3.06	2160	3.34
4750	1971	2.46	2034	2.71	2095	2.96	2155	3.22	—	—
5000	2036	2.63	2096	2.87	2155	3.11	—	—	—	—

Standard/Medium Static 1100-2000 rpm, 2.4 Max bhp

High Static 1100-2200 rpm, 5.0 Max bhp

547K*12 — Standard/Medium Static — 10 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
3000	1100	5.4	1202	5.9	1301	6.4	1396	6.9	1487	7.4
3250	1176	5.8	1270	6.2	1363	6.7	1453	7.2	1539	7.6
3500	1252	6.2	1341	6.6	1428	7.1	1512	7.5	1595	7.9
3750	1330	6.6	1413	7.0	1495	7.4	1575	7.8	1653	8.2
4000	1409	7.0	1487	7.4	1563	7.8	1639	8.1	1714	8.5
4250	1488	7.4	1561	7.7	1634	8.1	1706	8.5	1776	8.8
4500	1568	7.8	1637	8.1	1706	8.5	1774	8.8	1841	9.2
4750	1648	8.2	1714	8.5	1779	8.9	1844	9.2	1908	9.5
5000	1728	8.6	1791	8.9	1853	9.2	1915	9.6	1976	9.9

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
3000	1573	7.8	1654	8.2	1732	8.6	1805	9.0	1875	9.4
3250	1622	8.1	1702	8.5	1777	8.9	1849	9.2	—	—
3500	1674	8.3	1751	8.7	1825	9.1	1895	9.5	—	—
3750	1729	8.6	1803	9.0	1874	9.4	—	—	—	—
4000	1786	8.9	1857	9.3	1926	9.6	—	—	—	—
4250	1846	9.2	1914	9.6	—	—	—	—	—	—
4500	1908	9.5	1973	9.9	—	—	—	—	—	—
4750	1971	9.9	—	—	—	—	—	—	—	—
5000	—	—	—	—	—	—	—	—	—	—

Standard/Medium Static 1100-2000 rpm, 2.4 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*12 — High Static — 10 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
3000	1100	4.9	1202	5.4	1301	5.9	1396	6.3	1487	6.7
3250	1176	5.3	1270	5.7	1363	6.1	1453	6.6	1539	6.9
3500	1252	5.6	1341	6.0	1428	6.4	1512	6.8	1595	7.2
3750	1330	6.0	1413	6.4	1495	6.7	1575	7.1	1653	7.5
4000	1409	6.3	1487	6.7	1563	7.1	1639	7.4	1714	7.8
4250	1488	6.7	1561	7.1	1634	7.4	1706	7.7	1776	8.0
4500	1568	7.1	1637	7.4	1706	7.7	1774	8.0	1841	8.3
4750	1648	7.5	1714	7.8	1779	8.1	1844	8.4	1908	8.7
5000	1728	7.8	1791	8.1	1853	8.4	1915	8.7	1976	9.0

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
3000	1573	7.1	1654	7.5	1732	7.8	1805	8.2	1875	8.5
3250	1622	7.3	1702	7.7	1777	8.0	1849	8.4	1919	8.7
3500	1674	7.6	1751	7.9	1825	8.3	1895	8.6	1964	8.9
3750	1729	7.8	1803	8.2	1874	8.5	1943	8.8	2010	9.1
4000	1786	8.1	1857	8.4	1926	8.7	1993	9.0	2058	9.3
4250	1846	8.4	1914	8.7	1980	9.0	2045	9.3	2108	9.6
4500	1908	8.7	1973	9.0	2036	9.2	2099	9.5	2160	9.8
4750	1971	8.9	2034	9.2	2095	9.5	2155	9.8	—	—
5000	2036	9.2	2096	9.5	2155	9.8	—	—	—	—

High Static 1100-2200 rpm, 5.0 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*14 — 12.5 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
3750	947	0.45	1044	0.60	1140	0.78	1236	0.99	1329	1.23
4065	1019	0.55	1108	0.71	1197	0.90	1286	1.11	1373	1.36
4375	1091	0.68	1174	0.85	1257	1.04	1339	1.26	1421	1.50
4690	1164	0.82	1242	1.00	1319	1.20	1396	1.42	1473	1.67
5000	1237	0.98	1310	1.16	1383	1.37	1455	1.60	1527	1.85
5315	1312	1.16	1381	1.35	1449	1.56	1517	1.79	1585	2.05
5625	1387	1.36	1452	1.56	1516	1.77	1580	2.00	1645	2.26
5940	1463	1.57	1524	1.77	1585	2.00	1646	2.23	1707	2.49
6250	1537	1.79	1596	2.01	1654	2.23	1712	2.48	1770	2.74

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
3750	1419	1.50	1506	1.79	1589	2.11	1668	2.44	1743	2.78
4065	1459	1.63	1542	1.92	1622	2.24	1699	2.57	1773	2.92
4375	1502	1.77	1581	2.07	1658	2.38	1732	2.72	1805	3.08
4690	1549	1.94	1624	2.23	1698	2.55	1769	2.88	1839	3.24
5000	1599	2.12	1670	2.41	1740	2.73	1809	3.07	1877	3.43
5315	1653	2.32	1721	2.62	1787	2.93	1853	3.27	1918	3.63
5625	1709	2.54	1773	2.83	1836	3.14	1899	3.48	1961	3.83
5940	1768	2.77	1829	3.07	1889	3.38	1949	3.71	2008	4.06
6250	1828	3.01	1886	3.31	1943	3.62	2001	3.95	2057	4.29

Standard/Medium Static 947-2200 rpm, 3.0 Max bhp

High Static 947-2200 rpm, 5.0 Max bhp

547K*14 — Standard/Medium Static — 12.5 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
3750	947	4.2	1044	4.7	1140	5.1	1236	5.6	1329	6.0
4065	1019	4.5	1108	5.0	1197	5.4	1286	5.8	1373	6.2
4375	1091	4.9	1174	5.3	1257	5.6	1339	6.0	1421	6.4
4690	1164	5.2	1242	5.6	1319	5.9	1396	6.3	1473	6.6
5000	1237	5.6	1310	5.9	1383	6.2	1455	6.6	1527	6.9
5315	1312	5.9	1381	6.2	1449	6.5	1517	6.8	1585	7.2
5625	1387	6.2	1452	6.5	1516	6.8	1580	7.1	1645	7.4
5940	1463	6.6	1524	6.9	1585	7.2	1646	7.4	1707	7.7
6250	1537	6.9	1596	7.2	1654	7.5	1712	7.7	1770	8.0

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
3750	1419	6.4	1506	6.8	1589	7.2	1668	7.5	1743	7.9
4065	1459	6.6	1542	7.0	1622	7.3	1699	7.7	1773	8.0
4375	1502	6.8	1581	7.1	1658	7.5	1732	7.8	1805	8.2
4690	1549	7.0	1624	7.3	1698	7.7	1769	8.0	—	—
5000	1599	7.2	1670	7.6	1740	7.9	1809	8.2	—	—
5315	1653	7.5	1721	7.8	1787	8.1	—	—	—	—
5625	1709	7.7	1773	8.0	1836	8.3	—	—	—	—
5940	1768	8.0	1829	8.3	—	—	—	—	—	—
6250	1828	8.3	—	—	—	—	—	—	—	—

Standard/Medium Static 947-2200 rpm, 3.0 Max bhp

APPENDIX C — FAN PERFORMANCE (cont)

547K*14 — High Static — 12.5 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
3750	947	4.2	1044	4.7	1140	5.1	1236	5.6	1329	6.0
4065	1019	4.5	1108	5.0	1197	5.4	1286	5.8	1373	6.2
4375	1091	4.9	1174	5.3	1257	5.6	1339	6.0	1421	6.4
4690	1164	5.2	1242	5.6	1319	5.9	1396	6.3	1473	6.6
5000	1237	5.6	1310	5.9	1383	6.2	1455	6.6	1527	6.9
5315	1312	5.9	1381	6.2	1449	6.5	1517	6.8	1585	7.2
5625	1387	6.2	1452	6.5	1516	6.8	1580	7.1	1645	7.4
5940	1463	6.6	1524	6.9	1585	7.2	1646	7.4	1707	7.7
6250	1537	6.9	1596	7.2	1654	7.5	1712	7.7	1770	8.0

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
3750	1419	6.4	1506	6.8	1589	7.2	1668	7.5	1743	7.9
4065	1459	6.6	1542	7.0	1622	7.3	1699	7.7	1773	8.0
4375	1502	6.8	1581	7.1	1658	7.5	1732	7.8	1805	8.2
4690	1549	7.0	1624	7.3	1698	7.7	1769	8.0	1839	8.3
5000	1599	7.2	1670	7.6	1740	7.9	1809	8.2	1877	8.5
5315	1653	7.5	1721	7.8	1787	8.1	1853	8.4	1918	8.7
5625	1709	7.7	1773	8.0	1836	8.3	1899	8.6	1961	8.9
5940	1768	8.0	1829	8.3	1889	8.6	1949	8.8	2008	9.1
6250	1828	8.3	1886	8.6	1943	8.8	2001	9.1	2057	9.3

