



Installation, Start-Up and Service Instructions

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IMPORTANT: Read the entire instruction manual before starting installation.

SAFETY CONSIDERATIONS

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

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

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

Follow all safety codes. Wear safety glasses and work gloves. Use quenching 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 applicable electrical codes for special installation requirements.

Understand the signal words — DANGER, WARNING, and CAUTION. DANGER identifies the most serious hazards which will result in severe personal injury or death. WARNING

signifies hazards that could result in personal injury or death. CAUTION is used to identify unsafe practices, which would result in minor personal injury or product and property damage.

⚠ WARNING

Electrical shock can cause personal injury or death. Before installing or servicing system, always turn off main power to system. There may be more than one disconnect switch. Turn off accessory heater power if applicable.

GENERAL

The 50PEC water source heat pump console unit is a decentralized room terminal designed for field connection to a closed-circuit piping loop.

Units are typically installed in perimeter zones, usually under windows. Supply air is discharged directly into the conditioned space through discharge grilles located in the top of the unit.

IMPORTANT: The installation of console water source heat pump units and all associated components, parts, and accessories which make up the installation shall be in accordance with the regulations of ALL authorities having jurisdiction and **MUST** conform to all applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations.

INSTALLATION

Step 1 — Check Jobsite — Units are typically installed along an outside wall of the room. Refer to Fig. 1 and 2 for an illustration showing piping locations. Install units with adequate clearance to allow maintenance and servicing. Refer to Table 1 and Fig. 3-14. Locate the console unit so that it provides adequate air circulation throughout the room.

Installation, operation and maintenance instructions are provided with each unit. Before unit start-up, read all manuals and become familiar with the unit and its operation. Thoroughly check out the system before operation. Complete the inspections and instructions listed below to prepare a unit for installation.

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Keep both the chassis and cabinet covered with the shipping carton until all plastering, painting, and finish work is complete and it is time to install the chassis and cabinet.
3. Verify that the refrigerant tubing is free of kinks or dents, and that it does not touch other unit components.
4. Inspect all electrical connections. Connections must be clean and tight at the terminals.

⚠ CAUTION

To avoid equipment damage, do not use these units as a source of heating or cooling during the construction process. The mechanical components and filters used in these units quickly become clogged with construction dirt and debris which may cause system damage.

⚠ CAUTION

To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must only be serviced by technicians who meet local, regional, and national proficiency requirements.

⚠ CAUTION

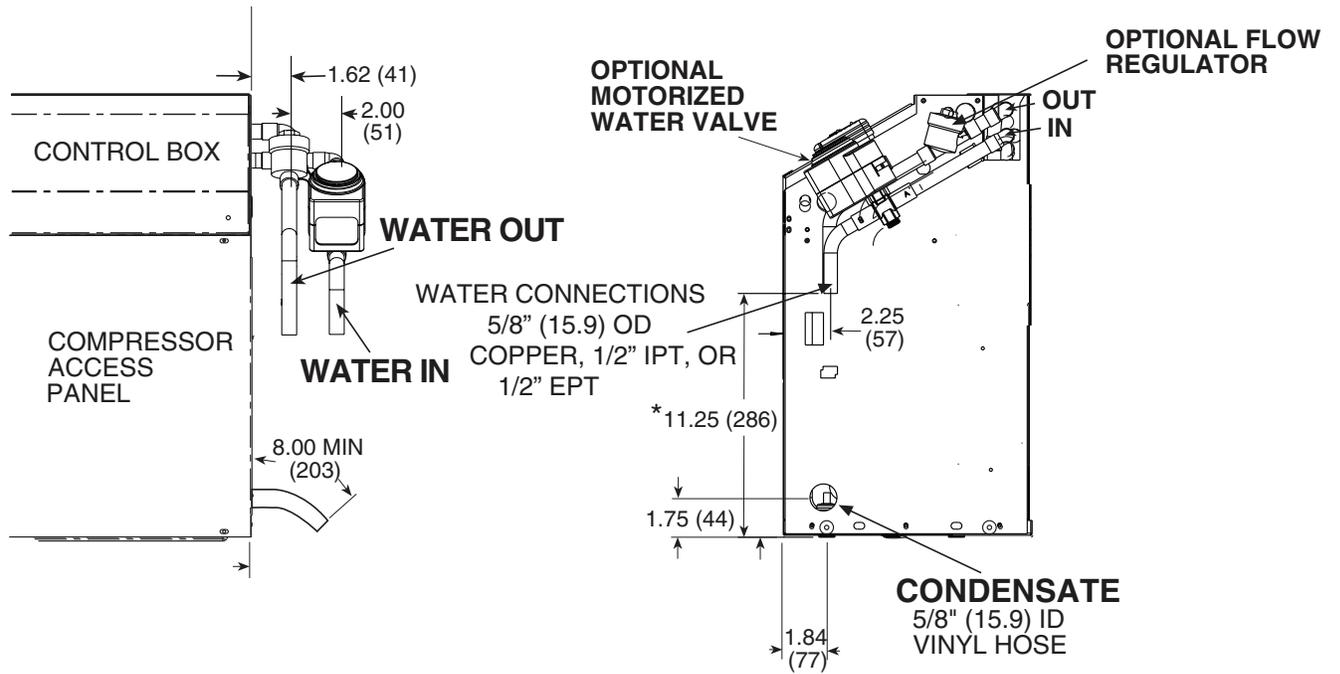
All refrigerant discharged from this unit must be recovered without exception. Technicians must follow industry accepted guidelines and all local, regional, and national statutes for the recovery and disposal of refrigerants.

⚠ CAUTION

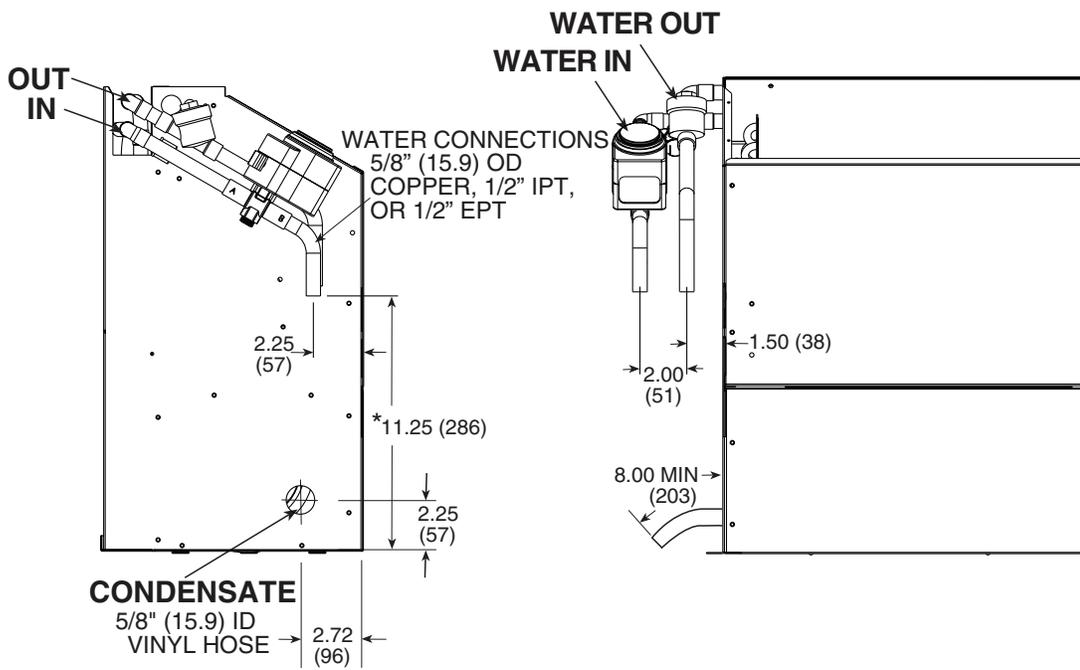
When a compressor is removed from this unit, system refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, the refrigerant lines of the compressor must be sealed after it is removed.

Table 1 — 50PEC Physical Data

BASE UNIT 50PEC	09	12	15	18
NOMINAL COOLING CAPACITY (Btuh)	9,300	12,300	13,800	16,000
COMPRESSOR	Rotary			
BLOWER				
Motor Horsepower	1/20	1/12	1/8	1/8
Wheel Size D x W (in.) 2 each	5 1/4 x 6 1/4			
FILTER SIZE (in.) Bottom Return (Qty)	10 x 30 x 1 (1)	10 x 30 x 1 (1)	10 x 30 x 1 (1)	10 x 36 x 1 (1)
FILTER SIZE (in.) Front Return (Qty)	7 x 29 1/2 x 1/8 (1)	7 x 29 1/2 x 1/8 (1)	7 x 29 1/2 x 1/8 (1)	7 x 35 1/2 x 1/8 (1)
UNIT WEIGHT (lb)				
Shipping	185	190	200	232
Operating	175	180	190	220
REF. TO AIR HEAT EXCHANGER				
Face Area (sq ft)	1.4	1.4	1.8	1.8
No. of Rows Deep	2	3	3	3
Copper Tube Size OD (in.)	3/8	3/8	3/8	3/8
Fin Spacing (FPI)	13	13	13	12
REFRIG. CHARGE (R-410A)/CKT (oz)	28	29	37	39
No. of Circuits	1	1	1	1
UNIT CABINET WITH BOTTOM RETURN WITH STANDARD 5 in. SUBBASE Width x Height x Depth (in.)	48 x 26 x 12	48 x 26 x 12	48 x 26 x 12	54 x 26 x 12
UNIT CABINET WITH FRONT RETURN (NO SUBBASE) Width x Height x Depth (in.)	48 x 21 x 12	48 x 21 x 12	48 x 21 x 12	54 x 21 x 12
WATER IN/OUT SIZE OD SWEAT (in.)	1/2	1/2	1/2	3/4
CONDENSATE SIZE ID VINYL (in.)	5/8	5/8	5/8	5/8



Right Hand Configuration



Left Hand Configuration

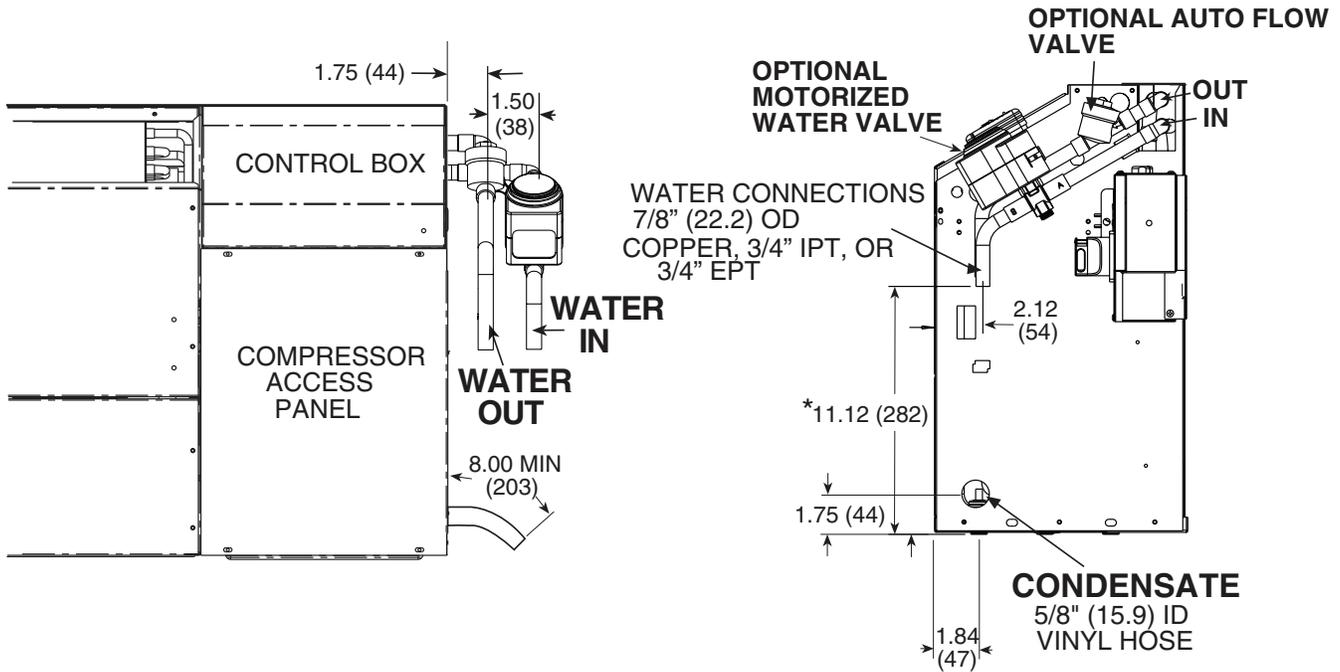
LEGEND

- EPT** — External Pipe Thread
- IPT** — Internal Pipe Thread

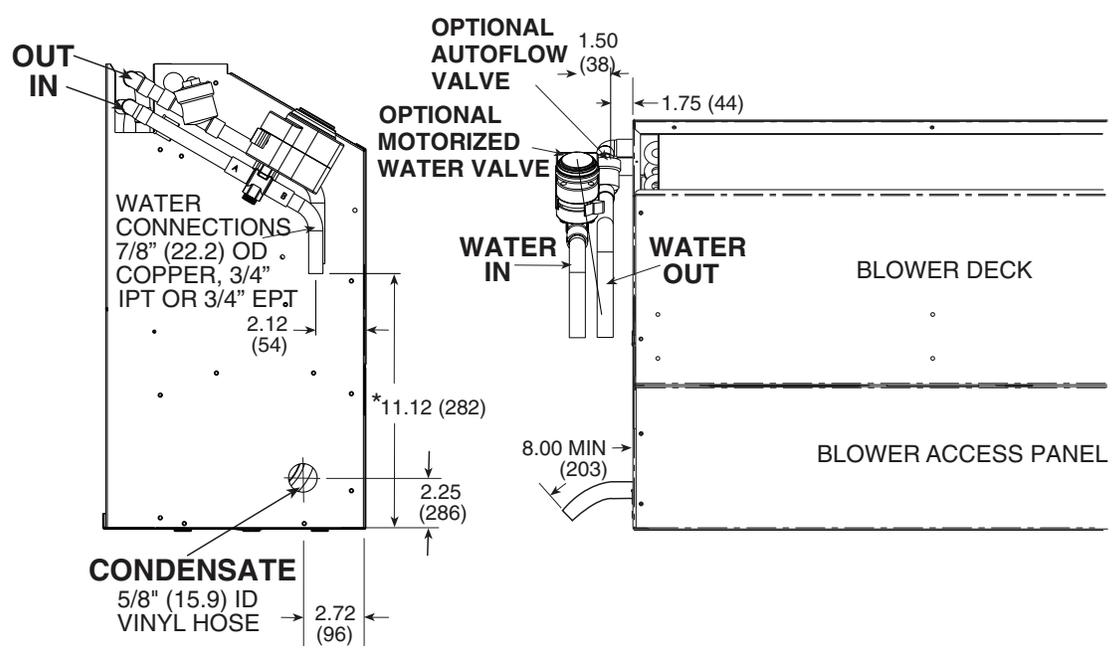
*Dimension reduced by fitting if selected.

NOTE: Dimensions shown are in inches. Dimensions in parentheses are in millimeters.

Fig. 1 — 50PEC09-15 Piping Dimensions



Right Hand Configuration

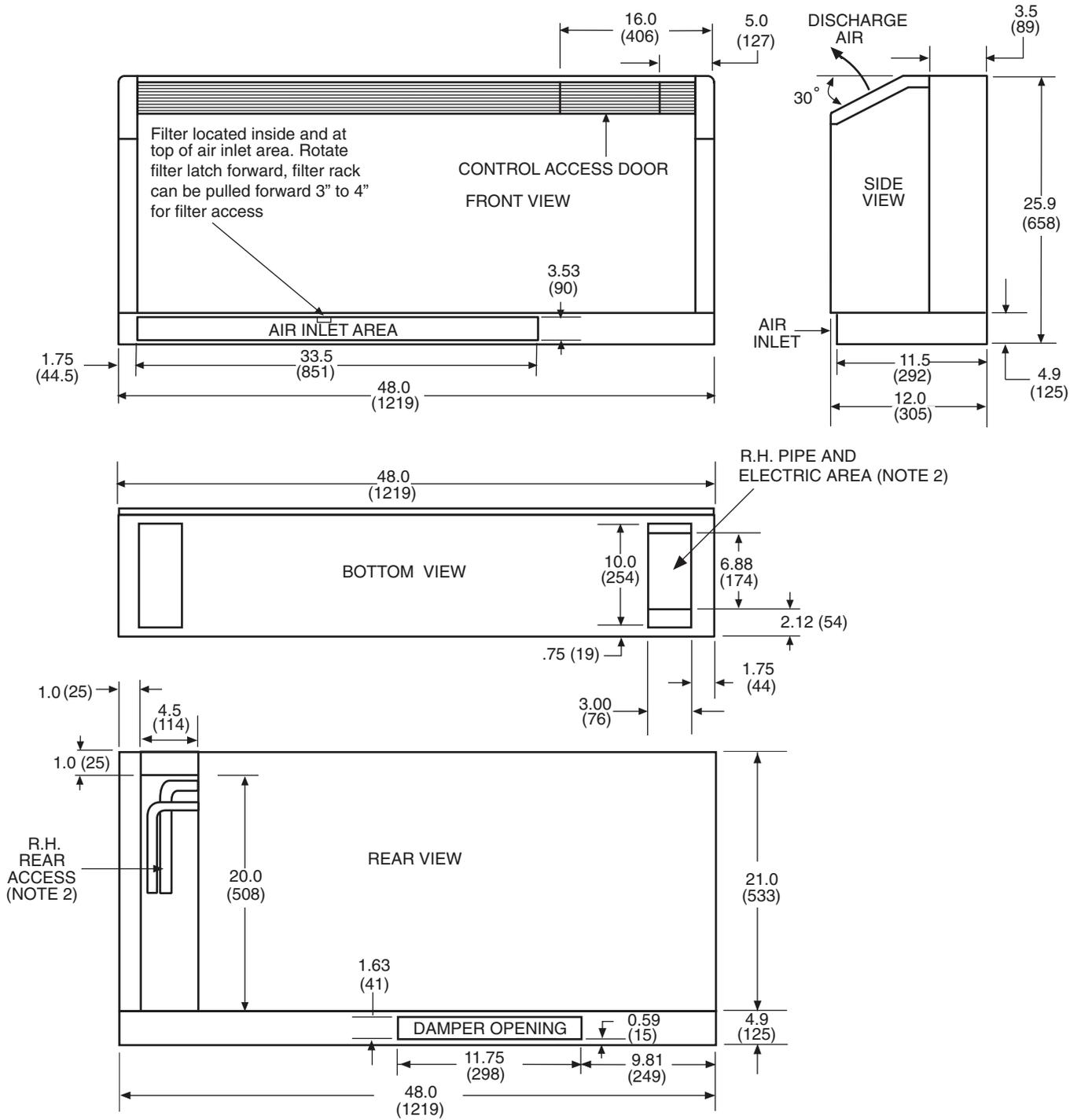


Left Hand Configuration

LEGEND
EPT — External Pipe Thread
IPT — Internal Pipe Thread

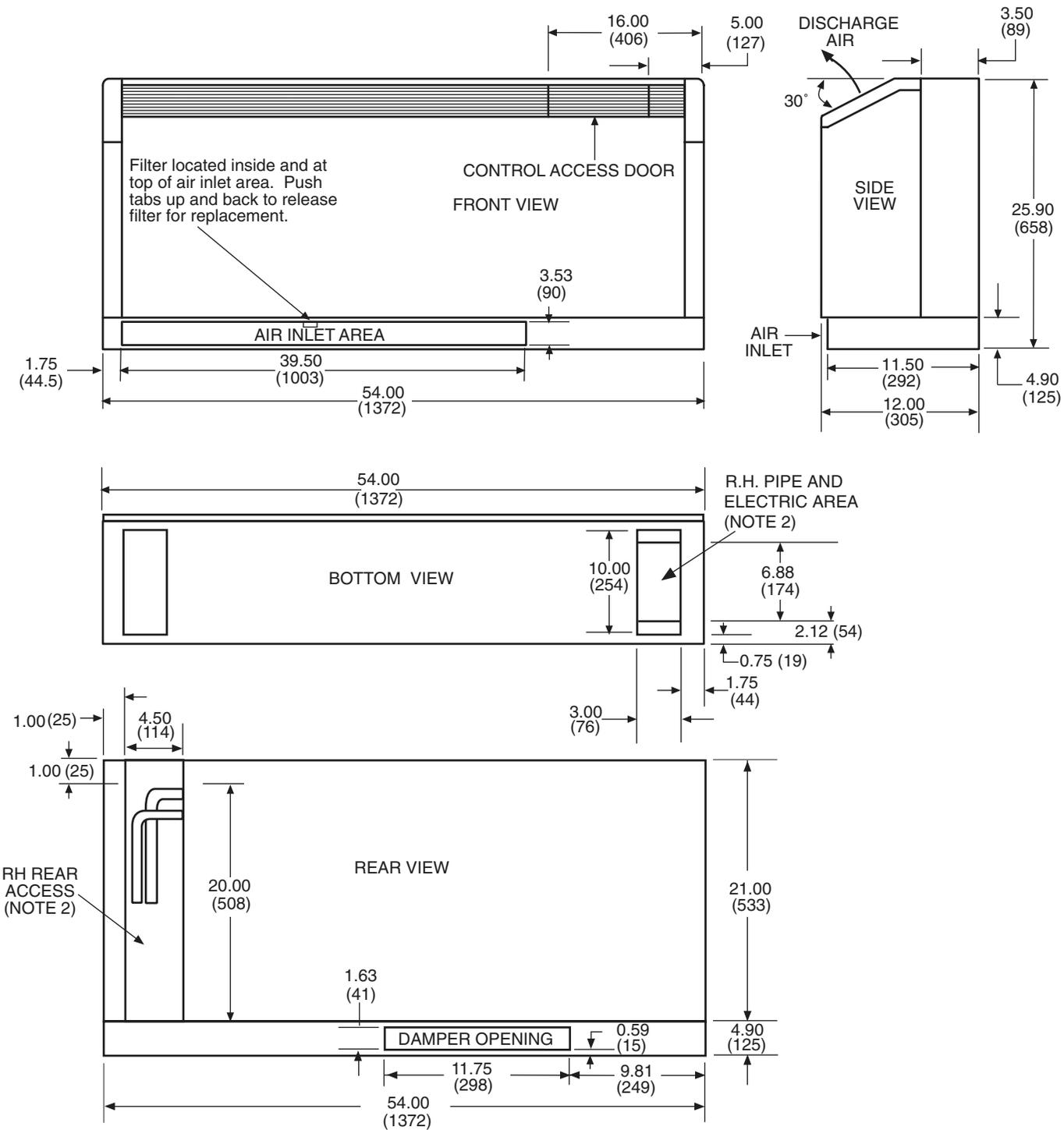
*Dimension reduced by fitting if selected.
 NOTE: Dimensions shown are in inches. Dimensions in parentheses are in millimeters.

Fig. 2 — 50PEC18 Piping Dimensions



- NOTES:
1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
 2. Access is reduced if optional disconnect box is selected.
 3. Optional autoflow valve, motorized water valve and disconnect box are shown.

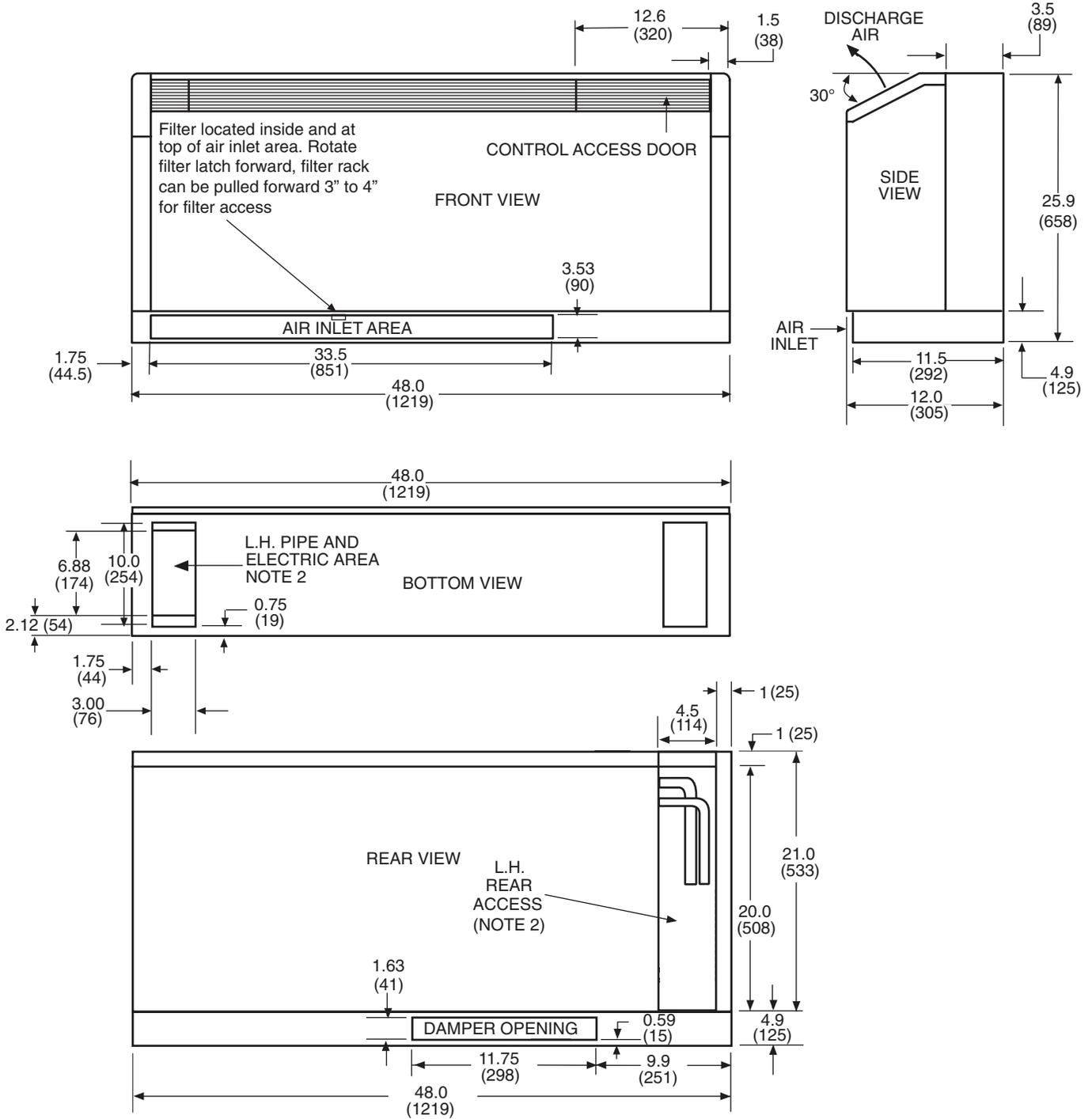
Fig. 3 — 50PEC09-15 Bottom Return Cabinet Dimensions — Right Hand Piping



NOTES:

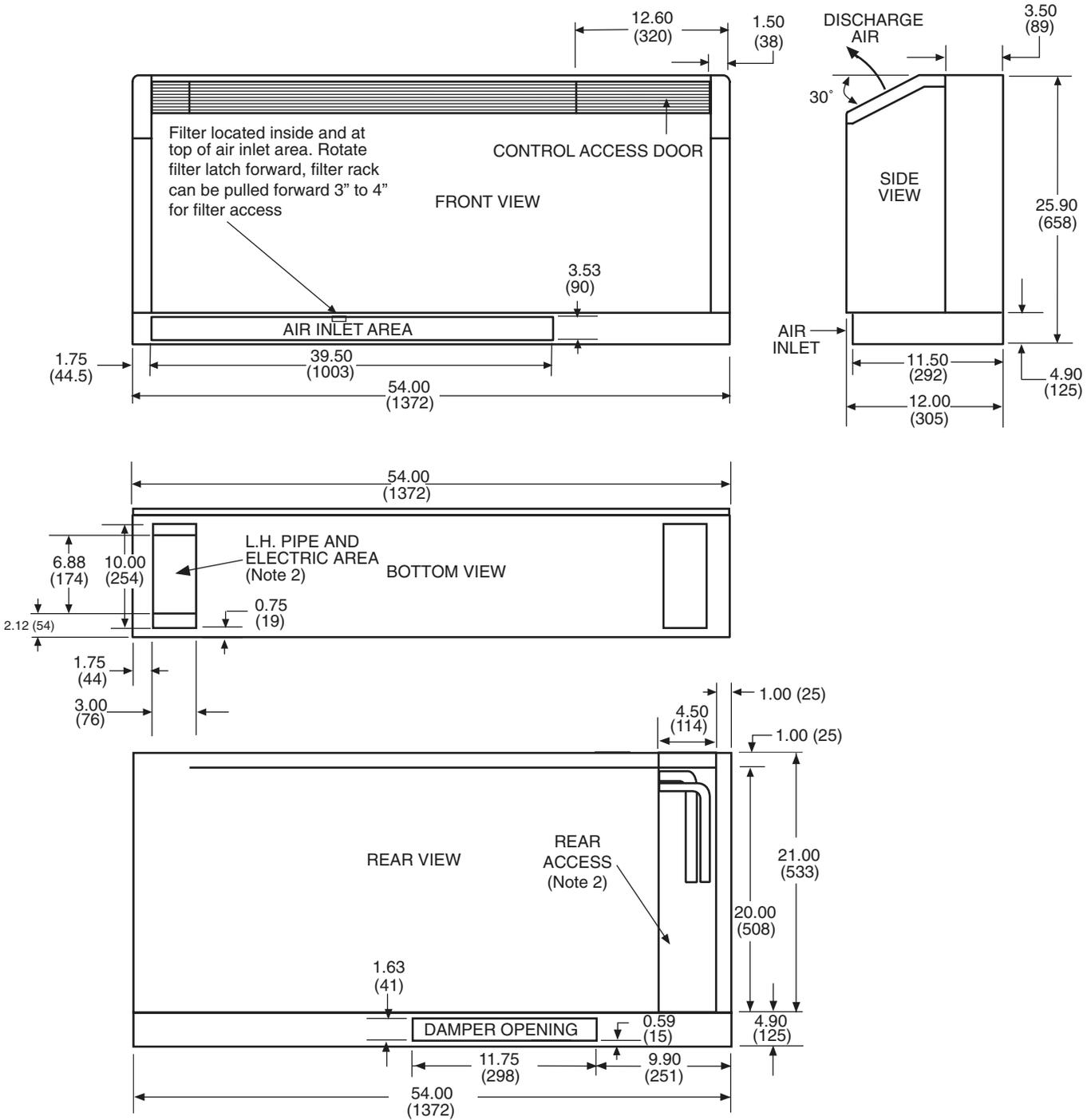
1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
2. Access is reduced if optional disconnect box is selected.
3. Optional autoflow valve, motorized water valve and disconnect box are shown.

Fig. 4 — 50PEC18 Bottom Return Cabinet Dimensions — Right Hand Piping



- NOTES:
1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
 2. Access is reduced if optional disconnect box is selected.
 3. Optional autoflow valve, motorized water valve and disconnect box are shown.

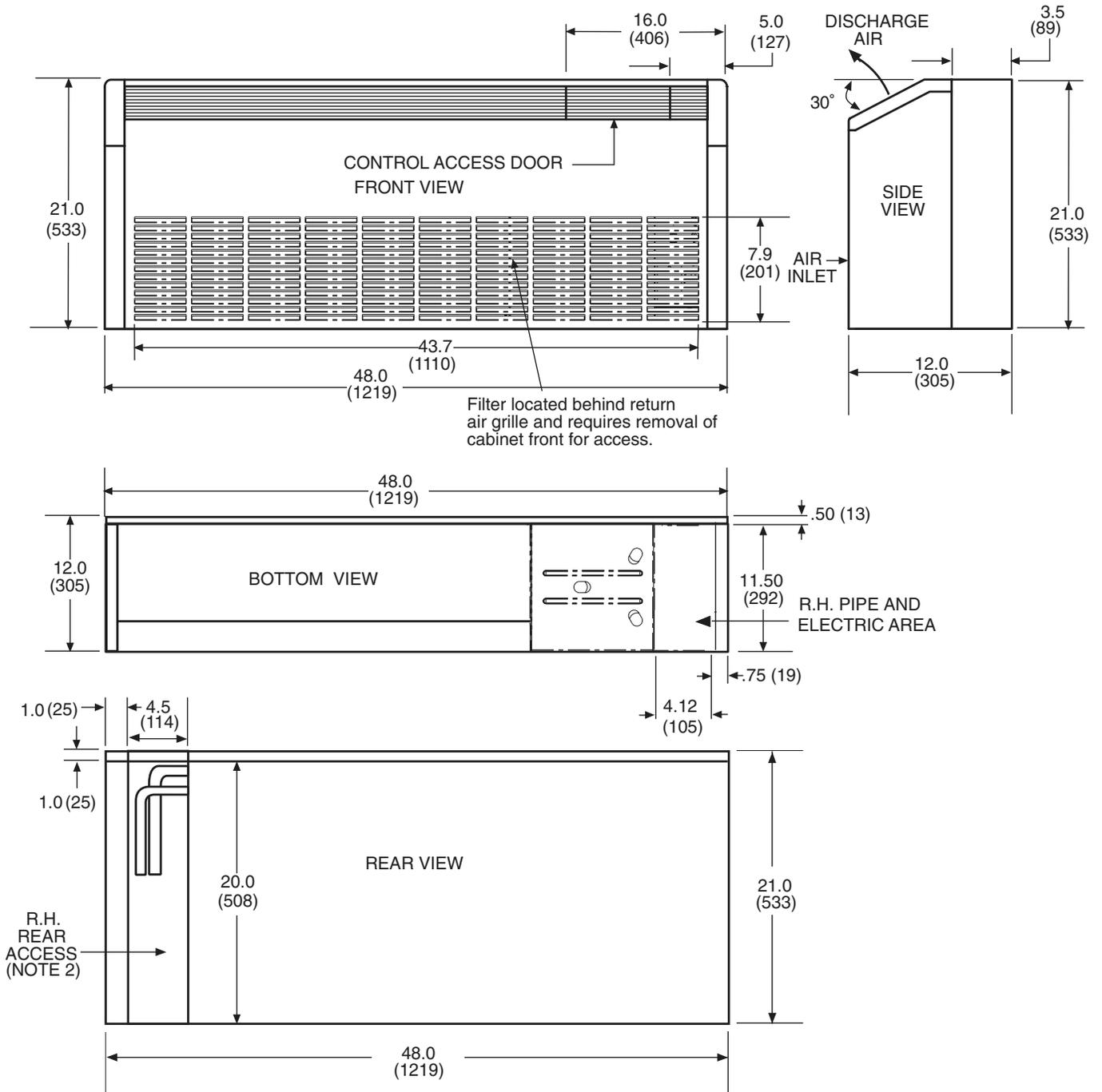
Fig. 5 — 50PEC09-15 Bottom Return Cabinet Dimensions — Left Hand Piping



NOTES:

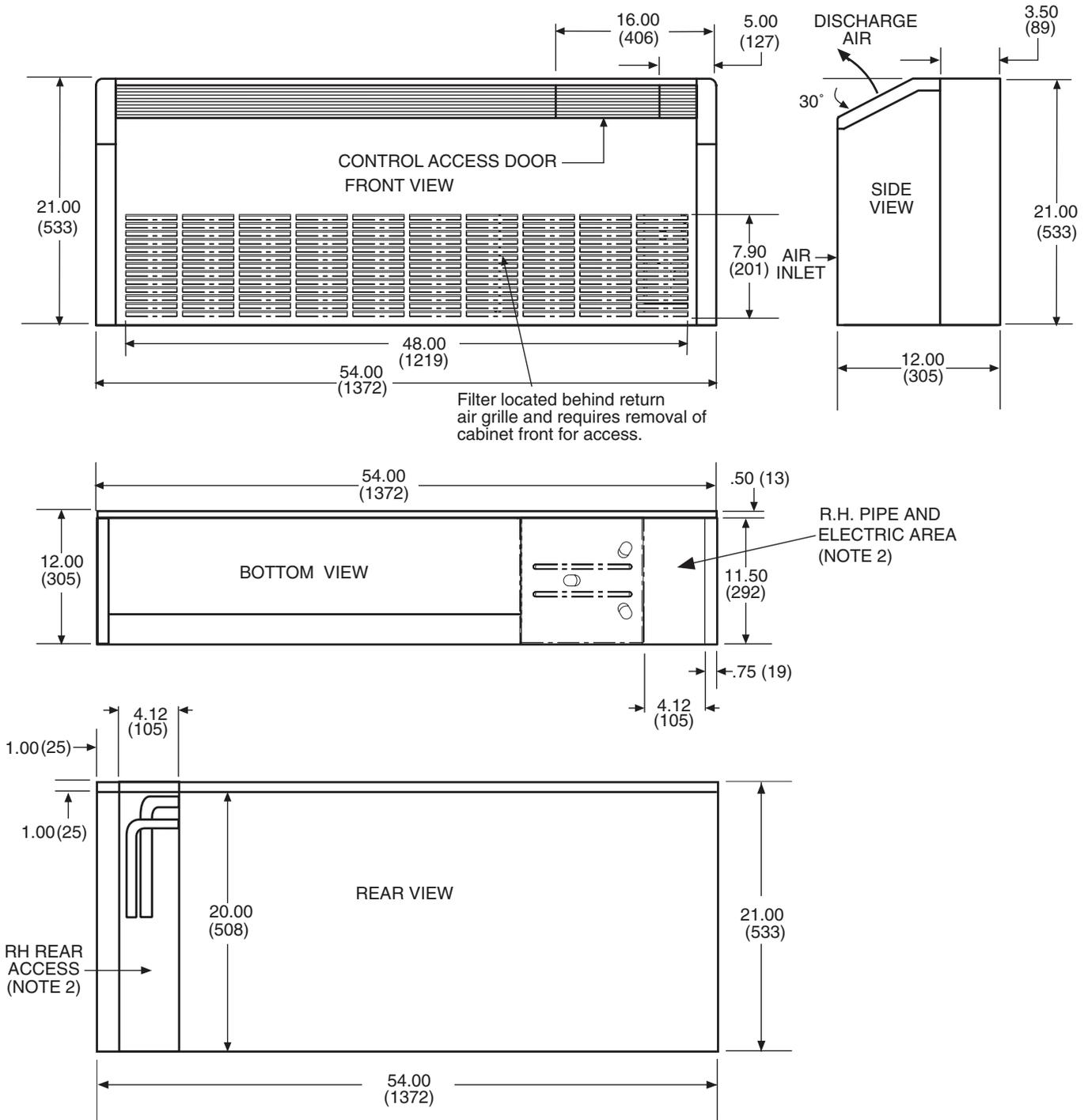
1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
2. Access is reduced if optional disconnect box is selected.
3. Optional autoflow valve, motorized water valve and disconnect box are shown.

Fig. 6 — 50PEC18 Bottom Return Cabinet Dimensions — Left Hand Piping



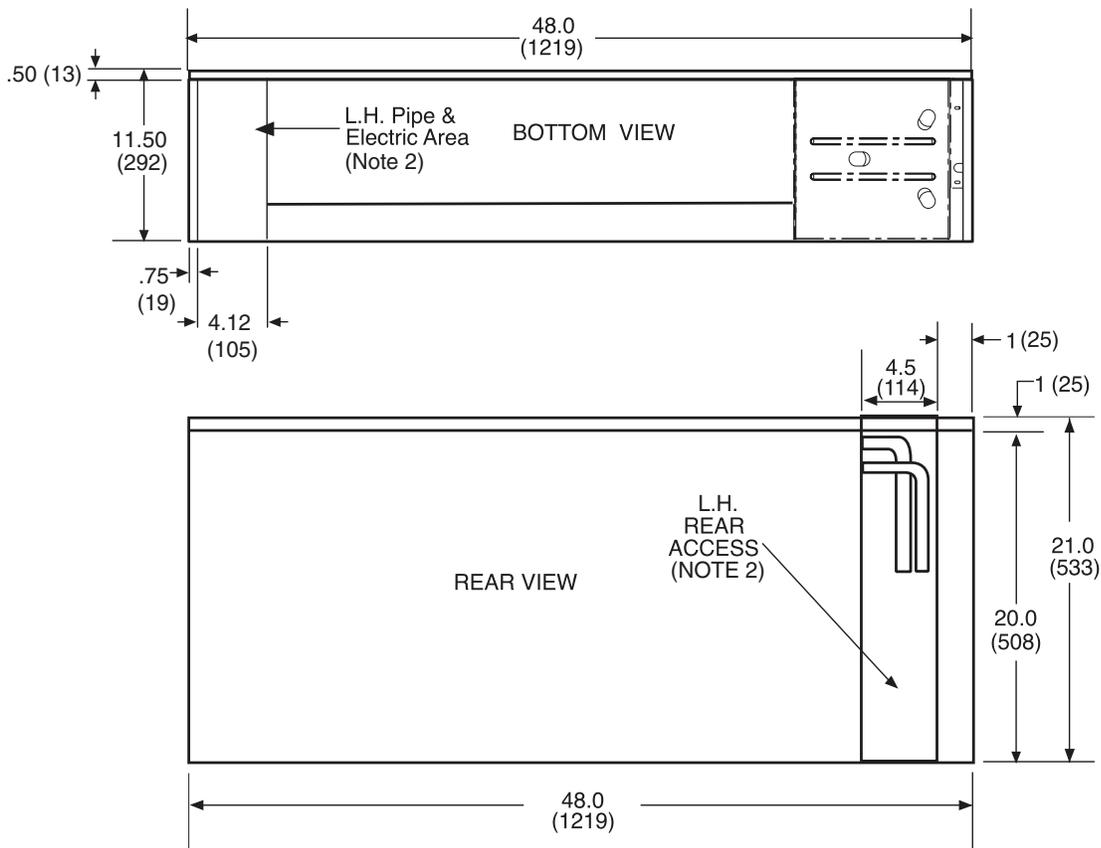
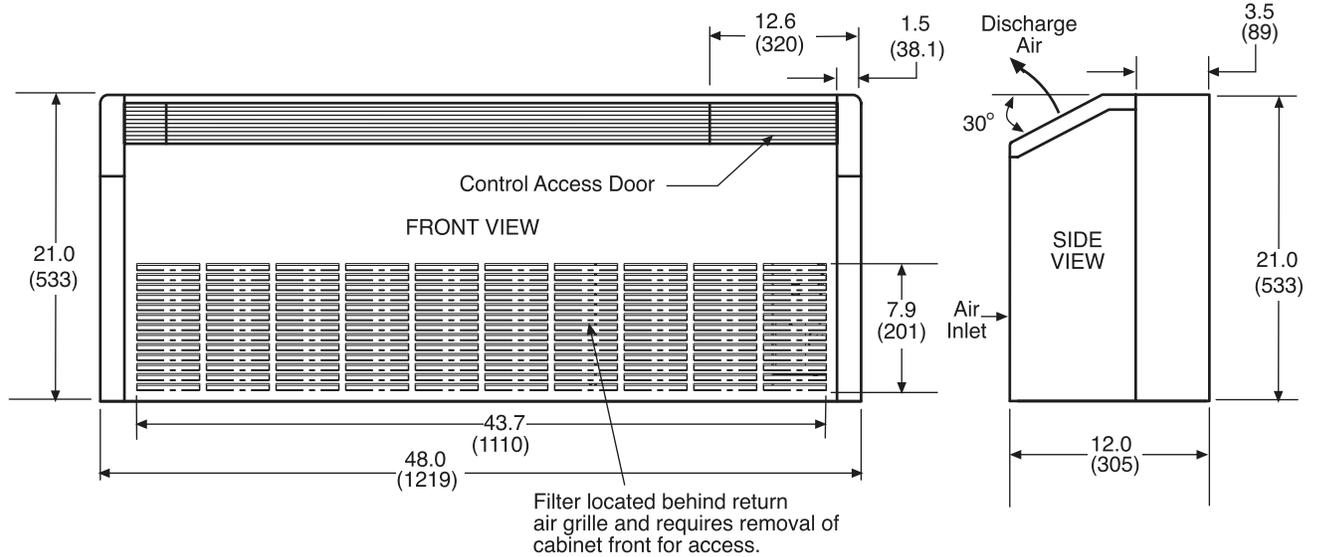
- NOTES:
1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
 2. Access is reduced if optional disconnect box is selected.
 3. Optional autoflow valve, motorized water valve and disconnect box are shown.

Fig. 7 — 50PEC09-15 Front Return Cabinet Dimensions — Right Hand Piping



- NOTES:
1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
 2. Access is reduced if optional disconnect box is selected.
 3. Optional autoflow valve, motorized water valve and disconnect box are shown.

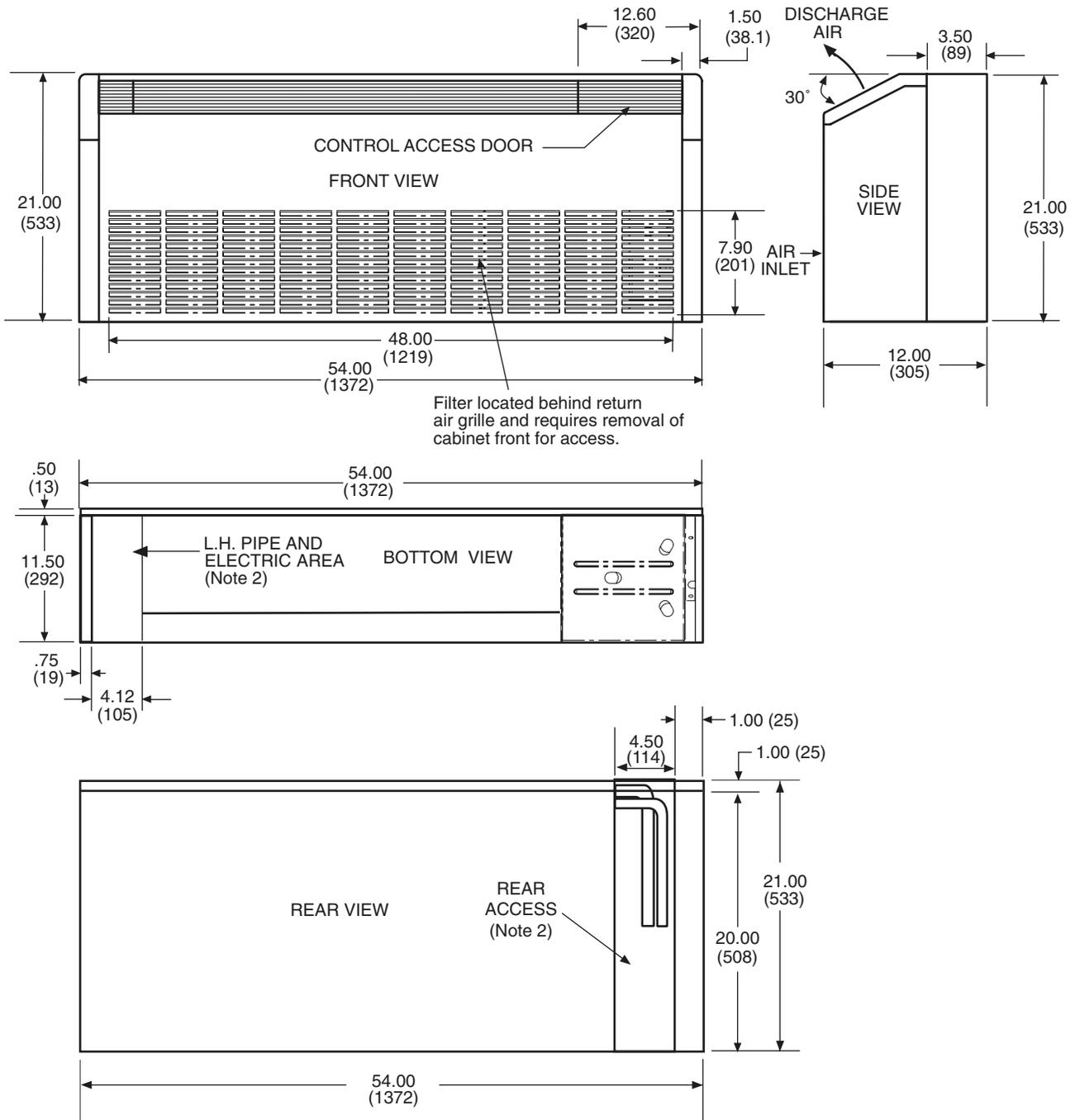
Fig. 8 — 50PEC18 Front Return Cabinet Dimensions — Right Hand Piping



NOTES:

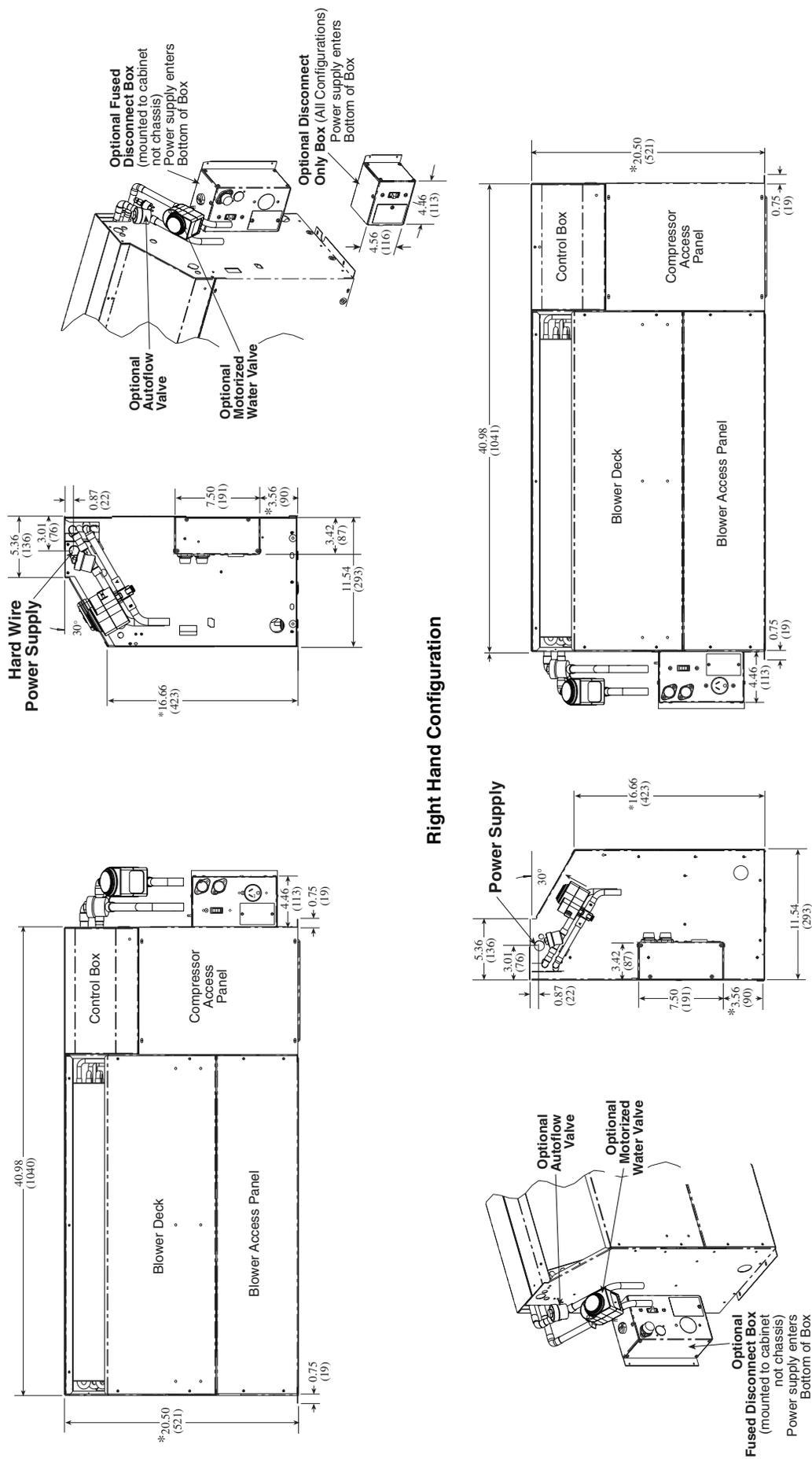
1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
2. Access is reduced if optional disconnect box is selected.
3. Optional autoflow valve, motorized water valve and disconnect box are shown.

Fig. 9 — 50PEC09-15 Front Return Cabinet Dimensions — Left Hand Piping



- NOTES:
1. Dimensions are shown in inches. Dimensions in parentheses are in millimeters.
 2. Access is reduced if optional disconnect box is selected.
 3. Optional autoflow valve, motorized water valve and disconnect box are shown.

Fig. 10 — 50PEC18 Front Return Cabinet Dimensions — Left Hand Piping

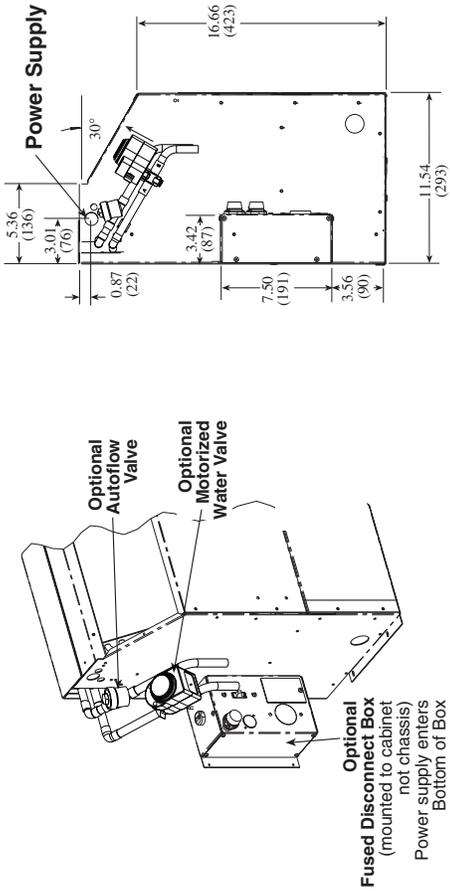
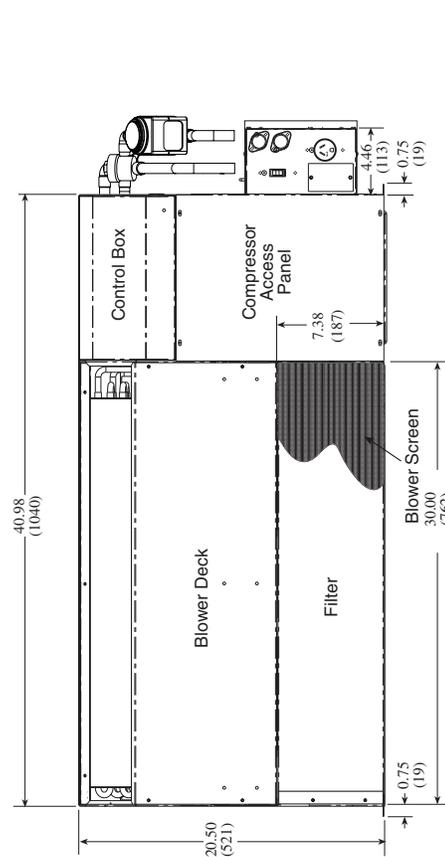
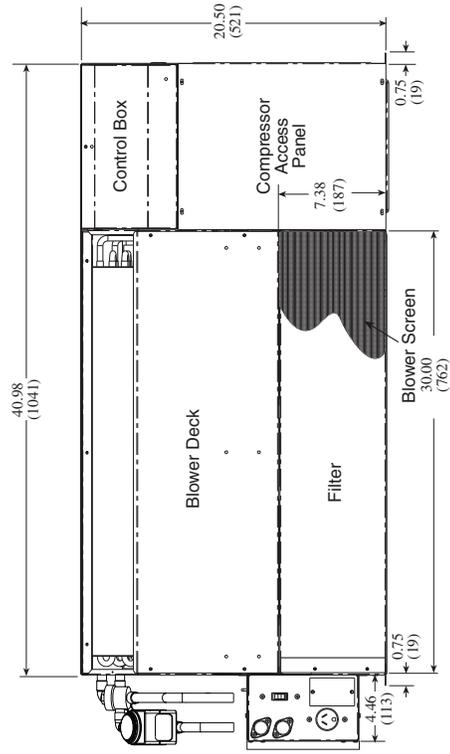
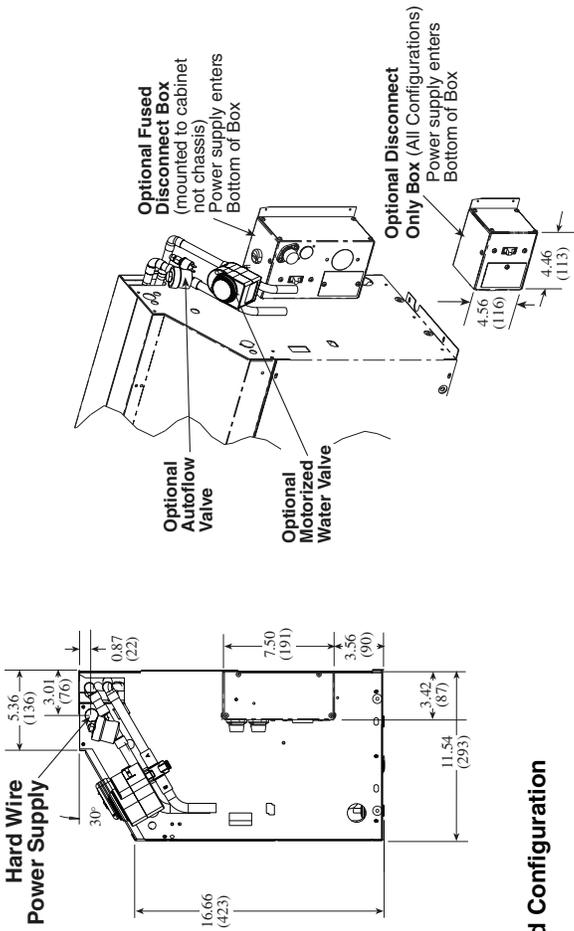


*If optional subbase is selected or if unit is installed raised above the floor, add 4.9 in. to dimension.

NOTES:

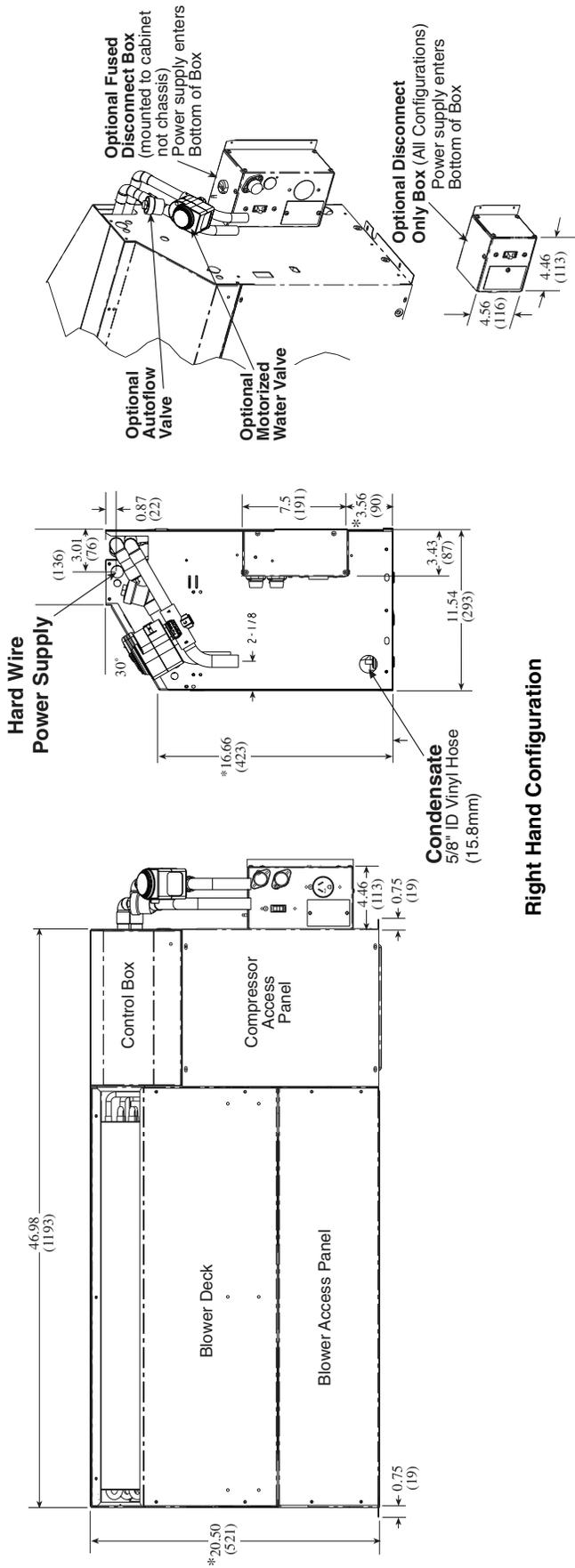
1. Dimensions shown are in inches. Dimensions in parentheses are in millimeters.
2. Optional autoflow valve, motorized water valve and disconnect box are shown.

Fig. 11 — 50PEC09-15 Chassis Dimensions — Bottom Return

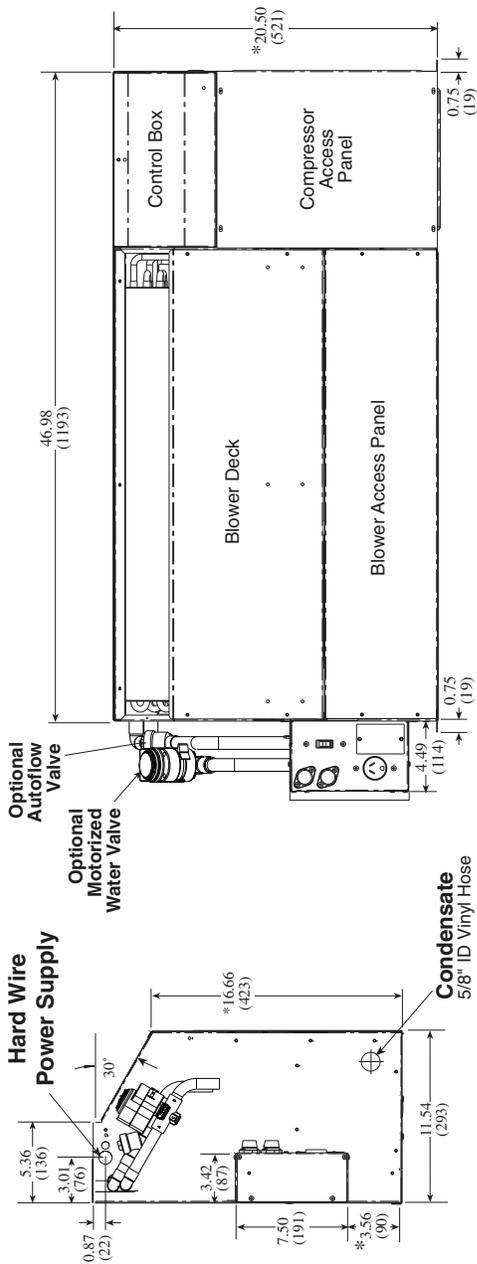


- NOTES:**
1. Dimensions shown are in inches. Dimensions in parentheses are in millimeters.
 2. Optional autoflow valve, motorized water valve and disconnect box are shown.
 3. Chassis can mount directly on floor.