High Static 947-2200 rpm, 5.0 Max bhp

APPENDIX D — WIRING DIAGRAMS

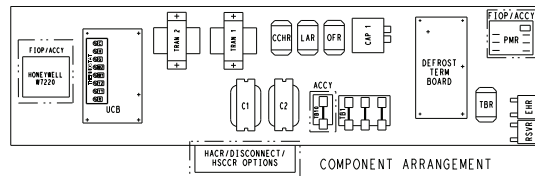
547K*08 to 14 Wiring Diagrams — SCCR

SIZE	VOLTAGE	CONTROL	PAGE	POWER	PAGE
547K*08-09 with Electro- Mechanical Controls and W7220	208/230-3-60	48TM007040	88	48TM005717	91
	460-3-60			48TM005994	92
	575-3-60			48TM005988	93
547K*12 with Electro- Mechanical Controls and W7220	208/230-3-60	48TM007041	89	48TM005987	94
	460-3-60				
	575-3-60				
547K*14 with Electro- Mechanical Controls and W7220	208/230-3-60	50TM002446	90	50TM001913	95
	460-3-60			50TM001915	96
	575-3-60				

547K*08 to 14 Wiring Diagrams — HSCCR

SIZE	VOLTAGE	CONTROL	PAGE	POWER	PAGE
547K*08-09 with Electro- Mechanical Controls and W7220	208/230-3-60	48TM007040	88	48TM008023	97
	460-3-60				
547K*12 with Electro- Mechanical Controls and W7220	208/230-3-60	48TM007041	89	48TM008025	98
	460-3-60			48TM008026	99
547K*14 with Electro- Mechanical Controls and W7220	208/230-3-60	50TM002446	90	50TM002450	100
	460-3-60				

APPENDIX D — WIRING DIAGRAMS (cont)



- NOTES:
1. UCB LAYOUT DOES NOT MATCH ACTUAL TERMINAL BOARD LAYOUT.
 2. TERMINAL BOARD JUMPERS 1, 2 AND 3 ARE CUT FROM THE FACTORY.
 3. REMOVE DESIGNATED JUMPERS ON TERMINAL BOARD WHEN ADDING SMOKE DETECTORS, OCCUPANCY AND REMOTE SHUTDOWN.
 4. USE ABC AS COARSE AND POT AS FINE ADJUSTMENTS FOR SETTING HIGH FAN SPEED. LOW SPEED IS AN OFFSET BASED ON DIP SWITCHES.
 5. 2-PIN LOW SPEED DIP SWITCH POSITIONS ARE FACTORY SET AS SHOWN FOR T1 UNITS. ON T2 UNITS THE SETTING IS "ON-OFF".
 6. HANDSAFET AND CUTOFF SET TO "MIN". JUMPER PIN ON TOP 2-PINS AS SHOWN.
 7. THE * WIRE COLOR IS FOR DIFFERENTIATION WITHIN THIS SCHEMATIC.
 8. TRANSFORMER IS DEDICATED BASED ON UNIT VOLTAGE. TAPS ONLY SHOWN TO SIMPLIFY SCHEMATIC. 208/230V UNIT TRANS IS WIRED FOR 230V UNIT. IF UNIT IS TO BE RUN WITH 208V POWER SUPPLY DISCONNECT BLK WIRE FROM 230V TAP AND CONNECT TO 208V TAP.
 9. T84 LOCATED IN HEAT SECTION.
 10. TO CONVERT TO A SINGLE STAGE HEATER MOVE VIOLET WIRE AT T84 TO CONNECT WITH WHITE WIRE.

HP DIP SWITCH SETTINGS

(DEFAULT)

30 MINUTES 60 MINUTES 90 MINUTES 120 MINUTES

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

SPEED UP JUMPERED TEST PINS (USE METAL OBJECT) FIELD SPEED-UP CYCLE

- 1) MOMENTARILY SHORT PINS AND RELEASE TO BYPASS COMPRESSOR OFF DELAY
- 2) SHORT FOR 1-10 SEC. AND RELEASE FOR FORCED DEFROST.
- 3) PERMANENT SHORT WILL BE IGNORED. DEFROST WILL TERMINATE IN 30 SEC. IF DFT IS OPEN. DEFROST WILL TERMINATE NORMALLY IF DFT IS CLOSED.

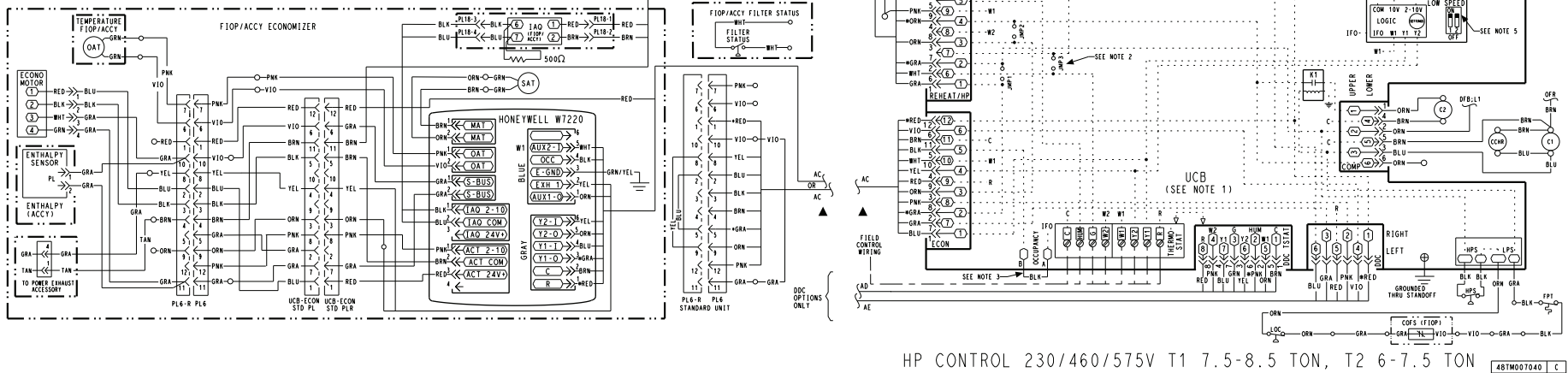
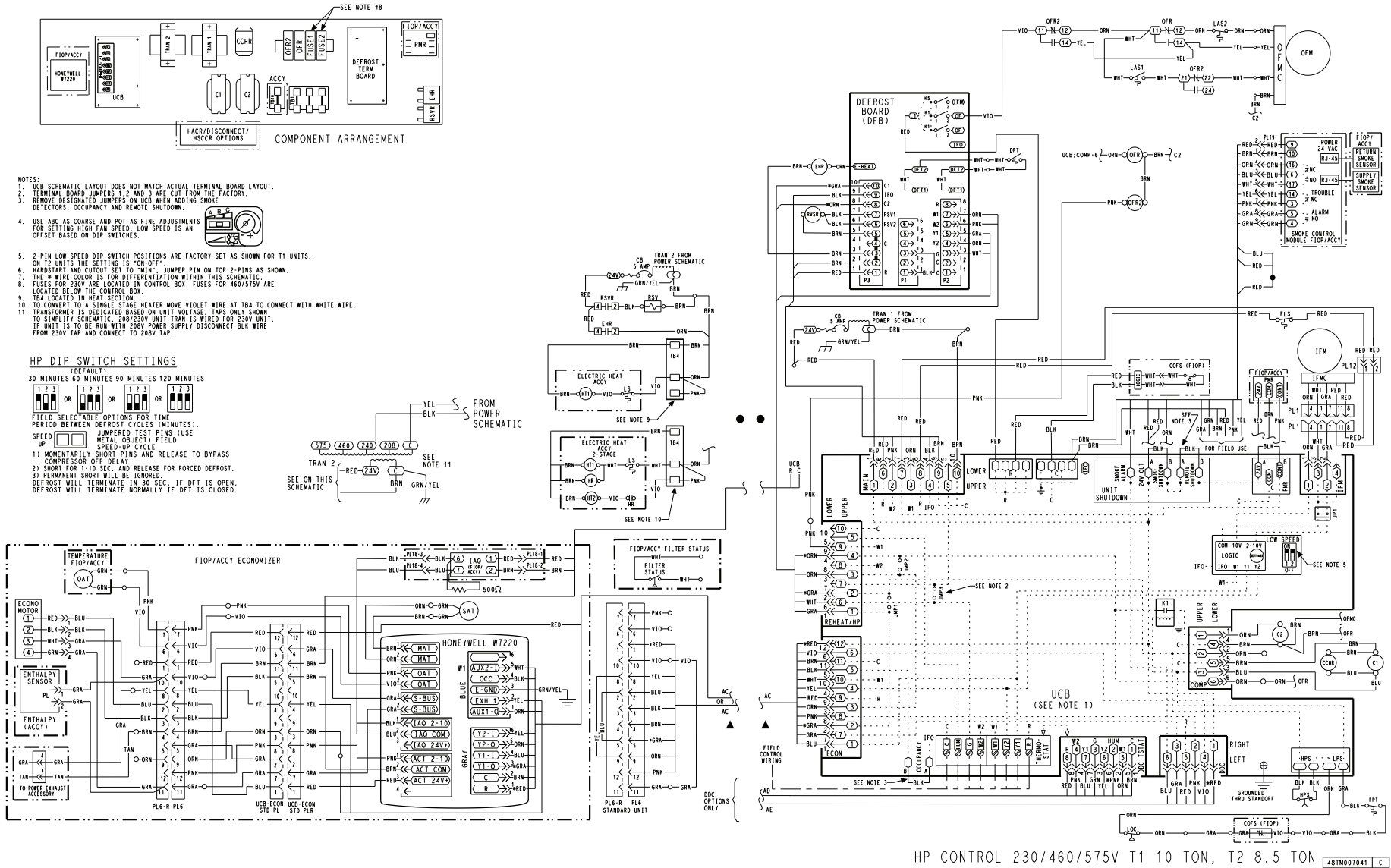
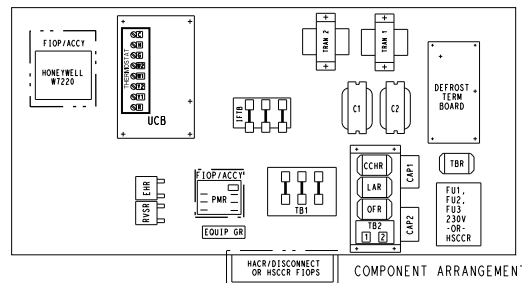