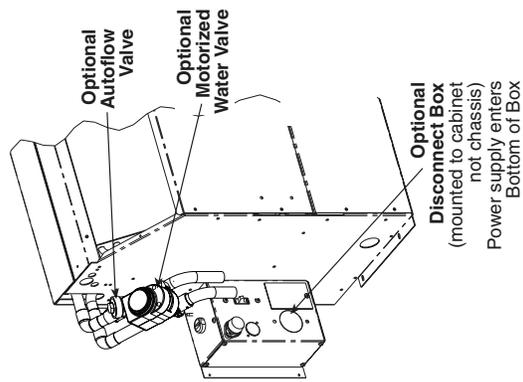
Fig. 12 — 50PEC09-15 Chassis Dimensions — Front Return



Right Hand Configuration



Left Hand Configuration

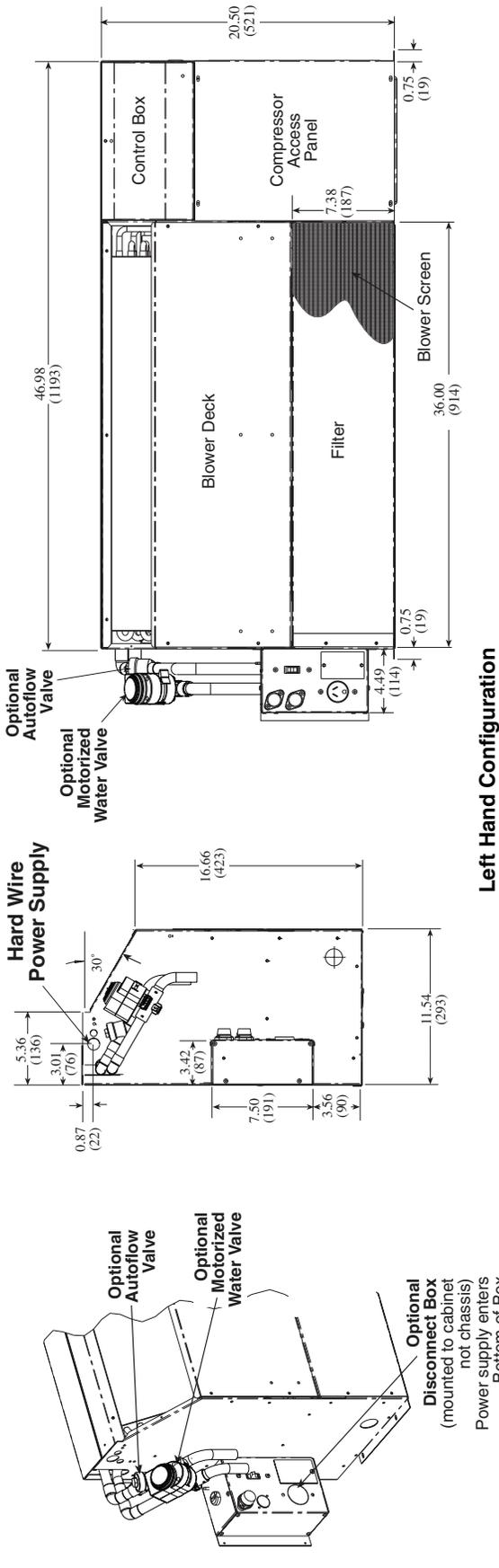
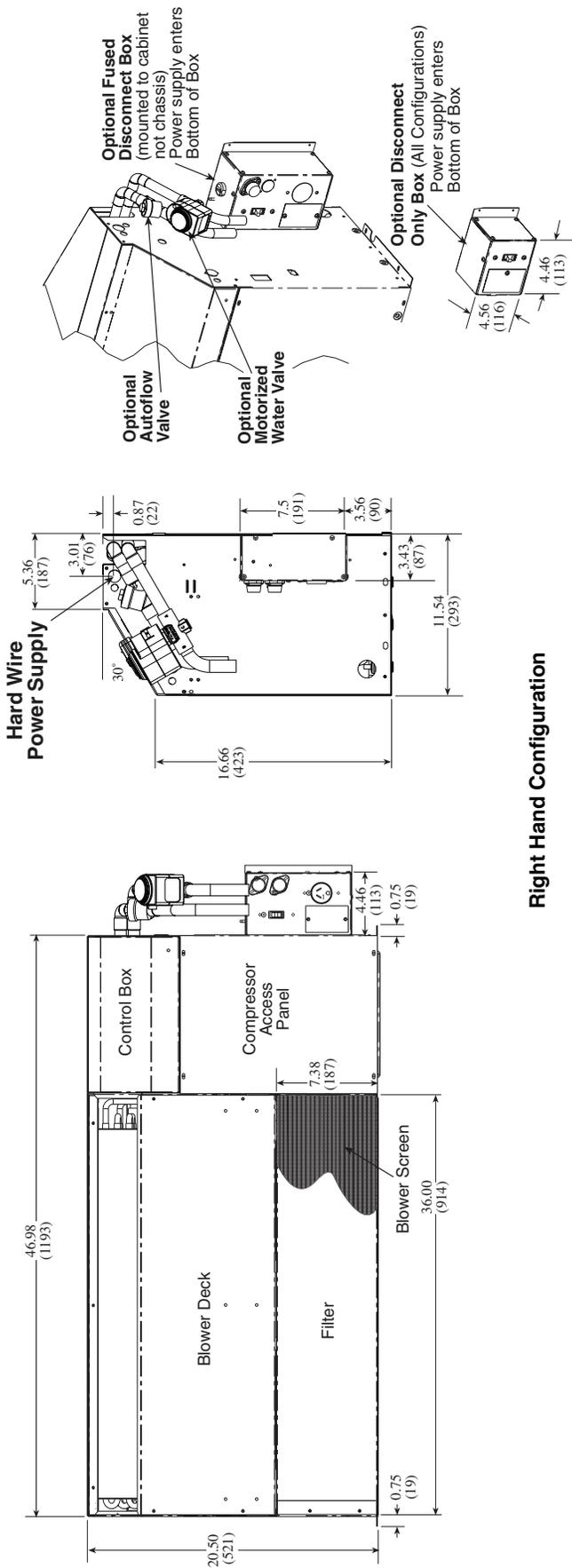


*If optional subbase is selected, add 4.9 in. to dimension.

NOTES:

1. Dimensions shown are in inches. Dimensions in parentheses are in millimeters.
2. Optional autoflow valve, motorized water valve and disconnect box are shown.

Fig. 13 — 50PEC18 Chassis Dimensions — Bottom Return



NOTES:

1. Dimensions shown are in inches. Dimensions in parentheses are in millimeters.
2. Optional autoflow valve, motorized water valve and disconnect box are shown.
3. Chassis can mount directly on floor.

Fig. 14 — 50PEC18 Chassis Dimensions — Front Return

Step 2 — Check Unit — Upon receipt of shipment at the jobsite, carefully check the shipment against the bill of lading. Make sure all units have been received. Inspect the carton or crating of each unit, and inspect each unit for damage. Ensure the shipping company makes proper notation of any shortages or damage on all copies of the freight bill. Concealed damage not discovered during unloading must be reported to the shipping company within 15 days of receipt of shipment.

NOTE: It is the responsibility of the purchaser to file all necessary claims with the shipping company.

STORAGE

CAUTION

DO NOT store or install console units in corrosive environments or in locations subject to temperature or humidity extremes (e.g., attics, garages, rooftops, etc.). Corrosive conditions and high temperature or humidity can significantly reduce performance, reliability, and service life. Always move units in an upright position. Tilting units on their sides may cause equipment damage.

Upon the arrival of equipment at the jobsite, immediately store units in their shipping cartons in a clean, dry area. **Store units in an upright position at all times. Stack units a maximum of 3 units high. Use pallets to separate each layer of units. DO NOT remove equipment from shipping cartons until equipment is required for installation.**

UNIT PROTECTION — Cover console units on the jobsite with either shipping cartons, vinyl film, or an equivalent protective covering. Cap the open ends of pipes stored on the jobsite. In areas where painting, plastering, or the spraying of fireproof material has not been completed, all due precautions must be taken to avoid physical damage to the units and contamination by foreign material. Physical damage and contamination may prevent proper start-up and may result in costly equipment clean-up.

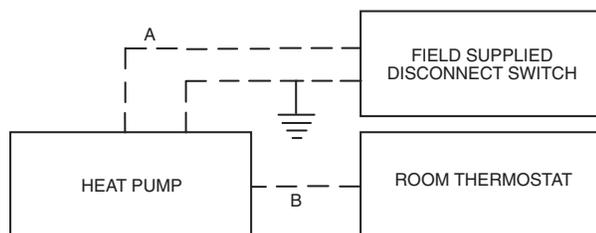
Examine all pipes, fittings, and valves before installing any of the system components. Remove any dirt found on these components.

Step 3 — Mount Unit

1. Unpack the unit from the shipping carton. Remove the front cabinet by lifting up and away from the backplate. Protect the cabinet from damage during installation by returning it to its original vinyl pack until required.
2. Remove compressor isolation plate shipping bolts (4), as shown in Fig. 15.
3. Using a carpenter's square and a level, ensure the unit is level. Shim the unit if necessary to assure proper installation.

Poor or inadequate installation may result in noisy unit operation or unattractive appearance.

4. Select the proper fasteners to connect the backplate securely to the wall.



A = Two power wires for single-phase units.

B = 1 heat/1 cool/manual or auto changeover remote 24-V thermostat.

NOTE: All customer-supplied wiring to be copper only and must conform to national and local electrical codes. Wiring shown with dashed lines must be field-supplied and field-installed. "B" wiring only required with systems using remote-mounted thermostats.

Fig. 16 — Typical Field-Installed Wiring

5. Fasten the backplate onto the wall through the screw holes located in the back flange. Secure the subbase in place.

Step 4 — Wire Electrical Connections

WARNING

To avoid possible injury or death due to electrical shock, open the power supply disconnect switch and secure it in an open position during installation.

CAUTION

Use only copper conductors for field-installed electrical wiring. Unit terminals are not designed to accept other types of conductors.

All field-installed wiring, including the electrical ground, **MUST** comply with National Electrical Code (NEC) as well as all applicable local codes. In addition, all field wiring must conform to the Class II temperature limitations described in the NEC.

Consult the unit wiring diagram located on the inside of the compressor access panel to ensure proper electrical hookup. The installing (or electrical) contractor must make the field connections shown in Fig. 16 when using field-supplied disconnect.

Refer to unit wiring diagrams Fig. 17-29 for a schematic of the field connections, which must be made by the installing (or electrical) contractor. Operating voltage must be within voltage range shown in Table 2.

Make all final electrical connections with a length of flexible conduit to minimize vibration and sound transmission to the building.

SUPPLY VOLTAGE — Operating voltage to unit must be within voltage range indicated on unit nameplate.

EXTERNAL LOOP POWER CONNECTION — If the unit will be connected to an external loop pump or flow controller, connect the pump to the loop pump terminal block PB1. The maximum power handling is 4 amps at 240-v. The pumps will automatically cycle as required by the unit.

230-V OPERATION — All 208/230-v units are factory-wired for 208-v. The transformer wiring may be switched for 230-v operation (as illustrated on the wiring diagrams) by switching the RED and ORG leads at L1.

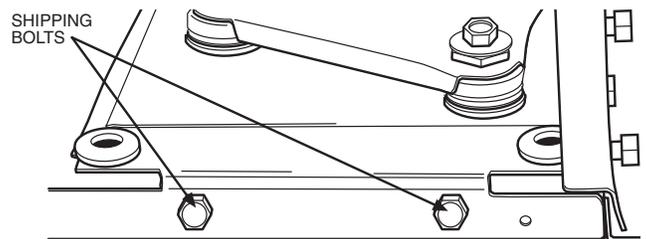


Fig. 15 — Remove 4 Shipping Bolts on Compressor Isolator Plate

WARNING

Disconnect electrical power source to prevent injury or death from electrical shock.

CAUTION

Use copper conductors only to prevent equipment damage.

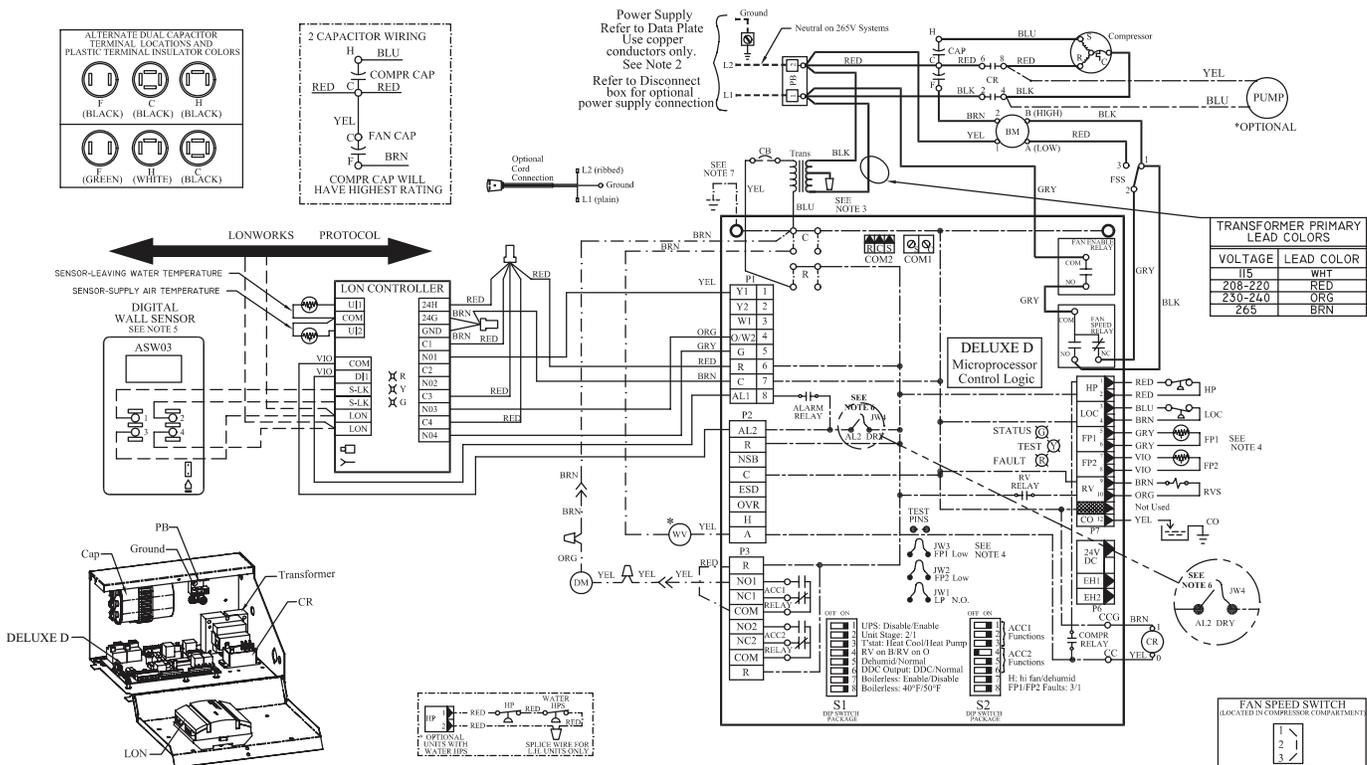
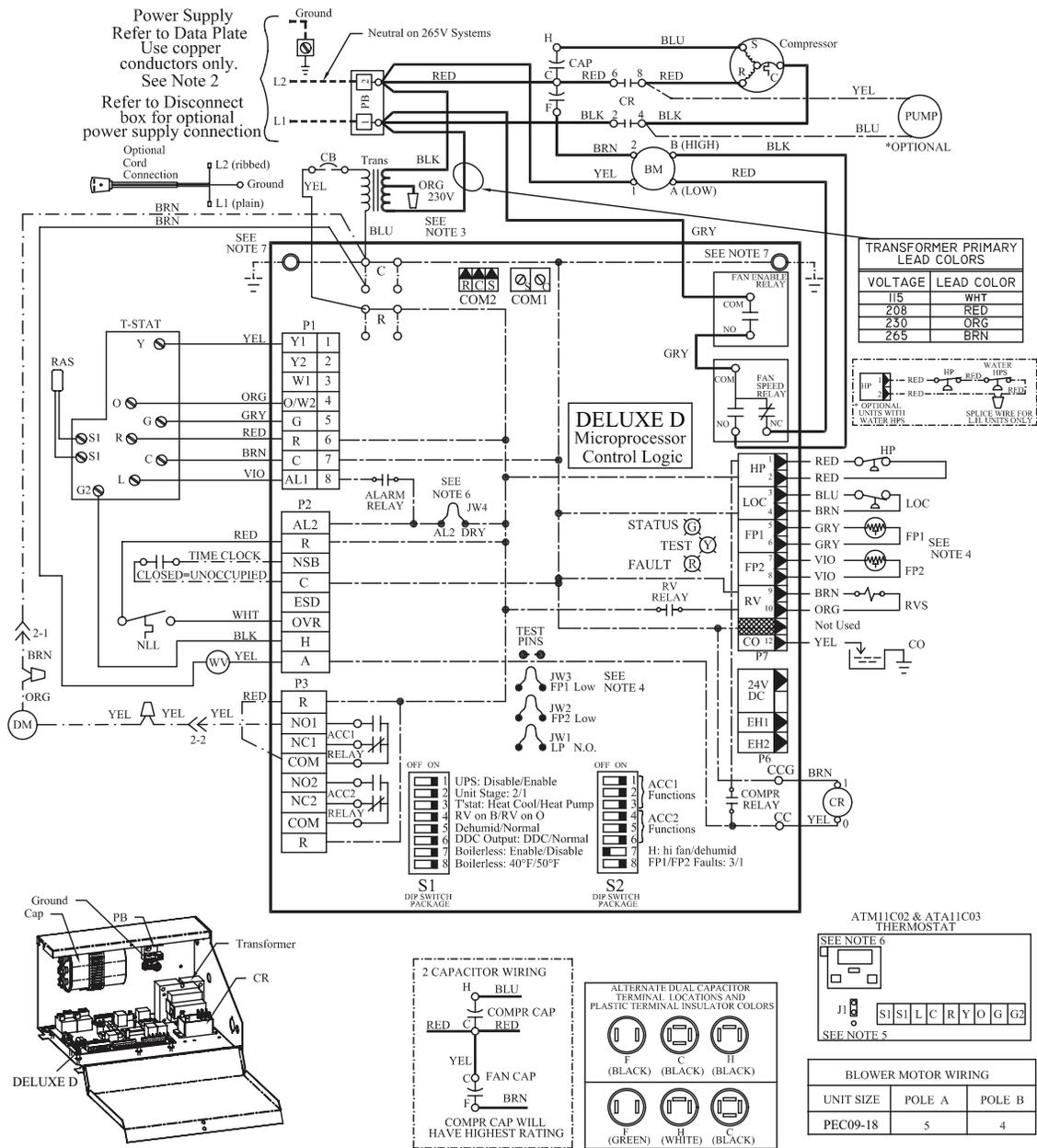


Fig. 19 — 50PEC Unit with Deluxe D and LON Controllers



- LEGEND**
- AL — Alarm Relay Contacts
 - BM — Blower Motor
 - BR — Blower Relay
 - CAP — Capacitor
 - CB — Circuit Breaker
 - CO — Sensor, Condensate Overflow
 - CR — Compressor Relay
 - DM — Damper Motor
 - FP1 — Sensor, Water Coil Freeze Protection
 - FP2 — Sensor, Air Coil Freeze Protection
 - HP — High-Pressure Switch
 - JW1 — Jumper Wire for Alarm
 - LOC — Loss of Charge Pressure Switch
 - NLL — Night Low Limit Switch
 - PB — Power Terminal Block
 - RAS — Return Air Sensor
 - RVS — Reversing Valve Solenoid
 - TRANS — Transformer
 - WV — Water Valve
 - Field Line Voltage Wiring
 - Field Low-Voltage Wiring
 - Printed Circuit Trace

- Relay/Contactor Coil
- Solenoid Coil
- Thermistor
- Circuit Breaker
- Relay Contacts-N.O.
- Switch-Temperature
- Switch-High Pressure
- Switch-Low Pressure
- Ground
- Wire Nut
- Mate-N-Lock

- NOTES:**
- Compressor and blower motor thermally protected internally.
 - All wiring to the unit must comply with local codes.
 - Transformer is wired to 115-V (WHT) lead for 115/1/60 units, 265-V (BRN) lead for 265/1/60 units, 240-V (ORG) lead for 240/1/50 units, or 208-V (RED) lead for 208/1/60 units. Rewire transformer L1 connection if voltage is 230-1-60 or 220-1-50, insulate unused lead.
 - FP1 thermistor provides freeze protection for WATER. When using ANTI-FREEZE solutions, cut JW3 jumper.
 - Refer to Microprocessor Control Installation, Application, and Operation manual for control wiring to the unit. Low voltage wiring must be "class 1" and voltage rated equal to or greater than unit supply voltage.
 - Factory-cut jumper (JW4). Dry contact will be available between AL1 and AL2.
 - Transformer secondary ground via Deluxe D board standoffs and screws to control box. (Ground available from top 2 standoffs as shown.)

Fig. 20 — 50PEC Unit Manual or Auto Changeover and Deluxe D Controller

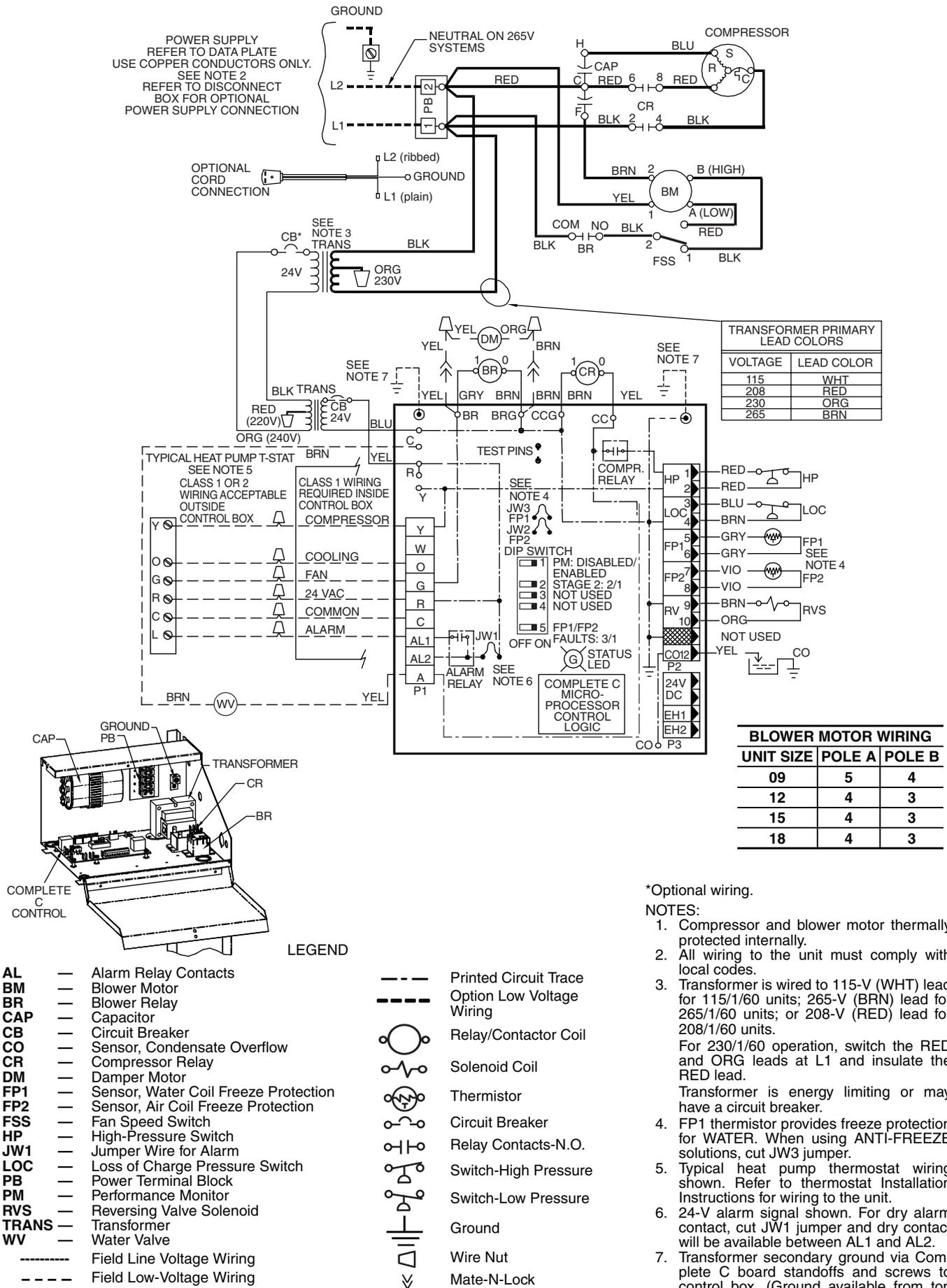
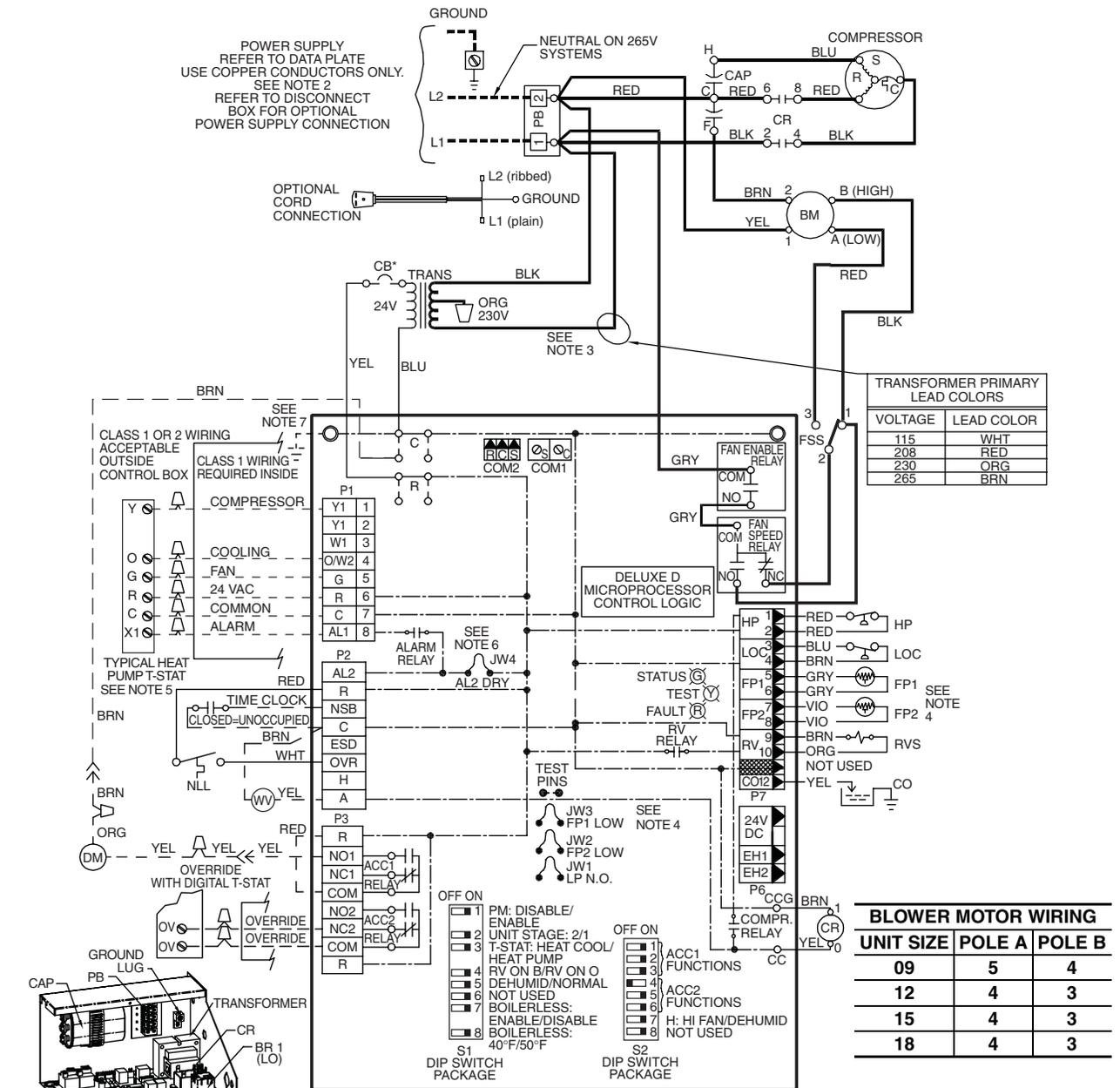


Fig. 21 — 50PEC Unit Remote-Mounted Thermostat with Complete C Controller Wiring



*Optional wiring.

NOTES:

- Compressor and blower motor thermally protected internally.
- All wiring to the unit must comply with local codes.
- Transformer is wired to 115-V (WHT) lead for 115/1/60 units; 265-V (BRN) lead for 265/1/60 units; or 208-V (RED) lead for 208/1/60 units.
For 230/1/60 operation, switch the RED and ORG leads at L1 and insulate the RED lead. Transformer is energy limiting or may have a circuit breaker.
- FP1 thermistor provides freeze protection for WATER. When using ANTI-FREEZE solutions, cut JW3 jumper.
- Typical heat pump thermostat wiring shown. Refer to thermostat Installation Instructions for wiring to the unit.
- 24-V alarm signal shown. For dry alarm contact, cut AL2 DRY (JW4) jumper and dry contact will be available between AL1 and AL2.
- Transformer secondary ground via Deluxe D board standoffs and screws to control box. (Ground available from top two standoffs as shown.)

- LEGEND**
- AL — Alarm Relay Contacts
 - BM — Blower Motor
 - BR — Blower Relay
 - CAP — Capacitor
 - CB — Circuit Breaker
 - CO — Sensor, Condensate Overflow
 - CR — Compressor Relay
 - DM — Damper Motor
 - FP1 — Sensor, Water Coil Freeze Protection
 - FP2 — Sensor, Air Coil Freeze Protection
 - FSS — Fan Speed Switch
 - HP — High-Pressure Switch
 - JW1 — Jumper Wire for Alarm
 - LOC — Loss of Charge Pressure Switch
 - NLL — Night Low Limit
 - OV — Override
 - PB — Power Terminal Block
 - PM — Performance Monitor
 - RVS — Reversing Valve Solenoid
 - TRANS — Transformer
 - WV — Water Valve
 - Field Line Voltage Wiring

- Field Low-Voltage Wiring
- Printed Circuit Trace
- Option Low Voltage Wiring
- Relay/Contactor Coil
- Solenoid Coil
- Thermistor
- Circuit Breaker
- Relay Contacts-N.O.
- Switch-High Pressure
- Switch-Low Pressure
- Ground
- Wire Nut
- Mate-N-Lock

Fig. 22 — 50PEC Unit Remote-Mounted Thermostat with Deluxe D Controller Wiring

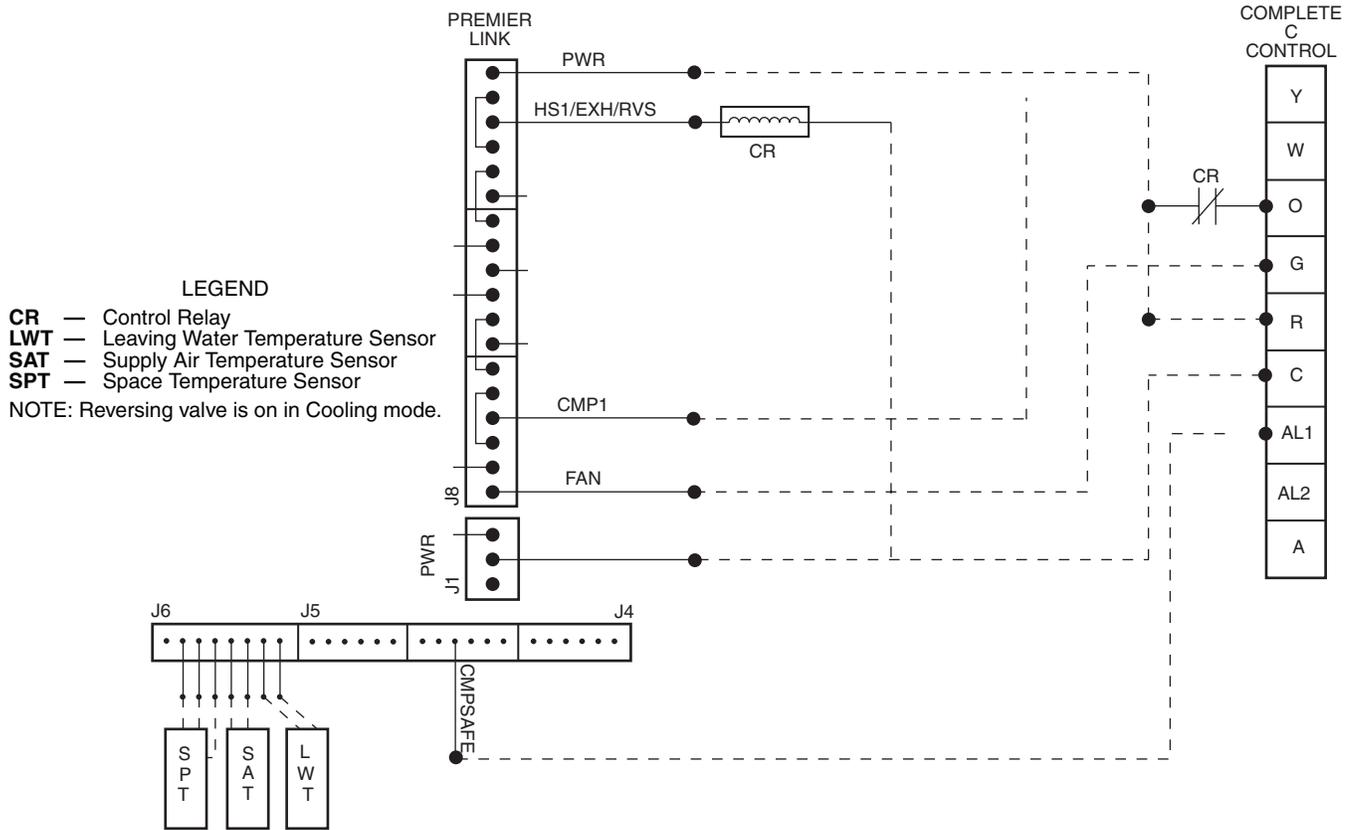


Fig. 23 — PremierLink™ Controller Applications with Complete C Control

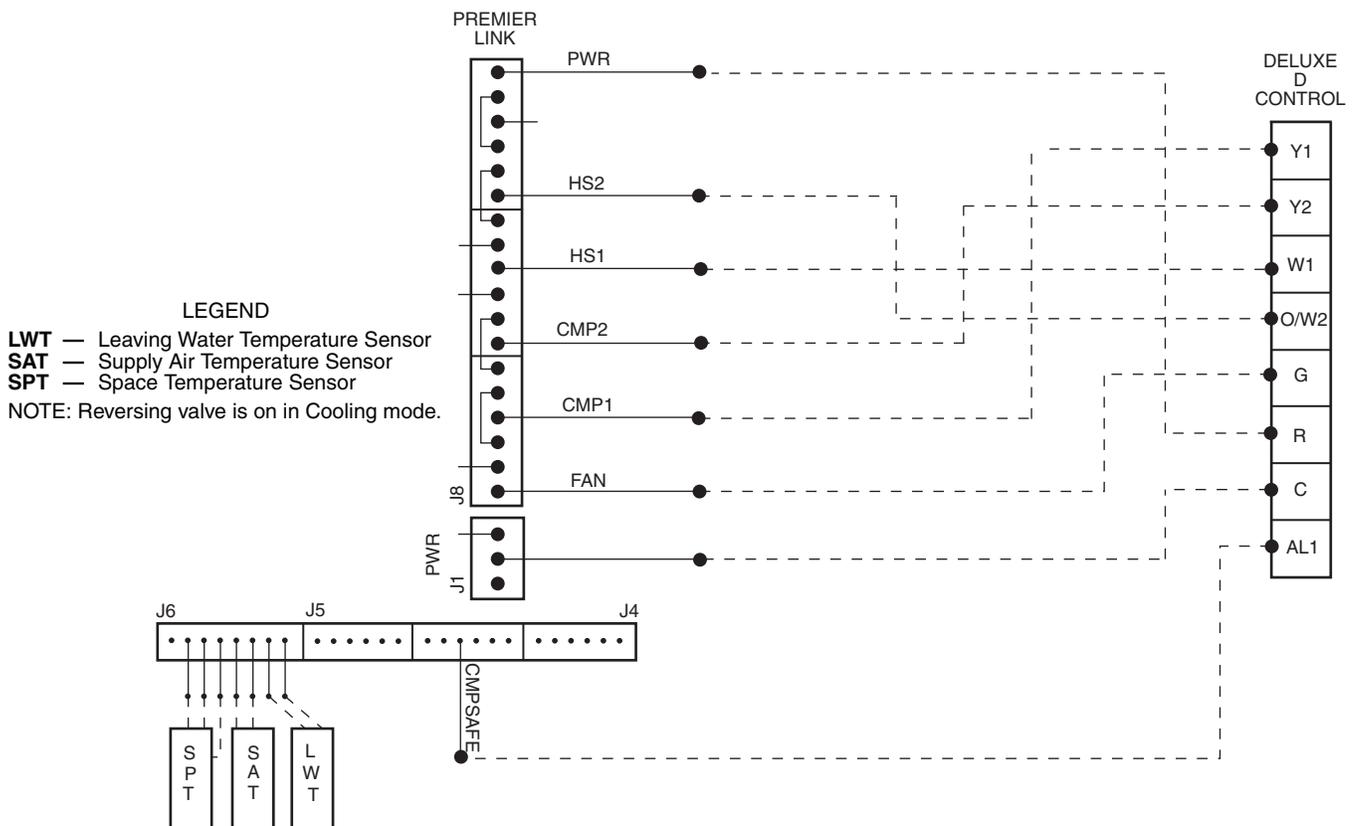


Fig. 24 — PremierLink Controller Applications with Deluxe D Control

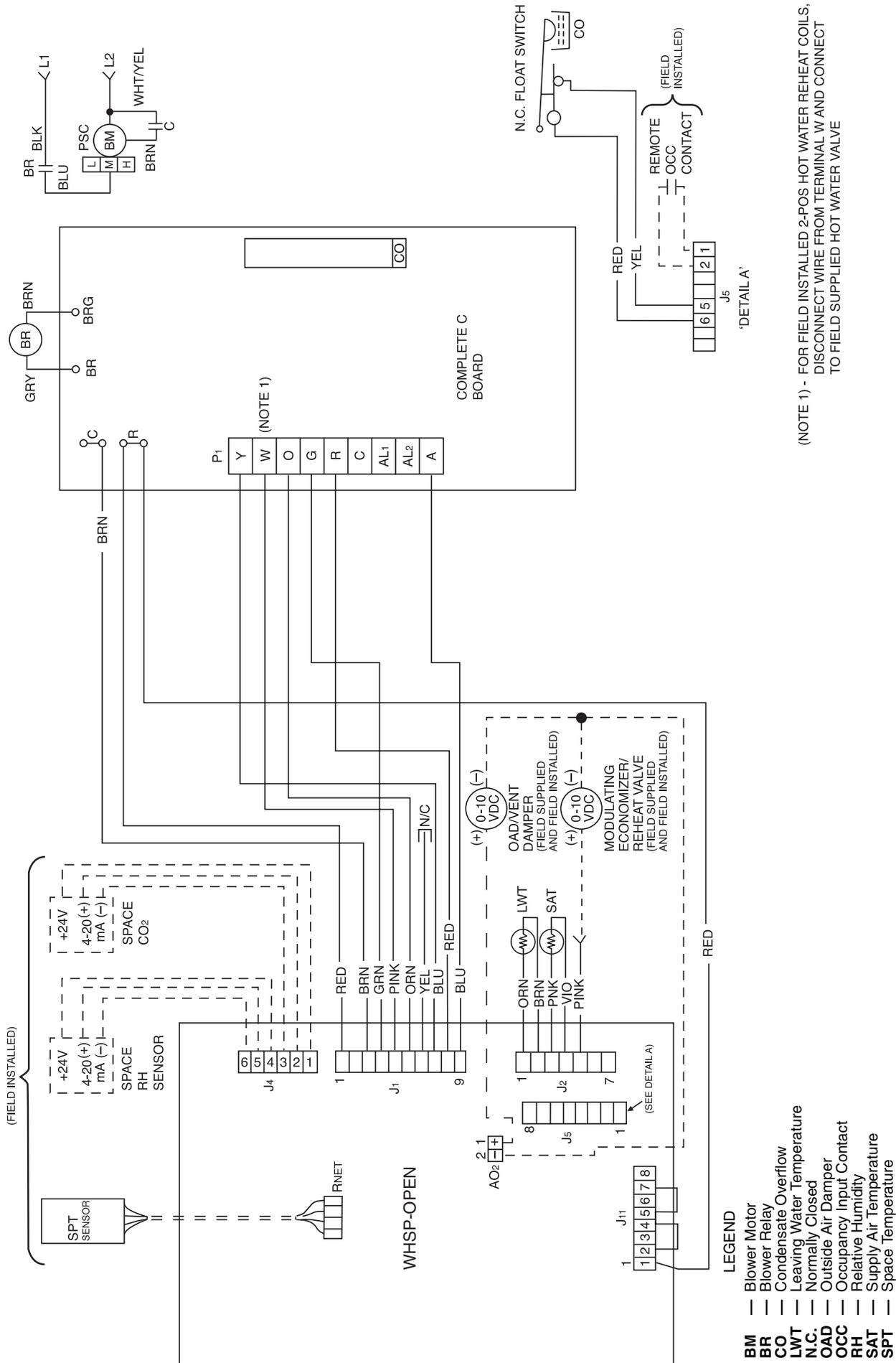


Fig. 25 — Units with Complete C and WSHP Open Multiple Protocol Controls

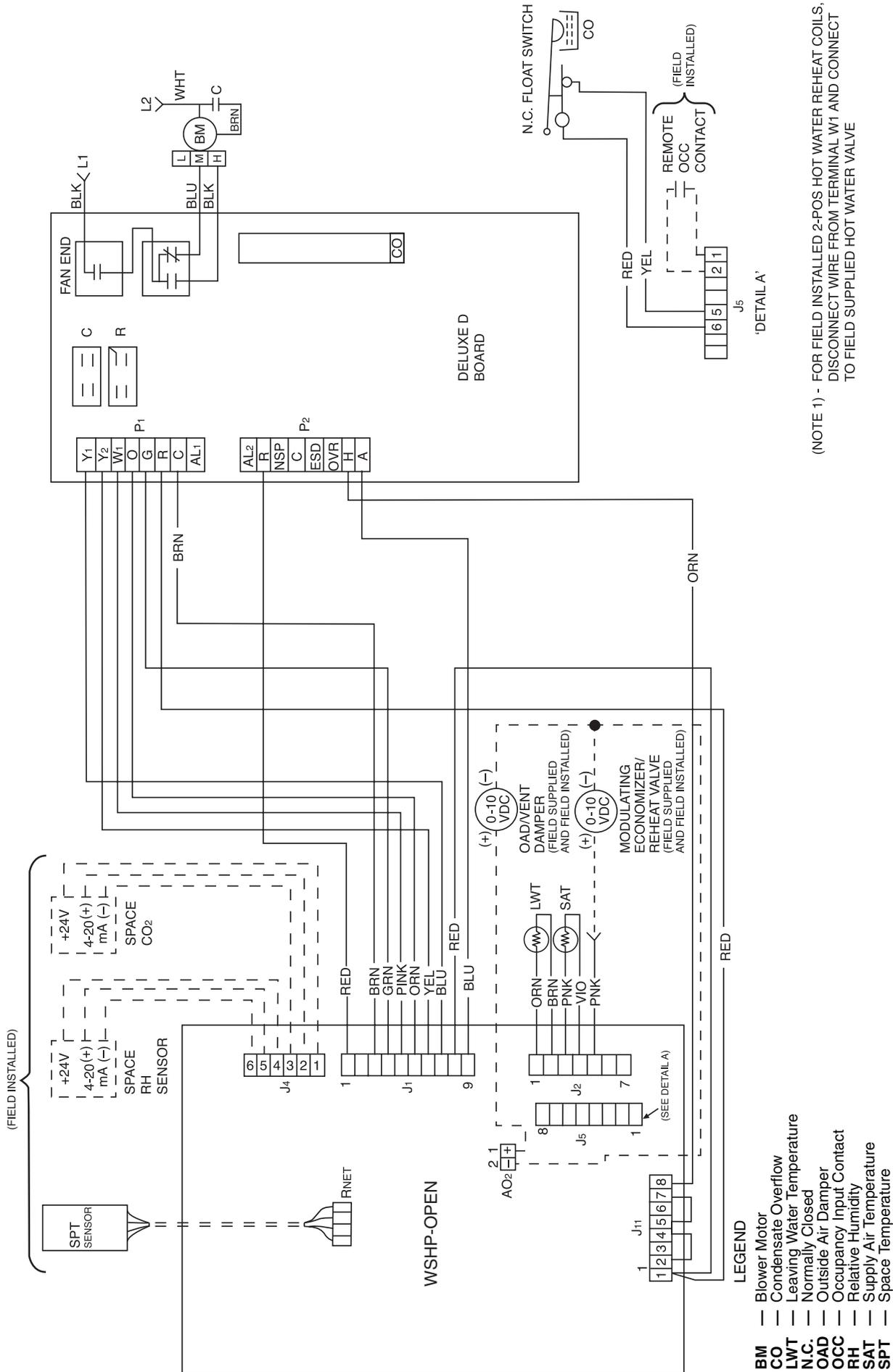


Fig. 26 — Units with Delux D and WSHP Open Multiple Protocol Controls

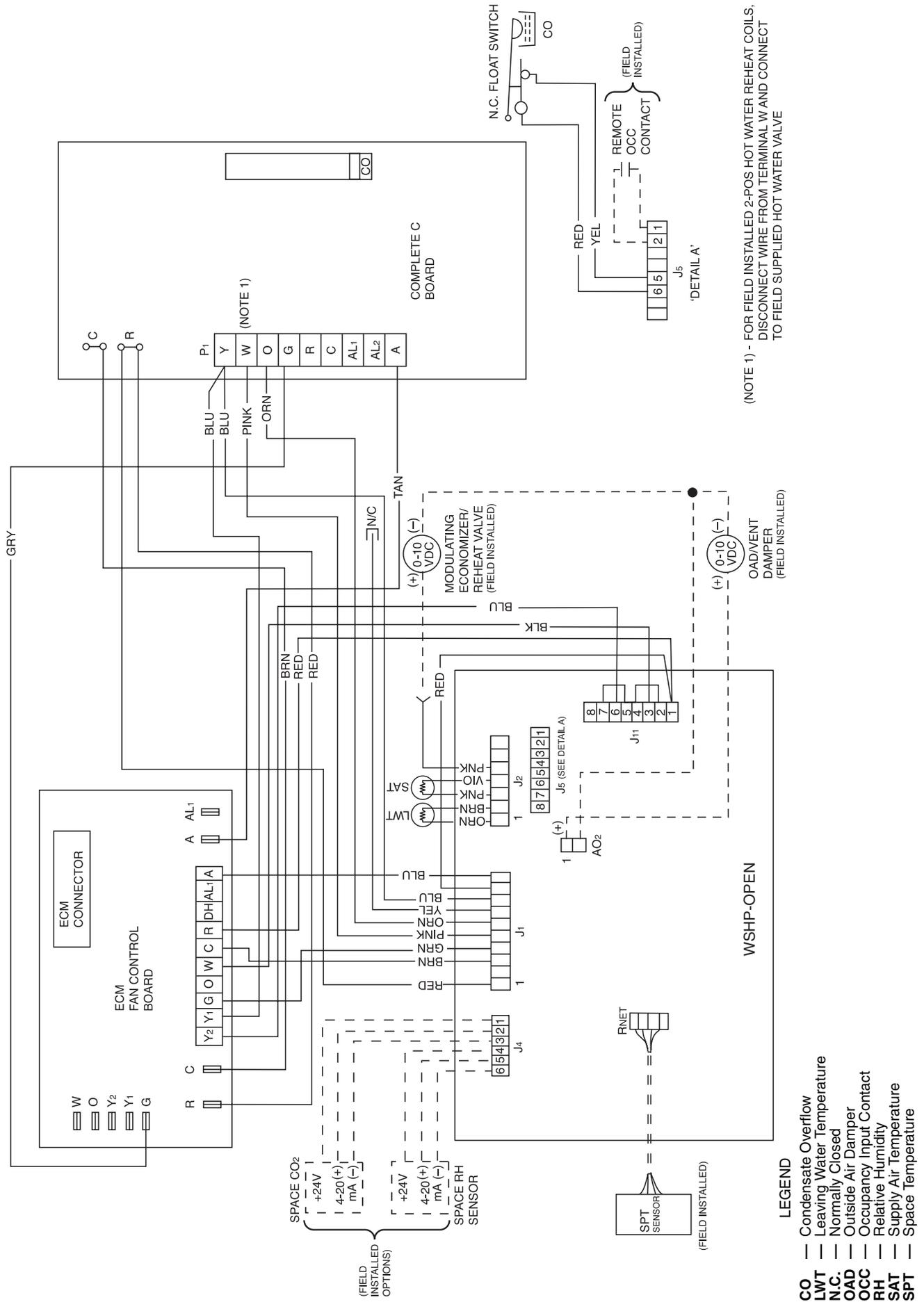
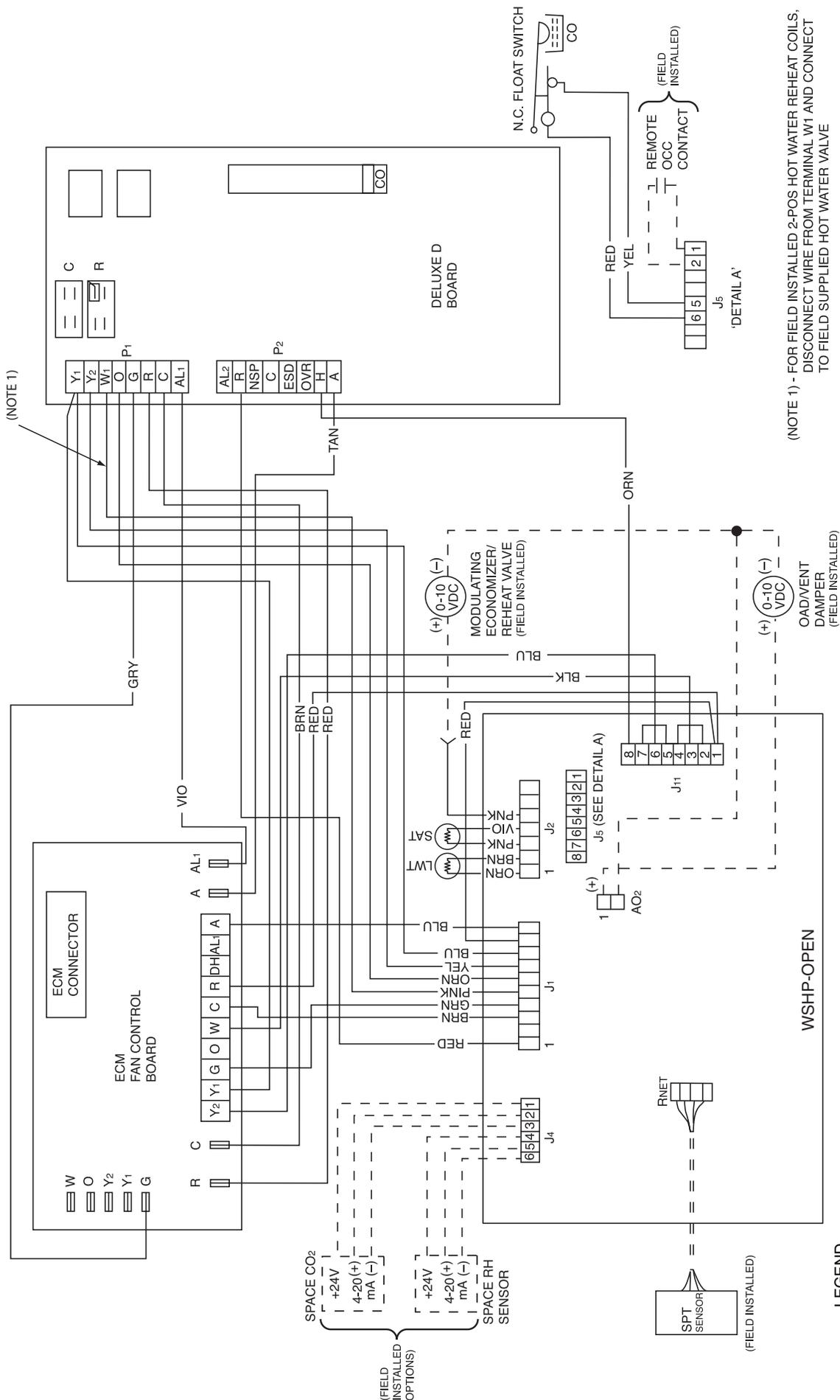


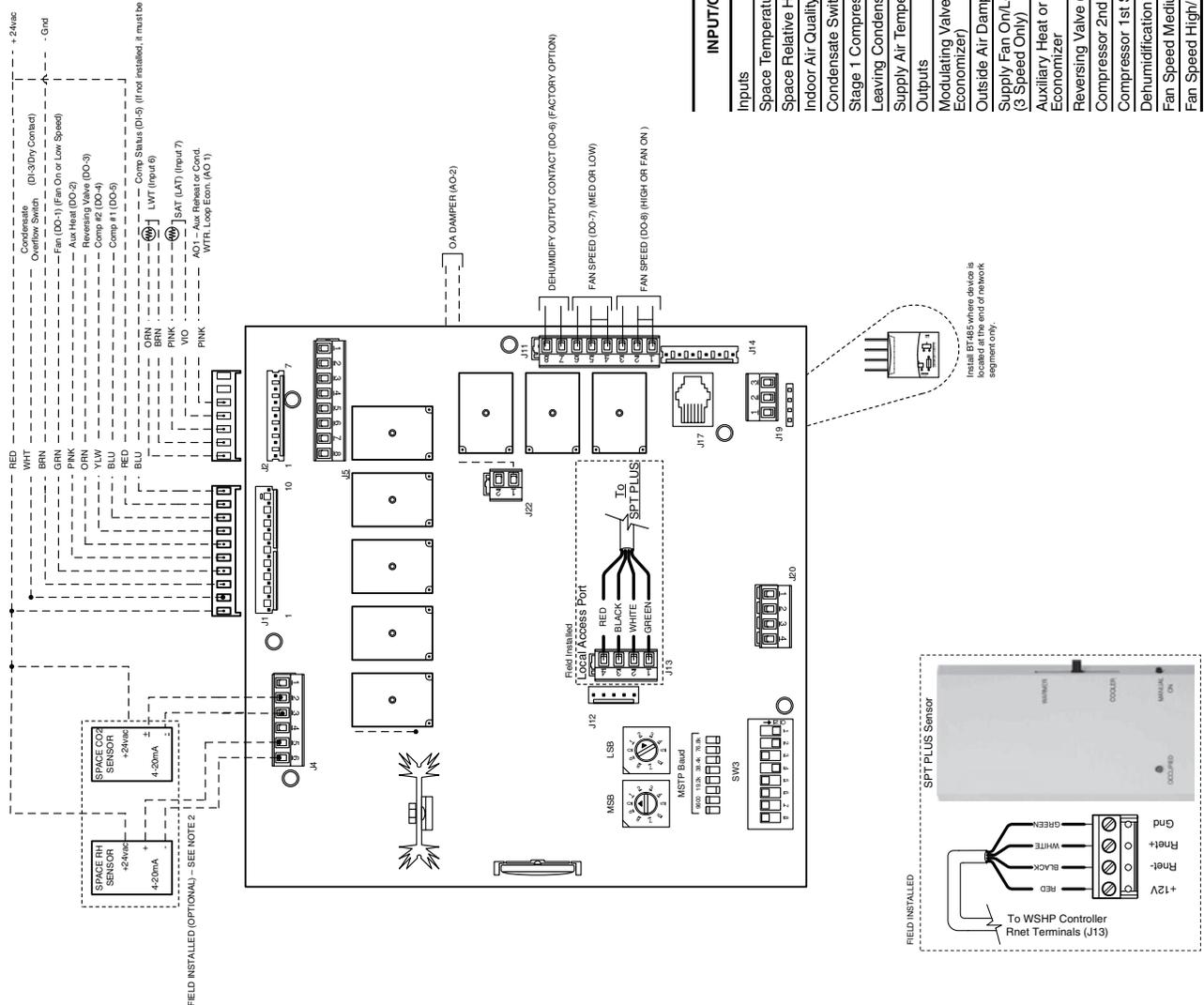
Fig. 27 — Units with Complete C, ECM and WSHP Open Multiple Protocol Controls

- LEGEND**
- CO Condensate Overflow
 - LWT Leaving Water Temperature
 - N.C. Normally Closed
 - OAD Outside Air Damper
 - OCC Occupancy Input Contact
 - RH Relative Humidity
 - SAT Supply Air Temperature
 - SPT Space Temperature



(NOTE 1) - FOR FIELD INSTALLED 2-POS HOT WATER REHEAT COILS, DISCONNECT WIRE FROM TERMINAL W1 AND CONNECT TO FIELD SUPPLIED HOT WATER VALVE

Fig. 28 — Units with Delux D, ECM and WSHP Open Multiple Protocol Controls



LEGEND

AI	—	Analog Input
AO	—	Analog Output
BI	—	Binary Input
BO	—	Binary Output
SPT	—	Space Temperature
---	---	Factory Wiring
---	---	Field Wiring

- NOTES:**
- Mount the water source heat pump controller in the equipment controls enclosure with at least two #6 x 1 in. self-tapping screws. Allow adequate clearance for wiring.
 - Verify sensor power and wiring requirements prior to making any terminations. Sensors requiring a separate isolated 24 vac power source will not utilize WSHP terminals J4-1, or 4.

WSHP Open Inputs and Outputs Table

INPUT/OUTPUT TYPE	PART NUMBERS	TYPE OF I/O	CONNECTION PIN NUMBERS	CHANNEL DESIGNATION
Inputs				
Space Temperature Sensor	SPS, SPPL, SPP	Communicating	J13, 1 - 4	Local Access Port
Space Relative Humidity	33ZCSENSRH-01	AI (4 - 20mA)	J4, 5 and 6	Analog Input 1
Indoor Air Quality	33ZCSENSCO2	AI (4 - 20mA)	J4, 2 and 3	Analog Input 2
Condensate Switch	N/A	BI (Dry Contacts)	J1, 2	Binary Input 3
Stage 1 Compressor Status	N/A	BI (Dry Contacts)	J1, 10	Binary Input 5
Leaving Condenser Water Temperature	10K Type II	AI (10K Thermistor)	J2, 1 and 2	Analog Input 6
Supply Air Temperature	33ZCSENSAT	AI (10K Thermistor)	J2, 3 and 4	Analog Input 7
Outputs				
Modulating Valve (Auxiliary Heat/Water Economizer)	N/A	AO (0-10Vdc/2 - 10Vdc)	J2 4 and 5*	Analog Output 1
Outside Air Damper	N/A	AO (0-10Vdc/2 - 10Vdc)	J22 1 and 2*	Analog Output 2
Supply Fan On/Low Speed (3 Speed Only)	N/A	BO Relay (24VAC, 1A)	J1, 4*	Binary Output 1 (G)
Auxiliary Heat or 2-Position Water Loop Economizer	N/A	BO Relay (24VAC, 1A)	J1, 5*	Binary Output 2
Reversing Valve (B or O Operation)	N/A	BO Relay (24VAC, 1A)	J1, 6*	Binary Output 3 (RV)
Compressor 2nd Stage	N/A	BO Relay (24VAC, 1A)	J1, 7	Binary Output 4 (Y2)
Compressor 1st Stage	N/A	BO Relay (24VAC, 1A)	J1, 8	Binary Output 5 (Y1)
Dehumidification Relay	N/A	BO Relay (24VAC, 1A)	J11, 7 and 8 (NO)	Binary Output 6
Fan Speed Medium/Low (3 Speed Only)	N/A	BO Relay (24VAC, 1A)	J11, 5 and 6 (NO)*	Binary Output 7
Fan Speed High/Low (3 Speed Only)	N/A	BO Relay (24VAC, 1A)	J11, 2 and 3 (NO)*	Binary Output 8

*These inputs are configurable.