Fig. B — 547K*08-09 Electro-Mechanical Control Wiring Diagram — All Voltages (with W7220 Control) — Standard and High SCCR

APPENDIX D — WIRING DIAGRAMS (cont)



APPENDIX D — WIRING DIAGRAMS (cont)



- NOTES:
1. UCB LAYOUT DOES NOT MATCH ACTUAL TERMINAL BOARD LAYOUT.
 2. TERMINAL BOARD JUMPERS 1, 2 AND 3 ARE CUT FROM THE FACTORY.
 3. REMOVE DESIGNATED JUMPERS ON TERMINAL BOARD WHEN ADDING SMOKE DETECTORS, OCCUPANCY AND REMOTE SHUTDOWN.
 4. USE ABC AS COARSE AND AS POT FINE ADJUSTMENTS FOR SETTING HIGH FAN SPEED. LOW SPEED IS AN OFFSET BASED ON DIP SWITCHES.
 5. 2-PIN LOW SPEED DIP SWITCH POSITIONS ARE FACTORY SET AS SHOWN.
 6. HANDSTART AND CUTOFF SET TO "MIN". JUMPER PIN ON TOP 2-PINS AS SHOWN.
 7. THE * WIRE COLOR IS FOR DIFFERENTIATION WITHIN THIS SCHEMATIC.
 8. TRANSFORMER IS DEDICATED BASED ON UNIT VOLTAGE. TAPS ONLY SHOWN TO SIMPLIFY SCHEMATIC. 200/230V UNIT TRANS IS WIRED FOR 230V UNIT. IF UNIT IS TO BE RUN WITH 208V POWER SUPPLY DISCONNECT BLK WIRE FROM 230V TAP AND CONNECT TO 208V TAP.
 9. TBA LOCATED IN HEAT SECTION.

HP DIP SWITCH SETTINGS

(DEFAULT)

30 MINUTES 60 MINUTES 90 MINUTES 120 MINUTES

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

SPEED JUMPED TEST PINS (USE UP SPEED-UP CYCLE)

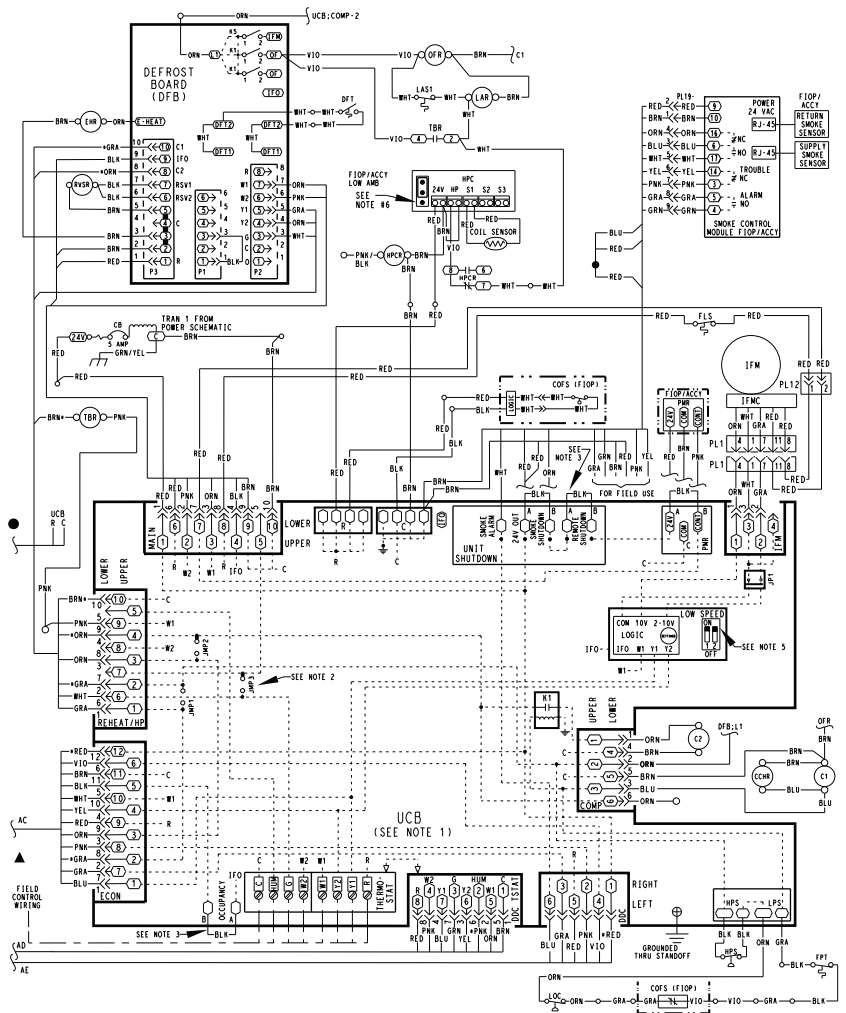
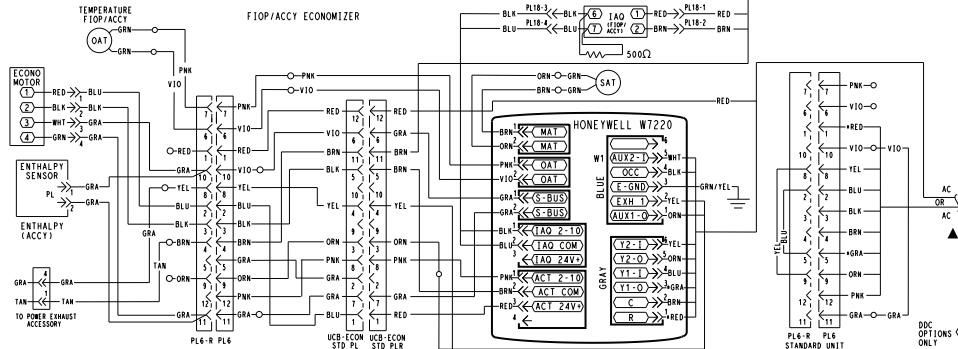
1) MOMENTARILY SHORT PINS AND RELEASE TO BYPASS COMPRESSOR OFF DELAY

2) SHORT FOR 1-10 SEC. AND RELEASE FOR FORCED DEFROST.

3) PERMANENT SHORT WILL BE IGNORED.

DEFROST WILL TERMINATE IN 30 SEC. IF DFT IS OPEN.

DEFROST WILL TERMINATE NORMALLY IF DFT IS CLOSED.