Fig. 29 — WSHP Open Control

Table 2 — Electrical Data — 50PEC Units

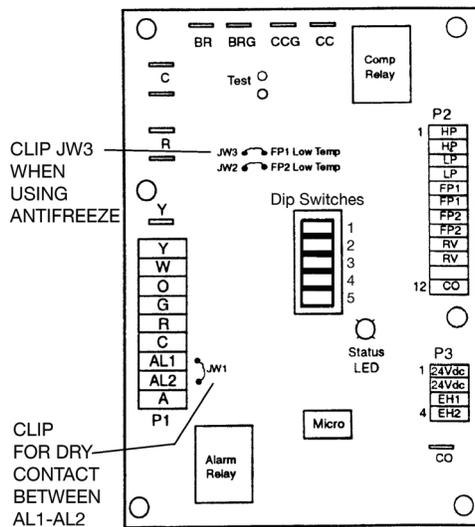
50PEC UNIT SIZE	VOLTAGE CODE	V-PH-Hz	MIN/MAX VOLTAGE	COMPRESSOR			FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMPS	MAX FUSE/HACR
				QTY	RLA	LRA				
09	1	115-1-60	104/126	1	8.1	46.5	0.6	8.6	10.7	15
	3	208/230-1-60	197/254	1	4.5	23.0	0.4	4.9	6.0	15
	4	265-1-60	239/292	1	3.1	24.0	0.4	3.5	4.3	15
12	1	115-1-60	104/126	1	10.6	55.8	1.0	11.6	14.3	25
	3	208/230-1-60	197/254	1	5.2	24.0	0.6	5.8	7.1	15
	4	265-1-60	239/292	1	4.2	25.0	0.4	4.6	5.7	15
15	3	208/230-1-60	197/254	1	6.1	30.0	0.8	6.9	8.4	15
	4	265-1-60	239/292	1	4.7	28.5	0.6	5.3	6.5	15
18	3	208/230-1-60	197/254	1	6.8	38.0	0.7	7.5	9.2	15
	4	265-1-60	239/292	1	6.2	29.0	0.6	6.8	8.4	15

LEGEND

- FLA** — Full Load Amps
- HACR** — Heating, Air Conditioning and Refrigeration
- LRA** — Locked Rotor Amps
- RLA** — Rated Load Amps

Step 5 — Wire Low Voltage Connections

WATER FREEZE PROTECTION — The Aquazone™ control allows the field selection of source fluid freeze protection points through jumpers. The factory setting of jumper JW3 (FP1) is set for water at 30 F. In earth loop applications, jumper JW3 should be clipped to change the setting to 10 F when using antifreeze in colder earth loop applications. See Fig. 30.



AQUAZONE CONTROL (Complete C Control Shown)

Fig. 30 — Typical Aquazone Control Board Jumper Locations

ACCESSORY CONNECTIONS — Terminal labeled A on the control is provided to control accessory devices such as water valves, electronic air cleaners, humidifiers, etc. This signal operates with the compressor terminal. See Fig. 31. Refer to the specific unit wiring schematic for details.

NOTE: The A terminal should *only* be used with 24-v signals — not line voltage signals.

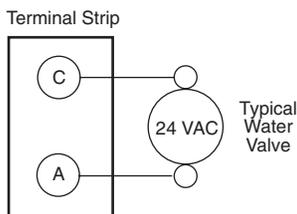


Fig. 31 — Typical Aquazone Accessory Wiring

WATER SOLENOID VALVES — An external solenoid valve(s) should be used on ground water installations to shut off flow to the unit when the compressor is not operating. A slow closing valve may be required to help reduce water hammer. Figure 31 shows typical wiring for a 24-vac external solenoid valve. Figures 32 and 33 illustrate typical slow closing water control valve wiring for Taco 500 Series and Taco ESP Series valves. Slow closing valves take approximately 60 sec. to open (very little water will flow before 45 sec.). Once fully open, an end switch allows the compressor to be energized (only on valves with end switches). Only relay or triac based electronic thermostats should be used with slow closing valves. When wired as shown, the slow closing valve will operate properly with the following notations:

1. The valve will remain open during a unit lockout.
2. The valve will draw approximately 25 to 35 VA through the "Y" signal of the thermostat.

IMPORTANT: Connecting a water solenoid valve can overheat the anticipators of electromechanical thermostats. Only use relay based electronic thermostats.

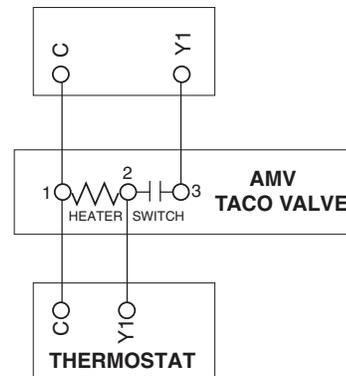


Fig. 32 — AMV Valve Wiring

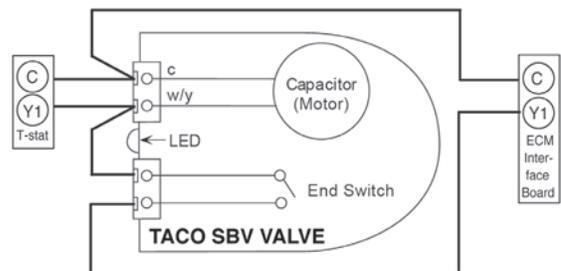


Fig. 33 — Taco SBV Valve Wiring

OPTIONAL WALL-MOUNTED THERMOSTAT — The 50PEC water source heat pump units are built with standard internal thermostats in either manual changeover (MCO) or automatic changeover (ACO) configuration. Refer to Fig. 17-20.

When desired, the unit can be furnished with a 24-v control circuit which is field wired to a Carrier-supplied accessory remote thermostat. Most heat pump thermostats can be used with the controller. Use a thermostat with Y, G, O and W outputs. Refer to unit wiring diagrams in Fig. 21 and 22 and Aquazone Controls, Operation, and Troubleshooting Instructions for additional information.

Vendor installation instructions and additional installation information is shipped with each thermostat.

NOTE: Low-voltage wiring between the unit and the wall thermostat must comply with all applicable electrical codes (i.e., NEC and local codes), and be completed before the unit is installed.

Table 3 lists recommended wire sizes and lengths to install the thermostat. The total resistance of low-voltage wiring must not exceed 1 ohm. Any resistance in excess of 1 ohm may cause the control to malfunction because of high voltage drop.

Table 3 — Recommended Thermostat Wire Sizes

WIRE SIZE	MAX WIRE LENGTH*
18-Gage	75 ft
16-Gage	125 ft
14-Gage	200 ft

*Length = Physical distance from thermostat to unit.

OPTIONAL PREMIERLINK™ CONTROLLER — This direct digital controller (DDC) allows the water source heat pump to be incorporated into a Carrier Comfort Network® (CCN) system installation. PremierLink control is factory-installed with the Complete C controller, or field-installed with the Deluxe D control option. Refer to Fig. 23 and 24.

WSHP OPEN WIRING — The WSHP Open controller will be factory wired to the Complete C or Deluxe D control board, however, the system wiring will need to be completed utilizing WSHP Open controller wiring diagrams and the Third Party Integration (TPI) Guide. Factory installation includes harness, LWT (leaving water temperature), supply air, and condensate sensor.

 WARNING
Disconnect all power to the unit before performing maintenance or service. Unit may automatically start if power is not disconnected. Failure to follow this warning could cause personal injury, death, and/or equipment damage.

Wiring Sensors to Inputs — Sensors can be wired to the WSHP Open controller's inputs. See Table 4.

All field control wiring that connects to the WSHP Open controller must be routed through the raceway built into the corner post. The raceway provides the UL required clearance between high and low-voltage wiring.

1. Pass control wires through the hole provided in the corner post.
2. Feed the wires through the raceway to the WSHP Open controller.
3. Connect the wires to the removable Phoenix connectors.
4. Reconnect the connectors to the board.

Field-Supplied Sensor Hardware — The WSHP Open controller is configurable with the following field-supplied sensors. See Table 4.

Table 4 — Field-Supplied Sensors for WSHP Open Controller

SENSOR	NOTES
Space Temperature Sensor (SPT)	Field Installed (Must be used with WSHP Open controller.)
Outdoor Air Temperature Sensor	Network Sensor
Indoor Air Quality Sensor (Separate Sensor)	Required only for demand control ventilation.
Space Relative Humidity Sensor	Separate Sensor

NOTE: BACview⁶ Handheld or Virtual BACview can be used as the user interface.

For specific details about sensors, refer to the literature supplied with the sensor.

Wiring a SPT Sensor — A WSHP Open controller is connected to a wall-mounted space temperature (SPT) sensor to monitor room temperature using a Molex plug.

The WSHP Open system offers the following SPT sensors. See Table 5.

Table 5 — SPT Sensors

SENSOR	PART NUMBER	FEATURES
SPT Standard	SPS	<ul style="list-style-type: none"> • Local access port • No operator control
SPT Plus	SPPL	<ul style="list-style-type: none"> • Slide potentiometer to adjust set point • Manual on button to override schedule • LED to show occupied status • Local access port
SPT Pro	SPP	<ul style="list-style-type: none"> • LCD display • Manual on button to override schedule • Warmer and cooler buttons to adjust set point • Info button to cycle through zone and outside air temperatures, set points, and local override time • Local access port
SPT Pro Plus	SPPF	<ul style="list-style-type: none"> • LCD display • Manual on button to override schedule • Warmer and cooler buttons to adjust set point • Info button to cycle through zone and outside air temperatures, set points, and local override time • Local access port • Fan speed*

*The SPT Pro Plus fan speed adjustment has no effect in this application.

Wire SPT sensors to the WSHP Open controller's Rnet port. An Rnetbus can consist of any of the following combinations of devices wired in a daisy-chain configuration:

- 1 SPT Plus, SPT Pro, or SPT Pro Plus sensor
- 1 to 4 SPT Standard sensors
- 1 to 4 SPT Standard sensors and 1 SPT Plus, SPT Pro, or SPT Pro Plus sensor
- Any of the above combinations, plus up to 2 BACview⁶ Handheld but no more than 6 total devices

NOTE: If the Rnetbus has multiple SPT Standard sensors, each sensor must be given a unique address on the Rnetbus. See the Carrier Open Sensor Installation Guide.

Use the specified type of wire and cable for maximum signal integrity. See Table 6.

Table 6 — Rnet Wiring Specifications

RNET WIRING SPECIFICATIONS	
Description	4 conductor, unshielded, CMP, plenum rated cable
Conductor	18 AWG
Maximum Length	500 ft
Recommended Coloring	Jacket: white Wiring: black, white, green, red
UL Temperature	32 to 167 F
Voltage	300-vac, power limited
Listing	UL: NEC CL2P, or better

LEGEND

- AWG** — American Wire Gage
- CMP** — Communications Plenum Cable
- NEC** — National Electrical Code
- UL** — Underwriters Laboratories

To wire the SPT sensor to the controller:

- Partially cut, then bend and pull off the outer jacket of the Rnet cable(s), being careful not to nick the inner insulation.
- Strip about 1/4 in. of the inner insulation from each wire. See Fig. 34.

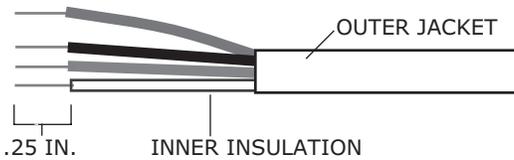


Fig. 34 — Rnet Cable Wire

- Wire each terminal on the sensor to the same terminal on the controller. See Fig. 25-29. Table 7 shows the recommended Rnet wiring scheme.

Table 7 — Rnet Wiring

WIRE	TERMINAL
Red	+12-v
Black	.Rnet-
White	Rnet+
Green	Gnd

NOTE: The wire should be connected to the terminal shown.

Wiring a Supply Air Temperature (SAT) Sensor — The SAT sensor is required for reheat applications.

If the cable used to wire the SAT sensor to the controller will be less than 100 ft, an unshielded 22 AWG (American Wire Gage) cable should be used. If the cable will be greater than 100 ft, a shield 22 AWG cable should be used. The cable should have a maximum length of 500 ft.

To wire the SAT sensor to the controller:

- Wire the sensor to the controller. See Fig. 25-29.
- Verify that the Enable SAT jumper is on.
- Verify that the Enable SAT and Remote jumper is in the left position.

Wiring an Indoor Air Quality (IAQ) Sensor — An IAQ sensor monitors CO₂ levels. The WSHP Open controller uses this information to adjust the outside-air dampers to provide proper ventilation. An IAQ sensor can be wall-mounted or mounted in a return air duct. (Duct installation requires an aspirator box assembly.)

The sensor has a range of 0 to 2000 ppm and a linear 4 to 20 mA output. This is converted to 1 to 5 vdc by a 250-ohm, 1/4 watt, 2% tolerance resistor connected across the zone controller's IAQ input terminals.

NOTE: Do not use a relative humidity sensor and CO₂ sensor on the same zone controller if both sensors are powered off the board. If sensors are externally powered, both sensors may be used on the same zone controller.

If the cable used to wire the IAQ sensor to the controller will be less than 100 ft, an unshielded 22 AWG (American Wire Gage) cable should be used. If the cable will be greater than 100 ft, a shield 22 AWG cable should be used. The cable should have a maximum length of 500 ft.

To wire the IAQ sensor to the controller:

- Wire the sensor to the controller. See Fig. 25-29.
- Install a field-supplied 250-ohm, 1/4 watt, 2% tolerance resistor across the controller's RH/IAQ and Gnd terminals.
- Verify the the RH/IAQ jumper is set to 0 to 5-vdc.

Wiring a Relative Humidity (RH) Sensor — The RH sensor is used for zone humidity control (dehumidification) if the WSHP unit has a dehumidification device. If not, the sensor only monitors humidity.

NOTE: Do not use a relative humidity sensor and CO₂ sensor on the same zone controller if both sensors are powered off the board. If sensors are externally powered, both sensors may be used on the same zone controller.

If the cable used to wire the RH sensor to the controller will be less than 100 ft, an unshielded 22 AWG (American Wire Gage) cable should be used. If the cable will be greater than 100 ft, a shield 22 AWG cable should be used. The cable should have a maximum length of 500 ft.

To wire the RH sensor to the controller:

- Strip the outer jacket from the cable for at least 4 inches.
- Strip 1/4 in. of insulation from each wire.
- Wire the sensor to the controller.

Step 6 — Install Supply and Return Piping

CAUTION

To ensure proper functioning of unit and system, be sure to connect entering water to upper pipe on right-hand units. On left-hand units, connect entering water to lower pipe. Failure to do so could result in equipment damage.

SUPPLY AND RETURN HOSES — Optional pressure-rated hose assemblies are available for use with units. Use the following guidelines when installing supply and return hose assemblies.

- Install supply and return hoses fitted with swivel-joint fittings at one end to prevent the hose from twisting.
- Use male adapters to secure the hose assembly to the unit and the riser.
- Do not allow the hose to twist during installation. Twisting may damage the hose wall or the rubber compound.
- Use pipe joint compound sparingly on the fitting adapters' male pipe threads.
- Prevent sealant from reaching the joint's flared surfaces.
- Do not use pipe joint compound when Teflon* thread tape is pre-applied to hose assemblies or when flared-end connections are used.
- Maximum torque that may be applied to brass fittings is 30 ft-lb. When a torque wrench is not used, tighten brass fittings finger-tight plus one quarter turn.
- Tighten steel fittings as necessary.
- Use shut-off/balancing valves, flow indicators, and drain tees in the supply runout and return at each floor to aid in loop balancing and servicing.

SUPPLY AND RETURN PIPING — System piping MUST comply with all applicable codes.

- Install a drain valve at the base of each supply and return riser to enable system flushing at start-up and during routine servicing.

*Teflon is a trademark of E. I. du Pont de Nemours and Company.

2. Install shut-off/balancing valves and unions at each unit to allow unit removal for servicing.

NOTE: If flex hoses are used, unions are not necessary.

3. Install strainers at the inlet of each system circulating pump.

IMPORTANT: Since loop temperatures are normally between 60 and 90 F, pipe sweating and heat loss do not occur at normal ambient temperature conditions. Insulation must be installed on loop water piping on those sections that run through unheated areas or are located outside the building. If loop temperatures are expected below the ambient dew point, the optional internal insulation (extended range) package must be ordered.

⚠ CAUTION

DO NOT bend or kink supply lines or hoses. Damage to unit may result.

4. Before making the final water connections, flush the system as described in the Pre-Start-Up section of this manual. After flushing the system, connect piping and hoses to the proper supply, return and condensate connections of the unit.

NOTE: When necessary, use adapters to connect hoses.

5. Install any other system components, as required, following manufacturer's instructions.
6. Reinstall the front cabinet by carefully lowering the front cabinet over the chassis onto the backplate.

Step 7 — Install Condensate Piping — Connect the unit condensate drain to the building condensate drain with a flexible, nonpressure-rated ⁵/₈-in. (16 mm) ID plastic hose. Avoid kinks in this hose to ensure an unobstructed flow of condensate from the unit to the drain.

The horizontal run of the condensate hose is usually too short to pose any drainage problems, however, the horizontal run of condensate line should be pitched at least 1 in. for every 10 ft of run (in the direction of flow). Avoid low points and un-pitched piping since dirt collects in these areas and may cause stoppage and overflow.

Field installation of a trap or vent is not required unless specified by local codes. The 50PEC units are designed in a blow-thru configuration. The condensate drain pan is located on the outlet side of the blower so that the pressure in the drain pan is higher than the atmospheric pressure.

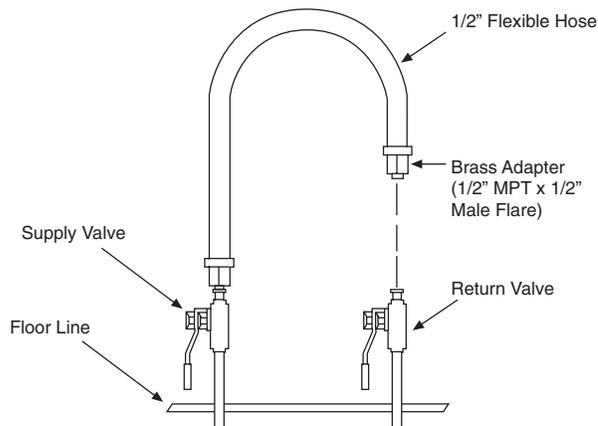


Fig. 35 — Temporary Connection for Flushing System Piping

PRE-START-UP

System Cleaning and Flushing — Cleaning and flushing the unit and system is the single most important step to ensure proper start-up and continued efficient operation of the system.

⚠ WARNING

To prevent injury or death due to electrical shock or contact with moving parts, open unit disconnect before servicing unit.

Follow the instructions below to properly clean and flush the system:

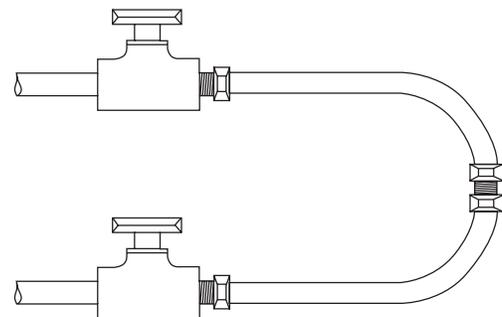
⚠ CAUTION

DO NOT FLUSH SYSTEM THROUGH THE UNIT!

1. Verify that electrical power to the units is disconnected, and that the circulation pump is deenergized.
2. Connect the supply hose directly to the return riser valve. Use a single length of flexible hose, as shown in Fig. 35.

NOTE: If the length of hose is too short (i.e., the resulting connection would exceed the minimum bend radius of the hose), substitute two lengths of flexible hose joined together with a field-supplied, standard NPT coupling and the flare-fitting-to-pipe adapters provided with the hose kit (Fig. 35).

3. Open all air vents. Fill the system with water. Do not allow system to overflow. Bleed all air from the system. Check the system for leaks and repair appropriately.
4. Check and adjust the water and air level in the expansion tank.
5. Verify all strainers are in place. Start the pumps, and systematically check each vent to ensure all air is bled from the system.
6. Verify make-up water is available. Adjust make-up water appropriately to replace the air that was bled from the system. Pressure test and inspect the system for leaks and make any necessary repairs. Check and adjust the water and air level in the expansion tank.
7. Open a drain at the lowest point in the system. Adjust the make-up water replacement rate to equal the rate of bleed. Continue to bleed the system until the water appears clean or for at least three hours, whichever is longest; then, completely drain the system.



NOTE: Use standard coupling (field-supplied) and hose adapters to join 2 hoses.

8. Refill the system with clean, chemically treated water. Since water varies for each locality, contact a local water treatment company for the correct treatment chemicals to use in the area. Set the boiler to raise the loop temperature to approximately 85 F.

⚠ CAUTION

To avoid possible damage to piping systems constructed of plastic piping DO NOT allow loop temperature to exceed 110 F.

Circulate the solution for a minimum of 8 to 24 hours. At the end of this period, shut off the circulating pump and drain the solution. Repeat system cleaning as necessary.

9. When the cleaning process is complete, remove the short-circuited hoses. Connect the hoses to the proper supply and return connections on each unit. Refill the system and bleed off all air.
10. Test the system pH with litmus paper. The system water should be slightly alkaline (pH 7.0 to 8.5). Add chemicals, as appropriate, to maintain acidity levels.

⚠ CAUTION

DO NOT use “Stop-Leak” or any similar chemical agent in this system. Addition of these chemicals to the loop water will foul the system and will inhibit unit operation.

11. When the system is successfully cleaned, flushed, refilled and bled, check the main system panels, safety cutouts and alarms. Set the controls to properly maintain loop temperatures.

System Checkout — When the installation is complete and the system is cleaned and flushed, follow the system checkout procedure outlined below.

1. Voltage: Ensure voltage is within the utilization range specifications of the unit compressor and fan motor.
2. System Water Temperature: Ensure temperature is within an acceptable range shown in Table 8. (When conducting this check, also verify proper heating and cooling set points.)

Table 8 — Air and Water Limits

50PEC UNIT	COOLING (F)	HEATING (F)
Min Ambient Air	50	50
Rated Ambient Air	80	70
Max Ambient Air	100	85
Min Entering Air	50	50
Rated Entering Air, dry bulb/wet bulb	80/67	70
Max Entering Air, dry bulb/wet bulb	100/83	80
Min Entering Water	30	20
Normal Entering Water	85	70
Max Entering Water	110	90

NOTES:

1. Minimum air and water conditions can only be used at nominal flow rates.
2. 50PEC units may have up to two values at maximum or minimum with all other parameters at normal conditions.
3. Operating limits shown are for start-up, not continuous operation. It is assumed that such a start-up is for the purpose of bringing the space to desired occupancy temperature.

3. System Water pH: Verify system water is slightly alkaline (pH = 7.5 to 8.5). Proper pH promotes the longevity of the hoses and heat exchangers. See Table 9.
4. Closed-Type Cooling Tower (Open Tower with Heat Exchanger): Check equipment for proper temperature set points and operation.
5. Balanced Water Flow Rate to Heat Pump: Record the inlet and outlet water temperatures as each heat pump unit is started. This check will eliminate nuisance unit tripouts resulting from water velocities that are either too low or too high; it can also prevent erosive water flow rates.
6. Standby Pump: Verify the standby pump is properly installed and in operating condition.
7. System Control: To ensure no catastrophic system failures occur, verify system controls are functioning and the sequencing is correct.
8. Freeze Protection for Water Systems: Verify freeze protection is provided for the outdoor portion of the loop water system. Inadequate freeze protection leads to expensive repairs.

⚠ CAUTION

To avoid equipment damage, DO NOT leave system filled in a building without heat during the winter unless antifreeze is added to system water. Condenser coils never fully drain by themselves and will freeze unless winterized with antifreeze.

9. System Water Loop: Verify all air is bled from the system. Air in the system impedes unit operation and causes corrosion in the system piping.
10. Unit Filters: To avoid system damage and to provide maximum performance, ensure the unit filter is clean.
11. Unit Fans: Manually rotate fans to assure free rotation. Ensure fans are properly secured to the fan shaft. Do not oil fan motors on start-up since they are lubricated at the factory.
12. System Control Center: To ensure control of the temperature set points for operation of the system’s heat rejector and boiler, examine the system control and alarm panel for proper installation and operation.

Table 9 — Water Quality Guidelines

CONDITION	HX MATERIAL*	CLOSED RECIRCULATING†	OPEN LOOP AND RECIRCULATING WELL**
Scaling Potential — Primary Measurement			
Above the given limits, scaling is likely to occur. Scaling indexes should be calculated using the limits below.			
pH/Calcium Hardness Method	All	N/A	pH < 7.5 and Ca Hardness, <100 ppm
Index Limits for Probable Scaling Situations (Operation outside these limits is not recommended.)			
Scaling indexes should be calculated at 150 F for direct use and HWG applications, and at 90 F for indirect HX use. A monitoring plan should be implemented.			
Ryznar Stability Index	All	N/A	6.0 - 7.5 If >7.5 minimize steel pipe use.
Langelier Saturation Index	All	N/A	-0.5 to +0.5 If <-0.5 minimize steel pipe use. Based upon 150 F HWG and direct well, 85 F indirect well HX.
Iron Fouling			
Iron Fe ²⁺ (Ferrous) (Bacterial Iron Potential)	All	N/A	<0.2 ppm (Ferrous) If Fe ²⁺ (ferrous) >0.2 ppm with pH 6 - 8, O ₂ <5 ppm check for iron bacteria.
Iron Fouling	All	N/A	<0.5 ppm of Oxygen Above this level deposition will occur.
Corrosion Prevention††			
pH	All	6 - 8.5 Monitor/treat as needed.	6 - 8.5 Minimize steel pipe below 7 and no open tanks with pH <8.
Hydrogen Sulfide (H ₂ S)	All	N/A	<0.5 ppm At H ₂ S>0.2 ppm, avoid use of copper and cupronickel piping of HXs. Rotten egg smell appears at 0.5 ppm level. Copper alloy (bronze or brass) cast components are okay to <0.5 ppm.
Ammonia Ion as Hydroxide, Chloride, Nitrate and Sulfate Compounds	All	N/A	<0.5 ppm
Maximum Chloride Levels			Maximum allowable at maximum water temperature.
			50 F (10 C) 75 F (24 C) 100 F (38 C)
	Copper	N/A	<20 ppm NR NR
	Cupronickel	N/A	<150 ppm NR NR
	304 SS	N/A	<400 ppm <250 ppm <150 ppm
	316 SS	N/A	<1000 ppm <550 ppm <375 ppm
	Titanium	N/A	>1000 ppm >550 ppm >375 ppm
Erosion and Clogging			
Particulate Size and Erosion	All	<10 ppm of particles and a maximum velocity of 6 fps. Filtered for maximum 800 micron size.	<10 ppm (<1 ppm "sandfree" for reinjection) of particles and a maximum velocity of 6 fps. Filtered for maximum 800 micron size. Any particulate that is not removed can potentially clog components.
Brackish	All	N/A	Use cupronickel heat exchanger when concentrations of calcium or sodium chloride are greater than 125 ppm are present. (Seawater is approximately 25,000 ppm.)

LEGEND

- HWG** — Hot Water Generator
HX — Heat Exchanger
N/A — Design Limits Not Applicable Considering Recirculating Potable Water
NR — Application Not Recommended
SS — Stainless Steel

*Heat exchanger materials considered are copper, cupronickel, 304 SS (stainless steel), 316 SS, titanium.

†Closed recirculating system is identified by a closed pressurized piping system.

**Recirculating open wells should observe the open recirculating design considerations.

††If the concentration of these corrosives exceeds the maximum allowable level, then the potential for serious corrosion problems exists. Sulfides in the water quickly oxidize when exposed to air, requiring that no agitation occur as the sample is taken. Unless tested immediately at the site, the sample will require stabilization with a few drops of one Molar zinc acetate solution, allowing accurate sulfide determination up to 24 hours after sampling. A low pH and high alkalinity cause system problems, even when both values are within ranges shown. The term pH refers to the acidity, basicity, or neutrality of the water supply. Below 7.0, the water is considered to be acidic. Above 7.0, water is considered to be basic. Neutral water contains a pH of 7.0. To convert ppm to grains per gallon, divide by 17. Hardness in mg/l is equivalent to ppm.

FIELD SELECTABLE INPUTS

Jumpers and DIP (dual in-line package) switches on the control board are used to customize unit operation and can be configured in the field.

IMPORTANT: Jumpers and DIP switches should only be clipped when power to control board has been turned off.

Complete C Control Jumper Settings (See Fig. 17, 18, and 21)

WATER COIL FREEZE PROTECTION (FP1) LIMIT SETTING — Select jumper 3, (JW3-FP1 Low Temp) to choose FP1 temperature limit of 10 F or 30 F. To select 30 F as the temperature limit, DO NOT clip the jumper. To select 10 F as the limit, clip the jumper.

ALARM RELAY SETTING — Select jumper 1 (JW1) for connecting alarm relay terminal (AL2) to 24-vac (R) or to remain as a dry contact (no connection). To connect AL2 to R, do not clip the jumper. To set as dry contact, clip the jumper.

Complete C Control DIP Switches — The Complete C control has one DIP switch block with five switches. See Fig. 17, 18, and 21.

PERFORMANCE MONITOR (PM) — DIP switch 1 will enable or disable this feature. To enable the PM, set the switch to ON. To disable the PM, set the switch to OFF.

STAGE 2 — DIP switch 2 will enable or disable compressor delay. Set DIP switch to OFF for Stage 2 in which the compressor will have a 3-second delay before energizing.

SWITCH 3 AND SWITCH 4 — Not used.

FREEZE PROTECTION (FP1) — DIP switch 5 is used to initiate one or 3 tries for the FP1 fault. If there is water freeze protection for the water coil then DIP switch 5 can be set to lock out on the FP1 fault after one try. ON = One try. OFF = 3 tries.

Deluxe D Control Jumper Settings (See Fig. 19, 20, and 22)

WATER COIL FREEZE PROTECTION (FP1) LIMIT SETTING — Select jumper 3, (JW3-FP1 Low Temp) to choose FP1 temperature limit of 10 F or 30 F. To select 30 F as the temperature limit, DO NOT clip the jumper. To select 10 F as the limit, clip the jumper.

ALARM RELAY SETTING — Select jumper 4 (JW4-AL2 Dry) for connecting alarm relay terminal (AL2) to 24-vac (R) or to remain as a dry contact (no connection). To connect AL2 to R, do not clip the jumper. To set as dry contact, clip the jumper.

LOW PRESSURE SETTING — The Deluxe D control can be configured for low pressure setting (LP). Select jumper 1 (JW1-LP Norm Open) for choosing between low pressure input normally opened or closed. To configure for normally closed operation, do not clip the jumper. To configure for normally open operation, clip the jumper.

Deluxe D Control DIP Switches — The Deluxe D control has 2 DIP switch blocks. Each DIP switch block has 8 switches and is labeled either S1 or S2 on the circuit board. See Fig. 19, 20, and 22.

DIP SWITCH BLOCK 1 (S1) — This set of switches offers the following options for Deluxe D control configuration:

Performance Monitor (PM) — Set switch 1 to enable or disable performance monitor. To enable the PM, set the switch to ON. To disable the PM, set the switch to OFF.

Compressor Relay Staging Operation — Switch 2 will enable or disable compressor relay staging operation. The

compressor relay can be set to turn on with Stage 1 or Stage 2 call from the thermostat. This setting is used with dual stage units (units with 2 compressors and 2 Deluxe D controls) or in master/slave applications. In master/slave applications, each compressor and fan will stage according to its switch 2 setting. If switch is set to Stage 2, the compressor will have a 3-second delay before energizing during stage 2 demand.

NOTE: If DIP switch is set for Stage 2, the alarm relay will not cycle during Test mode.

Heating/Cooling Thermostat Type — Switch 3 provides selection of thermostat type. Heat pump or heat/cool thermostats can be selected. Select OFF for heat/cool thermostats. When in heat/cool mode, Y1 is used for Cooling Stage 1, Y2 is used for Cooling Stage 2, W1 is used for Heating Stage 1 and O/W2 is used for Heating Stage 2. Select ON for heat pump applications. In heat pump mode, Y1 used is for Compressor Stage 1, Y2 is used for Compressor Stage 2, W1 is used for Heating Stage 3 or emergency heat, and O/W2 is used for RV (heating or cooling) depending upon switch 4 setting.