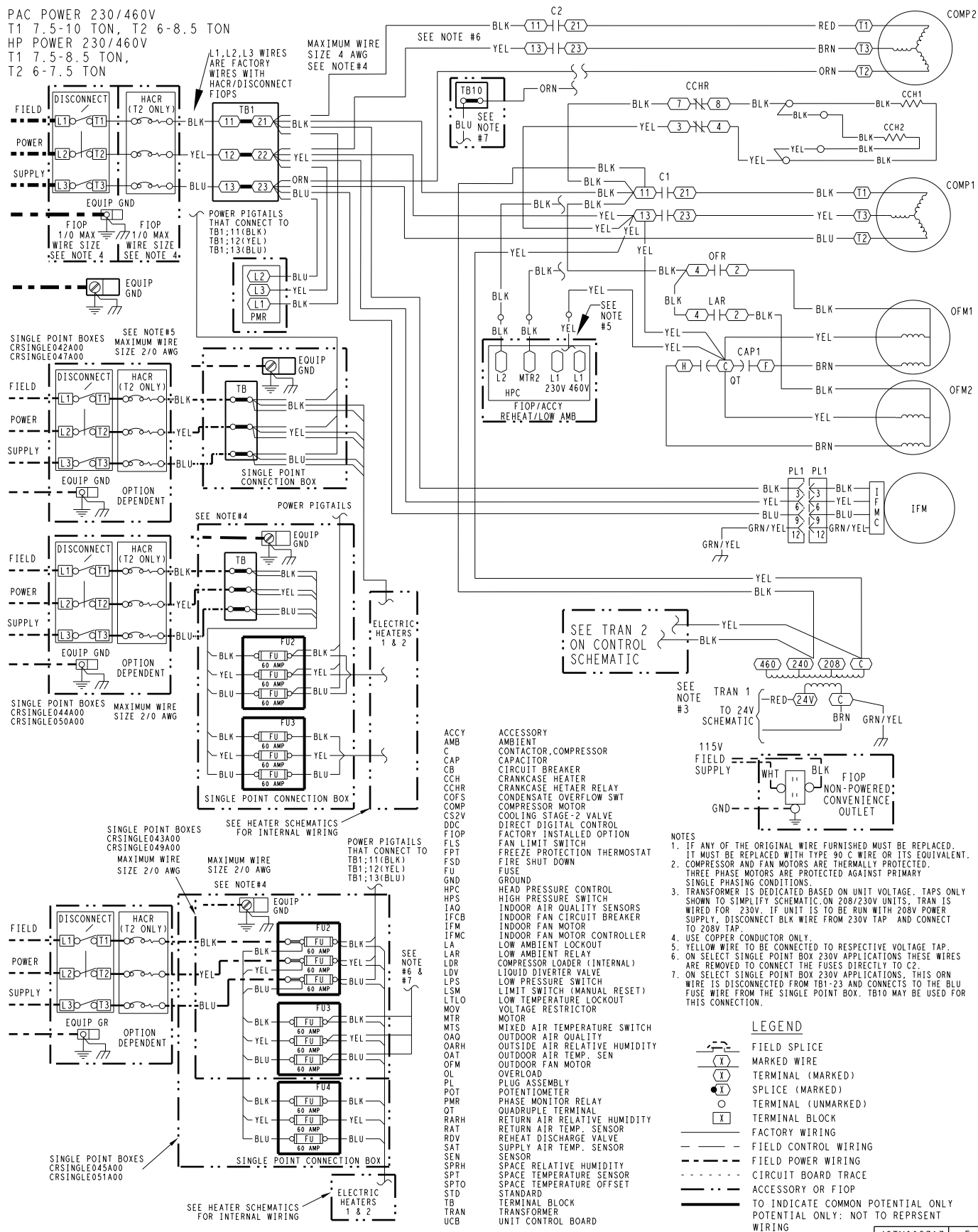


HP CONTROL 230/460/575V T1 12.5 TON, T2 10 TON

50TMO02446 C

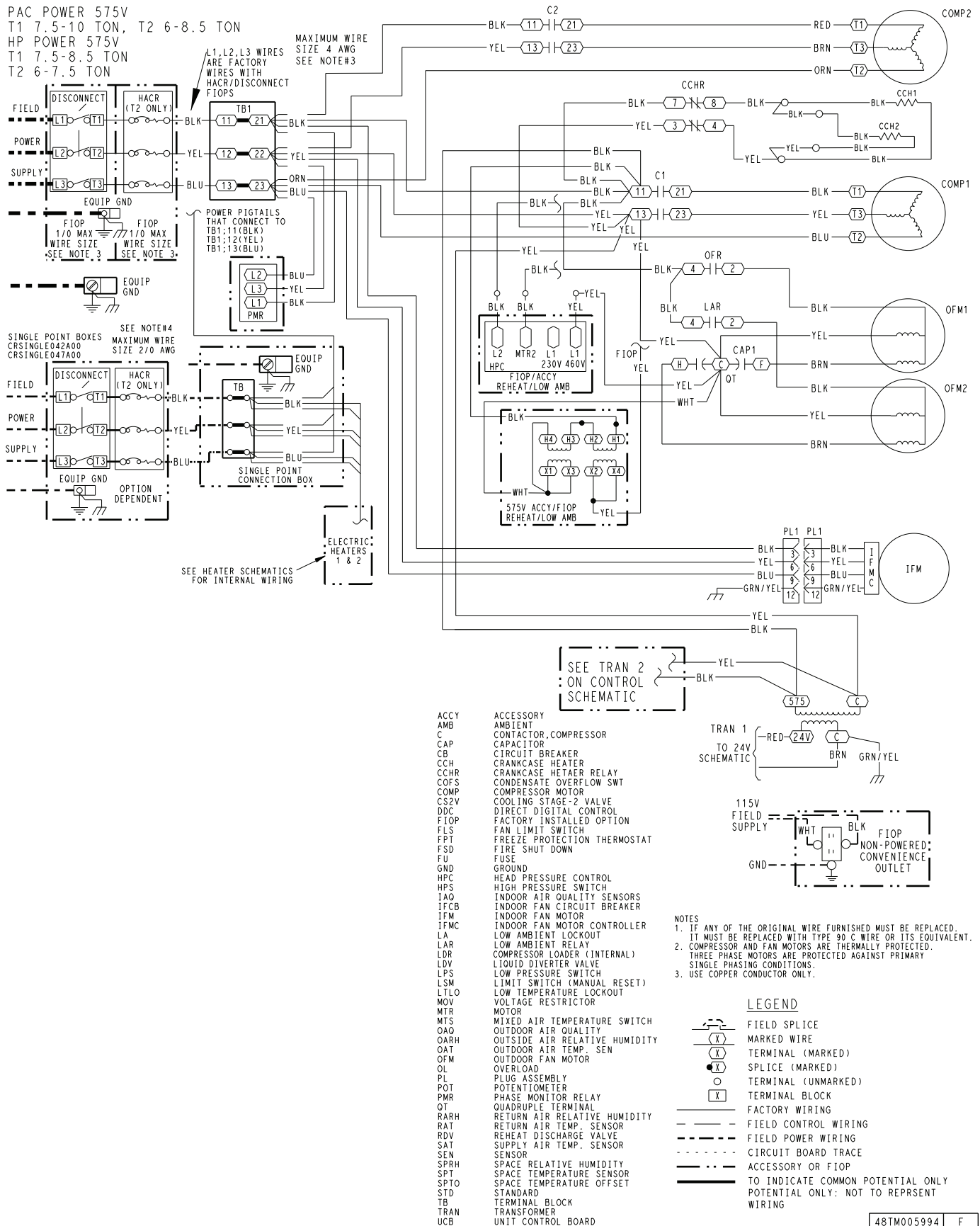
Fig. D — 547K*14 Electro-Mechanical Control Wiring Diagram — All Voltages (with W7220 Control) — Standard and High SCCR

APPENDIX D — WIRING DIAGRAMS (cont)



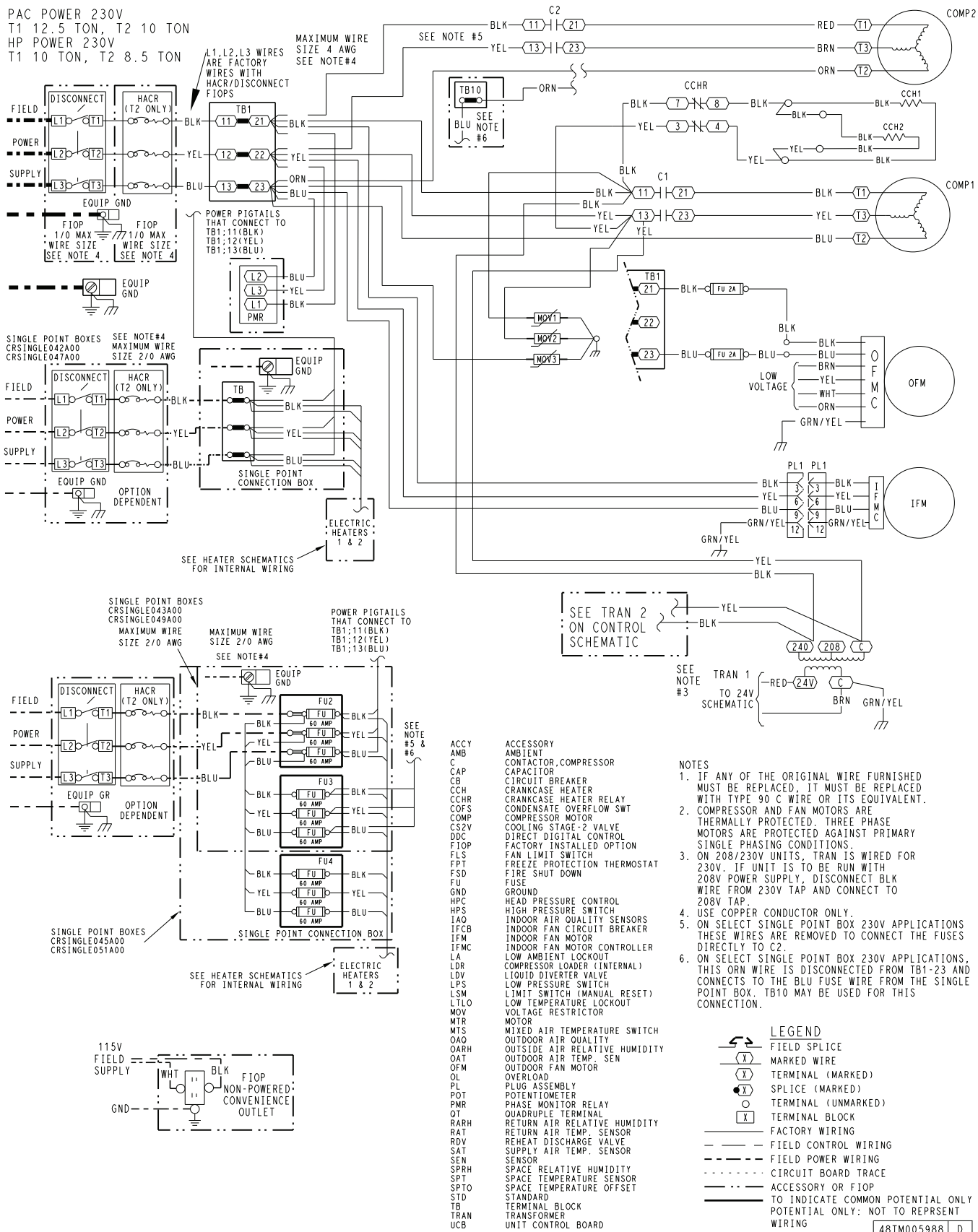
**Fig. E — 547K*08-09 — Power Wiring Diagram — 208/230, 460-3-60
with Electro-Mechanical Controls and W7220 — Standard SCCR**

APPENDIX D — WIRING DIAGRAMS (cont)



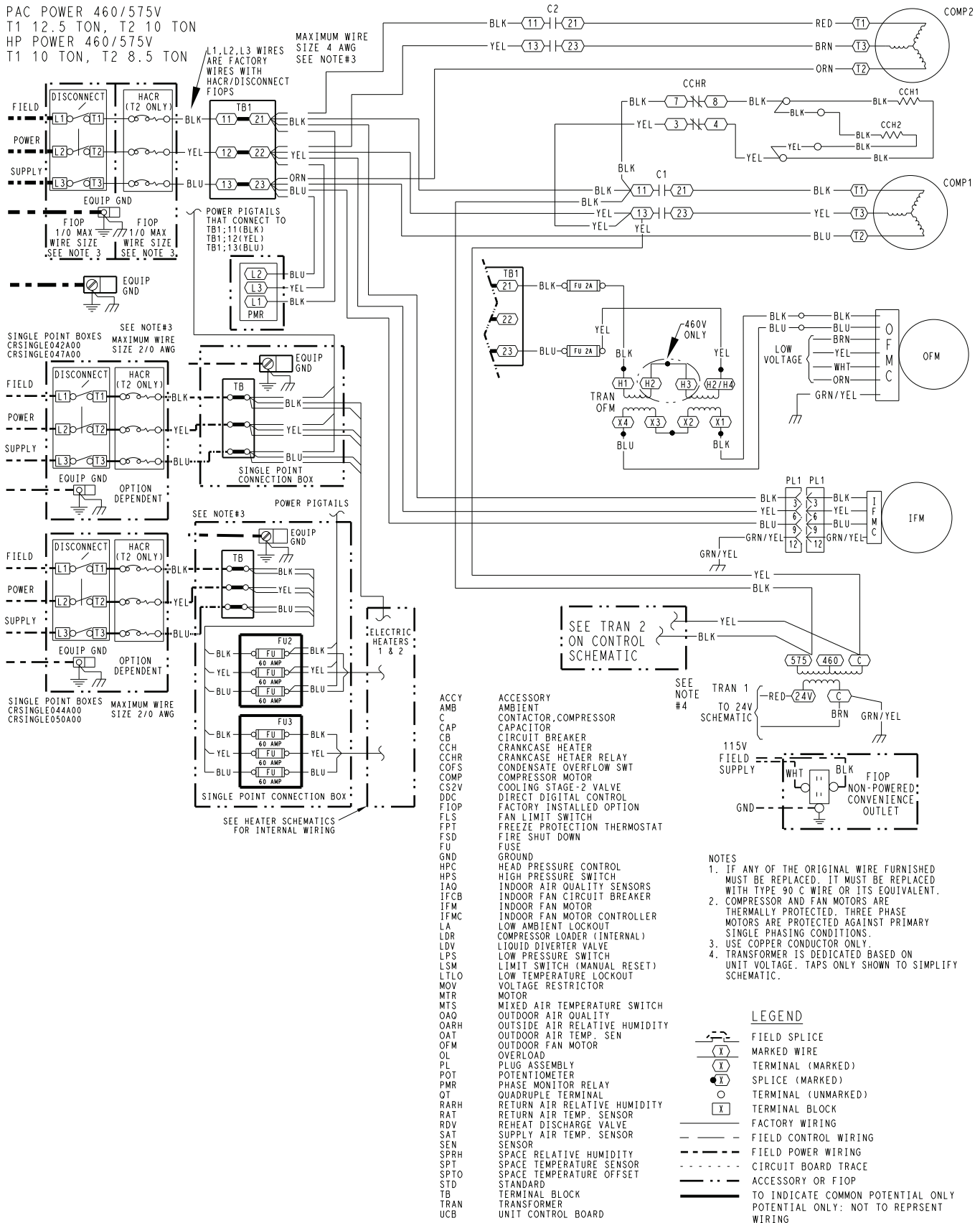
**Fig. F — 547K*08-09 — Power Wiring Diagram — 575-3-60
with Electro-Mechanical Controls and W7220 — Standard SCCR**

APPENDIX D — WIRING DIAGRAMS (cont)



**Fig. G — 547K*12 — Power Wiring Diagram — 208/230-3-60
with Electro-Mechanical Controls and W7220 Controller — Standard SCCR**

APPENDIX D — WIRING DIAGRAMS (cont)



**Fig. H — 547K*12 — Power Wiring Diagram — 460, 575-3-60
with Electro-Mechanical Controls and W7220 Controller — Standard SCCR**

APPENDIX D — WIRING DIAGRAMS (cont)