O/B Thermostat Type — Switch 4 provides selection for heat pump O/B thermostats. O is cooling output. B is heating output. Select ON for heat pumps with O output. Select OFF for heat pumps with B output.

Dehumidification Fan Mode — Switch 5 provides selection of normal or dehumidification fan mode. Select OFF for dehumidification mode. The fan speed relay will remain OFF during Cooling Stage 2. Select ON for normal mode. The fan speed relay will turn on during Cooling Stage 2 in normal mode.

Switch 6 — Not used.

Boilerless Operation — Switch 7 provides selection of boilerless operation and works in conjunction with switch 8. In boilerless operation mode, only the compressor is used for heating when FP1 is above the boilerless changeover temperature set by switch 8 below. Select ON for normal operation or select OFF for boilerless operation.

Boilerless Changeover Temperature — Switch 8 on S1 provides selection of boilerless changeover temperature set point. Select OFF for set point of 50 F or select ON for set point of 40 F.

If switch 8 is set for 50 F, then the compressor will be used for heating as long as the FP1 is above 50 F. The compressor will not be used for heating when the FP1 is below 50 F and the compressor will operate in emergency heat mode, staging on EH1 and EH2 to provide heat. If a thermal switch is being used instead of the FP1 thermistor, only the compressor will be used for heating mode when the FP1 terminals are closed. If the FP1 terminals are open, the compressor is not used and the control goes into emergency heat mode.

DIP SWITCH BLOCK 2 (S2) — The following set of DIP switches is used to configure accessory relay options.

Switches 1 to 3 — These DIP switches provide selection of Accessory 1 relay options. See Table 10 for DIP switch combinations.

Table 10 — DIP Switch Block S2 — Accessory 1 Relay Options

ACCESSORY 1 RELAY OPTIONS	DIP SWITCH POSITION		
	1	2	3
Digital NSB	Off	On	On
Water Valve — Slow Opening	On	Off	On

LEGEND

NSB — Night Setback

NOTE: All other DIP switch combinations are invalid.

Switches 4 to 6 — These DIP switches provide selection of Accessory 2 relay options. See Table 11 for DIP switch combinations.

**Table 11 — DIP Switch Block S2 —
Accessory 2 Relay Options**

ACCESSORY 2 RELAY OPTIONS	DIP SWITCH POSITION		
	4	5	6
Digital NSB	Off	On	On
Water Valve — Slow Opening	On	Off	On

LEGEND

NSB — Night Setback

NOTE: All other switch combinations are invalid.

Auto Dehumidification Mode or High Fan Mode — Switch 7 provides selection of auto dehumidification fan mode or high fan mode. In auto dehumidification fan mode, the fan speed relay will remain off during Cooling Stage 2 if terminal H is active. In high fan mode, the fan enable and fan speed relays will turn on when terminal H is active. Set the switch to ON for auto dehumidification fan mode or to OFF for high fan mode.

Switch 8 — Not used.

Deluxe D Control Accessory Relay Configurations — The following accessory relay settings are applicable for Deluxe D control only:

CYCLE WITH COMPRESSOR — In this configuration, the relay will be ON any time the compressor relay is on.

DIGITAL NIGHT SETBACK (NSB) — In this configuration, the relay will be ON if the NSB input is connected to ground C.

NOTE: If there are no relays configured for digital NSB, then the NSB and OVR (override) inputs are automatically configured for mechanical operation.

MECHANICAL NIGHT SETBACK — When NSB input is connected to ground C, all thermostat inputs are ignored. A thermostat setback heating call will then be connected to the OVR input. If OVR input becomes active, then the Deluxe D control will enter night low limit (NLL) staged heating mode. The NLL staged heating mode will then provide heating during the NSB period.

WATER VALVE (SLOW OPENING) — If relay is configured for water valve (slow opening), the relay will start 60 seconds prior to starting compressor relay.

⚠ CAUTION

To avoid equipment damage, DO NOT leave system filled in a building without heat during the winter unless antifreeze is added to system water. Condenser coils never fully drain by themselves and will freeze unless winterized with antifreeze.

START-UP

Use the procedure outlined below to initiate proper unit start-up:

IMPORTANT: This equipment is designed for indoor installation ONLY.

⚠ WARNING

When the disconnect switch is closed, high voltage is present in some areas of the electrical panel. Exercise caution when working with the energized equipment.

1. Adjust all valves to the full open position and turn on the line power to all heat pump units.
2. Operate each unit in the Cooling mode first. Room temperature should be in the normal range

(i.e., approximately 50 to 80 F dry bulb). Loop water temperature entering the heat pumps should be at least 40 F but not in excess of 110 F. Refer to Table 8 for more specific information on the operating parameters of units.

IMPORTANT: Three factors determine the operating limits of a unit: (1) return-air temperature, (2) water temperature and (3) ambient temperature. Whenever any one of these factors is at a minimum or maximum level, the other two factors must be at normal levels to ensure proper unit operation. Flow rates must be at nominal ARI (Air Conditioning and Refrigeration Institute)/ISO (International Organization for Standardization)/ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) 13256-1 standards.

Unit Start-Up/Cooling

1. Turn the unit thermostat to the cooling position and turn the fan speed switch to “HI.” If the unit has an optional MCO thermostat, set the selector switch to Cool. Both the fan and compressor should run.
2. Check for cool air delivery at unit grille 15 minutes after the unit has begun operating. List the identification number of any machines that do not function at this time.
3. Check the elevation and cleanliness of the condensate lines; any dripping could be a sign of a blocked line.
4. Select low fan speed. Airflow should decrease and compressor should operate.
5. Slowly turn thermostat toward warmer position. Both fan and compressor should shut off when thermostat set point equals room temperature. Room temperature must be below 90 F for unit to shut off.
6. Operate each heat pump in the heating cycle immediately after checking cooling cycle operation. A time delay will prevent the compressor from re-starting for approximately 5 minutes.

Operating Limits

ENVIRONMENT — This equipment is designed for indoor installation ONLY.

POWER SUPPLY — A voltage variation of ± 10% of nameplate utilization voltage is acceptable.

50PEC UNIT STARTING CONDITIONS — The 50PEC units will start and operate at an ambient temperature of 50 F with entering-air temperature at 50 F, entering water at 60 F, and with both air and water at the flow rates used in the ARI/ISO/ASHRAE Standard 13256-1 rating test, for initial start-up in winter.

IMPORTANT: These operating limits are not normal or continuous operating conditions. It is assumed that such a start-up is for the purpose of bringing the building space up to occupancy temperature.

Unit Start-Up/Heating

1. Adjust the unit thermostat to the warmest setting and turn the fan speed switch to “HI.” If the unit has an optional MCO thermostat, set the selector switch to Heat. The blower should start immediately and after the time delay is complete, the compressor will start.
2. Once the unit has begun to run, check for warm air delivery at the unit grille. Again, the installing contractor must list the serial number of any machine that does not function.
3. Log the unit operating conditions at initial start-up for each unit to establish a permanent operating record.
4. Select low fan speed. Airflow should decrease and compressor should continue to operate.

5. Slowly turn thermostat toward cooler position. Both fan and compressor should shut off when thermostat set point equals room temperature. Room temperature must be above 65 F for unit to shut off.

Unit Start-Up with WSHP Open Controls —

The WSHP Open is a multi-protocol (default BACnet*) controller with extensive features, flexible options and powerful capabilities. The unit comes from the factory pre-programmed and needs minimal set up to function in a BAS (Building Automation System) system or provide additional capabilities to Carrier's WSHP product line. Most settings on the controller have factory defaults set for ease of installation. There are a few settings that must be configured in the field and several settings that can be adjusted if required by unique job conditions. Refer to Appendix A — WSHP Open Screen Configuration. In order to configure the unit, a BACview⁶ display is required. See Fig. 36.

NOTE: If the WSHP Open control has lost its programming, all display pixels will be displayed on the SPT sensor. See the WSHP Third Party Integration Guide.

When the unit is OFF, the SPT sensor will indicate OFF. When power is applied, the SPT sensor will indicate temperature in the space at 78 F.

To start-up a unit with WSHP Open controls:

1. To plug in the BACview⁶ handheld display into a SPT sensor, point the two ears on the connector up and tilt the bottom of the plug toward you. Insert the plug up into the SPT sensor while pushing the bottom of the plug away from you.
2. BACview⁶ should respond with "Establishing Connection." The Home screen will then appear on the display showing operating mode and space temperature. Press any button to continue.
See Appendix A — WSHP Open Screen Configuration for the hierarchal structure of the WSHP Open controller. All functions of the controller can be set from the Home screen.
3. When the Login is requested, type 1111 and push the OK softkey. The Logout will then be displayed to indicate the password was accepted.
4. To set the Clock if it is not already displayed:
 - a. Select System Settings from the Home screen, then press Clockset.
 - b. Scroll to hour, minute and second using the arrow keys. Use the number keypad to set actual time.

- c. Scroll to day, month and year using arrow keys. Use number keypad to set date.
5. To set Daylight Savings Time (DST):
 - a. Push the DST softkey. The display will indicate 02:00:060 which is equal to 2:00AM.
 - b. To program the beginning and end dates, scroll down to the beginning month and press the enter key. The softkeys (INCR and DECR) will activate to increment the month in either direction, Jan, Feb, March, etc.
 - c. Use number keys to select the day of month and year.
 - d. Push the OK softkey to finalize the data.
6. To view configuration settings:
 - a. Select the Config softkey.
 - b. Select the Service Config softkey. Scroll through the factory settings by using the up and down arrow keys. See below for factory settings.
Only the following settings will need to be checked.
 - # of Fan Speeds — This should be set to "1" for units with PSC motors and set to "3" for units with ECM motors.
 - Compressor Stages — This should be set to "1."
 - Factory Dehumidification Reheat Coil — This should be set to "none" unless the modulating hot water reheat option is supplied in the unit, then set to "installed."
 - The condenser water limit needs to be verified depending on design parameters and application, whether geothermal or boiler/tower.
7. To view unit configuration settings:
 - a. Select the Unit Configuration softkey, then select Unit.
 - b. Scroll through the unit settings by using the up and down arrow keys. Unit settings include:
 - Fan Mode: Default Continuous
 - Fan Delay:
 - Minimum SAT Cooling: Default 50 F
 - Maximum SAT Heating: Default 110 F
 - Filter Service Alarm: Must be set from 0 to 9999 hr
8. To set local schedules:
 - a. Select the Schedule softkey from the Configuration screen, then press enter.

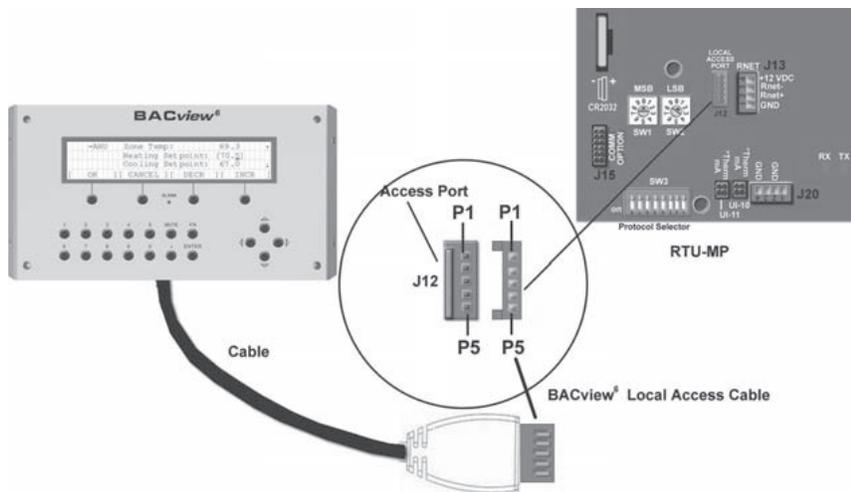


Fig. 36 — BACview⁶ Display Interface

*Sponsored by ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers).

- b. Select Weekly, then press enter (7 schedules available).
- c. Select day and press enter.
- d. Press enter again and select ADD or DEL (DECR or INCR) set schedule.
- e. Enter ON/OFF time, then press continue.
- f. Press OK to apply and save to a particular day of the week.
- g. Continue to add the same or different schedule specific days of the week.
To add exceptions to the schedule:
 - i. Press Add softkey.
 - ii. Select exception type from following:
 - Date
 - Date Range
 - Week-N-Day
 - Calender Reference
9. Go back to Home Screen.
10. Remove BACview⁶ cable from SPT sensor by reversing the process in Step 1.
11. Perform system test.

Flow Regulation — Flow regulation can be accomplished by two methods. Most water control valves have a built-in flow adjustment valve. Determine the flow rate by measuring the pressure drop through the unit heat exchanger. See Table 12. Adjust the water control valve until a flow of 1.5 to 2 gpm per ton cooling is achieved. Since the pressure constantly varies, two pressure gages may be needed.

An alternative method for regulating flow is to install a flow control device. These devices are typically an orifice of plastic material mounted on the outlet of the water control valve, designed to allow a specified flow rate. Occasionally these valves produce a velocity noise that can be reduced by

applying some back pressure. To accomplish this, slightly close the leaving isolation valve of the water regulating device.

⚠ CAUTION

DO NOT use “Stop Leak” or any similar chemical agent in this system. Addition of these chemicals to the loop water will foul the system and inhibit unit operation.

Antifreeze — In areas where entering loop temperatures drop below 40 F or where piping will be routed through areas subject to freezing, antifreeze is needed.

Alcohols and glycols are commonly used as antifreeze agents. Freeze protection should be maintained to 15 F below the lowest expected entering loop temperature. For example, if the lowest expected entering loop temperature is 30 F, the leaving loop temperature would be 22 to 25 F. Therefore, the freeze protection should be at 15 F (30 F – 15 F) = 15 F.

IMPORTANT: All alcohols should be pre-mixed and pumped from a reservoir outside of the building or introduced under water level to prevent alcohols from fuming.

Calculate the total volume of fluid in the piping system. See Table 13. Use the percentage by volume in Table 14 to determine the amount of antifreeze to use. Antifreeze concentration should be checked from a well mixed sample using a hydrometer to measure specific gravity.

FREEZE PROTECTION SELECTION — The 30 F FP1 factory setting (water) should be used to avoid freeze damage to the unit.

Once antifreeze is selected, the JW3 jumper (FP1) should be clipped on the control to select the low temperature (antifreeze 10 F) set point to avoid nuisance faults.

Table 12 — Coaxial Water Pressure Drop

UNIT 50PEC	FLOW (GPM)	PRESSURE DROP (ft wg)							
		30 F		50 F		70 F		90 F	
		Without Motorized Valve	With Cv = 2.9 MOPD = 125 psi	Without Motorized Valve	With Cv = 2.9 MOPD = 125 psi	Without Motorized Valve	With Cv = 2.9 MOPD = 125 psi	Without Motorized Valve	With Cv = 2.9 MOPD = 125 psi
09	1.3	1.8	2.0	1.3	1.5	1.2	1.3	1.0	1.2
	1.9	3.2	3.6	2.5	2.9	2.2	2.7	2.0	2.4
	2.5	5.0	5.8	3.9	4.6	3.5	4.2	3.0	3.8
12	1.6	1.8	6.5	1.6	6.5	1.4	6.5	1.3	6.5
	2.3	3.3	11.4	2.9	11.4	2.6	11.4	2.3	11.4
	3.1	5.3	19.6	4.5	19.6	4.1	19.6	3.7	19.6
15	1.8	1.2	1.6	1.2	1.6	1.1	1.5	1.0	1.4
	2.7	2.6	3.4	2.2	3.1	2.0	2.9	1.9	2.7
	3.6	4.2	5.7	3.5	5.0	3.2	4.8	3.0	4.5
18	2.4	2.1	2.8	2.0	2.6	1.8	2.4	1.6	2.3
	3.6	4.2	5.8	3.7	5.2	3.3	4.9	3.0	4.6
	4.8	6.8	9.6	6.0	8.8	5.5	8.2	4.9	7.7

LEGEND

- Cv** — Flow Coefficient
MOPD — Maximum Operating Pressure Differential

Table 13 — Approximate Fluid Volume (gal) per 100 ft of Pipe

PIPE	DIAMETER (in.)	VOLUME (gal.)
Copper	1	4.1
	1.25	6.4
	1.5	9.2
Rubber Hose	1	3.9
Polyethylene	3/4 IPS SDR11	2.8
	1 IPS SDR11	4.5
	1 1/4 IPS SDR11	8.0
	1/2 IPS SDR11	10.9
	2 IPS SDR11	18.0
	1 1/4 IPS SCH40	8.3
	1 1/2 IPS SCH40	10.9
2 IPS SCH40	17.0	

LEGEND

- IPS — Internal Pipe Size
- SCH — Schedule
- SDR — Standard Dimensional Ratio

NOTE: Volume of heat exchanger is approximately 1.0 gallon.

Table 14 — Antifreeze Percentages by Volume

ANTIFREEZE	MINIMUM TEMPERATURE FOR FREEZE PROTECTION (F)			
	10	15	20	25
Methanol (%)	25	21	16	10
100% USP Food Grade Propylene Glycol (%)	38	30	22	15

Cooling Tower/Boiler Systems — These systems typically use a common loop maintained at 60 to 90 F. Carrier recommends using a closed circuit evaporative cooling tower with a secondary heat exchanger between the tower and the water loop. If an open type cooling tower is used continuously, chemical treatment and filtering will be necessary.

Ground Coupled, Closed Loop and Plateframe Heat Exchanger Well Systems — These systems allow water temperatures from 30 to 110 F. The external loop field is divided up into 2 in. polyethylene supply and return lines. Each line has valves connected in such a way that upon system start-up, each line can be isolated for flushing using only the system pumps. Air separation should be located in the piping system prior to the fluid re-entering the loop field.

OPERATION

Power Up Mode — The unit will not operate until all the inputs, terminals and safety controls are checked for normal operation.

NOTE: The compressor will have a 5-minute anti-short cycle delay upon power up.

Units with Aquazone™ Complete C Control

STANDBY — The Y and W terminals are not active in Standby mode, however the O and G terminals may be active, depending on the application. The compressor will be off.

COOLING — The Y and O terminals are active in Cooling mode. After power up, the first call to the compressor will initiate a 5 to 80-second random start delay and a 5-minute anti-short cycle protection time delay. After both delays are complete, the compressor is energized.

NOTE: On all subsequent compressor calls the random start delay is omitted.

HEATING STAGE 1 — Terminal Y is active in Heating Stage 1. After power up, the first call to the compressor will initiate a 5 to 80-second random start delay and a 5-minute anti-short cycle protection time delay. After both delays are complete, the compressor is energized.

NOTE: On all subsequent compressor calls the random start delay is omitted.

HEATING STAGE 2 — To enter Stage 2 mode, terminal W is active (Y is already active). Also, the G terminal must be active

or the W terminal is disregarded. The compressor relay will remain on and EH1 (emergency heat) is immediately turned on. EH2 will turn on after 10 minutes of continual Stage 2 demand. NOTE: EH2 will not turn on (or if on, will turn off) if FP1 (freeze protection) temperature is greater than 45 F and FP2 is greater than 110 F.

EMERGENCY HEAT — In Emergency Heat (EH) mode, terminal W is active while terminal Y is not. Terminal G must be active or the W terminal is disregarded. EH1 is immediately turned on. EH2 will turn on after 5 minutes of continuous emergency heat demand.

Units with Aquazone Deluxe D Control

STANDBY/FAN ONLY — The compressor will be off. The fan enable, fan speed, and reversing valve (RV) relays will be on if inputs are present. If there is a Fan 1 demand, the fan enable will immediately turn on. If there is a Fan 2 demand, the fan enable and fan speed will immediately turn on.

NOTE: DIP switch 5 on S1 does not have an effect upon Fan 1 and Fan 2 outputs.

HEATING STAGE 1 — In Heating Stage 1 mode, the fan enable and compressor relays are turned on immediately. Once the demand is removed, the relays are turned off and the control reverts to Standby mode. If there is a master/slave or dual compressor application, all compressor relays and related functions will operate per their associated DIP switch 2 setting on S1.

HEATING STAGE 2 — In Heating Stage 2 mode, the fan enable and compressor relays remain on. The fan speed relay is turned on immediately and turned off immediately once the demand is removed. The control reverts to Heating Stage 1 mode. If there is a master/slave or dual compressor application, all compressor relays and related functions will operate per their associated DIP switch 2 setting on S1.

HEATING STAGE 3 — In Heating Stage 3 mode, the fan enable, fan speed and compressor relays remain on. The EH1 output is turned on immediately. With continuing Heat Stage 3 demand, EH2 will turn on after 10 minutes. EH1 and EH2 are turned off immediately when the Heating Stage 3 demand is removed. The control reverts to Heating Stage 2 mode.

Output EH2 will be off if FP1's temperature is greater than 45 F AND FP2 (when shorted) is greater than 110 F during Heating Stage 3 mode. This condition will have a 30-second recognition time. Also, during Heating Stage 3 mode, EH1, EH2, fan enable, and fan speed will be ON if G input is not active.

EMERGENCY HEAT — In Emergency Heat mode, the fan enable and fan speed relays are turned on. The EH1 output is turned on immediately. With continuing emergency heat demand, EH2 will turn on after 5 minutes. Fan enable and fan speed relays are turned off after a 60-second delay. The control reverts to Standby mode.

Output EH1, EH2, fan enable, and fan speed will be ON if the G input is not active during Emergency Heat mode.

COOLING STAGE 1 — In Cooling Stage 1 mode, the fan enable, compressor and RV relays are turned on immediately. If configured as stage 2 (DIP switch set to OFF) then the compressor and fan will not turn on until there is a stage 2 demand. The fan enable and compressor relays are turned off immediately when the Cooling Stage 1 demand is removed. The control reverts to Standby mode. The RV relay remains on until there is a heating demand. If there is a master/slave or dual compressor application, all compressor relays and related functions will track with their associated DIP switch 2 on S1.

COOLING STAGE 2 — In Cooling Stage 2 mode, the fan enable, compressor and RV relays remain on. The fan speed relay is turned on immediately and turned off once the Cooling Stage 2 demand is removed. The control reverts to Cooling Stage 1 mode. If there is a master/slave or dual compressor

application, all compressor relays and related functions will track with their associated DIP switch 2 on S1. NIGHT LOW LIMIT (NLL) STAGED HEATING — In NLL staged Heating mode, the override (OVR) input becomes active and is recognized as a call for heating and the control will immediately go into a Heating Stage 1 mode. With an additional 30 minutes of NLL demand, the control will go into Heating Stage 2 mode. With another additional 30 minutes of NLL demand, the control will go into Heating Stage 3 mode.

Units with WSHP Open Multiple Protocol —

The WSHP Open multi-protocol controller will control mechanical cooling, heating and waterside economizer outputs based on its own space temperature input and set points. An optional CO₂ IAQ (indoor air quality) sensor mounted in the space can maximize the occupant comfort. The WSHP Open controller has its own hardware clock that is automatically set when the heat pump software is downloaded to the board. Occupancy types are described in the scheduling section below. The following sections describe the functionality of the WSHP Open multi-protocol controller. All point objects referred to in this sequence of operation will be referenced to the objects as viewed in the BACview⁶ handheld user interface.

SCHEDULING — Scheduling is used to start/stop the unit based on a time period to control the space temperature to specified occupied heating and cooling set points. The controller is defaulted to control by occupied set points all the time, until either a time schedule is configured with BACview⁶, Field Assistant, i-Vu[®] Open, or a third party control system to enable/disable the BAS (Building Automation System) on/off point. The local time and date must be set for these functions to operate properly. The occupancy source can be changed to one of the following:

Occupancy Schedules — The controller will be occupied 24/7 until a time schedule has been configured using either Field Assistant, i-Vu Open, BACview⁶ or a third party control system to enable/disable the BAS on/off point. The BAS point can be disabled by going to Config, then Unit, then Occupancy Schedules and changing the point from enable to disable then clicking OK.

NOTE: This point must be enabled in order for the i-Vu Open, Field Assistant, or BACview⁶ control system to assign a time schedule to the controller.

Schedule schedule — The unit will operate according to the schedule configured and stored in the unit. The schedule is accessible via the BACview⁶ Handheld tool, i-Vu Open, or Field Assistant control system. The daily schedule consists of a start/stop time (standard or 24-hour mode) and seven days of the week, starting with Monday and ending on Sunday. To enter a daily schedule, navigate to Config, then Sched, then enter BACview⁶ Admin Password (1111), then go to schedule_schedule. From here, enter either a Weekly or Exception schedule for the unit.

Occupancy Input Contact — The WSHP Open controller has the capability to use an external dry contact closure to determine the occupancy status of the unit. The Occupancy Schedules will need to be disabled in order to utilize the occupancy contact input.

NOTE: Scheduling can only be controlled from one source.

BAS (Building Automation System) On/Off — A BAS system that supports network scheduling can control the unit through a network communication and the BAS scheduling function once the Occupancy Schedules have been disabled.

NOTE: Scheduling can either be controlled via the unit or the BAS, but not both.

INDOOR FAN — The indoor fan will operate in any one of three modes depending on the user configuration selected.

Fan mode can be selected as Auto, Continuous, or Always On. In Auto mode, the fan is in intermittent operation during

both occupied and unoccupied periods. Continuous fan mode is intermittent during unoccupied periods and continuous during occupied periods. Always On mode operates the fan continuously during both occupied and unoccupied periods. In the default mode, Continuous, the fan will be turned on whenever any one of the following is true:

- The unit is in occupied mode as determined by its occupancy status.
- There is a demand for cooling or heating in the unoccupied mode.
- There is a call for dehumidification (optional).

When power is reapplied after a power outage, there will be a configured time delay of 5 to 600 seconds before starting the fan. There are also configured fan delays for Fan On and Fan Off. The Fan On delay defines the delay time (0 to 30 seconds; default 10) before the fan begins to operate after heating or cooling is started while the Fan Off delay defines the delay time (0 to 180 seconds; default 45) the fan will continue to operate after heating or cooling is stopped. The fan will continue to run as long as the compressors, heating stages, or the dehumidification relays are on. If the SPT failure alarm or condensate overflow alarm is active; the fan will be shut down immediately regardless of occupancy state or demand.

Fan Speed Control (During Heating) — Whenever heat is required and active, the control continuously monitors the supply-air temperature to verify it does not rise above the configured maximum heating SAT limit (110 F default). As the SAT approaches this value, the control will increase the fan speed as required to ensure the SAT will remain within the limit. This feature provides the most quiet and efficient operation by operating the fan at the lowest speed possible.

Fan Speed Control (During Cooling) — Whenever mechanical cooling is required and active, the control continuously monitors the supply-air temperature to verify it does not fall below the configured minimum cooling SAT limit (50 F default). As the SAT approaches this value, the control will increase the fan speed as required to ensure the SAT will remain within the limit. The fan will operate at lowest speed to maximize latent capacity during cooling.

COOLING — The WSHP Open controller will operate one or two stages of compression to maintain the desired cooling set point. The compressor outputs are controlled by the PI (proportional-integral) cooling loop and cooling stages capacity algorithm. They will be used to calculate the desired number of stages needed to satisfy the space by comparing the space temperature (SPT) to the appropriate cooling set point. The water side economizer, if applicable, will be used for first stage cooling in addition to the compressor(s). The following conditions must be true in order for the cooling algorithm to run:

- Cooling is set to Enable.
- Heating mode is not active and the compressor time guard has expired.
- Condensate overflow input is normal.
- If occupied, the SPT is greater than the occupied cooling set point.
- Space temperature reading is valid.
- If unoccupied, the SPT is greater than the unoccupied cooling set point.
- If economizer cooling is available and active and the economizer alone is insufficient to provide enough cooling.
- OAT (if available) is greater than the cooling lockout temperature.

If all the above conditions are met, the compressors will be energized as required, otherwise they will be deenergized. If cooling is active and should the SAT approach the minimum SAT limit, the fan will be indexed to the next higher speed. Should this be insufficient and if the SAT falls further (equal to the minimum SAT limit), the fan will be indexed to the

maximum speed. If the SAT continues to fall 5° F below the minimum SAT limit, all cooling stages will be disabled.

During Cooling mode, the reversing valve output will be held in the cooling position (either B or O type as configured) even after the compressor is stopped. The valve will not switch position until the Heating mode is required.

The configuration screens contain the minimum SAT parameter as well as cooling lockout based on outdoor-air temperature (OAT) Both can be adjusted to meet various specifications.

There is a 5-minute off time for the compressor as well as a 5-minute time delay when staging up to allow the SAT to achieve a stable temperature before energizing a second stage of capacity. Likewise, a 45-second delay is used when staging down.

After a compressor is staged off, it may be restarted again after a normal time-guard period of 5 minutes and if the supply-air temperature has increased above the minimum supply-air temperature limit.

The WSHP Open controller provides a status input to monitor the compressor operation. The status is monitored to determine if the compressor status matches the commanded state. This input is used to determine if a refrigerant safety switch or other safety device has tripped and caused the compressor to stop operating normally. If this should occur, an alarm will be generated to indicate the faulted compressor condition.

HEATING — The WSHP Open controller will operate one or two stages of compression to maintain the desired heating set point. The compressor outputs are controlled by the heating PI (proportional-integral) loop and heating stages capacity algorithm. They will be used to calculate the desired number of stages needed to satisfy the space by comparing the space temperature (SPT) to the appropriate heating set point. The following conditions must be true in order for the heating algorithm to run:

- Heating is set to Enable.
- Cooling mode is not active and the compressor time guard has expired.
- Condensate overflow input is normal.
- If occupied, the SPT is less than the occupied heating set point.
- Space temperature reading is valid.
- If unoccupied, the SPT is less than the unoccupied heating set point.
- OAT (if available) is less than the heating lockout temperature.

If all the above conditions are met, the heating outputs will be energized as required, otherwise they will be deenergized. If the heating is active and should the SAT approach the maximum SAT limit, the fan will be indexed to the next higher speed. Should this be insufficient, and the SAT rises further reaching the maximum heating SAT limit, the fan will be indexed to the maximum speed. If the SAT still continues to rise 5° F above the maximum limit, all heating stages will be disabled.

During Heating mode, the reversing valve output will be held in the heating position (either B or O type as configured) even after the compressor is stopped. The valve will not switch position until the Cooling mode is required.

The configuration screens contain the maximum SAT parameter as well as heating lockout based on outdoor-air temperature (OAT); both can be adjusted to meet various specifications.

There is a 5-minute off time for the compressor as well as a 5-minute time delay when staging up to allow the SAT to achieve a stable temperature before energizing a second stage of capacity. Likewise, a 45-second delay is used when staging down.

After a compressor is staged off, it may be restarted again after a normal time-guard period of 5 minutes and if the supply-air temperature has fallen below the maximum supply air temperature limit.

The WSHP Open controller provides a status input to monitor the compressor operation. The status is monitored to determine if the compressor status matches the commanded state. This input is used to determine if a refrigerant safety switch or other safety device has tripped and caused the compressor to stop operating normally. If this should occur, an alarm will be generated to indicate the faulted compressor condition. Also, if auxiliary heat is available (see below), the auxiliary heat will operate to replace the reverse cycle heating and maintain the space temperature as required.

AUXILIARY HEAT — The WSHP Open controller can control a two-position, modulating water, or steam valve connected to a coil on the discharge side of the unit and supplied by a boiler or a single-stage ducted electric heater in order to maintain the desired heating set point. Should the compressor capacity be insufficient or a compressor failure occurs, the auxiliary heat will be used. Unless the compressor fails, the auxiliary heat will only operate to supplement the heat provided by the compressor if the space temperature falls more than one degree below the desired heating set point (the amount is configurable). The heat will be controlled so the SAT will not exceed the maximum heating SAT limit.