PAC POWER 208/230, 460V T1 15 TON, T2 12.5 TON
HP POWER 208/230, 460V T1 12.5 TON, T2 10 TON

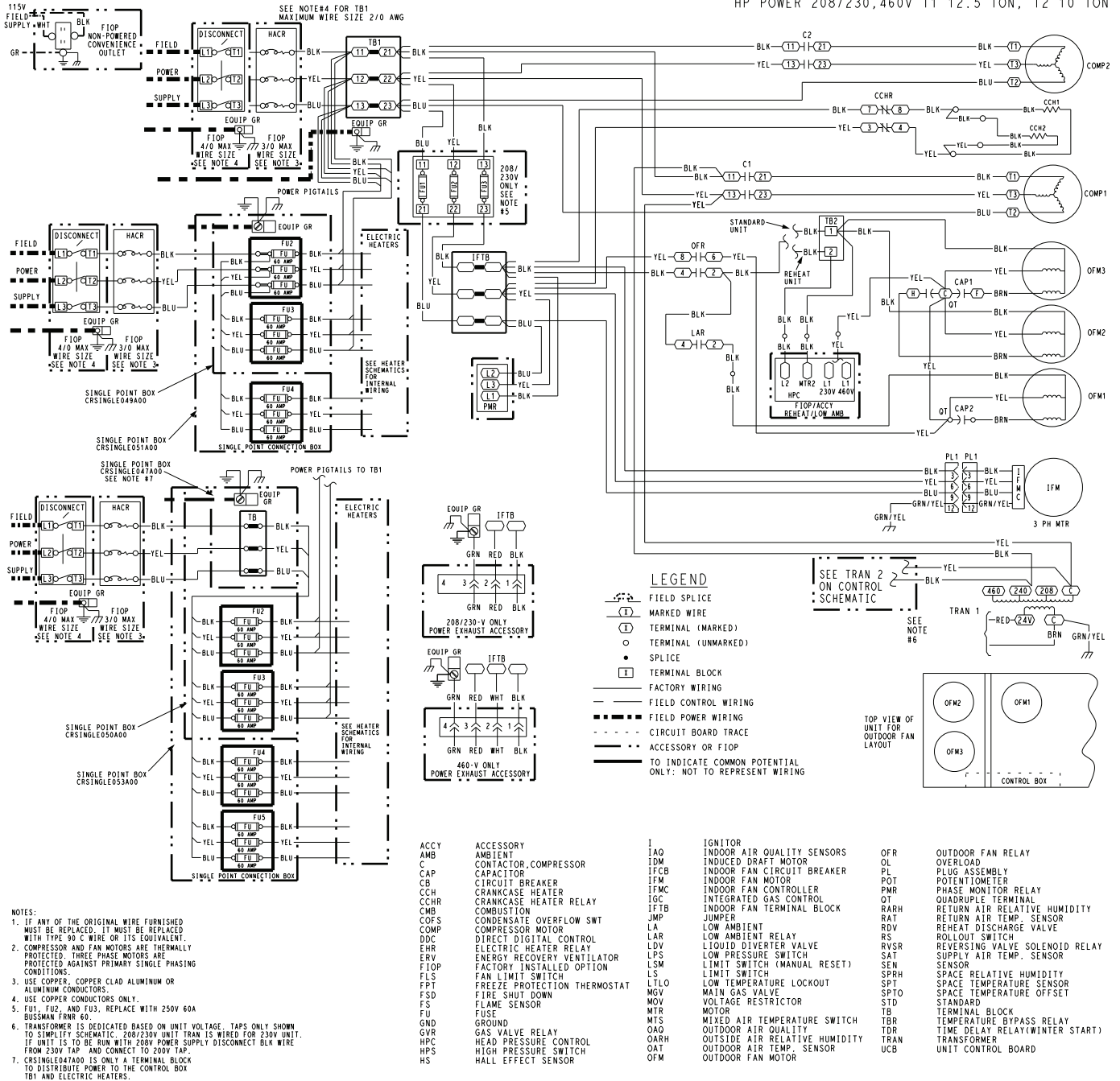
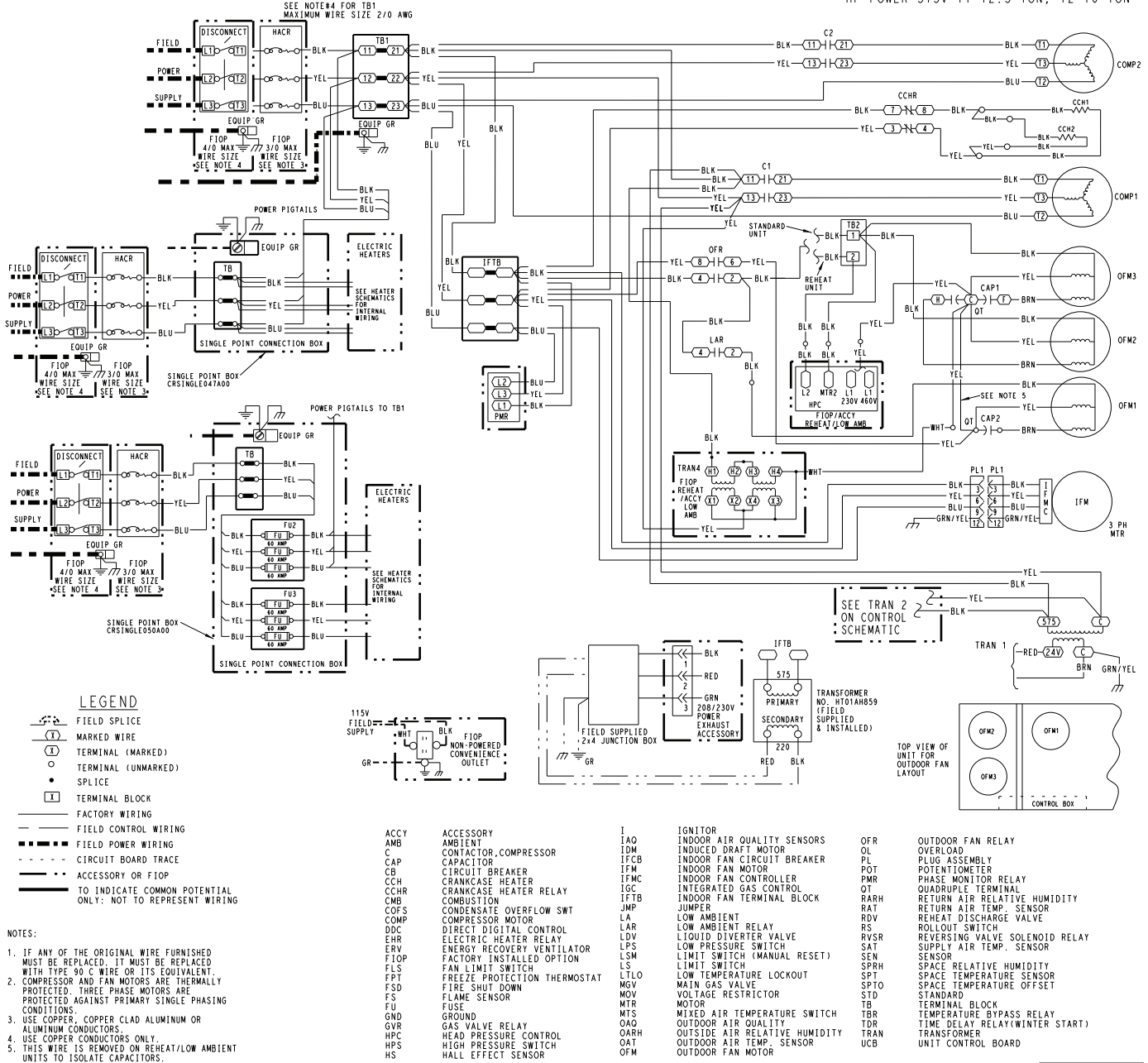


Fig. I — 547K*14 — Power Wiring Diagram — 208/230, 460-3-60 with Electro-Mechanical Controls and W7220 Controller — Standard SCCR

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APPENDIX D — WIRING DIAGRAMS (cont)

PAC POWER 575V T1 15 TON, T2 12.5 TON
HP POWER 575V T1 12.5 TON, T2 10 TON

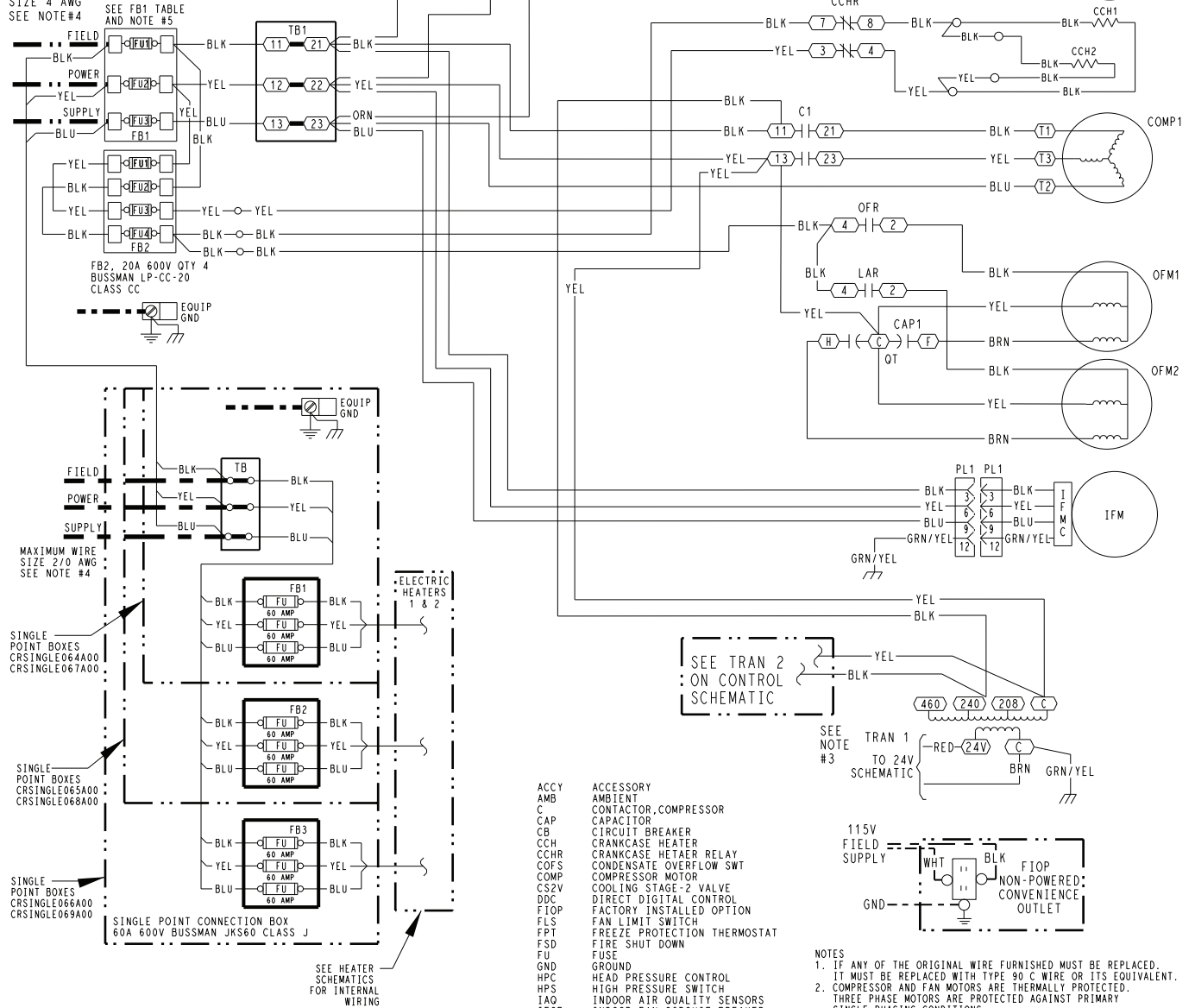


**Fig. J — 547K*14 — Power Wiring Diagram — 575-3-60
with Electro-Mechanical Controls and W7220 Controller — Standard SCCR**