Auxiliary Modulating Hot Water/Steam Heating Reheat — The control can modulate a hot water or steam valve connected to a coil on the discharge side of the unit and supplied by a boiler in order to maintain the desired heating set point should the compressor capacity be insufficient or a compressor failure occurs. Unless a compressor fault condition exists, the valve will only operate to supplement the heat provided by the compressor if the space temperature falls more than one degree below the desired heating set point. The valve will be controlled so the SAT will not exceed the maximum heating SAT limit.

Two-Position Hot Water/Steam Heating Reheat — The control can operate a two-position, NO or NC, hot water or steam valve connected to a coil on the discharge side of the unit and supplied by a boiler in order to maintain the desired heating set point should the compressor capacity be insufficient or a compressor failure occurs. Unless a compressor fault condition exists, the valve will only open to supplement the heat provided by the compressor if the space temperature falls more than one degree below the desired heating set point. The valve will be controlled so the SAT will not exceed the maximum heating SAT limit. The heat stage will also be subject to a 2-minute minimum OFF time to prevent excessive valve cycling.

Single Stage Electric Auxiliary Heat — The control can operate a field-installed single stage of electric heat installed on the discharge side of the unit in order to maintain the desired heating set point should the compressor capacity be insufficient or a compressor failure occurs. Unless a compressor fault condition exists, the heat stage will only operate to supplement the heat provided by the compressor if the space temperature falls more than one degree below the desired heating set point. The heat stage will be controlled so the SAT will not exceed the maximum heating SAT limit. The heat stage will also be subject to a 2-minute minimum OFF time to prevent excessive cycling.

INDOOR AIR QUALITY (IAQ) AND DEMAND CONTROLLED VENTILATION (DCV) — If the optional indoor air quality sensor is installed, the WSHP Open controller can maintain indoor air quality via a modulating OA damper providing demand controlled ventilation. The control operates the modulating OA damper during occupied periods. The control monitors the CO₂ level and compares it to the configured set points, adjusting the ventilation rate as required. The control provides proportional ventilation to meet the requirements of

ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) specifications by providing a base ventilation rate and then increasing the rate as the CO₂ level increases. The control will begin to proportionally increase ventilation when the CO₂ level rises above the start ventilation set point and will reach the full ventilation rate when the CO₂ level is at or above the maximum set point. A user-configurable minimum damper position ensures that proper base ventilation is delivered when occupants are not present. The IAQ configurations can be accessed through the configuration screen. The following conditions must be true in order for this algorithm to run:

- Damper control is configured for DCV.
- The unit is in an occupied mode.
- The IAQ sensor reading is greater than the DCV start control set point.

The control has four user adjustable set points: DCV start control set point, DCV maximum control set point, minimum damper position, and DCV maximum damper position.

Two-Position OA Damper — The control can be configured to operate a ventilation damper in a two-position ventilation mode to provide the minimum ventilation requirements during occupied periods.

WATERSIDE ECONOMIZER — The WSHP Open controller has the capability of providing modulating or two-position water economizer operation (for a field-installed economizer coil mounted to the entering air side of the unit and connected to the condenser water loop) in order to provide free cooling (or preheating) when water conditions are optimal. Water economizer settings can be accessed through the equipment status screen. The following conditions must be true for economizer operation:

- SAT reading is available.
- LWT reading is available.
- If occupied, the SPT is greater than the occupied cooling set point or less than the occupied heating set point and the condenser water is suitable.
- Space temperature reading is valid.
- If unoccupied, the SPT is greater than the unoccupied cooling set point or less than the unoccupied heating set point and the condenser water is suitable.

Modulating Water Economizer Control — The control has the capability to modulate a water valve to control condenser water flowing through a coil on the entering air side of the unit.

Cooling — The purpose is to provide an economizer cooling function by using the water loop when the entering water loop temperature is suitable (at least 5° F below space temperature). If the water loop conditions are suitable, then the valve will modulate open as required to maintain a supply-air temperature that meets the load conditions. Should the economizer coil capacity alone be insufficient for a period greater than 5 minutes, or should a high humidity condition occur, then the compressor will also be started to satisfy the load. Should the SAT approach the minimum cooling SAT limit, the economizer valve will modulate closed during compressor operation.

Heating — Additionally, the control will modulate the water valve should the entering water loop temperature be suitable for heating (at least 5° F above space temperature) and heat is required. The valve will be controlled in a similar manner except to satisfy the heating requirement. Should the economizer coil capacity alone be insufficient to satisfy the space load conditions for more than 5 minutes, then the compressor will be started to satisfy the load. Should the SAT approach the maximum heating SAT limit, the economizer valve will modulate closed during compressor operation.

Two-Position Water Economizer Control — The control has the capability to control a NO or NC, two-position water valve to control condenser water flow through a coil on the entering air side of the unit.

Cooling — The purpose is to provide a cooling economizer function directly from the condenser water loop when the entering water loop temperature is suitable (at least 5° F below space temperature). If the optional coil is provided and the water loop conditions are suitable, then the valve will open to provide cooling to the space when required. Should the capacity be insufficient for a period greater than 5 minutes, or should a high humidity condition occur, then the compressor will be started to satisfy the load. Should the SAT reach the minimum cooling SAT limit, the economizer valve will close during compressor operation.

Heating — Additionally, the economizer control will open the water valve should the entering water loop temperature be suitable for heating (at least 5° F above space temperature) and heat is required. The valve will be controlled in a similar manner except to satisfy the heating requirement. Should the coil capacity be insufficient to satisfy the space load for more than 5 minutes, then the compressor will be started to satisfy the load. Should the SAT reach the maximum heating SAT limit, the economizer valve will close during compressor operation.

DEMAND LIMIT — The WSHP Open controller has the ability to accept three levels of demand limit from the network. In response to a demand limit, the unit will decrease its heating set point and increase its cooling set point to widen the range in order to immediately lower the electrical demand. The amount of temperature adjustment in response is user adjustable for both heating and cooling and for each demand level. The response to a particular demand level may also be set to zero.

CONDENSER WATER LINKAGE — The control provides optimized water loop operation using an universal controller (UC) open loop controller. Loop pump operation is automatically controlled by WSHP equipment occupancy schedules, unoccupied demand and tenant override conditions. Positive pump status feedback prevents nuisance fault trips. The condenser water linkage operates when a request for condenser water pump operation is sent from each WSHP to the loop controller. This request is generated whenever any WSHP is scheduled to be occupied, is starting during optimal start (for warm-up or pull down prior to occupancy), there is an unoccupied heating or cooling demand, or a tenant pushbutton override. At each WSHP, the water loop temperature and the loop pump status is given. The WSHP will NOT start a compressor until the loop pumps are running or will shutdown the compressors should the pumps stop. This prevents the WSHP from operating without water flow and thus tripping out on refrigerant pressure, causing a lockout condition. The WSHP Open controller control will prevent this from occurring. Also, the loop controller can be configured to start the pumps only after a configurable number of WSHPs are requesting operation (from 1-"N"). This can be used to prevent starting the entire loop operation for only one WSHP. Meanwhile, the WSHPs will not operate if the loop pump status is off and therefore the WSHP compressor will not run.

COMPLETE C AND DELUXE D BOARD SYSTEM TEST

System testing provides the ability to check the control operation. The control enters a 20-minute Test mode by momentarily shorting the test pins. All time delays are reduced by a factor of 15.

Test Mode — To enter Test mode on Complete C or Deluxe D controls, cycle the power 3 times within 60 seconds. The LED (light-emitting diode) will flash a code representing the last fault when entering the Test mode. The alarm relay will also power on and off during Test mode. See Tables 15-17. To exit Test mode, short the terminals for 3 seconds or cycle the power 3 times within 60 seconds.

NOTE: The Deluxe D control has a flashing code and alarm relay cycling code that will both have the same numerical

label. For example, flashing code 1 will have an alarm relay cycling code 1. Code 1 indicates the control has not faulted since the last power-off to power-on sequence.

WSHP Open Test Mode — To enter WSHP Open test mode, navigate from the BACview⁶ home screen to the configuration screen. Choose the service screen and enable unit test. The controller will then test the following:

FAN TEST — Tests all fan speeds, sequences fan from low to high, and operates each speed for one minute. Resets to disable on completion.

COMPRESSOR TEST — Tests compressor cooling and heating operation. Sequences cooling stage 1 then cooling stage 2 followed by heating stage 2 then reduces capacity to heating stage 1. Operates for 1 minute per step.

DEHUMIDIFICATION TEST — Tests dehumidification mode. Operates for 2 minutes.

AUXILIARY HEATING TEST — Tests auxiliary heat. Sequences fan on and enables heating coil for 1 minute.

H₂O ECONOMIZER TEST — Tests entering/returning water loop economizer operation. Sequences fan and opens economizer water valve for one minute.

OPEN VENT DAMPER 100% TEST — Tests outside air (OA) damper operation.

PREPOSITION OA DAMPER — Prepositions OA damper actuator to set proper preload.

NOTE: The auxiliary heating test, H₂O economizer test, open vent damper 100% test, and preposition OA damper features will not be visible on the screen unless configured.

Once tests are complete, set unit test back to disable. Unit will automatically reset to disable after 1 hour.

Retry Mode — In Retry mode, the status LED will start to flash slowly to signal that the control is trying to recover from an input fault. The control will stage off the outputs and try to again satisfy the thermostat used to terminal Y. Once the thermostat input calls are satisfied, the control will continue normal operation.

NOTE: If 3 consecutive faults occur without satisfying the thermostat input call to terminal Y, the control will go into lockout mode. The last fault causing the lockout is stored in memory and can be viewed by entering Test mode.

Aquazone™ Deluxe D Control LED Indicators — There are 3 LED indicators on the Deluxe D control:

STATUS LED — Status LED indicates the current status or mode of the Deluxe D control. The Status LED light is green.

TEST LED — Test LED will be activated any time the Deluxe D control is in Test mode. The Test LED light is yellow.

FAULT LED — Fault LED light is red. The fault LED will always flash a code representing the last fault in memory. If there is no fault in memory, the fault LED will flash code 1 and appear as 1 fast flash alternating with a 10-second pause. See Table 17.

Table 15 — Complete C Control Current LED Status and Alarm Relay Operations

LED STATUS	DESCRIPTION OF OPERATION	ALARM RELAY
On	Normal Mode	Open
	Normal Mode with PM Warning	Cycle (Closed 5 sec, Open 25 sec)
Off	Complete C Control is non-functional	Open
	Fault Retry	Open
Slow Flash	Over/Under Voltage Shutdown	Open (Closed after 15 minutes)
	Lockout	Closed
Flashing Code 1	Test Mode — No fault in memory	Cycling Code 1
Flashing Code 2	Test Mode — HP Fault in memory	Cycling Code 2
Flashing Code 3	Test Mode — LP Fault in memory	Cycling Code 3
Flashing Code 4	Test Mode — FP1 Fault in memory	Cycling Code 4
Flashing Code 5	Test Mode — FP2 Fault in memory	Cycling Code 5
Flashing Code 6	Test Mode — CO Fault in memory	Cycling Code 6
Flashing Code 7	Test Mode — Over/Under shutdown in memory	Cycling Code 7
Flashing Code 8	Test Mode — PM in memory	Cycling Code 8
Flashing Code 9	Test Mode — FP1/FP2 swapped fault in memory	Cycling Code 9

LEGEND

CO — Condensate Overflow
FP — Freeze Protection
HP — High Pressure
LED — Light-Emitting Diode
LP — Low Pressure
PM — Performance Monitor

NOTES:

1. Slow flash is 1 flash every 2 seconds.
2. Fast flash is 2 flashes every 1 second.
3. EXAMPLE: "Flashing Code 2" is represented by 2 fast flashes followed by a 10-second pause. This sequence will repeat continually until the fault is cleared.

Table 16 — Complete C Control LED Code and Fault Descriptions

LED CODE	FAULT	DESCRIPTION
1	No fault in memory	There has been no fault since the last power-off to power-on sequence
2	High-Pressure Switch	HP open instantly
3	Low-Pressure Switch	LP open for 30 continuous seconds before or during a call (bypassed for first 60 seconds)
4	Freeze Protection Coax — FP1	FP1 below temp limit for 30 continuous seconds (bypassed for first 60 seconds of operation)
5	Freeze Protection Air Coil — FP2	FP2 below temp limit for 30 continuous seconds (bypassed for first 60 seconds of operation)
6	Condensate overflow	Sensor overflow (grounded) for 30 continuous seconds
7 (Autoreset)	Over/Under Voltage Shutdown	"R" power supply is <19-vac or >30-vac
8	PM Warning	Performance monitor Warning has occurred.
9	FP1 and FP2 Thermistors are swapped	FP1 temperature is higher than FP2 in heating/test mode, or FP2 temperature is higher than FP1 in cooling/test mode.

LEGEND

FP — Freeze Protection
HP — High Pressure
LED — Light-Emitting Diode
LP — Low Pressure
PM — Performance Monitor

Table 17 — Aquazone™ Deluxe D Control Current LED Status and Alarm Relay Operations

DESCRIPTION	STATUS LED (Green)	TEST LED (Yellow)	FAULT LED (Red)	ALARM RELAY
Normal Mode	On	Off	Flash Last Fault Code in Memory	Open
Normal Mode with PM	On	Off	Flashing Code 8	Cycle (closed 5 sec, open 25 sec, ...)
D Control is non-functional	Off	Off	Off	Open
Test Mode	—	On	Flash Last Fault Code in Memory	Cycling Appropriate Code
Night Setback	Flashing Code 2	—	Flash Last Fault Code in Memory	—
ESD	Flashing Code 3	—	Flash Last Fault Code in Memory	—
Invalid T-stat Inputs	Flashing Code 4	—	Flash Last Fault Code in Memory	—
No Fault in Memory	On	Off	Flashing Code 1	Open
HP Fault	Slow Flash	Off	Flashing Code 2	Open
LP Fault	Slow Flash	Off	Flashing Code 3	Open
FP1 Fault	Slow Flash	Off	Flashing Code 4	Open
FP2 Fault	Slow Flash	Off	Flashing Code 5	Open
CO Fault	Slow Flash	Off	Flashing Code 6	Open
Over/Under Voltage	Slow Flash	Off	Flashing Code 7	Open (closed after 15 minutes)
HP Lockout	Fast Flash	Off	Flashing Code 2	Closed
LP Lockout	Fast Flash	Off	Flashing Code 3	Closed
FP1 Lockout	Fast Flash	Off	Flashing Code 4	Closed
FP2 Lockout	Fast Flash	Off	Flashing Code 5	Closed
CO Lockout	Fast Flash	Off	Flashing Code 6	Closed

LEGEND

- | | |
|--------------------------|----------------------------|
| CO — Condensate Overflow | LED — Light-Emitting Diode |
| ESD — Emergency Shutdown | LP — Low Pressure |
| FP — Freeze Protection | PM — Performance Monitor |
| HP — High Pressure | |

NOTES:

1. If there is no fault in memory, the Fault LED will flash code 1.
2. Codes will be displayed with a 10-second Fault LED pause.
3. Slow flash is 1 flash every 2 seconds.
4. Fast flash is 2 flashes every 1 second.
5. EXAMPLE: "Flashing Code 2" is represented by 2 fast flashes followed by a 10-second pause. This sequence will repeat continually until the fault is cleared.

SERVICE

Perform the procedures outlined below periodically, as indicated.

⚠ WARNING

To prevent injury or death due to electrical shock or contact with moving parts, open unit disconnect switch before servicing unit.

IMPORTANT: When a compressor is removed from this unit, system refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, the refrigerant lines of the compressor must be sealed after it is removed.

IMPORTANT: All refrigerant discharged from this unit must be recovered without exception. Technicians must follow industry accepted guidelines and all local, state and federal statutes for the recovery and disposal of refrigerants.

IMPORTANT: To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must only be serviced by technicians who meet local, state and federal proficiency requirements.

Unit Inspection — Visually inspect the unit at least once a month. Pay special attention to hose assemblies. Repair any leaks and replace deteriorated hoses immediately. Note any signs of deterioration or cracking.

System Flushing — Properly clean and flush system periodically. Refer to Pre-Start-Up, System Cleaning and Flushing section.

Water Coil — Keep air out of the water coil. Check open loop systems to be sure the well head is not allowing air to infiltrate the water line. Always keep lines airtight.

Inspect heat exchangers regularly and clean more frequently if the unit is located in a "dirty" environment. The heat

exchanger should be kept full of water at all times. Open loop systems should have an inverted P trap placed in the discharge line to keep water in the heat exchanger during off cycles. Closed loop systems must have a minimum of 15 psig during the summer and 40 psig during the winter.

Check P trap frequently for proper operation.

FILTERS — Inspect filters. Establish a regular maintenance schedule. Clean or replace filters frequently depending on need.

To remove the filter from the 50PEC unit, slide the filter out of its frame located in the return air opening at the bottom front of the unit. When re-installing the filter, use the slide-in rails of the filter frame to guide the filter into the proper position.

⚠ CAUTION

To avoid fouled machinery and extensive unit clean-up, DO NOT operate units without filters in place. DO NOT use equipment as a temporary heat source during construction.

Refrigerant System — Verify air and water flow rates are at proper levels before servicing. To maintain sealed circuitry integrity, do not install service gages unless unit operation appears abnormal.

Condenser Cleaning — Water-cooled condensers may require cleaning of scale (water deposits) due to improperly maintained closed-loop water systems. Open water tower systems may require removal of sludge build-up due to induced contaminants.

Local water conditions may cause excessive fouling or pitting of tubes. Therefore, condenser tubes should be cleaned at least once a year, or more often if the water is contaminated.

Use standard coil cleaning procedures which are compatible with both the heat exchanger material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling, however flow rates over 3 gpm per ton can

produce water (or debris) velocities that can erode the heat exchanger wall and ultimately produce leaks.

Proper water treatment can minimize tube fouling and pitting. If such conditions are anticipated, water treatment analysis is recommended. Refer to the Carrier System Design Manual, Part 5, for general water conditioning information.

CAUTION

Follow all safety codes. Wear safety glasses and rubber gloves when using inhibited hydrochloric acid solution. Observe and follow acid manufacturer's instructions.

Clean condensers with an inhibited hydrochloric acid solution. The acid can stain hands and clothing, damage concrete, and, without inhibitor, damage steel. Cover surroundings to guard against splashing. Vapors from vent pipe are not harmful, but take care to prevent liquid from being carried over by the gases.

Warm solution acts faster, but cold solution is just as effective if applied for a longer period.

GRAVITY FLOW METHOD — Do not add solution faster than vent can exhaust the generated gases.

When condenser is full, allow solution to remain overnight, then drain condenser and flush with clean water. Follow acid manufacturer's instructions. See Fig. 37.

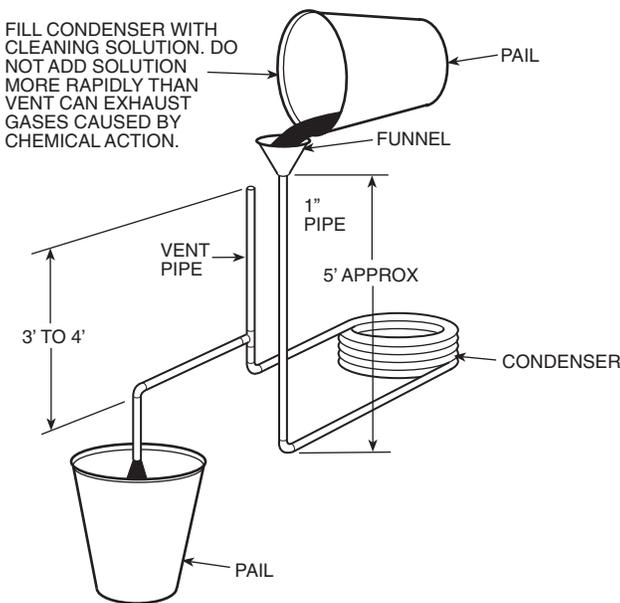


Fig. 37 — Gravity Flow Method

FORCED CIRCULATION METHOD — Fully open vent pipe when filling condenser. The vent may be closed when condenser is full and pump is operating. See Fig. 38.

Regulate flow to condenser with a supply line valve. If pump is a nonoverloading type, the valve may be fully closed while pump is running.

For average scale deposit, allow solution to remain in condenser overnight. For heavy scale deposit, allow 24 hours. Drain condenser and flush with clean water. Follow acid manufacturer's instructions.

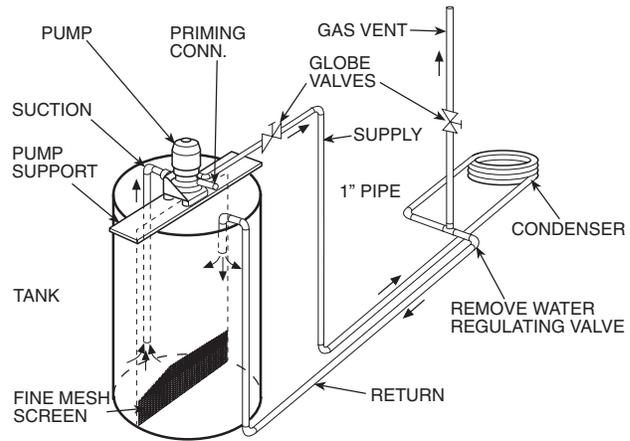


Fig. 38 — Forced Circulation Method

Condensate Pans — Check condensate drain pans for algae growth every three months. If algae growth is apparent, consult a water treatment specialist for proper chemical treatment. The application of an algicide every three months will typically eliminate algae problems in most locations. Check condensate hose for leaks and blockage and correct any problems.

Blower Motors — All units have lubricated fan motors. **BLOWER MOTORS SHOULD NEVER BE LUBRICATED UNLESS OBVIOUS, DRY OPERATION IS SUSPECTED.** Periodic maintenance oiling is not recommended because it will result in dirt accumulating on excess oil and cause eventual motor failure. Conduct annual dry operation check and amperage check to ensure amp draw is no more than 10% greater than that indicated by serial plate data.

Compressor — Conduct an amperage check annually on the compressor and fan motor. Amperage draw should not exceed normal full load amps. Maintain a log of amperage to detect deterioration prior to component failure.

Safety Control Reset — The 50PEC heat pumps are furnished with high-pressure, low-pressure and low-temperature cutouts to prevent the machine from operating at abnormal conditions of temperature or water flow.

The contacts of the high-pressure control used on 50PEC units are designed to open at 376 psig and automatically re-close at 304 psig. The Complete C or Deluxe D control monitors this and other functions such as refrigerant temperatures and pressures and condensate overflow and will interrupt unit heating or cooling operation.

The machine must be reset manually. Reset is accomplished by pressing the STOP button and then pushing either HI HEAT, LOW HEAT, HI COOL or LO COOL to restart the unit in the desired mode of operation. (The 50PEC unit can also be reset by opening and closing the supply power disconnect switch.)

IMPORTANT: If the unit must be reset more than twice, check the unit for a dirty filter, abnormal entering water temperature, inadequate or excessive water flow, and internal malfunctions. If the unit continues to cut out, contact a trained service technician.

WARNING

When replacing the compressor contactor or lockout relay in a unit with electromechanical controls, use only Carrier factory authorized parts. Substitution of other components may result in an inoperative safety circuit and may cause a hazardous condition.

Checking System Charge — Units are shipped with full operating charge. If recharging is necessary:

1. Insert thermometer bulb in insulating rubber sleeve on liquid line near filter drier. Use a digital thermometer for all temperature measurements. DO NOT use a mercury or dial-type thermometer.
2. Connect pressure gage to discharge line near compressor.
3. After unit conditions have stabilized, read head pressure on discharge line gage.

NOTE: Operate unit a minimum of 15 minutes before checking charge. From standard field-supplied Pressure-Temperature chart for R-410A, find equivalent saturated condensing temperature.

4. Read liquid line temperature on thermometer, then subtract from bubble point temperature. The difference equals subcooling temperature.

Refrigerant Charging

⚠ WARNING

To prevent personal injury, wear safety glasses and gloves when handling refrigerant. Do not overcharge system — this can cause compressor flooding.

NOTE: Do not vent or depressurize unit refrigerant to atmosphere. Remove and recover refrigerant following accepted practices.

Air Coil Fan Motor Removal

⚠ CAUTION

Before attempting to remove fan motors or motor mounts, place a piece of plywood over evaporator coils to prevent coil damage.

Motor power wires need to be disconnected from motor terminals before motor is removed from unit.

1. Shut off unit main power supply.
2. Loosen bolts on mounting bracket so that fan belt can be removed.
3. Loosen and remove the 2 motor mounting bracket bolts on left side of bracket.
4. Slide motor/bracket assembly to extreme right and lift out through space between fan scroll and side frame. Rest motor on a high platform such as a step ladder. Do not allow motor to hang by its power wires.

Replacing the WSHP Open Controller's Battery — The WSHP Open controller's 10-year lithium CR2032 battery provides a minimum of 10,000 hours of data retention during power outages.

NOTE: Power must be ON to the WSHP Open controller when replacing the battery, or the date, time and trend data will be lost.

1. Remove the battery from the controller, making note of the battery's polarity.
2. Insert the new battery, matching the battery's polarity with the polarity indicated on the WSHP Open controller.

TROUBLESHOOTING

When troubleshooting problems with a WSHP, consider the following and refer to Table 18.

Thermistor — A thermistor may be required for single-phase units where starting the unit is a problem due to low voltage.

WSHP Open Controller — With the WSHP Open controller option, the 100 most recent alarms can be viewed using the BACview⁶ alarm status and alarm history.

To view the alarms:

1. Navigate to the Alarm Status screen from the Home screen using the arrow softkeys. The screen will display the current alarm status, either normal or Alarm, and allow for scrolling through the unit's alarm status.
2. From the Alarm Status screen, press the Alarm softkey to view the 100 most recent alarms which are labeled with date and time for easy reference.

NOTE: Active faults can be viewed by scrolling down, these faults indicate a possible bad sensor or some condition which may not merit an alarm.

3. To view alarms which have been corrected, scroll down through the Alarm screen to Return Top Normal screen.

NOTE: Alarms are automatically reset once alarm condition has been corrected.

See Table 18 for possible alarm cause and solution.

Table 18 — Troubleshooting

FAULT	HEATING	COOLING	POSSIBLE CAUSE	SOLUTION	
Main Power Problems	X	X	Green Status LED Off	Check line voltage circuit breaker and disconnect.	
				Check for line voltage between L1 and L2 on the contactor.	
				Check for 24-vac between R and C on controller.	
				Check primary/secondary voltage on transformer.	
HP Fault — Code 2 High Pressure		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting. Check water flow adjust to proper flow rate.	
		X	Water temperature out of range in cooling	Bring water temperature within design parameters.	
	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. Dirty air coil — construction dust, etc. Perform preventative maintenance; Clean air coil. High external static. Check duct design and downstream interference.	
	X		Air temperature out of range in heating	Bring return-air temperature within design parameters.	
	X	X	Overcharged with refrigerant	Check superheat/subcooling vs. typical operating condition.	
	X	X	Bad HP switch	Check switch continuity and operation. Replace.	
LP Fault — Code 3 Low Pressure/Loss of Charge	X	X	Insufficient charge	Check for refrigerant leaks.	
	X		Compressor pump down at start-up	Check charge and start-up water flow.	
FP1 Fault — Code 4 Water Freeze Protection	X		Reduced or no water flow in heating	Check pump operation or water valve operation/setting. Plugged strainer or filter. Clean or replace. Check water flow adjust to proper flow rate.	
		X	Inadequate antifreeze level	Check antifreeze density with hydrometer.	
		X	Improper freeze protect setting (10 F vs. 30 F)	Clip JW3 jumper for antifreeze (10 F) use.	
	X		Water temperature out of range	Bring water temperature within design parameters.	
	X	X	Bad thermistor	Check temperature and impedance correlation.	
	FP2 Fault — Code 5 Air Coil Freeze Protection		X	Reduced or no airflow in cooling	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. High external static. Check duct design and downstream interference.
		X	Air temperature out of range	Too much cold vent air. Bring entering-air temperature within design parameters.	
		X	Improper freeze protect setting (10 F vs. 30 F)	Normal airside applications will require 30 F only.	
X		X	Bad thermistor	Check temperature and impedance correlation.	
Condensate Fault — Code 6	X	X	Blocked drain	Check for blockage and clean drain.	
	X	X	Improper trap	Check trap dimensions and location ahead of vent.	
		X	Poor drainage	Check for piping slope away from unit. Check slope of unit toward outlet. Poor venting. Check vent location.	
		X	Moisture on sensor	Check for moisture shorting to air coil.	
Over/Under Voltage — Code 7 (Auto Resetting)	X	X	Under voltage	Check power supply and 24-vac voltage before and during operation. Check power supply wire size. Check compressor starting. Check 24-vac and unit transformer tap for correct power supply voltage.	
				Over voltage	Check power supply voltage and 24 vac before and during operation. Check 24-vac and unit transformer tap for correct power supply voltage.
Performance Monitor — Code 8	X		Heating mode FP2>125 F	Check for poor airflow or overcharged unit.	
		X	Cooling mode FP1>125 F OR FP2< 40 F	Check for poor water flow or airflow.	
No Fault Code Shown	X	X	Compressor overload	Check and replace if necessary.	
	X	X	Control board	Reset power and check operation.	
Unit Short Cycles	X	X	Dirty air filter	Check and clean air filter.	
	X	X	Unit in Test mode	Reset power or wait 20 minutes for auto exit.	
	X	X	Unit selection	Unit may be oversized for space. Check sizing for actual load of space.	
	X	X	Compressor overload	Check and replace if necessary.	
Only Fan Runs	X	X	Thermostat position	Ensure thermostat set for heating or cooling operation.	
	X	X	Unit locked out	Check for lockout codes. Reset power.	
	X	X	Compressor overload	Check compressor overload. Replace if necessary.	
	X	X	Thermostat wiring	Check Y and W wiring at heat pump. Jumper Y and R for compressor operation in Test mode.	

LEGEND

- FP** — Freeze Protection
- HP** — High Pressure
- LED** — Light-Emitting Diode
- LP** — Low Pressure
- RV** — Reversing Valve

Table 18 — Troubleshooting (cont)

FAULT	HEATING	COOLING	POSSIBLE CAUSE	SOLUTION	
Only Compressor Runs	X	X	Thermostat wiring	Check G wiring at heat pump. Jumper G and R for fan operation. Check Y and W wiring at heat pump. Jumper Y and R for compressor operation in Test mode.	
	X	X	Fan motor relay	Jumper G and R for fan operation. Check for line voltage across BR contacts. Check fan power enable relay operation (if present).	
	X	X	Fan motor	Check for line voltage at motor. Check capacitor.	
Unit Does Not Operate in Cooling		X	Reversing valve	Set for cooling demand and check 24-vac on RV coil and at control. If RV is stuck, run high pressure up by reducing water flow and while operating engage and disengage RV coil voltage to push valve.	
		X	Thermostat setup	Check for 'O' RV setup not 'B'.	
		X	Thermostat wiring	Check O wiring at heat pump. Jumper O and R for RV coil.	
Insufficient Capacity/ Not Cooling or Heating Properly		X	Dirty filter	Replace or clean.	
	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. High external static. Check duct design and downstream interference.	
		X	Reduced or no airflow in cooling	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. High external static. Check duct design and downstream interference.	
	X	X	Leaky ductwork	Check supply and return-air temperatures at the unit and at distant duct registers if significantly different, duct leaks are present.	
	X	X	Low refrigerant charge	Check superheat and subcooling.	
	X	X	Restricted metering device	Check superheat and subcooling. Replace.	
		X	Defective reversing valve	Perform RV touch test.	
	X	X	Thermostat improperly located	Check location and for air drafts behind thermostat.	
	X	X	Unit undersized	Recheck loads and sizing check sensible cooling load and heat pump capacity.	
	X	X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.	
	X	X	Inlet water too hot or cold	Check load, loop sizing, loop backfill, ground moisture.	
	High Head Pressure	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. High external static. Check duct design and downstream interference.
			X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting. Check water flow adjust to proper flow rate.
		X	Inlet water too hot	Check load, loop sizing, loop backfill, ground moisture.	
X			Air temperature out of range in heating	Bring return-air temperature within design parameters.	
		X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.	
X		X	Unit overcharged	Check superheat and subcooling. Reweigh in charge.	
X		X	Non-condensables in system	Vacuum system and reweigh in charge.	
X		X	Restricted metering device	Check superheat and subcooling. Replace.	
Low Suction Pressure		X		Reduced water flow in heating	Check pump operation or water valve operation/setting. Plugged strainer or filter. Clean or replace. Check water flow adjust to proper flow rate.
	X		Water temperature out of range	Bring water temperature within design parameters.	
		X	Reduced airflow in cooling	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. High external static. Check duct design and downstream interference.	
		X	Air temperature out of range	Too much cold vent air. Bring entering air temperature within design parameters.	
	X	X	Insufficient charge	Check for refrigerant leaks.	
Low Discharge Air Temperature in Heating	X		Too high airflow	Check blower.	
	X		Poor performance	See 'Insufficient Capacity' above.	
High Humidity		X	Too high airflow	Check blower.	
		X	Unit oversized	Recheck loads and sizing check sensible cooling load and heat pump capacity.	

LEGEND

- FP — Freeze Protection
- HP — High Pressure
- LED — Light-Emitting Diode
- LP — Low Pressure
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APPENDIX A — WSHP OPEN SCREEN CONFIGURATION

SCREEN NAME	POINT NAME	PASSWORD LEVEL	EDITABLE	RANGE	DEFAULT	NOTES	
Equipment Status	Operating Mode	No Password Required		Off, Fan Only, Economize, Cooling, Heating, Cont Fan, Test, Start Delay, Dehumidify		Displays unit operating mode	
	SPT			° F		Displays SPT	
	SAT			° F		Displays SAT	
	Condenser Leaving Temperature			° F		Displays leaving condenser water temperature	
	Condenser Entering Temperature			° F		Displays entering condenser water temperature (Value will not update when compressor is operating)	
	Fan				Off/Low Speed/ Medium Speed High Speed/On		Displays fan speed status
	Compressor Capacity				0 - 100%		Displays compressor capacity
	Damper Position				0 - 100%		Displays current damper position (Viewable only if Ventilation DMP Type = 2 position or DCV)
	H ₂ O Economizer				0 - 100%		Displays position of economizer valve
	Auxiliary Heat				0 - 100%		Displays position of auxiliary reheat valve (Viewable only if Leaving Air Auxiliary Heat Type = 2 position, 1 stage Elect or Modulating)
	Space RH				0 - 100%		Displays space RH% (Viewable only if Humidity Sensor = Installed)
	Dehumidification				Inactive/Active		Displays if dehumidification is active (Viewable only if Factory Dehumidification Reheat = Installed)
	IAQ CO ₂				0 - 9999 ppm		Displays the space CO ₂ level
Alarm Status	SPT Alarm Status	No Password Required		Normal/Alarm		Displays current space temperature condition	
	Alarming SPT			° F		Displays the SPT that exceeded the alarm limit (when SPT alarm above is in Alarm)	
	SPT Alarm Limit			° F		Displays the SPT alarm limit that was exceeded; causing the alarm condition (when SPT alarm above is in Alarm)	
	SPT Sensor Alarm Status				Normal/Alarm		Displays the status of the Rnet SPT sensor - ALARM is displayed should the sensor fail to communicate with the control module
	IAQ Alarm Status				Normal/Alarm		Current IAQ/ventilation condition
	Compressor Alarm Status				Normal/Alarm		Current compressor condition
	SAT Alarm Status				Normal/Alarm		Current SAT condition
	Condensate Overflow Alarm Status				Normal/Alarm		Current status of the condensate drain (overflow switch)
	Condenser Water Temperature Alarm Status				Normal/Alarm		Current status of the condenser water
	Filter Alarm Status				Normal/Alarm		Current filter condition
	Space RH Alarm Status				Normal/Alarm		Current space RH condition
	OAT Alarm Status				Normal/Alarm		Current status of the OAT broadcast function
	Airside Linkage Status				Normal/Alarm		Current linkage status if enabled
	Condenser Water Linkage				Normal/Alarm		Current linkage status if enabled
Sensor Calibration	SAT	Admin Password level access only		° F		Display SAT	
	SAT Offset		X	-9.9 - 10.0 ° F	0 ° F	Used to correct sensor reading	
	Leaving Condenser Water Temperature			° F		Displays Leaving Condenser Water Temperature	
	Leaving CW Offset		X	-9.9 - 10.0 ° F	0 ° F	Used to correct sensor reading	
	Rnet Sensor Temperature			° F		Displays SPT	
	Rnet Offset		X	-9.9 - 10.0 ° F	0 ° F	Used to correct sensor reading	
	RH			%		Displays Space RH value	
	RH Sensor Offset		X	-15% - 15%	0 %	Used to correct sensor reading	

LEGEND

- BAS** — Building Automation System
- DCV** — Demand Controlled Ventilation
- IAQ** — Indoor Air Quality
- OAT** — Outdoor Air Temperature
- RH** — Relative Humidity
- SAT** — Supply Air Temperature
- SPT** — Space Temperature
- TPI** — Third Party Integration

APPENDIX A — WSH OPEN SCREEN CONFIGURATION (cont)

SCREEN NAME	POINT NAME	PASSWORD LEVEL	EDITABLE	RANGE	DEFAULT	NOTES		
Unit Maintenance	Operating Mode	No Password required		Off, Fan Only, Economize, Cooling, Heating, Cont Fan, Test, Start Delay, Dehumidify		Displays unit operating mode		
	Fan Operating Mode			Auto/Continuous/Always On		Displays how the fan is configured to operate		
	Occupancy Status				Unoccupied/Occupied		Displays the current occupancy status	
	Occupancy Control				Always Occupied/Local Schedule/BACnet Schedule/BAS Keypad/ Occupied Contact/Holiday Schedule/Override Schedule/Pushbutton Override/Unoccupied None		Displays the origin of the occupancy control	
	Outside Air Temperature				° F		Displays OAT (Viewable only if OAT is a network broadcast)	
	SPT				° F		Displays SPT	
	SPT Status				Normal/Above Limit/Below Limit/Sensor Failure		Displays the SPT status	
	SPT Sensor Status				Inactive/Connected		Displays the connection status of the Rnet sensor	
	Condensate Overflow				Normal/Alarm		Displays the status of the condensate overflow	
	Cooling Set Point				° F		Displays the actual set point being used for cooling control	
	Heating Set Point				° F		Displays the actual set point being used for heating control	
	Set Point Adjustment				° F		Displays the offset values from the Rnet user set point adjustment that is being applied to the configured set points	
	Auxiliary Heat Control Set Point				° F		Displays the calculated set point being used for auxiliary heating control	
	H ₂ O Economizer Control Set Point				° F		Displays the calculated set point being used for economizer control	
	Calculated IAQ/ Ventilation Damper position				%		Displays the ventilation damper position calculated by the DCV control	
	Active Compressor Stages				0/1/2		Displays the actual number of compressor stages operating	
	SAT				° F		Displays SAT	
	Reset Filter Alarm				X	No/Yes		Used to reset the filter alarm timer after the filter has been cleaned or replaced
	Overflow Contact					Closed/Open		Displays the state of the condensate overflow switch contact
	Occupancy Contact					Closed/Open		Displays the state of the external/ remote occupancy input switch contact
BAS/Keypad Override			X	Inactive/Occupied/ Unoccupied	Inactive	Provides capability to force the equipment to operate in an occupied or unoccupied mode		
OAT Input				N/A / Network		Displays if an OAT value is being received from the Network		
System Settings	BACnet		X			See TPI		
	Keypad Configuration		X			Mapping		
	Password		X			Changes password		
	Network		X			See TPI		
	BACnet Time Master		X			See TPI		
	Clock Set		X			Changes clock/time setting		
Occupancy Maintenance	Override Schedules	No Password required		Inactive/Active Occupied		Used to display the active and inactive occupancy control inputs		
	Pushbutton Override			Inactive/Active Occupied				
	Keypad Override			Inactive/Active Occupied/Active Unoccupied				
	Schedules			Inactive/Active Occupied				
	Occupancy Contact			Inactive/Active Occupied				
	BAS on/off			Inactive/Active Occupied				
Schedule Configuration	Local Occupancy Schedules	User/Admin Password level access	X	Disable/Enable	Enable	Used to define which occupancy inputs are used to determine occupancy mode.		
	Local Holiday Schedules		X	Disable/Enable	Disable			
	Local Override Schedules		X	Disable/Enable	Disable			
	BACnet Occupancy Schedules		X	Disable/Enable	Disable			

LEGEND

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APPENDIX A — WSHP OPEN SCREEN CONFIGURATION (cont)

SCREEN NAME	POINT NAME	PASSWORD LEVEL	EDITABLE	RANGE	DEFAULT	NOTES
Configuration ↓ Set Points	Occupied Heating	User/Admin Password level access	X	40 - 90 ° F	72 ° F	Defines the Occupied Heating Set Point
	Occupied Cooling		X	55 - 99 ° F	76 ° F	Defines the Occupied Cooling Set Point
	Unoccupied Heating		X	40 - 90 ° F	55 ° F	Defines the Unoccupied Heating Set Point
	Unoccupied Cooling		X	55 - 99 ° F	90 ° F	Defines the Unoccupied Cooling Set Point
	Effective Heating Set Point		X	0 - 10 ° F		Takes into effect bias (maximum allowable set point deviation)
	Effective Cooling Set Point		X	0 - 10 ° F		Takes into effect bias (maximum allowable set point deviation)
	Optimal Start					Uses historical data to calculate ramp up time so as to be at set point at occupied/unoccupied time
	Occupied RH Set Point		X	0 - 100%	65%	Defines the control set point used during occupied periods (Viewable only if Humidity Sensor = Installed/ Determines when to start Dehumidification when occupied)
	Unoccupied RH Set Point		X	0 - 100%	90%	Defines the control set point used during unoccupied periods (Viewable only if Humidity Sensor = Installed/Determines when to start Dehumidification when unoccupied)
	DCV CTRL Start Set Point		X	0 - 9999 ppm	500 ppm	Defines the control set point used to start increasing ventilation during occupied periods (Viewable only if Ventilation DMP Type = DCV)
	DCV Max CTRL Set Point		X	0 - 9999 ppm	1050 ppm	Defines the control set point used to define where the ventilation will reach its maximum limit during occupied periods (Viewable only if Ventilation DMP Type = DCV/Used to determine DCV ending control point)
Configuration ↓ Schedule ↓ Weekly Schedule	Start Time	User/Admin Password level access	X	00:00 - 23:59	06:00	Defines the start time for an occupied period
	End Time		X	00:00 - 24:00	18:00	Defines the ending time of an occupied period
	Mon		X	No/Yes	Yes	Determines if this day is included in this schedule
	Tue		X	No/Yes	Yes	Determines if this day is included in this schedule
	Wed		X	No/Yes	Yes	Determines if this day is included in this schedule
	Thur		X	No/Yes	Yes	Determines if this day is included in this schedule
	Fri		X	No/Yes	Yes	Determines if this day is included in this schedule
	Sat		X	No/Yes	No	Determines if this day is included in this schedule
Sun	X	No/Yes	No	Determines if this day is included in this schedule		
Configuration ↓ Schedule ↓ Exception Schedules 1 - 12	Start Month	User/Admin Password level access	X	0 - 12	0	Defines the start month of this holiday schedule
	Start Day		X	0 - 31	0	Defines the start day of this holiday schedule
	Start Time		X	00:00 - 23:59	0:00	Determines the start time for this schedule
	End Month		X	0 - 12	0	Defines the month to end this holiday schedule
	End Day		X	0 - 31	0	Defines the day to end this holiday schedule
	End Time		X	00:00 - 24:00	0:00	Determines the time to end this schedule

LEGEND

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APPENDIX A — WSHP SCREEN OPEN CONFIGURATION (cont)

SCREEN NAME	POINT NAME	PASSWORD LEVEL	EDITABLE	RANGE	DEFAULT	NOTES
Configuration ↓ Unit Configuration	Fan Mode	Admin Password level access only	X	Auto/Continuous/ Always On	Continuous	Auto= Intermittant operation during both occupied and unoccupied periods/ Continuous = Intermittant during unoccupied periods and continuous during occupied periods/Always on = fan operates continuously during both occupied and unoccupied periods
	Fan On Delay		X	0 - 30 sec	10 sec	Defines the delay time before the fan begins to operate after heating or cooling is started
	Fan Off Delay		X	0 - 180 sec	45 sec	Defines the amount of time the fan will continue to operate after heating or cooling is stopped
	Heating Enable		X	Disable/Enable	Enable	Provides capability to manually disable heating operation
	Cooling Enable		X	Disable/Enable	Enable	Provides capability to manually disable cooling operation
	Minimum SAT in Cooling		X	40 - 60 ° F	50 ° F	Defines the minimum acceptable operating temperature for the Supply Air
	Maximum SAT in Heating		X	80 - 140 ° F	110 ° F	Defines the maximum acceptable operating temperature for the Supply Air
	Damper Ventilation Position		X	0 - 100%	100%	Normally set to 100% if 2 position damper type or set to minimum ventilation position if damper type = DCV
	DCV Maximum Vent Position		X	0 - 100%	100%	Usually set at 100% - Used to limit maximum damper opening in DCV mode
	Filter Alarm Timer		X	0 - 9999 hrs	0 hrs	Disables Filter Alarm if set to 0
	Pushbutton Override		X	Disable/Enable	Enable	Enables Override Feature on Rnet sensor
	SPT Sensor Set Point Adjustment		X	Disable/Enable	Enable	Enables Set Point adjustment capability on Rnet Sensor
	Lockout Cooling if OAT <		X	-65 - 80 ° F	-65 ° F	Cooling is locked out when OAT is less than configured value and OAT is actively being broadcast
	Lockout Heating if OAT >		X	35 - 150 ° F	150 ° F	Heating is locked out when OAT is greater than configured value and OAT is actively being broadcast
	Power Fail Restart Delay		X	0 - 600 sec	60 sec	Delay before equipment starts
	Occupancy Schedules		X	Disable/Enable	Enable	Enables unit occupied
Set Point Separation	X	2 - 9 ° F	4 ° F	Used to enforce minimum set point separation		
Configuration ↓ Service ↓ Test	Test Mode	Admin Password level access only	X	Disable/Enable	Disable	Used to enable test mode. Will automatically reset to disable after 1 hour
	Fan Test		X	Disable/Enable	Disable	Used to test all fan speeds. Sequences fan from low to high and operates each speed for 1 minute. Resets to disable on completion
	Fan Speed			Off/Low Speed/Medium Speed/High Speed/On		Displays current fan operation
	Compressor Test		X	Disable/Enable	Disable	Used to test compressor cooling and heating operation. Sequences cooling stage 1, then stage 2, then heating stage 2 and reduces capacity to stage 1. Operates for 1 minute per step. Resets to disable on completion.
	Dehumidification Test		X	Disable/Enable	Disable	Used to test dehumidification mode - Operates for 2 minutes. Resets to disable on completion.
	Testing Compressor			Inactive/Heating/Cooling/Dehumidify/TimeGard Wait		Displays compressor test mode
	Aux Heating Test		X	Disable/Enable	Disable	Used to test auxiliary heat. Sequences fan on and enables heating coil for 1 minute. Resets to disable on completion
	H ₂ O Economizer Test		X	Disable/Enable	Disable	Used to test entering/return air water loop economizer coil operation. Sequences fan on and opens economizer coil water valve for 1 minute. Resets to disable on completion
	Preposition OA Damper		X	Disable/Enable	Disable	Used to preposition OA damper actuator to set proper preload
	Open Vent Damper 100%		X	Disable/Enable	Disable	Used to test OA damper operation
	SAT			° F		Displays SAT
	LCWT			° F		Displays Leaving Condenser Water Temperature

LEGEND

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APPENDIX A — WSHP SCREEN OPEN CONFIGURATION (cont)

SCREEN NAME	POINT NAME	PASSWORD LEVEL	EDITABLE	RANGE	DEFAULT	NOTES
Configuration ↓ Service Configuration	# of Fan Speeds	Admin Password level access only	X	1,2,3	3	Used to set number of fan motor speeds
	G Output Type		X	Fan On/Fan Low	Fan On	When set to Fan On, G output is energized when ever any fan speed is active (required for ECM and Fan control board). When set to Fan Low, output is only energized for Low Speed
	Compressor Stages		X	One Stage/Two Stages	One Stage	Defines the number of stages of compression
	Reversing Valve Type		X	O type output/B type output	O type	Determines reversing valve signal output type
	Leaving Air Auxiliary Heat Type		X	None/2-Position HW/1 Stage Electric/Modulating HW	None	Determines Auxiliary Reheat Coil Type
	Entering Air Water Economizer Type		X	None/2-Position/Modulating	None	Determines Entering Air Economizer Coil Type
	2-Position Water Valve Type		X	Normally Closed/Normally Open	Normally Closed	Determines type of 2-position water valve used
	Modulating Water Valve Type		X	Normally Closed/Normally Open	Normally Closed	Determines type of modulating water valve used
	Ventilation Damper Type		X	None/2-Position/DCV	None	Determines Type of ventilation damper control to be used
	Damper Actuator Type		X	(0-10 volt)/(2-10 volt)	0-10 volt	Used to determine ventilation damper output signal range (closed - open)
	Humidity Sensor		X	None/Installed	None	Set to Installed if Humidity sensor is present
	Factory Dehumidification Reheat Coil		X	None/Installed	None	Set to Installed if factory-installed dehumidification reheat coil is present
	Occupancy Input Logic		X	Occupied Open/Occupied Closed	Occupied CLOSED	Used to determine external occupancy switch contact occupied state
	Condensate Switch Alarm Delay		X	5 - 600 seconds	10 sec	Delay before equipment alarms on high condensate level
	Condensate Switch Alarm State		X	Alarm OPEN/Alarm CLOSED	Alarm CLOSED	Determine Alarm state of condensate switch input
	Minimum Condenser Water Temperature in Heating		X	25 - 60 ° F	60 ° F	Determines the minimum acceptable water loop temperature to start heating
	Maximum Condenser Water Temperature in Heating		X	65 - 100 ° F	90 ° F	Determines the maximum acceptable water loop temperature to start heating
	Minimum Condenser Water Temperature in Cooling		X	30 - 60 ° F	60 ° F	Determines the minimum acceptable water loop temperature to start cooling
	Maximum Condenser Water Temperature in Cooling		X	85 - 120 ° F	95 ° F	Determines the maximum acceptable water loop temperature to start cooling
	IAQ sensor minimum input		X	0 - 5 ma	4 ma	Minimum output current (mA) for IAQ sensor
	IAQ sensor maximum input		X	5 - 20 ma	20 ma	Maximum output current (mA) for IAQ sensor
	IAQ sensor minimum output		X	0 - 9999 ppm	0 ppm	Corresponding value in ppm for minimum output current
	IAQ sensor maximum output		X	0 - 9999 ppm	2000 ppm	Corresponding value in ppm for maximum output current

LEGEND

- BAS** — Building Automation System
- DCV** — Demand Controlled Ventilation
- IAQ** — Indoor Air Quality
- OAT** — Outdoor Air Temperature
- RH** — Relative Humidity
- SAT** — Supply Air Temperature
- SPT** — Space Temperature
- TPI** — Third Party Integration

APPENDIX A — WSHP SCREEN OPEN CONFIGURATION (cont)

SCREEN NAME	POINT NAME	PASSWORD LEVEL	EDITABLE	RANGE	DEFAULT	NOTES
Configuration ↓ Alarm Configuration	SPT Occupied Alarm Hysteresis	Admin Password level access only	X	2 - 20 ° F	5 ° F	Defines the hysteresis applied above the cooling and below the heating set points before an alarm condition will occur
	SPT Alarm Delay		X	0 - 30 min per degree	10 min	Used to calculate the delay time before an alarm is generated after the alarm condition occurs
	SPT Unoccupied Low Alarm Temperature		X	35 - 90 ° F	45 ° F	Defines the fixed unoccupied low SPT alarm limit
	SPT Unoccupied High Alarm Temperature		X	45 - 100 ° F	95 ° F	Defines the fixed unoccupied high SPT alarm limit
	SAT Low SAT Alarm Limit		X	15 - 90 ° F	45 ° F	Defines the fixed minimum SAT alarm limit
	SAT High SAT Alarm Limit		X	90 - 175 ° F	120 ° F	Defines the fixed maximum SAT alarm limit
	Condensate Overflow Alarm Delay		X	5 - 600 sec	10 sec	Defines the delay time before an alarm is generated after the alarm condition occurs
	Space Humidity Occupied High Alarm Limit		X	45% - 100%	100%	Defines the fixed occupied high space RH alarm limit
	Space Humidity Alarm Delay		X	0 - 30 min per % RH	5 min	Used to calculate the delay time before an alarm is generated after the alarm condition occurs
	Space Humidity Unoccupied High Alarm Limit		X	45% - 100%	100%	Defines the fixed unoccupied high space RH alarm limit
	IAQ/Ventilation Occupied High Alarm Limit		X	0 - 9999 ppm	1100 ppm	Defines the fixed occupied high space IAQ/Ventilation alarm limit
	IAQ/Ventilation Alarm Delay		X	0.1 - 1.0 min per ppm	0.25 min	Used to calculate the delay time before an alarm is generated after the alarm condition occurs
	Rnet Sensor SPT Alarm		X	Ignore/Display	Ignore	Determines if the SPT alarm is displayed on the local Rnet sensor
	Rnet Sensor SAT Alarm		X	Ignore/Display	Ignore	Determines if the SAT alarm is displayed on the local Rnet sensor
	Rnet Sensor Compressor Lockout Alarm		X	Ignore/Display	Display	Determines if the Compressor Lockout alarm is displayed on the local Rnet sensor
	Rnet Sensor Condenser Water Temperature Alarm		X	Ignore/Display	Display	Determines if the Condenser Water Temperature alarm is displayed on the local Rnet sensor
	Rnet Sensor Condensate Overflow Alarm		X	Ignore/Display	Display	Determines if the Condensate Overflow alarm is displayed on the local Rnet sensor
Rnet Sensor Dirty Filter Alarm	X	Ignore/Display	Display	Determines if the Dirty Filter alarm is displayed on the local Rnet sensor		
Rnet Sensor Space High Humidity Alarm	X	Ignore/Display	Ignore	Determines if the High Space RH alarm is displayed on the local Rnet sensor		
Configuration ↓ Linkage	Loop Control Network Number					See TPI
	Loop Control Network Address					See TPI
	Number of Linked Heat Pumps					See TPI

LEGEND

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**50PEC UNIT
START-UP CHECKLIST**

CUSTOMER: _____ JOB NAME: _____
MODEL NO.: _____ SERIAL NO.: _____ DATE: _____

I. PRE-START-UP

DOES THE UNIT VOLTAGE CORRESPOND WITH THE SUPPLY VOLTAGE AVAILABLE? (Y/N) _____

HAVE THE POWER AND CONTROL WIRING CONNECTIONS BEEN MADE AND TERMINALS TIGHT? (Y/N) _____

HAVE WATER CONNECTIONS BEEN MADE AND IS FLUID AVAILABLE AT HEAT EXCHANGER? (Y/N) _____

HAS PUMP BEEN TURNED ON AND ARE ISOLATION VALVES OPEN? (Y/N) _____

HAS CONDENSATE CONNECTION BEEN MADE AND IS A TRAP INSTALLED? (Y/N) _____

IS AN AIR FILTER INSTALLED? (Y/N) _____

II. START-UP

IS FAN OPERATING WHEN COMPRESSOR OPERATES? (Y/N) _____

UNIT VOLTAGE — COOLING OPERATION

PHASE AB VOLTS _____

PHASE AB AMPS _____

CONTROL VOLTAGE

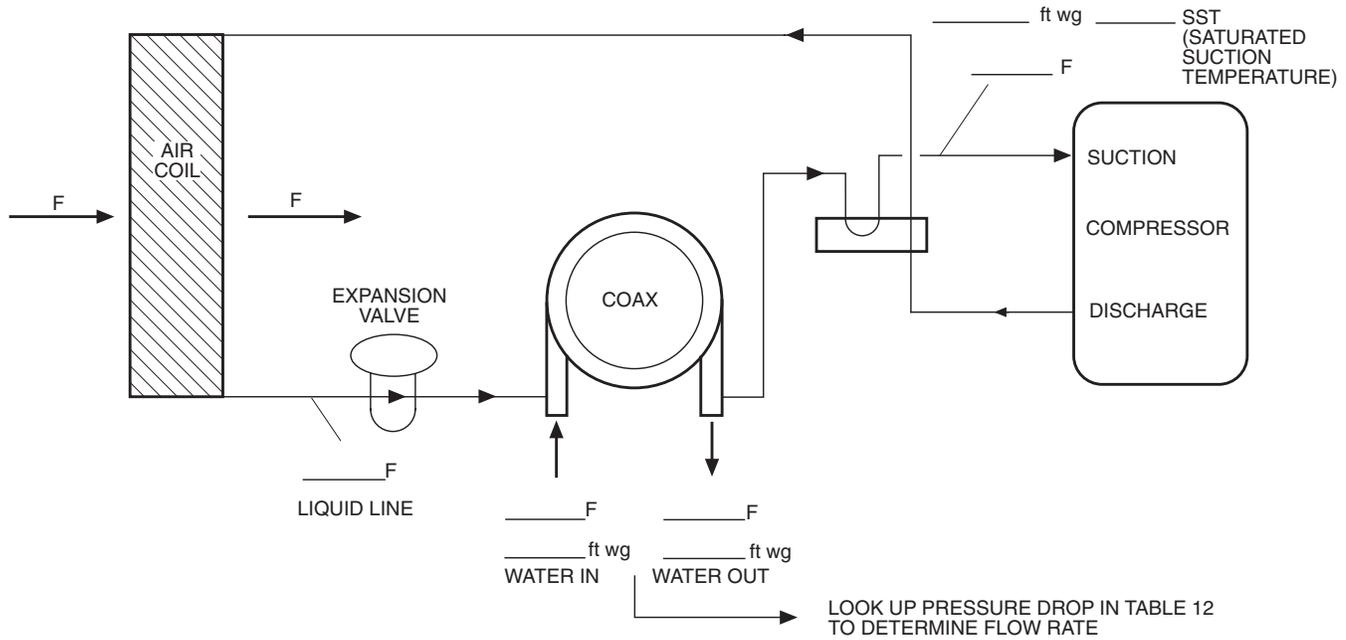
IS CONTROL VOLTAGE ABOVE 21.6 VOLTS? (Y/N) _____.
IF NOT, CHECK FOR PROPER TRANSFORMER CONNECTION.

TEMPERATURES

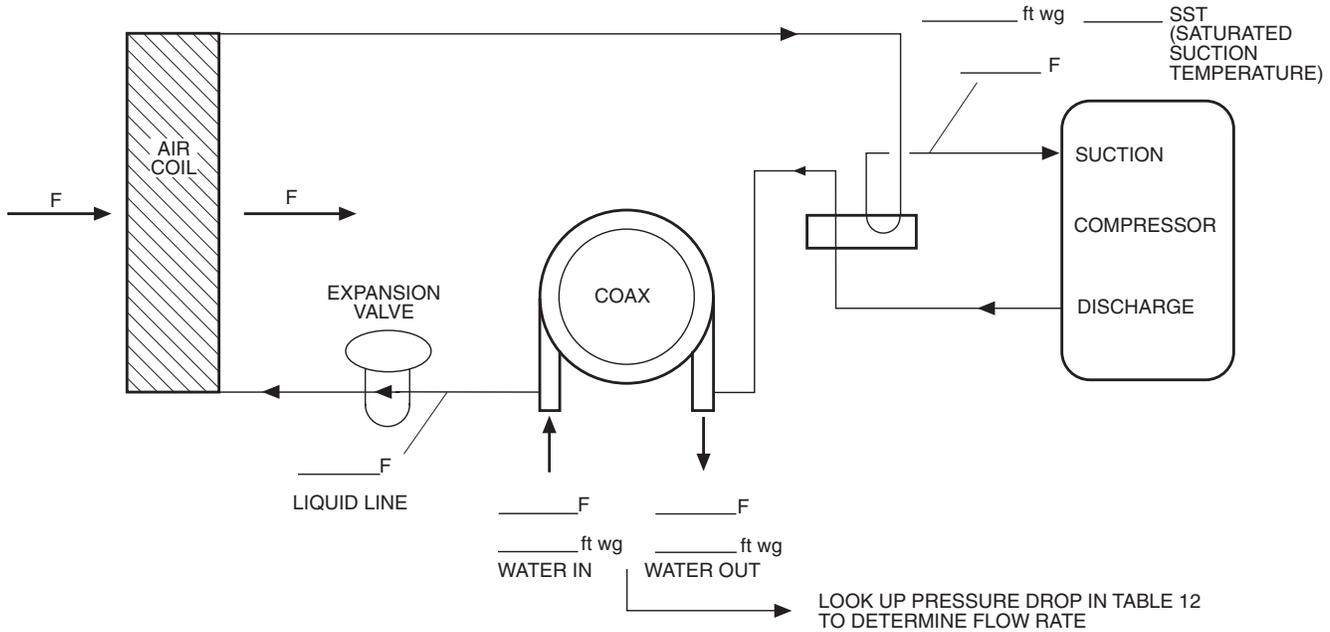
FILL IN THE ANALYSIS CHART ATTACHED.

COAXIAL HEAT EXCHANGER	COOLING CYCLE:						
	WATER IN	_____ F	WATER OUT	_____ F	_____ ft wg	_____ gpm	
AIR COIL	HEATING CYCLE:						
	WATER IN	_____ F	WATER OUT	_____ F	_____ ft wg	_____ gpm	
AIR COIL	COOLING CYCLE:						
	AIR IN	_____ F	AIR OUT	_____ F			
AIR COIL	HEATING CYCLE:						
	AIR IN	_____ F	AIR OUT	_____ F			

HEATING CYCLE ANALYSIS



COOLING CYCLE ANALYSIS



HEAT OF EXTRACTION (ABSORPTION) OR HEAT OF REJECTION =

$$\text{FLOW RATE (gpm)} \times \text{TEMP. DIFF. (DEG. F)} \times \text{FLUID FACTOR*} = \text{Btu/hr}$$

$$\text{SUPERHEAT} = \text{SUCTION TEMPERATURE} - \text{SATURATED SUCTION TEMPERATURE}$$

$$= \text{ (DEG F)}$$

$$\text{SUBCOOLING} = \text{SATURATED CONDENSING TEMPERATURE} - \text{LIQUID LINE TEMPERATURE}$$

$$= \text{ (DEG F)}$$

*Use 500 for water, 485 for antifreeze.

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CUT ALONG DOTTED LINE