APPENDIX D — WIRING DIAGRAMS (cont)

PAC POWER 230/460V
T1 7.5-10 TON, T2 6-8.5 TON HSCCR
HP POWER 230/460V
T1 7.5-8.5 TON, T2 6-7.5 TON HSCCR

MAXIMUM WIRE
SIZE 4 AWG
SEE NOTE #4



FB1 TABLE
THE FB1 WILL CONTAIN ONE OF FUSE COMBINATIONS BELOW
80A 600V QTY 3 BUSSMAN TCF80RN CLASS J
60A 600V QTY 3 BUSSMAN TCF60RN CLASS J
30A 600V QTY 3 BUSSMAN LP-CC-30 CLASS CC

**Fig. K — 547K*08-09 — Power Wiring Diagram — 208/230, 460-3-60
with Electro-Mechanical Controls and W7220 Controller — High SCCR**

APPENDIX D — WIRING DIAGRAMS (cont)

PAC POWER 230V
T1 12.5 TON, T2 10 TON HSCCR
HP POWER 230V
T1 10 TON, T2 8.5 TON HSCCR

MAXIMUM WIRE
SIZE 4 AWG
SEE NOTE #4

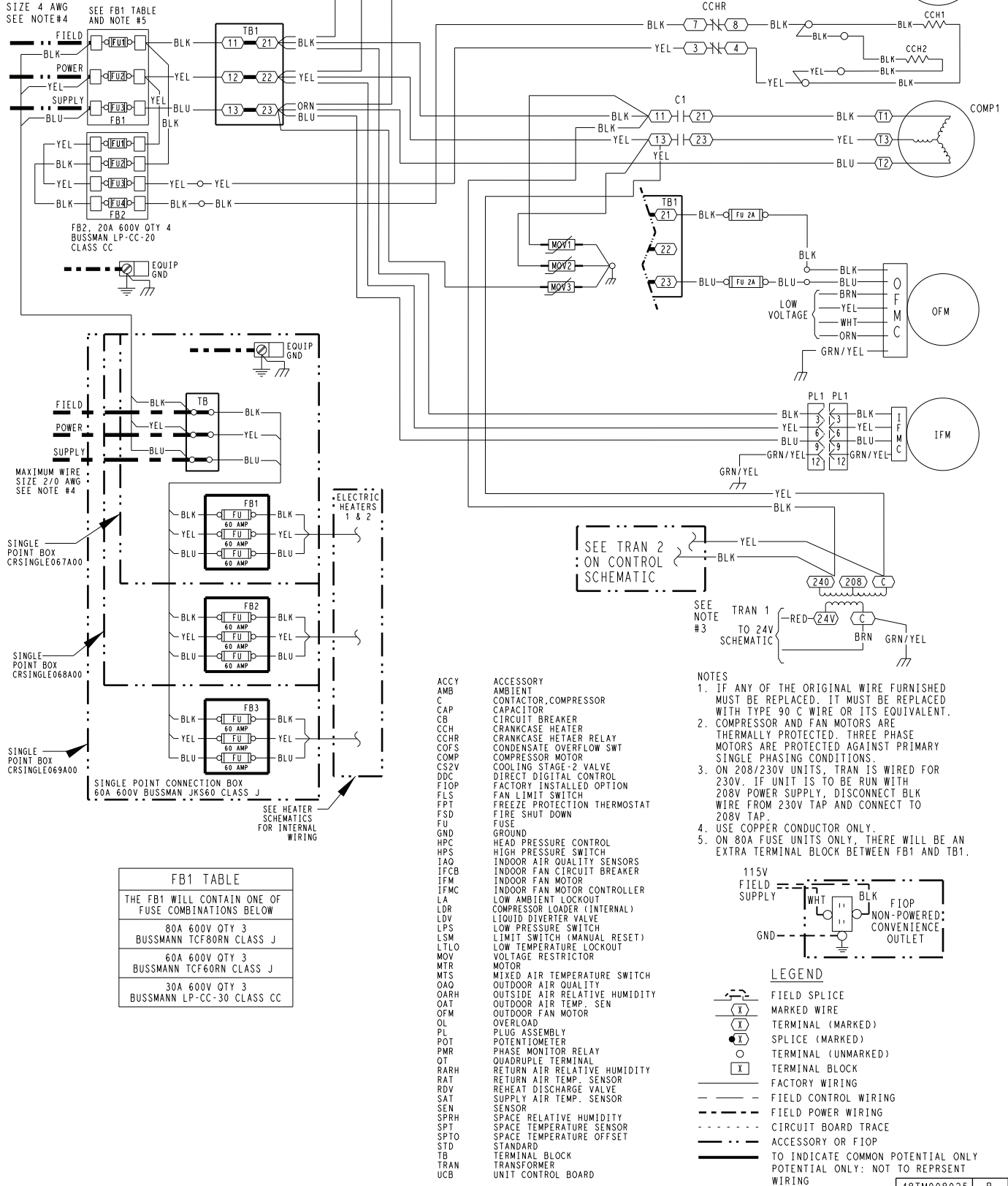
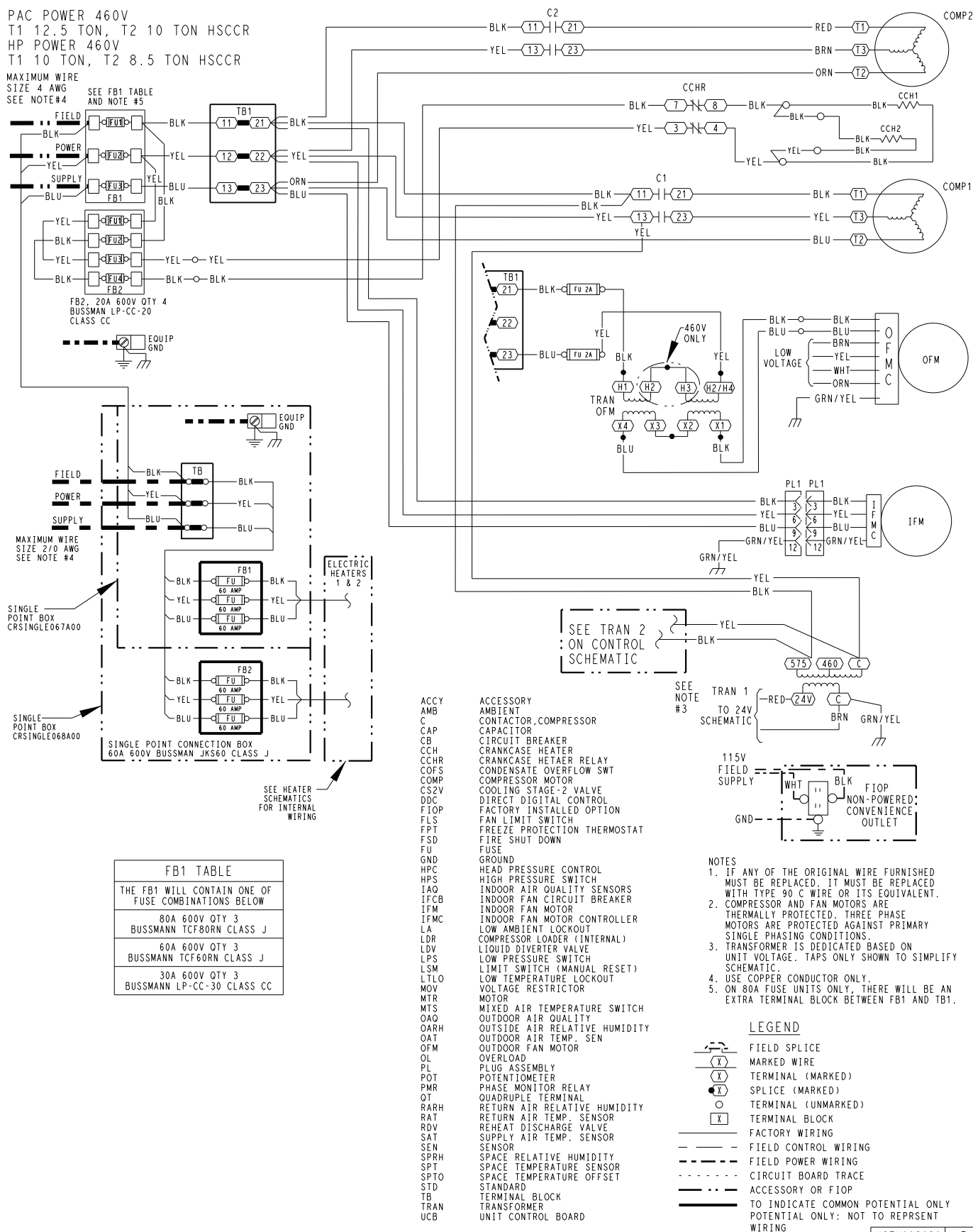


Fig. L — 547K*12 — Power Wiring Diagram — 208/230-3-60
with Electro-Mechanical Controls and W7220 Controller — High SCCR

APPENDIX D — WIRING DIAGRAMS (cont)



**Fig. M — 547K*12 — Power Wiring Diagram — 460-3-60
with Electro-Mechanical Controls and W7220 Controller — High SCCR**

APPENDIX D — WIRING DIAGRAMS (cont)

PAC POWER 208/230, 460V T1 15 TON, T2 12.5 HSCCR
HP POWER 208/230, 460V T1 12.5 TON, T2 10 TON HSCCR

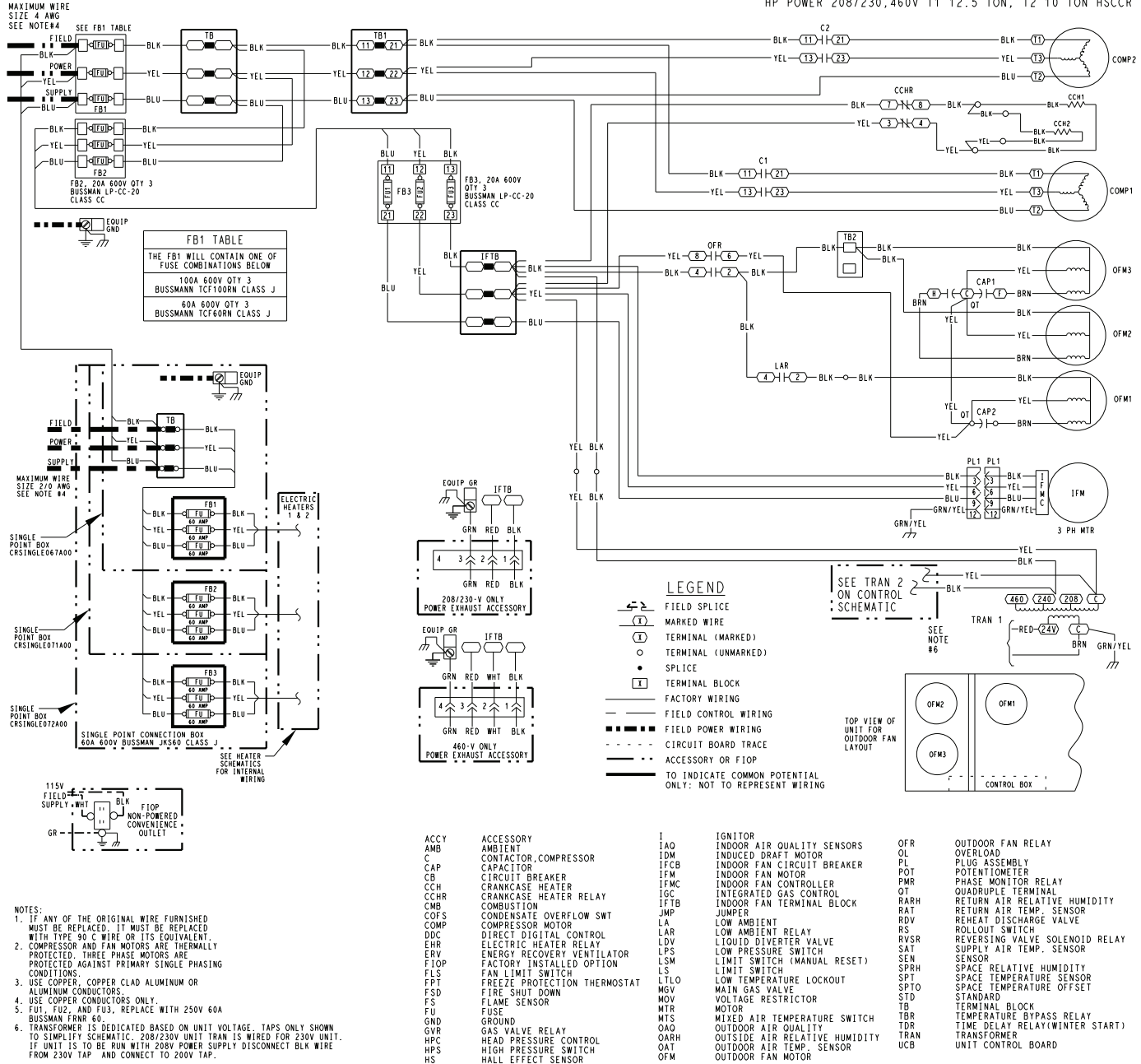
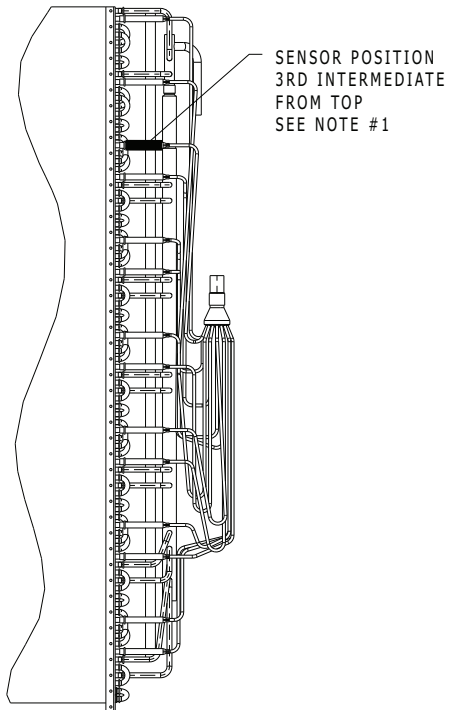


Fig. N — 547K*14 — Power Wiring Diagram — 208/230, 460-3-60 with Electro-Mechanical Controls and W7220 Controller — High SCCR

50TM002450 B

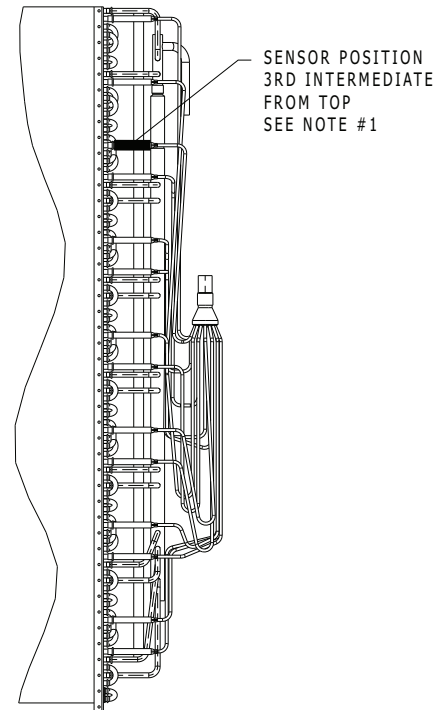
APPENDIX E — LOW AMBIENT CONTROL SENSOR LOCATION

TOP OF COIL



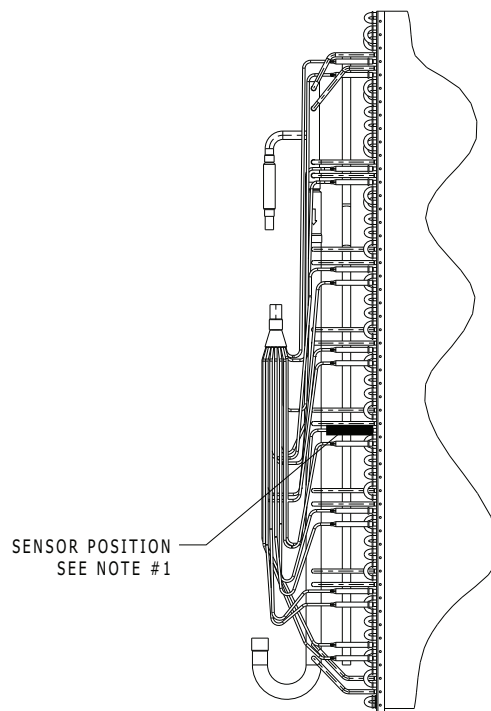
7.5 Ton Outdoor Circuited

TOP OF COIL



8.5 Ton Outdoor Circuited

TOP OF COIL



12.5 Ton Outdoor Circuited

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).
2. Not available for 10 ton unit. That unit uses an ECM motor control.

Fig. O — 547K*08-14 Outdoor Circuited

START-UP CHECKLIST

547K*08-14 Single Package Rooftop Heat Pump Units

(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 Manual 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 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) _____

III. START-UP

ELECTRICAL

Supply Voltage	L1-L2 _____	L2-L3 _____	L3-L1 _____
Compressor Amps 1	L1 _____	L2 _____	L3 _____
Compressor Amps 2	L1 _____	L2 _____	L3 _____
Supply Fan Amps	L1 _____	L2 _____	L3 _____
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) _____

CUT ALONG DOTTED LINE

CUT ALONG DOTTED LINE